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Report of the Benchmark Workshop on North Sea Stocks (WKNSEA)

14–18 March 2016

Copenhagen, Denmark

ICES International Council for the Exploration of the Sea
CIEM Conseil International pour l'Exploration de la Mer

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Contents

Executive summary

The ICES Benchmark Workshop on North Sea Stocks 2016 (WKNSEA) convened at two meetings in Copenhagen, one data compilation workshop (23–25 November 2015) and the final benchmark meeting (14–18 March 2016).

In WKNSEA 2016 two stocks were benchmarked: saithe in IIIa, IV and VI (sai-3a46) and dab in IV and IIIa (dab-nsea). The most important conclusions for each stock were:

Saithe in IIIa, IV and VI (sai-3a46)

Existing research suggests that the North Sea stock boundary might lie north of the current 62°N management boundary. However, no trials using alternate stock definitions were attempted.

InterCatch was used for estimation of landings age composition, as well as the estimation of both discards numbers and age composition. Data from each nation were input for 2002–2014.

Alternative ways of calculating standardized age-based survey indices based on GAMs and Delta distributions were explored. The general methodology followed Berg and Kristensen (2012) and Berg *et al*. (2014) and was implemented using the *DATRAS* (Kristensen and Berg, 2010) and *surveyIndex* (Berg, 2016) packages in R.

The previous benchmark assessment used three cpue indices from the main saithe trawler fleets of Germany, France, and Norway. A single combined index was estimated to avoid using the same information twice (information in the catch-at-age matrix and in the three individual cpue fleets) in the assessment. The final model included spatial and temporal resolution, and grouped vessels by engine power intervals to avoid the potential to identify single vessels.

The North Sea IBTS Q1, Q3 and Scottish West Coast Q1, Q4 surveys were used for the biological data for saithe. The Scottish West coast survey gives valuable information about the saithe population in Area 6, which is not covered in the IBTS Q1 or Q3 surveys. Maturity-at-age were summarized directly from the length-stratified samples taken for the 1st and 4th quarter NS-IBTS and SWC-IBTS SMALK databases. The proportions mature-at-age estimated from the survey data showed large fluctuations between years for ages 3 and 4. As a conservative approach, proportions mature-at-age 3 were set to zero and proportions-at-age 4 to half of the estimated average proportion mature. Lack of time meant natural mortality could not be fully investigated at this benchmark.

A SAM (State–space Assessment Model, Nielsen and Berg, 2014), which has been run in parallel as an exploratory run since 2013, was explored. The final model includes the standardized single cpue index, GAM Q1 and Q3 indices, and accounts for the survey autocorrelation structure (between ages within years, i.e. year-effects).

The short-term projection is run in SAM in the form of short-term stochastic projections.

New reference points were estimated. F_{MSY} analyses were conducted with Eqsim.

Future Research and data requirements were identified, also by the external reviewers.

Dab in IV and IIIa (dab-nsea)

No scientific evidence was available to examine different stock units within the North Sea. The current stock structure was maintained.

Catch data were raised in InterCatch. Discards are extremely high in the case of dab. During the WGNSSK 2015 discards could be estimated for the years 2012–2014. At the benchmark more discard data sampled under the DCF was available so it was possible to create a time-series on total catch from 2002 to 2014. The discard rate (relative to total catch) increases from 76% in 2002 up to 91% for the last year of the series.

The most suitable survey for dab is the International Beam Trawl Survey (BTS) targeting flatfish species in the North Sea. Though the geographical coverage is limited compared to the International Bottom-trawl Survey (IBTS), the IBTS has never collected any biological parameters of dab in a consistent way or covering the whole distribution range of dab. Age–length keys were available for the two Dutch beam trawl surveys and the German beam trawl survey. A combined age-based index constructed by applying the delta GAM method of Berg *et al*. (2014) showed the best internal consistency. It was agreed to use this as input for the assessment model runs.

Weight-at-age data were estimated form Dutch survey data using the DATRAS R package (Kristensen and Berg, 2010). Only very few maturity data are available from surveys. Based on these observations, and taking into account information from literature that dab mature early (Rijnsdorp *et al*., 1992), a fixed maturity ogive was applied. The natural mortality for dab was estimated following the approach by Then *et al*. (2014). This method is based on an empirical formula taking the maximum observed age into account. The maximum observed age for dab in the available data was 18 years which resulted in an estimated natural mortality of 0.35.

A SURBAR assessment (Needle, 2015) model run resulted in an overall decreasing mortality z from 0.53 in 2003 to 0.32 in 2014. The spawning–stock biomass showed an increasing trend, especially from 2009 onwards, from 100 to 240 (relative abundance estimate). Recruitment showed an increase by a factor of 2.5 from 1.5 (2003) to 3.8 (2013), but dropped below 3 in 2014. The assessment results from SURBAR seemed to be robust to different parameter settings, and were supported by several other analyses.

A length-based mortality estimator method was also used to estimate fishing mortality for dab. A modification of the original Gedamke-Hoenig mean length-based mortality estimator was applied (Gedamke and Hoenig, 2006). Using this method F was estimated to have decreased from 0.33 to 0.12 from 2002 to 2014. The lack of trend in mean length in the time-series can be explained by the increased recruitment concurrent with the decrease in effort. Additionally, the estimate of M in the model is consistent with that obtained.

The benchmark explored the possibility of an age-based assessment model for dab. An exploratory assessment using the SAM model produced similar results as the SURBA model: decreasing F, increasing stock biomass and recruitment. The SAM model puts most weight on the survey data which are the same data as used for the SURBA model. Given the unrealistic age distribution of the catch samples the fishing mortality pattern for age 5 was not considered realistic, and the survey-based SURBAR model was considered more appropriate.

The external reviewers agreed that results generated by the SURBAR assessment model could be used for providing fisheries advice under the ICES Stock Category 3 framework. Hence no short-term forecast or reference points were decided upon.

1 Introduction

The ICES Benchmark Workshop on North Sea Stocks 2016 (WKNSEA) convened at two meetings in Copenhagen, one data compilation workshop (23–25 November 2015) and the final benchmark meeting (14–18 March 2016). Matthew Dunn, Martin Dorn, and John Hoenig acted as the external experts. They reviewed data compilation and modelling methods at the 2016 meeting attended by the assessment analysts.

The previous benchmark of North Sea saithe was in 2011 (WKBENCH 2011). Since them a number of issues regarding the data and assessment model have been identified. These were compiled into an issue list by WGNSSK. The benchmark address most of these concerns, but due to a lack of time, data and/or expertise a few of the issue remain unaddressed.

Prior to WKNSEA dab was treated as a data-limited species. The assessment was solely based on survey trends (IBTS-Q1, mature biomass) and catch data (DLS 3.2. method). Although dab is treated as a data-limited stock a lot of data exist which were not currently utilized. The IBTS survey is not considered the most appropriate to a flatfish species as the gear used (GOV) is not designed for the purpose of catching flatfish. Therefore, it was decided to explore the available beam trawl survey indices. Previously only three years of discard estimates were available to ICES for dab in the North Sea. Additional data back to 2002 was obtained allowing a more appropriate raising of the catch data for this stock.

The following terms of reference were addressed during the WKNSEA meetings in 23–25 November 2015 (data compilation workshop) and 14–18 March 2016 (benchmark assessment workshop):

2015/2/ACOM38 A **Benchmark Workshop on North Sea stocks** (WKNSEA), chaired by External Chair Matthew Dunn, New Zealand and ICES Chair David Miller, the Netherlands, and attended by invited external experts Martin Dorn, USA and John Hoenig, USA will be established and will meet at ICES HQ, 23–25 November 2015 for a data evaluation meeting and 14–18 March 2016 for a Benchmark meeting to:

a) Evaluate the appropriateness of data and methods to determine stock status and investigate methods for short-term outlook taking agreed or proposed management plans into account for the stocks listed in the text table below. The evaluation shall include consideration of:
   - i) Stock identity and migration issues;
   - ii) Life-history data;
   - iii) Fishery-dependent and fishery-independent data;
   - iv) Further inclusion of environmental drivers, multispecies information, and ecosystem impacts for stock dynamics in the assessments and outlook.

b) Agree and document the preferred method for evaluating stock status and (where applicable) short-term forecast and update the stock annex as appropriate. Knowledge of environmental drivers, including multispecies interactions, and ecosystem impacts should be integrated in the methodology. If no analytical assessment method can be agreed, then an alternative method (the former method, or following the ICES data-limited stock approach) should be put forward;

c) Evaluate the possible implications for biological reference points, when new standard analyses methods are proposed. Propose new MSY reference points taking into account the WKFRAME2, results and the introduction to the ICES advice (section 1.2), WKMSYREF3 and WKMSYREF4.

d) Develop recommendations for future improving of the assessment methodology and data collection;

e) As part of the evaluation:

  i) Conduct a 3 day data evaluation workshop. Stakeholders are invited to contribute data (including data from non-traditional sources) and to contribute to data preparation and evaluation of data quality. As part of the data compilation workshop consider the quality of data including discard and estimates of misreporting of landings;

  ii) Following the Data evaluation, produce working documents to be reviewed during the Benchmark meeting at least seven days prior to the meeting.

Stocks	Stock leader
Dab-nsea	Holger Haslob
Sai-3a46	Jennifer Devine

The Benchmark Workshop will report by 15 April 2016 for the attention of ACOM.

2 Description of the Benchmark Process

The ICES benchmark on North Sea stocks included the following steps:

1) A data call was issued in 2015 for the North Sea stocks to be benchmarked in WKNSEA. The data call was based on the WGNSSK data call but asked for InterCatch data back to 2002 and additional data where asked for (i.e. tagging data, maturity-at-length/age data).

2) A data compilation workshop was held in Copenhagen, 23–25 November 2015. The main focus of this meeting was to review relevant datasets and consider information and issues for each stock, as well as prioritizing work in the run up to the actual benchmark. A summary was prepared on issues, data available, data gaps and planned working papers. The summary was sent to the external experts to facilitate the contact between the externals and stock coordinators.

3) In the build-up to the assessment meeting, a WebEx was held with the external experts to discuss the main outcome of the Data Compilation Workshop, present conclusions and the work planned for the next two months to prepare for the benchmark workshop.

4) The majority of the working documents to be discussed were provided to meeting participants in advance of the final meeting. The following working documents were prepared before the meeting:

Saithe WDs

Saithe		
Title	Description	Contributors
1. Saithe Stock ID	Conduct a review of existing genetic and tagging studies	J. Devine, TJ, K. Nedreaas, JES (all IMR)
2. CPUE indices for saithe	Summary of national CPUE time-series and description of fisheries, combination of national data, age-aggregated biomass indices	K. Korsbrekke, A. Kempf, Y. Vermard, J. Devine
3. IBTS indices of saithe	Exploration of combining IBTS indices	J. Devine, C. Berg, F. Burns, +IMR, +IBTS
4. Catchability of age 3 fish in the surveys	Explore factors affecting this	J. Devine, +IMR
5. Raising of catch data in Intercatch	Effect of different raising procedures for discards and landings	J. Devine
6. National sampling/raising of saithe catches	Collation of information about national sampling/raising procedures	J. Devine, +ICES data
7. Biological data for saithe	Maturity, weights-at-age	J. Devine
8. Assessment models: SAM	Exploration of alternative assessment model (settings).	J. Devine, A. Nielsen, A. Magnusson
9. Assessment models: A4A	Exploration of alternative assessment model (settings).	J. Devine, E. Jardim

10. Recruitment data for saithe	Collation of available data sources (Norwegian)	J. Devine, R. Nash, K. Nedreaas

Dab WDs

Dab		
Title	Description	Contributors
1. Survey indices for dab	Evaluation of different survey indices in order to inform the stock status of North Sea dab - combining BTS, ALKs from BTS to IBTS data, recruit survey results	H. Haslob, C. Berg, L. Bolle, I. de Boois
2. Catch data	Outcome and description of InterCatch raising (discards and landings)	H. Haslob, R. Verkempnyck, A. Kempf, D. Miller
3. Biological data	Evaluate and compile all available biological data for North Sea dab	H. Haslob, L. Bolle
4. Age-based assessments	Testing the suitability of age-based models	H. Haslob, R. Verkempnyck, A. Nielsen
5. Survey-based models	SURBA fits	H. Haslob, C. Needle

5) The benchmark meeting was held in Copenhagen, 14–18 March 2016.

6) The first few days of the benchmark meeting were devoted to presentations of working papers, presentation of input data. The rest of the meeting was spent exploring assessment model runs. After each presentation, discussions were held and participants tried to reach conclusions.

7) By the end of the meeting, conclusions were not reached for all of the ToRs. Additional work was needed, agreed between the external reviewers and the respective scientists.

Following the conclusion of the benchmark, invited Experts Matthew Dunn (New Zealand), John Hoenig (US) and Martin Dorn (US) reviewed data compilation and modelling methods and provided agreement for the main aims of the meeting (i.e. final assessment procedures). The external reviewers commended all of the participants for their efforts during the benchmark process. Both of the assessment teams were asked to provide additional analyses during the meeting, and their response to those request were helpful in furthering our understanding of each assessment. They felt the work conducted by the analysts and other researchers was successful in bringing useful information to the management process.

3 Saithe in 3.a, 4, 6

This section relates to the saithe stock in the North Sea (4), the Skagerrak (the northern section of Division 3.a) and the west of Scotland (6).

3.1 Stock ID and substock structure

Two working papers were presented that summarized studies examining genetic differentiation, movement, and life stage connectivity in North Sea saithe (WD1 and WD10). These working papers provided evidence that the geographical range for North Sea saithe is north of 62°N (the northern management boundary) and the stock border might actually lie as far north as 65°N.

Genetic studies on saithe provided conflicting evidence of stock differentiation. Gel electrophoresis (Child, 1988) and mitochondrial DNA (Erikson *et al*., 2015) found no indication of genetic differentiation when comparing samples in the Northeast Atlantic, or when comparing samples from the Northeast Atlantic with those off Canada. However, Saha *et al*. (2015), using seascape genetics and single nucleotide polymorphisms, identified four distinct genetic clusters: Canada, Rockall, Barents Sea, and central Northeast Atlantic. Furthermore, saithe sampled from Halten Bank (64.6°N; part of the Northeast Arctic saithe stock) were found to be similar to North Sea saithe, while those from Rockall (currently part of the North Sea saithe stock) were found to be genetically different.

Norway conducted an extensive saithe tagging program along the coast in the 1950s through the 1980s, the results of which corroborate the Saha *et al*. (2015) study. Saithe tagged south of 65°N were found to migrate into the North Sea, while those tagged north of 68°N migrated northwards; fish between 65° to 68°N could move either north or south (Jakobsen, 1978a, b; 1981; 1985). North Sea saithe were also recaptured around the Faroese Islands and Iceland, but fish spawned around Iceland and the Faroes do not seem to migrate to the North Sea (Armannsson *et al*., 2007, Homrum *et al*., 2013).

Surveys of 0-group gadoids were undertaken in June–July in the northern North Sea between 1974 and 1983 (Holden, 1981; Hislop *et al*., 1984), along the Norwegian coast from 58°N to 70°N from 1985–1993 (details in Nedreaas, 1986; Nedreaas and Smedstad, 1987; Bjørke and Sætre, 1994), and again from 1996–2014. These surveys showed a clear mixing of stocks across management boundaries. The Norwegian inshore nursery areas between 62°N and 66°N were suggested as being populated by larvae from the North Sea spawning grounds, and possibly also grounds from west of Shetland and the Faroes, while those north of 66°N were from the grounds along the Norwegian shelf edge (Bjørdal and Skar, 1992). Once within the inshore nursery areas, saithe have high fidelity to their nursery grounds; no large migrations between or among adjacent nursery grounds occur (Jakobsen, 1978c; Bjordal and Johnstone, 1993; Armannsson *et al*., 2007; Uglem *et al*., 2009; Otterå and Skilbrei, 2014).

While there appears to be evidence that the North Sea stock boundary might lie north of 62°N (the current management boundary), no trials using alternate stock definitions were attempted. This was noted as being worth exploration and would necessitate coordinating with the NEA saithe stock coordinator.

3.2 Issue list

The issue list is taken from Annex 6 of ICES WGNSSK (2015). The 'Comments' column indicates whether the issue was handled during this benchmark and, if yes, where it can be found.

Issue	Problem/Aim	Work needed	Data needed: are these available/where should they come from?	Comments
Catch data	Load historic data into InterCatch	Sensitivity analyses for various allocation scenarios	Catch data: 2004–2014 primary years, further back would be better. Sampled data for fleets/nations taking 5% or more of catch National institutes	Section 3.6.1, WD 5
	Load discard data into InterCatch	Sensitivity analyses for various allocation scenarios	Required years 2012–2014; further back would be better Sampled data for major fleets/nations National institutes	Section 3.6.1, WD 5
	Create new cpue indices for major fleets	Exploration of alternate cpue indices, including: standardized indices, horsepower Index of dispersal of commercial fleets	Germany, France, Norway	Section 3.6.2.2, WD 2
	Changes in exploitation pattern and how that might affect cpue indices	Data from VMS and logbooks to look at patterns of catches	National Institutes (France, Germany, Norway, others?)	Not investigated
	Large catch from the recreational fishery, esp. of prerecruit fish, could be large	Collate recreational catch information to determine fishing mortality on prerecruit/recently recruited fish	Recreational fishery catch statistics, national institutes (Scotland, Norway, others?)	Not investigated

Issue	Problem/Aim	Work needed	Data needed: are these available/where should they come from?	Comments
Survey data	Is there a better index area from the IBTS Q1 and Q3 surveys that encompasses the distributional range of saithe	Exploration of different index calculations	DATRAS; national institutes	Section 3.6.2, WD 3 and 8 (Appendix C)
	Are there alternate surveys which can be combined with IBTS Q1/Q3 or used in addition to current surveys?	Exploration of different surveys for use as tuning indices. Can standard IBTS surveys be combined with West of Scotland surveys to give a more complete picture of the saithe stock dynamics?	DATRAS: West Coast of Scotland Q1 and Q4 surveys IBTS Q1 & Q3 Others?	WD 3 No, saithe data (incl. age information) is too sparse in the Scottish West Coast surveys.
	Can the NORACU index be used for part of the time period (is there any information in this index) Can NORACU be designed to give good information?	Reanalysis of acoustic data from NORACU survey Look at survey design	Norway	No, the series cannot be used due to the lack of biological samples and target identification tows. A new series was begun in 2014 (new design, fixed issues) and will be ready for use in the 2019 assessment.
Stock identity/stock structure	Determine if stock structure adequate / degree of mixing with NEA and Icelandic stocks		Tagging/genetic information to help differentiate stock structure; national institutes	Section 3.1, WD 1
Biological data	Is there a good source of data for use as stock weights? Are there evidence of changes in productivity (linked to changes in growth/growth rates)?		IBTS/other surveys/fisheries-independent data	Section 3.6.3.1, WD 7 Productivity not fully explored.

Issue	Problem/Aim	Work needed	Data needed: are these available/where should they come from?	Comments
	Is there a better recruitment model? Are there models available to predict recruitment under different productivity regimes? Could recruitment-at-age 0 be used look for trends in production in future? Recruitment to open ocean – unknown amount/timing changes	Explore alternate recruitment models Explore if age 0 fish index give an indication of future (3-year) trends? Is recruitment from nursery areas to the North Sea being delayed by increasing fish-farm activity?	3. MIK survey/Keno project 4. Acoustic tagging work in fjords	Random walk model used for recruitment in SAM model. Sources of potential data for recruitment series catalogued in WD 10 (egg and larval surveys, juvenile nearshore survey in Skagerrak) Acoustic tagging in fjords in WD 1.
	Maturation Constant maturity ogive used for entire period – explore alternatives	Is a constant ogive over the entire time-series appropriate? What is the most appropriate dataset to use? Does the maturation at age match with the recently changed maturation scale used on surveys?	IBTS surveys	Section 3.6.3.2, WD 7.
	Natural mortality Constant rate of 0.2 used – explore alternatives	Does M vary with different productivity regimes? Is a static or dynamic period appropriate?		Section 3.6.3.3, WD 7. Alternate M of 0.26 trialled in SAM model (WD 8)

Issue	Problem/Aim	Work needed	Data needed: are these available/where should they come from?	Comments
Assessment model	Replace XSA	Is there a better assessment model for this stock than XSA (e.g. SAM, Canadian Pollock model)? Is there anything we should explore within the model, e.g. landing fraction, dome-shaped harvest, impact of changing the plus-group, bias in the survey(s)? Perform sensitivity runs with different model input data configurations Analyse performance of different ages in the assessment model		Section 3.6.4, WD 8
Biological reference points	Do these need modification with new knowledge?	Benchmarked assessment method	During benchmark	Section 3.8

3.3 Scorecard on data quality

A scorecard was not used for this benchmark.

3.4 Multispecies and mixed fisheries issues

No new information was presented at the benchmark meeting.

3.5 Ecosystem drivers

No new information was presented at the benchmark meeting.

3.6 Stock assessment

3.6.1 Catch; quality, misreporting, discards

InterCatch: 2002–2014

InterCatch was used for estimation of landings age composition, as well as the estimation of both discards numbers and age composition (WD 5). Data co-ordinators from each nation were tasked to input data for 2002–2014 into InterCatch, disaggregated by quarter and métier. Allocations of discard ratios and age compositions for unsampled strata were then performed in order to obtain the data required for the assessment. Although InterCatch was previously used to estimate 2012–2013 catch data, these years were re-calculated in InterCatch following the 2014 data call; catch data for the years 2002–2011 have now been processed through InterCatch for the first time. Appendix 1 in WD5 provides a detailed summary of the InterCatch input data.

Discards were raised within InterCatch. If discards were not included for a particular métier-area-quarter-country-year combination, they were assumed to be unknown (non-zero) and raised. The instructions in the data call specified that if discards were 0, this had to be included in the upload to InterCatch as a 0. Discards on a country-area-quarter-métier basis were automatically matched by InterCatch to the corresponding landings. Quarterly discards were manually matched to annual landings on a country-area-métier basis (e.g. UKS discards for OTB_DEF_>=120_0_0_all in 6.a for quarters 1-4 were matched to annually reported landings by UKS for OTB_DEF_>=120_0_0_all in 6.a). These matched discards-landings were used to estimate a landing-discard ratio, which was then used for further raising (creating discard amounts) of the unmatched discards.

The approach used for discard ratio allocations was as follows:

- The saithe trawler métiers for Germany and France were raised using matched landings-discards from the saithe trawler métiers for these countries. This was because German and French discard practices were stated to be similar (French and German delegates, WGNSSK, pers. comm.).
- Division 3.a, discards were raised by quarter for all métiers, all countries using matched landings-discards in 3.a by quarter from all métiers, all countries.
    - If the only available matched landings-discards had high ratios or were from only OTB métiers, then matched landings-discards from Area 4 were also used (same quarter, all countries, all métiers). This

was because OTB métiers generally had higher discard ratios than other métiers.

- Areas 4/6: were often grouped because matches of landings-to-discards in 6 were few; if enough discard data existed for Area 6, which was typically only in the more recent years, these two areas were treated separately. When enough discard information existed, OTB_DEF (bottom trawlers, demersal fish) métiers were dealt with separately from other métiers because these landings-to-discards ratios tended to be higher.
  - All Non-OTB_DEF métiers by quarter (all countries) were raised using matched landings-discards ratios for all non-OTB_DEF métiers by quarter (all countries). If not enough data existed, data were raised by area (all quarters were lumped); this was generally only for years early in the series.
  - All OTB_DEF métiers by quarter (all countries) were raised using matched landings-discards ratios for all OTB_DEF métiers by quarter (all countries). If not enough data existed, data were raised by area (all quarters were lumped); this was generally only for years early in the series.
- FDF métiers were not treated separately (note, FDF métiers were not available prior to 2009).
- Where annual, not seasonal, landings were reported: discards were raised using matched landings-discards from all quarters and the same area, using the rules either for Division 3.a or Areas 4/6.
- If no matched landings-discards existed for an area in a particular quarter (e.g. no matched landings-discards in 3.aN Q1), data were matched on a neighbouring area for that quarter (e.g. used matches from 4 Q1).

High ratios for matched landings-discards were not included in the raising (e.g. ratios >0.5). Higher ratios were not assumed to be typical for all métiers and countries because they generally came from countries that had no or limited quota for a métier (e.g. Sweden, OTB_CRU_70-89_2_35_all métier; UK-Scotland all métiers). The weighting factor for raising the discards was '*Landings CATON*' (landings catch).

When allocating age compositions, landings and discards were handled separately. For discards, if too few data existed in general (typically further back in time): all sampled data from all areas, all countries, all métiers were allocated to all unsampled data. Otherwise, the same procedure was followed as used for landings.

For landings, unsampled data were allocated sampled data on a quarter and area grouping, using data from all métiers. Where data allowed, OTB_DEF métiers and non-OTB_DEF métiers were handled separately. When age samples were missing from Area 6, allocations were borrowed from Area 4. Allocations from Division 3.a were never used in Area 6 because younger saithe are typically found in the Skagerrak and older fish are along the shelf edge in Area 6. If age samples were missing from Division 3.a, samples were first borrowed from the preceding quarter; if none were available, samples were allocated from Area 4 in the same quarter.

For the directed saithe bottom-trawl fleets from France, Germany, and Norway, age samples were sparse, especially for early years. This meant that age allocations often had to be borrowed. Because the Norwegian saithe bottom-trawler fleet typically caught and/or sampled older fish than the French or German fleets (see Appendix 3, WD5), samples were allocated from other nation's OTB_DEF métiers in the same quarter and same area. For the French or German trawler fleets: if no sampled data existed, samples were first borrowed from another quarter (e.g. Q1 allocated to Q2), then from a neighbouring area (Areas 4 and 6 only), then from the other country's samples (e.g. Germany was allocated samples from France), and finally (if no other option remained) from other OTB_DEF fleets in the same quarter and area. The weighting factor used for all allocations was *Mean Weight weighted by numbers-at-age*.

Table 3.6.1.1 indicates the level of discard ratio coverage of the landings, together with the age coverage of both the landings and observed discards. Coverage is poor for both the ratios and ages of the discards and for the ages of the landings. Some countries do not consistently report sampling coverage (France, Germany, Scotland), which means these proportions are underestimates of the amount of coverage. The inability of nations to accurately report their data into InterCatch hinders assessment of the quality of the data in InterCatch.

Table 3.6.1.2 provides a comparison of the overall tonnage used in the 2015 assessment and that being calculated through the InterCatch allocation scenarios for landings and discards. Discrepancies are relatively small for landings. Discards have not been estimated previously prior to the 2012 fishing year. The discrepancy in 2012 discards is because Norwegian discards were not raised originally, but were at the benchmark. Table 3.6.1.3 provides a similar comparison by age for landings, and Table 3.6.1.4 weights-at-age for landings. This was not done for discards because discard data were reported only for the last three years prior to the 2015 data call.

To estimate discards weights- and numbers-at-age prior to 2002, a constant ratio of landings to discards by age was applied. Discard weights for age 8+ were set to 1. Average landings (2002–2014) to average discards (2002–2014) ratios for discard weight- and number-at-age were:

	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10+
Weight	1.32	1.27	1.16	1.07	1.05	1	1	1
Number	1.72	3.46	10.77	33.56	58.24	26.19	28.10	30.35

If discard weight-at-age was missing within the period 2002–2014, it was estimated using the landings to discard ratio. If discard weights for a given age were much higher than the corresponding landed weights (e.g. landed weights were >60% discard weight; WD 5), they were replaced with an estimate using the landings to discards ratio for that age. Some countries will discard large fish due to lack of fishing rights (e.g. Scotland, Sweden, Denmark), so discard weights-at-age above landing weights-at-age are not necessarily incorrect. In 2003, the discards numbers-at-age 3 estimated within InterCatch was >35 000; this was deemed unlikely and replaced with an estimate using the ratio.

InterCatch currently does not support saving multiple discard raising schemes (unlike with sample allocations), which makes it a time laborious process. Because of this, a sensitivity test for the raising of discards was not completed. Two alternate options for allocating age samples were completed: by quarter (grouping all areas) and no stratification (i.e. all sampled data were used to allocate all unsampled data). Differences were slightly greater for the allocation stratification used in the final assessment (see WD 5).

Revision to discards data

A bug was discovered in InterCatch in May that affected the raising of the discards for four years. The data revisions are detailed in WD 5, but are not mentioned here because the revisions were made after the benchmark concluded.

Table 3.6.1.1. Proportion of landings caught, discard ratio coverage (reported, not raised) of the landings, and age coverage of the landings and the reported discards. Numbers are percentages. Not all countries report information on their sampling coverage, therefore these should be considered as underestimates.

	Proportion of landings			Discard ratio coverage			Landings: Proportion of age coverage			Discards: Proportion of age coverage:		
Year	3.a	4	6	3.a	4	6	3.a	4	6	3.a	4	6
2002	3	92	5	10	76	15	100	18	0	100	100	0
2003	4	91	5	2	77	20	100	6	0	100	0	0
2004	4	91	5	3	90	8	100	8	0	100	100	0
2005	4	90	5	5	75	20	100	7	0	100	100	0
2006	5	87	8	5	75	20	100	5	0	100	100	0
2007	6	87	6	4	91	5	67	4	0	100	100	0
2008	6	88	5	6	82	12	100	5	0	100	100	0
2009	7	88	6	6	82	12	82	7	0	100	0	0
2010	6	88	6	19	76	5	97	6	0	100	2	0
2011	4	88	7	8	80	12	100	6	0	100	0	0
2012	4	87	9	1	60	39	96	6	0	100	1	0
2013	6	83	10	2	80	18	100	7	0	100	0	0
2014	3	88	9	2	90	8	100	8	0	100	0	0

Table 3.6.1.2. Comparison of overall tonnage for the previous (2015 assessment) and new estimates of landings and discards. Differences are shaded such that darker colours highlight greater differences.

Year	2015 assessment	Landings	Difference	2015 assessment	Discards	Difference
2002	115 395	121 794	6		24 812	100
2003	105 569	110 618	5		26 377	100
2004	104 237	107 011	3		9656	100
2005	124 532	117 653	-6		8571	100
2006	125 681	120 744	-4		15 950	100
2007	101 202	95 225	-6		12 078	100
2008	119 305	121 281	2		9436	100
2009	115 747	112 459	-3		14 216	100
2010	101 940	102 103	0		10 937	100
2011	96 217	97 188	1		12 729	100
2012	77 447	77 595	0	7585	9415	24
2013	79 684	80 245	1	8083	8173	1
2014	75 176	75 157	0	6289	6362	1

Table 3.6.1.3. As in Table 3.6.1.2, but showing difference by age for the landings.

Landings								
Year/Age	3	4	5	6	7	8	9	10+
2002	-54	-25	38	50	-8	-25	-36	-9
2003	12	22	-21	9	-3	1	1	97
2004	51	34	-12	13	-47	-47	16	32
2005	-34	24	13	13	-31	-43	-47	150
2006	24	-5	-19	21	-26	-36	-35	-11
2007	-13	27	-11	-4	-1	-31	-32	-5
2008	-29	-6	35	-17	9	-4	47	80
2009	-29	10	-17	17	-21	-17	-32	-8
2010	7	7	17	4	-19	18	-22	-32
2011	6	10	52	-17	16	-21	-40	-13
2012	6	11	-13	4	-2	26	19	-10
2013	0	0	0	1	2	1	1	1
2014	22	-4	-1	3	-6	2	4	0

Table 3.6.1.4. As in Table 3.6.1.2, but showing difference by weights-at-age for the landings.

Landings								
Year/Age	3	4	5	6	7	8	9	10+
2002	15	20	12	1	29	10	12	51
2003	16	3	8	9	5	-5	0	18
2004	5	7	11	20	16	19	12	27
2005	38	8	2	7	7	1	-5	17
2006	6	7	12	10	17	19	14	7
2007	12	4	14	13	16	8	10	0
2008	6	9	9	4	-3	-1	-5	6
2009	43	12	12	-1	13	6	7	11
2010	5	3	5	1	3	0	1	5
2011	-5	-8	-3	1	2	-3	-2	3
2012	1	-1	0	-2	1	0	-3	9
2013	1	0	1	0	1	0	0	0
2014	2	-1	0	3	2	4	4	2

3.6.2 Surveys

3.6.2.1 Research surveys

The last benchmark of North Sea saithe (ICES-WKBENCH 2011) noted that all surveys had problems that were related to the coverage of the stock (age and area). It was acknowledged that the life history of saithe, where choice of habitat and behaviour changed over the life cycle, made it impractical to obtain complete coverage with only one survey, but that IBTS-Q1 held potential. Recommendations included expanding the existing surveys with trawl stations deeper than 200 m or combining a bottom-trawl and an acoustic survey conducted during the 1st quarter to give valuable information on age groups currently not covered in the existing surveys. The benchmark resulted in the continued exclusion of the IBTS Q1 survey and kept the IBTS Q3 survey (ages 3–5) in the assessment. The indices were calculated using the standard stratified mean methodology (mean by rectangle within year, followed by mean over rectangles by year), where the stock definition includes only Area 4 (Figure 3.6.2.1). This simple design based estimator is unable to account for systematic changes in experimental conditions (e.g. change of survey gear or haul duration).

This section describes an alternative way of calculating standardized age-based survey indices based on GAMs and Delta distributions (see WD 3). The general methodology is described in Berg and Kristensen (2012) and Berg *et al*. (2014) and is implemented using the *DATRAS* (Kristensen and Berg, 2010) and *surveyIndex* (Berg, 2016) packages in R.

ALKs

Smooth spatially varying age–length keys are estimated using the methodology described in Berg and Kristensen (2012). Numbers-at-age are then calculated using the observed numbers-at-length and the estimated ALKs. This methodology avoids *ad hoc* borrowing of samples from neighbour roundfish areas when certain age groups are missing. The method also provides an objective fill-in procedure for missing length groups by modelling the probability of age-given length using smooth functions of the length of the fish and the spatial coordinates where the haul was taken, rather than relying on some specific stratification of length and space.

The differences between the standard ALKs and the ones used here were not investigated in detail at the benchmark, but comparisons of the survey indices calculated using the smooth ALKs and the stratified mean method with the standard DATRAS product survey indices displayed little differences, indicating that the choice of ALK method was not crucial (Figures 3.6.2.2 and 3.6.2.3).

Delta-GAM models

The primary purpose of the Delta-GAM model is to derive survey indices by age free of nuisance factors caused by changes in conditions (e.g. spatial coverage, haul duration, ship). Such effects may be balanced out by the relatively stable survey design in the later years; however, several changes in the gear used, haul duration, and which nation surveys in an area have occurred over the time-series.

The indices are obtained by summing filtered model predictions over a spatial grid. Each age group and quarter was modelled independently. The most complex equation considered for the expected numbers-at-age in the *i*th haul (or probability of non-zero catch for the presence-absence part), μ_i, is as follows:

$$g(\mu_i) = Year(i) + Month(i) + U(i)_{Ship} + f_1(lon_i, lat_i) + f_2(depth_i) + f_3(\text{time}_i) + \log(HaulDur_i)$$

where the two first terms map the *i*th haul to a categorical effect for each year and month, $U(i)_{Ship} \sim (N(0,\sigma_\mu)$ is a random effect for the vessel at haul i, f_1 is a two-dimensional thin plate regression spline on the geographical coordinates, f_2 is a one-dimensional thin plate spline for the effect of bottom depth, f_3 is a cyclic cubic regression spline on the time of day, and includes a haul duration offset. Using data for one type of gear eliminated the need for a more complex model.

The function g is the link function, which is taken to be the logit function for the binomial model. The strictly positive observations can be modelled using either a Gamma or a lognormal distribution; a lognormal distribution was found to provide the best fit. The nuisance parts of the model (here month and haul duration) were held constant when the filtered predictions on the grid were calculated so as to remove their effect on the index. For the binomial part of the model (non-zero catch), a logit link is used. The lognormal part of the delta-lognormal model is fit using the Gaussian distribution and a unit link on log-transformed response data (Berg *et al.*, 2014).

Model selection

Models were evaluated using the AIC and BIC values for each distribution, following the procedure outlined in Berg *et al.* (2014) and Wood (2006). Internal consistencies (correlations) were also evaluated to determine how well cohorts could be tracked through time.

Seven models of varying complexity were considered (see Table 3.6.2.1). The best model for the Q1 data included month, whereas the Q3 model had to be relatively simple in order to converge without overly restricting the number of age classes (and dimensions) included. The best Q1 model was actually the second best in terms of AIC and internal consistencies; however, not including depth for a species that is spawning on the slope edge at the time of the survey seemed counter-intuitive. The internal consistencies by age were better for the model that included depth. For Q3, the better model in terms of AIC include an additional parameter, but the internal consistencies (average and between ages) were poorer, resulting in choosing the next best model.

Table 3.6.2.2 provides a comparison of within-survey correlations for the GAM indices used in the final SAM model as estimated with the DATRAS R package (which presents the information differently than when using FLR). The newly generated GAM indices showed a higher internal consistency; however, the age range available in the old indices was limited. Table 3.6.2.3 compares between-survey correlations for the GAM indices, which showed a high consistency between both the Q1 and Q3 and the Q3 (in year_i for age_j) and Q1 (in year_{i+1} for age_{j+1}).

The problems noted at the previous benchmark still exist. No survey adequately covers the distribution of North Sea saithe. The recommendations that came out of the previous benchmark did not appear to have been sent to the IBTSWG for (potential) action. Since then, it has been acknowledged by the IBTSWG that the boundary for calculating the saithe indices in DATRAS should be expanded to include the Skagerrak and that the IBTS surveys might need to be extended deeper (ICES-IBTSWG

2015). A new acoustic survey for saithe during the spawning period is planned (but not yet implemented), while the previous acoustic saithe survey (June–July) has been modified, is considered a new series (begun in 2013), and will be available for exploration in the assessment by 2018.

Revisions to survey data

Following WGNSSK in May and concerns that the survey indices were overly optimistic, the survey indices were further explored. Details on this are in WD 3 and 8, but are not detailed here because the revisions were made after the benchmark concluded.

Table 3.6.2.1. Model selection criteria: Akaike's Information Criteria (AIC), Bayesian Information Criteria (BIC), and average Internal Consistency over all ages (IC) for the delta GAM models with a lognormal distribution. Chosen model is in bold.

Model	AIC Q1	BIC Q1	IC Q1	AIC Q3	BIC Q3	IC Q3
Year+s(lon,lat)+HaulDur				34388.94	42641.49	0.3720
Year+s(lon,lat)+s(Depth)+HaulDur	24442.66	32874.02	0.5420	34460.04	42834.36	0.3948
Year+s(lon,lat)+s(Depth)+s(Ship)+HaulDur	24332.64	32421.26	0.5362	34497.15	43555.4	0.3728
Year+s(lon,lat)+s(Depth)+s(Time)+HaulDur	–	–	–	34363.73	43155.4	0.3664
Year+Month+s(lon,lat)+s(Depth)+HaulDur	**24102.52**	**31498.93**	**0.5182**	–	–	–
Year+Month+s(lon,lat)+HaulDur	23981	31329.68	0.5271	–	–	–
Year+Month+s(lon,lat)+s(Ship)+HaulDur	24230.6	32560.4	0.5264	–	–	–
Year+Month+s(lon,lat)+s(Depth)+s(Ship)+HaulDur	24412.54	32560.74	0.5332	–	–	–
Year+Month+s(lon,lat)+s(Depth)+s(Ship)+s(Time)+HaulDur	24468.01	33057.82	0.5396	–	–	–
Year+Month+s(lon,lat)+s(Depth)+s(Time)+HaulDur	24278.63	32180.45	0.5350	–	–	–

Table 3.6.2.2. Internal consistencies between ages for the GAM and DATRAS indices for Q1 (GAM: ages 1–10, DATRAS: ages 1–5) and Q3 (GAM: ages 0–10, DATRAS: ages 0–5). Number in bold refer to the ages included in the tuning indices in the final assessment model.

MODEL	INTERNAL CONSISTENCIES	
	GAM	DATRAS
Q1	Age 1 vs. 2 : 0.3624028	Age 1 vs. 2 : 0.272445
	Age 2 vs. 3 : 0.1142664	Age 2 vs. 3 : 0.1451218
	Age 3 vs. 4 : 0.2792068	Age 3 vs. 4 : 0.281987
	Age 4 vs. 5 : 0.5312613	Age 4 vs. 5 : 0.4502273
	Age 5 vs. 6 : 0.7979588	
	Age 6 vs. 7 : 0.7900055	
	Age 7 vs. 8 : 0.7431158	
	Age 8 vs. 9 : 0.6239088	
	Age 9 vs. 10 : 0.4217236	
Q3	Age 0 vs. 1 : 0.3231104	Age 0 vs. 1 : 0.4342136
	Age 1 vs. 2 : -0.1937066	Age 1 vs. 2 : -0.491945
	Age 2 vs. 3 : 0.03960032	Age 2 vs. 3 : 0.2724042
	Age 3 vs. 4 : 0.4954253	Age 3 vs. 4 : 0.4862166
	Age 4 vs. 5 : 0.7447504	Age 4 vs. 5 : 0.7011004
	Age 5 vs. 6 : 0.7943942	
	Age 6 vs. 7 : 0.750217	
	Age 7 vs. 8 : 0.6407721	
	Age 8 vs. 9 : 0.4044236	
	Age 9 vs. 10 : -0.05130193	

Table 3.6.2.3. External consistencies (lognormal models) between Q1 and Q3, ages 1–10, 1992–2015 and between Q3 (ages 1–9, 1992–2014) and Q1 in the next year (ages 2–10, 2015). Numbers in bold refer to the ages included in the IBTS Q1 tuning index in the final assessment model.

Q1 VS. Q3	Q3 VS. Q1
Survey 1 Age 1 vs.Survey 2 1 : 0.3858029	Survey 1 Age 1 vs.Survey 2 2 : 0.3218696
Survey 1 Age 2 vs.Survey 2 2 : 0.0804089	Survey 1 Age 2 vs.Survey 2 3 : 0.4586471
Survey 1 Age 3 vs.Survey 2 3 : 0.2515709	**Survey 1 Age 3 vs.Survey 2 4 : 0.8203473**
Survey 1 Age 4 vs.Survey 2 4 : 0.4606226	**Survey 1 Age 4 vs.Survey 2 5 : 0.8739198**
Survey 1 Age 5 vs.Survey 2 5 : 0.8044465	**Survey 1 Age 5 vs.Survey 2 6 : 0.8839688**
Survey 1 Age 6 vs.Survey 2 6 : 0.8202876	**Survey 1 Age 6 vs.Survey 2 7 : 0.7743481**
Survey 1 Age 7 vs.Survey 2 7 : 0.6872475	**Survey 1 Age 7 vs.Survey 2 8 : 0.696888**
Survey 1 Age 8 vs.Survey 2 8 : 0.7285338	**Survey 1 Age 8 vs.Survey 2 9 : 0.625716**
Survey 1 Age 9 vs.Survey 2 9 : 0.03350431	Survey 1 Age 9 vs.Survey 2 10 : 0.4047001
Survey 1 Age 10 vs.Survey 2 10 : 0.4003755	
Mean: 0.4652801	Mean: 0.6511561

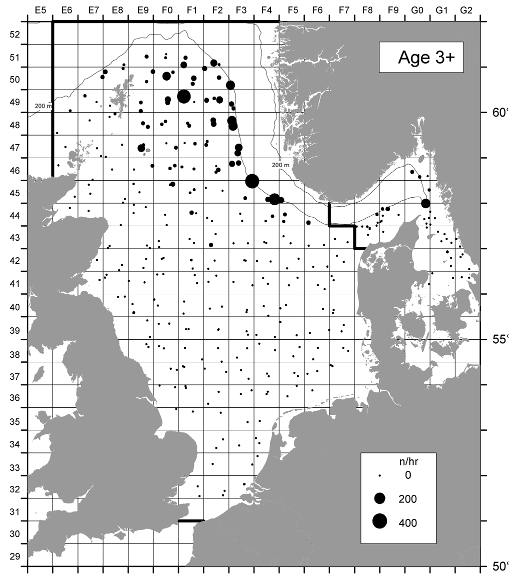


Figure 3.6.2.1. The area previously used to generate the saithe index is outlined in black (the entire North Sea, excluding the Skagerrak). Figure taken from ICES-IBTSWG (2015).

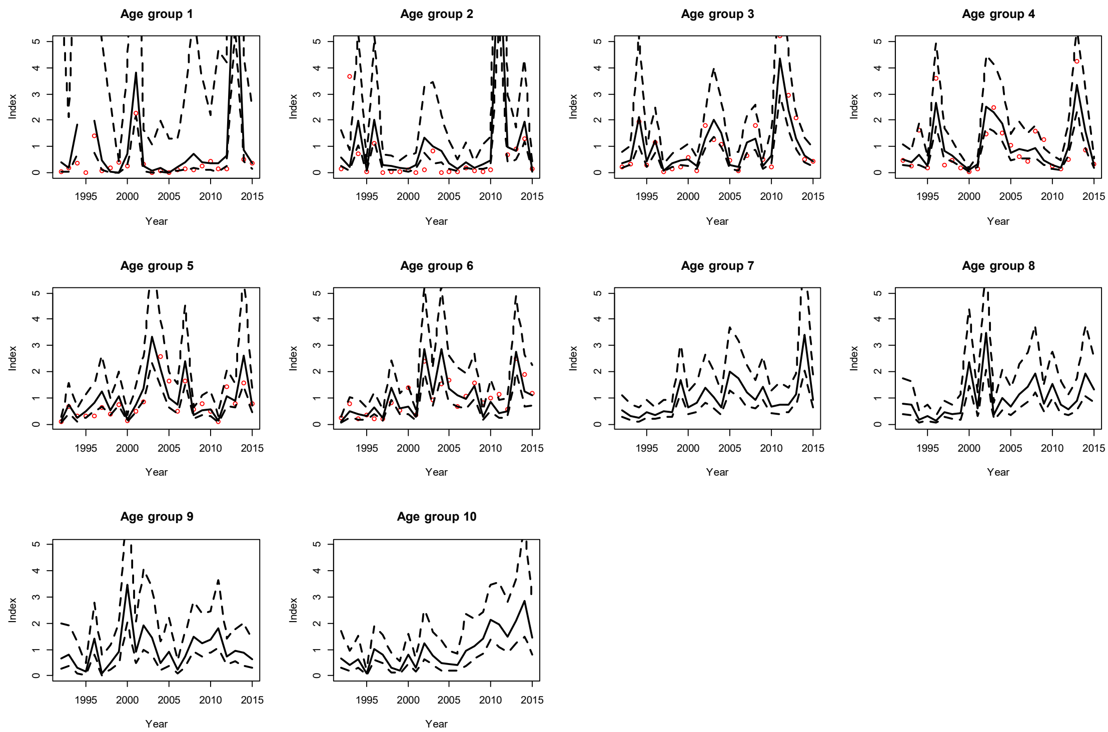


Figure 3.6.2.2. Abundance index by age from the Q1 survey (excluding the Scottish 60-min tows). GAM estimates from the lognormal model and confidence intervals are in black, ages 1–10+. DATRAS estimates ages 1–6+ are red points.

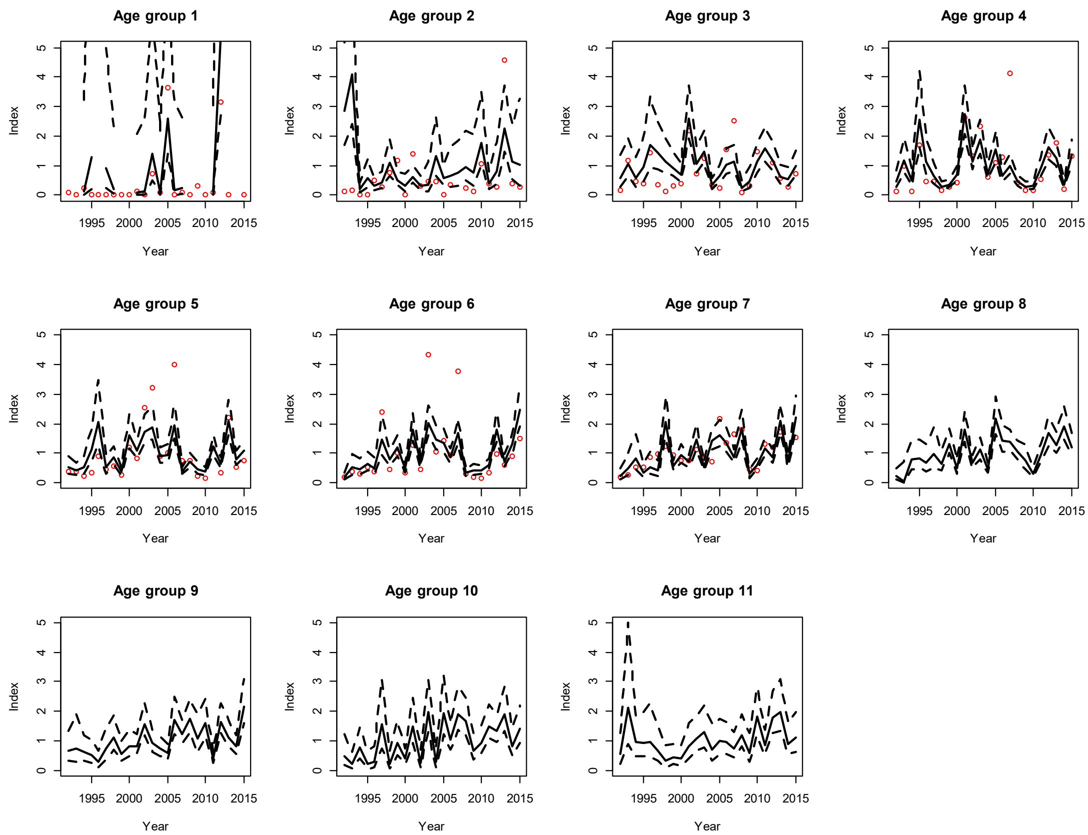


Figure 3.6.2.3. Abundance index by age from the Q3 survey. GAM estimates from the lognormal model and confidence intervals are in black, ages 0–10+. DATRAS estimates ages 0–6+ are red points.

3.6.2.2 Catch and effort series

The current assessment uses three cpue indices from the main saithe trawler fleets of Germany, France, and Norway. A single combined index was estimated to avoid using the same information twice (information in the catch-at-age matrix and in the three individual cpue fleets) in the assessment. There were concerns that using the information twice gave too much weight in the tuning. One "standardized" commercial tuning series was generated for the period 2000–present. The index combined catch and effort information for the French, German, and Norwegian target bottom trawlers (see details in WD 2).

The combined index used information from the commercial logbooks on single trawl operations. Only trawl operations catching at least 50% saithe were included in the target fishery, thereby removing catches with accidental levels of bycatch. In periods where saithe spread to areas not fished heavily, there is a chance of losing information. All horsepower groups were included. To be included, the number of observations in a rectangle and quarter combination had to be above ten.

The model included spatial and temporal resolution, and grouped vessels by engine power intervals to avoid the potential to identify single vessels. While variables initially explored in the model were nation, year, month, engine power group, mesh size, special coordinates (centre of ICES rectangle), effort, landing, quarter, and area, based on roundfish areas), the final model included only nation, year, quarter, kW group, and area. The year effects from this "standardization" were included in the assessment model, which was then tuned to the exploitable (fishable) biomass within the assessment model (Figure 3.6.2.4). Information from the catch-at-age matrix was not used.

There is concern that a trend in the use of engine power may explain a trend in abundance over the same time period; the time-series of the data is too short to be certain this is not the case. Changes in mesh size preference may have the same effects.

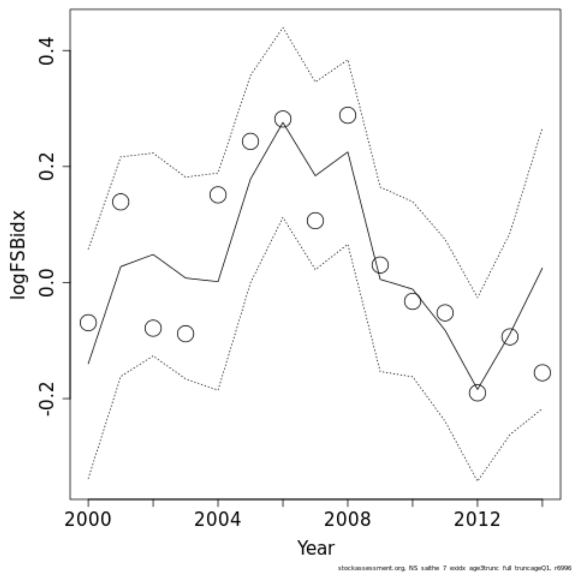


Figure 3.6.2.4. Standardized cpue index (points) tuned to the exploitable fish biomass (solid line) with confidence interval (dashed lines).

3.6.3 Weights, maturity, growth, natural mortality

3.6.3.1 Weights and growth

Weights-at-age in the stock were previously set equal to weights-at-age in the catch. The North Sea IBTS Q1, Q3 and Scottish West Coast Q1, Q4 surveys were used for the biological data for saithe (see WD 7). The Scottish West coast survey gives valuable information about the saithe population in Area 6, which is not covered in the IBTS Q1 or Q3 surveys. Data from the SWC-IBTS surveys included only those stations north of 54.5°N (i.e. the southern boundary of Area 6).

Individual weight data for saithe were not available in the DATRAS data for years prior to 2002. Figure 3.6.3.1 plots catch weights and stock weights for comparison for ages 1–10, where age 10 is a plus group, 2003–2014. Stock weights were generally lower than catch weights before age 7, after which, they were generally higher than catch weights. The benchmark group discussed that this was plausible; fish that are larger for a given age would be selected by the fisheries up to a certain age, after which, selection should drop (i.e. selection is towards an "average" sized fish).

To generate stock weights for the period 1967–2002, the average ratio of stock weight to catch weight by age (for 2003–2014) was used (Figure 3.6.3.2).

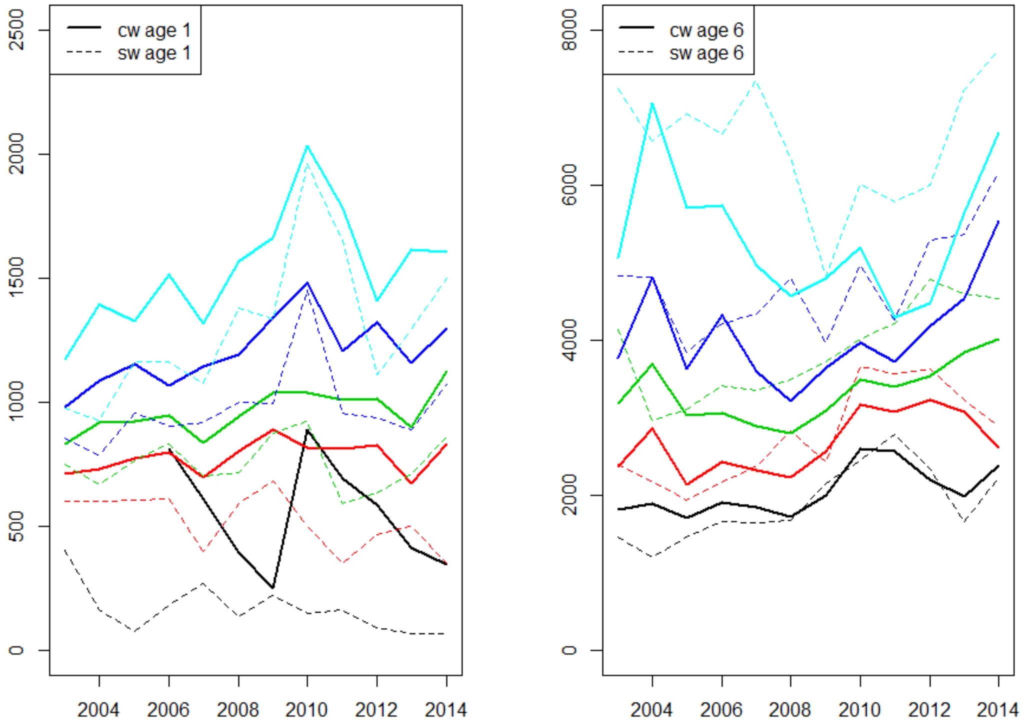


Figure 3.6.3.1. Stock weights (dashed lines) and catch weights (solid lines) for ages 1–10+. The left panel shows age 1 (black lines) to age 5 (light blue lines), while ages 6–10+ are in the right panel.

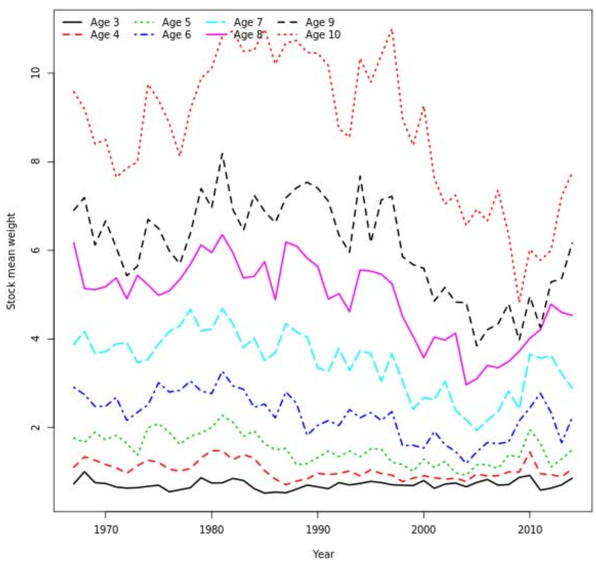


Figure 3.6.3.2. Stock weights-at-age for the entire time period, 1967–2014.

3.6.3.2 Maturity

Maturity age key

A static maturity ogive, estimated at WKBENCH 2011, was previously used in the assessment. Maturity-at-age were summarized directly from the length-stratified samples taken for the 1st and 4th quarter NS-IBTS and SWC-IBTS SMALK databases (see WD 7). Other quarters were not included because staging is too uncertain further from the spawning period. The SWC-IBTS survey gives valuable information for a part of the population not covered in the IBTS surveys. Data from the SWC-IBTS surveys included only those stations north of 54.5°N (i.e. the southern boundary of Area 6). Maturation data did not exist in DATRAS prior to 1991. Proportion mature (M) was estimated using a logistic generalized linear model according to:

$$\text{logit}(M) \sim \text{length} + \text{age} + \text{cohort},$$

where *age* and *cohort* were treated as factors with maturity state (immature or mature) as a proportion, where weights were number-at-ALK. Interactions (length:age and length:cohort) improved the model fit. A static ogive was also estimated using all data:

$$\text{logit}(M) \sim \text{length} + \text{age},$$

where *age* was treated as a factor.

After much discussion, it was agreed that the ogive including cohort showed too much variability that was unlikely over such a short time period, even after smoothing was applied within the SAM model (Figure 3.6.3.3). Therefore, the newly estimated static ogive was used, with some modification based on expert knowledge within the group (Table 3.6.3.1).

The proportions mature-at-age estimated from the survey data showed large fluctuations between years for ages 3 and 4 (Figure 3.6.3.3). This was assumed to be due to variability of the amount of fish that migrate into the survey area; proportions of age 3 and 4 year old fish that migrate from coastal areas to the North Sea varies annually and it is generally assumed that larger (and thus faster maturing) fish migrate out earlier. The proportion of 3/4 year olds can be low, such that using observed proportions mature without correcting for the large amount of immature fish outside the survey area will introduce a large bias in the ogive. The discussion at this benchmark meeting concluded that using a slightly conservative approach was best. Proportions mature-at-age 3 were set to zero and proportions-at-age 4 to half of the estimated average proportion mature.

Table 3.6.3.1. Maturity ogive agreed upon in WKNSEA.

	1	2	3	4	5	6	7	8	9+
Proportion mature	0.0	0.0	0.0	0.20	0.65	0.84	0.97	1.00	1.00

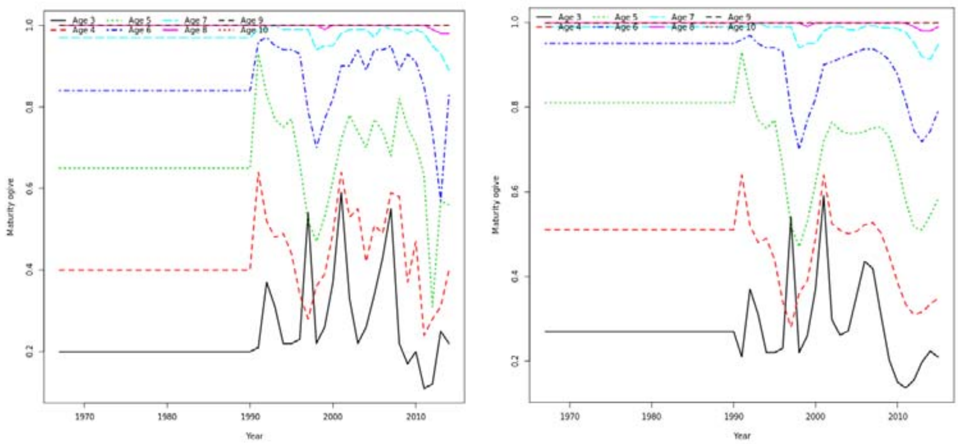


Figure 3.6.3.3. Plots of estimated maturity-at-age. (Left) Estimates as reported in WD 7. (Right) Smoothed estimates, after a GAM model was applied within the SAM model to data in left panel. Maturity-at-age for the period 1967–2002 was a five-year average (2003–2007).

3.6.3.3 Natural mortality

Currently, the assessment uses a constant natural mortality rate of 0.2 for all ages and years. Lack of time meant it could not be fully investigated at this benchmark, but should be at the next benchmark (or inter-benchmark). There was a brief discussion regarding whether the stochastic multispecies model SMS (Lewy and Vinther, 2004) could be used; it cannot because saithe is included only as a predator in that model. A new M of 0.26 (all ages) was estimated using the longevity equation (following Then *et al.*, 2014), where $M = 5.109/t_{max}$, and t_{max} was 25. The expert group agreed to leave M as 0.2 because there was not enough time to fully explore new rates of natural mortality.

3.6.4 Assessment models

The assessment model from previous benchmark was XSA (ICES, WKBENCH 2011). A SAM (State–space Assessment Model, Nielsen and Berg, 2014) has been run in parallel as an exploratory run since 2013 (ICES, WGNSSK 2013). The description of the SAM assessment model is clearly outlined in Nielsen and Berg (2014) and will not be presented here.

An a4a model was to be run in parallel with the SAM model. Development had begun on the model, however, it was dropped from the benchmark due to lack of time.

3.6.4.1 Exploratory assessment models

The base model was the final model from the previous assessment year (ICES, WGNSSK 2015) except that an AR(1) autocorrelation structure (instead of a random walk) and a random walk recruitment model were used. Within the base model:

- four survey indices were used: three cpue indices (French, German, Norwegian trawler fleets) and one survey index (IBTS Q3)
- Stock weights = catch weights = landings weights
- No discards
- Age range: 3–10+
- Max age was considered a plus group
- Fishing mortalities were a flat F from age 9, AR1 autocorrelation modelled the structure
- Catchability parameters were coupled for ages 8–9 (flat) for the cpue (three fleets) and not coupled for the IBTS Q3 survey
- Log N random walk variances were coupled for age 4–10, but different for age 3
- Observation variances were coupled within each tuning index (all ages)
- Random walk stock–recruitment model was used (because first age in the model was age 3)
- Catch data were not scaled to be similar for any years
- F was averaged for ages 3–6

Including an AR correlation structure and the random walk stock–recruitment model improved the negative log-likelihood from 658.33 to 641.36, while decreasing the number of estimated parameters by one.

Table 3.6.4.1 outlines most of the exploratory models run during the benchmark. Once the changes in the catch data using different stratification methods had been explored, one stratification method was chosen for the continuity runs. The continuity runs tested the revised data (one revision at a time) to determine how changes to the data changed perceptions of the stock. More details can be found in WD 8. Details on the data revisions can be found in WDs 2, 3, 5, and 7.

Sensitivity runs, where alternate model settings or modifications to the data were used, were also conducted. Table 3.6.4.2 outlines these runs. More details on these runs can be found in WD 8.

Four models were chosen for detailed inspection (Table 3.6.4.1), which included:

1) three cpue indices, GAM Q1 indices (ages 5–8), GAM Q3 indices (ages 3–8);
2) Standardized cpue;
3) Standardized cpue, GAM Q1 indices (ages 5–8), GAM Q3 indices (ages 3–8);
4) Standardized cpue, GAM Q1 indices (ages 5–8), GAM Q3 indices (ages 3–8); accounting for autocorrelation structure in the survey indices following the method of Berg and Nielsen (2016).

One of the assumptions is that age-specific observations are independent; when that assumption is violated, strong residuals patterns are often observed. The residual pattern in the survey indices (Figure 3.6.4.1) led to the decision to include the correlation between age groups within years in the model, following the method of Berg and Nielsen (2016).

The final year estimates for SSB, F_{4-7}, and recruitment for the four models are in Table 3.6.4.3. Historic stock trends are in Figure 3.6.4.2, retro patterns for SSB and F are in Figures 3.6.4.3 and 3.6.4.4, and residual patterns are in Figure 3.6.4.5. Model (3) gave more weight to the survey indices, which, because they showed patterns, indicated they were not reliable. A major assumption of the model is independence between age classes in the survey; this assumption was likely incorrect. Model (1) is dominated by the three cpue indices, which, due to the lack of a retrospective pattern, appeared to be internally consistent. However, the cpue indices use the same age information at the catch-at-age matrix (re-use same information twice); the fisheries information may receive more weight than the survey information in the model.

The model approved at the benchmark was option 4: standardized cpue, GAM Q1 and Q3 indices, and accounting for the survey autocorrelation structure (between ages within years).

Revisions

After the assessment working group, other model configurations and sensitivity runs were performed. These are detailed in Appendix C of WD 8, but are not detailed here because the revisions were made after the benchmark concluded.

Table 3.6.4.1. Table of the different scenarios, including the modifications to the input data. Data were run on ages 1–10+ and ages 3–10+. For models using ages 1–2, catch numbers were set to NA prior to 2002.

Scenario		Modified input data			
Base		Ages 3–10+			
1	catch: by Q&A	Ages 3–10+			
2	catch: by Q	Ages 3–10+			
3	catch: unstratified	Ages 3–10+			
4	catch: by Q&A	Ages 1–10+			
5	catch: by Q&A	Stock weights			
6	catch: by Q&A	Maturity-varying			
7	catch: by Q&A	Maturity-constant			
8	catch: by Q&A	Discards			
9	catch: by Q&A	GAM Q3 indices			
10	catch: by Q&A	GAM Q1 indices (incl. 60-min tows)			
11	catch: by Q&A	GAM Q1 indices (excl. 60-min tows)			
12	catch: by Q&A	Standardized cpue			
13	catch: by Q&A	M of 0.26			
14	catch: by Q&A	Stock weights	Maturity-varying		
15	catch: by Q&A	Stock weights	Maturity-constant		
16	catch: by Q&A	Maturity-constant	Discards		
17	catch: by Q&A	Stock weights	Discards		
18	catch: by Q&A	Stock weights	Maturity-constant	Discards	
19	catch: by Q&A	Maturity-constant	Stock weights	Discards	GAM Q3 indices (3–10)
20	catch: by Q&A	Maturity-varying	Stock weights	Discards	GAM Q3 indices (3–10)

Scenario		Modified input data						
21	catch: by Q&A	Standardized cpue	Maturity-varying	Stock weights	Discards	GAM Q3 indices (3–10)		
22	catch: by Q&A	Standardized cpue incl. std error of estimates	Maturity-varying	Stock weights	Discards	GAM Q3 indices (3–10)		
23	catch: by Q&A	New constant maturity ogive (final ogive)						
24	catch: by Q&A	Stock weights	Maturity (final)	Discards	GAM Q1 indices (5–8)			
25	catch: by Q&A	Stock weights	Maturity (final)	Discards	GAM Q3 indices (3–8)			
26	catch: by Q&A	Standardized cpue	Stock weights	Discards	Maturity (final)			
27	catch: by Q&A	Standardized cpue	Stock weights	Discards	Maturity (final)	GAM Q3 indices (3–8)	GAM Q1 indices (5–8)	
28	catch: by Q&A	3 cpue indices	Stock weights	Discards	Maturity (final)	GAM Q3 indices (3–8)	GAM Q1 indices (5–8)	
29	catch: by Q&A	Standardized cpue	Stock weights	Discards	Maturity (final)	GAM Q3 indices (3–8)	GAM Q1 indices (5–8)	Survey autocorrelation

Table 3.6.4.2. Sensitivity runs.

Model Name	
1) Modelling ages 1–10+ and 3–10+	
2) Testing various maturity ogives	
	Static maturity ogive (v1)
	Varying maturity ogive
	Varying maturity ogive (smoothed within SAM)
	Static maturity ogive (MO; expert group decision)
3) Q1 survey index	
	Varying age range included in index: 1–10+, 3–10+, 4–10+, 3–8, 4–8, 5–8
	Breaking index into two time periods at 2012 (to rectify residual pattern)
	With and without 'month' in the index model
4) Q3 survey index	Varying age range included in index: 1–10+, 3–10+, 4–10+, 3–8
5) Natural morality	
	M = 0.2
	M = 0.26
6) No cpue indices (only survey)	
7) No survey indices (only standardized cpue index or three cpue indices)	
8) Coupling/uncoupling catchability parameters for the final year	
9) Ages coupled for fishing mortality variances	
10) Ages coupled for log N variances	
11) Ages coupled for observation variances	
12) Age range for average F	

Table 3.6.4.3. Final year estimates for SSB, $F_{4\text{-}7}$, and recruitment for the four final candidate models.

	Scenario	SSB	F4–7	Recruitment ('000)
1	three cpue indices, GAM Q1, GAM Q3	281 813	0.282	68 597
2	Standardized cpue	186 435	0.404	46 985
3	Standardized cpue, GAM Q1, GAM Q3	357 542	0.171	101 990
4	Standardized cpue, GAM Q1, GAM Q3, autocorrelation structure	289 819	0.219	62 545

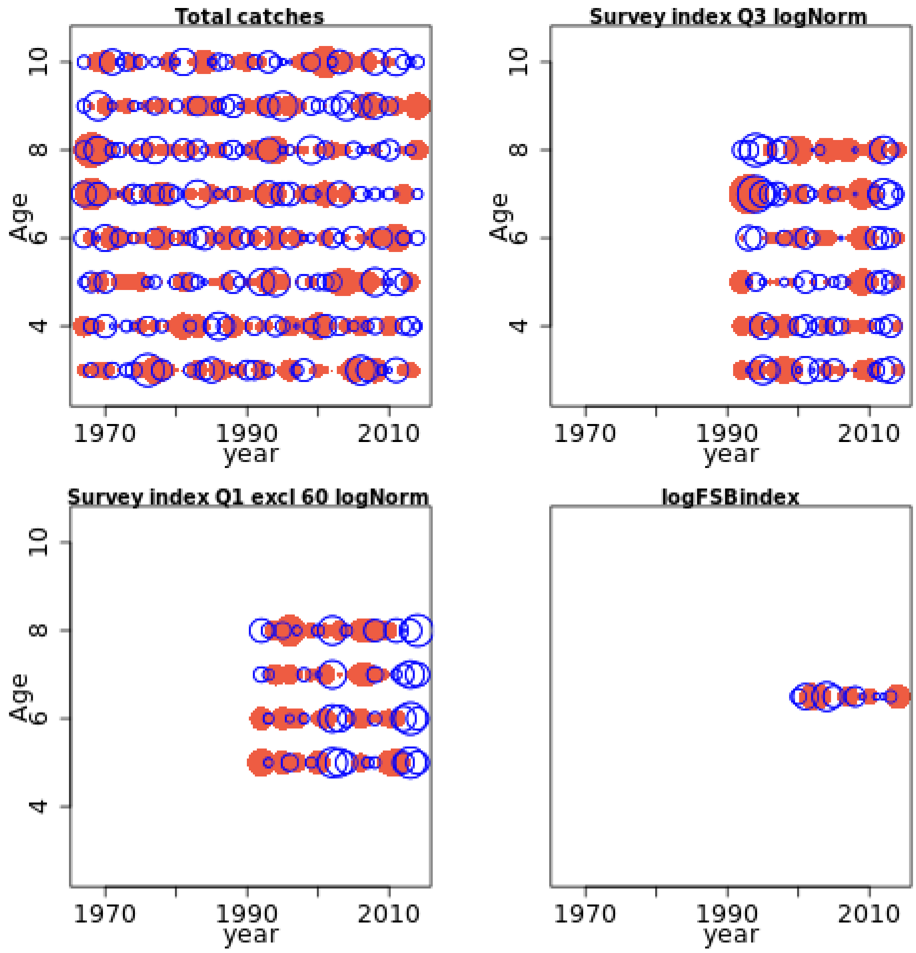
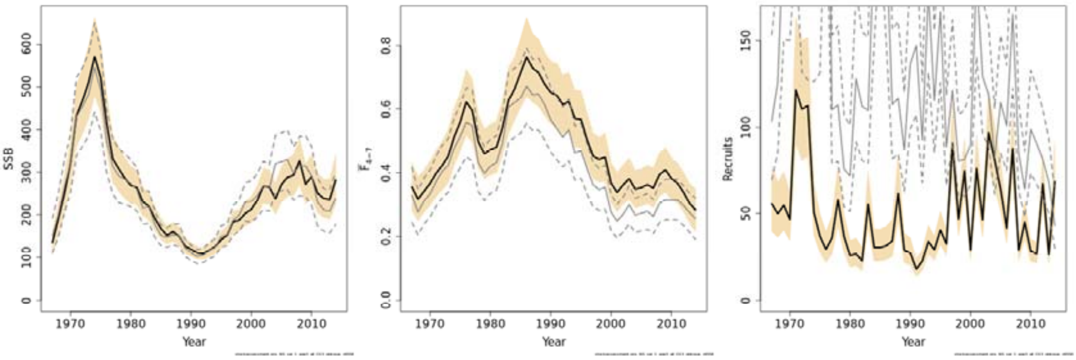
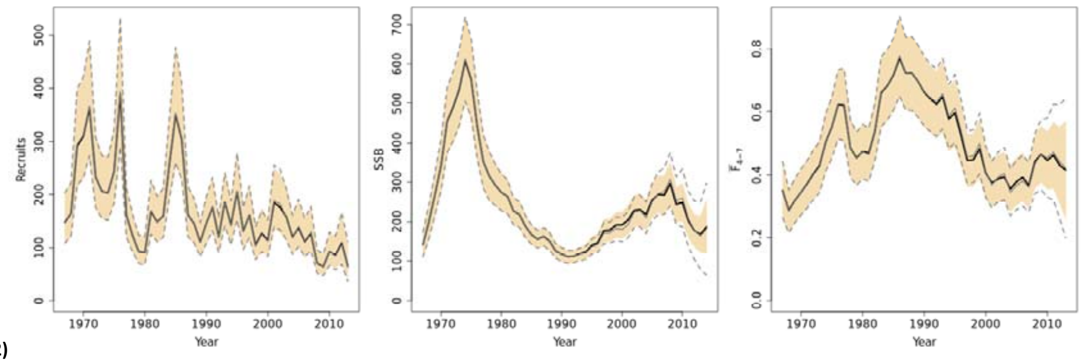


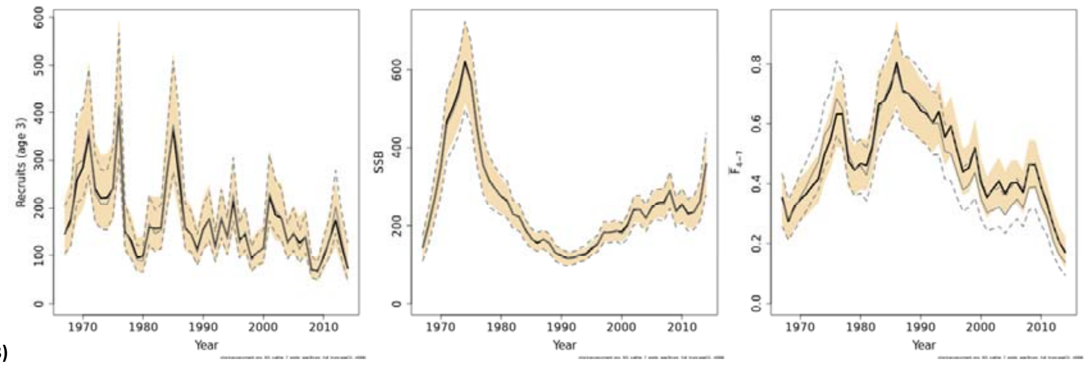
Figure 3.6.4.1. Residual pattern indicating correlation between ages within years in the survey indices.



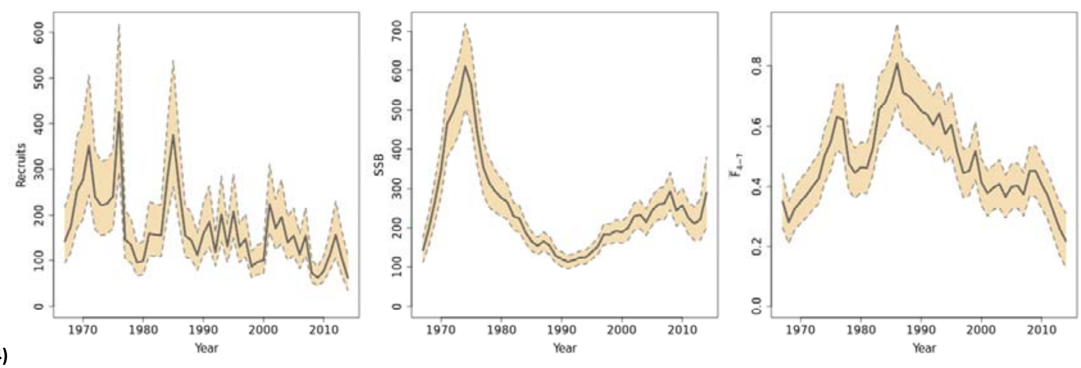
(1)



(2)



(3)



(4)

Figure 3.6.4.2. Plots of (left column) SSB, (middle) average F (4–7), and (right) recruitment for models: (1) 3 cpue indices, GAM Q1, GAM Q3, (2) standardized cpue, (3) standardized cpue, GAM Q1, GAM Q3, and (4) standardized cpue, GAM Q1, GAM Q3, autocorrelation structure. Grey lines (solid and dashed) were previous base model (model unknown at this stage).

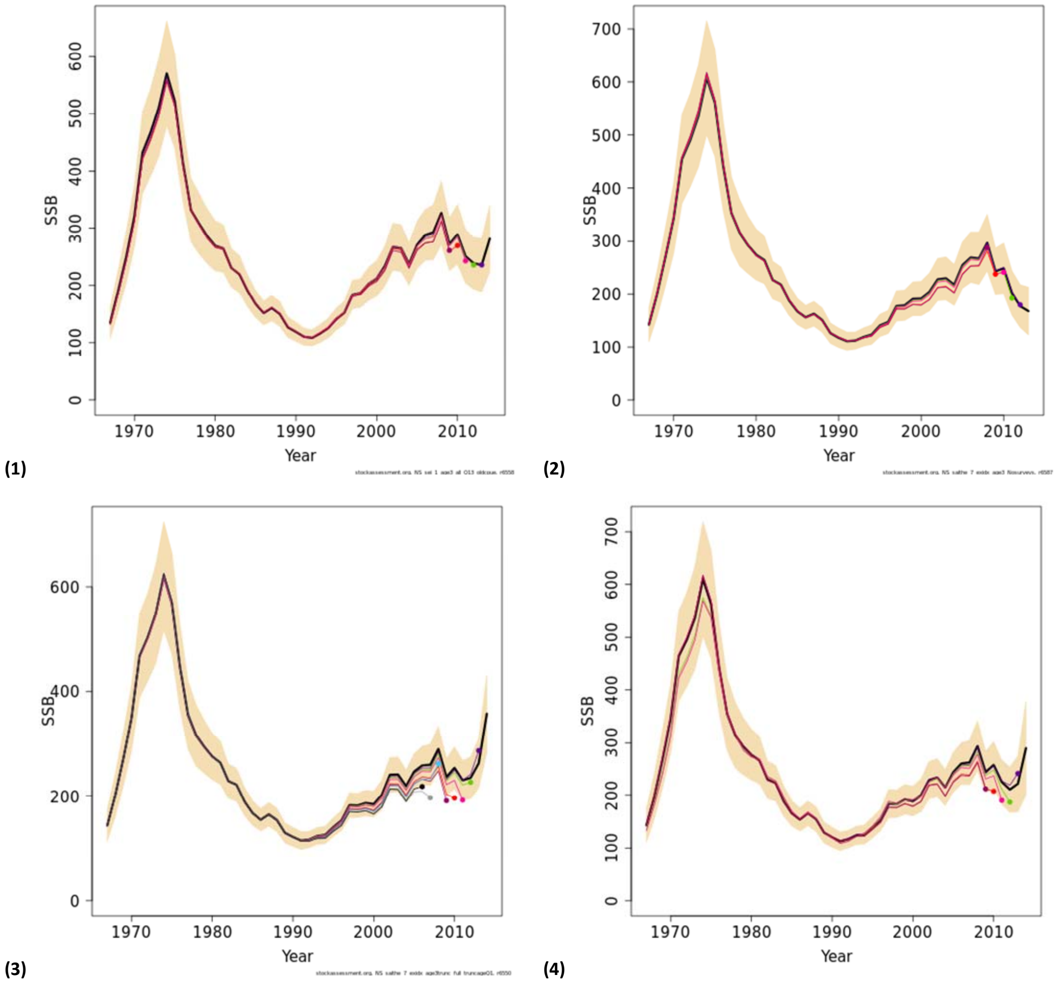


Figure 3.6.4.3. Retrospective pattern in SSB for models: (1) 3 cpue indices, GAM Q1, GAM Q3, (2) standardized cpue, (3) standardized cpue, GAM Q1, GAM Q3, and (4) standardized cpue, GAM Q1, GAM Q3, autocorrelation structure.

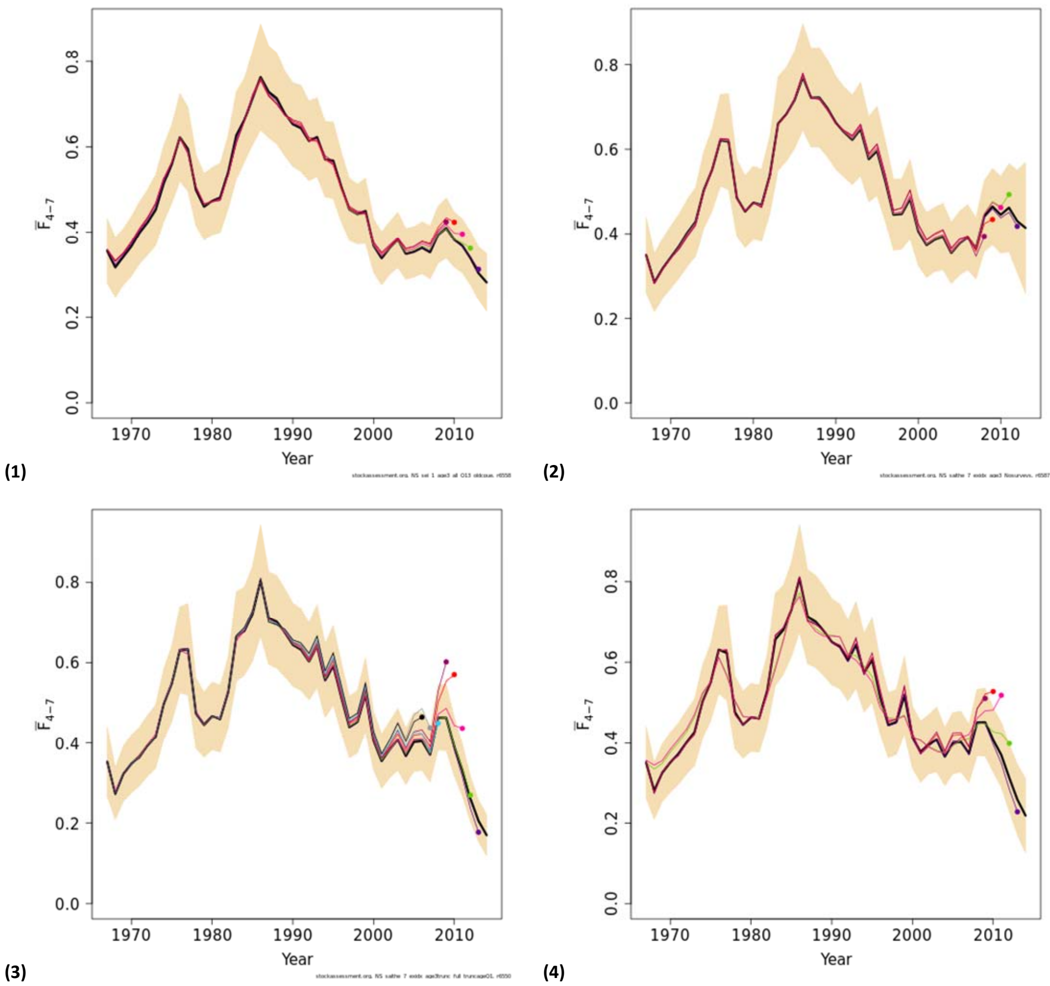


Figure 3.6.4.4. Retrospective pattern in F for models: (1) 3 cpue indices, GAM Q1, GAM Q3, (2) standardized cpue, (3) standardized cpue, GAM Q1, GAM Q3, and (4) standardized cpue, GAM Q1, GAM Q3, autocorrelation structure.

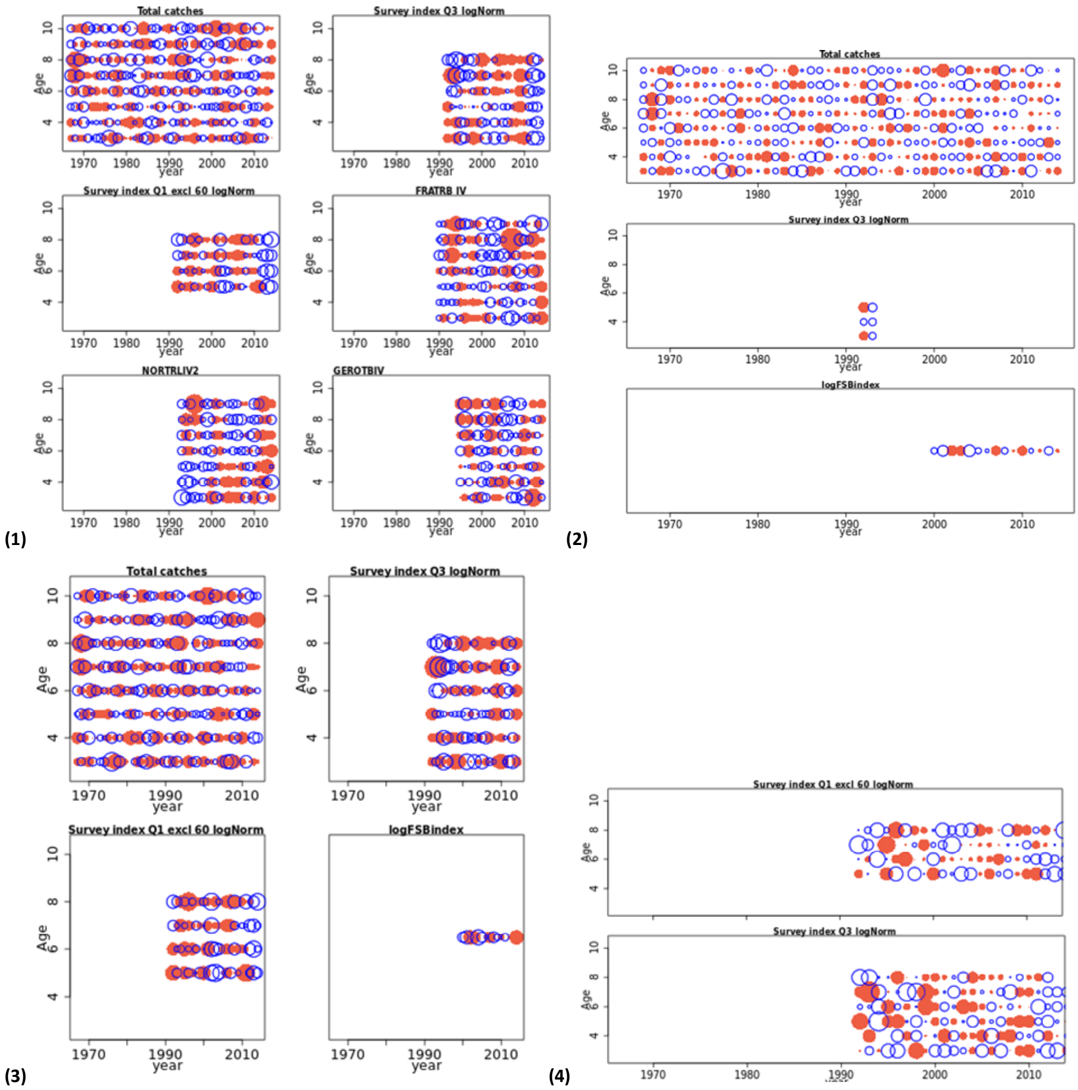


Figure 3.6.4.5. Residual patterns for models: (1) 3 cpue indices, GAM Q1, GAM Q3, (2) standardized cpue, (3) standardized cpue, GAM Q1, GAM Q3, and (4) standardized cpue, GAM Q1, GAM Q3, autocorrelation structure. Final model shows residuals for the two survey indices only.

3.6.4.2 Final assessment model

A state–space assessment model (SAM, Nielsen and Berg, 2014) was used. SAM allows for objective estimation of important variance parameters, leaving out the need for subjective *ad hoc* adjustment numbers, allows error in input data and provides estimates of uncertainty in summary statistics. The model includes the correlation between ages within years in the survey data in the assessment model, following the method of Berg and Nielsen (2016). The model approved at the benchmark was option 4: standardized cpue, GAM Q1 and Q3 indices, and accounting for the survey autocorrelation structure (between ages within years).

Data

Input data types and characteristics:

Type	Name	Year range	Age range	Variable from year to year Yes/No
Caton	Catch in tonnes	1967–present	3–10+	Yes
Canum	Catch-at-age in numbers	1967–present	3–10+	Yes
Discards	Discards in tonnes	1967–present	3–10+	Yes
Landing fraction	Percent landed	1967–present	3–10+	Yes from 2002; constant by age 1967–2002
Weca	Weight-at-age in the commercial catch	1967–present	3–10+	Yes
Stock weights	Weight-at-age in the commercial catch	1967–present	3–10+	Yes
Mprop	Proportion of natural mortality before spawning	0		No
Fprop	Proportion of fishing mortality before spawning	0		No
Matprop	Proportion mature at-age	1967–present, See Section 3.6.3.2 - Maturity		No
Natmor	Natural mortality	1967–present, See Section 3.6.3.3 – Natural mortality		No

Tuning data:

Type	Name	Year range	Age range
cpue index	cpue; combined cpue, tuned to the exploitable biomass	2000–present	NA
Survey index	IBTS-Q3; International bottom-trawl survey in the North Sea, 3th quarter	1992–present	3–8
	IBTS-Q3; International bottom-trawl survey in the North Sea, 1st quarter	1992–present	5–8

Model settings: Final model configuration

Min Age: 3
Max Age: 10
Max Age considered a plus group (Yes)
The following matrix describes the coupling of fishing mortality STATES, where rows represent fleets and columns represent ages:

1	2	3	4	5	6	7	7
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Use correlated random walks for the fishing mortalities: AR1
Coupling of catchability PARAMETERS

0	0	0	0	0	0	0	0
1	2	3	4	5	6	0	0
0	0	7	8	9	10	0	0

Coupling of power law model EXPONENTS (if used)

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Coupling of fishing mortality RW VARIANCES

1	2	3	4	4	4	4	4
0	0	0	0	0	0	0	0

Coupling of log N RW VARIANCES

1	2	3	4	4	4	4	4

Coupling of OBSERVATION VARIANCES

1	1	1	1	1	1	1	1
2	2	2	2	2	2	0	0
0	0	3	3	3	3	0	0

Stock recruitment model code (random walk)
Years in which catch data are to be scaled by an estimated parameter
0
Fbar range: 4 to 7
Observation correlation coupling (0 = uncorrelated). Rows represent fleets, columns represent adjacent age groups, i.e. the first column is the correlation between the first and 2nd age group. An NA in all non-empty age groups for a fleet specifies unstructured correlation. NA's and positive numbers cannot be mixed within fleets.

0	0	0	0	0	0	0
NA	NA	NA	NA	NA	0	0
0	0	NA	NA	NA	0	0

3.7 Short-term projections

The short-term projection is run in SAM in the form of short-term stochastic projections. These projections are carried out using estimates and the covariance matrix of those estimates from the final year. A total of 1000 samples are generated from the estimated distribution of the final year's estimates. These 1000 replicates are then simulated forward according to model and forecast assumptions and subject to different scenarios. Intermediate year assumptions are the TAC constraint (landings, without adjustment, but this may change as the total discard ban is phased in). The basis (assumptions) for the forecast is in the table below, where *Yi* is the intermediate year.

VARIABLE	NOTES
F ages 4–7 (Yi)	TAC constraint *
SSB (Yi)	SSB in the intermediate year
SSB (Yi+1)	SSB at the beginning of the TAC year
Rage3 (Yi)	Median recruitment resampled from 2003–present
Rage3 (Yi+1)	Median recruitment resampled from 2003–present
Total catch (Yi)	Assuming landings fraction by age in assessment year
Commercial landings (Yi)	TAC in year assessment year
Discards (Yi)	Assuming discard fraction by age in assessment year

*** TAC without adjustment.**

3.8 Appropriate reference points (MSY)

3.8.1 Reference points used so far

Table 3.8.1. Summary table of current stock reference points.

REFERENCE POINT	VALUE	TECHNICAL BASIS
Current F_{MSY}	0.3	Stochastic simulation using hockey-stick stock–recruitment.
Current B_{lim}	106 000	B_{loss} = 106 000 t (estimated in 1998).
Current B_{pa}	200 000	Affords a high probability of maintaining SSB above B_{lim}.
Current $MSYB_{trigger}$	200 000	Default value B_{pa}

3.8.2 Source of data

Data used in the MSY interval analysis were taken from the FLStock object created from the benchmark model.

3.8.3 Stock–recruitment relationship and new B_{lim} and B_{pa} reference points

The interval analysis was based on a segmented regression, where the inflection point was set to B_{loss}. (113 000; Figure 3.8.3.1). Recruitment is fairly flat with increasing SSB; this is considered a Type 5 stock–recruitment characteristic (distinct plateau, wide range of SSB) and for these stocks, B_{lim} is recommended to be B_{loss}. B_{lim} = B_{loss} = 113 000. B_{pa} was estimated to be 158 000, from the equation B_{pa} = B_{lim} * 1.4.

The alternate equation of $B_{pa} = B_{lim} * \exp(1.645 * \sigma)$, where σ is the standard deviation of ln(SSB) in the final the assessment year (σ = 0.1524), was not used (here, B_{pa} = 145 000). The argument against this was that $B_{pa,}$ could be overly influenced by the standard deviation for stocks where retrospective patterns are strong, while for stocks that use state–space models, estimating uncertainty that accounts for both the process and observation error is often not straightforward; a more precautionary approach (across stocks) was recommended.

The time period for the interval analysis was truncated to 2003–present. Recruitment per SSB showed signs of a cyclic trend over time (Figure 3.8.3.2). Whether the low productivity observed in recent years is part of cyclic changes or reflects that the stock has entered a new productivity regime is unknown. A change-point analysis, conducted using the *changepoint* library (Killick *et al*., 2016) in R, identified three distinct periods: high recruitment in the first years of the series, mid-level recruitment from 1969–2002, and low recruitment 2003–present (Figure 3.8.3.2). Although the low recruitment period was used in the interval analysis, B_{loss} was estimated from the entire time-series because no low levels of SSB have been observed during the truncated period (see also sensitivity analysis).

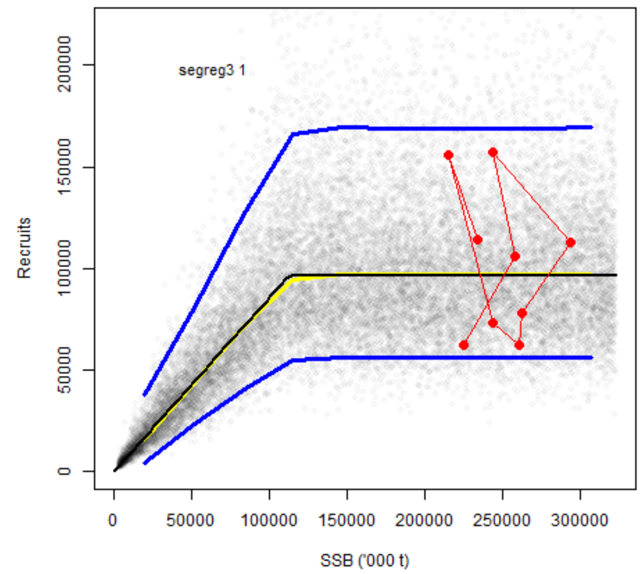


Figure 3.8.3.1. Stock–recruitment relationship saithe in Subareas 4 and 6 and Division 3.a, based on segmented regression over the truncated time period (2003–2014), where the inflection point was forced to be B_{loss} from the complete time-series 1967–2014.

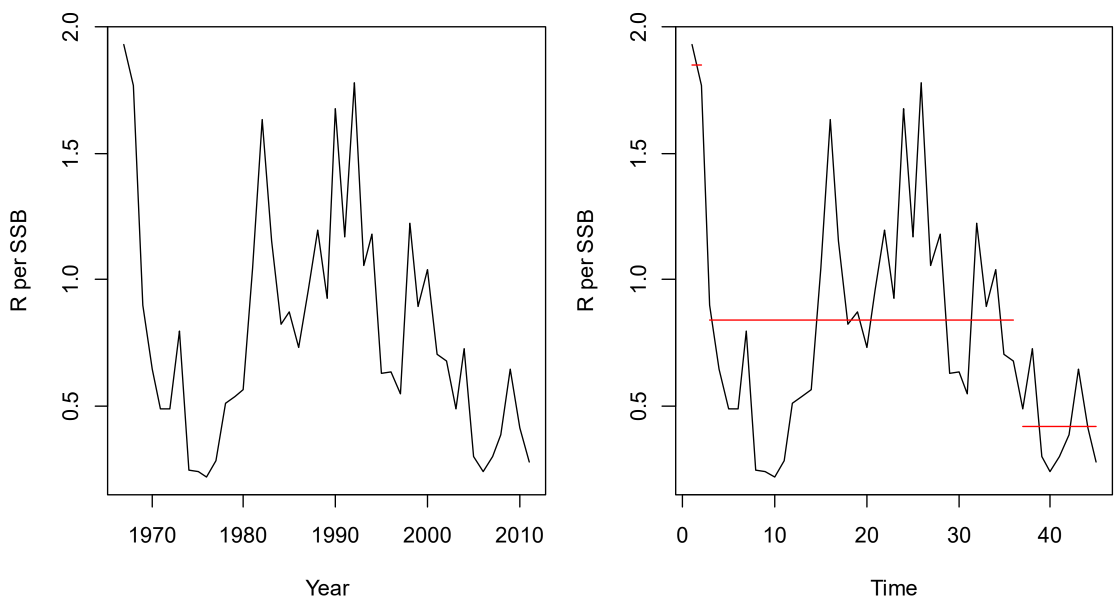


Figure 3.8.3.2. Saithe in Subareas 4 and 6 and Division 3.a: (left) Recruitment per SSB over time. (right) Periods identified in the change-point analysis as having different levels of recruitment.

3.8.4 Methods and settings used to determine ranges for F_{MSY}

All analyses were conducted with Eqsim. The Assessment error in the advisory year (F_{CV}) and the autocorrelation (F_{phi}) were set to values agreed at WKMSYREF4 for stocks where these uncertainties cannot be estimated (ICES-WKMSYREF4 2016). These values, which are normally derived by comparing F values from the latest assessment with forecasted F values in year^{-1}, could not be estimated for North Sea saithe because the assessment model, input data, and age range for F_{bar} were changed during the benchmark.

A landings obligation is soon to be mandatory for the North Sea and Skagerrak. Because of this, adjustments had to be made to the landings weights- and numbers-at-age for ages 4+. Discard numbers-at-age were added to the landings and catch weights-at-age were used for landings weights-at-age.

Table 3.8.2 Model and data selection settings.

Data and parameters	Setting	Comments
Recruitment model	Segmented regression, where the inflection point was forced to be B_{loss} from the entire time-series	Recruitment vs. SSB for the entire time-series showed a distinct plateau across a wide range of SSB. For stocks showing this characteristic, B_{loss} is recommended to be the inflection point in the segmented regression.
SSB-recruitment data	(a) Truncated time-series, based on changepoint analysis (year classes 2000 to 2011)	Changepoint analysis of R per SSB showed distinct periods in recruitment: higher R per SSB in 1969–2002 and lower in 2003 to present (see also section sensitivity/discussion).
	(b) Full dataseries (year classes 1967 to 2011)	R per SSB shows signs of cyclic changes in productivity over time. Whether the current low productivity of the stock can be explained by cyclic changes or whether the stock is in a new productivity regime remains unclear (see also section sensitivity/discussion).
Exclusion of extreme values (option extreme.trim)	No	
Mean weights and proportion mature; natural mortality	Default (2005–2014)	During the last ten years mean weight-at-age was noisy without trend or declined and increased again in recent years for some ages.
Exploitation pattern	Default (2005–2014)	Exploitation pattern noisy without clear trends. Selectivity for age 4 increased in the last two years. Based on only two years it is not possible to judge whether this is a longer-lasting change in the fishery.
Assessment error in the advisory year. CV of F	0.212	Default value for stocks where these uncertainties cannot be estimated.
Autocorrelation in assessment error in the advisory year	0.423	Default value for stocks where these uncertainties cannot be estimated.

3.8.5 Final Eqsim run

The results of Eqsim simulations run with and without $MSYB_{trigger}$ are shown in Figures 3.8.5.1 and 3.8.5.2, respectively.

The median F_{MSY} estimated by Eqsim applying a fixed F harvest strategy was 0.34 (Figure 3.8.5.3). The upper bound of the F_{MSY} range giving at least 95% of the maximum yield was estimated at 0.46 and the lower bound at 0.20. Because $F_{P.05}$ was estimated at 0.40, the upper bound needs to be restricted. However, the upper bound is still above F_{pa} and therefore must be further constrained to 0.377, where F_{pa} was estimated as $F_{lim}/1.4$ (again opting for the more precautionary approach when estimating F_{pa}). If F_{pa} was estimated as F_{lim} / exp(1.645 * σ), where σ is estimated standard deviation of ln(F) in the final assessment year, F_{pa} would equal 0.374. However, this estimation of F_{pa} fails to consider that uncertainty is often underestimated in the assessment and, when using state–space models, estimating uncertainty that accounts for both the process and observation error is often not straightforward. The median of the SSB estimates at F_{MSY} was 233 163 (Figure 3.8.5.4). Median SSB at the lower bound of the F_{MSY} range was 420 776 and 199 966 at the upper precautionary bound (F=0.377; using F=0.374 results in an upper bound of 202 249).

When applying the ICES MSY harvest control rule with a $B_{trigger}$ of 170 000 tonnes, median F_{MSY} increased to 0.37 with a lower bound of the range at 0.20 and an upper bound at 0.62 (Figure 3.8.5.5). The $F_{P.05}$ value also increased to 0.48, which is still above F_{pa}, and the upper bound must be again restricted to 0.377 (see text above). Median SSB values are lower than under the constant F scenario because of the higher F_{MSY} values (Figure 3.8.5.6).

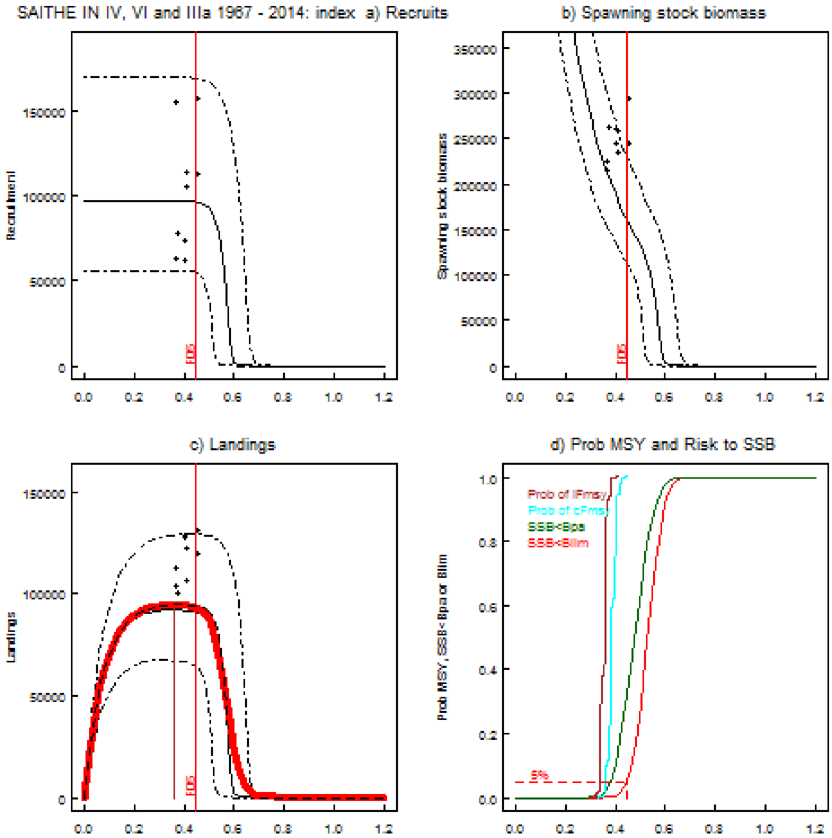


Figure 3.8.5.1. Eqsim results for saithe in Subareas 4 and 6 and Division 3.a (no trim, no $B_{trigger}$, segmented regression with B_{loss} forced to be the inflection point). Panels a–c: historic values (dots), median (solid black), and 90% intervals (dotted black) for recruitment, SSB, and landings for exploitation at fixed values of F. Panel c also shows mean landings (red solid line). Panel d shows the probability of SSB<B_{lim} (red), SSB<B_{pa} (green), and the cumulative distribution of F_{MSY} based on yield as landings (brown) and catch (cyan).

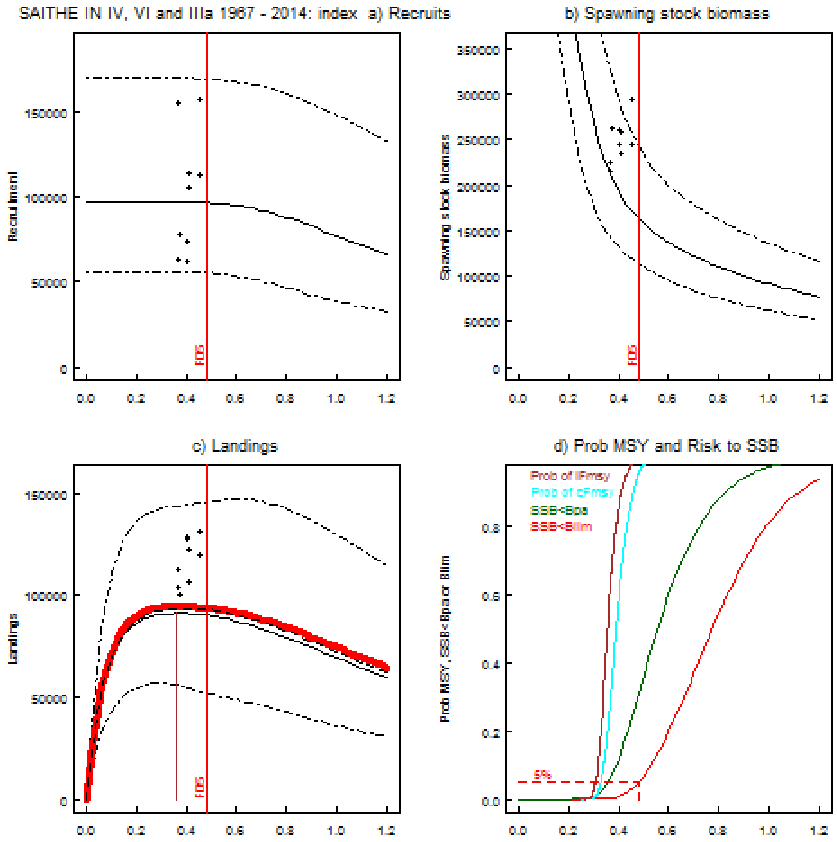


Figure 3.8.5.2. Eqsim results for saithe in Subareas 4 and 6 and Division 3.a (no trim, with $B_{trigger}$, segmented regression with B_{loss} forced to be the inflection point). Panels a–c: historic values (dots), median (solid black), and 90% intervals (dotted black) for recruitment, SSB, and landings for exploitation at fixed values of F. Panel c also shows mean landings (red solid line). Panel d shows the probability of SSB<B_{lim} (red), SSB<B_{pa} (green), and the cumulative distribution of F_{MSY} based on yield as landings (brown) and catch (cyan).

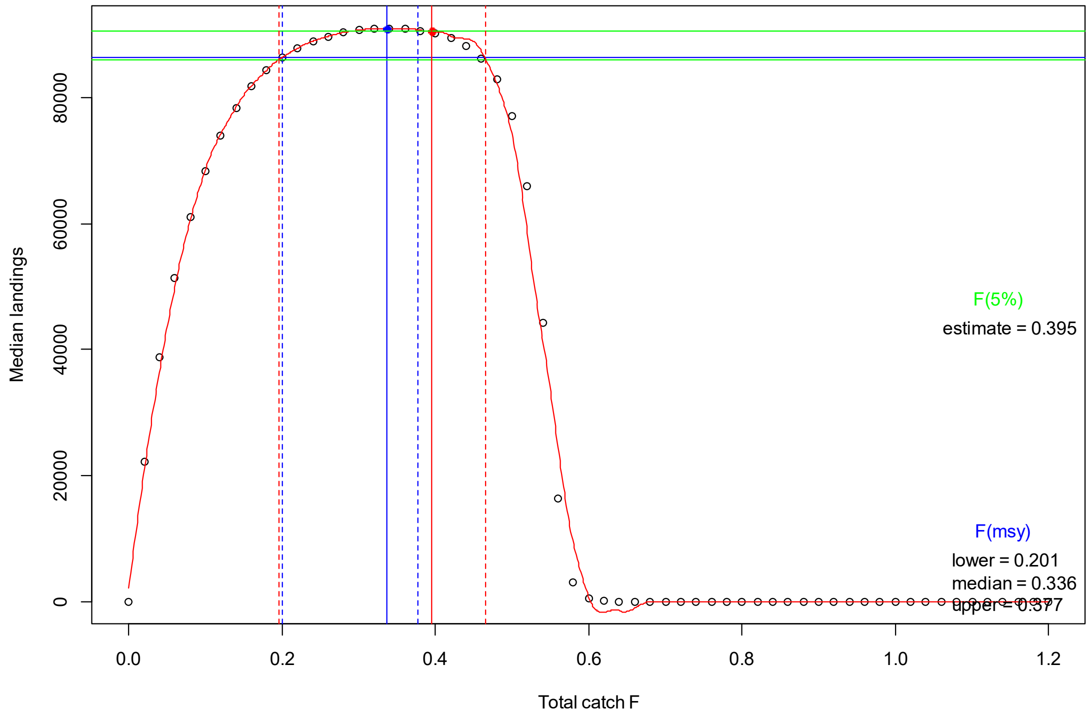


Figure 3.8.5.3. Median landing yield curve with estimated reference points for saithe in Subareas 4 and 6 and Division 3.a with a fixed F exploitation from F = 0 to 1.2 (no $B_{trigger}$). Blue lines: F_{MSY} estimate (solid) and range at 95% of maximum yield, with the upper bound restricted to F_{pa} (dotted). Green lines: F(5%) estimate (solid).

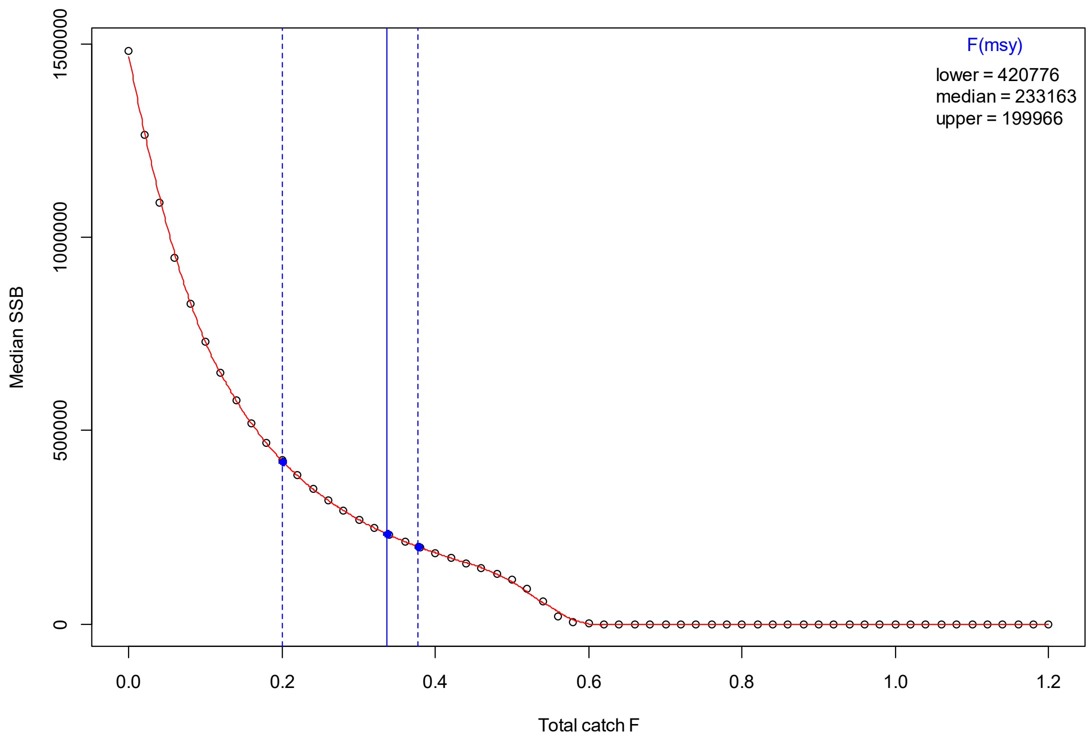


Figure 3.8.5.4. Median SSB with estimated reference points for saithe in Subareas 4 and 6 and Division 3.a with a fixed F exploitation (no $B_{trigger}$). Blue lines show the location of F_{MSY} (solid) with the (dotted) lower 95% F_{MSY} and the upper precautionary bound (restricted to F_{pa}).

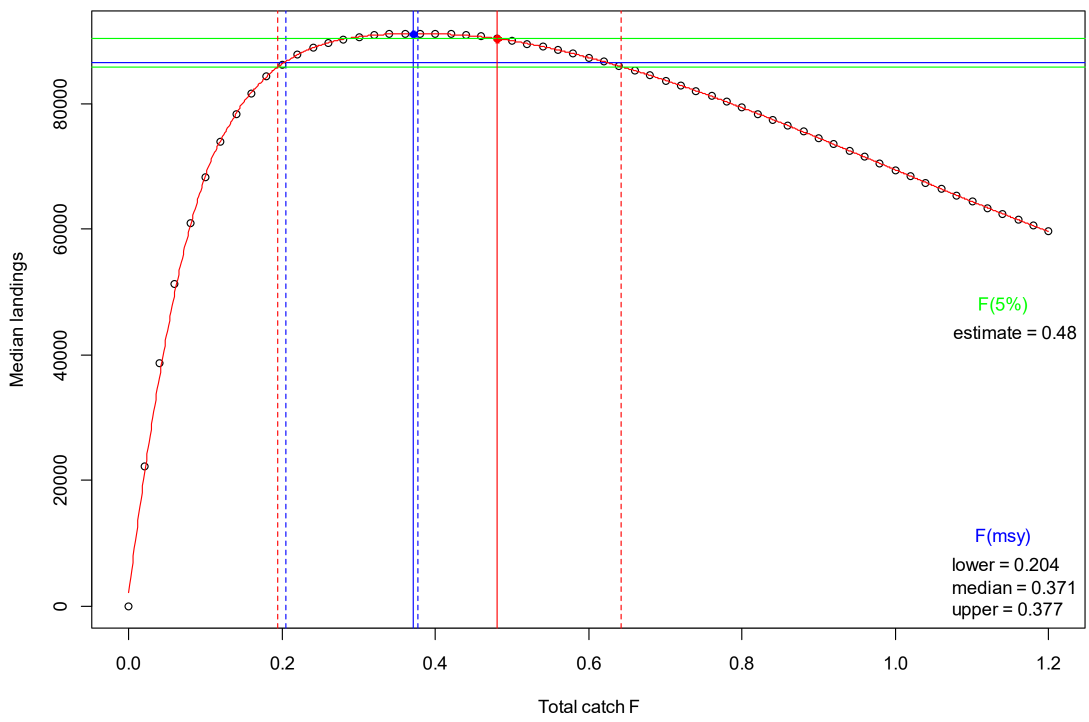


Figure 3.8.5.5. Median landing yield curve with estimated reference points when applying the ICES MSY harvest control rule with a $B_{trigger}$ at 170 000 tonnes for saithe in Subareas 4 and 6 and Division 3.a with a fixed F exploitation from F = 0 to 1.2. Blue lines: F_{MSY} estimate (solid) and range at 95% of maximum yield (dotted). Green lines: F(5%) estimate (solid).

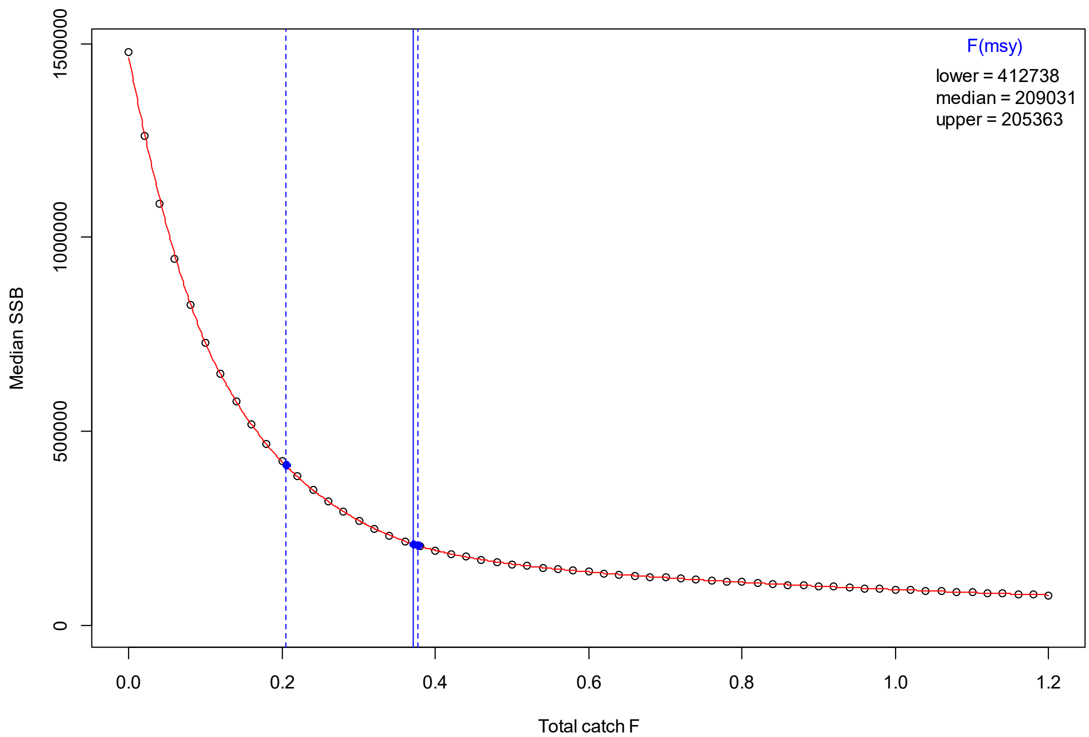


Figure 3.8.5.6. Median SSB with estimated reference points when applying the ICES MSY harvest control rule with a $B_{trigger}$ at 170 000 tonnes for saithe in Subareas 4 and 6 and Division 3.a. Blue lines show the location of F_{MSY} (solid) with the (dotted) lower 95% F_{MSY} and the upper precautionary bound.

3.8.6 Sensitivity runs

Recruitment per SSB shows signs of a cyclic trend over time, therefore, a precautionary approach was taken in the estimation of the reference points. However, it is unclear whether the low productivity observed in recent years is part of cyclic changes or whether the stock has entered a new productivity regime (Figure 3.8.3.2). To test the effect of different assumptions on future recruitment, two scenarios were included (1) using the truncated time-series, but setting B_{loss} equal to the lowest observed SSB in the truncated period (ignoring that no low SSB had been observed in the time period; an extremely pessimistic scenario) and (2) using the full time-series for the interval analysis (an optimistic scenario). The Eqsim analysis was carried out with similar settings as before (Table 3.8.2). A third scenario was also run on the truncated time-series, where B_{lim} = B_{loss} from the entire time period, and only the last five years (instead of the default ten years) were used for the biological parameters. This was done because in this period, stock weights appear to be increasing, while the exploitation pattern shows a decline (Figure 3.8.3.7).

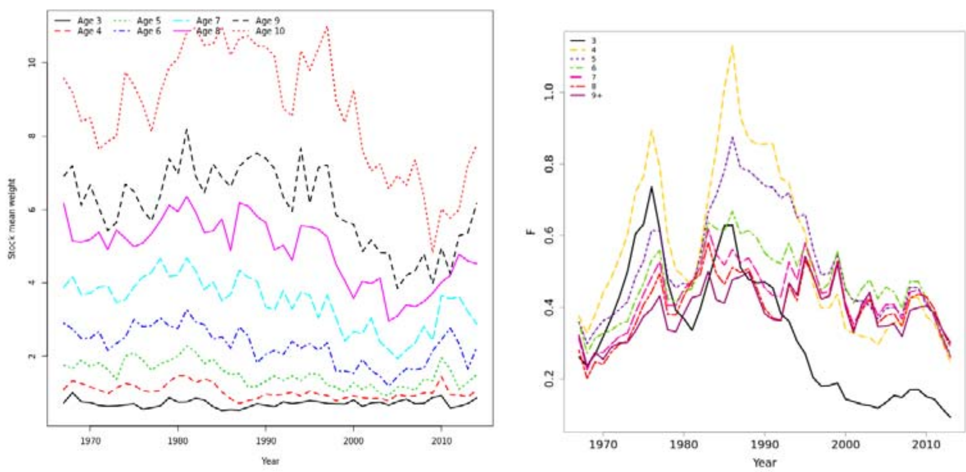


Figure 3.8.6.1. Saithe in Subareas 4 and 6 and Division 3.a: (right) Stock weights for ages 3–10+. (left) Exploitation pattern for ages 3–10+.

Because of the concerns regarding the use of the standard deviation from the last assessment in calculating B_{pa} and F_{pa} (see 'Final EqSim Run section'), estimates using both methods are reported. B_{pa1} and F_{pa1} refer to the method using 1.4, while B_{pa2} and F_{pa2} are estimated using the standard deviation.

In scenario (1), B_{lim} was again set to be B_{loss}, but this time using the lowest SSB observed in the truncated time-series (B_{lim} = 211 000, B_{pa1} = 295 000, B_{pa2} = 271 000). Under a fixed F harvest strategy, F_{MSY} was initially estimated to be 0.253 (lower = 0.183, upper = 0.304), but this lead to a $F_{MSY} > F_{pa1}$, therefore, F_{MSY} was reduced to 0.246 (F_{pa2} = 0.244). The median of the SSB estimates at F_{MSY} was 346 776. $F_{P.05}$ was estimated to be 0.253. The upper bound of F_{MSY} is above $F_{P.05}$ and F_{pa}, and therefore the upper bound = F_{MSY} = F_{pa}. The fifth percentile of equilibrium SSB at the new F_{MSY} was 230 275 tonnes and below the B_{pa} in this scenario; $B_{trigger}$ was thus set to B_{pa}. When applying the HCR with a $B_{trigger}$ of 295 000 tonnes (B_{pa1}), median F_{MSY} increased to 0.304 (range: 0.192-0.435). $F_{P.05}$ was estimated to be 0.303, necessitating restricting both F_{MSY} and the upper bound to 0.303 because of precautionary limits. Under the HCR, median SSB was

289 674. When applying the HCR with a $B_{trigger}$ of 271 000 tonnes (B_{pa2}), median F_{MSY} increased to 0.299 (range: 0.192–0.41). $F_{P.05}$ was estimated to be 0.285, necessitating restricting both F_{MSY} and the upper bound on F_{MSY} to 0.285 because of precautionary limits. Under the HCR, median SSB was 297 780.

In scenario (2), B_{loss} was used to set B_{lim} (B_{lim} = 113 000; B_{pa1} = 158 000, B_{pa2} = 145 000, F_{pa1}=0.509, F_{pa2}=0.504). The median F_{MSY} estimated by Eqsim when applying a fixed F harvest strategy was 0.347. The upper bound of the F_{MSY} range giving at least 95% of the maximum yield was estimated at 0.573 and the lower bound at 0.198. $F_{P.05}$ was estimated at 0.525. Because the upper bound of the F_{MSY} range was above F_{pa1}, it was reduced to 0.509. Equilibrium SSB at F_{MSY} was 372 982 tonnes. When applying the ICES MSY harvest control rule with a $B_{trigger}$ at 226 000 tonnes, median F_{MSY} increased to 0.353 (range: 0.199, 0.77). The $F_{P.05}$ value was 0.777. Fishing mortalities up to 0.77 can be regarded as precautionary even under this optimistic scenario as long as a decrease in F when the stock falls below $B_{trigger}$ is ensured; fishing mortalities at this level were experienced only a few times during the time-series (only for ages 4 and 5). With a harvest control rule, equilibrium SSB is estimated to be over B_{pa} when fishing at the median F_{MSY} value (360 767).

In scenario (3), B_{lim} = 113 000, B_{pa1} = 158 000, and B_{pa2} = 145 000 (F_{pa1}= 0.405, F_{pa2}= 0.401). When applying a fixed F harvest strategy, F_{MSY} was estimated to be 0.33 (lower = 0.192, upper = 0.495). $F_{P.05}$ was estimated to be 0.423. The upper limit on F_{MSY} must be restricted to 0.405. Equilibrium SSB at the new F_{MSY} was 258 960 tonnes. When applying the HCR with a $B_{trigger}$ of 209 000 tonnes, median F_{MSY} increased to 0.353 (range: 0.195–0.765). $F_{P.05}$ was estimated to be 0.658, necessitating restricting the upper bound on F_{MSY} to 0.658 because of precautionary limits. Under the HCR, equilibrium SSB was 242 352.

Figures 3.8.6.2 and 3.8.6.3 compare the results of the three scenarios.

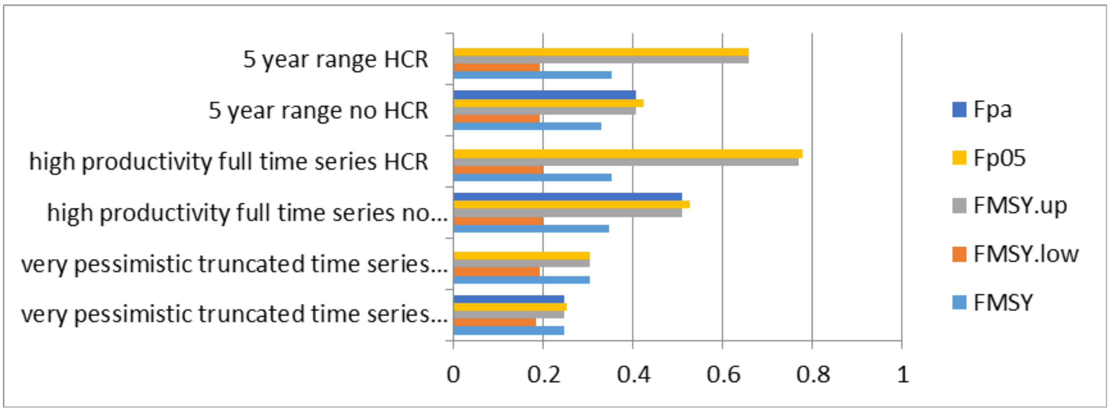


Figure 3.8.6.2. Fishing mortality reference point estimates under the three scenarios.

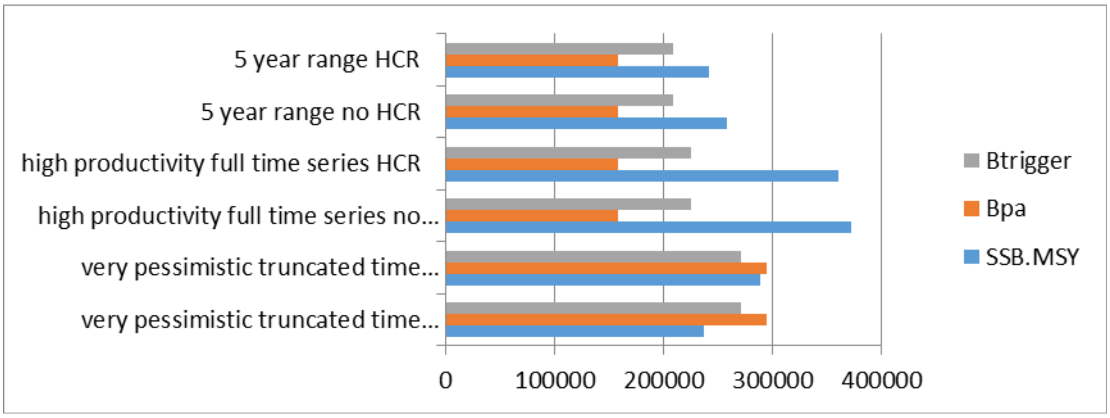


Figure 3.8.6.3. Biomass reference point estimates under the three scenarios.

3.8.7 Proposed MSY reference points

Table 3.8.3. Summary table of proposed stock reference points for method Eqsim (details in "Final Eqsim run" above).

Stock	
Reference point	Value
Blim	113 000
Bpa	158 000
Btrigger	170 000
Flim	0.528
Fpa	0.377
FMSY without Btrigger	0.336
FMSY lower without Btrigger	0.201
FMSY upper without Btrigger	0.464
New FP.05 (5% risk to Blim without Btrigger)	0.395
FMSY upper precautionary without Btrigger	0.377
FP.05 (5% risk to Blim with Btrigger)	0.480
FMSY with Btrigger	0.371
FMSY lower with Btrigger	0.204
FMSY upper with Btrigger	0.622
FMSY upper precautionary with Btrigger	0.377
MSY (without HCR)	90 986
Median SSB at FMSY (without HCR)	233 163
Median SSB lower precautionary (median at FMSY upper precautionary; without HCR)	199 966
Median SSB upper (median at FMSY lower; without HCR)	420 776

3.9 Future Research and data requirements

The following were noted as needing further exploration:

- External reviewers expressed concern over the large difference in catch-at-age for the period between 2002 and 2014 compared to previous years; this was noted as not being satisfactorily explained.

- Alternate scenarios for raising of the discards should be explored. The lack of Norwegian discard information was an issue; this needs to be resolved in the near future.
- Whether the survey fully encompasses the stock and the catchability of saithe in a bottom-trawl survey needs exploration. A new acoustic survey will be available in 2019 for including in an exploratory assessment.
- The catch and discard sampling as poorly explained; more information on national programs is needed.
- A recruitment index should be initiated for the stock.
- The feasibility of a shallow water, inshore survey for 0-group saithe should be investigated, with the intention of providing an 0-group index.
- Alternate rates of natural mortality need to be investigated.

3.10 External Reviewers report

The following section of this report covers what the reviewers believed to be the most important aspects of each stock assessment along with their recommendations. This report reflects solely the views of the external experts.

3.10.1 Issues addressed at the benchmark

The key issues discussed with the saithe assessment were stock structure, the new fishable biomass index, assumptions concerning new catch and biological data, the SAM specification, and problems with SAM performance, in particular residual and retrospective patterns.

Stock structure was a key concern. Evidence from genetics, tagging exercises, and fisheries and research survey data, all indicated that the North Sea stock extended to the north, and outside the assessed area. This could not be addressed within the benchmark because it would have required a new data call and considerable work, but it was recognised that the incorrect stock structure could produce additional uncertainty or bias in the stock assessment.

Input datasets were extensively revised. Catch-at-age for the period 2002–2014 were revised using a smoothed age–length key. Updated Q1 and Q3 survey estimates of numbers-at-age also used a smoothed age–length key. Updated unsmoothed stock weights and catch weights-at-age were used. Annual estimates of maturity-at-age were discussed, but a decision was made to use a long-term average maturity-at-age, where proportion mature at-age 3 was adjusted by expert opinion. A new standardised index of fishable biomass was provided. These were all regarded as useful updates.

The SAM model was the only assessment tool discussed during the benchmark meeting. The initial model included ages 1 to 10+ for all data inputs, and included as tuning series the Q1 and Q3 surveys, and the fishable biomass index. Results from sensitivity runs resulted in the age ranges being reduced to ages 3–10+ for the fishery, and ages 5–8 and 3–8 for the surveys, because the ages 1–2 and 9–10 were highly uncertain and not internally consistent with other ages. However, this model was considered unacceptable because of a relatively severe pattern in the residuals, and retrospective patterns in the estimates of SSB and F_{bar}. A range of models runs with different configurations, and/or combinations of tuning series, were explored to determine the cause of the residual and retrospective patterns. The problems were caused by a conflict between data from the fishery, and from the surveys.

The group was concerned that too much weight was being given to the surveys, given their likely lower information content for saithe. To deal with this, a final set of candidate models were developed with tuning datasets of (a) the three cpue indices used in the previous assessment, and the Q1 and Q3 surveys, (b) only the fishable biomass index, (c) the fishable biomass index and the Q1 and Q3 surveys, and (d) the fishable biomass index and the Q1 and Q3 surveys, but with estimation of a correlation structure for the survey numbers-at-age. Model (c) had an unrealistic change in biomass in the last year of the assessment and the strongest retrospective pattern of the four models; model (b) used only fishery-dependent data, and therefore was considered more susceptible to bias. Of the two remaining models, (d) was the consensus choice because it had the most realistic model structure, and did not make use the fishery catch-at-age data twice.

Option (d) is a new development of the SAM model, where the model was modified to estimate correlations in catch-at-age data. This option was only considered towards the end of the meeting, following clarification of the assessment model issues. A journal publication describing correlation structure in catch-at-age data was in press, but because of the late addition of this model the benchmark group discussion, as a whole, did not have time to fully evaluate all of the technical aspects.

Projections and reference points were done by correspondence after the Copenhagen meeting. The selection of the reference period for recruitment deviates was appropriate, and the estimation of projections and reference points followed the established and accepted ICES methodology.

3.10.2 Use of the final stock annex as basis for providing advice

We agree that results generated by the SAM assessment model can be used for providing fisheries advice as an ICES Category 1 stock (stocks with quantitative assessments).

3.10.3 Recommendations for future research

- The stock area assumption must be addressed in the next benchmark assessment of saithe.
- The available surveys for saithe do not cover the full distribution of the stock. Exploratory survey work is need to better delineate the depth and geographic distribution; in particular, this may include extending the depth range of the existing trawl and acoustic surveys.
- A review of maximum age achieved by saithe would be useful in refining estimates of natural mortality.
- In general, there should be consideration of alternative models or approaches, rather than relying on a single modelling framework (SAM). We do recognise that alternative model runs were planned, but issues with the SAM model (SAM being the *a priori* preferred option) precluded consideration of other modelling frameworks during the benchmark.
- We note that some retrospective changes are to be expected as additional information is added to assessments, but it is only when they are consistently in one direction that there should be concern. When evaluating model performance we recommend greater emphasis be given to model diagnostics such as residual patterns, and consideration of process errors, selectivity and catchability estimates, and only after this should there be evaluation of retrospective patterns.

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4 North Sea Dab

This section relates to the dab stock in the North Sea (Subarea 4) and the Skagerrak (the northern section of Division 3.a).

4.1 Stock ID and substock structure

Several spawning grounds and the wide distribution of dab indicate the presence of more than one stock. Meristic data (Lozán, 1988) corroborate the hypothesis of several stocks for dab, distinguishing significantly between populations from western British waters and the North Sea and the Baltic. However, no further scientific evidence is available for different stock units within the North Sea. Thus, stock identity and substock structure was no issue during the current benchmark workshop.

4.2 Issue list

dab-nsea	Data-limited	No/WGNEW	no	2016	no	Test analytical assessment methods

Dab in 4 and 3.a

Data needed

- Catch (landings and discards) data back to 2002 (BEL, NDL, GER, DNK, SWE, NOR, UK ENG, UK SCO, FRA)
- Effort data by single métiers as additional source of information to estimate the amount of discards where no sufficient information from sampling programmes is available:
  - Norway to provide;
  - STECF data and WGMIXFISH in case InterCatch is incomplete.
- Available beam trawl survey data on dab (offshore and inshore surveys):
  - Dutch dataseries are available in DATRAS for RV Isis (1987–2014) and RV Tridens (1996–2014). Dutch inshore indices and data were provided separately;
  - German data are available for RV Solea (2002–2003) and RV Solea2 (2004–2005, 2007–2014);
  - UK data are available in DATRAS;
  - Belgium indices were provided but are not available in the DATRAS format.
- Available biological data from scientific surveys and sampling programmes of the commercial fleets (length distributions, age distributions, weight, maturity data).

Current assessment issues

Currently dab is treated as a data-limited species and the assessment is solely based on survey trends and catch data. For the current assessment method the IBTS-Q1 index (mature biomass in kg) is used as basis for the trend based analysis (DLS 3.2.

method). This might not be the best index for a flat fish species as the IBTS gear (GOV) is not designed for the purpose of catching flat fish. Therefore, the available beam trawl survey indices should be evaluated and if these indices would be more suitable to be used for this assessment approach. Further, it was often argued within the WGNSSK that the indices used for the DLS 3.2 method do not come along with uncertainty estimates and that these estimates should be calculated.

Discards are extremely high in the case of dab. During the WGNSSK 2015 discards could be estimated for the years 2012–2014. However, more discard data sampled under the DCF should be available and should be uploaded into the InterCatch data portal by all relevant institutes.

Although dab is treated as a data-limited stock a lot of data exist which are not utilized today. For example weight-at-age data exist from Dutch, German and Danish sampling programmes for a number of years. Age-based stock index time-series from the Beam Trawl Surveys could be constructed and be used as tuning indices or recruitment indices (offshore Beam Trawl as well as inshore Beam Trawl surveys). Therefore, the benchmark should explore the possibility of an age-based assessment model in the case of dab, e.g. XSA, SAM or a4a. Most challenging in the case of dab will probably be to adequately assess the stock structure of the discarded proportion of the catch.

No biological reference points are defined yet. The benchmark should explore if reference points can be defined or if the use of SSB proxies is possible.

Proposed working papers/analyses

Time-series of dab discards in North Sea fisheries obtained under the DCF (2002-2014)

Dab is a bycatch species in fisheries for plaice, sole and demersal round fish and the discard rates for this species are extremely high. Therefore a proper estimation of the amount of discarded dab is essential to give catch advice for this species. Landings and discards data should be made available from all relevant national institutes by a data call including all relevant information. All available data will be compiled and a time-series will be constructed. The discard information was already compiled for the years 2012–2014 during the WGNSSK 2015 and it was possible to estimate the total catch these years. The previous years will be updated with the new data. It would be appreciable if these data could be available and ready to use (e.g. uploaded into the InterCatch system) for a data collection workshop previous to the benchmark meeting in order to quality check the data.

The evaluation of different survey indices in order to inform the stock status of North Sea dab

Dab is a widespread flatfish species in the North Sea where it is one of the most abundant species. It is distributed over the whole area down to depths of 100 m, but it was also found occasionally down to depths of 150 m. The main concentration of dab can be found in the southeastern North Sea and abundance decreases towards the northern parts of the North Sea. Currently a mature biomass index based on the IBTS-Q1 is used for a trend based assessment to give catch advice. The IBTS gear, an otter trawl, is not the best gear to catch flatfish but this survey index was used because the IBTS covers more or less the whole distribution area of dab in the North Sea with a relatively standardized methodology. This is not necessarily the case for the different beam trawl surveys (BTS) which use a different gear set up, cover different areas and do not cover the whole distribution area of dab. However, the BTS target especially flatfish species and should be preferred in the case of dab. Therefore this working paper will evaluate if one BTS index or possible combinations of some BTS indices (e.g. similar as in the case of North Sea plaice) would be a more suitable indicator for the dab stock status. Further, the use of age-based indices will be explored as age data from BTS exist at least for the Dutch and German BTS.

Time-series of length-at-age, weight-at-age, and available maturity data of North Sea dab

This working document will evaluate and compile all available biological data for North Sea dab which were obtained on scientific surveys and/or from programmes sampling the commercial fisheries. The constructed time-series can be used to estimate the input data which are needed to set up an age-based assessment as age–length keys, weight-at-age time-series, and maturity-at-age.

Testing the suitability of age based models in the "DLS" case of dab - exploratory assessment runs

Workplan

Compilation of catch data in InterCatch format (2002–2011): all national institutes; previous to data collection WS

Compilation of survey data (BTS): UK England, Belgium, Germany, The Netherlands; previous to data collection WS

Evaluation of survey indices: Belgium, England, Germany, Netherlands; previous to the benchmark

Compilation of input data for age-based assessment models: Belgium, England, Germany, The Netherlands; previous to the benchmark

Exploratory assessment runs: Belgium, England, Germany, The Netherlands; during the benchmark

Other working groups to be involved

WGBEAM, IBTS-WG (age-based indices, index uncertainty estimate, combination of BTS indices).

STOCK	NSEA-DAB	
Stock coordinator	Name: Holger Haslob	E-mail: holger.haslob@ti.bund.de
Stock assessor	Name:	E-mail:
Data contact	Name:	E-mail:

ISSUE	PROBLEM/AIM	WORK NEEDED / POSSIBLE DIRECTION OF SOLUTION	DATA NEEDED TO BE ABLE TO DO THIS: ARE THESE AVAILABLE / WHERE SHOULD THESE COME FROM?	EXTERNAL EXPERTISE NEEDED AT BENCHMARK TYPE OF EXPERTISE / PROPOSED NAMES
(New) data to be considered and/or quantified	Currently dab is treated as a data-limited species and the assessment is solely based on survey trends and catch data (DLS 3.2. method). However, a lot of data exist but are not utilized today. Weight-at-age data exist from Dutch, German and Danish sampling programmes. Therefore, the dab benchmark should explore the possibility of an age-based assessment model in the case of dab.		Data should be available at least for the years covering the DCF programme. Institutes: IMARES, TI-SF, DTU-AQUA	
	See discard section below.			

Issue	Problem/Aim	Work needed / possible direction of solution	Data needed to be able to do this: are these available / where should these come from?	External expertise needed at benchmark type of expertise / proposed names
Tuning series	Currently the IBTS Q1 index is used as basis for the trend based assessment (DLS 3.2). This might not be the best index for a flat fish species. The available beam trawl survey indices should be evaluated to be used instead for this assessment approach or their suitability as tuning index in an age based assessment. The demersal young fish survey could also be tested as a recruitment index.	Age readings are available for the Dutch beam trawl surveys and for the German beam trawl survey. However, not all data are available in the DATRAS data portal. A first step has to be the upload of all survey data on dab in the DATRAS format. Estimate an 0-group and 1-group index from the demersal young fish surveys.	Data are not fully available via DATRAS.	
Discards	Discards are extremely high for dab. During the WGNSSK2015 discards were estimated for the years 2012-2014. However, more discard data sampled under the DCF should be available and should be uploaded into the InterCatch data portal by all relevant institutes.	Check availability of discard data from commercial sampling programmes and upload data to InterCatch for years previuos to 2012.	Discard information from national sampling programmes. All relevant institutes (BEL, DNK, NDL, GER, ENG, SCO, FRA, SWE, NOR?).	

Issue	Problem/Aim	Work needed / possible direction of solution	Data needed to be able to do this: are these available / where should these come from?	External expertise needed at benchmark type of expertise / proposed names
Biological Parameters	Data on dab maturity are scarce. It should be evaluated which maturity data exist in the national databases and which information is available in literature. It might be possible to construct a maturity ogive.	Check data availability, literature review.	Maturity data at age or length. National databases, DATRAS, literature.	
	M -> unknown	Evaluate the use of proposed models on M from literature (e.g. Gislason), or assume similar M as used for other flatfish species.		
Assessment method	No age-based assessment available today. Explore the possibility to set up an age-based model for dab (e.g. XSA or SAM).			
Biological Reference Points	Not defined yet. Explore if reference points can be defined or if the use of SSB proxies is possible.			

4.3 Scorecard on data quality

A scorecard was not used for this benchmark.

4.4 Multispecies and mixed fisheries issues

Dab is mainly a bycatch species in the demersal fisheries for North Sea plaice and sole. The largest part of dab catches is discarded (up to 90% in the period 2012–2014). In the year 2014, 53% of landings were taken in the beam trawl fishery, followed by 22% and 13% in otter trawl and seine fishery, respectively (ICES, 2015). In recent years large effort reduction took place in the mixed demersal fisheries of about 60% in beam trawl and otter trawl fisheries in the period 2000–2012 (STECF-14-03).

4.5 Ecosystem drivers

No new information was presented at the benchmark meeting. Dab is currently not included into any multispecies assessment models. However, being one of the most abundant demersal fish species in the North Sea, the dab stock has probably some impact on the ecosystem.

4.6 Stock assessment

4.6.1 Catch; quality, misreporting, discards

Data available on official landings are incomplete for the years 1984–1997 due to the lack of Dutch data for this time period. Due to the high amount of discards, the official landings data cannot be used to inform the stock status of dab. Total catch data (landings and discards) are available for some countries and fleets since 2002 and were requested within the data call for this benchmark workshop. The data were uploaded by all relevant countries into the InterCatch data portal. The amount of imported discard data was lower for the earlier years of the time-series and the InterCatch raising procedure introduces some uncertainty. However, in general discard data for the most important fleet, the Dutch TBB_DEF_70-99_0_0_all métier, was provided and most of the amount of discard estimates was therefore based on imported data. Thus, for the present benchmark assessment it was possible to create a time-series on total catch from 2002 to 2014 (Table 4.6.1.1.). The discard increases from 76% in 2002 up to 91% for the last year of the series.

Table 4.6.1.1. Total dab catch, discards and landings (tonnes) based on imported and raised InterCatch data.

Landings	Imported Discards	Raised Discards	Total Discards	Total Catch	% Discards
8588	14 448	12 183	26 631	35 219	76%
9433	22 152	22 778	44 930	54 363	83%
8647	18 559	15 714	34 273	42 920	80%
9537	21 295	13 996	35 291	44 828	79%
10236	16 106	21 871	37 977	48 214	79%
9881	8936	24 392	33 328	43 208	77%
8645	14 781	12 598	27 379	36 024	76%
7040	20 652	12 769	33 421	40 461	83%
8279	23 688	18 798	42 486	50 765	84%
7422	28 227	16 234	44 460	51 882	86%
7047	33 220	19 412	52 632	59 679	88%
6611	36 855	16 621	53 476	60 087	89%
5047	35 383	18 350	53 733	58 780	91%

4.6.2 Surveys

A number of survey indices are available for dab (*Limanda limanda*) in the North Sea. The international coordinated surveys IBTS and BTS catching dab in reasonable amounts and the total catch in numbers, total catch in weight and length measurements for most of the time-series were recorded. Probably the most suitable survey for dab is the International Beam Trawl Survey (BTS) targeting especially on flatfish species in the North Sea. The problem with this survey is that it is not fully standardized and not all data are already available via the DATRAS data portal. Further, the geographical coverage is limited compared to the International Bottom-trawl Survey (IBTS). However, the IBTS never collected any biological parameters of dab in a consistent way or covering the whole distribution range of dab.

Age–length keys were available for the two Dutch beam trawl surveys and the German beam trawl survey. Different options were tested to make use of age-based indices in a survey based assessment model (SURBA). A combined age-based index was constructed applying the delta GAM method by Berg *et al*. (2014). This index showed the best internal consistency, and it was agreed to use this as input for the subsequent SURBA model runs (Figures 4.6.2.1 and 4.6.2.2).

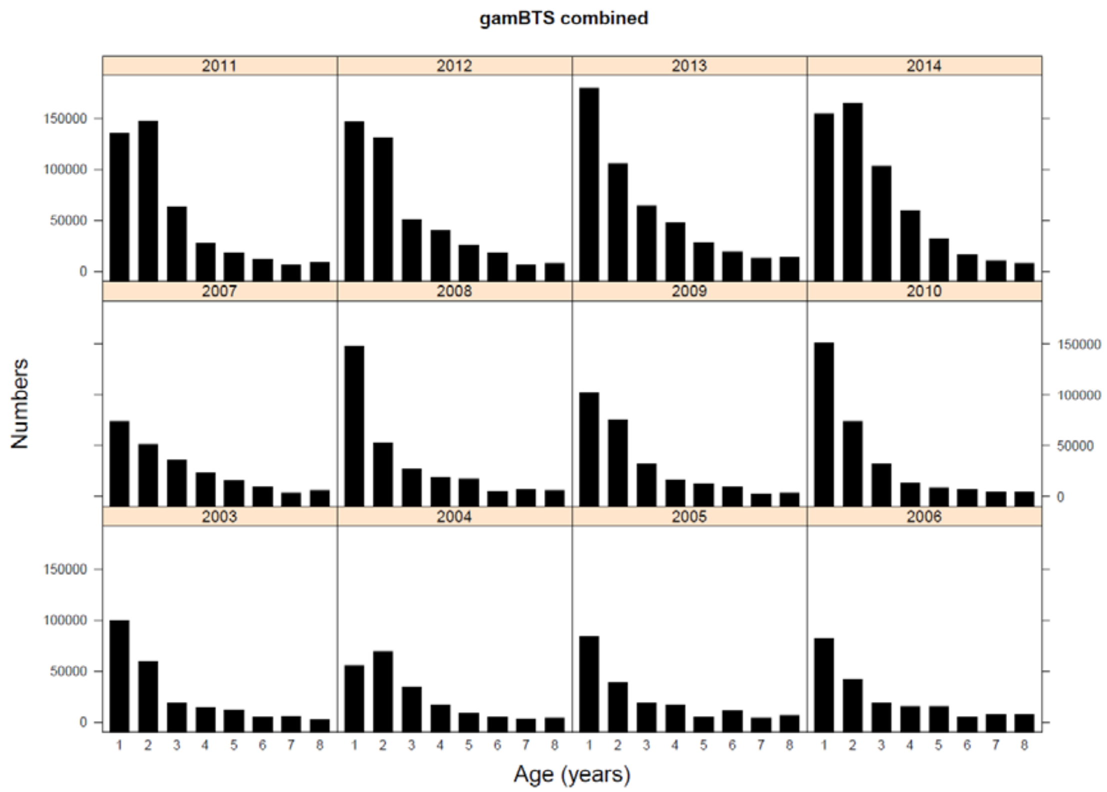


Figure 4.6.2.1. Numbers-at-age from combining the Dutch and German beam trawl surveys.

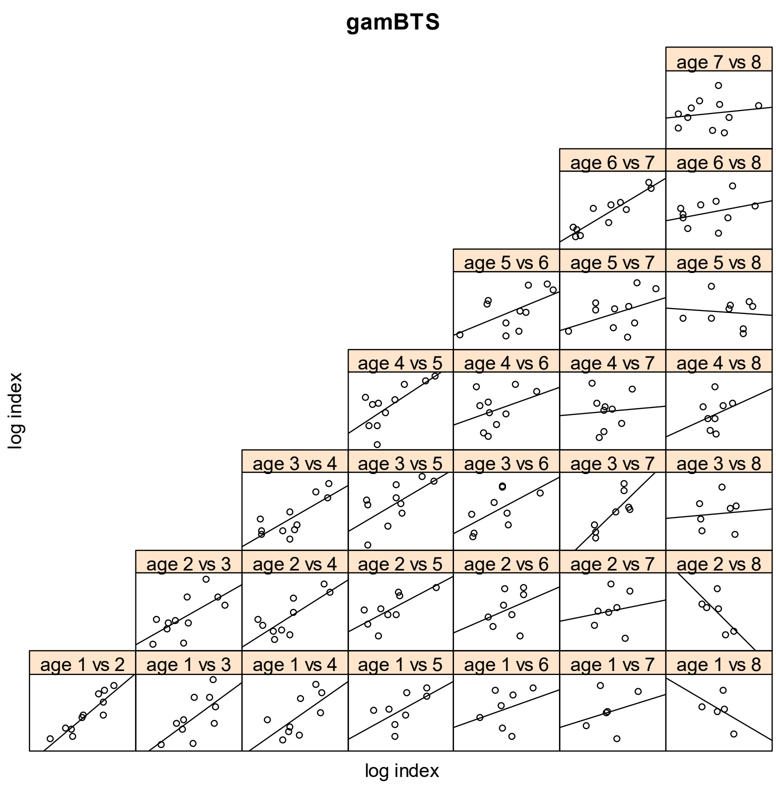


Figure 4.6.2.2. Within-survey correlations for the combined gamBTS (Isis, Tridens, Solea) survey index, comparing index values at different ages for the same year classes (cohorts).

4.6.3 Weights, maturity, growth, natural mortality

Some countries provided catch-at-age (numbers) and weight-at-age data based on samples from commercial fleets. From 2002 to 2005 only Dutch data were available (~25–50 age readings per quarter and catch category). Since 2006 German age-reading data were available and since 2009 also age-reading data from Denmark. The estimated numbers-at-age and weights-at-age are displayed in Figure 4.6.1.1. The age distribution pattern seems to be odd for the years 2002–2005 and 2008–2010 with age group 5 always showing very large numbers. The estimated results of weight-at-age from the commercial samplings are also poor for the years 2002–2005, which can probably be explained by the comparatively low sample sizes for these years. The use of these data as input for any age-based assessment model seems to be questionable.

A number of individual fish data were also available from different surveys (Table 4.6.3.1). These data were used to estimate weight-at-age applying the DATRAS R package by Kristensen and Berg (2010). A dip in weight-at-age is visible in 2006 and a decrease for the last year 2014 (Figure 4.6.3.2). For most of the time-series no trend is visible.

Dab is in general a slow growing flat fish (Bohl, 1957), but growth seems to be highly variable and the length range per age group can be large, e.g. 8–20 cm for two year old male dab. However, difficulties in age reading may also explain these large length ranges per age group. Von Bertalanffy growth parameters were estimated from the available survey data. The growth curves differ between sexes with females growing faster and larger compared to males (Figure 4.6.3.3. and Table 4.6.3.2.).

Only very few maturity data are available from surveys. Based on these observations, and taking into account information from literature that dab mature early (Rijnsdorp *et al*., 1992), a fixed maturity ogive was applied with age 1 being 60% mature, age 2 80% and age 3 and older 100% mature (Figure 4.6.3.4).

The natural mortality for dab is not known. For this benchmark it was estimated following the approach by Then *et al*. (2014). This method is based on an empirical formula taking the maximum observed age into account. The maximum observed age for dab in the available data was 18 years which resulted in an estimated natural mortality of 0.35.

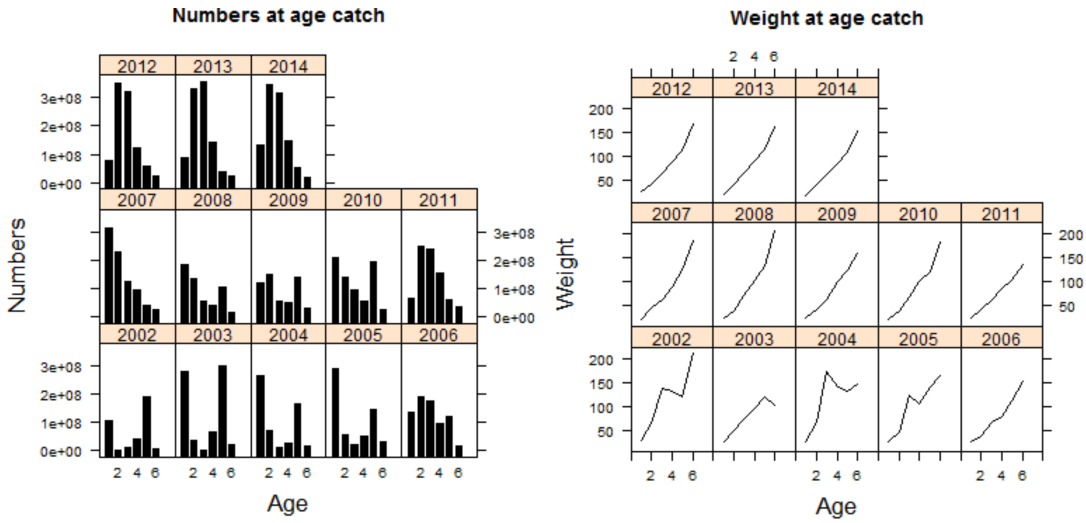


Figure 4.6.3.1. Dab numbers-at-age (left panel) and weight-at-age (right panel) from 2002 to 2014 as result from InterCatch raising procedure and sample allocations.

Table 4.6.3.1. Overview of biological data for dab (*Limanda limanda*) available from the DATRAS data portal.

	BTS Isis Q3		BTS Tridens Q3		BTS Solea Q3		IBTS Q1		IBTS Q3	
year	IndWgt	Age	IndWgt	Age	IndWgt	Age	IndWgt	Age	IndWgt	Age
2002			474			434				
2003	301	286	482	473		494				
2004	276	274	522	504		977			366	
2005	391	373	549	534					391	
2006	345	341	496	482					374	
2007	400	394	544	517		620			387	
2008	312	285	529	515		585			388	
2009	272	269	549	538		975			384	2
2010	155	155	563	538		1022			419	
2011	485	476	620	613		1254			390	
2012	371	365	561	556		1074	452	445	364	13
2013	284	259	527	516	1994	1995	485	481	214	
2014	183	182	550	548	431	460	392	427	269	
2015	203		588						269	

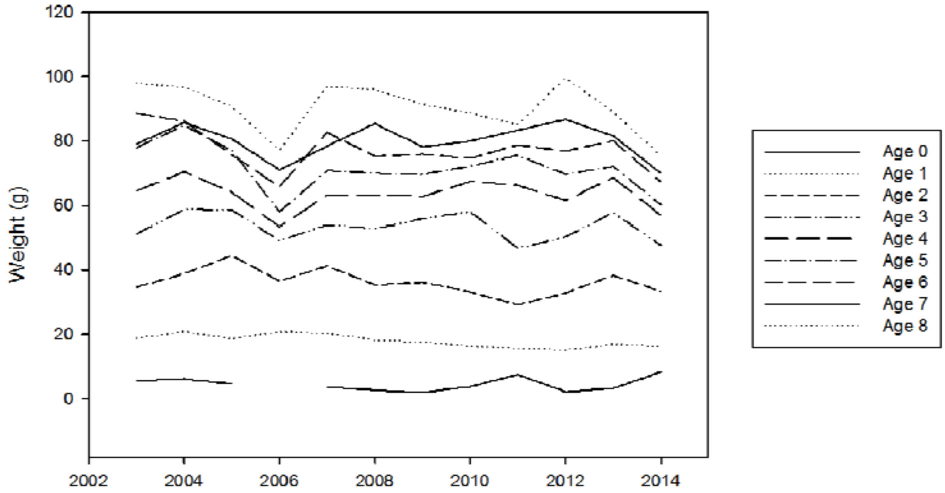


Figure 4.6.3.2. Dab weight-at-age from survey data.

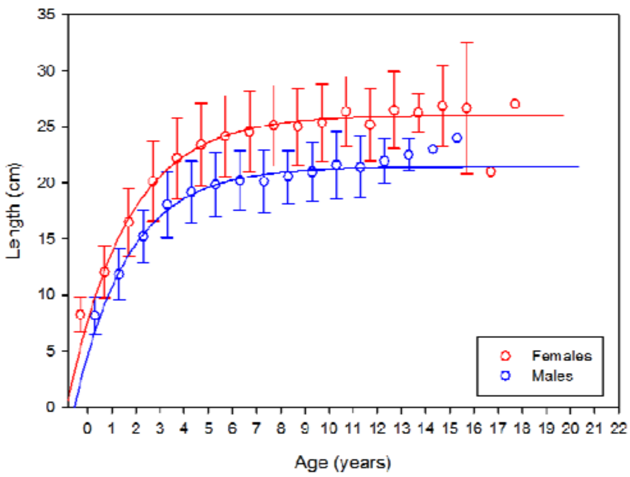


Figure 4.6.3.3. Dab mean length-at-age and von Bertalanffy growth curves separated by sex.

Table 4.6.3.2. Von Bertalanffy growth model parameters.

	LINF	K	T0
female	25.79	0.44	-0.48
male	20.99	0.43	-1.01
combined	24.9	0.39	-0.7

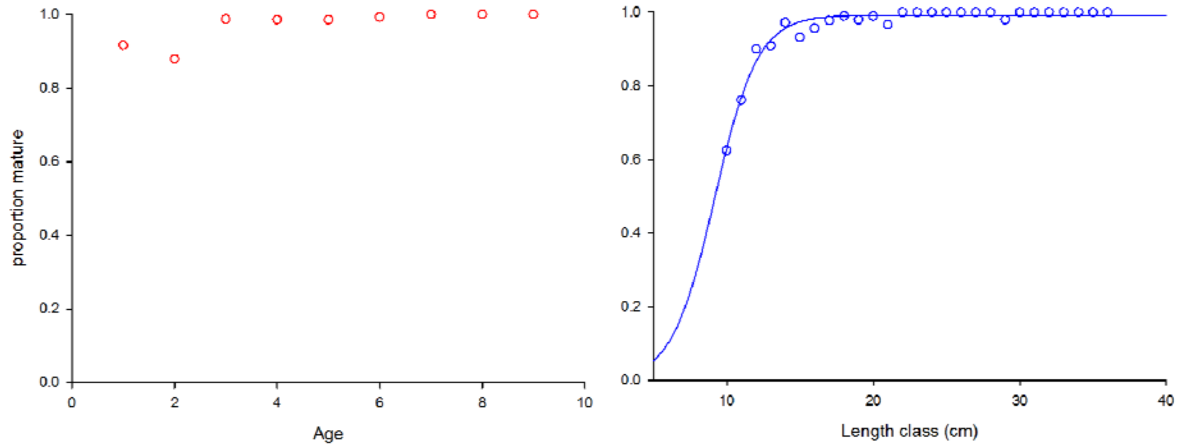


Figure 4.6.3.4. Age (n=1335) and length (n=1360) based maturity ogives for dab from IBTS quarter 1 data (2012–2014).

4.6.4 Assessment models

4.6.4.1 Survey Based Assessment Model (SURBAR)

The required input data for SURBAR (Needle, 2015) are at least one age-based survey index, weight-at-age and maturity data for the calculation of relative SSB and TSB. Weight-at-age data were estimated form Dutch survey data using the DATRAS R package (Kristensen and Berg, 2010). One fixed maturity ogive was used for all runs based on data from literature and maturity data collected during the IBTS Q1. During the benchmark it was agreed to use a combined beam trawl survey index which was estimated by applying the delta GAM method by Berg *et al*. (2014). Other index options were also tested (e.g. using BTS indices separately), but the delta GAM index showed the best internal consistency among age classes.

The SURBAR model only allows for a few settings to be changed. That is the range to calculate zbar, choice of a reference age and a smoothing parameter lambda. Figure 4.6.4.1 shows the effect of changing lambda from 1 to 5. SSB, TSB and recruitment is not affected by a change in lambda, but there is some effect on the mortality estimate (Figure 4.6.4.1. upper left panel). Since the impact of changing lambda on the model outputs was rather low, the default setting of lambda=3 was maintained for the final run. Further, different zbar ranges were tested (Figure 4.6.4.2.). The pattern of mean z over the time-series does not change by different settings of the used zbar range.

One issue during the benchmark was the selectivity pattern with a decreasing selectivity with increasing ages (Figure 4.6.4.3a). The observed trend becomes less pronounced the less age groups were included into the SURBAR model. Since there was no obvious explanation for this pattern it was agreed to reduce the input to age groups 1–6. For this setting the selectivity for age groups 4–6 is the same, and not that much lower compared to age groups 1–3. Again, the sensitivity of the SURBA model was tested by changing the included age groups. No changes in the trend of biomass and recruitment were observed and only slight differences in mortality z (Figure 4.6.4.3).

The final SURBAR model run resulted in an overall decreasing mortality z from 0.53 in 2003 to 0.32 in 2014 (Results Figure 4.6.4.5, Settings Table 4.6.4.1). Accordingly to this observation the spawning–stock biomass showed an increasing trend, especially from 2009 onwards, from 100 to 240 (relative abundance estimate). Recruitment showed an increase by a factor of 2.5 from 1.5 (2003) to 3.8 (2013), but dropped below 3 in 2014.

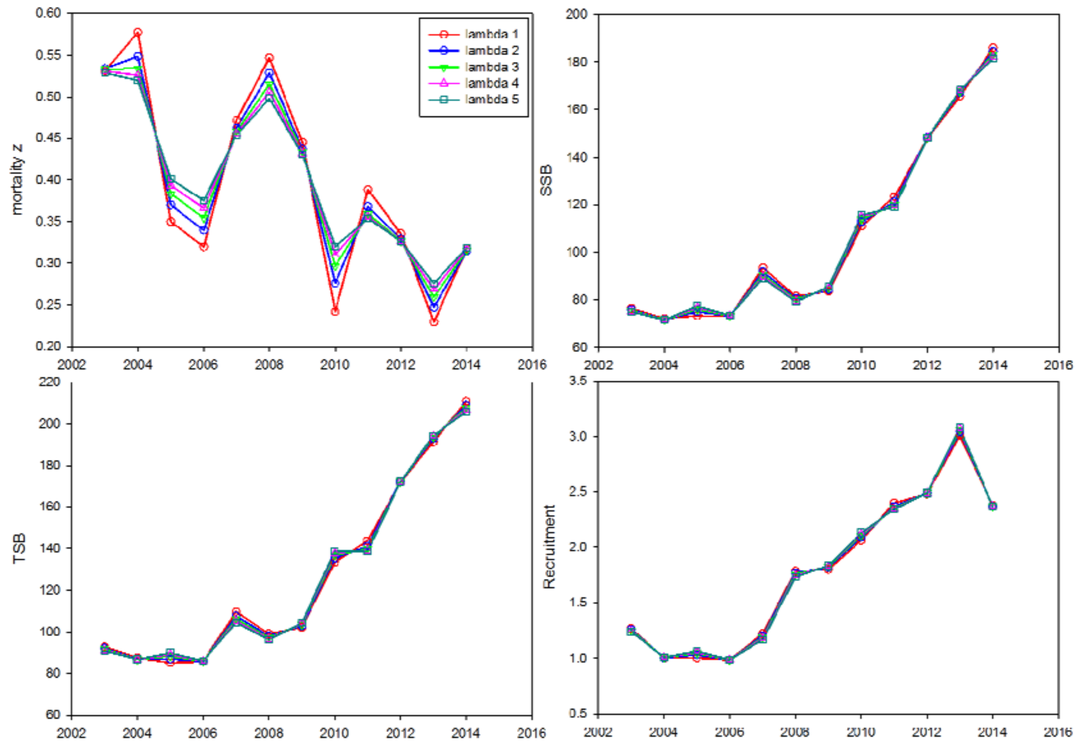


Figure 4.6.4.1: Sensitivity analysis of SURBAR model changing the smoothing parameter lambda.

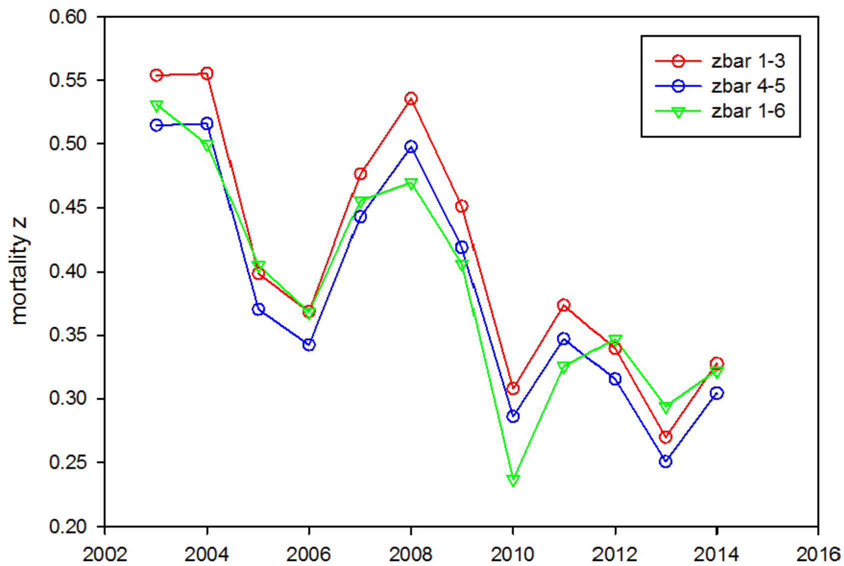


Figure 4.6.4.2. Mortality z for different zbar ranges.

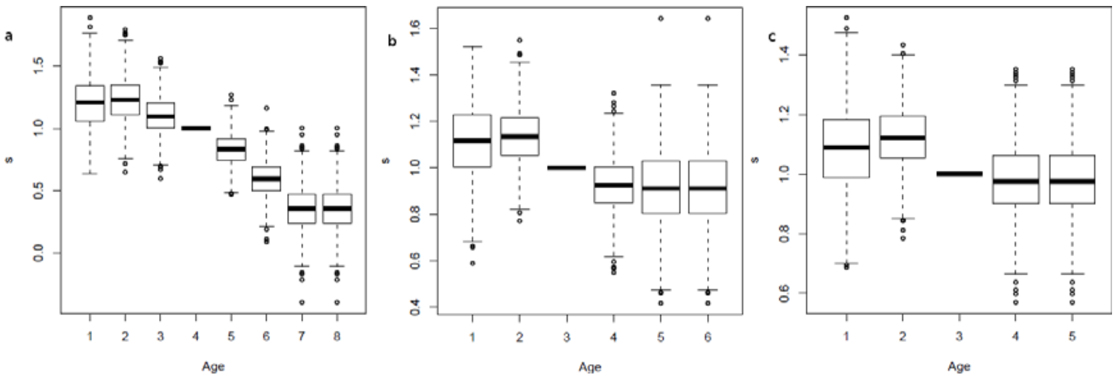


Figure 4.6.4.3. Changes in selectivity by reducing included age groups.

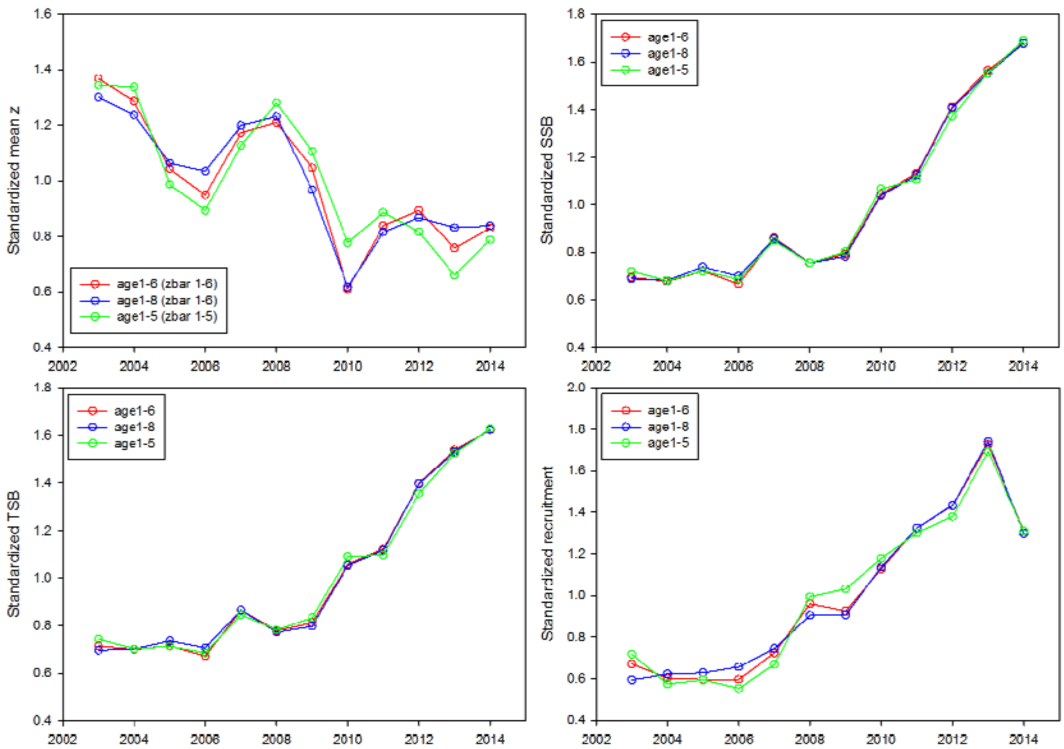


Figure 4.6.4.4. Sensitivity analysis of the SURBAR model testing for including different age groups. Red lines: ages 1–6 included, blue lines: ages 1–8 included, green lines: ages 1–5 included.

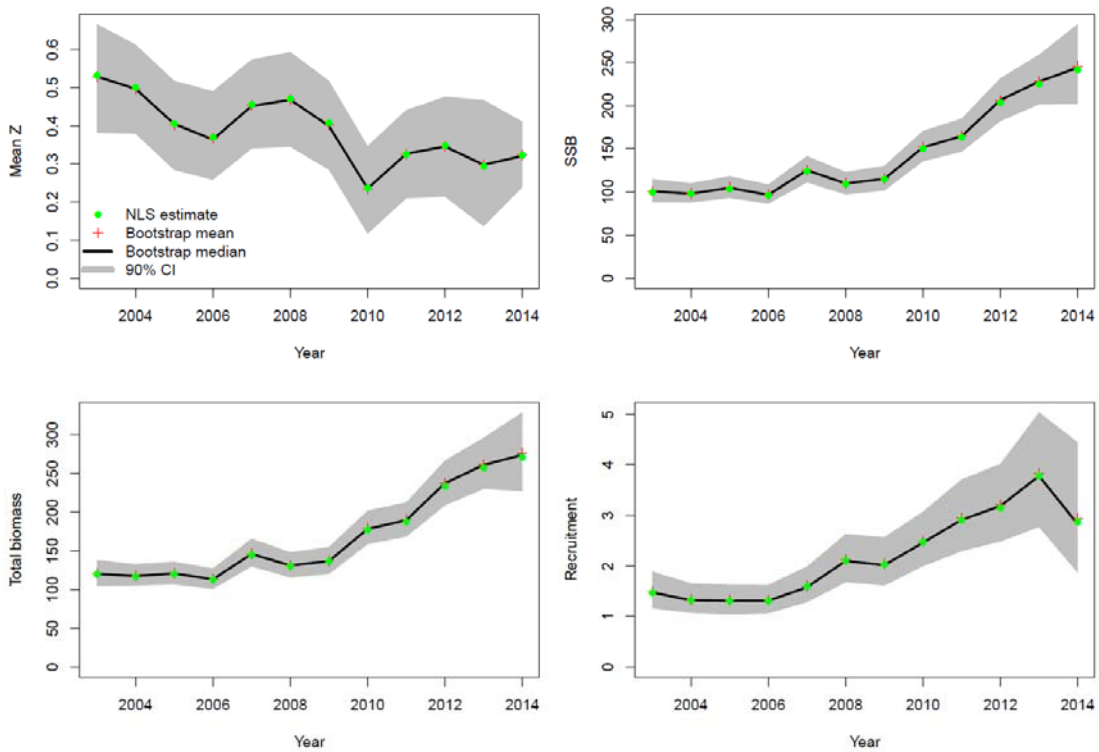


Figure 4.6.4.5. SURBAR output final model. Total mortality (z ages 1–6), relative trends in SSB, TSB and recruitment.

Figure 4.6.4.6. SURBAR output final model. Log residuals by age of the used survey index.

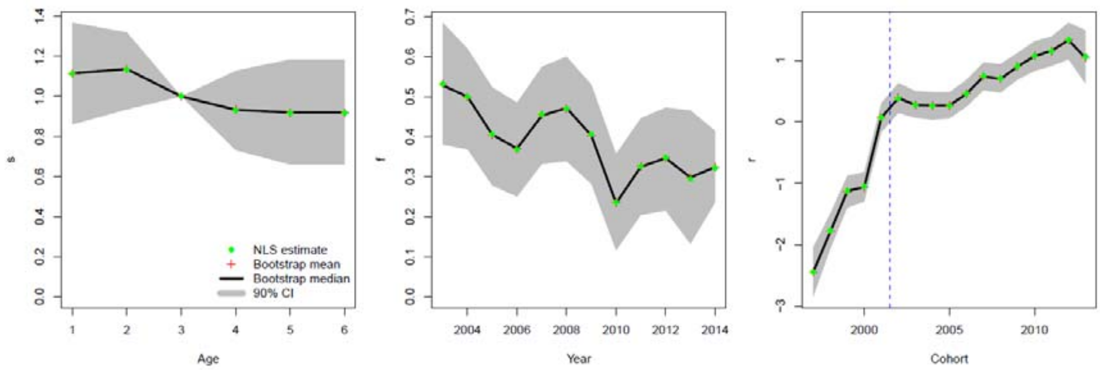


Figure 4.6.4.7. SURBAR output final model. Age, year and cohort effect.

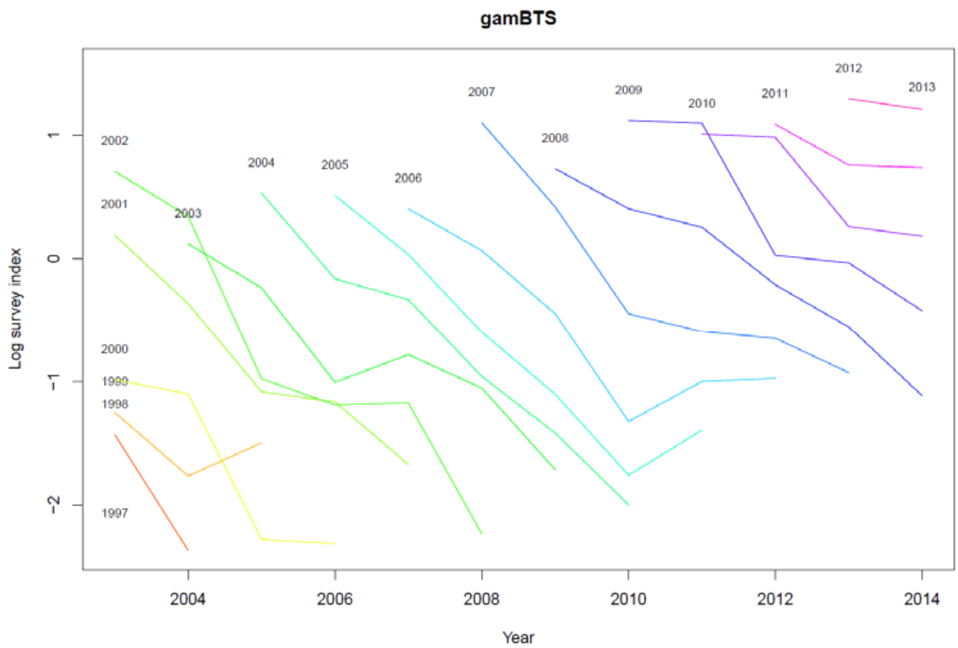


Figure 4.6.4.8. SURBAR output final model. Log abundance indices by cohort (survey "catch curves").

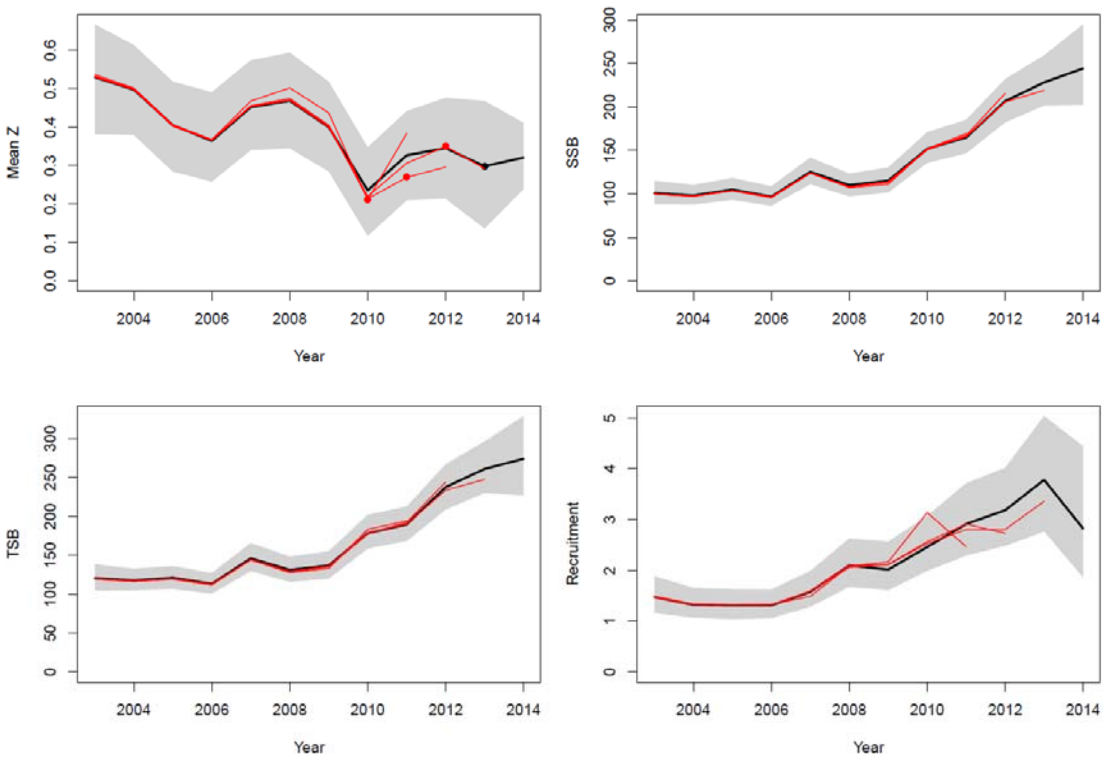


Figure 4.6.4.9. SURBAR output final model. Retrospective analysis.

Table 4.6.4.1. Settings and input data used for the final SURBA assessment run.

SETTING/DATA	VALUES/SOURCE
Survey index	Combined beam trawl survey index 2003–current assessment year (BTS-Isis, BTS-Tridens, German BTS) . Delta GAM Method by Berg *et al*., 2014.
Ages	1–6
Lambda	3
zbar	1–6
Spawning time	0.4
Maturity ogive	Fixed ogive, age 1 = 60%, age 2 = 80%, age 3 and older 100%
Weight-at-age	Data from Dutch Beam Trawl Surveys (2003–current assessment year)

4.6.4.2 Length-based mortality estimator

In order to estimate fishing mortality for dab, a modification of the original Gedamke-Hoenig mean length-based mortality estimator was used (Gedamke and Hoenig, 2006) were total mortality Z is replaced by q*effort + M following Then *et al*. (2014). Further, instead of assuming constant recruitment of cohorts, a recruitment index was taken into account as proposed by a method by Gedamke *et al*. (2008). For this purpose a time-series of effort (STECF data 2002–2012 BT2, InterCatch data 2013–2014 TBB<=119 mm) and a recruitment index (CPUE_BTS_isis_recruits, kg/h <=15 cm) was used. Equilibrium effort and recruitment (both equal to the values in the 2002) was assumed prior to the start of the time-series.

First, fishing mortality was estimated with fixed M = 0.35 (M estimated following Then *et al.*, 2014). F was estimated to have decreased from 0.33 to 0.12 from 2002 to 2014 (Figure 4.6.4.1). Next, both fishing and natural mortality were estimated (Figure 2). The magnitudes of F were very similar, decreasing from 0.32 to 0.11, with an estimated natural mortality rate (age and time-invariant) of M=0.36.

Incorporating the recruitment index accounts for the dynamics of the mean length with the observed effort time-series. The lack of trend in mean length in the time-series can be explained by the increased recruitment concurrent with the decrease in effort. Additionally, the estimate of M in the model is consistent with that obtained from the indirect method (using maximum observed age, Then *et al.*, 2014).

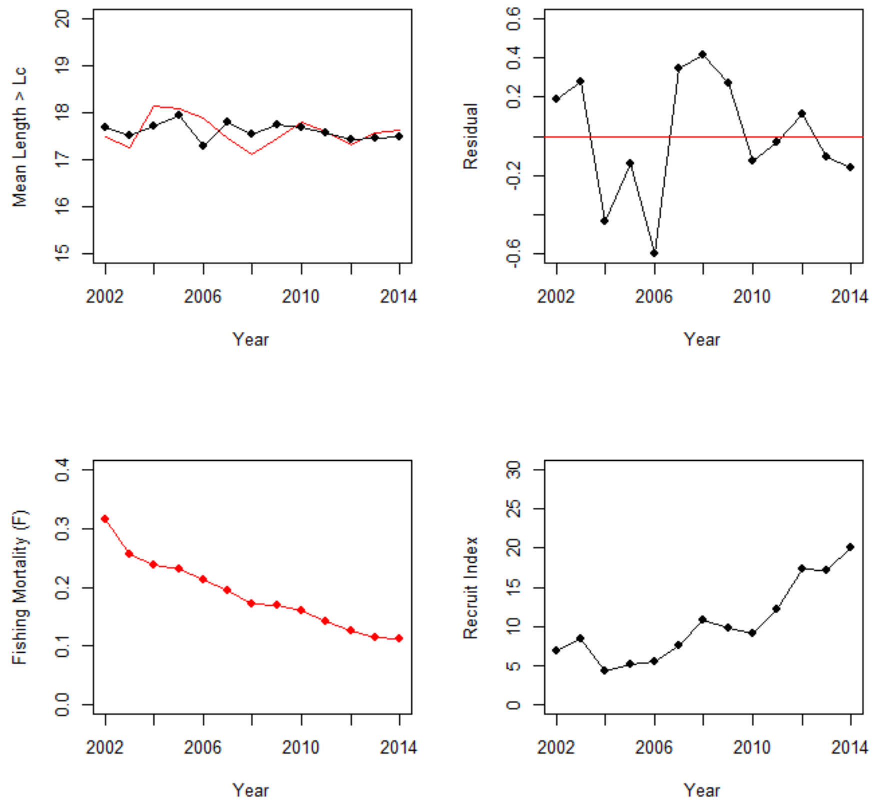


Figure 4.6.4.1. Predicted (red) vs. observed (black) mean lengths, with residuals, estimates of F when M is fixed in the model (M=0.35), and observed recruitment index.

