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

23–27 March 2015

Bergen, Norway

ICES International Council for the Exploration of the Sea

CIEM Conseil International pour l'Exploration de la Mer

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Conseil International pour l'Exploration de la Mer

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Executive summary

The report presents summaries of the national contributions in 2014/2015 and planning for 2015/2016 for the surveys coordinated by the International Bottom Trawl Survey Working Group (IBTSWG). In the North Sea, the International Bottom Trawl Surveys are performed in quarters 1 and 3; in the Northeastern Atlantic they are conducted in quarters 1, 3 and 4 with a suite of 13 surveys covering shelf areas from north of Scotland to the Gulf of Cádiz. Highlights and problems of the 2014/2015 surveys have been or will be brought to the attention of the relevant assessment groups before their next meeting.

North Sea Q3, 2014: *Biological data* – Distribution plots indicate that for some target species high densities were found just outside the actual index areas, and in particular for cod, haddock, whiting and Norway pout this may – if occurring repeatedly - warrant a revision of the species-specific areas on which the standard indices as calculated in DATRAS is based. The survey participants will try to allocate ship time in Q3 2015 to sample the respective rectangles with additional hauls. Survey conditions – No major issues or technical problems occurred, but exceptionally stormy weather conditions caused delays during part of the survey period (winds up to 12 bft for extended period).

North Sea Q1, 2015: *Biological data* – Unusually high abundances of anchovy, 1-ringer herring and sprat were observed, while the index of 0-ringer herring (larvae) was the lowest on record since the 1977-year class. *Survey conditions* – The weather during the 2015 IBTS was reasonable to very good, consequently all rectangles were covered by at least 1 GOV haul and nearly all planned rectangles by at least 1 MIK haul. Due to refit of the Dutch vessel 'Tridens II', the Dutch portion of the survey was performed with the vessel 'Endeavour' (using the Dutch gear with the doors from 'Endeavour'). Several rectangles in the southern North Sea had to be covered twice by the same vessel ('Thalassa'), instead of by two different vessels.

The 13 IBTSWG-coordinated surveys in the Northeastern Atlantic (NeAtl) amounted to a total of 326 days at sea in 2014.

NeAtl 2015: *Biological data* – Regarding species abundances, NeAtl survey results are in general patterns and distribution similar to those from the previous years. Most remarkable differences to 2014 are related to recruitment signals of different species, e.g. haddock (≤20 cm) around northern UK, or small white angler (≤20 cm) in the Celtic Sea. The abundance of hake recruits remained low compared to the 2012 peak, and the increment of catches of hake larger than 20 cm, detected in 2013 surveys has decreased again in 2014 to values still larger than those in previous years.

The IBTSWG has produced three manuals, where the Manual for the North Sea IBTS and the MIK sampling are currently being revised, and an additional manual for the Northeastern Atlantic has been written. All three manuals will be submitted to ICES in their newest version during summer of 2015.

IBTSWG regularly examines various aspects of data quality. During the 2015 meeting, data (cpue per length per haul) were downloaded from DATRAS (23/03/2015). Individual cases of inconsistencies or questionable data are being highlighted in the report, and the respective survey participants are asked to check and correct their national data and re-upload the revised data to DATRAS.

The development of a swept-area based abundance index has been advanced. The goal of this effort, to be explored in collaboration with the WGISDAA, is to be able to provide this index in addition to the traditional haul-duration based index. National datasets of net geometry and tow … have been completed for the agreed years (2004–2014), in order to produce a 'flex file' as an additional data product besides the regular DATRAS output. During the current year, the flex file will be quality-controlled, and initial comparisons of cpue values based on tow duration vs. swept-area will be performed.

The IBTSWG 2015 started work on a new multi-annual ToR for an evaluation of the survey design of the IBTS. Two invited external experts in survey design joined the IBTSWG to pursue this task. The main issues tackled in 2015 included initial analyses for the question how the sampling strategy for age readings for the assessed species can be made more efficient. Furthermore, the group developed a plan for an experimental study on the effect of tow duration.

1 Administrative details

Working Group name

International Bottom Trawl Survey Working Group (IBTSWG)

Year of Appointment

2013

Reporting year within current cycle (1, 2 or 3)

3 (for multiannual ToRs)

Chair(s)

Anne Sell, Germany

Meeting venue

Bergen, Norway

Meeting dates

23–27 March 2015

2 Terms of Reference a) – g)

	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.	113, 121, 141, 144, 161, 162, 173, 211, 251, 252, 311, 321	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. 2) Indices for the relevant species to assessment WGs (see above) 3) Planning of the upcoming surveys for the survey coordinators and cruise leaders.
b	Review IBTS manuals and consider additional updates and improvements in survey design and standardization	Intersessional activity, ongoing in order to improve survey quality	161, 162, 321	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. Step 2: Adressing action points as listed in IBTSWG report 2013, Action List.	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	161, 162, 321	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). 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.	141, 144	3 years	Manuscript for paper or CRR, analysing the potential advantages of moving to swept-area-based standardization. To be presented to assessment groups for evaluation by 2015.
e	Compile status quo, report and propose ways forward in standardization, on the different materials and specifications of the GOVs and gears currently used by the IBTS participants. Analyse and report on the effect of variable sweep length and standardization on the uses in the IBTS.	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. (For this ToR, IBTS seeks support from gear technology experts and welcomes their contribution.)	141,144	3 years	Technical paper / manuscript.

f	Ensure that the most recent versions of each survey manual is submitted to the Series of ICES Survey Protocols (SISP)	The Series of ICES Survey Protocols (SISP) is an online, web-accessible series of ecosystem (fishery) survey manuals, covering the protocols and procedures used in ICES coordinated fisheries and ecosystem surveys, including trawl, acoustic, and ichthyoplankton surveys (http://www.ices.dk/products/surveyprotocols.asp). The aim is to have all ICES coordinated surveys allocated an ISSN number and become openly available.	As appropriate	Updates of SISP.
g	Survey design: 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 could include: Spatial distribtion and numbers samples for age readings; suitability of species-specific index areas; stratification.	New in 2015; multi-annual	Update of SISP if changes in survey procedure and manual are decided for.

3 Summary of Work plan

Year 1 (2013)	Datras Workshop, adjustment of Quality-checking Routines (ToR c); laise with stock coordinators and assessment groups, evaluate data availability for gear parameters in Datras and in national databases (ToR d); Compile status quo, Seek and collate input from gear experts (ToR e); Evaluate output from WKECES 2012 (ToR f).
Year 2	Evaluate the effect of changing to swept-area-based indices for additional examples/ stocks, particularly linked to WGISDAA and benchmark process (ToR d). Continue analyses of different GOV configurations (ToR e).
Year 3	Continue to evaluate the effect of chaning to swept-area-based indiced for additional examples/ stocks (ToR d). Continue analyses of different GOV configurations (ToR e). Start with additional, new ToR f.
Recurrent annual activity	Updates for ToRs a and c. Additionally: ToRs a and b ongoing intersessionally.

4 List of Outcomes and Achievements of the WG in this delivery period

- Description of survey products: Survey summaries of IBTSWG-coordinated surveys for Q3/Q4 2014 and Q1 2015.
- Updates of survey manuals for surveys in the North Sea and in the North-eastern Atlantic, as well as for the MIK sampling for ichthyoplankton. Revisions to be submitted by summer of 2015.
- For the calculation of swept-area-based indices for the North Sea, each nation contributing to NS-IBTS has checked and where necessary updated their national data of gear geometry and distance towed, for the years 2004–2014. Individual national regression functions have been produced to use for fill-ins of missing data in any of the parameters needed. Based on these preparations, a 'flex file' has been produced by the ICES Data Centre, including complete sets (incl. fill-in's) of the data needed to calculate swept-area. IBTSWG to perform quality checks and initial analyses with these products during the coming year.
- Work on a new multi-annual ToR on IBTS survey design has started. Initial analyses have been performed to evaluate the efficiency of the current sampling of otoliths for age data. First results look promising with respect to the potential to reduce sampling effort for otoliths without losing essential information.
- An experiment on the effect of tow duration has been planned for the NS-IBTS Q3 survey.
- Several Annexes and Working Documents have been produced (available on the IBTSWG homepage as supplement to this report):
  1) 'NS-IBTS species-specific standard areas: Suggestion for revision to account for change in stock distribution and stock units used in the assessment'.
  2) Kai Wieland, DTU Aqua, Denmark.
  3) A series of working documents describing the national procedures in 'Interpolation of missing observations needed for swept-area calculation in the 1st and 3rd quarter NS-IBTS'. Various authors.
  4) Gear Standardization: Net plans and gear components tables. Robert Kynoch, Marine Scotland Science, Aberdeen, UK.
  5) 'Intercalibration of research survey vessels: 'GWEN DREZ' and 'THALASSA'', performed in preparation of a change of vessels in the Channel Groundfish Survey. Arnaud Auber *et al.*, Ifremer Boulogne-sur-Mer, France.
  6) 'Analysis of Evhoe and IGFS survey data in the Celtic Sea for optimizing the sampling design'. Verena Trenkel, Ifremer Nantes, France.
  7) 'CAMANOC Survey Report', Morgane Travers-Trolet and Yves Vérin, Ifremer, France.

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

5.1 Q3 North Sea Survey in 2014

5.1.1 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 IIIa and Subarea IV. During daytime a bottom trawl is used. This is the GOV (Grand Ouverture Verticale), with ground gear A or B. 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, herring, mackerel, and sprat, and a number of additional species.

Six nations (using five vessels) participated in the quarter 3 survey in 2014: 'Dana' (Denmark and Sweden), 'Walther Herwig III' (Germany), 'Johan Hjort' (Norway), 'Cefas Endeavour' (England) and 'Scotia' (Scotland). The overall survey period extended from 26 June to 3 September (Table 5.1.1). In all, 327 valid GOV hauls were made in planned rectangles (Table 5.1.2). Although this should, together with some additional tows conducted, have allowed at least one haul per rectangle, some rectangles in the Skagerrak did not achieve coverage of two hauls, whereas the sampling in the North Sea was more balanced than in previous years (Figure 5.1.1).

Biological data are collected fora large number of species, for most of these species length, weight, gender and maturity and age material was collected (Tabs. 5.1.3 and 5.1.4).

Table 5.1.1. Overview of the surveys performed during the North Sea IBTS Q3 survey in 2014.

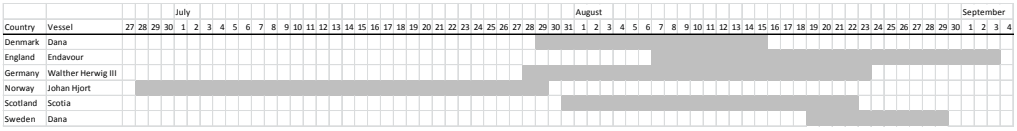


Table 5.1.2. Overview of the GOV stations fished in the North Sea IBTS Q3 survey in 2014 (*: conducted with Campelen trawl in rectangles 52E9, 52F0 and 52F1).

ICES Divisions	Country	Gear	Number of tows planned	Planned tows valid	Additional tows valid	Invalid	% stations fished
IIIa	SWE	GOV-A	45	45	0	0	100%
	DEN	GOV-A	1	1	0	0	
			49	49	0	2	
IV	ENG	GOV-A	76	73	1	7	96%
	GER	GOV-A	29	29	0	0	100%
	NOR	GOV-A	47	46	3*	1	98%
IVa	SCO	GOV-B	44	44	0	3	100%
IVb		GOV-A	40	40	0	0	

Table 5.1.3. Overview of age samples collected during the North Sea IBTS Q3 survey in 2014.

Species	DEN	ENG	GER	NOR	SCO	SWE	Total
Clupea harengus	1235	1119	513	1213	1237	1199	6516
Sprattus sprattus	567		246		432	587	1832
Gadus morhua	318	381	41	374	595	695	2404
Merlangius merlangus	654	1408	527	444	1403	429	4865
Melanogrammus aeglefinus	223	1152	148	571	1336	289	3719
Trisopterus esmarki	9	429	79	233	508	139	1397
Pollachius virens	9	495	5	457	244	182	1392
Merluccius merluccius	15	397			453	202	1067
Scomber scombrus	175	372	153	293	269		1262
Pleuronectes platessa	848	1353	307	136	271	643	3558
Limanda limanda		279					279
Glyptocephalus cynoglossus	6	25				55	86
Solea solea	38					5	43
Microstomus kitt		222					222
Scopthalmus maximus	10	8					18
Scophtalmus rhombus	3	2					5
Chelidonichthys cuculus		2			37		39
Chelidonichthys lucerna		26					26
Eutrigla gurnadus		233					233
Mullus surmuletus		33					33
Lophius piscatorius	6	54					60
Lophius budegassa		2					2
Zeus faber		2			1		3
Molva molva		29					29

Table 5.1.4. Overview of individual length, weight and/or maturity data collected other than the regular measurements in the manual during the North Sea IBTS Q3 survey in 2014 (* correct species names under discussion, see Section 7).

Species	DEN	ENG	GER	NOR	SCO	SWE	Total
Hippoglossus hippoglossus				1			1
Squalus acanthias		13		55			68
Galeorhinus galeus	18		8				26
Scyliorhinus canicula			12	17			29
Raja montagui		11	1		50		62
Leucoraja naevus		33	1	1	27		62
Amblyraja radiata		98	13	24	78		213
Leucoraja fullonica							0
*Raja batis**							0
*Dipturus intermedia**		1			7		8
Raja clavata		66					66
Lithodes maja				13			13
Nephrops norvegicus				191			191
Mustelus asterias		15			2		17
Chelidonichthys cuculus				7	37		44
Zeus faber					1		1
Scophtalmus rhombus					2		2
Etmopterus spinax				18			18

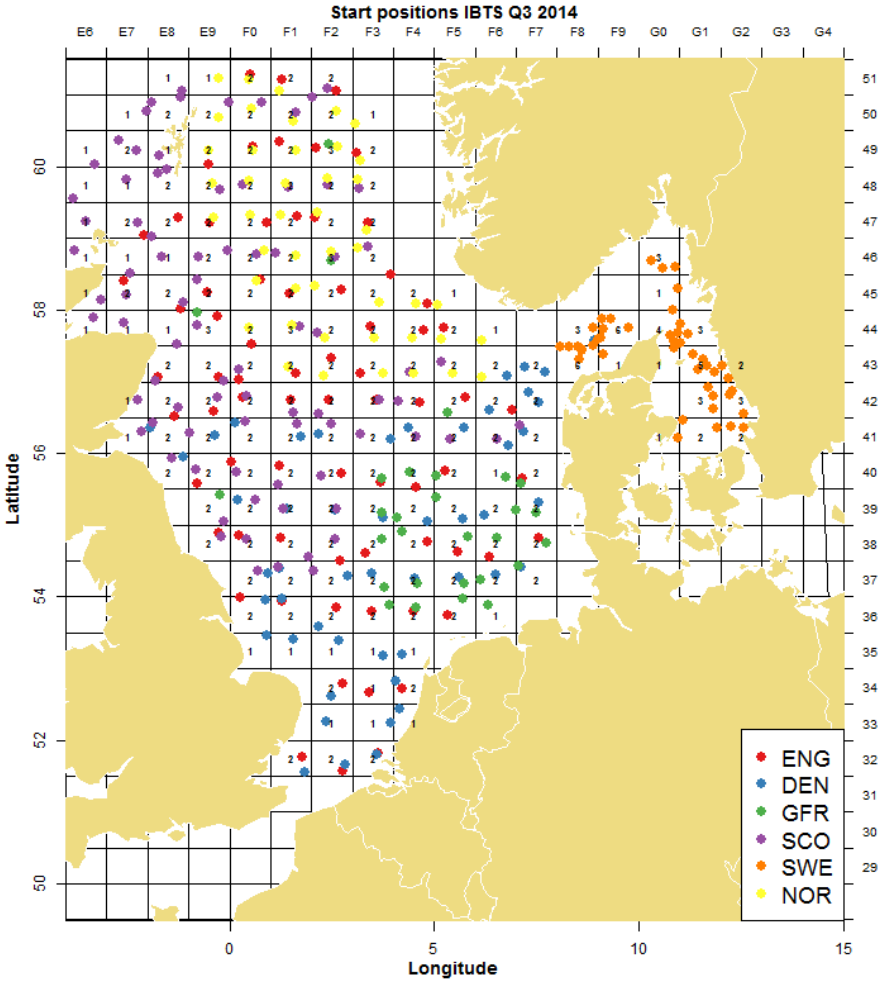


Figure 5.1.1. Number of hauls per ICES rectangle with GOV during the North Sea IBTS Q3 2014 and the start positions of the trawls by country.

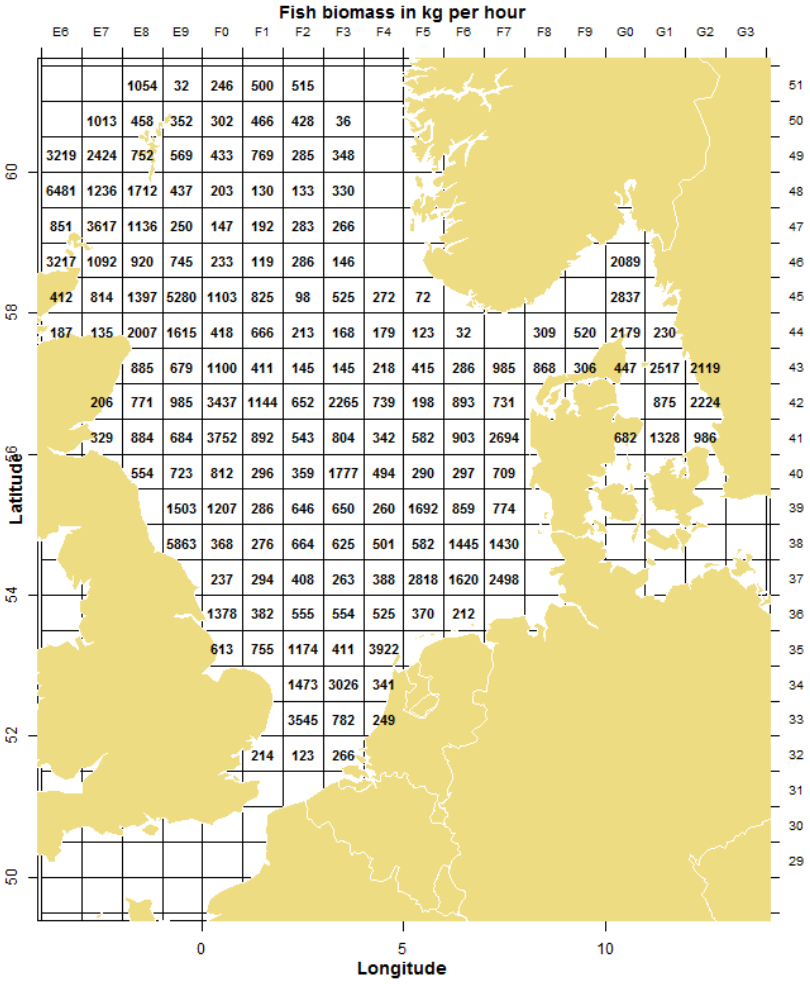


Figure 5.1.2 Distribution of fish biomass density (kg per hour; mean) by rectangle in the North Sea IBTS Q3 2014.

5.1.2 Issues and problems

There were no major issues and problems.

5.1.3 Additional activities

All countries collected seabed litter from the GOV tows and collected CTD (temperature and salinity, oxygen for some countries) at all GOV stations when possible. A list of other additional activities is given in Table 5.1.5.

Table 5.1.5. Overview of additional activities in the North Sea IBTS Q3 survey in 2014 (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
Seabed Litter	x	x	x	x	x	x
Water sampler (Nutrients)		x	x	(x)	x	
Collection of fish stomachs						
Collection of fish tissues	x		(x)	x	x	x
Jellyfish from GOV catches		x		x		
Plankton biodiversity		(x)				
Epibenthos (beam trawl)			x			
Sediment (VanVeen grab)			x			
Seabirds, Marine mammals		(x)			x	
Zooplankton (MIK)				x		
Hydrological transect				x		
Acoustics (Ichthyofauna)		x		x		

5.1.4 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). The results shown in Figure 5.1.3 indicate that in general all countries except Norway achieved door spread values, which either are within or close to the theoretical limits defined for the GOV 36/47.

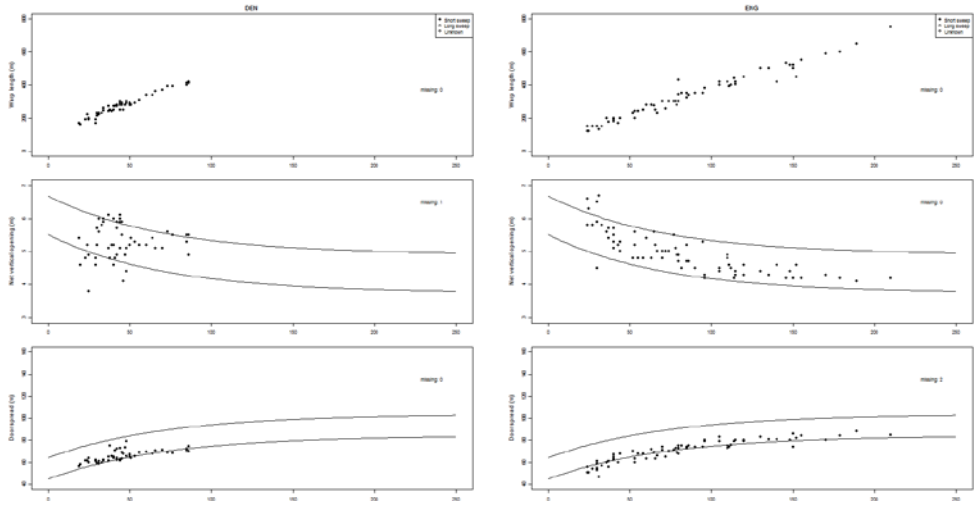


Figure 5.1.3a. Warp length and net geometry related to depth by country for the North Sea IBTS Q3 2014 – Denmark and England (solid lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual).

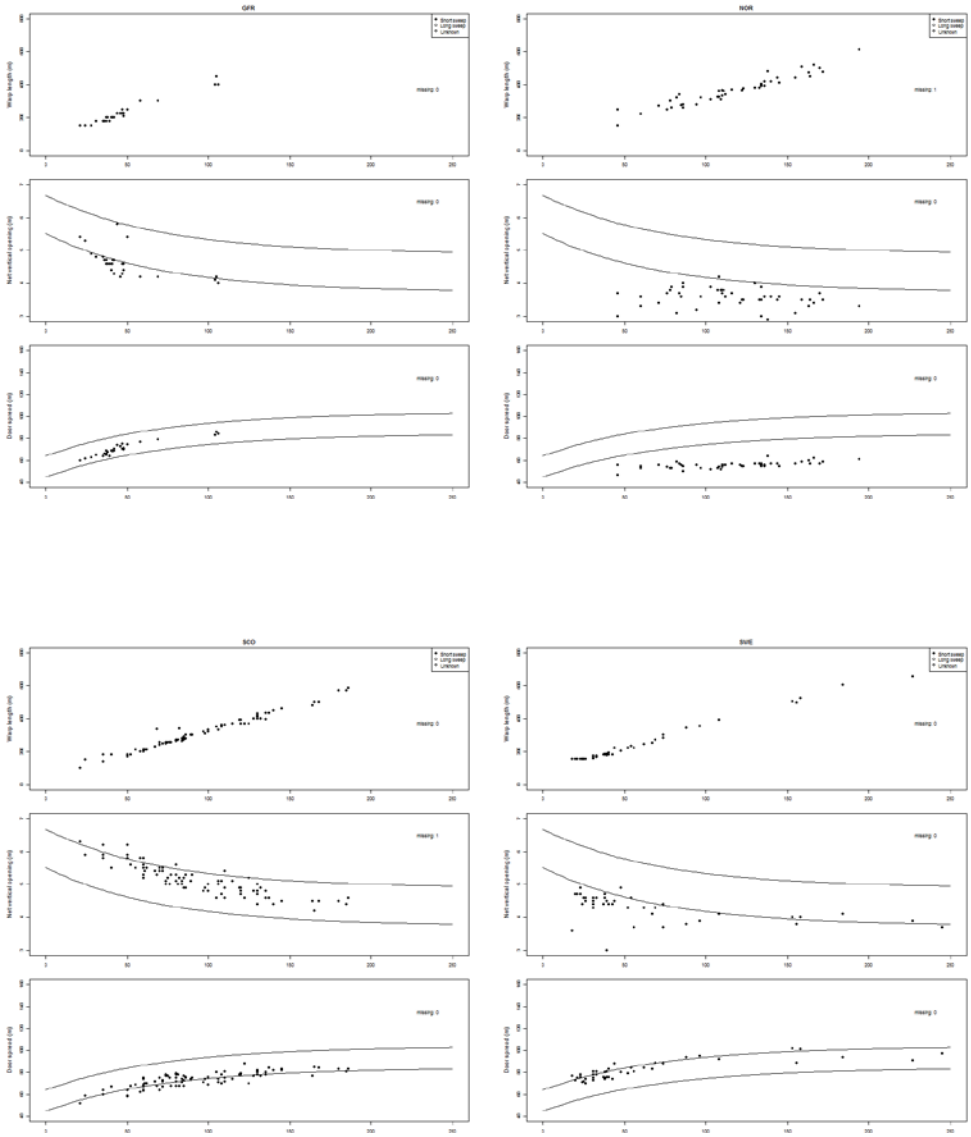


Figure 5.1.3b. Warp length and net geometry related to depth by country for the North Sea IBTS Q3 2014 – Germany, Norway Scotland and Sweden (solid lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual).

In terms of vertical net opening, however, notably Norway and Sweden were below the theoretical values.

5.1.5 GOV standard indices and distribution of target species

The indices for the recruits of the NS-IBTS standard species based on the 2014 quarter 3 survey are shown in Figure 5.1.4. The 3Q 2014 0-group indices for whiting, saithe, Norway pout, herring, mackerel and sprat in subarea IV (North Sea) are above long-term average. However, not all of these 0-group indices are meaningful due to low catchability and because some of the species only occur sporadically in the IBTS index at this age and time of the year. At age 1, only the indices for sprat in area IV (North Sea) and Division IIIa (Skagerrak and Kattegat) were above the long-term average (Figure 5.1.5).

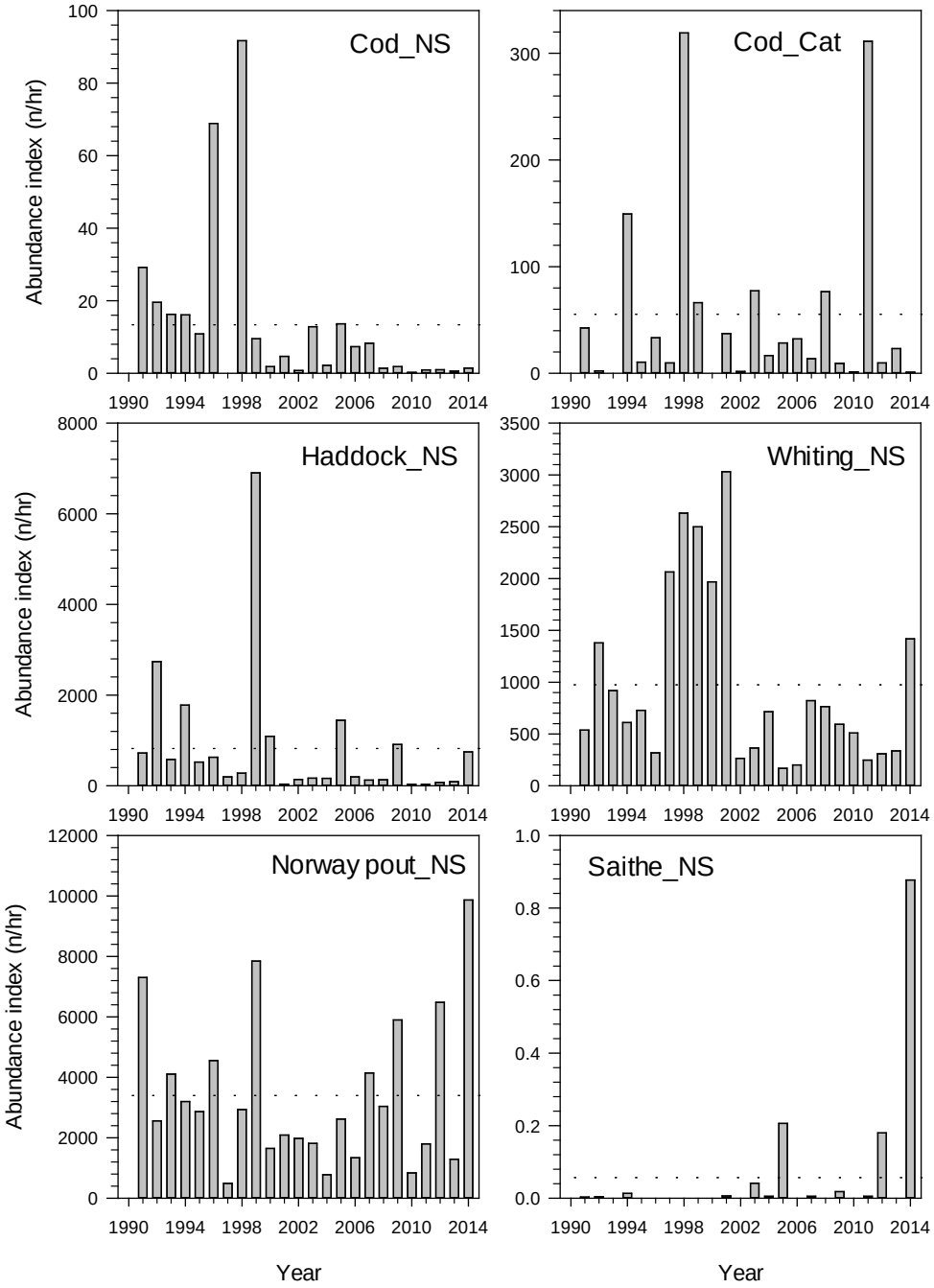


Figure 5.1.4a. Abundance indices for 0-group cod, haddock, whiting, Norway pout and saithe caught during the quarter 3 IBTS survey in the North Sea (_NS), Skagerrak and Kattegat (_Cat; dashed lines: mean values 1991–2014, no coverage of area IIIA in 2000, see http://vocab.ices.dk/ for definition of the indices and the species-specific standard areas).

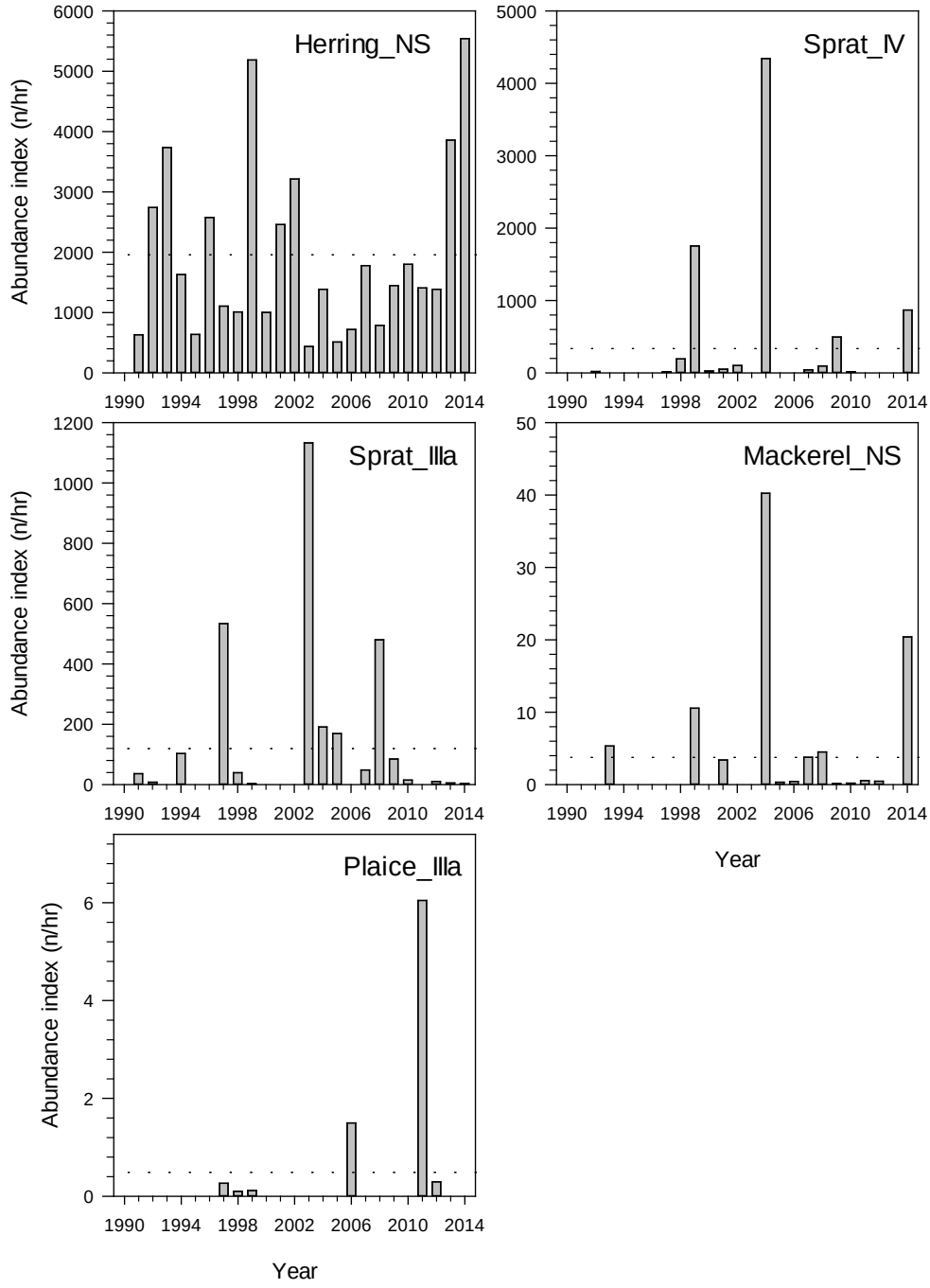


Figure 5.1.4b. Abundance indices for 0-group herring, sprat, mackerel and plaice caught during the quarter 3 IBTS survey in the North Sea, Skagerrak and Kattegat (dashed lines: mean values 1991–2014, no coverage of area IIIA in 2000, for plaice, see http://vocab.ices.dk/ for the definition of indices and the species-specific standard areas).

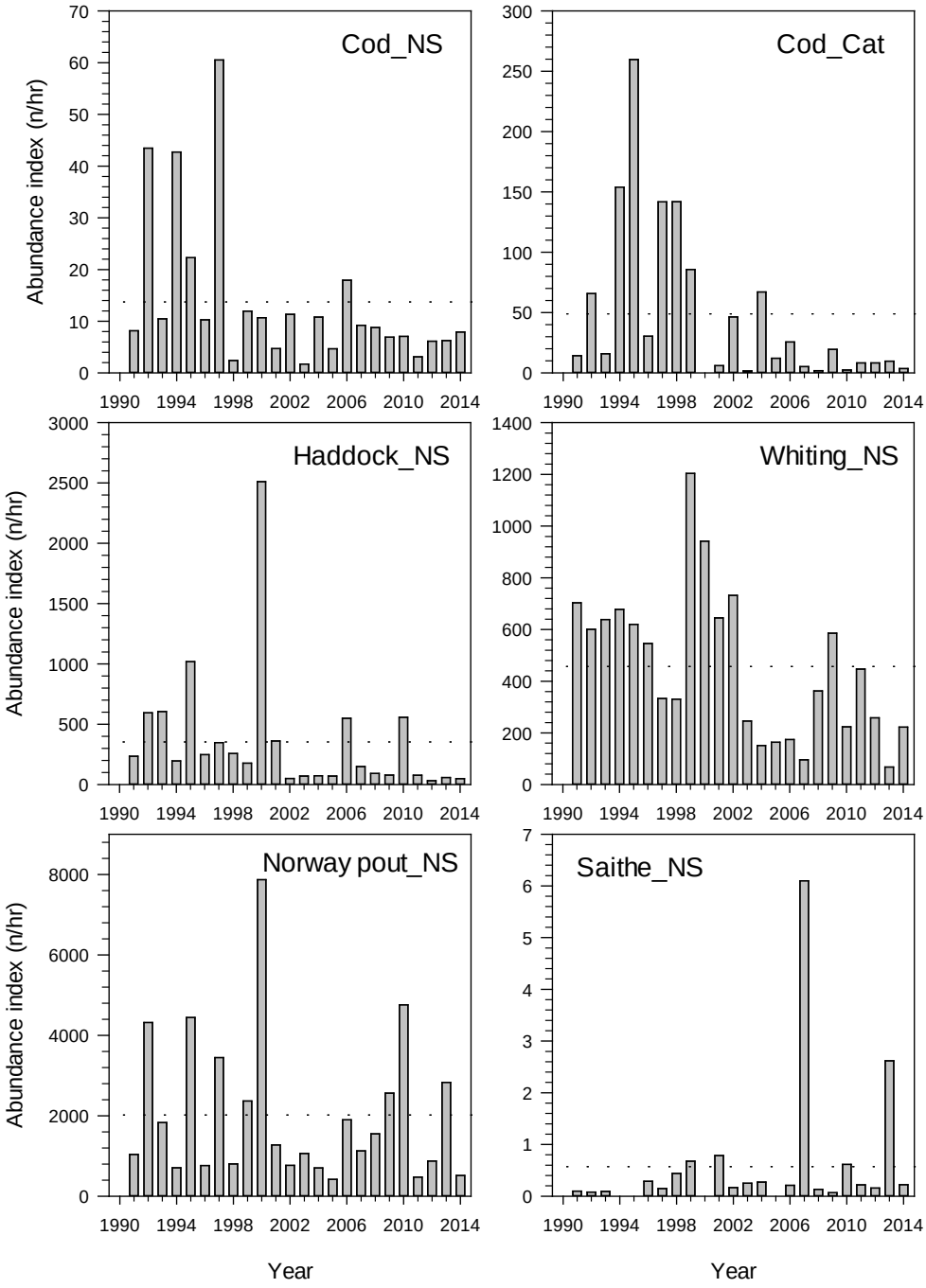


Figure 5.1.5a. Abundance indices for 1-group cod, haddock, whiting, Norway pout and saithe caught during the quarter 3 IBTS survey in the North Sea, Skagerrak and Kattegat (dashed lines: mean values 1991–2014, no coverage of area IIIA in 2000, see http://vocab.ices.dk/ for definition of the indices and the species-specific standard areas).

