WORKING GROUP ON BEAM TRAWL SURVEYS (WGBEAM)

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Contents

i Executive summary

The Working Group on Beam Trawl Surveys (WGBEAM) coordinates and implements European inshore and offshore beam trawl surveys, including planning, standardization, data transmission and data quality assurance. The group also coordinates the Italian/Croatian/Slovenian beam trawl survey in the Adriatic Sea as there is no other body in the EU coordinating beam trawl surveys, and the EU Data Collection Framework requires survey coordination.

In 2021, eleven beam trawl surveys were planned, covering the North Sea, 7d, 7e, 7fg, 7a, 8a, 8b and the Northern Adriatic Sea. Despite the COVID-19 pandemic, most surveys could be carried out according to schedule, but sometimes with less staff, or leaving out some part of the sampling, e.g. limited marine litter data collection in German offshore survey. All data have been transmitted to the ICES Database of Trawl Surveys (DATRAS). The German inshore survey was conducted by commercial shrimp vessels due to technical issues with the research vessel. Shortly before the end of the survey one of the commercial vessels sank, and the remainder of the survey (3 more days) was cancelled. A new hermit crab species for the North Sea was encountered (*Pagurus longicarpus*) in the German inshore survey.

In 2022, a combined session with North Sea and Celtic Sea stock coordinators took place where all surveys were presented. Stock coordinators discussed developments in data use and provided an overview of current beam trawl survey data use in the assessments. Main topics that arose from this session were the request for additional age data collection on witch flounder (*Glyptocephalus cynoglossus*) and a further investigation of the changing maturation and growth patterns in plaice (*Pleuronectes platessa*).

The 2018 cohort for sole (*Solea solea*) and plaice (*Pleuronectes platessa*) in the North Sea and 7d is still visible as 3-year olds in the 2021 beam trawl surveys. No additional strong year classes could be seen for sole and plaice.

R scripts to evaluate the combined offshore and inshore beam trawl surveys data by region and cross-regionally have been further developed, and a preferred calculation method for swept area has been created. Specific analyses have been conducted on elasmobranchs (patterns in abundance and spatial distribution), brown shrimp *Crangon crangon* (numbers measured and length ranges by survey), and marine litter (consistency in reporting).

The manual for the offshore beam trawl surveys has been updated and made ready for publication in 2022. The manual for the inshore beam trawl surveys has been further developed towards a final draft, to be finalised in autumn 2022.

ii Expert group information

Expert group name	Working Group on Beam Trawl Surveys (WGBEAM)
Expert group cycle	Multiannual fixed term
Year cycle started	2020
Reporting year in cycle	3/3
Chair(s)	Ingeborg de Boois, the Netherlands
Meeting venue(s) and dates	23-25 March 2020, online (due to COVID-19), 13 participants
	22-26 March 2021, online (due to COVID-19), 14 participants
	10, 11, 18 May 2022, online, 11 participants (postponed from 22-26 March 2022 due to conflict Ukraine/Russia)

1 General information

Participation

Due to the COVID-19 pandemic the meeting took place as a hybrid meeting, and due to the war in Ukraine, the meeting was postponed from 22-25 March to 10, 11 and 18 May 2022. In total 11 participants joined the meeting (Annex 1), from 7 countries and ICES Data Centre (10/05: 9 participants, 11/05: 9 participants, 18/05: 11 participants). On 11th May, 8 data end-users for the relevant flatfish and elasmobranch stocks, as well as from WGCRAN participated in a joint session

Meeting goals

The group's terms of reference (Annex 2) relate mostly to the role of the group, i.e. to coordinate beam trawl surveys in the ICES area, including planning, standardisation, data transmission and data quality assurance. The group also coordinates the Italian/Croatian/Slovenian beam trawl survey in the Adriatic Sea as there is no other body in the EU coordinating beam trawl surveys, and the EU Data Collection Framework requires survey coordination.

For 2022, the specific tasks were:

1. Compilation of survey summary sheets
2. Provide tabular overview of survey planning, including geographical areas for overlapping tows
3. Upload data for all beam trawl surveys (inshore and offshore) including litter in DATRAS for at least the last two years, as far as DATRAS allows the survey data to be submitted. For datasets where index calculation is done directly from DATRAS, as many years of the time-series should be uploaded as is feasible.
4. Develop R scripts for the data evaluation by region as well as across regions, and evaluate beam trawl survey data for on a selection of parameters.
5. Provide the manual for inshore beam trawl surveys as a TIMES document for review.
6. Provide updated SISP 14 (offshore beam trawl survey manual) as a TIMES document for review.

Follow-up of recommendations

ID	EG	YEAR	RECOMMENDATION	RECIPIENTS	UPDATED STATUS MAY 2022
142	IPBWITCH	2021	Consider increasing biological sampling of witch in the northern and north-western North Sea	IBTSWG, WGBEAM	See section 5.4.2
22	WGBEAM	2021	Based on the discussions on methodologies used in the inshore surveys, WGBEAM recommends that WGCRAN provides the following information: • WGCRAN's preferred conservation method of shrimp to be measured (fresh, frozen, cooked, ethanol, etc.) for the DYFS; • WGCRAN's view on the minimum number of measurements on shrimp per	WGCRAN	Pending WGCRAN 01/02/2022: "and it is planned to discuss the recommendations with the Working Group at the next opportunity, which means that in the course of this year you will receive a response." In February 2022 a meeting has taken place between the chairs of WGCRAN and the

ID	EG	Year	Recommendation	Recipients	Updated status May 2022
			stratum (i.e., subarea) for a reliable assessment in the DYFS.		WGBEAM chair to further explain the background of the recommendation.
	WGML	2021	Collect, count and report litter data according to the latest guidance documents produced by WGML: a. Updated manual on sampling, identification and registration of seafloor litter caught in bottom trawl surveys. b. QA/QC tools such as the ICES WGML Seafloor Litter PhotoGuide.	WGBEAM	Pending, waiting for the finalised manual. WGML manual has been reviewed and will be resubmitted in June 2022. WGML reference: ICES. In press. ICES manual for seafloor litter data collection and reporting. Techniques in Marine Environmental Sciences.
35	WGBEAM	2019	WGBEAM recommends that ACOM ensures that when a benchmark workshop has been approved on the ACOM forum that the responsible ICES scientific officer when informing the relevant stock coordinators, also informs the chair of WGBEAM (and possibly other data collection EGs) of the resolution. WGBEAM understands that its data may not be relevant for many stocks being benchmarked and is happy to ignore irrelevant announcements.	ACOM	To be closed, although no action by ACOM However, the increased communication between WGBEAM and stock assessors (combined session at WGBEAM and survey presentation at WGNSSK) provides opportunities for contribution to data preparation groups. WGBEAM chair has checked with the chair of the Ecosystem observation group if benchmark timelines have been shared during WGCHAIRS 2022 (not the case). Benchmarks scheduled for 2023 have been provided by EOSG chair; only the benchmark on elasmobranch species seems to be relevant to WGBEAM. Heleen and Ingeborg will participate in data preparation workshop. Ingeborg will inform the WGEF chair.
18	WGBEAM	2021	WGBEAM noted requirements for further developments of DATRAS and recommends that this is discussed in WGDG: • Record methodology of distance (calculated by speed and duration, by ship's log, by calculation shoot-haul position, etc.) • Record conservation status of species: fresh, frozen, cooked, ... • Although WGBEAM suggests not to add so-called 'seeded ages' and upload individual fish for which no age has been collected with Age=-9, it may be considered to add additional coding in TS_AgeSource, e.g. 'estimate'. • It appeared that DATRAS does not allow for submission of HH records of valid tows without HL and/or CA records. WGBEAM concluded that this should be allowed, as valid tows may occur, but in single-species surveys (stdspecrec=1, bycspecrec=0) it may lead to wrong estimates of average catches if 0-hauls are not taken into account.	WGDG; WGBIOP	Resolved: Seeded ages: WGDG agreed in their 2021-02 meeting, will be implemented as 'length-based' by Data Centre. This is contrary to the WGBIOP advice that Age =-9 is used for individual fish for which no age data has been collected. Passed on: adding HH records without HL/CA information: follow-up in recommendation 2021-24 Pending: In the context of this recommendation WGBIOP understands 'conservation status' to mean the way the fish specimen is preserved. WGBIOP would suggested that rather than having a separate conservation status this would be merged with METFP, where the suggested states could be added. Follow-up action WGBEAM: Adriana to internally discuss the option of adding the requested vocabulary in METFP (chemical preservation methods) risking the inconsistency of adding physical preservation methods (e.g. freezing, cooking) to vocabulary for chemical preservation methods.
19	WGBEAM	2021	WGBEAM evaluated the proposed data products for DYFS, SNS and BTS-VIII and recommends that ICES Data Centre reviews the mapping of the aphiaIDs with	Data Centre	Resolved. DATRAS team did an intensive check with all different scenarios and that incidence of mapping issue was resolved in the database.

ID	EG	YEAR	RECOMMENDATION	RECIPIENTS	UPDATED STATUS MAY 2022
			species names, not only for the newly developed products, but also for the existing CPUE products. The species name in the product should always be the valid species name as available in www.marinespecies.org, and a valid aphiaID should always be available in the file.		WGBEAM checked randomly and it seems to be in order.
20	WGBEAM	2021	WGBEAM recommends that ICES Data Centre also takes into account benthos data without lengths in the new products for DYFS, SNS and BTS-VIII, in line with the BTS product CPUE_per_length_per_Hour_and_Swept_Area.	Data Centre	Resolved. For BTS, checked during WGBEAM 10/11 May, and implemented for SNS and DYFS after agreement by WGBEAM. Follow-up action: WGBEAM requests more than 2 digits for the field Swept Area, preferably 6. Resolved during WGBEAM 2022.
21	WGBEAM	2021	WGBEAM recommends that the values entered in StatRec and AreaType be returned in all data products, so not to apply a calculation to ICES statistical rectangle. If it is in the eyes of ICES Data Centre preferred to either change the field name StatRec (HH) into a term that better covers the needs, or to add a field to HH for area codes not being ICES statistical rectangles, WGBEAM recommends that WGDG to further decides on the way forward.	Data Centre; WGDG	Resolved. The topic was discussed by WGDG in 2021. An additional field has been added to the DYFS and SNS products, called 'SurveyIndexArea'. The SurveyIndexArea is however identified based on the position in the file and the shapefile for the survey, and not on the actual value provided by the submitter. The latter is preferred by WGBEAM, as it is up to the people on board to decide in which index area they are sampling. WGBEAM proposes an additional field for HH upon data submission, called 'SurveyIndexArea', that can be entered by the submitter and will stay as uploaded by the submitter.
36	WGBEAM	2019	WGBEAM recommends to create CPUE per length per Hour and Swept-area as a DATRAS product for Inshore surveys (currently DFS/DYFS/SNS).	Data Centre; WGDG	Resolved. WGDG has discussed this recommendation, a standard product has been developed by ICES Data Centre and has been presented for approval at WGBEAM 2021. WGBEAM 2021 agreed upon the product.
37	WGBEAM	2019	WGBEAM recommends to continue the work on DATRAS checking procedures to be made available in an R-script so national data can be screened prior to the DATRAS screening, making the process more efficient.	Data Centre	Resolved, and to be further developed. An R script has been developed by ICES Data Centre that incorporates the DATSU checks. See report section 5.1.

2 Survey results (ToR a, b, d, f, i)

2.1 Survey achievements 2021 (ToR f)

For the offshore and the inshore surveys survey summary sheets (Annex 5) have been prepared, containing the main data end-users for fish stock assessment, data collected during the survey, and specific comments on the 2021 surveys. Following the decision in the 2021 meeting, industry beam trawl surveys have been taken into account as well.

2.1.1 Offshore surveys

Eleven research surveys were carried out, covering the North Sea, 5a, 7d, 7e, 7fg, 7a, 8a, 8b and the Northern Adriatic Sea. On top, three industry beam trawl surveys have been carried out (UK, The Netherlands, France). The participating vessels and time of the surveys are listed in Table 2.1. Further details (areas covered, technical specifications) by country are given in Annex 5.

Comments on the 2021 surveys:

- The Belgian BTS was carried out from 23 Aug to 2 Sept 2021 with RV Celtic Explorer as the RV Belgica was taken out of service and the new RV Belgica was not ready in time for the survey;
- In the Belgian and Dutch BTS for some hauls the haul duration was set to 15 minutes, due to large catches of epifauna, risking net damage at a longer haul duration;
- In the German survey marine litter could not be collected at all stations, due to COVID-19 restrictions (limited staff);
- In the Dutch survey exceptional catches of the bryozoan *Electra pilosa* occurred (Figure 2.1);
- Spawning male plaice (*Pleuronectes platessa*) was encountered in the southwestern part of the Dutch survey area. Very mature plaice was also encountered in the Belgian survey, but not recorded;

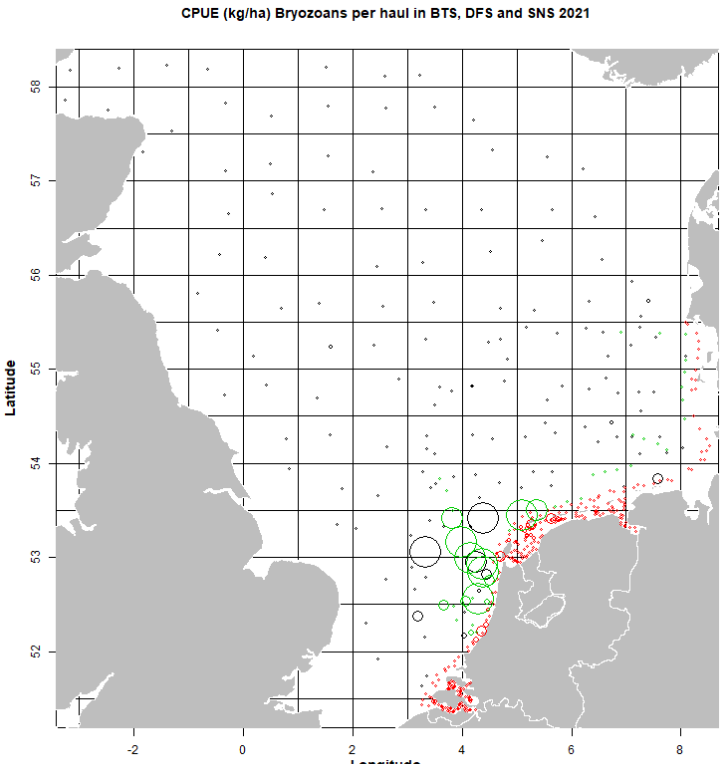

Figure 2.1 *Electra pilosa* catches in Dutch BTS (black, SNS (green), DYFS (red) in 2021

- Icelandic survey timing was changed compared to original planning. This will probably remain in future;
- Nine stations in the Adriatic survey could not be sampled, the method used in 2020 will be used to correct for the absent stations.

Table 2.1. Overview of offshore beam trawl surveys during 2021 (planned dates)

Country	Vessel	Area	PLanned Dates	Gear
Belgium	Celtic Explorer	western-southern North Sea	23 Aug – 02 Sept 2021	4 m beam
France	Côtes de la Manche	8a, 8b	03 Nov – 30 Nov 2021	4 m beam
Germany	Solea	German Bight	23 Aug – 10 Sept 2021	7 m beam
Iceland	Bjarni Saemunds-son	Entire coast of Iceland	26 Aug – 11 Sept 2021	4 m beam
Italy/ Slovenia/Cro-atia	G. Dallaporta	Northern Adriatic Sea (GSA 17)	28 Nov – 19 Dec 2021	2x 3.5m modified beam
Netherlands	Tridens II	southern North Sea, Ger-man Bight	2–20 Aug 2021	2x 8 m beam
Netherlands	Tridens II	central and western North Sea	23 Aug–17 Sep 2021	2x 8 m beam + flip-up rope
UK	Cefas Endeavour	English Channel /Celtic Sea	8 Mar – 3 Apr 2021	4 m beam
UK	Cefas Endeavour	7d, 4c	30 Jun – 13 Jul 2021	4 m beam
UK	Cefas Endeavour	7fg, 7a	10 – 29 Sept 2021	4 m beam

2.1.2 Inshore surveys

The inshore surveys in the North Sea are carried out by Belgium (Demersal Young Fish Survey-DYFS), Germany (DYFS) and the Netherlands (Demersal Fish Survey-DFS). UK (Young Fish Survey-YFS) ceased the survey due financial constraints in 2012.

The Sole Net Survey (SNS), which is carried out by the Netherlands in the North Sea, is classified as an inshore survey, but 'nearshore' may be more appropriate because the area covered is further offshore than the other inshore surveys.

The participating vessels and time of the cruises are listed in Table 2.2. Details on the surveys are given in Annex 9. Details on the 2021 survey achievements are in Annex 5.

Comments on the 2021 surveys:

- The German survey with RV Clupea was conducted by commercial shrimp vessels due to technical issues with RV Clupea. Shortly before the end of the survey one of the commercial vessels sank, and the remainder of the survey (3 more days) was cancelled. A new hermit crab species for the North Sea was encountered (*Pagurus longicarpus*);
- The SNS (Netherlands) lasted a week longer than planned, thus postponing the NL-DYFS. SNS was delayed due to technical and medical issues, and bad weather;
- In the SNS as well as the NL-DYFS in the coastal zone large amounts of *Electra pilosa* were caught in some hauls (Figure 2.1). For that reason, the duration of some hauls was limited to 7.5 minutes a priori.

Table 2.2. Overview of surveys during 2021 (planned dates)

Country	Vessel	Area	PLanned Dates	Gear
Belgium	**Simon Stevin**	**Belgian coastal zone**	**8 – 10 Sept & 20-24 Sept 2021**	**6 m shrimp trawl**
Germany	Chartered vessels	German Wadden Sea areas	26 Aug – 24 Sep 2021	3 m shrimp trawl
Germany	RV Clupea	German coastal zone	13 Sep – 01 Oct 2021	3 m shrimp trawl
Netherlands (SNS)	Isis	Dutch, German, Danish coastal zone	13-24 Sep 2021	6 m beam trawl
Netherlands (DYFS)	Luctor	Scheldt estuary	6-23 Sep 2020	3 m shrimp trawl
Netherlands (DYFS)	Stern	Dutch Wadden Sea	30 Aug–1 Oct 2021	3 m shrimp trawl
Netherlands (DYFS)	Isis	Dutch coastal zone, German Bight and Danish coastal zone	27 Sep–29 Oct 2021	6 m shrimp trawl

2.1.3 Industry surveys

Three industry surveys have been carried out in 2021, by France, UK, and the Netherlands. Further details (areas covered, technical specifications) by country are given in Annex 5.

More information on the Dutch industry survey on turbot and brill: https://library.wur.nl/WebQuery/wurpubs/fulltext/544588

Comments on the 2021 surveys:

- In the Dutch survey some hauls were dominated by bryozoan *Electra pilosa*, leading to dangerous situations as the nets could only be hauled in with difficulty. Tow duration on a number of stations has therefore been shortened.

2.2 Data transmission to DATRAS (ToR d)

(1) Evaluate achievable deadlines for data delivery

In 2020, WGBEAM proposed new data delivery deadlines for beam trawl survey data submission to DATRAS. The deadlines were evaluated during WGBEAM 2021 and have not been changed, as they all could be met. The deadlines for submission of the 2022 beam trawl survey results are in Annex 4.

The deadlines for beam trawl survey data delivery to DATRAS are based on a realistic timeline where data for all species that are relevant for stock assessment can be delivered at the same moment. That is different from to the current situation, where, under high pressure, plaice and sole data for the offshore beam trawl surveys in the North Sea, mainly targeting older flatfish, are made available for the update assessment in autumn. Recruit information comes from the inshore surveys (SNS, DYFS) that are still running when the update assessment is carried out. The distributional range of the younger age classes (0-2) ranges for both plaice and sole is only properly covered by the combination of the DYFS, SNS, BTS, NS-IBTS.

(2) Coordinate and evaluate data delivery to DATRAS

Fish trawl data

Unaggregated beam trawl data are stored in DATRAS up and until the survey of the year previous to the meeting year. For 2021 all countries managed to upload their data to DATRAS prior to the meeting. These data are available in the database, but not all of them are already available for download in exchange format. A full overview of the DATRAS submission status is available at https://datras.ices.dk/Data_products/Submission_Status.aspx (select one of the Beam Trawl Surveys, Inshore beam trawl survey or Sole Net Survey).

Exceptions in data submission:

- For the offshore beam trawl surveys, only the Icelandic survey data are not delivered, as DATRAS does not allow for that data yet and Icelandic data sharing policy is still not clear about the possibility to share the data;
- German shrimp data were delayed due to a delay in sample processing.

Marine litter

Data on by-catches of marine litter are also stored in the DATRAS database. In the offshore beam trawl surveys (BTS) and Belgian inshore survey (DYFS) in the North Sea litter is being registered and submitted to DATRAS on a regular basis. Litter data from the English BTS surveys are regularly added for western Channel and Celtic Sea (Q1), North sea and eastern Channel (Q3), Irish Sea and Bristol Channel (Q3).

Exceptions in data submission:

- For German data, no information is added for hauls where no litter was caught; a record should be provided for hauls without any litter using the code.

Haul type	LTREF	PARAM	Other points of attention
With litter	C-TS-REV	See http://vocab.ices.dk/?CodeID=149933	
Without litter	RECO-LT	LT-TOT	-9 for missing numerical values, fill in char values as for the hauls with litter included

2.3 Survey indices (Tor a, b, i)

The full text and figures for the index series are in Annex 7.

North Sea – Subarea 4

The 2021 1-age group sole (offshore text Annex 7.1, figures Annex 7.1.1; inshore text Annex 7.2, figures Annex 7.2.1) index value is on a similar low level as observed for the previous year. While the 2-group index in 2020 was the highest value observed for the 2-group in the 2000s, it has sharply dropped in 2021, confirming the weak 2020 1-group. The strong 2019 1-group can be followed to the 2021 3-age group with an increasing trend. However, all age groups older than 3 show a declining trend compared to the previous year apart from the 10-group.

For plaice (offshore text Annex 7.1, figures Annex 7.1.2; inshore text Annex 7.2, figures Annex 7.2.2) the strong 2018 year class is still present as 3-years old. From the Dutch offshore survey in the western and central North Sea it seems that older age groups have disappeared from the survey area. It is in line with the field observation that less larger plaice have been caught during the 2019, 2020 and 2021 survey.

Western waters-subarea 7 and 8

7d

The sole relative abundances for the ages 1–3 for the UK survey in the eastern Channel (text Annex 7.1, figures Annex 7.1.1) have been quite variable over time, what can often be attributed to strong 1-group recruitments that can be followed through from one year to the next.

For plaice (text Annex 7.1, figures Annex 7.1.2) the strong 2018 year class is evident, in line with the North Sea. Age group 1 has decreased again in 2021, whereas age group 4+ has reached the peak of the time series.

7f

Except a very large cohort observed in 1999, sole 1-group recruitments (text Annex 7.1, figures Annex 7.1.1) have been quite stable across the whole time series, fluctuating around the long-term average. In 2021, the 1-group is above average following a recruitment below average in 2020. The 2-group is below average in 2021, and shows a declining trend since 2019. For the past four years, the 3-group also showed a declining trend from the highest observed value for this age group in 2018 to a below average value in 2021. The survey has been able to track the last strong 1-group recruitments in 2017 very well through its existence.

Age classes 1 and 2 for plaice (text Annex 7.1, figures Annex 7.1.2) are below the long-term mean, with an increase for age class 1 and a decrease in age 2. Age groups 3 and 4+ are above the mean, but decrease compared to the previous year.

7a

Sole in 7a (text Annex 7.1, figures Annex 7.1.1) has in recent years been of concern to managers due to low SSB values. The most recent survey trends indicate that following the strong decrease in sole abundance at age 1 until 2013 is starting to reverse with higher recruitment rates being observed since then.

In contrast to the 7a sole stock the plaice stock (text Annex 7.1, figures Annex 7.1.2) seems to be in a very healthy condition, although the reduction in recent recruitment indicates that it is unlikely that the recent period of high productivity may not be maintained. A change in productivity might be indicative of some changes to the ecosystem relevant to plaice reproduction and that historic levels of catches applied to the current stock would require further analysis to ensure that they would remain sustainable.

8

Since 2018, the time series of age group abundances of sole (text Annex 7.1, figures Annex 7.1.1) in the Bay of Biscay are marked by 1-group recruitments below average. The 1-group recruitments in 2008 is the highest of the time series, which contrasts with a decrease in the inter-annual variability of recruitment in recent years. The 1-group and 2-group show a decreasing trend since 2018, with 2020 and 2021 being the lowest values of the 2-group for the whole time series.

Northern Adriatic Sea

The 2021 survey indicates that the 0, 1, 2 and 3 age groups for sole (text Annex 7.1, figures Annex 7.1.1) were higher than the long-term arithmetic mean. Differently from 2020, age 4 in 2021 survey has been slightly lower than the level of the long-term arithmetic mean. Ages 5+ stays below the long-term arithmetic mean since 2019. More in general this plus group is quite fluctuating due to the very few specimens that reach these ages. Overall, it is possible to notice a general increasing trend for the ages in the second part on the time series

Icelandic Sea

The younger age classes (1-4) show similar values for plaice since 2017 (text Annex 7.1, figures Annex 7.1.2). Age classes 5-8 show significantly higher values. The year 2016 was a pilot study with fewer hauls than in later years, which were largely conducted in nursery areas of plaice.

3 Survey coordination and standardisation (ToR e, g, h)

3.1 Offshore and inshore beam trawl survey planning 2022 and comparative tows (ToR e)

The survey planning for the offshore and inshore beam trawl surveys 2022 is largely in line with previous years. Annex 6 contains the detailed planning for offshore, inshore and industry beam trawl surveys in 2022.

As in previous years, WGBEAM encourages that if time and weather allows, overlapping hauls should be carried out by countries operating in the same area.

During the Dutch and German surveys in the North Sea, some overlapping hauls should be attempted in the following rectangles, like in 2020 and 2021: 40F4, 40F5, 40F6, 41F4, 41F5, 41F6, 42F4, 42F5, 42F6, 43F4, 43F5, 43F6. The responsible scientists will contact each other approx. one month before the start of the Dutch survey to make appointments on the execution of the comparative tows. Comparative fishing has always been on the WGBEAM task list, but has become more important since the index calculation takes into account all beam trawl survey data in the North Sea with DeltaGAM. The model is more reliable when overlapping tows are available in the dataseries.

The Belgian and Dutch surveys also include rectangles fished by both in the same time frame, but the fishing ground at the Belgian positions is very rough. It is not possible to fish on these locations with the gear used by The Netherlands.

UK will conduct an inshore survey in Thames area (14 sea days) in 2022, coordinated by Louise Cox (Cefas). Idea is to continue annually, although funding is still unclear.

For the North Sea offshore and inshore surveys it is worth to create an app group to facilitate easy contact, e.g. about special catches in a commonly surveyed area, or when strange biological developments seem to take place in an area.

3.2 Manuals (ToR g, h)

In 2020, an outline was made for the Manual on inshore beam trawl surveys (table of contents in Annex 10). The structure is based on the manual on offshore beam trawl surveys SISP 14 (ICES 2019). It was decided not to include the UK survey (ceased in 2012) nor the French inshore survey, so Demersal Young Fish surveys (DYFS) Belgium, Germany and the Netherlands as well as Sole Net Survey (SNS) are included. The manual will be ready as final draft in June 2022. That will be transposed to the TIMES series, and the formal communication with ICES on the release of the manual will be started. Trawling time seemed to be different between Netherlands and Germany (15 mins) on one hand and Belgium (30 mins) on the other hand. It will be looked into if the duration can be standardised along surveys.

The Manual on offshore beam trawl surveys (ICES 2019) has been updated where necessary. The updated manual has been prepared as a TIMES product, for final review and production, and will be sent to ICES by the end of May 2022.

4 Evaluation of combined survey data (ToR a, b, c)

4.1 Consistency analyses offshore beam trawl surveys

WGBEAM subgroups evaluated offshore and inshore data from DATRAS. The R scripts produced can be used to evaluate any beam trawl survey (BTS, DYFS, SNS) and any species in DATRAS. The R scripts have been stored at https://github.com/ices-eg/wg_WGBEAM.

In general, addition of the option to select specific species in the DATRAS R package is recommended, in order to facilitate code sharing and parallel use of scripts developed during the working group, and would stimulate use of the most recent data set. Currently the full timeseries for all species have to be loaded in the dataframe and the species selection takes place afterwards (taking up to 1 hour for approx. 20 years). This means that when someone else would like to run the script, or when the person doing the analyses knows changes have been done to the data (maybe even based on the analyses), this will takes another hour.

(i) Regional evaluation of offshore data from DATRAS

Elasmobranch catches over time were compared for the different surveys in ICES areas 4 and 7. Data were retrieved from DATRAS and standardised to CPUE per swept area, using the R script developed by WGBEAM 2021. In 2022 the script has been updated and run to evaluate spatial-temporal distribution of commercially-important elasmobranchs in BTS and DYFS surveys for the years 2000-2021.

(ii) Species consistency check across surveys

To assess species consistency between the surveys of the participating countries, the R script developed in WGBEAM in 2021 was used again (https://github.com/ices-eg/wg_WGBEAM). The haul information (HH) and length information (HL) of the current BTS data from the last three years (North Sea) from DATRAS were combined into one dataset. Data from areas where survey activities overlap were compared. The analysis showed a high degree of agreement in the recording of species. Species identification was consistent except for the identification of difficult species (e.g. *Ammodytes*). There are differences between the surveys in the approach to recording species in the macro-epibenthos. In some cases only presence/absence is recorded or all species are counted and weighed in sub-samples and then extrapolated to the haul. Generally, all species are recorded in a comparable species in the different surveys (Annex 8.2).

(iii) Litter recording consistency check across surveys

Consistency of litter recording seems to be fine across surveys. Main difference is that for German data, no information is added for hauls where no litter was caught. A record should be provided for hauls without any litter. A closer look was taken in the plastic and rubber fraction as this was recorded the most. The more detailed litter composition looks similar for the different surveys (mostly fishing gear, plastic sheets and plastic bags). More detail is listed in Annex 8.3.

The consistency in reporting size of monofilaments (related to fishing gear) was checked across the different surveys and years. Belgium, Germany and the UK only report the surface (A-F), while the Netherlands report length when available. As length is more informative than surface for this type of litter, it may be preferred to adapt records when length is available and to start collecting this type of data from 2022 onwards.

Data was downloaded from DATRAS (Litter Assessment Output) for the offshore survey (BTS) as only Belgium uploaded litter data of the inshore survey to DATRAS. Data was compared using an R script. The R script has been stored at https://github.com/ices-eg/wg_WGBEAM.

4.2 Consistency analyses inshore beam trawl surveys

(i) Regional evaluation of inshore data from DATRAS (shrimp data)

In 2021, WGBEAM subgroups evaluated inshore beam trawl survey data available in DATRAS. Scripts were made available at https://github.com/ices-eg/wg_WGBEAM. The R script was updated in WGBEAM 2022 and used to evaluate available DYFS data for Brown shrimp (*Crangon crangon*).

Data from DYFS-NED and DYFS-GER were retrieved from DATRAS, and combined with separately provided data from DYFS-BEL. Length distributions for Netherlands and Germany seem to be in line with each other, shrimp caught in the Belgian waters seem to be a bit larger (see Annex 8.1.2).

5 Other topics

5.1 DATRAS developments

5.1.1 DATRAS technical updates

The unified DATRAS format has been introduced in 2020, with the possibility to submit files with or without. From the third quarter in 2022 only file submission with headers will be allowed. This provides the opportunity to leave out specific fields (e.g. not used in the survey, or no data collected on the variable) from the files, or to list the fields in a different order. It also means that file formats don't have to be updated by all users when new fields have been added to the format, unless the field is mandatory for the survey.

Service-based submission is in a testing phase (collaboration ICES Data Centre and Wageningen Marine Research). The service will primarily be used for resubmission of files, as it is not necessary to stay at the computer while the file is being processed. It is assumed that resubmitted files are free of error messages, and that the majority of the warnings is already dealt with in the first submission. When other WGBEAM participants are interested in service-based (re)submission, the ICES Data Centre can be contacted.

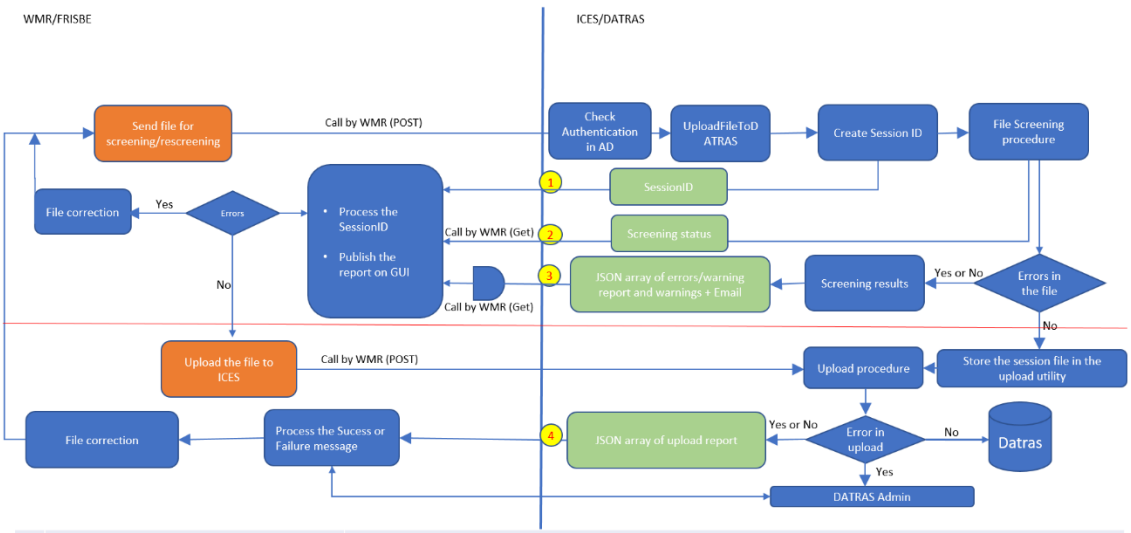

Figure 5.1 Schematic of the data flow for service based submission of files to DATRAS

Products (CPUE per length per haul and SweptArea) for the Adriatic beam trawl survey have been crosschecked and agreed upon, and will be available with the other BTS surveys.

In 2020 the Litter assessment output has been generated, which has been used by the European Marine Observation and Data Network (EMODnet) since 2021. From 2022 onwards, automatic synchronisation takes place with EMODnet twice a year, via webservices. Scripts available at https://github.com/ices-tools-prod/icesDatras/blob/master/R/getLTassessment.R

In 2018 development of the Swept area assessment output has started by the Workshop on Methods to develop a swept-area based effort index (WKSABI). The development proceeded in 2021

by the Workshop on the production of swept-area estimates for all hauls in DATRAS for biodiversity assessments (WKSAE-DATRAS). Output is available for all surveys at https://datras.ices.dk/Data_products/Download/Download_Data_public.aspx. Updates take place upon (re)submission of data. The main flow is that first omitting distances are filled in, and then swept area is calculated following the definitions set by the respective survey working groups.

Next to that, the Workshop on the production of abundance estimates for sensitive species (WKABSENS) has developed Indices for sensitive species. Output is available for all surveys at https://datras.ices.dk/Data_products/Download/Download_Data_public.aspx. Updates take place on demand.

An R package has been developed to check files to be submitted to DATRAS prior to uploading those to the DATRAS checking module DATSU. The R script is ready for testing. An internet connection is still needed to check the files.

GitHub repositories
(icesDatsu) -https://github.com/ices-tools-prod/icesDatsu
(icesDatsuQC) -https://github.com/ices-tools-prod/icesDatsuQC
r-universe development repository https://ices-tools-prod.r-universe.dev/ui#builds

CRAN repositories
(icesDatsu) -https://cran.r-project.org/package=icesDatsu
(icesDatsuQC) -https://cran.r-project.org/package=icesDatsuQC

5.1.2 DATRAS web and documentation updates

A new library has been created for the DATRAS documentation: https://www.ices.dk/data/data-portals/Pages/DATRAS-Docs.aspx

It contains 'News and updates' (DATRAS news and updates (ices.dk)) as well as a 'Format description' landing page (https://www.ices.dk/data/data-portals/Pages/DATRAS_format_description.aspx). A brief description of Data products has been added in the download dropdown.

IBTSWG requested to add a disclaimer on top of Download page:
"Data users not involved in primary data collection are encouraged to communicate and collaborate with relevant institutes to aid in the interpretation of data and outputs.
It is the responsibility of the data users to read the relevant documentation regarding the surveys and the format and calculation of all data products (link to documents page)."
WGBEAM is asked for feedback on the relevance of such a disclaimer as well on the text.

5.2 WGBEAM Feedback to ICES DATRAS team

Unified format: all participants involved in WGBEAM deliver files with headers, so no problems are to be expected when submission without headers is not allowed anymore.

Web documentation: in general the new documentation library looks nice. Detailed feedback is delivered in a separate document to DATRAS team directly.

Disclaimer: Although the current disclaimers theoretically should be sufficient, WGBEAM does not object to add an additional disclaimer on top of the download page. It is then proposed to change the order of the sentences, so the disclaimer will be: "It is the responsibility of the data users to read the relevant documentation regarding the surveys and the format and calculation of all data products (link to documents page).Data users not involved in primary data collection

are encouraged to communicate and collaborate with relevant institutes to aid in the interpretation of data and outputs."