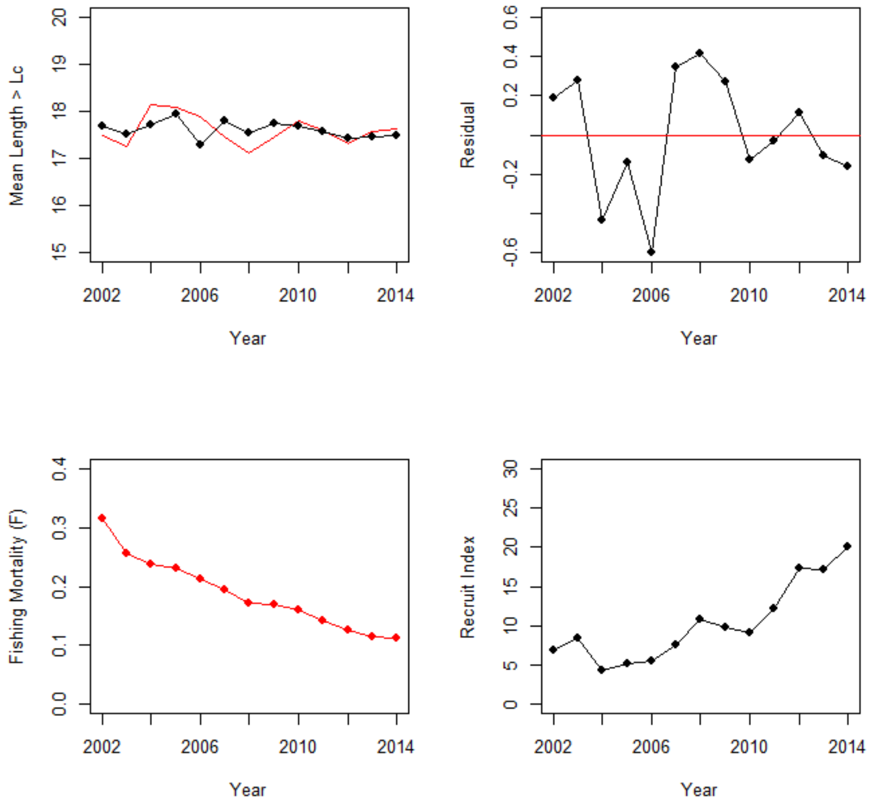


Figure 4.6.4.2. Predicted (red) vs. observed (black) mean lengths, with residuals, estimates of F when M is estimated in the model, and observed recruitment index. Natural mortality is estimated to be M = 0.36.

4.6.4.3 Exploratory assessment models

An exploratory assessment was done using the SAM model which is a state–space assessment model which takes the uncertainty of the assessment inputs and outputs into account.

As input data for this model the total catch weight, catch numbers-at-age and catch weight-at-age from commercial sampling data were used. Further, stock weight-at-age from survey data and one beam trawl survey index was used. The latter was the same combined beam trawl survey index estimated by the delta GAM method by Berg *et al*. (2014) which was used in the SURBA model. The SAM model produced similar results as the SURBA model: decreasing F, increasing stock biomass and recruitment (Figure 4.6.4.1.1). This is due to the fact that the SAM model puts most weight on the survey data which are the same data as used for the SURBA model. Given the unrealistic age distribution of the catch samples the fishing mortality pattern for age 5 is also not realistic.

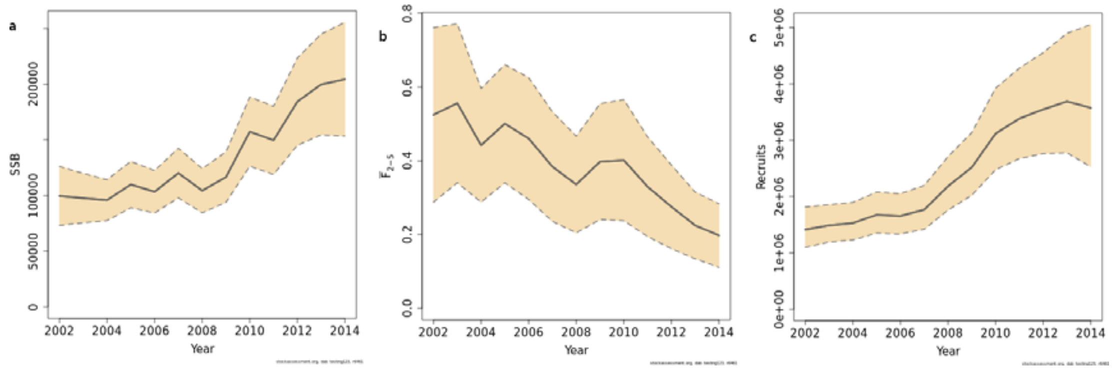


Figure 4.6.4.1.1. SAM output. Spawning–stock biomass (a), F_{bar2-5} (b), recruitment (c) and point wise 95% confidence intervals are shown by shaded area.

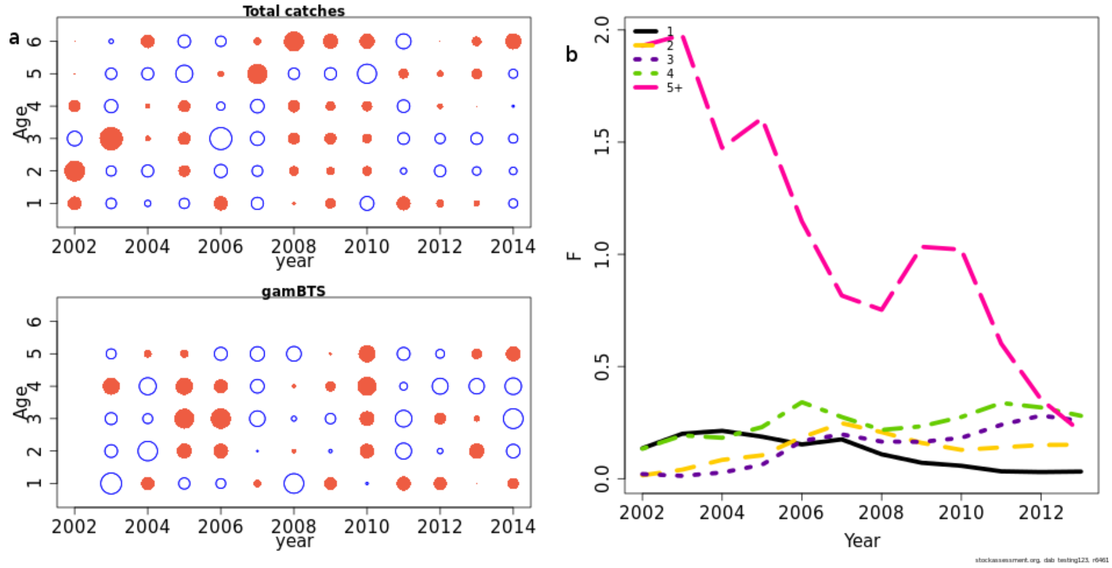


Figure 4.6.4.1.2. SAM output. (a) Normalized residuals. Blue circles indicate positive residuals (obs larger than predicted) and filled red circles indicate negative residuals. (b) F by age groups 1–5+.

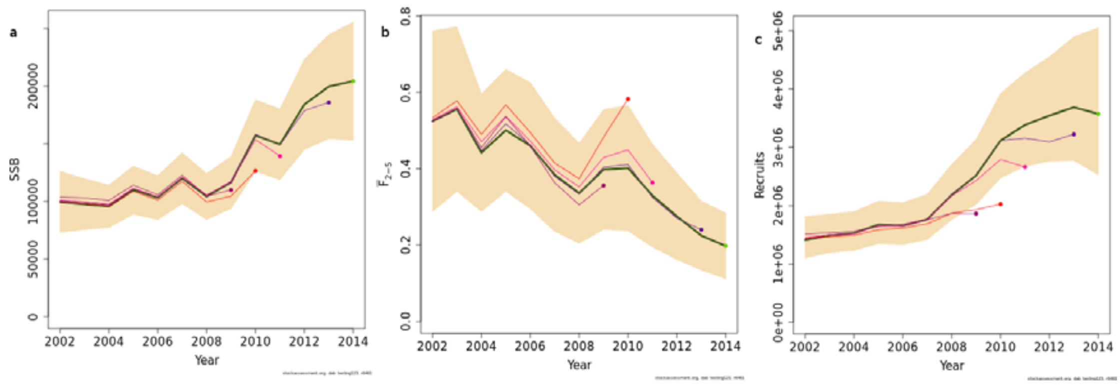


Figure 4.6.4.1.3. SAM output. Retrospective runs for SSB(a), F_{bar2-5} (b) and recruitment (c).

Table 4.6.4.1.1. The settings and data used for the exploratory SAM.

SETTING/DATA	VALUES/SOURCE
Catch-at-age	Landings and discard data 2002–current assessment year (InterCatch)
Weight-at-age (stock)	Data from Dutch Beam Trawl Surveys (2003–current assessment year)
Weight-at-age (catch)	Landings and discard data 2002–current assessment year (InterCatch)
Survey index	Combined beam trawl survey index 2003–current assessment year (BTS-Isis, BTS-Tridens, German BTS) . Delta GAM Method by Berg *et al.*, 2014.
Plus group	6
First tuning survey year	2003
Catchability independent of ages for ages >=	5
Natural mortality	0.35
Maturity ogive	Fixed ogive, age 1 = 60%, age 2 = 80%, age 3 and older 100%
Prior weighting	

4.6.4.4 Final assessment model

The SURBA model was accepted as final assessment model for dab. The relative trends of total mortality and stock biomass were corroborated by the used length-based models.

Data

- Weight-at-age was estimated by using survey data from Dutch beam trawl surveys (2003–2014). The DATRAS R package was applied to estimate weight-at-age (Kristensen and Berg, 2010).
- A combined survey index by age groups (Dutch and German beam trawl data) was used. The delta GAM method by Berg *et al*. (2014) was applied to take ship effect into account.
- Only very few maturity data are available from surveys. Based on these observations, and taking into account information from literature that dab mature early (Rijnsdorp *et al*., 1992), a fixed maturity ogive was constructed with age 1 being 60% mature, age 2 80% and age 3 and older 100% mature.

Model settings

- Ages used: 1–6
- Reference age 3
- Lambda = 3
- Spawning time = 0.4
- Number of years for retrospective analysis = 5

4.7 Short-term projections

Not applicable for the SURBAR assessment.

4.8 Appropriate reference points (MSY)

Not applicable for the SURBAR assessment.

4.9 Future Research and data requirements

In future, ICES methods for estimating reference points for data-limited stocks should be applied to this stock.

A review or research on stock structure should be conducted.

4.10 External Reviewers report

The following section of this report covers what the reviewers believed to be the most important aspects of each stock assessment along with their recommendations. This report reflects solely the views of the external experts.

4.10.1 Issues addressed at the benchmark

The key issues discussed with the dab assessment were the estimation of total catch, the assumptions of the SURBAR method, and validation of the SURBAR results using other analyses.

High catch discard rates for dab made catch estimation from landings and discard data problematic, and as a result there was reduced confidence in the catch data. A fishery-independent assessment method (SURBAR) was preferred. The SURBAR dataset used a fishery-independent biomass index, which was derived from three beam trawl surveys analysed using a GAM. This made best use of the available data, and also produced a survey index that had the best internal consistency. Other survey datasets were evaluated (such as the IBTS), but the beam trawl dataset was considered the most appropriate because of its internal consistency, and the higher catchability of flatfish in beam trawls. The results of the SURBAR analysis were found to be robust, in that they were found to be insensitive to the parameter settings. The SURBAR sensitivity analyses included changing the smoothing parameter, and using different age ranges in the analysis. The choice of ages 1–6 in the SURBAR analysis was based upon selectivity patterns. When ages 1–8 were used a strong decline in selectivity-at-age was estimated, which was difficult to explain. When ages 1–6 were used this pattern was greatly reduced. The interpretation of the magnitude of fishing mortality was based upon estimates of M which were derived from maximum age.

An extensive age frequency dataset was not available for dab, and dab were also considered a difficult species to age. As an alternative to age-based methods, a length-based method was used to estimate mortality over time, using the research trawl survey length–frequency data and commercial effort data from the largest métier. This method combined elements of the models of Gedamke *et al*. (2008) and Then (2014). This results of this analysis gave support to the results of the SURBAR analysis.

The commercial fishery cpue, and the biomass estimated from an exploratory SAM assessment, both produced similar trends to the SURBAR analysis, giving further support to the results. Although there was potential for a SAM assessment, it was not taken further during the benchmark because the input data time-series was considered too short, and it was reliant upon uncertain catch-at-age estimates. Comparison of the total mortality trend estimated for dab by SURBAR was found to be similar to mortality trends for sole and plaice, which are target and important bycatch species in the main métier catching dab.

4.10.2 Use of the final stock annex as basis for providing advice

The assessment results from SURBAR seemed to be robust to different parameter settings, and were supported by several other analyses. We agree that results generated by the assessment model can be used for providing fisheries advice under the ICES Stock Category 3 framework.

4.10.3 Recommendations for future work

- The rationale for the raising procedure to estimate discards was confusing, and possibly unnecessarily complicated. It would be useful to revise the estimation methods for discarded catches, in order to make best use of the available data, and increase accuracy and precision. This should include investigation of other ways to estimate discarded catch, for example using discards-per-unit-effort, catch ratios between dab and other associated species, or spatial models (e.g. GAM).
- No information was presented on stock structure, and a review or research should be conducted.
- A review of maximum age achieved by dab would be useful in refining estimates of M, which would allow a more confident estimation of F from the Z estimates made by SURBAR.
- Future benchmarks should continue to evaluate multiple assessment methods to confirm the veracity of the preferred model (SURBAR). This should include the continued development of the SAM approach. Approaches such as SAM allow more flexibility in assumptions, and make more complete use of the available data. Additional data, such as historical age compositions, should be added to the analysis where possible.

4.10.4 Conclusions

A Possible Summary of Dab dynamics

The SURBA model indicates, based on survey numbers-at-age that the total mortality rate Z started at around 0.53 yr^{-1} and declined somewhat over time to about 0.32 (Figure 4.6.4.5). A rough estimate of natural mortality rate M (based on a longevity of 18) is 0.35 suggesting fishing mortality is low. Reducing Z by M to obtain F gives negative values for some years (Figure 4.10.3.2). It is not clear if the SURBA estimate of Z is too low or the empirical value of M is too high. The SURBA model also indicates that the biomass (total and spawning) went up in recent years from about 100 to 240 (relative biomass). Further, it also indicates that recruitment went up steadily (monotonically except for a dip in the second to last year) by about a factor of 2.5 from about 1.5 to about 3.8; this is supported by raw data on survey age composition.

The mean lengths from the surveys are quite flat (Figure 4.6.4.1 and 4.6.4.2) and give rise to an estimated total mortality rate of around 0.6 yr^{-1}, somewhat higher than the SURBA model estimate and implying F is about equal to M. One would think that the declining mortality rate over time observed in the SURBA model would be accompanied by an increase in mean length over time under the assumption that recruitment is stable. However, if recruitment shows an increasing trend over time then this would pull down the mean length; thus, decreasing mortality should cause mean length to increase while increasing recruitment should affect the mean length in the opposite direction. This would explain the flat trend in mean length over time. The survey data do show an increasing trend in recruitment in recent years which resolves, at least qualitatively, the apparent conflict in the data (that mean length isn't going up in response to decreasing mortality).

The commercial effort has gone down over time to about a third of its initial value (i.e. from about 6.3 to 2.1). This can be compared to the decline in Z in the SURBA model from 0.53 to 0.32. The commercial cpue has gone up over time by a factor of about 4.3 (from 0.35 to 1.5). This is in contrast to the SURBA model estimate that the biomass has gone up by a factor of 3.

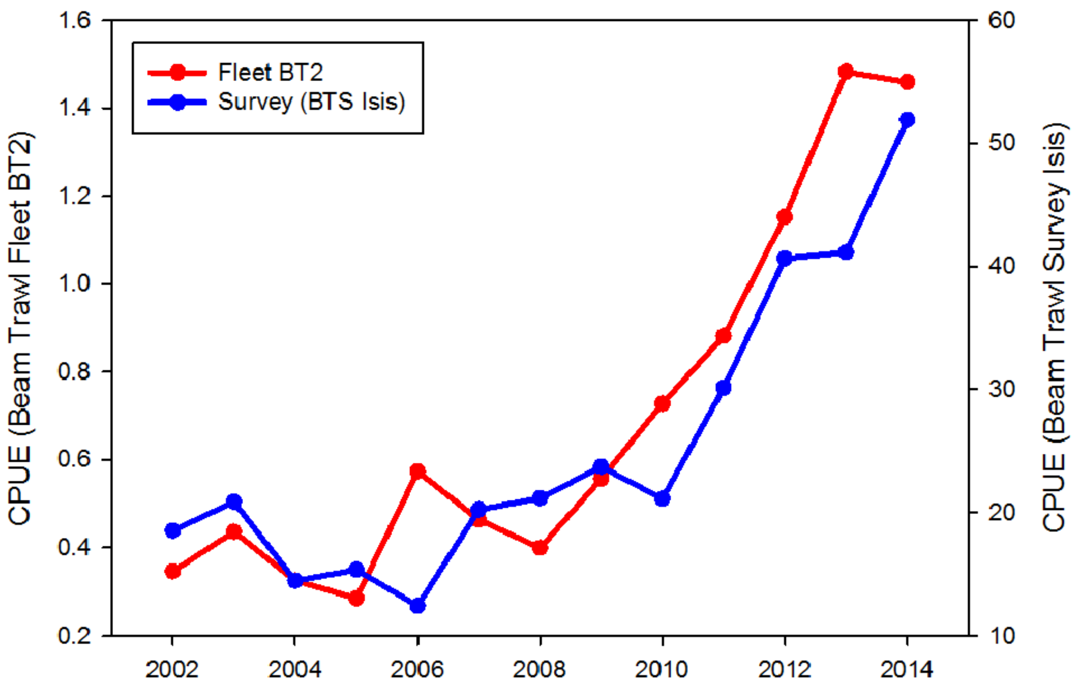
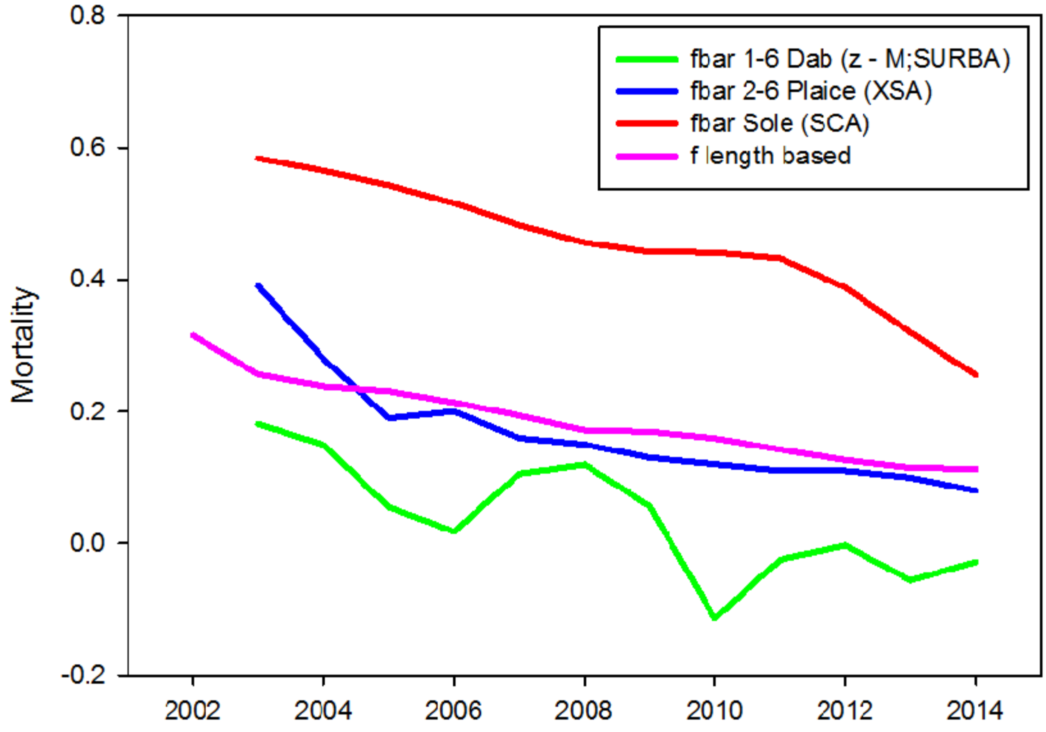


Figure 4.10.3.1. Comparison between commercial cpue (Fleet BT2) and survey cpue (BTS Isis).



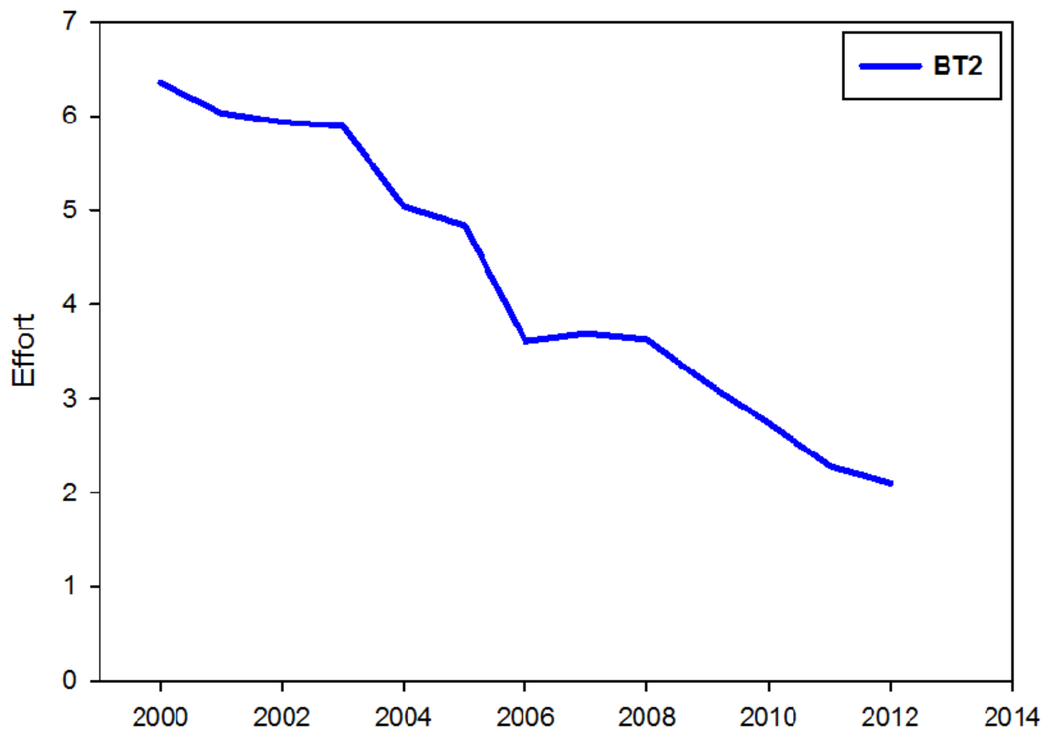


Figure 4.10.3.2. Fishing mortality estimated for dab during WKNSEA2016 and for the main target species of the beam trawl fleet (upper panel). Trend in effort of the beam trawl fleet in the North Sea (lower panel).

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Annex 1: List of participants

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Annex 2: Stock Annexes

The table below provides an overview of the stock annexes updated at WKNSEA 2016. Stock annexes for other stocks are available on the ICES website Library under the Publication Type "Stock Annexes". Use the search facility to find a particular stock annex, refining your search in the left-hand column to include the *year*, *ecoregion*, *species*, and *acronym* of the relevant ICES expert group.

Stock ID	Stock name	Last updated	Link
Dab3.a4	Dab (*Limanda limanda*) in Subarea 4 and Division 3.a (North Sea, Skagerrak and Kattegat)	March 2016	NS dab
Sai3.a46	Saithe (*Pollachius virens*) in Subareas 4–5 and Division 3.a (North Sea, Rockall and West of Scotland, Skagerrak and Kattegat)	June 2016	Sai 3.a46

Annex 3: Saithe Working Documents

The following working documents on saithe were available to WKNSEA 2016 and are presented in full in this report:

TITLE	DESCRIPTION	CONTRIBUTORS
1. Saithe Stock ID	Conduct a review of existing genetic and tagging studies	J. Devine, TJ, K. Nedreaas, JES (all IMR)
2. CPUE indices for saithe	Summary of national CPUE time-series and description of fisheries, combination of national data, age-aggregated biomass indices	K. Korsbrekke, A. Kempf, Y. Vermard, J. Devine
3. IBTS indices of saithe	Exploration of combining IBTS indices	J. Devine, C. Berg, F. Burns, +IMR, +IBTS
5. Raising of catch data in Intercatch	Effect of different raising procedures for discards and landings	J. Devine
6. National sampling/raising of saithe catches	Collation of information about national sampling/raising procedures	J. Devine, +ICES data
7. Biological data for saithe	Maturity, weights-at-age	J. Devine
8. Assessment models: SAM	Exploration of alternative assessment model (settings).	J. Devine, A. Nielsen, A. Magnusson
10. Recruitment data for saithe	Collation of available data sources (Norwegian)	J. Devine, R. Nash, K. Nedreaas

WD 1: Saithe Stock ID

Jon Egil Skjæraasen

Genetic structure of saithe

Genetic studies on saithe population structure are surprisingly scarce. In 1988, Cefas produced a technical report on the population structure of cod, haddock, whiting, and saithe (Child, 1988). This study used gel electrophoresis to study saithe population structure and included samples from numerous different locations in the North Sea, Hebrides, west coast of Ireland, and Rockall Bank. No indication of any population structure was found and it was concluded that saithe in the sampled areas belonged to one homogenous population. Erikson et al. (2015) used mitochondrial DNA to study differentiation and population structure of saithe in the North Atlantic. Again, little indication of any differentiation was found when comparing samples from Canada, Iceland, Faroe Islands, and the Norwegian Coast.

The most recent study on saithe genetics is that of (Saha *et al.*, 2015). This study used seascape genetics and the use of single nucleotide polymorphisms to investigate population structure. Sampled areas included locations within the North Sea proper, Rockall, the Faroe Island, Iceland, Canada, and various areas along the Norwegian coast. In contrast to the aforementioned studies, they identified four distinct genetic clusters: the Central Northeast Atlantic, Rockall, the Barents Sea, and Canada. No differences were found between the Faroe Island, Viking Bank, Tampen Bank, or the Hebrides and West of Scotland.

Saithe Tagging studies

Tagging studies on saithe have been conducted along the Norwegian coast from the 1950s through the 1980s. Generally, juveniles will remain in coastal waters and fjords before migrating out into deeper oceanic waters with age (Jakobsen, 1976; Heino *et al.*, 2012). Olsen (1959a; b; 1961) reported that juvenile saithe tagged along the Norwegian coast tended to move northwards along the coast, whereas saithe tagged further south moved into the North Sea. However, many of the more southern tagged fish were also recaptured around the Faroese Islands and Iceland, especially in the 1950s.

Jakobsen (1978e; d; 1981; 1985) found slightly different trends; the majority of juveniles tagged south of 65° N moved southwards into the North Sea, while fish tagged above 68° N moved primarily northwards (although some of these juveniles also ended up in the North Sea later in life). Recaptures still occurred around the Faroese Islands and Iceland, but Icelandic recaptures were rarer than as reported in Olsen's (1959a; b; 1961) studies. Jakobsen (1978d) suggested that this difference might be explained by food availability; saithe were believed to follow the herring stock into Iceland waters in the 1950s. However, Jakobsen and Olsen (1987) concluded that although recaptures had declined, no conclusive evidence existed to show the migration had been reduced. Little to no evidence existed to show that fish that had migrated into the North Sea would move north again to spawn (Jakobsen, 1981). Jakobsen (1981) suggested that fisheries on young saithe along the Norwegian coast between 62-65° N would be detrimental to the North Sea stock.

Armannsson *et al.* (2007) tagged juveniles along the Iceland coast and found seasonal inshore and offshore movements, but limited indications of emigration from Icelandic fishing grounds. Homrum *et al.* (2013) reviewed information on tagging data in the Northeast Atlantic, which were divided into three separate targets areas: continental, Faroese Islands, and Iceland. They concluded that whereas young fish would stay in the vicinity of the tagging location, adults were more likely to move, but movement differed between the areas. Fish tagged along the Norwegian coast were recaptured in both Icelandic (2.3-7 %) and Faroese (0-2.3 %) waters, but Icelandic recaptures varied with time and appeared more common in 1961-1970. This was again attributed to availability of herring in Icelandic waters. Of the fish tagged in Faroese waters, 26% were recaptured off Iceland and 11 % were recaptured off the coast of Scotland. Fish tagged in Icelandic waters were never recaptured outside of Icelandic waters.

Studies on the movement of saithe in relation to aquaculture have found that saithe show high site fidelity to fish farms (Bjordal and Skar, 1992; Uglem *et al.*, 2009). The dynamic relationship between the coastal and oceanic phases for saithe have been suggested to have been altered by fish farming (Ottera and Skilbrei, 2014). Additional details on tagging studies can be found in Jakobsen and Jakupsstovu (1977), Jakobsen (1978c; b; a; 1982), Neilson *et al.* (2006), and Armannsson and Jonsson (2012).

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Working document: Combining commercial trawl CPUE for Saithe in IIIa, IV and VI.

Knut Korsbrekke, Youen Vermard, and Alexander Kempf

Background

The current XSA assessment of saithe in IIIa, IV and VI are using three commercial CPUE series disaggregated into age groups. This represents a serious methodological challenge since this is using some information twice in the assessment (both in the catch at age matrix and tuning) and is also likely to be given far too much weight in the tuning.

DCKW met last autumn and agreed to develop a combined CPUE as a biomass index to be explored in the upcoming benchmark.

Data and methods

The following analyses are using commercial logbook information from France, Germany and Norway. The analyses have been limited to single trawl operations and position is given as center in a rectangle. This in addition to keeping time resolution to month and grouping vessels by engine power intervals should be sufficient to avoid single vessel identification. The grouping vessel power intervals were made according to:

$$EP_C = 10 \cdot \left\lfloor \frac{e^{\frac{\lfloor 4.48 \cdot Ln(EP) \rfloor}{4.48}}}{10} \right\rfloor + 10$$

with the brackets $\lfloor \ \rfloor$ being the notation for the integer part of a number[1]. Available variables for the analyses are given in the following table:

Variable	
Nation	FRA-GER-NOR
Year	2000-2015
Month	Calendar month (01-12)
Engine Power	kW groups. 340 420 520 650 810 1010 1270 1580 1980 2470 3090 3860 4820 6020 with the number being the lower end of the interval
Mesh size	Cod end mesh size in mm
Latitude	With a half degree resolution (xx.25 – xx.75) corresponding to the ICES rectangles.
Longitude	With one degree resolution (xx.5)
Effort	Number of hours towed
Landing	Catch/Landing of saithe

[1] The 4.48 in the equation is actually $Ln(1.25)^{-1} = 4.48142$

Percent	Saithe as a percentage of total catch (for this logbook entry)
Quarter	Derived from Month
Area	Derived from Latitude and Longitude: All rectangles west 5°W belongs to Area 1 All rectangles between 0° and 5°W belongs to Area 2 All rectangles north of 60°N belongs to Area 3 All rectangles between 0° and 7°E and being south of 60°N belongs to Area 2 All rectangles east of 7°E belongs to Area 7

The catch rates show a rather skewed distribution with the log transformed catch rate being close to symmetrical and residuals was assumed to be normally distributed. The analyses presented here are similar to what is often referred to as “standardized CPUE”, but without being a standardization as such. These are Generalized Linear Models and for our approach an analysis of variance with an unbalanced design.

The fitting of the model was done using a stepwise approach with the inclusion of next explanatory factor decided by Schwarz Bayesian criteria (SBC) which is rather on the conservative side. The aim of the analysis is to estimate the contribution of a year effect reflecting the variation in abundance. Other factors may be linked to saithe abundance and inclusion of such factors may explain some of the variation linked to abundance variation. Any factor with a certain trend over the time series or a part of the time series may contribute to reduce the variation in the essential Year (abundance) effect. Based on preliminary modeling it was apparent that the final model would benefit from being based on a subset of the available information. The criteria explored were the overall number of observations within a rectangle for a specific quarter, a criteria basically leaving out the vessels belonging to the lowest kW groups and a criteria for selecting only observations with catches of saithe representing more than a specific percentage.

Results

A summary of fit and estimated parameters for a final GLM model including Nation, Year, Quarter, kW group and Area is presented in

Appendix I. Initial analysis included models with a higher number of parameters and using interaction effects. Interaction effects were significant, but contributed rather modestly to overall fit. The final model “explains” like 18% of total variation, while the most complex model reached 20% (adj. R^2). The improved fit using interactions seemed partly to be derived from the model starting to “identify” observations in parts of the material. To avoid the same happening with the chosen simple model the fitting was made using a selected subset of the available data. The criteria used to select the final subset related to number of observations in a rectangle per quarter and to leaving out the lower kW groups in addition to the percentage of saithe in the catch.

One result regarding the use of an interaction term is presented in Figure 1. This is a somewhat peculiar result and the estimated parameters show that the potential increase in fishing power from increasing engine may be different between nations, but can also be caused by other mechanisms related to data quality.

The subset selection using the three criteria are presented in Figure 2. Please note that the goodness of fit was very similar for all of the models presented here due to the reduction in number of observations being compensated by removing the more noisy data. Results all show the same overall trend and with percentage of saithe having a strong influence.

Conclusion

A high percentage of saithe in the catch as criterion for selecting information for the analysis will remove catches with accidental levels of bycatch. At lower percentages catches may be a result of targeting other species and these may not be representative of saithe abundance. The impact of varying the percent criterion is considerable and my point to a change in fishing practice, but can be caused by other factors.

Including combinations of rectangle/quarters a low number of observations includes explorative tows, but again also tows not targeting saithe. Models using N>20 was “tidied” up considerably, but may lose information from periods with saithe spreading out to areas not fished as heavily.

The final model presented in this working document use observations with a percentage of saithe in the catches above 50%, all horsepower groups and with the number of observations in a rectangle/quarter combination being above 10.

Confounding: A trend in the use of engine power may end up explaining a trend in abundance over the same time period (our time series is short). Changes in mesh size preference may do the same. The mesh size factor did not contribute significantly to the models during the stepwise fitting, while the engine power was the major factor explaining variation after the Nation effect. This confounding over time being different between Nations is a matter of concern and lacking the ability to explain the estimates of the interaction (in Figure 1) led to the choice of a simpler model.

Figures

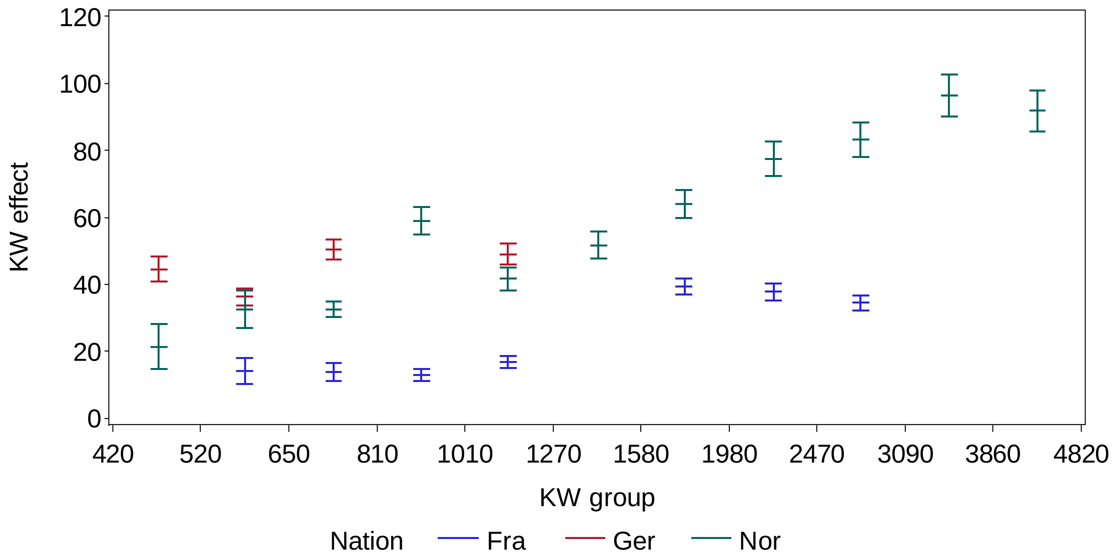
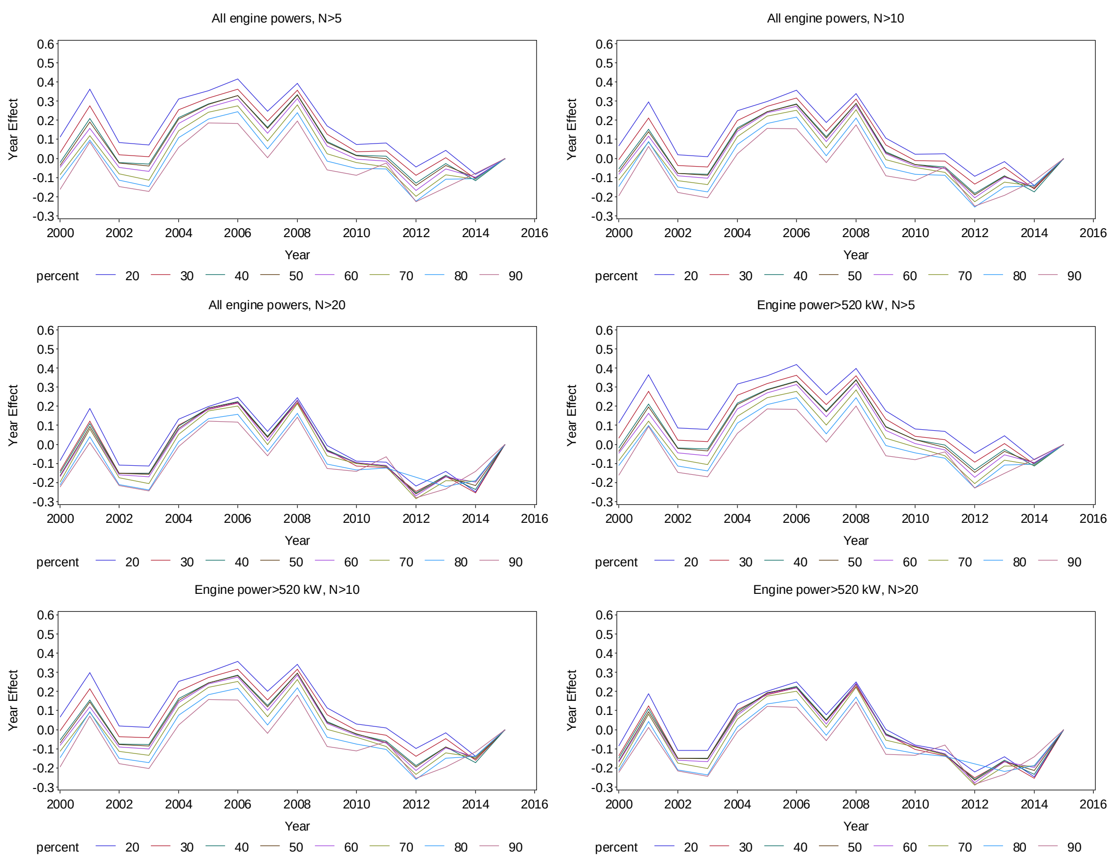


Figure 1 Estimated interaction effects (kW group*Nation). The estimates has been exponentially transformed and the last parameter (kW group above 4820, Norway) set to 0 compares to $100 \cdot e^{estimate}$



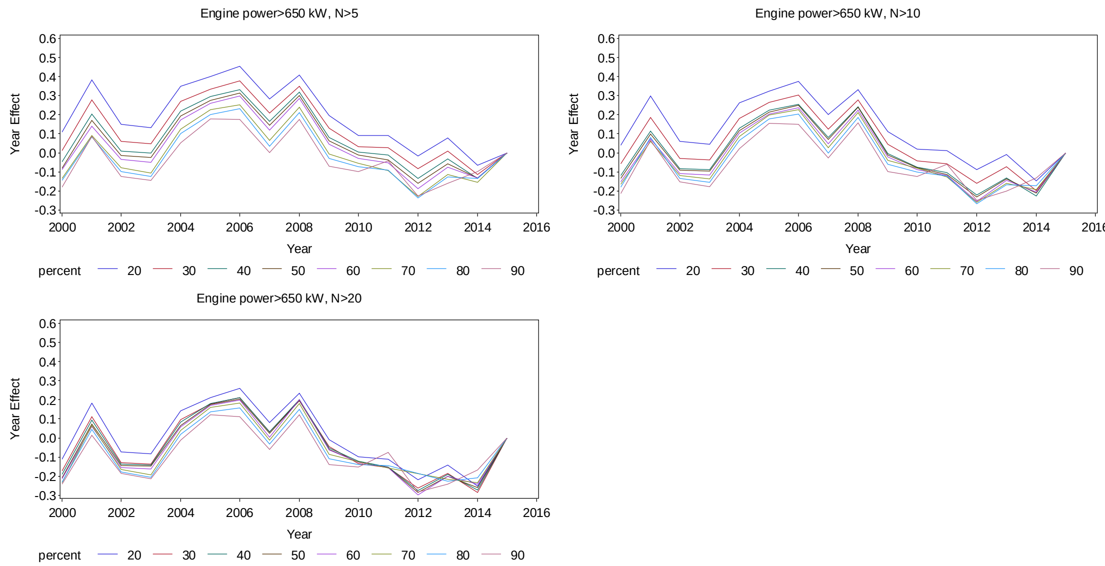


Figure 2 Exploring the effect on the estimated Year effect by choosing subsets of data. The year effect is presented with the last point being set to 0.

Appendix I

Step	Effect Entered	Effect Removed	Number Effects In	Number Parms In	SBC
0	Intercept		1	1	-13688.537
1	Nation		2	3	-20350.408
2	EPc		3	14	-23299.484
3	Year		4	29	-25532.341
4	quarter		5	32	-26415.774
5	area		6	36	-26698.441

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value
Model	35	9865.24931	281.86427	424.03
Error	66232	44026	0.66473	
Corrected Total	66267	53892		

Root MSE	0.81531
Dependent Mean	-0.40994
R-Square	0.1831
Adj R-Sq	0.1826
AIC	39244
AICC	39244
SBC	-26698

Parameter Estimates

Parameter		DF	Estimate	Standard Error
Intercept		1	0.150868	0.047955
Year	2000	1	-0.069112	0.043250
Year	2001	1	0.139148	0.039835
Year	2002	1	-0.078619	0.035418
Year	2003	1	-0.088124	0.034880
Year	2004	1	0.151324	0.035141
Year	2005	1	0.243401	0.035161
Year	2006	1	0.281975	0.034984
Year	2007	1	0.106698	0.035204
Year	2008	1	0.288473	0.035096
Year	2009	1	0.030344	0.035123
Year	2010	1	-0.032261	0.035337
Year	2011	1	-0.052076	0.035025
Year	2012	1	-0.190070	0.035318
Year	2013	1	-0.093452	0.035323
Year	2014	1	-0.155374	0.035319
Year	2015	0	0	.
Nation	Fra	1	-0.608912	0.011813
Nation	Ger	1	0.101161	0.017073
Nation	Nor	0	0	.
quarter	1	1	0.167438	0.017955
quarter	2	1	-0.015310	0.017731
quarter	3	1	-0.043652	0.017734
quarter	4	0	0	.
area	1	1	-0.088468	0.027745
area	2	1	0.053240	0.016248
area	3	1	0.031600	0.015120
area	4	1	-0.106814	0.013077
area	5	0	0	.
EPc	420	1	-0.929338	0.042407
EPc	520	1	-1.121196	0.035363
EPc	650	1	-0.818090	0.033104
EPc	810	1	-0.530473	0.034820
EPc	1010	1	-0.849555	0.033569
EPc	1270	1	-0.648625	0.037260
EPc	1580	1	-0.335882	0.030893
EPc	1980	1	-0.264577	0.031255
EPc	2470	1	-0.257324	0.030354
EPc	3090	1	-0.049636	0.031770
EPc	3860	1	-0.105914	0.032836
EPc	4820	0	0	.

WD 3: IBTS Indices

Jennifer Devine, Michael Pennington, Casper Berg

The current assessment of saithe includes the IBTS Q3, ages 3-5, 1992-2015, as a survey turning index. Two other acoustic survey indices, NORASS and NORACU, were included in the assessment, but were removed in 2013 and 2015. Those surveys are briefly mentioned below.

NORASS (2006-2012) was an acoustic survey covering a small part of the "seiskalle" or small seamounts (term used loosely) at the coast of Norway, south of 62°N (Figure 1). This is where young saithe congregate to feed for several months after leaving the nursery area, but before migrating into the North Sea. This survey was never meant to be used in the assessment because it was an exploratory survey and, as such, was poorly designed. This survey was discontinued after 2012 and removed from the assessment in 2014.

NORACU, run concurrently with the IBTS Q3 survey, was begun in 1995. The survey had been a systematic coverage of the ICES statistical rectangles from south to north (1 transect through each row of rectangles; Figure 2), but had never included target identification tows or towing for biological samples other than those taken in the IBTS stations, which were one per statistical rectangle. The survey was merged with the North Sea acoustic herring survey (HERAS) in 2008; this merge resulted in a reduction in the amounted of area surveyed and a modification to the design (e.g., transects, 2 per statistical rectangle, were used east of 2° E; Figure 2). The survey did not take place in 2009 and, when re-established, it was carried out differently than previously due to a change in personnel. The survey was modified again in 2014 (Figure 3) with the addition of more transects, target identification tows, and towing for biological sampling. The NORACU survey was removed from the assessment in 2015 due to its lack of a design, target identification tows, and biological samples. The new series (begun in 2014) will be assessed for inclusion in 5 years.

The indices currently estimated by ICES from the IBTS survey data include only the quarter 3 data from area 4 (North Sea excluding the Skagerrak; Figure 4). This standard approach is to estimate ALKs that are consistent with roundfish areas and, if samples are lacking, involves ad-hoc borrowing of samples from neighboring roundfish areas (see http://www.ices.dk/marine-data/Documents/DATRAS/Indices_Calculation_Steps_IBTS.pdf for details). This method is referred to as the DATRAS index from this point forward.

The IBTS Q1 and Q3 surveys, as well as the Scottish West Coast Q1 and Q4 survey, were investigated to determine if an improved index (or indices) could be created. Work in WD 7 (biological data for saithe) showed that the amount of data in the Scottish West Coast surveys were relatively poor for saithe. Alternate indices of abundance were therefore estimated for only the North Sea IBTS Q1 and Q3 surveys, using the method of Berg et al. (2014). The Q1 survey index was explored to determine if an index could be created for older fish because previously, older fish were represented in only the catch data. The Q1 survey takes place at the start of the spawning period and covers a large portion of the potential spawning area, therefore, large/old fish should be present in the survey area at the survey time.

Methods

IBTS data

Tows marked valid and of duration 15-34 minutes were included in the data. IBTS protocol clearly states that tows of 15 minutes duration are considered valid and that nations may reduce the duration when necessary (ICES-IBTSWG 2015); reduced tow times should not be interpreted as an indication of reduced tow quality. Tow duration experiments were conducted in 2015 by all nations in the Q3 survey and by Norway-only in the Q1 (see Appendix A). Preliminary analyses of the tow duration experiments showed that there was no difference in catch weights, numbers, or length (select number of species) when reducing haul duration from 30 to 15 minutes in the IBTS surveys (Appendix A), a result that is also stated in many publications elsewhere (e.g., Godø et al. 1990, Walsh 1991, Pennington & Vølstad 1991, Ehrich & Stransky 2001, Pennington et al. 2002, Wieland & Storr-Paulsen 2006). No difference was observed in the length frequency for saithe in the Q3 survey (Appendix A).

Data for the IBTS Q1 survey were from 1992-2015. Scotland used 60-minute tows on the IBTS Q1 survey between 1992 and 1998. A large part of the Scottish survey area includes where saithe are found and omitting this data could further limit a data poor survey. Models including and excluding these data were trialed to find the best model (in terms of AIC and internal consistencies). Age data were available for ages 1-10+; after age 10, data became scarce (Appendix B, Tables 1B, 2B). Because of the timing (fish are moving to/from the spawning grounds), any change in when the survey takes place for the different nations could potentially have an effect on the index; therefore month was included as a variable in the model.

Data from the IBTS Q3 survey were for years 1992-2015; no age data existed in the DATRAS database in 1991. Two different gears were used, the GOV and the Aberdeen 18 ft trawl (ABD). The ABD gear was used in 1992 for only a few stations. The Aberdeen trawl data was removed because more than 1 year of data was needed to fit a gear effect. Data were for ages 0-10+; after age 10, data became scarce (Appendix B, Table 3B).

Models

The method of Berg et al. (2014) was carried out using the *DATRAS* (Kristensen & Berg 2010) and *surveyIndex* (Berg 2016) packages in R. Data were from the North Sea IBTS Q1 (1992-2015) and Q3 (1992-2015) surveys. Models were fit using delta-Gamma and delta-logNormal GAMs.

The model used for Q1, for both the presence-absence and positive parts of the model, was:

$$g(\mu_i)=\mathrm{Year}_i + \mathrm{Month}_i + s(\mathrm{lon}_i,\mathrm{lat}_i) + s(\mathrm{depth}_i) + \log(\mathrm{haul\ duration}_i),$$

while that for Q3 was without month:

$$g(\mu_i)=\mathrm{Year}_i + s(\mathrm{lon}_i,\mathrm{lat}_i) + s(\mathrm{depth}_i) + \log(\mathrm{haul\ duration}_i).$$

A 2-dimensional thin-plate spline was used for space and a 1-dimensional thin plate spline fit the effect of bottom depth.

Results

The delta-logNormal models (in terms of AIC) fit the Q1 and Q3 data better than the delta-Gamma models (Table 1). Excluding the Scottish 60-min tows in Q1 improved the fit of the model and the internal consitencies, both the average as well as between subsequent age classes, but mainly for the older age classes (Tables 1, 2, Figures 5, 6). Internal consistencies for the younger ages (up to age 5) are better for the indices including the Scottish 60-min tows. The model that included the 60-min tows data was deemed not appropriate and is not discussed further. The delta-logNormal estimates were fairly similar to the DATRAS index estimates for most years and ages, but appear to be less influenced by extreme values than the DATRAS indices (Figure 7). Maps of the distribution by age (all years combined) showed fish where they were expected to be captured; younger fish (under age 3) were found close to shore around Shetland and deep in the Skagerrak and Kattegat, while older fish were distributed along the shelf boundary (Figure 8).

For the IBTS Q3 indices, the internal consistencies were marginally better with the delta-Gamma model (Tables 1, 2, Figure 9). The internal consistencies between ages 3-4 and ages 4-5 are better for the delta-logNormal IBTS Q3 index when compared with DATRAS version (Figure 10). As with the Q1 data, delta-logNormal estimates were fairly similar to the DATRAS index estimates for most years and ages and appeared to be less influenced by extreme values than the DATRAS indices; however, delta-logNormal estimates were higher than DATRAS estimates in 2014 and 2015 for most ages. (Figure 11). Maps of predicted distribution by age showed fish where they were expected to be found except for age 0 fish (Figure 12). Full model summary included in Appendix C.

The external consistencies between Q1 and Q3 were tested; fish that appear in the Q1 survey should also appear in the Q3 survey (Table 3). Consistencies between ages ranged from 0.22 to 0.45 for ages 1 to 4. After age 4, external consistencies were higher (0.55-0.81) until age 9. External consistencies between Q3 and Q1 (age+1) were also tested, to see if cohorts could be tracked from the Q3 survey into the following year. Consistencies were poor (<0.1).

Conclusion

All three data set will be trialed in the assessment model to determine which is best.

Post-benchmark:

The assessment working group did not agree with the benchmark model. Because of this, a second review was made following WGNSSK. The survey indices were thought to be overly positive in the last two years. This prompted a more thorough exploration of the survey data to:

- Determine if spatial changes had occurred that could be the result of fish moving in and out of the survey area (unrelated to stock size).
- Investigate the Q3 index models to:
  - o Include a ship effect to determine whether a newly added ship at the end of the time series might be causing the problem (e.g., Dana in Skagerrak).
  - o Modify the spatial grid over which the indices are estimated so that it is roughly representative of the population (do not include large areas where there are almost no saithe). Two potential indices were explored: one that removed the Skagerrak/Kattegat and southern North Sea (south of 57° N); one that kept the Skagerrak but removed the Kattegat and southern North Sea.
- Investigate consistencies for each model option.

Results

Spatial changes in the surveys

Spatial plots of the catches (all ages combined) showed that, for the Q1 survey, saithe were mainly on the shelf edges and the survey was unlikely to be sampling much of the population (see Appendix D: Q1 plots are catch weight per station per year, not age specific). At the time of the benchmark, this was discussed, but it was thought that, for the older ages, the amount of the population surveyed should be fairly consistent over time. A month parameter had been added to the delta-GAM model to account for changes in survey timing and any effect of fish movement in and out of the survey area. However, in some years, fish are found further up on the shelf, while in other years, they are only along the shelf boundary, and this does not appear to be related to stock abundance (200 m contour; Appendix D). This does call into question using the Q1 index in the assessment. Because of this, it was agreed to omit the Q1 index from the assessment.

For the Q3 surveys, saithe were found on the northern part of the shelf, along the shelf boundary, and in the Skagerrak (see Appendix E: Q3 plots are catch weight per station per year, not age specific). The amount of saithe found within the area differed, but the distribution appeared fairly consistent. Stronger year classes were, for the most part, appearing in the survey when expected and persisting for at least 1 year (e.g., 1995, 2001, 2005).

Q3 index models

A ship effect was included in the index estimation. Sweden had begun using a new vessel in 2011 in the Skagerrak. Including ship in the model resulted in a higher AIC and BIC, and slightly worse internal consistencies (Tables 4, 5). The effect seen at the start of the time series cannot be due to ship; it would have been captured within the model or also seen from 2001, when Sweden changed its research vessel.

The spatial grid was truncated to a) exclude the area east of 8° E and south of 57° N, i.e., Skagerrak/Kattegat and southern North Sea information were removed, and b) exclude south of 57° N and the Kattegat (but include the Skagerrak). Saithe are not found in the southern North Sea; excluding this area mainly truncates the zeros and keeps the spatial spline of the GAM model from attempting to put fish where they are typically not found. Mainly young fish (the ages not included in the assessment model) are found in the Skagerrak, but the German fleet fishes in this area; therefore, datasets including and excluding this region were trialed. Ship was included in the final model.

Truncating the spatial area improved the model fit (Table 4, model summaries in Appendices F and G). Removing the Skagerrak improved the fit of the model the most, but the indices were larger for a given age class and more variable for many of the age classes, especially at the beginning of the time series (Figure 13). The indices (all ages) with and without the Skagerrak show similar trends, but the indices excluding ship and using all available data is generally lower. Average internal consistencies were higher for the model including the Skagerrak, but the fit was not as good as the model excluding the Skagerrak (Tables 4, 5). Figure 14 shows the internal consistency plot for both models, as given by FLR (note: correlations are reported differently using FLR); there is no evidence in the internal consistencies that something has gone wrong in the survey. The time series of indices by age (including confidence intervals and comparison to the DATRAS indices) for the full survey area, excluding the southern North Sea and Skagerrak/Kattegat, and excluding the southern North Sea and Kattegat are in Figures 11, 15-16.

Survey properties

Internal consistencies

Internal consistencies for the Q3 survey are decent, although slightly poorer for age 3 vs. age 4 (Tables 2 and 5, Figures 9, 10, and 14). There is no evidence in the internal consistencies that something has gone wrong in the survey.

Cross consistency with other data sources

Despite the Q1 survey having limited coverage of the stock, the external consistencies between the Q3 and Q1 (in the following year and age), as well as catch numbers at age, were used to see if tracking of cohorts was possible (Tables 3, 6, and 7). Cohorts can be tracked between surveys (and ages). The external consistencies are not as strong when comparing the catch numbers at age with the Q3 index, however, they still track cohorts reasonably well (Table 8). The external consistency for age 4, the age when fish are expected to be fully recruited to the fishery, is the lowest of all the age class comparisons.

Coverage

The amount of saithe found within the survey area differs between years, but the distribution has not changed over the time period (Appendix E). Stronger year classes are, for the most part, appearing in the survey when expected and persisting for at least 1 year. The increase in the last 2 years appears to be related to stronger recruitment.

Conclusions

The Q1 indices were removed from the assessment model because fish were thought to be moving in and out of the survey area unrelated to abundance. The amount of saithe found within the survey area during the Q3 survey was thought to be representative; strong cohorts were appearing when expected and persisting for a number of years.

The Skagerrak was never included in the old index estimation (in DATRAS). There is no documentation of why the Skagerrak was included and the IBTSWG was unable to answer this question. The Skagerrak-Kattegat may have been excluded because until 2003, Sweden did not take age samples, only lengths, which resulted in the age-length key for the North Sea (subarea 4) being applied to the Skagerrak. Whether fish in the Skagerrak were different from the North Sea was not thoroughly investigated, so it is questionable whether the age-length key from the North Sea should be applied to the Skagerrak. In addition, Sweden did not survey in 2000; this year had incomplete coverage of the entire survey area.

There is no evidence in the internal consistencies that the Q3 survey should be removed from the assessment.

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Table 1. Summary of Q1 and Q3 GAM models used to generate an index of abundance and average internal consistencies

Model		Data	Age range	AIC	BIC	Average internal consistencies	
						All ages	Ages 3-8
Q1	Gamma	incl. 60 min tows	1-10	28792.94	37655.34	0.441656	
Q1	Gamma	excl. 60 min tows	1-10	28176.35	35956.72	0.4332855	0.5602738
Q1	LogNormal	incl. 60 min tows	1-10	25004.02	33367.87	0.5183216	
Q1	LogNormal	excl. 60 min tows	1-10	**24102.52**	**31498.93**	**0.5182055**	**0.6283097**
Q3	Gamma		1-8	42826.23	51562.1	0.4067515	0.7079169
Q3	LogNormal		1-8	**34460.04**	**42834.36**	0.3947685	0.6851118
Q1	LogN incl time		5-8	24253.09	32142.82		
Q1	LogN -hauldur		5-8	24589.55	32869.15		
Q3	LogN incl time		3-8	34357.61	43147.13		
Q3	LogN -hauldur		3-8	34206.66	42571.58		

Table 2. Internal consistencies between ages for the Q1 and Q3 GAM indices. Numbers in bold refer to the ages included in the tuning indices in the final assessment model.

Model	Internal consistencies	
	Gamma	LogNormal
Q1	Age 1 vs 2 : 0.3301977	Age 1 vs 2 : 0.4021616
Incl. SCO 60-min tows	Age 2 vs 3 : 0.1909130	Age 2 vs 3 : 0.2431400
Ages 1-10	Age 3 vs 4 : 0.2691643	Age 3 vs 4 : 0.3197848
	Age 4 vs 5 : 0.4881792	Age 4 vs 5 : 0.541898 0
	Age 5 vs 6 : 0.6595562	Age 5 vs 6 : 0.7743256
	Age 6 vs 7 : 0.6321451	Age 6 vs 7 : 0.7191462
	Age 7 vs 8 : 0.6188431	Age 7 vs 8 : 0.6641455
	Age 8 vs 9 : 0.5056346	Age 8 vs 9 : 0.5748680
	Age 9 vs 10 : 0.309012	Age 9 vs 10 : 0.425425
Q1	Age 1 vs 2 : 0.2338507	Age 1 vs 2 : 0.3624028
Excl. SCO 60-min tows	Age 2 vs 3 : 0.08524412	Age 2 vs 3 : 0.1142664
Ages 1-10	Age 3 vs 4 : 0.2380629	Age 3 vs 4 : 0.2792068
	Age 4 vs 5 : 0.499084	Age 4 vs 5 : 0.5312613
	Age 5 vs 6 : 0.6768538	**Age 5 vs 6 : 0.7979588**
	Age 6 vs 7 : 0.7033534	**Age 6 vs 7 : 0.7900055**
	Age 7 vs 8 : 0.6840147	**Age 7 vs 8 : 0.7431158**
	Age 8 vs 9 : 0.5390269	Age 8 vs 9 : 0.6239088
	Age 9 vs 10 : 0.2400787	Age 9 vs 10 : 0.4217236
Q3	Age 1 vs 2 : 0.2312732	Age 1 vs 2 : 0.3231104
Ages 0-10	Age 2 vs 3 : -0.2520704	Age 2 vs 3 : -0.1937066
	Age 3 vs 4 : 0.01605231	Age 3 vs 4 : 0.03960032
	Age 4 vs 5 : 0.5737321	**Age 4 vs 5 : 0.4954253**
	Age 5 vs 6 : 0.7874409	**Age 5 vs 6 : 0.7447504**
	Age 6 vs 7 : 0.7468328	**Age 6 vs 7 : 0.7943942**
	Age 7 vs 8 : 0.7585442	**Age 7 vs 8 : 0.750217**
	Age 8 vs 9 : 0.6730346	**Age 8 vs 9 : 0.6407721**
	Age 9 vs 10 : 0.439469	**Age 9 vs 10 : 0.4044236**
	Age 10 vs 11 : 0.09320628	Age 10 vs 11 : -0.05130193

Table 3. External consistencies of the delta-lognormal GAM models between the Q1 and Q3, ages 1-10, 1992-2015; both indices are generated using the GAM approach. Numbers in bold refer to the ages included in the IBTS Q1 tuning index in the final assessment model.

Q1 vs Q3
Survey 1 Age 1 vs Survey 2 1 : 0.215
Survey 1 Age 2 vs Survey 2 2 : 0.153
Survey 1 Age 3 vs Survey 2 3 : 0.252
Survey 1 Age 4 vs Survey 2 4 : 0.454
Survey 1 Age 5 vs Survey 2 5 : 0.786
Survey 1 Age 6 vs Survey 2 6 : 0.806
Survey 1 Age 7 vs Survey 2 7 : 0.547
Survey 1 Age 8 vs Survey 2 8 : 0.695
Survey 1 Age 9 vs Survey 2 9 : 0.145
Survey 1 Age 10 vs Survey 2 10 : 0.486
Mean: 0.454

Table 4. Model diagnostics for the Q3 indices. The models are the benchmark model (no truncation of spatial grid); benchmark model including Ship (no truncation of spatial grid); removing the Skagerrak/Kattegat and southern North Sea and including Ship; removing the Kattegat and southern North Sea and including Ship.

Model	AIC	BIC	IC (all ages)
Year+s(lon,lat)+s(Depth)+ HaulDur	34460	42834	0.3948
Year+Ship+s(lon,lat)+s(Depth)+HaulDur	34274	43476	0.4358
Truncated spatial range (57°N, 8°E): Year+Ship+s(lon,lat)+s(Depth)+HaulDur, ages 1-10	28122	36032	0.40527
Truncated spatial range (57°N, no Kattegat): Year+Ship+s(lon,lat)+s(Depth)+HaulDur, ages 1-10	32565	40590	0.4264

Table 5. Internal consistencies between ages classes for the four different Q3 indices.

Model/Data	IC	Average IC (all ages)	Average IC (ages 3-8)
Benchmark model: Year+s(lon,lat)+s(Depth)+ HaulDur, ages 0-10	Age 0 vs. 1 : 0.3231104 Age 1 vs. 2 : -0.1937066 Age 2 vs. 3 : 0.03960032 Age 3 vs. 4 : 0.4954253 Age 4 vs. 5 : 0.7447504 Age 5 vs. 6 : 0.7943942 Age 6 vs. 7 : 0.750217 Age 7 vs. 8 : 0.6407721 Age 8 vs. 9 : 0.4044236 Age 9 vs. 10 : -0.05130193	0.3948	0.6851
Benchmark model + Ship: Year+Ship+s(lon,lat)+s(Depth)+HaulDur, ages 0-10	Age 0 vs. 1 : 0.4646722 Age 1 vs. 2 : -0.1081123 Age 2 vs. 3 : 0.05023302 Age 3 vs. 4 : 0.4406976 Age 4 vs. 5 : 0.7406408 Age 5 vs. 6 : 0.8363853 Age 6 vs. 7 : 0.7676941 Age 7 vs. 8 : 0.5378916 Age 8 vs. 9 : 0.3850141 Age 9 vs. 10 : 0.2426996	0.4358	0.6647
Truncated spatial range (no Skagerrak/Kattegat or southern North Sea): Year+Ship+s(lon,lat)+s(Depth)+HaulDur, ages 1-10	Age 1 vs. 2 : 0.4287579 Age 2 vs. 3 : 0.1669562 Age 3 vs. 4 : 0.3777139 Age 4 vs. 5 : 0.759958 Age 5 vs. 6 : 0.7629555 Age 6 vs. 7 : 0.7211942 Age 7 vs. 8 : 0.6095779 Age 8 vs. 9 : 0.08241081 Age 9 vs. 10 : -0.262115	0.4053	0.6463
Truncated spatial range (no Kattegat or southern North Sea): Year+Ship+s(lon,lat)+s(Depth)+HaulDur, ages 1-10	Age 1 vs. 2 : -0.3264555 Age 2 vs. 3 : -0.02738525 Age 3 vs. 4 : 0.4273828 Age 4 vs. 5 : 0.7532319 Age 5 vs. 6 : 0.8270072 Age 6 vs. 7 : 0.7994671 Age 7 vs. 8 : 0.6195003 Age 8 vs. 9 : 0.3514482 Age 9 vs. 10 : 0.4138057	0.4264	0.6853

Table 6. External consistencies of the delta-lognormal GAM Q1 and Q3 indices, ages 1-10, 1992-2015. (Left) External consistencies between Q1 and Q3, and (right) between Q3 and Q1 in the next year (fish are age+1). Numbers in bold refer to the ages included in the tuning index in the assessment model. Q3 indices are from the model that includes ship and excludes the southern North Sea and Kattegat.

Q1 (excl. 60 min. tows) vs Q3	Q3 vs Q1 (excl. 60 min. tows)
Survey 1 Age 1 vs Survey 2 1 : 0.2224358	Survey 1 Age 1 vs Survey 2 2 : 0.3334015
Survey 1 Age 2 vs Survey 2 2 : -0.1013232	Survey 1 Age 2 vs Survey 2 3 : 0.4619701
Survey 1 Age 3 vs Survey 2 3 : 0.2002926	**Survey 1 Age 3 vs Survey 2 4 : 0.8187865**
Survey 1 Age 4 vs Survey 2 4 : 0.353633	**Survey 1 Age 4 vs Survey 2 5 : 0.8626418**
Survey 1 Age 5 vs Survey 2 5 : 0.7869737	**Survey 1 Age 5 vs Survey 2 6 : 0.918004**
Survey 1 Age 6 vs Survey 2 6 : 0.8579079	**Survey 1 Age 6 vs Survey 2 7 : 0.8188451**
Survey 1 Age 7 vs Survey 2 7 : 0.7411159	**Survey 1 Age 7 vs Survey 2 8 : 0.6805626**
Survey 1 Age 8 vs Survey 2 8 : 0.6897497	**Survey 1 Age 8 vs Survey 2 9 : 0.6008325**
Survey 1 Age 9 vs Survey 2 9 : 0.1185041	Survey 1 Age 9 vs Survey 2 10 : 0.3736171
Survey 1 Age 10 vs Survey 2 10 : 0.5690648	[1] 0.6520735
[1] 0.4438354	

Table 7. External consistencies of the delta-lognormal GAM Q1 and Q3 indices, ages 1-10, 1992-2015. (Left) External consistencies between Q1 and Q3, and (right) between Q3 and Q1 in the next year (fish are age+1). Numbers in bold refer to the ages included in the tuning index in the assessment model. Q3 indices are from the model that includes ship and excludes the southern North Sea and Skagerrak/Kattegat.

Q1 (excl. 60 min. tows) vs Q3	Q3 vs Q1 (excl. 60 min. tows)
Survey 1 Age 1 vs Survey 2 1 : -0.08152475	Survey 1 Age 1 vs Survey 2 1 : 0.1939847
Survey 1 Age 2 vs Survey 2 2 : 0.05694812	Survey 1 Age 2 vs Survey 2 2 : 0.4723581
Survey 1 Age 3 vs Survey 2 3 : 0.1020217	**Survey 1 Age 3 vs Survey 2 3 : 0.8362897**
Survey 1 Age 4 vs Survey 2 4 : 0.3706748	**Survey 1 Age 4 vs Survey 2 4 : 0.902246**
Survey 1 Age 5 vs Survey 2 5 : 0.7711997	**Survey 1 Age 5 vs Survey 2 5 : 0.8618752**
Survey 1 Age 6 vs Survey 2 6 : 0.740938	**Survey 1 Age 6 vs Survey 2 6 : 0.63448**
Survey 1 Age 7 vs Survey 2 7 : 0.5653235	**Survey 1 Age 7 vs Survey 2 7 : 0.5339529**
Survey 1 Age 8 vs Survey 2 8 : 0.5377298	**Survey 1 Age 8 vs Survey 2 8 : 0.5500205**
Survey 1 Age 9 vs Survey 2 9 : -0.06474444	Survey 1 Age 9 vs Survey 2 9 : 0.2335378
Survey 1 Age 10 vs Survey 2 10 : 0.3390903	[1] 0.5798606
[1] 0.3337657	

Table 8. External consistencies between catch numbers at age and Q3 (in the same year, model excluding ship and using all available data). This is identifying if cohorts can be tracked from Q3 to the next survey in Q1. Numbers in bold refer to the ages included in the IBTS Q3 tuning index in the assessment model.

External consistencies: catch vs. Q3
Catch Age 1 vs. Q3 1 : -0.0165032
Catch Age 2 vs. Q3 2 : -0.1492027
Catch Age 3 vs. Q3 3 : 0.5044318
Catch Age 4 vs. Q3 4 : 0.3768049
Catch Age 5 vs. Q3 5 : 0.5894862
Catch Age 6 vs. Q3 6 : 0.5557922
Catch Age 7 vs. Q3 7 : 0.5059279
Catch Age 8 vs. Q3 8 : 0.4097457
Catch Age 9 vs. Q3 9 : 0.05872988
Catch Age 10 vs. Q3 10 : 0.4557988

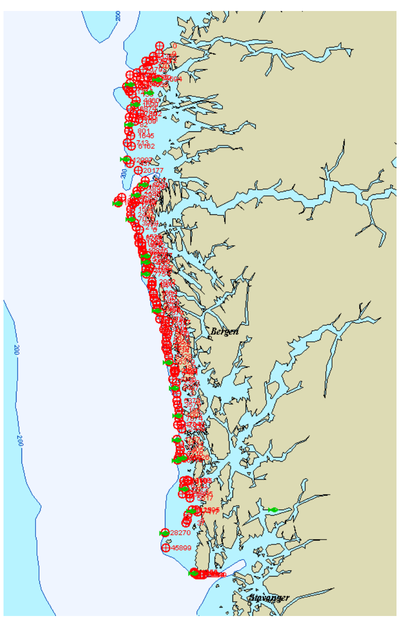


Figure 1. Location of small underwater peaks along the Norwegian coast upon which juvenile saithe congregate before recruiting to the North Sea (source: IMR).

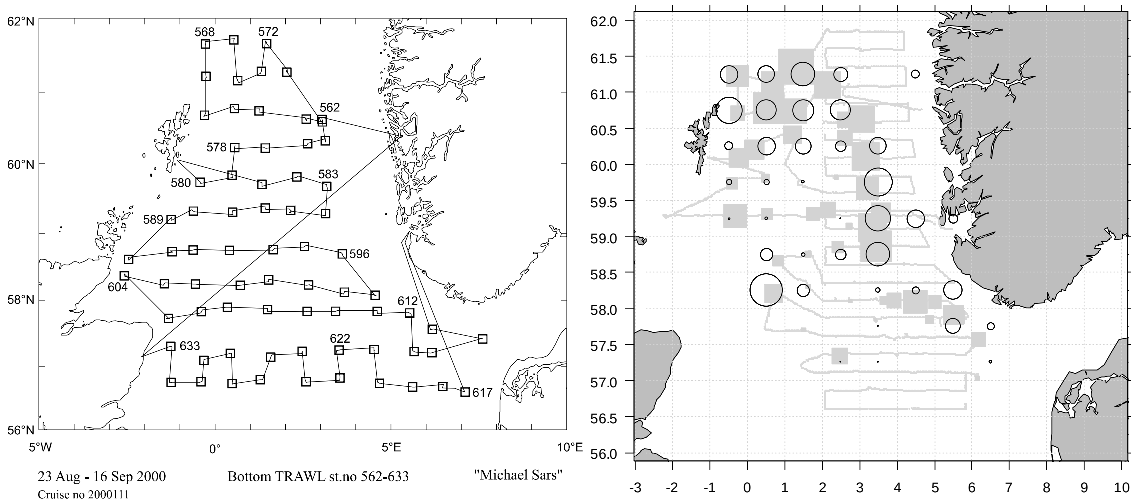


Figure 2. (left) NORACU survey until 2005; survey shown is from 2000. Lines are the path of the vessel and squares are the positions of the bottom trawls, taken for the IBTS Q3 survey. (right) Typical NORACU survey, 2008-2013; survey shown is the 2013 survey. Lines are the path of the vessel, circles correspond to the amount of backscatter assigned to saithe, squares correspond to the amount of catch (weight) of saithe in the IBTS Q3 bottom trawl station.

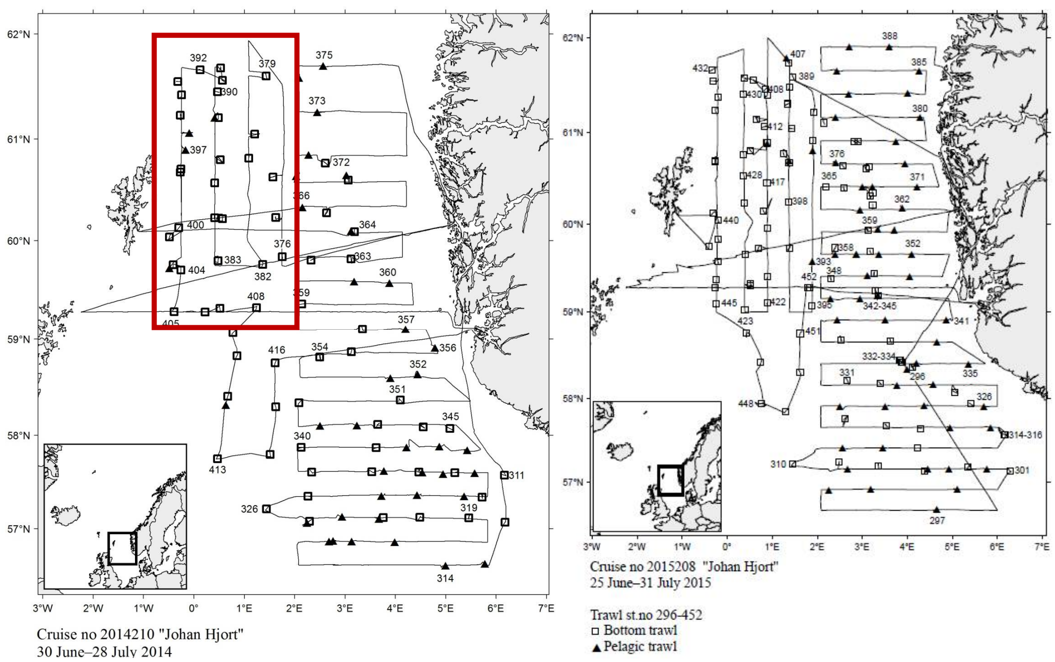


Figure 3. NORACU survey in (left) 2014 and (right) 2015. Lines show the path of the vessel, squares are bottom trawl stations, triangles are pelagic trawl stations. Note that biological sampling for saithe out with the IBTS stations only occurred in the area with the red box in 2014. This was modified in 2015.

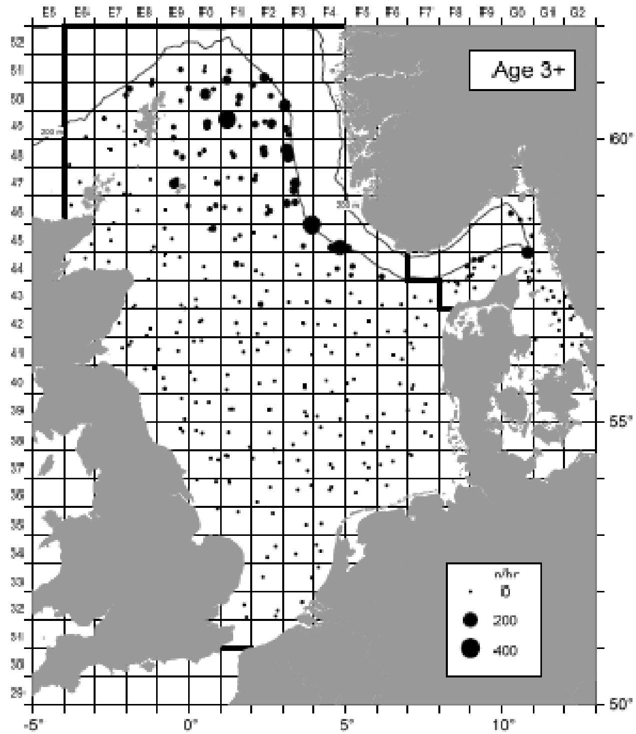


Figure 4. The area currently used to generate the saithe index is outlined in black (the entire North Sea, excluding the Skagerrak). Figure taken from ICES-IBTSWG (2015) showing the number hr^{-1} of age 3 saithe captured at each station in 2014.

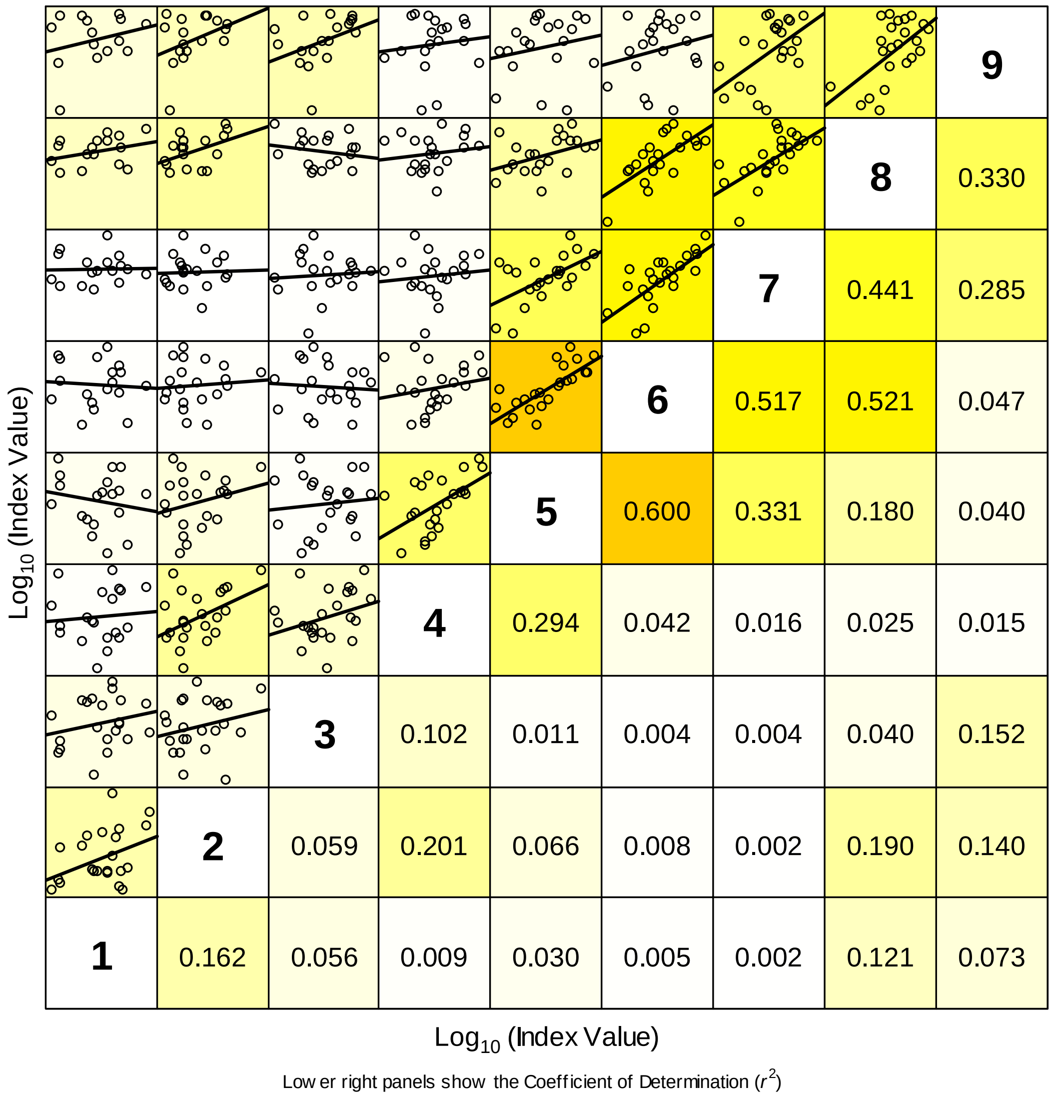


Figure 5. Internal consistencies for IBTS Q1; data include the 60-min tows, age 1-9. Age 10 is not shown because it is a plus group. Note: values in the internal consistency plots made with the FLR package (here) differ from values from the surveyIndex package.

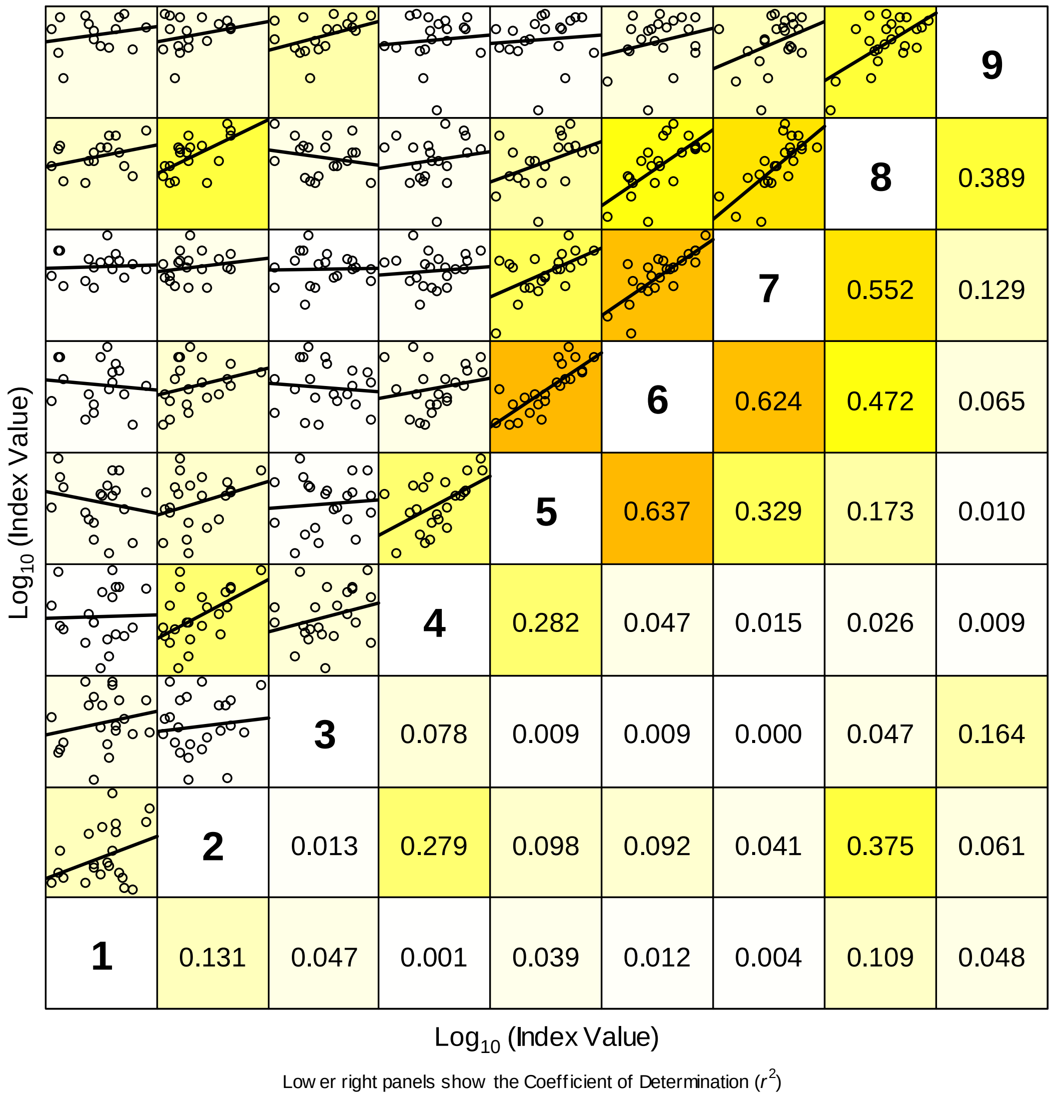


Figure 6. Internal consistencies for IBTS Q1; data exclude the 60-min tows, age 1-9. Age 10 is not shown because it is a plus group. Note: values in the internal consistency plots made with the FLR package (here) differ from values from the surveyIndex package.

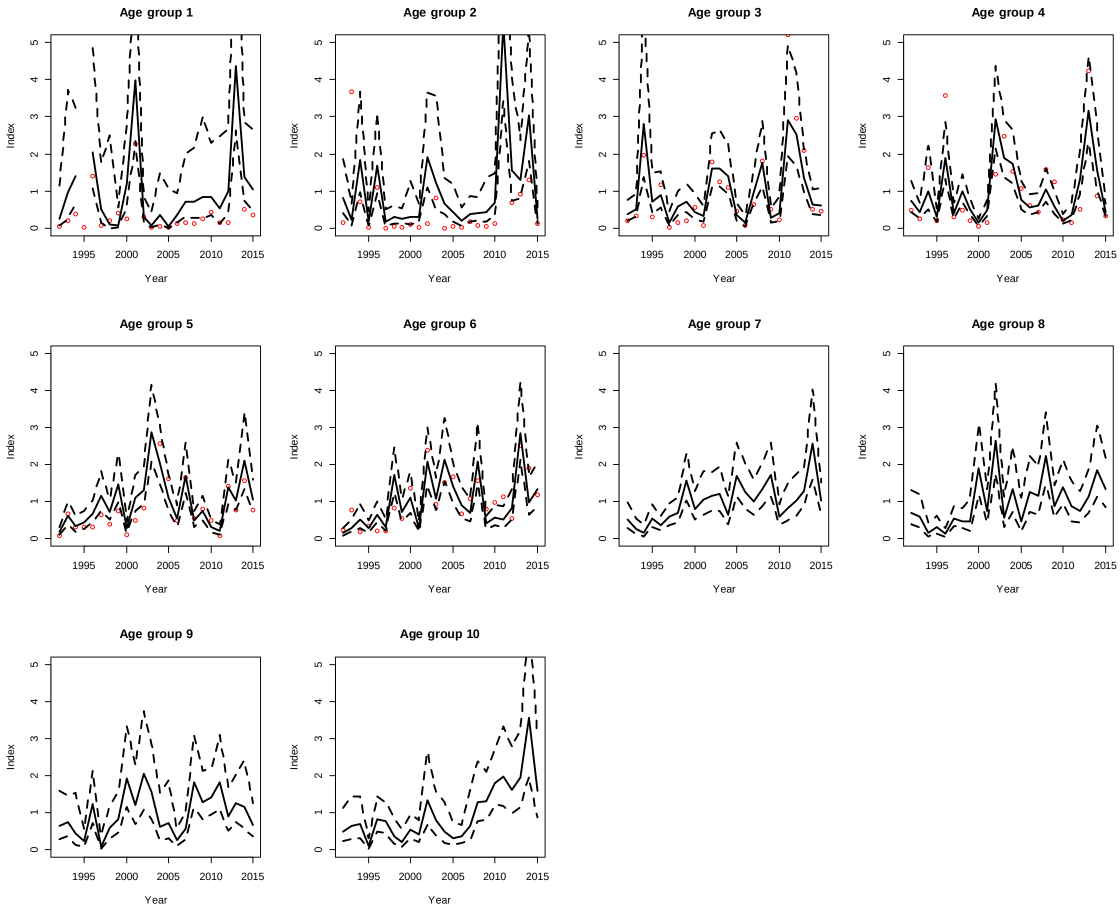


Figure 7. Abundance index by age from the Q1 survey (excluding the Scottish 60-min tows). GAM estimates from the lognormal model and confidence intervals are in black, ages 1-10+. DATRAS estimates, ages 1-6+ are red points.

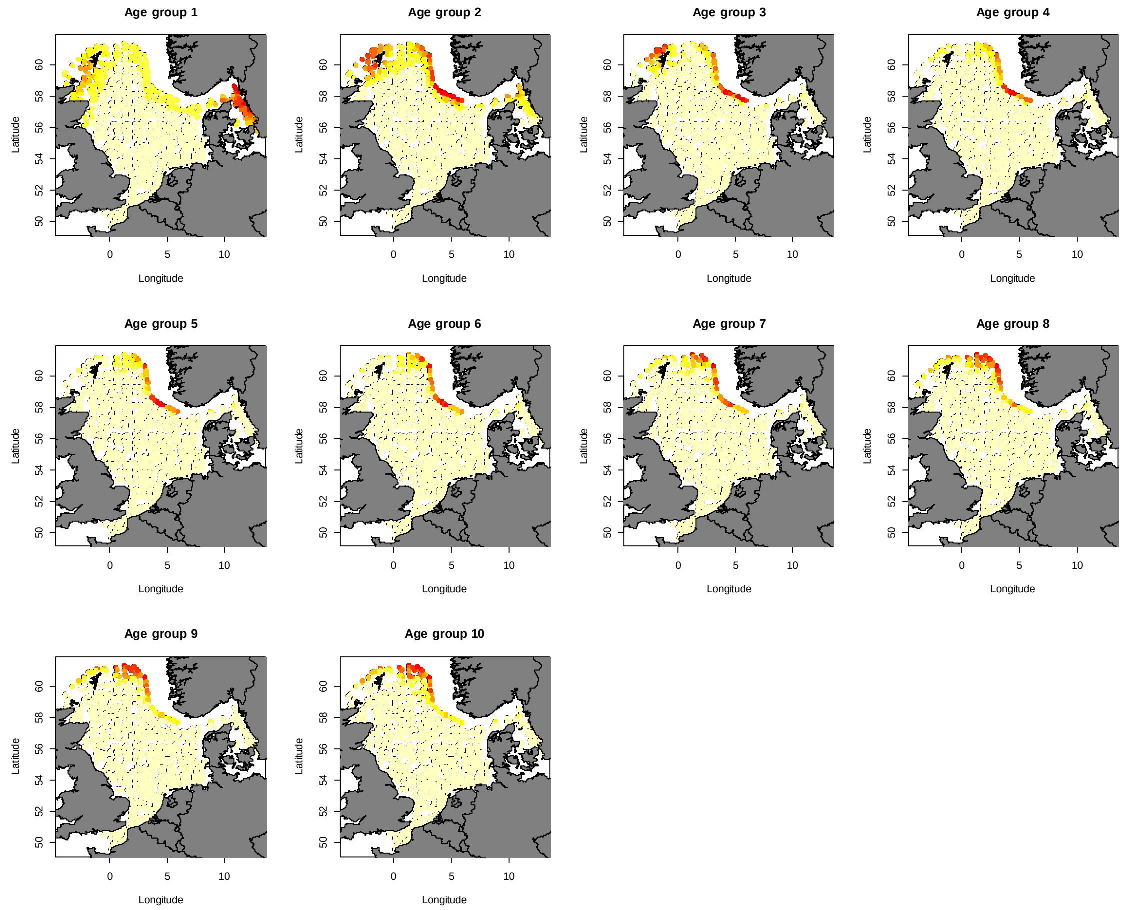


Figure 8. Map showing distribution of estimated abundance of saithe, age 1-10, from the logNormal GAM model for IBTS Q1 (data excluding Scottish 60-min tows). Age 10 is a plus group.

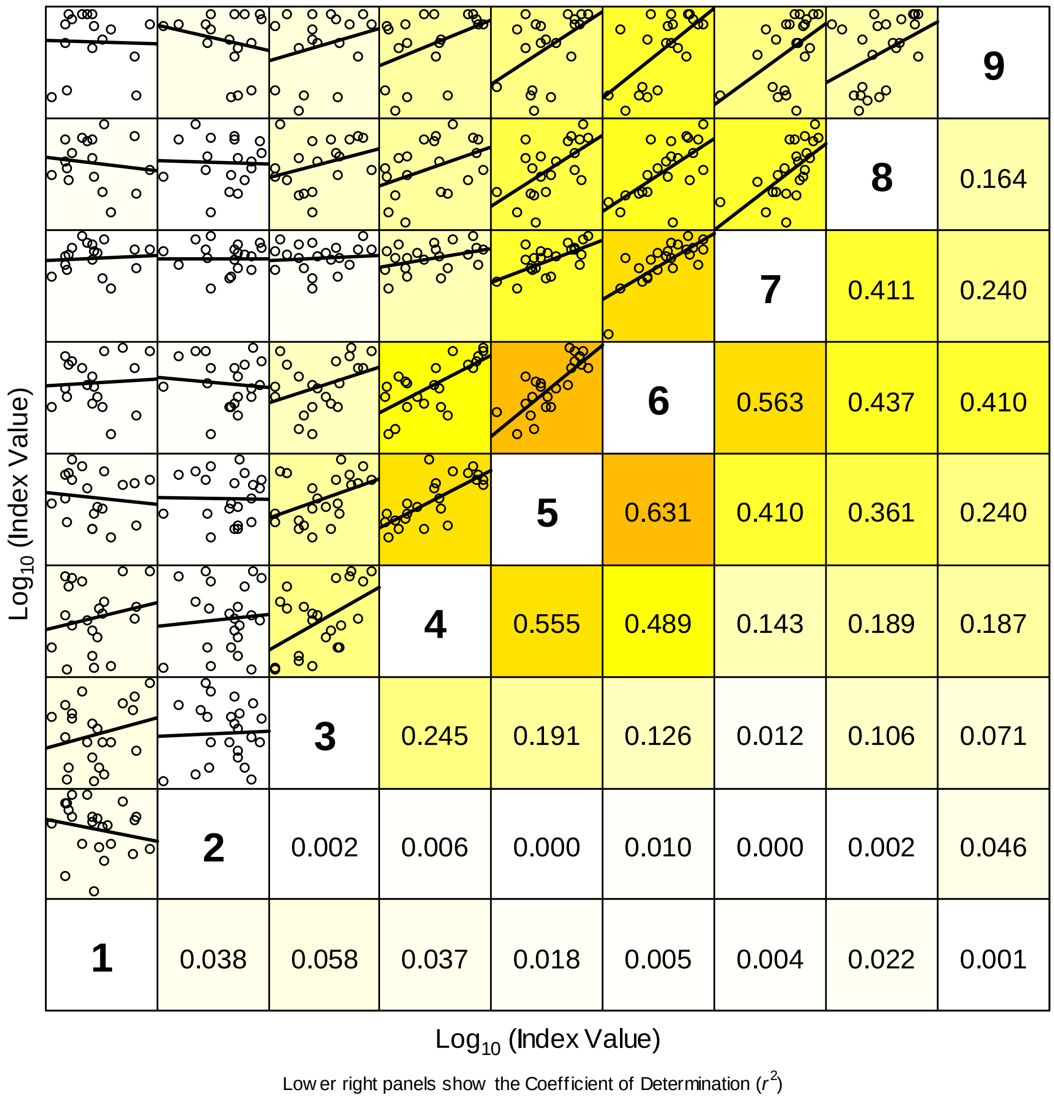


Figure 9. Internal consistencies for IBTS Q3, age 1-9. Age 10 is not shown because it is a plus group. Note: values in the internal consistency plots made with the FLR package (here) differ from values from the surveyIndex package.

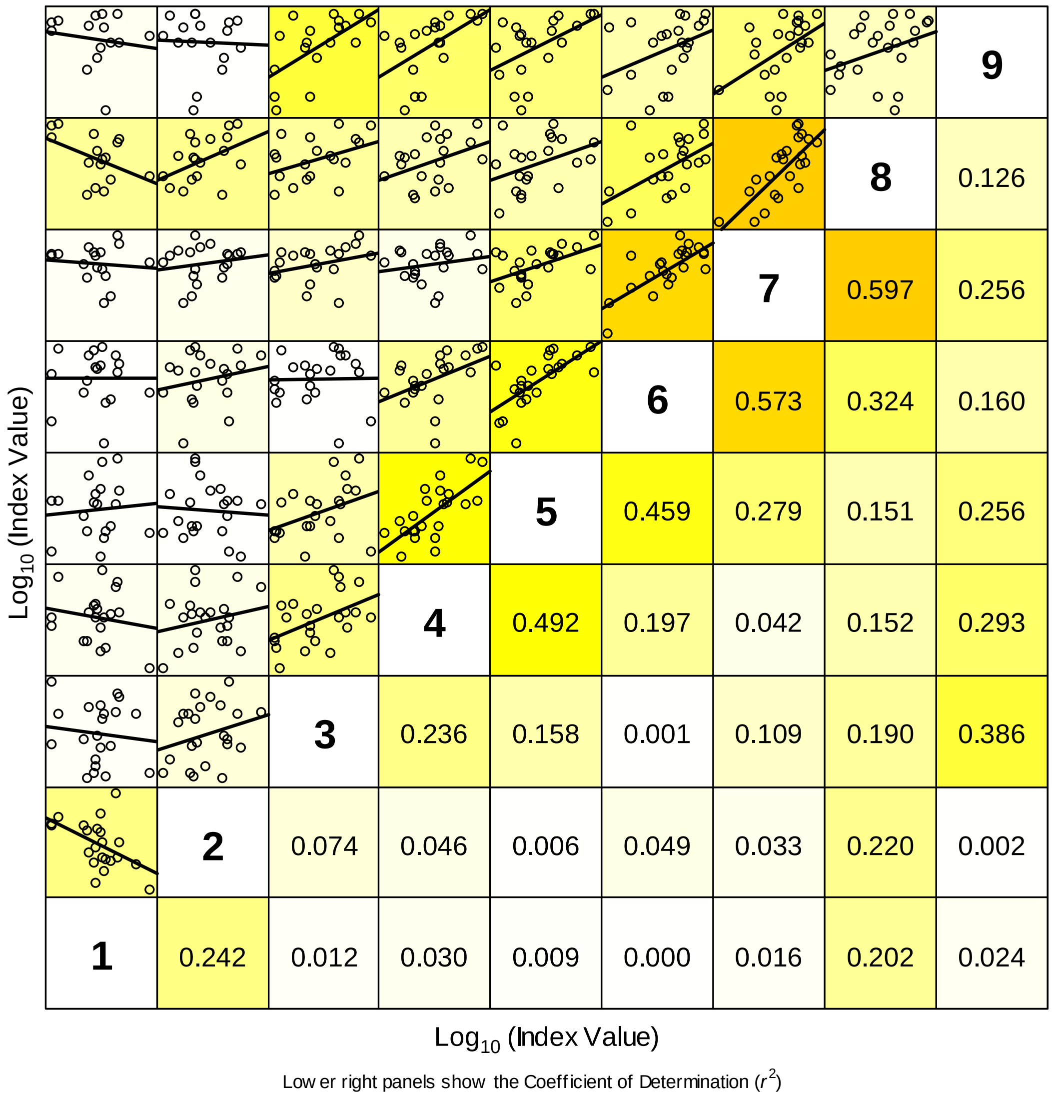


Figure 10. DATRAS IBTS Q3 index internal consistencies, age 1-9. Age 10 is not shown because it is a plus group..

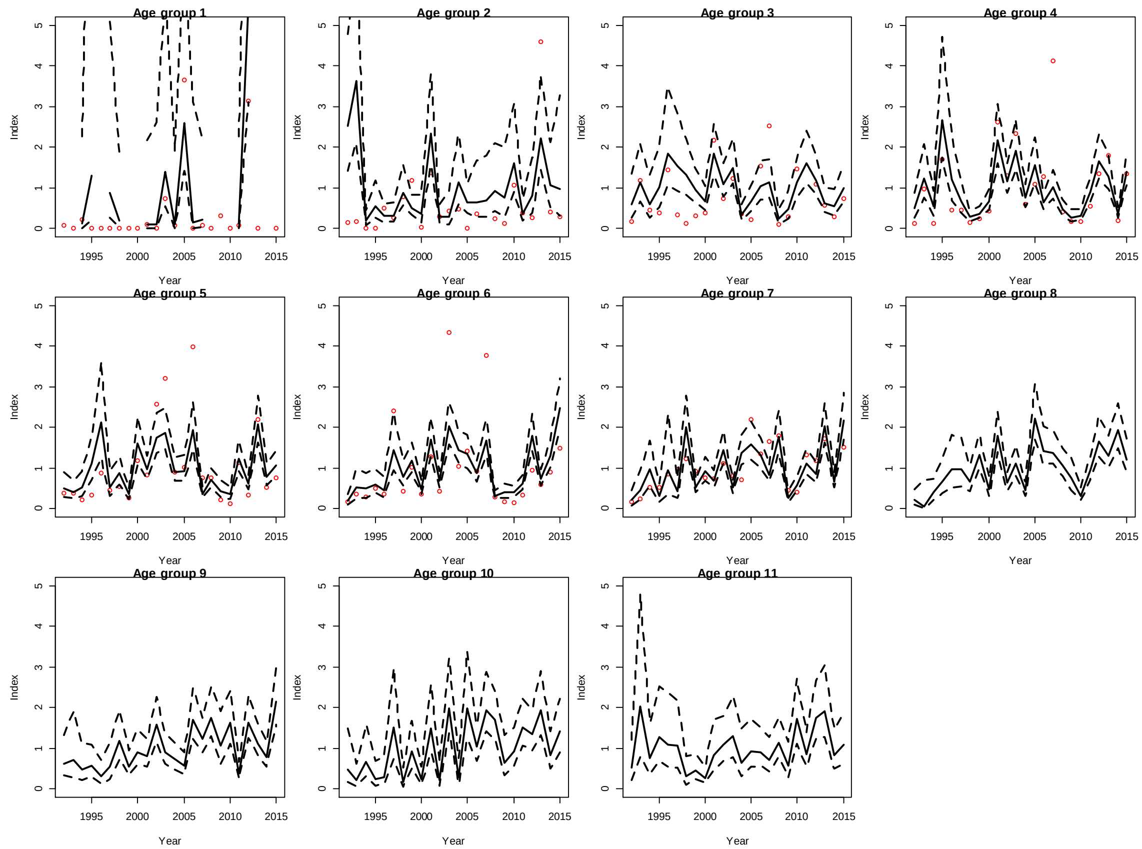


Figure 11. Abundance index by age from the Q3 survey. GAM estimates from the lognormal model and confidence intervals are in black, ages 0-10+ (age group 1 indicates age 0 fish; age group 11 is age 10+). DATRAS estimates, ages 0-6+ are red points.

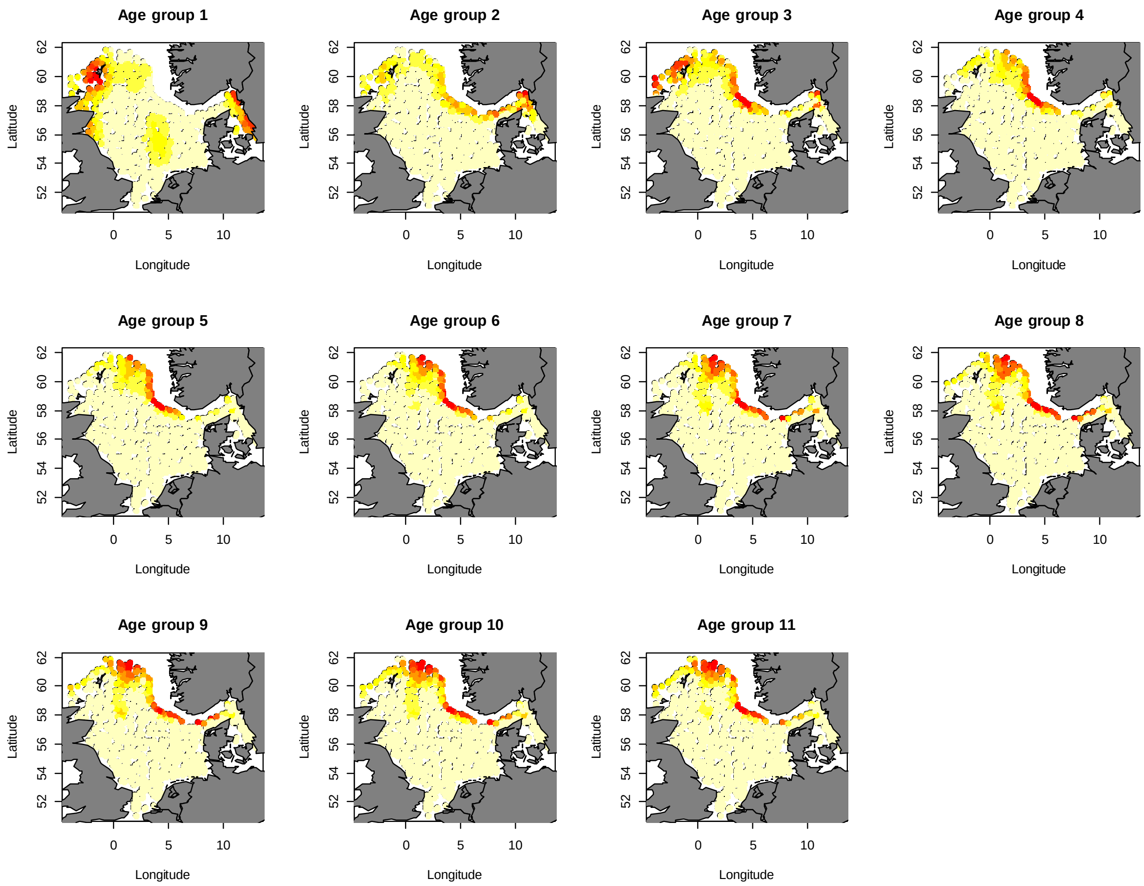


Figure 12. Map showing distribution of estimated abundance of saithe, age 0-10+, from the logNormal GAM model for IBTS Q3. Age group 1 indicates age 0, whereas age group 11 is the 10+ group.

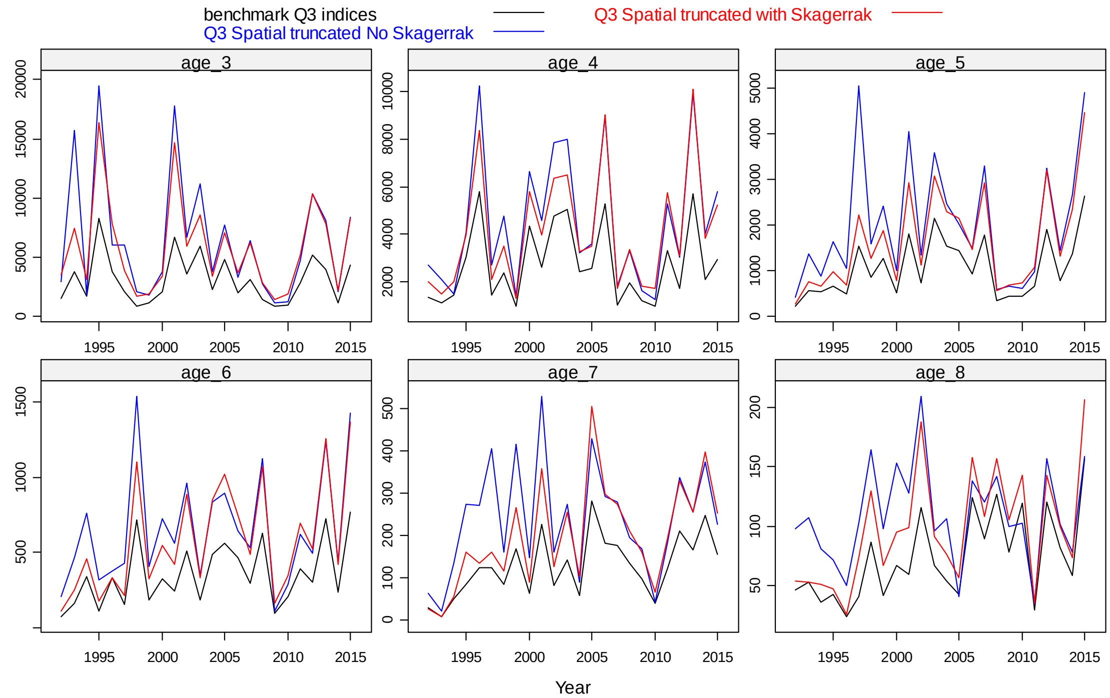


Figure 13. Comparison of IBTS Q3 indices, 1992-2015. Black lines: benchmark Q3 indices (no spatial truncation, without 'Ship' in model); blue lines: truncated spatial grid (No Skagerrak) + 'Ship' in model; red lines: truncated spatial grid (including Skagerrak) + 'Ship' in model.

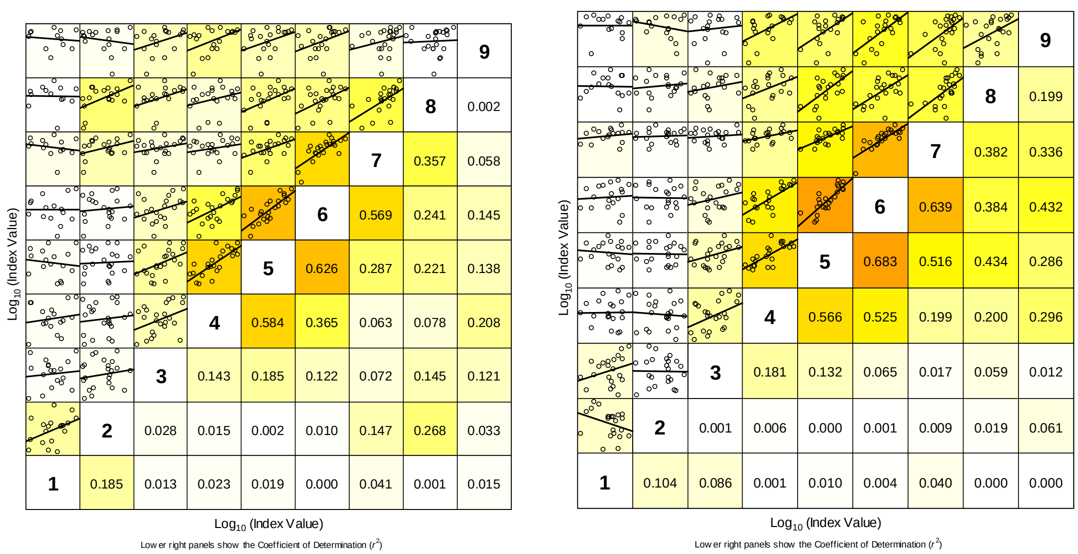


Figure 14. Internal consistencies as given by FLR for (left) model excluding southern North Sea, Skagerrak, and Kattegat and (right) model excluding southern North Sea and Kattegat. Note: FLR internal consistencies are estimated differently from Berg et al. 2014.

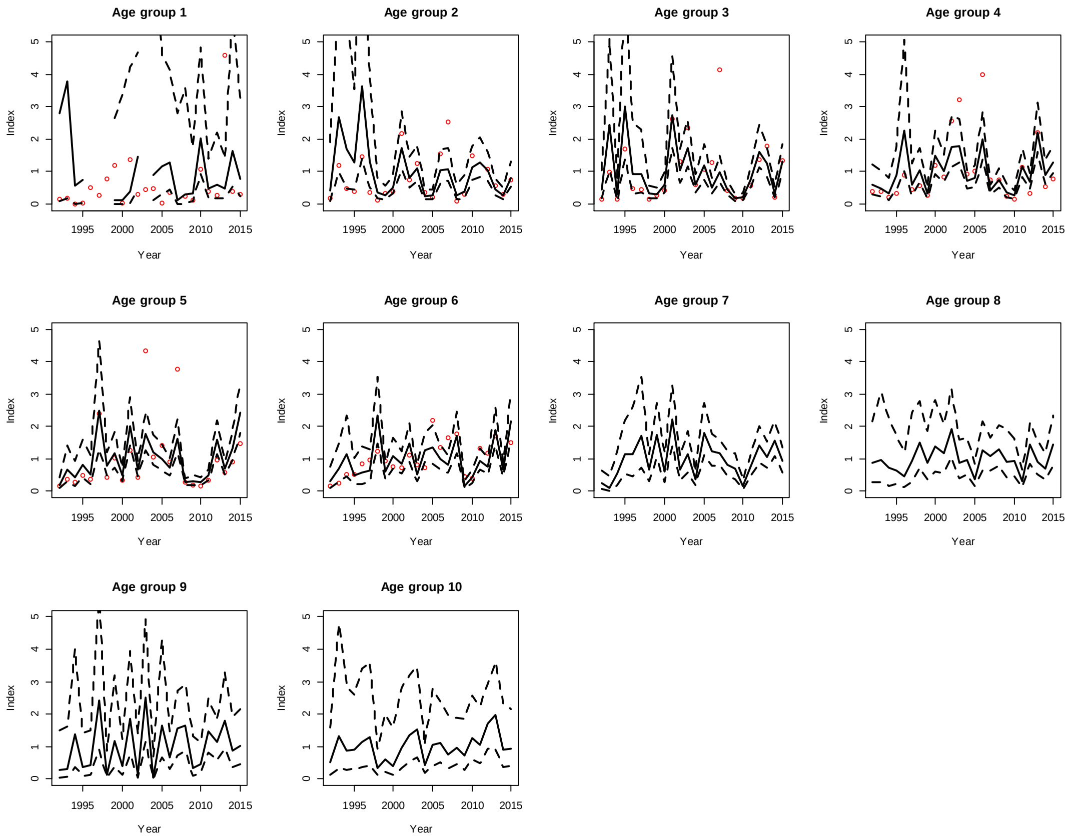


Figure 15. IBTS Q3 indices, ages 1-10+, 1992-2015. Comparing survey indices by age (and confidence interval) to DATRAS indices (ages 1-6+) for the truncated spatial grid-with ship delta-GAM model; this data excludes the Skagerrak-Kattegat and southern North Sea.

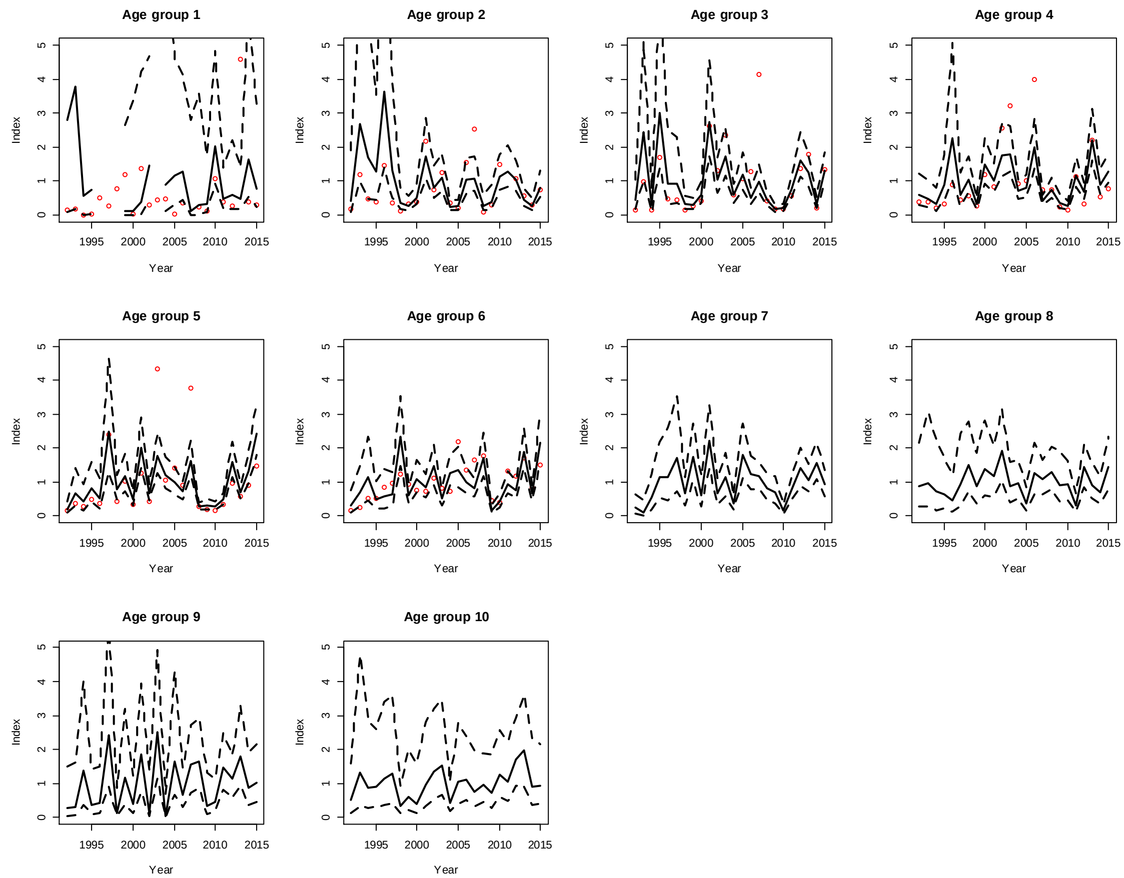


Figure 16. IBTS Q3 indices, ages 1-10+, 1992-2015. Comparing survey indices by age (and confidence interval) to DATRAS indices (ages 1-6+) for the truncated spatial grid-with ship delta-GAM model; this data includes the Skagerrak and excludes the southern North Sea and Kattegat.

Appendix A

Tow duration experiment IBTS Q1 2015 (Norway only)

Time did not allow for a truly paired tow experiment, i.e., tows conducted side-by-side. Tows were approximately randomly allocated to either 30- or 15-minute duration; because time was limited due to weather, gear trials, or other reasons, some rectangles were sampled at 15-minutes out of necessity. Figure 1A shows the location of the tows, where all tows less than 20 minutes were called 15-min for the analysis, and those that were 25-31 in duration were allocated to 30-minutes. Areas in the north and south of the survey area (Figure 1A) were analyzed separately because the fish communities differed greatly; this was to not introduce a spurious significant result when using a limited area of the North Sea. Fish communities to the south are dominated by a few flatfish species and sporadic high catches of herring, sprat, and anchovy; the overall number of species caught is relatively low. To the north, roundfish (cod, haddock, whiting, saithe, Norway pout) dominate the catches, small pelagic species are seldom captured, and the number of species caught is generally high.

Table 1A. Average, mean, and CV comparing 15-min and 30-min tows in the Norwegian survey area, IBTS Q1 2015.

South	**15-min tows (*n*= 8)**			**30-min tows (*n*=10)**		
Total number per tow	$\bar{X}_{no}$ = 1012	*s.e.* = 350	*cv* = 98%	$\bar{X}_{no}$ = 4222	*s.e.* = 2537	*cv* = 190%
Total weight per tow	$\bar{X}_{wt}$ = 69	*s.e.*=16	*cv* =66%	$\bar{X}_{wt}$ =130	*s.e.* = 37	*cv*=89%
North	**15-min tows (*n* = 6)**			**30-min tows (*n* = 11)**		
Total number per tow	$\bar{X}_{no}$ =5589	*s.e.*=2096	*cv*=92%	$\bar{X}_{no}$ =12,190	*s.e.*=2314	*cv* = 63%
Total weight per tow	$\bar{X}_{wt}$ =174	*s.e.*=61	*cv* = 86%	$\bar{X}_{wt}$ =480	*s.e.*= 92	*cv* = 64%

Table 2A. Average CV's north (upper) and south (lower).

	15-min tow	**30-min tows**
Number	95%	127%
Weight	76%	77%

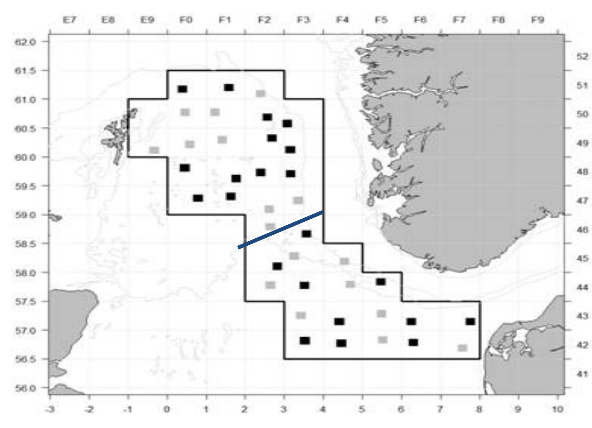


Figure 1A. Norwegian survey area and stations; grey squares indicate <20 minutes in duration, black are 25-31 minutes. Stations called 'south' in the analysis are south of the blue line; these are stations that capture a different community (flatfish dominated, includes sprat and anchovy) than the northern stations (mainly roundfish, no sprat or anchovy).

Tow duration experiment IBTS Q3 2015

The 2015 IBTSWG report (ICES-IBTSWG 2015) details how the tow duration experiment was to be carried out. An excerpt is included here:

> In order to warrant a thorough comparison with the current methodology, it has been planned that in each ICES rectangle, one of the two assigned hauls will remain at 30-min haul duration, whereas the second will be reduced to 15 min. Any freed-up survey time will, where logistically possible, be utilized to conduct additional hauls and to increase coverage of the fringe areas highlighted with the proposed extended index areas for assessed species (ICES-IBTSWG 2015).

The results from multiple analysis, including species-specific analysis, are included in the 2016 IBTSWG report (ICES-IBTSWG 2016).

Data were pulled from the DATRAS database and the *DATRAS* R-package (Kristensen & Berg 2010) was used to prepare the data. Stations within a statistical rectangle were considered 'paired tows', however, data was also screened to prepare a second data set, where tows within at least 15 n mi of each other with considered pairs. In the tables below, 'not paired' refer to tows that were taken in the same statistical rectangle, while 'paired' refer to tows taken within 15 n. mi of each other. Data were standardized to catch (in kg or numbers) per 15 minutes or 30 minutes, depending on haul duration. All tows between 15-17 minutes were considered 15-min duration; those within 25-32 minutes were classified as 30-minute duration. Figure 2A shows the location of all stations, as well as the closer paired tows, used in the 'paired' analyses.

Analyses compared mean catch per tow in numbers and weights of all species, where 'All' included all IBTS mandatory species (all fish, sharks, skates, rays, cephalopods, and a few species of crustaceans and mollusks). Norway was also tasked with comparing 5 of the 8 fish species that have age sampling conducted: herring, sprat, mackerel, plaice, and saithe. Analyses for these five species included comparisons of mean catch per tow (in weight and numbers) and of mean length per tow. Methods are those of Pennington et al. (2002).

Results

Tables 3A-5A show the results of the analyses. Tow duration was not significant for any of the analysis except for plaice (mean catch weight only), when using stations that were within 15 n mi of each other (Table 3A). Tow duration did not have a significant effect on the length distribution of fish caught and sampled.

Therefore, tows of 15-min duration were deemed as representative as those of 30-min duration.

Table 3A. Comparison of mean catch per tow (in weight), by the *n* 15 and 30 minute tows. Tows in a statistical rectangle where both catches were zero are not included. N.S and S.D. denote not significant and significant difference, respectively. The category "All" is the total catch of all the mandatory species. 'Not paired' refer to tows that were taken in the same statistical rectangle, while 'paired' refer to tows taken within 15 n. mi of each other.

Species	*n*	$2\times\bar{x}_{15wt.}$ (Kg / tow)	$s.e.(2\times\bar{x}_{15wt.})$	$\bar{x}_{30.wt.}$ (Kg / tow)	$s.e.(\bar{x}_{30wt.})$	Significance (Pr. value, not paired)	Significance (Pr. value, paired)
All	140	492.8	81.4	574.5	58.9	N.S. (0.42)	N.S. (0.41)
Mackerel	128	32.8	7.9	43.1	10.9	N.S. (0.45)	N.S. (0.43)
Sprat	77	148.1	64.8	90.7	33.6	S.D. (0.43)	N.S. (0.44)
Herring	133	137.6	76.4	177.2	50.4	N.S. (0.67)	N.S. (0.67)
Plaice	125	11.4	1.2	8.5	0.9	N.S. (0.07)	S.D. (0.02)
Saithe	58	32.0	6.9	41.4	9.1	N.S. (0.40)	N.S. (0.30)

Table 4A. Comparison of mean catch per tow (in numbers) by the *n* 15 and 30 minute tows. The tows in a statistical rectangle where both catches were zero are not included. N.S and S.D. denote not significant and significant difference, respectively. The "All" is the total catch of all the mandatory species. 'Not paired' refer to tows that were taken in the same statistical rectangle, while 'paired' refer to tows taken within 15 n. mi of each other.

Species	*n*	$2\times\bar{x}_{15no..}$ (No./tow)	$s.e.(2\times\bar{x}_{15no.})$	$\bar{x}_{30.no.}$ (No./tow)	$s.e.(\bar{x}_{30no.})$	Significance (Pr. value, not paired)	Significance (Pr. value, paired)
All	140	15,160	3,719	13,520	2,664	N.S. (0.72)	N.S. (0.71)
Mackerel	128	201.0	60.6	251.1	79.9	N.S. (0.62)	N.S. (0.60)
Sprat	77	13,520	5,826	9,073	3,952	N.S. (0.53)	N.S. (0.54)
Herring	133	1,690	712.8	1,765	403.6	N.S. (0.93)	N.S. (0.93)
Plaice	125	51.4	6.2	40.4	5.3	N.S. (0.18)	N.S. (0.08)
Saithe	58	22.4	5.0	36.0	9.5	N.S. (0.21)	N.S. (0.17)

Table 5A. Estimates of the mean length of fish caught in the 15 or the 30 minute tows. A ratio estimator, $\widehat{R}$, was used to estimate mean length. The difference in the estimated means, $\widehat{R}_{30} - \widehat{R}_{15}$, was considered significant if the difference was greater than 2 times the standard error (Col 9).

Species	n_{15}	$\widehat{R}_{15}$ (cm)	$s.e.(\widehat{R}_{15})$	n_{30}	$\widehat{R}_{30}$ (cm)	$s.e.(\widehat{R}_{30})$	$\widehat{R}_{30} - \widehat{R}_{15}$ (cm)	$s.e.(\widehat{R}_{30} - \widehat{R}_{15})$	Significance
Mackerel	92	26.29	0.63	116	26.85	0.60	0.56	0.87	N.S.
Sprat	64	10.86	0.25	74	10.38	0.25	-0.48	0.34	N.S.
Herring	105	18.85	3.34	119	21.87	0.98	3.02	3.48	N.S.
Plaice	114	26.38	0.34	122	26.2	0.33	-0.18	0.47	N.S.
Saithe	47	51.69	0.81	50	48.6	1.37	-3.09	1.59	N.S.

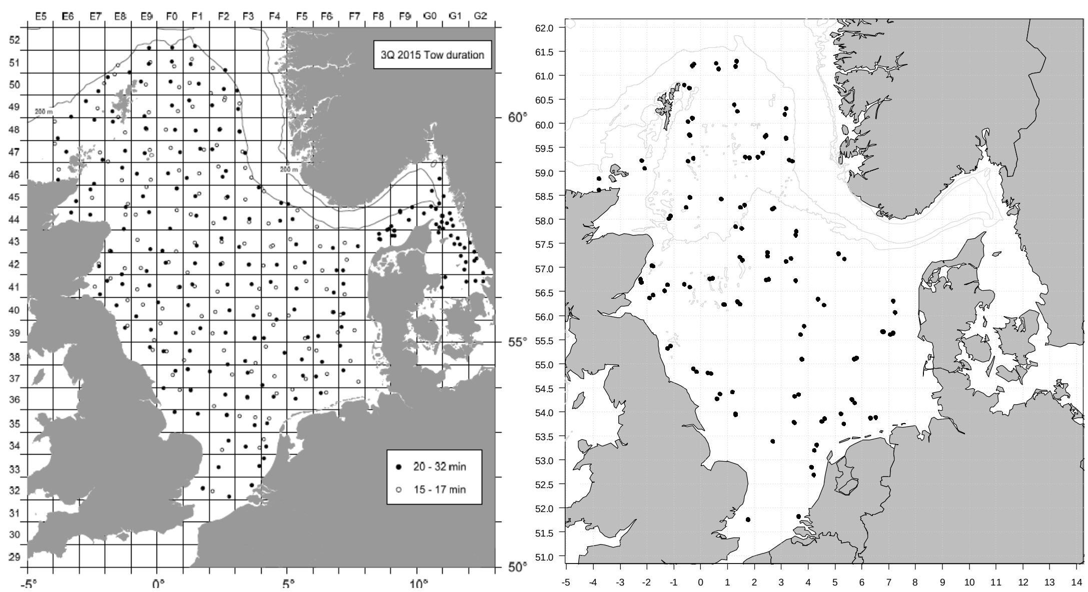


Figure 2A. (left) Location of 15-min and 30-min tows during the tow duration experiment, IBTS Q3 2015. (Right) Location of the tows within 15 n mi of each other; these are considered 'paired' for the analyses.

Appendix B

Table 1B. Amount of age records, including Scottish 60-min tows, IBTS Q1, 1992-2015.

Year/Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18
1992	0	15	22	111	21	6	15	15	9	2	0	2	0	1	1	0	1
1993	1	8	67	161	172	56	19	20	16	8	5	3	1	0	0	0	0
1994	5	20	89	199	55	35	7	3	4	2	9	0	0	1	0	0	0
1995	0	1	65	136	159	49	43	11	4	1	4	2	0	0	0	0	0
1996	0	7	13	126	36	15	3	2	1	0	0	2	0	1	0	0	0
1997	0	0	1	44	125	19	10	6	1	4	0	0	2	0	0	0	0
1998	0	2	21	207	128	166	27	13	7	4	0	0	1	1	0	0	0
1999	0	1	26	77	234	73	82	6	10	1	1	0	0	0	0	0	0
2000	4	4	71	28	40	67	23	29	8	2	1	0	0	0	0	0	0
2001	2	1	13	58	157	45	58	20	17	1	3	1	0	0	0	0	0
2002	2	5	72	169	112	165	35	72	26	15	3	1	0	0	1	0	0
2003	1	42	52	117	179	45	26	10	12	2	3	2	0	1	1	0	0
2004	5	1	59	162	176	124	17	16	7	5	1	2	1	0	1	0	0
2005	1	10	19	103	146	118	73	12	10	0	3	0	0	0	0	0	0
2006	6	4	4	104	84	88	76	25	2	1	2	0	0	0	1	0	0
2007	16	14	56	82	216	66	49	34	8	4	2	2	0	1	0	2	0
2008	3	5	152	185	64	107	36	44	20	16	1	2	0	0	0	0	0
2009	15	9	19	135	133	33	88	25	25	20	15	0	0	0	1	0	0
2010	20	15	29	75	117	84	26	32	23	17	17	7	2	0	0	0	0
2011	7	242	376	76	43	46	33	17	28	15	10	7	5	0	0	0	0
2012	17	31	247	151	256	50	41	18	16	22	10	9	4	5	1	1	0
2013	66	33	97	416	116	216	64	32	22	17	24	9	7	8	1	1	0
2014	30	57	30	116	143	44	68	31	11	17	5	9	8	9	3	1	0
2015	19	5	57	91	148	116	57	57	11	12	8	3	4	5	6	1	0

Table 2B. Amount of age records, excluding Scottish 60-min tows, for IBTS Q1, 1992-2015.

Year/Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1992	0	14	22	109	20	6	15	13	5	2	0	2	0	1	0	0
1993	0	1	50	141	159	36	13	19	14	6	3	2	1	0	0	0
1994	5	19	88	191	53	29	4	2	3	0	3	0	0	0	0	0
1995	0	1	65	136	159	48	43	11	4	1	1	0	0	0	0	0
1996	0	5	10	96	29	11	3	1	0	0	0	0	0	0	0	0
1997	0	0	1	44	124	19	10	5	0	1	0	0	1	0	0	0
1998	0	2	21	201	126	165	24	11	7	3	0	0	1	1	0	0
1999	0	1	26	77	234	73	82	6	10	1	1	0	0	0	0	0
2000	4	4	71	28	40	67	23	29	8	2	1	0	0	0	0	0
2001	2	1	13	58	157	45	58	20	17	1	3	1	0	0	0	0
2002	2	5	72	169	112	165	35	72	26	15	3	1	0	0	1	0
2003	1	42	52	117	179	45	26	10	12	2	3	2	0	1	1	0
2004	5	1	59	162	176	124	17	16	7	5	1	2	1	0	1	0
2005	1	10	19	103	146	118	73	12	10	0	3	0	0	0	0	0
2006	6	4	4	104	84	88	76	25	2	1	2	0	0	0	1	0
2007	16	14	56	82	216	66	49	34	8	4	2	2	0	1	0	2
2008	3	5	152	185	64	107	36	44	20	16	1	2	0	0	0	0
2009	15	9	19	135	133	33	88	25	25	20	15	0	0	0	1	0
2010	20	15	29	75	117	84	26	32	23	17	17	7	2	0	0	0
2011	7	242	376	76	43	46	33	17	28	15	10	7	5	0	0	0
2012	17	31	247	151	256	50	41	18	16	22	10	9	4	5	1	1
2013	66	33	97	416	116	216	64	32	22	17	24	9	7	8	1	1
2014	30	57	30	116	143	44	68	31	11	17	5	9	8	9	3	1
2015	19	5	57	91	148	116	57	57	11	12	8	3	4	5	6	1

Table 3B. Amount of age records for IBTS Q3, 1992-2015

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1992	11	14	52	81	22	9	3	6	2	2	0	0	1	0	0	0	0	0	0	0	0
1993	5	36	137	80	39	17	1	6	1	7	2	3	1	1	0	1	0	0	0	0	1
1994	0	16	39	50	35	32	6	4	3	1	3	1	0	0	0	0	0	0	0	0	0
1995	1	22	163	82	57	19	13	4	1	0	0	2	0	4	1	0	0	0	0	0	0
1996	1	36	43	133	27	20	11	2	1	0	1	0	0	1	0	1	0	1	0	0	0
1997	1	19	77	76	156	16	18	7	8	0	2	1	1	0	1	0	0	0	0	0	1
1998	2	10	54	205	102	153	16	19	1	2	0	0	0	0	1	0	0	0	0	0	0
1999	1	16	110	101	207	58	64	11	9	5	2	0	0	0	2	0	0	0	0	0	0
2000	2	31	125	327	71	83	17	22	2	2	1	0	0	0	0	0	0	0	0	0	0
2001	1	70	428	214	252	42	50	22	22	11	9	4	3	5	0	0	0	0	0	0	0
2002	13	29	216	383	81	91	19	31	1	16	1	5	5	1	0	1	0	0	0	0	2
2003	38	61	267	271	192	24	24	9	11	3	5	3	4	1	0	1	0	0	0	0	0
2004	87	22	162	261	207	97	13	18	1	4	2	0	0	0	0	0	1	0	0	0	0
2005	1	26	242	193	173	104	80	13	19	4	9	6	2	0	2	0	0	0	0	0	0
2006	10	82	150	460	130	95	43	30	8	11	2	3	0	3	0	0	0	0	0	0	0
2007	25	67	366	104	303	59	46	28	18	11	4	2	3	2	1	0	0	0	0	0	0
2008	23	26	239	306	57	151	34	36	16	16	3	8	0	2	0	0	0	0	0	0	0
2009	15	46	107	139	59	11	23	20	6	3	4	3	0	2	0	0	0	0	0	0	0
2010	55	214	132	116	71	37	6	25	5	5	11	3	1	2	2	0	0	0	0	1	0
2011	8	230	225	389	90	91	34	8	15	10	5	4	4	3	0	0	0	0	0	0	0
2012	22	85	405	160	278	73	65	43	17	34	4	6	8	5	0	0	0	0	0	0	0
2013	107	81	526	664	124	198	56	24	21	18	7	5	6	5	2	1	0	0	0	0	0
2014	35	51	151	368	354	67	80	17	7	8	4	5	3	5	1	0	0	0	0	0	0
2015	20	62	448	295	352	162	33	43	12	5	4	2	4	3	0	1	0	0	1	0	0

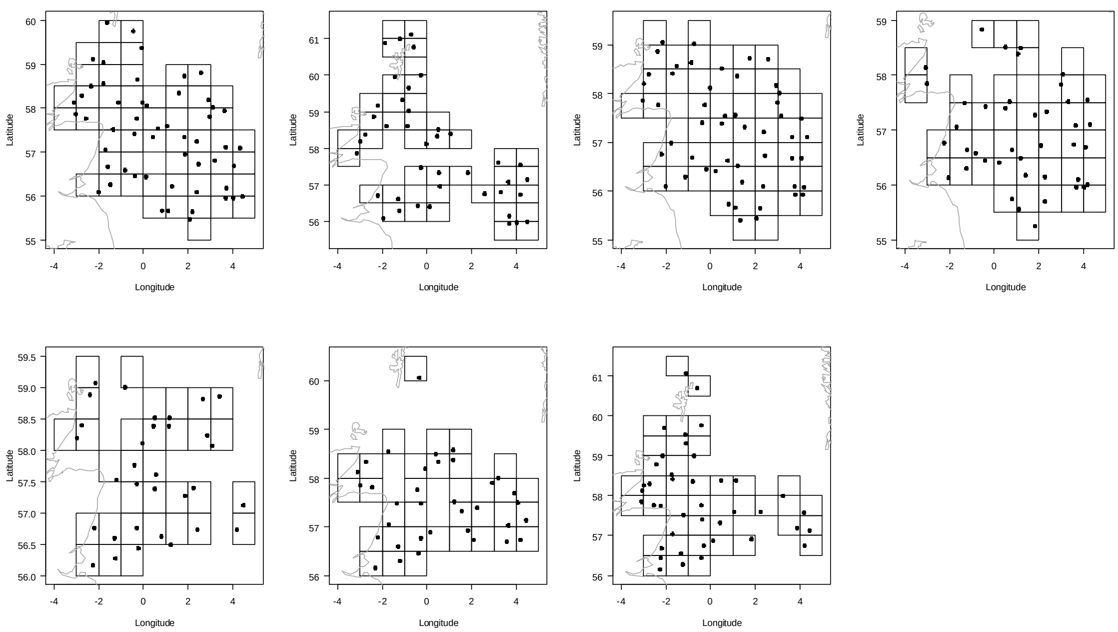


Figure 1B. Location of Scottish 60-min tows that were excluded from the final Q1 index.

Appendix C: Model summaries for Q3 index as estimated at benchmark No truncation, *Ship* not included in model

Model fits and residual plots

Table 1C. Deviance explained, R^2, and Scale estimate for the presence and absence delta GAM models, for ages 0-10.

	Positive/Presence			Zero/Absence		
Age	**% Deviance explained**	**R^2**	**-ML**	**% Deviance explained**	**R^2**	**-ML**
0	22.2	-0.086	81.763	38	0.145	258.32
1	35.6	0.308	779.32	30.6	0.238	1296.5
2	22.2	0.181	2059.3	45.4	0.442	1848.1
3	39.1	0.36	3143	61.4	0.634	1626.3
4	42.7	0.4	3048	66.3	0.688	1437.9
5	42.8	0.395	2521.4	68.2	0.696	1295.3
6	36.6	0.33	1948.3	66.1	0.66	1239.2
7	26.1	0.215	1386.2	60.1	0.569	1232.8
8	19.7	0.136	922.37	55.3	0.473	1097.5
9	14.5	0.089	582.29	48.3	0.369	967.74
10	17.1	0.096	711.91	48.1	0.374	1018.8

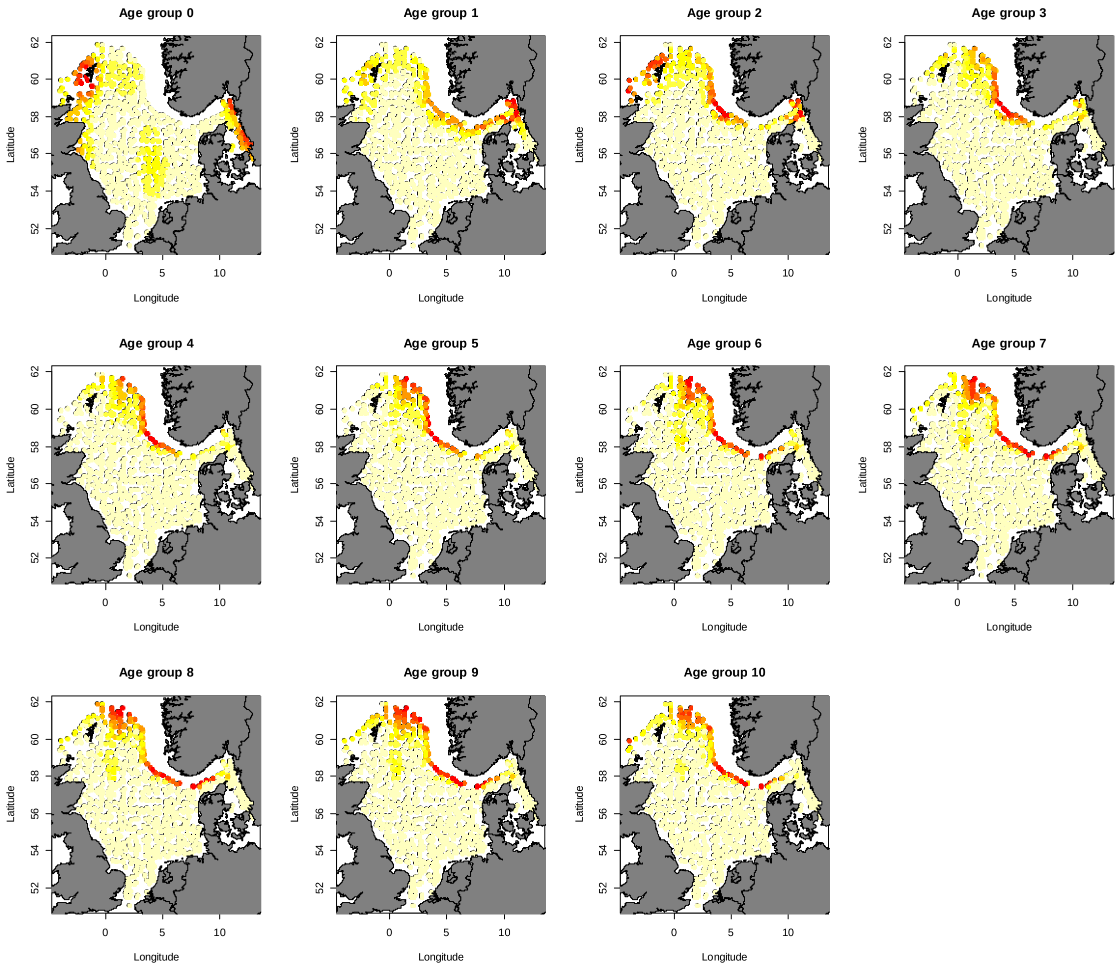


Figure 1C. Predicted values for positive delta GAM model for ages 1-10 (no truncation, without *Ship* in model). Scale goes from pale yellow (low values) to red (high values).

Figure 2C. Residuals for positive/presence delta GAM model for ages 1-10 (no truncation, without *Ship* in model). Scale goes from negative (light yellow) to positive (red).

Figure 3C. Residuals for zero/absence delta GAM model for ages 1-10 (no truncation, without *Ship* in model). Scale goes from negative (light yellow) to positive (red).

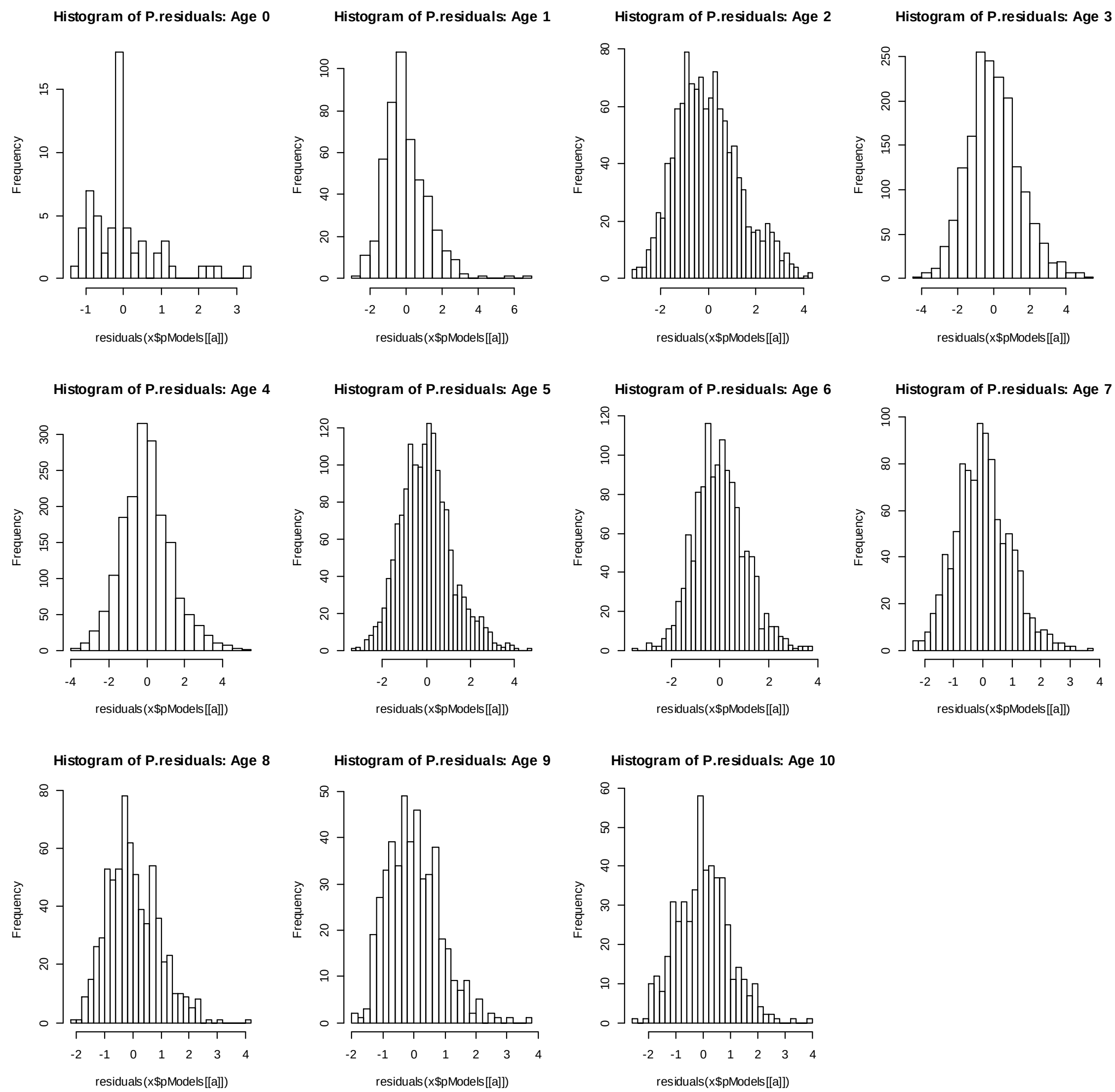


Figure 4C. Histogram of residuals for positive/presence delta GAM model for ages 1-10 (no truncation, without *Ship* in model).

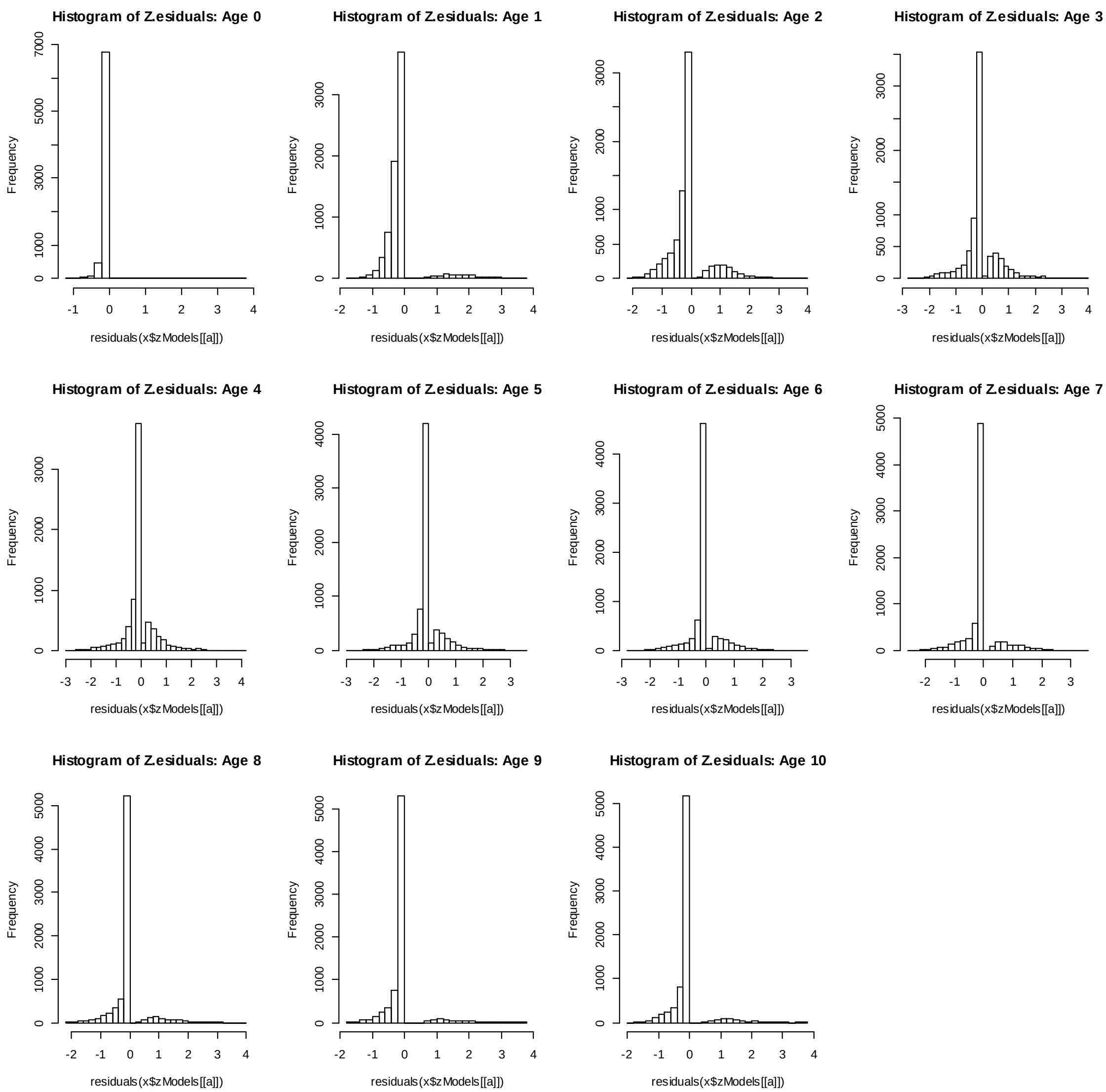


Figure 5C. Histogram of residuals for zero/absence delta GAM model for ages 1-10 (no truncation, without *Ship* in model).

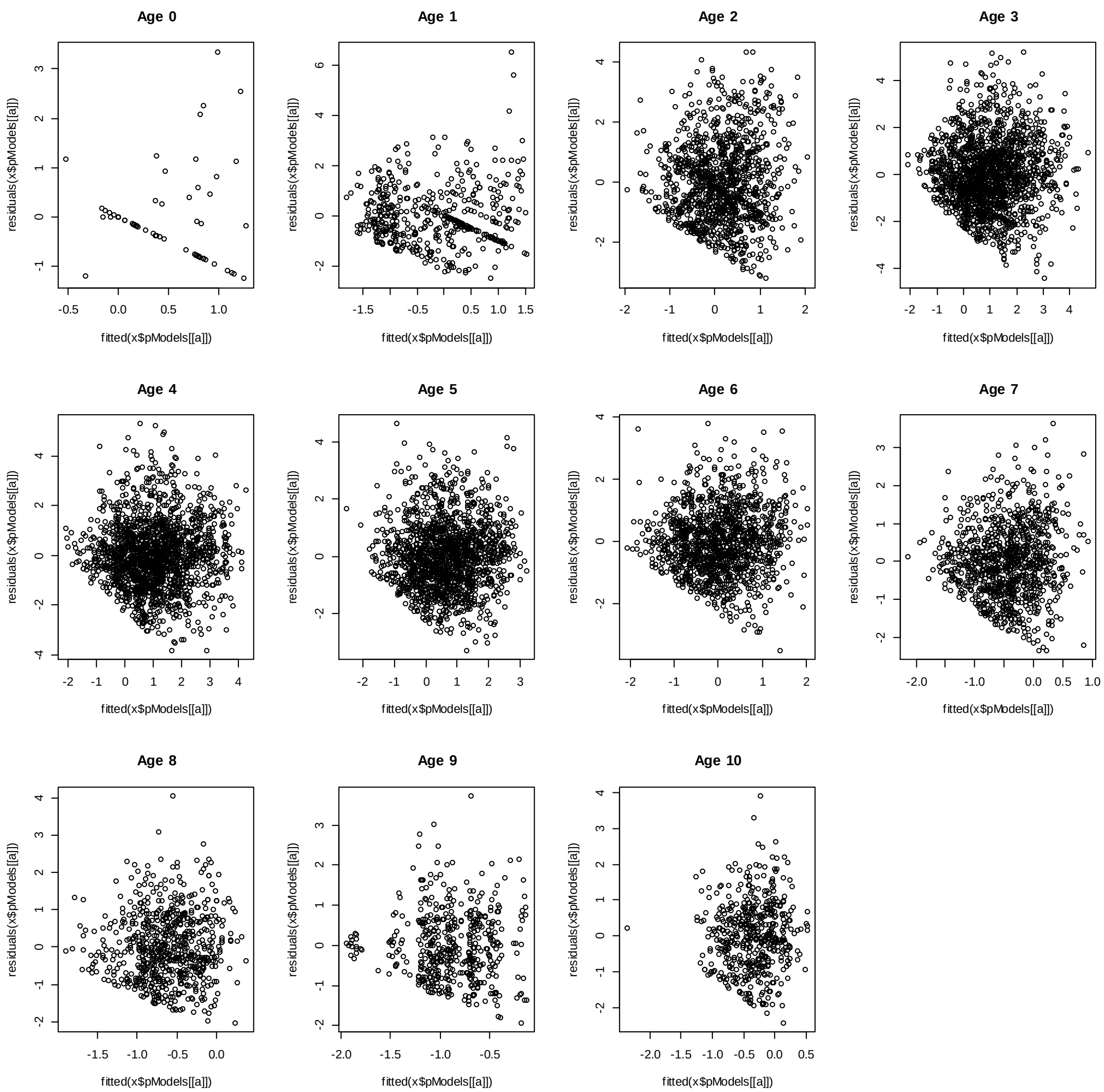


Figure 6C. Residuals vs. fitted values for positive/presence delta GAM model for ages 1-10 (no truncation, without *Ship* in model).

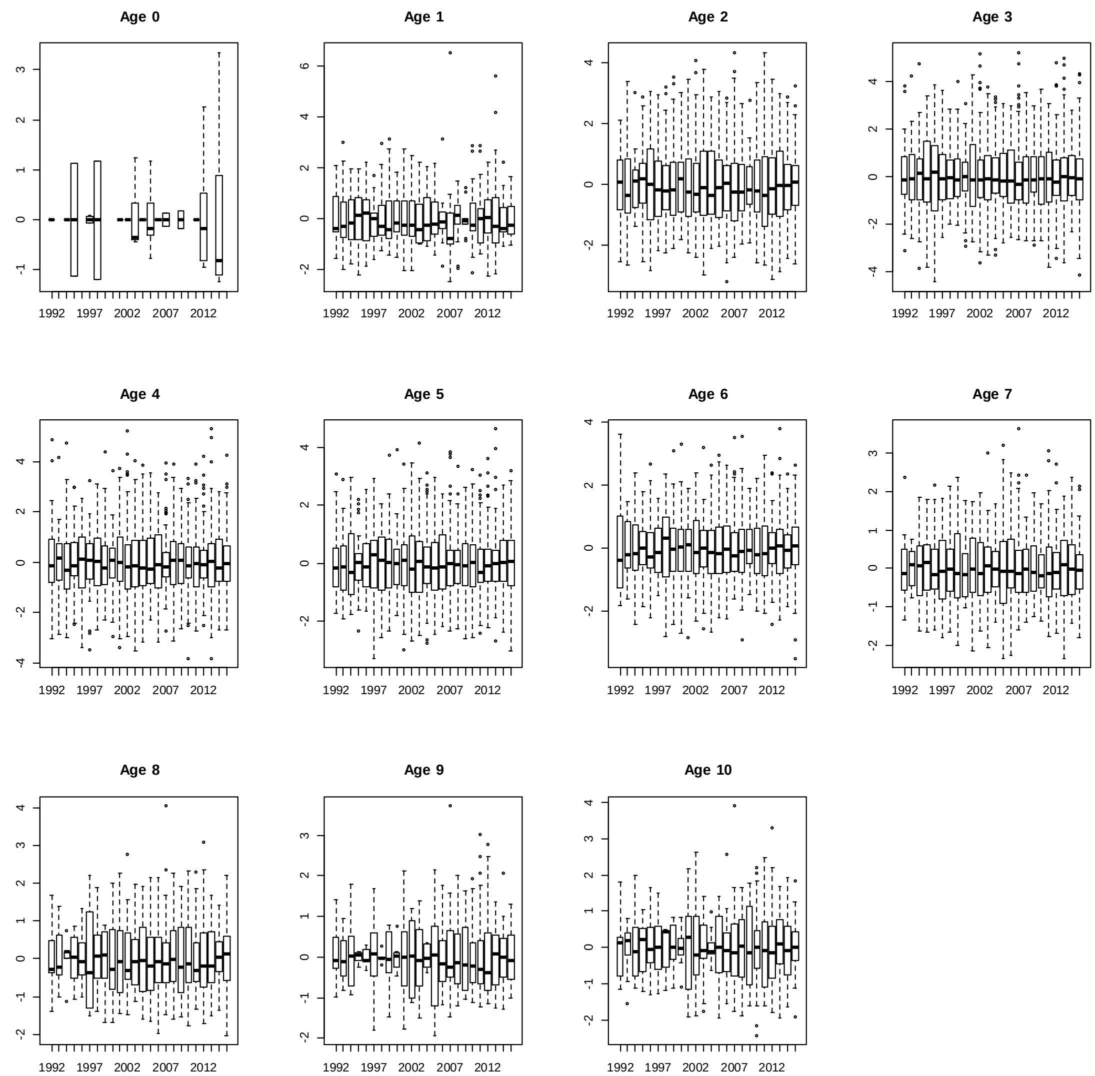


Figure 7C. Boxplot of residuals by year for positive/presence delta GAM model for ages 1-10 (no truncation, without *Ship* in model).

Positive / Presence GAM model

```
[1] "Age 0"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + s(lon, lat, k = kvecP[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  -3.1341     1.1077  -2.829  0.00704 **
Year1994     -0.5673     1.5892  -0.357  0.72287
Year1995      0.9964     1.3597   0.733  0.46763
Year1997     -0.2509     1.2574  -0.200  0.84280
Year1998     -0.6543     1.3654  -0.479  0.63421
Year2001     -0.6418     1.5999  -0.401  0.69028
Year2002     -0.4587     1.5759  -0.291  0.77237
Year2003      0.2789     1.1953   0.233  0.81661
Year2004     -0.5786     1.5864  -0.365  0.71711
Year2005      0.1957     1.1443   0.171  0.86502
Year2006     -0.2215     1.5369  -0.144  0.88606
Year2007     -0.4392     1.3724  -0.320  0.75052
Year2009     -0.4357     1.3610  -0.320  0.75040
Year2011     -0.4126     1.5627  -0.264  0.79299
Year2012      0.6768     1.1552   0.586  0.56100
Year2014      0.6376     1.1843   0.538  0.59307
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
                 edf Ref.df     F p-value
s(lon,lat) 7.103e-01     23 0.087  0.0809 .
s(Depth)   5.534e-05      5 0.000  0.8087
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  -0.0863   Deviance explained = 22.2%
-ML = 81.763  Scale est. = 1.1748    n = 60
```

```
[1] "Age 1"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + s(lon, lat, k = kvecP[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -2.74539    0.51064  -5.376 1.23e-07 ***
Year1993     0.13737    0.55984   0.245  0.80628
Year1994    -1.54147    0.62601  -2.462  0.01418 *
Year1995    -1.42722    0.58620  -2.435  0.01529 *
Year1996    -1.63858    0.56505  -2.900  0.00392 **
Year1997    -1.66803    0.59500  -2.803  0.00528 **
Year1998    -0.93415    0.56378  -1.657  0.09823 .
Year1999    -1.49638    0.55546  -2.694  0.00733 **
Year2000    -1.56386    0.61087  -2.560  0.01079 *
Year2001    -1.37413    0.55348  -2.483  0.01340 *
Year2002    -1.17276    0.58886  -1.992  0.04702 *
Year2003    -0.31710    0.70025  -0.453  0.65089
Year2004     0.04506    0.58966   0.076  0.93912
Year2005    -1.31782    0.56546  -2.331  0.02022 *
Year2006    -0.30395    0.60955  -0.499  0.61827
Year2007    -0.11528    0.64058  -0.180  0.85727
Year2008    -0.19058    0.59940  -0.318  0.75067
Year2009    -0.24683    0.63672  -0.388  0.69846
Year2010     0.03537    0.55668   0.064  0.94937
Year2011    -1.30796    0.57478  -2.276  0.02334 *
Year2012    -0.35320    0.59996  -0.589  0.55635
Year2013    -0.12096    0.55123  -0.219  0.82640
Year2014    -0.14342    0.59941  -0.239  0.81101
Year2015     0.56102    0.68516   0.819  0.41332
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
             edf Ref.df     F p-value
s(lon,lat) 6.227     23 1.768 2.1e-08 ***
s(Depth)   2.598      5 2.196 0.00366 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.308   Deviance explained = 35.6%
-ML = 779.32  Scale est. = 1.4646    n = 481
```

```
[1] "Age 2"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + s(lon, lat, k = kvecP[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -3.339539   0.236437 -14.124  < 2e-16 ***
Year1993     0.400069   0.305463   1.310  0.19056
Year1994     0.079573   0.409028   0.195  0.84579
Year1995     0.030971   0.359568   0.086  0.93138
Year1996     0.249178   0.327745   0.760  0.44725
Year1997     0.007846   0.308466   0.025  0.97971
Year1998     0.358237   0.318783   1.124  0.26136
Year1999     0.088751   0.296013   0.300  0.76437
Year2000    -0.399973   0.306264  -1.306  0.19183
Year2001     0.727703   0.279103   2.607  0.00925 **
Year2002     0.036186   0.289325   0.125  0.90049
Year2003     0.253363   0.287555   0.881  0.37846
Year2004    -0.562038   0.333073  -1.687  0.09180 .
Year2005    -0.190690   0.309553  -0.616  0.53801
Year2006     0.241902   0.308509   0.784  0.43315
Year2007     0.202058   0.299432   0.675  0.49994
Year2008    -0.525329   0.372459  -1.410  0.15869
Year2009    -0.076929   0.393708  -0.195  0.84512
Year2010     0.277345   0.310206   0.894  0.37148
Year2011     0.451091   0.296011   1.524  0.12782
Year2012     0.123187   0.292872   0.421  0.67412
Year2013    -0.063163   0.319753  -0.198  0.84344
Year2014    -0.065233   0.334969  -0.195  0.84563
Year2015     0.111203   0.304483   0.365  0.71502
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df     F  p-value
s(lon,lat) 27.159    143 1.496  < 2e-16 ***
s(Depth)    3.799      5 7.625 1.01e-09 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.181   Deviance explained = 22.2%
-ML = 2059.3  Scale est. = 1.8856    n = 1167
```

```
[1] "Age 3"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + s(lon, lat, k = kvecP[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -3.152537   0.206383 -15.275  < 2e-16 ***
Year1993     0.615816   0.296007   2.080 0.037642 *
Year1994    -0.068407   0.301340  -0.227 0.820445
Year1995     1.445632   0.293468   4.926 9.24e-07 ***
Year1996     0.566015   0.300087   1.886 0.059448 .
Year1997    -0.050191   0.289884  -0.173 0.862561
Year1998    -0.173521   0.315685  -0.550 0.582625
Year1999     0.009768   0.270221   0.036 0.971167
Year2000     0.583513   0.278333   2.096 0.036194 *
Year2001     1.867810   0.254669   7.334 3.48e-13 ***
Year2002     0.989708   0.254228   3.893 0.000103 ***
Year2003     1.458513   0.252089   5.786 8.63e-09 ***
Year2004     0.692812   0.271772   2.549 0.010886 *
Year2005     1.394093   0.267514   5.211 2.11e-07 ***
Year2006     0.451106   0.261810   1.723 0.085071 .
Year2007     0.940133   0.264235   3.558 0.000384 ***
Year2008     0.283968   0.280798   1.011 0.312027
Year2009    -0.214424   0.323243  -0.663 0.507197
Year2010    -0.080260   0.285227  -0.281 0.778448
Year2011     0.778544   0.263086   2.959 0.003128 **
Year2012     1.411558   0.262557   5.376 8.70e-08 ***
Year2013     1.082669   0.254553   4.253 2.23e-05 ***
Year2014    -0.055283   0.270887  -0.204 0.838314
Year2015     1.141712   0.251412   4.541 6.00e-06 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df      F p-value
s(lon,lat) 38.497    143  3.954  <2e-16 ***
s(Depth)    3.927      5 13.103  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =   0.36   Deviance explained = 39.1%
-ML =   3143  Scale est. = 2.1775    n = 1712
```

```
[1] "Age 4"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + s(lon, lat, k = kvecP[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -2.29573    0.18604 -12.340  < 2e-16 ***
Year1993    -0.75947    0.28536  -2.661 0.007855 **
Year1994    -0.51636    0.26676  -1.936 0.053078 .
Year1995     0.04211    0.26286   0.160 0.872747
Year1996     0.48787    0.27208   1.793 0.073132 .
Year1997    -0.72512    0.26961  -2.690 0.007227 **
Year1998    -0.06435    0.26444  -0.243 0.807775
Year1999    -0.83447    0.25197  -3.312 0.000947 ***
Year2000     0.59989    0.25237   2.377 0.017563 *
Year2001     0.13644    0.23825   0.573 0.566940
Year2002     0.57972    0.23148   2.504 0.012359 *
Year2003     0.59688    0.22938   2.602 0.009347 **
Year2004    -0.04259    0.24045  -0.177 0.859431
Year2005     0.06312    0.24680   0.256 0.798176
Year2006     0.70052    0.23709   2.955 0.003174 **
Year2007    -0.92845    0.23815  -3.899 0.000101 ***
Year2008    -0.22485    0.24783  -0.907 0.364386
Year2009    -0.61793    0.29300  -2.109 0.035097 *
Year2010    -0.78887    0.26190  -3.012 0.002634 **
Year2011     0.20651    0.23502   0.879 0.379714
Year2012    -0.43857    0.23409  -1.874 0.061169 .
Year2013     0.72946    0.23021   3.169 0.001559 **
Year2014    -0.17106    0.24252  -0.705 0.480712
Year2015     0.08160    0.23167   0.352 0.724722
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df      F p-value
s(lon,lat) 41.395    143  3.896  <2e-16 ***
s(Depth)    3.897      5 15.103  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =    0.4   Deviance explained = 42.7%
-ML =   3048  Scale est. = 1.8448    n = 1737
```

```
[1] "Age 5"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + s(lon, lat, k = kvecP[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  -3.9260     0.2219 -17.693  < 2e-16 ***
Year1993      1.0118     0.3131   3.231 0.001259 **
Year1994      0.4358     0.2926   1.489 0.136639
Year1995      1.1667     0.2826   4.128 3.85e-05 ***
Year1996      0.7251     0.2869   2.528 0.011583 *
Year1997      1.6484     0.2773   5.944 3.46e-09 ***
Year1998      0.9995     0.2819   3.545 0.000404 ***
Year1999      1.4814     0.2661   5.567 3.07e-08 ***
Year2000      0.5598     0.2715   2.062 0.039419 *
Year2001      1.7700     0.2565   6.900 7.68e-12 ***
Year2002      0.8500     0.2598   3.271 0.001095 **
Year2003      1.8042     0.2524   7.150 1.36e-12 ***
Year2004      1.5486     0.2595   5.968 2.99e-09 ***
Year2005      1.5622     0.2644   5.909 4.26e-09 ***
Year2006      1.0826     0.2621   4.131 3.81e-05 ***
Year2007      1.6640     0.2550   6.524 9.32e-11 ***
Year2008      0.1824     0.2723   0.670 0.503229
Year2009      0.4814     0.3046   1.580 0.114251
Year2010      0.4734     0.2753   1.720 0.085704 .
Year2011      0.6839     0.2605   2.626 0.008729 **
Year2012      1.7055     0.2540   6.715 2.66e-11 ***
Year2013      0.8300     0.2561   3.241 0.001218 **
Year2014      1.4507     0.2602   5.574 2.94e-08 ***
Year2015      2.0759     0.2576   8.060 1.55e-15 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df      F p-value
s(lon,lat) 34.838    143  3.018  <2e-16 ***
s(Depth)    4.063      5 21.466  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.395   Deviance explained = 42.8%
-ML = 2521.4  Scale est. = 1.406     n = 1559
```

```
[1] "Age 6"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + s(lon, lat, k = kvecP[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  -4.3561     0.2530 -17.218  < 2e-16 ***
Year1993      0.5110     0.3370   1.517 0.129635
Year1994      1.0238     0.3170   3.230 0.001273 **
Year1995      0.4081     0.3139   1.300 0.193894
Year1996      0.8474     0.3063   2.766 0.005755 **
Year1997      0.5192     0.3021   1.719 0.085908 .
Year1998      1.7049     0.2995   5.692 1.57e-08 ***
Year1999      0.5021     0.2900   1.731 0.083635 .
Year2000      1.0153     0.2952   3.439 0.000603 ***
Year2001      0.6834     0.2884   2.370 0.017941 *
Year2002      1.4101     0.2865   4.923 9.70e-07 ***
Year2003      0.4700     0.2915   1.613 0.107091
Year2004      1.2415     0.2817   4.408 1.14e-05 ***
Year2005      1.5171     0.2868   5.290 1.45e-07 ***
Year2006      1.3286     0.2879   4.615 4.35e-06 ***
Year2007      0.7494     0.2811   2.666 0.007781 **
Year2008      1.6082     0.2880   5.584 2.88e-08 ***
Year2009      0.2078     0.3549   0.586 0.558248
Year2010      0.7017     0.2997   2.342 0.019350 *
Year2011      1.0667     0.2852   3.740 0.000193 ***
Year2012      0.8331     0.2846   2.927 0.003482 **
Year2013      1.5641     0.2788   5.610 2.50e-08 ***
Year2014      0.6179     0.2872   2.151 0.031636 *
Year2015      1.6904     0.2812   6.012 2.41e-09 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df      F  p-value
s(lon,lat) 34.667    143  1.779  < 2e-16 ***
s(Depth)    3.903      5 12.499 2.62e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =   0.33   Deviance explained = 36.6%
-ML = 1948.3  Scale est. = 1.13      n = 1287
```

```
[1] "Age 7"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + s(lon, lat, k = kvecP[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -4.22942    0.22436 -18.851  < 2e-16 ***
Year1993    -0.68171    0.37992  -1.794 0.073082 .
Year1994     0.23847    0.29612   0.805 0.420851
Year1995     0.25160    0.28227   0.891 0.372972
Year1996     0.32829    0.28580   1.149 0.250981
Year1997     0.38267    0.27572   1.388 0.165500
Year1998     0.12641    0.30316   0.417 0.676800
Year1999     0.64880    0.26387   2.459 0.014123 *
Year2000     0.09150    0.29976   0.305 0.760236
Year2001     0.82911    0.26059   3.182 0.001513 **
Year2002     0.03895    0.26899   0.145 0.884896
Year2003     0.52266    0.26993   1.936 0.053135 .
Year2004    -0.35466    0.27083  -1.310 0.190678
Year2005     0.97760    0.25709   3.803 0.000153 ***
Year2006     0.61729    0.26202   2.356 0.018688 *
Year2007     0.41451    0.25384   1.633 0.102822
Year2008     0.35918    0.26521   1.354 0.175958
Year2009     0.42360    0.31821   1.331 0.183455
Year2010    -0.17981    0.30997  -0.580 0.562008
Year2011     0.16638    0.26253   0.634 0.526406
Year2012     0.77616    0.26086   2.975 0.003003 **
Year2013     0.45099    0.25817   1.747 0.080996 .
Year2014     0.79180    0.25772   3.072 0.002186 **
Year2015     0.44245    0.26248   1.686 0.092200 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df     F p-value
s(lon,lat) 29.768    143 0.924 < 2e-16 ***
s(Depth)    2.551      5 2.746 0.00017 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.215   Deviance explained = 26.1%
-ML = 1386.2  Scale est. = 0.92668   n = 979
```

```
[1] "Age 8"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + s(lon, lat, k = kvecP[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -3.718967   0.217494 -17.099  < 2e-16 ***
Year1993    -0.519661   0.378732  -1.372  0.17051
Year1994    -0.249056   0.471412  -0.528  0.59746
Year1995    -0.465428   0.329713  -1.412  0.15855
Year1996    -1.224930   0.287874  -4.255  2.4e-05 ***
Year1997    -0.665500   0.367843  -1.809  0.07089 .
Year1998    -0.027953   0.301126  -0.093  0.92607
Year1999    -0.308883   0.305234  -1.012  0.31194
Year2000    -0.020653   0.305832  -0.068  0.94618
Year2001    -0.457694   0.275321  -1.662  0.09692 .
Year2002    -0.057186   0.259080  -0.221  0.82538
Year2003    -0.373387   0.274545  -1.360  0.17430
Year2004    -0.472984   0.281400  -1.681  0.09329 .
Year2005    -0.640656   0.280042  -2.288  0.02248 *
Year2006     0.033838   0.260881   0.130  0.89684
Year2007    -0.433240   0.254176  -1.704  0.08878 .
Year2008    -0.062061   0.256797  -0.242  0.80911
Year2009     0.007466   0.320450   0.023  0.98142
Year2010     0.179872   0.272718   0.660  0.50978
Year2011    -0.941241   0.296174  -3.178  0.00155 **
Year2012    -0.120095   0.255376  -0.470  0.63832
Year2013    -0.344318   0.262782  -1.310  0.19057
Year2014    -0.598323   0.270063  -2.215  0.02708 *
Year2015     0.289470   0.261664   1.106  0.26903
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df     F  p-value
s(lon,lat) 13.592    143 0.300 4.44e-06 ***
s(Depth)    1.647      5 1.185   0.0151 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.136   Deviance explained = 19.7%
-ML = 922.37  Scale est. = 0.85379   n = 679
```

```
[1] "Age 9"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + s(lon, lat, k = kvecP[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -4.22041    0.21136 -19.968  < 2e-16 ***
Year1993    -0.18498    0.54632  -0.339  0.73508
Year1994     0.27276    0.32855   0.830  0.40688
Year1995    -1.09799    0.48425  -2.267  0.02385 *
Year1996    -1.04418    0.39206  -2.663  0.00802 **
Year1997     0.39335    0.27858   1.412  0.15866
Year1998    -1.03858    0.44313  -2.344  0.01954 *
Year1999     0.19533    0.30338   0.644  0.52002
Year2000    -0.66801    0.34750  -1.922  0.05521 .
Year2001     0.34929    0.28767   1.214  0.22531
Year2002    -0.22919    0.41401  -0.554  0.58015
Year2003     0.32476    0.26976   1.204  0.22928
Year2004    -0.13872    0.41376  -0.335  0.73759
Year2005     0.62687    0.28218   2.222  0.02682 *
Year2006    -0.29555    0.26970  -1.096  0.27375
Year2007     0.12184    0.25637   0.475  0.63484
Year2008    -0.11354    0.25551  -0.444  0.65699
Year2009    -0.37849    0.32863  -1.152  0.25006
Year2010    -0.23036    0.28141  -0.819  0.41347
Year2011    -0.20773    0.25749  -0.807  0.42026
Year2012    -0.35615    0.25219  -1.412  0.15859
Year2013     0.15839    0.26003   0.609  0.54276
Year2014    -0.09183    0.29465  -0.312  0.75544
Year2015     0.10915    0.27211   0.401  0.68851
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
                 edf Ref.df     F p-value
s(lon,lat) 0.0003748    143 0.000   0.379
s(Depth)   0.4982015      5 0.193   0.164

R-sq.(adj) =  0.0888   Deviance explained = 14.5%
-ML = 582.29  Scale est. = 0.75847   n = 464
```

```
[1] "Age 10"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + s(lon, lat, k = kvecP[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -4.236308   0.281853 -15.030  < 2e-16 ***
Year1993     1.157036   0.412324   2.806  0.00523 **
Year1994     0.592517   0.403794   1.467  0.14296
Year1995     0.630977   0.397352   1.588  0.11298
Year1996    -0.070259   0.337722  -0.208  0.83529
Year1997     0.569915   0.352288   1.618  0.10640
Year1998    -0.095558   0.452402  -0.211  0.83281
Year1999     0.280342   0.393452   0.713  0.47651
Year2000    -0.006083   0.412795  -0.015  0.98825
Year2001     0.794187   0.384904   2.063  0.03964 *
Year2002     0.619625   0.345284   1.795  0.07338 .
Year2003     0.768624   0.349099   2.202  0.02818 *
Year2004     0.840603   0.412884   2.036  0.04233 *
Year2005     0.674020   0.361019   1.867  0.06254 .
Year2006     0.386631   0.349624   1.106  0.26937
Year2007     0.378810   0.355159   1.067  0.28672
Year2008     0.256885   0.328191   0.783  0.43419
Year2009     0.208673   0.403983   0.517  0.60573
Year2010     0.805138   0.335047   2.403  0.01665 *
Year2011     0.239643   0.345065   0.694  0.48773
Year2012     0.581414   0.321412   1.809  0.07111 .
Year2013     0.890170   0.332793   2.675  0.00774 **
Year2014     0.529301   0.361809   1.463  0.14417
Year2015     0.830691   0.361083   2.301  0.02186 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df     F  p-value
s(lon,lat) 11.004    143 0.203 0.000442 ***
s(Depth)    2.515      5 1.841 0.005907 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.0959   Deviance explained = 17.1%
-ML = 711.91  Scale est. = 0.98326   n = 497
```

Non-positive / Absence GAM model

```
[1] "Age 0"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + s(lon, lat, k = kvecZ[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -1.028e+01  1.037e+00  -9.920   <2e-16 ***
Year1993    -3.131e+01  3.975e+06   0.000   1.0000
Year1994    -2.395e-02  1.426e+00  -0.017   0.9866
Year1995     7.662e-01  1.239e+00   0.619   0.5362
Year1996    -3.125e+01  3.927e+06   0.000   1.0000
Year1997     1.899e+00  1.136e+00   1.671   0.0946 .
Year1998     8.126e-01  1.240e+00   0.655   0.5124
Year1999    -3.104e+01  3.522e+06   0.000   1.0000
Year2000    -3.045e+01  4.194e+06   0.000   1.0000
Year2001     2.692e-02  1.427e+00   0.019   0.9850
Year2002     2.109e-02  1.427e+00   0.015   0.9882
Year2003     1.918e+00  1.097e+00   1.749   0.0803 .
Year2004    -1.607e-02  1.427e+00  -0.011   0.9910
Year2005     2.694e+00  1.059e+00   2.544   0.0110 *
Year2006     8.599e-02  1.428e+00   0.060   0.9520
Year2007     7.426e-01  1.240e+00   0.599   0.5493
Year2008    -3.103e+01  3.728e+06   0.000   1.0000
Year2009     8.081e-01  1.241e+00   0.651   0.5150
Year2010    -3.100e+01  3.751e+06   0.000   1.0000
Year2011     7.919e-02  1.428e+00   0.055   0.9558
Year2012     3.008e+00  1.054e+00   2.855   0.0043 **
Year2013    -3.107e+01  3.769e+06   0.000   1.0000
Year2014     2.279e+00  1.081e+00   2.107   0.0351 *
Year2015    -3.081e+01  3.542e+06   0.000   1.0000
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
               edf Ref.df  Chi.sq p-value
s(lon,lat) 21.4398     63 111.820  <2e-16 ***
s(Depth)    0.1109      5   0.106   0.307
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.145   Deviance explained =   38%
-ML = 258.32  Scale est. = 1         n = 7425
```

```
[1] "Age 1"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + s(lon, lat, k = kvecZ[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  -8.8569     0.4545 -19.489  < 2e-16 ***
Year1993      2.4203     0.4865   4.975 6.51e-07 ***
Year1994      0.7775     0.5348   1.454 0.146021
Year1995      1.5299     0.5044   3.033 0.002422 **
Year1996      2.3784     0.4900   4.854 1.21e-06 ***
Year1997      1.5777     0.5173   3.050 0.002290 **
Year1998      2.3458     0.4874   4.813 1.49e-06 ***
Year1999      2.2019     0.4765   4.621 3.82e-06 ***
Year2000      1.5513     0.5307   2.923 0.003467 **
Year2001      2.3725     0.4763   4.981 6.32e-07 ***
Year2002      1.2058     0.5094   2.367 0.017939 *
Year2003      0.2739     0.5879   0.466 0.641312
Year2004      1.3864     0.5037   2.752 0.005918 **
Year2005      2.1199     0.4827   4.392 1.12e-05 ***
Year2006      0.9567     0.5334   1.793 0.072901 .
Year2007      0.8248     0.5414   1.524 0.127618
Year2008      1.2598     0.5179   2.433 0.014982 *
Year2009      1.0308     0.5512   1.870 0.061460 .
Year2010      1.8409     0.4931   3.734 0.000189 ***
Year2011      1.5096     0.5030   3.001 0.002689 **
Year2012      1.2117     0.5164   2.346 0.018953 *
Year2013      2.3275     0.4769   4.881 1.06e-06 ***
Year2014      1.3439     0.5097   2.637 0.008370 **
Year2015      0.3992     0.5865   0.681 0.496125
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 25.686     63 499.56  <2e-16 ***
s(Depth)    3.527      5  70.37  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.238   Deviance explained = 30.6%
-ML = 1296.5  Scale est. = 1         n = 7425
```

```
[1] "Age 2"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + s(lon, lat, k = kvecZ[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  -7.4240     0.3342 -22.214  < 2e-16 ***
Year1993      0.6760     0.3176   2.128 0.033325 *
Year1994     -1.4986     0.3627  -4.131 3.61e-05 ***
Year1995     -0.6807     0.3331  -2.044 0.040993 *
Year1996      0.0767     0.3279   0.234 0.815048
Year1997      0.6524     0.3259   2.002 0.045296 *
Year1998      0.1478     0.3165   0.467 0.640581
Year1999      0.1399     0.2922   0.479 0.632020
Year2000      0.7694     0.3052   2.521 0.011713 *
Year2001      1.2615     0.2859   4.412 1.03e-05 ***
Year2002      0.6769     0.2877   2.353 0.018641 *
Year2003      1.0849     0.2883   3.763 0.000168 ***
Year2004     -0.5041     0.3098  -1.627 0.103693
Year2005      0.1322     0.2987   0.443 0.658099
Year2006      0.1957     0.3008   0.651 0.515216
Year2007      0.4776     0.2951   1.619 0.105539
Year2008     -1.0395     0.3364  -3.090 0.002002 **
Year2009     -0.8274     0.3575  -2.314 0.020648 *
Year2010      0.3702     0.2967   1.248 0.212130
Year2011      0.7226     0.2925   2.471 0.013486 *
Year2012      0.8056     0.2906   2.772 0.005569 **
Year2013     -0.2642     0.3056  -0.865 0.387274
Year2014     -0.5942     0.3169  -1.875 0.060796 .
Year2015      0.3035     0.2956   1.027 0.304546
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 29.581     63  650.9  <2e-16 ***
s(Depth)    4.518      5  149.2  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.442   Deviance explained = 45.4%
-ML = 1848.1  Scale est. = 1         n = 7425
```

```
[1] "Age 3"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + s(lon, lat, k = kvecZ[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -7.47089    0.36249 -20.610  < 2e-16 ***
Year1993    -0.13799    0.35563  -0.388  0.69801
Year1994    -0.90311    0.33657  -2.683  0.00729 **
Year1995    -0.30072    0.34014  -0.884  0.37663
Year1996    -0.23579    0.35948  -0.656  0.51188
Year1997     0.31027    0.36554   0.849  0.39600
Year1998    -0.79411    0.34605  -2.295  0.02174 *
Year1999    -0.33460    0.31520  -1.062  0.28844
Year2000     0.12773    0.33627   0.380  0.70406
Year2001     0.85234    0.31805   2.680  0.00736 **
Year2002     0.89423    0.31595   2.830  0.00465 **
Year2003     1.50113    0.32082   4.679 2.88e-06 ***
Year2004    -0.09255    0.31773  -0.291  0.77085
Year2005     0.16109    0.32445   0.497  0.61954
Year2006     0.82920    0.32867   2.523  0.01164 *
Year2007     0.35947    0.32708   1.099  0.27175
Year2008    -0.30926    0.33379  -0.926  0.35419
Year2009    -0.73255    0.35778  -2.047  0.04061 *
Year2010    -0.58766    0.32412  -1.813  0.06982 .
Year2011     0.77438    0.32261   2.400  0.01638 *
Year2012     0.63891    0.32493   1.966  0.04926 *
Year2013     1.29704    0.32280   4.018 5.87e-05 ***
Year2014     0.06933    0.32560   0.213  0.83137
Year2015     1.63925    0.31750   5.163 2.43e-07 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 25.349     63  698.6  <2e-16 ***
s(Depth)    4.547      5  237.9  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.634   Deviance explained = 61.4%
-ML = 1626.3  Scale est. = 1         n = 7425
```

```
[1] "Age 4"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + s(lon, lat, k = kvecZ[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -7.32835    0.39140 -18.724  < 2e-16 ***
Year1993    -1.07485    0.38573  -2.787 0.005327 **
Year1994    -0.98428    0.36068  -2.729 0.006353 **
Year1995    -0.38501    0.36489  -1.055 0.291358
Year1996    -0.43701    0.38939  -1.122 0.261733
Year1997    -0.21670    0.39439  -0.549 0.582693
Year1998    -0.30593    0.36483  -0.839 0.401724
Year1999    -1.00561    0.33894  -2.967 0.003007 **
Year2000    -0.23971    0.36121  -0.664 0.506924
Year2001     0.06703    0.33964   0.197 0.843555
Year2002     0.59872    0.33737   1.775 0.075948 .
Year2003     1.38358    0.34178   4.048 5.16e-05 ***
Year2004     0.05661    0.33944   0.167 0.867546
Year2005    -0.52749    0.34830  -1.514 0.129906
Year2006     0.63617    0.35292   1.803 0.071456 .
Year2007     0.23480    0.35305   0.665 0.506019
Year2008    -0.18021    0.36043  -0.500 0.617082
Year2009    -1.06879    0.38073  -2.807 0.004997 **
Year2010    -1.19605    0.34702  -3.447 0.000568 ***
Year2011     0.88541    0.34357   2.577 0.009964 **
Year2012     0.78731    0.34770   2.264 0.023551 *
Year2013     1.28832    0.34349   3.751 0.000176 ***
Year2014     0.02408    0.34887   0.069 0.944972
Year2015     1.08011    0.34080   3.169 0.001528 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 25.772     63  648.6  <2e-16 ***
s(Depth)    4.487      5  270.1  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.688   Deviance explained = 66.3%
-ML = 1437.9  Scale est. = 1         n = 7425
```

```
[1] "Age 5"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + s(lon, lat, k = kvecZ[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -9.49978    0.49929 -19.027  < 2e-16 ***
Year1993     0.07906    0.42869   0.184 0.853690
Year1994     0.32030    0.40218   0.796 0.425805
Year1995     1.24291    0.40507   3.068 0.002152 **
Year1996     1.25169    0.43310   2.890 0.003852 **
Year1997     2.28735    0.43825   5.219 1.80e-07 ***
Year1998     1.48002    0.40925   3.616 0.000299 ***
Year1999     0.93863    0.37794   2.484 0.013009 *
Year2000     1.17509    0.39873   2.947 0.003208 **
Year2001     2.11368    0.38339   5.513 3.52e-08 ***
Year2002     1.71820    0.38023   4.519 6.22e-06 ***
Year2003     3.28676    0.38948   8.439  < 2e-16 ***
Year2004     2.02275    0.38332   5.277 1.31e-07 ***
Year2005     1.19326    0.38635   3.089 0.002012 **
Year2006     1.77628    0.39157   4.536 5.72e-06 ***
Year2007     2.51723    0.39907   6.308 2.83e-10 ***
Year2008     0.90351    0.39646   2.279 0.022670 *
Year2009     0.54279    0.41893   1.296 0.195089
Year2010     0.58226    0.38079   1.529 0.126245
Year2011     2.01838    0.38950   5.182 2.20e-07 ***
Year2012     2.87427    0.39385   7.298 2.92e-13 ***
Year2013     2.49780    0.39164   6.378 1.80e-10 ***
Year2014     1.97889    0.39099   5.061 4.16e-07 ***
Year2015     2.28327    0.38636   5.910 3.43e-09 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 28.141     63  566.8  <2e-16 ***
s(Depth)    4.351      5  240.4  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.696   Deviance explained = 68.2%
-ML = 1295.3  Scale est. = 1         n = 7425
```

```
[1] "Age 6"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + s(lon, lat, k = kvecZ[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -10.3724     0.5506 -18.837  < 2e-16 ***
Year1993      0.6547     0.4675   1.401  0.16134
Year1994      0.8901     0.4407   2.020  0.04340 *
Year1995      1.4011     0.4408   3.178  0.00148 **
Year1996      1.9333     0.4636   4.170 3.05e-05 ***
Year1997      2.4952     0.4665   5.349 8.86e-08 ***
Year1998      2.5395     0.4453   5.702 1.18e-08 ***
Year1999      1.6657     0.4141   4.023 5.75e-05 ***
Year2000      1.8862     0.4318   4.368 1.25e-05 ***
Year2001      2.0650     0.4133   4.996 5.85e-07 ***
Year2002      2.1806     0.4146   5.260 1.44e-07 ***
Year2003      1.8112     0.4185   4.328 1.50e-05 ***
Year2004      3.0615     0.4198   7.293 3.04e-13 ***
Year2005      2.0461     0.4200   4.871 1.11e-06 ***
Year2006      2.2080     0.4207   5.248 1.54e-07 ***
Year2007      2.9346     0.4262   6.886 5.72e-12 ***
Year2008      2.3266     0.4327   5.376 7.60e-08 ***
Year2009      0.3827     0.4729   0.809  0.41837
Year2010      1.2653     0.4173   3.032  0.00243 **
Year2011      2.6963     0.4230   6.374 1.84e-10 ***
Year2012      2.4861     0.4223   5.888 3.91e-09 ***
Year2013      3.6483     0.4277   8.530  < 2e-16 ***
Year2014      2.3890     0.4235   5.641 1.69e-08 ***
Year2015      3.0834     0.4213   7.319 2.50e-13 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
               edf Ref.df Chi.sq p-value
s(lon,lat) 27.352     63  477.6  <2e-16 ***
s(Depth)    4.471      5  242.5  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =   0.66   Deviance explained = 66.1%
-ML = 1239.2  Scale est. = 1         n = 7425
```