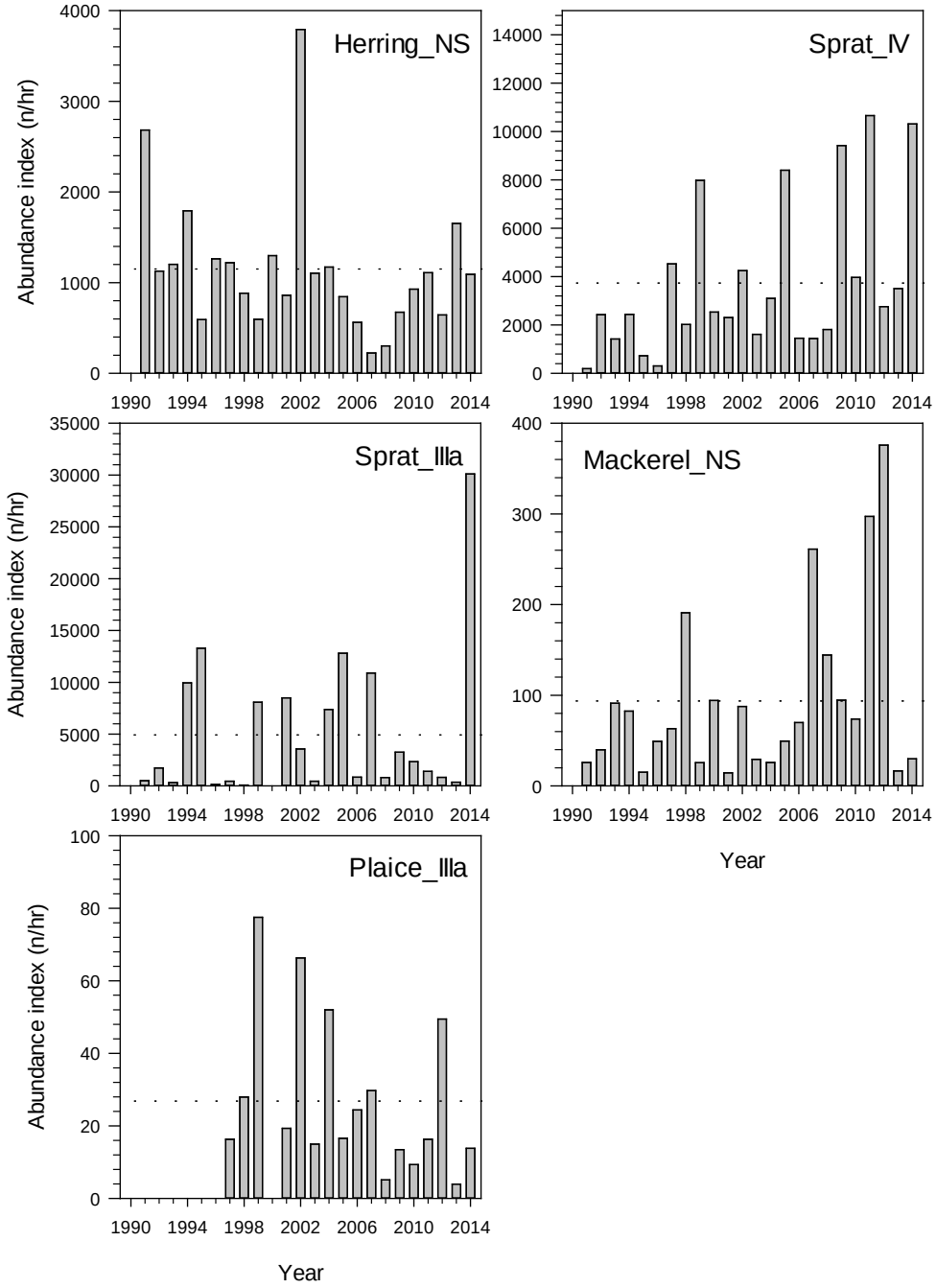


Figure 5.1.5b. Abundance indices for 1-group herring, sprat, mackerel and plaice caught during the quarter 3 IBTS survey in the North Sea, Skagerrak and Kattegat (dashed lines: mean values 1991–2014, no coverage of area IIIA in 2000, for plaice, see http://vocab.ices.dk/ for the definition of indices and the species-specific standard areas).

Distribution plots (Figure 5.1.6) indicate that, for some target species, high densities were found outside the actual index areas, particularly for cod, haddock, whiting and Norway pout this may warrant a revision of the species-specific areas on which the standard indices as calculated in DATRAS is based. It is proposed that during the Q3 survey in 2015, any possibility for extra hauls will be used to obtain additional hauls from these areas (compare Section 10). The Q3 coordinator will communicate with survey participants and will assign such hauls should they be achievable.

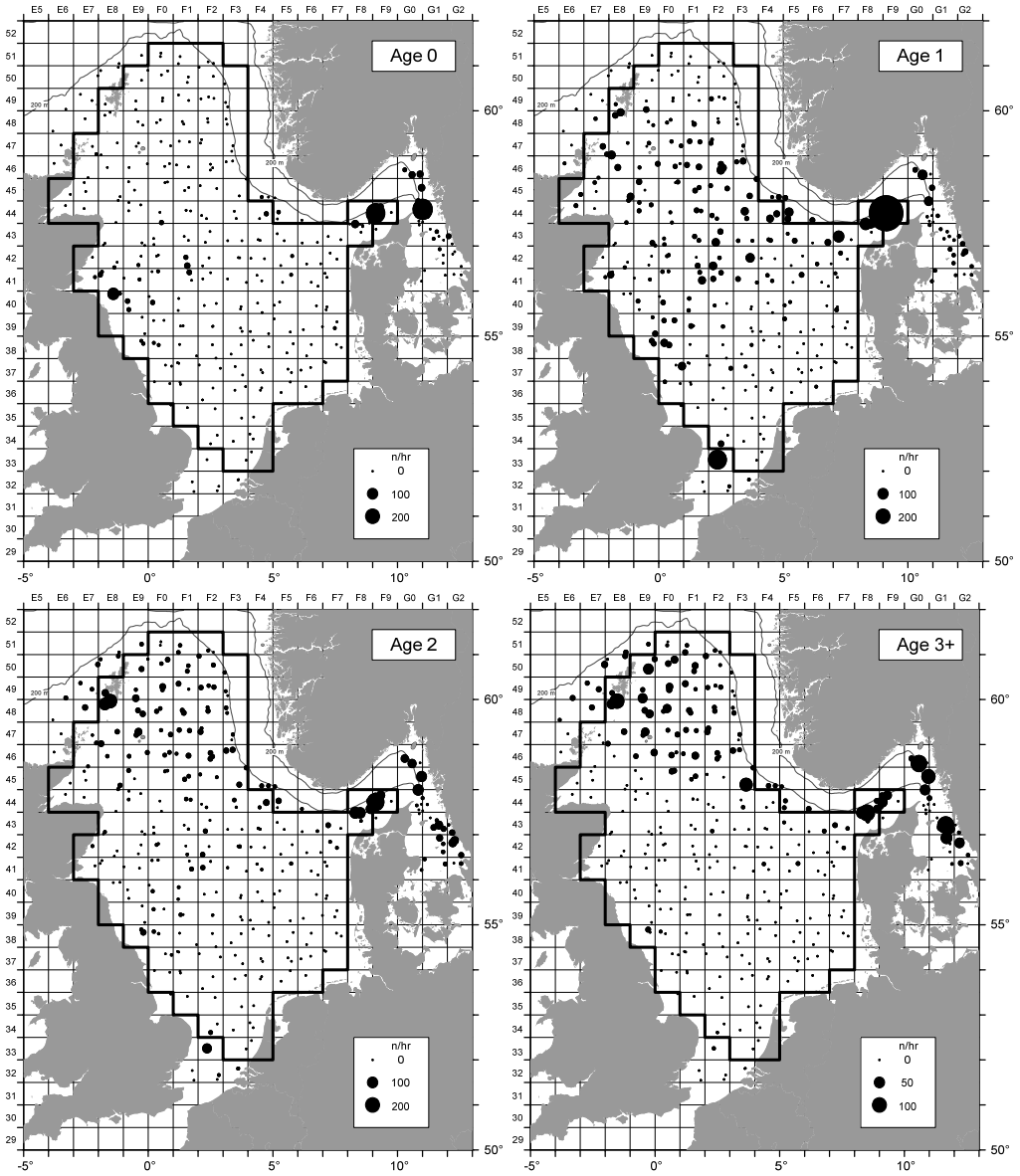


Figure 5.1.6a. Distribution of cod in the quarter 3 IBTS 2014 (solid line: NS cod index area).

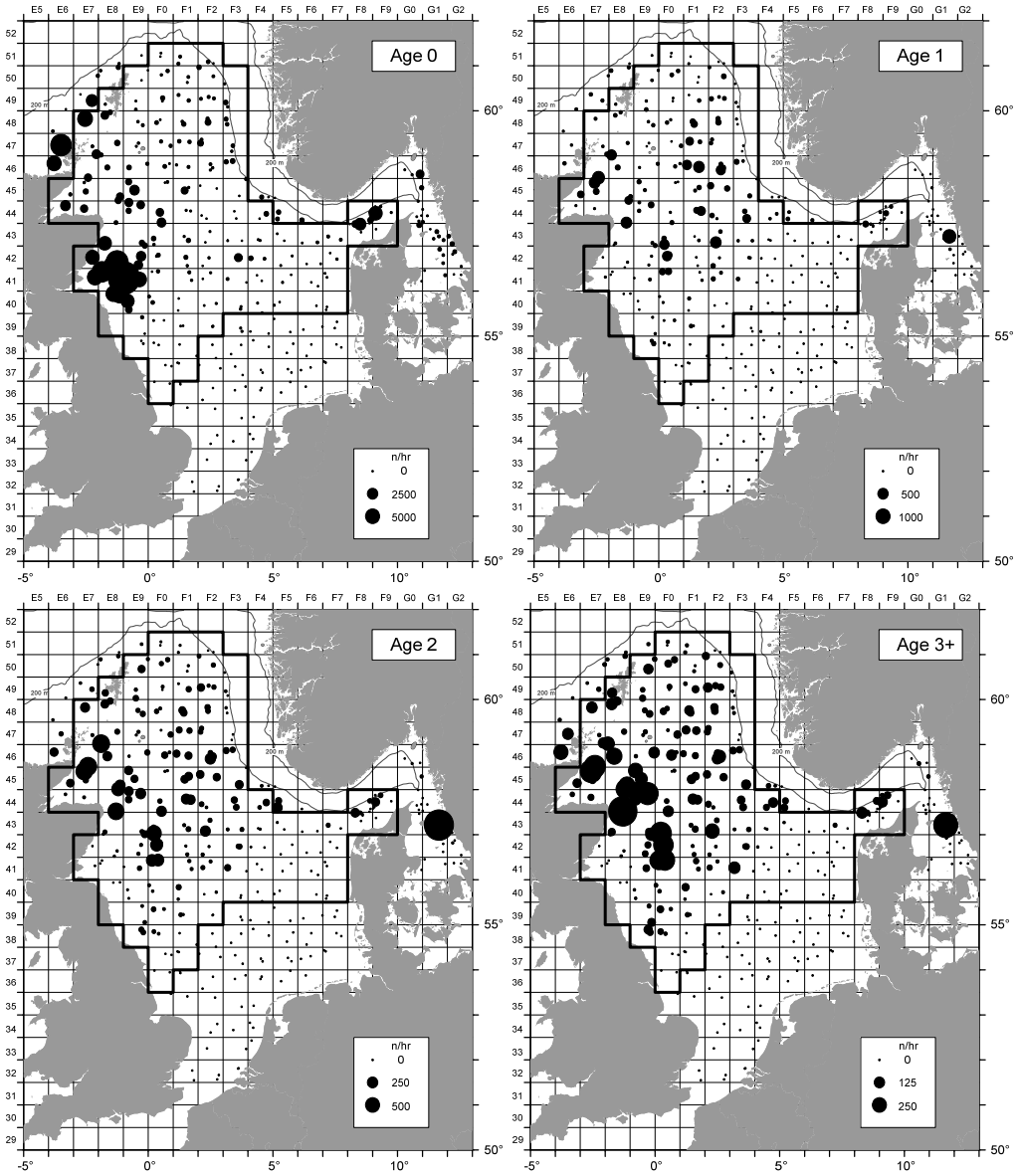


Figure 5.1.6b. Distribution of haddock in the quarter 3 IBTS 2014 (solid line: NS haddock index area).

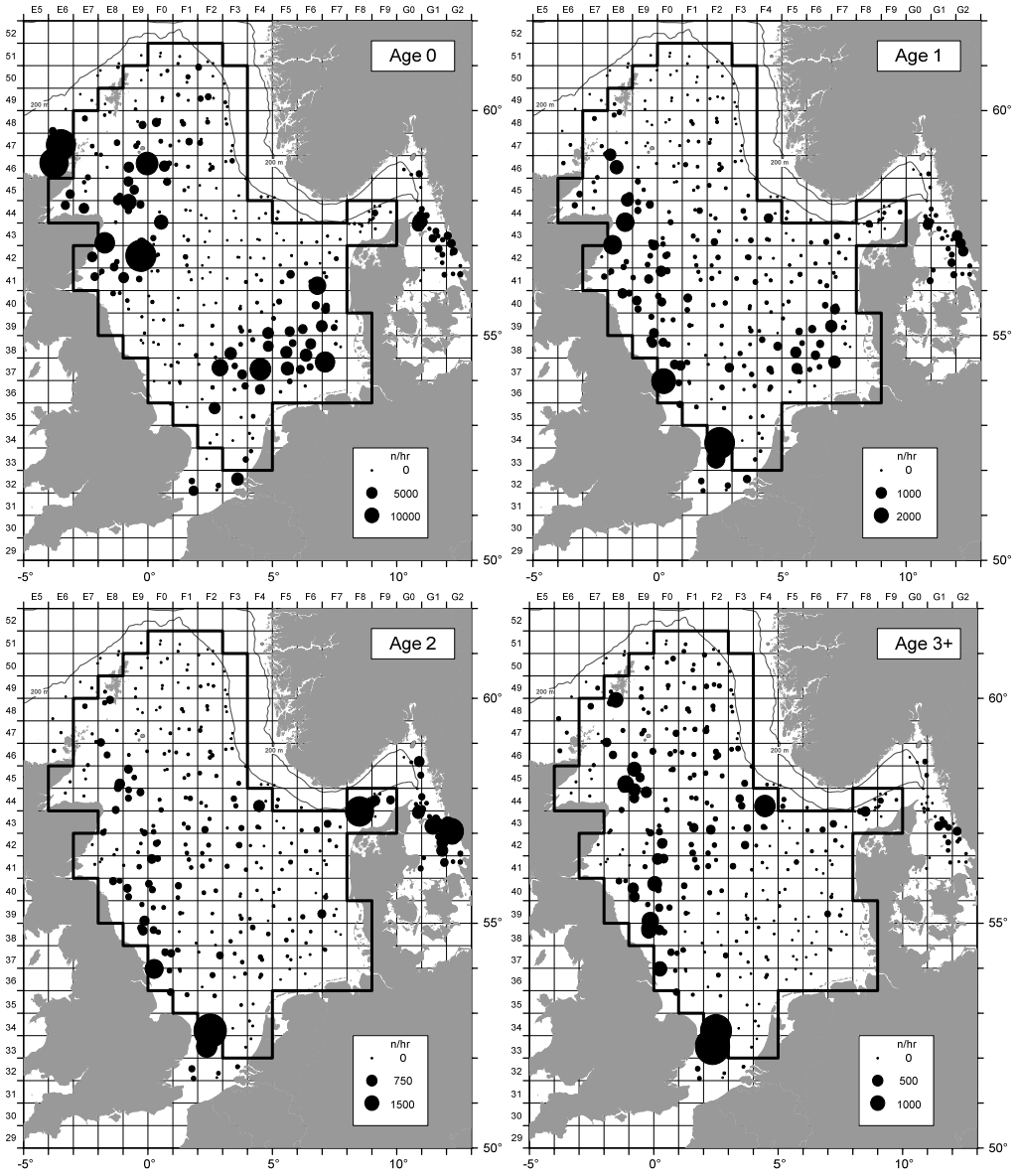


Figure 5.1.6c. Distribution of whiting in the quarter 3 IBTS 2014 (solid line: NS whiting index area).

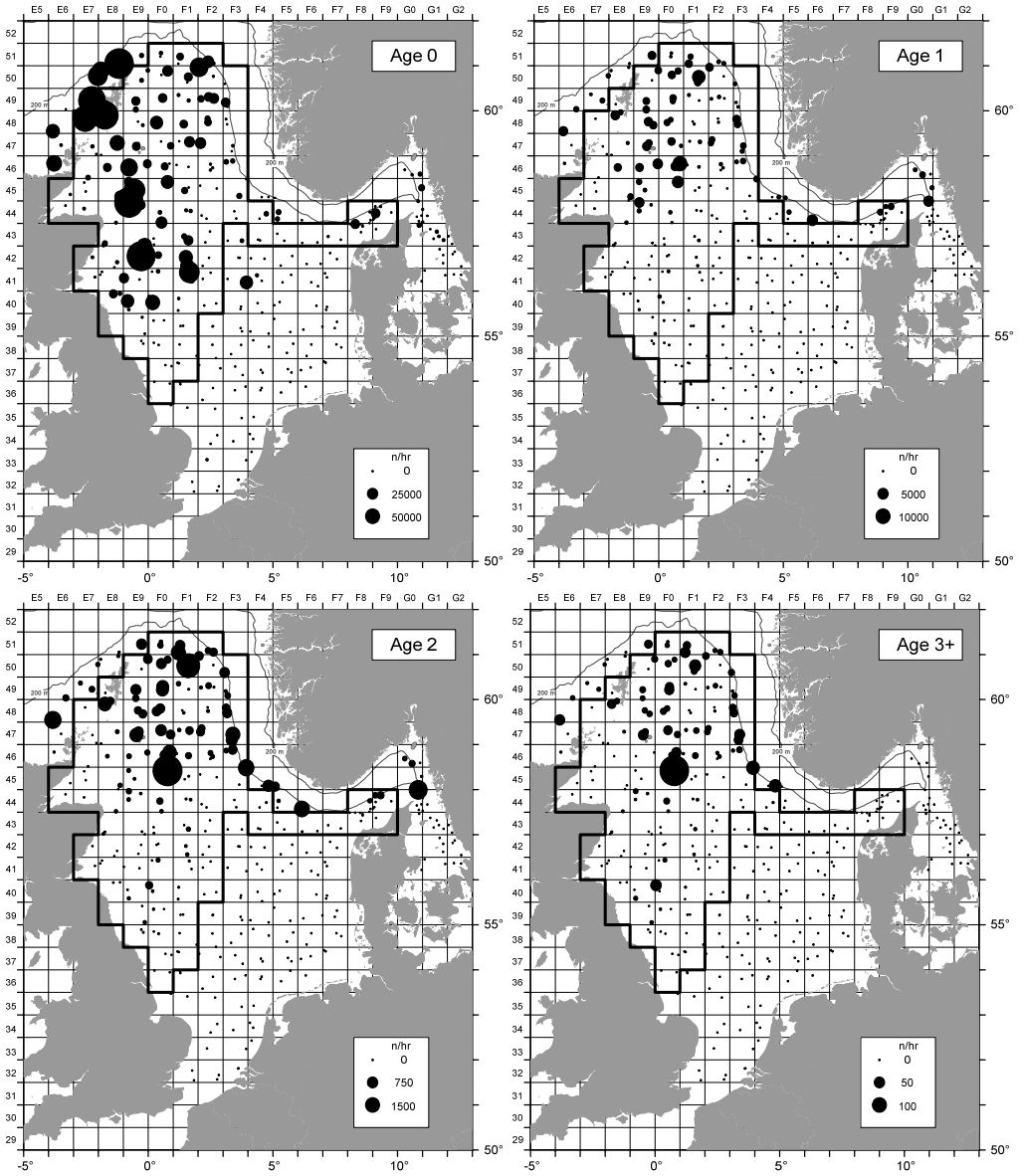


Figure 5.1.6d. Distribution of Norway pout in the quarter 3 IBTS 2014 (solid line: NS Norway pout index area).

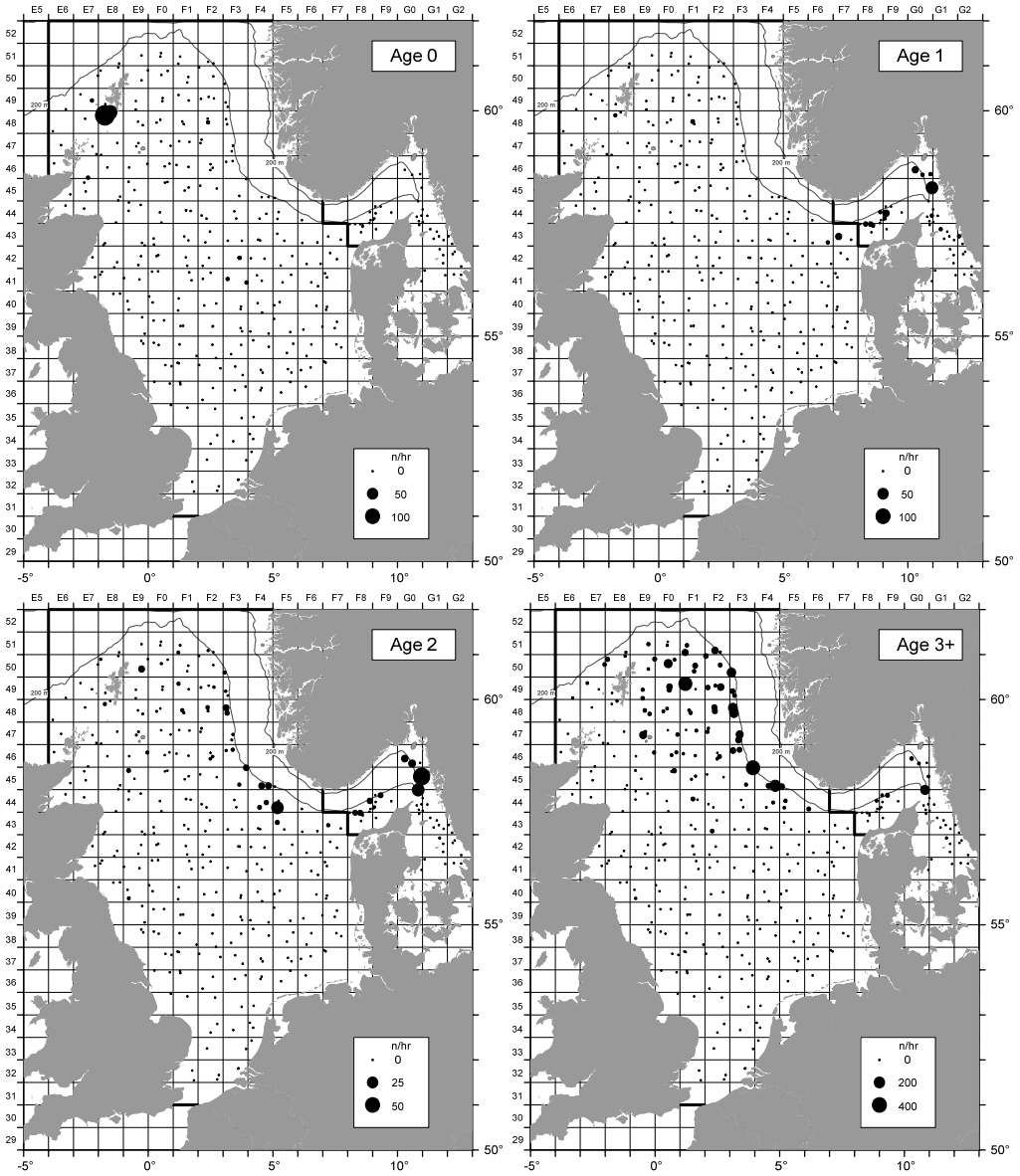


Figure 5.1.6e. Distribution of saithe in the quarter 3 IBTS 2014 (solid line: ICES North Sea (area IV) border.

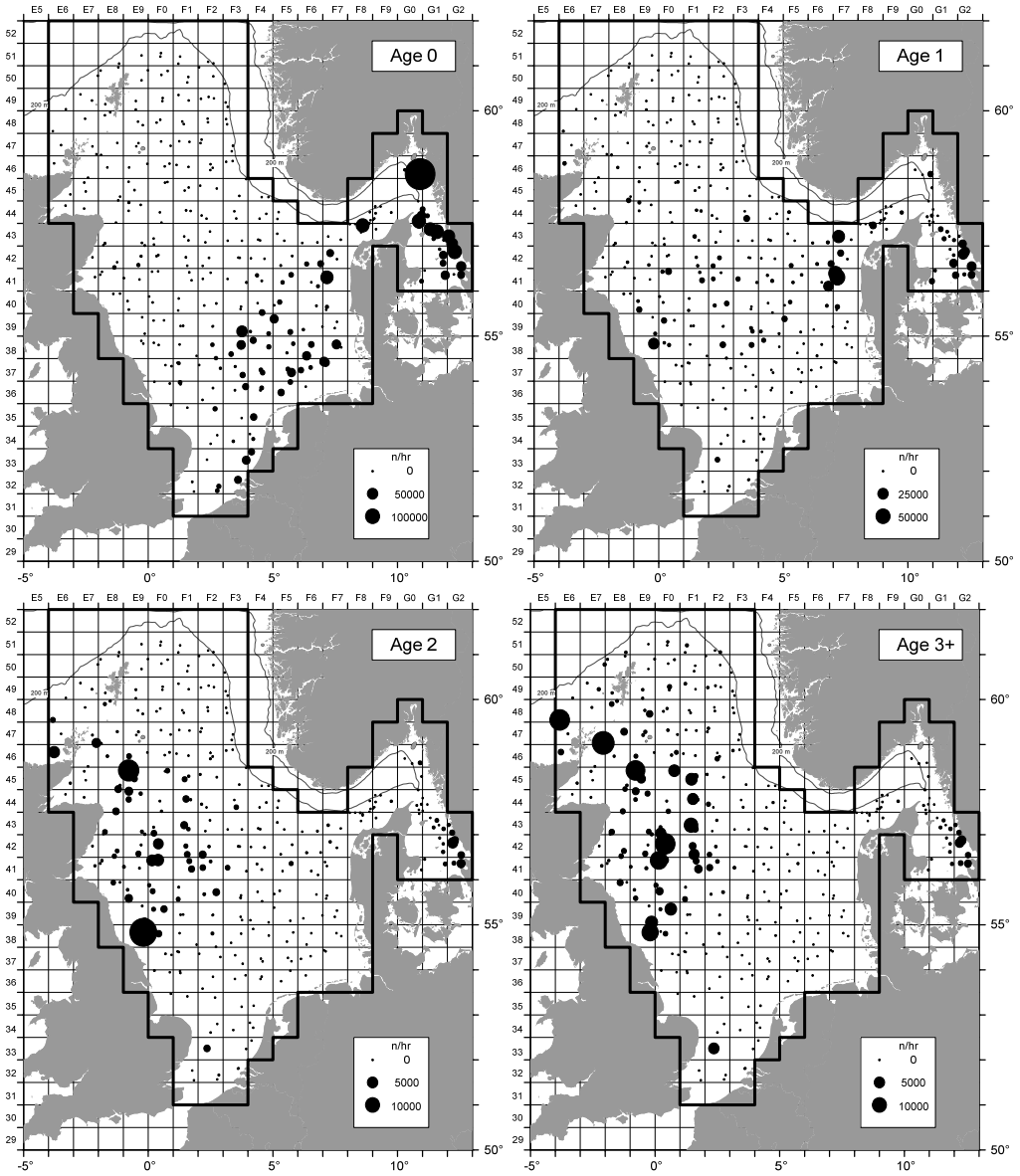


Figure 5.1.6f. Distribution of herring in the quarter 3 IBTS 2014 (solid line: NS herring index area in the 3rd quarter).

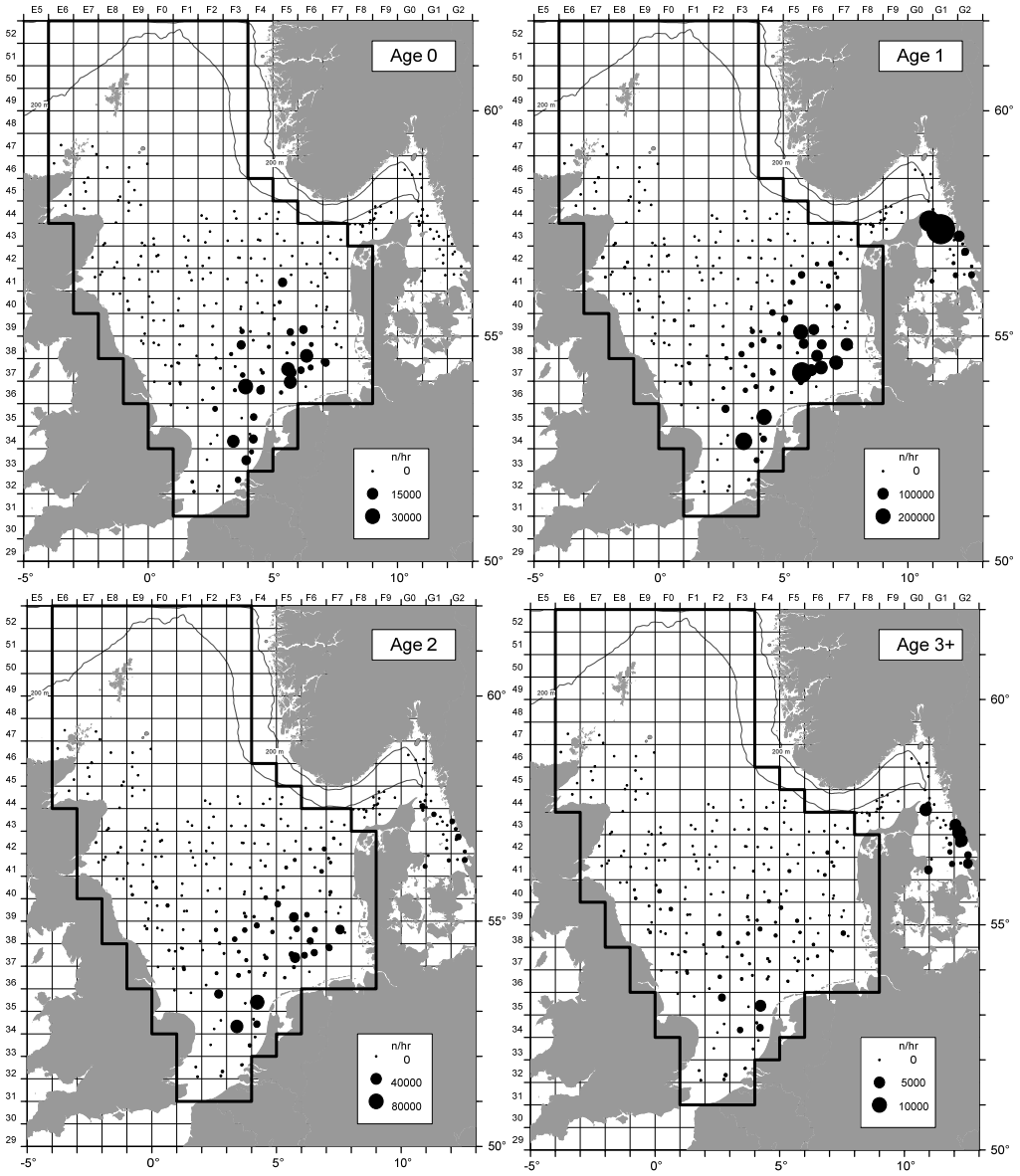


Figure 5.1.6g. Distribution of sprat in the quarter 3 IBTS 2014 (solid line: NS sprat index area).

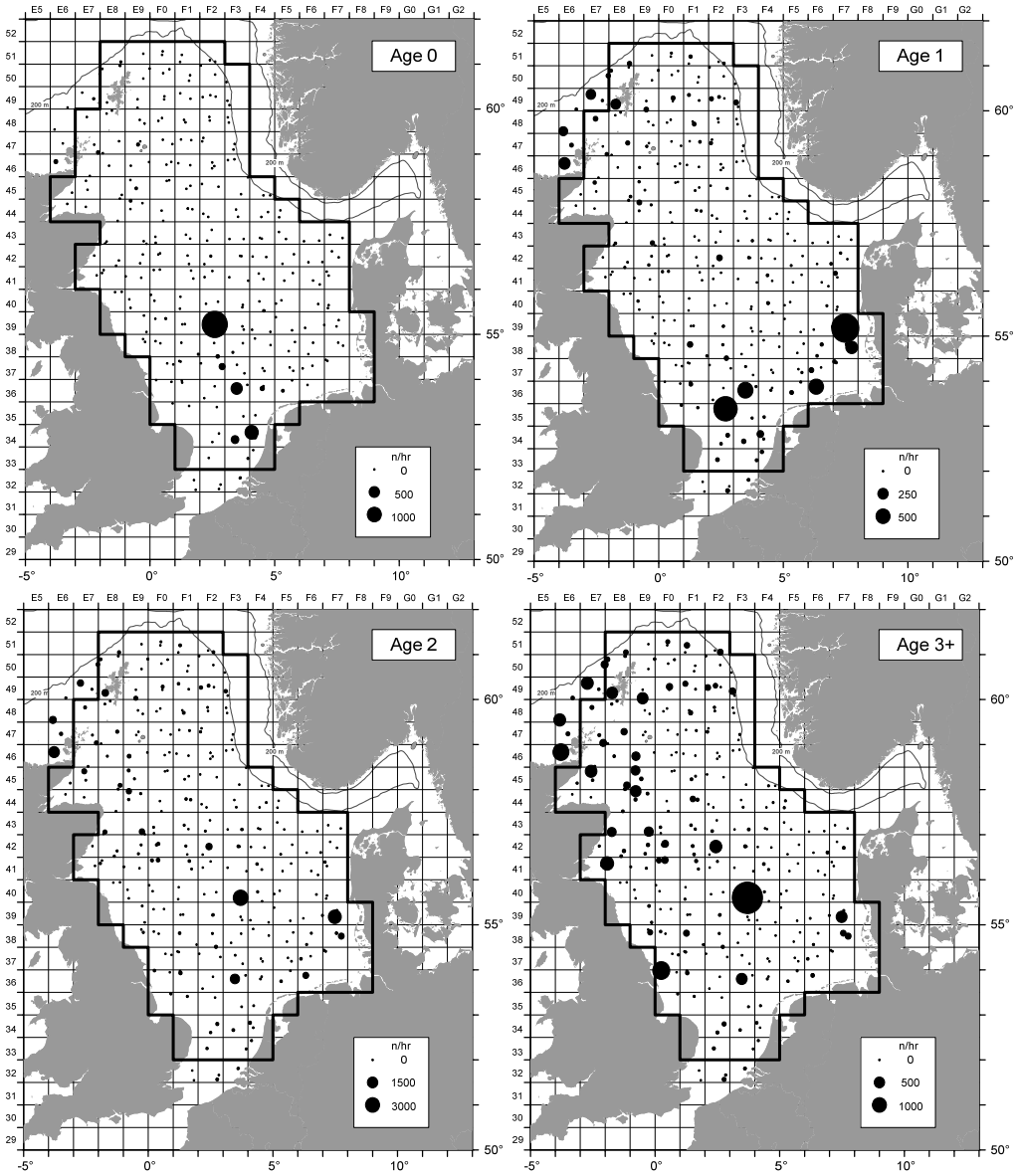


Figure 5.1.6h. Distribution of mackerel in the quarter 3 IBTS 2014 (solid line: NS mackerel index area).

