# ICES IBTSWG 2018 REPORT

ECOSYSTEM OBSERVATION STEERING GROUP

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# Report of the International Bottom Trawl Survey Working Group (IBTSWG)

19 - 23 March 2018

Oranmore, Ireland

ICES International Council for the Exploration of the Sea

CIEM Conseil International pour l'Exploration de la Mer

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IBTS

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INTERNATIONAL-BOTTOM-TRAWL-SURVEY

Francisco Velasco, Dave Stokes, Erik Olsen, Anne Sell, Francisco Baldo, Kai Wieland, Finlay Burns, Corina Chaves, Pia Schubert, Rob Kynoch, Natoya Jourdain (Note: Group photo taken on day 5, see Annex 1 for full list of participants)

## Executive summary

The report summarizes the national contributions in 2017–2018 and planning for 2018–2019 for the surveys coordinated by the International Bottom Trawl Survey Working Group (IBTSWG). In the North Sea, the surveys are performed in quarters 1 and 3 while in the Northeast Atlantic the surveys are conducted in quarters 1, 3, and 4 with a suite of 14 national surveys covering shelf areas from north off Scotland to the Gulf of Cádiz. Results achieved during the 3 year cycle are briefly summarized or reference to previous reports is given.

**North Sea Q1, 2018:** Seven countries using six different vessels participated and performed 364 valid GOV hauls and 567 valid MIK hauls in the period between 17th January and 28th February. All rectangles were covered by at least 1 GOV haul. There were, however, a number of rectangles, which could not be sampled with the MIK due to technical problems with the Scottish and the German vessel. Consequently, 8 rectangles in the northwest of the survey area weren't sampled at all. This was managed despite poor weather conditions, and required some shifts in stations between countries. In particular, Norway and Denmark did some additional GOV and MIK in rectangles, which had originally been allocated to Germany. Denmark and Sweden used both "DANA" and France used "Tridens" for a few days because "Thalassa" was not available in the beginning of the survey. As usual, all countries used their own survey gear. Overall, most of the countries reported small to very small catches with the GOV.

**North Sea Q3, 2017:** Six countries using five different vessels participated and performed 337 valid GOV hauls in period 17 July to 2 September. Denmark and Sweden used both "DANA" but with their own survey gear. The total number of hauls was lower than in the two previous years since all counties resembled using 30 min standard tows only after the use of 15 min tows were abandoned. While some rectangles did not achieve coverage of two hauls, the number of rectangles with only one haul was less than in any year since 2010 due to some reallocation of rectangles to the different countries.

**Northeast Atlantic 2017:** Seven vessels from five countries performed 13 surveys in the North-eastern Atlantic IBTS area. A total of 950 valid hauls, out of the 1062 hauls planned, were accomplished within 277 days distributed between the first, third and fourth quarters. Besides, 110 hauls and 21 days were done by the RV Celtic Explorer during the mentioned IE-IAMS-Q1. The most remarkable event has been the breakage of the RV Thalassa during the FR-EVHOE survey, which was reduced to 25 valid hauls in northern part of the French shelf on the Biscay Bay. The Marine Institute of Ireland prolonged their groundfish survey on the subarea 7 to perform some extra 22 hauls on the Celtic Sea area to cover the gap left by the breakage.

**General:** The IBTSWG has produced three manuals, the manual for the North Sea IBTS (SISP10) and the Northeast Atlantic IBTS (SISP 15) as well as the manual for the MIK sampling during the North Sea IBTS (SISP 2). The NS-IBTS manual is currently being revised and will be submitted to ICES in their newest version until the end of 2018.

Staff exchange has been a routinely performed in IBTS surveys with great success and advantage to the surveys standardization. The group strongly recommends that this practice continues and involves more countries.

In 2017-2018 most of the IBTS participants recorded time to settle and time to haul, in addition to the times of the nominal standard tow duration and conducted so-called zero-minute tows (i.e. tows that are hauled as soon as the net settles on the bottom).

IBTSWG is willing to support the idea to establish a WG on Marine Litter that would improve on the guidelines, create a field guide, and checks the data provided to the database.

IBTSWG is planning to organize a workshop together with WGFTFB to identify a possible new standard survey gear for the IBTS.

# 1 Administrative details

**Working Group name**

International Bottom Trawl Survey Working Group (IBTSWG)

**Year of Appointment within the current three-year cycle**

2018

**Reporting year concluding the current three-year cycle**

3

**Chair(s)**

Kai Wieland, Denmark

Corina Chaves, Portugal

**Meeting venue(s) and dates**

4-8 April 2016, Sète, France, 21 participantes + 7 participants for MEDITS Seminar

27-31 March 2017, ICES Headquarters, Copenhagen, Denmark, 22 participants

19–23 March 2018, Oranmore, Ireland, 18 participants

## 2 Terms of Reference (a-i)

| ToR | Description | Background | Science plan topics addressed | Duration | Expected deliverables |
|---|---|---|---|---|---|
| a | Coordination and reporting of North Sea and northeastern Atlantic surveys, including appropriate field sampling in accordance to the EU Data Collection Framework | Intersessional planning of Q1- and Q3- surveys; communication of coordinator with cruise leaders; combing the results of individual nations into an overall survey summary. | 30 | Recurrent annual update | 1) Survey summary including collected data and description of alterations to the plan, to relevant assessment-WGs (WGHMM, WGCSE, WGNEW, WGNSSK, HAWG, WGDEEP, WGEF, WGEEL, WGCEPH, WGHANSA) and SCICOM.<br>2) Indices for the relevant species to assessment WGs (see above)<br>3) Planning of the upcoming surveys for the survey coordinators and cruise leaders. |
| b | Review IBTS SISP manuals and consider additional updates and improvements in survey design and standardization | Intersessional activity, ongoing in order to improve survey quality | 31 | Permanently ongoing | Updated version of survey manual, whenever substantial changes are made (intersessionally) |
| c | Address DATRAS-related topics in cooperation with DUAP: data quality checks and the progress in re-uploading corrected datasets, quality checks of indices calculated, and prioritizing further developments in DATRAS. | 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 | 30 | Multi-annual activity, supported by WKDATR workshop in January of 2013 to solve issues with highest priorities; | 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 (Compare Action List in 2013 report).<br>Once data quality control routines are estabished, annual check of recent survey data. |
| d | Produce a swept-area-based index (instead of haul time-based index) to be explored in collaboration with the WGISDAA | Swept-area is suggested as an alternative to haul time, because it would remove possible bias resulting from different riggings or gear specifications. In order to evaluate the effect changing to new indices, IBTSWG intends to liase with relevant stock coordinators or assessment groups at ICES. | 28 | 1 year | Manuscript for paper or CRR, analysing the<br>potential advantages of moving to swept-area-based standardization. To be presented to assessment groups for evaluation by 2016 (postponed to 2018). |

| ToR | Description | Background | Science plan topics addressed | Duration | Expected deliverables |
|---|---|---|---|---|---|
| e | Analyse and report on the effect of variable sweep length, groundgears and GOV riggings between the participating countries | Some aspects of the gear applied in the surveys are not required to be standardized. The effect of these variations are to be evaluated. Partly, different standards for sweep lengths have been applied in Q1 vs. Q3 surveys, and different groundgears and riggings are applied.<br>(For this ToR, the IBTS WG seeks support from gear technology experts and welcomes their contribution, in particular for advice on a potential change of the survey gear.) | 28 | 2 years | Working document(s) by 2016, Manuscript or CRR by 2017 |
| f | Evaluate the present scheme of collection of age and other biological data | Analysis of spatial distribution of sampling of age and other biological data, options to increase efficiency and minimum required sample sizes | | 2 years | Working document(s) by 2016, Manuscript by 2017 |
| g | 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. | Specific issues to be addressed include: Effect of tow duration; Suitability of species-specific index areas; Stratification and optimal spatial distribution of effort. | | 3 years | Paper on tow duration experiment in NS-IBTS 3Q 2015 by 2016,<br>Manuscript for paper or CRR by 2018. |
| h | Data overviews | ICES is building an overview of the different data products and how the information flows from survey to advice, and input is needed from the survey groups in this process. | 25, 27 | Sept 2016 | Quality assure the data product overviews |
| i | Give input to WKSUREP on data reporting guidelines. | The information flow between data users and the data providers needs to be strengthened | 31 | Sept 2016 | Comment on WKSUREP draft data reporting guidelines. |

# 3 Summary of Work Plan

| | |
|---|---|
| **Year 1 (2016)** | Evaluate the effect of changing to swept-area-based indices for additional examples/stocks, particularly linked to WGISDAA and benchmark process (ToR d).<br>Evaluate the results of the tow duration experiment from the NS-IBTS 3Q 2015 survey. |
| **Year 2 (2017)** | Continue analyses of different GOV configurations (ToR e). |
| **Year 3 (2018)** | Complete the evaluation of the current survey design and explore modifications or alternative survey designs (ToR g), Update survey manuals if necessary (ToRs e, f, and g) |
| **Recurrent annual activity** | Updates for ToRs a, b, and c. |

# 4 Summary of Achievements of the WG during 3-year term

**2018:**

- Description of survey products: Survey summaries of IBTS coordinated surveys for Q3/Q4 2017 and Q1 2018;
- Update of survey manual for the International Bottom Trawl Surveys in the North Sea has almost been completed and will soon be sent to the ICES secretariat for publication;
- Zero-minute tows have been conducted in NS-IBTS and NeAtl-IBTS. Results of preliminary analyses are given in this report and datasets have been prepared for a comprehensive analysis;
- Input data for NS-IBTS swept area estimates have been checked and are made available to the ICES Data Centre for the period back to 2004;
- Trials with modified GOV's have been conducted and analysed, and a roadmap for replacing the current standard survey trawl with a modern, more robust, cost efficient and easier to handle survey has been defined;
- The outline of a cooperative research report on the effect of tow duration on catch rates and species richness has been drafted.

**2017:**

- Description of survey products: Survey summaries of IBTS coordinated surveys for Q3/Q4 2016 and Q1 2017;
- Updates of the survey manuals for the International Bottom Trawl Surveys in the North Sea and the Northeast Atlantic areas as well as for the MIK sampling in the Q1 NS-IBTS. The manuals will be submitted to review by SGESST by July 2017;
- Tow duration experiment have been conducted in Q3 2016 NS-IBTS and analysed together with the data from Q3 2015 NS-IBTS;
- Input data and algorithms for NS-IBTS swept area estimates have been checked for almost all countries;
- First results from analyses on survey stratification based on fish communities and other ecological information have been presented for the NS-IBTS and the Western English Channel NeAtl-IBTS.

**2016:**

- Description of survey products: Survey summaries of IBTS-coordinated surveys for Q3/Q4 2015 and Q1 2016;
- Updates of survey manual for the International Bottom Trawl Surveys in the North Sea and in the northeastern Atlantic Areas. Northeastern Atlantic to be submitted to review by SGESST by June 2016;
- Review of WKPIMP outcome (Workshop to plan an integrated monitoring plan in the North Sea in the third quarter), initiated by WGISUR 2015, and held in February 2016;
- Tow duration experiment in Q3 2015 has been conducted and analysed;
- Initial analysis on the efficiency of the current sampling scheme of otoliths in the NS-IBTS has been performed;
- NS-IBTS data on net geometry since 2004 has been cleaned and a interpolation routines for missing values have been established;
- Swept-area based CPUE has been used in the analyses of the NS-IBTS 3Q 2015 tow duration experiment.

# 5 Coordination of North Sea and Northeast Atlantic surveys (ToR a)

## 5.1 North Sea Q1

**(Coordinator: Ralf van Hal)**

### 5.1.1 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 area 3a, 4 and 7d. During daytime a bottom trawl, the GOV (Grand Ouverture Verticale), with groundgear A or B, was used. A CTD was deployed at most trawl stations to collect temperature and salinity profiles. During night-time herring larvae were sampled with a MIK-net (Methot Isaac Kitt). Age data were collected for the target species cod, haddock, whiting, saithe, Norway pout, herring, mackerel, and sprat, and a number of additional species.

The full quarter 1 2018 fleet consisted of six vessels: "Dana" (Sweden and Denmark), "GO Sars" (Norway), "Scotia" (Scotland), "Thalassa" (France), "Tridens II" (France and Netherlands) and "Walther Herwig III" (Germany). The survey covered the period 17 January to 28 February 2018 (Table 5.1.1.1).

A total of 372 GOV hauls (8 of which were invalid) (Table 5.1.1.2) and 567 MIK hauls (Table 5.1.1.3) were deployed. This means that all rectangles were covered by at least 1 GOV haul (Figure 5.1.1.1). There were, however, a number of rectangles, which couldn't be sampled with the MIK due to technical problems with the Scottish vessel. Consequently, 8 rectangles in the northwest of the survey area weren't sampled at all. This was managed despite the bad weather conditions, and required some shifts in stations between countries.

Biological data are collected from a number of species, for most of these species length, weight, gender and maturity and age material were collected (Table 5.1.1.4). An impression of the catches is given in Figure 5.1.1.2, by presenting the total fish catch in kilograms. Gear geometry plots are given in Figures 5.1.1.3a to 5.1.1.3d (lines represent theoretical values for the GOV from flume tank experiments, ICES 2015)

A specific comment is to be made on the French participation in 2018: Their first week of the survey was onboard the Dutch vessel Tridens 2. Due to storms encountered they only managed to do 4 GOV hauls on board of the Tridens. One of the issues encountered by the French, using the Dutch vessel, was that they have to obey the Dutch laws including the Law on Animal Experiments. This law requires a survey plan to be approved, taking 6-12 weeks, if the intention is to take tissue (otoliths) of animals. As this was not possible for the French they were not allowed to take otoliths on board of the Tridens.

Overall, most of the countries reported small to very small catches. In the Dutch case the total number of fish caught in 2018 is not even 80% of the number of sprat caught in 2017, and whilst completing an almost equivalent number of stations. This was not only the case for fish species but also the case for benthic species being recorded. The small catches are visualized in the biomass plot (Figure 5.1.1.2). Discussions have taken place during this meeting, if these small catches are related to the actual small biomass currently present in the North Sea or if it could be related to the storms affecting the catchability of the survey.

**Table 5.1.1.1. Overview of the surveys performed during the North Sea IBTS Q1 survey in 2018.**

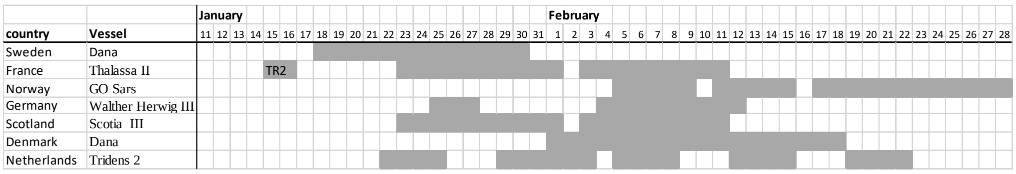



**Table 5.1.1.2. Overview of the GOV stations fish in the North Sea IBTS Q1 survey in 2018.**

| ICES Divisions | Country | Gear | Tows planned | Valid | Invalid | % stations fished |
|---|---|---|---|---|---|---|
| 3a | SWE | GOV-A | 43 | 43 | 1 | 102% |
| 3a | DEN | GOV-A | 0 | 3 | | |
| 4 | GFR | GOV-A | 74 | 44 | | 59% |
| | SWE | GOV-A | 3 | 3 | | 150% |
| | NO | GOV-A | 41 | 55 | 3 | 134% |
| | FRA | GOV-A | 43 | 51 | | 116% |
| | DEN | GOV-A | 40 | 46 | | 115% |
| | NED | GOV-A | 55 | 56 | | 102% |
| | SCO | GOV-A | 12 | 11 | | 92% |
| | SCO | GOV-B | 47 | 46 | 3 | 98% |
| 7d | FRA | GOV-A | 10 | 9 | 1 | 100% |

**Table 5.1.1.3. Overview of the MIK stations fish in the North Sea IBTS Q1 survey in 2018.**

| ICES Divisions | Country | Gear | Tows planned | Valid | % stations fished |
|---|---|---|---|---|---|
| 3a | SWE | MIK | 66 | 50 | 76% |
| 4 | DEN | MIK | 2 | 2 | 100% |
| | GFR | MIK | 148 | 106 | 72% |
| | SWE | MIK | 6 | 6 | 100% |
| | NO | MIK | 84 | 108 | 129% |
| | FRA | MIK | 86 | 81 | 94% |
| | DEN | MIK | 80 | 81 | 101% |
| | NED | MIK | 110 | 95 | 86% |
| | SCO | MIK | 116 | 22 | 19% |
| 7d | FRA | MIK | 20 | 16 | 80% |
| total | | | 718 | 567 | 79% |

**Table 5.1.1.4. Overview of individual length, weight and/or maturity and/or age samples collected during the North Sea IBTS Q1 survey in 2018.**

| Species | DEN | FRA | GFR | NED | NOR | SCO | SWE | Total |
|---|---|---|---|---|---|---|---|---|
| *Clupea harengus* | 529 | 347 | 825 | 534 | 2558 | 636 | 1332 | 6761 |
| *Merlangius merlangus* | 625 | 655 | 339 | 493 | 781 | 829 | 836 | 4558 |
| *Sprattus sprattus* | 319 | 207 | 515 | 341 | | 268 | 2074 | 3724 |
| *Melanogrammus aeglefinus* | 149 | 1 | 399 | 228 | 1024 | 1151 | 126 | 3078 |
| *Scomber scombrus* | 93 | | 223 | 42 | 2344 | 173 | | 2875 |
| *Pleuronectes platessa* | 457 | 435 | 157 | 294 | 55 | 168 | 495 | 2061 |
| *Trisopterus esmarkii* | 53 | | 76 | 93 | 1098 | 382 | 232 | 1934 |
| *Gadus morhua* | 121 | 29 | 100 | 35 | 189 | 732 | 394 | 1600 |
| *Pollachius virens* | 19 | 1 | 4 | 1 | 387 | 319 | 88 | 819 |
| *Eutrigla gurnardus* | 207 | | 465 | | | | | 672 |
| *Microstomus kitt* | 120 | 41 | 59 | | | 93 | | 313 |
| *Merluccius merluccius* | 14 | | 15 | | | 124 | 105 | 258 |
| *Limanda limanda* | 207 | | | | | | | 207 |
| *Solea solea* | | 68 | | | | | 62 | 130 |
| *Trisopterus luscus* | | 110 | | | | | | 110 |
| *Squalus acanthias* | | | 13 | | | 97 | | 110 |
| Micromesistius poutassou | | | | | 91 | | | 91 |
| *Glyptocephalus cynoglossus* | 18 | | | | | | 54 | 72 |
| *Mullus surmuletus* | | 68 | | | | | | 68 |
| *Scyliorhinus canicula* | | | 50 | 8 | 9 | | | 67 |
| *Raja montagui* | | | | 1 | 1 | 64 | | 66 |
| *Lepidorhombus whiffiagonis* | | | | | | 48 | | 48 |
| *Leucoraja naevus* | | | 11 | | 4 | 32 | | 47 |
| *Mustelus asterias* | | | 17 | 9 | 1 | 12 | | 39 |
| *Lophius piscatorius* | | | 2 | | | 30 | | 32 |
| *Dicentrarchus labrax* | | 30 | | | | | | 30 |
| *Sardina pilchardus* | | | 27 | | | | | 27 |
| *Amblyraja radiata* | | | 3 | | 15 | 5 | | 23 |
| *Etmopterus spinax* | | | | | 20 | | | 20 |
| *Chelidonichthys cuculus* | | 18 | | | | | | 18 |
| *Dipturus intermedia* | | | | | | 11 | | 11 |
| *Trachurus trachurus* | | | | | 8 | | | 8 |
| Raja clavata | | | | 5 | | 3 | | 8 |
| *Dipturus flossada* | | | | | | 7 | | 7 |
| *Engraulis encrasicolus* | | | 7 | | | | | 7 |
| *Scophthalmus maximus* | | 2 | 2 | | | 3 | | 7 |
| *Lithodes maja* | | | | | 4 | | | 4 |
| *Scophthalmus rhombus* | | 2 | | | | 2 | | 4 |
| *Lophius budegassa* | | | 1 | | | | | 1 |
| *Hippoglossus hippoglossus* | | | | 1 | | | | 1 |
| *Galeus melastomus* | | | | | 1 | | | 1 |
| *Cancer pagurus* | | | | | 1 | | | 1 |
| *Nephrops norvegicus* | | | | | 1 | | | 1 |

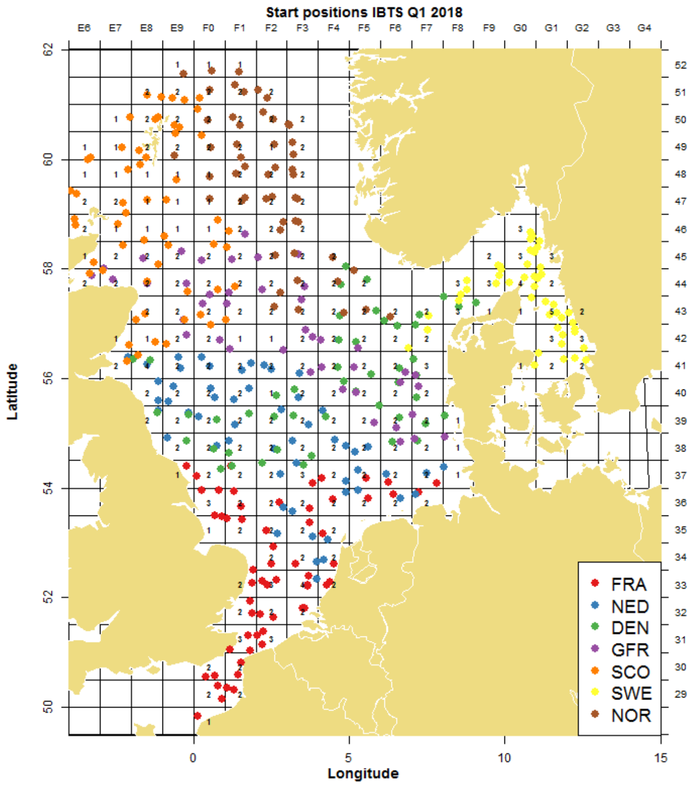



**Figure 5.1.1.1 Number of hauls per ICES rectangle with GOV during the North Sea IBTS Q1 2018 and the start positions of the trawls by country.**

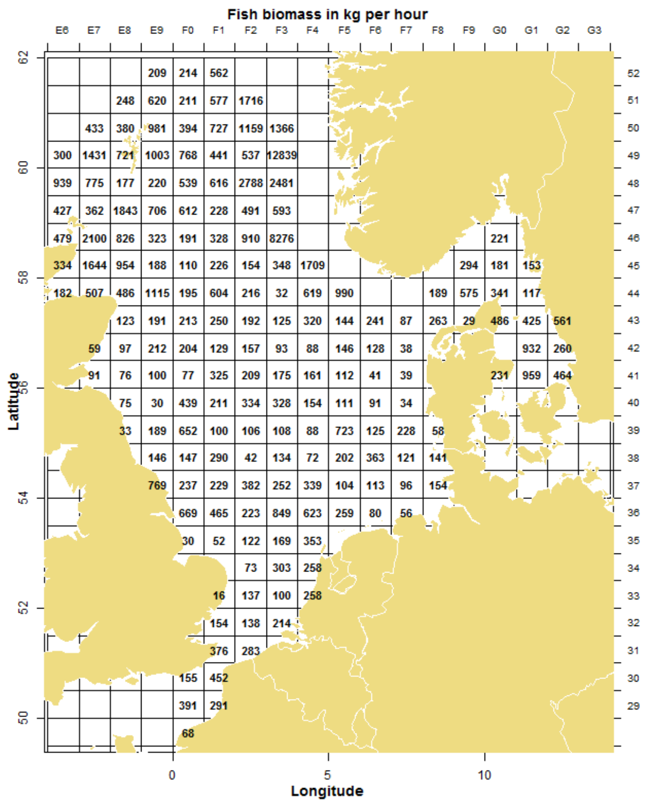



**Figure 5.1.1.2 Distribution of fish biomass in IBTS hauls by rectangle in the North Sea, Q1 2018 (values standardized to kg per hour haul duration; mean per rectangle).**

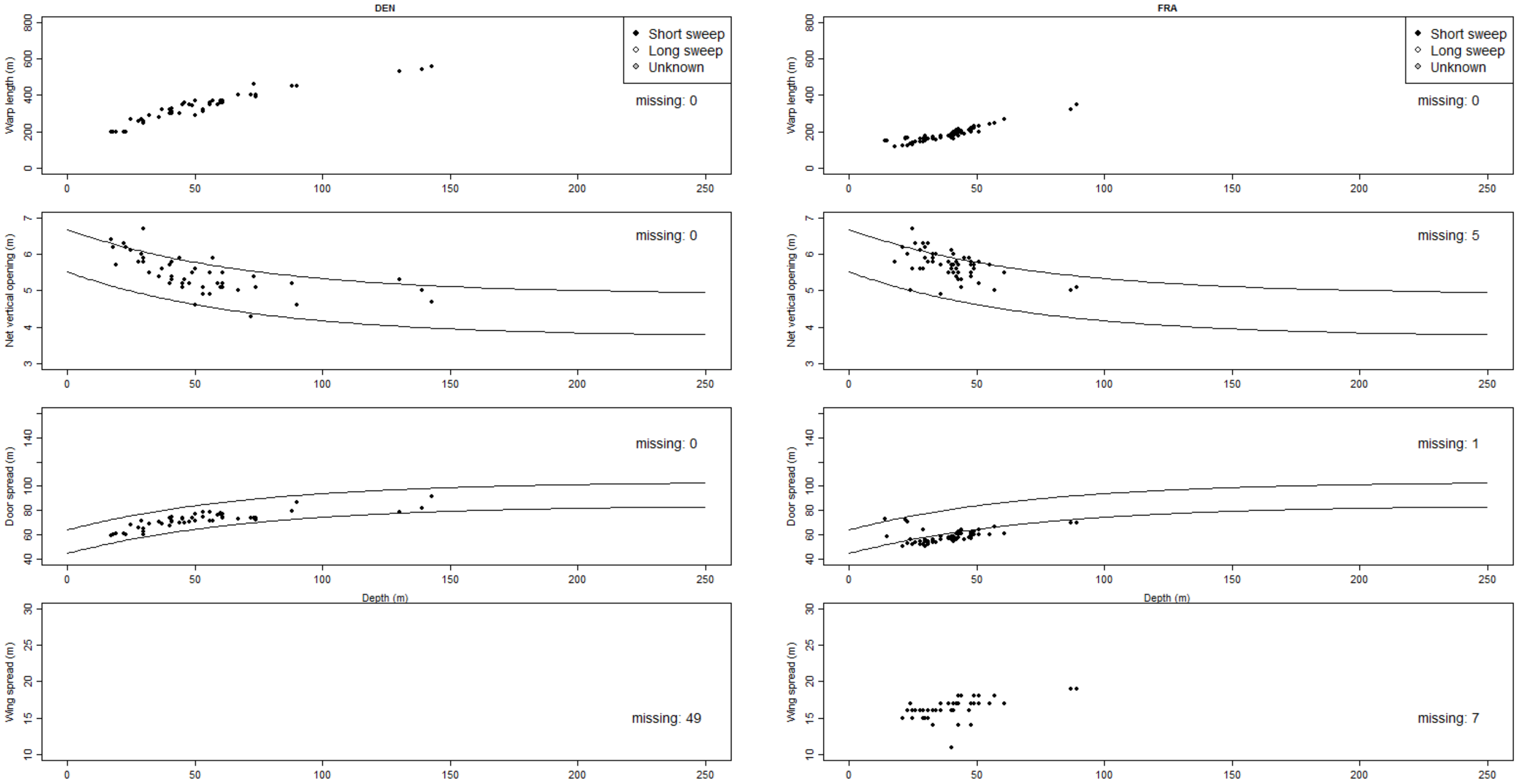



**Figure 5.1.1.3a Danish and French warp length and gear geometry**

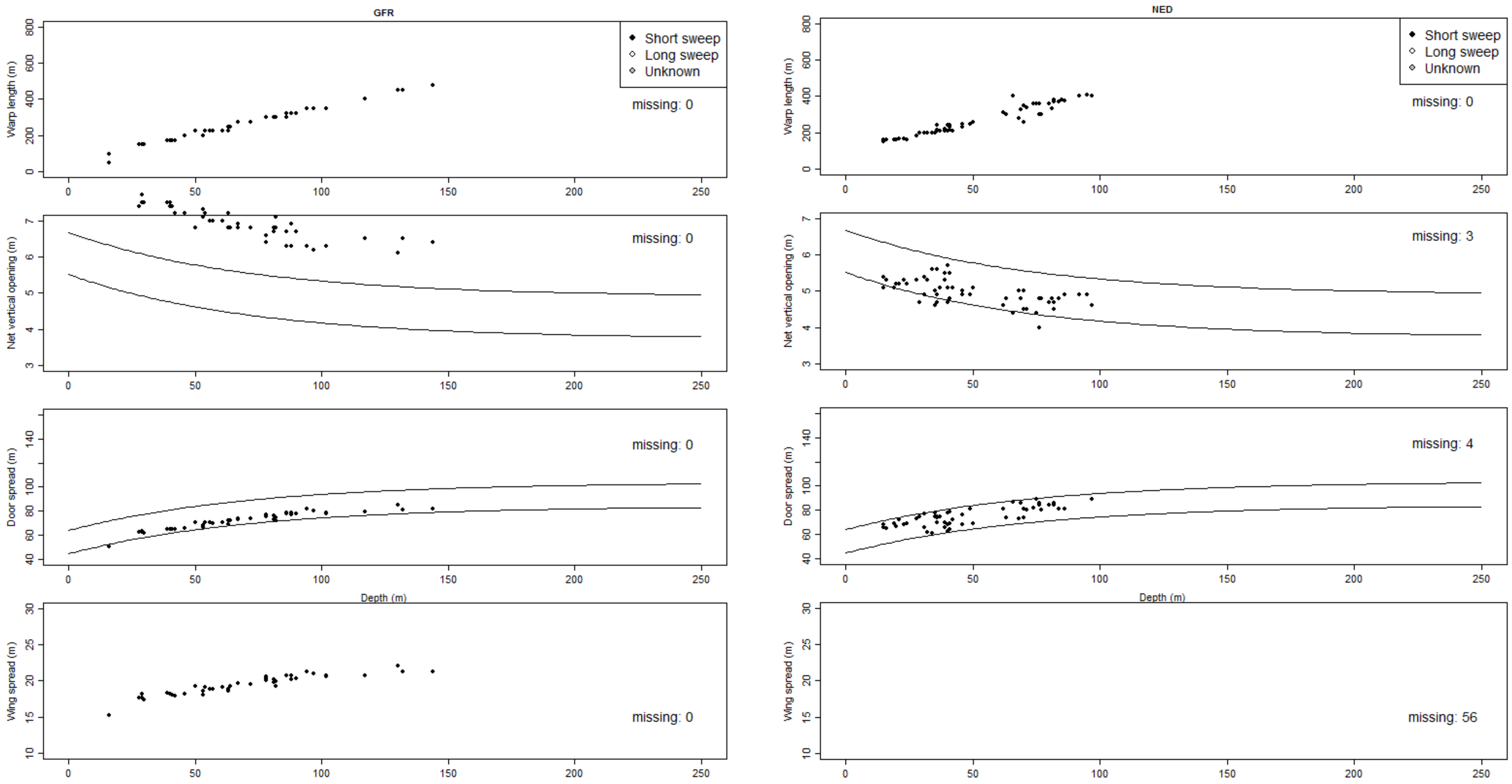



**Figure 5.1.1.3b German and Dutch warp length and gear geometry.**

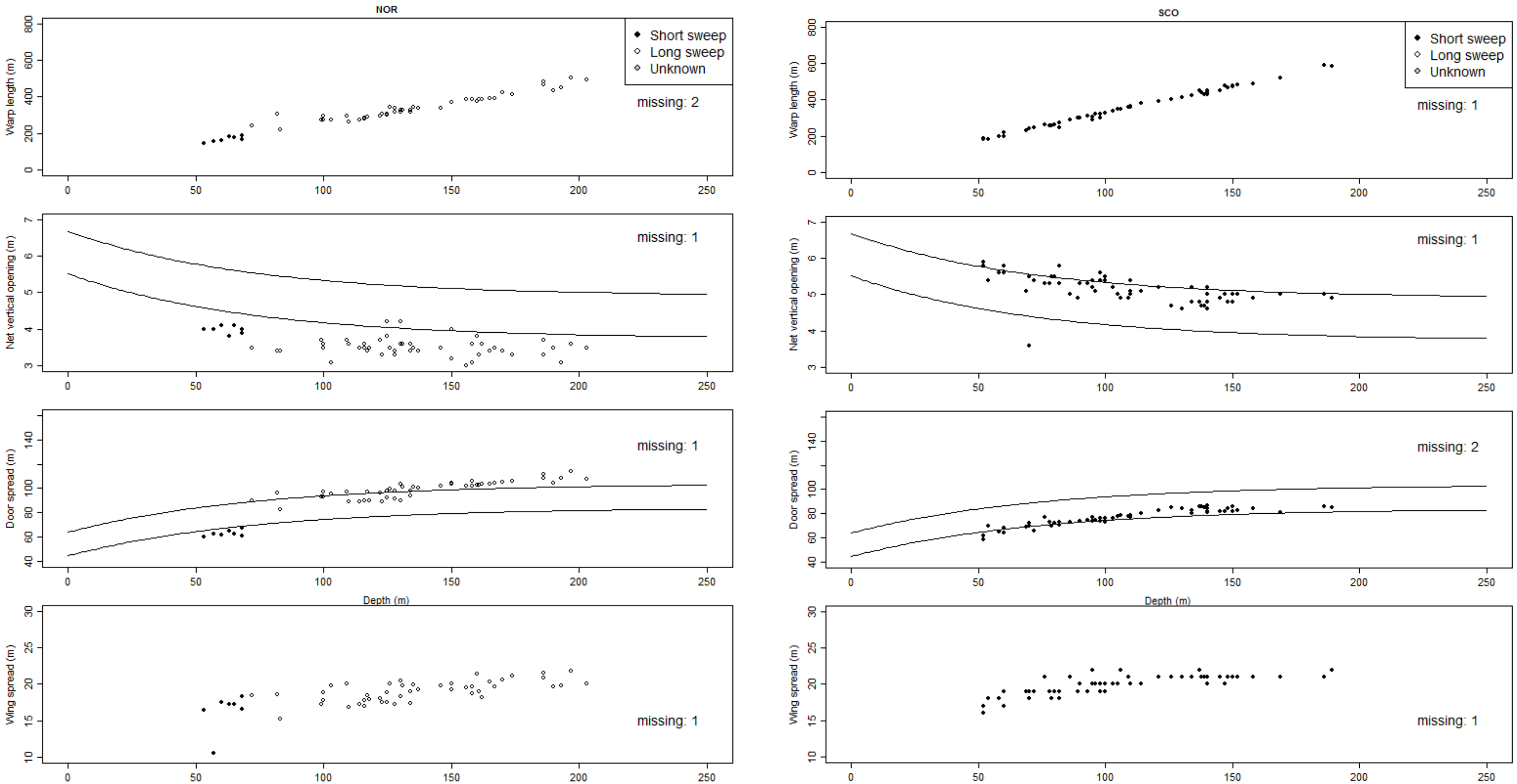



**Figure 5.1.1.3c Norwegian and Scottish warp length and gear geometry.**

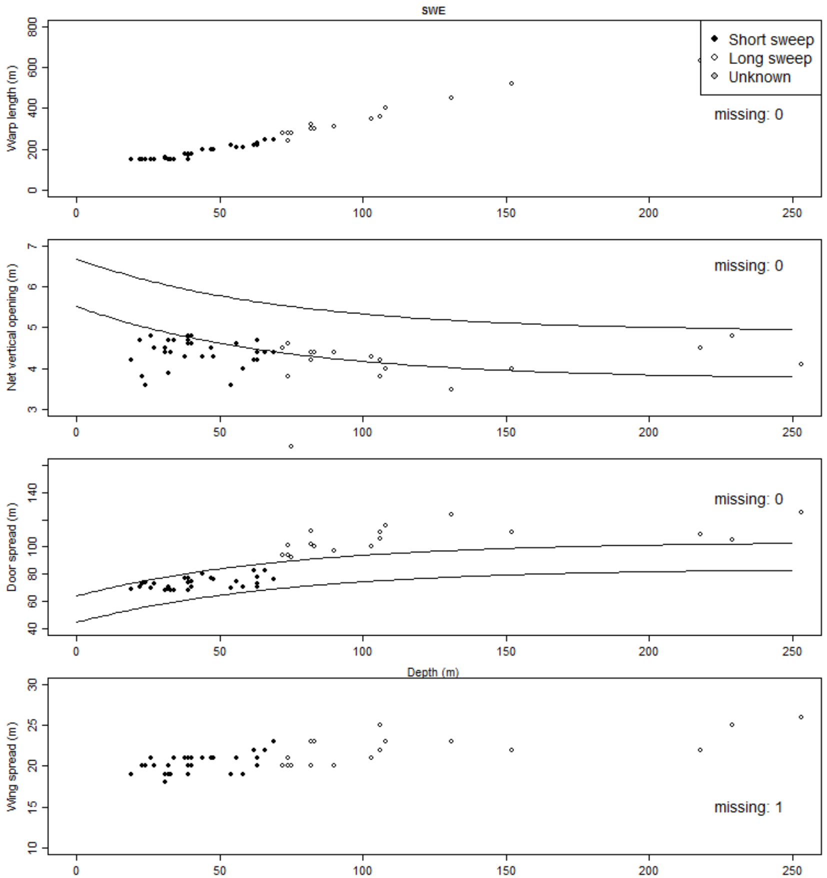



**Figure 5.1.1.3d Swedish warp length and gear geometry.**

### 5.1.2 Issues and problems encountered

Bad weather with strong winds affected sampling for most of the survey. The German vessel also encountered problems with the engine and had to return to its home port for repairs, which cost 3 full survey days in total. On the Scottish vessel the crane for deploying the MIK was taken out of action pending an ongoing internal review surrounding its appropriate use. This resulted in MIK sampling being curtailed after just 22 hauls. A number of rectangles therefore remained unsampled with respect to the MIK (see below).

As during last year's survey, the German participation was again affected by a large oil and gas development area in ICES rectangles 42F1 and 42F2 (see last year's report, ICES 2017). Trawling was also affected by enlarged protection areas around submarine installations, e.g. pipelines, cables, drilling sites) in the British EEZ.

### 5.1.3 Additional activities

Next to the GOV and MIK tows 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 5.1.3.1.

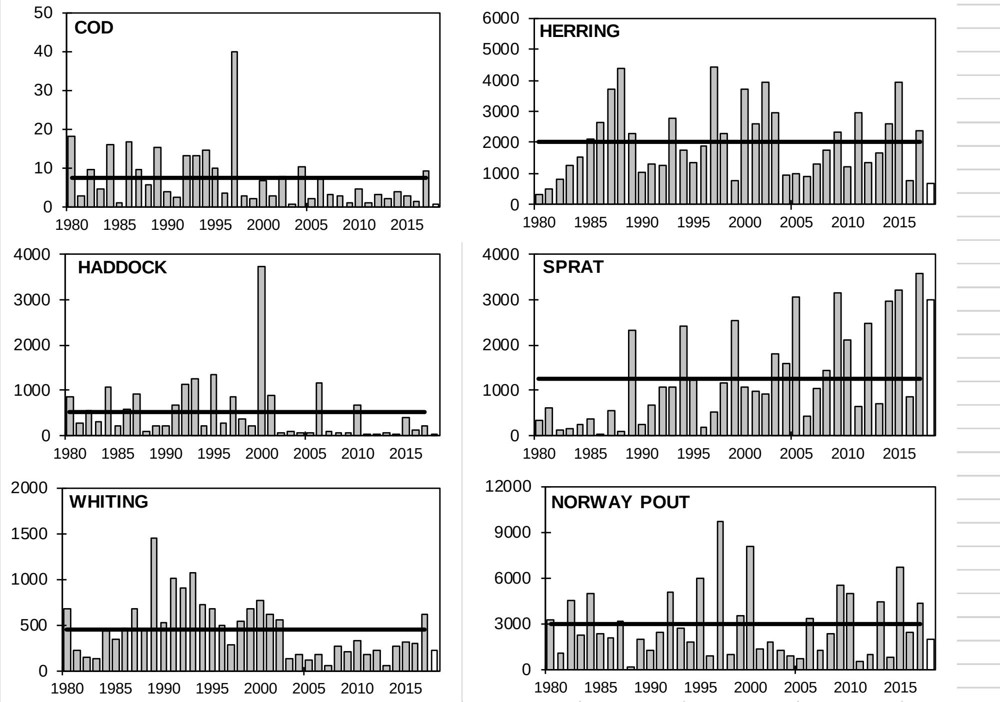
**Table 5.1.3.1 Overview of additional activities in the North Sea IBTS Q1 survey in 2018**

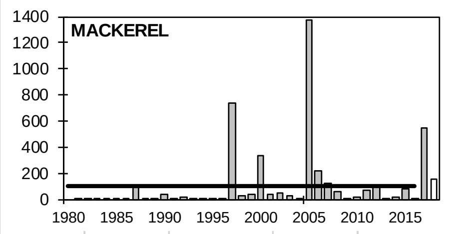
| Activity | GFR | NOR | SCO | DEN | NED | SWE | FRA |
|---|---|---|---|---|---|---|---|
| CTD(temperature-salinity) | x | x | x | x | x | x | x |
| Seafloor litter | x | x | x | x | x | x | x |
| Water sampler (Nutrients) | | | x | x | x | | x |
| Egg samples (Small fine-meshed ringnet; CUFES) | x | x | x | x | x | | x |
| By-caught benthic animals | | x | | | | | x |
| Observer for mammals and/or birds | | | | | | | x |
| Additional biological data on fish | | x | x | x | | x | |
| Bentic samples (boxcore, video, dredge) | | | | | | | |
| Zoo and phytoplankton | | x | | | | | |
| Jellyfish | | x | | | | | x |
| Hydrological transects | | x | | | | | x |
| Beam trawl (juvenile fish - age 0) | | x | | | | | |

### 5.1.4 GOV

The preliminary indices for the recruits of seven commercial species based on the 2018 quarter 1 survey are shown in Figure 5.1.4.1. According to these preliminary results, sprat is above the mean while all the other species are below the long-term mean.

| **International Bottom Trawl Survey: 1-group indices as average N/hour fishing** | | | 3/14/2018 |
|---|---|---|---|
| *1980-2017 Final indices, 2018 preliminary values based on:* | 364 | hauls | |




| | final 2017 | preliminary 2018 | MEAN av 80-17 |
|---|---|---|---|
| cod | 9.4 | **0.9** | 7 |
| haddock | 218.5 | **34** | 513 |
| whiting | 612.9 | **216** | 456 |
| Norway pout | 4357.2 | **1941** | 2948 |
| herring | 2396.2 | **669** | 2020 |
| sprat | 3588.4 | **2998** | 1262 |
| mackerel | 551.3 | **158** | 107 |

**Figure 5.1.4.1. Time-series of indices for 1-group (1-ring) herring, sprat, haddock, cod, whiting, Norway pout, and mackerel caught during the quarter 1 IBTS survey in the North Sea, Skagerrak and Kattegat. Indices for the last year are preliminary, and based on a length split of the catches. Horizontal line is the mean 1980-2017.**

Distribution maps of the 1-group of NS-IBTS target species with the limits of the species-specific stock assessment or index areas are given in Figures 5.1.4.2a to 5.1.4.2e.

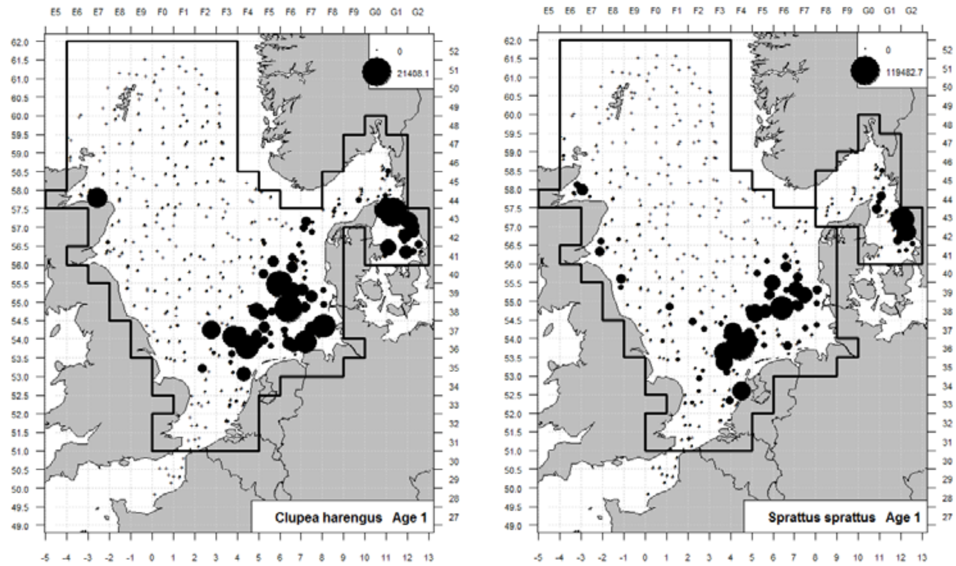



**Figure 5.1.4.2a Distribution of herring and sprat age 1 in the quarter 1 IBTS 2018 (thick lines: index areas for sprat in Q1 but for herring in Q3).**

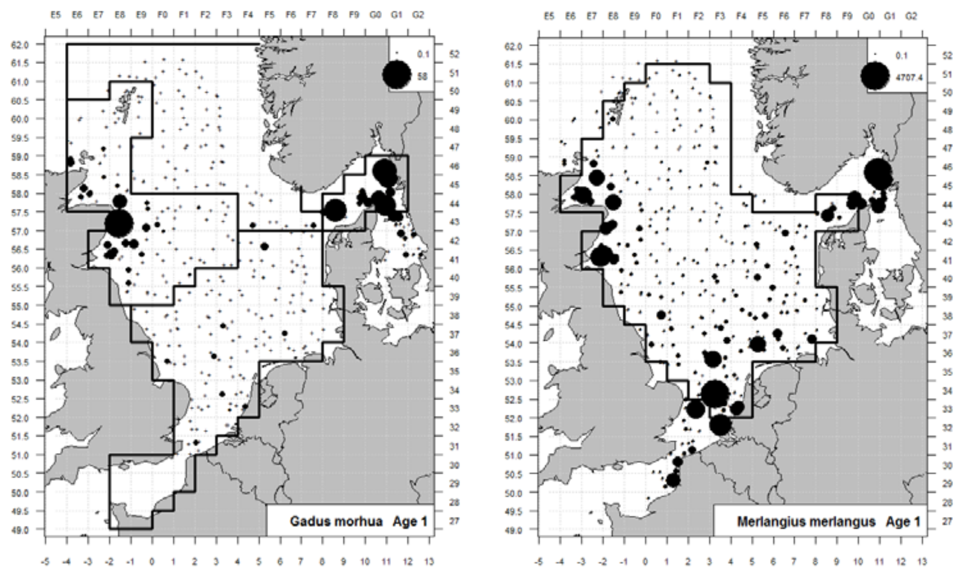



**Figure 5.1.4.2b Distribution of cod and whiting age 1 in the quarter 1 IBTS 2018 (thick lines: Subpopulation separation for cod, index areas for whiting).**

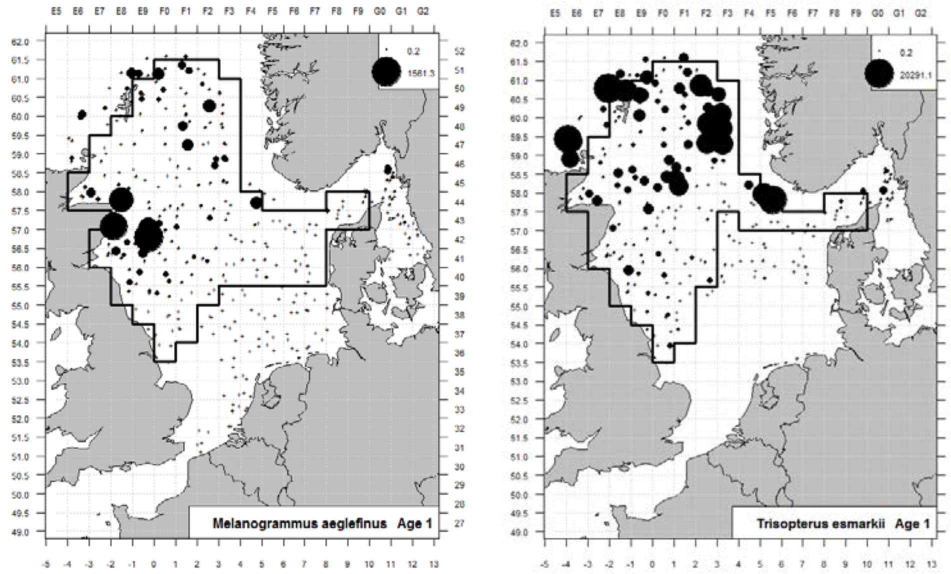



**Figure 5.1.4.2c Distribution of haddock and Norway pout age 1 in the quarter 1 IBTS 2018 (thick lines: index areas).**

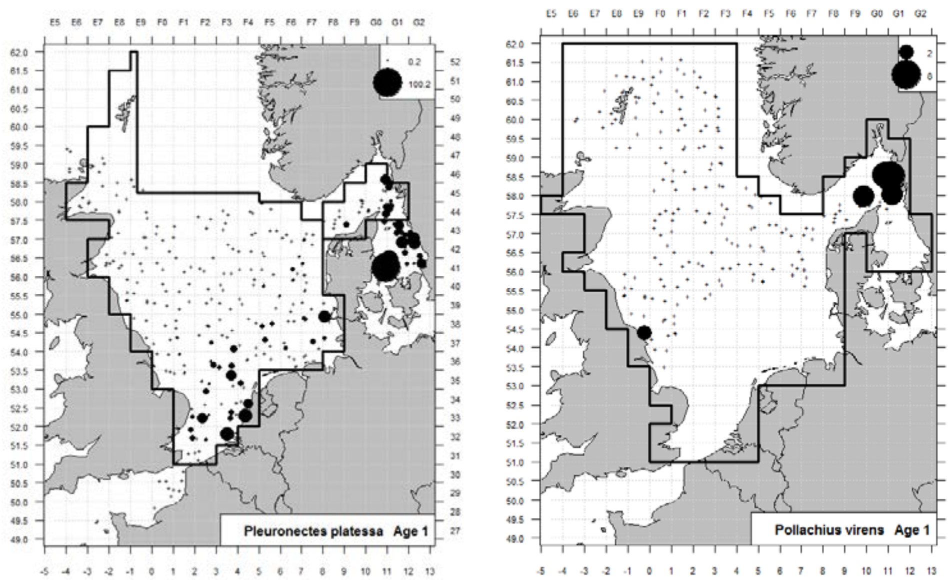



**Figure 5.1.4.2d Distribution of plaice and saithe age 1 in the quarter 1 IBTS 2018 (thick line: old index areas).**

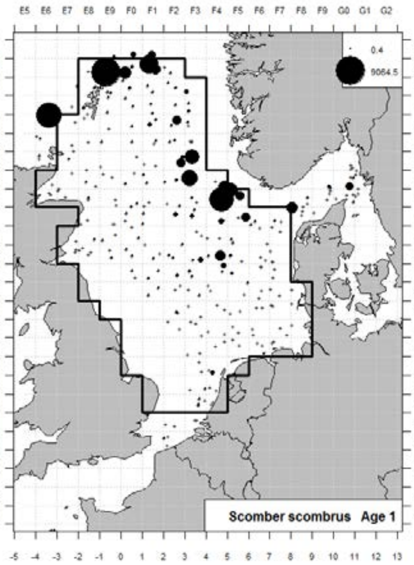



**Figure 5.1.4.2e Distribution of mackerel age 1 in the quarter 1 IBTS 2018 (thick line: index area).**

### 5.1.5 MIK

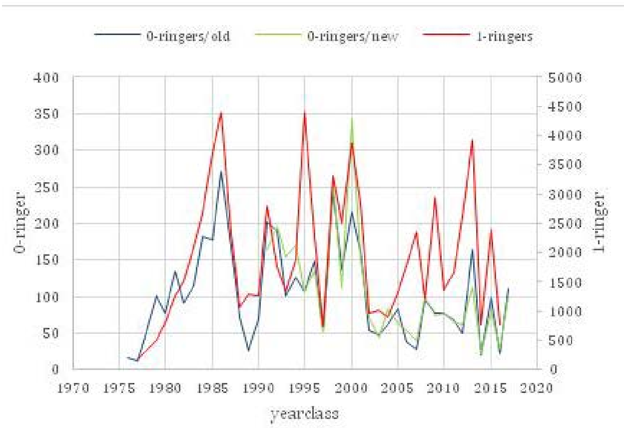
For the ICES Herring Assessment Working Group (HAWG), the IBTS survey provides recruitment indices and abundance estimates of adults of herring and sprat for the North Sea area South of 62°N. Sampling at night with fine-meshed nets (MIK; Midwater Ring Net) was implemented from 1977 onwards, and the catch of herring larvae has been used for the estimation of 0-ringer abundance in the survey area. The total abundance of 0-ringers in the survey area is used as a recruitment index for the stock. This year, 567 depth-integrated hauls were completed with the MIK-net. The coverage of the survey area was sufficient with at least 2 hauls in most of ICES rectangles in the North Sea as well as in Kattegat and Skagerrak. There were, however, a number of rectangles, which couldn't be sampled due to technical problems with the Scottish vessel. Consequently, 8 rectangles in the northwest of the survey area weren't sampled at all. Since herring larvae abundance in that area is low to very low, the consequences for the index are negligible.

Index values are calculated as described in detail in the Stock Annex except for the necessary exclusion of herring larvae of Downs origin. Following the recommendations/suggestions of WGISDAA, WKHERLARS and WKSIDAC a new exclusion rule to reliably remove the Downs herring larvae from the index calculation was introduced. The rules can be summarized as follows:

1. The herring larvae data of every station is used
2. The exclusion rule is applied only in area that is potentially affected drift of Downs larvae, i.e. south of 54°N and west of 6°E and south of 57°N and east of 6° E
3. In that area defined above, only larvae > 18 mm SL are included in the index calculation.

Larvae measured between 7 and 39 mm standard length (SL). Again and as in most years, the smallest larvae < 10 mm were the most numerous but were less abundant than in previous years. Larger larvae > 18 mm SL were rarer but were caught in higher densities than last year. The smallest larvae were chiefly caught in 7d and in the Southern Bight. The large larvae appeared in moderate to high quantities in a wideband across the central and southern North Sea and showed 2 distinct cores of higher abundances: one occurring east of the northern English coast and another in the German Bight. In the Kattegat and Skagerrak area, herring larvae remained relatively rare.

The newly proposed rule was applied to the MIK herring larvae data time-series from 1992 onwards, where because of data quality issues all French data before 2008 were excluded. For most of the time-series the new algorithm produces comparable index values to the old algorithm. However, for some years the results differ substantially from each other. For those year classes, where it was apparent that increased drift of small Downs larvae influenced the index (2013 and 2015), the index decreased (from 164.8 to 113.8, and from 99.8 to 81.2, respectively). Last year's index was slightly increased by application of the new algorithm (27.8 instead of 22.8). The 2018 index is 101.4.



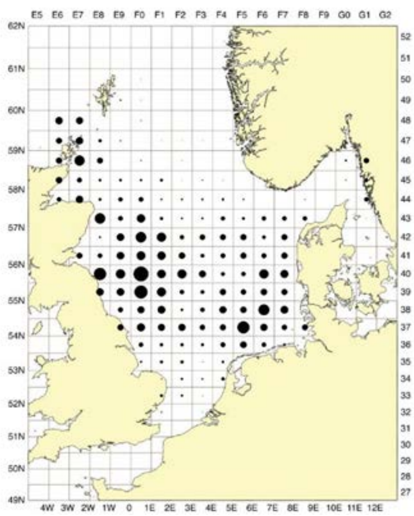



**Figure 5.1.5.1 Distribution of MIK caught herring larvae during the IBTS Q1 2018 (right) and the time-series of 0- and 1-ringer abundance by year class since 1976 (left) The green line represents the 0-ringer index according to the new algorithm since 1991.**

### 5.1.6 Planning and Coordination

Again Germany wasn't able to cover all their rectangles as has been the issue for a number of years now. Denmark and the Netherlands stepped up and offered to take over a small number of the German stations. Denmark is offering to take over 43F4, 42F4, 42F5, where the Netherlands is offering to take over the GOV stations in 41F0 and 41F1. This results in the new map, figure 5.1.6.1.

There has been a request to try to survey some deeper stations in Norwegian waters and the Skagerrak, these are deeper than the current depth limits currently stipulated in the manual. The idea behind this is that cod do occur in areas beyond the current North Sea IBTS depth limit. Sweden, and possibly Norway, will try to plan some deeper stations during Q1 2019.

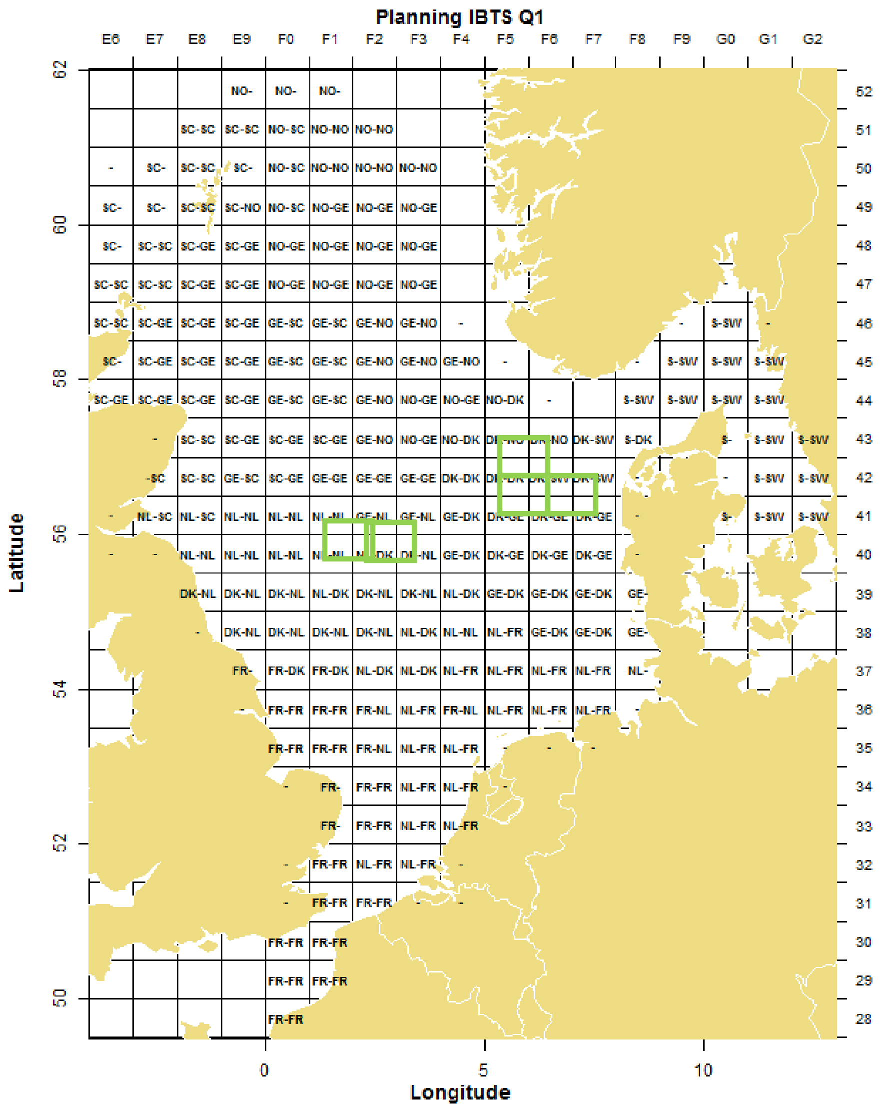



**Figure 5.1.6.1 Allocation map for Q1 2019. In green the rectangles taken by Denmark and the Netherlands.**

### 5.1.7 Staff exchange

France used the Dutch vessel Tridens for part of their Q1 North Sea survey in 2018. During that trip two members of staff from Wageningen Marine Research (WMR) joined the French team to assist them whilst on board. One was a technician with knowledge of the net geometry sensors and the procedures on the bridge. The other is experienced with the methods of sorting the fish on board of Tridens and with the way the MIK is deployed. The latter member from WMR also joined the French team on board the Thallassa and as such was therefore already familiar with the French survey methods. Unfortunately, owing to the bad weather conditions only one day of fishing was possible making it difficult to discuss and compare each other's methods of working.

In exchange a French member of staff joined the Dutch IBTS for a week. Unfortunately, owing once again to the bad weather with conditions believed to be the worst seen in years, only 6 GOV and 4 MIK tows were completed and the vessel dodging for 2.5 days and waiting for the weather to abate. There have been interesting talks of how work is done on both vessels; however the experience was limited due to the weather.

## 5.2 North Sea Q3

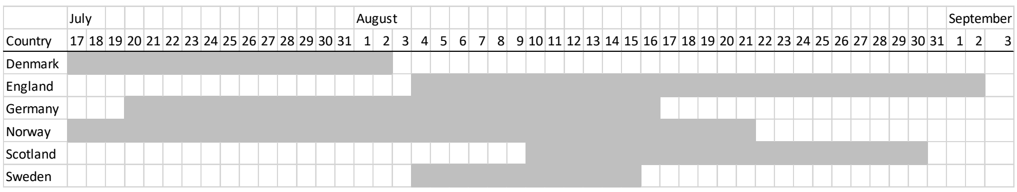
**(Coordinator: Jennifer Devine, Kai Wieland)**

### 5.2.1 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 3a and Subarea 4. The bottom trawl, GOV (Grand Ouverture Verticale) with standard groundgear A for normal bottom conditions or groundgear B for rough ground is used during daytime. A CTD was deployed at most trawl stations to collect temperature and salinity profiles. Age data were collected for cod, haddock, whiting, saithe, Norway pout, plaice, herring, mackerel, and sprat, and a number of additional species.

Six nations (using five vessels) participated in the quarter 3 survey in 2017: Dana (Denmark and Sweden), Walther Herwig III (Germany), Kristine Bonnevie (Norway), Cefas Endeavour (England) and Scotia (Scotland). The overall survey period extended from 17 July to 2 September (Table 5.2.1.1).

**Table 5.2.1.1. Overview of the surveys performed during the North Sea IBTS Q3 survey in 2017.**




In total, 337 valid GOV hauls were made in the planned rectangles (Table 5.2.1.2). No tow duration experiment took place; all hauls were planned 30-min duration (Figure 5.2.1.1). While some rectangles did not achieve coverage of two hauls, the number of rectangles with only one haul was less than in any year since 2010 (Figs 5.2.1.1, 5.2.1.2). Of those with only one haul, most are rectangles that have a small amount of area at depths < 200 m, which is the maximum survey depth limit in the North Sea according to the current manual, are largely covered by land or other obstructions, or are not fishable with the GOV (Figure 5.2.1.1).

Biological data (weight, gender, maturation stage, and age material) were collected for many species (Tables 5.2.1.3 and 5.2.1.4); maturation stage can be difficult to determine outside the spawning period and was therefore not recorded as routinely as in quarter 1. For some species, otoliths have yet not been read and thus age information must be submitted to DATRAS at a later time.

**Table 5.2.1.2. Overview of the GOV stations fished in the North Sea IBTS Q3 survey in 2017 (*: Relative to the number of tows proposed in the manual, **: not reported to DATRAS).**

| ICES Division | Country | Gear used | Number of tows proposed (Manual) | Number of proposed valid tows | Number of additional valid tows | Proportion of achieved valid tows (%) * | Number of zero-minute hauls (non-standard **) |
|---|---|---|---|---|---|---|---|
| 3a | SWE | GOV-A | 45 | 45 | | 100 | 7 |
| 3a | DEN | GOV-A | - | - | 2 | 106 | 11 |
| 4a,b,c | DEN | GOV-A | 47 | 47 | 1 | | |
| 4a,b,c | ENG | GOV-A | 76 | 78 | 2 | 102 | 22 |
| 4a,b,c | GER | GOV-A | 29 | 32 | 3 | 121 | 3 |
| 4a,b | NOR | GOV-A | 47 | 47 | 9 | 119 | 22 |
| 4a | SCO | GOV-B | 44 | 43 | 0 | 86 | 3 |
| 4b | SCO | GOV-A | 40 | 33 | 0 | | |

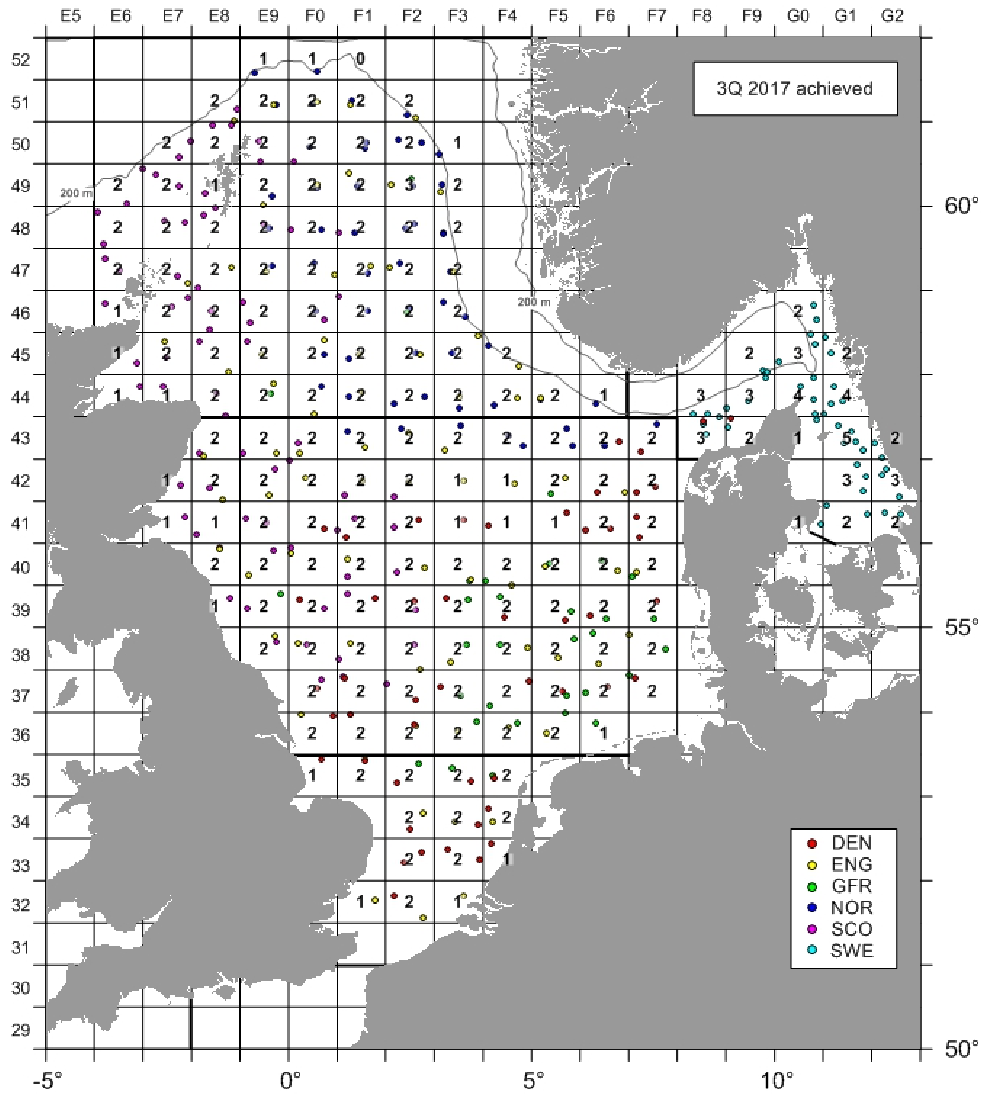



**Figure 5.2.1.1. Number and start position of hauls per ICES statistical rectangle as taken with the GOV during the North Sea IBTS Q3 2017. Tows are separated into ICES Divisions in the North Sea (4a, 4b,and 4c), the Skagerrak/Kattegat (3a), and the English Channel (7d).**

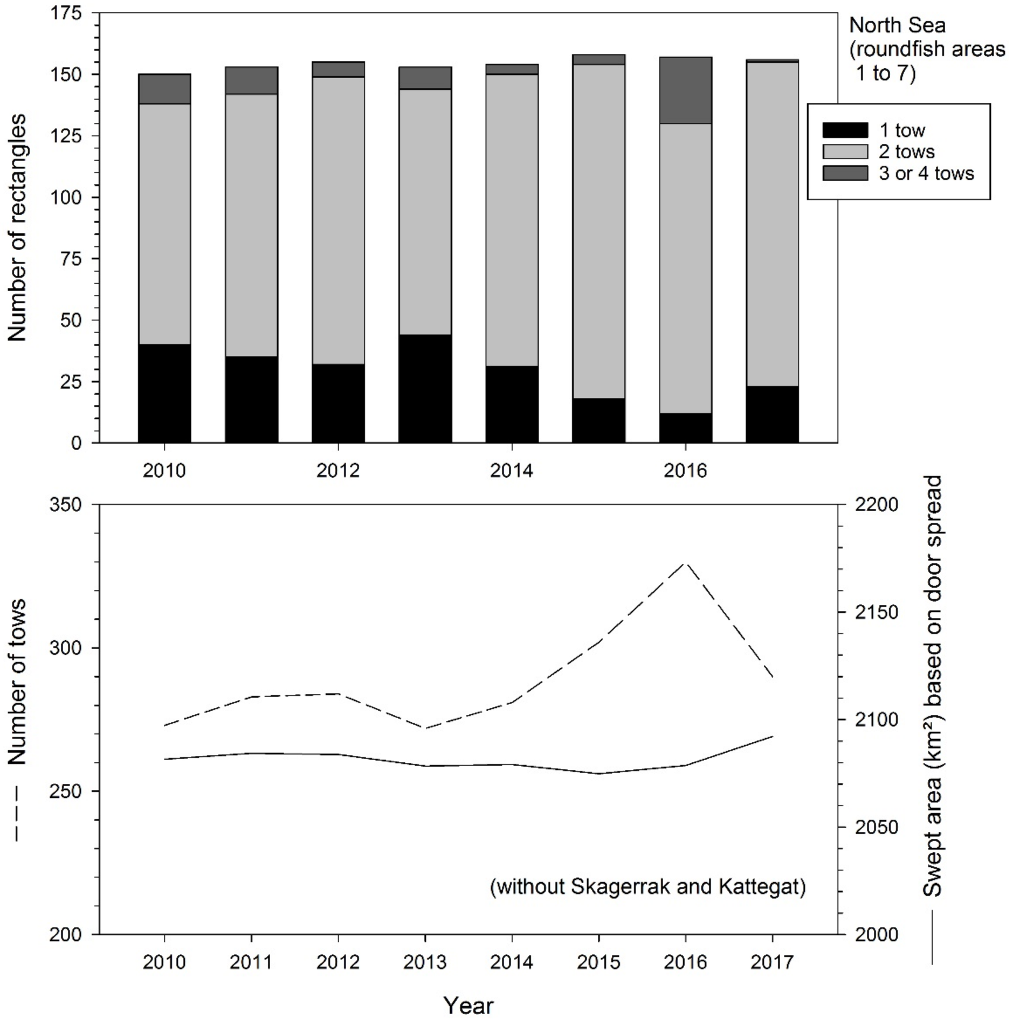



**Figure 5.2.1.2. Changes in survey performance, 2010-2017, reported as number of tows achieved and total amount of swept area in the North Sea (based on door spread and towed distance by haul).**

**Table 5.2.1.3. Overview of age samples collected of NS-IBTS target species during the North Sea IBTS Q3 survey in 2017 (NOR and SCO collect but do currently not read place otoliths).**

| Species | DEN | ENG | GFR | NOR | SCO | SWE | Total |
|---|---|---|---|---|---|---|---|
| *Clupea harengus* | 431 | 1272 | 196 | 568 | 853 | 1042 | 4362 |
| *Sprattus sprattus* | 297 | 0 | 152 | 0 | 87 | 333 | 869 |
| *Scomber scombrus* | 252 | 445 | 186 | 235 | 366 | 0 | 1484 |
| *Gadus morhua* | 108 | 731 | 28 | 395 | 495 | 462 | 2219 |
| *Merlangius merlangus* | 518 | 1766 | 258 | 471 | 1228 | 659 | 4900 |
| *Melanogrammus aeglefinus* | 92 | 1277 | 70 | 584 | 1160 | 171 | 3354 |
| *Pollachius virens* | 8 | 838 | 24 | 625 | 415 | 181 | 2091 |
| *Trisopterus esmarkii* | 21 | 460 | 12 | 240 | 335 | 176 | 1244 |
| *Pleuronectes platessa* | 760 | 1323 | 152 | | | 388 | 2623 |

**Table 5.2.1.4. Overview of additional biological data collected in addition to the regular measurements specified in the manual during the North Sea IBTS Q3 survey in 2017.**

| Species | DEN | ENG | GER | NOR | SCO | SWE | Total |
|---|---|---|---|---|---|---|---|
| *Amblyraja radiata* | | 128 | 4 | 16 | 39 | | 187 |
| *Chelidonichthys cuculus* | | | | 1 | | | 1 |
| *Dipturus batis** | | | | | | | |
| *Dipturus intermedia** | | | | | 9 | | 9 |
| *Enchelyopus cimbrius* | | 112 | | | | | 112 |
| *Galeorhinus galeus* | | 6 | 4 | | | | 10 |
| *Galeus melastomus* | | 11 | | 1 | | | 12 |
| *Hippoglossus hippoglossus* | | | | | 3 | | 3 |
| *Leucoraja circularis* | | | | | | | |
| *Leucoraja fullonica* | | 2 | | | 1 | | 3 |
| *Leucoraja naevus* | | 47 | | 3 | 55 | | 105 |
| *Limanda limanda* | | 237 | | | | | 237 |
| *Lophius piscatorius* | | 82 | | | | | 82 |
| *Lophius budegassa* | | 4 | | | | | 4 |
| *Merluccius merluccius* | 26 | 443 | 1 | | 200 | 148 | 818 |
| *Microstomus kitt* | | 273 | 76 | | | | 349 |
| *Molva molva* | | 47 | | | | | 47 |
| *Mullus surmuletus* | | 33 | | | 2 | | 35 |
| *Mustelus asterias* | | 36 | 8 | | | | 44 |
| *Raja brachyura* | | | | | 2 | | 2 |
| *Raja clavata* | | 11 | 8 | | | | 19 |
| *Raja montagui* | | 23 | 1 | | 41 | | 65 |
| *Scophthalmus maximus* | | 15 | 2 | 1 | 2 | | 20 |
| *Scophthalmus rhombus* | | 5 | | | | | 5 |
| *Scyliorhinus canicula* | | | 14 | 4 | | | 18 |
| *Squalus acanthias* | | 72 | | 1 | 30 | | 103 |
| *Zeus faber* | | 17 | | | 2 | | 19 |

* *Dipturus batis* and *D. intermedia* are currently under nomenclature review.

### 5.2.2 Issues and problems

There were no major issues and problems.

### 5.2.3 Additional 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. A list of other additional activities is given in table 5.2.3.1.

**Table 5.2.3.1. Overview of additional activities in the North Sea IBTS Q3 survey in 2017. Water samples for CTD calibration not explicitly listed, x: routinely, (x): ad hoc studies.**

| Activity | DEN | ENG | GER | NOR | SCO | SWE |
|---|---|---|---|---|---|---|
| CTD | x | x | x | x | x | x |
| Seafloor Litter | x | x | x | x | | |
| Water sampler (Nutrients) | | | | | x | |
| Collection of fish tissue (genetics) | x | | | | | |
| Jellyfish from GOV catches | | X | | x | | |
| Epibenthos (beam trawl) | | | x | | | |
| Sediment (VanVeen grab) | | | x | | | |
| Seabirds, Marine mammals | | | | | | |
| Hydrological transect | | | | x | | |
| GOV intercalibrations | | (x) | | (x) | | |
| Acoustics (Ichthyofauna) | | x | | x | | |

### 5.2.4 Gear geometry

The current manual does not specify a specific warp length to depth ratio as this may not fit to the different vessels. It has, however, been emphasized that each country carefully measure net geometry, i.e. door spread and headline height over bottom (vertical opening) and, if possible, also wing spread. Missing observations of these parameters are listed in table 5.2.4.1.

**Table 5.2.4.1. Number of valid tows with missing gear parameters (No sensors for wing spread were available for Denmark and Norway).**

| Parameter | DEN | ENG | GFR | NOR | SCO | SWE |
|---|---|---|---|---|---|---|
| Door spread | 0 | 3 | 0 | 0 | 0 | 0 |
| Net opening | 3 | 0 | 0 | 0 | 2 | 0 |
| Wing spread | 0 | 5 | 3 | 52 | 1 | 0 |

No country had serious problems in achieving the theoretical values for door spread (Figures 5.2.3 a-c). Most countries were within or near the theoretical values for net opening for almost all tows they made. Norway and Sweden had net opening that was consistently low, but the gear operated within the normal range for these countries (see manual, version IX).

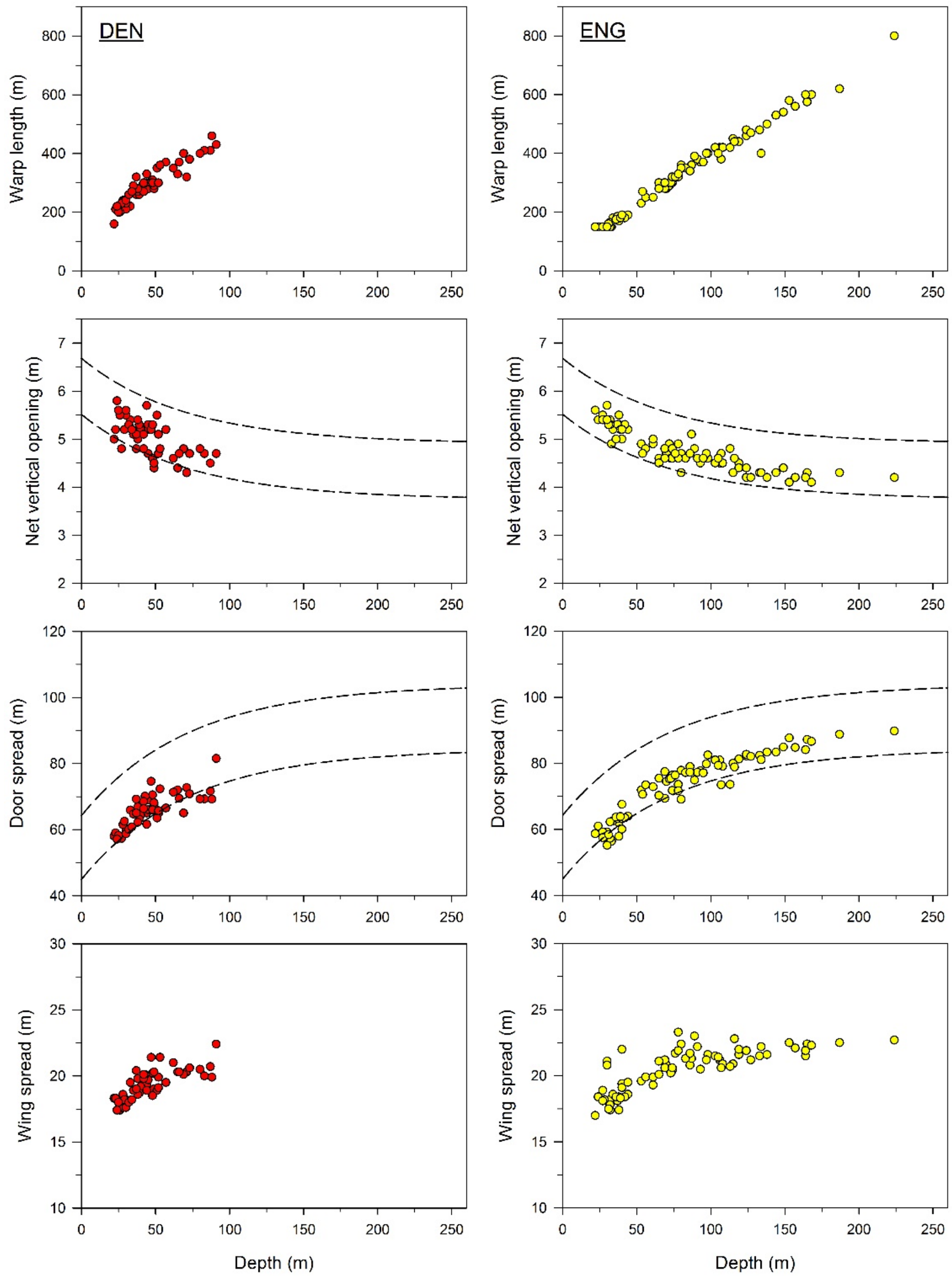



**Figure 5.2.4.1a. Warp length and net geometry related to depth by country for the North Sea IBTS Q3 2017, Denmark and England. Dashed lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual.**

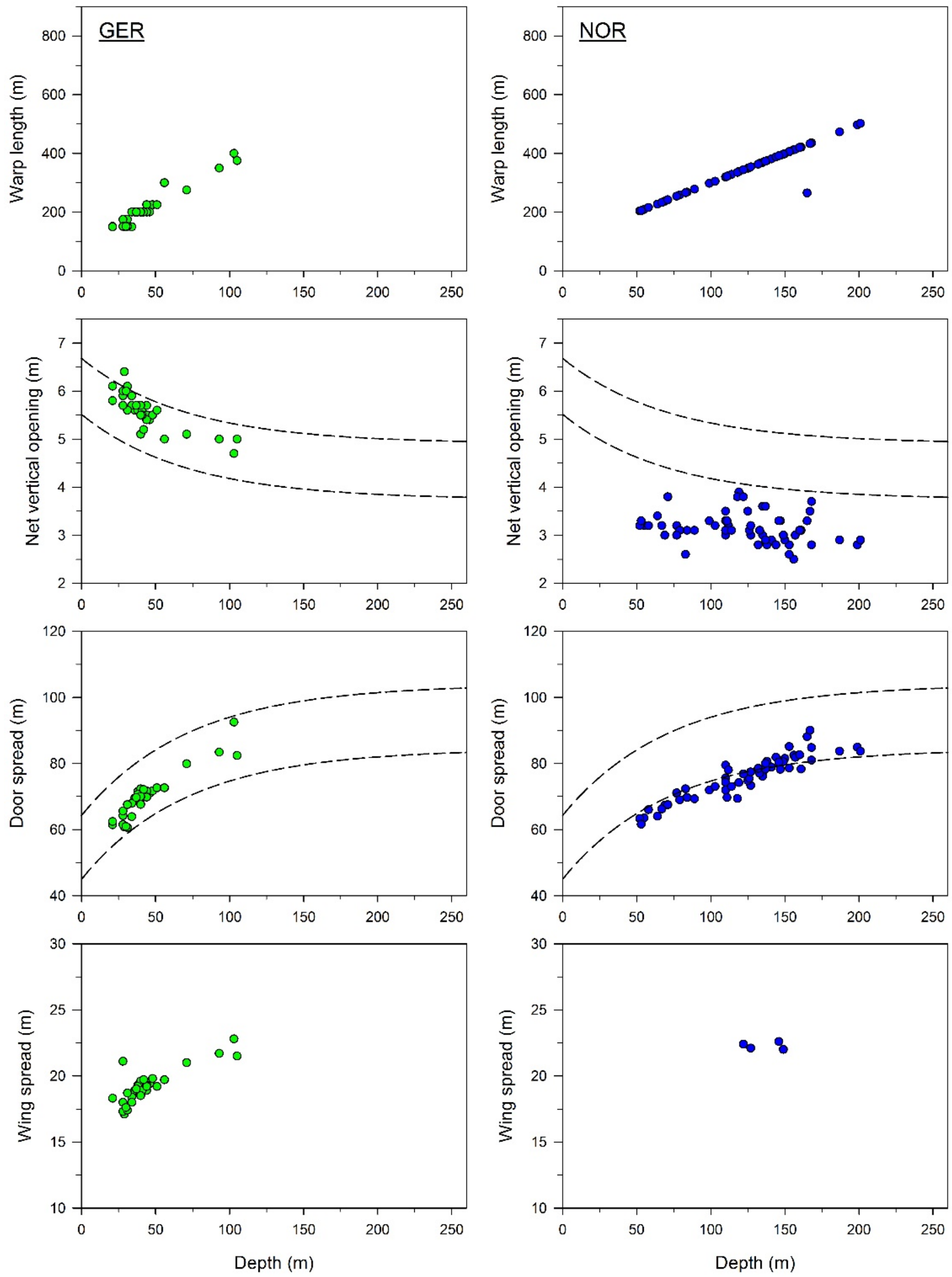



**Figure 5.2.4.1b. Warp length and net geometry related to depth by country for the North Sea IBTS Q3 2017, Germany and Norway. Dashed lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual.**

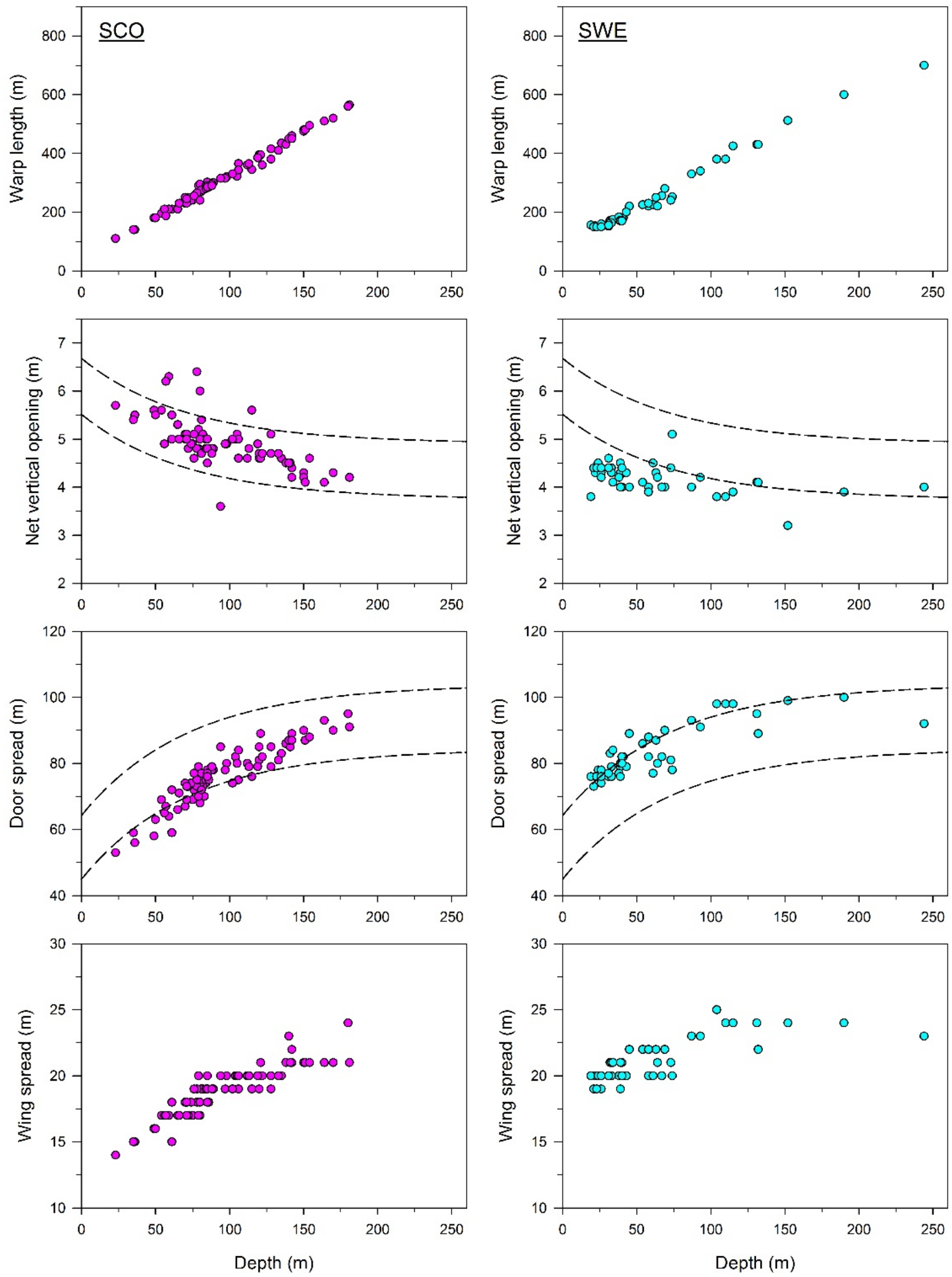



**Figure 5.2.4.1c. Warp length and net geometry related to depth by country for the North Sea IBTS Q3 2017, Scotland and Sweden. Dashed lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual.**

### 5.2.5 GOV standard indices and distribution of target species

Distribution plots for the recruits of the NS-IBTS standard species based on the 2017 quarter 3 survey are shown in Figure 5.2.5.1. For some target species, high densities were found outside the actual index areas. Cod and plaice index areas were revised during recent benchmarks, but for other species, this may warrant a revision of the species-specific areas on which the standard indices calculated in DATRAS are based. The DATRAS download of CPUE by age and haul does not include data for rectangles 45F5 and 44F6 although valid tows have been made there and it had been requested repeatedly by IBTSWG since 2015 to include the two rectangles in the DATRAS products.