5.3 Requests for new DATRAS developments

WGBEAM will hand in a request for an additional field in HH, for direct submission of SurveyIndexArea.

5.4 Input from data end-users

End-users joining the session: Lies Vansteenbrugge, Ching Villanueva, Jurgen Batsleer, Chun Chen, Kim Hühnerlage, Tanja Miethe, representing WGNSSK, WGEF, WGCRAN.

5.4.1 Presentations and discussions

The following topics were discussed:

- Sole 7d survey got rejected in the assessment -despite the high internal consistency- because the age-based model gives a different prediction to the catch data. Size of the sole decreases towards more recent years, and survey is treating all years in the same manner. An interbenchmark is organised in June 2022, to be able to provide advice on sole in 7d.
- Sole abundance index (recruits) from the French industry survey have been used in the assessments. The abundances were low compared to previous years.
- Brill will be benchmarked (MSY-SPICT) in 2023 and survey experts are welcomed from areas 4 and 7, especially because brill seems to move towards the English Channel.
- In 2018 a benchmark (CAT 1 stock) and in 2021 an interbenchmark (Tweedie-GAM survey index) for witch flounder took place. Witch flounder assessment in ICES areas 3a, 4, 7d were presented. TAC of witch flounder is combined with lemon sole TAC. There is a limited number of witch flounder age data. Spatial area is North of 55 degrees N. No east-west limits. See section 5.4.2 for further details.
- Plaice benchmark in the North Sea has taken place in spring 2022. Main development is that the BTS survey index is combined with the IBTS Q3 survey index. Recruitment data are not yet used in the assessment.
- Flatfish seems to be smaller at age: WGBEAM will add a term of reference to the new resolution to have a closer look at the development of length (and weight) at age for plaice over all surveyed regions, and also investigate effects of changes in maturation cycle for plaice. See section 5.6.3 for further background.
- Shrimp length in the Belgian DYFS seems to be significantly different from length distributions in Dutch and German DYFS. This may have an ecological background, as the depth range of the Belgian DYFS is different from the other DYFS areas. See section 4.2 and Annex 8.1.2 for more analyses on shrimp catches.
- Possibility to retrace changes made in DATRAS data, recommendation from WGNSSK to WGDG. Survey submitters should be encouraged to fill in correct information in the upload remarks, which will be linked to specific stocks (WGBFAS). It is difficult to retrace changes in the data submitted, a solution should be found to mark (a) changes in vocabulary, (b) major data changes affecting the CPUE calculation (in HH), (c) species specific changes affecting stock assessments (especially addition of CA).

5.4.2 Witch flounder in BTS

WGBEAM chair has contacted stock coordinators of witch flounder for clarification on the IBP-WITCH recommendation that more witch flounder is collected for age reading. The current assessment relies on low numbers of data in the northern and north-western North Sea. Age reading of witch flounder is however not standardised, and difficult. A witch flounder age reading exchange has taken place at SLU Sweden quite some years ago, in which Swedish and Icelandic age readers participated. Based on the difficulties in age reading, and the absence of a clear end-user at that time, The Netherlands has decided to stop collecting otoliths and other biological information of individual witch flounder from 2007 onwards.

(i) Data on witch flounder in BTS

Witch flounder is a flatfish species with a northern and western distribution (Figure 5.1).

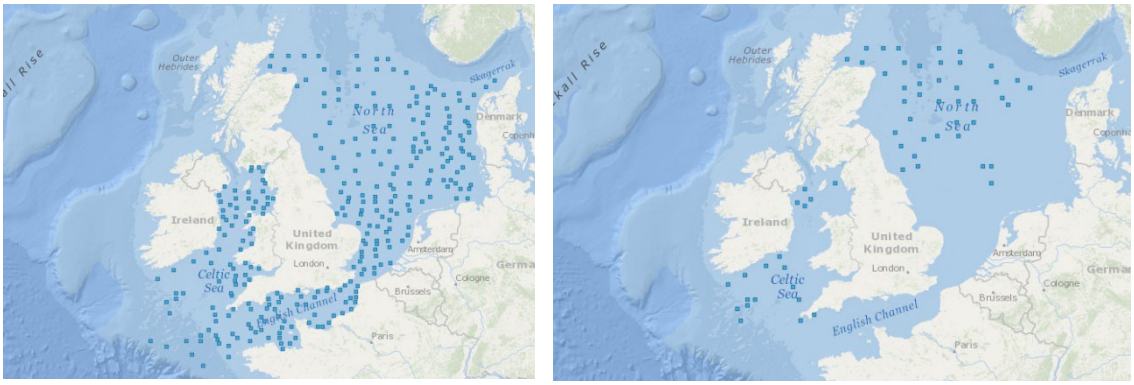

Figure 5.1 BTS coverage in 2021 (left), and statios where witch flounder was caught in 2021 (right) – pictures via https://data.ices.dk/view-map

BTS survey catches in the North Sea north of 55°N, 2017-2021 were looked at in more detail. Witch flounder was caught mainly in the Dutch survey (Table 5.1), in the northernmost statistical rectangles. In 2021, the species was caught in 35 rectangles of the Dutch BTS (bold line in Table 5.1). However, approx. 85% of the witch flounder north of 55°N caught in that survey was collected from 50% of the rectangles where the species was caught. That means that often only low numbers (1-5 fish) occur in a catch.

Table 5.1 Catches of witch flounder in BTS 2017-2021 (from datras.ices.dk on 11th May 2022; product CPUE per length per Hour and Swept Area)

Survey area	Survey	Quarter	Country	Ship	Year	Number of statrec caught in	Number caught per year	Number of hauls caught in
North Sea <55N	BTS	3	NL	64T2	2018	4	8	4
North Sea <55N	BTS	3	NL	64T2	2019	2	12	2
North Sea <55N	BTS	3	NL	64T2	2020	2	84	2
North Sea <55N	BTS	3	NL	64T2	2021	5	12	6

Survey area	Survey	Quarter	Country	Ship	Year	Number of statrec caught in	Number caught per year	Number of hauls caught in
North Sea >=55N	BTS	3	DE	06SL	2017	6	13	8
North Sea >=55N	BTS	3	DE	06SL	2018	5	11	7
North Sea >=55N	BTS	3	DE	06SL	2019	4	7	4
North Sea >=55N	BTS	3	DE	06SL	2020	5	8	5
North Sea >=55N	BTS	3	DE	06SL	2021	4	7	4
North Sea >=55N	BTS	3	NL	64T2	2017	21	333	21
North Sea >=55N	BTS	3	NL	64T2	2018	33	376	33
North Sea >=55N	BTS	3	NL	64T2	2019	30	540	30
North Sea >=55N	BTS	3	NL	64T2	2020	35	393	35
North Sea >=55N	**BTS**	**3**	**NL**	**64T2**	**2021**	**35**	**385**	**35**
Other area	BTS	3	GB	74E9	2017	4	124	8
Other area	BTS	3	GB	74E9	2018	5	150	11
Other area	BTS	3	GB	74E9	2019	8	99	10
Other area	BTS	3	GB	74E9	2021	5	53	7

Length-frequency (numbers per year, Figure 5.2) may vary over time for the smaller fish, but the length range of the fish caught is quite stable: approx. 15-40 cm.

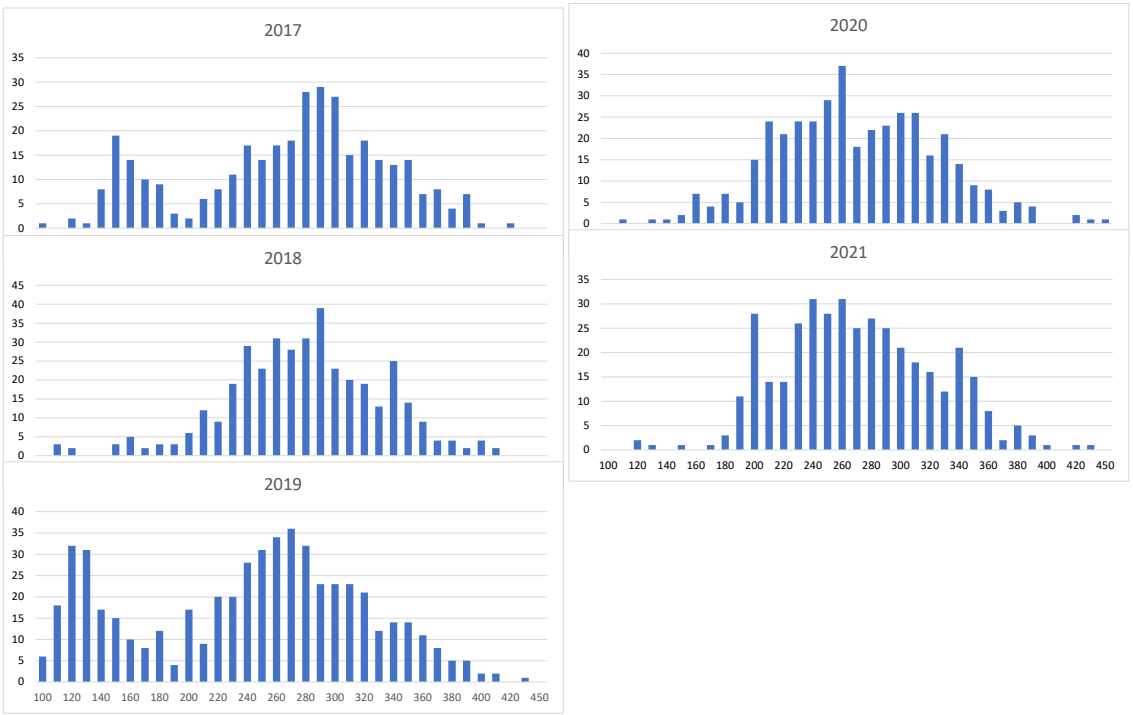

Figure 5.2 Length-frquency of witch flounder in BTS 2017-2021, >= 55°N (from datras.ices.dk on 11th May 2022; product CPUE per length per Hour and Swept Area). x-axis: measured length (mm), y-axis: total numbers per year.

(ii) Age reading of witch flounder

With respect to age reading of the species https://www.ices.dk/sites/pub/Publication%20Reports/Cooperative%20Research%20Report%20(CRR)/CRR%20346.pdf, section 3.3.7 states 'Witch flounder otoliths are best read directly after removal from the fish.', which won't be possible during the surveys. Age reading of witch flounder is, at the moment, exclusively done in Sweden and Iceland.

In Iceland the otoliths are placed in water as soon as they are collected, and stored frozen in water. Subsequently, the age reading is done later in the laboratory at land, with the otoliths just in water. Still then, age reading of this species requires a lot of expertise and is even then, prone to discussion.

In Sweden the otoliths are stored dry, and read after being soaked for 1-2 days before reading. Most otoliths are grinded before reading. The surface tends to get blurry when the otoliths are kept in water for too long and they definitely have to be grinded. Age reading is relatively straightforward up until 5-6 years they but at older ages the rings become narrower and the opaque zone less pronounced.

No official age reading workshop has taken place in the retraceable past, but Icelandic and Swedish age readers have collaborated on age reading of witch flounder.

(iii) Way forward

Although it may be possible to collect biological information including otoliths from witch flounder during BTS, first an age reading exchange has to take place, including a definition on the best methodology to collect, store and read the otoliths. Frozen storage on the long term is not preferred. Next to that, a clear reasoning for the new data collection should be made available by the data end-user, including sampling scheme, including the area for otolith collection, the fish length range, the number of otoliths, and additional biological information to be collected. It should be taken into consideration that BTS as well as IBTS-Q3 take place in the area, and that it is preferred to only collect the number of otoliths really needed for a proper assessment. Apart from the extra workload on board, animal welfare rules are strict in some countries, and exemptions only can be made based on clearly formulated goals and reasons.

5.5 Age exchanges and other workshops

Plaice age exchange (2020) and follow-up workshop (WKARP2 online workshop in December 2021): It was the first workshop on plaice age reading since plaice in Subareas 4.b and 4.c (North Sea) and Subdivision 20 (Skagerrak) are considered as a single-stock unit (ple.27.420) (ICES 2021). Reporting on stock subsets also with respect to different methodologies is difficult. Furthermore, it is difficult to have reports published soon after age workshops. The results of the exchange and workshop are reported to the stock assessors, who were interested in the error matrices (showing variation in age reading), and those can and will be used in the stock assessments. As an outcome of WKARP2, there is now a reference set for plaice available in SmartDots, which can be used for either training or by current age readers to evaluate the quality . Reference sets are going to set up for more species in future (coordination by WGSMART).

During the workshop on plaice the age distributions for DYFS were discussed. Small fish has been taken into account in the workshop, and especially in 0- and 1-year olds from in- and offshore areas a discussion has taken place on the winter ring. This topic will be further investigated as it was not solved in the exchange. BEL collects age data from 5 cm onwards, taking smaller than 15 cm fish back to the lab. NED will start collecting fish from 5 cm onwards. GER is collecting plaice from 10 cm onwards in the offshore survey, will start collecting from 5 cm onwards. It is worth to also think about additional information from those otoliths.

Exchanges or workshops planned in 2022 that may be relevant to WGBEAM:

- Cod (*Gadus morhua*) Otolith exchange from North Sea (Subarea 4), eastern English Channel (7d) and Skagerrak (3a.20) Coordinators: Valerio Visconti (UK) and TBD;
- Sole maturity staging exchange. Area North Sea. Coordinators: Karen Bekaert (Belgium) and Maria Krüger Johnson (Denmark). Postponed from 2021;
- Elasmobranch vertebrae exchange in Mediterranean and Atlantic. Coordinators: Karen Bekaert (Belgium) and Kelig Mahe (France). Postponed from 2021;
- Sole of the stock sol.27.7d is prioritized in connection to coming benchmark but is not yet definitely planned for 2022.

WGBEAM recommends that next to that, an exchange and/or workshop is organised on the maturity staging of lemon sole (*Microstomus kitt*). This summer spawning flatfish species has not been taken into account in previous maturity staging workshops, but is caught frequently in the beam trawl surveys in Q3.

5.6 New data collections and techniques

5.6.1 Stomach data collection from fresh fish

During the Dutch beam trawl survey 2012 fresh stomach sample processing on board was conducted. One person did the sampling and happened as soon as possible after sorting the catch. To reduce animals killed, it is preferred to use fish already used for e.g. otolith collection. Per haul 10 fish were collected, to ensure all fish could be sampled within due time after the catch came in on board. A working document was provided to WGBEAM, for information (Annex 9).

5.6.2 Use of SmartDots

A presentation has been given on the use of SmartDots for age reading on a systematic basis. Belgium and the Netherlands already use it for all age readings. In both countries the SmartDots output format fits directly to the database output, and automatically distances between marked age rings are added to the recorded age. Distances between age rings can be used for age validation as well as for back-calculation to obtain individual size at previous ages. Using SmartDots makes it easier to compare age readings, and to go back to age readings that may be aberrant. The SmartDots tool can also be used for maturity, and eggs and larvae.

This system is also running at ICES. The software itself can be downloaded, but the API should be further developed at the institutional level.

Shifting towards SmartDots age reading takes time to develop the API, making pictures of otoliths of sufficient quality, and to move from physical otoliths to pictures of otoliths. The physical otolith is however still available if there are doubts in the respective age reading via image

5.6.3 Maturation and growth rates of plaice

A term of reference will be added to the next period of WGBEAM, focussing on the changes in maturation and growth of plaice.

(i) Changes in plaice maturation pattern

In the Netherlands the gonad development and spawning cycle of plaice and sole in the North Sea were closer studied. As maturity can only be reliably studied macroscopically in the period directly prior to spawning and during spawning, microscopic maturity staging was used to reliably do year-round observations.

The expected development for both species is that the relative number of vitellogenic oocytes and their diameters increase towards the spawning season, and decline soon afterwards. As a consequence, the relative number of previtellogenic oocytes is expected to increase soon after the end of the spawning season, when the maturation cycle starts again.

The plaice development seems to be aberrant from the expectation, especially in the southern North Sea. Plaice, as a capital winter spawner, is to be expected to build up the number of oocytes and let them evolve gradually towards the spawning season. The relatively high proportion of vitellogenic oocytes found from June till August, followed by the decline and an increase towards December is not in line with the expectation. The decline of the relative number of vitellogenic oocytes is most likely due to spawning activity, as post-ovulatory follicles were encountered in the samples from September to November 2019. Incidental spawning activity in summer for plaice in the southern North Sea is in line with the signals from the North Sea beam trawl survey.

For sole no changes in the maturity pattern were found in this study, despite the signals from market sampling that sole gonads seemed to develop earlier in the season towards spawning than expected. The number of fish analysed in this study are low, due to the time-intensive labour of the histological analyses. Possibly the low number of samples missed any aberrant development in sole. However, analyses of gonadosomatic index and condition index (Fulton's K) development over the year in the time-series from 1996 to 2019 did not show any changes over time. This supports the results of the current study that no changes in gonad maturation are found.

Full report available at https://research.wur.nl/en/publications/gonad-development-in-plaice-pleuronectes-platessa-and-sole-solea-

Maturity will be collected for plaice by Belgium in the offshore survey, because Dutch research showed that plaice is spawning in summer incidentally, especially in the southwestern North Sea. Netherlands and UK already collect plaice maturity information.

(ii) Changes in plaice growth

WGBEAM has analysed the growth of sole and plaice in 2013 and 2014 (ICES 2013; 2015). The main goal of this study was to examine consistency of trends across areas and species, to enable formulation and evaluation of hypotheses on the causal factors underlying trends in length-at-age. Mean length-at-age clearly decreased over the full time span of the surveys for both plaice and sole aged 2 years or older. This was observed in all surveys, except for 2-group plaice in the UK BTS, which is possibly due to the fact that overall catch rates of plaice were relatively low in this survey. One-group fish, both plaice and sole, showed a decline since approximately 2005 (ICES 2015).

This research has however never been published other than in the working group reports. As the survey timeseries has grown since then (improved data availability for historic years as well as new data from recent surveys), and changes in length-at-age lead to issues in the model interpretation in the stock assessments, it is relevant to further study the topic. This should include a methodology for easy evaluation of the data, as the change in length-at-age is not only seen in plaice, but also in other flatfish species.

6 References

Boois, I.J. de, T. Wilkes, E. Blom, E. Koelemij, I. Pennock, J.A.M. Wiegerinck, C. J.G. van Damme. 2021. Gonad development in plaice (*Pleuronectes platessa*) and sole (*Solea solea*) in the North Sea : Histological analysis of samples from 2019 and 2020. https://doi.org/10.18174/562442

ICES. 2013. Report of the Working Group on Beam Trawl Surveys (WGBEAM). ICES Expert Group reports (until 2018). Report. https://doi.org/10.17895/ices.pub.19419476.v1

ICES. 2015. Report of the Working Group on Beam Trawl Surveys (WGBEAM), 6-9 May 2014, Hamburg, Germany. ICES CM 2014/SSGESST:09. 168 pp. https://doi.org/10.17895/ices.pub.19419488.v1

ICES. 2021. Plaice (*Pleuronectes platessa*) in Subarea 4 (North Sea) and Subdivision 20 (Skagerrak). In Report of the ICES Advisory Committee, 2021. ICES Advice 2021, ple.27.420. https://doi.org/10.17895/ices.advice.7819.

Annex 1: List of participants

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Annex 2: Resolutions

2019/FT/EOSG10 A **Working Group on Beam Trawl Surveys** (WGBEAM), chaired by Ingeborg de Boois, the Netherlands, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Planned Venue	Reporting details	Comments (change in Chair, etc.)
Year 1	24-26 March 2020	Online meeting	The first interim report by 30 April 2020 to SCICOM and ACOM	**Incoming Chair:** Ingeborg de Boois Meeting took place online due to COVID-19 restictions
Year 2	22-26 March 2021	Online meeting	The second interim report by 30 April 2021 to SCICOM and ACOM	Meeting took place online due to COVID-19 restictions
Year 3	10, 11 &18 May 2022	Online meeting	Final report by 15 June 2022 to SCICOM and ACOM	Meeting was postponed (10, 11, 18 May) due to Russian-Ukrainian conflict, and due to that, held online

ToR descriptors[1]

ToR	Description	Background	Science plan codes	Duration	Expected Deliverables
a	Evaluate the combined offshore and inshore beam trawl surveys data by region data in a reproduceable manner for the species used in fish stock assessment, including elasmobranchs and brown shrimp. Compare internal and external consistency of indicies age based indices where provided. Document inconsistencies or correct errors or omissions where identified.	Evaluation by region will ensure that patterns in the data (e.g. time-series, cohort strength) are consistent and sampling artefacts including year effects are identified, even when inter survey trends contradict.	3.1, 3.2	annually	(a) Updated, consistent and quality controlled beam trawl survey data are available in DATRAS; (b) R script to evaluate the results by region
b	Evaluate the cross regional offshore beamtrawl data in a reproduceable manner for the overlapping species used in fish stock assessment in multiple regions (e.g. sole, elasmobranch species). Document inconsistencies and correct errors or omissions where relevant.	Evaluation of species that are assessed in multiple regions cross-regionally will provide insight in the commonalities and differences in stock dynamics in different regions.	3.1, 3.2	annually	(a) Updated, consistent and quality controlled beam trawl survey data are available in DATRAS; (b) R script to evaluate the results cross-regionally
c	Evaluate the combined survey results of the offshore and inshore beam trawl surveys by region on consistency,	Evaluation of e.g. species composition and litter registrations will ensure that patterns in the data (e.g. time-	3.1, 3.2	annually	(a) Updated, consistent and quality controlled (e.g. species composition, litter coding, consistent species

[1] Avoid generic terms such as "Discuss" or "Consider". Aim at drafting specific and clear ToR, the delivery of which can be assessed

ToR	Description	Background	Science plan codes	Duration	Expected Deliverables
	including litter data in a reproduceable manner.	series non-commercial species, litter, species composition, length frequencies) are based on correct data and not due to artefacts, even when the signals contradict. By doing this in a reproduceable manner (R script), the focus can be shifted or extended over the years without re-inventing the wheel. Moreover, traceability of analyses increases.			identification in overlapping survey areas) beam trawl survey data are available in DATRAS. (b) R script to evaluate the results by region
d	Coordinate and evaluate the data delivery into the ICES database for offshore and inshore beam trawl surveys of (at least) the last two years and document gaps.	Unaggregated beam trawl survey data are stored in DATRAS up and until the survey of the year previous to the meeting year. Data from the year(s) before that, should be checked for completeness (final data submitted).	3.1	annually	(1) Achievable deadlines for data delivery of the next survey (2) Updated ICES database for inshore and offshore beam trawl surveys.
e	Coordinate and plan inshore and offshore surveys including overlapping tows	Dates, sampling areas and contact details of key persons are shared in order to (a) identify opportunities for tows on the same location, to support the deltaGAM methodology for index calculation in combining different survey gears. (b) coordinate effort in case of unforeseen circumstances hampering one of the surveys, primarily North Sea	3.1	annually	Finalized planning for the inshore and offshore beam trawl surveys, including areas where overlappinig tows may occur.
f	Report on the performance and abnormalities in the inshore and offshore surveys in the past year	For interpretation of the results, information on the performance of the sampling has to be provided to end-users	3.1	annually	Survey summary sheet by region.
g	Review and update the manual for offshore beam trawl surveys (SISP 14)	Review and update the survey manual.	3.1, 3.2	Year 3	Updated BTS manual (SISP 14)
h	Review and update the manual for inshore beam trawl surveys (DYFS, SNS)	Finalize the current draft manual in line with SISP 14 and hand in for review.	3.1, 3.2	Year 2	Manual for inshore beam trawl surveys
i	Provide indices for plaice, sole and if necessary other species if not yet derived directly from DATRAS	Indices are needed for the stock assessments. Especially for the Q1SWECOS survey, North Sea inshore surveys and offshore surveys outside the North Sea where indices	3.1, 3.2	annually	Indices for plaice and sole if needed

ToR Description	Background	Science plan codes	Duration	Expected Deliverables
	are not (always) yet derived from DATRAS directly			

Summary of the Work Plan

Year 1	(1) Compilaton of survey summary sheets (2) Provide tabular overview of survey planning, including geographical areas for overlapping tows (3) Data for all beam trawl surveys (inshore and offshore) including litter uploaded in DATRAS for at least the past two years, as far as DATRAS allows the survey data to be submitted. For datasets where index calculation is done directly from DATRAS, as many years of the time-series should be uploaded as is feasible (4) R scripts for and results from the data evaluation by region as well as across regions (5) First draft of inshore beam trawl survey manual following the outlines of SISP 14 (6) If relevant, updated SISP 14 at sharepoint
Year 2	(1) Compilaton of survey summary sheets (2) Provide tabular overview of survey planning, including geographical areas for overlapping tows (3) Data for all beam trawl surveys (inshore and offshore) including litter uploaded in DATRAS for at least the past two years, as far as DATRAS allows the survey data to be submitted. For datasets where index calculation is done directly from DATRAS, as many years of the time-series should be uploaded as is feasible (4) R scripts for and results from the data evaluation by region as well as across regions (5) Final version of inshore beam trawl survey manual following the outlines of SISP 14 (6) If relevant, updated SISP 14 at sharepoint
Year 3	(1) Compilaton of survey summary sheets (2) Provide tabular overview of survey planning, including geographical areas for overlapping tows (3) Data for all beam trawl surveys (inshore and offshore) including litter uploaded in DATRAS for at least the past two years, as far as DATRAS allows the survey data to be submitted. For datasets where index calculation is done directly from DATRAS, as many years of the time-series should be uploaded as is feasible (4) R scripts for and results from the data evaluation by region as well as across regions (5) If relevant, updated SISP 14 for review and publication

Supporting information

Priority	The scientific surveys coordinated by this Group provide major fishery-independent tuning information for the assessment of several fish stocks in the a number of regions. Consequently, these activities are considered to have a very high priority.
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	The Group is normally attended by about 12 beam trawl survey experts
Secretariat facilities	Report finalization, support ICES Data Centre with respect to DATRAS-related topics
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	The survey data feed into to the assessments of flatfish stocks, brown shrimp and elasmobranch species carried out by various stock assessment EGs. Linked to ACOM through the quality of stock assessments and management advice.

Linkages to other committees or groups	Outcomes of and data supplied by WGBEAM are relevant to WGML and integrated ecosystem assessment groups.
Linkages to other organizations	The offshore beam trawl survey data are used in the large fish indicator (OSPAR).

Annex 3: Recommendations and actions

Annex 3.1 Recommendations

Section number	Recommendation	Receiving group	Added to Recommendations database
1	WGBEAM proposes to add a field to the DATRAS HH format for data submission, called 'SurveyIndexArea', that can be entered by the submitter and will stay as uploaded by the submitter, so the output parameter SurveyIndexArea will not have to be calculated from the trawling position.	ICES Centre, WGDG	Data
4.1	The addition of the option to select specific species in the DATRAS R package (and possibly extension to DATRAS download page) is recommended, in order to facilitate code sharing and parallel use of scripts developed during the working group, and would stimulate use of the most recent data set. Currently the full timeseries for all species have to be loaded in the dataframe and the species selection takes place afterwards (taking up to 1 hour for approx. 20 years). This means that when someone else would like to run the script, or when the person doing the analyses knows changes have been done to the data (maybe even based on the analyses), this will takes another hour.	ICES Centre, WGDG	Data
5.5	It is recommended that an exchange and/or workshop is organised on the maturity staging of lemon sole (*Microstomus kitt*). This summer spawning flatfish species has not been taken into account in previous maturity staging workshops, but is caught frequently in the beam trawl surveys in Q3.	WGBIOP	

Annex 3.2 Actions

Topic	Action	Action by (lead=*Italics*)	Milestone dates
DATRAS checks	Provide shapefiles of SW Irish Sea and DYFS area 400 to DATRAS Team	*Gary (SW Irish Sea), Heleen (DYFS area 400)*	15 July 2022
Data submission: Service-based submission to DATRAS	Contact local IT people and meet up with WMR to discuss the submitter's side of the service-based submission of files to DATRAS	Belgium: *Heleen* UK: *Gary*	15 October 2022
Data submission: Litter data	Provide records for hauls in which no litter was caught to DATRAS	*Kay*	15 July 2022
Data submission: shrimp data	Submit shrimp data from DYFS-BEL for the complete timeseries	Belgium: *Heleen*	15 June 2022
Vocabulary	Internally discuss the option of adding the requested vocabulary in METFP (chemical preservation methods) risking the inconsistency of adding physical preservation methods (e.g.	*Adriana*	15 July 2022

Topic	Action	Action by (lead=*Italics*)	Milestone dates
	freezing, cooking) to vocabulary for chemical preservation methods.		
Vocabulary	Add references to LTPRP and PARAM at https://datras.ices.dk/Data_products/ReportingFormat.aspx	*Adriana*	30 August 2022
Biological data collection	Add maturity data collection for plaice to the Belgian offshore survey protocol	*Heleen*	15 July 2022
Biological data collection	Start collecting plaice otoliths for fish 5-8 cm in DYFS, discuss sampling scheme and potential further use of the data collection	*Ingeborg*, Ulrika, Holger, Heleen, Louise	30 June 2022
Biological data collection	Follow-up on IBPWITCH recommendation	*Ingeborg*	15 October 2022
Collaboration with end-users	Invite survey data end-users as well as industry survey representatives to WGBEAM 2023	*Ingeborg*, new chair	15 January 2023
Collaboration with end-users	Inform WGEF chair about interest of Heleen and Ingeborg to participate in elasmobranch data preparation workshop prior to benchmark	*Ingeborg*	30 May 2022
DATRAS submission	Prepare DATRAS for submission of Icelandic beam trawl survey data. NB this also depends on the Icelandic data policy.	*Magnús*, Vaishav	March 2023
Survey manual	Finalise manual for offshore beam trawl surveys	*Ingeborg*	30 May 2022
Survey manual	Send in formal resolution for the manual on inshore beam trawl surveys	*Ulrika*	30 May 2022
Survey manual	Create final draft of manual on inshore beam trawl surveys	*Ulrika*	15 June 2022
Survey manual	Transfer the final draft (SISP format) manual on inshore beam trawl surveys to TIMES format	*Ingeborg*	15 August 2022
Survey manual	Finalise manual on inshore beam trawl surveys	*Ulrika*, Heleen, Holger	30 September 2022

Annex 4: Deadlines for data delivery to DATRAS

The deadlines for beam trawl survey data delivery to DATRAS are based on a realistic timeline where data for all species that are relevant for stock assessment can be delivered at the same moment. That is different from to the current situation, where, under high pressure, plaice and sole data for the offshore beam trawl surveys in the North Sea, mainly targeting older flatfish, are made available for the update assessment in autumn. Recruit information comes from the inshore surveys (SNS, DYFS) that are still running when the update assessment is carried out. The distributional range of the younger age classes (0-2) ranges for both plaice and sole is only properly covered by the combination of the DYFS, SNS, BTS, NS-IBTS.

Annex 4.1 Deadlines for data delivery to DATRAS of the offshore beam trawl surveys in 2022.

Country	Area	End date survey	DATRAS survey code	Deadline DATRAS delivery	Deadline DATRAS litter delivery
Belgium	western-southern North Sea	mid September	BTS	Incomplete: 5th December[2] Complete: 1st March	1st March
Germany	German Bight	mid September	BTS	Complete: 5th December	1st March
Netherlands	North Sea	mid September	BTS	Incomplete: 5th December [3] Complete: 1st March	1st March
UK	English Channel / Celtic Sea	mid April	BTS	Incomplete: 5th August [4] Complete: 1st December	1st December
UK	7d, 4c	end July	BTS	Incomplete: 5th December [5] Complete: 1st March	1st March
UK	7fg, 7a	mid September	BTS	Incomplete: 5th December [6] Complete: 1st March	1st March
Italy/ Slovenia	Northern Adriatic Sea (GSA 17)	mid December	BTS-GSA17	Complete: 1st June	No litter data delivery
France	8a, 8b	mid December	BTS-VIII	Complete: 1st April	No litter data delivery
Iceland	Entire coast of Iceland	end July	No code	Complete: 1st April (currently no delivery to DATRAS)	No litter data delivery

[2] file includes complete HH information, HL information for fish species, CA information for commercial flatfish species (brill, dab, flounder, lemon sole, plaice, sole, turbot)
[3] file includes complete HH and HL information; CA information available for commercial flatfish species (brill, dab, flounder, lemon sole, plaice, sole, turbot)
[4] file includes complete HH and HL information; CA information available for commercial flatfish species (brill, lemon sole, plaice, sole, turbot, megrim)
[5] file includes complete HH and HL information; CA information available for commercial flatfish species (brill, lemon sole, plaice, sole, turbot)
[6] file includes complete HH and HL information; CA information available for commercial flatfish species (brill, lemon sole, plaice, sole, turbot)

Annex 4.2 Deadlines for data delivery to DATRAS of the inshore beam trawl surveys in 2021.

COUNTRY	AREA	END DATE SURVEY	DATRAS SURVEY CODE	DEADLINE DATRAS DELIVERY
Belgium	Belgian coastal zone	end September	DYFS	Complete: 1st February
Germany	German Bight and German Wadden Sea. Coastal Area outside the island chain	mid October	DYFS	Complete: 1st February
Netherlands (DYFS)	Scheldt estuary, Dutch Wadden Sea, Dutch coastal zone and German Bight	end October	DYFS	Complete: 1st February
Netherlands (SNS)	Dutch coastal zone	end September	SNS	Complete: 1st February

Annex 4.3 Overview of open (green) and closed (grey marked with X) periods for resubmission of beam trawl survey data to DATRAS.

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Greater North Sea				X	X	X						
7d				X	X	X						
7a, fg				X	X	X						
Bay of Biscay					X	X						
Adriatic Sea						X					X	X
Icelandic Sea				X	X	X						

Annex 5: Survey summary sheets 2021

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
Beam Trawl Survey (BTS), Belgium	South-western North Sea	1985	WGBEAM beam trawl survey manual	**WGNSSK:** *Pleuronectes platessa* (ple.27.420), indices by age group, age 1-10+; *Solea solea* (sol.27.4), indices by age group, age 1-9+ **WGEF**: elasmobranch species, CPUE per species per haul	Unaggregated data: (2004-2021) http://datras.ices.dk Area based age information from 2004-2009. Haul based age information from 2010-2021. Density plots per species: ICES DataPortal	The Belgian BTS was carried out from 23 Aug to 2 Sept 2021 with RV Celtic Explorer as the RV Belgica was taken out of service and the new RV Belgica was not ready in time for the survey. Two stations were cancelled due to timing and the presence of commercial fishing activities on the fishing track. Due to bad weather, the presence of large amounts of *Alcyonidium digitatum* or *Sabellaria sp.* and the presence of ships at anchor, some hauls were shortened to 15 minutes. Sampling design remained the same as last year. Conclusion: 60 out of a total of 62 planned stations were	**Fish species:** all species **Fish length**: all species, elasmobranch by sex **Fish weight:** sample weight per species, elasmobranch by sex **Fish biological data:** individual weight, length, sex, yearclass for plaice, sole, cod, turbot, brill, dab and lemon sole. Maturity data for summer spawner lemon sole. **Benthos:** all species, numbers and total weight per species per haul. Length measurements for *Sepia sp., Loligo vulgaris,*and *Loligo forbesii*. Carapax width measurements for

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
						successfully fished and declared valid. This is within the margin of 90% of the plan to be achieved imposed by the European Commission (DG Mare).	*Cancer pagurus* (by sex), carapax length measurement for *Nephrops norvegicus* (by sex) and *Homarus gammarus* (by sex). Only presence absence for Anthozoa, Bryozoa, Hydrozoa and Porifera. **Marine litter:** all hauls **CTD:** continuous tow profile **Other:** /
Beam Trawl Survey (BTS), Germany	German Bight (North Sea)	1991	WGBEAM beam trawl survey manual	**WGNSSK:** Limanda limanda (dab.27.3a4), Pleuronectes platessa (ple.27.420), Solea solea (sol.27.4), indices by age group, age 1-10+ **WGEF:** elasmobranch species, CPUE per species per haul	Unaggregated data (fish, benthos, litter): datras.ices.dk Density plots per species: ICES DataPortal	The survey started one day late due to COVID-19 testing and was carried out as planned. A total of 63 valid stations were fished (approx. 31.5 hours fishing time). Due to COVID-19 restrictions (only 5 scientific members on board) marine litter could not be collected at all stations.	**Fish species:** all species **Fish length**: all species; dab, plaice, elasmobranch by sex. **Fish weight:** sample weight per species, elasmobranch by sex **Fish biological data:** individual weight, length, sex, yearclass for dab, plaice, sole **Benthos:** all species, numbers and

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
							total weight per species per haul. Cephalopods, edible crab, *Nephrops norvegicus* length measurements. Marine litter: all trawls **CTD:** vertical profile planned for all hauls **Other:** -
Beam Trawl Survey (BTS), Netherlands	Southern and Eastern North Sea	1985	WGBEAM beam trawl survey manual	**WGNSSK:** Limanda limanda (dab.27.3a4), Pleuronectes platessa (ple.27.420), Scophthalmus maximus (tur.27.4), Scophthalmus rhombus (bll.27.3a47de), Solea solea (sol.27.4), indices by age group, age 1-10+ **WGEF:** CPUE per species per haul	Unaggregated data (fish, benthos, litter): datras.ices.dk Density plots per species: ICES DataPortal Hydrographic data: ocean.ices.dk	Most stations have been fished, 71 in total, 2 invalid hauls. Some hauls in the south-eastern North Sea were dominated by bryozoan *Electra pilosa*. Tow durations have been shortened to max. 15 minutes in those areas to still be able to process the catch properly. Strong 2018 year-classes for plaice visible in index as 3 year olds in whole survey area, strong 2018 yearclasssole visible as 3 year olds in the	**Fish species:** all species Fish length: all species, elasmobranch by sex. **Fish weight:** no sample weight per species till 2017, elasmobranchs by sex. **Fish biological data:** individual weight, length, sex, yearclass for plaice, sole, dab, lemon sole, turbot, brill, long rough dab, flounder, cod. Maturity data for summer spawners such as lemon sole. **Benthos**: all species, numbers.