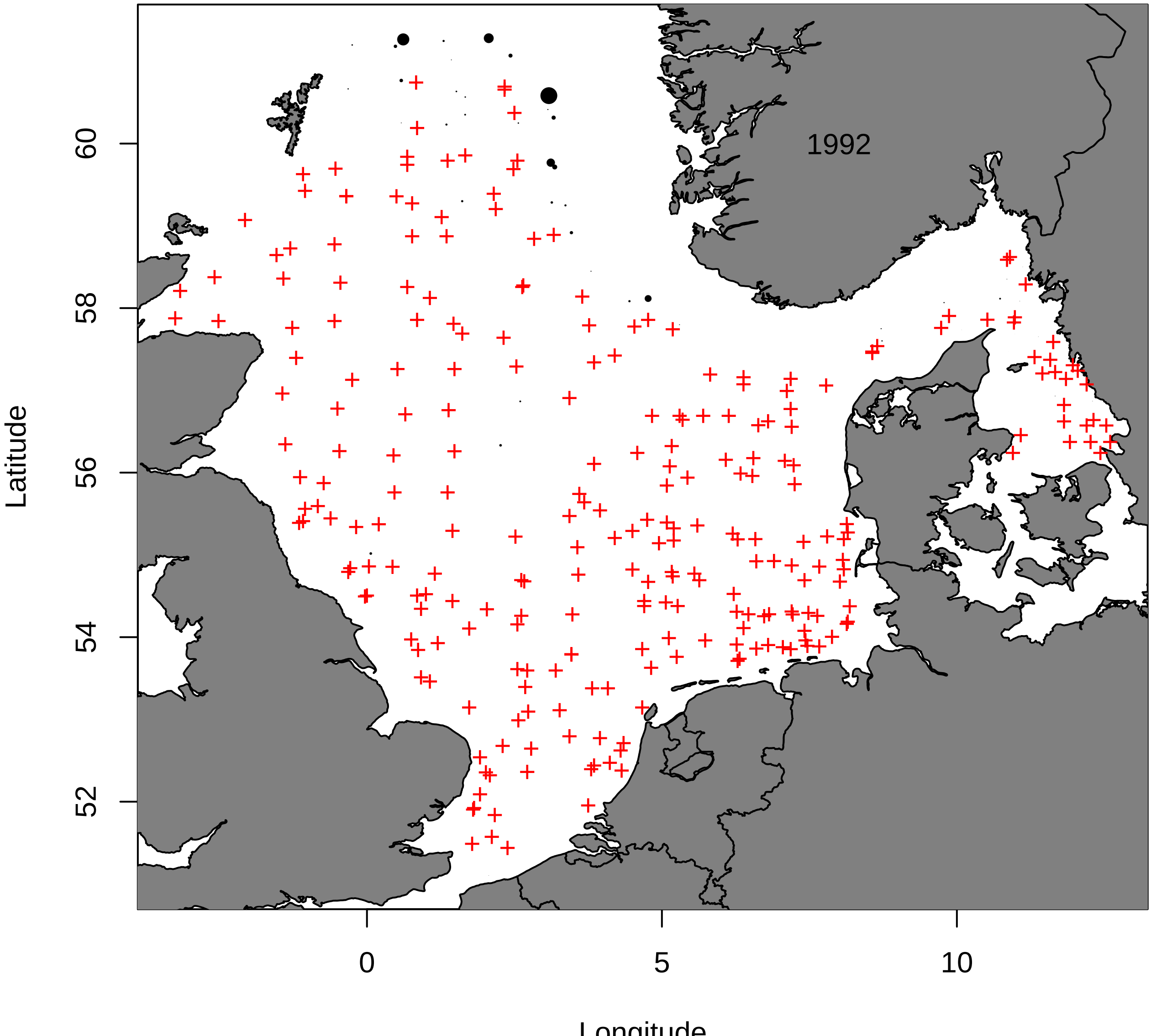
```
[1] "Age 7"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + s(lon, lat, k = kvecZ[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -10.002596   0.587225 -17.034  < 2e-16 ***
Year1993     -0.905056   0.504151  -1.795 0.072620 .
Year1994      0.276964   0.429695   0.645 0.519213
Year1995      1.129386   0.424977   2.658 0.007872 **
Year1996      0.992789   0.446933   2.221 0.026328 *
Year1997      1.777504   0.442828   4.014 5.97e-05 ***
Year1998      0.529080   0.443819   1.192 0.233219
Year1999      1.134948   0.396413   2.863 0.004196 **
Year2000     -0.009036   0.427831  -0.021 0.983149
Year2001      1.626366   0.394391   4.124 3.73e-05 ***
Year2002      0.910391   0.398513   2.284 0.022344 *
Year2003      0.993853   0.402998   2.466 0.013658 *
Year2004      0.909436   0.403761   2.252 0.024296 *
Year2005      1.760520   0.399751   4.404 1.06e-05 ***
Year2006      1.458185   0.400054   3.645 0.000267 ***
Year2007      2.208430   0.401517   5.500 3.79e-08 ***
Year2008      1.311104   0.410465   3.194 0.001402 **
Year2009      0.235897   0.455573   0.518 0.604596
Year2010     -0.347366   0.424817  -0.818 0.413538
Year2011      1.583252   0.399958   3.959 7.54e-05 ***
Year2012      1.548198   0.398525   3.885 0.000102 ***
Year2013      1.741359   0.399496   4.359 1.31e-05 ***
Year2014      1.977180   0.401922   4.919 8.68e-07 ***
Year2015      1.511727   0.399709   3.782 0.000156 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 27.081     63  362.6  <2e-16 ***
s(Depth)    4.375      5  195.7  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.569   Deviance explained = 60.1%
-ML = 1232.8  Scale est. = 1         n = 7425
```

```
[1] "Age 8"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + s(lon, lat, k = kvecZ[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -9.61371    0.64507 -14.903  < 2e-16 ***
Year1993    -1.05153    0.50720  -2.073 0.038151 *
Year1994    -2.14279    0.57758  -3.710 0.000207 ***
Year1995    -0.50238    0.46445  -1.082 0.279396
Year1996     0.41895    0.44666   0.938 0.348263
Year1997    -0.94653    0.50106  -1.889 0.058887 .
Year1998     0.26274    0.44521   0.590 0.555095
Year1999    -0.67926    0.42530  -1.597 0.110234
Year2000    -0.39821    0.43496  -0.916 0.359920
Year2001     0.28528    0.40298   0.708 0.478992
Year2002     0.91898    0.39237   2.342 0.019174 *
Year2003     0.35144    0.40544   0.867 0.386054
Year2004     0.10512    0.40907   0.257 0.797194
Year2005    -0.03002    0.41015  -0.073 0.941648
Year2006     0.90315    0.39695   2.275 0.022891 *
Year2007     1.31780    0.39399   3.345 0.000824 ***
Year2008     1.23246    0.40346   3.055 0.002253 **
Year2009    -0.10869    0.45860  -0.237 0.812651
Year2010     0.43692    0.39984   1.093 0.274514
Year2011    -0.20675    0.42099  -0.491 0.623359
Year2012     1.20719    0.39312   3.071 0.002135 **
Year2013     0.77749    0.39759   1.956 0.050523 .
Year2014     0.55080    0.40378   1.364 0.172534
Year2015     0.84814    0.39607   2.141 0.032244 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 28.826     63  309.5  <2e-16 ***
s(Depth)    4.311      5  121.7  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.473   Deviance explained = 55.3%
-ML = 1097.5  Scale est. = 1         n = 7425
```

```
[1] "Age 9"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + s(lon, lat, k = kvecZ[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -8.90137    0.50248 -17.715  < 2e-16 ***
Year1993    -2.09296    0.68342  -3.062 0.002195 **
Year1994    -0.75600    0.45949  -1.645 0.099907 .
Year1995    -1.88496    0.62061  -3.037 0.002387 **
Year1996    -1.34448    0.52876  -2.543 0.011000 *
Year1997     0.71775    0.43060   1.667 0.095539 .
Year1998    -1.46391    0.57871  -2.530 0.011419 *
Year1999    -0.65402    0.42786  -1.529 0.126367
Year2000    -1.03622    0.47644  -2.175 0.029637 *
Year2001    -0.19099    0.41466  -0.461 0.645084
Year2002    -1.84868    0.53734  -3.440 0.000581 ***
Year2003     0.32229    0.40053   0.805 0.421017
Year2004    -1.73519    0.53647  -3.234 0.001219 **
Year2005    -0.19274    0.41246  -0.467 0.640287
Year2006     0.26950    0.40052   0.673 0.501029
Year2007     0.64191    0.39075   1.643 0.100430
Year2008     0.84612    0.39480   2.143 0.032099 *
Year2009    -0.33386    0.46829  -0.713 0.475884
Year2010    -0.05391    0.40874  -0.132 0.895077
Year2011     0.78420    0.39148   2.003 0.045157 *
Year2012     0.85570    0.38646   2.214 0.026813 *
Year2013     0.55802    0.39301   1.420 0.155641
Year2014    -0.42139    0.42390  -0.994 0.320181
Year2015     0.12357    0.40180   0.308 0.758430
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 25.831     63 238.18  <2e-16 ***
s(Depth)    3.733      5  93.51  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.369   Deviance explained = 48.3%
-ML = 967.74  Scale est. = 1         n = 7425
```

```
[1] "Age 10"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + s(lon, lat, k = kvecZ[a], bs = "ts") + s(Depth,
    bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -9.29808    0.50106 -18.557  < 2e-16 ***
Year1993    -0.12976    0.49574  -0.262 0.793518
Year1994    -0.35053    0.47971  -0.731 0.464948
Year1995     0.06618    0.48001   0.138 0.890344
Year1996     1.35989    0.44652   3.046 0.002323 **
Year1997     1.11918    0.45492   2.460 0.013888 *
Year1998    -0.50057    0.52870  -0.947 0.343746
Year1999    -0.44741    0.45817  -0.977 0.328808
Year2000    -0.56802    0.48543  -1.170 0.241941
Year2001    -0.25586    0.45510  -0.562 0.573967
Year2002     0.44025    0.42402   1.038 0.299151
Year2003     0.45017    0.43044   1.046 0.295638
Year2004    -0.65623    0.48042  -1.366 0.171959
Year2005     0.04448    0.43776   0.102 0.919076
Year2006     0.46055    0.42846   1.075 0.282420
Year2007     0.09857    0.43353   0.227 0.820139
Year2008     1.18955    0.41900   2.839 0.004525 **
Year2009     0.04558    0.48807   0.093 0.925589
Year2010     0.89626    0.41694   2.150 0.031583 *
Year2011     0.64337    0.42705   1.507 0.131925
Year2012     1.44057    0.40861   3.526 0.000423 ***
Year2013     0.91942    0.41709   2.204 0.027498 *
Year2014     0.09658    0.43911   0.220 0.825910
Year2015     0.08599    0.43613   0.197 0.843694
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
               edf Ref.df Chi.sq p-value
s(lon,lat) 27.092     63 243.04  <2e-16 ***
s(Depth)    3.913      5  97.74  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.374   Deviance explained = 48.1%
-ML = Scale est. = 1
```

Appendix D: Plots of catches from the IBTS Q1 survey by year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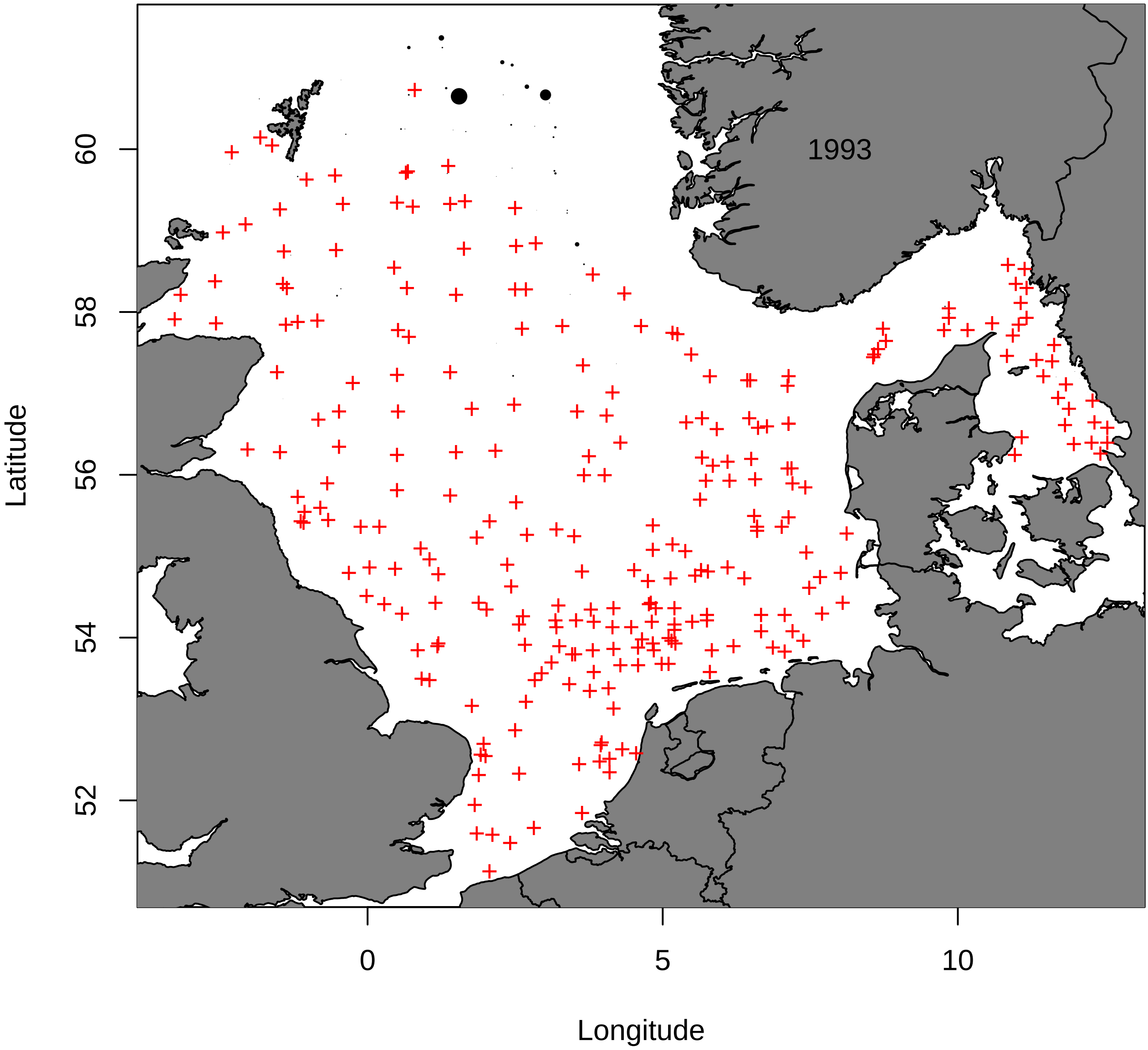
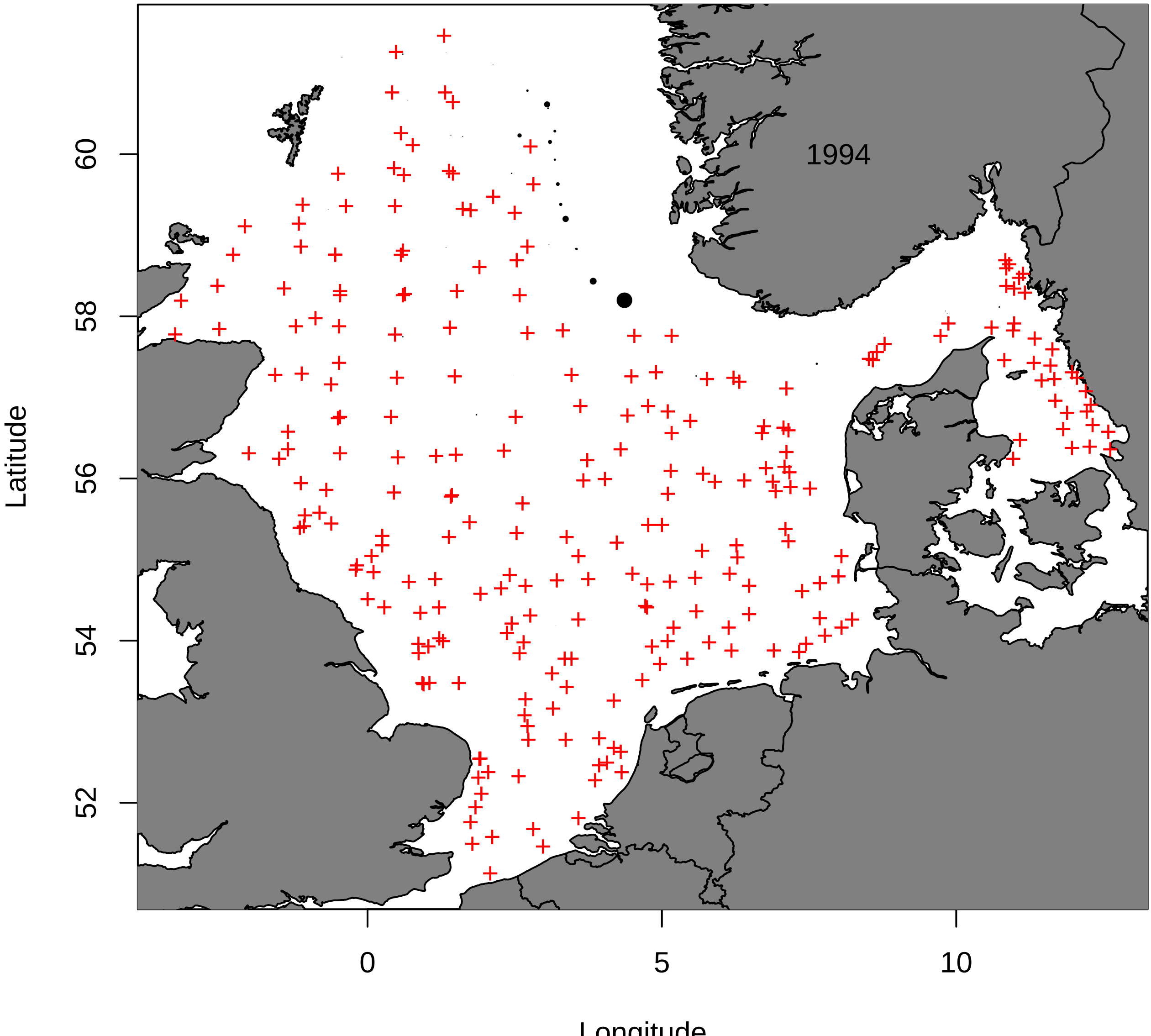
58
56
54
52
Longitude
0
5
10


1993
Latitude
60
58
56
54
52
Longitude
0
5
10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58
56
54
52
Longitude
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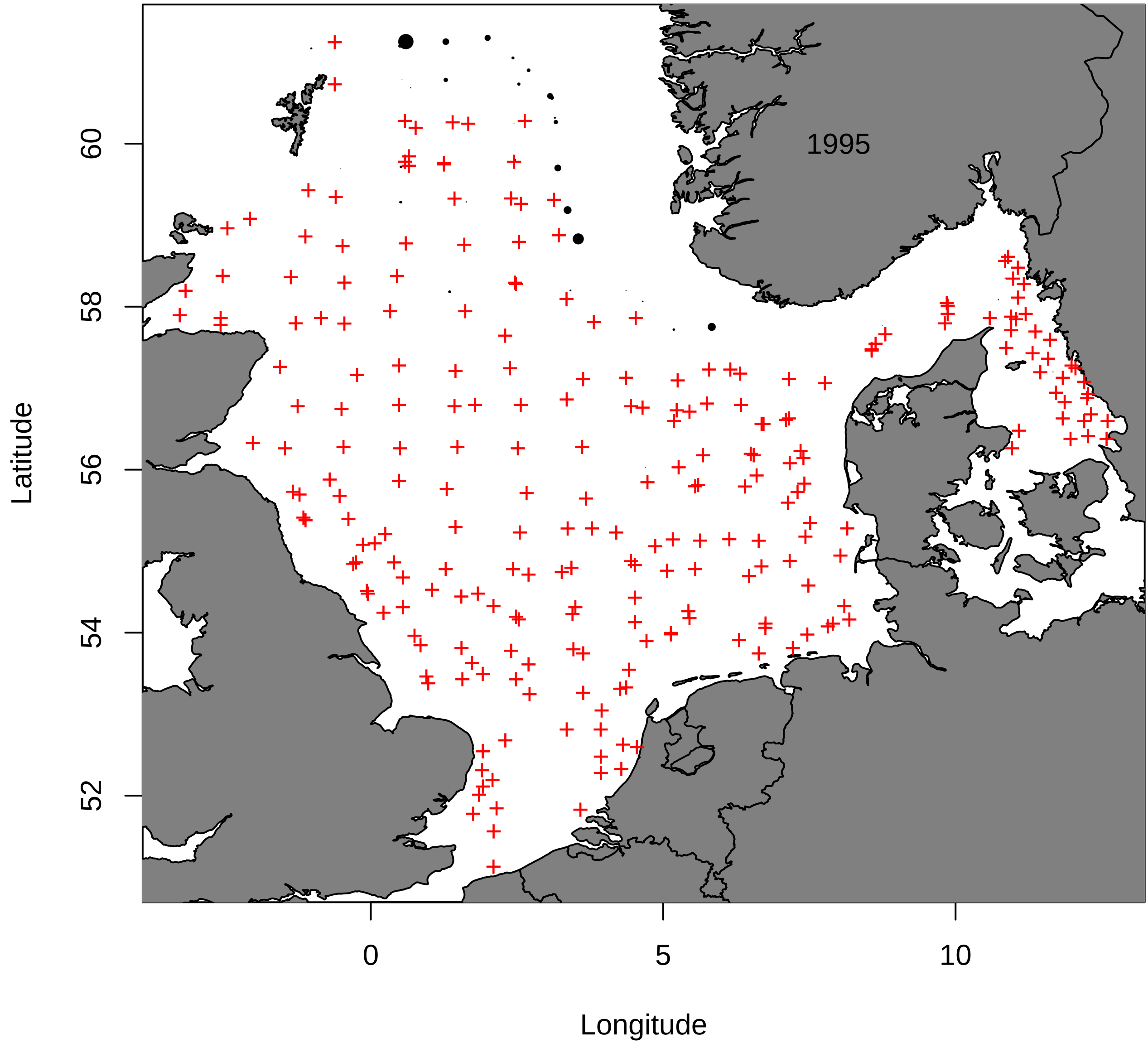
5
10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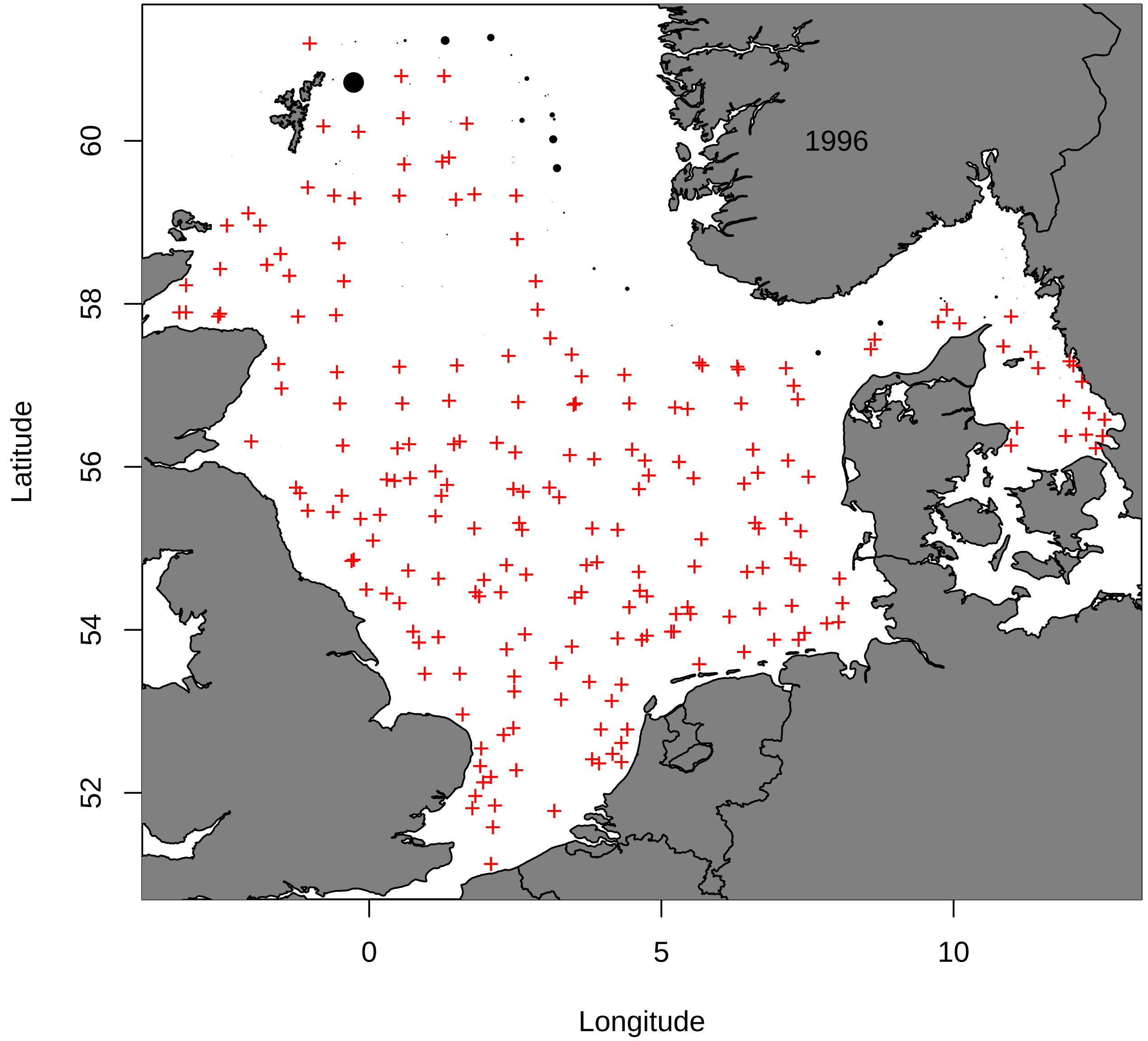
60
58
56
54
52
Latitude
0
5
10
Longitude


1996
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58
56
54
52
Latitude
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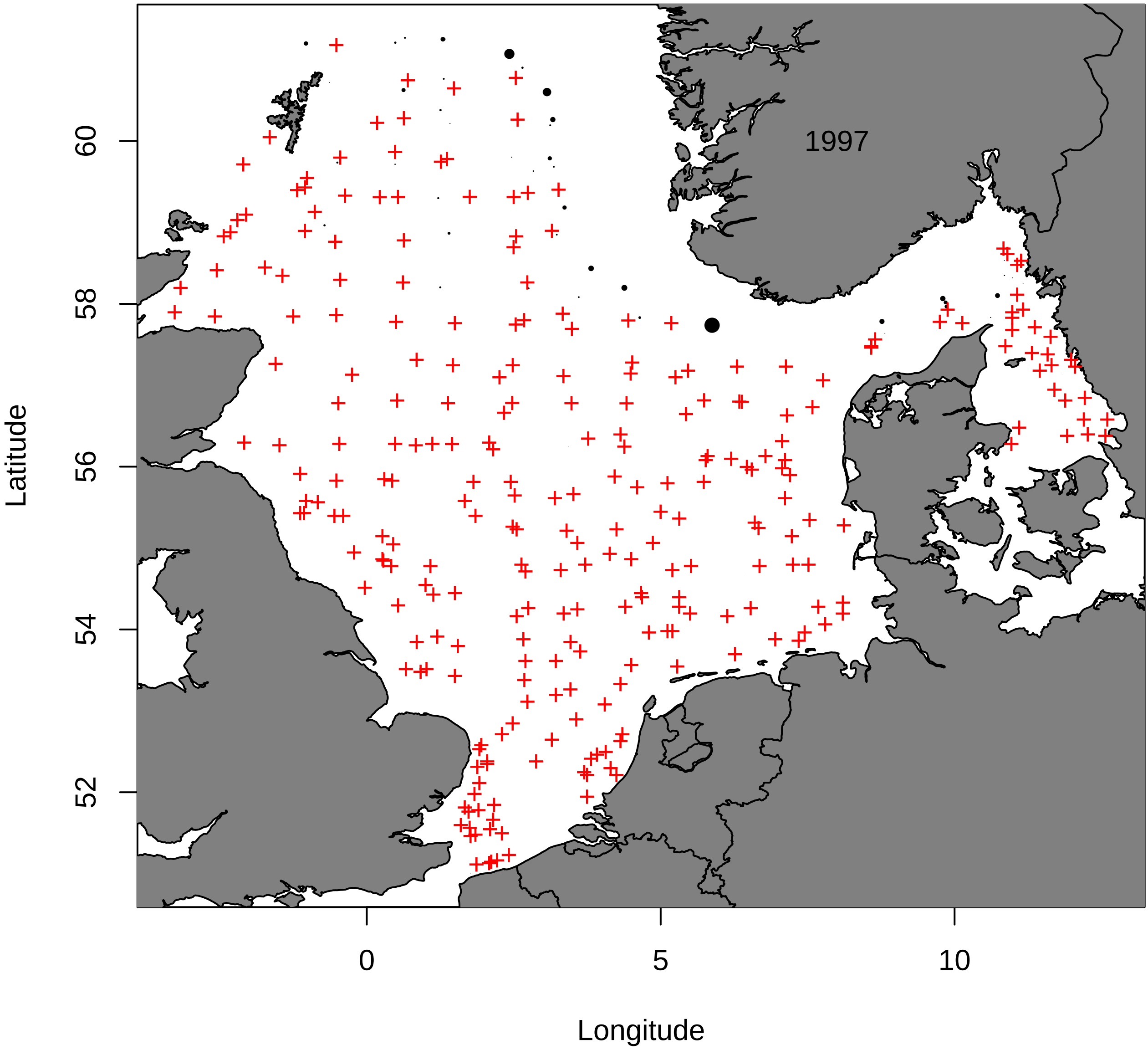
5
10
Longitude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Latitude
Longitude
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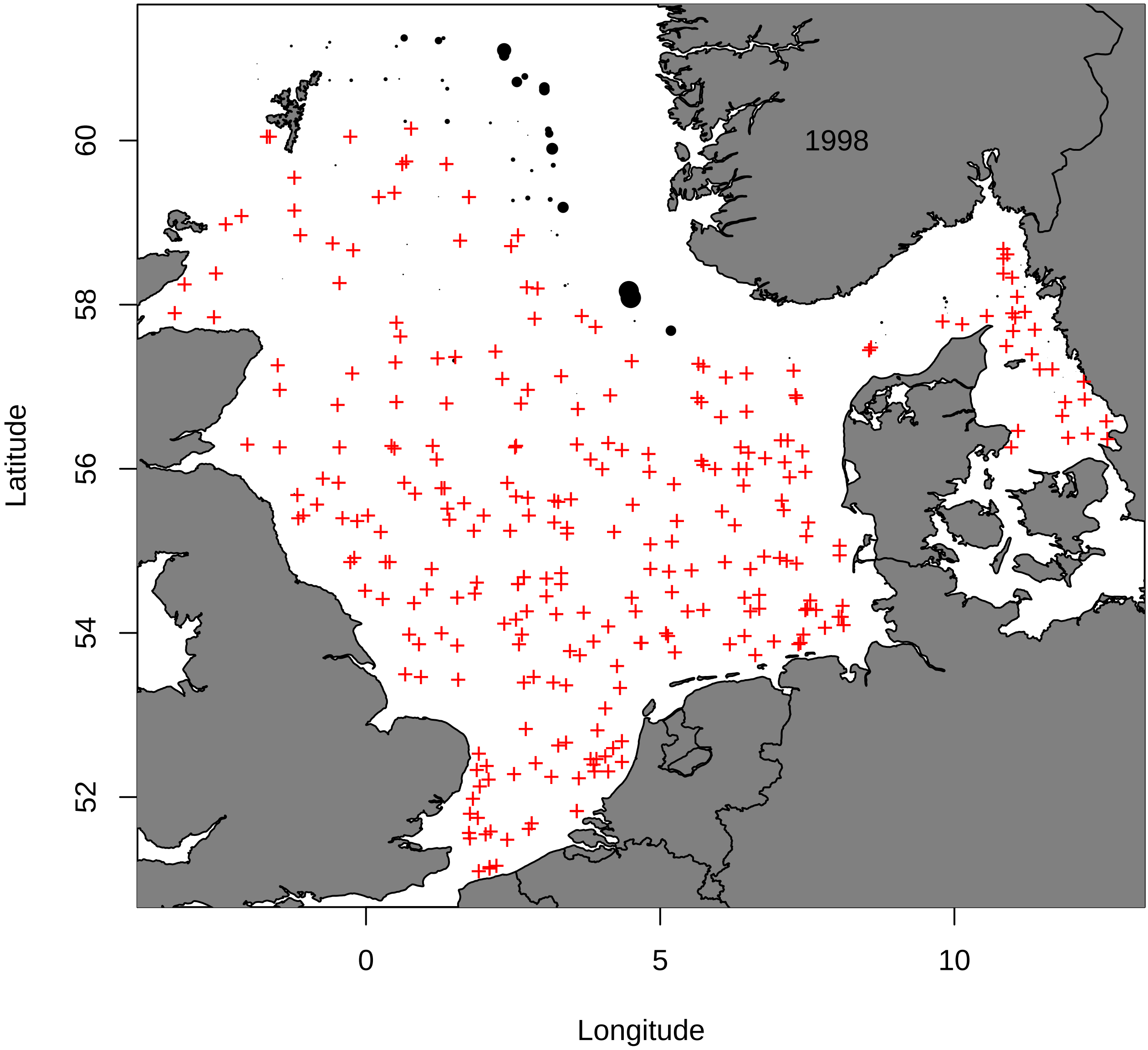
56
54
52
0
5
10



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Latitude
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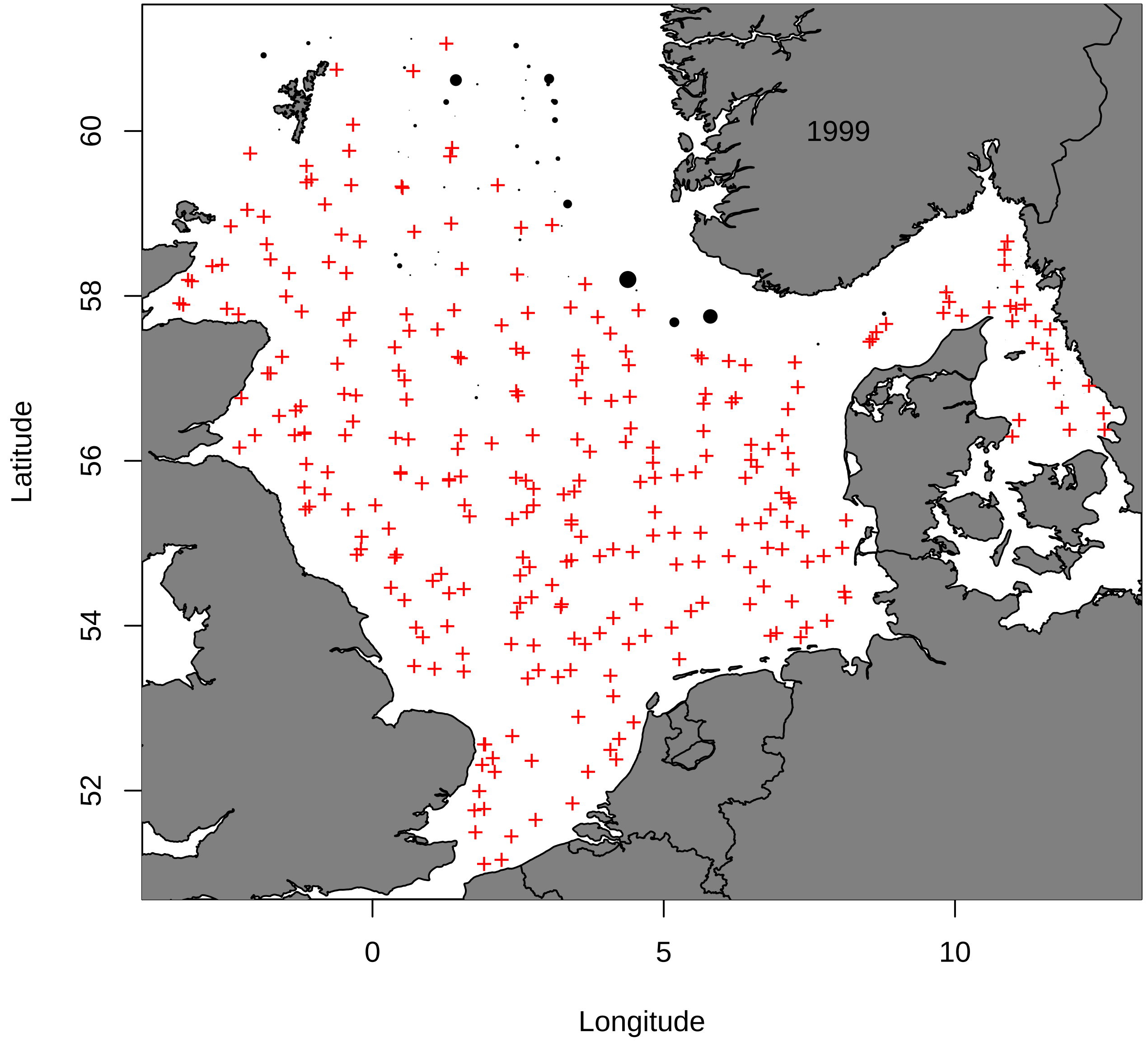
58
56
54
52
Longitude
0
5
10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Longitude
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54
52
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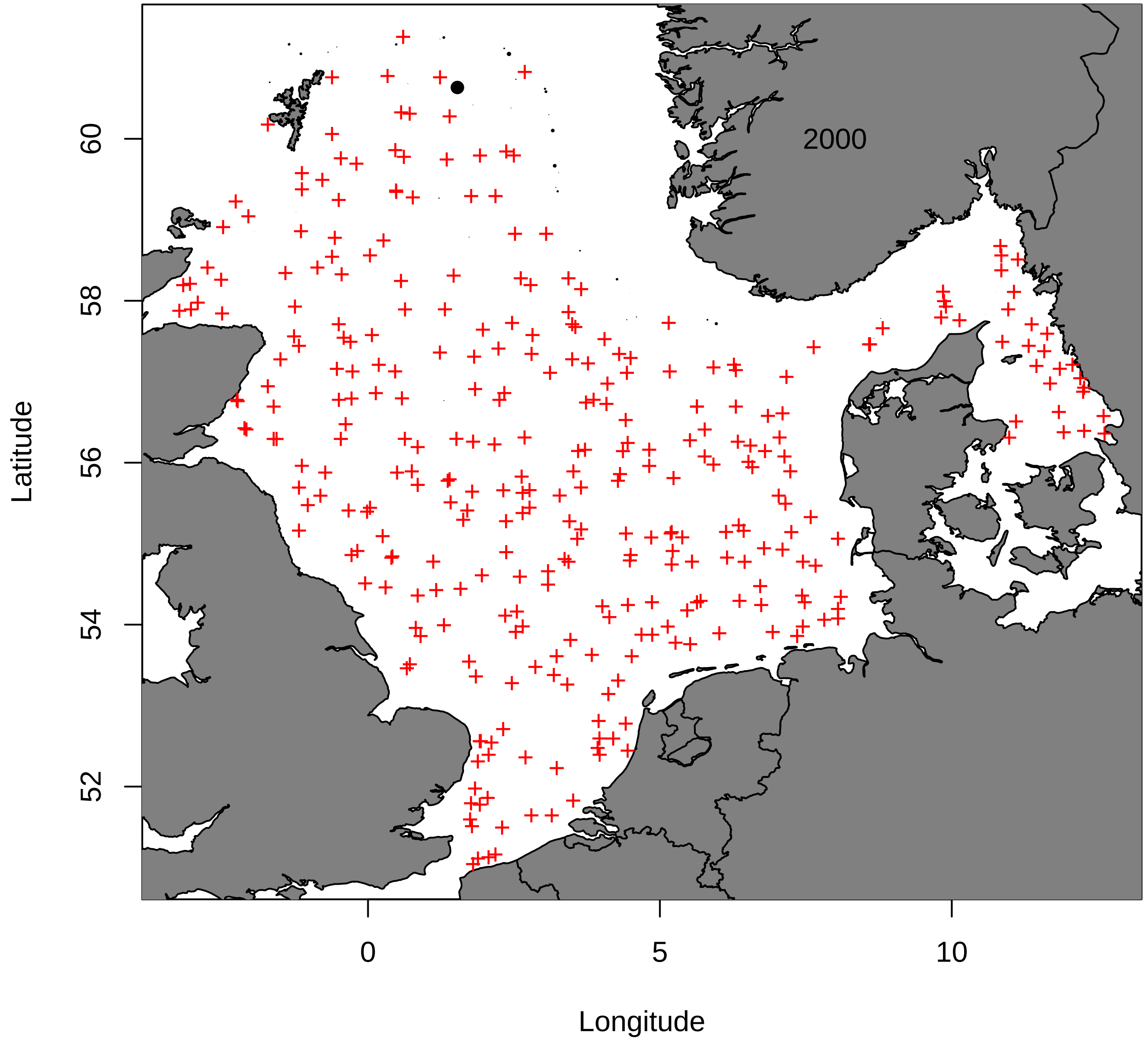
5
10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58
56
54
52
Longitude
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5
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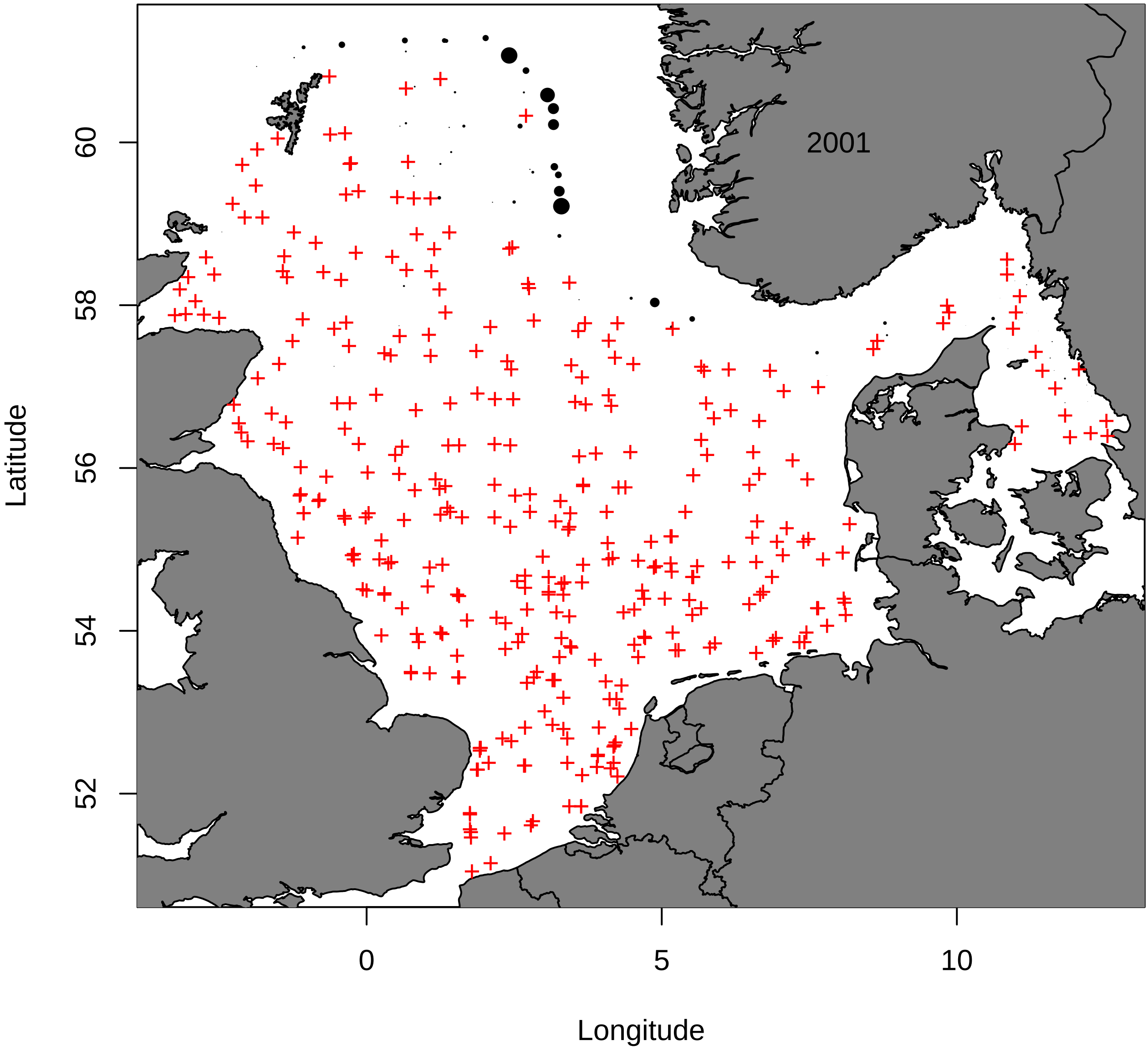
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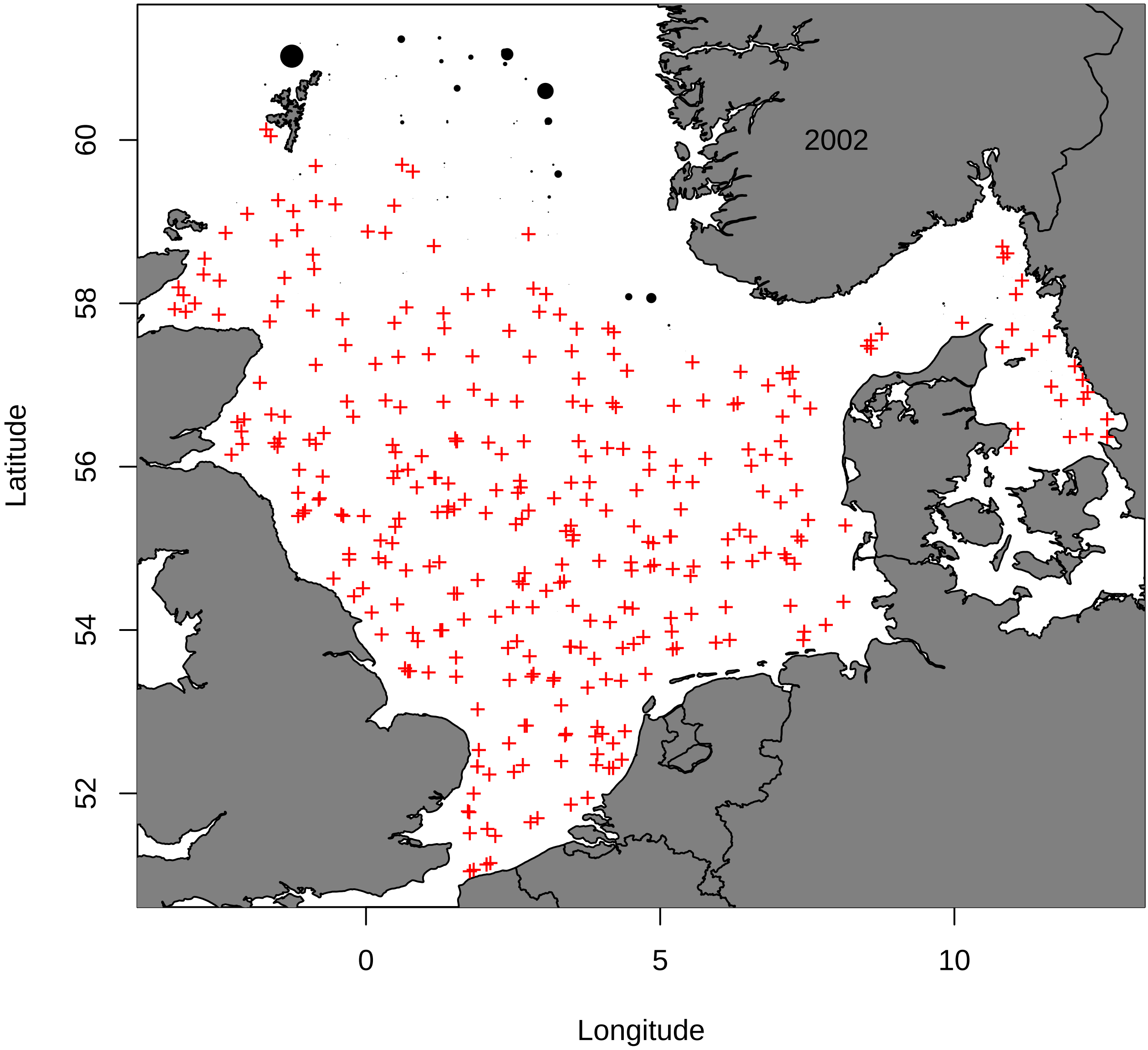
58
56
54
52
Longitude
0
5
10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Longitude
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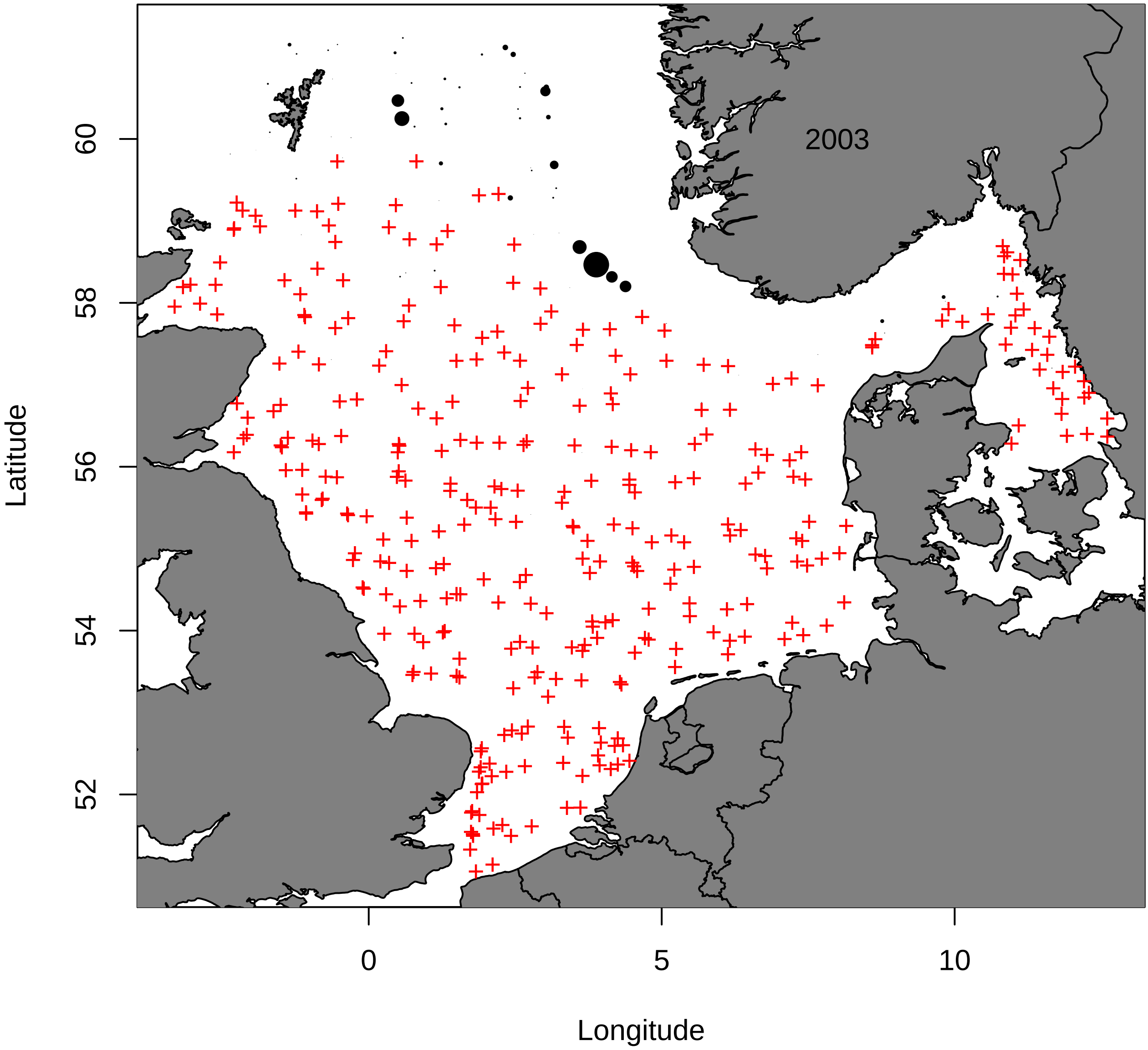
56
54
52
0
5
10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58
56
54
52
Longitude
0
5
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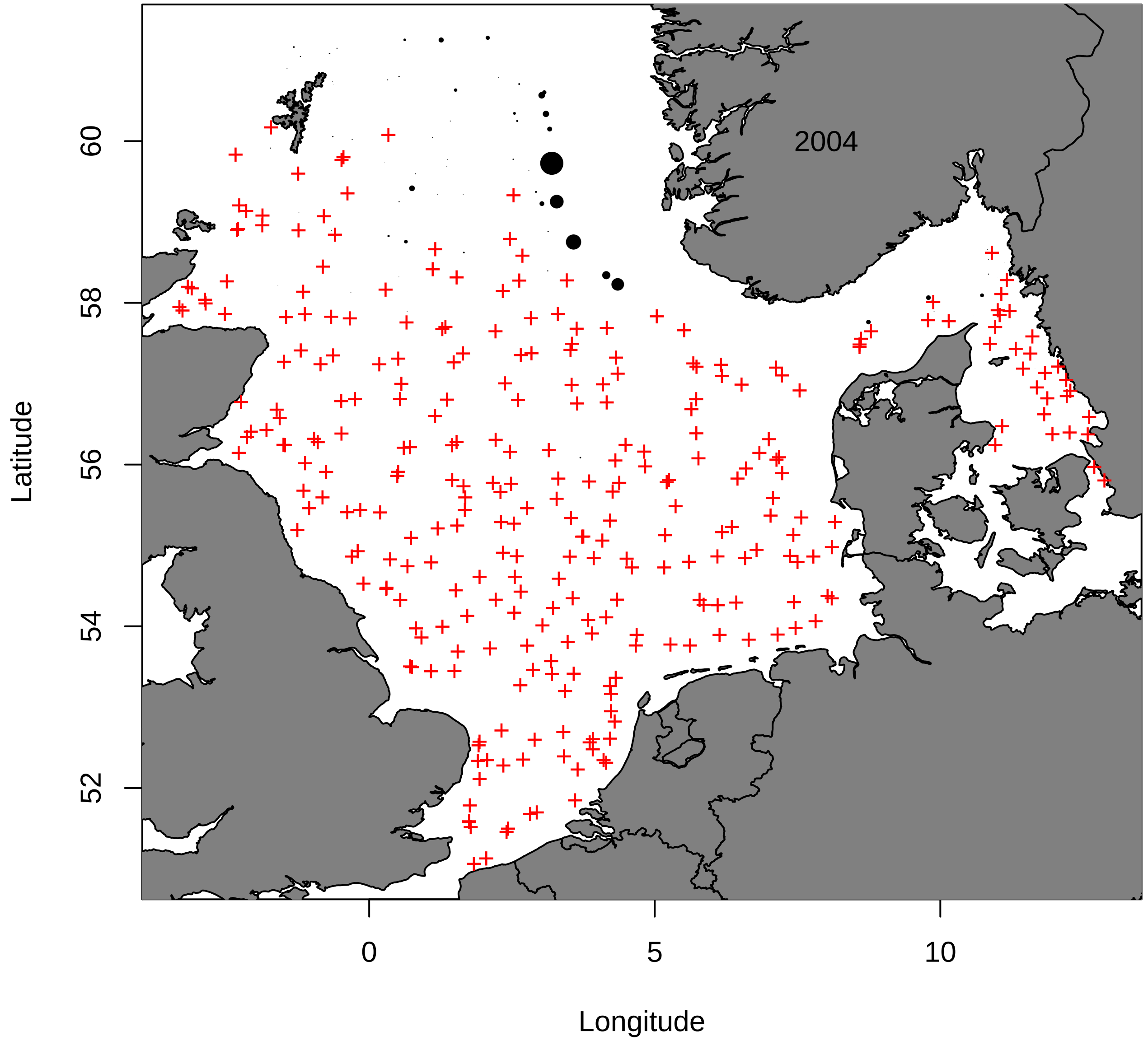
2004
Latitude
60
58
56
54
52
Longitude
0
5
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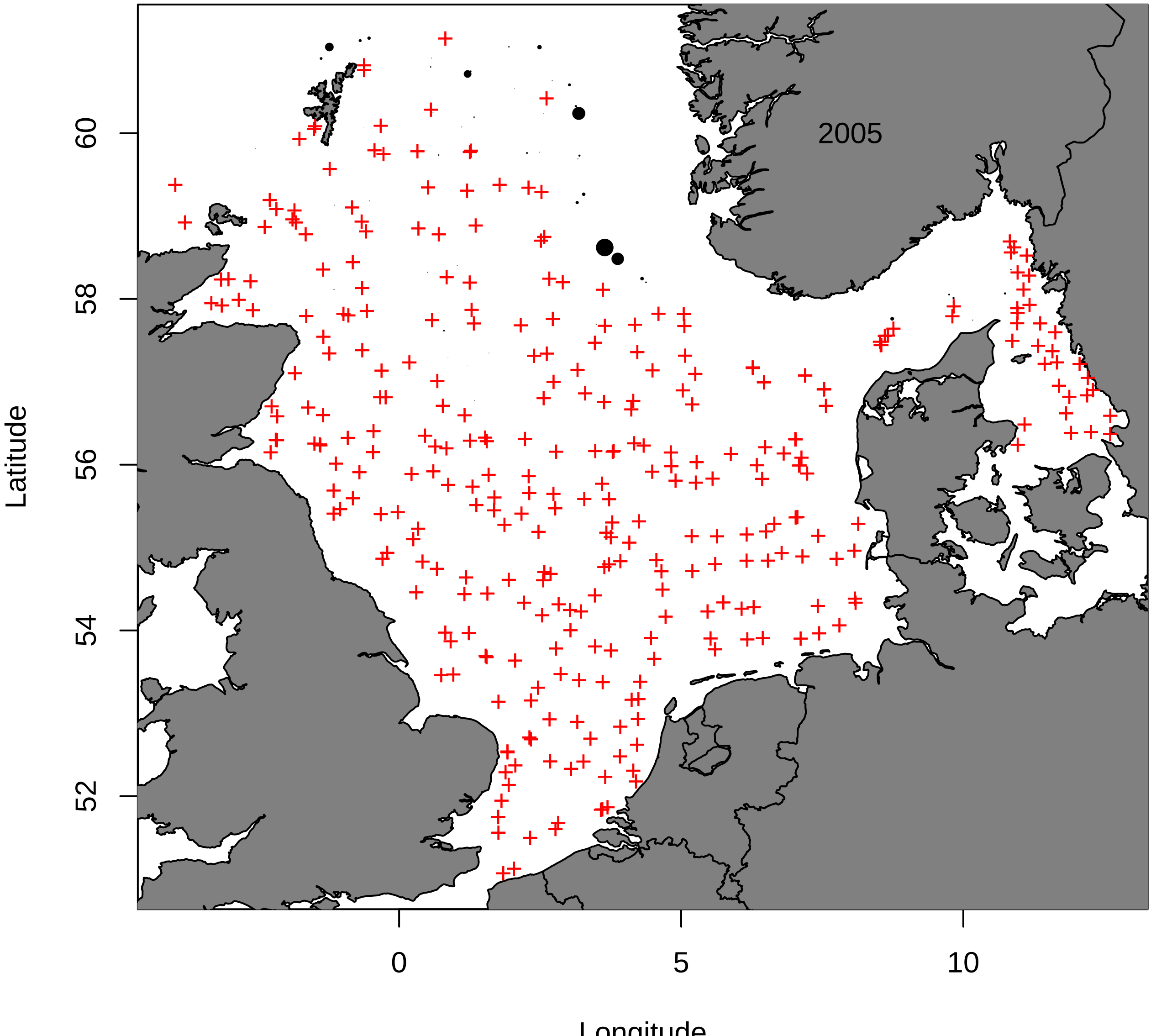
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Latitude
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52
Longitude
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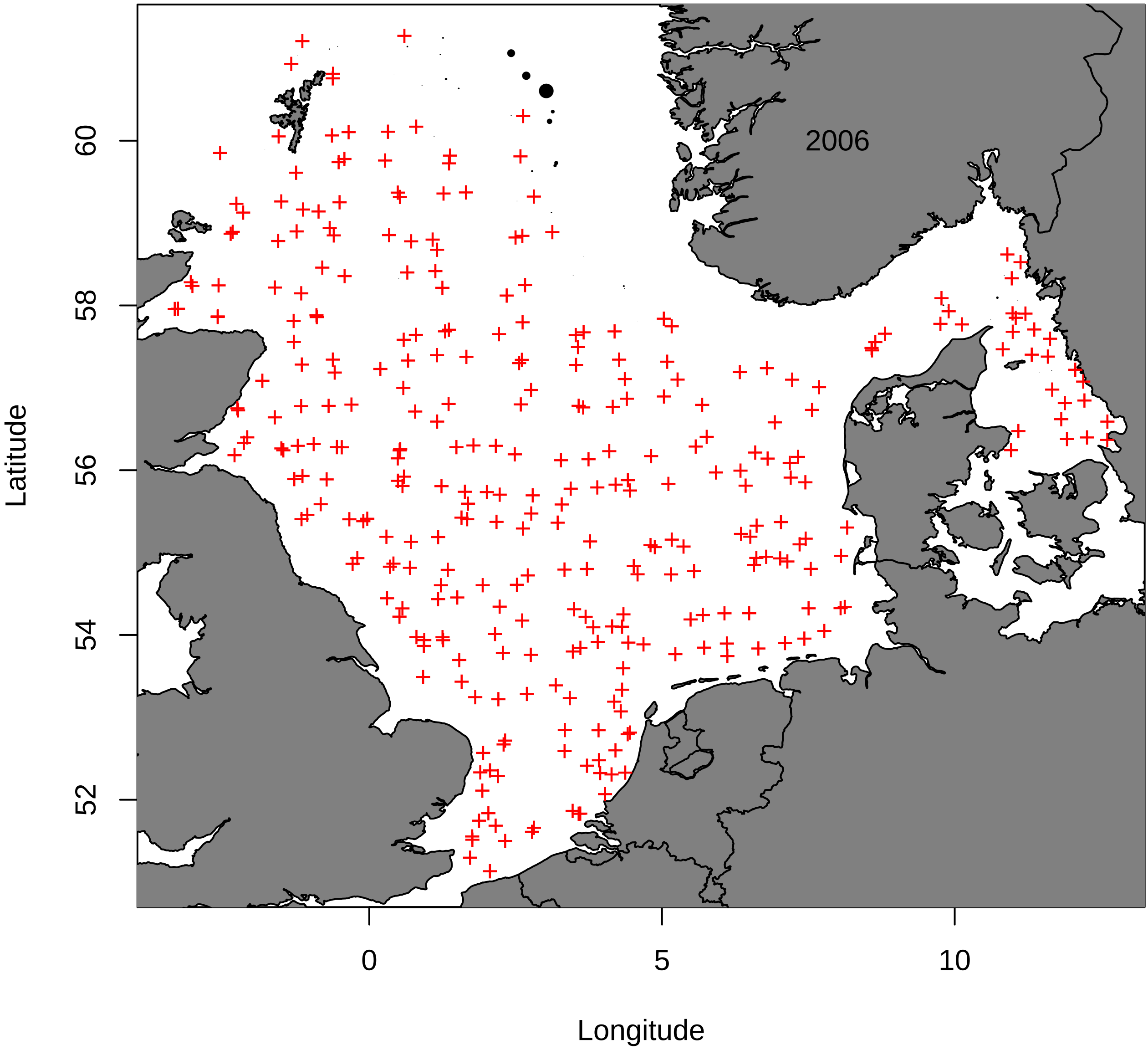
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56
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52
Longitude
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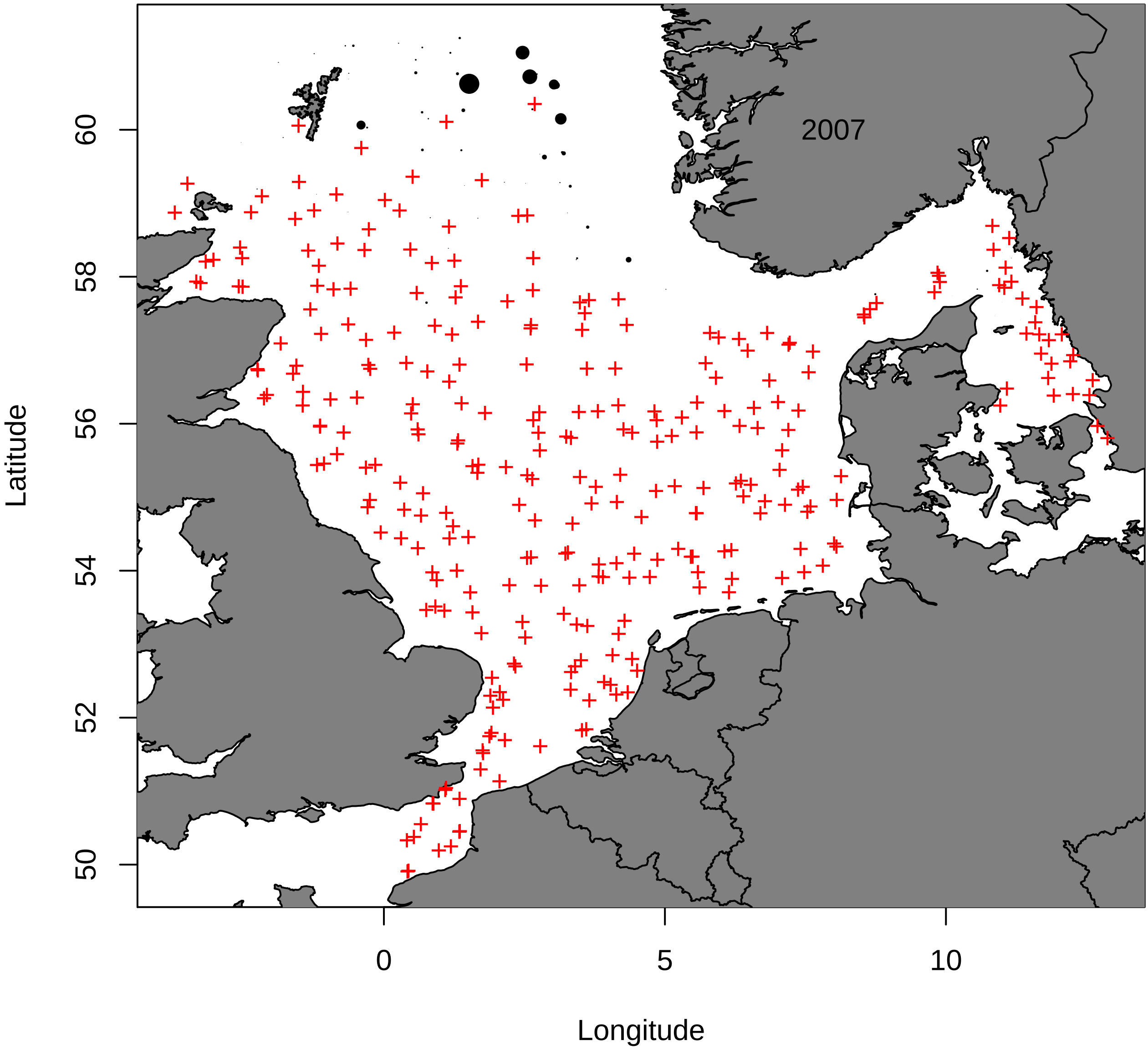
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Longitude
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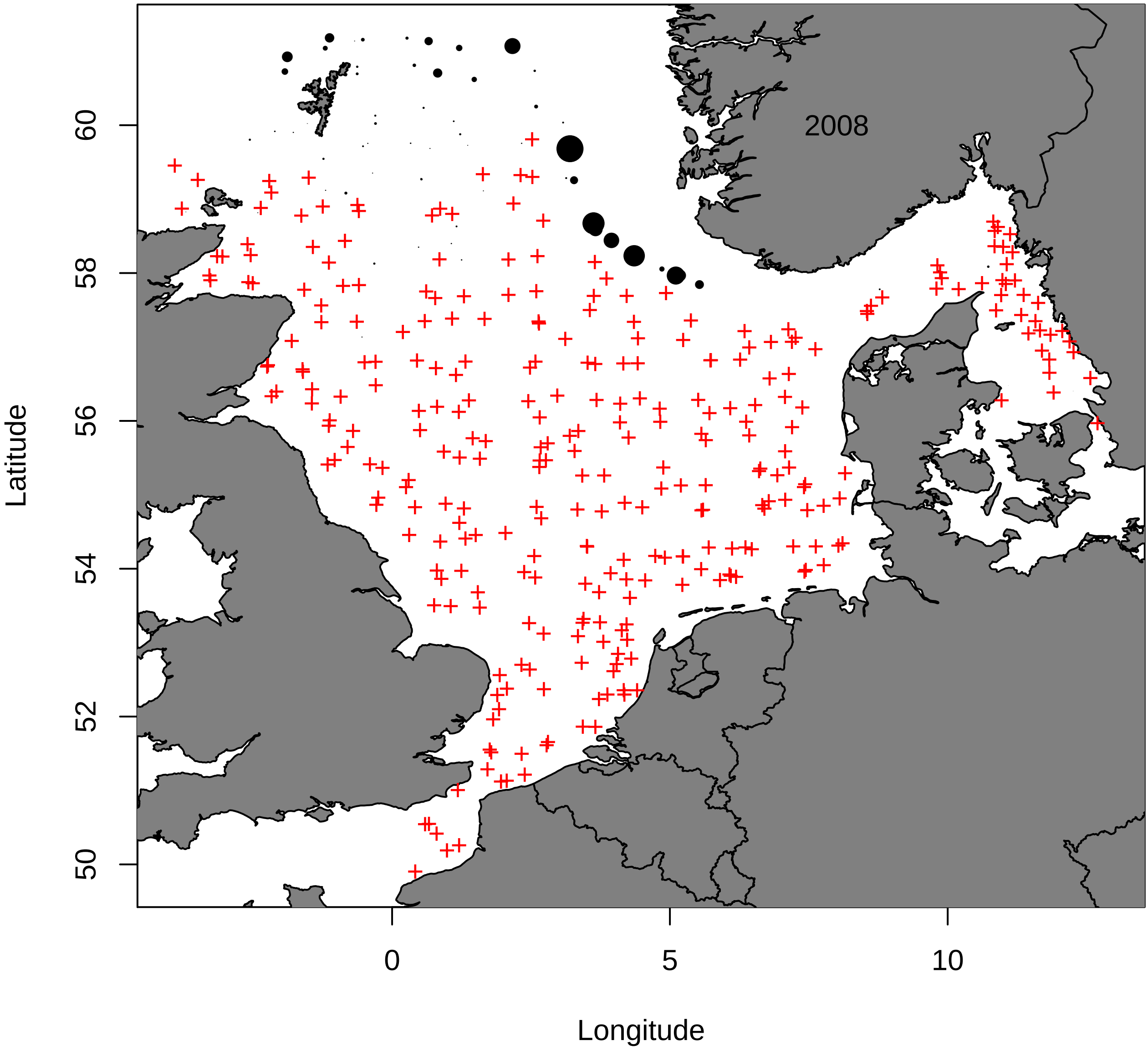
0
5
10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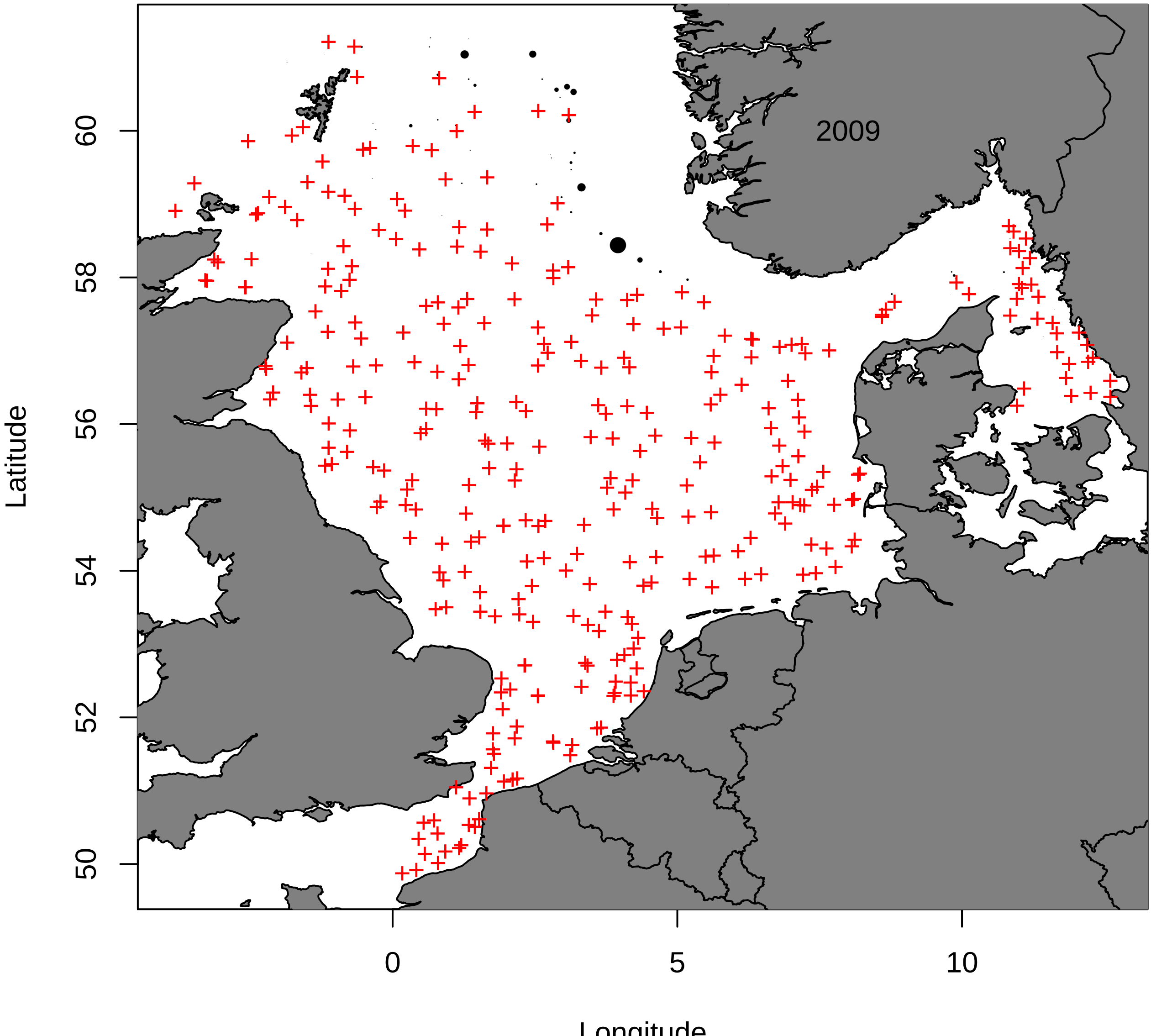
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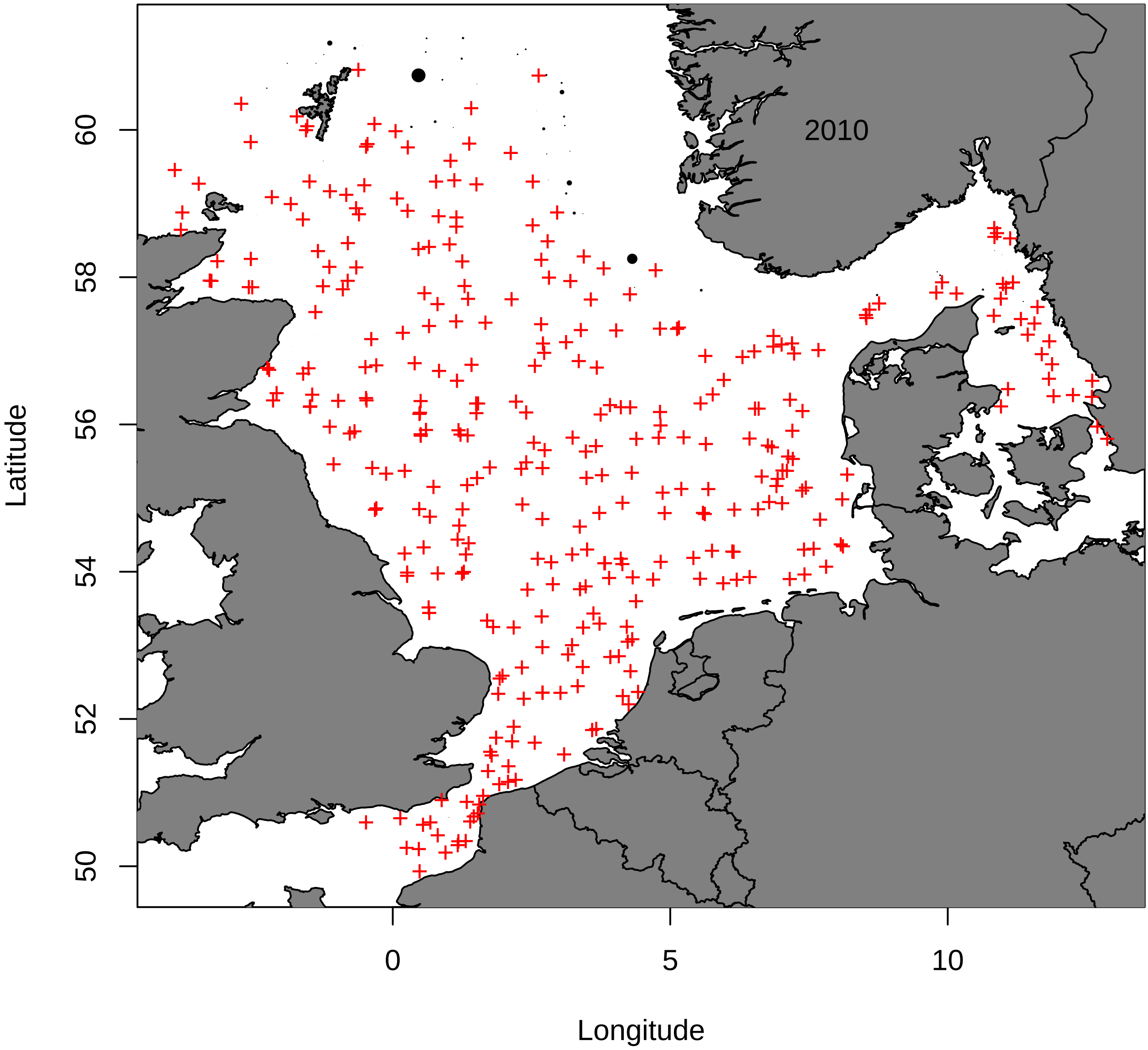
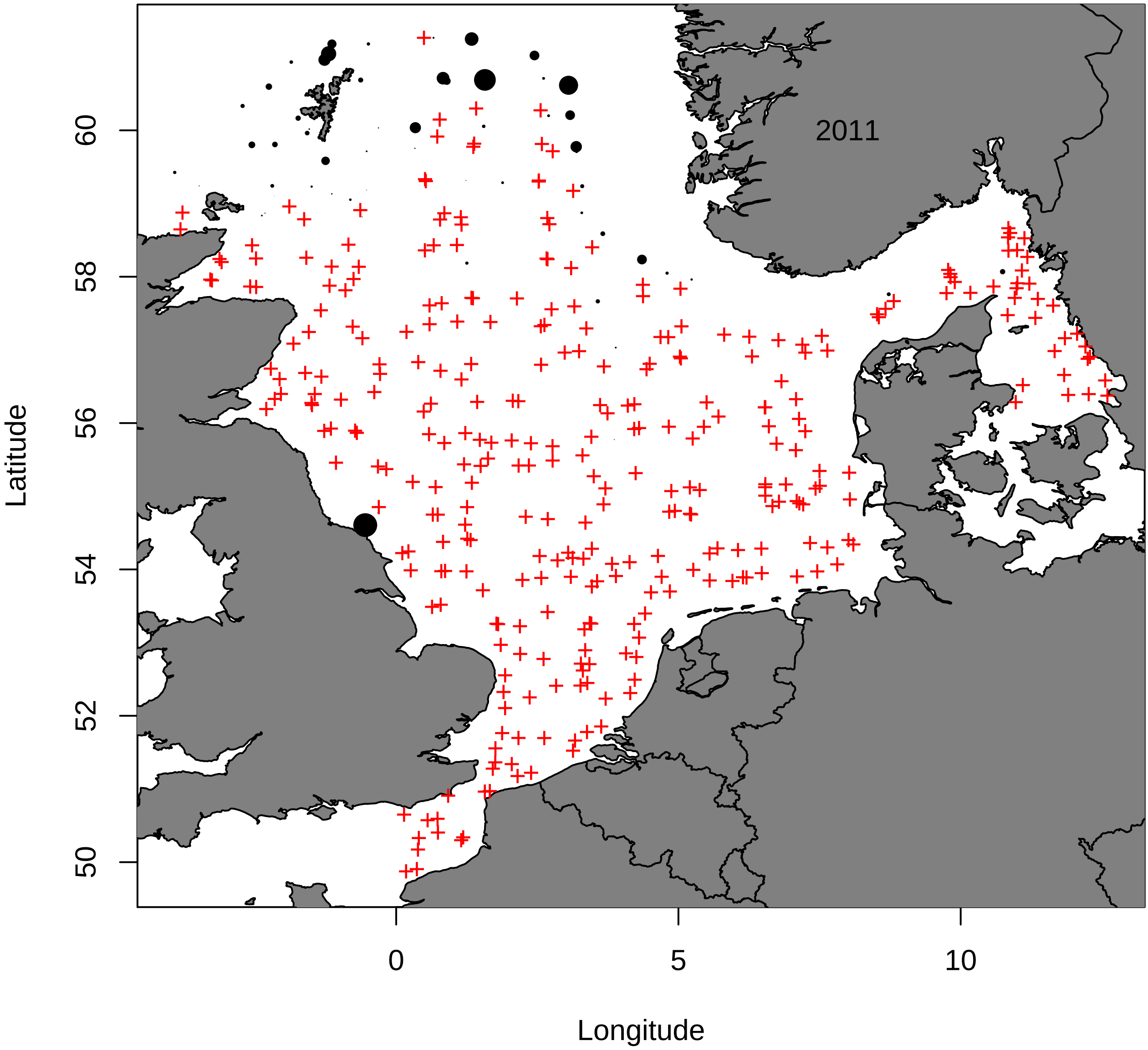
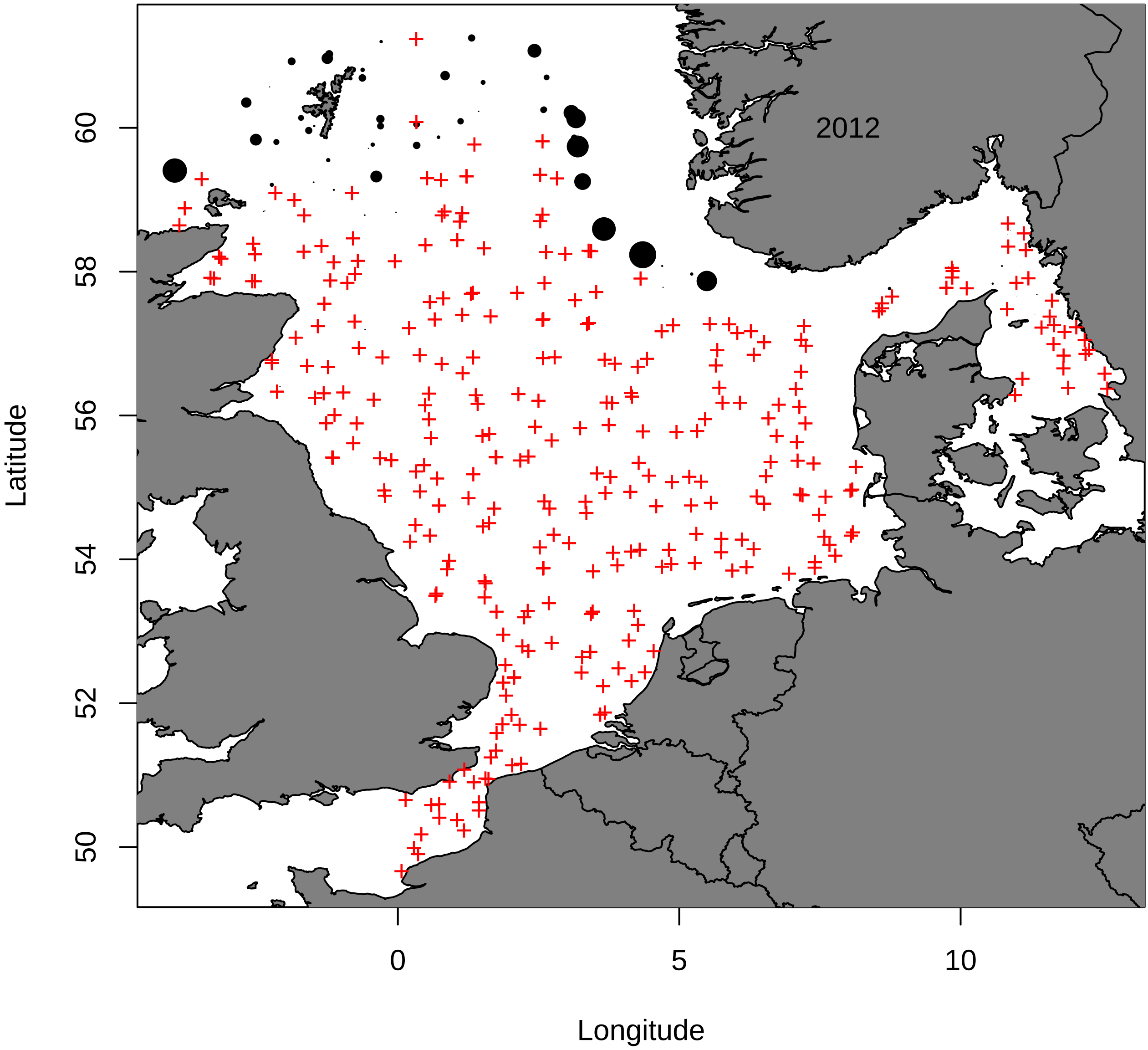
Latitude
Longitude
60
58
56
54
52
50
0
5
10


2010
Latitude
Longitude
60
58
56
54
52
50
0
5
10


2011
Latitude
60
58
56
54
52
50
Longitude
0
5
10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Latitude
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52
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Longitude
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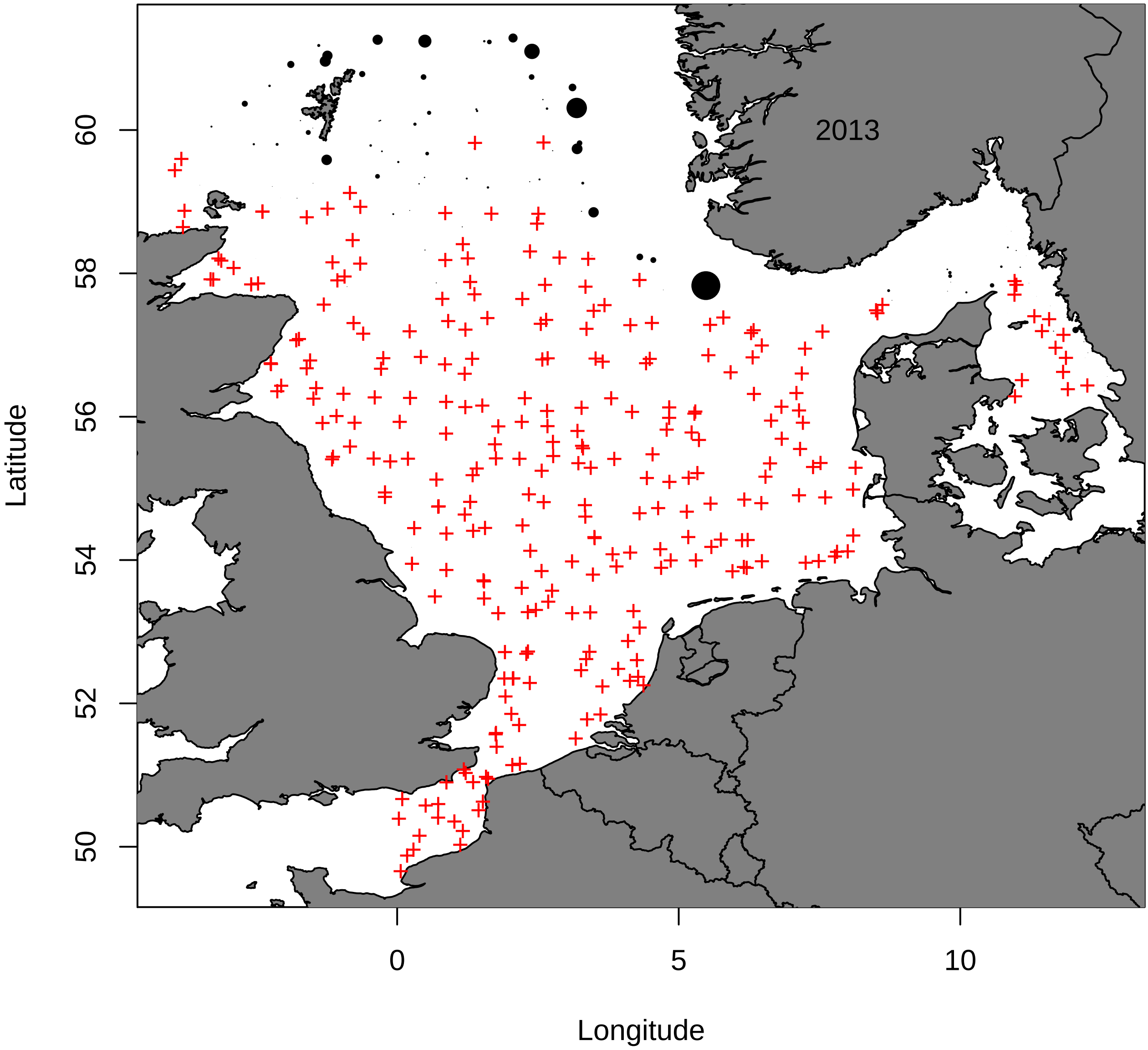
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Longitude
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5
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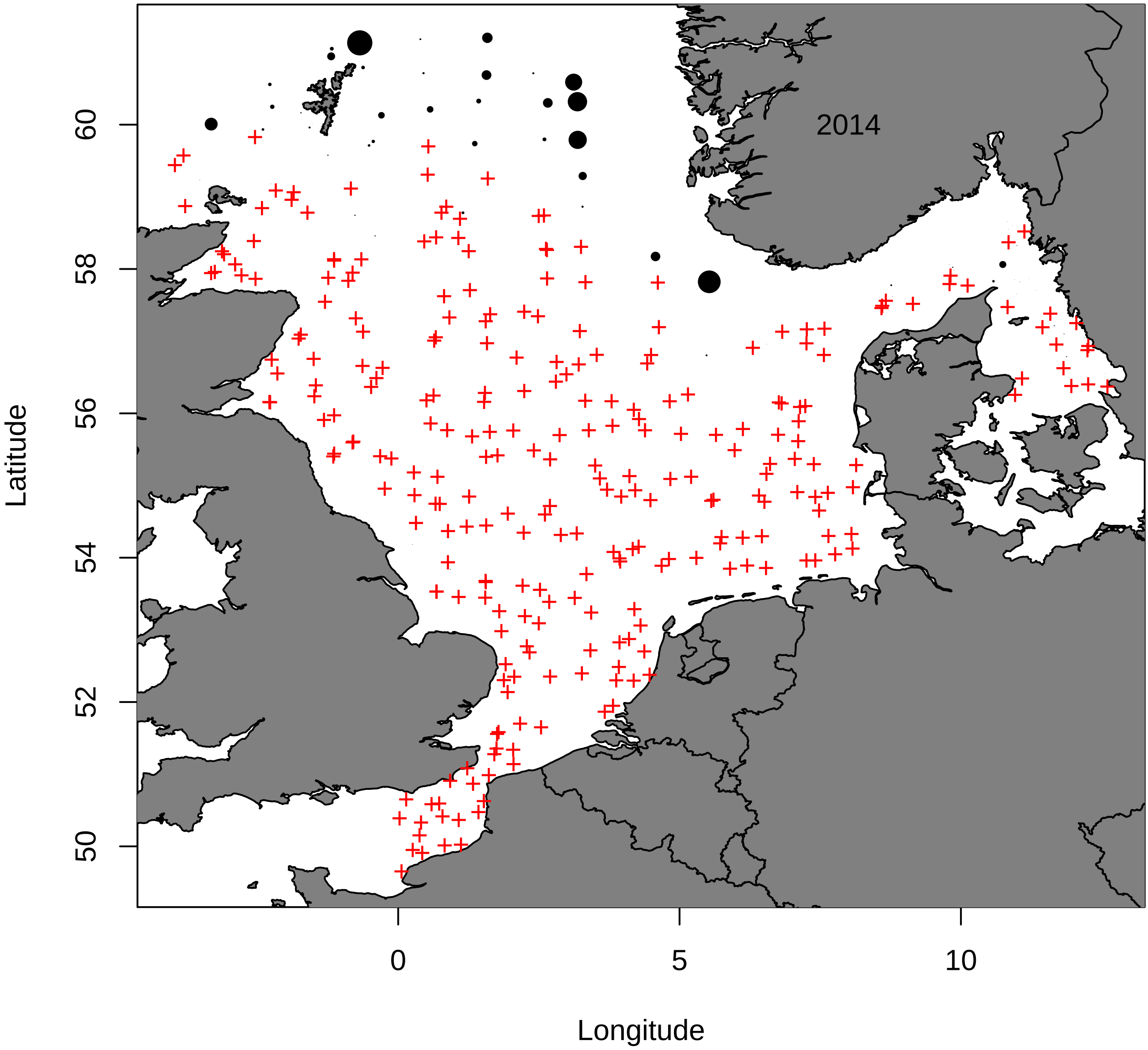
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Latitude
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Longitude
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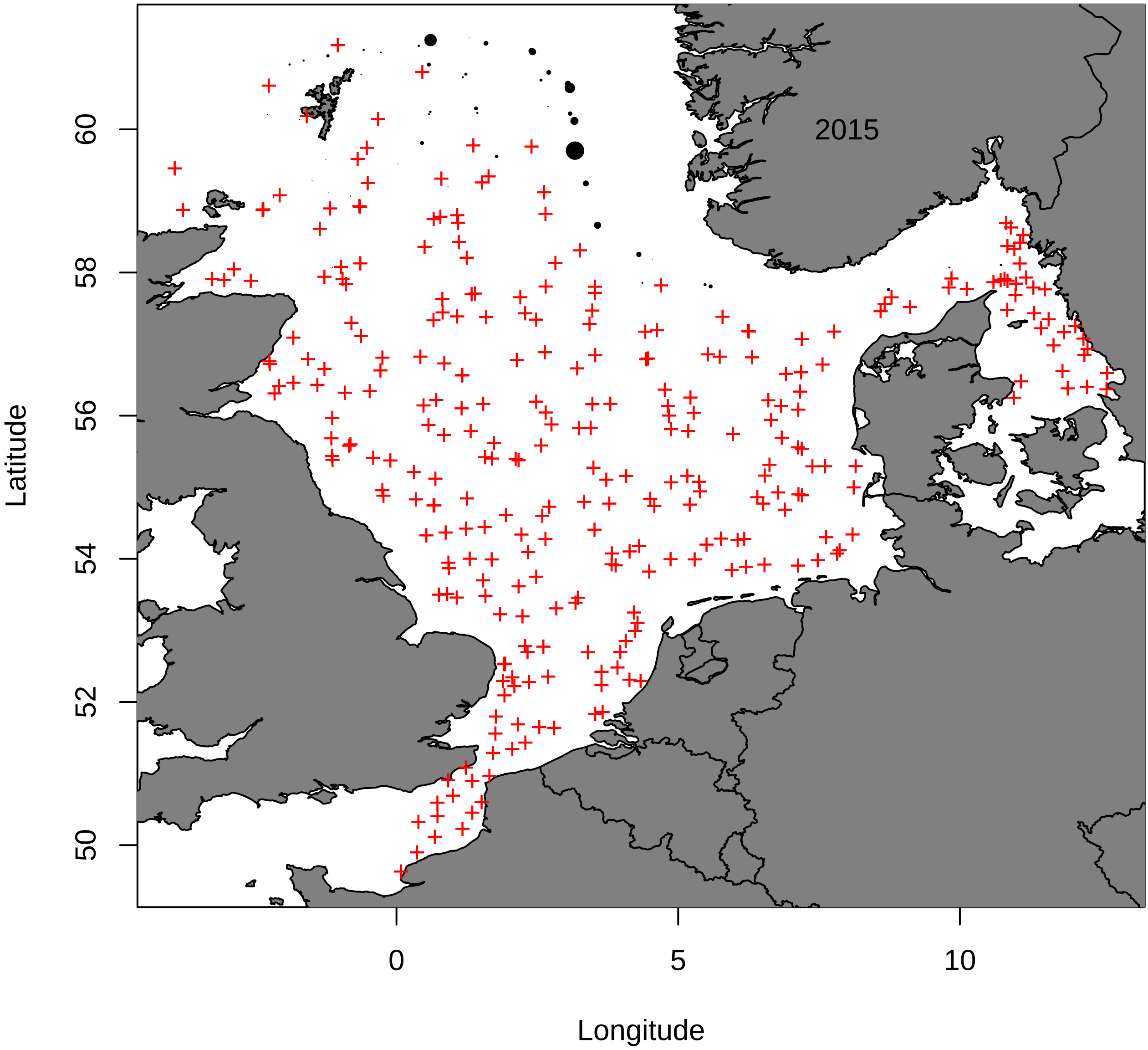
2015
Latitude
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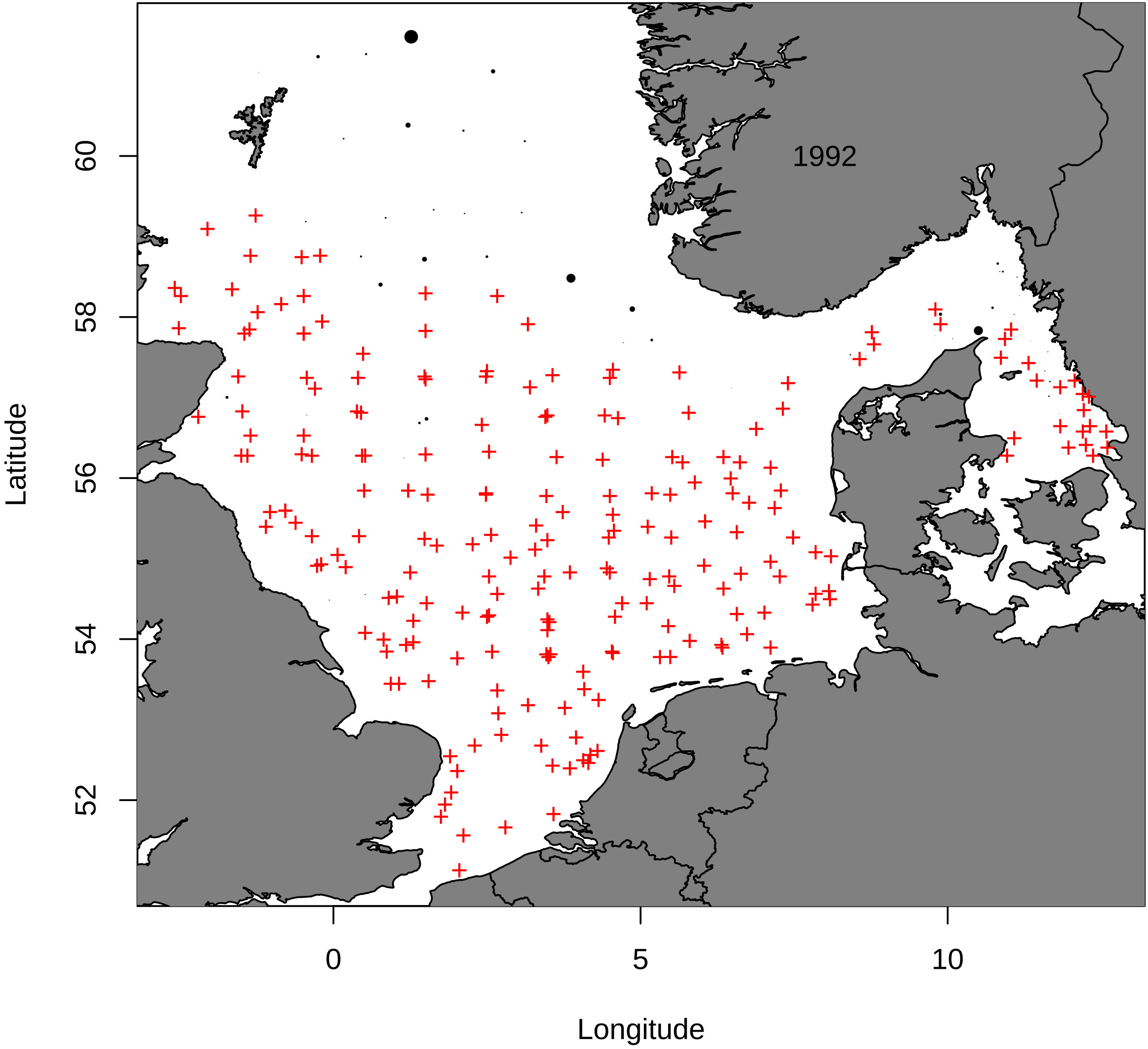
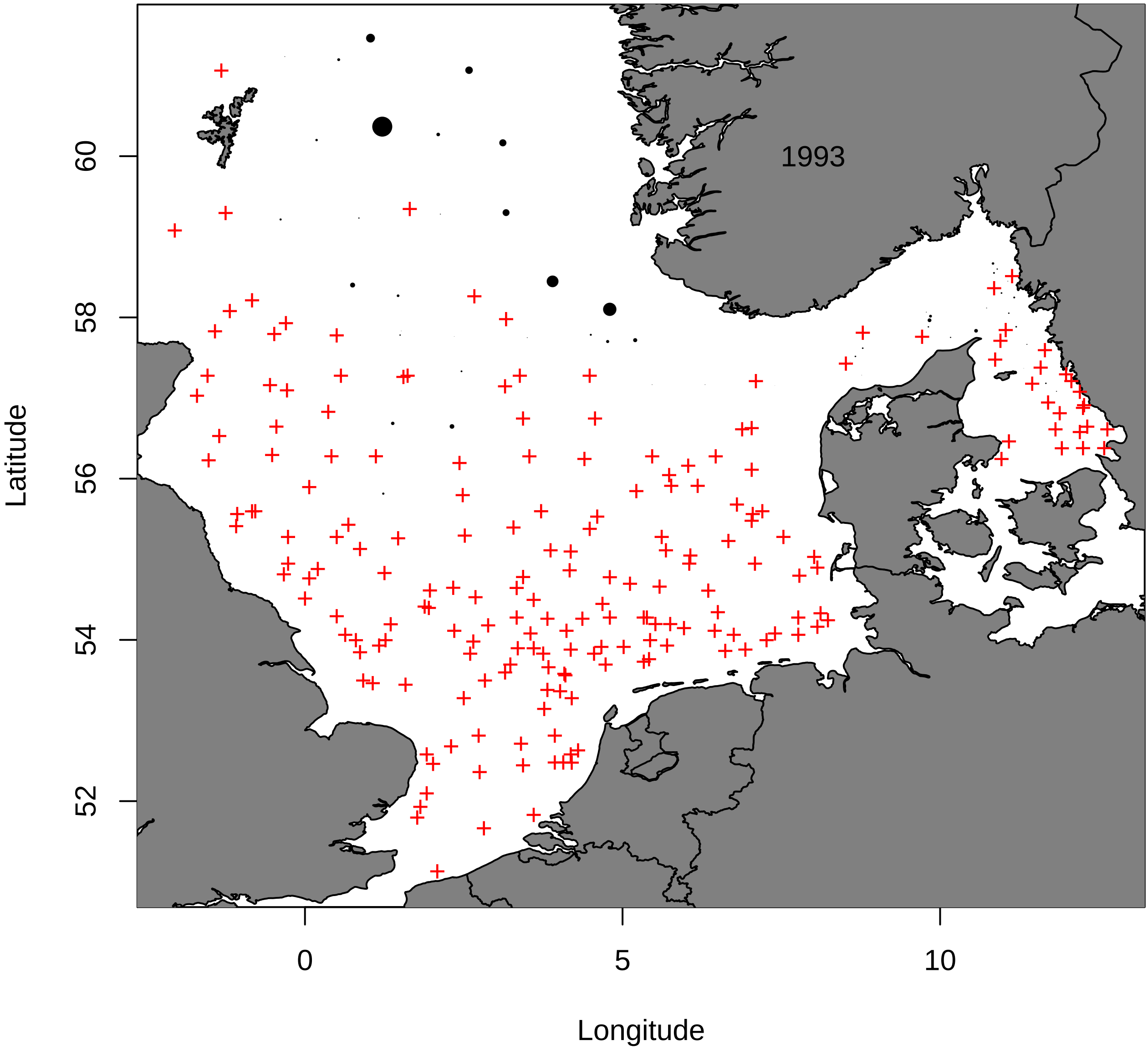
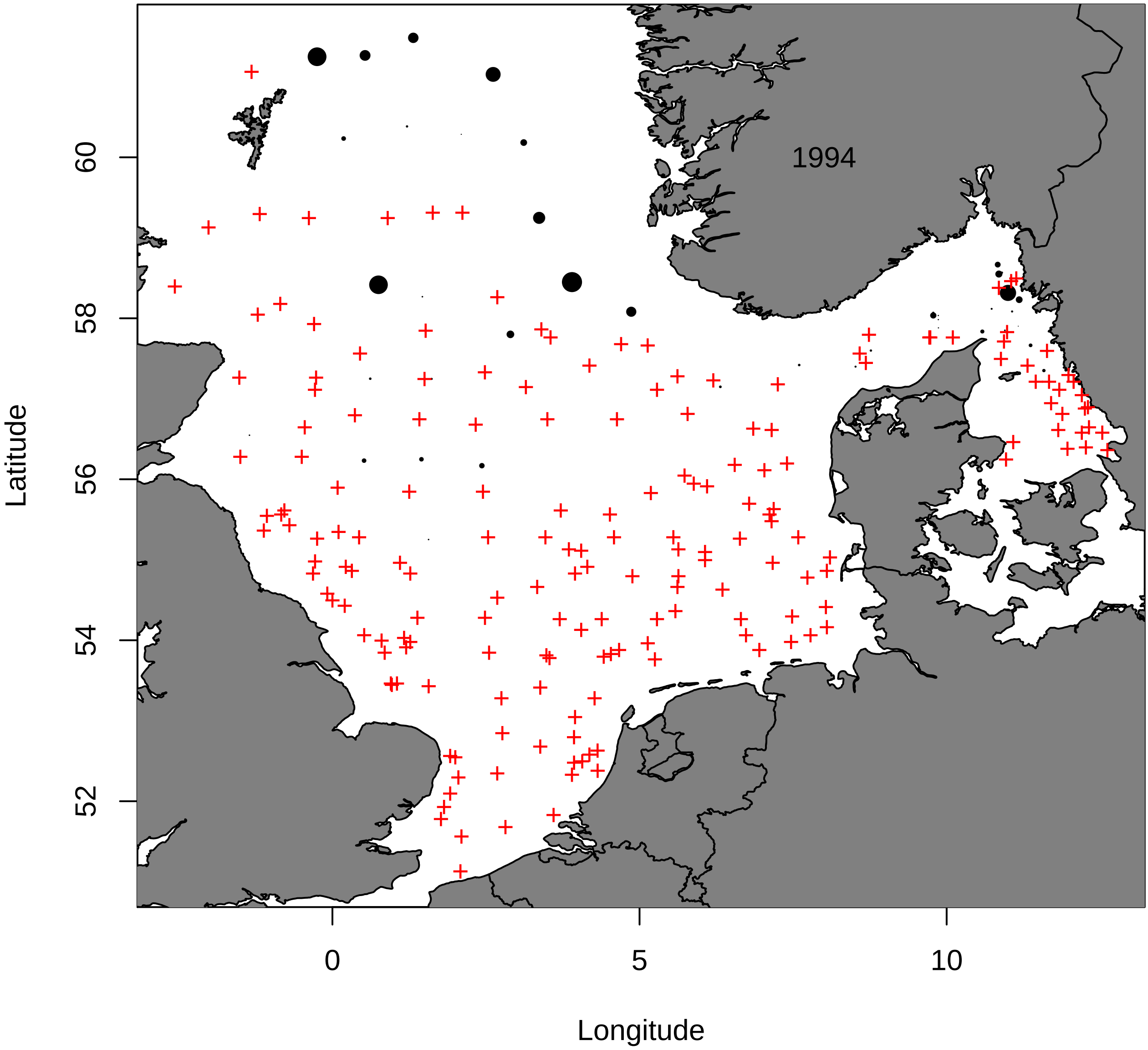
54
52
50
Longitude
0
5
10

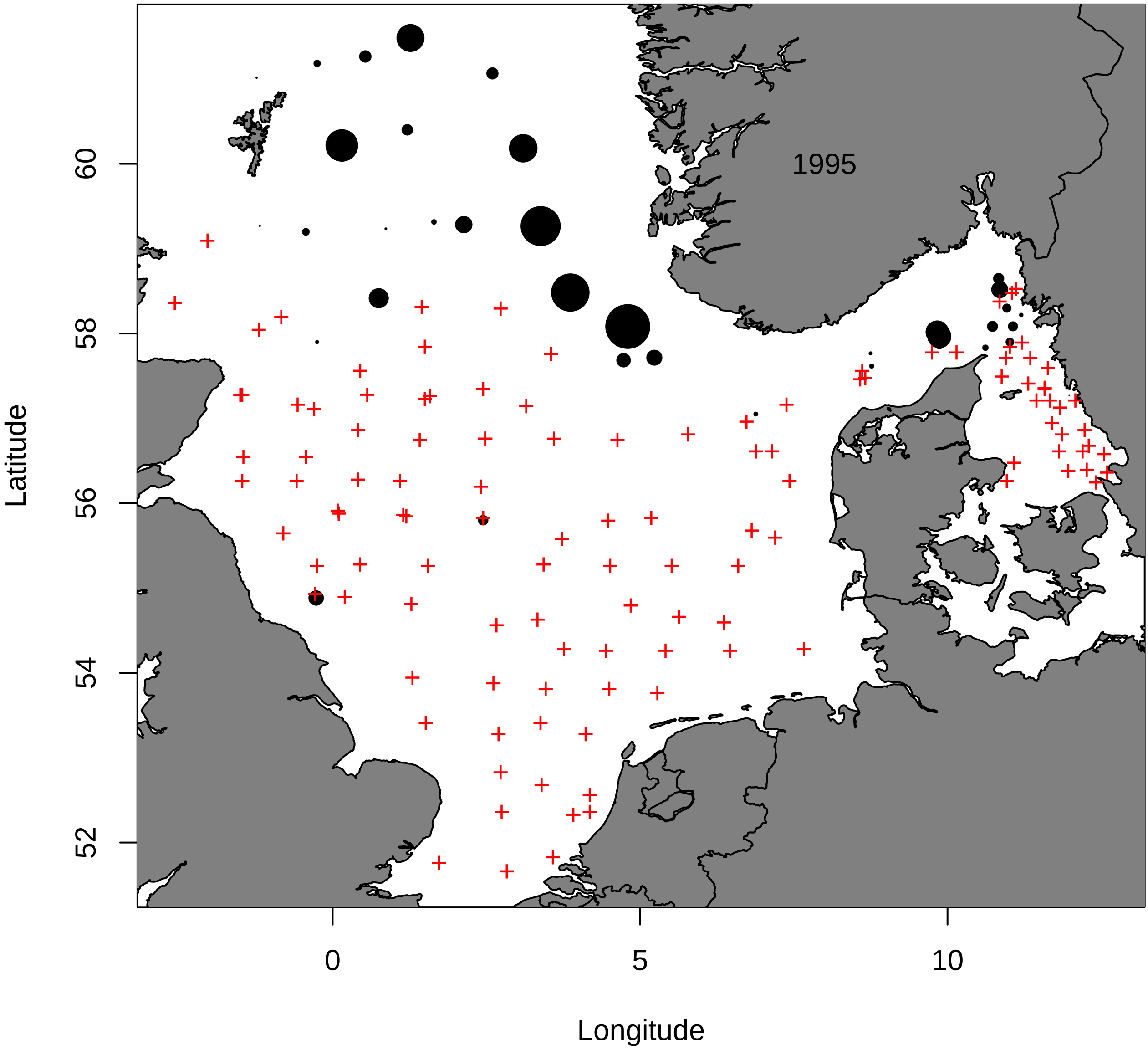
Appendix E: Plots of catches from the IBTS Q3 survey by year

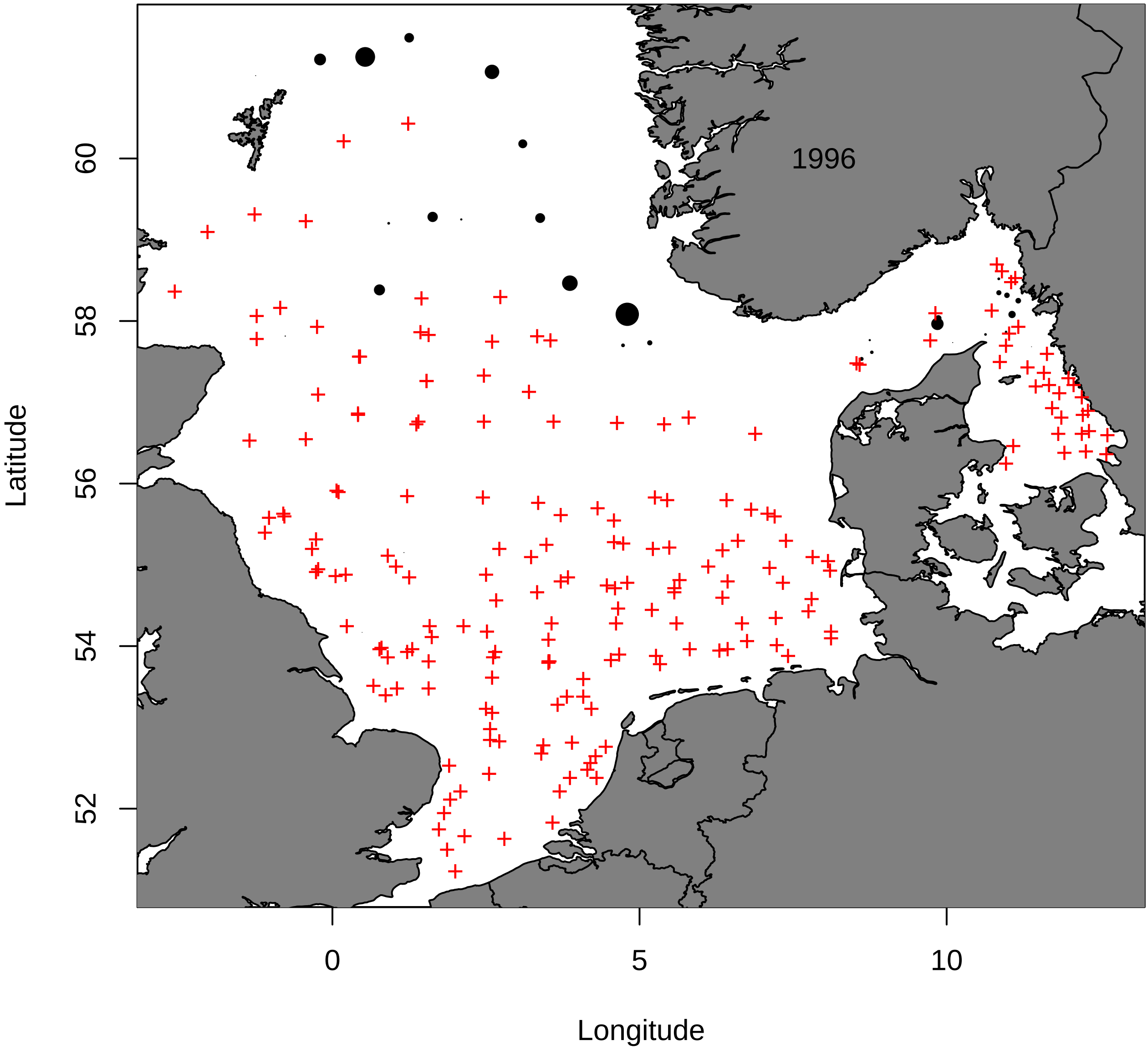

1992
60
58
56
54
52
Latitude
0
5
10
Longitude

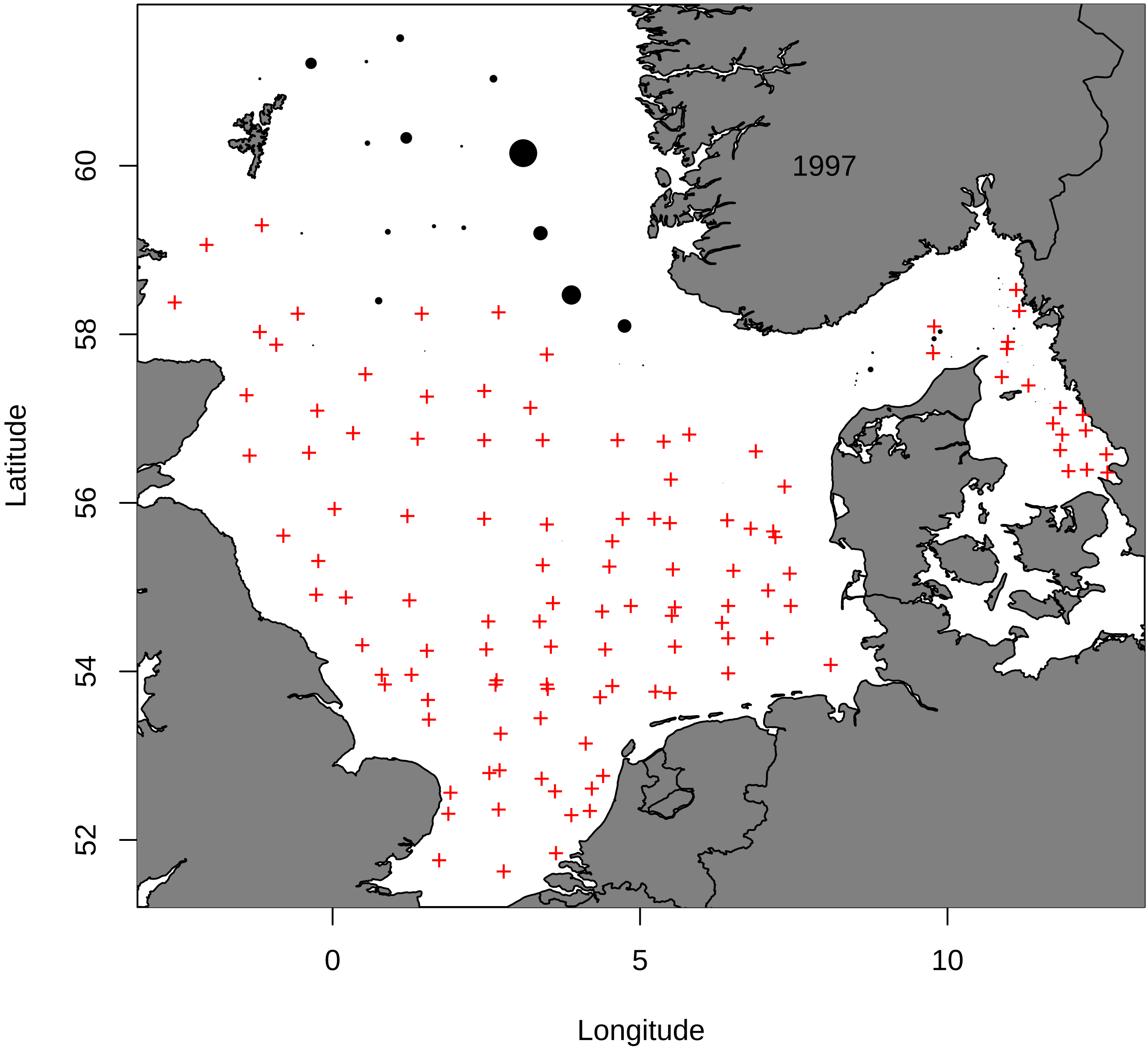

1993
Latitude
52
54
56
58
60
Longitude
0
5
10

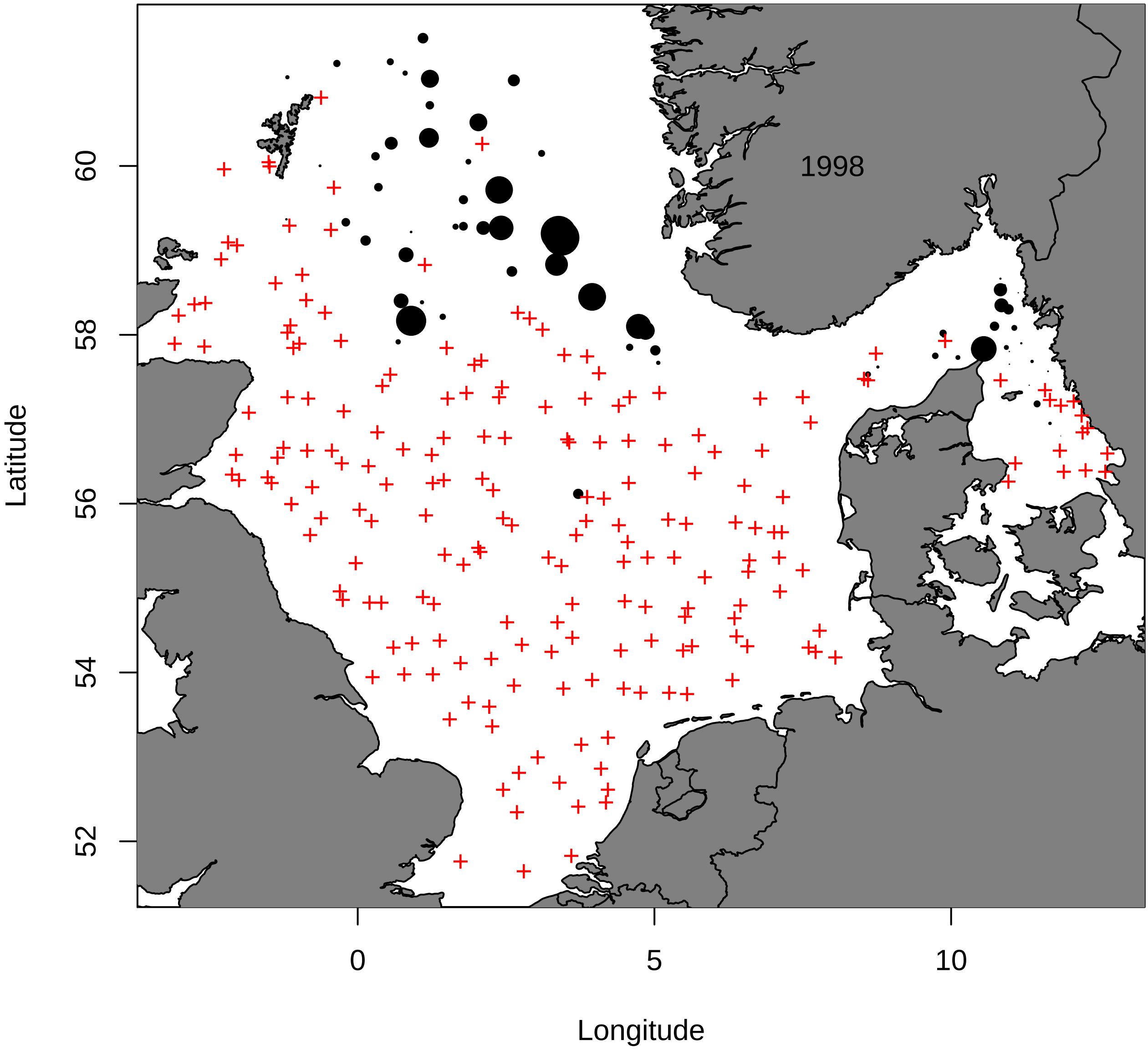


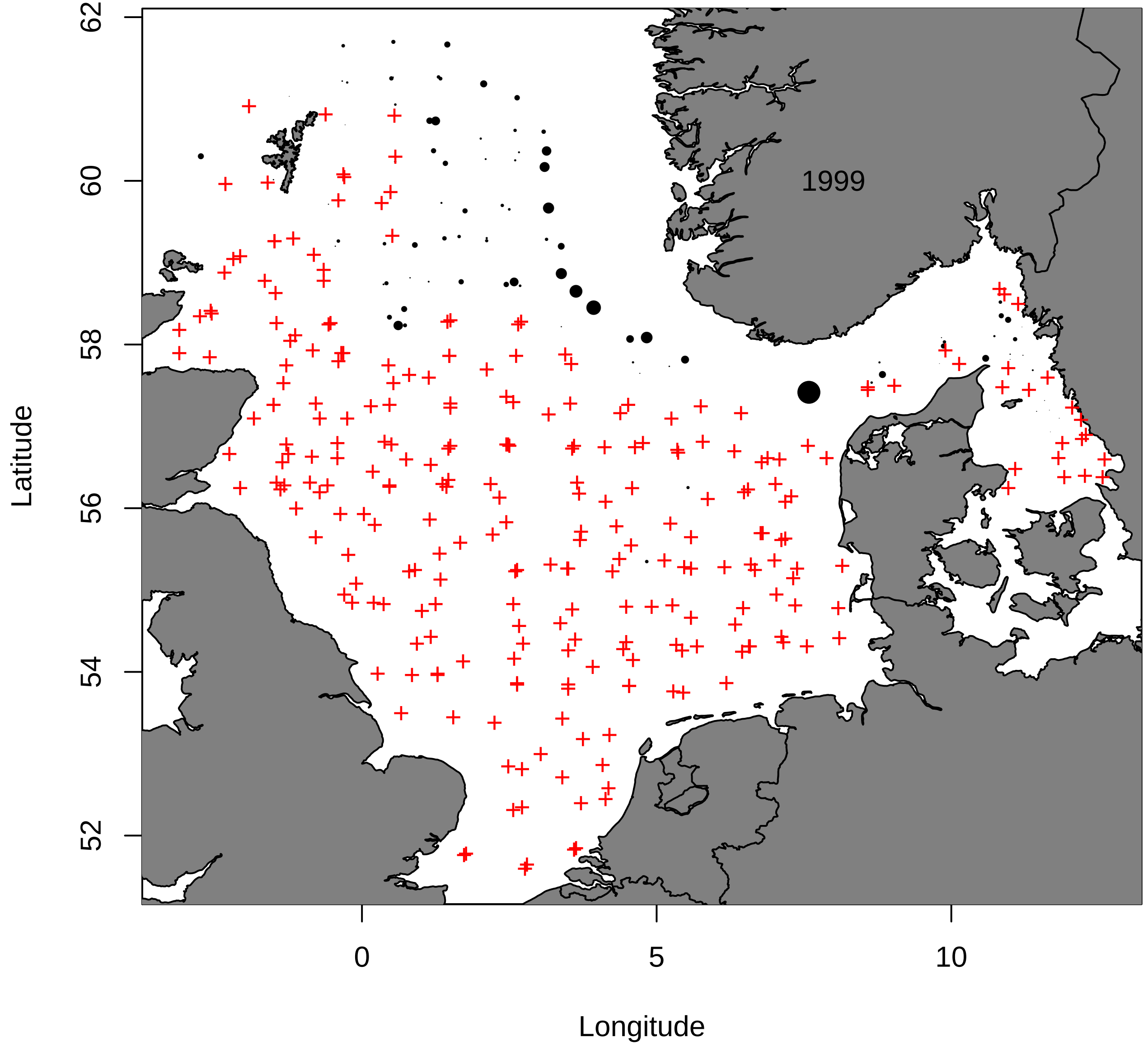
1994
Latitude
Longitude
0
5
10
52
54
56
58
60

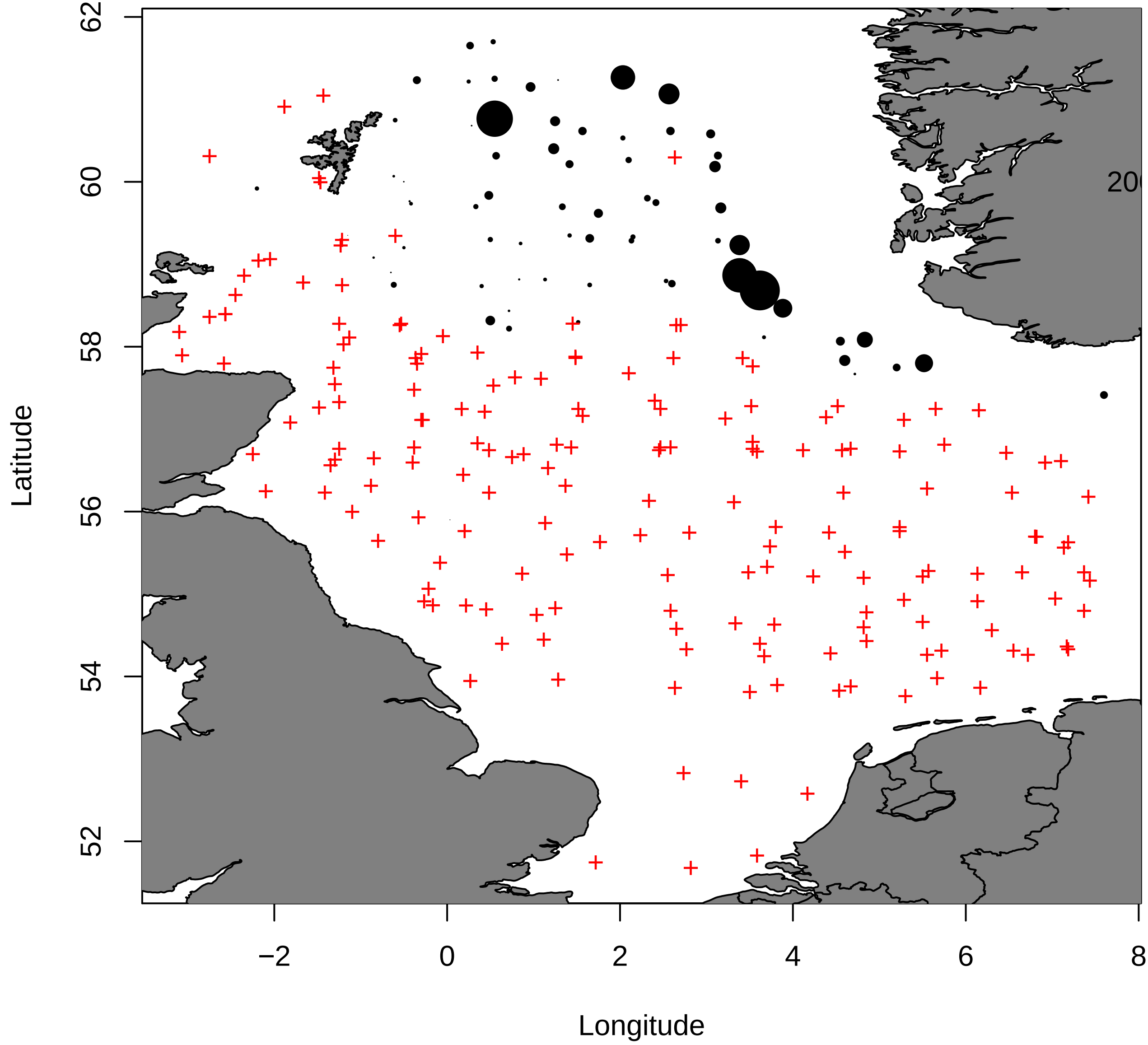

1995
Latitude
Longitude
60
58
56
54
52
0
5
10

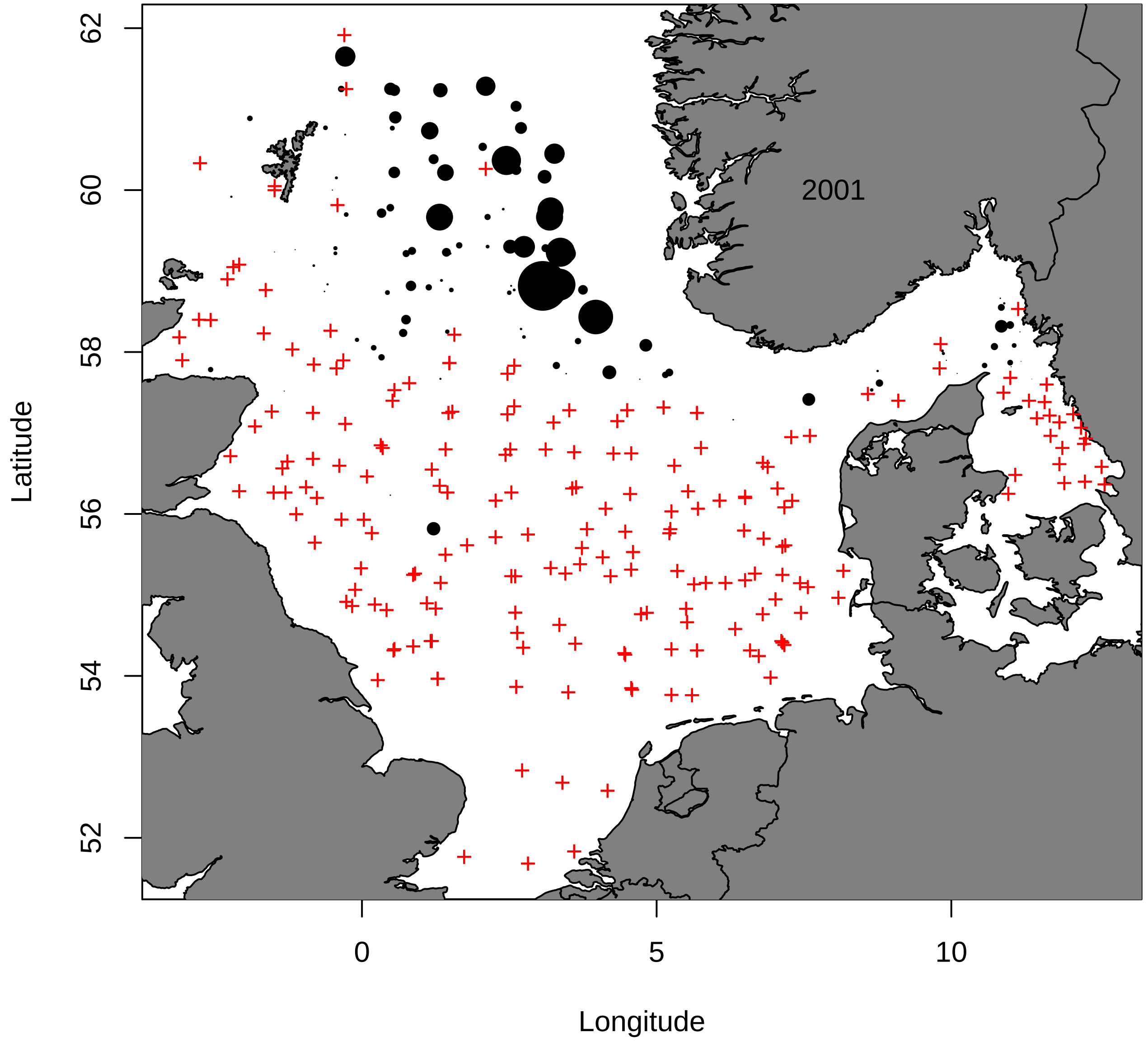

1996
Latitude
60
58
56
54
52
Longitude
0
5
10

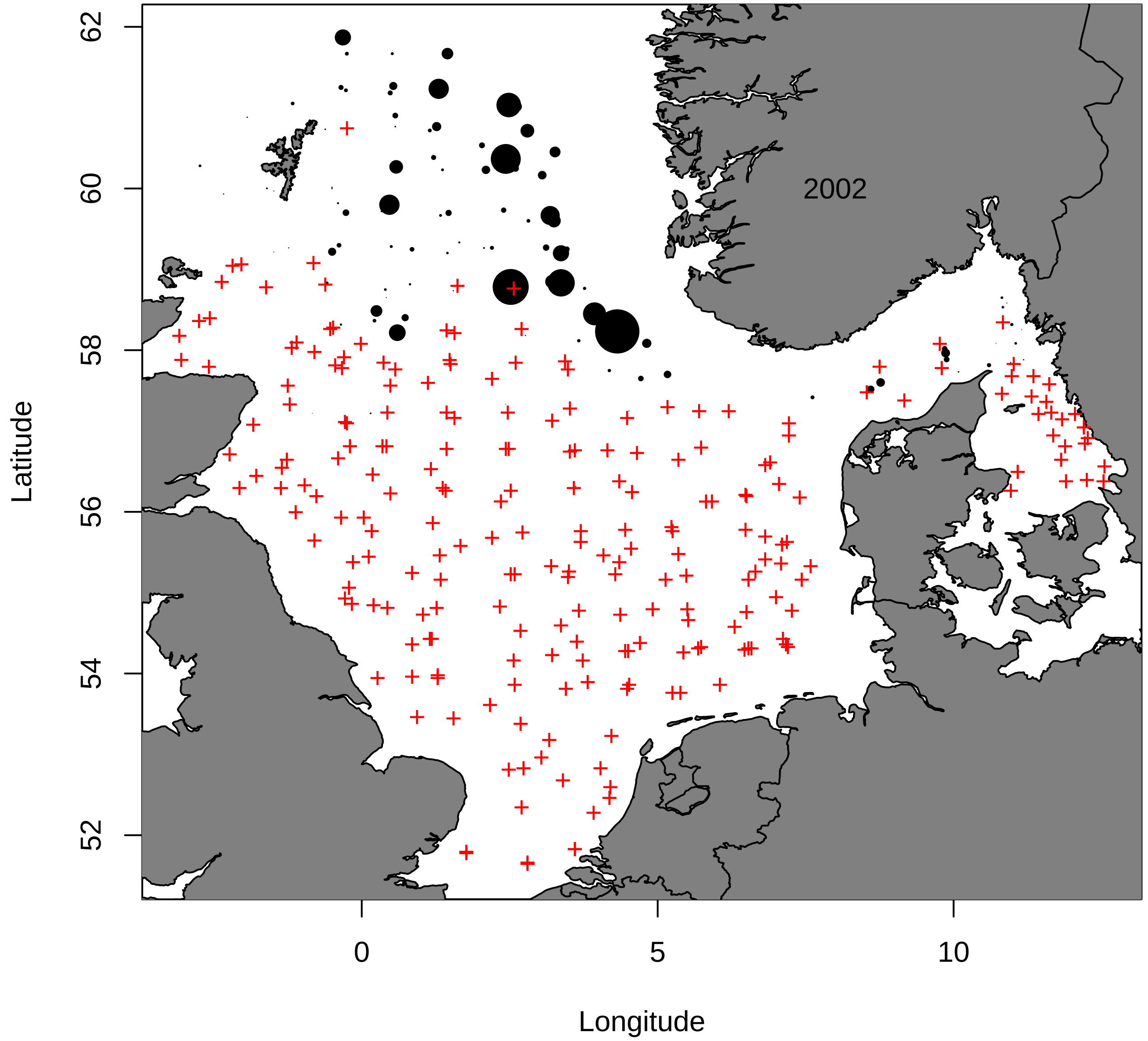

1997
Latitude
60
58
56
54
52
Longitude
0
5
10


1998
Latitude
Longitude
60
58
56
54
52
0
5
10

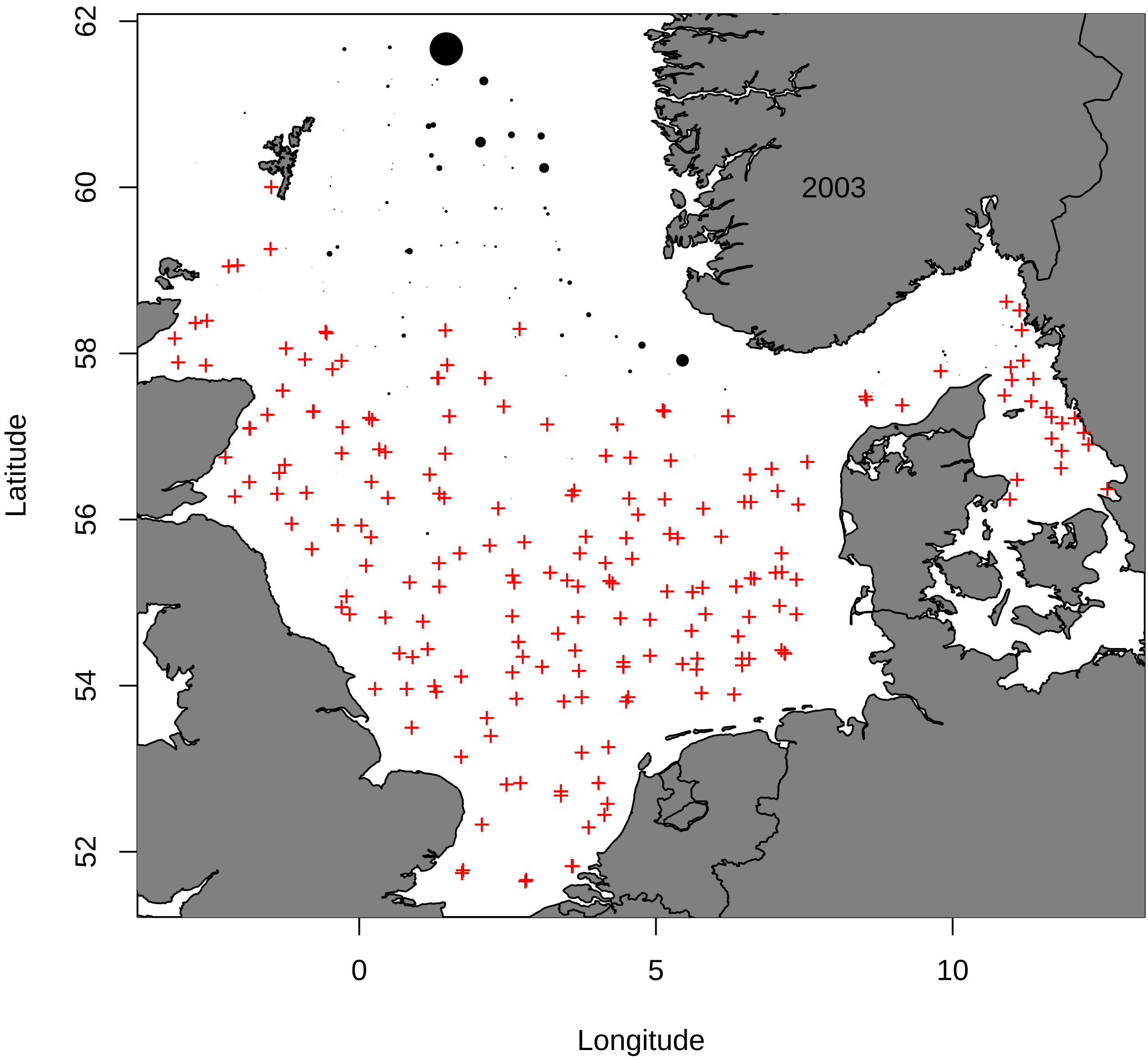

1999
62
60
58
56
54
52
Latitude
0
5
10
Longitude

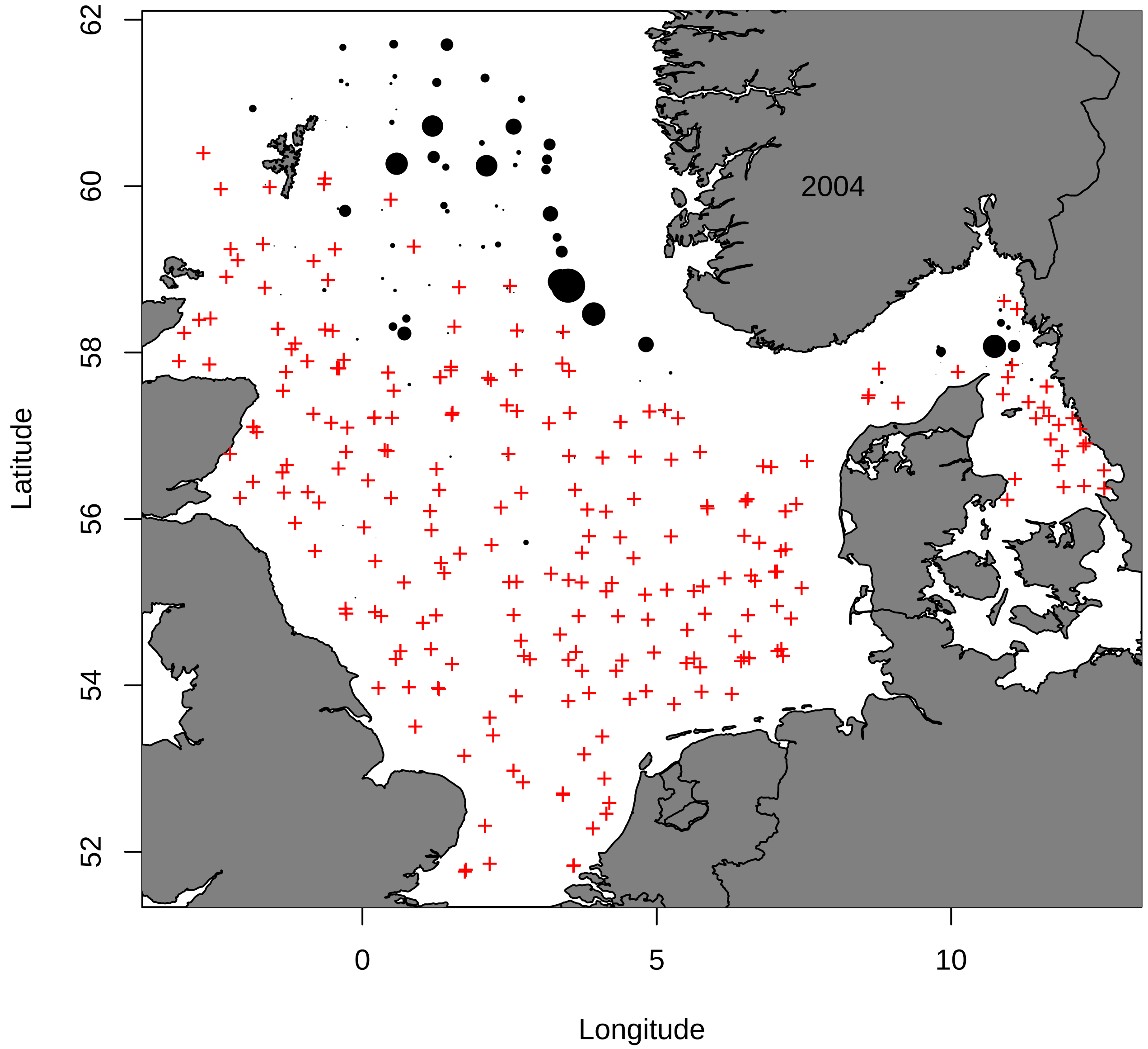

62
60
58
56
54
52
Latitude
−2
0
2
4
6
8
Longitude
20

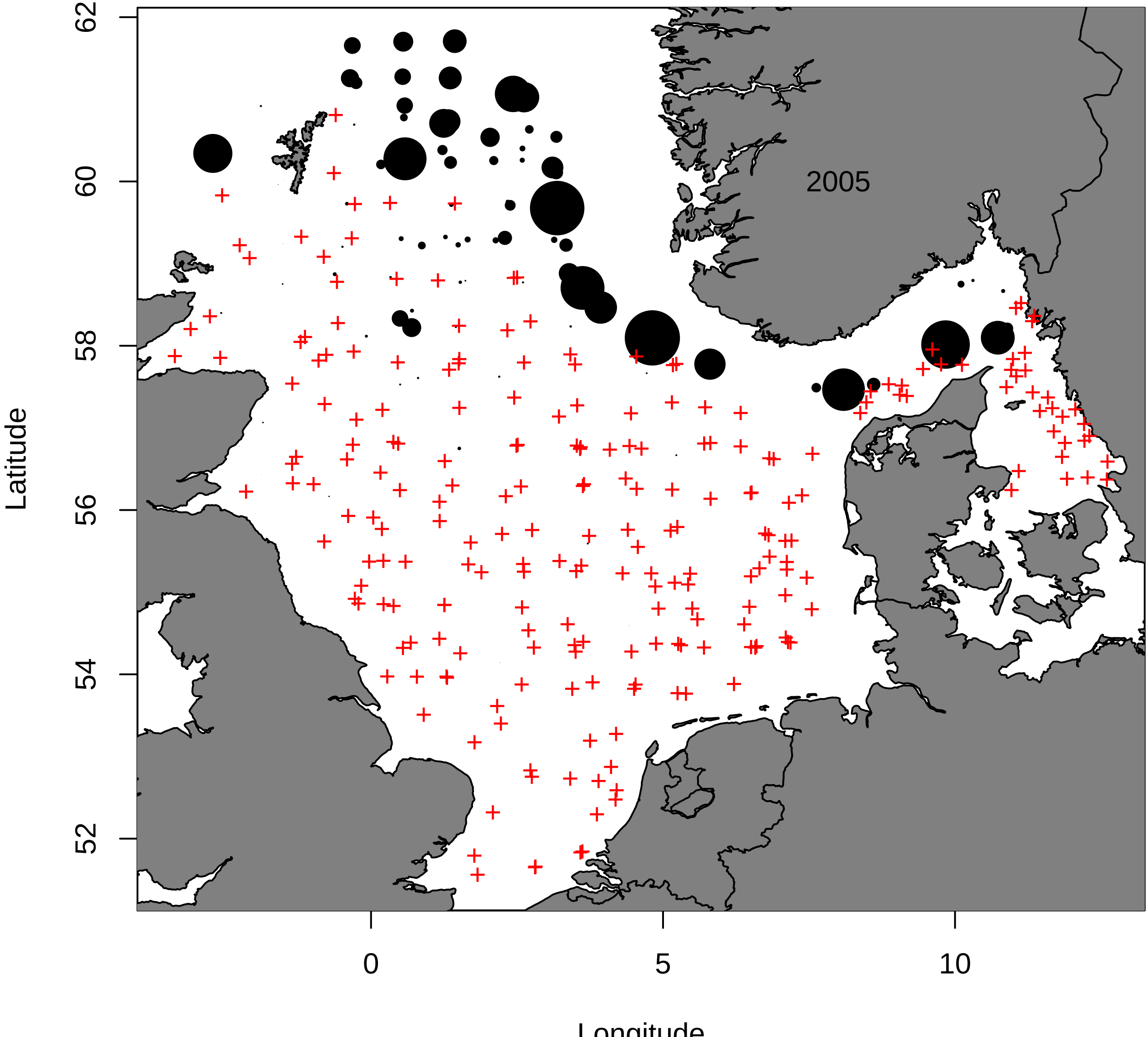

2001
Latitude
Longitude
62
60
58
56
54
52
0
5
10

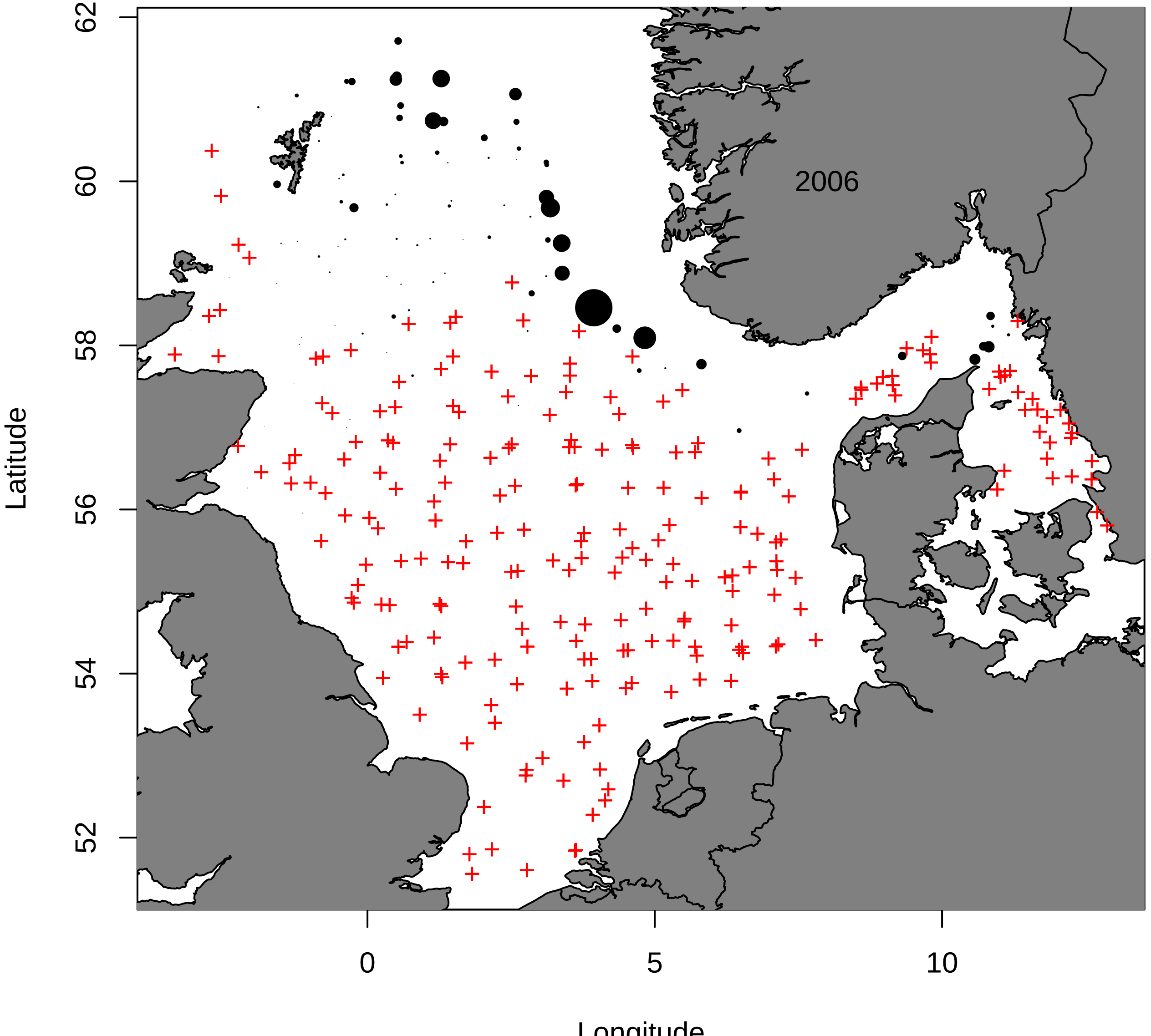


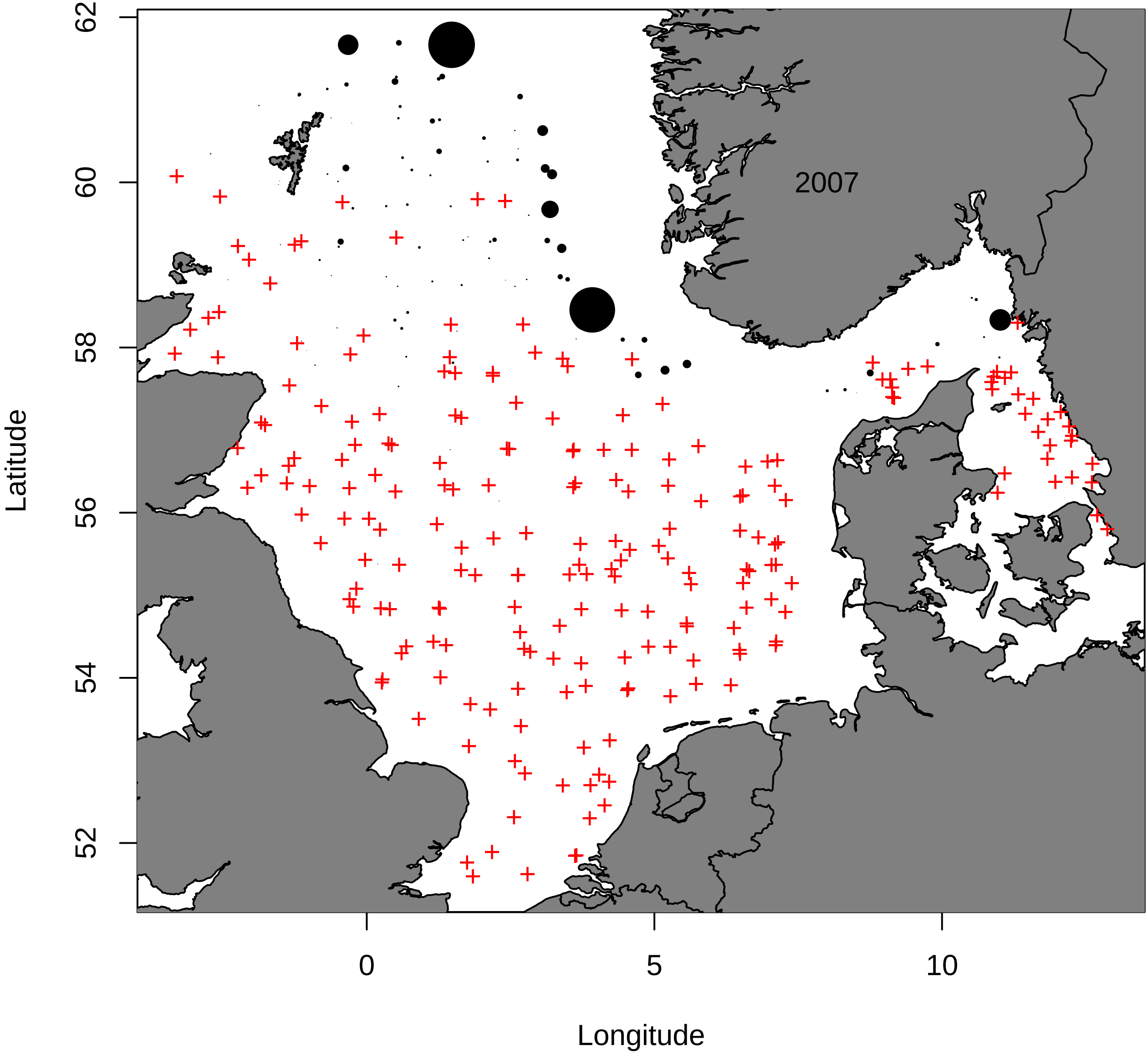
2002
62
60
58
56
54
52
Latitude
0
5
10
Longitude

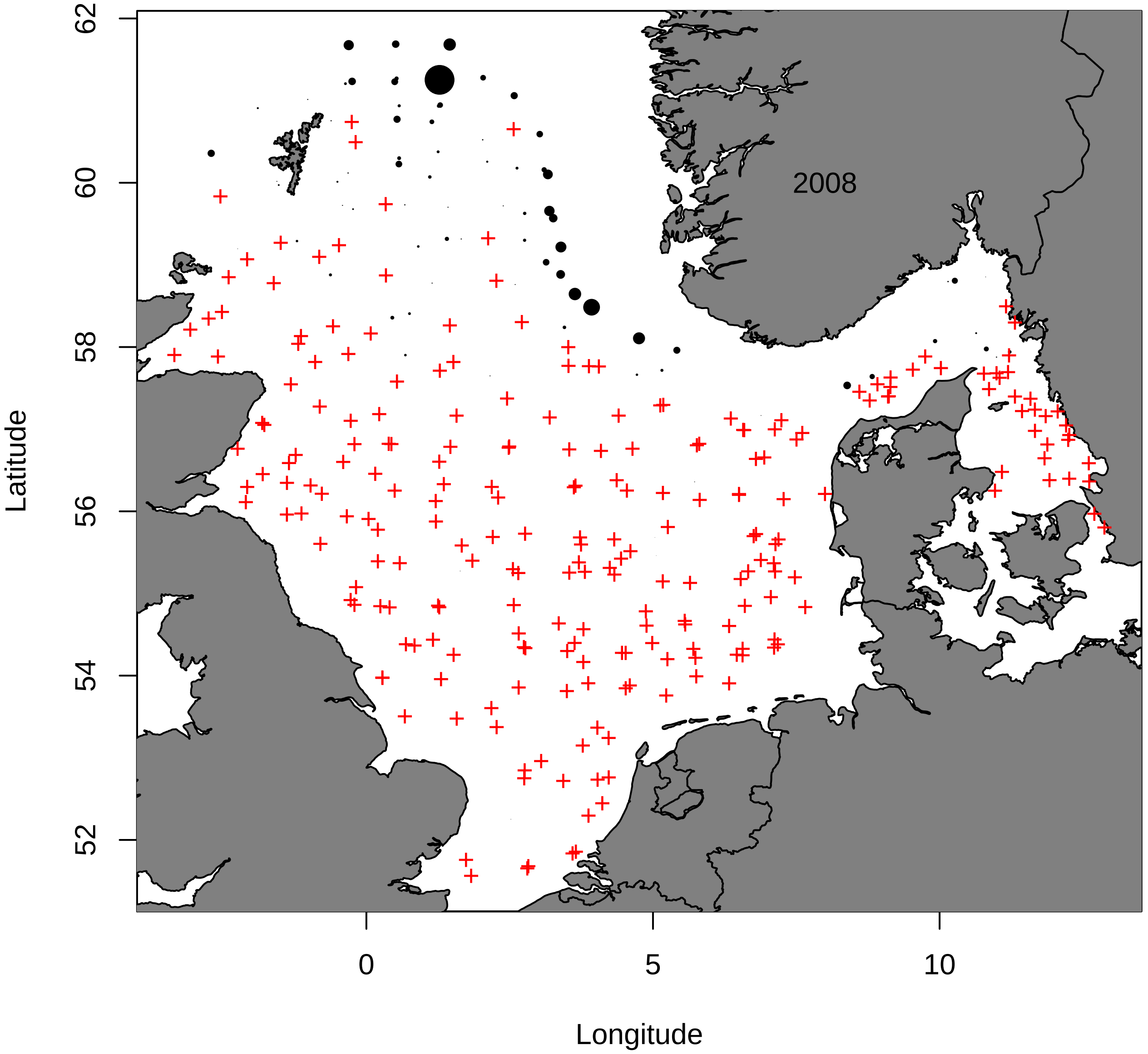

2003
Latitude
Longitude
62
60
58
56
54
52
0
5
10

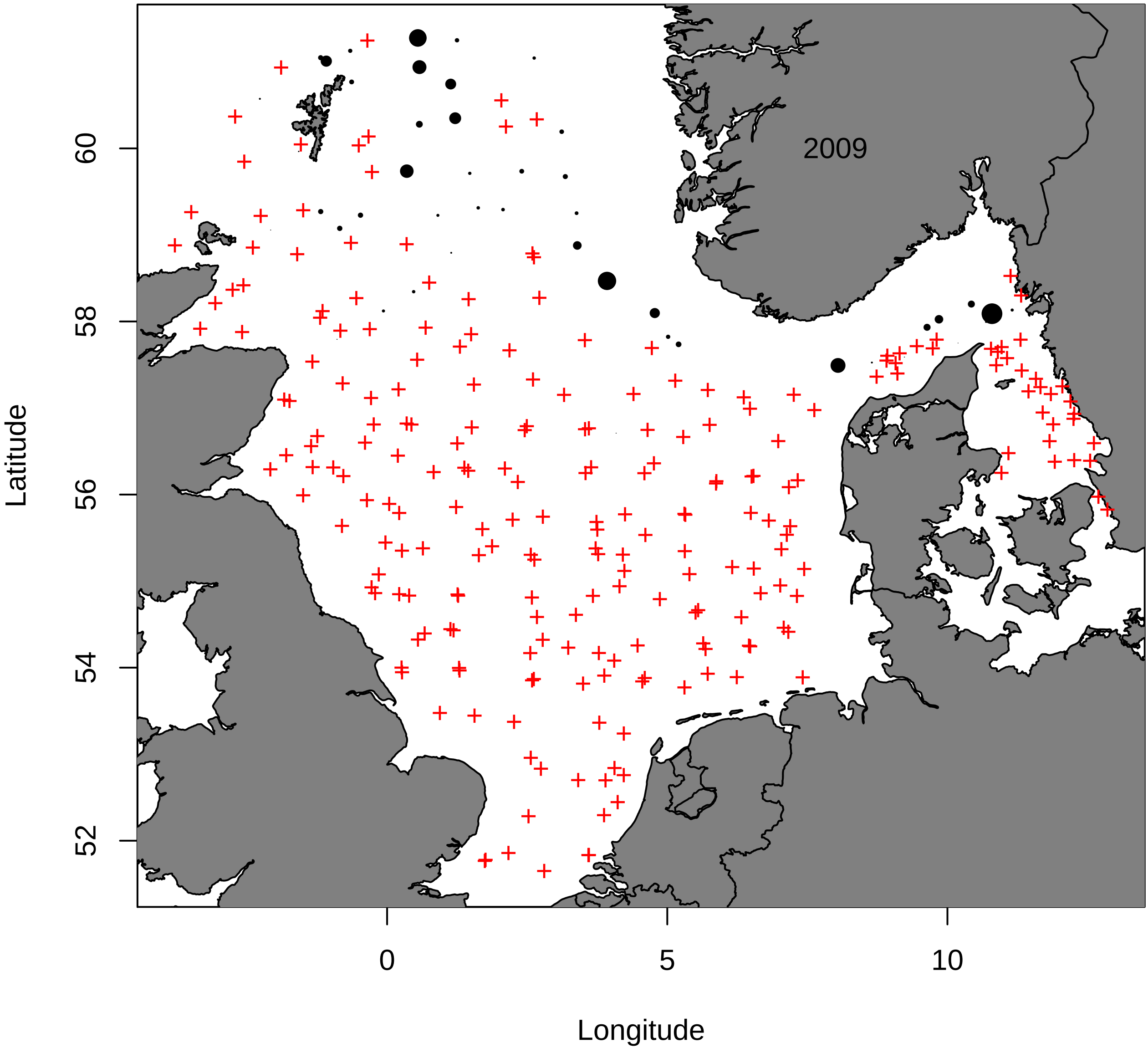

2004
Latitude
Longitude
62
60
58
56
54
52
0
5
10

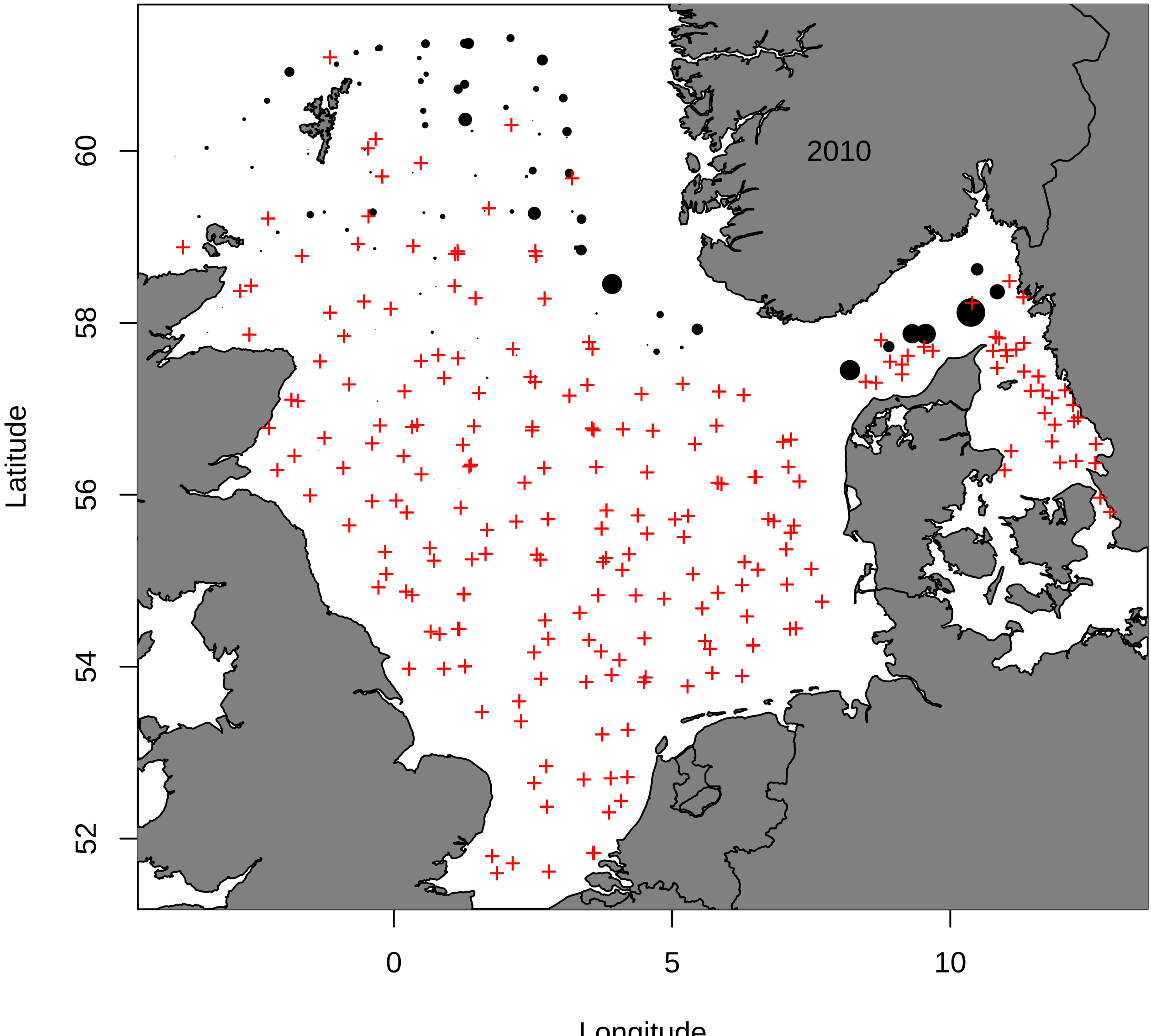

2005
Latitude
Longitude
62
60
58
56
54
52
0
5
10

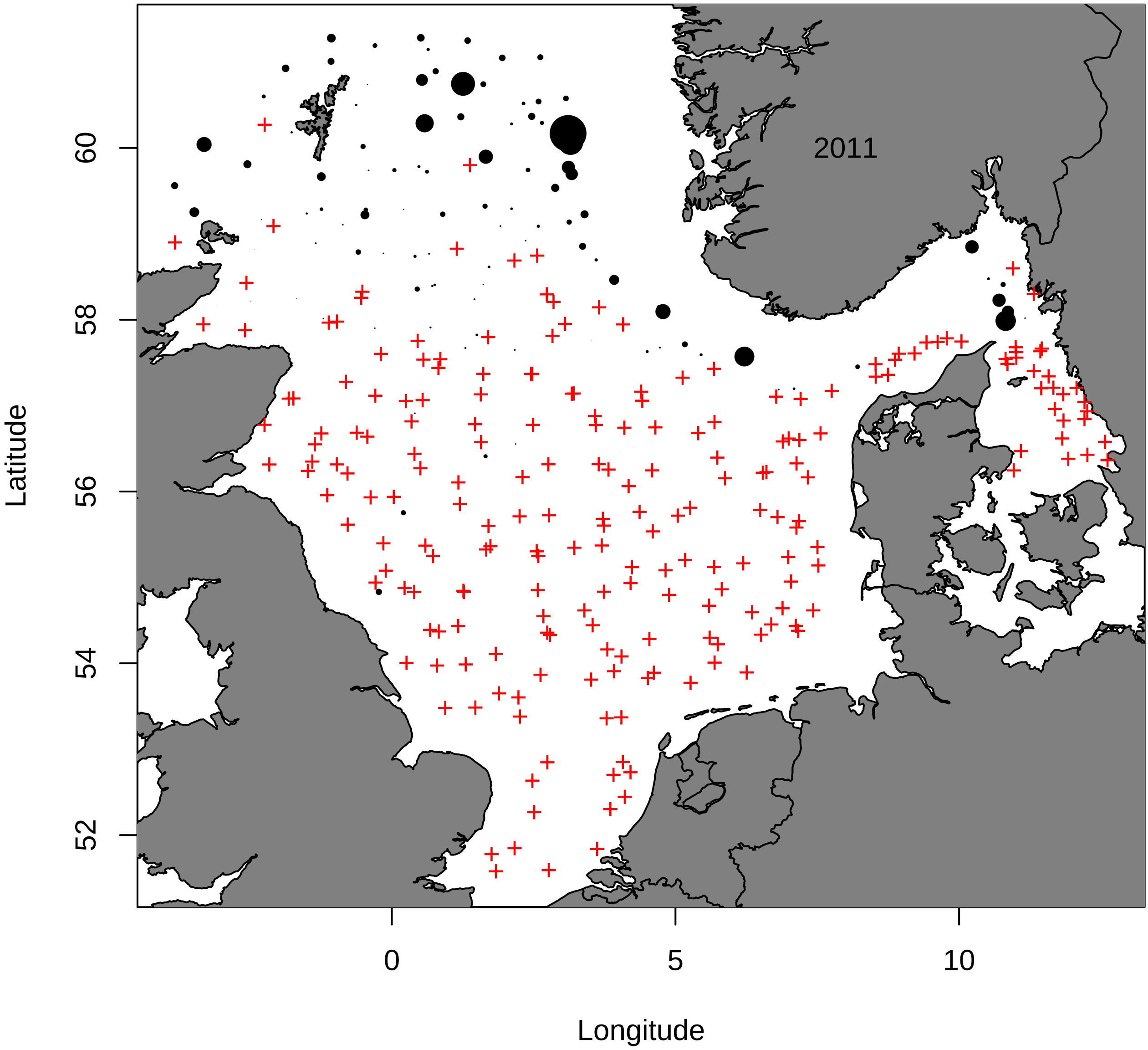

2006
Latitude
Longitude
62
60
58
56
54
52
0
5
10

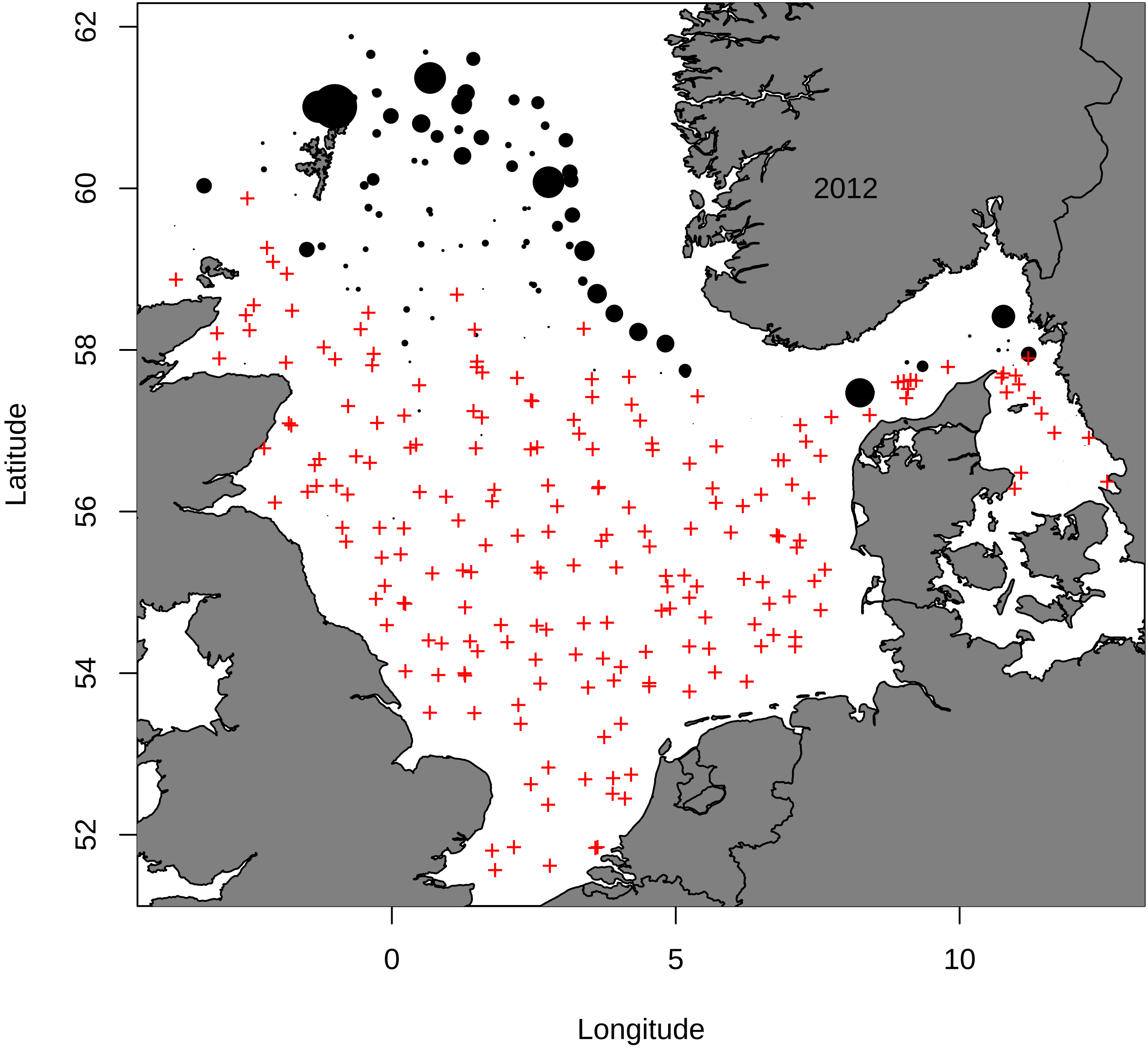

2007
Latitude
Longitude
62
60
58
56
54
52
0
5
10

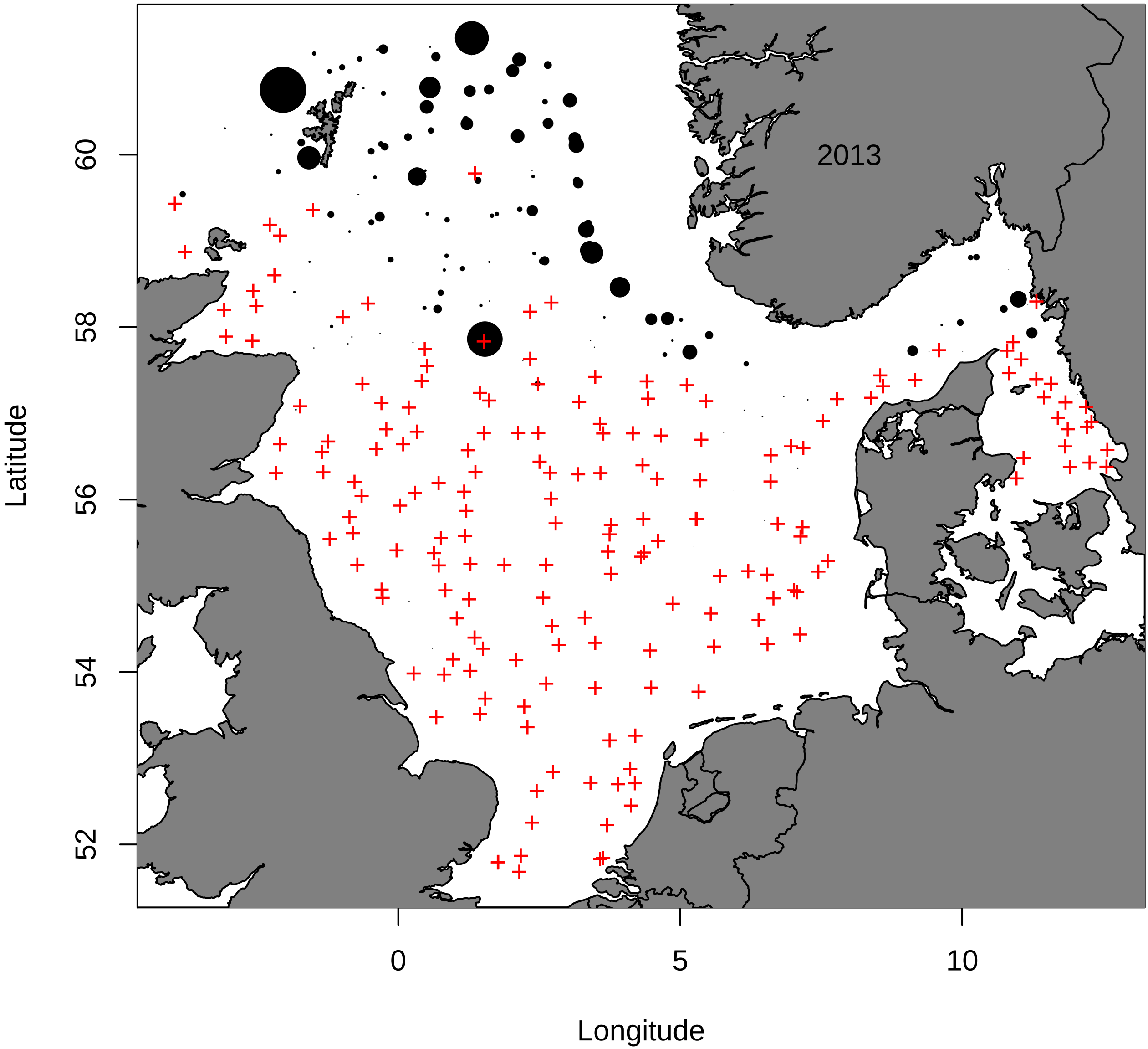

2008
Latitude
Longitude
62
60
58
56
54
52
0
5
10

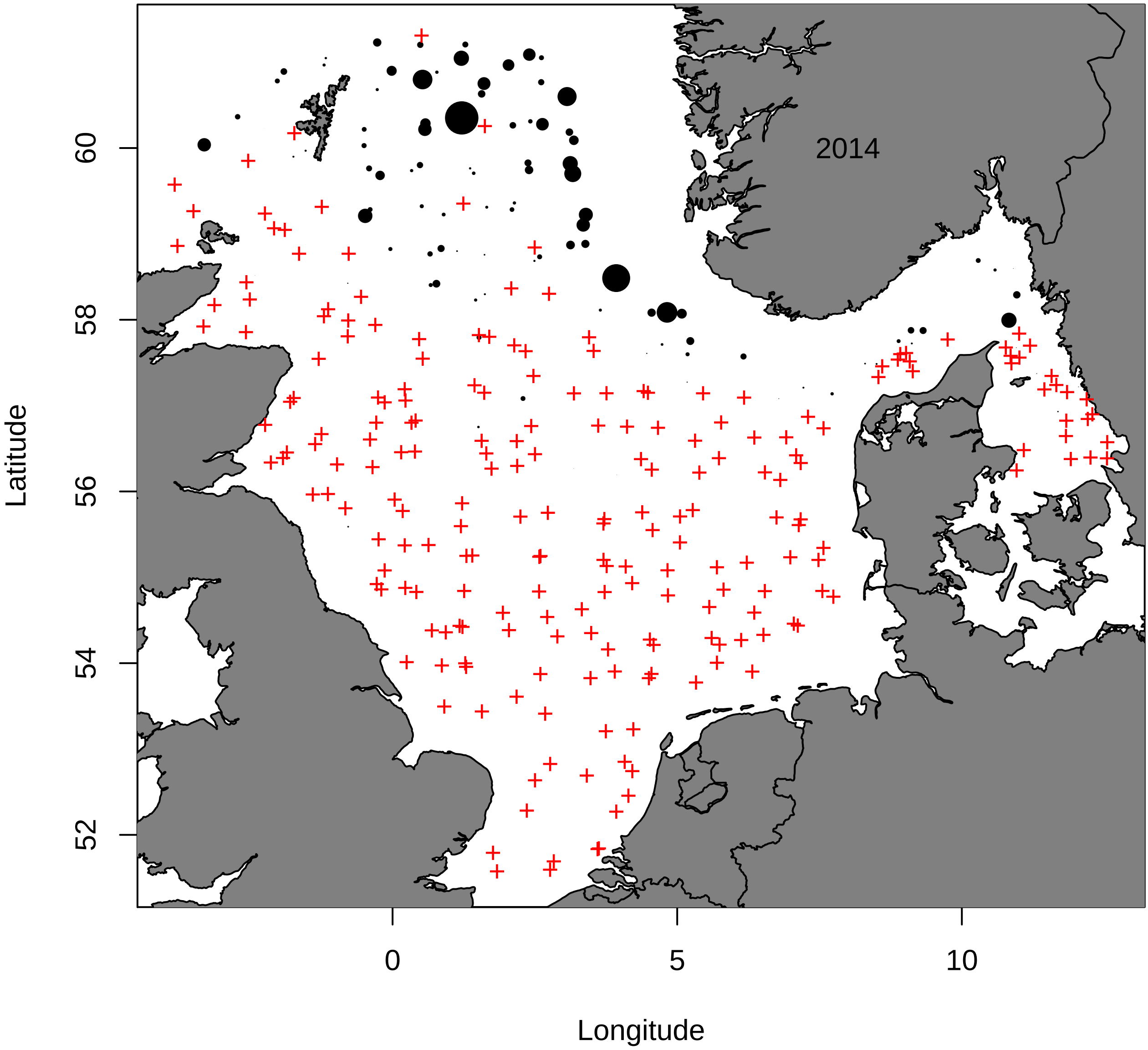

2009
Latitude
60
58
56
54
52
Longitude
0
5
10

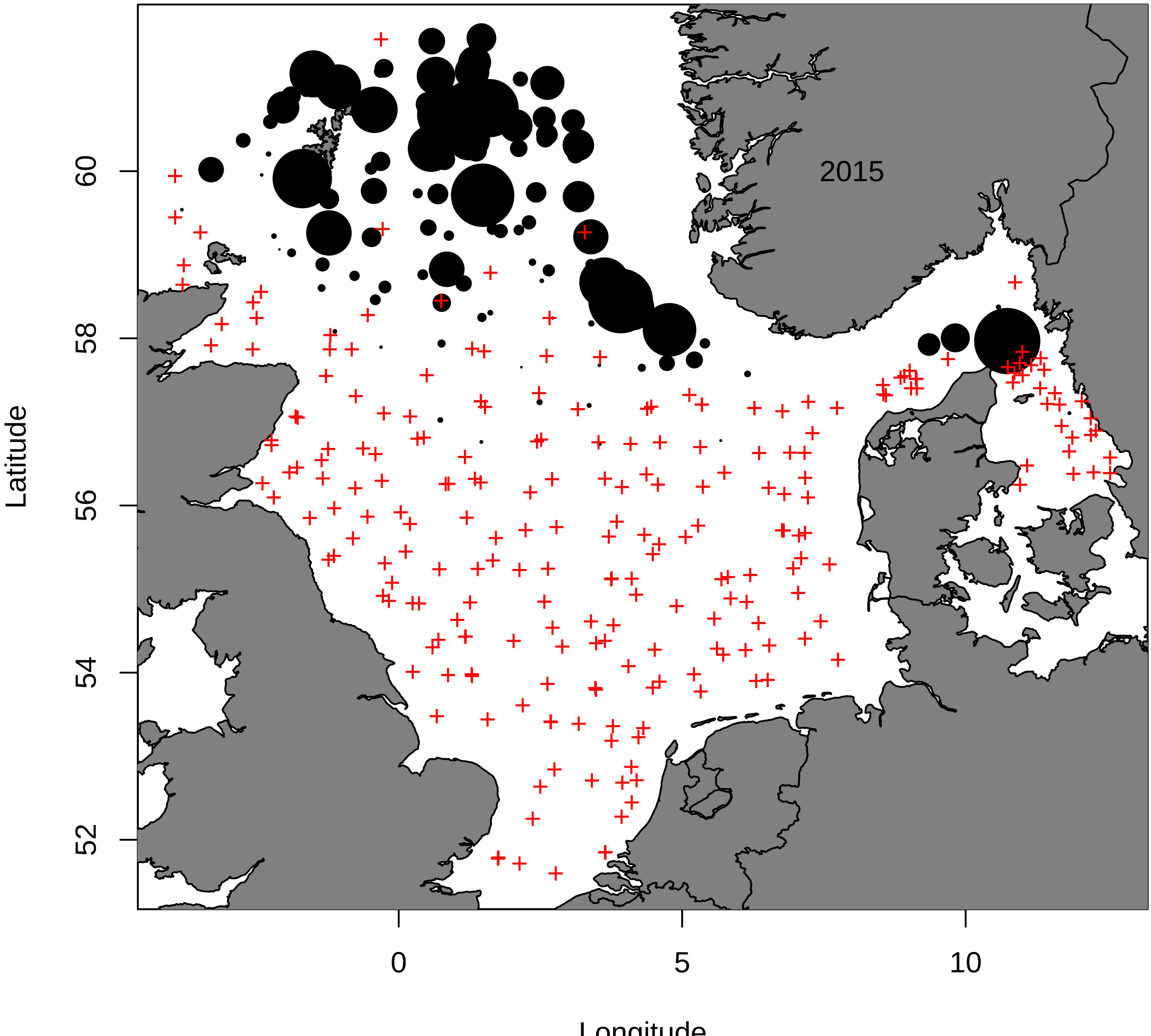

2010
Latitude
60
58
56
54
52
Longitude
0
5
10


2011
Latitude
Longitude
60
58
56
54
52
0
5
10


2012
Latitude
Longitude
62
60
58
56
54
52
0
5
10


2013
Latitude
Longitude
60
58
56
54
52
0
5
10


2014
60
58
56
54
52
Latitude
0
5
10
Longitude


2015
Latitude
Longitude
60
58
56
54
52
0
5
10

Appendix F: Model summaries for truncated Q3 index No Skagerrak or southern North Sea

Model fits and residual plots

Table 1F. Deviance explained, R^2, and Scale estimate for the presence and absence delta GAM models, for ages 1-10.