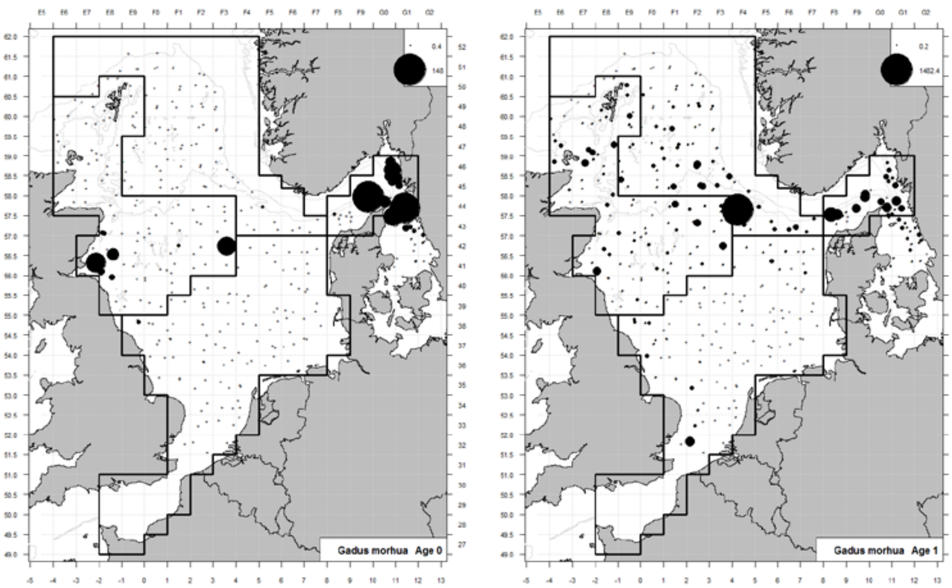



**Figure 5.2.5.1a. Distribution of cod in the quarter 3 IBTS 2017 (thick line: NS cod population separation areas).**

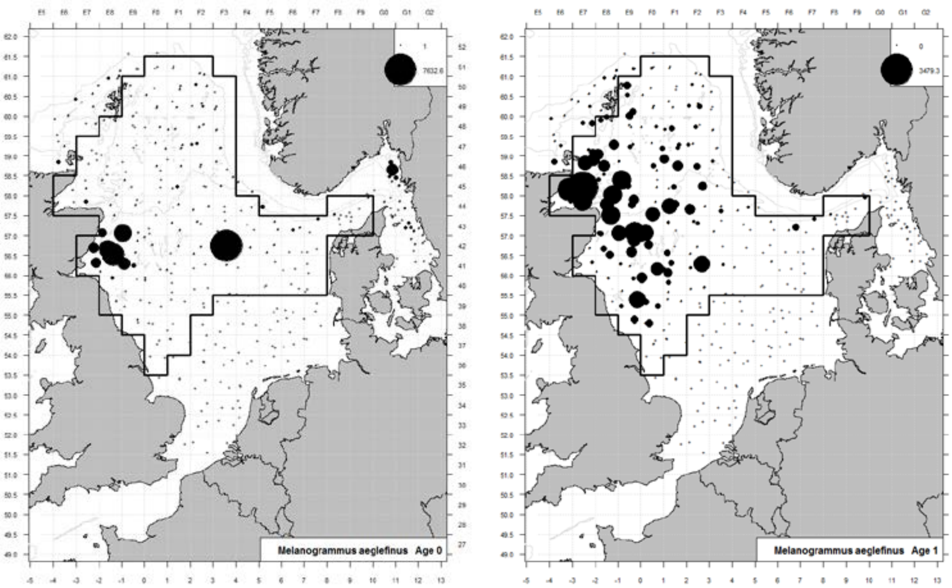



**Figure 5.2.5.1b. Distribution of haddock in the quarter 3 IBTS 2017 (thick line: NS haddock index area).**

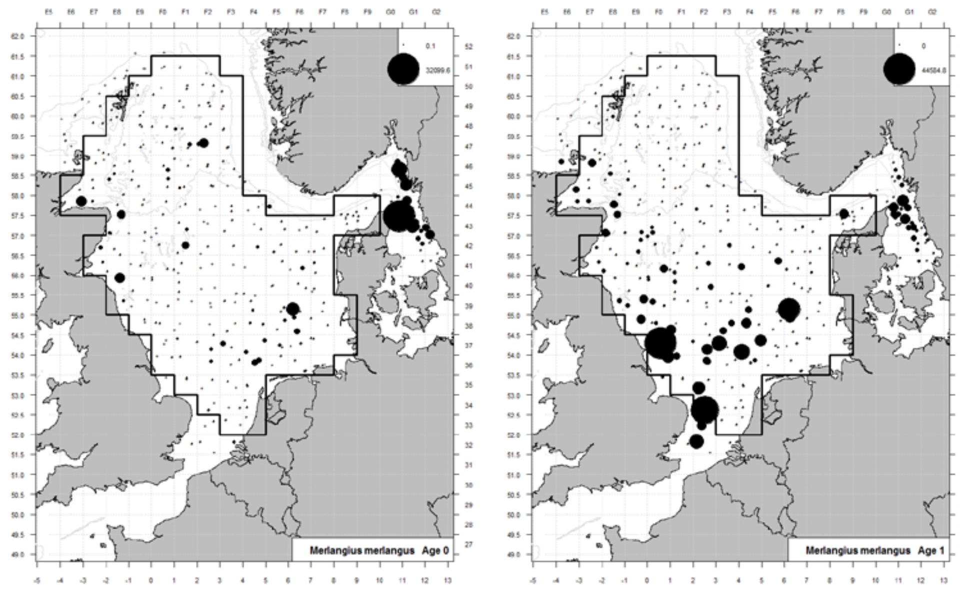



**Figure 5.2.5.1c. Distribution of whiting in the quarter 3 IBTS 2017 (thick line: NS whiting index area).**

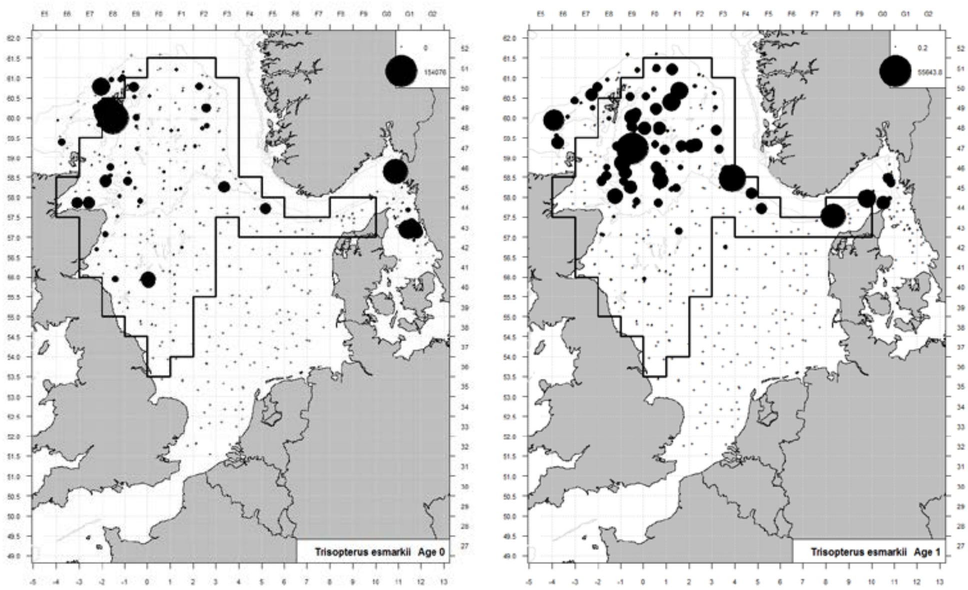



**Figure 5.2.5.1d. Distribution of Norway pout in the quarter 3 IBTS 2017 (thick line: NS Norway pout index area).**

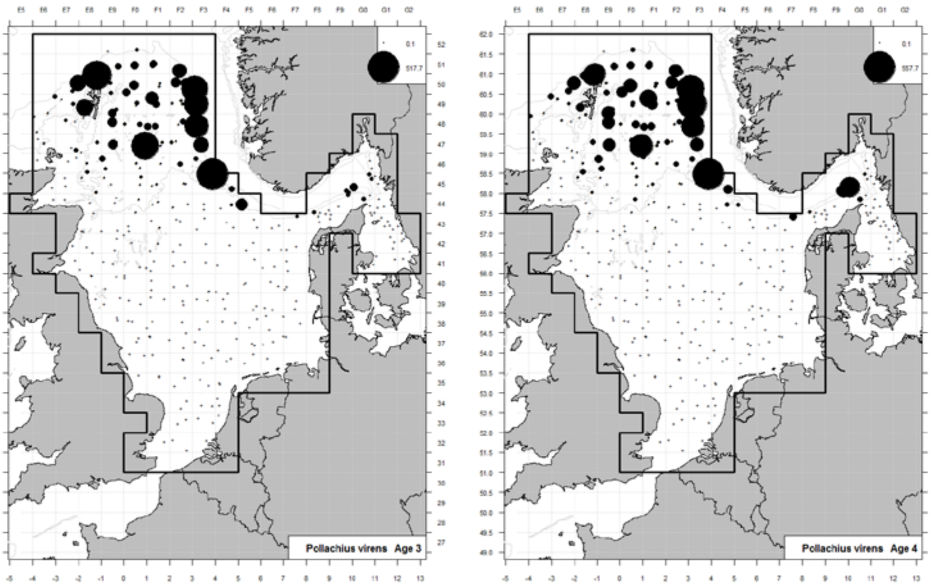



**Figure 5.2.6e. Distribution of saithe in the quarter 3 IBTS 2017 (thick line: saithe index area).**

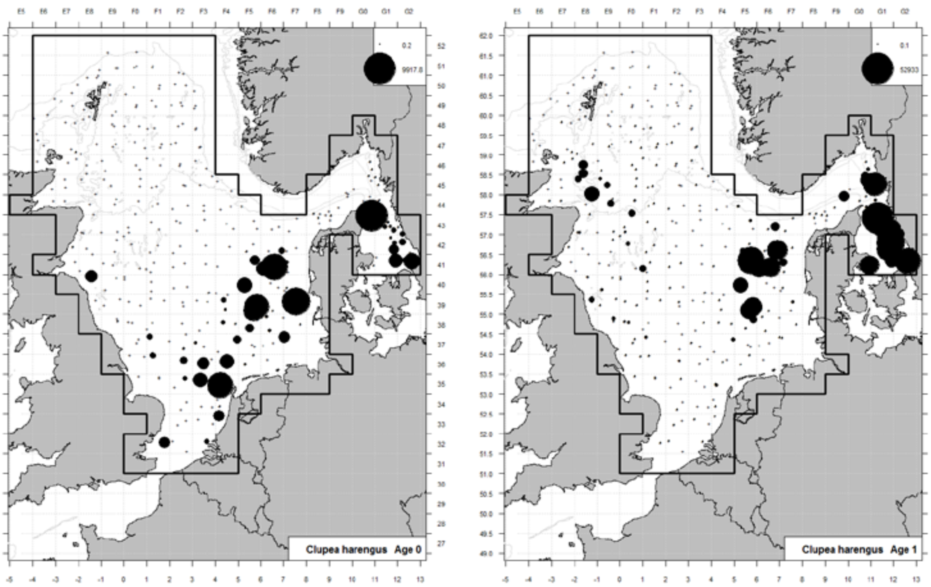



**Figure 5.2.5.1f. Distribution of herring in the quarter 3 IBTS 2017 (thick line: NS herring index area in the 3rd quarter).**

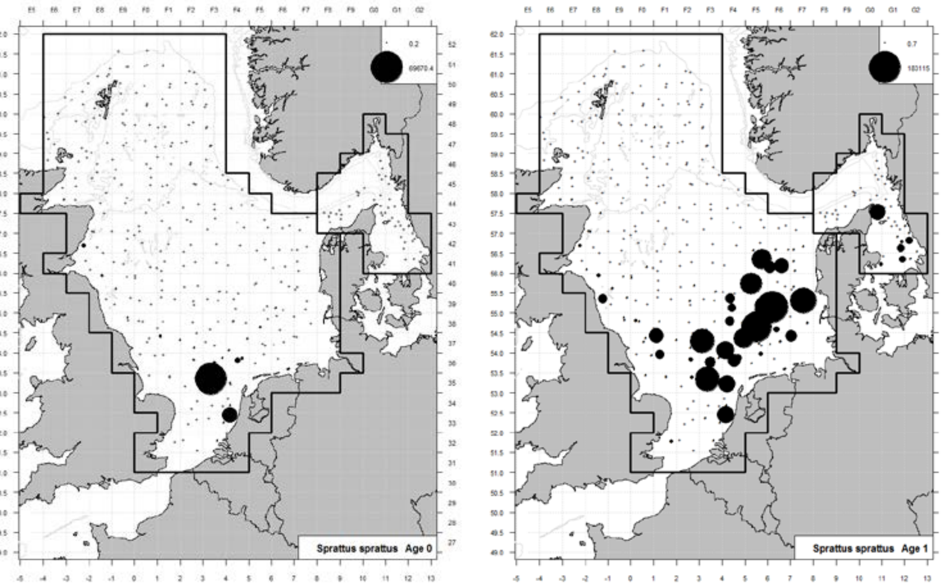



**Figure 5.2.5.1g. Distribution of sprat in the quarter 3 IBTS 2017 (thick line: NS sprat index areas).**

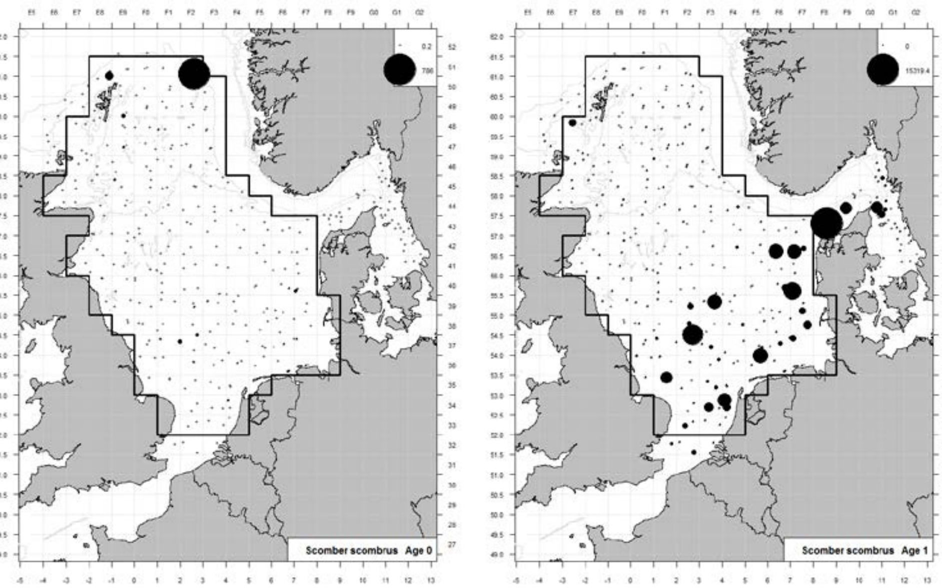



**Figure 5.2.5.1h. Distribution of mackerel in the quarter 3 IBTS 2017 (thick line: NS mackerel index area).**

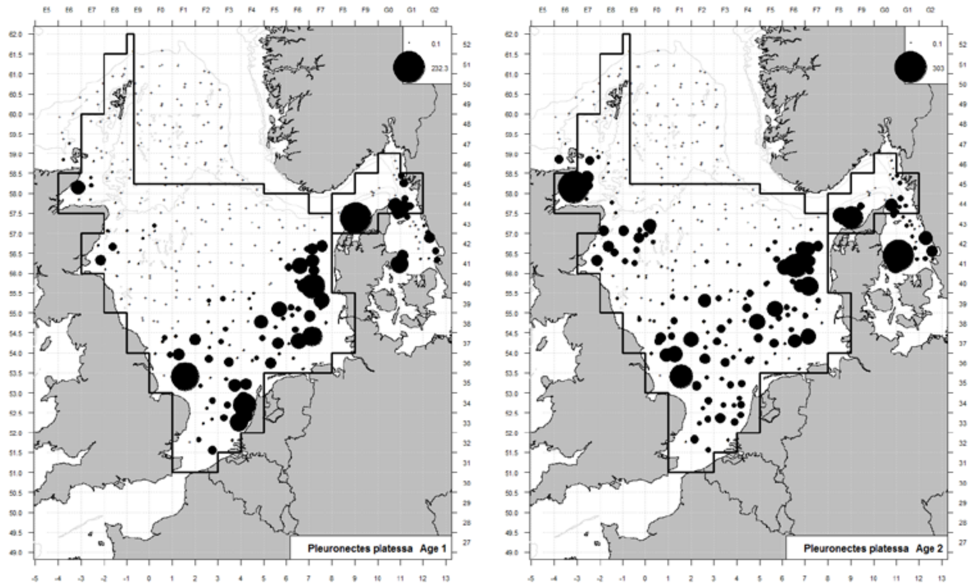



**Figure 5.2.5.1i. Distribution of plaice in the quarter 3 IBTS 2017 (thick line: NS plaice index areas).**

### 5.2.6 Planning and participation in 2018

All regularly contributing countries intend to participate in the quarter 3 2018 NS-IBTS survey program. Below is a table showing the expected program dates for each country for this year.

| | | |
|---|---|---|
| England | Cefas Endeavour | 9 August to 9 September |
| Denmark | Dana | 30 July to 17 August |
| Germany | Walther Herwig III | 19 July to 15 August |
| Norway | Kristine Bonnevie | 25 July to 16 August |
| Scotland | Scotia | 28 July to 17 August |
| Sweden | Dana | 20 August to 30 August |

No major changes in the rectangle allocation scheme are planned and the actual rectangle allocation to the countries is show in Figure 5.2.6.1.

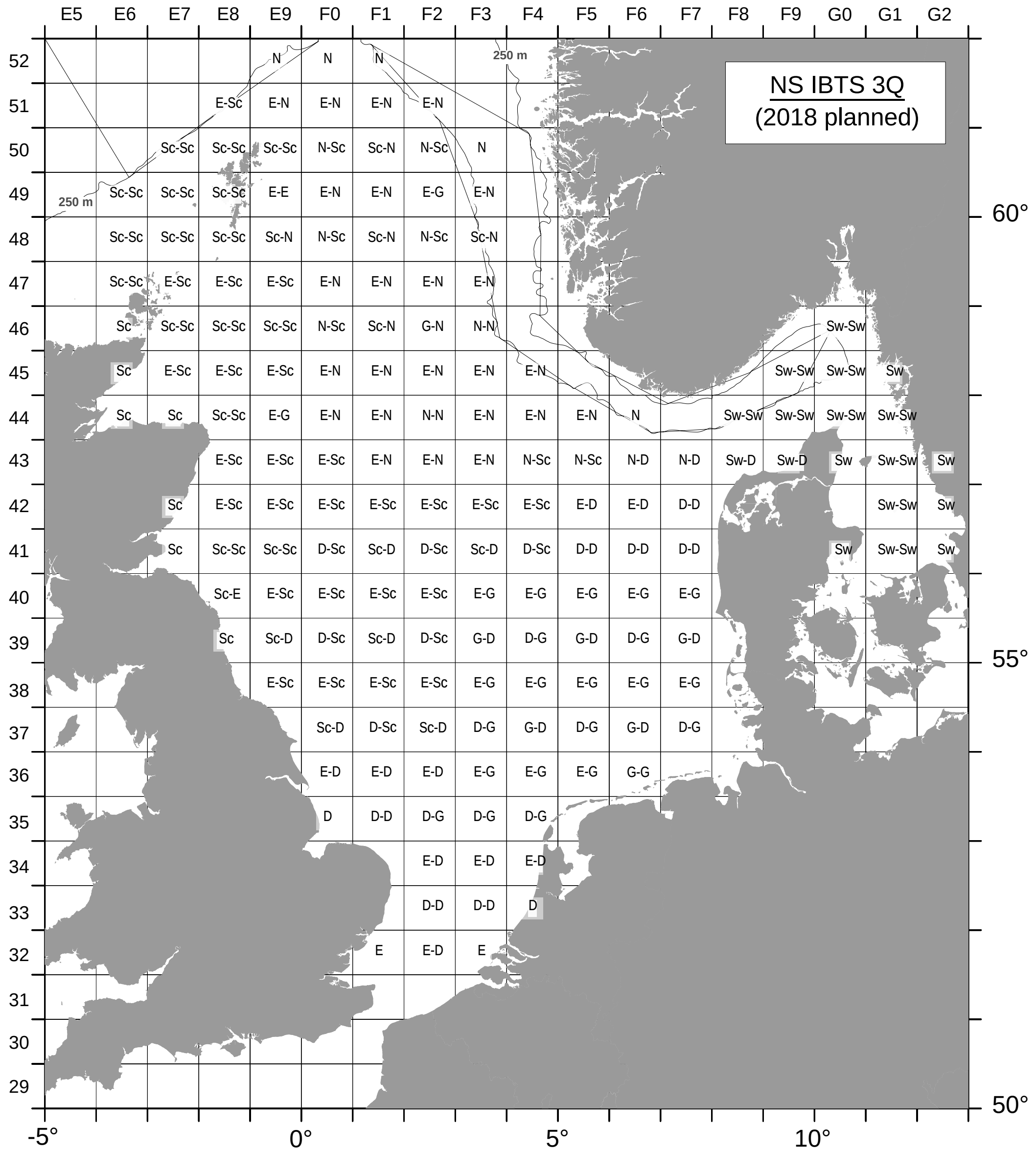



**Figure 5.2.6.1. Rectangle allocation by country for the 3Q survey in 2018 (D: Denmark, E: England, G: Germany, N: Norway, Sc: Scotland, Sw: Sweden).**

### 5.2.7 Other issues

### 5.2.8 Staff exchange

No staff exchange has occurred during the 2017 Q3 surveys, and no concrete plans are there yet to have an exchange in 2018. However, IBTSWG continues to encourage staff exchange.

#### 5.2.8.1 Data exchange

It has been agreed that preliminary indices based on length splitting for the standard species will no longer exchanged during the Q3 survey since the final data for the NS-IBTS main target species (if not all species), including age information, are usually submitted to DATRAS within 2 to 3 weeks after completion of the survey.

## 5.3 Northeast Atlantic

**(Coordinator: Francisco Velasco)**

### 5.3.1 General overview

In 2017, seven vessels from five countries performed 13 surveys along the Northeastern Atlantic IBTS area. The most remarkable event has been the breakage of the RV *Thalassa* during the FR-EVHOE survey, which was reduced to 25 valid hauls in the northern part of the French shelf on the Biscay Bay. The Marine Institute of Ireland prolonged their groundfish survey on the subarea 7 to perform some extra 22 hauls on the Celtic Sea area to cover the gap left by the breakage.

The Irish Anglerfish and Megrim Survey (IE-IAMS-Q1) started two years ago and presented to be considered under the coordination by the IBTSWG was also performed in 2017. Although some problems with gear configuration were detected the results from 2018 and 2017 surveys are presented together with a standard summary similar to that from the NeAtl surveys, although it only will be considered as a IBTSWG coordinated survey when the abundance indices are used by the relevant assessment working groups (namely WGCSE and WGBIE). Information was also included as an annex on the new version of the Manual of the IBTS North Eastern Atlantic Surveys, SISP 15 (ICES, 2017) that replaced the Manual for the International Bottom Trawl Surveys in the Western and Southern Areas Revision III (ICES, 2010).

A total of 950 valid hauls, out of the 1062 hauls planned, were accomplished within 277 days distributed between the first, third and fourth quarters (See Figure 5.3.1.1, Table 5.3.1.1 and Table 5.3.1.2). Besides, 110 hauls and 21 days were done by the RV *Celtic Explorer* during the mentioned IE-IAMS-Q1.

In 2017 most surveys were performed including, as in previous years, three 1st quarter surveys (Scotland, Northern Ireland and Spanish survey on the Gulf of Cadiz), and also the usual 3rd quarter surveys (UK-ScoRoc and SP-Porc). But in the case of 4th quarter surveys, the French groundfish survey EVHOE was cancelled after 5 days and only 26 hauls, due to serious engine problems. 22 hauls were performed by the RV *Celtic Explorer* in EVHOE northern area, adjacent to the Irish Ground Fish Survey area. The decrease of hauls from last year is due to the fact that French EVHOE survey has completed only 25 of their planned 156 hauls.

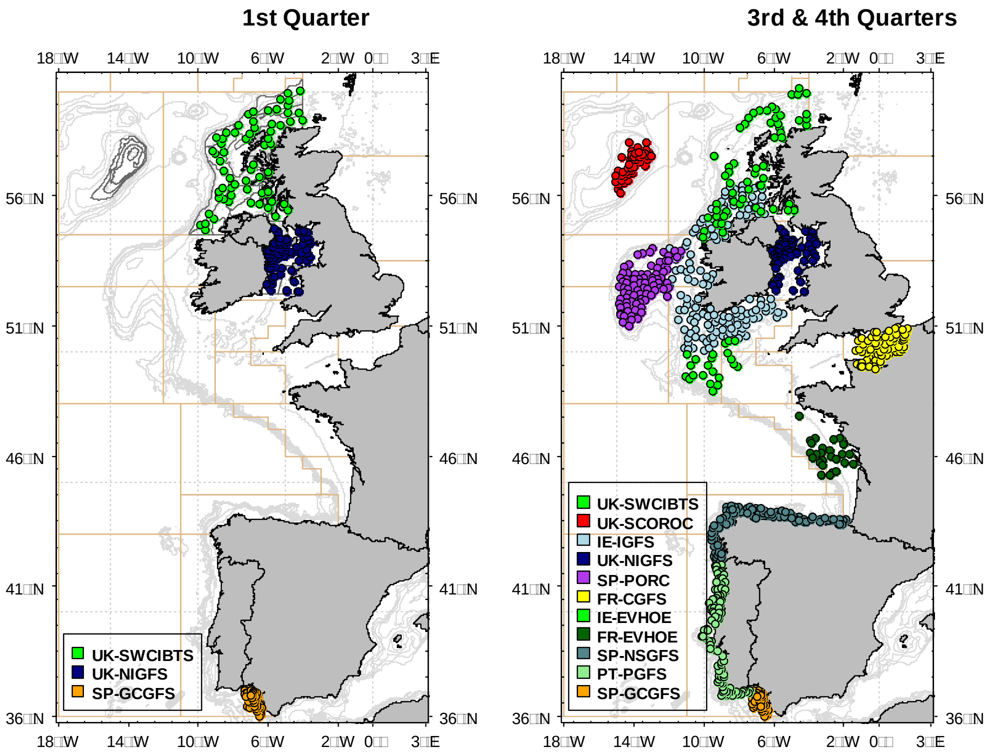


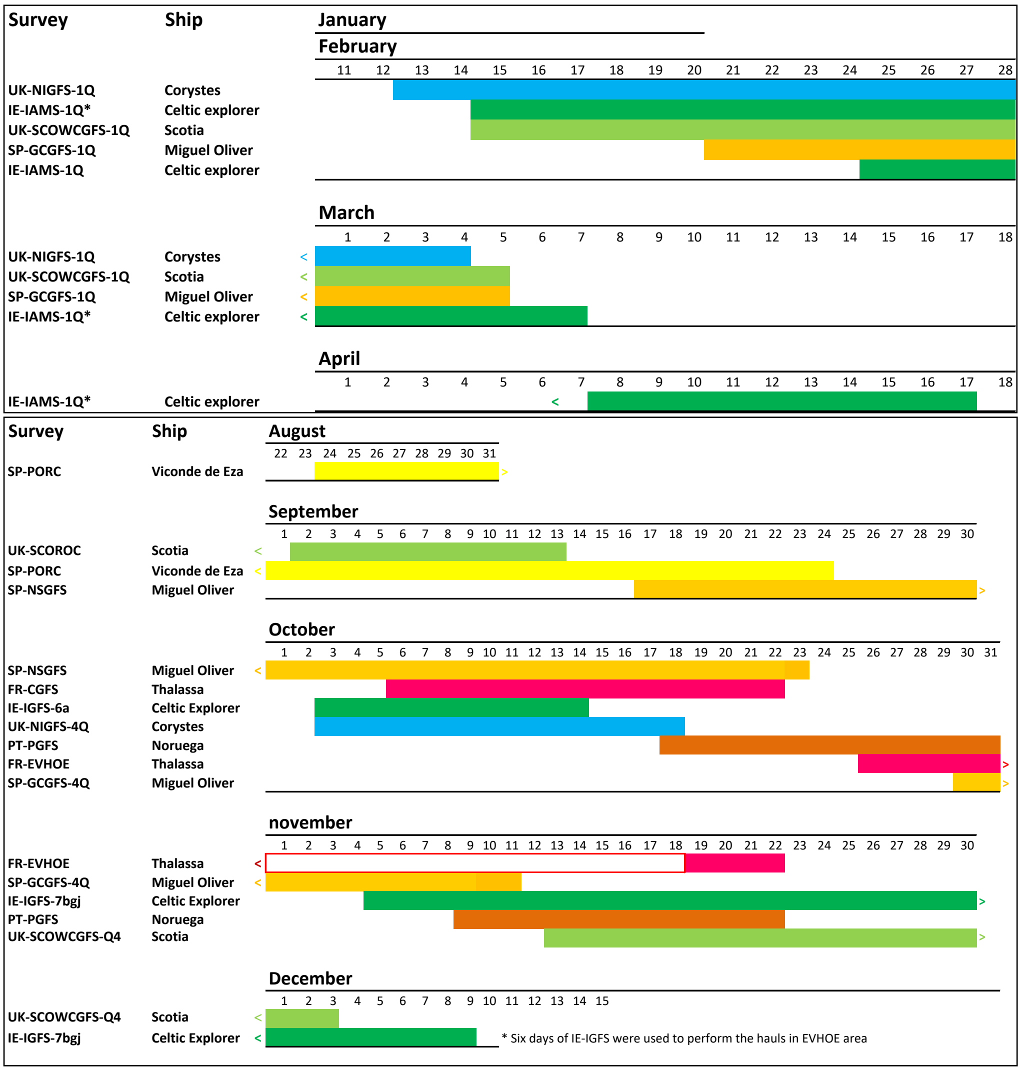

**Figure 5.3.1. Hauls performed on the northeastern Atlantic IBTS in 2017. Left panel 1st quarter, and right panel 3rd and 4th quarters.**

**Table 5.3.1. Summary of surveys, hauls and days at sea per country performed in the IBTS Northeastern Atlantic area in 2017**

| Country | Survey | Hauls | | | | Days |
|---|---|---|---|---|---|---|
| | | Planned | Valid | Null | Total | |
| UK-Scotland | UK-SCOWCGFS-Q1 | 60 | 62 | 3 | 65 | 16 |
| | UK-SCOROC-Q3 | 40 | 41 | 3 | 44 | 8 |
| | UK-SCOWCGFS-Q4 | 60 | 55 | 3 | 58 | 26 |
| UK-North Ireland | UK-NIGFS-Q1 | 60 | 62 | 1 | 63 | 20 |
| | UK-NIGFS-Q4 | 60 | 58 | 4 | 62 | 16 |
| Ireland | IE-IAMS-Q1** | 110 | 110 | 1 | 109 | 21 |
| | IE-IGFS-Q4 | 45+125 | 149 | - | 149 | 42 |
| France | FR-CGFS-Q4 | 74 | 66 | 5 | 71 | 15 |
| | FR-EVHOE-Q4 | 156 | 25 | 1 | 26 | 5 |
| | **IE-EVHOE-Q4 *** ** | | **22** | **-** | **22** | **6** |
| Spain | SP-PORC-Q3 | 80 | 80+4+10* | 4 | 84 | 32 |
| | SP-NSGFS-Q4 | 116 | 112+15+8* | 3 | 138 | 37 |
| | SP-GCGFS-Q1 | 45 | 45 | 3 | 48 | 13 |
| | SP-GCGFS-Q4 | 45 | 44 | 6 | 50 | 13 |
| Portugal | PT-PGFS-Q4 | 96 | 89+3* | 2 | 94 | 28 |
| Total | | 1062 | 950 | 38 | 974 | 277 |

* Zero minutes hauls.
** Not included in total numbers, not yet coordinated by IBTSWG
*** EVHOE area hauls performed by the RV *Celtic Explorer* due to the engine breakage of the RV *Thalassa*.

**Table 5.3.1. Overview of the surveys performed during 1st, 3rd and 4th quarters on the Northeastern Atlantic IBTS area in 2017.**




A summary of the biological sampling conducted within the IBTS NE Atlantic in 2017 is presented in Table 5.3.3.1.1

## 5.3.2 Survey summaries by country

In this year report an effort was made to reduce the information presented and referring to the new manual ICES SISP 2017 has been done, information on the survey design can be looked up in the manual with the individual summaries by country on annex 6, and maps of stations performed can be found in Figure 5.3.1.1 and Figure 5.3.6.2.1, together with the species distribution maps in annex 7.

## 5.3.3 Results

### 5.3.3.1 Biological samples

Table 5.3.3.1.1 summarizes the number of biological samples taken in all surveys, previously reported per country/survey within the North-eastern Atlantic area (in Section Annex 6 individual Survey reports).

**Table 5.3.3.1.1. Number of individuals sampled for maturity and/or age in 2017 surveys on NeAtlIBTS**

| | UK-SCO | | | UK-NIRL | | IRL | | FR | | SP | | | | PT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WCGFS | ROC | WCGFS | NIGFS | NIGFS | IAMS | IGFS | CGFS | EVHOE | PORC | NSGFS | GCGFS | GCGFS | PGFS |
| | Q1 | Q3 | Q4 | Q1 | Q4 | Q1 | Q4 | Q4 | Q4 | Q3 | Q4 | Q1 | Q4 | Q4 |
| **Target species** | | | | | | | | | | | | | | |
| *Clupea harengus* | 606 | | 296 | | | | 184 | | | | | | | |
| *Gadus morhua* | 445 | 5 | 192** | 202 | 50 | | 102 | 8 | | | | | | |
| *Lepidorhombus boscii* | | | | | | | | | | 314 | 509/92† | | | 82/102 |
| *L. whiffiagonis* | | | | 5 | | | 1370 | | 118 | 736 | 502/88† | | | |
| *Lophius budegassa* | | | | | | | 366 | 3 | | 39 | 43 | | | 10 |
| *L. piscatorius* | | | | | | | 415 | | | 184 | 33 | | | |
| *M. aeglefinus* | 1346 | 1838 | 1108** | 1067 | 747 | | 2154 | | | | | | | |
| *Merlangius merlangus* | 866 | 68 | 657** | 1360 | 1090 | | 1381 | 287 | 99 | | | | | |
| *Merluccius merluccius* | 310 | | 448** | 9 | 30 | | 707 | | 373 | 998 | 881 | 312/754 | 294/959 | 1036/1343 |
| *Nephrops norvegicus* | | | | | | | | | | 473* | 151* | 152* | 252* | 110* |
| *Pollachius virens* | 359 | 5 | 88** | | | | 18*** | | | | | | | |
| *Scomber scombrus* | 297 | 13 | 168 | | | | 592 | | | 27 | 568 | | | 130/244 |
| *Sprattus sprattus* | 277 | | 138** | | | | | | | | | | | |
| *Trachurus trachurus* | | | | | | | 1007 | | | | 572 | | | 538/1307 |
| *Trisopterus esmarkii* | 317 | | 214** | | | | | 81 | | | | | | |
| **Additional species Elasmobranchii** | | | | | | | | | | | | | | |
| *Dipturus batis cf. flossada* | 7* | 58* | 7* | | | | 30* | | | | | | | |
| *D. batis cf.intermedia* | 77* | | 63* | | | | 70* | | | | | | | |
| *Dipturus nidarosiensis* | | 6* | | | | | | | | | | | | |
| *Galeorhinus galeus* | 1* | | 5* | | | | | | | | | | | |
| *Leucoraja fullonica* | | 8* | 1* | | | | | | | | | | | |
| *Leucoraja naevus* | 77* | | 98* | 19* | 9* | | 256* | | | | | | | |
| *Mustelus spp.* | 23* | | 9* | | | | 1*** | | | | | | | |
| *Raja brachyura* | 4* | | 6* | 43* | 6* | | 40* | | | | | | | |
| *Raja clavata* | 115* | 34* | 83* | 52* | 4* | | 320* | | | | | | | |
| *Raja montagui* | 96* | | 200* | 78* | 8* | | 637* | | | | | | | |
| *Squalus acanthias* | 130* | | | | | | 759* | | | | | | | |
| **Actinopterigii** | | | | | | | | | | | | | | |
| *Chelidonichthys cuculus* | | | | 84 | | | 153*** | 129** | 66 | | | | | 69 |
| *Chelidonichthys lucerna* | | | | | | | | | | | | | | |
| *Conger conger* | | | | 9 | 4 | | 53*** | | | 17 | 220/220†† | | | |
| *Dicentrarchus labrax* | | | | | | | 12 | 237 | 1††† | | | | | |
| *Diplodus vulgaris* | | | | | | | | | | | | | | 197/271 |
| *Engraulis encrasicolus* | | | | | | | | | | | 449 | | | 268/361 |
| *Glyptocephalus cynoglossus* | 15 | | 54* | | | | 199*** | | | | | | | |
| *Helicolenus dactylopterus* | | | | | | | | | | 192 | 208 | | | 302/638 |
| *Micromesistius poutassou* | | | | | | | 452 | | | | 937/933 | | | 822/2364 |
| *Microstomus kitt* | | | | 93 | | | 722 | | 4 | | | | | |
| *Molva dypterygia* | | | | | | | | | | | | | | |
| *Molva molva* | | | 76** | | | | 55 | | | 32 | | | | |
| *Mullus surmuletus* | | | | | | | | 139 | 17 | | 139 | | | 27 |
| *Pagellus acarne* | | | | | | | | | | | | | | 238/419 |
| *Phycis blennoides* | | | | | | | | | 30 | 192 | 111 | | | |
| *Pleuronectes platessa* | 243 | | 209 | 393 | 218 | | 910 | 343 | | | | | | |
| *Pollachius pollachius* | 5* | | | 1 | | | 203*** | | | | | | | |
| *Sardina pilchardus* | | | | | | | | | | | 100/97 | | | 348/434 |
| *Scomber colias* | | | | | | | | | | | 345/340 | | | 296/472 |
| *Scophthalmus maximus* | 7* | | 4* | | | | 36 | 7 | | | | | | |
| *Scophthalmus rhombus* | 1* | | | 27 | 18 | | 27*** | 4 | | | | | | |
| *Spondyliosoma cantharus* | | | | | | | | | | | | | | 24 |
| *Solea solea* | | | | | | | 167 | 91 | 17 | | | | | |
| *Trisopterus luscus* | | | | | | | | | | | 284 | | | |
| *Zeus faber* | | | 72** | 1 | 26 | | 331*** | | | | 82/80†† | | | |

| | UK-SCO | | | UK-NIRL | | IRL | | FR | | SP | | | | PT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WCGFS | ROC | WCGFS | NIGFS | NIGFS | IAMS | IGFS | CGFS | EVHOE | PORC | NSGFS | GCGFS | GCGFS | PGFS |
| | Q1 | Q3 | Q4 | Q1 | Q4 | Q1 | Q4 | Q4 | Q4 | Q3 | Q4 | Q1 | Q4 | Q4 |
| **Crustacea** | | | | | | | | | | | | | | |
| *Parapenaeus longirostris* | | | | | | | | | | | | 1109* | 2167* | 495* |
| **Mollusca** | | | | | | | | | | | | | | |
| *Illex coindeti* | | | | | | | | | | | | | 26* | 92* |
| *Loligo forbesi* | | | | | | | | | | | | | 17* | |
| *Loligo vulgaris* | | | | | | | | | | | | 184* | 247* | 327* |
| *Octopus vulgaris* | | | | | | | | | | | | 208* | 139* | |
| *Sepia officilis* | | | | | | | | | | | | 81* | 227* | |
| *Todaropsis eblanae* | | | | | | | | | | | | | 3* | |

*** No age material collected**
**** No maturity data collected**
***** Length and weight only**
**† Gonads**
**†† Vertebrae**
**††† Scales**

### 5.3.4 Additional activities

Table 5.3.4.1 gives an overview of the Additional activities performed in 2017 as reported per country/survey within the North-eastern Atlantic area (in annex 6).

**Table 5.3.2 Additional activities performed in 2017 surveys on the northeastern atlantic IBTS Surveys.**

| | UK-Sco | | | UK-NIGFS | | Irl | Fr | | Sp | | | | Pt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Q1 | Q3 | Q4 | Q1 | Q4 | IGFS | CGFS | EVHOE | Porc | NS | GC Q1 | GC Q4 | PGFS |
| 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 |
| Water sampler (Nutrients) | | | | | | | 1 | X | | | | | |
| Egg samples (Small fine-meshed ringnet, CUFES) | | | | | | | 1 | | | | | | |
| Non-commercial benthic invertebrates | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Observers: mammals, birds | | | | | | | 1 | 1 | X | 1 | | | |
| Additional biological data on fish | X | X | X | X | X | | X | X | X | X | | X | X |
| Fish stomach contents | | | | X | X | | X | X | | 1 | X | X | X |
| Benthic samples (boxcore, video, dredge) | | 1 | | | | | X | X | X | X | | | |
| Zoo and phytoplankton | | | | | | | 1 | 1 | | | | | |
| Jellyfish | | | | X | X | X | 1 | X | X | | | | 1 |
| Hydrological transect | | | | | | 1 | | | | X | X | X | |
| Acoustic for fish species | X | | X | | | | | X | X | | | | X |
| Multibeam: seabed mapping | | | | | | | | 1 | X | | | | X |

**1: Every year, 2: biannual, 3 every three years, X: occasional**

### 5.3.5 Participation planned for 2017

Table 5.3.5.1 below, presents the expected dates for the northeastern Atlantic IBTS Surveys.

**Table 5.3.3. Dates foreseen for 2017/2018 NeAtl Surveys**

| Survey | Code | Starting | Ending | Expected hauls | Planned Intercal. |
|---|---|---|---|---|---|
| UK-Scotland West (spring) | UK-SCOWCQ1 | 17-02-19 | 11/03/19 | 60 | - |
| UK-Scotland Rockall | UK-SCROCQ3 | 19-09-18 | 01/10/18 | 40 | - |
| UK-Scotland West (aut.) | UK -SCOWCQ4 | 12/11/18 | 08/12/18 | 60 | - |
| UK-North Ireland (aut.) | UK-NIGFS Q4 | 02-10-18 | 23-10-18 | 60 | - |
| UK-North Ireland (spring) | UK-NIGFS Q1 | 12-02-19 | 04-03-19 | 60 | - |
| Ireland - Groundfish Survey 6a | IE-IGFS | 29-10-18 | 08-11-18 | 45 | - |

| | | | | | |
|---|---|---|---|---|---|
| Ireland - Groundfish Survey 7bgj | IE-IGFS | 09-11-18 | 14-12-18 | 125 | - |
| Ireland – IAMS leg 7bcjk* | | 19-02-18 | 19-03-18 | 70 | - |
| Ireland – IAMS leg 6a* | | 10-04-18 | 21-04-18 | 45 | - |
| France – EVHOE | FR-EVHOE | 25-10-18 | 11-12-18 | 155 | - |
| France - English Channel | FR-CGFS | 13-09-18 | 14-10-18 | 74 | - |
| Spain – Porcupine | SP-PORC | 10-09-18 | 13-10-18 | 80 | - |
| Spain - North Shelf | SP-NSGFS | 17-09-18 | 23-10-18 | 116 | - |
| Spain - Gulf of Cádiz (Spring) | SP-GCGFS Q1 | 19-02-18 | 04-03-18 | 45 | - |
| Spain - Gulf of Cádiz (Aut.) | SP-GCGFS Q4 | 29-10-18 | 12-11-18 | 45 | - |
| Portugal (Aut.) | PT-PGFS | 02-09-18 | 31-10-18 | 96 | - |

**Intercal: intercalibration between vessels**

*** New time-series being monitored, not yet in DATRAS with agreed code.**

### 5.3.6 References

ICES, 2010. Manual for the International Bottom Trawl Surveys in the Western and Southern Areas Revision III Agreed during the meeting of the International Bottom Trawl Survey Working Group 22–26 March 2010, Lisbon. Addendum 2: ICES CM 2010/SSGESST:06. 58 pp.

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.

Reid, D.G., Allen, V.J., Bova, D.J., Jones, E.G., Kynoch, R.J., Peach, K.J., Fernandes, P.G., Turrell, W.R., 2007. Anglerfish catchability for swept-area abundance estimates in a new survey trawl. ICES Journal of Marine Science 64, 1503–1511. doi:10.1093/icesjms/fsm106

## 5.4 Combined North Sea and Northeast Atlantic survey results

**(Francisco Baldo, Francisco Velasco)**

Catches from latest bottom-trawl surveys (IBTS) in the North Sea and the north-eastern Atlantic areas covered by the IBTS (Table 5.4.1 and Figure 5.4.1) are mapped and presented in Annex 7. As in last year report, the plots presenting a summary of the length distributions per ICES divisions and survey, had been updated including their evolution between 2011 and 2017 (see an example in Figure 5.4.2), this year surveys and ICES divisions are ordered from north to south and division acronyms have been updated to the new numeric format instead of the roman numerals used before.

The distribution maps show results with the usual patterns from other years. Although the lack of an important part of the hauls on the French part of the Bay of Biscay, are a gap difficult to replace, especially for the species usually abundant on that area as it is the case of hake, horse mackerel, or blue whiting. In spite of this problem horse mackerel has been abundant in the hauls performed in EVHOE survey and presents the usual spots of higher abundances, especially considering recruits (< 15 cm). Compared to last year, cod recruits (<23 cm) seem again scarce out of the North Sea, although there was a haul with a remarkable catch on the Irish Sea.

Also in 2017 the recruitment of monkfish (*L. piscatorius*) appears to be relatively important in the surveys in division 7 out of the Irish Sea, while it is scarce on the Iberian coasts, with no information from the French part of the Bay of Biscay. On the other hand black anglerfish recruits are scarce in all the areas compared with 2016 surveys.

The rest of species present a distribution that follows the usual patterns from other years with small variations even in the spots where they appear.

**Table 5.4.1. Species for which distribution maps have been produced, with length split for prerecruit (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 name | Common name | Code | Figs No. | Length Split (<cm) |
|---|---|---|---|---|
| *Clupea harengus* | *Herring* | *HER* | *8-10* | *17.5* |
| *Gadus morhua* | Atlantic Cod | COD | 2-4 | 23 |
| *Galeorhinus galeus* | Tope Shark | GAG | 48 | |
| *Galeus melastomus* | Blackmouthed dogfish | DBM | 56 | |
| *Lepidorhombus boscii* | Four-Spotted Megrim | LBI | 23-25 | 19 |
| *Lepidorhombus whiffiagonis* | Megrim | MEG | 20-22 | 21 |
| *Leucoraja naevus* | Cuckoo Ray | CUR | 44-45 | |
| *Lophius budegassa* | Black-bellied Anglerfish | WAF | 29-31 | 20 |
| *Lophius piscatorius* | Anglerfish (Monk) | MON | 26-28 | 20 |
| *Merlangus merlangius* | Whiting | WHG | 35-37 | 20 |
| *Melanogrammus aeglefinus* | Haddock | HAD | 5-7 | 20 |
| *Merluccius merluccius* | European hake | HKE | 12-13 | 20 |
| *Micromesistius poutassou* | Blue whiting | WHB | 38-40 | 19 |
| *Mustelus* spp. | Smooth Hounds | SDS | 49 | |
| *Nephrops norvegicus* | Norway Lobster | NEP | 41 | |
| *Pleuronectes platessa* | European Plaice | PLE | 32-34 | 12 |
| *Raja clavata* | Thornback ray (Roker) | THR | 50-51 | |
| *Raja microocellata* | Painted/Small Eyed Ray | PTR | 52 | |
| *Raja montagui* | Spotted Ray | SDR | 53 | |
| *Raja undulata* | Undulate Ray | UNR | 54 | |
| *Scomber scombrus* | European Mackerel | MAC | 17-19 | 24 |
| *Scyliorhinus canicula* | Lesser Spotted Dogfish | LSD | 42-43 | |
| *Scyliorhnus stellaris* | Nurse Hound | DGN | 55 | |
| *Sprattus sprattus* | European sprat | SPR | 57-58 | |
| *Squalus acanthias* | Spurdog | DGS | 46-47 | |
| *Trachurus picturatus* | Blue Jack Mackerel | JAA | 60 | |

| | | | | |
|---|---|---|---|---|
| *Trachurus trachurus* | Horse Mackerel (Scad) | HOM | 14-16 | 15 |
| *Trisopterus smarkii* | Norway pout | NPO | 59 | |

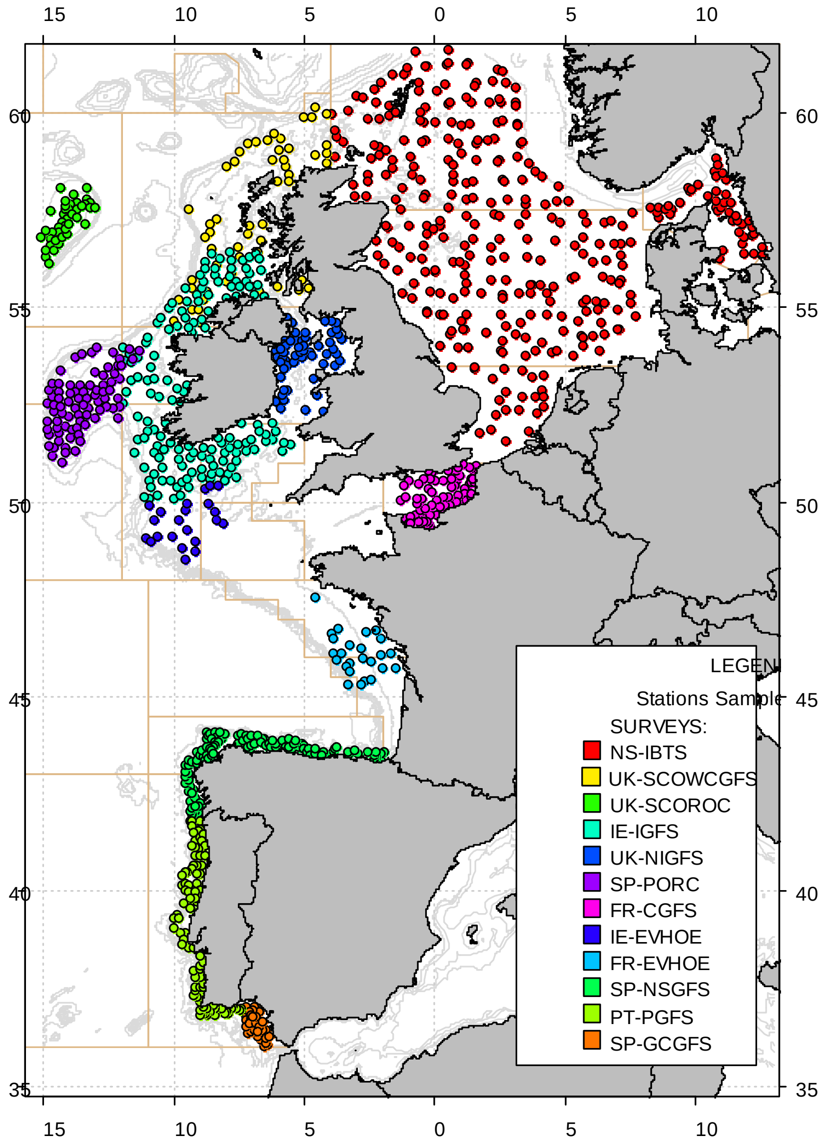



**Figure 5.4.1. Station positions for the IBTS carried out in the northeastern Atlantic and North Sea area in summer/autumn of 2017.**

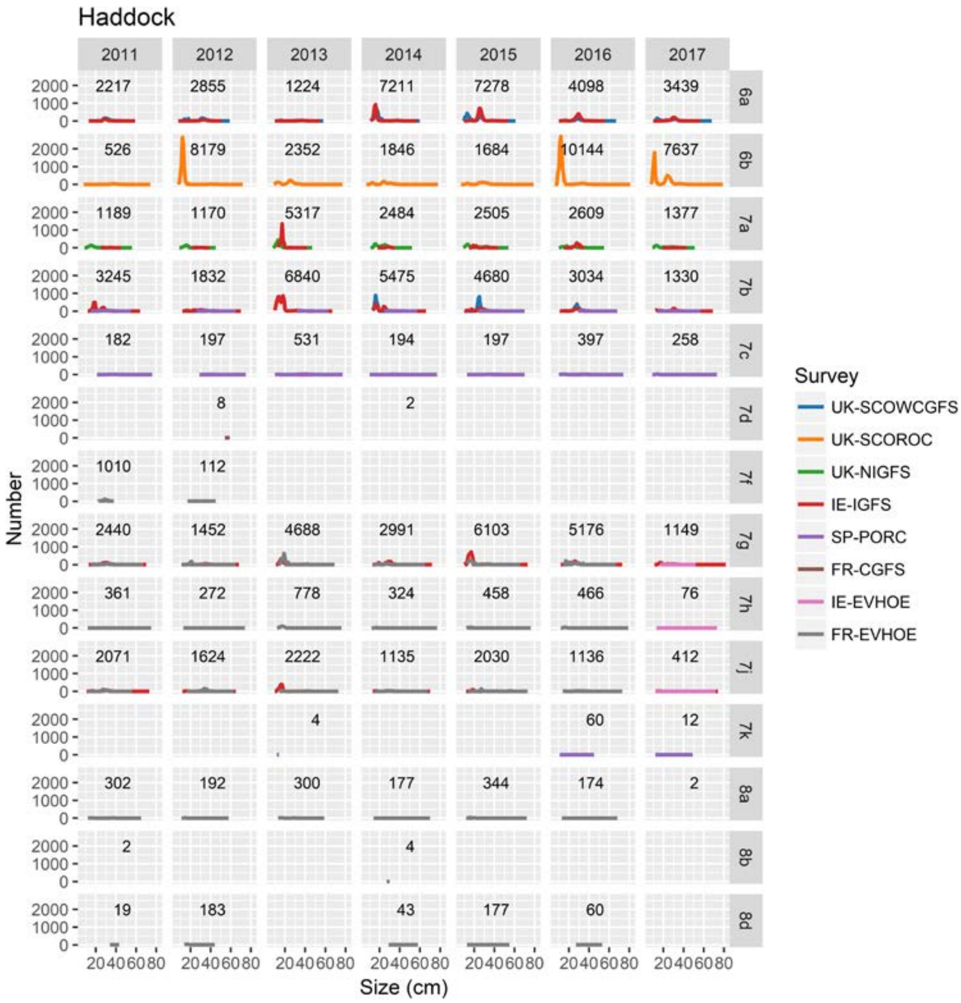



**Figure 5.4.2. Example of the length distribution graphs per ICES Subareas and surveys presented in Annex 7: Length distributions of haddock, Melanogrammus aeglefinus, per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last six years, each panel presents the surveys occur-ring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore, the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one-hour haul in the surveys carried out in that subdivision.**

# 6 Survey Manuals (ToR b)

## 6.1 Manual for the North Sea IBTS

The revision of the current manual for the NS-IBTS (ICES 2015. Manual for the International Bottom Trawl Surveys. Series of ICES Survey Protocols SISP 10 - IBTS IX. 86 pp.) has almost been completed and a new version will be submitted in due course.

## 6.2 Manual for the Midwater Ring Net sampling during NS-IBTS Q1

The current version (ICES 2017. Manual for the Midwater Ring Net sampling during IBTS Q1. Series of ICES Survey Protocols SISP 2. 25 pp.) is still valid.

## 6.3 Manual for the Northeast Atlantic IBTS

The actual version has been complete last year (ICES 2017. Manual of the IBTS North Eastern Atlantic Surveys. Series of ICES Survey Protocols SISP 15. 92 pp) and so far just minor amendments were identified.

# 7 DATRAS and related topics on data quality (ToR c)

## 7.1 DATRAS progress and development

**(Vaishav Soni)**

### 7.1.1 Swept Area product

Swept Area base flex file is available on the DATRAS download page. All NS-IBTS countries doorspread and wingspread calculation algorithm has been adopted by DATRAS and implemented in the database. Calculation of Swept area base flex file calculated dynamically when exchange data are updated.

ICES Data centre needs to update the procedure document on Swept area calculation for missing observation (DATRAS Procedure Document 1.3 SweptArea-based calculations - 2017) with the most recent formulae for several countries (IBTSWG 2015 Report Annex 7) and to ensure that the data in the flexfile correspond.

CPUE per swept area and swept area based indices is the next task which need to develop, this product will be part of "CPUE per SweptArea" product.

### 7.1.2 Marine Litter data

Litter assessment output product which used by OSPAR, is developed and it is available on the DATRAS download page. This product is merged with SweptAreaKm2 by doorspread and wingspread fields, so Litter data product also exposing Sweptarea information.

### 7.1.3 Archiving and Version compare

Utility of archiving and version compare of submitted data are published on DATRAS data submission test page, for most recent years still there is null values and it need to update.

### 7.1.4 Substitution of ALK and borrowing ALK for neighbouring Round Fish Areas

Semi-automatic approach of NS-IBTS ALK (age length key) substitution procedure is developed in R and for 2018 third quarter this process is going to be done automatically with minimum manual intervention. Source code of ALK borrowing and lookup table going to publish under DATRAS

ICES GitHub. Documentation of the process steps and lookup table has been developed and it will publish under DATRAS document section.

### 7.1.5 Service base data submission

There is an ongoing project between ICES datacentre and IMARES, DATRAS project has developed service base data uploading utility. There is a request from DATRAS project to IBTS national submitter, if submitter willing to participate in the exercises of automatic service base upload then DATRAS team establish the test environment for that. This utility is very helpful to keep DATRAS database most up-to-date with national database. It also minimizes the time of browser base data submission. With this utility there is a possibility to multiple file submission without waiting checking error report.

WebMethod: UploadFileToDATRAS(FileName, SurveyName, UploadMessage, Username, Userpass, DATRASExchangeFile);

FIleName: NameoftheFile(e.g:surveyxx_Qx_Yearxxx_Shipxx.csv)

SurveyName: Name of survey (according to ICES vocabularies e.g.:NS-IBTS, BTS)

Upload message: Comment about the file

Username: ICES username

Userpass : ICES pass

DATRASExchangeFile: CSV file

### 7.1.6 ROCKALL and SWC-WC indices development

There was an indices calculation workshop at Marine Scotland in Week 29 July 2017, participated by Andrzej, Finlay and Vaishav. Outcomes are as below.

- Split SW-IBTS and ROCKALL in pre 2011 and post 2011 survey
- Separate screening rules applies for both pre and post 2011
- Reviewed and developed the indices calculation code align with DATRAS
- Will part of ICES DATRAS GitHub.

### 7.1.7 DATRAS governance group tasks

Year by year size of the data in DATRAS is growing rapidly and there are increasingly demand of additional requests comes to DATRAS team. To priorities and decide which tasks is more important and getting feedback in ICES community DATRAS governance group-DGG is established. There is a representation of each survey working group personal in DGG. It has been decided there is no physical meeting required for this group and most of the meeting will arrange on Skype. There are some major initial goals of this group are as below:

**Related to goal 1:**

- Discuss and fill in the DIG governance framework for DATRAS (trawl survey data as well as litter data);
- Provide suggestions to ICES Data Centre for implementation of the improvements.

**Related to goal 2:**

- Based on the compilation of recommendations from other expert groups and committees, with a focus on synergy and coherence of similar requests for products and services.

**Related to goal 3:**

- Align DATRAS input formats for the surveys where possible;
- Align QC and QA protocols between the surveys where possible;
- Align DATRAS CA input format with Acoustic data portal biological data format where possible;
- Align products for the DATRAS surveys where possible.

**Related to goal 4:**

- Seek and collate feedback from end-users of DATRAS via interaction in working groups and committees, targeted questions, through the ICES websites, or feedback given directly to the Data Centre.

Provide responses to the end-user feedback, and create recommendations to the relevant entities if a follow-up action is appropriate and practical.

## 7.2 Report on WKSEATEC

**(Dave Stokes)**

The Workshop on Technical Development to Support Fisheries Data Collection (WKSEATEC) was proposed by IBTSWG in 2015 to make recommendations on technical solutions for the collection and quality assurance of fisheries data at sea and in ports. The objectives can be summarized by two complimentary themes; i) in order to maximize the effectiveness of quality assurance checks in fisheries data collection the greatest efforts need to be focused on the start of the process, during sampling itself; ii) this can only reasonably be achieved once the data are in a digital format which requires improved uptake of electronic data capture methods.

This workshop was held at ICES headquarters, Copenhagen, from 12th – 14th September 2017. There were 16 attendees and 2 remote participants representing 12 countries from the Mediterranean, Baltic and Atlantic areas including the US.

To address the Terms of Reference the workshop was structured into 4 topic sections:

1. **Overview – benefits and impediments to paperless sampling:** The report highlights the difference between reactively screening data products in Quality Control (QC) compared to proactive Quality Assurance (QA) where information is fed back at source during the process of sampling itself. The ready availability of affordable powerful computing and the effectiveness of open source visual and statistical data checks in open source code such as R is widely known. However, there has been less than 50% uptake on IBTS surveys for example, so barriers to wider implementation of paperless sampling during the measuring process are discussed.

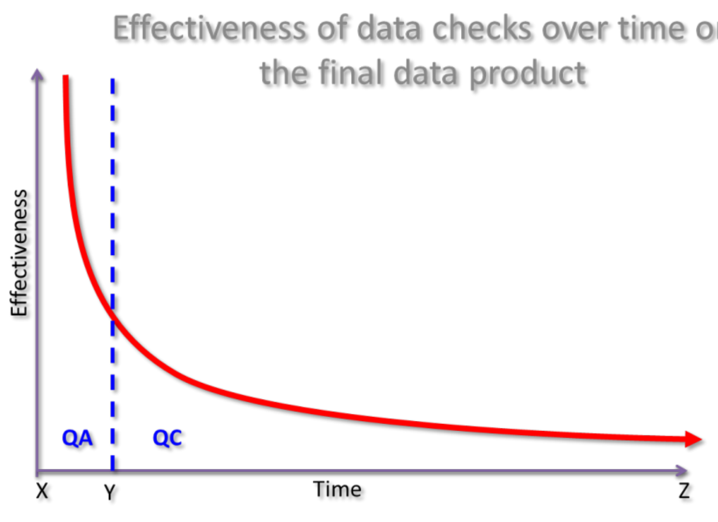



**Figure 7.2.1. A generalized schematic showing the data quality management process over time, from sampling (X) to final data product (Z). The effectiveness of data checks to correct data and actively target the Quality Assurance (QA) process dissipates quickly once the sampling process is complete (Y). Thereafter Quality Control (QC) of the data takes over to screen out anything outside agreed standards and control the quality of the final data product.**

2. **Review of current approaches:** Presentations from at the workshop illustrated that whether purchasing off-the-shelf or developing technology in-house significant time and resources can be expended. However, low cost, effective solutions are quite achievable and small-scale open source projects have been successful and are currently being field tested. Despite the financial and time investment in the projects and other areas of collaborative work being carried out by various Institutes, no collaboration development could be identified in this area.

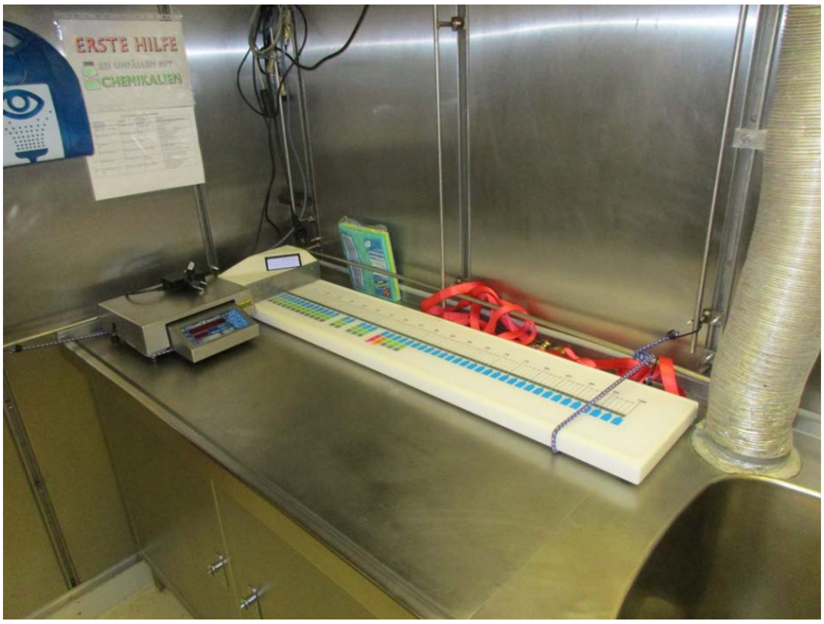



**Figure 7.2.2. One of the open source measuring board projects presented at WKSEATEC. openSMB measuring board using linear magnetorestriction sensor and linked to electronic marine scales.**

3. **Data quality control and management:** Approaches to error trapping and feedback to the board user was examined using 3 case studies presented during the workshop. The important measurement errors likely to occur as well as the efficiency of graphical data display to highlight and aid correcting potential errors was also illustrated. Once collected the ease with which data formats can be understood and exchanged is of great importance to how widely and efficiently they can be utilized to answer questions and guide management advice. Therefore guidance on a range on internationally available and maintained standard reference lists was also given.

4. Collaborative potential: Experience from developing the DATRAS and RDB data exchange formats highlight some general principles. Significant resources have been expended and experience gained by individual institutes addressing this issue and guidance is given in section 5 of the report on how best to collaborate and support increased engagement with paperless sampling.

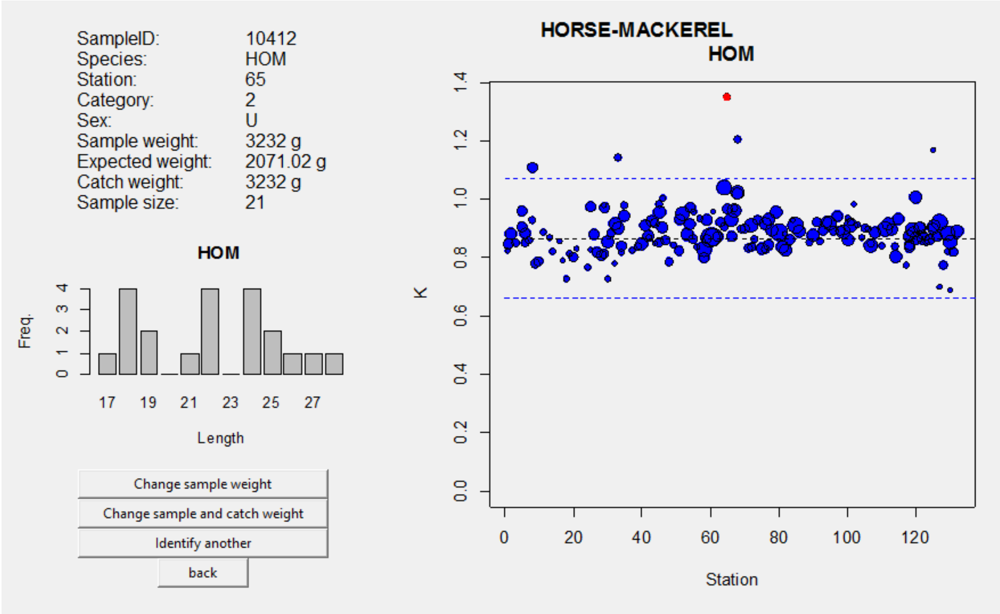



**Figure 7.2.3. Fulton's condition factor (K) for length samples. The red point is an outlier; based on the mean value of K, the expected weight for this sample was 2071g while the recorded weight was 3232g.**

WKEATEC discussed a broad spectrum of content from user perception and uptake to technical programming details. Two overarching conclusions were reached however:

i) No single factor seemed to impede a move to paperless sampling. However, no agreed standards mean uncertainty around what exactly to expect from a costly electronic data capture system can lead to inertia; ii) Significant progress in electronic data capture has been made in the Atlantic/Baltic area while progress in the Mediterranean has centred on implementation of a standardized data checking routine across surveys.

To maximize the benefits of these developments the group proposed an agile approach to development and technology exchange. The first is to broaden the regular static data exchange format approach into a more generic *Fisheries Data Language (FDL)*. The second, more ambitious proposal is to combine this with an Application Program Interface (API). API's are proven in many other fields, but seen by the workshop as potential 'game changers' in supporting the integration of technology and open source "data tool boxes" for fisheries data collection. The end goal being that that technology and data tools would become 'plug and play'. Any piece of hardware then that could collect a length measurement would output that length data in format that would be understood by any application or data tools written to expect that standard, regardless of programming language or operating system where the API would translate between the data standard format and your application environment. It should operate in a similar way to a smartphone where you load your App and allow it access to your hardware (camera, GPS etc.) regardless of hardware manufacturer or operating system and the software will quickly provide the same functionality across a vast range of hardware/software combinations.

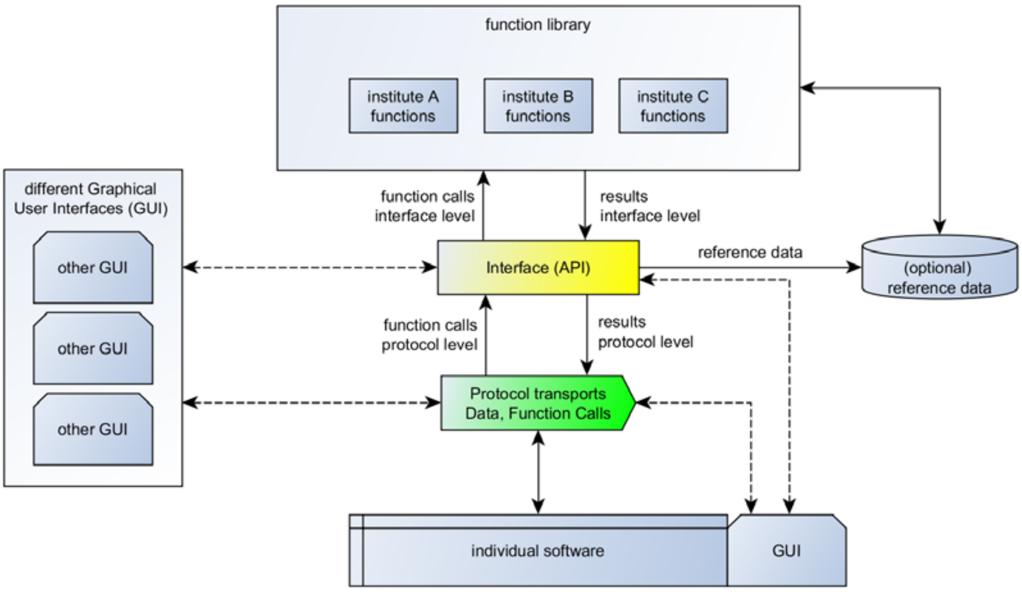



**Figure 7.2.4. Schematic view of how an Application Program Interface (API) can sit between multiple independent applications managing the flow of function calls and responses as data and information flow in both directions.**

The resolutions from WKSEATEC have been approved by and a second workshop is planned for Sept 2018 to develop the themes further. In particular to review alternative electronic data capture equipment such as digital calipers in particular. Also to progress the common FDL idea and scope the work required to prioritize and develop one or more API's in the first instance.

## 7.3 New data registration system on Thalassa and other IFREMER vessels

**(Morgane Travers)**

**Allegro – Tutti Project, IFREMER**

IFREMER carries out approximately 20 fisheries surveys per year on vessels from 20 m – 74 m staffed by teams of between 2-15 scientists. Since 2013 the development of a new software application, Allegro Campagne, has been undertaken as part of an overall project, Tutti. There were roughly 3 development phases performed over 3 years, and completed by some ergonomic improvements from times to times: i) initial basic version of the software, ii) implementation of the connection with electronic measuring boards, iii) addition of a sampling algorithm for otoliths.

Allegro is an **open source** Java based software, however some underlying tables (e.g. reference taxonomic species list) are specific to, and held by IFREMER. The application has been developed to import data from the Big Fin Scientific Data Collection System[1] measuring boards, Sylvac Evo electronic calipers and Marel scales (Figure 7.3.1). The application then takes over the management, storage, quality control and general reporting of the data thereafter.

[1] https://www.bigfinscientific.com/documentation/

Since 2017 autumn, the RV Thalassa has been fully equipped with electronic measuring boards and calipers, associated with the Allegro software. First experiences during bottom-trawl surveys FR-CGFS-Q4, FR-EVHOE-Q4 and FR-IBTS-Q1 were encouraging, and real-time data control have been implemented to improve data quality (preselection of a list species with possibility to add species during the survey, weight-length relationships, mapping…). As the software provides an exchange format containing raw data, it is possible to run any R-script on these data during the survey.

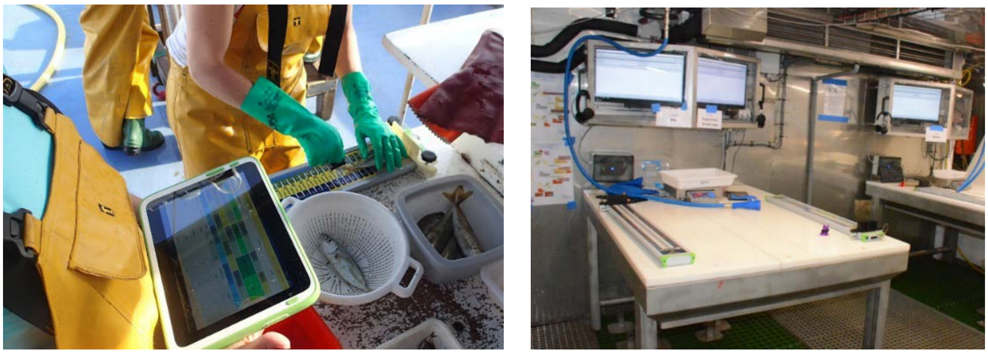


**Figure 7.3.1. BigFin DCS board being used at sea with rugged Android tablet (on the left) or associated to slave screens managed by the Allegro software on RV Thalassa (on the right).**

## 8 Development of a swept-area based index (ToR d)

Data checking and provision of interpolation routines for missing observations required for swept-area based CPUE products have been delayed again but is now almost completed. Using the new DATRAS products for the period 2004 to present, a comparison of swept area based abundance indices with haul time-based indices is now planned for the next 3-year term of IBTSWG.

# 9 Sweep length and other gear issues (ToR e)

## 9.1 Effect of varying sweep length

Analysis on the effect of variable sweeps lengths has been postpone to the next 3-year term of the IBTSWG due to the delay of DATRAS swept-area based CPUE products.

## 9.2 Use of Vonin flyers instead of Exocet kite

**(Kai Wieland)**

Denmark carried out GOV trials using Vonin flyers (Figure 9.2.1) instead of the Exocet kite during the 1Q NS-IBTS in 2018. The trials were done at 8 stations distributed throughout the survey area and covered depths ranging from 25 to 140 m. Except for one station at which only one flyer was used, vertical net opening was within the normal range, and in all cases door spread was well within the theoretical limits and the range observed when using the standard rigging with the Excocet kite (Figure 9.2.2). Hence, IBTSWG concluded that the use of Vonin flyers is a valid alternative to the kite and the survey manual will be amended accordingly.

**Figure 9.2.1. Two Vonin flyers (http://www.vonin.com/en/fishing/flyer/) attached to the headrope of the GOV.**

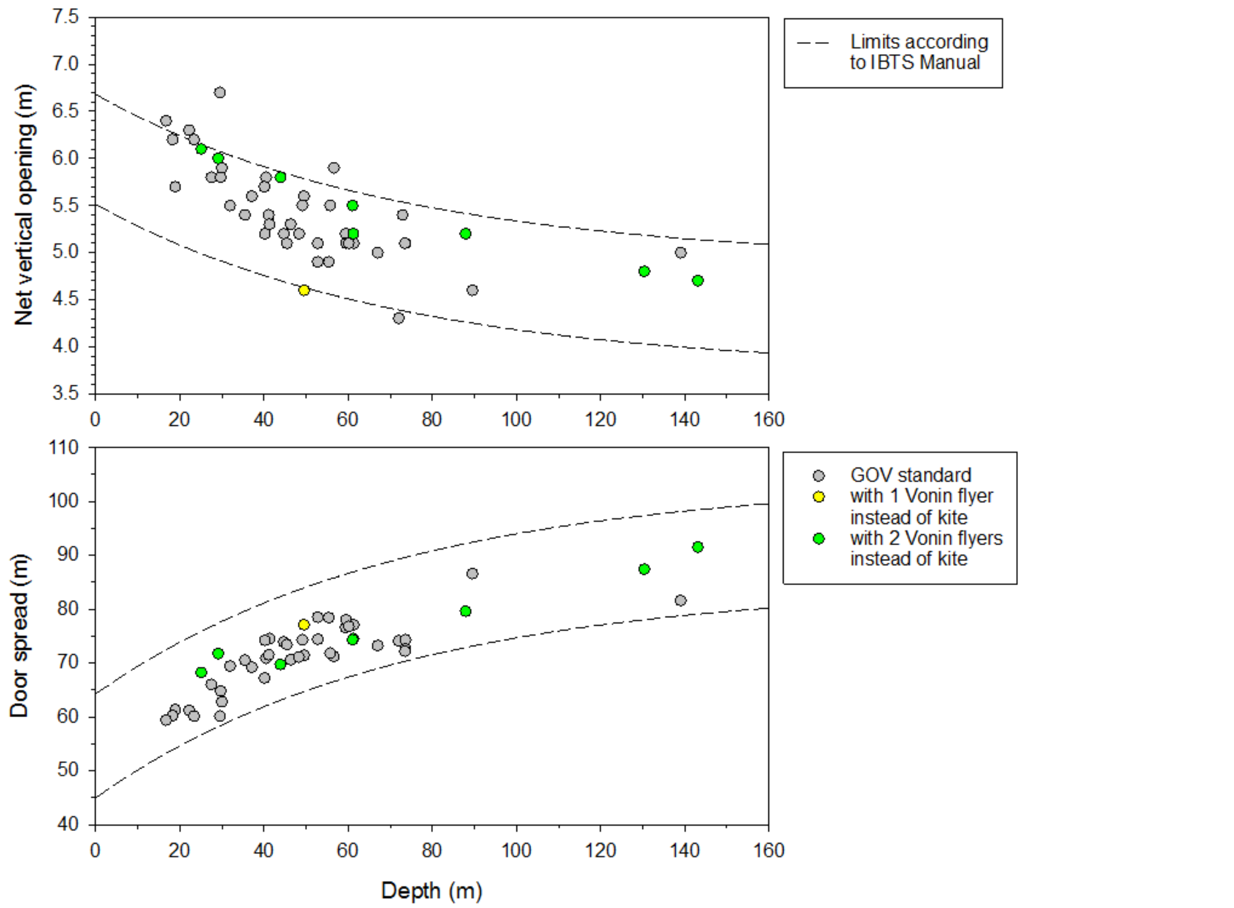



**Figure 9.2.2. Vertical net opening and door spread during the Danish 1Q2018 NS-IBTS.**

## 9.3 Comparison of nylon and polyethylene GOV trawls

**(Erik Olsen)**

### Background

Norway is considering switching to polyethylene GOV trawls as the nylon GOVs are worn out. The background is that the polyethylene GOV is considered more durable and less prone to tearing than the nylon version. Before changing trawl material Norway wanted to evaluate the effects of trawl materials on the catch rates. A controlled inter-calibration experiment was therefore carried out during IBTS Q3 in 2017.

### Methods

A total of 35 paired trawl hauls were carried out with the nylon and polyethylene trawls in the eastern and central North Sea in august 2017 (Figure 9.3.1).

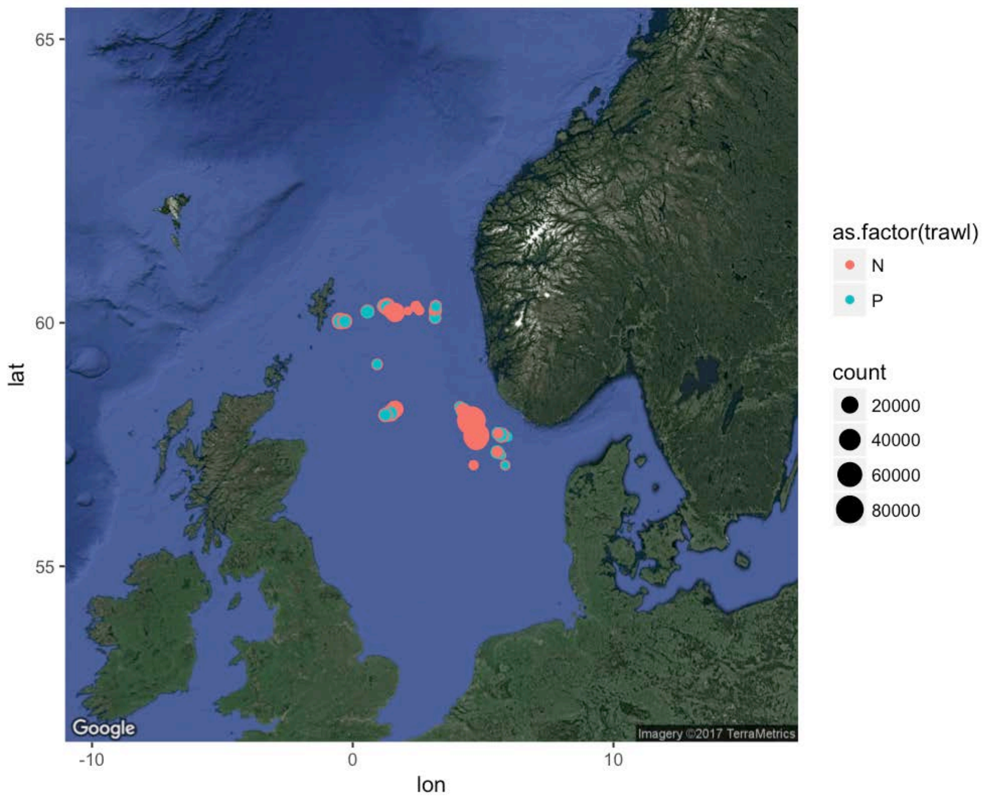



**Figure 9.3.1. Location and catch rates (number fish caught) for the inter-calibration of nylon and polyethylene GOV trawls during the IBTS Q3 survey in 2017 (vessel: F/F Kristine Bonnevie).**

Trawling was carried out aboard the Norwegian research vessel F/F 'Kristine Bonnevie' where both types of trawls were used interchangeably at each station. The order of trawling was chosen by random. A normal 30 minute IBTS bottom trawl hauls was conducted with each trawl at each location. The two paired hauls were placed with some distance so that they did not overlap, while sampling in the same area and depth.

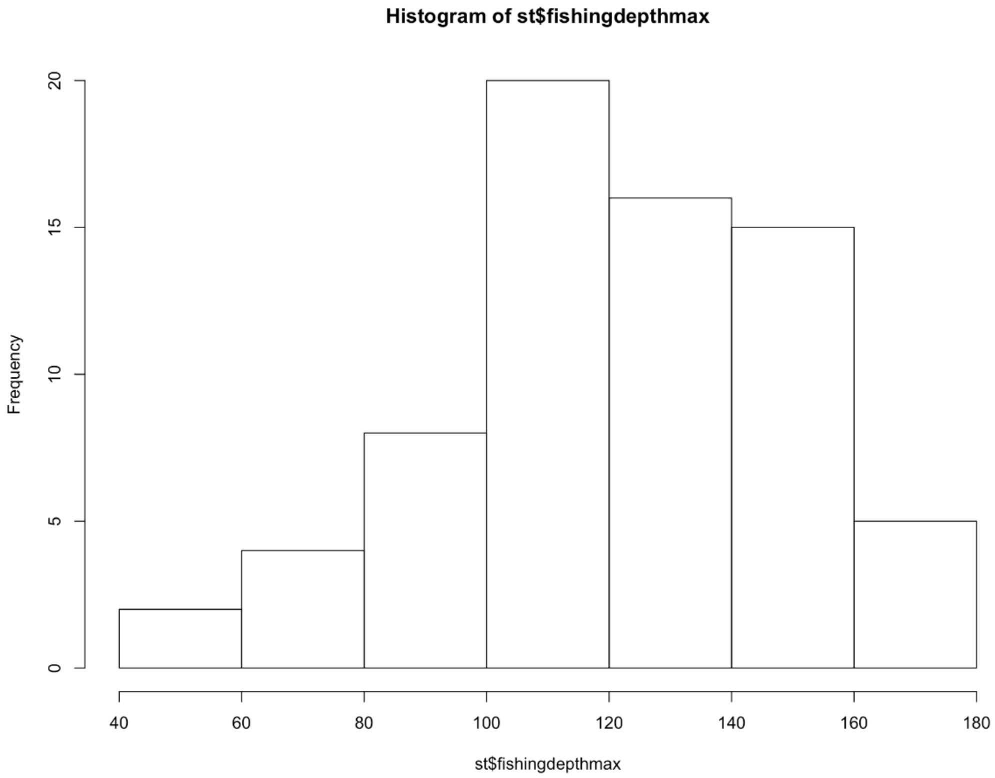



**Figure 9.3.2. Distribution of trawling stations by depth categories**

The depth of the stations varied from 54 to 167m, with a mean depth of 122 (Figure 9.3.2). Bottom substrate also varied from hard to soft sediment.

### Analysis

The catch rates were both compared overall, and by species, in relation to catch in weight and numbers as well as the length distribution of fish species. The analysis was done in R, through a 'Shiny' app that has been made available on the IBTS WG sharepoint site (and soon GitHub site).

### Results

A linear model evaluating the effects of latitude, longitude, depth, netting type, vertical opening, door-spread and wire length on total catch rate in numbers only showed significant effects of depth and latitude – netting type had no significant effects.

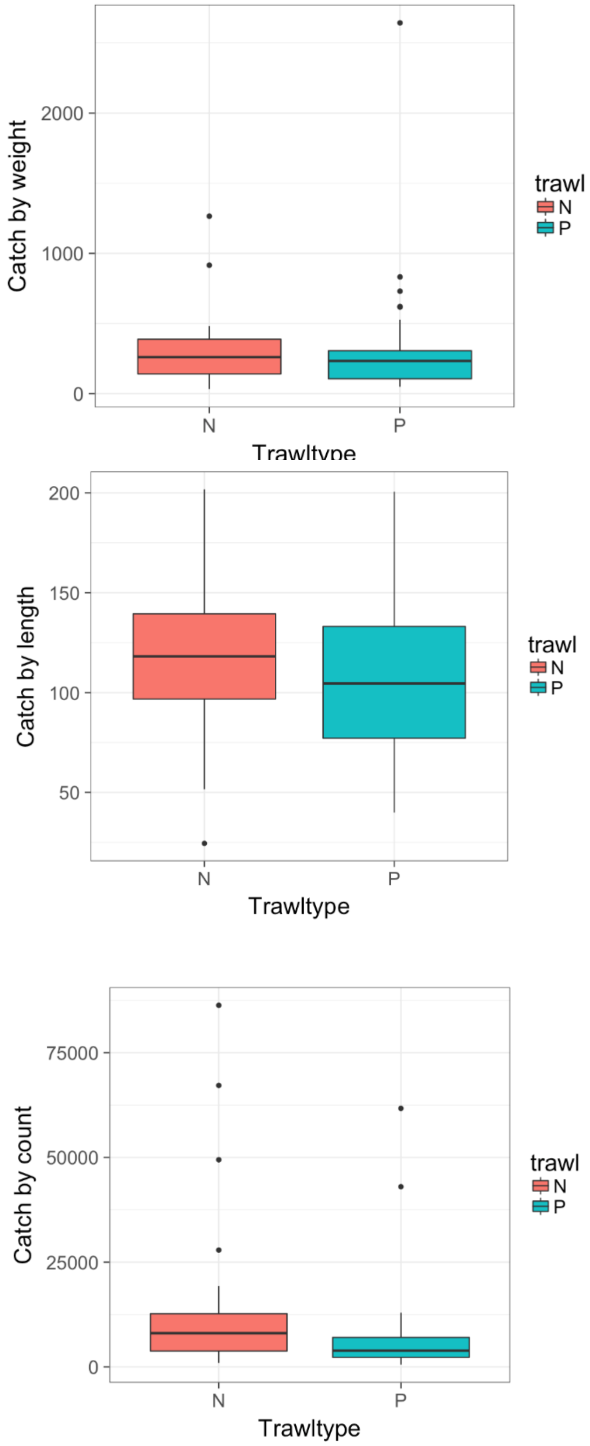



**Figure 9.3.2. Catch rates of nylon (N) and polyethylene (P) trawls measured in terms of total catch weight, numbers caught and catch by length.**

Total catch rates measured in numbers of fish caught or the total weight of the catch did not differ significantly between the two trawl types, but the length distribution was significantly different (Figure 9.3.3).

Looking in more detail at the species-specific catch rates (Table 9.3.1) showed that there were significant differences in the catches by length for 24% of the species, 8% by numbers and no significant difference by weight.

**Table 9.3.2. Evaluation of significant differences in catch rates between nylon and polyethylene trawls.**

| | Length | Weight | Count |
|---|---|---|---|
| Bluemouth | | | |
| Long rough dab | X | | |
| Horse mackerel | | | |
| Whiting | | | |
| Haddock | | | |
| Thorny ray | | | |
| Pearlsides | X | | |
| Ling | | | |
| Lemon sole | | | |
| Hake | | | X |
| Mackerel | | | |
| Saithe | X | | |
| Herring | | | |
| Hagfish | | | |
| Witch flounder | X | | |
| Poor cod | X | | |
| Cod | | | |
| Argentine *(A. silus)* | | | |
| Norway pout | | | |
| Monkfish | | | |
| *Eledonecirrhosa* | | | |
| Wolffish | | | |
| *Ilex coindetii* | | | |
| Loligo | | | |
| Argentine *(A. sphyraena)* | X | | X |
| Blue whiting | X | | |
| Pollack | | | |
| Dragonet | | | |
| Nephrops | | | |
| Grey gurnard | | | |
| Boarfish | | | |
| Plaice | | | |
| Gudgeon | X | | |
| Silvery cod | | | X |
| Crystal goby | X | | |
| *Sepiola* | | | |
| Four-bearded rockling | | | |
| Megrim | | | |
| *Pontophilus norvegicus* | | | |
| *Pontophilus spinosus* | | | |
| Shrimp | | | |
| *Lithodes maja* | | | |
| | | | |
| **% significant differences** | **24 %** | **0 %** | **8 %** |

The significant difference were usually due to large differences in catches at a few stations as shown with the saithe catch rates below (Figure 9.3.4)

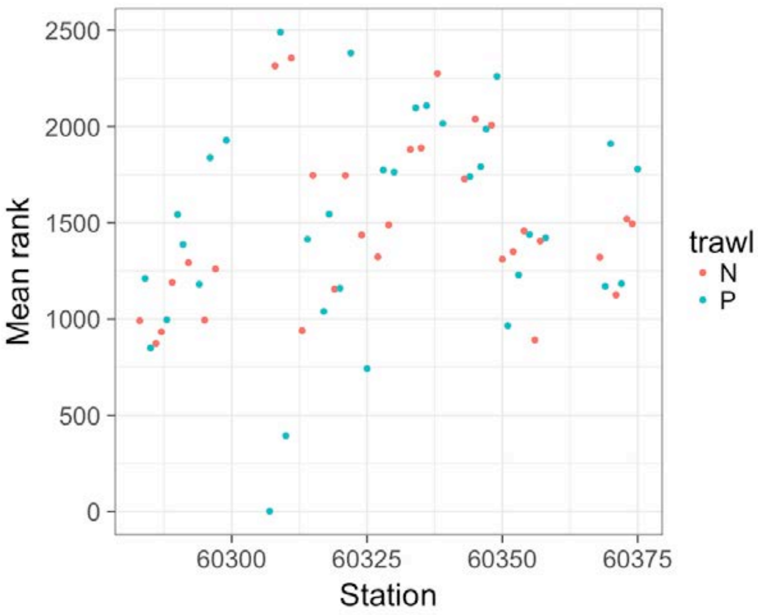



**Figure 9.3.3. Mean rank of catch rates of saithe for the pairwise inter-calibration of nylon and polyethyelene trawls. This difference was statistically significant (t-test, p<0.05), but caused by three stations where the polyethylene trawl had a very different length distribution than the nylon trawl.**

### Conclusion

The overall results show no difference in catch rates by weight and number, and neither does the linear model analysis. The significant differences are found in the length distribution and are due to differences in length distribution at a few stations. The conclusion is therefore that there is no difference in the performance of the nylon vs the polyethylene GOV trawls and both types can be used interchangeably.