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
						south-eastern North Sea.	Cephalopods, edible crab, *Nephrops norvegicus* length measurements. Marine litter: all trawls **CTD:** vertical profile planned for all hauls, but not always managed due to technical issues and weather conditions. **Other:** -
Beam Trawl Survey (BTS), Netherlands	Central and Western North Sea	1998	WGBEAM beam trawl survey manual	**WGNSSK:** *Limanda limanda* (dab.27.3a4), *Pleuronectes platessa* (ple.27.420), *Scophthalmus maximus* (tur.27.4), *Scophthalmus rhombus* (bll.27.3a47de), *Solea solea* (sol.27.4), indices by age group, age 1-10+ **WGEF:** elasmobranch species, CPUE per species per haul	Unaggregated data (fish, benthos, litter): datras.ices.dk Density plots per species: ICES DataPortal Hydrographic data: ocean.ices.dk	Survey conducted as planned. All planned stations have been fished, 73 in total, 1 invalid haul. Strong 2018 year-classes for plaice visible in index as 3 year olds in whole survey area.	**Fish species:** all species **Fish length:** all species, elasmobranch by sex. **Fish weight:** sample weight per species, elasmobranchs by sex. **Fish biological data:** individual weight, length, sex, yearclass for plaice, sole, dab, lemon sole, turbot, brill, long rough dab, flounder, scaldfish, solenette, thickback sole, cod, hake. Maturity data

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
							for summer spawners such as lemon sole and thickback sole. **Benthos:** all species, numbers and total weight per species per haul. Commercial cephalopods, edible crab, *Nephrops norvegicus* length measurements. Marine litter: all trawls **CTD:** vertical profile planned for all hauls, but not always managed due to technical issues and weather conditions. **Other:** selection of box corer samples for pulse trawling research for NIOZ PhD.
Western Channel Beam Trawl Survey, VIIe, 1st quarter	Western English and Celtic Sea	2006	WGBEAM beam trawl survey manual	**WGCSE** Sole 7e Plaice 7e **WGEF** Cuckoo ray 6 7 8abd	Unaggregated data: Cefas Density plots per species: Cefas	Survey undertaken between 6 Mar to 4 Apr 2021. A Total of 78, out of 81 planned tows, in the western Channel survey area were successfully	**Fish species:** all species **Fish length:** all species. Elasmobrach species, four-spot

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
(SWECOS), England				Spotted ray 7ae-h Undulate ray 7de Smooth hound Nea Lesser-spotted dogfish 7a-ce-j Greater-spotted dogfish 6 7 Blonde ray 7e Small-eyed ray 7de Thornback ray 7e Category 6 stocks Common skate 6 7a-ce-k		fished. The locations not worked were in stratum 10 (1 station missed) and stratum 12 (2 stations missed), which were due to major gear damage and loss encountered within those strata. One extra station was completed in stratum 4 on the English coast. An unscheduled return to port for ~6 days, meant that it was only possible to complete 28 out of 50 planned tows in the Celtic Sea part of the survey. The stations left were either UK waters or the French EEZ and were mostly concentrated in the Bristol Channel and outer waters. It was not possible for further survey days be allocated later in the calendar year.	megrim, megrim, plaice by sex. **Fish weight:** sample weight by species and sex for all elasmobrach species, four-spot megrim, megrim, plaice. **Fish biological data:** Individual weight, length, sex and maturity for all elasmobranch species, and conger eel, (cod), (haddock), (whiting), ling, hake, (monkfish), John dory, all species of gurnard, seabass, red mullet, four-spot megrim, (megrim), (turbot), (brill), witch, (lemon sole), (plaice), (sole). Ages determined for those species

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
							highlighted by brackets. **Benthos:** all species, numbers and total weight per species quantified for beam trawl with blinder. Additional observations made for beam trawl without blinder captured against catch for beam trawl with blinder. Length measurements collected for cephalopods and commercial shellfish. Sentinel and non-native species weighed and counted for both beam trawls. Marine litter: all trawls **CTD:** average surface and bottom temperatures and salinities collected for each tow.

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
							Other: zoo-plankton (ring net), phyto-plankton (plankton image analyser), epibenthos (2m beam trawl), infauna, PSA (grab), seabed images (drop camera), environmental data (ESM2), acoustic data, water samples for caesium & tritium analysis, opportunistic tagging of species of elasmobranch.
Beam Trawl Survey (BTS), England	Eastern English Channel and Southern North Sea	1988	WGBEAM beam trawl survey manual	**WGNSSK** Plaice 4 SD20 Plaice 7d Sole 7d **WGEFlonde** ray 4c 7d Cuckoo ray 3 4 Spotted ray 3 4 7d Thornback ray 3 4 7d Undulate ray 7de Smooth-hound Nea	Unaggregated data: datras.ices.dk Density plots per species: ICES DataPortal	Survey completed between 2 to 15 July 2021 without major incident. A total of 61 valid stations were sampled in the English Channel. Four stations were invalid, 2 of which (prime 65, 95) were successfully repeated, whereas prime stations 21 and 76 were not after	**Fish species:** all species **Fish length:** all species. Elasmobrach species, plaice by sex. **Fish weight:** sample weight by species and sex for all

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
				Lesser-spotted dogfish 3a 4 7d		damage to the beam trawl occurred. One further station (prime 68), could not be fished due to the presence of static gear and the tow duration for a number was reduced from the nominal 30 min due to either historic large catches or the presence of static gear. One additional station was fished to trail an unfished ICES rectangle. 15 valid stations were completed in the North Sea with one being invalid (prime 104) on the first attempt, and one station was reduced to 20 min due to the presence of a cable. A further 5 additional stations were fished off the Belgium coast.	elasmobrach species, plaice. **Fish biological data:** Individual weight, length, sex and maturity for all elasmobranch species, and conger eel, (cod), (whiting), ling, (monkfish), John dory, all species of gurnard, (seabass), red mullet, (turbot), (brill), dab (lemon sole), flounder, (plaice), (sole). Ages determined for those species highlighted by brackets. **Benthos:** all species. Numbers and total weight per species at a selected number of pre-selected stations. If not, species observed only. Sentinel and

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
							non-native species weighed and counted. Length measurements collected for cephalopods and commercial shellfish. Marine litter: all trawls **CTD:** average surface and bottom temperatures and salinities collected for each tow. **Other**: environmental data (ESM2), collection of water samples for nutrient analysis, opportunistic tagging of species of elasmobranch.
ISBCBTS (September) (ISBCTS), England	Irish Sea and Bristol Channel	1988	WGBEAM beam trawl survey manual	**WGCSE** Plaice 7a Sole 7a Sole 7fg Plaice 7fg **WGEF** Thornback ray 7afg Small-eyed ray 7fg	Unaggregated data: datras.ices.dk Density plots per species: http://ecosystemdata.ices.dk/map/	The survey was completed between 7 Sept and 1 Oct 2021 without major incident. Valid samples were obtained for all of the 108 stations targeted. For 4 of these stations (primes 14, 40, 53, 137) it was	**Fish species:** all species **Fish length:** all species. Elasmobrach species, plaice by sex. **Fish weight:** sample weight by species and sex

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
				Spotted ray 7ae-h Cuckoo ray 6 7 8abd Smooth-hound Nea Lesser-spotted dogfish 7a-ce-j Greater-spotted dogfish 6 7 Category 5 stocks Blonde ray 7afg		not possible to collect valid samples on the first attempt due either to the presence of static gear or damage to the net. As usual for the survey the duration for some of the tows was reduced from the nominal 30 min due to either a history of large catches or the presence of static gear.	for all elasmobrach species, plaice. **Fish biological data:** individual weight, length, sex and maturity for all elasmobranch species, and conger eel, (cod), (haddock), (whiting), ling, hake, (monkfish), John dory, all species of gurnard, seabass, red mullet, (turbot), (brill), dab (lemon sole), (plaice), (sole). Ages determined for those species highlighted by brackets. **Benthos:** all species. Numbers and total weight per species at a selected number of pre-selected stations. If not, species observed

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
							only. Sentinel and non-native species weighed and counted. Length measurements collected for cephalopods and commercial shellfish. **Marine litter:** all trawls CTD: average surface and bottom temperatures and salinities collected for each tow. **Other:** environmental data (ESM2), collection of surface water samples for analysis of tritium and water samples to determine alkalinity, opportunistic tagging of species of elasmobranch.
Beam Trawl Survey, France	Bay of Biscay	2007	WGBEAM beam trawl survey manual	**WGBIE** : Sole 8ab	Unaggregated data: datras.ices.dk http://datras.ices.dk	47 hauls were carried out during 2021 survey. 1 reference station was not sampled because of bad weather conditions.	**Fish species:** all species **Fish length:** all species, meagre, monkfish, red

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
						Main issue in 2021 : Three hauls of the 47 reference stations were invalidated because of a damage trawl. However, after fixing the trawl, the three invalid stations were sampled.	mullet, seabass, sole and elasmobrach species by sex. **Fish weight:** sample weight by species. **Fish biological data:** maturity, sex, otoliths for meagre, red mullet, seabass and sole. Illicium for monksfish. **Benthos:** Numbers and total weight per species **Marine litter:** all trawls. **CTD:** bottom temperatures collected for each tow (end).
Beam Trawl Survey, Iceland	Waters around Iceland	2016	WGBEAM beam trawl survey manual	**NWWG:** Used for local assessments for *Limanda limanda* and *Microstomus kitt* since 2016 and for *Pleuronectes platessa* since 2020	Upon request	The survey was combined with an environmental survey and was completed between the 8th of and 27th of August instead of late august to the ~10th of September. A	**Fish species:** all species **Fish length:** all species **Fish weight:** Individual weight taken for 10 fish at each

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
						total of 73 valid hauls were carried out. Additional 51 shorter hauls for sea cucumbers were conducted for the second time.	station for following species: plaice, dab, lemon sole, halibut, megrim, long rough dab, flounder, witch flounder. At the additional stations for sea cucumber, all sea cucumbers were measured (length, weight, circumference, drained weight), while **Fish biological data:** individual weight, maturity, sex, otoliths for 10 fish at each station for plaice, dab, lemon sole, halibut, megrim, long rough dab, flounder, witch flounder **Benthos:** Crabs, Nephrops, commercially important shrimp and sea cucumber are counted. All benthos identified and weighted for daytime stations until 2020.

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
							Marine litter: all trawls, recorded and weighted **CTD:** continuous during haul; CTD attached to net. **Other:** -
Beam Trawl Survey, Italy-Slovenia-Croatia	North Adriatic Sea (GSA 17)	2005	WGBEAM beam trawl survey manual; SoleMon handbook (available here: https://dcf-italia.cnr.it/web/#/links/linee-guida)	FAO-GFCM-SAC-WGSAD, STECF: *Melicertus kerathurus, Pecten jacobeus, Scophthalmus maximus, Scophthalmus rhombus, Sepia officinalis, Solea solea, Squilla mantis, Bolinus brandaris* Index of Abundance by size and/or age for common sole, spottail mantis shrimp, cuttlefish and Mediterranean scallop.	Unaggregated data: datras.ices.dk for sole	The 2021 survey was carried out from 27/11 to 19/12/2021 with RV G. Dallaporta. 61 hauls (51 Italian + 6 Croatian EEZ + 1 Slovenian + 3 Croatian) were carried out during 2021 survey. Due to bad weather conditions and limited time, 9 Italian hauls and 4 Croatian waters hauls had to be dropped. Main issues in 2021 survey were the overlap of 1) limited ship-time; 2) bad weather conditions (14 working days out of 23 available days); 3) Covid-19 restrictions (only 7 scientific members on board) Also, CTD profiles were not performed in 2021.	**Fish species:** The primary target species is *Solea solea*, with additional species including cuttlefish, Mediterranean scallop, queen scallop, turbot, brill, skates, purple dye murex, spottail mantis shrimp and caramote prawn. **Fish length:** all species **Fish weight**: individual weight for target species, total weight for the other. **Fish biological data:** individual weight, length, sex

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
						Like in 2020, spatial coverage effect on the survey index have to be explored. A tagging experiment on common sole was also started.	and maturity for target species. Length and total weight for other species. **Benthos:** all hauls, more than 250 macro and megabenthos species **Marine litter:** all hauls Temperature and depth data loggers attached to the gears recording bottom parameters during hauls.
Inshore beam trawl survey (DYFS)	Coastal zone Belgium	1971	Inshore beam trawl survey manual in progress	**WGNSSK:** *Pleuronectes platessa* (ple.27.420), *Solea solea* (sol.27.4), combined BEL/GER/NED recruitment index	Unaggregated data (1985 – 2021): http://datras.ices.dk	The Belgian DYFS was carried out from 8-10 and 20-23 Sept 2021 with RV Simon Stevin. The weather did not interfere with the seagoing operations. At 4 stations some technical problems were encountered with the new shrimp sieve. Those stations were sampled again. Conclusion: 33 sampling	**Fish species:** all species (since 2020), before only commercial species. **Fish length:** selected list of commercial species; elasmobranchs by sex **Fish weight:** sample weight per species for species that are measured

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
						stations were completed successfully.	**Fish biological data:** individual weight, length, sex, age for plaice and sole **Benthos:** *Crangon crangon* weight per size fraction (small and large) and length of minimal 250 individuals per haul. Subsample of epi-benthos: numbers and sample weight (since 2020). **Marine litter:** all hauls **CTD:** continuous tow profile **Other:** /
Inshore beam trawl survey (DYFS)	Coastal zone Germany and German Wadden Sea	1972	Inshore beam trawl survey manual in progress	**WGNSSK:** *Pleuronectes platessa* (ple.27.420), *Solea solea* (sol.27.4), combined BEL/GER/NED recruitment index	Unaggregated data (2012–2021): datras.ices.dk	Due to technical problems, the RV Clupea cruise had to be cancelled in 2021. Most of the planned RV Clupea stations in area 405 were realized by a chartered vessel instead. Four stations in the Northern part of area 406 were covered by the RV Mya2.	**Fish species:** all species **Fish length:** all species **Fish weight:** sample of all species **Fish biological data:** individual weight, length, sex, year class for plaice.

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
						Unfortunately, one of the chartered vessels was lost at sea during one of the German DYFS campaigns. The DYFS campaign was terminated after this incident. Therefore, some stations were not realized in 2021. No stations at all were realized in the area 412, River Elbe. In total, 198 stations were completed successfully. Many hauls in the coastal zone were dominated by the bryozoan *Electra pilosa*.	**Benthos:** all species, *Crangon crangon* total weight and length measurements of 250g subsample. **Marine litter:** only on RV Clupea **CTD:** continuous during haul, CTD attached to net. **Other:** Secchi-Depth
Inshore beam trawl survey (DYFS)	Coastal zone Netherlands, Germany, Denmark, Dutch Wadden Sea, Eastern and Western Scheldt	1970	Inshore beam trawl survey manual in progress	**WGNSSK:** *Pleuronectes platessa* (ple.27.420), *Solea solea* (sol.27.4), combined BEL/GER/NED recruitment index	Unaggregated data (1985-2021): datras.ices.dk Density plots per species: ICES DataPortal	Survey coverage in coastal zone as planned (88 valid hauls), except that some "extra" stations were dropped because of time restrictions due to weather. Some hauls in the coastal zone were dominated by bryozoan *Electra pilosa*. Tow durations were shortened to max. 7.5 minutes in	**Fish species:** all species **Fish length:** all species **Fish weight:** no sample weight per species **Fish biological data:** individual weight, length, sex, yearclass for plaice, dab, sole, flounder, turbot, brill. Maturity data only to

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
						those areas to be able to process the catch properly, and a few stations were considered invalid (at one station the net broke because of the large amounts). Survey coverage in the Dutch Wadden Sea (131 valid hauls) and in Eastern and Western Scheldt (71 valid hauls) conducted as planned. Strong 2021 year class for plaice visible in 2021 Dutch DYFS index.	separate between immature and maturing. **Benthos:** all species numbers. *Crangon crangon*, Cephalopods, edible crab length measurements **Marine litter:** no **CTD:** continuous during haul, CTD attached to net. **Other:** additional hauls conducted for national programmes.
Sole net survey (SNS)	Dutch EEZ and southern German Bight	1969	Inshore beam trawl survey manual in progress	**WGNSSK:** *Pleuronectes platessa* (ple.27.420), *Solea solea* (sol.27.4), indices by age group age 1-4+	Unaggregated data (1985-2021): datras.ices.dk Density plots per species: ICES DataPortal	In total 41 valid hauls were collected (median=50 1995-2021). A number of stations had to be dropped due to weather, technical problems and other issues. Spatial coverage was maintained, so limited effect on the survey indices is to be expected. However, some hauls in the coastal zone were dominated by	**Fish length:** all species **Fish weight:** no sample weight per species **Fish biological data:** individual weight, length, sex, yearclass for plaice, dab, sole, flounder, turbot, brill. Maturity data only to separate between immature and maturing.

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
						bryozoan *Electra pilosa*. Tow duration was shortened to max. 7.5 minutes in those areas to be able to process the catch properly. Strong 2021 year class for plaice visible in 2021 SNS index.	**Benthos:** all species numbers. Cephalopods, edible crab length measurements. **Marine litter:** no **CTD:** continuous during haul, CTD attached to net. Other: -
Industry survey, The Netherlands	Southern North Sea	2019	Schematic: https://edepot.wur.nl/545556 (in Dutch) Report: 544588 (wur.nl)	Not yet, but after 5 years to benchmark related to WGNSSK: *Scophthalmus maximus* (tur.27.4), *Scophthalmus rhombus* (bll.27.3a47de)	Unaggregated data (2019-2021): datras.ices.dk; due to the sampling methodology only HH and CA records; length-frequency can be based on the individual length measurements, as all fish has been individually measured and weighed.	Area fully covered as planned. Some hauls were dominated by bryozoan *Electra pilosa,* leading to dangerous situations as the nets could only be hauled in with difficulty. Tow duration on a number of stations has therefore been shortened. It is unclear to what extent this affects the catchability. A discussion will take place on the consequences for the validity of 2021 trawl hauls, and area coverage in future surveys.	**Fish length:** turbot and brill **Fish weight:** individual weights per fish **Fish biological data:** individual weight, length, sex, yearclass for turbot, brill. Maturity data only to separate between immature and maturing. **Benthos:** no **Marine litter:** no **CTD:** no **Other:** -
							Fish species: all species **Fish length:** all commercial species, sole,

Survey, country	Area coverage	Running since	Methodology described in	Information to assessment WG	Data availability	Comments on 2021 survey	Data collected
Industry Beam Trawl Survey, France	Bay of Somme	1978	No information	**WGBIE :** Sole 7d, Plaice 7d, Dab 7d	No information	50 hauls were carried out during 2021 survey.	plaice, dab and elasmobrach species by sex. **Fish weight:** sample weight by species. **Fish biological data:** maturity, sex, otoliths for sole, plaice and dab. **Benthos:** Numbers and total weight per species **Marine litter:** all trawls. **CTD:** bottom temperatures collected for each tow.

Annex 6: Survey planning 2022

a. Timing of the offshore beam trawl surveys in 2022.

Country	Vessel	Area	Dates	Gear	Contact
Belgium	Belgica	western-southern North Sea	24 Aug – 02 Sept 2022	4 m beam	heleen.raat@ilvo.vlaanderen.be; lies.vansteenbrugge@ilvo.vlaanderen.be; Cc: els.torreele@ilvo.vlaanderen.be
France	Côtes de la Manche	8a, 8b	03 Nov – 30 Nov 2022	4 m beam	jean.baptiste.lecomte@ifremer.fr yann.coupeau@ifremer.fr
Germany	Solea	German Bight	22 Aug – 09 Sept 2022	7 m beam	kay.panten@thuenen.de
Iceland	Bjarni Saemundsson	Entire coast of Iceland	10 Aug – 28 Aug 2022	4 m beam	magnus.thorlacius@hafogvatn.is
Italy/ Slovenia	G. Dallaporta	Northern Adriatic Sea (GSA 17)	21 Nov – 18 Dec 2022	2x 3.5m modified beam	giuseppe.scarcella@cnr.it
Netherlands	Tridens	southern North Sea, German Bight	1–19 Aug 2022	2x 8 m beam	ingeborg.deboois@wur.nl Cc: betty.vanos@wur.nl
Netherlands	Tridens	central and western North Sea	22 Aug–16 Sep 2022	2x 8 m beam + flip-up rope	ingeborg.deboois@wur.nl Cc:
UK	Cefas Endeavour	English Channel /Celtic Sea	5 – 31 Mar 2022	4 m beam	ian.holmes@cefas.co.uk
UK	Cefas Endeavour	7d, 4c	12 – 25 Jul 2022	4 m beam	joanne.smith@cefas.co.uk Cc: ian.holmes@cefas.co.uk
UK	Cefas Endeavour	7fg, 7a	2 – 21 Sept 2022	4 m beam	stephen.shaw@cefas.co.uk Cc: ian.holmes@cefas.co.uk

b. Timing of the inshore beam trawl surveys in 2022.

Country	Vessel	Area	Dates	Gear	Contact
Belgium (DYFS)	**Simon Stevin**	**Belgian coastal zone**	**12-21 Sep 2022**	**6 m shrimp trawl**	heleen.raat@ilvo.vlaanderen.be; lies.vansteenbrugge@ilvo.vlaanderen.be; Cc: els.torreele@ilvo.vlaanderen.be
Germany	Chartered vessels	German Wadden Sea areas	26 Aug – 16 Oct 2022	3 m shrimp trawl	**holger.haslob@thuenen.de**
Germany	RV Clupea	German coastal zone	12 Sep – 30 Sep 2022	3 m shrimp trawl	**holger.haslob@thuenen.de**
Netherlands (SNS)	Isis	Dutch coastal zone	6-16 Sep 2022	6 m beam trawl	Maarten.vanhoppe@wur.nl; Cc: ulrika.beier@wur.nl
Netherlands (DYFS)	Luctor	Scheldt estuary	5-23 Sep 2022	3 m shrimp trawl	Andre.dijkman@wur.nl; Cc: ulrika.beier@wur.nl
Netherlands (DYFS)	Stern	Dutch Wadden Sea	29 Aug – 30 Sep 2022	3 m shrimp trawl	Marcel.devries@wur.nl; Cc: ulrika.beier@wur.nl
Netherlands (DYFS)	Isis	Dutch coastal zone and German Bight	19 Sep– 21 Oct 2022	6 m shrimp trawl	Thomas.pasterkamp@wur.nl; Cc: ulrika.beier@wur.nl
UK (YFS)		Thames estuary	July 2022	tbd	Louise.strakercos@cefas.co.uk

c. Timing of the industry beam trawl surveys in 2022.

Country	Vessel	Area	Dates	Gear	Contact
Netherlands	Industry survey on Turbot and Brill	southern North Sea	Oct 2022	Commercial beam trawl	Edward.schram@wur.nl
UK	Industry survey	7e (western English Channel)	Aug – Sept 2022		gary.burt@cefas.co.uk
France	Industry survey	Dieppe to Authie Bay	22-26 Aug 2022	3 m beam trawl	Victor.Martin.Baillet@ifremer.fr

Annex 7: Survey indices

Annex 7.1 Offshore surveys

Sole

North Sea – Subarea 4

The combined sole BTS delta-GAM index was calculated by the North Sea sole stock coordinator (Annex 7.1.1: Figure A7.1.1.1). The combined index confirms the strong 1-age group in 2019 and the following drop in 2020. The 2021 1-age group index value is on a similar low level as observed for the previous year. While the 2-group index in 2020 was the highest value observed for the 2-group in the 2000s, it has sharply dropped in 2021, confirming the weak 2020 1-group. The strong 2019 1-group can be followed to the 2021 3-age group with an increasing trend. However, all age groups older than 3 show a declining trend compared to the previous year apart from the 10-group. Overall, the combined index largely averages the trends between the single surveys as expected. Nevertheless, before 1993, where only Dutch survey was present, for the older ages (7-8-9) some higher values were predicted in the GAM model respect the single survey index.

The indices for sole from different surveys in area 4 stocks are summarized in Figure A7.1.1.2 – A7.1.1.4.

Time-series trends for sole in the south-eastern North Sea and the German Bight, based on the Netherlands BTS-I (previously Isis) offshore survey indicate that recent year classes have been mainly poor with the 1-group below the long-term arithmetic mean for the years (2012–2021) except for 2019. In fact, the 1-group observed in 2019 was the second highest observed value of the time-series and can be found with a good consistency in 2020 2-group index (second highest observed for the 2-group). The low observed 1-group index value in 2020 resulted also in a low 2-group value in 2021. The 3-group index was observed above the long-term mean in 2021, while the 4-group index was again below the average. In 2021 the 5+-group index was below the long-term arithmetic mean and lower compared to the 2020 index value.

Time-series trends for sole in the Southern North Sea (4c), based on the UK offshore survey show that number of 1-group is highly variable, and numbers of one-year olds were below the long-term mean from 2012–2014. Since then, observed 1-group values increased and in 2017, the highest 1-group survey index was observed for the whole time-series. The strong 2017 cohort is well trackable in the survey indices and formed the second highest observed index value for age 2 in 2018, and the third highest of age 3 in 2019. However, in 2018 the value for the 1-group was well below the average again. Similar to the Dutch survey index, a strong 1-group in 2019, led to the highest recorded 2-group value in 2020 survey. This cohort is still visible in the 2021 3-group index value, which is the highest in the whole time-series for this age group. The number of older fish (4+ group) fluctuated around the long-term arithmetic mean for the last 10 years, and was below in 2021.

Time-series trends for sole in the Southern North Sea (4c), based on the Belgian offshore survey show variations in 1-group, with high observed values in 2015, 2017 and also in 2019. In 2021 the value is on the average of the long-term mean. The 2017 cohort is tracked good by this survey until 2021, where an above average age 5 was observed. The strong 2019 1-group is also tracked good in 2020 2-group and 2021 3-group index. The observed age 2 value in 2020 was the highest recorded in this time-series and reflects the strong 1-group observed in 2019. This is similar to the UK survey which has a strong geographical overlap with the Belgian survey. The strong 2013

age 3 cohort is visible until 2015 where a strong age 5 was observed. However, age 5 for the years 2016 – 2020 was observed below the average mean, with the 2021 value being again above the average. For age group 6+ a decreasing trend was observed from 2016 until 2018. A slight increase was observed for 2019 and in 2020 the 6+ index value was above the average. The 2021 6+ group value is again below the average.

Western Waters - Subareas 7 and 8

The indices for sole from area 7 stocks are summarized in Annex 7.1.1, Figures A 7.1.1.5-A 7.1.1.8.

Division 7d

Figure A7.1.1.5 shows the sole indices for the UK survey in the eastern Channel. The relative abundances for the ages 1–3 have been quite variable over time, what can often be attributed to strong 1-group recruitments that can be followed through from one year to the next. In fact, the observed 1-group value in 2019 was the highest in the time series followed by one of the lowest observed 1-group values for 2020. The strong 2019 cohort is reflected by one of the highest observed 2-group in 2020, and the highest observed 3-group in 2021. However, the weak 2020 1-group is not necessarily reflected by a similar weak 2-group in 2021, which is still below the long-term average. The 4+-group was above the long-term average for the last nine years now, with an increase in 2021 compared to the previous year.

Division 7efg

The UK quarter 1 survey indices (Figure A7.1.1.10) show some strong 1-age group index values in the time period 2014 – 2017, but for the majority of years it seems that this survey is not able to catch age group 1 sufficiently. Only the strong 1-group in 2014 is clearly reflected by a strong 2-group in 2015. The above average 2-group from 2018 – 2020 are in line with above average 3-group in 2019 – 2021. However, the 2021 2-age group value is clearly below the long-term average. Age group 4 and 5+ do not show any clear trends over the whole time series, but for both the index values are above the long-term average for the recent 4 years, except age group 5+ in 2020. The 2021 index value for age group 5+ is clearly above the average and the highest observed in the time series. In general, it seems that this survey is not able to track sole cohorts well.

The 7e UK industrial survey (Figure A7.1.1.11) seems not to be able to catch the age 1-group sufficiently, which might be due to a larger mesh size used by commercial vessels. The index displays an increasing trend for the 2-group since 2014, with above average values since 2018 and the highest value observed in 2020. The index value for the 2- group in 2021 dropped sharply below the average again and is the lowest observed in the time series. The strong age 2 year class observed in 2020 is not reflected by a strong age 3 in 2021, which is below the long-term average. The age groups 3 and 5+ do not show any clear trend, but for age group 4 and 5+ above average index values are more often observed from 2012 onwards.

Figure A7.1.1.6 shows the sole indices for the UK survey in the Bristol Channel (7f). Except a very large cohort observed in 1999, 1-group recruitments have been quite stable across the whole time series, fluctuating around the long-term average. In 2021, the 1-group is above average following a recruitment below average in 2020. The 2-group is below average in 2021, and shows a declining trend since 2019. For the past four years, the 3-group also showed a declining trend from the highest observed value for this age group in 2018 to a below average value in 2021. The 4+-group was rather stable over the time series and was above the long-term average for the last seven years now with a general increase since 2014. The survey has been able to track the last strong 1-group recruitments in 2017 very well through its existence.

Division 7a

Figure A7.1.1.7 shows the sole indices for the UK survey in the Irish Sea. Sole in 7a has in recent years been of concern to managers due to low SSB values. The most recent survey trends indicate that following the strong decrease in sole abundance at age 1 until 2013 is starting to reverse with higher recruitment rates being observed since then. In 2019, the 1-group is well above average as well as the 2-group, 3-group and 4+-group. The survey index seems to be able to pick up the long-term population dynamic trends well and demonstrates internal consistency. For example, the strong 1-group recruitments arrival in 2015 is well tracked to the 4+-group by this survey. In 2020, there was no survey. However, the strong 1-age group in 2019 resulted in a strong 3-age group in 2021, one of the highest values recorded in the time-series. The 4+-group index value in 2021 is on average. However, unlike other sole stocks the recruitment autocorrelation seems quite high and the lack of year-to-year contrast in cohort strengths is likely to make it difficult for an age-based assessment model to distinguish rapid changes in fishing mortality or selectivity.

Division 8 a, b

Figure A7.1.1.8 shows the time series of sole abundance indices for the French survey in the Bay of Biscay. Since 2018, the time series of age group abundances of sole are marked by 1-group recruitments below average. The 1-group recruitments in 2008 is the highest of the time series, which contrasts with a decrease in the inter-annual variability of recruitment in recent years. The 1-group and 2-group show a decreasing trend since 2018, with 2020 and 2021 being the lowest values of the 2-group for the whole time series. The 3-group appears to have been largely stable over the time series. The 4+-group abundance indices indicate a sudden jump from 2011 to 2012 inconsistent with the weakly estimated year class coming in, but the 4+-group remains stable ever since. The observed contrast in cohort strength appears to be smaller than Celtic Sea sole stocks. There is no evidence of a synchrony in recruitment pattern observed between division 7a and 7f. The index suggests little if any change in the rate of mortality over the period for the observed age groups. Full selectivity appears to be reached at age 2.

Northern Adriatic Sea

Figure A7.1.1.9 shows the time-series trends in the indices for the northern Adriatic Sea common sole, based on the SoleMon offshore beam trawl surveys. Age slicing, based on von Bertalanffy parameters coming from 2020 FAO-GFCM Benchmark assessment (*Linf*: 38.1; *k*: 0.29, *t0*: -1.7), was carried out using FSA R script.

The 2021 survey indicates that the 0, 1, 2 and 3 age groups were higher than the long-term arithmetic mean. Differently from 2020, age 4 in 2021 survey has been slightly lower than the level of the long-term arithmetic mean. Ages 5+ stays below the long-term arithmetic mean since 2019. More in general this plus group is quite fluctuating due to the very few specimens that reach these ages. Overall, it is possible to notice a general increasing trend for the ages in the second part on the time series, in particular the high recruitment observed in 2013 can be followed in the succeeding years. Moreover, the 2019 and 2020 seem to be good years for recruitment.

Plaice

North Sea – Subarea 4

The combined plaice BTS deltaGAM index was calculated by the plaice stock coordinator (Figure A7.1.2.1). It has to be noted that this combined index is not directly used in the stock assessment model of North Sea plaice, but is a major part of the combined BTS and NS-IBTS Q3 index. However, the combined BTS index shows the highest numbers for age group 1 in 2019 for the whole time-series, since then it decreased again but the values for 2020 and 2021 are still above the long-

term average. The 2019 1-age group is well traceable and resulted in a strong 2-group in 2020 and a strong 3-group in 2021. This index also shows above average numbers for all age groups for the most recent years, with an increasing trend since the beginning of the 21st century, and a peak of age groups older than 4 between 2014 - 2018. The strong decrease for the 9-group and 10+ group visible in the Dutch index (see below) is not as strong as in the combined index. There are some strong cohorts which can be tracked well (e.g. 1996, 2001, 2003, 2006) through the years (Figure A7.1.2.2).

Figure A7.1.2.3 show trends in the indices for North Sea plaice from the Netherlands offshore survey carried out by Tridens. The survey is split up in two parts: one that covers mainly the southeastern North Sea (BTS-I; previously: Isis), and the other part extends substantially further north and west (BTS-II; previously: Tridens).

The BTS-I survey indicates that recruitment has been below average in most years since the strong 2001 year class became apparent as one year olds in 2002. In 2014, as detected in 2009, 2011 and 2013, the observed number of one year olds was higher than the long-term mean. In 2015, 2016 and 2018 it was again below the average, while it was above the long-term mean in 2017. In 2019, the strong 2018 cohort, which was detected in the inshore surveys, reflects the highest age-1 index value since 1997. This cohort is recognisable as age 2 in 2020 above the average. The 1-group in 2020 decreased to just below the long-term mean, and the 2021 index value for age 1 even further declined. The 2-group index values were below or on average for the time period 1999 – 2011. Since then it fluctuated around the average. For age 3 and older the indices are very similar to the combined index described above, with a general increase since the beginning of the 21st century, levelling of an decreasing somewhat for the most recent years, but still above the average for all age groups.

The BTS-II survey documented eight year classes that were above average from 2007 onwards. This pattern is visible at all ages in this survey, and the cohorts can be tracked well over time. The 2018-year cohort is by far the highest on record, and is well traceable with the strongest 1-, 2-, and 3-groups observed for this time-series. The 2017 cohort was lower than the average, but still resulted in above average 1-group in 2019 and 3-group in 2020. The clear increasing trend in age 4 ended in 2018, and is in general decreasing since then. The 4-group index value for 2021 is the lowest observed for the most recent five years but still on average. The 5+ group showed the highest record of the time-series ever for the 2018 value, but in 2019 and 2020 it decreased. The 2021 5+ group index value increased again. Within the 5+ group, especially the oldest age groups show increasing indices since 2019 again.

The population abundance series for plaice from the UK offshore survey (depicted in Figure A7.1.2.4), confirms the strong incoming 2016 and 2018 cohorts. The observed number of age groups 2 and 3 in 2021 were the highest ever observed in the time-series. The respective age groups 3 and 4 were well above the long-term average.

The plaice abundance time-series for plaice by the Belgian offshore survey are displayed in Figure A7.1.2.5. Age 1 shows variable values fluctuating around the long-term average without trend and above the average in 2020 and 2021. The strong incoming 2018 year class is confirmed in this survey, and results in the highest observed 2-group in 2020 and 3-group in 2021. Age 2 values were observed above or near the average since 2014, but below in 2021. Age 3 was fluctuating without trend around the average, but the strong 2013 cohort is traceable until age group 3. Age 4 values are since 2012 observed above the average with only the 2017 and 2019 values below the average.

The index calculated for the German survey data is presented in Figure A7.1.2.6.. Also this survey confirms the strong 2018 cohort, which is traceable up to age group 3 in 2021. The 2-group shows the two highest observed values in 2018 and 2020. The 3-group show below average

values for the last four years, but a high index value in 2021 confirming the strong 2018 cohort. A decreasing trend for the 4-group is visible from 2016 to 2019, which is also the case for age groups 5 and 7. For these age groups a slight increase in the indices was observed for 2021. For the older age groups (8 to 10+) the 2019 values were the highest in the time-series. Since then, the indices dropped considerably, especially for the 10+ age group.

Western Waters - Subarea 7

The indices for plaice from area 7 stocks are summarized in Figure A7.1.2.7 to A7.1.2.9 in Annex 7.1.2.

Division 7d

Age group 1 has dropped significantly in 2020 and 2021 compared to 2019 when it was the second highest observed of the time series (Figure A7.1.2.7). The abundance at age 1 fluctuates, with strong cohorts of 2010, 2013 and 2018. As a result of some good year classes, the numbers of age 4+ were the highest observed in the time-series for the years 2013-2021. After a decrease for the age-3 and 4+ groups from 2019 to 2020, the 2021 index values were again on record high levels.

Division 7efg

The UK quarter 1 survey indices for plaice (Figure A7.1.2.10) show well above average index values for the 1-group in the early time period of the survey (2006 – 2011). However, since then in most years the survey was not able to catch the 1-group, except from 2014 with the last strong 1-group index value observed. For the 2-group no clear trend is visible, with the index value strongly fluctuating. The above average strong 2020 age 2 is reflected by an above average index value for the 3-age group in 2021. And also the strong 2014 age 2 is traceable to 4+. This group shows above average values since 2011, with record high values in the middle of the time series (2014, 2017).