	Positive/Presence			Zero/Absence		
Age	**% Deviance explained**	**R^2**	**-ML**	**% Deviance explained**	**R^2**	**-ML**
1	30.4	0.036	161.84	25.2	0.140	369.68
2	25.1	0.201	1456.8	34.9	0.382	1138.2
3	44.6	0.408	2417.1	48.7	0.541	995.28
4	47.8	0.447	2362.2	53.5	0.594	895.69
5	47.0	0.431	2009.1	57.3	0.624	826.72
6	38.3	0.337	1555.3	55.6	0.603	827.81
7	28.6	0.235	1108.1	50.4	0.528	844.74
8	19.6	0.122	772.61	45.9	0.454	819.55
9	18.7	0.109	477.18	44.6	0.398	664.95
10	21.4	0.110	595.95	41.3	0.374	730.48

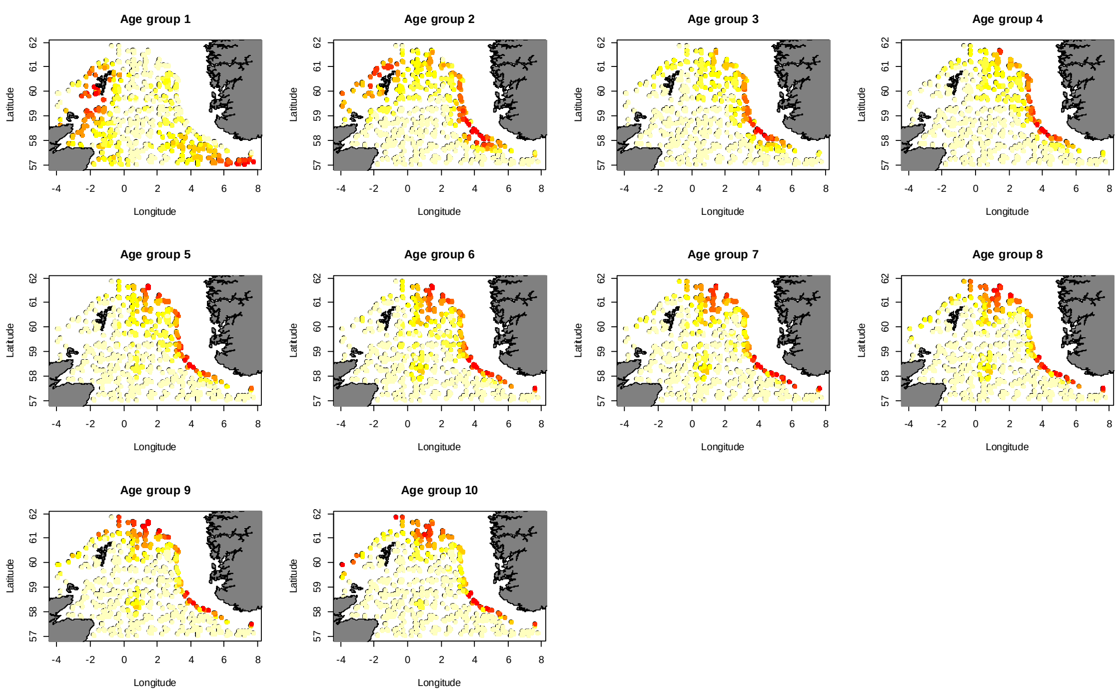


Figure 1F. Predicted values for positive delta GAM model for ages 1-10, using truncated survey data (no southern NS or Skagerrak/Kattegat). Scale goes from pale yellow (low values) to red (high values).

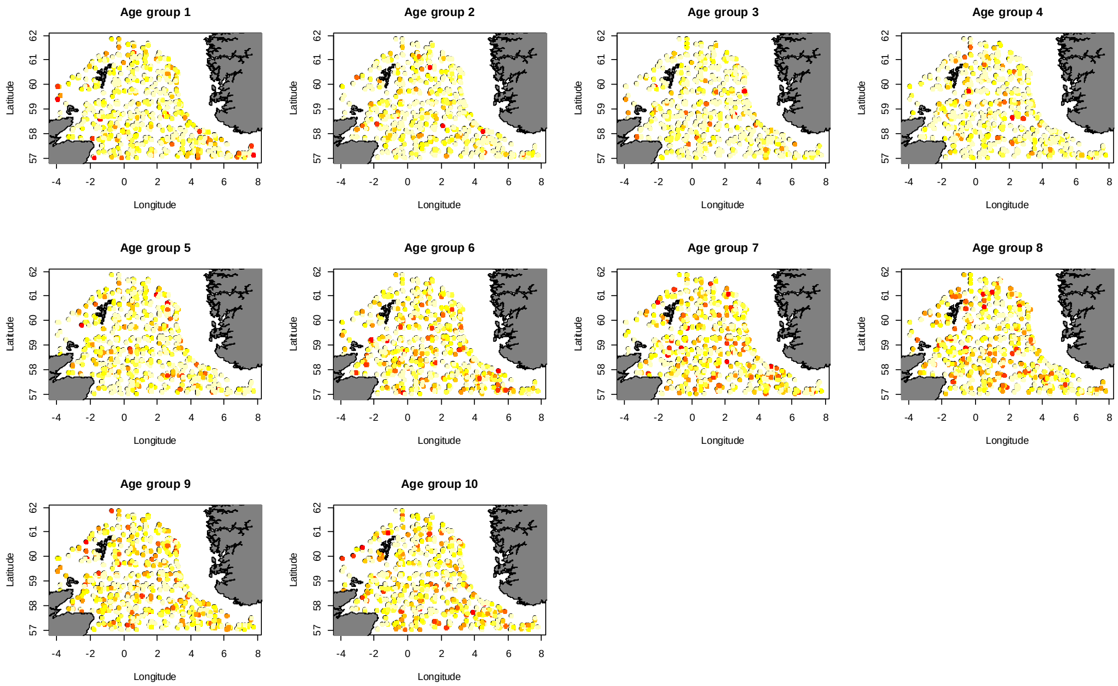


Figure 2F. Residuals for positive/presence delta GAM model for ages 1-10, using truncated survey data (no southern NS or Skagerrak/Kattegat). Scale goes from negative (light yellow) to positive (red).

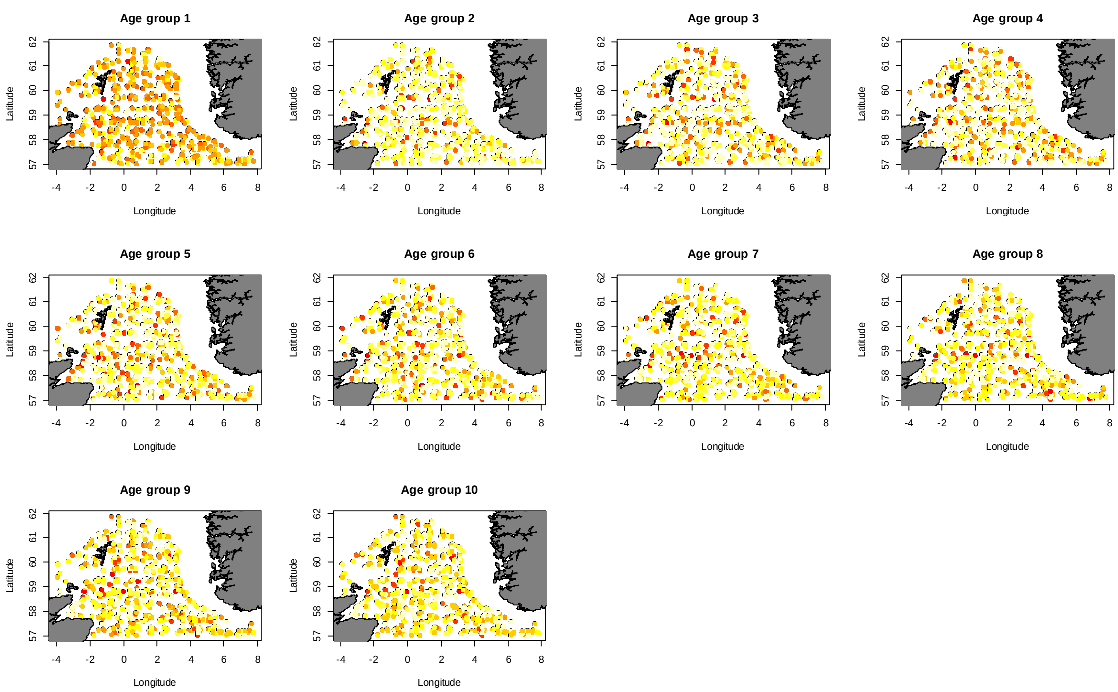


Figure 3F. Residuals for zero/absence delta GAM model for ages 1-10, using truncated survey data (no southern NS or Skagerrak/Kattegat). Scale goes from negative (light yellow) to positive (red).

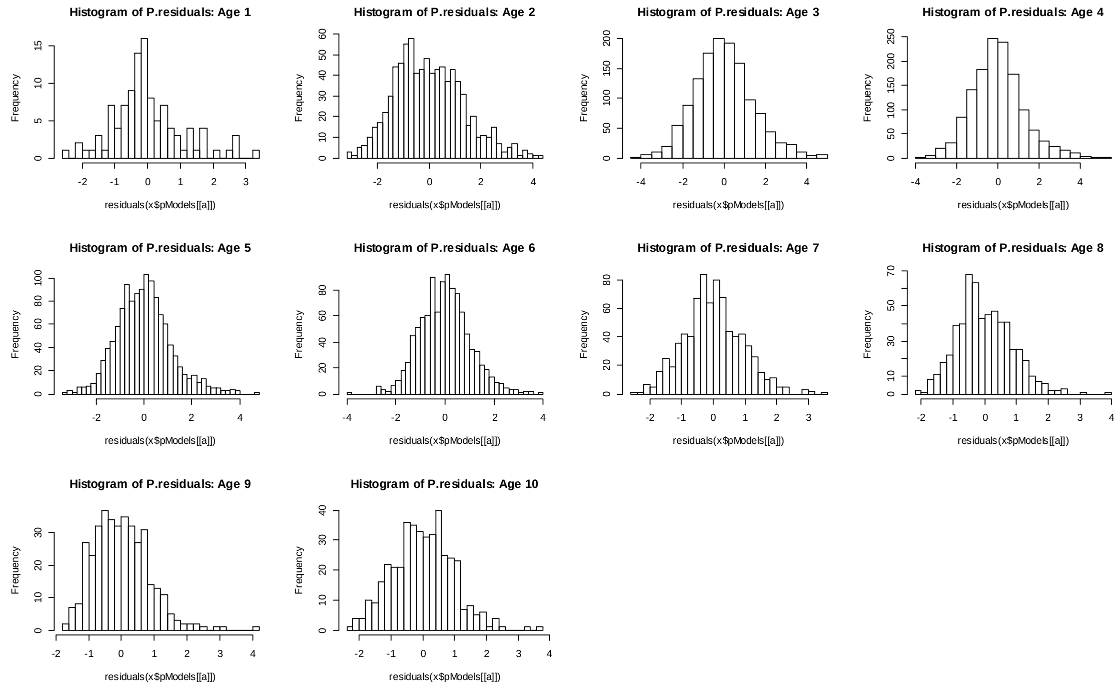


Figure 4F. Histogram of residuals for positive/presence delta GAM model for ages 1-10, using truncated survey data (no southern NS or Skagerrak/Kattegat).

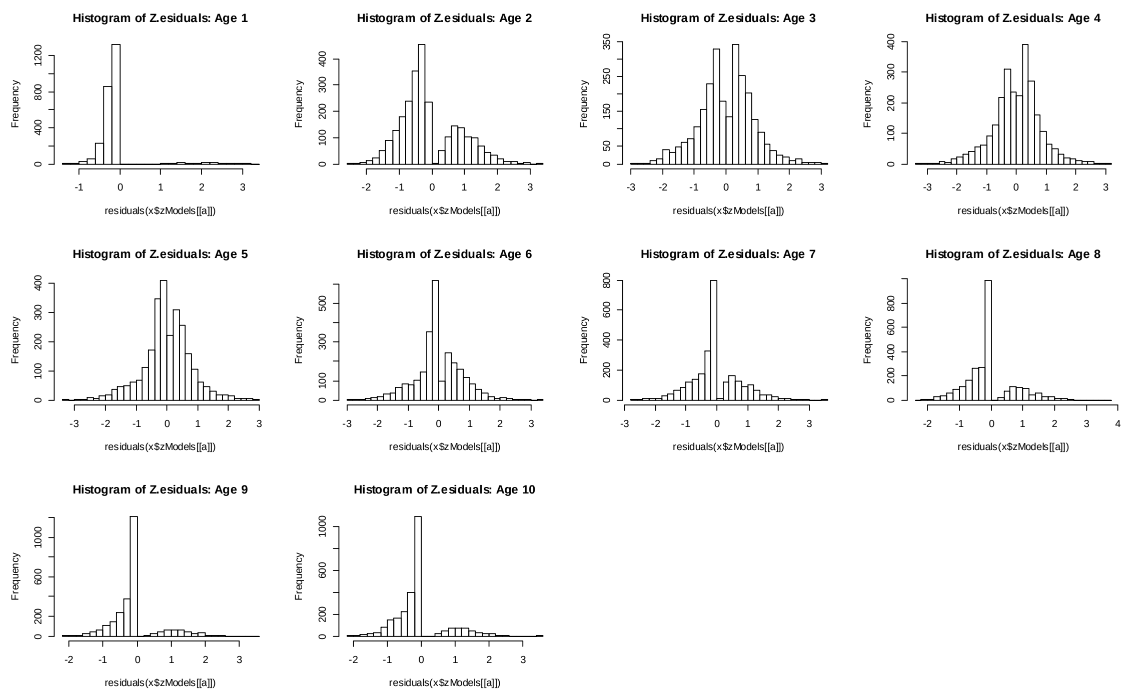


Figure 5F. Histogram of residuals for zero/absence delta GAM model for ages 1-10, using truncated survey data (no southern NS or Skagerrak/Kattegat).

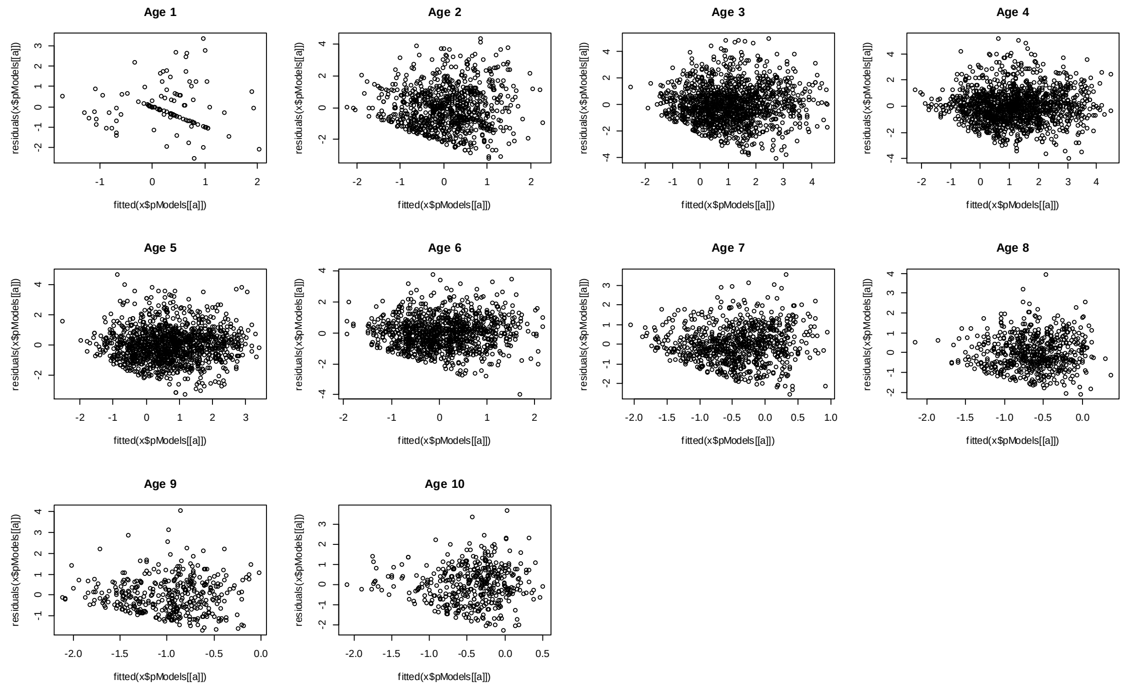


Figure 6F. Residuals vs. fitted values for positive/presence delta GAM model for ages 1-10, using truncated survey data (no southern NS or Skagerrak/Kattegat).

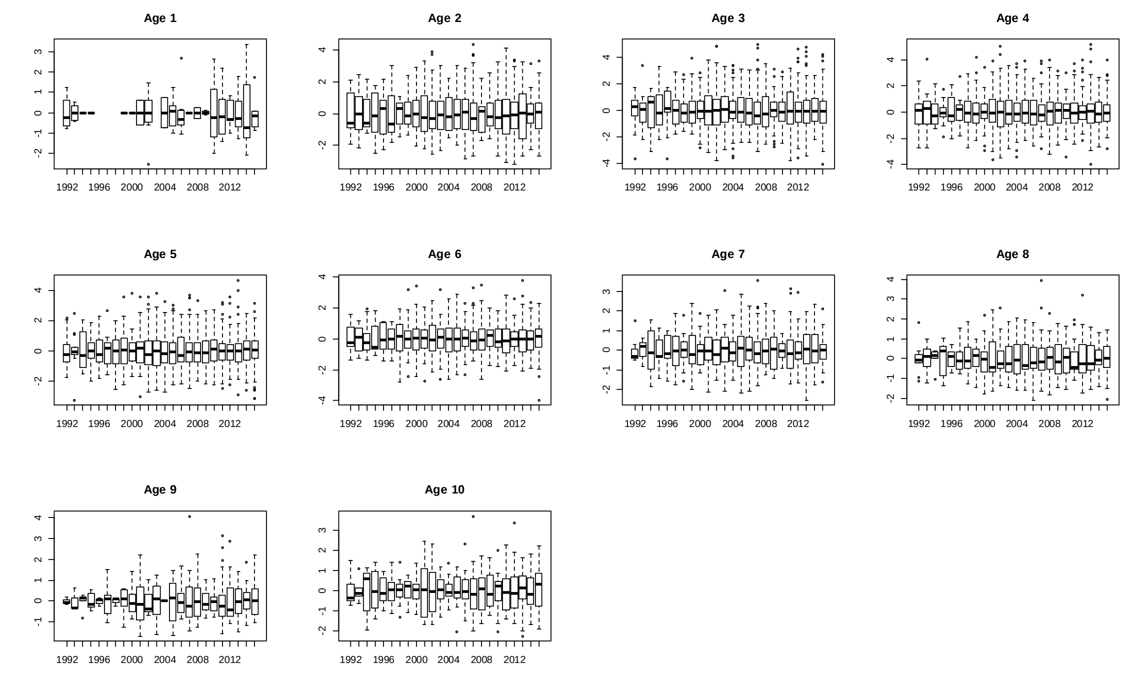


Figure 7F. Boxplot of residuals by year for positive/presence delta GAM model for ages 1-10, using truncated survey data (no southern NS or Skagerrak/Kattegat).

Positive / Presence GAM model

```
[1] "Age 1"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -2.641652   0.748050  -3.531 0.000689 ***
Year1993    -0.459213   0.835019  -0.550 0.583887
Year1994    -0.712349   1.437302  -0.496 0.621522
Year1995    -0.577830   1.440202  -0.401 0.689330
Year1999    -0.646722   1.966050  -0.329 0.743055
Year2000    -0.589412   1.970571  -0.299 0.765632
Year2001    -0.131389   1.787902  -0.073 0.941601
Year2002    -0.237175   1.463402  -0.162 0.871658
Year2004     0.802875   1.777393   0.452 0.652694
Year2005     0.099617   1.630712   0.061 0.951441
Year2006     0.005571   1.603715   0.003 0.997237
Year2007    -0.434491   1.985133  -0.219 0.827306
Year2008    -0.034182   1.840387  -0.019 0.985228
Year2009    -0.666030   1.647691  -0.404 0.687127
Year2010    -0.076497   1.555845  -0.049 0.960908
Year2011    -0.871926   1.592516  -0.548 0.585546
Year2012    -0.372645   1.608894  -0.232 0.817427
Year2013    -1.220971   1.617295  -0.755 0.452494
Year2014     0.519806   1.608548   0.323 0.747421
Year2015    -0.047806   1.599583  -0.030 0.976232
ShipTRI2    -0.369588   0.759632  -0.487 0.627915
ShipWAH2     0.055425   1.445848   0.038 0.969517
ShipMIC     -1.124043   1.592982  -0.706 0.482469
ShipWAH3    -0.812325   1.536191  -0.529 0.598411
ShipDAN2     0.298665   1.539734   0.194 0.846689
ShipSCO3    -0.065612   1.337858  -0.049 0.961007
ShipEND     -0.366655   1.381505  -0.265 0.791381
ShipJHJ     -0.318941   1.405903  -0.227 0.821111
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
                 edf Ref.df     F p-value
s(lon,lat) 0.0001151     23 0.000   0.212
s(Depth)   0.8357621      5 0.684   0.044 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.036   Deviance explained = 30.4%
-ML = 161.84  Scale est. = 1.5049    n = 109
```

```
[1] "Age 2"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -3.28665    0.62488  -5.260 1.86e-07 ***
Year1993     0.69827    0.71169   0.981  0.32683
Year1994     0.93738    0.81440   1.151  0.25008
Year1995     0.20754    0.74594   0.278  0.78091
Year1996     1.15371    0.73605   1.567  0.11742
Year1997     0.14497    0.73915   0.196  0.84456
Year1998    -0.74341    0.71991  -1.033  0.30209
Year1999    -1.02110    0.68652  -1.487  0.13732
Year2000    -0.94094    0.67054  -1.403  0.16094
Year2001     0.08832    0.66472   0.133  0.89433
Year2002    -0.47403    0.66517  -0.713  0.47628
Year2003    -0.46297    0.70341  -0.658  0.51062
Year2004    -1.17551    0.73110  -1.608  0.10827
Year2005    -1.36501    0.72109  -1.893  0.05873 .
Year2006    -0.22713    0.70960  -0.320  0.74899
Year2007    -0.30251    0.70379  -0.430  0.66744
Year2008    -0.88822    0.75894  -1.170  0.24222
Year2009    -0.60233    0.76398  -0.788  0.43070
Year2010    -0.34687    0.69961  -0.496  0.62018
Year2011    -0.15482    0.70448  -0.220  0.82611
Year2012    -0.46217    0.70042  -0.660  0.50954
Year2013    -0.91123    0.70999  -1.283  0.19972
Year2014    -1.11531    0.73145  -1.525  0.12772
Year2015    -0.59060    0.70455  -0.838  0.40214
ShipTRI2    -0.67367    0.77662  -0.867  0.38596
ShipMIC      0.60341    0.22894   2.636  0.00856 **
ShipWAH3     0.07367    0.38750   0.190  0.84927
ShipDAN2     0.67128    0.77717   0.864  0.38799
ShipSCO3     0.60399    0.25965   2.326  0.02026 *
ShipEND      0.48488    0.29118   1.665  0.09627 .
ShipHAV      0.87858    0.35138   2.500  0.01261 *
ShipJHJ      0.52093    0.30105   1.730  0.08396 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df     F  p-value
s(lon,lat) 14.985     23 6.126  < 2e-16 ***
s(Depth)    3.058      5 4.119 7.04e-06 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.201   Deviance explained = 25.1%
-ML = 1456.8  Scale est. = 1.8644    n = 833
```

```
[1] "Age 3"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -3.20156    0.34957  -9.159  < 2e-16 ***
Year1993     1.63358    0.47042   3.473 0.000533 ***
Year1994    -0.27327    0.54393  -0.502 0.615474
Year1995     1.75000    0.46899   3.731 0.000199 ***
Year1996     0.81948    0.53440   1.533 0.125420
Year1997     0.70039    0.50444   1.388 0.165249
Year1998    -0.34087    0.44412  -0.768 0.442916
Year1999    -0.44587    0.42059  -1.060 0.289294
Year2000     0.19399    0.41597   0.466 0.641048
Year2001     1.68052    0.41150   4.084 4.71e-05 ***
Year2002     0.68465    0.40862   1.676 0.094082 .
Year2003     1.13935    0.45636   2.497 0.012666 *
Year2004     0.17100    0.46655   0.367 0.714045
Year2005     0.87091    0.46378   1.878 0.060634 .
Year2006    -0.06404    0.45220  -0.142 0.887408
Year2007     0.64662    0.45485   1.422 0.155388
Year2008    -0.12450    0.46593  -0.267 0.789358
Year2009    -0.92896    0.50207  -1.850 0.064510 .
Year2010    -0.86585    0.46948  -1.844 0.065378 .
Year2011     0.30280    0.45402   0.667 0.504940
Year2012     1.08478    0.45268   2.396 0.016705 *
Year2013     0.80123    0.44730   1.791 0.073490 .
Year2014    -0.44322    0.45831  -0.967 0.333696
Year2015     0.82308    0.44674   1.842 0.065651 .
ShipTRI2     0.53324    0.57912   0.921 0.357345
ShipMIC      0.69320    0.21119   3.282 0.001058 **
ShipWAH3     0.23822    0.35877   0.664 0.506805
ShipDAN2     0.60107    0.89423   0.672 0.501604
ShipSCO3     0.57091    0.23328   2.447 0.014529 *
ShipEND      0.53208    0.25537   2.084 0.037399 *
ShipHAV      0.81100    0.31016   2.615 0.009036 **
ShipJHJ      0.30949    0.26299   1.177 0.239502
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df     F  p-value
s(lon,lat) 36.454    143 3.698  < 2e-16 ***
s(Depth)    3.741      5 7.089 4.11e-10 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.408   Deviance explained = 44.6%
-ML = 2417.1  Scale est. = 2.1246    n = 1324
```

```
[1] "Age 4"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -2.657920   0.305839  -8.691  < 2e-16 ***
Year1993    -0.244919   0.422287  -0.580  0.56203
Year1994    -0.466579   0.473020  -0.986  0.32413
Year1995     0.354984   0.425424   0.834  0.40419
Year1996     1.382861   0.464609   2.976  0.00297 **
Year1997     0.000672   0.448118   0.001  0.99880
Year1998     0.566302   0.386702   1.464  0.14332
Year1999    -0.580468   0.371324  -1.563  0.11824
Year2000     0.896497   0.366020   2.449  0.01444 *
Year2001     0.475510   0.362515   1.312  0.18985
Year2002     1.006107   0.359458   2.799  0.00520 **
Year2003     0.985042   0.399900   2.463  0.01390 *
Year2004     0.135465   0.405618   0.334  0.73845
Year2005     0.295011   0.409643   0.720  0.47155
Year2006     1.114097   0.396583   2.809  0.00504 **
Year2007    -0.432907   0.398247  -1.087  0.27722
Year2008     0.185160   0.404078   0.458  0.64686
Year2009    -0.439373   0.438690  -1.002  0.31674
Year2010    -0.687800   0.415137  -1.657  0.09780 .
Year2011     0.580140   0.396186   1.464  0.14335
Year2012     0.032677   0.395497   0.083  0.93416
Year2013     1.191274   0.391817   3.040  0.00241 **
Year2014     0.339067   0.399620   0.848  0.39633
Year2015     0.656320   0.392916   1.670  0.09508 .
ShipTRI2     0.589275   0.519350   1.135  0.25674
ShipMIC      0.254471   0.190585   1.335  0.18204
ShipWAH3    -0.047781   0.318984  -0.150  0.88095
ShipDAN2     0.533320   0.804246   0.663  0.50736
ShipSCO3     0.060450   0.204724   0.295  0.76783
ShipEND      0.154145   0.224497   0.687  0.49244
ShipHAV      0.387710   0.273505   1.418  0.15656
ShipJHJ     -0.152780   0.230729  -0.662  0.50799
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df     F  p-value
s(lon,lat) 39.013    143 3.786  < 2e-16 ***
s(Depth)    3.431      5 6.770 3.07e-10 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.447   Deviance explained = 47.8%
-ML = 2362.2  Scale est. = 1.7188    n = 1373
```

```
[1] "Age 5"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -4.203231   0.313712 -13.398  < 2e-16 ***
Year1993     1.215543   0.434622   2.797 0.005245 **
Year1994     0.934106   0.484533   1.928 0.054112 .
Year1995     1.239626   0.416786   2.974 0.002996 **
Year1996     1.054210   0.460580   2.289 0.022262 *
Year1997     2.290736   0.412827   5.549 3.54e-08 ***
Year1998     1.242784   0.384155   3.235 0.001249 **
Year1999     1.708318   0.366662   4.659 3.53e-06 ***
Year2000     0.801153   0.364955   2.195 0.028342 *
Year2001     2.107208   0.359499   5.862 5.94e-09 ***
Year2002     1.023027   0.359282   2.847 0.004483 **
Year2003     1.935794   0.394600   4.906 1.06e-06 ***
Year2004     1.655290   0.400290   4.135 3.80e-05 ***
Year2005     1.523421   0.402568   3.784 0.000162 ***
Year2006     1.113021   0.394082   2.824 0.004817 **
Year2007     1.871753   0.390138   4.798 1.81e-06 ***
Year2008     0.264695   0.402608   0.657 0.511019
Year2009     0.455596   0.430426   1.058 0.290053
Year2010     0.340970   0.406384   0.839 0.401619
Year2011     0.684912   0.395113   1.733 0.083274 .
Year2012     1.833417   0.389329   4.709 2.78e-06 ***
Year2013     1.030272   0.389846   2.643 0.008331 **
Year2014     1.676157   0.393136   4.264 2.17e-05 ***
Year2015     2.267009   0.389603   5.819 7.62e-09 ***
ShipTRI2     0.705162   0.582686   1.210 0.226446
ShipMIC      0.075936   0.173065   0.439 0.660908
ShipWAH3     0.028416   0.288912   0.098 0.921666
ShipDAN2    -0.001136   0.719131  -0.002 0.998740
ShipSCO3     0.267880   0.188167   1.424 0.154817
ShipEND      0.252052   0.208296   1.210 0.226495
ShipHAV      0.326844   0.251199   1.301 0.193465
ShipJHJ      0.148841   0.213518   0.697 0.485885
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:
              edf Ref.df      F p-value
s(lon,lat) 31.851    143  2.655  <2e-16 ***
s(Depth)    3.512      5 11.741  <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) =  0.431   Deviance explained =   47%
-ML = 2009.1  Scale est. = 1.3642    n = 1255
```

```
[1] "Age 6"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -4.16168    0.36439 -11.421  < 2e-16 ***
Year1993     0.53891    0.46623   1.156 0.248004
Year1994     1.08972    0.48309   2.256 0.024307 *
Year1995     0.02934    0.45879   0.064 0.949019
Year1996     1.69493    0.56318   3.010 0.002684 **
Year1997     0.29447    0.46501   0.633 0.526723
Year1998     1.57781    0.41978   3.759 0.000181 ***
Year1999     0.36892    0.40766   0.905 0.365703
Year2000     0.89339    0.40710   2.194 0.028435 *
Year2001     0.58367    0.40320   1.448 0.148046
Year2002     1.12603    0.40279   2.796 0.005283 **
Year2003     0.26934    0.44578   0.604 0.545846
Year2004     0.89869    0.43514   2.065 0.039160 *
Year2005     1.11082    0.43878   2.532 0.011510 *
Year2006     0.76863    0.43538   1.765 0.077807 .
Year2007     0.45077    0.42927   1.050 0.293941
Year2008     1.29007    0.43512   2.965 0.003102 **
Year2009    -0.04511    0.49745  -0.091 0.927766
Year2010     0.12050    0.44434   0.271 0.786300
Year2011     0.63266    0.43256   1.463 0.143898
Year2012     0.42543    0.43176   0.985 0.324699
Year2013     1.20332    0.42641   2.822 0.004870 **
Year2014     0.27381    0.43243   0.633 0.526764
Year2015     1.40721    0.42864   3.283 0.001064 **
ShipTRI2    -0.29729    0.80207  -0.371 0.710976
ShipMIC     -0.19323    0.16912  -1.143 0.253500
ShipWAH3     0.22015    0.27998   0.786 0.431871
ShipDAN2    -0.50078    0.78518  -0.638 0.523760
ShipSCO3     0.28197    0.18586   1.517 0.129569
ShipEND      0.12351    0.20654   0.598 0.549997
ShipHAV      0.03891    0.25165   0.155 0.877166
ShipJHJ      0.21478    0.21006   1.022 0.306811
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df     F p-value
s(lon,lat) 28.886    143 1.488 < 2e-16 ***
s(Depth)    3.583      5 7.673 5.9e-11 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.337   Deviance explained = 38.3%
-ML = 1555.3  Scale est. = 1.1023    n = 1039
```

```
[1] "Age 7"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  -4.9868     0.3657 -13.637  < 2e-16 ***
Year1993     -0.3739     0.6631  -0.564 0.573053
Year1994      0.5303     0.4742   1.118 0.263784
Year1995      1.0117     0.4510   2.243 0.025187 *
Year1996      1.2415     0.4829   2.571 0.010332 *
Year1997      1.1633     0.4458   2.609 0.009257 **
Year1998      0.7556     0.4336   1.743 0.081775 .
Year1999      1.4922     0.4091   3.648 0.000283 ***
Year2000      0.8228     0.4283   1.921 0.055081 .
Year2001      1.5875     0.4032   3.938    9e-05 ***
Year2002      0.6716     0.4122   1.629 0.103667
Year2003      1.2510     0.4556   2.746 0.006179 **
Year2004      0.1266     0.4532   0.279 0.780041
Year2005      1.4598     0.4447   3.282 0.001078 **
Year2006      1.1462     0.4423   2.592 0.009739 **
Year2007      0.8854     0.4347   2.037 0.042038 *
Year2008      0.7705     0.4442   1.734 0.083250 .
Year2009      0.7517     0.4774   1.575 0.115754
Year2010     -0.1140     0.4838  -0.236 0.813846
Year2011      0.5598     0.4397   1.273 0.203389
Year2012      1.1796     0.4370   2.699 0.007103 **
Year2013      0.8853     0.4364   2.029 0.042830 *
Year2014      1.1770     0.4365   2.697 0.007161 **
Year2015      0.8511     0.4391   1.938 0.052984 .
ShipMIC      -0.1225     0.1777  -0.690 0.490593
ShipWAH3      0.3545     0.2831   1.252 0.210904
ShipDAN2     -0.3484     0.6195  -0.562 0.574066
ShipSCO3      0.3550     0.1973   1.800 0.072331 .
ShipEND       0.2677     0.2196   1.219 0.223178
ShipHAV       0.1411     0.2674   0.528 0.597850
ShipJHJ       0.4054     0.2216   1.830 0.067724 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df     F  p-value
s(lon,lat) 19.403    143 0.578 3.19e-12 ***
s(Depth)    2.836      5 4.706 2.98e-07 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.235   Deviance explained = 28.6%
-ML = 1108.1  Scale est. = 0.91552   n = 793
```

```
[1] "Age 8"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -4.39180    0.29796 -14.739   <2e-16 ***
Year1993     0.57778    0.49698   1.163   0.2455
Year1994     0.28754    0.47323   0.608   0.5437
Year1995    -0.21268    0.43331  -0.491   0.6237
Year1996    -0.54357    0.44903  -1.211   0.2266
Year1997     0.09507    0.40045   0.237   0.8124
Year1998     0.62948    0.37460   1.680   0.0935 .
Year1999     0.60592    0.38566   1.571   0.1167
Year2000     0.70986    0.36827   1.928   0.0544 .
Year2001     0.41580    0.36664   1.134   0.2573
Year2002     0.75798    0.35255   2.150   0.0320 *
Year2003     0.32971    0.41996   0.785   0.4327
Year2004     0.24090    0.41019   0.587   0.5573
Year2005    -0.20744    0.42919  -0.483   0.6291
Year2006     0.56105    0.40251   1.394   0.1639
Year2007     0.20971    0.39408   0.532   0.5948
Year2008     0.40817    0.39852   1.024   0.3062
Year2009     0.70413    0.45818   1.537   0.1249
Year2010     0.41060    0.40808   1.006   0.3148
Year2011    -0.36282    0.42755  -0.849   0.3965
Year2012     0.42747    0.39307   1.088   0.2773
Year2013     0.23954    0.39800   0.602   0.5475
Year2014    -0.02093    0.40331  -0.052   0.9586
Year2015     0.68953    0.39907   1.728   0.0846 .
ShipMIC     -0.43385    0.19675  -2.205   0.0279 *
ShipWAH3    -0.06123    0.32682  -0.187   0.8514
ShipDAN2    -0.82074    0.69725  -1.177   0.2397
ShipSCO3     0.04451    0.21246   0.210   0.8341
ShipEND      0.08050    0.24042   0.335   0.7379
ShipHAV      0.04952    0.29615   0.167   0.8673
ShipJHJ      0.24075    0.24023   1.002   0.3167
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
             edf Ref.df     F  p-value
s(lon,lat) 9.542    143 0.171 0.001199 **
s(Depth)   2.327      5 2.856 0.000167 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.122   Deviance explained = 19.6%
-ML = 772.61  Scale est. = 0.79041   n = 590
```

```
[1] "Age 9"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -5.164503   0.505630 -10.214   <2e-16 ***
Year1993     0.158832   0.713291   0.223   0.8239
Year1994     1.082184   0.620447   1.744   0.0820 .
Year1995    -0.049890   0.638987  -0.078   0.9378
Year1996     0.006761   0.667133   0.010   0.9919
Year1997     0.976846   0.569535   1.715   0.0872 .
Year1998    -0.052565   0.721621  -0.073   0.9420
Year1999     1.234687   0.579812   2.129   0.0339 *
Year2000     0.146901   0.602621   0.244   0.8076
Year2001     1.298099   0.570315   2.276   0.0234 *
Year2002     0.541314   0.738724   0.733   0.4642
Year2003     1.455347   0.642295   2.266   0.0241 *
Year2004     0.275796   1.060425   0.260   0.7950
Year2005     1.571967   0.655956   2.396   0.0171 *
Year2006     0.455635   0.637527   0.715   0.4753
Year2007     0.952340   0.627740   1.517   0.1301
Year2008     0.947521   0.626489   1.512   0.1313
Year2009     0.512832   0.725554   0.707   0.4801
Year2010     0.353080   0.645825   0.547   0.5849
Year2011     0.824275   0.625861   1.317   0.1887
Year2012     0.535046   0.624152   0.857   0.3919
Year2013     1.136180   0.626223   1.814   0.0705 .
Year2014     0.930667   0.639620   1.455   0.1466
Year2015     0.894122   0.633228   1.412   0.1588
ShipMIC     -0.315189   0.283209  -1.113   0.2665
ShipWAH3     0.069812   0.448356   0.156   0.8764
ShipSCO3    -0.050013   0.329223  -0.152   0.8793
ShipEND     -0.055390   0.356678  -0.155   0.8767
ShipHAV     -0.214481   0.428283  -0.501   0.6168
ShipJHJ      0.014385   0.353892   0.041   0.9676
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
                  edf Ref.df    F p-value
s(lon,lat) 0.0005756    143 0.00  0.6605
s(Depth)   0.9306153      5 1.62  0.0029 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.109   Deviance explained = 18.7%
-ML = 477.18  Scale est. = 0.76278   n = 383
```

```
[1] "Age 10"

Family: gaussian 
Link function: identity 

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") + 
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)    
(Intercept) -4.30790    0.37800 -11.397   <2e-16 ***
Year1993     1.11924    0.55318   2.023   0.0437 *  
Year1994     0.45061    0.51641   0.873   0.3834    
Year1995     0.23314    0.49174   0.474   0.6357    
Year1996     0.64816    0.51476   1.259   0.2088    
Year1997     0.47083    0.48189   0.977   0.3292    
Year1998    -0.18783    0.52562  -0.357   0.7210    
Year1999     0.71414    0.49475   1.443   0.1497    
Year2000     0.06545    0.50007   0.131   0.8959    
Year2001     0.99070    0.49176   2.015   0.0447 *  
Year2002     0.93503    0.45068   2.075   0.0387 *  
Year2003     1.08267    0.56097   1.930   0.0544 .  
Year2004    -0.14560    0.56585  -0.257   0.7971    
Year2005     1.02289    0.57284   1.786   0.0750 .  
Year2006     0.74126    0.55024   1.347   0.1787    
Year2007     0.72324    0.56140   1.288   0.1984    
Year2008     0.43899    0.54162   0.811   0.4182    
Year2009     0.51666    0.59398   0.870   0.3850    
Year2010     0.70658    0.53693   1.316   0.1890    
Year2011     0.60362    0.54526   1.107   0.2690    
Year2012     0.65470    0.52569   1.245   0.2138    
Year2013     1.04641    0.53368   1.961   0.0506 .  
Year2014     0.75181    0.55811   1.347   0.1788    
Year2015     0.64850    0.54733   1.185   0.2368    
ShipMIC     -0.50349    0.27336  -1.842   0.0663 .  
ShipWAH3    -0.30355    0.50786  -0.598   0.5504    
ShipDAN2    -1.10067    1.06477  -1.034   0.3019    
ShipSCO3    -0.33116    0.32119  -1.031   0.3032    
ShipEND     -0.08188    0.35534  -0.230   0.8179    
ShipHAV     -0.01345    0.43319  -0.031   0.9753    
ShipJHJ     -0.06761    0.35858  -0.189   0.8505    
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
                 edf Ref.df     F  p-value    
s(lon,lat) 1.157e+01    143 0.209 0.000544 ***
s(Depth)   6.059e-04      5 0.000 0.465872    
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =   0.11   Deviance explained = 21.4%
-ML = 595.95  Scale est. = 0.98331   n = 421
```

Non-positive / Absence GAM model

```
[1] "Age 1"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)    -6.4609     0.6679  -9.674   <2e-16 ***
Year1993        1.2454     0.7324   1.700   0.0891 .
Year1994       -1.1478     1.2049  -0.953   0.3408
Year1995       -0.9928     1.2054  -0.824   0.4102
Year1996      -24.6950 88760.3398   0.000   0.9998
Year1997      -24.5990 94497.6202   0.000   0.9998
Year1998      -25.9357 56283.5464   0.000   0.9996
Year1999       -2.9300     1.4272  -2.053   0.0401 *
Year2000       -2.9233     1.4267  -2.049   0.0405 *
Year2001       -2.1982     1.2439  -1.767   0.0772 .
Year2002       -0.5699     1.0444  -0.546   0.5853
Year2003      -25.5461 47453.6569  -0.001   0.9996
Year2004       -2.3106     1.3113  -1.762   0.0781 .
Year2005       -1.2438     1.1935  -1.042   0.2974
Year2006       -1.0294     1.1606  -0.887   0.3751
Year2007       -3.2815     1.4907  -2.201   0.0277 *
Year2008       -2.6210     1.3174  -1.989   0.0466 *
Year2009       -1.8130     1.2177  -1.489   0.1365
Year2010       -0.3377     1.1320  -0.298   0.7655
Year2011       -1.1834     1.1534  -1.026   0.3049
Year2012       -1.4622     1.1682  -1.252   0.2107
Year2013       -0.7562     1.1395  -0.664   0.5069
Year2014       -1.3349     1.1607  -1.150   0.2501
Year2015       -1.5571     1.1789  -1.321   0.1866
ShipTRI2        0.5328     0.6602   0.807   0.4196
ShipWAH2        0.3826     1.2497   0.306   0.7595
ShipMIC        -0.1734     1.0138  -0.171   0.8642
ShipWAH3        1.2668     1.1378   1.113   0.2655
ShipDAN2        1.8458     1.2621   1.462   0.1436
ShipSCO3        1.3754     0.8792   1.564   0.1177
ShipEND         1.0380     0.9263   1.121   0.2625
ShipHAV       -22.2426 46137.1179   0.000   0.9996
ShipJHJ         1.0631     0.9437   1.126   0.2600
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
               edf Ref.df Chi.sq  p-value
s(lon,lat) 14.4303     63 70.072 2.18e-12 ***
s(Depth)    0.8763      5  6.174  0.00282 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =   0.14   Deviance explained = 25.2%
-ML = 369.68  Scale est. = 1         n = 2605
```

```
[1] "Age 2"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -6.373e+00  5.595e-01 -11.390  < 2e-16 ***
Year1993     2.257e+00  6.713e-01   3.362 0.000773 ***
Year1994     7.270e-01  7.321e-01   0.993 0.320711
Year1995     1.635e+00  7.141e-01   2.290 0.022015 *
Year1996     1.868e+00  7.156e-01   2.610 0.009055 **
Year1997     1.858e+00  7.147e-01   2.599 0.009350 **
Year1998     9.572e-01  6.583e-01   1.454 0.145921
Year1999     9.871e-01  6.296e-01   1.568 0.116954
Year2000     2.229e+00  6.229e-01   3.579 0.000345 ***
Year2001     2.816e+00  6.231e-01   4.520 6.18e-06 ***
Year2002     2.240e+00  6.214e-01   3.605 0.000312 ***
Year2003     3.240e+00  6.667e-01   4.859 1.18e-06 ***
Year2004     1.037e+00  6.807e-01   1.524 0.127497
Year2005     1.519e+00  6.729e-01   2.257 0.023978 *
Year2006     2.208e+00  6.631e-01   3.330 0.000869 ***
Year2007     2.597e+00  6.590e-01   3.940 8.15e-05 ***
Year2008     7.296e-01  6.881e-01   1.060 0.289012
Year2009     9.552e-01  7.001e-01   1.364 0.172442
Year2010     2.888e+00  6.576e-01   4.392 1.12e-05 ***
Year2011     2.693e+00  6.589e-01   4.087 4.37e-05 ***
Year2012     3.056e+00  6.576e-01   4.647 3.36e-06 ***
Year2013     1.811e+00  6.618e-01   2.737 0.006205 **
Year2014     1.128e+00  6.745e-01   1.673 0.094336 .
Year2015     2.571e+00  6.573e-01   3.912 9.16e-05 ***
ShipTRI2     7.113e-01  6.835e-01   1.041 0.298074
ShipWAH2    -2.692e+01  1.469e+06   0.000 0.999985
ShipMIC      4.419e-01  2.729e-01   1.619 0.105409
ShipWAH3     9.378e-02  4.149e-01   0.226 0.821193
ShipDAN2     8.047e-03  8.334e-01   0.010 0.992296
ShipSCO3    -1.265e-01  2.767e-01  -0.457 0.647364
ShipEND     -4.511e-01  3.141e-01  -1.436 0.151048
ShipHAV      4.826e-01  3.958e-01   1.219 0.222725
ShipJHJ     -9.122e-01  3.220e-01  -2.833 0.004608 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq  p-value
s(lon,lat) 30.200     63 352.80  < 2e-16 ***
s(Depth)    4.224      5  36.03 2.26e-09 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.382   Deviance explained = 34.9%
-ML = 1138.2  Scale est. = 1         n = 2605
```

```
[1] "Age 3"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -4.118e+00  4.637e-01  -8.881  < 2e-16 ***
Year1993     3.194e-01  6.021e-01   0.531 0.595713
Year1994    -1.058e+00  6.502e-01  -1.627 0.103654
Year1995     1.313e+00  6.522e-01   2.014 0.044028 *
Year1996    -6.114e-01  6.838e-01  -0.894 0.371262
Year1997     1.350e-01  6.829e-01   0.198 0.843332
Year1998     7.085e-02  5.809e-01   0.122 0.902918
Year1999    -2.421e-01  5.566e-01  -0.435 0.663639
Year2000     4.635e-01  5.604e-01   0.827 0.408192
Year2001     1.056e+00  5.639e-01   1.872 0.061178 .
Year2002     1.361e+00  5.625e-01   2.419 0.015575 *
Year2003     2.288e+00  6.184e-01   3.699 0.000216 ***
Year2004     6.466e-01  6.112e-01   1.058 0.290130
Year2005     7.514e-01  6.115e-01   1.229 0.219207
Year2006     2.082e+00  6.165e-01   3.377 0.000733 ***
Year2007     1.246e+00  6.055e-01   2.058 0.039581 *
Year2008     5.662e-01  6.096e-01   0.929 0.353007
Year2009    -1.636e-01  6.261e-01  -0.261 0.793833
Year2010     2.277e-01  5.986e-01   0.380 0.703603
Year2011     1.825e+00  6.073e-01   3.005 0.002657 **
Year2012     1.777e+00  6.081e-01   2.923 0.003470 **
Year2013     2.711e+00  6.160e-01   4.401 1.08e-05 ***
Year2014     1.086e+00  6.051e-01   1.794 0.072739 .
Year2015     2.997e+00  6.112e-01   4.903 9.44e-07 ***
ShipTRI2     9.383e-01  5.696e-01   1.647 0.099484 .
ShipWAH2    -3.464e+01  1.733e+07   0.000 0.999998
ShipMIC      3.456e-01  3.112e-01   1.111 0.266779
ShipWAH3    -8.819e-01  4.486e-01  -1.966 0.049295 *
ShipDAN2    -1.841e+00  8.753e-01  -2.103 0.035487 *
ShipSCO3    -2.484e-01  2.976e-01  -0.835 0.403867
ShipEND     -4.097e-01  3.410e-01  -1.201 0.229641
ShipHAV     -3.881e-01  4.361e-01  -0.890 0.373424
ShipJHJ     -9.675e-01  3.537e-01  -2.736 0.006227 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq  p-value
s(lon,lat) 28.034     63 422.35  < 2e-16 ***
s(Depth)    3.228      5  38.24 1.54e-11 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.541   Deviance explained = 48.7%
-ML = 995.28  Scale est. = 1         n = 2605
```

```
[1] "Age 4"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -4.099e+00  4.924e-01  -8.324  < 2e-16 ***
Year1993     2.618e-02  6.305e-01   0.042 0.966876
Year1994    -1.117e+00  6.769e-01  -1.650 0.098988 .
Year1995     7.568e-01  6.934e-01   1.092 0.275042
Year1996    -5.245e-01  7.205e-01  -0.728 0.466646
Year1997     3.176e-02  7.241e-01   0.044 0.965019
Year1998     1.642e-02  6.150e-01   0.027 0.978696
Year1999    -6.397e-01  5.874e-01  -1.089 0.276152
Year2000     8.584e-02  5.923e-01   0.145 0.884770
Year2001     7.282e-01  5.967e-01   1.220 0.222304
Year2002     1.016e+00  5.941e-01   1.710 0.087348 .
Year2003     1.992e+00  6.520e-01   3.055 0.002254 **
Year2004     6.141e-01  6.455e-01   0.951 0.341415
Year2005    -1.178e-01  6.449e-01  -0.183 0.855045
Year2006     1.590e+00  6.538e-01   2.433 0.014984 *
Year2007     7.680e-01  6.422e-01   1.196 0.231706
Year2008     3.757e-01  6.502e-01   0.578 0.563349
Year2009    -7.129e-01  6.588e-01  -1.082 0.279161
Year2010    -7.727e-01  6.317e-01  -1.223 0.221228
Year2011     1.635e+00  6.437e-01   2.540 0.011076 *
Year2012     1.477e+00  6.449e-01   2.291 0.021965 *
Year2013     2.398e+00  6.507e-01   3.685 0.000228 ***
Year2014     8.255e-01  6.418e-01   1.286 0.198382
Year2015     2.096e+00  6.418e-01   3.266 0.001089 **
ShipTRI2     1.178e+00  5.972e-01   1.972 0.048636 *
ShipWAH2    -3.564e+01  1.733e+07   0.000 0.999998
ShipMIC      6.552e-01  3.275e-01   2.001 0.045430 *
ShipWAH3    -4.999e-01  4.614e-01  -1.084 0.278573
ShipDAN2    -1.509e+00  8.853e-01  -1.705 0.088243 .
ShipSCO3     3.906e-01  3.132e-01   1.247 0.212423
ShipEND      2.078e-01  3.591e-01   0.579 0.562815
ShipHAV      9.388e-03  4.579e-01   0.021 0.983643
ShipJHJ     -1.582e-01  3.734e-01  -0.424 0.671846
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 21.895     63 389.98  <2e-16 ***
s(Depth)    3.571      5  84.17  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.594   Deviance explained = 53.5%
-ML = 895.69  Scale est. = 1         n = 2605
```

```
[1] "Age 5"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -5.122e+00  5.087e-01 -10.069  < 2e-16 ***
Year1993    -1.257e-01  6.604e-01  -0.190 0.849051
Year1994    -1.001e+00  7.206e-01  -1.389 0.164748
Year1995     1.150e+00  7.279e-01   1.580 0.114181
Year1996    -3.391e-01  7.442e-01  -0.456 0.648685
Year1997     1.971e+00  7.721e-01   2.553 0.010681 *
Year1998     8.333e-01  6.358e-01   1.311 0.189972
Year1999     4.647e-01  6.071e-01   0.765 0.443993
Year2000     6.993e-01  6.101e-01   1.146 0.251732
Year2001     1.861e+00  6.207e-01   2.999 0.002712 **
Year2002     1.489e+00  6.131e-01   2.428 0.015176 *
Year2003     2.920e+00  6.835e-01   4.272 1.93e-05 ***
Year2004     1.237e+00  6.707e-01   1.844 0.065122 .
Year2005     5.426e-01  6.676e-01   0.813 0.416315
Year2006     1.681e+00  6.679e-01   2.517 0.011843 *
Year2007     2.333e+00  6.744e-01   3.459 0.000542 ***
Year2008     6.288e-01  6.661e-01   0.944 0.345191
Year2009     4.386e-02  6.810e-01   0.064 0.948647
Year2010     1.936e-01  6.513e-01   0.297 0.766306
Year2011     1.829e+00  6.662e-01   2.746 0.006037 **
Year2012     2.979e+00  6.777e-01   4.395 1.11e-05 ***
Year2013     2.495e+00  6.722e-01   3.712 0.000205 ***
Year2014     2.027e+00  6.684e-01   3.032 0.002430 **
Year2015     2.469e+00  6.651e-01   3.711 0.000206 ***
ShipTRI2     1.486e+00  6.874e-01   2.162 0.030600 *
ShipWAH2    -3.055e+01  1.733e+07   0.000 0.999999
ShipMIC      3.316e-01  3.432e-01   0.966 0.333938
ShipWAH3    -1.686e-01  4.772e-01  -0.353 0.723796
ShipDAN2    -7.632e-01  9.366e-01  -0.815 0.415148
ShipSCO3     4.518e-02  3.289e-01   0.137 0.890738
ShipEND      1.151e-01  3.780e-01   0.305 0.760678
ShipHAV      1.792e-01  4.823e-01   0.372 0.710245
ShipJHJ     -4.217e-01  3.897e-01  -1.082 0.279220
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 21.623     63  353.2  <2e-16 ***
s(Depth)    3.257      5  110.2  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.624   Deviance explained = 57.3%
-ML = 826.72  Scale est. = 1         n = 2605
```

```
[1] "Age 6"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -6.721e+00  5.509e-01 -12.200  < 2e-16 ***
Year1993     1.013e+00  7.094e-01   1.428 0.153332
Year1994     7.648e-01  7.427e-01   1.030 0.303086
Year1995     1.765e+00  7.626e-01   2.314 0.020646 *
Year1996    -7.934e-01  8.017e-01  -0.990 0.322388
Year1997     1.559e+00  7.750e-01   2.012 0.044244 *
Year1998     2.021e+00  6.643e-01   3.043 0.002345 **
Year1999     1.249e+00  6.321e-01   1.976 0.048170 *
Year2000     1.554e+00  6.349e-01   2.448 0.014357 *
Year2001     1.899e+00  6.355e-01   2.988 0.002804 **
Year2002     1.868e+00  6.337e-01   2.947 0.003204 **
Year2003     1.018e+00  6.948e-01   1.465 0.142833
Year2004     2.534e+00  6.964e-01   3.638 0.000275 ***
Year2005     1.544e+00  6.921e-01   2.230 0.025734 *
Year2006     1.671e+00  6.846e-01   2.441 0.014626 *
Year2007     2.596e+00  6.889e-01   3.768 0.000164 ***
Year2008     1.890e+00  6.949e-01   2.719 0.006539 **
Year2009    -3.168e-01  7.340e-01  -0.432 0.665982
Year2010     7.515e-01  6.800e-01   1.105 0.269082
Year2011     2.364e+00  6.890e-01   3.432 0.000600 ***
Year2012     2.175e+00  6.860e-01   3.170 0.001525 **
Year2013     3.684e+00  7.028e-01   5.242 1.59e-07 ***
Year2014     2.343e+00  6.900e-01   3.395 0.000686 ***
Year2015     2.860e+00  6.880e-01   4.157 3.23e-05 ***
ShipTRI2     1.093e+00  8.688e-01   1.258 0.208323
ShipWAH2    -3.427e+01  1.733e+07   0.000 0.999998
ShipMIC      3.854e-01  3.272e-01   1.178 0.238907
ShipWAH3     6.058e-01  4.604e-01   1.316 0.188247
ShipDAN2    -3.386e-01  1.160e+00  -0.292 0.770382
ShipSCO3     2.295e-01  3.241e-01   0.708 0.478826
ShipEND      3.327e-01  3.731e-01   0.892 0.372557
ShipHAV      4.106e-01  4.605e-01   0.892 0.372541
ShipJHJ      2.950e-01  3.818e-01   0.773 0.439781
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 17.793     63  294.5  <2e-16 ***
s(Depth)    3.849      5  169.7  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.603   Deviance explained = 55.6%
-ML = 827.81  Scale est. = 1         n = 2605
```

```
[1] "Age 7"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -6.815e+00  5.951e-01 -11.452  < 2e-16 ***
Year1993    -1.480e+00  9.124e-01  -1.622  0.10481
Year1994     6.920e-01  7.837e-01   0.883  0.37720
Year1995     1.733e+00  8.011e-01   2.163  0.03052 *
Year1996     4.461e-01  7.981e-01   0.559  0.57623
Year1997     2.086e+00  7.942e-01   2.627  0.00862 **
Year1998     5.259e-01  7.010e-01   0.750  0.45313
Year1999     1.307e+00  6.660e-01   1.962  0.04977 *
Year2000     7.346e-02  6.735e-01   0.109  0.91315
Year2001     1.983e+00  6.677e-01   2.969  0.00298 **
Year2002     8.010e-01  6.671e-01   1.201  0.22982
Year2003     5.897e-01  7.308e-01   0.807  0.41966
Year2004     5.608e-01  7.308e-01   0.767  0.44288
Year2005     1.537e+00  7.237e-01   2.123  0.03373 *
Year2006     1.260e+00  7.168e-01   1.758  0.07867 .
Year2007     2.284e+00  7.161e-01   3.189  0.00143 **
Year2008     1.139e+00  7.235e-01   1.574  0.11537
Year2009     3.718e-01  7.511e-01   0.495  0.62057
Year2010    -7.618e-01  7.404e-01  -1.029  0.30352
Year2011     1.748e+00  7.154e-01   2.443  0.01457 *
Year2012     1.727e+00  7.139e-01   2.419  0.01557 *
Year2013     1.792e+00  7.146e-01   2.508  0.01215 *
Year2014     2.254e+00  7.186e-01   3.136  0.00171 **
Year2015     1.391e+00  7.145e-01   1.947  0.05149 .
ShipTRI2    -3.408e+01  1.061e+07   0.000  1.00000
ShipWAH2    -3.317e+01  1.733e+07   0.000  1.00000
ShipMIC     -1.997e-02  3.221e-01  -0.062  0.95055
ShipWAH3     8.747e-01  4.585e-01   1.908  0.05640 .
ShipDAN2     6.922e-01  9.806e-01   0.706  0.48026
ShipSCO3     2.068e-01  3.286e-01   0.630  0.52900
ShipEND      2.323e-01  3.738e-01   0.622  0.53425
ShipHAV      3.493e-01  4.557e-01   0.767  0.44337
ShipJHJ      3.503e-01  3.788e-01   0.925  0.35510
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 19.786     63  233.4  <2e-16 ***
s(Depth)    3.579      5  143.9  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.528   Deviance explained = 50.4%
-ML = 844.74  Scale est. = 1         n = 2605
```

```
[1] "Age 8"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -6.115e+00  5.742e-01 -10.650  < 2e-16 ***
Year1993    -1.223e+00  7.935e-01  -1.541  0.12322
Year1994    -1.169e+00  7.805e-01  -1.497  0.13434
Year1995    -3.750e-01  7.682e-01  -0.488  0.62543
Year1996    -7.366e-01  7.712e-01  -0.955  0.33947
Year1997     5.305e-01  7.609e-01   0.697  0.48571
Year1998    -2.869e-01  6.686e-01  -0.429  0.66782
Year1999    -1.441e+00  6.501e-01  -2.217  0.02663 *
Year2000    -6.057e-01  6.380e-01  -0.949  0.34250
Year2001    -4.112e-01  6.368e-01  -0.646  0.51840
Year2002     3.957e-02  6.321e-01   0.063  0.95009
Year2003    -7.959e-01  7.111e-01  -1.119  0.26305
Year2004    -3.397e-01  7.050e-01  -0.482  0.62985
Year2005    -1.501e+00  7.200e-01  -2.084  0.03715 *
Year2006    -4.821e-01  6.939e-01  -0.695  0.48715
Year2007     1.236e-01  6.864e-01   0.180  0.85714
Year2008    -9.643e-03  6.973e-01  -0.014  0.98897
Year2009    -1.411e+00  7.461e-01  -1.891  0.05861 .
Year2010    -8.570e-01  6.920e-01  -1.238  0.21553
Year2011    -1.559e+00  7.084e-01  -2.200  0.02781 *
Year2012     2.783e-01  6.856e-01   0.406  0.68481
Year2013    -4.528e-01  6.896e-01  -0.657  0.51137
Year2014    -4.721e-01  6.931e-01  -0.681  0.49578
Year2015    -4.609e-01  6.915e-01  -0.667  0.50504
ShipTRI2    -3.259e+01  1.061e+07   0.000  1.00000
ShipWAH2    -3.178e+01  1.733e+07   0.000  1.00000
ShipMIC      1.760e-01  3.302e-01   0.533  0.59405
ShipWAH3     1.337e+00  5.071e-01   2.636  0.00839 **
ShipDAN2     1.396e-01  1.131e+00   0.123  0.90174
ShipSCO3     3.988e-01  3.446e-01   1.157  0.24726
ShipEND      5.474e-01  3.865e-01   1.416  0.15664
ShipHAV      6.030e-01  4.751e-01   1.269  0.20432
ShipJHJ      1.011e+00  3.920e-01   2.579  0.00991 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 27.484     63 196.29  <2e-16 ***
s(Depth)    3.254      5  64.12  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.454   Deviance explained = 45.9%
-ML = 819.55  Scale est. = 1         n = 2605
```

```
[1] "Age 9"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -7.867e+00  7.361e-01 -10.687  < 2e-16 ***
Year1993     4.242e-02  9.711e-01   0.044  0.96516
Year1994     9.616e-01  8.877e-01   1.083  0.27867
Year1995     7.650e-01  9.111e-01   0.840  0.40113
Year1996     3.595e-01  9.319e-01   0.386  0.69969
Year1997     2.547e+00  8.785e-01   2.900  0.00374 **
Year1998    -8.444e-01  9.570e-01  -0.882  0.37760
Year1999     3.947e-01  8.087e-01   0.488  0.62546
Year2000     1.543e-01  8.208e-01   0.188  0.85087
Year2001     1.111e+00  7.984e-01   1.391  0.16409
Year2002    -1.481e+00  9.535e-01  -1.553  0.12039
Year2003     1.353e+00  8.939e-01   1.513  0.13015
Year2004    -2.863e+00  1.327e+00  -2.158  0.03093 *
Year2005     3.983e-01  9.072e-01   0.439  0.66060
Year2006     7.192e-01  8.831e-01   0.814  0.41543
Year2007     1.400e+00  8.727e-01   1.604  0.10879
Year2008     1.562e+00  8.800e-01   1.776  0.07581 .
Year2009    -4.508e-01  9.744e-01  -0.463  0.64363
Year2010     3.203e-01  8.870e-01   0.361  0.71806
Year2011     1.576e+00  8.727e-01   1.806  0.07095 .
Year2012     1.641e+00  8.721e-01   1.882  0.05986 .
Year2013     1.326e+00  8.735e-01   1.518  0.12914
Year2014     3.629e-01  8.877e-01   0.409  0.68267
Year2015     7.230e-01  8.811e-01   0.821  0.41191
ShipTRI2    -4.333e+01  1.061e+07   0.000  1.00000
ShipWAH2    -4.190e+01  1.733e+07   0.000  1.00000
ShipMIC     -1.281e-01  4.186e-01  -0.306  0.75956
ShipWAH3     1.297e+00  6.369e-01   2.037  0.04164 *
ShipDAN2    -4.491e+01  1.225e+07   0.000  1.00000
ShipSCO3     2.714e-01  4.631e-01   0.586  0.55776
ShipEND      4.987e-01  4.963e-01   1.005  0.31493
ShipHAV      3.084e-01  6.136e-01   0.503  0.61529
ShipJHJ      1.036e+00  5.000e-01   2.072  0.03823 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 25.412     63 154.63 < 2e-16 ***
s(Depth)    3.383      5  40.73 5.3e-12 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.396   Deviance explained = 44.6%
-ML = 664.95  Scale est. = 1         n = 2605
```

```
[1] "Age 10"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -6.479e+00  5.821e-01 -11.131   <2e-16 ***
Year1993    -3.054e-01  7.715e-01  -0.396    0.692
Year1994     1.997e-01  7.535e-01   0.265    0.791
Year1995     8.212e-01  7.601e-01   1.080    0.280
Year1996     1.991e-01  7.609e-01   0.262    0.794
Year1997     1.101e+00  7.567e-01   1.455    0.146
Year1998    -4.973e-01  6.996e-01  -0.711    0.477
Year1999    -1.073e+00  6.757e-01  -1.588    0.112
Year2000    -9.060e-01  6.737e-01  -1.345    0.179
Year2001    -8.152e-01  6.701e-01  -1.217    0.224
Year2002    -6.146e-02  6.512e-01  -0.094    0.925
Year2003    -3.066e-01  7.500e-01  -0.409    0.683
Year2004    -3.900e-01  7.496e-01  -0.520    0.603
Year2005    -8.619e-01  7.596e-01  -1.135    0.256
Year2006    -2.989e-01  7.328e-01  -0.408    0.683
Year2007    -9.217e-01  7.404e-01  -1.245    0.213
Year2008     1.154e-02  7.328e-01   0.016    0.987
Year2009    -6.593e-01  7.772e-01  -0.848    0.396
Year2010     1.033e-02  7.232e-01   0.014    0.989
Year2011    -1.704e-01  7.286e-01  -0.234    0.815
Year2012     8.040e-01  7.180e-01   1.120    0.263
Year2013     2.540e-01  7.215e-01   0.352    0.725
Year2014    -6.309e-01  7.373e-01  -0.856    0.392
Year2015    -4.335e-01  7.317e-01  -0.592    0.554
ShipTRI2    -3.007e+01  1.061e+07   0.000    1.000
ShipWAH2    -2.934e+01  1.733e+07   0.000    1.000
ShipMIC     -2.657e-01  3.662e-01  -0.726    0.468
ShipWAH3     8.523e-01  5.746e-01   1.483    0.138
ShipDAN2     2.405e-01  1.342e+00   0.179    0.858
ShipSCO3    -2.037e-02  3.933e-01  -0.052    0.959
ShipEND      2.475e-01  4.334e-01   0.571    0.568
ShipHAV     -1.747e-01  5.309e-01  -0.329    0.742
ShipJHJ      4.958e-01  4.393e-01   1.129    0.259
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 21.545     63 152.63  <2e-16 ***
s(Depth)    3.435      5  68.17  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.374   Deviance explained = 41.3%
-ML = 730.48  Scale est. = 1         n = 2605
```

Appendix G: Model summaries for truncated Q3 index
With Skagerrak, but without Kattegat and southern North Sea

Model fits and residual plots

Table 1G. Deviance explained, R^2, and Scale estimate for the presence and absence delta GAM models, for ages 1-10.

	Positive/Presence			Zero/Absence		
Age	**% Deviance explained**	**R^2**	**-ML**	**% Deviance explained**	**R^2**	**-ML**
1	41.7	0.305	445.06	36.8	0.35	606.11
2	20.8	0.164	1818.9	34.0	0.376	606.11
3	40.4	0.367	2859.7	46.8	0.523	1232.9
4	44.9	0.418	2740.2	51.6	0.573	1121.1
5	43.5	0.395	2296	55.1	0.602	1042.8
6	37.6	0.33	1766.1	53.9	0.581	1032.3
7	29.1	0.235	1235.3	49.3	0.506	1026.5
8	23.2	0.156	854.93	44.6	0.427	958.84
9	18.7	0.096	543.26	41.4	0.362	806.19
10	18.2	0.089	655.7	41.7	0.364	832.46

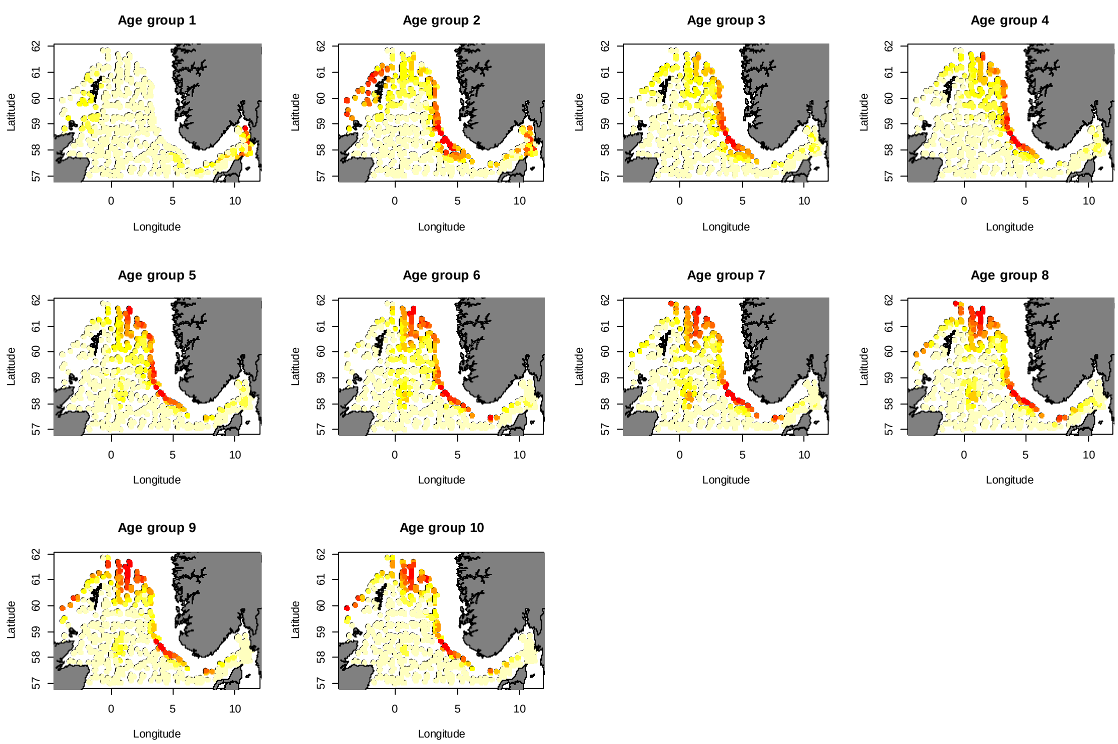


Figure 1G. Predicted values for positive delta GAM model for ages 1-10, using truncated survey data (no southern NS or Kattegat). Scale goes from pale yellow (low values) to red (high values).

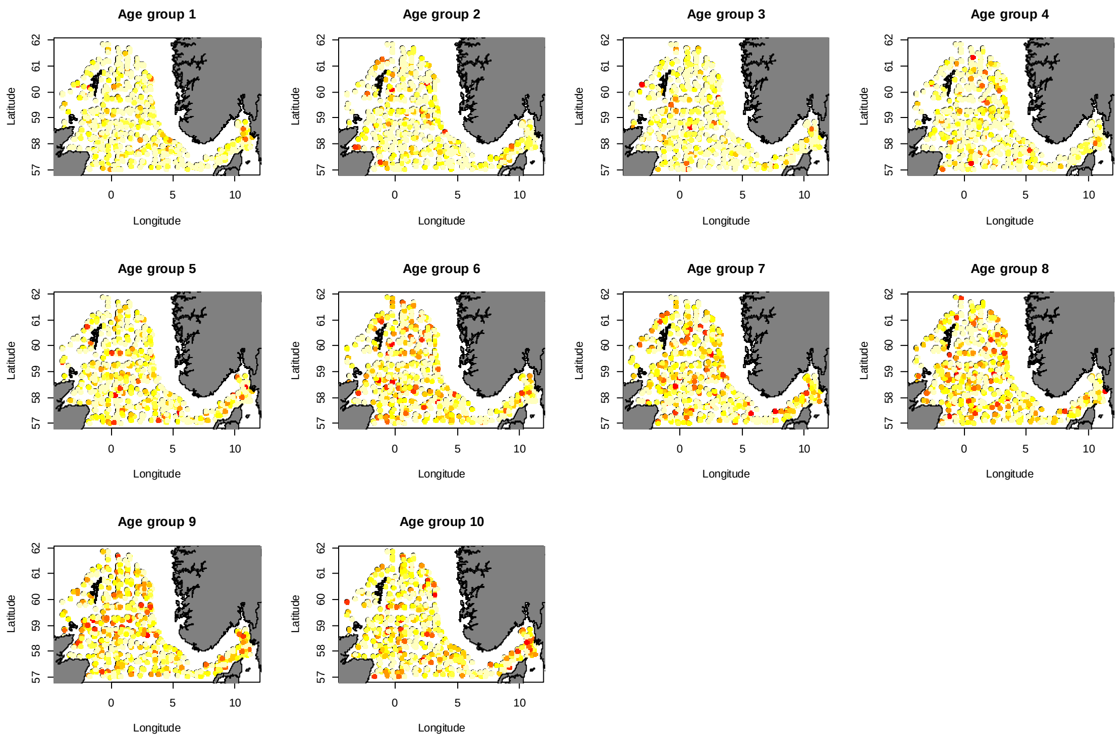


Figure 2G. Residuals for positive/presence delta GAM model for ages 1-10, using truncated survey data (no southern NS or Kattegat). Scale goes from negative (light yellow) to positive (red).

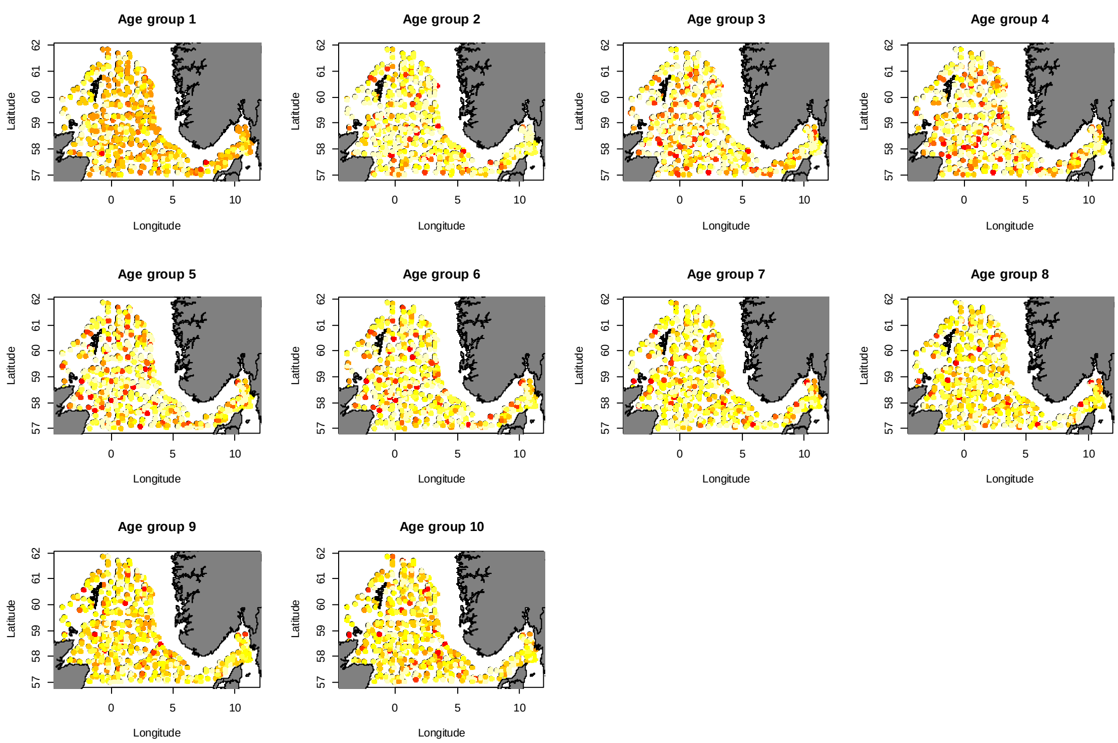


Figure 3G. Residuals for zero/absence delta GAM model for ages 1-10, using truncated survey data (no southern NS or Kattegat). Scale goes from negative (light yellow) to positive (red).

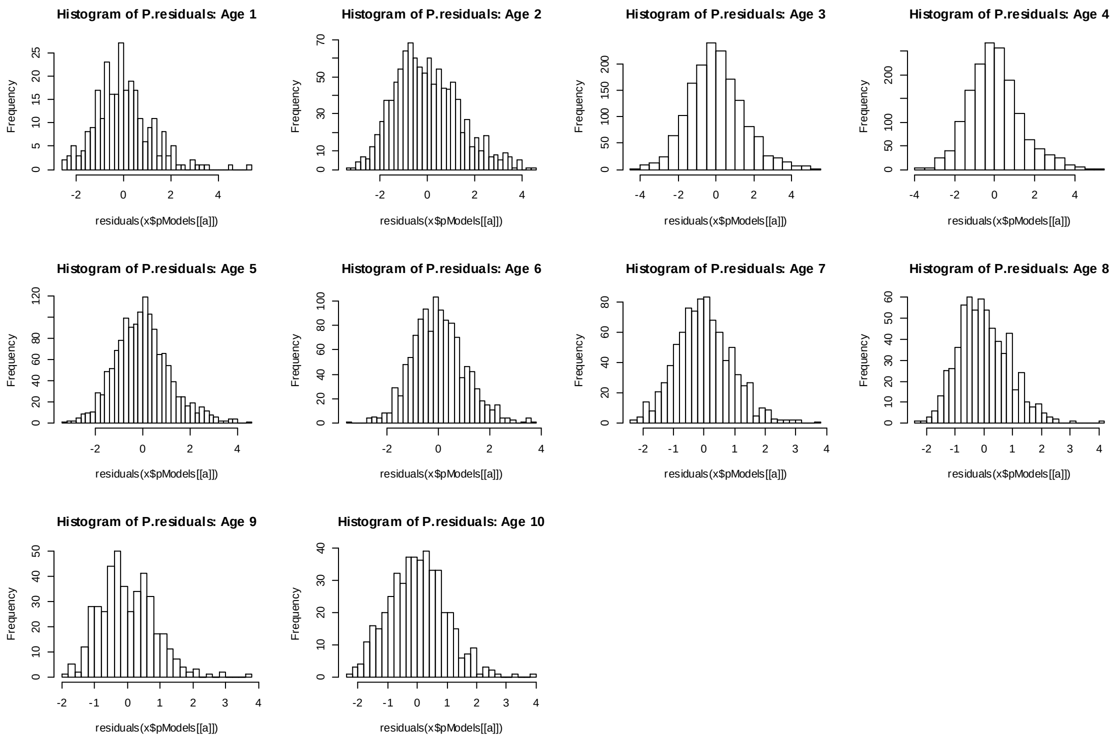


Figure 4G. Histogram of residuals for positive/presence delta GAM model for ages 1-10, using truncated survey data (no southern NS or Kattegat).

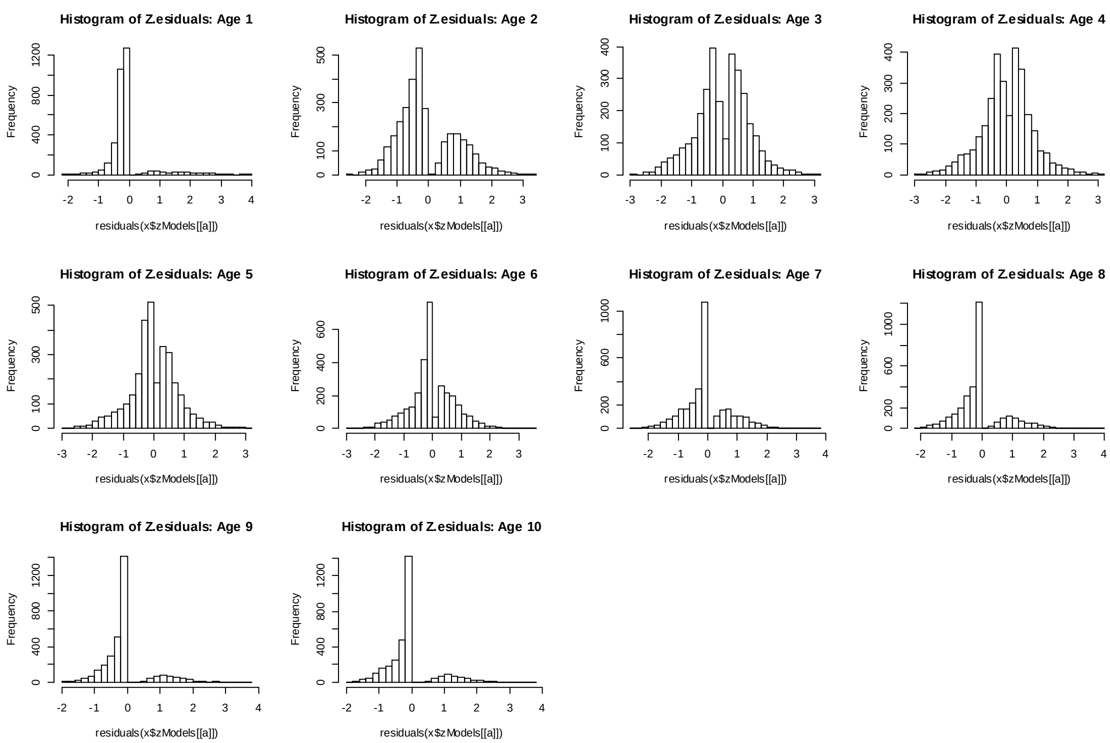


Figure 5G. Histogram of residuals for zero/absence delta GAM model for ages 1-10, using truncated survey data (no southern NS or Kattegat).

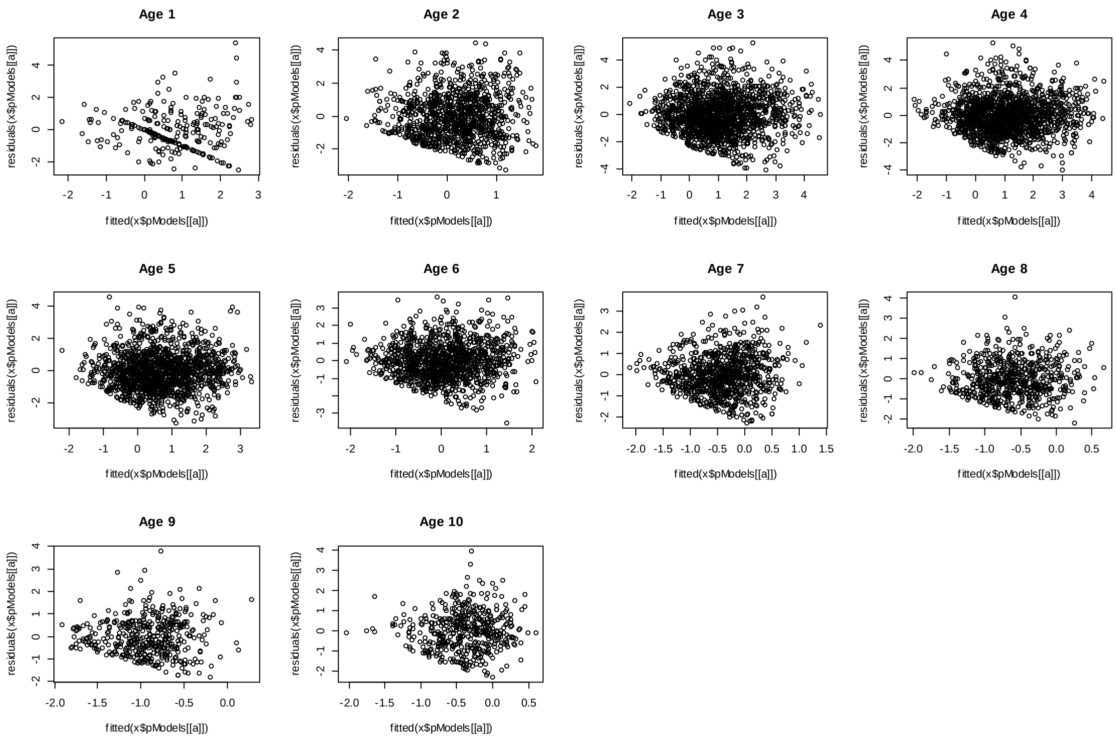


Figure 6G. Residuals vs. fitted values for positive/presence delta GAM model for ages 1-10, using truncated survey data (no southern NS or Kattegat).

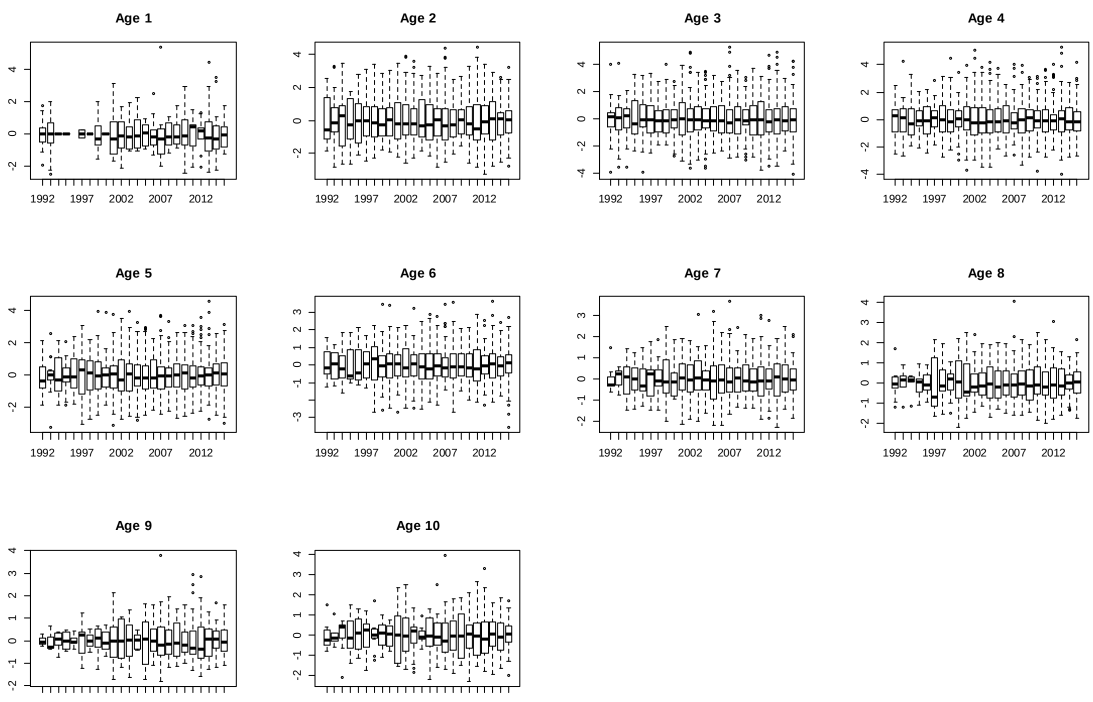


Figure 7G. Boxplot of residuals by year for positive/presence delta GAM model for ages 1-10, using truncated survey data (no southern NS or Kattegat).

Positive / Presence GAM model

```
[1] "Age 1"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -2.69960    0.52356  -5.156 5.62e-07 ***
Year1993     0.34536    0.42250   0.817  0.41458
Year1994    -0.57300    1.46374  -0.391  0.69584
Year1995    -0.23437    1.44336  -0.162  0.87116
Year1997    -1.92124    0.99168  -1.937  0.05399 .
Year1998    -1.78266    1.35599  -1.315  0.19000
Year1999     0.48498    0.49173   0.986  0.32509
Year2000    -1.26774    1.39842  -0.907  0.36564
Year2001     0.24307    0.45639   0.533  0.59485
Year2002    -1.29807    0.49868  -2.603  0.00987 **
Year2003    -0.88741    0.64102  -1.384  0.16765
Year2004    -0.02628    0.46785  -0.056  0.95525
Year2005    -0.54582    0.75392  -0.724  0.46985
Year2006    -0.71851    0.59186  -1.214  0.22606
Year2007     0.14788    0.54421   0.272  0.78608
Year2008    -0.72318    0.58852  -1.229  0.22046
Year2009    -0.59494    0.55978  -1.063  0.28904
Year2010    -0.49587    0.52665  -0.942  0.34745
Year2011    -1.38802    0.60080  -2.310  0.02180 *
Year2012    -0.65751    0.65556  -1.003  0.31698
Year2013    -1.06273    0.59525  -1.785  0.07558 .
Year2014    -0.64627    0.61957  -1.043  0.29806
Year2015    -0.41565    0.71514  -0.581  0.56169
ShipCIR      0.64415    1.04460   0.617  0.53811
ShipTRI2     0.28711    0.89261   0.322  0.74802
ShipWAH2     1.26681    1.70246   0.744  0.45761
ShipMIC     -0.13091    0.90683  -0.144  0.88535
ShipWAH3     0.82929    1.37450   0.603  0.54691
ShipDAN2     2.06453    0.84023   2.457  0.01478 *
ShipSCO3     0.85014    1.01294   0.839  0.40223
ShipEND      0.68959    1.02460   0.673  0.50164
ShipJHJ      0.97799    1.00877   0.969  0.33337
ShipDANS     1.25951    0.50837   2.478  0.01398 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
             edf Ref.df     F  p-value
s(lon,lat) 5.818     23 0.893 0.000642 ***
s(Depth)   4.094      5 7.660  6.1e-08 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.305   Deviance explained = 41.7%
-ML = 445.06  Scale est. = 1.6933    n = 262
```

```
[1] "Age 2"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -3.155759   0.753339  -4.189 3.05e-05 ***
Year1993     0.217830   0.539603   0.404   0.6865
Year1994    -0.258364   0.597274  -0.433   0.6654
Year1995     0.679028   0.560386   1.212   0.2259
Year1996     0.931023   0.552380   1.685   0.0922 .
Year1997     0.341388   0.539162   0.633   0.5268
Year1998     0.653417   0.536072   1.219   0.2232
Year1999    -0.233521   0.524432  -0.445   0.6562
Year2000    -0.487585   0.522171  -0.934   0.3507
Year2001     0.527189   0.504706   1.045   0.2965
Year2002     0.020759   0.507306   0.041   0.9674
Year2003     0.000789   0.527941   0.001   0.9988
Year2004    -0.739150   0.551286  -1.341   0.1803
Year2005    -0.457410   0.542356  -0.843   0.3992
Year2006     0.194974   0.536397   0.363   0.7163
Year2007     0.130274   0.530700   0.245   0.8061
Year2008    -0.594555   0.587109  -1.013   0.3115
Year2009    -0.148877   0.582796  -0.255   0.7984
Year2010     0.116999   0.537425   0.218   0.8277
Year2011     0.116176   0.535259   0.217   0.8282
Year2012     0.008923   0.533023   0.017   0.9866
Year2013    -0.224301   0.548119  -0.409   0.6825
Year2014    -0.093567   0.572524  -0.163   0.8702
Year2015    -0.026672   0.539035  -0.049   0.9605
ShipCIR     -0.380129   0.735224  -0.517   0.6053
ShipTRI2     0.068949   1.017841   0.068   0.9460
ShipMIC     -0.051003   0.727788  -0.070   0.9441
ShipWAH3    -0.603826   0.787175  -0.767   0.4432
ShipDAN2    -0.871629   0.865067  -1.008   0.3139
ShipSCO3    -0.030126   0.734416  -0.041   0.9673
ShipEND     -0.067752   0.736067  -0.092   0.9267
ShipHAV      0.303663   0.748231   0.406   0.6849
ShipJHJ     -0.108083   0.734354  -0.147   0.8830
ShipDANS     0.394529   0.323047   1.221   0.2223
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
             edf Ref.df     F  p-value
s(lon,lat) 14.90     23 6.121  < 2e-16 ***
s(Depth)    3.59      5 6.434 6.23e-08 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.164   Deviance explained = 20.8%
-ML = 1818.9  Scale est. = 1.9365    n = 1030
```

```
[1] "Age 3"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -2.03515    0.70447  -2.889 0.003922 **
Year1993     0.65129    0.38921   1.673 0.094471 .
Year1994    -0.16658    0.40681  -0.409 0.682255
Year1995     1.41140    0.39069   3.613 0.000313 ***
Year1996     0.75761    0.41679   1.818 0.069311 .
Year1997    -0.01785    0.39965  -0.045 0.964374
Year1998    -0.62292    0.39463  -1.578 0.114668
Year1999    -0.60666    0.36353  -1.669 0.095364 .
Year2000    -0.07131    0.36892  -0.193 0.846747
Year2001     1.31815    0.35261   3.738 0.000192 ***
Year2002     0.40020    0.35085   1.141 0.254194
Year2003     0.74521    0.37251   2.001 0.045624 *
Year2004    -0.02087    0.38865  -0.054 0.957175
Year2005     0.65870    0.38418   1.715 0.086630 .
Year2006    -0.07420    0.37664  -0.197 0.843856
Year2007     0.48399    0.37781   1.281 0.200381
Year2008    -0.21909    0.38952  -0.562 0.573883
Year2009    -0.80617    0.41600  -1.938 0.052826 .
Year2010    -0.58567    0.39227  -1.493 0.135636
Year2011     0.26401    0.38275   0.690 0.490439
Year2012     0.95313    0.38135   2.499 0.012550 *
Year2013     0.62220    0.37581   1.656 0.098014 .
Year2014    -0.56333    0.38712  -1.455 0.145824
Year2015     0.66673    0.37463   1.780 0.075330 .
ShipCIR     -0.97448    0.75357  -1.293 0.196160
ShipTRI2    -0.60038    0.92373  -0.650 0.515828
ShipMIC     -0.30895    0.74234  -0.416 0.677332
ShipWAH3    -0.81622    0.79673  -1.024 0.305781
ShipDAN2    -0.96372    0.94103  -1.024 0.305949
ShipSCO3    -0.53292    0.74699  -0.713 0.475698
ShipEND     -0.64451    0.74896  -0.861 0.389627
ShipHAV     -0.18113    0.76195  -0.238 0.812134
ShipJHJ     -0.88128    0.74853  -1.177 0.239243
ShipDANS    -0.17039    0.30037  -0.567 0.570613
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df      F p-value
s(lon,lat) 36.639    143  3.732  <2e-16 ***
s(Depth)    4.068      5 15.270  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.367   Deviance explained = 40.4%
-ML = 2859.7  Scale est. = 2.16      n = 1562
```

```
[1] "Age 4"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -2.232622   0.669294  -3.336 0.000871 ***
Year1993    -0.297631   0.383895  -0.775 0.438290
Year1994     0.049621   0.405404   0.122 0.902599
Year1995     0.644640   0.370340   1.741 0.081946 .
Year1996     1.416220   0.393827   3.596 0.000334 ***
Year1997     0.039104   0.393020   0.099 0.920758
Year1998     0.553380   0.354548   1.561 0.118781
Year1999    -0.357710   0.347902  -1.028 0.304026
Year2000     1.067416   0.347636   3.070 0.002175 **
Year2001     0.652822   0.337984   1.932 0.053608 .
Year2002     1.091150   0.333887   3.268 0.001108 **
Year2003     1.093235   0.354684   3.082 0.002092 **
Year2004     0.477512   0.362928   1.316 0.188469
Year2005     0.577890   0.365949   1.579 0.114511
Year2006     1.431635   0.355815   4.024 6.02e-05 ***
Year2007    -0.178579   0.357660  -0.499 0.617642
Year2008     0.499441   0.362596   1.377 0.168593
Year2009    -0.002975   0.391296  -0.008 0.993935
Year2010    -0.062410   0.372789  -0.167 0.867067
Year2011     0.975249   0.359387   2.714 0.006731 **
Year2012     0.346870   0.358274   0.968 0.333116
Year2013     1.514287   0.355006   4.266 2.12e-05 ***
Year2014     0.612106   0.363804   1.683 0.092677 .
Year2015     0.866265   0.355466   2.437 0.014926 *
ShipCIR     -0.720753   0.695818  -1.036 0.300446
ShipTRI2    -0.129601   0.859179  -0.151 0.880120
ShipMIC     -0.476272   0.681797  -0.699 0.484939
ShipWAH3    -0.882710   0.730391  -1.209 0.227029
ShipDAN2    -0.630433   0.859359  -0.734 0.463303
ShipSCO3    -0.790328   0.686051  -1.152 0.249507
ShipEND     -0.769390   0.687643  -1.119 0.263371
ShipHAV     -0.439380   0.699499  -0.628 0.530011
ShipJHJ     -1.061007   0.687421  -1.543 0.122930
ShipDANS    -0.444700   0.266615  -1.668 0.095535 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df      F p-value
s(lon,lat) 39.118    143  3.686  <2e-16 ***
s(Depth)    3.943      5 14.670  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.418   Deviance explained = 44.9%
-ML = 2740.2  Scale est. = 1.795     n = 1575
```

```
[1] "Age 5"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -3.82379    0.69580  -5.496 4.65e-08 ***
Year1993     1.09470    0.43511   2.516 0.011988 *
Year1994     0.88697    0.43308   2.048 0.040749 *
Year1995     1.02106    0.38913   2.624 0.008790 **
Year1996     0.79290    0.41692   1.902 0.057413 .
Year1997     1.81380    0.38855   4.668 3.34e-06 ***
Year1998     1.35288    0.37463   3.611 0.000316 ***
Year1999     1.82845    0.36331   5.033 5.49e-07 ***
Year2000     0.89465    0.36579   2.446 0.014581 *
Year2001     2.12598    0.35594   5.973 2.98e-09 ***
Year2002     1.19703    0.35764   3.347 0.000839 ***
Year2003     2.11891    0.37536   5.645 2.01e-08 ***
Year2004     1.91690    0.38123   5.028 5.62e-07 ***
Year2005     1.91838    0.38387   4.997 6.57e-07 ***
Year2006     1.45403    0.37848   3.842 0.000128 ***
Year2007     2.09228    0.37488   5.581 2.88e-08 ***
Year2008     0.57887    0.38684   1.496 0.134783
Year2009     0.83123    0.40739   2.040 0.041509 *
Year2010     0.87244    0.38852   2.246 0.024895 *
Year2011     1.12190    0.38257   2.933 0.003419 **
Year2012     2.14881    0.37661   5.706 1.42e-08 ***
Year2013     1.26676    0.37713   3.359 0.000804 ***
Year2014     1.89264    0.38047   4.974 7.39e-07 ***
Year2015     2.51644    0.37742   6.668 3.79e-11 ***
ShipCIR     -0.41169    0.70147  -0.587 0.557375
ShipTRI2     0.05429    0.86870   0.062 0.950179
ShipMIC     -0.48991    0.69269  -0.707 0.479528
ShipWAH3    -0.70656    0.72873  -0.970 0.332432
ShipDAN2    -0.89709    0.80223  -1.118 0.263659
ShipSCO3    -0.48963    0.69396  -0.706 0.480581
ShipEND     -0.51742    0.69472  -0.745 0.456531
ShipHAV     -0.41759    0.70282  -0.594 0.552508
ShipJHJ     -0.62279    0.69559  -0.895 0.370761
ShipDANS    -0.29642    0.25330  -1.170 0.242120
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df      F p-value
s(lon,lat) 34.228    143  2.657  <2e-16 ***
s(Depth)    3.972      5 17.618  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.395   Deviance explained = 43.5%
-ML =   2296  Scale est. = 1.4194    n = 1416
```

```
[1] "Age 6"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -3.383902   0.655469  -5.163 2.89e-07 ***
Year1993     0.536484   0.471305   1.138 0.255246
Year1994     1.070975   0.464284   2.307 0.021256 *
Year1995     0.053458   0.470075   0.114 0.909478
Year1996     0.573444   0.456583   1.256 0.209404
Year1997     0.077222   0.445789   0.173 0.862507
Year1998     1.473944   0.414988   3.552 0.000399 ***
Year1999     0.441077   0.407241   1.083 0.279009
Year2000     0.980833   0.409942   2.393 0.016896 *
Year2001     0.609894   0.404696   1.507 0.132088
Year2002     1.349660   0.403759   3.343 0.000858 ***
Year2003     0.376289   0.430200   0.875 0.381937
Year2004     1.139951   0.423874   2.689 0.007268 **
Year2005     1.444672   0.427167   3.382 0.000745 ***
Year2006     1.101964   0.424137   2.598 0.009499 **
Year2007     0.572935   0.420512   1.362 0.173330
Year2008     1.432600   0.425000   3.371 0.000776 ***
Year2009    -0.008889   0.469559  -0.019 0.984899
Year2010     0.526328   0.432941   1.216 0.224360
Year2011     0.946424   0.425588   2.224 0.026365 *
Year2012     0.692129   0.424569   1.630 0.103348
Year2013     1.419657   0.419774   3.382 0.000745 ***
Year2014     0.480592   0.426305   1.127 0.259844
Year2015     1.568966   0.421448   3.723 0.000207 ***
ShipCIR     -0.877899   0.605161  -1.451 0.147154
ShipTRI2    -1.175215   1.011140  -1.162 0.245380
ShipMIC     -1.179912   0.589454  -2.002 0.045563 *
ShipWAH3    -0.907182   0.629730  -1.441 0.149987
ShipDAN2    -1.109121   0.747331  -1.484 0.138068
ShipSCO3    -0.764306   0.592181  -1.291 0.197093
ShipEND     -0.970859   0.594120  -1.634 0.102523
ShipHAV     -1.073457   0.604091  -1.777 0.075849 .
ShipJHJ     -0.902277   0.593787  -1.520 0.128918
ShipDANS    -0.254527   0.246684  -1.032 0.302397
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df      F  p-value
s(lon,lat) 35.102    143  1.805  < 2e-16 ***
s(Depth)    3.758      5 10.359 7.13e-14 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =   0.33   Deviance explained = 37.6%
-ML = 1766.1  Scale est. = 1.1256    n = 1168
```

```
[1] "Age 7"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  -4.0917     0.6110  -6.697 3.97e-11 ***
Year1993     -0.3261     0.6617  -0.493 0.622254
Year1994      0.5141     0.4593   1.119 0.263286
Year1995      0.8939     0.4305   2.076 0.038172 *
Year1996      1.2109     0.4643   2.608 0.009277 **
Year1997      1.0958     0.4404   2.488 0.013036 *
Year1998      0.8950     0.4280   2.091 0.036825 *
Year1999      1.4583     0.4030   3.618 0.000315 ***
Year2000      0.8893     0.4250   2.092 0.036708 *
Year2001      1.5989     0.3989   4.008 6.68e-05 ***
Year2002      0.8229     0.4054   2.030 0.042712 *
Year2003      1.3616     0.4290   3.174 0.001562 **
Year2004      0.4737     0.4285   1.105 0.269275
Year2005      1.8372     0.4225   4.348 1.55e-05 ***
Year2006      1.4138     0.4219   3.351 0.000843 ***
Year2007      1.1304     0.4178   2.705 0.006965 **
Year2008      1.0802     0.4245   2.545 0.011112 *
Year2009      1.1839     0.4563   2.594 0.009644 **
Year2010      0.5282     0.4519   1.169 0.242777
Year2011      0.9135     0.4268   2.140 0.032630 *
Year2012      1.4293     0.4220   3.387 0.000741 ***
Year2013      1.1298     0.4214   2.681 0.007490 **
Year2014      1.5184     0.4216   3.602 0.000335 ***
Year2015      1.1824     0.4226   2.798 0.005265 **
ShipCIR      -0.9286     0.5469  -1.698 0.089910 .
ShipMIC      -1.1773     0.5317  -2.214 0.027091 *
ShipWAH3     -0.9137     0.5763  -1.585 0.113253
ShipDAN2     -1.6606     0.6044  -2.748 0.006133 **
ShipSCO3     -0.8702     0.5319  -1.636 0.102241
ShipEND      -1.0604     0.5318  -1.994 0.046464 *
ShipHAV      -1.1802     0.5436  -2.171 0.030210 *
ShipJHJ      -0.9129     0.5314  -1.718 0.086187 .
ShipDANS      0.3600     0.2668   1.349 0.177574
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df     F p-value
s(lon,lat) 31.410    143 1.143 < 2e-16 ***
s(Depth)    0.868      5 1.066 0.00475 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.235   Deviance explained = 29.1%
-ML = 1235.3  Scale est. = 0.90859   n = 880
```

```
[1] "Age 8"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -3.49296    0.54720  -6.383 3.53e-10 ***
Year1993     0.58962    0.51642   1.142 0.254027
Year1994     0.52644    0.47493   1.108 0.268119
Year1995    -0.15735    0.43966  -0.358 0.720559
Year1996    -0.40982    0.46726  -0.877 0.380814
Year1997    -0.12083    0.44311  -0.273 0.785197
Year1998     0.69626    0.38559   1.806 0.071480 .
Year1999     0.71126    0.39938   1.781 0.075445 .
Year2000     0.97823    0.42068   2.325 0.020394 *
Year2001     0.51640    0.38000   1.359 0.174685
Year2002     0.86589    0.36221   2.391 0.017137 *
Year2003     0.34765    0.41403   0.840 0.401434
Year2004     0.27529    0.41746   0.659 0.509869
Year2005     0.06082    0.41648   0.146 0.883947
Year2006     0.72524    0.39691   1.827 0.068179 .
Year2007     0.17455    0.39240   0.445 0.656604
Year2008     0.55312    0.39533   1.399 0.162297
Year2009     0.68913    0.43541   1.583 0.114032
Year2010     0.79867    0.40351   1.979 0.048251 *
Year2011    -0.29413    0.42977  -0.684 0.493991
Year2012     0.46584    0.39476   1.180 0.238455
Year2013     0.28585    0.39968   0.715 0.474781
Year2014     0.05419    0.40515   0.134 0.893652
Year2015     0.97950    0.39832   2.459 0.014218 *
ShipCIR     -0.94414    0.49633  -1.902 0.057628 .
ShipMIC     -1.54925    0.47676  -3.250 0.001222 **
ShipWAH3    -1.14757    0.54600  -2.102 0.036001 *
ShipDAN2    -2.02235    0.60561  -3.339 0.000893 ***
ShipSCO3    -1.07943    0.47128  -2.290 0.022351 *
ShipEND     -1.00124    0.47071  -2.127 0.033832 *
ShipHAV     -1.05284    0.49213  -2.139 0.032820 *
ShipJHJ     -0.86995    0.46779  -1.860 0.063430 .
ShipDANS     0.19626    0.29890   0.657 0.511706
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
               edf Ref.df     F  p-value
s(lon,lat) 14.8397    143 0.426 3.13e-09 ***
s(Depth)    0.7371      5 0.518   0.0405 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.156   Deviance explained = 23.2%
-ML = 854.93  Scale est. = 0.85221   n = 633
```

```
[1] "Age 9"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -4.02544    0.69015  -5.833 1.14e-08 ***
Year1993     0.15968    0.70783   0.226  0.82164
Year1994     0.93777    0.60446   1.551  0.12161
Year1995     0.04971    0.66350   0.075  0.94032
Year1996     0.09518    0.63314   0.150  0.88058
Year1997     1.16903    0.58017   2.015  0.04459 *
Year1998    -0.04336    0.71826  -0.060  0.95189
Year1999     1.16472    0.57313   2.032  0.04281 *
Year2000     0.25233    0.56921   0.443  0.65780
Year2001     1.27957    0.56262   2.274  0.02349 *
Year2002     0.53649    0.65351   0.821  0.41218
Year2003     1.15875    0.61491   1.884  0.06025 .
Year2004     0.53151    0.70257   0.757  0.44979
Year2005     1.27241    0.61971   2.053  0.04071 *
Year2006     0.59233    0.61183   0.968  0.33358
Year2007     0.87917    0.60445   1.455  0.14661
Year2008     0.65828    0.60310   1.091  0.27573
Year2009     0.36177    0.63863   0.566  0.57139
Year2010     0.48199    0.61588   0.783  0.43433
Year2011     0.64488    0.60507   1.066  0.28717
Year2012     0.43989    0.60177   0.731  0.46522
Year2013     1.00885    0.60487   1.668  0.09614 .
Year2014     0.74816    0.61947   1.208  0.22787
Year2015     0.88942    0.61081   1.456  0.14616
ShipCIR     -1.19294    0.50339  -2.370  0.01828 *
ShipMIC     -1.36462    0.46637  -2.926  0.00363 **
ShipWAH3    -1.06686    0.53201  -2.005  0.04561 *
ShipSCO3    -1.23990    0.43095  -2.877  0.00423 **
ShipEND     -1.10665    0.41456  -2.669  0.00791 **
ShipHAV     -1.07498    0.46512  -2.311  0.02134 *
ShipJHJ     -1.06029    0.41342  -2.565  0.01070 *
ShipDANS    -0.04807    0.32922  -0.146  0.88398
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df     F p-value
s(lon,lat) 5.5589    143 0.089  0.0183 *
s(Depth)   0.5246      5 0.214  0.1386
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.0957   Deviance explained = 18.7%
-ML = 543.26  Scale est. = 0.74788   n = 430
```

```
[1] "Age 10"

Family: gaussian
Link function: identity

Formula:
log(A1) ~ Year + Ship + s(lon, lat, k = kvecP[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -3.57512    0.70203  -5.093 5.37e-07 ***
Year1993     1.12752    0.56285   2.003   0.0458 *
Year1994     0.75464    0.53166   1.419   0.1565
Year1995     0.22588    0.48019   0.470   0.6383
Year1996     0.47699    0.50123   0.952   0.3418
Year1997     0.45031    0.49999   0.901   0.3683
Year1998    -0.06219    0.51655  -0.120   0.9042
Year1999     0.67305    0.49968   1.347   0.1787
Year2000     0.26998    0.48079   0.562   0.5747
Year2001     1.01043    0.49416   2.045   0.0415 *
Year2002     0.87758    0.45117   1.945   0.0524 .
Year2003     0.92727    0.52559   1.764   0.0784 .
Year2004     1.01349    0.57480   1.763   0.0786 .
Year2005     0.88907    0.52848   1.682   0.0933 .
Year2006     0.70377    0.51692   1.361   0.1741
Year2007     0.65660    0.51961   1.264   0.2071
Year2008     0.52227    0.50227   1.040   0.2990
Year2009     0.43011    0.55202   0.779   0.4363
Year2010     1.07633    0.50224   2.143   0.0327 *
Year2011     0.51610    0.51534   1.001   0.3172
Year2012     0.88316    0.49866   1.771   0.0773 .
Year2013     1.20925    0.50692   2.385   0.0175 *
Year2014     0.81825    0.52949   1.545   0.1230
Year2015     1.14260    0.52782   2.165   0.0310 *
ShipCIR     -0.80949    0.64364  -1.258   0.2092
ShipMIC     -1.19737    0.63424  -1.888   0.0597 .
ShipWAH3    -1.32278    0.69465  -1.904   0.0576 .
ShipSCO3    -1.27794    0.59388  -2.152   0.0320 *
ShipEND     -1.01390    0.58309  -1.739   0.0828 .
ShipHAV     -0.78001    0.61604  -1.266   0.2062
ShipJHJ     -0.95935    0.58183  -1.649   0.0999 .
ShipDANS    -0.42684    0.39539  -1.080   0.2810
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
             edf Ref.df     F p-value
s(lon,lat) 7.822    143 0.132 0.00508 **
s(Depth)   2.264      5 1.384 0.02137 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.0889   Deviance explained = 18.2%
-ML =  655.7  Scale est. = 1.0182    n = 457
```

Non-positive / Absence GAM model

```
 [1] "Age 1"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -5.139e+00  8.737e-01  -5.882 4.06e-09 ***
Year1993     1.094e+00  5.257e-01   2.081 0.037471 *
Year1994    -4.122e+00  1.118e+00  -3.688 0.000226 ***
Year1995    -4.100e+00  1.119e+00  -3.664 0.000249 ***
Year1996    -3.918e+01  8.389e+06   0.000 0.999996
Year1997    -3.307e+00  8.736e-01  -3.786 0.000153 ***
Year1998    -4.198e+00  1.117e+00  -3.757 0.000172 ***
Year1999    -9.019e-01  5.594e-01  -1.612 0.106897
Year2000    -2.363e+00  1.115e+00  -2.120 0.034045 *
Year2001    -3.147e-01  5.414e-01  -0.581 0.561031
Year2002    -5.635e-01  5.485e-01  -1.027 0.304253
Year2003    -2.137e+00  6.474e-01  -3.301 0.000965 ***
Year2004    -5.027e-01  5.610e-01  -0.896 0.370257
Year2005    -1.843e+00  6.707e-01  -2.748 0.005988 **
Year2006    -9.009e-01  5.788e-01  -1.557 0.119545
Year2007    -1.001e+00  5.878e-01  -1.702 0.088726 .
Year2008    -1.154e+00  6.003e-01  -1.922 0.054561 .
Year2009    -8.275e-01  5.873e-01  -1.409 0.158821
Year2010     8.673e-02  5.441e-01   0.159 0.873364
Year2011    -5.493e-01  5.913e-01  -0.929 0.352907
Year2012    -6.967e-01  5.991e-01  -1.163 0.244887
Year2013     2.982e-01  5.541e-01   0.538 0.590487
Year2014    -2.072e-01  5.721e-01  -0.362 0.717260
Year2015    -1.543e+00  6.809e-01  -2.266 0.023470 *
ShipCIR     -1.044e+00  9.994e-01  -1.045 0.296137
ShipTRI2    -1.254e-01  1.022e+00  -0.123 0.902309
ShipWAH2    -5.815e-01  1.466e+00  -0.397 0.691560
ShipMIC     -1.679e+00  9.961e-01  -1.685 0.091950 .
ShipWAH3    -8.586e-01  1.176e+00  -0.730 0.465404
ShipDAN2     1.289e-01  7.305e-01   0.176 0.859976
ShipSCO3    -4.515e-01  9.413e-01  -0.480 0.631476
ShipEND     -6.171e-01  9.489e-01  -0.650 0.515437
ShipHAV     -3.616e+01  5.733e+06   0.000 0.999995
ShipJHJ     -6.183e-01  9.287e-01  -0.666 0.505584
ShipDANS    -2.106e-01  3.965e-01  -0.531 0.595373
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq  p-value
s(lon,lat) 12.816     63  82.21 4.35e-16 ***
s(Depth)    3.515      5  83.64  < 2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =   0.35   Deviance explained = 36.8%
-ML = 606.11  Scale est. = 1         n = 3129
```

```
[1] "Age 2"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -6.113e+00  8.508e-01  -7.186 6.69e-13 ***
Year1993     2.058e+00  5.041e-01   4.083 4.45e-05 ***
Year1994     7.227e-01  5.287e-01   1.367 0.171681
Year1995     1.492e+00  5.227e-01   2.855 0.004310 **
Year1996     1.689e+00  5.219e-01   3.236 0.001212 **
Year1997     2.373e+00  5.232e-01   4.535 5.75e-06 ***
Year1998     1.216e+00  4.838e-01   2.513 0.011973 *
Year1999     9.166e-01  4.694e-01   1.953 0.050846 .
Year2000     1.979e+00  4.785e-01   4.136 3.53e-05 ***
Year2001     2.554e+00  4.649e-01   5.494 3.92e-08 ***
Year2002     2.044e+00  4.637e-01   4.409 1.04e-05 ***
Year2003     2.305e+00  4.822e-01   4.779 1.76e-06 ***
Year2004     3.946e-01  4.958e-01   0.796 0.426113
Year2005     1.085e+00  4.911e-01   2.208 0.027224 *
Year2006     1.538e+00  4.867e-01   3.160 0.001580 **
Year2007     1.945e+00  4.835e-01   4.023 5.74e-05 ***
Year2008     2.126e-01  5.099e-01   0.417 0.676746
Year2009     4.943e-01  5.199e-01   0.951 0.341731
Year2010     1.946e+00  4.843e-01   4.017 5.89e-05 ***
Year2011     2.211e+00  4.898e-01   4.513 6.38e-06 ***
Year2012     2.360e+00  4.885e-01   4.831 1.36e-06 ***
Year2013     1.199e+00  4.943e-01   2.425 0.015298 *
Year2014     6.361e-01  5.060e-01   1.257 0.208734
Year2015     1.824e+00  4.896e-01   3.726 0.000195 ***
ShipCIR     -1.382e-01  9.115e-01  -0.152 0.879466
ShipTRI2     5.647e-01  1.074e+00   0.526 0.599008
ShipWAH2    -2.814e+01  1.733e+07   0.000 0.999999
ShipMIC      4.265e-01  8.923e-01   0.478 0.632623
ShipWAH3     3.960e-01  9.493e-01   0.417 0.676528
ShipDAN2    -2.335e-01  9.866e-01  -0.237 0.812893
ShipSCO3     1.502e-01  9.009e-01   0.167 0.867605
ShipEND      3.899e-02  9.065e-01   0.043 0.965692
ShipHAV      9.097e-01  9.254e-01   0.983 0.325602
ShipJHJ     -3.694e-01  9.052e-01  -0.408 0.683177
ShipDANS    -1.971e-02  3.624e-01  -0.054 0.956629
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 33.068     63  393.7  <2e-16 ***
s(Depth)    4.559      5  117.2  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.376   Deviance explained =   34%
-ML = 1393.9  Scale est. = 1         n = 3129
```

```
[1] "Age 3"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.784e+00  8.276e-01  -4.573 4.82e-06 ***
Year1993     9.891e-01  4.578e-01   2.160 0.030746 *
Year1994     4.162e-01  4.622e-01   0.900 0.367863
Year1995     1.437e+00  4.859e-01   2.957 0.003103 **
Year1996     4.361e-01  4.852e-01   0.899 0.368801
Year1997     1.214e+00  4.964e-01   2.446 0.014458 *
Year1998    -3.850e-01  4.329e-01  -0.889 0.373832
Year1999    -9.123e-02  4.136e-01  -0.221 0.825448
Year2000     5.008e-01  4.381e-01   1.143 0.252944
Year2001     1.154e+00  4.199e-01   2.748 0.006000 **
Year2002     1.456e+00  4.210e-01   3.458 0.000544 ***
Year2003     1.745e+00  4.454e-01   3.918 8.92e-05 ***
Year2004     5.192e-02  4.359e-01   0.119 0.905188
Year2005     4.251e-01  4.451e-01   0.955 0.339580
Year2006     1.459e+00  4.506e-01   3.239 0.001199 **
Year2007     8.662e-01  4.440e-01   1.951 0.051056 .
Year2008     1.814e-01  4.456e-01   0.407 0.683846
Year2009    -3.354e-01  4.637e-01  -0.723 0.469487
Year2010    -7.926e-02  4.391e-01  -0.181 0.856759
Year2011     1.509e+00  4.548e-01   3.318 0.000907 ***
Year2012     1.428e+00  4.554e-01   3.136 0.001710 **
Year2013     2.280e+00  4.621e-01   4.934 8.06e-07 ***
Year2014     9.024e-01  4.529e-01   1.992 0.046318 *
Year2015     2.561e+00  4.581e-01   5.590 2.27e-08 ***
ShipCIR     -9.073e-01  9.282e-01  -0.978 0.328315
ShipTRI2    -3.246e-02  1.013e+00  -0.032 0.974422
ShipWAH2    -3.119e+01  1.733e+07   0.000 0.999999
ShipMIC     -2.921e-01  9.037e-01  -0.323 0.746508
ShipWAH3    -1.285e+00  9.724e-01  -1.322 0.186304
ShipDAN2    -1.874e+00  1.034e+00  -1.814 0.069734 .
ShipSCO3    -5.199e-01  9.163e-01  -0.567 0.570504
ShipEND     -5.150e-01  9.232e-01  -0.558 0.576944
ShipHAV     -4.194e-01  9.510e-01  -0.441 0.659192
ShipJHJ     -1.059e+00  9.239e-01  -1.146 0.251829
ShipDANS    -1.160e+00  3.907e-01  -2.968 0.002996 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 29.716     63  436.9  <2e-16 ***
s(Depth)    4.473      5  149.6  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.523   Deviance explained = 46.8%
-ML = 1232.9  Scale est. = 1         n = 3129
```

```
[1] "Age 4"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -4.440e+00  8.491e-01  -5.229 1.70e-07 ***
Year1993     4.856e-01  4.825e-01   1.006 0.314214
Year1994    -6.159e-02  4.974e-01  -0.124 0.901455
Year1995     1.761e+00  5.070e-01   3.472 0.000516 ***
Year1996     7.389e-01  5.156e-01   1.433 0.151824
Year1997     7.385e-01  5.172e-01   1.428 0.153344
Year1998     6.827e-01  4.618e-01   1.478 0.139287
Year1999    -1.919e-01  4.411e-01  -0.435 0.663554
Year2000     5.521e-01  4.666e-01   1.183 0.236698
Year2001     1.019e+00  4.447e-01   2.292 0.021904 *
Year2002     1.575e+00  4.467e-01   3.527 0.000421 ***
Year2003     2.117e+00  4.715e-01   4.491 7.09e-06 ***
Year2004     7.803e-01  4.636e-01   1.683 0.092302 .
Year2005     3.401e-01  4.741e-01   0.717 0.473145
Year2006     1.757e+00  4.816e-01   3.648 0.000265 ***
Year2007     1.128e+00  4.750e-01   2.374 0.017594 *
Year2008     8.459e-01  4.797e-01   1.764 0.077807 .
Year2009    -1.820e-01  4.910e-01  -0.371 0.710899
Year2010    -2.479e-01  4.651e-01  -0.533 0.594014
Year2011     2.025e+00  4.873e-01   4.155 3.25e-05 ***
Year2012     1.938e+00  4.887e-01   3.965 7.33e-05 ***
Year2013     2.658e+00  4.930e-01   5.392 6.97e-08 ***
Year2014     1.136e+00  4.838e-01   2.349 0.018849 *
Year2015     2.427e+00  4.849e-01   5.004 5.61e-07 ***
ShipCIR     -4.556e-01  9.467e-01  -0.481 0.630315
ShipTRI2     8.701e-01  1.024e+00   0.849 0.395672
ShipWAH2    -3.149e+01  1.733e+07   0.000 0.999999
ShipMIC      3.730e-01  9.207e-01   0.405 0.685360
ShipWAH3    -8.100e-01  9.921e-01  -0.817 0.414208
ShipDAN2    -1.597e+00  1.047e+00  -1.526 0.126962
ShipSCO3     1.169e-01  9.339e-01   0.125 0.900368
ShipEND     -8.158e-03  9.414e-01  -0.009 0.993086
ShipHAV     -1.024e-01  9.716e-01  -0.105 0.916023
ShipJHJ     -4.369e-01  9.426e-01  -0.463 0.643027
ShipDANS    -4.629e-01  4.124e-01  -1.122 0.261694
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 25.966     63  412.6  <2e-16 ***
s(Depth)    4.454      5  197.3  <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) =  0.573   Deviance explained = 51.6%
-ML = 1121.1  Scale est. = 1         n = 3129
```

```
[1] "Age 5"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -4.867e+00  9.176e-01  -5.305 1.13e-07 ***
Year1993     3.229e-02  5.503e-01   0.059 0.953214
Year1994     2.080e-01  5.619e-01   0.370 0.711281
Year1995     2.213e+00  5.512e-01   4.015 5.94e-05 ***
Year1996     1.101e+00  5.724e-01   1.924 0.054403 .
Year1997     2.645e+00  5.711e-01   4.632 3.63e-06 ***
Year1998     1.706e+00  5.127e-01   3.327 0.000878 ***
Year1999     1.097e+00  4.908e-01   2.235 0.025430 *
Year2000     1.300e+00  5.117e-01   2.541 0.011069 *
Year2001     2.428e+00  4.980e-01   4.876 1.08e-06 ***
Year2002     1.938e+00  4.942e-01   3.921 8.82e-05 ***
Year2003     3.465e+00  5.282e-01   6.561 5.35e-11 ***
Year2004     2.076e+00  5.178e-01   4.009 6.09e-05 ***
Year2005     1.439e+00  5.257e-01   2.737 0.006194 **
Year2006     2.235e+00  5.221e-01   4.280 1.87e-05 ***
Year2007     2.969e+00  5.338e-01   5.563 2.66e-08 ***
Year2008     1.393e+00  5.255e-01   2.651 0.008019 **
Year2009     8.854e-01  5.406e-01   1.638 0.101459
Year2010     1.061e+00  5.127e-01   2.069 0.038581 *
Year2011     2.553e+00  5.357e-01   4.766 1.88e-06 ***
Year2012     3.602e+00  5.471e-01   6.584 4.56e-11 ***
Year2013     3.284e+00  5.418e-01   6.061 1.36e-09 ***
Year2014     2.646e+00  5.368e-01   4.929 8.25e-07 ***
Year2015     3.012e+00  5.323e-01   5.658 1.53e-08 ***
ShipCIR     -1.286e+00  1.010e+00  -1.273 0.202966
ShipTRI2     7.499e-01  1.127e+00   0.665 0.505755
ShipWAH2    -3.624e+01  1.733e+07   0.000 0.999998
ShipMIC     -8.444e-01  9.806e-01  -0.861 0.389218
ShipWAH3    -1.565e+00  1.052e+00  -1.487 0.136891
ShipDAN2    -1.908e+00  1.107e+00  -1.723 0.084868 .
ShipSCO3    -1.321e+00  9.956e-01  -1.327 0.184435
ShipEND     -1.351e+00  1.004e+00  -1.347 0.178134
ShipHAV     -1.205e+00  1.035e+00  -1.164 0.244363
ShipJHJ     -1.895e+00  1.004e+00  -1.888 0.059057 .
ShipDANS    -5.728e-01  4.109e-01  -1.394 0.163287
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 28.033     63  399.9  <2e-16 ***
s(Depth)    4.449      5  186.0  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.602   Deviance explained = 55.1%
-ML = 1042.8  Scale est. = 1         n = 3129
```

```
[1] "Age 6"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -6.869e+00  9.612e-01  -7.146 8.94e-13 ***
Year1993     7.349e-01  6.244e-01   1.177 0.239179
Year1994     1.133e+00  6.272e-01   1.806 0.070985 .
Year1995     9.819e-01  6.425e-01   1.528 0.126456
Year1996     1.543e+00  6.359e-01   2.426 0.015261 *
Year1997     1.903e+00  6.327e-01   3.007 0.002640 **
Year1998     2.933e+00  5.776e-01   5.078 3.81e-07 ***
Year1999     1.929e+00  5.551e-01   3.474 0.000513 ***
Year2000     2.152e+00  5.712e-01   3.767 0.000165 ***
Year2001     2.363e+00  5.551e-01   4.257 2.07e-05 ***
Year2002     2.439e+00  5.558e-01   4.389 1.14e-05 ***
Year2003     2.335e+00  5.829e-01   4.006 6.17e-05 ***
Year2004     3.446e+00  5.835e-01   5.906 3.51e-09 ***
Year2005     2.569e+00  5.877e-01   4.371 1.24e-05 ***
Year2006     2.767e+00  5.818e-01   4.755 1.98e-06 ***
Year2007     3.462e+00  5.888e-01   5.880 4.10e-09 ***
Year2008     2.959e+00  5.925e-01   4.994 5.90e-07 ***
Year2009     9.367e-01  6.183e-01   1.515 0.129784
Year2010     1.833e+00  5.790e-01   3.166 0.001545 **
Year2011     3.360e+00  5.957e-01   5.641 1.69e-08 ***
Year2012     3.221e+00  5.935e-01   5.427 5.72e-08 ***
Year2013     4.568e+00  6.086e-01   7.506 6.11e-14 ***
Year2014     3.077e+00  5.951e-01   5.170 2.34e-07 ***
Year2015     3.881e+00  5.951e-01   6.521 6.96e-11 ***
ShipCIR     -3.117e-01  1.007e+00  -0.309 0.756991
ShipTRI2     1.087e+00  1.306e+00   0.833 0.405089
ShipWAH2    -3.012e+01  1.733e+07   0.000 0.999999
ShipMIC     -1.717e-01  9.715e-01  -0.177 0.859731
ShipWAH3    -1.953e-01  1.041e+00  -0.188 0.851203
ShipDAN2    -1.642e+00  1.194e+00  -1.375 0.169098
ShipSCO3    -7.626e-01  9.884e-01  -0.772 0.440378
ShipEND     -7.687e-01  9.970e-01  -0.771 0.440694
ShipHAV     -7.225e-01  1.021e+00  -0.707 0.479280
ShipJHJ     -7.344e-01  9.966e-01  -0.737 0.461212
ShipDANS    -6.794e-01  4.021e-01  -1.690 0.091080 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 30.050     63  344.5  <2e-16 ***
s(Depth)    4.456      5  176.9  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.581   Deviance explained = 53.9%
-ML = 1032.3  Scale est. = 1         n = 3129
```

```
[1] "Age 7"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -7.804e+00  1.002e+00  -7.785 6.97e-15 ***
Year1993    -1.243e+00  8.286e-01  -1.500 0.133682
Year1994     6.929e-01  6.631e-01   1.045 0.296048
Year1995     2.049e+00  6.494e-01   3.155 0.001606 **
Year1996     7.994e-01  6.695e-01   1.194 0.232506
Year1997     1.544e+00  6.541e-01   2.361 0.018222 *
Year1998     1.134e+00  6.065e-01   1.870 0.061509 .
Year1999     1.907e+00  5.743e-01   3.322 0.000895 ***
Year2000     7.255e-01  5.967e-01   1.216 0.224047
Year2001     2.441e+00  5.739e-01   4.254 2.10e-05 ***
Year2002     1.603e+00  5.756e-01   2.786 0.005342 **
Year2003     2.052e+00  6.039e-01   3.397 0.000681 ***
Year2004     1.955e+00  6.049e-01   3.232 0.001231 **
Year2005     2.821e+00  6.064e-01   4.652 3.28e-06 ***
Year2006     2.418e+00  5.998e-01   4.031 5.56e-05 ***
Year2007     3.237e+00  6.044e-01   5.357 8.48e-08 ***
Year2008     2.390e+00  6.083e-01   3.929 8.53e-05 ***
Year2009     1.235e+00  6.344e-01   1.946 0.051617 .
Year2010     6.767e-01  6.157e-01   1.099 0.271735
Year2011     2.668e+00  6.098e-01   4.375 1.21e-05 ***
Year2012     2.757e+00  6.077e-01   4.538 5.69e-06 ***
Year2013     2.959e+00  6.092e-01   4.858 1.19e-06 ***
Year2014     3.184e+00  6.123e-01   5.199 2.00e-07 ***
Year2015     2.677e+00  6.068e-01   4.411 1.03e-05 ***
ShipCIR      4.868e-01  1.037e+00   0.470 0.638629
ShipTRI2    -2.959e+01  1.061e+07   0.000 0.999998
ShipWAH2    -2.847e+01  1.733e+07   0.000 0.999999
ShipMIC      2.544e-01  1.000e+00   0.254 0.799263
ShipWAH3     6.628e-01  1.069e+00   0.620 0.535194
ShipDAN2     2.337e-02  1.087e+00   0.021 0.982851
ShipSCO3    -4.417e-02  1.017e+00  -0.043 0.965366
ShipEND     -8.693e-02  1.025e+00  -0.085 0.932379
ShipHAV     -1.353e-01  1.047e+00  -0.129 0.897139
ShipJHJ     -3.479e-02  1.023e+00  -0.034 0.972876
ShipDANS    -1.007e+00  4.190e-01  -2.403 0.016259 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 32.669     63  292.8  <2e-16 ***
s(Depth)    4.357      5  125.4  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.506   Deviance explained = 49.3%
-ML = 1026.5  Scale est. = 1         n = 3129
```

```
[1] "Age 8"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -7.857e+00  9.960e-01  -7.889 3.04e-15 ***
Year1993    -9.604e-01  7.101e-01  -1.353  0.17619
Year1994    -8.953e-01  6.824e-01  -1.312  0.18955
Year1995    -2.348e-02  6.465e-01  -0.036  0.97102
Year1996    -4.837e-01  6.708e-01  -0.721  0.47081
Year1997    -4.502e-02  6.474e-01  -0.070  0.94456
Year1998     5.582e-01  5.692e-01   0.981  0.32673
Year1999    -6.493e-01  5.637e-01  -1.152  0.24935
Year2000    -8.473e-01  5.905e-01  -1.435  0.15130
Year2001     4.052e-01  5.434e-01   0.746  0.45587
Year2002     1.084e+00  5.360e-01   2.022  0.04315 *
Year2003     7.251e-01  5.774e-01   1.256  0.20919
Year2004     4.715e-01  5.808e-01   0.812  0.41695
Year2005     3.229e-01  5.850e-01   0.552  0.58095
Year2006     1.142e+00  5.658e-01   2.018  0.04358 *
Year2007     1.609e+00  5.664e-01   2.841  0.00450 **
Year2008     1.599e+00  5.743e-01   2.784  0.00537 **
Year2009     2.867e-01  6.067e-01   0.473  0.63652
Year2010     7.206e-01  5.676e-01   1.269  0.20430
Year2011     8.387e-03  5.937e-01   0.014  0.98873
Year2012     1.554e+00  5.728e-01   2.714  0.00665 **
Year2013     1.057e+00  5.759e-01   1.835  0.06650 .
Year2014     8.642e-01  5.795e-01   1.491  0.13589
Year2015     1.135e+00  5.749e-01   1.975  0.04826 *
ShipCIR      1.322e+00  1.055e+00   1.253  0.21025
ShipTRI2    -2.917e+01  1.061e+07   0.000  1.00000
ShipWAH2    -2.799e+01  1.733e+07   0.000  1.00000
ShipMIC      1.262e+00  1.015e+00   1.243  0.21372
ShipWAH3     1.709e+00  1.104e+00   1.547  0.12181
ShipDAN2     2.133e-01  1.090e+00   0.196  0.84481
ShipSCO3     9.963e-01  1.033e+00   0.965  0.33478
ShipEND      9.145e-01  1.038e+00   0.881  0.37852
ShipHAV      1.078e+00  1.062e+00   1.015  0.31027
ShipJHJ      1.359e+00  1.037e+00   1.310  0.19006
ShipDANS    -1.430e-01  4.453e-01  -0.321  0.74806
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 33.495     63 260.92  <2e-16 ***
s(Depth)    4.156      5  84.67  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.427   Deviance explained = 44.6%
-ML = 958.84  Scale est. = 1         n = 3129
```

```
[1] "Age 9"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -8.328e+00  1.211e+00  -6.877 6.09e-12 ***
Year1993     4.085e-02  9.126e-01   0.045 0.964299
Year1994     9.940e-01  8.063e-01   1.233 0.217651
Year1995     3.772e-01  8.700e-01   0.434 0.664574
Year1996     6.804e-01  8.406e-01   0.809 0.418242
Year1997     1.594e+00  7.893e-01   2.019 0.043435 *
Year1998    -2.924e-01  9.032e-01  -0.324 0.746151
Year1999     9.174e-01  7.407e-01   1.239 0.215516
Year2000     1.505e+00  7.399e-01   2.034 0.041923 *
Year2001     1.624e+00  7.282e-01   2.230 0.025726 *
Year2002    -1.453e-01  8.015e-01  -0.181 0.856165
Year2003     2.767e+00  7.672e-01   3.607 0.000310 ***
Year2004     6.436e-01  8.458e-01   0.761 0.446659
Year2005     2.347e+00  7.762e-01   3.024 0.002495 **
Year2006     2.311e+00  7.647e-01   3.022 0.002513 **
Year2007     2.847e+00  7.611e-01   3.741 0.000183 ***
Year2008     3.135e+00  7.656e-01   4.095 4.23e-05 ***
Year2009     1.955e+00  7.995e-01   2.445 0.014494 *
Year2010     2.125e+00  7.677e-01   2.768 0.005647 **
Year2011     3.105e+00  7.693e-01   4.036 5.43e-05 ***
Year2012     3.187e+00  7.669e-01   4.155 3.25e-05 ***
Year2013     2.848e+00  7.693e-01   3.701 0.000215 ***
Year2014     1.828e+00  7.838e-01   2.333 0.019666 *
Year2015     2.391e+00  7.738e-01   3.090 0.002003 **
ShipCIR      2.864e-01  1.229e+00   0.233 0.815650
ShipTRI2    -3.573e+01  1.061e+07   0.000 0.999997
ShipWAH2    -3.463e+01  1.733e+07   0.000 0.999998
ShipMIC     -1.409e-01  1.180e+00  -0.119 0.904975
ShipWAH3     2.835e-01  1.281e+00   0.221 0.824840
ShipDAN2    -3.863e+01  9.789e+06   0.000 0.999997
ShipSCO3    -8.212e-01  1.198e+00  -0.685 0.493044
ShipEND     -6.632e-01  1.199e+00  -0.553 0.580098
ShipHAV     -1.001e+00  1.227e+00  -0.816 0.414710
ShipJHJ     -2.642e-01  1.195e+00  -0.221 0.825073
ShipDANS    -6.436e-01  4.812e-01  -1.337 0.181070
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 28.654     63 208.88  <2e-16 ***
s(Depth)    3.634      5  72.35  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.362   Deviance explained = 41.4%
-ML = 806.19  Scale est. = 1         n = 3129
```

```
[1] "Age 10"

Family: binomial
Link function: logit

Formula:
A1 > 0.1 ~ Year + Ship + s(lon, lat, k = kvecZ[a], bs = "ts") +
    s(Depth, bs = "ts", k = 6) + offset(log(HaulDur))

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -7.514e+00  1.094e+00  -6.868 6.52e-12 ***
Year1993    -2.545e-01  6.988e-01  -0.364  0.71569
Year1994     8.519e-03  6.731e-01   0.013  0.98990
Year1995     1.214e+00  6.477e-01   1.874  0.06088 .
Year1996     6.387e-01  6.606e-01   0.967  0.33365
Year1997     6.125e-01  6.594e-01   0.929  0.35297
Year1998     2.144e-01  6.282e-01   0.341  0.73284
Year1999    -5.638e-01  6.101e-01  -0.924  0.35542
Year2000     2.768e-01  5.973e-01   0.463  0.64307
Year2001    -2.631e-01  6.015e-01  -0.437  0.66177
Year2002     6.056e-01  5.768e-01   1.050  0.29375
Year2003     1.226e+00  6.259e-01   1.959  0.05009 .
Year2004     1.787e-02  6.663e-01   0.027  0.97860
Year2005     9.253e-01  6.340e-01   1.459  0.14443
Year2006     1.039e+00  6.172e-01   1.684  0.09226 .
Year2007     6.584e-01  6.235e-01   1.056  0.29091
Year2008     1.874e+00  6.172e-01   3.036  0.00240 **
Year2009     7.046e-01  6.587e-01   1.070  0.28477
Year2010     1.531e+00  6.105e-01   2.507  0.01218 *
Year2011     1.409e+00  6.262e-01   2.251  0.02440 *
Year2012     2.183e+00  6.177e-01   3.534  0.00041 ***
Year2013     1.603e+00  6.211e-01   2.580  0.00987 **
Year2014     7.283e-01  6.351e-01   1.147  0.25148
Year2015     7.049e-01  6.341e-01   1.112  0.26632
ShipCIR      6.413e-01  1.170e+00   0.548  0.58347
ShipTRI2    -3.223e+01  1.061e+07   0.000  1.00000
ShipWAH2    -3.126e+01  1.733e+07   0.000  1.00000
ShipMIC      2.189e-01  1.128e+00   0.194  0.84612
ShipWAH3     5.106e-01  1.232e+00   0.415  0.67847
ShipDAN2    -3.432e+01  9.789e+06   0.000  1.00000
ShipSCO3    -4.351e-01  1.144e+00  -0.380  0.70371
ShipEND     -2.834e-01  1.146e+00  -0.247  0.80467
ShipHAV     -8.341e-01  1.176e+00  -0.709  0.47818
ShipJHJ     -8.454e-02  1.143e+00  -0.074  0.94104
ShipDANS    -3.852e-01  4.965e-01  -0.776  0.43782
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:
              edf Ref.df Chi.sq p-value
s(lon,lat) 29.504     63 218.65  <2e-16 ***
s(Depth)    3.931      5  69.63  <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) =  0.364   Deviance explained = 41.7%
-ML = 832.46  Scale est. = 1
```

Preparation of Catch Data for North Sea Saithe (3a46)

Jennifer Devine

Catch data for 2002-2014

Intercatch was used for estimation of both landings and discards numbers and age compositions. Data co-ordinators from each nation input data for 2002-2014 into Intercatch, disaggregated by quarter, area, and métier (fleet). Allocations of discard ratios and age compositions for unsampled strata were then performed to obtain the data required for the assessment. Although Intercatch was previously used to estimate 2011-2014 catch data, these years were re-calculated in Intercatch following the 2015 data call; catch data for the years 2002-2010 have now been processed through Intercatch for the first time.

Raising discard data

If discards were not included for a particular métier-area-quarter-country-year combination, they were assumed to be unknown (non-zero) and raised. The instructions in the data call specified that if discards were 0, this had to be included in the upload to InterCatch (as a 0).

- Discards on a country-area-quarter-métier basis were automatically matched by InterCatch to the corresponding landings
- Quarterly discards were manually matched to annual landings on a country-area-métier basis (e.g., UKS discards for OTB_DEF_>=120_0_0_all in VIa for quarters 1-4 were matched to annually reported landings by UKS for OTB_DEF_>=120_0_0_all in VIa).

The matched discards-landings were used to estimate a landing-discard ratio, which was then used for further raising (creating discard amounts) of the unmatched discards. The weighting factor for raising the discards was '*Landings CATON'* (landings catch).

Unmatched discards were raised for the benchmark using the following 'rules':

- OTB_DEF métiers for Germany and France (saithe target trawler métiers) were raised using matched landings-discards from the OTB_DEF German or French métiers. This was because German and French discard practices were stated to be similar (French and German delegates, WGNSSK, pers. comm.).
- In Division IIIa, discards were raised by quarter for all métiers, all countries using matched landings-discards in IIIa by quarter from all métiers, all countries.
- In IV and VI: These two areas were often grouped because matches of landings-discards in VI were few. OTB_DEF (bottom trawlers, demersal fish) métiers were dealt with differently than all other métiers because the matched landings-discards ratios tended to be higher for this métier.
    - Non-OTB_DEF métiers in VI (or VI) by quarter (all métiers, all countries) were raised using matched landings-discards ratios for non-OTB_DEF métiers by quarter (all non-OTB_DEF métiers, all countries). Where possible (i.e., enough data existed), data were matched by quarter and area; this was possible only for more recent years.
    - A similar procedure was then used for OTB_DEF métiers; discards were raised by area and quarter, all countries combined. When data were sparse, raising was done by area, all countries (annual) or by all countries (annual, all areas).

- In Area IIIaN, if the only available matched landings-discards had high ratios or were from only OTB_DEF/OTB_CRU métiers, than matched landings-discards from Area IV were used (same quarter, all countries, all métiers).
- Some countries report annual, not seasonal landings. Annual discards in an area were raised using matched landings-discards from the same area, all quarters, using the 'rules' stated above.
- FDF métiers were not treated separately (note, FDF métiers were not available prior to 2009).
- High ratios for matched landings-discards were not included in the raising (e.g., ratios > 0.3, but also ratios >>1). These higher ratios were not assumed to be typical for all métiers and countries, but there is no knowledge to support that assumption. Few countries monitor their discards, especially as one goes further back in time. Higher ratios generally came from countries that had no or limited quota for a métier (e.g., Sweden, OTB_CRU_70-89_2_35_all métier; UK-Scotland all métiers).
- If no matched landings-discards existed for an area in a particular quarter, data were matched on a neighboring area for a particular quarter (e.g., no matched landings-discards in IIIaN Q1, used matches from IV Q1).

A sensitivity test for the raising of discards should have been completed. InterCatch currently does not support saving multiple discard raising schemes (unlike with sample allocations), which makes it a time laborious process. There was not time to complete this for the benchmark.

Tabulating the sampled data for discards and landings was problematic. Many countries did not report the number of age and length samples, nor did they report the amount of sampled catch. Knowing how representative the samples for discards and landings were for a strata was difficult to determine. Because allocations were weighted by *mean weight weighted by numbers at age*, missing numbers have an effect on the weighting. Denmark sampled data for discards in Area IV, Q1, for the métiers OTB_CRU_70-99_0_0_all & OTB_DEF_>=120_0_0_all included fish up to age 32; these samples were deleted as saithe this old are highly unlikely (discard amounts were retained).

Age allocations

To allocate age compositions, age information from landings and discards were handled separately; samples from landings were used only for landings and vice versa. As with raising the discards, OTB_DEF métiers and non-OTB_DEF métiers were handled separately; only OTB_DEF sampled data was used with OTB_DEF unsampled and vice versa. Age samples were sparse, especially further back in time, for the directed saithe bottom trawl fleets from France, Germany, and Norway. This meant that age allocations often had to be borrowed from other métiers (typically from other nation's OTB_DEF métiers).

Allocations were completed using 3 scenarios.

1. **By quarter and area.** Unsampled data were allocated sampled data on a quarter and area grouping, using data from all métiers. Often age samples were missing from Area VI, so data were borrowed from Area IV (never from IIIa); this is because younger saithe are typically found in the Skagerrak. If samples were missing from Division IIIa, samples were borrowed from Area IV, but only if there were no samples in the preceding quarter (e.g., if IIIa quarter 2 had no samples from any métier, samples were first allocated from IIIa quarter 1. If no samples existed, samples were allocated from IV quarter 2). Exceptions to the allocations scheme included:

   a. French and German saithe bottom trawler fleet: if samples existed for a quarter-area combination, these were used to allocate samples to unsampled landings for the French or German saithe bottom trawler fleet for that area-quarter. If no sampled data existed for one country, samples were first borrowed from another quarter (e.g., Q1 allocated to Q2), then from a neighbouring area (Areas IV and VI only), then from the other country's samples (e.g., Germany was allocated samples from France), and finally (if no other option remained) from other OTB_DEF fleets in the same quarter and area.
   b. The Norwegian saithe bottom trawler fleet typically caught/sampled older fish than the French or German fleets (see Appendix 3), as well as from a larger area (less spatially directed fisheries), therefore they were allocated under the general 'by quarter and area' OTB_DEF allocation.
   c. Annual landings in a given area were allocated samples from all quarters for that area.
2. **By quarter.** Unsampled data from all areas (IIIa, IV, VI) within a particular quarter were allocated sampled data from all areas within that quarter.
3. **Unstratified.** All sampled data were used to allocate to all unsampled data.

For discards, if too few data existed in general (typically further back in time): all sampled data from all areas, all countries, all métiers were allocated to all unsampled data.

The weighting factor used with all scenarios was *Mean Weight weighted by numbers at age*.

Output from InterCatch

Table 1 provides a comparison of the overall tonnage used in the 2015 assessment and that being estimated through the Intercatch allocation scenarios (Quarter & Area, Quarter, Unstratified). The discrepancies are relatively small for landings. Discards have not been estimated previously prior to the 2012 fishing year (Table 2). The discrepancy in 2012 discards is because Norwegian discards were not raised originally, but were at the benchmark. Table 3 provides a similar comparison by age for landings and Table 4 weights-at-age for landings. Internal consistencies for landings between subsequent age groups were worse in the revised landings numbers-at-age data when compared to pre-revision (Figure 1).

Table 1: Comparison of overall tonnage estimates of landings. Darker shaded colours highlight greater differences.

		Landings			Difference		
Year	2015 assessment	Quarter & Area	Quarter	All	Quarter & Area	Quarter	Unstratified
2002	115395	121794	121700	121742	6	5	5
2003	105569	110618	110632	111027	5	5	5
2004	104237	107011	106992	107078	3	3	3
2005	124532	117653	117685	118179	-6	-5	-5
2006	125681	120744	120764	120960	-4	-4	-4
2007	101202	95225	95032	95901	-6	-6	-5
2008	119305	121281	121317	121360	2	2	2
2009	115747	112459	112341	112726	-3	-3	-3
2010	101940	102103	101961	102110	0	0	0
2011	96217	97188	97197	97213	1	1	1
2012	77447	77595	77604	77605	0	0	0
2013	79684	80245	80240	80276	1	1	1
2014	75176	75157	75153	75184	0	0	0

Table 2: Comparison of overall tonnage estimates of discards. Discards were not estimated for saithe prior to 2012. The amount of reported and raised discards are given separately. Darker shaded colours highlight greater differences.

Year	2015 assessment	New estimate	Reported	Raised	% Difference
2002		24812	21440	3372	100
2003		26377	11044	15333	100
2004		9656	7850	1806	100
2005		8571	8072	499	100
2006		15950	8340	7610	100
2007		12078	11353	725	100
2008		9436	7891	1545	100
2009		14216	4170	10046	100
2010		10937	3009	7928	100
2011		12729	4285	8444	100
2012	7585	9415	7471	1944	24
2013	8083	8173	7311	862	1
2014	6289	6362	6068	294	1

Table 3: Difference by age for landings numbers, using the by quarter and area allocation. This was not done for discards because discard data was reported for only the last 3 years prior to the 2015 data call.

Landings Year/Age	3	4	5	6	7	8	9	10+
2002	-54	-25	38	50	-8	-25	-36	-9
2003	12	22	-21	9	-3	1	1	97
2004	51	34	-12	13	-47	-47	16	32
2005	-34	24	13	13	-31	-43	-47	150
2006	24	-5	-19	21	-26	-36	-35	-11
2007	-13	27	-11	-4	-1	-31	-32	-5
2008	-29	-6	35	-17	9	-4	47	80
2009	-29	10	-17	17	-21	-17	-32	-8
2010	7	7	17	4	-19	18	-22	-32
2011	6	10	52	-17	16	-21	-40	-13
2012	6	11	-13	4	-2	26	19	-10
2013	0	0	0	1	2	1	1	1
2014	22	-4	-1	3	-6	2	4	0

Table 4: As in Table 4, but showing weights-at-age differences for landings. This was not done for discards because discard data was reported for only the last 3 years prior to the 2015 data call.

Landings Year/Age	3	4	5	6	7	8	9	10+
2002	15	20	12	1	29	10	12	51
2003	16	3	8	9	5	-5	0	18
2004	5	7	11	20	16	19	12	27
2005	38	8	2	7	7	1	-5	17
2006	6	7	12	10	17	19	14	7
2007	12	4	14	13	16	8	10	0
2008	6	9	9	4	-3	-1	-5	6
2009	43	12	12	-1	13	6	7	11
2010	5	3	5	1	3	0	1	5
2011	-5	-8	-3	1	2	-3	-2	3
2012	1	-1	0	-2	1	0	-3	9
2013	1	0	1	0	1	0	0	0
2014	2	-1	0	3	2	4	4	2

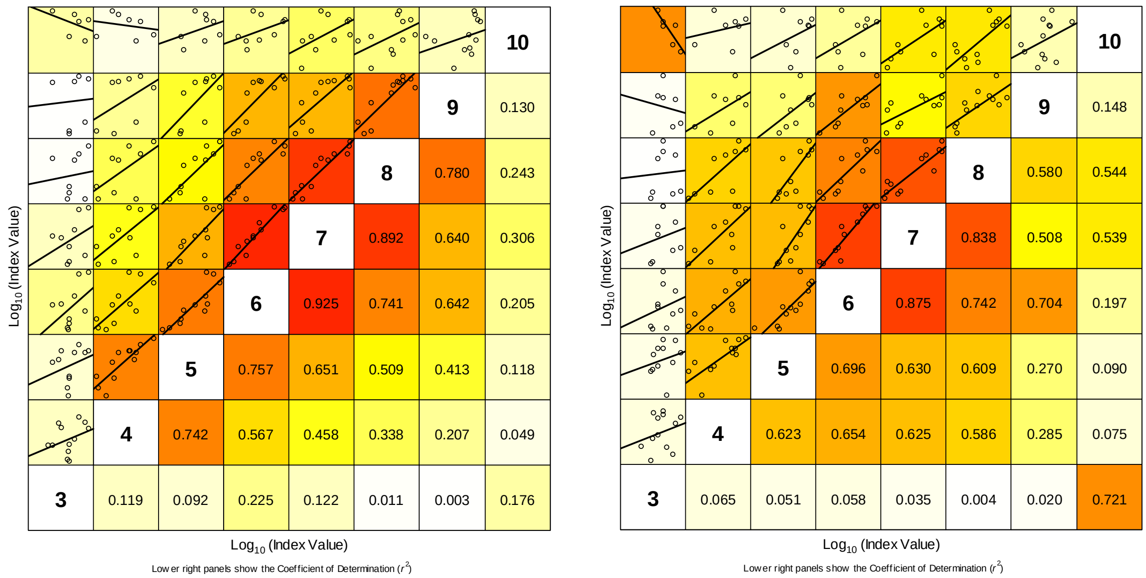


Figure 1. Internal consistencies in (right) old and (left) new landings data.

Discard weight-at-age from InterCatch are in Table 5, numbers-at-age are in Table 6. Poor sampling of the discards was clearly evident in the highly variable weights at age 3. The full series of estimated and reported discard weights- and numbers-at-age are in Figure 2. The percentage of discards by nation and year is in Table 7. Details on sampling coverage of the landings and discards are in Tables 8 and 9.

Table 5. Discard weight-at-age, 2002-2014, as estimated by InterCatch. Shaded cells in 2002 and 2011 were replaced with the estimated weights, using the landings to discards ratios.

Year/Age	3	4	5	6	7	8	9	10+
1967-2001								
2002	0.6163	0.8963	1.5803	2.4827	3.4694	6.0584	6.9347	6.9269
2003	0.4686	0.5714	0.6409					
2004	0.6171	0.6755						
2005	0.1742							
2006	0.8081	0.7243	0.8587					
2007	0.6600	1.0618	0.9486	1.3654				
2008	0.6327	0.6802	0.9672	1.1609	1.4949	1.8200		2.7969
2009	1.0316	1.2546	1.9469	2.4034	2.8385	3.3880	3.9345	3.9115
2010	1.0460	1.3743	1.9868	2.5605	2.4908	3.3510		6.8952
2011	0.7561	0.9711	2.0543	2.4450	3.1701	4.0716	4.3690	6.6175
2012	0.8082	0.9967	1.1005	1.8311	2.6750	3.4110	4.8043	5.3134
2013	0.8347	1.0028	1.1799	1.2996	2.2977			5.8612
2014	0.9773	1.0722	1.2739	1.4882	2.0784	3.2230		7.5689

Table 6. Discard numbers-at-age, 2002-2014, as estimated by InterCatch. Shaded cell in 2003 was not used to estimate the landings to discard ratio, and was replaced by the value estimated from the ratio.

Year/Age	3	4	5	6	7	8	9	10+
1967-2001								
2002	9719	6577	2823	489	74	373	140	110
2003	35337	16425	542					
2004	4710	3704						
2005	3659							
2006	9501	9814	733					
2007	9179	3067	1715	94				
2008	786	8671	1817	841	125	10		
2009	2690	3989	1365	104	323	55	50	39
2010	2161	951	650	286	2	27		93
2011	7692	4289	375	129	20	73	2	23
2012	7413	1361	1397	59	7		4	
2013	2383	5046	356	235	4			
2014	964	2229	1836	222	78	4		

Table 7. Discard percentage of total catch (landings + discards) by country and year.

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Belgium	5	24	1	0	1	5	1	15	13	1	15	10	2
Denmark	51	14	10	6	9	10	8	1	2	5	3	4	1
Faroe Islands	0	10	3	0	3	4	2	8	7	4	1	0	2
France	0	9	0	0	0	0	0	0	2	0	0	1	1
Germany	0	9	1	0	0	0	0	0	0	0	0	1	0
Greenland	4	15	3	1	3	1	-	-	-	1	-	-	-
Ireland	1	36	18	66	2	23	2	0	2	9	1	1	1
Netherlands	5	16	2	0	1	5	2	14	12	9	10	24	3
Norway	5	15	3	1	3	1	2	14	12	12	5	2	1
Poland	0	10	-	1	1	0	1	13	13	13	-	-	-
Russia	0	10	9	0	3	4	-	-	7	-	-	-	2
Spain	0	10	9	0	3	4	-	-	7	4	1	0	2
Sweden	9	8	5	1	17	3	10	18	27	11	6	1	7
UK (England)	3	15	3	2	3	1	2	5	8	15	6	33	0
UK(Northern Ireland)	3	17	3	0	2	3	3	16	10	-	-	0	1
UK(Scotland)	63	58	46	43	56	55	35	22	15	29	40	34	35
Lithuania	-	-	-	0	-	-	-	-	-	-	-	-	-
Portugal	-	-	-	-	4	5	-	-	-	-	-	-	-

Table 8. Number of age measurement and samples per year (total for all fleets combined) for the landings. This hides countries that use one key to raise all fleets. – denotes no samples, 0 reflects what the country filled in for the measurements/samples.

	Number age measurements					Number age samples				
Year	Denmark	Germany	UK(Scotland)	France	Norway	Denmark	Germany	UK(Scotland)	France	Norway
2002	36189	549	0	-	-	933	0	0	-	-
2003	61285	-	0	0	754	1070	-	0	0	87
2004	50754	1881	0	0	366	982	0	0	0	144
2005	33751	2572	0	0	655	999	0	0	0	63
2006	24761	2978	0	0	587	770	0	0	0	119
2007	20329	2532	0	0	421	587	0	0	0	114
2008	22517	2748	0	0	5508	651	0	0	0	250
2009	21546	4181	3993	0	754	660	0	127	0	195
2010	21744	3708	3907	0	835	767	0	161	0	281
2011	25134	2605	4199	0	1483	952	0	173	0	379
2012	29194	4916	5970	9688	2691	1070	0	240	96	633
2013	24684	3846	5007	0	2243	950	0	226	0	469
2014	18507	4114	4236	9424	1442	1030	0	199	120	224

Table 9. Number of age measurement and samples per year (total for all fleets combined) for the discards. This hides countries that use one key to raise all fleets. – denotes no samples, 0 reflects what the country filled in for the measurements/samples.

	Number age measurements				Number age samples			
Year	Denmark	Germany	UK(Scotland)	France	Denmark	Germany	UK(Scotland)	France
2002	230	380	-	-	26	0	-	-
2003	15	-	-	-	10	-	-	-
2004	17	-	-	-	25	-	-	-
2005	5	-	-	-	12	-	-	-
2006	146	-	-	-	25	-	-	-
2007	86	-	-	-	42	-	-	-
2008	28	1300	-	-	29	0	-	-
2009	97	1271	1342	-	50	0	64	-
2010	159	349	845	-	75	0	54	-
2011	44	3142	1118	-	62	0	59	-
2012	55	2606	1331	-	63	0	64	-
2013	227	1400	1259	-	67	0	80	-
2014	226	1350	1202	4712	83	0	79	60

Landings data 1967-2001

No adjustments were made.

Discard data prior to 2002

A constant ratio landings/discards by age was applied to obtain discard weights and landings prior to 2002. Discard weights for age 8+ were set to 1. Average landings (2002-2014) to average discards (2002-2014) ratios for discard weight- and number-at-age were:

	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10+
Weight	1.32	1.27	1.16	1.07	1.05	1	1	1
Number	1.72	3.46	10.77	33.56	58.24	26.19	28.10	30.35

For the assessment model, if discard weight-at-age was NA within the period 2002-2014, it was estimated using the above landings to discard ratio. If discard weights for a given age were much higher than the corresponding landed weights (e.g., landed weights were ~60% discard weight; shaded cells in Table 5), they were replaced with an estimate using the landings to discards ratio for that age. Some countries will discard large fish due to lack of fishing rights (e.g., Scotland, Sweden, Denmark), so discard weights-at-age above landing weights-at-age are not necessarily incorrect. Discard weights- and numbers-at age between 1967 and 2014 are given in Figure 2.

Reported and raised discards by each nation between 2002 and 2014 are in Figure 3. Discards by Scotland, a nation that has no saithe quota, have declined, while discarding by England has recently increased. Other nations reporting high discards include Sweden, Netherlands, and Ireland; these are countries with limited saithe quota.

Total catch

Total catch and landings by each nation between 2002 and 2014 are in Figure 4. For most nations, including discards did not result in large increases above reported landings. For those nations that showed large increases in total catch compared to reported landings, most had limited saithe quota (i.e., could not land saithe) or were Norway, for which discards were estimated; Norway does not currently collect information on discards from its fleets.

A comparison of landings, discards, and stock weights (see WD-7) show broadly similar trends in the older age classes (Figure 5). Discards weights for all ages have increased since 2005 and, for ages 3 and 4, the size of discarded fish is larger than in the previous two decades.

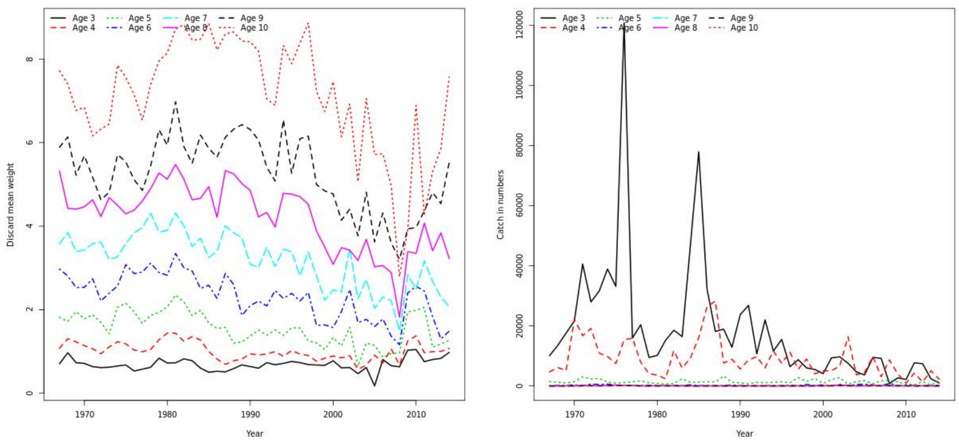


Figure 2. Discard weights- and numbers-at age, 1967–2014.

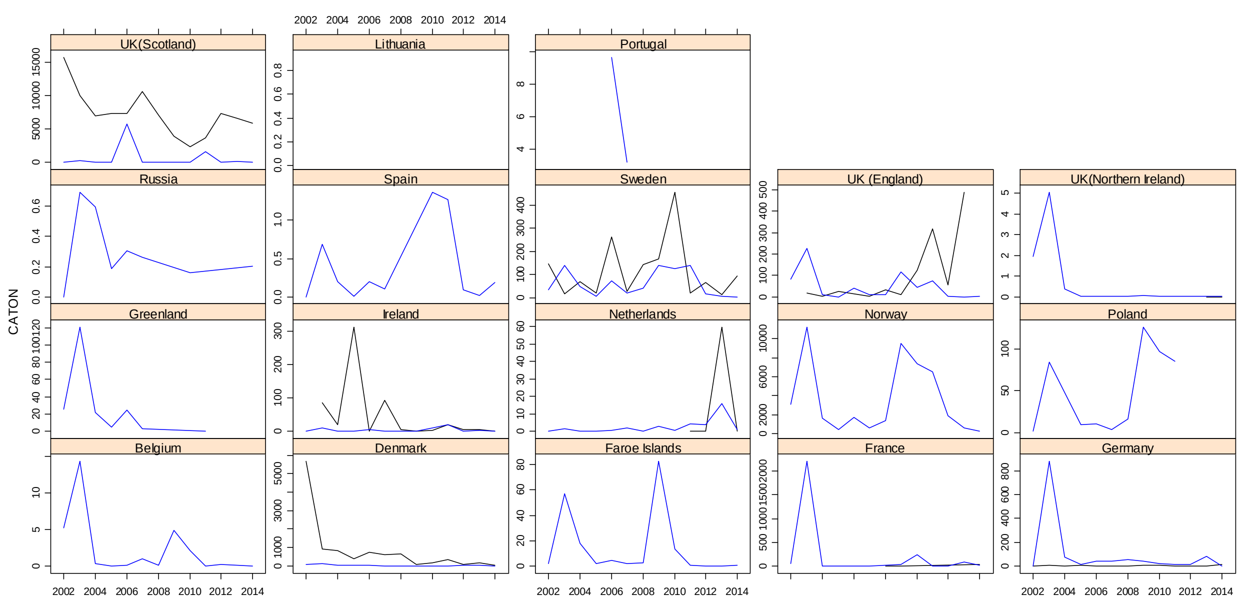


Figure 3. Imported and raised discards by country and year. Black line is the imported discards, blue is the raised discards.

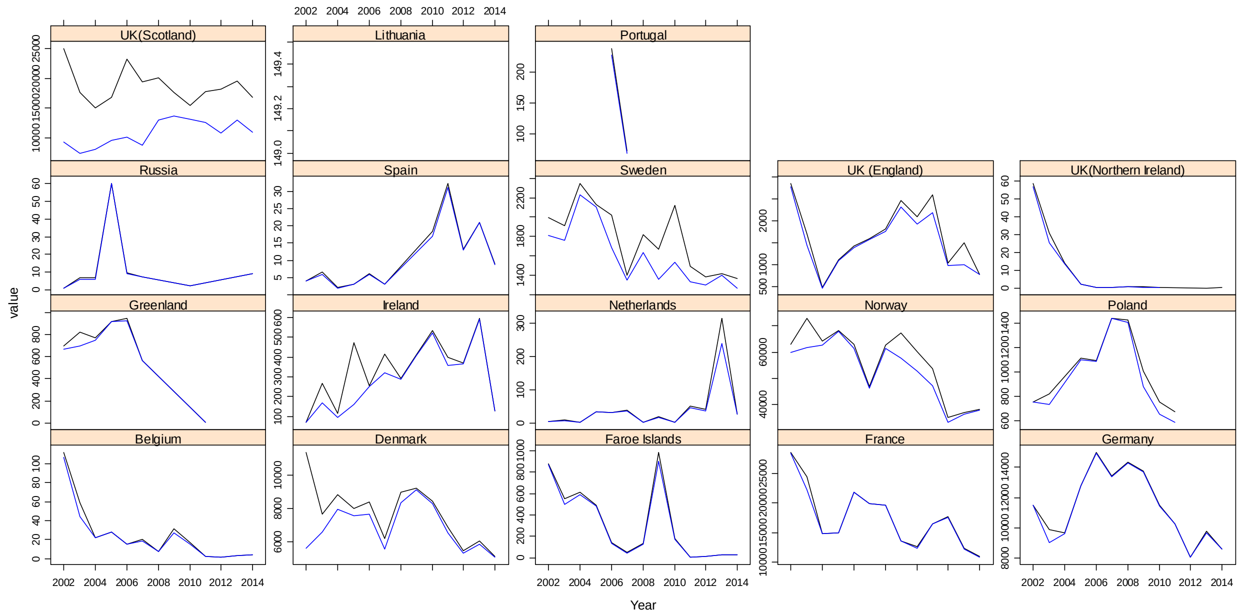


Figure 4. Total catch (black line) and landings (blue line) by country and year.

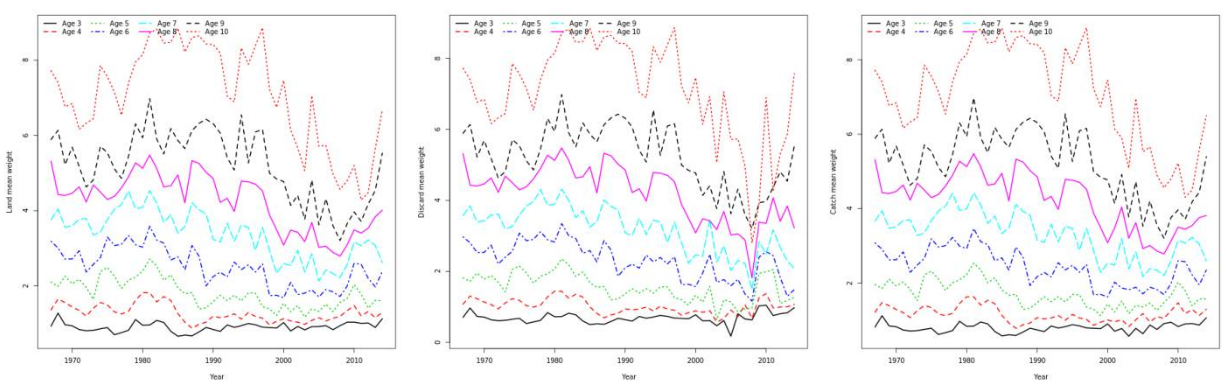


Figure 5. Landings, discards, and catch weights at age.

Post-WGNSSK 2016

A bug was discovered in InterCatch, which mainly affected the raising of discards for years 2003, 2006, 2011, and 2014. Discards were re-raised for these years and 2002 because the amount was oddly high following the protocol used in the benchmark (described above). After this re-raising of the discards, several years still appeared to be atypical (high), therefore all years were re-raised using the following modification:

- No discard ratio >= 0.25 was used in the raising of any fleet. Previously, ratios >= 0.3 were omitted.
- Norwegian trawler fleet discards were raised using German or French (or both) discard information. Previously, they were raised with other OTB_DEF fleets, using discard information from all OTB_DEF fleets for a given area and quarter.

The change in discard amounts are in Table 10. Because there is no information on the discarding practices of Norwegian fleets, the truth is expected to lie somewhere between estimate (3) and estimate (2); these estimates should be treated as upper and lower bounds on discards.

Table 10. Amount of discards (estimated and reported) following 3 procedures: (1) as outlined in WD-5 during the benchmark, (2) after fixing the bug in InterCatch (bolded years), and (3) after the modification noted above. Differences are percentage.

Year	2015 assessment	(1) Benchmark estimate	(2) InterCatch bug correction	(3) Modification to Norway & reduced ratio estimate	Reported	Difference 2015 to (1)	Difference (1) to (2)	Difference (2) to (3)
2002		**24812**	**21620**	**21544**	**21440**	**100**	**-13**	**0**
2003		**26377**	**12898**	**11438**	**11044**	**100**	**-51**	**-11**
2004		9600	9656	8088	7850	100	1	-16
2005		8571	8571	8196	8072	100	0	-4
2006		**15950**	**9498**	**8585**	**8340**	**100**	**-40**	**-10**
2007		12050	12078	12413	11353	100	0	3
2008		9436	9436	8359	7891	100	0	-11
2009		14216	14216	4296	4170	100	0	-70
2010		10937	10937	4484	3009	100	0	-59
2011		**12729**	**4951**	**4362**	**4285**	**100**	**-61**	**-12**
2012	7585	9415	9415	9278	7471	24	0	-1
2013	8083	8173	8173	7777	7311	1	0	-5
2014	**6289**	**6362**	**6356**	**6337**	**6068**	**1**	**0**	**0**
2015		5060	5060	5003	4914		0	-1

The revision to the discards resulted in a revised ratio landings/discards by age for estimating discard weights and landings prior to 2002. Discard weights for age 8+ were set to 1. Average landings (2002-2014) to average discards (2002-2014) ratios for discard weight- and number-at-age were:

	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10+
Weight	1.24	1.27	1.16	1.07	1.05	1	1	1
Number	1.80	5.11	13.61	42.11	101.5	42.52	39.19	90.71

Discard clarification:

Norway does not collect information on discards because of the 'No discards' rule. However, this does not mean Norway does not discard. They are anecdotal reports of high amounts of discarding taking place, particularly in regards to high-grading of the catch during quarters 1 and 2 by the bottom trawl fleet.

Because it was not known, the discards were originally raised following the same procedure as OTB_DEF fleets for non-German/French countries: use all available discards from OTB_DEF fleets in that area and quarter, but remove the higher ratios as these were from nations that did not have quota. The difference between the raising with this practice vs. raising the discards based on only the OTB_DEF German & French discards was small for most years. The years where it was large were years where very little discard information existed (bolded); modifying the discard (scenario 3) resulted in Norway having close to 0 discards raised for the OTB_DEF fleet.

Year	(2) Difference (Reported vs. InterCatch bug correction)	(3) Difference (Reported vs. Modification to Norwegian discards)	Difference (2) to (3)
2002	180	104	76
2003	1854	394	1460
2004	1806	238	1568
2005	499	124	375
2006	1158	245	913
2007	725	1060	-335
2008	1545	468	1077
2009	10046	126	**9920**
2010	7928	1475	**6453**
2011	666	77	589
2012	1944	1807	137
2013	862	466	396
2014	288	269	19
2015	146	89	57

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Appendix 1

Intercatch Details

Data in these appendices are from the benchmark; this was prior to the revisions to raised discards.

Guide to the tables in this Appendix:

This Appendix lists 5 sections of tables (A-D) for each Intercatch year (2002-2014). It provides a detailed summary of the Intercatch input data in terms of importance by landed weight and the proportional coverage for age data and discard ratios

Section A: Importance by landed weight

1. Proportion of landings by area and season (note, for later years, season could also be the year itself, since some data are reported by year and not by season).
2. Proportion of landings by métier and country.
3. Proportion of landings by country.
4. Proportion of landings by métier and area.
5. Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum.

Section B: Age coverage of landings and discards

1. Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.
2. Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.
3. Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high.
4. Coverage (proportion) of landings in each métier-country stratum for age composition.
5. Coverage (proportion) of reported discards in each métier-country stratum for age composition. Note: raised discards not included, only reported discards.
6. Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have more than 1% of the total landings.

Section C: Landings age coverage ranked by landed weights

This section shows the proportion of landings covered for age composition, in total and by métier, for all areas combined and for each area in turn. The métiers are ranked by landed weight, so it is easy to check whether the most important métiers have reasonable coverage for age composition.

Section D: Discard ratio coverage ranked by landed weight

As for Section C, but this time for discard ratio coverage.

2002: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2002: Proportion of landings by area and season.

Area	1	2	3	4	2002
IIIaN	0.46	1.1	0.54	0.65	0
IV	31.03	10.9	12.45	15.62	22.18
VI	0.76	0.52	0.37	0.9	2.52

Table 2. 2002: Proportion of landings by métier and nation.

Fleet	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	0.073	-	-	0.003	-	-	0	0	-	-
GNS_DEF	-	-	-	-	-	-	-	0.002	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	0.002	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.249	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	0	-	-	-	-	0	-	-	-	5.12	-	-	0.002	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	0.001	0	-	-
LLS_FIF_0_0_0_all	-	0.005	-	-	-	-	-	-	-	0.419	-	-	0.002	0	-	-
MIS_MIS_0_0_0_HC	-	0.275	0.003	0.717	23.357	-	-	-	-	0	0.616	0.001	0	0	-	0.04
MIS_MIS_0_0_0_IBC	-	0.307	-	-	-	-	-	-	-	-	-	-	0.007	-	-	-
OTB_CRU_16-31_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_32-69_0_0_all	-	0.239	-	-	-	-	-	-	-	0.155	-	-	0.13	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	0.044	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_70-99_0_0_all	0.065	0.032	-	-	-	0	-	-	-	-	-	-	0	0.018	0	0.217
OTB_CRU_90-119_0_0_all	-	1.372	-	-	-	0.014	-	-	-	-	-	-	0.232	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0.056	-	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	1.779	-	-	-	9.381	0.477	-	0.002	38.357	-	-	1.111	2.248	-	7.362
OTB_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	0	-	-	-	-	-	0.001	-
OTB_SPF_32-69_0_0_all	-	0.074	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.045	-
PTB_DEF_≥120_0_0_all	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	0.097	-	-	-	-	-	-	-	0.05	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	0.124	-	-	-	-	-	-	-	5.079	-	-	-	-	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-
SSC_DEF_All_0_0_All	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
TBB_CRU_16-31_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0.02	0.003	-	-	-	0	-	-	0	0	-	-	-	0.004	-	-
TBB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0.002	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-
TBB_DEF_90-99_0_0_all	-	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 3. 2002: Proportion of landings by nation.

BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
0.1	4.6	0	0.7	23.4	9.4	0.5	0.1	0	49.2	0.6	0	1.5	2.3	0	7.6

Table 4. 2002: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
FPO_CRU_0_0_0_all	0	1	0.004	3	0.072	1
GNS_DEF	-	-	-	-	0.002	1
GNS_DEF_≥220_0_0_all	0	1	0	1	-	-
GNS_DEF_100-119_0_0_all	0.001	1	0.001	2	-	-
GNS_DEF_120-219_0_0_all	0.076	1	0.173	2	-	-
GNS_DEF_all_0_0_all	0.099	2	5.022	4	-	-
GTR_DEF_all_0_0_all	0.001	1	0	1	-	-
LLS_FIF_0_0_0_all	0.029	2	0.387	3	0.01	1
MIS_MIS_0_0_0_HC	0.191	4	22.296	6	2.522	5
MIS_MIS_0_0_0_IBC	0.007	1	0.307	2	-	-
OTB_CRU_16-31_0_0_all	-	-	0	1	-	-
OTB_CRU_32-69_0_0_all	0.272	3	0.252	3	-	-
OTB_CRU_32-69_2_22_all	0	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0.044	1	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.315	6	0.016	3
OTB_CRU_90-119_0_0_all	1.618	3	-	-	-	-
OTB_DEF	-	-	-	-	0.056	1
OTB_DEF_≥120_0_0_all	0.259	3	58.113	8	2.344	4
OTB_DEF_100-119_0_0_all	-	-	0	1	0.001	1
OTB_SPF_32-69_0_0_all	0.035	1	0.039	2	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	0.045	1
PTB_DEF_≥120_0_0_all	-	-	0.001	1	-	-
SDN_DEF_≥120_0_0_all	0.071	2	0.077	2	-	-
SSC_DEF_≥120_0_0_all	0.043	2	5.16	2	-	-
SSC_DEF_100-119_0_0_all	-	-	0.001	1	-	-
SSC_DEF_All_0_0_All	-	-	0	1	0	1
TBB_CRU_16-31_0_0_all	-	-	0	1	-	-
TBB_DEF_≥120_0_0_all	0.001	2	0.028	6	-	-
TBB_DEF_100-119_0_0_all	-	-	0	1	-	-
TBB_DEF_70-99_0_0_all	-	-	0.002	3	-	-
TBB_DEF_90-99_0_0_all	0.005	1	-	-	-	-

Table 5. 2002: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	8	60.717	61
MIS_MIS_0_0_0_HC	10	25.009	86
SSC_DEF_≥120_0_0_all	2	5.203	91
GNS_DEF_all_0_0_all	5	5.122	96
OTB_CRU_90-119_0_0_all	3	1.618	98
OTB_CRU_32-69_0_0_all	3	0.524	98
LLS_FIF_0_0_0_all	4	0.426	99
OTB_CRU_70-99_0_0_all	7	0.331	99
MIS_MIS_0_0_0_IBC	2	0.314	99
GNS_DEF_120-219_0_0_all	2	0.249	100
SDN_DEF_≥120_0_0_all	2	0.147	100
FPO_CRU_0_0_0_all	4	0.076	100
OTB_SPF_32-69_0_0_all	2	0.074	100
OTB_DEF	1	0.056	100
OTM_DEF_100-119_0_0_all	1	0.045	100
OTB_CRU_70-89_2_35_all	1	0.044	100
TBB_DEF_≥120_0_0_all	6	0.029	100
TBB_DEF_90-99_0_0_all	1	0.005	100
GNS_DEF	1	0.002	100
GNS_DEF_100-119_0_0_all	2	0.002	100
TBB_DEF_70-99_0_0_all	3	0.002	100
GTR_DEF_all_0_0_all	2	0.001	100
OTB_DEF_100-119_0_0_all	2	0.001	100
PTB_DEF_≥120_0_0_all	1	0.001	100
SSC_DEF_100-119_0_0_all	1	0.001	100
GNS_DEF_≥220_0_0_all	1	0	100
OTB_CRU_16-31_0_0_all	1	0	100
OTB_CRU_32-69_2_22_all	1	0	100
SSC_DEF_All_0_0_All	1	0	100
TBB_CRU_16-31_0_0_all	1	0	100
TBB_DEF_100-119_0_0_all	1	0	100

2002: Appendix B: Age coverage of landings and discards

Table 1. 2002: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	14.94
Discards	25.98

Table 2. 2002: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	91.58	22.78	0
Landings	63.2	13.59	13.19

Table 3. 2002: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2002
Discards	IIIaN	67.99	42.7	-	97.53	-
Discards	IV	98.24	99.86	77.63	97.96	-
Discards	VI	-	-	-	-	-
Landings	IIIaN	73.55	74.44	-	89.48	-
Landings	IV	6.52	35.97	34.49	14.64	-
Landings	VI	50.24	5.52	69.27	0.19	-

Table 4. 2002: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	0	-	-	0	-	-	0	0	-	-
GNS_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	99.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	99.52	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	87.48	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	0	-	-	-	-	0	-	-	-	0	-	-	0	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-
LLS_FIF_0_0_0_all	-	100	-	-	-	-	-	-	-	0	-	-	0	0	-	-
MIS_MIS_0_0_0_HC	-	70.28	0	0	0	-	-	-	-	0	0	0	0	0	-	0
MIS_MIS_0_0_0_IBC	-	0	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_16-31_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_32-69_0_0_all	-	94.57	-	-	-	-	-	-	-	0	-	-	0	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	88.21	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_70-99_0_0_all	0	100	-	-	-	0	-	-	-	-	-	-	0	0	0	50.08
OTB_CRU_90-119_0_0_all	-	88.07	-	-	-	0	-	-	-	-	-	-	0	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	99.15	-	-	-	47.29	0	-	0	0	-	-	0	0	-	87.5
OTB_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	0	-	-	-	-	-	0	-
OTB_SPF_32-69_0_0_all	-	66.61	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
PTB_DEF_≥120_0_0_all	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	92.49	-	-	-	-	-	-	-	0	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	91.96	-	-	-	-	-	-	-	0	-	-	-	-	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
SSC_DEF_All_0_0_All	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
TBB_CRU_16-31_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0	96.81	-	-	-	0	-	-	0	0	-	-	-	0	-	-
TBB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-
TBB_DEF_90-99_0_0_all	-	88.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5. 2002: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	5.92	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_16-31_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_70-89_2_35_all	–	96.56	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_70-99_0_0_all	–	62.98	–	–	–	–	–	–	–	–	–	–	–	–	–	0
OTB_CRU_90-119_0_0_all	–	100	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	99.79	–	–	–	7.84	–	–	–	–	–	–	–	–	–	0
OTB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTM_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
PTB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	74.53	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_All_0_0_All	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_CRU_16-31_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_70-99_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_90-99_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 6. 2002: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	UKE	UKS
GNS_DEF_all_0_0_all	-	-	-	0	-	-
MIS_MIS_0_0_0_HC	-	0	-	-	-	-
OTB_CRU_90-119_0_0_all	88.1	-	-	-	-	-
OTB_DEF_≥120_0_0_all	99.2	-	47.3	0	0	87.5
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-

2002: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2002: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	8	60.717	20.82	3
MIS_MIS_0_0_0_HC	10	25.009	0.77	1
SSC_DEF_≥120_0_0_all	2	5.203	2.2	1
GNS_DEF_all_0_0_all	5	5.122	-	-
OTB_CRU_90-119_0_0_all	3	1.618	74.7	1
OTB_CRU_32-69_0_0_all	3	0.524	43.11	1
LLS_FIF_0_0_0_all	4	0.426	1.07	1
OTB_CRU_70-99_0_0_all	7	0.331	42.36	2
MIS_MIS_0_0_0_IBC	2	0.314	-	-
GNS_DEF_120-219_0_0_all	2	0.249	87.48	1
SDN_DEF_≥120_0_0_all	2	0.147	61.2	1
FPO_CRU_0_0_0_all	4	0.076	-	-
OTB_SPF_32-69_0_0_all	2	0.074	65.88	1
OTB_DEF	1	0.056	-	-
OTM_DEF_100-119_0_0_all	1	0.045	-	-
OTB_CRU_70-89_2_35_all	1	0.044	88.21	1
TBB_DEF_≥120_0_0_all	6	0.029	11.73	1
TBB_DEF_90-99_0_0_all	1	0.005	88.56	1
GNS_DEF	1	0.002	-	-
GNS_DEF_100-119_0_0_all	2	0.002	99.26	1
TBB_DEF_70-99_0_0_all	3	0.002	-	-
GTR_DEF_all_0_0_all	2	0.001	-	-
OTB_DEF_100-119_0_0_all	2	0.001	-	-
PTB_DEF_≥120_0_0_all	1	0.001	-	-
SSC_DEF_100-119_0_0_all	1	0.001	-	-
GNS_DEF_≥220_0_0_all	1	0	99.46	1
OTB_CRU_16-31_0_0_all	1	0	-	-
OTB_CRU_32-69_2_22_all	1	0	-	-
SSC_DEF_All_0_0_All	1	0	-	-
TBB_CRU_16-31_0_0_all	1	0	-	-
TBB_DEF_100-119_0_0_all	1	0	-	-

Table 2. 2002 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	3	58.799	74.7	1
OTB_CRU_32-69_0_0_all	IIIaN	3	9.88	43.74	1
OTB_DEF_≥120_0_0_all	IIIaN	3	9.423	41.92	1
MIS_MIS_0_0_0_HC	IIIaN	4	6.931	57.1	1
GNS_DEF_all_0_0_all	IIIaN	2	3.6	-	-
GNS_DEF_120-219_0_0_all	IIIaN	1	2.772	59.16	1
SDN_DEF_≥120_0_0_all	IIIaN	2	2.562	86.93	1
OTB_CRU_70-89_2_35_all	IIIaN	1	1.611	88.21	1
SSC_DEF_≥120_0_0_all	IIIaN	2	1.556	74	1
OTB_SPF_32-69_0_0_all	IIIaN	1	1.287	30.65	1
LLS_FIF_0_0_0_all	IIIaN	2	1.06	-	-
MIS_MIS_0_0_0_IBC	IIIaN	1	0.239	-	-
TBB_DEF_90-99_0_0_all	IIIaN	1	0.192	88.56	1
GTR_DEF_all_0_0_all	IIIaN	1	0.031	-	-
TBB_DEF_≥120_0_0_all	IIIaN	2	0.03	85.33	1
GNS_DEF_100-119_0_0_all	IIIaN	1	0.025	98.67	1
FPO_CRU_0_0_0_all	IIIaN	1	0	-	-
GNS_DEF_≥220_0_0_all	IIIaN	1	0	-	-
OTB_CRU_32-69_2_22_all	IIIaN	1	0	-	-

Table 3. 2002 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	8	63.043	20.42	3
MIS_MIS_0_0_0_HC	IV	6	24.188	0.38	1
SSC_DEF_≥120_0_0_all	IV	2	5.598	1.6	1
GNS_DEF_all_0_0_all	IV	4	5.448	-	-
LLS_FIF_0_0_0_all	IV	3	0.42	1.18	1
OTB_CRU_70-99_0_0_all	IV	6	0.342	44	2
MIS_MIS_0_0_0_IBC	IV	2	0.333	-	-
OTB_CRU_32-69_0_0_all	IV	3	0.274	42.43	1
GNS_DEF_120-219_0_0_all	IV	2	0.187	100	1
SDN_DEF_≥120_0_0_all	IV	2	0.083	37.59	1
OTB_SPF_32-69_0_0_all	IV	2	0.042	97.9	1
TBB_DEF_≥120_0_0_all	IV	6	0.03	9.56	1
FPO_CRU_0_0_0_all	IV	3	0.005	-	-
TBB_DEF_70-99_0_0_all	IV	3	0.002	-	-
GNS_DEF_100-119_0_0_all	IV	2	0.001	99.59	1
PTB_DEF_≥120_0_0_all	IV	1	0.001	-	-
SSC_DEF_100-119_0_0_all	IV	1	0.001	-	-
GNS_DEF_≥220_0_0_all	IV	1	0	100	1
GTR_DEF_all_0_0_all	IV	1	0	-	-
OTB_CRU_16-31_0_0_all	IV	1	0	-	-
OTB_DEF_100-119_0_0_all	IV	1	0	-	-
SSC_DEF_All_0_0_All	IV	1	0	-	-
TBB_CRU_16-31_0_0_all	IV	1	0	-	-
TBB_DEF_100-119_0_0_all	IV	1	0	-	-

Table 4. 2002 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
MIS_MIS_0_0_0_HC	VI	5	49.763	-	-
OTB_DEF_≥120_0_0_all	VI	4	46.258	28.45	1
FPO_CRU_0_0_0_all	VI	1	1.413	-	-
OTB_DEF	VI	1	1.096	-	-
OTM_DEF_100-119_0_0_all	VI	1	0.893	-	-
OTB_CRU_70-99_0_0_all	VI	3	0.322	10.89	1
LLS_FIF_0_0_0_all	VI	1	0.195	-	-
GNS_DEF	VI	1	0.041	-	-
OTB_DEF_100-119_0_0_all	VI	1	0.019	-	-
SSC_DEF_All_0_0_All	VI	1	0	-	-

2002: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2002: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	3	90.187	20.2	2
OTB_CRU_90-119_0_0_all	2	8.274	91.76	1
OTB_CRU_70-99_0_0_all	2	1.035	3.06	1
MIS_MIS_0_0_0_HC	1	0.38	5.92	1
OTB_CRU_70-89_2_35_all	1	0.099	96.56	1
SDN_DEF_≥120_0_0_all	1	0.022	100	1
SSC_DEF_≥120_0_0_all	1	0.003	74.53	1
OTB_CRU_32-69_0_0_all	1	0.001	-	-
TBB_DEF_≥120_0_0_all	1	0	-	-
TBB_DEF_70-99_0_0_all	1	0	-	-
TBB_DEF_90-99_0_0_all	1	0	-	-

Table 2. 2002 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	2	8.274	91.76	1
OTB_DEF_≥120_0_0_all	IIIaN	1	1.048	96.41	1
OTB_CRU_70-89_2_35_all	IIIaN	1	0.099	96.56	1
MIS_MIS_0_0_0_HC	IIIaN	1	0.078	-	-
SDN_DEF_≥120_0_0_all	IIIaN	1	0.014	100	1
SSC_DEF_≥120_0_0_all	IIIaN	1	0.001	-	-
TBB_DEF_≥120_0_0_all	IIIaN	1	0	-	-
TBB_DEF_90-99_0_0_all	IIIaN	1	0	-	-

Table 3. 2002 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	3	74.512	23.09	2
OTB_CRU_70-99_0_0_all	IV	2	0.996	3.18	1
MIS_MIS_0_0_0_HC	IV	1	0.302	7.44	1
SDN_DEF_≥120_0_0_all	IV	1	0.008	100	1
SSC_DEF_≥120_0_0_all	IV	1	0.002	100	1
OTB_CRU_32-69_0_0_all	IV	1	0.001	-	-
TBB_DEF_≥120_0_0_all	IV	1	0	-	-
TBB_DEF_70-99_0_0_all	IV	1	0	-	-

Table 4. 2002 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	1	14.627	-	-
OTB_CRU_70-99_0_0_all	VI	1	0.039	-	-

2003: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2003: Proportion of landings by area and season.

Area	1	2	3	4	2003
IIIaN	0.49	1.17	0.85	1.27	0
IV	45.55	14.84	12.83	16.61	1.09
VI	2.58	0.74	0.7	1.27	0.01

Table 2. 2003: Proportion of landings by métier and nation.

Fleet	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	-	0.013	-	-	0	0	-	-
GNS_DEF	-	-	-	-	-	-	-	0.006	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	0.001	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.134	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0.001	-	-	-	6.371	-	-	0.006	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	0.003	-	-	-
LLS_FIF_0_0_0_all	-	0.003	-	-	-	-	-	-	-	0.516	-	-	0	-	-	-
MIS_MIS	-	-	-	-	-	-	-	0.011	-	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	0.245	0.005	0.441	-	-	-	-	-	0	0.653	0.005	0	0	-	0.05
MIS_MIS_0_0_0_IBC	-	0.063	-	-	-	-	-	-	-	-	-	-	0.005	-	-	-
OTB_CRU_16-31_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_32-69_0_0_all	-	0.338	-	-	-	0.006	-	-	-	0.257	-	-	0.168	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	-	0.002	-	-	-
OTB_CRU_70-89_2_35_all	-	0.052	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_70-99_0_0_all	0.016	0.034	-	-	-	0	-	-	-	-	-	-	-	0.011	0	0.553
OTB_CRU_90-119_0_0_all	-	2.031	-	-	-	0.005	-	-	-	-	-	-	0.42	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0.134	-	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	2.677	-	-	-	7.973	0.621	-	0.006	44.422	-	-	0.963	1.279	-	5.989
OTB_DEF_100-119_0_0_all	-	-	-	-	19.754	-	-	-	0	-	-	-	-	-	0.001	-
OTB_DEF_70-99_0_0_all	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	0.018	-	-	-	0.032	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.021	-
SDN_DEF_≥120_0_0_all	-	0.092	-	-	-	-	-	-	-	0.043	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	0.176	-	-	-	-	-	-	-	3.336	-	-	-	-	-	-
SSC_DEF_All_0_0_All	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
TBB_CRU_16-31_0_0_all	0	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-
TBB_DEF_≥120_0_0_all	0.021	0.009	-	-	-	0	-	-	0	0.001	-	-	-	0.002	-	-
TBB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	0	-	-	-	-	-	0	-
TBB_DEF_70-99_0_0_all	0.002	-	-	-	-	0	-	-	0	-	-	-	-	0	-	-

Table 3. 2003: Proportion of landings by nation.

BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
0	5.9	0	0.4	19.8	8	0.6	0.2	0	55	0.7	0	1.6	1.3	0	6.6

Table 4. 2003: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
FPO_CRU_0_0_0_all	0	1	0.013	2	-	-
GNS_DEF	-	-	-	-	0.006	1
GNS_DEF_≥220_0_0_all	0	1	0	1	-	-
GNS_DEF_100-119_0_0_all	0.001	1	0	2	-	-
GNS_DEF_120-219_0_0_all	0.061	1	0.073	2	-	-
GNS_DEF_all_0_0_all	0.119	2	6.258	3	-	-
GTR_DEF_all_0_0_all	0.003	1	-	-	-	-
LLS_FIF_0_0_0_all	0.022	2	0.477	2	0.02	1
MIS_MIS	-	-	-	-	0.011	1
MIS_MIS_0_0_0_HC	0.183	4	1.197	5	0.02	4
MIS_MIS_0_0_0_IBC	0.007	2	0.06	2	-	-
OTB_CRU_16-31_0_0_all	-	-	0	1	-	-
OTB_CRU_32-69_0_0_all	0.437	4	0.331	3	-	-
OTB_CRU_32-69_2_22_all	0.002	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0.052	1	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.597	5	0.017	3
OTB_CRU_90-119_0_0_all	2.457	3	-	-	-	-
OTB_DEF	-	-	0	1	0.134	1
OTB_DEF_≥120_0_0_all	0.313	3	62.049	8	1.568	5
OTB_DEF_100-119_0_0_all	-	-	16.259	2	3.497	2
OTB_DEF_70-99_0_0_all	-	-	0	1	-	-
OTB_SPF_32-69_0_0_all	0.009	1	0.041	3	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	0.021	1
SDN_DEF_≥120_0_0_all	0.065	2	0.07	2	-	-
SSC_DEF_≥120_0_0_all	0.041	2	3.472	2	-	-
SSC_DEF_All_0_0_All	-	-	0	1	-	-
TBB_CRU_16-31_0_0_all	-	-	0	3	-	-
TBB_DEF_≥120_0_0_all	0.009	2	0.025	6	-	-
TBB_DEF_100-119_0_0_all	-	-	0	3	-	-
TBB_DEF_70-99_0_0_all	-	-	0.002	4	-	-

Table 5. 2003: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	8	63.929	64
OTB_DEF_100-119_0_0_all	3	19.755	84
GNS_DEF_all_0_0_all	4	6.378	90
SSC_DEF_≥120_0_0_all	2	3.512	94
OTB_CRU_90-119_0_0_all	3	2.457	96
MIS_MIS_0_0_0_HC	9	1.4	97
OTB_CRU_32-69_0_0_all	4	0.768	98
OTB_CRU_70-99_0_0_all	6	0.614	99
LLS_FIF_0_0_0_all	3	0.519	99
SDN_DEF_≥120_0_0_all	2	0.135	99
GNS_DEF_120-219_0_0_all	2	0.134	100
OTB_DEF	1	0.134	100
MIS_MIS_0_0_0_IBC	2	0.068	100
OTB_CRU_70-89_2_35_all	1	0.052	100
OTB_SPF_32-69_0_0_all	3	0.051	100
TBB_DEF_≥120_0_0_all	6	0.034	100
OTM_DEF_100-119_0_0_all	1	0.021	100
FPO_CRU_0_0_0_all	3	0.013	100
MIS_MIS	1	0.011	100
GNS_DEF	1	0.006	100
GTR_DEF_all_0_0_all	1	0.003	100
OTB_CRU_32-69_2_22_all	1	0.002	100
TBB_DEF_70-99_0_0_all	4	0.002	100
GNS_DEF_100-119_0_0_all	2	0.001	100
GNS_DEF_≥220_0_0_all	1	0	100
OTB_CRU_16-31_0_0_all	1	0	100
OTB_DEF_70-99_0_0_all	1	0	100
SSC_DEF_All_0_0_All	1	0	100
TBB_CRU_16-31_0_0_all	3	0	100
TBB_DEF_100-119_0_0_all	3	0	100

2003: Appendix B: Age coverage of landings and discards

Table 1. 2003: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	60.1
Discards	0.84

Table 2. 2003: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	34.45	0	0
Landings	75.06	57.84	88.25

Table 3. 2003: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2003
Discards	IIIaN	87.19	80.47	-	-	-
Discards	IV	-	-	-	-	-
Discards	VI	-	-	-	-	-
Landings	IIIaN	73	73.25	80.24	74.36	-
Landings	IV	77.02	34.56	47.62	37.74	-
Landings	VI	92.32	91.7	83.28	81.47	-

Table 4. 2003: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	-	0	-	-	0	0	-	-
GNS_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	100	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	100	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0	-	-	-	0	-	-	0	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
LLS_FIF_0_0_0_all	-	100	-	-	-	-	-	-	-	0	-	-	0	-	-	-
MIS_MIS	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	100	0	0	-	-	-	-	-	0	0	0	0	0	-	0
MIS_MIS_0_0_0_IBC	-	0	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_16-31_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_32-69_0_0_all	-	100	-	-	-	0	-	-	-	0	-	-	0	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_70-99_0_0_all	0	100	-	-	-	0	-	-	-	-	-	-	-	0	0	2.83
OTB_CRU_90-119_0_0_all	-	100	-	-	-	0	-	-	-	-	-	-	0	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	100	-	-	-	0	0	-	0	64.22	-	-	0	0	-	100
OTB_DEF_100-119_0_0_all	-	-	-	-	100	-	-	-	0	-	-	-	-	-	0	-
OTB_DEF_70-99_0_0_all	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	100	-	-	-	0	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
SDN_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	-	0	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	-	0	-	-	-	-	-	-
SSC_DEF_All_0_0_All	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
TBB_CRU_16-31_0_0_all	0	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-
TBB_DEF_≥120_0_0_all	0	100	-	-	-	0	-	-	0	0	-	-	-	0	-	-
TBB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	0	-	-	-	-	-	0	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	0	-	-	-	-	0	-	-

Table 5. 2003: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB	–	–	–	–	–	–	–	0	–	–	–	–	–	–	–	–
OTB_CRU_16-31_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_70-89_2_35_all	–	48.1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_70-99_0_0_all	–	0	–	–	–	0	–	–	–	–	–	–	–	–	–	0
OTB_CRU_90-119_0_0_all	–	40.64	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	0	–	–	–	0	–	–	–	–	–	–	–	0	–	0
OTB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTM_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	14.53	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_All_0_0_All	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_CRU_16-31_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 6. 2003: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	UKE	UKS
GNS_DEF_all_0_0_all	-	-	-	0	-	-
OTB_CRU_90-119_0_0_all	100	-	-	-	-	-
OTB_DEF_≥120_0_0_all	100	-	0	64.2	0	100
OTB_DEF_100-119_0_0_all	-	100	-	-	-	-
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-

2003: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2003: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	8	63.929	58.18	3
OTB_DEF_100-119_0_0_all	3	19.755	99.99	1
GNS_DEF_all_0_0_all	4	6.378	-	-
SSC_DEF_≥120_0_0_all	2	3.512	5.02	1
OTB_CRU_90-119_0_0_all	3	2.457	82.68	1
MIS_MIS_0_0_0_HC	9	1.4	17.47	1
OTB_CRU_32-69_0_0_all	4	0.768	44	1
OTB_CRU_70-99_0_0_all	6	0.614	8.06	2
LLS_FIF_0_0_0_all	3	0.519	0.57	1
SDN_DEF_≥120_0_0_all	2	0.135	67.9	1
GNS_DEF_120-219_0_0_all	2	0.134	100	1
OTB_DEF	1	0.134	-	-
MIS_MIS_0_0_0_IBC	2	0.068	-	-
OTB_CRU_70-89_2_35_all	1	0.052	100	1
OTB_SPF_32-69_0_0_all	3	0.051	36.48	1
TBB_DEF_≥120_0_0_all	6	0.034	28.06	1
OTM_DEF_100-119_0_0_all	1	0.021	-	-
FPO_CRU_0_0_0_all	3	0.013	-	-
MIS_MIS	1	0.011	-	-
GNS_DEF	1	0.006	-	-
GTR_DEF_all_0_0_all	1	0.003	-	-
OTB_CRU_32-69_2_22_all	1	0.002	-	-
TBB_DEF_70-99_0_0_all	4	0.002	-	-
GNS_DEF_100-119_0_0_all	2	0.001	98.92	1
GNS_DEF_≥220_0_0_all	1	0	100	1
OTB_CRU_16-31_0_0_all	1	0	-	-
OTB_DEF_70-99_0_0_all	1	0	-	-
SSC_DEF_All_0_0_All	1	0	-	-
TBB_CRU_16-31_0_0_all	3	0	-	-
TBB_DEF_100-119_0_0_all	3	0	-	-

Table 2. 2003 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	3	64.986	82.68	1
OTB_CRU_32-69_0_0_all	IIIaN	4	11.563	53.78	1
OTB_DEF_≥120_0_0_all	IIIaN	3	8.282	50.85	1
MIS_MIS_0_0_0_HC	IIIaN	4	4.836	97.33	1
GNS_DEF_all_0_0_all	IIIaN	2	3.155	-	-
SDN_DEF_≥120_0_0_all	IIIaN	2	1.71	95.86	1
GNS_DEF_120-219_0_0_all	IIIaN	1	1.623	100	1
OTB_CRU_70-89_2_35_all	IIIaN	1	1.388	100	1
SSC_DEF_≥120_0_0_all	IIIaN	2	1.072	99.59	1
LLS_FIF_0_0_0_all	IIIaN	2	0.583	-	-
OTB_SPF_32-69_0_0_all	IIIaN	1	0.246	100	1
TBB_DEF_≥120_0_0_all	IIIaN	2	0.229	93.57	1
MIS_MIS_0_0_0_IBC	IIIaN	2	0.192	-	-
GTR_DEF_all_0_0_all	IIIaN	1	0.07	-	-
OTB_CRU_32-69_2_22_all	IIIaN	1	0.047	-	-
GNS_DEF_100-119_0_0_all	IIIaN	1	0.016	100	1
GNS_DEF_≥220_0_0_all	IIIaN	1	0.002	100	1
FPO_CRU_0_0_0_all	IIIaN	1	0	-	-

Table 3. 2003 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	8	68.241	57.82	3
OTB_DEF_100-119_0_0_all	IV	2	17.881	100	1
GNS_DEF_all_0_0_all	IV	3	6.883	-	-
SSC_DEF_≥120_0_0_all	IV	2	3.818	3.92	1
MIS_MIS_0_0_0_HC	IV	5	1.317	5.57	1
OTB_CRU_70-99_0_0_all	IV	5	0.657	5.66	1
LLS_FIF_0_0_0_all	IV	2	0.525	0.62	1
OTB_CRU_32-69_0_0_all	IV	3	0.364	31.08	1
GNS_DEF_120-219_0_0_all	IV	2	0.08	100	1
SDN_DEF_≥120_0_0_all	IV	2	0.077	42.17	1
MIS_MIS_0_0_0_IBC	IV	2	0.066	-	-
OTB_SPF_32-69_0_0_all	IV	3	0.045	22.16	1
TBB_DEF_≥120_0_0_all	IV	6	0.028	5.49	1
FPO_CRU_0_0_0_all	IV	2	0.014	-	-
TBB_DEF_70-99_0_0_all	IV	4	0.003	-	-
GNS_DEF_≥220_0_0_all	IV	1	0	100	1
GNS_DEF_100-119_0_0_all	IV	2	0	94.38	1
OTB_CRU_16-31_0_0_all	IV	1	0	-	-
OTB_DEF	IV	1	0	-	-
OTB_DEF_70-99_0_0_all	IV	1	0	-	-
SSC_DEF_All_0_0_All	IV	1	0	-	-
TBB_CRU_16-31_0_0_all	IV	3	0	-	-
TBB_DEF_100-119_0_0_all	IV	3	0	-	-

Table 4. 2003 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_100-119_0_0_all	VI	2	66.06	99.96	1
OTB_DEF_≥120_0_0_all	VI	5	29.618	74	1
OTB_DEF	VI	1	2.526	-	-
OTM_DEF_100-119_0_0_all	VI	1	0.399	-	-
LLS_FIF_0_0_0_all	VI	1	0.38	-	-
MIS_MIS_0_0_0_HC	VI	4	0.372	-	-
OTB_CRU_70-99_0_0_all	VI	3	0.315	93.83	1
MIS_MIS	VI	1	0.208	-	-
GNS_DEF	VI	1	0.121	-	-

2003: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2003: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	4	94.622	-	-
OTB_CRU_70-99_0_0_all	3	2.263	-	-
OTB_CRU_90-119_0_0_all	2	1.991	37.64	1
OTB	1	0.778	-	-
OTB_CRU_70-89_2_35_all	1	0.165	48.1	1
MIS_MIS_0_0_0_HC	1	0.125	-	-
SDN_DEF_≥120_0_0_all	1	0.051	14.53	1
SSC_DEF_≥120_0_0_all	1	0.005	-	-
GNS_DEF_120-219_0_0_all	1	0	-	-
GNS_DEF_all_0_0_all	1	0	-	-
TBB_DEF_≥120_0_0_all	1	0	-	-

Table 2. 2003 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	2	1.991	37.64	1
OTB_CRU_70-89_2_35_all	IIIaN	1	0.165	48.1	1
OTB_DEF_≥120_0_0_all	IIIaN	1	0.151	-	-
MIS_MIS_0_0_0_HC	IIIaN	1	0.068	-	-
SDN_DEF_≥120_0_0_all	IIIaN	1	0.051	14.53	1
SSC_DEF_≥120_0_0_all	IIIaN	1	0.002	-	-

Table 3. 2003 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	4	75.318	-	-
OTB_CRU_70-99_0_0_all	IV	3	2.021	-	-
MIS_MIS_0_0_0_HC	IV	1	0.057	-	-
SSC_DEF_≥120_0_0_all	IV	1	0.003	-	-
GNS_DEF_120-219_0_0_all	IV	1	0	-	-
GNS_DEF_all_0_0_all	IV	1	0	-	-
SDN_DEF_≥120_0_0_all	IV	1	0	-	-
TBB_DEF_≥120_0_0_all	IV	1	0	-	-

Table 4. 2003 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	1	19.153	-	-
OTB	VI	1	0.778	-	-
OTB_CRU_70-99_0_0_all	VI	1	0.243	-	-

2004: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2004: Proportion of landings by area and season.

Area	1	2	3	4	2004
IIIaN	1.44	1.4	0.71	0.88	0
IV	42.4	15.39	15.72	16.69	0.52
VI	1.99	1.17	0.64	1.02	0.04

Table 2. 2004: Proportion of landings by métier and nation.

Fleet	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	-	0.002	-	0	-	-	-
GNS_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.098	-	-	-	-	-	-	0	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0.004	-	-	-	4.123	-	0.005	0.001	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	0.002	-	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	-	0.397	-	0.001	-	-	-
MIS_MIS	-	-	-	-	-	-	-	0.002	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	0.181	0.002	0.551	-	-	-	-	0	0	0.006	0	-	-	0.05
MIS_MIS_0_0_0_IBC	-	0.071	-	-	-	-	-	-	-	-	-	0.013	-	-	-
OTB_CRU_32-69_0_0_all	-	0.431	-	-	-	-	-	-	-	0.412	-	0.298	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	0.002	-	-	-
OTB_CRU_70-89_2_35_all	-	0.003	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	0.016	-	-	-	0	-	-	-	-	-	-	0.003	0.001	0.567
OTB_CRU_90-119_0_0_all	-	2.349	-	-	-	0.127	-	-	-	-	-	0.373	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0.087	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	4.021	-	-	-	8.799	0.694	-	0	48.844	-	1.372	0.436	-	6.86
OTB_DEF_100-119_0_0_all	-	-	-	-	13.793	-	-	-	0	-	-	-	-	0.001	-
OTB_SPF_32-69_0_0_all	-	0.017	-	-	-	-	-	-	-	-	-	0.012	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0.011	-
PTB_DEF_≥120_0_0_all	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	0.08	-	-	-	-	-	-	-	0.029	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	0.15	-	-	-	-	-	-	-	4.671	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0.019	0.002	-	-	-	0	-	-	0.001	0.001	-	-	0	-	-
TBB_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	0	-	-	-	-	0	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	-	-	-	-	0.005	-	-

Table 3. 2004: Proportion of landings by nation.

BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	RUS	SWE	UKE	UKNI	UKS
0	7.4	0	0.6	13.8	8.9	0.7	0.1	0	58.5	0	2.1	0.4	0	7.5

Table 4. 2004: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
FPO_CRU_0_0_0_all	0	1	0.002	1	-	-
GNS_DEF	-	-	-	-	0	1
GNS_DEF_≥220_0_0_all	0	1	0	1	-	-
GNS_DEF_100-119_0_0_all	0	1	0	1	-	-
GNS_DEF_120-219_0_0_all	0.036	1	0.062	2	-	-
GNS_DEF_all_0_0_all	0.129	2	4.004	3	-	-
GTR_DEF_all_0_0_all	0.002	1	-	-	-	-
LLS_FIF_0_0_0_all	0.008	2	0.374	2	0.015	1
MIS_MIS	-	-	0.001	1	0.001	1
MIS_MIS_0_0_0_HC	0.136	4	0.606	5	0.048	4
MIS_MIS_0_0_0_IBC	0.026	2	0.059	2	-	-
OTB_CRU_32-69_0_0_all	0.62	3	0.522	3	-	-
OTB_CRU_32-69_2_22_all	0.002	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0.003	2	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.573	5	0.014	3
OTB_CRU_90-119_0_0_all	2.849	3	-	-	-	-
OTB_DEF	-	-	-	-	0.087	1
OTB_DEF_≥120_0_0_all	0.555	3	68.541	8	1.93	3
OTB_DEF_100-119_0_0_all	-	-	11.042	2	2.752	2
OTB_SPF_32-69_0_0_all	0.001	1	0.028	2	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	0.011	1
PTB_DEF_≥120_0_0_all	-	-	0	1	-	-
SDN_DEF_≥120_0_0_all	0.049	2	0.06	2	-	-
SSC_DEF_≥120_0_0_all	0.012	2	4.809	2	-	-
TBB_DEF_≥120_0_0_all	0.001	2	0.023	6	-	-
TBB_DEF_100-119_0_0_all	-	-	0	2	-	-
TBB_DEF_70-99_0_0_all	-	-	0.006	3	-	-

Table 5. 2004: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	8	71.026	71
OTB_DEF_100-119_0_0_all	3	13.794	85
SSC_DEF_≥120_0_0_all	2	4.821	90
GNS_DEF_all_0_0_all	4	4.133	94
OTB_CRU_90-119_0_0_all	3	2.849	97
OTB_CRU_32-69_0_0_all	3	1.142	98
MIS_MIS_0_0_0_HC	8	0.791	99
OTB_CRU_70-99_0_0_all	6	0.587	99
LLS_FIF_0_0_0_all	2	0.397	100
SDN_DEF_≥120_0_0_all	2	0.109	100
GNS_DEF_120-219_0_0_all	2	0.098	100
OTB_DEF	1	0.087	100
MIS_MIS_0_0_0_IBC	2	0.085	100
OTB_SPF_32-69_0_0_all	2	0.03	100
TBB_DEF_≥120_0_0_all	6	0.023	100
OTM_DEF_100-119_0_0_all	1	0.011	100
TBB_DEF_70-99_0_0_all	3	0.006	100
OTB_CRU_70-89_2_35_all	2	0.003	100
FPO_CRU_0_0_0_all	2	0.002	100
GTR_DEF_all_0_0_all	1	0.002	100
MIS_MIS	1	0.002	100
OTB_CRU_32-69_2_22_all	1	0.002	100
GNS_DEF	1	0	100
GNS_DEF_≥220_0_0_all	1	0	100
GNS_DEF_100-119_0_0_all	1	0	100
PTB_DEF_≥120_0_0_all	1	0	100
TBB_DEF_100-119_0_0_all	2	0	100

2004: Appendix B: Age coverage of landings and discards

Table 1. 2004: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	64.66
Discards	3.98

Table 2. 2004: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	60.81	2.65	0
Landings	67.14	63.57	82.75

Table 3. 2004: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2004
Discards	IIIaN	82.35	18.81	29.81	-	-
Discards	IV	-	-	-	79.44	-
Discards	VI	-	-	-	-	-
Landings	IIIaN	53.64	78.35	76.71	63.82	-
Landings	IV	88.58	38.72	44.11	43.28	-
Landings	VI	97.17	89.74	83.46	49.13	-

Table 4. 2004: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	-	0	-	0	-	-	-
GNS_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	100	-	-	-	-	-	-	0	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	10.95	-	-	-	0	-	0	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	-	0	-	0	-	-	-
MIS_MIS	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	100	0	0	-	-	-	-	0	0	0	0	-	-	0
MIS_MIS_0_0_0_IBC	-	0	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_32-69_0_0_all	-	100	-	-	-	-	-	-	-	0	-	0	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	100	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	100	-	-	-	0	-	-	-	-	-	-	0	0	2.11
OTB_CRU_90-119_0_0_all	-	100	-	-	-	0	-	-	-	-	-	0	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	100	-	-	-	95.68	0	-	0	58.57	-	0	0	-	94.53
OTB_DEF_100-119_0_0_all	-	-	-	-	100	-	-	-	0	-	-	-	-	0	-
OTB_SPF_32-69_0_0_all	-	100	-	-	-	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
PTB_DEF_≥120_0_0_all	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	-	0	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	-	0	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0	100	-	-	-	0	-	-	0	0	-	-	0	-	-
TBB_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	0	-	-	-	-	0	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	-	-	-	-	0	-	-

Table 5. 2004: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB	–	–	–	–	–	–	–	0	–	–	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_70-89_2_35_all	–	98.82	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-99_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	0	–	0
OTB_CRU_90-119_0_0_all	–	94.33	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	52.64	–	–	–	0	–	–	–	–	–	–	0	–	0
OTB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTM_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
PTB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	77.42	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 6. 2004: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	SWE	UKS
GNS_DEF_all_0_0_all	-	-	-	0	-	-
OTB_CRU_90-119_0_0_all	100	-	-	-	-	-
OTB_DEF_≥120_0_0_all	100	-	95.7	58.6	0	94.5
OTB_DEF_100-119_0_0_all	-	100	-	-	-	-
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-

2004: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2004: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	8	71.026	66.92	4
OTB_DEF_100-119_0_0_all	3	13.794	100	1
SSC_DEF_≥120_0_0_all	2	4.821	3.11	1
GNS_DEF_all_0_0_all	4	4.133	0.01	1
OTB_CRU_90-119_0_0_all	3	2.849	82.44	1
OTB_CRU_32-69_0_0_all	3	1.142	37.75	1
MIS_MIS_0_0_0_HC	8	0.791	22.88	1
OTB_CRU_70-99_0_0_all	6	0.587	4.74	2
LLS_FIF_0_0_0_all	2	0.397	-	-
SDN_DEF_≥120_0_0_all	2	0.109	73.12	1
GNS_DEF_120-219_0_0_all	2	0.098	99.98	1
OTB_DEF	1	0.087	-	-
MIS_MIS_0_0_0_IBC	2	0.085	-	-
OTB_SPF_32-69_0_0_all	2	0.03	58.06	1
TBB_DEF_≥120_0_0_all	6	0.023	8.28	1
OTM_DEF_100-119_0_0_all	1	0.011	-	-
TBB_DEF_70-99_0_0_all	3	0.006	-	-
OTB_CRU_70-89_2_35_all	2	0.003	98.05	1
FPO_CRU_0_0_0_all	2	0.002	-	-
GTR_DEF_all_0_0_all	1	0.002	-	-
MIS_MIS	1	0.002	-	-
OTB_CRU_32-69_2_22_all	1	0.002	-	-
GNS_DEF	1	0	-	-
GNS_DEF_≥220_0_0_all	1	0	100	1
GNS_DEF_100-119_0_0_all	1	0	100	1
PTB_DEF_≥120_0_0_all	1	0	-	-
TBB_DEF_100-119_0_0_all	2	0	-	-

Table 2. 2004 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	3	64.312	82.44	1
OTB_CRU_32-69_0_0_all	IIIaN	3	13.992	46.41	1
OTB_DEF_≥120_0_0_all	IIIaN	3	12.533	19.05	1
MIS_MIS_0_0_0_HC	IIIaN	4	3.077	97.57	1
GNS_DEF_all_0_0_all	IIIaN	2	2.92	-	-
SDN_DEF_≥120_0_0_all	IIIaN	2	1.114	95.94	1
GNS_DEF_120-219_0_0_all	IIIaN	1	0.811	100	1
MIS_MIS_0_0_0_IBC	IIIaN	2	0.581	-	-
SSC_DEF_≥120_0_0_all	IIIaN	2	0.274	91.18	1
LLS_FIF_0_0_0_all	IIIaN	2	0.189	-	-
OTB_CRU_70-89_2_35_all	IIIaN	2	0.069	98.05	1
OTB_CRU_32-69_2_22_all	IIIaN	1	0.053	-	-
GTR_DEF_all_0_0_all	IIIaN	1	0.034	-	-
OTB_SPF_32-69_0_0_all	IIIaN	1	0.026	100	1
TBB_DEF_≥120_0_0_all	IIIaN	2	0.014	70.3	1
GNS_DEF_100-119_0_0_all	IIIaN	1	0.001	100	1
FPO_CRU_0_0_0_all	IIIaN	1	0	-	-
GNS_DEF_≥220_0_0_all	IIIaN	1	0	100	1

Table 3. 2004 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	8	75.559	67.36	4
OTB_DEF_100-119_0_0_all	IV	2	12.173	100	1
SSC_DEF_≥120_0_0_all	IV	2	5.301	2.89	1
GNS_DEF_all_0_0_all	IV	3	4.414	0.01	1
MIS_MIS_0_0_0_HC	IV	5	0.668	7.91	1
OTB_CRU_70-99_0_0_all	IV	5	0.632	2.78	1
OTB_CRU_32-69_0_0_all	IV	3	0.575	27.46	1
LLS_FIF_0_0_0_all	IV	2	0.412	-	-
GNS_DEF_120-219_0_0_all	IV	2	0.068	99.98	1
SDN_DEF_≥120_0_0_all	IV	2	0.066	54.35	1
MIS_MIS_0_0_0_IBC	IV	2	0.065	-	-
OTB_SPF_32-69_0_0_all	IV	2	0.031	56.37	1
TBB_DEF_≥120_0_0_all	IV	6	0.025	6.54	1
TBB_DEF_70-99_0_0_all	IV	3	0.006	-	-
FPO_CRU_0_0_0_all	IV	1	0.002	-	-
MIS_MIS	IV	1	0.001	-	-
GNS_DEF_≥220_0_0_all	IV	1	0	100	1
GNS_DEF_100-119_0_0_all	IV	1	0	100	1
PTB_DEF_≥120_0_0_all	IV	1	0	-	-
TBB_DEF_100-119_0_0_all	IV	2	0	-	-

Table 4. 2004 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_100-119_0_0_all	VI	2	56.641	99.98	1
OTB_DEF_≥120_0_0_all	VI	3	39.728	65.12	1
OTB_DEF	VI	1	1.793	-	-
MIS_MIS_0_0_0_HC	VI	4	0.994	-	-
LLS_FIF_0_0_0_all	VI	1	0.304	-	-
OTB_CRU_70-99_0_0_all	VI	3	0.294	83.64	1
OTM_DEF_100-119_0_0_all	VI	1	0.23	-	-
MIS_MIS	VI	1	0.015	-	-
GNS_DEF	VI	1	0.001	-	-

2004: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2004: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	4	86.684	2.74	1
OTB_CRU_70-99_0_0_all	3	10.449	-	-
OTB_CRU_90-119_0_0_all	2	2.524	62	1
OTB	1	0.257	-	-
OTB_CRU_70-89_2_35_all	2	0.044	95.79	1
MIS_MIS_0_0_0_HC	1	0.04	-	-
SDN_DEF_≥120_0_0_all	1	0.002	77.42	1
GNS_DEF_all_0_0_all	1	0	-	-
SSC_DEF_≥120_0_0_all	1	0	-	-

Table 2. 2004 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	2	2.524	62	1
OTB_DEF_≥120_0_0_all	IIIaN	1	0.061	-	-
OTB_CRU_70-89_2_35_all	IIIaN	2	0.044	95.79	1
MIS_MIS_0_0_0_HC	IIIaN	1	0.014	-	-
SDN_DEF_≥120_0_0_all	IIIaN	1	0.002	77.42	1
SSC_DEF_≥120_0_0_all	IIIaN	1	0	-	-

Table 3. 2004 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	4	79.26	2.99	1
OTB_CRU_70-99_0_0_all	IV	2	10.298	-	-
MIS_MIS_0_0_0_HC	IV	1	0.026	-	-
GNS_DEF_all_0_0_all	IV	1	0	-	-

Table 4. 2004 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	1	7.364	-	-
OTB	VI	1	0.257	-	-
OTB_CRU_70-99_0_0_all	VI	2	0.152	-	-

2005: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2005: Proportion of landings by area and season.

Area	1	2	3	4	2005
IIIaN	0.43	1.54	0.89	1.32	0.01
IV	39.88	20.7	16.16	13.04	0.54
VI	2.49	1.32	0.4	1.24	0.04

Table 2. 2005: Proportion of landings by métier and nation.

Fleet	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	LIT	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	-	-	0.002	-	-	0	-	-	-
GNS_DEF_≥220_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	0.001	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.078	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0.001	-	-	-	-	2.092	-	-	0.004	0.001	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002	-	-	-
LLS_DEF_0_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	-	-	0.468	-	-	0.001	0	-	-
MIS_MIS	-	-	-	-	-	-	-	0.009	-	-	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	0.132	0.003	0.41	-	-	-	-	0.125	0.027	0.044	-	0.05	0	-	-	0.032
MIS_MIS_0_0_0_IBC	-	0.012	-	-	-	-	-	-	-	-	-	-	-	0.004	-	-	-
OTB_CRU_32-69_0_0_all	-	0.392	-	-	-	-	-	-	-	-	0.349	-	-	0.186	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-
OTB_CRU_70-89_2_35_all	-	0.001	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	0.006	-	-	-	0	-	-	-	-	-	-	-	-	0.003	0	0.475
OTB_CRU_90-119_0_0_all	-	2.397	-	-	-	0.001	-	-	-	-	-	-	-	0.362	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0.126	-	-	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	3.206	-	-	-	10.729	0.77	-	-	0	48.564	0.925	-	1.21	0.913	-	7.517
OTB_DEF_100-119_0_0_all	-	-	-	-	12.517	-	-	-	-	0.001	-	-	-	-	-	0	-
OTB_SPF_32-69_0_0_all	-	0.009	-	-	-	0.013	-	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002	-
SDN_DEF_≥120_0_0_all	-	0.059	-	-	-	-	-	-	-	-	0.039	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	0.089	-	-	-	-	-	-	-	-	4.878	-	-	-	-	-	-
TBB_CRU_16-31_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0.023	0	-	-	-	-	-	-	-	0	0.735	-	-	-	0	-	-
TBB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	-	0	-	-	-	-	0	-	-
TBB_DEF_90-99_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 3. 2005: Proportion of landings by nation.

BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	LIT	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
0	6.4	0	0.4	12.5	10.7	0.8	0.1	0.1	0	57.2	0.9	0.1	1.8	0.9	0	8

Table 4. 2005: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
FPO_CRU_0_0_0_all	0	1	0.002	1	-	-
GNS_DEF_≥220_0_0_all	0	1	0	1	-	-
GNS_DEF_100-119_0_0_all	0	1	0	2	-	-
GNS_DEF_120-219_0_0_all	0.024	1	0.055	1	-	-
GNS_DEF_all_0_0_all	0.142	2	1.956	3	-	-
GTR_DEF_all_0_0_all	0.002	1	-	-	-	-
LLS_DEF_0_0_0_all	-	-	-	-	0	1
LLS_FIF_0_0_0_all	0.013	2	0.44	3	0.016	1
MIS_MIS	-	-	-	-	0.009	1
MIS_MIS_0_0_0_HC	0.114	4	0.635	7	0.075	5
MIS_MIS_0_0_0_IBC	0.004	2	0.012	2	-	-
OTB_CRU_32-69_0_0_all	0.494	3	0.433	3	-	-
OTB_CRU_32-69_2_22_all	0.001	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0.001	2	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.479	5	0.006	3
OTB_CRU_90-119_0_0_all	2.76	3	-	-	-	-
OTB_DEF	-	-	-	-	0.126	1
OTB_DEF_≥120_0_0_all	0.554	3	71.243	9	2.037	4
OTB_DEF_100-119_0_0_all	-	-	9.291	2	3.227	2
OTB_SPF_32-69_0_0_all	0.002	1	0.021	3	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	0.002	1
SDN_DEF_≥120_0_0_all	0.044	2	0.055	2	-	-
SSC_DEF_≥120_0_0_all	0.029	2	4.937	2	-	-
TBB_CRU_16-31_0_0_all	-	-	0	1	-	-
TBB_DEF_≥120_0_0_all	0	1	0.759	5	-	-
TBB_DEF_100-119_0_0_all	-	-	0	1	-	-
TBB_DEF_70-99_0_0_all	-	-	0.001	4	-	-
TBB_DEF_90-99_0_0_all	0	1	-	-	-	-

Table 5. 2005: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	9	73.834	74
OTB_DEF_100-119_0_0_all	3	12.518	86
SSC_DEF_≥120_0_0_all	2	4.966	91
OTB_CRU_90-119_0_0_all	3	2.76	94
GNS_DEF_all_0_0_all	4	2.098	96
OTB_CRU_32-69_0_0_all	3	0.927	97
MIS_MIS_0_0_0_HC	9	0.824	98
TBB_DEF_≥120_0_0_all	5	0.759	99
OTB_CRU_70-99_0_0_all	6	0.484	99
LLS_FIF_0_0_0_all	3	0.469	100
OTB_DEF	1	0.126	100
SDN_DEF_≥120_0_0_all	2	0.098	100
GNS_DEF_120-219_0_0_all	1	0.078	100
OTB_SPF_32-69_0_0_all	3	0.023	100
MIS_MIS_0_0_0_IBC	2	0.015	100
MIS_MIS	1	0.009	100
FPO_CRU_0_0_0_all	2	0.002	100
GTR_DEF_all_0_0_all	1	0.002	100
OTM_DEF_100-119_0_0_all	1	0.002	100
GNS_DEF_100-119_0_0_all	2	0.001	100
OTB_CRU_32-69_2_22_all	1	0.001	100
OTB_CRU_70-89_2_35_all	2	0.001	100
TBB_DEF_70-99_0_0_all	4	0.001	100
GNS_DEF_≥220_0_0_all	1	0	100
LLS_DEF_0_0_0_all	1	0	100
TBB_CRU_16-31_0_0_all	1	0	100
TBB_DEF_100-119_0_0_all	1	0	100
TBB_DEF_90-99_0_0_all	1	0	100

2005: Appendix B: Age coverage of landings and discards

Table 1. 2005: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	57.37
Discards	1.65

Table 2. 2005: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	29.68	0.16	0
Landings	72.81	54.81	87.7

Table 3. 2005: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2005
Discards	IIIaN	-	-	-	67.39	-
Discards	IV	-	94.83	77.13	-	-
Discards	VI	-	-	-	-	-
Landings	IIIaN	65.56	72.7	67.13	79.54	-
Landings	IV	90.09	22.24	26.66	35.7	-
Landings	VI	81.38	91.25	88.28	99.59	-

Table 4. 2005: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	LIT	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	-	-	0	-	-	0	-	-	-
GNS_DEF_≥220_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	100	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	65.32	-	-	-	-	0	-	-	0	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
LLS_DEF_0_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	-	-	0	-	-	0	0	-	-
MIS_MIS	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	100	0	0	-	-	-	-	0	0	0	-	0	0	-	-	0
MIS_MIS_0_0_0_IBC	-	0	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_32-69_0_0_all	-	100	-	-	-	-	-	-	-	-	0	-	-	0	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	100	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	100	-	-	-	0	-	-	-	-	-	-	-	-	0	0	79.57
OTB_CRU_90-119_0_0_all	-	100	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	100	-	-	-	32.58	0	-	-	0	55.78	0	-	0	0	-	100
OTB_DEF_100-119_0_0_all	-	-	-	-	100	-	-	-	-	0	-	-	-	-	-	0	-
OTB_SPF_32-69_0_0_all	-	100	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
SDN_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
TBB_CRU_16-31_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0	100	-	-	-	-	-	-	-	0	0	-	-	-	0	-	-
TBB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	-	0	-	-	-	-	0	-	-
TBB_DEF_90-99_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5. 2005: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	LIT	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_DEF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB	–	–	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-89_2_35_all	–	0	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-99_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
OTB_CRU_90-119_0_0_all	–	65.84	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	21.63	–	–	–	0	–	–	–	–	–	–	–	–	0	–	0
OTB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–	–	–
OTM_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_CRU_16-31_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_90-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 6. 2005: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	SWE	UKS
GNS_DEF_all_0_0_all	-	-	-	0	-	-
OTB_CRU_90-119_0_0_all	100	-	-	-	-	-
OTB_DEF_≥120_0_0_all	100	-	32.6	55.8	0	100
OTB_DEF_100-119_0_0_all	-	100	-	-	-	-
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-

2005: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2005: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	9	73.834	55.95	4
OTB_DEF_100-119_0_0_all	3	12.518	100	1
SSC_DEF_≥120_0_0_all	2	4.966	1.78	1
OTB_CRU_90-119_0_0_all	3	2.76	86.85	1
GNS_DEF_all_0_0_all	4	2.098	0.05	1
OTB_CRU_32-69_0_0_all	3	0.927	42.31	1
MIS_MIS_0_0_0_HC	9	0.824	16.03	1
TBB_DEF_≥120_0_0_all	5	0.759	0.06	1
OTB_CRU_70-99_0_0_all	6	0.484	79.27	2
LLS_FIF_0_0_0_all	3	0.469	-	-
OTB_DEF	1	0.126	-	-
SDN_DEF_≥120_0_0_all	2	0.098	60.08	1
GNS_DEF_120-219_0_0_all	1	0.078	100	1
OTB_SPF_32-69_0_0_all	3	0.023	39.17	1
MIS_MIS_0_0_0_IBC	2	0.015	-	-
MIS_MIS	1	0.009	-	-
FPO_CRU_0_0_0_all	2	0.002	-	-
GTR_DEF_all_0_0_all	1	0.002	-	-
OTM_DEF_100-119_0_0_all	1	0.002	-	-
GNS_DEF_100-119_0_0_all	2	0.001	99.75	1
OTB_CRU_32-69_2_22_all	1	0.001	-	-
OTB_CRU_70-89_2_35_all	2	0.001	75.53	1
TBB_DEF_70-99_0_0_all	4	0.001	-	-
GNS_DEF_≥220_0_0_all	1	0	100	1
LLS_DEF_0_0_0_all	1	0	-	-
TBB_CRU_16-31_0_0_all	1	0	-	-
TBB_DEF_100-119_0_0_all	1	0	-	-
TBB_DEF_90-99_0_0_all	1	0	100	1

Table 2. 2005 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	3	65.966	86.85	1
OTB_DEF_≥120_0_0_all	IIIaN	3	13.242	37.6	1
OTB_CRU_32-69_0_0_all	IIIaN	3	11.8	53.59	1
GNS_DEF_all_0_0_all	IIIaN	2	3.404	-	-
MIS_MIS_0_0_0_HC	IIIaN	4	2.72	93.21	1
SDN_DEF_≥120_0_0_all	IIIaN	2	1.041	99.38	1
SSC_DEF_≥120_0_0_all	IIIaN	2	0.703	0.94	1
GNS_DEF_120-219_0_0_all	IIIaN	1	0.563	100	1
LLS_FIF_0_0_0_all	IIIaN	2	0.304	-	-
MIS_MIS_0_0_0_IBC	IIIaN	2	0.088	-	-
GTR_DEF_all_0_0_all	IIIaN	1	0.055	-	-
OTB_SPF_32-69_0_0_all	IIIaN	1	0.047	100	1
OTB_CRU_70-89_2_35_all	IIIaN	2	0.03	75.53	1
OTB_CRU_32-69_2_22_all	IIIaN	1	0.026	-	-
GNS_DEF_100-119_0_0_all	IIIaN	1	0.006	100	1
TBB_DEF_≥120_0_0_all	IIIaN	1	0.003	100	1
GNS_DEF_≥220_0_0_all	IIIaN	1	0.002	100	1
FPO_CRU_0_0_0_all	IIIaN	1	0	-	-
TBB_DEF_90-99_0_0_all	IIIaN	1	0	100	1

Table 3. 2005 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	9	78.88	55.46	4
OTB_DEF_100-119_0_0_all	IV	2	10.287	99.99	1
SSC_DEF_≥120_0_0_all	IV	2	5.466	1.79	1
GNS_DEF_all_0_0_all	IV	3	2.166	0.05	1
TBB_DEF_≥120_0_0_all	IV	5	0.841	0.05	1
MIS_MIS_0_0_0_HC	IV	7	0.703	4.09	1
OTB_CRU_70-99_0_0_all	IV	5	0.53	79.28	2
LLS_FIF_0_0_0_all	IV	3	0.487	-	-
OTB_CRU_32-69_0_0_all	IV	3	0.48	29.46	1
GNS_DEF_120-219_0_0_all	IV	1	0.061	100	1
SDN_DEF_≥120_0_0_all	IV	2	0.06	28.72	1
OTB_SPF_32-69_0_0_all	IV	3	0.023	33.37	1
MIS_MIS_0_0_0_IBC	IV	2	0.013	-	-
FPO_CRU_0_0_0_all	IV	1	0.002	-	-
TBB_DEF_70-99_0_0_all	IV	4	0.001	-	-
GNS_DEF_≥220_0_0_all	IV	1	0	100	1
GNS_DEF_100-119_0_0_all	IV	2	0	99.59	1
TBB_CRU_16-31_0_0_all	IV	1	0	-	-
TBB_DEF_100-119_0_0_all	IV	1	0	-	-

Table 4. 2005 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_100-119_0_0_all	VI	2	58.697	100	1
OTB_DEF_≥120_0_0_all	VI	4	37.054	78.06	1
OTB_DEF	VI	1	2.298	-	-
MIS_MIS_0_0_0_HC	VI	5	1.36	-	-
LLS_FIF_0_0_0_all	VI	1	0.297	-	-
MIS_MIS	VI	1	0.162	-	-
OTB_CRU_70-99_0_0_all	VI	3	0.101	78.25	1
OTM_DEF_100-119_0_0_all	VI	1	0.029	-	-
LLS_DEF_0_0_0_all	VI	1	0.001	-	-

2005: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2005: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	4	87.087	0.14	1
OTB_CRU_70-99_0_0_all	2	4.205	0	1
OTB	1	3.869	-	-
OTB_CRU_90-119_0_0_all	2	2.554	59.77	1
SDN_DEF_≥120_0_0_all	1	2.163	-	-
OTB_SPF_32-69_0_0_all	1	0.069	-	-
MIS_MIS_0_0_0_HC	1	0.026	-	-
OTB_CRU_32-69_0_0_all	1	0.012	-	-
SSC_DEF_≥120_0_0_all	1	0.01	-	-
OTB_CRU_70-89_2_35_all	2	0.005	-	-
GNS_DEF_all_0_0_all	1	0	-	-
OTB_CRU_32-69_2_22_all	1	0	-	-

Table 2. 2005 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	2	2.554	59.77	1
SDN_DEF_≥120_0_0_all	IIIaN	1	2.157	-	-
OTB_DEF_≥120_0_0_all	IIIaN	2	0.383	-	-
MIS_MIS_0_0_0_HC	IIIaN	1	0.025	-	-
OTB_CRU_32-69_0_0_all	IIIaN	1	0.012	-	-
SSC_DEF_≥120_0_0_all	IIIaN	1	0.008	-	-
OTB_CRU_70-89_2_35_all	IIIaN	2	0.005	-	-
OTB_CRU_32-69_2_22_all	IIIaN	1	0	-	-

Table 3. 2005 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	4	70.434	0.17	1
OTB_CRU_70-99_0_0_all	IV	2	4.082	0	1
OTB_SPF_32-69_0_0_all	IV	1	0.069	-	-
SDN_DEF_≥120_0_0_all	IV	1	0.006	-	-
MIS_MIS_0_0_0_HC	IV	1	0.002	-	-
SSC_DEF_≥120_0_0_all	IV	1	0.001	-	-
GNS_DEF_all_0_0_all	IV	1	0	-	-

Table 4. 2005 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	2	16.27	-	-
OTB	VI	1	3.869	-	-
OTB_CRU_70-99_0_0_all	VI	1	0.122	-	-

2006: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2006: Proportion of landings by area and season.

Area	1	2	3	4	2006
IIIaN	0.97	1.79	1.35	0.73	0.06
IV	41.33	18.37	19.14	8.25	0.18
VI	1.89	1.74	2.05	2.07	0.07

Table 2. 2006: Proportion of landings by métier and nation.

Fleet	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	POR	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	-	0	-	-	-	0	-	-	-
GNS_DEF	-	-	-	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.075	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0.003	-	-	-	2.797	-	-	-	0.006	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0.003	0	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	-	0.554	-	-	-	0.001	0	-	-
MIS_MIS	-	-	-	-	-	-	-	0.004	-	-	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	0.145	0.005	0.112	-	-	-	-	0.024	0.002	-	0.187	0.007	0.001	0	-	0.025
MIS_MIS_0_0_0_IBC	-	0.037	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_32-69_0_0_all	-	0.47	-	-	-	-	-	-	-	0.475	-	-	-	0.204	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-
OTB_CRU_70-89_2_35_all	-	0	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	0.012	-	-	-	0	-	-	-	-	-	-	-	-	0.003	-	0.294
OTB_CRU_90-119_0_0_all	-	2.564	-	-	-	0.01	-	-	-	-	-	-	-	0.432	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0.199	-	-	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	2.86	-	-	-	12.256	0.76	-	0	44.408	0.891	-	-	0.736	1.144	-	8.014
OTB_DEF_100-119_0_0_all	-	-	-	-	17.95	-	-	-	0	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	0.008	-	-	-	0.003	-	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
PTB_DEF_≥120_0_0_all	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	0.084	-	-	-	-	-	-	-	0.04	-	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	0.024	-	-	-	-	-	-	-	1.96	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0.012	0	-	-	-	-	-	-	0	0.193	-	-	-	-	0	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	0	-	-	-	-	-	0	-	-

Table 3. 2006: Proportion of landings by nation.

BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	POR	RUS	SWE	UKE	UKNI	UKS
0	6.3	0	0.1	17.9	12.3	0.8	0.2	0	50.4	0.9	0.2	0	1.4	1.1	0	8.3

Table 4. 2006: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
FPO_CRU_0_0_0_all	0	1	0	1	-	-
GNS_DEF	-	-	-	-	0.002	1
GNS_DEF_≥220_0_0_all	0	1	0	1	-	-
GNS_DEF_100-119_0_0_all	0	1	0	1	-	-
GNS_DEF_120-219_0_0_all	0.041	1	0.034	2	-	-
GNS_DEF_all_0_0_all	0.131	3	2.674	3	-	-
GTR_DEF_all_0_0_all	0.003	1	0	1	-	-
LLS_FIF_0_0_0_all	0.007	2	0.526	3	0.023	2
MIS_MIS	-	-	-	-	0.004	1
MIS_MIS_0_0_0_HC	0.18	5	0.246	8	0.082	5
MIS_MIS_0_0_0_IBC	0	1	0.037	2	-	-
OTB_CRU_32-69_0_0_all	0.773	3	0.376	3	-	-
OTB_CRU_32-69_2_22_all	0.001	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0	2	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.307	5	0.002	2
OTB_CRU_90-119_0_0_all	3.006	3	-	-	-	-
OTB_DEF	-	-	-	-	0.199	1
OTB_DEF_≥120_0_0_all	0.696	3	67.834	9	2.538	3
OTB_DEF_100-119_0_0_all	-	-	12.967	2	4.983	1
OTB_SPF_32-69_0_0_all	0.006	1	0.004	3	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	0	1
PTB_DEF_≥120_0_0_all	-	-	0	1	-	-
SDN_DEF_≥120_0_0_all	0.055	2	0.069	2	-	-
SSC_DEF_≥120_0_0_all	0.001	2	1.984	2	-	-
TBB_DEF_≥120_0_0_all	0	2	0.206	5	-	-
TBB_DEF_70-99_0_0_all	-	-	0.001	4	-	-

Table 5. 2006: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	9	71.069	71
OTB_DEF_100-119_0_0_all	2	17.95	89
OTB_CRU_90-119_0_0_all	3	3.006	92
GNS_DEF_all_0_0_all	4	2.805	95
SSC_DEF_≥120_0_0_all	2	1.984	97
OTB_CRU_32-69_0_0_all	3	1.149	98
LLS_FIF_0_0_0_all	3	0.556	99
MIS_MIS_0_0_0_HC	10	0.508	99
OTB_CRU_70-99_0_0_all	5	0.309	99
TBB_DEF_≥120_0_0_all	5	0.206	100
OTB_DEF	1	0.199	100
SDN_DEF_≥120_0_0_all	2	0.124	100
GNS_DEF_120-219_0_0_all	2	0.075	100
MIS_MIS_0_0_0_IBC	2	0.037	100
OTB_SPF_32-69_0_0_all	3	0.011	100
MIS_MIS	1	0.004	100
GTR_DEF_all_0_0_all	2	0.003	100
GNS_DEF	1	0.002	100
OTB_CRU_32-69_2_22_all	1	0.001	100
TBB_DEF_70-99_0_0_all	4	0.001	100
FPO_CRU_0_0_0_all	2	0	100
GNS_DEF_≥220_0_0_all	1	0	100
GNS_DEF_100-119_0_0_all	1	0	100
OTB_CRU_70-89_2_35_all	2	0	100
OTM_DEF_100-119_0_0_all	1	0	100
PTB_DEF_≥120_0_0_all	1	0	100

2006: Appendix B: Age coverage of landings and discards

Table 1. 2006: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	70.57
Discards	5.22

Table 2. 2006: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	21.19	5.57	0
Landings	70.04	69.24	85.65

Table 3. 2006: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2006
Discards	IIIaN	-	32	22.68	25.89	-
Discards	IV	-	-	99.83	99.99	-
Discards	VI	-	-	-	-	-
Landings	IIIaN	67.37	70.58	71.94	74.45	-
Landings	IV	94.3	47.33	42.32	56.43	-
Landings	VI	79.81	89.43	81.3	95.14	-

Table 4. 2006: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	POR	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	-	0	-	-	-	0	-	-	-
GNS_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	100	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0	-	-	-	72.89	-	-	-	0	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	-	0	-	-	-	0	0	-	-
MIS_MIS	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	100	0	0	-	-	-	-	0	0	-	0	0	0	0	-	0
MIS_MIS_0_0_0_IBC	-	0	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_32-69_0_0_all	-	100	-	-	-	-	-	-	-	0	-	-	-	0	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	100	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	100	-	-	-	0	-	-	-	-	-	-	-	-	0	-	92.74
OTB_CRU_90-119_0_0_all	-	100	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	100	-	-	-	93.04	0	-	0	56.22	0	-	-	0	0	-	95.98
OTB_DEF_100-119_0_0_all	-	-	-	-	100	-	-	-	0	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	100	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
PTB_DEF_≥120_0_0_all	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0	100	-	-	-	-	-	-	0	0	-	-	-	-	0	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	0	-	-	-	-	-	0	-	-

Table 5. 2006: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	POR	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB	–	–	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_70-89_2_35_all	–	0	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-99_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
OTB_CRU_90-119_0_0_all	–	63.78	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	58.58	–	–	–	0	–	–	–	–	–	–	–	–	–	–	0
OTB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–	–	–
OTM_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
PTB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 6. 2006: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	UKE	UKS
GNS_DEF_all_0_0_all	-	-	-	72.9	-	-
OTB_CRU_90-119_0_0_all	100	-	-	-	-	-
OTB_DEF_≥120_0_0_all	100	-	93	56.2	0	96
OTB_DEF_100-119_0_0_all	-	100	-	-	-	-
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-

2006: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2006: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	9	71.069	66.02	4
OTB_DEF_100-119_0_0_all	2	17.95	100	1
OTB_CRU_90-119_0_0_all	3	3.006	85.31	1
GNS_DEF_all_0_0_all	4	2.805	72.67	1
SSC_DEF_≥120_0_0_all	2	1.984	1.23	1
OTB_CRU_32-69_0_0_all	3	1.149	40.89	1
LLS_FIF_0_0_0_all	3	0.556	-	-
MIS_MIS_0_0_0_HC	10	0.508	28.51	1
OTB_CRU_70-99_0_0_all	5	0.309	92.05	2
TBB_DEF_≥120_0_0_all	5	0.206	0.04	1
OTB_DEF	1	0.199	-	-
SDN_DEF_≥120_0_0_all	2	0.124	68.07	1
GNS_DEF_120-219_0_0_all	2	0.075	99.99	1
MIS_MIS_0_0_0_IBC	2	0.037	-	-
OTB_SPF_32-69_0_0_all	3	0.011	72.96	1
MIS_MIS	1	0.004	-	-
GTR_DEF_all_0_0_all	2	0.003	-	-
GNS_DEF	1	0.002	-	-
OTB_CRU_32-69_2_22_all	1	0.001	-	-
TBB_DEF_70-99_0_0_all	4	0.001	-	-
FPO_CRU_0_0_0_all	2	0	-	-
GNS_DEF_≥220_0_0_all	1	0	100	1
GNS_DEF_100-119_0_0_all	1	0	100	1
OTB_CRU_70-89_2_35_all	2	0	50.68	1
OTM_DEF_100-119_0_0_all	1	0	-	-
PTB_DEF_≥120_0_0_all	1	0	-	-

Table 2. 2006 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	3	61.314	85.31	1
OTB_CRU_32-69_0_0_all	IIIaN	3	15.776	51.41	1
OTB_DEF_≥120_0_0_all	IIIaN	3	14.201	35.85	1
MIS_MIS_0_0_0_HC	IIIaN	5	3.676	66.78	1
GNS_DEF_all_0_0_all	IIIaN	3	2.678	-	-
SDN_DEF_≥120_0_0_all	IIIaN	2	1.127	96.6	1
GNS_DEF_120-219_0_0_all	IIIaN	1	0.844	100	1
LLS_FIF_0_0_0_all	IIIaN	2	0.138	-	-
OTB_SPF_32-69_0_0_all	IIIaN	1	0.129	100	1
GTR_DEF_all_0_0_all	IIIaN	1	0.07	-	-
OTB_CRU_32-69_2_22_all	IIIaN	1	0.025	-	-
SSC_DEF_≥120_0_0_all	IIIaN	2	0.012	72.43	1
OTB_CRU_70-89_2_35_all	IIIaN	2	0.005	50.68	1
GNS_DEF_100-119_0_0_all	IIIaN	1	0.003	100	1
TBB_DEF_≥120_0_0_all	IIIaN	2	0.001	95.74	1
FPO_CRU_0_0_0_all	IIIaN	1	0	-	-
GNS_DEF_≥220_0_0_all	IIIaN	1	0	100	1
MIS_MIS_0_0_0_IBC	IIIaN	1	0	-	-

Table 3. 2006 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	9	77.735	66.26	4
OTB_DEF_100-119_0_0_all	IV	2	14.859	100	1
GNS_DEF_all_0_0_all	IV	3	3.064	76.24	1
SSC_DEF_≥120_0_0_all	IV	2	2.273	1.2	1
LLS_FIF_0_0_0_all	IV	3	0.602	-	-
OTB_CRU_32-69_0_0_all	IV	3	0.431	19.25	1
OTB_CRU_70-99_0_0_all	IV	5	0.352	92.19	2
MIS_MIS_0_0_0_HC	IV	8	0.281	9.98	1
TBB_DEF_≥120_0_0_all	IV	5	0.236	0.01	1
SDN_DEF_≥120_0_0_all	IV	2	0.079	45.06	1
MIS_MIS_0_0_0_IBC	IV	2	0.042	-	-
GNS_DEF_120-219_0_0_all	IV	2	0.039	99.98	1
OTB_SPF_32-69_0_0_all	IV	3	0.005	33.3	1
TBB_DEF_70-99_0_0_all	IV	4	0.001	-	-
FPO_CRU_0_0_0_all	IV	1	0	-	-
GNS_DEF_≥220_0_0_all	IV	1	0	100	1
GNS_DEF_100-119_0_0_all	IV	1	0	100	1
GTR_DEF_all_0_0_all	IV	1	0	-	-
PTB_DEF_≥120_0_0_all	IV	1	0	-	-

Table 4. 2006 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_100-119_0_0_all	VI	1	63.607	100	1
OTB_DEF_≥120_0_0_all	VI	3	32.395	67.98	1
OTB_DEF	VI	1	2.544	-	-
MIS_MIS_0_0_0_HC	VI	5	1.051	-	-
LLS_FIF_0_0_0_all	VI	2	0.298	-	-
MIS_MIS	VI	1	0.05	-	-
GNS_DEF	VI	1	0.027	-	-
OTB_CRU_70-99_0_0_all	VI	2	0.024	68.54	1
OTM_DEF_100-119_0_0_all	VI	1	0.004	-	-

2006: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2006: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	3	90.232	4.71	1
OTB_CRU_70-99_0_0_all	2	5.059	-	-
OTB_CRU_90-119_0_0_all	2	4.681	20.82	1
MIS_MIS_0_0_0_HC	1	0.015	-	-
OTB_SPF_32-69_0_0_all	1	0.008	-	-
OTB_CRU_70-89_2_35_all	2	0.005	-	-
GNS_DEF_≥220_0_0_all	1	0	-	-
GNS_DEF_100-119_0_0_all	1	0	-	-
GNS_DEF_120-219_0_0_all	1	0	-	-
OTB	1	0	-	-
SDN_DEF_≥120_0_0_all	1	0	-	-
SSC_DEF_≥120_0_0_all	1	0	-	-

Table 2. 2006 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	2	4.681	20.82	1
OTB_DEF_≥120_0_0_all	IIIaN	1	0.222	30.47	1
MIS_MIS_0_0_0_HC	IIIaN	1	0.009	-	-
OTB_CRU_70-89_2_35_all	IIIaN	2	0.005	-	-
SDN_DEF_≥120_0_0_all	IIIaN	1	0	-	-
SSC_DEF_≥120_0_0_all	IIIaN	1	0	-	-

Table 3. 2006 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	3	70.517	5.93	1
OTB_CRU_70-99_0_0_all	IV	2	4.524	-	-
OTB_SPF_32-69_0_0_all	IV	1	0.008	-	-
MIS_MIS_0_0_0_HC	IV	1	0.006	-	-
GNS_DEF_≥220_0_0_all	IV	1	0	-	-
GNS_DEF_100-119_0_0_all	IV	1	0	-	-
GNS_DEF_120-219_0_0_all	IV	1	0	-	-
SDN_DEF_≥120_0_0_all	IV	1	0	-	-
SSC_DEF_≥120_0_0_all	IV	1	0	-	-

Table 4. 2006 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	1	19.493	-	-
OTB_CRU_70-99_0_0_all	VI	1	0.535	-	-
OTB	VI	1	0	-	-

2007: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2007: Proportion of landings by area and season.

Area	1	2	3	4	2007
IIIaN	0.46	1.39	1.57	2.87	0.07
IV	35.88	22.49	18.94	9.71	0.02
VI	2.35	1.35	1.92	0.93	0.04

Table 2. 2007: Proportion of landings by métier and nation.

Fleet	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	POR	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	-	0.002	-	-	-	0	-	-	-
GNS_DEF	-	-	-	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.054	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	0	-	-	-	-	0.001	-	-	-	4.627	-	-	-	0.004	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002	-	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	-	0.755	-	-	-	0.001	0	-	-
MIS_MIS	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	0.031	0.003	0.048	-	0.006	-	-	0.033	0.003	-	0.068	0.007	0	-	-	0.042
MIS_MIS_0_0_0_IBC	-	0.007	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_32-69_0_0_all	-	0.156	-	-	-	-	-	-	-	0.336	-	-	-	0.197	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	0.001	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	0.006	-	-	-	0	-	-	-	-	-	-	-	-	0.002	0	0.647
OTB_CRU_90-119_0_0_all	-	1.957	-	-	-	0.288	-	-	-	-	-	-	-	0.385	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0.313	-	-	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	0	3.293	-	-	-	13.146	0.567	-	0.001	38.259	1.444	-	-	0.771	1.593	-	8.15
OTB_DEF_100-119_0_0_all	0	-	-	-	20.018	-	-	-	0	-	-	-	-	-	-	0	-
OTB_SPF_32-69_0_0_all	-	0.009	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
SDN_DEF_≥120_0_0_all	-	0.038	-	-	-	-	-	-	-	0.026	-	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	0.033	-	-	-	-	-	-	-	2.56	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0.017	0.001	-	-	-	-	-	-	0.002	0.075	-	-	-	-	0	-	-
TBB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0.001	-	-	-	-	0	-	-	0	-	-	-	-	-	0	-	-
TBB_DEF_90-99_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 3. 2007: Proportion of landings by nation.

BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	POR	RUS	SWE	UKE	UKNI	UKS
0	5.6	0	0	20	13.4	0.6	0.3	0	46.6	1.4	0.1	0	1.4	1.6	0	8.8

Table 4. 2007: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
FPO_CRU_0_0_0_all	0	1	0.002	1	-	-
GNS_DEF	-	-	-	-	0.01	1
GNS_DEF_≥220_0_0_all	0	1	0.001	1	-	-
GNS_DEF_100-119_0_0_all	0	1	0	2	-	-
GNS_DEF_120-219_0_0_all	0.028	1	0.026	2	-	-
GNS_DEF_all_0_0_all	0.174	3	4.459	4	-	-
GTR_DEF_all_0_0_all	0.002	1	-	-	-	-
LLS_FIF_0_0_0_all	0.012	2	0.716	3	0.029	2
MIS_MIS	-	-	-	-	0	1
MIS_MIS_0_0_0_HC	0.094	5	0.059	6	0.089	6
MIS_MIS_0_0_0_IBC	0	1	0.007	2	-	-
OTB_CRU_32-69_0_0_all	0.439	3	0.25	3	-	-
OTB_CRU_32-69_2_22_all	0	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0.001	2	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.652	5	0.003	3
OTB_CRU_90-119_0_0_all	2.629	3	-	-	-	-
OTB_DEF	-	-	-	-	0.313	1
OTB_DEF_≥120_0_0_all	2.915	3	62.38	10	1.93	5
OTB_DEF_100-119_0_0_all	-	-	15.799	3	4.219	2
OTB_SPF_32-69_0_0_all	0.004	1	0.006	2	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	0	1
SDN_DEF_≥120_0_0_all	0.032	2	0.032	2	-	-
SSC_DEF_≥120_0_0_all	0.029	2	2.564	2	-	-
TBB_DEF_≥120_0_0_all	0	2	0.094	5	-	-
TBB_DEF_100-119_0_0_all	-	-	0	2	-	-
TBB_DEF_70-99_0_0_all	-	-	0.002	4	-	-
TBB_DEF_90-99_0_0_all	0	1	-	-	-	-

Table 5. 2007: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	10	67.224	67
OTB_DEF_100-119_0_0_all	4	20.018	87
GNS_DEF_all_0_0_all	5	4.632	92
OTB_CRU_90-119_0_0_all	3	2.629	95
SSC_DEF_≥120_0_0_all	2	2.593	97
LLS_FIF_0_0_0_all	3	0.757	98
OTB_CRU_32-69_0_0_all	3	0.689	99
OTB_CRU_70-99_0_0_all	6	0.655	99
OTB_DEF	1	0.313	100
MIS_MIS_0_0_0_HC	10	0.241	100
TBB_DEF_≥120_0_0_all	5	0.095	100
SDN_DEF_≥120_0_0_all	2	0.064	100
GNS_DEF_120-219_0_0_all	2	0.054	100
GNS_DEF	1	0.01	100
OTB_SPF_32-69_0_0_all	2	0.01	100
MIS_MIS_0_0_0_IBC	2	0.007	100
FPO_CRU_0_0_0_all	2	0.002	100
GTR_DEF_all_0_0_all	1	0.002	100
TBB_DEF_70-99_0_0_all	4	0.002	100
GNS_DEF_≥220_0_0_all	1	0.001	100
OTB_CRU_70-89_2_35_all	2	0.001	100
GNS_DEF_100-119_0_0_all	2	0	100
MIS_MIS	1	0	100
OTB_CRU_32-69_2_22_all	1	0	100
OTM_DEF_100-119_0_0_all	1	0	100
TBB_DEF_100-119_0_0_all	2	0	100
TBB_DEF_90-99_0_0_all	1	0	100

2007: Appendix B: Age coverage of landings and discards

Table 1. 2007: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	75.63
Discards	4.62

Table 2. 2007: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	78.74	1.38	0
Landings	64.27	76.17	79.35

Table 3. 2007: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2007
Discards	IIIaN	77.32	90.91	73.16	90.22	-
Discards	IV	-	99.29	95.56	97.72	-
Discards	VI	-	-	-	-	-
Landings	IIIaN	62.02	55.41	45.92	80.54	-
Landings	IV	83.43	87.11	53.41	68.59	-
Landings	VI	82.5	84.88	69.08	87.77	-

Table 4. 2007: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	POR	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	-	0	-	-	-	0	-	-	-
GNS_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	18.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	99.36	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	90.31	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	0	-	-	-	-	0	-	-	-	0	-	-	-	0	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	-	0	-	-	-	0	0	-	-
MIS_MIS	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	99.9	0	0	-	0	-	-	0	0	-	0	0	0	-	-	0
MIS_MIS_0_0_0_IBC	-	0	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_32-69_0_0_all	-	99.94	-	-	-	-	-	-	-	0	-	-	-	0	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	100	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	88.26	-	-	-	0	-	-	-	-	-	-	-	-	0	0	99.64
OTB_CRU_90-119_0_0_all	-	100	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	0	88.74	-	-	-	90.92	0	-	0	78.09	0	-	-	0	0	-	97.38
OTB_DEF_100-119_0_0_all	0	-	-	-	100	-	-	-	0	-	-	-	-	-	-	0	-
OTB_SPF_32-69_0_0_all	-	95.77	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
SDN_DEF_≥120_0_0_all	-	96.53	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	99.52	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0	97.48	-	-	-	-	-	-	0	0	-	-	-	-	0	-	-
TBB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	0	-	-	-	-	-	0	-	-
TBB_DEF_90-99_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5. 2007: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	POR	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB	–	–	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-89_2_35_all	–	0	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-99_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	0	–	0
OTB_CRU_90-119_0_0_all	–	100	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	69.94	–	–	–	0	–	–	–	–	–	–	–	–	0	–	0
OTB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTM_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	48.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_90-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 6. 2007: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	POL	UKE	UKS
GNS_DEF_all_0_0_all	-	-	-	0	-	-	-
OTB_CRU_90-119_0_0_all	100	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	88.7	-	90.9	78.1	0	0	97.4
OTB_DEF_100-119_0_0_all	-	100	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-	-

2007: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2007: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	10	67.224	78.38	4
OTB_DEF_100-119_0_0_all	4	20.018	100	1
GNS_DEF_all_0_0_all	5	4.632	-	-
OTB_CRU_90-119_0_0_all	3	2.629	74.42	1
SSC_DEF_≥120_0_0_all	2	2.593	1.28	1
LLS_FIF_0_0_0_all	3	0.757	-	-
OTB_CRU_32-69_0_0_all	3	0.689	22.65	1
OTB_CRU_70-99_0_0_all	6	0.655	99.16	2
OTB_DEF	1	0.313	-	-
MIS_MIS_0_0_0_HC	10	0.241	13.04	1
TBB_DEF_≥120_0_0_all	5	0.095	0.86	1
SDN_DEF_≥120_0_0_all	2	0.064	57.52	1
GNS_DEF_120-219_0_0_all	2	0.054	90.2	1
GNS_DEF	1	0.01	-	-
OTB_SPF_32-69_0_0_all	2	0.01	85.98	1
MIS_MIS_0_0_0_IBC	2	0.007	-	-
FPO_CRU_0_0_0_all	2	0.002	-	-
GTR_DEF_all_0_0_all	1	0.002	-	-
TBB_DEF_70-99_0_0_all	4	0.002	-	-
GNS_DEF_≥220_0_0_all	1	0.001	18.3	1
OTB_CRU_70-89_2_35_all	2	0.001	58.13	1
GNS_DEF_100-119_0_0_all	2	0	97.79	1
MIS_MIS	1	0	-	-
OTB_CRU_32-69_2_22_all	1	0	-	-
OTM_DEF_100-119_0_0_all	1	0	-	-
TBB_DEF_100-119_0_0_all	2	0	-	-
TBB_DEF_90-99_0_0_all	1	0	100	1

Table 2. 2007 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IIIaN	3	45.842	64.61	2
OTB_CRU_90-119_0_0_all	IIIaN	3	41.352	74.42	1
OTB_CRU_32-69_0_0_all	IIIaN	3	6.897	29.31	1
GNS_DEF_all_0_0_all	IIIaN	3	2.73	-	-
MIS_MIS_0_0_0_HC	IIIaN	5	1.48	26.78	1
SDN_DEF_≥120_0_0_all	IIIaN	2	0.501	96.17	1
SSC_DEF_≥120_0_0_all	IIIaN	2	0.454	99.95	1
GNS_DEF_120-219_0_0_all	IIIaN	1	0.446	100	1
LLS_FIF_0_0_0_all	IIIaN	2	0.186	-	-
OTB_SPF_32-69_0_0_all	IIIaN	1	0.058	100	1
GTR_DEF_all_0_0_all	IIIaN	1	0.028	-	-
OTB_CRU_70-89_2_35_all	IIIaN	2	0.014	58.13	1
TBB_DEF_≥120_0_0_all	IIIaN	2	0.006	95.37	1
GNS_DEF_100-119_0_0_all	IIIaN	1	0.003	100	1
OTB_CRU_32-69_2_22_all	IIIaN	1	0.002	-	-
GNS_DEF_≥220_0_0_all	IIIaN	1	0.001	100	1
TBB_DEF_90-99_0_0_all	IIIaN	1	0.001	100	1
FPO_CRU_0_0_0_all	IIIaN	1	0	-	-
MIS_MIS_0_0_0_IBC	IIIaN	1	0	-	-

Table 3. 2007 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	10	71.66	79.82	4
OTB_DEF_100-119_0_0_all	IV	3	18.15	100	1
GNS_DEF_all_0_0_all	IV	4	5.122	-	-
SSC_DEF_≥120_0_0_all	IV	2	2.946	0.17	1
LLS_FIF_0_0_0_all	IV	3	0.822	-	-
OTB_CRU_70-99_0_0_all	IV	5	0.749	99.52	2
OTB_CRU_32-69_0_0_all	IV	3	0.288	10.98	1
TBB_DEF_≥120_0_0_all	IV	5	0.108	0.49	1
MIS_MIS_0_0_0_HC	IV	6	0.067	10.68	1
SDN_DEF_≥120_0_0_all	IV	2	0.037	19.05	1
GNS_DEF_120-219_0_0_all	IV	2	0.03	79.49	1
MIS_MIS_0_0_0_IBC	IV	2	0.008	-	-
OTB_SPF_32-69_0_0_all	IV	2	0.007	77.5	1
FPO_CRU_0_0_0_all	IV	1	0.003	-	-
TBB_DEF_70-99_0_0_all	IV	4	0.002	-	-
GNS_DEF_≥220_0_0_all	IV	1	0.001	10.72	1
GNS_DEF_100-119_0_0_all	IV	2	0	93.86	1
TBB_DEF_100-119_0_0_all	IV	2	0	-	-

Table 4. 2007 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_100-119_0_0_all	VI	2	63.996	100	1
OTB_DEF_≥120_0_0_all	VI	5	29.268	52.45	1
OTB_DEF	VI	1	4.754	-	-
MIS_MIS_0_0_0_HC	VI	6	1.343	-	-
LLS_FIF_0_0_0_all	VI	2	0.442	-	-
GNS_DEF	VI	1	0.146	-	-
OTB_CRU_70-99_0_0_all	VI	3	0.041	11.32	1
MIS_MIS	VI	1	0.006	-	-
OTM_DEF_100-119_0_0_all	VI	1	0.004	-	-

2007: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2007: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	4	92.851	1.66	1
OTB_CRU_90-119_0_0_all	2	3.317	92.96	1
OTB_CRU_70-99_0_0_all	3	2.974	-	-
OTB	1	0.817	-	-
MIS_MIS_0_0_0_HC	1	0.015	-	-
OTB_CRU_70-89_2_35_all	2	0.015	-	-
SSC_DEF_≥120_0_0_all	1	0.006	-	-
SDN_DEF_≥120_0_0_all	1	0.005	48.9	1
OTB_CRU_32-69_2_22_all	1	0	-	-

Table 2. 2007 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	2	3.317	92.96	1
OTB_DEF_≥120_0_0_all	IIIaN	2	0.938	31.04	1
MIS_MIS_0_0_0_HC	IIIaN	1	0.015	-	-
OTB_CRU_70-89_2_35_all	IIIaN	2	0.015	-	-
SDN_DEF_≥120_0_0_all	IIIaN	1	0.002	66.53	1
OTB_CRU_32-69_2_22_all	IIIaN	1	0	-	-
SSC_DEF_≥120_0_0_all	IIIaN	1	0	-	-

Table 3. 2007 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	4	87.71	1.42	1
OTB_CRU_70-99_0_0_all	IV	3	2.906	-	-
SSC_DEF_≥120_0_0_all	IV	1	0.006	-	-
SDN_DEF_≥120_0_0_all	IV	1	0.003	36.86	1
MIS_MIS_0_0_0_HC	IV	1	0	-	-

Table 4. 2007 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	1	4.202	-	-
OTB	VI	1	0.817	-	-
OTB_CRU_70-99_0_0_all	VI	1	0.068	-	-

2008: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2008: Proportion of landings by area and season.

Area	1	2	3	4	2008
IIIaN	0.54	2.01	1.16	2.59	0
IV	25.19	28.36	23.99	10.57	0.09
VI	1.18	2	1.17	1.16	0.02

Table 2. 2008: Proportion of landings by métier and nation.

Fleet	BEL	DEN	FO	FRA	GFR	IRL	NED	NOR	POL	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	0.001	-	0	0	-	-
GNS_DEF	-	-	-	-	-	0.001	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.041	-	0.292	-	-	0	-	-	-	-	-	-
GNS_DEF_all_0_0_all	0	-	-	-	0.001	-	-	3.39	-	0.003	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	0.001	0	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	0.546	-	0	-	-	-
MIS_MIS	-	-	-	-	-	0.007	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	0.044	0.107	0.002	-	-	0.001	0.001	-	0	-	-	0.029
MIS_MIS_0_0_0_IBC	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_32-69_0_0_all	-	0.179	-	-	-	-	-	0.386	-	0.112	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	0.01	-	-	0	-	-	-	-	-	0.001	-	0.426
OTB_CRU_90-119_0_0_all	-	2.261	-	-	0.57	-	-	-	-	0.423	-	-	-
OTB_DEF	-	-	-	-	-	0.229	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	0	4.255	-	0	11.154	-	0	44.624	1.154	0.803	1.448	-	10.208
OTB_DEF_100-119_0_0_all	0	-	-	15.672	-	-	0	-	-	-	-	-	-
OTB_DEF_70-99_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-
OTB_DWS_≥120_0_0_all	-	-	-	0	-	-	-	-	-	-	-	-	-
OTB_DWS_100-119_0_0_all	-	-	-	0.133	-	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	0.001	-	-	0.001	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	0	-
OTT_DEF_100-119_0_0_all	-	-	-	0.037	-	-	-	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	0.027	-	-	-	-	-	0.018	-	0	-	-	-
SSC_DEF_≥120_0_0_all	-	0.014	-	-	-	-	-	1.377	-	-	-	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	-	-	0	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0.005	0	-	-	-	-	0	-	-	-	0	-	-
TBB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	0	-	0	-	-	-	0	-	-

Table 3. 2008: Proportion of landings by nation.

BEL	DEN	FO	FRA	GFR	IRL	NED	NOR	POL	SWE	UKE	UKNI	UKS
0	6.8	0.1	16.1	11.7	0.2	0	50.3	1.2	1.3	1.4	0	10.7

Table 4. 2008: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
FPO_CRU_0_0_0_all	0	1	0.001	2	-	-
GNS_DEF	-	-	-	-	0.001	1
GNS_DEF_≥220_0_0_all	0	1	0	1	-	-
GNS_DEF_100-119_0_0_all	0	1	0	1	-	-
GNS_DEF_120-219_0_0_all	0.017	1	0.024	2	0.292	1
GNS_DEF_all_0_0_all	0.186	3	3.207	4	-	-
GTR_DEF_all_0_0_all	0.001	1	0	1	-	-
LLS_FIF_0_0_0_all	0.012	2	0.473	2	0.061	1
MIS_MIS	-	-	-	-	0.007	1
MIS_MIS_0_0_0_HC	0.042	4	0.117	4	0.025	4
MIS_MIS_0_0_0_IBC	0	1	0	1	-	-
OTB_CRU_32-69_0_0_all	0.443	3	0.234	3	-	-
OTB_CRU_32-69_2_22_all	0	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0	1	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.436	5	0.001	2
OTB_CRU_90-119_0_0_all	3.254	3	-	-	-	-
OTB_DEF	-	-	-	-	0.229	1
OTB_DEF_≥120_0_0_all	2.294	3	68.81	9	2.545	5
OTB_DEF_100-119_0_0_all	-	-	13.485	3	2.188	1
OTB_DEF_70-99_0_0_all	-	-	0	1	-	-
OTB_DWS_≥120_0_0_all	-	-	-	-	0	1
OTB_DWS_100-119_0_0_all	-	-	-	-	0.133	1
OTB_SPF_32-69_0_0_all	0.001	1	0.001	2	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	0	1
OTT_DEF_100-119_0_0_all	-	-	-	-	0.037	1
SDN_DEF_≥120_0_0_all	0.028	2	0.017	3	-	-
SSC_DEF_≥120_0_0_all	0.014	2	1.377	2	-	-
SSC_DEF_100-119_0_0_all	-	-	0	1	-	-
TBB_DEF_≥120_0_0_all	0	1	0.006	4	-	-
TBB_DEF_100-119_0_0_all	-	-	0	1	-	-
TBB_DEF_70-99_0_0_all	-	-	0	4	-	-

Table 5. 2008: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	10	73.648	74
OTB_DEF_100-119_0_0_all	3	15.673	89
GNS_DEF_all_0_0_all	5	3.393	93
OTB_CRU_90-119_0_0_all	3	3.254	96
SSC_DEF_≥120_0_0_all	2	1.391	97
OTB_CRU_32-69_0_0_all	3	0.677	98
LLS_FIF_0_0_0_all	2	0.546	99
OTB_CRU_70-99_0_0_all	5	0.437	99
GNS_DEF_120-219_0_0_all	3	0.333	99
OTB_DEF	1	0.229	100
MIS_MIS_0_0_0_HC	7	0.183	100
OTB_DWS_100-119_0_0_all	1	0.133	100
SDN_DEF_≥120_0_0_all	3	0.045	100
OTT_DEF_100-119_0_0_all	1	0.037	100
MIS_MIS	1	0.007	100
TBB_DEF_≥120_0_0_all	4	0.006	100
OTB_SPF_32-69_0_0_all	3	0.002	100
FPO_CRU_0_0_0_all	3	0.001	100
GNS_DEF	1	0.001	100
GTR_DEF_all_0_0_all	2	0.001	100
GNS_DEF_≥220_0_0_all	1	0	100
GNS_DEF_100-119_0_0_all	1	0	100
MIS_MIS_0_0_0_IBC	1	0	100
OTB_CRU_32-69_2_22_all	1	0	100
OTB_CRU_70-89_2_35_all	1	0	100
OTB_DEF_70-99_0_0_all	1	0	100
OTB_DWS_≥120_0_0_all	1	0	100
OTM_DEF_100-119_0_0_all	1	0	100
SSC_DEF_100-119_0_0_all	1	0	100
TBB_DEF_100-119_0_0_all	1	0	100
TBB_DEF_70-99_0_0_all	4	0	100

2008: Appendix B: Age coverage of landings and discards

Table 1. 2008: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	88.07
Discards	7.58

Table 2. 2008: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	68.21	4.38	0
Landings	48.82	93.63	43.86

Table 3. 2008: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2008
Discards	IIIaN	78.81	82.9	-	32.33	-
Discards	IV	97.41	87.48	92.21	0.56	-
Discards	VI	-	-	-	-	-
Landings	IIIaN	54.37	49.03	68.03	38.92	-
Landings	IV	92.43	92.81	95.78	94.62	-
Landings	VI	34.97	53.71	33.15	47.4	-

Table 4. 2008: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	FO	FRA	GFR	IRL	NED	NOR	POL	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	0	-	0	0	-	-
GNS_DEF	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	100	-	0	-	-	0	-	-	-	-	-	-
GNS_DEF_all_0_0_all	0	-	-	-	0	-	-	94.59	-	0	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	0	0	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	0	-	0	-	-	-
MIS_MIS	-	-	-	-	-	0	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	100	0	0	-	-	0	0	-	0	-	-	0
MIS_MIS_0_0_0_IBC	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_32-69_0_0_all	-	100	-	-	-	-	-	0	-	0	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	100	-	-	0	-	-	-	-	-	0	-	99.98
OTB_CRU_90-119_0_0_all	-	100	-	-	0	-	-	-	-	0	-	-	-
OTB_DEF	-	-	-	-	-	0	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	0	100	-	0	89.6	-	0	98.41	0	0	0	-	100
OTB_DEF_100-119_0_0_all	0	-	-	86.04	-	-	0	-	-	-	-	-	-
OTB_DEF_70-99_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-
OTB_DWS_≥120_0_0_all	-	-	-	0	-	-	-	-	-	-	-	-	-
OTB_DWS_100-119_0_0_all	-	-	-	0	-	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	100	-	-	0	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	0	-
OTT_DEF_100-119_0_0_all	-	-	-	0	-	-	-	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	100	-	-	-	-	-	0	-	0	-	-	-
SSC_DEF_≥120_0_0_all	-	100	-	-	-	-	-	0	-	-	-	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	-	-	0	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0	100	-	-	-	-	0	-	-	-	0	-	-
TBB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	0	-	0	-	-	-	0	-	-

Table 5. 2008: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	FO	FRA	GFR	IRL	NED	NOR	POL	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	0	–	0	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB	–	–	–	–	–	0	–	–	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-89_2_35_all	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-99_0_0_all	–	0	–	–	–	–	–	–	–	–	0	–	0
OTB_CRU_90-119_0_0_all	–	98.92	–	–	–	–	–	–	–	0	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	86.88	–	–	46.57	–	–	–	–	–	0	–	0
OTB_DEF_100-119_0_0_all	–	–	–	0	–	–	–	–	–	–	–	–	–
OTB_DEF_70-99_0_0_all	–	–	–	0	–	–	–	–	–	–	–	–	–
OTB_DWS_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DWS_100-119_0_0_all	–	–	–	0	–	–	–	–	–	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
OTM_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
OTT_DEF_100-119_0_0_all	–	–	–	0	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 6. 2008: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	POL	UKE	UKS
GNS_DEF_all_0_0_all	-	-	-	94.6	-	-	-
OTB_CRU_90-119_0_0_all	100	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	100	-	89.6	98.4	0	0	100
OTB_DEF_100-119_0_0_all	-	86	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-	-

2008: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2008: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	10	73.648	92.84	4
OTB_DEF_100-119_0_0_all	3	15.673	86.03	1
GNS_DEF_all_0_0_all	5	3.393	94.5	1
OTB_CRU_90-119_0_0_all	3	3.254	69.48	1
SSC_DEF_≥120_0_0_all	2	1.391	0.98	1
OTB_CRU_32-69_0_0_all	3	0.677	26.45	1
LLS_FIF_0_0_0_all	2	0.546	-	-
OTB_CRU_70-99_0_0_all	5	0.437	99.7	2
GNS_DEF_120-219_0_0_all	3	0.333	12.35	1
OTB_DEF	1	0.229	-	-
MIS_MIS_0_0_0_HC	7	0.183	23.94	1
OTB_DWS_100-119_0_0_all	1	0.133	-	-
SDN_DEF_≥120_0_0_all	3	0.045	60.49	1
OTT_DEF_100-119_0_0_all	1	0.037	-	-
MIS_MIS	1	0.007	-	-
TBB_DEF_≥120_0_0_all	4	0.006	6.11	1
OTB_SPF_32-69_0_0_all	3	0.002	44.49	1
FPO_CRU_0_0_0_all	3	0.001	-	-
GNS_DEF	1	0.001	-	-
GTR_DEF_all_0_0_all	2	0.001	-	-
GNS_DEF_≥220_0_0_all	1	0	100	1
GNS_DEF_100-119_0_0_all	1	0	100	1
MIS_MIS_0_0_0_IBC	1	0	-	-
OTB_CRU_32-69_2_22_all	1	0	-	-
OTB_CRU_70-89_2_35_all	1	0	-	-
OTB_DEF_70-99_0_0_all	1	0	-	-
OTB_DWS_≥120_0_0_all	1	0	-	-
OTM_DEF_100-119_0_0_all	1	0	-	-
SSC_DEF_100-119_0_0_all	1	0	-	-
TBB_DEF_100-119_0_0_all	1	0	-	-
TBB_DEF_70-99_0_0_all	4	0	-	-

Table 2. 2008 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	3	51.722	69.48	1
OTB_DEF_≥120_0_0_all	IIIaN	3	36.457	23.9	1
OTB_CRU_32-69_0_0_all	IIIaN	3	7.042	37.1	1
GNS_DEF_all_0_0_all	IIIaN	3	2.957	-	-
MIS_MIS_0_0_0_HC	IIIaN	4	0.661	98.52	1
SDN_DEF_≥120_0_0_all	IIIaN	2	0.442	89.5	1
GNS_DEF_120-219_0_0_all	IIIaN	1	0.272	100	1
SSC_DEF_≥120_0_0_all	IIIaN	2	0.217	99.95	1
LLS_FIF_0_0_0_all	IIIaN	2	0.196	-	-
GTR_DEF_all_0_0_all	IIIaN	1	0.018	-	-
OTB_SPF_32-69_0_0_all	IIIaN	1	0.014	100	1
TBB_DEF_≥120_0_0_all	IIIaN	1	0.001	100	1
FPO_CRU_0_0_0_all	IIIaN	1	0	-	-
GNS_DEF_≥220_0_0_all	IIIaN	1	0	100	1
GNS_DEF_100-119_0_0_all	IIIaN	1	0	100	1
MIS_MIS_0_0_0_IBC	IIIaN	1	0	-	-
OTB_CRU_32-69_2_22_all	IIIaN	1	0	-	-
OTB_CRU_70-89_2_35_all	IIIaN	1	0	-	-

Table 3. 2008 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	9	78.025	95.05	4
OTB_DEF_100-119_0_0_all	IV	3	15.291	99.99	1
GNS_DEF_all_0_0_all	IV	4	3.637	99.98	1
SSC_DEF_≥120_0_0_all	IV	2	1.562	0	1
LLS_FIF_0_0_0_all	IV	2	0.536	-	-
OTB_CRU_70-99_0_0_all	IV	5	0.494	99.75	2
OTB_CRU_32-69_0_0_all	IV	3	0.266	6.31	1
MIS_MIS_0_0_0_HC	IV	4	0.133	2.42	1
GNS_DEF_120-219_0_0_all	IV	2	0.027	99.93	1
SDN_DEF_≥120_0_0_all	IV	3	0.02	13.74	1
TBB_DEF_≥120_0_0_all	IV	4	0.006	4.84	1
FPO_CRU_0_0_0_all	IV	2	0.002	-	-
OTB_SPF_32-69_0_0_all	IV	2	0.001	-	-
GNS_DEF_≥220_0_0_all	IV	1	0	100	1
GNS_DEF_100-119_0_0_all	IV	1	0	100	1
GTR_DEF_all_0_0_all	IV	1	0	-	-
MIS_MIS_0_0_0_IBC	IV	1	0	-	-
OTB_DEF_70-99_0_0_all	IV	1	0	-	-
SSC_DEF_100-119_0_0_all	IV	1	0	-	-
TBB_DEF_100-119_0_0_all	IV	1	0	-	-
TBB_DEF_70-99_0_0_all	IV	4	0	-	-

Table 4. 2008 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	5	46.112	95.06	1
OTB_DEF_100-119_0_0_all	VI	1	39.649	-	-
GNS_DEF_120-219_0_0_all	VI	1	5.291	-	-
OTB_DEF	VI	1	4.158	-	-
OTB_DWS_100-119_0_0_all	VI	1	2.416	-	-
LLS_FIF_0_0_0_all	VI	1	1.102	-	-
OTT_DEF_100-119_0_0_all	VI	1	0.663	-	-
MIS_MIS_0_0_0_HC	VI	4	0.445	-	-
MIS_MIS	VI	1	0.121	-	-
OTB_CRU_70-99_0_0_all	VI	2	0.027	83.36	1
GNS_DEF	VI	1	0.009	-	-
OTM_DEF_100-119_0_0_all	VI	1	0.008	-	-
OTB_DWS_≥120_0_0_all	VI	1	0	-	-

2008: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2008: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	4	90.313	4.62	2
OTB_CRU_70-99_0_0_all	3	4.329	-	-
OTB_CRU_90-119_0_0_all	2	3.523	96.62	1
OTB_CRU_32-69_0_0_all	1	1.732	-	-
OTB	1	0.059	-	-
GNS_DEF_120-219_0_0_all	1	0.033	-	-
MIS_MIS_0_0_0_HC	2	0.005	-	-
OTB_CRU_70-89_2_35_all	1	0.003	-	-
OTB_DEF_100-119_0_0_all	1	0.002	-	-
OTT_DEF_100-119_0_0_all	1	0.002	-	-
GNS_DEF_≥220_0_0_all	1	0	-	-
GNS_DEF_100-119_0_0_all	1	0	-	-
OTB_CRU_32-69_2_22_all	1	0	-	-
OTB_DEF_70-99_0_0_all	1	0	-	-
OTB_DWS_100-119_0_0_all	1	0	-	-
SDN_DEF_≥120_0_0_all	1	0	-	-
SSC_DEF_≥120_0_0_all	1	0	-	-

Table 2. 2008 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	2	3.523	96.62	1
OTB_CRU_32-69_0_0_all	IIIaN	1	1.732	-	-
OTB_DEF_≥120_0_0_all	IIIaN	1	0.604	98.54	1
OTB_CRU_70-89_2_35_all	IIIaN	1	0.003	-	-
MIS_MIS_0_0_0_HC	IIIaN	1	0.001	-	-
OTB_CRU_32-69_2_22_all	IIIaN	1	0	-	-
SDN_DEF_≥120_0_0_all	IIIaN	1	0	-	-
SSC_DEF_≥120_0_0_all	IIIaN	1	0	-	-

Table 3. 2008 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	4	78.817	4.54	2
OTB_CRU_70-99_0_0_all	IV	3	2.987	-	-
GNS_DEF_120-219_0_0_all	IV	1	0.033	-	-
MIS_MIS_0_0_0_HC	IV	1	0.005	-	-
GNS_DEF_≥220_0_0_all	IV	1	0	-	-
GNS_DEF_100-119_0_0_all	IV	1	0	-	-
SDN_DEF_≥120_0_0_all	IV	1	0	-	-
SSC_DEF_≥120_0_0_all	IV	1	0	-	-

Table 4. 2008 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	1	10.892	-	-
OTB_CRU_70-99_0_0_all	VI	1	1.342	-	-
OTB	VI	1	0.059	-	-
OTB_DEF_100-119_0_0_all	VI	1	0.002	-	-
OTT_DEF_100-119_0_0_all	VI	1	0.002	-	-
MIS_MIS_0_0_0_HC	VI	1	0	-	-
OTB_DEF_70-99_0_0_all	VI	1	0	-	-
OTB_DWS_100-119_0_0_all	VI	1	0	-	-

2009: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2009: Proportion of landings by area and season.

Area	1	2	3	4	2009
IIIaN	1.23	2.98	1.12	1.29	0
IV	29.53	30.6	17.64	9.22	0.74
VI	0.61	0.91	0.65	0.44	3.05

Table 2. 2009: Proportion of landings by métier and nation.

Fleet	BEL	DEN	FO	FRA	GFR	IRL	NED	NOR	POL	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	0.07	-	0	-	-	-
GNS_DEF	-	-	-	-	-	0.001	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	0.001	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.064	-	0.084	-	-	0	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all_FDF	-	0.001	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	0.001	-	-	4.889	-	0.007	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	0.005	0	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	0.465	-	0.005	-	-	-
MIS_MIS	-	-	-	-	-	0	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	0	0.037	0.791	-	-	-	0	0.001	-	0	-	-	0.019
MIS_MIS_0_0_0_IBC	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_32-69_0_0_all	-	0.29	-	-	-	-	-	0.284	-	0.191	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	0.013	-	-	-
OTB_CRU_70-89_2_35_all	-	0.003	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	0.005	-	-	0	-	-	-	-	-	0	-	0.334
OTB_CRU_90-119_0_0_all	-	2.383	-	-	0.837	-	-	-	-	0.311	-	-	-
OTB_CRU_90-119_0_0_all_FDF	-	0.038	-	-	-	-	-	-	-	-	-	-	-
OTB_DEF	-	-	-	-	-	0.357	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	0.022	4.345	-	0	11.213	-	0.002	42.272	0.773	0.662	2.046	-	11.672
OTB_DEF_≥120_0_0_all_FDF	-	0.817	-	-	-	-	-	-	-	-	-	-	-
OTB_DEF_100-119_0_0_all	0	-	-	11.501	-	-	-	-	-	-	-	0	-
OTB_DEF_70-99_0_0_all	-	-	-	0.001	-	-	-	-	-	-	-	-	-
OTB_DWS_≥120_0_0_all	-	-	-	0	-	-	-	-	-	-	-	-	-
OTB_DWS_100-119_0_0_all	-	-	-	0.279	-	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	-	-	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	0	-
OTT_DEF_100-119_0_0_all	-	-	-	0.014	-	-	-	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	0.026	-	-	-	-	-	0.041	-	-	-	-	-
SDN_DEF_≥120_0_0_all_FDF	-	0.004	-	-	-	-	-	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	0.008	-	-	-	-	-	2.799	-	-	-	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	-	-	0.012	-	-	-	-	-	-
SSC_DEF_All_0_0_All	-	-	-	-	-	-	-	-	-	-	0	-	-
TBB_DEF_≥120_0_0_all	0.002	-	-	-	-	-	-	-	-	-	0	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	0	-	-	-	-	-	0	-	-
TBB_DEF_90-99_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-

Table 3. 2009: Proportion of landings by nation.

BEL	DEN	FO	FRA	GFR	IRL	NED	NOR	POL	SWE	UKE	UKNI	UKS
0	8	0.8	11.9	12.1	0.4	0	50.8	0.8	1.2	2	0	12

Table 4. 2009: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
FPO_CRU_0_0_0_all	0	1	0.07	1	-	-
GNS_DEF	-	-	-	-	0.001	1
GNS_DEF_≥220_0_0_all	0	1	0	1	-	-
GNS_DEF_100-119_0_0_all	0	1	0	1	-	-
GNS_DEF_120-219_0_0_all	0.023	1	0.04	2	0.084	1
GNS_DEF_120-219_0_0_all_FDF	0.001	1	-	-	-	-
GNS_DEF_all_0_0_all	0.17	3	4.727	3	-	-
GTR_DEF_all_0_0_all	0.005	1	0	1	-	-
LLS_FIF_0_0_0_all	0.011	2	0.404	2	0.055	1
MIS_MIS	-	-	0	1	-	-
MIS_MIS_0_0_0_HC	0.036	4	0.754	6	0.057	2
MIS_MIS_0_0_0_IBC	0	1	0	1	-	-
OTB_CRU_32-69_0_0_all	0.509	3	0.257	3	-	-
OTB_CRU_32-69_2_22_all	0.013	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0.003	2	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.325	5	0.015	1
OTB_CRU_90-119_0_0_all	3.532	3	-	-	-	-
OTB_CRU_90-119_0_0_all_FDF	0.038	1	-	-	-	-
OTB_DEF	-	-	-	-	0.357	1
OTB_DEF_≥120_0_0_all	2.246	3	67.448	9	3.312	5
OTB_DEF_≥120_0_0_all_FDF	0.001	1	0.816	1	-	-
OTB_DEF_100-119_0_0_all	-	-	10.021	2	1.481	2
OTB_DEF_70-99_0_0_all	-	-	-	-	0.001	1
OTB_DWS_≥120_0_0_all	-	-	-	-	0	1
OTB_DWS_100-119_0_0_all	-	-	-	-	0.279	1
OTB_SPF_32-69_0_0_all	-	-	0	1	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	0	1
OTT_DEF_100-119_0_0_all	-	-	-	-	0.014	1
SDN_DEF_≥120_0_0_all	0.021	2	0.046	2	-	-
SDN_DEF_≥120_0_0_all_FDF	0.004	1	-	-	-	-
SSC_DEF_≥120_0_0_all	0.006	2	2.802	2	-	-
SSC_DEF_100-119_0_0_all	-	-	0.012	1	-	-
SSC_DEF_All_0_0_All	-	-	0	1	-	-
TBB_DEF_≥120_0_0_all	-	-	0.002	2	-	-
TBB_DEF_70-99_0_0_all	-	-	0	3	-	-
TBB_DEF_90-99_0_0_all	0	1	-	-	-	-

Table 5. 2009: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	10	73.006	73
OTB_DEF_100-119_0_0_all	3	11.501	85
GNS_DEF_all_0_0_all	4	4.897	89
OTB_CRU_90-119_0_0_all	3	3.532	93
SSC_DEF_≥120_0_0_all	2	2.807	96
MIS_MIS_0_0_0_HC	7	0.848	97
OTB_DEF_≥120_0_0_all_FDF	1	0.817	97
OTB_CRU_32-69_0_0_all	3	0.766	98
LLS_FIF_0_0_0_all	2	0.47	99
OTB_DEF	1	0.357	99
OTB_CRU_70-99_0_0_all	5	0.34	99
OTB_DWS_100-119_0_0_all	1	0.279	100
GNS_DEF_120-219_0_0_all	3	0.148	100
FPO_CRU_0_0_0_all	2	0.07	100
SDN_DEF_≥120_0_0_all	2	0.067	100
OTB_CRU_90-119_0_0_all_FDF	1	0.038	100
OTT_DEF_100-119_0_0_all	1	0.014	100
OTB_CRU_32-69_2_22_all	1	0.013	100
SSC_DEF_100-119_0_0_all	1	0.012	100
GTR_DEF_all_0_0_all	2	0.005	100
SDN_DEF_≥120_0_0_all_FDF	1	0.004	100
OTB_CRU_70-89_2_35_all	2	0.003	100
TBB_DEF_≥120_0_0_all	2	0.002	100
GNS_DEF	1	0.001	100
GNS_DEF_100-119_0_0_all	1	0.001	100
GNS_DEF_120-219_0_0_all_FDF	1	0.001	100
OTB_DEF_70-99_0_0_all	1	0.001	100
GNS_DEF_≥220_0_0_all	1	0	100
MIS_MIS	1	0	100
MIS_MIS_0_0_0_IBC	1	0	100
OTB_DWS_≥120_0_0_all	1	0	100
OTB_SPF_32-69_0_0_all	1	0	100
OTM_DEF_100-119_0_0_all	1	0	100
SSC_DEF_All_0_0_All	1	0	100
TBB_DEF_70-99_0_0_all	3	0	100
TBB_DEF_90-99_0_0_all	1	0	100

2009: Appendix B: Age coverage of landings and discards

Table 1. 2009: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	74.69
Discards	95.16

Table 2. 2009: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	25.83	99.38	99.37
Landings	62.07	77.06	52.61

Table 3. 2009: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2009
Discards	IIIaN	29.58	7.39	51.35	13.91	-
Discards	IV	54.11	-	-	18.22	100
Discards	VI	-	-	-	-	99.73
Landings	IIIaN	64.2	56.27	48.21	85.65	-
Landings	IV	93.2	89.62	36.93	66.65	-
Landings	VI	-	-	-	-	97.63

Table 4. 2009: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	FO	FRA	GFR	IRL	NED	NOR	POL	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	0	-	0	-	-	-
GNS_DEF	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	100	-	0	-	-	0	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	0	-	-	69.08	-	0	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	0	0	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	0	-	0	-	-	-
MIS_MIS	-	-	-	-	-	0	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	0	100	0	-	-	-	0	0	-	0	-	-	0
MIS_MIS_0_0_0_IBC	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_32-69_0_0_all	-	100	-	-	-	-	-	0	-	0	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	100	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	100	-	-	0	-	-	-	-	-	0	-	95.39
OTB_CRU_90-119_0_0_all	-	100	-	-	0	-	-	-	-	0	-	-	-
OTB_CRU_90-119_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-
OTB_DEF	-	-	-	-	-	0	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	0	100	-	0	97.05	-	0	71.9	0	0	0	-	100
OTB_DEF_≥120_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-
OTB_DEF_100-119_0_0_all	0	-	-	87.13	-	-	-	-	-	-	-	0	-
OTB_DEF_70-99_0_0_all	-	-	-	0	-	-	-	-	-	-	-	-	-
OTB_DWS_≥120_0_0_all	-	-	-	0	-	-	-	-	-	-	-	-	-
OTB_DWS_100-119_0_0_all	-	-	-	0	-	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	-	-	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	0	-
OTT_DEF_100-119_0_0_all	-	-	-	0	-	-	-	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	100	-	-	-	-	-	0	-	-	-	-	-
SDN_DEF_≥120_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	100	-	-	-	-	-	0	-	-	-	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	-	-	0	-	-	-	-	-	-
SSC_DEF_All_0_0_All	-	-	-	-	-	-	-	-	-	-	0	-	-
TBB_CRU_16-31_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0	-	-	-	-	-	-	-	-	-	0	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	0	-	-	-	-	-	0	-	-
TBB_DEF_90-99_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-

Table 5. 2009: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	FO	FRA	GFR	IRL	NED	NOR	POL	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	38.33	–	0	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all_FDF	–	64.07	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	3.33	–	0	–	–	–	–	–	–	–	–	0
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB	–	–	–	–	–	0	–	–	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	17.72	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-89_2_35_all	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	100
OTB_CRU_90-119_0_0_all	–	100	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_90-119_0_0_all_FDF	–	56.34	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	53.3	–	–	0.06	–	–	–	–	–	0	–	100
OTB_DEF_≥120_0_0_all_FDF	–	72.45	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_100-119_0_0_all	–	–	–	0	–	–	–	–	–	–	–	–	–
OTB_DEF_70-99_0_0_all	–	–	–	0	–	–	–	–	–	–	–	–	–
OTB_DWS_≥120_0_0_all	–	–	–	0	–	–	–	–	–	–	–	–	–
OTB_DWS_100-119_0_0_all	–	–	–	0	–	–	–	–	–	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
OTM_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
OTT_DEF_100-119_0_0_all	–	–	–	0	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	70.59	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_All_0_0_All	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_CRU_16-31_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_90-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 6. 2009: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	UKE	UKS
GNS_DEF_all_0_0_all	-	-	-	69.1	-	-
OTB_CRU_90-119_0_0_all	100	-	-	-	-	-
OTB_DEF_≥120_0_0_all	100	-	97.1	71.9	0	100
OTB_DEF_100-119_0_0_all	-	87.1	-	-	-	-
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-

2009: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2009: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	10	73.006	78.48	4
OTB_DEF_100-119_0_0_all	3	11.501	87.13	1
GNS_DEF_all_0_0_all	4	4.897	68.97	1
OTB_CRU_90-119_0_0_all	3	3.532	67.49	1
SSC_DEF_≥120_0_0_all	2	2.807	0.27	1
MIS_MIS_0_0_0_HC	7	0.848	4.33	1
OTB_DEF_≥120_0_0_all_FDF	1	0.817	100	1
OTB_CRU_32-69_0_0_all	3	0.766	37.89	1
LLS_FIF_0_0_0_all	2	0.47	-	-
OTB_DEF	1	0.357	-	-
OTB_CRU_70-99_0_0_all	5	0.34	95.35	2
OTB_DWS_100-119_0_0_all	1	0.279	-	-
GNS_DEF_120-219_0_0_all	3	0.148	42.96	1
FPO_CRU_0_0_0_all	2	0.07	-	-
SDN_DEF_≥120_0_0_all	2	0.067	39.07	1
OTB_CRU_90-119_0_0_all_FDF	1	0.038	100	1
OTT_DEF_100-119_0_0_all	1	0.014	-	-
OTB_CRU_32-69_2_22_all	1	0.013	-	-
SSC_DEF_100-119_0_0_all	1	0.012	-	-
GTR_DEF_all_0_0_all	2	0.005	-	-
SDN_DEF_≥120_0_0_all_FDF	1	0.004	100	1
OTB_CRU_70-89_2_35_all	2	0.003	100	1
TBB_DEF_≥120_0_0_all	2	0.002	-	-
GNS_DEF	1	0.001	-	-
GNS_DEF_100-119_0_0_all	1	0.001	100	1
GNS_DEF_120-219_0_0_all_FDF	1	0.001	100	1
OTB_DEF_70-99_0_0_all	1	0.001	-	-
GNS_DEF_≥220_0_0_all	1	0	100	1
MIS_MIS	1	0	-	-
MIS_MIS_0_0_0_IBC	1	0	-	-
OTB_DWS_≥120_0_0_all	1	0	-	-
OTB_SPF_32-69_0_0_all	1	0	-	-
OTM_DEF_100-119_0_0_all	1	0	-	-
SSC_DEF_All_0_0_All	1	0	-	-
TBB_DEF_70-99_0_0_all	3	0	-	-
TBB_DEF_90-99_0_0_all	1	0	100	1

Table 2. 2009 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	3	53.359	67.49	1
OTB_DEF_≥120_0_0_all	IIIaN	3	33.931	59.23	2
OTB_CRU_32-69_0_0_all	IIIaN	3	7.688	51.89	1
GNS_DEF_all_0_0_all	IIIaN	3	2.57	-	-
OTB_CRU_90-119_0_0_all_FDF	IIIaN	1	0.568	100	1
MIS_MIS_0_0_0_HC	IIIaN	4	0.549	93.39	1
GNS_DEF_120-219_0_0_all	IIIaN	1	0.352	100	1
SDN_DEF_≥120_0_0_all	IIIaN	2	0.316	99.98	1
OTB_CRU_32-69_2_22_all	IIIaN	1	0.203	-	-
LLS_FIF_0_0_0_all	IIIaN	2	0.163	-	-
SSC_DEF_≥120_0_0_all	IIIaN	2	0.084	88.66	1
GTR_DEF_all_0_0_all	IIIaN	1	0.07	-	-
SDN_DEF_≥120_0_0_all_FDF	IIIaN	1	0.066	100	1
OTB_CRU_70-89_2_35_all	IIIaN	2	0.042	100	1
OTB_DEF_≥120_0_0_all_FDF	IIIaN	1	0.02	100	1
GNS_DEF_120-219_0_0_all_FDF	IIIaN	1	0.017	100	1
FPO_CRU_0_0_0_all	IIIaN	1	0	-	-
GNS_DEF_≥220_0_0_all	IIIaN	1	0	100	1
GNS_DEF_100-119_0_0_all	IIIaN	1	0	100	1
MIS_MIS_0_0_0_IBC	IIIaN	1	0	-	-
TBB_DEF_90-99_0_0_all	IIIaN	1	0	100	1

Table 3. 2009 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	9	76.886	78.56	4
OTB_DEF_100-119_0_0_all	IV	2	11.423	100	1
GNS_DEF_all_0_0_all	IV	3	5.388	71.45	1
SSC_DEF_≥120_0_0_all	IV	2	3.194	0.1	1
OTB_DEF_≥120_0_0_all_FDF	IV	1	0.93	100	1
MIS_MIS_0_0_0_HC	IV	6	0.86	0.36	1
LLS_FIF_0_0_0_all	IV	2	0.46	-	-
OTB_CRU_70-99_0_0_all	IV	5	0.37	99.88	2
OTB_CRU_32-69_0_0_all	IV	3	0.293	10.19	1
FPO_CRU_0_0_0_all	IV	1	0.079	-	-
SDN_DEF_≥120_0_0_all	IV	2	0.052	11.3	1
GNS_DEF_120-219_0_0_all	IV	2	0.046	100	1
SSC_DEF_100-119_0_0_all	IV	1	0.014	-	-
TBB_DEF_≥120_0_0_all	IV	2	0.002	-	-
GNS_DEF_100-119_0_0_all	IV	1	0.001	100	1
MIS_MIS	IV	1	0.001	-	-
GNS_DEF_≥220_0_0_all	IV	1	0	100	1
GTR_DEF_all_0_0_all	IV	1	0	-	-
MIS_MIS_0_0_0_IBC	IV	1	0	-	-
OTB_SPF_32-69_0_0_all	IV	1	0	-	-
SSC_DEF_All_0_0_All	IV	1	0	-	-
TBB_DEF_70-99_0_0_all	IV	3	0	-	-

Table 4. 2009 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	5	58.552	89.85	1
OTB_DEF_100-119_0_0_all	VI	2	26.175	-	-
OTB_DEF	VI	1	6.318	-	-
OTB_DWS_100-119_0_0_all	VI	1	4.931	-	-
GNS_DEF_120-219_0_0_all	VI	1	1.491	-	-
MIS_MIS_0_0_0_HC	VI	2	1.007	-	-
LLS_FIF_0_0_0_all	VI	1	0.972	-	-
OTB_CRU_70-99_0_0_all	VI	1	0.272	-	-
OTT_DEF_100-119_0_0_all	VI	1	0.241	-	-
OTB_DEF_70-99_0_0_all	VI	1	0.019	-	-
GNS_DEF	VI	1	0.011	-	-
OTB_DWS_≥120_0_0_all	VI	1	0.006	-	-
OTM_DEF_100-119_0_0_all	VI	1	0.006	-	-

2009: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2009: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	4	75.373	99.13	3
OTB_CRU_70-99_0_0_all	1	19.065	100	1
OTB_CRU_90-119_0_0_all	2	2.904	42.91	1
OTB_CRU_32-69_0_0_all	2	2.35	0.15	1
GNS_DEF_120-219_0_0_all	2	0.111	28.04	1
OTB_DEF_≥120_0_0_all_FDF	1	0.064	72.45	1
GNS_DEF_120-219_0_0_all_FDF	1	0.06	64.07	1
OTB	1	0.034	-	-
OTB_CRU_90-119_0_0_all_FDF	1	0.018	56.34	1
OTB_DEF_100-119_0_0_all	1	0.015	-	-
OTB_CRU_70-89_2_35_all	1	0.003	-	-
MIS_MIS_0_0_0_HC	3	0.001	3.33	1
OTB_CRU_32-69_2_22_all	1	0	-	-
OTB_DEF_70-99_0_0_all	1	0	-	-
OTB_DWS_≥120_0_0_all	1	0	-	-
OTB_DWS_100-119_0_0_all	1	0	-	-
OTT_DEF_100-119_0_0_all	1	0	-	-
SDN_DEF_≥120_0_0_all	1	0	-	-
SDN_DEF_≥120_0_0_all_FDF	1	0	-	-
SSC_DEF_≥120_0_0_all	1	0	70.59	1
TBB_CRU_16-31_0_0_all	1	0	-	-

Table 2. 2009 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	2	2.904	42.91	1
OTB_CRU_32-69_0_0_all	IIIaN	2	2.35	0.15	1
OTB_DEF_≥120_0_0_all	IIIaN	2	0.307	45.24	1
GNS_DEF_120-219_0_0_all	IIIaN	1	0.081	38.33	1
GNS_DEF_120-219_0_0_all_FDF	IIIaN	1	0.06	64.07	1
OTB_CRU_90-119_0_0_all_FDF	IIIaN	1	0.018	56.34	1
OTB_DEF_≥120_0_0_all_FDF	IIIaN	1	0.014	97.8	1
OTB_CRU_70-89_2_35_all	IIIaN	1	0.003	-	-
MIS_MIS_0_0_0_HC	IIIaN	1	0.001	3.33	1
OTB_CRU_32-69_2_22_all	IIIaN	1	0	-	-
SDN_DEF_≥120_0_0_all	IIIaN	1	0	-	-
SDN_DEF_≥120_0_0_all_FDF	IIIaN	1	0	-	-
SSC_DEF_≥120_0_0_all	IIIaN	1	0	70.59	1

Table 3. 2009 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	4	64.188	99.24	3
OTB_CRU_70-99_0_0_all	IV	1	17.582	100	1
OTB_DEF_≥120_0_0_all_FDF	IV	1	0.05	65.28	1
MIS_MIS_0_0_0_HC	IV	1	0	-	-
SDN_DEF_≥120_0_0_all	IV	1	0	-	-
SSC_DEF_≥120_0_0_all	IV	1	0	-	-
TBB_CRU_16-31_0_0_all	IV	1	0	-	-

Table 4. 2009 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	1	10.878	100	1
OTB_CRU_70-99_0_0_all	VI	1	1.482	100	1
OTB	VI	1	0.034	-	-
GNS_DEF_120-219_0_0_all	VI	1	0.03	-	-
OTB_DEF_100-119_0_0_all	VI	1	0.015	-	-
MIS_MIS_0_0_0_HC	VI	2	0	-	-
OTB_DEF_70-99_0_0_all	VI	1	0	-	-
OTB_DWS_≥120_0_0_all	VI	1	0	-	-
OTB_DWS_100-119_0_0_all	VI	1	0	-	-
OTT_DEF_100-119_0_0_all	VI	1	0	-	-

2010: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2010: Proportion of landings by area and season.

Area	1	2	3	4	2010
IIIaN	1.15	1.73	1.68	1.36	0
IV	36.74	26.13	14.14	10.94	0.14
VI	0.74	0.78	1.04	0.31	3.12

Table 2. 2010: Proportion of landings by métier and nation.

Fleet	BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
DemIND	-	-	-	-	1.936	-	-	-	-	-	-	-	-	-	-
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	0.001	-	-	0	0	-	-
GNS_DEF	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all_FDF	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0.003	-	-	5.042	-	-	0.014	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	0.007	0	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	0.734	-	-	0.019	-	-	-
MIS_MIS	-	-	-	-	-	-	0.003	-	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	0.028	0.017	0.166	-	-	-	0.001	0.001	-	0.002	0	0	-	0.019
MIS_MIS_0_0_0_IBC	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_32-69_0_0_all	-	0.179	-	-	-	-	-	-	0.296	-	-	0.361	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	0.005	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	0.003	-	-	-	0	-	-	-	-	-	-	0.001	0	0.212
OTB_CRU_90-119_0_0_all	-	2.556	-	-	-	0.041	-	-	-	-	-	0.321	-	-	-
OTB_DEF	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	0.012	3.028	-	-	-	11.071	-	0.002	42.215	0.635	-	0.77	1.873	-	11.227
OTB_DEF_≥120_0_0_all_FDF	-	2.018	-	-	-	-	-	-	-	-	-	-	-	-	1.279
OTB_DEF_100-119_0_0_all	0	-	-	-	10.066	-	-	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
SDN_DEF_≥120_0_0_all	-	0.055	-	-	-	-	-	-	0.095	-	-	0.001	-	-	-
SSC_DEF_≥120_0_0_all	-	0.063	-	-	-	-	-	-	2.999	-	-	-	-	-	-
SSC_DEF_70-99_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0.002	0	-	-	-	-	-	-	-	-	-	-	0	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	-	-	-	-	0	-	-

Table 3. 2010: Proportion of landings by nation.

BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
0	8.1	0	0.2	12	11.1	0.5	0	51.4	0.6	0	1.5	1.9	0	12.7

Table 4. 2010: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
DemIND	-	-	-	-	1.936	1
FPO_CRU_0_0_0_all	0	1	0.001	2	-	-
GNS_DEF	-	-	-	-	0.001	1
GNS_DEF_≥220_0_0_all	0	1	0	1	-	-
GNS_DEF_100-119_0_0_all	0	1	0	1	-	-
GNS_DEF_120-219_0_0_all	0.07	1	0.05	1	-	-
GNS_DEF_120-219_0_0_all_FDF	0	1	0	1	-	-
GNS_DEF_all_0_0_all	0.189	2	4.871	3	-	-
GTR_DEF_all_0_0_all	0.007	1	0	1	-	-
LLS_FIF_0_0_0_all	0.019	2	0.62	2	0.113	1
MIS_MIS	-	-	-	-	0.003	1
MIS_MIS_0_0_0_HC	0.026	4	0.163	6	0.042	4
MIS_MIS_0_0_0_IBC	0	1	0	1	-	-
OTB_CRU_32-69_0_0_all	0.607	3	0.228	3	-	-
OTB_CRU_32-69_2_22_all	0	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0.005	2	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.216	5	0.001	2
OTB_CRU_90-119_0_0_all	2.918	3	-	-	-	-
OTB_DEF	-	-	-	-	0.5	1
OTB_DEF_≥120_0_0_all	1.819	3	65.629	9	3.384	3
OTB_DEF_≥120_0_0_all_FDF	0.219	1	3.078	2	-	-
OTB_DEF_100-119_0_0_all	-	-	10.066	2	-	-
OTB_SPF_32-69_0_0_all	-	-	0	1	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	0	1
SDN_DEF_≥120_0_0_all	0.048	1	0.102	3	-	-
SSC_DEF_≥120_0_0_all	0.006	1	3.056	2	-	-
SSC_DEF_70-99_0_0_all	-	-	0	1	-	-
TBB_DEF_≥120_0_0_all	-	-	0.002	3	-	-
TBB_DEF_70-99_0_0_all	-	-	0	3	-	-

Table 5. 2010: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	9	70.832	71
OTB_DEF_100-119_0_0_all	2	10.066	81
GNS_DEF_all_0_0_all	4	5.06	86
OTB_DEF_≥120_0_0_all_FDF	2	3.297	89
SSC_DEF_≥120_0_0_all	2	3.063	92
OTB_CRU_90-119_0_0_all	3	2.918	95
DemIND	1	1.936	97
OTB_CRU_32-69_0_0_all	3	0.836	98
LLS_FIF_0_0_0_all	2	0.753	99
OTB_DEF	1	0.5	99
MIS_MIS_0_0_0_HC	9	0.232	99
OTB_CRU_70-99_0_0_all	6	0.217	100
SDN_DEF_≥120_0_0_all	3	0.15	100
GNS_DEF_120-219_0_0_all	1	0.12	100
GTR_DEF_all_0_0_all	2	0.007	100
OTB_CRU_70-89_2_35_all	2	0.005	100
MIS_MIS	1	0.003	100
TBB_DEF_≥120_0_0_all	3	0.002	100
FPO_CRU_0_0_0_all	3	0.001	100
GNS_DEF	1	0.001	100
GNS_DEF_≥220_0_0_all	1	0	100
GNS_DEF_100-119_0_0_all	1	0	100
GNS_DEF_120-219_0_0_all_FDF	1	0	100
MIS_MIS_0_0_0_IBC	1	0	100
OTB_CRU_32-69_2_22_all	1	0	100
OTB_SPF_32-69_0_0_all	1	0	100
OTM_DEF_100-119_0_0_all	1	0	100
SSC_DEF_70-99_0_0_all	1	0	100
TBB_DEF_70-99_0_0_all	3	0	100

2010: Appendix B: Age coverage of landings and discards

Table 1. 2010: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	83.08
Discards	80.02

Table 2. 2010: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	17.01	94.11	98.32
Landings	62.06	84.45	83.72

Table 3. 2010: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2010
Discards	IIIaN	1.45	1.5	34.65	22.21	-
Discards	IV	4.14	99.03	98.43	47.52	100
Discards	VI	-	-	-	-	98.32
Landings	IIIaN	74.33	66.14	53.26	57.34	-
Landings	IV	95.28	87.82	56.48	77.3	-
Landings	VI	47.19	83.1	65.6	83.68	98.6

Table 4. 2010: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
DemIND	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	0	-	-	0	0	-	-
GNS_DEF	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	95.64	-	-	96.54	-	-	0	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	0	-	-	0	-	-	-
MIS_MIS	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	100	0	0	-	-	-	0	0	-	0	0	0	-	0
MIS_MIS_0_0_0_IBC	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_32-69_0_0_all	-	100	-	-	-	-	-	-	0	-	-	0	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	100	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	100	-	-	-	0	-	-	-	-	-	-	0	0	99.5
OTB_CRU_90-119_0_0_all	-	100	-	-	-	0	-	-	-	-	-	0	-	-	-
OTB_CRU_90-119_0_0_all_FDF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_DEF	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	0	100	-	-	-	95.94	-	0	82.55	0	-	0	0	-	100
OTB_DEF_≥120_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-	-	97.29
OTB_DEF_100-119_0_0_all	0	-	-	-	100	-	-	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTM_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
SDN_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	0	-	-	0	-	-	-
SSC_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	0	-	-	-	-	-	-
SSC_DEF_70-99_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_CRU_16-31_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0	100	-	-	-	-	-	-	-	-	-	-	0	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	-	-	-	-	0	-	-

Table 5. 2010: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	POL	RUS	SWE	UKE	UKNI	UKS
DemIND	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	74.79	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all_FDF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB	–	–	–	–	–	–	0	–	–	–	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	0	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-89_2_35_all	–	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-99_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	0	–	100
OTB_CRU_90-119_0_0_all	–	100	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_90-119_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	98.9	–	–	–	95.75	–	–	–	–	–	–	0	–	100
OTB_DEF_≥120_0_0_all_FDF	–	38.11	–	–	–	–	–	–	–	–	–	–	–	–	100
OTB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTM_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	51.75	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_CRU_16-31_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 6. 2010: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	UKE	UKS
DemIND	-	100	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	96.5	-	-
OTB_CRU_90-119_0_0_all	100	-	-	-	-	-
OTB_DEF_≥120_0_0_all	100	-	95.9	82.6	0	100
OTB_DEF_≥120_0_0_all_FDF	100	-	-	-	-	97.3
OTB_DEF_100-119_0_0_all	-	100	-	-	-	-
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-

2010: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2010: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	9	70.832	84.32	4
OTB_DEF_100-119_0_0_all	2	10.066	100	1
GNS_DEF_all_0_0_all	4	5.06	96.26	2
OTB_DEF_≥120_0_0_all_FDF	2	3.297	98.95	2
SSC_DEF_≥120_0_0_all	2	3.063	2.06	1
OTB_CRU_90-119_0_0_all	3	2.918	87.61	1
DemIND	1	1.936	100	1
OTB_CRU_32-69_0_0_all	3	0.836	21.41	1
LLS_FIF_0_0_0_all	2	0.753	-	-
OTB_DEF	1	0.5	-	-
MIS_MIS_0_0_0_HC	9	0.232	11.96	1
OTB_CRU_70-99_0_0_all	6	0.217	98.58	2
SDN_DEF_≥120_0_0_all	3	0.15	36.32	1
GNS_DEF_120-219_0_0_all	1	0.12	100	1
GTR_DEF_all_0_0_all	2	0.007	-	-
OTB_CRU_70-89_2_35_all	2	0.005	99.17	1
MIS_MIS	1	0.003	-	-
TBB_DEF_≥120_0_0_all	3	0.002	2.98	1
FPO_CRU_0_0_0_all	3	0.001	-	-
GNS_DEF	1	0.001	-	-
GNS_DEF_≥220_0_0_all	1	0	100	1
GNS_DEF_100-119_0_0_all	1	0	100	1
GNS_DEF_120-219_0_0_all_FDF	1	0	100	1
MIS_MIS_0_0_0_IBC	1	0	-	-
OTB_CRU_32-69_2_22_all	1	0	-	-
OTB_SPF_32-69_0_0_all	1	0	-	-
OTM_DEF_100-119_0_0_all	1	0	-	-
SSC_DEF_70-99_0_0_all	1	0	-	-
TBB_DEF_70-99_0_0_all	3	0	-	-

Table 2. 2010 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	3	49.169	87.61	1
OTB_DEF_≥120_0_0_all	IIIaN	3	30.654	32.4	2
OTB_CRU_32-69_0_0_all	IIIaN	3	10.238	26.84	1
OTB_DEF_≥120_0_0_all_FDF	IIIaN	1	3.686	100	1
GNS_DEF_all_0_0_all	IIIaN	2	3.181	-	-
GNS_DEF_120-219_0_0_all	IIIaN	1	1.185	100	1
SDN_DEF_≥120_0_0_all	IIIaN	1	0.804	100	1
MIS_MIS_0_0_0_HC	IIIaN	4	0.446	98.72	1
LLS_FIF_0_0_0_all	IIIaN	2	0.325	-	-
GTR_DEF_all_0_0_all	IIIaN	1	0.115	-	-
SSC_DEF_≥120_0_0_all	IIIaN	1	0.104	100	1
OTB_CRU_70-89_2_35_all	IIIaN	2	0.088	99.17	1
OTB_CRU_32-69_2_22_all	IIIaN	1	0.004	-	-
MIS_MIS_0_0_0_IBC	IIIaN	1	0.001	-	-
FPO_CRU_0_0_0_all	IIIaN	1	0	-	-
GNS_DEF_≥220_0_0_all	IIIaN	1	0	100	1
GNS_DEF_100-119_0_0_all	IIIaN	1	0	100	1
GNS_DEF_120-219_0_0_all_FDF	IIIaN	1	0	100	1

Table 3. 2010 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	9	74.507	85.43	4
OTB_DEF_100-119_0_0_all	IV	2	11.427	100	1
GNS_DEF_all_0_0_all	IV	3	5.53	99.99	2
OTB_DEF_≥120_0_0_all_FDF	IV	2	3.494	98.88	2
SSC_DEF_≥120_0_0_all	IV	2	3.47	1.86	1
LLS_FIF_0_0_0_all	IV	2	0.704	-	-
OTB_CRU_32-69_0_0_all	IV	3	0.259	6.98	1
OTB_CRU_70-99_0_0_all	IV	5	0.246	99.07	2
MIS_MIS_0_0_0_HC	IV	6	0.185	1.02	1
SDN_DEF_≥120_0_0_all	IV	3	0.116	6.63	1
GNS_DEF_120-219_0_0_all	IV	1	0.057	100	1
FPO_CRU_0_0_0_all	IV	2	0.002	-	-
TBB_DEF_≥120_0_0_all	IV	3	0.002	2.98	1
GNS_DEF_≥220_0_0_all	IV	1	0	100	1
GNS_DEF_100-119_0_0_all	IV	1	0	100	1
GNS_DEF_120-219_0_0_all_FDF	IV	1	0	100	1
GTR_DEF_all_0_0_all	IV	1	0	-	-
MIS_MIS_0_0_0_IBC	IV	1	0	-	-
OTB_SPF_32-69_0_0_all	IV	1	0	-	-
SSC_DEF_70-99_0_0_all	IV	1	0	-	-
TBB_DEF_70-99_0_0_all	IV	3	0	-	-

Table 4. 2010 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	3	56.575	90.78	1
DemIND	VI	1	32.367	100	1
OTB_DEF	VI	1	8.358	-	-
LLS_FIF_0_0_0_all	VI	1	1.895	-	-
MIS_MIS_0_0_0_HC	VI	4	0.71	-	-
MIS_MIS	VI	1	0.058	-	-
OTB_CRU_70-99_0_0_all	VI	2	0.018	-	-
GNS_DEF	VI	1	0.015	-	-
OTM_DEF_100-119_0_0_all	VI	1	0.005	-	-

2010: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2010: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	4	71.451	94.21	3
OTB_CRU_32-69_0_0_all	2	11.668	-	-
OTB_DEF_≥120_0_0_all_FDF	2	8.771	93.54	2
OTB_CRU_90-119_0_0_all	2	6.051	43.07	1
OTB_CRU_70-99_0_0_all	3	1.876	98.18	1
OTB	1	0.084	-	-
SDN_DEF_≥120_0_0_all	1	0.076	51.75	1
GNS_DEF_120-219_0_0_all	1	0.02	74.79	1
OTB_CRU_70-89_2_35_all	1	0.003	-	-
GNS_DEF_all_0_0_all	1	0	-	-
MIS_MIS_0_0_0_HC	1	0	-	-
OTB_CRU_32-69_2_22_all	1	0	-	-
OTB_CRU_90-119_0_0_all_FDF	1	0	-	-
TBB_CRU_16-31_0_0_all	1	0	-	-

Table 2. 2010 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_32-69_0_0_all	IIIaN	2	11.668	-	-
OTB_CRU_90-119_0_0_all	IIIaN	2	6.051	43.07	1
OTB_DEF_≥120_0_0_all	IIIaN	2	0.509	96.73	1
OTB_DEF_≥120_0_0_all_FDF	IIIaN	1	0.213	-	-
SDN_DEF_≥120_0_0_all	IIIaN	1	0.076	51.75	1
GNS_DEF_120-219_0_0_all	IIIaN	1	0.02	74.79	1
OTB_CRU_70-89_2_35_all	IIIaN	1	0.003	-	-
MIS_MIS_0_0_0_HC	IIIaN	1	0	-	-
OTB_CRU_32-69_2_22_all	IIIaN	1	0	-	-
OTB_CRU_90-119_0_0_all_FDF	IIIaN	1	0	-	-

Table 3. 2010 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	4	66.949	93.85	3
OTB_DEF_≥120_0_0_all_FDF	IV	2	8.558	95.87	2
OTB_CRU_70-99_0_0_all	IV	3	0.933	96.35	1
GNS_DEF_120-219_0_0_all	IV	1	0	-	-
GNS_DEF_all_0_0_all	IV	1	0	-	-
SDN_DEF_≥120_0_0_all	IV	1	0	-	-
TBB_CRU_16-31_0_0_all	IV	1	0	-	-

Table 4. 2010 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	1	3.993	100	1
OTB_CRU_70-99_0_0_all	VI	1	0.944	100	1
OTB	VI	1	0.084	-	-

2011: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2011: Proportion of landings by area and season.

Area	1	2	3	4	2011
IIIaN	0.53	0.98	0.96	1.92	0
IV	29.38	25.98	22.82	10.24	0
VI	0.42	0.68	1.07	0.37	4.65

Table 2. 2011: Proportion of landings by métier and nation.

Fleet	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	SWE	UKE	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	0.004	-	-	0.004	-	0	0	-
GNS_DEF	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.091	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all_FDF	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0.001	-	-	-	5.706	-	0.002	0	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	0.001	0	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	-	0.47	-	0.045	0	-
MIS_MIS	-	-	-	-	-	-	-	0.003	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	0.103	0.032	0.008	-	-	-	-	0.024	0	-	0	0	0.036
MIS_MIS_0_0_0_IBC	-	-	-	-	-	0	-	-	-	-	-	0	-	-
OTB_CRU_32-69_0_0_all	-	0.163	-	-	-	-	-	-	-	0.262	-	0.397	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_70-89_2_35_all	-	0.007	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_70-99_0_0_all	0	0.001	-	-	-	0	-	-	-	-	-	-	0.001	0.238
OTB_CRU_70-99_0_0_all_FDF	-	0.031	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_90-119_0_0_all	-	1.658	-	-	-	0.001	-	-	-	-	-	0.122	-	-
OTB_CRU_90-119_0_0_all_FDF	-	0.038	-	-	-	-	-	-	-	-	-	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0.364	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	0.643	-	-	-	10.484	-	-	0.019	39.052	0.599	0.798	2.251	10.368
OTB_DEF_≥120_0_0_all_FDF	-	3.788	-	-	-	-	-	-	0.002	-	-	-	-	2.21
OTB_DEF_>40_≥100_POK	-	-	-	-	2.089	-	-	-	-	-	-	-	-	-
OTB_DEF_100-119_0_0_≥40m__POK	-	-	-	-	14.758	-	-	-	-	-	-	-	-	-
OTB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	0.001	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	0.002	-	-	-	-	-	-	-	-	-	0	-	-
SDN_DEF_≥120_0_0_all	-	0.016	-	-	-	-	-	-	-	0.085	-	0.001	-	-
SDN_DEF_≥120_0_0_all_FDF	-	0.021	-	-	-	-	-	-	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	0	0.076	-	-	-	-	-	-	-	2.884	-	-	-	-
SSC_DEF_≥120_0_0_all_FDF	-	0.033	-	-	-	-	-	-	-	-	-	-	-	-
SSC_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	0	-	-	-	-	-
SSC_DEF_100-119_0_0_all_FDF	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-
SSC_DEF_70-99_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-
SSC_DEF_70-99_0_0_all_FDF	-	-	-	-	-	-	-	-	0	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0.002	0	-	-	-	-	-	-	-	-	-	-	0	-
TBB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	-	-	-	-	0	-

Table 3. 2011: Proportion of landings by nation.

BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	SWE	UKE	UKS
0	6.7	0	0	16.8	10.5	0	0.4	0	48.5	0.6	1.4	2.3	12.9

Table 4. 2011: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
FPO_CRU_0_0_0_all	0	1	0.009	3	-	-
GNS_DEF	-	-	-	-	0.001	1
GNS_DEF_≥220_0_0_all	0	1	0.001	1	-	-
GNS_DEF_100-119_0_0_all	0	1	0	1	-	-
GNS_DEF_120-219_0_0_all	0.045	1	0.046	1	-	-
GNS_DEF_120-219_0_0_all_FDF	0	1	0.001	1	-	-
GNS_DEF_all_0_0_all	0.169	2	5.469	3	0.07	1
GTR_DEF_all_0_0_all	0.001	1	0	1	-	-
LLS_FIF_0_0_0_all	0.051	2	0.452	3	0.013	1
MIS_MIS	-	-	-	-	0.003	1
MIS_MIS_0_0_0_HC	0.089	4	0.073	6	0.041	3
MIS_MIS_0_0_0_IBC	0	1	0	2	-	-
OTB_CRU_32-69_0_0_all	0.613	3	0.209	3	-	-
OTB_CRU_32-69_2_22_all	0	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0.007	2	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.238	5	0.002	1
OTB_CRU_70-99_0_0_all_FDF	-	-	0.031	1	-	-
OTB_CRU_90-119_0_0_all	1.781	3	-	-	-	-
OTB_CRU_90-119_0_0_all_FDF	0.038	1	-	-	-	-
OTB_DEF	-	-	-	-	0.364	1
OTB_DEF_≥120_0_0_all	1.504	3	58.103	8	4.606	1
OTB_DEF_≥120_0_0_all_FDF	0.044	1	5.956	3	-	-
OTB_DEF_>40_≥100_POK	-	-	-	-	2.089	1
OTB_DEF_100-119_0_0_≥40m__POK	-	-	14.758	1	-	-
OTB_DEF_100-119_0_0_all	-	-	0.001	2	-	-
OTB_SPF_32-69_0_0_all	-	-	0.002	2	-	-
SDN_DEF_≥120_0_0_all	0.015	2	0.087	3	-	-
SDN_DEF_≥120_0_0_all_FDF	0.017	1	0.004	1	-	-
SSC_DEF_≥120_0_0_all	0.003	1	2.957	3	-	-
SSC_DEF_≥120_0_0_all_FDF	0.011	1	0.023	1	-	-
SSC_DEF_100-119_0_0_all	-	-	0	2	-	-
SSC_DEF_100-119_0_0_all_FDF	-	-	0.001	1	-	-
SSC_DEF_70-99_0_0_all	-	-	0	1	-	-
SSC_DEF_70-99_0_0_all_FDF	-	-	0	1	-	-
TBB_DEF_≥120_0_0_all	0	1	0.002	3	-	-
TBB_DEF_100-119_0_0_all	-	-	0	1	-	-
TBB_DEF_70-99_0_0_all	-	-	0	3	-	-

Table 5. 2011: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	8	64.213	64
OTB_DEF_100-119_0_0_≥40m__POK	1	14.758	79
OTB_DEF_≥120_0_0_all_FDF	3	6	85
GNS_DEF_all_0_0_all	4	5.709	91
SSC_DEF_≥120_0_0_all	3	2.96	94
OTB_DEF_>40_≥100_POK	1	2.089	96
OTB_CRU_90-119_0_0_all	3	1.781	98
OTB_CRU_32-69_0_0_all	3	0.822	98
LLS_FIF_0_0_0_all	3	0.515	99
OTB_DEF	1	0.364	99
OTB_CRU_70-99_0_0_all	5	0.24	99
MIS_MIS_0_0_0_HC	8	0.202	100
SDN_DEF_≥120_0_0_all	3	0.102	100
GNS_DEF_120-219_0_0_all	1	0.091	100
OTB_CRU_90-119_0_0_all_FDF	1	0.038	100
SSC_DEF_≥120_0_0_all_FDF	1	0.033	100
OTB_CRU_70-99_0_0_all_FDF	1	0.031	100
SDN_DEF_≥120_0_0_all_FDF	1	0.021	100
FPO_CRU_0_0_0_all	4	0.009	100
OTB_CRU_70-89_2_35_all	2	0.007	100
MIS_MIS	1	0.003	100
OTB_SPF_32-69_0_0_all	2	0.002	100
TBB_DEF_≥120_0_0_all	3	0.002	100
GNS_DEF	1	0.001	100
GNS_DEF_≥220_0_0_all	1	0.001	100
GNS_DEF_120-219_0_0_all_FDF	1	0.001	100
GTR_DEF_all_0_0_all	2	0.001	100
OTB_DEF_100-119_0_0_all	2	0.001	100
SSC_DEF_100-119_0_0_all_FDF	1	0.001	100
GNS_DEF_100-119_0_0_all	1	0	100
MIS_MIS_0_0_0_IBC	2	0	100
OTB_CRU_32-69_2_22_all	1	0	100
SSC_DEF_100-119_0_0_all	2	0	100
SSC_DEF_70-99_0_0_all	1	0	100
SSC_DEF_70-99_0_0_all_FDF	1	0	100
TBB_DEF_100-119_0_0_all	1	0	100
TBB_DEF_70-99_0_0_all	3	0	100

2011: Appendix B: Age coverage of landings and discards

Table 1. 2011: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	90.24
Discards	90.91

Table 2. 2011: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	89.91	90.24	96.27
Landings	47.84	92.1	93.16

Table 3. 2011: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2011
Discards	IIIaN	80.31	40.51	94.7	27.6	-
Discards	IV	9.66	0.01	0.17	-	100
Discards	VI	-	-	-	-	96.27
Landings	IIIaN	60.58	74.34	61.11	24.16	-
Landings	IV	94.91	89.92	90.35	93.5	-
Landings	VI	87.34	89.14	76.51	80.43	99.13

Table 4. 2011: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	SWE	UKE	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	0	-	-	0	-	0	0	-
GNS_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0	-	-	-	95.83	-	0	0	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	-	0	0	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	-	79.2	-	0	0	-
MIS_MIS	-	-	-	-	-	-	-	0	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	100	0	0	-	-	-	-	0	0	-	0	0	0
MIS_MIS_0_0_0_IBC	-	-	-	-	-	0	-	-	-	-	-	0	-	-
OTB	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_32-69_0_0_all	-	100	-	-	-	-	-	-	-	0	-	0	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_70-89_2_35_all	-	100	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_70-99_0_0_all	0	100	-	-	-	0	-	-	-	-	-	-	0	100
OTB_CRU_70-99_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_90-119_0_0_all	-	100	-	-	-	0	-	-	-	-	-	0	-	-
OTB_CRU_90-119_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-	-
OTB_DEF	-	-	-	-	-	-	-	0	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	100	-	-	-	90.87	-	-	0	98.67	0	0	0	100
OTB_DEF_≥120_0_0_all_FDF	-	100	-	-	-	-	-	-	0	-	-	-	-	100
OTB_DEF_>40_≥100_POK	-	-	-	-	100	-	-	-	-	-	-	-	-	-
OTB_DEF_100-119_0_0_≥40m__POK	-	-	-	-	100	-	-	-	-	-	-	-	-	-
OTB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	0	-	-	-	-	-
OTB_DEF_70-99_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	100	-	-	-	-	-	-	-	-	-	0	-	-
SDN_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	-	0	-	0	-	-
SDN_DEF_≥120_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	0	100	-	-	-	-	-	-	-	0	-	-	-	-
SSC_DEF_≥120_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-	-
SSC_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	0	-	-	-	-	-
SSC_DEF_100-119_0_0_all_FDF	-	-	-	-	-	-	-	-	0	-	-	-	-	-
SSC_DEF_70-99_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-
SSC_DEF_70-99_0_0_all_FDF	-	-	-	-	-	-	-	-	0	-	-	-	-	-
TBB_CRU_16-31_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0	100	-	-	-	-	-	-	-	-	-	-	0	-
TBB_DEF_100-119_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	-	-	-	-	-	0	-

Table 5. 2011: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	GRE	IRL	NED	NOR	POL	SWE	UKE	UKS
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	100	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	100	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	0	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB	–	–	–	–	–	–	–	0	–	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	34.17	–	–	–	–	–	–	–	–	–	0	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	–	–	0	–	–
OTB_CRU_70-89_2_35_all	–	–	–	–	–	–	–	–	–	–	–	0	–	–
OTB_CRU_70-99_0_0_all	–	6.75	–	–	–	–	–	–	0	–	–	–	–	100
OTB_CRU_70-99_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_90-119_0_0_all	–	100	–	–	–	–	–	–	–	–	–	0	–	–
OTB_CRU_90-119_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	92.9	–	–	–	50.58	–	–	–	–	–	–	0	100
OTB_DEF_≥120_0_0_all_FDF	–	59.07	–	–	–	–	–	–	–	–	–	–	–	100
OTB_DEF_>40_≥100_POK	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_100-119_0_0_≥40m__POK	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	0	–	–	–	–	–
OTB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	0	–	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	0	–	–	–	–	–
SSC_DEF_≥120_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	0	–	–	–	–	–
SSC_DEF_100-119_0_0_all_FDF	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_70-99_0_0_all_FDF	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_CRU_16-31_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	0	–	–	–	–	–
TBB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	0	–	–	–	–	–

Table 6. 2011: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	UKE	UKS
GNS_DEF_all_0_0_all	-	-	-	95.8	-	-
OTB_CRU_90-119_0_0_all	100	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	-	90.9	98.7	0	100
OTB_DEF_≥120_0_0_all_FDF	100	-	-	-	-	100
OTB_DEF_>40_≥100_POK	-	100	-	-	-	-
OTB_DEF_100-119_0_0_≥40m__POK	-	100	-	-	-	-
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-

2011: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2011: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	8	64.213	91.99	4
OTB_DEF_100-119_0_0_≥40m__POK	1	14.758	100	1
OTB_DEF_≥120_0_0_all_FDF	3	6	99.96	2
GNS_DEF_all_0_0_all	4	5.709	95.78	1
SSC_DEF_≥120_0_0_all	3	2.96	2.57	1
OTB_DEF_>40_≥100_POK	1	2.089	100	1
OTB_CRU_90-119_0_0_all	3	1.781	93.09	1
OTB_CRU_32-69_0_0_all	3	0.822	19.83	1
LLS_FIF_0_0_0_all	3	0.515	72.26	1
OTB_DEF	1	0.364	-	-
OTB_CRU_70-99_0_0_all	5	0.24	99.51	2
MIS_MIS_0_0_0_HC	8	0.202	50.78	1
SDN_DEF_≥120_0_0_all	3	0.102	15.38	1
GNS_DEF_120-219_0_0_all	1	0.091	100	1
OTB_CRU_90-119_0_0_all_FDF	1	0.038	100	1
SSC_DEF_≥120_0_0_all_FDF	1	0.033	100	1
OTB_CRU_70-99_0_0_all_FDF	1	0.031	100	1
SDN_DEF_≥120_0_0_all_FDF	1	0.021	100	1
FPO_CRU_0_0_0_all	4	0.009	-	-
OTB_CRU_70-89_2_35_all	2	0.007	100	1
MIS_MIS	1	0.003	-	-
OTB_SPF_32-69_0_0_all	2	0.002	100	1
TBB_DEF_≥120_0_0_all	3	0.002	5.88	1
GNS_DEF	1	0.001	-	-
GNS_DEF_≥220_0_0_all	1	0.001	100	1
GNS_DEF_120-219_0_0_all_FDF	1	0.001	100	1
GTR_DEF_all_0_0_all	2	0.001	-	-
OTB_DEF_100-119_0_0_all	2	0.001	-	-
SSC_DEF_100-119_0_0_all_FDF	1	0.001	-	-
GNS_DEF_100-119_0_0_all	1	0	100	1
MIS_MIS_0_0_0_IBC	2	0	-	-
OTB_CRU_32-69_2_22_all	1	0	-	-
SSC_DEF_100-119_0_0_all	2	0	-	-
SSC_DEF_70-99_0_0_all	1	0	-	-
SSC_DEF_70-99_0_0_all_FDF	1	0	-	-
TBB_DEF_100-119_0_0_all	1	0	-	-
TBB_DEF_70-99_0_0_all	3	0	-	-

Table 2. 2011 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	3	40.592	93.09	1
OTB_DEF_≥120_0_0_all	IIIaN	3	34.284	1.94	1
OTB_CRU_32-69_0_0_all	IIIaN	3	13.964	23.74	1
GNS_DEF_all_0_0_all	IIIaN	2	3.859	-	-
MIS_MIS_0_0_0_HC	IIIaN	4	2.021	99.77	1
LLS_FIF_0_0_0_all	IIIaN	2	1.151	-	-
GNS_DEF_120-219_0_0_all	IIIaN	1	1.034	100	1
OTB_DEF_≥120_0_0_all_FDF	IIIaN	1	1	100	1
OTB_CRU_90-119_0_0_all_FDF	IIIaN	1	0.859	100	1
SDN_DEF_≥120_0_0_all_FDF	IIIaN	1	0.392	100	1
SDN_DEF_≥120_0_0_all	IIIaN	2	0.341	85.98	1
SSC_DEF_≥120_0_0_all_FDF	IIIaN	1	0.241	100	1
OTB_CRU_70-89_2_35_all	IIIaN	2	0.166	100	1
SSC_DEF_≥120_0_0_all	IIIaN	1	0.061	100	1
GTR_DEF_all_0_0_all	IIIaN	1	0.021	-	-
OTB_CRU_32-69_2_22_all	IIIaN	1	0.007	-	-
GNS_DEF_120-219_0_0_all_FDF	IIIaN	1	0.005	100	1
GNS_DEF_100-119_0_0_all	IIIaN	1	0.002	100	1
GNS_DEF_≥220_0_0_all	IIIaN	1	0.001	100	1
FPO_CRU_0_0_0_all	IIIaN	1	0	-	-
MIS_MIS_0_0_0_IBC	IIIaN	1	0	-	-
TBB_DEF_≥120_0_0_all	IIIaN	1	0	100	1

Table 3. 2011 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	8	65.71	93.69	4
OTB_DEF_100-119_0_0_≥40m__POK	IV	1	16.69	100	1
OTB_DEF_≥120_0_0_all_FDF	IV	3	6.736	99.96	2
GNS_DEF_all_0_0_all	IV	3	6.186	99.98	1
SSC_DEF_≥120_0_0_all	IV	3	3.344	2.49	1
LLS_FIF_0_0_0_all	IV	3	0.511	82.38	1
OTB_CRU_70-99_0_0_all	IV	5	0.269	99.5	2
OTB_CRU_32-69_0_0_all	IV	3	0.236	8.39	1
SDN_DEF_≥120_0_0_all	IV	3	0.099	3.3	1
MIS_MIS_0_0_0_HC	IV	6	0.082	19.4	1
GNS_DEF_120-219_0_0_all	IV	1	0.052	100	1
OTB_CRU_70-99_0_0_all_FDF	IV	1	0.035	100	1
SSC_DEF_≥120_0_0_all_FDF	IV	1	0.026	100	1
FPO_CRU_0_0_0_all	IV	3	0.01	-	-
SDN_DEF_≥120_0_0_all_FDF	IV	1	0.005	100	1
GNS_DEF_≥220_0_0_all	IV	1	0.002	100	1
OTB_SPF_32-69_0_0_all	IV	2	0.002	100	1
TBB_DEF_≥120_0_0_all	IV	3	0.002	5.74	1
GNS_DEF_120-219_0_0_all_FDF	IV	1	0.001	100	1
OTB_DEF_100-119_0_0_all	IV	2	0.001	-	-
SSC_DEF_100-119_0_0_all_FDF	IV	1	0.001	-	-
GNS_DEF_100-119_0_0_all	IV	1	0	100	1
GTR_DEF_all_0_0_all	IV	1	0	-	-
MIS_MIS_0_0_0_IBC	IV	2	0	-	-
SSC_DEF_100-119_0_0_all	IV	2	0	-	-
SSC_DEF_70-99_0_0_all	IV	1	0	-	-
SSC_DEF_70-99_0_0_all_FDF	IV	1	0	-	-
TBB_DEF_100-119_0_0_all	IV	1	0	-	-
TBB_DEF_70-99_0_0_all	IV	3	0	-	-

Table 4. 2011 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	1	64.075	100	1
OTB_DEF_>40_≥100_POK	VI	1	29.059	100	1
OTB_DEF	VI	1	5.061	-	-
GNS_DEF_all_0_0_all	VI	1	0.98	-	-
MIS_MIS_0_0_0_HC	VI	3	0.564	-	-
LLS_FIF_0_0_0_all	VI	1	0.177	-	-
MIS_MIS	VI	1	0.04	-	-
OTB_CRU_70-99_0_0_all	VI	1	0.03	100	1
GNS_DEF	VI	1	0.013	-	-

2011: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2011: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	4	57.148	86.88	3
OTB_DEF_≥120_0_0_all_FDF	2	27.293	98.63	2
OTB_CRU_70-99_0_0_all	3	8.401	99.87	2
OTB_CRU_90-119_0_0_all	2	5.806	99.86	1
OTB_CRU_32-69_0_0_all	2	0.506	5.43	1
OTB	1	0.436	-	-
OTB_CRU_90-119_0_0_all_FDF	1	0.257	-	-
GNS_DEF_120-219_0_0_all	1	0.127	100	1
MIS_MIS_0_0_0_HC	1	0.023	-	-
GNS_DEF_all_0_0_all	1	0.002	100	1
OTB_CRU_70-99_0_0_all_FDF	1	0.001	-	-
GNS_DEF_120-219_0_0_all_FDF	1	0	-	-
LLS_FIF_0_0_0_all	1	0	-	-
OTB_CRU_32-69_2_22_all	1	0	-	-
OTB_CRU_70-89_2_35_all	1	0	-	-
OTB_DEF_100-119_0_0_all	1	0	-	-
OTB_DEF_70-99_0_0_all	1	0	-	-
SDN_DEF_≥120_0_0_all	1	0	-	-
SDN_DEF_≥120_0_0_all_FDF	1	0	-	-
SSC_DEF_≥120_0_0_all	1	0	-	-
SSC_DEF_≥120_0_0_all_FDF	1	0	-	-
SSC_DEF_100-119_0_0_all	1	0	-	-
TBB_CRU_16-31_0_0_all	1	0	-	-
TBB_DEF_100-119_0_0_all	1	0	-	-
TBB_DEF_70-99_0_0_all	1	0	-	-

Table 2. 2011 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	2	5.806	99.86	1
OTB_DEF_≥120_0_0_all	IIIaN	2	1.109	94.62	1
OTB_DEF_≥120_0_0_all_FDF	IIIaN	1	0.559	96.49	1
OTB_CRU_32-69_0_0_all	IIIaN	2	0.506	5.43	1
OTB_CRU_90-119_0_0_all_FDF	IIIaN	1	0.257	-	-
GNS_DEF_120-219_0_0_all	IIIaN	1	0.127	100	1
MIS_MIS_0_0_0_HC	IIIaN	1	0.023	-	-
GNS_DEF_120-219_0_0_all_FDF	IIIaN	1	0	-	-
OTB_CRU_32-69_2_22_all	IIIaN	1	0	-	-
OTB_CRU_70-89_2_35_all	IIIaN	1	0	-	-
SDN_DEF_≥120_0_0_all	IIIaN	1	0	-	-
SDN_DEF_≥120_0_0_all_FDF	IIIaN	1	0	-	-
SSC_DEF_≥120_0_0_all_FDF	IIIaN	1	0	-	-

Table 3. 2011 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	4	44.911	83.44	3
OTB_DEF_≥120_0_0_all_FDF	IV	2	26.735	98.68	1
OTB_CRU_70-99_0_0_all	IV	3	8.29	99.87	2
GNS_DEF_all_0_0_all	IV	1	0.002	100	1
OTB_CRU_70-99_0_0_all_FDF	IV	1	0.001	-	-
GNS_DEF_120-219_0_0_all	IV	1	0	-	-
GNS_DEF_120-219_0_0_all_FDF	IV	1	0	-	-
LLS_FIF_0_0_0_all	IV	1	0	-	-
OTB_DEF_100-119_0_0_all	IV	1	0	-	-
OTB_DEF_70-99_0_0_all	IV	1	0	-	-
SDN_DEF_≥120_0_0_all	IV	1	0	-	-
SDN_DEF_≥120_0_0_all_FDF	IV	1	0	-	-
SSC_DEF_≥120_0_0_all	IV	1	0	-	-
SSC_DEF_100-119_0_0_all	IV	1	0	-	-
TBB_CRU_16-31_0_0_all	IV	1	0	-	-
TBB_DEF_100-119_0_0_all	IV	1	0	-	-
TBB_DEF_70-99_0_0_all	IV	1	0	-	-

Table 4. 2011 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	1	11.128	100	1
OTB	VI	1	0.436	-	-
OTB_CRU_70-99_0_0_all	VI	1	0.11	100	1

2012: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2012: Proportion of landings by area and season.

Area	1	2	3	4	2012
IIIaN	0.39	1.06	0.78	1.34	0
IV	26.58	33.1	15.26	11.77	0.01
VI	0.33	1.48	1.65	0.4	5.86

Table 2. 2012: Proportion of landings by métier and nation.

Fleet	BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	SWE	UKE	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	0.04	-	0	-
GNS_DEF	-	-	-	-	-	-	0	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	0.003	-	-	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all_FDF	-	0.004	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.061	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all_FDF	-	0.012	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0.001	-	-	6.333	0.003	0	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	0.001	0	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	0.956	0.039	-	-
MIS_MIS	-	-	-	-	-	-	0.001	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	0.132	0.017	0.019	0.011	-	-	0.003	0.003	0	-	0.183
MIS_MIS_0_0_0_HC_FDF	-	-	-	-	-	-	-	0.009	-	-	-	-
MIS_MIS_0_0_0_IBC	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_32-69_0_0_all	-	0.209	-	-	-	-	-	-	0.336	0.392	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_70-89_2_35_all	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_70-99_0_0_all	0	0.007	-	-	-	0	-	-	-	-	0.001	0.197
OTB_CRU_90-119_0_0_all	-	1.581	-	-	-	0.051	-	-	-	0.127	-	-
OTB_CRU_90-119_0_0_all_FDF	-	0.016	-	-	-	-	-	-	-	-	-	-
OTB_DEF	-	-	-	-	-	-	0.465	-	-	-	-	-
OTB_DEF_≥120_0_0_all	0	0.509	-	-	2.813	7.64	-	0.013	28.915	1.101	1.257	11.342
OTB_DEF_≥120_0_0_all_FDF	-	4.078	-	-	-	2.659	-	0.004	-	-	-	2.22
OTB_DEF_100-119_0_0_all	-	-	-	-	19.812	-	-	0.001	-	-	-	-
OTB_DEF_100-119_0_0_all_FDF	-	-	-	-	-	-	-	0	-	-	-	-
OTB_SPF_32-69_0_0_all	-	0.012	-	-	-	-	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	0.008	-	-	-	-	-	-	0.118	0.014	-	-
SDN_DEF_≥120_0_0_all_FDF	-	0.019	-	-	-	-	-	-	-	-	-	-
SSC_DEF	-	-	-	-	-	-	0	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	0.128	-	-	-	-	-	-	6.056	-	-	-
SSC_DEF_≥120_0_0_all_FDF	-	0.05	-	-	-	-	-	-	-	-	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	-	-	-	0.001	-	-	-	-
SSC_DEF_100-119_0_0_all_FDF	-	-	-	-	-	-	-	0.016	-	-	-	-
SSC_DEF_70-99_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0.002	0.001	-	-	-	-	-	-	-	-	0	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	0	-	-	0	-

Table 3. 2012: Proportion of landings by nation.

BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	SWE	UKE	UKS
0	6.8	0	0	22.6	10.4	0.5	0	42.8	1.7	1.3	13.9

Table 4. 2012: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
FPO_CRU_0_0_0_all	-	-	0.04	2	-	-
GNS_DEF	-	-	-	-	0	1
GNS_DEF_≥220_0_0_all	0	1	0.003	1	-	-
GNS_DEF_≥220_0_0_all_FDF	0.001	1	0.003	1	-	-
GNS_DEF_100-119_0_0_all	0	1	0	1	-	-
GNS_DEF_120-219_0_0_all	0.016	1	0.045	1	-	-
GNS_DEF_120-219_0_0_all_FDF	0.001	1	0.011	1	-	-
GNS_DEF_all_0_0_all	0.112	3	6.225	3	-	-
GTR_DEF_all_0_0_all	0.001	1	0	1	-	-
LLS_FIF_0_0_0_all	0.078	2	0.911	2	0.006	1
MIS_MIS	-	-	-	-	0.001	1
MIS_MIS_0_0_0_HC	0.089	5	0.128	6	0.151	4
MIS_MIS_0_0_0_HC_FDF	-	-	0.009	1	-	-
MIS_MIS_0_0_0_IBC	0	1	-	-	-	-
OTB_CRU_32-69_0_0_all	0.674	3	0.263	3	-	-
OTB_CRU_32-69_2_22_all	0	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0	1	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.191	5	0.013	2
OTB_CRU_90-119_0_0_all	1.759	3	-	-	-	-
OTB_CRU_90-119_0_0_all_FDF	0.016	1	-	-	-	-
OTB_DEF	-	-	-	-	0.465	1
OTB_DEF_≥120_0_0_all	0.478	3	44.575	8	8.537	4
OTB_DEF_≥120_0_0_all_FDF	0.275	2	8.685	4	-	-
OTB_DEF_100-119_0_0_all	-	-	19.281	2	0.531	1
OTB_DEF_100-119_0_0_all_FDF	-	-	0	1	-	-
OTB_SPF_32-69_0_0_all	-	-	0.012	1	-	-
SDN_DEF_≥120_0_0_all	0.027	2	0.113	3	-	-
SDN_DEF_≥120_0_0_all_FDF	0.016	1	0.002	1	-	-
SSC_DEF	-	-	-	-	0	1
SSC_DEF_≥120_0_0_all	0.006	2	6.177	2	-	-
SSC_DEF_≥120_0_0_all_FDF	0.02	1	0.03	1	-	-
SSC_DEF_100-119_0_0_all	-	-	0.001	1	-	-
SSC_DEF_100-119_0_0_all_FDF	-	-	0.016	1	-	-
SSC_DEF_70-99_0_0_all	-	-	0	1	-	-
TBB_DEF_≥120_0_0_all	0	1	0.003	3	-	-
TBB_DEF_70-99_0_0_all	-	-	0	4	-	-

Table 5. 2012: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	9	53.59	54
OTB_DEF_100-119_0_0_all	2	19.812	73
OTB_DEF_≥120_0_0_all_FDF	4	8.96	82
GNS_DEF_all_0_0_all	4	6.337	89
SSC_DEF_≥120_0_0_all	2	6.184	95
OTB_CRU_90-119_0_0_all	3	1.759	97
LLS_FIF_0_0_0_all	2	0.995	98
OTB_CRU_32-69_0_0_all	3	0.937	99
OTB_DEF	1	0.465	99
MIS_MIS_0_0_0_HC	8	0.368	99
OTB_CRU_70-99_0_0_all	5	0.205	100
SDN_DEF_≥120_0_0_all	3	0.14	100
GNS_DEF_120-219_0_0_all	1	0.061	100
SSC_DEF_≥120_0_0_all_FDF	1	0.05	100
FPO_CRU_0_0_0_all	2	0.04	100
SDN_DEF_≥120_0_0_all_FDF	1	0.019	100
OTB_CRU_90-119_0_0_all_FDF	1	0.016	100
SSC_DEF_100-119_0_0_all_FDF	1	0.016	100
GNS_DEF_120-219_0_0_all_FDF	1	0.012	100
OTB_SPF_32-69_0_0_all	1	0.012	100
MIS_MIS_0_0_0_HC_FDF	1	0.009	100
GNS_DEF_≥220_0_0_all_FDF	1	0.004	100
GNS_DEF_≥220_0_0_all	1	0.003	100
TBB_DEF_≥120_0_0_all	3	0.003	100
GTR_DEF_all_0_0_all	2	0.001	100
MIS_MIS	1	0.001	100
SSC_DEF_100-119_0_0_all	1	0.001	100
GNS_DEF	1	0	100
GNS_DEF_100-119_0_0_all	1	0	100
MIS_MIS_0_0_0_IBC	1	0	100
OTB_CRU_32-69_2_22_all	1	0	100
OTB_CRU_70-89_2_35_all	1	0	100
OTB_DEF_100-119_0_0_all_FDF	1	0	100
SSC_DEF	1	0	100
SSC_DEF_70-99_0_0_all	1	0	100
TBB_DEF_70-99_0_0_all	4	0	100

2012: Appendix B: Age coverage of landings and discards

Table 1. 2012: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	88.46
Discards	97.93

Table 2. 2012: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	36.87	98.17	99.84
Landings	60.46	89.67	87.88

Table 3. 2012: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2012
Discards	IIIaN	22.84	24.78	2.94	75.57	-
Discards	IV	-	-	100	2.79	100
Discards	VI	-	-	-	-	99.84
Landings	IIIaN	51.06	73.19	64.03	51.09	-
Landings	IV	95.45	81.94	93.86	93.03	-
Landings	VI	44.7	72.98	82.17	59.06	97.61

Table 4. 2012: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	SWE	UKE	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	0	-	0	-
GNS_DEF	-	-	-	-	-	-	0	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0	-	-	98.28	0	0	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	0	0	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	91.93	0	-	-
MIS_MIS	-	-	-	-	-	-	0	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	100	0	0	0	-	-	0	0	0	-	0
MIS_MIS_0_0_0_HC_FDF	-	-	-	-	-	-	-	0	-	-	-	-
MIS_MIS_0_0_0_IBC	-	-	-	-	-	-	-	-	-	0	-	-
OTB	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_32-69_0_0_all	-	100	-	-	-	-	-	-	0	0	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_70-89_2_35_all	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_70-99_0_0_all	0	100	-	-	-	0	-	-	-	-	0	100
OTB_CRU_90-119_0_0_all	-	100	-	-	-	0	-	-	-	0	-	-
OTB_CRU_90-119_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-
OTB_DEF	-	-	-	-	-	-	0	-	-	-	-	-
OTB_DEF_≥120_0_0_all	0	100	-	-	100	97.18	-	0	99.37	0	0	100
OTB_DEF_≥120_0_0_all_FDF	-	100	-	-	-	94.58	-	0	-	-	-	100
OTB_DEF_100-119_0_0_all	-	-	-	-	97.32	-	-	0	-	-	-	-
OTB_DEF_100-119_0_0_all_FDF	-	-	-	-	-	-	-	0	-	-	-	-
OTB_DEF_70-99_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	0	0	-	-
SDN_DEF_≥120_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-
SSC_DEF	-	-	-	-	-	-	0	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	0	-	-	-
SSC_DEF_≥120_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	-	-	-	0	-	-	-	-
SSC_DEF_100-119_0_0_all_FDF	-	-	-	-	-	-	-	0	-	-	-	-
SSC_DEF_70-99_0_0_all	0	-	-	-	-	-	-	-	-	-	-	-
TBB_CRU_16-31_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0	100	-	-	-	-	-	-	-	-	0	-
TBB_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	0	-	0	-	-	0	-

Table 5. 2012: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	SWE	UKE	UKS
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all_FDF	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	100	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all_FDF	–	24.14	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC_FDF	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–
OTB	–	–	–	–	–	–	0	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	82.99	–	–	–	–	–	–	–	0	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	0	–	–
OTB_CRU_70-89_2_35_all	–	–	–	–	–	–	–	–	–	0	–	–
OTB_CRU_70-99_0_0_all	–	0	–	–	–	–	–	0	–	–	–	100
OTB_CRU_90-119_0_0_all	–	100	–	–	–	–	–	–	–	0	–	–
OTB_CRU_90-119_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	80.86	–	–	–	100	–	–	–	–	0	100
OTB_DEF_≥120_0_0_all_FDF	–	56.71	–	–	–	100	–	–	–	–	–	100
OTB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–
OTB_DEF_100-119_0_0_all_FDF	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all_FDF	–	100	–	–	–	–	–	–	–	–	–	–
SSC_DEF	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–
SSC_DEF_≥120_0_0_all_FDF	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_100-119_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–
SSC_DEF_100-119_0_0_all_FDF	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–
TBB_CRU_16-31_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–
TBB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–

Table 6. 2012: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	SWE	UKE	UKS
GNS_DEF_all_0_0_all	-	-	-	98.3	-	-	-
OTB_CRU_90-119_0_0_all	100	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	100	97.2	99.4	0	0	100
OTB_DEF_≥120_0_0_all_FDF	100	-	94.6	-	-	-	100
OTB_DEF_100-119_0_0_all	-	97.3	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-	-

2012: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2012: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	9	53.59	94.83	5
OTB_DEF_100-119_0_0_all	2	19.812	97.32	1
OTB_DEF_≥120_0_0_all_FDF	4	8.96	98.35	3
GNS_DEF_all_0_0_all	4	6.337	98.21	1
SSC_DEF_≥120_0_0_all	2	6.184	2.07	1
OTB_CRU_90-119_0_0_all	3	1.759	89.91	1
LLS_FIF_0_0_0_all	2	0.995	88.32	1
OTB_CRU_32-69_0_0_all	3	0.937	22.33	1
OTB_DEF	1	0.465	-	-
MIS_MIS_0_0_0_HC	8	0.368	35.81	1
OTB_CRU_70-99_0_0_all	5	0.205	99.5	2
SDN_DEF_≥120_0_0_all	3	0.14	5.52	1
GNS_DEF_120-219_0_0_all	1	0.061	100	1
SSC_DEF_≥120_0_0_all_FDF	1	0.05	100	1
FPO_CRU_0_0_0_all	2	0.04	-	-
SDN_DEF_≥120_0_0_all_FDF	1	0.019	100	1
OTB_CRU_90-119_0_0_all_FDF	1	0.016	100	1
SSC_DEF_100-119_0_0_all_FDF	1	0.016	-	-
GNS_DEF_120-219_0_0_all_FDF	1	0.012	100	1
OTB_SPF_32-69_0_0_all	1	0.012	100	1
MIS_MIS_0_0_0_HC_FDF	1	0.009	-	-
GNS_DEF_≥220_0_0_all_FDF	1	0.004	100	1
GNS_DEF_≥220_0_0_all	1	0.003	100	1
TBB_DEF_≥120_0_0_all	3	0.003	30.18	1
GTR_DEF_all_0_0_all	2	0.001	-	-
MIS_MIS	1	0.001	-	-
SSC_DEF_100-119_0_0_all	1	0.001	-	-
GNS_DEF	1	0	-	-
GNS_DEF_100-119_0_0_all	1	0	100	1
MIS_MIS_0_0_0_IBC	1	0	-	-
OTB_CRU_32-69_2_22_all	1	0	-	-
OTB_CRU_70-89_2_35_all	1	0	-	-
OTB_DEF_100-119_0_0_all_FDF	1	0	-	-
SSC_DEF	1	0	-	-
SSC_DEF_70-99_0_0_all	1	0	-	-
TBB_DEF_70-99_0_0_all	4	0	-	-

Table 2. 2012 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	3	49.276	89.91	1
OTB_CRU_32-69_0_0_all	IIIaN	3	18.883	27.17	1
OTB_DEF_≥120_0_0_all	IIIaN	3	13.38	18.9	2
OTB_DEF_≥120_0_0_all_FDF	IIIaN	2	7.717	47.69	2
GNS_DEF_all_0_0_all	IIIaN	3	3.137	-	-
MIS_MIS_0_0_0_HC	IIIaN	5	2.48	99.32	1
LLS_FIF_0_0_0_all	IIIaN	2	2.181	-	-
SDN_DEF_≥120_0_0_all	IIIaN	2	0.755	25.09	1
SSC_DEF_≥120_0_0_all_FDF	IIIaN	1	0.558	100	1
SDN_DEF_≥120_0_0_all_FDF	IIIaN	1	0.461	100	1
OTB_CRU_90-119_0_0_all_FDF	IIIaN	1	0.457	100	1
GNS_DEF_120-219_0_0_all	IIIaN	1	0.452	100	1
SSC_DEF_≥120_0_0_all	IIIaN	2	0.172	98.95	1
GNS_DEF_120-219_0_0_all_FDF	IIIaN	1	0.041	100	1
GTR_DEF_all_0_0_all	IIIaN	1	0.021	-	-
GNS_DEF_≥220_0_0_all_FDF	IIIaN	1	0.014	100	1
GNS_DEF_≥220_0_0_all	IIIaN	1	0.008	100	1
TBB_DEF_≥120_0_0_all	IIIaN	1	0.005	100	1
MIS_MIS_0_0_0_IBC	IIIaN	1	0.001	-	-
GNS_DEF_100-119_0_0_all	IIIaN	1	0	100	1
OTB_CRU_32-69_2_22_all	IIIaN	1	0	-	-
OTB_CRU_70-89_2_35_all	IIIaN	1	0	-	-

Table 3. 2012 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	8	51.398	94.7	4
OTB_DEF_100-119_0_0_all	IV	2	22.232	100	1
OTB_DEF_≥120_0_0_all_FDF	IV	4	10.014	99.96	3
GNS_DEF_all_0_0_all	IV	3	7.178	99.98	1
SSC_DEF_≥120_0_0_all	IV	2	7.123	1.97	1
LLS_FIF_0_0_0_all	IV	2	1.051	96.44	1
OTB_CRU_32-69_0_0_all	IV	3	0.303	9.93	1
OTB_CRU_70-99_0_0_all	IV	5	0.221	99.48	2
MIS_MIS_0_0_0_HC	IV	6	0.148	34.1	1
SDN_DEF_≥120_0_0_all	IV	3	0.13	0.83	1
GNS_DEF_120-219_0_0_all	IV	1	0.052	100	1
FPO_CRU_0_0_0_all	IV	2	0.046	-	-
SSC_DEF_≥120_0_0_all_FDF	IV	1	0.035	100	1
SSC_DEF_100-119_0_0_all_FDF	IV	1	0.019	-	-
OTB_SPF_32-69_0_0_all	IV	1	0.014	100	1
GNS_DEF_120-219_0_0_all_FDF	IV	1	0.012	100	1
MIS_MIS_0_0_0_HC_FDF	IV	1	0.01	-	-
GNS_DEF_≥220_0_0_all_FDF	IV	1	0.004	100	1
GNS_DEF_≥220_0_0_all	IV	1	0.003	100	1
SDN_DEF_≥120_0_0_all_FDF	IV	1	0.003	100	1
TBB_DEF_≥120_0_0_all	IV	3	0.003	25.26	1
SSC_DEF_100-119_0_0_all	IV	1	0.001	-	-
GNS_DEF_100-119_0_0_all	IV	1	0	100	1
GTR_DEF_all_0_0_all	IV	1	0	-	-
OTB_DEF_100-119_0_0_all_FDF	IV	1	0	-	-
SSC_DEF_70-99_0_0_all	IV	1	0	-	-
TBB_DEF_70-99_0_0_all	IV	4	0	-	-

Table 4. 2012 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	4	87.959	99.76	2
OTB_DEF_100-119_0_0_all	VI	1	5.475	-	-
OTB_DEF	VI	1	4.795	-	-
MIS_MIS_0_0_0_HC	VI	4	1.555	-	-
OTB_CRU_70-99_0_0_all	VI	2	0.137	99.85	1
LLS_FIF_0_0_0_all	VI	1	0.062	-	-
MIS_MIS	VI	1	0.014	-	-
SSC_DEF	VI	1	0.004	-	-
GNS_DEF	VI	1	0.001	-	-

2012: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2012: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	4	77.672	98.97	3
OTB_DEF_≥120_0_0_all_FDF	3	20.472	98.44	3
OTB_CRU_90-119_0_0_all	2	1.27	33.3	1
OTB_CRU_70-99_0_0_all	3	0.439	100	1
OTB	1	0.06	-	-
OTB_CRU_32-69_0_0_all	2	0.053	55.68	1
OTB_CRU_90-119_0_0_all_FDF	1	0.018	-	-
GNS_DEF_120-219_0_0_all	1	0.009	100	1
OTB_CRU_70-89_2_35_all	1	0.005	-	-
SDN_DEF_≥120_0_0_all_FDF	1	0.001	100	1
GNS_DEF_≥220_0_0_all	1	0	-	-
GNS_DEF_100-119_0_0_all	1	0	-	-
GNS_DEF_120-219_0_0_all_FDF	1	0	24.14	1
OTB_CRU_32-69_2_22_all	1	0	-	-
OTB_DEF_100-119_0_0_all	1	0	-	-
OTB_DEF_70-99_0_0_all	1	0	-	-
SDN_DEF_≥120_0_0_all	1	0	-	-
SSC_DEF_≥120_0_0_all	1	0	-	-
SSC_DEF_100-119_0_0_all	1	0	-	-
TBB_CRU_16-31_0_0_all	1	0	-	-
TBB_DEF_100-119_0_0_all	1	0	-	-
TBB_DEF_70-99_0_0_all	1	0	-	-

Table 2. 2012 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	2	1.27	33.3	1
OTB_DEF_≥120_0_0_all	IIIaN	2	0.07	100	1
OTB_CRU_32-69_0_0_all	IIIaN	2	0.047	62.86	1
OTB_DEF_≥120_0_0_all_FDF	IIIaN	2	0.032	14.25	1
OTB_CRU_90-119_0_0_all_FDF	IIIaN	1	0.018	-	-
GNS_DEF_120-219_0_0_all	IIIaN	1	0.008	100	1
OTB_CRU_70-89_2_35_all	IIIaN	1	0.005	-	-
GNS_DEF_100-119_0_0_all	IIIaN	1	0	-	-
GNS_DEF_120-219_0_0_all_FDF	IIIaN	1	0	100	1
OTB_CRU_32-69_2_22_all	IIIaN	1	0	-	-
SDN_DEF_≥120_0_0_all	IIIaN	1	0	-	-
SDN_DEF_≥120_0_0_all_FDF	IIIaN	1	0	-	-

Table 3. 2012 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	4	39.193	97.97	3
OTB_DEF_≥120_0_0_all_FDF	IV	3	20.44	98.57	3
OTB_CRU_70-99_0_0_all	IV	3	0.332	100	1
OTB_CRU_32-69_0_0_all	IV	1	0.006	-	-
GNS_DEF_120-219_0_0_all	IV	1	0.001	100	1
SDN_DEF_≥120_0_0_all_FDF	IV	1	0.001	100	1
GNS_DEF_≥220_0_0_all	IV	1	0	-	-
GNS_DEF_120-219_0_0_all_FDF	IV	1	0	-	-
OTB_DEF_100-119_0_0_all	IV	1	0	-	-
OTB_DEF_70-99_0_0_all	IV	1	0	-	-
SSC_DEF_≥120_0_0_all	IV	1	0	-	-
SSC_DEF_100-119_0_0_all	IV	1	0	-	-
TBB_CRU_16-31_0_0_all	IV	1	0	-	-
TBB_DEF_100-119_0_0_all	IV	1	0	-	-
TBB_DEF_70-99_0_0_all	IV	1	0	-	-

Table 4. 2012 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	1	38.41	100	1
OTB_CRU_70-99_0_0_all	VI	1	0.107	100	1
OTB	VI	1	0.06	-	-

2013: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2013: Proportion of landings by area and season.