## 9.4 New survey trawl

**(Robert Kynoch)**

A presentation was made to the group outline potential steps as a way forward in designing a new IBTS survey trawl to replace the existing standard trawl gear (GOV). A previous study reported to IBTSWG (2015) highlighted the divergence in the GOV specification from the one given in the survey manual (ICES, 2015) due to historical drift and technical creep. Furthermore, the group recognized the fundamental design of the GOV causes net damage and is therefore not fit for purpose.

The 'road map' process defined by WGSTSG (2009) in designing new survey trawls was outlined for the group. Reviewed were catchability (groundgear contact, vertical/horizontal opening and herding effect), selectivity (mesh size and groundgear construction) and trawl construction (robustness, durability, stability and cost). Some basic gear design parameters were discussed and trawls from Ireland (design stage) and Scotland (constructed) were presented as examples. All GOV users were asked to contribute to the development process and provide feedback from relevant groups within their institute. Furthermore, to assist in guiding the process a join workshop during 2018 with FTFB participation was recommended. The group were also informed of catch comparison trials planned by Scotland to compare a Scottish GOV with the new (Scottish) trawl in October 2018.

The presentation concluded with a discussion on the methodology of introducing a replacement for the GOV and continuation of the assessments and time-series. It was acknowledge this would need to be defined in parallel with the development of the new gear.

Actions

1. GOV users to contact relevant groups within their institute and provide feedback on design criteria/requirements with reference to the WGSTG 'Road may' by 29 June 2018.
2. Establish a workshop with WGFTFB participation during 2018 to assist in developing the new trawl package and reported back to IBTSWG (2019).

### 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. 2009. Report of the Study Group on Survey Trawl Standardisation (SGSTS), by correspondence. ICES CM 2009/FTC:09. 127 pp.

ICES. 2015. Manual for the International Bottom Trawl Surveys. Series of ICES Survey Protocols SISP 10 - IBTS IX. 86 pp.

# 10 Evaluate the present scheme of collection of age and other biological data (ToR f)

Following analysis in 2016, the collection of otoliths in Q1 and Q3 surveys for the North Sea as well as in the NeAtl-IBTS has been made by tow instead by roundfish area or survey strata for all of the target species in the recent years. Further details are specified in the respective survey manuals.

## 11 Survey design (ToR g)

### 11.1 French MFSD: Request for fixed stations in the Eastern Channel

**(Arnaud Auber)**

During the 2018 meeting of the IBTSWG, a presentation was done by France in order to get advice from the group concerning a recent request from D1 and D5 coordinators of MSFD. The request consists to sample zooplankton, phytoplankton and to measure hydrological parameters (through the CTD) each year in fixed areas (see yellow rectangles in figure 11.1.1) during the French IBTSQ1.

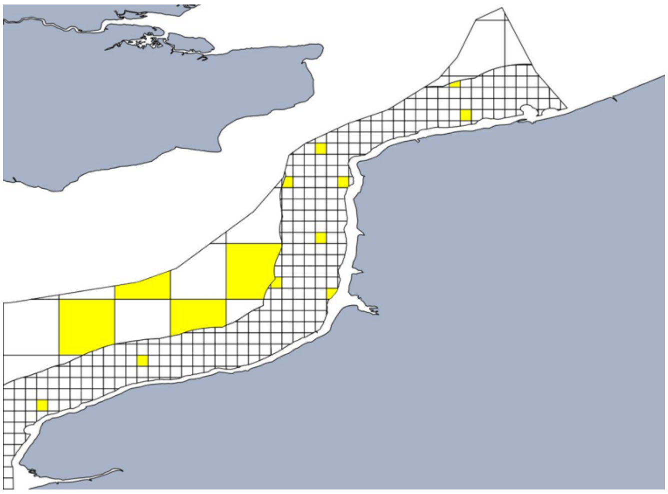


**Figure 11.1.1. Targeted areas for MSFD sampling during IBTSQ1.**

Three cases can be identified:

1. If time permits: both IBTS and MSFD stations are performed (Figure 11.1.2).
2. If time doesn't permit: <u>choice n°1</u> = Do we perform scheduled IBTS stations but any within MSFD areas (yellow polygon)?
3. If time doesn't permit: <u>choice n°2</u> = Do we move scheduled IBTS stations to MSFD area (yellow polygon, see Figure 11.1.3)? In this case, the consequence is that the time doesn't permit every year, the sampling scheme could become relatively fixed through time (which is not the case since several decades in the IBTS protocol).

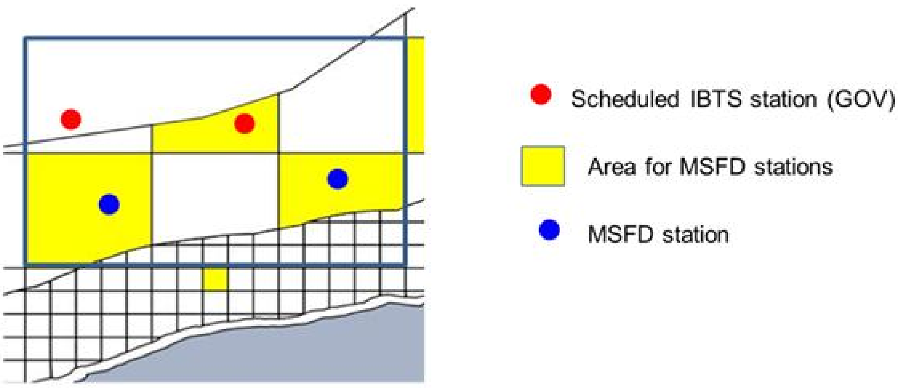



**Figure 11.1.2. Example of stations position within the 29F0 ICES rectangle (IBTS stations are not necessarily in MSFD areas).**

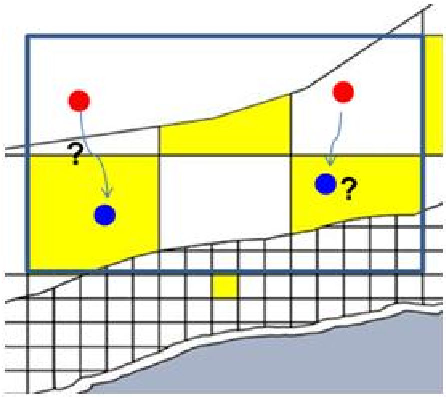



**Figure 11.1.3. Example of scheduled IBTS stations moved into MSFD areas.**

The main conclusion of the IBTSWG was that choice 1 was the most reasonable in case where time doesn't permit to perform all the work planned during the cruise. Of course, when IBTS and MSFD stations will not be in the same areas and where times will permit to do all of them, 100% of the stations will be performed.

## 11.2 Uncertainty estimation of the North Sea IBTS abundance indices

**(Natoya Jourdain)**

The North Sea International Bottom Trawl Survey (IBTS) was started by the International Centre for the Exploration of the Sea (ICES) in 1990. Seven research vessels using standardized fishing methods participate in the survey. The survey with these vessels, which allows fishing also on course bottom provides information on seasonal distribution of stocks, abundance, hydrography and the environment which is then used for stock assessments. Estimates of abundance indices based on age–length keys (ALK) are provided without any assessment of their accuracy. We present a model-based ALK estimator, and a stratified design-based ALK estimator for estimating abundance at age. Both estimators take into the spatial differences in age–length structures. These estimators are compared with the designed-based ALK estimator proposed by ICES for IBTS, which does not account for spatial differences in the age–length structure. As the proposed ALK estimator by ICES is a combination of age data over a large area, this can result in strongly biased estimates of numbers-at-age. An example of cod (*Gadus morhua*) in ICES Subareas 4a and 4b is used to illustrate spatial differences in the proportions of age-at-length, and estimates of uncertainty are presented using nonparametric bootstrapping. In general, the model-based ALK estimator provides a more accurate coverage probability compared with the other estimators.

### ALK Estimators

#### 1. DATRAS ALK Estimator

a ) Datras assumes that the age–length compositions are homogeneous over relatively large areas;

b ) The ALK is an aggregation of individual samples from a haul combined over a RFA. Violations of assumption will give bias results;

c ) A single ALK is produced for ICES round fish areas (RFA) in the North Sea.

There are no estimates of variance for the abundance indices of catch-at -age, but the bootstrap procedure is as follows.

Pool all hauls in a RFA and sample with replacement, placing hauls in the relevant statistical rectangle. For the new sample, a haul from a different statistical rectangle can be placed in a statistical from which it did not originate, hence, the location of the trawl hauls is not preserved. Hence, we propose a ***stratified* bootstrap procedure**:

Sample all hauls in each statistical rectangle in a RFA with replacement and the new sample is placed in the relevant statistical rectangle. This preserves both the location of the trawl and the age observations within each length class.

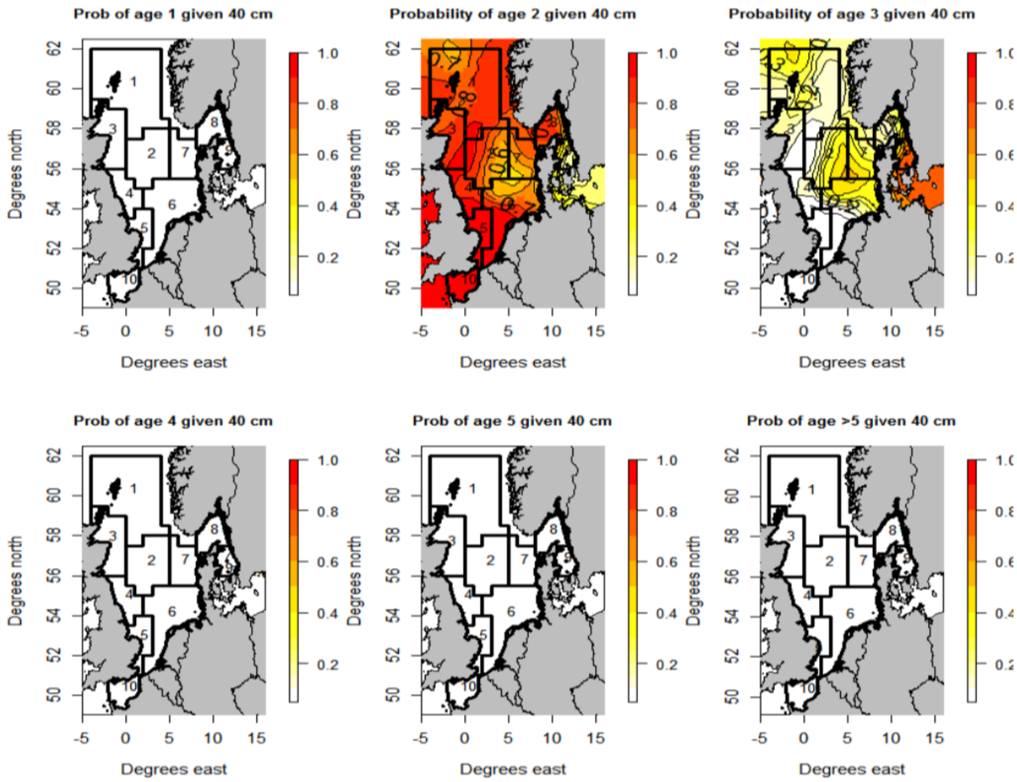



**Figure 11.2.1: Estimated probability of age a 40-cm cod in the first quarter of year 2015. The probability that the fish is of age one, three or older is approximately zero. The polygons marked 1 to 10 are the round fish areas (RFAs) where the ALK is assumed to be constant in the currently used estimators of the official CPUEs.**

### 2. Haul-based ALK

a ) Assumes variation in the age–length structures within a larger area, for example ICES RFA. The plot below shows clear variation in age–length structures for a cod of age 2 given that it is length 40 cm;

b ) An ALK is produced for each trawl, and the spatial variation in the data are accounted for.

The variance is estimated using nonparametric *stratified* bootstrapping approach described above.

### 3. Model-based ALK Estimator

Spatial model-based ALKs are widely used in fisheries (Berg and Kristensen, 2012; Gerritsen *et al.*, 2006). Statistical models

- create a distribution of age given length and possibly other covariates such haul location

- fill in of missing values in a more objective and robust manner,
- accounts for uncertainty arising due to sampling variability
- We consider Logits: a type pf model for categorical response data (e.g. age groups)
- Model

  Pr(age | length, location, haul) = function($length_{age} + location_{age} + \ haul_{age}$)

  - $location_a$ : Will capture spatial variation in the ALK
  - $haul_{age}$ : Will capture trawl haul variation e.g. a haul made may "hit" a school of fish of a certain age
- Provides an ALK for each trawl haul

The variance is computed using the *stratified* bootstrap procedure described above. The uncertainty in the ALK is considered by the model (Logit) and the variance-covariance matrix is extracted from the estimated model in TMB. This preserves the positions of trawl hauls in statistical rectangles.

### THE NORTH SEA COD DATA

Brief description of cod data in Q1 of 2015

**Table 11.2.1: Summary of North Sea IBTS cod data for the first quarter of 2015.**

| Data | Description |
|---|---|
| Trawl hauls | Total of 387 trawl hauls (303 with age information of cod) |
| Age | The age of cod varied between 1 to 8 years. |
| Length | Length information in cm of each cod varied between 8 to 112 cm |
| Date | Date of catch varied between 13.01.2015 to 19.02.2015 |
| Statistical rectangle | The stratum in which at least two trawl hauls are made |
| Coordinates | Geographic coordinates of each trawl haul in a statistical rectangle |
| Duration of haul | Mean duration is 25.9 minutes, with 15 to 30 minutes as 90% coverage interval. |
| Total count per age ($\text{Total}_{\text{age}}$) | $3017_1$, $2629_2$, $1773_3$, $1051_4$, $460_5$, $194_6$, $58_7$ |
| Total count for all ages | 7605 cod in the first quarter of 2015. |

Table 11.2.2 shows the fraction of trawl of trawl hauls with length recordings that also had age recordings from 2010-2017. In 2015, 89% of the trawl hauls with length observations also had an age observation. Conditioning on $l > 50\ cm$ the percentage is higher. The probability generally increased over the years, almost 10% between 2010 - 2017.

**Table 11.2.2: Fraction of trawl hauls with length recordings that also had age recordings.**

| **Year** | **cod** | |
|---|---|---|
| | $\Pr(a \mid l)$ | $\Pr(a \mid l > 50\ \text{cm})$ |
| 2010 | 86.4 % | 83.2 % |
| 2011 | 90.7 % | 92.4 % |
| 2012 | 87.6 % | 92.0 % |
| 2013 | 88.1 % | 93.0 % |
| 2014 | 89.8 % | 93.7 % |
| 2015 | 89.3 % | 93.8 % |
| 2016 | 93.0 % | 93.7 % |
| 2017 | 95.5 % | 98.8 % |

Table 11.2.3 shows lower catch rates for larger age–length groups and higher catch rates for smaller, younger fish. Table 11.2.4 gives the number at ALK for cod in the first quarter for all years.

**Table 11.2.3: Age–length composition of cod and number at ALK in Q1 of 2015.**

| Age ($a$) | NoAtALK | Length ($l$ in cm) |
|---|---|---|
| 1 | 460 | 9.0 - 38.0 |
| 2 | 1191 | 16.0 - 63.0 |
| 3 | 676 | 24.0 - 84.1 |
| 4 | 284 | 30.0 - 93.0 |
| 5 | 101 | 52.0 - 94.2 |
| 6 | 63 | 62.0 - 104.0 |
| 7 | 12 | 75 - 98 |
| 8 | 1 | 113 |

**Table 11.2.4: Age–length composition of cod and number at ALK in Q1 for all years.**

| Age ($a$) | NoAtALK | Length ($l$ in cm) |
|---|---|---|
| 1 | 1423 | 8.0 - 38.0 |
| 2 | 1561 | 16.0 - 63.0 |
| 3 | 1099 | 24.0 - 84.1 |
| 4 | 665 | 30.0 - 93.0 |
| 5 | 293 | 51.0 - 94.2 |
| 6 | 128 | 57 - 105.0 |
| 7 | 34 | 66 - 112 |
| 8 | 9 | 60 - 113 |

### RESULTS

Model-based ALK generally performs better in terms of uncertainty estimation. Accounts for Spatial differences in age–length structures.

DATRAS procedure generally gave smaller estimates of uncertainty as it lacks the potential to account for spatial variation in the data.

Estimated CPUE at age is captured within a 95% CI for all methods.

**Table 11.2.5: Estimates of abundance indices ($\mathbf{mCPUE_{1,a}}$) and the estimated bootstrap mean ($\mathbf{boot.mCPUE_{1,a}}$) for cod in RFA 1 in the Q1 of 2015. Estimated standard error estimates of the $\mathbf{mCPUE_{1,a}}$ are given on parentheses, and approximate 95% confidence intervals (CI) for DATRAS, Stratified, Haul-based and Model-Based bootstrap procedures are also given.**

| | DATRAS | | Stratified | | Haul-based | | Model-based | |
|---|---|---|---|---|---|---|---|---|
| Age ($a$) | $mCPUE_{1,a}$ | $boot.mCPUE_{1,a}$ | $mCPUE_{1,a}$ | $boot.mCPUE_{1,a}$ | $mCPUE_{1,a}$ | $boot.mCPUE_{1,a}$ | $mCPUE_{1,a}$ | $boot.mCPUE_{1,a}$ |
| 1 | 0 (0) | 0 | 0 (0) | 0 | 0 (0) | 0 | 0 (0) | 0 |
| 2 | 0.764 (0.25) | 0.718 | 0.764 (0.23) | 0.828 | 0.590 (0.16) | 0.631 | 0.704 (0.40) | 0.924 |
| 3 | 21.989 (6.78) | 22.399 | 21.989 (4.34) | 22.576 | 22.233 (4.23) | 22.553 | 22.113 (4.21) | 22.242 |
| 4 | 11.285 (2.20) | 10.385 | 11.285 (1.27) | 11.878 | 10.580 (1.23) | 11.532 | 10.995 (1.94) | 11.798 |
| 5 | 3.265 (0.69) | 2.665 | 3.265 (0.60) | 3.444 | 3.656 (0.54) | 3.740 | 3.501 (0.97) | 3.642 |
| 6 | 1.147 (0.34) | 0.959 | 1.147 (0.35) | 1.263 | 1.267 (0.42) | 1.448 | 1.199 (0.51) | 1.327 |
| 7 | 1.276 (0.38) | 0.999 | 1.276 (0.40) | 1.472 | 1.400 (0.52) | 1.701 | 1.215 (0.43) | 1.379 |
| | Approximate 95% CI from bootstrap procedures | | | | | | | |
| 1 | (0, 0) | | (0, 0) | | (0, 0) | | (0, 0) | |
| 2 | (0.301, 1.293) | | (0.405, 1.307) | | (0.324, 0.933) | | (0.354, 1.845) | |
| 3 | (12.673, 38.274) | | (14.956, 30.131) | | (14.867, 30.043) | | (14.531, 30.396) | |
| 4 | (6.661, 15.106) | | (9.613, 14.470) | | (9.215, 13.897) | | (8.383, 15.741) | |
| 5 | (1.553, 4.339) | | (2.329, 4.617) | | (2.797, 4.659) | | (2.025, 5.797) | |
| 6 | (0.424, 1.810) | | (0.637, 1.959) | | (0.644, 2.222) | | (0.540, 2.487) | |
| 7 | (0.387, 1.839) | | (0.735, 2.299) | | (0.756, 2.644) | | (0.648, 2.286) | |

### PLANNED WORK

- Include trawl haul in the model-based ALK estimator
- Derive an abundance-at-age estimator for the whole North Sea, and its variance estimator
- **Compare ALK estimators**
- Use ALK estimators in an assessment model, e.g. SAM or XSAM
- **Optimize sampling effort**: removal of trawl hauls and otoliths to determine if there is any effect on the variance
- As a means of justifying sampling effort e.g. number of days at sea and number of stations sampled and number of samples taken
- Consider Hierarchical bootstrapping approach **(completed)**
- **Fully model-based approach for estimating abundance at age**

## 11.3 Towing times outside the nominal duration of standard tows

**(Morgane Travers, Kai Wieland)**

Towing times additional to nominal tow duration, which is the only measured time reported routinely to DATRAS, were recorded during the recent NS- and NeAtl-IBTS. Here different time-steps were defined (Figure 11.3.1):

1. Setting the codend
2. Start firing the doors
3. Touchdown of the trawl on the bottom
4. Stop firing the warps
5. Trawl geometry and vessel speed has stabilized / Start nominal tow duration
6. Start retrieving the warps / End of nominal tow duration
7. Trawl lift-off from bottom
8. End of hauling the doors
9. Codend on deck.

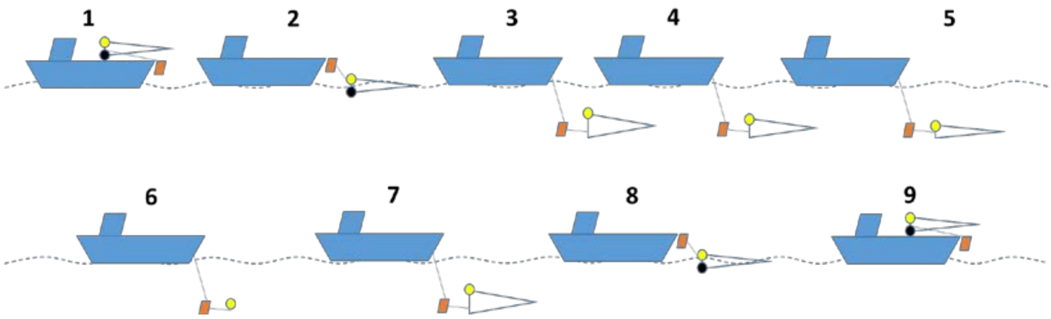



**Figure 11.3.1. Illustration of steps for recording of towing times during the French CGFS-O4 in 2017 (from presentation on WD1).**

As defined in the IBTSWG 2017 report steps 2, 3, 5, 6, 7 and 8 have been recorded by all countries and an examples for the results are given here for France from the Channel Goundfish Survey in Q4 (CGFS-Q4) in 2017 and for Denmark from the North Sea IBTS in Q3 2017 and in Q1 2018. Observations from other countries will be analysed together with the results of zero-minute tows as outlined in section 11.4).

Difficulties for a clear identification of the time when the trawl lifted off the bottom based on the echograms from the acoustic trawl geometry sensors were encountered in particular in shallow waters. However, bottom contact duration (from time-step 3 to 7) and total towing time (from time-step 2 to 8) exceeded the nominal tow duration (from time-step 5 to 6) by about 5 and 10 min on average (Figure 11.3.2). Time from the beginning of shooting (step 2) until groundgear bottom contact (step 3) (Figure 11.3.3.) and hence total fishing time outside the nominal tow duration was related to depth (Figures 11.3.2. and 11.3.4) due to higher warp length at larger depth.

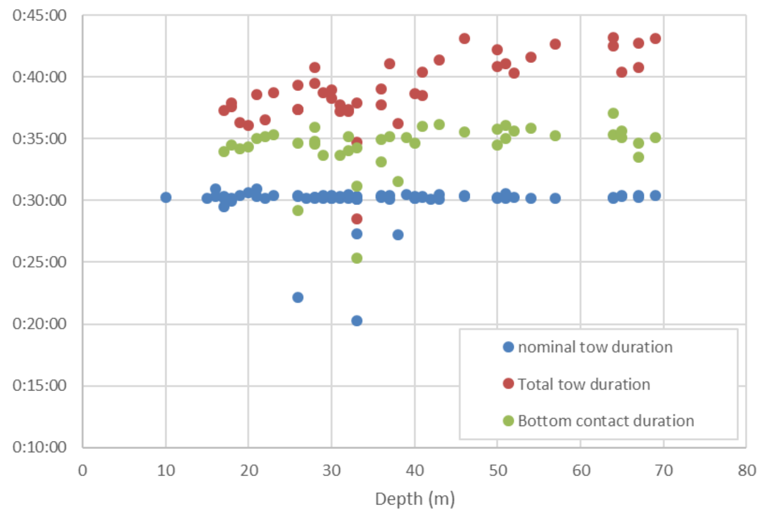



**Figure 41.3.2. Tow times during the FR-CGFS-Q4 in 2017.**

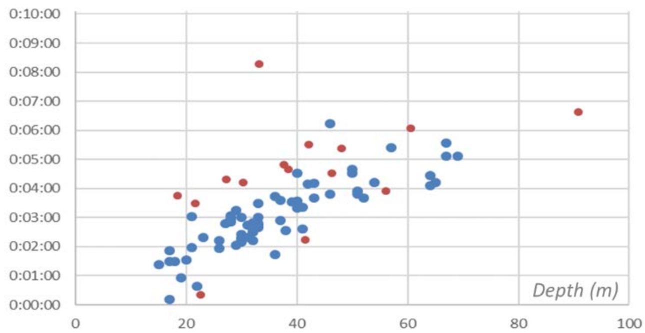



**Figure 11.3.3. Time from setting the doors until touchdown during the 2017 FR-CGFS in Q4.**

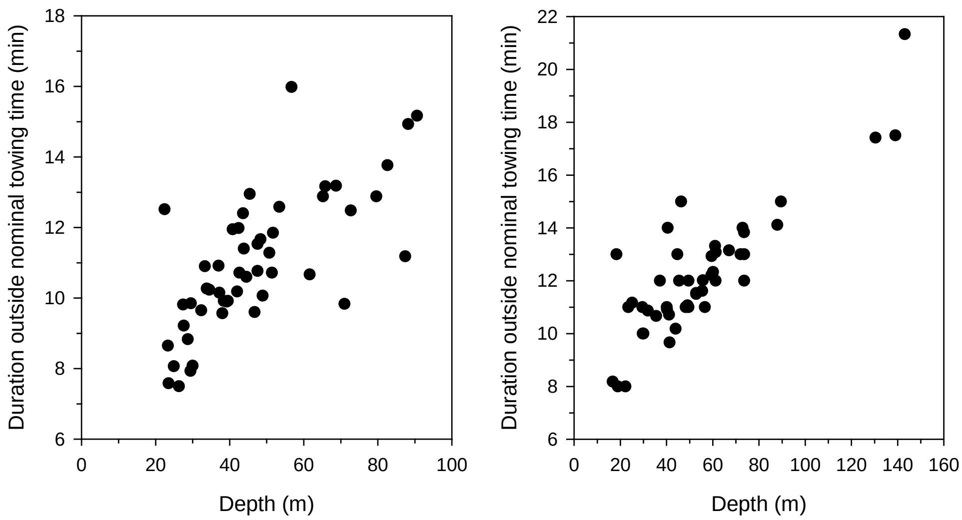



**Figure 11.3.4. Total fishing time outside the nominal tow duration related to depth during the Danish NS-IBTS in Q3 2017 (left) and Q1 2018 (right).**

## 11.4 Effect of tow duration on catch rates: Preliminary results from zero-minute tows

**(Kai Wieland, Finlay Burns, Erik Olsen, Arnaud Auber, Chris Lynam, Anne Sell, Barbara Bland, Francisco Velasco, Corina Chaves, Ralf van Hal)**

### Background

IBTSWG has discussed the effect of varying tow duration together with the possibility of reducing the standard tow duration. This would potentially free up survey effort that could then be used to satisfy additional sampling requirements. These would allow the survey to move towards a more integrated ecosystem survey without impairing the integrity of the date required for stock assessments several times during the current 3 year but also during the previous term (see e.g. IBTSWG reports 2015 – 2017). In an experimental setup, the IBTSWG explored during the Q3 surveys in 2015 and 2016 the question whether the standard 30-min hauls could be reduced to 15-min without losing important information. During this analysis, it became apparent, that the portion of a haul caught during shooting and hauling of the net may be substantial in some cases. While it is obvious, that a portion of the catch may be obtained outside the nominal tow duration, but its magnitude and importance has not been well documented. It had been assumed that the proportion of the catch outside the nominal tow duration was relatively more important for short than for long tows and may depend on depth but there is no evidence that this has a significant effect on the overall abundance indices derived from a survey, and so far tows are accepted as valid even if their duration differed substantially from the standard towing time. Therefore, during its meeting in 2017, IBTSWG encouraged the participants in the NS- and NeAtl-IBTS to collect information on GOV fishing times outside the nominal tow duration (see section 11.3) and to conduct 'zero-minute' tows for estimating the so-called 'end effect' for the GOV trawl (ICES 2018: Report of the IBTSWG. ICES CM 2017/SSGIEOM:01. 337 pp.).

### Information collected

10 different countries conducted zero-minute tows (Table 11.4.1) and for some of them details are described in several working documents (as attached in Annex 9). The zero-minute tows were usually conducted close to a 30-min standard tow and in some cases also additional 15-min tows were carried out. In a few cases replicates of zero-minute tows at the same sampling location were completed in order to estimate small-scale variability. An example for the geographical layout of the tows in the vicinity of a standard tow is shown in figure 11.4.1, avoiding fishing on exactly the same ground. This should ensure that the catches were taken far enough away from the preceding tows, thus ensuring there are no resulting aggregation/disturbance issues.

The trawl track of a zero-minute tow does not necessarily follow a straight line depending on wind and wave conditions during setting and hauling and thus towed distance cannot simply be calculated from the vessel positions at start and end of the station (Figure 11.4.1). Net geometry and vessel speed changes constantly during zero-minute tows (Figure 11.4.2) in which hauling back of the trawl starts just in the moment when stable values are obtained on the sea floor. Hence, catches can only be standardized by total tow duration or, preferably for demersal species, by fishing time at the bottom (outside stable conditions), but not by swept area as done in a study by Battaglia *et al* (2006, ICES JMS 63: 956-959).

**Table 11.4.1. Inventory of zero-minute tow datasets collect during the NS- and NeAtl-Atlantic IBTS.**

| Year | Quarter | Country | Vessel | Set number / ID (Location) | Rectangle | Depth range | Number of zero minute tows | Accompanied 30 min tow (Y/N) | Accompanied 15 min tow (Y/N) | Documentation |
|---|---|---|---|---|---|---|---|---|---|---|
| 2017 | 3 | DNK | DAN2 | A | 34F2 | 48 - 49 | 1 | Y | N | IBTSWG 2018 WD4, Data files on sharepoint |
| 2017 | 3 | DNK | DAN2 | B | 39F1 | 47 - 48 | 3 | Y | N | |
| 2017 | 3 | DNK | DAN2 | C | 41F1 | 83 | 1 | Y | N | |
| 2017 | 3 | DNK | DAN2 | D | 41F4 | 68 - 69 | 3 | Y | N | |
| 2017 | 3 | DNK | DAN2 | E | 43F7 | 34 - 39 | 3 | Y | N | |
| 2017 | 3 | SCO | SCO3 | A | 41E9 | 66 - 74 | 3 | Y | N | IBTSWG 2018 WD3, Data files on sharepoint |
| 2018 | 1 | SCO | SCO3 | B | 47E7 | 80 - 72 | 3 | Y | N | |
| 2018 | 1 | SCO | SCO3 | C | 43E9 | 82 | 3 | Y | N | |
| 2018 | 1 | SCO | SCO3 | D | 49E5 | 182 - 188 | 3 | Y | N | |
| 2018 | 1 | FRA | THA2 | W9939 | 34F3 | 40-41 | 1 | Y | Y | IBTSWG 2018 WD5, Data files on sharepoint |
| 2018 | 1 | FRA | THA2 | W9944 | 36F2 | 36 | 1 | Y | N | |
| 2018 | 1 | FRA | THA2 | W9961 | 35F1 | 50-51 | 1 | Y | N | |
| 2018 | 1 | FRA | THA2 | W9986 | 37F3 | 48 | 1 | Y | N | |
| 2018 | 1 | FRA | THA2 | W9103 | 36F5 | 29 | 1 | Y | Y | |
| 2018 | 1 | FRA | THA2 | W9126 | 34F2 | 39-40 | 1 | Y | Y | |
| 2018 | 1 | FRA | THA2 | W9135 | 32F1 | 32-35 | 1 | Y | N | |
| 2017 | 3 | SWE | DANS | Haul 48 - 50 | 44F9 | 104 - 108 | 3 | Y | N | Data files on sharepoint |
| 2017 | 3 | SWE | DANS | Haul 70 - 71 | 43G1 | 62 - 63 | 1 | Y | N | |
| 2017 | 3 | SWE | DANS | Haul 76 - 77 | 44G1 | 83 - 87 | 1 | Y | N | |
| 2017 | 3 | SWE | DANS | Haul 85 - 87 | 44G0 | 109 - 116 | 2 | Y | N | |
| 2017 | 3 | GER | WH3 | A | 38F7 | 21 | 1 | Y | N | IBTSWG 2018 WD6, Data files on sharepoint |
| 2017 | 3 | GER | WH3 | B | 39F7 | 21 - 23 | 2 | Y | N | |
| 2017 | 4 | SPA | MO29 | Set1_SPNSGFS | 14E0 | 231-238 | 1 | Y | N | Data files on sharepoint |
| 2017 | 4 | SPA | MO29 | Set2_SPNSGFS | 15E0 | 169-170 | 1 | Y | N | |
| 2017 | 4 | SPA | MO29 | Set3_SPNSGFS | 16E1 | 191-193 | 1 | Y | N | |
| 2017 | 4 | SPA | MO29 | Set4_SPNSGFS | 16E1 | 167-170 | 1 | Y | N | |
| 2017 | 4 | SPA | MO29 | Set5_SPNSGFS | 16E3 | 139-140 | 1 | Y | N | |
| 2017 | 4 | SPA | MO29 | Set6_SPNSGFS | 16E4 | 309-311 | 1 | Y | N | |
| 2017 | 4 | SPA | MO29 | Set7_SPNSGFS | 16E5 | 174-180 | 1 | Y | N | |
| 2017 | 4 | SPA | MO29 | Set8_SPNSGFS | 16E7 | 130-135 | 1 | Y | N | |
| 2017 | 3 | SPA | EZA | Set1_SPPORC | 36D6 | 343-348 | 1 | Y | N | |
| 2017 | 3 | SPA | EZA | Set2_SPPORC | 35D7 | 343-322 | 1 | Y | N | |
| 2017 | 3 | SPA | EZA | Set3_SPPORC | 34D7 | 264-287 | 1 | Y | N | |
| 2017 | 3 | SPA | EZA | Set4_SPPORC | 33D7 | 608-587 | 1 | Y | N | |
| 2017 | 3 | SPA | EZA | Set5_SPPORC | 34D5 | 366-369 | 1 | Y | N | |
| 2017 | 3 | SPA | EZA | Set6_SPPORC | 33D6 | 305-317 | 1 | Y | N | |
| 2017 | 3 | SPA | EZA | Set7_SPPORC | 33D6/33D7 | 656-698 | 1 | Y | N | |
| 2017 | 3 | SPA | EZA | Set8_SPPORC | 32D6 | 425-429 | 1 | Y | N | |
| 2017 | 4 | POR | NOR | 6 | 02E2 | 380 | 1 | Y | N | |
| 2017 | 4 | POR | NOR | 74 | 09E0 | 73 | 2 | Y | N | |
| 2016 | 3 | ENG | END | 70 | 49F3 | 130 - 135 | 1 | Y | N | IBTSWG 2018 WD2 and IBTSWG 2017 WD6 |
| 2016 | 3 | ENG | END | 62 | 47F0 | 118 | 1 | Y | N | |
| 2016 | 3 | ENG | END | 54A | 45F0 | 148 | 1 | Y | Y | |
| 2016 | 3 | ENG | END | 55 | 45F1 | 106 - 108 | 1 | (Y) | Y | |
| 2016 | 3 | ENG | END | 26 | 40F3 | 37 | 1 | Y | Y | |
| 2016 | 3 | ENG | END | 9 | 36F2 | 70 - 73 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 1 | 32F1 | 33 - 34 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 2 | 32F2 | 30 - 34 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 3 | 32F3 | 24 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 4 | 34F2 | 38 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 5 | 34F3 | 27 - 29 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 7 | 36F0 | 54 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 8 | 36F1 | 40 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 15 | 38F1 | 37 - 38 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 18 | 38F4 | 44 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 29 | 40F6 | 37 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 34 | 42F1 | 96 - 98 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 39 | 42F6 | 39 - 40 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 40 | 43E8 | 116 - 129 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 58 | 45F4 | 156 - 164 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 60 | 47E8 | 114 -115 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 64 | 47F2 | 124 - 126 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 65 | 47F3 | 164 - 187 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 66 | 49E9 | 127 - 130 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 74 | 51F1 | 130 - 135 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 76 | 43F0 | 80 - 82 | 1 | Y | N | |
| 2017 | 3 | ENG | END | 54B | 45F0 | 149 | 1 | Y | N | |
| 2017 | 3 | ENG | END | X1 | 35F1 | 30 | 1 | Y | N | |
| 2018 | 1 | NOR | 58G2 | | 43F4 | 53 - 182 | 12 | | | IBTSWG 2018 P8 |
| 2018 | 1 | NOR | 58G2 | | 49F1 | | 12 | | | |
| 2018 | 1 | NOR | 58G2 | | 49F2 | | 1 | | | |
| 2018 | 1 | NOR | 58G2 | | 49F3 | | 2 | | | |
| 2018 | 1 | NOR | 58G2 | | 50F3 | | 1 | | | |
| 2018 | 1 | NED | TRI2 | | | 14 - 95 | 8 hauls | | | |

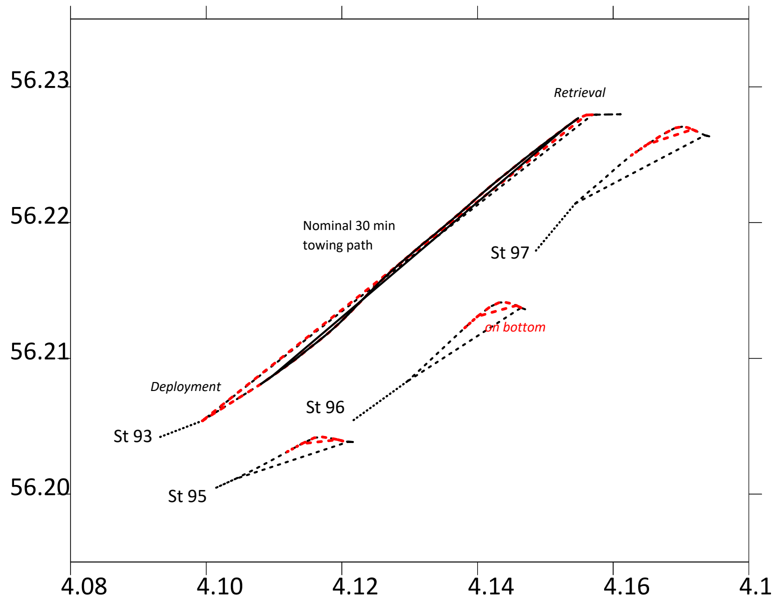



**Figure 11.4.1. Trawl tracks of a 30-min standard tow and 3 subsequent zero-minute tows conducted in rectangle 41F4 by Denmark during the 3Q NS-IBTS in 2017 (St.: station, CTD taken between the standard tow and the first zero minute tow, station 94) .**

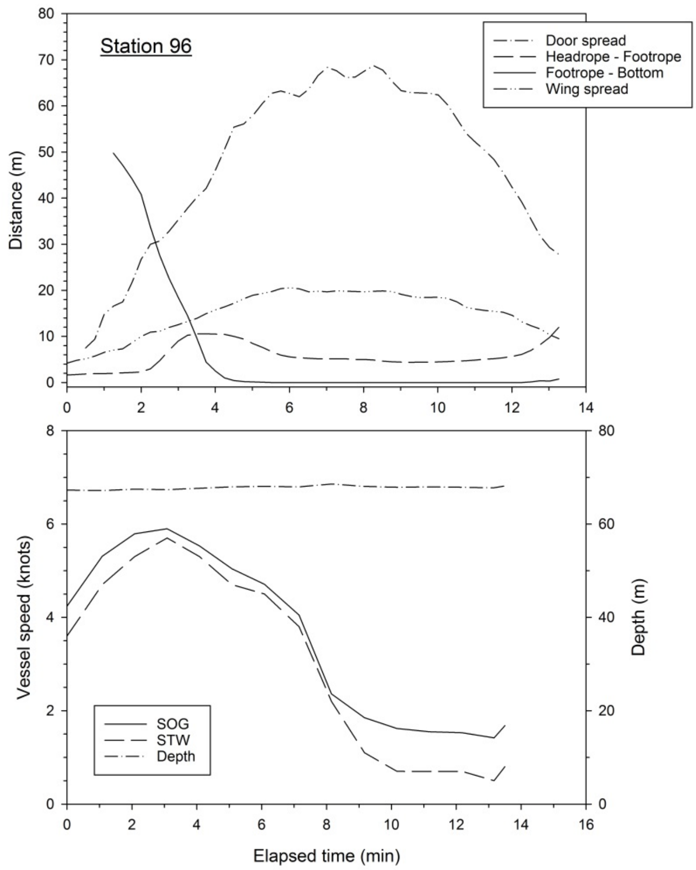



**Figure 11.4.2. Gear geometry and vessel speed during a zero-minute tow conducted in rectangle 41F4 by Denmark during the 3Q NS-IBTS in 2017.**

For most of the countries, average total tow duration and fishing time at the bottom for the zero minute tows were about 11 and 5 min, respectively (Figure 11.4.3, see section 11.3 for further details). Scotland reported significantly lower values for the bottom contact time (1 -2 min, WD3) whereas total tow duration of zero-minute tows for England (up to more than 30 min, WD2) far exceeded the ranges reported by the other countries. Since in general, for each country's vessel the fishing times outside the nominal tow duration is equal between standard tows and zero-minute tows, the comparison between both sets of catches is still valid. However, the difference when compared to the results from other countries has to be considered when a combined dataset is used and here standardization by either total tow duration of bottom contact time appears to be essential.

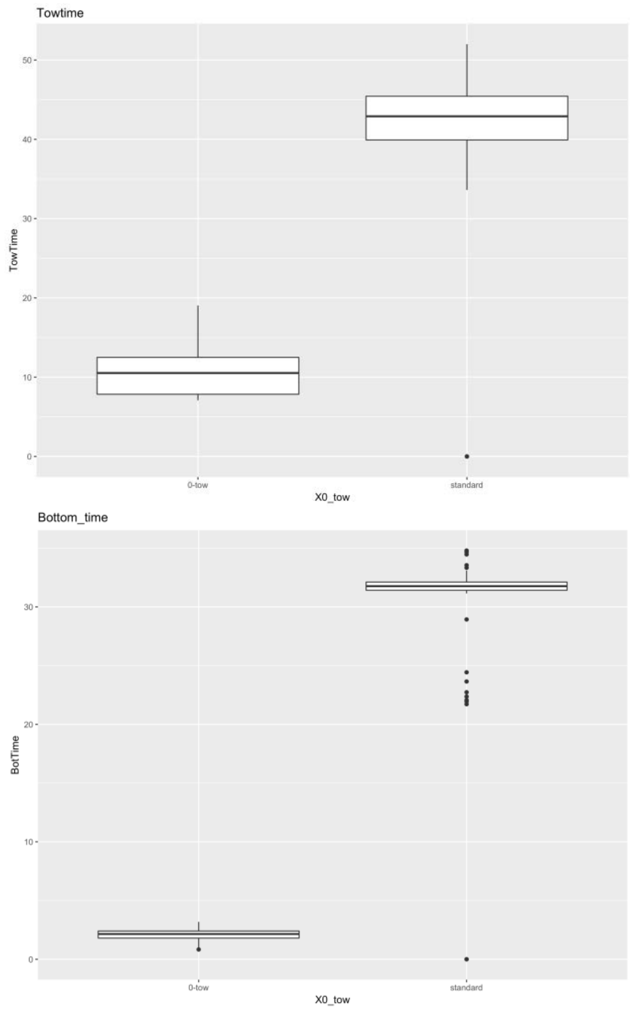



**Figure 11.4.3. Total tow duration and bottom contact time of zero-minute tows compared to standard 30-min tows for Norway, NS-IBTS 1Q 2018.**

### Preliminary results

The results from the replicate zero-minute tows from Denmark, Scotland, Sweden and Germany are highly variable for pelagic species and indicate that it is questionable that comparisons of a single zero-minute tow with the closest standard tows can give conclusive results. In contrast, the variability for the demersal species was much less, except on one sampling location (Table 11.4.2) at which 93 % of the catch was saithe

(WD3). Without this, the average coefficient of variation of the demersal species group would decrease from 0.45 to 0.34, and the average catch of demersal fish species in the zero-minute tows ranged between 1 and 17 % of the nearest 30 min tow.

**Table 11.4.2. Catches of pelagic and demersal fish species in replicate zero-minute tows.**

| | | Pelagic fish species catch (kg) | | | | | Demersal fish species catch (kg) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Zero minute tow | | | | | Zero minute tow | | | | |
| Country | Rectangle | 1 | 2 | 3 | mean | cv | 1 | 2 | 3 | mean | cv |
| DNK | 39F1 | 0.15 | 0.00 | 0.00 | 0.05 | 1.73 | 30.57 | 21.24 | 27.09 | 26.30 | 0.18 |
| | 41F4 | 0.00 | 0.00 | 0.00 | 0.00 | | 18.69 | 33.97 | 26.82 | 26.49 | 0.29 |
| | 43F7 | 0.91 | 0.00 | 1.16 | 0.69 | 0.88 | 28.90 | 26.49 | 30.57 | 28.65 | 0.07 |
| SCO | 41E9 | 0.00 | 0.00 | 0.00 | 0.00 | | 1.48 | 0.75 | 2.15 | 1.46 | 0.48 |
| | 47E7 | 1.44 | 0.21 | 0.02 | 0.56 | 1.39 | 0.24 | 0.87 | 1.12 | 0.74 | 0.61 |
| | 43E9 | 0.00 | 0.00 | 0.00 | 0.00 | | 2.31 | 0.62 | 0.87 | 1.26 | 0.72 |
| | 49E5 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.84 | 1.60 | 24.92 | 9.12 | 1.50 |
| SWE | 44F9 | 89.70 | 32.13 | 468.40 | 196.74 | 1.20 | 137.64 | 53.10 | 100.18 | 96.97 | 0.44 |
| | 44G0 | 0.00 | 7.06 | | 3.53 | 1.41 | 59.28 | 49.34 | | 54.31 | 0.13 |
| GER | 39F7 | 4.34 | 1.58 | | 2.96 | 0.66 | 0.75 | 0.66 | | 0.70 | 0.10 |
| | | | | | average: | 1.33 | | | | average: | 0.45 |

The few available data for comparing catches in zero-minute tows with 15- and 30-minute tows conducted at the same locations are shown in table 11.4.3 for demersal gadoids. They do not allow conclusive interpretations, and for this aspect the collection of more data would be desirable.

**Table 11.4.3. Catches of demersal gadoids in long and short standard tows compared to zero minute tows (*: 30 min tow average for two stations, **: 30 min tow aborted after 25 min, data for ENG from IBTSWG2017 WD6).**

| | | Demersal gadoid catch (kg) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Nominal tow duration | | | Catch zero minute tow in | Catch zero minute tow in | |
| Country | Rectangle | 30 min | 15 min | 0 min | % of 30 min tow | % of 15 min tow | |
| FRA | 36F5 | 2.30 | 1.13 | 0.00 | 0.00 | 0.00 | |
| | 34F2 | 0.60 | 0.05 | 0.00 | 0.00 | 0.00 | |
| ENG | 45F0 | 183.83 | 119.30 | 52.36 | 28.48 | 43.89 | * |
| | 45F1 | 221.47 | 252.73 | 94.76 | 42.79 | 37.49 | ** |
| | 40F3 | 2.96 | 0.99 | 0.07 | 2.36 | 7.07 | |
| | | | | Average: | 14.73 | 17.69 | |

Species richness of demersal fish species in the zero-minute tow amounted to between 24 and 120 % and on average 69 % of that in the nearest 30-min standard tow, and maximum observed lengths for zero-minute and 30-min tows were similar (Figure 11.4.4). Hence, it is unlikely that the result of the comparison of catch rates is affected by the possibility that the zero-minute hauls do catch only a minor part of the present fish community or do only catch the small individuals.

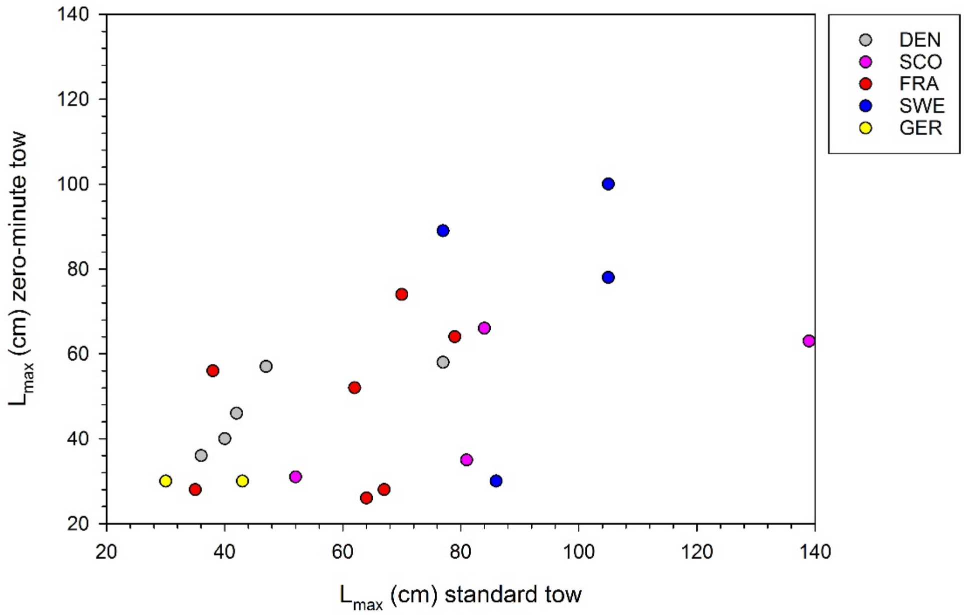



**Figure 11.4.4. Comparison of maximum length of demersal fish species in zero-minute and 30-min tows.**

### Future plans

The IBTSWG 2018 meeting participants agreed that the national data will be made available to the IBTSWG member at IMR Bergen for a comprehensive analysis of the international dataset. Here, the data should be grouped into at least pelagic fish species, demersal gadoids, flatfish and other demersal fish species and this more in-depth analysis should consider additional potentially influential factors such as depth and behavioural aspects of the target species as well as differences between countries and vessels in respect of trawl settling and hauling time. Additional information, in particular for comparing 15-min tows with zero-minute tows, may be required to test whether the effect of the catch taken outside the nominal tow duration is more important for short than for long tows. It is planned that the results of the analyses will be written in collaboration between IBTSWG members and presented as a section in an ICES Cooperative Research Report entitled "Effect of tow duration on catch rates and species richness in the North Sea and Northeast Atlantic IBTS", which should then also include a full documentation of the additional tow time data (as specified in section 11.3) collected during recent North Sea and Northeast Atlantic International Bottom Trawl Surveys.

# 12 Data overviews (ToR h) and Data reporting guidelines and Input to WKSUREP (ToR i)

As stated in last year's report, generic issues on data overviews and the type of information collected of the North Sea and the NeAtlantic IBTS are provided in the respective survey manuals. In relation to how survey data have informed the assessment and advisory process for any specific stocks assessed by ICES Expert Groups, the annual report of the relevant assessment working groups, or benchmark reports, should be consulted. The information on the data collected on the annual surveys coordinated by IBTSWG is already collated in a standardized format and are presented in separated sections for the North Sea IBTS in the 1st and 3rd quarter and the NeAtlantic IBTS in the annual reports.

# 13 Cooperation

- **Cooperation with other WG's**

IBTSWG has close contact with HAWG and WGISDAA but less cooperation with assessment WG's such as e.g. WGNSSK and WGWIDE. Members of the IBTSWG participated regularly in WGISUR meetings.

- **Cooperation with Advisory structures**

There has been or is a good contact to the parental committees SSGIEOM and EOSG.

- **Cooperation with other IGOs**

Cooperation with other IGOs is currently not applicable for IBTSWG.

## 14 Summary of Working Group self-evaluation and conclusions

A summary list of IBTSWG achievements during this cycle is given in section 4. The group recommends continuing a new term in 2019 with new chairs (Annex 5).

## Annex 1: List of participants

| Name | Address | Phone/Fax | E-mail |
|---|---|---|---|
| Anne Sell | *until June 2018:*<br>Thünen Institute of Sea Fisheries<br>Palmaille 9<br>22767 Hamburg<br>Germany<br>*after 1st June 2018:* | +49 40 38905 246<br>+49 40 38905 263 | anne.sell@thuenen.de |
| | Thünen Institute of Sea Fisheries<br>Heuwigstrape 31<br>27572 Bremerhaven<br>Germany | +49 471 94460-0 | anne.sell@thuenen.de |
| Arnaud Auber (part-time, day 1 -4) | Ifremer<br>Boulogne-sur-Mer Centre<br>150, Quai Gambetta<br>PO Box 699<br>62321 Boulogne Cedex<br>France | +33 321 995 674 | arnaud.auber@ifremer.fr |
| Barbara Bland (part-time, day 1 – 3.5) | Swedish University of Agricultural Sciences<br>Institute of Marine Research<br>Turistgatan 5<br>453 30 Lysekil<br>Sweden | +46 104784013 | barbara.bland@slu.se |
| Christopher Lynam (part-time, day 2 -4) | CEFAS<br>Pakefield Road<br>Lowestoft<br>Suffolk NR330HT<br>UK | +44 1502 524 514 | chris.lynam@cefas.co.uk |
| Corina Chaves (co-chair) | Portuguese Institute for the Sea and the Atmosphere (IPMA)<br>Avenida Alfredo Magalhães Ramalho, 6<br>1495-165 Lisbon<br>Portugal | +351 213027185 | corina@ipma.pt |
| David Stokes | Marine Institute<br>Rinville<br>Oranmore<br>Co. Galway<br>Ireland | Tel: +353 (0)91 387200<br>Fax: +353 (0)91 387201 | david.stokes@marine.ie |
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| | | | |
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| Erik Olsen | Institute of Marine Research<br>Nordnes<br>PO Box 1870<br>5817 Bergen<br>Norway | +47 934 39 256 | eriko@hi.no |
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| Francisco Baldó<br>(part time, day 2 – 5, sick on day 1) | Instituto Español de Oceanografía<br>Centro Oceanografico de Cádiz<br>Puerto Pesquero,<br>Muelle de Levante s/n<br>E-11006 Cádiz<br>Spain | +34956294189 | francisco.baldo@ieo.es |
| Francisco Velasco | Instituto Español de Oceanografía<br>Centro Oceanográfico de Santander<br>Promontorio San Martín, s/n<br>PO Box 240<br>39004 Santander<br>Cantabria<br>Spain | +34 942 291716<br>+34 942 275072 | francisco.velasco@ieo.es |
| Kai Ulrich Wieland<br>(co-chair) | DTU Aqua - National Institute of Aquatic Resource<br>The North Sea Science Park<br>Willemoesvej 2<br>9850 Hirtshals<br>Denmark | +45 3396 3276<br>+45 3396 3260 | kw@aqua.dtu.dk |
| Morgane Travers<br>(part-time, day 1 - 4) | Ifremer<br>Rue de l'Île d'Yeu<br>44000 Nantes<br>France | | morgane.travers@ifremer.fr |
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| | | | |
|---|---|---|---|
| Ralf van Hal<br>(part-time, day 1 - 4) | Wageningen Marine Research, PO Box 68, 1970 AB IJmuiden, Netherlands | +31317487088 | ralf.vanhal@wur.nl |
| Rob Kynoch | Marine Scotland Science<br>Marine Laboratory<br>375 Victoria Road<br>PO Box 101<br>AB11 9DB Aberdeen<br>UK | +44 131 244 3360 | |
| Vaishav Soni<br>(part time, day 2 – 3, sick on day 1) | International Council for the Exploration of the Sea<br>H. C. Andersens Boulevard 44-46<br>1553 Copenhagen V<br>Denmark | + 45 33 38 6735 | vaishav@ices.dk |

## Annex 2: Agenda adopted

Note: All items of the agenda were covered but not in the order as given below due to short term changes of the availability of several participants (see Annex 1).

| | | | | |
|---|---|---|---|---|
| **Monday, 19/3** | | | | |
| 09:00 | | Start, setting-up IT | *Plenary* | |
| 09:30 | | **Welcome and housekeeping** | ***Introduction:*** | ***Kai, Corina, Dave*** |
| | | **Adoption of agenda** | | |
| | | **Structure and future of IBTSWG**<br>Introductory information and initial discussion on<br>1 chair / 2 co-chairs setup<br>Self-evaluation<br>ToR's for next period | | |
| 10:30 | COFFEE | | | |
| 11:00 | | **ToR a** - **Survey coordination** | *Plenary* | |
| | | Status of reports on previous surveys<br>Northeastern Atlantic 2017<br>NS Q3 2017<br>NS Q1 2018 | ***Lead:*** | ***Fran***<br>***NN***<br>***Ralf*** |
| | | **ToR b – Survey Manuals**<br>Status of SISP's updates:<br>- Northeast Atlantic<br>- North Sea GOV<br>- North Sea MIK<br>- Marine litter | *Plenary*<br>***Lead:*** | ***Fran***<br>***Anne***<br>***Matthias***<br>***Ralf*** |
| 11:30 | | **ToR c** – DATRAS related topics | *Plenary*<br>***Presentation*** | ***Vaishav*** |
| 13:00 | Lunch | | | |
| 14:00 | | **ToR a – Survey coordination** | *Subgroups* | |
| | | Prepare reports on previous surveys<br>- Northeast Atlantic<br>- North Sea | ***Lead:*** | ***Fran***<br>***Ralf/NN*** |
| 15:30 | COFFEE | | | |
| 16:00 | | **ToR b – Survey Manuals**<br>Prepare updates<br>- North Sea GOV<br>- North Sea MIK<br>- Northeast Atlantic<br><br>**ToR a – Survey coordination**<br>Prepare reports on previous surveys<br>- Northeast Atlantic | *Subgroups*<br>***Lead:*** | ***As above*** |
| 18:00 | | Adjourn | | |

| **Tuesday, 20/3** | | | | |
|---|---|---|---|---|
| 09:00 | | **ToR g – Survey design** | *Plenary* | |
| | | Results from zero-minute tows<br>Presentations by country: | ***Lead:***<br>***Presentations:*** | ***Finlay, Chris***<br>***National representatives*** |
| 10:30 | COFFEE | | | |
| 11:00 | | Overview on towing times outside nominal tow duration<br><br>News on results from tow duration consideration<br><br>Estimating variance at age for the NS-IBTS<br><br>Request French MFSD for fixed stations<br><br>Discussion on progress and decisions on future work | ***Presentations:*** | ***Fran, NN, Ralf, Morgane***<br><br>***Finlay, Kai, Anne***<br><br>***Natoya***<br><br>***Arnaud*** |
| 13:00 | Lunch | | | |
| 14:00 | | **ToR's a, b, c, and g (zero-minute tows)**<br>Report writing | | |
| 15:30 | COFFEE | | | |
| 16:00 | | **ToR f** – Collection of age and other biological data | *Plenary*<br>***Lead:*** | ***Ralf*** |
| | | **ToR d** – Swept area index<br>**ToR e** – Effect of variable sweep lengths, groundgears etc.) | *Plenary*<br>***Lead:*** | ***Vaishav, Rob, Finlay*** |
| | | WKSEATEC: final update<br><br>French onboard data collection | *Plenary*<br>***Presentation:*** | ***Dave***<br><br>***Pascal*** |
| 18:00 | | Adjourn | | |

| **Wednesday, 21/3** | | | | |
|---|---|---|---|---|
| 9:00 | | **ToR a** - Survey coordination | *Subgroups* | |
| | | Planning the next surveys:<br>- Northeast Atlantic 2018<br>- North Sea 3Q 2018 and North Sea 1Q 2019<br><br>Response to ACOM Future Survey Risk Form<br>(by survey/country) | ***Lead:*** | ***Fran***<br>***NN, Ralf*** |
| | | **ToR a, b and c**<br>Prepare report | | |
| 10:30 | COF-FEE | | | |
| 11:00 | | **ToR a, b and c** | *Plenary* | |
| | | Draft report<br>Northeastern Atlantic 2017<br>NS Q3 2017<br>NS Q1 2018<br>DATRAS<br>(incl. species identification and other data issues | ***Presenta-tions:*** | ***Fran,***<br>***NN,***<br>***Ralf,***<br>***Vaishav,***<br>***?*** |
| 13:00 | Lunch | | | |
| 14:00 | | **Structure and future of IBTSWG**<br>Self-evaluation report<br>Decision on 1 chair / 2 chair setup<br>'Nomination' of volunteers for chair(s) and area coordinators | *Plenary* | |
| 15:30 | COF-FEE | | | |
| 16:00 | | **ToR d, e, f and g; Self-evaluation**<br>Prepare report | | |
| 18:00 | | Adjourn | | |

| Thursday, 22/3 | | | | |
|---|---|---|---|---|
| 9:00 | | Modifications of GOV<br>Vonon flyers instead of kite<br><br>Comparisons with different netting materials<br><br>New IBTS survey trawl<br><br>Status, discussion on progress and decisions on future work on gear issues | <u>*Plenary*</u><br>***Presentations:***<br><br><br><br><br><br>***Lead:*** | <br>***Kai***<br><br>***Erik***<br><br>***Rob***<br><br>***Finlay, Rob*** |
| 10:30 | COFFEE | | | |
| 11:00 | | **Structure and future of IBTSWG**<br>Election of new chairs and/or area co-ordinators<br>Recommendations from other EG's to IBTS WG<br>Action list<br>Recommendations to other EG's | <u>*Plenary*</u> | |
| 13:00 | LUNCH | | | |
| 14:00 | | ToR's and deliverables for next period<br>Venue(s) and date(s) for next meeting(s)<br>Contribution to ICES ASC 2018 Theme Session J (Survey data products for stock and ecosystem assessments) | <u>*Plenary*</u> | |
| | | Input to WGISUR in 2018 and to workshop on integrated monitoring in the North Sea in 2019 | ***Lead:*** | ***Ralf*** |
| 15:30 | COFFEE | | | |
| 16:00 | | **ToR d, e, f and g**<br>Draft report | ***Presentations:*** | ***ToR leads*** |
| | | Contribution to WKESIG (Workshop on evaluating survey information Celtic gadoids) in October 2018 | ***Lead:*** | ***Dave*** |
| | | Report writing | | |
| 18:00 | | Adjourn | | |

| Friday, 23/3 | | | | |
|---|---|---|---|---|
| 9:00 | | | *Plenary* | |
| | | Contribution to WKUSER (Workshop on unavoidable survey effort reduction) in January 2019 | ***Lead:*** | ***Dave, Arnaud*** |
| | | Contribution to WKNSIMP (Workshop on impacts of planned changes in the North Sea) in June 2019 | ***Lead:*** | ***Kai*** |
| | | Update of action list and recommendations, e.g.<br>Contact to WGFTFB (Meeting 4-7 June in Hirtshals) and Survey trawl flume tank workshop | | |
| 10:00 | COFFEE | | | |
| 10:30 | | Report Final Draft | *Plenary* | |
| | | Change / Adoption of final sections | ***Presentations:*** | ***ToR leads and area coordinators Corina, Kai*** |
| 12:00 | | Closure of the meeting | | |
| | | Update IBTSWG membership list | | ***Chairs*** |

## Annex 3: Recommendations

| Recommendation | Adressed to |
|---|---|
| 1. Provide swept area based CPUE by length and haul and CPUE by age and haul (for all rectangles including e.g. also 44F6), and swept area based based indices for the NS-IBTS target species (including plaice) applying the most recent species-specific standard areas as used in the stock assessments and defined by e.g. WKNSEA/WGNSSK, WGWIDE and HAWG | ICES Data Centre |
| 2. Etablish a joint workshop (WGFTFB and IBTSWG) for developing an new standard survey trawl and rigging for the NS-IBTS and the NeAtl-IBTS | SCICOM, WGFTFB |
| 3. Advice on improving the standardization of marine litter and provision categories and provision of an extended description preferably together with a photographic field guide for the identification of marine litter categories | WGML |
| 4. Provide a list of other experts groups that are using IBTS data from a particular survey identifying the species and/or other information from NS-IBTS and NeAtl-IBTS such as cephlapods, benthos and marine litter | SCICOM |
| 5. Identifying the species and age groups for which NS-IBTS and NeAtl-IBTS indices are used in the assessments or give acces to such information | ACOM, SCICOM |
| 6. Add a field in HH records allowing to specify experimental tows, e.g. for trawl calibration or non-standard tow durations | ICES Data Centre |
| 7. Prepare output from DATRAS for routine reporting on NS-IBTS and NeAtl-IBTS results | ICES Data Centre |
| 8. Establish a follow-up workshop on recent technical developments for improving data collection and data quality at sea (WKSEATEC II). | SCICOM |

## Annex 4: Continuation of IBTSWG and ToRs for the next period

The **International Bottom Trawl Survey Working Group** (IBTSWG), co-chaired by Ralf van Hal, Netherlands, and Pascal Laffargue, France, will meet to work on ToRs and generate deliverables as listed in the Table below:

| | MEETING DATES | VENUE | REPORTING DETAILS | COMMENTS (CHANGE IN CHAIR, ETC.) |
|---|---|---|---|---|
| Year 2019 | 1–5 April | Bremerhaven Germany, or Den Helder, NL | Interim report by xxx to ACOM-SCICOM | |
| Year 2020 | xx-xx March/ April | Lysekil, Sweden, or Belfast, UK | Interim report by xxx to ACOM-SCICOM | |
| Year 2021 | xx-xx March/ April | Aberdeen, UK, or Madrid, Spain | **Final report by xxx** to ACOM-SCICOM | |

**ToR descriptors**

| ToR | Description | Background | Science plan topics addressed | Duration | Expected deliverables |
|---|---|---|---|---|---|
| a | Coordination and reporting of North Sea and Northeastern Atlantic surveys, including appropriate field sampling in accordance to the EU Data Collection Framework. Review IBTS SISP manuals in order to achieve additional updates and improvements in survey design and standardization. | Intersessional planning of Q1; Q3 and Q4 surveys; communication of coordinator with cruise leaders; combing the results of individual nations into an overall survey summary. Intersessional activity, ongoing in order to improve survey and manuals quality. | 30, 31 | 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, WGHMM;,WGDEEP, WGWIDE, WGEEL, WGCEPH, WGML) and SCICOM.<br>2) Indices for the relevant species to assessment WGs (see above)<br>3) Planning of the upcoming surveys for the survey coordinators and cruise leaders<br>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 developments in DATRAS. | 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 | 30 | 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.<br>Annual check of recent survey data. |
| c | Develop a new survey trawl gear package to replace the existing standard survey trawl GOV. | 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 (WGIBTS 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.<br>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 | 28 | 2 years | Design specification (Working document) in 2020 |

| | | | | |
|---|---|---|---|---|
| | | Celtic Sea area where the necessity to optimize sampling oppertunities 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.<br>(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) | | |
| 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, survey effort in terms of number of otoliths by species and number of trawl hauls. | Specific issues to be addressed include: Stratification and optimal spatial distribution of effort. | 1 - 3 years | CRR on effect of tow duration on catch rates and species richness by end of 2019<br>Paper on variance estimation of abundance indices in 2020<br>Paper on Stratification and distribution of survey effort in 2021. |

## Summary of the Work plan

| | |
|---|---|
| **Year 1 (2019)** | |
| **Year 2** | |
| **Year 3** | |
| **Recurrent annual activity** | Updates for ToRs a, b and c. |

## 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 biodiversity, foodwebs, and bottom integrity. Besides the relation of fish abundance with descriptor 3 Exploited stocks. |

| | |
|---|---|
| Scientific justification | **ToR a)** This is a core function of the IBTSWG, an important forum for coordination and evaluation of standardized bottom trawl surveys in the Eastern Atlantic Area, to ensure good survey coverage in relation to stocks and areas. inter-calibration work. and high quality of data. The group also provides a brief overview the result of the individual surveys undertaken during the previous year and in the first quarter of the ongoing year. IBTSWG will continue to review feedback and implement modifications, including coordination and implementing new requirements of the EU DCF. To ensure quality and traceability of sampling protocols, changes in the design and procedures used in the surveys coordinated by the IBTSWG have tobe implemented and documented in detail in the IBTS manuals, which are available via the ICES webpage under Series of ICES Surveys Protocols.<br>**ToR b)** DATRAS has become the core database containing the data obtained in the national IBTSurveys, the The development of DATRAS needs to be evaluated annually, and the group is also one of the forum to discuss with ICES Data Centre and agree on the priority of desired further developments.<br>**ToR c)** A number of IBTS members is due to replace vessels in the next few years and this provides an opportunity to review time-series and undertake inter-calibration trials between the GOV and a new trawl.<br>**ToR d**) |
| Resource requirements | A five day IBTS meeting. Prepared documents from members following ToR Leaders identified above. Eight days Chair’s time to edit. It is estimated that each ToR will require at least 8 hours preparation. |
| Participants | The Group is normally attended by some 20–25 members and guests. All members will participate on the discussion of all ToRs, but ToRs leaders have been identified and appointed to intersessionally prepare the work and lead it in the meeting. |
| Secretariat facilities | Sharepoint plus normal secretariat support. |
| Financial | No financial implications. |
| Linkages to advisory committees | ACOM. IBTS indices are used in the assessment of multiple stocks. |
| Linkages to other committees or groups | There are relations with other botttom trawl surveys (WGBEAM, WGBIFS) that also use DATRAS as the international repository for its data (WGDIM, DGG).<br>There are also a 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) and Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR).<br>. |
| Linkages to other organizations | IOC, GOOS, OSPRA. |

## Annex 5: Working Group self-evaluation

1. **Working Group name:** International Bottom Trawl Surveys Working Group (IBTSWG)
2. **Year of appointment:** 2016
3. **Current Chairs:** Kai Wieland (Denmark) and Corina Chaves (Portugal)
4. **Venues, dates and number of participants per meeting:**

| Venues | Dates | Number of participants |
|---|---|---|
| Sète, France | 4–8 April 2016 | 21 + 7 MEDITS Seminar |
| ICES Headquarters | 27-31 March 2017 | 22 |
| Oranmore, Ireland | 19-23 March 2018 | 18 |

### WG Evaluation

5. **If applicable, please indicate the research priorities (and sub priorities) of the Science Plan to which the WG make a significant contribution.**

The IBTSWG is committed with Science Plan's topics 25, 27, 28, 30 and 31. The group has made significant contributions to the specified topics namely in the identification of monitoring requirements and quality of data estimates (SP 25); on the development of strategies to fill gaps in knowledge and methodological monitoring (SP 27); on the promotion of new technologies for observation and monitoring (SP 28); to comply with requests from other WG's and Experts Groups on the quality of its data products (SP30) and to ensure the best practices and the establishment of guidelines and quality standards for surveys's sampling programmes (SP 31)

6. **In bullet form, list the main outcomes and achievements of the WG since their last evaluation. Outcomes including publications, advisory products, modelling outputs, methodological developments, etc. ***

- Publish and update of survey manuals for the International Bottom Trawl Surveys in the North Sea (SISP 10) and in the Northeast Atlantic areas (SISP 15) as well as for the MIK sampling in the Q1 NS-IBTS (SISP 2);
- Establish routines for description of survey products: Survey summaries of IBTS coordinated surveys;
- Results from analyses on survey stratification based on fish communities and other ecological information (NS-IBTS and the Western English Channel NeAtl-IBTS);
- Tow durations experiments performed and analysed in Q3 NS-IBTS, 2015 and 2016 (Meadhdh Moriarty peer reviewed article on biodiversity aspects, several WD's to WGISDAA on catch rates effects)
- Pursued and analysis on effects of stratification presented to WGISDAA and to be carry on as new ToR in 2019-2021 (further in-depth analysis)
- Input data and algorithms for swept-area estimates have been checked for all NS-IBTS countries and some NE-Atl surveys (flexfile, CPUE estimates);
- Swept-area based CPUE used in the analyses of the NS-IBTS 3Q 2015/2016 tow duration experiment in respect to catch rates.

**From 2016/2017 reports:**

- Review of WKPIMP outcome (Workshop to plan an integrated monitoring plan in the North Sea in the third quarter), initiated by WGISUR 2015, and held in February 2016;
- Initial analysis on the efficiency of the current sampling scheme of otoliths in the NS-IBTS;
- NS-IBTS data on net geometry since 2004 has been cleaned and interpolation routines for missing values have been established.

**7. Has the WG contributed to Advisory needs? If so, please list when, to whom, and what was the essence of the advice.**

The group provides fishery-independent survey indices to assessment working groups annually, such as: WGNSSK, WGBIE, WGDEEP, WGHANSA, WGWIDE, WGEF, WGCEPH, etc...

The group provides information and input to WG Marine Litter on Litter on the seabed collected in IBTSWG surveys;

The group provides information and data products to other EG within the ICES such as WGBIOP, etc...

**8. Please list any specific outreach activities of the WG outside the ICES network (unless listed in question 6). For example, EC projects directly emanating from the WG discussions, representation of the WG in meetings of outside organizations, contributions to other agencies' activities.**

Input on MSFD and marine litter for OSPAR committees.

**9. Please indicate what difficulties, if any, have been encountered in achieving the work plan.**

Experts required for the EG have shortage of time and heavy workloads, delaying delivery of products in time.

The lack of "ownership" on matters to be changed/evaluated (e.g. nº otoliths, indices for assessment), which implies a more close interaction with other coordinators of data final products.

**Future plans**

**10. Does the group think that a continuation of the WG beyond its current term is required? (If yes, please list the reasons)**

Yes as the core actions of this group includes:

- Planning and coordination of International Bottom Trawl Surveys;
- Delivery of annual data products from bottom trawl surveys in the North Sea and the Northeast Atlantic;
- Identify ways to make surveys more cost-efficiency;
- Provide quality-ensured fishery-independent abundance indices with the lowest possible level of uncertainty.

**11. If you are not requesting an extension, does the group consider that a new WG is required to further develop the science previously addressed by the existing WG.**

*(If you answered YES to question 10 or 11, it is expected that a new Category 2 draft resolution will be submitted through the relevant SSG Chair or Secretariat.)*

**12. What additional expertise would improve the ability of the new (or in case of renewal, existing) WG to fulfil its ToR?**

The Group feels there is a need for the re-establishment of the link with data-users, whether their areas are gear technology, statistical modelling, and stock assessment WG's.

Links to other data end-users such as MSFD and Marine Litter legislators inside and outside ICES would be desirable.

**13. Which conclusions/or knowledge acquired of the WG do you think should be used in the Advisory process, if not already used? (please be specific)**

The distribution of many IBTS target species is changing and is not always being taken into account by the advisory process. The same or just slightly changed species-specific index areas are being used in DATRAS products and stock assessments of IBTS target species and this does not reflect the reality which has been identified by this group and other ICES EG's (see e.g. Heessen *et al*. (2015) Fish Atlas based on IBTS in the Celtic Sea, North Sea and Baltic Sea, and ICES (2016) WKFISHDISH). The process should integrate those alterations or adapt to those changes.

Technical developments occur and should be integrated improving data quality as in the evolution of fishery-based surveys into more complete and multi-purpose ecosystem surveys which then may also change sampling protocols and effort distribution.

# Annex 6: Individual surveys summary reports

## A.6.1. Introduction

This annex to the IBTSWG 2018 report presents the survey summaries by country that were formerly presented in the main report under section on the Northeastern Atlantic (i.e. ICES, 2017a section 5.3.2). All information about biological samples taken in all surveys, has been summarized and gathered on Table 5.3.3.1.1. under section 5.3.3.1. Biological samples).

Detailed information on survey sampling designs, stratifications and gears are also available from the Manual of the IBTS North Eastern Atlantic Surveys (ICES, 2017b).