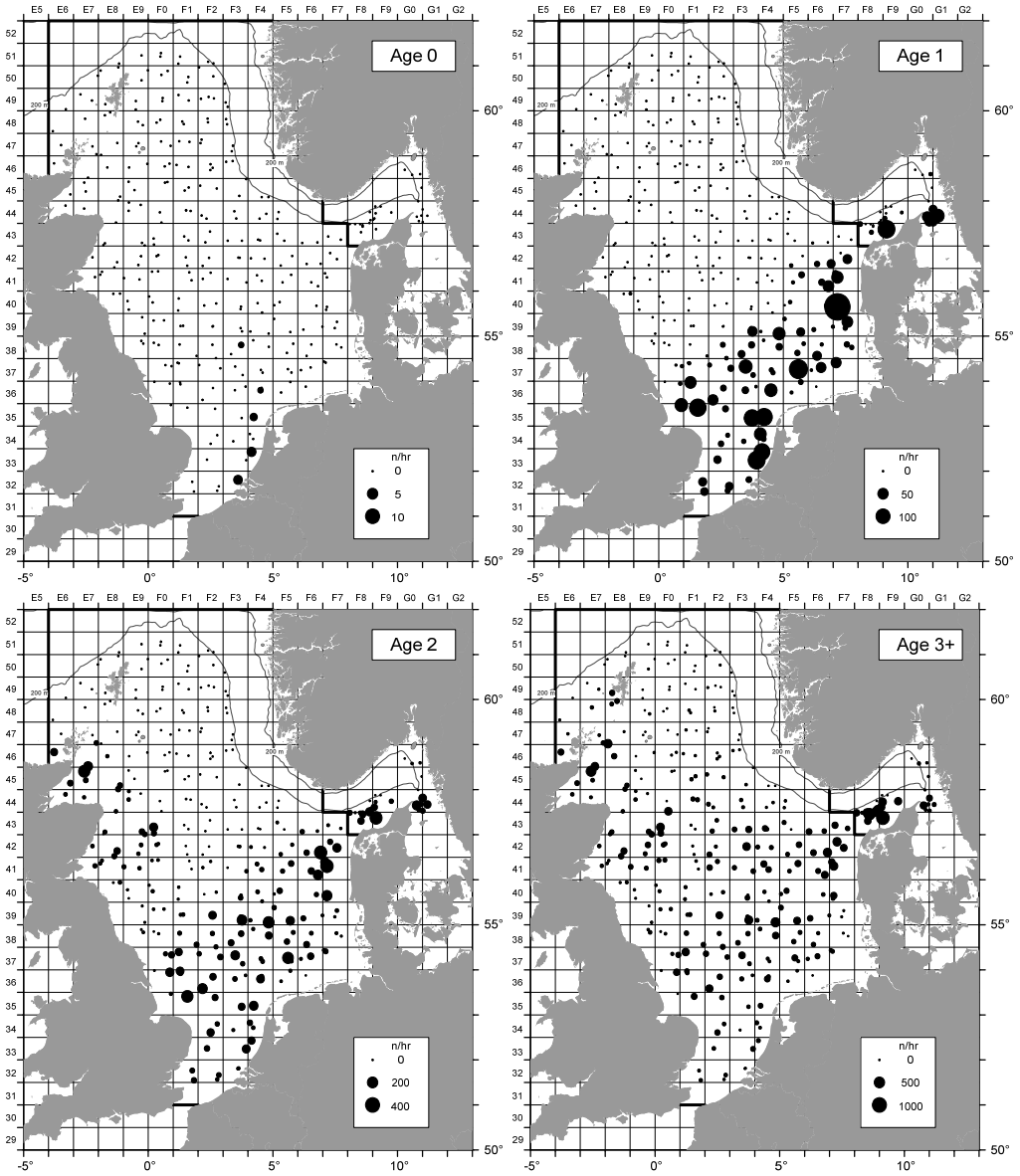


Figure 5.1.6i. Distribution of plaice in the quarter 3 IBTS 2014 (solid line: ICES North Sea (area IV) border).

5.1.6 Planning and participation in 2015

All regularly contributing countries intend to participate in the quarter 3 2015 NS-IBTS survey program. Below is a table showing the expected program dates for each country for this year.

England	Cefas Endeavour	8 August to 6 September 2015
Denmark	Dana	28 July to 14 August 2015
Germany	Walther Herwig III	27 July to 24 August 2015
Norway	Johan Hjort	26 June to 31 July 2015
Scotland	Scotia	30 July to 20 August
Sweden	Dana	20 August to 31 August 2015.

No major changes in the rectangle allocation scheme are planned for 2015 (Figure 5.1.7). However, if time allows, experimental GOV tows in rectangles 52E9, 52F0 or 52F1 which have previously not been included in the survey area, and other extensions of the area coverage would be highly desirable (compare Figure 5.1.6).

IBTSWG 2015 started to evaluate the survey design, and proposes to conduct an experiment on tow duration in Q3 2015, because evidence exists for other surveys that benefits arose from changing to shorter tow duration (15 min instead of 30 min; see Section 10). It is planned that in rectangles to which two hauls are allocated, tow duration of one of the two hauls will be reduced to 15 min while 30 min tow duration will be maintained for the other one. This way, a full North Sea-wide set of the regular 30 min hauls would still be available, even if the 15 min hauls proved to be significantly different. The coordinator will provide the selection of tow duration per rectangle and country prior to the survey together with the overall information to the participants.

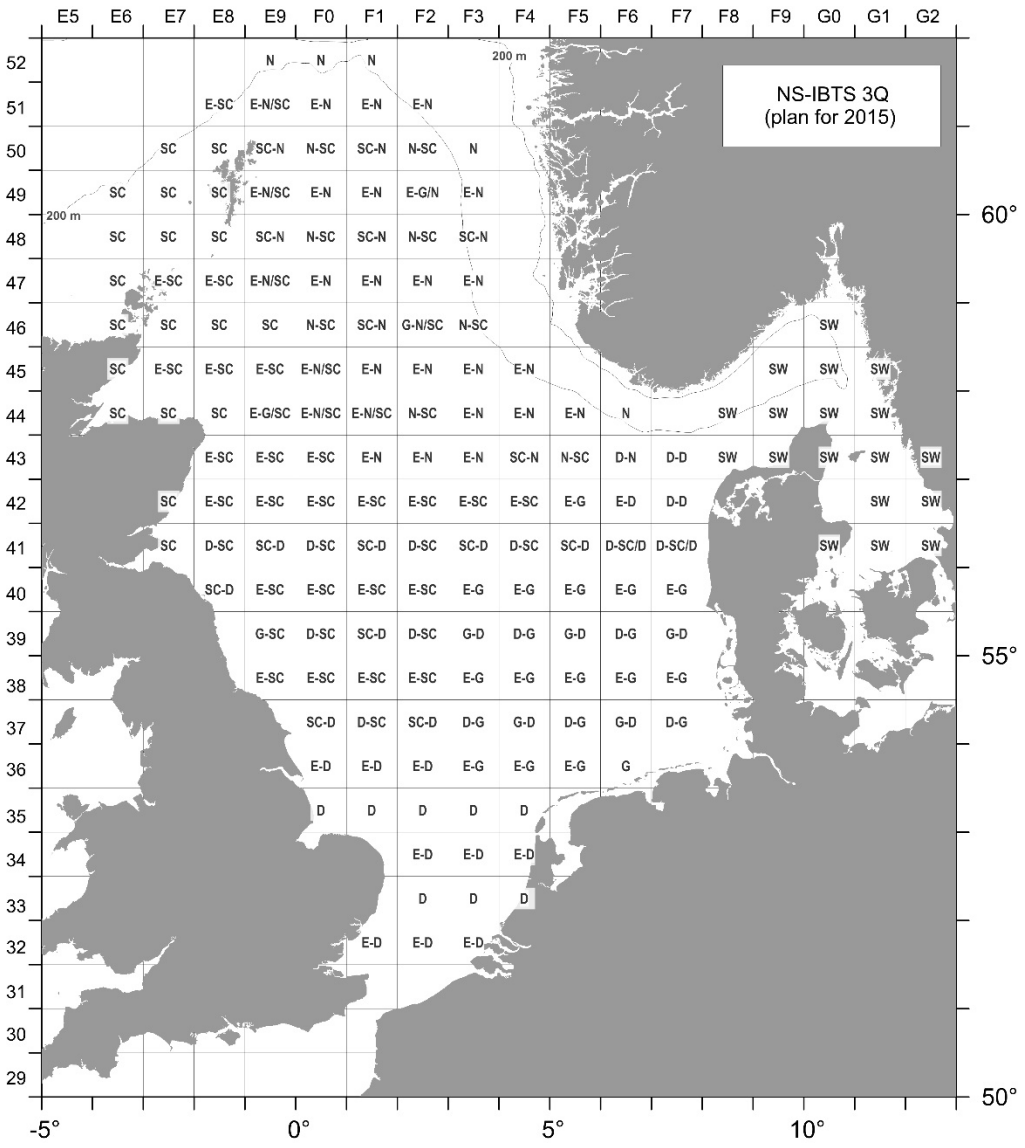


Figure 5.1.7. Planned rectangle allocation by country for the 3Q survey in 2015 (D: Denmark, E: England, G: Germany, N: Norway, SC: Scotland, SW: Sweden; country named first in a rectangle is supposed to conduct a standard 30 min tow whereas the second country should conduct a 15 min tow).

5.1.7 Other issues

Staff exchange

No staff exchange has occurred during the 2014 Q3 surveys, and no concrete plans are there yet to have an exchange in 2015. However, IBTSWG continues to encourage staff exchange.

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 at least for the NS-IBTS main target species including the age information are usually submitted to DATRAS within 2 to 3 weeks after completion of the survey.

5.2 Q1 North Sea Survey

5.2.1 General overview

The North Sea IBTS Q1 survey aims to collect data on the distribution, relative abundance and biological information on a range of fish species in ICES area IIIa, IV and VIId. During daytime a bottom trawl was used. This is the GOV (Grand Ouverture Verticale), with groundgear A or B. 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 2015 fleet consisted of six vessels: "Dana" (Sweden+ Denmark), "G.O. Sars" (Norway), "Scotia" (Scotland), "Thalassa" (France), "Cefas Endeavour" (Netherlands) and "Walther Herwig III" (Germany). The survey covered the period 11 January to 23 February (see Table 5.2.1).

The weather during the 2015 IBTS was reasonable to very good, resulting in a total of 374 GOV (Table 5.2.2) and 657 MIK (Table 5.2.3) hauls (see Figure 5.2.1 and Figure 5.2.2). All rectangles were covered by at least 1 GOV haul and nearly all planned rectangles were covered by at least 1 MIK haul.

Biological data are collected from a large number of species, for most of these species length, weight, gender and maturity and age material were collected (Table 5.2.4). An impression of the catches is given in Figure 5.2.3, by presenting the total catch in kilograms.

As specific comment is to be made on the Dutch participation in 2015: Regularly the Dutch use the vessel RV 'Tridens II', however this was refitted at the time of the survey. Therefore, the 'Cefas Endeavour' was used (with the Dutch gear combined with the doors from Endeavour), providing less time for the Dutch to executed their survey. Prior to the survey, it was decided that France would additionally cover the Channel area (Roundfish Area 10, Division VII d) and during the survey, the French offered to cover also a number of stations in the southern North Sea. Therefore, in the southern part there is a number of rectangles covered twice by France, in contrast to previous years.

Table 5.2.1. Overview of the surveys performed during the North Sea IBTS Q1 survey in 2015.

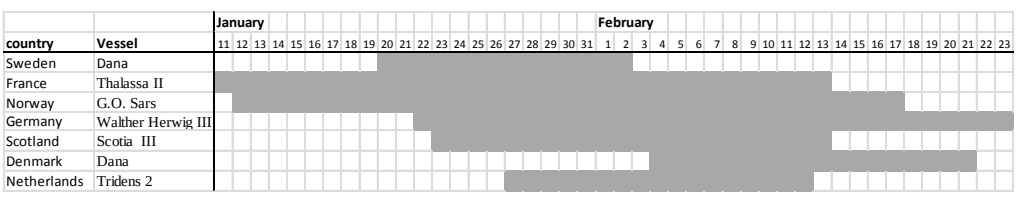


Table 5.2.2. Overview of the GOV stations fished in the North Sea IBTS Q1 survey in 2015 (GOV-A, GOV-B: with groundgears A and B, respectively).

ICES Divisions	Country	Gear	Number of tows planned	Planned tows valid	Additional tows valid	Invalid	% stations fished
IIIa	SWE	GOV-A	46	46		1	100%
IIIa	DEN	GOV-A	1	1	4		500%
IV	GFR	GOV-A	77	69			90%
	NOR	GOV-A	40	39			98%
	FRA	GOV-A	58	70			121%
	DEN	GOV-A	39	39	1		102%
	NED	GOV-A	49	44		2	90%
	SCO	GOV-A	14	14		1	100%
	SCO	GOV-B	43	40		3	93%
VIId	FRA	GOV-A	10	10	3		130%

Table 5.2.3. Overview of the MIK stations fish in the North Sea IBTS Q1 survey in 2015.

ICES Divisions	Country	Gear	Tows planned	Valid	Additional	Invalid	% stations fished
IIIa	SWE	MIK	57	65			114%
IV	GFR	MIK	154	141			92%
	NOR	MIK	80	80			100%
	FRA	MIK	116	102			88%
	DEN	MIK	78	76			97%
	NED	MIK	98	87		3	89%
	SCO	MIK	112	91			81%
VIId	FRA	MIK	20	15			75%

Table 5.2.4. Overview of individual length, weight and/or maturity and/or age samples collected during the North Sea IBTS Q1 survey in 2015.

Species	DEN	FRA	GFR	NED	NOR	SCO	SWE	Total
Clupea harengus	578	466	802	267	1149	337	2009	5608
Merlangius merlangus	495	1230	889	609	793	910	442	5368
Melanogrammus aeglefinus	133	88	1011	306	776	1063	294	3671
Pleuronectes platessa	582	1081	319	463	0	0	799	3244
Sprattus sprattus	374	177	427	353	134	204	1269	2938
Gadus morhua	154	172	337	159	483	602	853	2760
Trisopterus esmarkii	59	67	281	105	296	312	158	1278
Pollachius virens	13	0	285	0	215	64	38	615
Microstomus kitt	140	0	219	0	0	0	97	456
Merluccius merluccius	35	0	0	0	0	211	99	345
Solea solea	14	89	0	0	0	0	96	199
Mullus surmuletus	0	175	0	0	0	0	0	175
Glyptocephalus cynoglossus	2	0	0	0	0	0	170	172
Scomber scombrus	24	0	0	49	25	56	0	154
Raja montagui	0	0	13	20	0	116	0	149
Amblyraja radiata	0	0	48	0	74	16	0	138
Leucoraja naevus	0	0	7	0	3	108	0	118
Scyliorhinus canicula	0	0	69	10	9	0	0	88
Micromesistius poutassou	0	0	70	0	0	0	0	70
Dicentrarchus labrax	0	64	0	0	0	0	0	64
Buglossidium luteum	0	0	0	49	0	0	0	49
Nephrops norvegicus	0	0	0	0	38	0	0	38
Lophius piscatorius	1	0	18	0	0	0	0	19
Lithodes maja	0	0	0	0	18	0	0	18
Mustelus asterias	0	0	14	3	0	0	0	17
Mustelus mustelus	0	0	1	0	0	16	0	17
Trachurus trachurus	0	0	0	0	16	0	0	16
Squalus acanthias	0	0	7	0	7	0	0	14
Scophthalmus maximus	5	5	0	0	0	2	0	12
Cancer pagurus	0	0	0	0	11	0	0	11
Scophthalmus rhombus	7	1	0	0	0	2	0	10
Pollachius pollachius	0	9	0	0	0	0	0	9
Etmopterus spinax	0	0	0	0	7	0	0	7
Raja clavata	0	0	0	6	0	1	0	7
Dipturus intermedia	0	0	0	0	0	4	0	4
Dipturus flossada	0	0	0	0	0	4	0	4
Galeus melastomus	0	0	0	0	2	0	0	2
Leucoraja fullonica	0	0	1	0	0	1	0	2
Leucoraja circularis	0	0	1	0	0	0	0	1
Raja brachyura	0	0	0	0	0	1	0	1

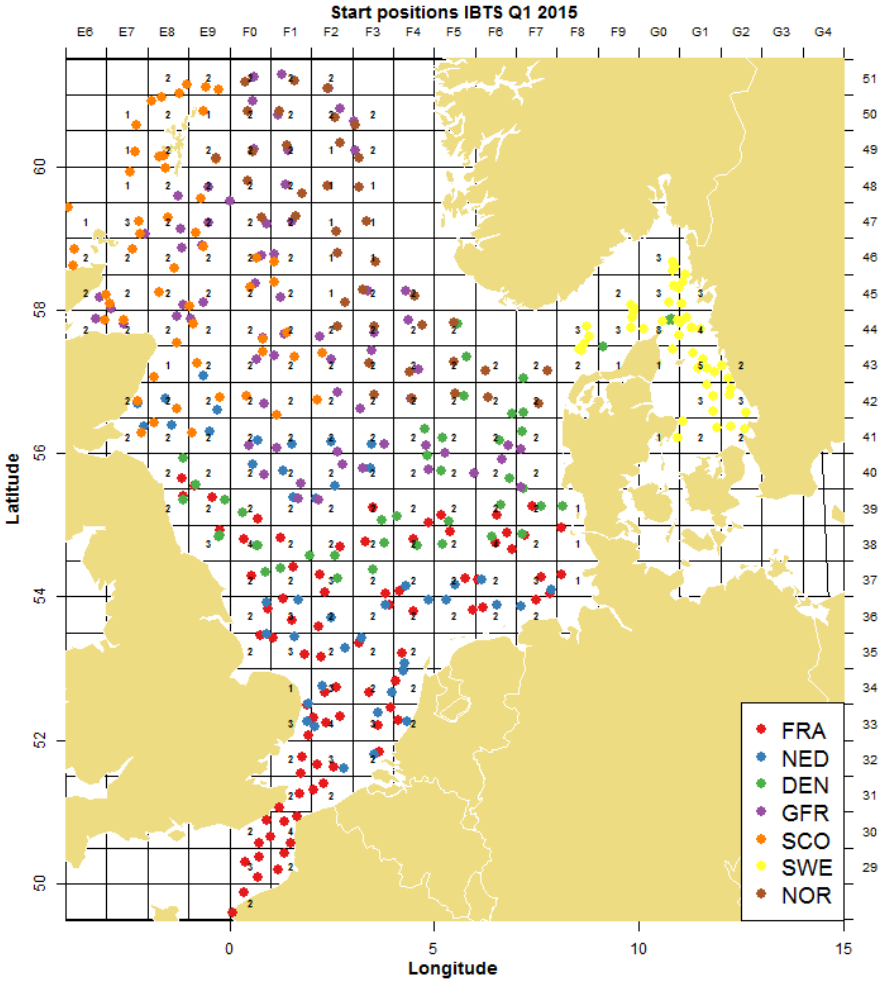


Figure 5.2.1. Number of hauls per ICES-rectangle with GOV during the North Sea IBTS Q1 2015 and the start positions of the trawls by country.

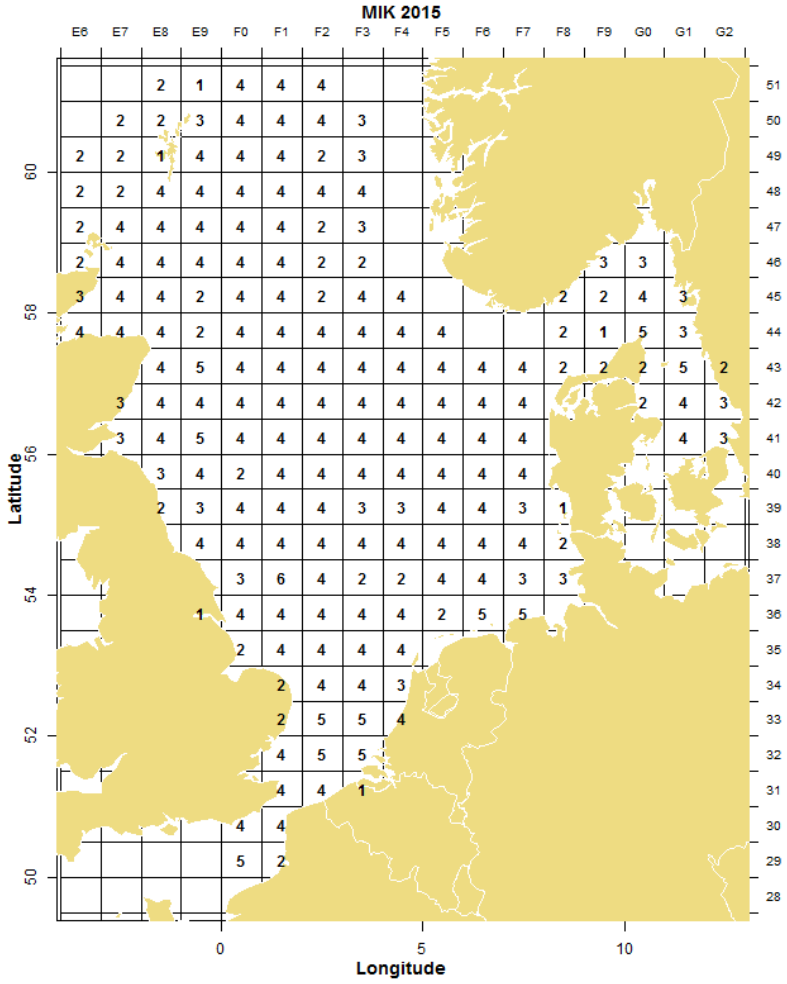


Figure 5.2.2. Number of hauls per ICES-rectangle with MIK during the North Sea IBTS Q1 2015.

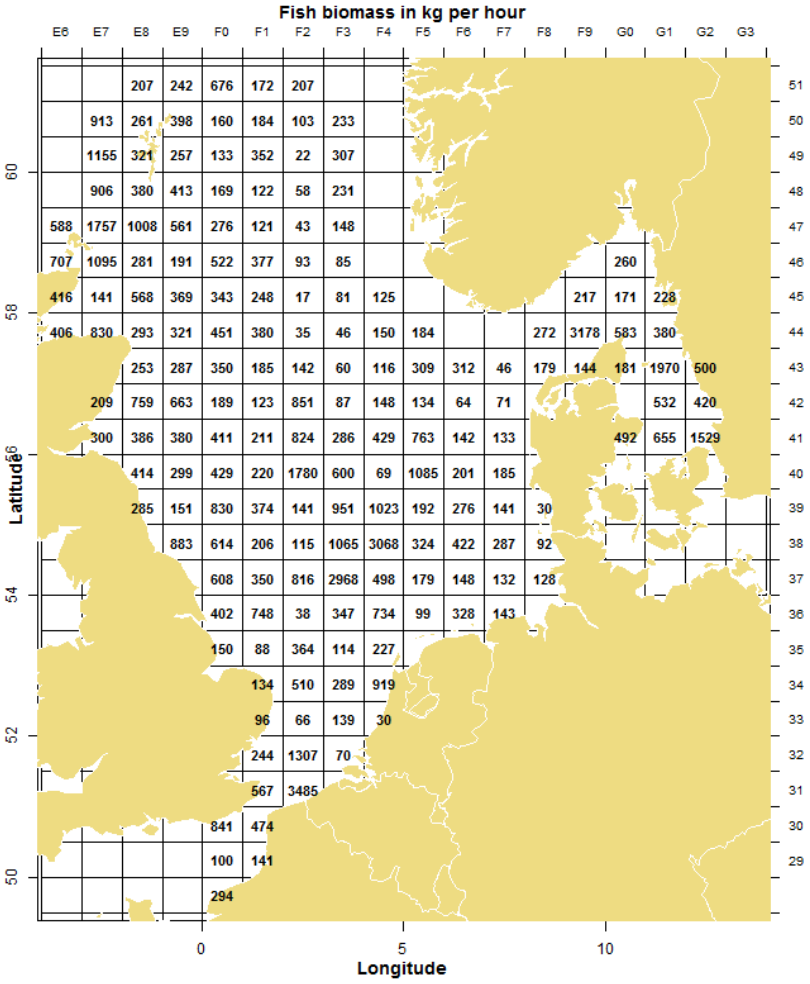


Figure 5.2.3. Distribution of fish biomass in IBTS hauls by rectangle in the North Sea, Q1 2015 (values standardized to kg per hour haul duration; mean per rectangle).

5.2.2 Additional activities

Next to the GOV and MIK tows, all countries have collected additional data. All countries collected seabed litter from the GOV tows and took CTD profiles (temperature and salinity) at all GOV stations when possible. A complete list of additional activities is given in Table 5.2.2.4.

Table 5.2.2.4. Overview of additional activities in the North Sea IBTS Q1 survey in 2015.

Activity	GFR	NOR	SCO	DEN	NED	SWE	FRA
CTD (temperature+salinity)	x	x	x	x	x	x	x
Seabed Litter	x	x	x	x	x	x	x
Water sampler (Nutrients)		(x)					x
Egg samples (Small fine-meshed ringnet, CUFES)	x	x	x	x	x	x	x
Taken as bycatch benthic animals		x			x		x
Observers for mammals and/or birds		x					x
Additional biological data on fish							x
Benthic samples (boxcore, video, dredge)							x
Zoo- and phytoplankton		x					x
Jellyfish		x			x		x
Hydrological transect		x					

5.2.3 Gear geometry

Relevant to good fishing practise and for the calculation of swept-area are the net geometry data: door spread and net opening, along with the recordings of warp length and depth. The data by country are presented in Figure 5.2.4 and Figure 5.2.5.

The net opening of the Norwegian GOV is regularly below the limits set, which is in line with previous years. This year together with the Scottish gear expert test were executed with different ways of rigging the Norwegian net. It was concluded that Norway's gear operates consistently and as it should for Norway.

France door spread and net opening are outside the limits. This is not in line with previous years. This might be due because the French data from the Marport system still had to be processed and validated. This might alter the currently reported data.

For all countries combined, only 7 net opening recordings and 14 door spread recordings are missing. The latter will be calculated based on the country-specific functions based on the relation with depth, which have been provided to the ICES datacentre in autumn 2014 (Annex 11).

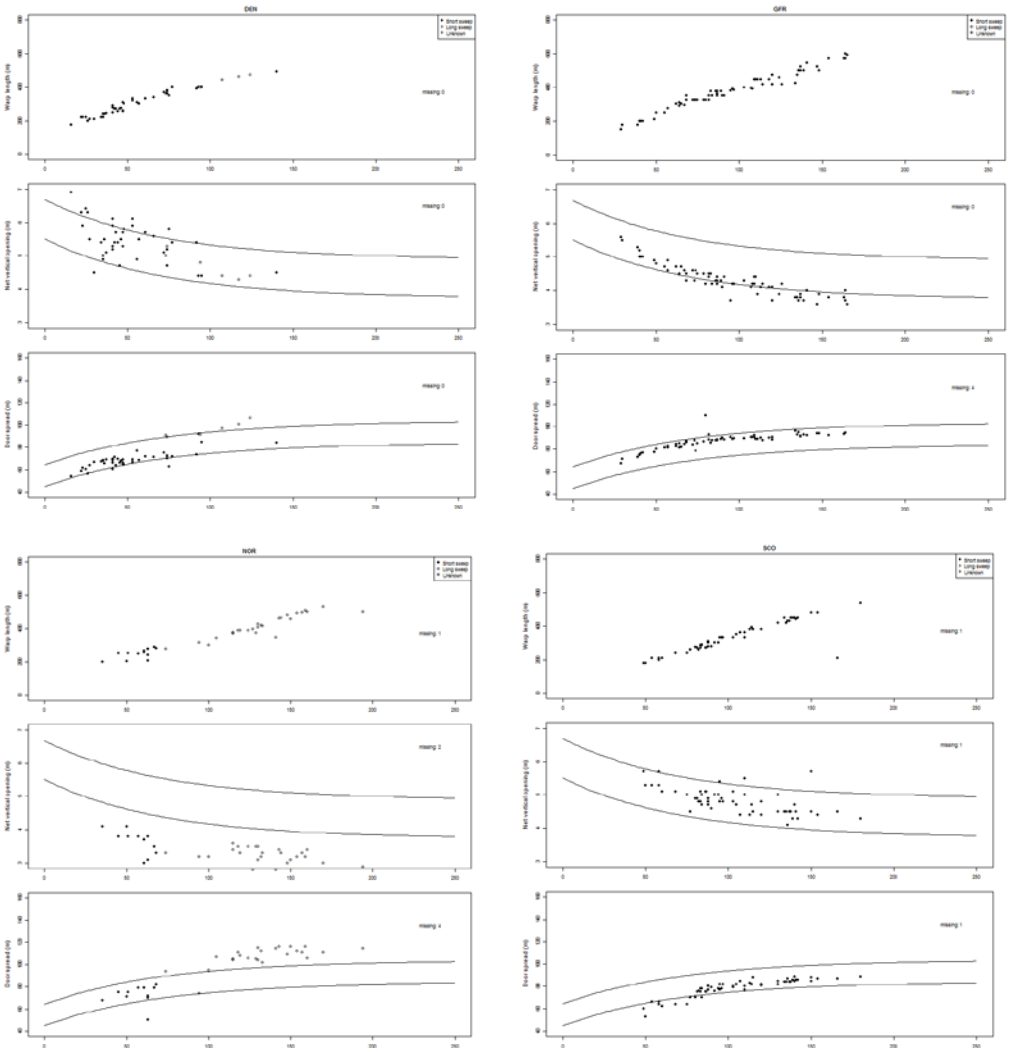


Figure 5.2.4. Warp length and net geometry related to depth by country for the North Sea IBTS Q1 2015. DEN, GFR, NOR, SCO; the data are presented by long and short sweeps which affect the door and wing spread.

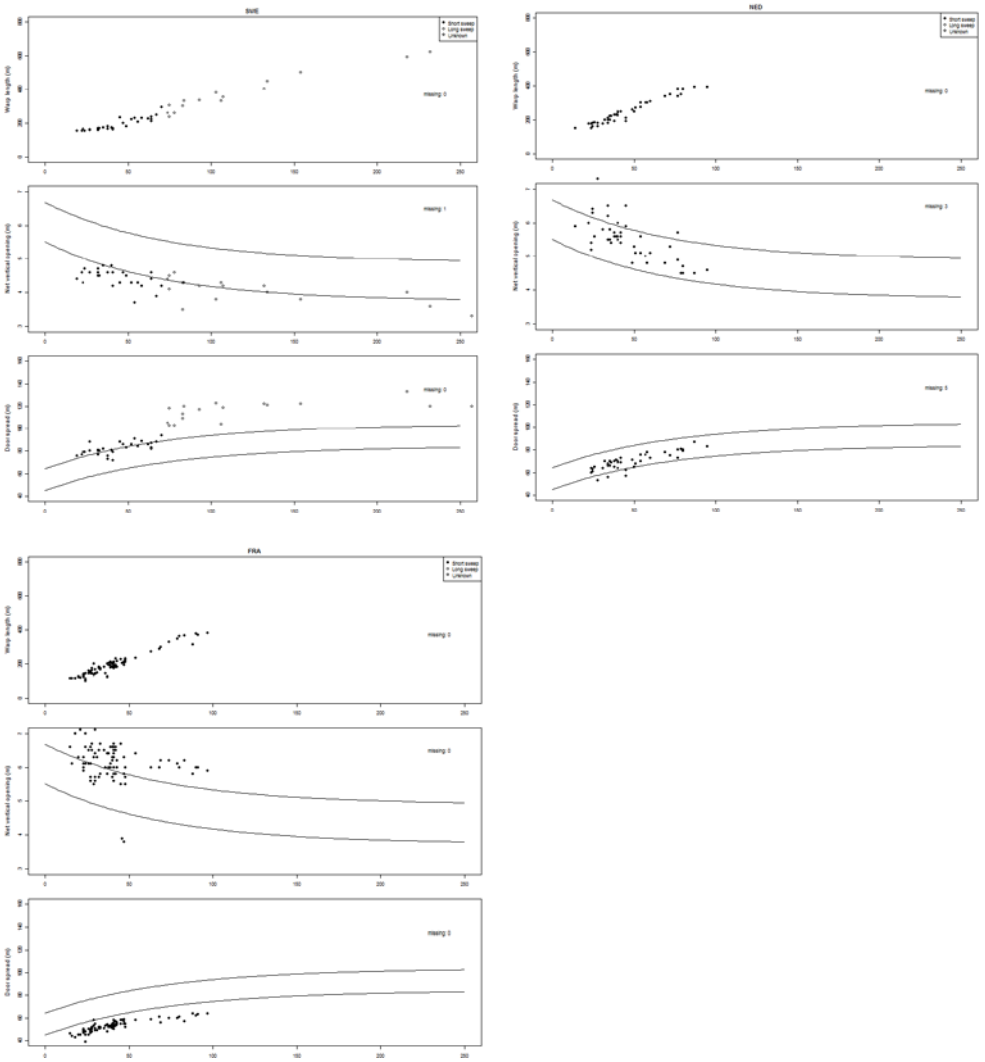
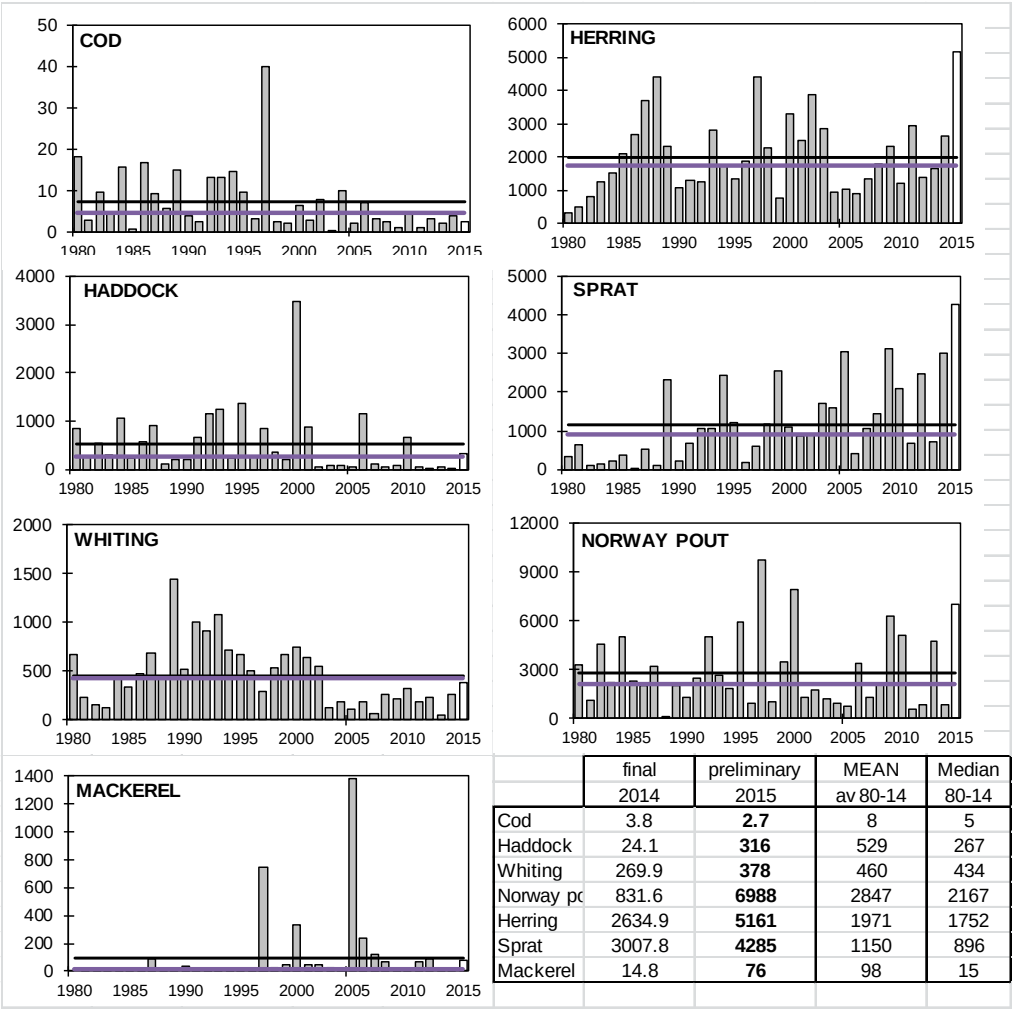


Figure 5.2.5. Warp length and net geometry related to depth by country for the North Sea IBTS Q1 2015. SWE, NED, FRA.

5.2.4 GOV

The preliminary indices for the recruits of seven commercial species based on the 2015 quarter 1 survey are shown in Figure 5.2.6. According to these preliminary results herring and sprat had the highest catches since 1980. Norway pout was above the average of 1980–2014, while all the other species were below the average. However, whiting and haddock were higher than in the last couple of years. Mackerel is near the average, well above the median.



	final	preliminary	MEAN	Median
	2014	2015	av 80-14	80-14
Cod	3.8	**2.7**	8	5
Haddock	24.1	**316**	529	267
Whiting	269.9	**378**	460	434
Norway po	831.6	**6988**	2847	2167
Herring	2634.9	**5161**	1971	1752
Sprat	3007.8	**4285**	1150	896
Mackerel	14.8	**76**	98	15

Figure 5.2.6. 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 latest year are preliminary, and based on a length split of the catches. Horizontal black line is the mean for years 80–14, while the purple line is the median 80–14.

5.2.5 MIK

For the ICES Herring Assessment Working Group for the area South of 62°N (HAWG), the IBTS survey provides recruitment indices and abundance estimates of adults of herring and sprat. Sampling at night with fine-meshed nets (MIK; Midwater Ringnet) has been 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 0-ringer abundance (IBTS-0 index) the total abundance of 0-ringers in the survey area is used as recruitment index for the North Sea herring stock. Index values are calculated as described in the HAWG report of 1996 (ICES, 1996/ACFM:10).

This year, 657 depth-integrated hauls were completed with the MIK-net. The coverage of the survey area was very good with at least 2 hauls in almost all ICES rectangles in the North Sea as well as in Kattegat and Skagerrak. Only 2 rectangles in the Skagerrak and 2 rectangles in the northwestern North Sea were only sampled once while there were no rectangles that could not be sampled at all.

This year, there were 51 hauls from the area south of 54° N with mean herring larval length <20mm which had to be excluded from the index calculation as specified in the calculation procedure. The index is, thus, calculated from the results of 606 hauls, and 3 rectangles, 32F2, 32F3 and 33F4, in the Southern Bight are not accounted for in the index calculation. These small larvae in the southern area are thought to be larvae of the Downs component of North Sea herring. The exclusion of these stations from the index should ensure that the Downs component is not accounted for in the IBTS-0 index.

Larvae measured ranged between 7 and 34 mm standard length (SL), where the bulk of larvae fell into the small size classes between 7 and 10 mm SL. These small larvae were mainly recorded in the Channel and Southern Bight area and represent the Downs larvae. Larger larvae were comparatively rare and much less abundant than last year. Modes of their size frequency distribution fell in the 20 and 22 mm SL length classes indicating that the 0-ringers were also smaller than last year when modes in the size distribution were recorded in the 22 and 28 mm SL length classes.