Area	1	2	3	4	2013
IIIaN	1.42	1.46	1.76	1.31	0
IV	27.82	27.53	14.33	13.76	0
VI	1.42	2.87	1.36	0.4	4.56

Table 2. 2013: Proportion of landings by métier and nation.

Fleet	BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	SWE	UKE	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	0.025	-	0	-
GNS_DEF	-	-	-	-	-	-	0.006	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	0.003	-	-	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all_FDF	-	0.001	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	0	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all_FDF	-	0	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.215	-	-	-	-	0.006	-	-	-	-	-
GNS_DEF_120-219_0_0_all_FDF	-	0.123	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0.017	-	-	6.237	0.002	0	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	0.002	0	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	0.003	-	0.694	0.005	-	-
MIS_MIS	-	-	-	-	-	-	0.003	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	0.076	0.026	0.034	0.545	-	-	0.002	-	0	-	0.075
MIS_MIS_0_0_0_IBC	-	0.012	-	-	-	-	-	-	-	-	-	-
OTB_CRU_32-69_0_0_all	-	0.241	-	-	-	-	-	-	0.138	0.255	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	0.001	-	-
OTB_CRU_70-89_2_35_all	-	-	-	-	-	-	-	-	-	0	-	-
OTB_CRU_70-99_0_0_all	0	0	-	-	-	-	-	-	-	-	0.001	0.21
OTB_CRU_90-119_0_0_all	-	1.322	-	-	-	0.027	-	-	-	0.357	-	-
OTB_CRU_90-119_0_0_all_FDF	-	0.013	-	-	-	-	-	-	-	-	-	-
OTB_DEF	-	-	-	-	-	-	0.378	-	-	-	-	-
OTB_DEF_≥120_0_0_all	0	0.859	-	-	2.71	8.962	0.332	-	35.976	1.086	1.253	14.118
OTB_DEF_≥120_0_0_all_FDF	-	4.054	-	-	-	3.035	-	-	-	-	-	1.739
OTB_DEF_100-119_0_0_all	-	-	-	-	11.509	-	-	-	-	-	-	-
OTB_DWS_≥120_0_0_all	-	-	-	-	0.423	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	0.051	-	-	-	-	-	-	-	0.001	-	-
SDN_DEF_≥120_0_0_all	-	0.041	-	-	-	-	-	-	-	0.032	-	-
SDN_DEF_≥120_0_0_all_FDF	-	0.065	-	-	-	-	-	-	-	-	-	-
SSC_DEF	-	-	-	-	-	-	0.002	-	-	-	-	-
SSC_DEF_≥120_0_0_all	0.001	0.205	-	-	-	-	0.002	-	2.191	-	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	-	-	-	0.188	-	-	-	-
SSC_DEF_100-119_0_0_all_FDF	-	-	-	-	-	-	-	0.108	-	-	-	-
SSC_DEF_70-99_0_0_all	-	-	-	-	-	-	-	0	-	-	-	-
SSC_DEF_All_0_0_All	-	-	-	-	-	-	-	-	-	-	0	-
TBB_DEF_≥120_0_0_all	0.002	0	-	-	-	0	-	-	-	-	0	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	-	-	-	-	-	0	-

Table 3. 2013: Proportion of landings by nation.

BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	SWE	UKE	UKS
0	7.3	0	0	15.2	12	0.7	0.3	45.3	1.7	1.3	16.1

Table 4. 2013: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
FPO_CRU_0_0_0_all	0	1	0.024	2	-	-
GNS_DEF	-	-	-	-	0.006	1
GNS_DEF_≥220_0_0_all	0.001	1	0.002	1	-	-
GNS_DEF_≥220_0_0_all_FDF	0	1	0	1	-	-
GNS_DEF_100-119_0_0_all	0	1	0	1	-	-
GNS_DEF_100-119_0_0_all_FDF	-	-	0	1	-	-
GNS_DEF_120-219_0_0_all	0.022	1	0.193	1	0.006	1
GNS_DEF_120-219_0_0_all_FDF	0.01	1	0.113	1	-	-
GNS_DEF_all_0_0_all	0.135	3	6.12	3	-	-
GTR_DEF_all_0_0_all	0.002	1	0	1	-	-
LLS_FIF_0_0_0_all	0.03	2	0.666	1	0.006	2
MIS_MIS	-	-	-	-	0.003	1
MIS_MIS_0_0_0_HC	0.049	3	0.068	4	0.641	4
MIS_MIS_0_0_0_IBC	0.006	1	0.005	1	-	-
OTB_CRU_32-69_0_0_all	0.51	3	0.125	3	-	-
OTB_CRU_32-69_2_22_all	0.001	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0	1	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.202	4	0.009	1
OTB_CRU_90-119_0_0_all	1.705	3	-	-	-	-
OTB_CRU_90-119_0_0_all_FDF	0.013	1	-	-	-	-
OTB_DEF	-	-	-	-	0.378	1
OTB_DEF_≥120_0_0_all	2.271	3	54.899	7	8.125	5
OTB_DEF_≥120_0_0_all_FDF	0.754	2	8.074	3	-	-
OTB_DEF_100-119_0_0_all	-	-	10.502	1	1.007	1
OTB_DWS_≥120_0_0_all	-	-	-	-	0.423	1
OTB_SPF_32-69_0_0_all	-	-	0.052	2	-	-
SDN_DEF_≥120_0_0_all	0.04	1	0.033	2	-	-
SDN_DEF_≥120_0_0_all_FDF	0.051	1	0.014	1	-	-
SSC_DEF	-	-	-	-	0.002	1
SSC_DEF_≥120_0_0_all	0.263	2	2.134	3	0.002	1
SSC_DEF_100-119_0_0_all	0.08	1	0.108	1	-	-
SSC_DEF_100-119_0_0_all_FDF	-	-	0.108	1	-	-
SSC_DEF_70-99_0_0_all	-	-	0	1	-	-
SSC_DEF_All_0_0_All	-	-	0	1	-	-
TBB_DEF_≥120_0_0_all	0	1	0.002	4	-	-
TBB_DEF_70-99_0_0_all	-	-	0	2	-	-

Table 5. 2013: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	9	65.296	65
OTB_DEF_100-119_0_0_all	1	11.509	77
OTB_DEF_≥120_0_0_all_FDF	3	8.829	86
GNS_DEF_all_0_0_all	4	6.256	92
SSC_DEF_≥120_0_0_all	4	2.399	94
OTB_CRU_90-119_0_0_all	3	1.705	96
MIS_MIS_0_0_0_HC	7	0.758	97
LLS_FIF_0_0_0_all	3	0.702	97
OTB_CRU_32-69_0_0_all	3	0.634	98
OTB_DWS_≥120_0_0_all	1	0.423	99
OTB_DEF	1	0.378	99
GNS_DEF_120-219_0_0_all	2	0.22	99
OTB_CRU_70-99_0_0_all	4	0.211	99
SSC_DEF_100-119_0_0_all	1	0.188	100
GNS_DEF_120-219_0_0_all_FDF	1	0.123	100
SSC_DEF_100-119_0_0_all_FDF	1	0.108	100
SDN_DEF_≥120_0_0_all	2	0.073	100
SDN_DEF_≥120_0_0_all_FDF	1	0.065	100
OTB_SPF_32-69_0_0_all	2	0.052	100
FPO_CRU_0_0_0_all	2	0.025	100
OTB_CRU_90-119_0_0_all_FDF	1	0.013	100
MIS_MIS_0_0_0_IBC	1	0.012	100
GNS_DEF	1	0.006	100
GNS_DEF_≥220_0_0_all	1	0.003	100
MIS_MIS	1	0.003	100
GTR_DEF_all_0_0_all	2	0.002	100
SSC_DEF	1	0.002	100
TBB_DEF_≥120_0_0_all	4	0.002	100
GNS_DEF_≥220_0_0_all_FDF	1	0.001	100
OTB_CRU_32-69_2_22_all	1	0.001	100
GNS_DEF_100-119_0_0_all	1	0	100
GNS_DEF_100-119_0_0_all_FDF	1	0	100
OTB_CRU_70-89_2_35_all	1	0	100
SSC_DEF_70-99_0_0_all	1	0	100
SSC_DEF_All_0_0_All	1	0	100
TBB_DEF_70-99_0_0_all	2	0	100

2013: Appendix B: Age coverage of landings and discards

Table 1. 2013: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	83.12
Discards	91.37

Table 2. 2013: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	75.05	89.94	99.62
Landings	35.66	86.76	81.07

Table 3. 2013: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2013
Discards	IIIaN	62.37	59.23	73.22	93.05	-
Discards	IV	5.1	0.8	71.3	10.63	98.88
Discards	VI	-	-	-	-	99.83
Landings	IIIaN	56.18	27.89	20.09	43.01	-
Landings	IV	97.96	91.96	67.31	73.97	-
Landings	VI	82.49	70.18	43.14	91.51	97.9

Table 4. 2013: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	0	-	0	-	-
GNS_DEF	-	-	-	-	-	-	0	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	100	-	-	-	-	0	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0	-	-	97.86	0	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	0	0	-	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	0	-	0	0	-	-	-
MIS_MIS	-	-	-	-	-	-	0	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	100	0	0	0	-	-	0	-	0	-	-	0
MIS_MIS_0_0_0_IBC	-	0	-	-	-	-	-	-	-	-	-	-	-
OTB	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_32-69_0_0_all	-	100	-	-	-	-	-	-	0	0	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	0	100	-	-	-	-	-	-	-	-	0	-	92.36
OTB_CRU_90-119_0_0_all	-	100	-	-	-	0	-	-	-	0	-	-	-
OTB_CRU_90-119_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-
OTB_DEF	-	-	-	-	-	-	0	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	0	100	-	-	100	89.34	0	-	79.33	0	0	-	100
OTB_DEF_≥120_0_0_all_FDF	-	100	-	-	-	82.55	-	-	-	-	-	-	100
OTB_DEF_100-119_0_0_all	-	-	-	-	100	-	-	-	-	-	-	-	-
OTB_DEF_70-99_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_DWS_≥120_0_0_all	-	-	-	-	100	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	100	-	-	-	-	-	-	-	0	-	-	-
SDN_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	-	0	-	-	-
SDN_DEF_≥120_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-
SSC_DEF	-	-	-	-	-	-	0	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	0	100	-	-	-	-	0	-	0	-	-	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	-	-	-	0	-	-	-	-	-
SSC_DEF_100-119_0_0_all_FDF	-	-	-	-	-	-	-	0	-	-	-	-	-
SSC_DEF_70-99_0_0_all	-	-	-	-	-	-	-	0	-	-	-	-	-
SSC_DEF_All_0_0_All	-	-	-	-	-	-	-	-	-	-	0	-	-
TBB_CRU_16-31_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0	100	-	-	-	0	-	-	-	-	0	-	-
TBB_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	-	-	-	-	-	0	-	-

Table 5. 2013: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	100	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all_FDF	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	3.91	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all_FDF	–	100	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB	–	–	–	–	–	–	0	–	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	100	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-89_2_35_all	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-99_0_0_all	–	100	–	–	–	–	–	0	–	–	–	0	100
OTB_CRU_90-119_0_0_all	–	100	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_90-119_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	62.84	–	–	–	100	0	–	–	–	0	–	100
OTB_DEF_≥120_0_0_all_FDF	–	67.97	–	–	–	100	–	–	–	–	–	–	100
OTB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–	–
OTB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–	–
OTB_DWS_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	100	–	–	–	–	–	0	–	–	–	–	–
SSC_DEF_100-119_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–	–
SSC_DEF_100-119_0_0_all_FDF	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_70-99_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_All_0_0_All	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_CRU_16-31_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	0	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–	–
TBB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–	–

Table 6. 2013: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	UKE	UKS
GNS_DEF_all_0_0_all	-	-	-	97.9	-	-
OTB_CRU_90-119_0_0_all	100	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	100	89.3	79.3	0	100
OTB_DEF_≥120_0_0_all_FDF	100	-	82.5	-	-	100
OTB_DEF_100-119_0_0_all	-	100	-	-	-	-
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-

2013: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2013: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	9	65.296	83.06	5
OTB_DEF_100-119_0_0_all	1	11.509	100	1
OTB_DEF_≥120_0_0_all_FDF	3	8.829	94	3
GNS_DEF_all_0_0_all	4	6.256	97.57	1
SSC_DEF_≥120_0_0_all	4	2.399	8.56	1
OTB_CRU_90-119_0_0_all	3	1.705	77.52	1
MIS_MIS_0_0_0_HC	7	0.758	9.96	1
LLS_FIF_0_0_0_all	3	0.702	-	-
OTB_CRU_32-69_0_0_all	3	0.634	37.98	1
OTB_DWS_≥120_0_0_all	1	0.423	100	1
OTB_DEF	1	0.378	-	-
GNS_DEF_120-219_0_0_all	2	0.22	97.49	1
OTB_CRU_70-99_0_0_all	4	0.211	92.01	2
SSC_DEF_100-119_0_0_all	1	0.188	-	-
GNS_DEF_120-219_0_0_all_FDF	1	0.123	100	1
SSC_DEF_100-119_0_0_all_FDF	1	0.108	-	-
SDN_DEF_≥120_0_0_all	2	0.073	56.05	1
SDN_DEF_≥120_0_0_all_FDF	1	0.065	100	1
OTB_SPF_32-69_0_0_all	2	0.052	98.6	1
FPO_CRU_0_0_0_all	2	0.025	-	-
OTB_CRU_90-119_0_0_all_FDF	1	0.013	100	1
MIS_MIS_0_0_0_IBC	1	0.012	-	-
GNS_DEF	1	0.006	-	-
GNS_DEF_≥220_0_0_all	1	0.003	100	1
MIS_MIS	1	0.003	-	-
GTR_DEF_all_0_0_all	2	0.002	-	-
SSC_DEF	1	0.002	-	-
TBB_DEF_≥120_0_0_all	4	0.002	1.58	1
GNS_DEF_≥220_0_0_all_FDF	1	0.001	100	1
OTB_CRU_32-69_2_22_all	1	0.001	-	-
GNS_DEF_100-119_0_0_all	1	0	100	1
GNS_DEF_100-119_0_0_all_FDF	1	0	100	1
OTB_CRU_70-89_2_35_all	1	0	-	-
SSC_DEF_70-99_0_0_all	1	0	-	-
SSC_DEF_All_0_0_All	1	0	-	-
TBB_DEF_70-99_0_0_all	2	0	-	-

Table 2. 2013 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IIIaN	3	38.203	6.39	1
OTB_CRU_90-119_0_0_all	IIIaN	3	28.678	77.52	1
OTB_DEF_≥120_0_0_all_FDF	IIIaN	2	12.687	29.77	1
OTB_CRU_32-69_0_0_all	IIIaN	3	8.571	44.26	1
SSC_DEF_≥120_0_0_all	IIIaN	2	4.429	6.36	1
GNS_DEF_all_0_0_all	IIIaN	3	2.278	-	-
SSC_DEF_100-119_0_0_all	IIIaN	1	1.345	-	-
SDN_DEF_≥120_0_0_all_FDF	IIIaN	1	0.863	100	1
MIS_MIS_0_0_0_HC	IIIaN	3	0.82	99.67	1
SDN_DEF_≥120_0_0_all	IIIaN	1	0.677	100	1
LLS_FIF_0_0_0_all	IIIaN	2	0.503	-	-
GNS_DEF_120-219_0_0_all	IIIaN	1	0.374	100	1
OTB_CRU_90-119_0_0_all_FDF	IIIaN	1	0.227	100	1
GNS_DEF_120-219_0_0_all_FDF	IIIaN	1	0.163	100	1
MIS_MIS_0_0_0_IBC	IIIaN	1	0.109	-	-
GTR_DEF_all_0_0_all	IIIaN	1	0.032	-	-
OTB_CRU_32-69_2_22_all	IIIaN	1	0.017	-	-
GNS_DEF_≥220_0_0_all	IIIaN	1	0.01	100	1
FPO_CRU_0_0_0_all	IIIaN	1	0.008	-	-
GNS_DEF_≥220_0_0_all_FDF	IIIaN	1	0.006	100	1
GNS_DEF_100-119_0_0_all	IIIaN	1	0	100	1
OTB_CRU_70-89_2_35_all	IIIaN	1	0	-	-
TBB_DEF_≥120_0_0_all	IIIaN	1	0	100	1

Table 3. 2013 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	7	65.79	85.48	4
OTB_DEF_100-119_0_0_all	IV	1	12.585	100	1
OTB_DEF_≥120_0_0_all_FDF	IV	3	9.676	100	3
GNS_DEF_all_0_0_all	IV	3	7.334	99.72	1
SSC_DEF_≥120_0_0_all	IV	3	2.558	8.84	1
LLS_FIF_0_0_0_all	IV	1	0.799	-	-
OTB_CRU_70-99_0_0_all	IV	4	0.242	91.65	2
GNS_DEF_120-219_0_0_all	IV	1	0.231	100	1
OTB_CRU_32-69_0_0_all	IV	3	0.149	12.31	1
GNS_DEF_120-219_0_0_all_FDF	IV	1	0.135	100	1
SSC_DEF_100-119_0_0_all	IV	1	0.13	-	-
SSC_DEF_100-119_0_0_all_FDF	IV	1	0.13	-	-
MIS_MIS_0_0_0_HC	IV	4	0.081	39.74	1
OTB_SPF_32-69_0_0_all	IV	2	0.062	98.6	1
SDN_DEF_≥120_0_0_all	IV	2	0.039	1.67	1
FPO_CRU_0_0_0_all	IV	2	0.029	-	-
SDN_DEF_≥120_0_0_all_FDF	IV	1	0.017	100	1
MIS_MIS_0_0_0_IBC	IV	1	0.007	-	-
GNS_DEF_≥220_0_0_all	IV	1	0.003	100	1
TBB_DEF_≥120_0_0_all	IV	4	0.003	1.25	1
GNS_DEF_≥220_0_0_all_FDF	IV	1	0	100	1
GNS_DEF_100-119_0_0_all	IV	1	0	100	1
GNS_DEF_100-119_0_0_all_FDF	IV	1	0	100	1
GTR_DEF_all_0_0_all	IV	1	0	-	-
SSC_DEF_70-99_0_0_all	IV	1	0	-	-
SSC_DEF_All_0_0_All	IV	1	0	-	-
TBB_DEF_70-99_0_0_all	IV	2	0	-	-

Table 4. 2013 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	5	76.591	88.13	2
OTB_DEF_100-119_0_0_all	VI	1	9.494	100	1
MIS_MIS_0_0_0_HC	VI	4	6.045	-	-
OTB_DWS_≥120_0_0_all	VI	1	3.988	100	1
OTB_DEF	VI	1	3.564	-	-
OTB_CRU_70-99_0_0_all	VI	1	0.087	100	1
LLS_FIF_0_0_0_all	VI	2	0.057	-	-
GNS_DEF	VI	1	0.052	-	-
GNS_DEF_120-219_0_0_all	VI	1	0.052	-	-
MIS_MIS	VI	1	0.032	-	-
SSC_DEF	VI	1	0.018	-	-
SSC_DEF_≥120_0_0_all	VI	1	0.018	-	-

2013: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2013: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	5	84.988	91.89	3
OTB_DEF_≥120_0_0_all_FDF	3	11.699	99.22	3
OTB_CRU_90-119_0_0_all	2	1.165	91.31	1
SSC_DEF_≥120_0_0_all	2	0.82	0.4	1
GNS_DEF_120-219_0_0_all	1	0.601	3.91	1
OTB_CRU_70-99_0_0_all	4	0.569	100	2
OTB_CRU_90-119_0_0_all_FDF	1	0.055	-	-
OTB_CRU_70-89_2_35_all	1	0.039	-	-
OTB	1	0.03	-	-
OTB_CRU_32-69_0_0_all	2	0.029	48.64	1
OTB_CRU_32-69_2_22_all	1	0.002	-	-
TBB_DEF_≥120_0_0_all	1	0.002	-	-
GNS_DEF_120-219_0_0_all_FDF	1	0.001	100	1
GNS_DEF_≥220_0_0_all	1	0	-	-
GNS_DEF_≥220_0_0_all_FDF	1	0	-	-
GNS_DEF_100-119_0_0_all	1	0	100	1
OTB_DEF_100-119_0_0_all	1	0	-	-
OTB_DEF_70-99_0_0_all	1	0	-	-
SDN_DEF_≥120_0_0_all	1	0	-	-
SDN_DEF_≥120_0_0_all_FDF	1	0	-	-
SSC_DEF_100-119_0_0_all	1	0	-	-
TBB_CRU_16-31_0_0_all	1	0	-	-
TBB_DEF_100-119_0_0_all	1	0	-	-
TBB_DEF_70-99_0_0_all	1	0	-	-

Table 2. 2013 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	2	1.165	91.31	1
OTB_DEF_≥120_0_0_all	IIIaN	1	0.436	60.89	1
OTB_DEF_≥120_0_0_all_FDF	IIIaN	1	0.205	55.82	1
OTB_CRU_90-119_0_0_all_FDF	IIIaN	1	0.055	-	-
GNS_DEF_120-219_0_0_all	IIIaN	1	0.042	56.34	1
OTB_CRU_70-89_2_35_all	IIIaN	1	0.039	-	-
OTB_CRU_32-69_0_0_all	IIIaN	2	0.029	48.64	1
OTB_CRU_32-69_2_22_all	IIIaN	1	0.002	-	-
GNS_DEF_≥220_0_0_all	IIIaN	1	0	-	-
GNS_DEF_≥220_0_0_all_FDF	IIIaN	1	0	-	-
GNS_DEF_100-119_0_0_all	IIIaN	1	0	100	1
GNS_DEF_120-219_0_0_all_FDF	IIIaN	1	0	100	1
SDN_DEF_≥120_0_0_all	IIIaN	1	0	-	-
SDN_DEF_≥120_0_0_all_FDF	IIIaN	1	0	-	-

Table 3. 2013 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	4	66.773	89.98	3
OTB_DEF_≥120_0_0_all_FDF	IV	3	11.493	100	3
SSC_DEF_≥120_0_0_all	IV	2	0.82	0.4	1
GNS_DEF_120-219_0_0_all	IV	1	0.559	-	-
OTB_CRU_70-99_0_0_all	IV	3	0.527	100	2
TBB_DEF_≥120_0_0_all	IV	1	0.002	-	-
GNS_DEF_120-219_0_0_all_FDF	IV	1	0.001	100	1
GNS_DEF_≥220_0_0_all	IV	1	0	-	-
OTB_DEF_100-119_0_0_all	IV	1	0	-	-
OTB_DEF_70-99_0_0_all	IV	1	0	-	-
SDN_DEF_≥120_0_0_all_FDF	IV	1	0	-	-
SSC_DEF_100-119_0_0_all	IV	1	0	-	-
TBB_CRU_16-31_0_0_all	IV	1	0	-	-
TBB_DEF_100-119_0_0_all	IV	1	0	-	-
TBB_DEF_70-99_0_0_all	IV	1	0	-	-

Table 4. 2013 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	2	17.778	99.78	1
OTB_CRU_70-99_0_0_all	VI	2	0.042	100	1
OTB	VI	1	0.03	-	-

2014: Appendix A: Importance by landed weight

Nation abbreviated names are as follows: BEL = Belgium, DEN = Denmark, ES = Spain, FO = Faroe Islands, FRA = France, GFR = Germany, GRE = Greenland, IRL = Ireland, LIT = Lithuania, NED = Netherlands, NOR = Norway, POL = Poland, POR = Portugal, RUS = Russia, UKE = UK-England, UKNI = UK-Northern Ireland, UKS = UK-Scotland, SWE = Sweden.

Table 1. 2014: Proportion of landings by area and season.

Area	1	2	3	4	2014
IIIaN	0.49	0.78	0.59	1.15	0
IV	20.89	25.67	18.91	22.46	0
VI	0.76	2.58	1.05	0.37	4.29

Table 2. 2014: Proportion of landings by métier and nation.

Fleet	BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	0.052	-	0	-	-	-
GNS_DEF	-	-	-	-	-	-	0.003	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all_FDF	-	0	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	0.091	-	-	0.607	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all_FDF	-	0.012	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0.005	-	-	3.196	-	0.002	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	0.001	0	-	-
LHM_DEF_0_0_0	-	-	-	-	-	-	-	-	-	-	-	-	0	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	0.674	-	0.018	-	-	-
MIS_MIS	-	-	-	-	-	-	0.008	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	0.079	0.012	0.04	0.019	-	-	0.024	0.001	0.012	0	-	-	0.104
MIS_MIS_0_0_0_HC_FDF	-	-	-	-	-	-	-	0	-	-	-	-	-	-
MIS_MIS_0_0_0_IBC	-	0.063	-	-	-	-	-	-	-	-	0.012	-	-	-
OTB_CRU_32-69_0_0_all	-	0.23	-	-	-	0.004	-	-	0.479	-	0.246	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-
OTB_CRU_70-89_2_35_all	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	-	0.002	-	-	-	-	-	-	-	-	-	0	-	0.184
OTB_CRU_70-99_0_0_all_FDF	-	0.018	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_90-119_0_0_all	-	0.978	-	-	-	0.003	-	-	-	-	0.214	-	-	-
OTB_CRU_90-119_0_0_all_FDF	-	0.008	-	-	-	-	-	-	-	-	-	-	-	-
OTB_DEF	-	-	-	-	-	-	0.159	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	0.72	-	-	2.332	7.938	-	0.001	42.368	-	1.175	1.039	-	12.689
OTB_DEF_≥120_0_0_all_FDF	-	3.948	-	-	-	3.39	-	0.002	-	-	-	-	-	1.432
OTB_DEF_100-119_0_0_all	0	-	-	-	11.15	-	-	0	-	-	-	-	-	-
OTB_DWS_≥120_0_0_all	-	-	-	-	0.192	-	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	0.192	-	-	-	0	-	-	-	-	-	-	-	-
OTT_DEF_100-119_0_0_all	-	-	-	-	0.021	-	-	-	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	0.01	-	-	-	-	-	-	0	-	0.017	-	-	-
SDN_DEF_≥120_0_0_all_FDF	-	0.065	-	-	-	-	-	-	-	-	-	-	-	-
SSC_DEF	-	-	-	-	-	-	0	-	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	0.304	-	-	-	-	-	-	3.439	-	-	-	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	0	-
SSC_DEF_100-119_0_0_all_FDF	-	-	-	-	-	-	-	0.007	-	-	-	-	-	-
SSC_DEF_All_0_0_All	-	-	-	-	-	-	-	-	-	-	-	0	-	-
TBB_DEF_≥120_0_0_all	0.005	0	-	-	-	0	-	0.001	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	-	-	-	-	-	-	0	-	-

Table 3. 2014: Proportion of landings by nation.

BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	RUS	SWE	UKE	UKNI	UKS
0	6.7	0	0	14.3	11.3	0.2	0	50.2	0	1.7	1	0	14.4

Table 4. 2014: Proportion of landings by métier and area, including the number of nations fishing that métier.

Fleet	IIIaN	IIIaN.nation	IV	IV.nation	VI	VI.nation
FPO_CRU_0_0_0_all	0	1	0.052	1	-	-
GNS_DEF	-	-	-	-	0.003	1
GNS_DEF_≥220_0_0_all	0.002	1	0.003	1	-	-
GNS_DEF_≥220_0_0_all_FDF	-	-	0	1	-	-
GNS_DEF_120-219_0_0_all	0.021	1	0.07	1	0.607	1
GNS_DEF_120-219_0_0_all_FDF	0	1	0.012	1	-	-
GNS_DEF_all_0_0_all	0.063	2	3.14	3	-	-
GTR_DEF_all_0_0_all	0.001	1	0	1	-	-
LHM_DEF_0_0_0	-	-	-	-	0	1
LLS_FIF_0_0_0_all	0.07	2	0.616	1	0.006	1
MIS_MIS	-	-	-	-	0.008	1
MIS_MIS_0_0_0_HC	0.065	4	0.061	6	0.163	6
MIS_MIS_0_0_0_HC_FDF	-	-	0	1	-	-
MIS_MIS_0_0_0_IBC	0.012	1	0.063	2	-	-
OTB_CRU_32-69_0_0_all	0.721	4	0.239	3	-	-
OTB_CRU_32-69_2_22_all	0.001	1	-	-	-	-
OTB_CRU_70-89_2_35_all	0	1	-	-	-	-
OTB_CRU_70-99_0_0_all	-	-	0.185	3	0.002	1
OTB_CRU_70-99_0_0_all_FDF	-	-	0.018	1	-	-
OTB_CRU_90-119_0_0_all	1.195	3	-	-	-	-
OTB_CRU_90-119_0_0_all_FDF	0.008	1	-	-	-	-
OTB_DEF	-	-	-	-	0.159	1
OTB_DEF_≥120_0_0_all	0.685	3	60.694	8	6.883	4
OTB_DEF_≥120_0_0_all_FDF	0.143	2	8.629	4	-	-
OTB_DEF_100-119_0_0_all	-	-	10.146	3	1.004	1
OTB_DWS_≥120_0_0_all	-	-	0.026	1	0.166	1
OTB_SPF_32-69_0_0_all	-	-	0.165	2	0.027	1
OTT_DEF_100-119_0_0_all	-	-	-	-	0.021	1
SDN_DEF_≥120_0_0_all	0.009	1	0.018	3	-	-
SDN_DEF_≥120_0_0_all_FDF	0.007	1	0.059	1	-	-
SSC_DEF	-	-	-	-	0	1
SSC_DEF_≥120_0_0_all	0.012	2	3.73	2	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	0	1
SSC_DEF_100-119_0_0_all_FDF	-	-	0.007	1	-	-
SSC_DEF_All_0_0_All	-	-	0	1	-	-
TBB_DEF_≥120_0_0_all	-	-	0.007	4	-	-
TBB_DEF_70-99_0_0_all	-	-	0	2	-	-

Table 5. 2014: Proportion of landings by métier, ranked from largest to smallest, together with cumulative sum and number of nations fishing that métier.

Fleet	Nation	Rank	Cum
OTB_DEF_≥120_0_0_all	8	68.262	68
OTB_DEF_100-119_0_0_all	3	11.15	79
OTB_DEF_≥120_0_0_all_FDF	4	8.773	88
SSC_DEF_≥120_0_0_all	2	3.742	92
GNS_DEF_all_0_0_all	4	3.204	95
OTB_CRU_90-119_0_0_all	3	1.195	96
OTB_CRU_32-69_0_0_all	4	0.96	97
GNS_DEF_120-219_0_0_all	2	0.697	98
LLS_FIF_0_0_0_all	2	0.692	99
MIS_MIS_0_0_0_HC	9	0.289	99
OTB_DWS_≥120_0_0_all	1	0.192	99
OTB_SPF_32-69_0_0_all	2	0.192	99
OTB_CRU_70-99_0_0_all	3	0.186	100
OTB_DEF	1	0.159	100
MIS_MIS_0_0_0_IBC	2	0.075	100
SDN_DEF_≥120_0_0_all_FDF	1	0.065	100
FPO_CRU_0_0_0_all	2	0.052	100
SDN_DEF_≥120_0_0_all	3	0.027	100
OTT_DEF_100-119_0_0_all	1	0.021	100
OTB_CRU_70-99_0_0_all_FDF	1	0.018	100
GNS_DEF_120-219_0_0_all_FDF	1	0.012	100
MIS_MIS	1	0.008	100
OTB_CRU_90-119_0_0_all_FDF	1	0.008	100
SSC_DEF_100-119_0_0_all_FDF	1	0.007	100
TBB_DEF_≥120_0_0_all	4	0.007	100
GNS_DEF_≥220_0_0_all	1	0.004	100
GNS_DEF	1	0.003	100
GTR_DEF_all_0_0_all	2	0.001	100
OTB_CRU_32-69_2_22_all	1	0.001	100
GNS_DEF_≥220_0_0_all_FDF	1	0	100
LHM_DEF_0_0_0	1	0	100
MIS_MIS_0_0_0_HC_FDF	1	0	100
OTB_CRU_70-89_2_35_all	1	0	100
SSC_DEF	1	0	100
SSC_DEF_100-119_0_0_all	1	0	100
SSC_DEF_All_0_0_All	1	0	100
TBB_DEF_70-99_0_0_all	2	0	100

2014: Appendix B: Age coverage of landings and discards

Table 1. 2014: Coverage (total proportion) of the sampled landings and discards for age composition. Note: discards include only reported discards, not raised.

	Percent
Landings	67
Discards	98.2

Table 2. 2014: Coverage (proportion) of sampled landings and sampled discards by area for age composition. Note: discards include only reported discards, not raised.

	IIIaN	IV	VI
Discards	24.62	99.91	99.68
Landings	54.49	67.3	68.25

Table 3. 2014: Coverage (proportion) of sampled landings and sampled discards by area and season for age composition. Note: discards include only reported discards, not raised, therefore, proportions will appear high. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-nation stratum.

	Area	1	2	3	4	2014
Discards	IIIaN	98	56.32	10.86	7.82	-
Discards	IV	99.17	-	100	100	100
Discards	VI	-	100	-	100	99.68
Landings	IIIaN	56.09	52.2	40.11	62.74	-
Landings	IV	94.93	34.94	46.55	96.07	-
Landings	VI	77.01	24.72	51.84	71.78	96.61

Table 4. 2014: Coverage (proportion) of landings in each métier-nation stratum for age composition. A 0 indicates no sample data where landings were reported, while a - indicates no landings were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	-	-	-	-	-	-	-	-	0	-	0	-	-	-
GNS_DEF	-	-	-	-	-	-	0	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all	-	100	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_≥220_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all	-	100	-	-	0	-	-	-	-	-	-	-	-	-
GNS_DEF_120-219_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-	-
GNS_DEF_all_0_0_all	-	-	-	-	-	0	-	-	98.08	-	0	0	-	-
GTR_DEF_all_0_0_all	-	-	-	-	-	-	-	-	-	-	0	0	-	-
LHM_DEF_0_0_0	-	-	-	-	-	-	-	-	-	-	-	-	0	-
LLS_FIF_0_0_0_all	-	-	-	-	-	-	-	-	0	-	0	-	-	-
MIS_MIS	-	-	-	-	-	-	0	-	-	-	-	-	-	-
MIS_MIS_0_0_0_HC	-	100	0	0	0	-	-	0	0	0	0	-	-	0
MIS_MIS_0_0_0_HC_FDF	-	-	-	-	-	-	-	0	-	-	-	-	-	-
MIS_MIS_0_0_0_IBC	-	0	-	-	-	-	-	-	-	-	0	-	-	-
OTB	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_32-69_0_0_all	-	100	-	-	-	0	-	-	0	-	0	-	-	-
OTB_CRU_32-69_2_22_all	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-89_2_35_all	-	-	-	-	-	-	-	-	-	-	0	-	-	-
OTB_CRU_70-99_0_0_all	-	100	-	-	-	-	-	-	-	-	-	0	-	99.16
OTB_CRU_70-99_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-	-
OTB_CRU_90-119_0_0_all	-	100	-	-	-	0	-	-	-	-	0	-	-	-
OTB_CRU_90-119_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-	-
OTB_DEF	-	-	-	-	-	-	0	-	-	-	-	-	-	-
OTB_DEF_≥120_0_0_all	-	100	-	-	87.16	98.99	-	0	46.12	-	0	0	-	100
OTB_DEF_≥120_0_0_all_FDF	-	100	-	-	-	98.86	-	0	-	-	-	-	-	100
OTB_DEF_100-119_0_0_all	0	-	-	-	90.99	-	-	0	-	-	-	-	-	-
OTB_DEF_70-99_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTB_DWS_≥120_0_0_all	-	-	-	-	0	-	-	-	-	-	-	-	-	-
OTB_SPF_32-69_0_0_all	-	86.05	-	-	-	0	-	-	-	-	-	-	-	-
OTT_DEF_100-119_0_0_all	-	-	-	-	0	-	-	-	-	-	-	-	-	-
SDN_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	0	-	0	-	-	-
SDN_DEF_≥120_0_0_all_FDF	-	100	-	-	-	-	-	-	-	-	-	-	-	-
SSC_DEF	-	-	-	-	-	-	0	-	-	-	-	-	-	-
SSC_DEF_≥120_0_0_all	-	100	-	-	-	-	-	-	0	-	-	-	-	-
SSC_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	0	-
SSC_DEF_100-119_0_0_all_FDF	-	-	-	-	-	-	-	0	-	-	-	-	-	-
SSC_DEF_All_0_0_All	-	-	-	-	-	-	-	-	-	-	-	0	-	-
TBB_CRU_16-31_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_≥120_0_0_all	0	100	-	-	-	0	-	0	-	-	-	-	-	-
TBB_DEF_100-119_0_0_all	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TBB_DEF_70-99_0_0_all	0	-	-	-	-	-	-	-	-	-	-	0	-	-

Table 5. 2014: Coverage (proportion) of reported discards in each métier-nation stratum for age composition. Note: raised discards not included, only reported discards. A 0 indicates no sample data where discards were reported, while a - indicates no discards were reported for that métier-country combination.

	BEL	DEN	ES	FO	FRA	GFR	IRL	NED	NOR	RUS	SWE	UKE	UKNI	UKS
FPO_CRU_0_0_0_all	–	–	–	–	–	–	–	–	–	–	0	–	–	–
GNS_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_≥220_0_0_all_FDF	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_100-119_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all	–	100	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_120-219_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–	–
GNS_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GTR_DEF_all_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
LHM_DEF_0_0_0	–	–	–	–	–	–	–	–	–	–	–	–	–	–
LLS_FIF_0_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_HC_FDF	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MIS_MIS_0_0_0_IBC	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB	–	–	–	–	–	–	0	–	–	–	–	–	–	–
OTB_CRU_32-69_0_0_all	–	100	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_32-69_2_22_all	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-89_2_35_all	–	–	–	–	–	–	–	–	–	–	0	–	–	–
OTB_CRU_70-99_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–	0	100
OTB_CRU_70-99_0_0_all_FDF	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_CRU_90-119_0_0_all	–	100	–	–	–	0	–	–	–	–	0	–	–	–
OTB_CRU_90-119_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_DEF_≥120_0_0_all	–	99.7	–	–	100	0.35	–	–	–	–	–	–	–	100
OTB_DEF_≥120_0_0_all_FDF	–	73.82	–	–	–	0.21	–	–	–	–	–	–	–	100
OTB_DEF_100-119_0_0_all	–	–	–	–	100	–	–	0	–	–	–	–	–	–
OTB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–	–	–
OTB_DWS_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
OTB_SPF_32-69_0_0_all	–	–	–	–	–	0	–	–	–	–	–	–	–	–
OTT_DEF_100-119_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all	–	100	–	–	–	–	–	–	–	–	–	–	–	–
SDN_DEF_≥120_0_0_all_FDF	–	0	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_≥120_0_0_all	–	100	–	–	–	–	–	0	–	–	–	–	–	–
SSC_DEF_100-119_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–	–	–
SSC_DEF_100-119_0_0_all_FDF	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSC_DEF_All_0_0_All	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_CRU_16-31_0_0_all	–	0	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_≥120_0_0_all	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TBB_DEF_100-119_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–	–	–
TBB_DEF_70-99_0_0_all	–	–	–	–	–	–	–	0	–	–	–	–	–	–

Table 6. 2014: Coverage (proportion) of landings in each métier-country stratum for age composition for those métier-country strata that have at least 1% of the total landings. 0 indicates landings were at least 1% of the total landings, but no samples were taken; a - indicates that métier was not included in the 1% of the total landings for that country.

	DEN	FRA	GFR	NOR	SWE	UKS
GNS_DEF_all_0_0_all	-	-	-	98.1	-	-
OTB_DEF_≥120_0_0_all	-	87.2	99	46.1	0	100
OTB_DEF_≥120_0_0_all_FDF	100	-	98.9	-	-	100
OTB_DEF_100-119_0_0_all	-	91	-	-	-	-
SSC_DEF_≥120_0_0_all	-	-	-	0	-	-

2014: Appendix C: Landings age coverage ranked by landed weights

Table 1. 2014: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	8	68.262	62.76	5
OTB_DEF_100-119_0_0_all	3	11.15	90.99	1
OTB_DEF_≥120_0_0_all_FDF	4	8.773	99.54	3
SSC_DEF_≥120_0_0_all	2	3.742	8.11	1
GNS_DEF_all_0_0_all	4	3.204	97.86	1
OTB_CRU_90-119_0_0_all	3	1.195	81.87	1
OTB_CRU_32-69_0_0_all	4	0.96	24.01	1
GNS_DEF_120-219_0_0_all	2	0.697	13	1
LLS_FIF_0_0_0_all	2	0.692	-	-
MIS_MIS_0_0_0_HC	9	0.289	27.29	1
OTB_DWS_≥120_0_0_all	1	0.192	-	-
OTB_SPF_32-69_0_0_all	2	0.192	86.05	1
OTB_CRU_70-99_0_0_all	3	0.186	99.07	2
OTB_DEF	1	0.159	-	-
MIS_MIS_0_0_0_IBC	2	0.075	-	-
SDN_DEF_≥120_0_0_all_FDF	1	0.065	100	1
FPO_CRU_0_0_0_all	2	0.052	-	-
SDN_DEF_≥120_0_0_all	3	0.027	35.98	1
OTT_DEF_100-119_0_0_all	1	0.021	-	-
OTB_CRU_70-99_0_0_all_FDF	1	0.018	100	1
GNS_DEF_120-219_0_0_all_FDF	1	0.012	100	1
MIS_MIS	1	0.008	-	-
OTB_CRU_90-119_0_0_all_FDF	1	0.008	100	1
SSC_DEF_100-119_0_0_all_FDF	1	0.007	-	-
TBB_DEF_≥120_0_0_all	4	0.007	5.38	1
GNS_DEF_≥220_0_0_all	1	0.004	100	1
GNS_DEF	1	0.003	-	-
GTR_DEF_all_0_0_all	2	0.001	-	-
OTB_CRU_32-69_2_22_all	1	0.001	-	-
GNS_DEF_≥220_0_0_all_FDF	1	0	100	1
LHM_DEF_0_0_0	1	0	-	-
MIS_MIS_0_0_0_HC_FDF	1	0	-	-
OTB_CRU_70-89_2_35_all	1	0	-	-
SSC_DEF	1	0	-	-
SSC_DEF_100-119_0_0_all	1	0	-	-
SSC_DEF_All_0_0_All	1	0	-	-
TBB_DEF_70-99_0_0_all	2	0	-	-

Table 2. 2014 IIIa: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_90-119_0_0_all	IIIaN	3	39.664	81.87	1
OTB_CRU_32-69_0_0_all	IIIaN	4	23.924	29.99	1
OTB_DEF_≥120_0_0_all	IIIaN	3	22.72	33.58	1
OTB_DEF_≥120_0_0_all_FDF	IIIaN	2	4.76	73.11	1
LLS_FIF_0_0_0_all	IIIaN	2	2.311	-	-
MIS_MIS_0_0_0_HC	IIIaN	4	2.146	99.06	1
GNS_DEF_all_0_0_all	IIIaN	2	2.106	-	-
GNS_DEF_120-219_0_0_all	IIIaN	1	0.695	100	1
SSC_DEF_≥120_0_0_all	IIIaN	2	0.397	22.79	1
MIS_MIS_0_0_0_IBC	IIIaN	1	0.391	-	-
SDN_DEF_≥120_0_0_all	IIIaN	1	0.283	100	1
OTB_CRU_90-119_0_0_all_FDF	IIIaN	1	0.258	100	1
SDN_DEF_≥120_0_0_all_FDF	IIIaN	1	0.219	100	1
GNS_DEF_≥220_0_0_all	IIIaN	1	0.057	100	1
GTR_DEF_all_0_0_all	IIIaN	1	0.039	-	-
OTB_CRU_32-69_2_22_all	IIIaN	1	0.022	-	-
GNS_DEF_120-219_0_0_all_FDF	IIIaN	1	0.009	100	1
FPO_CRU_0_0_0_all	IIIaN	1	0	-	-
OTB_CRU_70-89_2_35_all	IIIaN	1	0	-	-

Table 3. 2014 IV: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	8	69.019	60.03	4
OTB_DEF_100-119_0_0_all	IV	3	11.537	100	1
OTB_DEF_≥120_0_0_all_FDF	IV	4	9.813	99.97	3
SSC_DEF_≥120_0_0_all	IV	2	4.242	8.06	1
GNS_DEF_all_0_0_all	IV	3	3.571	99.84	1
LLS_FIF_0_0_0_all	IV	1	0.701	-	-
OTB_CRU_32-69_0_0_all	IV	3	0.272	5.98	1
OTB_CRU_70-99_0_0_all	IV	3	0.21	99.9	2
OTB_SPF_32-69_0_0_all	IV	2	0.188	100	1
GNS_DEF_120-219_0_0_all	IV	1	0.079	100	1
MIS_MIS_0_0_0_IBC	IV	2	0.072	-	-
MIS_MIS_0_0_0_HC	IV	6	0.07	24.21	1
SDN_DEF_≥120_0_0_all_FDF	IV	1	0.067	100	1
FPO_CRU_0_0_0_all	IV	1	0.059	-	-
OTB_DWS_≥120_0_0_all	IV	1	0.03	-	-
SDN_DEF_≥120_0_0_all	IV	3	0.021	5.82	1
OTB_CRU_70-99_0_0_all_FDF	IV	1	0.02	100	1
GNS_DEF_120-219_0_0_all_FDF	IV	1	0.014	100	1
TBB_DEF_≥120_0_0_all	IV	4	0.008	5.38	1
SSC_DEF_100-119_0_0_all_FDF	IV	1	0.007	-	-
GNS_DEF_≥220_0_0_all	IV	1	0.003	100	1
GNS_DEF_≥220_0_0_all_FDF	IV	1	0	100	1
GTR_DEF_all_0_0_all	IV	1	0	-	-
MIS_MIS_0_0_0_HC_FDF	IV	1	0	-	-
SSC_DEF_All_0_0_All	IV	1	0	-	-
TBB_DEF_70-99_0_0_all	IV	2	0	-	-

Table 4. 2014 VI: Landings age coverage ranked by landed weights. Nation.Ct is the number of nations fishing that métier, while Nation.Samp is the number of countries sampling that métier.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	4	76.07	89.72	2
OTB_DEF_100-119_0_0_all	VI	1	11.098	-	-
GNS_DEF_120-219_0_0_all	VI	1	6.704	-	-
OTB_DWS_≥120_0_0_all	VI	1	1.837	-	-
MIS_MIS_0_0_0_HC	VI	6	1.802	-	-
OTB_DEF	VI	1	1.755	-	-
OTB_SPF_32-69_0_0_all	VI	1	0.296	-	-
OTT_DEF_100-119_0_0_all	VI	1	0.234	-	-
MIS_MIS	VI	1	0.083	-	-
LLS_FIF_0_0_0_all	VI	1	0.069	-	-
GNS_DEF	VI	1	0.031	-	-
OTB_CRU_70-99_0_0_all	VI	1	0.017	-	-
SSC_DEF	VI	1	0.003	-	-
LHM_DEF_0_0_0	VI	1	0.001	-	-
SSC_DEF_100-119_0_0_all	VI	1	0	-	-

2014: Appendix D: Discard ratio coverage ranked by landed weight

Table 1. 2014: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	4	84.541	99.82	4
OTB_DEF_≥120_0_0_all_FDF	3	11.84	99.27	3
OTB_CRU_32-69_0_0_all	2	1.499	5.63	1
OTB_CRU_70-99_0_0_all	3	1.021	100	1
OTB_DEF_100-119_0_0_all	2	0.545	100	1
OTB_CRU_90-119_0_0_all	3	0.401	74.43	1
GNS_DEF_120-219_0_0_all	1	0.096	100	1
OTB	1	0.026	-	-
SDN_DEF_≥120_0_0_all	1	0.013	100	1
OTB_CRU_70-89_2_35_all	1	0.006	-	-
SDN_DEF_≥120_0_0_all_FDF	1	0.004	-	-
OTB_CRU_32-69_2_22_all	1	0.003	-	-
OTB_CRU_90-119_0_0_all_FDF	1	0.003	-	-
FPO_CRU_0_0_0_all	1	0.002	-	-
GNS_DEF_≥220_0_0_all	1	0	-	-
GNS_DEF_100-119_0_0_all	1	0	-	-
GNS_DEF_120-219_0_0_all_FDF	1	0	-	-
OTB_DEF_70-99_0_0_all	1	0	-	-
OTB_SPF_32-69_0_0_all	1	0	-	-
SSC_DEF_≥120_0_0_all	2	0	100	1
SSC_DEF_100-119_0_0_all	1	0	-	-
TBB_CRU_16-31_0_0_all	1	0	-	-
TBB_DEF_100-119_0_0_all	1	0	-	-
TBB_DEF_70-99_0_0_all	1	0	-	-

Table 2. 2014 IIIa: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_CRU_32-69_0_0_all	IIIaN	2	1.499	5.63	1
OTB_CRU_90-119_0_0_all	IIIaN	3	0.401	74.43	1
OTB_DEF_≥120_0_0_all	IIIaN	2	0.207	54.32	1
OTB_DEF_≥120_0_0_all_FDF	IIIaN	2	0.08	18.02	1
GNS_DEF_120-219_0_0_all	IIIaN	1	0.031	100	1
SDN_DEF_≥120_0_0_all	IIIaN	1	0.013	100	1
OTB_CRU_70-89_2_35_all	IIIaN	1	0.006	-	-
SDN_DEF_≥120_0_0_all_FDF	IIIaN	1	0.004	-	-
OTB_CRU_32-69_2_22_all	IIIaN	1	0.003	-	-
OTB_CRU_90-119_0_0_all_FDF	IIIaN	1	0.003	-	-
FPO_CRU_0_0_0_all	IIIaN	1	0.002	-	-
GNS_DEF_100-119_0_0_all	IIIaN	1	0	-	-
GNS_DEF_120-219_0_0_all_FDF	IIIaN	1	0	-	-

Table 3. 2014 IV: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	IV	3	76.241	99.92	3
OTB_DEF_≥120_0_0_all_FDF	IV	3	11.76	99.82	3
OTB_CRU_70-99_0_0_all	IV	2	1.021	100	1
OTB_DEF_100-119_0_0_all	IV	2	0.545	100	1
GNS_DEF_120-219_0_0_all	IV	1	0.064	100	1
GNS_DEF_≥220_0_0_all	IV	1	0	-	-
OTB_CRU_32-69_0_0_all	IV	1	0	-	-
OTB_DEF_70-99_0_0_all	IV	1	0	-	-
OTB_SPF_32-69_0_0_all	IV	1	0	-	-
SSC_DEF_≥120_0_0_all	IV	2	0	100	1
SSC_DEF_100-119_0_0_all	IV	1	0	-	-
TBB_CRU_16-31_0_0_all	IV	1	0	-	-
TBB_DEF_100-119_0_0_all	IV	1	0	-	-
TBB_DEF_70-99_0_0_all	IV	1	0	-	-

Table 4. 2014 VI: Reported discards age coverage ranked by reported discards weights. Nation.Ct is the number of nations that report discarding in that métier, while Nation.Samp is the number of countries sampling that métier. Note: this does not include the raised discards information.

Fleet	Area	Nation.Ct	Rank	Coverage	Nation.Samp
OTB_DEF_≥120_0_0_all	VI	2	8.094	100	2
OTB	VI	1	0.026	-	-
OTB_CRU_70-99_0_0_all	VI	2	0	-	-

Appendix 2: Notes on raising the discards and sample allocations (for discards and landings) for the benchmark.

Discards: weighting factor = landing CATON. Has to be since there is so little discard info (mainly 1 country) and could end up biasing raising. This also tends to be the standard.

Allocations of samples: weights = mean weight weighted by numbers at age –InterCatch manual states this is calculated the same way as weighting by CATON, but differences occur when the numbers at age for the allocated sampled catches do not have a smooth curve, but have large fluctuations in the numbers at age. This can be seen to be true for saithe in the frequency distributions by métier-country-quarter-area plots.

Notation: Q1(234) means in Q1 (and also in Q2, Q3, and Q4). Q234 means in Q2 (and also in Q3, Q4); it does not mean samples from Q2-4 were lumped together.

2002

Scottish reported discards in the OTB_DEF fleet were 15422 tons.

France could not reconstruct their data for 2002, therefore catches were taken from catch statistics by quarter and submitted as MIS_MIS.

Raising discards

- Very high discards reported for Scottish annual discards, Danish OTB_DEF in area IV, and Scottish OTB_CRU discards; did not use for raising discards for all countries. Sweden and Denmark also had high discards for OTB_CRU fleets.
- Used OTB_DEF to raise other country's OTB_DEF (except Germany). These discards were not used in the raising of other métiers.
- IIIa: raised by quarter and area for all fleets and countries – not gear specific
- Q4 OTB_DEF: had to raise using Q1,2,3 data (all areas) otherwise estimate discards were 2-3 x the landings.
- IV: OTB_DEF for Germany, France: raised only with OTB_DEF discards
    - For Q2,3: had Germany discard info – used that to raise French discards those 2 quarters.
    - Germany Q1: used German Q2 discards. Germany Q2 VIa: used German Q2 IV discards. Germany Q4: used German Q3 discards.
- IV: non-OTB_DEF fleets: raised by quarter and area, using all fleets except OTB_DEF.
    - In Q4: discarding by Denmark and Scotland (OTB_CRU & MIS fleets) was very high and was the only available info. Using Q123 data instead for Q4.
- VI: no discard info other than Scottish (very high rates). Used data from IV to raise discards in VI, using same rules as applied for OTB_DEF vs. non-OTB_DEF fleets.

Sample allocations (by quarter and area):

Discards

- IIIA discards: very few samples. VI: no samples. IV: few samples except Germany. Used all sampled discards to raise all unsampled (not quarter or area specific)
- German OTB_DEF fleet allocations – although had a lot of samples, only age 2. for Q2&Q1, used Q1 samples, for Q4 & Q3 used all countries, all fleets.

Landings

By quarter and area

- IIIa – quarter and area specific, except for Q3-no samples, so lumped Q3 and Q4 together
- Annual:
    - IIIa – used all samples from all quarters IIIa
    - IV – used all samples from IV
    - VIa+b combined – used all samples from VIa+b
- France (this year only) is lumped in with all catches (no data from France) under 1 fleet: MIS_MIS, so their trawler fleet data is raised by all métiers.
- German OTB_DEF (saithe trawler fleet):
    - Q1 IV – used samples from Q2 OTB_DEF Germany
    - Q4 IV – used samples from Q3 OTB_DEF Germany
- VI
    - Q1(and for 2, 3, 4) – few samples, only from Scottish OTB fleets, but had landings from many other fleets (other nations). So used samples from both VI and IV Q1(and for 2, 3, 4).

By quarter: Each quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

2003

Raising the discards:

- Very high discards ratios were not used.
- By quarter for IIIa – raised using info from Denmark and Sweden discards
- Faroes in IIIa was annual (MIS), so used all available discard data from IIIa (all quarters). Was a combination of fleets since Faroes data came from ICES catch statistics.
- No discard data for VI existed, so raised with IV – by quarter. Scottish and Denmark (IV) discard ratio for the OTB_DEF fleet was very high and not used in the raising for other countries.
- For OTB_DEF fleets (all countries):
    - Q1&4: IV and VI Q1 raised with all available Q1 OTB_DEF discards (Denmark, IIIa, IV).
    - Q2&3: French OTB fleet raised with German discards based on discussion at WGNSSK 2015 (that French and German discarding practices were similar).

Sample allocations:

Discards: Few samples, only IIIa and Denmark. Had to allocate without stratification (unstratified).

Landings

By quarter and area

- Annual:
    - IIIa – used all samples from all quarters IIIa
    - IV – used all samples from IV
    - VIa+b combined – used all samples from VIa+b & IV. Q1(234) because the only samples came from Scottish & French OTB fleets, but had landings from many other fleets (other nations).
- Germany: OTB_DEF

  - IV, VIa Q1 – used Norwegian, French OTB samples from VI & IV
  - IV Q2 – used French OTB samples from VI & IV
  - IV Q3 – used French OTB samples from VI & IV
  - IV, VIa Q4 – used French OTB samples from VI & IV
- Norway OTB_DEF Q234 from IV and VI: used OTB_DEF from all other nations in IV and VI (Q234). Norway had different age distribution than France or Germany (older ages).

By quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

2004

Sweden submitted discards for OTB_CRU_70-89_2_35_all but did not submit landings for this fleet. Denmark sampled data for IV, Q1, OTB_CRU_70-99_0_0_all & OTB_DEF_>=120_0_0_all (discards only) **–**had ages up to age 32. Deleted samples (not discard amounts) from input data because these ages are highly unlikely.

Raising discards: by area and quarter, IV and VI – had non-OTB_DEF & OTB_DEF separated

- Scottish OTB_DEF and Danish discard rates are very high. Denmark ratio >14 for OTB_CRU fleet in Q1 IV, >6 for Q2, >409 for Q3, >84 in Q4. Did not include these when raising discards for all fleets.
- VI Q1234: brought in IV ratios because VI only had OTB_CRU or OTB_DEF.
- For OTB_DEF: removed France, Germany from general raising. Raised these 2 countries using discards from Germany (had all 4 quarters); no data existed for France.
- For all other countries: raised using all OTB_DEF discards for that quarter (all areas), but removed very high ratios.
- Non-OTB_DEF fleets raised with non-OTB_DEF fleets for those areas and quarters.

Sample allocations

Discards

There were hardly any discard samples in 2004: none from VI, 2 (Danish) fleets with 7 age readings each in IV, and slightly more in IIIa (e.g., 24 age samples, all areas). Therefore, opted to group all discards, all areas and quarters and use all available discard samples for allocations. Removed samples from Denmark's discards in area IV Q1, OTB_CRU _70-99 and OTB_DEF fleets because included fish up to age 32. This was vastly different from rest of Danish discarding samples (in 2004 and in other years). Two scenarios for allocations: by quarter and Unstratified.

Landings

By quarter and area

- By quarter and area FOR IIIa.
- For non_OTB_DEF: VI + IV (by quarter) combined – because they are only OTB_DEF & OTB_CRU in VI (unknown number of samples because countries (Scotland, France) not reporting numbers). Used only non-OTB_DEF sampled data. Otherwise, non-OTB_DEF fleets raised with non-OTB_DEF fleets for those areas and quarters.
- OTB_DEF fleets raised with OTB_DEF by quarter and area.
- Annual unsampled landings are allocated all sampled landings from that area (all quarters). Areas IV and VI combined.

By quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

2005

Raising discards

- IIIa Q1 discard – Danish SDN fleet omitted from raising because ratio ~26
- IIIa Q2 discard – did not raise with Danish SDN fleet because ratio ~2
- IIIa Q3 discard – did not raise with Danish SDN fleet (ratio 8) or SCC (~2)
- IIIa Q4 discard – did not raise with Danish SDN fleet (ratio 3),SCC (~1.5),OTB_CRU(~1)
- IV, by quarter – did not separate OTB_DEF and non-OTB_DEF – too few discards from OTB_DEF to raise data for those fleets, so just lumped with all fleets (except Germany/France OTB_DEF saithe fleet)
- VI – had to raise with IV because only matches were from OTB_DEF & OTB_CRU fleets with very high discard ratios
- Germany, France saithe trawler fleets in IV + VI raised with German trawler fleet discards (by each quarter).

Sample allocations

Discards: used all samples to raise all unsampled because so few samples (3 strata).

Landings:

By quarter and area

- Annual unsampled fleets: allocated to all sampled data in that area (all fleets, all quarters)
- For non_OTB_DEF: VI + IV (by quarter) combined – because they are only OTB_DEF & OTB_CRU in VI (unknown number of samples because countries (Scotland, France) not reporting numbers).
- For OTB_DEF – combined IV & VI, but allocated by quarter
- OTB_DEF Germany (VIa) – raised using Germany & French samples IV & VI

By quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

2006

Raising discards:

Sweden submitted discards for OTB_CRU_70-89_2_35_all but did not submit landings for this fleet.

- IIIa Q1 – did not include Danish OTB_CRU_70-89_2_35_all, high ratio
- IIIa Q2,3,4 – did not include Swedish OTB_CRU_70-89_2_35_all, high ratio (>2,>180 in Q4)
- Non-OTB_DEF fleets: IV Q1234 – removed Scottish OTB_DEF and OTB_CRU (annual rates) because of high ratio
- Non-OTB_DEF fleets: VI Q1: only had OTB_CRU or OTB_DEF with either very high ratios (Scottish) or 0 discards; had many non-OTB fleets. So raised with IV Q1. Removed annual (high) Scottish OTB fleets.
    - Same for Q234
- OTB_DEF fleets (Germany, France) – raised with OTB_DEF fleets of those countries. Area IV & VI grouped together because discards available from only one area

- Rest of OTB_DEF fleets_ raised using discards of other OTB_DEF gears (all countries). IV & VI grouped by quarter. Dropped high discard ratios (Scotland)

Sample allocations

Discards: Few sampled discards (5 strata, not many samples for age) – so lumped all fleets, quarters, areas into 1 group

Landings:

By quarter and area

- Annual landings – used all fleets, all quarters, but area specific
- OTB_DEF saithe trawler fleets: French, German – did as in previous years.
    - For Q1 VI (Germany) had to use Q1 IV & VI France, IV German, IV Norway.
    - For Q124, VI (Germany) had to use Q1 IV & VI France, IV German
- All other métiers: by quarter but had to lump IV and VI because of low samples and only 3 (OTB) métiers.
- Treated OTB_DEF and non-OTB_DEF fleets separately (as in previous years).

By quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

2007

Raising discards

- Very high discards ratios were not used.
- IIIa by quarter
- IV + VI combined, by quarter: non-OTB_DEF, OTB_DEF
    - German and French trawler fleet done separately using German discards

Sample allocations

Discards: could only allocated by quarter (all areas together) or by combining all. Not enough data to do by quarter and area.

Landings:

By quarter and area

- IV and VI grouped together because of too few samples in VI, esp. for non-OTB_DEF fleets (by quarter)
    - Q3 – no samples except OTB_CRU in VI (UKS), so also used Q4
- All annual unsampled catches – allocated by area, all quarters
- Treated OTB_DEF and non-OTB_DEF fleets separately (as in previous years).

By quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

2008

Raising discards

- Very high discards ratios were not used.
- IIIa by quarter
- Non-OTB_DEF: IV & IV by quarter (grouped together because lack on non-OTB_DEF discards for raising in VI
- OTB_DEF: IV & VI - IV & IV by quarter (grouped together)

Sample allocations

Discards: Grouped by quarter or by unstratified because too few samples; all samples are from OTB_DEF or OTB_CRU fleets.

Landings:

By quarter and area

- Grouping IV & VI, allocated by quarter
- IIIa – by quarter
- IV & VI: German/French trawler fleet – raised unsampled with sampled from German, French, Norwegian trawler fleets (by quarter).
- Treated OTB_DEF and non-OTB_DEF fleets separately (as in previous years).

By quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

2009

Raising discards

- Very high discards ratios were not used.
- IV & VI grouped together (by quarter) because only OTB discards for raising in VI
    - Did not separate OTB_DF and non-OTB_DEF because all the discards to raise with were mainly from OTB_DEF
    - Did raise Germany & France trawl fleet with Germany & French trawl fleet
- IIIa by quarter

Sample allocations

Discards

Allocation 1 (by area)

- IIIa – grouped together (all, not by quarter)
- IV & VI grouped together (all, not by quarter)
- IV & VI Q12 Germany, France: allocated to German discards Q1 IV
    - Q34 were lumped with all fleets, countries in IV & VI because of no samples

Could also allocate by quarter (all areas together) or by combining all. Not enough data to do by quarter and area.

Landings

By quarter and area

- No samples in VI except UKS, so lumping VI&IV by quarter (all fleets)
- VI & IV did non-OTB_DEF & OTB_DEF separately
- VI&IV German & French trawl fleet – by quarter,
    - Q12: using German, French, Norway trawl fleet
    - Q34: using German, French trawl fleet

By quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

2010

Raising discards: by quarter and area except

- Very high discards ratios were not used.
- IV and VI – raised together because only discards (for raising) in VI were OTB fleets and had a lot of non-OTB fleets to be raised (in VI).
- IV and VI: non-OTB_DEF and OTB_DEF raised separately
- Germany & France: OTB_DEF saithe trawler fleet raised using German discards in IV

Sample allocations

Discards: Allocated by quarter (all areas together) or by combining all. Not enough data to do by quarter and area.

Landings

By quarter and area

- IV & VI grouped together because VI only has annual samples (UKS) and not very many
- OTB_DEF (saithe trawl fleet) Germany, France, Norway – by quarter and area group used Germany/France/Norwegian/Scottish samples (similar age freq).
- Rest of OTB_DEF, treated OTB_DEF as in previous years.
- Non-OTB_DEF fleets treated as in previous years.

By quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

2011

French effort series was not included at any point in the raising, allocations, or output

Raising discards:

- Very high discards ratios were not used.
- IIIa by quarter
- IV and VI grouped together because only OTB_DEF in VI with very high discard ratios
    - OTB_DEF and non-OTB_DEF raised separately (not mixing OTB_DEF with other fleets)
        - Q234 non-OTB_DEF had to raise with IIIa Q2 because few fleets, and those had either very high or 0 for ratios

- GER/FR OTB_DEF raised using only GER&FR discard ratios

Sample allocations:

Discards – Few data in IIIa by quarter. Samples in VI are annual, not by quarter. Across quarters, fleets, areas, countries – tends to be similar age distribution. Few exceptions (OTB_CRU UKS annual and German discards OTB_DEF Q1). Two allocations used: by quarter and unstratified.

Landings

By quarter and area

- IIIa by quarter
- IV & VI grouped together
- OTB_DEF (saithe trawl fleet) Germany, France, Norway – by quarter and area group used Germany/France/Norwegian/Scottish samples (similar age freq).
- Rest of OTB_DEF, treated OTB_DEF as in previous years.
- Non-OTB_DEF fleets treated as in previous years.

By quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

2012

French effort series was not included at any point in the raising, allocations, or output

Raising discards:

- Very high discards ratios were not used.
- IIIa by quarter
- IV and VI grouped together because only OTB_DEF in VI with very high discard ratios
  - OTB_DEF and non-OTB_DEF raised separately (not mixing OTB_DEF with other fleets)
  - GER/FR OTB_DEF raised using only GER&FR discard ratios

Sample allocations:

Discards –Few data in IIIa by quarter. Samples in VI are annual, not by quarter. Lacking Q12 samples in IV and very few in IIIa. Two allocations used: by quarter and unstratified.

Landings:

By quarter and area

- IV&VI together by quarter: took the OTB_DEF saithe trawler fleet for Ger/Fr and allocated with samples from Ger/Fr fleet
- Non-OTB_DEF and OTB_DEF: by quarter and area except
  - 2nd quarter VIb – not enough samples in VI in Q2, so used IV. Non OTB_DEF - didn't use OTB_DEF samples in this case. Same for Q1 in VIa.
    - If same was true for OTB_DEF fleets, than used same quarter in IV but only OTB_DEF fleets

By quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

2013

French effort series was not included at any point in the raising, allocations, or output

Raising discards:

- Very high discards ratios were not used.
- IIIa by quarter
- IV and VI grouped together because only OTB_DEF in VI with very high discard ratios
  - OTB_DEF and non-OTB_DEF raised separately (not mixing OTB_DEF with other fleets)
  - GER/FR OTB_DEF raised using only GER&FR discard ratios

Sample allocations:

Discards: Few data in IIIa by quarter. Samples in VI are annual, not by quarter. Lacking Q1&4 samples in IV and very few in IIIa. Two allocations used: by quarter and unstratified.

Landings:

By quarter and area

- IV&VI together by quarter: took the OTB_DEF saithe trawler fleet for Ger/Fr and allocated with samples from Ger/Fr fleet
- Non-OTB_DEF and OTB_DEF: by quarter and area. IV & VI grouped together.

By quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

2014

French effort series was not included at any point in the raising, allocations, or output

Raising discards:

- Very high discards ratios were not used.
- IIIa by quarter
- IV and VI grouped together because only OTB_DEF in VI with very high discard ratios
  - Q12: had to include IIIa to raise since there were so few fleets (2 and 1 had to be thrown out)
  - Q34 – no non_OTB_DEF, so used IIIa
- Ger/Fr trawl fleet – handled as in previous years

Sample allocations

Discards:

- Very high discards ratios were not used.
- IIIa by quarter
- IV + VI grouped by quarter. Annual in IV & VI used for each quarter.
  - Ger/FR trawl fleet discards per quarter – allocated using Ger/Fr discard samples

- This is the first year had enough discard samples to do 3 separate allocations scenarios: by quarter and area, by quarter, unstratified.

Landings

By quarter and area

- IV & VI grouped together because lack of samples (or unknown) in VI by quarter
    - Annual used each quarter
- Trawler fleet Ger/Fr – allocated with Ger/Fr trawler fleet samples in same area(s) and quarter
- Non-OTB_DEF and OTB_DEF: by quarter and area. IV & VI grouped together.

By quarter: used data from all area, métiers, and countries.

Unstratified: All data were used.

WD 6 National sampling/raising of saithe catches

The following pages provide more detail on the sampling and raising of national data for those countries that were able to provide it (Germany, Scotland, Norway). This request was not part of the data call, but came after the data workshop in November.

Additional information on the German sampling program for saithe in the North Sea

In general, the sampling program for saithe can be classified according to table 1. Germany has no market sampling and all data are sampled with onboard observers. The main sampling area is 4a and 4b. There are samplings in IIIa but only from a few years and quarters if there was fishing in 3a during the sampled trip. The fishery in area 6a is relatively small and does not take place in every year. Therefore, no samplings are available from this area.

The aim in current years is to sample at least one trip per quarter in the saithe fishery using otter trawls >=100mm (most vessels use >=120mm). In addition, fishing trips with cod and saithe as target species are sampled but less regularly. A small part of the saithe landings come from vessels using demersal seines. There is no targeted sampling for vessels using demersal seines and therefore the Intercatch metier OTB_DEF_>=120mm_0_0_all is the main metier containing landings and discards also from these smaller metiers. Table 2 shows the number of trips sampled per target species and area. Especially for earlier years trips were not sampled in every quarter. Therefore, for the missing quarters no SD data were uploaded to Intercatch.

The number of length measurements and age measurements is available directly from Intercatch. Germany uses length frequencies by year, quarter, metier and catch category (landings and discards). Age length keys are only year and quarter specific.

Table 1. General classification of the sampling program for saithe.

Sampling frame		Survey design and sample selection		Estimation procedures			Self evaluation of potential for bias (1-3 where 1 is the best)[2]
Vessel sizes and gears covered	ICES Divisions covered	Describe Survey design and vessel selection	Stratification	Raising procedure for stratum estimates for a stock	Methods to impute missing stratum estimates "borrowing procedures"	Variance estimates	
All national registered vessels >10m using towed demersal otter trawls or seines	IVab, IIIa	Non-random selection of vessels on opportunistic basis to meet sampling quotas by stratum.	by area, by target species, by gear, by quarter	Trip-raised estimates summed for sampled vessels in stratum, and then raised to total fleet using reported total fleet landings of stock and reported landings of stock by sampled vessels.	As much as possible real observations are used. Because the saithe fishery is conducted by only few vessels with similar characteristics borrowing is a minor issue. However trips using demersal seines and otter trawls are not differentiated and are raised in one stratum. Age length keys are year and quarter specific only. Missing length classes in the age length key are borrowed from neighboring length classes and if not available from a year based age length key.	Analytical	2

Table 2: Number of sampled trips per year, quarter and area with the main sampling activity.

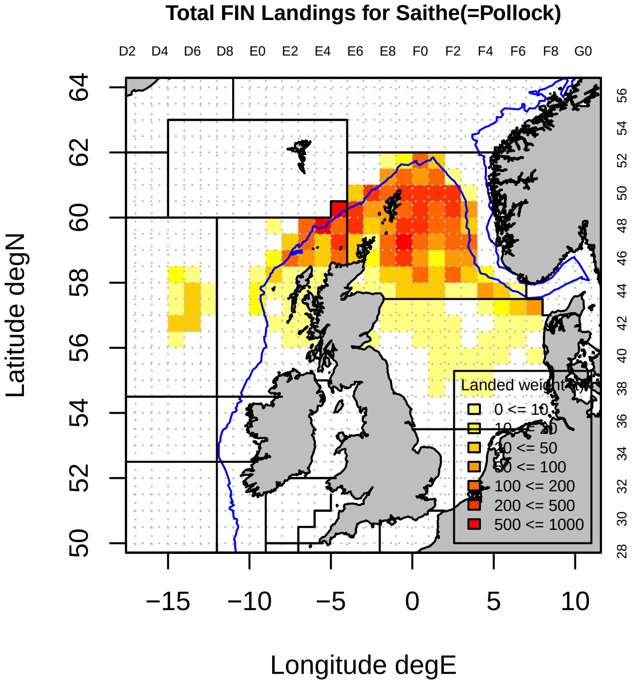
Year	Target species	Quarter	Division	No Trips
2002	Saithe	2	4A	2
2002	Saithe	3	4A	1
2003	Saithe	2	4A	1
2003	Saithe	3	4A	1
2004	Saithe	1	4A	2
2004	Saithe	2	4A	1
2004	Saithe	4	4A	1
2005	Cod	3	3A	1
2005	Saithe	1	4A	2
2005	Saithe	2	4A	1
2005	Saithe	3	4A	1
2005	Saithe	4	4A	1
2006	Cod	1	4A	1
2006	Saithe	1	4A	2
2006	Saithe	2	4A	1
2006	Saithe	3	4A	2
2006	Saithe	4	4A	1
2007	Cod	1	4A	1
2007	Saithe	2	4A	1
2007	Saithe	3	4A	1
2007	Saithe	4	3A	1
2007	Saithe	4	4A	1
2008	Saithe	1	4A	4
2008	Saithe	2	4A	1

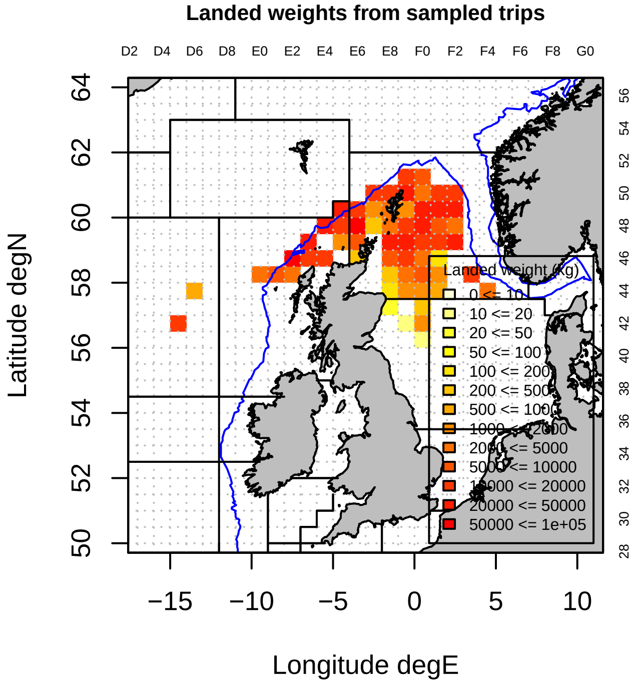
2008	Saithe	3	4A	1
2008	Saithe	4	4A	1
2009	Cod	3	4A	1
2009	Saithe	1	4A	3
2009	Saithe	2	3A	1
2009	Saithe	2	4A	2
2009	Saithe	3	4A	1
2009	Saithe	4	3A	1
2009	Saithe	4	4A	2
2010	Cod	1	4A	1
2010	Cod	2	3A	1
2010	Cod	4	4A	2
2010	Saithe	1	4A	2
2010	Saithe	2	3A	3
2010	Saithe	2	4A	1
2010	Saithe	4	4A	4
2011	Cod	2	3A	1
2011	Cod	4	4A	1
2011	Saithe	1	4A	2
2011	Saithe	2	3A	2
2011	Saithe	2	4A	1
2011	Saithe	3	4A	1
2011	Saithe	4	4A	2
2012	Cod	3	3A	1
2012	Saithe	2	4A	1
2012	Saithe	3	4A	1
2013	Saithe	1	4A	1

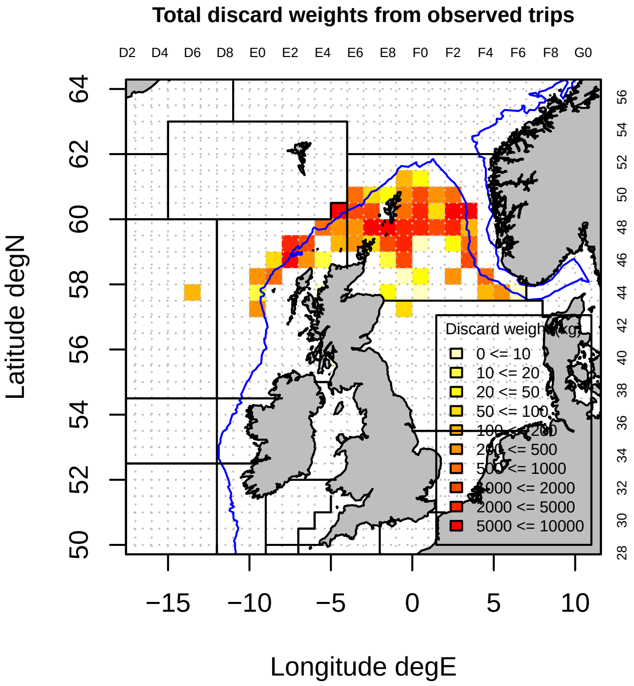
2013	Saithe	2	4A	1
2013	Saithe	4	4A	1
2014	Cod	2	3A	2
2014	Cod	3	3A	2
2014	Saithe	1	4A	2
2014	Saithe	2	3A	1
2014	Saithe	2	4A	2
2014	Saithe	3	4A	1
2014	Saithe	4	4A	1
2015	Cod	2	3A	1
2015	Cod	2	4B	1
2015	Cod	4	4A	2
2015	Saithe	1	4A	1
2015	Saithe	2	4A	1
2015	Saithe	3	4A	1

Scottish National Data

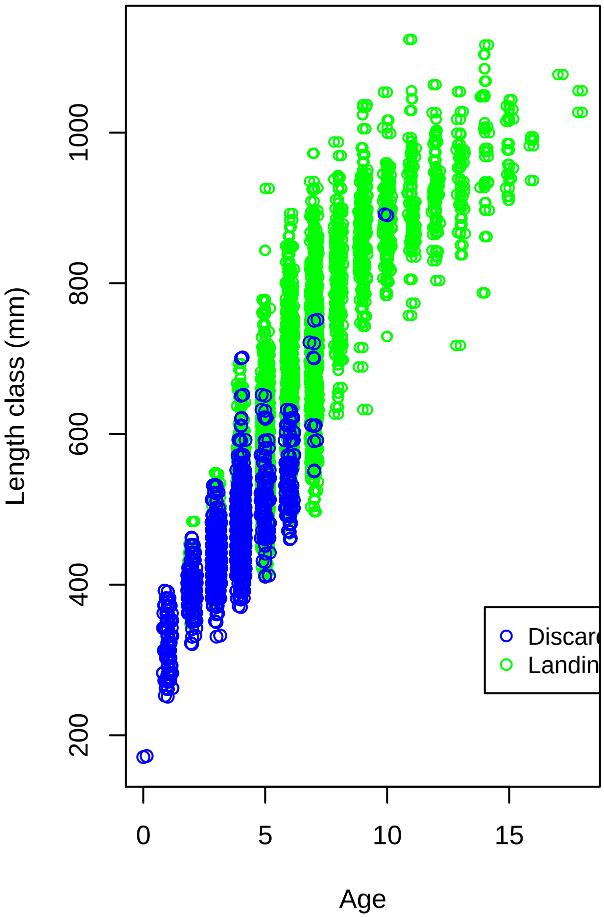
The following pages contain the information provide by Scotland on the samples, used to create the Scottish catch-at-age for sampled catches.

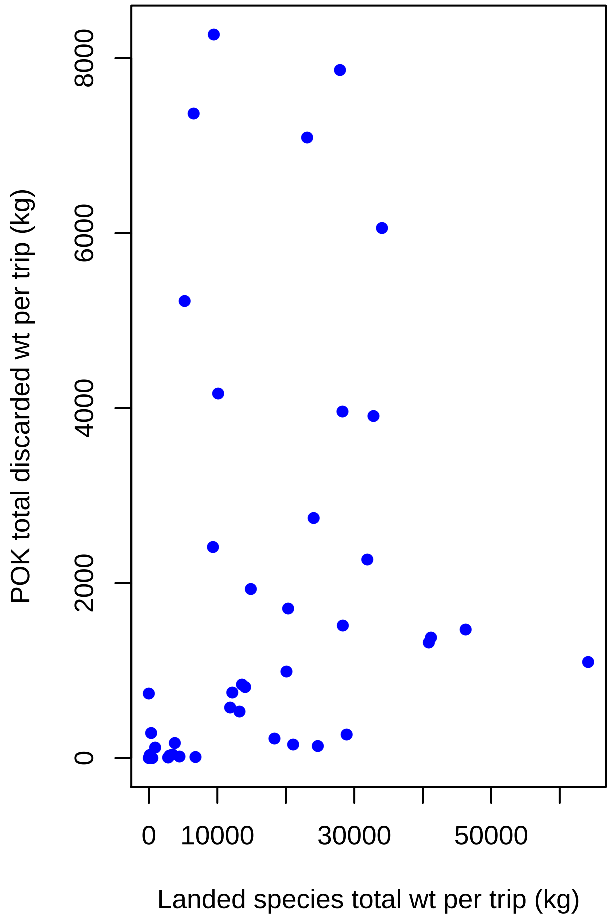

Total FIN Landings for Saithe(=Pollock)
Latitude degN
Longitude degE
Landed weight (kg)
0 <= 10
10 <= 20
20 <= 50
50 <= 100
100 <= 200
200 <= 500
500 <= 1000

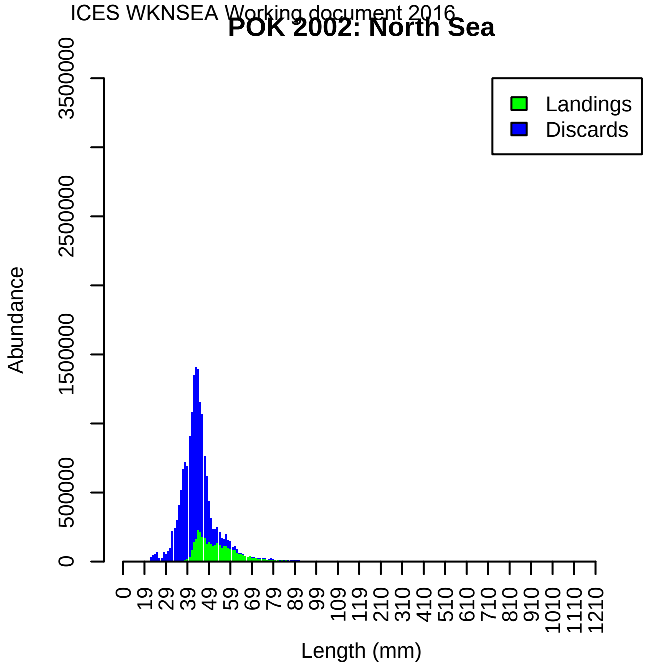

Landed weights from sampled trips
Latitude degN
Longitude degE
Landed weight (kg)
0 <= 10
10 <= 20
20 <= 50
50 <= 100
100 <= 200
200 <= 500
500 <= 1000
1000 <= 2000
2000 <= 5000
5000 <= 10000
10000 <= 20000
20000 <= 50000
50000 <= 1e+05

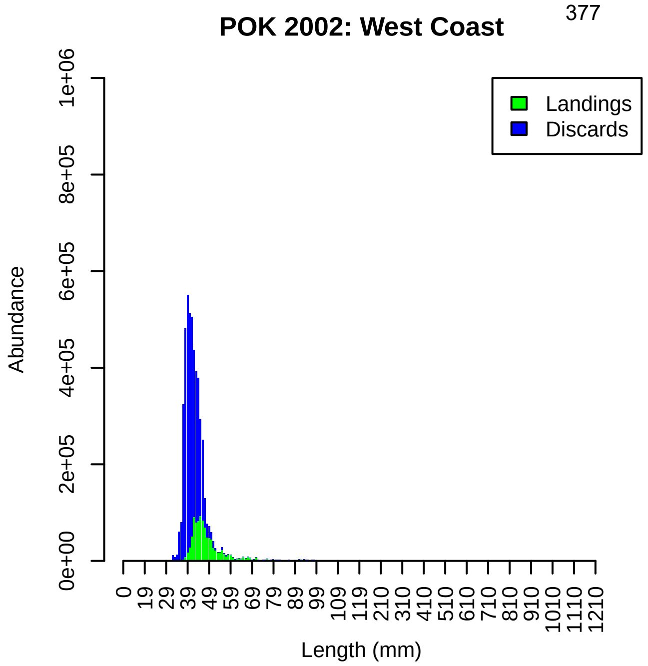

Total discard weights from observed trips
Latitude degN
Longitude degE
Discard weight (kg)
0 <= 10
10 <= 20
20 <= 50
50 <= 100
100 <= 200
200 <= 500
500 <= 1000
1000 <= 2000
2000 <= 5000
5000 <= 10000

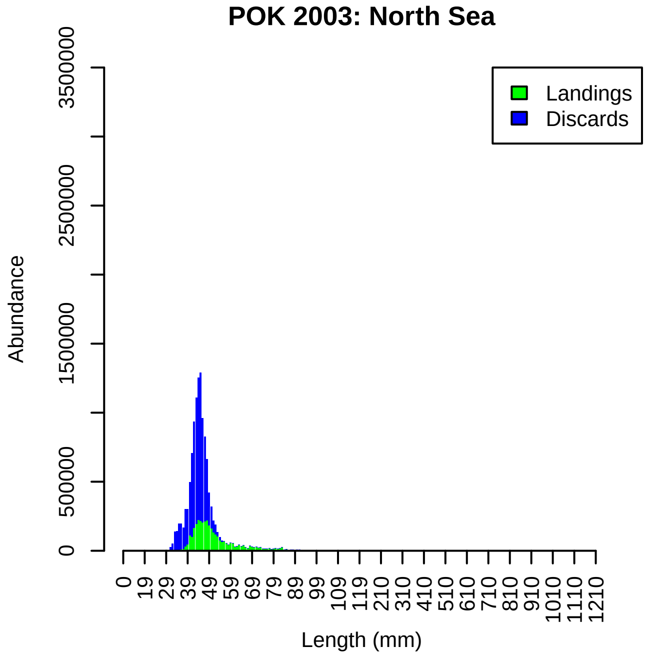
Age given length for Saithe(=Pollock)

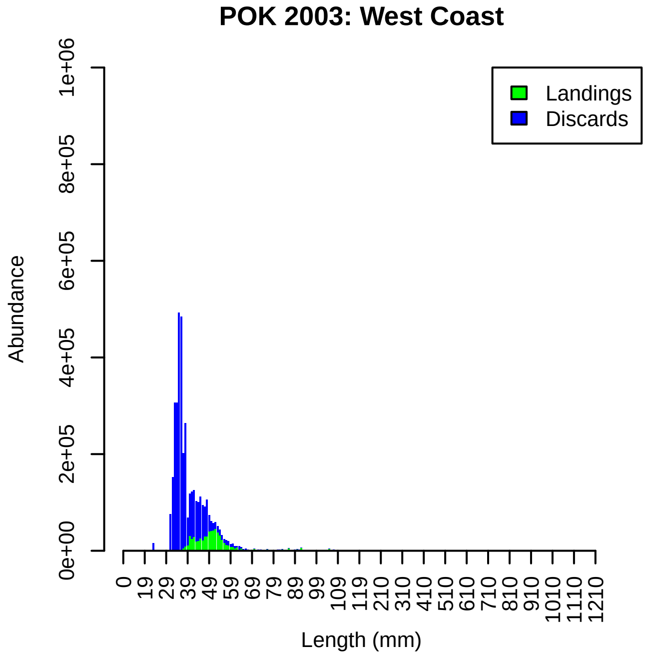


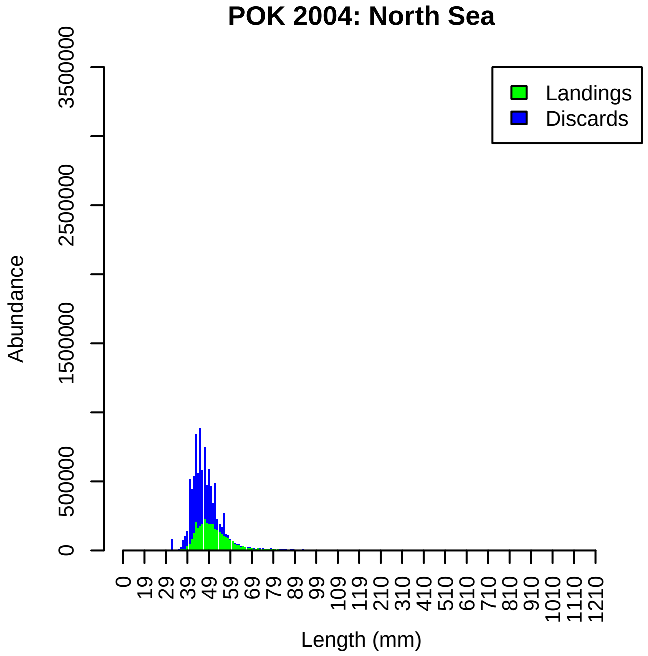


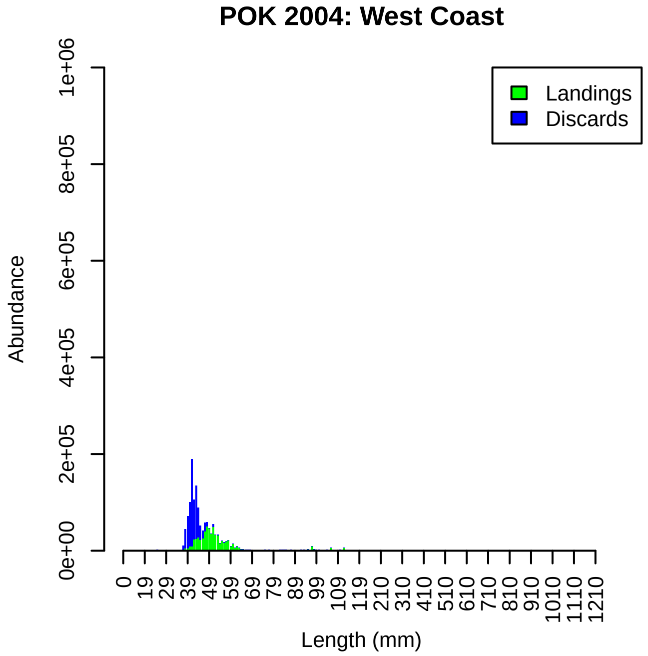

POK 2002: North Sea
Landings
Discards
Abundance
Length (mm)

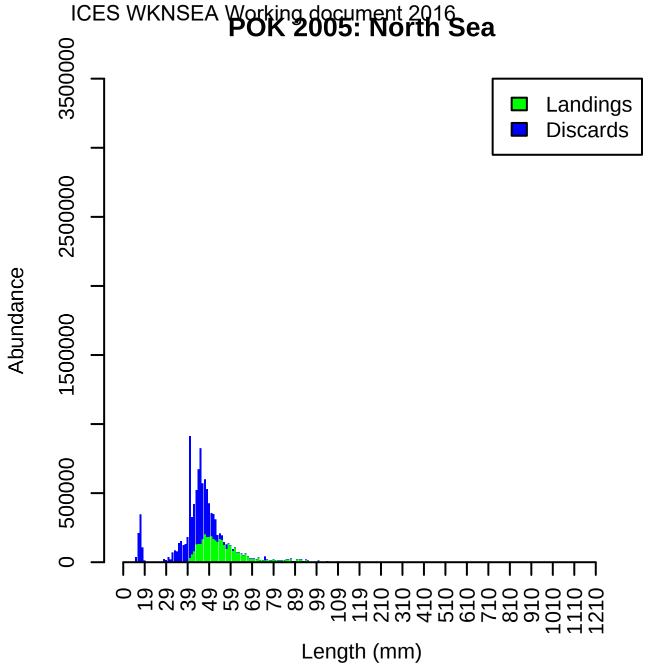

POK 2002: West Coast
Landings
Discards
Abundance
Length (mm)

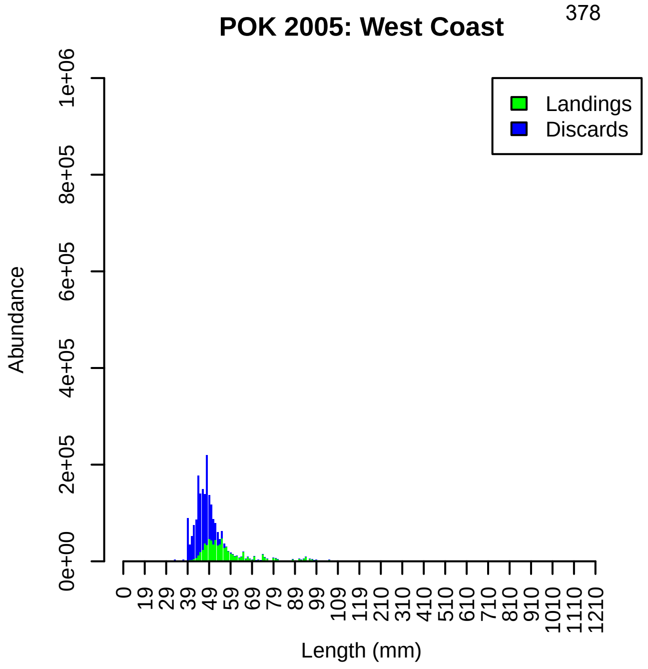

POK 2003: North Sea
Landings
Discards
Abundance
Length (mm)

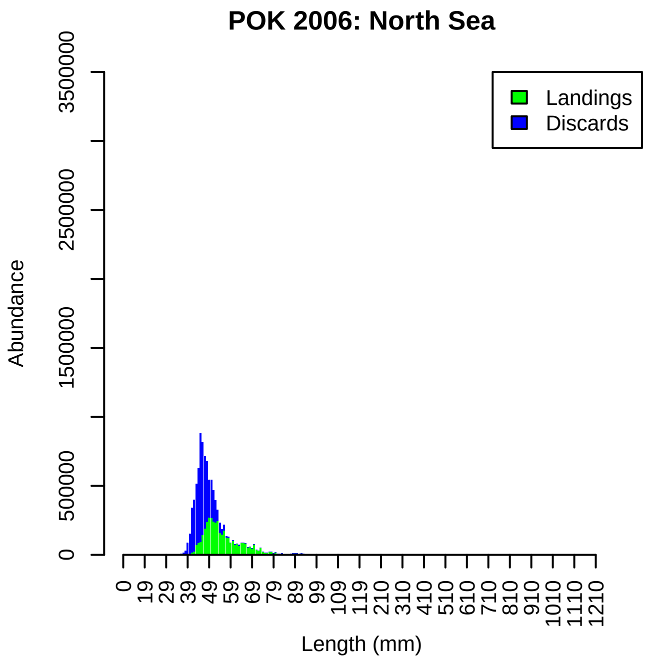

POK 2003: West Coast
Landings
Discards
Abundance
Length (mm)

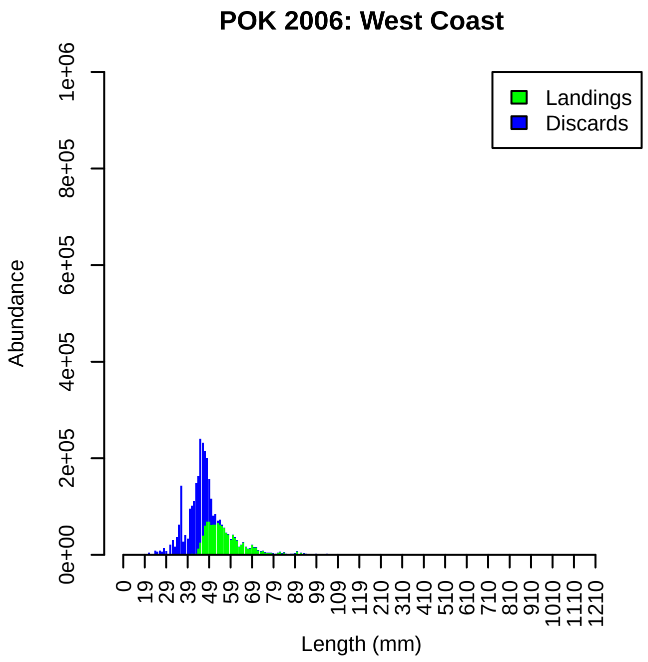

POK 2004: North Sea
Landings
Discards
Abundance
Length (mm)

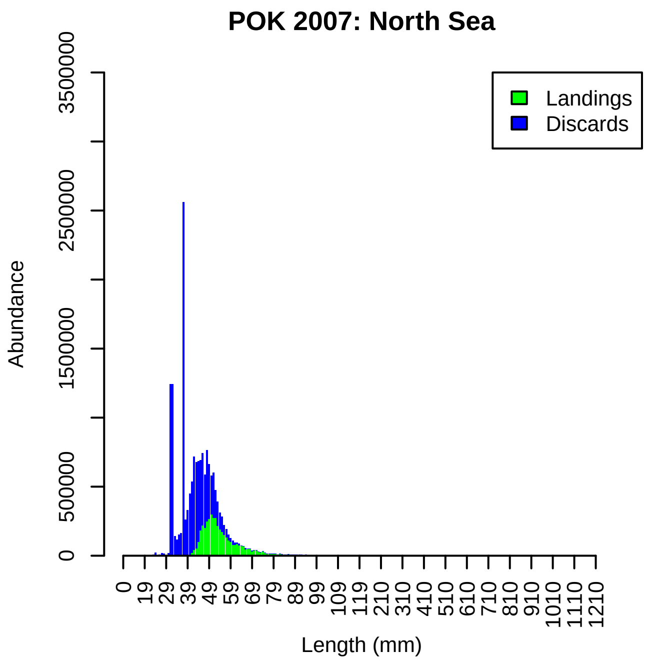

POK 2004: West Coast
Landings
Discards
Abundance
Length (mm)

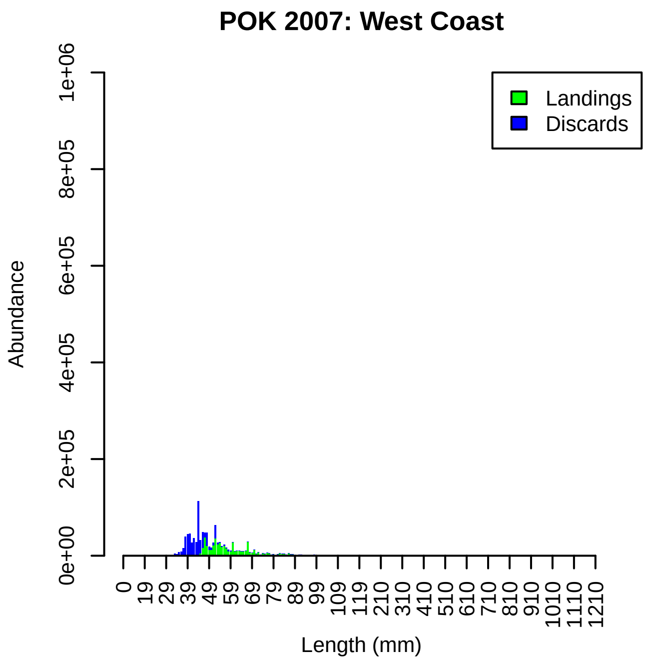

POK 2005: North Sea
Landings
Discards
Abundance
Length (mm)

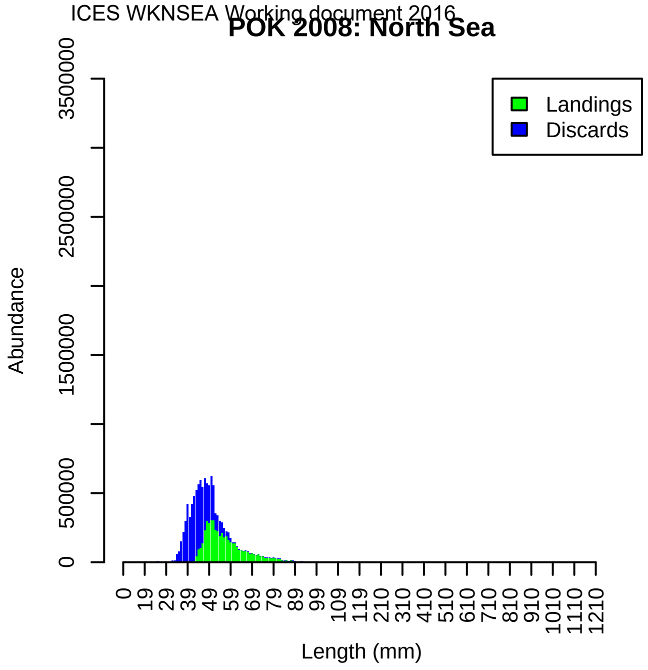

POK 2005: West Coast
Landings
Discards
Abundance
Length (mm)

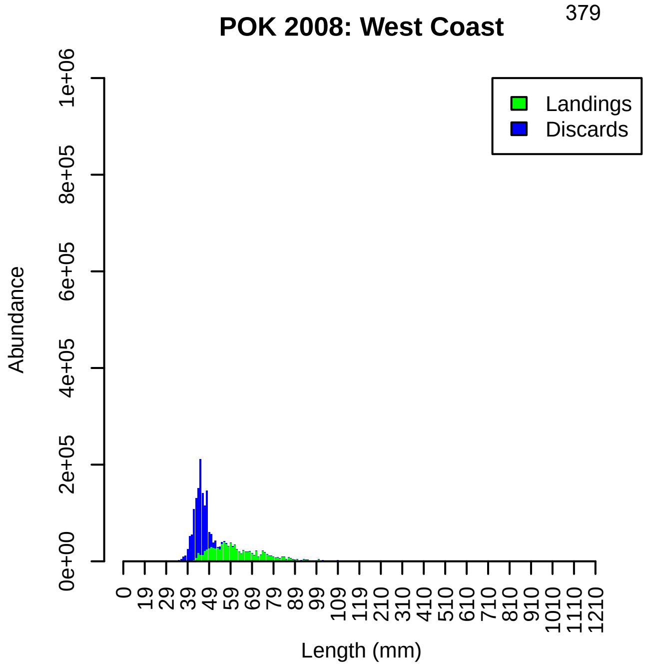

POK 2006: North Sea
Landings
Discards
Abundance
Length (mm)

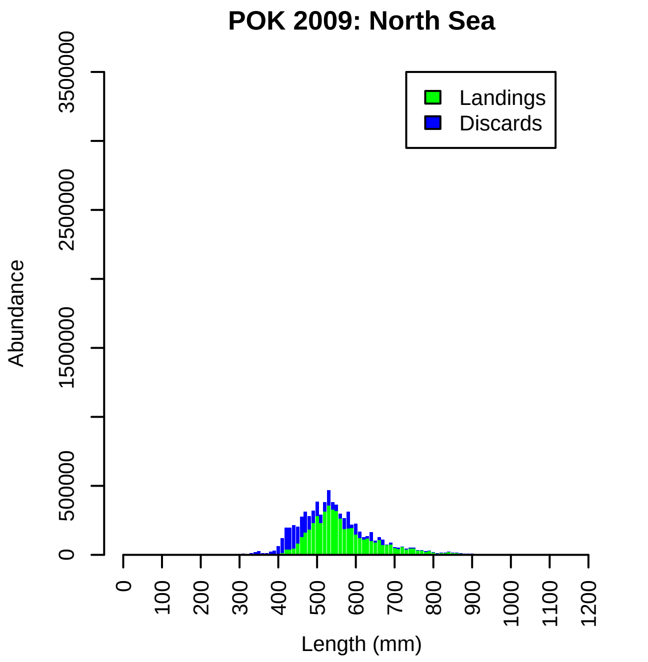

POK 2006: West Coast
Landings
Discards
Abundance
Length (mm)

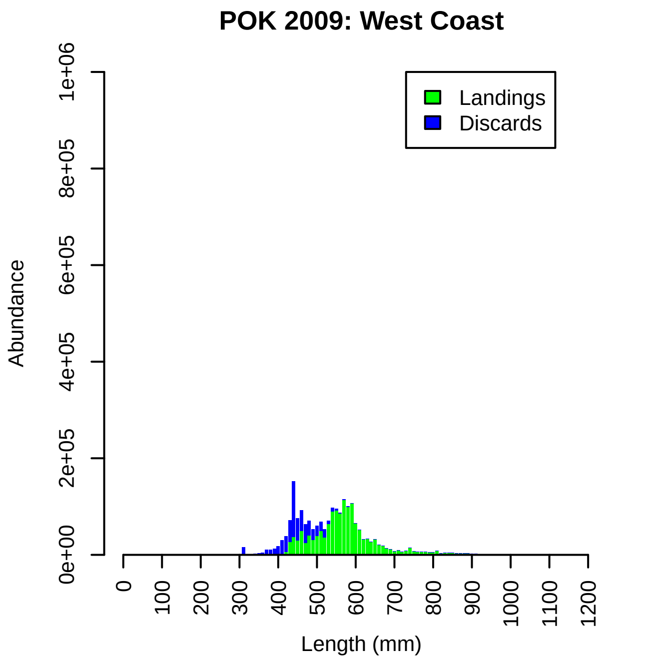

POK 2007: North Sea
Landings
Discards
Abundance
Length (mm)

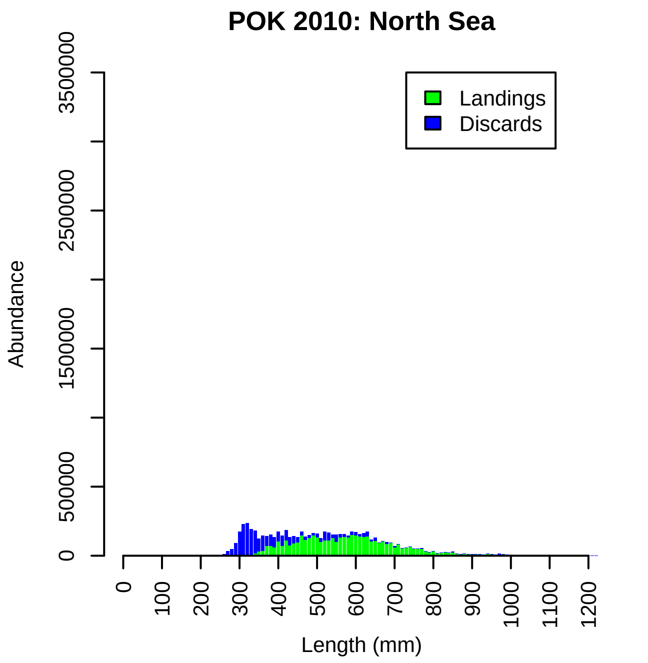

POK 2007: West Coast
Landings
Discards
Abundance
Length (mm)

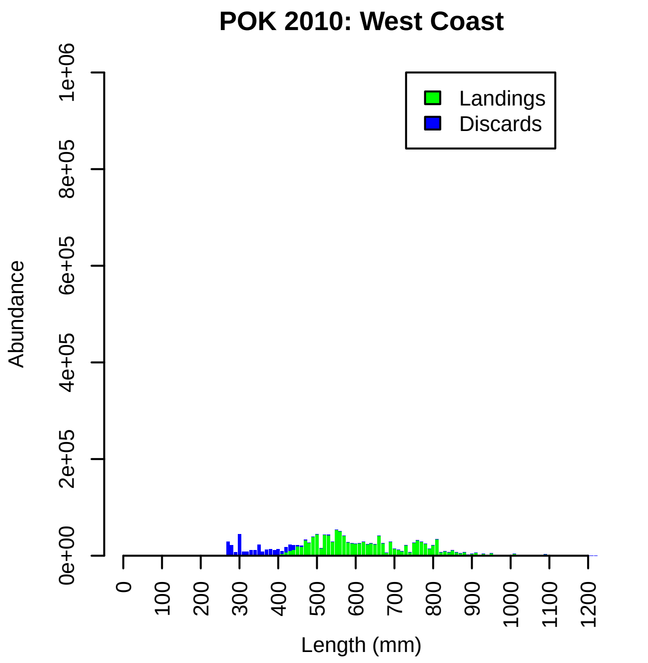

POK 2008: North Sea
Landings
Discards
Abundance
Length (mm)

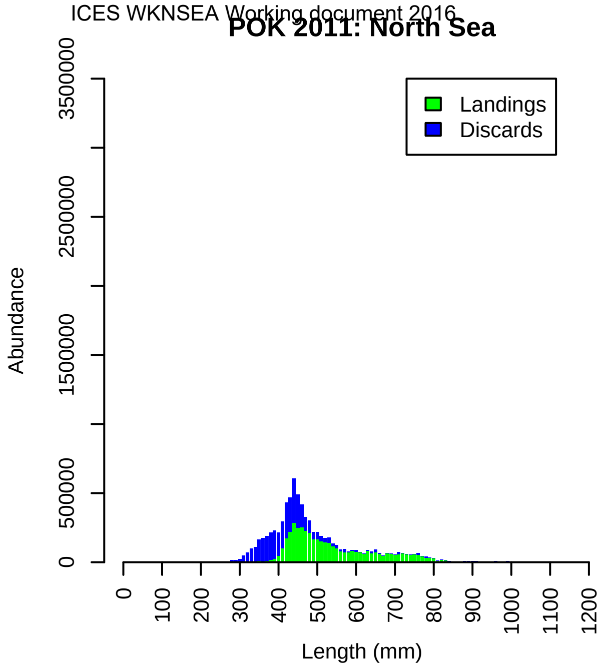

POK 2008: West Coast
Landings
Discards
Abundance
Length (mm)

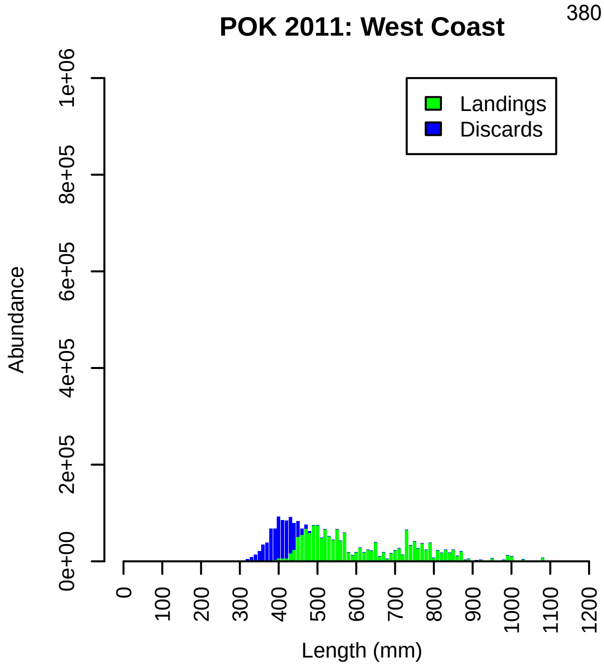

POK 2009: North Sea
Landings
Discards
Abundance
Length (mm)

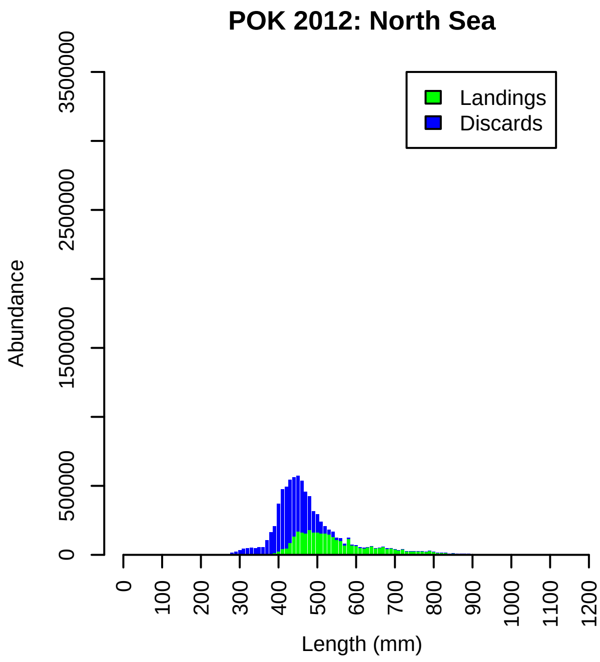

POK 2009: West Coast
Landings
Discards
Abundance
Length (mm)


POK 2010: North Sea
Landings
Discards
Abundance
Length (mm)


POK 2010: West Coast
Landings
Discards
Abundance
Length (mm)


POK 2011: North Sea
Landings
Discards
Abundance
0
500000
1500000
2500000
3500000
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Length (mm)


POK 2011: West Coast
Landings
Discards
Abundance
0e+00
2e+05
4e+05
6e+05
8e+05
1e+06
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Length (mm)


POK 2012: North Sea
Landings
Discards
Abundance
0
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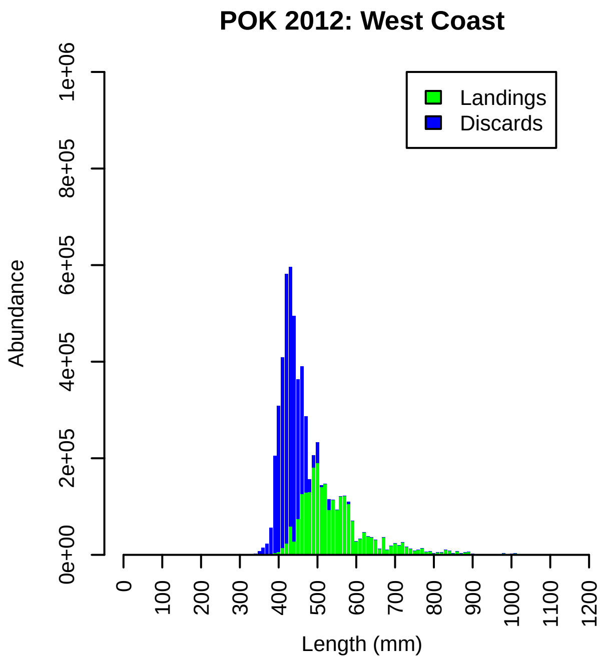
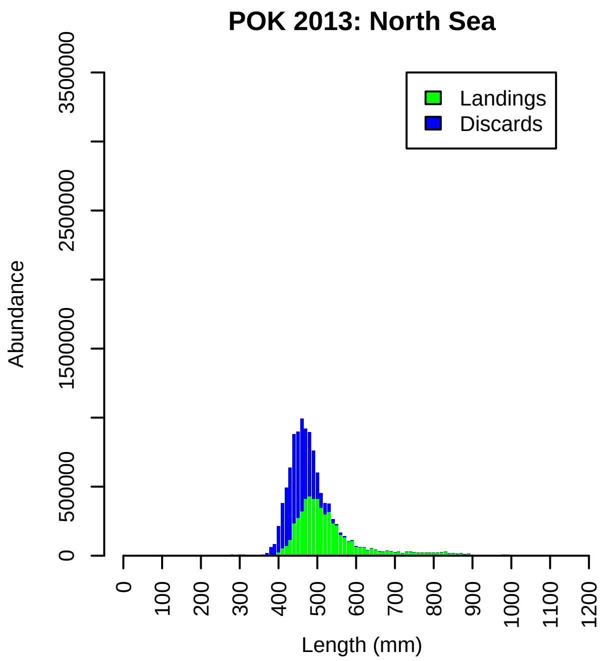
1500000
2500000
3500000
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Length (mm)


POK 2012: West Coast
Landings
Discards
Abundance
0e+00
2e+05
4e+05
6e+05
8e+05
1e+06
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Length (mm)


POK 2013: North Sea
Landings
Discards
Abundance
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3500000
0
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200
300
400
500
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700
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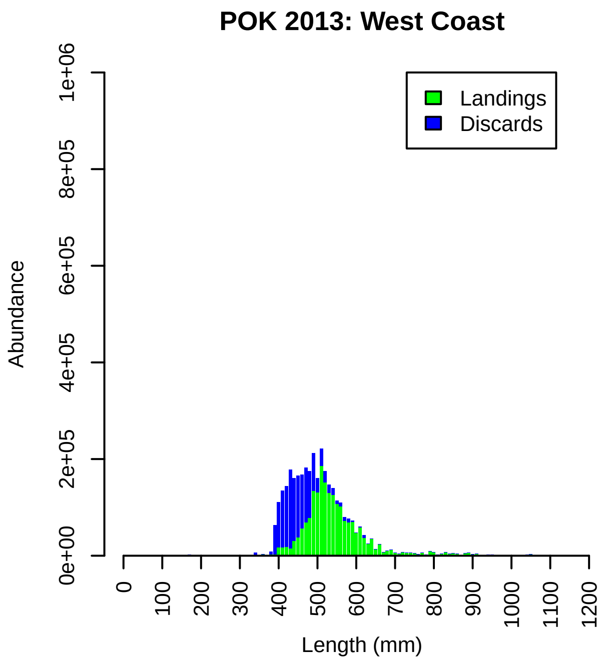
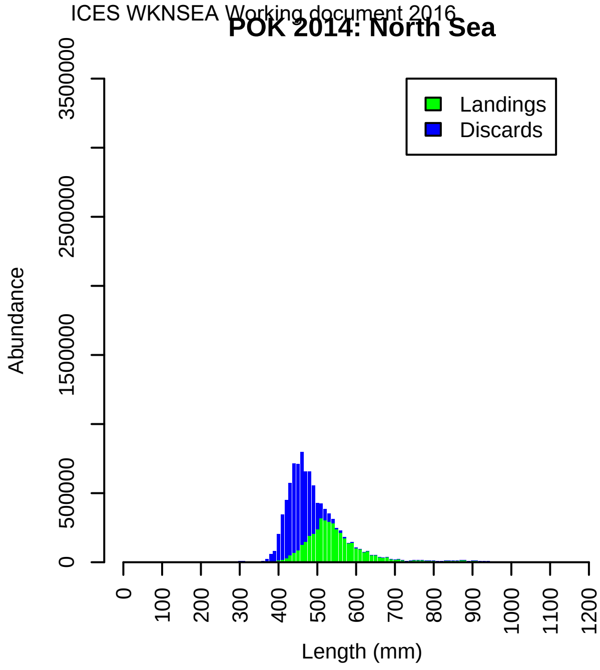
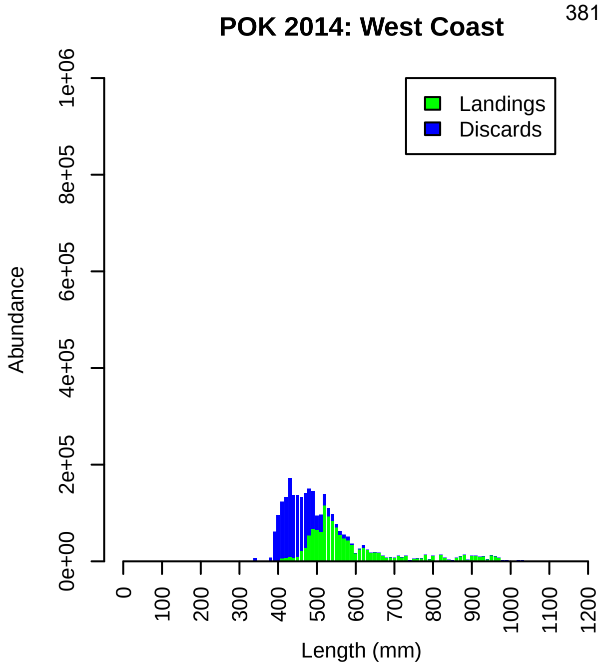
900
1000
1100
1200
Length (mm)


POK 2013: West Coast
Landings
Discards
Abundance
0e+00
2e+05
4e+05
6e+05
8e+05
1e+06
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Length (mm)


POK 2014: North Sea
Landings
Discards
Abundance
Length (mm)
0
500000
1500000
2500000
3500000
0
100
200
300
400
500
600
700
800
900
1000
1100
1200


POK 2014: West Coast
Landings
Discards
Abundance
Length (mm)
0e+00
2e+05
4e+05
6e+05
8e+05
1e+06
0
100
200
300
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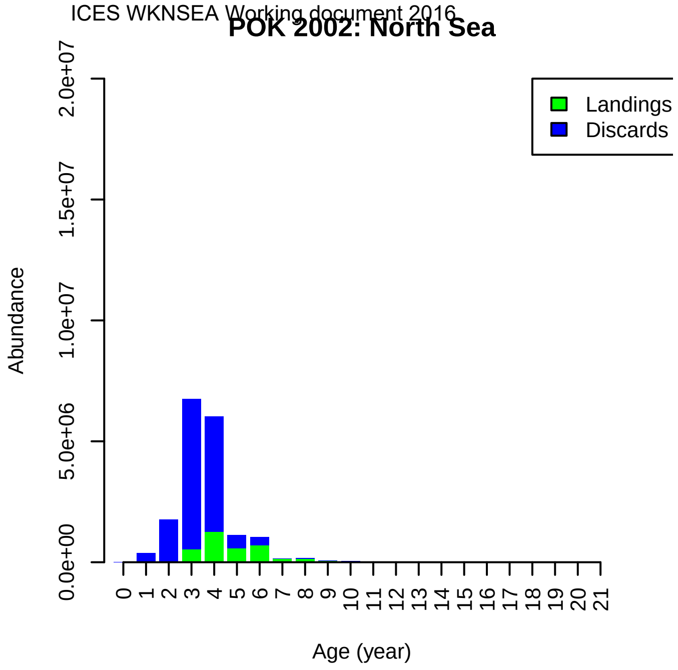
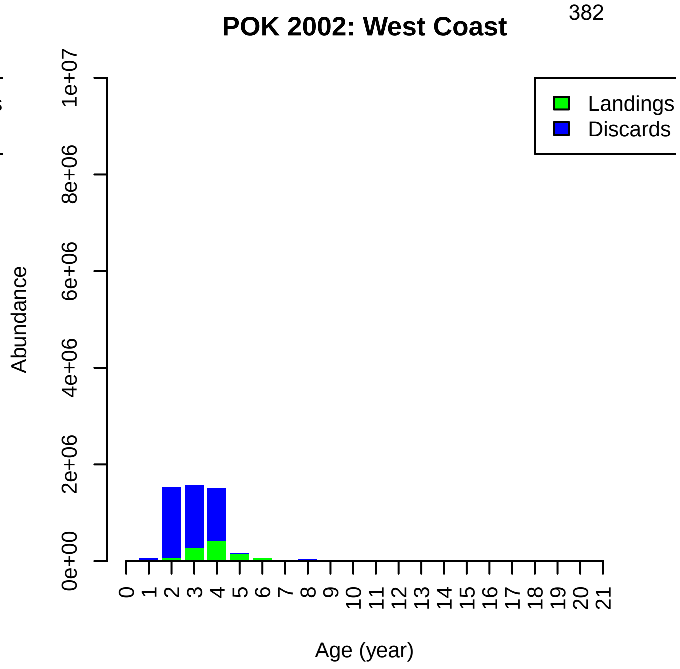
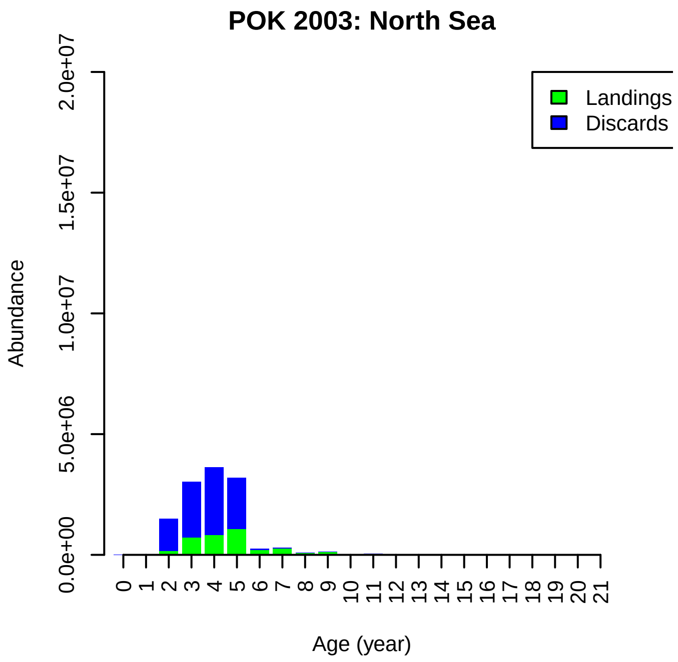
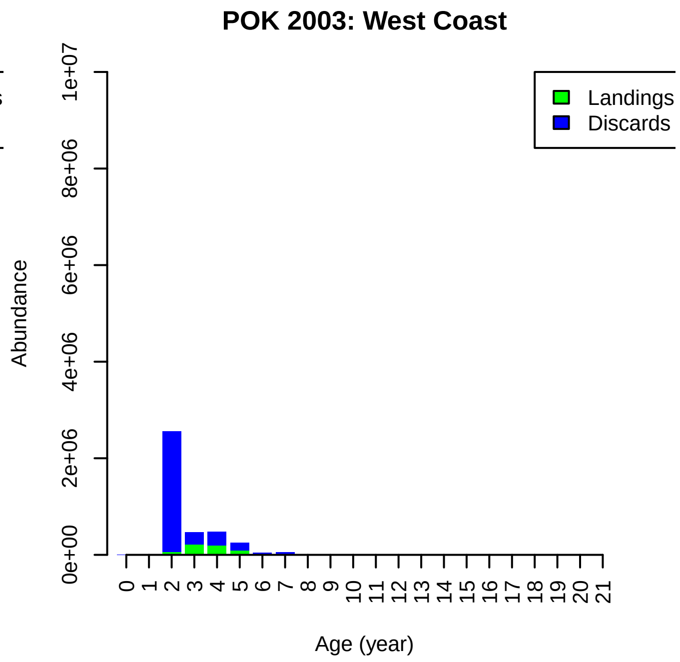
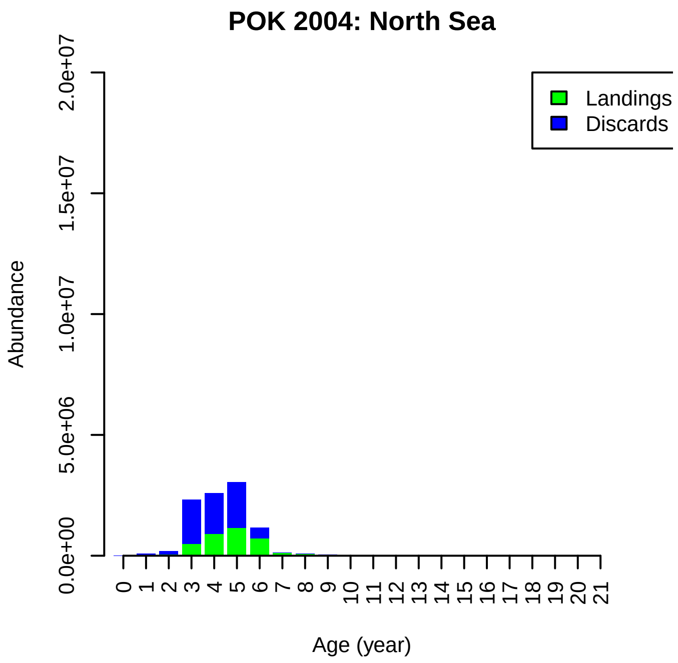
500
600
700
800
900
1000
1100
1200

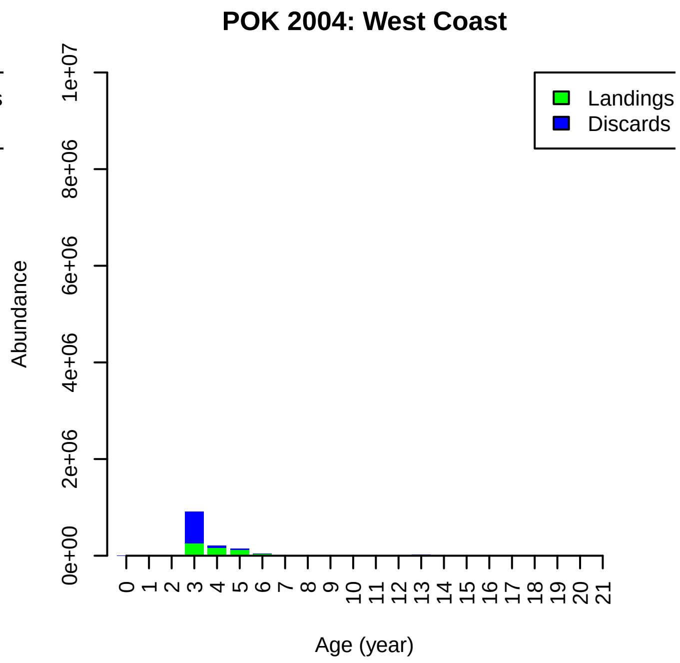

POK 2002: North Sea
Landings
Discards
Abundance
Age (year)

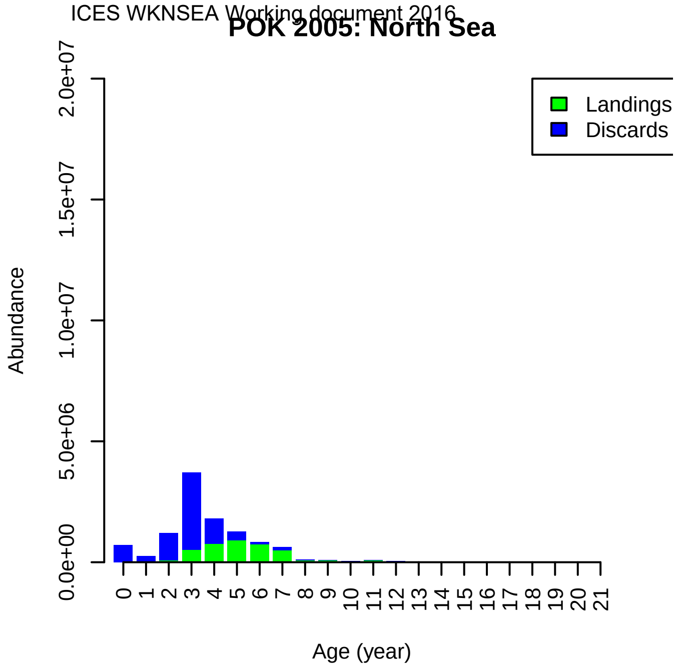

POK 2002: West Coast
Landings
Discards
Abundance
Age (year)

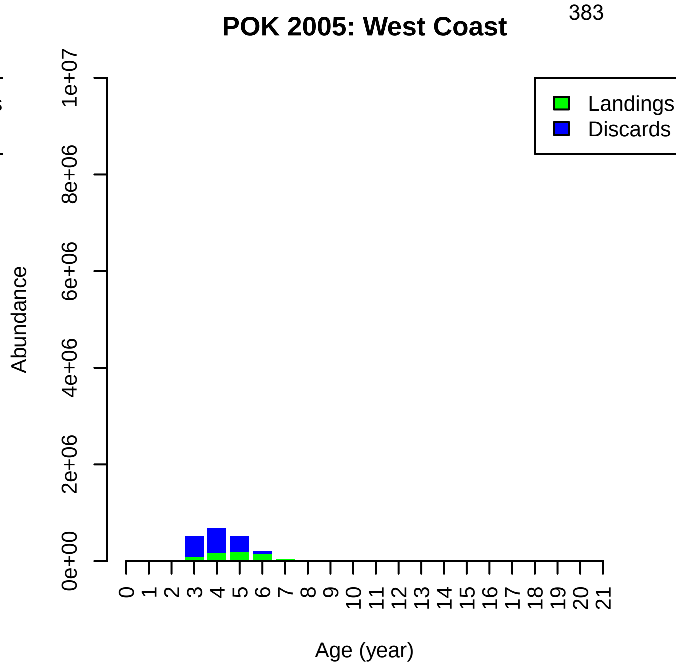

POK 2003: North Sea
Landings
Discards
Abundance
Age (year)

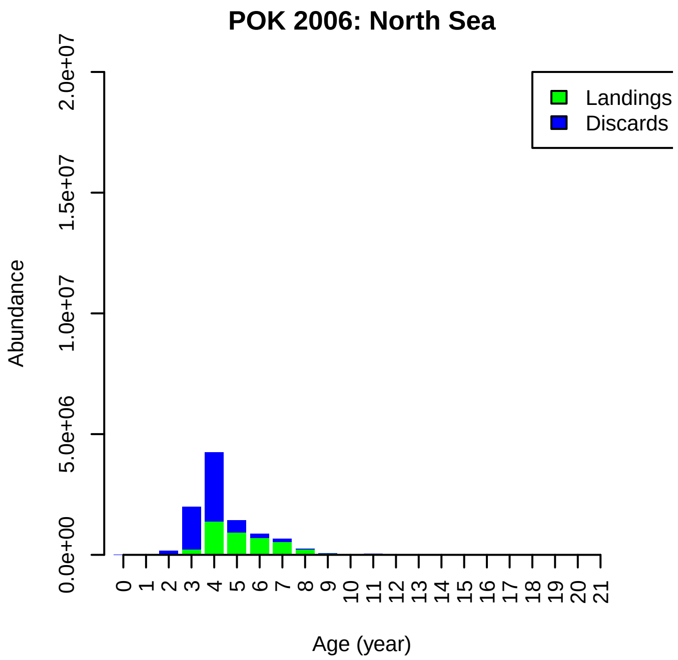

POK 2003: West Coast
Landings
Discards
Abundance
Age (year)


POK 2004: North Sea
Landings
Discards
Abundance
Age (year)


POK 2004: West Coast
Landings
Discards
Abundance
Age (year)


POK 2005: North Sea
Landings
Discards
Abundance
0.0e+00
5.0e+06
1.0e+07
1.5e+07
2.0e+07
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Age (year)


POK 2005: West Coast
Landings
Discards
Abundance
0e+00
2e+06
4e+06
6e+06
8e+06
1e+07
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Age (year)


POK 2006: North Sea
Landings
Discards
Abundance
0.0e+00
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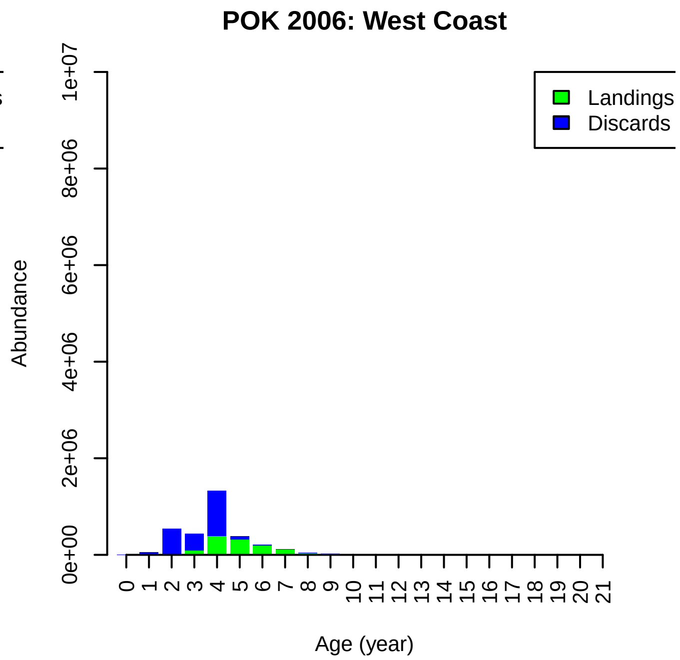
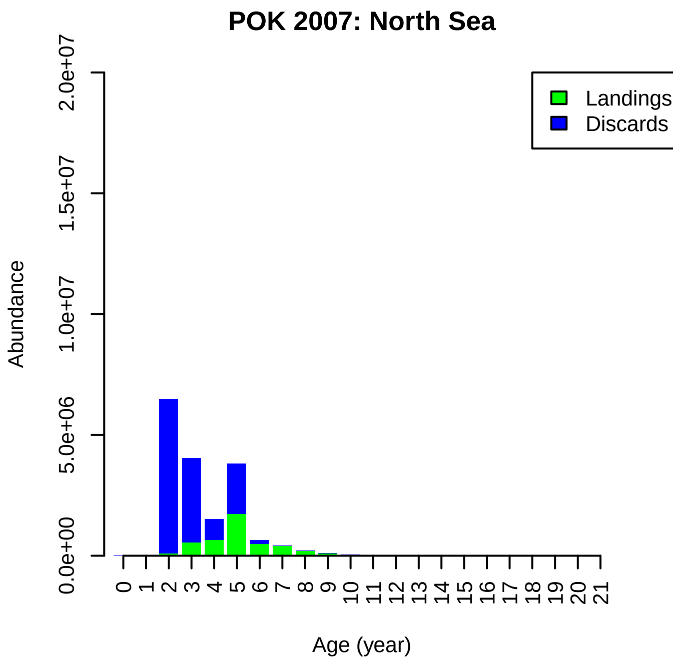
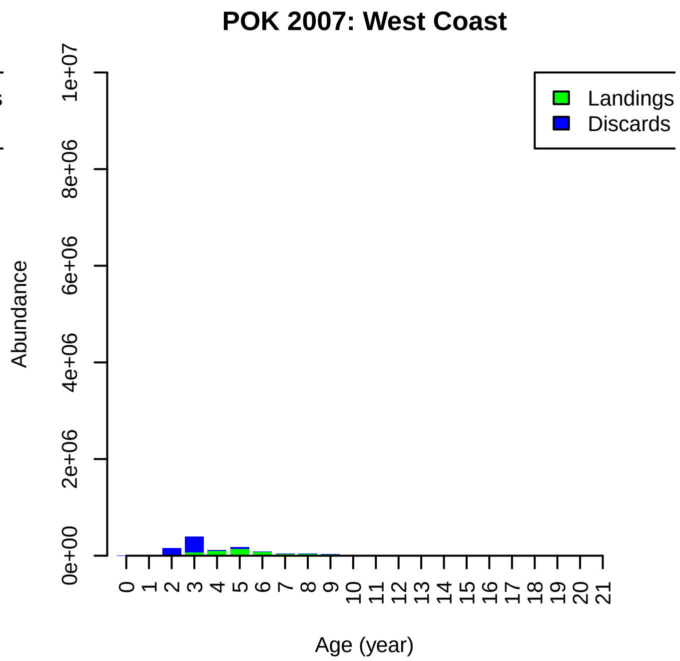
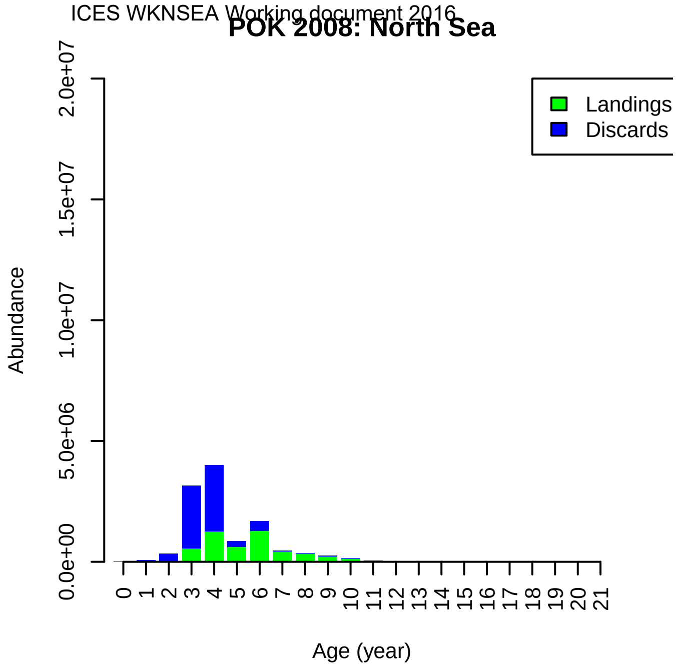
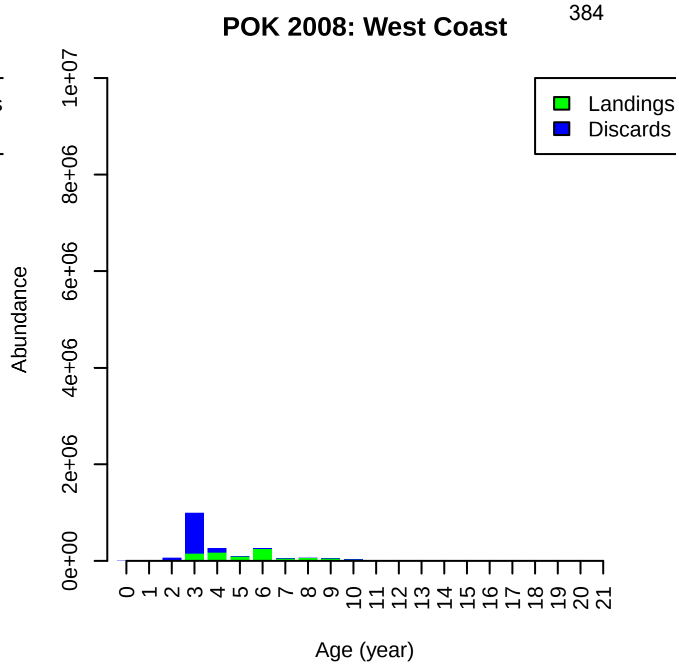
1.0e+07
1.5e+07
2.0e+07
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Age (year)

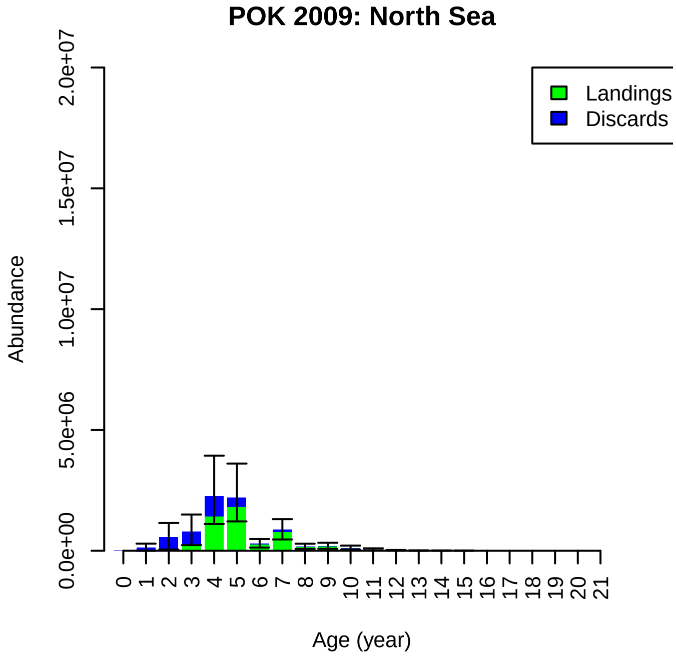

POK 2006: West Coast
Landings
Discards
Abundance
0e+00
2e+06
4e+06
6e+06
8e+06
1e+07
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Age (year)

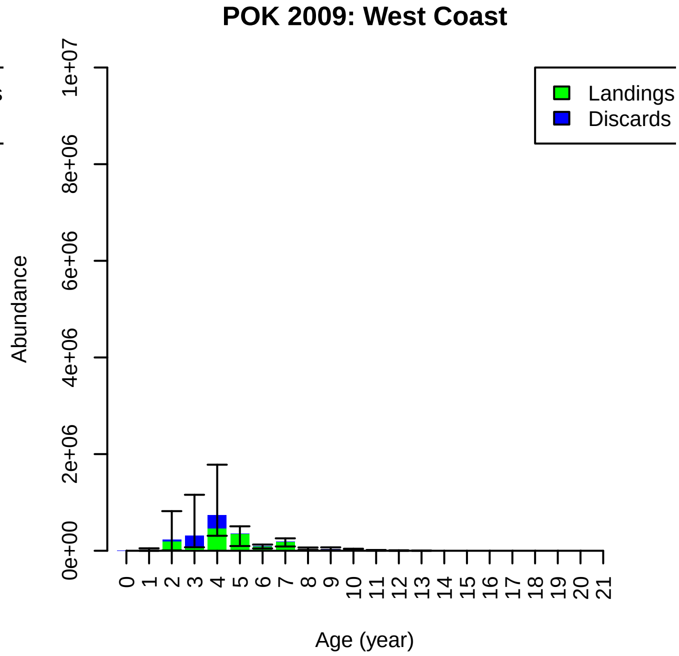

POK 2007: North Sea
Landings
Discards
Abundance
0.0e+00
5.0e+06
1.0e+07
1.5e+07
2.0e+07
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Age (year)

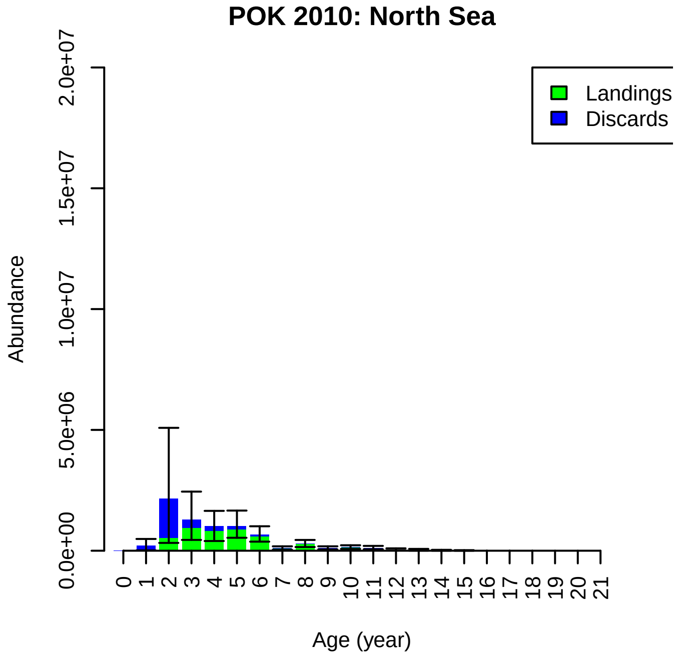

POK 2007: West Coast
Landings
Discards
Abundance
0e+00
2e+06
4e+06
6e+06
8e+06
1e+07
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Age (year)

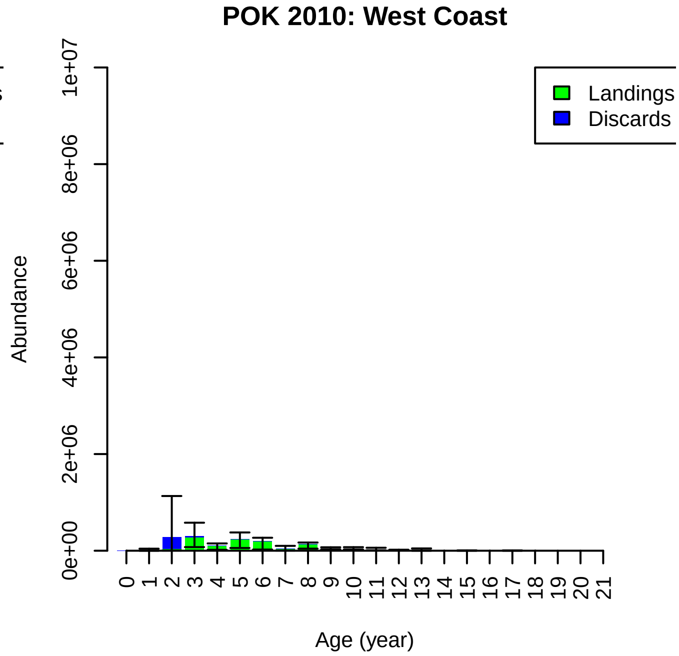

POK 2008: North Sea
Landings
Discards
Abundance
Age (year)

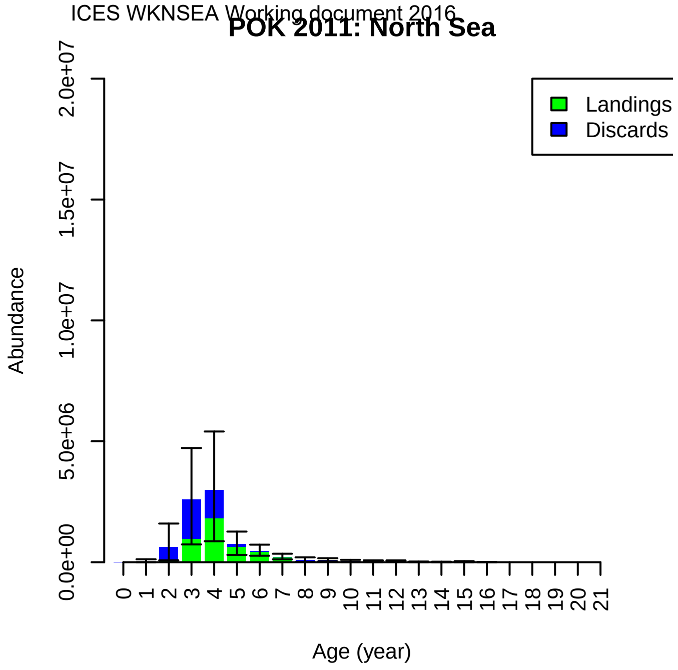

POK 2008: West Coast
Landings
Discards
Abundance
Age (year)

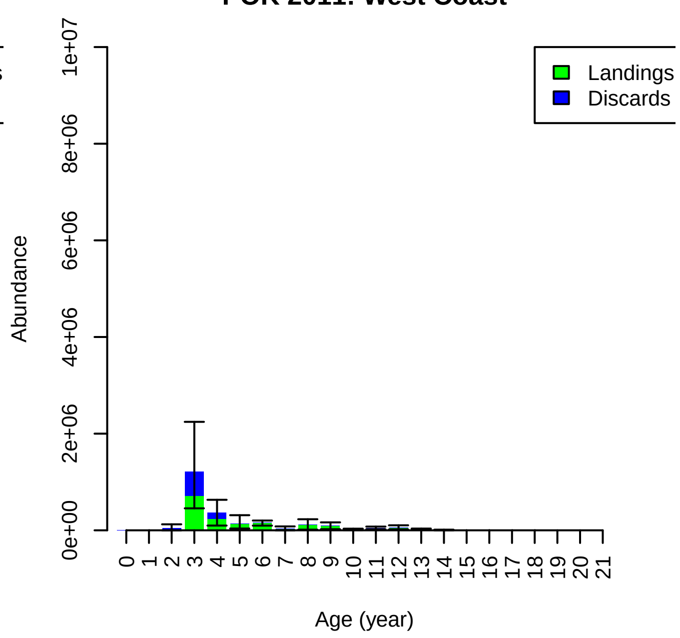

POK 2009: North Sea
Landings
Discards
Abundance
Age (year)

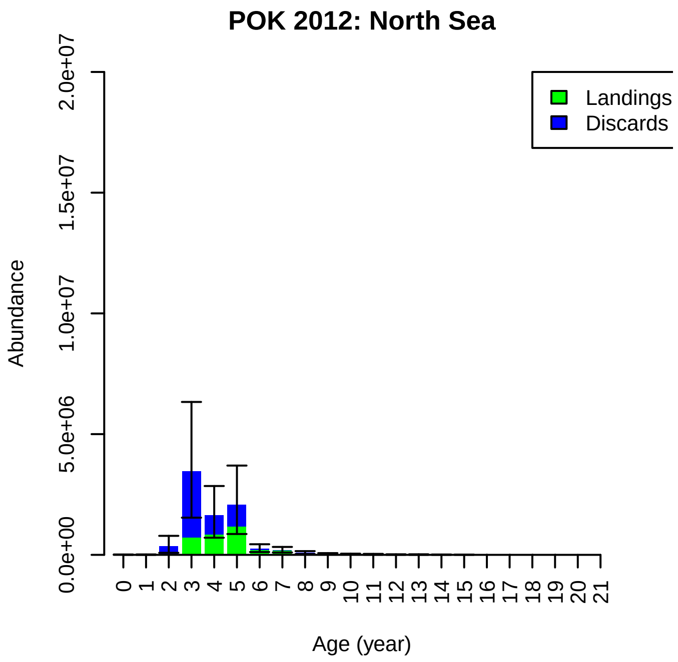

POK 2009: West Coast
Landings
Discards
Abundance
Age (year)

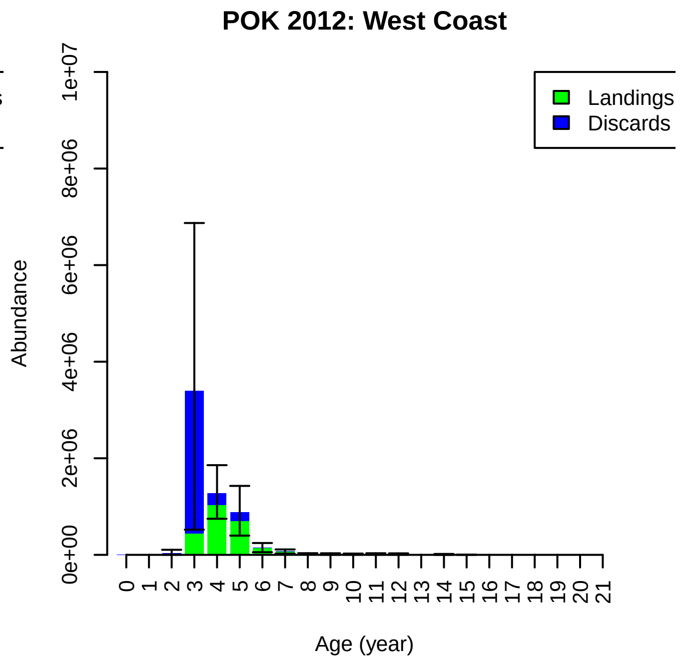

POK 2010: North Sea
Landings
Discards
Abundance
Age (year)

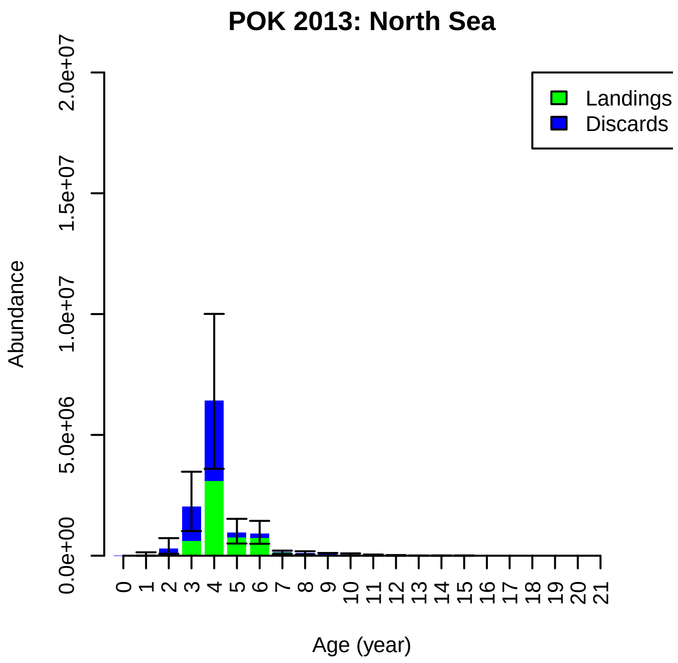

POK 2010: West Coast
Landings
Discards
Abundance
Age (year)

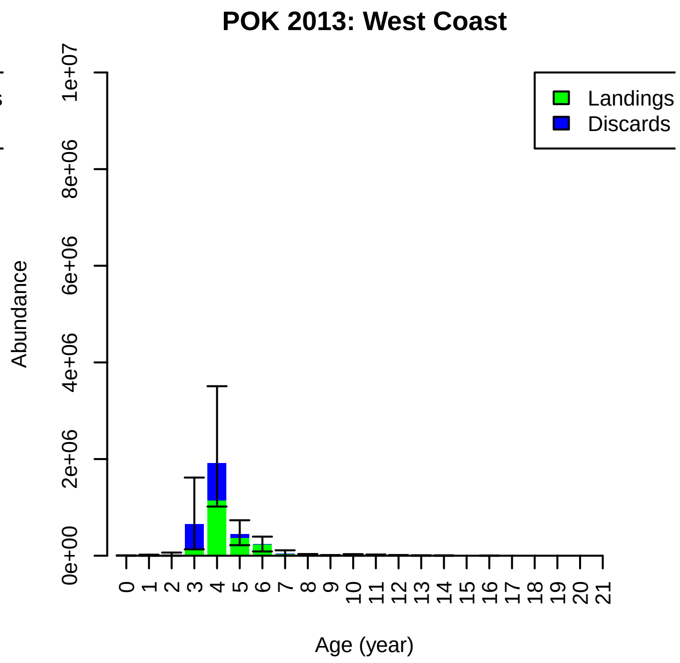

POK 2011: North Sea
Landings
Discards
Abundance
Age (year)

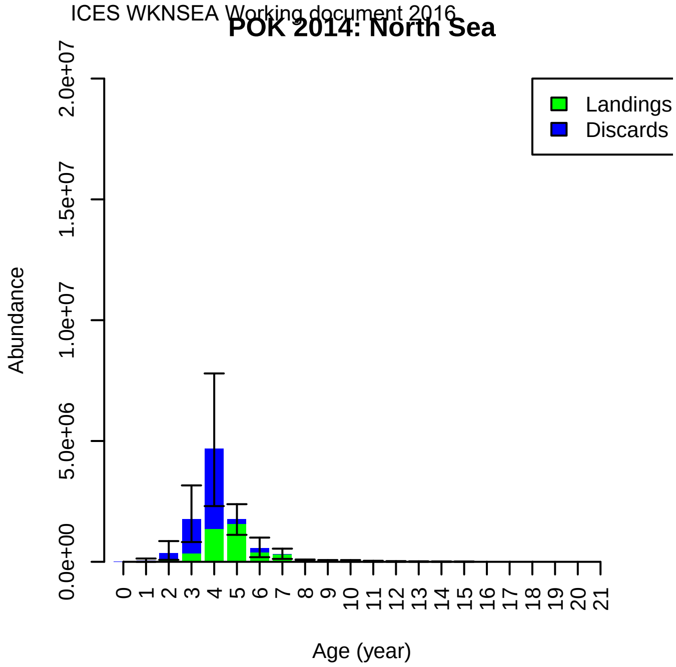

POK 2011: West Coast
Landings
Discards
Abundance
Age (year)

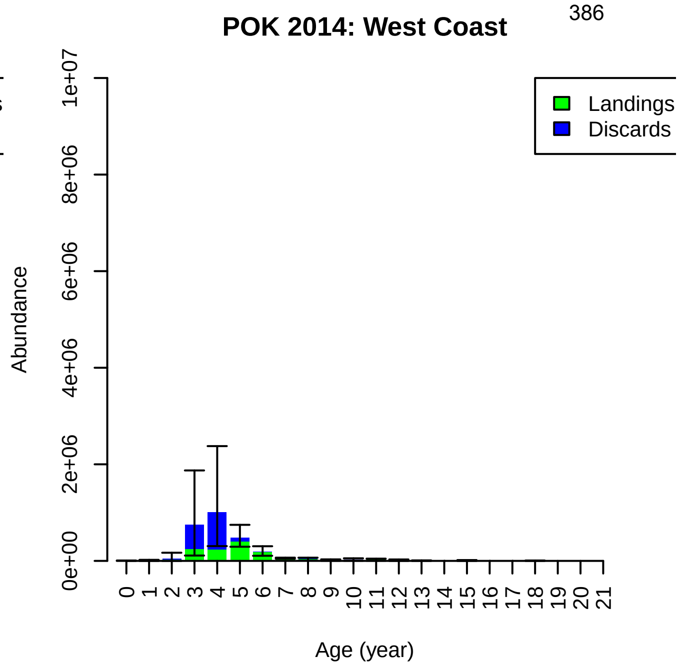

POK 2012: North Sea
Landings
Discards
Abundance
Age (year)

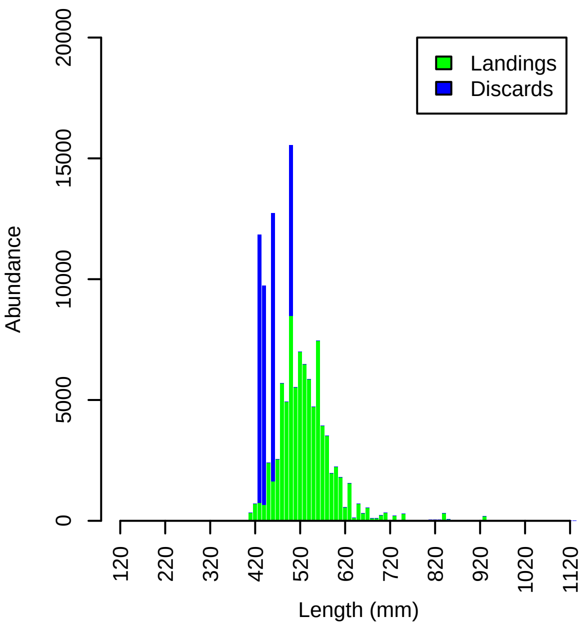

POK 2012: West Coast
Landings
Discards
Abundance
Age (year)

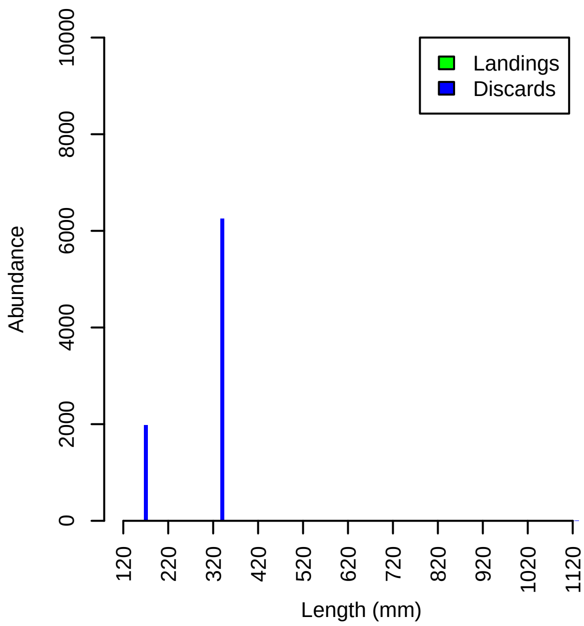

POK 2013: North Sea
Landings
Discards
Abundance
Age (year)

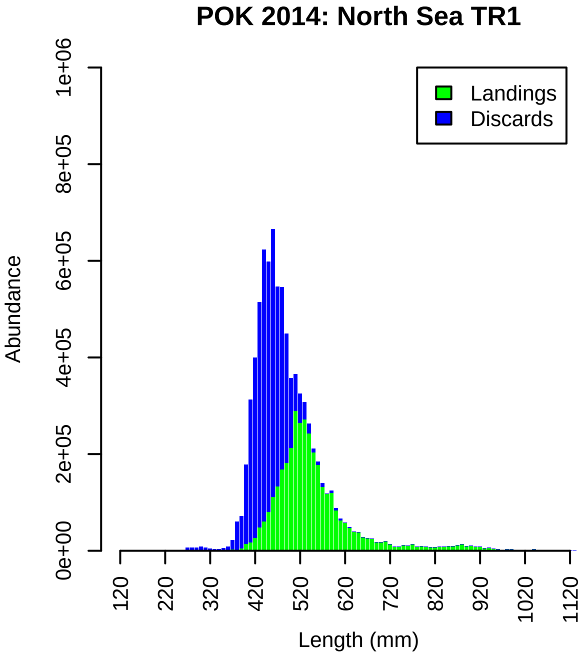

POK 2013: West Coast
Landings
Discards
Abundance
Age (year)

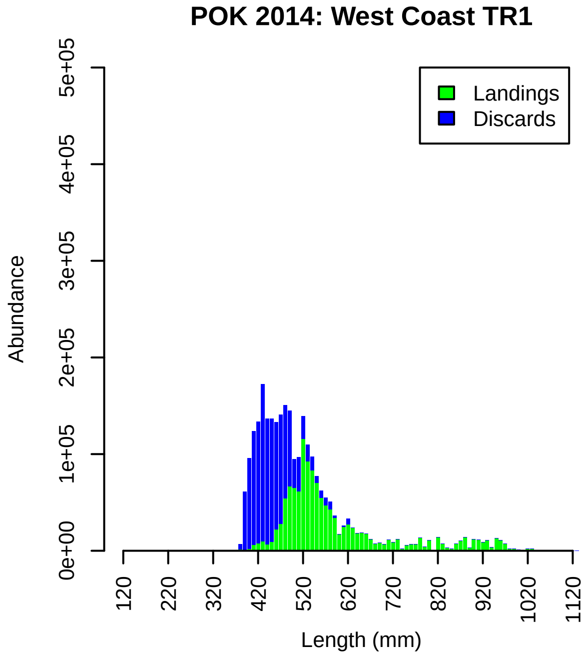

POK 2014: North Sea
Landings
Discards
Abundance
0.0e+00
5.0e+06
1.0e+07
1.5e+07
2.0e+07
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Age (year)

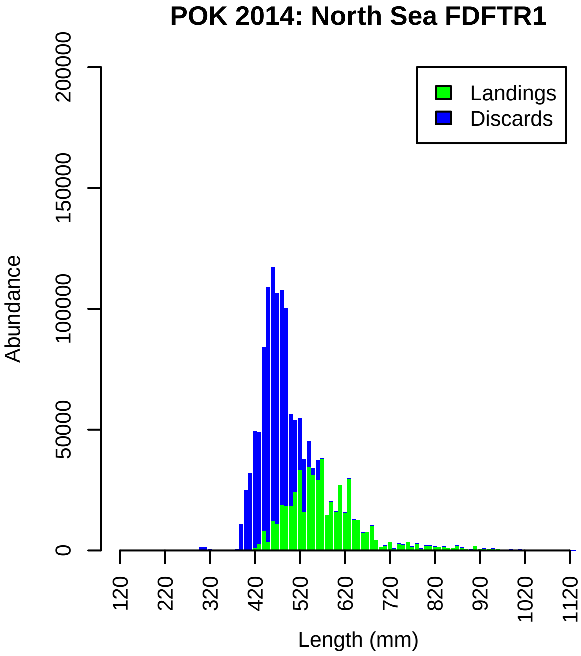

POK 2014: West Coast
Landings
Discards
Abundance
0e+00
2e+06
4e+06
6e+06
8e+06
1e+07
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Age (year)

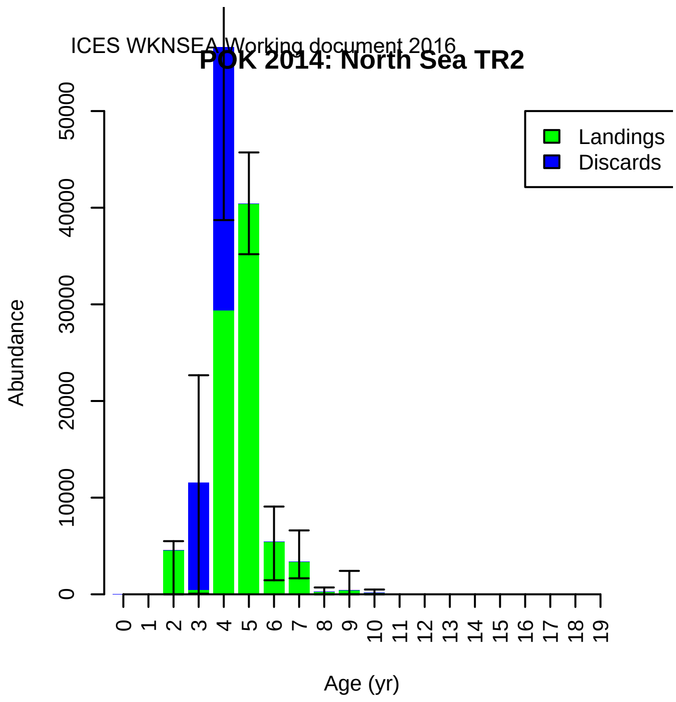

POK 2014: North Sea TR2
Landings
Discards
Abundance
0
5000
10000
15000
20000
Length (mm)
120 220 320 420 520 620 720 820 920 1020 1120

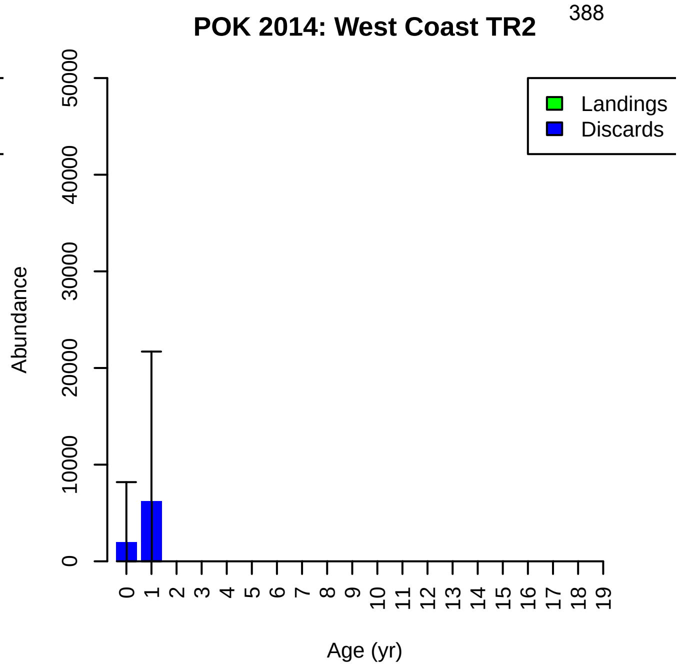

POK 2014: West Coast TR2
Landings
Discards
Abundance
0
2000
4000
6000
8000
10000
Length (mm)
120 220 320 420 520 620 720 820 920 1020 1120

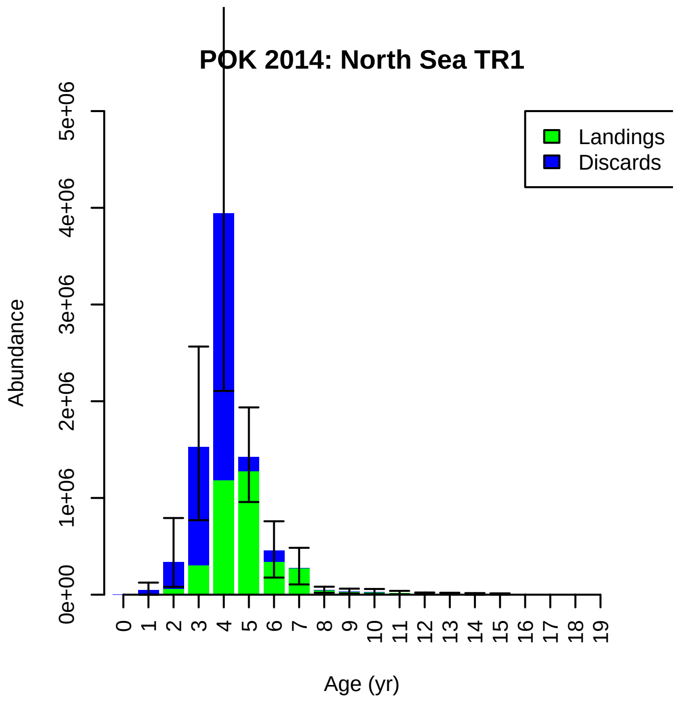

POK 2014: North Sea TR1
Landings
Discards
Abundance
0e+00
2e+05
4e+05
6e+05
8e+05
1e+06
Length (mm)
120 220 320 420 520 620 720 820 920 1020 1120

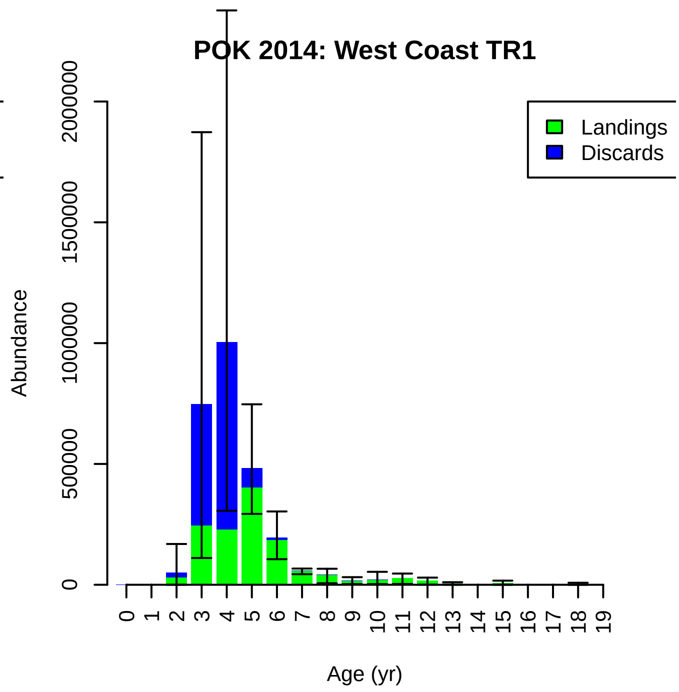

POK 2014: West Coast TR1
Landings
Discards
Abundance
0e+00
1e+05
2e+05
3e+05
4e+05
5e+05
Length (mm)
120 220 320 420 520 620 720 820 920 1020 1120

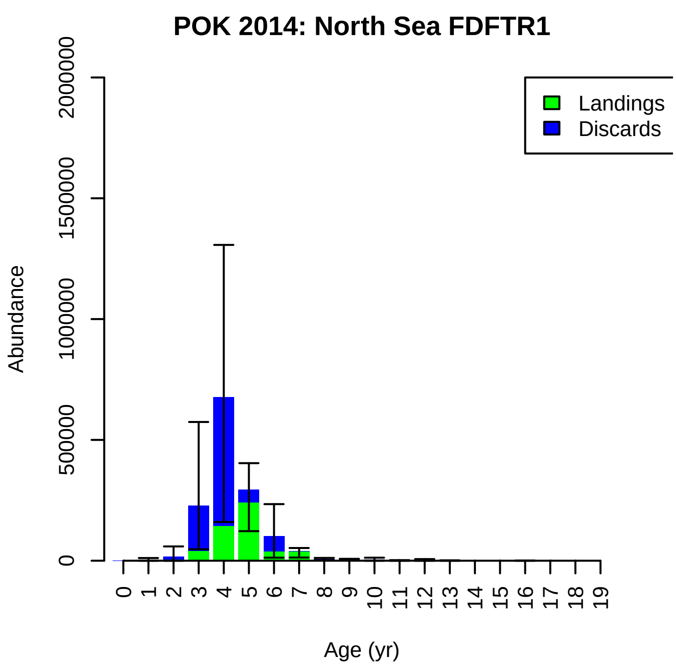

POK 2014: North Sea FDFTR1
Landings
Discards
Abundance
0
50000
100000
150000
200000
Length (mm)
120 220 320 420 520 620 720 820 920 1020 1120


POK 2014: North Sea TR2
Landings
Discards
Abundance
Age (yr)

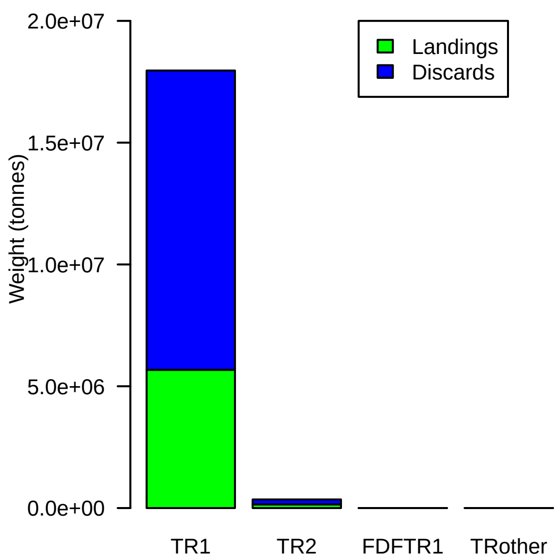

POK 2014: West Coast TR2
Landings
Discards
Abundance
Age (yr)


POK 2014: North Sea TR1
Landings
Discards
Abundance
Age (yr)

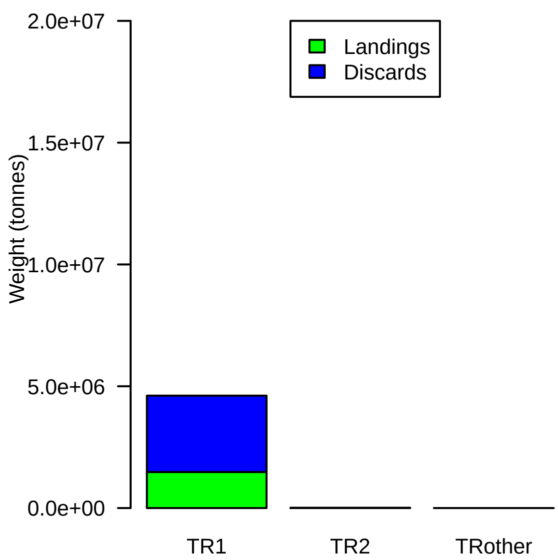

POK 2014: West Coast TR1
Landings
Discards
Abundance
Age (yr)


POK 2014: North Sea FDFTR1
Landings
Discards
Abundance
Age (yr)