The UK industrial survey indices for plaice (Figure A7.1.1.11) show below average values since 2015, with zero values for the years 2013, 2018-2020. For some years comparable strong 1-groups were observed, which can partly be tracked through the older age classes. Despite very low 1-groups observed in 2019 and 2020, the following age 2 in 2020 and 2021 are well above the long-term average. However, similar to the sole industrial index, it is questionable whether the UK industrial survey is suitable to observe the 1-age group sufficiently. For age 3, the index values were below the long-term average from 2017 – 2020, but in 2021 the highest value in the time series was observed. This is in line with the above average 2-group index value in 2020. While all index values for the age 4+ were below the average from 2003 – 2012, a peak was observed in 2014. Since then it was in general decreasing with below average value in 2020. The 2021 index value for the 4-group is again above the average.

Division 7f

For plaice the survey index is highly informative on long-term stock dynamic trends but estimates of individual cohort abundance are not necessarily tracked that well in all but the smallest and largest cohorts. Some age-based models may confuse these signals with rapid selectivity changes in the fleet. Particularly age 1 abundance seems to be affected by this which may be linked to variable rates of unintended fishing mortality in the area.

The relative abundance at age 1 increased considerably for plaice in the Bristol Channel in 2013, reaching a value similar to what was observed in 2010 and 2011 (Figure A7.1.2.8). This trend continued in 2014 and resulted in the highest record for age group one in the time-series observed so far. However, in 2015-2018 and 2020 the lowest values ever were recorded interrupted in 2019 by a stronger year class, but still below the long-term mean (1995-2021). A slight increase was observed for the 2021 age 1 group. The strong year class 2010 can be tracked over the years, and produced time-series peaks of 3 in 2013 and 4+ year olds in 2014. The numbers in the 4+

group were high from 2015 to 2018 and decreased since 2019, but are still above average. In earlier years of this time series, abundance peaks of age 1 fish could not always be tracked over the following years as well as in recent years.

Division 7a

Figure A7.1.2.9 shows the plaice indices for the UK survey in the Irish Sea. No survey was conducted in 2020. The age 1 abundance of plaice in the Irish Sea has been variable but generally increasing until reaching the maximum in 2014. Since then recruitment appears to have decreased persistently with some very low abundances being recorded in the last 5 years. Also 2021 values are below average. For age 2 – 4+ the picture is optimistic with these ages all increasing over the time-series with the strongest contrast observed in the oldest age. The apparent decrease in recruitment (after age 1 in 2014) feeds through well in recent years, indicating that it should be possible for assessment models to distinguish the population dynamic trends of decreasing recruitment and mortality well despite the inter annual variability in the index.

In contrast to the 7a sole stock the plaice stock seems to be in a very healthy condition, although the reduction in recent recruitment indicates that it is unlikely that the recent period of high productivity may not be maintained. A change in productivity might be indicative of some changes to the ecosystem relevant to plaice reproduction and that historic levels of catches applied to the current stock would require further analysis to ensure that they would remain sustainable.

Icelandic Sea – Subarea 5a

Figure A7.1.2.12 shows the time-series trends in the indices for Iceland Sea plaice based on the off-shore beam trawl surveys carried out along the entire coast of Iceland. Due to the recent establishment of the survey, plaice time-series is quite short. Moreover, the 2016 survey must be considered different from the other years, as it was a smaller pilot study (31 tows conducted vs 70-80 later), which focused on the main nursery areas of plaice. For this reason, some important differences in abundance can be highlighted between 2016 survey and the others, especially for the younger age groups (1-4). The 2021 survey indices show similar values as the previous years for age groups 1-4. The values for age groups 5-8 are, however, substantially higher than in 2020. For ages 10 and over the index is much lower than all previous years. The 2019 survey indicated that almost all the age groups (except for age 9) were lower than the long-term arithmetic mean, most likely due to it being conducted earlier in summer than in the other years.

Annex 7.1.1 Figures and tables offshore indices sole

North Sea – Subarea 4

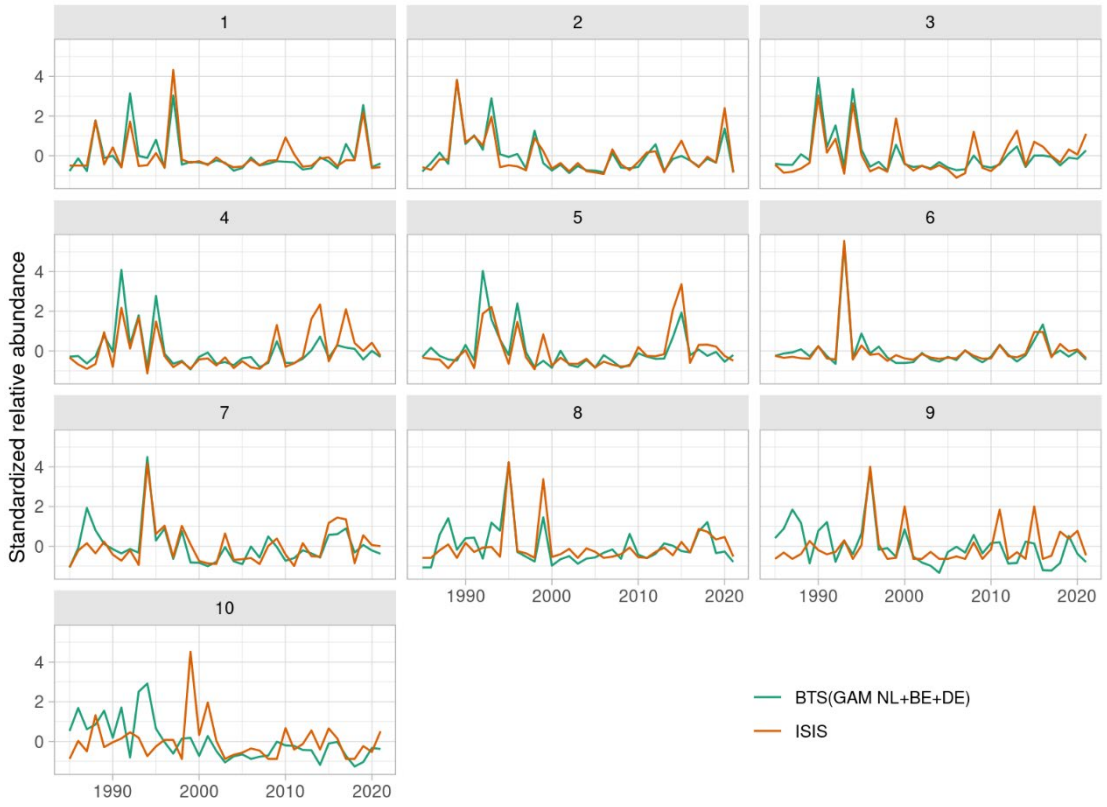

Figure A7.1.1.1 Combined sole BTS deltaGAM index North Sea, ages 1-10, combining NL 1985-2020, DE 1993-2020, BE 2004-2020 beam trawl survey data 57.5 N (blue), and Dutch sole BTS Isis index (red).

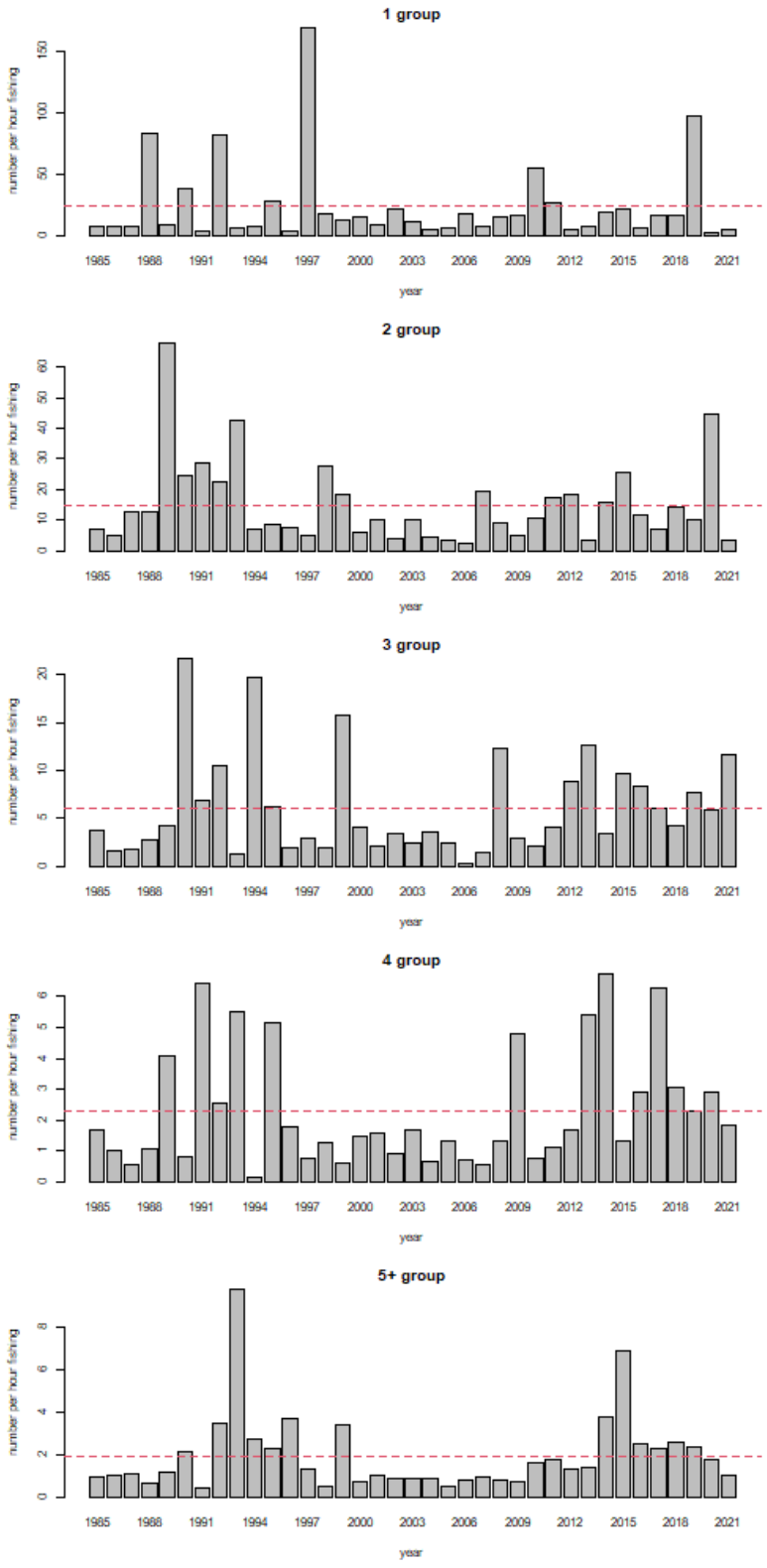

Figure A7.1.1.2 Sole indices Dutch offshore survey in south-eastern North Sea and German Bight, ages 1-4 and 5+

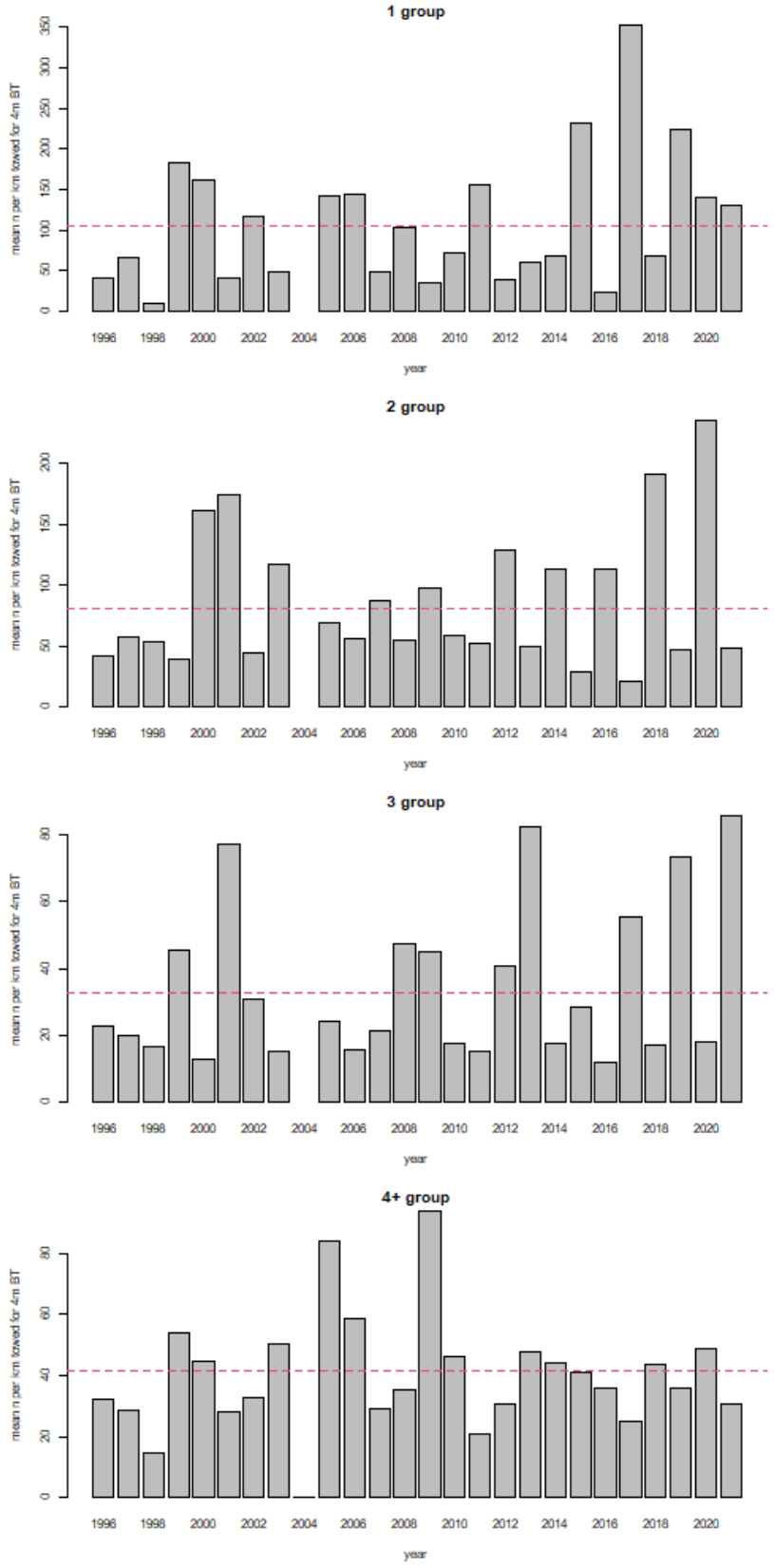

Figure A7.1.1.3 Sole indices UK survey in south-eastern North Sea, ages 1-3 and 4+

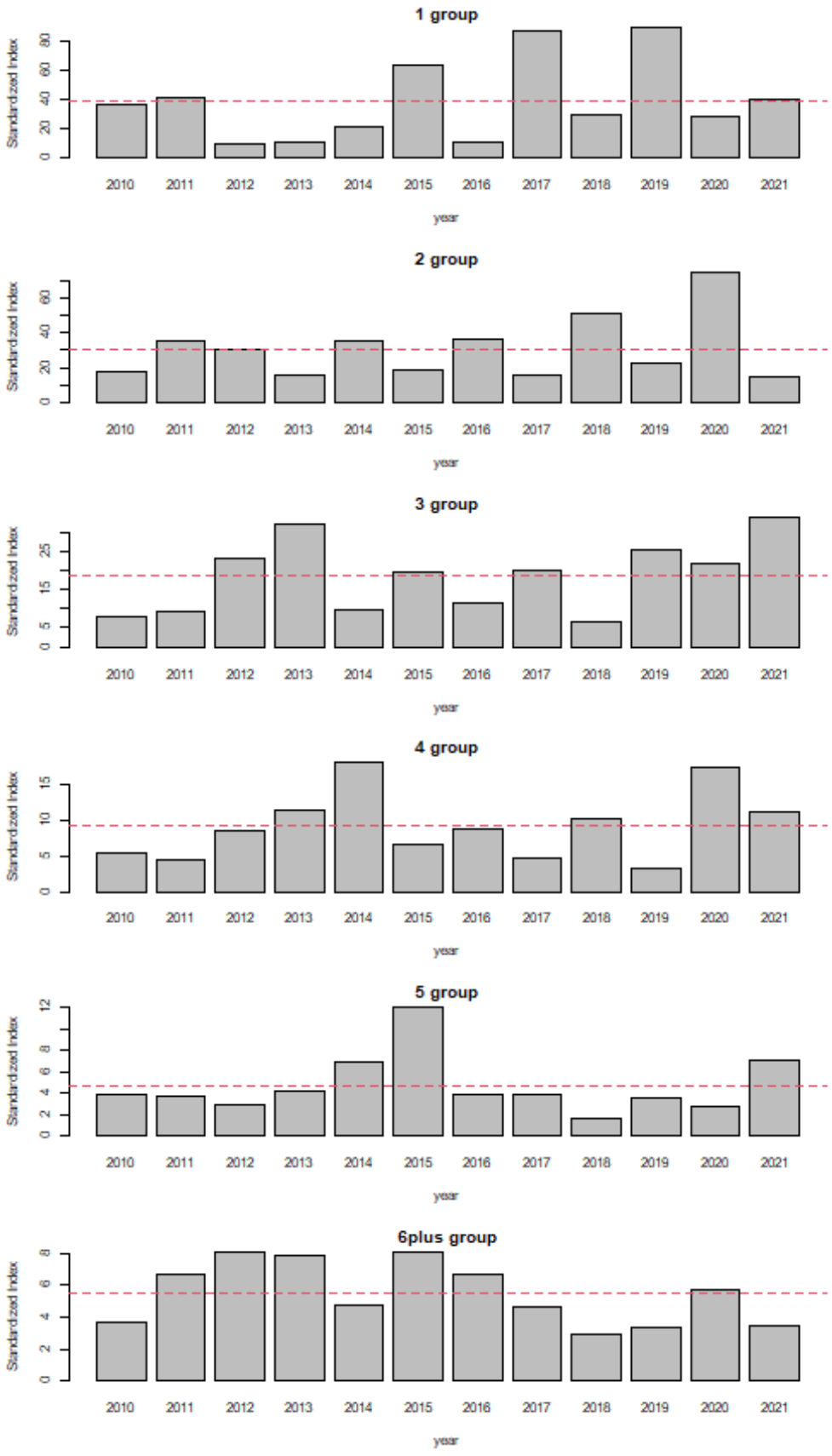

Figure A7.1.1.4 Sole indices Belgian survey in southwestern North Sea, ages 1-5 and 6+

Western Waters - Subarea 7 and 8

Division 7d

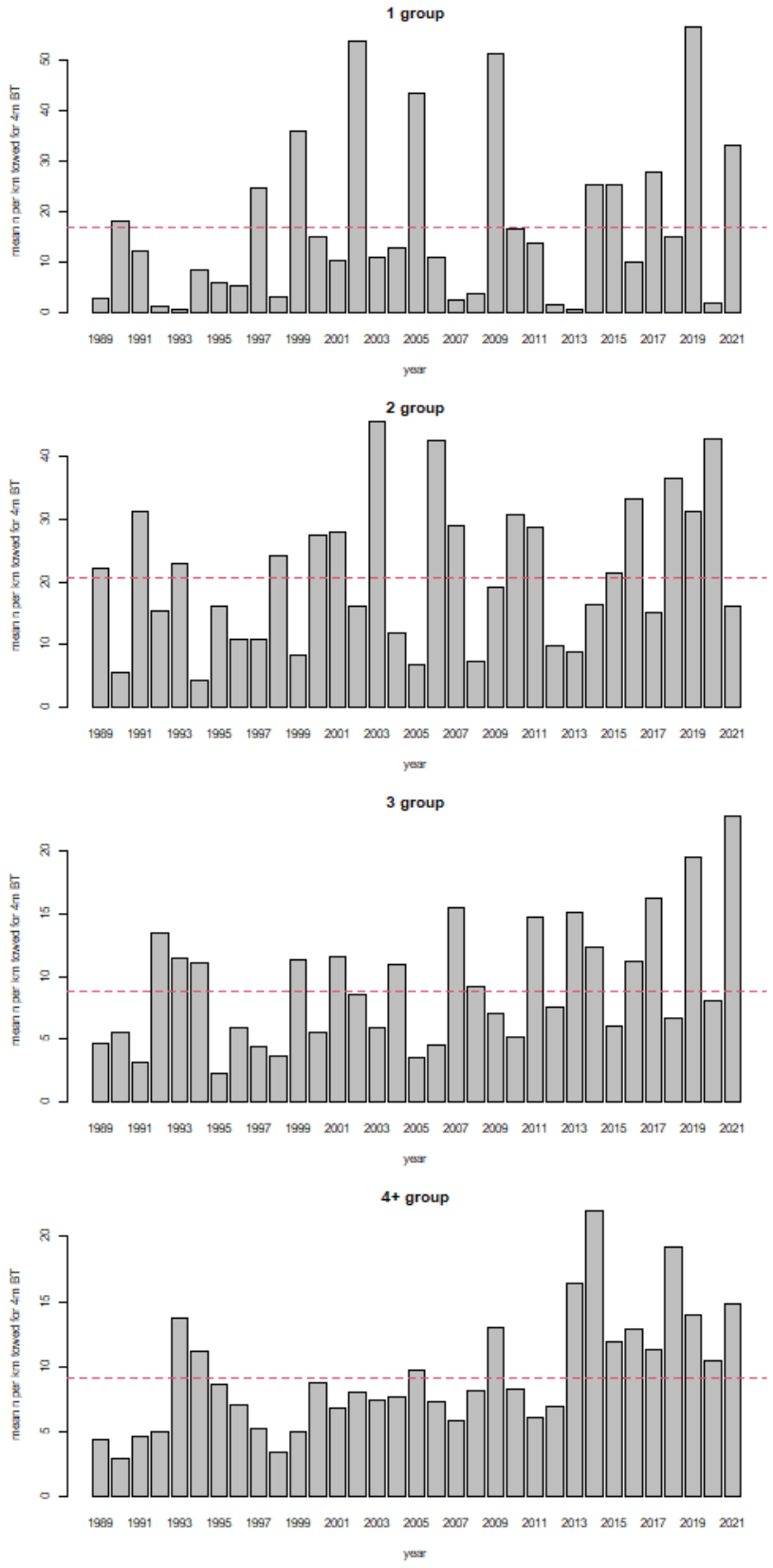

Figure A7.1.1.5 Sole indices UK survey in the eastern Channel, ages 1-3 and 4+

Division 7f

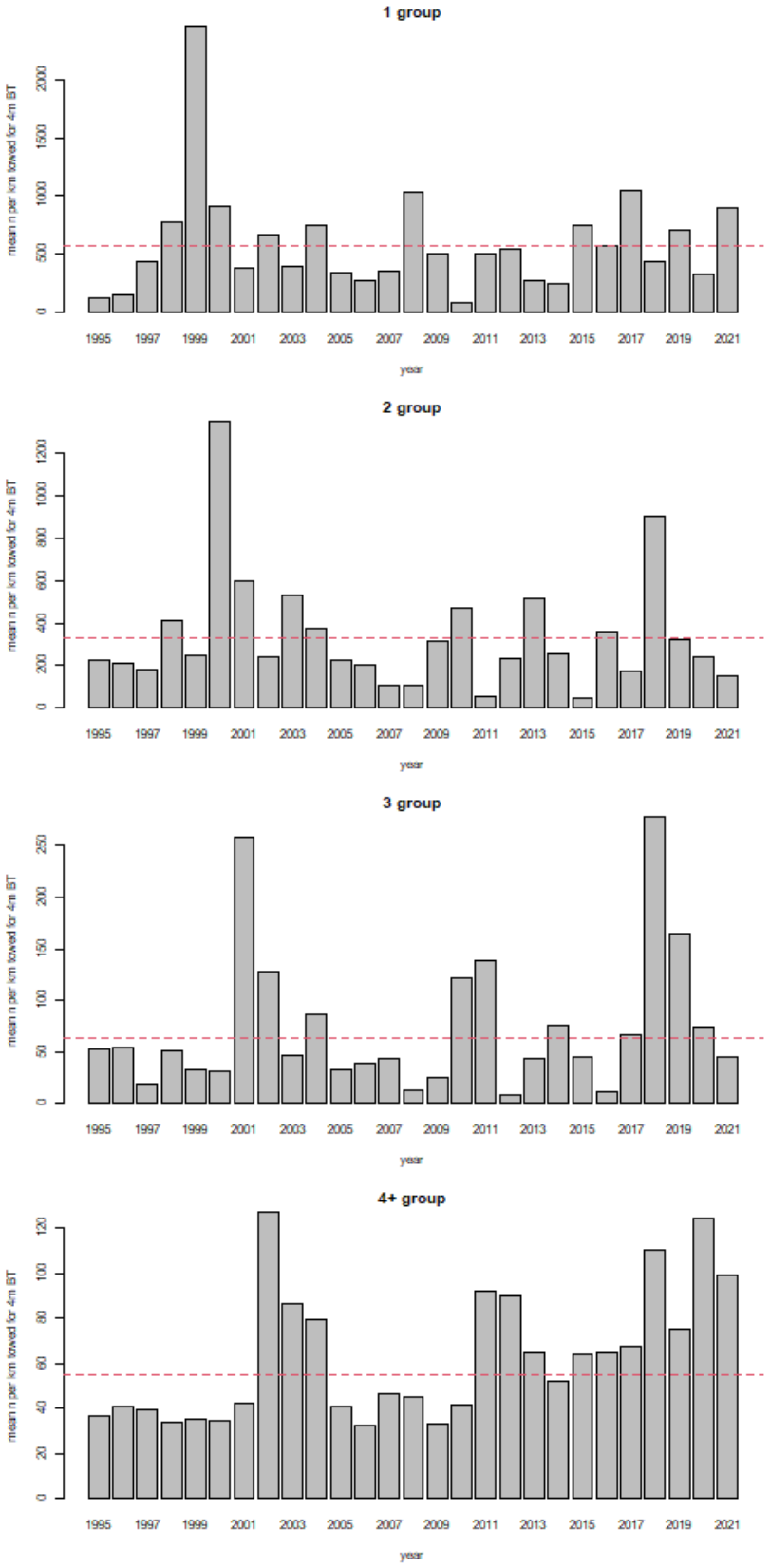

Figure A7.1.1.6 Sole indices UK survey in the Bristol Channel, ages 1-3 and 4+ (Limited spatial coverage for 2020 survey)

Division 7a

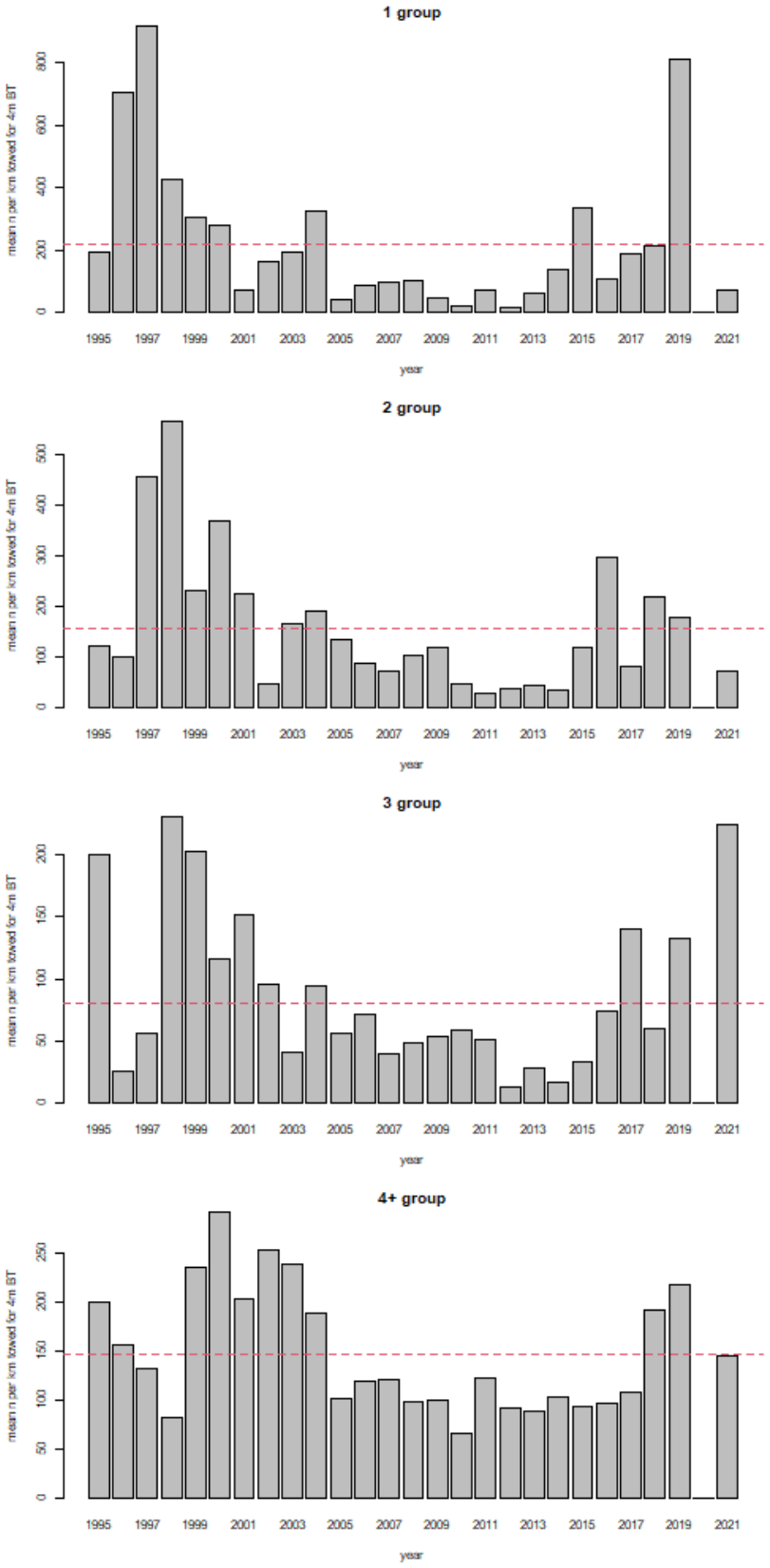

Figure A7.1.1.7 Sole indices UK survey in the Irish Sea, ages 1-3 and 4+ (No survey in 2020)

Division 8 a,b

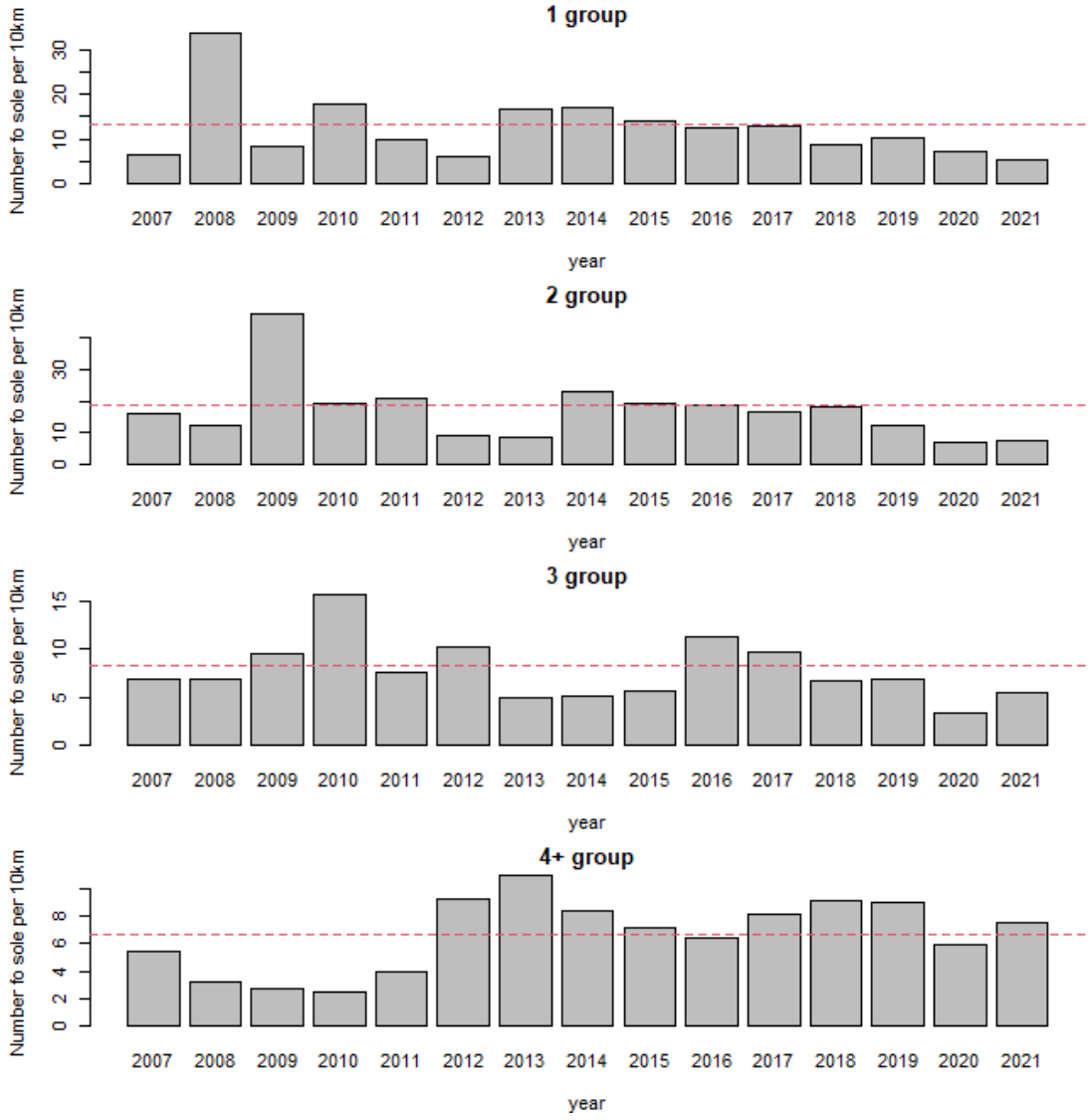

Figure A7.1.1.8 Common sole indices French survey in Bay of Biscay (ICES area 8), ages 1-3, 4+

Northern Adriatic Sea

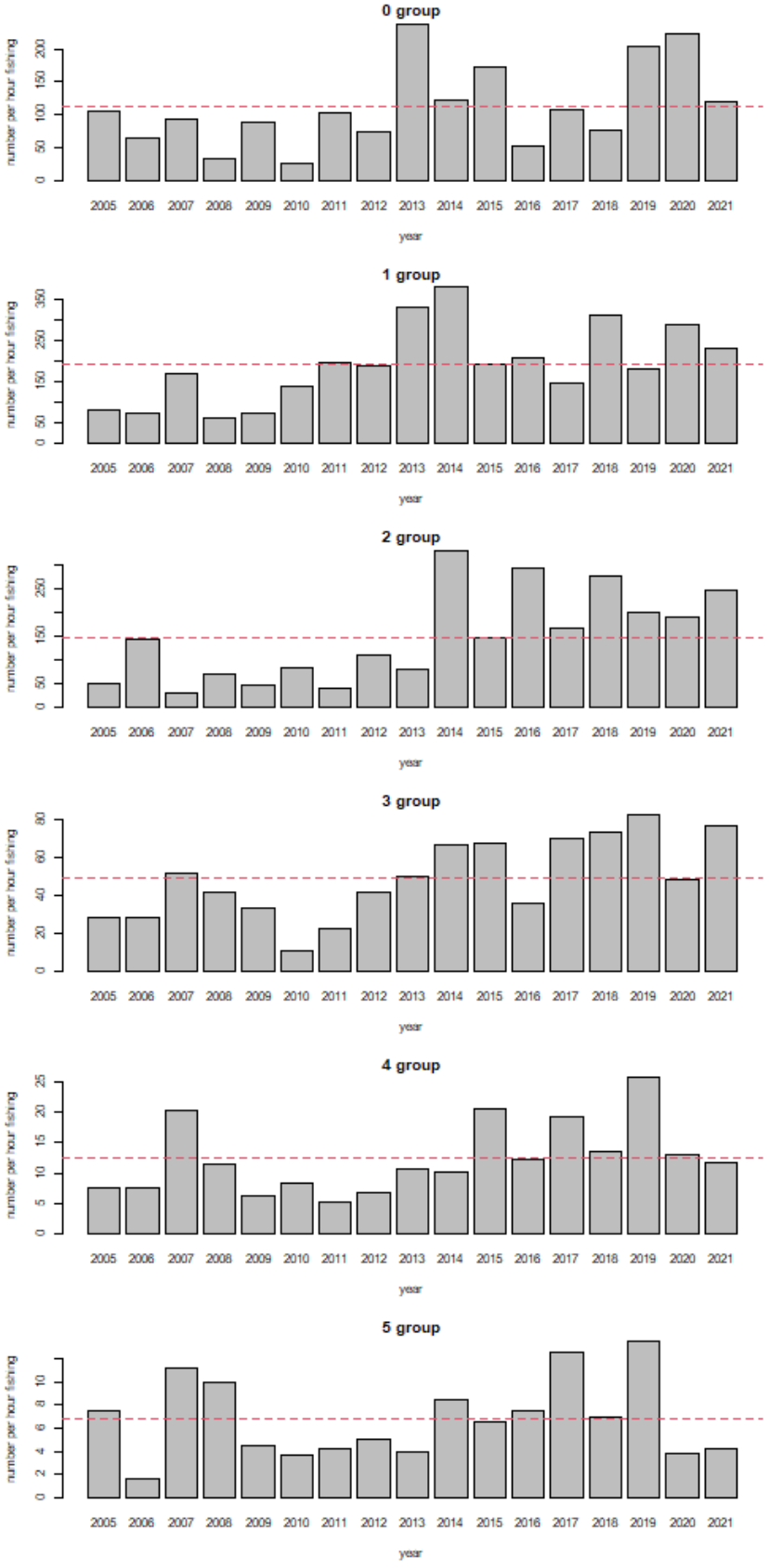

Figure A7.1.1.9 Common sole indices Adriatic survey in Adriatic Sea (BTS-GSA17), ages 0-5