The time-series of IBTS-0 estimates according to the standard index calculation algorithms is shown in Table 2.3.3.1. The new index value of 0-ringer abundance of the 2014 year class is estimated at 20.9.This index is very low and much less than last year's estimate for the 2013 year class. It is only 19.3% of the long-term mean, and would indicate at the lowest recruitment since the year class of 1977. In the southern and northern North Sea as well as Skagerrak and Kattegat, herring abundances were very low or large herring larvae didn't occur there at all, the latter being particularly true for the German Bight and the northern North Sea. The only area of higher abundance was that east of the northern English coast. That area extend slightly northeastwards into the central and northern North Sea.

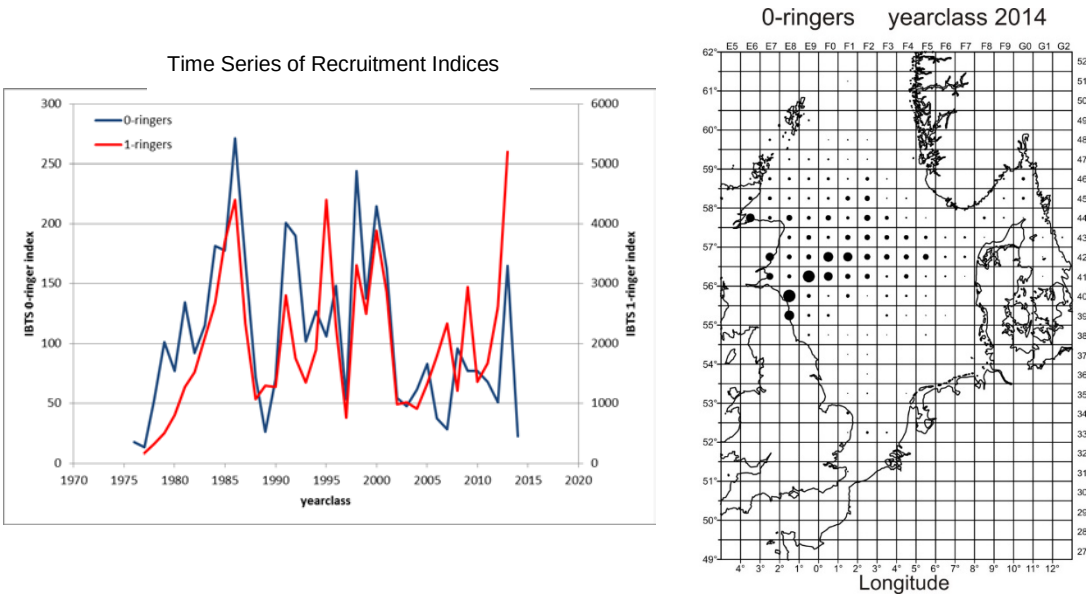


Figure 5.2.7. Distribution of MIK caught herring larvae during the IBTS Q1 2015 (right) and the time-series of herring larvae and 1-ringers since 1976 (left).

5.2.6 Planning and Participation in 2016

All countries have confirmed their intention to participate in the 2016 Q1 survey as in the last years. Sweden will participate again using the Dana. There is a chance that the Netherlands needs to use another vessel again. This will depend on the duration of a second refit for the 'Tridens II'. In case the refit will overlap with the IBTS, the Netherlands will very likely use the 'Cefas Endeavour' again.

The distribution of the rectangles will thus be as shown in Figure 5.2.8.

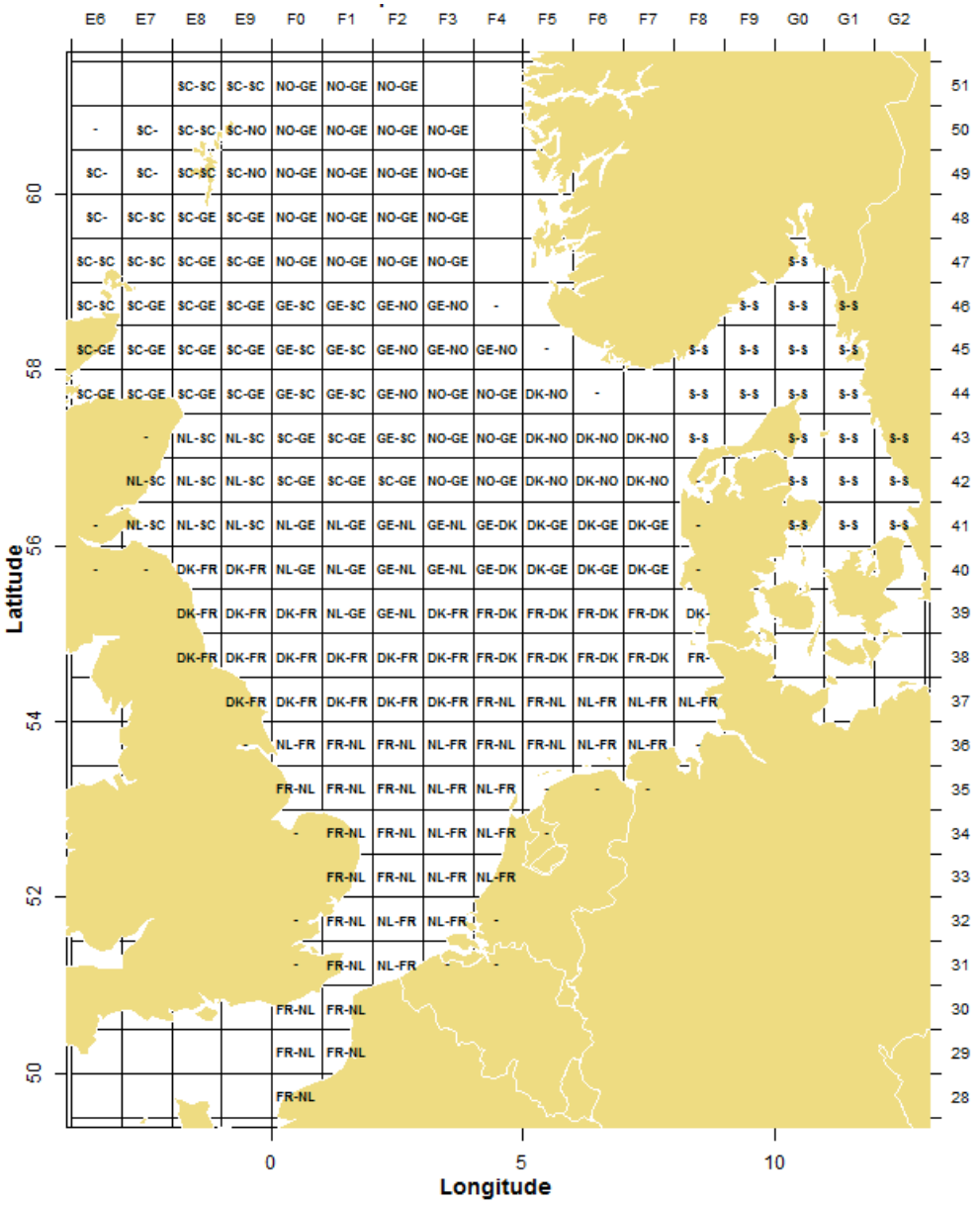


Figure 5.2.8. Allocation map for 2016.

WGEGGS2 has requested that countries continue the collection of egg samples with a small mesh net attached to the ring of the MIK-net (also called 'MIKey' net). As far as known, none of the countries made an objection against this request.

5.2.6.1 Otolith collection of target species

Studies and literature were presented during the 2015 IBTSWG meeting that show the benefits of collecting the otoliths by tow rather than by roundfish area. Collecting by

tow might increase the amount of otoliths to be collected, if every tow is sampled. At the same time, for a number of the target species the current number of otoliths collected are already expected to be higher than the required for estimating the Age–length-Keys.

Literature and calculations presented in Annex 7 indeed indicate that a similar ALK's would be constructed with a smaller number of otoliths.

Therefore, it is advised for the 2016 Q1 target species to collect otoliths by tow, at least until the currently requested number pre Roundfish Area is reached. In each haul sampled, one (pair of) otoliths should be collected for all length classes present in the haul. If the initial analyses conducted during the 2015 IBTSWG (Annex 7) are confirmed with a larger dataset, then, for whiting and haddock, it is advised to alter the collecting protocol such that 1 or 2 otoliths are collected by 5-cm class up to 30 cm; above this length, 1 otolith by cm needs to be collected. Calculations are ongoing which might result in similar advices for the other target species.

5.2.6.2 Biological sampling of additional species

There is no scheme proposed for the collection of additional species other than the guidelines in the manual. However, several countries regularly collect biological samples of additional species of their own choice.

5.2.7 Other issues

5.2.7.1 Staff Exchange

Norway and Scotland took part in a staff exchange in 2015, when Rob Kynoch joined the Norwegian vessel for the first half of Norway's Q1 survey. The exchange was done primarily to investigate Norway's gear issues: over-spreading of the doors and the low headline height. Norway's nets were found to be extremely robust to all changes in rigging and it was concluded that Norway's gear operates consistently and as it should for Norway, but this is different from all other countries. Particularly the vertical net opening is somewhat lower than advised for the GOV in the IBTS manual.

Although not an official staff exchange, the Dutch using the Cefas Endeavour having Dutch scientists, deck crew and fishing skipper working together with the English scientists, deck crew and captain, has been a very interesting experience. It has highlighted difference between the two countries. Using the Dutch net (combined with the English doors) on board of the Endeavour has given the English partners a number of suggestions for additions to their net: install a second lazy deckie, replace the codend liner to tie it up as the Dutch normally do and a proposal to use the Dutch kite. Vice versa, for the Dutch seeing the electronic measuring board in action was a good experience providing ideas for the Dutch to further develop their own measurement system. Furthermore, the vessels' skippers have had good discussions and have experienced new situations. The discussions between the staffs have definitely been good for moral and motivation.

It is still encouraged to conduct further staff exchange between the different countries. There is a growing awareness within the ICES internationally coordinated monitoring programs of the usefulness to exchange sea-going technical and scientific personnel between countries. Taking part in other countries' surveys allows the study of each other's trawling and biological sampling procedures on-board ships, and may lead to new insights to improve one's own protocol.

5.2.8 References

ICES. 1996. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES CM 1996/ACFM:10.

ICES. 2009. Report of the International Bottom Trawl Survey Working Group (IBTSWG). ICES CM 2009/RMC:04.

5.3 General issues for coordination within the North Sea IBTS

5.3.1 Request from WGNSSK regarding cod in Skagerrak

Recommendations addressed to IBTSWG:

WKNSEA analysed the differences between the Q1 and Q3 IBTS indices for cod. Since 2011, the indices show a larger discrepancy between the two quarters compared to the years before. The Skagerrak area was identified as the area responsible for a large part of these discrepancies. This coincides with a change in vessel (from ARGOS to DANA) and associated changes in the spatial distribution of hauls in quarter 3 (but not in quarter 1!). It would be beneficial if the IBTSWG could analyse the changes since 2011 in more detail and investigate whether the changes can explain the discrepancy or whether the assumption of a strong vessel (or gear or haul distribution effect) is misleading and higher abundances observed in Q3 compared to Q1 are real. Currently, the Delta GAM approach is used to explain the discrepancies with the help of a vessel effect to be able to include both survey time-series again in the cod assessment. However, this is open for discussion.

IBTS action:

According to IBTWG, the detected discrepancy between the two quarters can neither be interpreted as a vessel effect nor as a consequence of a changed design.

Sweden changed the vessel in 2011, using Mimer, a smaller vessel, during Q1 2011 and Dana, the Danish vessel, from Q3 2011 and following years in both quarters. This implies that a "vessel effect" should be visible in both quarters and not only in Q3 as shown by the GAM models.

Moreover, the sampling design in Skagerrak was changed in 2005 (ICES, 2004 and 2005) thus a “design effect” would have been observed since then and not only in the last years. The design was reckoned as more appropriate in this area by IBTSWG and it was intentionally applied only in Q3 in order to save the continuity of at least one time-series, namely Q1.

With reference to the WKNSEA report (preliminary), IBTSWG cannot see how it can be concluded from Figure 3.6.2.3 that the problem is in fact contained within the Skagerrak (which represents just a portion of the North Sea cod) as this is absolutely not reflected in Figure 3.6.2.5, where the inclusion of Skagerrak does not introduce any abnormality in the trends.

It is true that from Figure 3.6.2.4, Dana fishes in different areas in Q3 to some extent than previously fished by Argos before, but this is probably also the case for Argos from 2005 to 2011 given the new design. Again, if any impact was present it should be obvious since 2005 and any approach should be backdated to 2005.

It is noteworthy that Sweden changed the vessel but not the gear, which it is still the one traditionally used on board the Swedish RV Argos, although somewhat modified.

IBTSWG had (and still has) lots of discussions on GOV deployment and efficiency for the past few years so in many cases some countries adjusted the rigging but again in both quarters. It must be considered that in Q3 Sweden is always using short sweeps. Experts in survey design and gear technology present at IBTSWG 2015 agreed that typically, the vessel effect is almost negligible compared to the gear effect (Vølstad pers. comm., Kynoch pers. comm.).

If the explanation to the observed trends is to be sought in the gear, IBTSWG proposes for WGNSSK to recalculate the indices standardized by the swept-area (instead of haul duration) for the entire area, once the required data become available (currently in preparation by IBTSWG).

Recommendations addressed to IBTSWG (continued):

Next to this, the IBTSWG is asked to review the survey design in the Skagerrak with only one vessel fishing in this area. This increases the problem of determining whether a vessel effect or abundance changes in space and time are responsible for the observed discrepancies. It may be beneficial if either a second vessel make hauls in the Skagerrak or the Skagerrak vessel also fishes outside the Skagerrak to permit a comparison with other vessels.

IBTS action:

The only chance to calibrate the Swedish IBTS with another country is that either with Norway or Denmark. The Norwegian Q3 IBTS is conducted earlier than the Swedish one and the calibration with the Danish IBTS will not solve the problem of the vessel, being the same used by both countries, but will rather allow a gear comparison. Yet, differences in gear are expected to dominate over differences in vessels (see above). Denmark will try at the end of the survey in Q3 in 2015 to sample two extra hauls in the Skagerrak.

5.3.2 Request from WGISUR regarding development of an ecosystem survey

WGISUR 2015 formulated the following recommendation to IBTSWG: 'Agree on using the NS IBTS Q3 survey as a starting point for a North Sea wide Q3 ecosystem survey.'

Concretely, IBTSWG has been asked to consider this request in a first step only in terms of their general interest in discussion options for the integration of NS-IBTS Q3 into an ecosystem survey. In particular, if a general interest existed, IBTSWG has been asked to confirm that members would be willing to take part in a workshop to be initiated by WGISUR in the first quarter of 2016, in order to discuss possible approaches to this task.

IBTSWG 2015 confirmed their general interest in the topic and suggest that with sufficient time before the workshop, a few core topics could be identified in order to allow for discussion within IBTSWG, and reporting on existing viewpoints during the workshop.

IBTSWG would like to propose considering the following aspects:

- In 2015, IBTSWG started working on a new multi-annual ToR to evaluate aspects of the current survey design. Any results emerging from these analyses should be considered in the planning proposed by WGISUR.
- A hierarchy of objectives needs to be defined if additional objectives are to be considered.

- It would be helpful if on the workshop potential options for funding could be presented and discussed, because finding will limit the opportunities to get sufficient ship time and staff.
- Various nations involved in the Q3 IBTS currently sample additional data of ecosystem components, beyond the requirements of the IBTS per se. These additional programs should be evaluated with respect to their possible integration (or if needed modification) for an ecosystem survey.

5.4 Northeastern Atlantic

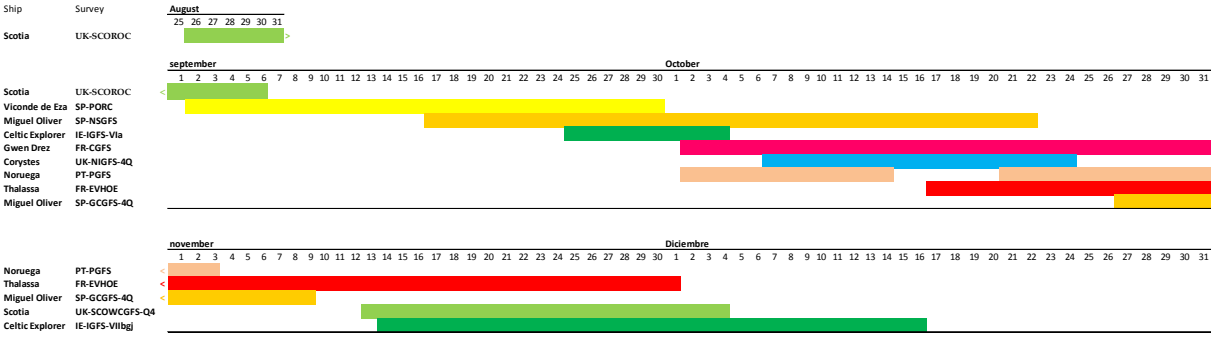
5.4.1 General overview

In 2014, nine vessels from five countries performed 13 surveys along the Northeastern Atlantic IBTS area. A total of 1054, out of the 1117 hauls planned, were accomplished within 326days at sea distributed between the first, third and fourth quarters (see Table 5.4.1 and Table 5.4.2 below for a complete summary of surveys, days at sea and hauls performed). Survey coverage was similar to the previous year and number of valid tows was also similar. Within these surveys are included, as in previous years, three 1st quarter spring surveys (Scotland, Northern Ireland and Spanish survey of the Gulf of Cadiz), as well as the common autumn and winter surveys. Due to engine problems the Northern Ireland 1st quarter survey had to be postponed to start on the 31 March thus, it finished on the 16 April, and occurred mostly on the 2nd quarter, nevertheless in consonance with the time-series it is ascribed as Q1 survey.

Table 5.4.1. Summary of surveys, hauls and days at sea per country performed in the IBTS Northeastern Atlantic area in 2014.

Country	Survey	Hauls				Days
		Planned	Valid	Null	Total	
UK-Scotland	UK-SCOWCGFS-Q1	61	61	1	62	22
	UK-SCOROCQ3	40	43	1	48	12
	UK-SCOWCGFS-Q4	60	59	2	61	22
UK-North Ireland	UK-NIGFS-Q1	61	55	0	55	17
	UK-NIGFS-Q4	61	58	2	60	18
Ireland	IE-IGFS-Q4	171	170	4	175	43
France	FR-CGFS-Q4	110	95	4	103	29
	FR-EVHOE-Q4	155	151	0	156	46
Spain	SP-PORC-Q3	80	80	3	88	29
	SP-NSGFS Q4	136	116	0	136	36
	SP-GCGFS-Q1	41	40	2	42	10
	SP-GCGFS-Q4	45	45	4	49	14
Portugal	PT-PGFS-Q4	96	81	2	83	28
Total		1117	1054	25	1118	326

Table 5.4.2. Overview of the surveys performed during quarters 3 and 4 on the Northeastern Atlantic IBTS area in 2014.



A summary of the biological sampling conducted within the IBTS NE Atlantic in 2014/2015 is presented in Table 5.4.3.

5.4.2 Survey summaries by country

5.4.2.1 UK-Scotland: UK-SCOWCGFS-Q1 (Western Division Bottom Trawl Survey Q1)

NATION:	UK (SCOTLAND)	VESSEL:	SCOTIA III
Survey:	0314S	**Dates:**	17 Feb – 10 Mar 2014
Cruise:	Q1 western ground fish, random stratified survey aims to collect data on the distribution, relative abundance and biological information (in connection with EU Data Directive 1639/2001) on a range of fish species in ICES areas VI. Age data were collected for Cod, Haddock, Whiting, Saithe, Norway Pout, Herring, Mackerel and Sprat. CTD was deployed at each trawl station to collect temperature and salinity profiles.		
Gear details:	GOV (+belly lines) with ground gear D for all stations. SCANMAR sensors and NOAA bottom contact sensor were used to monitor net geometry.		
Notes from survey (e.g. problems, additional work etc.):	61 valid hauls Scotia experienced very typical weather conditions for the time of year on this survey. As a result, only 2 half days were lost due to poor weather. Survey progressed well with next to no gear damage to report. 1 trawl haul was recorded as foul due to the bag bursting on contact with the ships stern ramp; this was as a result of excessive quantity of fish caught (ca 20 tonnes). The SCANMAR gear monitoring system and the NOAA bottom contact sensor were used throughout the survey to observe the gear performance. Catches of Marine litter were logged and categorized.		
Number of fish species recorded and notes on any rare species or unusual catches:	79 fish species were encountered during the survey, for a total catch weight of 25397 Kg. Biological data were recorded for a number of species in accordance with the requirements of the EU Data Regulations.		

Table 5.4.2.1.1. Stations fished (aim to complete 60 valid tows per year).

ICES DIVISIONS	STRATA	GEAR	TOWS PLANNED	TOWS VALID	TOWS ADDITIONAL	TOWS INVALID	% STATIONS FISHED	COMMENTS
VI	All	GOV-D	61	61	-	1	100	
TOTAL			61	61	-	1	100	

Table 5.4.2.1.2. Number of biological samples (maturity and age material, *maturity only):

SPECIES	AGE	SPECIES	AGE
Clupea harengus	1215	*Merluccius merluccius**	318
Gadus morhua	210	*Scophthalmus maximus**	1
Melanogrammus aeglefinus	991	*Pollachius virens*	241
Merlangius merlangus	838	*Scomber scombrus*	324
*Molva molva**	74	*Zeus faber**	23
Dipturus batis cf. intermedia	62	*Spratus spratus*	367
Dipturus batis	1	*Trispoterus esmarki*	321
*Raja clavata**	152	*Raja brachyura**	10
Leucoraja naevus	85	*Raja montaguii**	203

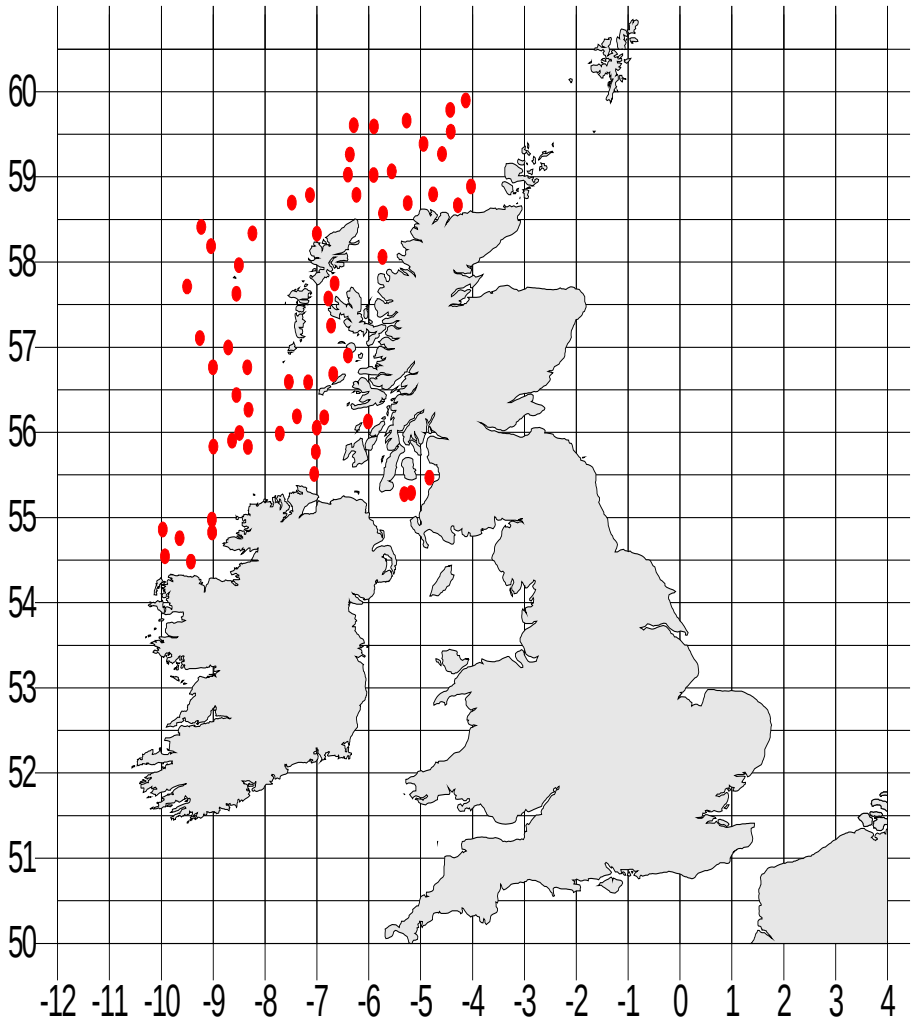


Figure 5.4.1. Trawl positions for Scotland Q1 Western Division Bottom Trawl Survey.

5.4.2.2 UK-Scotland: UK-SCORoc-Q3 (West of Scotland Rockall Survey Q3)

NATION:	UK (SCOTLAND)	VESSEL:	SCOTIA
Survey:	1214S Rockall Haddock	**Dates:**	26 Aug – 6 Sep
Cruise:	Q3 Rockall Haddock survey aims to collect data on the distribution, relative abundance and biological information (EU Data Directive 1639/2001) on haddock and a range of other fish species in ICES area VIb. Age data were collected for haddock, whiting, cod, saithe and mackerel.		
Gear details:	The GOV (Scottish West Coast design) was used throughout the cruise with groundgear D. Sweeps were 97m for all hauls. The SCANMAR system was used throughout the cruise to monitor headline height, wing spread, door spread and distance covered during each tow. A bottom contact sensor was attached to the groundgear for each tow.		
Notes from survey (e.g. problems, additional work etc.):	The primary objective of this survey is to assess the state of the haddock stock on the Rockall Plateau. The survey design is random-stratified with the survey divided into 4 depth strata bounded overall by the 350m depth contour. The survey excludes two areas that lie largely within this zone. Both of these are Northeast Atlantic Fisheries Commission (NEAFC) closures designed to protect vulnerable marine ecosystems (VMEs). The survey this year was composed of 40 randomly generated primary haul positions along with a further 20 secondary random haul positions for use when any particular primary station could not be completed or when extra stations were required. In most cases it was possible to find a suitable trawl path that passed over or close to the random position. Where this was not possible the tow was either relocated up to a maximum of 5 miles from the original random midpoint or a secondary position undertaken instead. A total of 48 trawl stations were completed. This includes 4 additional hauls undertaken outside the standard survey area (>350m) and also 1 haul which was considered foul with a broken sweep. Thus 43 valid hauls were completed inside the standard survey area overall (Table 4). The additional hauls were not included in the analysis and the following figures and preliminary analysis refers to results from inside the standard survey area only. Hauls outside the survey area were undertaken in response to observations of haddock from hauls >350 during the Rockall anglerfish survey of April 2014. During 1214S haul numbers 338 (370m, 63kg of haddock caught), 340 (430m, no haddock), 352 (420m, 13 kg haddock), and 353 (460m, no haddock) indicate a patchy distribution of relatively small densities of haddock at depths >350m. This had not been observed when comparable depths were last surveyed during a Rockall haddock survey (2011). Further hauls outside the standard survey to the east of the area were not undertaken for logistical reasons. In common with the previous three years very little damage to the net was incurred throughout the survey which reflected the change to groundgear 'D' made in 2011. A CTD was deployed (n=21) and water samples collected at selected stations to give coverage of the survey area. Ship's thermosalinograph was run continuously throughout the cruise. Sediment samples were attempted from a total of 49 positions during periods when the vessel was not fishing. Of these 33 produced viable sediment samples over a depth range of 136–345m. A Day grab was used for all sampling. The presence of coarse sediments (gravel, rocks) impeding closure of the grab was the main reason for lack of sample however any periods of slight-moderate swell also had a negative effect on the mechanics of grab deployment. 1214S Chart (below) displays trawl and sediment sample locations. All litter picked up in the trawl was classified, quantified and recorded then retained for appropriate disposal ashore. Tissue samples of whiting (n = 50) were collected for molecular analysis.		
Number of fish species recorded and notes on any rare species or	Overall a total of 54 species were caught during the survey for a total catch weight of 23.93 tonnes. There were large catches overall of grey gurnards (~6.35 tonnes), haddock (~5.75 tonnes) and blue whiting (~3.70 tonnes). The majority of grey gurnards (~ 6 tonnes) were taken in one haul (316) only. Table 2 summarizes cpue for the major species caught.		

unusual catches:	Haddock recruitment was observed spread over the upper bank however the catch per unit of effort (cpue) indices for these were lower than those of 2013 and 2012 (Figure 1). Catches of 1 and 2 year old fish were good and of a generally consistent level over the survey area reflecting the relatively good recruitment of the previous two years. There was a small amount of haddock 7 years or older however the survey encountered very few between the ages of 3–6 years. This is consistent with observations over the previous year's surveys. Few cod (n=4), whiting (n=58) and no saithe were caught. As with the previous three years the majority of whiting were 0-groups.

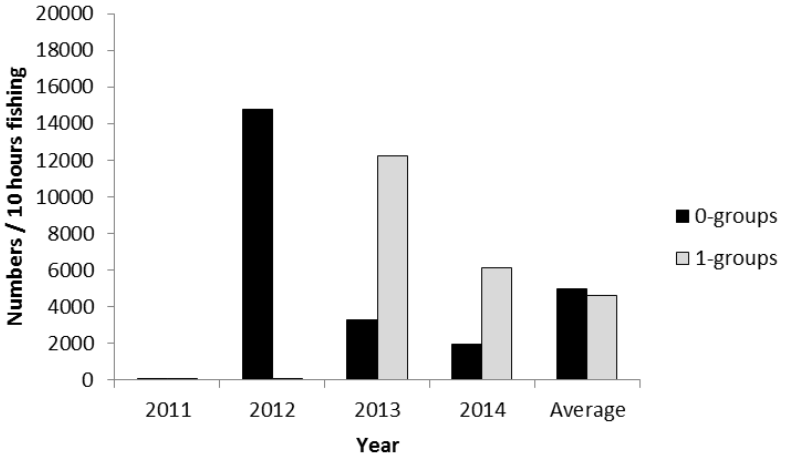


Figure 5.4.2. Indices of 0 and 1-group haddock at Rockall in 2014 shown relative to the previous years and the average since 2011 (beginning of new survey design).

Table 5.4.2.2.1. Rounded cpue indices (actual values) for Rockall haddock 2014.

AGE	IND/10 H
0	1926
1	6146
2	5275
3	4
4	0
5	9
6	0
7	7
8	6
9	94
10	1
11	1
12	0
13	1

Table 5.4.2.2.2. cpue data (rounded) for major species caught during 1214S.

SPECIES	STRATA	MEAN NO./HR	MEAN KG/HR
Micromesistius poutassou	All	6557	169
Gadiculus argenteus thori	All	2520	45
Argentina sphyraena	All	1528	83
Melanogrammus aeglefinus	All	1462	263
Sebastes viviparus	All	1461	98
Eutrigla gurnardus	All	1190	290
Trisopterus minutus	All	672	47
Helicolenus dactylopterus	All	117	11
Lepidorhombus whiffiagonis	All	69	12
Loligo sp	All	57	4
Microstomus kitt	All	57	6

Table 5.4.2.2.3. Numbers of biological observations per species collected during SCOROC (length, weight, sex and age, * length, weight, sex and maturity).

SPECIES	BIODATA	SPECIES	BIODATA
Gadus morhua	4	*Dipturus batis cf. intermedia*	64*
Melanogrammus aeglefinus	1282	*Dipturus oxyrinchus*	5*
Merlangius merlangius	58	*Leucoraja circularis*	1*
Scomber scombrus	5	*Leucoraja fullonica*	4*
		Raja clavata	21*

Table 5.4.2.2.4. Number of stations fished during SCOROC in 2014.

ICES Divisions	Strata	GEAR	STATIONS PLANNED	VALID STATIONS ACHIEVED	ADDITIONAL STATIONS	INVALID STATIONS	% STATIONS ACHIEVED
VIb	All	GOV-D	40	43	4	1	108

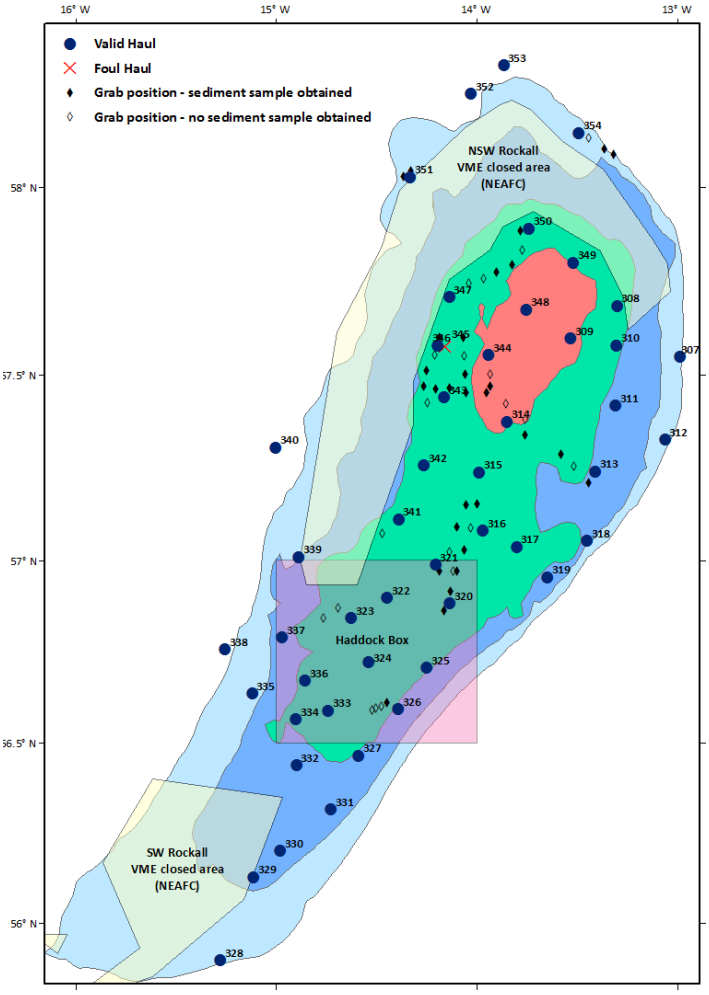


Figure 5.4.2. SCOROC 2014 Chart: Survey strata, NEAFC closed areas, trawl positions and haul numbers of stations completed at Rockall 2014. Red area = 0–150m, green = 150–200m, blue = 200–250m, light blue = 250–350m and white = >350m (outside the standard survey area).

5.4.2.3 UK–Scotland: UK–SCOWCGFS–Q4 (Western Division Bottom Trawl Survey Q4)

NATION:	UK (SCOTLAND)	VESSEL:	RV SCOTIA
Survey:	1814S	**Dates:**	13 Nov – 4 Dec 2014
Cruise	Q4 Scottish Western Coast VIa random stratified survey aims to collect data on the distribution, relative abundance and biological information (in connection with EU Data Directive 1639/2001) on a range of fish species in ICES areas VIa and VIIb. Age data were collected for cod, haddock, whiting, saithe, hake, John Dory, Norway pout, herring, mackerel and sprat. A CTD was deployed at each trawl station to collect temperature and salinity profiles.		
Gear details:	The GOV was used throughout the cruise with groundgear "D" (Rock-hoppers). Sweeps were 97m except where the water depth was <=80m where 47m sweeps were deployed. Headline height, wing/end and door spread were monitored by SCANMAR acoustic instrumentation and distance covered using the vessels GPS navigation system. A self-recording bottom contact sensor was attached to ground gear centre and monitored contact with the seabed.		
Notes from survey (e.g. problems, additional work etc.):	The 2014 survey design was the same as that used since 2011 using a random-stratified survey design with primary trawl locations randomly distributed within 12 sampling strata (see Figure 1 below). Trawls 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 trawl could not be undertaken at the primary site due to poor ground or creels then the nearest replacement was chosen from a list of secondary random positions. Fishing was carried out during daylight commencing each day at first light however due to logistical reasons and necessitated a relaxation of this policy with the result that 2 out of the 59 valid tows were conducted out with daylight period. During the cruise 2 hauls were classified as foul due to gear damage but only one additional station was available to compensate for these lost stations. Sweep length was altered according to bottom depth. 80m is the cut off for deploying the 110m sweep rig, standardizing the configuration with the Irish VIa survey. This resulted in 11 out of the 59 valid tows being completed using the 60m sweep rig and the remaining deeper 48 stations completed using the 110m sweep rig. 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 58 stations to obtain a vertical temperature and salinity profile. However, one deployment was abandoned due to CTD instrument failure but after investigation the unit was brought back into service for the remainder of the cruise. During part 2 of the cruise a staff exchange was carried out with J. Devine from Institute of Marine Research, Bergen joining Scotia.		
Number of fish species recorded and notes on any rare species or unusual catches:	A total of 80 species were caught during the survey with an overall catch weight of 39.1 tonnes. There were large catches overall of haddock (~6.15 tonnes), Norway pout (~ 2.99 tonnes), boar fish (~3.72 tonnes), mackerel (~4.27 tonnes) and blue whiting (7.13 tonnes). Biological data were recorded for a number of species in accordance with the requirements of the EU Data Regulations. Catch of significant note were the significant increase in the numbers of '0' and '1' group haddock across the survey area and quantities of skate/rays encountered.		

Table 5.4.2.3.1. Number of stations fished.