## A.6.2. UK-Scotland: Western Division Bottom Trawl Survey Q1

<table>
<tr><td>Nation:</td><td>UK-Scotland</td><td>Vessel:</td><td>Scotia</td></tr>
<tr><td>Survey</td><td>UK-SCOWCGFS Q1 0317S</td><td>Dates</td><td>14th February – 06th of March 2017</td></tr>
<tr><td>Notes from survey (e.g. problems, additional work etc.):</td><td colspan="3">The 2017 survey design was random-stratified with primary trawl locations randomly distributed within 10 sampling strata. Trawls were undertaken within a radius of 5 nautical miles 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 65 trawls undertaken (Table A.6.2.1) with all fishing bar 1 station (haul 96) taking place during daylight hours. A total of 62 valid hauls were achieved. There were 3 foul hauls encountered. One (haul 85) in stratum Red 1for which a valid substitute (haul 86) plus another 2 two in Red 3, one of which (haul 129) was redone successfully (haul 130) while the other (haul 124) was on poor ground and lacked a substitute close by. Regular communication was maintained with commercial static gear (crab creel) fishers working off the North coast, and in the Windsock (Cod Box) which facilitated the overall success of the survey. Figure 2.1 displays sampling strata, trawl locations and haul numbers<br><br>The CTD recorder (Seabird19+) was deployed at 57 out of the 62 valid trawling stations in order to obtain a temperature and salinity profile to within approximately 5m of the seabed. Hauls 86, 103, 125, 130, 132, and 136 had no associated hydrography data.<br><br>All of the otoliths from the main commercial demersal species were aged at sea, the pelagic otoliths were aged at the lab.<br><br>All litter picked up in the trawl was classified, quantified and recorded then retained for appropriate disposal ashore.<br><br>Misc Sampling:<br>• Pelagic fish sample collection<br>Approximately 6kg each of mackerel and herring were frozen for environmental monitoring (CRCE Scotland, Glasgow)<br>• Isopod preservation<br>Approximately 20 isopods (various species) were treated with RNA later and frozen for transcriptome examination (Aberdeen University)<br>• Bobtail squid identification<br>All bobtail squid (Sepiolida) caught (n=20) were preserved in 70% ethanol for identification at Naturalis Biodiversity Centre, Leiden where initial inspection shows Rossia macrosoma, Sepietta neglecta, and Sepiola pfefferi to be present.<br>• Golf Ball sponges<br>Tissue samples and sections of all golf ball sponges (Craniella spp) caught (n=3) were preserved in ethanol for molecular and morphological study that will contribute to a revision of the genus.</td></tr>
<tr><td>No. fish species recorded and</td><td colspan="3">A total of 80 species were caught for an overall catch weight of ~43.7 tonnes.<br>Notable hauls included number 91 approx. 4.5 miles west of Uig, Lewis which held over 4.7 tonnes of large cod and over 1 tonne of haddock and also number 117 approx. 9 miles</td></tr>
</table>

| notes on any rare species or unusual catches: | southeast of Lagavulin, Islay which contained a large proportion of mixed elasmobranchs. Catches from hauls 113, 114 and 115 in the Clyde exhibited large proportions by weight of cod, haddock and whiting. In previous years there has been a general trend of pelagic species dominating catches in this area. Table A.6. 2.2 and Table A.6. 2.3 present biomass and abundance indices of main commercial species in the survey. |
|---|---|

**Table A.6.2.1. Number of stations surveyed/gear during 0317S**

| ICES Divisions | Strata | Gear | Stations Planned | Valid Stations Achieved | Additional Stations | Invalid Stations | % Stations Achieved | Comments |
|---|---|---|---|---|---|---|---|---|
| 6a-7b | All | GOV-D | 64 | 62 | 0 | 3 | 97 | 3 foul hauls 2 re-done, 1 not redone |

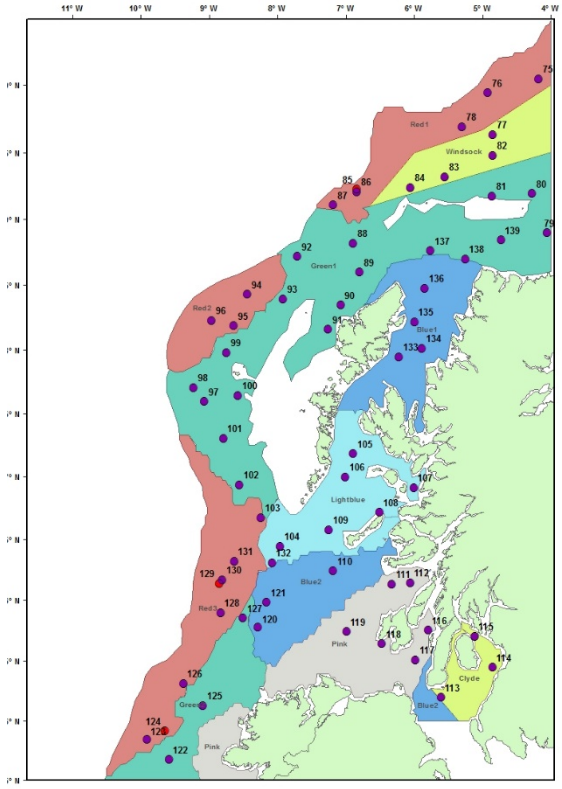


**Figure A.6. 2.1 0317S survey map showing survey strata (coloured polygons), approximate midpoints of haul positions valid (purple circles) and foul (red circles) with haul numbers.**

**Table A.6. 2.2. Indices (numbers/10 hrs fishing) of 1-groups as above since 2011**

| Species | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| *Gadus morhua* | 0.5 | 14.0 | 20.0 | 11.4 | 8.2 | 4.7 | 2.9 |
| *M. aeglefinus* | 23.8 | 147.0 | 52.5 | 529.0 | 6800.0 | 560.0 | 2171.0 |
| *M. merlangus* | 222.0 | 3441.0 | 552.0 | 5805.0 | 2545.0 | 3226.0 | 4970.0 |
| *P. virens* | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| *T. esmarkii* | 1726.0 | 10119.0 | 42379.0 | 21365.0 | 46492.0 | 32452.0 | 43699.0 |

**Table A.6. 2.3. CPUE indices (kg/hrs fishing) of major demersal species since 2011**

| Species | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| *Gadus morhua* | 9.6 | 21.2 | 29.3 | 11.6 | 72.5 | 44.1 | 190.5 |
| *Melanogrammus aeglefinus* | 148.8 | 153.4 | 180.0 | 113.7 | 169.2 | 191.0 | 324.6 |
| *Merlangius merlangus* | 49.3 | 46.9 | 63.8 | 35.0 | 58.7 | 96.9 | 109.7 |
| *Pollachius virens* | 10.8 | 6.1 | 15.2 | 25.0 | 24.0 | 17.1 | 16.2 |
| *Trisopterus esmarkii* | 280.9 | 131.1 | 130.7 | 125.8 | 65.4 | 73.9 | 126.8 |

### A.6.3. UK-Scotland: West of Scotland Rockall Survey Q3

<table>
<tr><td>Nation:</td><td>UK-Scotland</td><td>Vessel:</td><td>Scotia</td></tr>
<tr><td>Survey</td><td>UK-SCOROC-Q3<br>(Rockall Haddock)</td><td>Dates</td><td>2nd-13th September 2017</td></tr>
<tr><td>Notes from survey (e.g. problems, additional work etc.):</td><td colspan="3">The 2017 survey design was random-stratified with primary trawl locations randomly distributed within 4 sampling strata defined by depth contour: 0-150m, 150-200m, 200-250m, 250-350m.Trawls were undertaken within a radius of 5 nautical miles 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 41valid trawls completed (Table A.6. 3.1) with all fishing taking place during daylight hours. Figure A.6. 3.1displays sampling strata, trawl locations and haul numbers.<br><br>This year haddock catches stand out as very strong. Haddock recruitment was observed spread over the upper bank, particularly in the north with haul 269 showing particularly high CPUE. Although down from that of 2016, overall haddock recruitment is again well above the average since the new survey design of 2011. The CPUE of 1-groups was also observed to be very strong and evenly distributed over the upper bank. This reflects the high recruitment of 2016. Catches of 2-5 year old fish were of a generally consistent low-moderate level over the survey area. Relatively few haddock of age 6+ years were encountered.<br><br>CTD casts (n=9) were made at selected stations to give a representative coverage of the bank over the depth range surveyed.<br><br>Sediment samples were attempted from a total of 37 positions during periods when the vessel was not fishing. Of these 22 produced viable sediment samples over a depth range of 146-249m (Figure A.6. 3.1).<br><br>All otoliths were aged back at the marine lab.<br><br>All litter picked up in the trawl was classified, quantified and recorded then retained for appropriate disposal ashore.</td></tr>
<tr><td>No. fish species recorded and notes on any rare species or unusual catches:</td><td colspan="3">Overall a total of 47 species were caught during the survey for a total catch weight of ~27.3 tonnes. There were large catches overall of haddock (Melanogrammus aeglefinus~13.6 tonnes) and blue whiting (Micromesistius poutassou, ~4.6 tonnes).<br><br>Few cod (Gadus morhua, ~55kg) and saithe (Pollachius virens, ~64kg) were caught. As with the previous three years small amounts of whiting (Merlangius merlangius, ~18kg) were observed, many of them being 0-group fish. This catch however is a decrease on that of 2016. No mackerel (Scomber scombrus) were encountered this year.<br><br>Table A.6. 3.2 presents CPUE indices per 10 fishing by age for haddock. Table A.6. 3.3 Presents the megafauna sightings during the survey.</td></tr>
</table>

**Table A.6. 3.4. Number of stations surveyed/gear**

| ICES Divisions | Strata | Gear | Stations Planned | Valid Stations Achieved | Additional Stations | Invalid Stations | % Stations Achieved | Comments |
|---|---|---|---|---|---|---|---|---|
| 6b | All | GOV-D | 40 | 40 | 1 | 3 | 102 | |

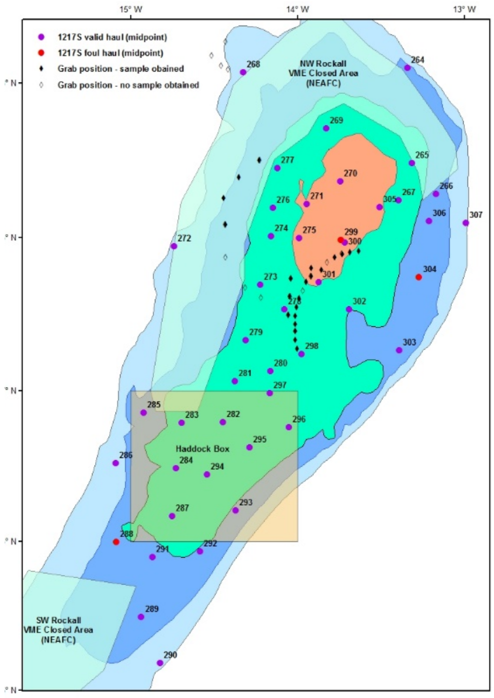



**Figure A.6. 3.1. Survey strata, NEAFC closed areas, trawl positions with haul numbers of stations and grab positions undertaken at Rockall during 1217S. Red area = 0-150m, green = 150-200m, blue = 200-250m, light blue = 250-350m and white = >350m (outside the standard survey area).**

**Table A.6. 3.5. Rounded CPUE indices (no. per 10 hrs fishing) by age for Rockall haddock 2011-2016 (actual values)**

| Age | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| 0 | 5.3 | 14779.0 | 3248.0 | 1926.0 | 1212.0 | 33441.0 | 18583.0 |
| 1 | 16.3 | 2.2 | 12259.0 | 6146.0 | 2238.0 | 1154.0 | 23853.0 |
| 2 | 138.0 | 8.5 | 7.9 | 5275.0 | 5390.0 | 1403.0 | 615.0 |
| 3 | 17.9 | 55.8 | 22.1 | 3.8 | 4195.0 | 2444.0 | 967.0 |
| 4 | 68.0 | 9.6 | 36.6 | 0.0 | 0.0 | 1703.0 | 1596.0 |
| 5 | 101.0 | 59.3 | 22.6 | 8.8 | 0.0 | 13.6 | 692.0 |
| 6 | 816.0 | 32.0 | 28.0 | 0.0 | 8.6 | 0.8 | 0.7 |
| 7 | 2.6 | 413.0 | 71.7 | 6.6 | 0.5 | 3.5 | 0.2 |
| 8 | 2.7 | 5.3 | 273.0 | 6.4 | 6.4 | 0.8 | 0.9 |
| 9 | 2.7 | 0.4 | 0.5 | 94.3 | 1.6 | 1.9 | 0.0 |
| 10 | 0.0 | 0.0 | 0.0 | 0.5 | 42.2 | 2.8 | 1.3 |
| 11 | 0.0 | 5.8 | 1.1 | 0.6 | 0.5 | 16.4 | 2.1 |
| 12 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.5 | 4.8 |
| 13 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.4 |

**Table A.6. 3.6. Megafauna encountered during sightings on 1216S**

| Species | No. of sighting events | Estimated no. of individuals |
|---|---|---|
| *Balaenoptera physalus* (Fin whale) | 3 | 3 |
| *Balaenoptera acutorostrata* (Minke whale) | 1 | 1 |
| Unidentified baleen whale | 1 | 1 |
| *Tursiops truncatus* (Bottlenose dolphin) | 2 | 20 |
| *Delphinus delphis* (Common dolphin) | 12 | 131 |
| *Stenella coeruleoalba* (Striped dolphin) | 2 | 15 |
| *Lagenorhynchus albirostris* (White-beaked dolphin) | 2 | 17 |
| Unidentified dolphin | 3 | 34 |
| Unidentified tuna | 2 | 40 |

### A.6.4. UK-Scotland: Western Division Bottom Trawl Survey Q4

| Nation: | UK - Scotland | Vessel: | Scotia |
|---|---|---|---|
| Survey | UK-SCOWCGFS-Q4 1617S | Dates | 13th November - 3rd December 2017 |
| Notes from survey (e.g. problems, additional work etc.): | The 2017 survey design was the same as that used since 2011 using a random-stratified design with primary trawl stations randomly distributed within 12 sampling strata. Hauls were undertaken on suitable ground as near to the specified sampling position as was practicable and within a radius of 5 nautical miles of the sample position. If for any reason the haul could not be undertaken at the primary site due to poor ground, static gear or prevailing weather conditions restricting towing direction then the nearest replacement was chosen from a list of secondary random positions.<br><br>For all hauls except one (390) fishing was carried out during daylight commencing each day at first light. On 21 November after haul 380 was completed the Scotia was contacted and advised by QinetiQ (MOD Hebrides) of a 50nm exclusion zone being in force. Therefore, the vessel had to steam 70nm to leave the area and this limited the fishing day to two stations. During the cruise two hauls were classified as foul in ICES area 6a, 407 due to significant pelagic fish marks entering the trawl after blockup and 399 due to the trawls belly sheet being badly torn. During the second half of the cruise weather conditions were poor with northerly or westerly gales throughout. Furthermore, significant shoals of pelagic fish (horse mackerel and herring) were encountered which limited a number of hauls to 15 minutes. Another issue encountered in ICES area 7b (stratum GY) along with pelagic shoals were significant quantities of creels. The first haul in the stratum (396) was reduced to 7 minutes due to pelagic shoals but on hauling a fleet of creels were snagged around the trawls headline and kite. Due to the continued presence of creels all around this area none of the 4 planned stations in this stratum were successfully completed.<br>A total of 58 hauls were completed during the survey with the position and daily cruise track given in Figure A.6. 4.1. The 110m sweep rig was used for 48 hauls and the 60m rig for 7 hauls.<br>All demersal and pelagic otoliths were processed at sea but were subsequently aged back at the institute. All haul summary data and length frequencies were entered at sea via the Electronic Data Collection system. A CTD was deployed at 52 stations to obtain a vertical temperature and salinity profile. However, 3 deployments were abandoned due to the prevailing weather conditions and problems with the vessels dynamic positioning system. | | |
| Number of fish species recorded and notes on any rare species or unusual catches: | A total of 90 species were caught during the survey with an overall catch weight of 32.2 tonnes. There were large catches overall of haddock (~6.51 tonnes), horse mackerel (~3.68 tonnes) and whiting (~3.38 tonnes). Herring were caught in significant numbers during one haul (408) where ~5.1 tonnes were retained.<br><br>Biological data was recorded for a number of species in accordance with the requirements of the EU Data Regulations.<br><br>Catch of significant note:<br>• Haul 408 where the herring catch was ~5.1 tonnes which represented 92.7% of the overall herring caught (~5.5 tonnes) during the survey. | | |

**Table A.6. 4.7. Number of stations surveyed/gear**

| ICES Divisions | Strata | Gear | Stations Planned | Valid Stations Achieved | Additional Stations | Invalid Stations | % Stations Achieved | Comments |
|---|---|---|---|---|---|---|---|---|
| 6a | 11 | GOV-D | 56 | 55 | 0 | 2 | 98.2 | |
| 7b | 1 | GOV-D | 4 | 0 | 0 | 1 | 0 | Creels |

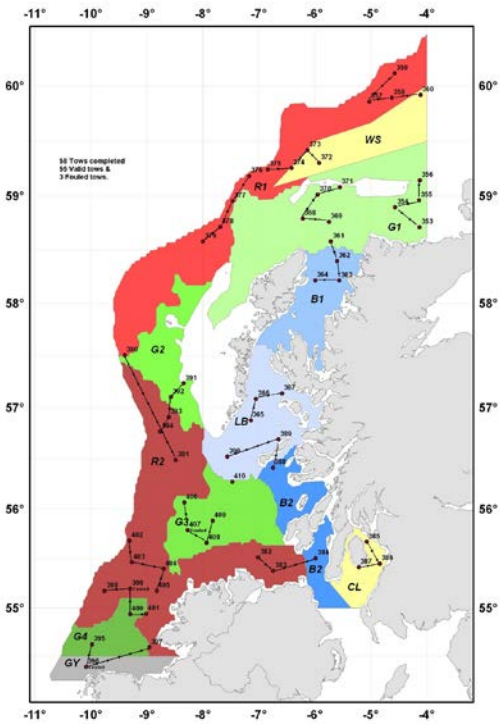



**Figure A.6. 4.2. Trawl stations completed during the Q4 WC with daily cruise track – IBTS 2017 (1617S) the 3 invalid hauls are marked Fouled. (Note - The colour shading indicates the 12 different sampling strata covered by this survey).**

**Table A.6. 4.8. CPUE indices (numbers/10hrs fishing) of 1-groups for Q4 since 2011**

| Species | 2011 | 2012 | 2013* | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| Cod | 10.0 | 19.8 | 14.0 | 23.7 | 28.2 | 6. 2 | 10.0 |
| Haddock | 39.2 | 114.8 | 69.6 | 678.7 | 9955.9 | 935.5 | 1688.2 |
| Whiting | 119.5 | 964.0 | 125.0 | 1517.8 | 2793.6 | 2415.4 | 2942.9 |
| Saithe | 0.0 | 1.1 | 0.0 | 0.4 | 5.0 | 0.6 | 0.0 |
| Norway Pout | 2192.5 | 7213.9 | 1343.9 | 2669.7 | 14814.3 | 12274.8 | 485.0 |

*** Q4 survey 2014 was not completed only covered half of the sampling area**

### A.6.5. UK-Northern Ireland: Northern Irish Groundfish Survey Q1

| Nation: | UK- Northern Ireland | Vessel: | Corystes |
|---|---|---|---|
| Survey: | UK-NIGFS Q1 | Dates: | 13/02/2017- 05/03/2017 |
| Notes from survey (e.g. problems, additional work etc.): | Temperature and salinity were recorded at each station.<br>Additional work included quantifying external parasite loads in whiting and cod by area.<br>• Table A.6. 5.1 presents the number of stations fished per ICES division, Figure A.6. 5.1 shows a map with tows carried out in 2017, while Table A.6. 5.2 presents biomass and abundance indices in the survey of main commercial species caught, with comparison in relative terms with the last 4 previous years. | | |
| Number of fish species recorded and notes on any rare species or unusual catches: | 80 species/groups were recorded.<br>No unusual species were recorded | | |

**Table A.6. 5.9. Stations fished (aim to complete 63 valid tows)**

| ICES Divisions | Tows Planned | Valid Tows | Invalid Tows | % covered |
|---|---|---|---|---|
| 7a | 63 | 62 | 1 | 98 |

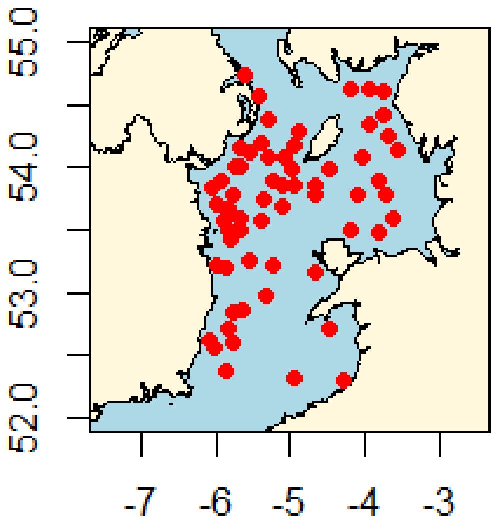



**Figure A.6. 5.3. Map of valid survey stations completed by UK-NiGFS Q1 2017**

**Table A.6. 5.10. Biomass and number estimates**

| | | Biomass index | | | Number index | | |
|---|---|---|---|---|---|---|---|
| Species | Strata | $y_i$ kg/nm | $y_i/y_{i-1}$ % | $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % | $y_i$ nº/nm | $y_i/y_{i-1}$ % | $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % |
| *Gadus morhua* | All | 2.77 | -24.0 | -37.9 | 1.97 | -33.0 | -41.3 |
| *Melanogrammusaeglefinus* | All | 27.67 | 1.4 | 101.8 | 60.98 | 22.0 | 9.6 |
| *Merlangius merlangus* | All | 40.41 | -31.9 | 92.8 | 135.10 | 26.0 | 1.9 |
| *Merluccius merluccius* | All | 0.03 | -61.0 | -81.9 | 0.40 | 135.0 | 34.5 |
| *Pleuronectes platessa* | All | 7.29 | -66.0 | 2.1 | 47.59 | 5.7 | 9.2 |

**$y_i$, year estimate (2017); $y_{i-1}$, previous year estimate (2016); $y_{(i,i-1)}$, Average of last two year estimates (2017 and 2016); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2015, 2014 and 2013).**

## A.6.6. UK–Northern Ireland: Northern Irish Groundfish Survey Q4

| Nation: | UK - Northern Ireland | Vessel: | RV Corystes |
|---|---|---|---|
| Survey: | UK-NIGFS Q4 | Dates: | 02/10/17-19/10/17 |
| Notes from survey (e.g. problems, additional work etc.): | Temperature and salinity were recorded at each station.<br>Some stations could not be completed due to averse weather conditions and the wing spread sensors could not be employed due to the same reason.<br>One station had to be omitted due to static gear and another one was attempted twice but aborted due to large herring marks.<br>Additional work included quantifying external parasite loads in whiting and cod by area.<br>Table A.6. 6.1 shows the number of stations fished per ICES division, Figure A.6. 6.1 depicts a map with the stations fished while Table A.6. 6.2 presents biomass and abundance indices of main commercial species caught in 2017 survey with comparison in relative terms with the last 4 previous years. | | |
| Number of fish species recorded and notes on any rare species or unusual catches: | 80 species/groups were recorded.<br>No unusual species were recorded, but large aggregations of herring as well as large amounts of jelly fish. | | |

**Table A.6. 6.11. Stations fished (aim to complete 63 valid tows)**

| ICES Divisions | Tows Planned | Valid Tows | Invalid tows | % covered |
|---|---|---|---|---|
| 7a | 63 | 58 | 1 | 92 |

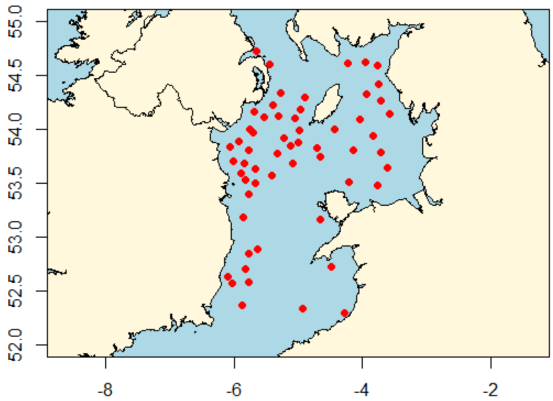



**Figure A.6. 6.4. Map of valid survey stations completed by the NIGFS Q4 during 2017 survey.**

**Table A.6. 6.12. Biomass and number estimates**

| Species | Strata | Biomass index | | | Number index | | |
|---|---|---|---|---|---|---|---|
| | | $y_i$<br>kg/nm | $y_i/y_{i-1}$<br>% | $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$<br>% | $y_i$<br>nº/nm | $y_i/y_{i-1}$<br>% | $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$<br>% |
| *Gadus morhua* | All | 0.45 | -45.8 | -71.6 | 0.86 | 19.4 | -37.1 |
| *Melanogrammus aeglefinus* | All | 18.43 | -14.5 | -33.8 | 80.36 | 14.3 | -24.5 |
| *Merlangius merlangus* | All | 62.68 | -13.6 | -13.0 | 205.5 | -6.8 | -16.98 |
| *Merluccius merluccius* | All | 0.21 | 624.1 | 25.0 | 0.57 | 796.0 | 75.0 |
| *Pleuronectes platessa* | All | 6.67 | 11.7 | -43.3 | 44.7 | 15.7 | -12.0 |

**yi, year estimate (2017); yi-1, previous year estimate (2016); y(i,i-1), Average of last two year estimates (2017 and 2016); y(i-2,i-3,i-4), Average of the previous three year estimates (2015, 2014 and 2013).**

### A.6.7. Ireland: Irish Anglerfish and Megrim Survey Q1

| NATION: | IRELAND | VESSEL: | CELTIC EXPLORER |
|---|---|---|---|
| Survey: | IE-IAMS-Q1 | Dates: | 14th Feb– 7th Mar2017 (7b,c,j,k)<br>8th – 16th April 2017 (6a) |
| Notes from survey (e.g. problems, additional work etc.): | • The tickler chain was shortened so it is now well ahead of the footrope (approx. 3m) as specified by WKAGME 2009. Last year it was about 1.5-2m ahead of the footrope)<br>• The doors were modified by fitting a new top-end in order to increase their surface area from 5.25m2 to approx. 5.45m2 resulting in an additional 6% spreading power (estimated by supplier). This resulted in 5-8m extra door spread in the deeper tows.<br>• The headrope was replaced and the floats were tidied up (tied on tighter and more regularly spaced). This resulted in an additional 60cm headline height, on average.<br>• The codend was replaced after the area 7 part of the survey was completed (legs 1 and 2); the mesh size of the original codend was larger than specified (around 110mm inside) versus the specification of 100mm.<br>• The netting at the tips of the wings was replaced with stronger netting to avoid damage when it is pulled onto the drum on top of the floats<br>• This was the first year a CTD was mounted on one of the trawl doors.<br>• No technical downtime<br>• One haul with significant gear damage<br>• Table A.6. 7.1 contains the number of stations per strata performed and details of the strata, while Table A.6. 7.2shows catches in numbers of anglers, and megrims in the same strata and Table A.6. 7.3 shows the biomass and abundance indices in the whole survey of both angler species, with their coefficient of variation. | | |
| Number of fish species recorded and notes on any rare species or unusual catches: | In 2017, 73 species of fish, 24 elasmobranch, 7 cephalopod and 17 other species/groups were recorded.<br>No unusual species were recorded. | | |

**Table A.6. 7.13. Stations fished (aim to complete 110 valid tows per year)**

| ICES DIVISIONS | STRATA | VALID TOWS | STRATUM AREA (KM²) | SWEPT AREA (KM²) |
|---|---|---|---|---|
| 6a | 6a_Shelf_L | 16 | 38424 | 6.38 |
| 6a | 6a_Shelf_M | 7 | 4441 | 3.56 |
| 6a | 6a_Slope_H | 11 | 3114 | 4.35 |
| 6a | 6a_Slope_M | 8 | 3044 | 2.53 |
| 7bcjk | 7_Shelf_H | 15 | 50764 | 7.08 |
| 7bcjk | 7_Shelf_L | 13 | 42034 | 5.90 |
| 7bcjk | 7_Shelf_M | 7 | 14621 | 3.32 |
| 7bcjk | 7_Slope_H | 25 | 35768 | 12.31 |
| 7bcjk | 7_Slope_M | 7 | 29406 | 4.02 |
| | TOTAL | 109 | 221616 | 49.45 |

**Table A.6. 7.14. Summary statistics by stratum. Catch numbers are given for *L. piscatorius* (MON), *L. budegassa* (WAF) and *L. whiffiagonis* (MEG).**

| Stratum | Catch num MON | Catch num WAF | Catch num MEG |
|---|---|---|---|
| 6a_Shelf_L | 156 | 35 | 111 |
| 6a_Shelf_M | 121 | 126 | 62 |
| 6a_Slope_H | 298 | 74 | 411 |
| 6a_Slope_M | 134 | 0 | 7 |
| 7_Shelf_H | 62 | 184 | 179 |
| 7_Shelf_L | 128 | 75 | 156 |
| 7_Shelf_M | 81 | 141 | 70 |
| 7_Slope_H | 271 | 273 | 191 |
| 7_Slope_M | 85 | 1 | 6 |
| Total | 1336 | 909 | 1193 |

**Table A.6. 7.15. Estimated numbers (millions) and biomass (kT) in the survey area, with CV and confidence intervals. Only fish >500g live weight (approximately 32 cm) were included in the estimate**

| | *L piscatorius* | | *L budegassa* | |
|---|---|---|---|---|
| | 6a | 7 | 6a | 7 |
| NumMln | 4.74 | 10.29 | 0.74 | 6.36 |
| NumCV | 16.7% | 11.8% | 25.1% | 11.8% |
| BiomKT | 8.11 | 31.44 | 0.81 | 9.27 |
| BiomCV | 17.9% | 11.5% | 24.7% | 11.3% |

## A.6.8. Ireland: Irish Groundfish Survey Q4

| NATION: | IRELAND | VESSEL: | RV CELTIC EXPLORER |
|---|---|---|---|
| Survey: | IE-IGFS-Q4 | Dates: | 3rdOct – 14thOct (6a)<br>5th Nov – 9th Dec (7b,g,j) |
| Notes from survey (e.g. problems, additional work etc.): | No significant weather disruption in during 2017 with only a few hours being lost in total. Difficulties with the neighbouring EVHOE survey however meant a number of days (c.6) was allocated to completing 22 hauls south of the normal IGFS survey range to ensure that at least some survey data would be available from the Northern part of the EVHOE survey area. Time was allocated mostly from 7bc where indices are not critical to assessments; catches are generally low and therefore also variance. Diplomatic Clearance prevented coverage further south than the UK territorial waters. | | |

| | |
|---|---|
| Number of fish species recorded and notes on any rare species or unusual catches: | In 2017, 81 species of fish, 18 elasmobranch, 11 cephalopod and 62 crustacean and 166 other species/groups were caught. Overall virtually all species saw a decrease in catch rate over the previous year (see table xx below).<br>The most significant change in 6a was a strong increase in horse mackerel in terms of both biomass (135%) and numbers (117%). Otherwise pelagics (herring, mackerel and blue whiting) are all showing a downward trend over the 5yrs.These trends are similar for the Celtic Sea (area 7) also. Overall haddock, monkfish and plaice show the strongest improvement for 6a.<br>As stated the survey perception for the west of Ireland and Celtic Sea was that pelagic catches of herring and mackerel were significanntly reduced while horse mackerel showed an improving trend. Reasonable increases in cod and hake were also seen in the Celtic Sea area. Hake however show an increase in number only, not biomass, indicating this relates to juveniles rather than adults with higher biomass. |

Table A.6. 8.1 and Figure A.6. 8.1 summarize the tows planned and performed per ICES Division and gear, and the area surveyed. Table A.6. 8.2 presents the abundance indices in weight and number with a comparison with the results in the last 4 years.

**Table A.6. 8.16. Stations fished (aim to complete 170 valid tows per year)**

| ICES Divisions | Strata | Gear | Tows planned | Valid | Additional | Invalid | % stations fished |
|---|---|---|---|---|---|---|---|
| 6a | All | D | 45 | 45 | 1 | 4 | 102 |
| 7b,c | All | A | 38 | 28 | 0 | 0 | 79 |
| 7g | All | A | 48 | 41 | 0 | 2 | 90 |
| 7j | All | A | 40 | 35 | 2 | 2 | 92 |
| EVHOE | - | A | NA | 0 | 22 | 0 | - |
| Total | | | 171 | 149 | 24 | 7 | 88* |

**Percentage completed of target stations is for the planned survey only and does not include the additional work allocated to compensate for the lack of EVHOE Survey.**

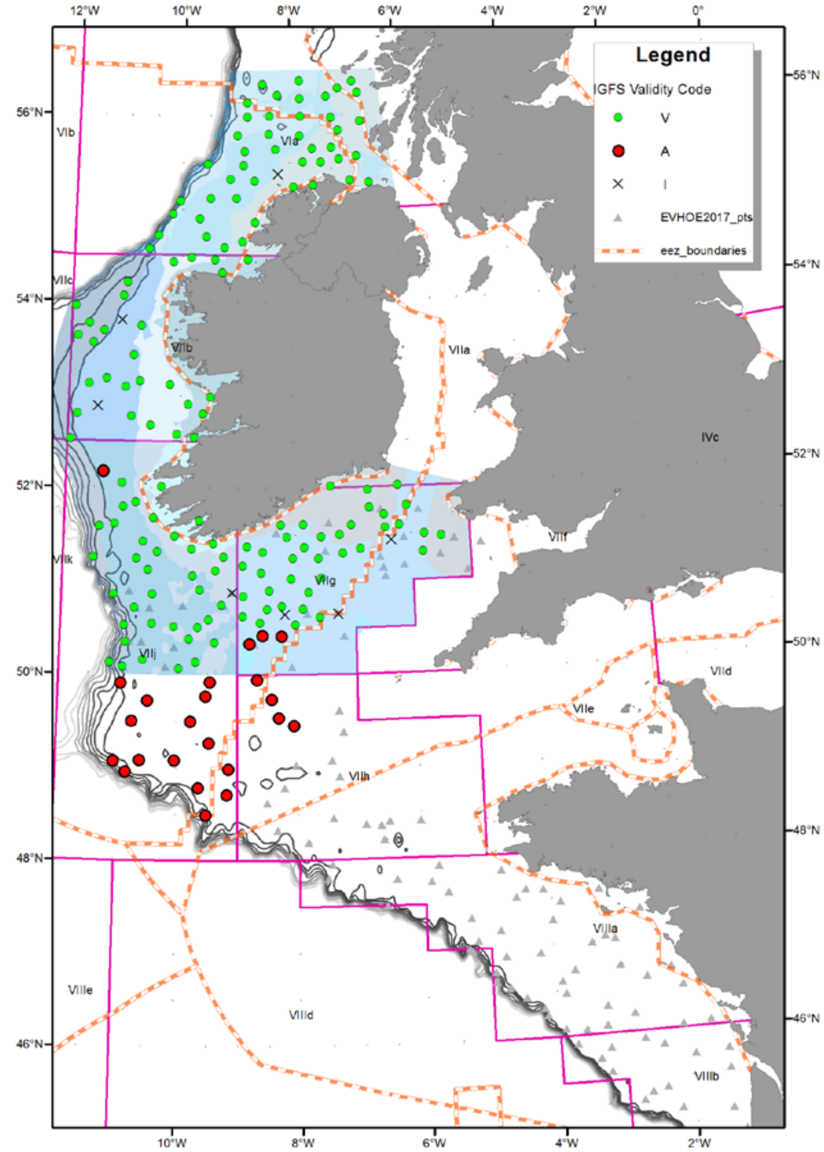



**Figure A.6. 8.5. Map of Survey Stations completed by the Irish Groundfish Survey in 2017. Valid = green circles; Invalid = black crosses; Additional = red circles (everything south of 51deg is the 22 hauls for EVHOE); EVHOE historic station coverage in Celtic Sea = grey triangles.**

**Table A.6. 8.17. Abundances in biomass and number of main species during 2017 Irish Groundfish Survey compared with the fourth previous years**

| Species | Strata | Valid tows | Biomass index $y_i$ kg/Hr | Biomass index $y_i/y_{i-1}$ % | Biomass index $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % | Number index $y_i$ No/Hr | Number index $y_i/y_{i-1}$ % | Number index $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % |
|---|---|---|---|---|---|---|---|---|
| *Gadus morhua* | 6a | 45 | 3.4 | -42.0 | 4.3 | 1.6 | -63.1 | -33.1 |
| *Melanogrammus aeglefinus* | 6a | 45 | 309.5 | -39.6 | 49.3 | 1102.5 | -42.8 | -13.4 |
| *Clupea harengus* | 6a | 45 | 44.8 | -72.9 | -55.8 | 507.2 | -57.1 | -51.8 |
| *Merluccius merluccius* | 6a | 45 | 8.2 | 2.1 | -60.2 | 39.8 | 30.7 | -47.7 |
| *Trachurus trachurus* | 6a | 45 | 341.6 | -6.2 | 135.1 | 3565.7 | 17.5 | 116.9 |
| *Scomber scombrus* | 6a | 45 | 149.6 | -8.1 | -43.3 | 1548.7 | -57.0 | 8.3 |
| *Lepidorhombus whiffiagonis* | 6a | 45 | 1.4 | -38.9 | 1.0 | 6.3 | -27.5 | 27.7 |
| *Lophius piscatorius* | 6a | 45 | 4.0 | -13.2 | 89.5 | 2.4 | -40.9 | 21.6 |
| *Pleuronectes platessa* | 6a | 45 | 13.9 | -38.8 | 43.6 | 90.7 | -30.1 | 52.4 |
| *Solea solea* | 6a | 45 | 0.2 | -69.3 | 23.8 | 0.9 | -58.7 | 37.0 |
| *Micromesistius poutassou* | 6a | 45 | 67.7 | -19.3 | -77.4 | 826.8 | -57.5 | -83.2 |
| *Merlangius merlangus* | 6a | 45 | 103.6 | -64.3 | -3.9 | 540.0 | -75.4 | -28.8 |
| *Gadus morhua* | 7bgj | 104 | 4.5 | -46.2 | 54.0 | 1.1 | -58.6 | 1.0 |
| *Melanogrammus aeglefinus* | 7bgj | 104 | 70.2 | -48.1 | -24.4 | 357.3 | -35.5 | -62.0 |
| *Clupea harengus* | 7bgj | 104 | 0.9 | -53.9 | -89.6 | 35.9 | -22.0 | -77.4 |
| *Merluccius merluccius* | 7bgj | 104 | 30.8 | 32.6 | 0.7 | 328.2 | 26.6 | 50.6 |
| *Trachurus trachurus* | 7bgj | 104 | 197.7 | 24.6 | 72.1 | 4628.9 | 38.2 | 28.8 |
| *Scomber scombrus* | 7bgj | 104 | 15.0 | -48.1 | -75.6 | 305.3 | -61.2 | -64.3 |
| *Lepidorhombus whiffiagonis* | 7bgj | 104 | 3.2 | -32.4 | 21.2 | 26.3 | -25.0 | 71.0 |
| *Lophius piscatorius* | 7bgj | 104 | 7.9 | -18.4 | 26.5 | 7.0 | -23.3 | 22.6 |
| *Pleuronectes platessa* | 7bgj | 104 | 6.9 | -43.1 | -22.5 | 39.6 | -41.7 | -14.7 |
| *Solea solea* | 7bgj | 104 | 0.6 | -18.5 | 34.5 | 2.8 | 10.6 | 10.2 |
| *Micromesistius poutassou* | 7bgj | 104 | 19.8 | -76.2 | -3.1 | 251.6 | -81.5 | -51.8 |
| *Merlangius merlangus* | 7bgj | 104 | 49.7 | -42.2 | -45.0 | 663.2 | -17.6 | -38.3 |

**Year estimate 2017 ($y_i$); previous year estimate 2016 ($y_{i-1}$); average of last two years estimate ($y_{(i,i-1)}$); average of the previous three year estimates 2013-15 ($y_{(i-2,i-3,i-4)}$). 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.**

## A.6.9. France: The Channel Groundfish Survey Q4

| **Nation:** | **FRANCE** | **Vessel:** | **RV THALASSA** |
|---|---|---|---|
| **Survey** | **FR-CGFS-Q4** | **Dates** | **6th October- 23 October** |
| Notes from survey (e.g. problems, additional work etc.): | Due to important works realized on the RV *Thalassa* during summer 2017, the CGFS survey was slightly delayed and the working conditions onboard changed with an increasing importance of numeric tools. These changes have globally not impacted the cruise program, except that a larger number of trawl damages occurred.<br>Weather conditions were rough at the beginning and at the end of the survey, preventing some stations to be sampled. In total, the following sampling has been realized:<br>71 trawls in the eastern English Channel with GOV 36 x 47 (Figure A.6. 9.1, but only 66 valid, i.e. without trawl damages)<br>Wastes were counted and weighted at each trawl station.<br>Benthos and jellyfish were sorted, identified and counted at each trawl station.<br>82 hydrology stations (deploying hydrological probe, niskin bottle and plankton WP2 net, the latter only on 71 stations).<br>15 stations where microplastics were sampled with a Manta net.<br>160 samples of subsurface water, in order to get fish eggs, along the vessel trajectory.<br>13 acoustic records of fine-scale bathymetry, during the night.<br>During daylight, two observers were also continuously recording seabirds and marine mammals. | | |

| | |
|---|---|
| Number of fish species recorded and notes on any rare species or unusual catches: | Over the eastern English Channel, 88 species of fish and cephalopods have been identified, and 111 taxa of benthic invertebrates (including commercial ones) and jellyfish have been identified. The preliminary results are characterized by a high dominance of horse mackerel, particularly in the central area, while the eastern part was dominated by mackerel and whiting to a lesser extent. Coastal areas show a higher species richness than offshore (from 61 species per haul down to 23 species per haul). When integrated over the area, the dominance shows a similar pattern: dominance of horse mackerel both in biomass and abundance; the small forage fish dominate the community in term of abundance (sardine, sprat, anchovy, mackerel), while the large individuals of the elasmobranch species make them important for the biomass dominance.It is worth noting the presence of sea bass among the most important species in biomass, which was not typical of the previous years. Globally, more red mullet but less plaice were caught this year compared to 2016. Both the number of fish and mean individual weight per haul have significantly increased compared to 2016. |

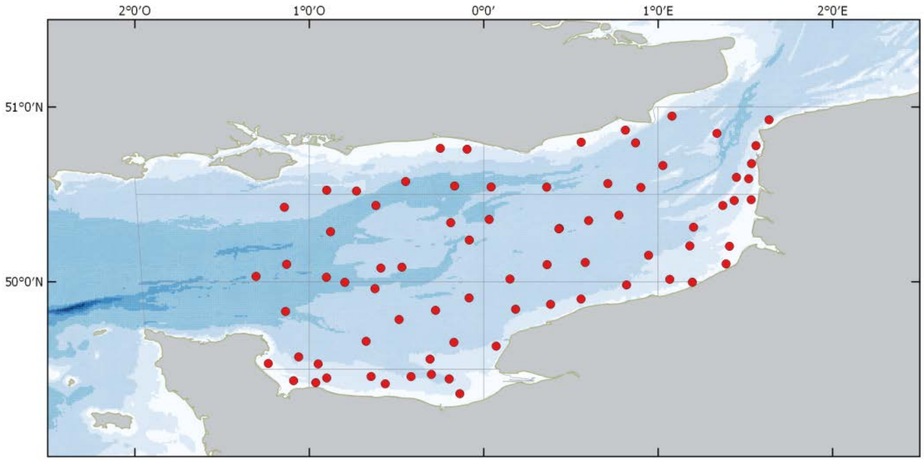



**Figure A.6. 9.6. Sampling stations (red dots) of the CGFS 2017 survey.**

## A.6.10. France: Celtic Sea/Bay of Biscay Groundfish Survey Q4

| | | | |
|---|---|---|---|
| Nation: | France | Vessel: | Thalassa 2 |
| Survey | FR-EVHOE Q4 | Dates | 25th Oct. -9th Dec. (planned) |
| Notes from survey (e.g. problems, additional work etc.): | EVHOE 2017 survey had to be cancelled due to engine failure of the RV *Thalassa*.<br>Only 26 stations have been sampled (25 validated) mostly in the central/western part of the Bay of Biscay from an initial total of 156 stations (Table A.6. 10.1 and Figure A.6. 10.1). Available data have been uploaded into DATRAS database but no regular dataset will be available for 2017 stock assessments.<br>Compensatory measures to try to minimize it could be summarized into the following 3 points:<br>- most of the northern part of the Celtic Sea is already covered by the regular IGFS survey (RV *Celtic Explorer*)<br>- 22 additional stations have been covered by the *Celtic Explorer* in the central/southern Celtic Sea (look at the enclosed map and table below) | | |
| Number of fish species recorded and notes on any rare species or unusual catches: | Not relevant | | |

**Table A.6. 10.18. Stations fished**

| ICES. DIVI-SIONS | STRATA | TOWS PLANNED | TOWS REAL-IZED | VALID | ADDI-TIONAL* | %.STA-TIONS FISHED | COM-MENTS |
|---|---|---|---|---|---|---|---|
| 7fghj | Cc3 | 8 | | | 2 | 25 | |
| | Cc4 | 15 | | | 8 | 53 | |
| | Cc5 | 4 | | | 1 | 25 | |
| | Cc6 | 3 | | | 1 | 33 | |
| | Cn2 | 7 | | | | 0 | |
| | Cn3 | 9 | | | | 0 | |
| | Cs4 | 24 | | | 6 | 25 | |
| | Cs5 | 7 | | | 3 | 43 | |
| | Cs6 | 4 | | | 1 | 25 | |
| 8abd | Gn1 | 5 | 3 | 3 | | 60 | |
| | Gn2 | 5 | 4 | 4 | | 80 | |
| | Gn3 | 14 | 5 | 5 | | 36 | |
| | Gn4 | 20 | 13 | 12 | | 65 | |
| | Gn5 | 3 | | | | 0 | |
| | Gn6 | 2 | | | | 0 | |
| | Gn7 | 2 | 1 | 1 | | 50 | |
| | Gs1 | 3 | | | | 0 | |
| | Gs2 | 6 | | | | 0 | |
| | Gs3 | 4 | | | | 0 | |
| | Gs4 | 4 | | | | 0 | |
| | Gs5 | 2 | | | | 0 | |
| | Gs6 | 2 | | | | 0 | |
| | Gs7 | 2 | | | | 0 | |
| TOTAL | ALL | 155 | 26 | 25 | | 16 | |

*** additional stations from IGFS, excluded from %s**

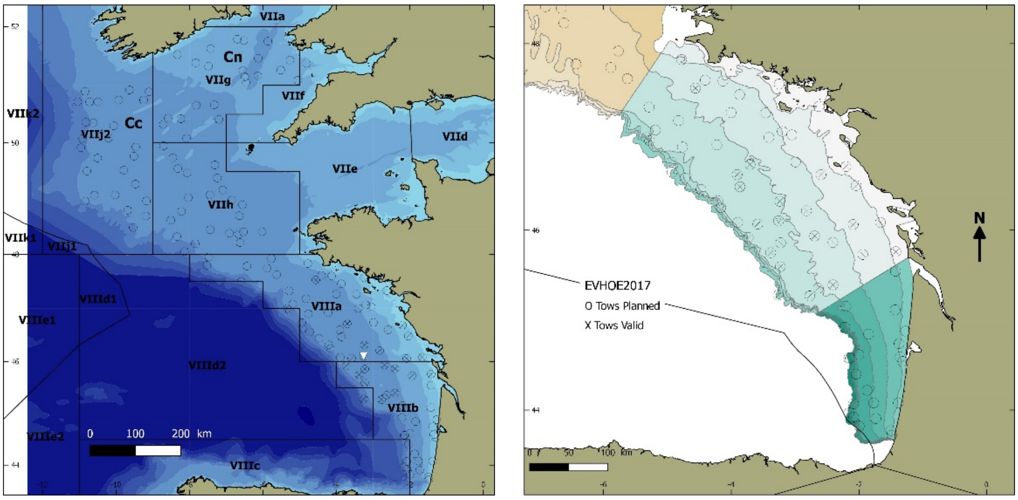



**Figure A.6. 10.7. Planned stations in the fixed sampling plan (o), validated (x) and invalidated (∇) tows for EVHOE 2017. ICES areas as well as EVHOE strata (Gs, Gn, Cs, Cc, Cn) are indicated.**

### A.6.11. Spain: The Porcupine Spanish Groundfish Survey Q3

| **Nation:** | **SP (Spain)** | **Vessel:** | **RV Vizconde de Eza** |
|---|---|---|---|
| **Survey** | **SP-PORC-Q3** | **Dates** | **24th Aug. – 24th Sep.** |

| | |
|---|---|
| Notes from survey (e.g. problems, additional work etc.): | Weather conditions were good during most of 2017 survey.<br>This year the reduction in tow duration implemented last year from 30 minutes after gear ground contact to 20 minutes was maintained.<br>10 experimental ‘0-minute’ tows were conducted during the survey. Catches of these tows were highly variable ranging from 8.5 to 225 kg.<br>Additional work undertaken included 84 CTD casts, at most trawl stations, 3 within the non-trawlable area, and 8 in four radials perpendicular to the bank limits to obtain a general image of the hydrography. |
| Number of fish species recorded and notes on any rare species or unusual catches: | First estimates: Overall a total of 99 fish species, 44 crustaceans, 27 molluscs, 26 echinoderms and 32 species of other invertebrates were identified. |

**Table A.6. 11.19. Stations fished (aim: to complete 80 valid tows per year)**

| ICES Divisions | Strata | Gear | Tows planned | Valid | Valid with rock-hopper | Additional | Invalid | % stations fished | comments |
|---|---|---|---|---|---|---|---|---|---|
| 7b-k | All | Porcupine baca 39/52 | 80 | 80 | - | 4+10 | 4 | 117.5% | Also available by depth and geographical strata |
| | TOTAL | | 80 | 80 | - | 14 | 4 | 117.5% | |

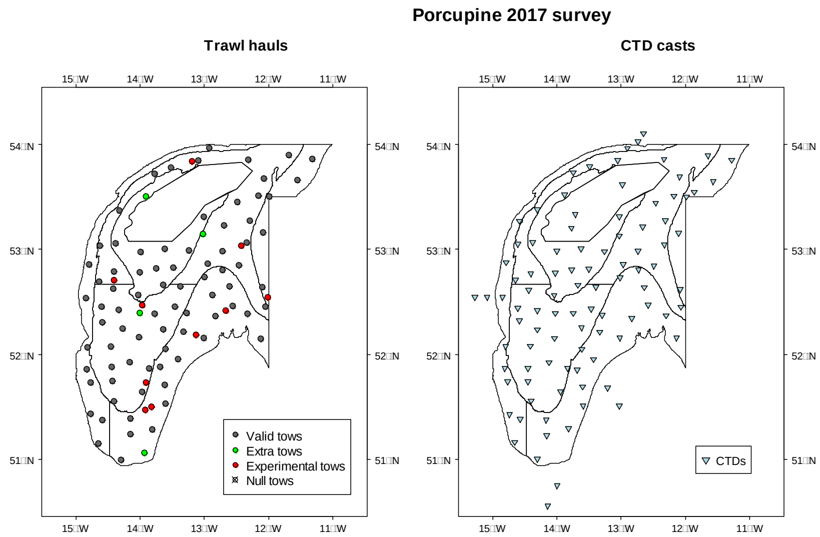



**Figure A.6. 11.8. Trawl and CTD stations in Porcupine 2017 survey.**

Figure A.6. 11.1 and Table A.6. 11.1 summarize the trawls and samplings performed during 2017 survey while Table A.6. 11.2 contain the biomass and number abundance indices on 2017 survey also compared with results from the last 4 years.

**Table A.6. 11.20. Abundances in biomass and number of main species during 2017 Spanish Porcupine Bank Survey compared with the fourth previous years**

| Biomass and number estimates | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Biomass index | | | Number index | | |
| Species | Strata | Valid tows | $y_i$ kg/.5h | $y_i/y_{i-1}$ % | $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % | $y_i$ nº/.5h | $y_i/y_{i-1}$ % | $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % |
| *Merluccius merluccius* | All | 80 | 48.46 | -12.3 | -30.7 | 92.3 | 70.6 | -19.2 |
| *Lepidorhombus whiffiagonis* | All | 80 | 14.11 | -4.5 | 4.0 | 190.7 | -8.3 | 25.9 |
| *Lepidorhombus boscii* | All | 80 | 11.37 | -4.5 | -13.1 | 110.4 | -8.2 | -28.5 |
| *Lophius budegassa* | All | 80 | 1.02 | -6.4 | -41.6 | 0.6 | -20.5 | -32.3 |
| *Lophius piscatorius* | All | 80 | 20.41 | 7.3 | -2.6 | 6.0 | 16.0 | 2.2 |
| *Micromesistius poutassou* | All | 80 | 662.63 | 69.6 | 21.9 | 6546.4 | 40.1 | 13.5 |
| *Nephrops norvegicus* | All | 80 | 1.45 | 1.4 | 245.6 | 59.8 | -8.4 | 406.3 |

**yi, year estimate (2017); yi-1, previous year estimate (2016); y(i,i-1), Average of last two year estimates (2016 and 2015); y(i-2,i-3,i-4), Average of the previous three year estimates (2015, 2014 and 2013).**

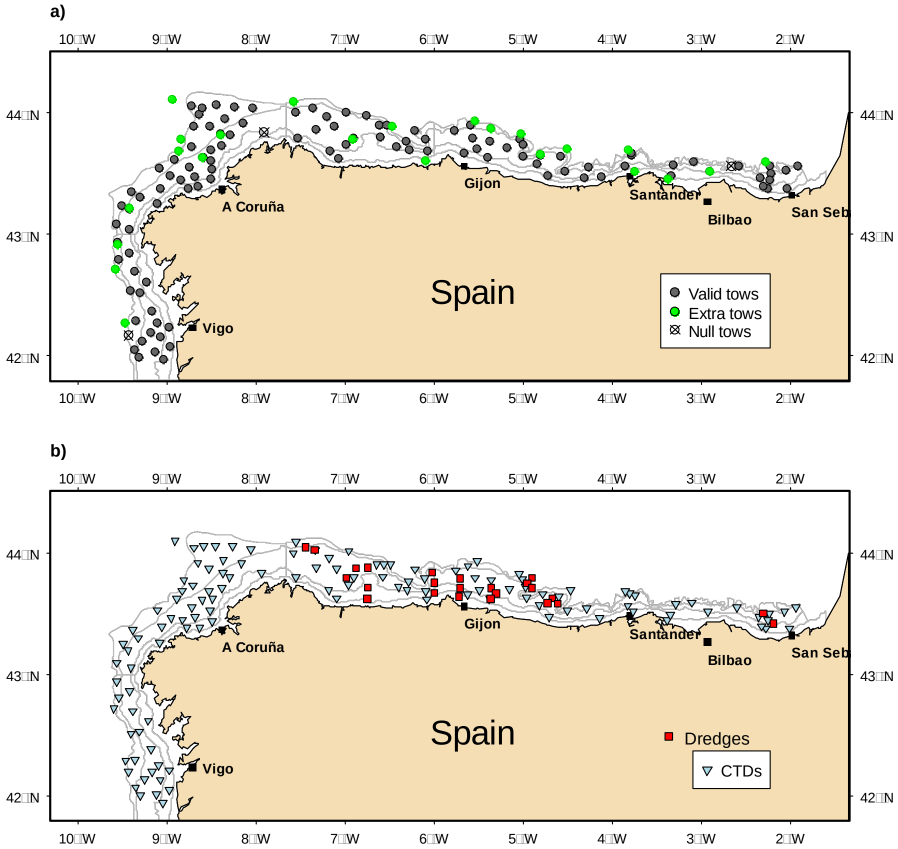
## A.6.12. Spain: Spanish Northern Shelf Ground Fish Survey Q4

| Nation: | SP (Spain) | Vessel: | RV Miguel Oliver |
|---|---|---|---|
| Survey | SP-NSGFS-Q4 | Dates | 17th sep.- 23rd oct. |
| Notes from survey (e.g. problems, additional work etc.): | 2017 was the fitth year the RV Miguel Oliver was used to perform the survey instead of the RV Cornide de Saavedra, after the intercalibration performed in 2012. Results from the survey are in line with those from the time-series, showing the usual proportion of bentho-demersal species as megrims, skates, catfish.<br>As in previous years, three additional hauls were undertaken to cover shallow stations between 30 and 70 m, and 14 deeper stations, between 500 and 700 m.<br>Additional work undertaken included CTD casts at all trawl stations and dredges carried out with a boxcorer to create a grid of sediment and in some areas infauna samples (Figure A.6. 12.1).<br>Seabirds census was also carried out during fishing manoeuvres.<br>Analyses of stomach contents of main demersal species was performed in all hauls during the survey. | | |
| Number of fish species recorded and notes on any rare species or unusual catches: | A total of 240 species were captured, 88 fish species, 54 crustaceans, 45 molluscs, 32 echinoderms and 35 other invertebrates. | | |

**Table A.6. 12.21. Stations fished (aim: to complete 116 valid tows per year)**

| ICES Divisions | Strata | Gear | Tows planned | Valid | Additional (1) | Invalid | % stations fished | comments |
|---|---|---|---|---|---|---|---|---|
| 8c | All | Standard baca | 96 | 92 | 20 | 2 | 98% | |
| 9a North | All | Standard baca | 20 | 19 | 3 | 1 | 99% | |
| 8b | All | Standard baca | 0 | 1 | 0 | 0 | na | |
| | TOTAL | | 116 | 112 | 23 | 3 | 106% | |

**(1) Additional 15 hauls on shallow and deep grounds and 8 zero minutes tows.**




(2)

(3) **Figure A.6. 12.9. a) Trawl stations in northern Spanish Shelf 2017 survey, b) CTD and dredge stations**

(4) Table A.6. 12.2 contains the biomass and number abundance indices on 2017 survey also compared with results from the last 4 years.

**Table A.6. 12.22. Abundance indices in biomass and number during 2017 survey compared with previous years in the time-series.**

| | | | 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* | 9aN | 19 | 5.29 | -58.8 | -17.2 | 123.0 | -59.4 | -38.2 |
| *Lepidorhombus boscii* | 9aN | 19 | 6.58 | -0.8 | 39.4 | 126.6 | 1.0 | 49.2 |
| *Lepidorhombus whiffiagonis* | 9aN | 19 | 0.18 | 157.1 | 150.0 | 1.8 | 89.4 | 191.4 |
| *Lophius budegassa* | 9aN | 19 | 0.19 | 850.0 | -33.0 | 0.2 | -31.0 | 206.3 |
| *Lophius piscatorius* | 9aN | 19 | 0.11 | 450.0 | -72.1 | 0.1 | -41.2 | -35.7 |
| *Micromesistius poutassou* | 9aN | 19 | 19.20 | -57.9 | -51.5 | 450.9 | -57.1 | -62.2 |
| *Trachurus trachurus* | 9aN | 19 | 122.98 | 411.4 | 1319.2 | 1379.8 | 514.2 | 1414.0 |
| *Scomber scombrus* | 9aN | 19 | 4.23 | -49.9 | 40.6 | 32.8 | -74.8 | 28.7 |
| *Nephrops norvegicus* | 9aN | 19 | 0.01 | -50.0 | -25.0 | 0.1 | -70.8 | -37.2 |
| *Merluccius merluccius* | 8c | 93 | 6.86 | 3.9 | 23.6 | 166.5 | -13.5 | 26.1 |
| *Lepidorhombus boscii* | 8c | 93 | 6.14 | 37.4 | -12.9 | 108.4 | 37.6 | 4.5 |
| *Lepidorhombus whiffiagonis* | 8c | 93 | 4.49 | 37.3 | 69.4 | 60.2 | 15.9 | 151.4 |
| *Lophius budegassa* | 8c | 93 | 0.63 | 0.0 | -45.1 | 0.4 | -13.6 | -60.5 |
| *Lophius piscatorius* | 8c | 93 | 0.62 | -32.6 | -58.9 | 0.2 | -39.4 | -83.6 |
| *Micromesistius poutassou* | 8c | 93 | 50.33 | -61.0 | -25.8 | 996.7 | -65.8 | -54.6 |
| *Trachurus trachurus* | 8c | 93 | 16.28 | -40.0 | -51.5 | 394.2 | -35.2 | -51.8 |
| *Scomber scombrus* | 8c | 93 | 2.98 | 684.2 | -60.8 | 110.7 | 4240.0 | -6.7 |
| *Nephrops norvegicus* | 8c | 93 | 0.03 | -25.0 | -38.2 | 0.7 | -20.2 | -22.2 |
| *Merluccius merluccius* | Total | 112 | 6.59 | -14.2 | 11.6 | 159.0 | -24.8 | 4.6 |
| *Lepidorhombus boscii* | Total | 112 | 6.21 | 28.3 | -5.7 | 111.5 | 28.5 | 11.8 |
| *Lepidorhombus whiffiagonis* | Total | 112 | 3.75 | 37.9 | 69.7 | 50.2 | 16.2 | 151.6 |
| *Lophius budegassa* | Total | 112 | 0.55 | 5.8 | -45.2 | 0.4 | -14.6 | -56.5 |
| *Lophius piscatorius* | Total | 112 | 0.53 | -31.2 | -59.2 | 0.2 | -40.0 | -82.5 |
| *Micromesistius poutassou* | Total | 112 | 44.98 | -60.8 | -28.5 | 902.9 | -65.2 | -55.3 |
| *Trachurus trachurus* | Total | 112 | 34.63 | 30.1 | -19.3 | 563.7 | 3.9 | -36.5 |
| *Scomber scombrus* | Total | 112 | 3.19 | 81.3 | -42.8 | 97.3 | 297.2 | -0.4 |
| *Nephrops norvegicus* | Total | 112 | 0.03 | -25.0 | -34.4 | 0.6 | -23.0 | -22.9 |

**$y_i$, year estimate (2017); $y_{i-1}$, previous year estimate (2016); $y_{(i,i-1)}$, Average of last two year estimates (2017 and 2016); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2015, 2014 and 2013).**

## A.6.13. Spain: Spanish Gulf of Cadiz Bottom Trawl Survey Q1

| | | | |
|---|---|---|---|
| Nation: | SP (Spain) | Vessel: | Miguel Oliver |
| Survey: | SP-GCGFS-Q1 (0317) | Dates: | 21 February– 06 March 2017 |
| Notes from survey (e.g. problems, additional work etc.): | Additional work undertaken included CTD cast at every trawl stations. | | |
| Number of fish species recorded and notes on any rare species or unusual catches: | Overall, 152 fish species, 53 crustaceans, 62 molluscs were recorded during the survey. | | |

**Table A.6. 13.23. Stations fished (aim: to complete 45 valid tows per year)**

| ICES Division | Strata | Gear | Tows planned | Valid | Additional | Invalid | % stations fished |
|---|---|---|---|---|---|---|---|
| 9a | All | Standard baca 36/40 | 45 | 45 | 2 | 1 | 100 % |
| | TOTAL | | 45 | 45 | 2 | 1 | 100 % |

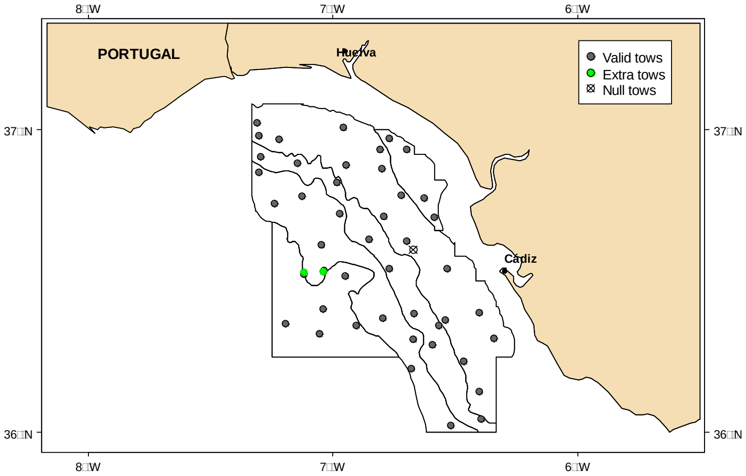



**Figure A.6. 13.10. Map showing tows performed during the 1st quarter Gulf of Cadiz groundfish survey**

Figure A.6. 13.1 and Table A.6. 13.1 summarize the number of hauls performed per ICES division. Table A.6. 13.2 presents the biomass and number abundance indices from 2017 1st quarter survey and compares with results from the last 4 years.

**Table A.6. 13.24. Biomass and number estimates and time-series comparisons in SP-GCGFS Q1**

| | | | Biomass index | | | Number index | | |
|---|---|---|---|---|---|---|---|---|
| Species | Strata | Valid tows | $y_i$ kg/h | $y_i/y_{i-1}$ % | $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % | $y_i$ n/h | $y_i/y_{i-1}$ % | $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % |
| *Merluccius merluccius* | All | 45 | 3.39 | -47.5 | -15.7 | 51.3 | -44.3 | -37.2 |
| *Micromesistius poutassou* | All | 45 | 8.21 | -89.0 | 76.0 | 82.4 | -97.1 | 128.5 |
| *Nephrops norvegicus* | All | 45 | 0.68 | -38.7 | 64.7 | 21.8 | -54.6 | 98.6 |
| *Parapenaeus longirostris* | All | 45 | 0.68 | -9.3 | -34.8 | 130.5 | -10.4 | -30.4 |
| *Octopus vulgaris* | All | 45 | 2.65 | 45.6 | -43.4 | 4.6 | 56.3 | -41.1 |
| *Loligo vulgaris* | All | 45 | 0.67 | -9.5 | 28.2 | 4.1 | -42.1 | 57.1 |
| *Sepia officinalis* | All | 45 | 0.66 | -68.3 | -2.6 | 1.8 | -69.2 | -4.1 |

**$y_i$, year estimate (2017); $y_{i-1}$, previous year estimate (2016); $y_{(i,i-1)}$, Average of last two year estimates (2017 and 2016); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2015, 2014 and 2013).**

### A.6.14. Spain: Spanish Gulf of Cadiz Bottom Trawl Survey Q4

| | | | |
|---|---|---|---|
| Nation: | SP (Spain) | Vessel: | Miguel Oliver |
| Survey | SP-GCGFS-Q4 (ARSA) | Dates | 30th Oct. – 12th Nov. 2017 |
| Notes from survey (e.g. problems, additional work etc.): | Additional work undertaken included CTD cast at every trawl station. | | |
| Number of fish species recorded and notes on any rare species or unusual catches: | Overall, 156 species of fish, 59 of crustacean and 64 of mollusc, 27 echinoderms and 59 other invertebrates were recorded during the survey. | | |

**Table A.6. 14.25. Stations fished (aim: to complete 45 valid tows per year)**

| ICES Division | Strata | Gear | Tows planned | Valid | Additional | Invalid | % stations fished |
|---|---|---|---|---|---|---|---|
| 9a | All | Standard baca 36/40 | 45 | 44 | 4 | 2 | 98 % |
| | TOTAL | | 45 | 44 | 4 | 2 | 98% |

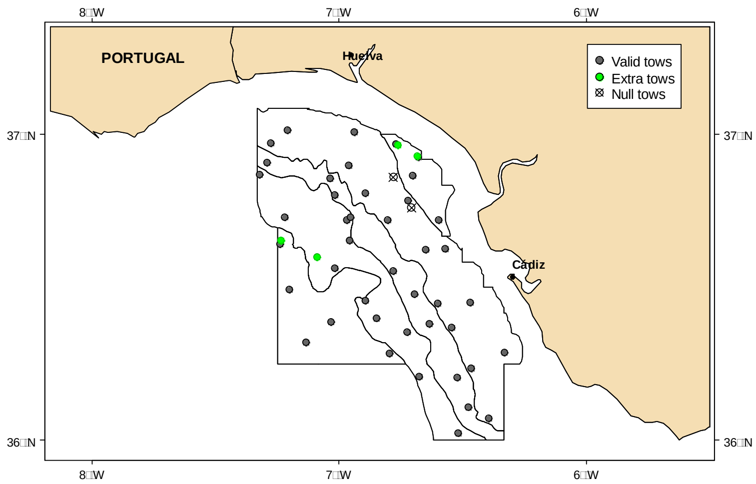



**Figure A.6. 14.11. Map showing tows performed during the 4th quarter Gulf of Cadiz groundfish survey**

Table A.6. 14.1 and Figure A.6. 14.1 show the hauls performed per ICES division during SP-GCGFS-Q4 in 2017. Table A.6. 14.2 contain the biomass and number abundance indices from 2016 4th quarter survey and compares with results from the last 4 years.

**Table A.6. 14.26. Biomass and number estimates and time-series comparisons in SP-GCGFS Q4**

| | | | Biomass index | | | Number index | | |
|---|---|---|---|---|---|---|---|---|
| Species | Strata | Valid tows | $y_i$ kg/h | $y_i/y_{i-1}$ % | $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % | $y_i$ n/h | $y_i/y_{i-1}$ % | $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % |
| *Merluccius merluccius* | All | 44 | 4.74 | -19.9 | -54.9 | 175.4 | 57.3 | -31.9 |
| *Micromesistius poutassou* | All | 44 | 18.68 | -39.0 | 87.5 | 320.9 | -15.1 | -25.1 |
| *Nephrops norvegicus* | All | 44 | 0.94 | 11.9 | 42.8 | 39.3 | 60.4 | 24.3 |
| *Parapenaeus longirostris* | All | 44 | 1.67 | 456.7 | 80.2 | 430.2 | 769.1 | 155.8 |
| *Octopus vulgaris* | All | 44 | 0.81 | -80.3 | -9.3 | 5.4 | -77.9 | -0.9 |
| *Loligo vulgaris* | All | 44 | 0.80 | -59.3 | -34.2 | 1.4 | -67.1 | -39.7 |
| *Sepia officinalis* | All | 44 | 1.89 | 127.7 | -35.4 | 4.7 | 112.2 | -41.6 |

**yi, year estimate (2017); yi-1, previous year estimate (2016); y(i,i-1), Average of last two year estimates (2017 and 2016); y(i-2,i-3,i-4), Average of the previous three year estimates (2015, 2014 and 2013).**

## A.6.15. Portugal: Portuguese Autumn Groundfish Survey Q4

| NATION: | PORTUGAL | VESSEL: | RV NORUEGA |
|---|---|---|---|
| SURVEY: | **PT-PGFS-Q4**<br>**AUTUMN 2017** | DATES: | **18TH - 31ST OCTOBER**<br>**9TH – 22ND NOVEMBER** |
| Notes from survey (e.g. problems, additional work etc.) | 7 stations could not be performed due to time constraints and bad weather. The 9 day interval in the middle of the survey was due to urgent repairs and bad weather.<br>89 CTDs Stations were recorded. | | |
| Number of fish species recorded and notes on any rare species or unusual catches: | Overall, 143 species of fish, 20 of cephalopods and 30 of crustaceans were recorded during the survey. 40 species of other groups were recorded, e.g. Echinodermata, Cnidarians, Bivalves, Gastropods, Polychaeta, Ascidians and Nudibranchia | | |

**Table A.6. 15.27. Stations fished**

| ICES DIVISIONS | STRATA | GEAR | TOWS PLANNED | VALID | INVALID | % STATIONS FISHED | COMMENTS |
|---|---|---|---|---|---|---|---|
| 9a | ALL | NCT | **96** | **89** | **2** | **93** | Also available by depth and geographical strata |

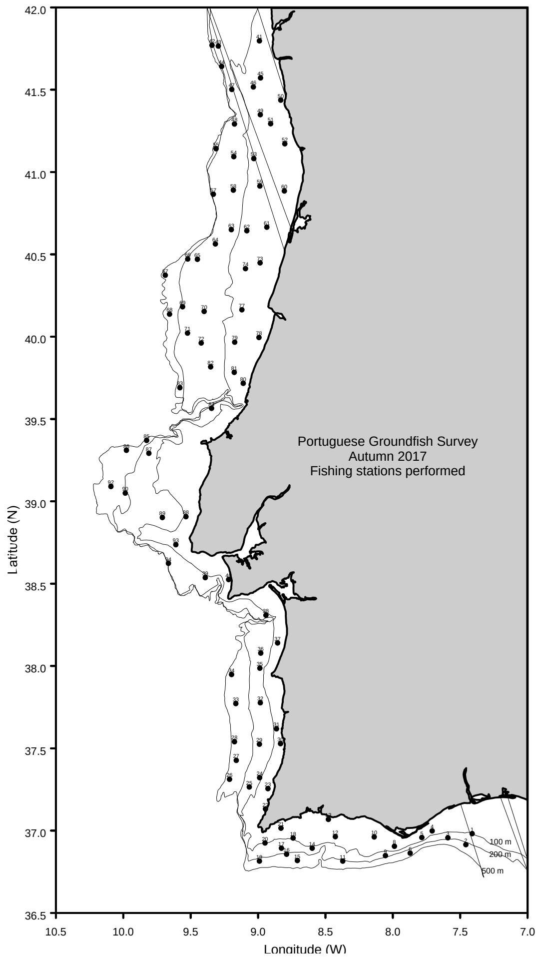



**Figure A.6. 15.12. Fishing stations performed during the PT-IBTS 2017 cruise.**

Table A.6. 15.1 presents a summary of the stations performed per ICES division and Figure A.6. 15.1 shows the area surveyed with the hauls, CTD, dredge and stations carried out. Table A.6. 15.2 contains the biomass and number abundance indices from 2016 quarter survey and compares with results from the last 4 years.

**Table A.6. 15.28. Biomass and number estimates and comparison over the last years**

| Biomass and number estimates | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Biomass index | | | Number index | | |
| Species | Strata | Valid tows | $y_i$ kg/h | $y_i/y_{i-1}$ % | $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % | $y_i$ n/h | $y_i/y_{i-1}$ % | $y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % |
| *Merluccius merluccius* | 9a | 89 | 19.7 | 9.3 | -37.0 | 256.1 | 46.0 | -49.6 |
| *Trachurus trachurus* | 9a | 89 | 128.9 | 723.3 | 33.5 | 1862.7 | 702.9 | -6.4 |
| *Trachurus picturatus* | 9a | 89 | 3.3 | -47.9 | -83.7 | 39.0 | -49.6 | -92.7 |
| *Micromesistius poutassou* | 9a | 89 | 90.7 | 71.1 | 51.6 | 1666.7 | 62.1 | 9.6 |
| *Scomber scombrus* | 9a | 89 | 65.9 | 213.8 | 44.9 | 179.7 | 33.6 | -3.7 |
| *Scomber colias* | 9a | 89 | 22.0 | 8254.0 | 1875.3 | 1115.8 | 5615.3 | 3265.6 |
| *Lepidorhombus boscii* | 9a | 89 | 0.2 | 38.8 | 33.9 | 2.7 | 31.8 | 52.0 |
| *Lepidorhombus whiffiagonis* | 9a | 89 | 0.0 | -11.7 | 99.4 | 0.2 | 31.9 | 34.7 |
| *Lophius budegassa* | 9a | 89 | 0.0 | -89.5 | 1889.2 | 0.0 | 115.3 | 593.7 |
| *Lophius piscatorius* | 9a | 89 | 0.0 | -.- | -.- | 0.0 | -.- | -.- |
| *Nephrops norvegicus* | 9a | 89 | 0.2 | 56.2 | 239.5 | 3.8 | 53.1 | 178.6 |

**$y_i$, year estimate (2017); $y_{i-1}$, previous year estimate (2016); $y_{(i,i-1)}$, Average of last two year estimates (2017 and 2016); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2015, 2014 and 2013).**

## A.6.16. References

ICES. 2017a. Interim Report of the International Bottom Trawl Survey Working Group. IBTSWG Report 2017 27-31 March 2017. ICES CM 2017/SSGIEOM:01. 337 pp.

ICES. 2017b. 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.

# Annex 7: Maps of species distribution and length frequencies

**(Francisco Velasco, Francisco Baldó)**

### Initial warning

As mentioned in the report of the IBTSWG 2018, in 2017 a breakage of RV Thalassa forced to suspend the FR-EVHOE survey after only 26 valid hauls. To obtain some information and data for the area not covered, the RV Celtic Explorer and the Marine Institute performed some hauls in area 7g, 7h and 7j. These hauls are included in this annex as IE-EVHOE, are not considered part of the standard EVHOE time-series and the coverage of FR-EVHOE has suffered a remarkable reduction compared with other years, these facts have to be considered when comparing the species distribution maps and length distributions per ICES areas.

**Table A.7.1. Species for which distribution maps have been produced, with length split for prerecruit (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 | Figure No | Length Split (<cm) |
|---|---|---|---|---|
| *Clupea harengus* | Herring | HER | 9-11 | 17.5 |
| *Gadus morhua* | Atlantic Cod | COD | 3-5 | 23 |
| *Galeorhinus galeus* | Tope Shark | GAG | 49 | |
| *Galeus melastomus* | Blackmouthed dogfish | DBM | 58 | |
| *Lepidorhombus boscii* | Four-Spotted Megrim | LBI | 24-26 | 19 |
| *Lepidorhombus whiffiagonis* | Megrim | MEG | 21-23 | 21 |
| *Leucoraja naevus* | Cuckoo Ray | CUR | 45-46 | |
| *Lophius budegassa* | Black-bellied Anglerfish | WAF | 30-32 | 20 |
| *Lophius piscatorius* | Anglerfish (Monk) | MON | 27-29 | 20 |
| *Merlangus merlangius* | Whiting | WHG | 36-38 | 20 |
| *Melanogrammus aeglefinus* | Haddock | HAD | 6-8 | 20 |
| *Merluccius merluccius* | European hake | HKE | 12-14 | 20 |
| *Micromesistius poutassou* | Blue whiting | WHB | 39-41 | 19 |
| *Mustelus mustelus* | Smooth Hound | SMH | 50 | |
| *Mustelus asterias* | Starry smooth hound | SDS | 51 | |
| *Nephrops norvegicus* | Norway Lobster | NEP | 42 | |
| *Pleuronectes platessa* | European Plaice | PLE | 33-35 | 12 |
| *Raja clavata* | Thornback ray (Roker) | THR | 52-53 | |
| *Raja microocellata* | Painted/Small Eyed Ray | PTR | 55 | |
| *Raja montagui* | Spotted Ray | SDR | 55 | |
| *Raja undulata* | Undulate Ray | UNR | 56 | |
| *Scomber scombrus* | European Mackerel | MAC | 18-20 | 24 |
| *Scyliorhinus canicula* | Lesser Spotted Dogfish | LSD | 43-44 | |
| *Scyliorhnus stellaris* | Nurse Hound | DGN | 57 | |
| *Sprattus sprattus* | European sprat | SPR | 59-60 | |
| *Squalus acanthias* | Spurdog | DGS | 47-48 | |
| *Trachurus picturatus* | Blue Jack Mackerel | JAA | 62 | |
| *Trachurus trachurus* | Horse Mackerel (Scad) | HOM | 15-17 | 15 |
| *Trisopterus smarkii* | Norway pout | NPO | 61 | |

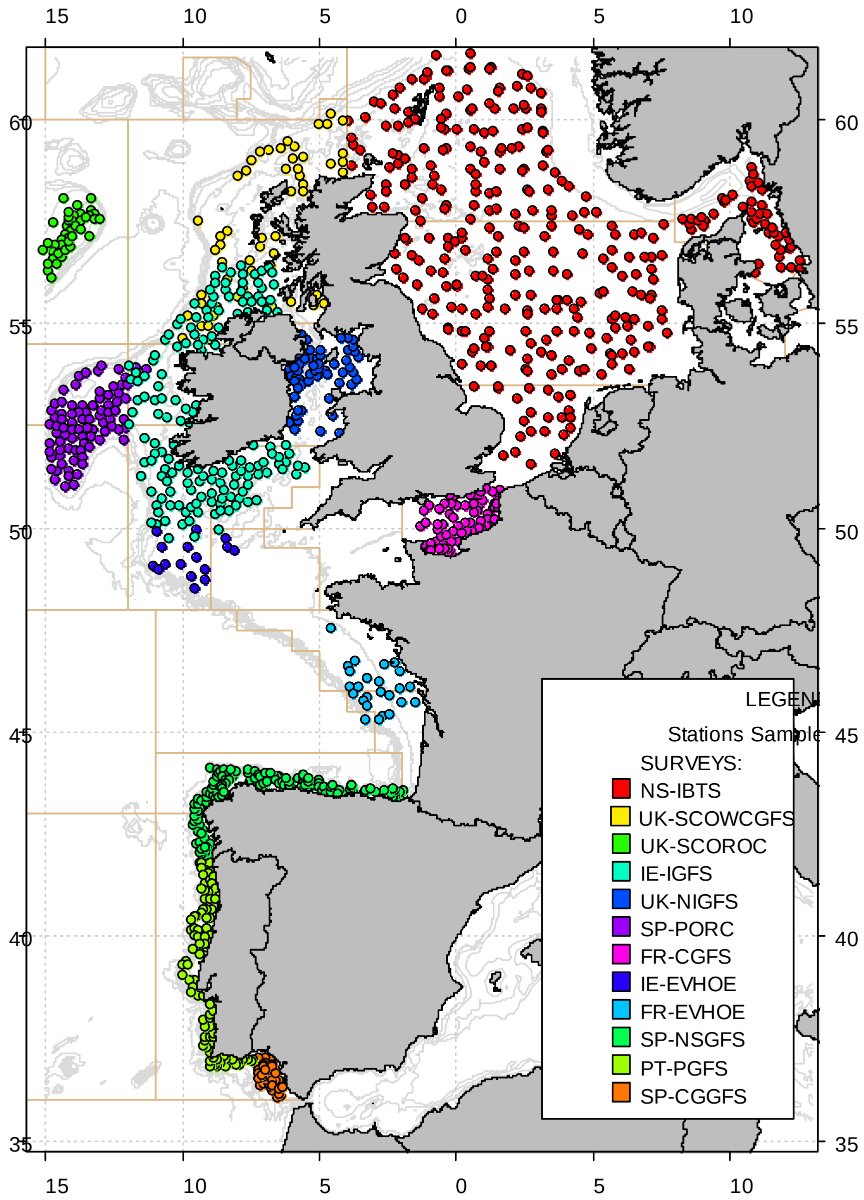



**Figure A.7.1. Station positions for the IBTSurveys carried out in the North Eastern Atlantic and North Sea area in summer/autumn of 2017. Quarters 3 and 4.**

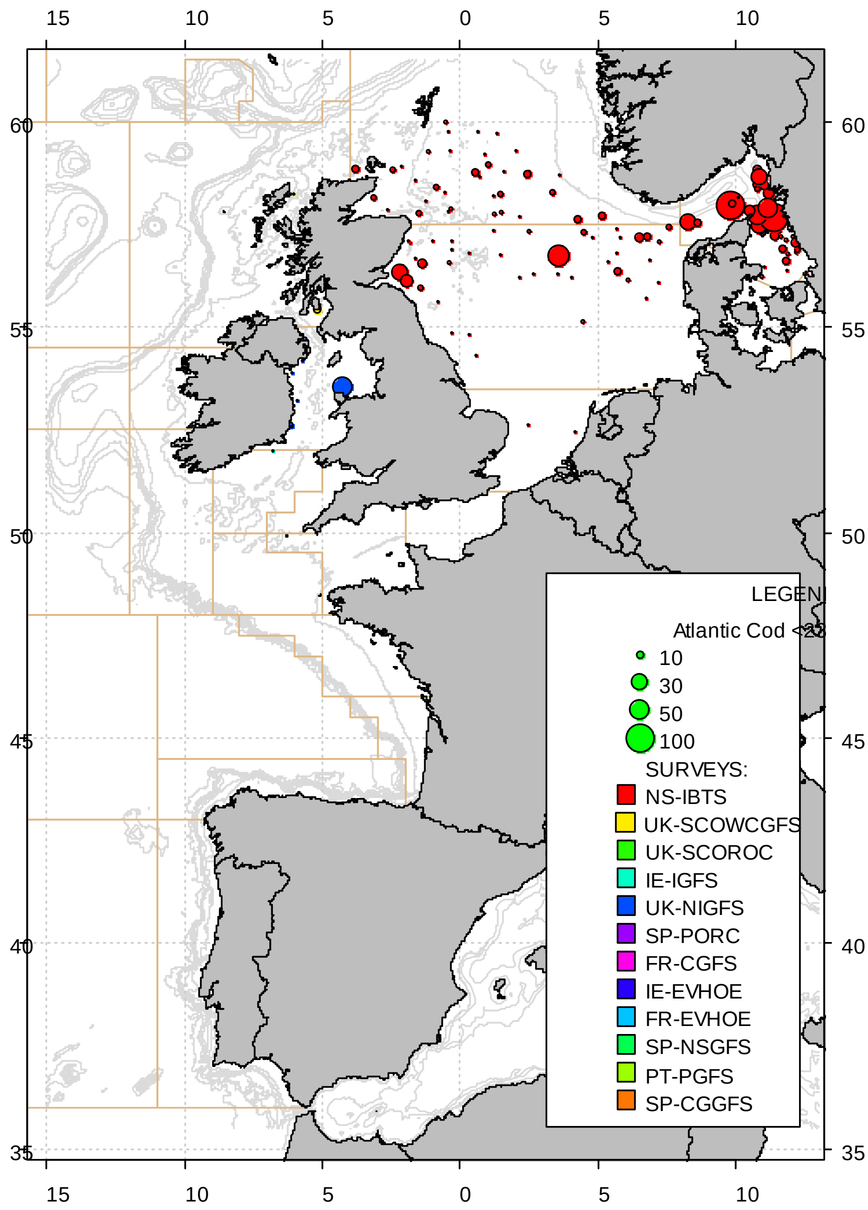



**Figure A.7.2. Catches in numbers per hour of 0-group Cod, *Gadus morhua* (<23cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

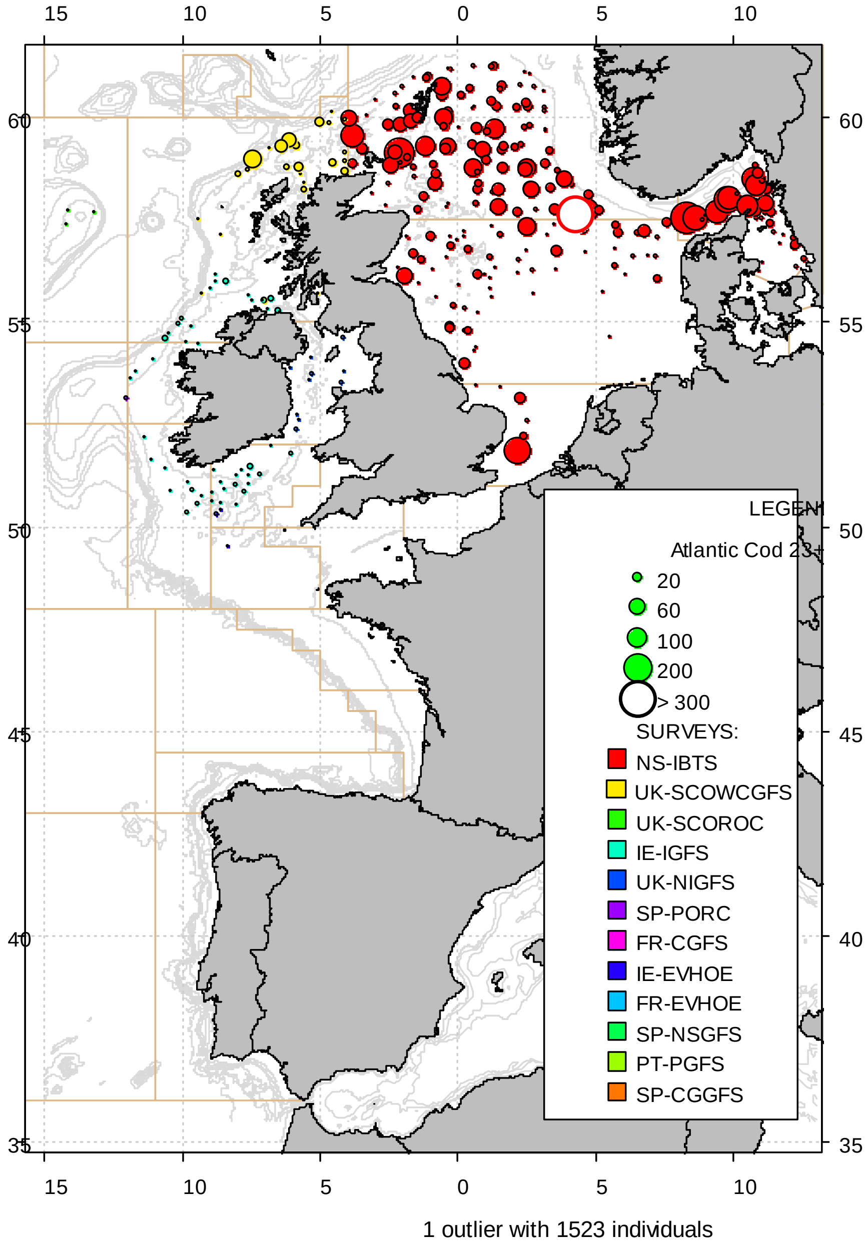



**Figure A.7.3. Catches in numbers per hour of 1+ cod, *Gadus morhua* (≥23cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

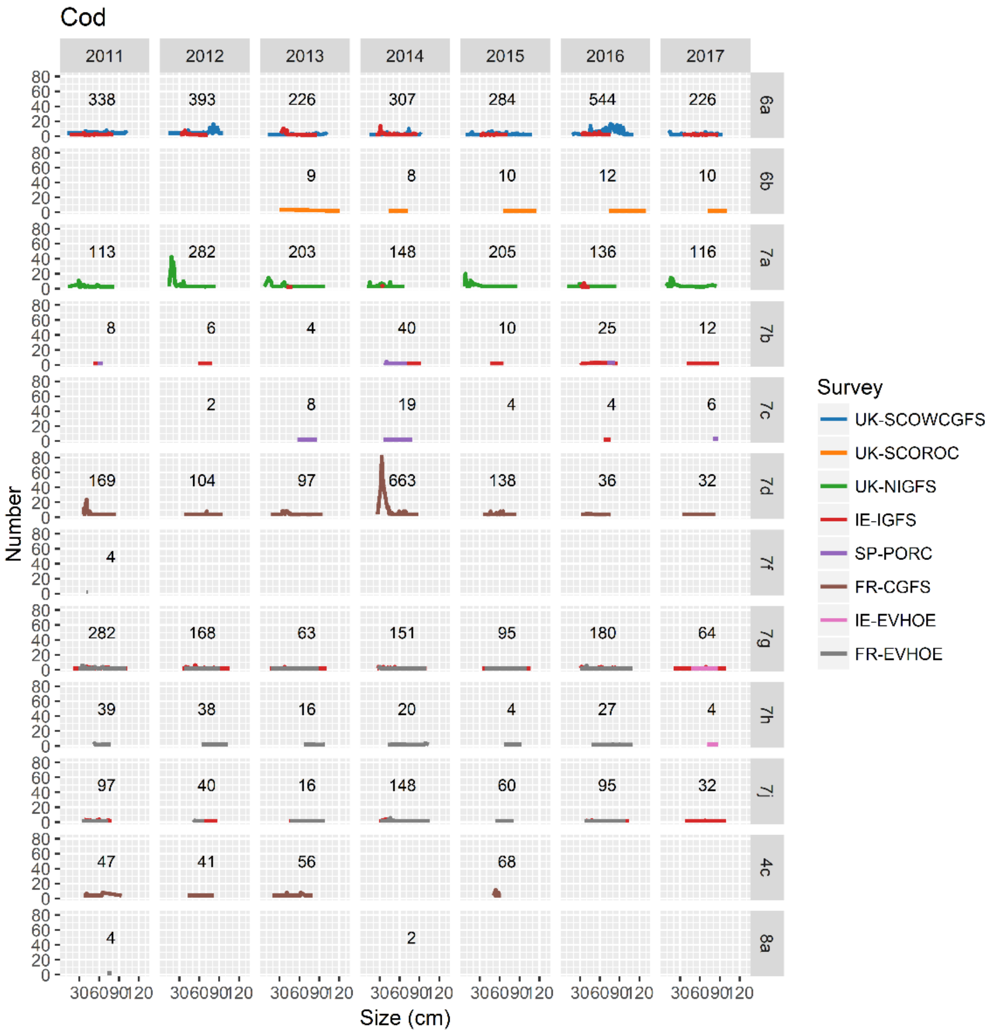



**Figure A.7.4. Length distribution of cod, *Gadus morhua*, per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

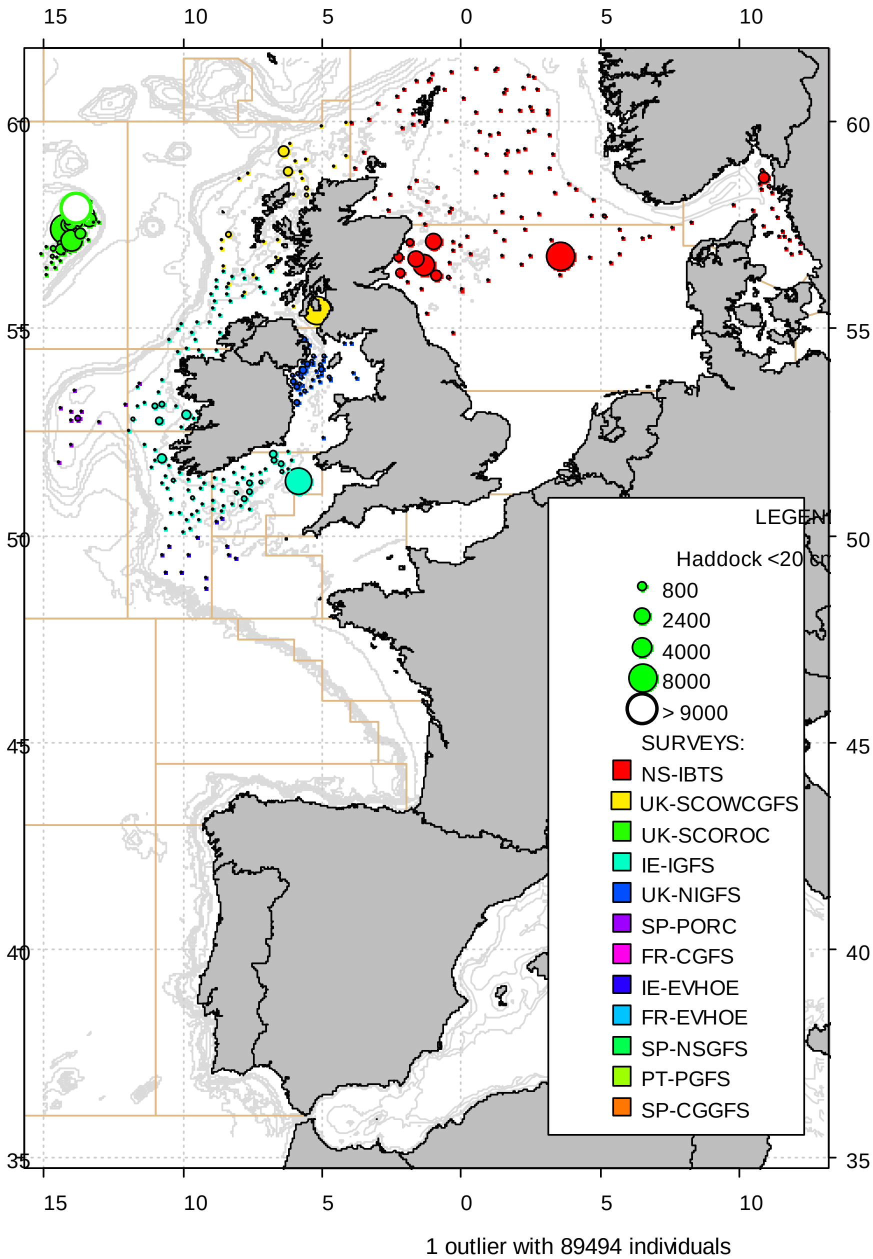



**Figure A.7.5. Catches in numbers per hour of 0-group haddock, *Melanogrammus aeglefinus* (<20cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

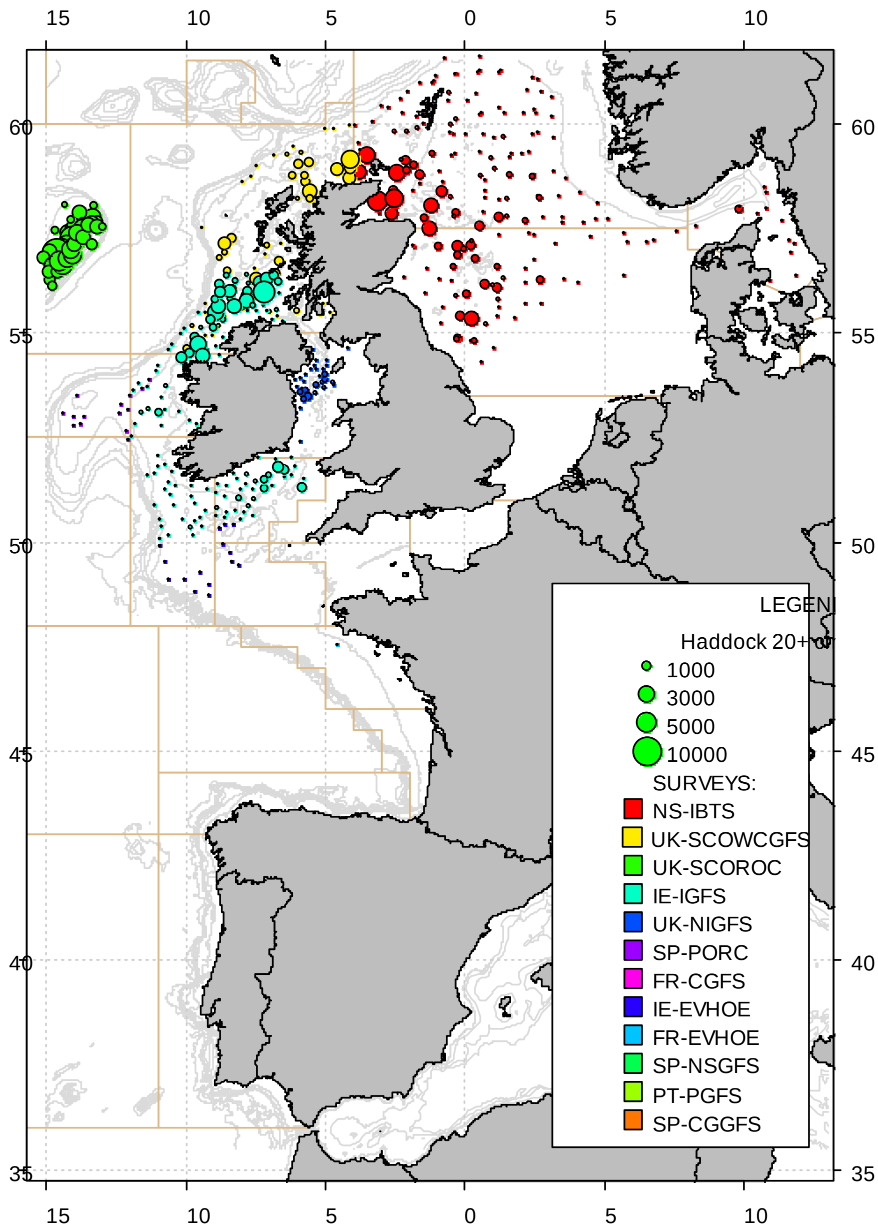



**Figure A.7.6. Catches in numbers per hour of 1+ group haddock, *Melanogrammus aeglefinus* (≥20cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

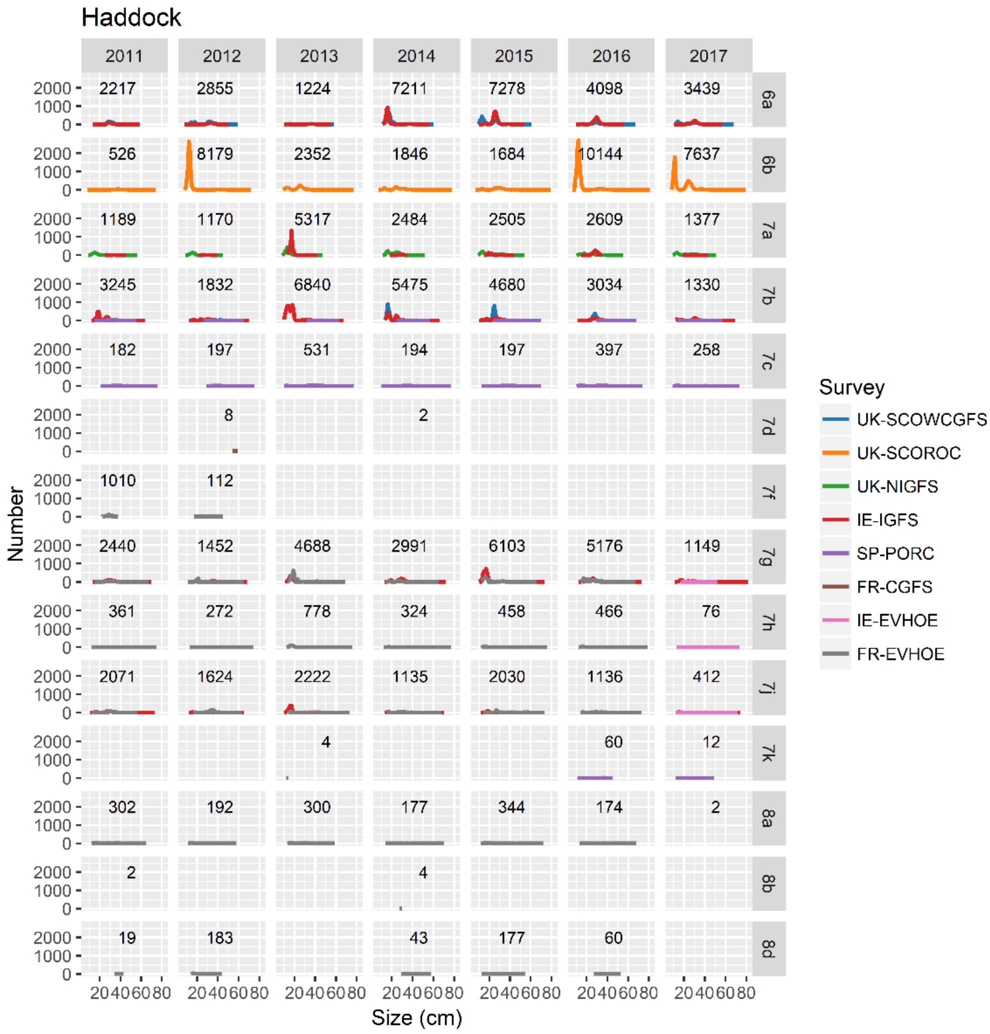



**Figure A.7.7. Length distribution of haddock, *Melanogrammus aeglefinus* per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