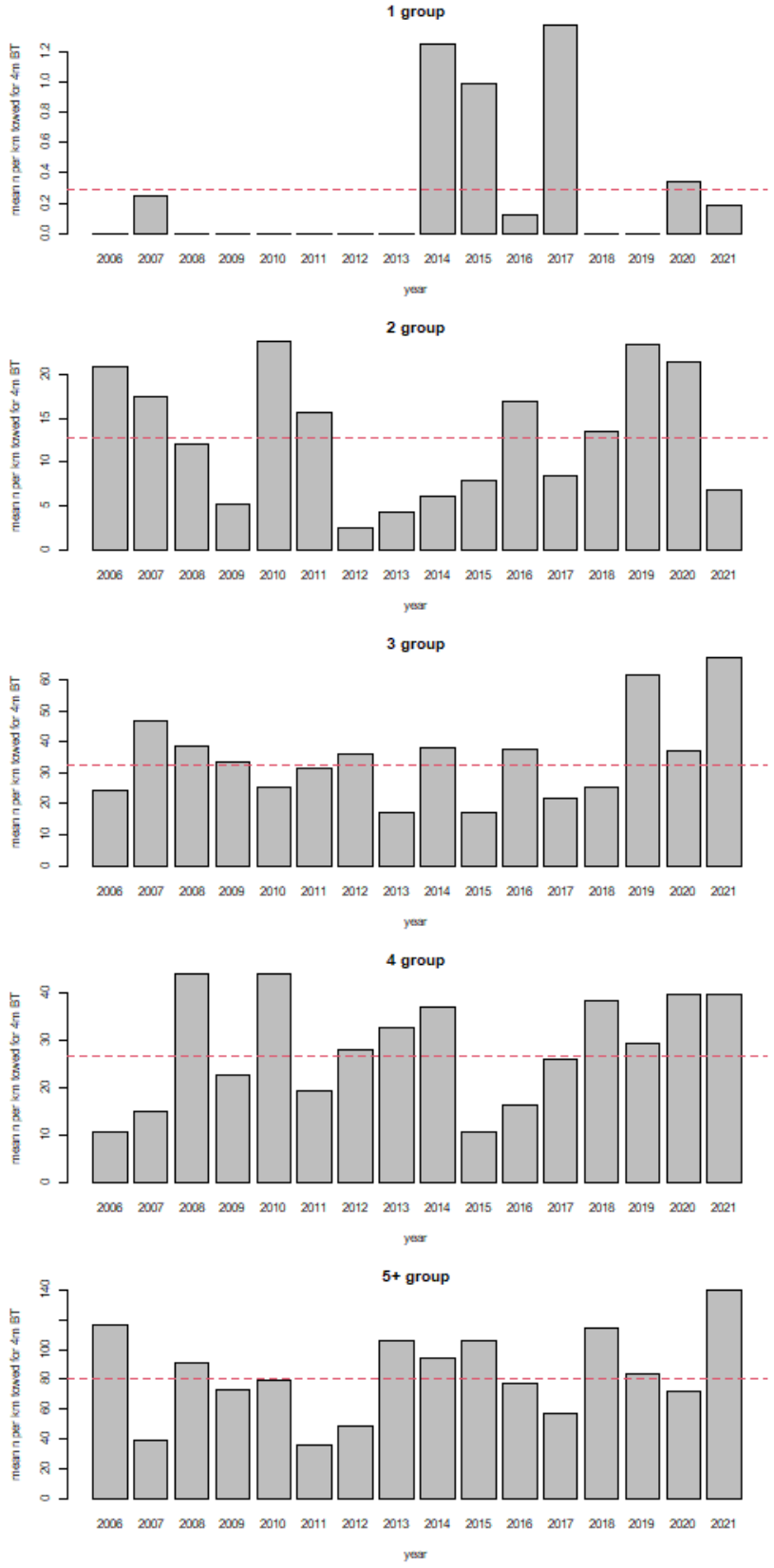

Figure A7.1.1.10 Common sole UK quarter 1 indices, ages 1-4 and 5+

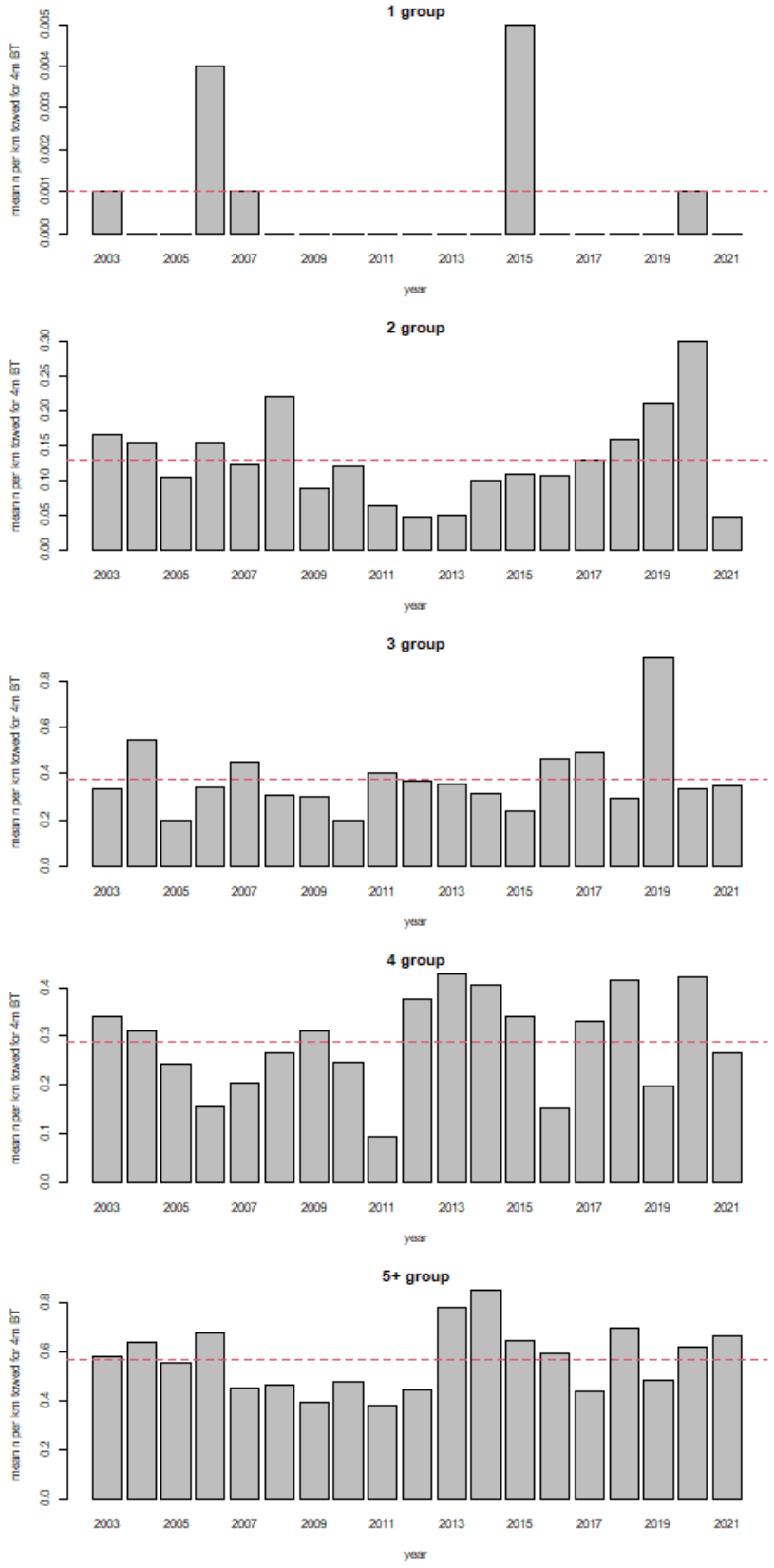

Figure A7.1.1.11 Common sole UK indices from the industrial survey, ages 1-4, and 5+

Annex 7.1.2 Figures and tables offshore indices plaice

North Sea – Subarea 4

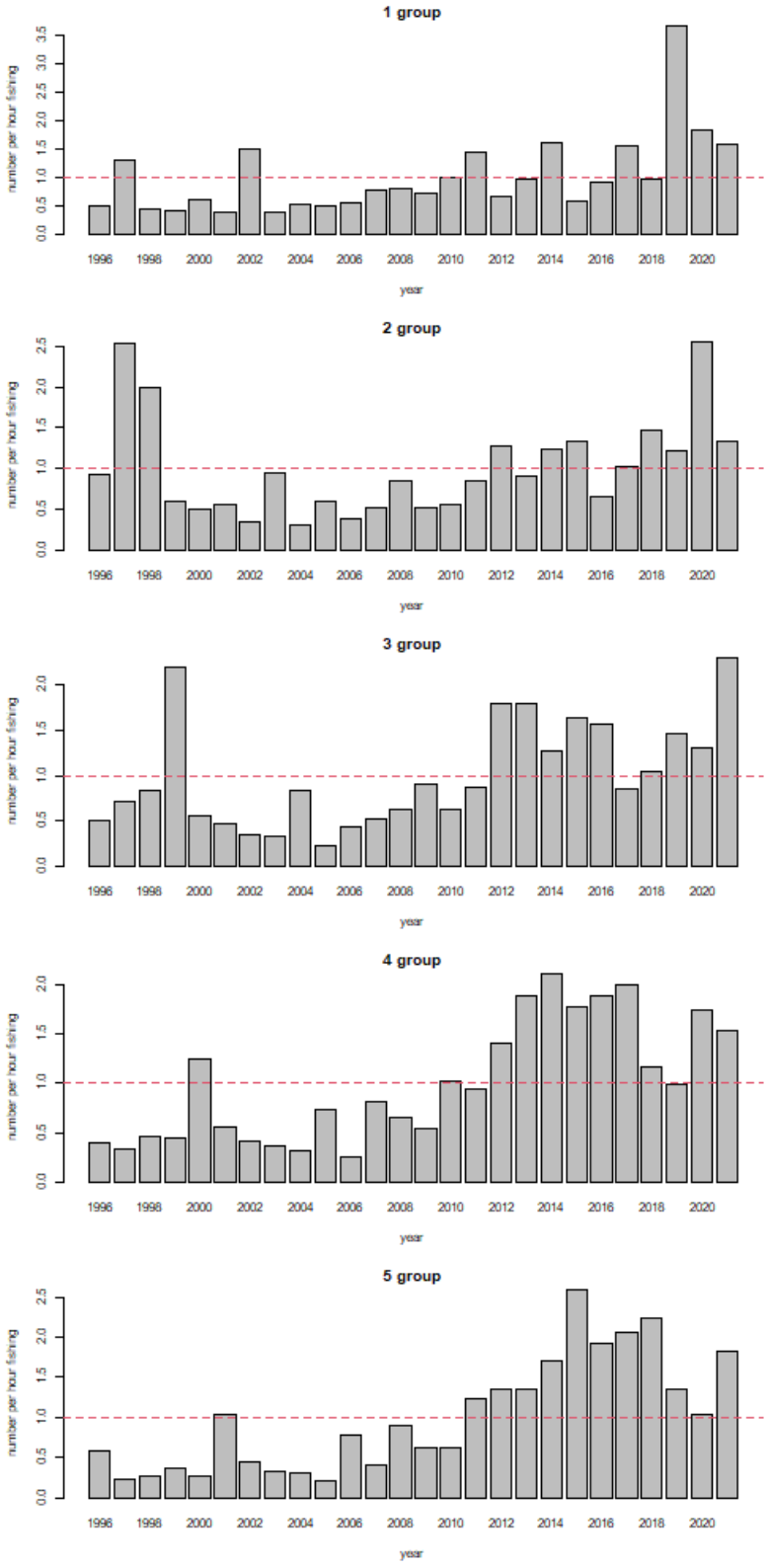

Figure A7.1.2.1 Combined plaice BTS deltaGAM index North Sea: ages 1-5 (combining Dutch, Belgian, German and UK beam trawl survey data)

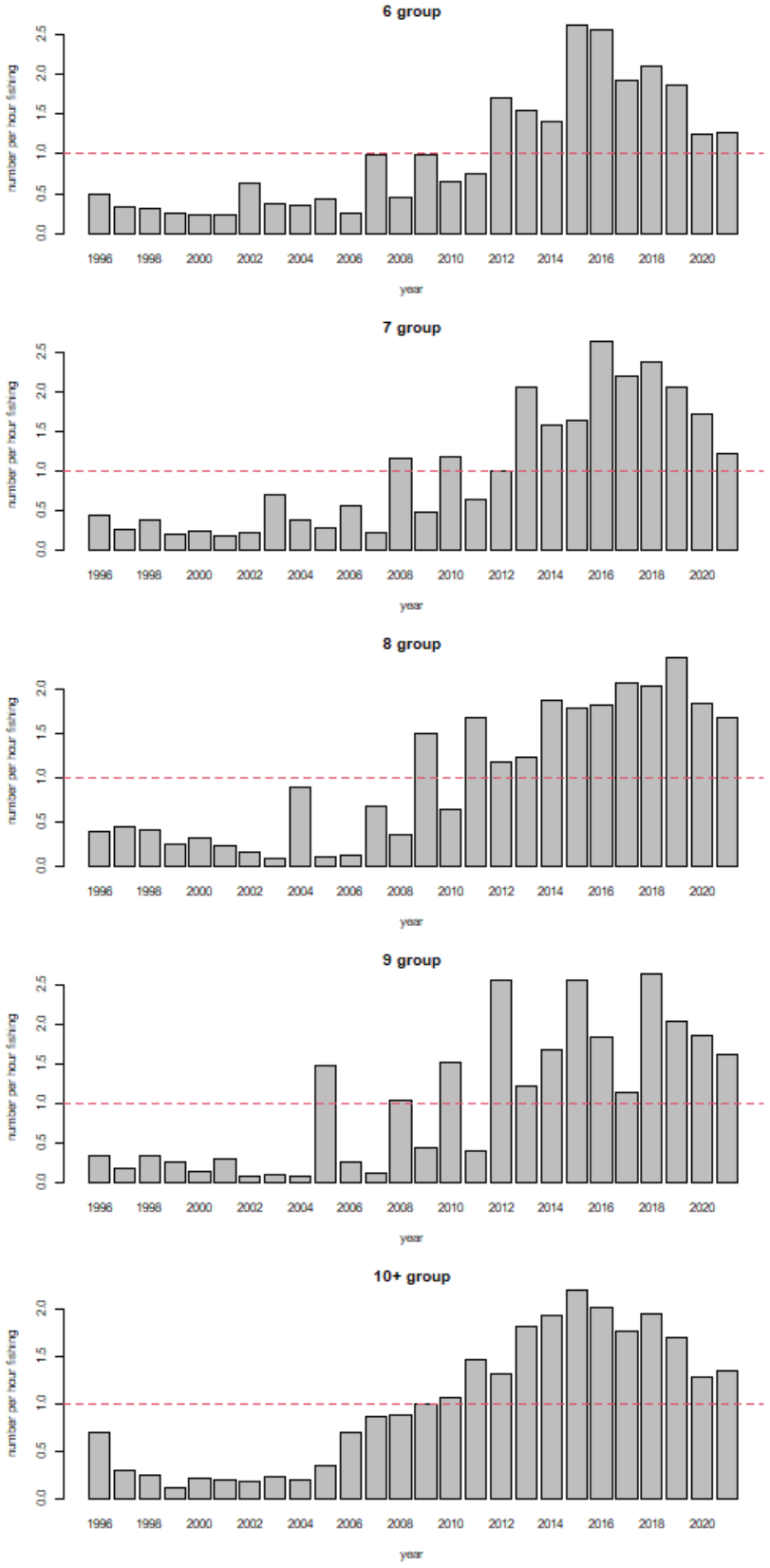

Figure A7.1.2.1 continued: Combined plaice BTS deltaGAM index North Sea: ages 6-9 and 10+ (combining Dutch, Belgian, German and UK beam trawl survey data)

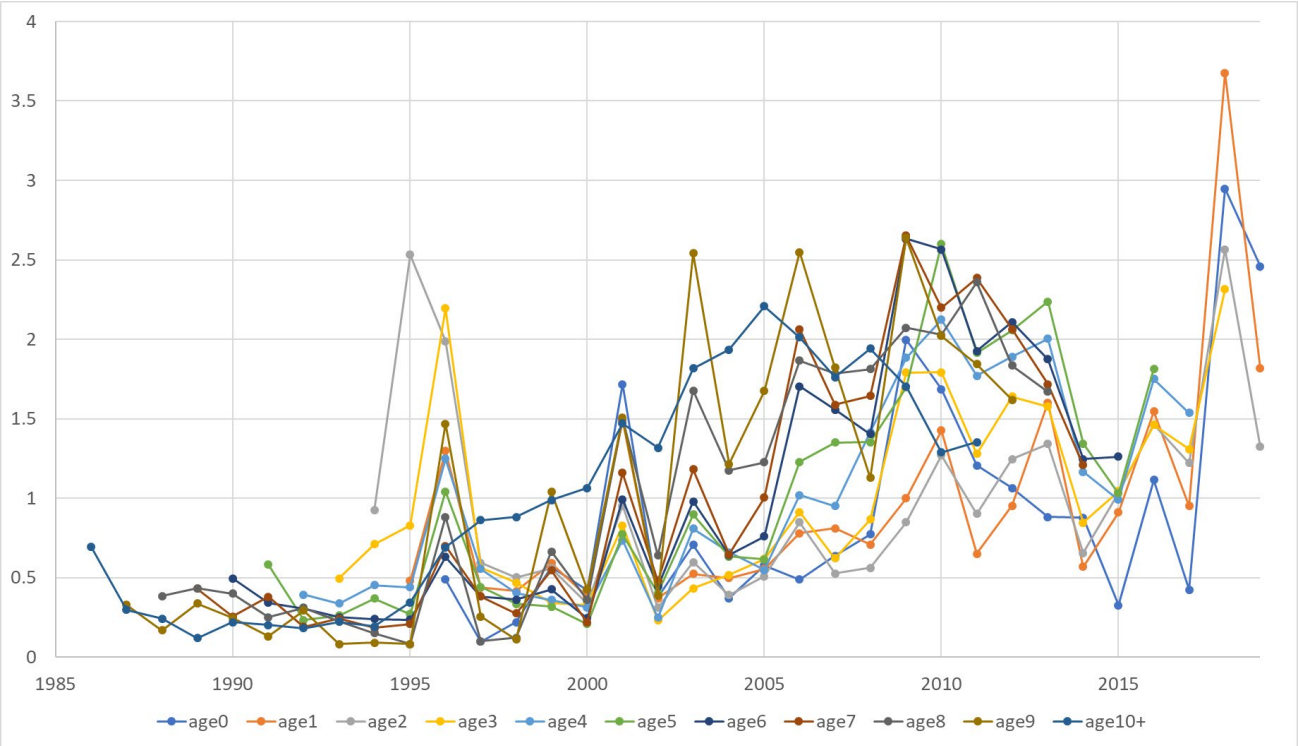

Figure A7.1.2.2 Cohort plot of the combined plaice BTS deltaGAM index North Sea ages 0-9 and 10+ (combining Dutch, Belgian, German and UK beam trawl survey data)

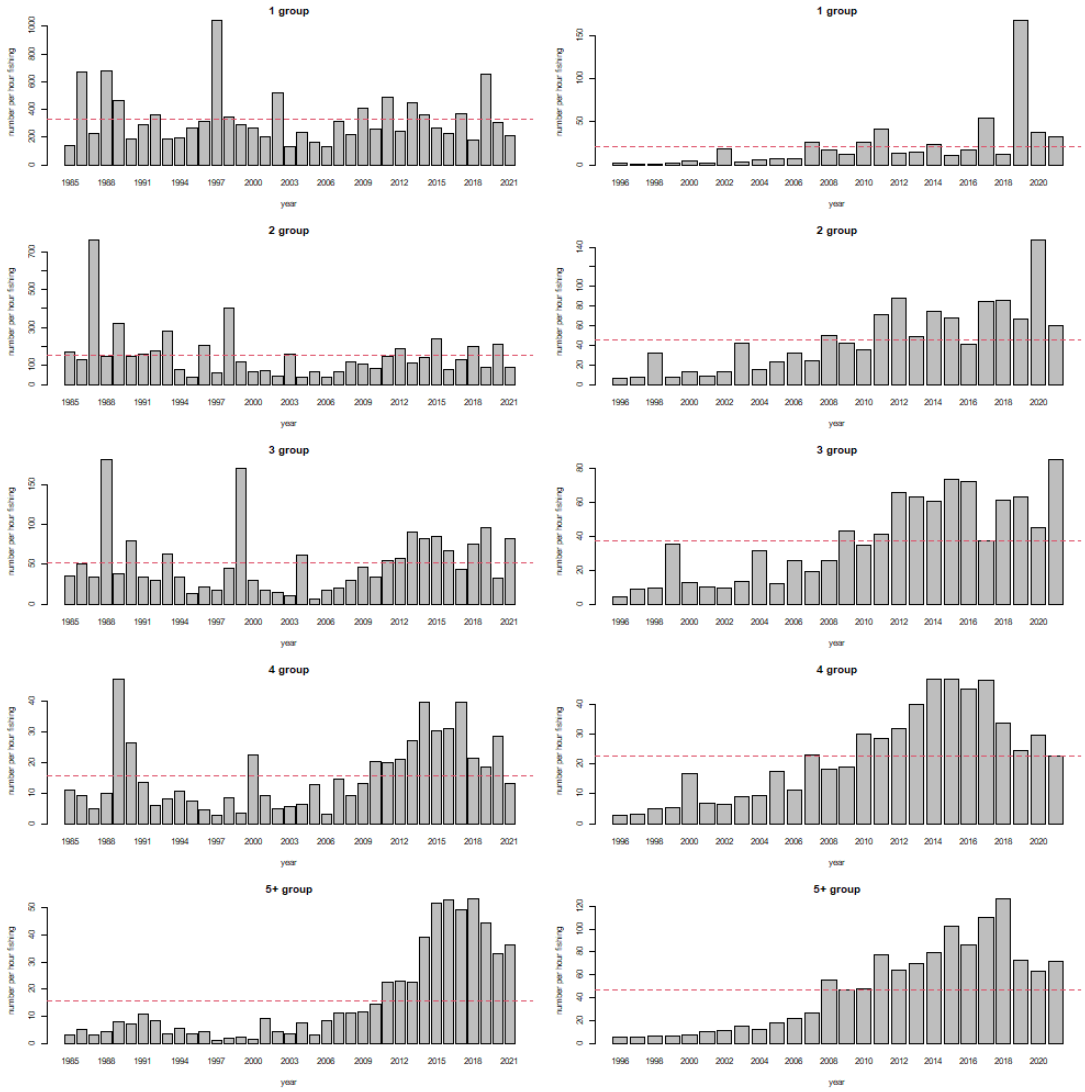

Figure A7.1.2.3 Plaice indices Dutch surveys in southeastern North Sea and German Bight (left) and central and western North Sea (right): ages 1-4 and 5+

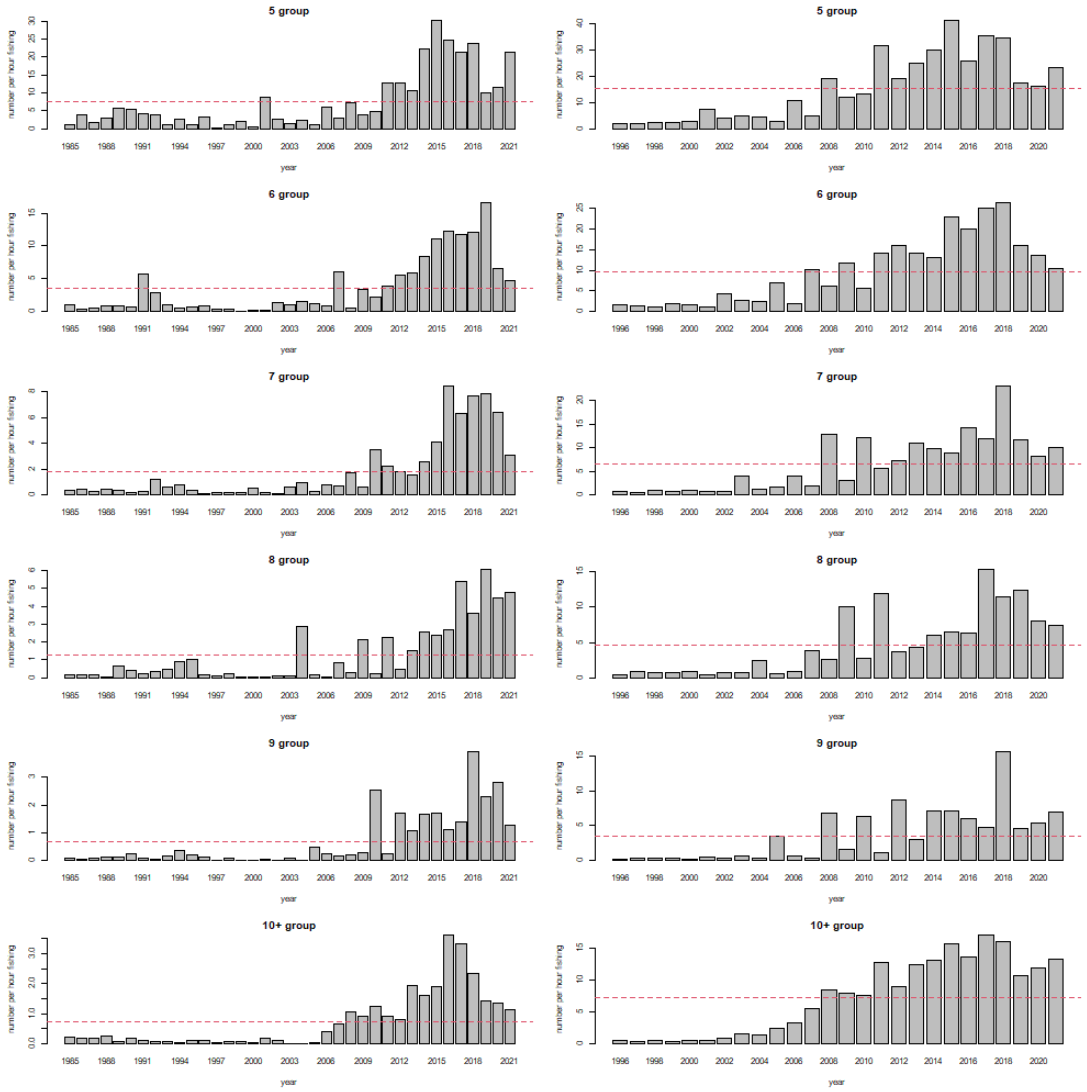

Figure A7.1.2.3 continued: Plaice indices Dutch surveys in southeastern North Sea and German Bight (left) and central and western North Sea (right): ages 5-9 and 10+

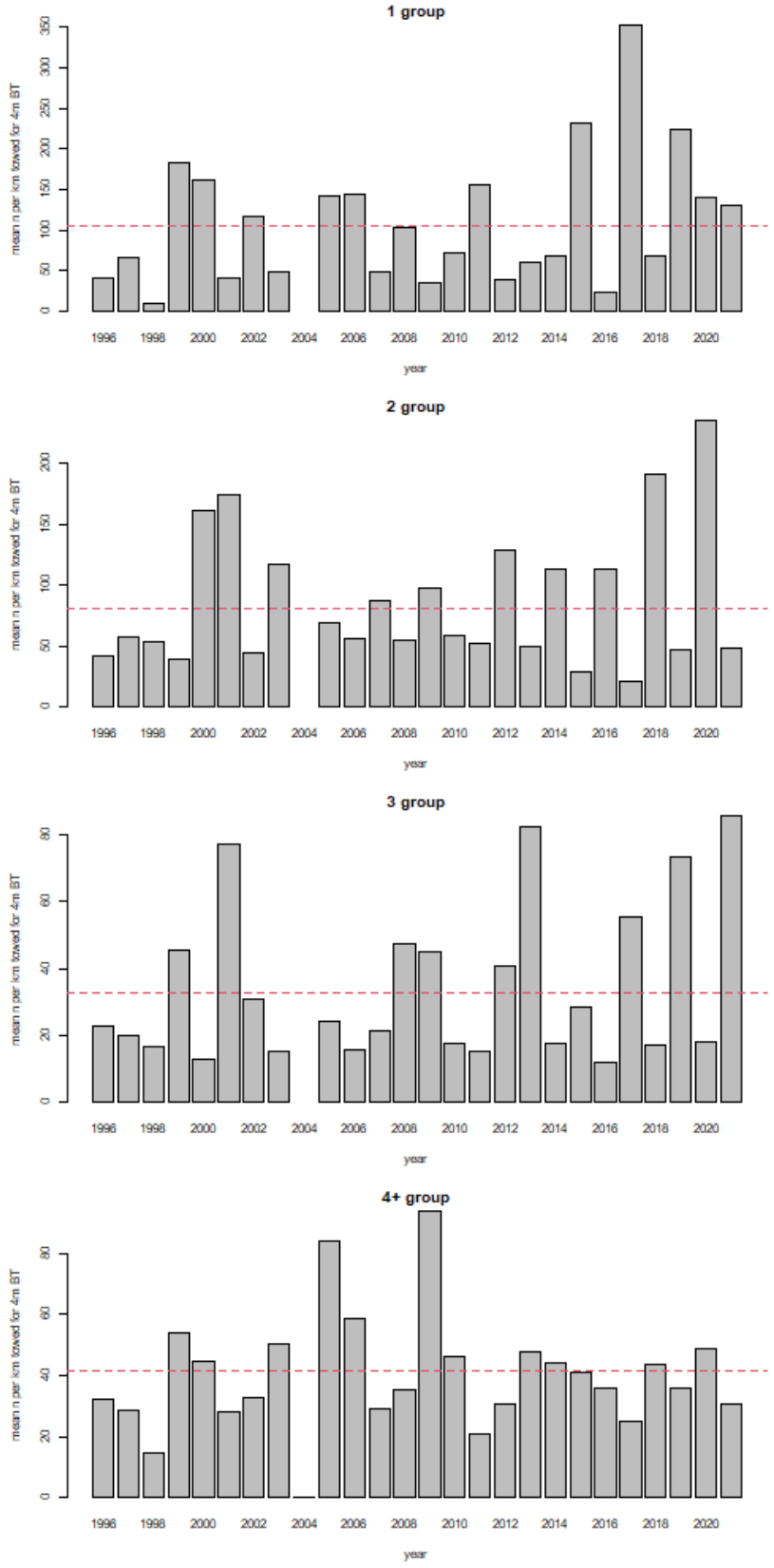

Figure A7.1.2.4 Plaice indices UK survey in southeastern North Sea (4c), ages 1-3 and 4+

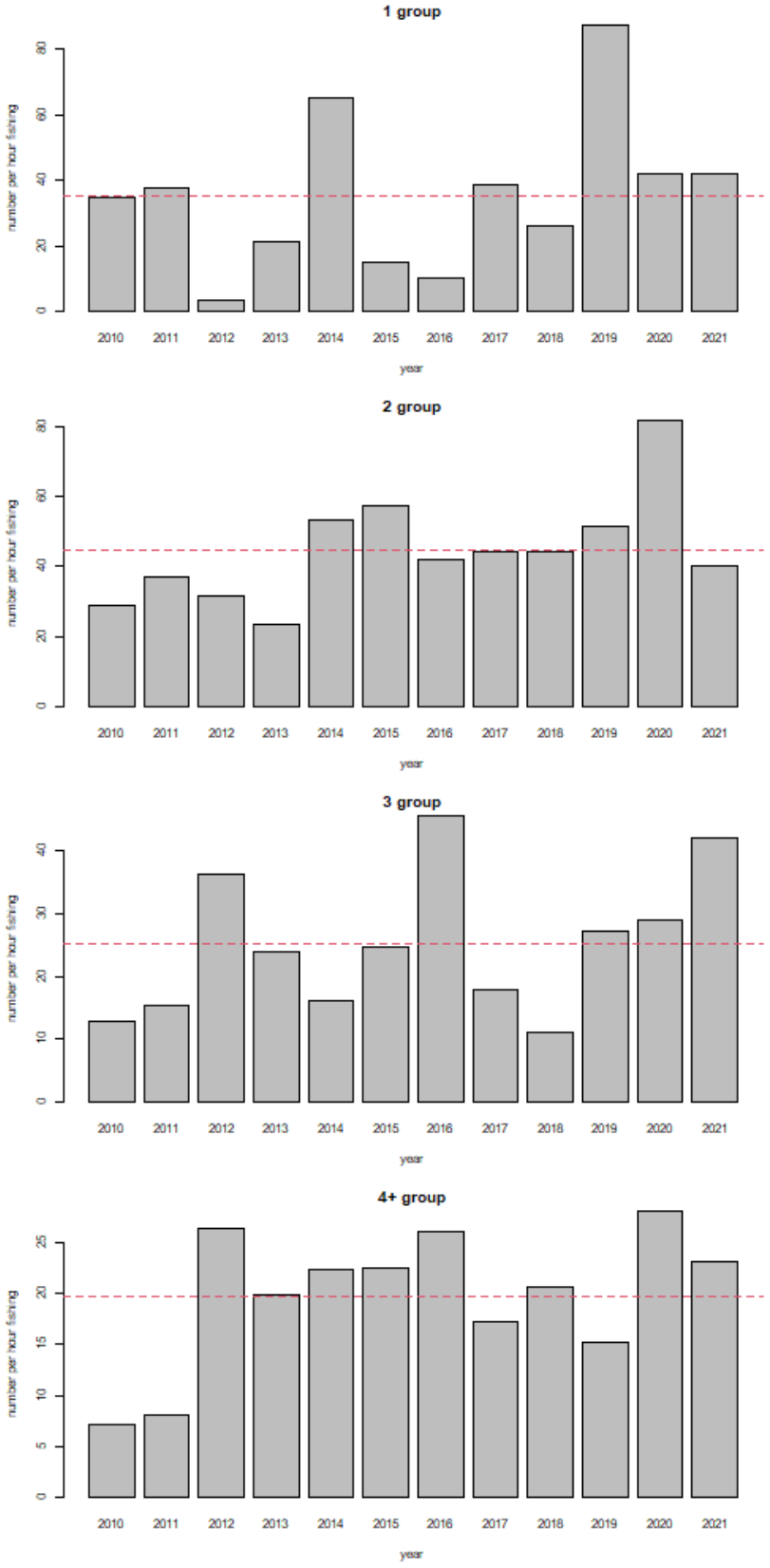

Figure A7.1.2.5 Plaice indices Belgian survey in southwestern North Sea (4c and 4b), ages 1-3 and 4+

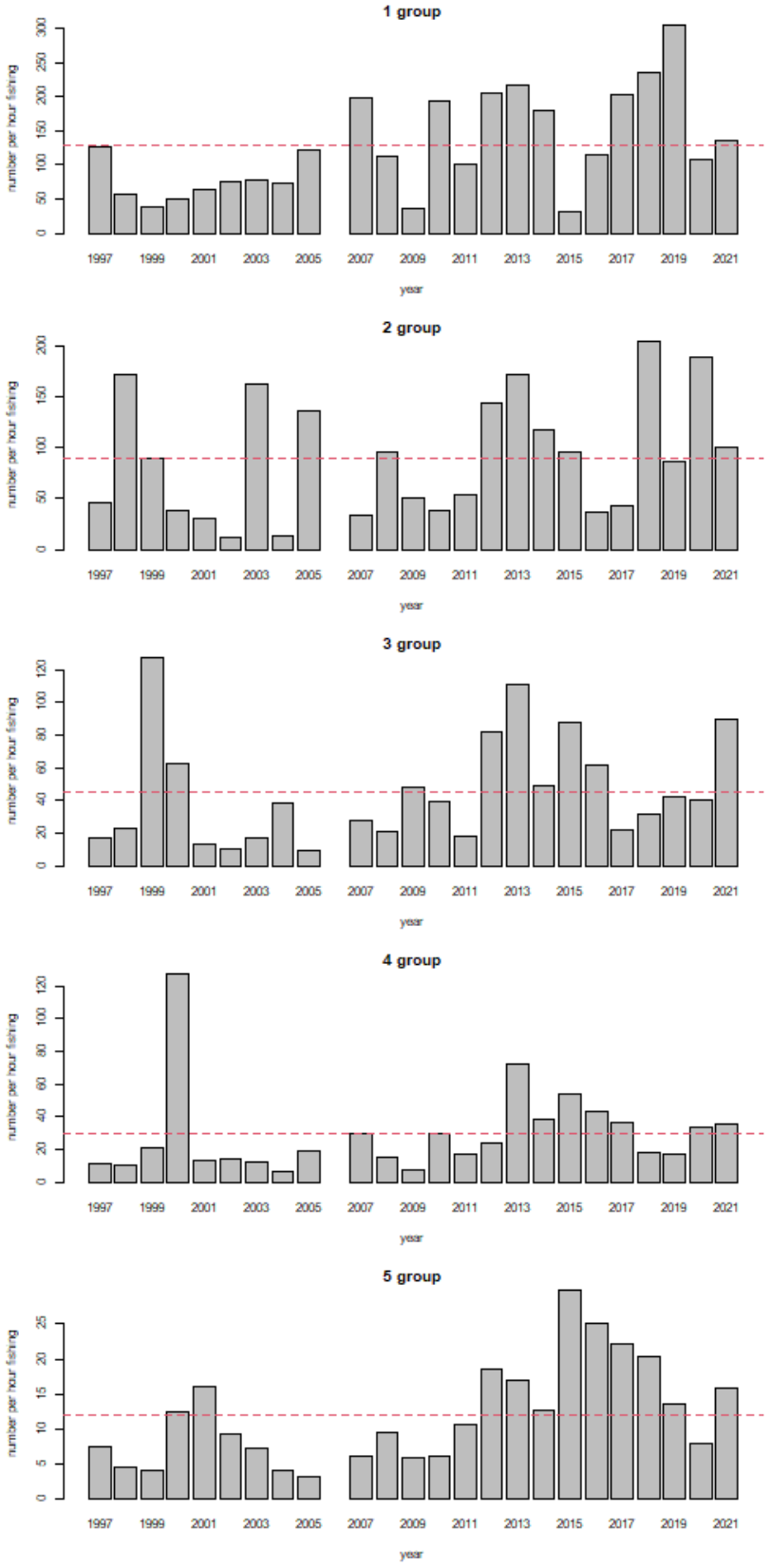

Figure A7.1.2.6 Plaice indices German survey in the central and northeastern North Sea (4b), ages 1-5