ICES Divs	Strata	Gear	Tows planned	Tows Valid	Valid with rock–hopper	Additional	Invalid	% stations fished	comments
Via	11	GOV - D	56	55	-	-	2	98	
VIIb	1	GOV - D	4	4	-	-	-	100	
	TOTAL		60	59			2	99	

Table 5.4.2.3.2. cpue indices (no./10hrs) by year class for major species in UK-SCOWCGFS-Q4 survey in 2014,

Age	No/10 hours				
	G. morhua	*M. aeglefinus*	*M. merlangius*	*P. virens*	*T. esmarkii*
0	1.66	20879.04	11576.91	0	85865.32
1	23.69	636.14	1533.99	0.36	2671.15
2	28.69	111.64	346.12	1.96	1421.18
3	15.63	78.43	169.12	3.31	15.98
4	5.57	13.61	81.71	3.31	0
5	6.63	1296.88	55.15	2.44	0
6	1.37	9.78	31.83	0.26	0
7	0	10.06	0	2.48	0
8	0	3.86	0	0.77	0
9	0	34.28	0	1.02	0
10	0	0	0	2.82	0
11	0	0.35	0	0.77	0

Table 5.4.2.3.3. cpue indices (numbers/hrs fishing) of 1-groups for Q4 since 2011.

Species	2011	2012	2013*	2014
Gadus morhua	10.03	19.78	13.98	23.70
Melanogrammus aeglefinus	39.21	114.77	69.58	636.14
Merlangus merlangius	119.47	963.95	124.96	1533.99
Pollachius virens	0	1.05	0	0.36
Trisopterus esmarkii	2192.53	7213.86	1343.88	2671.15

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

Table 5.4.2.3.4. Number of biological samples (maturity and age material, *maturity only):

Species	Age	Species	Age
Gadus morhua	235	*Sprattus*	195
Merlangius merlangus	871	*Galeorhinus galeus*	3
Melanogrammus aeglefinus	1375	*Psetta maximus*	114
Merluccius	341	*Scophthalmus rhombus*	31
Trisopterus esmarkii	569	*Raja brachyura*	11
Pollachius virens	68	*Leucoraja naevus*	21
Molva	57*	*Dipturus batis cf. intermedia*	153
Zeus faber	104	*Dipturus batis cf.flossada*	2
Scomber scombrus	235	*Raja clavata*	20
Clupea harengus	325	*Raja montagui*	326*

5.4.2.3.5. Q4 cpue data for major species: 2014.

SPECIES	STRATA	MEAN NO./HR	MEAN KG/HR
Micromesistius poutassou	All	11545.73	248.53
Melanogrammus aeglefinus	All	2475.48	214.32
Scomber scombrus	All	1064.03	148.97
Capros aper	All	2505.08	129.67
Trachurus	All	546.73	98.09
Trisopterus esmarkii	All	8626.37	104.12
Merlangius merlangus	All	1742.96	89.51
Scyliorhinus canicula	All	101.91	48.68
Clupea harengus	All	674.89	54.69
Eutrigla gurnardus	All	197.82	26.44
Squalus acanthias	All	22.32	26.22
Gadus morhua	All	8.37	20.98
Loligo forbesii	All	184.85	16.80
Pollachius virens	All	2.58	14.29
Merluccius	All	32.32	14.36
Dipturus batis cf. intermedia	All	2.89	10.11
Raja montagui	All	11.54	9.86
Argentina sphyraena	All	169.30	8.18
Chelidonichthys cuculus	All	34.83	7.86
Raja clavata	All	5.47	6.86
Trisopterus minutus	All	465.74	7.17
Molva	All	3.80	4.65
Lophius piscatorius	All	2.93	4.51
Lepidorhombus whiffiagonis	All	13.42	4.43
Zeus faber	All	5.16	4.39
Gadiculus thori	All	221.07	4.16
Pleuronectes platessa	All	36.22	6.39
Leucoraja naevus	All	3.90	3.54
Limanda	All	69.73	4.86
Dipturus batis cf. flossada	All	0.70	2.83
Helicolenus dactylopterus	All	21.93	1.92
Microstomus kitt	All	12.03	2.04
Ommastrephidae	All	36.61	1.45
Argentina silus	All	6.90	0.63

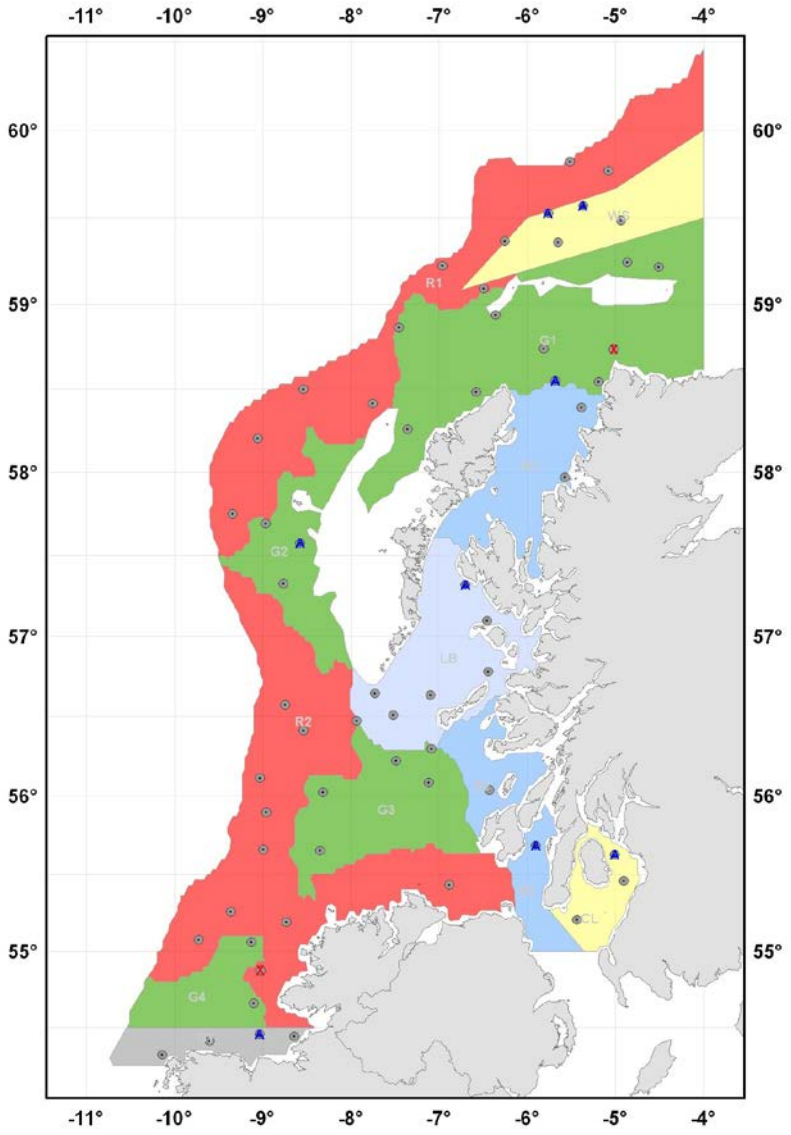


Figure 5.4.3. Trawl stations completed during the SCOWCGFSQ4– IBTS 2014 (1814S). Primary stations marked grey circle, fouled stations marked with a red cross and additional stations marked with a blue A.

5.4.2.4 UK –Northern Ireland: UK–NIGFS –Q1 (Northern Irish Groundfish Survey Q1)

NATION:	UK (NORTHERN IRELAND)	VESSEL:	RV CORYSTES
Survey:	10/14	**Dates:**	31 March – 16 April 2014
Cruise	Q1Irish Sea survey aims to collect data on the distribution and relative abundance, and biological information of commercial fish in VIIa. The primary species are cod, haddock and whiting, herring and plaice.		
Gear details:	Rock-hopper otter trawl with a 17m footrope fitted with 250 mm non-rotating rubber discs. SCANMAR sensors were fitted to gear and trawl parameters recorded, this included trawl eye sensor.		
Notes from survey (e.g. problems, additional work etc.):	Due to engine problems the Q1 GFS was postponed from 03 March to 31 March 2014. Very little gear damage and relatively good weather meant very little fishing time was lost overall. With the time conrtaints the catch at six stations were subsampled and six stations in the St George's Channel were abandoned due to the prescence of static gear, strong tides and closure area for firing practice in Cardigan Bay. Temperature and salinity were recorded at each station. Additional work included quantifying external parasite loads in whiting and cod by area and collected tissue samples from cod and hake for a genetics study. Anisakis samples were collected from *G. morhua*, *C. harengus*and *Ch. lucerna*and tissue samples were collected from *Scyliorhinus canicula* for student studies. Daily collection of clean seawater samples were taken daily for Natrional Oceaography Centre, Liverpool.		
Number of fish species recorded and notes on any rare species or unusual catches:	Overall, 68 species of fish were recorded during the survey. One female common skate (*Dipturus batis*) was caught at staion 77, length 65cm.		

Table 5.4.2.4.1. Stations fished (aims: to complete 61 valid tows per year).

ICES DIVISIONS	STRATA	GEAR	TOWS PLANNED	TOWS VALID	TOWS ADDITIONAL	TOWS INVALID	STATIONS FISHED %
VIIa		Otter trawl	61	55	0	0	90
	TOTAL		61	55	0	0	90

Table 5.4.2.4.2. Number of biological samples (maturity and age material).

SPECIES	NO	SPECIES	NO
Gadus morhua	312	*Molva molva*	2
Melanogrammus aeglefinus	985	*Zeus faber*	8
Pleuronectes platessa	391	*Chelidonichthys cuculus*	54
Merlangius merlangus	1270	*Microstomus kitt*	43
Merluccius merluccius	5	*Raja brachyura*	13*
Scophthalmus rhombus	15	*Leucoraja naevus*	32*
Scophthalmus maximus	2	*Raja montagui*	266*
Pollachius pollachius	9	*Raja clavata*	119*

*** Maturity only.**

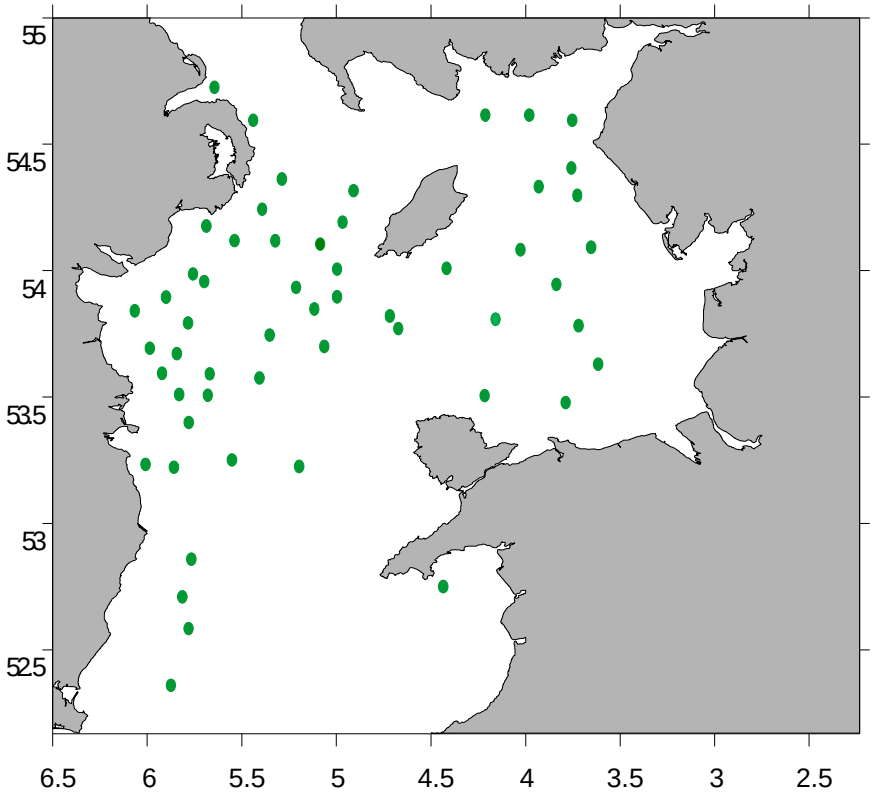


Figure 5.4.4. Map of valid survey stations completed during the 2014 Northern Irish Q1 groundfish survey.

5.4.2.5 UK –Northern Ireland: UK-NIGFS –Q4 (Northern Irish Groundfish Survey Q4)

NATION:	UK (NORTHERN IRELAND)	VESSEL:	CORYSTES
Survey:	41/14	**Dates:**	07–24 October 2014
Cruise	Q4 Irish Sea survey aims to collect data on the distribution and relative abundance, and biological information of commercial fish in VIIa. The primary species are cod, haddock and whiting, herring and plaice.		
Gear details:	Rock-hopper otter trawl with a 17m footrope fitted with 250 mm non-rotating rubber discs. SCANMAR sensors were fitted to gear and trawl parameters recorded, including trawl eye and wing end distance sensors.		
Notes from survey (e.g. problems, additional work etc.):	The net was damaged at station 113 resuting this station as a invalid tow. Relatively good weather meant very little fishing time was lost overall. Additional work included quantifying external parasite loads in whiting and cod by area and collection of tissue samples from mature cod and hake for a genetics study. Daily collection of clean seawater samples were taken daily for Natrional Oceaography Centre, Liverpool. Whiting samples from each ICES rectangle were collected for student studies.		
Number of fish species recorded and notes on any rare species or unusual catches:	Overall, 64 species of fish were recorded during the survey.		

Table 5.4.2.5.1. Stations fished (aims: to complete 60 valid tows per survey).

ICES DIVISIONS	STRATA	GEAR	TOWS PLANNED	VALID	ADDITIONAL	INVALID	STATIONS FISHED %
VIIa	All	Rock-hopper	61	58	0	2	95
	TOTAL		61	58	0	2	95

Table 5.4.2.5.2. Numbers of biological samples (maturity and age material).

SPECIES	NO	SPECIES	NO
Gadus morhua	77	*Pollachius pollachius*	1
Melanogrammus aeglefinus	725	*Chelidonichthys cuculus*	77
Pleuronectes platessa	287	*Microstomus kitt*	35
Merlangius merlangus	1210	*Raja montagui*	228*
Merluccius merluccius	3	*Raja clavata*	100*
Scophthalmus rhombus	6	*Raja brachyura*	24*
Scophthalmus maximus	3	*Raja naevus*	22*
Conger conger	4		

*** Maturity only.**

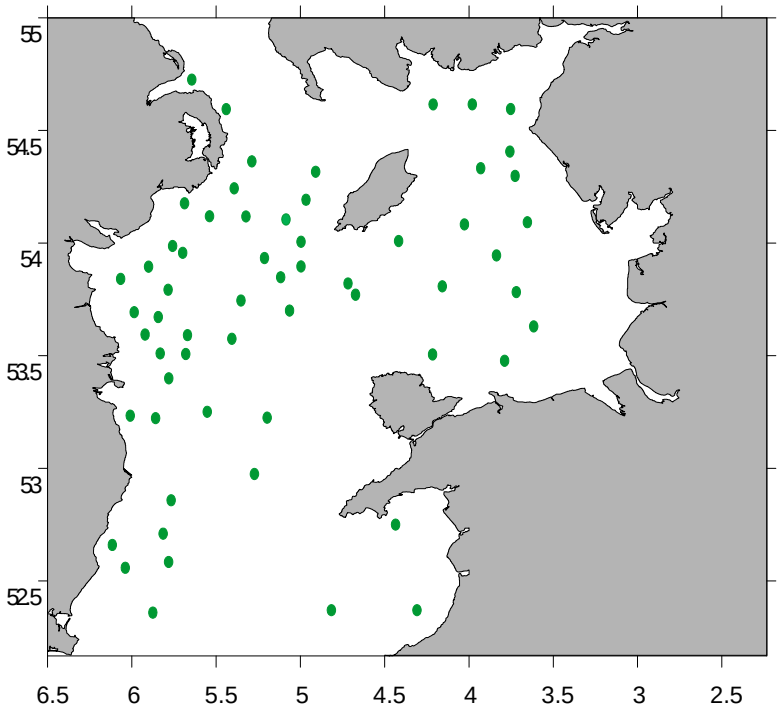


Figure 5.4.5. Map of valid survey stations completed during the Northern Irish Q4 groundfish survey.

5.4.2.6 Ireland: IE-IGFS-Q4 (Irish Groundfish Survey Q4)

NATION:	IRELAND	VESSEL:	CELTIC EXPLORER
Survey:	IGFS	**Dates:**	25 Sept – 4 Oct (VIa) 14 Nov – 16 Dec (VIIb,g,j)
Cruise	The Q4 Irish Groundfish survey collects data on the distribution, relative abundance and biological parameters of commercial fish in VIa south, VIIb and VIIg,j north. The indicess currently utilized by assessment WG's are for haddock, whiting, plaice, cod, hake and sole. Survey data are also provided for white and black anglerfish, megrim, lemon sole, saithe, ling, blue whiting and a number of elasmobranchs as well as several pelagics (herring, horse mackerel and mackerel). An additional deep water strata (200–600m) was added in 2005 and is recently incoporated into the main survey area for index calculation.		
Gear details:	Two different gears are used in the survey since 2004, using GOV ground gear "A" for areas VIIb,g and j; and "D"for area VIa.		
Notes from survey (e.g. problems, additional work etc.):	• No significant weather disruption in 2014, only 1.5 days lost to weather. • 2 v. large mackerel catches on leg 1, VIa, and leg 3 VIIg could not be handled and had to be slipped.		
Number of fish species recorded and notes on any rare species or unusual catches:	In 2014, 91 species of fish, 17 elasmobranch, 9 cephalopod and 52 crustacean species/groups were caught. The most significant change in VIa was significantly increased numbers of juvenile haddock (265%) and whiting (340%) over the recent 5 year term. Biomass was not significantly increased however confirming that more, smaller and younger fish were the main cause. Monkfish too increased (216%) on 2013, but the 5 year average saw only half that difference. In area VII horse mackerel (*Trachurus trachurus*) numbers show an increase (386%) over the recent five year period, while a slight decline (13.6%) on the previous year alone is observed. Cod and blue whiting both show a distinct increase on 2013, but over the 5 year term catches show a slight downward trend. The other gadoid and pelagic species are within the normal interannual fluctuations..		

Table 5.4.2.6.1. Stations fished (aim to complete 170 valid tows per year).

			TOWS				% STATIONS	
ICES DIVISIONS	STRATA	GEAR	PLANNED	VALID	ADDITIONAL	INVALID	FISHED	COMMENTS
VIa	All	D	45	44	0	2	102	
VIIb,c	All	A	38	35	0	1	95	
VIIg	All	A	48	50	1	1	108	
VIIj	All	A	40	41	0	0	103	
	TOTAL		171	170	1	4	102	

Table 5.4.2.6.2. Number of biological samples (age, sex and maturity; *sex and maturity; **length weight only).

Species	No.	Species	No.
*Argentina silus***	50	*Micromesistius poutassou*	773
*Argentina sphyraena***	108	*Microstomus kitt*	614
Clupea harengus	335	*Molva molva*	122
*Conger conger***	31	*Pleuronectes platessa*	1106
Dicentrarchus labrax	168	*Pollachius pollachius***	42
*Dipturus batis cf. flossada**	31	*Pollachius virens*	247
*Dipturus batis cf. intermedia**	38	*Raja brachyura**	32
*Eutrigla gurnardus***	393	*Raja clavata**	255
*Gadiculus argenteus***	115	*Raja montagui**	734
Gadus morhua	401	*Scomber scombrus*	476
*Glyptocephalus cynoglossus***	371	*Scophthalmus maximus**	39
Lepidorhombus whiffiagonis	921	*Scophthalmus rhombus**	63
*Leucoraja naevus**	136	*Solea solea*	216
*Limanda limanda***	167	*Squalus acanthias**	146
Lophius budegassa	283	*Trachurus trachurus*	1030
Lophius piscatorius	548	*Trisopterus esmarki***	117
Melanogrammus aeglefinus	2412	*Trisopterus minutus***	185
Merlangius merlangus	2012	*Zeus faber***	308
Merluccius merluccius	668		

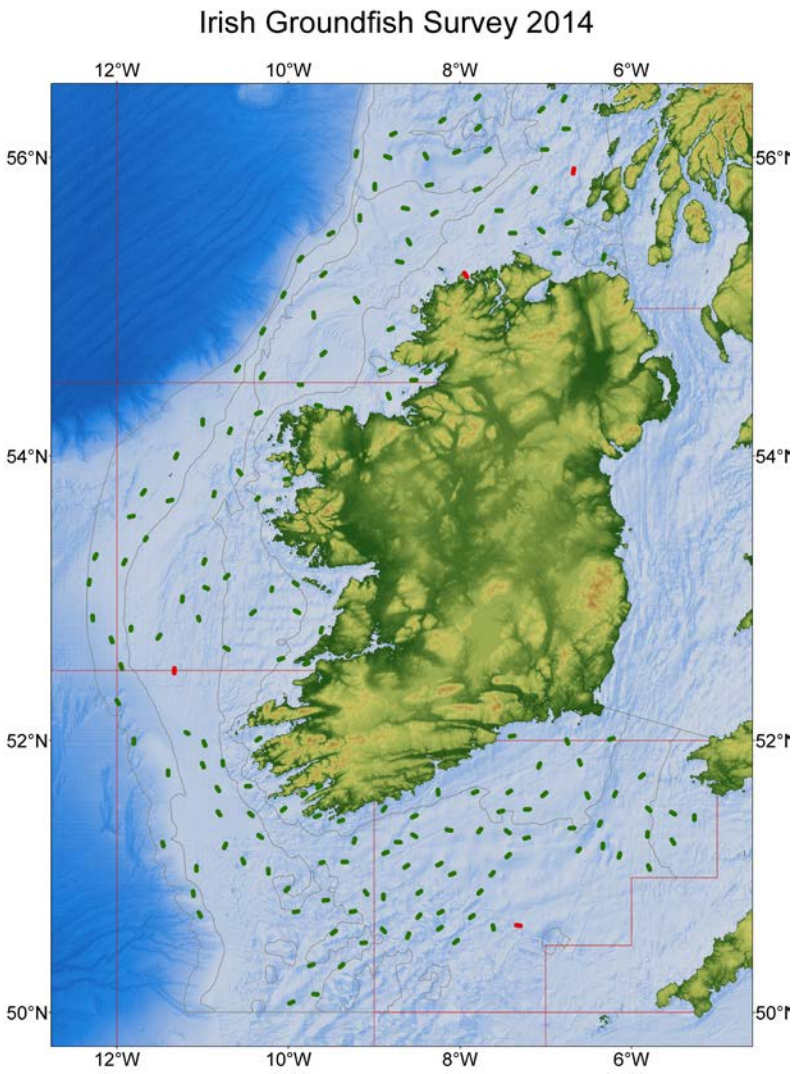


Figure 5.4.6. Stations completed by the Irish Groundfish Survey in 2014. Valid = green lines; Invalid = red lines.

Table 5.4.2.6.3. Biomass and numbers of individual species caught: Year estimate 2014 (y_i); previous year estimate 2013 (y_{i-1}); average of last two years estimate ($y_{(i,i-1)}$); average of the previous three year estimates 2010–12 ($y_{(i-2,i-3,i-4)}$). As results for survey trends are ratios they are quite sensitive to stocks with high variance, therefore comparing the 2 yr vs. 5 yr trend is advisable.

			Biomass index			Number index		
Species	Strata	Valid tows	y_i	y_i/y_{i-1}	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$	y_i	y_i/y_{i-1}	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$
			kg/Hr	%	%	No/Hr	%	%
Gadus morhua	VIa	44	7.8	117.5	3.5	7.3	55.0	40.3
Melanogrammus aeglefinus	VIa	44	185.2	67.1	24.4	2299.2	795.8	265.4
Clupea harengus	VIa	44	236.1	-16.4	3.7	1493.8	-39.4	38.1
Merluccius merluccius	VIa	44	24.6	-14.6	1.7	60.6	-51.5	4.9
Trachurus trachurus	VIa	44	191.2	81.9	-52.3	981.6	77.0	-52.6
Scomber scombrus	VIa	44	51.8	-88.6	15.1	681.5	-83.2	40.8
Lepidorhombus whiffiagonis	VIa	44	2.0	1.8	-3.0	5.9	-6.2	-21.4
Lophius piscatorius	VIa	44	3.9	658.7	-1.6	3.9	216.1	105.2
Pleuronectes platessa	VIa	44	11.4	-43.9	-4.5	77.2	-25.2	-17.4
Solea	VIa	44	0.6	77.5	-18.4	2.1	83.7	-34.2
Micromesistius poutassou	VIa	44	86.2	-16.1	12.2	4024.0	82.0	8.3
Merlangius merlangus	VIa	44	231.7	186.9	110.7	2497.1	87.5	340.4
Gadus morhua	VIIbgj	126	6.9	311.5	-46.5	3.8	583.2	-55.1
Melanogrammus aeglefinus	VIIbgj	126	154.2	33.5	-28.1	767.9	-52.0	16.8
Clupea harengus	VIIbgj	126	19.7	90.1	-68.6	164.6	20.9	-77.0
Merluccius	VIIbgj	126	23.6	-40.6	28.0	129.7	-56.8	-50.6
Trachurus	VIIbgj	126	53.1	15.8	113.3	1140.4	-13.6	386.4
Scomber scombrus	VIIbgj	126	82.4	-37.9	-29.4	1422.4	-36.0	-36.1
Lepidorhombus whiffiagonis	VIIbgj	126	3.2	8.9	-35.1	17.8	21.6	-37.4
Lophius piscatorius	VIIbgj	126	6.4	-20.4	11.0	7.9	73.6	15.6
Pleuronectes platessa	VIIbgj	126	10.6	-6.6	29.4	50.0	-11.4	2.3
Solea	VIIbgj	126	0.6	27.9	5.6	2.7	8.7	13.9
Micromesistius poutassou	VIIbgj	126	68.5	102.4	-4.5	2911.9	330.5	-3.9
Merlangius merlangus	VIIbgj	126	154.9	44.4	-10.0	962.9	-44.3	35.4

5.4.2.7 France: FR-EVHOE-Q4 (Celtic Sea/Bay of Biscay Groundfish Survey Q4)

Nation:	France	Vessel:	RV Thalassa
Survey:	EVHOE 2014	Dates:	17 October – 1st December 2014
Cruise	EVHOE Groundfish survey aims to collect data on the distribution and relative abundance, and biological information of all fish and selected commercial invertebrates in subareas VIIf-j VIIIa,b. The primary species are hake, monkfish, anglerfish, megrim, cod, haddock and whiting, with data also collected for all other demersal and pelagic fish. CTD temperature and salinity profiles recorded at each trawling position. Sampling design is stratified random.		
Gear details:	A GOV with standard Ground gear (A) but no kite, replaced by 6 extra floats. Marport sensors for door, wing, and vertical net opening.		
Notes from survey (e.g. problems, additional work etc.):	No significant problems during the survey. -100% of the initial program was achieved. (157 hauls of 157 planed). 99% valid. -151 CTD temperature and salinity profiles recorded. -33 "boxes" with multibeam echosounder in bathymetric mode. -5 pelagic hauls carried out during the second leg in the south of Celtic Sea. -5 videos transects with the Pagure (towed sledge for submarine photo). This tool is to be used to get qualitative information (photo and video) of the nature of the seabed for the different strata visited during the survey. A module using a laser beam and video is used to acquire supplementary information on granulometry and seabed structure. -Marport data collected during all the hauls. -Mammals and birds observations during the legs 1 and 2. -Additional works for MSFD were realized: • CUFES device (Continuous Underwater Fish Egg Sampler), Manta net for collecting surface microplastics were used during first and second leg and samples of zoo and phytoplankton were collected at the same legs. -Wastes were counted and weighted at each trawl station. -Benthos was sorted and identified at each trawl station. An intercalibration with SP-North Survey on the RV Miguel Oliver was carried out during the first leg		
Number of fish species recorded and notes on any rare species or unusual catches:	175 species encountered Additional work on selected species (950 muscle samples and 950 stomach contents		

Table 5.4.2.7.1. Stations fished.

ICES Divisions	Strata	Tows planned	Valid	Additional	% stations fished	comments
VII	Cc3	9	10	1	111%	
	Cc4	20	19		95%	
	Cc5	3	3		100%	
	Cc6	3	2		67%	
	Cc7	2	2		100%	
	Cn2	7	7		100%	
	Cn3	7	5		71%	
	Cs4	20	17		85%	
	Cs5	10	12	2	120%	
	Cs6	3	3		100%	
	Cs7	2	3	1	150%	
VIII	Gn1	3	3		100%	
	Gn2	4	4		100%	

ICES Divisions	Strata	Tows planned	Valid	Additional	% stations fished	comments
	Gn3	16	17	1	106%	
	Gn4	21	20		95%	
	Gn5	3	3		100%	
	Gn6	2	1		50%	
	Gn7	2	1		50%	
	Gs1	3	3		100%	
	Gs2	3	4		133%	
	Gs3	3	3		100%	
	Gs4	3	3		100%	
	Gs5	2	2		100%	
	Gs6	2	2		100%	
	Gs7	2	2		100%	
TOTAL		155	151	5	100.5%	

Table 5.4.2.7.2. Number of biological samples (maturity and age material, *only maturity, weight, length no age).

SPECIES	AGE	SPECIES	AGE
Merluccius merluccius	*1014**	*Lophius piscatorius*	*181**
Gadus morhua	*102*	*Solea solea*	*135*
Melanogrammus aeglefinus	*469*	*Pleuronectes platessa*	*141*
Merlangius merlangus	*696*	*Chelidonichthys cuculus*	*194*
Lepidorhombus whiffiagonis	*336*	*Micostomus kitt*	*143*
Lophius budegassa	*213**	*Glyptocephalus cynoglossus*	*40*
Dicentrarchus labrax	*56*	*Mullus surmuletus*	*25*

Figure 5.4.7. Map of station positions and depth strata for the EVHOE 2014 Q4 survey.

5.4.2.8 France: FR-CGFS-Q4 (The Channel Groundfish Survey Q4)

Nation:	France	Vessel:	RV Gwen Drez
Survey:	CGFS14	**Dates:**	2 October 2014– 30 October 2014
Cruise	The first objective of the Channel Ground Fish Survey carried out every year in October since 1988 is to collect data on the distribution, the relative abundance and biological information on commercial fish in the Eastern English Channel and the Southern North Sea. The most important species are cod, whiting, plaice, striped red mullet and sea bass		
Gear details:	The gear used is a GOV trawl adapted to the ship power. The headline and the groundrop are respectively 19.70 m and 25.90 m long. The mesh size in the codend is 10mm (20 mm stretched). To record the main trawl parameters, Marport sensors are used.		
Notes from survey (e.g. problems, additional work etc.):	95 valid hauls were carried out in the whole area at the same position as every year but 4 hauls were not validated because of trawl damages. Hydrological parameters were recorded for 65 hauls. During this survey the first 30 hauls were made in the setting of an intercalibation with oceanographic vessel Thalassa. The two vessels have worked together in order to compare ship efficiency.		
Number of fish species recorded and notes on any rare species or unusual catches:	Overall, 87 commercial species were recorded during the survey. 117 Benthic fauna species were also identified and counted at each haul. Some parasites were collected. Total biomass and abundance calculated from the area always prospected all along the serial is decreasing compare to 2013.		

Table 5.4.2.8.1. Stations fished (aims: to complete 103 valid tows per year).

ICES Divisions	Strata	Gear	Tows planned	Valid	Additional	Invalid	% stations fished	comments
VIId, IVc,		GOV	110	95	4	4	100%	
	TOTAL		110	95	4	4		

Table 5.4.2.8.2. Number of biological samples (maturity and age material).

Number of biological samples (maturity and age material, *maturity only):			
Species	Age	Species	Age
Gadus morhua	291	*Pleuronectes platassa*	302
Merlangius merlangus	191	*Mullus surmuletus*	77
Dicentrachus labrax	60		

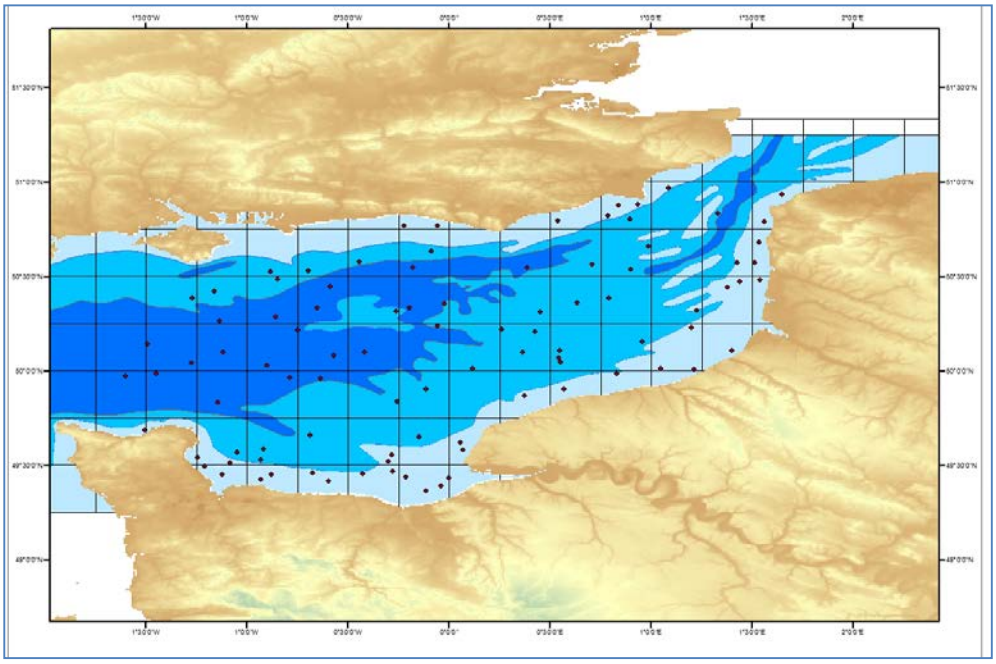


Figure 5.4.8. Map of station positions for CGFS 2014, Quarter 4.

5.4.2.9 Spain: SP-PORC-Q3 (The Porcupine Groundfish Survey Q3)

Nation:	SP (Spain)	Vessel:	RV: Vizconde de Eza
Survey:	Porcupine 2014	**Dates:**	2– 30 September 2014
Cruise	Spanish Porcupine bottom trawl survey aims to collect data on the distribution and relative abundance, and biological information of commercial fish in Porcupine bank area (ICES Division VIIb-k). The primary target species are hake, monkfish, white anglerfish and megrim, which abundance indices are estimated by age, with abundance indices also estimated for *Nephrops*, four-spot megrim and blue whiting. Data collection is also collected for several other demersal fish species and invertebrates.		
Survey Design	This survey is random stratified with two geographical strata (northern and southern) and 3 depth strata (170–300 m, 301–450 m, and 451–800 m). Stations are allocated at random according to the strata surface.		
Gear details:	Porcupine baca 39/52 (Otter trawl gear).		
Notes from survey (e.g. problems, additional work etc.):	Weather conditions were good during most of 2014 survey. Additional work undertaken included 85 CTD casts at most trawl stations, 5 within the non-trawlable area, and 8 in 4 perpendicular radials to obtain a general image of the hydrography. 29 boxcorers were carried out fulfilling the aim to sample different areas on the Porcupine Bank.		
Number of fish species recorded and notes on any rare species or unusual catches:	First estimates: Overall, a total of 110 fish species, 44 crustaceans, 32 molluscs, 25 echinoderms and 26 species of other invertebrates were identified.		

Table 5.4.2.9.1. Stations fished (aims: to complete 80 valid tows per year).

ICES Divisions	Strata	Gear	Tows planned	Valid	Valid with rock-hopper	Additional	Invalid	% stations fished	comments
VIIb-k	All	Porcupine baca 39/52	80	80	-	5	3	106.3%	Also available by depth and geographical strata
	TOTAL		80	80	-	5	3	106.3%	

Table 5.4.2.9.2. Number of biological samples (maturity and age material).

Number of biological samples (maturity and age material, *maturity only):			
Species	Age	Species	Age
Merlucciusmerluccius	1159	*Molvamolva*	161
Lepidorhombuswhiffiagonis	797	*Conger*	45
Lepidorhombusboscii	367	*Helicolenusdactylopterus*	200
Lophiusbudegassa	119	*Phycisblennoides*	158
Lophiuspiscatorius	543	*Merlangiusmerlangus*	76
*Nephrops norvegicus**	282		

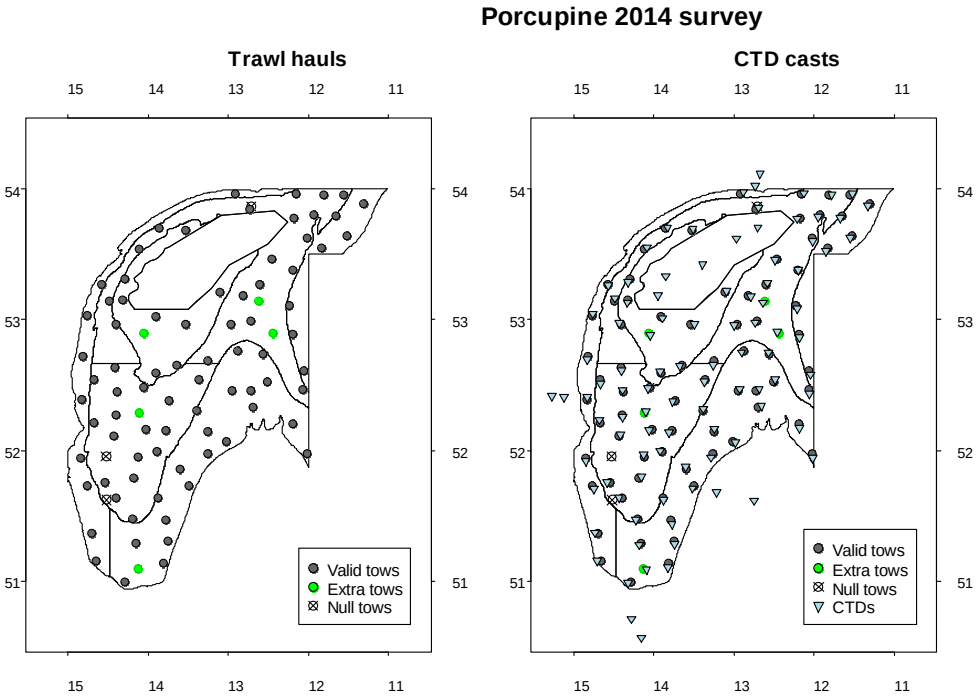


Figure 5.4.9. Trawl stations in Porcupine 2014 survey (left panel), CTD stations in relation to trawl stations (right panel).