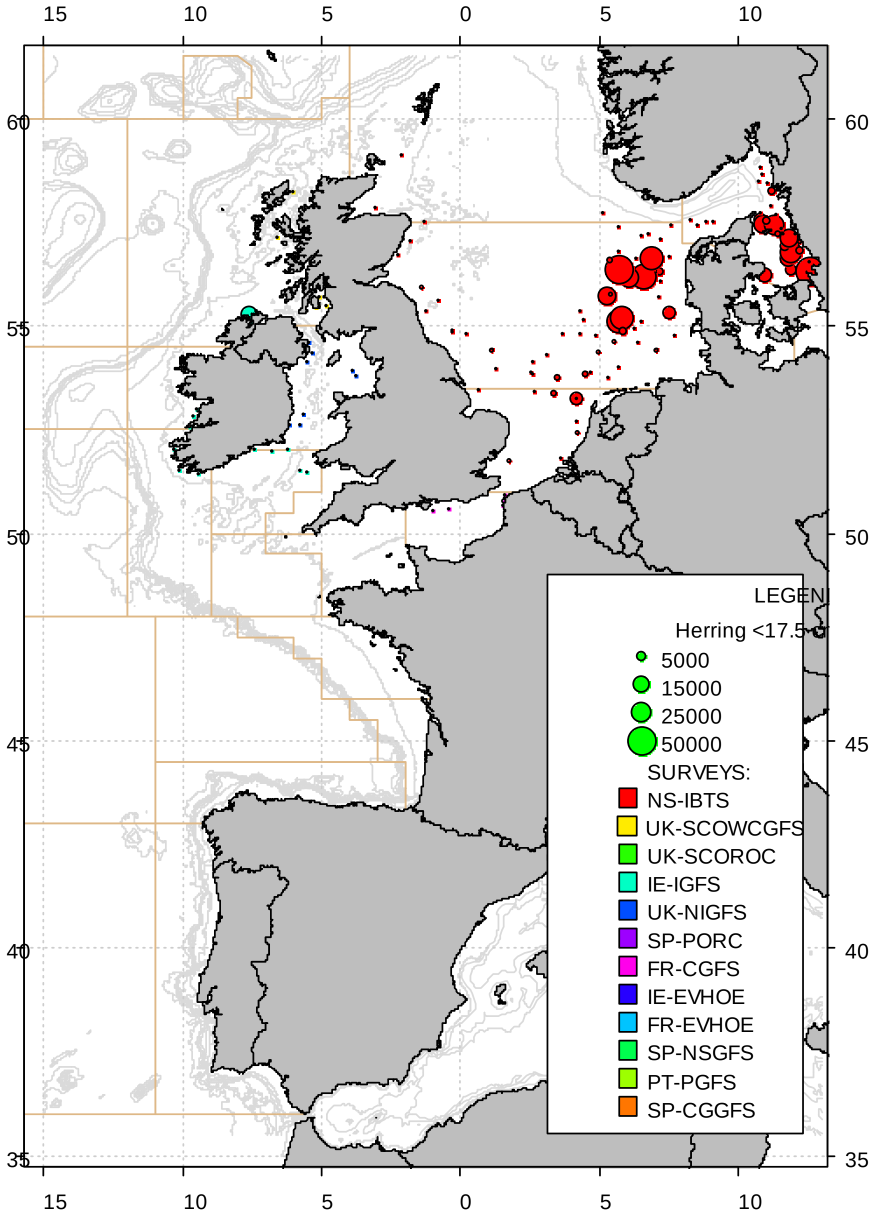



**Figure A.7.8. Catches in numbers per hour of 0-group herring, *Clupea harengus* (<17.5 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

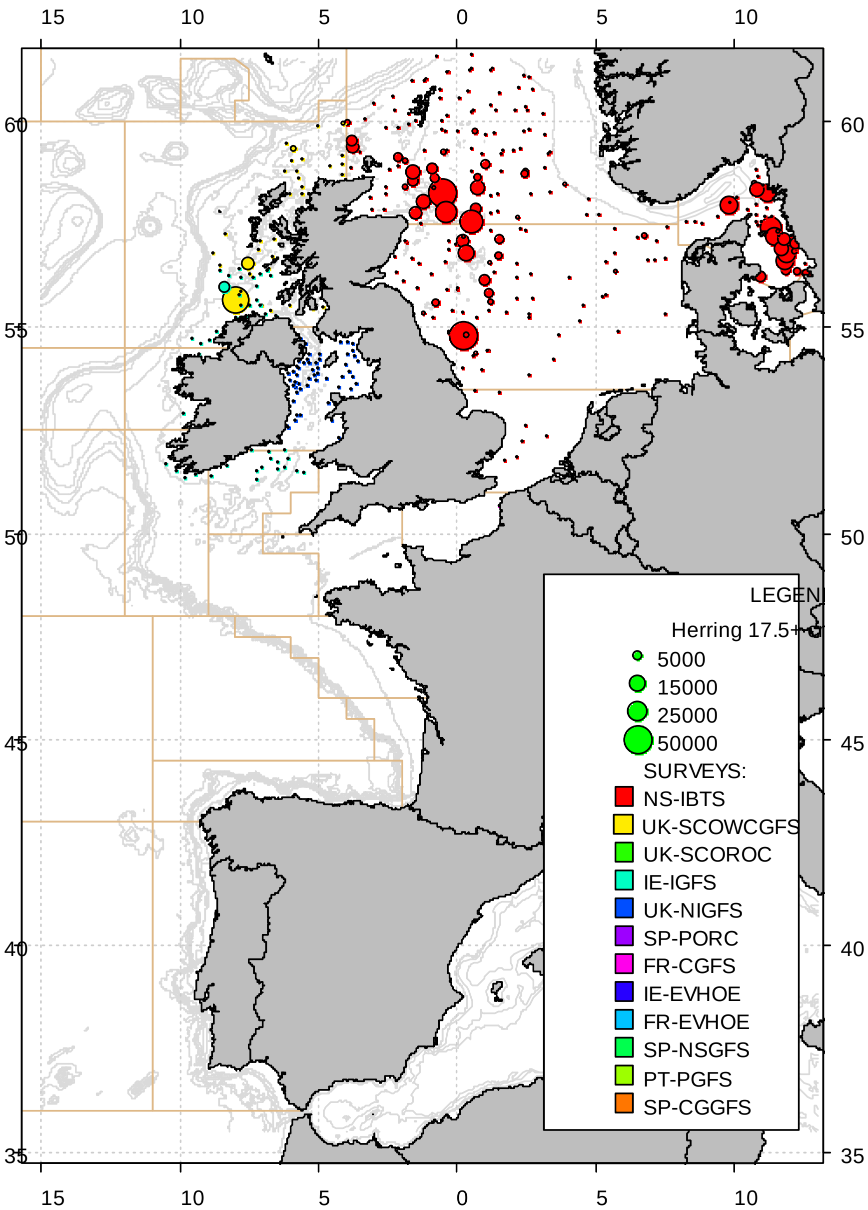



**Figure A.7.9. Catches in numbers per hour of 1+ group herring, *Clupea harengus* (≥17.5 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

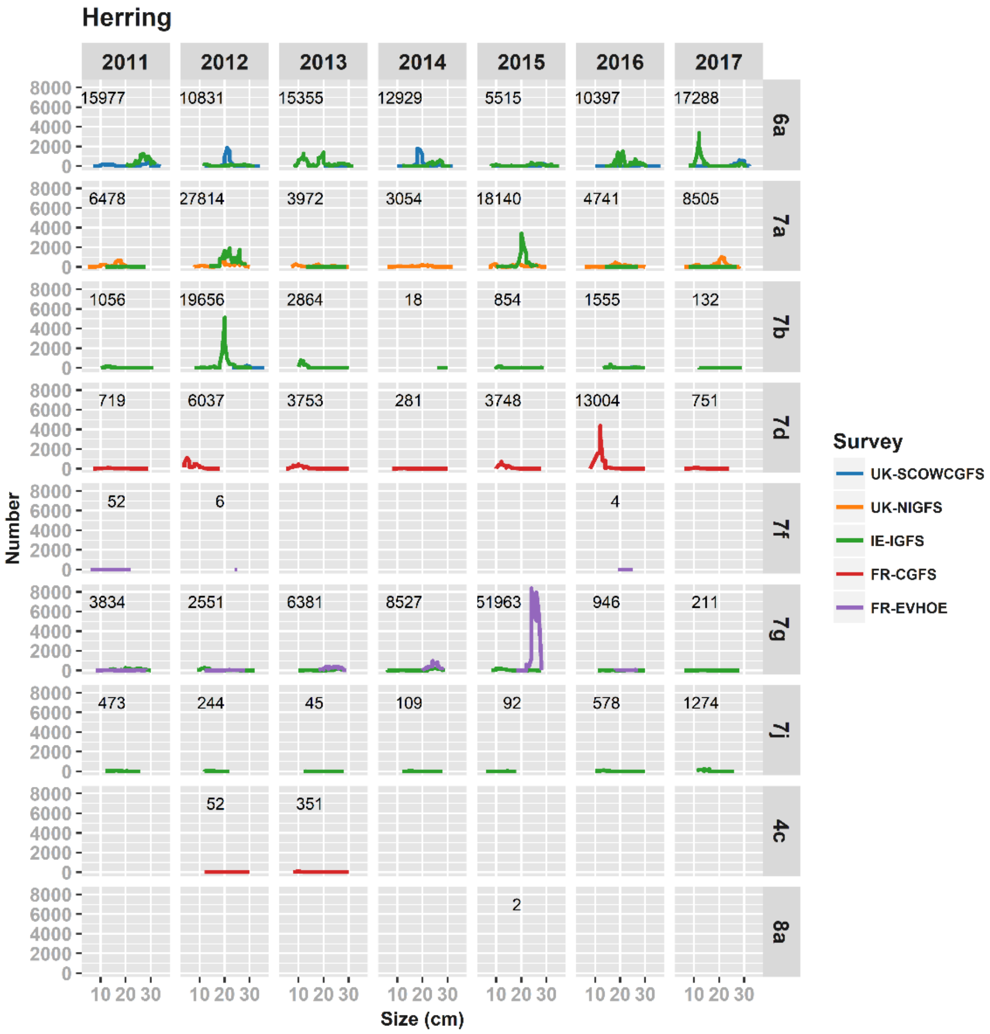



**Figure A.7.10. Length distribution of herring, *Clupea harengus* per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

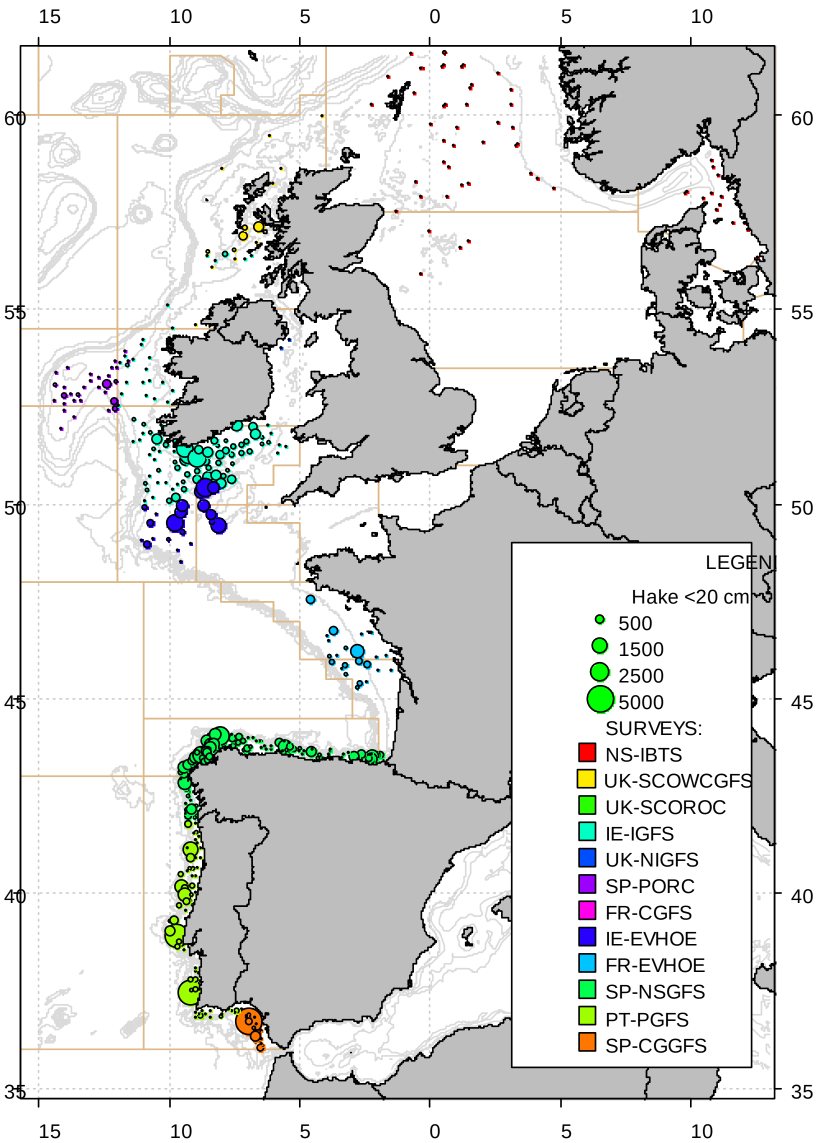



**Figure A.7.11. Catches in numbers per hour of 0-group European hake, *Merluccius merluccius* (<20cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

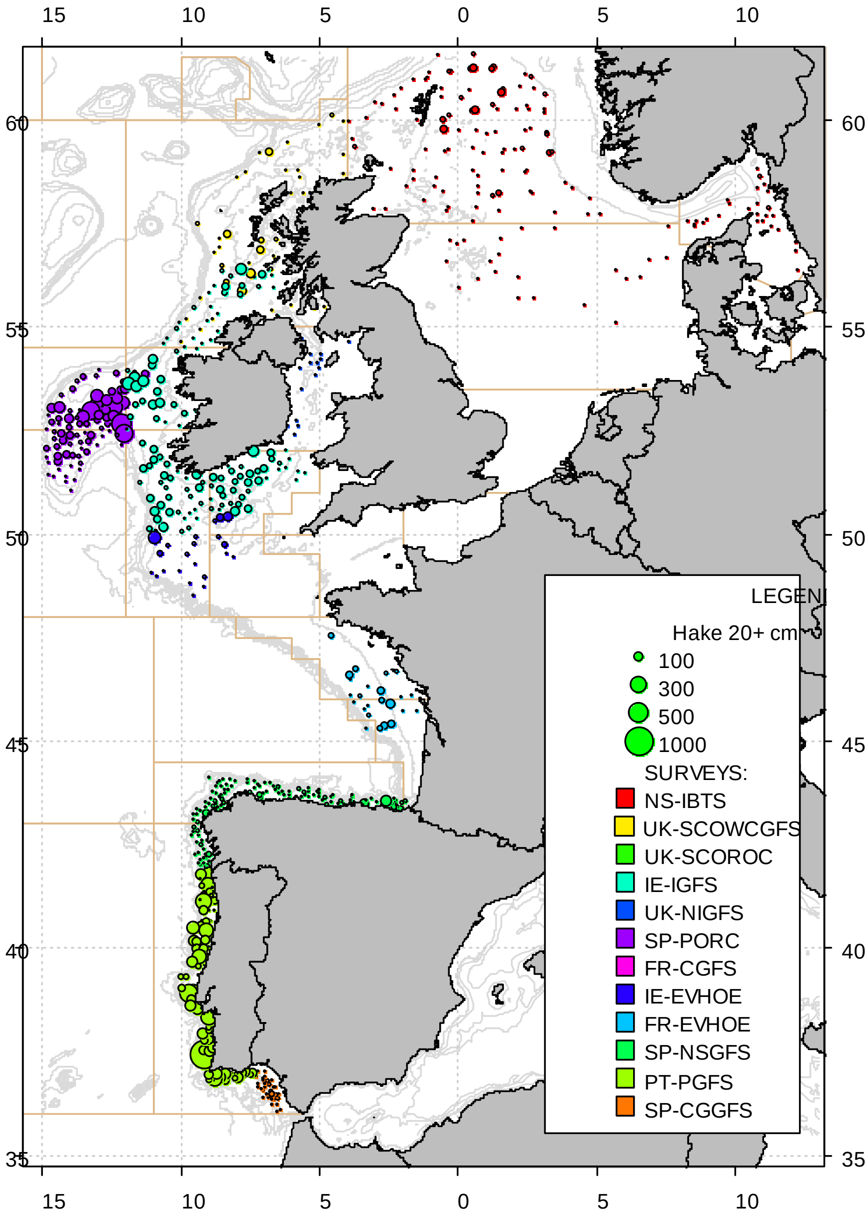



**Figure A.7.12. Catches in numbers per hour of 1+ group European hake, *Merluccius merluccius* (≥20cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

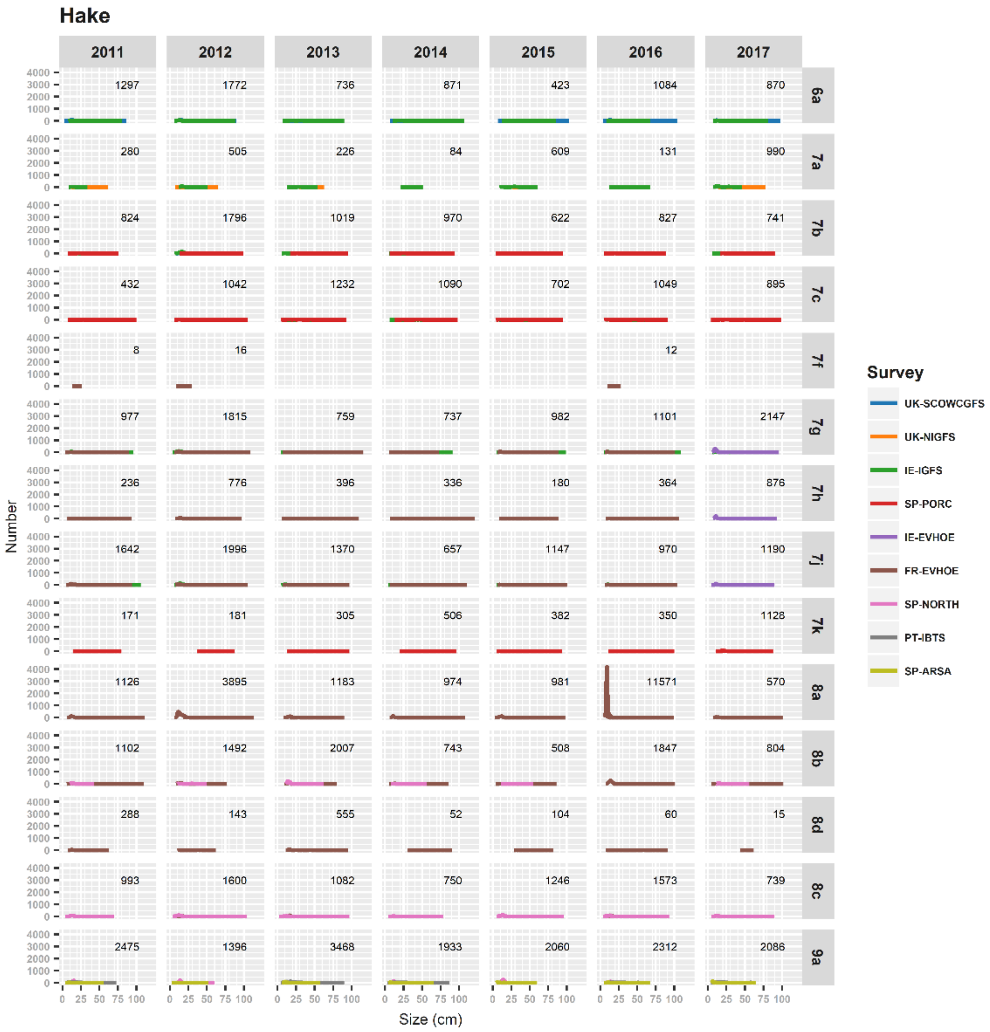



**Figure A.7.13. Length distribution of hake, *Merluccius merluccius* per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

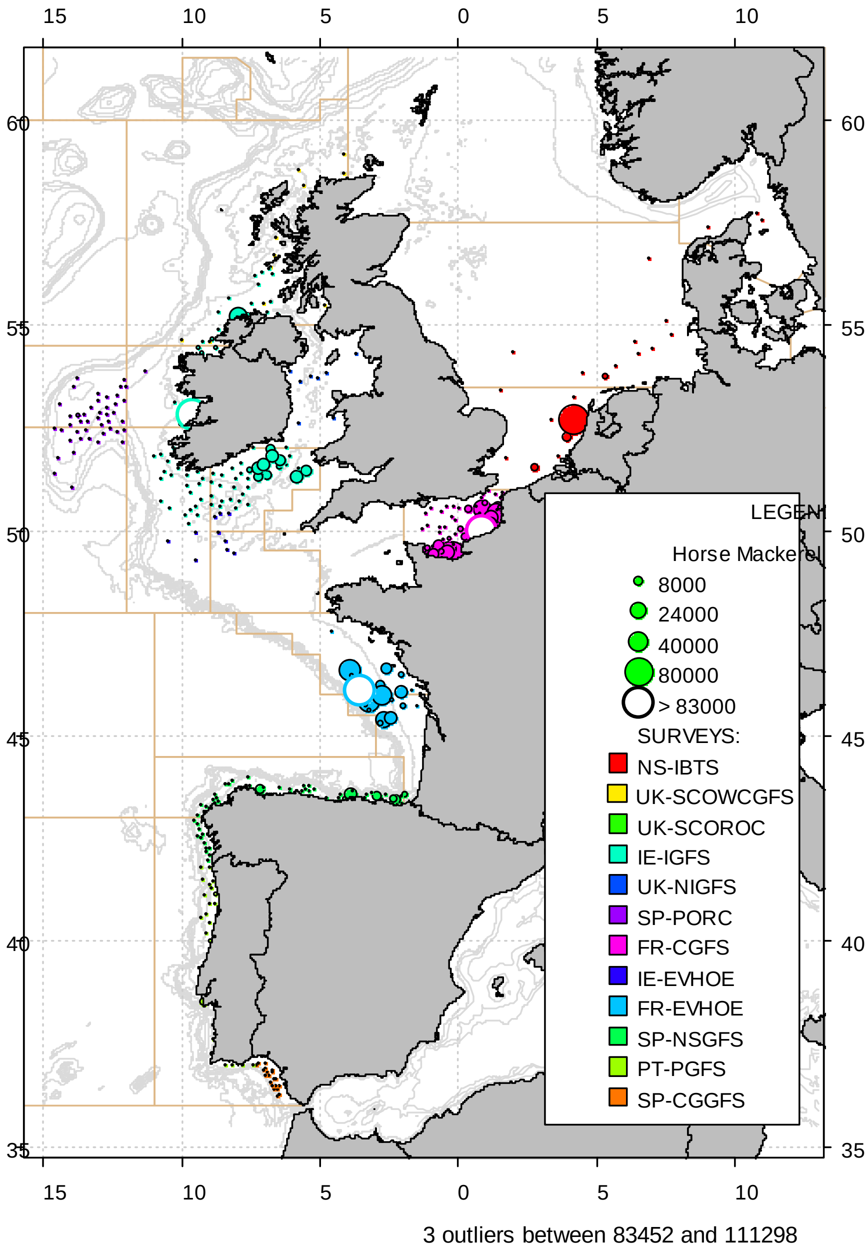



**Figure A.7.14. Catches in numbers per hour of 0-group horse mackerel, T*rachurus trachurus* (<15 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

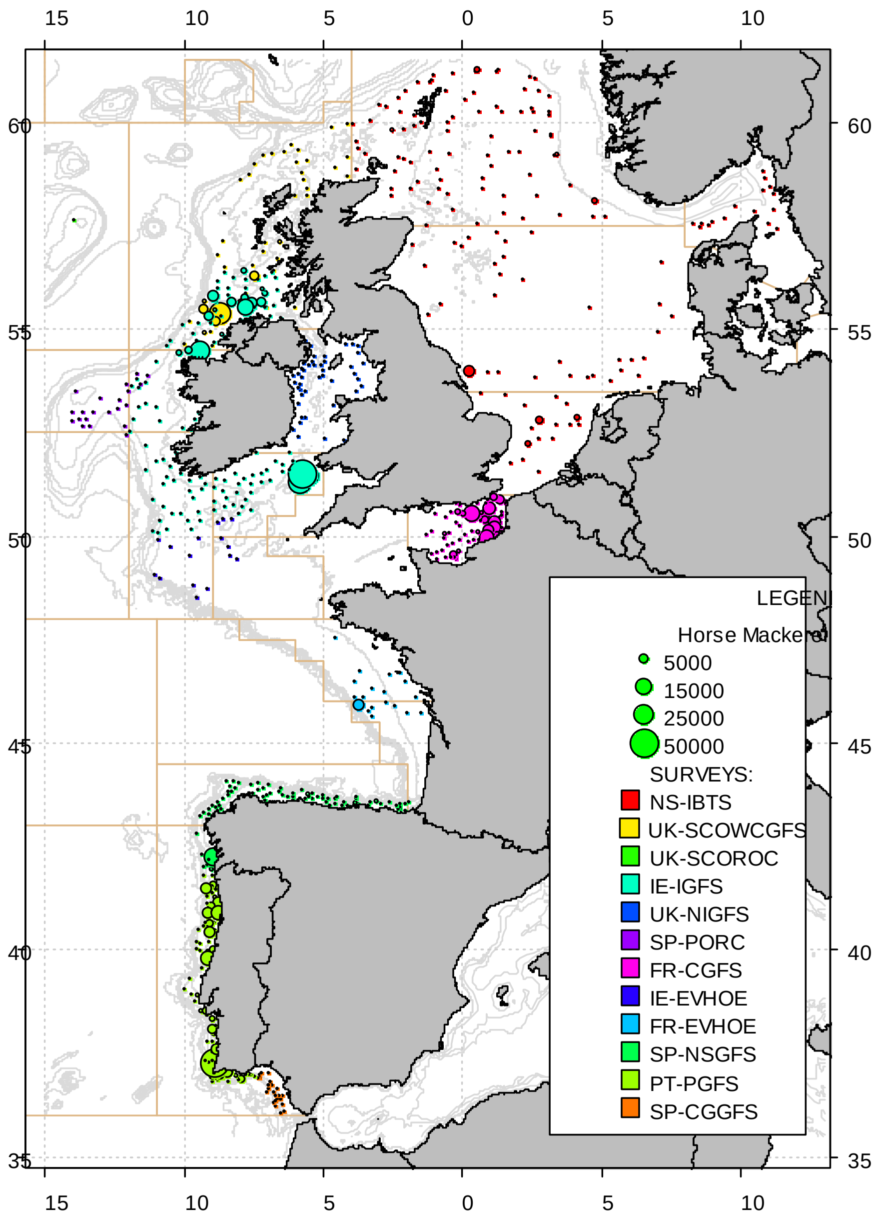



**Figure A.7.15. Catches in numbers per hour of 1+ group horse mackerel, *Trachurus trachurus* (≥ 15 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

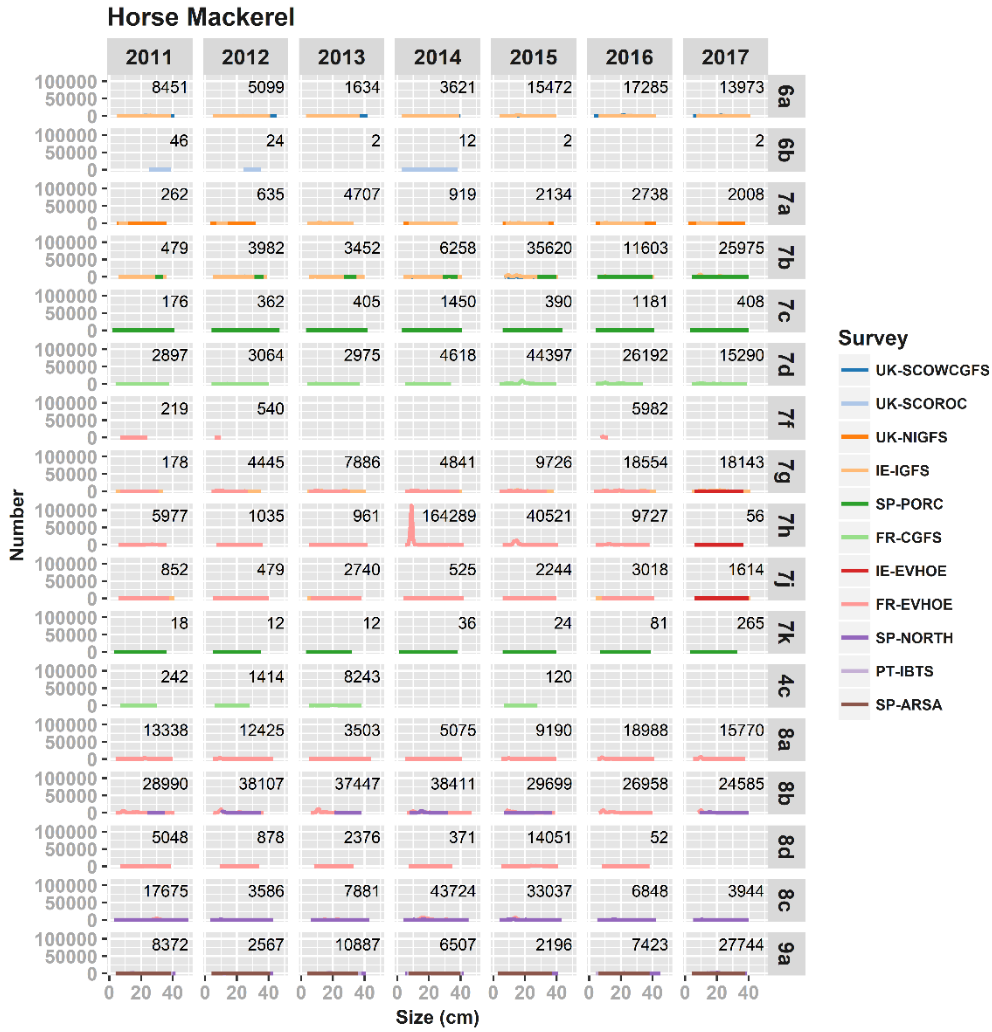



**Figure A.7.16. Length distribution of horse mackerel, *Trachurus trachurus* per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

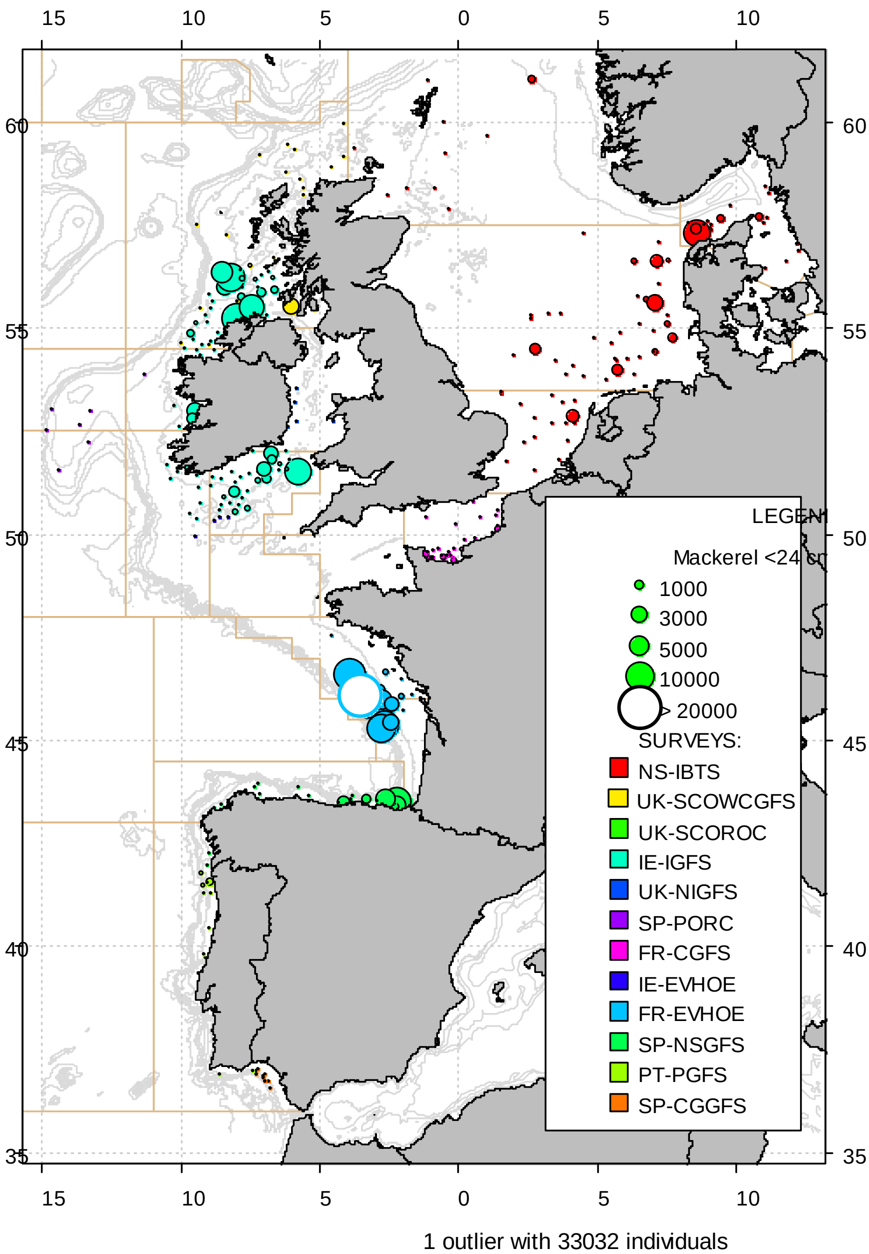



**Figure A.7.17. Catches in numbers per hour of 0-group mackerel, *Scomber scombrus* (<24 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

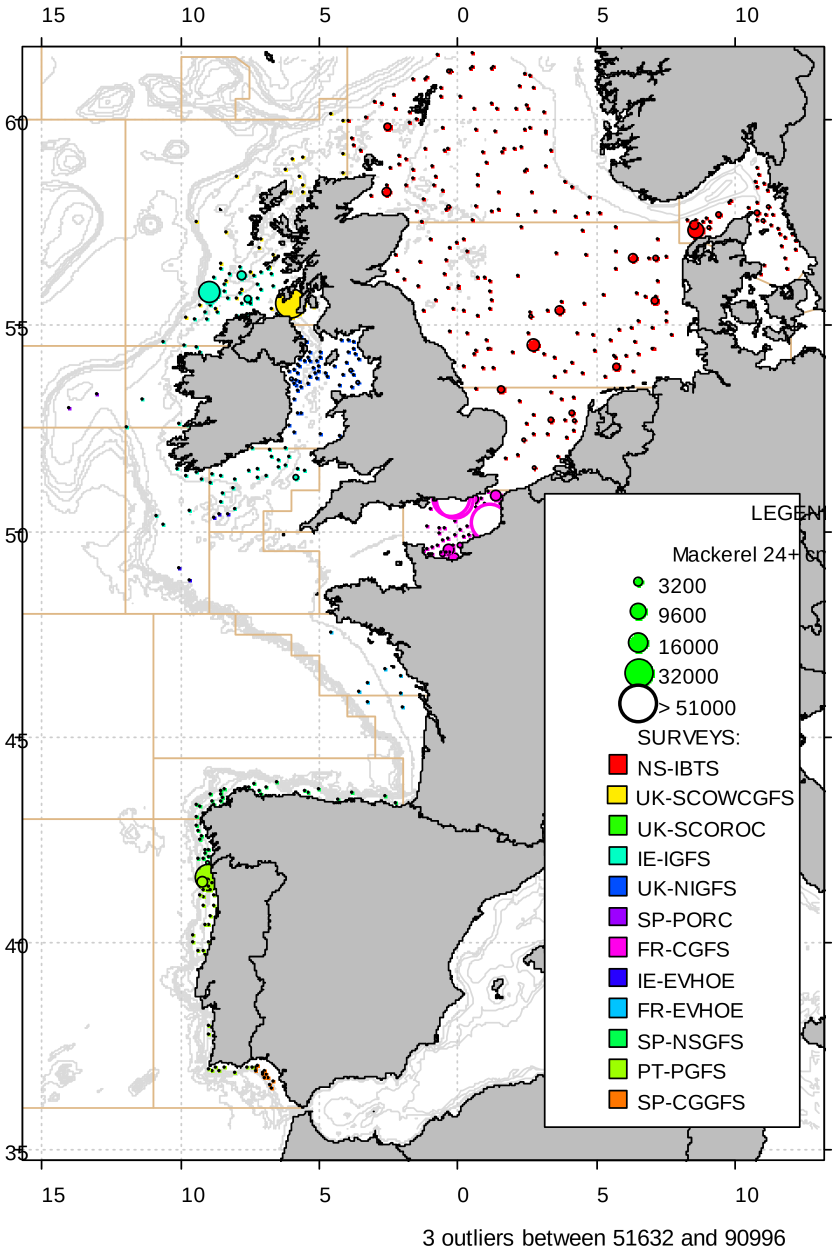



**Figure A.7.18. Catches in numbers per hour of 1+ group mackerel, *Scomber scombrus* (≥24 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**


**Figure A.7.19. Length distribution of mackerel, *Scomber scombrus* per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

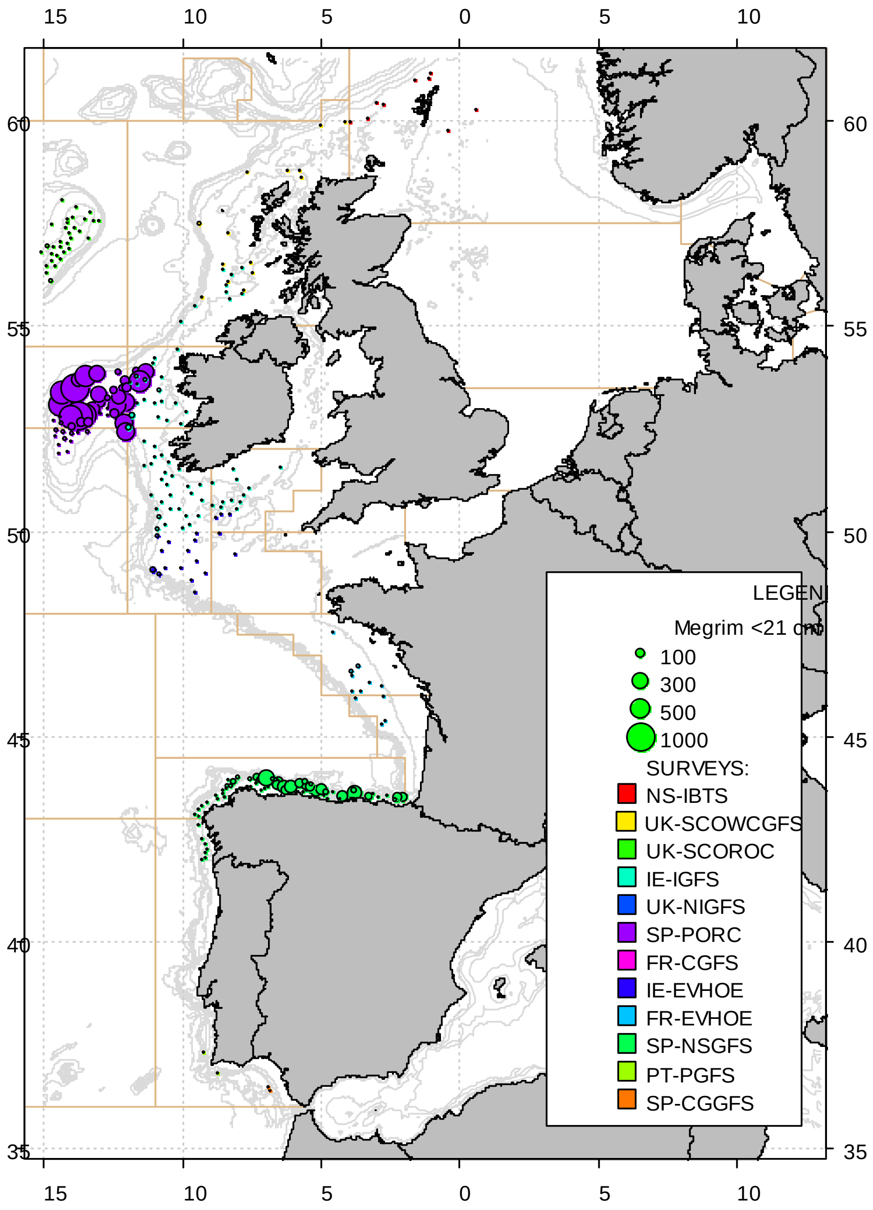



**Figure A.7.20. Catches in numbers per hour of megrim recruits, *Lepidorhombus whiffiagonis* (<21 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

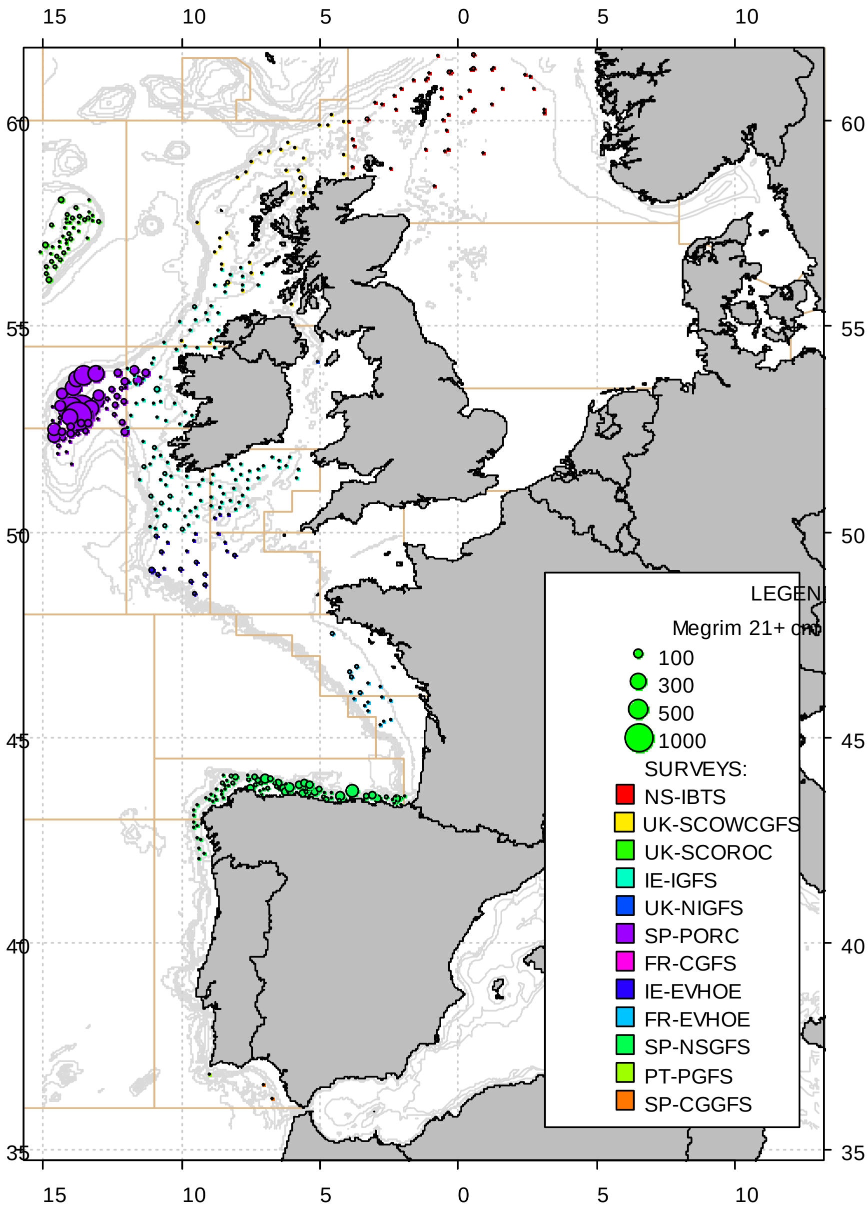



**Figure A.7.21. Catches in numbers per hour of 2+ group megrim, *Lepidorhombus whiffiagonis* (≥21cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

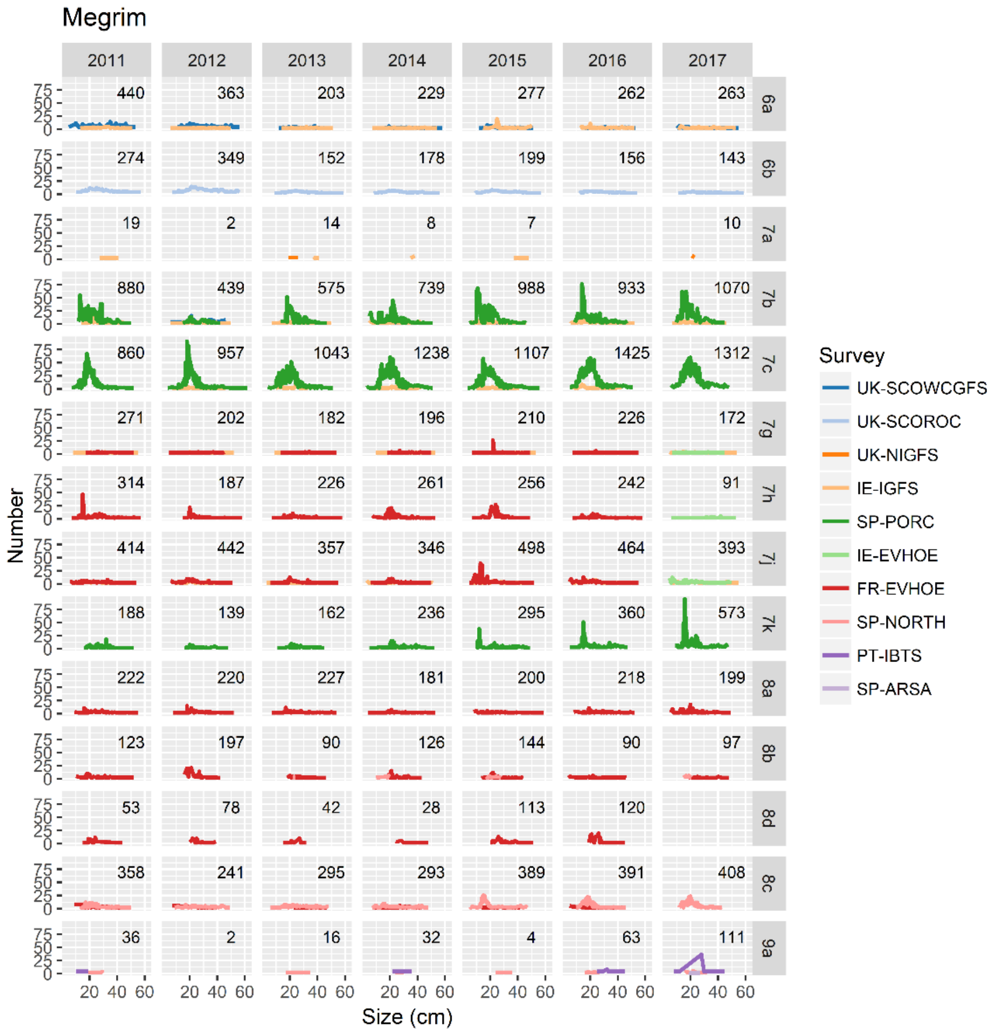



**Figure A.7.22. Length distribution of megrim, *Lepidorhombus whiffiagonis*, per ICES Sub-area in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

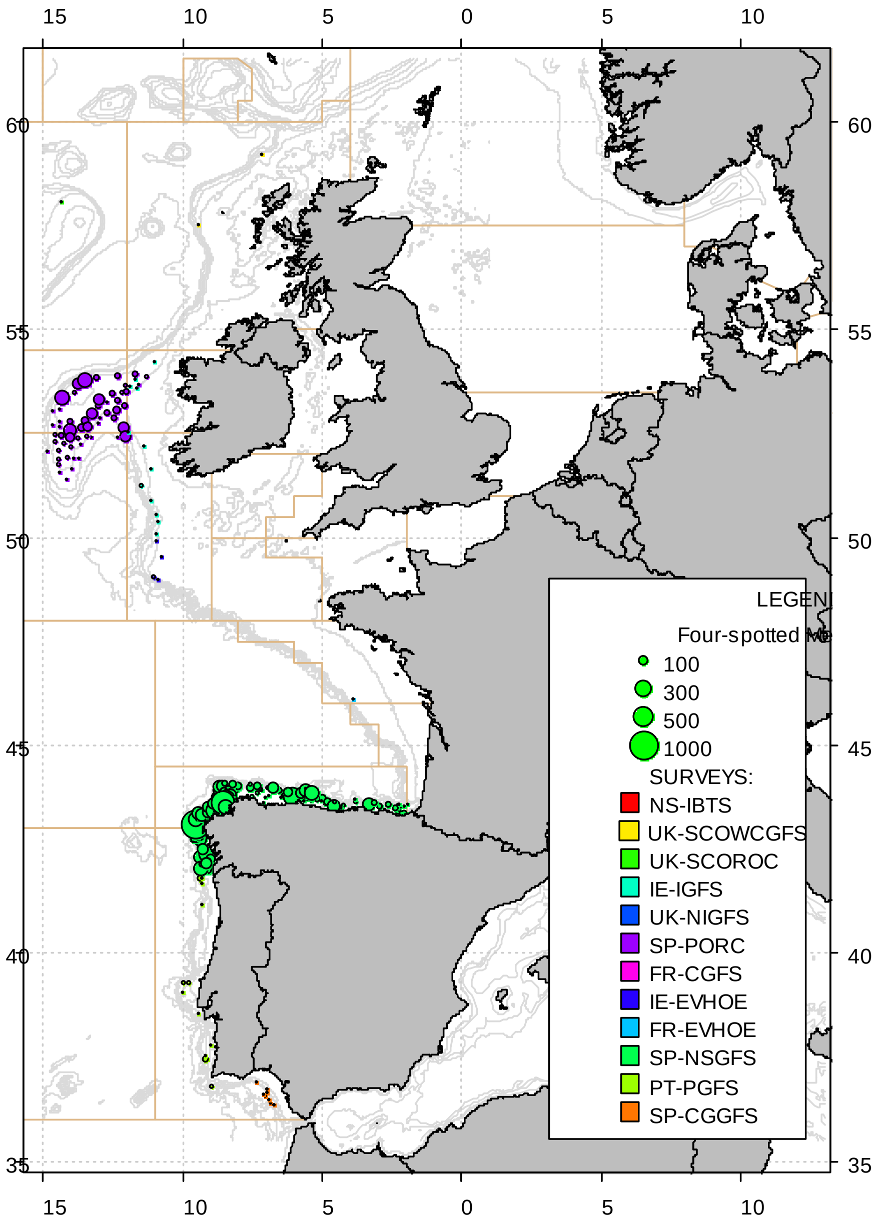



**Figure A.7.23. Catches in numbers per hour of recruits of four-spotted megrim, *Lepidorhombus boscii* (<19 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

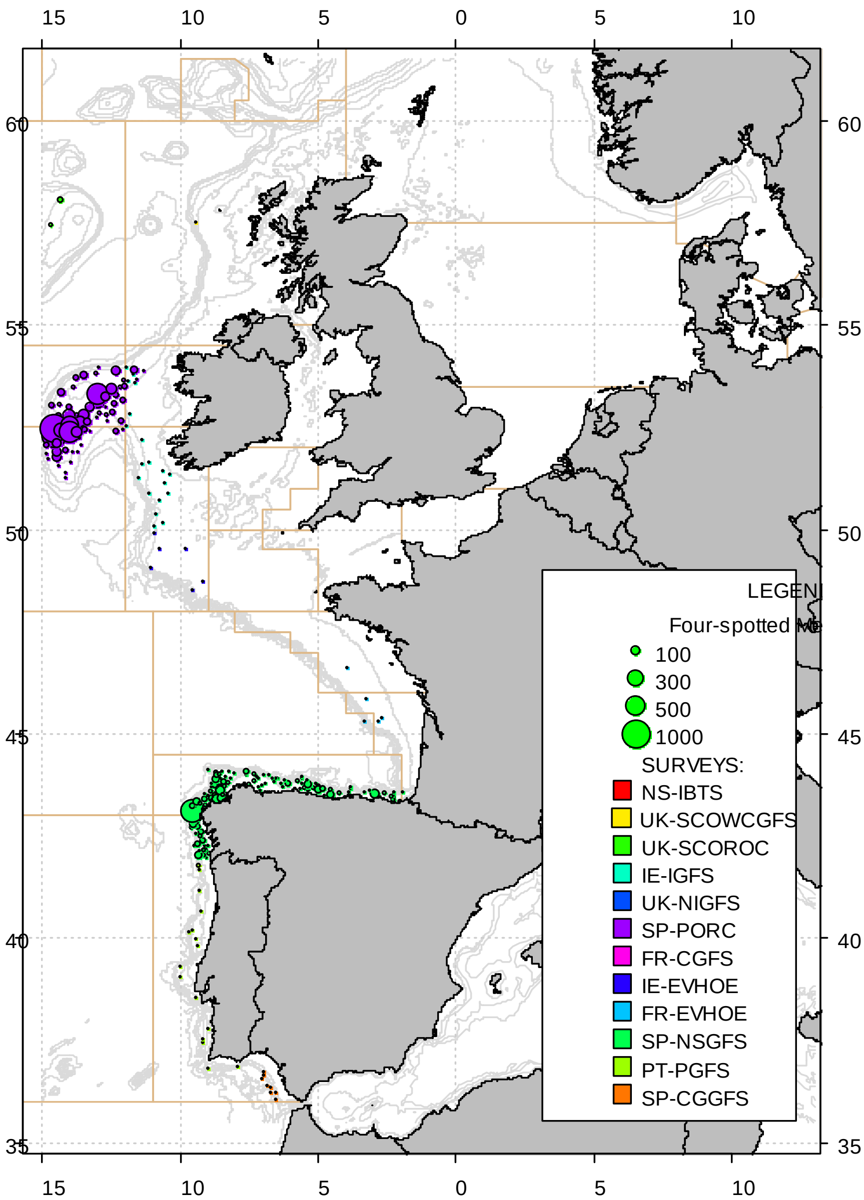



**Figure A.7.24. Catches in numbers per hour of 2+ group four-spotted megrim, *Lepidorhombus boscii* (≥19 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

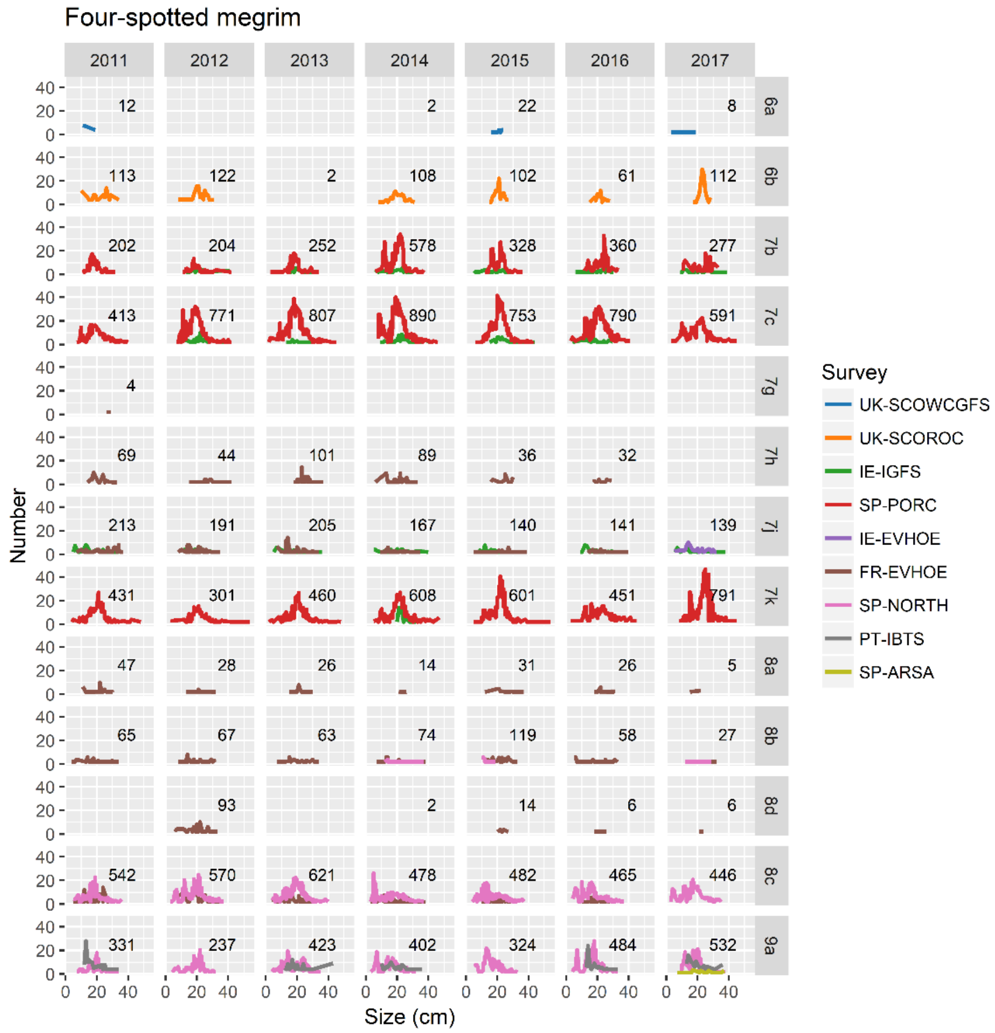



**Figure A.7.25. Length distribution of four-spotted megrim, *Lepidorhombus boscii*, per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

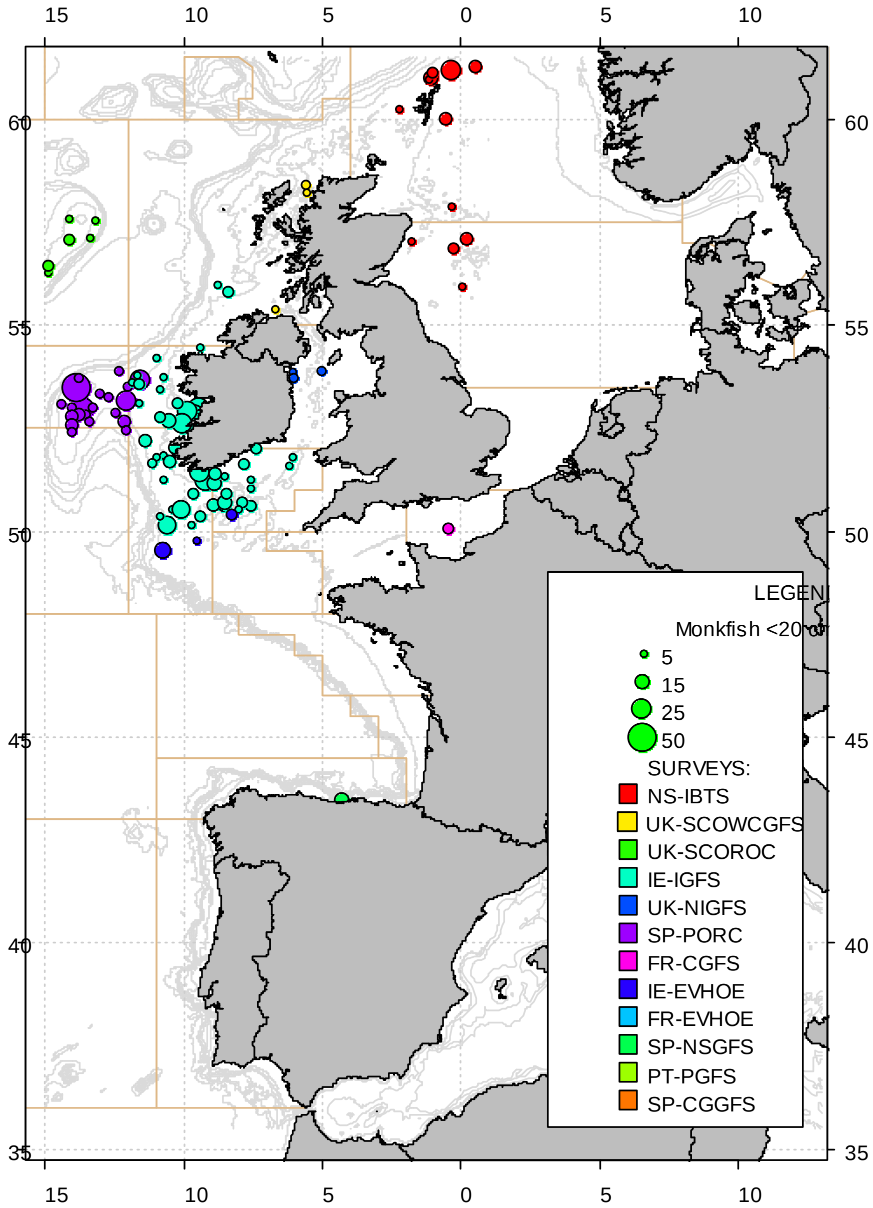



**Figure A.7.26. Catches in numbers per hour of 0-group monkfish, *Lophius piscatorius* (<20 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

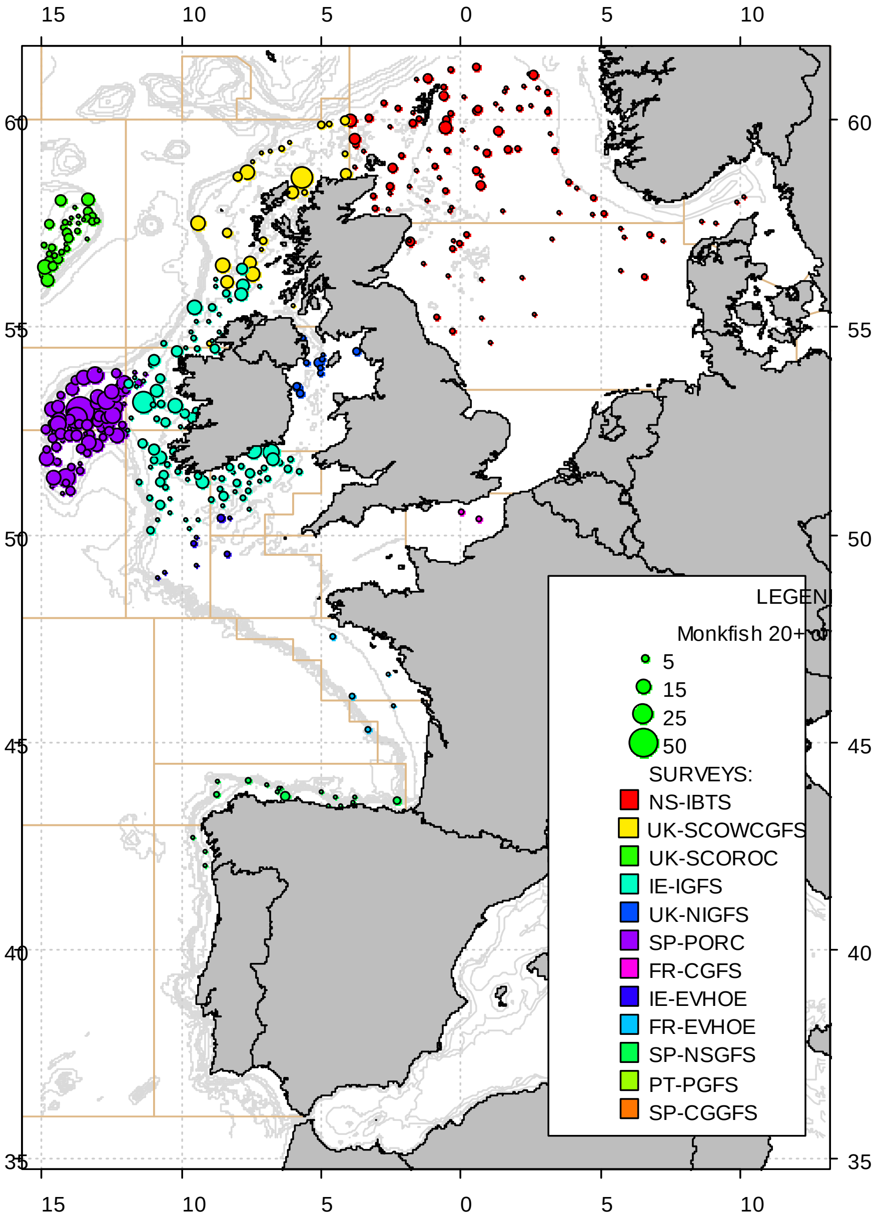



**Figure A.7.27. Catches in numbers per hour of 1+ group monkfish, *Lophius piscatorius* (≥20 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

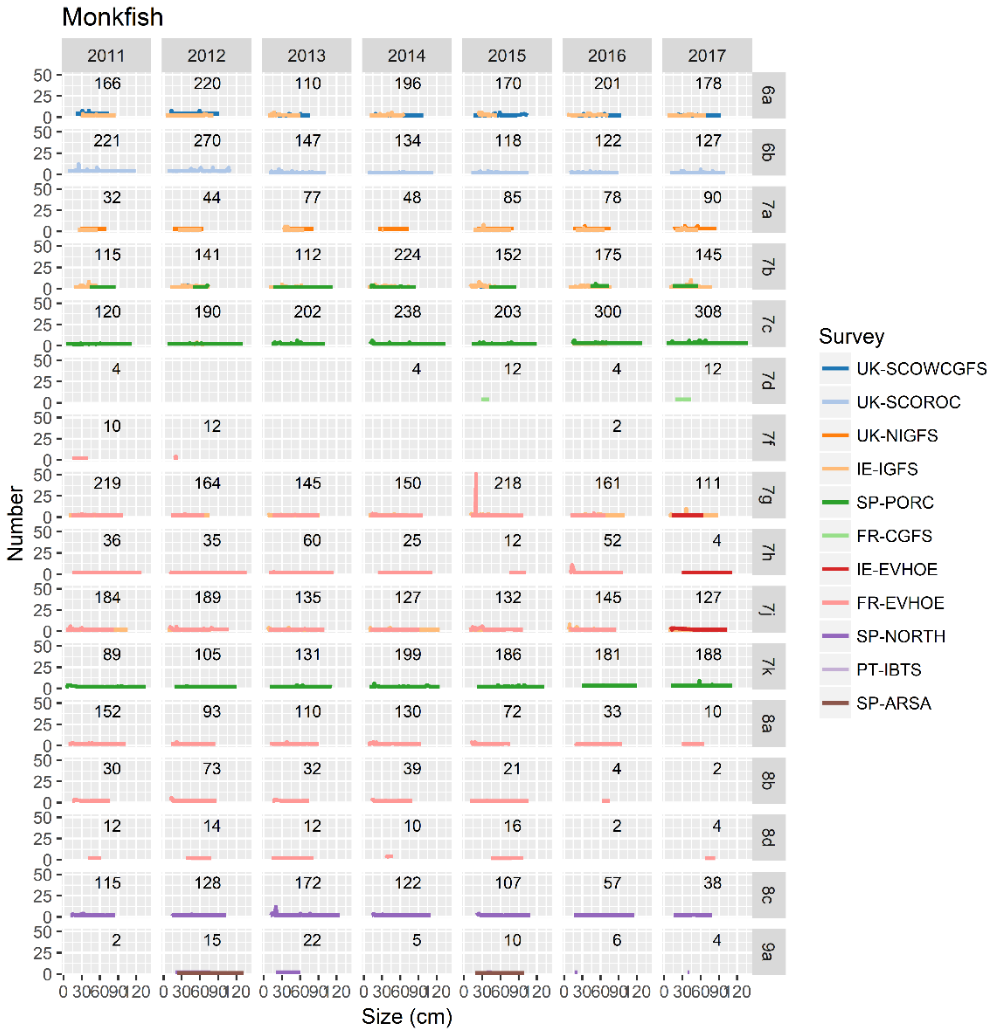



**Figure A.7.28. Length distribution of monkfish, *Lophius piscatorius*, per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

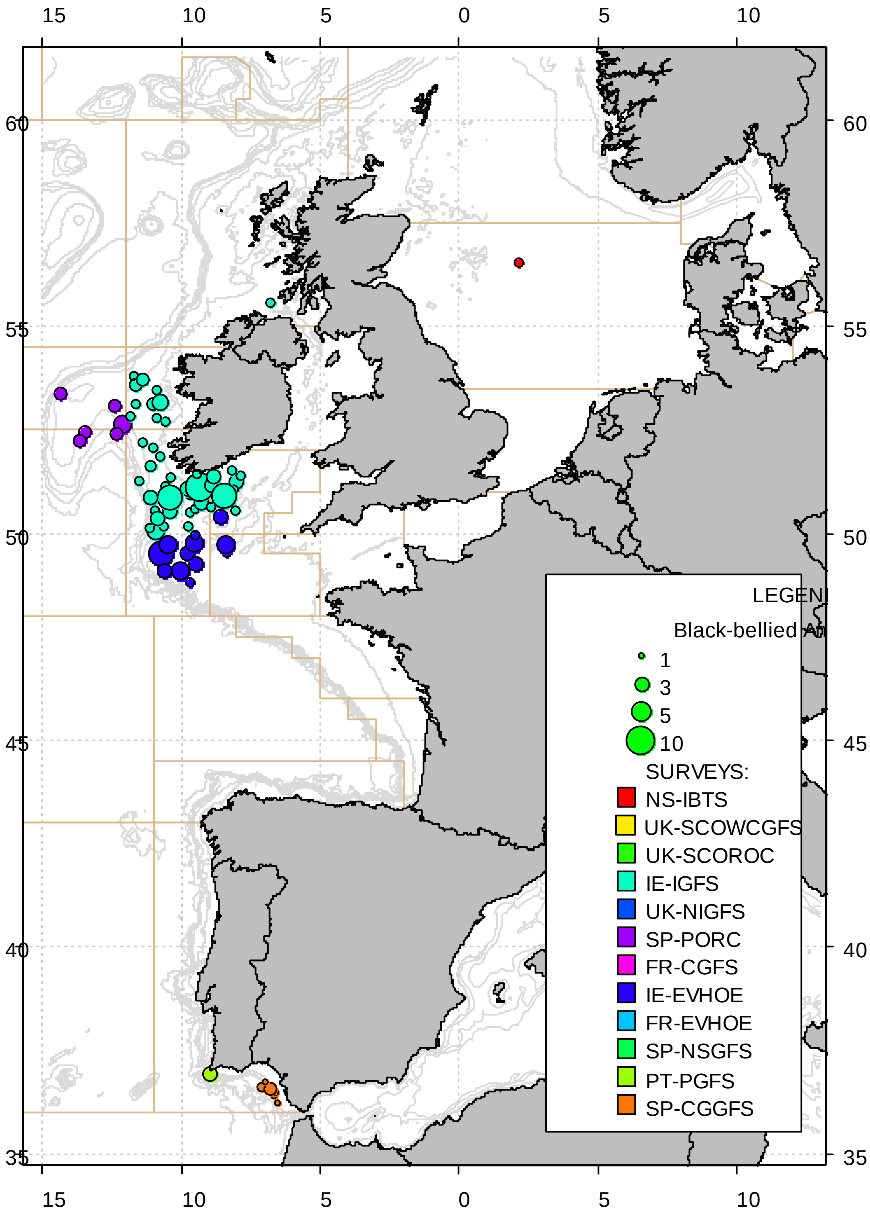



**Figure A.7.29. Catches in numbers per hour of 0-group black-bellied anglerfish, *Lophius budegassa* (<20 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

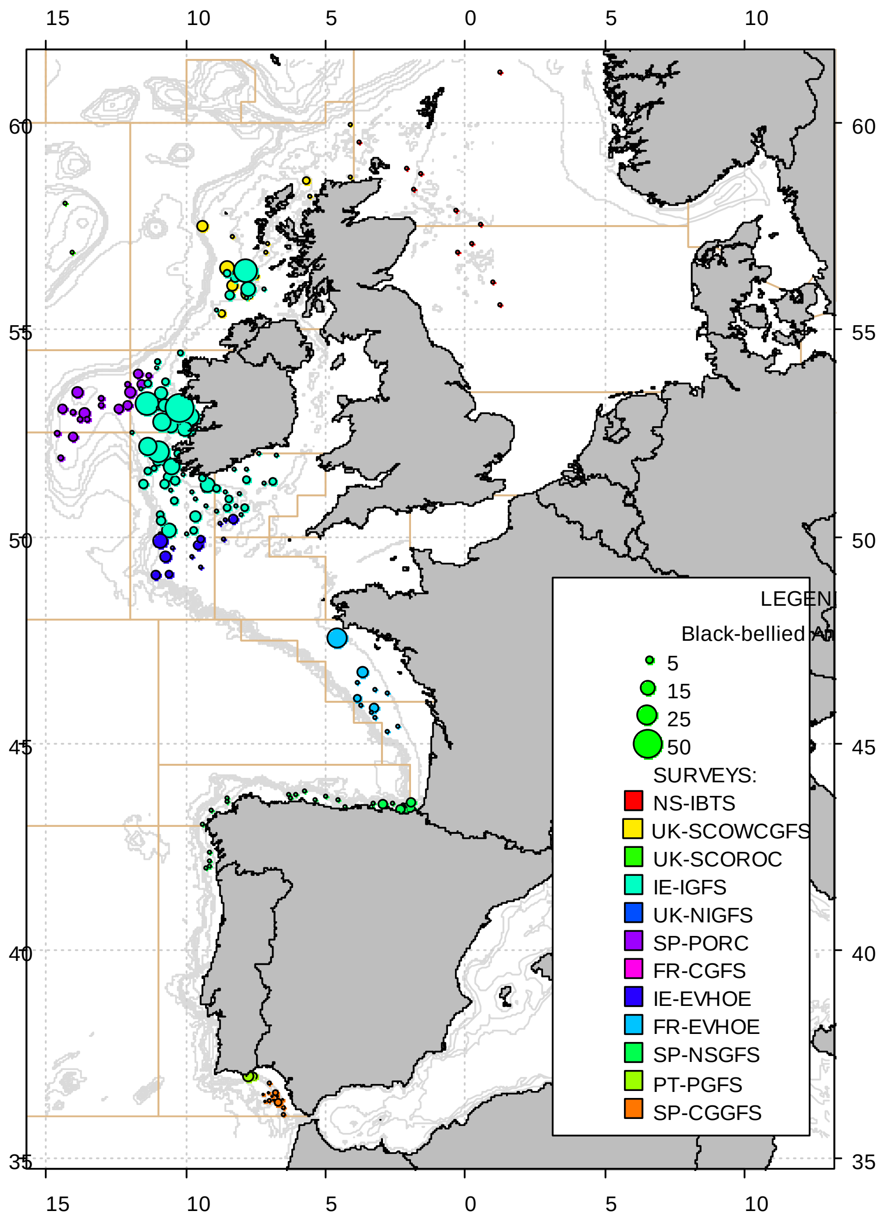



**Figure A.7.30. Catches in numbers per hour of 1+ group black-bellied anglerfish, *Lophius budegassa* (≥20 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

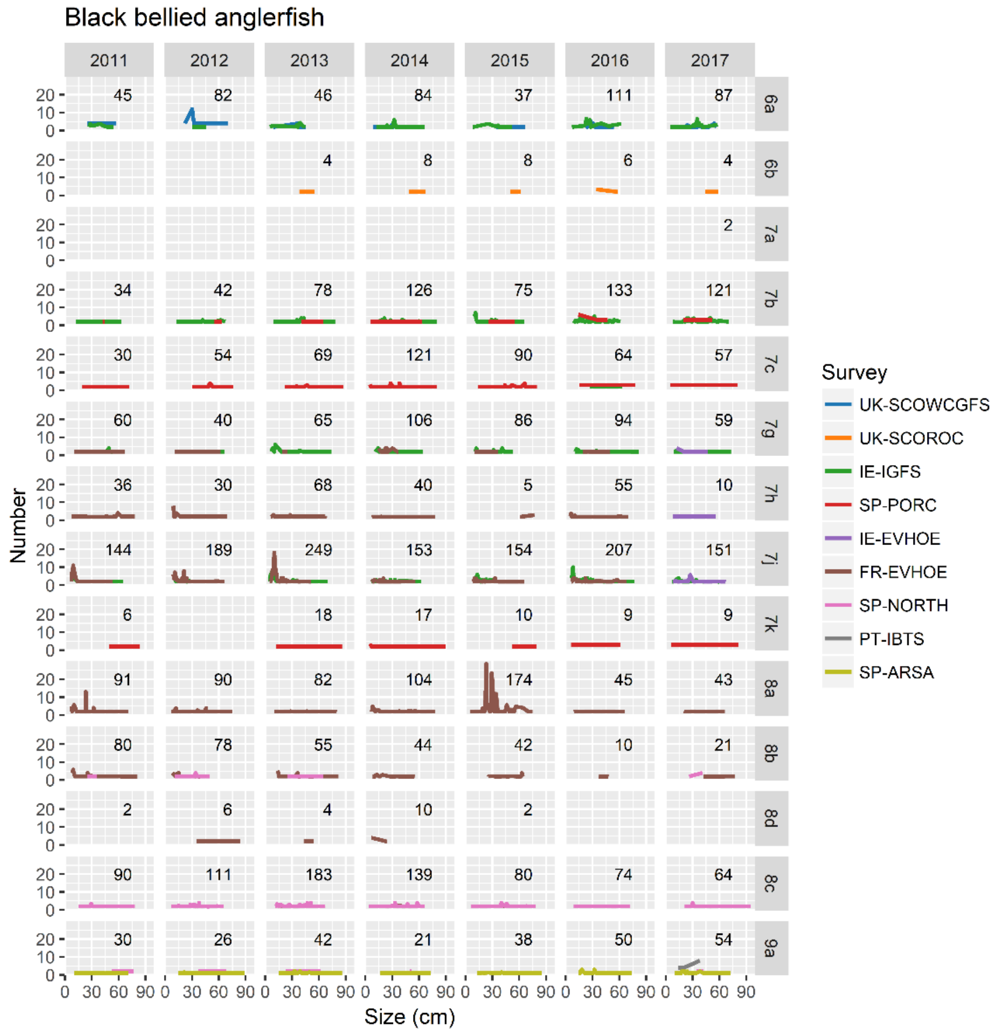



**Figure A.7.31. Length distribution of black-bellied anglerfish, *Lophius budegassa*, per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

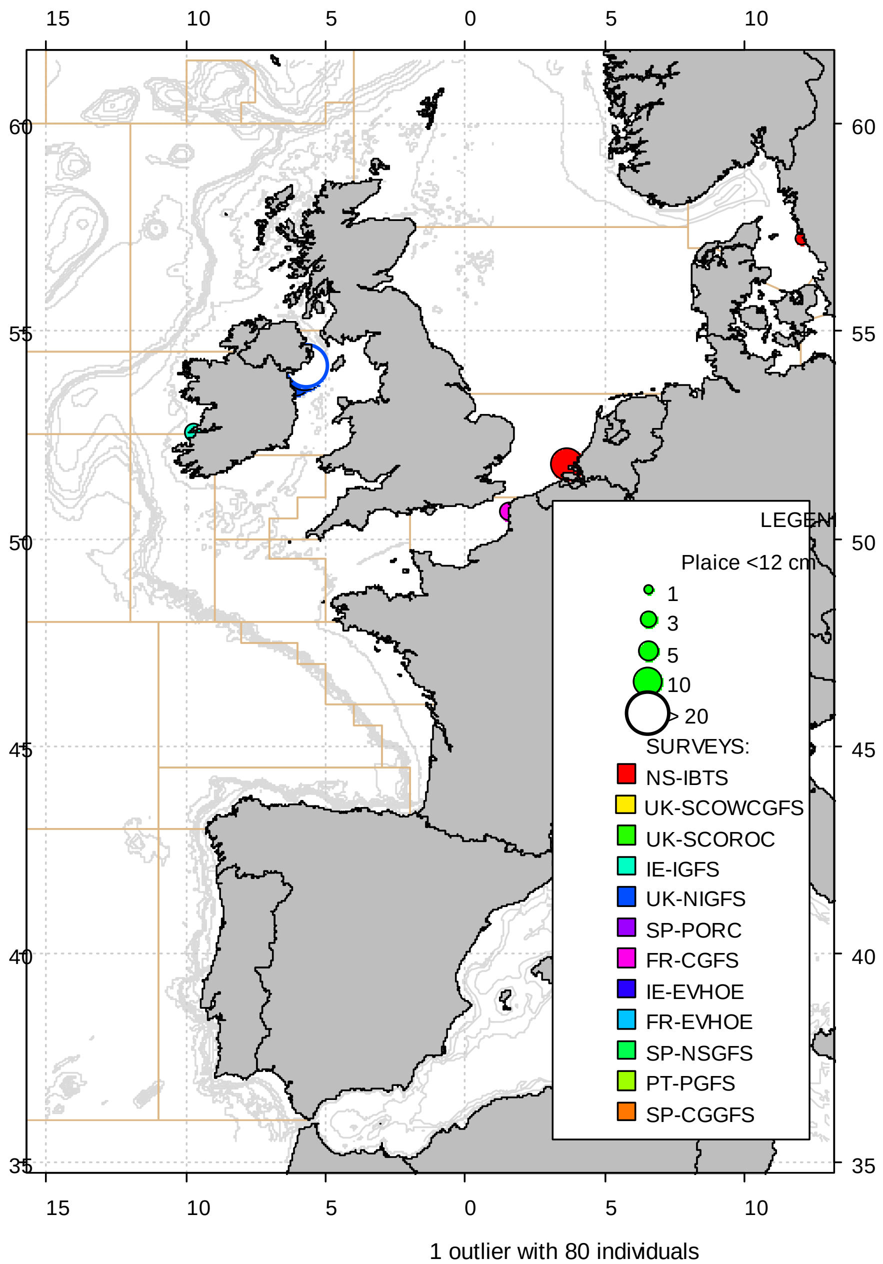



**Figure A.7.32. Catches in numbers per hour of 0-group plaice, *Pleuronectes platessa* (<12 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

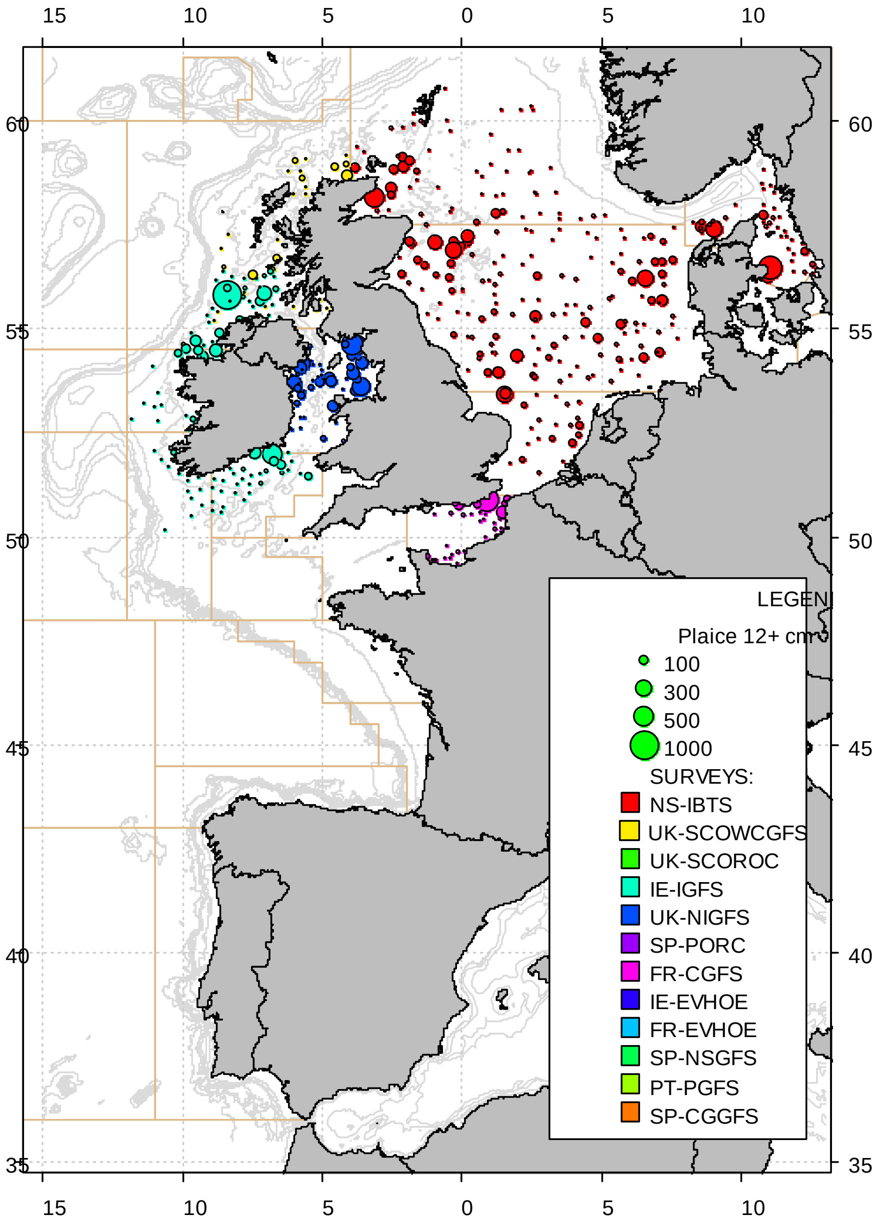



**Figure A.7.33. Catches in numbers per hour of 1+ group plaice, *Pleuronectes platessa* (≥12 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

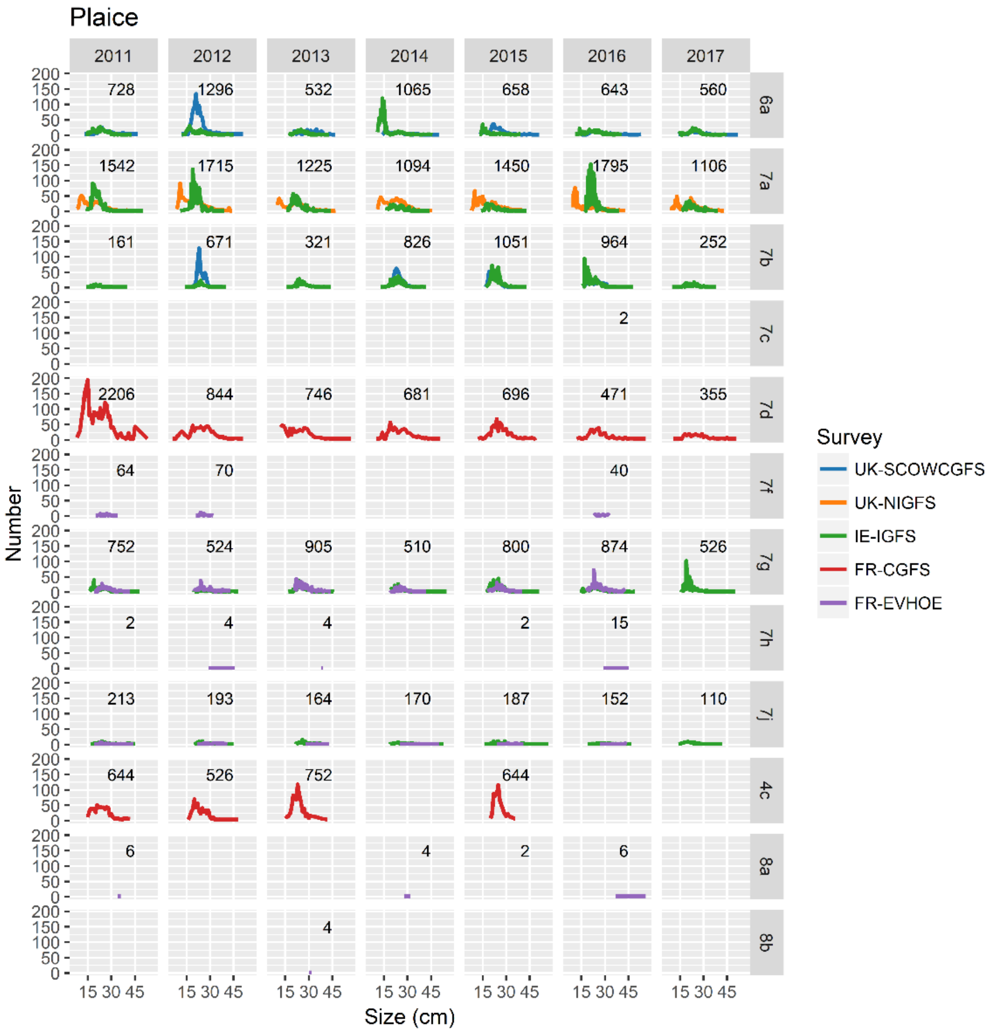



**Figure A.7.34. Length distribution of plaice, *Pleuronectes platessa*, per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

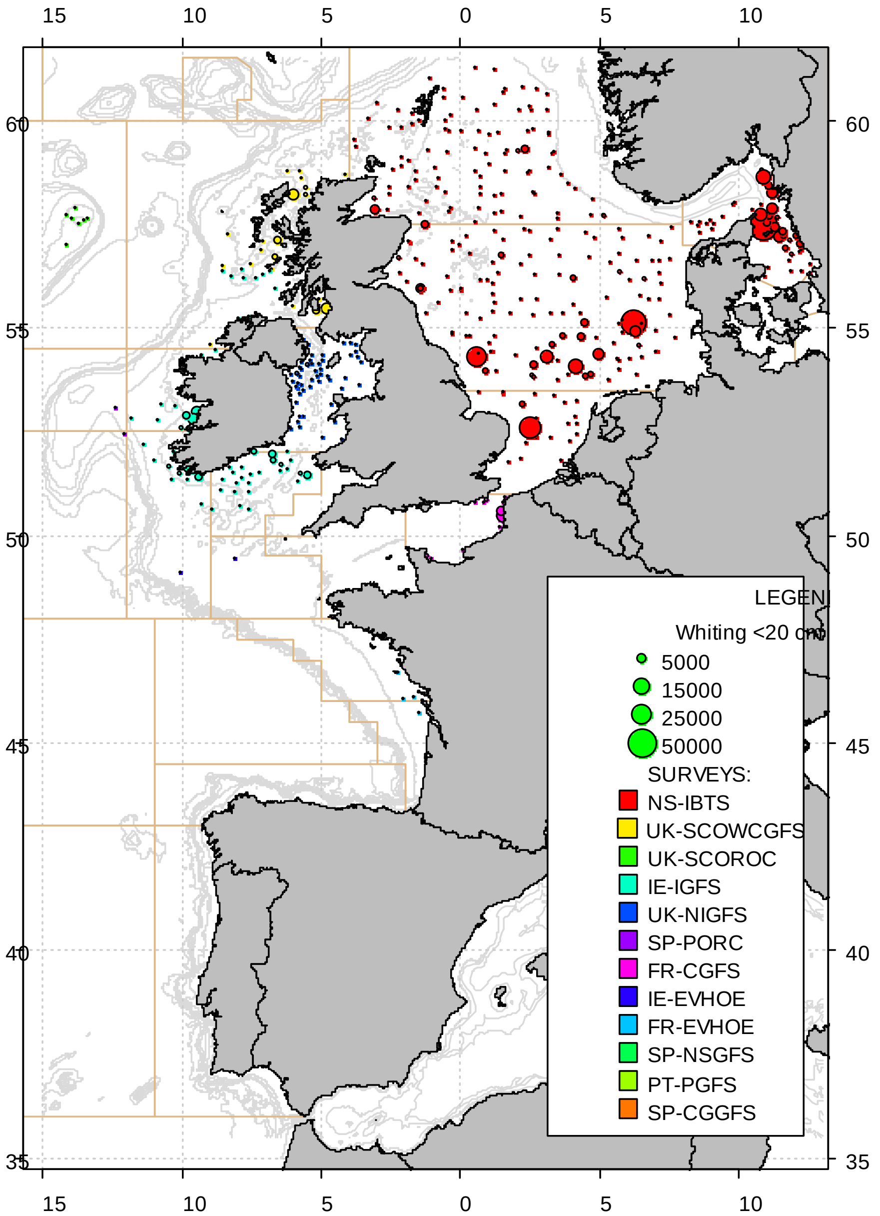



**Figure A.7.35. Catches in numbers per hour of 0-group whiting, *Merlangius merlangus* (<20 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