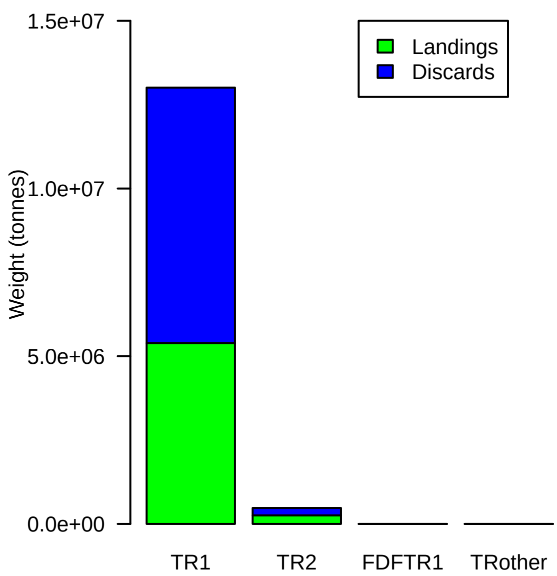
POK 2002: 27.4



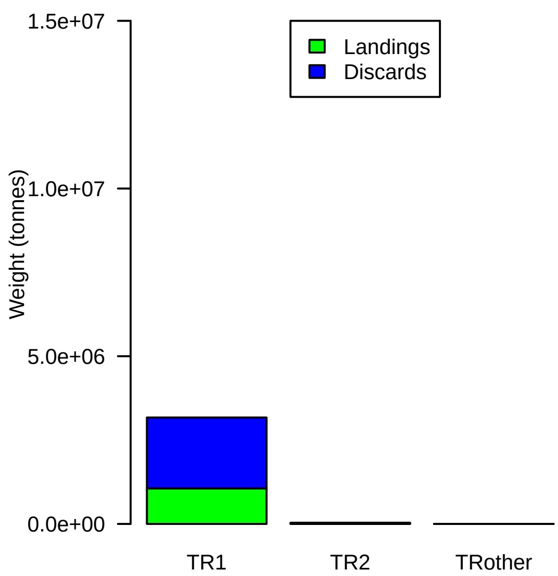
POK 2002: 27.6.a



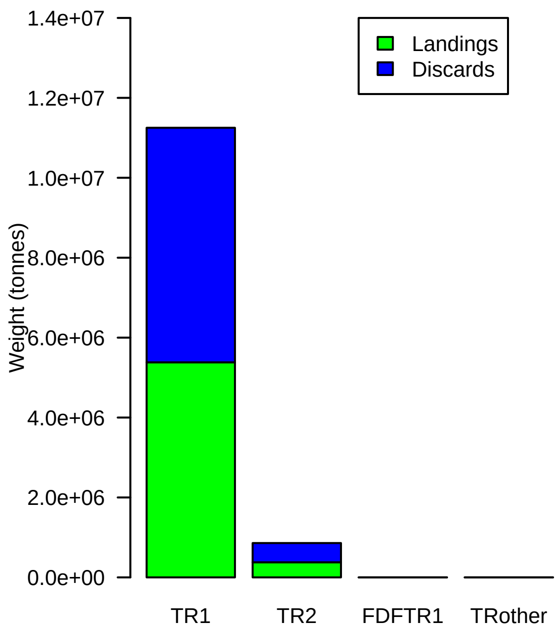
POK 2003: 27.4



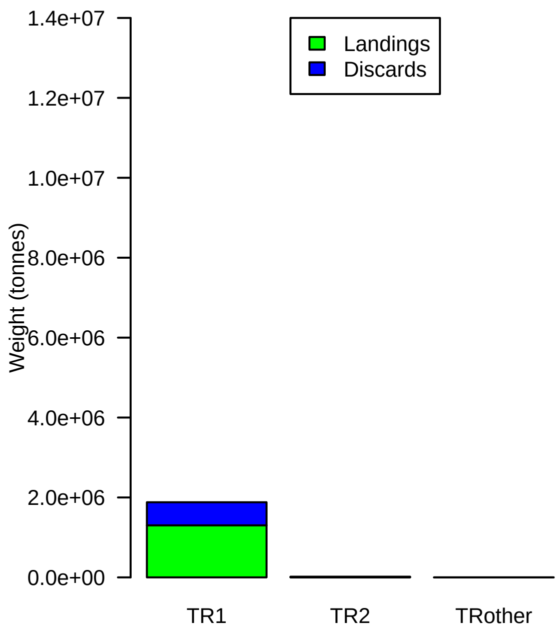
POK 2003: 27.6.a



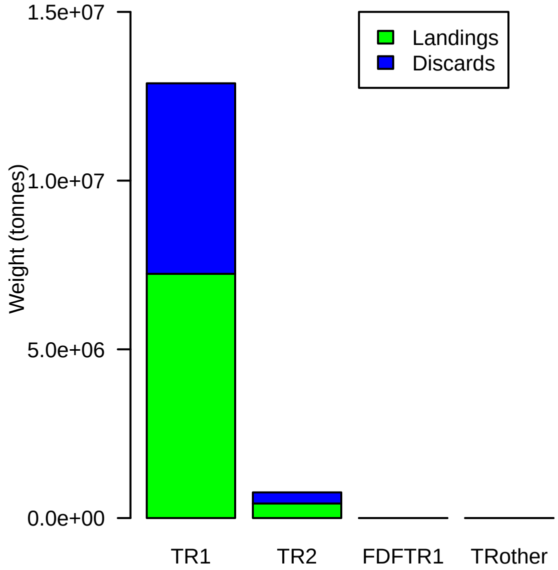
POK 2004: 27.4



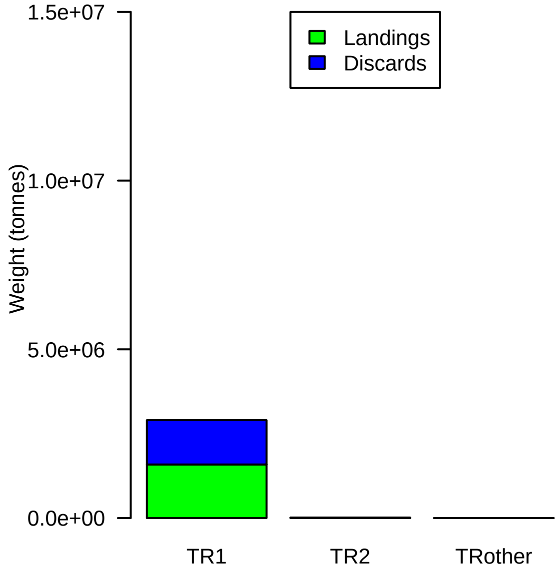
POK 2004: 27.6.a



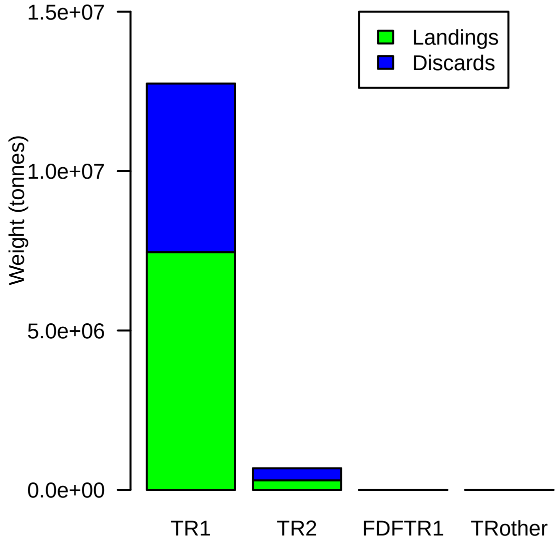
POK 2005: 27.4



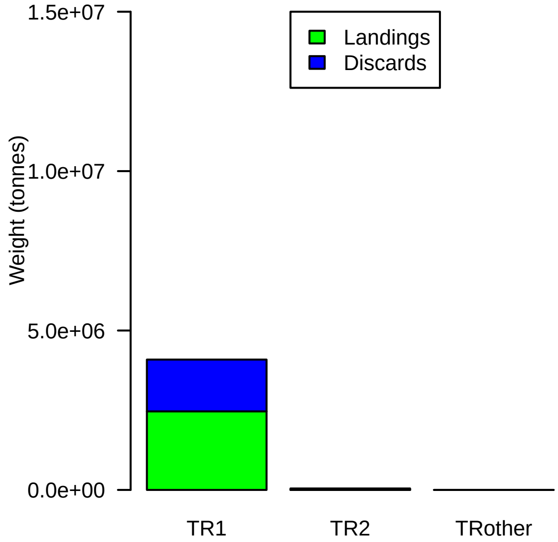
POK 2005: 27.6.a



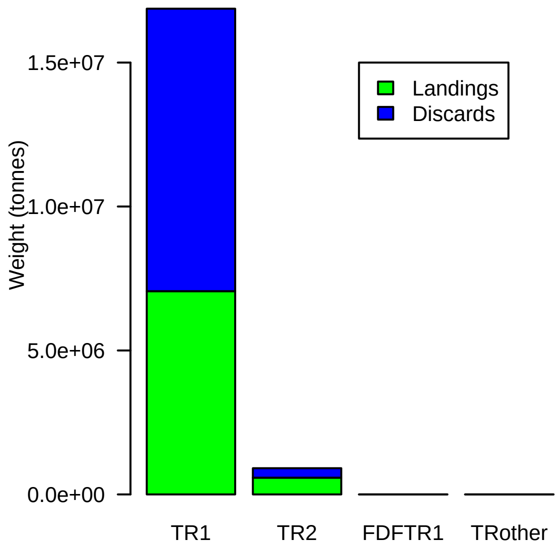
POK 2006: 27.4



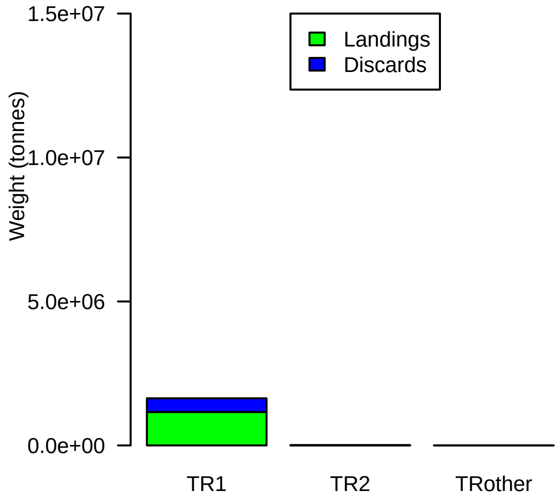
POK 2006: 27.6.a

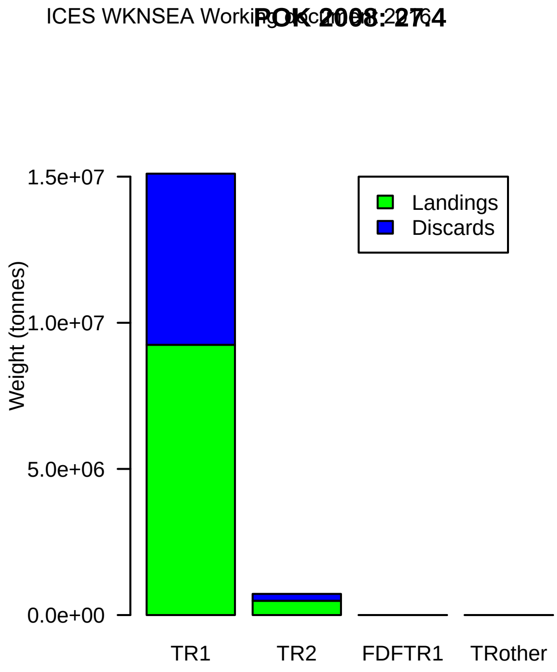


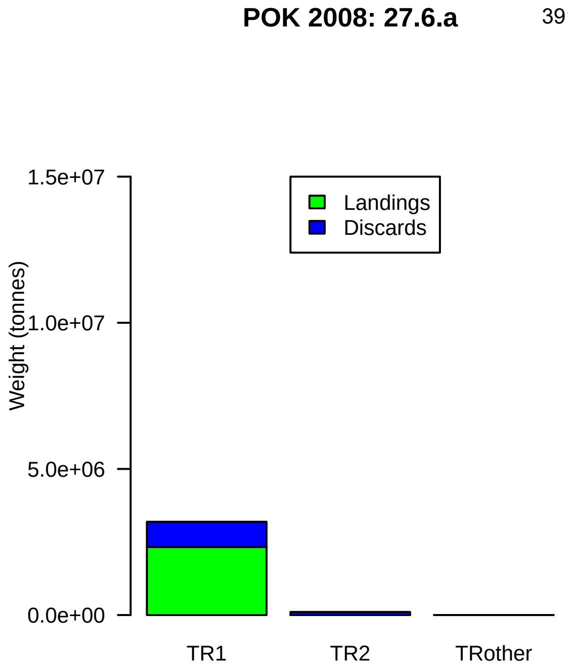
POK 2007: 27.4

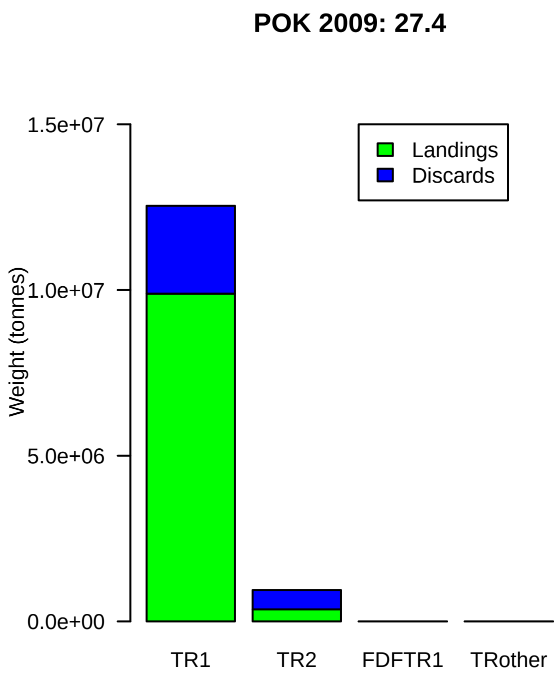


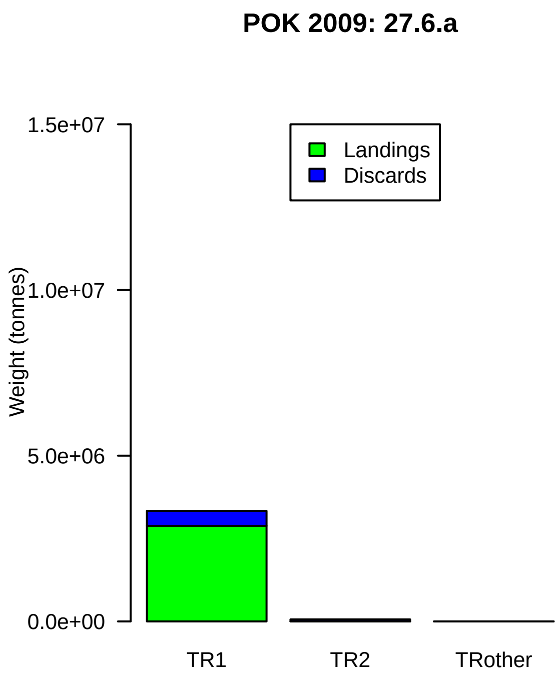
POK 2007: 27.6.a

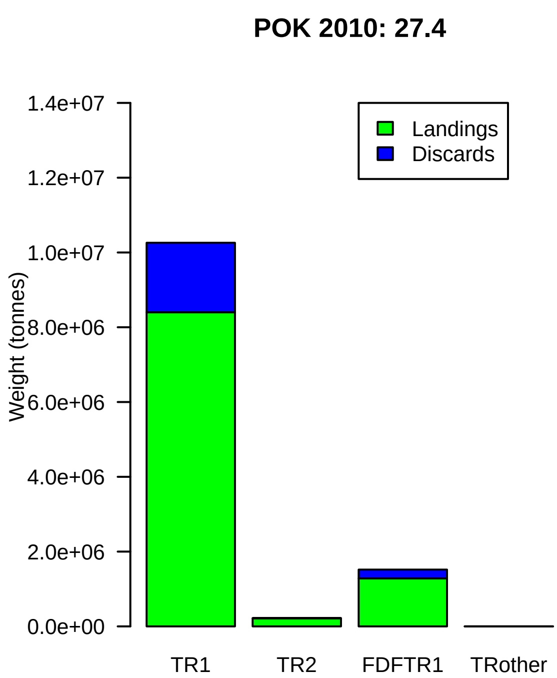


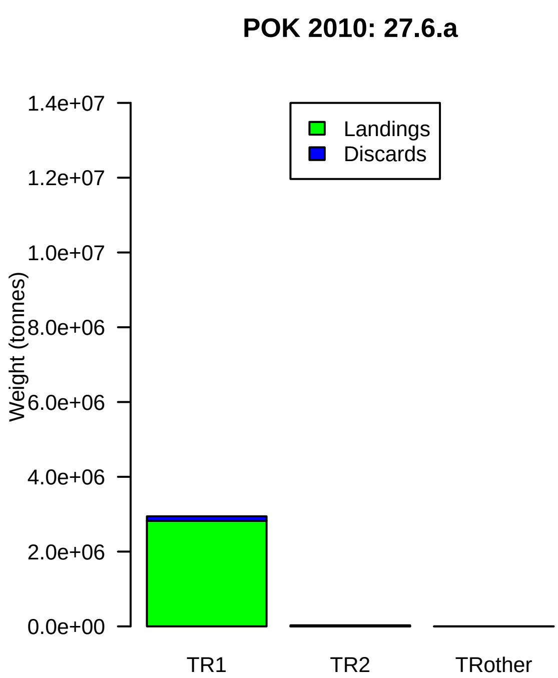

POK 2008: 27.4
Weight (tonnes)
0.0e+00
5.0e+06
1.0e+07
1.5e+07
Landings
Discards
TR1
TR2
FDFTR1
TRother


POK 2008: 27.6.a
Weight (tonnes)
0.0e+00
5.0e+06
1.0e+07
1.5e+07
Landings
Discards
TR1
TR2
TRother

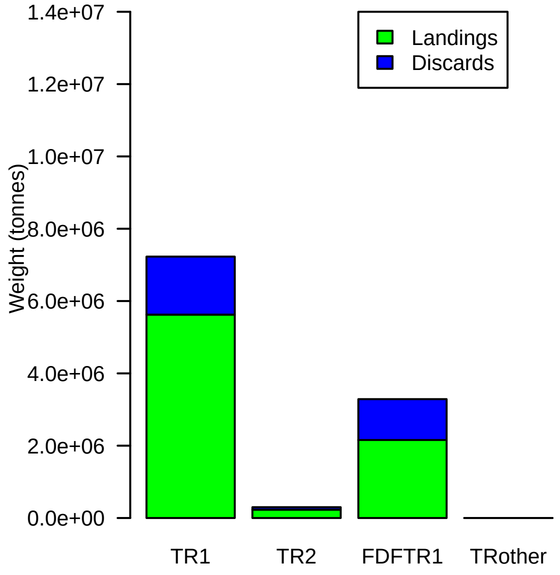

POK 2009: 27.4
Weight (tonnes)
0.0e+00
5.0e+06
1.0e+07
1.5e+07
Landings
Discards
TR1
TR2
FDFTR1
TRother


POK 2009: 27.6.a
Weight (tonnes)
0.0e+00
5.0e+06
1.0e+07
1.5e+07
Landings
Discards
TR1
TR2
TRother

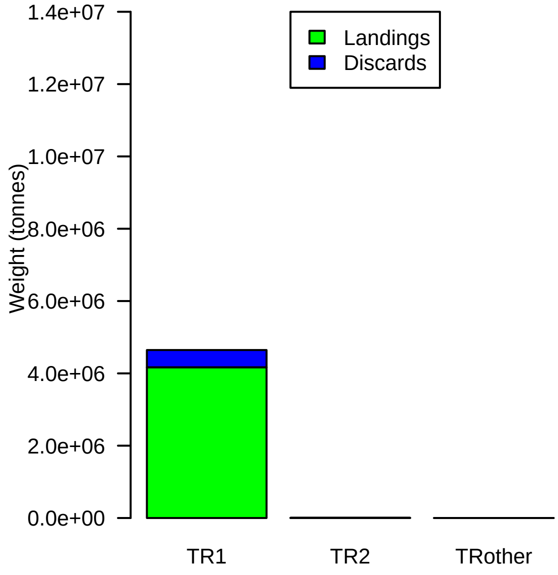

POK 2010: 27.4
Weight (tonnes)
0.0e+00
2.0e+06
4.0e+06
6.0e+06
8.0e+06
1.0e+07
1.2e+07
1.4e+07
Landings
Discards
TR1
TR2
FDFTR1
TRother


POK 2010: 27.6.a
Weight (tonnes)
0.0e+00
2.0e+06
4.0e+06
6.0e+06
8.0e+06
1.0e+07
1.2e+07
1.4e+07
Landings
Discards
TR1
TR2
TRother

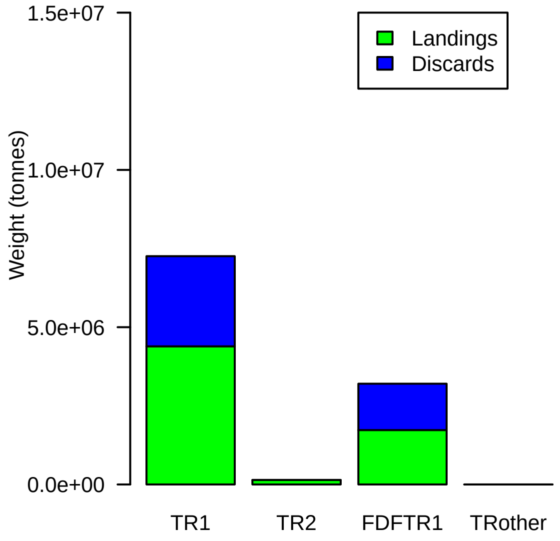
POK 2011: 27.4



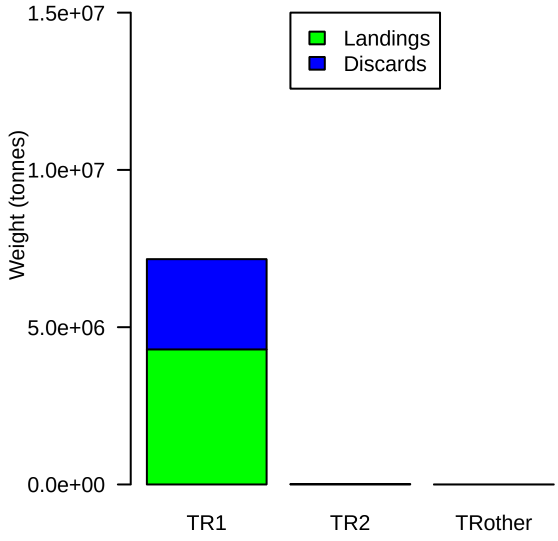
POK 2011: 27.6.a



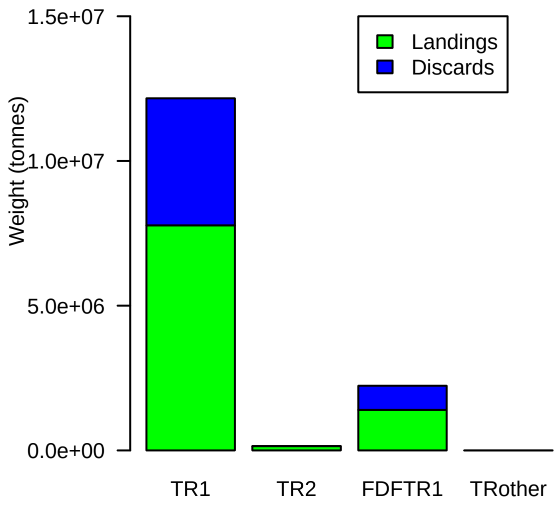
POK 2012: 27.4



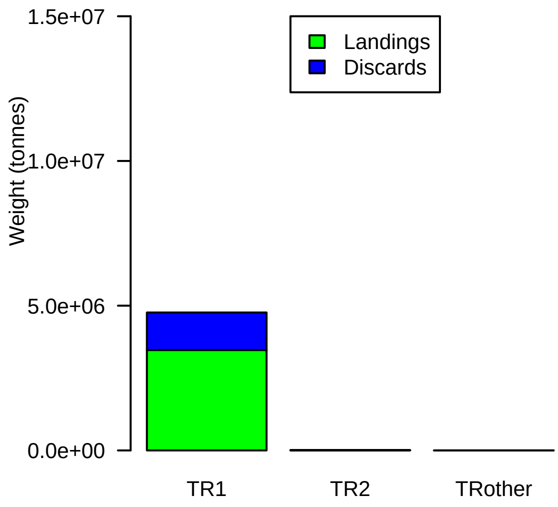
POK 2012: 27.6.a



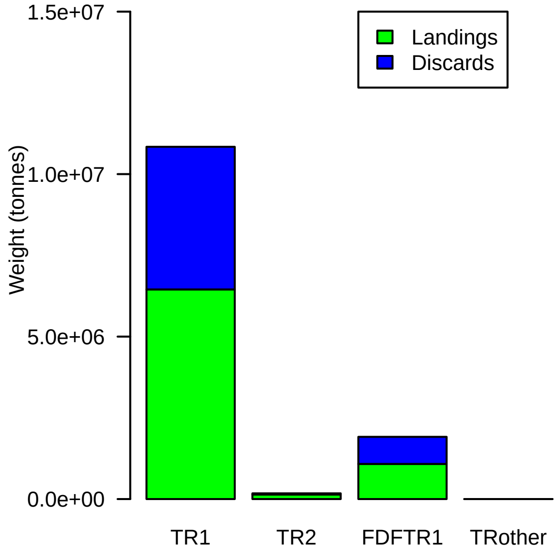
POK 2013: 27.4



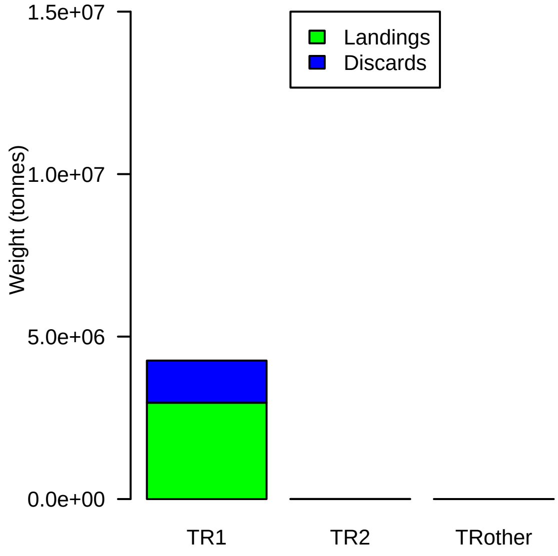
POK 2013: 27.6.a

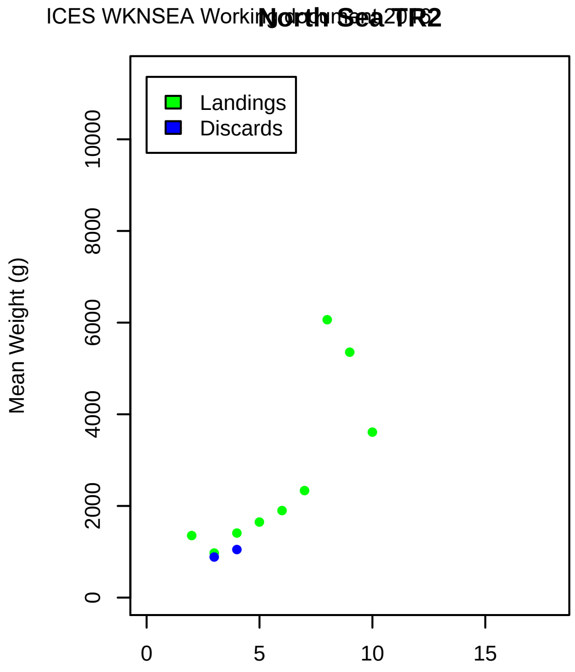


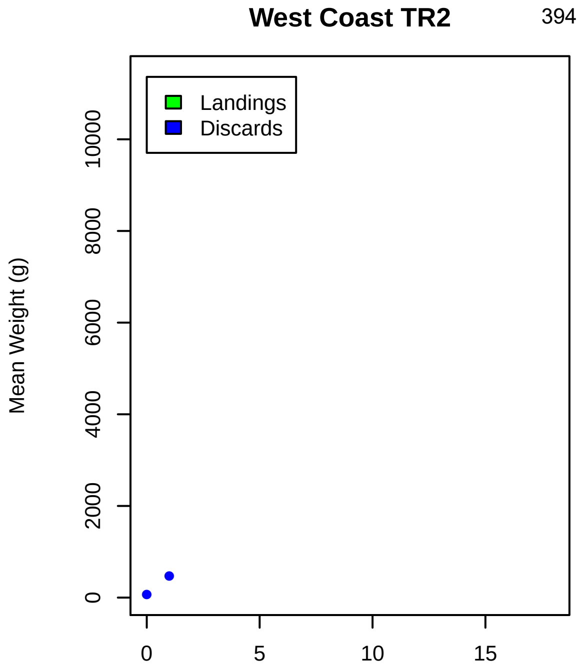
POK 2014: 27.4

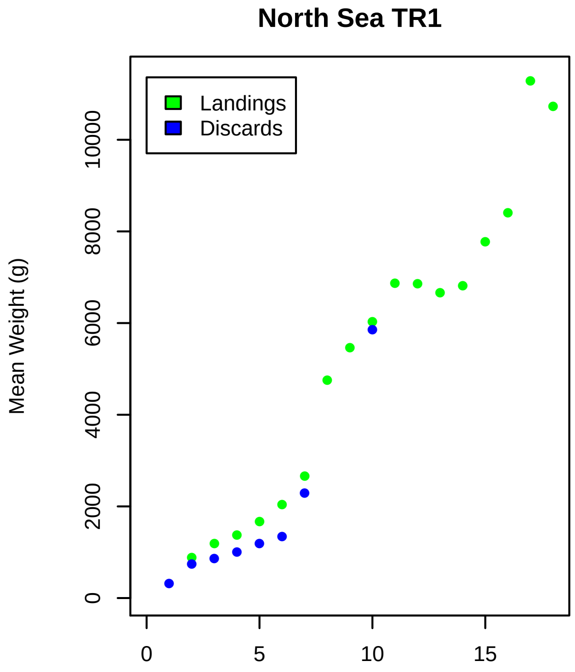


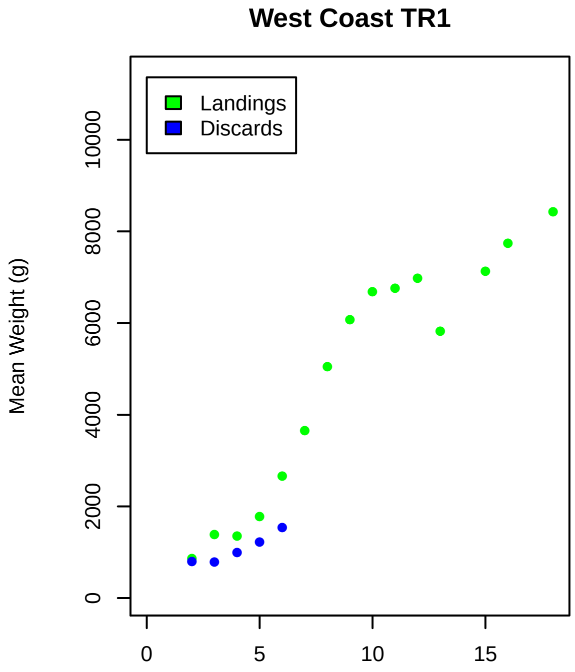
POK 2014: 27.6.a

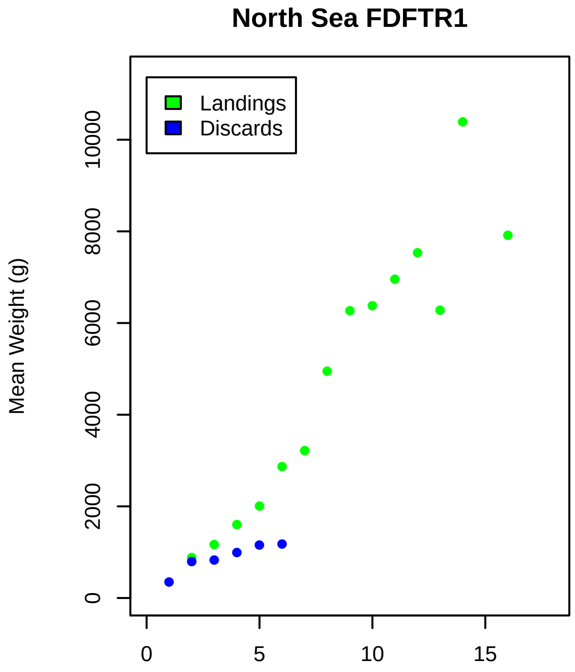



North Sea TR2
Landings
Discards
Mean Weight (g)
0
2000
4000
6000
8000
10000
0
5
10
15

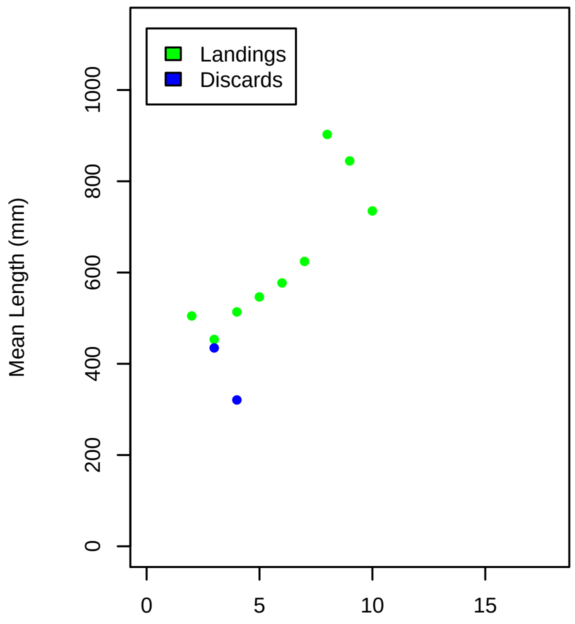

West Coast TR2
Landings
Discards
Mean Weight (g)
0
2000
4000
6000
8000
10000
0
5
10
15


North Sea TR1
Landings
Discards
Mean Weight (g)
0
2000
4000
6000
8000
10000
0
5
10
15

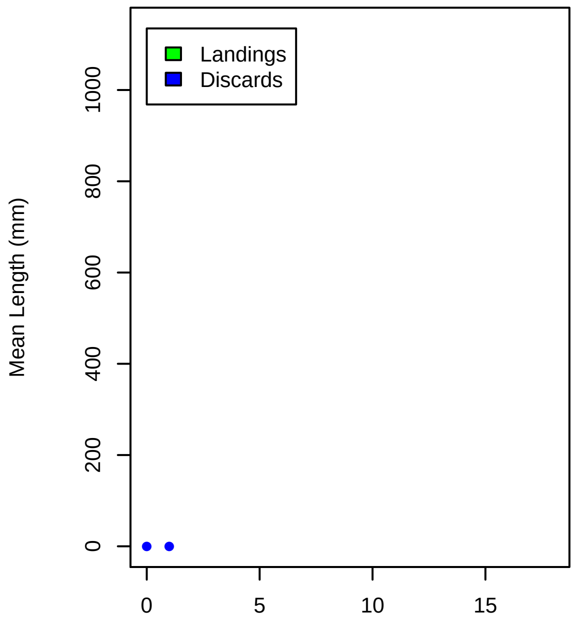

West Coast TR1
Landings
Discards
Mean Weight (g)
0
2000
4000
6000
8000
10000
0
5
10
15


North Sea FDFTR1
Landings
Discards
Mean Weight (g)
0
2000
4000
6000
8000
10000
0
5
10
15

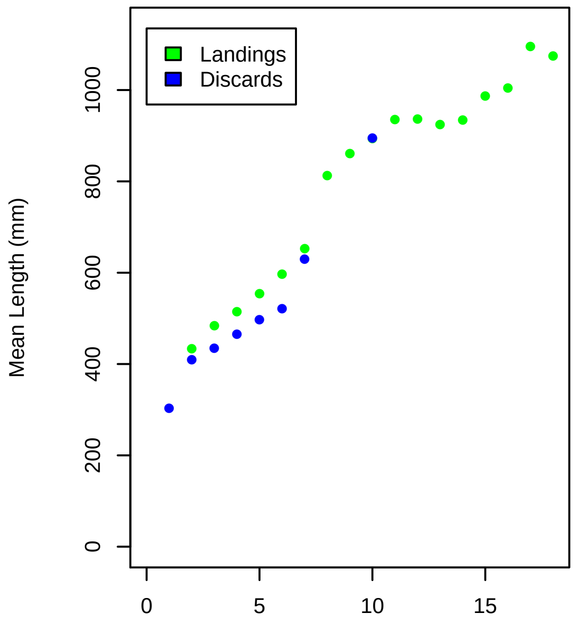
North Sea TR2



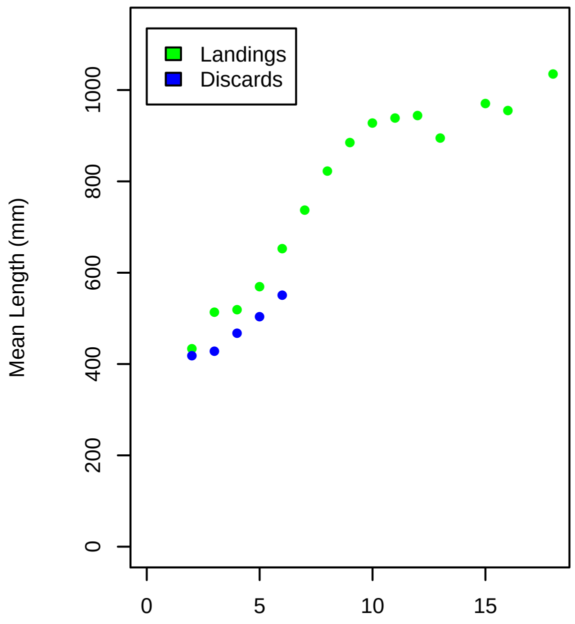
West Coast TR2



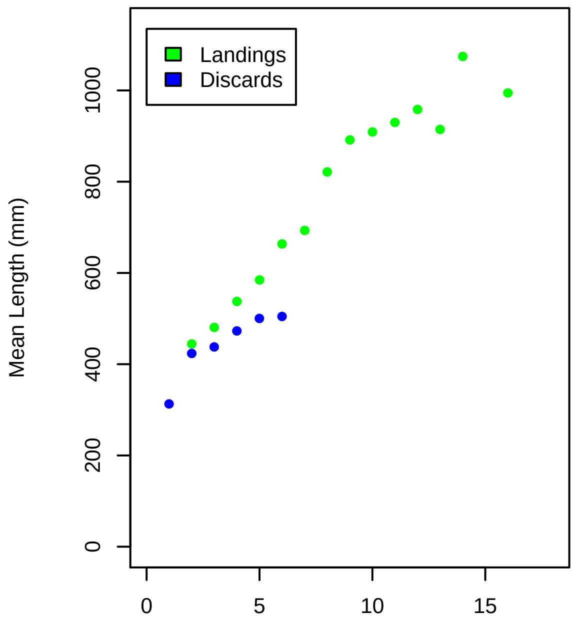
North Sea TR1



West Coast TR1



North Sea FDFTR1



Norwegian National Data

Sources of samples included the coastal and oceanic reference fleets, the coast guard, and sampling onshore (from pelagic vessel catches). These sources (in Norwegian) are referanseflåte, kystreferanseflåte, kystvakten, møreforskning, prøvebåt, and kontrollverket. Samples were not available from all sources 2002–2014. No data existed from prøvebåt before 2009, from kystreferanseflåte before 2005, or kontrollverket before 2007.

All tables for **length and age samples** (in Appendices) show catch and sample information by gear groupings, quarter, and area. If area is labeled 9, it is Division IIIaN (Skagerrak); 8 (or any other number) will be Area IV and VI combined. Information in the table is the total catch (in kg, black number) taken by that gear in that area and quarter. Small numbers in red below the catch are the number of boats sampled, the number of unique stations, and the number of fish. If the table cell is colored green, enough catch has been sampled in that cell to use within ECA, yellow = marginally, orange = not enough data.

Three or more gear groups were used: 31, 41, 51, other. Gear groups are defined as follows:

- 31 = OTB_DEF_>=120_0_0_all
- 41 = GNS_DEF_120-219_0_0_all
- 51 = LLS_FIF_0_0_0_all
- Any other number combines the remaining métiers into one category.

Often there were not enough data for gear group 51, so if only 3 gear groups are shown, the third is an ‘other’ category.

These tables were used to give a rough indication if enough samples were available to run generate a catch-at-age using a Bayesian hierarchical model. This model is detailed in Hirst et al. (2004, 2005, 2012).

Histograms of the sampled catch for all length samples, length samples with age samples, and ages samples were generated from all métiers, first using all data, and then by quarter. This gave an idea of whether data from different fleets could (or should) be pooled. In the end, no data were pooled. The samples from the GNS, OTB_DEF, and LLS fleets were very different. There were very few samples from other métiers. Samples also showed large differences in length (or age) by quarter within a métier. This meant data were not borrowed between métiers or quarters for generating the CAA. Unsampled catches were uploaded to InterCatch for most fleets and quarters. Data were not re-uploaded for 2013 and 2014; there was no need to update this data (no changes were made to procedure).

The next pages detail by year (2002–2012) the following:

1. Table of length samples by métier, quarter, and area.
2. Table of age samples by métier, quarter, and area.
3. Histograms of length data, length for fish where age data were collected, and age data.
4. Simple map of location of the sampled data, by fleet and quarter.
5. Plots of length-age and weight-length, used for removing outliers in length, weight, and age data.

References

Hirst, D; Aanes, S; Storvik, G; Huseby, RB; Tvete, IF. 2004. Estimating catch at age from market sampling data by using a Bayesian hierarchical model. Applied Statistics 53: 1-14.

Hirst, D; Storvik, G; Aldrin, M; Aanes, S; Huseby, RB. 2005. Estimating catch-at-age by combining data from different sources. Canadian Journal of Fisheries and Aquatic Sciences 62 (6): 1377-1385.

Hirst, D; Storvik, G; Rognebakke, H; Aldrin, M; Aanes, S; Vølstad, JH. 2012. A Bayesian modelling framework for the estimation of catch-at-age of commercially harvested fish species. Canadian Journal of Fisheries and Aquatic Sciences 69: 2064-2076.

2002 length samples

Gear	Q '\' A	9	8
31	1	11653.8 0, 0, 0	25260508.1 6, 23, 2694
31	2	58690 0, 0, 0	2182051.5 2, 2, 337
31	3	54975 0, 0, 0	8427170.2 7, 30, 2643
31	4	12589 0, 0, 0	10802165 11, 33, 2963
41	1	34218.5 0, 0, 0	5124357.8 3, 47, 4432
41	2	15323 0, 0, 0	375386.6 0, 0, 0
41	3	37659 0, 0, 0	344782.3 0, 0, 0
41	4	31788.5 0, 0, 0	284234.2 0, 0, 0
51	1	20217.8 0, 0, 0	205597 0, 0, 0
51	2	26015.6 0, 0, 0	5204371.3 0, 0, 0
51	3	20477.2 0, 0, 0	440752.9 0, 0, 0
51	4	22912.5 0, 0, 0	1023585.3 1, 6, 60

Total catch= 60021482.1

Sampled catch=52819837.9(88)%

Sampled catch required for DB estimation=52819837.9(88)%

#Boats sampled= 30

#Serienr sampled= 141

#Fish sampled= 13129

2002 age samples

Gear	Q '\' A	9	8
31	1	11653.8 0, 0, 0	25260508.1 2, 2, 70
31	2	58690 0, 0, 0	2182051.5 2, 2, 47
31	3	54975 0, 0, 0	8427170.2 3, 3, 42
31	4	12589 0, 0, 0	10802165 5, 5, 90
41	1	34218.5 0, 0, 0	5124357.8 2, 2, 124
41	2	15323 0, 0, 0	375386.6 0, 0, 0
41	3	37659 0, 0, 0	344782.3 0, 0, 0
41	4	31788.5 0, 0, 0	284234.2 0, 0, 0
51	1	20217.8 0, 0, 0	205597 0, 0, 0
51	2	26015.6 0, 0, 0	5204371.3 0, 0, 0
51	3	20477.2 0, 0, 0	440752.9 0, 0, 0
51	4	22912.5 0, 0, 0	1023585.3 0, 0, 0

Total catch= 60021482.1

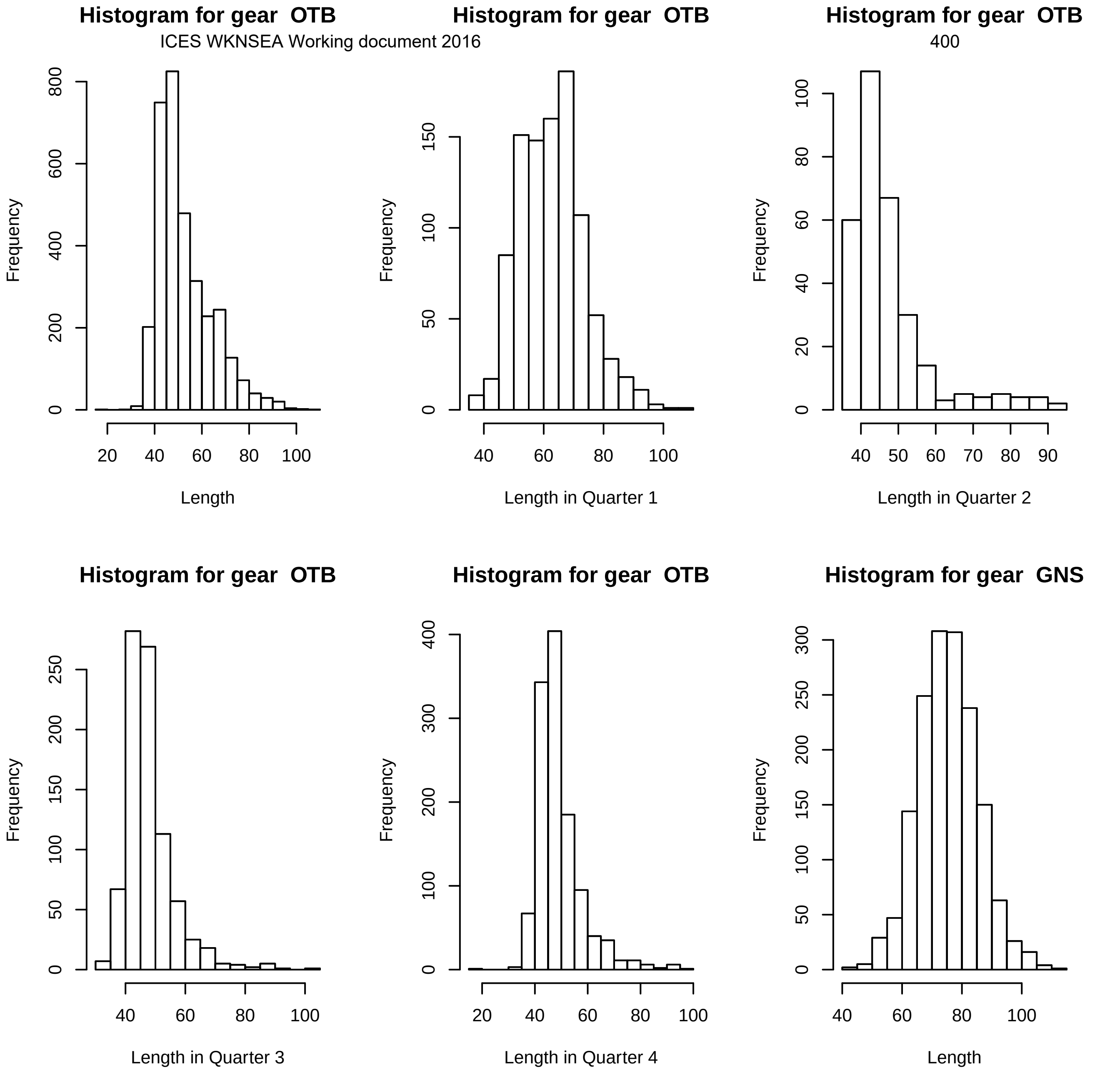
Sampled catch=51796252.6(86)%

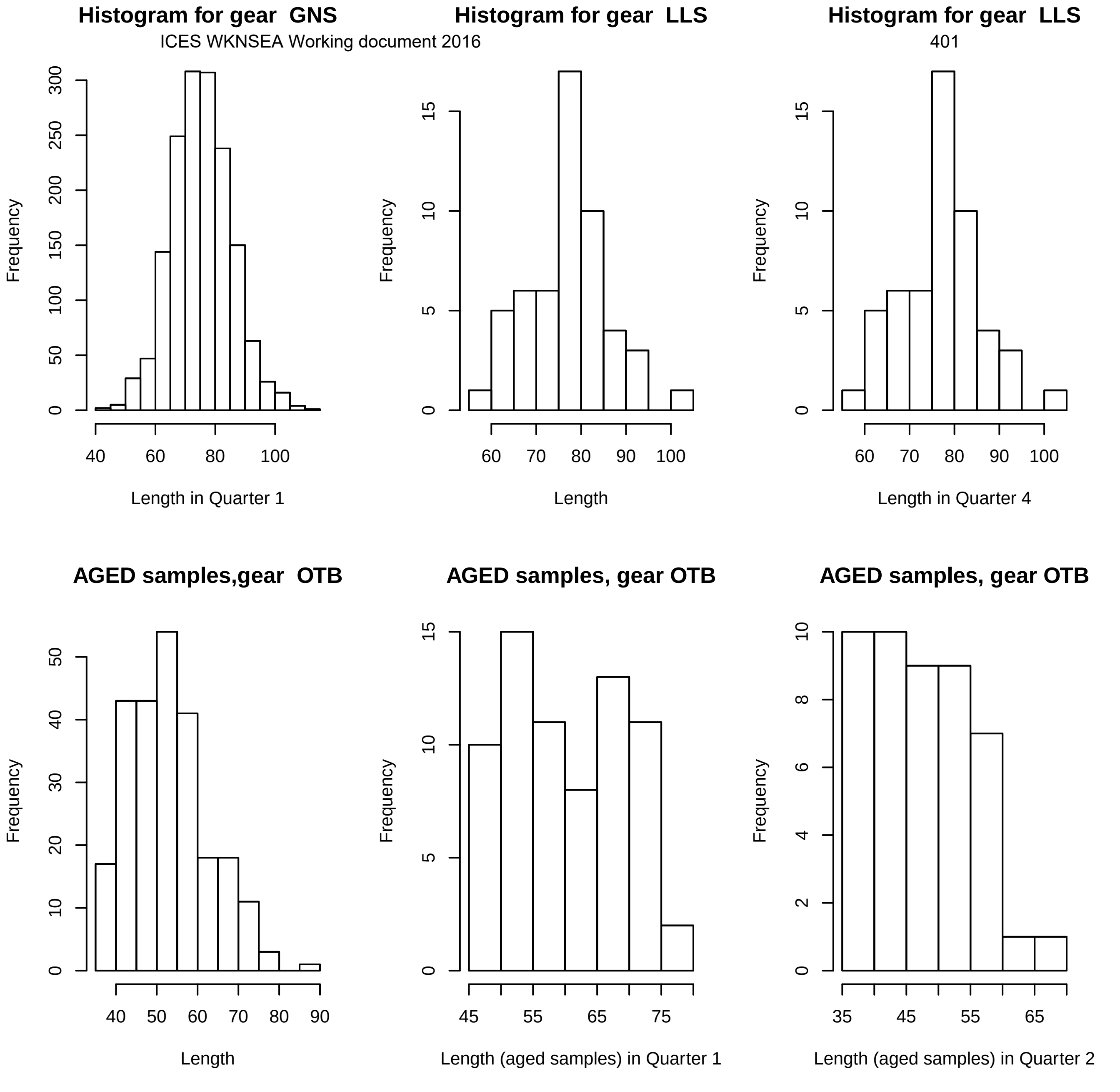
Sampled catch required for DB estimation=51796252.6(86)%

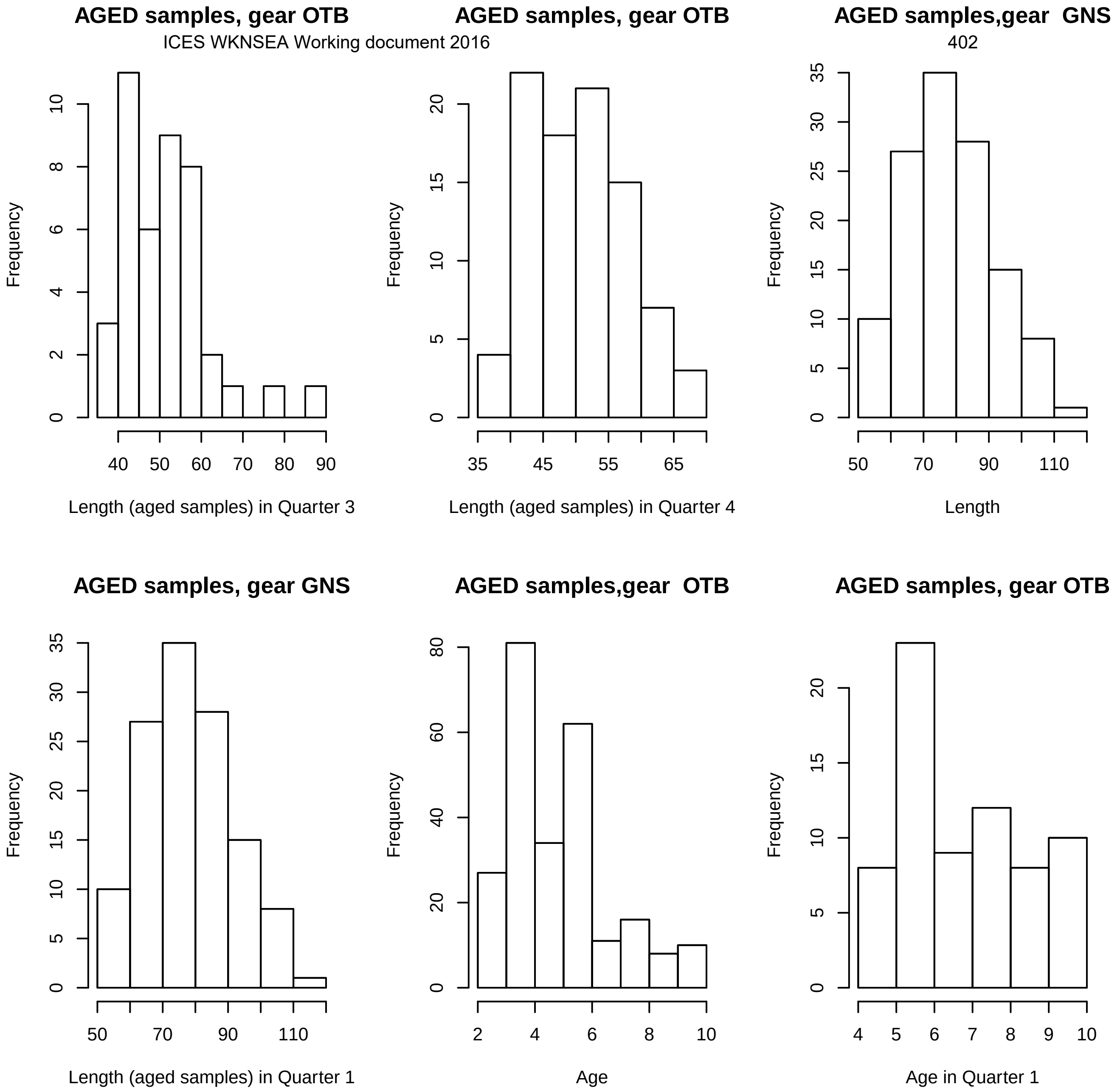
#Boats sampled= 14

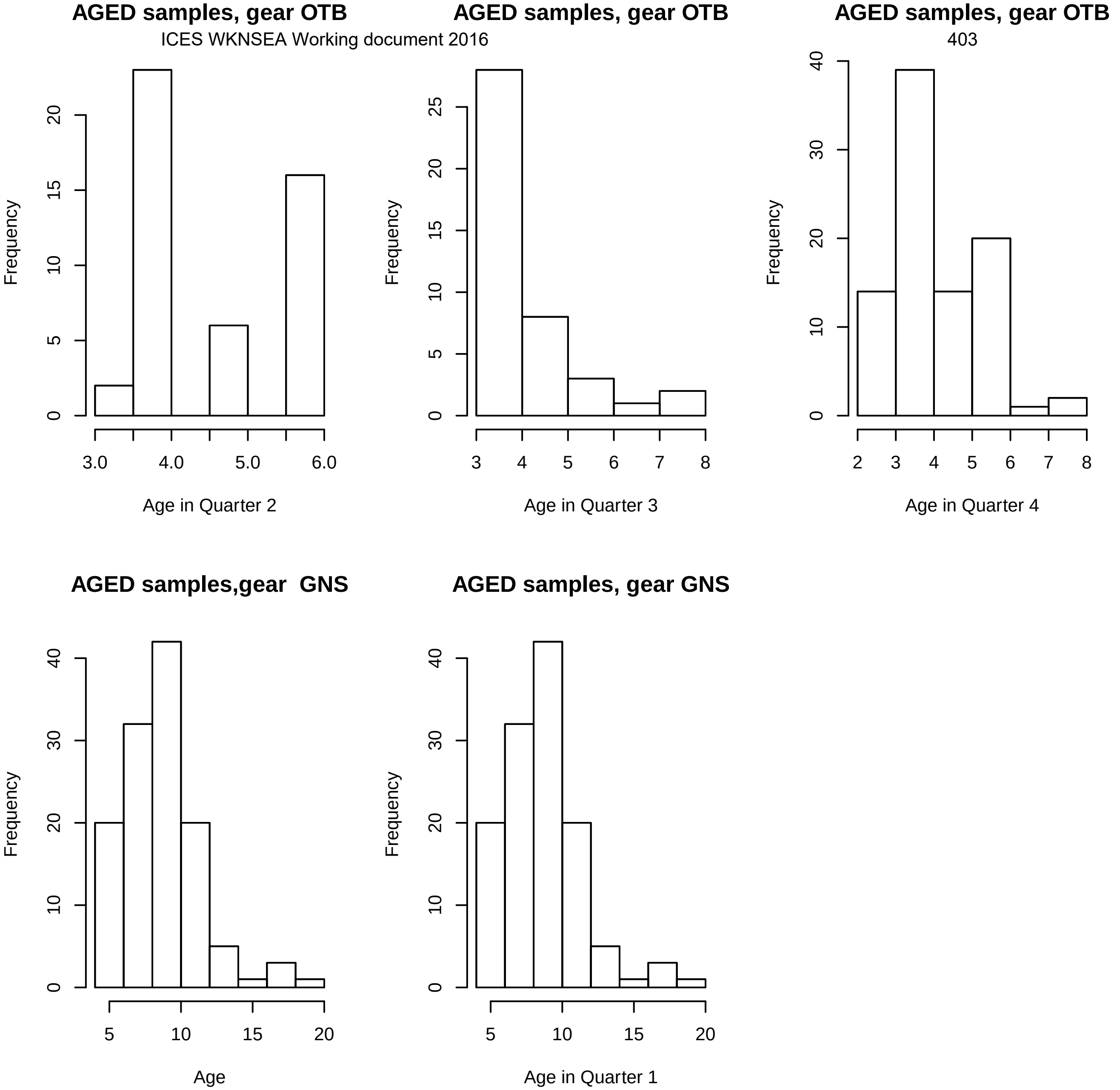
#Serienr sampled= 14

#Fish sampled= 373

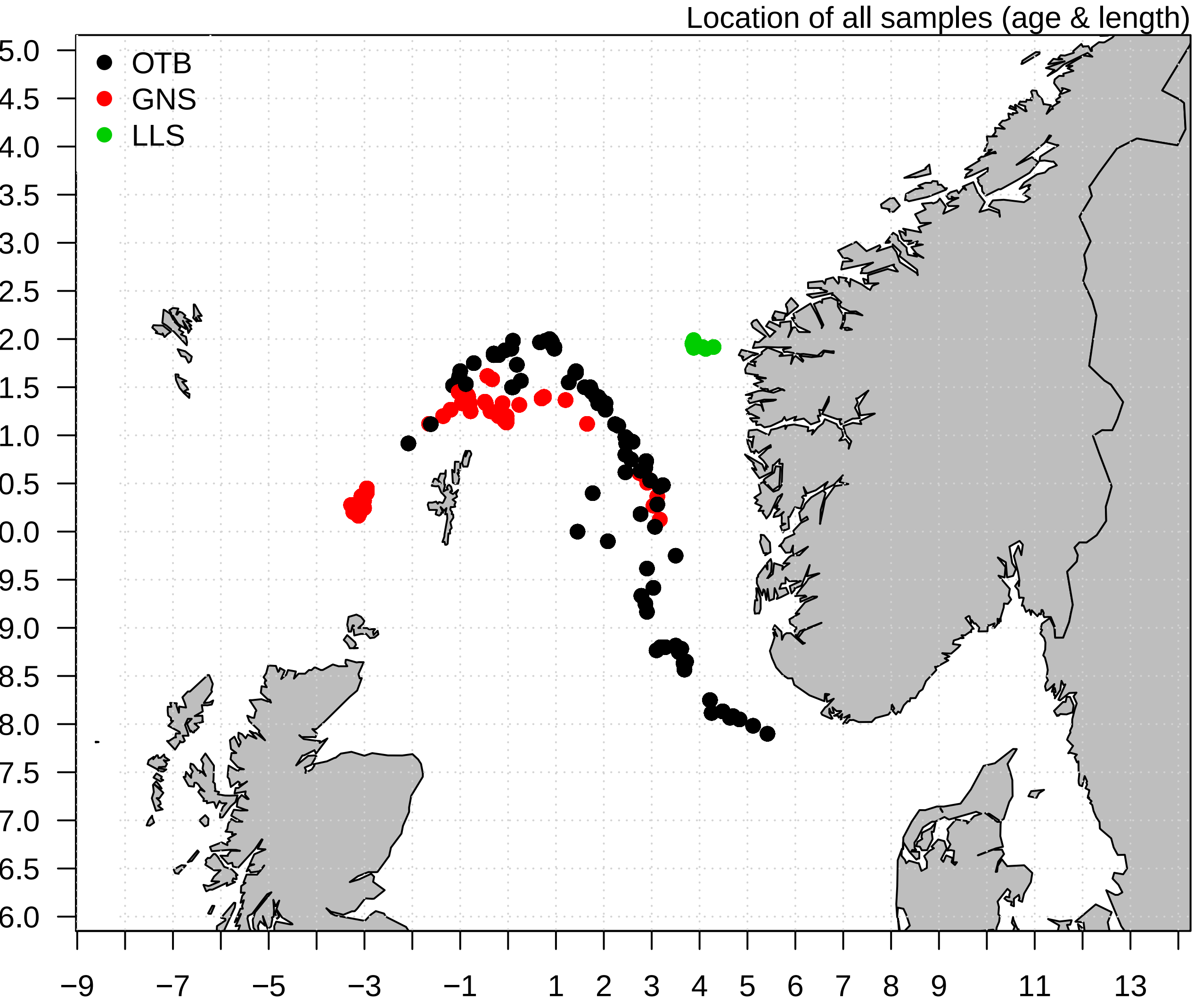

Histogram for gear OTB
Frequency
Length
Histogram for gear OTB
Frequency
Length in Quarter 1
Histogram for gear OTB
Frequency
Length in Quarter 2
Histogram for gear OTB
Frequency
Length in Quarter 3
Histogram for gear OTB
Frequency
Length in Quarter 4
Histogram for gear GNS
Frequency
Length

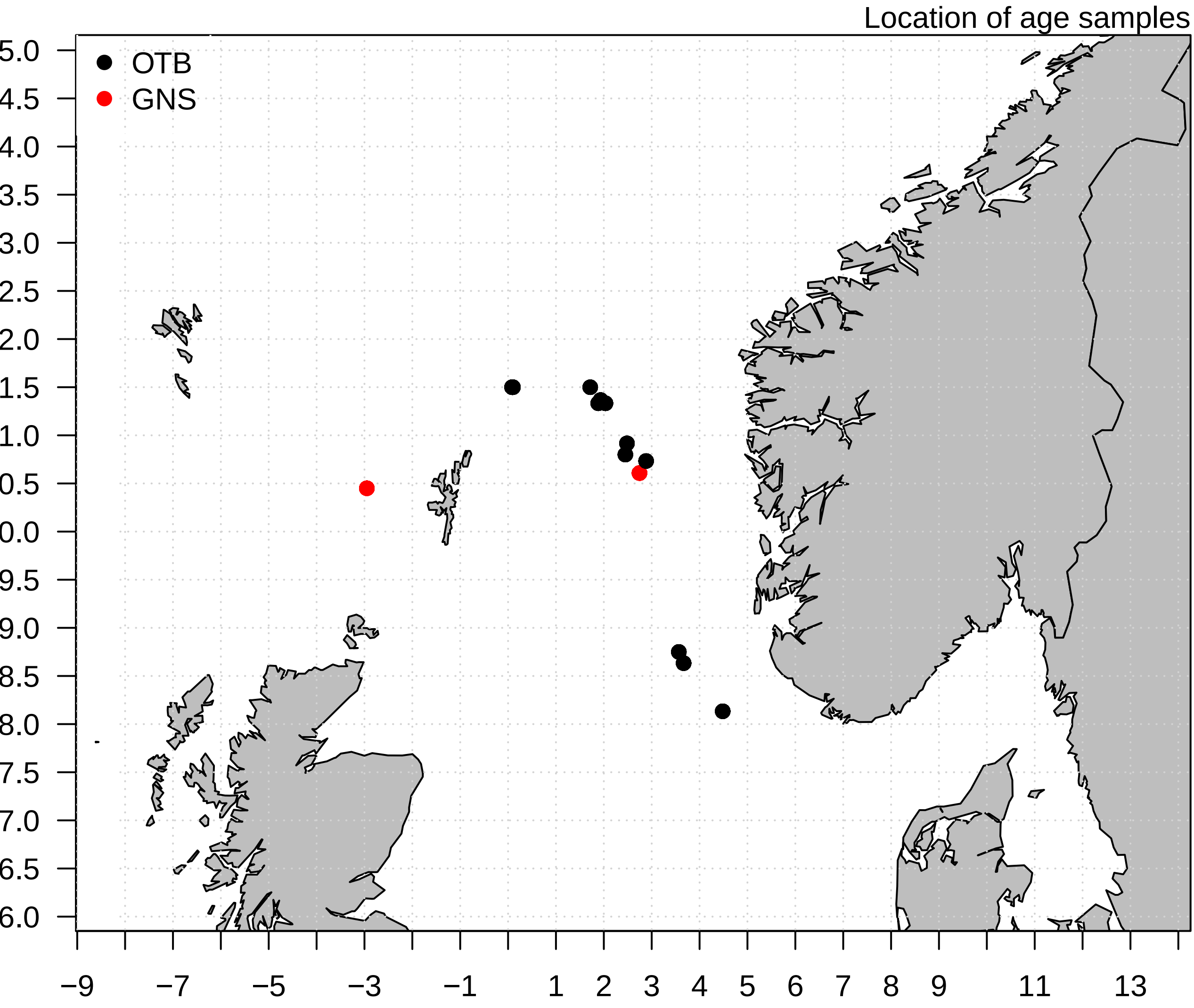

Histogram for gear GNS
Frequency
Length in Quarter 1
Histogram for gear LLS
Frequency
Length
Histogram for gear LLS
Frequency
Length in Quarter 4
AGED samples,gear OTB
Frequency
Length
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 1
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 2


AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 3
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 4
AGED samples,gear GNS
402
Frequency
Length
AGED samples, gear GNS
Frequency
Length (aged samples) in Quarter 1
AGED samples,gear OTB
Frequency
Age
AGED samples, gear OTB
Frequency
Age in Quarter 1

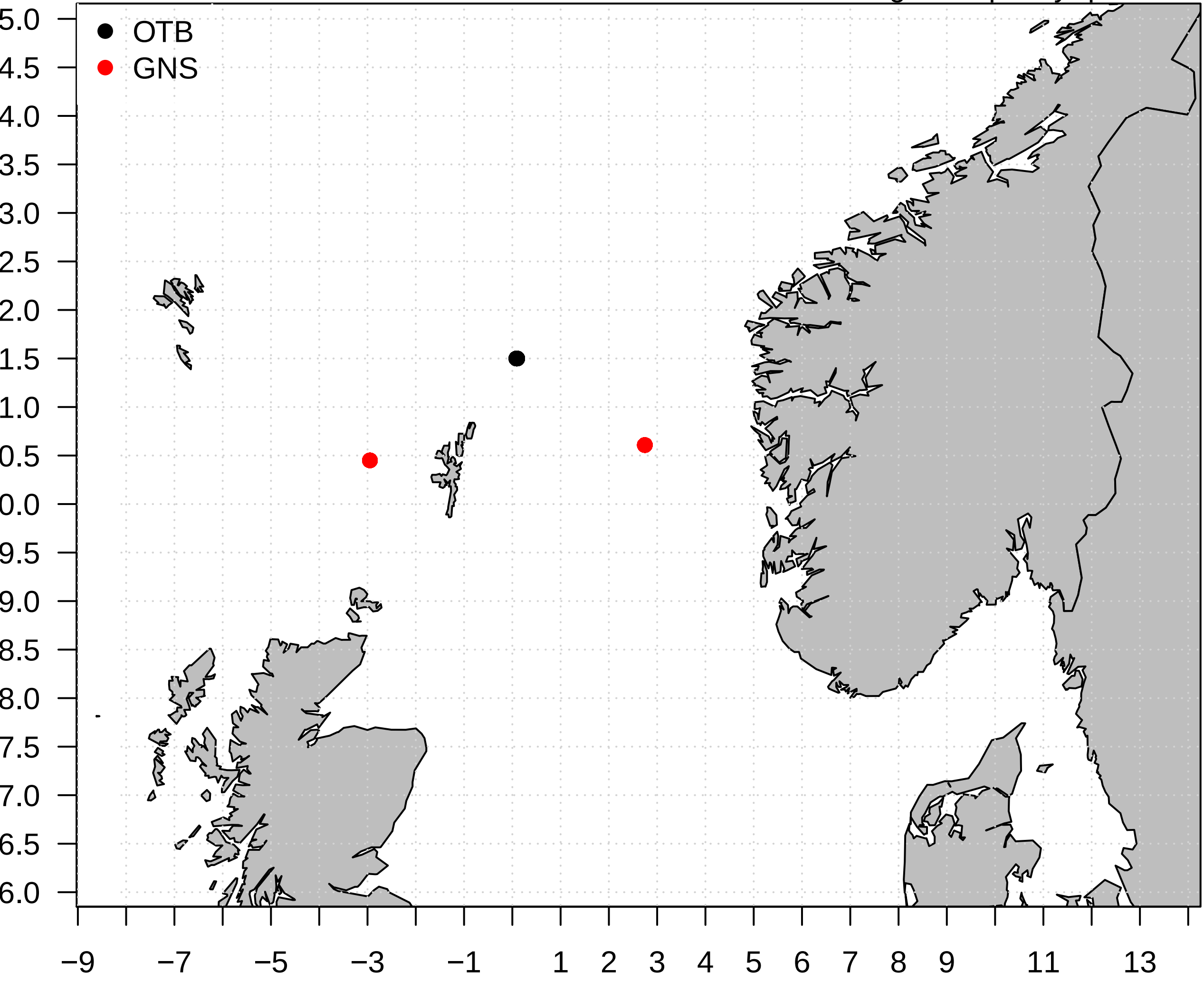

AGED samples, gear OTB
Frequency
Age in Quarter 2
AGED samples, gear OTB
Frequency
Age in Quarter 3
AGED samples, gear OTB
Frequency
Age in Quarter 4
AGED samples,gear GNS
Frequency
Age
AGED samples, gear GNS
Frequency
Age in Quarter 1

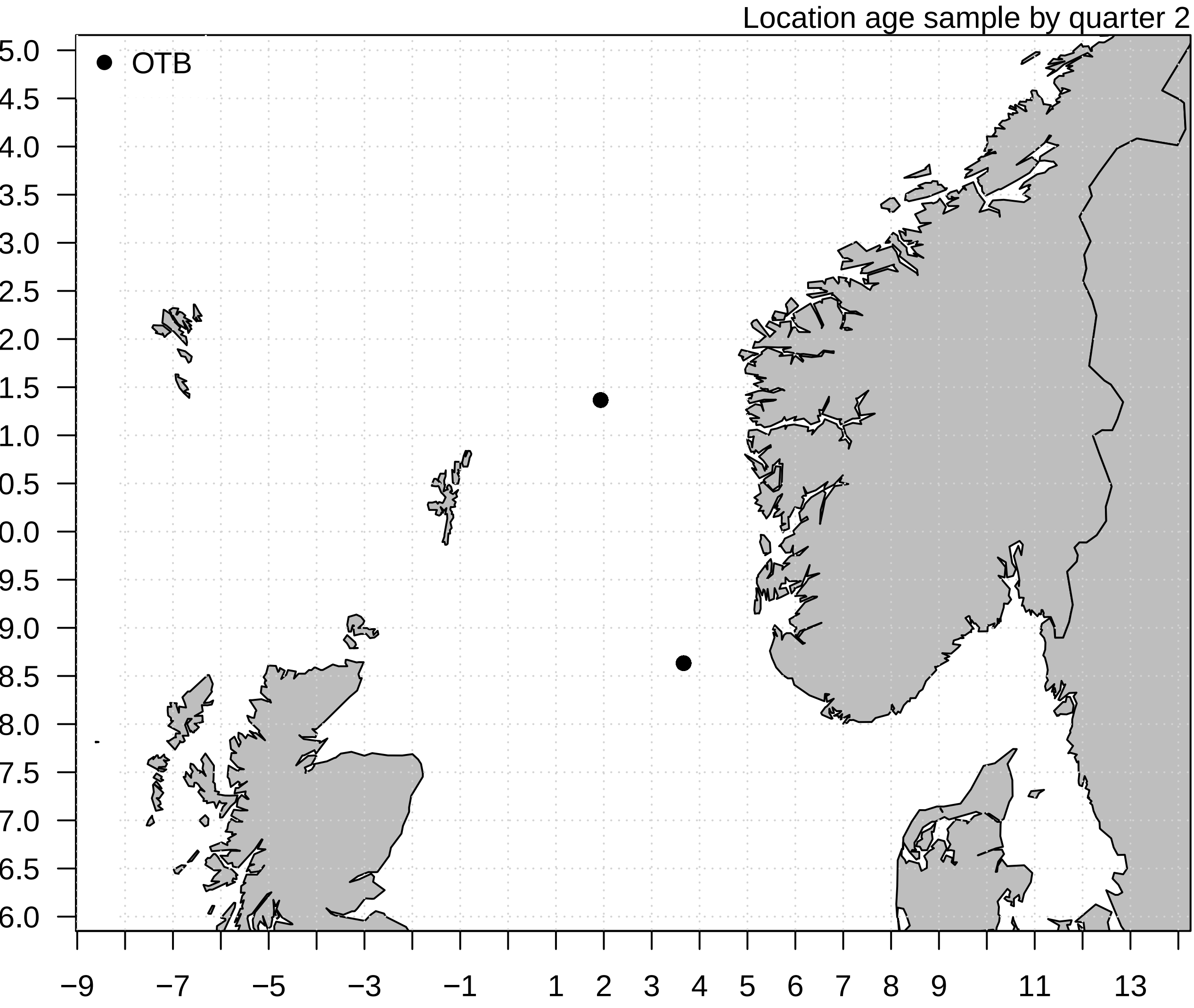
2002

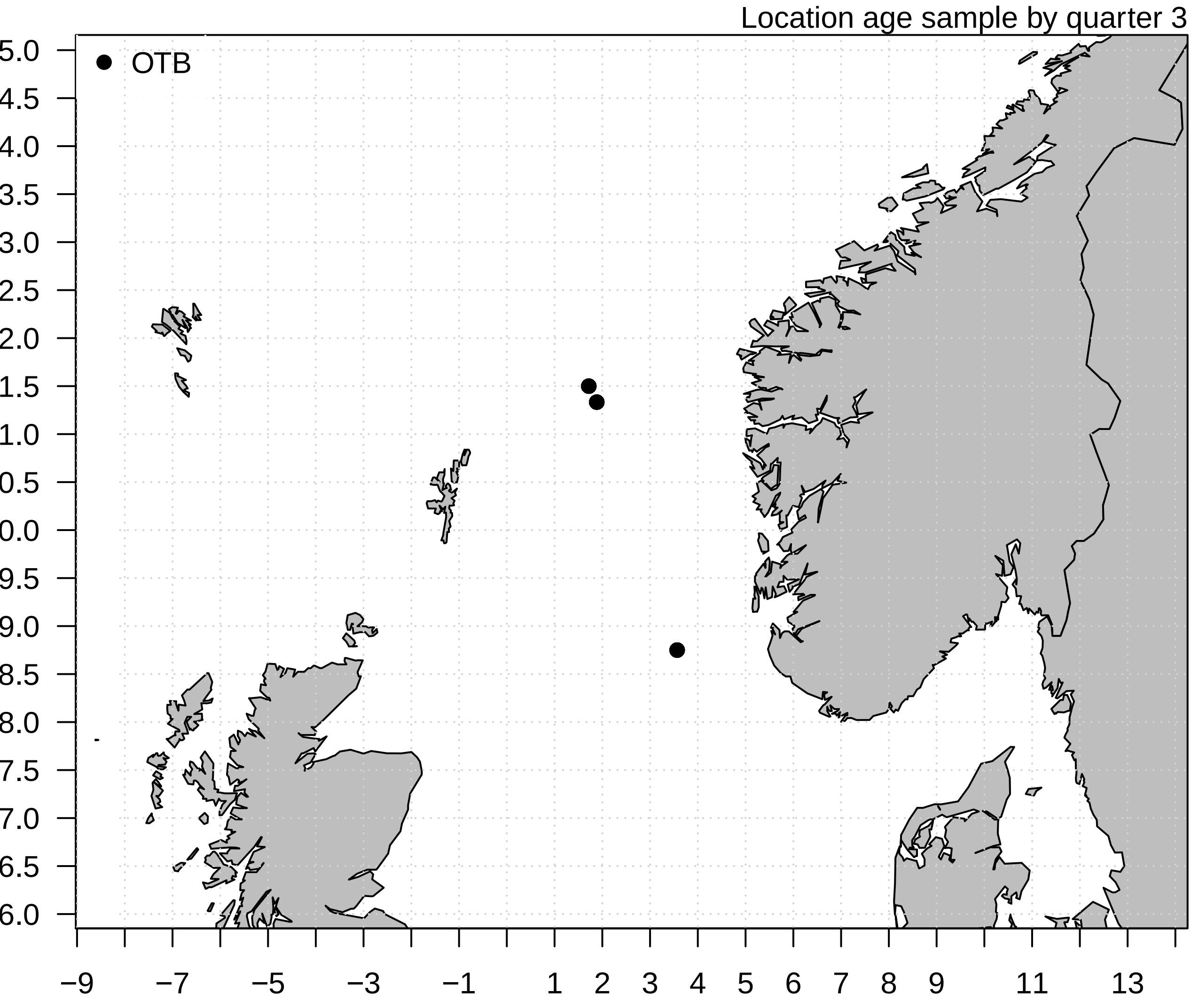

Location of all samples (age & length)
OTB
GNS
LLS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location of age samples
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

Location age sample by quarter 1




Location age sample by quarter 2
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 3
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
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3
4
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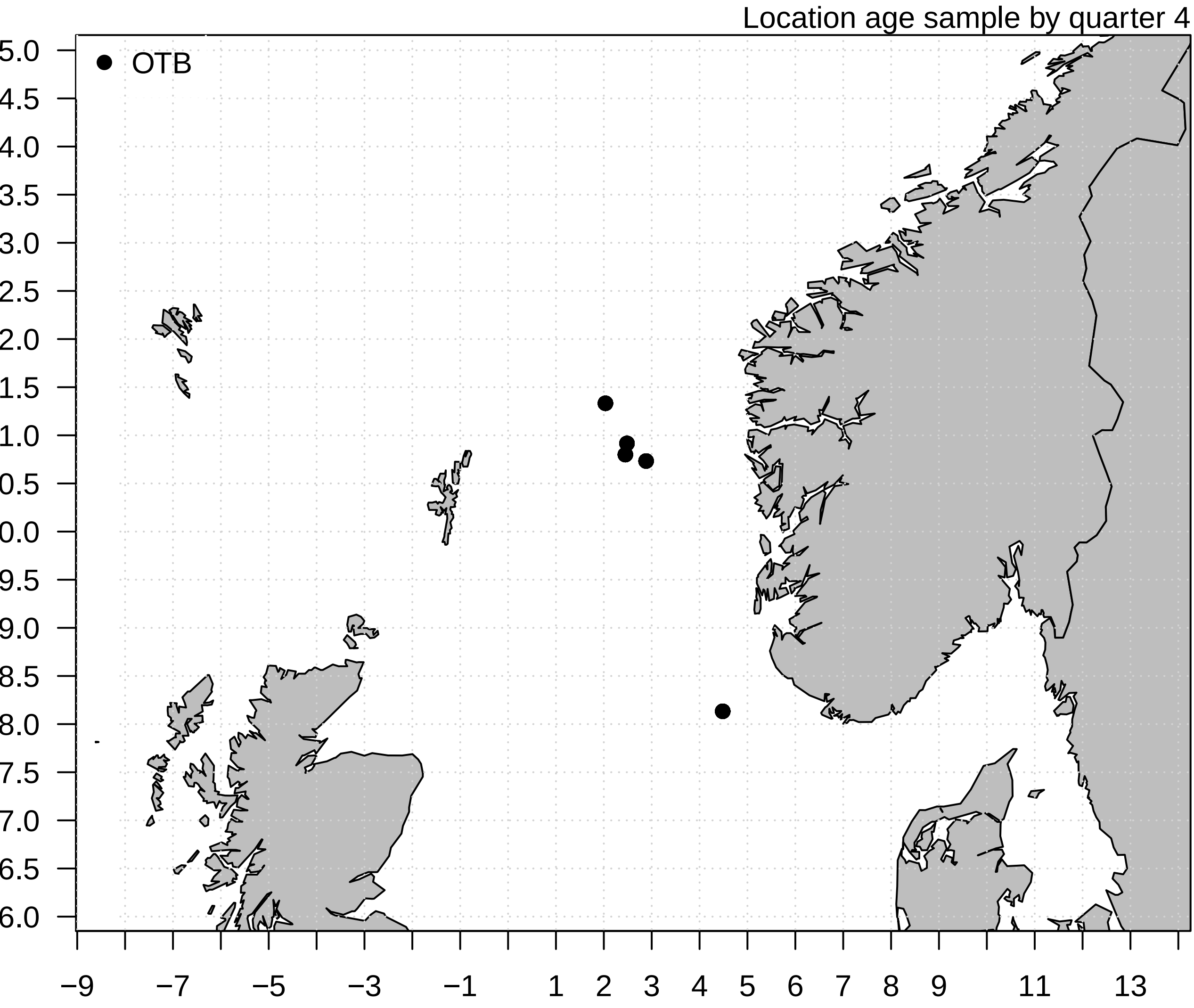
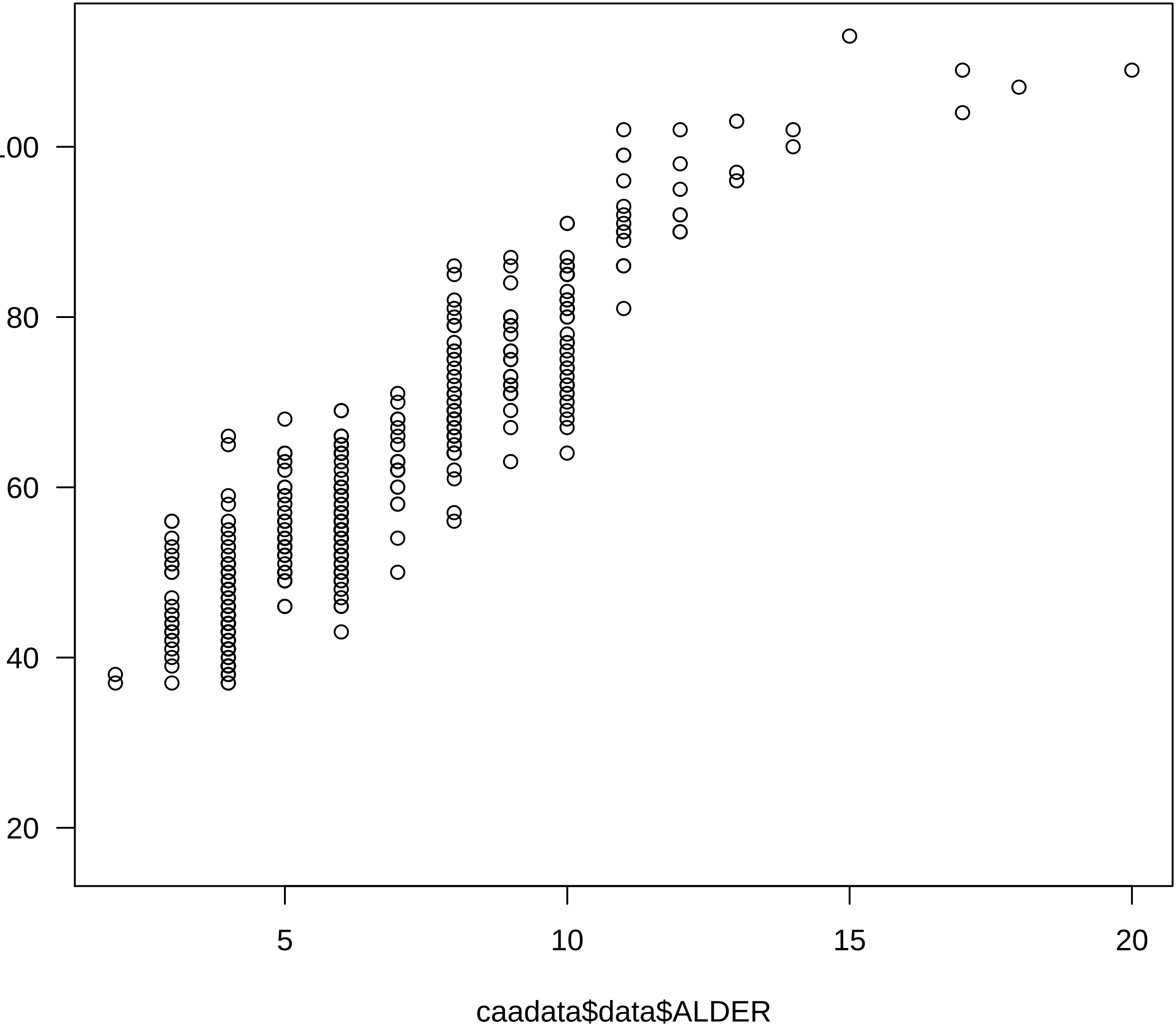
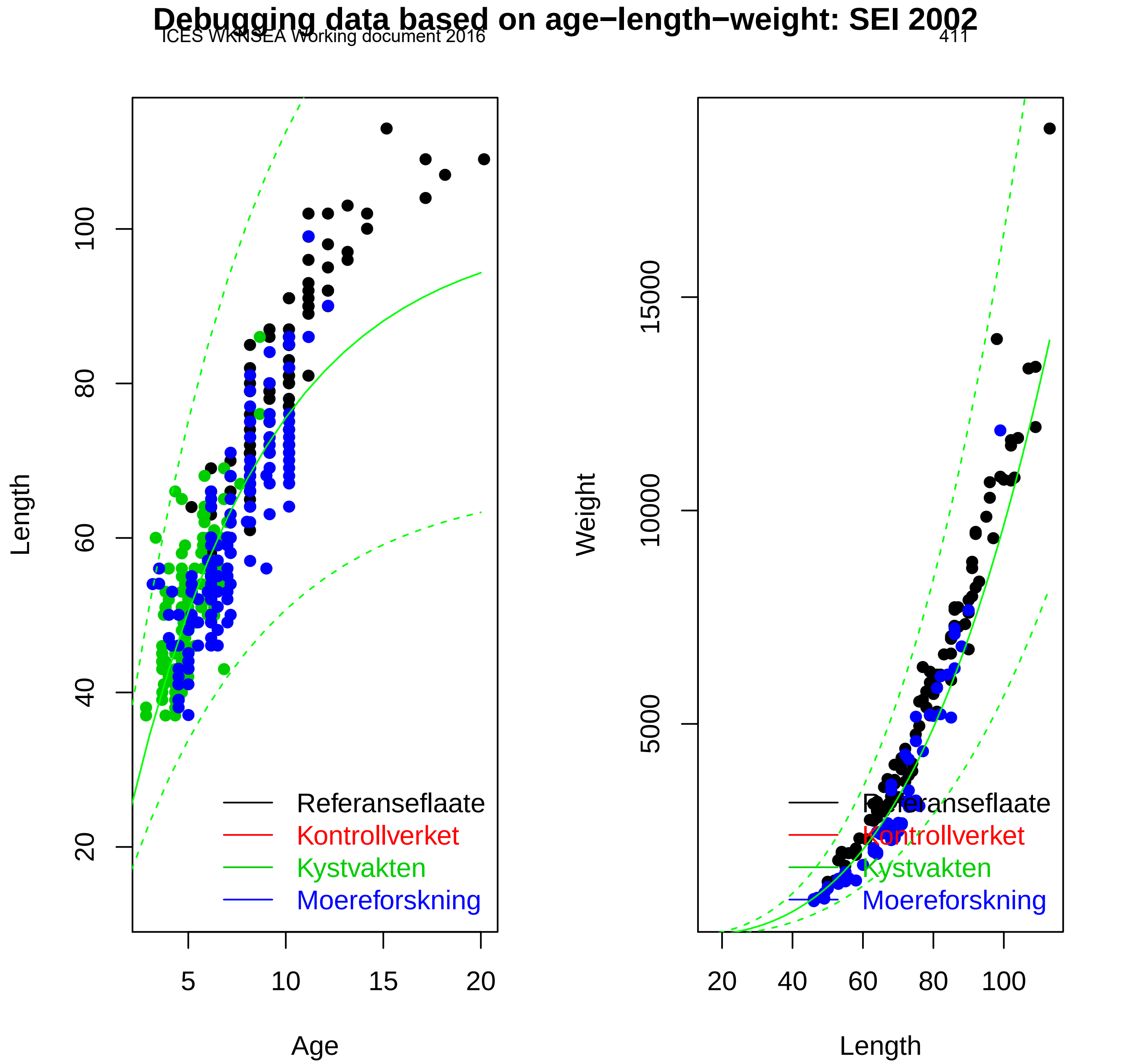
7
8
9
11
13


Location age sample by quarter 4
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13



100
80
60
40
20
5
10
15
20
caadata$data$ALDER


Debugging data based on age−length−weight: SEI 2002
Length
Age
Weight
Length
Referanseflaate
Kontrollverket
Kystvakten
Moereforskning
Referanseflaate
Kontrollverket
Kystvakten
Moereforskning

2003 length samples

Gear	Q '\' A	9	8
31	1	22062.1 0, 0, 0	32060850 9, 87, 5888
31	2	24283.3 0, 0, 0	4243219.3 5, 5, 555
31	3	2380 0, 0, 0	5085361.8 8, 20, 1701
31	4	89008 0, 0, 0	8395259.7 3, 4, 1440
41	1	35516.3 0, 0, 0	5826470.3 2, 45, 2639
41	2	14206.5 0, 0, 0	434389 1, 1, 18
41	3	32075.3 0, 0, 0	253787 0, 0, 0
41	4	45665.3 0, 0, 0	517410.5 0, 0, 0
51	1	859 0, 0, 0	230106.8 0, 0, 0
51	2	11973 0, 0, 0	61995.7 0, 0, 0
51	3	7749 0, 0, 0	168529.7 1, 18, 470
51	4	4132.2 0, 0, 0	94744.3 1, 3, 80
43	1	25626 0, 0, 0	706989.3 0, 0, 0
43	2	12436.6 0, 0, 0	2458683.9 0, 0, 0
43	3	7492.5 0, 0, 0	225983.5 1, 1, 11
43	4	30881.4 0, 0, 0	633385.3 3, 3, 24

Total catch= 61763512.6

Sampled catch=57168192.9(93)%

Sampled catch required for DB estimation=56507820.4(91)%

#Boats sampled= 34

#Serienr sampled= 187

#Fish sampled= 12826

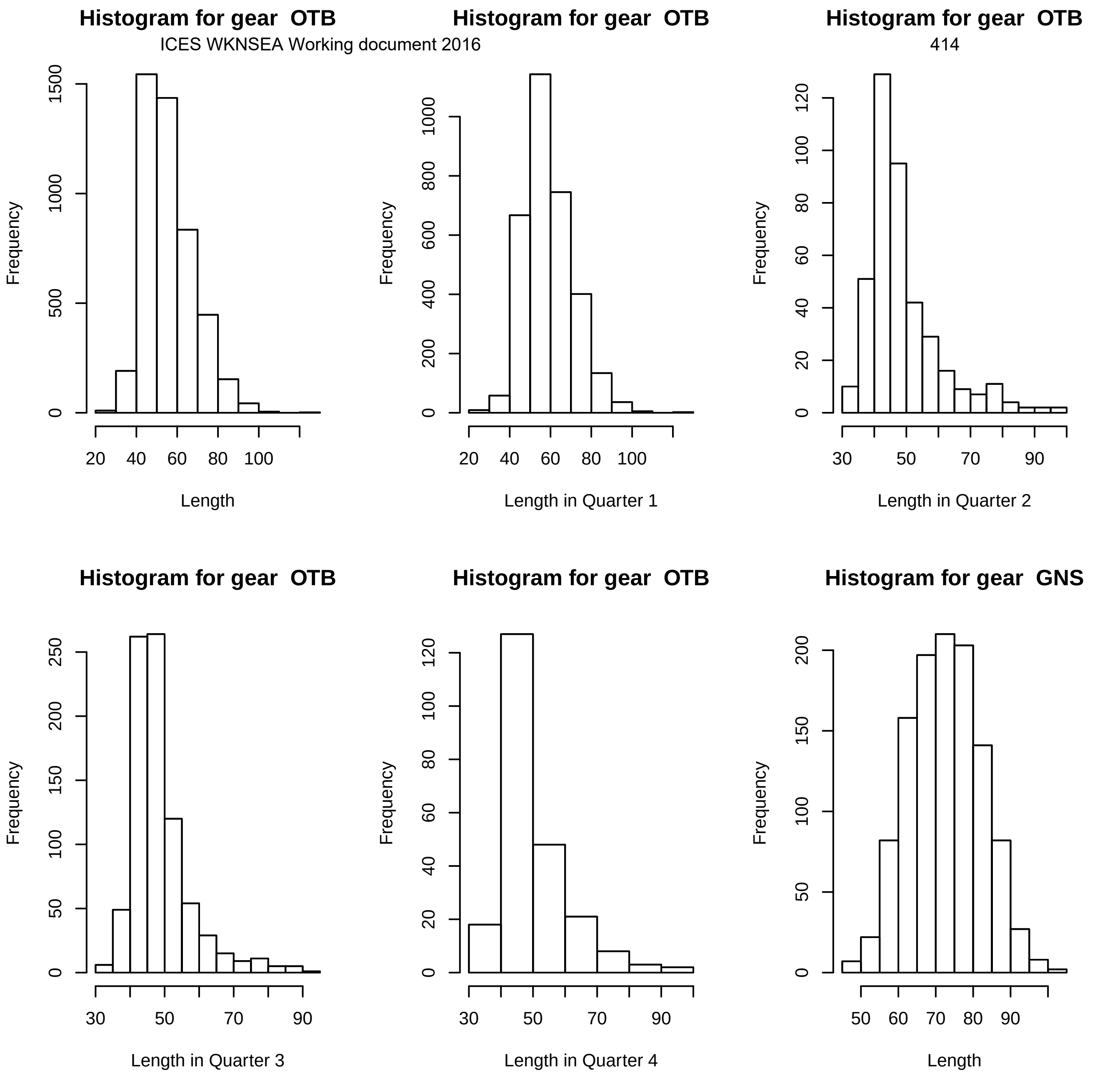
2003 age samples

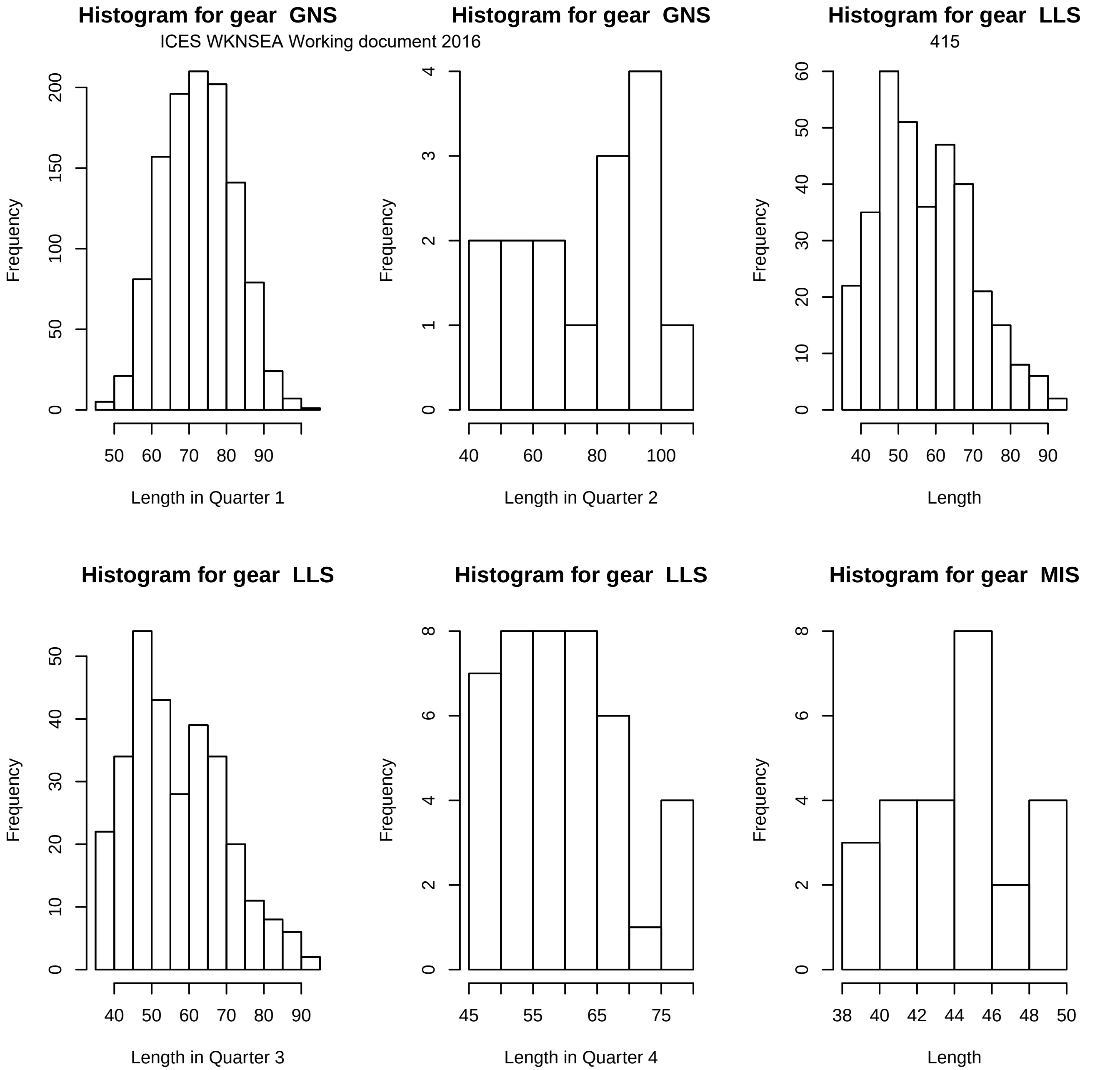
Gear	Q '\' A	9	8
31	1	22062.1 0, 0, 0	32060850 4, 20, 754
31	2	24283.3 0, 0, 0	4243219.3 3, 3, 50
31	3	2380 0, 0, 0	5085361.8 4, 4, 73
31	4	89008 0, 0, 0	8395259.7 1, 1, 14
41	1	35516.3 0, 0, 0	5826470.3 0, 0, 0
41	2	14206.5 0, 0, 0	434389 0, 0, 0
41	3	32075.3 0, 0, 0	253787 0, 0, 0
41	4	45665.3 0, 0, 0	517410.5 0, 0, 0
51	1	859 0, 0, 0	230106.8 0, 0, 0
51	2	11973 0, 0, 0	61995.7 0, 0, 0
51	3	7749 0, 0, 0	168529.7 0, 0, 0
51	4	4132.2 0, 0, 0	94744.3 0, 0, 0
43	1	25626 0, 0, 0	706989.3 0, 0, 0
43	2	12436.6 0, 0, 0	2458683.9 0, 0, 0
43	3	7492.5 0, 0, 0	225983.5 0, 0, 0
43	4	30881.4 0, 0, 0	633385.3 0, 0, 0

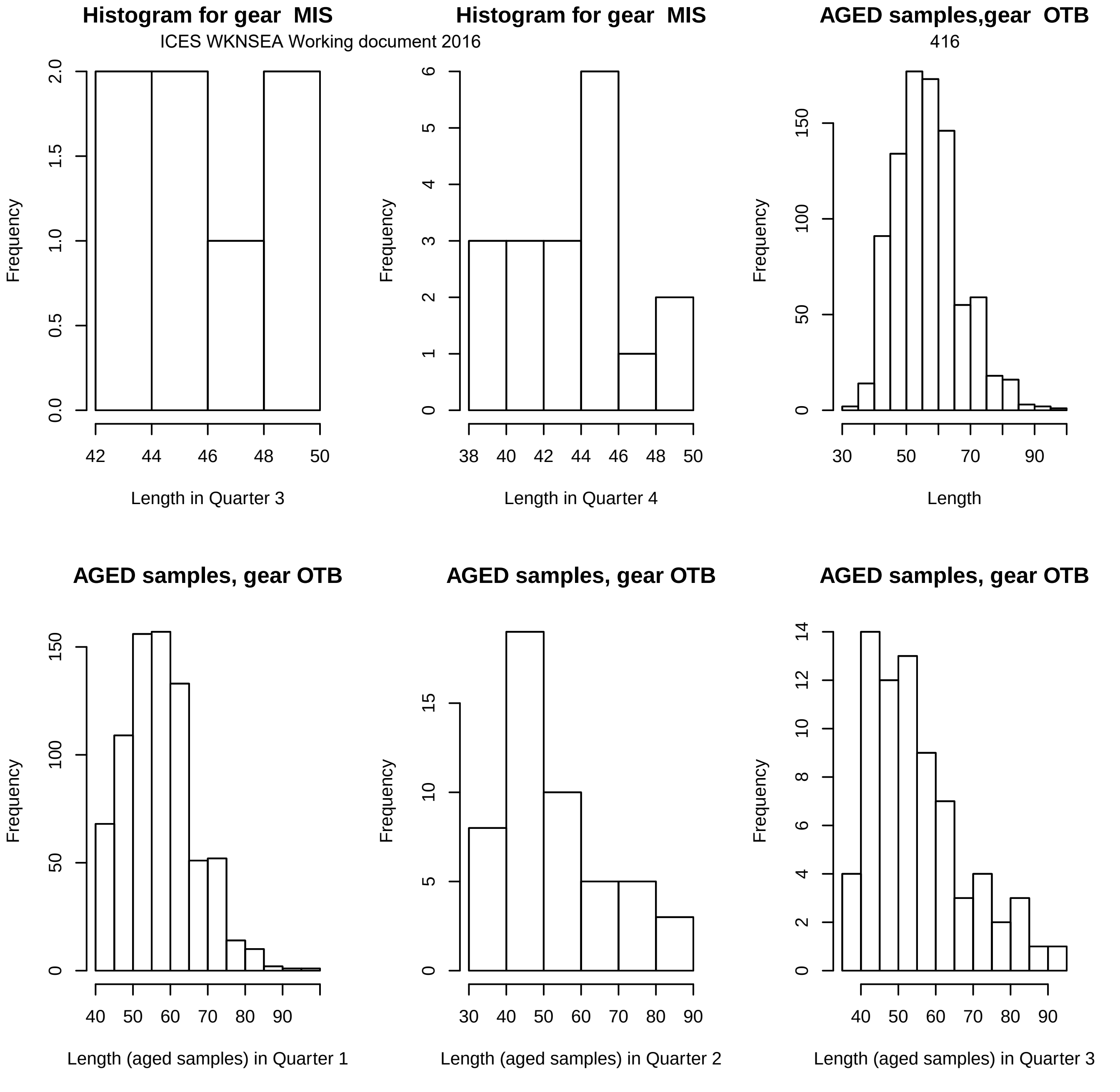
Total catch= 61763512.6 #Boats sampled= 12

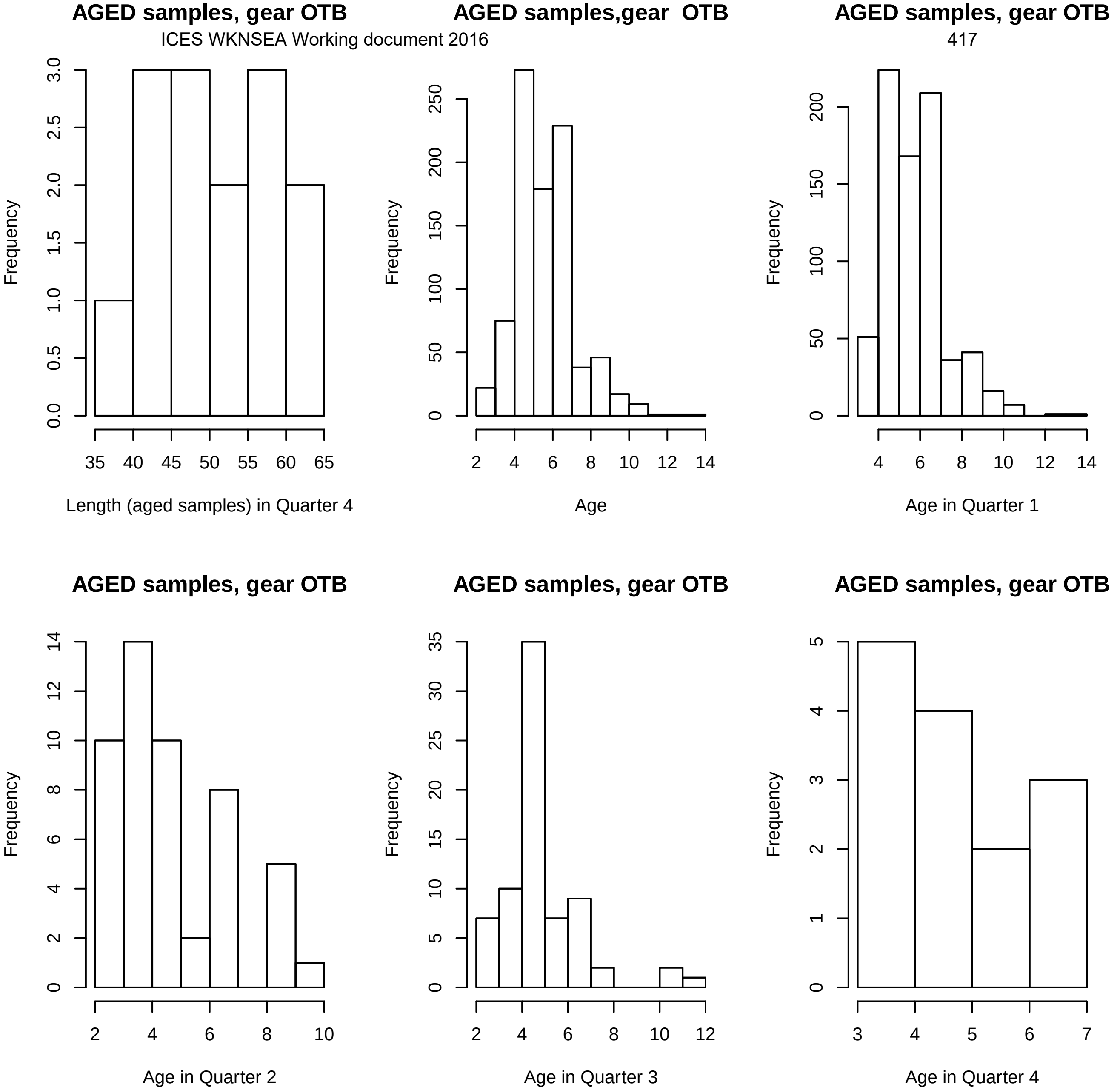
Sampled catch=49784690.8(81)% #Serienr sampled= 28

Sampled catch required for DB estimation=41389431.1(67)% #Fish sampled= 891

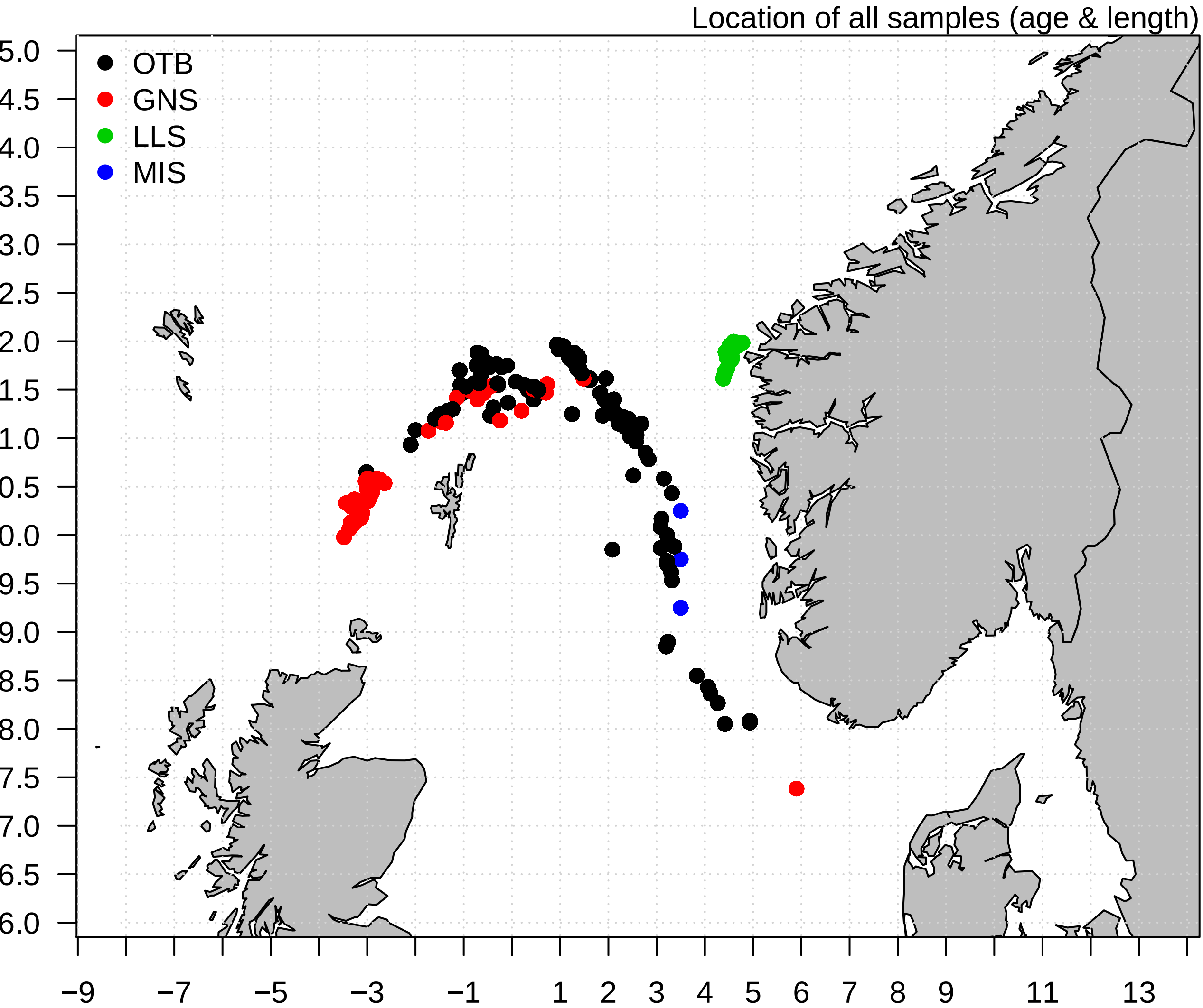

Histogram for gear OTB
Frequency
Length
Histogram for gear OTB
Frequency
Length in Quarter 1
Histogram for gear OTB
Frequency
Length in Quarter 2
Histogram for gear OTB
Frequency
Length in Quarter 3
Histogram for gear OTB
Frequency
Length in Quarter 4
Histogram for gear GNS
Frequency
Length


Histogram for gear GNS
Length in Quarter 1
Frequency
Histogram for gear GNS
Length in Quarter 2
Frequency
Histogram for gear LLS
Length
Frequency
Histogram for gear LLS
Length in Quarter 3
Frequency
Histogram for gear LLS
Length in Quarter 4
Frequency
Histogram for gear MIS
Length
Frequency


Histogram for gear MIS
Frequency
Length in Quarter 3
Histogram for gear MIS
Frequency
Length in Quarter 4
AGED samples,gear OTB
416
Frequency
Length
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 1
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 2
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 3


AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 4
AGED samples,gear OTB
Frequency
Age
AGED samples, gear OTB
Frequency
Age in Quarter 1
AGED samples, gear OTB
Frequency
Age in Quarter 2
AGED samples, gear OTB
Frequency
Age in Quarter 3
AGED samples, gear OTB
Frequency
Age in Quarter 4

2003


Location of all samples (age & length)
OTB
GNS
LLS
MIS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
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4
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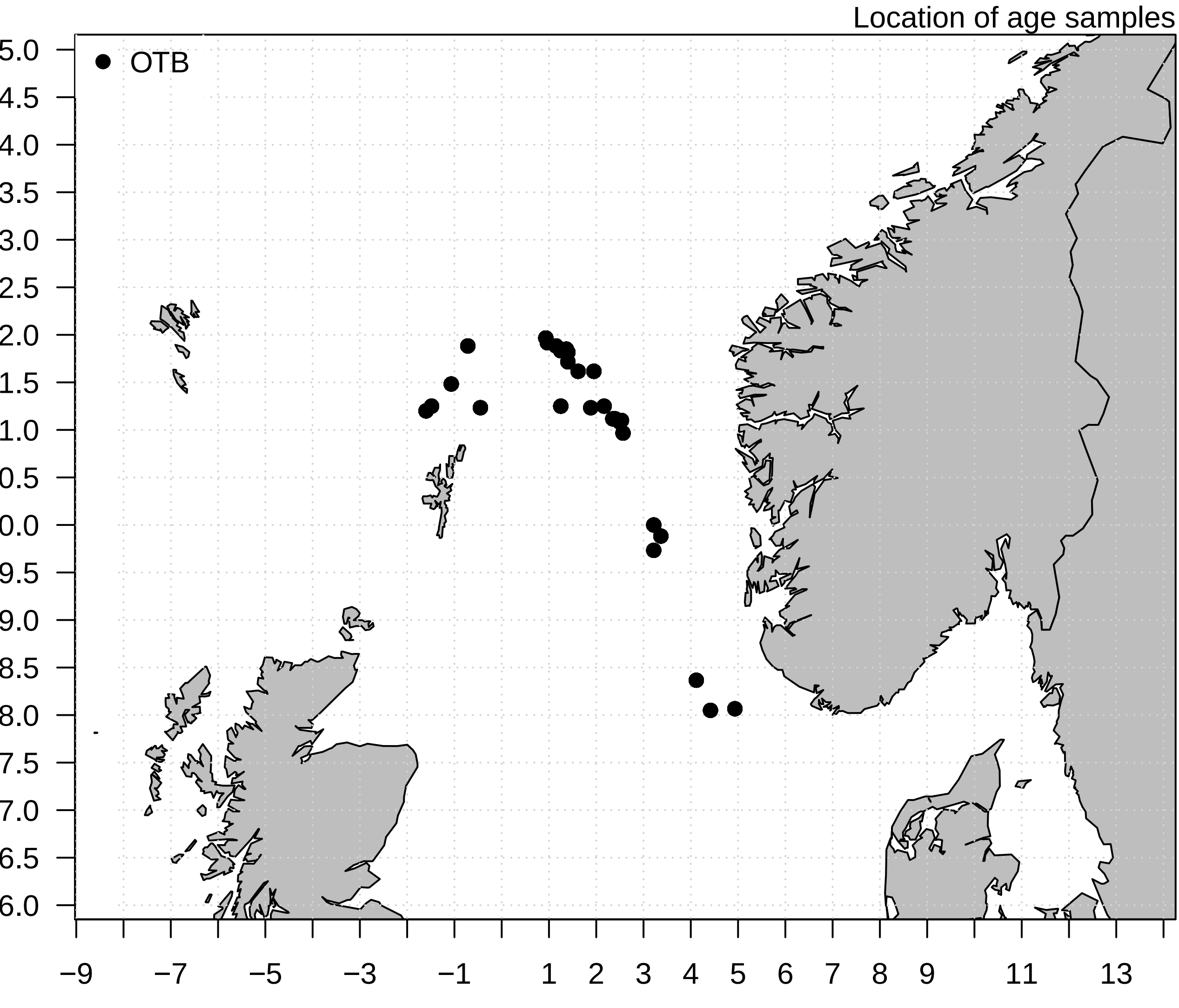
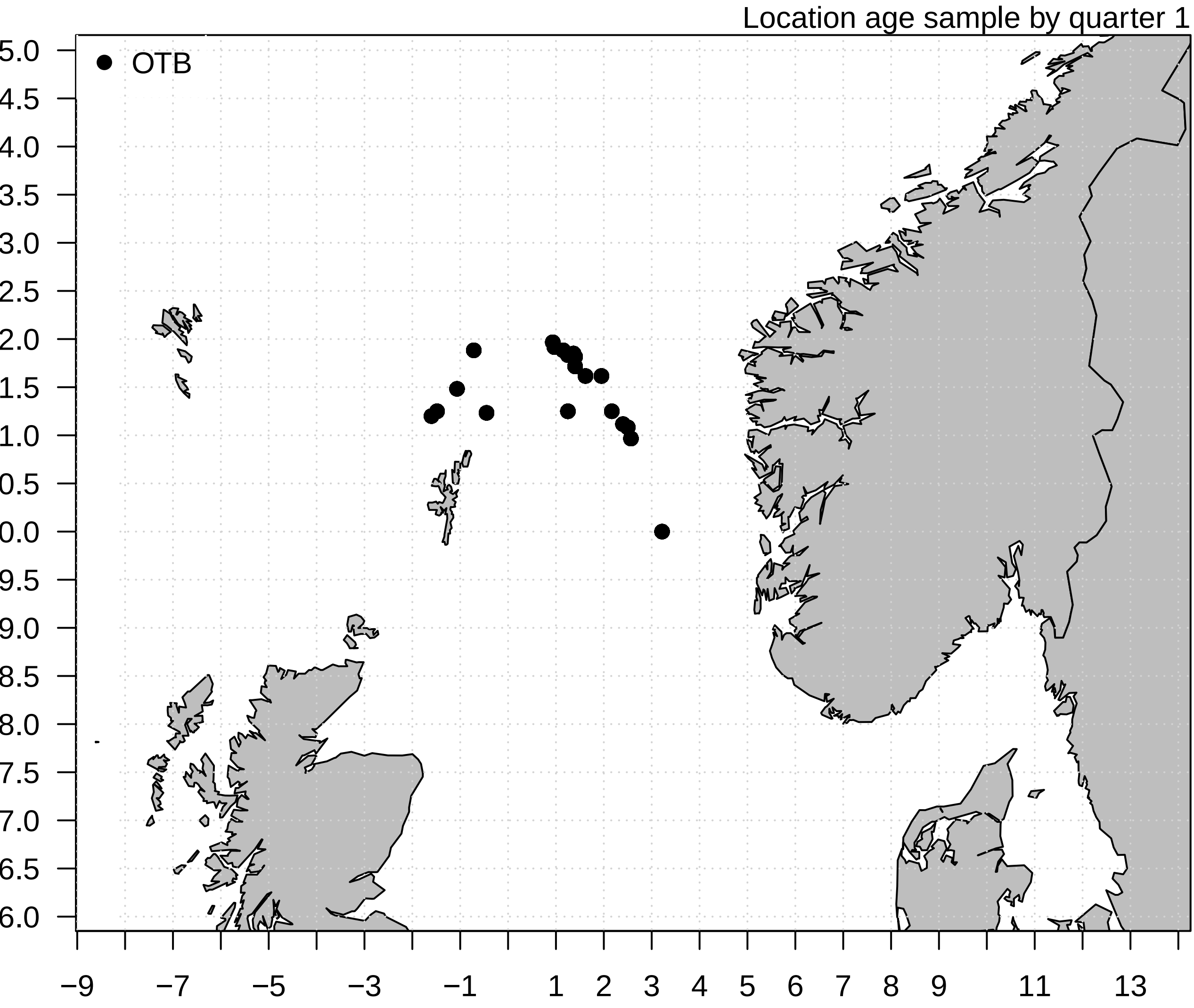
6
7
8
9
11
13


Location of age samples
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9 −7 −5 −3 −1 1 2 3 4 5 6 7 8 9 11 13


Location age sample by quarter 1
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
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4
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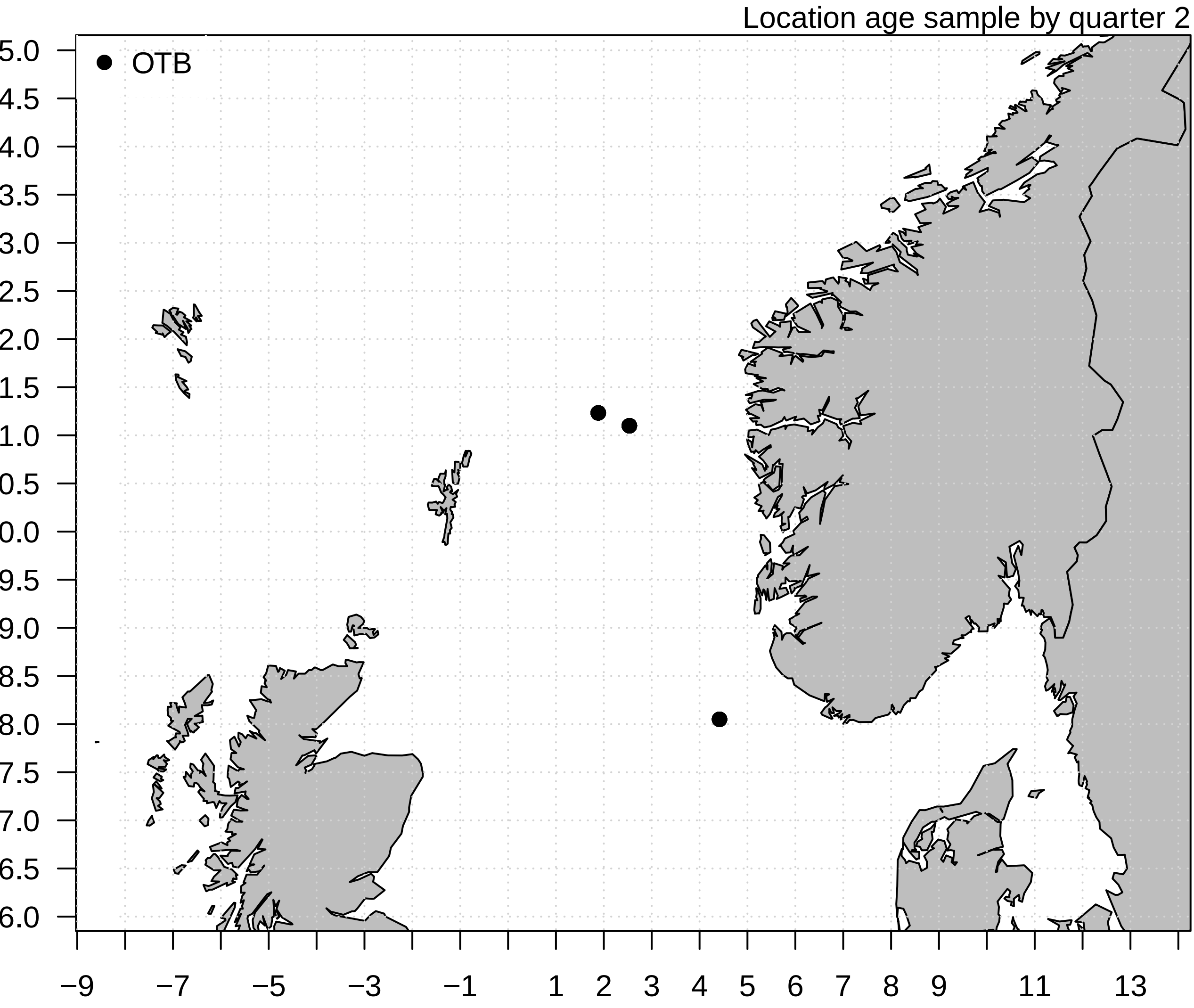
7
8
9
11
13


Location age sample by quarter 2
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
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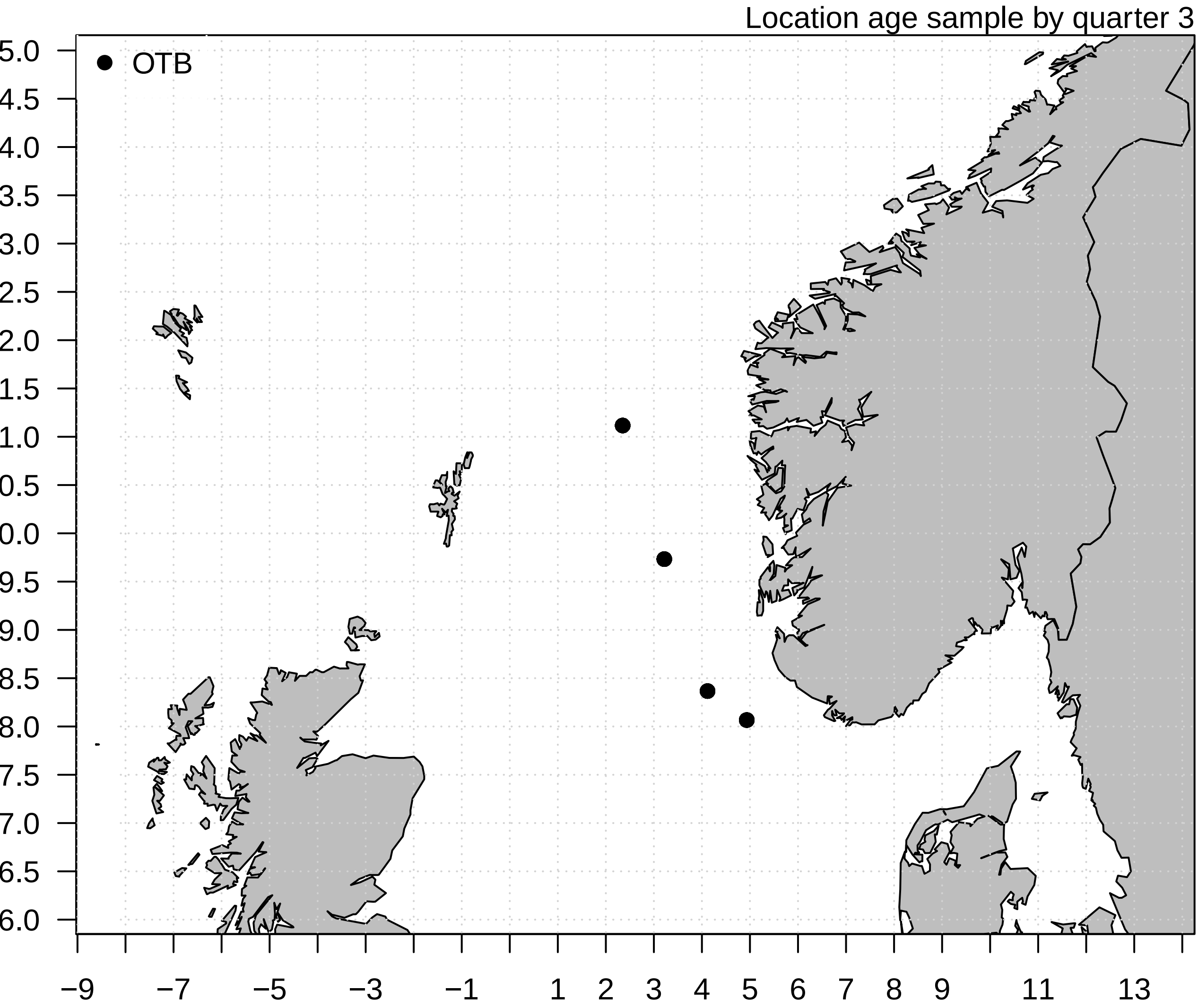
7
8
9
11
13


Location age sample by quarter 3
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
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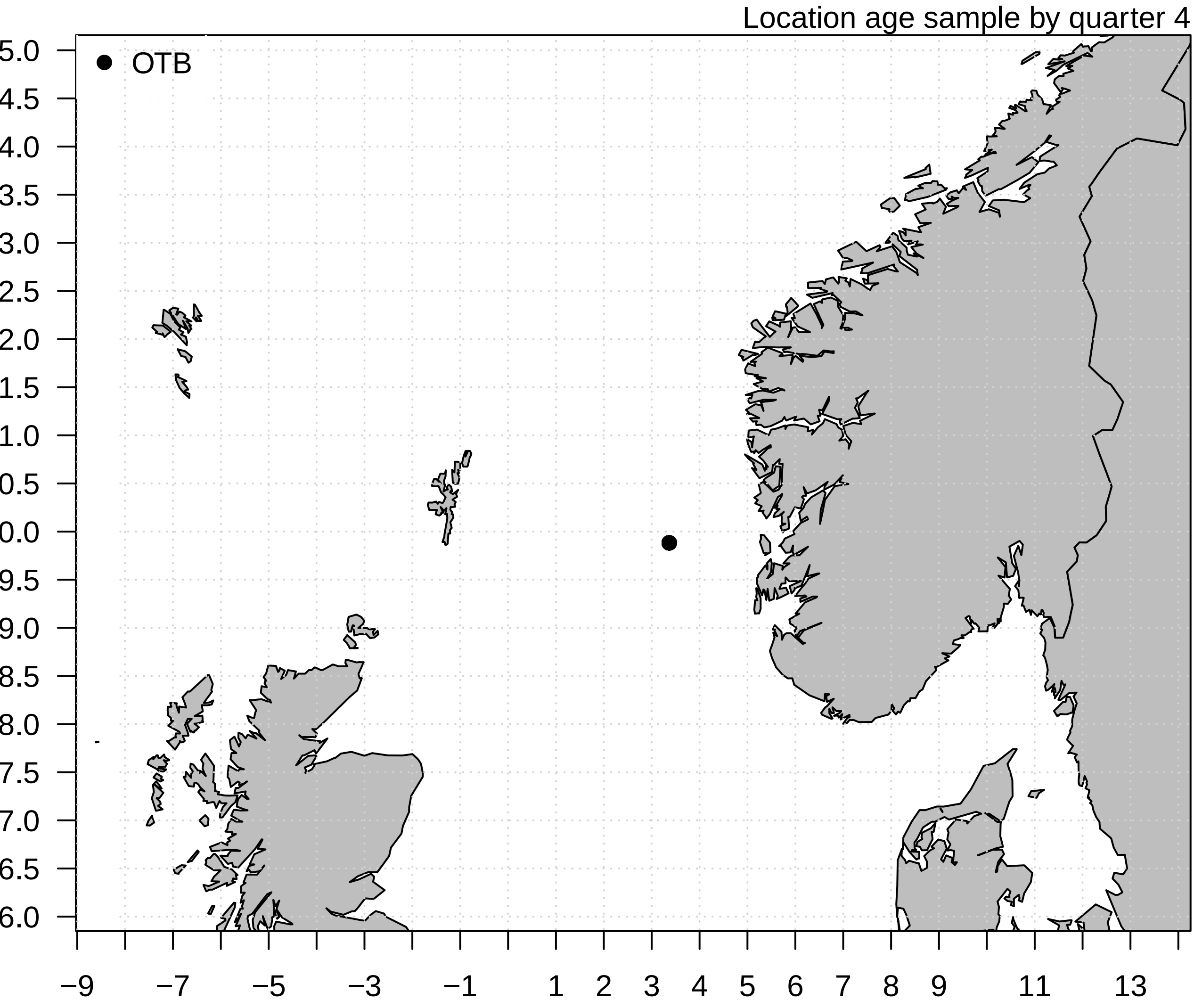
4
5
6
7
8
9
11
13


Location age sample by quarter 4
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
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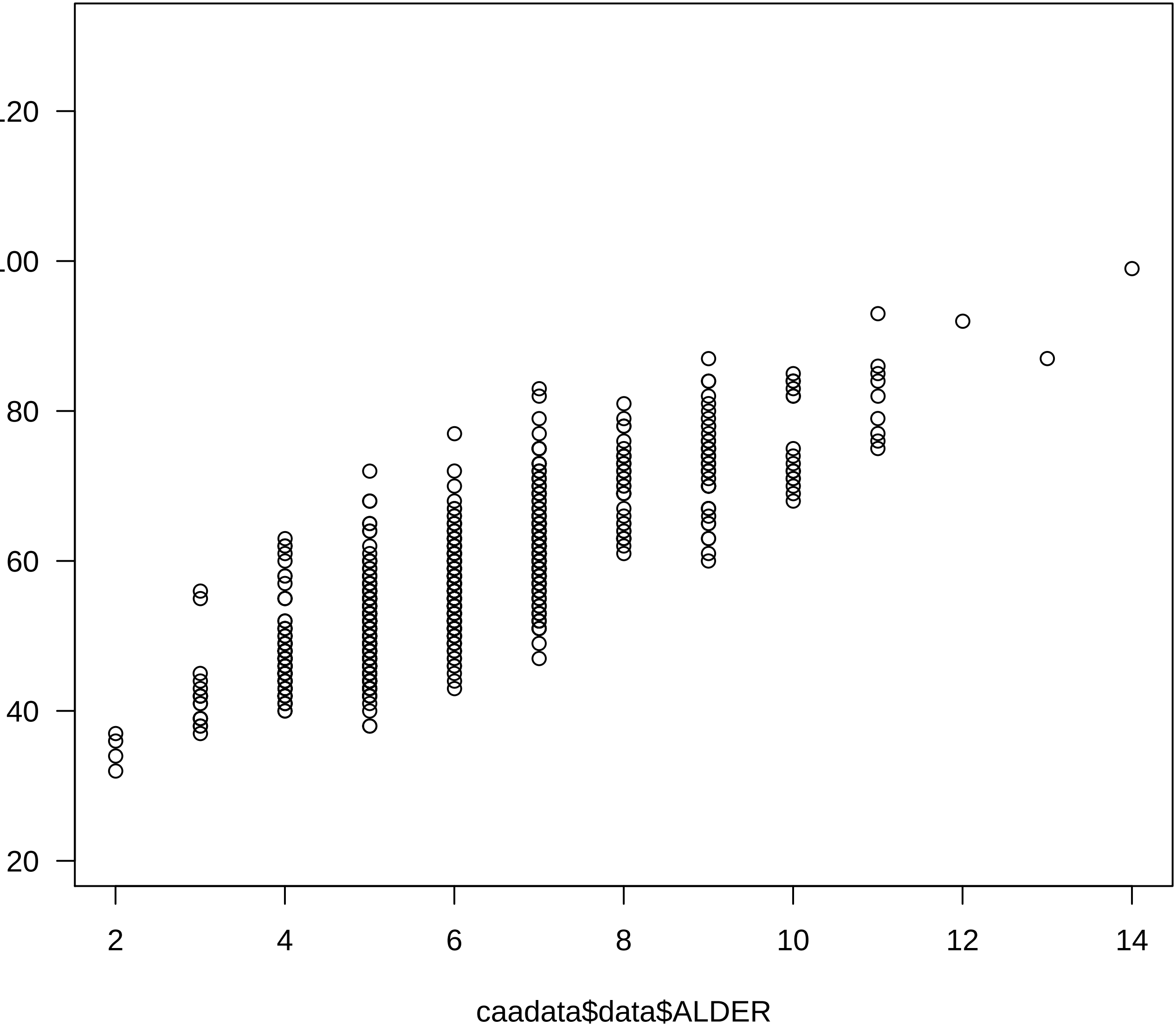
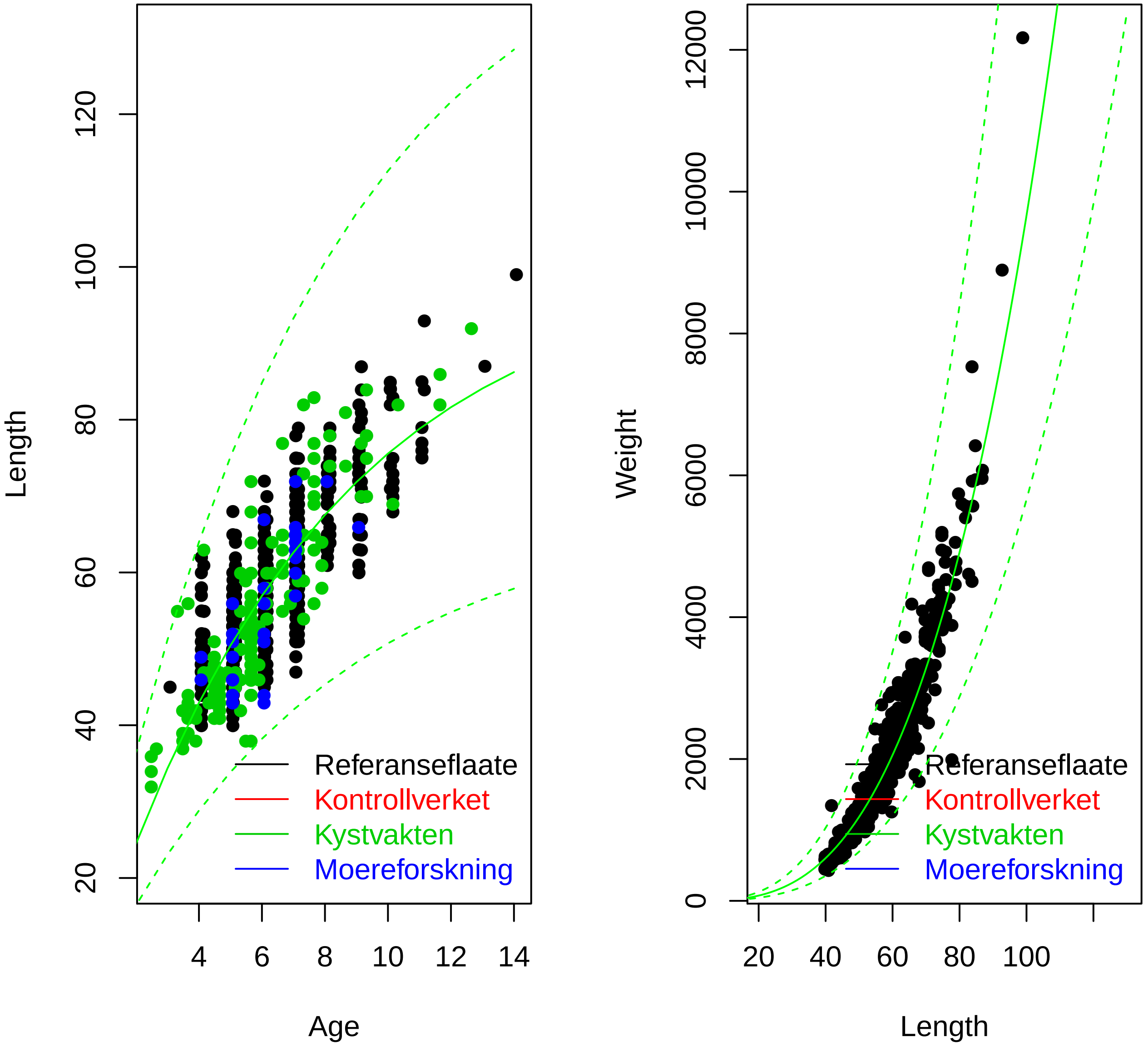
7
8
9
11
13


120
100
80
60
40
20
2
4
6
8
10
12
14
caadata$data$ALDER

Debugging data based on age−length−weight: SEI 2003



2004 length samples

Gear	Q '\' A	9	8
31	1	4628.7 0, 0, 0	30719666.3 10, 144, 17141
31	2	9231 0, 0, 0	5183780.6 5, 5, 265
31	3	292.2 0, 0, 0	7692828 9, 20, 1279
31	4	60139.1 0, 0, 0	8780444.3 5, 5, 278
41	1	55244.9 0, 0, 0	3584884.2 2, 22, 1385
41	2	23064.6 0, 0, 0	223385.6 0, 0, 0
41	3	25605.3 0, 0, 0	219997.7 0, 0, 0
41	4	29723.8 0, 0, 0	265962.3 0, 0, 0
51	1	21553.2 0, 0, 0	539579.9 1, 1, 103
51	2	26799.3 0, 0, 0	3878249.6 1, 7, 148
51	3	15006.3 0, 0, 0	649751.2 1, 53, 1242
51	4	23119 0, 0, 0	765908.2 0, 0, 0

Total catch= 62798845.3

Sampled catch=61029184.1(97)%

Sampled catch required for DB estimation=60489604.2(96)%

#Boats sampled= 34

#Serienr sampled= 257

#Fish sampled= 21841

2004 age samples

Gear	Q '\' A	9	8
31	1	4628.7 0, 0, 0	30719666.3 2, 21, 366
31	2	9231 0, 0, 0	5183780.6 0, 0, 0
31	3	292.2 0, 0, 0	7692828 0, 0, 0
31	4	60139.1 0, 0, 0	8780444.3 0, 0, 0
41	1	55244.9 0, 0, 0	3584884.2 1, 2, 77
41	2	23064.6 0, 0, 0	223385.6 0, 0, 0
41	3	25605.3 0, 0, 0	219997.7 0, 0, 0
41	4	29723.8 0, 0, 0	265962.3 0, 0, 0
51	1	21553.2 0, 0, 0	539579.9 0, 0, 0
51	2	26799.3 0, 0, 0	3878249.6 0, 0, 0
51	3	15006.3 0, 0, 0	649751.2 0, 0, 0
51	4	23119 0, 0, 0	765908.2 0, 0, 0

Total catch= 62798845.3

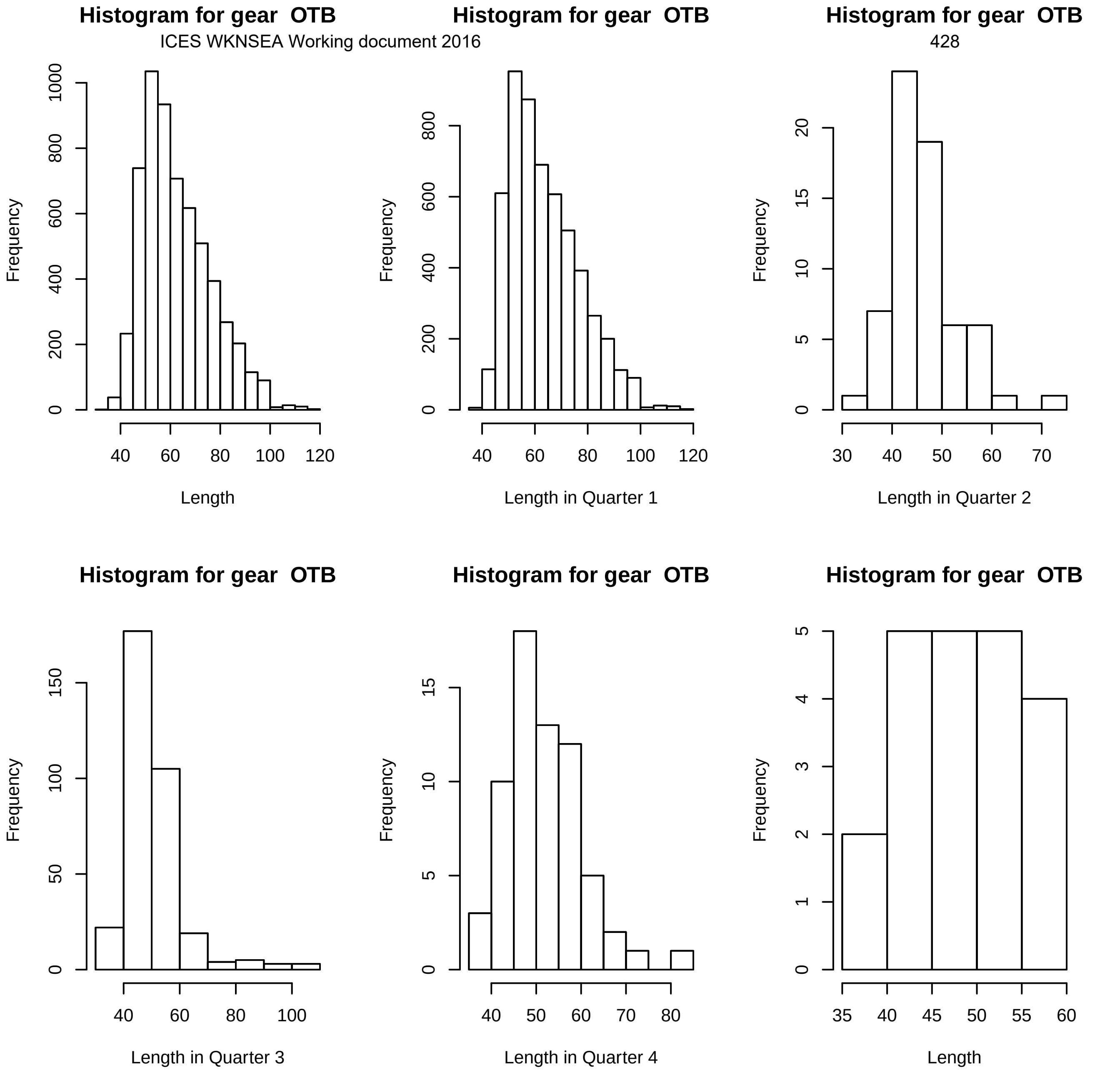
Sampled catch=34304550.5(55)%

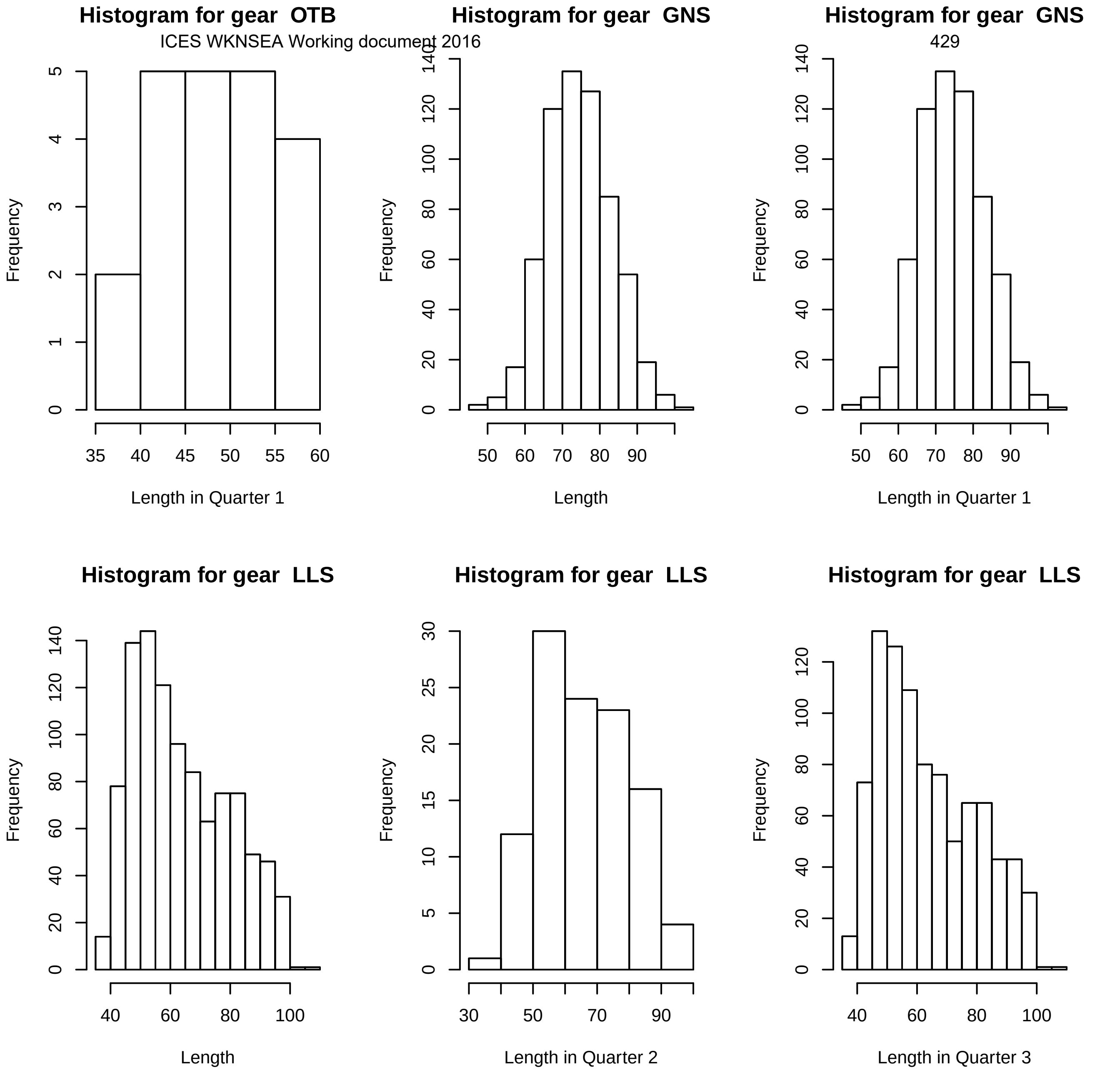
Sampled catch required for DB estimation=34304550.5(55)%

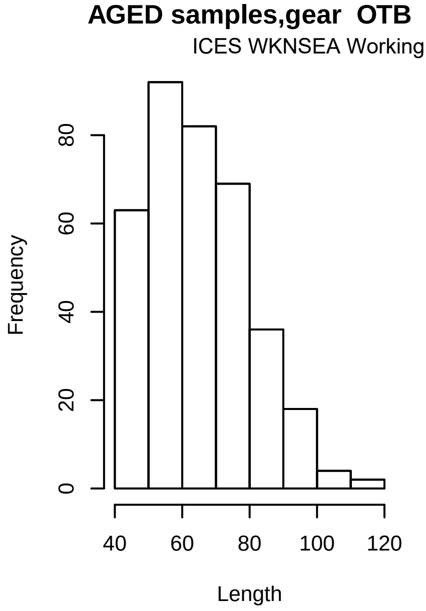
#Boats sampled= 3

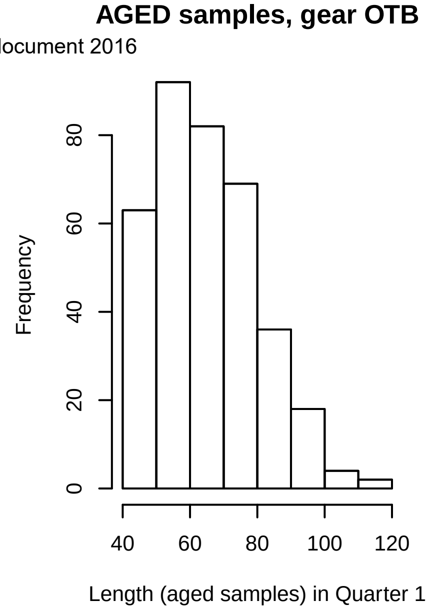
#Serienr sampled= 23

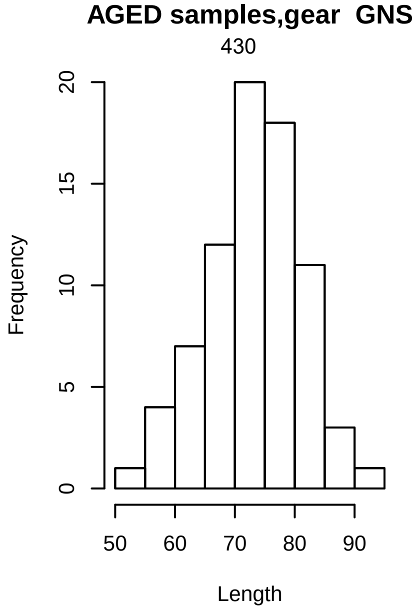
#Fish sampled= 443

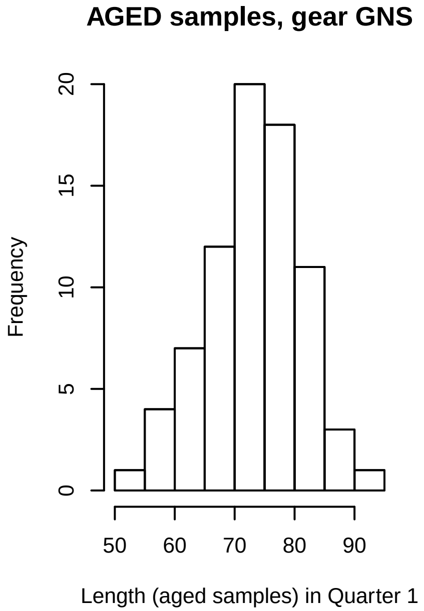

Histogram for gear OTB
Frequency
Length
Histogram for gear OTB
Frequency
Length in Quarter 1
Histogram for gear OTB
Frequency
Length in Quarter 2
Histogram for gear OTB
Frequency
Length in Quarter 3
Histogram for gear OTB
Frequency
Length in Quarter 4
Histogram for gear OTB
Frequency
Length

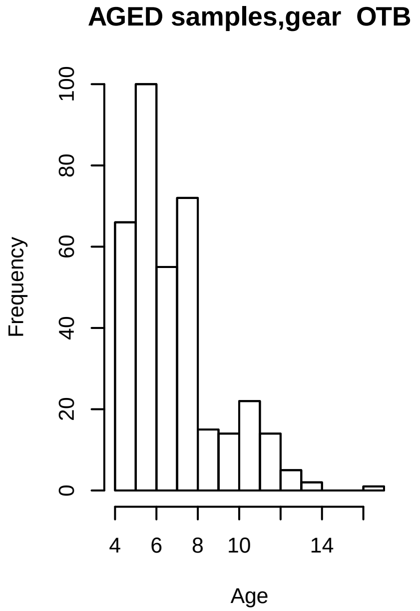

Histogram for gear OTB
Frequency
Length in Quarter 1
Histogram for gear GNS
Frequency
Length
Histogram for gear GNS
Frequency
Length in Quarter 1
Histogram for gear LLS
Frequency
Length
Histogram for gear LLS
Frequency
Length in Quarter 2
Histogram for gear LLS
Frequency
Length in Quarter 3

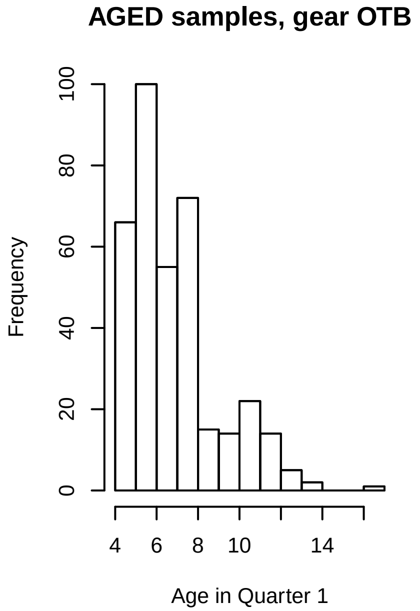

AGED samples,gear OTB
Frequency
0
20
40
60
80
40
60
80
100
120
Length

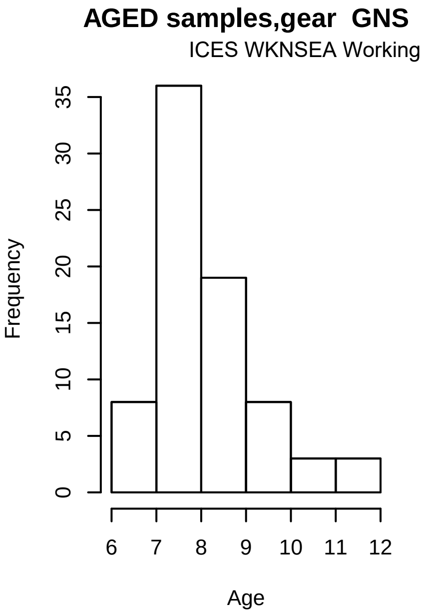

AGED samples, gear OTB
Frequency
0
20
40
60
80
40
60
80
100
120
Length (aged samples) in Quarter 1

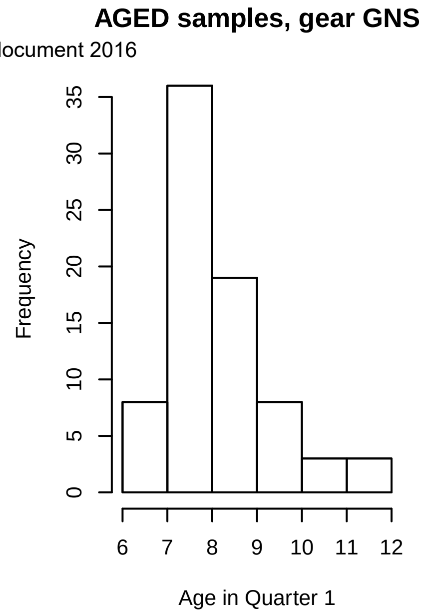

AGED samples,gear GNS
Frequency
0
5
10
15
20
50
60
70
80
90
Length


AGED samples, gear GNS
Frequency
0
5
10
15
20
50
60
70
80
90
Length (aged samples) in Quarter 1

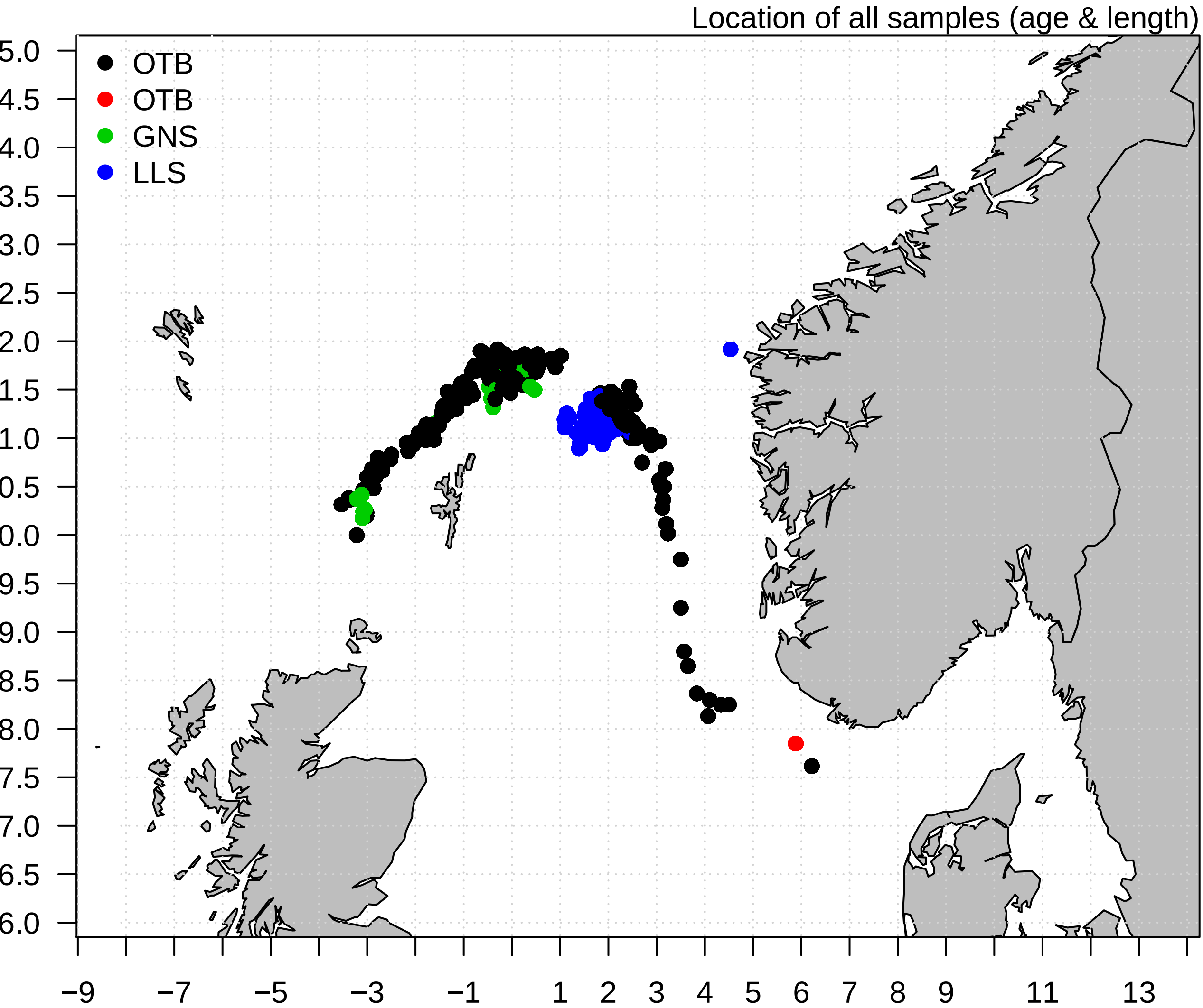

AGED samples,gear OTB
Frequency
0
20
40
60
80
100
4
6
8
10
14
Age

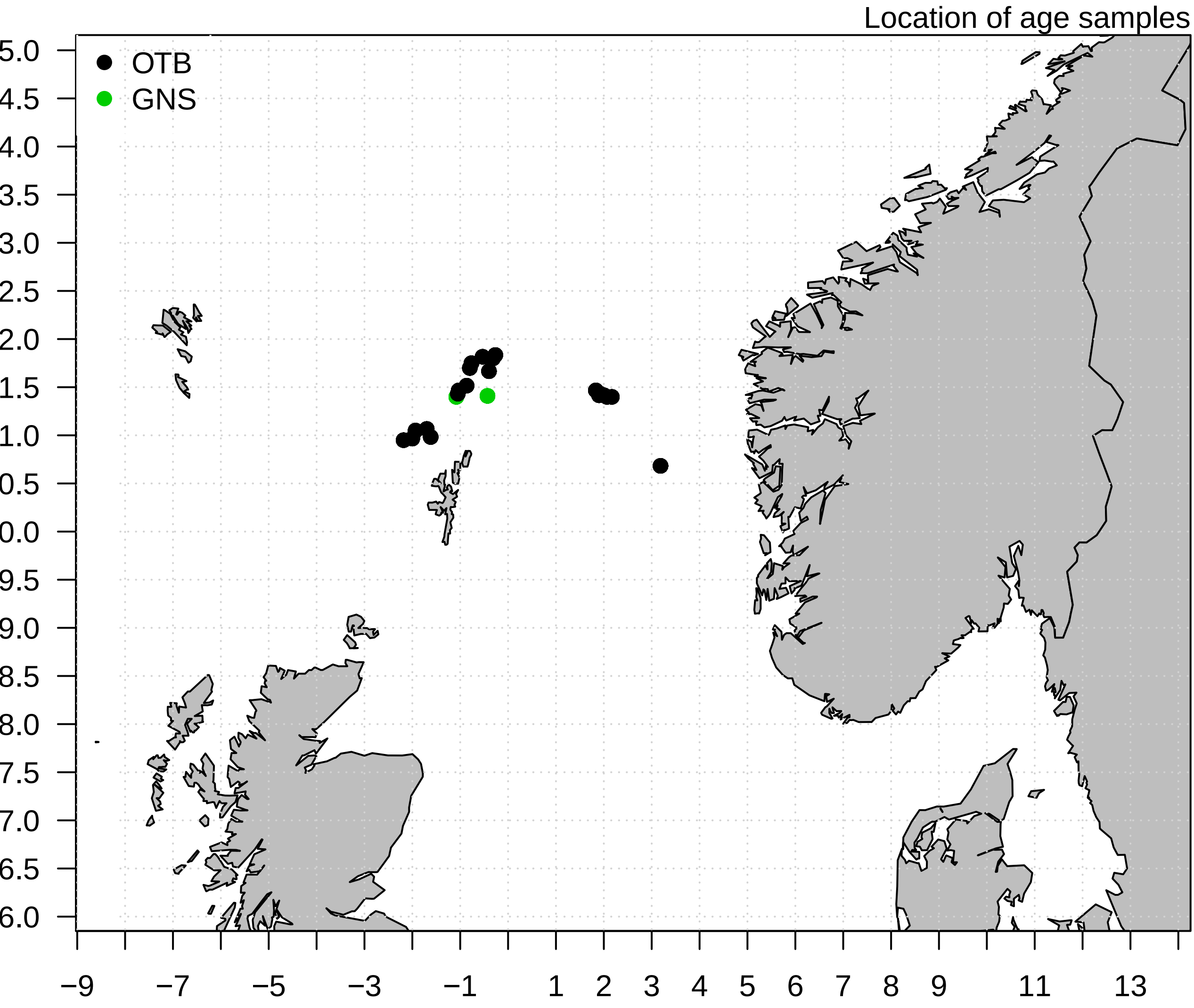

AGED samples, gear OTB
Frequency
0
20
40
60
80
100
4
6
8
10
14
Age in Quarter 1

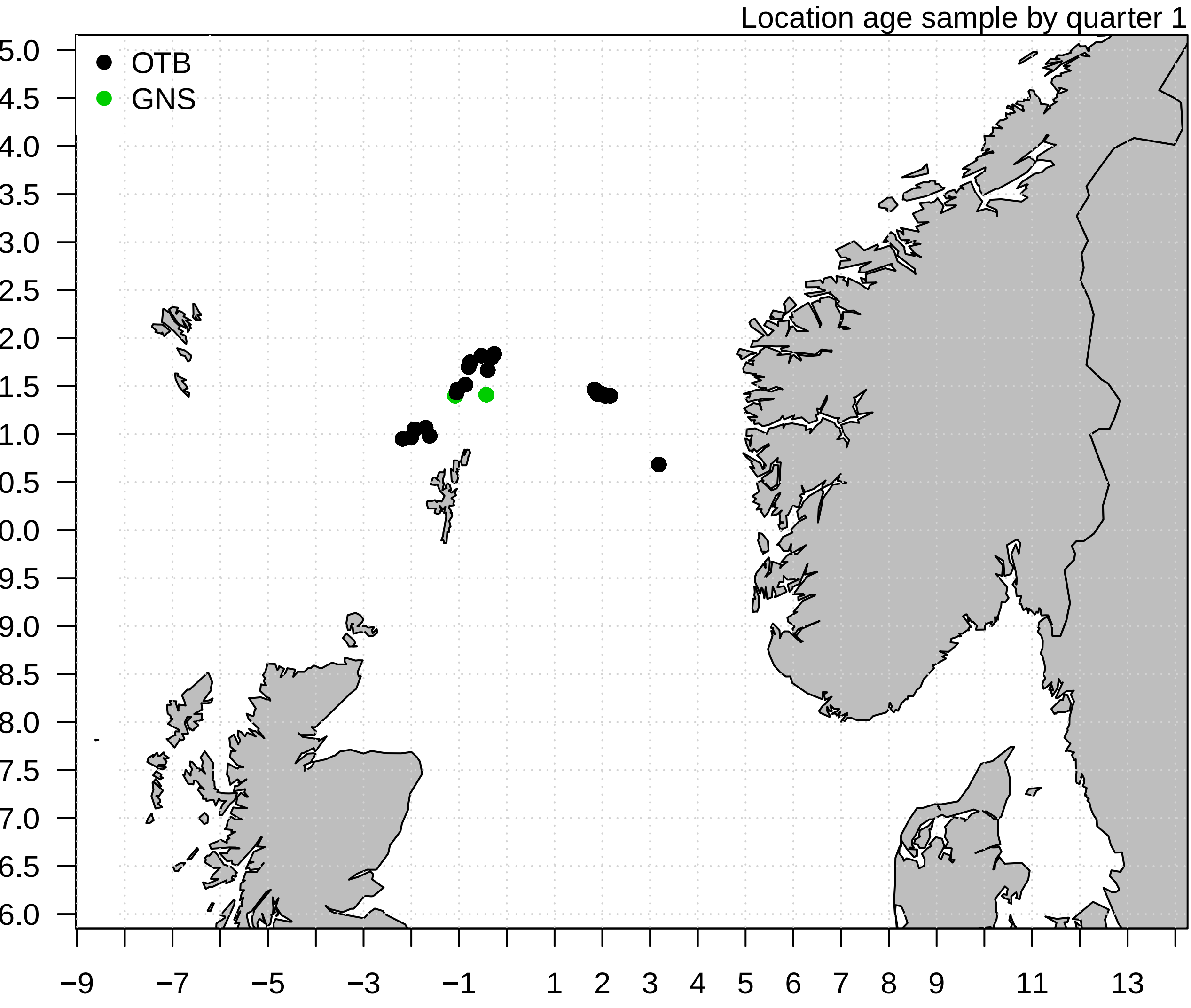

AGED samples,gear GNS
Frequency
0
5
10
15
20
25
30
35
6
7
8
9
10
11
12
Age

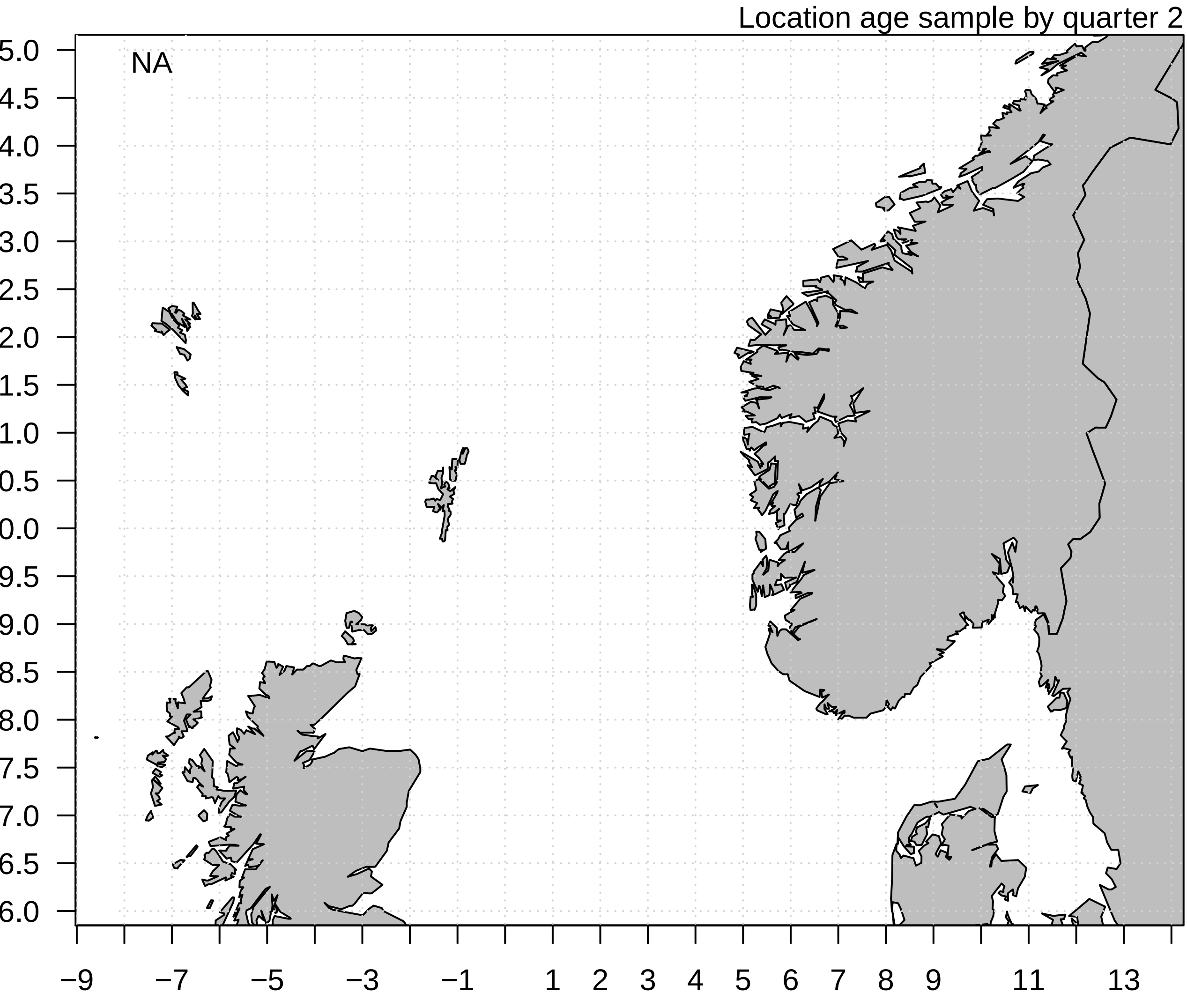

AGED samples, gear GNS
Frequency
0
5
10
15
20
25
30
35
6
7
8
9
10
11
12
Age in Quarter 1

2004

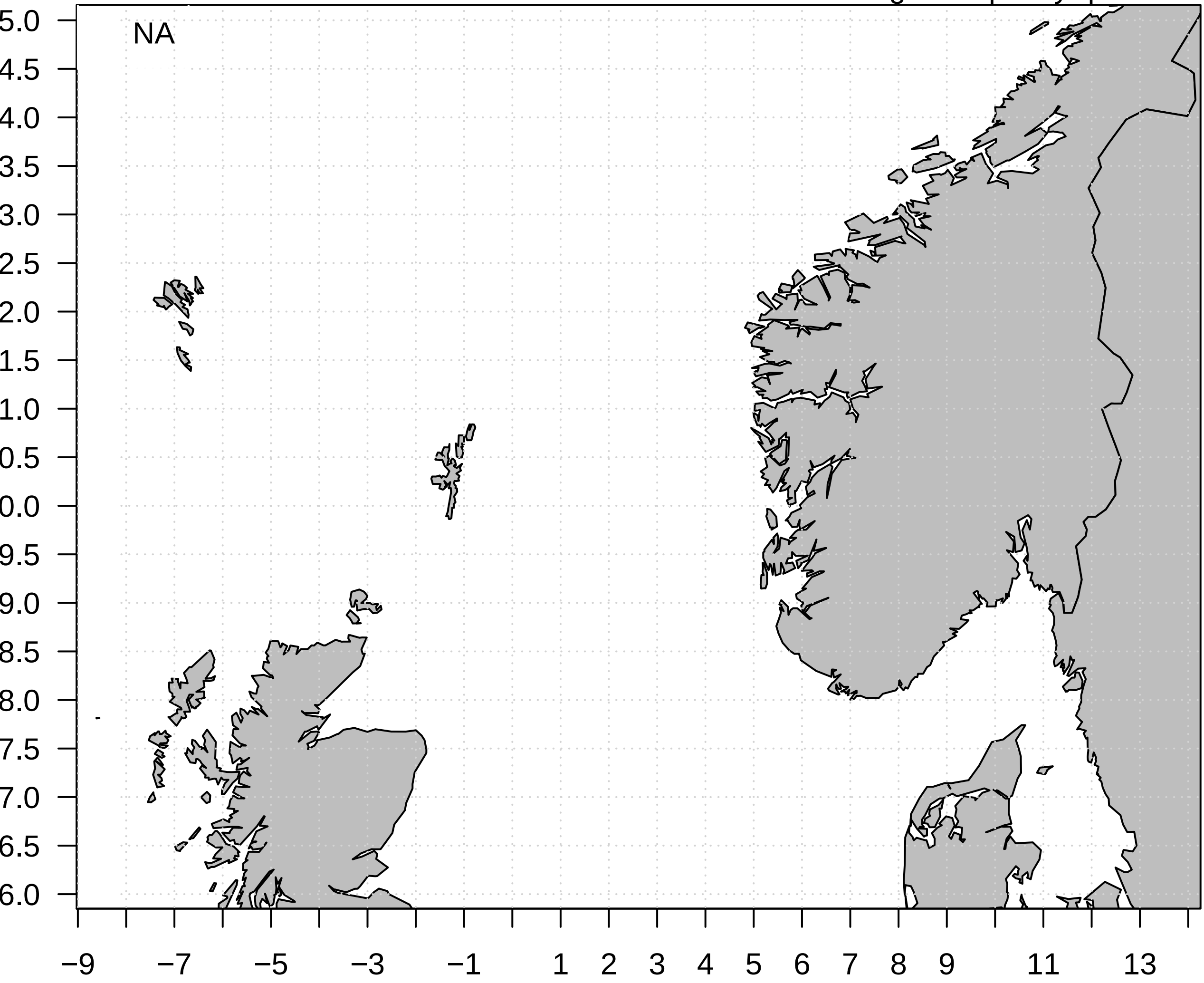

Location of all samples (age & length)
OTB
OTB
GNS
LLS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

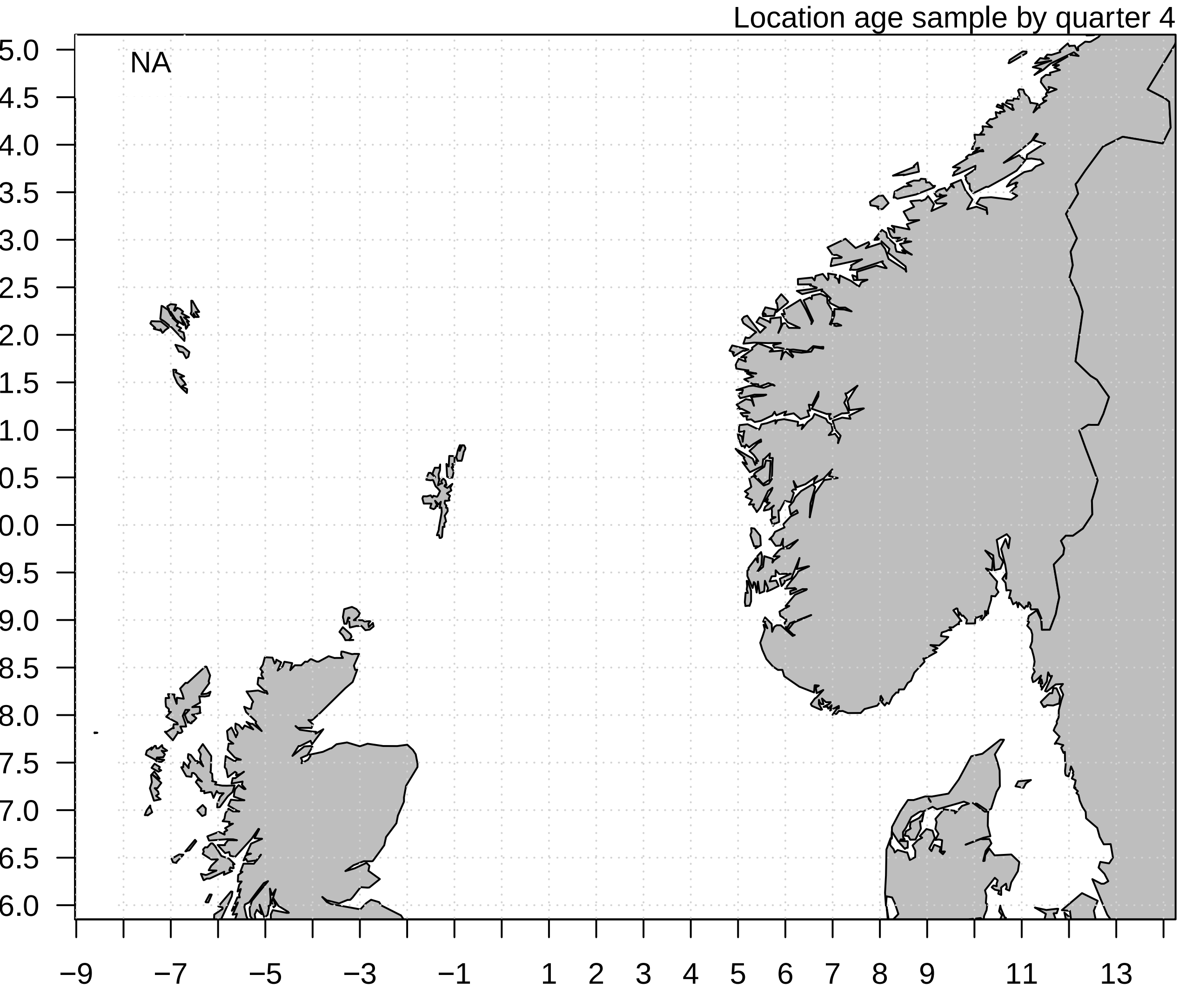

Location of age samples
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

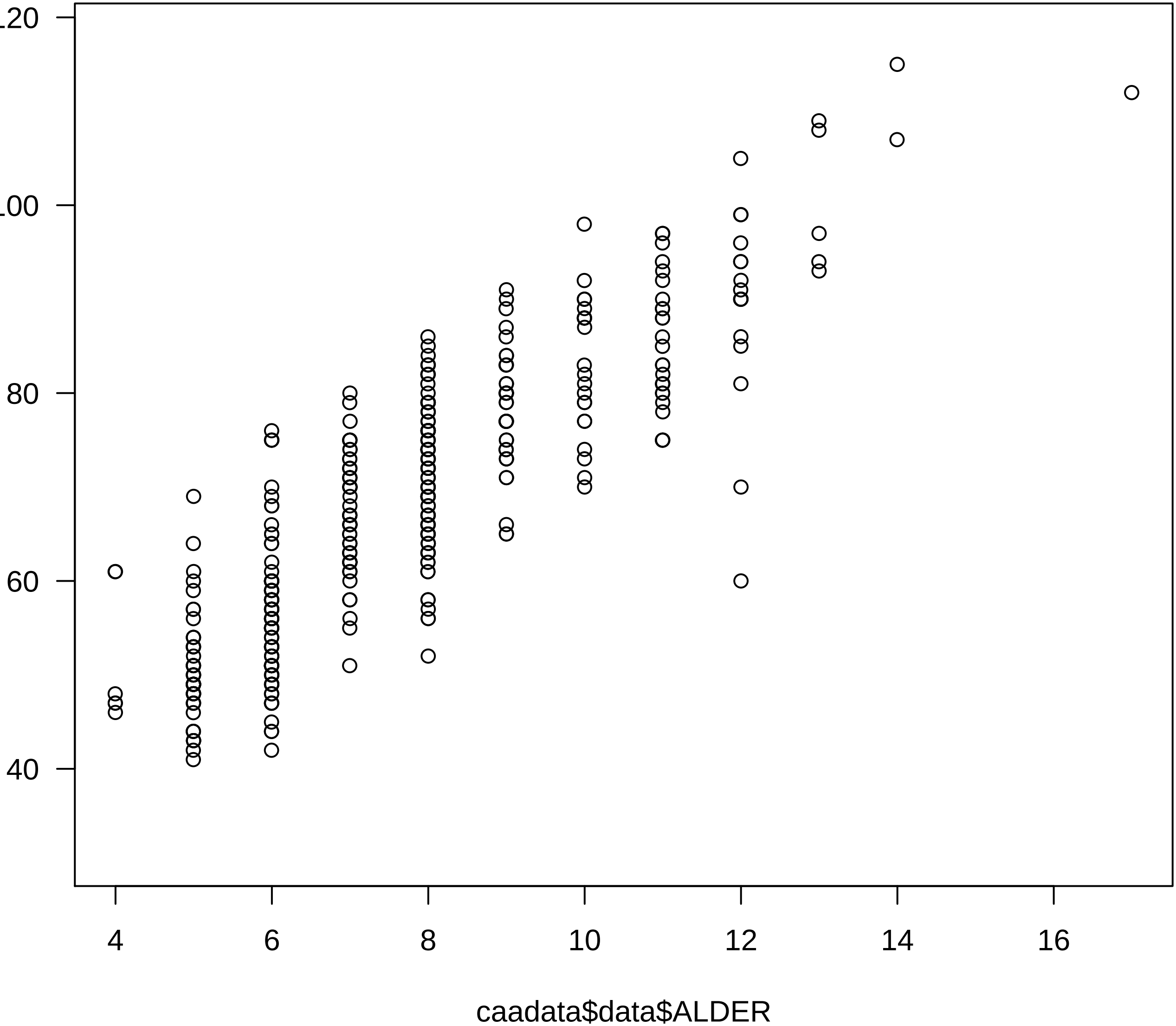

Location age sample by quarter 1
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

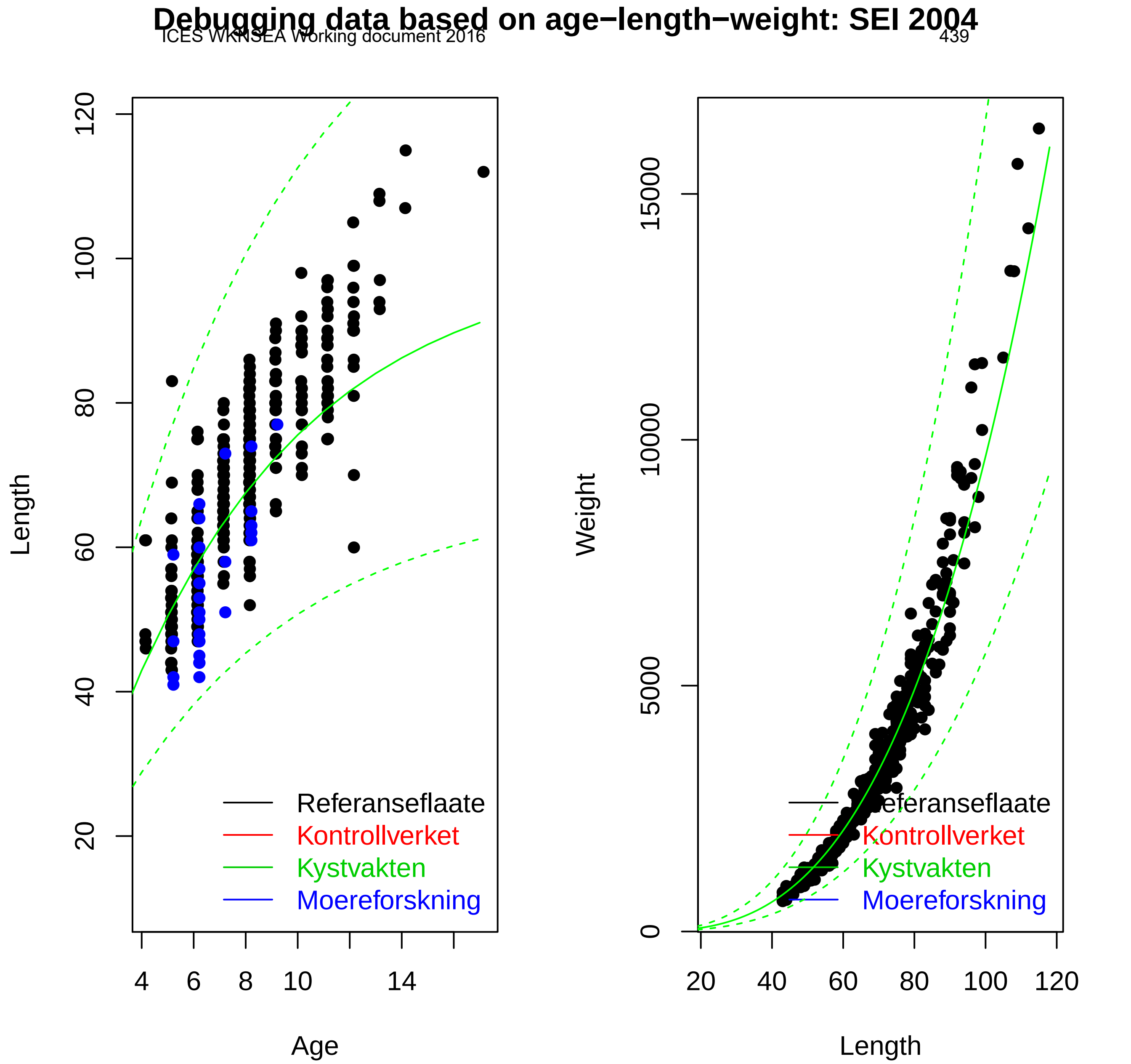

Location age sample by quarter 2
NA
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

Location age sample by quarter 3




Location age sample by quarter 4
NA
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


120
100
80
60
40
4
6
8
10
12
14
16
caadata$data$ALDER



Debugging data based on age−length−weight: SEI 2004
Length
Age
Weight
Length
Referanseflaate
Kontrollverket
Kystvakten
Moereforskning
Referanseflaate
Kontrollverket
Kystvakten
Moereforskning

2005 length samples

Gear	Q '\' A	9	8
31	1	5805.6 0, 0, 0	32203849 3, 63, 3540
31	2	3732 0, 0, 0	9827226.9 3, 3, 85
31	3	16014.6 0, 0, 0	9703380.4 0, 0, 0
31	4	29436.6 0, 0, 0	5940403.5 0, 0, 0
41	1	64656.4 0, 0, 0	1616147.2 1, 5, 300
41	2	38359.9 0, 0, 0	192071.6 0, 0, 0
41	3	26791.8 0, 0, 0	206356.5 0, 0, 0
41	4	34849.7 0, 0, 0	307908 0, 0, 0
51	1	4399.5 0, 0, 0	18236.3 1, 11, 331
51	2	2128.8 0, 0, 0	113095.2 1, 7, 177
51	3	3375.6 0, 0, 0	361669.7 1, 60, 2093
51	4	4799.4 0, 0, 0	48561.3 0, 0, 0
43	1	22544.3 0, 0, 0	723910.5 0, 0, 0
43	2	54504.1 0, 0, 0	5142798.1 0, 0, 0
43	3	11879.6 0, 0, 0	789417.5 0, 0, 0
43	4	40435.2 0, 0, 0	403077.4 0, 0, 0

Total catch= 67961822.2

Sampled catch=44140224.3(65)%

Sampled catch required for DB estimation=44140224.3(65)%

#Boats sampled= 10

#Serienr sampled= 149

#Fish sampled= 6526

2005 age samples

Gear	Q '\' A	9	8
31	1	5805.6 0, 0, 0	32203849 3, 33, 655
31	2	3732 0, 0, 0	9827226.9 0, 0, 0
31	3	16014.6 0, 0, 0	9703380.4 0, 0, 0
31	4	29436.6 0, 0, 0	5940403.5 0, 0, 0
41	1	64656.4 0, 0, 0	1616147.2 1, 2, 39
41	2	38359.9 0, 0, 0	192071.6 0, 0, 0
41	3	26791.8 0, 0, 0	206356.5 0, 0, 0
41	4	34849.7 0, 0, 0	307908 0, 0, 0
51	1	4399.5 0, 0, 0	18236.3 0, 0, 0
51	2	2128.8 0, 0, 0	113095.2 0, 0, 0
51	3	3375.6 0, 0, 0	361669.7 0, 0, 0
51	4	4799.4 0, 0, 0	48561.3 0, 0, 0
43	1	22544.3 0, 0, 0	723910.5 0, 0, 0
43	2	54504.1 0, 0, 0	5142798.1 0, 0, 0
43	3	11879.6 0, 0, 0	789417.5 0, 0, 0
43	4	40435.2 0, 0, 0	403077.4 0, 0, 0

Total catch= 67961822.2

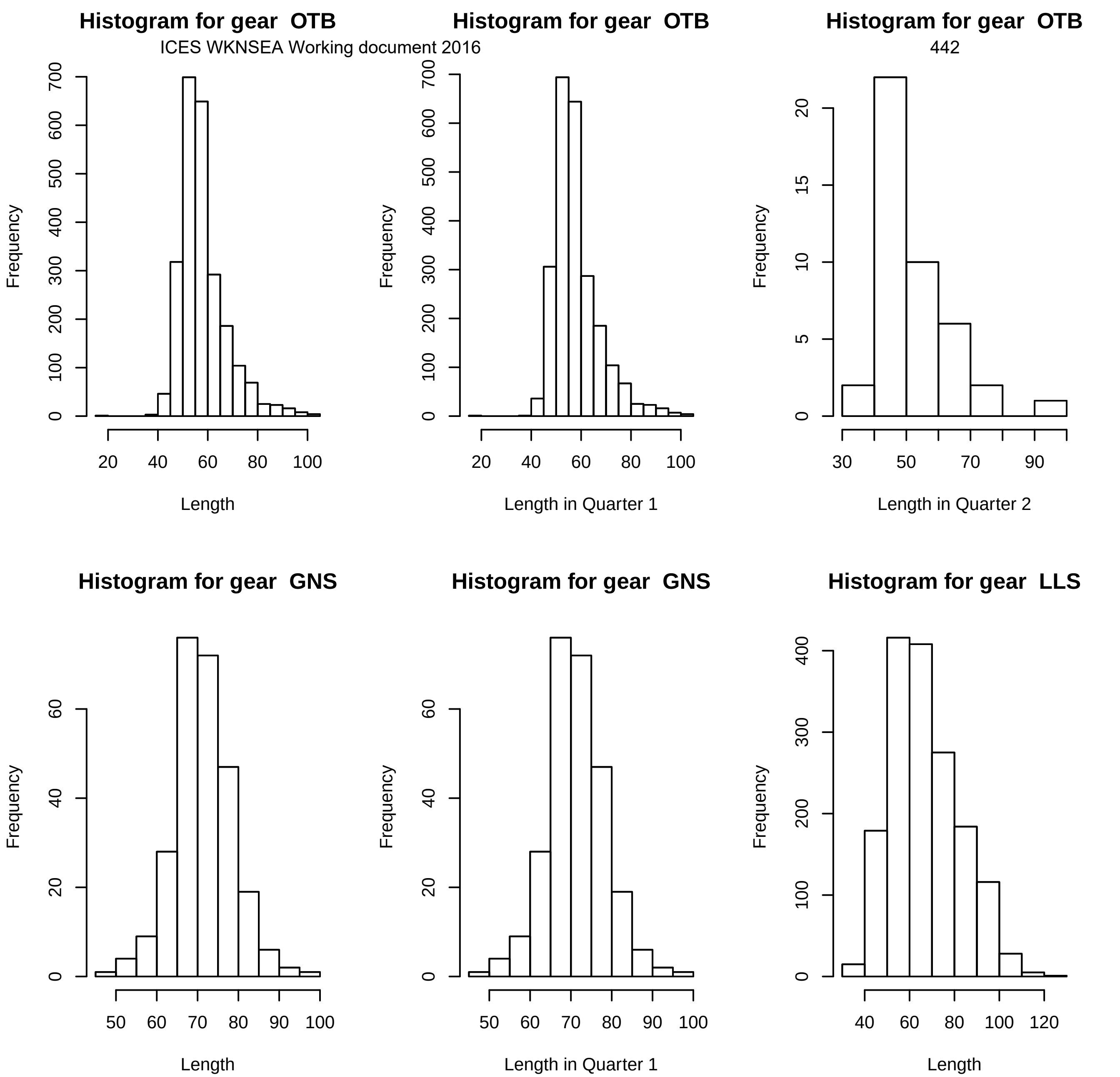
Sampled catch=33819996.2(50)%

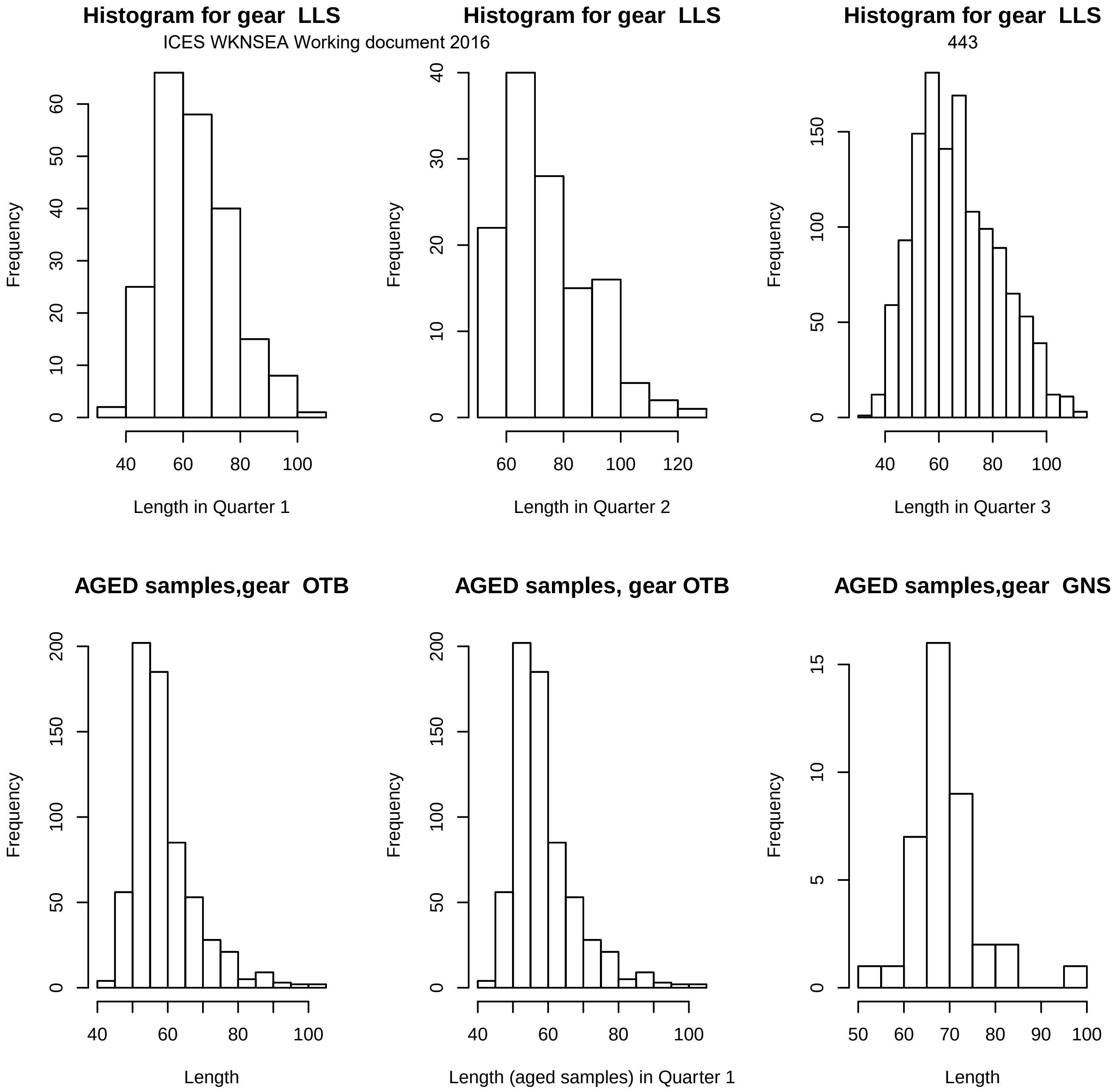
Sampled catch required for DB estimation=33819996.2(50)%