Table 5.4.2.9.3. Biomass and number estimates.

			Biomass index			Number index		
Species	**Strata**	**Valid tows**	**y_i kg/.5hour**	**y_i/y_{i-1} %**	**$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %**	**y_i nº/.5 hour**	**y_i/y_{i-1} %**	**$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %**
Merluccius	All	80	88.74	32.1	59.6	108.1	12.4	96.2
Lepidorhombus whiffiagonis	All	80	15.78	23.1	17.9	166.7	15.8	1.6
Lepidorhombus boscii	All	80	13.89	18.3	31.8	155.5	-6.7	23.0
Lophius budegassa	All	80	1.77	2.3	100.4	1.4	73.4	163.4
Lophius piscatorius	All	80	21.28	9.6	83.5	6.4	26.6	80.0
Micromesistius poutassou	All	80	294.31	-13.0	73.1	2724.0	-24.5	21.6
Nephrops norvegicus	All	80	0.54	35.0	-48.5	17.3	75.8	-46.3

y_i, year estimate (2014); y_{i-1}, previous year estimate (2013); $y_{(i,i-1)}$, Average of last two year estimates (2013 and 2012); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2012, 2011 and 2010).

5.4.2.10 Spain: SP-NSGFS-Q4 (Spanish North Coast Survey Q4)

NATION:	SP (SPAIN)	VESSEL:	MIGUEL OLIVER
Survey:	N14	Dates:	17/09/2014 – 22/10/2014
Cruise	Spanish North Coast bottom trawl survey aims to collect data on the distribution and relative abundance, and biological information of commercial fish in ICES Divisions VIIIc and Northern IXa. The primary species are hake, monkfish and white anglerfish, megrim, four-spot megrim, blue whiting and horse mackerel abundance indices are estimated by age, with abundance indices also estimated for Nephrops, and data collection for other demersal fish and invertebrates.		
Survey Design	This survey is random stratified with five geographical strata along the coast and 3 depth strata (70–120 m, 121–200 m, 201–500 m). Stations are allocated at random within the trawlable stations available according to the strata surface.		
Gear details:	Standard baca 36/40 with thyborøn doors		
Notes from survey (e.g. problems, additional work etc.):	Due to the differences in the catchability of some species, specially benthic ones, in 2013 survey, an additional intercalibration experiment between the RV Miguel Oliver and RV Cornide de Saavedra was undertaken on Galician shelf. 53 paired hauls were performed following the methodology used in previous experiences. The results are much more in line with those from 2012, not presenting the obvious outliers compared with those in teh time-series of main species. As in previous years, two additional hauls were undertaken to cover shallow stations between 30 and 70 m, (though gillnets in some of the hauls planed, reduced the sampling in shallow waters) and 13 deeper stations, between 500 and 700 m. Additional work undertaken included CTD casts at all trawl stations and ground sediment samples with a cylinder attached to the groundrope. Seabirds census was also carried out during fishing manoeuvres. Analyses of stomach contents of main demersal species was performed in all hauls during the survey. Calibration hauls in the French EEZ were carried on Oct. 17th. While the French Vessel carried her hauls in the Spanish EEZ on		
Number of fish species recorded and notes on any rare species or unusual catches:	A total of 316 species were captured, 145 fish species, 63 crustaceans, 47 molluscs, 30 echinoderms and 31 other invertebrates.		

Table 5.4.2.10.1. Stations fished (aims: to complete 116 valid tows per year).

ICES Divisions	Strata	Gear	Tows planned	Valid	Additional	Invalid	% stations fished	comments
VIIIc	All	Standard baca	96 / 18[(1)]	96	18	0	100%	Also available by depth
IXa North	All	Standard baca	20/ 2[(1)]	20	2	0	100%	
	TOTAL		136	116	20	0	100%	

Additional hauls on shallow and deep grounds and 3 inter-calibration hauls in French ZEE, actually VIIIb.

Table 5.4.2.10.2. Number of biological samples (maturity and age material).

SPECIES	AGE	SPECIES	AGE
Merluccius merluccius anual	1020	*Scomber scombrus*	974
Lepidorhombus whiffiagonis	519	*Zeus faber*	80
Lepidorhombus boscii	582	*Trisopterus luscus*	169
Lophius budegassa	95	*Helicolenus dactylopterus*	240
Lophius piscatorius	152	*Phycis blennoides*	163
Trachurus trachurus	812	*Conger conger*	264
Micromesistius poutassou	2108 (1391*)	*Engraulis encrasicolus*	338

*** Actually read for the ALK.**

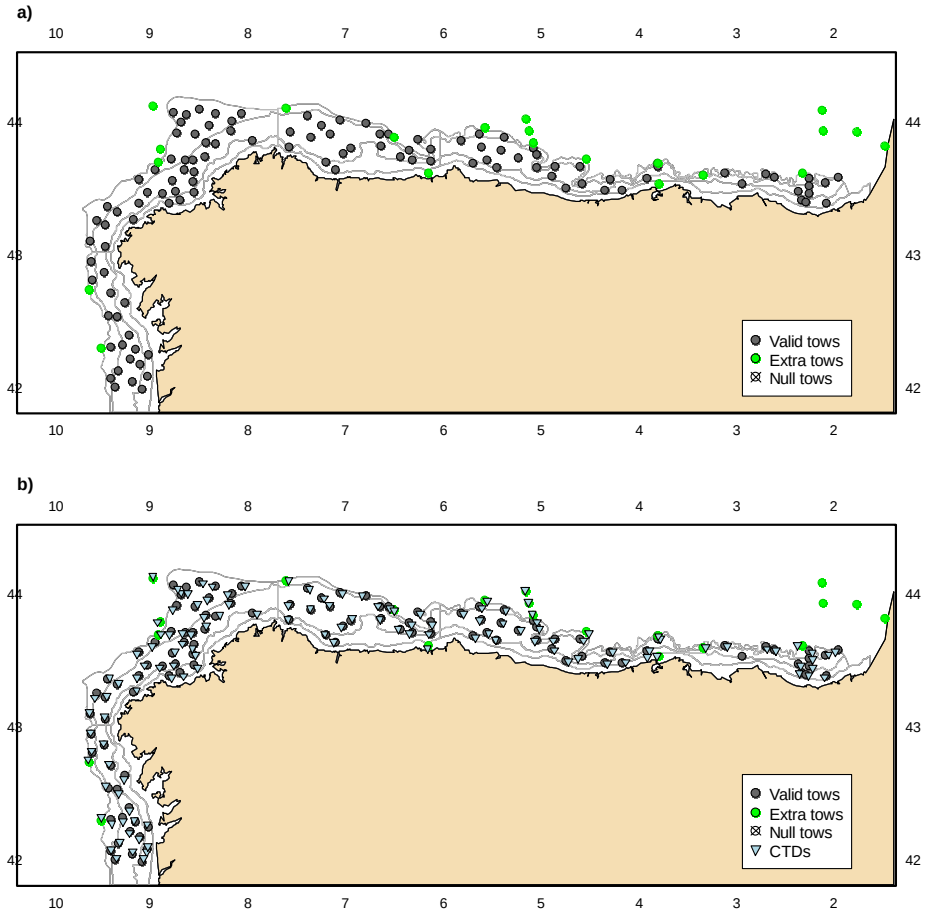


Figure 5.4.80a). Trawl stations in Northern Spanish Shelf 2014 survey, b) CTD stations in relation to trawl stations.

Table 5.4.2.10.3. Biomass and number estimates.

			Biomass index			Number index		
Species	**Strata**	**Valid tows**	**yi** kg/.5hour	**yi/yi-1** % incr.	**y(i,i-1)/ y(i-2,i-3,i-4)** % incr.	**yi** nº/.5hour	**yi/yi-1** % incr.	**y(i,i-1)/ y(i-2,i-3,i-4)** % incr.
Merluccius merluccius	VIIIc	95	3.47	-15.0	-47.7	55.5	-49.8	-61.6

			Biomass index			Number index		
Species	**Strata**	**Valid tows**	**yi kg/.5hour**	**yi/yi-1 % incr.**	**y(i,i-1)/ y(i-2,i-3,i-4) % incr.**	**yi nº/.5hour**	**yi/yi-1 % incr.**	**y(i,i-1)/ y(i-2,i-3,i-4) % incr.**
Lepidorhombus boscii	VIIIc	95	4.88	-44.2	33.6	66.5	-47.8	26.0
L. whiffiagonis	VIIIc	95	1.61	-46.9	42.3	10.8	-43.1	2.3
Lophius budegassa	VIIIc	95	1.29	-14.0	152.1	1.0	-38.9	98.8
Lophius piscatorius	VIIIc	95	1.89	-20.9	72.6	1.5	-44.6	29.8
Micromesistius poutassou	VIIIc	95	127.41	185.0	32.6	4544.0	665.4	-1.4
Nephrops norvegicus	VIIIc	95	0.06	0.0	157.1	0.9	-24.0	131.5
Trachurus trachurus	VIIIc	95	37.57	809.7	205.1	702.0	715.3	74.1
Scomber scombrus	VIIIc	95	6.71	77.0	264.6	98.3	86.5	204.7

y_i, year estimate (2014); y_{i-1}, previous year estimate (2013); $y_{(i,i-1)}$, Average of last two year estimates (2013 and 2012); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2012, 2011 and 2010).

			Biomass index			Number index		
Species	**Strata**	**Valid tows**	**yi kg/.5hour**	**yi/yi-1 %**	**y(i,i-1)/ y(i-2,i-3,i-4) %**	**yi nº/.5hour**	**yi/yi-1 %**	**y(i,i-1)/ y(i-2,i-3,i-4) %**
Merluccius merluccius	IXaN	19	4.92	-61.7	-41.2	183.4	-30.3	-43.3
Lepidorhombus boscii	IXaN	19	4.14	-26.3	32.0	72.6	-17.2	26.4
L. whiffiagonis	IXaN	19	0.07	16.7	50.0	0.5	-47.1	80.6
Lophius budegassa	IXaN	19	0.18	12.5	-58.9	0.1	0.0	-56.5
Lophius piscatorius	IXaN	19	0.01	-98.2	52.7	0.0	-90.0	53.5
Micromesistius poutassou	IXaN	19	48.48	1771.8	-60.7	1735.9	6166.8	-56.9
Nephrops norvegicus	IXaN	19	0.01	-75.0	25.0	0.1	-73.9	-17.9
Trachurus trachurus	IXaN	19	10.48	17366.7	282.8	107.9	23871.1	528.8
Scomber scombrus	IXaN	19	12.52	5116.7	-53.2	129.7	11800.9	-68.5
Merluccius merluccius	All	111	3.72	-33.5	-45.7	77.5	-43.4	-56.6
Lepidorhombus boscii	All	111	4.75	-42.1	33.3	67.6	-44.0	26.1
L. whiffiagonis	All	111	1.34	-46.8	41.9	9.0	-43.1	2.6
Lophius budegassa	All	111	1.10	-13.4	123.6	0.9	-38.6	89.4
Lophius piscatorius	All	111	1.57	-24.2	71.7	1.2	-45.9	29.8
Micromesistius poutassou	All	111	113.84	203.9	16.6	4061.2	718.2	-9.2
Nephrops norvegicus	All	111	0.05	-16.7	135.7	0.8	-28.4	112.5
Trachurus trachurus	All	111	32.91	859.5	208.1	599.9	740.4	77.7
Scomber scombrus	All	111	7.71	142.5	53.8	103.7	136.6	31.3

y_i, year estimate (2014); y_{i-1}, previous year estimate (2013); $y_{(i,i-1)}$, Average of last two year estimates (2013 and 2012); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2012, 2011 and 2010).

5.4.2.11 Spain: SP-GCGFS-Q1 (Spanish Gulf of Cadiz Bottom Trawl Survey Q1)

Nation:	SP (Spain)	Vessel:	Miguel Oliver
Survey:	Q1 SP-GCGFS (ARSA 0314)	**Dates:**	22 February – 3 March 2014
Cruise:	Spanish Gulf of Cadiz bottom trawl survey aim to collect data on the distribution, relative abundance and biological information of commercial fish, crustaceans and cephalopods in the Gulf of Cadiz area (ICES Division IXa). The primary species are hake, horse mackerel, mackerel, Spanish mackerel, wedge sole, sea breams and crustaceans as rose and red shrimps, Norway lobster and cephalopod molluscs. Data and abundance indices are also estimated and reported for other demersal fish species and invertebrates.		
Gear details:	Standard baca 36/40		
Notes from survey (e.g. problems, additional work etc.):	Sediment samples were collected with a collector attached to the groundgear. Temperature and salinity data were also collected during each tow with a CTD attached to the gear. Additionally 79 CTD casts were carried out in the survey area.		
Number of fish species recorded and notes on any rare species or unusual catches:	A total of 298 species were captured, 144 fish species, 56 crustaceans, 49 molluscs, 21 echinoderms and 51 other invertebrates.		

Table 5.4.2.11.1. Stations fished (aims: to complete 41 valid tows per year).

ICES Divisions	Strata	Gear	Tows planned	Valid	Valid with rock hopper	Additional	Invalid	% stations fished	comments
IXa	All	Standard baca 36/40	41	40	-	-	2	98%	Also available by depth
	TOTAL		41	40	-	-	2	98%	

Table 5.4.2.11.2. Number of biological samples (maturity and age material, *maturity only).

Number of biological samples (maturity and age material, *maturity only):			
Species	**Age**	**Species**	**Age**
Merluccius merluccius	336/16 42*	*Loligo forbesi**	22
*Parapenaeus longirostris**	1256	*Sepia officinalis**	158
*Nephrops norvegicus**	340	*Eledone cirrhosa**	159
*Octopus vulgaris**	66		

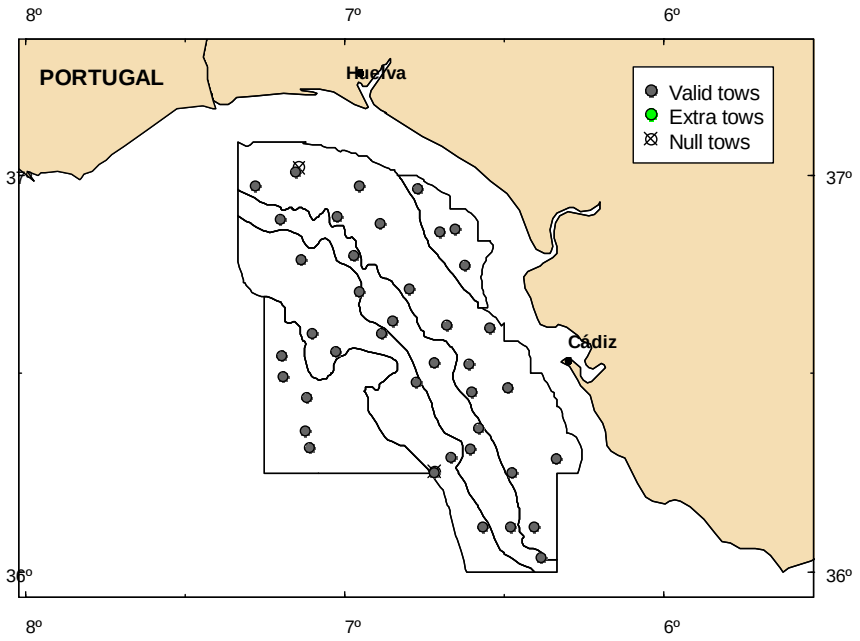


Figure 5.4.11. Map of sampling grid and station positions.

Table 5.4.2.11.3. Biomass and number estimates,

			Biomass index			Number index		
Species	Strata	Valid tows	y_i kg/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %	y_i no./0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %
Merluccius	ALL	40	3.01	9.3	27.3	41.58	8.7	2.9
Micromesistius poutassou	ALL	40	0.08	-99.1	182.8	0.6	-99.7	223.8
Nephrops norvegicus	ALL	40	0.39	136.4	375.7	10.63	79	373.1
Parapenaeus longirostris	ALL	40	0.45	-54.5	-32.7	104.41	-33.6	-22
Octopus vulgaris	ALL	40	0.7	-84.3	272.8	0.86	-88.9	399
Loligo vulgaris	ALL	40	0.25	28.2	-16	1.75	77.7	-37.2
Sepia officinalis	ALL	40	0.59	-53	4.2	1.9	-45.5	28.8

y_i, year estimate (2014); y_{i-1}, previous year estimate (2013); $y_{(i,i-1)}$, average of last two year estimates (2014 and 2013);$y_{(i-2,i-3,i-4)}$, average of the previous three year estimates (2012, 2011 and 2010).

5.4.2.12 Spain: Sp-GCGFS-Q4: (Spanish Gulf of Cadiz Bottom Trawl Survey Q4)

Nation:	SP (Spain)	Vessel:	Miguel Oliver
Survey:	Q4 SP-GCGFS (ARSA 1114)	**Dates:**	27 Oct – 9 Nov 2014
Cruise	Spanish Gulf of Cadiz bottom trawl survey aim to collect data on the distribution, relative abundance and biological information of commercial fish, crustaceans and cephalopods in the Gulf of Cadiz area (ICES Division IXa). The primary species are hake, horse mackerel, mackerel, Spanish mackerel, wedge sole, sea breams and crustaceans as rose and red shrimps, Norway lobster and cephalopod molluscs. Data and abundance indices are also estimated and reported for other demersal fish species and invertebrates.		
Gear details:	Standard baca 36/40		
Notes from survey (e.g. problems, additional work etc.):	Sediment samples were collected with a collector attached to the groundgear. Temperature and salinity data were also collected during each tow with a CTD attached to the gear. Additionally 79 CTD casts were carried out in the survey area.		
Number of fish species recorded and notes on any rare species or unusual catches:	A total of 298 species were captured, 146 fish species, 48 crustaceans, 55 molluscs, 22 echinoderms and 51 other invertebrates.		

Table 5.4.2.12.1. Stations fished (aims: to complete 41 valid tows per year).

ICES Divisions	Strata	Gear	Tows planned	Valid	Valid with rock-hopper	Additional	Invalid	% stations fished	Comments
IXa	All	Standard baca 36/40	45	45	-	-	4	100%	Also available by depth
	TOTAL		45	45	-	-	4	100%	

Table 5.4.2.12.2. Number of biological samples (maturity and age material, *maturity only).

Number of biological samples (maturity and age material, *maturity only):			
Species	**Age**	**Species**	**Age**
Merluccius merluccius	339/1355*	*Loligo forbesi**	142
*Parapenaeus longirostris**	1079	*Sepia officinalis**	56
*Nephrops norvegicus**	206	*Eledone cirrhosa**	506
*Octopus vulgaris**	120		

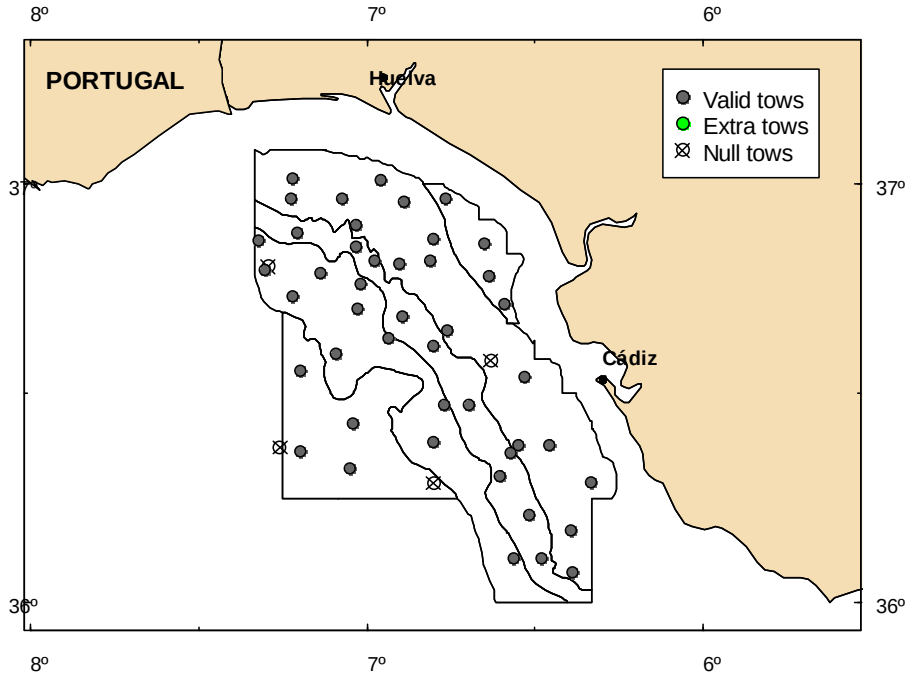


Figure 5.4.12. Map of sampling grid and station positions.

Table 5.4.2.12.3. Biomass and number estimates.

			Biomass index			Number index		
Species	**Strata**	**Valid tows**	**yi kg/0.5h**	**yi/yi-1 %**	**y(i,i-1)/ y(i-2,i-3,i-4) %**	**yi no./0.5h**	**yi/yi-1 %**	**y(i,i-1)/ y(i-2,i-3,i-4) %**
Merluccius	ALL	40	4.67	-25.5	131.3	47.97	-66.4	166.7
Micromesistius poutassou	ALL	40	3.1	104.3	18.1	87.25	677.2	-27.1
Nephrops norvegicus	ALL	40	0.19	-46.4	156.5	7.36	-45.3	149.6
Parapenaeus longirostris	ALL	40	0.3	-16.9	-73.9	34.37	-49.7	-81.1
Octopus vulgaris	ALL	40	0.54	-77.8	-2.3	1.05	-66.3	-52.4
Loligo vulgaris	ALL	40	0.71	44.9	-33.1	6.29	-4.3	29
Sepia officinalis	ALL	40	0.39	-71.2	16.9	0.59	-80.8	-13.9

y_i, year estimate (2014); y_{i-1}, previous year estimate (2013); $y_{(i,i-1)}$, average of last two year estimates (2014 and 2013);$y_{(i-2,i-3,i-4)}$, average of the previous three year estimates (2012, 2011 and 2010).

5.4.2.13 Portugal: PT-PGFS-Q4 (Portuguese Autumn Groundfish Survey Q4)

Nation:	Portugal	Vessel:	RV Noruega
Survey:	Autumn 2014	**Dates:**	1st – 14th Oct and 21st – 3rd Nov
Cruise	Autumn groundfish survey aims to estimate the abundance and distribution of hake and horse mackerel recruits, indices of abundance and biomass of the most important commercial species, biological parameters, e.g. maturity, ages, sex-ratio, weight, food habits and biodiversity indicators. The primary species are hake, horse mackerel, blue whiting, mackerel and Spanish mackerel. Other data are also collected for several other demersal fish species and invertebrates.		
Area	Portuguese continental waters (Div. IXa), from 20 to 500 m depth.		
Survey design	96 fishing stations, 66 at fixed (grid) positions and 30 at random. Tow duration is 30 min, with a trawl speed of 3.5 knots, during day light.		
Gear details	NCT (Norwegian Campbell Trawl) gear with rollers in the groundrope. The mean horizontal opening between the wings is 14.7 m and the mean vertical opening is 4.4 m. Codend mesh size is 20 mm.		
Notes from survey (e.g. problems, additional work etc.)	15 stations could not be performed due to static gears present in the area. Survey was interrupted for 6 days due to bad weather. Mechanical problems caused disruption for 2 full days of work. Temperature was recorded with a CTD (Conductivity, Temperature, Depth) equipment: – 81 CTDs Stations took place in the final position of each fishing station, but only 65 were considered valid. SCANMAR equipment was used in most stations to monitor wings, vertical opening and bottom contact.		
Number of fish species recorded and notes on any rare species or unusual catches:	Overall, 91 species of fish, 15 of cephalopods and 18 of crustaceans were recorded during the survey. 28 species of other groups were recorded, e.g. Echinodermata, Cnidarians, Bivalves, Gastropods, Polychaeta, Ascidians and Nudibranchia.		

Table 5.4.2.13.1. Stations fished.

ICES Divisions	Strata	Gear	Tows planned	Valid	Invalid	% stations fished	comments
IXa	ALL	NCT	**96**	**81**	**2**	**86**	Also available by depth and geographical strata

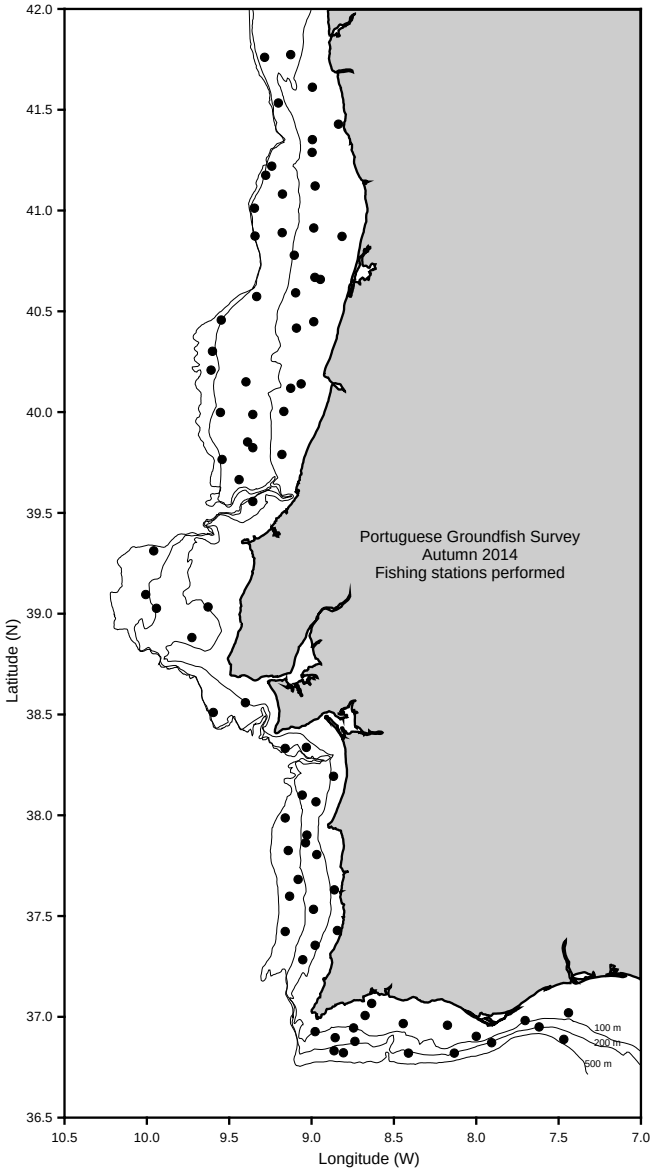


Figure 5.4.13. Map of station positions.

Table 5.4.2.13.2. Number of biological samples (maturity and age material).

Species	Age	Maturity only
Merluccius merluccius	1078	1862
Trachurus trachurus	514	1126
Micromesistius poutassou	646	1206
Scomber scombrus	213	
Scomber colias	130	135
Nephrops norvegicus		15
Parapenaeus longirostris		1241

Table 5.4.2.13.3. 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	IXa	81	17.1	-51.8	-17.4	195.7	-59.7	-12.6
Trachurus trachurus	IXa	81	22.7	-76.3	118.6	283.8	-82.2	12.8
Trachurus picturatus	IXa	81	18.4	28.9	279.5	534.4	106.1	668.3
Micromesistius poutassou	IXa	81	35.0	445.3	-77.1	1087.8	1562.8	-82.8
Scomber scombrus	IXa	81	1.5	-40.4	-52.7	12.2	-56.7	-58.0
Scomber colias	IXa	81	15.7	48.6	-50.0	300.1	114.0	-44.7
Lepidorhombus boscii	IXa	81	0.1	3.8	47.9	1.5	39.4	36.1
Lepidorhombus whiffiagonis	IXa	81	0.0	NA	700.7	0.2	NA	281.3
Lophius budegassa	IXa	81	0.0		NA	0.0		
Lophius piscatorius	IXa	81	0.0		NA	0.0		
Nephrops norvegicus	IXa	81	0.0	-89.6	42.8	0.2	-91.5	38.1

y_i, year estimate (2014); y_{i-1}, previous year estimate (2013); $y_{(i,i-1)}$, Average of last two year estimates (2014 and 2013); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2011, 2010 and 2009, for no survey in 2012).

5.4.3 Results

5.4.3.1 Biological samples

Table 5.4.3.1.1 gives an overview of the number of biological samples as reported per country/survey within the Northeastern Atlantic area (in Section5.4.2).

Table 5.4.3.1.1. Number of individuals sampled for maturity and/or age in 2014.

	UK-Sco			UK-NIGFS		Irl	Fr			Sp		Pt
	Q1	Q3	Q4	Q1	Q4	IGFS	CGFS	EVHOE	Porc	NS	GC Q1	GC Q4	
Target species													
Clupea harengus	1215		325			335							
Gadus morhua	210	4	235	312	77	401	291	102					
Lepidorhombus boscii									367	582			
Lepidorhombuswhiffiagonis						921		336	797	519			
Lophius budegassa						283		213*	119	95			
Lophius piscatorius						548		181*	543	152			
Melanogrammusaeglefinus	991	1282	1375	985	725	2412		469					
Merlangius merlangus	838	58	871	1270	1210	2012	191	696	76				
Merluccius merluccius	318*		341	5	3	668		1014*	1159	1020	336/ 1642*	339/ 1355*	1078/ 1862*
Nephrops norvegicus									282*		340*	206*	15*
Pollachius virens	241		68			247							
Scomber scombrus	324	5	235			476				974			213
Sprattus sprattus	367		15										
Trachurus trachurus						1030				812			514/ 1126*
Trisopterus esmarkii	321		569			117**							
Additional species													
Argentina silus						50**							
Argentina sphyraena						108**							
Chelidonichthys cuculus				54	77			194					
Conger conger					4	31**			45	264			
Dicentrarchus labrax						168	60	56					
Dipturusbatis cf. flossada	1*		2			31*							
Dipturusbatis cf.intermedia	62*	64*	153			38**							
Dipturus oxyrinchus		5*											
Eledone cirrhosa											15*	506*	
Engraulis encrasicolus										338			
Eutrigla gurnardus						393**							
Gadiculus argenteus						115**							
Galeorhinus galeus			3										
Glyptocephalus cynoglossus						371**		40					
Helicolenus dactylopterus									200	240			
Leucoraja circularis		1*											
Leucoraja fullonica		4*											
Leucoraja naevus	85*		21	32*	22*	136*							
Limanda limanda						167**							
Loligo forbesi											22*	142*	
Loligo vulgaris													
Micromesistius poutassou						773				2108/ 1391*			646/ 1206*
Microstomus kitt				43	35	614		143					

	UK-SCO			UK-NIGFS		IRL	FR				SP		PT
	Q1	Q3	Q4	Q1	Q4	IGFS	CGFS	EVHOE	PORC	NS	GC Q1	GC Q4	
Molva molva	74*		57*	2		122			161				
Mullus surmuletus							77	25					
Octopus vulgaris											66*		
Parapenaeus longirostris											1256*	1079*	1241*
Phycis blennoides									158	163			
Pleuronectes platessa				391	287	1106	302	141					
Pollachius pollachius				9	1	42**							
Scophthalmus maximus	1*		114	2	3	39**							
Raja brachyura	10*		11	13*	24*	32*							
Raja clavata	152*	21*	20	119*	100*	255*							
Raja montagui	203*		326*	266*	228*	734*							
Scomber colias													130/ 135*
Scophthalmus rhombus			31	15	6	63**							
Sepia officinalis											158*	56*	
Solea solea						216		135					
Squalus acanthias						146*							
Trisopterus luscus										169			
Trisopterus minutus						185**							
Zeus faber	23*		104	8		308**				80			

*** Samples collected for maturity only**

(2) Otoliths + Illiciums

5.4.4 Intercalibration experiments

In 2014, as in 2008, 2009, 2013 and 2014, 8–9 intercalibration hauls were performed in the adjacent area between FR-EVHOE and SP-NSGFS surveys as recommended in 2006 by IBTSWG (ICES, 2006) with the shortest interval between the French and Spanish hauls. Hauls were performed with an interval close to 10 days at the end of the Spanish survey and the first part of the EVHOE survey. Next year a report on the results of the comparison between the results of both vessels will be presented and the utility of using this approach to compare the results between vessels working in adjacent but not overlapped survey areas will be assessed.

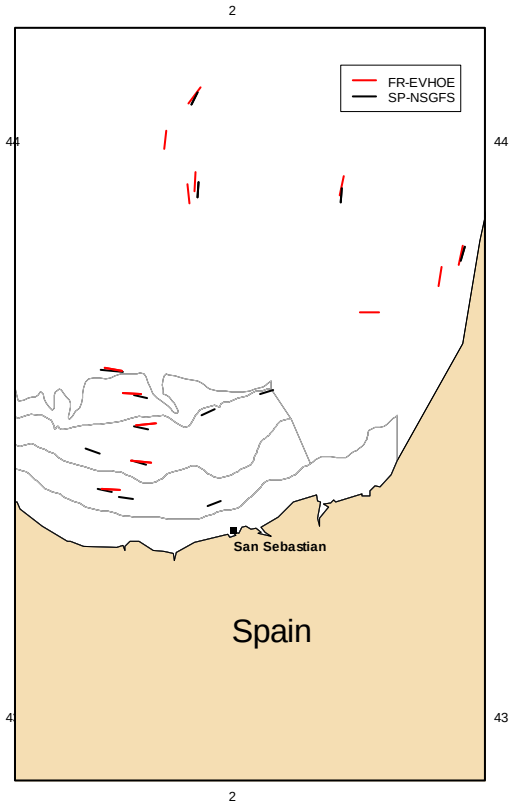


Figure 5.4.14. Map showing the positions of the intercalibration hauls performed between FR-EVHOE and SP-NSGFS in autumn 2014.

5.4.5 Participation planned for 2015/2016

Survey	Code	Starting	Ending	expected hauls	Planned Intercal
UK-Scotland Rockall	UK-SCROCQ3	XX/08/15	XX/09/15	40	-
UK-Scotland West(aut.)	UK -SCOWCQ4	XX/11/15	XX/12/15	60	-
UK-Scotland West (spring)	UK-SCOWCQ1	XX/02/16	XX/03/16	60	-
UK-North Ireland (aut.)	UK-NIGFS Q4	XX/10/15	XX/10/15	60	-
UK-North Ireland (spring)	UK-NIGFS Q1	XX/03/16	XX/03/16	60	-
Ireland – GFS Via	IE-IGFS	19/08/15	30/09/15	45	-
Ireland – GFS VIIb,g,j	IE-IGFS	13/11/15	17/12/15	125	-
France – EVHOE	FR-EVHOE	17/10/15	01/12/15	155	SPNGFS
France - Western Channel	FR-CGFS			110	-
Spain – Porcupine	SP-PORC	02/09/15	01/10/15	80	-
Spain - Northernshelf	SP-NSGFS	18/09/15	24/10/15	116	EVHOE
Spain - Gulf of Cádiz (Spring)	SP-GCGFS Q1	22/02/15	03/03/15	43	-
Spain - Gulf of Cádiz (Aut.)	SP-GCGFS Q4	30/10/15	12/11/15	43	-
Portugal -(Aut.)	PT-PGFS	01/10/15	31/10/15	96	-

Intercal: intercalibration between vessels.

5.4.6 Actions and Recommendations

Recommendation:

Considering the likely change of the vessel used by Portugal for the PT-PGFS within 2015 and 2016, it is recommended that in order to facilitate a future combination of abundance indices along the whole Iberian Atlantic shelf the adoption of a gear more similar to the ones used by Spain in the Iberian Atlantic shelf would be considered. (This will be brought to the attention of WGBIE, WGWIDE and WGHANSA.)

5.4.7 References

ICES. 2006. Report of the International Bottom Trawl Survey Working Group (IBTSWG), 27–31 March 2006, Lysekil, Sweden. ICES CM 2006/RMC:03, Ref. ACFM. 298 pp.

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5.5 Combined results

5.5.1 Combined North Sea and Eastern Atlantic survey results

Catches from latest bottom trawl surveys (IBTS) in the North Sea and the Northeastern Atlantic areas covered by the IBTS (see Table 5.4.3.1.1and Figure 5.) are mapped and presented in Annex 5. This year data from the Scottish survey on Rockall Q3 have been included for the first time, adding new information from the deep areas fished around the Rockall. The map also shows the stations performed by Ifremer during CAMANOC survey on ICES Subdivision VIIe, the western part of the Channel. This survey is being evaluated for its suitability or necessary adaptations to become part of the surveys co-ordinated within the IBTSWG to overcome the gap of the coverage of IBTS in this area. Results per species are not included in the maps presented in Annex 5 since the survey design is still under discussion (see Annex 7 – Working Document #7).

Regarding distribution of abundances, results are in general patterns and distribution similar to those from the previous years. Most remarkable differences (comparison with ICES, 2014, Annex 5) are related with recruitment signals of different species, some good recruitments are apparent, as is the case of herring (≤17.5 cm) in the North Sea, haddock (≤20 cm) around northern UK, but less than 2013 survey in the Irish Sea, or small white angler (≤20 cm) in the Celtic Sea. The abundance of hake recruits, remains low as in 2013, specially compared with the remarkable peak found in 2012, and the increment of catches of hake larger than 20 cm, detected in 2013 surveys has decreased again in 2014 to values still larger than those in previous years. In addition, a remarkable abundance of European sprat was found in the North Sea surveys.