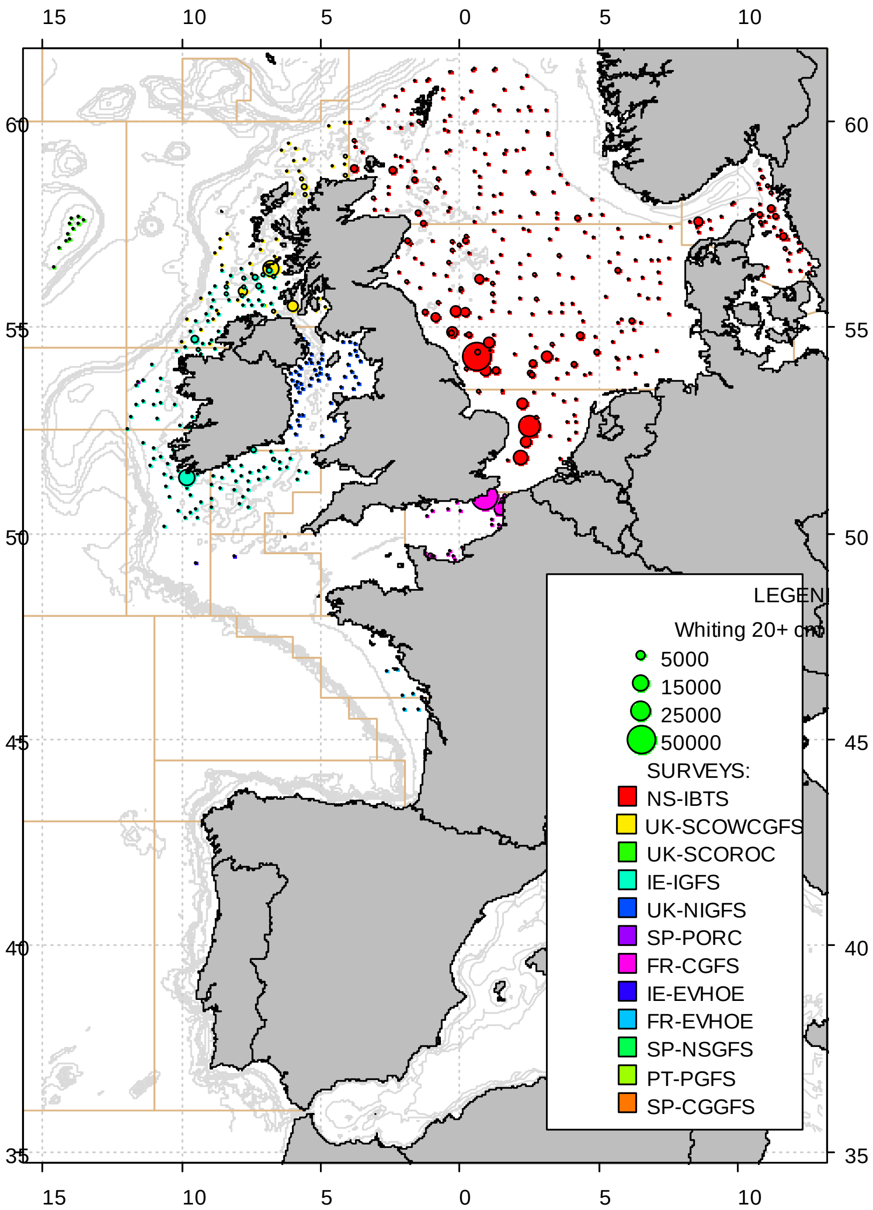



**Figure A.7.36. Catches in numbers per hour of 1+ group whiting, *Merlangius merlangus* (≥20 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

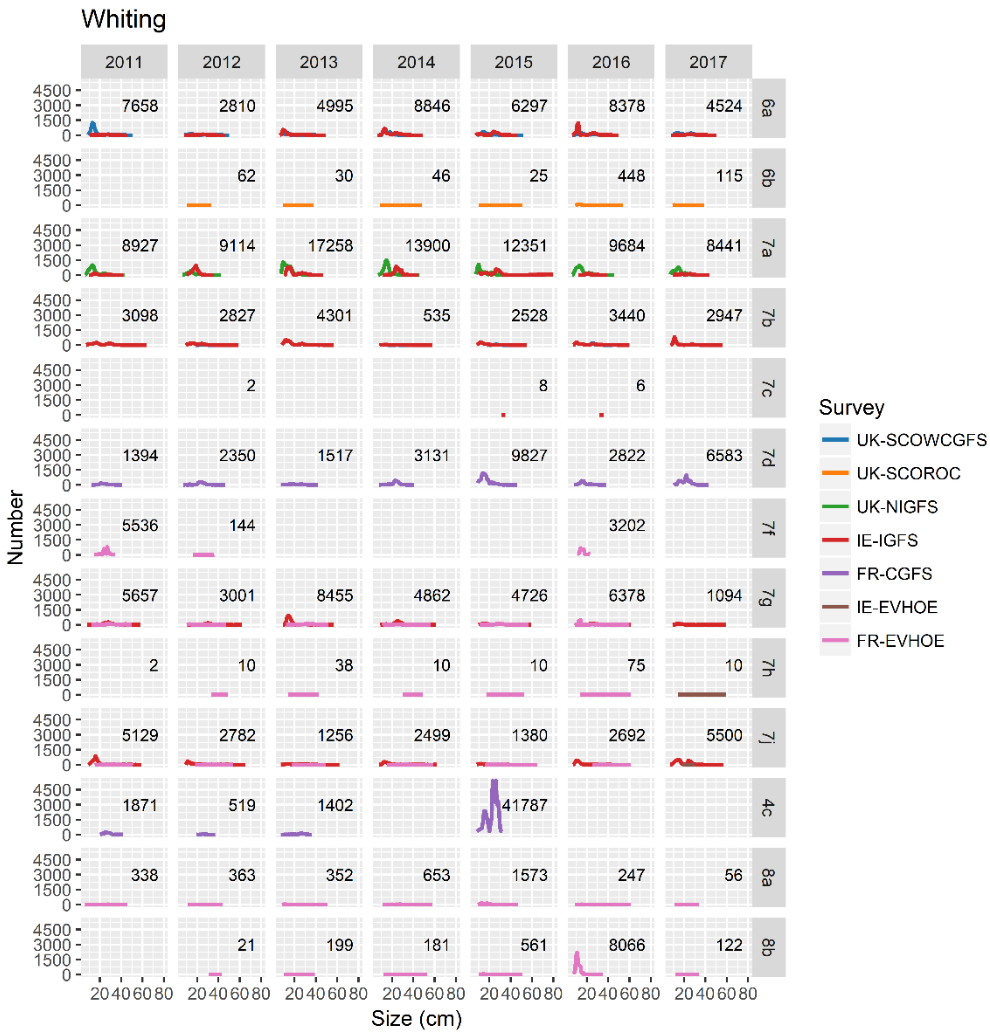



**Figure A.7.37. Length distribution of whiting, *Merlangius merlangus*, per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

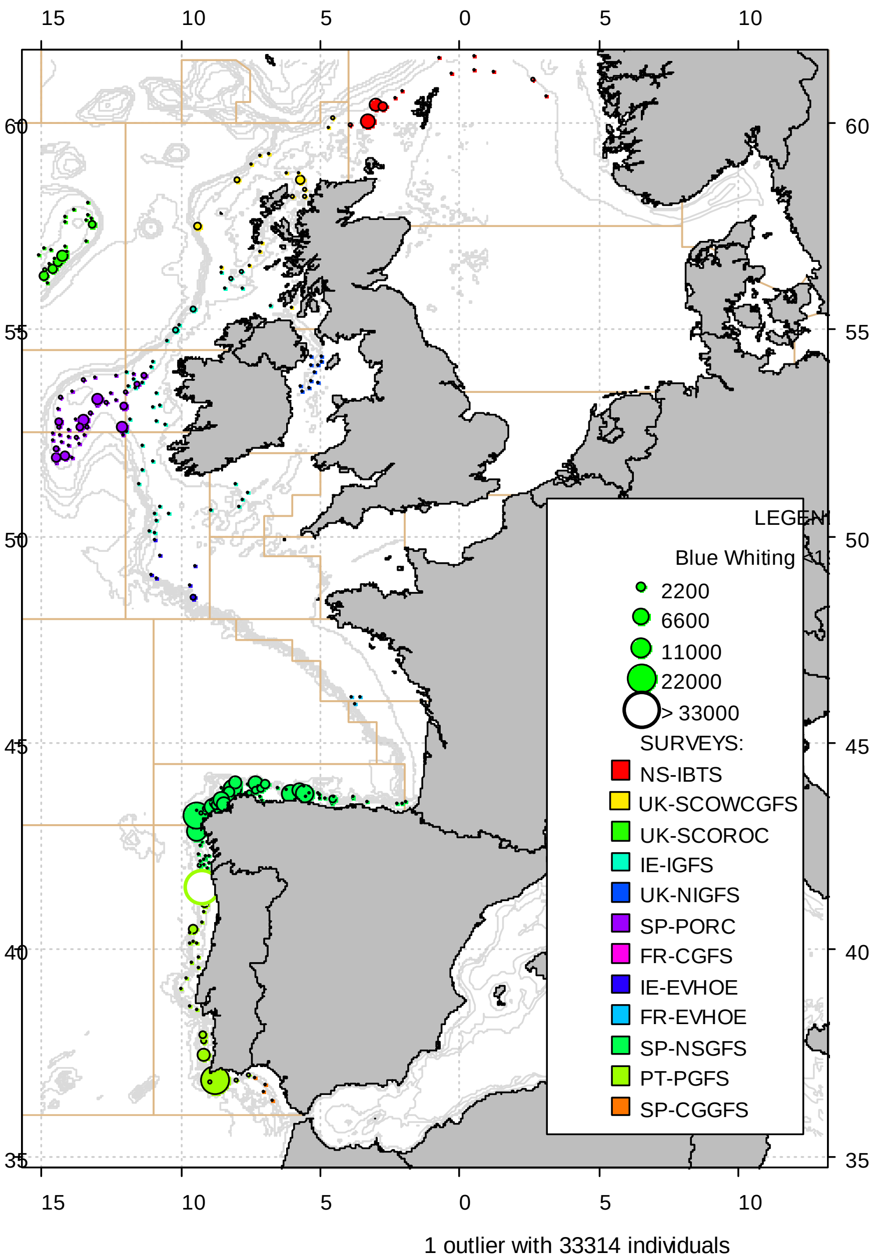



**Figure A.7.38. Catches in numbers per hour of 0-group blue whiting, *Micromesistius poutassou* (<19 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

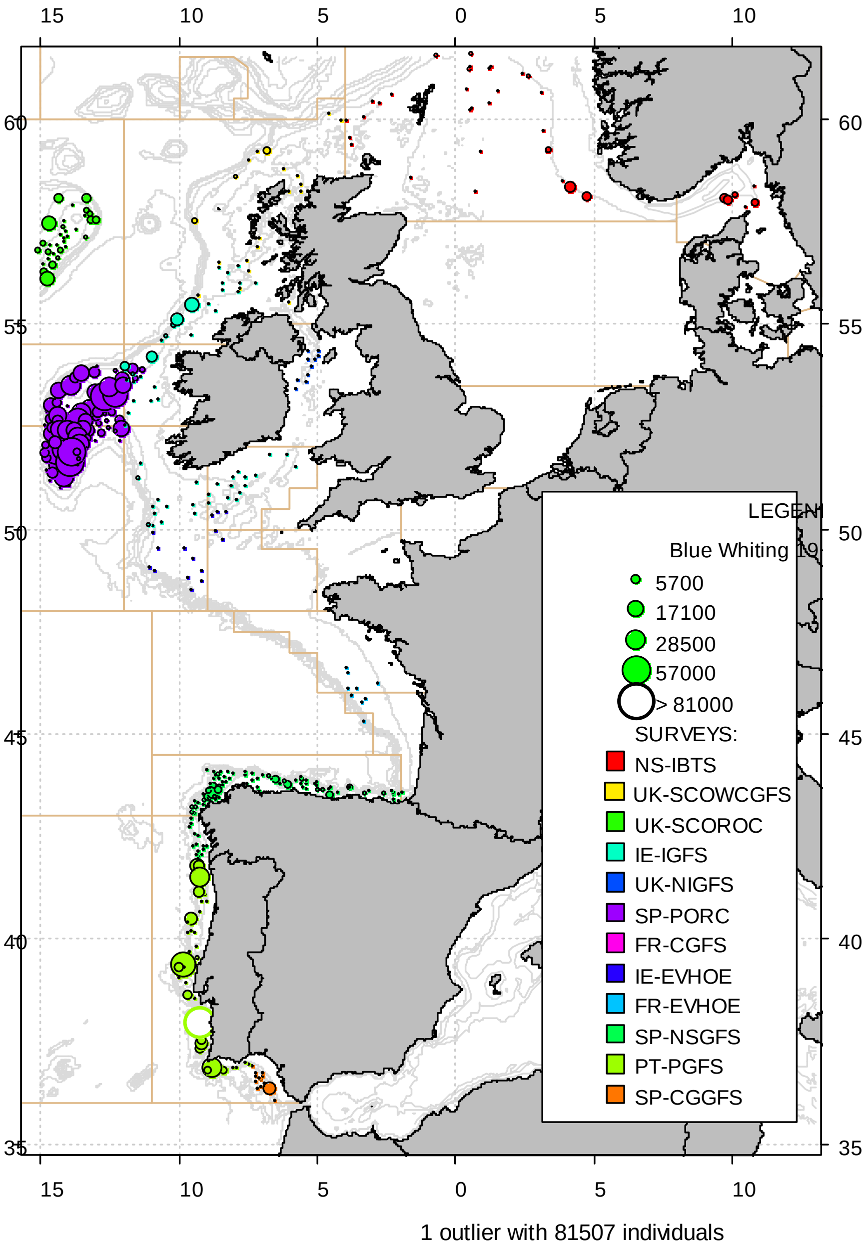



**Figure A.7.39. Catches in numbers per hour of 1+ group blue whiting, *Micromesistius poutassou* (≥19 cm), in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

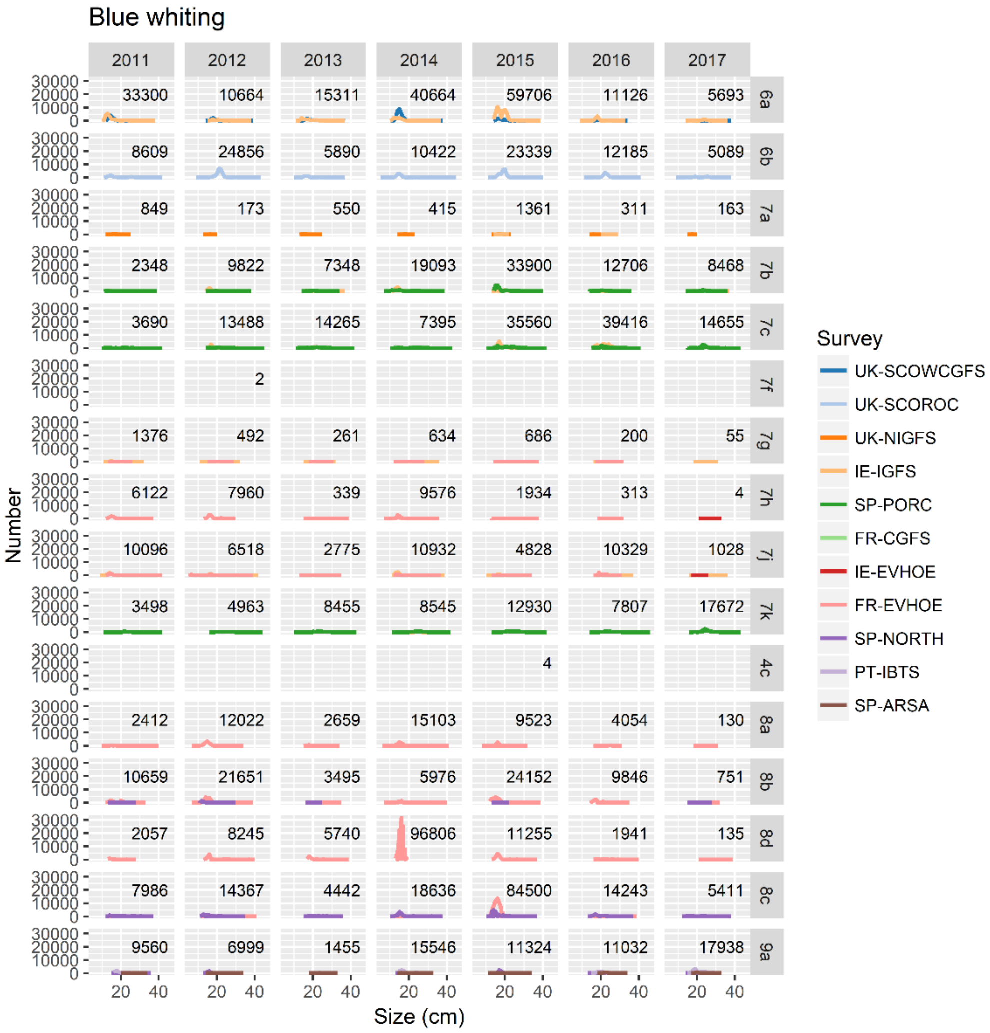



**Figure A.7.40. Length distribution of blue whiting, *Micromesistius poutassou*, per ICES Sub-area in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

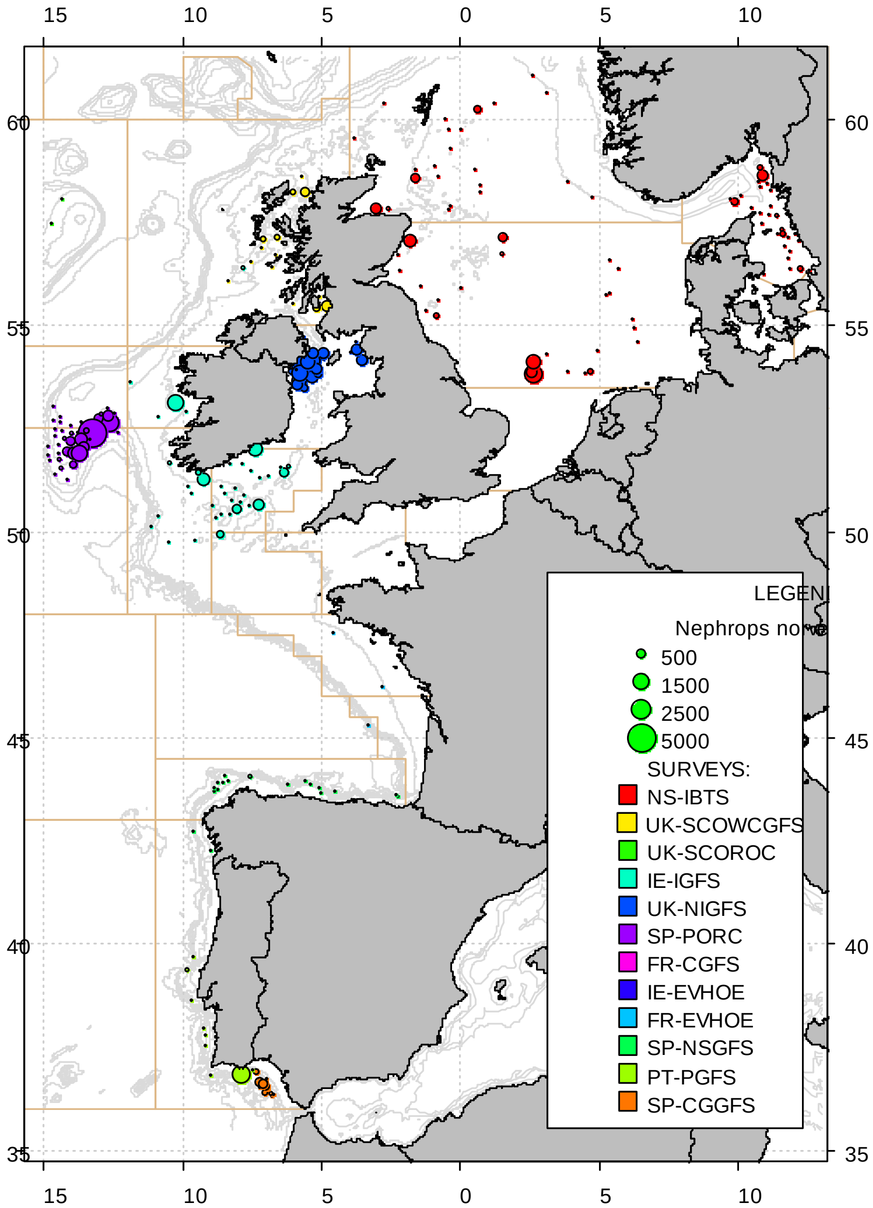



**Figure A.7.41. Catches in numbers per hour of Norway lobster, *Nephrops norvegicus*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

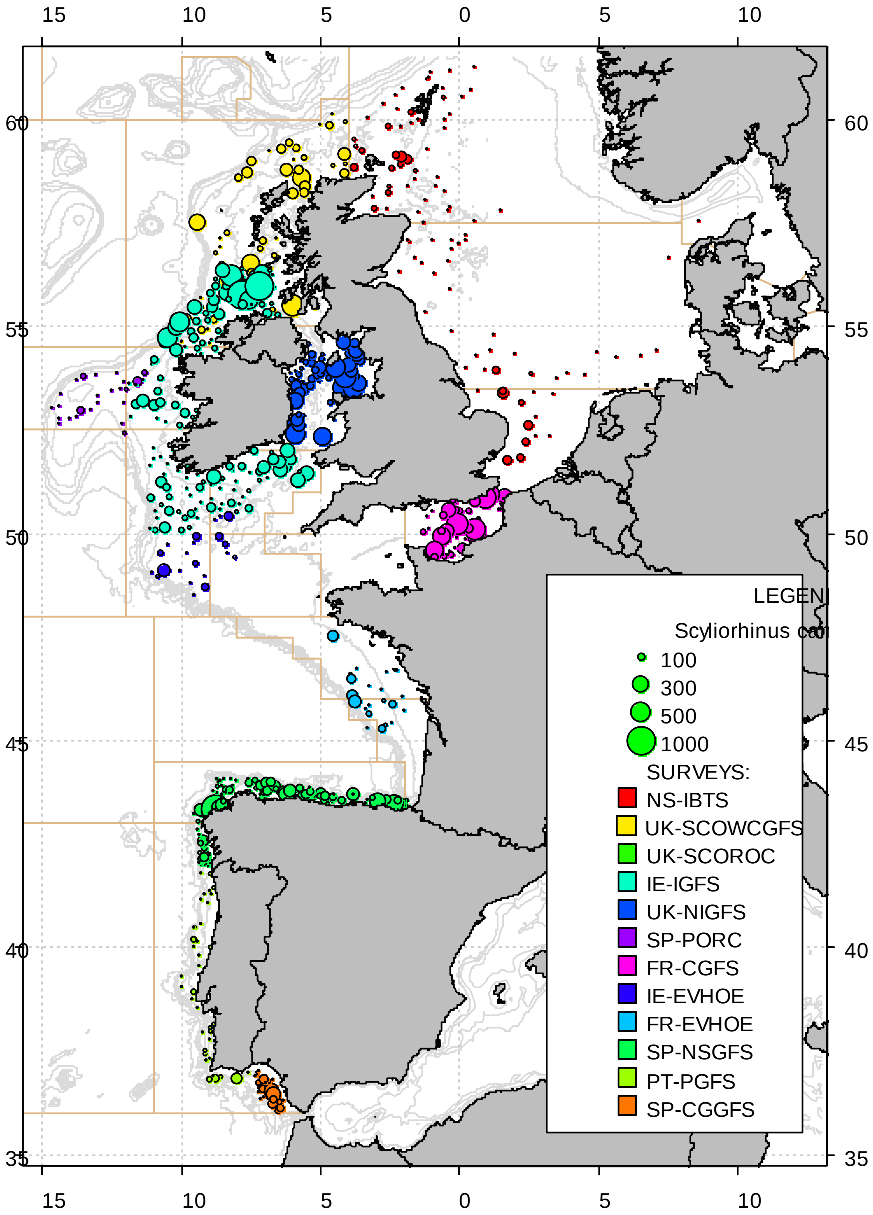



**Figure A.7.42. Catches in numbers per hour of lesser spotted dogfish, *Scyliorhinus canicula*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

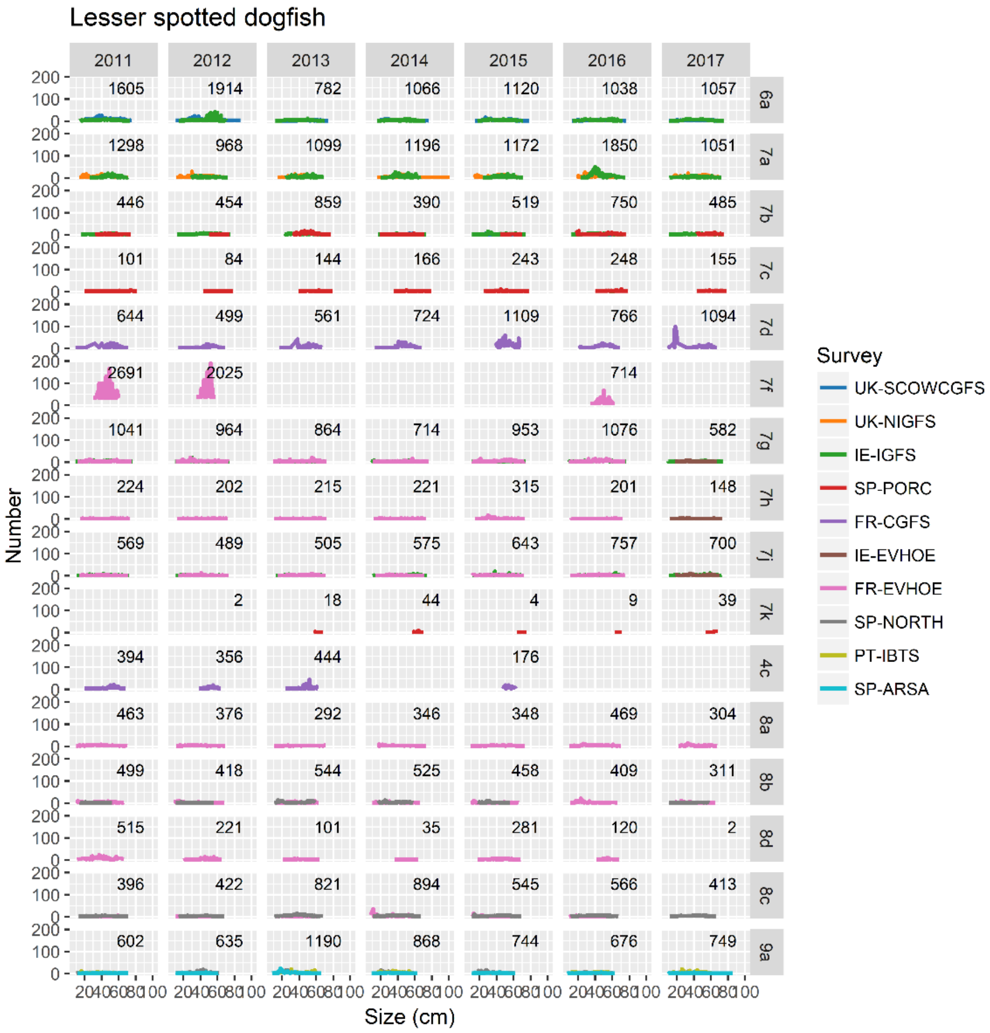



**Figure A.7.43. Length distribution of lesser spotted dogfish, *Scyliorhinus canicula*, per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

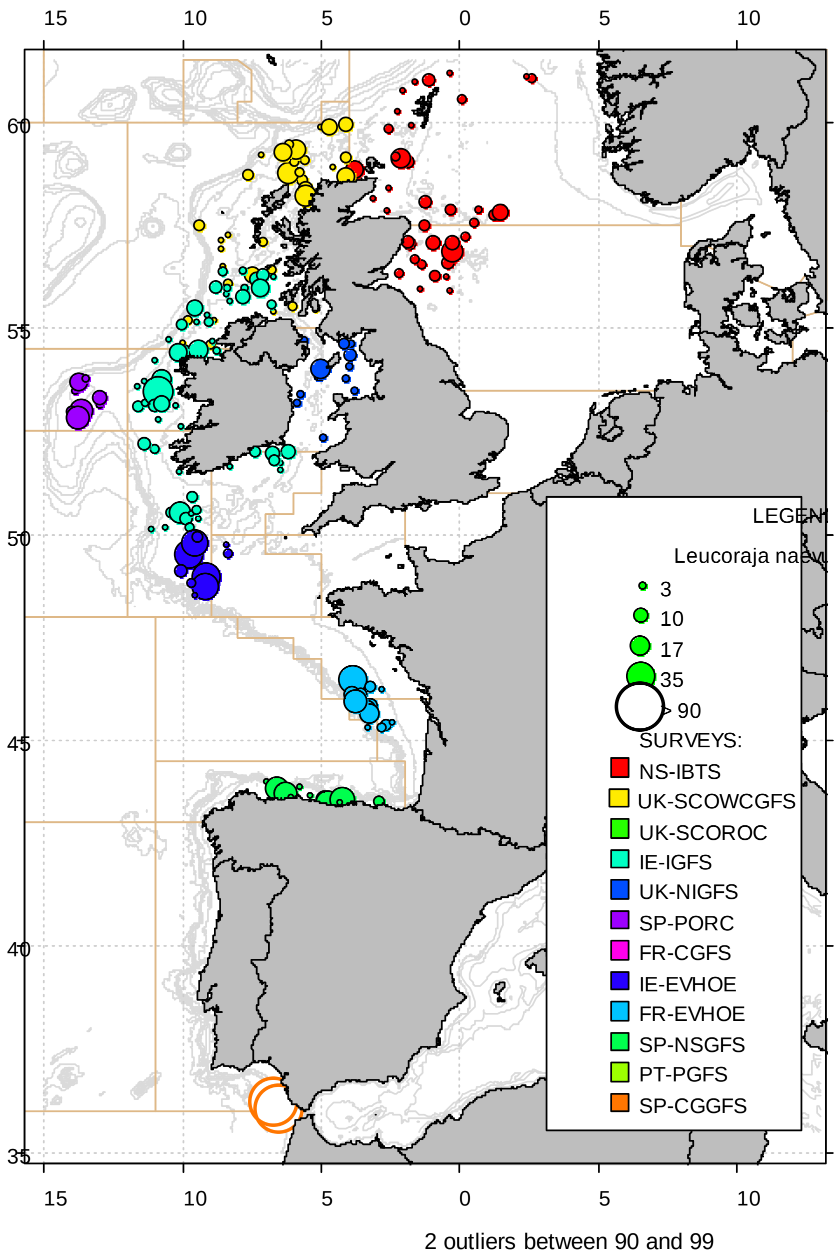



**Figure A.7.44. Catches in numbers per hour of cuckoo ray, *Leucoraja naevus*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

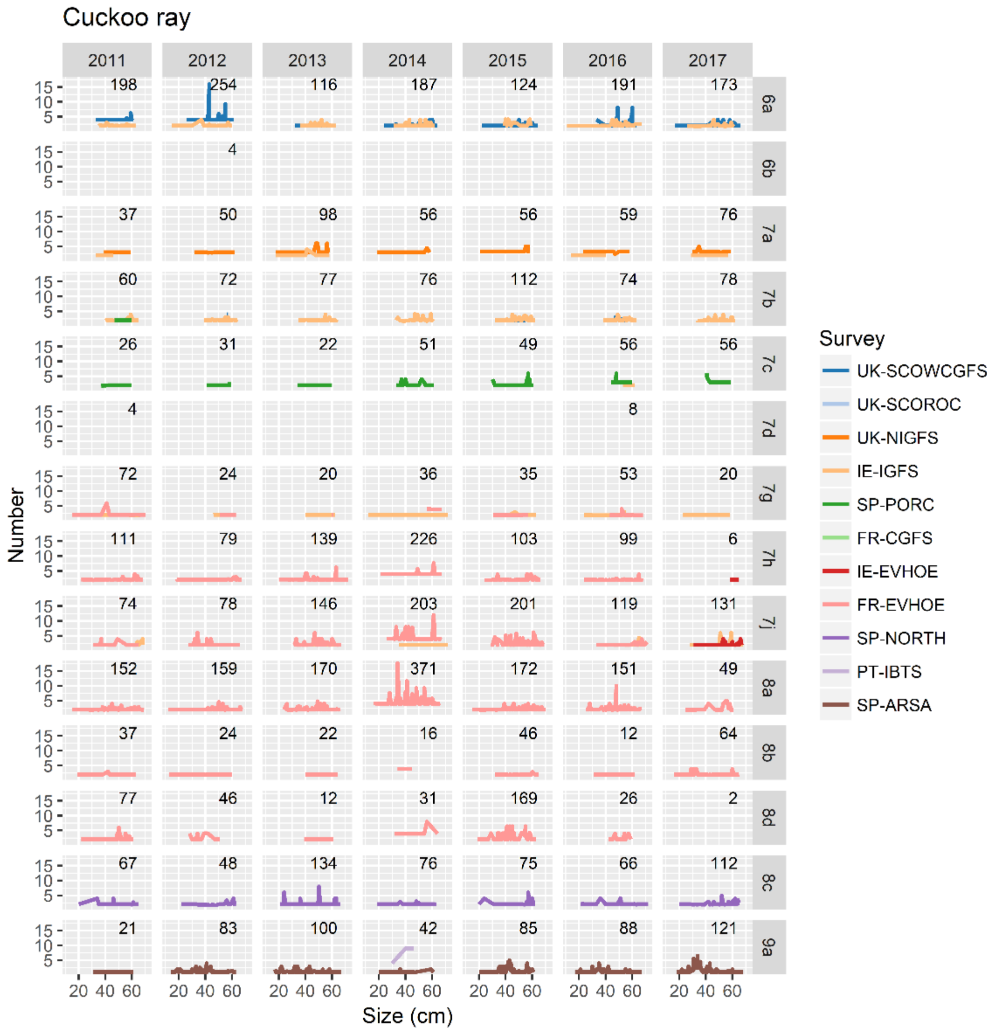



**Figure A.7.45. Length distribution of cuckoo ray, *Leucoraja naevus*, per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

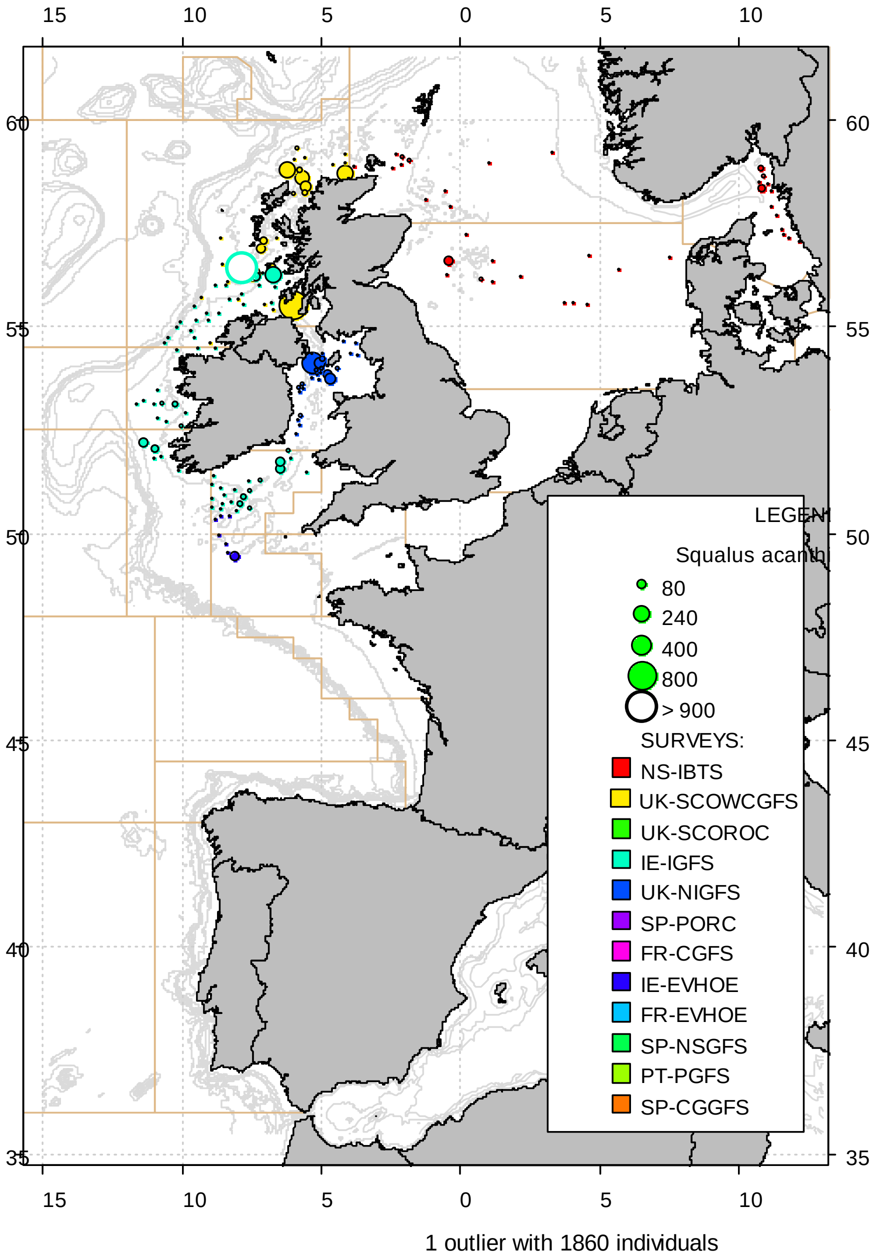



**Figure A.7.46. Catches in numbers per hour per hour of spurdog, *Squalus acanthias*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

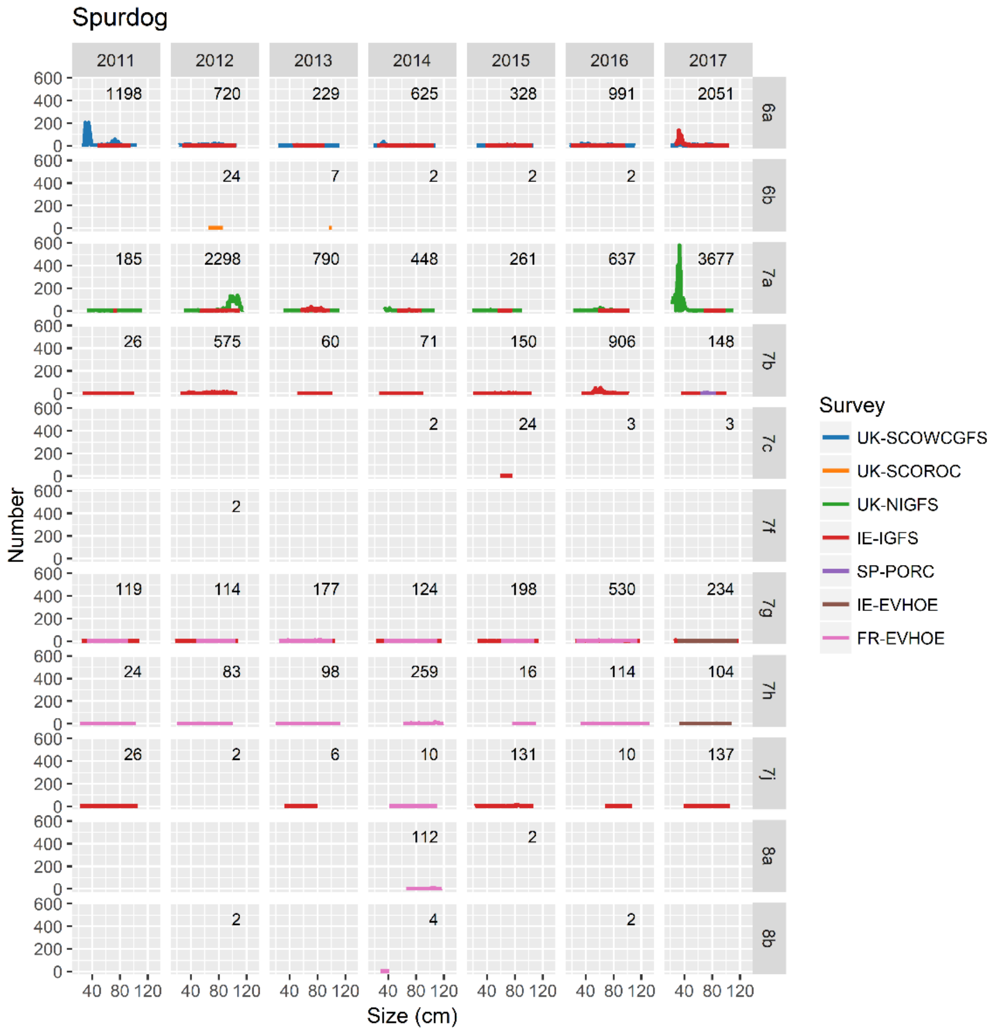



**Figure A.7.47. Length distribution of spurdog, *Squalus acanthias*, per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

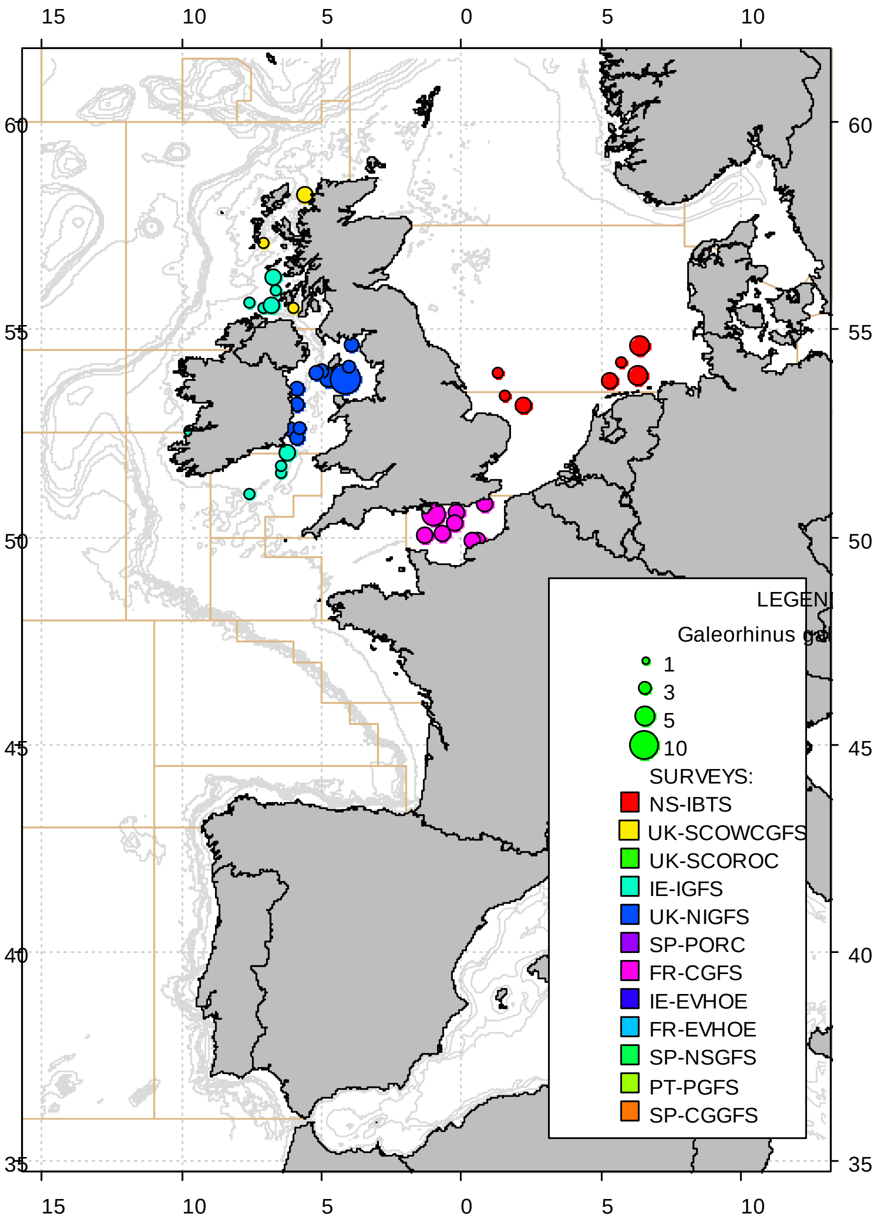



**Figure A.7.48. Catches in numbers per hour per hour of tope, *Galeorhinus galeus*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

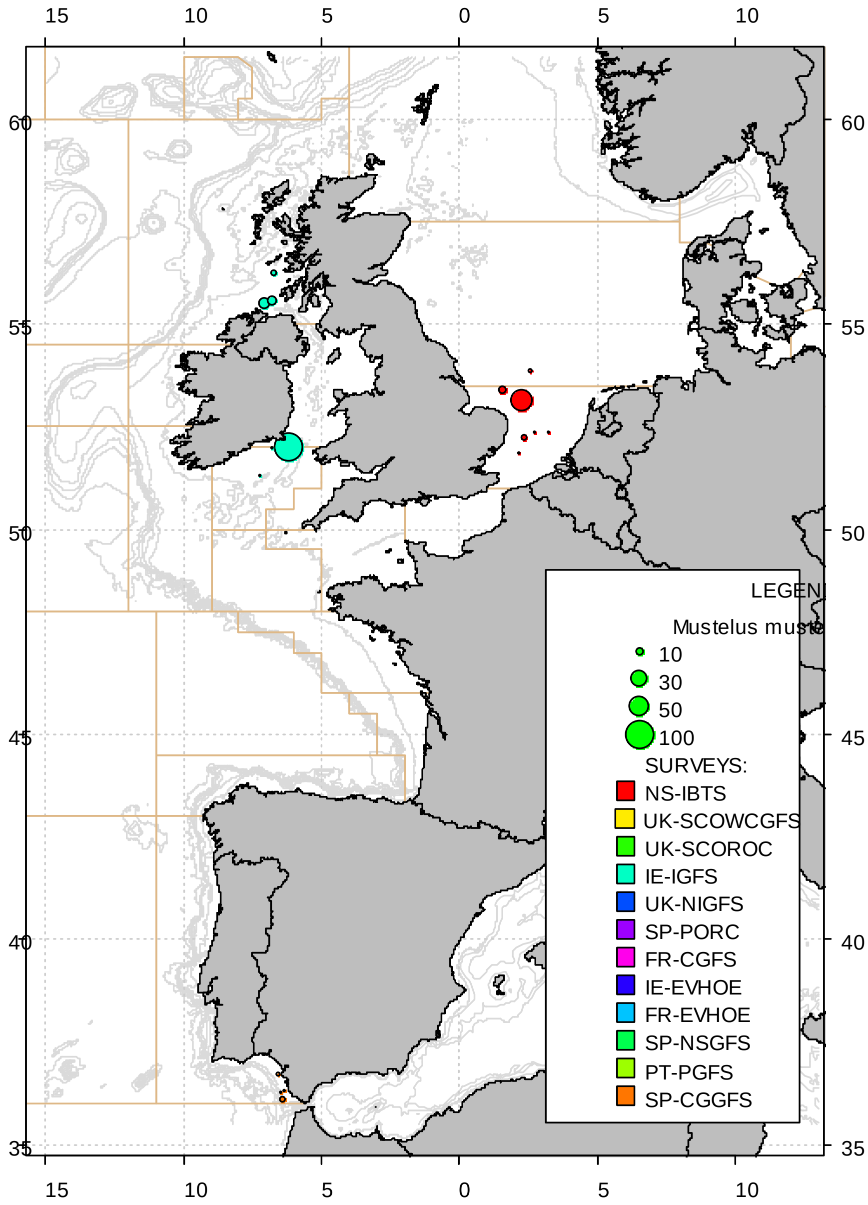



**Figure A.7.49. Catches in numbers per hour per hour of smooth-hound, *Mustelus mustelus* in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

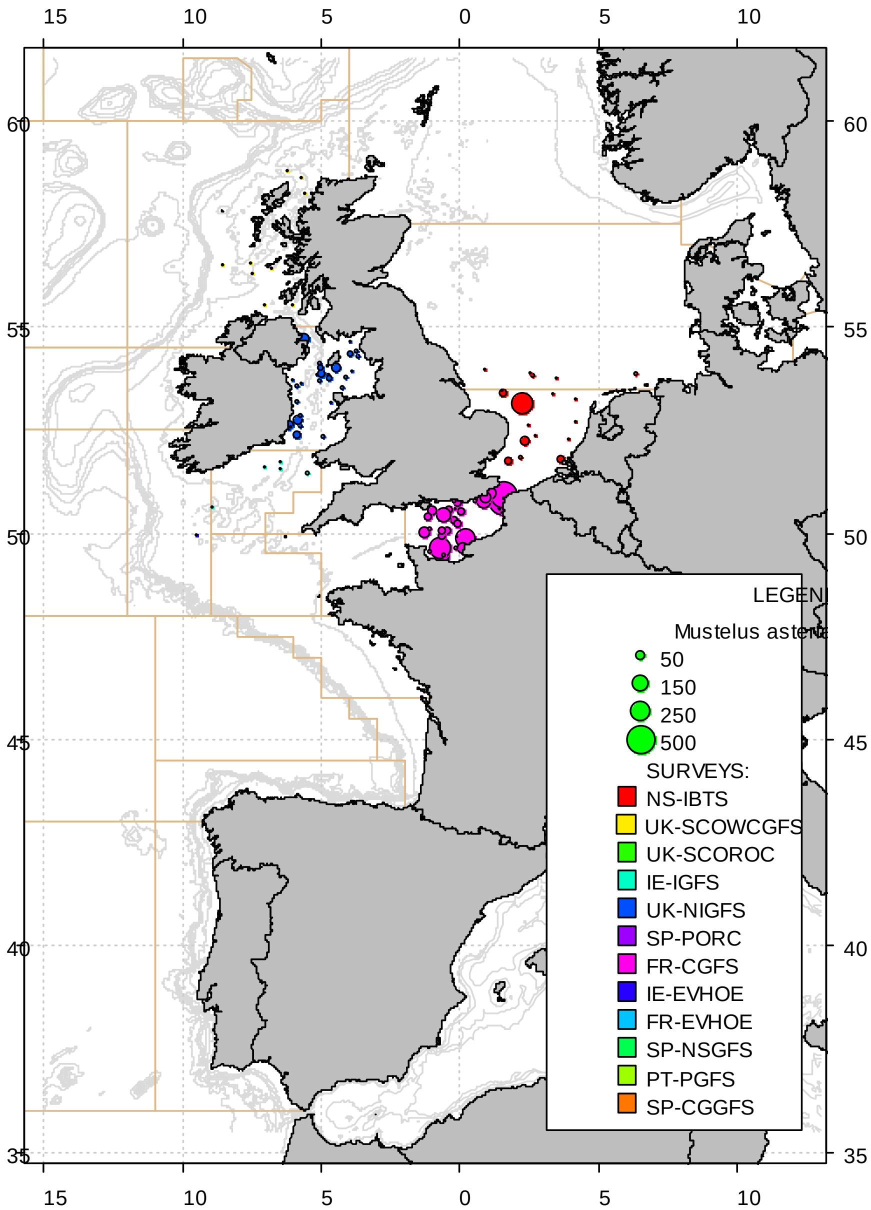



**Figure A.7.49. Catches in numbers per hour per hour of smooth-hound, *Mustelus asterias* in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

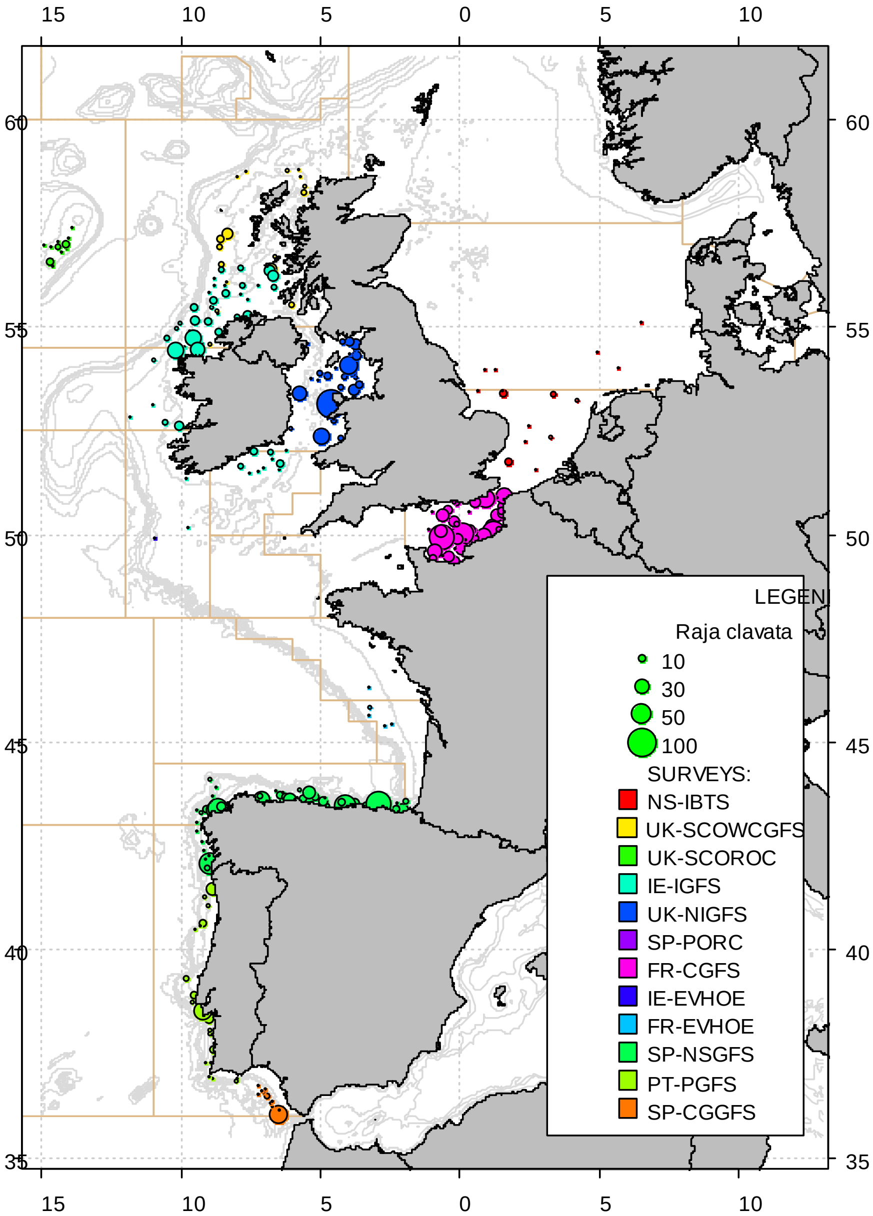



**Figure A.7.50. Catches in numbers per hour per hour of thornback ray, *Raja clavata*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

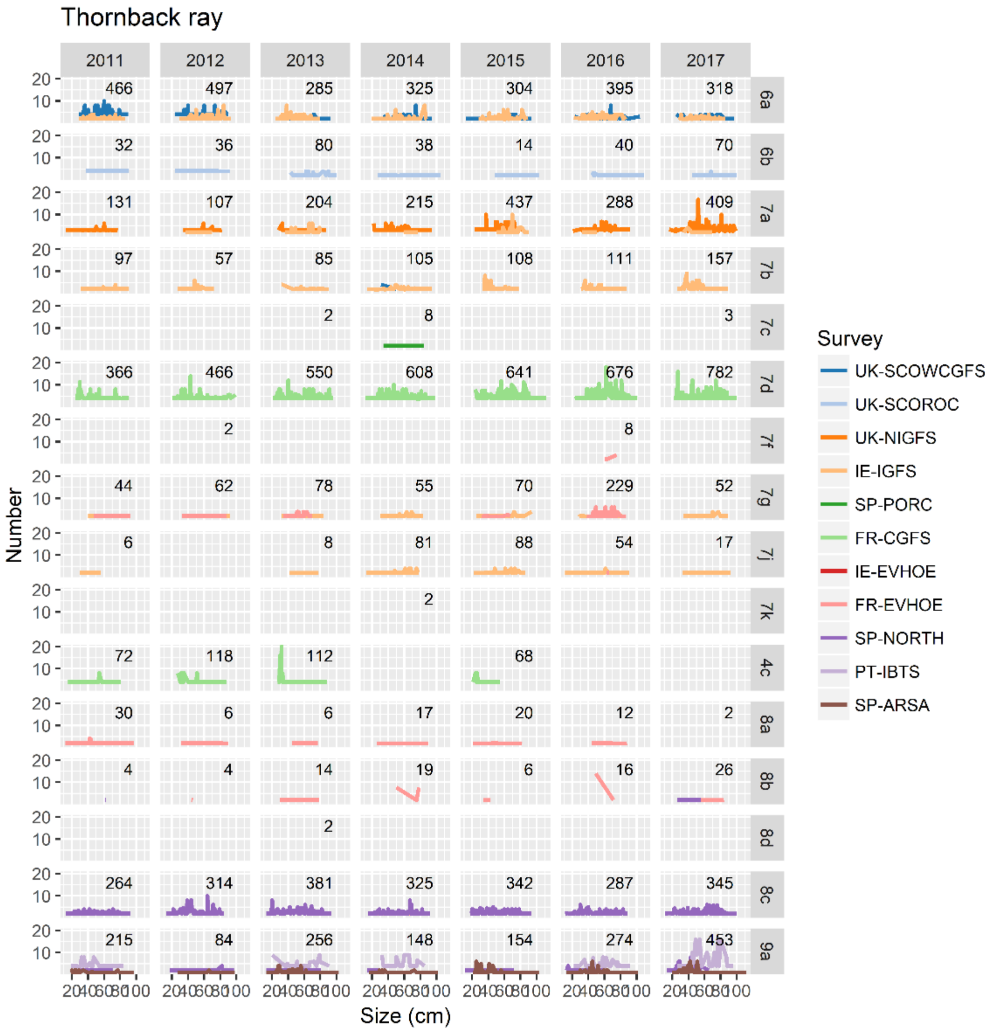



**Figure A.7.51. Length distribution of thornback ray, *Raja clavata*, per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

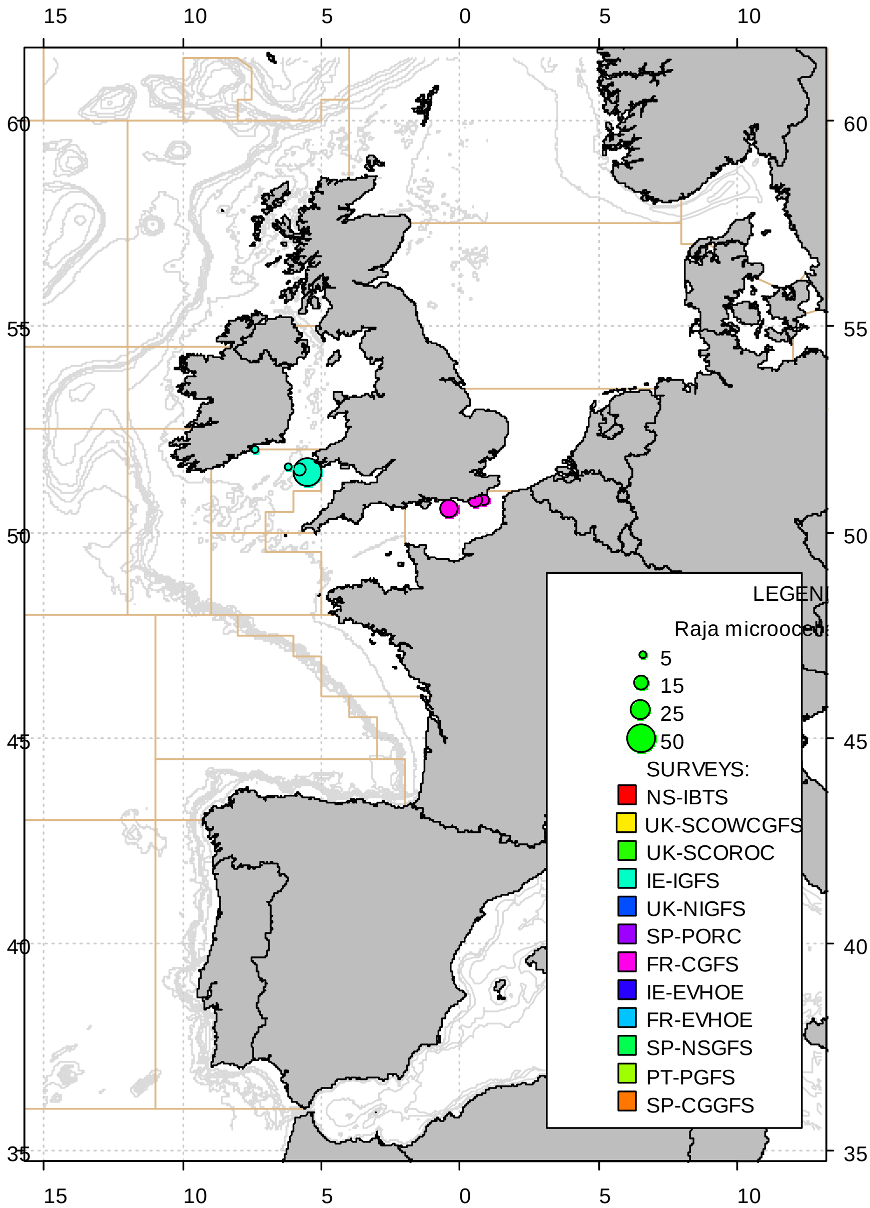



**Figure A.7.52. Catches in numbers per hour per hour of small eyed ray, *Raja microocellata*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

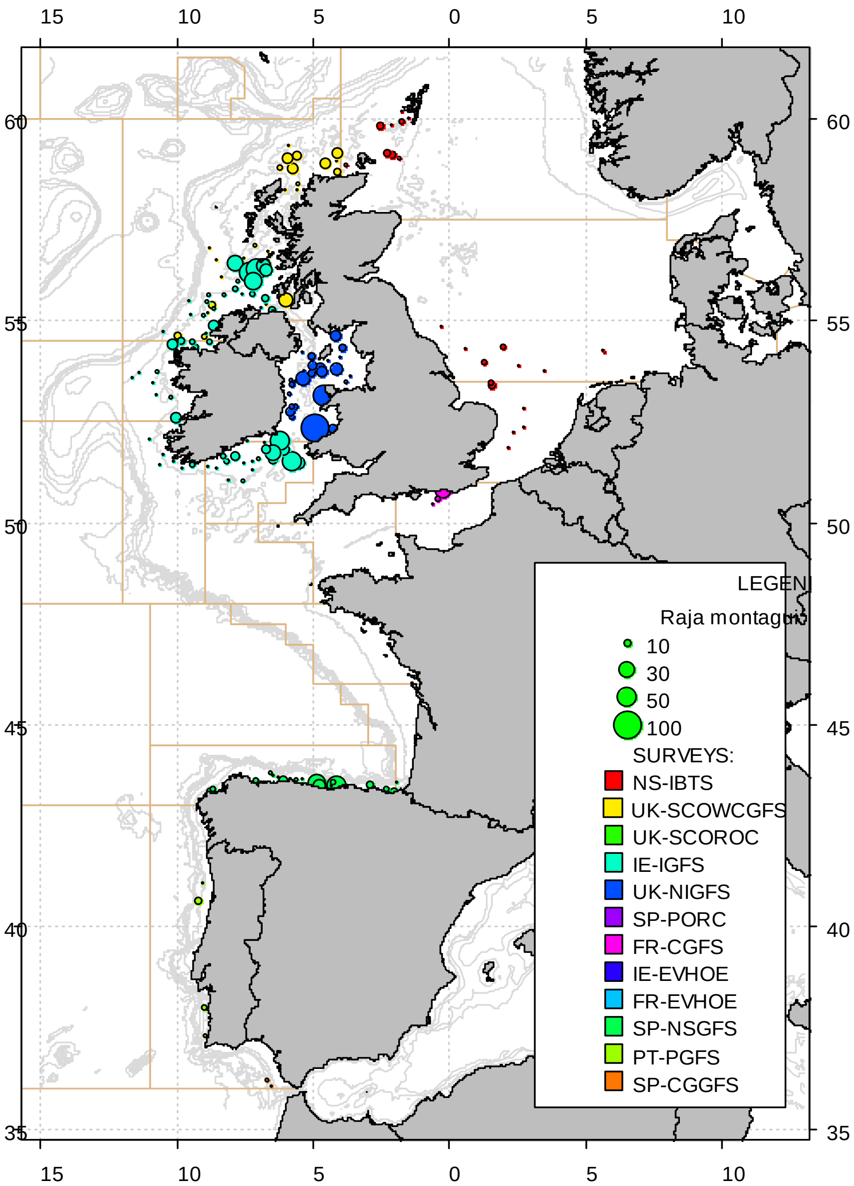



**Figure A.7.53. Catches in numbers per hour per hour of spotted ray, *Raja montagui*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

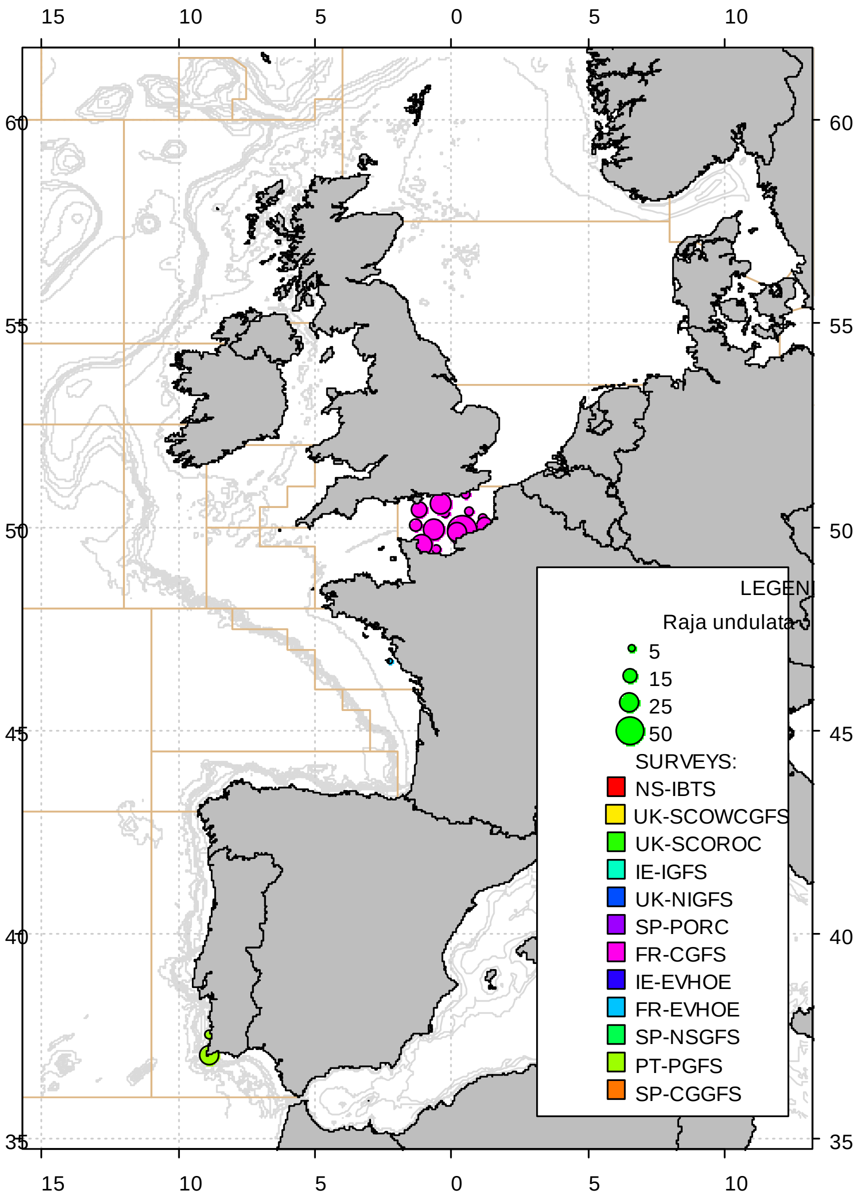



**Figure A.7.54. Catches in numbers per hour per hour of undulate ray, *Raja undulata*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

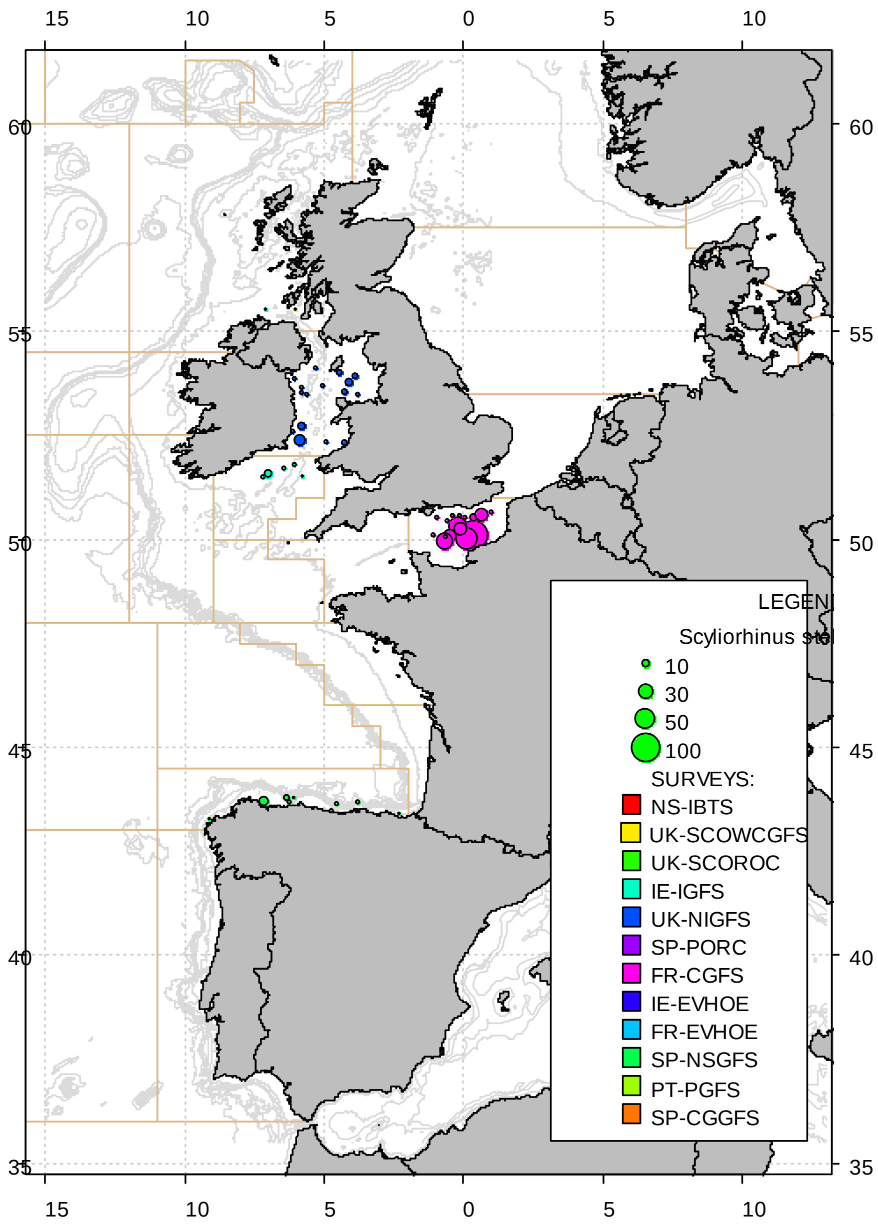



**Figure A.7.55. Catches in numbers per hour per hour of nurse hound, *Scyliorhinus stellaris*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

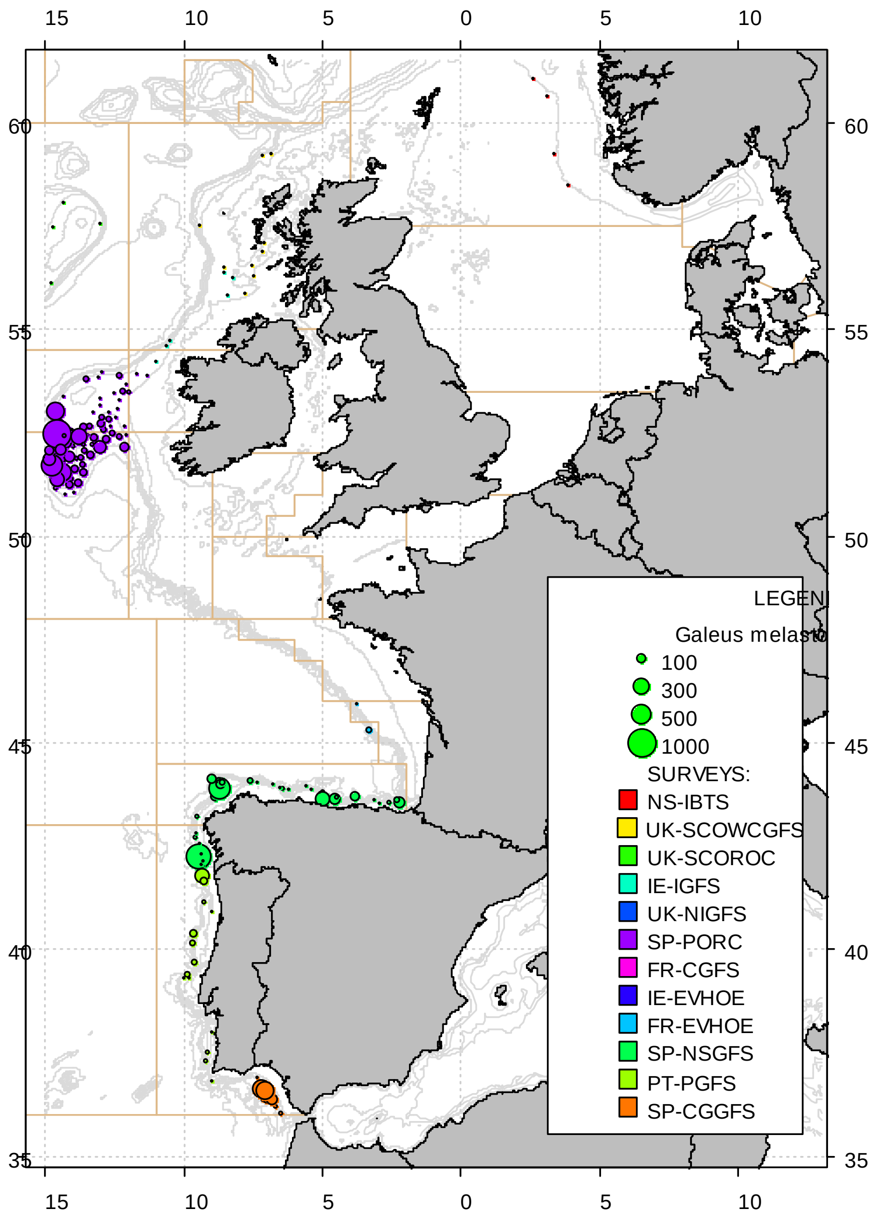



**Figure A.7.56. Catches in numbers per hour per hour of Blackmouthed dogfish, *Galeus melastomus*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

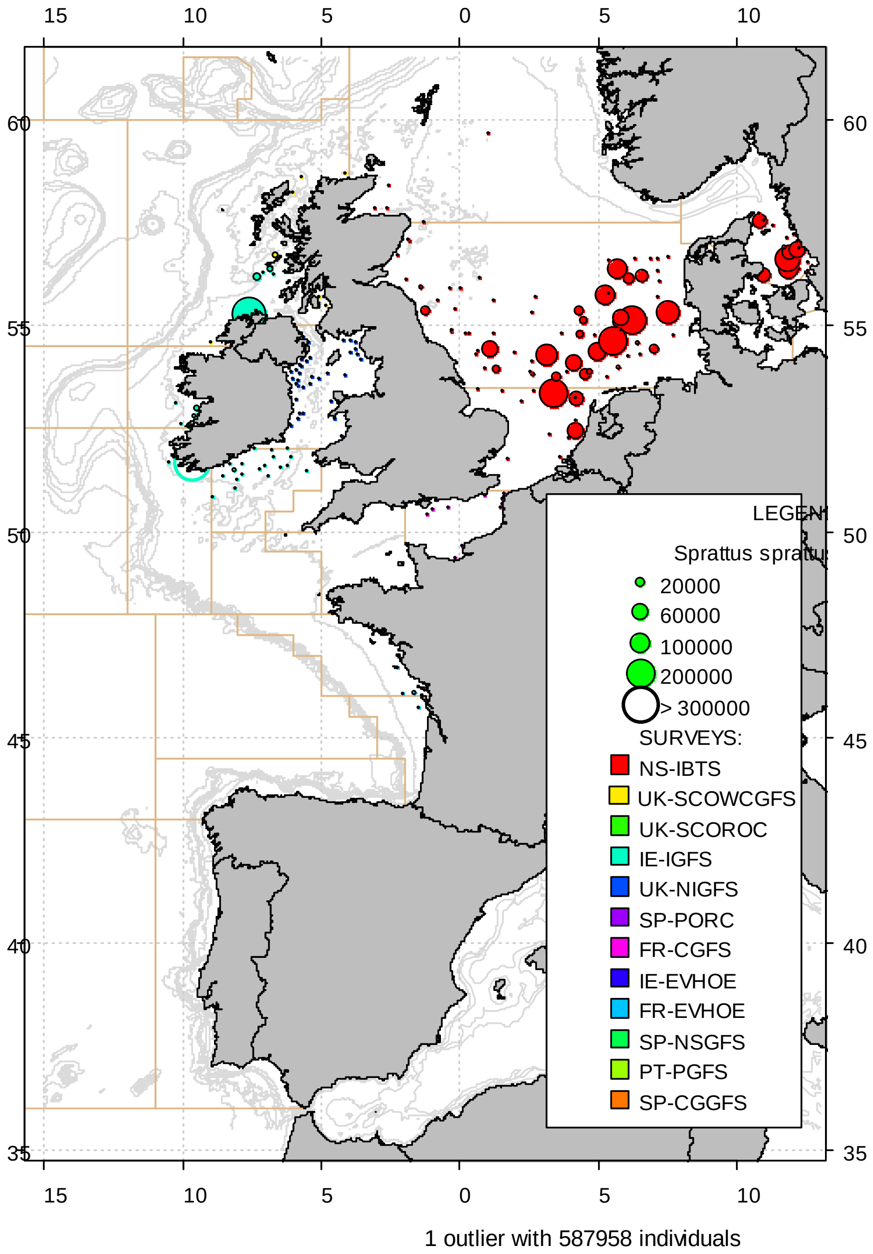



**Figure A.7.57. Catches in numbers per hour per hour of European sprat, *Sprattus sprattus*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

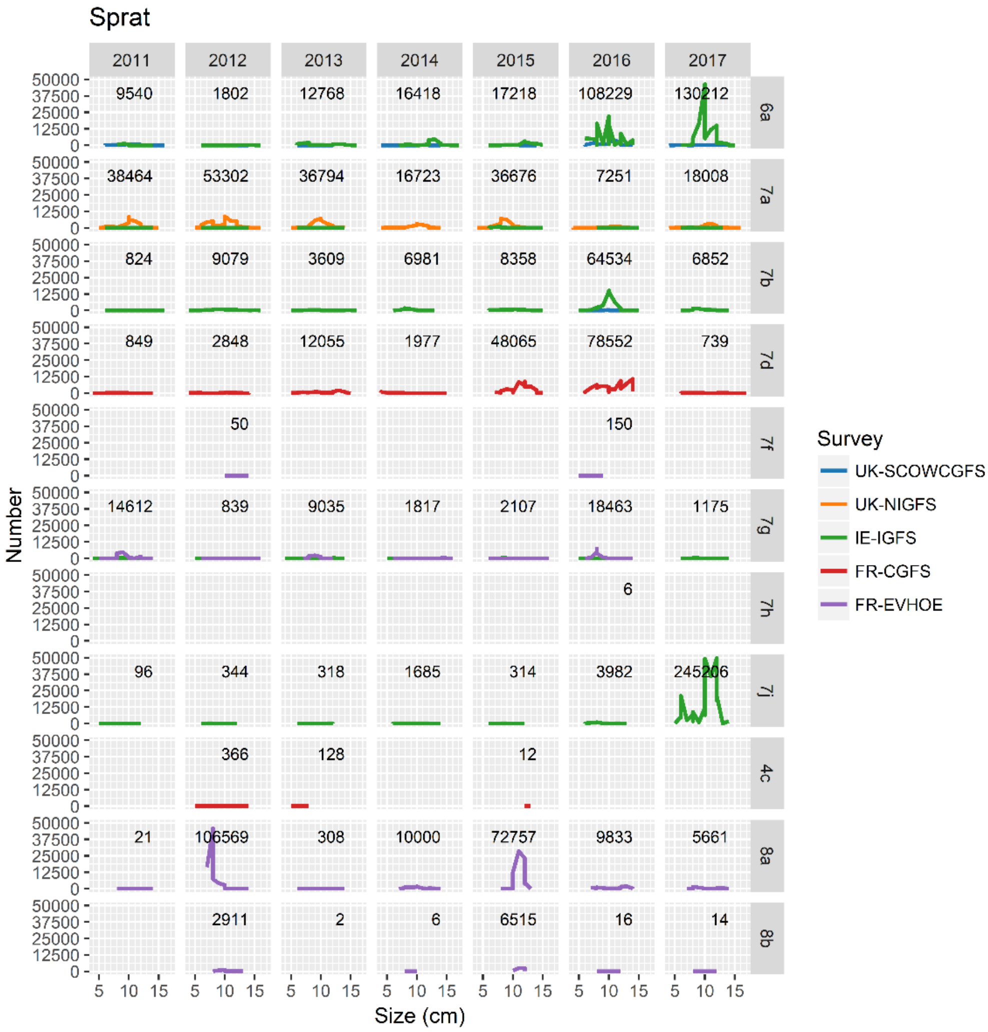



**Figure A.7.58. Length distribution of sprat, *Sprattus sprattus*, per ICES Subarea in the NeAtl surveys (North Sea IBTS not included) during the last seven years, each panel presents the surveys occurring. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the lines do not reflect proportional abundance in all the areas but within each survey. The number in each panel corresponds to the sum of the mean stratified number of individuals caught in one hour haul in the surveys carried out in that subdivision.**

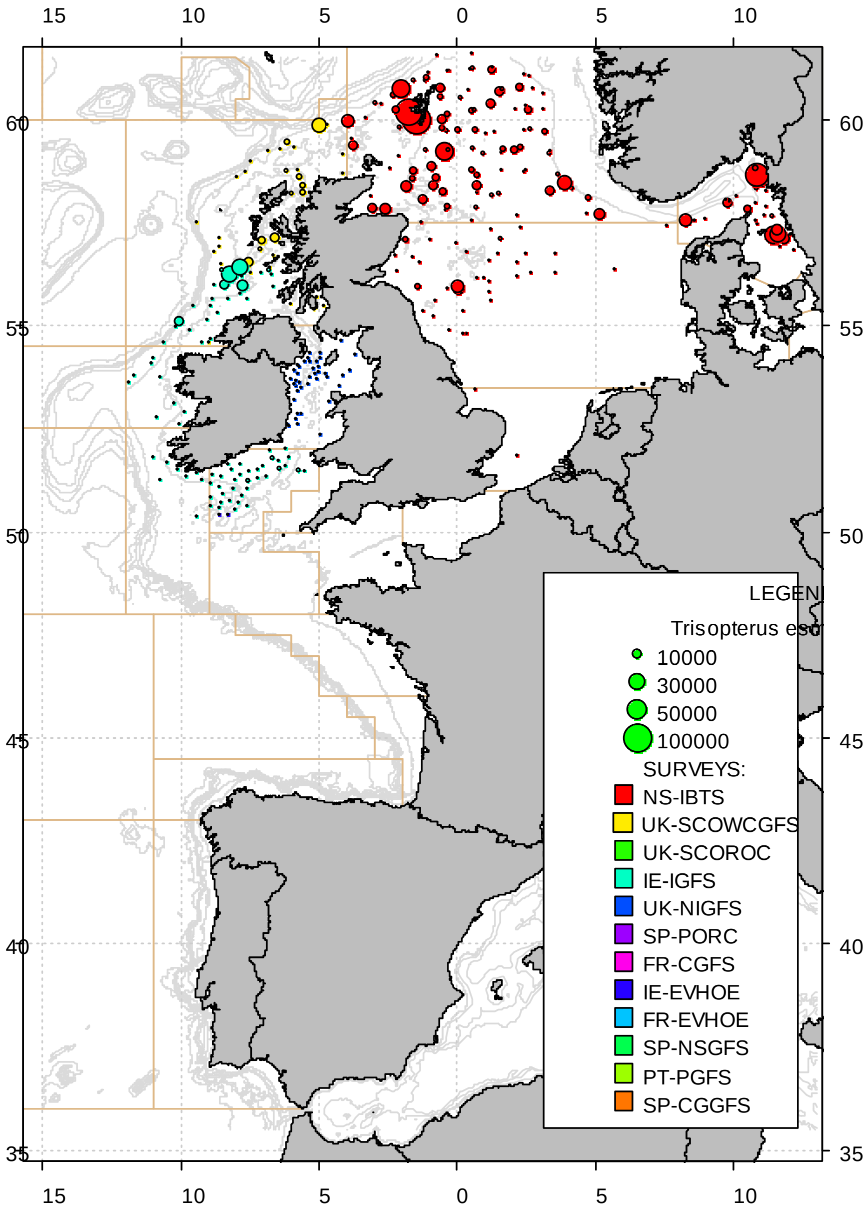



**Figure A.7.59. Catches in numbers per hour per hour of Norway pout, *Trisopterus esmarkii*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

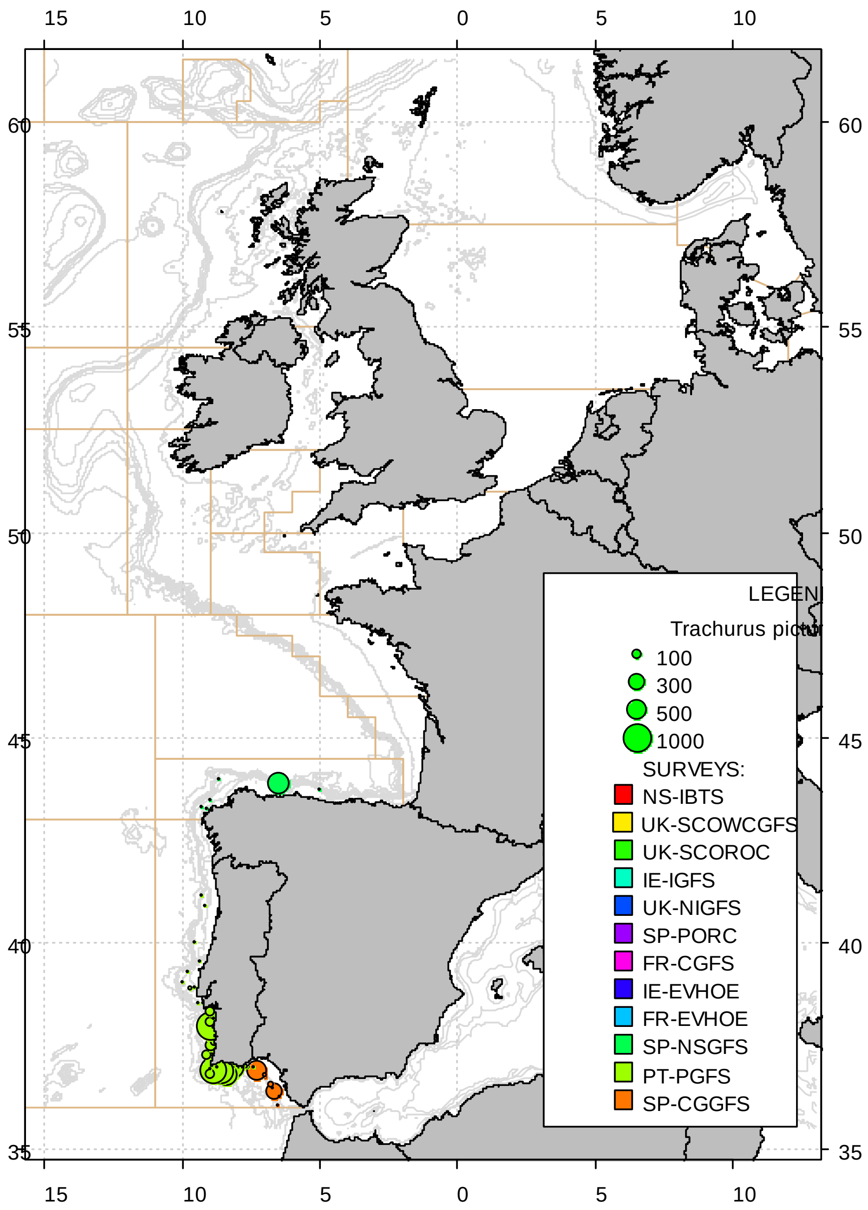



**Figure A.7.60. Catches in numbers per hour per hour of blue jack mackerel, *Trachurus picturatus*, in summer/autumn 2017 IBTSurveys. The catchability of the different gears used in the NeAtl surveys is not constant; therefore the map does not reflect proportional abundance in all the areas but within each survey.**

## Annex 8: List of working documents and presentations

**Working documents:**

WD1 - Quantifying the different tow durations during the FR-CGFS-Q4. M. Travers-Trolet, IFREMER, Nantes, France.