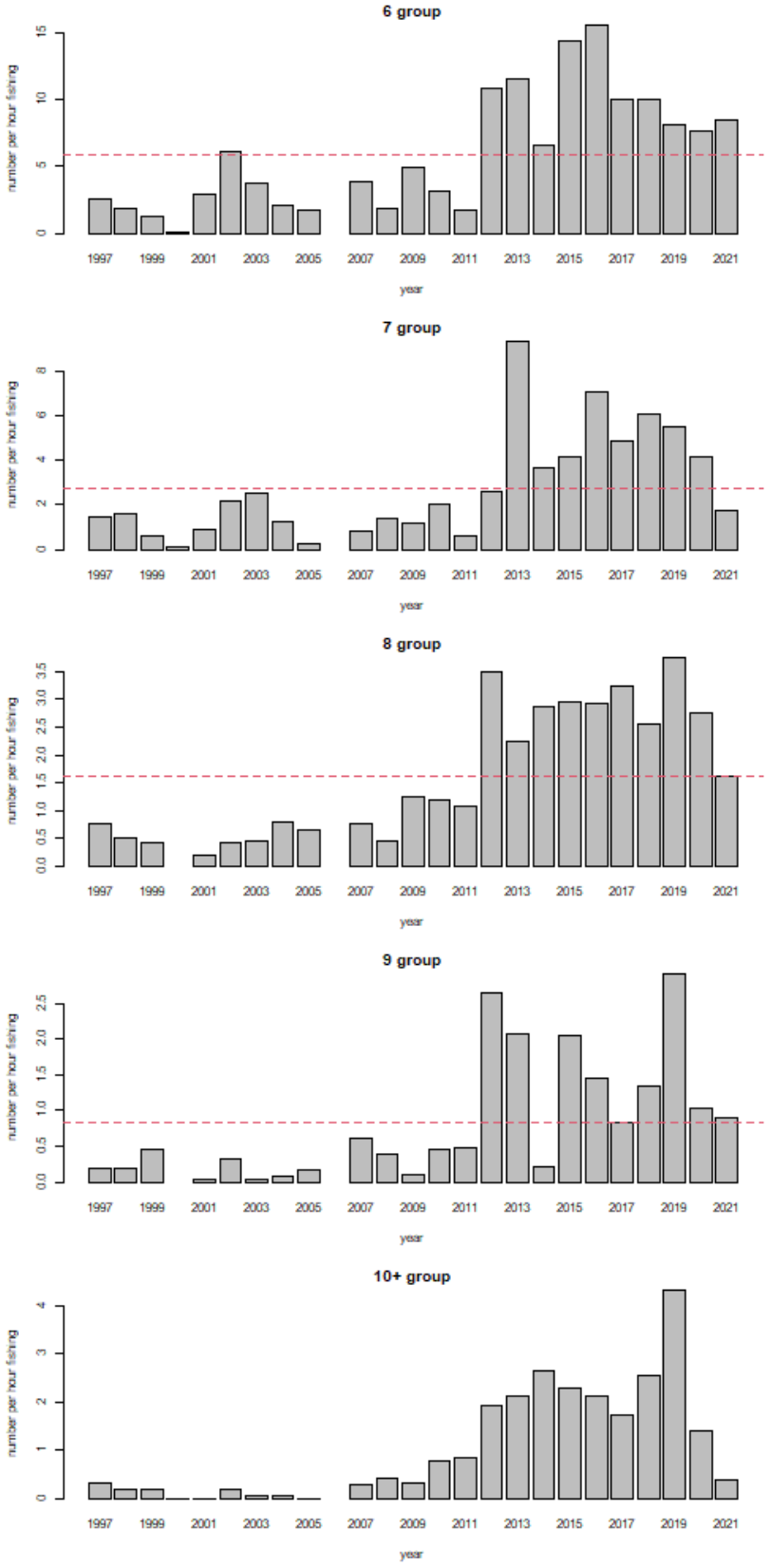

Figure A7.1.2.6 continued. Plaice indices German survey in the central and northeastern North Sea (4b), ages 6-9 and 10+

Western Waters - Subarea 7

Division 7d

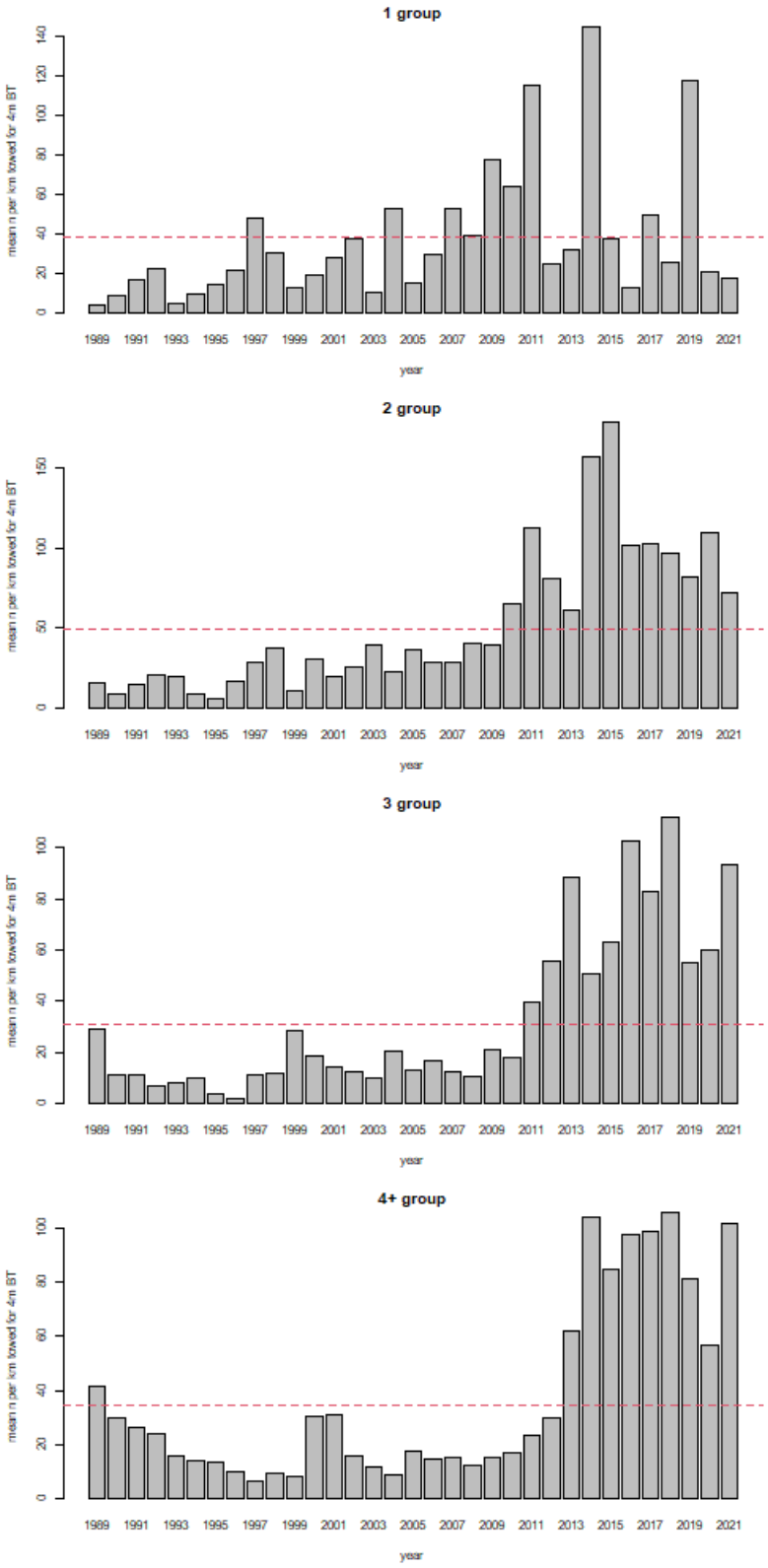

Figure A7.1.2.7 Plaice indices UK survey in the Eastern Channel, ages 1-3 and 4+

Division 7f

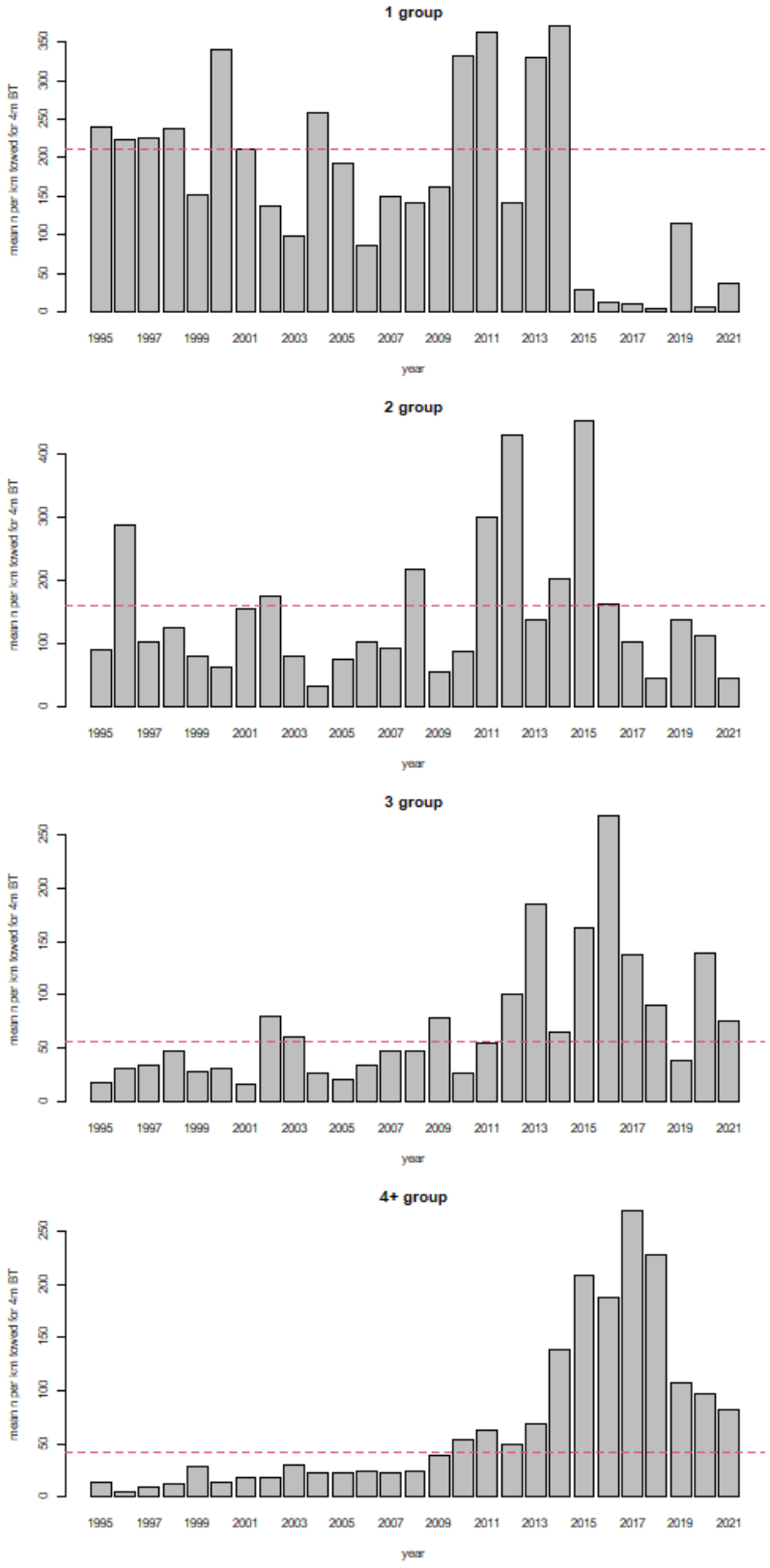

Figure A7.1.2.8 Plaice indices UK survey in the Bristol Channel, ages 1-3 and 4+ (Limited spatial coverage for 2020 survey)

Division 7a

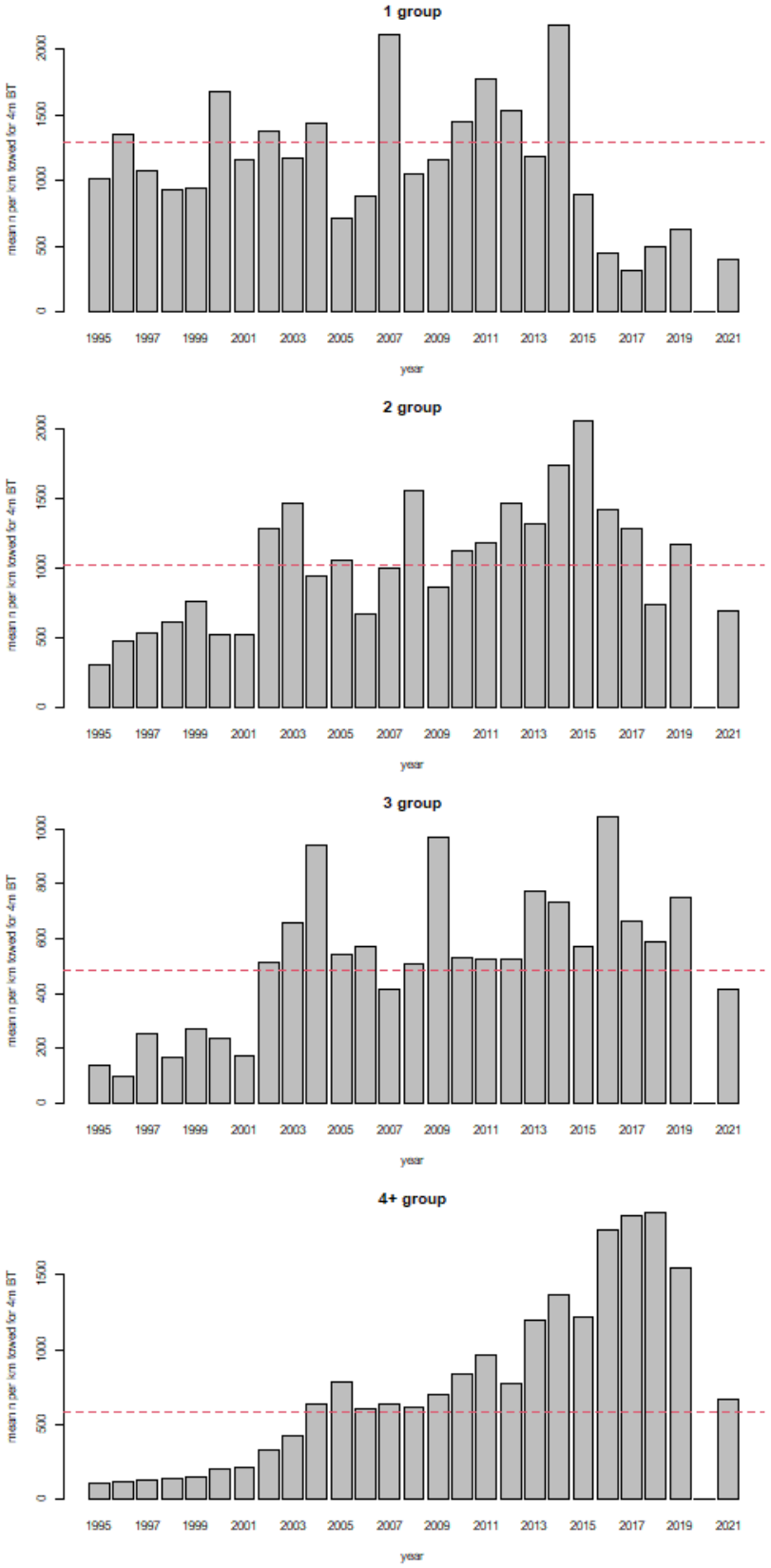

Figure A7.1.2.9 Plaice indices UK survey in the Irish Sea, ages 1-3 and 4+ (No survey in 2020)

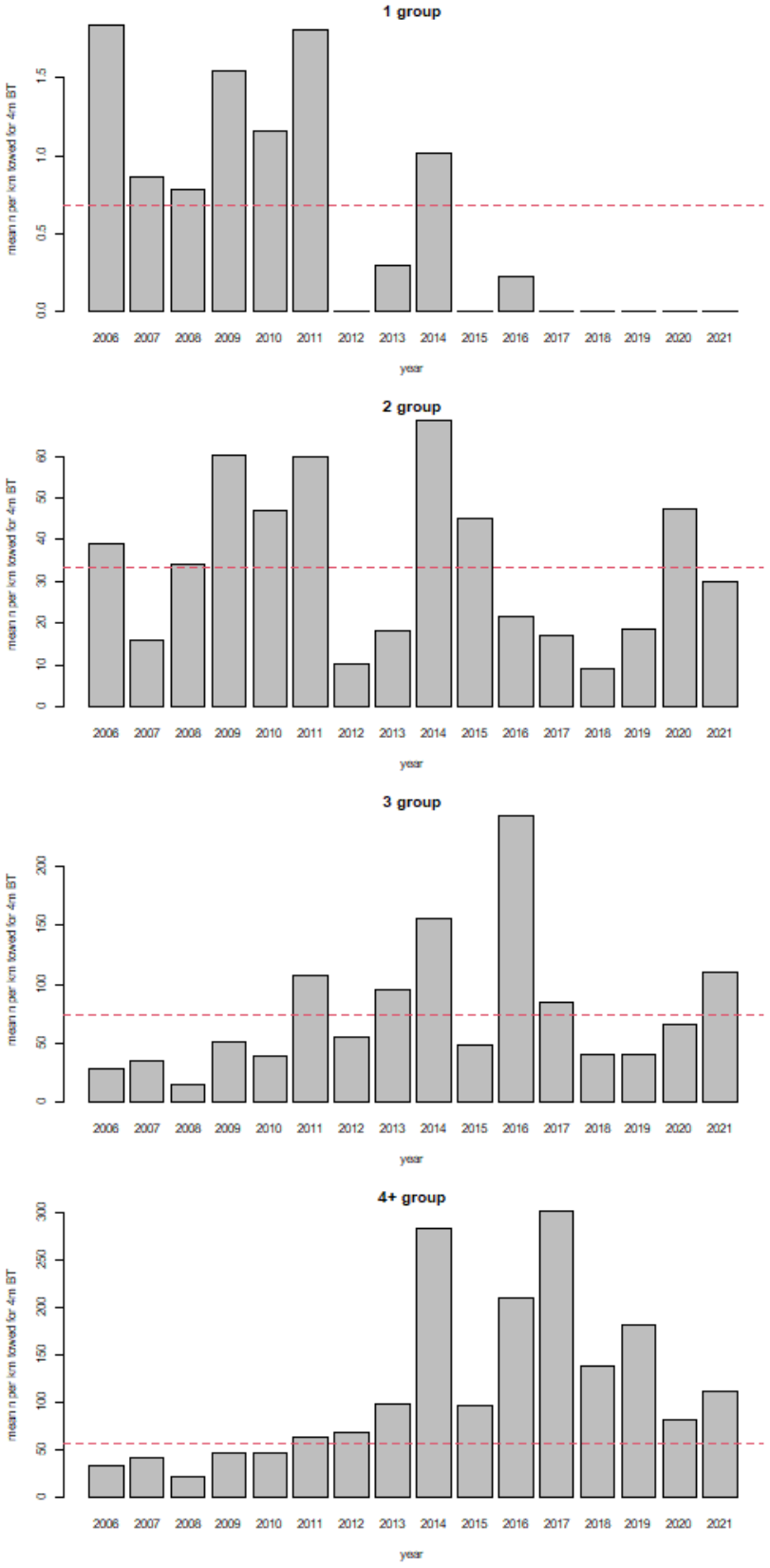

Figure A7.1.2.10 Plaice indices UK quarter 1 survey, ages 1 – 3 and 4+

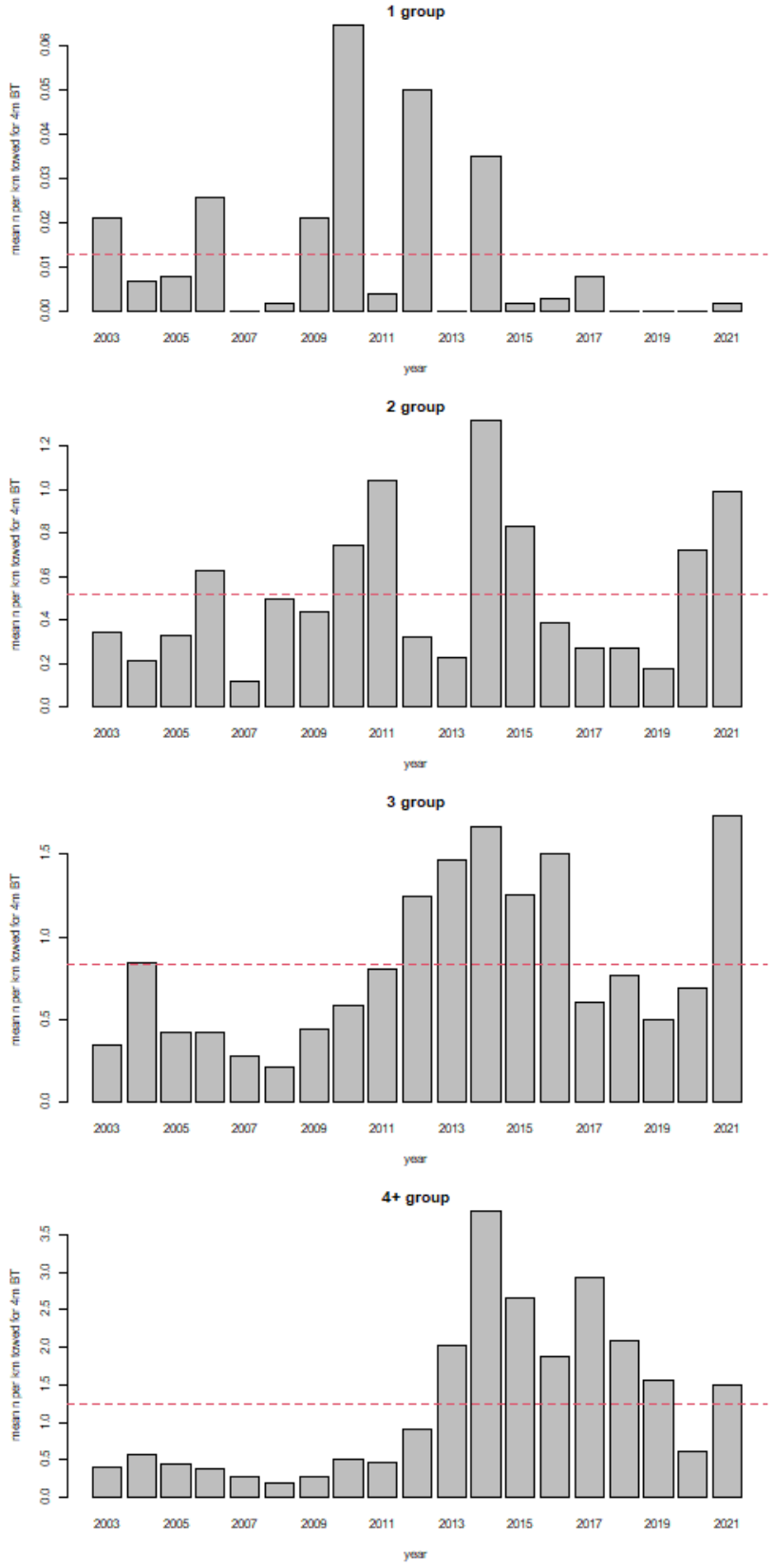

Figure A7.1.2.11 Plaice indices UK industrial survey Division 7e, ages 1 – 3 and 4+

Icelandic Sea

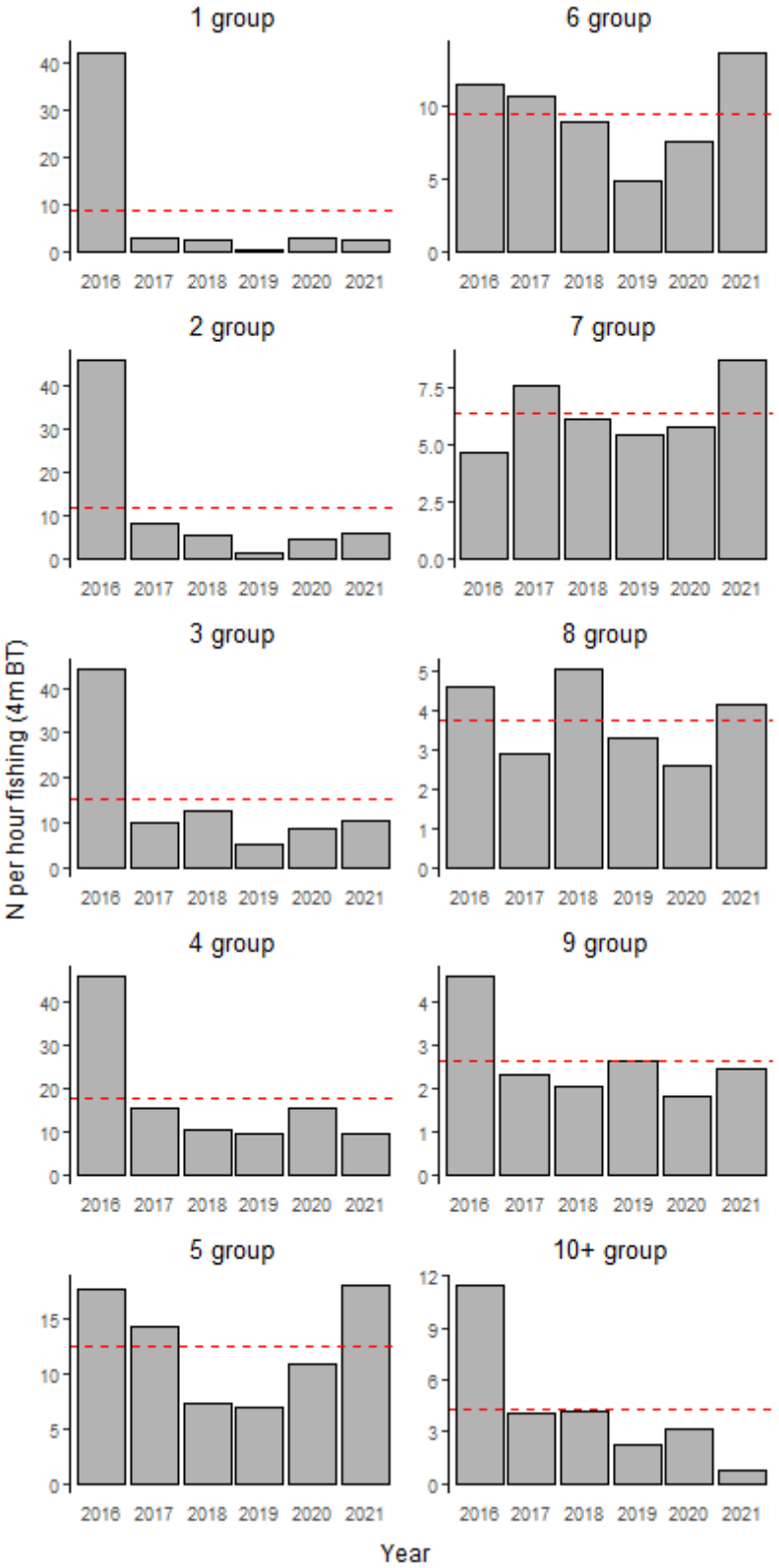

Figure A7.1.2.12 Plaice indices Icelandic survey in Icelandic Sea, ages 1-9 and 10+

Annex 7.2 Inshore surveys

The Dutch Sole Net Survey (SNS) was initiated in 1970 and samples transects further offshore than the other inshore surveys. The SNS survey area overlaps with those of the Dutch DYFS and BTS.

The Belgian Demersal Young Fish Survey (DYFS), the German DYFS and the Dutch Demersal Fish Survey (DFS) together cover most of the coastal and estuarine waters along the continental coast from the French-Belgian border to Esbjerg in Denmark. All these surveys were initiated in the 1970s.

Index calculation DYFS

The combined 0 group indices are calculated using Belgian, Dutch and German data, and the combined 1 group indices using Belgian and Dutch data. The Dutch, and hence the combined indices, are calculated from 1990 onwards, mainly due to a change in the survey design of the Dutch DYFS in 1990. As in the Belgian survey no age information has been collected up to 2017, the index calculation for that area is done based on the age-length key from the Dutch inshore survey. It should be noted that incorporation of the age data collected during the Belgian survey leads to different index results, as the length-at-age seems to be different over the latitudinal gradient.

Previously, the three continental surveys and the UK Young Fish Survey (YFS) were combined into international inshore indices for 0 and 1 group plaice and sole. Due to termination of the UK YFS in 2010 and the spring survey of the German DYFS, the data selected for the index calculation has been re-defined in 2012.

Data use

The Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK) uses the SNS indices and the combined inshore DYFS indices for recruitment estimates of the North Sea plaice and sole stocks. The SNS indices are also used as tuning fleet in the assessment models for plaice and sole. The combined inshore indices are considered to be suitable for 0 group plaice and sole, but less suitable for 1 group sole and even more so for 1 group plaice, because of the spatial coverage of the survey in relation to the spatial distribution of these age groups. The SNS is considered to be suitable for plaice and sole age groups 1 to 4.

Sole North Sea – Subarea 4

Sole Net survey (SNS)

The index from the 2021 survey (Figure A7.2.1.1) indicates that one of the lowest 1-group index values was observed in 2021. The strong age 2 in 2021 and the strong 3-group in 2021 reflects the strong 2018 cohort, also seen in the offshore surveys. However, the 2013 cohort appeared even stronger as age 2 than the 2018 cohort did in the 2020 survey. Ages 4 and 5+ in 2021 survey were lower than the level of the long-term arithmetic mean, especially the 5+ age group index value dropped quite sharply in 2021. Indices trends are quite fluctuating and record peaks well above the arithmetic mean from the 90's onwards were observed (Figure A7.2.2.1). A year-effect can be observed for sole in 2012, where the total for all age groups was the lowest in the entire time-series since 1990 (Figure A7.2.2.1). In that year the SNS was carried out on the RV Tridens instead of the RV Isis (ICES WGBEAM 2013) and the observed year effect may indicate that the change in vessel has caused a bias in the SNS indices.

The internal consistency is relatively good until age 3 but becomes weaker for age group 4, especially in the most recent years. In addition, the strong 2018 cohort is still visible as 2-group individuals in the 2020 survey. This is in line with the other surveys in the North Sea.

Demersal Young Fish survey (DYFS)

The international sole recruitment index (Figure A7.2.1.2, Table A7.2.1.1) shows a higher recruitment compared to the previous two years, but the 0-age group observed in 2021 is below the long-term mean. The strong 0-age group observed in 2018 is reflected by one of the strongest 1-age groups visible in 2019. Since then also the 1-age group values are on a low level below the long-term mean.

Plaice North Sea – Subarea 4

Sole Net survey (SNS)

The 2021 survey (Figure A7.2.2.1) indicates that the plaice year class seen as age 1 group was lower than the long-term arithmetic mean and lower than the previous year index value, in contrast to the strong 2018 year class. Ages 2, 3 and 4 in the 2021 survey were also lower than the level of the long-term arithmetic mean. However, the 5+ group indices are above the average since 2015, and in 2021 this trend continued with a well above average index value. Overall, indices were generally higher before 2000 (especially ages 1 and 2). However, in recent years (especially since 2010) an increasing trend is recorded for ages 4 and 5+.

Although a year-effect in 2012 in the SNS is far less evident for plaice than for sole, this year should also be treated with caution for plaice. The use of a different vessel in this year may also have affected the catchability of plaice in 2012 (see above). The internal consistency is rather poor for plaice in the most recent survey years.

Demersal Young Fish survey (DYFS)

For plaice, the international recruitment index (Figure A7.2.2.2, Tables A7.2.2.1, A7.2.2.2) shows the second highest record since 1990. The 1-age group index values were below the long-term mean since 2000. The observed 1-age group index value in 2021 is the lowest observed since 1990.