Table 5.4.3.1.1. Species for which distribution maps have been produced, with length split for pre-recruit (0-group) and post-recruit (1+ group) where appropriate. The maps cover all the area encompassed by surveys coordinated within the IBTSWG (North Sea and Northeastern Atlantic area).

Scientific	Common	Code	Fig No	Length Split (<cm)
Clupea harengus	Herring	HER	6–7	17.5
Gadus morhua	Atlantic Cod	COD	2–3	23
Galeorhinus galeus	Tope Shark	GAG	32	
Lepidorhombus boscii	Four-Spotted Megrim	LBI	16–17	19
Galeus melastomus	Blackmouthed dogfish	DBM	40	
Lepidorhombus whiffiagonis	Megrim	MEG	14–15	21
Leucoraja naevus	Cuckoo Ray	CUR	30	
Lophius budegassa	Black-bellied Anglerfish	WAF	20–21	20
Lophius piscatorius	Anglerfish (Monk)	MON	18–19	20
Merlangus merlangius	Whiting	WHG	24–25	20
Melanogrammus aeglefinus	Haddock	HAD	4–5	20
Merluccius merluccius	European hake	HKE	8–9	20
Micromesistius poutassou	Blue whiting	WHB	26–27	19
Mustelus asterias	Starry Smooth Hound	SDS	33	
Mustelus mustelus	Smooth Hound	SMH	34	
Nephrops norvegicus	Norway Lobster	NEP	28	
Pleuronectes platessa	European Plaice	PLE	22–23	12
Raja clavata	Thornback ray (Roker)	THR	35	
Raja microocellata	Painted/Small Eyed Ray	PTR	36	
Raja montagui	Spotted Ray	SDR	37	
Raja undulata	Undulate Ray	UNR	38	
Scomber scombrus	European Mackerel	MAC	12–13	24
Scyliorhinus canicula	Lesser Spotted Dogfish	LSD	29	
Scyliorhnus stellaris	Nurse Hound	DGN	39	
Sprattus sprattus	European sprat	SPR	41	
Squalus acanthias	Spurdog	DGS	31	
Trachurus picturatus	Blue Jack Mackerel	JAA	43	
Trachurus trachurus	Horse Mackerel (Scad)	HOM	10–11	15
Trisopterus smarkii	Norway pout	NPO	42	

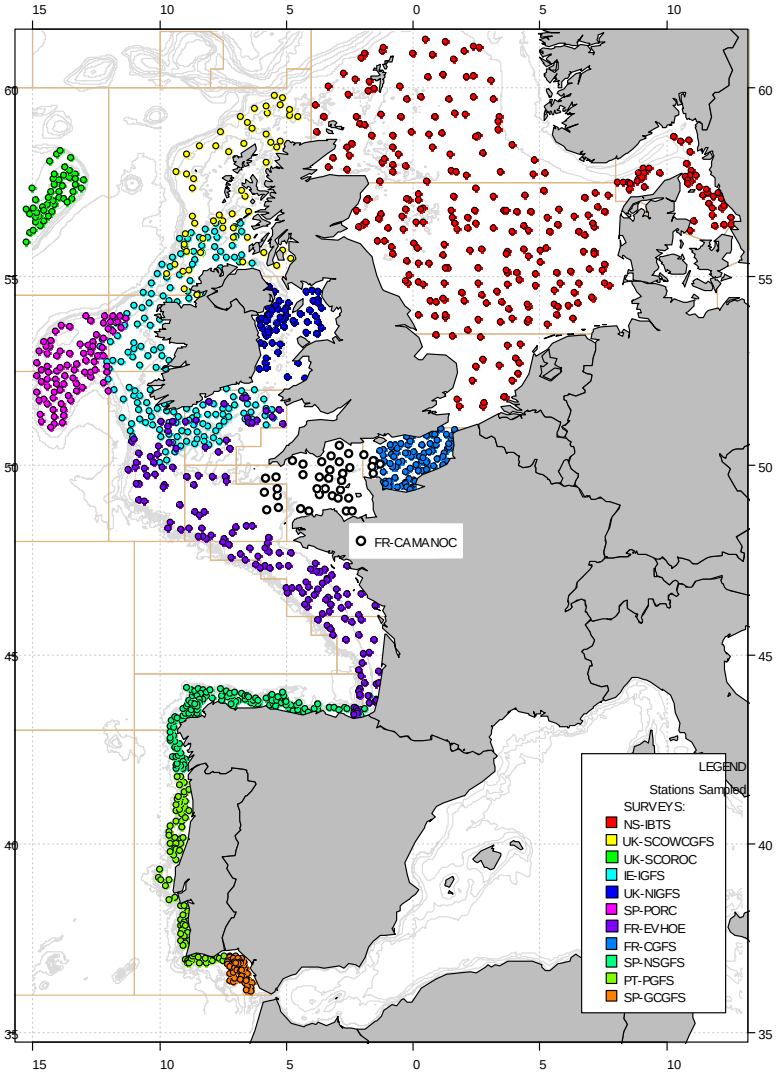

Figure 5.4.15. Station positions for the IBTSurveys carried out in the Northeastern Atlantic and North Sea area in summer/autumn of 2014. The map also shows the positions of the tows performed on the FR-CAMANOC survey (see Annex 7 – WD #7).

6 Survey Manuals (ToR b)

The IBTSWG has produced three manuals, where the Manual for the North Sea IBTS and the MIK sampling are currently being revised, and an additional manual for the Northeastern Atlantic has been written. All three manuals will be submitted to ICES in their newest version during summer of 2015.

6.1 Manual for the North Sea IBTS

The revision IX of the North Sea manual has been further amended during the last year after preparing a preliminary version, and is now planned to be submitted and uploaded to the ICES website before the start of the 2015 Q3 surveys. Changes compared to the previous revision (ICES, 2012) have been made, following suggestions of its review, performed by Philip Politis in December of 2012.

A number of the changes recommended by the reviewer could be implemented in the new version, for example:

- Removal of the section on the survey's history from the manual itself into an annex. The purpose of this was to free the core manual from information not needed directly for the survey, and to follow the proposal of the reviewer that "survey protocols should answer the question 'what do we do now?' rather than 'how did we get here?'".
- "It is suggested that this document focus more on defining the current survey methods utilized by each country and acknowledge and outline any inconsistencies found." – This has partly been addressed in the update of the manual (e.g. annexes describing the detail of national data collections). Furthermore, a comprehensive comparison of the survey gears has contributed by detailing the fishing methods applied by each country (see Section 9.)

Other proposals, while still considered useful, will yet require further effort and are planned for a future revision. These included primarily:

- Description of the limitations for deciding on tow locations, which are (partly due to the fragility of the survey gear) not chosen completely at random, and for which are expected to cause a bias towards areas with smoother, more safely trawlable ground.

A few additional changes may yet also be needed to take into account suggestions provided in the Guidelines for writing an ICES survey protocol (ICES, 2014b).

IBTSWG anticipates that another revision of the current manual may still be needed within the near future when the current analyses under ToR f related to the sampling design, particularly for obtaining otoliths for age readings, will be completed. Preliminary analyses during the 2015 IBTSWG have indicated options to reduce the overall sampling effort without reducing the quality of the information (compare Section 10).

6.1.1 Actions and Recommendations

Action:

- Submission of North Sea manual revision and letter about revisions to ICES/Nils Olav Handegard in June of 2015 for upload on IBTSWG website before the Q3 surveys.

6.2 Manual for MIK ichthyoplankton sampling, NS-IBTS Q1

During the last working group meeting in Hamburg, the MIK manual (2nd revision) was thoroughly revised and subsequently updated. Independent referees are currently evaluating the resulting third revision of the MIK manual.

It is planned to store MIK herring larvae data at the ICES egg and larvae database. Guidelines for submission and storage will be discussed and defined at the upcoming Workshop on ICES Egg and Larvae Database (WKIELD), 27–29 April 2015. This will necessitate amending of the MIK manual by a chapter on data quality assurance and submission rules. The new manual will also contain a chapter on MIKkey (20 cm ring-net attached to the standard 2 m MIK ring) net deployment for fish egg sampling during the MIK hauls, which will also become compulsory for all Q1 IBTS participants. The resulting fourth revision of the manual will be finalized before the 2016 Q1 IBTS. Participants in the Q1 IBTS will be obliged to follow those guidelines for data quality assurance and data submission.

6.2.1 Actions and Recommendations

According to the last year's proposed Actions and Recommendations w.r.t. MIK sampling during the Q1 IBTS, and following a recommendation of the Herring Assessment Working Group (HAWG) to investigate MIK sampling w.r.t its historical development, gear and methods standardization, data quality and storage as well as data quality management for scientific analyses and index generation for stock assessment, a MIK survey description with its currently associated problems was presented and discussed at WGALES (Working Group for Atlantic Larvae and Egg Surveys) and WGISDAA (Working Group on Improving use of Survey Data for Assessment and Advice). The discussions at both working groups resulted in a couple of recommendations for the MIK survey, which can be found in the respective working group reports (ICES 2014a, 2015). Most of the recommendations have no direct relevance for the IBTSWG since they are particularly addressed at statistical data analysis and reformulation of the index algorithm. These activities lie within the responsibility of the MIK survey coordinator in cooperation with members of HAWG. However, all those issues presuppose high data quality, which is within the responsibility of the survey participants.

In order to assure data quality in already existing data, quality checks were carried out on MIK data back to 2000. The resulting errors were reported to the survey participants by country and each participant was requested to check and correct those errors where possible. Up to date, data errors back to 2000 have been corrected.

For current and future data submissions, survey participants are now requested to thoroughly check their data for quality issues before submission to the MIK coordinator. An especially dedicated chapter will be inserted into the MIK manual (see above) and participants are requested to follow that procedure meticulously.

Another issue raised during the 2014 IBTSWG meeting was the low degree of standardization in MIK netting material, which resulted in inappropriate mesh widths for some participants. Those participants bought new nets so that degree of standardization has increased substantially. That change of gears will be documented within the MIK herring larvae database.

6.3 Manual for surveys in the Northeastern Atlantic

The Northeastern Atlantic IBTS Manual was submitted for revision to the SSGESST during the 2013 ICES Annual Science Conference. The document was reviewed and

thoroughly commented by Ian Tuck (NIWA: National Institute of Water and Atmospheric Research) and the chair of the SSGESST, Nils Olav Handegard (IMR Norway). The revision was discussed and addressed during the 2014 WG meeting in Hamburg. The different national responsible of the surveys discussed the review and the group revised the text. Most of the editorial, scientific and graphic suggestions were finally discussed and adopted during the 2015 WG meeting, and the manual will be adapted to the Series of ICES Surveys Protocols. The new version of the IBTS Northeastern Atlantic Manual Series of ICES Survey Protocols will be submitted to ICES in June including detailed descriptions of the up-to-date survey and stratification designs with areas covered, and sampling protocols (main target species sampling in relation to the geographical area sampled).

6.3.1 Actions and Recommendations

Last year's actions list proposed to include standardized gears plots in the manual for the Northeastern Atlantic IBTS area, which was finally was not accomplished due to problems to build the database and collate the revised data to produce the plots. This fact resulted in delaying also the submission of the NeAtlIBTS manual, which has now been revised again during the 2015 IBTSWG meeting and will be finalized and submitted during summer of 2015.

Action:

- Agree between members on standardized gear plots to include in the manual to be used in each survey as quality control. These plots can be applied in two ways: (1) visualizing gear geometry data and highlight potential need for correction before data upload to Datras; (2) visualizing gear geometry in annual survey summaries.
- Submission of Northeastern Atlantic manual revision and letter about revisions to Nils Olav Handegard in July of 2015.

6.4 References

ICES. 2012. Manual for the International Bottom Trawl Surveys. Series of ICES Survey Protocols. SISP 1-IBTS VIII. 68 pp.

ICES. 2014a. First Interim Report of the Working Group on Atlantic Fish Larvae and Egg Surveys (WGALES). 1–5 December 2014, San Sebastian, Spain. ICES CM 2014/SSGESST:02. 66 pp.

ICES. 2014b. Guidelines for writing an ICES survey protocol. SCICOM Ecosystem Surveys Science and Technology (SSGESST) and Workshop of SSGESST expert groups chairs (WKESST). 9 pp.

ICES. 2015. First Interim Report of the Working Group on Improving use of Survey Data for Assessment and Advice (WGISDAA), 20–22 January 2015, ICES HQ, Copenhagen, Denmark. ICES CM 2015/SSGIEOM:28. 24pp.

7 DATRAS-related issues (ToR c)

7.1 Re-uploading of data to DATRAS

7.1.1 Alterations of North Sea IBTS data in DATRAS during 2014-2015

The IBTSWG started prepared data for the calculation and testing of swept-area-based indices, as requested by assessment WGs and WGISDAA. This involved re-uploading of different portions of the national data for the time-series from 2004–2013 (2004 was chosen as a starting point because since then the current format of the exchange data are in place). The re-uploads were needed to correct or add missing data of net geometry and tow tracks, which were available in the national institutes, but have not always been mandatory to upload to DATRAS. This set of re-uploads itself did not affect the biological data at all. [Next steps towards swept-area-based indices: IBTSWG will quality-check the data and conduct initial analyses to compare the cpue-based and area-based indices for different species. The dataset will then be made public in a separate "flex file", in addition to the traditional cpues in DATRAS.]

Independent of the described technical data, several nations re-uploaded biological data during the past year. Below, statements from national data submitters, as replies to a request from 22/04/2015, when during the preparations for WGNSSK, discrepancies in previous and current data downloads from DATRAS became apparent:

NORWAY: A large portion of data has been re-uploaded, and is currently being checked, because in some cases considerable discrepancies and effects on the index calculation have been observed during preparations for WGNSSK. Significant changes occurred particularly in 2004–2008, and 2012. Further information will be delivered by NOR when checking is completed, and will be communicated directly during WGNSSK 2015.

DENMARK: Some severe discrepancies between catch data for cod and Norway pout reported by Denmark between upload versions before March 2014 and after March 2015 were found just prior to the meeting of ICES WGNSSK. The reason for this was not immediately clear. Denmark has re-uploaded all the IBTS data back to 2004 during the past two years along with corrections and additions required for the correct calculation of swept-area. Together with this some other ancillary information such as hydrography station, number or bottom temperature and salinity were added for some surveys. However, the original catch data were not changed except for errors found related to dubious species identification or wrong species codes. Since the database setup has changed also a new program for extracting the data and converting them into the DATRAS format has been used. A comparison between old and new uploads showed that the earlier program used in conjunction of transferring catch data from the national database and DATRAS had an error leading in some cases to incorrect raising of subsamples and combination of subsamples collected separately by sex. This error should have been discovered much earlier, i.e. through intensive testing the old conversion program. The usual routine has always included a thorough data check prior to submission and during the submission process to DATRAS. However, the example here demonstrate that it is essential to include an additional check when data are re-submitted which compares in particular the catch data used for the calculation of abundance indices for assessments of IBTS target species.

FRANCE: Changes of haul status from 'partly valid' to 'invalid' for 5 hauls between 1998–2003. Change of some HHrecords for *Engraulis encrasicolus* and *Alosa fallax* in 2003 and 2005. The assessed species, which could be potentially affected by these changes,

are herring, sprat, whiting cod and Norway pout, but their abundance was generally low.

GERMANY: No major changes in assessed species with the new uploads, except for corrections for the year 2004 when the transfer to the new DATRAS system had caused a systematic error in the weights of all species (weights were until 2004 recorded as X.x kg with 1 digit, since then as X.xxx kg; previous data for 2004 were too low – factor 100).

ENGLAND: RE-uploading of data in November to input the additional information for calculating swept-area; no changes were made to the catch numbers of any of the fish species. (Exceptions: Possible change to abundance might occur on the rare occasion that the fishing time was changed due to errors; only single or no corrections of this kind for the period in question; compare comment fields in DATRAS.)

SCOTLAND: Re-uploading in 2014 in relation to the gear parameter data did not affect the abundance or age data submitted, except for corrections for the transformations related with the change to the new DATRAS system in 2004 (compare GER).

NETHERLANDS: Only minor changes were made in HL and CA information based on DATRAS checks at resubmission. Changes in CA records that might influence any index are due to addition of ages (2005 and 2006 haddock ages have been added/ 2008 and 2011 plaice ages have been added / 2008 and 2009 lemon sole ages have been added/ 2013 ages have been added for plaices, sole, whiting, Norway pout, and some haddock.

7.2 Examples of data quality issues in North Sea IBTS, 2013–2015(Q1)

There have been earlier concerns over data quality in DATRAS data (Daan, 2001; ICES, 2007) and IBTSWG regularly examines various aspects of data quality. During the 2015 meeting, data (cpue per length per haul) were downloaded from DATRAS (23/03/2015).

Examples where cpue appears to be high for 'unusual species'

Butterfish *Pholis gunnellus* is typically a coastal species and is generally found in small numbers. It was reported in 43 individual haul stations across the five IBTS surveys analysed. For 41 of these hauls, the cpue was <30 butterfish per tow, but two tows had much larger numbers. These tows were both characterized by a moderate number of fish caught and high raising factors, and so were highlighted for checking.

Year (Quarter)	Vessel (Haul)	Length (mm) 110	120	130	140	150	160	170	180	190	200	210	Total
2014 (Q1)	TRI2 (53)	24	56	56	80	76	80	32	8	8	8		428
2014 (Q3)	DAN2 (14)				8.47	16.94	8.47	16.94		25.41	8.47	8.47	93.17

The large catch of butterfish by TRI2 was confirmed, and this catch was characterized by a quantity of *Sabellaria spinulosa.* Similar, the relative large catch by DAN2, which was recorded in shallow waters together with a high amount of seaweed, was confirmed

Black sea bream *Spondyliosoma cantharus* is generally found only occasionally in small numbers during the North Sea IBTS, and is caught mostly in the Channel (Roundfish Area 10). The record of 82 specimens, all of 8 cm, could usefully be checked, as data from this one station (30F0, English Channel) accounted for 61% of the total raised numbers of this species across all the surveys.

Year (Quarter)	Vessel (Haul)	Length (mm)									Total
		60	80	90	100	110	160	170	330	350	
2013 (Q1)	THA2 (17)									2	2
2013 (Q1)	TRI2 (43)						2	2			4
2013 (Q3)	DAN2 (18)								2.3		2.3
2014 (Q1)	THA2 (16)		82								82
2014 (Q1)	THA2 (19)				2						2
2014 (Q1)	THA2 (21)			2	2						4
2014 (Q1)	THA2 (7)		2								2
2014 (Q1)	THA2 (8)	2	4	10	6	2					24
2014 (Q1)	TRI2 (6)		4	6	2						12

Examples of incorrect species identifications or species names

The following taxonomic errors were noted. In most instances, these are thought to represent coding errors rather than at-sea misidentifications.

Species reported	Year; Quarter; Vessel	Stations	Comment
Alosa agone	2013; Q1; THA2	24–26, 30, 32, 47–48, 70, 72	Possible coding error for another *Alosa* spp. Furthermore, high catch in one of these hauls (haul 32, see Table below)
Myoxocephalus scorpioides	2014; Q1; THA2	58 and 87	Arctic sculpin *M. scorpioides* in unlikely in survey area. Presumably meant to relate to *Myoxocephalus scorpius*
Sciliorhinus caniculus	2014; Q1; THA2	Multiple stations	Incorrect species name for *Scyliorhinus canicula*
Lycodes vahlii	2013–2015 Q1 & Q3; DANS	Multiple stations	What was earlier regarded as *Lycodes vahlii* is now viewed as two species: *L. vahlii* in the NW Atlantic and *L. gracilis* in the NE Atlantic (Carl, 2002).
	2013; Q3; END	158	
	2014; Q1; DAN2	18	
	2015; Q1; DAN2	36	
Solea vulgaris	2014; Q1; 58G2	1–2	Junior synonym of *Solea solea* (see Wheeler, 1988)
	2015; Q1; 58G2	22, 26, 27	
Mustelus mustelus	There is increasing evidence that a single species of *Mustelus (M. asterias)* occurs in the area covered by the North Sea IBTS (Farrell *et al.*, 2009) and WGEF agrees with this. The presence/absence of spots should not be used as the main identification feature (see Section 8.1 of ICES, 2008)		

One quite large catch of *Alosa* was also made by THA2 (2013, Q1, haul 32), which could usefully be checked.

THA2 2013, Q1	Length (mm)													
	110	130	150	160	170	180	190	200	210	220	230	240	250	260
Haul 24										2				2
Haul 25									2					
Haul 26							2	2		2		2		2
Haul 30									2					
Haul 32		5		63		11	5	5						
Haul 47	2		2	2	4		2		2	2	2	2	4	2
Haul 48								2	4					
Haul 70							2	2						
Haul 72									2			2		

7.2.1 Unnecessary use of higher taxonomic recording (e.g. genus/family) level

Trawl surveys should only record species to the most detailed taxonomic level possible. Whereas most sea-going staff can reasonably be expected to identify the majority of commonly occurring species to species-level, some problematic taxa or damaged specimens can only be identified reliably to genus/family. Hence, data recorded as *Pomatoschistus* spp., *Ammodytes* spp. or Ammodytidae are to be expected. Some genera, however, only have a single species in the North Sea. These may relate to using different numeric codes when uploading data to DATRAS.

Species reported	Year	Quarter	Vessel	Stations	Comment
Anguilla	2013	Q1	SCO2	4	Presumably could have been recorded as *Anguilla anguilla*
Trigla	2013–2014	Q3	END	Multiple	Data refer to tub gurnard *C. lucerna*
Chelidonichthys	2013–2014	Q3	END	129 and 174 (2013); 43 and 77 (2014)	Data refer to red gurnard *C. cuculus*
Echiichthys	2013–2014	Q3	END	Multiple	Data refer to lesser weever *E. vipera*
Eutrigla	2013–2014	Q3	END	Multiple	Data refer to grey gurnard *E. gurnardus*

Given that there has been recent confusion with regards the correct scientific names of gurnards, Catalogue of Fishes, WoRMS and FishBase were all consulted and these sites are all in agreement for the following:

English name	Old scientific name	Valid scientific name
Red gurnard	*Aspitrigla cuculus*	*Chelidonichthys cuculus*
Tub gurnard	*Trigla lucerna*	*Chelidonichthys lucerna*
Long-finned gurnard	*Aspitrigla obscura or A. obscurus*	*Chelidonichthys obscurus*
Grey gurnard	*Eutrigla gurnardus*	*Eutrigla gurnardus*
Piper	*Trigla lyra*	*Trigla lyra*
Streaked gurnard	*Trigloporus lastoviza*	*Trigloporus lastoviza*

7.2.2 Species where minimum length is less than the size at birth

Whereas many quality assurance routines check the maximum size reported, it is also important to recognize that the size at birth/hatching of elasmobranchs means that some smaller specimens require data checks.

Species reported	Year	Quarter	Vessel	Stations	Comment
Scyliorhinus canicula	2013	Q1	WAH3	28	A 60 mm *S. canicula* is less than the size at hatching and may be an embryo or incorrect measurement or wrong species
Raja brachyura	2013	Q1	SCO3	4	Individuals of 110, 120 and 130 mm unlikely, and possibly relate to other Raja spp. (or disc width?)
Leucoraja naevus	2015	Q1	58G2	22	Individuals of 50 and 60 mm unlikely, and would likely relate to embryos (or disc width?), or a coding error
Squalus acanthias	2013	Q1	SCO3	12	Individual of 130 mm either incorrect species, incorrect length or an embryo

7.2.3 Species where largest reported length is greater than L_{max}

Species reported	Year	Quarter	Vessel	Stations	Comment
Callionymus lyra	2014	Q1	THA2	20	A 390 mm (and 310 mm) *C. lyra* is unlikely (next largest in data extracted was 310 mm)
Echiichthys vipera	2014	Q3	DAN2	24	Length–frequency for one station inconsistent (see below)

Species reported	Year	Quarter	Vessel	Stations	Comment
Synganthus acus	2013	Q1	THA2	52	A 460 mm *S. acus* is theoretically possible, but could usefully be checked (next largest specimen in data extracted was 380 mm)
Phrynorhombus norvegicus	2013	Q1	SCO3	35	Specimens of 150 and 170 mm uncertain
Capros aper	2014	Q1	SCO3	25	Specimen of 170 mm unlikely (next largest in data extracted was 120 mm)
Raja montagui	2014	Q3	DAN2	15	Specimen of 810 mm uncertain (next largest in data extracted was 700 mm)
Scyliorhinus canicula	2014	Q1	58G2	14	Length distribution at this station seems unlikely, especially fish at 890, 900 and 930 mm
Alloteuthis subulata	2014	Q3	WAH3	12	Specimens of 180, 190 and 220 mm uncertain
Loligo	2015	Q1	58G2	65 and 70	Specimen of 710 mm (haul 70) very much at the upper end of expected size range, specimen of 1000 mm (haul 65) seems unlikely
Gasterosteus aculeatus	2013	Q1	THA2	33	Specimens of 100 mm uncertain (next largest in data extracted were 70 mm)

Length distribution of lesser weever *Echiichthys vipera* (DAN2, 2014 Q3; no decimal places given).

	Haul station (DAN2, 2014, Q3)													
Length of *E. vipera*	9	10	12	15	16	19	20	21	23	24	25	26	27	48
40							3							
50							3							
60														
70					44		6				4			
80					74	2	32	33						4
90			81		133	18	49	241			4	5		
100			432	30	325	30	40	424			4	26		10
110	12	6	540	41	665	42	17	233	51		11	41	4	8
120		22	729	16	532	12	14	50	153		87	128	14	12
130	2	28	405	8	355	4	3	17	178		58	57	16	6
140		20	108	5	30			8	76		14	26	20	
150		6	81	3	163				25		7	5	4	
160	2		27		118					11				
170					59					81				

	Haul station (DAN2, 2014, Q3)													
Length of *E. vipera*	9	10	12	15	16	19	20	21	23	24	25	26	27	48
180										16				
190										32				
200										16				
210										32				
220										64				
230										54				
240										118				
250										27				
260										5				

The length frequency for DAN2 haul 24 was checked and found erroneous. A correction has been uploaded to DATRAS.

7.2.4 Inconsistent taxonomy

The following taxonomic inconsistencies were noted, and all are species for which there has been recent taxonomic confusion.

Species reported	Year	Quarter	Vessel	Comment
Loligo subulata	2014	Q1	THA2	Data should be submitted as *Alloteuthis subulata*
Loligo forbesi	2014	Q1	58G2 and THA2	All other nations submitting data as *Loligo forbesii*
Chelidonichthys lucernus	2013	Q1	DAN2	Data should be recorded as *Chelidonichthys lucerna*
	2014	Q1	DANS	
Psetta maxima	2014	Q1	THA2	Data for other nations now being recorded as *Scophthalmus maximus*
Microchirus variegatus	Some data reported as Microchirus variegatus, other data reported as *Microchirus (Microchirus) variegatus*			
Liparis liparis	Some data reported as *Liparis liparis*, other data reported as *Liparis liparis liparis*			
Salmo trutta	Some data reported as *Salmo trutta*, other data reported as *Salmo trutta trutta*			
Gadiculus thori	Some data (SCO3) for *Gadiculus* are reported as *G. thori*, whist most nations report *G. argenteus*. Whereas several scientific studies have reported subspecies of *Gadiculus*, namely *G. a. argenteus* and *G. a. thori* (Raitt, 1964; Cohen *et al.*, 1990; Mercader and Vinyoles, 2008). The rationale for FishBase and WoRMS considering the two subspecies to be valid is unclear, and the Catalogue of Fishes considers *G. thori* to be a junior synonym of *G. argenteus* (Eschmeyer, 2015).			

Species reported	Year	Quarter	Vessel	Comment
*Maja (or Maia) squinado (*or *brachydactyla)*	There have been various names used for the spider crab. Based on several studies (Sotelo *et al.*, 2008), Atlantic specimens may be best referred to as *Maja brachydactyla*, with *Maja squinado* referring to a Mediterranean species. This species is encountered mostly in Roundfish Area 10. Data for THA2 were correct in 2013, but 2014 data were for *Maia squinado*, and so are inconsistent.			

7.2.5 Shellfish specimens that are too large

Some commercial shellfish are measured to the mm, but data can accidentally be uploaded as cm. This was apparent in some of the recent data for *Nephrops norvegicus*, *Lithodes maja*, *Maia* and *Pecten maximus.*

Species	Year	Quarter	Vessel	Haul	Comment
Lithodes maja	2013	Q3	SCO3	205	750 mm specimen incorrect
Lithodes maja	2013	Q3	SCO3	216	Specimens of 680, 880, 890, 920, 940, 980 and 1120 mm incorrect
Pecten maximus	2014	Q1	THA2	20	Specimen of 800 mm incorrect
Maia squinado	2014	Q1	THA2	14	Specimens of 1000 and 1200 mm incorrect Species should refer to Maja brachydactyla
Maia squinado	2014	Q1	THA2	16	Specimen of 1100 mm incorrect species should refer to Maja brachydactyla
Nephrops norvegicus	See table below				

Incorrect lengths of Nephrops	Year	2013	2013	2013	2013	2013	2013	2015
	Quarter	Q3	Q3	Q3	Q3	Q3	Q3	Q1
	Vessel	END	SCO3	SCO3	SCO3	SCO3	SCO3	ENDN
	Haul	158	207	210	266	275	281	12
100				2				2
120				2				
150				6				
170				2				
220				4				
250					2			
260				2				
300						2.6087	2	
310						2.6087		
330							4	
340							8	
350							8	
360							8	
370							4	
380							12	
390		2					4	
400							6	
410							6	
420							2	
430							4	
440						5.2174		
450							6	
470						2.6087		
480							2	
520						2.6087		
530			2					

7.3 Taxonomic issues regarding common skate

Two papers (Iglésias *et al*., 2010; Griffiths *et al*., 2010) have shown that common skate *Dipturus batis* actually comprises two distinct species, and data for these species have been confounded since these two species were synonymised in the 1920s.

One of these papers suggested that *D. batis* should be separated into *D. flossada* (blue skate) and *D. intermedia* (flapper skate). However, this has not been accepted, as the specific name '*batis'* is a Linnean name and so the International Commission on Zoological Nomenclature (ICZN) will not accept the loss of '*batis'*. There are also potential issues regarding '*intermedia*', as '*macrorhynchus*' may have priority as a valid name.

The ICES WGEF currently use the following:

Dipturus batis-complex: (Earlier) data that may refer to either of the two species

Dipturus batis (cf. *flossada*): Data that refers to the smaller of the two species. This species will likely remain as *'batis'* pending official changes to nomenclature

Dipturus cf. *intermedia:* Data that refers to the larger of the two species. There is some uncertainty as to which name will be agreed for this species.

In terms of uploading data to DATRAS, the following guidelines could be followed.

Data for the smaller of the two species (i.e. the form described by Iglésias *et al*., 2010 as *Dipturus* cf. *flossada*) should be uploaded as *Dipturus batis*

Data for the larger of the two species (i.e. the form described by Iglésias *et al*., 2010 as *Dipturus* cf. *intermedia*) should be uploaded as *Dipturus intermedia* (although this is scientific name is currently considered 'Invalid').

Data for the genus (i.e. if the species has not been identified accurately) should be uploaded at genus level only (*Dipturus* spp.)

WoRMS AphiaID	TSN Code	Scientific name	Common Name	Validity
105762	564033	*Dipturus*		VALID
105869	564126	*Dipturus batis*	Blue skate	VALID
711846		*Dipturus intermedia*	Flapper skate	INVALID

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

8.1 Progress in data preparation and next steps

The IBTSWG started prepared data for the calculation and testing of swept-area-based indices, as requested by assessment WGs and WGISDAA. This involved re-uploading of different portions of the national data for the time-series from 2004–2014 (+2015; 2004 was chosen as a starting point because since then the current format of the exchange data are in place). The re-uploads were needed to correct or add missing data of net geometry and tow tracks, which were available in the national institutes, but have not always been mandatory to upload to DATRAS. This set of re-uploads itself did not affect the biological data at all. [However, independent of the described technical data, several nations re-uploaded biological data during the past year.]

Next steps (within IBTSWG): Quality checks of flex file; exploratory plots for comparison of traditional cpues based on haul duration, with cpues based on swept-area per species, also considering alternative calculation of swept are between doors or between wings. Previous experiments have indicated that for individual species, differences exist in which of the two alternatives is more suitable, depending on escape responses).

During the IBTS meeting of 2014, the requirement to progress making available the data to standardize indices by swept-area was discussed under TOR D. As well as institutes checking the existing data, gaps in trawl geometry measurements would need to be estimated so that area effort would be available for all valid haul data for the previous 10 years as a minimum. It was felt that observed data only should be submitted and held in DATRAS, but simple formulae should be provided by each survey to allow DATRAS to calculate fill-ins where required.

It was agreed data checks and resubmissions should be completed for all participating nations by October 2014 along with provision of the algorithms. This has been achieved for IBTS 2015 by participants of the North Sea IBTS to the extent data has been collected, and is in progress as a result of some data gaps for the Western Area.

Previous work presented in earlier IBTS reports has shown significant changes in swept-area effort while effort in time remained ostensibly constant, therefore underlining the requirement to adopt area standardization. Notwithstanding the obvious need for the transition, work will still be carried out over the interim year to evaluate the extent of detectable changes in the index.

Finally, it is becoming apparent that the utility of swept-area indices is of interest to a number of other groups also, notably those dealing with indicators under the Marine Strategy Framework Directive (MSFD). In contrast to assessment groups where relative indices tend to be used in a single species context, many MSFD indictors such as the large fish indicator (LFI) make comparisons across species. Whereas for a single species the effect of using door or wing spread will be the same year on year, in contrast using wing spread for a positively herded species like most gadoids for example will produce about a X6 overestimate in abundance[1] compared to a relatively non-herded species such as many flatfish. It is seems prudent therefore that IBTS, DATRAS, FTFB

[1] This is based on a standard GOV where a species likely to be collected between the doors using long sweeps (c.120m door spread) is estimated to have been collected between the wings only (c.20m wing spread).

and other relevant expert groups within ICES collaborate to provide some broad guidance as to how these metrics are likely to affect different components of the catch.

Preparations toward the calculation of swept-area- based indices required preparation of a ten-year test dataset – the so called "flex file"– with the necessary data on trawl width and distance towed from all countries contributing to the NS-IBTS, namely: Denmark, France, Germany, The Netherlands, Norway, Sweden, UK-England, UK-Scotland.

For fill-ins needed in case of missing data for one of the parameters used in the calculation, regression analyses were performed per country, in order to accommodate ship- or gear-specific differences in the most suitable corrections. These individual national correction methods are described in detail in a set of working documents accompanying this report – see Annex 7.

8.1.1 Actions and Recommendations

Action points:

(1) Quality checks of the flex file; discussion of outcome and possible clarification of corrections needed.

(2) Exploratory plots for comparison of traditional cpues based on haul duration, with cpues based on swept-area per species; also considering alternative calculation of swept-area between doors or between wings.

9 Gear standardization (ToR e)

ToR e. Compile status quo, report and propose ways forward in standardization, on the different materials and specifications of the GOVs and gear currently used by the IBTS participants. (ToR e – multi-annual, year 3)

9.1 Compile status quo and report on ways forward in standardization

It has been acknowledged by IBTSWG that historical drift and technical creep have impacted on national GOV specifications and therefore deviations from the standard manual (ICES, 2012) have occurred. Due to the longevity of this survey and the number of participating countries, these deviations could be due, in part, to the complexity of the GOV (design/rigging), new survey vessels entering service, modification in deployment methods (warp to depth ratio), or discontinued materials/components. The main aims of this study were to investigate (a) the status quo of current national GOV specifications and (b) to propose a way forward in re-standardizing construction and specifications. A detailed trawl gear specification questionnaire was drafted at WGIBTS (2013) and subsequently circulated to all GOV countries. The questionnaire covered the following aspects of the GOV specification:

- Table 1 – Trawl (netting) sections.
- Table 2 – Trawl roping and framelines.
- Table 3 – Groundgear construction.
- Table 4 – Flotation and kite.
- Table 5 – Wire rig and otterboards.

All gear questionnaires were completed by November 2014. As highlighted in the 2014 meeting report, difficulties were encountered by participants in meeting the December 2013 deadline due to a lack of gear technology expertise and communication difficulties within some institutes. The following nine countries applying the GOV provided responses to the questionnaire, but some were unable to give a complete specification. However, these omissions will be further investigated and should be concluded by May 2015.

- Denmark (DEN)
- England (ENG)
- France (FRA)
- Germany (GER)
- Ireland (IRE)
- Netherlands (NED)
- Norway (NOR)
- Scotland (SCO)
- Sweden (SWE)

A presentation was made to the IBTS working group detailing the results from the subsequent analysis of the questionnaires, which suggested a significant drift had occurred from the standard specification contained in the survey manual. The results (net

plans and gear components) are presented in Working Document 3 Annex 7 and summarized below, with conclusions and recommendations provided at the end of this section.

Trawl (netting) sections

Two different types of netting are used to construct all GOV trawls, manufactured from either polyamide (PA) or Polyethylene (PE) twines. Originally only PA was used in the construction, but the use of PE twines was accepted in 1984 (Wileman, 1984). Two countries (IRE and SWE) use PE twine, six (GER, DEN, ENG, FRA, NED and NOR) use PA twine, and one uses a mixture of both (SCO). However, during 2014, due to discontinued materials, ENG replaced their PA GOVs with a mixed construction similar to SCO. All countries use larger twine diameters than stated in the manual and therefore twine surface areas for some trawls are considerable higher (+60%) than the standard trawl. Previous recommendations (Wileman, 1984) suggested the total twine surface area (resistance) should not be increased by >5% from the standard trawl. Furthermore, Anon (1992) recommended the French net specification (twine diameters) should be followed unless experimental trials demonstrate little or no effect on net geometry and capture efficiency. Nearly all countries now incorporate guard meshes and tearing strips into their trawl and have removed the quarter meshes. Two countries have modified wingtip cutting rates and three increased the mesh size and dimension of some netting panels. All countries except ENG use a heavier 20mm blinder constructed from 1.9mm (nominal) PA twine.