WD2 - Catches in zero-minute tows compared to standard tows in the NS-IBTS for England. F. Flaviani, B. Hatton, I. Holmes, J.R. Ellis and C. Lynam, CEFAS, Lowestoft, UK England.

WD3 - Catches in zero-minute tows compared to standard tows in the NS-IBTS for Scotland. F. Burns, MSS, Marine Laboratory, Aberdeen, UK Scotland.

WD4 - Catches in zero-minute tows compared to standard tows in the NS-IBTS for Denmark. K. Wieland, DTU Aqua, Hirtshals, Denmark

WD5 - Catches in zero-minute tows compared to standard tows in the NS-IBTS for France. A. Auber, IREMER, Boulogne-sur-Mer, France.

WD6 - Catches in zero-minute tows compared to standard tows in the NS-IBTS for Germany. A. Sell and M. Bernreuther. Thünen Institute of Sea Fisheries, Hamburg, Germany.

**Presentations (without corresponding working document):**

P1 - The MIK and IBTS results for 0- and 1-ringer herring. M. Kloppmann, Thünen Institute of Sea Fisheries, Hamburg, Germany.

P2 - EVHOE 2017 fail. V. Badts, IFREMER, France.

P3 - DATRAS. V. Soni, ICES Data Centre, Copenhagen, Denmark.

P4 - WKSEATEC 2017. D. Stokes, MI, Oranmore, Ireland.

P5 - Comparison of nylon and polyethylene GOV trawl IBTS Q3 2017. A. Stordal, T. Haugen, R. Wienroither, J. Devine and E. Olsen, IMR, Bergen, Norway.

P6 - GOV tows with Vonin flyers replacing the Exocet kite – Dana NS-IBTS 1Q2018. K. Wieland, DTU Aqua, Hirtshals, Denmark.

P7 - New IBTS survey trawl – First steps, R. Kynoch, MSS, Marine Laboratory, Aberdeen, UK Scotland.

P8 - Norwegian 0-hauls, IBTS Q1 2018. E. Olsen, IMR Bergen, Norway.

## Annex 9: Working documents

### IBTS2018 WD1

# Quantifying the different tow durations during the FR-CGFS-Q4

Morgane Travers-Trolet, IFREMER, France

**Context**

IBTSWG has been encouraging its members to record the entire tow duration additionally to nominal tow duration, and whenever possible to realize some 0-minute tows in order to estimate the portion of catch which is realized outside nominal tow duration. During the FR-CGFS-Q4 2017 survey, there was not sufficient time at sea to realized 0-minute tows, but the different time-steps constituting the tow duration have been recorded, in order to quantify the time where the gear was fishing outside the nominal tow duration.

**Results**

The total tow duration, from deployment start time (trawl winches start and doors start to move) to retrieval finish time (trawl winches stop and doors arrive back at vessel) was related to depth (figure 1) and varies between 36 to 43 minutes for the classic 30-min tows.

The duration of bottom contact of the gear (from groundgear touch-down to groundgear take-off, assessed using MARPORT sensors) was also recorded but does not seem to varies with depth. Additionally to nominal tow duration (30 minutes in average, with few exceptions where the tow needed to be stopped earlier to prevent trawl damage), the groundgear was on the seabed for about 5 minutes, partly prior to the nominal tow duration (between 1 and 2 minutes), partly after. These different durations are reported for the different stations in table 1.

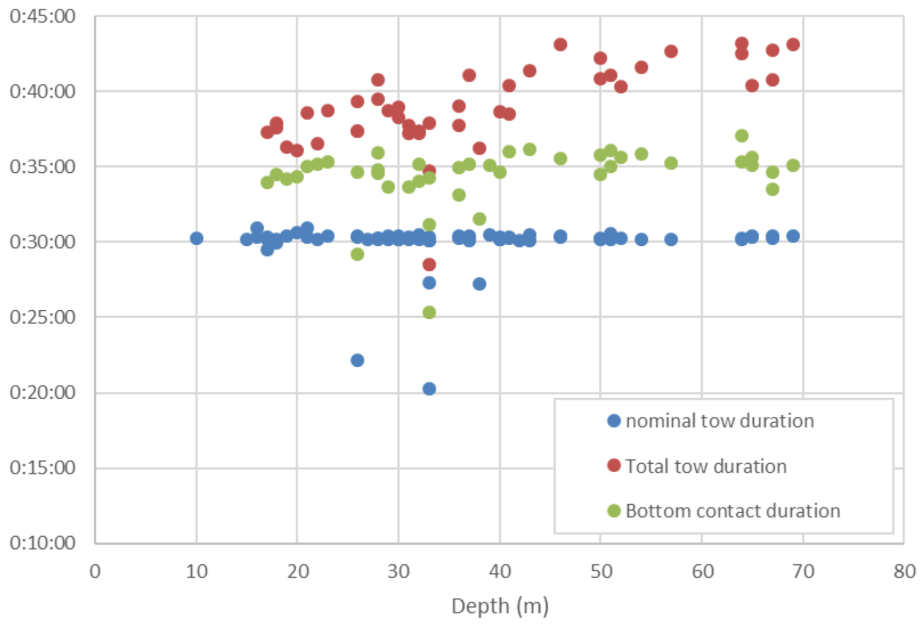



**Figure 5 : Tow duration during the 2017 FR-CGFS-Q4 survey.**

**Table 1 : Different duration tows recorded during FR-CGFS-Q4 survey in 2017, with associated station depth**

| STATION | DEPTH | TOTAL TOW DURATION | NOMINAL TOW DURATION | BOTTOM CONTACT DURATION |
|---|---|---|---|---|
| **V0392** | 28 | | 00:30:14 | 00:34:35 |
| **V0396** | 29 | | 00:30:11 | 00:33:41 |
| **V0397** | 43 | 00:41:22 | 00:30:06 | 00:36:08 |
| **V0398** | 41 | 00:40:23 | 00:30:16 | 00:35:59 |
| **V0413** | 18 | 00:37:53 | 00:29:59 | |
| **V0414** | 26 | 00:37:23 | 00:22:10 | 00:29:12 |
| **V0416** | 31 | 00:37:47 | 00:30:22 | |
| **V0417** | 22 | 00:36:33 | 00:30:11 | 00:35:13 |
| **V0420** | 19 | 00:36:20 | 00:30:23 | 00:34:11 |
| **V0421** | 32 | | 00:30:17 | 00:35:10 |
| **V0422** | 23 | 00:38:46 | 00:30:25 | 00:35:21 |
| **V0424** | 31 | 00:37:13 | 00:30:12 | 00:33:42 |
| **V0425** | 32 | 00:37:21 | 00:30:31 | |
| **V0427** | 36 | 00:37:47 | 00:30:24 | 00:34:55 |
| **V0428** | 37 | 00:41:03 | 00:30:25 | 00:35:11 |
| **V0430** | 32 | 00:37:12 | 00:30:18 | 00:34:02 |
| **V0431** | 29 | 00:38:44 | 00:30:24 | |
| **V0434** | 18 | 00:37:37 | 00:30:13 | 00:34:28 |
| **V0436** | 26 | 00:37:24 | 00:30:22 | 00:34:39 |
| **V0437** | 33 | 00:37:54 | 00:30:21 | 00:34:18 |
| **V0441** | 51 | | 00:30:13 | 00:36:04 |
| **V0442** | 54 | 00:41:39 | 00:30:11 | 00:35:53 |
| **V0446** | 38 | 00:36:15 | 00:27:12 | 00:31:33 |

| | | | | |
|---|---|---|---|---|
| **V0447** | 26 | 00:39:20 | 00:30:27 | |
| **V0448** | 39 | | 00:30:30 | 00:35:06 |
| **V0449** | 40 | 00:38:38 | 00:30:20 | 00:34:39 |
| **V0450** | 41 | 00:38:31 | 00:30:19 | |
| **V0452** | 65 | 00:40:26 | 00:30:18 | 00:35:06 |
| **V0453** | 65 | | 00:30:23 | 00:35:37 |
| **V0454** | 52 | 00:40:18 | 00:30:14 | 00:35:39 |
| **V0455** | 51 | 00:41:07 | 00:30:33 | 00:35:01 |
| **V0456** | 46 | 00:43:08 | 00:30:24 | 00:35:33 |
| **V0459** | 64 | 00:43:10 | 00:30:15 | 00:37:06 |
| **V0460** | 67 | 00:42:47 | 00:30:16 | 00:34:41 |
| **V0461** | 30 | 00:38:17 | 00:30:24 | |
| **V0462** | 36 | 00:39:03 | 00:30:17 | 00:33:09 |
| **V0463** | 67 | 00:40:45 | 00:30:24 | 00:33:31 |
| **V0464** | 69 | 00:43:07 | 00:30:24 | 00:35:07 |
| **V0465** | 57 | 00:42:40 | 00:30:13 | 00:35:16 |
| **V0466** | 64 | 00:42:31 | 00:30:11 | 00:35:19 |
| **V0467** | 50 | 00:40:50 | 00:30:11 | 00:34:28 |
| **V0468** | 50 | 00:42:13 | 00:30:15 | 00:35:48 |
| **V0471** | 21 | 00:38:33 | 00:30:57 | 00:35:00 |
| **V0472** | 17 | 00:37:20 | 00:30:11 | 00:33:56 |
| **V0473** | 33 | 00:34:43 | 00:27:18 | 00:31:10 |
| **V0474** | 33 | 00:28:30 | 00:20:18 | 00:25:19 |
| **V0475** | 20 | 00:36:06 | 00:30:39 | 00:34:20 |
| **V0477** | 30 | 00:38:56 | 00:30:15 | |
| **V0478** | 28 | 00:40:49 | 00:30:11 | 00:34:47 |
| **V0479** | 28 | 00:39:30 | 00:30:16 | 00:35:54 |

## IBTS2018 WD2

**Working document to the ICES IBTSWG**

Not to be cited without prior reference to the author

# Catches in zero-minute tows compared to standard tows in the NS-IBTS for England

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**Introduction**

Following the preliminary observations of considerable catches taken outside the nominal tow duration of a 30 min standard tow (Hatton *et al*. 2016), the IBTS WG encouraged its members to collect data in 2017 where possible on unquantified trawl times, i.e. during shooting and hauling and crucially outside the nominal trawl period (ICES 2017). The data collected through these experiments will be collated with that from several participating nations.

**Method:**

England completed 22 zero-minute tows during 2017 (survey CEND 17/17) to complement the 6 tows made during 2016 (survey CEND 18/16) (Table 1). These data were combined, and analyses made here to investigate the difference in species catch-rates and length distributions and the community composition between tows with duration equal to 0 and tows greater than 24 min. For CEND 17/17, prime stations 1, 2, 3, 4, 5, 7, 8, 15, 18, 29, 34, 39, 40, 54 (here after as 54B), 58, 60, 64, 65, 66, 74, 76, NA (X1) were selected. Catches for tows with duration of 25 and 31 minutes have been normalized to 30 minutes duration. The trawl was deployed normally, electronic net sensors monitored, and time stamps were recorded as specified in section 11.1.6 of the 2017 IBTSWG (ICES 2017).

**Results:**

A total of 28 stations were sampled after 0 minutes and 30 minutes of towing, between August 2016 and September 2017 (Table 1, Figure 1). In total the combined hauls caught 264,488 individual organisms (fish, jellyfish, shellfish, and cephalopods), of this 29% were caught during the 0 minutes hauls and 71% caught during the 30 minutes hauls (Table 1). The majority of the catches for both zero and 30 minutes hauls were comprised by fish species (98% and 97% respectively), but with differences in the composition overall (Figure 2) and by station (Figure 3). The catch in zero minute hauls were composed of 68% pelagic fish by number, representing over 85% of the biomass (Table 4). For the 30 minutes hauls, the catches included similar proportions of benthopelagic and pelagic fish, catching 38% by number (31% by weight) and 36% by number (56% by weight) respectively.

Two demersal species were only be caught during the zero minutes hauls (*Pholis gunnellus* and *Anguilla anguilla*) whilst 11 demersal species were caught only during the 30 minute hauls (*Trisopterus luscus, Gobius niger, Scophthalmus rhombus, Galeus melastomus, Ciliata mustela, Zeus faber, Lumpenus lampretaeformis, Raja montagui, Leucoraja fullonica, Scophthalmus maximus, Lophius budegassa*) (Tables 5 and 6). In addition, the following species were caught exclusively on the 30 minute hauls: 2 benthopelagic species *Cyclopterus lumpus and Etmopterus spinax and 7 pelagic species Crystallogobius linearis,* Clupeidae, *Dicentrarchus labrax, Galeorhinus galeus, Lampetra fluviatilis, Entelurus aequoreus, Alosa fallax*. The remaining 49 fish species were sampled on both surveys. The zero minutes hauls also sampled jellyfish species that were absent in the 30 minutes hauls. A total of 185 individual jellyfish were caught during the zero minutes hauls and identified as moon jellyfish (*Aurelia aurita*), blue jellyfish (*Cyanaea lamarckii*), compass jellyfish (*Chrysaora hysoscella*), lions mane jellyfish (*Cyanaea capillata*), crystal jellies (*Aequorea spp*) and unidentified jellyfish (*Cyanea spp*). Shellfish were caught during both hauls with the majority of the catches represented by cephalopods. Cephalopods represented 1.5% and 2.0% of catches for the zero and thirty minutes hauls respectively (Figure 2) with two species recovered only during the thirty minutes hauls: *Loligo vulgaris* and *Todarodes saggittatus*. The remaining four species of cephalopods (*Loligo -Allotheuthis- subulate, Loligo forbesi, Todaropsis eblane, Illex illecebrosus*) and six shellfish (*Cancer pagurus, Homarus gammarus, Lithodes maja, Necora puber, Nephrops norvegicus, Pecten maimum*) were found during both zero and 30 minutes hauls. The difference in catch rate by number per species and station if shown in Figure 4. Length distributions by species are similar for catches by both 0 and 30 minutes hauls as can be seen in Figure 5.

**References**

Hatton, B., Holmes, I., Ellis, J.R., Lynam, C. 2017. Preliminary observations on catches of fish in 'zero-minute' hauls. IBTSWG 2017. WD6. 9pp.

ICES. 2017. Interim Report of the International Bottom Trawl Survey Working Group. ICES CM 2017/SSGIEOM:01. 337 pp.

**Table 1: Stations details.**

| Prime Station | Haul Duration | dd/mm/yyyy | Shot Depth | Shot Latitude | Shot Longitude | Haul Latitude | Haul Longitude | Shot Time | Haul Time |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 01/09/2017 | 34 | 51.745 | 1.748 | 51.745 | 1.748 | 05:56:25 | 05:56:25 |
| | 31 | 04/08/2017 | 33 | 51.77 | 1.771 | 51.742 | 1.743 | 12:54:25 | 13:25:25 |
| 2 | 0 | 01/09/2017 | 34 | 51.583 | 2.782 | 51.583 | 2.782 | 10:43:25 | 10:43:25 |
| | 30 | 04/08/2017 | 30 | 51.563 | 2.767 | 51.592 | 2.79 | 18:07:25 | 18:37:25 |
| 3 | 0 | 01/09/2017 | 24 | 51.813 | 3.62 | 51.813 | 3.62 | 15:11:25 | 15:11:25 |
| | 30 | 05/08/2017 | 24 | 51.812 | 3.617 | 51.83 | 3.661 | 04:08:25 | 04:38:25 |
| 4 | 0 | 02/09/2017 | 38 | 52.808 | 2.751 | 52.808 | 2.751 | 07:43:25 | 07:43:25 |
| | 30 | 05/08/2017 | 38 | 52.803 | 2.753 | 52.825 | 2.714 | 18:41:25 | 19:11:25 |
| 5 | 0 | 02/09/2017 | 29 | 52.677 | 3.41 | 52.677 | 3.41 | 05:03:25 | 05:03:25 |
| | 30 | 05/08/2017 | 27 | 52.691 | 3.409 | 52.658 | 3.413 | 15:00:25 | 15:30:25 |
| 7 | 0 | 30/08/2017 | 54 | 53.961 | 0.269 | 53.961 | 0.269 | 16:56:25 | 16:56:25 |
| | 30 | 30/08/2017 | 54 | 53.977 | 0.252 | 53.947 | 0.275 | 13:32:25 | 14:02:25 |
| 8 | 0 | 31/08/2017 | 40 | 53.949 | 1.282 | 53.949 | 1.282 | 06:21:25 | 06:21:25 |
| | 30 | 31/08/2017 | 40 | 53.965 | 1.281 | 53.934 | 1.297 | 04:56:25 | 05:26:25 |
| 9 | 0 | 06/09/2016 | 70 | 53.834 | 2.636 | 53.834 | 2.636 | 09:17:44 | 09:17:44 |
| | 30 | 12/08/2016 | 73 | 53.84 | 2.622 | 53.85 | 2.568 | 14:53:44 | 15:23:44 |
| 15 | 0 | 08/08/2017 | 37 | 54.798 | 1.322 | 54.798 | 1.322 | 15:42:25 | 15:42:25 |
| | 31 | 08/08/2017 | 38 | 54.806 | 1.266 | 54.777 | 1.295 | 14:03:25 | 14:34:25 |
| 18 | 0 | 07/08/2017 | 44 | 54.759 | 4.855 | 54.759 | 4.855 | 18:06:25 | 18:06:25 |
| | 30 | 07/08/2017 | 44 | 54.77 | 4.917 | 54.763 | 4.861 | 16:48:25 | 17:18:25 |
| 26 | 0 | 05/09/2016 | 37 | 55.576 | 3.73 | 55.576 | 3.73 | 15:17:44 | 15:17:44 |
| | 30 | 16/08/2016 | 37 | 55.594 | 3.708 | 55.567 | 3.741 | 12:37:44 | 13:07:44 |
| 29 | 0 | 10/08/2017 | 39 | 55.719 | 6.669 | 55.719 | 6.669 | 08:42:25 | 08:42:25 |

| Prime Station | Haul Duration | dd/mm/yyyy | Shot Depth | Shot Latitude | Shot Longitude | Haul Latitude | Haul Longitude | Shot Time | Haul Time |
|---|---|---|---|---|---|---|---|---|---|
| | 30 | 10/08/2017 | 36 | 55.678 | 6.77 | 55.695 | 6.721 | 07:17:25 | 07:47:25 |
| 34 | 0 | 12/08/2017 | 96 | 56.781 | 1.398 | 56.781 | 1.398 | 09:36:25 | 09:36:25 |
| | 30 | 12/08/2017 | 98 | 56.744 | 1.517 | 56.76 | 1.464 | 07:55:25 | 08:25:25 |
| 39 | 0 | 10/08/2017 | 40 | 56.598 | 6.93 | 56.598 | 6.93 | 17:07:25 | 17:07:25 |
| | 30 | 10/08/2017 | 39 | 56.601 | 6.908 | 56.591 | 6.964 | 15:04:25 | 15:34:25 |
| 40 | 0 | 27/08/2017 | 129 | 57.049 | -1.757 | 57.049 | -1.757 | 16:49:25 | 16:49:25 |
| | 31 | 27/08/2017 | 116 | 57.043 | -1.757 | 57.068 | -1.719 | 14:22:25 | 14:53:25 |
| 55 | 0 | 04/09/2016 | 106 | 58.238 | 1.459 | 58.238 | 1.459 | 13:03:44 | 13:03:44 |
| | 25 | 26/08/2016 | 108 | 58.244 | 1.457 | 58.218 | 1.444 | 10:05:44 | 10:30:44 |
| 58 | 0 | 15/08/2017 | 156 | 58.094 | 4.781 | 58.094 | 4.781 | 06:30:25 | 06:30:25 |
| | 30 | 15/08/2017 | 164 | 58.11 | 4.748 | 58.089 | 4.796 | 04:40:25 | 05:10:25 |
| 60 | 0 | 23/08/2017 | 114 | 59.279 | -1.218 | 59.279 | -1.218 | 17:42:25 | 17:42:25 |
| | 30 | 23/08/2017 | 115 | 59.277 | -1.185 | 59.285 | -1.247 | 15:12:25 | 15:42:25 |
| 62 | 0 | 02/09/2016 | 118 | 59.221 | 0.904 | 59.221 | 0.904 | 13:45:44 | 13:45:44 |
| | 30 | 02/09/2016 | 118 | 59.197 | 0.92 | 59.226 | 0.888 | 11:56:44 | 12:26:44 |
| 64 | 0 | 16/08/2017 | 126 | 59.308 | 2.142 | 59.308 | 2.142 | 13:53:25 | 13:53:25 |
| | 30 | 16/08/2017 | 124 | 59.278 | 2.076 | 59.3 | 2.127 | 11:59:25 | 12:29:25 |
| 65 | 0 | 15/08/2017 | 164 | 59.195 | 3.351 | 59.195 | 3.351 | 18:16:25 | 18:16:25 |
| | 30 | 15/08/2017 | 187 | 59.22 | 3.397 | 59.19 | 3.367 | 15:58:25 | 16:28:25 |
| 66 | 0 | 23/08/2017 | 130 | 60.035 | -0.492 | 60.035 | -0.492 | 06:06:25 | 06:06:25 |
| | 30 | 23/08/2017 | 127 | 60.012 | -0.51 | 60.033 | -0.486 | 04:38:25 | 05:08:25 |
| 70 | 0 | 01/09/2016 | 130 | 60.198 | 3.121 | 60.198 | 3.121 | 14:31:44 | 14:31:44 |
| | 30 | 01/09/2016 | 135 | 60.177 | 3.127 | 60.207 | 3.157 | 12:18:44 | 12:48:44 |
| 74 | 0 | 21/08/2017 | 153 | 61.187 | 1.27 | 61.187 | 1.27 | 19:00:25 | 19:00:25 |

| Prime Station | Haul Duration | dd/mm/yyyy | Shot Depth | Shot Latitude | Shot Longitude | Haul Latitude | Haul Longitude | Shot Time | Haul Time |
|---|---|---|---|---|---|---|---|---|---|
| | 30 | 21/08/2017 | 157 | 61.206 | 1.27 | 61.179 | 1.309 | 17:23:25 | 17:53:25 |
| 76 | 0 | 26/08/2017 | 82 | 57.039 | 0.248 | 57.039 | 0.248 | 15:12:25 | 15:12:25 |
| | 30 | 26/08/2017 | 80 | 57.068 | 0.226 | 57.034 | 0.224 | 13:15:25 | 13:45:25 |
| 54A | 0 | 04/09/2016 | 148 | 58.408 | 0.73 | 58.408 | 0.73 | 07:32:44 | 07:32:44 |
| | 30 | 26/08/2016 | 148 | 58.394 | 0.712 | 58.419 | 0.752 | 04:49:44 | 05:19:44 |
| 54B | 0 | 25/08/2017 | 149 | 58.428 | 0.746 | 58.428 | 0.746 | 14:59:25 | 14:59:25 |
| | 30 | 25/08/2015 | 149 | 58.408 | 0.74 | 58.435 | 0.773 | 12:46:25 | 13:16:25 |
| X1 | 0 | 31/08/2017 | 30 | 53.451 | 1.585 | 53.451 | 1.585 | 17:40:25 | 17:40:25 |
| | 30 | 31/08/2017 | 30 | 53.441 | 1.573 | 53.472 | 1.593 | 14:36:25 | 15:06:25 |

**Table 2: Catch number for 0 minutes and 30 minutes tows. Avg: Average; Stdev: Standard deviation.**

| | 0 Minutes tows | | | | 30 minutes tows | | | |
|---|---|---|---|---|---|---|---|---|
| | **Total number** | **Avg** | **Stdev** | **Range (min-max)** | **Total number** | **Avg** | **Stdev** | **Range (min - max)** |
| Fish Total | **75892** | **1069** | **4929** | **0 — 37021** | **181816** | **2561** | 9251 | 0 — 64330 |
| Benthopelagic | 15043 | 1671 | 4618 | 0 — 13965 | 70366 | 7818 | 21245 | 1 — 64330 |
| Demersal | 8103 | 169 | 613 | 0 — 3856 | 44310 | 923 | 3193 | 0 — 19029 |
| Pelagic | 52746 | 3768 | 10259 | 0 — 37021 | 67139 | 4796 | 10572 | 1 — 37413 |
| Jellyfish Total | **185** | **31** | **30** | **1 — 74** | **0** | **0** | 0 | 0 — 0 |
| Shellfish Total | **1286** | **107** | **205** | **0 — 552** | **5309** | **442** | 667 | 1 — 1823 |
| Cephalopod | 1095 | 182 | 277 | 0 — 552 | 3676 | 613 | 868 | 1 — 1823 |
| Shellfish | 191 | 32 | 43 | 1 — 92 | 1634 | 272 | 393 | 3 — 924 |
| Catch by number | **77363** | **869** | **4415** | **0 — 37021** | **187125** | **2103** | 8305 | 0 — 64330 |

**Table 3: Weight of catches (kg) for 0 minutes and 30 minutes tows. Avg: Average; Stdev: Standard deviation.**

| | 0 Minutes tows | | | | 30 minutes tows | | | |
|---|---|---|---|---|---|---|---|---|
| | **Total (kg)** | **Avg (kg)** | **Stdev** | **Range (min-max)** | **Total (kg)** | **Avg (kg)** | **Stdev** | **Range (min - max)** |
| Fish Total | 8459 | 119 | 822 | **0 - 6937** | 14491 | 207 | 670 | **0 - 4643** |
| Benthopelagic | 362 | 40 | 91 | 0 – 271 | 1659 | 184 | 393 | 0.003 - 1144 |
| Demersal | 833 | 17 | 42 | 0 - 199 | 4564 | 97 | 228 | 0 – 971 |
| Pelagic | 7264 | 519 | 1848 | 0 – 6937 | 8268 | 591 | 1379 | 0.001 - 4643 |
| Jellyfish Total | 26 | 4 | 9 | **0.01 - 23** | 0 | 0 | 0 | **0 – 0** |
| Shellfish Total | 33 | 3 | 3 | **0 - 9.9** | 186 | 16 | 18 | **0.6 – 50** |
| Cephalopod | 16 | 2 | 4 | 0 - 9.9 | 48 | 8 | 13 | 0.6 - 33 |
| Shellfish | 19 | 3 | 3 | 0.5 – 7.0 | 138 | 23 | 21 | 1.2 -50 |
| Catches Total | 8519 | 96 | 735 | **0 — 6937** | 14678 | 167 | 602 | 0 — 4643 |

**Table 4: Percentages of number of catches and weights of catches per zero and 30 minutes hauls**

| | Percentage by number | | Percentage by weights | |
|---|---|---|---|---|
| | Zero Minutes Hauls | 30 Minutes Hauls | Zero Minutes Hauls | 30 Minutes Hauls |
| Benthopelagic | 19.4% | 37.6% | 4.3% | 11.3% |
| Demersal | 10.5% | 23.7% | 9.8% | 31.1% |
| Pelagic | 68.2% | 35.9% | 85.3% | 56.3% |
| Jellyfish | 0.2% | 0% | 0.3% | 0% |
| Cephalopod | 1.4% | 1.96% | 0.2% | 0.3% |
| Shellfish | 0.3% | 0.87% | 0.2% | 0.9% |

**Table 5: Number of species within groups caught by haul type**

| | **Zero minutes** | **30 Minutes** | **Only Zero minutes** | **Only 30 Minutes** | **Zero and 30 minutes** |
|---|---|---|---|---|---|
| Fish Total | **51** | **69** | **2** | **20** | **49** |
| Benthopelagic | 7 | 9 | 0 | 2 | 7 |
| Demersal | 37 | 46 | 2 | 11 | 35 |
| Pelagic | 7 | 14 | 0 | 7 | 7 |
| Jellyfish Total | **6** | **0** | **6** | **0** | **0** |
| Shellfish Total | **10** | **12** | **0** | **2** | **10** |
| Cephalopod | 4 | 6 | 0 | 2 | 4 |
| Shellfish | 6 | 6 | 0 | 0 | 6 |
| Catches Total | **67** | **81** | **8** | **22** | **59** |

**Table 6: (A) Organisms caught only during zero minutes hauls; (B) Organisms caught only during 30 minutes hauls; (C) Organisms caught during both zero and 30 minutes hauls**

| Organism | Group | Species code | Scientific name | Common Name | A | B | C |
|---|---|---|---|---|---|---|---|
| Fish | Benthopelagic | ARG | Argentinidae | Argentines | | | X |
| Fish | Benthopelagic | BOF | *Capros aper* | Boar fish | | | X |
| Fish | Benthopelagic | GSE | *Hyperoplus lanceolatus* | Great sandeel | | | X |
| Fish | Benthopelagic | LUM | *Cyclopterus lumpus* | Lumpsucker | | X | |
| Fish | Benthopelagic | NOP | *Trisopterus esmarki* | Norway pout | | | X |
| Fish | Benthopelagic | REV | *Sebastes viviparus* | Redfish | | | X |
| Fish | Benthopelagic | SYP | *Gadiculus argenteus* | Silvery pout | | | X |
| Fish | Benthopelagic | VBY | *Etmopterus spinax* | Velvet belly | | X | |
| Fish | Benthopelagic | WHB | *Micromesistius poutassou* | Blue whiting | | | X |
| Fish | Demersal | BIB | *Trisopterus luscus* | Whiting-pout (bib) | | X | |
| Fish | Demersal | BLG | *Gobius niger* | Black goby | | X | |
| Fish | Demersal | BLL | *Scophthalmus rhombus* | Brill | | X | |
| Fish | Demersal | BRT | *Myoxocephalus scorpius* | Bullrout | | | X |
| Fish | Demersal | BTF | *Pholis gunnellus* | Butter fish | X | | |
| Fish | Demersal | CAA | *Anarhichas lupus* | Catfish (wolffish) | | | X |
| Fish | Demersal | CDT | *Callionymus lyra* | Common dragonet | | | X |
| Fish | Demersal | COD | *Gadus morhua* | Atlantic cod | | | X |
| Fish | Demersal | CUR | *Leucoraja naevus* | Cuckoo ray | | | X |
| Fish | Demersal | DAB | *Limanda limanda* | Dab | | | X |
| Fish | Demersal | DBM | *Galeus melastomus* | Blackmouthed dogfish | | X | |
| Fish | Demersal | ELE | *Anguilla anguilla* | European eel | X | | |
| Fish | Demersal | FRR | *Enchelyopus cimbrius* | Four-bearded rockling | | | X |
| Fish | Demersal | FVR | *Ciliata mustela* | Five-bearded rockling | | X | |
| Fish | Demersal | GUG | *Eutrigla (Chelidonicthys) gurnardus* | Grey gurnard | | | X |
| Fish | Demersal | HAD | *Melanogrammus aeglefinus* | Haddock | | | X |
| Fish | Demersal | HGF | *Myxine glutinosa* | Hagfish | | | X |
| Fish | Demersal | HKE | *Merluccius merluccius* | European hake | | | X |
| Fish | Demersal | JOD | *Zeus faber* | John dory | | X | |
| Fish | Demersal | LEM | *Microstomus kitt* | Lemon sole | | | X |
| Fish | Demersal | LIN | *Molva molva* | Common ling | | | X |
| Fish | Demersal | LSD | *Scyliorhinus canicula* | Lesser spotted dogfish | | | X |
| Fish | Demersal | MEG | *Lepidorhombus whiffiagonis* | Megrim | | | X |
| Fish | Demersal | MON | *Lophius piscatorius* | Anglerfish (monk) | | | X |
| Fish | Demersal | MUR | *Mullus surmuletus* | Red mullet | | | X |
| Fish | Demersal | PLA | *Hippoglossoides platessoides* | American plaice (lr dab) | | | X |
| Fish | Demersal | PLE | *Pleuronectes platessa* | European plaice | | | X |
| Fish | Demersal | POD | *Trisopterus minutus* | Poor cod | | | X |
| Fish | Demersal | POG | *Agonus cataphractus* | Pogge (armed bullhead) | | | X |
| Fish | Demersal | POK | *Pollachius virens* | Saithe | | | X |
| Fish | Demersal | POM | *Pomatoschistus spp* | Gobies | | | X |
| Fish | Demersal | SBY | *Lumpenus lampretaeformis* | Snake blenny | | X | |
| Fish | Demersal | SDF | *Arnoglossus laterna* | Scald fish | | | X |
| Fish | Demersal | SDR | *Raja montagui* | Spotted ray | | X | |

| Organ-ism | Group | Spe-cies code | Scientific name | Common Name | A | B | C |
|---|---|---|---|---|---|---|---|
| Fish | Demersal | SDS | *Mustelus asterias* | Starry smooth hound | | | X |
| Fish | Demersal | SDT | *Callionymus maculatus* | Spotted dragonet | | | X |
| Fish | Demersal | SHR | *Leucoraja fullonica* | Shagreen ray | | | X |
| Fish | Demersal | SOL | *Solea solea* | Sole (dover sole) | | | X |
| Fish | Demersal | SOT | *Buglossidium luteum* | Solenette | | | X |
| Fish | Demersal | SYR | *Amblyraja radiata* | Starry ray | | | X |
| Fish | Demersal | THR | *Raja clavata* | Thornback ray (roker) | | | X |
| Fish | Demersal | TUB | *Trigla (Chelidonichthys) lucerna* | Tub gurnard | | | X |
| Fish | Demersal | TUR | *Scophthalmus maximus (psetta max-ima)* | Turbot | | X | |
| Fish | Demersal | VLP | *Lycodes vahlii* | Vahl's eelpout | | | X |
| Fish | Demersal | WAF | *Lophius budegassa* | Black-bellied an-glerfish | | X | X |
| Fish | Demersal | WEL | *Echiichthys (Trachinus) vipera* | Lesser weever fish | | | X |
| Fish | Demersal | WHG | *Merlangius merlangus* | Whiting | | | X |
| Fish | Demersal | WIT | *Glyptocephalus cynoglossus* | Witch | | | X |
| Fish | Pelagic | ANE | *Engraulis encrasicolus* | European anchovy | | | X |
| Fish | Pelagic | CLG | *Crystallogobius linearis* | Crystal goby | | X | |
| Fish | Pelagic | CLU | Clupeidae | Herrings | | X | |
| Fish | Pelagic | ESB | *Dicentrarchus labrax* | European seabass | | X | |
| Fish | Pelagic | GAG | *Galeorhinus galeus* | Tope shark | | X | |
| Fish | Pelagic | HER | *Clupea harengus* | Herring | | | X |
| Fish | Pelagic | HOM | *Trachurus trachurus* | Horse-mackerel (scad) | | | X |
| Fish | Pelagic | LAR | *Lampetra fluviatilis* | River lamprey | | X | |
| Fish | Pelagic | MAC | *Scomber scombrus* | (european) mackerel | | | X |
| Fish | Pelagic | PIL | *Sardina pilchardus* | Pilchard | | | X |
| Fish | Pelagic | PLS | *Maurolicus muelleri* | Pearlside | | | X |
| Fish | Pelagic | SKP | *Entelurus aequoreus* | Snake pipefish | | X | |
| Fish | Pelagic | SPR | *Sprattus sprattus* | Sprat | | | X |
| Fish | Pelagic | TAS | *Alosa fallax* | Twaite shad | | X | |
| Jellyfish | Jellyfish | AUA | *Aurelia aurita* | Moon jellyfish | X | | |
| Jellyfish | Jellyfish | BLU | *Cyanea lamarckii* | Blue jellyfish | X | | |
| Jellyfish | Jellyfish | CAX | *Cyanea spp* | Cyanea spp | X | | |
| Jellyfish | Jellyfish | COJ | *Chrysaora hysoscella* | Compass jellyfish | X | | |
| Jellyfish | Jellyfish | CRI | *Aequorea spp* | Cry(i)stal jellies | X | | |
| Jellyfish | Jellyfish | LIO | *Cyanea capillata* | Lions mane jellyfish | X | | |
| Shell-fish | Cephalopod | ATS | *Loligo (Alloteuthis) subulata* | | | | X |
| Shell-fish | Cephalopod | LLV | *Loligo vulgaris* | Squid | | X | |
| Shell-fish | Cephalopod | NSQ | *Loligo forbesi* | Northern squid | | | X |
| Shell-fish | Cephalopod | OME | *Todaropsis eblanae* | | | | X |
| Shell-fish | Cephalopod | SQE | *Todarodes saggittatus* | Flying squid | | X | |
| Shell-fish | Cephalopod | SQI | *Illex illecebrosus* | Northern shortfin squid | | | X |
| Shell-fish | Shellfish | CRE | *Cancer pagurus* | Edible crab | | | X |
| Shell-fish | Shellfish | LBE | *Homarus gammarus* | European lobster | | | X |
| Shell-fish | Shellfish | LDM | *Lithodes maja* | Stone crab | | | X |
| Shell-fish | Shellfish | MLP | *Necora puber* | Velvet swimming crab | | | X |
| Shell-fish | Shellfish | NEP | *Nephrops norvegicus* | Norway lobster | | | X |

| Organ-ism | Group | Spe-cies code | Scientific name | Common Name | A | B | C |
|---|---|---|---|---|---|---|---|
| Shell-fish | Shellfish | SCE | *Pecten maximus* | Great scallop | | | X |

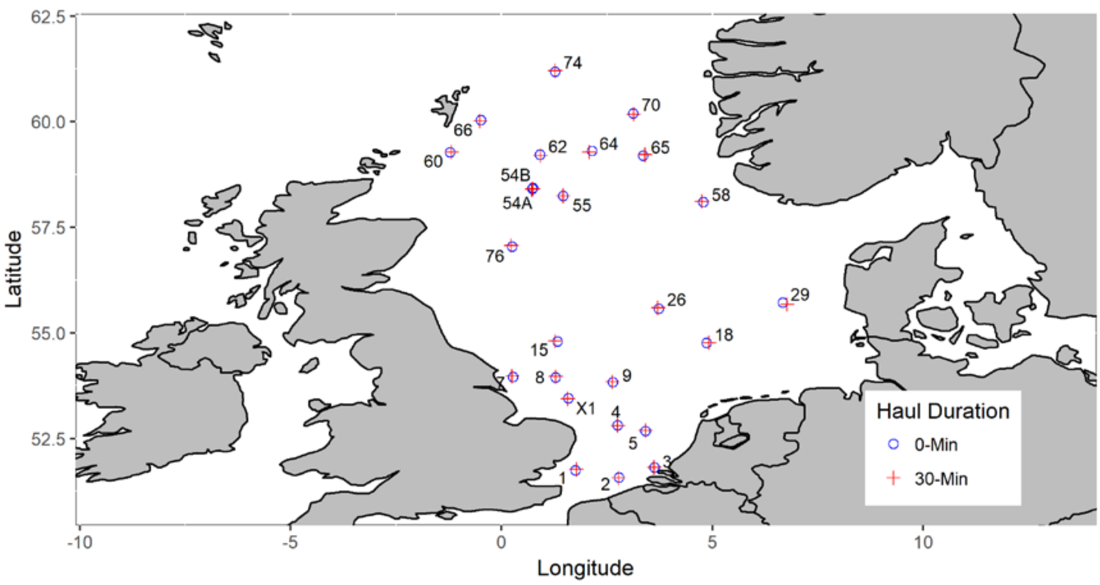


**Figure 6: Station position at shot for 0 minutes and 30 minutes tows.**

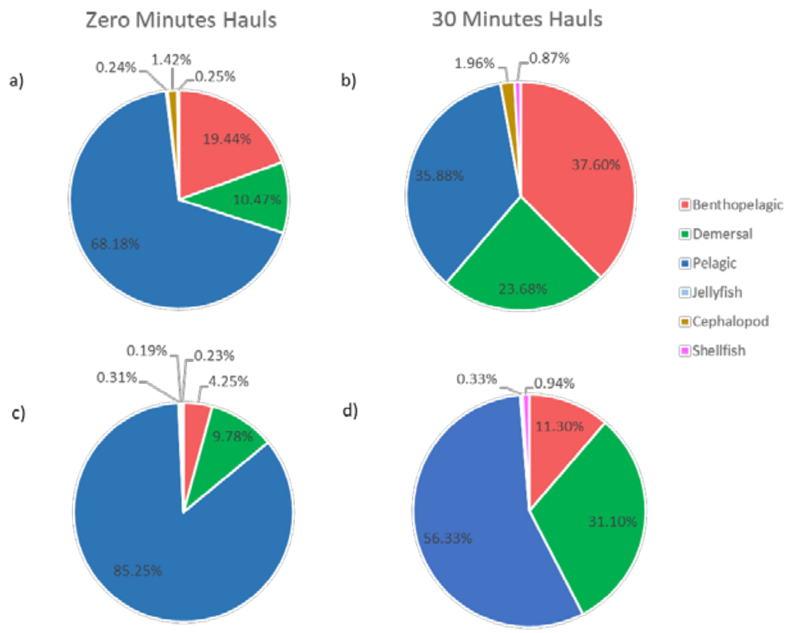


**Figure 7: Grouping of zero minutes and thirty minutes hauls. a–b number of fish ; c-d weight of catches. Values in table 3**

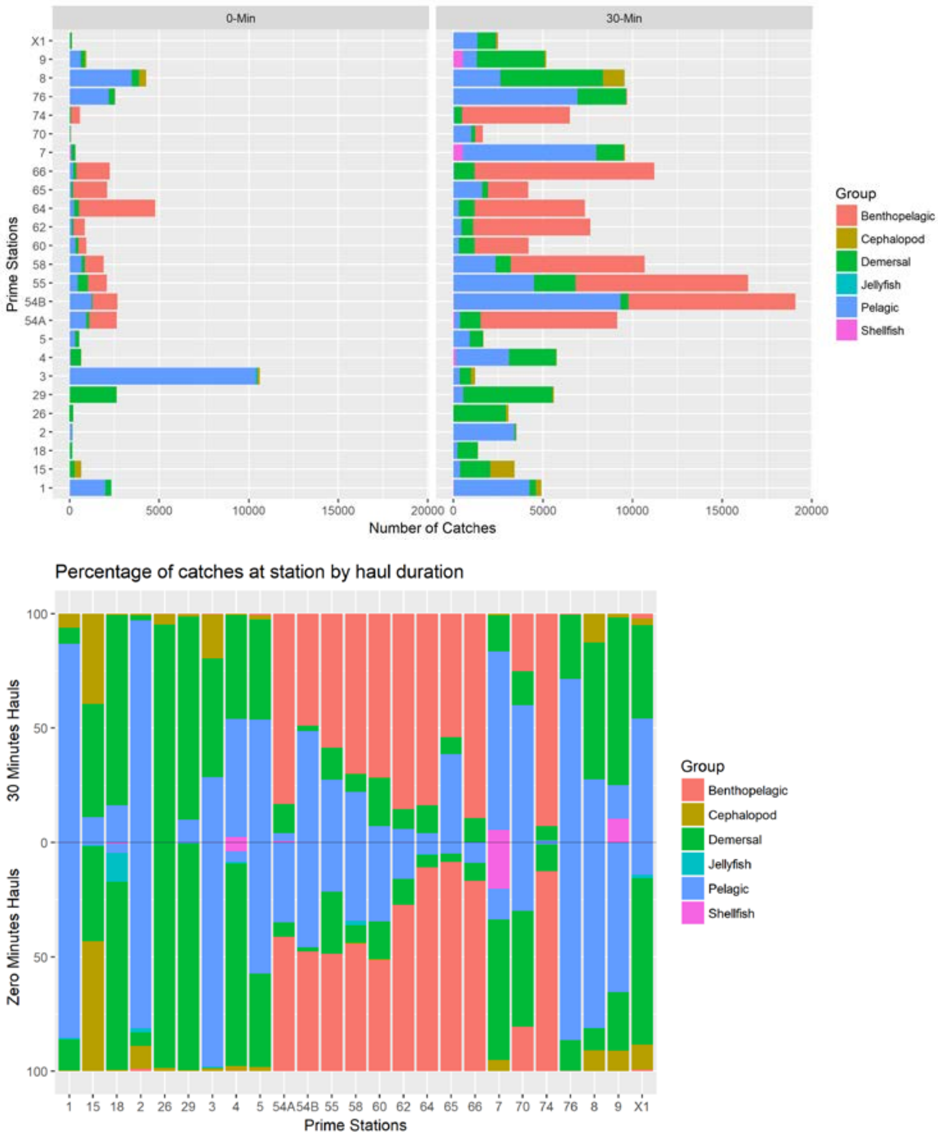


**Figure 8: Group catch by number per station for zero and 30 minutes hauls (above by number and below by percentage of each group at station).**

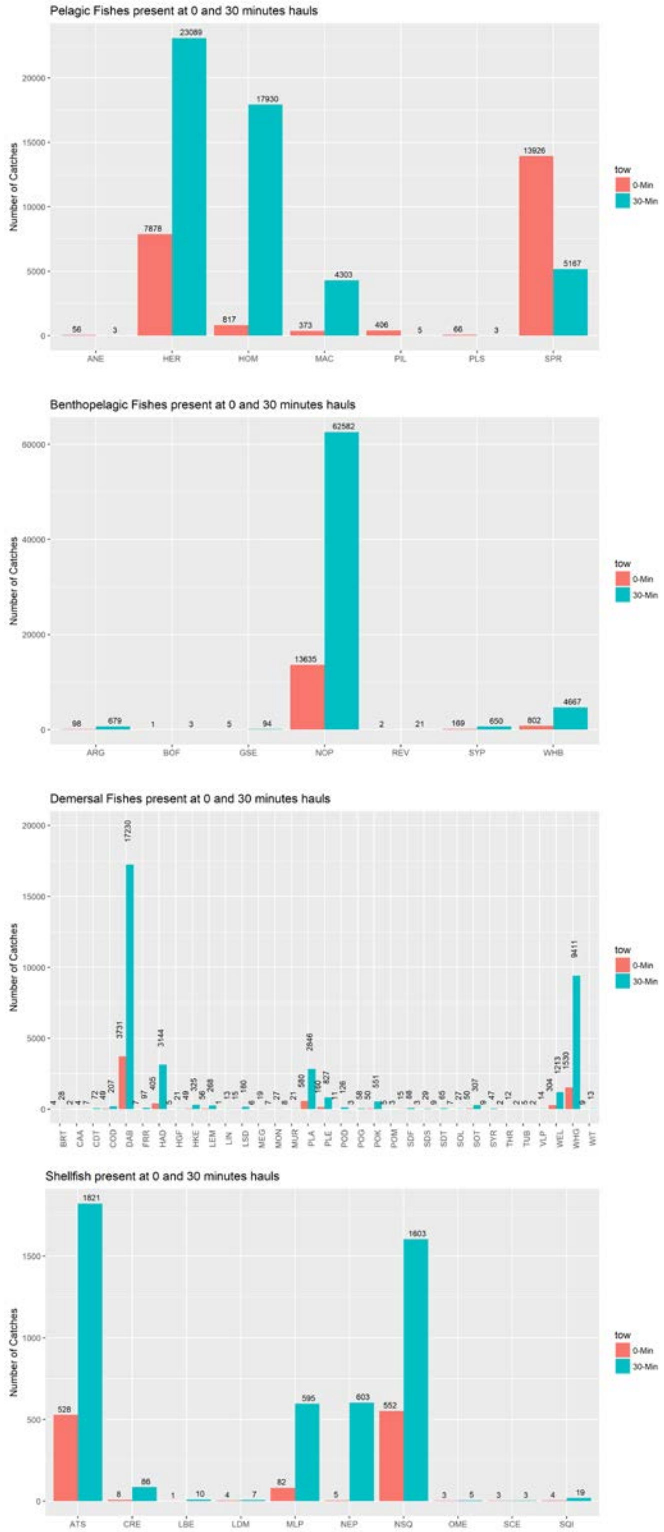


**Figure 4: Group catch by number and species per station for zero and 30 minutes hauls**

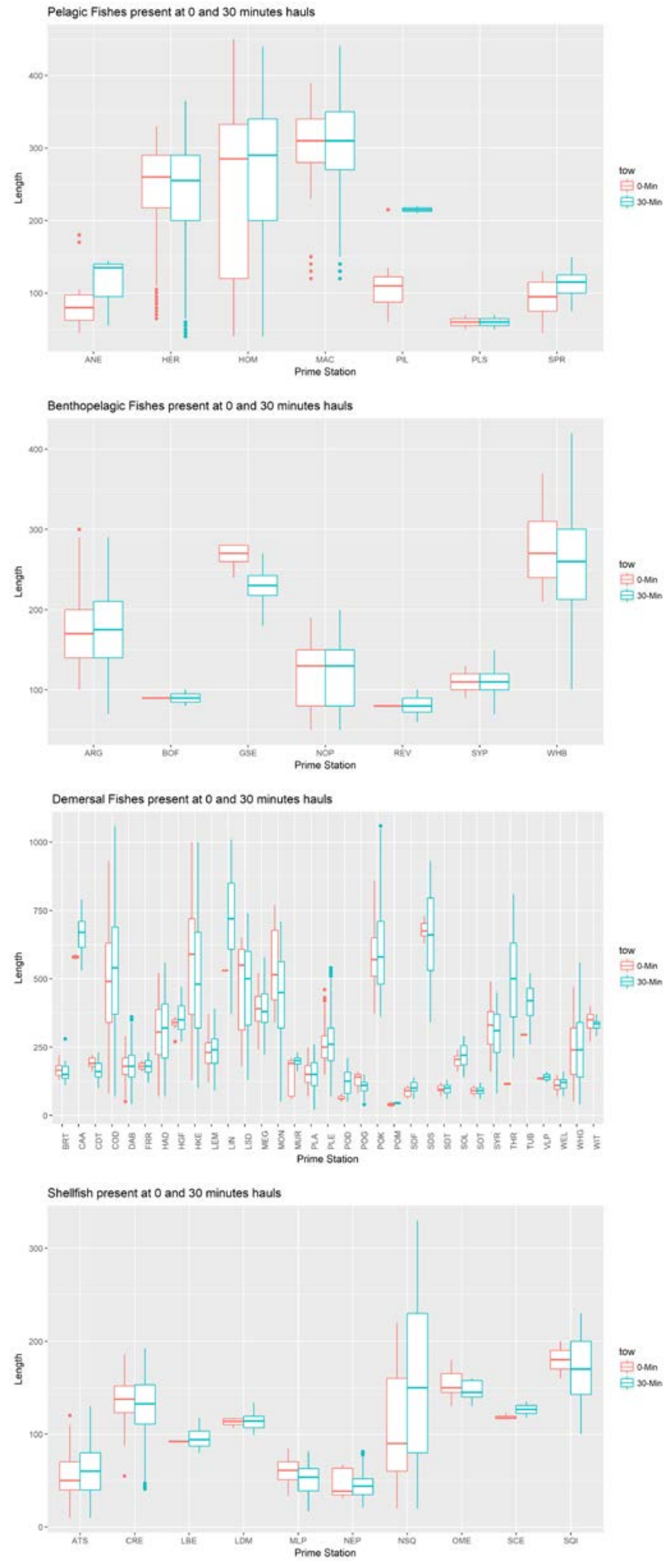


**Figure 5: Length distribution of species for zero and 30 minutes hauls**

## IBTS2018 WD3

# Catches in zero-minute tows compared to standard tows in the NS-IBTS for Scotland

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**Introduction**

Based on a report citing considerable catches taken outside the nominal tow duration of a 30 min standard tow (Hatton *et al*. 2016), the IBTS WG encourages its members to collect data where possible on unquantified trawl times, i.e. during shooting and hauling and crucially outwith the nominal trawl period. This was possible using the so - called zero minute tows (ICES 2017). It is hoped that this will provide an interesting comparison between participating nations regarding the trawl deployment methodologies adopted by each vessel.

**Material and Methods**

Scotland conducted comparative standard and zero-minute tows at 4 locations and during 3 different surveys in 2017/2018. The 3Q NS-IBTS in 2017 (A), the 1Q NS-IBTS in 2018 (B,C) and also during the Q1 SCOWCGFS 2018 (D) (Figure 1). At all 4 locations 3 replicate zero-minute tow were made within a short distance of the standard 30 min tow (Figure 2).

Time stamps were recorded as specified in section 11.1.6 of the 2017 IBTSWG (ICES 2017). During fishing, vessel position, speed over ground (SOG) and depth were recorded. The trawl geometry (Door and wing spread, vertical net opening) was also monitored using ScanMar net mounted sensors and their readings recorded and displayed onto the MSS RADOS net monitoring system with an update interval rate of 20 seconds. Validation of touchdown and liftoff of trawl on the seabed was provided post haul using a bottom contact sensor mounted onto the footrope in the centre of the trawl groundgear.

All catches were worked up according to standard NS-IBTS procedures. Species were grouped into pelagic and demersal gadoids, flatfish and other demersal fish, and molluscs and crustaceans in the first place. For later analysis demersal gadoids, flatfish and other demersal fish were combined and summarized as demersal fish species.

**Results and Conclusions**

Towing times outside the nominal tow duration ranged from 5.3 to 10.05 minutes for the standard tows and amounted to between 4.8 and 14.4 minutes for the zero-minute tows with the highest values unsurprisingly being observed within set D which was undertaken at a depth of approximately 185m. Unquantified bottom time outside the nominal 30 minute bottom duration when the net was classified to be settling or during the process of hauling ranged from between 1.3 to 2.1 minutes. The same measurements recorded for the zero hours hauls ranged from between 0.8 to 1.8 minutes (Table1).

Catches observed in all the zero minute hauls were extremely small and with respect to pelagic species, only the zero minute hauls from set B yielded any pelagic fish (Table2). With regards to demersal species the zero minute catches generally ranged from between 0.2 - 2.5 kgs, the exception being one of the replicates from set D that yielded 24 kgs of predominantly small saithe. A comprehensive breakdown of each haul by speciesand species type is provided in table 2a – 2c. As one would expect with such small catches the number of taxa represented within the zero minute tows were also very low when compared to that of the accompanying standard duration haul. Table 3 provides the mean catchweight across all the replicate zero minute hauls and also provides an estimate of the zero minute catches expressed as percentage of the catchweight from the accompanying standard duration tow. For the demersal species the zero minute results are fairly consistent ranging from 0.8 – 1.5% with a mean of just over 1.17%.

Finally table 4 provides some reference information regarding the gear and vessel parameters data collected both for the standard duration tow and also the zero minutes tow. These provide information that allows a comparison to be made between the trawl geometry for both the standard hauls and also the zero minute tows. On balance I am confident that the results are overall comparable however it is clear than on a couple of occasions that during the zero hours tow the speed was significantly lower than is permitted by IBTS during trawling (Set B, stations 16 and 17), however these results are almost certainly an artefact due to the 20 second update rate that exists when recording the vessel and trawl sensor readings. The same issue is also responsible for the higher than permitted headline reading obverved within Set C, station 66. Should we repeat this experiment in future we would ideally increase the update rate to around 5 seconds for a zero minute tow in an effort to reduce the risk of this issue reoccurring. MSS is confident that it has successfully demonstrated that only a very small amount of time is being spent on the seabed either side of the nominal tow time. The methodology employed by the fishing masters on Scotia attempt to ensure that the trawl arrives on the seabed pretty much ready to fish almost immediately thus settlement time is reduced to a minimum.

**References**

Hatton, B., Holmes, I., Ellis, J.R., Lynam, C. 2017. Preliminary observations on catches of fish in 'zero-minute' hauls. IBTSWG 2017. WD6. 9pp.

ICES. 2017. Interim Report of the International Bottom Trawl Survey Working Group. ICES CM 2017/SSGIEOM:01. 337 pp.

**Table 1: Sampling information (all tows *: from start of deployment until end of retrieval of the trawl doors)**
**(**estimate derived from time taken at similar depths as liftoff time not recorded)**

| Set | Rectangle | Depth (m) | Total Tow Duration (min)* | | | | Duration trawl at bottom (min) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Standard Tow | Zero Minute Tow | | | Standard Tow | Zero Minute Tow | | |
| | | | | 1 | 2 | 3 | | 1 | 2 | 3 |
| SET A | 41E9 | 66-74 | 36.05 | 4.8 | 5 | 5.28 | 31.77 | 0.83 | 0.93 | 1.08 |
| SET B | 47E7 | 68 - 80 | 39.09 | 8.85 | 7.57 | 7.17 | 32.12 | 1.43 | 1.8 | 1.77 |
| SET C | 43E9 | 82 | 35.33 | 6.23 | 6.47 | 6.70 | 31.27** | 1.23 | 1.3 | 1.32 |
| SET D | 49E5 | 183-18[illegible] | 41.05 | 11.32 | 14.42 | 13.25 | 31.32 | 1.05 | 0.92 | 1.47 |

**Table 1: Sampling information (all tows *: from start of deployment until end of retrieval of the trawl doors)**
**(**estimate derived from time taken at similar depths as liftoff time not recorded)**

**Table 2a: Species compositions for sampling locations A.**

| **Set A** | | Station 259 (Standard Tow) | | | | Station 260 (zero-minute tow) | | | | Station 261 (zero-minute tow) | | | | Station 262 (zero-minute tow) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Species | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ |
| Pelagic Fish | Scomber scombrus | 1.1 | 6 | 26 | 31 | | | | | | | | | | | | |
| Demersal Gadoids | Melanogrammus aeglefinus | 3.01 | 103 | 10 | 32 | | | | | 0.192 | 1 | 27 | 27 | 0.788 | 4 | 23 | 31 |
| | Merlangius merlangus | 5.5 | 42 | 13 | 37 | | | | | 0.116 | 1 | 24 | 24 | 0.153 | 1 | 28 | 28 |
| Flatfish | Limanda limanda | 57.6 | 1187 | 11 | 21 | 0.672 | 12 | 13 | 21 | 0.38 | 7 | 13 | 20 | 1.054 | 17 | 13 | 23 |
| | Hippoglossoides platessoides | 3.085 | 58 | 4 | 23 | | | | | 0.06 | 1 | 20 | 20 | 0.029 | 1 | 15 | 15 |
| | Microstomus kitt | 1.54 | 19 | 16 | 27 | | | | | | | | | | 4 | 19 | 28 |
| | Pleuronectes platessa | 12.7 | 67 | 18 | 38 | 0.238 | 3 | 18 | 24 | | | | | | | | |
| | Arnoglossus laterna | 0.035 | 1 | 16 | 16 | | | | | | | | | | | | |
| Other Demersal Fish | Callionymus maculatus | 0.13 | 5 | 14 | 17 | | | | | | | | | | | | |
| | Squalus acanthias | 0.09 | 1 | 30 | 30 | | | | | | | | | | | | |
| | Lophius piscatorius | 1.7 | 1 | 45 | 45 | | | | | | | | | | | | |
| | Eutrigla gurnardus | 12.1 | 145 | 15 | 26 | 0.566 | 7 | 18 | 23 | | | | | 0.123 | 2 | 19 | 20 |
| | Leucoraja naevus | 0.86 | 1 | 52 | 52 | | | | | | | | | | | | |
| | Crystallogobius linearis | 0.001 | 2 | 4 | 4 | | | | | 0.002 | 3 | 3 | 4 | 0.001 | 1 | 4 | 4 |
| | Amblyraja radiata | 0.048 | 1 | 40 | 40 | | | | | | | | | | | | |
| Molluscs | Loligo forbesii | | | | | 0.001 | 2 | 2 | 2 | 0.001 | 1 | 2 | 2 | 0.001 | 1 | 1 | 1 |
| Crustaceans | Cancer pagurus | 1.22 | 1 | 20.1 | 20.1 | | | | | | | | | | | | |
| Total Pelagic Fish | | 1.1 | 6 | 26 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Demersal Fish | | 98.399 | 1633 | 4 | 52 | 1.476 | 22 | 13 | 24 | 0.75 | 13 | 3 | 27 | 2.148 | 30 | 4 | 31 |
| Total Number of Pelagic Fish Taxa | | 1 | | | | 0 | | | | 0 | | | | 0 | | | |
| Total Number of Demersal Fish Taxa | | 14 | | | | 3 | | | | 5 | | | | 6 | | | |

# Table 2b: Species compositions for sampling locations B and C.

| Set B | | Station 14, Ggear B Standard tow | | | | Station 15 Ggear B (zero-min tow) | | | | Station 16 Ggear B (zero-min tow) | | | | Station 17 Ggear B (zero-min tow) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Species | W (kg) | N | Lmin | Lmax | W (kg) | N | Lmin | Lmax | W (kg) | N | Lmin | Lmax | W (kg) | N | Lmin | Lmax |
| Pelagic fish | Clupea harengus | 14.6 | 96 | 23 | 30 | 1.43 | 10 | 24.5 | 28 | | | | | | | | |
| | Sprattus sprattus | 0.836 | 72 | 8 | 14 | 0.014 | 1 | 12.5 | 12.5 | 0.208 | 19 | 10.5 | 13 | 0.017 | 1 | 13 | 13 |
| | Trachurus trachurus | 0.064 | 1 | 18 | 18 | | | | | | | | | | | | |
| Demersal Gadoids | Gadus morhua | 22.1 | 30 | 24 | 58 | | | | | | | | | | | | |
| | Melanogrammus aeglefinis | 31.1 | 107 | 24 | 42 | | | | | | | | | 1.03 | 4 | 24 | 35 |
| | Merluccius merluccius | 0.672 | 2 | 31 | 41 | | | | | | | | | | | | |
| | Trisopterus esmarkii | 0.188 | 12 | 8 | 15 | 0.023 | 1 | 15 | 15 | | | | | | | | |
| | Merlangius merlangus | 11.5 | 90 | 21 | 29 | | | | | 0.287 | 1 | 32 | 32 | | | | |
| Flats | Limanda limanda | 1.788 | 21 | 14 | 28 | | | | | | | | | 0.085 | 2 | 16 | 17 |
| | Pleuronectes platessa | 8.4 | 33 | 19 | 36 | 0.214 | 2 | 19 | 25 | 0.58 | 2 | 27 | 31 | | | | |
| | S rhombus | 1.6 | 1 | 45 | 45 | | | | | | | | | | | | |
| Other Demersal | L naevus | 1.26 | 1 | 56 | 56 | | | | | | | | | | | | |
| | E gurnardus | 0.536 | 6 | 18 | 27 | | | | | | | | | | | | |
| | M surmulletus | 0.118 | 1 | 20 | 20 | | | | | | | | | | | | |
| | S acanthias | 6.4 | 4 | 62 | 91 | | | | | | | | | | | | |
| | S canicula | 1.2 | 1 | 65 | 65 | | | | | | | | | | | | |
| | R montaguii | 7.5 | 5 | 57 | 63 | | | | | | | | | | | | |
| Molluscs | Loligo forbesii | 29.226 | 139 | 2 | 38 | 0.06 | 23 | 1 | 5 | | | | | | | | |
| Total Pelagic | | 15.5 | 169 | 8 | 30 | 1.444 | 11 | 12.5 | 28 | 0.208 | 19 | 10.5 | 13 | 0.017 | 1 | 13 | 13 |
| Total Demersal | | 94.362 | 314 | 8 | 81 | 0.237 | 3 | 15 | 25 | 0.867 | 3 | 27 | 32 | 1.115 | 6 | 16 | 35 |
| Total no. pelagic fish taxa | | 3 | | | | 2 | | | | 1 | | | | 1 | | | |
| Total no. demersal fish taxa | | 14 | | | | 2 | | | | 2 | | | | 2 | | | |

| Set C | | Station 63, Ggear A Standard tow | | | | Station 64 Ggear A (zero-min tow) | | | | Station 65 Ggear A (zero-min tow) | | | | Station 66 Ggear A (zero-min tow) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Species | W (kg) | N | Lmin | Lmax | W (kg) | N | Lmin | Lmax | W (kg) | N | Lmin | Lmax | W (kg) | N | Lmin | Lmax |
| Pelagic fish | Sprattus sprattus | 0.014 | 1 | 13 | 13 | | | | | | | | | | | | |
| | Trachurus trachurus | 0.152 | 14 | 9 | 14.5 | | | | | | | | | | | | |
| Demersal Gadoids | Gadus morhua | 8.4 | 5 | 20 | 84 | | | | | | | | | | | | |
| | Melanogrammus aeglefinis | 67.5 | 595 | 16 | 43 | | | | | 0.265 | 2 | 19 | 29 | | | | |
| | Trisopterus esmarkii | 0.39 | 24 | 9 | 16 | 0.006 | 1 | 10 | 10 | 0.01 | 1 | 11 | 11 | | | | |
| | Merlangius merlangus | 8.7 | 161 | 14 | 35 | | | | | | | | | | | | |
| Flats | Limanda limanda | 13.5 | 292 | 10 | 26 | | | | | 0.035 | 1 | 16 | 16 | 0.222 | 3 | 14 | 25 |
| | Hippoglossoides platessoides | 1.778 | 38 | 15 | 23 | 0.12 | 1 | 22 | 22 | 0.068 | 2 | 13 | 18 | 0.192 | 4 | 15 | 20 |
| | Microstomus kitt | 0.388 | 4 | 19 | 26 | | | | | | | | | 0.055 | 1 | 18 | 18 |
| | Pleuronectes platessa | 13.6 | 63 | 18 | 36 | 0.406 | 2 | 25 | 30 | 0.24 | 1 | 30 | 30 | | | | |
| Other Demersal | L naevus | 0.5 | 1 | 48 | 48 | 0.568 | 1 | 47 | 47 | | | | | | | | |
| | E gurnardus | 6.6 | 71 | 15 | 32 | 0.146 | 1 | 25 | 25 | | | | | | | | |
| | Gobiidei | | | | | | | | | | | | | 0.001 | 1 | 3 | 3 |
| | S canicula | 1.1 | 1 | 65 | 65 | 1.06 | 1 | 66 | 66 | | | | | | | | |
| | C cuculus | 4.8 | 36 | 17 | 29 | | | | | | | | | | | | |
| | M surmulletus | 0.082 | 2 | 11 | 18 | | | | | | | | | | | | |
| | A radiata | | | | | | | | | | | | | 0.395 | 1 | 40 | 40 |
| Molluscs | Alloteuthis | 7.4 | 2009 | 3 | 9 | | | | | 0.008 | 4 | 3 | 5 | 0.01 | 3 | 5 | 6 |
| | Sepiolidaie | | | | | | | | | 0.002 | 1 | | | | | | |
| | Loligo forbesii | 0.274 | 1 | 21 | 21 | | | | | | | | | | | | |
| | Ilex coindetti | 0.242 | 16 | 6 | 12 | 0.01 | 1 | 6 | 6 | | | | | | | | |
| Total Pelagic | | 0.166 | 15 | 9 | 14.5 | 0 | 0 | | | 0 | 0 | | | 0 | 0 | | |
| Total Demersal | | 127.338 | 1293 | 9 | 84 | 2.306 | 7 | 10 | 66 | 0.618 | 7 | 11 | 30 | 0.865 | 10 | 3 | 40 |
| Total no. pelagic fish taxa | | 2 | | | | 0 | | | | 0 | | | | 0 | | | |
| Total no. demersal fish taxa | | 13 | | | | 6 | | | | 5 | | | | 5 | | | |

## Table 2c: Species compositions for sampling location D

| **Set D** | | Station 79 (Standard Tow) | | | | Station 80 (zero-minute tow) | | | | Station 81 (zero-minute tow) | | | | Station 82 (zero-minute tow) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Species | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ |
| Pelagic Fish | Clupea harengus | 0.3 | 2 | 26 | 28 | | | | | | | | | | | | |
| Demersal Gadoids | Melanogrammus aeglefinus | 135.1 | 242 | 19 | 54 | 0.1 | 3 | 14 | 18 | 0.3 | 1 | 32 | 32 | | | | |
| | Gadus morhua | 46.9 | 21 | 29 | 81 | | | | | | | | | | | | |
| | Trisopterus esmarkii | 265.9 | 11245 | 10 | 19 | | | | | | | | | | | | |
| | Trisopterus minutus | 7.5 | 183 | 8 | 23 | 0.011 | 2 | 8 | 9 | | | | | | | | |
| | Pollachius virens | 1.7 | 1 | 56 | 56 | | | | | 1.2 | 1 | 51 | 51 | 23.2 | 18 | 41 | 60 |
| | Molva molva | 24.4 | 7 | 61 | 110 | | | | | | | | | | | | |
| | Merlangius merlangus | 45.7 | 156 | 22 | 47 | | | | | | | | | | | | |
| Flatfish | Limanda limanda | 1.8 | 21 | 14 | 27 | | | | | | | | | | | | |
| | Lepidorhombus whiffiagonis | 1.9 | 4 | 20 | 43 | | | | | | | | | | | | |
| | Microstomus kitt | 2.4 | 6 | 21 | 38 | | | | | | | | | | | | |
| | Pleuronectes platessa | 6.9 | 13 | 24 | 49 | | | | | | | | | | | | |
| Other Demersal Fish | Helicolenus dactylopterus | 0.004 | 1 | 6 | 6 | 0.028 | 3 | 5 | 10 | 0.002 | 1 | 5 | 5 | 0.019 | 3 | 5 | 9 |
| | Squalus acanthias | 1 | 1 | 65 | 65 | | | | | | | | | | | | |
| | Callionymus lyra | 0.1 | 2 | 14 | 28 | | | | | | | | | | | | |
| | Eutrigla gurnardus | 8.4 | 34 | 17 | 41 | | | | | | | | | | | | |
| | Argentina sphyraena | 0.1 | 1 | 22 | 22 | 0.1 | 2 | 21 | 22 | 0.1 | 1 | 21 | 21 | 0.1 | 2 | 16 | 17 |
| | Chelidonichthys cuculus | 27.3 | 84 | 23 | 39 | | | | | | | | | | | | |
| | Dipturus intermedia | 21.4 | 1 | 139 | 139 | | | | | | | | | | | | |
| | Raja montagui | 27.2 | 25 | 33 | 63 | | | | | | | | | | | | |
| | Gobiidei | 0.002 | 1 | 4 | 4 | | | | | | | | | | | | |
| | Scyliorhinus canicula | 13.5 | 21 | 43 | 71 | 0.6 | 1 | 57 | 57 | | | | | 1.6 | 2 | 52 | 63 |
| Molluscs | Loligo forbesii | 2.4 | 35 | 2 | 21 | 0.1 | 2 | 4 | 12 | 2.4 | 299 | 2 | 17 | 7 | 1116 | 3 | 6 |
| Crustaceans | | | | | | | | | | | | | | | | | |
| Total Pelagic Fish | | 0.3 | 2 | 26 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Demersal Fish | | 639.206 | 12070 | 4 | 139 | 0.839 | 11 | 5 | 57 | 1.602 | 4 | 5 | 51 | 24.919 | 25 | 5 | 63 |
| Total Number of Pelagic Fish Taxa | | 1 | | | | 0 | | | | 0 | | | | 0 | | | |
| Total Number of Demersal Fish Taxa | | 21 | | | | 5 | | | | 4 | | | | 4 | | | |

### Table 3: Comparison of total catch and species richness for taxonomic groups.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Pelagic Fish Species Catch (kg) | | | | | | | | |
| | | | Standard | Zero Minute Tow | | | | | Average for zero minute |
| Set | Rectangle | Depth (m) | Tow | 1 | 2 | 3 | Mean | CV | tow in % of standard tow |
| A | 41E9 | 66-74 | 1.1 | 0 | 0 | 0 | | | 0.00 |
| B | 47E7 | 68 - 80 | 15.5 | 1.444 | 0.208 | 0.017 | 0.556333 | 1.392423 | 3.59 |
| C | 43E9 | 82 | 0.166 | 0 | 0 | 0 | | | 0.00 |
| D | 49E5 | 182-188 | 0.3 | 0 | 0 | 0 | | | 0.00 |
| | | | | | | | | mean: | 0.90 |
| | | | | | | | | cv: | 1.79 |
| | Demersal Fish Species Catch (kg) | | | | | | | | |
| | | | Standard | Zero Minute Tow | | | | | Average for zero minute |
| SET | Rectangle | Depth (m) | Tow | 1 | 2 | 3 | Mean | CV | tow in % of standard tow |
| A | 41E9 | 66-74 | 98.399 | 1.476 | 0.75 | 2.148 | 1.458 | 0.48 | 1.48 |
| B | 47E7 | 68 - 80 | 94.362 | 0.237 | 0.867 | 1.115 | 0.739667 | 0.611949 | 0.78 |
| C | 43E9 | 82 | 127.338 | 2.306 | 0.618 | 0.865 | 1.263 | 0.721828 | 0.99 |
| D | 49E5 | 182-188 | 639.206 | 0.839 | 1.602 | 24.919 | 9.12 | 1.500839 | 1.43 |
| | | | | | | | | mean: | 1.17 |
| | | | | | | | | cv: | 0.30 |
| | | | | | | | | | |
| | Number of Pelagic and Demersal Fish Species | | | | | | | | |
| | | | Standard | Zero Minute Tow | | | | | Average for zero minute |
| SET | Rectangle | Depth (m) | Tow | 1 | 2 | 3 | Mean | CV | tow in % of standard tow |
| A | 41E9 | 66-74 | 99.499 | 1.476 | 0.75 | 2.148 | 1.458 | 0.48 | 1.47 |
| B | 47E7 | 68 - 80 | 109.862 | 1.681 | 1.075 | 1.132 | 1.296 | 0.258206 | 1.18 |
| C | 43E9 | 82 | 127.504 | 2.306 | 0.618 | 0.865 | 1.263 | 0.721828 | 0.99 |
| D | 49E5 | 182-188 | 639.506 | 0.839 | 1.602 | 24.919 | 9.12 | 1.500839 | 1.43 |
| | | | | | | | | mean: | 1.27 |
| | | | | | | | | cv: | 0.20 |

### Table 4: Comparison of gear and vessel parameters readings recorded for each haul within sets A - D.

| Set | Survey | Duration | Haul number | Lat Shoot | lon Shoot | Lat Haul | Lon Haul | Mean Wing Spread | Wing Spread TD | Mean Door Spread | Door Spread TD | Mean Headline Height | Headline Height TD | Mean SOG | SOG TD | Sounder Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 1117S | 30 | 259 | 56.25 | -0.465 | 56.28 | -0.462 | 17.2 | 17.9 | 71 | 74 | 5.1 | 5.0 | 3.7 | 3.6 | 66 |
| A | 1117S | 0 | 260 | 56.315 | -0.452 | 56.31 | -0.452 | | 18.2 | | 72 | | 5.2 | | 3.8 | 72 |
| A | 1117S | 0 | 261 | 56.338 | -0.45 | 56.34 | -0.45 | | 18.0 | | 72 | | 5.2 | | 3.9 | 74 |
| A | 1117S | 0 | 262 | 56.352 | -0.463 | 56.352 | -0.463 | | 18.6 | | 75 | | 5.4 | | 3.8 | 74 |
| B | 0218S | 30 | 14 | 59.193 | -2.263 | 59.215 | -2.223 | 18.7 | 19.3 | 72 | 74 | 5.5 | 5.9 | 3.6 | 3.6 | 80 |
| B | 0218S | 0 | 15 | 59.191 | -2.273 | 59.191 | -2.273 | | 17.8 | | 68 | | 5.7 | | 3.4 | 77 |
| B | 0218S | 0 | 16 | 59.206 | -2.256 | 59.206 | -2.256 | | 18.8 | | 69 | | 5.8 | | 2.9 | 78 |
| B | 0218S | 0 | 17 | 59.221 | -2.242 | 59.221 | -2.242 | | 17.8 | | 68 | | 5.9 | | 2.6 | 68 |
| C | 0218S | 30 | 63 | 57.074 | -0.273 | 57.099 | -0.310 | 19.2 | 21.9 | 73 | 73 | 5.3 | 5.5 | 3.8 | 3.1 | 82 |
| C | 0218S | 0 | 64 | 57.087 | -0.291 | 57.087 | -0.291 | | 20.4 | | 72 | | 5.5 | | 3.3 | 82 |
| C | 0218S | 0 | 65 | 57.088 | -0.296 | 57.088 | -0.296 | | 18.3 | | 71 | | 5.8 | | 3.1 | 82 |
| C | 0218S | 0 | 66 | 57.095 | -0.311 | 57.095 | -0.311 | | 18.3 | | 72 | | 7.1 | | 3.1 | 82 |
| D | 0318S | 30 | 79 | 60.179 | -4.284 | 60.19 | -4.227 | 20.7 | 24.4 | 101 | 104 | 5.3 | 5.2 | 3.7 | 3.5 | 186 |
| D | 0318S | 0 | 80 | 60.178 | -4.279 | 60.178 | -4.279 | | 19.1 | | 92 | | 5.7 | | 3.5 | 184 |
| D | 0318S | 0 | 81 | 60.186 | -4.237 | 60.186 | -4.237 | | 19.8 | | 100 | | 5.5 | | 3.6 | 183 |
| D | 0318S | 0 | 82 | 60.194 | -4.197 | 60.194 | -4.197 | | 20.5 | | 100 | | 5.7 | | 3.2 | 182 |

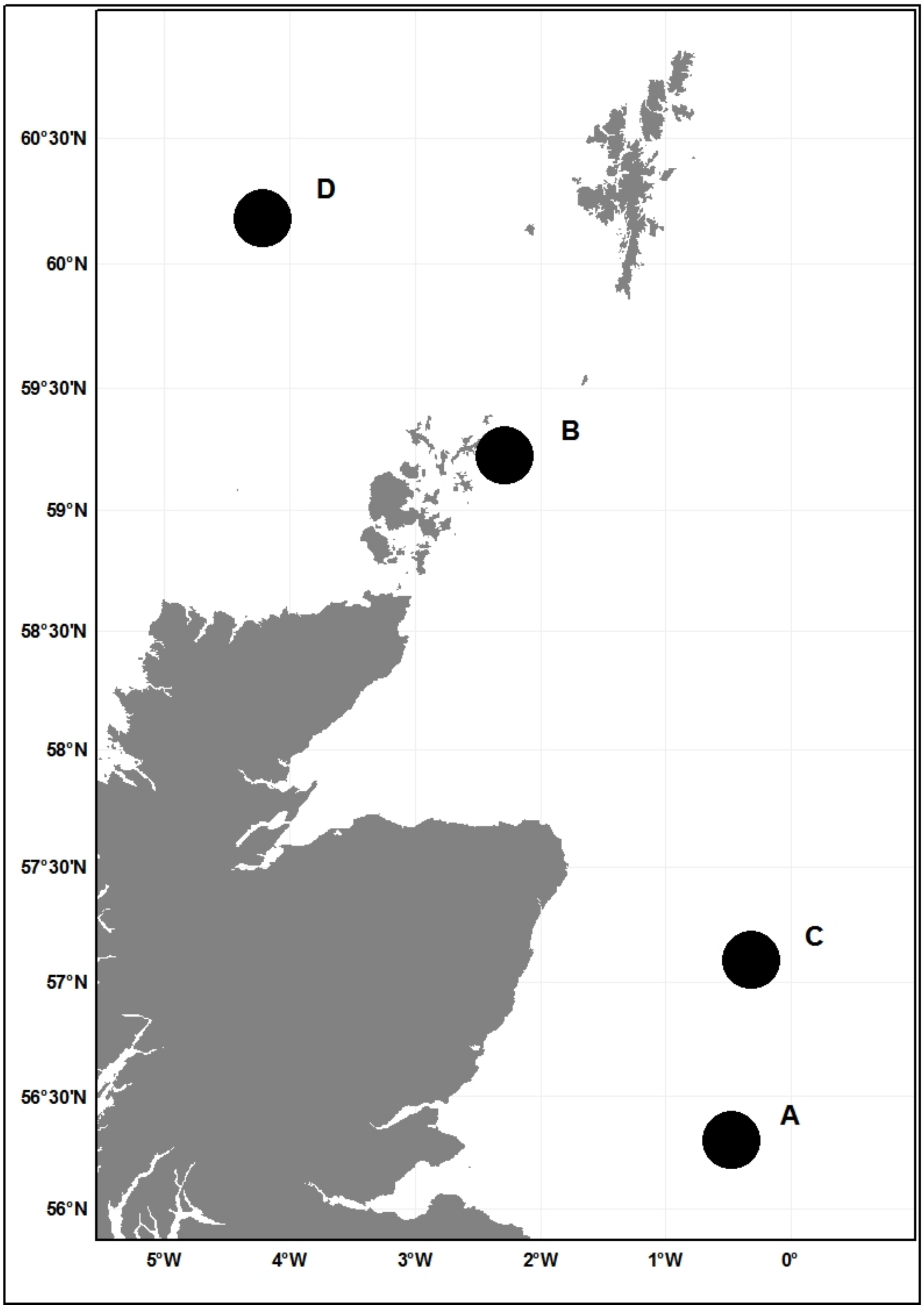


**Figure 1: Sampling locations**

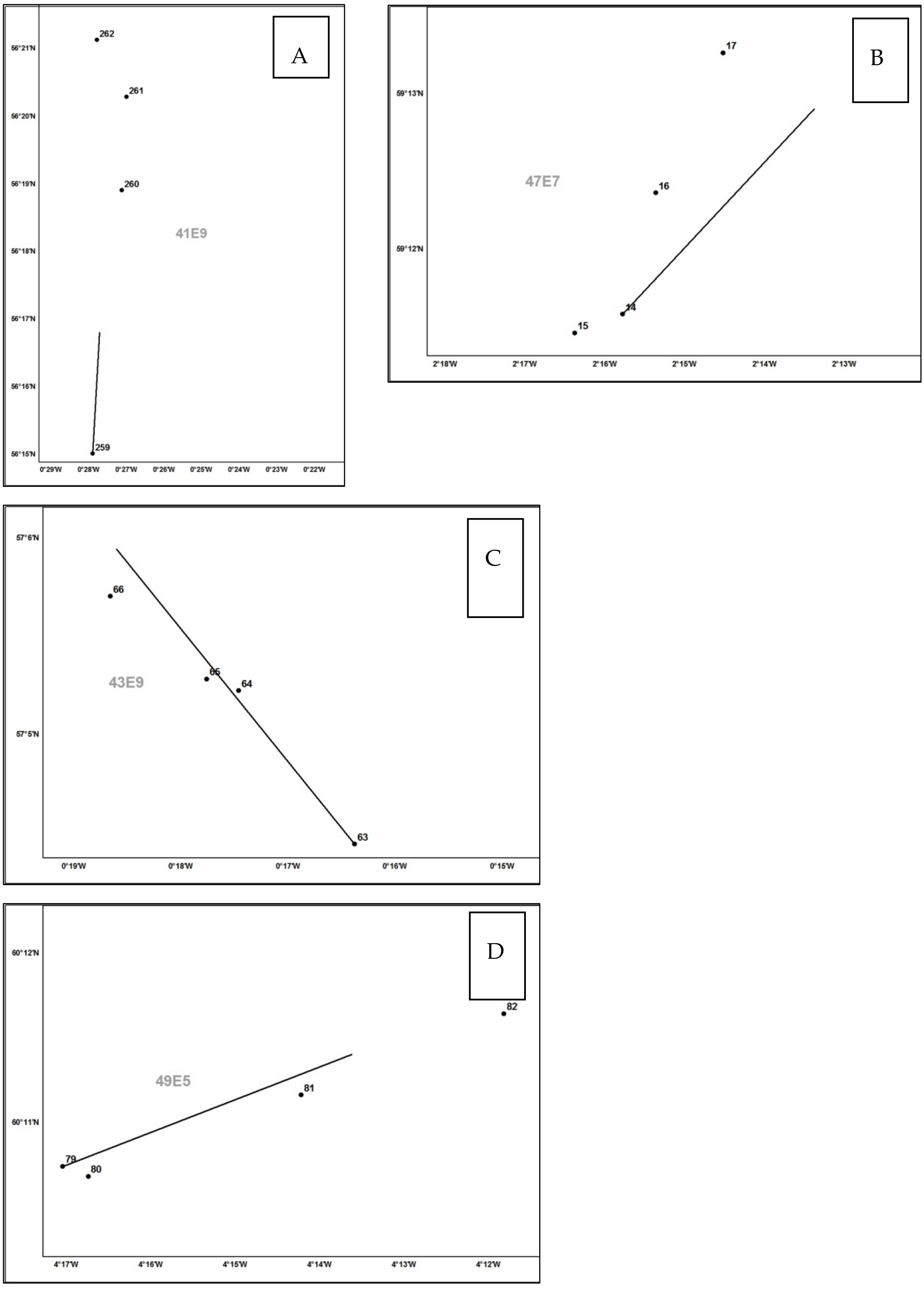


**Figure 2: Trawl tracks of standard and zero-minute tows at the 4 different locations and rectangles.**

## IBTS2018 WD4

# Catches in zero-minute tows compared to standard tows in the NS-IBTS for Denmark

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### Introduction

Based on a report on considerable catches outside the nominal tow duration of a 30 min standard tow (Hatton *et al*. 2016), the IBTS WG encourage its members to collect data on unquantified trawl times, i.e. during shooting and hauling, and to conduct so-called zero minute tows (ICES 2017). It has been argued that the catch outside the nominal tow duration is proportionally larger for shorter than for longer tows and that such an 'end effect' would cause a bias for surveys which comprises different tow durations or varying proportions of different tow durations between years although evidence for the significance of an 'end effect' in this respect this is so far missing.

### Material and Methods

Denmark conducted comparative standard and zero-minute tows at five locations during the 3Q NS-IBTS in 2017 (Figure 1). At three of the five locations 3 replicate zero-minute tow were made in a short distance parallel with the standard 30 min tow while at the two other locations just one zero-minute tow was done in the vicinity of the standard tow (Figure 2).

Time stamps were recorded as specified in section 11.1.6 of the 2017 IBTSWG (ICES 2017). During fishing, vessel position, speed over ground (SOG) and through water (STW) and depth were recorded in 30 s intervals, and the trawl geometry (Door and wing spread, vertical net opening and clearance (footrope distance to bottom)) was monitored by a ScanMar system with a time resolution of 15 s.

All catches were worked up according to standard NS-IBTS procedures. Species were grouped into pelagic and demersal gadoids, flatfish and other demersal fish, and molluscs and crustaceans in the first place. For later analysis demersal gadoids, flatfish and other demersal fish were combined and summarized as demersal fish species.

### Results and Conclusions

Towing times outside the nominal tow duration ranged from 10.3 to 13.7 min for the standard tows and amounted between 9.8 and 14.7 min for the zero-minute tows with the highest values observed at the largest depth in both cases (Table 1).

The swept area of the standard tows during the nominal tow duration of 30 min ranged between 0.2257 and 0.2568 $km^2$ but the trawl fished at the bottom some time before and after this period (Figure 2). The additional time at which the footrope had bottom contact but neither vessel speed nor net geometry was stable amounted to 6.7 min on average for the standard tows. Net geometry, vessel speed and bottom depth during the nominal tow duration of the standard tows are shown in Figure 3.

The time during which the footrope had bottom contact varied between 3.9 and 6.9 min (Table 1) and was 5.4 min on average for the zero-minute tows. Net geometry and vessel speed change considerably throughout this period (Figures 4a and 4b) and thus the calculation of swept area and a corresponding standardization of catches makes not much sense.

Species compositions varied between the five locations but were not that much different between the standard and the accompanying zero-minute tows except for rare species (Tab 2.). Little variation of the catches of demersal fish species between the replicate zero-minute tows at the same location except for pelagic species for which the catches were low in general. On average, the catch (in kg) and catch rate (in kg/h) of demersal fish species in a zero-minute tow amount to about 13 and 45 % of the values recorded in the corresponding standard tow (Tabs. 3 and 4) and species richness in the zero-minute tow was on average about 69 % of that found in the corresponding standard tow.

Catch rates and species richness observed in the zero-minute tow compared to the standard tows appears to be high considering that the effort in time for conducting a zero-minute tow is just 28 % of that for a standard 30 min tow.

Comparison of catch and catch rates did not give a clear indication that the amount of fish caught in a zero-minute tow is proportional to the amount seen in the corresponding standard tow (Figure 5) and that the maximum length recorded for demersal fish species differs between the two tow types (Figure 6).

However, further analysis of a much larger dataset, which should then also allow to analyse the three groups of demersal fish species separately, is needed before conclusions on the importance and the significance of an 'end-effect' can be made.

## References

Hatton, B., Holmes, I., Ellis, J.R., Lynam, C. 2017. Preliminary observations on catches of fish in 'zero-minute' hauls. IBTSWG 2017. WD6. 9pp.

ICES. 2017. Interim Report of the International Bottom Trawl Survey Working Group. ICES CM 2017/SSGIEOM:01. 337 pp.