Annex 7.2.1 Figures and tables inshore indices sole

North Sea – Subarea 4

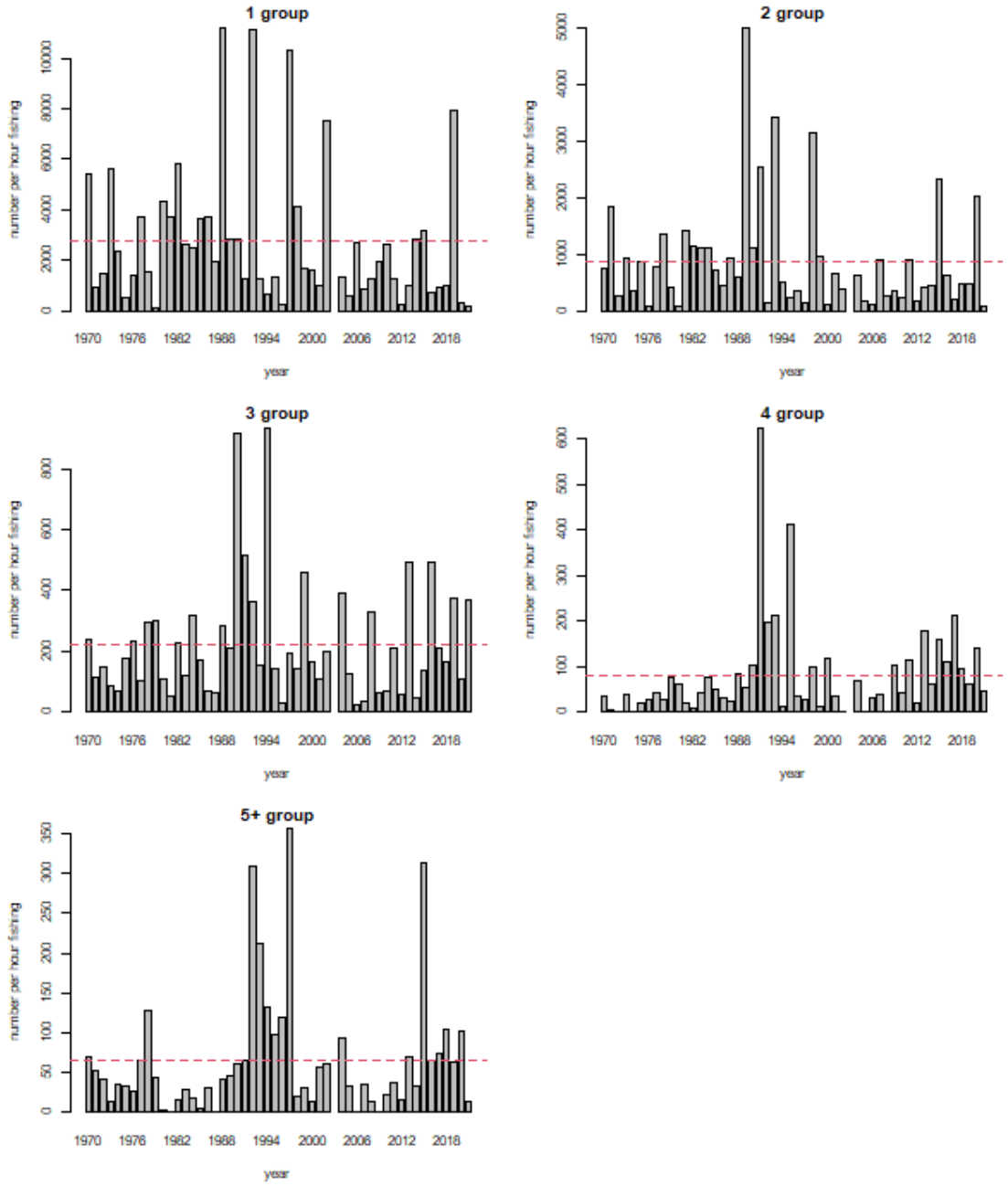

Figure A7.2.1.1. Sole indices from Sole Net Survey (SNS), in numbers per 100 hours fishing, age groups 1-4, 5+

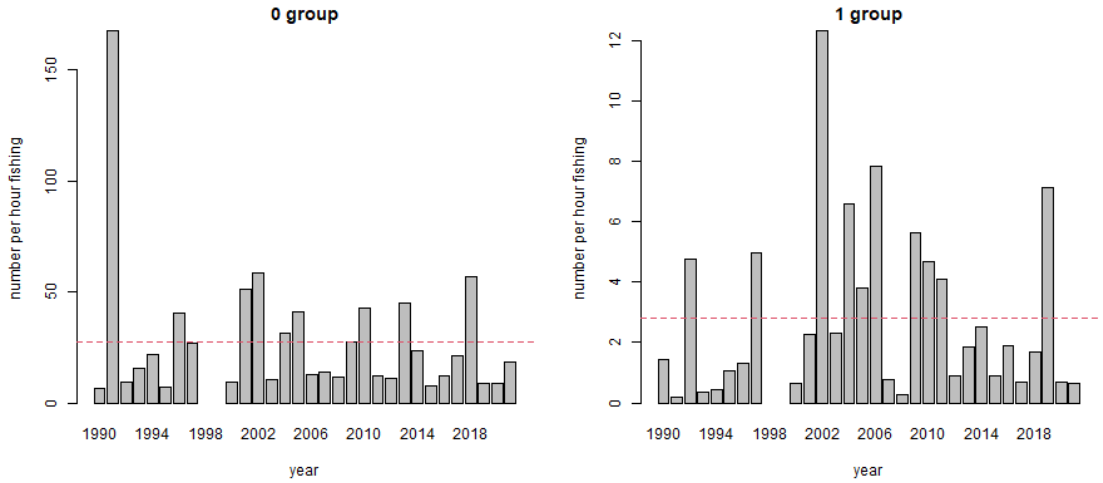

Figure A7.2.1.2 Sole indices from international DYFS survey (combined German, Dutch and Belgian data), in numbers per 1000 m2 fished area, age groups 0 and 1

Table A7.2.1.1 Sole indices from international DYFS survey (combined German, Dutch and Belgian data), in numbers 1000 m2 fished area, age groups 0 and 1 (*=invalid survey)

year	age0	age1
1990	6.381	1.435021
1991	167.5628	0.183961
1992	9.266028	4.770869
1993	15.32398	0.335254
1994	22.06324	0.456818
1995	7.064778	1.065177
1996	40.27174	1.305915
1997	26.93957	4.981413
1998	*	*
1999	*	*
2000	9.504133	0.63642
2001	51.42419	2.269092
2002	58.58299	12.30704
2003	10.60934	2.297676
2004	31.25178	6.585095
2005	40.98701	3.819168

year	age0	age1
2006	12.5667	7.813433
2007	13.72748	0.776117
2008	11.76762	0.291603
2009	27.33151	5.61977
2010	42.86197	4.673361
2011	12.12998	4.088182
2012	11.22614	0.880055
2013	44.81884	1.867842
2014	23.61608	2.521723
2015	7.448352	0.893179
2016	12.27554	1.88786
2017	20.96561	0.681463
2018	56.74828	1.693035
2019	8.749073	7.110469
2020	8.59870	0.69746
2021	18.40568	0.65873

* Incomplete survey

Annex 7.2.2 Figures and tables inshore indices plaice

North Sea – Subarea 4

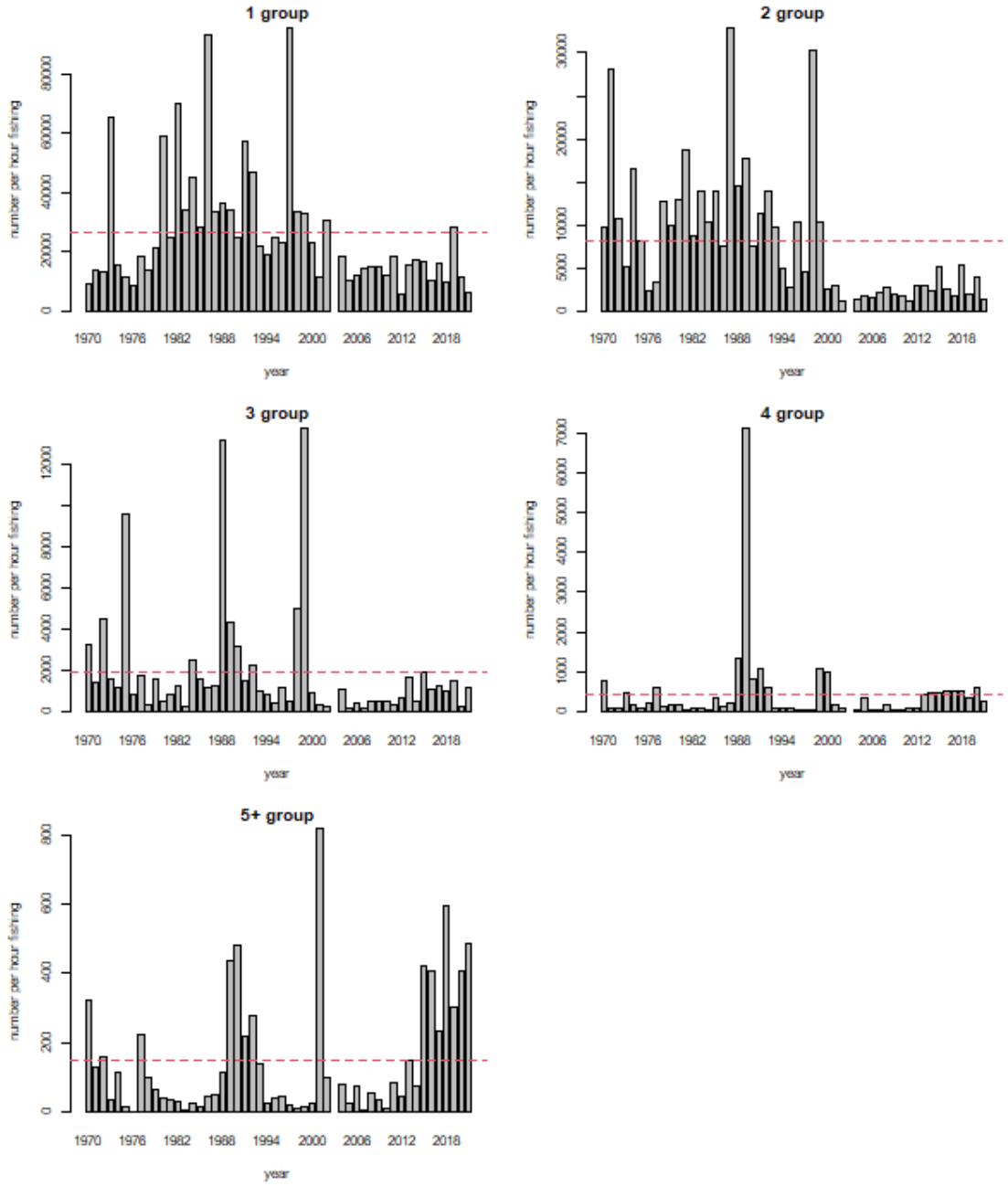

Figure A7.2.2.1. Plaice indices from the Sole Net Survey (SNS), in numbers per 100 hours fishing, age groups 1-4, 5+

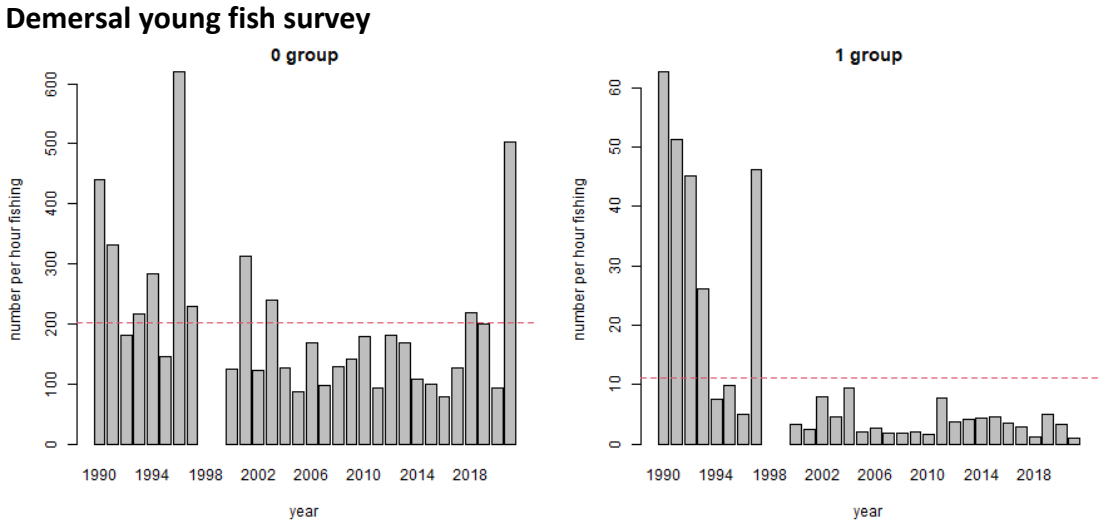

Figure A7.2.2.2 Plaice indices from international DYFS survey (combined German, Dutch and Belgian data), in numbers per 1000 m2 fished area, age groups 0 and 1

Table A7.2.2.1 Plaice indices from international DYFS survey (age0 combined German, Dutch and Belgian data, age1 combined Dutch and Belgian data), in numbers per 1000 m2 fished area, age groups 0 and 1 (*=invalid survey)

year	age0	age1
1990	439.593	62.58831
1991	332.3579	51.25087
1992	180.3098	45.02041
1993	216.9896	26.17763
1994	283.4379	7.432426
1995	146.0756	9.749124
1996	619.6147	4.985129
1997	229.2426	46.11934
1998	*	*
1999	*	*
2000	124.9256	3.185394
2001	313.1752	2.422088
2002	122.907	7.86081
2003	238.6262	4.607383
2004	126.7383	9.45473
2005	85.87962	2.099852
2006	167.9882	2.584789

year	age0	age1
2007	98.25258	1.769902
2008	129.7098	1.707966
2009	141.8704	1.981376
2010	179.6146	1.536524
2011	92.96254	7.713137
2012	181.1218	3.713203
2013	168.4809	4.033875
2014	107.9918	4.294105
2015	100.1616	4.559275
2016	78.05228	3.447096
2017	127.1979	2.867452
2018	219.3361	1.136788
2019	200.1965	5.002348
2020	93.83044	3.237539
2021	502.30049	1.047104

Table A7.2.2.2 Plaice indices by country and the combined international index, in numbers per 1000 m2 fished area, age groups 0 and 1 (*=invalid survey)

	age0				age1		
Country	**NL**	**BE**	**DE**	**International**	**NL**	**BE**	**International**
Raising factor	*11.007*	*1.472*	*1.919*		*11.007*	*1.472*	
Gear correction factor	*1*	*1.22*	*1.22*		*1*	*1*	
1990	34.52	2.48	23.59	439.593	5.52	1.26	62.58831
1991	25.49	1.15	21.24	332.3579	4.63	0.17	51.25087
1992	15.33	0.32	4.72	180.3098	4.07	0.18	45.02041
1993	18.86	0.20	3.86	216.9896	2.36	0.12	26.17763
1994	23.90	1.31	7.71	283.4379	0.64	0.29	7.432426
1995	10.62	2.62	10.44	146.0756	0.79	0.72	9.749124
1996	45.34	12.65	41.77	619.6147	0.43	0.20	4.985129
1997	16.58	4.27	16.67	229.2426	3.73	3.45	46.11934

	age0		age1		age0		age1
1998	*	2.76	8.11	*	*	1.54	*
1999	*	1.14	2.94	*	*	1.62	*
2000	8.95	1.29	10.28	124.9256	0.16	0.95	3.185394
2001	22.35	1.57	27.47	313.1752	0.14	0.63	2.422088
2002	10.01	5.61	1.12	122.907	0.09	4.69	7.86081
2003	19.20	3.22	9.20	238.6262	0.26	1.21	4.607383
2004	9.79	4.46	4.70	126.7383	0.59	2.00	9.45473
2005	6.59	3.94	2.68	85.87962	0.16	0.26	2.099852
2006	14.23	1.12	4.00	167.9882	0.14	0.69	2.584789
2007	7.07	4.30	5.41	98.25258	0.13	0.24	1.769902
2008	10.69	3.80	2.23	129.7098	0.07	0.66	1.707966
2009	9.76	7.40	9.05	141.8704	0.14	0.31	1.981376
2010	12.81	1.18	15.6	179.6146	0.07	0.50	1.536524
2011	6.90	2.18	5.61	92.96254	0.33	2.78	7.713137
2012	15.19	3.06	3.60	181.1218	0.11	1.69	3.713203
2013	12.37	5.72	9.42	168.4809	0.27	0.74	4.033875
2014	8.45	3.82	3.45	107.9918	0.21	1.37	4.294105
2015	8.12	1.50	3.43	100.1616	0.21	1.56	4.559275
2016	6.44	2.15	1.39	78.05228	0.19	0.89	3.447096
2017	10.88	1.70	1.89	127.1979	0.16	0.78	2.867452
2018	18.21	6.14	3.34	219.3361	0.08	0.16	1.136788
2019	15.53	2.46	10.59	200.1965	0.25	1.51	5.002348
2020	6.62	1.82	7.55	93.83044	0.21	0.64	3.237539
2021							

Annex 8: Results consistency analyses DATRAS BTS, SNS and DYFS data

Annex 8.1: Regional evaluation of offshore and inshore data from DATRAS

Annex 8.1.1 Elasmobranchs

Evaluate spatial-temporal distribution for commercially important elasmobranchs

In 2021, WGBEAM subgroups evaluated offshore and inshore beam trawl survey data from DATRAS. Consistency analyses scripts were made available at https://github.com/ices-eg/wg_WGBEAM. These R scripts can be used to evaluate any beam trawl survey (BTS, DYFS, SNS) and any species in DATRAS. In 2022 the script has been updated and ran to evaluate spatial-temporal distribution of commercially important elasmobranchs in BTS,DYFS and SNS surveys for the years 2000-2021. As an example the modified script has been applied to the elasmobranch species listed in table A8.1.

The latest information on DATRAS is extracted by the getDATRAS function (icesDatras package). Haul information (HH) and length information (HL) is combined into one dataset. Simple quality checks (e.g. tables to explore missing data, checks for NAs) are incorporated in the script. In the script a species list is created from WoRMS (www.marinespecies.org), so valid Aphia ID codes in DATRAS can be linked to the correct scientific names. Before filtering to a specific species of interest, a list of the fished stations is created. In this way stations with zero observations can be taken into account when calculating average values.

In order to calculate CPUEs (square roots of numbers/km^2) from the beam trawl surveys, total numbers per haul and the surface area that was fished (swept area option 1 = beam with*distance/10^6) for each haul need to be made available with the script. If the column for total numbers is not filled in (NA or -9), total catch numbers can be calculated based on haul numbers at-length (HLNoAtLngt) multiplied by the subsampling ratio (SubFactor).

Total number of individuals per year are shown by country for the *Raja* species in figure A8.1 and sharks and dogfish species in figure A8.5. Most species have generally increased throughout the time series (in particular *Raja clavata, Raja montagui, Mustelus sp., Scyliorhinus canicula and Scyliorhinus stellaris*). H however, *Amblyraja radiata*, is strongly decreasing over the years. In absolute terms, the dominant species are four: *Raja clavata* (mainly UK survey), *Amblyraja radiata* (mainly NL survey), *Raja montagui* (mainly UK survey) and *Scyliorhinus canicula* (mainly UK survey).

Looking at the Rajiformes distribution in the area under examination proposed in Figure A8.2 and A8.3, it can be seen that the species distribution differ considerably by area. *Amblyraja radiata* is mostly distributed to the north-east (between UK and Sweden) and is rarely found below the 54°N parallel. *Raja clavata* and *Raja montagui* are instead more evenly distributed around UK but, unlike *Amblyraja radiata*, they are rarely found at latitudes higher than the 54°N parallel. *Raja brachyura* is also distributed in the seas surrounding UK but with a greater concentration south of the English Channel and the French coast. Particular is the distribution of *Leucoraja naevus* which is present in the catches both in the south-west of the area sampled (English Channel and

Celtic Sea) and in the north along the coasts of Scotland (with a sample in 2003 even close to Shetland Island). The two rarest species, *Raja microocellata* and *Raja undulata*, seem to have a more restricted range confined to the Celtic Sea and English Channel only. All five of the shark and dogfish species are found in the Irish and Celtic Sea and the English Channel (Figure A8.1.6). *Scylorhinus caniculais* is found in high densities around England stretching into the southern part of the North Sea along with a patch around Orkney Islands (Figure A8.1.6). For the other four, *Mustelus spp.* has the highest density, while *Scyliorhinus stellaris*, *Galeorhinus galeus* and *Squalus acanthias* have much lower densities (Figure A8.1.6), the latest being more widely distributed but captured sporadically throughot most of the North Sea over the past 20 years (Figure A8.1.9).

The map by years (Rajidae: figure A8.4, shark and dogfish: figure A8.7-9) shows the same situation described above, also returning the general increase trend from year to year highlighted in the first plot. It should be noted that in the early years of the time series (2002-2005) the sampling stations in the English Channel were significantly lower compared to the sampling effort of more recent years. In addition, several transects further north of the 58°N parallel were carried out only in 2002 and 2003. This could affect the total number of individuals per year especially for *Amblyraja radiata* (Figure A8.4), *Leucoraja naevus* (Figure A8.4), *Scylorhinus canicula* (Figure A8.7) *and Mustelus spp.* (Figure A8.8).

Table A8.1: Elasmobranch species list used for the analysis with common name, scientific name and Aphia ID

Code	Common Name	Scientific Name	AphiaID
SYR	starry ray	*Amblyraja radiata*	105865
CUR	cuckoo ray	*Leucoraja naevus*	105876
BLR	blonde ray	*Raja brachyura*	367297
THR	thornback ray (roker)	*Raja clavata*	105883
PTR	smalleyed (painted) ray	*Raja microocellata*	105885
SDR	spotted ray	*Raja montagui*	105887
UNR	undulate (painted) ray	*Raja undulata*	105891
GAG	Tope shark	*Galeorhinus galeus*	105820
	Smooth-hound species	*Mustelus mustelus &* *Mustelus asterias*	105732
SYC	Lesser spotted dogfish	*Scyliorhinus canicula*	105815
SYT	Nursehound	*Scyliorhinus stellaris*	105815
DGS	Spiny dogfish	*Squalus acanthias*	105923

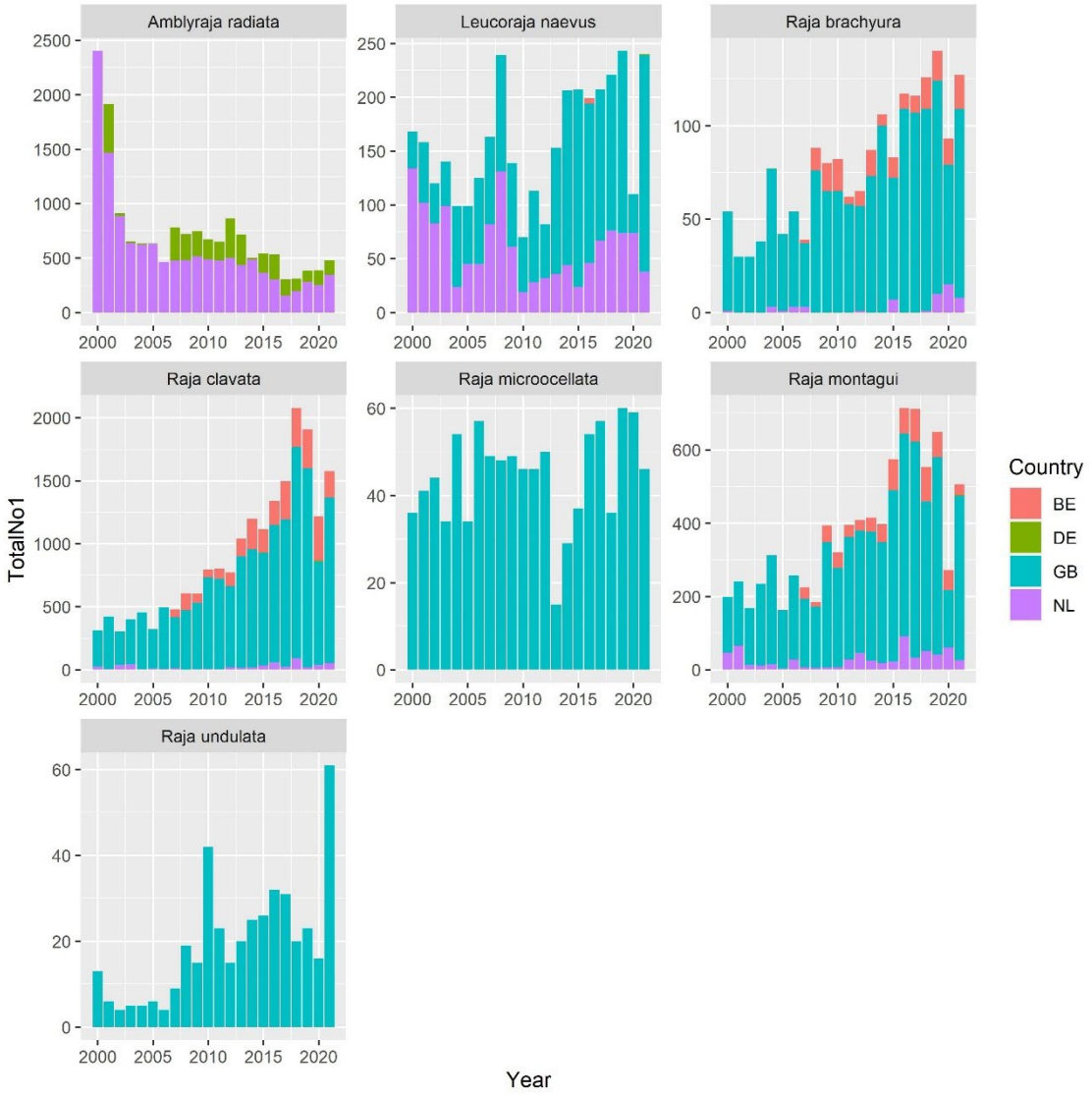

Figure A8.1: Total numbers of Rajiformes from BTS, DYFS & SNS data in DATRAS for the period 2000-2021. The panels are divided based on the different species. The colours show the different countries (purple=Netherlands; blue=UK; green=Germany; red=Belgium).

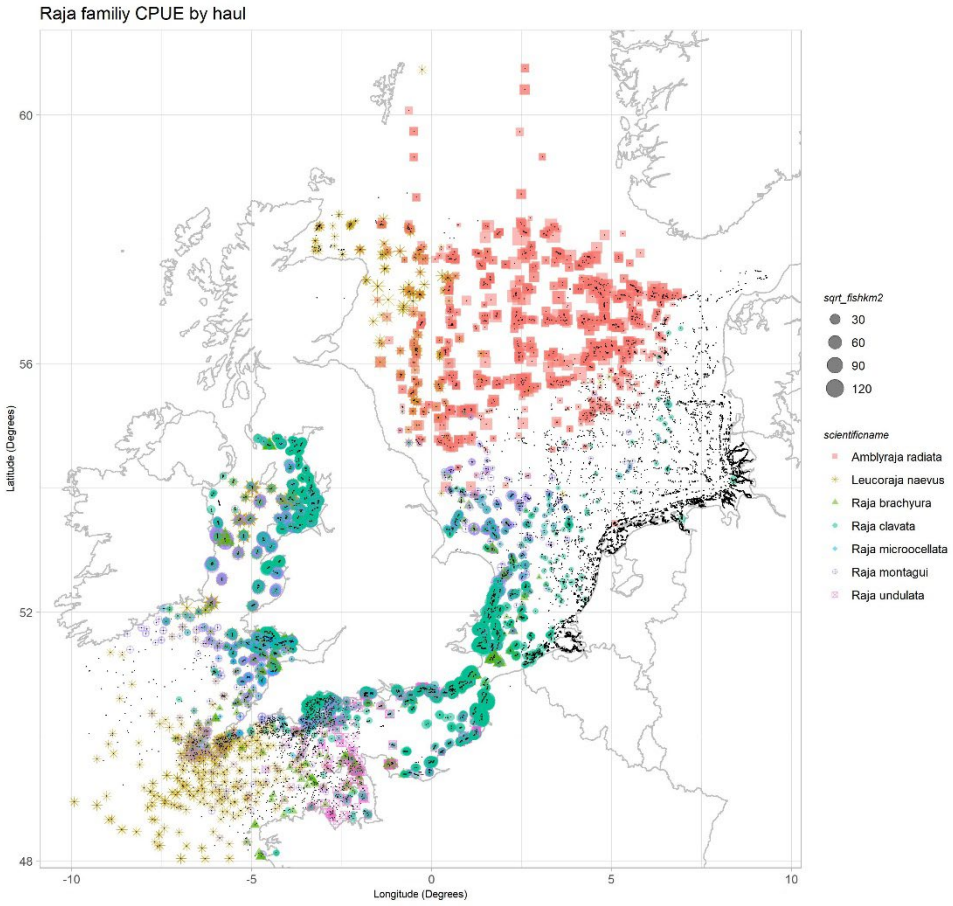

Figure A8.2: CPUE (square root of numbers/km²) by haul of Rajiformes from the BTS, SNS & DYFS (all years combined). The colours show the different species (see legend).

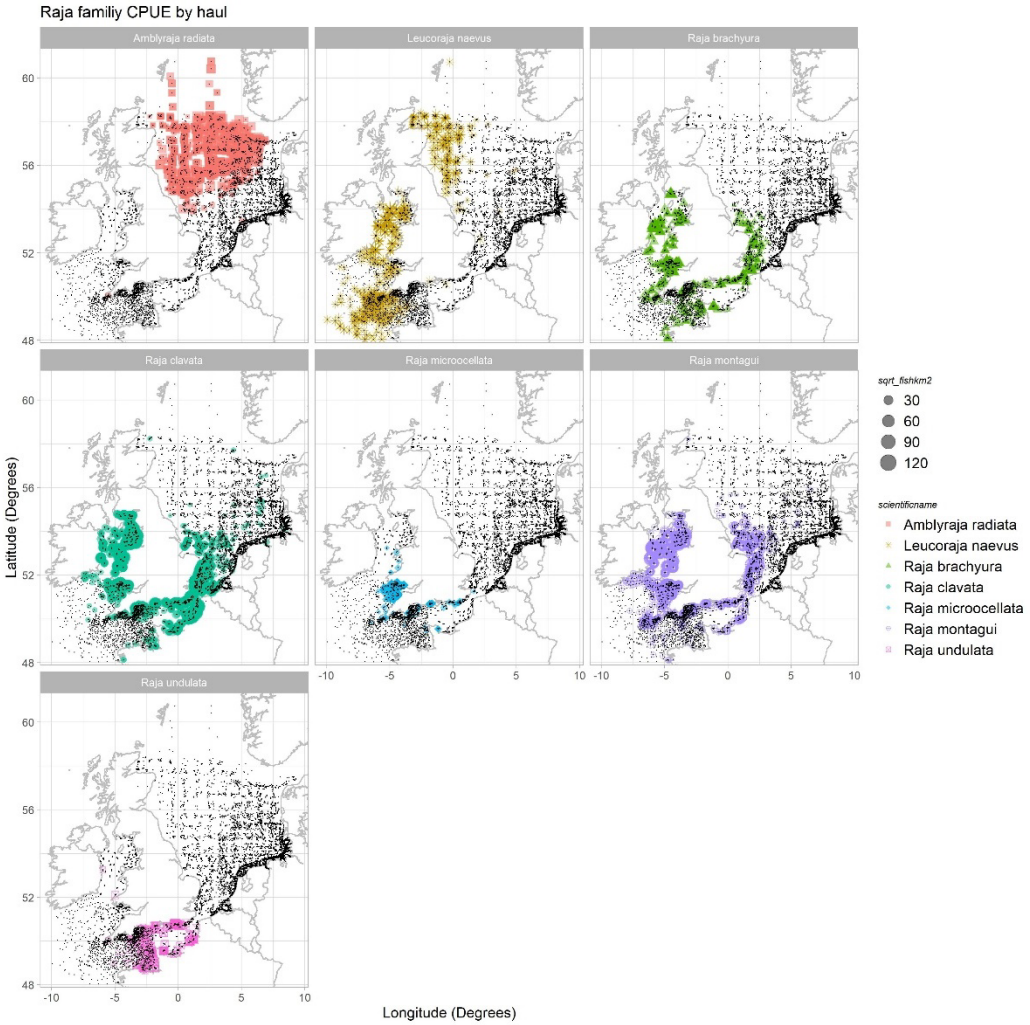

Figure A8.3: CPUE (square root of numbers/km²) by haul of Rajiformes from the BTS, SNS & DYFS for the years 2002-2021, all years combined. The colours show the different species (see legend).

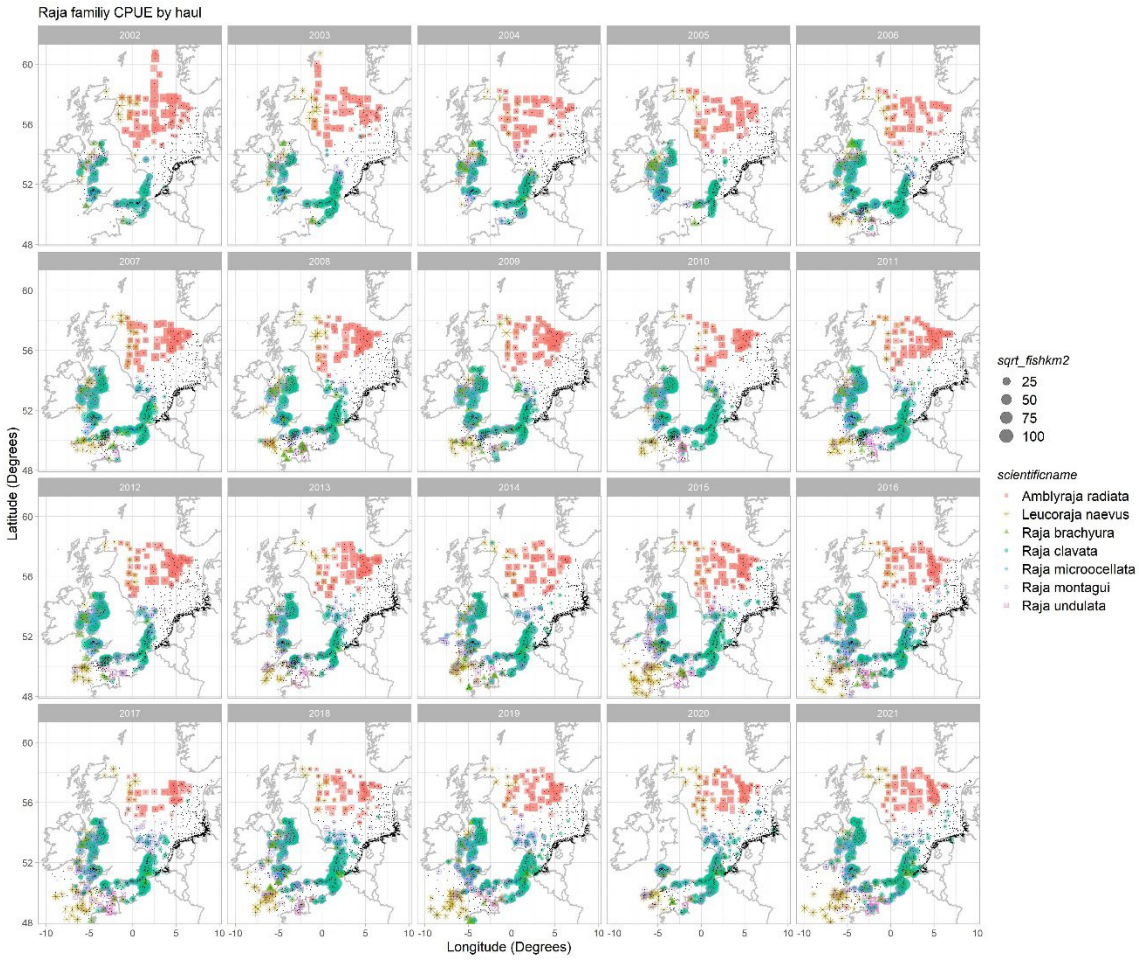

Figure A8.4: CPUE (square root of numbers/km²) by haul of Rajiformes from the BTS, SNS & DYFS for the years 2002-2021. The colours show the different species (see legend).

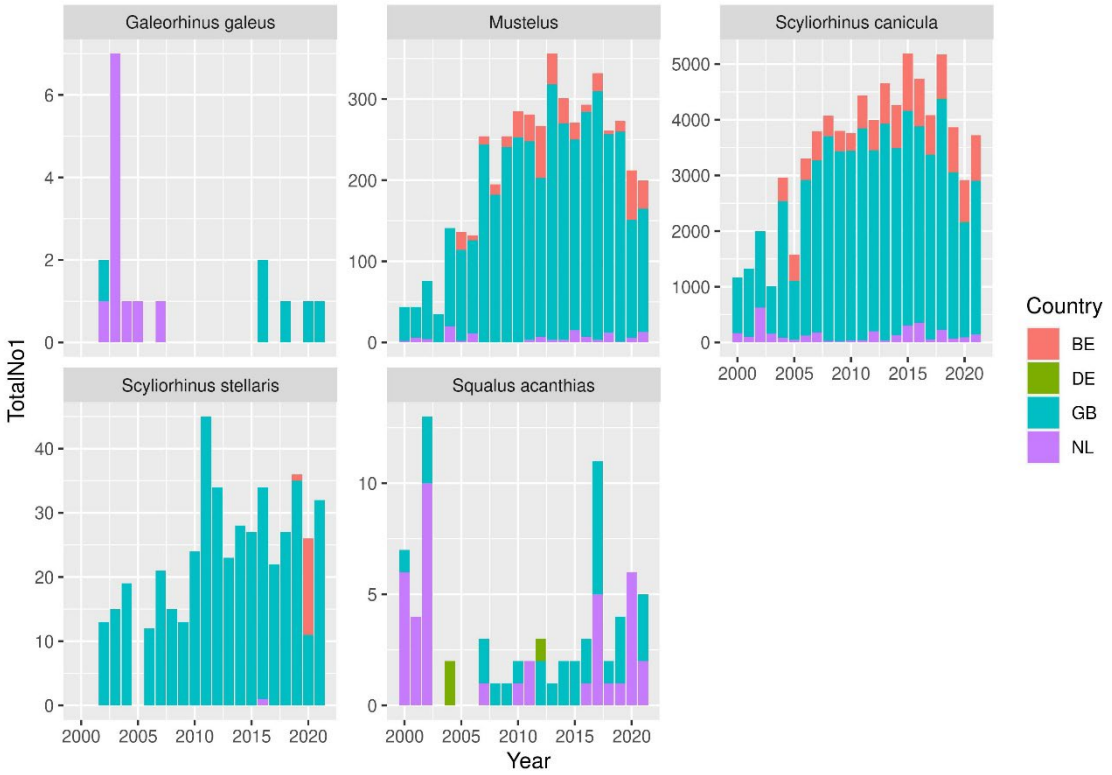

Figure A8.5: Total numbers of sharks and dogfish from BTS, SNS & DYFS data in DATRAS for the period 2000-2021. The panels are divided based on the different species. The colours show the different countries (purple=Netherlands; blue=UK; green=Germany; red=Belgium). Note the different y-axis scales per panel.

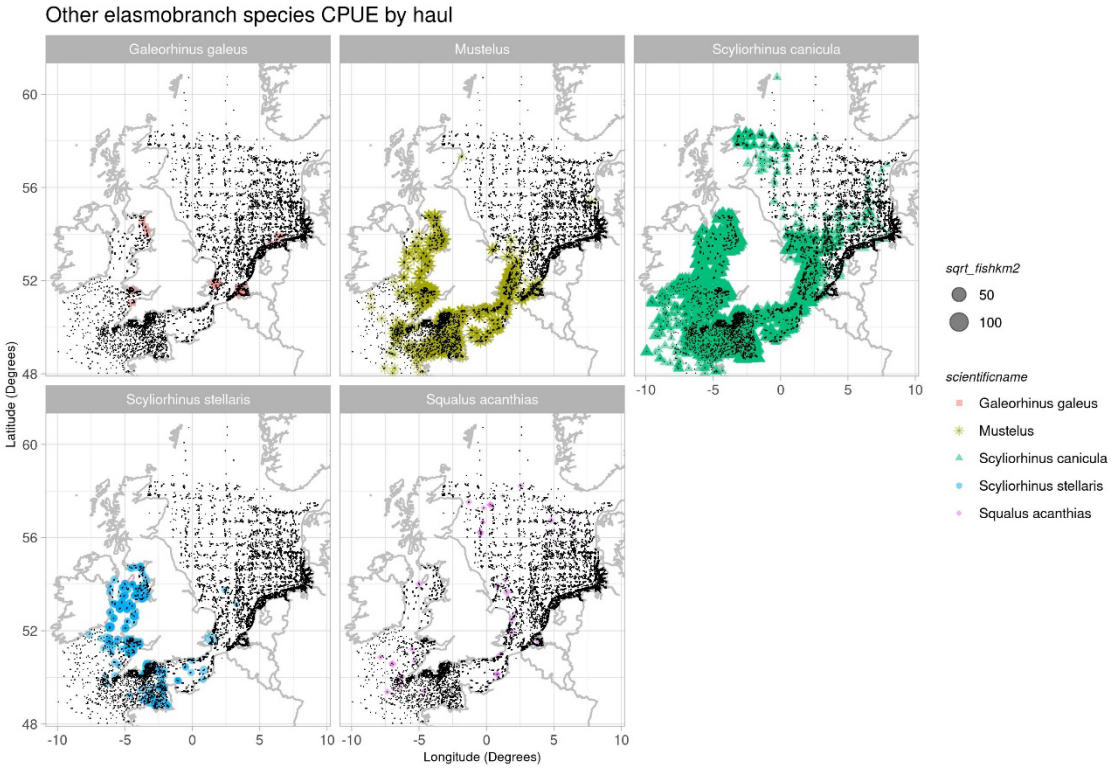

Figure A8.6: CPUE (square root of numbers/km²) by haul of sharks and dogfish from the BTS, SNS & DYFS (all years combined). The colours show the different species (see legend).