The alterations to the trawl specification have occurred in part due to:

- Move to PE due to the higher cost of PA twines.
- The PA twine diameters specified in manual are unavailable or prohibitively costly to manufacture.
- Larger diameter PA twines or rebuilding in PE to make the trawl more robust for the expanding survey area.
- Additional strengthening (tearing strips/guard meshes) incorporated to protect trawl, reduce lost time in repairs, and maintain trawl catchability.

Trawl roping and framelines

Many countries have increased the diameter and/or lengths of the combination rope framelines. Four countries have replaced the wire rapped headline with combination rope. All have the same length of 1st (6.7m) bolt rope except SWE, who use 7.04m. Lengthening this rope is not recommended as the surrounding netting panels are designed to be slack and therefore aid headline height. Only three countries (FRA, GER and DEN) use a middle bridle adjustment chain, two (SWE and DEN) have longer headline and fishingline lengths than the standard and one county (FRA), shorter.

Groundgear construction

A Rig

- Standard specified as 45–45.8 m and only SCO_NS, ENG, GER and NED within this range; all others are longer.
- Total weight varied 705–1106 kg, but four users were unable to provide information.
- All rubber disc sizes similar, but hung on a mixture of wire, chain, or a mixture of both (NOR).

B and D Rigs

- SCO is the only user of B Rig, but some components no longer manufactured.
- SCO and IRE use similar D Rigs in terms of length, hopper disc diameter, and weight (2000kg (IRE) and 2180kg (SCO).

Five countries use a fixed adjuster chain length and four make adjustments as per the manual; however, FRA uses a range (2.3m–2.8 m) higher than recommended. Four countries still use the 48–50 kg steel spherical bobbin and the others a rubber bunt bobbin. However, there is a significant difference in weight between the steel and rubber bobbin, which could compromise groundgear contact. Adjuster chain diameter varies between 13 mm or 16 mm, and is constructed in either mid or long link, which, again, have different weight characteristics.

Flotation and kite

All countries that use a kite, use 60 x 200mm floats with a variation in buoyancy ranging from 150kg to 187kg, except DEN (89 x 150 mm) and SWE (22 x 270 mm). FRA (EVHOE) and IRE do not use a kite, but add additional flotation to compensate. Wileman (1984) recommends increasing the buoyancy by 103 kg plus the 5 x 200 mm kite floats (~14.3kg); however, FRA and IRE increase buoyancy by 36 kg and 67 kg respectively. The attachment of floats varies between users, either spacing evenly or in groups around the headline.

The dimensions of most kits are 0.85m x 0.85m except NED (1.0 x 1.0) and ENG (0.6m x 0.6m). All are constructed from aluminium except NED, who use plywood. Integrated floatation is different for GER (added 1 x 15ltr fender), NED (only 1 x 15ltr fender), and SWE/DEN (5 x 180mm floats). The method of attaching the kite to the trawl varies considerably, with some using the standard frame arrangement, with ropes (SWE, DEN and NED), or directly without a frame (GER).

Wire rig and otterboards

For the limited responses, there appears to be a considerable difference in the wire constructions being employed. Short sweep lengths (60m) range from 59.8m to 65.1, constructed from either 22 mm or 26 mm diameter wire. For the countries (6) using long sweeps (110 m), this variability is also apparent. Only five responders were able to provide details of the rigging arrangement between the sweep and bridles. All use ~20m upper and middle bridles constructed from 14mm diameter wire, except ENG/FRA who use a 16mm diameter wire, and SWE a 20mm combination rope. Lower bridles are constructed from either 20 mm or 22 mm diameter wire, except SWE (combination rope). The length also varies, but this is due to compensating for the additional length of the connectors and/or swivel used to connect the mid/upper bridles.

In terms of otterboard specification, the standard manual only specifies the type (polyvalent) and surface area (4.5m^2). ICES (1992) recommended a weight (in air) of 1200 kg and attachment of the back-strops to the middle towing point (medium shearing efficiency). This study found most nations (6) are using the recommended otterboard, but the weight varied from 1075 kg and 1500 kg. ENG use a larger polyvalent otterboard, while IRE use a different design of otterboard, called a poly-foil. SWE use a vee door with a surface area of 5.6m^2, but this is as specified by Wileman (1984) when using flat or vee otterboards.

Conclusions

- No GOV construction currently in use matches the net plan given in the standard manual.
- Other trawl components vary to a lesser or greater extent from the standard manual and between all the countries.
- Historical drift is undocumented and anecdotal information suggests this has continued significantly since the last review (ICES, 1992); this has been due to:
  - Components becoming discontinued and no longer available.
  - The continued expansion of the survey into new areas and therefore some aspects of the standard gear no longer being fit for purpose and/or economically unsustainable.
- Considerable difficulties were experienced by some users to obtain their own GOV specification due predominately to the lack of gear technology expertise within their organization.
- Care should be taken when drafting international trawl gear specifications as, from this study, the technical fishing gear terminology is not universal and therefore, could be confusing and lead to nonstandard gear being introduced.

9.2 Actions and Recommendations

Actions

- As this study demonstrates, no GOV currently in use fully matches the gear specification contained in the standard manual and no two users share exactly the same specification. Therefore, each institute must draft their own GOV user manual detailing all trawl components and rigging. This is essential as it maintains consistency from year to year, ensures survey gear is constructed and rigged correctly by net makes and RV crew, and assists cruise leaders in maintaining Quality Assurance (QA) standards.

Recommendations

- It is acknowledged by IBTSWG that it is not possible to fully rig a GOV trawl from the information contained in the International Bottom Trawl Surveys manual. Therefore, future revisions to the manual should include all relevant information to fully rig and deploy the trawl gear. To ensure the appropriate information is obtained IBTSWG would look to gear technologists (FTFBWG) to assist in this process.
- Since the last review (ICES, 1992), clearly the historical drift from the specification contained in the manual and between users has widened to a point where it will never be possible to reverse. Therefore, what follows below are recommendations as to how to proceed in light of this new study:

Short term

Maintain standardization within each national gear specification. Where two counties undertake hauls in the same statistical rectangles, attempt to undertake an analysis of catchability trends to identify possible gear effects.

Medium term

Reconstruct all GOVs to an agreed specification incorporating modern materials and strengthening but maintaining standard mesh sizes, cutting rates, and netting panel (stretched) lengths. All countries would use their existing components, such as doors, groundgear, and wire rig. However, it should be noted there would be considerable cost and delivery time-scale implications in constructing new GOV trawls.

Long term

Introduce a new survey gear because:

- The fundamental design of the GOV causes net damage and therefore is not fit for purpose.
- The GOV is a relatively complex net to operate; modern gears are far simpler.
- A new robust design will allow far better coverage of existing and new survey areas.
- The need to simplify the survey gear due to the increasing use of inexperienced crew.
- A survey trawl should be user-friendly, reduce the need for ongoing maintenance, and therefore give better and/or consistent data throughout a survey.
- The potential of a new gear to reduce survey variance.

The introduction of a new gear can potentially be a time consuming and costly exercise. However, the "road map" to introducing a new gear has already been established by SGSTS (2009). This process would require IBTSWG to put out a call for input by gear technologists (WGFTFB) and statistical expertise into this process.

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10 Survey Design (ToR e)

10.1 Key aspects for NS-IBTS, priorities and workplan

The predecessor of the current IBTS survey, the International Young Herring Survey (IYHS), started in the 1960s in the southern and central North Sea and was extended north as interest in other roundfish species developed in the early 1970's (ICES, 1981; ICES, 2012). From the outset, the survey design was based on the 1-degree longitude by 0.5-degree latitude ICES rectangles with generally two ships fishing each to give a minimum of two hauls per rectangle.

By 1974 the IYHS survey covered the entire North Sea including the Kattegat and Skagerrak (the Channel area was added in 2009, see ICES (2012)). In that year, also a decision was made to divide the area in to three strata based on the previous year's herring catches. Effort was allocated to each stratum based on recent catch rate with 6 hauls per ICES square being allocated to the strata with the highest catch (top 6 squares), reducing to 2 hauls per square in the lower catch strata (lowest 35 squares)(Hessen *et al.,* 1997). Catch variance being a function of mean catch rate and distribution patchiness, increased sampling in strata with higher catch variance will improve precision for the overall survey without a change in sampling effort (Gunderson, 1993). Stratified designs are common across fisheries surveys and a comparison of variance between stratified and pure random sampling is a measure of survey design efficiency (Smith, 1999).

A number of years later the stratified survey design simplified to 4 hauls per rectangle in the herring centric southeastern North Sea with 2 hauls per rectangle elsewhere (Hessen *et al.,* 1997) . Thereafter, shifting research vessel effort and possibly survey objectives, meant by 1991 the now familiar IBTS target of a minimum of two hauls per rectangle across the survey area was established. How haul positions are located within rectangles was reviewed around the same time and in 1990 IBTS recommended the use of fixed station positions, accepting non-randomness has its advantages and drawbacks (see overviews in ICES, 2004; ICES, 2005). Accepting the limitations of trawlable ground countries select from a list of known safe tow positions therefore in a quasi-random manner.

In recent years however, questions have repeatedly arisen as to the appropriateness of the current design for a modern multispecies and also multi-purpose survey (e.g. Blanchard *et al.,* 2008). Consequently a number of Pro's and Con's of the present survey design have been brought forward in discussions:

Contra current NS-IBTS survey design:

- Systematic designs can be difficult to adapt when stations cannot be covered for whatever reason, and tend to result in a "hole" in survey coverage. Similarly, where a vessel has not been available in a given year the NS-IBTS design has resulted in a "large hole" in coverage and robustness to changes in effort needs to become part of any resulting design.
- It is being questioned whether the current design is the most efficient. Part of the reasons for initially choosing the regular design with straight boundaries along latitudes or longitudes (ICES rectangles) may have been of a more practical nature, especially with the vessels' navigation systems prior to GPS.
- Concerns exist that the present survey design may not be suitable to accommodate all future needs of an integrated ecosystem-based monitoring.

- Semi-randomness, ad-hoc selection procedures (the degree of applying randomness in determining sampling locations varies between countries) in the current design might hamper the actual statistical power of the current design.
- Overall, questions remain whether the current effort required to meet demands of the existing survey grid could be redistributed such that effort can be reduced while maintaining the same statistical power, or improving power while keeping effort the same.

Pro current NS-IBTS survey design:

- The systematic grid offers even coverage of the North Sea, which has advantages when trying to accommodate multiple objectives with the same survey.
- Statistical analysis of various survey designs indicated that a systematic gridded design, with random samples within the grid may actually deliver the best power, particularly for multi-purpose surveys (Cochran, 1977; compare 'systematic unaligned sampling').
- The present IBTS design offers long-term datasets over several decades. To accommodate future needs (compare last point under Con's), the IBTS would be one of many surveys that could be integrated in a holistic approach in order to achieve the best possible coverage of ecosystem components at the relevant spatial and temporal scales. The IBTS might be a core component, but could not possibly – and would not need to - accommodate all purposes.
- Fixed station designs will generally be biased in any given year. If species distribution is persistent however the relative mean abundance between years will be unbiased (ICES, 1992; ICES, 2004). With most surveys, producing relative abundance indices bias in itself need not be a critical issue once it is constant. Variability from changing sampling locations annually is also removed with fixed station allocation.
- Systematic designs tend to offer higher precision in situations of more even species distribution (lower variance and higher autocorrelation) than random or stratified random designs which fair better in the inverse scenario (Thompson, 2002); see also simulation study in (ICES, 2005).

Considering the range of listed advantages and disadvantages of the present survey design, the IBTSWG felt that independent of the discussion of any potential fundamental changes of the survey design – there are a number of specific aspects that need to be evaluated in the near future, because they appear to offer possibilities to improve the survey's efficiency. These include particularly the sampling of otoliths for age determination of fish (Section 10.2), and the trade-off between tow duration and numbers of stations sampled (Section 10.3). Furthermore, IBTSWG will commence an investigation tasked with reviewing the advantages and constraints of the current spatial structure of the survey with a post-stratification analysis (Section 10.4). All three topics will be part of the work plan for the coming year.

Beyond this short-term work plan, the IBTSWG has highlighted a need in the coming years to initiate an investigation into inherent sampling bias within the IBTS survey and specifically associated with bias concerned with the operational limitations of the survey gear. Obviously, each survey gear produces a bias in the sense that it only captures a portion of the 'real world', and represents some elements of it more completely

than others. Yet, a problem arises if the amount of un-sampled components – especially the ones assessed through the survey – remains unknown. This bias could be particularly relevant if a large portion of the area inhabited by a fish stock remains untrawlable, but more importantly if the portion of the stock in that area is variable. The fragile structure of the GOV as the primary survey gear of the North Sea IBTS limits the portion of trawlable ground. The degree of this restriction is high enough to limit the degree of 'randomness' in the allocation of stations markedly. Particularly the GOV with the standard groundgear A restricts the selection of trawl stations. Therefore, it can be assumed that the sampling frame of the IBTS does exclude a portion of several groundfish stocks.

Therefore, in the medium term, the question to be addressed is whether IBTS needs a new gear, in order to allow more complete coverage and/or opportunities for randomization. For the immediate future, the IBTSWG decided to compile a common 'clear tow database', which includes as many as possible locations of successful GOV tows (especially for the more sensitive groundgear A). A core for this database exists with the valid IBTS hauls reported in DATRAS, but individual nations' vessels have datasets with yet more useful positions. Making this "live" database available to cruise leaders of the IBTS will allow more randomization of hauls than currently applied and will also provide up to date information on recent damage where fasts or wrecks for example may have recently encroached on clear ground.

10.2 Sampling for age data – options to increase efficiency

Age data obtained from otoliths taken during the NS-IBTS are currently included in the stock assessment through the following steps, where the raw age data (CA table) are used to calculate an age–length key (ALK) by roundfish area (RFA) for a defined a age range (ICES, 2013):

a. Extraction of raw age at length data from DATRAS for species and index area

b. Calculation of age–length key by RFA by centimetre classes and for herring and sprat by 0.5 cm classes

c. If there is no ALK for a roundfish area, ALK's from neighbouring RFA's are used to fill gaps.

d. Numbers per length class are summed for age groups < plus group. Numbers per length class for ages >= plus group are added to the plus group

During IBTSWG 2015, strong arguments have been brought forward to move from this method to a station-specific sampling scheme (ICES, 2011; Aanes and Vølstad, in press). Age at length has been observed to vary spatially and temporally (Aanes and Vølstad, in press) and shown in west of Ireland haddock that the consequences of this bias would have been a nearly twofold overestimate of the 2003 year class, and an underestimate of the spawning stock by 15% (Gerritsen *et al.*, 2006). Since with the current routine of preparing indices for stock assessment, the IBTS creates one ALK for an entire roundfish area (RA), variance within a RA cannot be considered.

Typically, the lengths and ages of fish sampled in clusters exhibit positive intra-cluster correlation, which can drastically reduce the effective sample sizes for estimating length- and age-compositions (e.g. Pennington and Vølstad, 1994; Aanes and Pennington, 2003). Aanes and Vølstad (in press) present an analysis, where they compare the efficiency of using age–length keys (ALK) with that of design-based estimators for assessing age-compositions of fish. Instead of using fixed ALK's, they used the stations as primary sampling units and applied a bootstrap analysis to investigate the

effects of subsampling on variance in the estimated age composition. For the investigated case of arctic cod, with length-stratified subsampling of otoliths, the authors found no gain in precision from collecting 10 instead of only 1 otolith per 5-cm length class. While this result obviously depends on species and geographical area tested, it appears promising to conduct an analogous analysis for the IBTS, where the concept of the effective sample size would be used to calculate how many specimens are needed to be aged to maintain the same level of precision as with the original number sampled. There is strong evidence to suggest that the number of otoliths per length-class sampled in the North Sea IBTS could be significantly reduced without any significant loss in precision of the overall estimates being recorded (Aanes and Vølstad, in press).

Correspondingly, based on the analysis by Aanes and Vølstad (in press), the hypothesis exists and will be tested for the IBTS, that the number of sampled stations included in the analysis has a much greater effect than the number of otoliths sampled per station.

IBTSWG considers necessary a respective alteration of the current otolith-sampling scheme, which would follow up on a planned investigation to determine for each relevant species how many otoliths are required from how many hauls, and to subsequently define the appropriate species-specific length groupings.

A preliminary analysis has been conducted during the 2015 IBTSWG, which provides results supporting this proposal. A subset of the Q3 North Sea IBTS data from Scotland has been used, where the otolith collection is conducted using a 'by station' sampling scheme. Post-subsampling of fewer individuals allowed testing for the effect of the number of individuals aged per length group and per station. Results obtained during the preliminary study for the species whiting, haddock and Norway pout suggest that a reduced sampling scheme could be sufficient. In this, sampling per haul is prerequisite. Then, for some of the smallest size classes, otolith collection may be omitted altogether, and medium-sized fish, wider size classes (5 cm) can be appropriate, whereas for the largest individuals, narrower size classes (1 cm) would again be recommended (see WD#5 – Annex 7).

It is the intention of IBTSWG to have this analysis completed for several species in time to discuss results prior to the Q3 North Sea IBTS, and implement further trials of this new sampling scheme as soon as possible. In any case, IBTSWG advises the cruise leaders to collect where possible station-specific age data, where all length classes of the respective stations are sampled. Details will be specified by the Q3 coordinator. This will provide additional data supporting further analyses on suitable numbers of samples per length class, as well as on the opportunities to move to wider length classes without losing precision.

10.3 Tow duration – planned experiment

Together with invited experts in survey design, the current North Sea IBTS tow duration of 30 minutes has been discussed during the 2015 IBTSWG, questioning whether this was the optimal duration.

Quite intuitively, the composition of catches with a bottom-trawlnet depends on the duration of the hauls. In general, there has been a widely accepted paradigm that a longer haul warrants a more reliable integration over the species occurring in the habitat sampled, that large fish with strong swimming capabilities are more efficiently captured (Wardle, 1986), and that particularly rare species would be represented more

reliably with longer hauls. On the other hand, cpue of herding fish species may decrease with increased tow duration according to the "catch-by-surprise" hypothesis (Godø *et al.,* 1990). It is obviously true that with a longer haul, and hence a greater area swept by the net, the chance of encountering a rare species increases. However, using shorter tow duration could be accompanied by increasing the total number of hauls in the survey, which could then cover additional habitats and thereby increase the chance of encountering rare species.

However, the longer hauls also bears disadvantages: first, a relative disadvantage is that with a given amount of ship time, the number of hauls remains lower than if the individual hauls are shorter (although the requirements of time per haul for shooting and hauling the net do not change). A second, absolute disadvantage of longer hauls occurs in those cases when individual hauls are too large to be fully sorted, and subsampling of the catch increases the chance to miss individual rare species.

Tow duration of IBTS hauls has been reduced from 60 min to 30 min in 1978 for all survey participants, except for Scotland who changed to 30-min hauls in 1998 (ICES, 2012). The reason then was to allow more hauls to be conducted during the survey time. In order to evaluate the effect of the changed haul duration on the IBTS survey indices, in a dedicated comparative study, Ehrich and Stransky (2001) investigated the effect of changing between 60-min and 30-min haul duration on diversity measures. They found that shortening the haul duration led to a slightly reduced number of observed species, but similarly, subsampling of very large hauls also reduced the mean number of observed species by a comparable degree.

Several studies that examined the effect of reducing tow duration also exist from other surveys out with the IBTSWG community:

Godø *et al.* (1990) examined the effect of haul duration on the length composition of survey catches. Their study in the Barents Sea and on Georges Bank– in contrast to expectations that large fish would be underrepresented in shorter hauls – did not identify a significant difference in mean length of fish caught (the three species investigated were cod, haddock and long rough dab). Based on their results, the authors suggested that the efficiency of trawl surveys could be increased by reducing tow duration.

Walsh (1991) followed up on this study, by testing the effect of haul duration on several species on Georges Bank: long rough dab (*Hipploglossoides platessoides*), yellowtail flounder (*Limanda ferruginea*) and thorny skate (*Amblyraja radiata*). He also found no effect of shortened tows on mean lengths of the fish, and almost no difference in the cpues obtained with 15- or 30-min tows. Referring to Pennington and Vølstad (1991), he concluded that by using 15-minute tows, less subsampling and associated errors should be required, less probability of tear ups, and more stations could be sampled.

Similarly, Wieland and Storr-Paulsen (2006) found no significant effect on cpue and its precision as well as on the size composition and maximum length for Northern shrimp (*Pandalus borealis*) and Greenland halibut (*Reinhardtius hippoglossoides*) off West Greenland, and in this survey the time gained by using 15 min instead of longer tows was used to increase the total number of stations in order to improve overall survey precision.

In contrast, Somerton *et al.* (2002) noted that the catch per swept-area increased significantly for two commercial species of crab when tow duration was decreased from 30 min to 15 min. These authors suggested that the unaccounted-for fishing time (the time the net is potentially fishing prior to the official start time of the haul (i.e. when the net is being deployed and then settling) and the time the net spends on the bottom after

haul-back commences) allows catch to be made that is independent of the official haul time, and could so increase estimates of cpue when hauls are of decreased duration.

Should a stratified approach be developed, within strata mean abundance and therefore variance will be lower than between strata variance. The objective being to target greater sampling at high variance strata to improve overall precision. As higher variance is generally associated with higher mean abundance (see above) rather than add further probably large catches the possibility exists to take a greater number of smaller samples e.g. reducing haul duration within the higher variance strata.

Typically, fish are caught in clusters, where the differences between stations much greater than within a station (Pennington and Vølstad, pers. comm.) Where that is the case, one would gain much more precision in the survey estimates from sampling an additional station, compared to towing longer on one station.

Based on these earlier studies, the IBTSWG decided to initiate an experiment in Q3 of 2015, where systematically, a portion of the stations would be sampled with 15-min instead of 30-min hauls. The purpose of this experiment is to check whether abundance indices would become any less reliable with 15-min hauls. If not, IBTSWG may consider proposing a change to 15-min hauls in order to allow sampling more stations. [As a general practice and according to the IBTS manual, hauls shorter than 30 minutes are currently only conducted when large catches are expected or when concern over rough ground requires the net to be hauled early.]

- The majority of IBTSWG considers the risk that this experiment would impair the quality of the long-term survey dataset sufficiently small: If the two sets of hauls were do not differ significantly, the experimental data could still be included as usual in the index calculation for the assessment. In the worst-case scenario, it would produce one year where the time-series had reduced precision, due to fewer comparable stations.

In order to warrant a thorough comparison with the current methodology, it has been planned that in each ICES rectangle, one of the two assigned hauls will remain at 30-min haul duration, whereas the second will be reduced to 15 min. Any freed-up survey time will, where logistically possible, be utilized to conduct additional hauls and to increase coverage of the fringe areas highlighted with the proposed extended index areas for assessed species (ref-. to Working Document # 1 Wieland- Annex 7). The Q3 survey coordinator will propose a survey plan to implement this approach.

A comparative analysis between both sets of data will be carried out on abundance of assessed species but also comparing size ranges, to be evaluated by IBTSWG 2016. As a parameter of diversity, species richness will be compared.

10.4 Stratification of the North Sea IBTS

The design of the current North Sea IBTS with stations allocated in a regular grid of the ICES rectangles of roughly 30 x 30 nautical miles (one degree longitude x 0.5 degree latitude) is analogous to the "unaligned sampling" type described in (Cochran, 1977). In this, the rectangles do not form strata *sensu strictu*, where a stratum is a predefined spatial unit, non-overlapping, with the purpose to increase survey precision. In contrast, the roundfish areas (RA) as larger units do qualify as strata, which are sampled with effort proportional to their size (number of rectangles included). The allocation of stations within the RA follows the systematic grid, but then with a 'semi-random' location of sampling positions, and repeated sampling within each grid cell. Hence, the IBTS is not following a true stratified random survey design, which has been found

beneficial in many surveys (ICES, 2004; ICES, 2005). However in general, the more survey objectives are to be covered, the more advantageous it may be to have a more uniform, systematic sampling design, be it with random or fixed stations ((ICES, 2004), Vølstad and Pennington, pers. comm.).

Consequently, the advantages and disadvantages of the current IBTS survey design need to be analysed for the range of its core objectives. In this, attention should be paid to the existing limitation of trawl-able area by the gear, the GOV otter board trawl.

IBTSWG decided to initiate an evaluation of the effects of the current sampling design with a post-stratification experiment for the NS-IBTS. The goal would be to test a theoretical alternative survey design, which includes a stratification based upon habitat types [details to be decided; possible testing of strata that have been defined in the EU-project VECTORS for the ecosystem model 'Atlantis', Hufnagl *et al.*, unpublished data].

For a possible implementation in the IBTS, the following route could be considered, if a post-stratification experiment indicates that a habitat-dependent stratification would be advantageous: For a transition period, one station per rectangle could be kept as in the past, while the remaining hauls would be reallocated to a new stratification by habitats.

10.5 Beyond the North Sea IBTS: Plans for surveys in adjacent waters

10.5.1 Study on stratification for the Channel Ground Fish Survey, CGFS

Using the time-series of the CGFS, currently applying a systematic fixed sampling design, a series of sampling designs will be tested through post-stratification. First steps will involve identifying possible strata from either substrate/habitat, multivariate analysis of all species composition or assessed species in particular. A particular attention will be given into identifying strata of non-trawl-able areas. Using post-stratification, several options of strata will be evaluated under multiple aspects: values, variability and consistency of assessed species indices and ALKs as well as biodiversity consideration. Pros and cons of having a number of stations proportional to stratum areas (uniform sampling) vs. increasing the number of stations where the variability is higher will be listed.

Currently, work is underway to optimize and harmonize the sampling coverage of the Celtic Sea. Currently EVHOE and IGFS both carry out bottom trawling in quarter 4 using a GOV. The overlap zone extends from the Irish coast south to around 50.5°0N. Different options for optimization have been considered, including carrying out EVHOE stations beyond 400 m only every other year and cancelling all EVHOE hauls north of 51°N. The results of the effects of such changes on abundance indices were presented at the 2015 IBTSWG meeting. An additional option consists in exchanging stations between IGFS and EVHOE such as reducing the surveyed area of both surveys: EVHOE sampling up to a line at 51°N and IGFS sampling down the same line. The exchange option should not have any impact on abundance indices and the details of it are currently being discussed between the two institutes carrying out the surveys.

10.6 Actions and Recommendations

Actions:

- All IBTS partners to collate data from research vessels on additional clear tows, and enter in a clear tows database on SharePoint.

- IBTS cruise leaders to initiate, where possible, more haul-by-haul, length-stratified age sampling, instead of alternative sampling routines (i.e. taking the otoliths from one fish each from all length classes available at the respective station).
- For relevant fish species, IBTSWG to compare the use of ALKs vs. direct design-based estimators of abundance-indices by age-class and associated variances.
- IBTSWG to evaluate expected precision in abundance indices by age-class as a function of the number of primary samples (PSUs; stations, or clusters of stations) and the subsample sizes within PSUs (number of age-samples per length-class). x
- Evaluation of outcome of the tow duration experiment in the 2015 Q3 NS-IBTS.
- Initiate post-stratification experiment for NS-IBTS
- Investigate effects of different sampling design of the Channel Groundfish survey CGFS before the next IBTSWG.

Recommendations:

- Recommendation to the assessment groups (WGCSE, WGEF, WGWIDE) to nominate a contact person during their respective next meetings, to liaise with IBTSWG regarding which data from VIIe are would be of utility to the assessment group and how data from the CAMANOC survey and the time series that it initiated can be evaluated in collaboration with the IBTSWG over the short term to maximize the utility of the data.

10.7 References

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11 Revisions to the work plan and justification

11.1 Update of work plan for ToR d (Swept-area)

11.1.1 Contributions to ToR d, previous work plan:

- North Sea IBTS: Data checks and where necessary resubmissions of net geometry and towed distance data for the time since 2004.
- Provision of national (ship-specific) algorithms for fill-ins of missing data for the specified net geometry and haul data for the period 2004–2014 (2015). (Compare 2015 Working Documents see Annex 7)

11.1.2 Work plan for ToR d, to be prepared for 2016 IBTSWG:

- Quality checks of flex file
- Exploratory plots for comparison of traditional cpues based on haul duration, with cpues based on swept-area per species, also considering alternative calculation of swept are between doors or between wings.

11.2 Update of work plan for ToR g (Survey Design)

11.2.1 Contributions to ToR g, previous work plan:

- North Sea IBTS: Checked currently used index areas for each of the assessed species and proposed amendments: see 2015 Working Document #1 in Annex 7.
- North Sea IBTS: Conducted initial analyses on the efficiency of otoliths sampling: see 2015 Working Document # 5 in Annex 7.
- Northeastern Atlantic area: Analysis of Evhoe and IGFS survey data in the Celtic Sea for optimizing the sampling design: see 2015 Working Document # 6 in Annex 7.

11.2.2 Work plan for ToR g, to be prepared for 2016 IBTSWG:

- Explore effects of spatial distribution and number of otoliths samples currently taken for assessed fish species or other species of interest. Build-upon initial analysis during 2015 IBTSWG, compare Section 10.2.
- Initiate an analysis to compare the use of ALKs vs. direct design-based estimators of abundance-indices by age-class and associated variances.
- Initiate a post-stratification experiment for NS-IBTS.
- Investigate effects of different sampling design of the Channel Groundfish survey CGFS.

12 Next meeting

The next meeting of the IBTSWG will take place in Sète, France from 4-8 April 2016.

Annex 1: List of Participants

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Annex 2: Agenda

Monday, 23/03				
9:00		**Start, setting-up IT**	**Plenary**	
		Welcome, overview of meeting ToRs, Recommendations from other WGs, adoption of preliminary agenda, appointment of ToR leaders	Introduction:	Anne
11:00	COFFEE			
		ToR a - Survey coordination	Plenary	
		Discussion of any issues and possible (new) requirements regarding survey planning	Lead:	Area coordinators
13:30	LUNCH			
		ToR a - Survey coordination (continued)	Plenary	
15:00	COFFEE			
		Revision of IBTS standard areas (WD)	Presentation:	Kai
		CAMANOC survey – results and inter-calibration	Presentation:	Morgane

Tuesday, 24/03				
		ToR g - Survey design	Plenary	
		Viewpoints of IBTSWG members and proposals for analyses of NS-IBTS survey design	Presentations:	Jon Helge, Michael,
	COFFEE			
		Discussion of priorities and work plan		
		Definition of work needed during this week, identification of contributors		
12:00	LUNCH			
		ToR d – Swept-area-based indices	Plenary	
		Interpolation of missing values (WD)	Presentation:	Kai
		Definition of work needed during this week, identification of contributors		
	COFFEE			
		Time to prepare contributions for ToR's	Subgroups	
		--- In parallel: ---		
15:00		Video conference with WGEGGS	Subgroup	

Wednesday, 25/03				
		ToR e - Gear and rigging	Plenary	
		Status quo of gears used: Results from data collation of national GOV rigging schemes	Presentation:	Rob
		Experiences from Q1 survey NOR		Rob/ Jennifer
xxx	COFFEE			
		Time to prepare contributions for ToR's	Subgroups	
12:00	LUNCH			
		Time to prepare contributions for ToR's	Subgroups	

Xxx	COFFEE			
		ToR a - Survey coordination		
		Collation of information on past surveys; arrangements for upcoming surveys	Subgroups (by areas)	led by area coordinators
		MIK issues (presented in North Sea group)	Presentation:	Matthias
		Planning of upcoming survey	Subgroup	North Sea Q3, Kai

Thursday, 26/03				
		ToR a - Survey coordination	Plenary	
		CAMANOC survey – proposal for survey design	Presentation:	Morgane
xxx	COFFEE			
		Time to prepare contributions for ToR's	Subgroups	
12:00	LUNCH			
		ToR c - DATRAS	Plenary	
			Presentation:	Vaishav
		Taxonomic issues in DATRAS	Presentation:	Jim
xxx	COFFEE			
		Time to prepare contributions for ToR's	Subgroups	
17:00		Presentation of sections of report	Plenary	
		Change / adoption of final sections		

Friday, 27/03			
Nominations		or next chair	Plenary
Presentation of sections of report			
Change / adoption of final sections			
To Do's after IBTSWG / Updates		Matthias,	
ToR b – Survey Manuals / other ToR's		Fran, Anne	
xxx	COFFEE		
Election of new chair		Plenary	
Selection of next venue			
Update of remaining parts of report		Subgroups	
xxx	LUNCH		
Presentation of last sections of report		Plenary	
Change / adoption of final sections	AOB		
14:00	End of meeting		

Annex 3: Recommendations

	Recommendation	Adressed to
1.	Explore options for flagging data that have been changed during re-uploading, to make data users aware of such changes. Discuss plans with IBTSWG in order to specify in which cases data-uploaders should be prompted for explanations, and how these could be presented with data products.	ICES Data Centre; contact in IBTSWG
2.	For future revisions to the NS-IBTSmanual, IBTSWG seeks help for specifying all relevant information needed to fully rig and deploy the trawl gear (some aspects are undefined in the current GOV manual). To ensure that the appropriate information is obtained IBTSWG looks for gear technologists to assist in this process.	Gear technologists (WGFTFB)
3.	IBTSWG recommends that the relevant groups nominate a contact person during their respective next meetings, to liaise with IBTSWG regarding which data from ICES Division VIIe would be of utility to the assessment group. IBTSWG seeks feedback on how data from the CAMANOC survey and the time-series that it initiated can be evaluated in collaboration with the IBTSWG over the short term to maximize the utility of the data.	Assessment groups: WGCSE, WGEF, WGWIDE
4.	Considering the likely change of the vessel used by Portugal for the PT-PGFS within 2015 and 2016, it is recommended that in order to facilitate a future combination of abundance indices along the whole Iberian Atlantic shelf, the adoption of a gear more similar to the ones used by Spain would be considered. In this, IBTSWG seeks advice from the groups specified.	WGBIE, WGWIDE and WGHANSA

Annex 4: Action List

Nr	Description	ToR (2015)	Who	When	Status
1	In response to a recommendation from WGNSSK (see 5.3.1), Denmark will try at the end of the survey in Q3 in 2015 to sample two extra hauls in the Skagerrak.	ToR a (2015)	IBTSWG Q3 survey with 'Dana'	2015 Q3	
2	Submission of North Sea manual revision and letter about revisions to ICES/Nils Olav Handegard for upload on IBTSWG website before the Q3 surveys.	ToR a (2015)	Anne Sell / Jennifer Devine to lead	June 2015 (before Q3 surveys)	
3	Amendment of the MIK manual (adding to currently revised 3rd revision).	ToR a (2015)	Matthias Kloppmann to lead	Before 2016 Q1 surveys	
4	Northeastern Atlantic surveys: Agree on standardized gear plots to include in the manual to be used in each survey as quality control.	ToR a (2015)	Survey participants; lead: Francisco Velasco	Before July 2015 (see #5)	

Nr	Description	ToR (2015)	Who	When	Status
5	Submission of Northeastern Atlantic manual revision and letter about revisions to Nils Olav Handegard.	ToR a (2015)	Survey participants; lead: Francisco Velasco	July of 2015	
6	Develop a "summary of survey summaries" to be produced regularly as a tool to pinpoint highlights or issues in the year's survey datasets to WGNSSK. (For Q1 and Q3 North Sea surveys.)	ToR a (2015)	Survey coordinators, supported by survey leaders	Before IBTSWG 2016	Recurring task: To be produced during each IBSTWG meeting
7	Quality checks of the flex file; discussion of outcome and possible clarification of corrections needed.	ToR d (2015)	All NS-IBTS participants / data uploaders	By fall of 2015	
8	Exploratory plots for comparison of traditional cpues based on haul duration, with cpues based on swept-area per species; also considering alternative calculation of swept-area between doors or between wings.	ToR d (2015)	ToR d contributors	Before IBTSWG 2016	
9	Each institute to draft their own GOV user manual detailing all trawl components and rigging.	ToR e (2015)	Gear experts at national institutes	asap	
10	Maintain standardization within each national gear specification. Where two counties undertake hauls in the same statistical rectangles, attempt to undertake an analysis of catchability trends to identify possible gear effects.	ToR g (2015)	All IBTSWG cruise leaders	Upcoming surveys	Recurring task
11	Collate data from research vessels on additional clear tows, and enter in a clear tows database on SharePoint.	ToR g (2015)	All IBTS partners	asap	
12	Collect, where possible, haul-by-haul, length-stratified age sampling, instead of alternative sampling routines. Otoliths should be taken from each length class presented at the respective station. (Details to be specified by survey coordinators.)	ToR g (2015)	IBTS coordinators to specify for cruise leaders	Upcoming cruises	

Nr	Description	ToR (2015)	Who	When	Status
13	For relevant fish species, IBTSWG to compare the use of ALKs vs. direct design-based estimators of abundance-indices by age-class and associated variances.	ToR g (2015)	Contributors to ToR g	Plan work to be started by IBTSWG 2016	
14	Evaluate expected precision in abundance indices by age-class as a function of the number of primary samples (PSUs; stations, or clusters of stations) and the subsample sizes within PSUs (number of age-samples per length-class).	ToR g (2015)	Contributors to ToR g	Plan work to be started by IBTSWG 2016	
15	Evaluation of outcome of the tow duration experiment in the 2015 Q3 NS-IBTS.	ToR g (2015)	IBTSWG	Before IBTSWG 2016	
16	Initiate post-stratification experiment for NS-IBTS	ToR g (2015)	IBTSWG, Anne Sell	Plan work to be started by IBTSWG 2016	
17	Investigate effects of different sampling design of the Channel Groundfish survey CGFS.	ToR g (2015)	Morgane Travers	Before IBTSWG 2016	

Annexes 5, 6 and 7 to the IBTSWG report are available for download as separate documents