**Table 1: Sampling information (all tows in 3Q 2017; *: from start of deployment until end of retrieval of the trawl doors**

| | | Total tow duration (min)* | | | | Duration trawl at bottom (min) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Standard | Zero minute tow | | | Standard | Zero minute tow | | |
| Rectangle | Depth (m) | tow | 1 | 2 | 3 | tow | 1 | 2 | 3 |
| 34F2 | 48 - 49 | 41.03 | 10.40 | | | 37.30 | 3.90 | | |
| 39F1 | 47 - 48 | 41.63 | 11.02 | 10.90 | 11.57 | 35.87 | 4.62 | 3.97 | 4.95 |
| 41F1 | 83 | 43.70 | 14.68 | | | 36.73 | 6.55 | | |
| 41F4 | 69 | 43.33 | 13.22 | 13.50 | 14.45 | 38.13 | 6.88 | 6.50 | 6.95 |
| 43F7 | 34 - 39 | 40.30 | 10.30 | 9.83 | 9.98 | 36.00 | 5.53 | 4.90 | 4.88 |

**Table 2a: Species compositions for sampling locations A and B.**

| | | Station 40 (standard tow) | | | | Station 43 (zero-minute tow) | | | |
|---|---|---|---|---|---|---|---|---|---|
| Group | Species | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ |
| Pelagic fish | Clupea harengus | 1.31 | 16 | 18.0 | 24.0 | 0.17 | 2 | 21.5 | 21.5 |
| | Scomber scombrus | 0.92 | 2 | 37.0 | 38.0 | 0.46 | 2 | 25.0 | 30.0 |
| | Trachurus trachurus | 16.88 | 151 | 15.0 | 28.0 | 0.93 | 8 | 21.0 | 23.0 |
| Demersal gadoids | Gadus morhua | 1.10 | 5 | 22.0 | 29.0 | 0.54 | 3 | 24.0 | 28.0 |
| | Merlangius merlangus | 1520.25 | 21493 | 16.0 | 31.0 | 55.45 | 810 | 16.0 | 28.0 |
| | Trisopterus luscus | 0.12 | 1 | 22.0 | 22.0 | | | | |
| | Trisopterus minutus | 0.21 | 5 | 14.0 | 18.0 | 0.03 | 1 | 15.0 | 15.0 |
| Flatfish | Buglossidium luteum | 0.01 | 1 | 10.0 | 10.0 | | | | |
| | Limanda limanda | 19.68 | 268 | 15.0 | 26.0 | 3.89 | 55 | 12.0 | 24.0 |
| | Microstomus kitt | 0.51 | 3 | 23.0 | 26.0 | 0.35 | 1 | 30.0 | 30.0 |
| | Pleuronectes platessa | 2.01 | 13 | 17.0 | 29.0 | 0.29 | 3 | 20.0 | 23.0 |
| Other demersal fish | Callionymus lyra | 0.30 | 6 | 15.0 | 22.0 | 0.05 | 1 | 18.0 | 18.0 |
| | Chelidonichthys lucerna | 0.76 | 1 | 40.0 | 40.0 | | | | |
| | Echiichthys vipera | 0.31 | 19 | 8.0 | 13.0 | 0.08 | 5 | 8.0 | 11.0 |
| | Eutrigla gurnardus | 0.65 | 9 | 18.0 | 23.0 | 0.35 | 4 | 21.0 | 23.0 |
| | Mullus surmuletus | 2.11 | 14 | 15.0 | 26.0 | 0.69 | 4 | 22.0 | 26.0 |
| | Mustelus asterias | 2.84 | 3 | 49.0 | 70.0 | | | | |
| | Raja montagui | | | | | 0.26 | 1 | 34.0 | 34.0 |
| | Raja clavata | 2.98 | 1 | 77.0 | 77.0 | | | | |
| | Scyliorhinus canicula | 30.84 | 74 | 21.0 | 60.0 | 3.38 | 11 | 29.0 | 58.0 |
| Molluscs | Aequipecten opercularis | 0.03 | 2 | na | na | | | | |
| | Alloteuthis subulata | 0.16 | 22 | 4.0 | 9.0 | 0.09 | 15 | 5.0 | 9.0 |
| Total pelagic fish | | 19.11 | 169 | 15.0 | 38.0 | 1.56 | 12 | 21.0 | 30.0 |
| Total demersal fish | | 1584.70 | 21917 | 8.0 | 77.0 | 65.35 | 899 | 8.0 | 58.0 |
| Total number of pelagic fish taxa | | 3 | | | | 3 | | | |
| Total number demersal fish taxa | | 16 | | | | 12 | | | |

| | | Station 77 (standard tow) | | | | Station 79 (zero-minute tow) | | | | Station 80 (zero-minute tow) | | | | Station 81 (zero-minute tow) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Species | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ |
| Pelagic fish | Clupea harengus | 0.05 | 1 | 19.0 | 19.0 | | | | | | | | | | | | |
| | Scomber scombrus | | | | | 0.15 | 1 | 26.0 | 26.0 | | | | | | | | |
| Demersal gadoids | Melanogrammus aeglefinus | 0.08 | 1 | 21.0 | 21.0 | 0.27 | 1 | 31.0 | 31.0 | | | | | | | | |
| | Merlangius merlangus | 0.71 | 11 | 15.0 | 24.0 | 0.33 | 5 | 14.0 | 27.0 | 0.48 | 4 | 20.0 | 33.0 | 0.24 | 3 | 13.0 | 27.0 |
| Flatfish | Arnoglossus laterna | 0.04 | 5 | 9.0 | 10.0 | 0.01 | 1 | 10.0 | 10.0 | 0.01 | 1 | 10.0 | 10.0 | 0.01 | 1 | 10.0 | 10.0 |
| | Buglossidium luteum | 0.02 | 2 | 8.0 | 9.0 | 0.01 | 1 | 9.0 | 9.0 | | | | | | | | |
| | Limanda limanda | 120.80 | 1489 | 11.0 | 30.0 | 22.20 | 311 | 10.0 | 25.0 | 17.50 | 262 | 9.00 | 25.0 | 21.70 | 299 | 11.0 | 27.0 |
| | Microstomus kitt | 2.87 | 26 | 16 | 27 | 0.43 | 4 | 18 | 26 | 0.20 | 3 | 17.0 | 21.0 | 0.86 | 8 | 18.0 | 27.0 |
| | Pleuronectes platessa | 7.39 | 34 | 21.0 | 36.0 | 1.50 | 7 | 22.0 | 36.0 | 1.69 | 8 | 23.0 | 34.0 | 2.82 | 12 | 21.0 | 35.0 |
| Other demersal fish | Amblyraja radiata | 0.38 | 1 | 34.0 | 34.0 | | | | | | | | | | | | |
| | Callionymus lyra | | | | | 0.04 | 1 | 20.0 | 20.0 | 0.08 | 2 | 20.0 | 23.0 | | | | |
| | Eutrigla gurnardus | 19.90 | 244 | 12.0 | 31.0 | 5.78 | 64 | 15.0 | 30.0 | 1.29 | 15 | 15.0 | 25.0 | 1.45 | 19 | 13.0 | 26.0 |
| | Hyperoplus lanceolatus | 0.10 | 3 | 22.0 | 22.0 | | | | | | | | | | | | |
| | Mullus surmuletus | 0.18 | 1 | 26.0 | 26.0 | | | | | | | | | | | | |
| Crustaceans | Cancer pagurus | 1.67 | 2 | 15.9 | 19.9 | | | | | | | | | 1.20 | 1 | 19.9 | 19.9 |
| Molluscs | Aequipecten opercularis | | | | | | | | | 0.06 | 1 | na | na | 0.05 | 1 | na | na |
| | Illex coindetii | 0.16 | 3 | 11.0 | 12.0 | 0.06 | 1 | 13.0 | 13.0 | 0.04 | 2 | 8.0 | 9.0 | 0.06 | 1 | 12.0 | 12.0 |
| | Loligo forbesii | 0.42 | 45 | 3.0 | 17.0 | 0.05 | 8 | 3.0 | 5.0 | 0.12 | 20 | 3.0 | 5.0 | 0.01 | 1 | 4.0 | 4.0 |
| Total pelagic fish | | 0.05 | 1 | 19.0 | 19.0 | 0.15 | 1 | 26.0 | 26.0 | 0.00 | 0 | 0.0 | 0.0 | 0.00 | 0 | 0.0 | 0.0 |
| Total demersal fish | | 152.45 | 1818 | 8.0 | 36.0 | 30.57 | 395 | 9.0 | 36.0 | 21.24 | 295 | 9.0 | 34.0 | 27.09 | 342 | 10.0 | 35.0 |
| Total number of pelagic fish taxa | | 1 | | | | 1 | | | | 0 | | | | 0 | | | |
| Total number demersal fish taxa | | 11 | | | | 9 | | | | 7 | | | | 6 | | | |

**Table 2b: Species compositions for sampling locations C and D.**

| | | Station 86 (standard tow) | | | | Station 88 (zero-minute tow) | | | |
|---|---|---|---|---|---|---|---|---|---|
| Group | Species | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ |
| Pelagic fish | Scomber scombrus | 1.32 | 4 | 31.0 | 35.0 | | | | |
| Demersal gadoids | Gadus morhua | 0.13 | 1 | 24.0 | 24.0 | | | | |
| | Melanogrammus aeglefinus | 211.03 | 687 | 23.0 | 40.0 | 29.30 | 104 | 22.0 | 40.0 |
| | Merlangius merlangus | 113.87 | 864 | 19.0 | 32.0 | 24.60 | 173 | 19.0 | 35.0 |
| | Trisopterus esmarkii | 0.50 | 13 | 14.0 | 18.0 | 0.13 | 3 | 17.0 | 18.0 |
| Flatfish | Glyptocephalus cynoglossus | | | | | 0.35 | 1 | 35.0 | 35.0 |
| | Hippoglossoides platessoides | 1.59 | 49 | 11.0 | 20.0 | 1.09 | 32 | 12.0 | 19.0 |
| | Limanda limanda | 8.20 | 153 | 15.0 | 20.0 | 5.74 | 99 | 15.0 | 22.0 |
| | Microstomus kitt | 0.83 | 8 | 18.0 | 26.0 | 0.46 | 5 | 16.0 | 24.0 |
| | Pleuronectes platessa | 6.94 | 24 | 22.0 | 35.0 | 1.53 | 7 | 24.0 | 32.0 |
| Other demersal fish | Agonus cataphractus | 0.02 | 1 | 15.0 | 15.0 | | | | |
| | Eutrigla gurnardus | 6.10 | 74 | 17.0 | 24.0 | 4.14 | 44 | 18.0 | 26.0 |
| | Squalus acanthias | 0.07 | 1 | 28.0 | 28.0 | | | | |
| Crustaceans | Lithodes maja | 0.17 | 1 | 6.5 | 6.5 | | | | |
| Molluscs | Illex coindetii | 1.39 | 10 | 12.0 | 23.0 | 0.33 | 5 | 9.0 | 14.0 |
| | Loligo forbesii | 0.00 | 1 | 3.0 | 3.0 | | | | |
| | Todaropsis eblanae | 0.14 | 1 | 13 | 13 | 0.11 | 1 | 11.0 | 11.0 |
| Total pelagic fish | | 1.32 | 4 | 31.0 | 35.0 | 0.00 | 0 | | |
| Total demersal fish | | 349.29 | 1875 | 11.0 | 40.0 | 67.34 | 468 | 12.0 | 40.0 |
| Total number of pelagic fish taxa | | 1 | | | | 0 | | | |
| Total number demersal fish taxa | | 11 | | | | 9 | | | |

| | | Station 93 (standard tow) | | | | Station 95 (zero-minute tow) | | | | Station 96 (zero-minute tow) | | | | Station 97 (zero-minute tow) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Species | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ |
| Pelagic fish | Clupea harengus | 0.32 | 5 | 18.0 | 23.0 | | | | | | | | | | | | |
| Demersal gadoids | Gadus morhua | 0.10 | 1 | 22.0 | 22.0 | | | | | | | | | | | | |
| | Melanogrammus aeglefinus | 0.38 | 2 | 26.0 | 28.0 | | | | | 0.01 | 1 | 10.0 | 10.0 | | | | |
| | Merlangius merlangus | 67.99 | 1084 | 14.0 | 27.0 | 0.73 | 10 | 18.0 | 27.0 | 9.65 | 143 | 15.0 | 27.0 | 2.65 | 36 | 17.0 | 28.0 |
| | Trisopterus esmarkii | | | | | | | | | 0.03 | 1 | 15.0 | 15.0 | | | | |
| Flatfish | Hippoglossoides platessoides | 6.48 | 107 | 13.0 | 25.0 | 1.05 | 15 | 14.0 | 26.0 | 1.22 | 21 | 15.0 | 25.0 | 1.75 | 32 | 14.0 | 26.0 |
| | Limanda limanda | 75.60 | 1011 | 14.0 | 25.0 | 14.60 | 197 | 14.0 | 21.0 | 17.50 | 224 | 13.0 | 24.0 | 16.60 | 216 | 13.0 | 21.0 |
| | Microstomus kitt | 12.00 | 95 | 19.0 | 32.0 | 0.62 | 6 | 18.0 | 24.0 | 3.33 | 24 | 16.0 | 29.0 | 2.45 | 21 | 18.0 | 25.0 |
| | Pleuronectes platessa | 8.20 | 25 | 21.0 | 42.0 | 0.31 | 2 | 24.0 | 26.0 | 1.55 | 5 | 25.0 | 34.0 | 1.69 | 6 | 24.0 | 35.0 |
| Other demersal fish | Amblyraja radiata | | | | | | | | | | | | | 0.83 | 1 | 46.0 | 46.0 |
| | Eutrigla gurnardus | 5.51 | 66 | 16.0 | 29.0 | 1.38 | 15 | 17.0 | 25.0 | 0.68 | 9 | 17.0 | 24.0 | 0.85 | 11 | 17.0 | 27.0 |
| Crustaceans | Lithodes maja | | | | | 0.31 | 1 | 9.3 | 9.3 | | | | | | | | |
| Molluscs | Loligo forbesii | 0.26 | 1 | 20.0 | 20.0 | | | | | | | | | 0.05 | 11 | 3.0 | 7.0 |
| | Todaropsis eblanae | 0.21 | 1 | 15.0 | 15.0 | | | | | | | | | | | | |
| Total pelagic fish | | 0.32 | 5 | 18.0 | 23.0 | 0.00 | 0 | | | 0.00 | 0 | | | 0.00 | 0 | | |
| Total demersal fish | | 176.27 | 2390 | 13.0 | 42.0 | 18.69 | 245 | 14.0 | 27.0 | 33.97 | 428 | 10.0 | 34.0 | 26.82 | 323 | 13.0 | 46.0 |
| Total number of pelagic fish taxa | | 1 | | | | 0 | | | | 0 | | | | 0 | | | |
| Total number demersal fish taxa | | 8 | | | | 6 | | | | 8 | | | | 7 | | | |

**Table 2c: Species compositions for sampling location E.**

| | | Station 109 (standard tow) | | | | Station 111 (zero-minute tow) | | | | Station 112 (zero-minute tow) | | | | Station 113 (zero-minute tow) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Species | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ | W (kg) | N | $L_{min}$ | $L_{max}$ |
| Pelagic fish | Clupea harengus | 0.10 | 3 | 16.5 | 17.5 | | | | | | | | | | | | |
| | Scomber scombrus | 0.82 | 6 | 23.0 | 28.0 | 0.91 | 3 | 30.0 | 35.0 | | | | | 1.16 | 4 | 24.0 | 35.0 |
| Demersal gadoids | Gadus morhua | 1.01 | 8 | 21.0 | 26.0 | 0.10 | 1 | 21.0 | 21.0 | 0.67 | 8 | 17.0 | 23.0 | | | | |
| | Merlangius merlangus | 5.15 | 61 | 17.0 | 26.0 | 0.39 | 8 | 6.0 | 23.0 | 1.88 | 19 | 19.0 | 25.0 | 0.01 | 2 | 5.0 | 9.0 |
| Flatfish | Limanda limanda | 41.88 | 316 | 11.0 | 32.0 | 3.53 | 26 | 12.0 | 29.0 | 5.11 | 41 | 12.0 | 30.0 | 2.33 | 26 | 13.0 | 27.0 |
| | Microstomus kitt | 0.34 | 1 | 29.0 | 29.0 | 0.24 | 1 | 27.0 | 27.0 | | | | | | | | |
| | Pleuronectes platessa | 17.40 | 48 | 22.0 | 38.0 | 3.45 | 12 | 21.0 | 38.0 | 2.99 | 9 | 28.0 | 38.0 | 1.11 | 5 | 19.0 | 34.0 |
| Other demersal fish | Amblyraja radiata | 0.11 | 1 | 24.0 | 24.0 | | | | | | | | | | | | |
| | Ammodytes marinus | 26.76 | 2732 | 11 | 16 | 1.81 | 169 | 11.0 | 16.0 | | | | | 15.30 | 1677 | 12.0 | 16.0 |
| | Callionymus lyra | 0.58 | 16 | 15 | 19 | 0.15 | 4 | 16.0 | 17.0 | 0.11 | 3 | 15.0 | 19.0 | 0.17 | 5 | 15.0 | 18.0 |
| | Eutrigla gurnardus | 169.50 | 1076 | 19 | 37 | 16.60 | 128 | 16.0 | 31.0 | 12.50 | 88 | 17.0 | 32.0 | 8.90 | 72 | 12.0 | 31.0 |
| | Hyperoplus lanceolatus | 10.48 | 289 | 21.0 | 28.0 | 0.59 | 14 | 22.0 | 30.0 | 0.08 | 2 | 24.0 | 27.0 | 2.26 | 55 | 19.0 | 29.0 |
| | Lophius piscatorius | 1.70 | 1 | 47.0 | 47.0 | 2.05 | 1 | 55.0 | 55.0 | 3.16 | 1 | 57.0 | 57.0 | | | | |
| | Trachinus draco | 0.31 | 1 | 36.0 | 36.0 | | | | | | | | | 0.50 | 2 | 29.0 | 36.0 |
| Molluscs | Loligo forbesii | 0.05 | 5 | 4.0 | 5.0 | 0.20 | 2 | 13.0 | 14.0 | 0.01 | 1 | 4.0 | 4.0 | 0.49 | 44 | 4.0 | 8.0 |
| Total pelagic fish | | 0.92 | 9 | 16.5 | 28.0 | 0.91 | 3 | 30.0 | 35.0 | 0.00 | 0 | | | 1.16 | 4 | 24.0 | 35.0 |
| Total demersal fish | | 275.22 | 4550 | 11.0 | 47.0 | 28.90 | 365 | 6.0 | 55.0 | 26.49 | 171 | 12.0 | 57.0 | 30.57 | 1844 | 5.0 | 36.0 |
| Total number of pelagic fish taxa | | 2 | | | | 1 | | | | 0 | | | | 1 | | | |
| Total number demersal fish taxa | | 12 | | | | 10 | | | | 8 | | | | 8 | | | |

**Table 3: Comparison of total catch and species richness for taxonomic groups.**

| | | Pelagic fish species catch (kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Standard | Zero minute tow | | | | | Average for zero minute |
| Rectangle | Depth (m) | tow | 1 | 2 | 3 | mean | cv | tow in % of standard tow |
| 34F2 | 48 - 49 | 19.11 | 1.56 | | | | | 8.16 |
| 39F1 | 47 - 48 | 0.05 | 0.15 | 0.00 | 0.00 | 0.05 | 1.73 | 100.00 |
| 41F1 | 83 | 1.32 | 0.00 | | | | | 0.00 |
| 41F4 | 69 | 0.32 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 |
| 43F7 | 34 - 39 | 0.92 | 0.91 | 0.00 | 1.16 | 0.69 | 0.88 | 75.00 |
| | | | | | | | mean: | 36.63 |
| | | | | | | | cv: | 1.29 |
| | | | | | | | | |
| | | Demersal fish species catch (kg) | | | | | | |
| | | Standard | Zero minute tow | | | | | Average for zero minute |
| Rectangle | Depth (m) | tow | 1 | 2 | 3 | mean | cv | tow in % of standard tow |
| 34F2 | 48 - 49 | 1584.70 | 65.35 | | | | | 4.12 |
| 39F1 | 47 - 48 | 152.45 | 30.57 | 21.24 | 27.09 | 26.30 | 0.18 | 17.25 |
| 41F1 | 83 | 349.29 | 67.34 | | | | | 19.28 |
| 41F4 | 69 | 176.27 | 18.69 | 33.97 | 26.82 | 26.49 | | 15.03 |
| 43F7 | 34 - 39 | 275.22 | 28.90 | 26.49 | 30.57 | 28.65 | 0.07 | 10.41 |
| | | | | | | | mean: | 13.22 |
| | | | | | | | cv: | 0.46 |
| | | | | | | | | |
| | | Number of pelagic and demersal fish species | | | | | | |
| | | Standard | Zero minute tow | | | | | Average for zero minute |
| Rectangle | Depth (m) | tow | 1 | 2 | 3 | mean | cv | tow in % of standard tow |
| 34F2 | 48 - 49 | 21 | 16 | | | | | 76.19 |
| 39F1 | 47 - 48 | 16 | 12 | 10 | 10 | 10.67 | 0.11 | 66.67 |
| 41F1 | 83 | 16 | 11 | | | | | 68.75 |
| 41F4 | 69 | 12 | 7 | 8 | 8 | 7.67 | 0.08 | 63.89 |
| 43F7 | 34 - 39 | 15 | 12 | 9 | 10 | 10.33 | 0.15 | 68.89 |
| | | | | | | | mean: | 68.88 |
| | | | | | | | cv: | 0.07 |

**Table 4: Comparison of catch rates**

| | | Pelagic fish species CPUE (kg/h)* | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Standard | Zero minute tow | | | | | Average for zero minute |
| Rectangle | Depth (m) | tow | 1 | 2 | 3 | mean | cv | tow in % of standard tow |
| 34F2 | 48 - 49 | 27.94 | 9.00 | | | | | 32.21 |
| 39F1 | 47 - 48 | 0.07 | 0.82 | 0.00 | 0.00 | 0.27 | 1.73 | 377.91 |
| 41F1 | 83 | 1.81 | 0.00 | | | | | 0.00 |
| 41F4 | 69 | 0.44 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 |
| 43F7 | 34 - 39 | 1.37 | 5.30 | 0.00 | 6.97 | 4.09 | 0.89 | 298.66 |
| | | | | | | | mean: | 141.76 |
| | | | | | | | cv: | 1.28 |
| | | | | | | | | |
| | | Demersal fish species CPUE (kg/h)* | | | | | | |
| | | Standard | Zero minute tow | | | | | Average for zero minute |
| Rectangle | Depth (m) | tow | 1 | 2 | 3 | mean | cv | tow in % of standard tow |
| 34F2 | 48 - 49 | 2317.19 | 377.02 | | | | | 16.27 |
| 39F1 | 47 - 48 | 219.70 | 166.49 | 116.92 | 140.52 | 141.31 | 0.18 | 64.32 |
| 41F1 | 83 | 479.57 | 275.17 | | | | | 57.38 |
| 41F4 | 69 | 244.07 | 84.85 | 150.98 | 111.36 | 115.73 | | 47.42 |
| 43F7 | 34 - 39 | 409.76 | 168.35 | 161.63 | 183.73 | 171.24 | 0.07 | 41.79 |
| | | | | | | | mean: | 45.43 |
| | | | | | | | cv: | 0.41 |
| | | | | | | | | |
| *: tow duration from start of deployment until end of retrieval of the trawl doors | | | | | | | | |

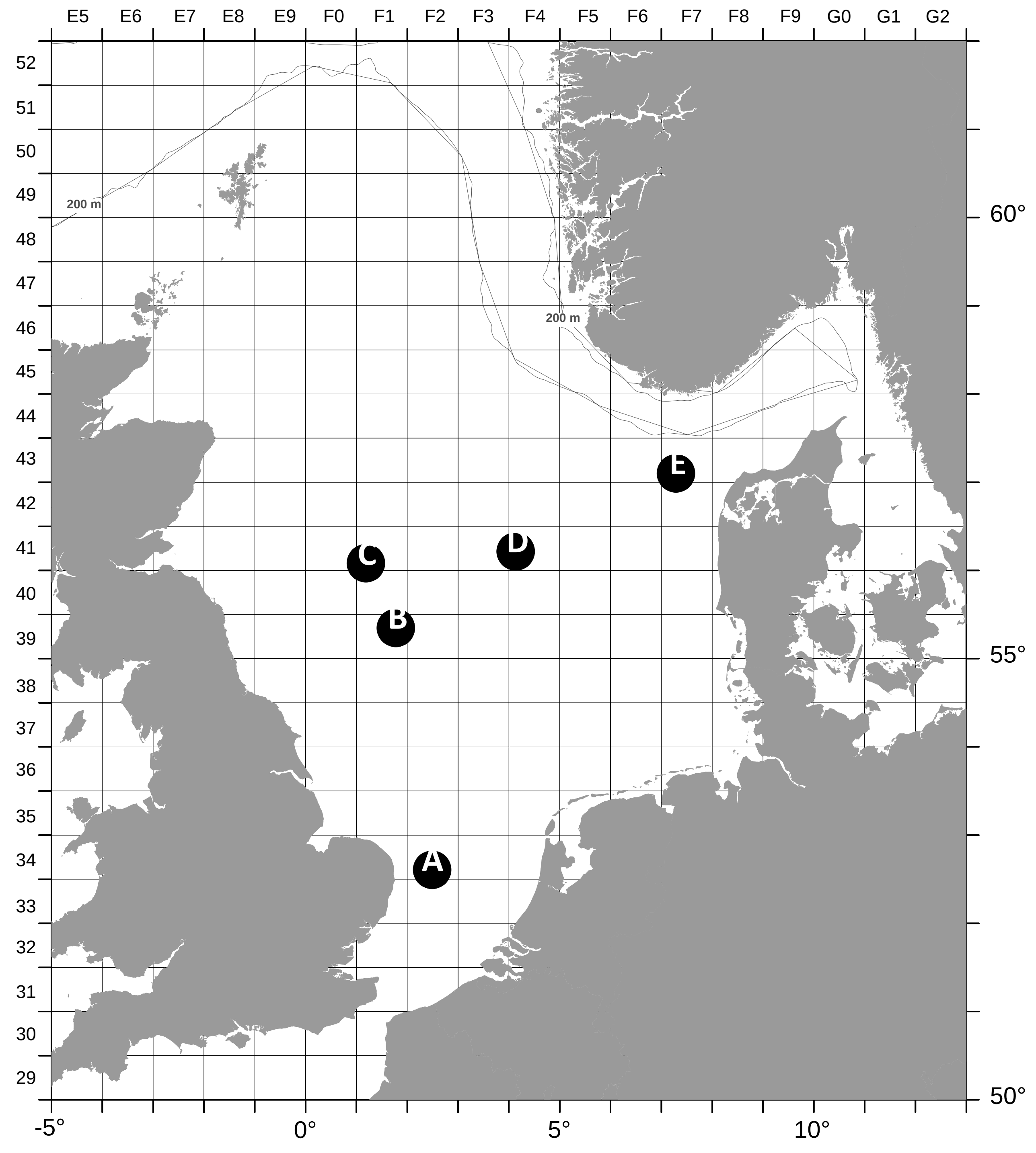


**Figure 1: Sampling locations**

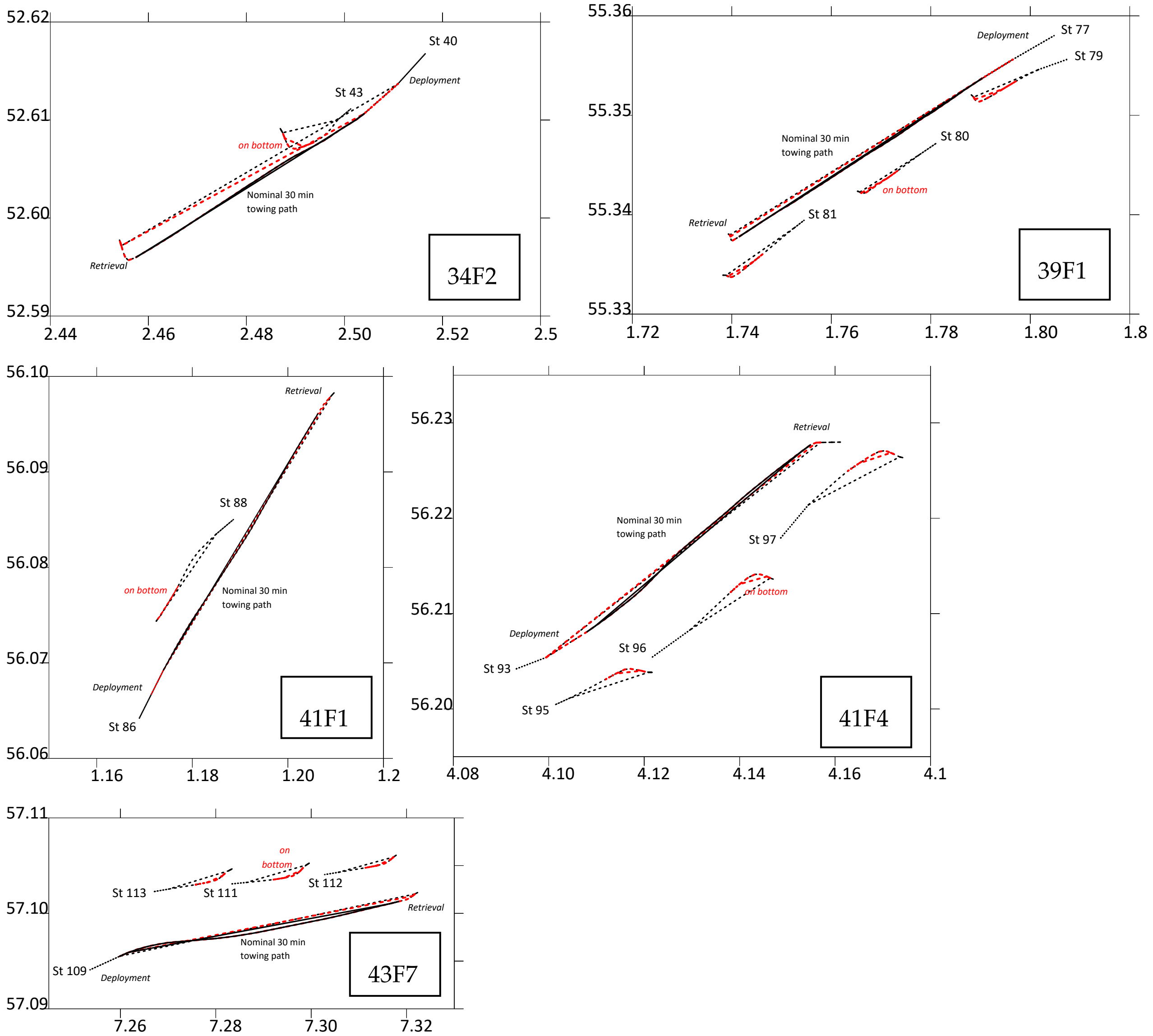


**Figure 2: Trawl tracks of standard and zero-minute tows at the five different locations and rectangles (position data recorded in 30 s intervals)**

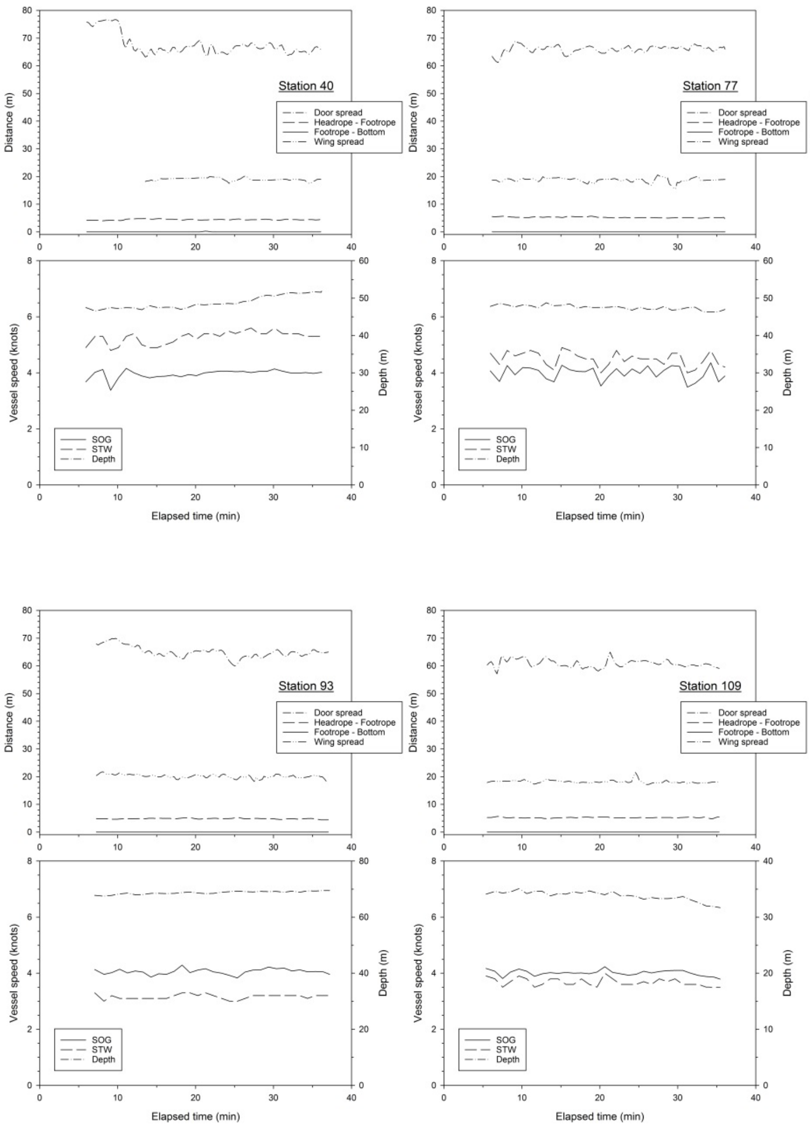


**Figure 3: Gear geometry and tow characteristics of standard tows (data for nominal 30 min tow duration only, time resolution: 15 s)**

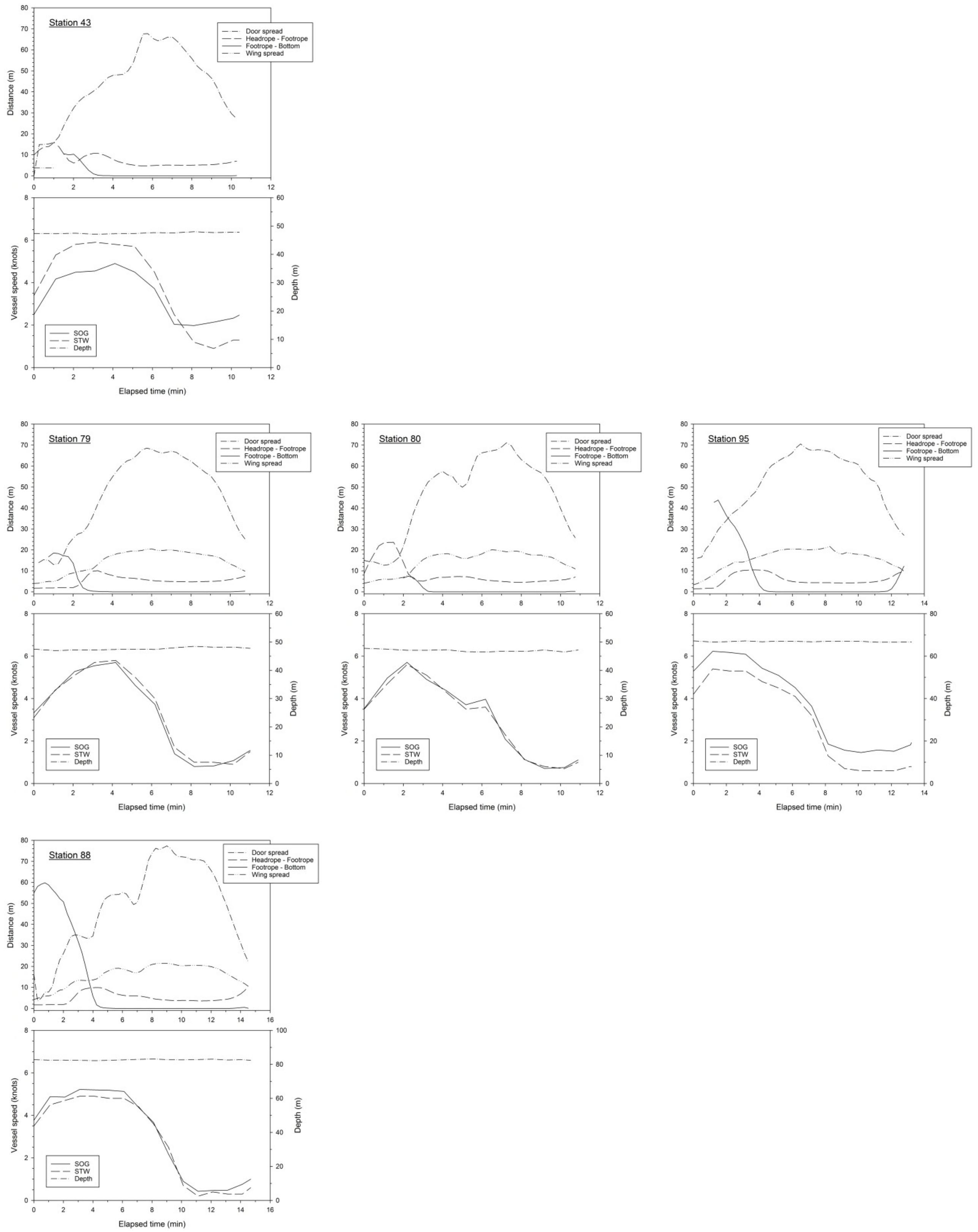


**Figure 4a: Gear geometry and tow characteristics of zero-minute tows, sampling locations A, B and C (time resolution: 15 s).**

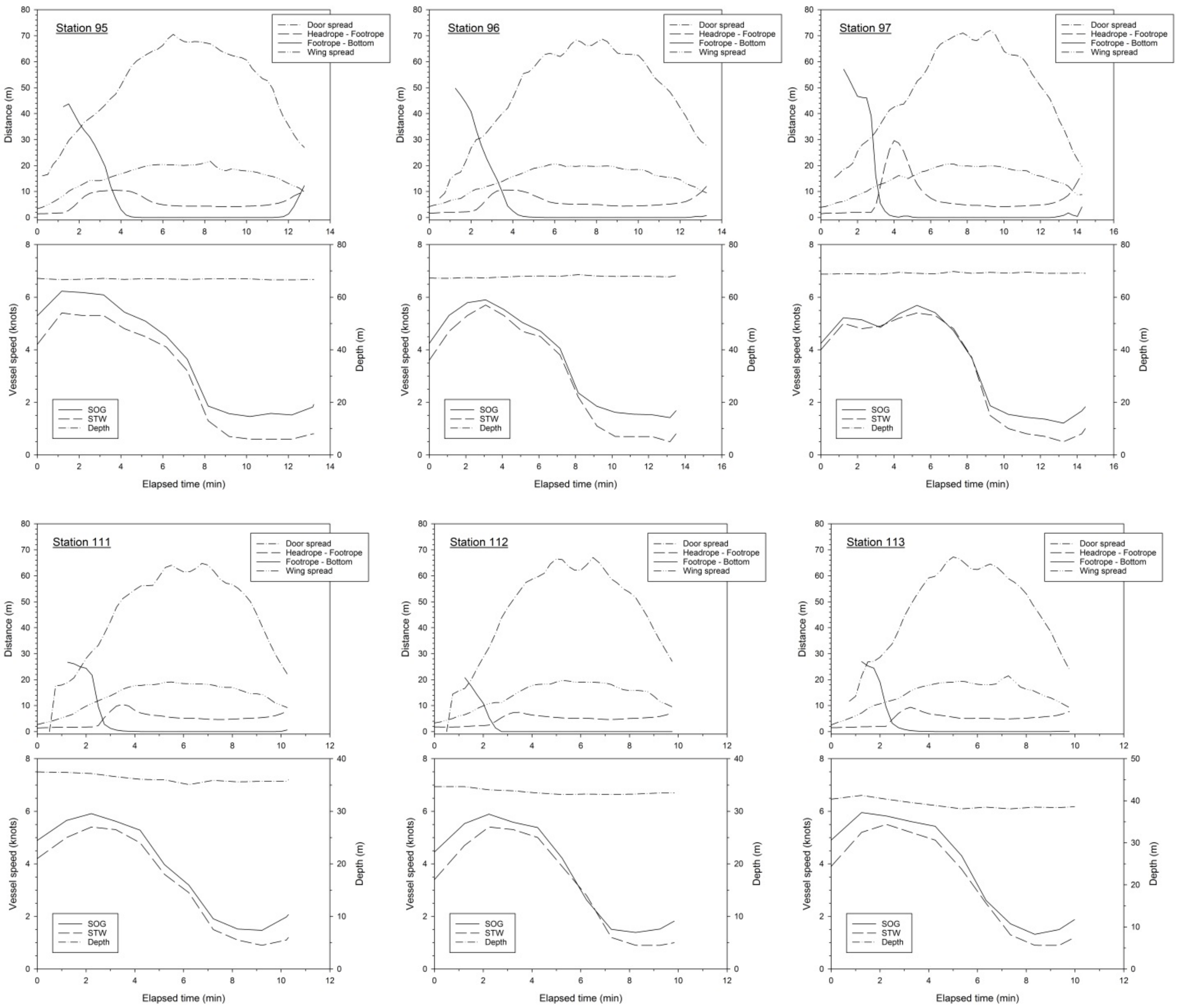


**Figure 4b: Gear geometry and tow characteristics of zero-minute tows, sampling locations D and E (time resolution: 15 s).**

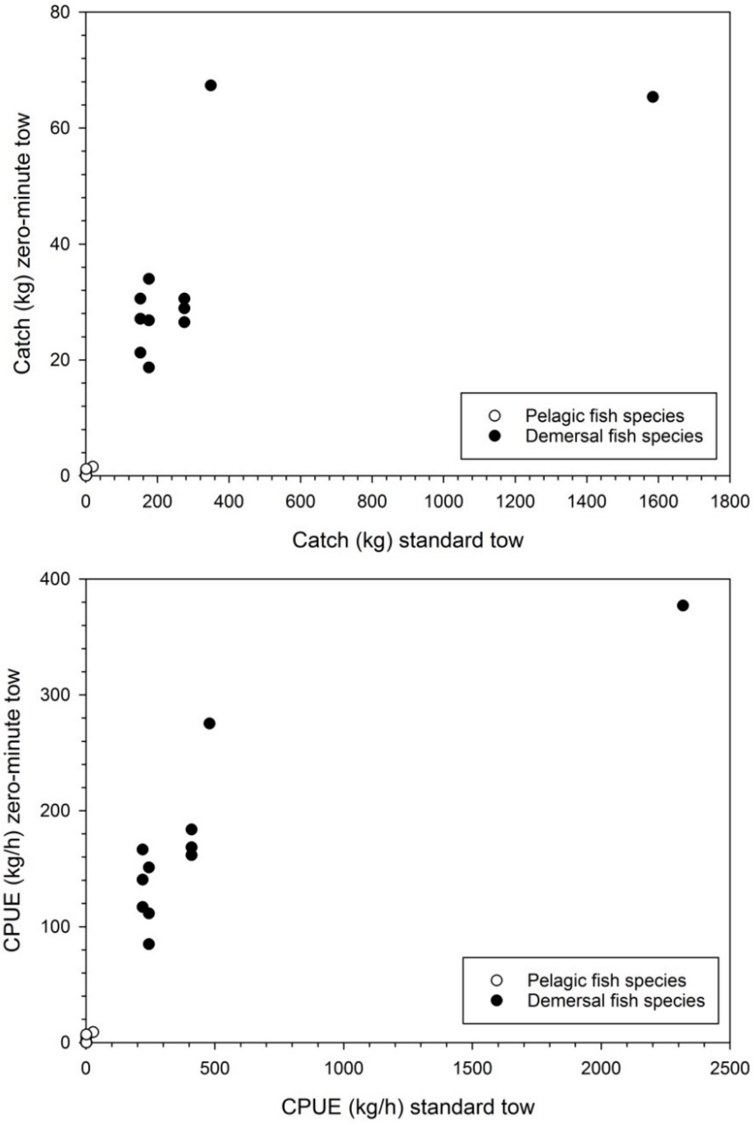


**Figure 5: Comparison of catch (kg) and CPUE (kg/h) of standard tow and zero minute tows.**

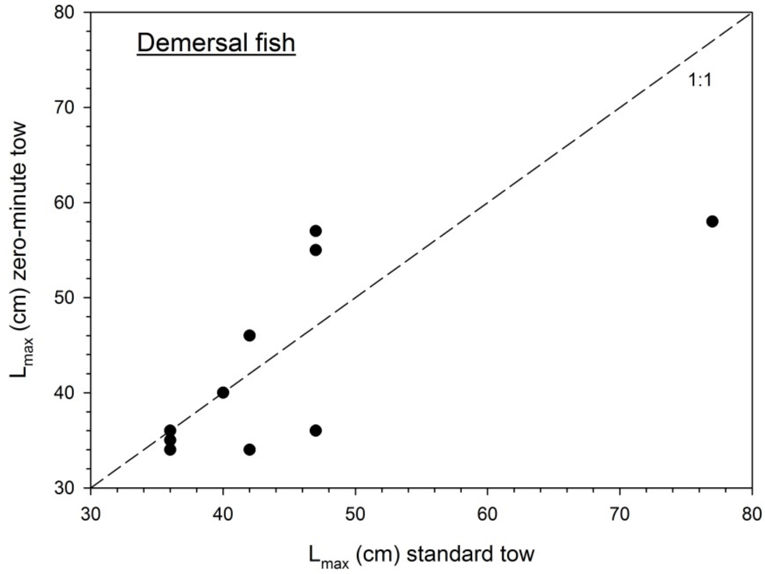


**Figure 6: Comparison of maximum length of demersal fish species for standard and zero-minute tows.**

# IBTS2018 WD5

# Catches in zero-minute tows compared to standard tows in the NS-IBTS for France

### Table 1: Sampling information (*: from start of deployment until end of retrieval of the trawl doors)

| Rectangle | Depth (m) | Standard tows | Zero minute tow |
|---|---|---|---|
| 36F5 | 29 | 42.09 | 9.16 |
| 34F2 | 39 - 40 | 47.18 | 7.26 |
| 32F1 | 35 - 32 | 41.41 | 11.30 |
| 34F3 | 40 - 41 | 46.02 | 8.45 |
| 36F2 | 36 | 49.01 | 12.42 |
| 35F1 | 51 - 50 | 46.55 | 16.35 |
| 37F3 | 48 | 44.02 | 10.02 |

### Table 2: Species compositions

| 34F3 | | Station W0039 (Standard Tow) | | | | Station W9939 (0 minute Tow) | | | | Station W0939 (15 minute Tow) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Goup | Species | W (kg) | N | Lmin | Lmax | W (kg) | N | Lmin | Lmax | W (kg) | N | Lmin | Lmax |
| Flatfish | *Buglossidium luteum* | | | | | | | | | 0.59 | 7 | 7 | 10 |
| | *Limanda Limanda* | 19.5 | 397 | 11 | 25 | 5.3 | 88 | 12 | 25 | 24.04 | 448 | 11 | 24 |
| | *Pleuronectes platessa* | 1.2 | 11 | 16 | 36 | 0.3 | 2 | 19 | 29 | 0.62 | 8 | 17 | 23 |
| | *Platichthys flesus* | 0.3 | 1 | 27 | 27 | | | | | | | | |
| | *Microchirus variegatus* | | | | | | | | | 0.042 | 1 | 15 | 15 |
| | *Solea solea* | | | | | | | | | 0.573 | 2 | 25 | 34 |
| Demersal Gadoids | *Trisopterus minutus* | 0.3 | 5 | 17 | 20 | | | | | | | | |
| | *Trisopterus luscus* | | | | | | | | | 0.25 | 6 | 12 | 19 |
| | *Merlangius merlangus* | 282.3 | 4453 | 13 | 40 | 7 | 93 | 14 | 31 | 96.1 | 1486 | 14 | 36 |
| | *Gadus morhua* | 0.7 | 2 | 28 | 35 | | | | | 1.129 | 2 | 32 | 43 |
| Other demersal fish | *Agonus cataphractus* | 0 | 1 | 7 | 7 | | | | | | | | |
| | *Alloteuthis* | | | | | | | | | 0.008 | 3 | | |
| | *Ammodytes marinus* | 0 | 1 | 5 | 5 | | | | | 0.006 | 7 | 6 | 7 |
| | *Dicentrarchus labrax* | 0.3 | 1 | 32 | 32 | | | | | 0.48 | 1 | 35 | 35 |
| | *Echiichthys vipera* | 0.1 | 3 | 8 | 14 | | | | | 0.03 | 2 | 9 | 13 |
| | *Eutrigla gurnardus* | 2.1 | 23 | 11 | 28 | | | | | 1.05 | 12 | 15 | 26 |
| | *Mullus surmuletus* | 0.1 | 1 | 19 | 19 | 0.1 | 2 | 14 | 18 | | | | |
| | *Myoxocephalus scorpius* | | | | | | | | | 0.16 | 1 | 21 | 21 |
| | *Scyliorhinus canicula* | 0.3 | 2 | 34 | 38 | | | | | 0.971 | 4 | 34 | 56 |
| | *Sepiola* | | | | | | | | | 0.001 | 1 | | |
| Pelagic fish | *Sprattus sprattus* | 0 | 3 | 11 | 12 | 0.1 | 15 | 10 | 13 | 2.45 | 221 | 10 | 12.5 |
| | *Clupea harengus* | 0.4 | 6 | 17.5 | 17.5 | | | | | 0.2 | 4 | 18 | 21.5 |
| | *Trachurus trachurus* | 0.1 | 1 | 25 | 25 | | | | | 0.018 | 1 | 13 | 13 |
| Crustacea | *Necora puber* | 0 | 1 | | | | | | | 0.033 | 2 | | |
| Benthos | | | | | | | | | | | | | |
| Total pelagic fish | | 0.6 | 10 | 17.8 | 18.2 | 0.1 | 15 | 10 | 13 | 2.668 | 226 | 14 | 16 |
| Total demersal fish | | 286.1 | 4492 | 17.4 | | 7.1 | 95 | 14 | 24.5 | 100.185 | 1525 | 20 | 28 |
| Total number of pelagic fish taxa | | 3 | | | | 1 | | | | 3 | | | |
| Total number of demersal fish taxa | | 10 | | | | 2 | | | | 11 | | | |

| 36F2 | | Station W0044(Standard Tow) | | | | Station W9944(0 minute Tow) | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Goup** | **Species** | **W (kg)** | **N** | **Lmin** | **Lmax** | **W (kg)** | **N** | **Lmin** | **Lmax** |
| **Flatfish** | *Limanda limanda* | 7.1 | 136.0 | 12.0 | 26.0 | 0.3 | 4.0 | 15.0 | 24.0 |
| | *Pleuronectes platessa* | 5.7 | 62.0 | 14.0 | 31.0 | | | | |
| | *Buglossidium luteum* | 0.1 | 6.0 | 6.0 | 10.0 | | | | |
| **Demersal Gadoids** | *Merlangius merlangus* | 68.3 | 638.0 | 16.0 | 31.0 | 8.7 | 106.0 | 16.0 | 28.0 |
| **Other demersal fish** | *Echiichthys vipera* | 0.1 | 4.0 | 8.0 | 13.0 | | | | |
| | *Eutrigla gurnardus* | 5.8 | 55.0 | 11.0 | 33.0 | | | | |
| | *Mullus surmuletus* | 0.0 | 1.0 | 11.0 | 11.0 | | | | |
| | *Myoxocephalus scorpius* | 0.3 | 4.0 | 13.0 | 21.0 | | | | |
| | *Loligo vulgaris* | 1.9 | 7.0 | 12.0 | 26.0 | 0.2 | 1.0 | | |
| | *Scyliorhinus canicula* | 2.3 | 4.0 | 47.0 | 67.0 | | | | |
| | *Sepiola* | 0.0 | 1.0 | | | | | | |
| **Pelagic fish** | *Clupea harengus* | 4.2 | 81.0 | 17.0 | 23.0 | 0.1 | 4.0 | 10.0 | 18.0 |
| | *Engraulis encrasicolus* | 0.0 | 7.0 | 8.5 | 12.0 | | | | |
| | *Sprattus sprattus* | 18.9 | 1573.0 | 7.0 | 13.5 | | | | |
| **Crustacea** | | | | | | | | | |
| **Benthos** | | | | | | | | | |
| **Total pelagic fish** | | 23.1 | 1661.0 | 10.8 | 16.2 | 0.1 | 4.0 | 10.0 | 18.0 |
| **Total demersal fish** | | 78.7 | 714.0 | 16.9 | 28.9 | 8.9 | 107.0 | 16.0 | 28.0 |
| **Total number of pelagic fish taxa** | | 3 | | | | 1 | | | |
| **Total number of demersal fish taxa** | | 8 | | | | 2 | | | |

| **35F1** | | Station W0061 (Standard Tow) | | | | Station W9961 (0 minute Tow) | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Goup** | **Species** | **W (kg)** | **N** | **Lmin** | **Lmax** | **W (kg)** | **N** | **Lmin** | **Lmax** |
| **Flatfish** | *Limanda limanda* | 3.2 | 45.0 | 14.0 | 26.0 | 0.3 | 4.0 | 16.0 | 21.0 |
| | *Pleurnectesse platessa* | | | | | 0.2 | 1.0 | 26.0 | 26.0 |
| | *Microstomus kitt* | 0.1 | 5.0 | 9.0 | 17.0 | | | | |
| **Demersal Gadoids** | *Gadus morhua* | 0.6 | 1.0 | 41.0 | 41.0 | | | | |
| | *Trisopterus minutus* | 1.0 | 37.0 | 10.0 | 17.0 | 0.3 | 12.0 | 11.0 | 15.0 |
| | *Merlangius merlangus* | 10.4 | 73.0 | 16.0 | 34.0 | 0.2 | 2.0 | 25.0 | 26.0 |
| **Other demersal fish** | *Agonus cataphractus* | 0.1 | 17.0 | 5.0 | 15.0 | | | | |
| | *Ammodytes tobianus* | 0.0 | 2.0 | 15.0 | 17.0 | | | | |
| | *Callionymus lyra* | 0.0 | 1.0 | 5.0 | 5.0 | | | | |
| | *Ciliata mustela* | 0.1 | 3.0 | 13.0 | 13.0 | | | | |
| | *Ciliata septentrionalis* | 0.0 | 1.0 | 10.0 | 10.0 | | | | |
| | *Liparis liparis* | 1.1 | 29.0 | 10.0 | 14.0 | | | | |
| | *Loligo vulgaris* | 0.2 | 1.0 | 20.0 | 20.0 | | | | |
| | *Myoxocephalus scorpius* | 0.1 | 1.0 | 15.0 | 15.0 | | | | |
| | *Pholis gunnellus* | 0.0 | 2.0 | 13.0 | 17.8 | | | | |
| | *Scyliorhinus canicula* | 5.3 | 5.0 | 57.0 | 64.0 | | | | |
| | *Taurulus bubalis* | 0.1 | 1.0 | 14.0 | 14.0 | | | | |
| **Pelagic fish** | *Clupea harengus* | 0.4 | 19.0 | 10.5 | 31.0 | | | | |
| | *Sprattus sprattus* | 0.2 | 30.0 | 8.0 | 12.5 | 0.1 | 4.0 | 10.0 | 13.0 |
| **Crustacea** | *Cancer pagurus* | 0.7 | 2.0 | 2.9 | 16.8 | 1.5 | 5.0 | | |
| | *Homarus gammarus* | 1.8 | 8.0 | 5.8 | 8.5 | | | | |
| | *Necora puber* | | | | | 0.3 | 3.0 | | |
| **Benthos** | | | | | | 3.9 | | | |
| **Total pelagic fish** | | 0.6 | 49.0 | 9.3 | 21.8 | 0.1 | 4.0 | 10.0 | 13.0 |
| **Total demersal fish** | | 19.1 | 174.0 | 17.4 | 21.2 | 0.5 | 14.0 | 18.0 | 20.5 |
| **Total number of pelagic fish taxa** | | 2 | | | | 1 | | | |
| **Total number of demersal fish taxa** | | 14 | | | | 2 | | | |

| 37F3 | | Station W0086 (Standard Tow) | | | | Station W9986 (0 minute Tow) | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Goup** | **Species** | **W (kg)** | **N** | **Lmin** | **Lmax** | **W (kg)** | **N** | **Lmin** | **Lmax** |
| **Flatfish** | *Limanda limanda* | 18.2 | 443.0 | 11.0 | 21.0 | 2.2 | 78.0 | 12.0 | 25.0 |
| | *Hippoglossoides platessoides* | 0.0 | 1.0 | 15.0 | 15.0 | | | | |
| | *Pleuronectes platessa* | 9.7 | 73.0 | 11.0 | 33.0 | 1.1 | 14.0 | 13.0 | 26.0 |
| **Demersal Gadoids** | *Merlangius merlangus* | 17.7 | 256.0 | 9.0 | 35.0 | 1.7 | 20.0 | 10.0 | 28.0 |
| **Other demersal fish** | *Alloteuthis* | 0.1 | 22.0 | | | | | | |
| | *Buglossidium luteum* | 0.1 | 8.0 | 8.0 | 11.0 | | | | |
| | *Enchelyopus cimbrius* | 0.0 | 1.0 | 15.0 | 15.0 | | | | |
| | *Eutrigla gurnardus* | 22.3 | 258.0 | 13.0 | 30.0 | 3.6 | 46.0 | 14.0 | 28.0 |
| **Pelagic fish** | *Clupea harengus* | 122.6 | 7032.0 | 10.0 | 19.5 | 3.7 | 313.0 | 10.0 | 17.0 |
| | *Sprattus sprattus* | 31.4 | 5291.0 | 7.5 | 12.0 | 1.2 | 54.0 | 10.0 | 18.0 |
| | *Engraulis encrasicolus* | 0.0 | 1.0 | 9.5 | 9.5 | | | | |
| **Crustacea** | *Nephrops norvegicus* | 0.0 | 0.0 | | | | | | |
| **Benthos** | | | | | | 8.5 | 413.0 | 11.3 | 21.0 |
| **Total pelagic fish** | | 153.9 | 12324.0 | 9.0 | 13.7 | 4.9 | 367.0 | 10.0 | 17.5 |
| **Total demersal fish** | | 40.2 | 1062 | 11.7143 | 160 | 5.3 | 158 | 12.25 | 107 |
| **Total number of pelagic fish taxa** | | 3 | | | | 2 | | | |
| **Total number of demersal fish taxa** | | 5 | | | | 2 | | | |

| 36F5 | | Station W0103 (Standard Tow) | | | | Station W9103 (0 minute Tow) | | | | Station W9103 (15 minute Tow) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Goup** | **Species** | **W (kg)** | **N** | **Lmin** | **Lmax** | **W (kg)** | **N** | **Lmin** | **Lmax** | **W (kg)** | **N** | **Lmin** | **Lmax** |
| **Flatfish** | *Buglossidium luteum* | | | | | | | | | 0.005 | 1 | 6 | 6 |
| | *Platichthys flesus* | 0.3 | 2 | 22 | 24 | | | | | | | | |
| | *Pleuronectes platessa* | 1 | 10 | 18 | 30 | | | | | 0.573 | 4 | 19 | 29 |
| | *Limanda limanda* | 7.7 | 139 | 9 | 26 | 0.2 | 4 | 16 | 19 | 5.04 | 71 | 12 | 26 |
| **Demersal Gadoids** | *Merlangius merlangus* | 2.3 | 42 | 9 | 30 | | | | | 1.128 | 23 | 13 | 24 |
| **Other demersal fish** | *Agonus cataphractus* | 0 | 1 | 9 | 9 | | | | | | | | |
| | *Alloteuthis* | 0 | 1 | | | | | | | | | | |
| | *Buglossidium luteum* | 0 | 1 | 10 | 10 | | | | | | | | |
| | *Callionymus lyra* | 0 | 1 | 15 | 15 | | | | | | | | |
| | *Echiichthys vipera* | 0 | 1 | 13 | 13 | | | | | | | | |
| | *Eutrigla gurnardus* | 2.1 | 14 | 15 | 35 | | | | | 0.235 | 2 | 20 | 24 |
| | *Scyliorhinus canicula* | 1.4 | 2 | 47 | 62 | | | | | 0.78 | 1 | 52 | 52 |
| **Pelagic fish** | *Clupea harengus* | 30.8 | 1123 | 8 | 20 | 0.6 | 60 | 9 | 15 | 2.47 | 104 | 8 | 21 |
| | *Engraulis encrasicolus* | 0 | 5 | 6 | 9.5 | | | | | | | | |
| | *Sprattus sprattus* | 12 | 3477 | 5.5 | 12 | 0.3 | 41 | 5.5 | 10.5 | 1.041 | 251 | 5.5 | 12 |
| **Crustacea** | *Cancer pagurus* | 1.7 | 2 | 17.7 | 20.7 | | | | | | | | |
| **Benthos** | | | | | | | | | | | | | |
| **Total pelagic fish** | | 42.8 | 4605 | 6.5 | 13.8 | 0.8 | 101 | 7.3 | 12.8 | 3.511 | 355 | 7 | 17 |
| **Total demersal fish** | | 5.9 | 63 | 16.9 | 24.9 | 0 | 0 | | | 2.143 | 26 | 28 | 33 |
| **Total number of pelagic fish taxa** | | 3 | | | | 2 | | | | 2 | | | |
| **Total number of demersal fish taxa** | | 8 | | | | 0 | | | | 3 | | | |

| 34F2 | | Station W0126 (Standard Tow) | | | | Station W9126 (0 minute Tow) | | | | Station W9126 (15 minute Tow) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Goup** | **Species** | **W (kg)** | **N** | **Lmin** | **Lmax** | **W (kg)** | **N** | **Lmin** | **Lmax** | **W (kg)** | **N** | **Lmin** | **Lmax** |
| **Flatfish** | *Limanda limanda* | 1.7 | 24 | 11 | 24 | 0.5 | 1 | 12 | 12 | 0.38 | 20 | 11 | 22 |
| | *Pleuronectes platessa* | 3.6 | 36 | 12 | 43 | 0.1 | 1 | 22 | 22 | 2.5 | 39 | 9 | 29 |
| | *Buglossidium luteum* | 0.2 | 23 | 6 | 10 | 0 | 1 | 5 | 5 | 0.266 | 33 | 5 | 10 |
| | *Solea solea* | 0.1 | 1 | 19 | 19 | | | | | | | | |
| **Demersal Gadoids** | *Merlangius merlangus* | 0.6 | 11 | 13 | 26 | | | | | 0.05 | 2 | 13 | 16 |
| **Other demersal fish** | *Echiichthys vipera* | 0.4 | 32 | 8 | 13 | 0 | 2 | 9 | 12 | 0.303 | 25 | 7 | 12 |
| | *Eutrigla gurnardus* | 1.4 | 10 | 19 | 31 | | | | | 0.18 | 2 | 21 | 23 |
| | *Hyperoplus lanceolatus* | 0 | 4 | 6 | 26 | 0 | 2 | 6 | 9 | 0.001 | 1 | 6 | 6 |
| | *Loligo vulgaris* | 0.5 | 2 | 17 | 24 | | | | | | | | |
| | *Pomatoschistus minutus* | 0 | 1 | 5 | 5 | | | | | 0.001 | 1 | 5 | 5 |
| | *Raja brachyura* | 7.4 | 2 | 88 | 60 | | | | | 0.295 | 1 | 64 | 64 |
| | *Raja clavata* | 5.8 | 4 | 61 | 79 | | | | | 0.158 | 2 | 14 | 27 |
| | *Raja montagui* | 5.6 | 5 | 50 | 42 | 1.3 | 1 | 58 | 58 | 1.042 | 4 | 27 | 44 |
| | *Scyliorhinus canicula* | 2.6 | 12 | 16 | 18 | | | | | 0.87 | 1 | 60 | 60 |
| **Pelagic fish** | *Clupea harengus* | 0.2 | 3 | 17.5 | 22 | 1.4 | 274 | 5 | 11 | 0.298 | 5 | 7 | 15 |
| | *Sprattus sprattus* | 19.3 | 3804 | 5 | 11.5 | | | | | 3.345 | 840 | 5 | 12.5 |
| | *Engraulis encrasicolus* | 0 | 7 | 8 | 10.5 | | | | | | | | |
| **Benthos** | | | | | | | | | | | | | |
| **Total pelagic fish** | | 19.5 | 3814 | 10.2 | 14.7 | 1.4 | 274 | 5 | 11 | 3.643 | 845 | 6 | 13.75 |
| **Total demersal fish** | | 43.8 | 83 | 28.3 | 27.6 | 2.8 | 5 | 24.3 | 22.5 | 2.9 | 39 | 24 | 29 |
| **Total number of pelagic fish taxa** | | 3 | | | | 1 | | | | 2 | | | |
| **Total number of demersal fish taxa** | | 10 | | | | 3 | | | | 9 | | | |

| 32F1 | | Station W0135 (Standard Tow) | | | | Station W9135 (0 minute Tow) | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Goup** | **Species** | **W (kg)** | **N** | **Lmin** | **Lmax** | **W (kg)** | **N** | **Lmin** | **Lmax** |
| **Flatfish** | *Limanda limanda* | 0.8 | 15.0 | 11.0 | 27.0 | 0.0 | 1.0 | 13.0 | 13.0 |
| | *Pleuronectes platessa* | 1.7 | 12.0 | 11.0 | 40.0 | 0.1 | 1.0 | 19.0 | 19.0 |
| | *Solea solea* | 0.8 | 7.0 | 11.0 | 28.0 | | | | |
| **Demersal Gadoids** | *Merlangius merlangus* | 4.6 | 65.0 | 14.0 | 26.0 | 0.7 | 6.0 | 14.0 | 22.0 |
| | *Trisopterus luscus* | 0.1 | 3.0 | 12.0 | 16.0 | | | | |
| **Other demersal fish** | *Alosa fallax* | 0.8 | 1.0 | 46.0 | 46.0 | 0.8 | 1.0 | 46.0 | 46.0 |
| | *Agonus cataphractus* | 0.0 | 1.0 | 12.0 | 12.0 | | | | |
| | *Ciliata mustela* | 0.1 | 2.0 | 14.0 | 20.0 | | | | |
| | *Echiichthys vipera* | 0.0 | 1.0 | 9.0 | 9.0 | | | | |
| | *Hyperoplus lanceolatus* | 0.0 | 2.0 | 5.0 | 6.0 | 0.0 | 1.0 | 6.0 | 6.0 |
| | *Liparis liparis* | 0.0 | 1.0 | 8.0 | 8.0 | | | | |
| | *Mustelus asterias* | 9.1 | 4.0 | 85.0 | 89.0 | | | | |
| | *Raja brachyura* | 4.0 | 3.0 | 55.0 | 70.0 | | | | |
| | *Raja clavata* | 11.4 | 10.0 | 34.0 | 32.0 | 3.0 | 3.0 | 33.0 | 74.0 |
| | *Raja montagui* | 1.7 | 1.0 | 62.0 | 62.0 | 1.2 | 4.0 | 21.0 | 58.0 |
| | *Scyliorhinus canicula* | 17.3 | 58.0 | 9.0 | 56.0 | 1.2 | 4.0 | 21.0 | 58.0 |
| **Pelagic fish** | *Sprattus sprattus* | 3.5 | 745.0 | 5.0 | 11.5 | 0.2 | 49.0 | 5.0 | 12.0 |
| | *Clupea harengus* | 0.0 | 1.0 | 15.0 | 15.0 | 0.0 | 1.0 | 15.0 | 15.0 |
| **Benthos** | | | | | | | | | |
| **Total pelagic fish** | | 3.5 | 746.0 | 10.0 | 13.3 | 0.2 | 50.0 | 10.0 | 13.5 |
| **Total demersal fish** | | 49.1 | 152.0 | 28.1 | 34.8 | 7.0 | 19.0 | 23.5 | 44.0 |
| **Total number of pelagic fish taxa** | | 2 | | | | 2 | | | |
| **Total number of demersal fish taxa** | | 13 | | | | 6 | | | |

## Table 3: Comparison of total catch and species richness for taxonomic groups.

| Pelagic fish species catch (kg) | | | | | |
|---|---|---|---|---|---|
| Rectangle | Depth | Standard | 0 minute tow | 15 minute | Average for 0 minute tow in % of standard |
| 34F3 | 29 | 0.1 | 0.1 | 2.7 | 100.0 |
| 36F2 | 39 | 23.1 | 0.1 | | 0.4 |
| 35F1 | 35 | 0.6 | 0.1 | | 15.9 |
| 37F3 | 40 | 153.9 | 4.9 | | 3.2 |
| 36F5 | 36 | 42.8 | 0.8 | 3.5 | 1.9 |
| 34F2 | 51 | 19.5 | 1.4 | 3.6 | 7.2 |
| 32F1 | | 3.5 | 0.2 | | 6.2 |

| Demersal fish species catch (kg) | | | | | |
|---|---|---|---|---|---|
| Rectangle | Depth | Standard | 0 minute tow | 15 minute | Average for 0 minute tow in % of standard |
| 34F3 | 29 | 286.1 | 7.1 | 100.2 | 2.5 |
| 36F2 | 39 | 78.7 | 8.9 | | 11.3 |
| 35F1 | 35 | 19.1 | 0.5 | | 2.7 |
| 37F3 | 40 | 40.2 | 5.3 | | 13.0 |
| 36F5 | 36 | 5.9 | 0.0 | 2.1 | 0.0 |
| 34F2 | 51 | 43.8 | 2.8 | 2.9 | 6.4 |
| 32F1 | | 49.1 | 7.0 | | 14.3 |

| Number of pelagic and demersal fish species | | | | | |
|---|---|---|---|---|---|
| Rectangle | Depth | Standard | 0 minute tow | 15 minute | Average for 0 minute tow in % of standard |
| 34F3 | 29 | 13 | 3 | 14 | 23.1 |
| 36F2 | 39 | 11 | 3 | | 27.3 |
| 35F1 | 35 | 16 | 5 | | 31.3 |
| 37F3 | 40 | 8 | 4 | | 50.0 |
| 36F5 | 36 | 11 | 2 | 5 | 18.2 |
| 34F2 | 51 | 13 | 4 | 11 | 30.8 |
| 32F1 | | 15 | 2 | | 13.3 |

A)

B)

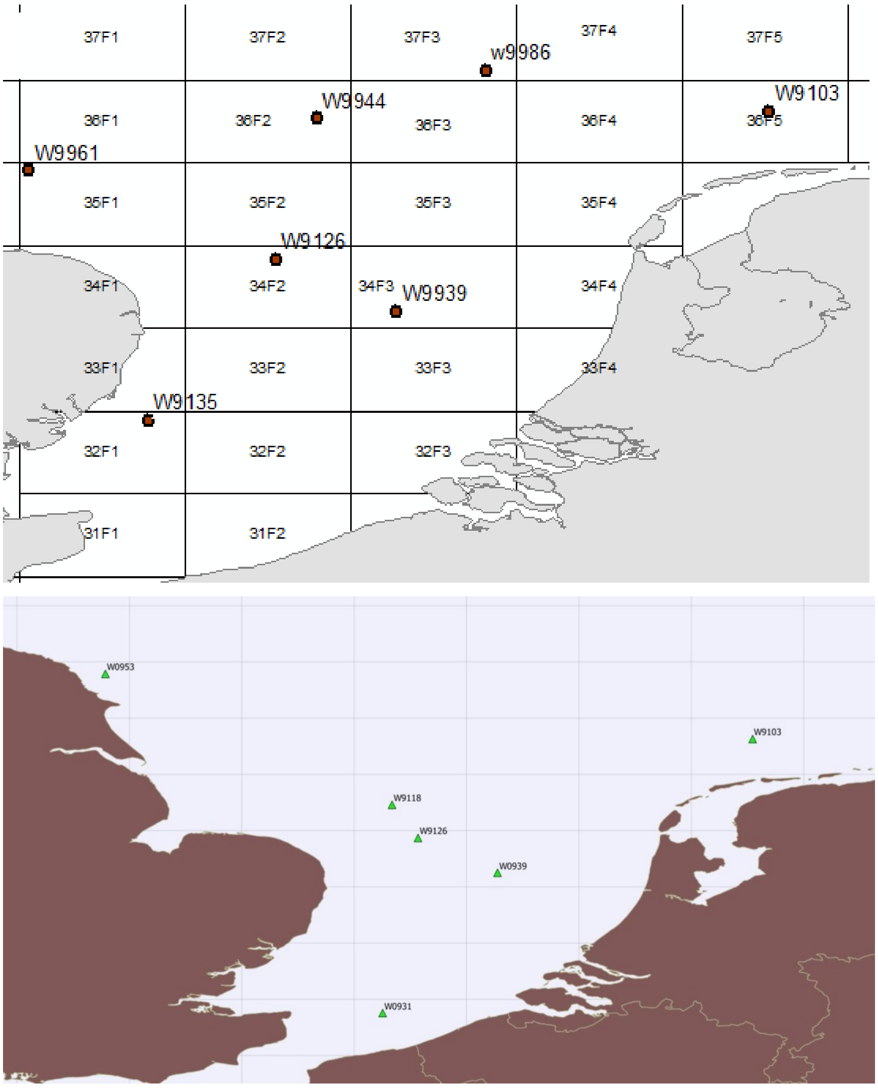


**Figure 1: Sampling locations. A. 0min hauls. B. 15 min hauls.**

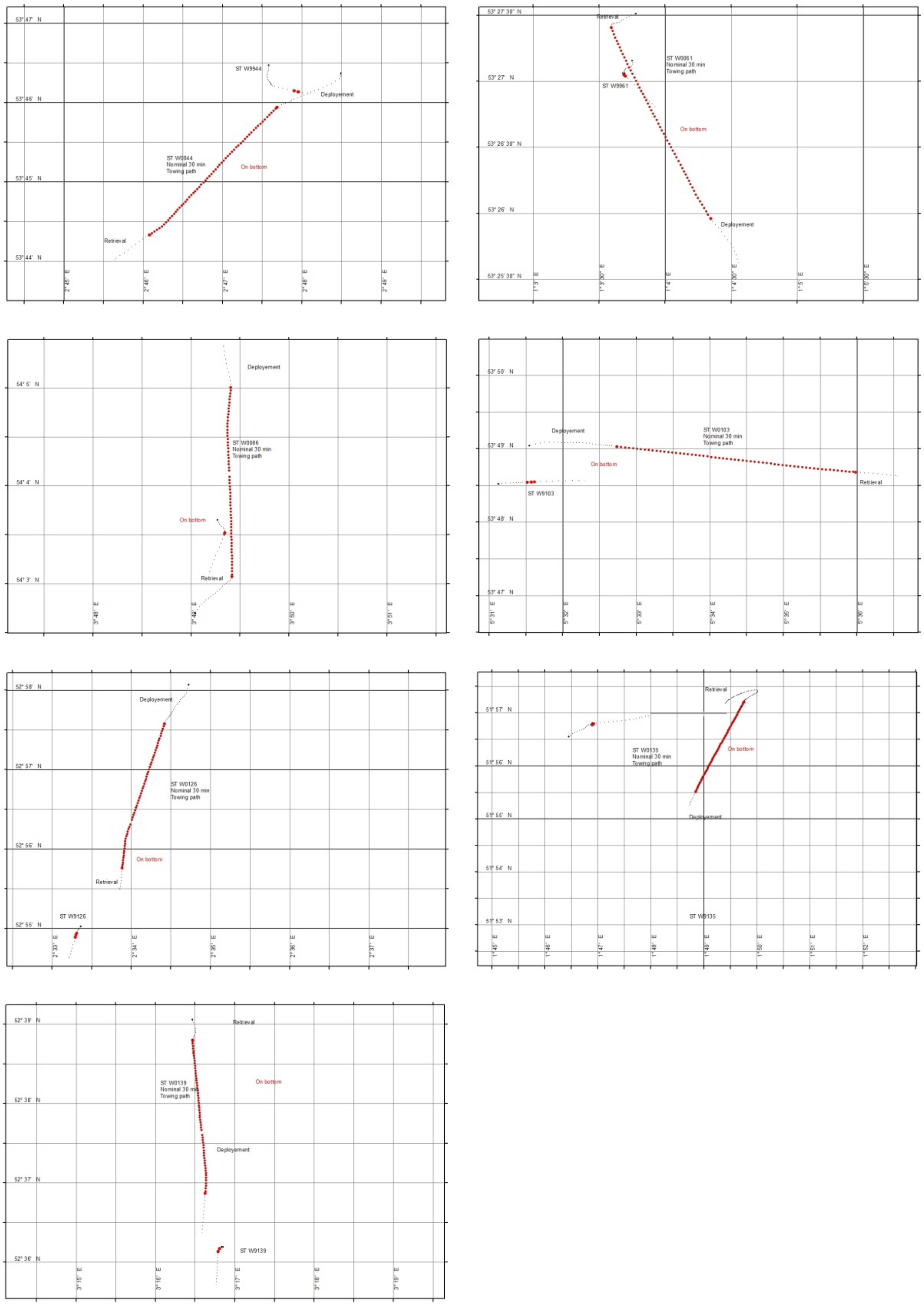

**Figure 2: Trawl tracks**

# IBTS2018 WD6

## Catches in zero-minute tows compared to standard tows in the NS-IBTS for Germany

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### Introduction

In 2017, the IBTSWG decided to take additional "zero-minute" hauls during the Q3 IBTS-survey in the North Sea, in order to evaluate how the process of deploying and hauling the net contributes to the reported catches. Reducing the official haul time to zero minutes resulted in catches containing only those fish and invertebrates, which were caught in the water column during the net's path downwards to the sea floor, during the brief time span while it settled on the ground, or during the process of retrieving it. These additional experimental hauls were performed, depending on ship time available on the individual vessels. In the case of the German vessel "Walther Herwig" (WHIII), they were limited to three extra hauls which could be performed outside the regular programme.

The zero-minute hauls were taken at relatively shallow stations with sandy sediment structure, and were opposed to regular hauls performed within the same ICES rectangles. Due to the small number of extra hauls taken aboard the WHIII, the statistical power of conclusions drawn from these samples is limited. Yet, the analyses presented here serve to give a preliminary impression of catches obtained outside the official towing time at typical shallow sandy stations. The data will be included in a comprehensive analysis across the zero-minute hauls performed by all survey partners.

### Methods

Zero-minute hauls were deployed just as regular 30-minute hauls, but retrieved as soon as the net had settled on the ground, i.e. exactly at the time which defines the start of a regular haul. The additional hauls were taken in two statistical rectangles of the German Bight (38F7 and 39F7), and were compared to the official IBTS hauls from the same rectangles. All five hauls in the analysis originated from depths barely exceeding 20 m. The catches were sorted and analysed in the same manner, taking total numbers and weights for all fish species and for the invertebrates specified in the IBTS manual (ICES 2015). Individual biological data and otolith for age readings were only taken for the valid 30-minute IBTS hauls as part of the regular programme, and are uploaded to DATRAS. In contrast, data from the zero-minute hauls are not being uploaded to DATRAS, but remain with the data pool of the IBTSWG, in order to prevent their unintentional inclusion in analyses of IBTS catches.

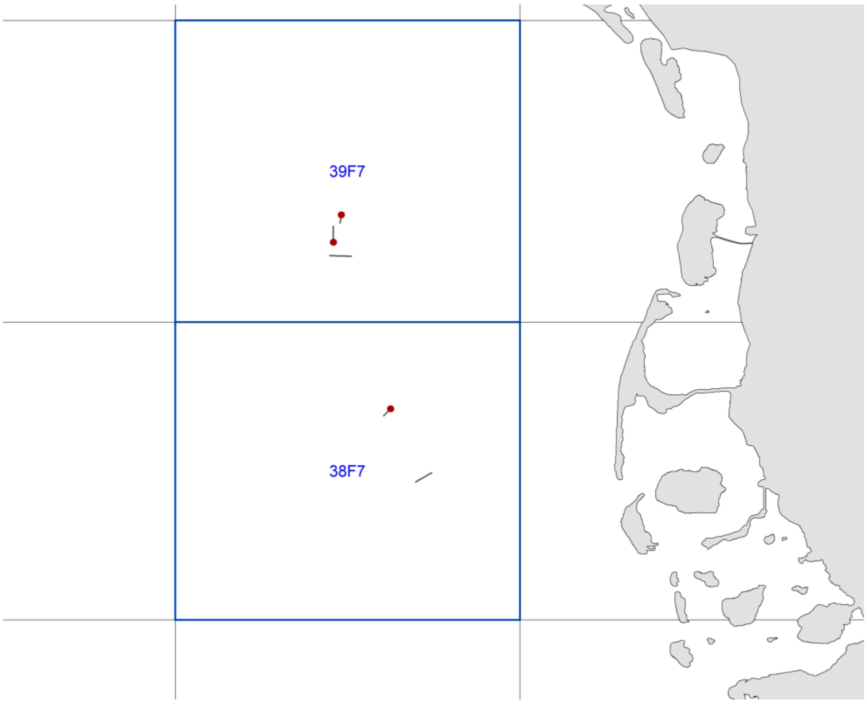


**Figure 1** **Positions of zero-minute hauls (short lines with red dots) and regular hauls used as reference (lines only) conducted during "Walther Herwig III" cruise WH407, as contribution to a joint analysis performed by the IBTSWG.**

**Results and Conclusions**

Due to the moderate depths of the stations sampled, ranging from 20.8 to 23.4 m, the time span needed for shooting and hauling of the net (deployment time) remained rather short and remained between 4:30 and 5:59 min (Table 1). Accordingly, the total number of individuals caught in the zero-minute hauls was rather low, ranging from 23-170 for fish, and from 0-1 invertebrates. The corresponding regular hauls contained between 520-1260 fish, and 43-143 invertebrates (Table 2).

Pelagic fish were the most abundant group in each of the three zero-minute hauls, and in analogy to the regular hauls in the same rectangles, mackerel (*Scomber scombrus*) dominated in number (Table 2). Apart from further purely pelagic species, sandeel (*Ammodytes tobianus* and *Hyperoplus lanceolatus*) also occurred in the zero-minute hauls, and may have been caught during the passage of the net between surface and seafloor. In contrast, the few demersal fish collected have presumably been scared up when the net hit the ground. Purely demersal fish species were caught with between 4-9 individuals in the three zero-minute hauls, as opposed to 19-128 individuals in 30-minute hauls.

Overall, the zero-minute hauls conducted in the rectangles 38F7 and 39F7 represent examples for shallow sandy habitats within the IBTS survey area in the North Sea, and their rather low biomass was dominated by pelagic fish species.

**References**

ICES (2015) Manual for the International Bottom Trawl Surveys. Series of ICES Survey Protocols SISP 10 - IBTS IX. 86 pp.

**Table 1 Sampling information for zero-minute hauls ("ZERO") and standard hauls ("IBTS") in the same rectangles; cruise WH 407, Q3 2017**

| Date | Station No. | Rectangle | Depth [m] | Tow duration [min] | Deployment time* [hh:mm:ss] | Station type | Validity |
|---|---|---|---|---|---|---|---|
| 2017-08-02 | 557 | 38F7 | 21.0 | 0 | 0:05:30 | ZERO | N |
| 2017-08-02 | 559 | 39F7 | 22.4 | 0 | 0:05:01 | ZERO | N |
| 2017-08-02 | 560 | 39F7 | 23.4 | 0 | 0:05:30 | ZERO | N |
| | | | | | | | |
| 2017-08-02 | 556 | 38F7 | 20.8 | 30 | 0:35:59 | IBTS | J |
| 2017-08-02 | 558 | 39F7 | 21.3 | 30 | 0:34:30 | IBTS | J |

*) Between start and end of operation of the trawl door winch (doors leaving deck/ doors back on deck)

**Table 2 Comparison of species compositions in zero-minute hauls (a) and standard hauls in the same ICES rectangles (b), conducted during cruise WH407, Q3 2017.**

| Group | Species | Weight [kg] | n [ind] | Min length [cm] | Max length [cm] | Rectangle | Station | Station type |
|---|---|---|---|---|---|---|---|---|
| Pelagic fish | SCOMBER SCOMBRUS | 11.355 | 110 | 21.5 | 32.5 | 38F7 | 557 | ZERO |
| | SPRATTUS SPRATTUS | 0.087 | 9 | 10.25 | 11.25 | 38F7 | 557 | ZERO |
| Flatfish | LIMANDA LIMANDA | 0.503 | 5 | 13.5 | 29.5 | 38F7 | 557 | ZERO |
| | AMMODYTES TOBIANUS | 0.031 | 2 | 16.5 | 16.5 | 38F7 | 557 | ZERO |
| Sandeel | HYPEROPLUS LANCEOLATUS | 0.903 | 44 | 16.5 | 24.5 | 38F7 | 557 | ZERO |
| Cephalopods | ALLOTEUTHIS SUBULATA | 0.005 | 1 | 6.25 | 6.25 | 38F7 | 557 | ZERO |
| *Total - Pelagic fish* | | *11.442* | *119* | | | | | |
| *Total - Flatfish* | | *0.534* | *7* | | | | | |
| *Total - Sandeel* | | *0.903* | *44* | | | | | |
| *Total - all demersal fish* | | *1.437* | *51* | | | | | |
| | | | | | | | | |
| Pelagic fish | SCOMBER SCOMBRUS | 4.337 | 47 | 21.5 | 35.5 | 39F7 | 559 | ZERO |
| | TRACHURUS TRACHURUS | 0.001 | 1 | 4.5 | 4.5 | 39F7 | 559 | ZERO |
| Flatfish | LIMANDA LIMANDA | 0.087 | 1 | 20.5 | 20.5 | 39F7 | 559 | ZERO |
| | PLATICHTHYS FLESUS | 0.276 | 1 | 30.5 | 30.5 | 39F7 | 559 | ZERO |
| Sandeel | HYPEROPLUS LANCEOLATUS | 0.167 | 5 | 18.5 | 28.5 | 39F7 | 559 | ZERO |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Other demersal fish (w/o gadoids) | EUTRIGLA GURNARDUS | 0.223 | 2 | 23.5 | 24.5 | 39F7 | 559 | ZERO |
| *Total - Pelagic fish* | | *4.338* | *48* | | | | | |
| *Total - Flatfish* | | *0.363* | *2* | | | | | |
| *Total - Sandeel* | | *0.167* | *5* | | | | | |
| *Total - all demersal fish* | | *0.753* | *9* | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Pelagic fish | SCOMBER SCOMBRUS | 1.580 | 11 | 22.5 | 36.5 | 39F7 | 560 | ZERO |
| | TRACHURUS TRACHURUS | 0.001 | 1 | 5.5 | 5.5 | 39F7 | 560 | ZERO |
| Flatfish | LIMANDA LIMANDA | 0.286 | 5 | 14.5 | 22.5 | 39F7 | 560 | ZERO |
| | PLEURONECTES PLATESSA | 0.050 | 1 | 16.5 | 16.5 | 39F7 | 560 | ZERO |
| Sandeel | HYPEROPLUS LANCEOLATUS | 0.029 | 2 | 16.5 | 17.5 | 39F7 | 560 | ZERO |
| Demersal gadoids | MERLANGIUS MERLANGUS | 0.073 | 1 | 21.5 | 21.5 | 39F7 | 560 | ZERO |
| Demersal fish (w/o gadoids) | EUTRIGLA GURNARDUS | 0.217 | 2 | 23.5 | 23.5 | 39F7 | 560 | ZERO |
| *Total - Pelagic fish* | | *1.581* | *12* | | | | | |
| *Total - Flatfish* | | *0.336* | *6* | | | | | |
| *Total - Sandeel* | | *0.029* | *2* | | | | | |
| *Total - all demersal fish* | | *0.655* | *11* | | | | | |

| Group | Species | Weight [kg] | n [ind] | Min length [cm] | Max length [cm] | Rectangle | Station | Station type |
|---|---|---|---|---|---|---|---|---|
| Pelagic fish | CLUPEA HARENGUS | 0.072 | 5 | 10.25 | 13.75 | 38F7 | 556 | IBTS |
| | SCOMBER SCOMBRUS | 82.300 | 719 | 21.5 | 37.5 | 38F7 | 556 | IBTS |
| | SPRATTUS SPRATTUS | 4.985 | 510 | 10.25 | 12.25 | 38F7 | 556 | IBTS |
| | TRACHURUS TRACHURUS | 0.001 | 2 | 3.5 | 4.5 | 38F7 | 556 | IBTS |
| Flatfish | LIMANDA LIMANDA | 0.478 | 5 | 12.5 | 24.5 | 38F7 | 556 | IBTS |
| | PLATICHTHYS FLESUS | 0.285 | 2 | 20.5 | 25.5 | 38F7 | 556 | IBTS |
| | PLEURONECTES PLATESSA | 0.201 | 3 | 18.5 | 20.5 | 38F7 | 556 | IBTS |
| Sandeel | HYPEROPLUS LANCEOLATUS | 0.136 | 5 | 17.5 | 24.5 | 38F7 | 556 | IBTS |
| Demersal gadoids | MERLANGIUS MERLANGUS | 0.193 | 6 | 5.5 | 18.5 | 38F7 | 556 | IBTS |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Demersal fish (w/o gadoids) | CHELIDONICHTHYS LUCERNA | 0.418 | 2 | 27.5 | 29.5 | 38F7 | 556 | IBTS |
| | EUTRIGLA GURNARDUS | 0.104 | 1 | 23.9 | 23.9 | 38F7 | 556 | IBTS |
| Cephalopods | ALLOTEUTHIS SUBULATA | 0.759 | 142 | 1.25 | 12.75 | 38F7 | 556 | IBTS |
| Crustaceans | CANCER PAGURUS | 0.897 | 1 | 174.5 | 174.5 | 38F7 | 556 | IBTS |
| *Total - Pelagic fish* | | *87.358* | *1236* | | | | | |
| *Total - Flatfish* | | *0.964* | *10* | | | | | |
| *Total - Sandeel* | | *0.136* | *5* | | | | | |
| *Total - all demersal fish* | | *1.815* | *24* | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Pelagic fish | SCOMBER SCOMBRUS | 40.622 | 389 | 19.5 | 34.5 | 39F7 | 558 | IBTS |
| | TRACHURUS TRACHURUS | 0.002 | 1 | 5.5 | 5.5 | 39F7 | 558 | IBTS |
| Flatfish | LIMANDA LIMANDA | 10.104 | 91 | 15.5 | 29.5 | 39F7 | 558 | IBTS |
| | PLATICHTHYS FLESUS | 0.318 | 2 | 19.5 | 29.5 | 39F7 | 558 | IBTS |
| | PLEURONECTES PLATESSA | 0.097 | 2 | 16.5 | 17.5 | 39F7 | 558 | IBTS |
| | PSETTA MAXIMA | 1.25 | 1 | 43.5 | 43.5 | 39F7 | 558 | IBTS |
| Sandeel | AMMODYTES TOBIANUS | 0.037 | 4 | 11.5 | 15.5 | 39F7 | 558 | IBTS |
| Demersal fish (w/o gadoids) | ECHIICHTHYS VIPERA | 0.066 | 1 | 18.5 | 18.5 | 39F7 | 558 | IBTS |
| | EUTRIGLA GURNARDUS | 2.809 | 29 | 19.5 | 28.5 | 39F7 | 558 | IBTS |
| Cephalopods | ALLOTEUTHIS SUBULATA | 0.2 | 41 | 3.75 | 9.75 | 39F7 | 558 | IBTS |
| Crustaceans | CANCER PAGURUS | 2.445 | 2 | 171.5 | 208.5 | 39F7 | 558 | IBTS |
| *Total - Pelagic fish* | | *40.624* | *390* | | | | | |
| *Total - Flatfish* | | *11.769* | *96* | | | | | |
| *Total - Sandeel* | | *0.037* | *4* | | | | | |
| *Total - all demersal fish* | | *14.681* | *130* | | | | | |