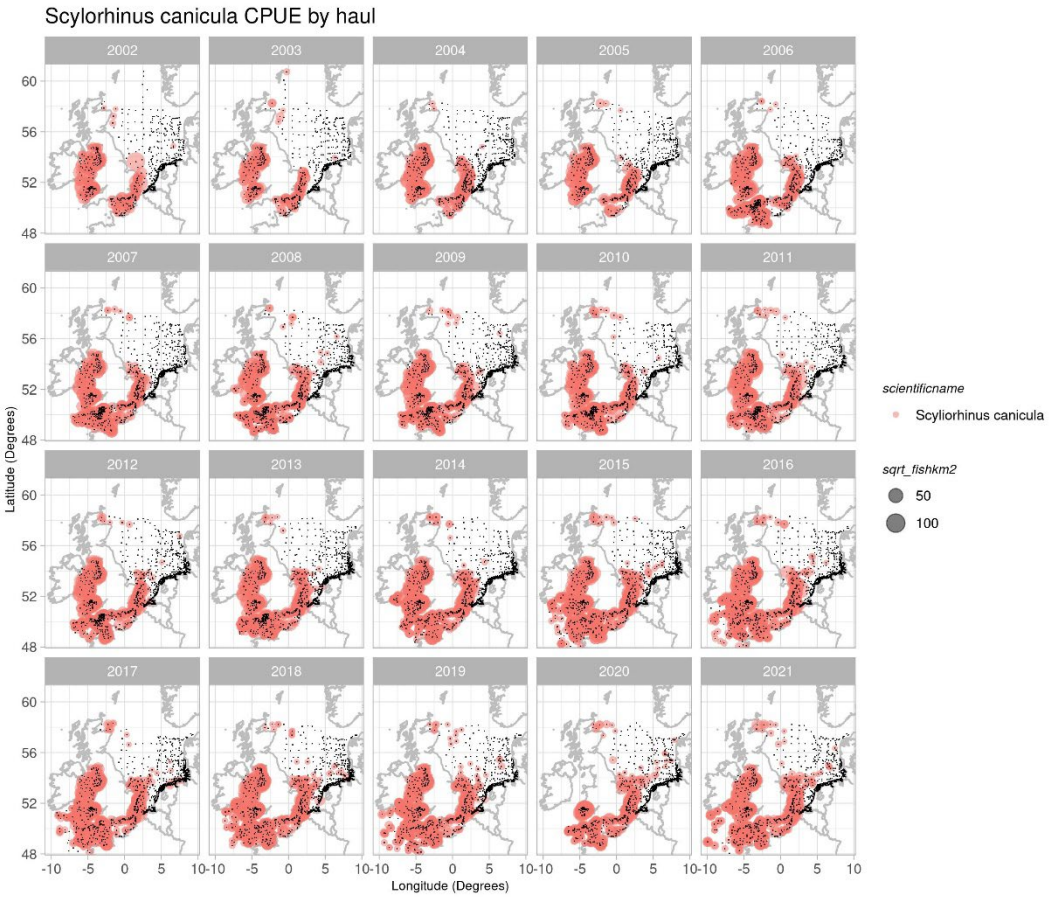

Figure A8.7: CPUE (square root of numbers/km²) by haul of the small spotted dogfish (*Scyliorhinus canicula)* from the BTS, SNS & DYFS for the years 2002-2021. The red colours show the CPUE while the black show trawl stations (see legend).

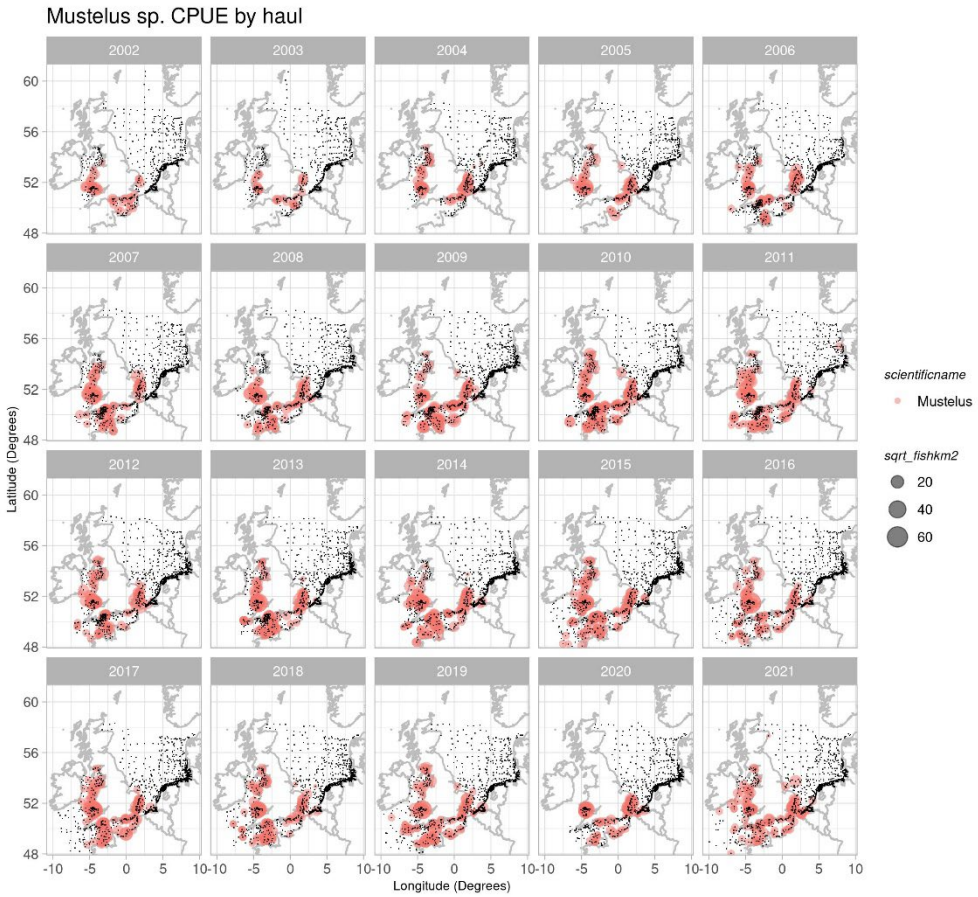

Figure A8.8: CPUE (square root of numbers/km²) by haul of the smooth-hound species (Mustelus spp.) from the BTS, SNS & DYFS for the years 2002-2021. The red colours show the CPUE while the black show trawl stations (see legend).

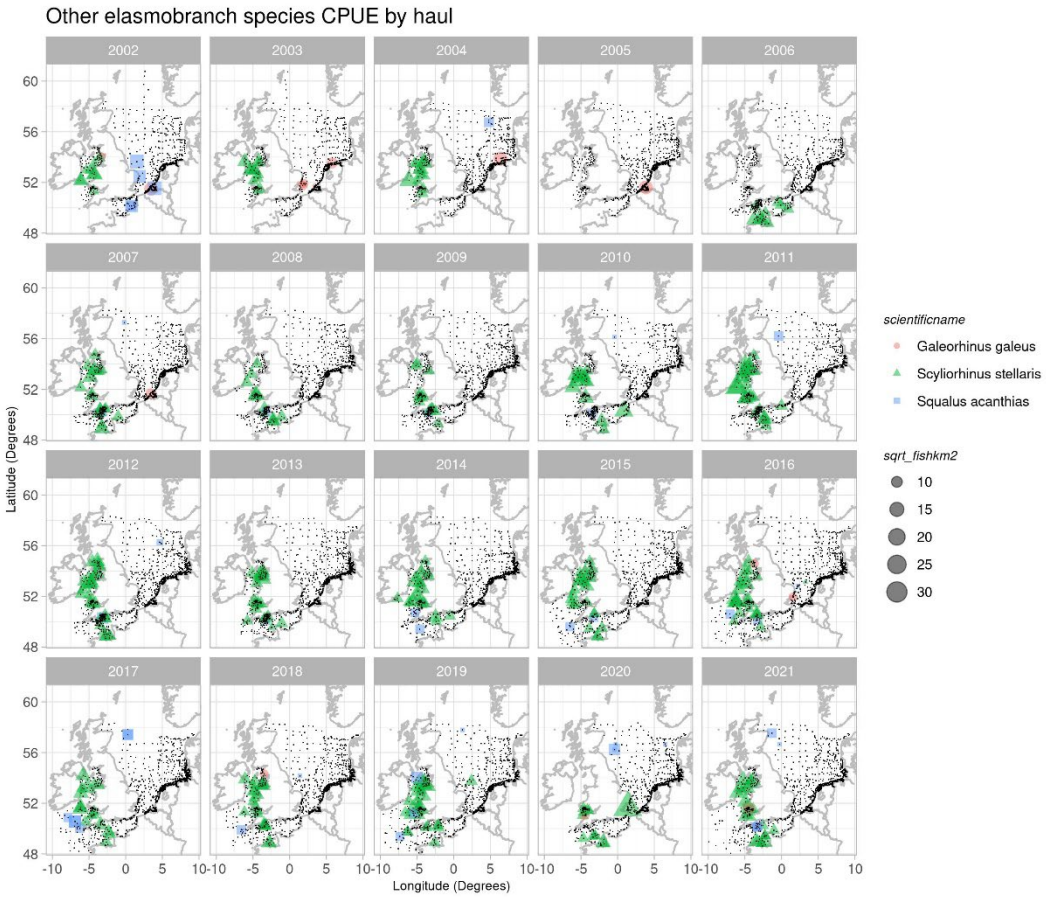

Figure A8.9: CPUE (square root of numbers/km²) by haul of the tope shark (*Galeorhinus galeus)*, nursehound *(Scyliorhinus stellaris)* & spiny dogfish *(Squalus acanthias)* from the BTS, SNS & DYFS for the years 2002-2021. The colours show the CPUE by species while the black show trawl stations (see legend).

Annex 8.1.2 Shrimp

Evaluation of shrimp data available in DATRAS

In 2021, WGBEAM subgroups evaluated inshore beam trawl survey data available in DATRAS. Scripts were made available at https://github.com/ices-eg/wg_WGBEAM. The R script was updated in WGBEAM 2022 and used to evaluate available DYFS data for brown shrimp (*Crangon crangon*). For description about data extraction and calculations of CPUE, see Annex 8.1.1. Swept area was calculated as beam width*distance, except in <5% of the cases where distance was missing and swept area was instead calculated using beam width, ground speed and haul duration.

There are clear differences among countries in the total number of shrimp measured (Figure A8.10). The total number measured is, partly explained by different number of stations per country (Belgium=33, Germany=235, and Netherlands=300), but also by different sampling procedures and subsampling routines. Those are available upon request, and in near future published in the Manual on inshore beam trawl surveys (in prep.). The number of measured shrimp does not provide information on the total amount of shrimp caught in the survey, as subsampling occurs frequently.

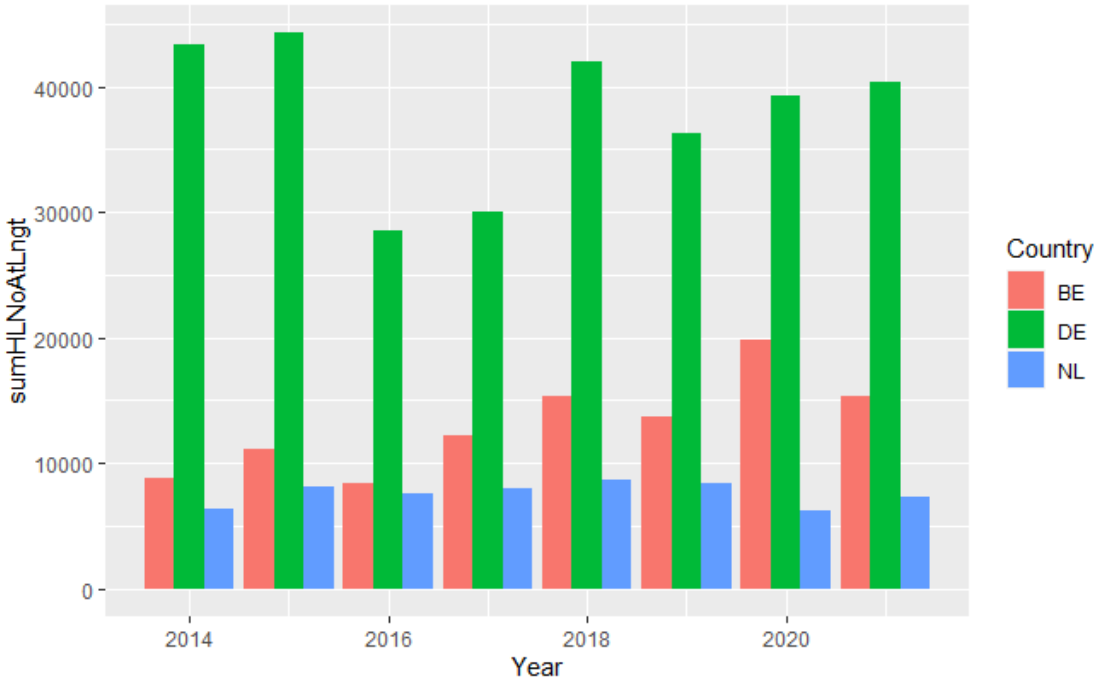

Figure A8.10: Total numbers of brown shrimp (*Crangon crangon*) measured during DYFS 2014-2021 by country.

Standardized length frequencies show differences between countries (Figure A8.11). The shrimp lengths from Belgian DYFS are skewed larger sizes compared to shrimps caught in DYFS in Germany and Netherlands, which show similar length distributions. The difference in Belgian shrimp length data can partly be explained by the survey area: the Belgian DYFS is carried out at greater depths. This is preferred by larger shrimp. Moreover, the Belgian DYFS uses slightly larger mesh sizes in the cod-end (BE: 22 mm, NL/DE: 20 mm).

The comparatively ragged length distributions of the Netherlands DYFS can be explained by the relatively smaller subsamples of shrimp compared to the German DYFS. More shrimp per swept area are caught in the Netherlands DYFS compared to the German DYFS. One explanation for this may be that a tickler chain which might increase catchability of shrimp is used in the

Netherlands DYFS while not in the German DYFS. The length ranges are relatively consistent within countries and between years.

In some years (2017, 2021) the length frequencies of shrimp in the NL and DE DYFS seem to diverge, especially with respect to smaller shrimp. In 2021 this may be clarified by large catches of bryozoans, leading to clogging of the net and so, less mesh size selectivity.

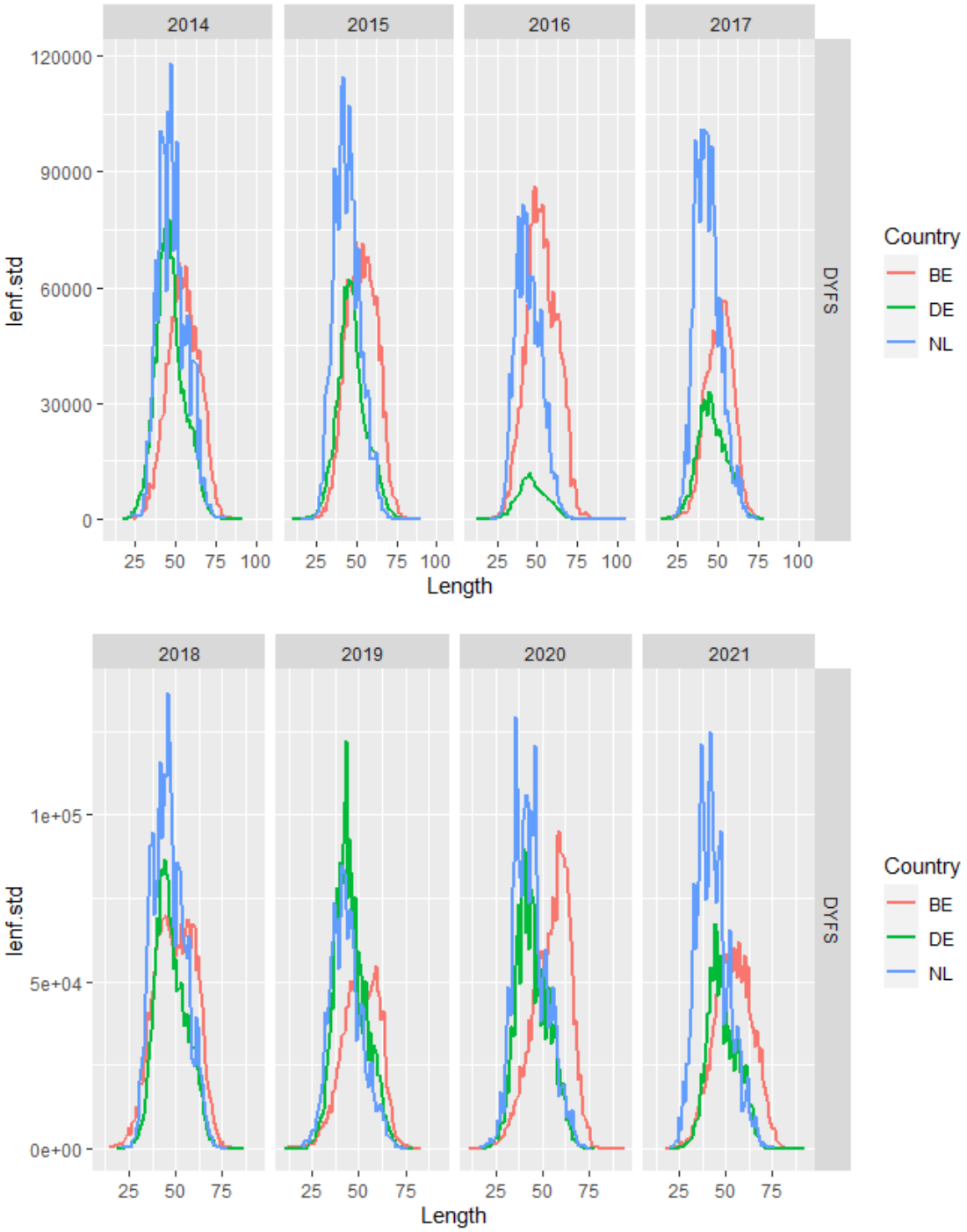

Figure A8.11: Standardized length frequencies of brown shrimp (*Crangon crangon*) obtained by raising numbers with a subfactor to estimate a total number per haul, divided by total swept area, during 2014-2021 in DYFS by Belgium, Germany, and the Netherlands.

Annex 8.2: Species consistency

Species comparison was done for overlapping areas (North Sea: Belgium/UK; Netherlands/Germany, Figure 8.12). Only a few discrepancies were found, mostly related to the level of detail in species identification, for invertebrates often due to different ways of recording (presence/absence vs. numbers), and for fish only when low numbers were caught (Table A8.2)

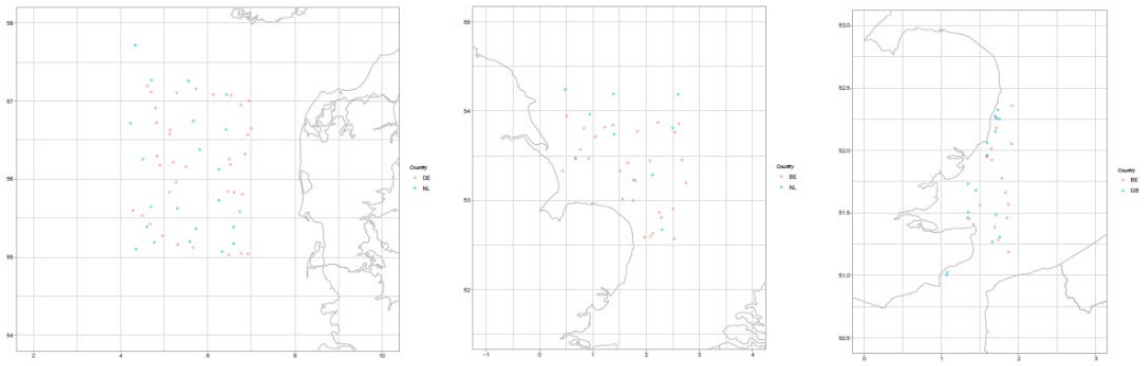

Figure A8.12: Overlapping hauls compared for species consistency across different offshore BTS.

Table A.2: Example of total number caught per species table to compare species consistency in overlapping BTS survey areas (first 15 lines displayed). NA = not recorded.

Scientific name	DE	NL	Type
Abra alba	NA	1	Bivalvia
Acanthocardia echinata	9	47	Bivalvia
Acanthodoris pilosa	NA	2	Mollusca / Gastropoda
Actinauge richardi	NA	6	Cnidaria / Anthozoa
Actiniaria	13	NA	Cnidaria / Anthozoa
Adamsia palliata	NA	22	Cnidaria / Anthozoa
Aequipecten opercularis	16	50	Bivalvia
Agonus cataphractus	194	402	Osteichthyes
Alcyonidium diaphanum	NA	51	Cnidaria / Anthozoa
Alcyonidium gelatinosum	28	NA	Cnidaria / Anthozoa
Alcyonium digitatum	37	84	Cnidaria / Anthozoa
Alloteuthis subulata	7	152	Cephalopoda
Amblyraja radiata	112	292	Chondrichthyes
Ammodytes	NA	61	Osteichthyes
Ammodytes tobianus	2	NA	Osteichthyes

Annex 8.3: Consistency in litter reporting

Data was downloaded from DATRAS (Litter Assessment Output) for the offshore survey (BTS). The inshore surveys were not considered as only Belgium collects litter data. Data was compared using an R script. The R script has been stored at https://github.com/ices-eg/wg_WGBEAM.

Different litter types are recorded during the offshore surveys. The comparison was made for the years 2019-2021 (Figure A8.13). The catch composition is quite consistent over the countries and years. It is clear records of plastic material are dominant for all countries and across all years.

A closer look was taken in the plastic and rubber fraction as this was recorded the most (Figure A8.14). The more detailed litter composition looks similar for the different surveys (mostly fishing gear, plastic sheets and plastic bags). It appeared that Germany caught a number of diapers. This seemed to be an erroneous entry and will be corrected in due time.

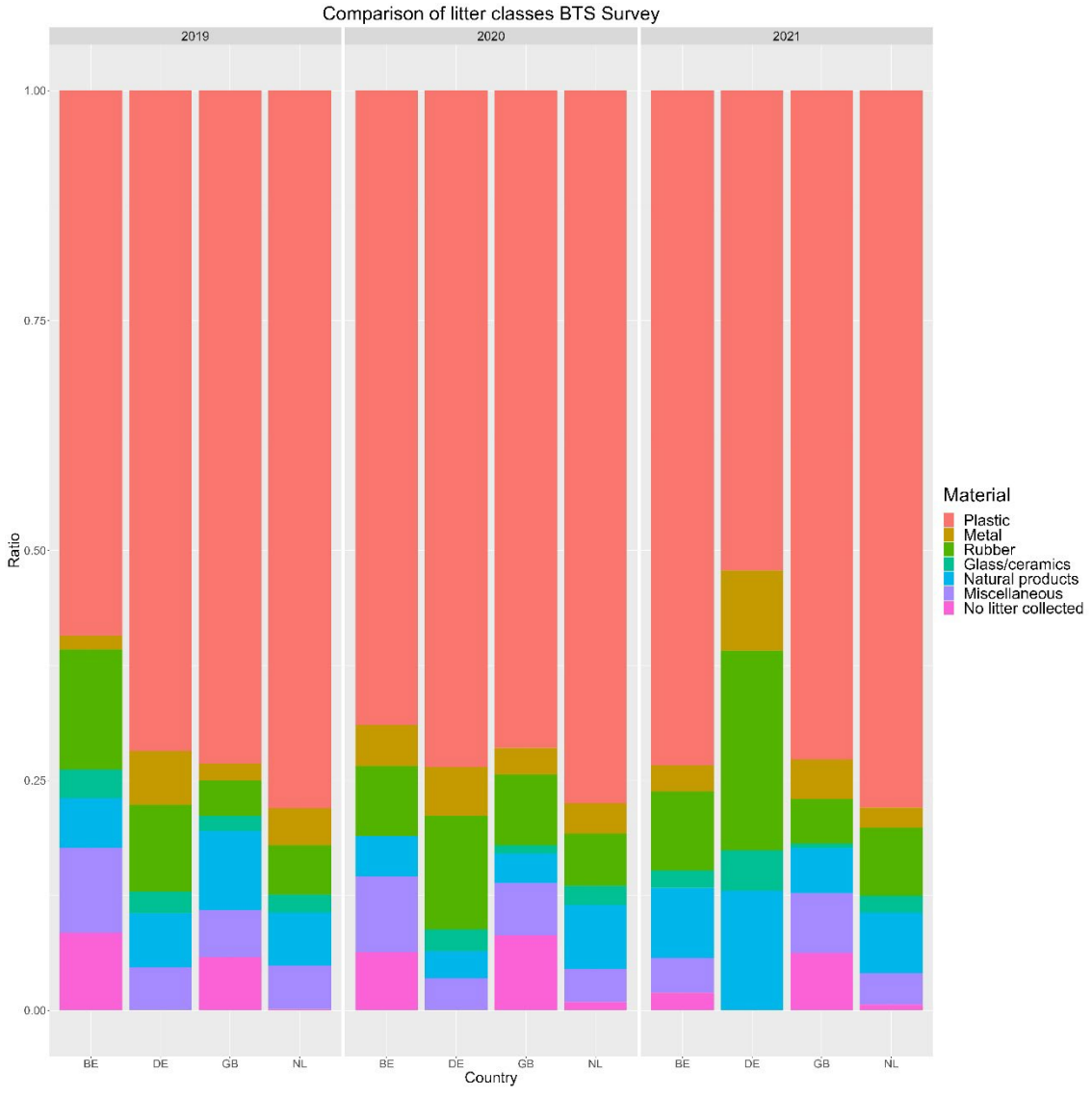

Figure A8.13 Comparison of catch compositions in different offshore surveys from 2019 to 2021; Belgium (BE), Germany (GE), Great Britain (GB) and the Netherlands (NL)

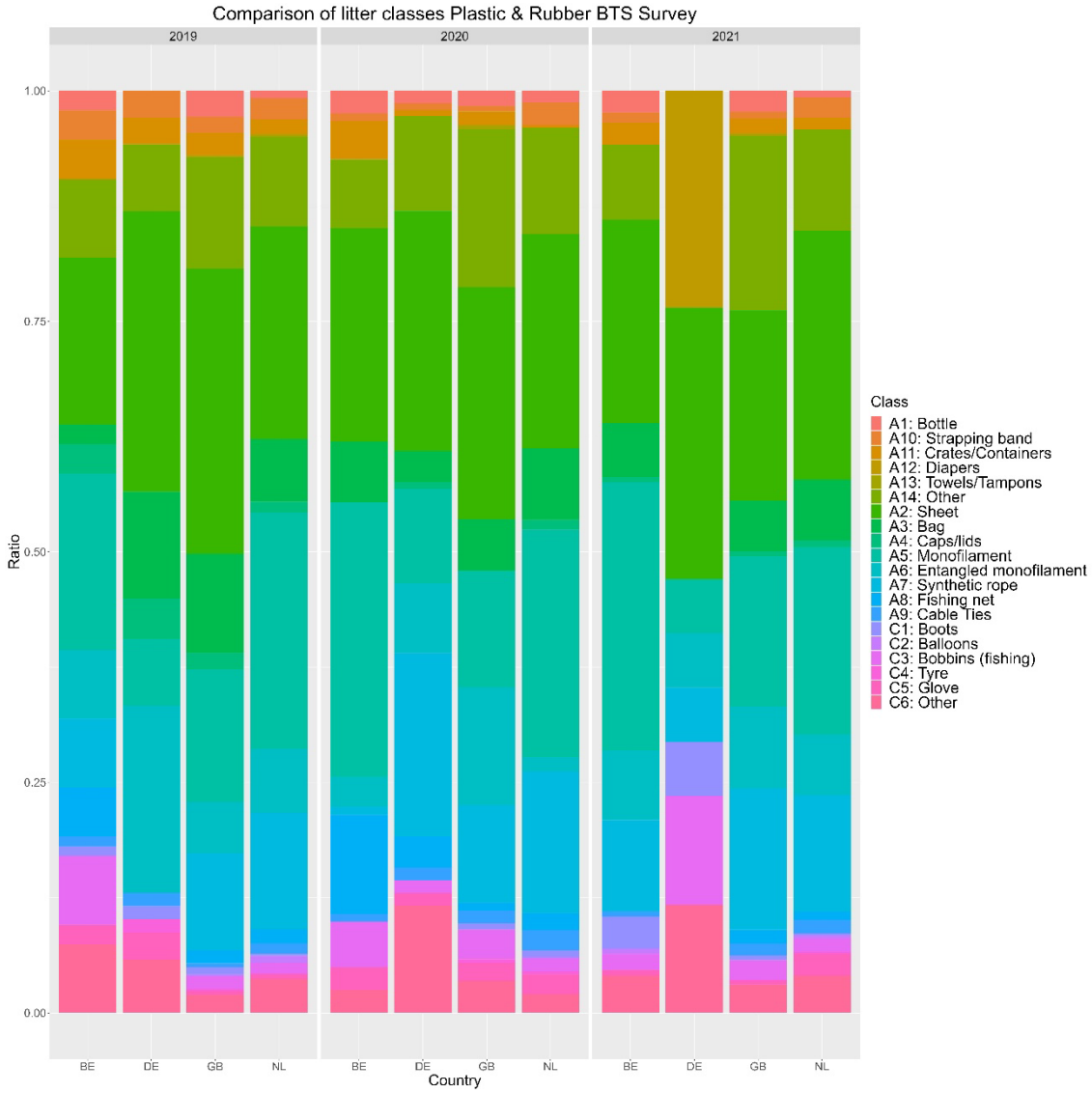

Figure A8.14 More detailed comparison of plastic and rubber fraction in different offshore surveys from 2019 to 2021; Belgium (BE), Germany (GE), Great Britain (GB) and the Netherlands (NL)

Another difference between countries is that for German data, no information is added for hauls where no litter was caught. In 2021, Germany had too little time to check all the hauls for litter. However, presently it seems that no litter was recorded. Following code should be used for hauls where no litter was collected. This will be corrected in due time.

Haul type	LTREF	PARAM	Other points of attention
With litter	C-TS-REV	See http://vocab.ices.dk/?CodeID=149933	
Without litter	RECO-LT	LT-TOT	-9 for missing numerical values, fill in char values as for the hauls with litter included

The consistency in reporting size of monofilaments (related to fishing gear) was checked across the different surveys and years. Belgium, Germany and the UK only report the surface (A-F), while the Netherlands report length when available (Figure A8.15). As length is more informative than surface for this type of litter, it is advised to adapt records when length is available and to start collecting this type of data from 2022 onwards. Additionally, it is unlikely that the surface of a monofilament is greater than A (25 cm²) as this would mean that the length of the monofilament would have to be greater than 250 m, assuming the width is 1 mm. Belgium and the UK record surfaces B to F in 2018 and 2019. This needs to be cross-checked and corrected when necessary in due time.

Finally, we noted that the links to the library on https://datras.ices.dk/Data_products/Reporting-Format.aspx were not always present or did not work properly, as links to PARAM & LTPRP are missing.

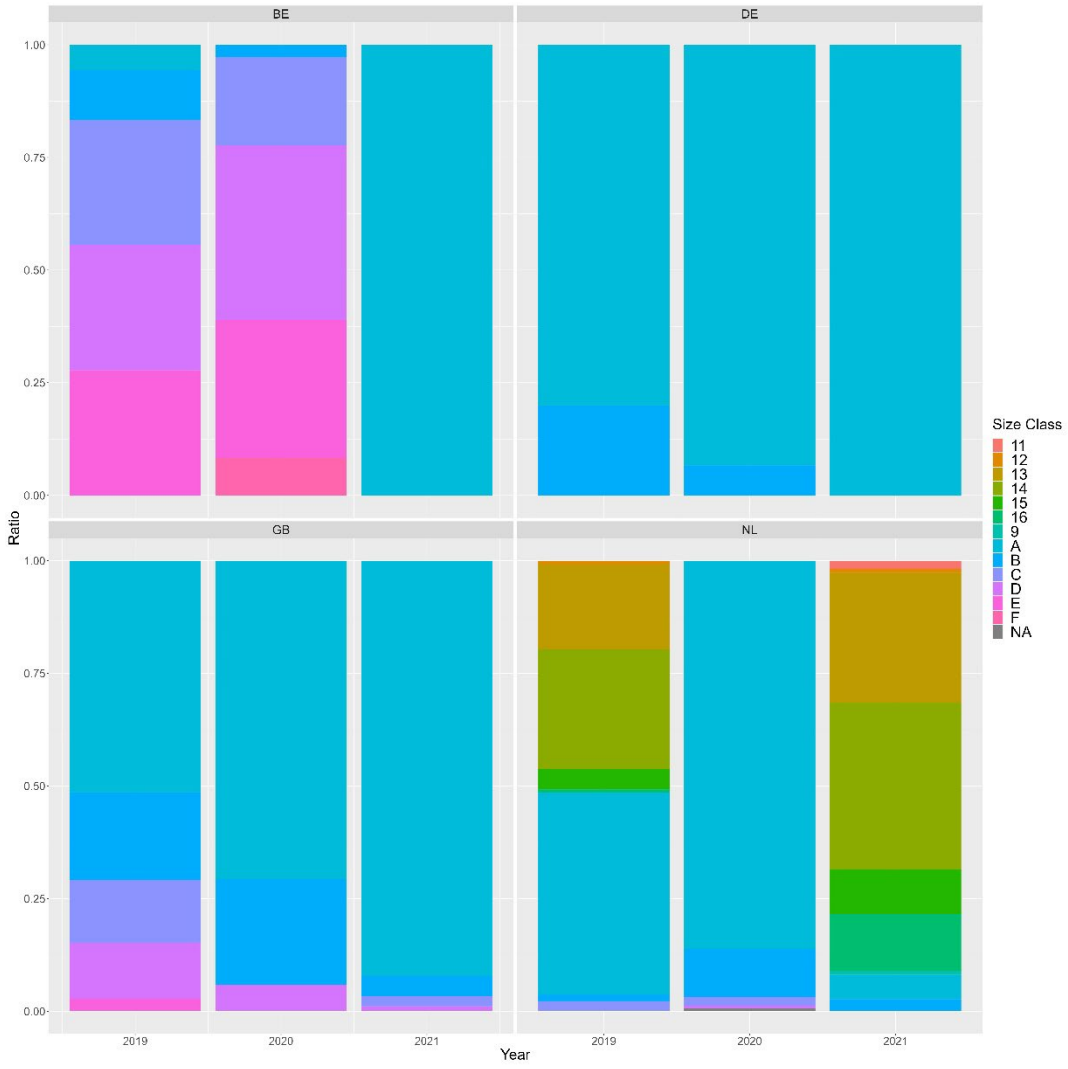

Figure A8.15 Size classes of monofilaments (A5) in different offshore surveys from 2019 to 2021; Belgium (BE), Germany (GE), Great Britain (GB) and the Netherlands (NL)

Annex 9: Fresh stomach sampling on board -an example

Ingeborg de Boois, WD for WGBEAM 2022

During the Dutch beam trawl survey 2012 fresh stomach sample processing on board was conducted. One person did the sampling and happened as soon as possible after sorting the catch. To reduce animals killed, it is preferred to use fish already used for e.g. otolith collection. Per haul 10 fish were collected, to ensure all fish could be sampled within due time after the catch came in on board.

Choice for species and/or length ranges was done based on discussion with ecosystem modellers: preferably one species, and of similar length range.

Information of the individual fish collected:
1. Fish weight (g)
2. Fish length ('to the mm below')
3. Fish sex

After that, the stomachs were sampled. The fish was cut open and the stomach was removed. The stomachs were emptied on a measuring board. At the end of the haul all stomachs and their contents laid next to each other on the measuring board.

The following information on the stomach was registered:
4. Stomach fullness (in %)
5. Digestion stage (digestion coding)
    - l or space living
    - f fresh
    - n nearly fresh
    - p partly digested
    - m mostly digested
    - s skeletal remains

Per stomach, preys were collated by species or species group, and where possible counted and/or weighed. The following information was registered:
6. Species or species group, depending on the knowledge of the person and the reliability of the identification based on the digestion stage;
7. Amount per species(group), numbers if possible, if not countable in % of the stomach content;
8. Length ('to the mm below'), if possible as an individual length, if not the smallest and the largest individual.

The information has been added to an Excel template for stomach sampling at Wageningen Marine Research (WMR). The information has been provided to the WMR database and can directly be related to the trawl haul information including the catches.