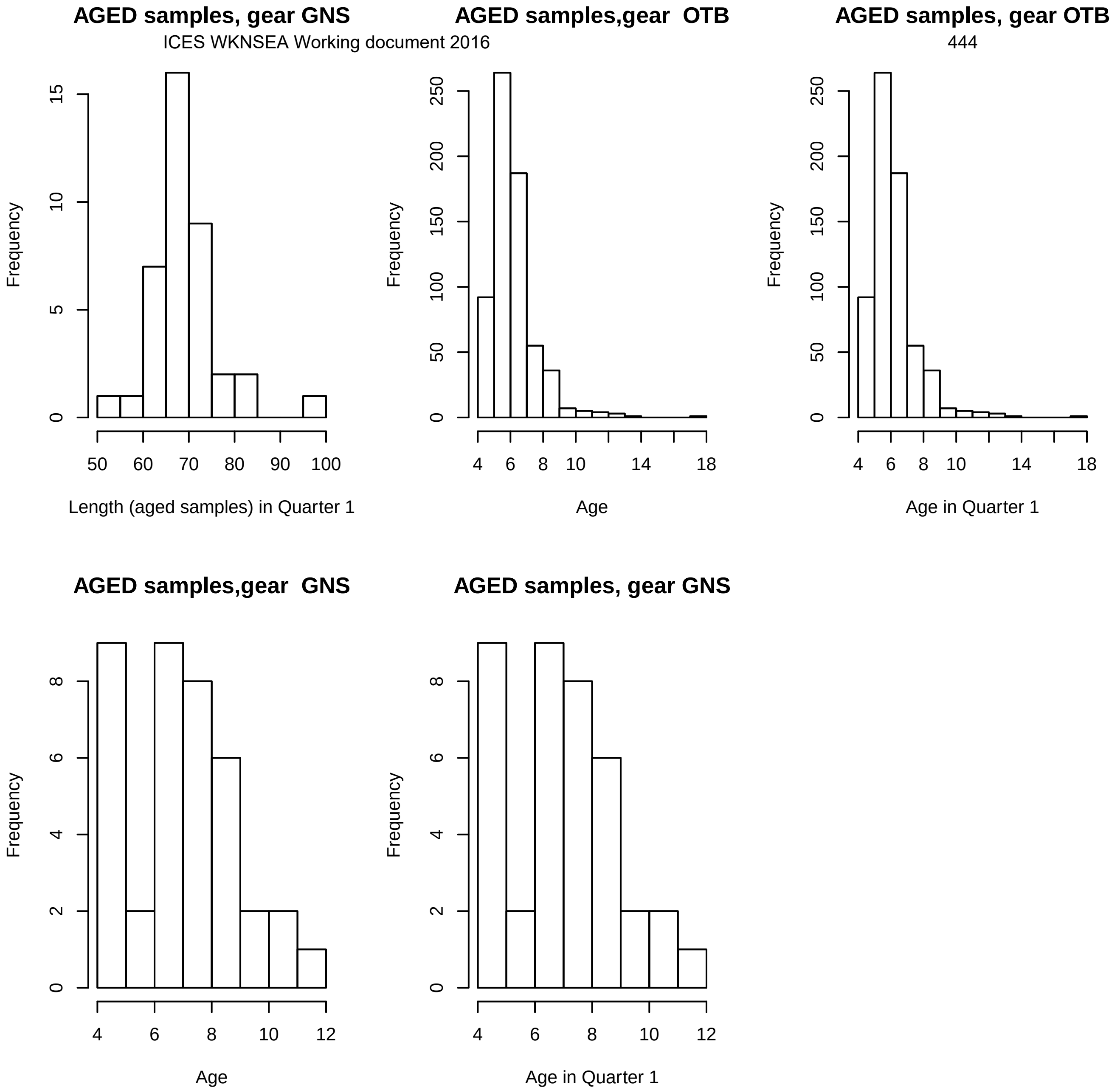
#Boats sampled= 4

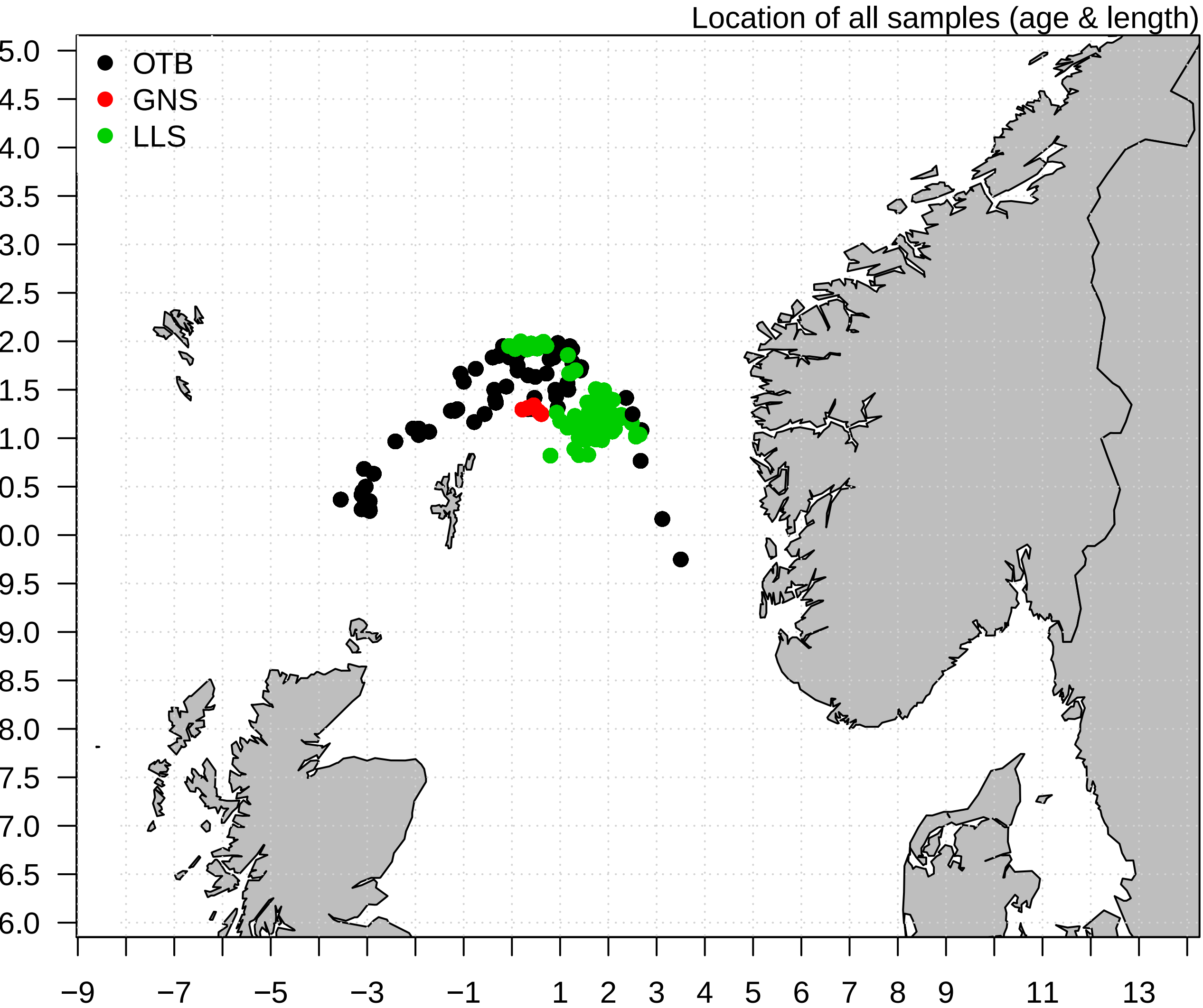
#Serienr sampled= 35

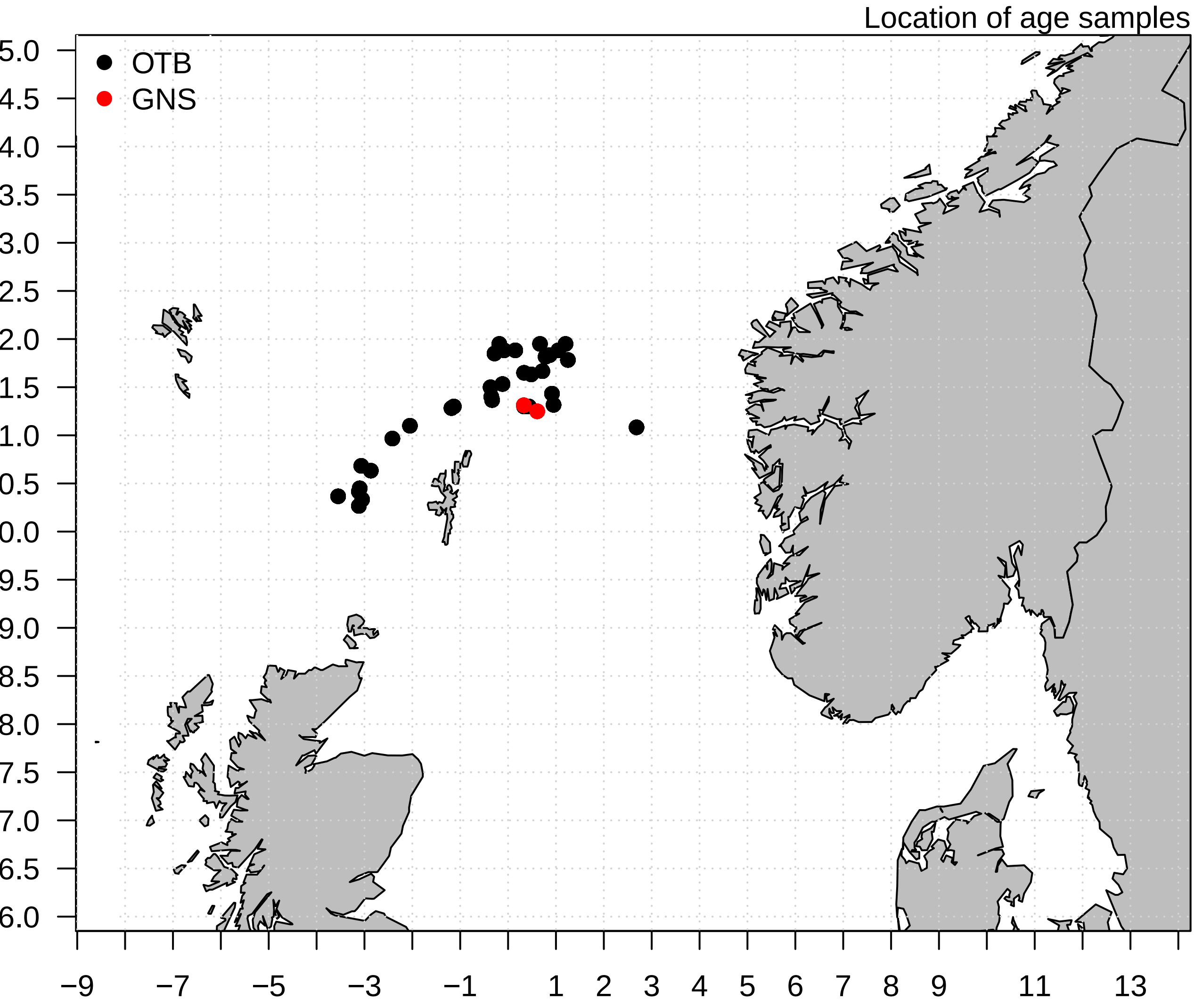
#Fish sampled= 694

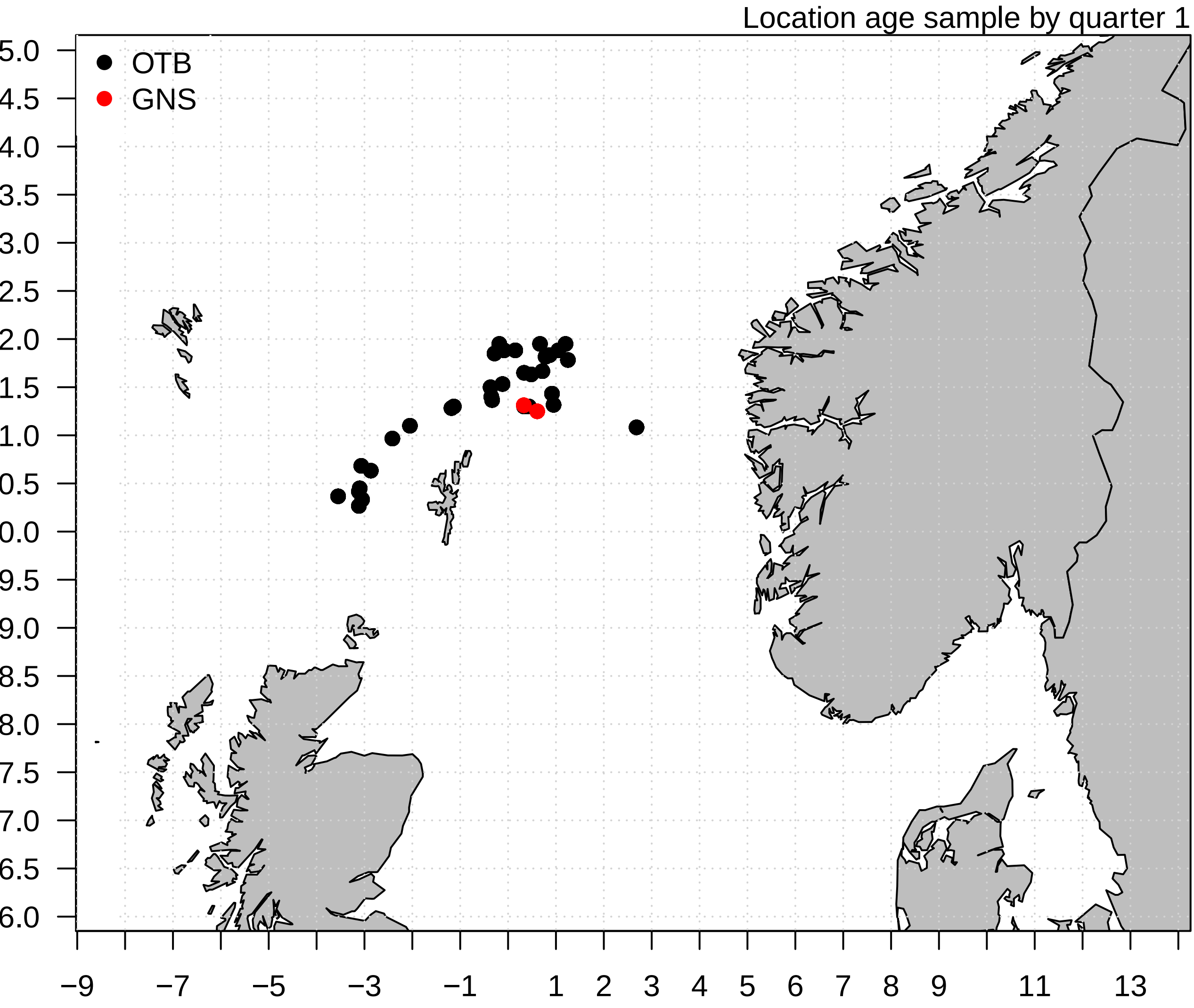

Histogram for gear OTB
Frequency
Length
Histogram for gear OTB
Frequency
Length in Quarter 1
Histogram for gear OTB
Frequency
Length in Quarter 2
Histogram for gear GNS
Frequency
Length
Histogram for gear GNS
Frequency
Length in Quarter 1
Histogram for gear LLS
Frequency
Length

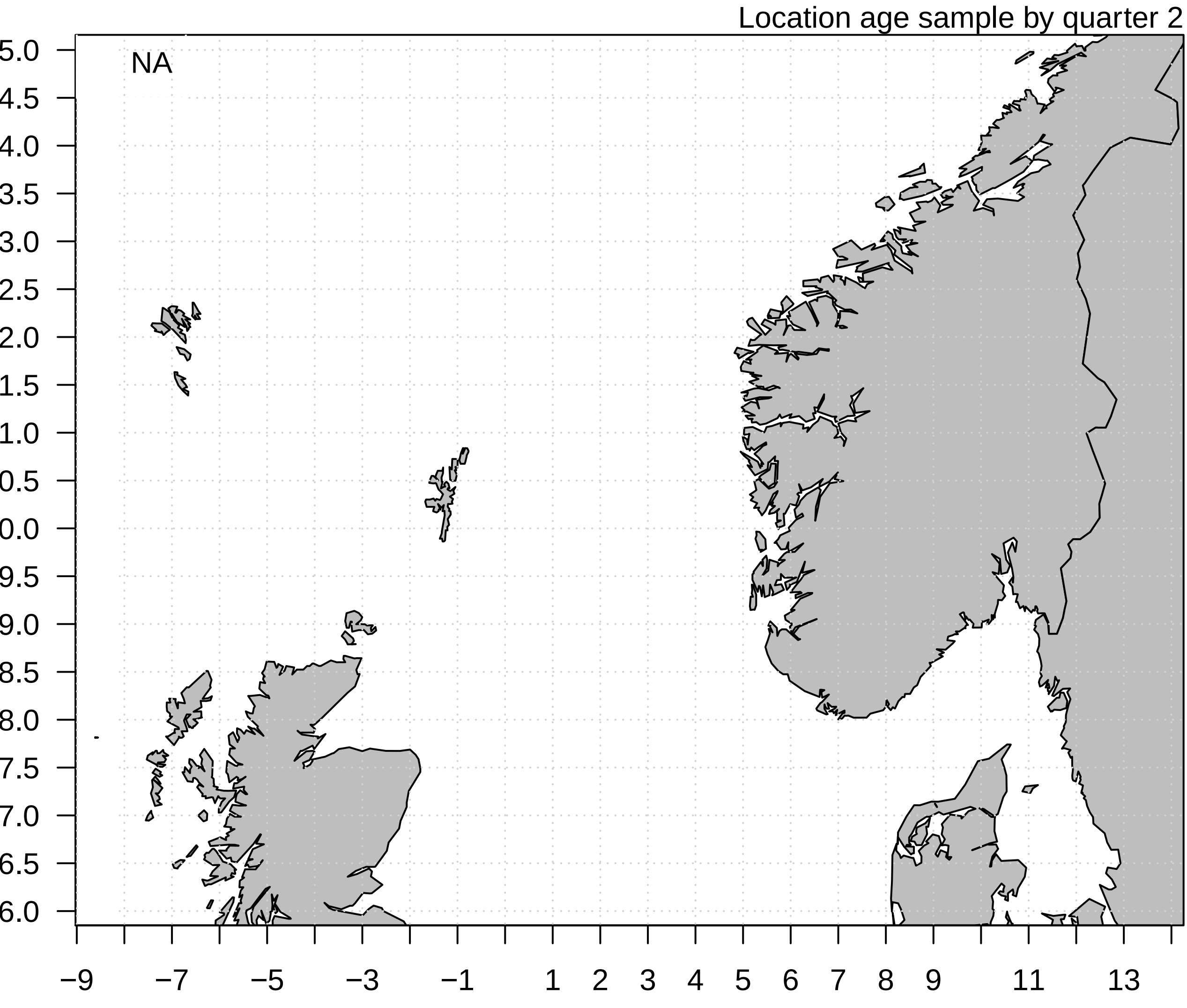

Histogram for gear LLS
Frequency
Length in Quarter 1
Histogram for gear LLS
Frequency
Length in Quarter 2
Histogram for gear LLS
Frequency
Length in Quarter 3
AGED samples,gear OTB
Frequency
Length
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 1
AGED samples,gear GNS
Frequency
Length

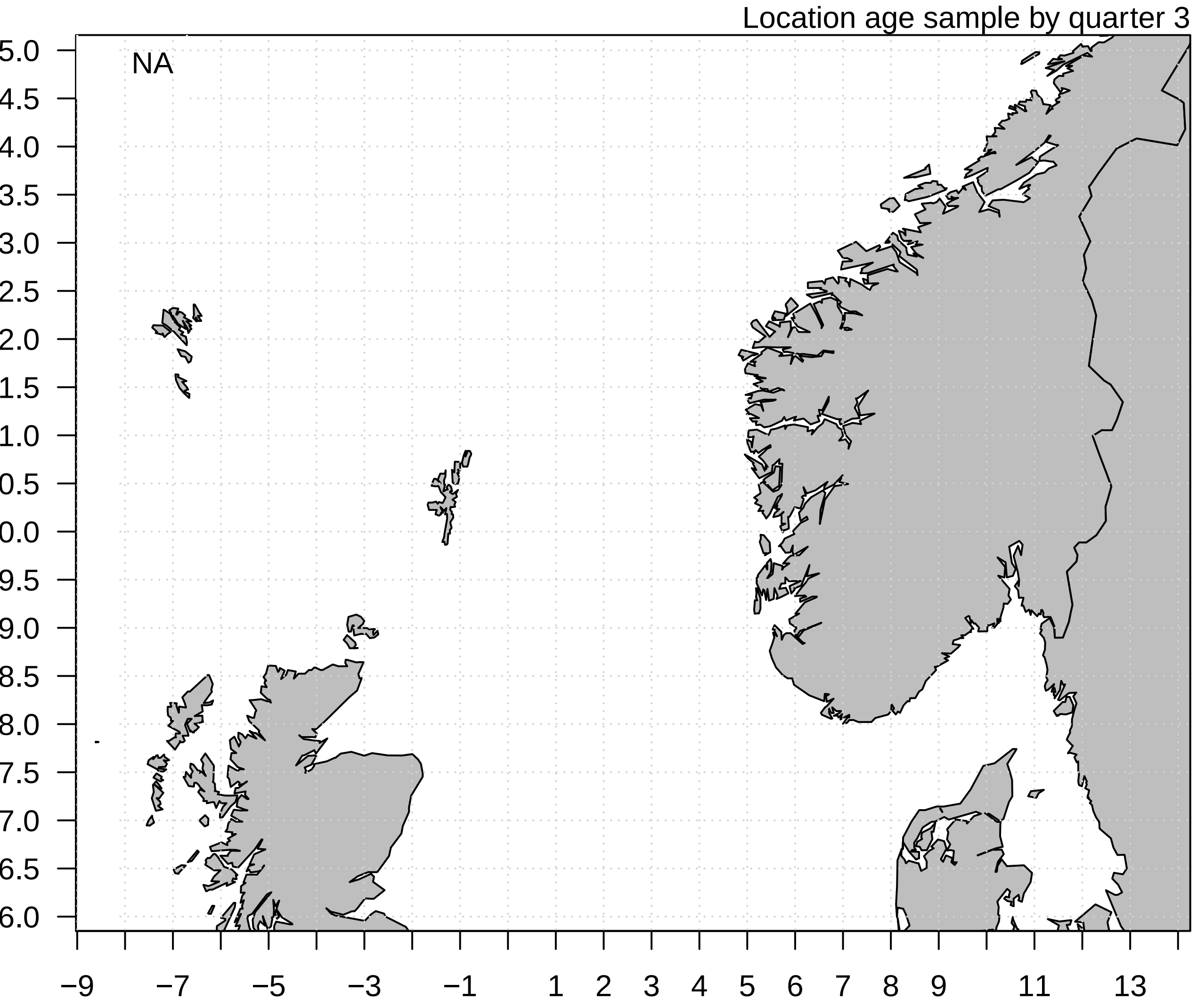

AGED samples, gear GNS
Frequency
Length (aged samples) in Quarter 1
AGED samples,gear OTB
Frequency
Age
AGED samples, gear OTB
Frequency
Age in Quarter 1
AGED samples,gear GNS
Frequency
Age
AGED samples, gear GNS
Frequency
Age in Quarter 1

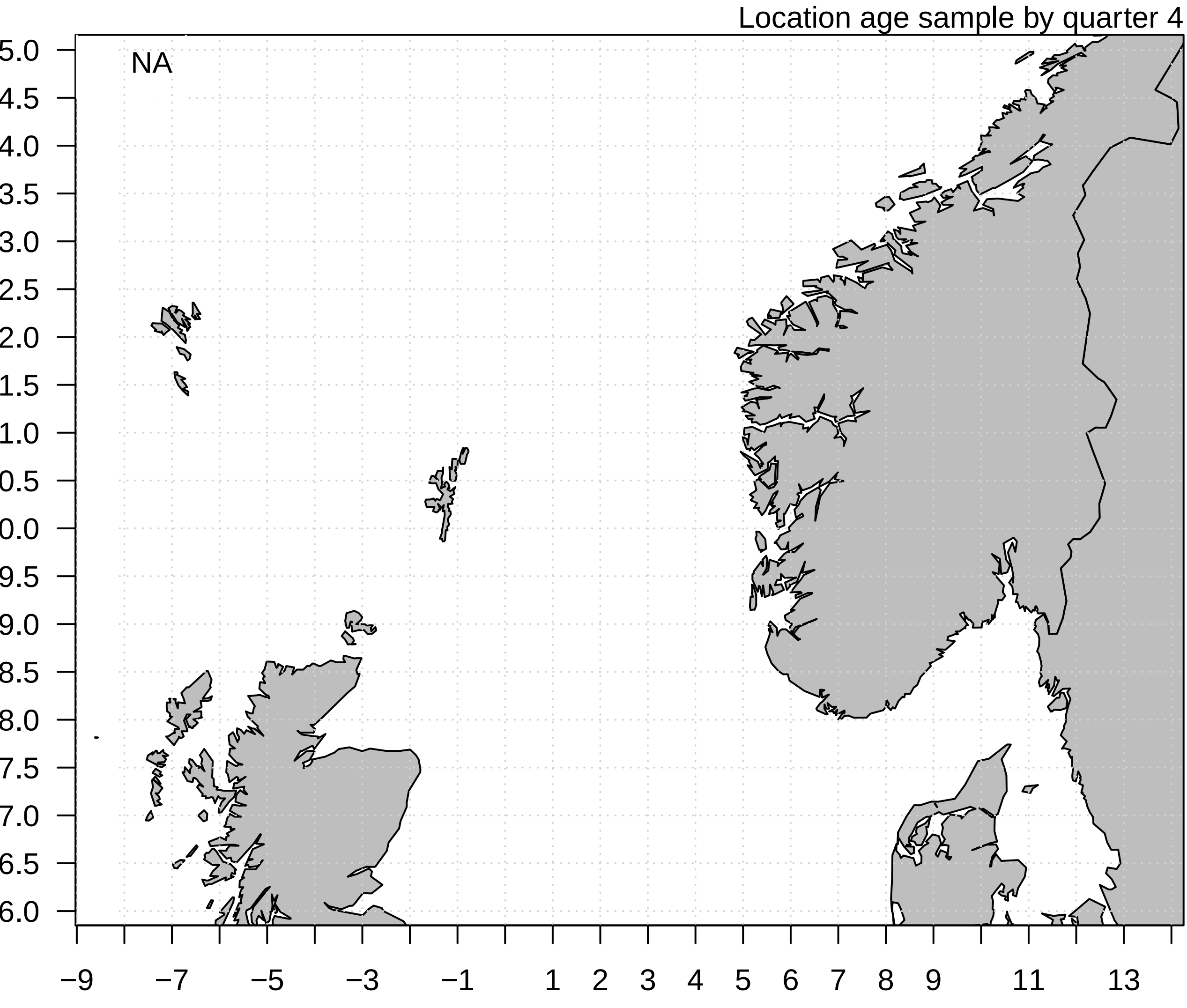

Location of all samples (age & length)
OTB
GNS
LLS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

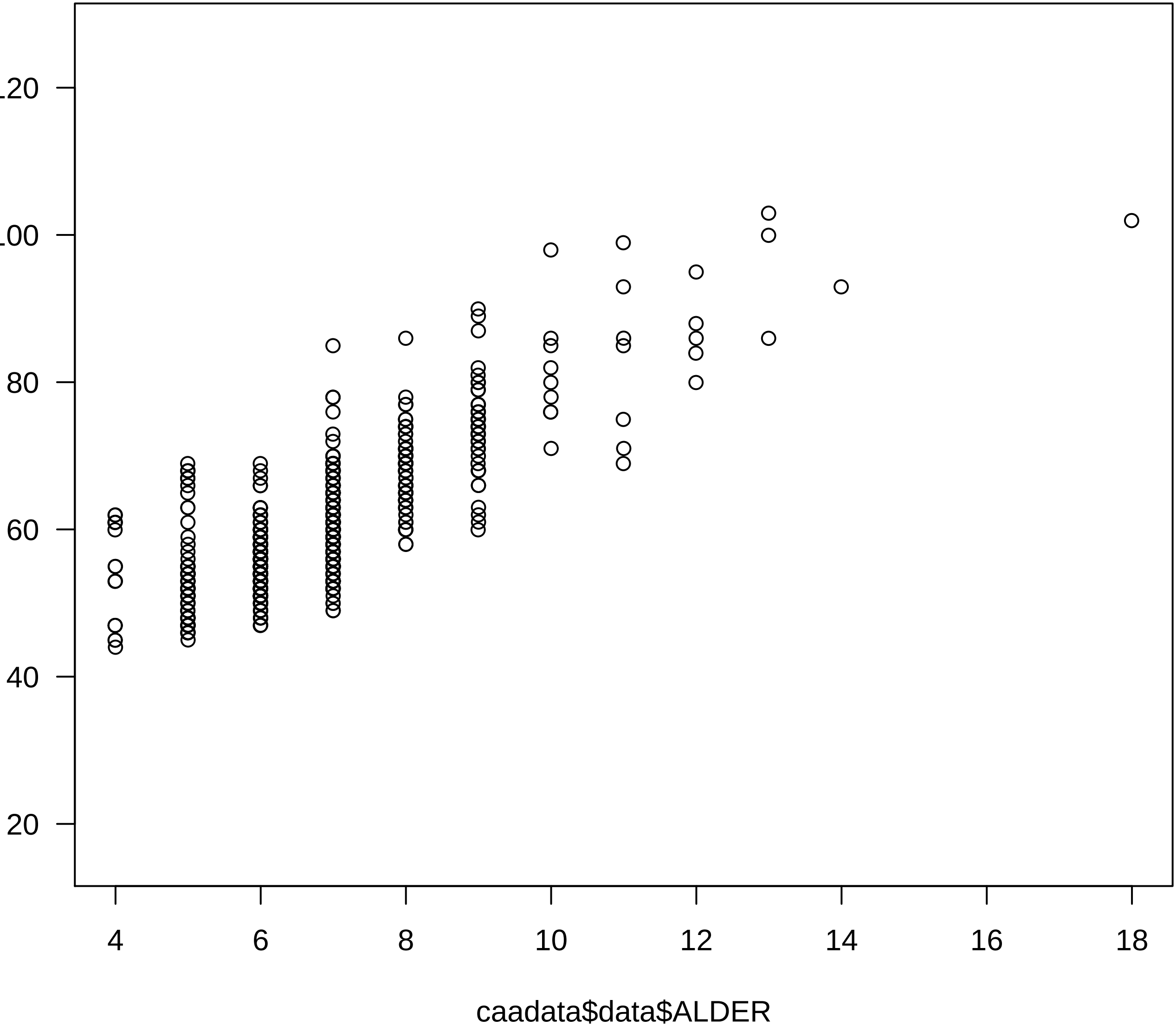

Location of age samples
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 1
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

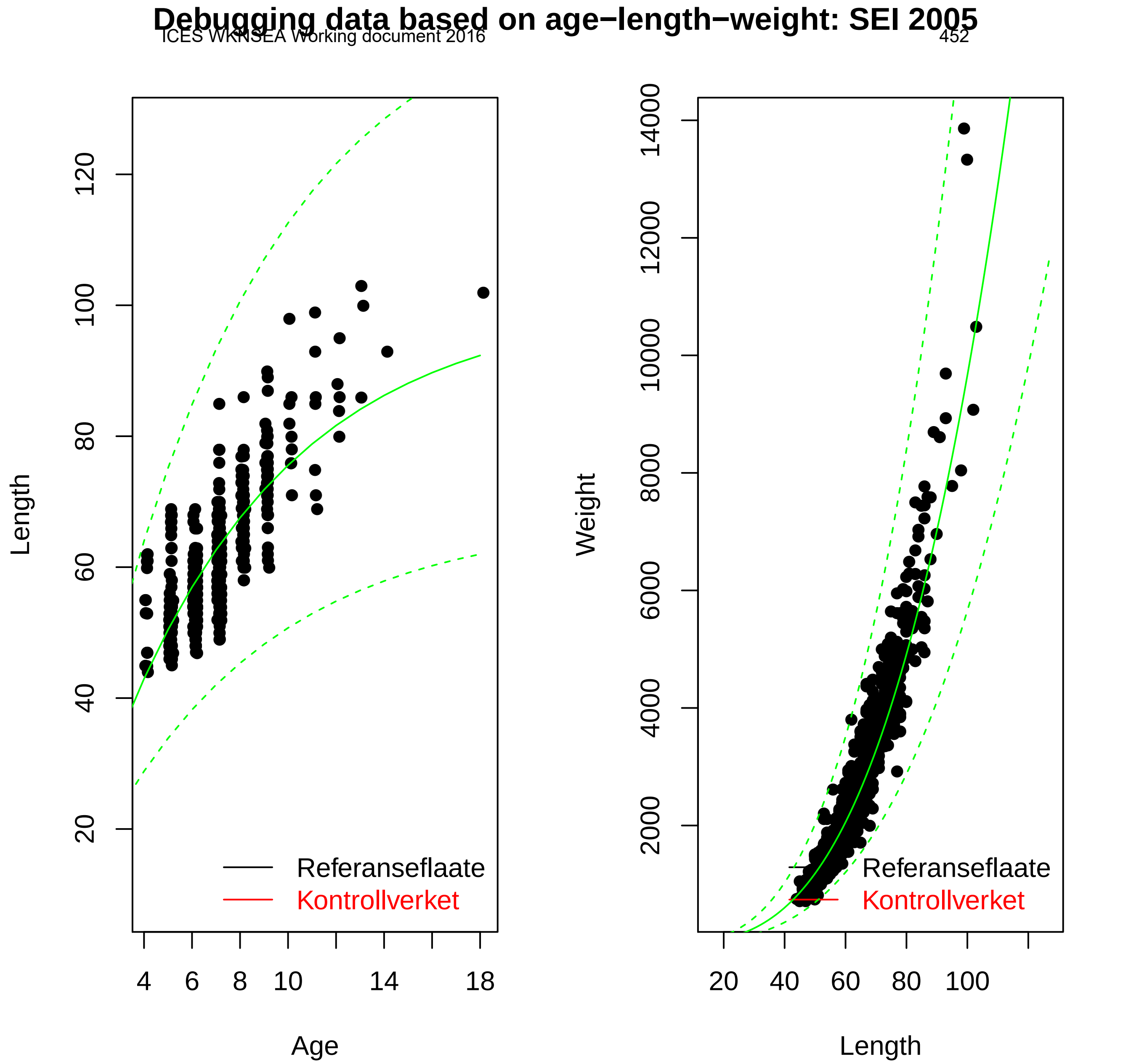

Location age sample by quarter 2
NA
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 3
NA
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 4
NA
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13



120
100
80
60
40
20
4
6
8
10
12
14
16
18
caadata$data$ALDER


Debugging data based on age−length−weight: SEI 2005
Length
120
100
80
60
40
20
4
6
8
10
14
18
Age
Referanseflaate
Kontrollverket
Weight
14000
12000
10000
8000
6000
4000
2000
20
40
60
80
100
Length
Referanseflaate
Kontrollverket

2006 length samples

Gear	Q '\' A	9	8
31	1	231 0, 0, 0	30372432.4 8, 88, 5539
31	2	20535.6 0, 0, 0	8325999.1 7, 11, 1060
31	3	12823.1 0, 0, 0	11518589.2 7, 7, 939
31	4	4061.1 0, 0, 0	3767377 1, 1, 130
41	1	71061.2 0, 0, 0	2479825.4 2, 31, 1868
41	2	30049.3 0, 0, 0	239609.4 3, 12, 217
41	3	33478.1 0, 0, 0	231989.8 2, 55, 1081
41	4	18400.1 0, 0, 0	297531.7 2, 14, 271
51	1	273.6 0, 0, 0	22194.4 0, 0, 0
51	2	3222 0, 0, 0	141551.6 0, 0, 0
51	3	2470.6 0, 0, 0	443558.9 2, 62, 2839
51	4	1781.4 0, 0, 0	59209.9 0, 0, 0
43	1	50516.8 0, 0, 0	260072.1 0, 0, 0
43	2	62802.7 0, 0, 0	2281927.7 0, 0, 0
43	3	60558.3 0, 0, 0	317204.8 0, 0, 0
43	4	92377.7 0, 0, 0	122574.2 0, 0, 0

Total catch= 61346290.2

Sampled catch=57676912.9(94)%

Sampled catch required for DB estimation=53909535.9(88)%

#Boats sampled= 34

#Serienr sampled= 281

#Fish sampled= 13944

2006 age samples

Gear	Q '\' A	9	8
31	1	231 0, 0, 0	30372432.4 6, 22, 427
31	2	20535.6 0, 0, 0	8325999.1 3, 3, 66
31	3	12823.1 0, 0, 0	11518589.2 1, 1, 16
31	4	4061.1 0, 0, 0	3767377 1, 1, 19
41	1	71061.2 0, 0, 0	2479825.4 2, 8, 160
41	2	30049.3 0, 0, 0	239609.4 0, 0, 0
41	3	33478.1 0, 0, 0	231989.8 1, 2, 32
41	4	18400.1 0, 0, 0	297531.7 0, 0, 0
51	1	273.6 0, 0, 0	22194.4 0, 0, 0
51	2	3222 0, 0, 0	141551.6 0, 0, 0
51	3	2470.6 0, 0, 0	443558.9 0, 0, 0
51	4	1781.4 0, 0, 0	59209.9 0, 0, 0
43	1	50516.8 0, 0, 0	260072.1 0, 0, 0
43	2	62802.7 0, 0, 0	2281927.7 0, 0, 0
43	3	60558.3 0, 0, 0	317204.8 0, 0, 0
43	4	92377.7 0, 0, 0	122574.2 0, 0, 0

Total catch= 61346290.2

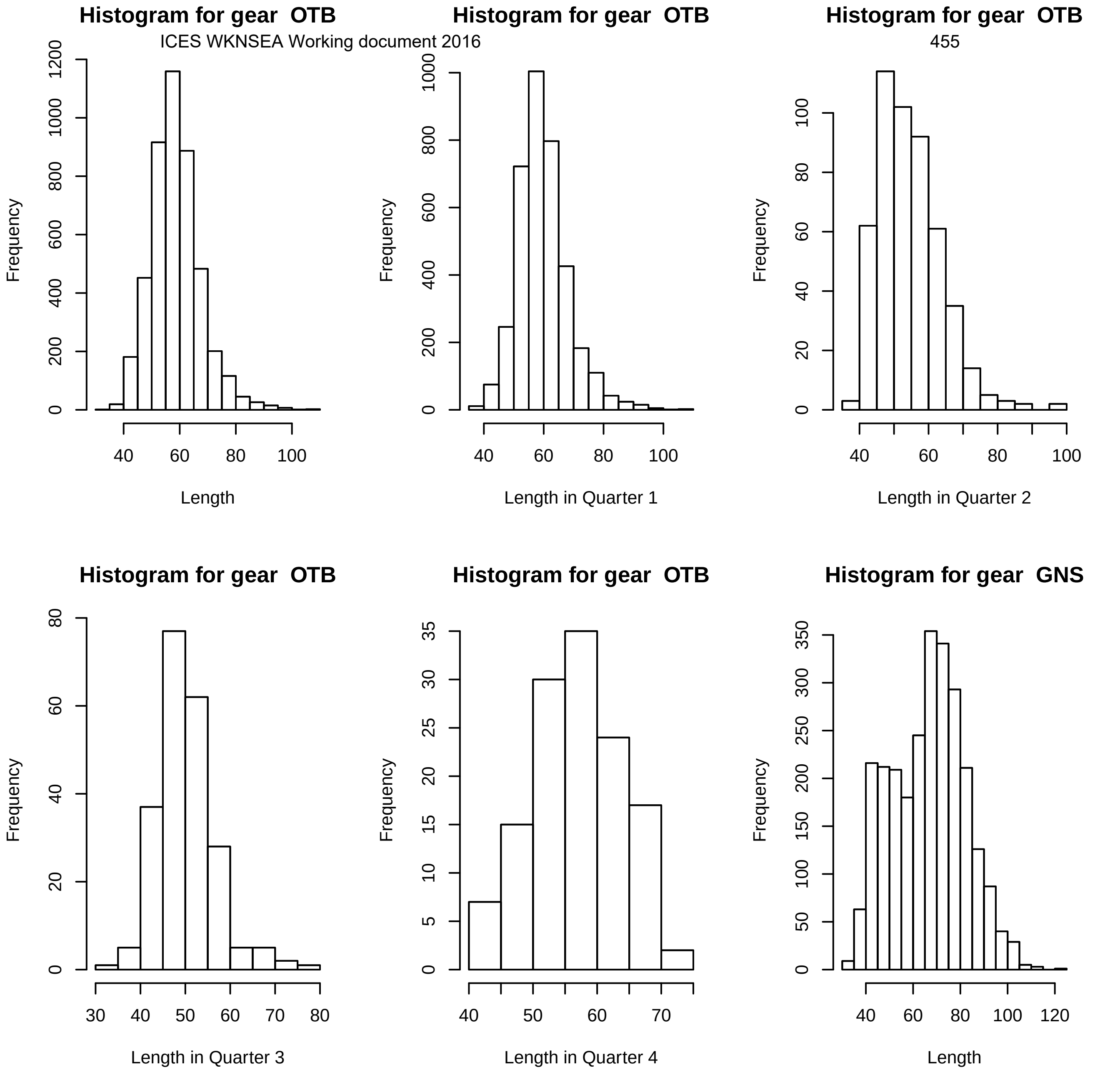
#Boats sampled= 14

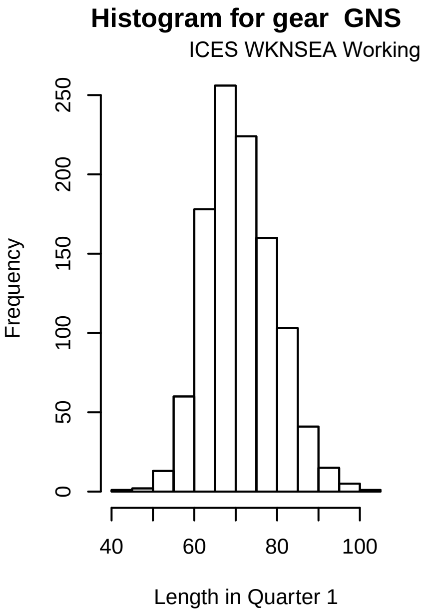
Sampled catch=56696212.9(92)%

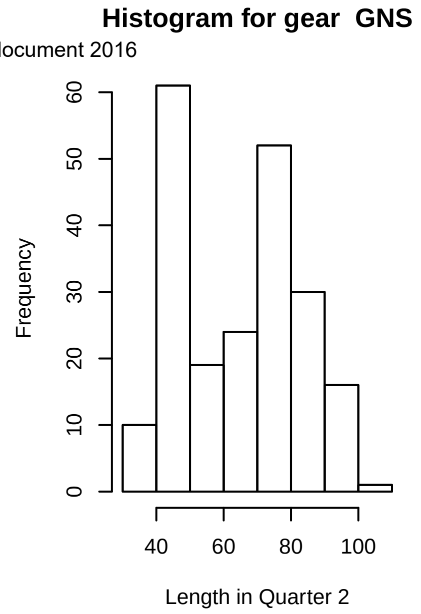
#Serienr sampled= 37

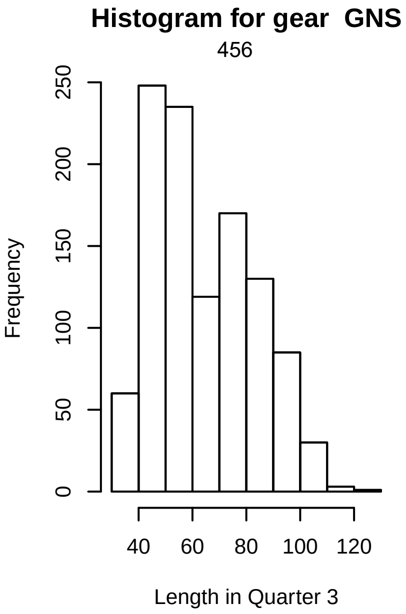
Sampled catch required for DB estimation=41410246.7(68)%

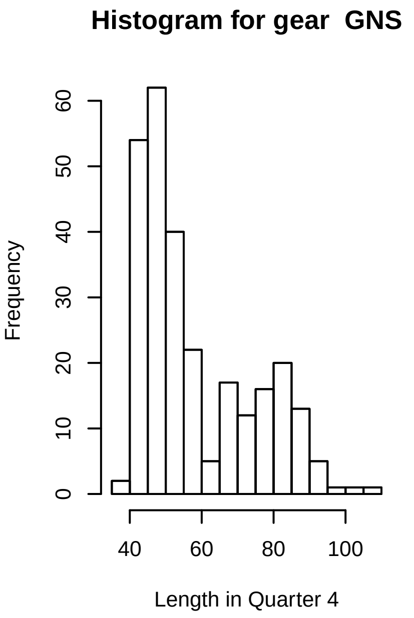
#Fish sampled= 720

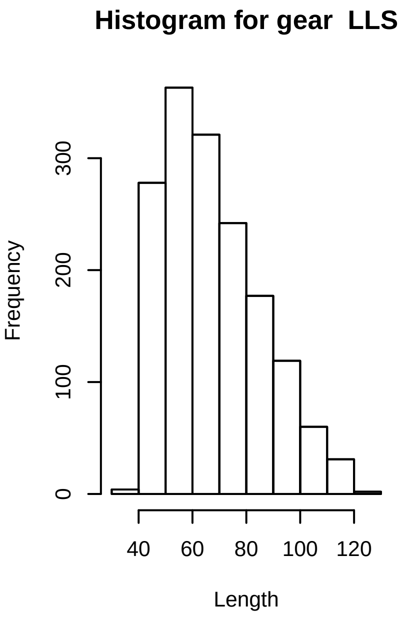

Histogram for gear OTB
Frequency
0
200
400
600
800
1000
1200
40
60
80
100
Length
Histogram for gear OTB
Frequency
0
200
400
600
800
1000
40
60
80
100
Length in Quarter 1
Histogram for gear OTB
Frequency
0
20
40
60
80
100
40
60
80
100
Length in Quarter 2
Histogram for gear OTB
Frequency
0
20
40
60
80
30
40
50
60
70
80
Length in Quarter 3
Histogram for gear OTB
Frequency
0
5
10
15
20
25
30
35
40
50
60
70
Length in Quarter 4
Histogram for gear GNS
Frequency
0
50
100
150
200
250
300
350
40
60
80
100
120
Length

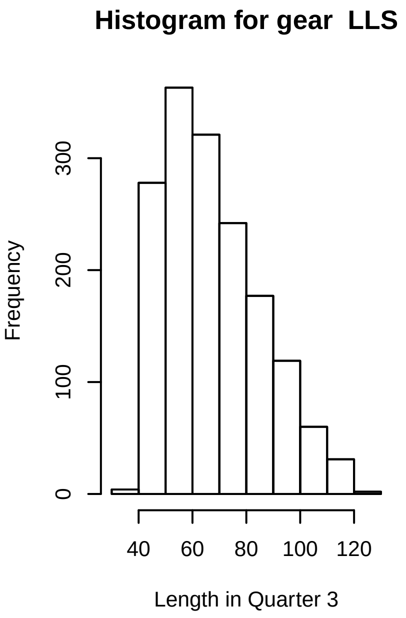

Histogram for gear GNS
Frequency
0
50
100
150
200
250
40
60
80
100
Length in Quarter 1

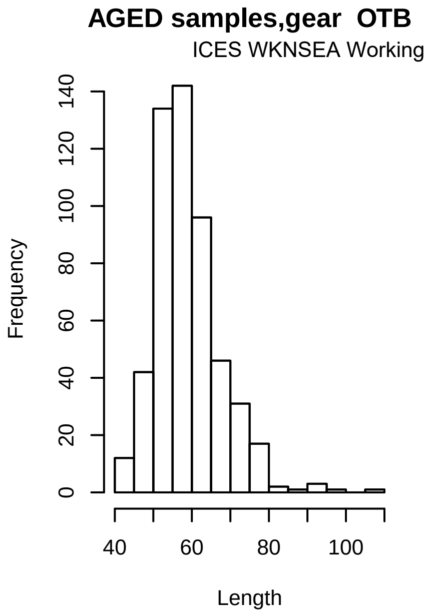

Histogram for gear GNS
Frequency
0
10
20
30
40
50
60
40
60
80
100
Length in Quarter 2

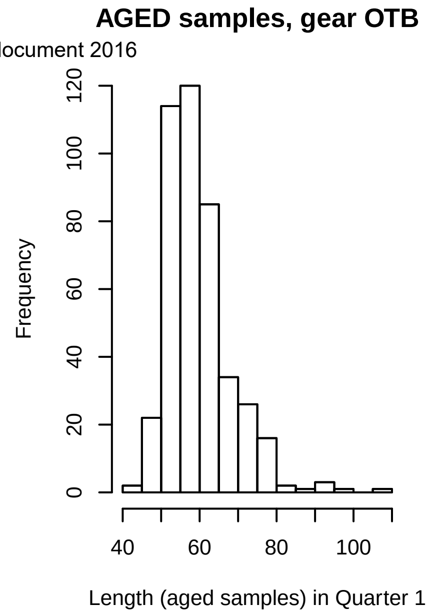

Histogram for gear GNS
Frequency
0
50
100
150
200
250
40
60
80
100
120
Length in Quarter 3

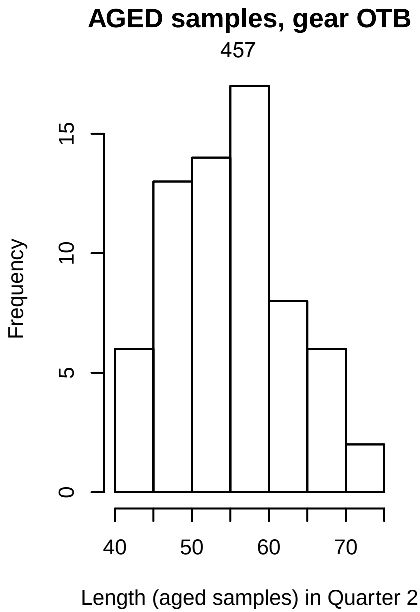

Histogram for gear GNS
Frequency
0
10
20
30
40
50
60
40
60
80
100
Length in Quarter 4

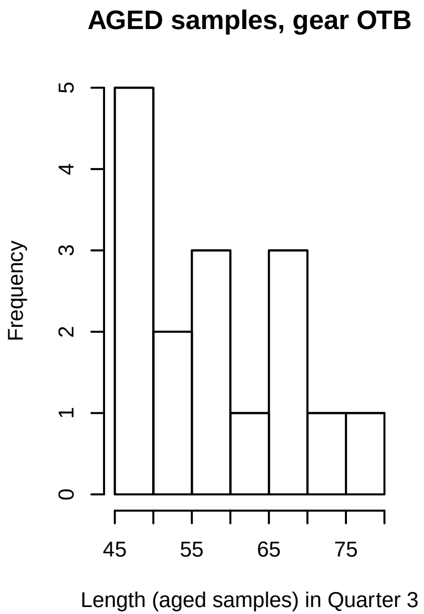

Histogram for gear LLS
Frequency
0
100
200
300
40
60
80
100
120
Length

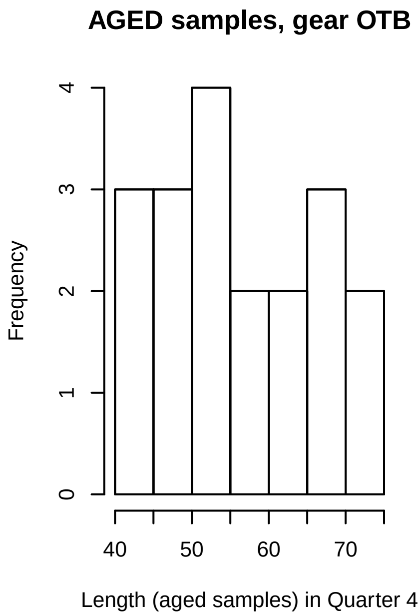

Histogram for gear LLS
Frequency
0
100
200
300
40
60
80
100
120
Length in Quarter 3

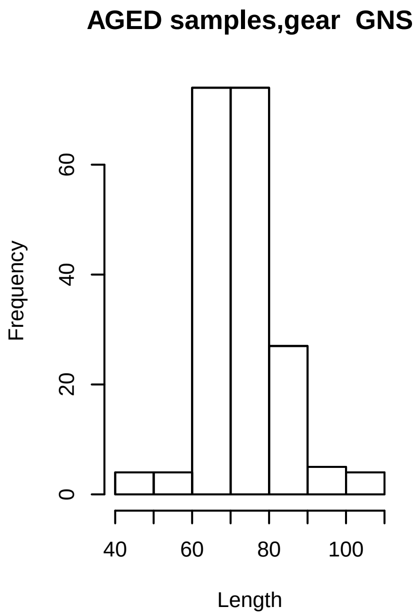

AGED samples,gear OTB
Frequency
0
20
40
60
80
100
120
140
40
60
80
100
Length

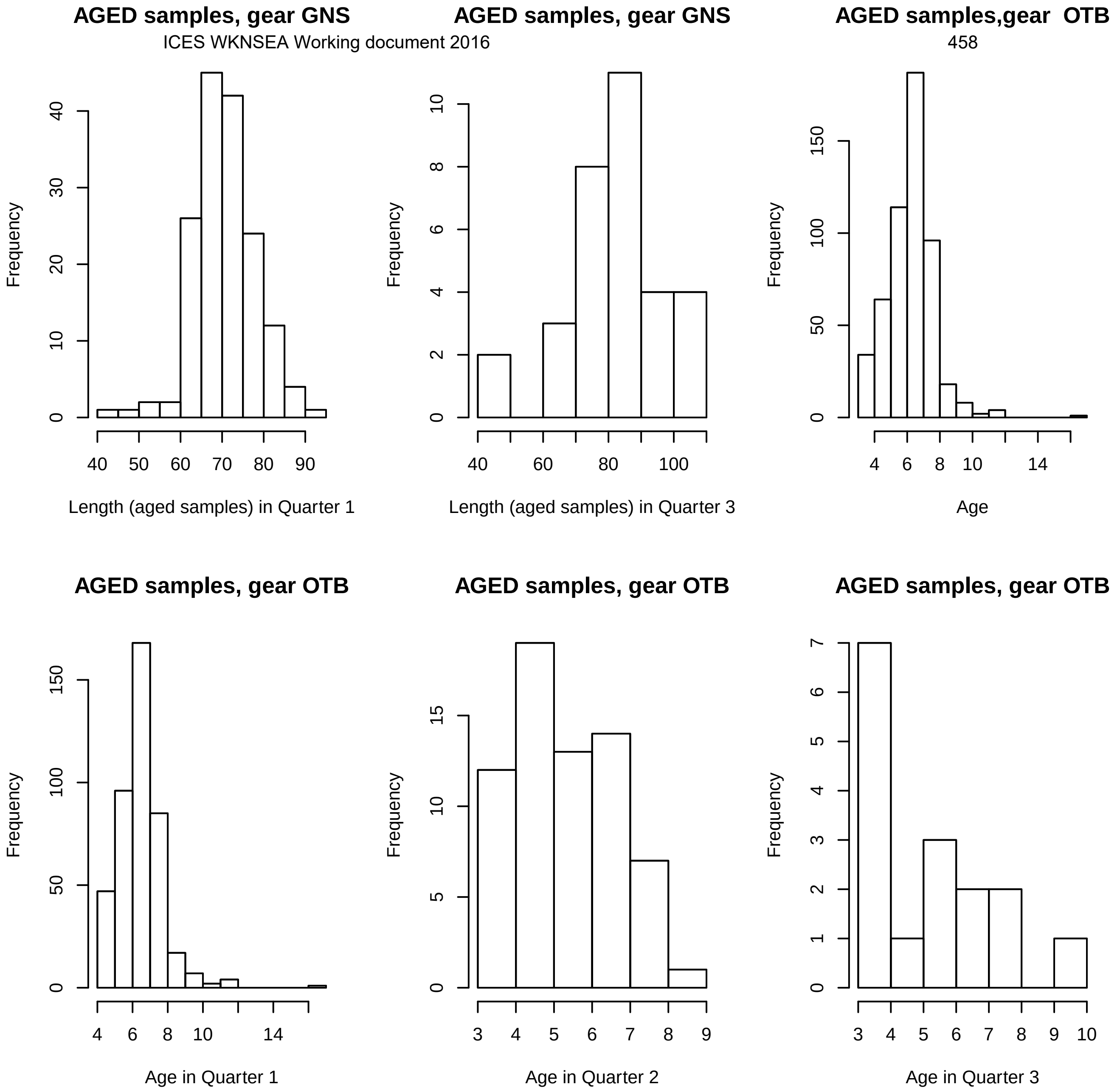

AGED samples, gear OTB
Frequency
0
20
40
60
80
100
120
40
60
80
100
Length (aged samples) in Quarter 1

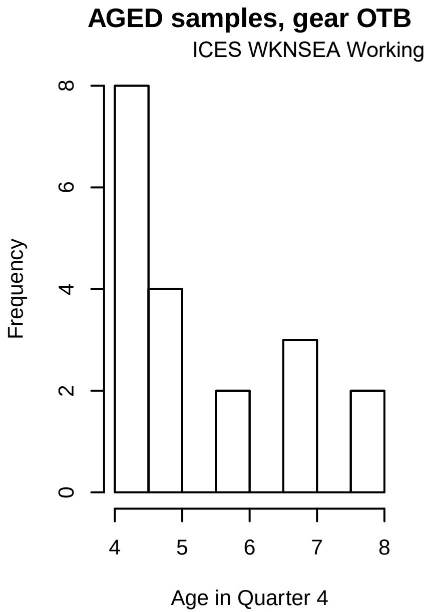

AGED samples, gear OTB
Frequency
0
5
10
15
40
50
60
70
Length (aged samples) in Quarter 2

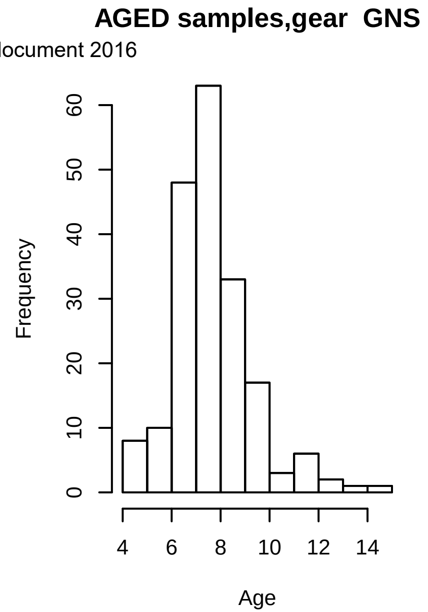

AGED samples, gear OTB
Frequency
0
1
2
3
4
5
45
55
65
75
Length (aged samples) in Quarter 3

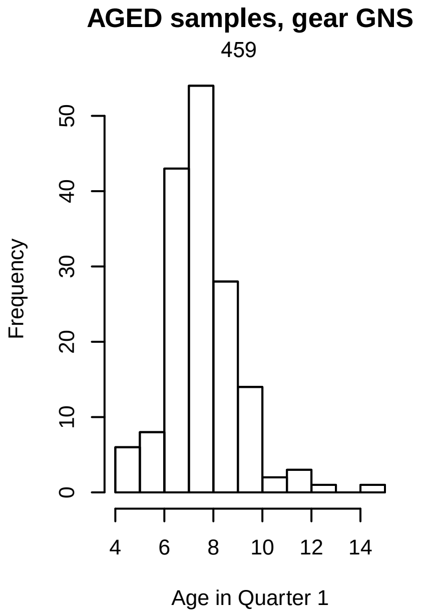

AGED samples, gear OTB
Frequency
0
1
2
3
4
40
50
60
70
Length (aged samples) in Quarter 4

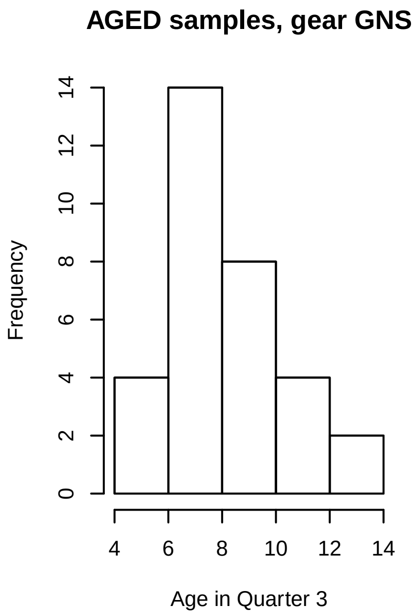

AGED samples,gear GNS
Frequency
0
20
40
60
40
60
80
100
Length

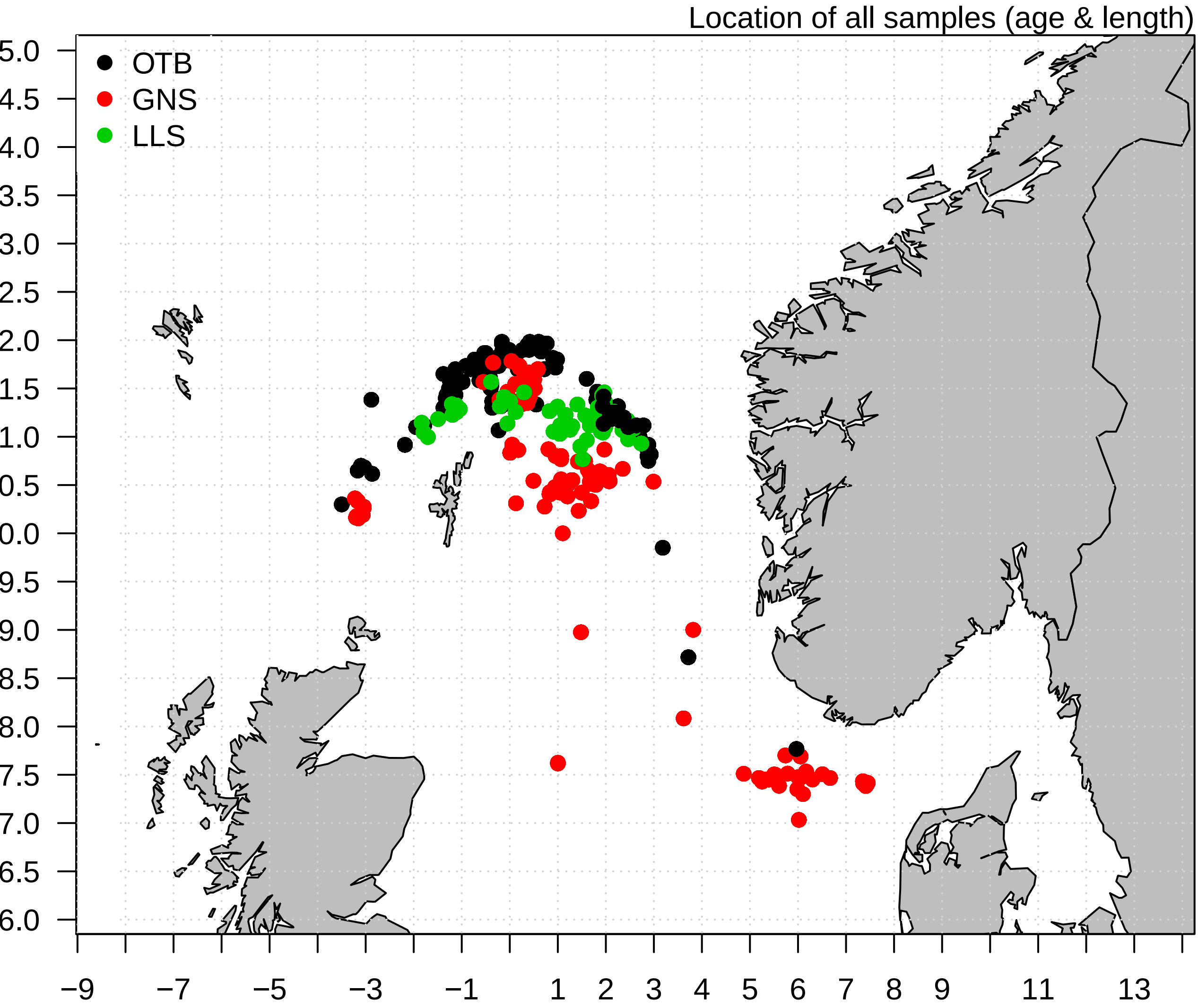

AGED samples, gear GNS
Frequency
0
10
20
30
40
40
50
60
70
80
90
Length (aged samples) in Quarter 1
AGED samples, gear GNS
Frequency
0
2
4
6
8
10
40
60
80
100
Length (aged samples) in Quarter 3
AGED samples,gear OTB
Frequency
0
50
100
150
4
6
8
10
14
Age
AGED samples, gear OTB
Frequency
0
50
100
150
4
6
8
10
14
Age in Quarter 1
AGED samples, gear OTB
Frequency
0
5
10
15
3
4
5
6
7
8
9
Age in Quarter 2
AGED samples, gear OTB
Frequency
0
1
2
3
4
5
6
7
3
4
5
6
7
8
9
10
Age in Quarter 3

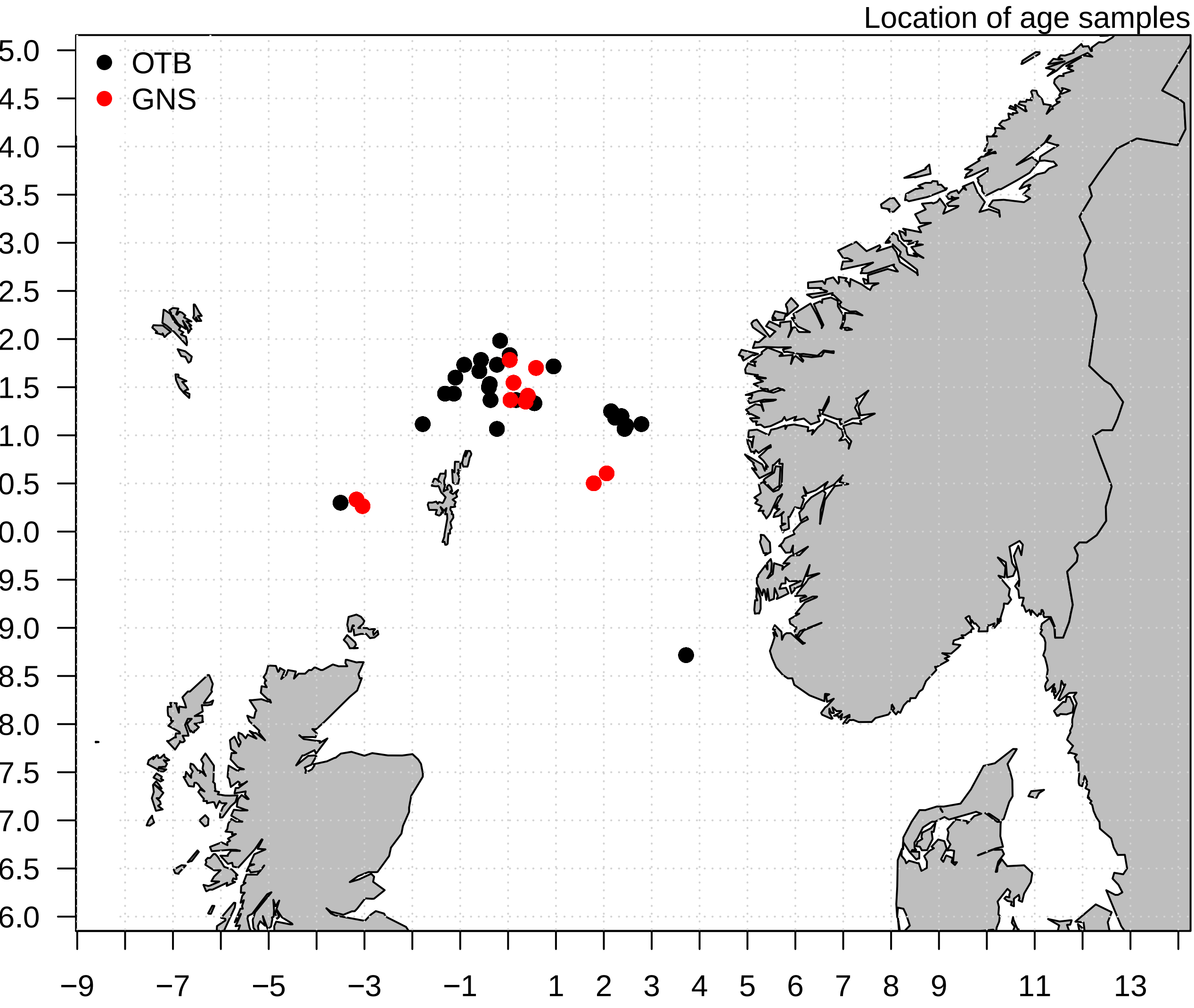

AGED samples, gear OTB
Frequency
0
2
4
6
8
4
5
6
7
8
Age in Quarter 4

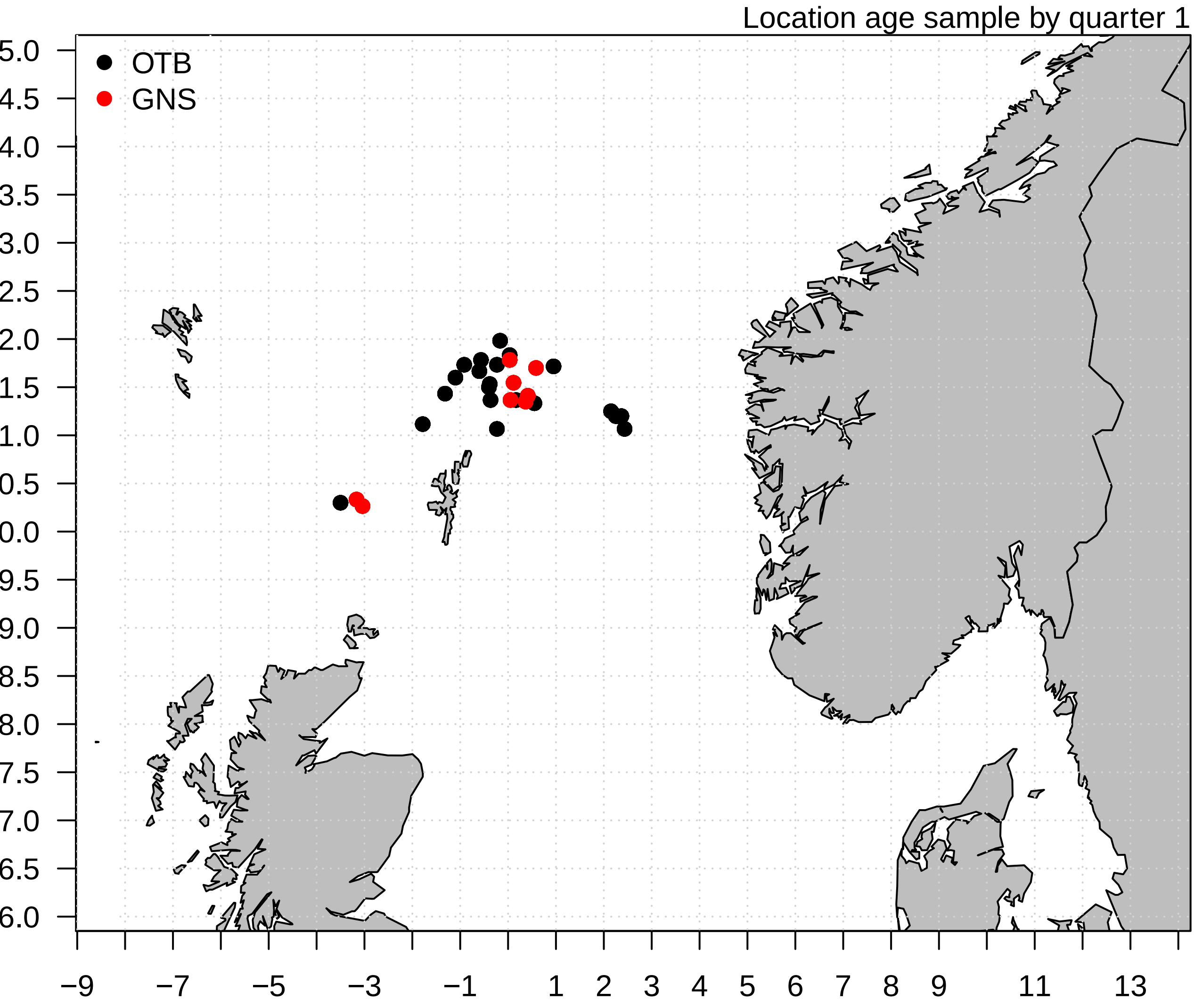

AGED samples,gear GNS
Frequency
0
10
20
30
40
50
60
4
6
8
10
12
14
Age

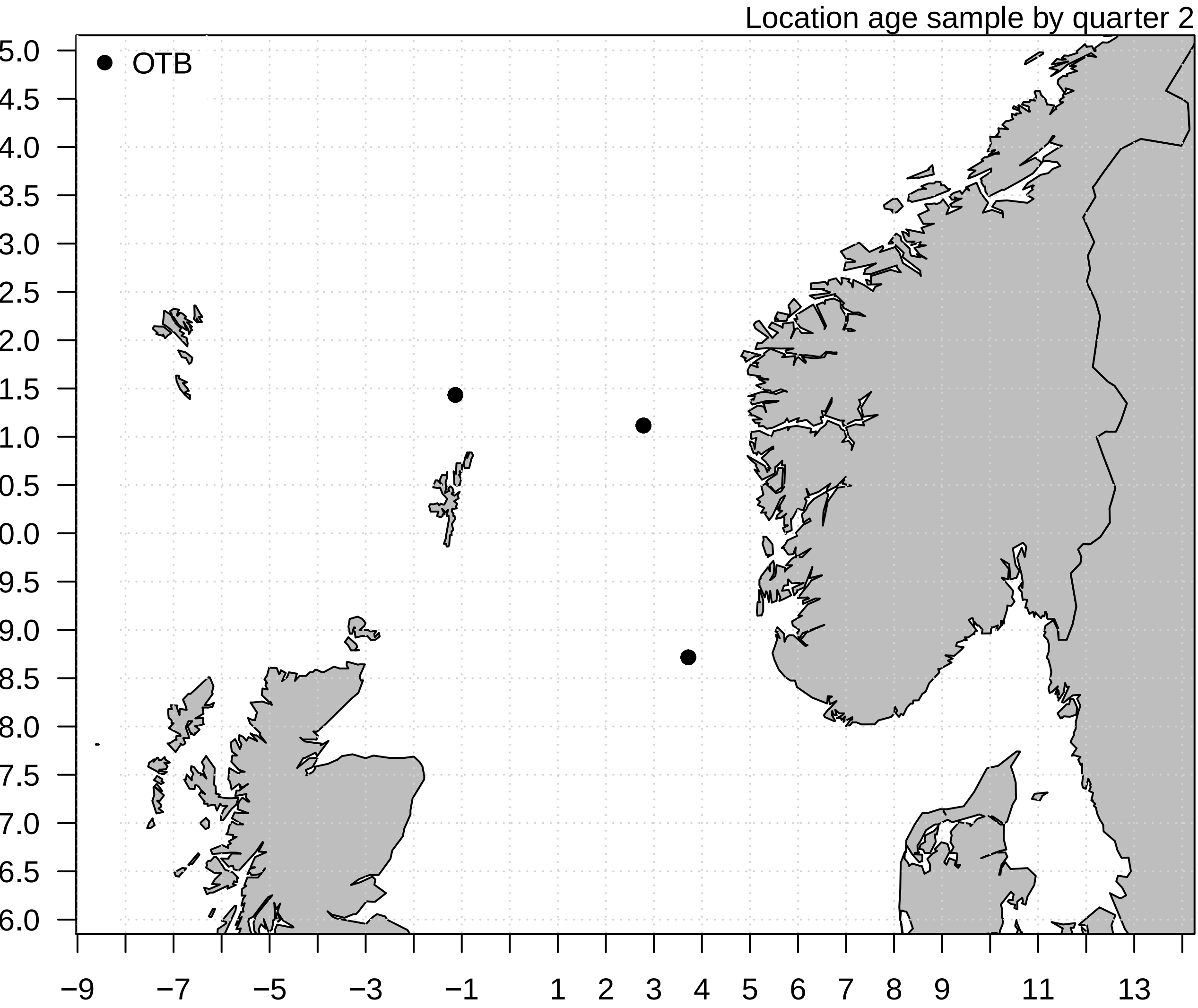

AGED samples, gear GNS
Frequency
0
10
20
30
40
50
4
6
8
10
12
14
Age in Quarter 1

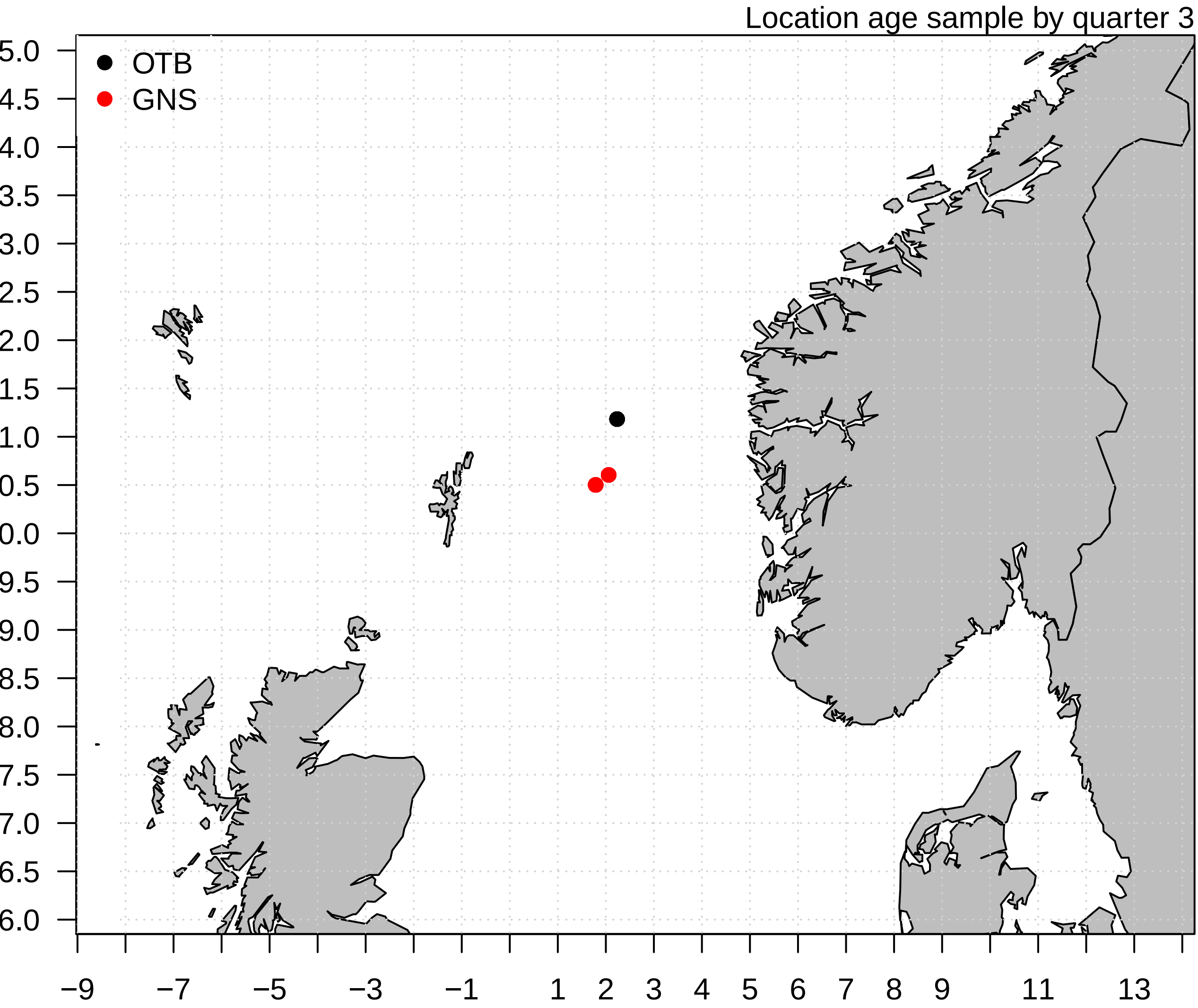

AGED samples, gear GNS
Frequency
0
2
4
6
8
10
12
14
4
6
8
10
12
14
Age in Quarter 3

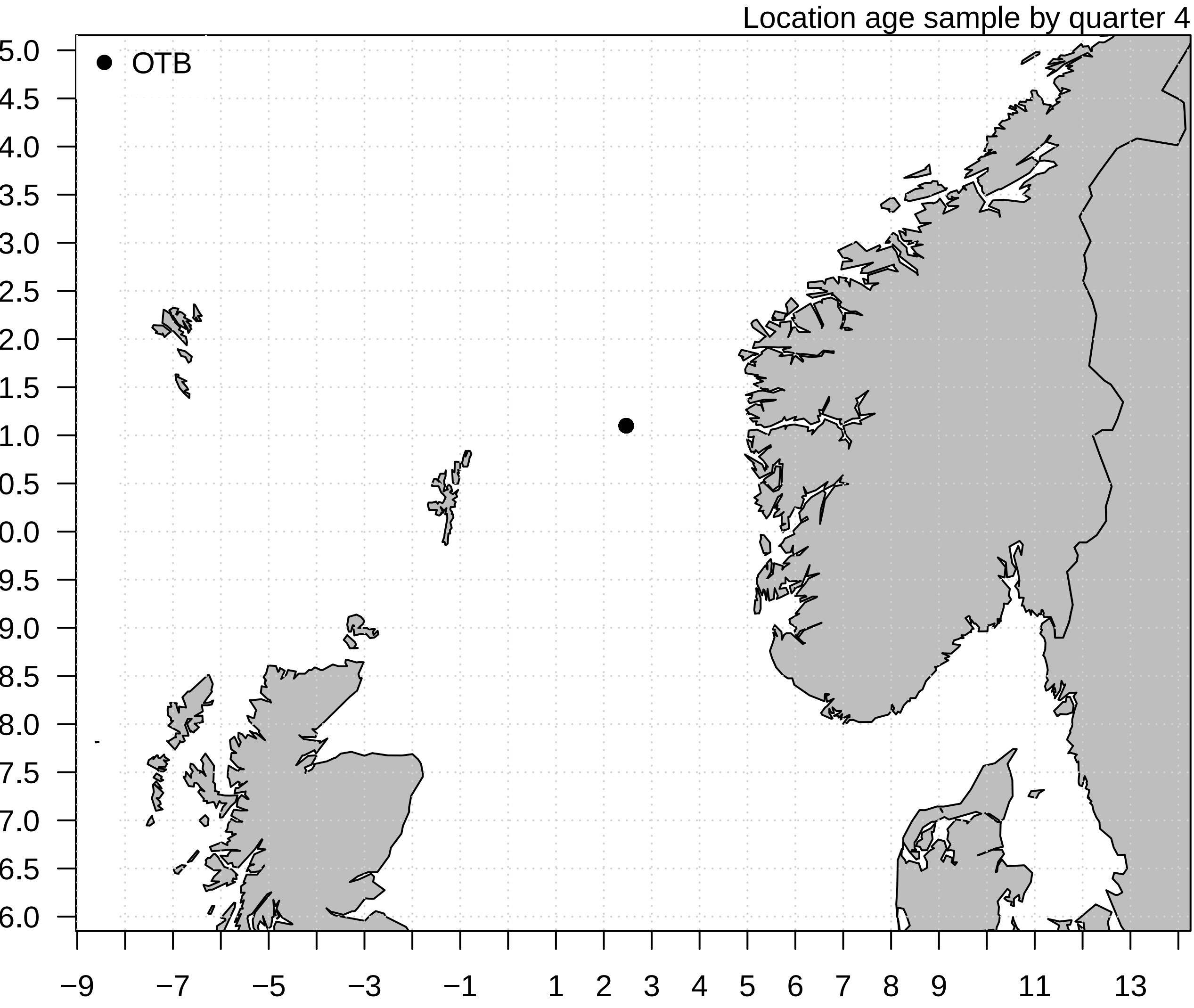

Location of all samples (age & length)
OTB
GNS
LLS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

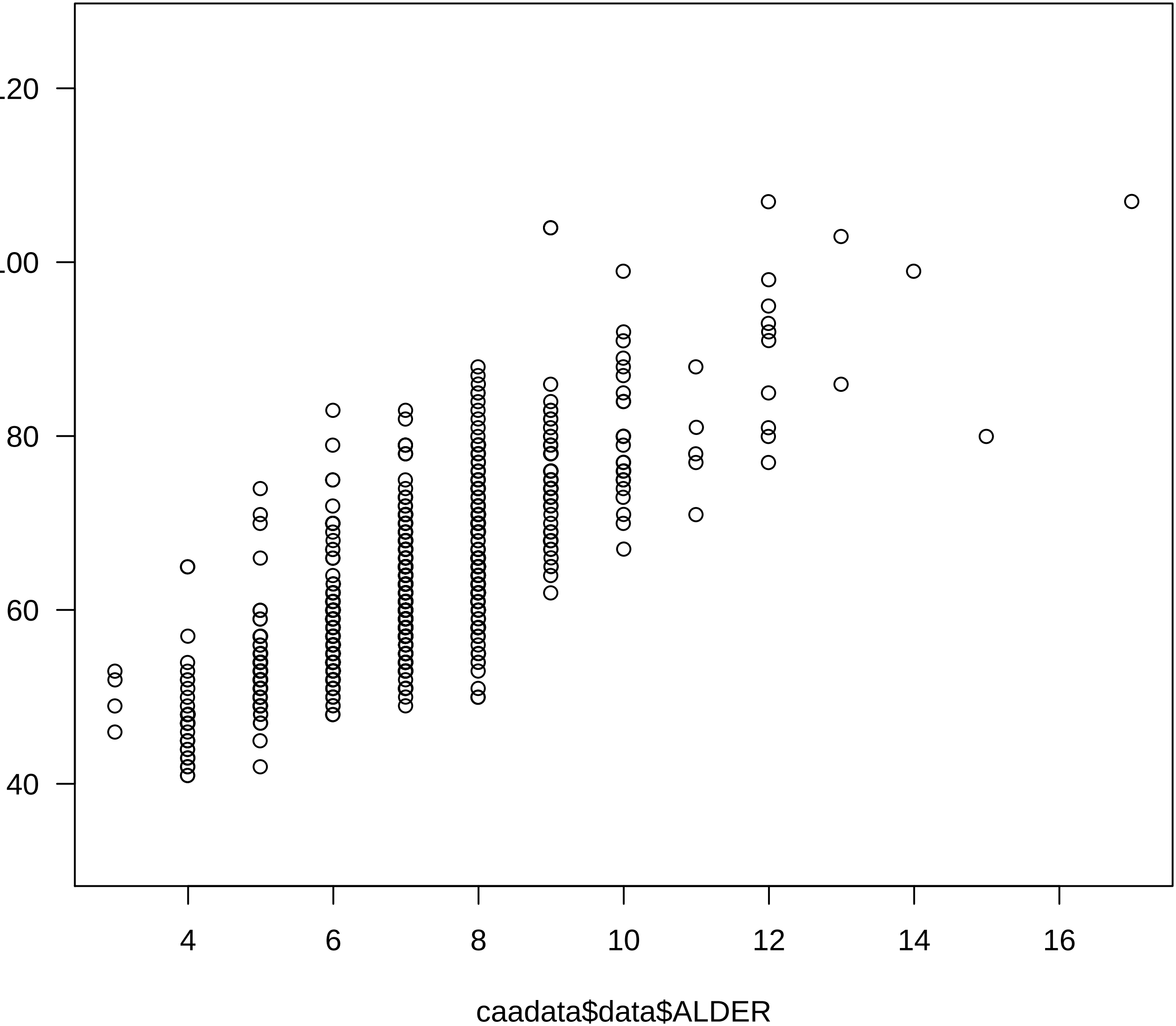

Location of age samples
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 1
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

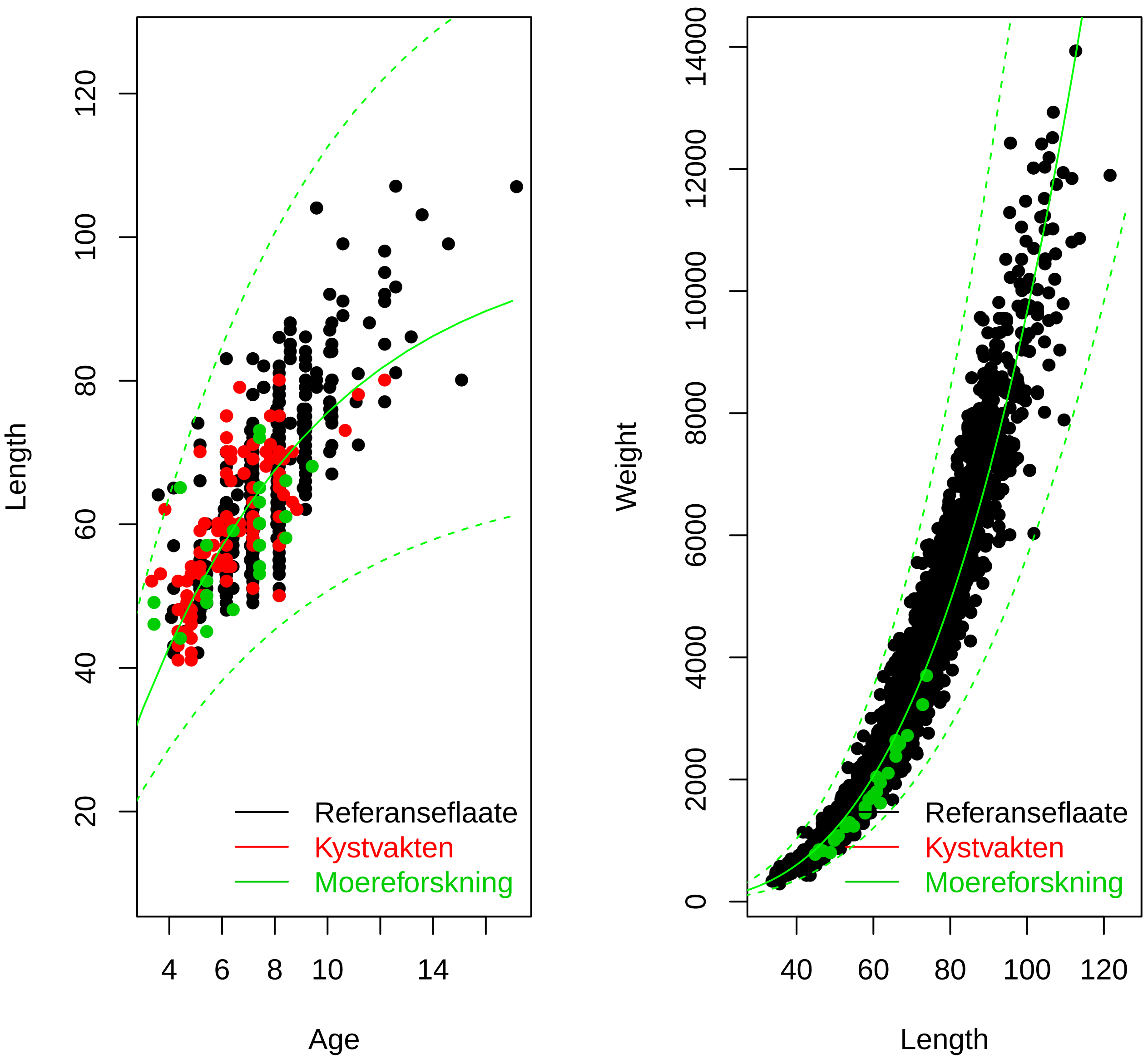

Location age sample by quarter 2
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 3
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 4
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


120
100
80
60
40
4
6
8
10
12
14
16
caadata$data$ALDER

Debugging data based on age−length−weight: SEI 2006



2007 length samples

Gear	Q '\' A	9	8
31	1	8160 0, 0, 0	20613971 7, 92, 5702
31	2	51750 0, 0, 0	9105017.6 3, 22, 1452
31	3	186686.4 0, 0, 0	6407264.1 4, 6, 643
31	4	165331 0, 0, 0	1518462.7 0, 0, 0
41	1	70395.1 2, 7, 411	3532493.9 3, 19, 1091
41	2	25855.8 1, 1, 60	295042.1 2, 16, 416
41	3	15732.7 1, 2, 45	295043.1 3, 36, 810
41	4	56160 2, 8, 435	311860.9 2, 21, 444
51	1	1941 0, 0, 0	12961 0, 0, 0
51	2	5049 0, 0, 0	66436 1, 9, 431
51	3	1826.4 0, 0, 0	595544.2 2, 58, 3022
51	4	2403.6 0, 0, 0	65242.6 0, 0, 0
43	1	34549.9 0, 0, 0	243130.7 0, 0, 0
43	2	73062.7 0, 0, 0	1803427.3 0, 0, 0
43	3	25901.3 0, 0, 0	548048.5 0, 0, 0
43	4	27646.4 0, 0, 0	229544.9 0, 0, 0

Total catch= 46395941.9

Sampled catch=41390816.5(89)%

Sampled catch required for DB estimation=41364960.7(89)%

#Boats sampled= 33

#Serienr sampled= 297

#Fish sampled= 14962

2007 age samples

Gear	Q '\' A	9	8
31	1	8160 0, 0, 0	20613971 3, 19, 362
31	2	51750 0, 0, 0	9105017.6 2, 3, 59
31	3	186686.4 0, 0, 0	6407264.1 1, 1, 21
31	4	165331 0, 0, 0	1518462.7 0, 0, 0
41	1	70395.1 0, 0, 0	3532493.9 1, 1, 20
41	2	25855.8 0, 0, 0	295042.1 0, 0, 0
41	3	15732.7 0, 0, 0	295043.1 0, 0, 0
41	4	56160 0, 0, 0	311860.9 0, 0, 0
51	1	1941 0, 0, 0	12961 0, 0, 0
51	2	5049 0, 0, 0	66436 0, 0, 0
51	3	1826.4 0, 0, 0	595544.2 0, 0, 0
51	4	2403.6 0, 0, 0	65242.6 0, 0, 0
43	1	34549.9 0, 0, 0	243130.7 0, 0, 0
43	2	73062.7 0, 0, 0	1803427.3 0, 0, 0
43	3	25901.3 0, 0, 0	548048.5 0, 0, 0
43	4	27646.4 0, 0, 0	229544.9 0, 0, 0

Total catch= 46395941.9

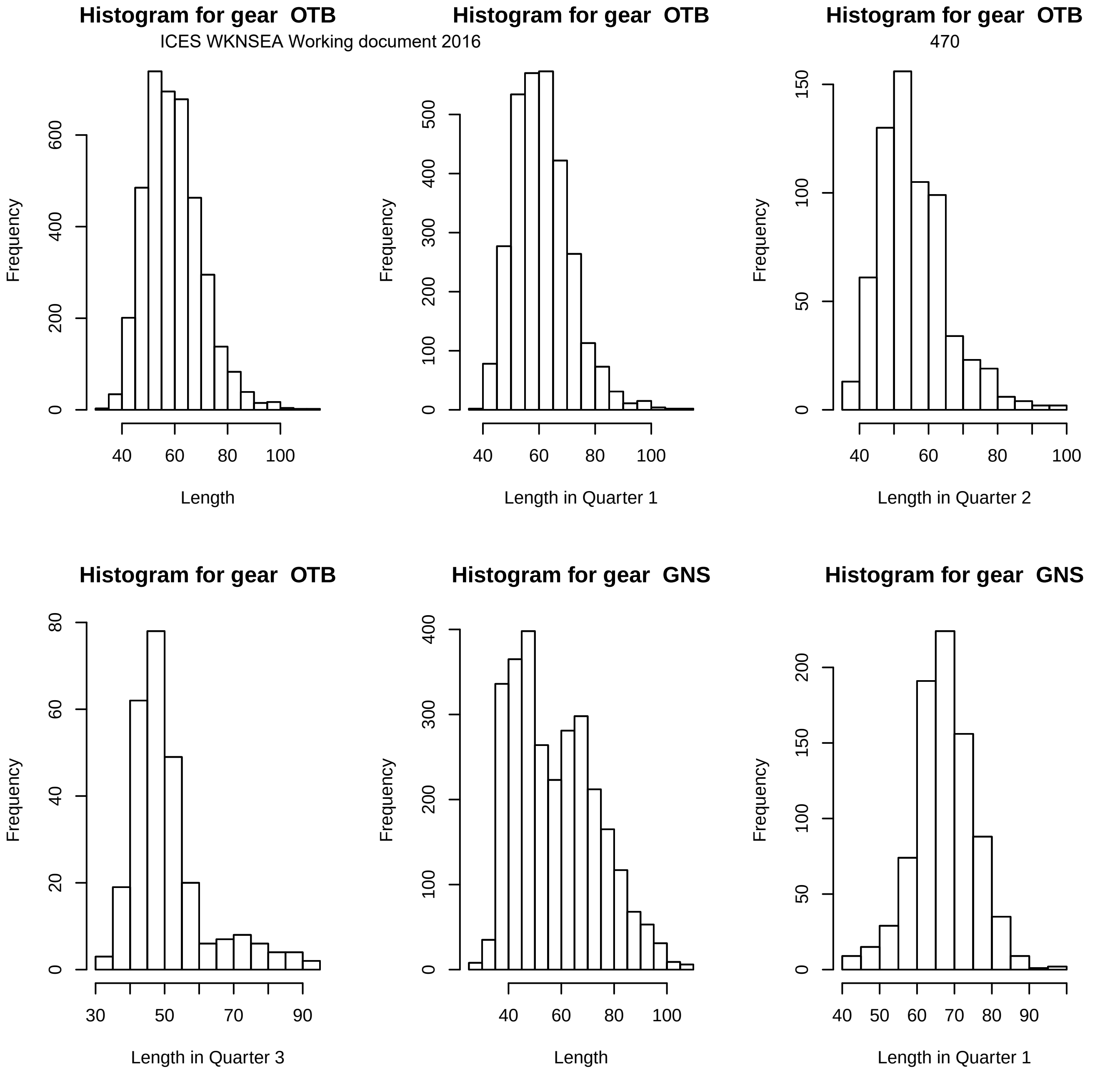
Sampled catch=39658746.6(85)%

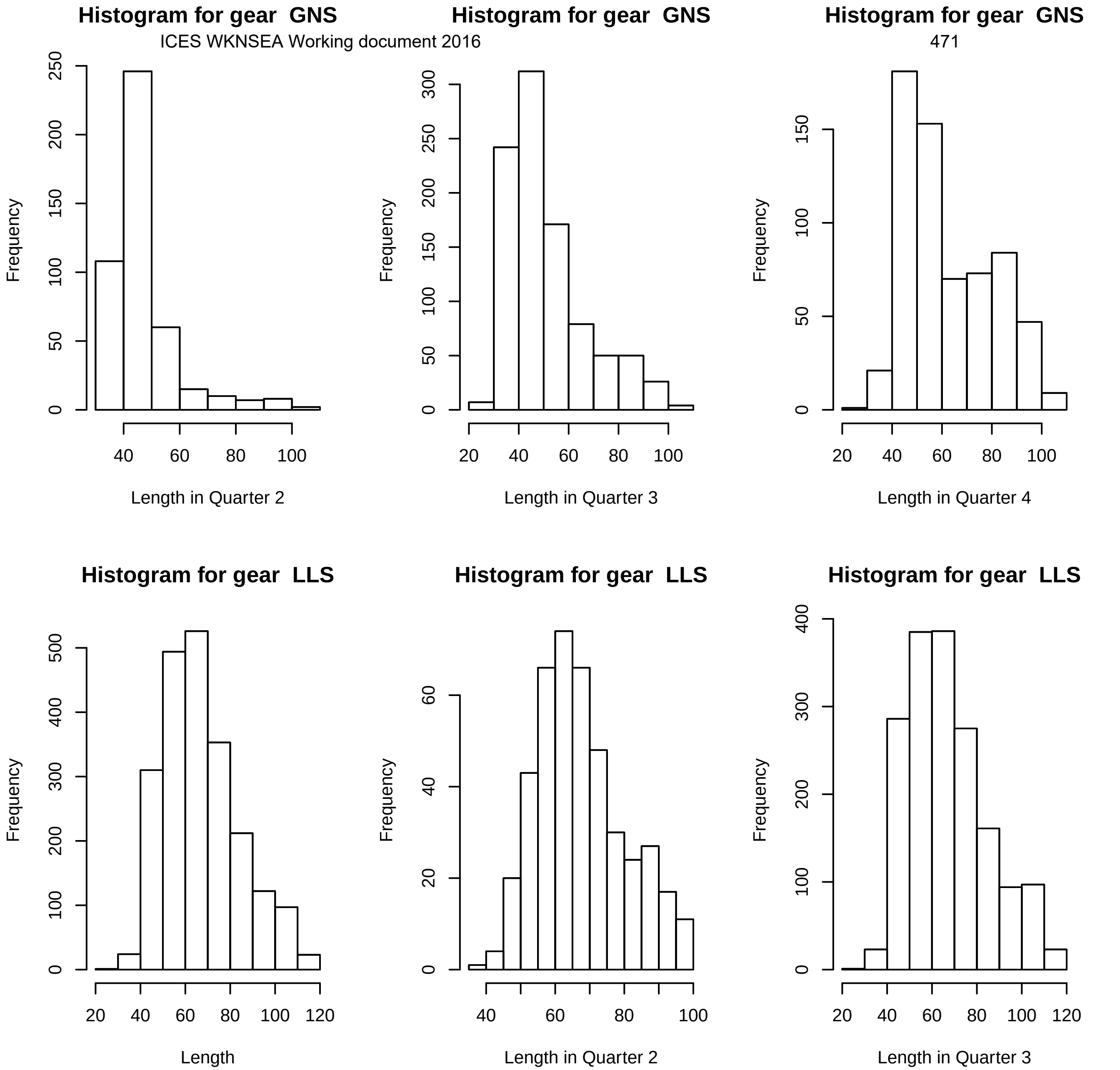
Sampled catch required for DB estimation=29718988.6(64)%

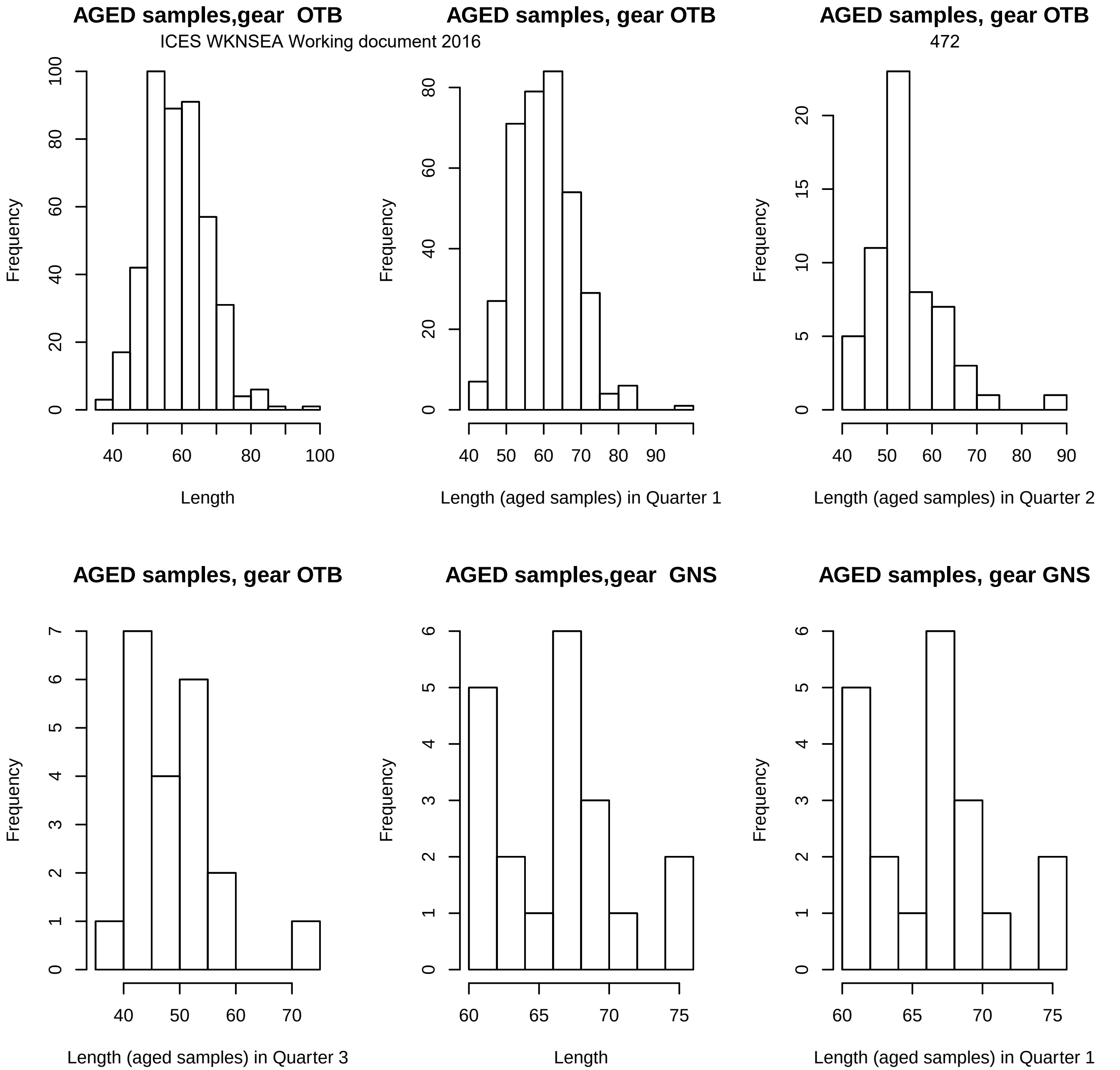
#Boats sampled= 7

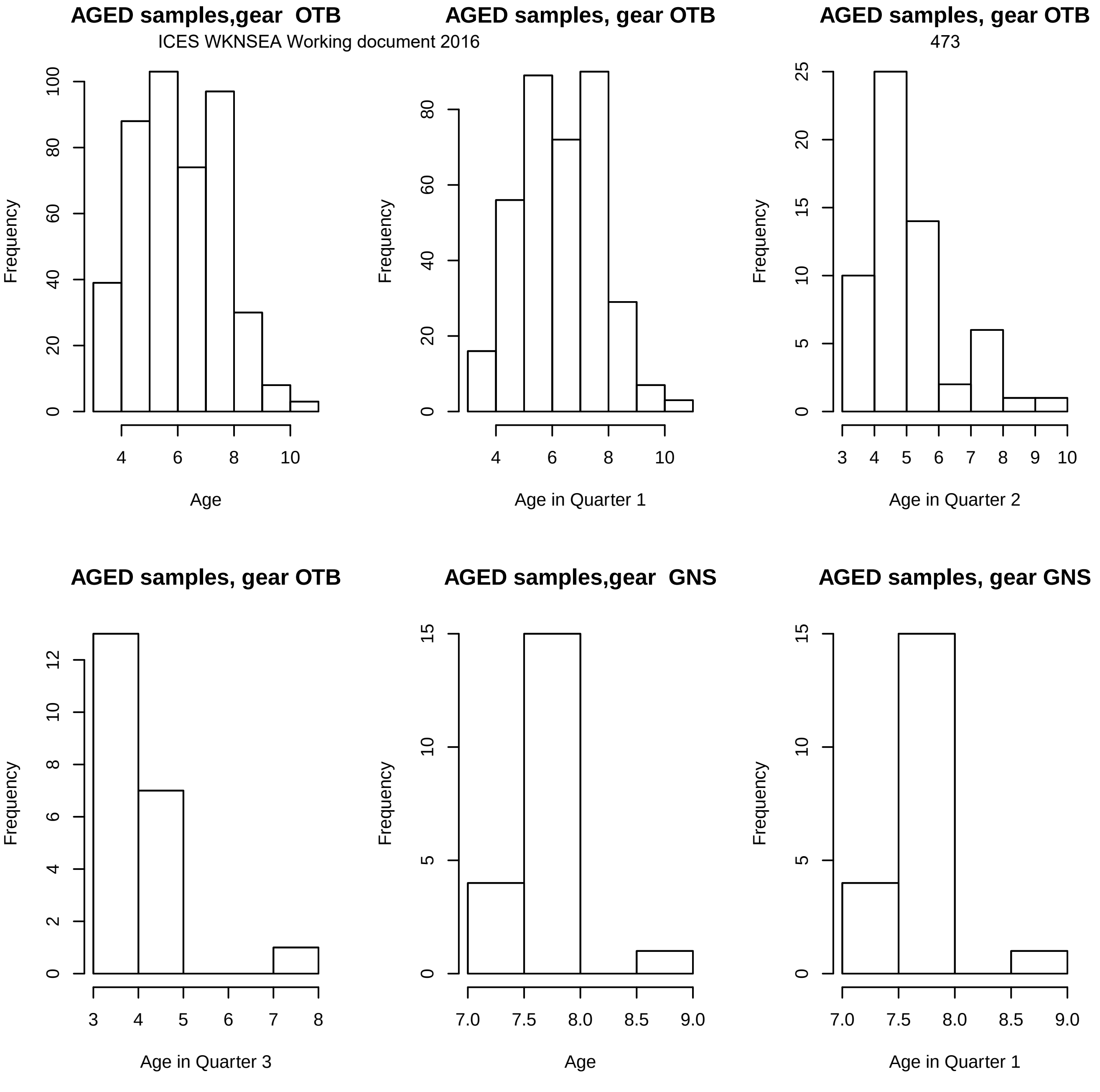
#Serienr sampled= 24

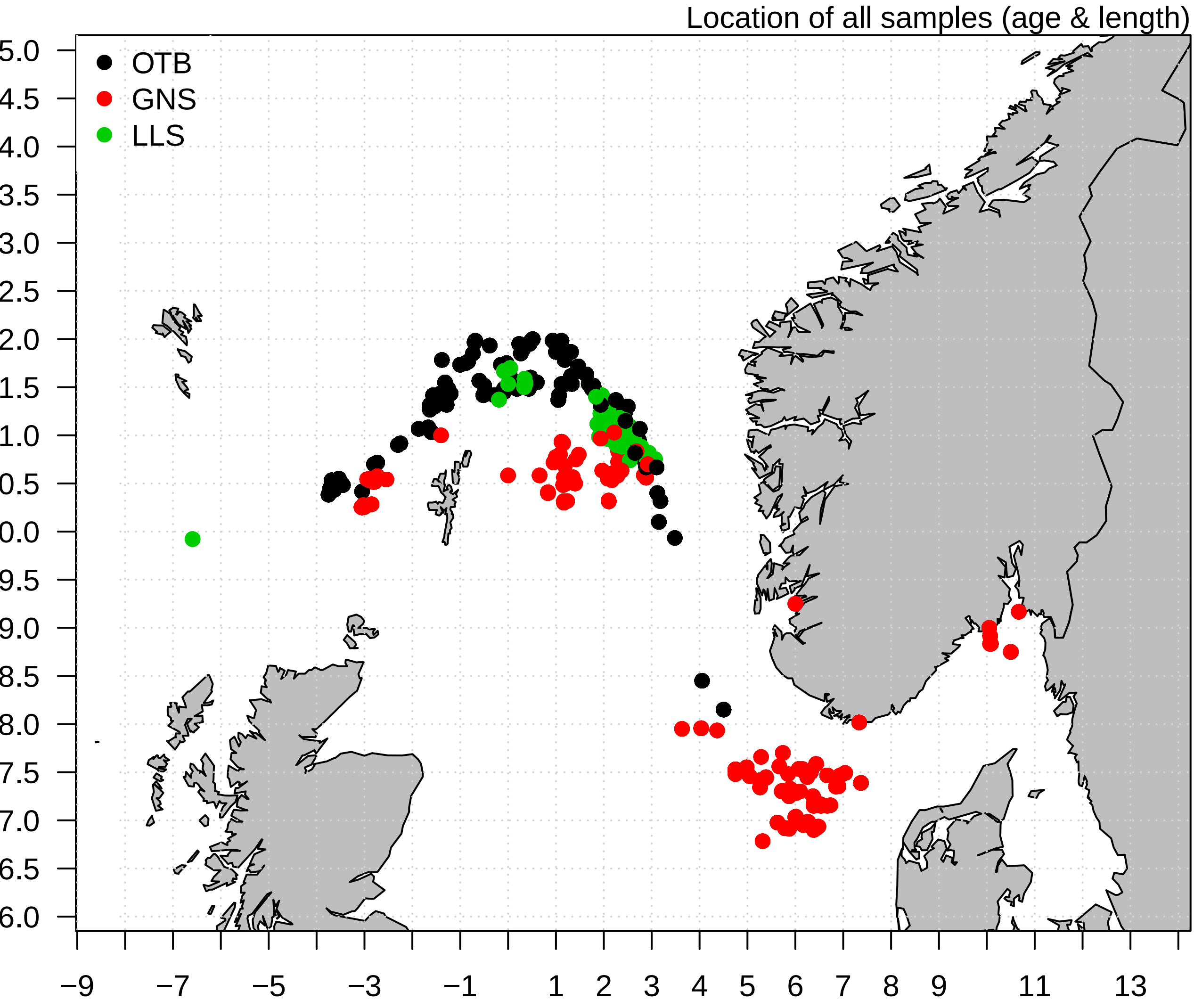
#Fish sampled= 462

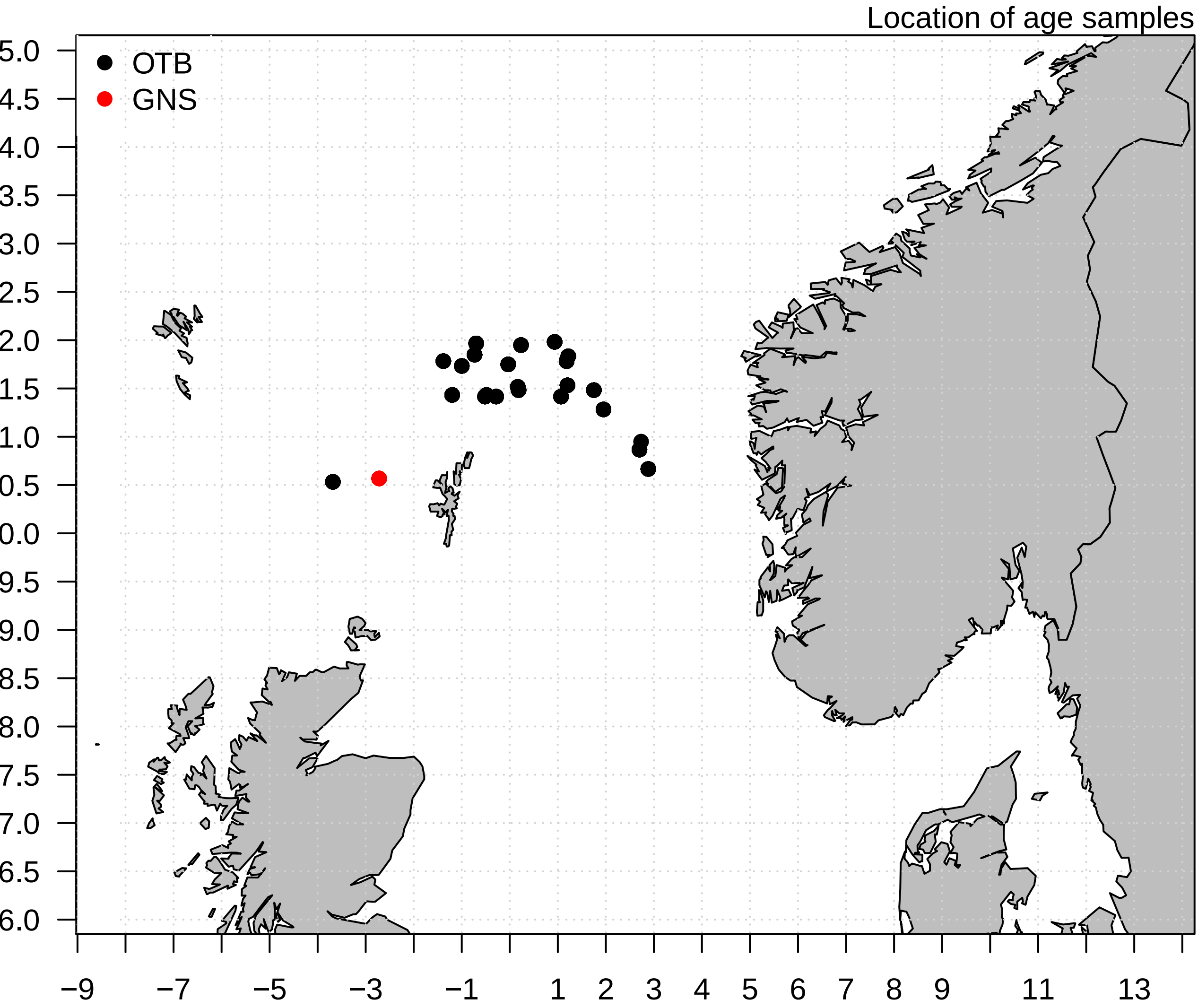

Histogram for gear OTB
Frequency
Length
Histogram for gear OTB
Frequency
Length in Quarter 1
Histogram for gear OTB
Frequency
Length in Quarter 2
Histogram for gear OTB
Frequency
Length in Quarter 3
Histogram for gear GNS
Frequency
Length
Histogram for gear GNS
Frequency
Length in Quarter 1

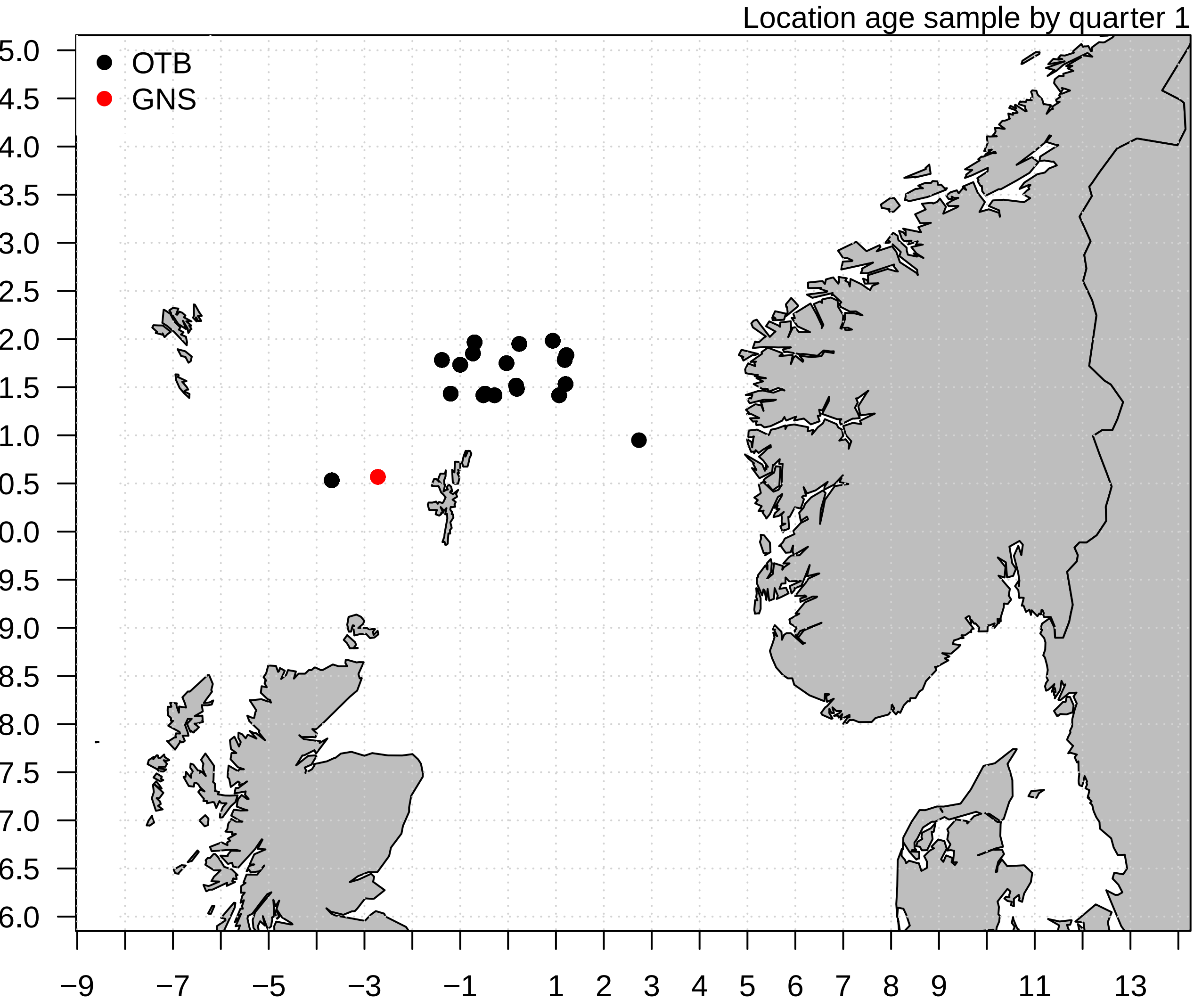

Histogram for gear GNS
Frequency
Length in Quarter 2
Histogram for gear GNS
Frequency
Length in Quarter 3
Histogram for gear GNS
Frequency
Length in Quarter 4
Histogram for gear LLS
Frequency
Length
Histogram for gear LLS
Frequency
Length in Quarter 2
Histogram for gear LLS
Frequency
Length in Quarter 3


AGED samples,gear OTB
Frequency
0 20 40 60 80 100
40 60 80 100
Length
AGED samples, gear OTB
Frequency
0 20 40 60 80
40 50 60 70 80 90
Length (aged samples) in Quarter 1
AGED samples, gear OTB
Frequency
0 5 10 15 20
40 50 60 70 80 90
Length (aged samples) in Quarter 2
AGED samples, gear OTB
Frequency
0 1 2 3 4 5 6 7
40 50 60 70
Length (aged samples) in Quarter 3
AGED samples,gear GNS
Frequency
0 1 2 3 4 5 6
60 65 70 75
Length
AGED samples, gear GNS
Frequency
0 1 2 3 4 5 6
60 65 70 75
Length (aged samples) in Quarter 1

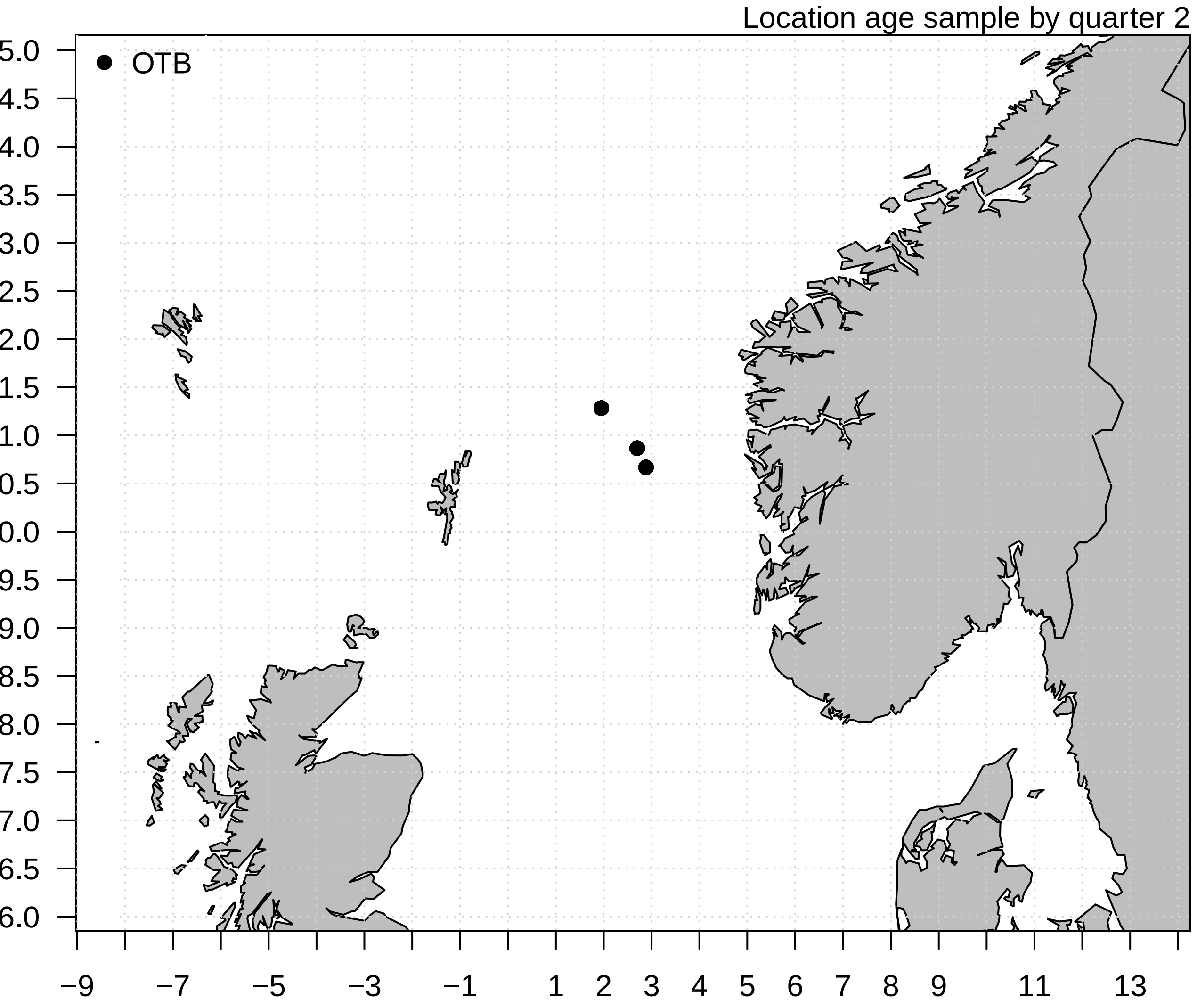

AGED samples,gear OTB
Frequency
Age
AGED samples, gear OTB
Frequency
Age in Quarter 1
AGED samples, gear OTB
Frequency
Age in Quarter 2
AGED samples, gear OTB
Frequency
Age in Quarter 3
AGED samples,gear GNS
Frequency
Age
AGED samples, gear GNS
Frequency
Age in Quarter 1

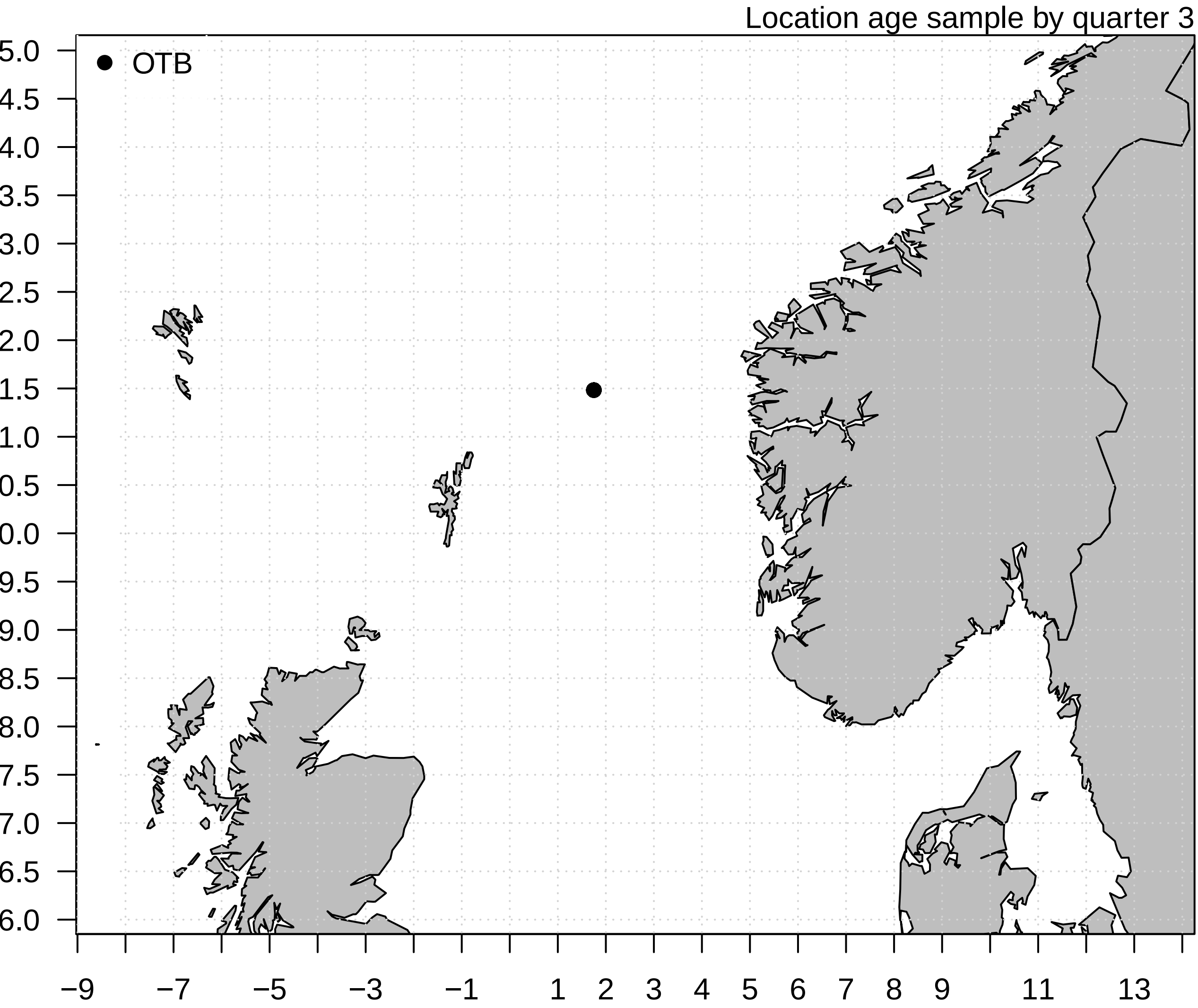

Location of all samples (age & length)
OTB
GNS
LLS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location of age samples
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

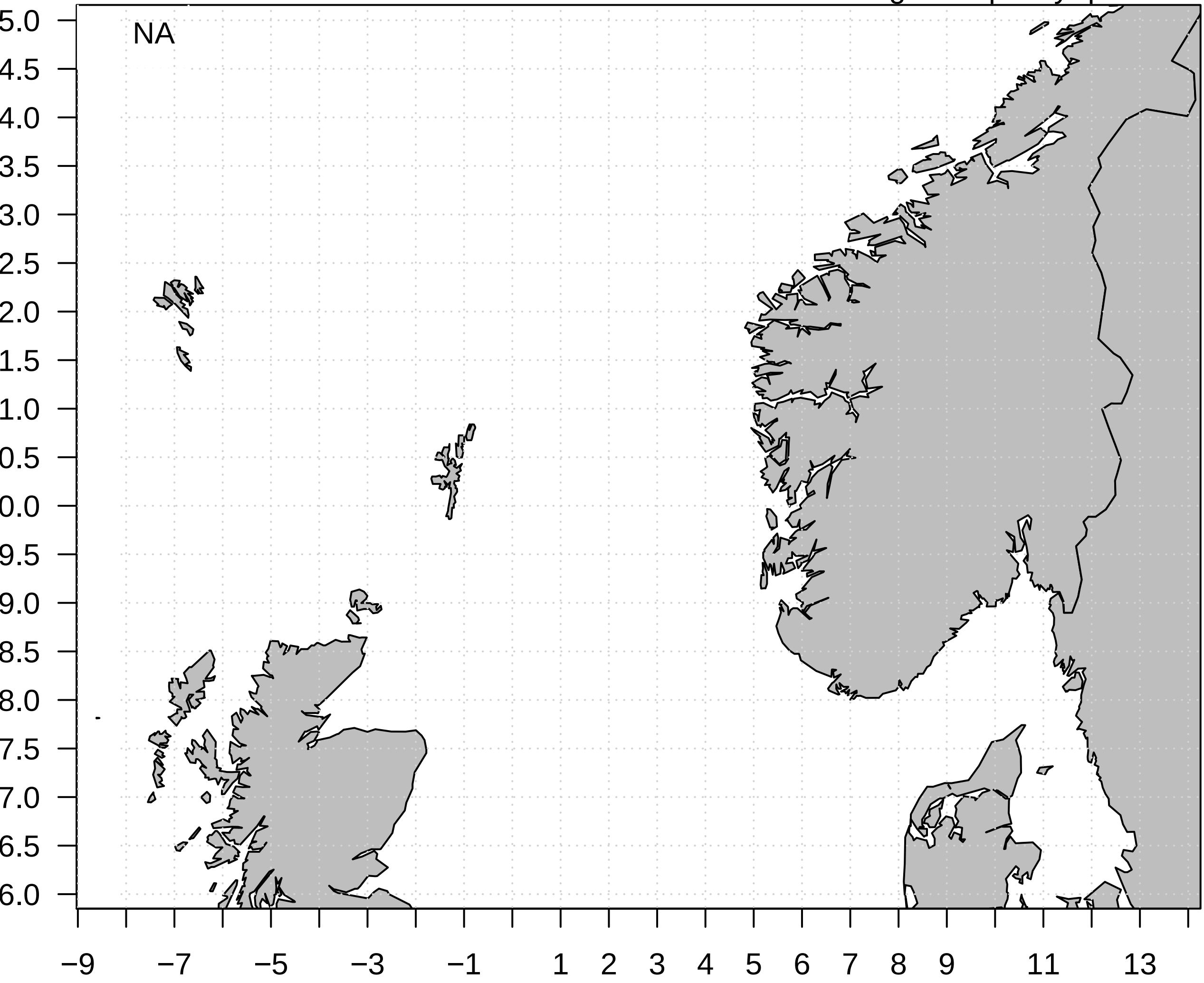


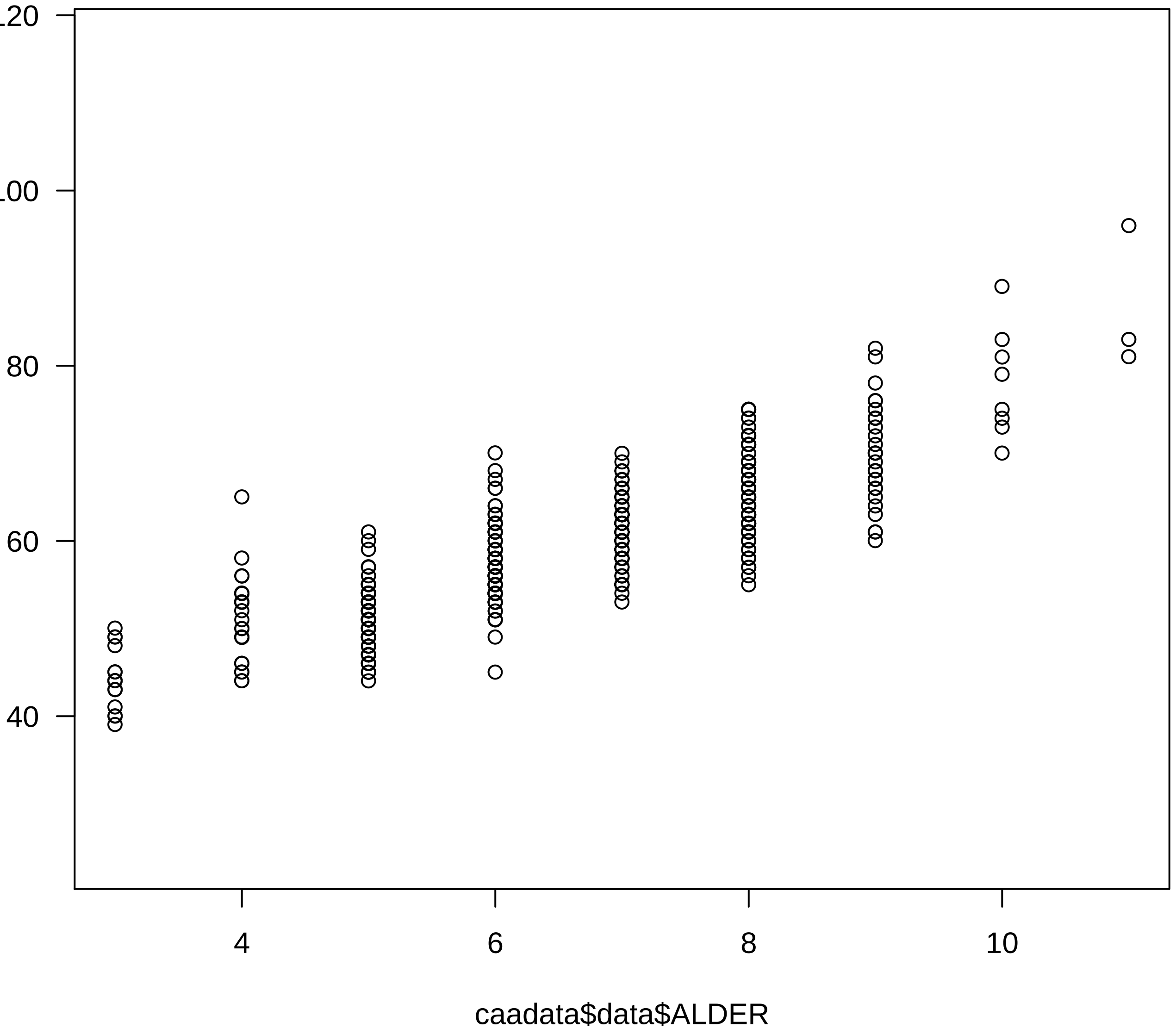
Location age sample by quarter 1
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

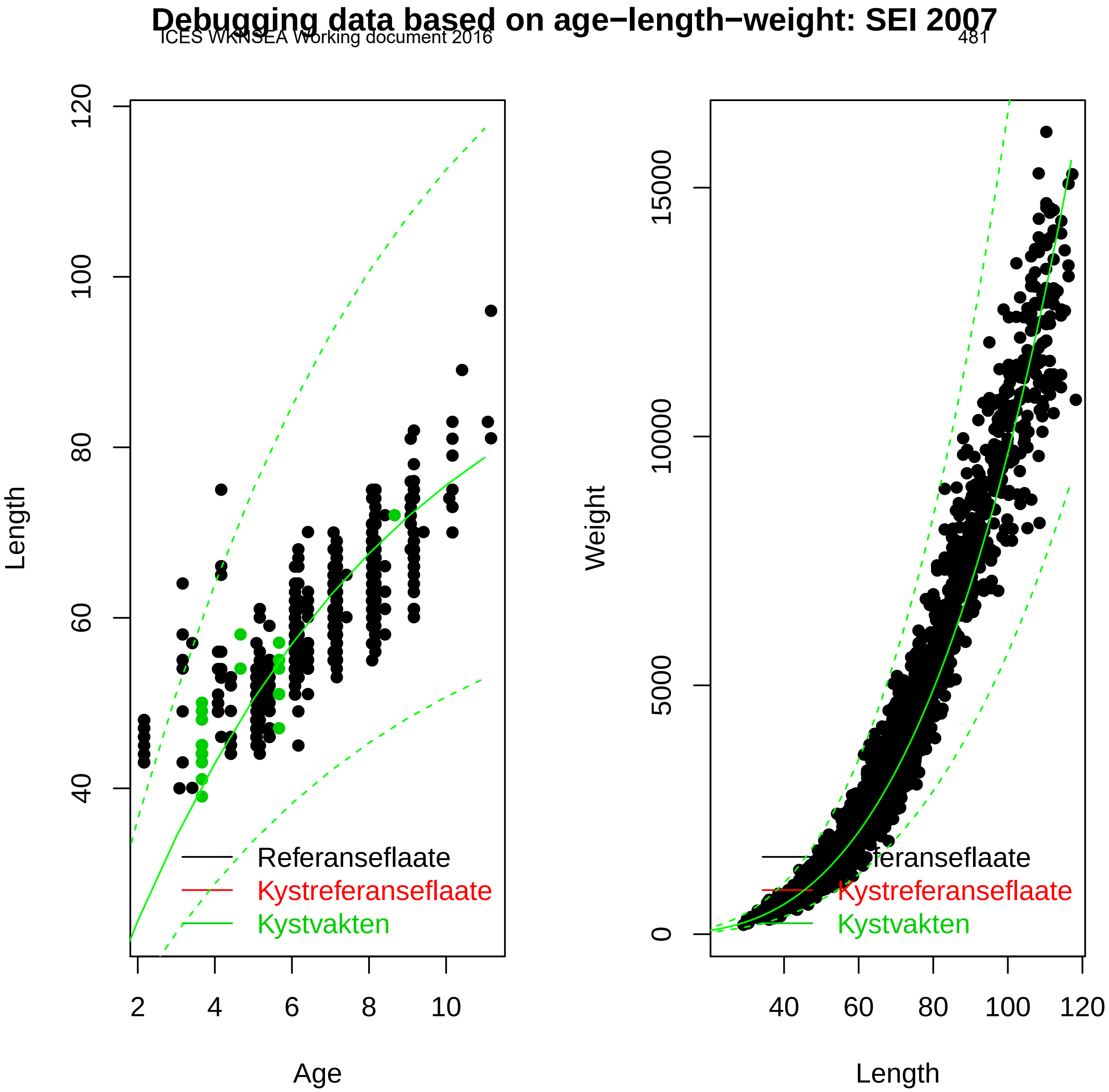

Location age sample by quarter 2
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 3
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

Location age sample by quarter 4




120
100
80
60
40
4
6
8
10
caadata$data$ALDER


Debugging data based on age−length−weight: SEI 2007
Length
120
100
80
60
40
2
4
6
8
10
Age
Referanseflaate
Kystreferanseflaate
Kystvakten
Weight
15000
10000
5000
0
40
60
80
100
120
Length
Referanseflaate
Kystreferanseflaate
Kystvakten

2008 length samples

Gear	Q '\' A	9	8
31	1	35312.9 0, 0, 0	12818143 5, 40, 2678
31	2	415543.2 0, 0, 0	19719188.4 10, 60, 4135
31	3	252768 0, 0, 0	16112909 14, 40, 3024
31	4	156820.8 0, 0, 0	4862949.2 3, 3, 303
41	1	109037.2 2, 11, 634	2504604 3, 22, 1025
41	2	50906.9 1, 3, 180	550026.7 2, 11, 222
41	3	14166.1 1, 1, 60	396409.2 3, 32, 696
41	4	49174 2, 7, 415	455917 3, 42, 1484
51	1	1745.4 0, 0, 0	11936.3 0, 0, 0
51	2	6580.4 0, 0, 0	73670.8 1, 1, 62
51	3	2500.2 0, 0, 0	440319.6 1, 27, 813
51	4	3801.6 0, 0, 0	124677.5 0, 0, 0
43	1	77500.1 0, 0, 0	198403.6 0, 0, 0
43	2	64571.1 0, 0, 0	1269753.9 0, 0, 0
43	3	21231.1 0, 0, 0	182436.1 0, 0, 0
43	4	81681.9 0, 0, 0	276872.6 1, 1, 115

Total catch= 61341557.8

Sampled catch=58434293.7(95)%

Sampled catch required for DB estimation=58069584.2(95)%

#Boats sampled= 52

#Serienr sampled= 301

#Fish sampled= 15846

2008 age samples

Gear	Q '\' A	9	8
31	1	35312.9 0, 0, 0	12818143 4, 8, 160
31	2	415543.2 0, 0, 0	19719188.4 3, 7, 139
31	3	252768 0, 0, 0	16112909 7, 13, 237
31	4	156820.8 0, 0, 0	4862949.2 0, 0, 0
41	1	109037.2 0, 0, 0	2504604 1, 4, 79
41	2	50906.9 0, 0, 0	550026.7 1, 2, 38
41	3	14166.1 0, 0, 0	396409.2 2, 3, 55
41	4	49174 0, 0, 0	455917 1, 5, 99
51	1	1745.4 0, 0, 0	11936.3 0, 0, 0
51	2	6580.4 0, 0, 0	73670.8 0, 0, 0
51	3	2500.2 0, 0, 0	440319.6 0, 0, 0
51	4	3801.6 0, 0, 0	124677.5 0, 0, 0
43	1	77500.1 0, 0, 0	198403.6 0, 0, 0
43	2	64571.1 0, 0, 0	1269753.9 0, 0, 0
43	3	21231.1 0, 0, 0	182436.1 0, 0, 0
43	4	81681.9 0, 0, 0	276872.6 0, 0, 0

Total catch= 61341557.8

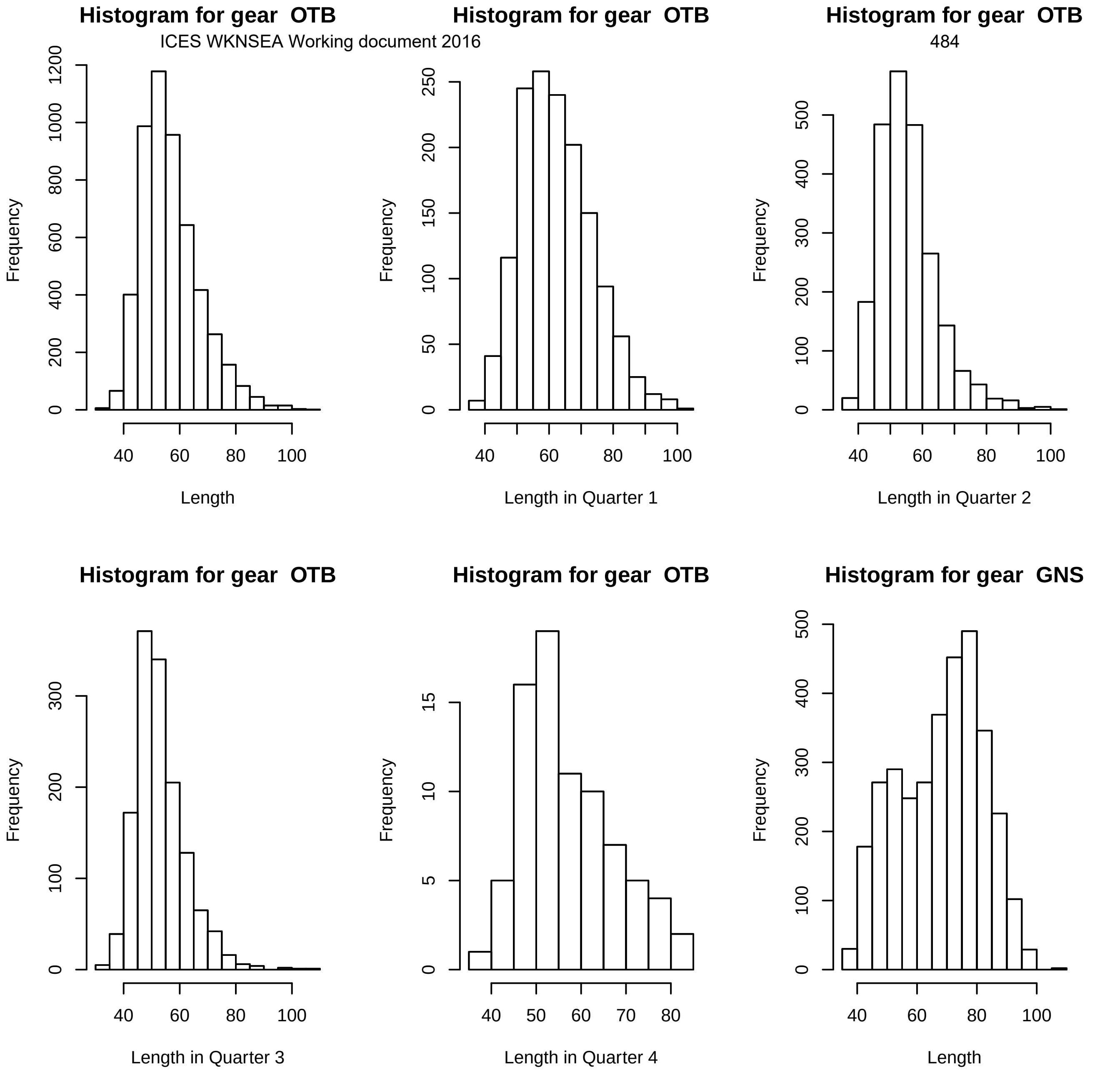
Sampled catch=52557197.3(86)%

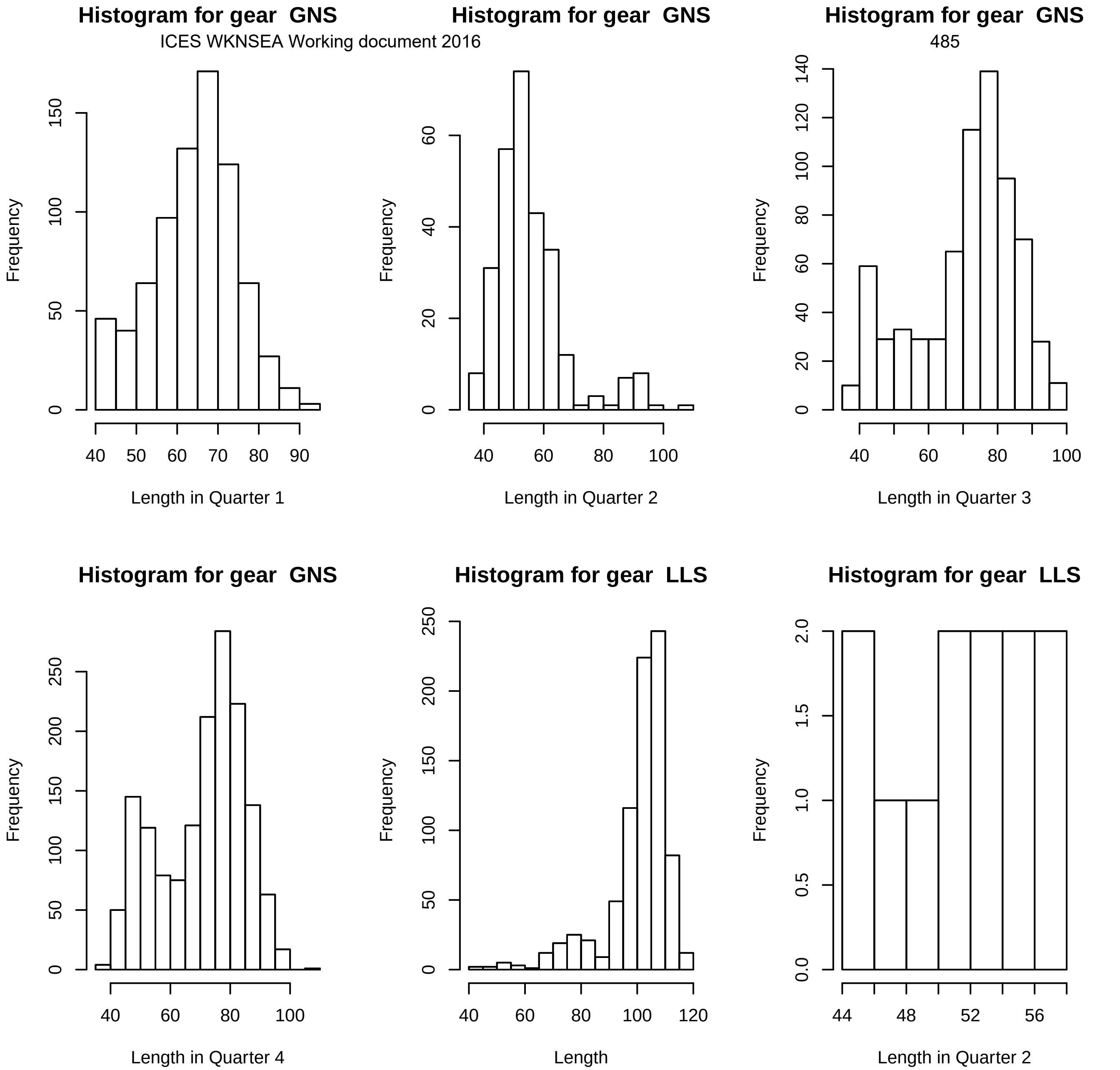
Sampled catch required for DB estimation=52557197.3(86)%

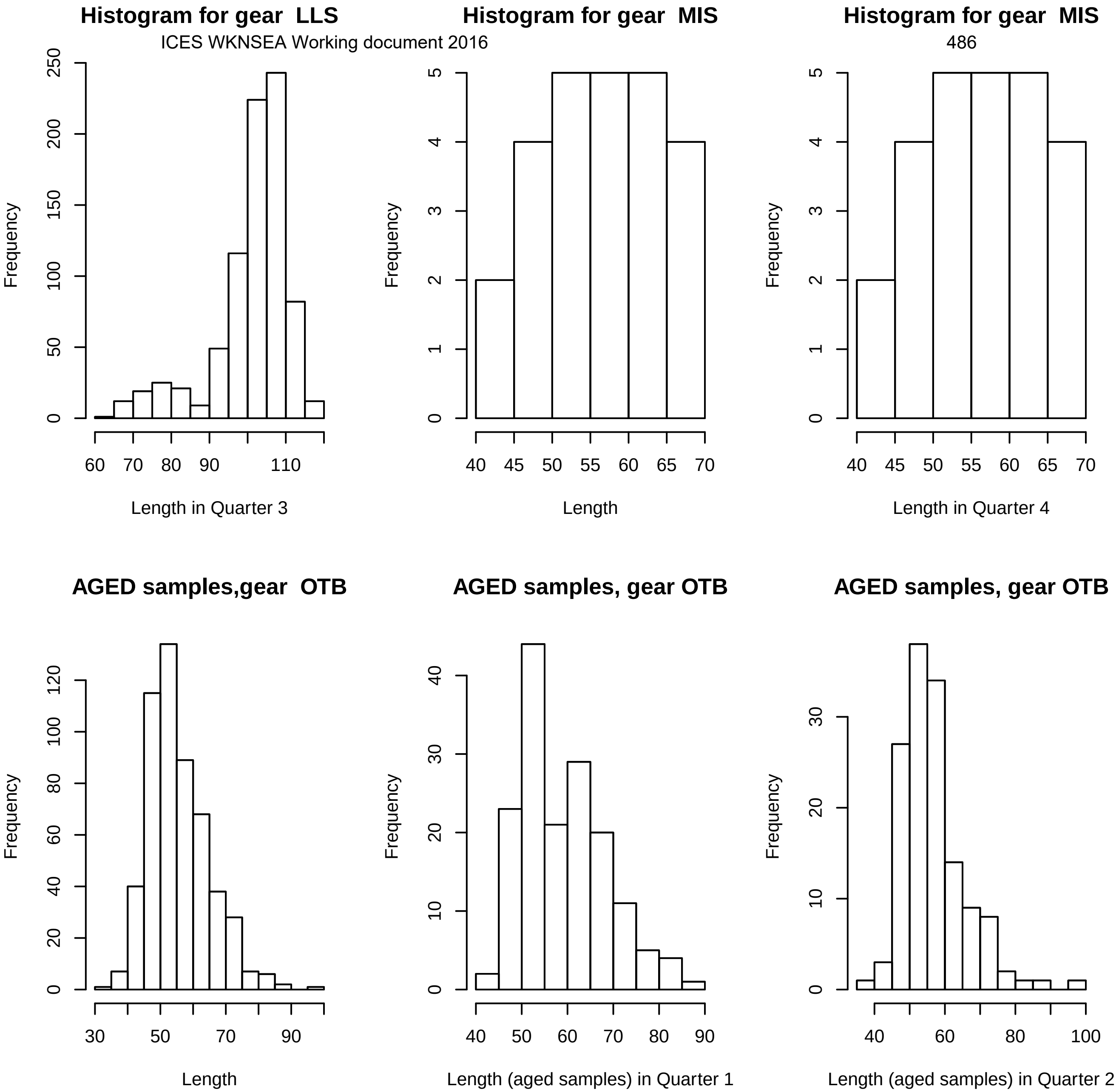
#Boats sampled= 19

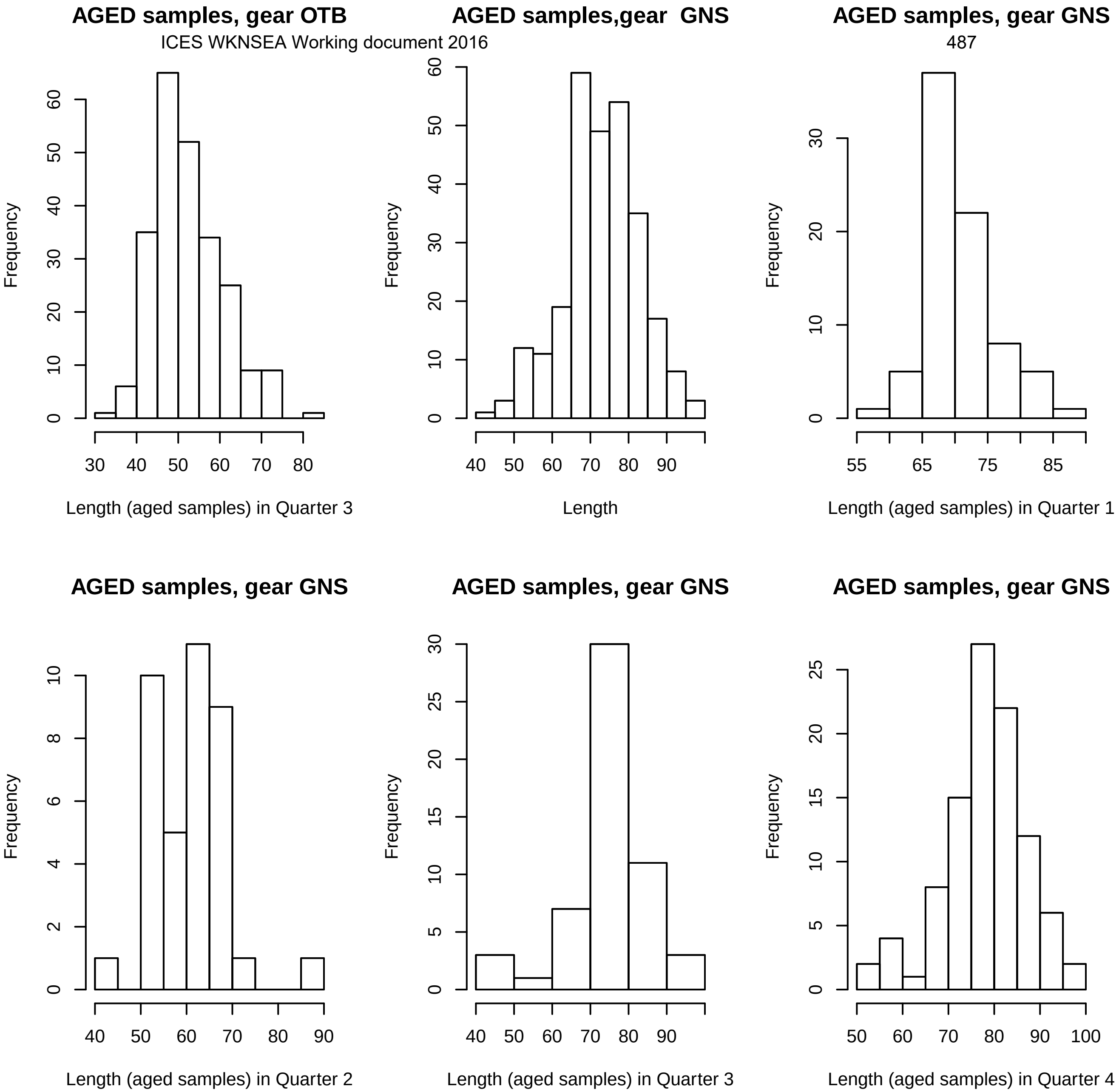
#Serienr sampled= 42

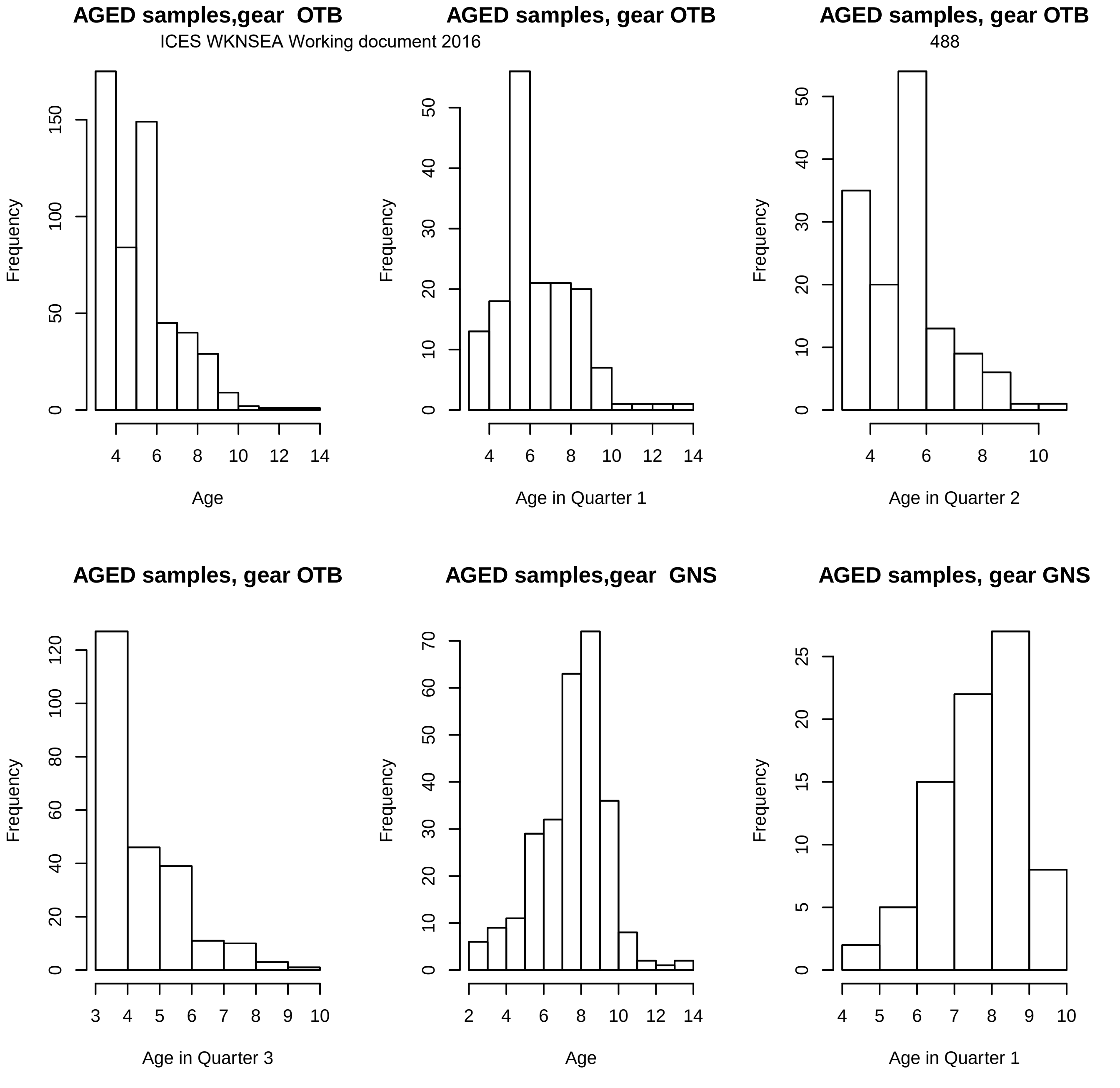
#Fish sampled= 807

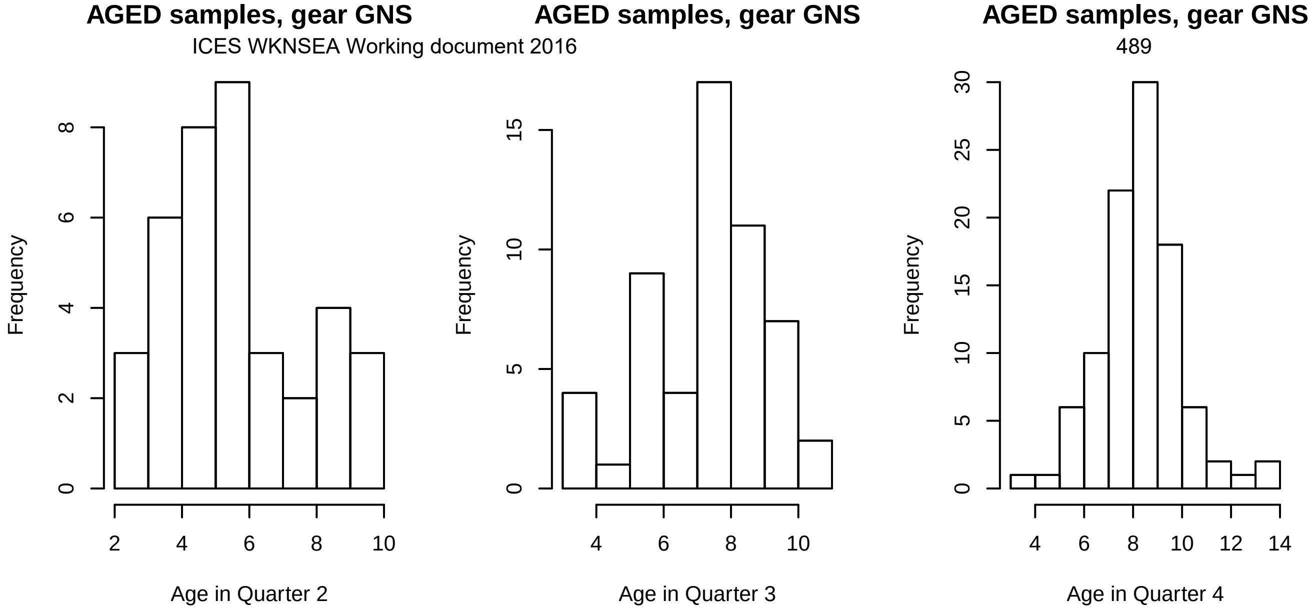

Histogram for gear OTB
Frequency
Length
Histogram for gear OTB
Frequency
Length in Quarter 1
Histogram for gear OTB
Frequency
Length in Quarter 2
Histogram for gear OTB
Frequency
Length in Quarter 3
Histogram for gear OTB
Frequency
Length in Quarter 4
Histogram for gear GNS
Frequency
Length


Histogram for gear GNS
Frequency
Length in Quarter 1
Histogram for gear GNS
Frequency
Length in Quarter 2
Histogram for gear GNS
Frequency
Length in Quarter 3
Histogram for gear GNS
Frequency
Length in Quarter 4
Histogram for gear LLS
Frequency
Length
Histogram for gear LLS
Frequency
Length in Quarter 2

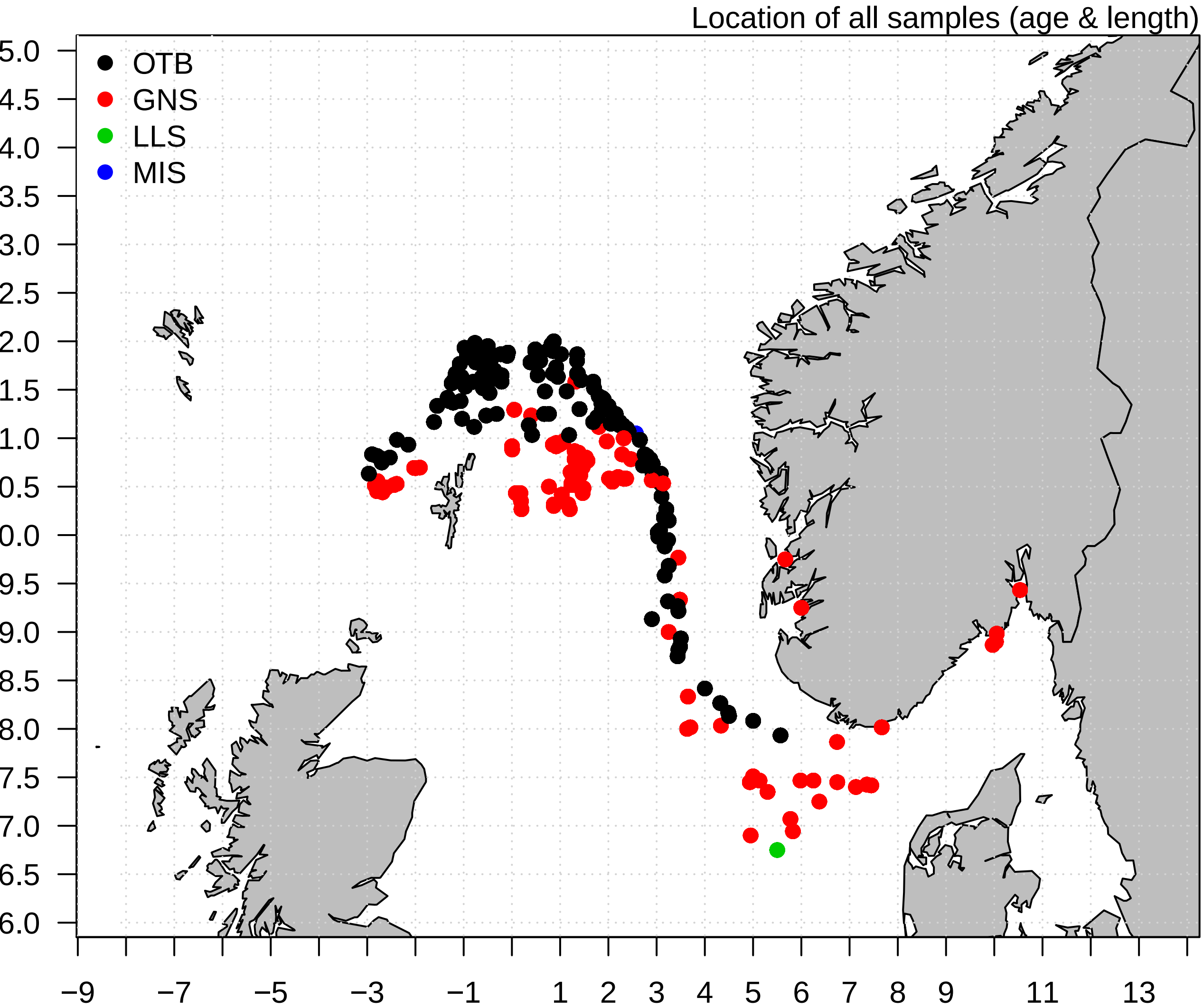

Histogram for gear LLS
Frequency
Length in Quarter 3
Histogram for gear MIS
Frequency
Length
Histogram for gear MIS
Frequency
Length in Quarter 4
AGED samples,gear OTB
Frequency
Length
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 1
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 2

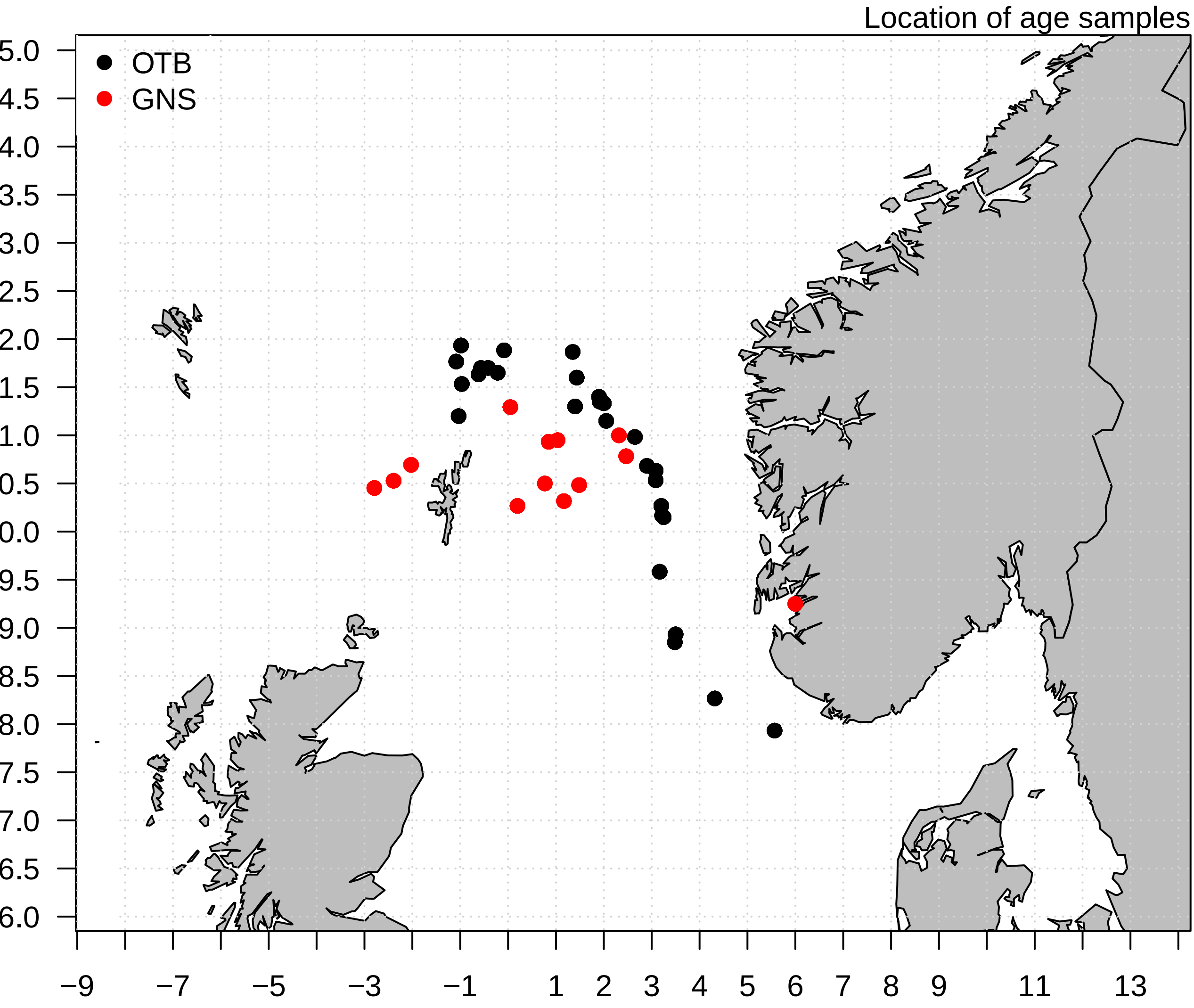

AGED samples, gear OTB
Frequency
0 10 20 30 40 50 60
30 40 50 60 70 80
Length (aged samples) in Quarter 3
AGED samples,gear GNS
Frequency
0 10 20 30 40 50 60
40 50 60 70 80 90
Length
AGED samples, gear GNS
Frequency
0 10 20 30
55 65 75 85
Length (aged samples) in Quarter 1
AGED samples, gear GNS
Frequency
0 2 4 6 8 10
40 50 60 70 80 90
Length (aged samples) in Quarter 2
AGED samples, gear GNS
Frequency
0 5 10 15 20 25 30
40 50 60 70 80 90
Length (aged samples) in Quarter 3
AGED samples, gear GNS
Frequency
0 5 10 15 20 25
50 60 70 80 90 100
Length (aged samples) in Quarter 4


AGED samples,gear OTB
Frequency
0
50
100
150
4
6
8
10
12
14
Age
AGED samples, gear OTB
Frequency
0
10
20
30
40
50
4
6
8
10
12
14
Age in Quarter 1
AGED samples, gear OTB
Frequency
0
10
20
30
40
50
4
6
8
10
Age in Quarter 2
AGED samples, gear OTB
Frequency
0
20
40
60
80
100
120
3
4
5
6
7
8
9
10
Age in Quarter 3
AGED samples,gear GNS
Frequency
0
10
20
30
40
50
60
70
2
4
6
8
10
12
14
Age
AGED samples, gear GNS
Frequency
0
5
10
15
20
25
4
5
6
7
8
9
10
Age in Quarter 1

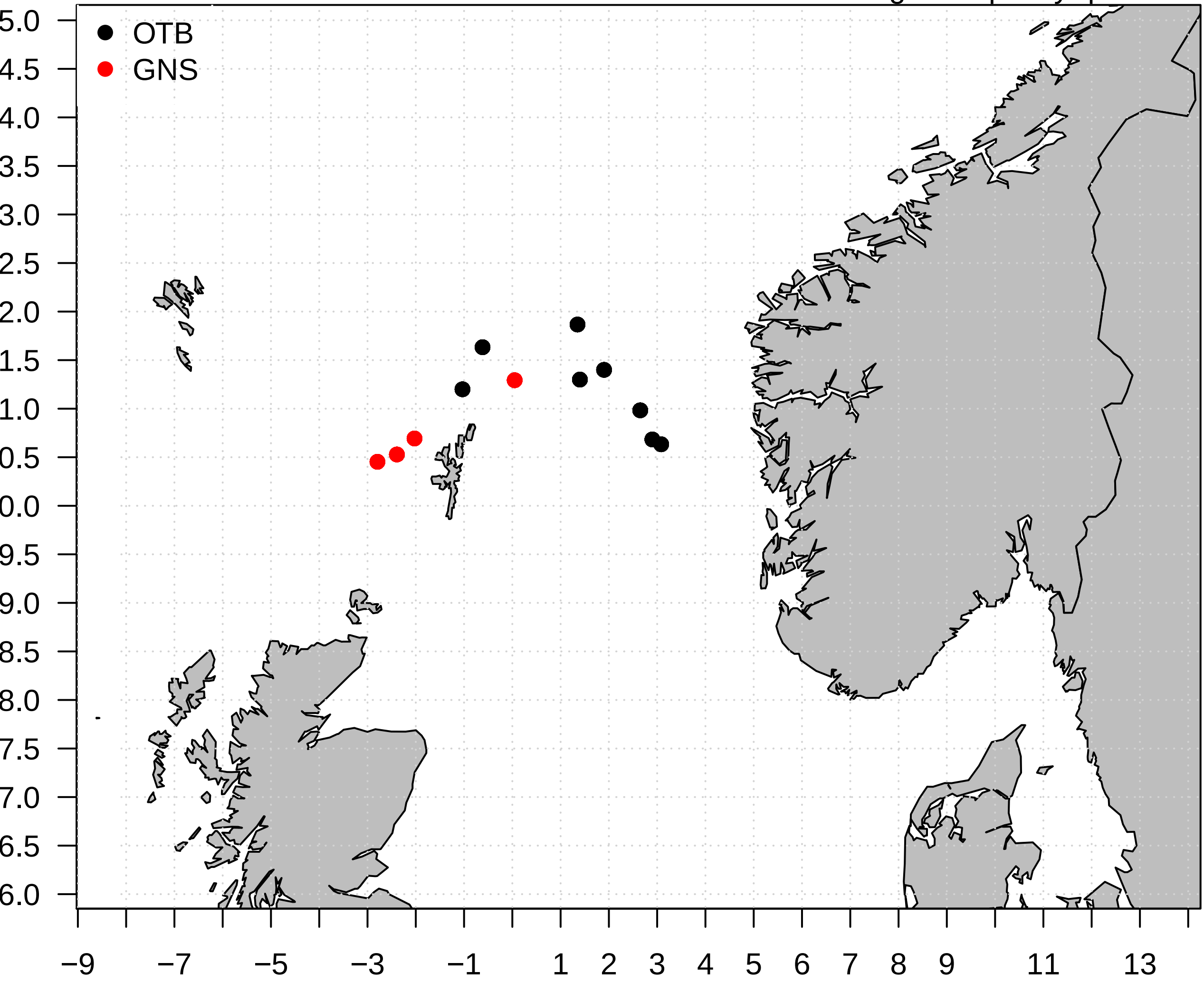

AGED samples, gear GNS
Frequency
Age in Quarter 2
AGED samples, gear GNS
Frequency
Age in Quarter 3
AGED samples, gear GNS
Frequency
Age in Quarter 4

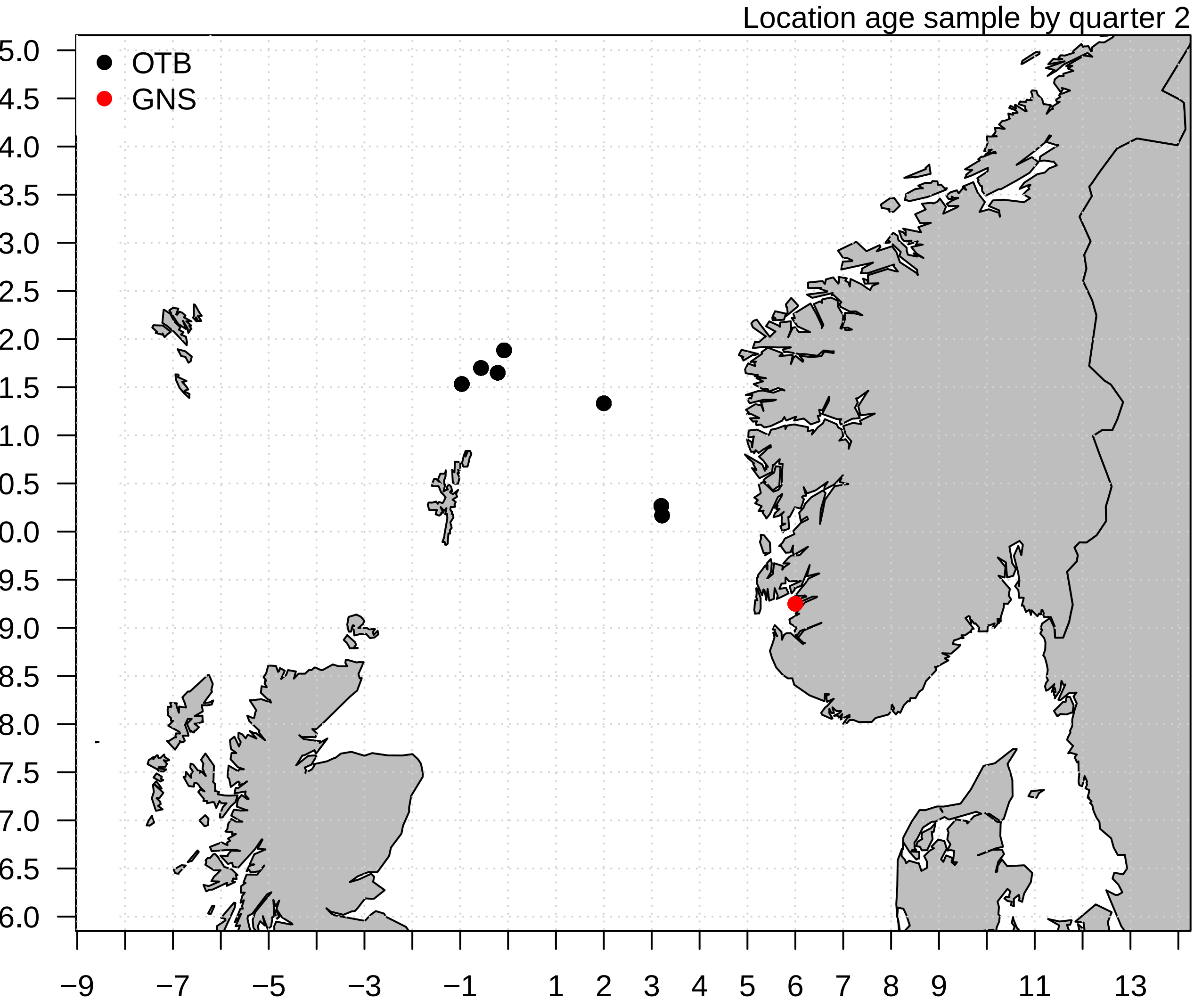
2008

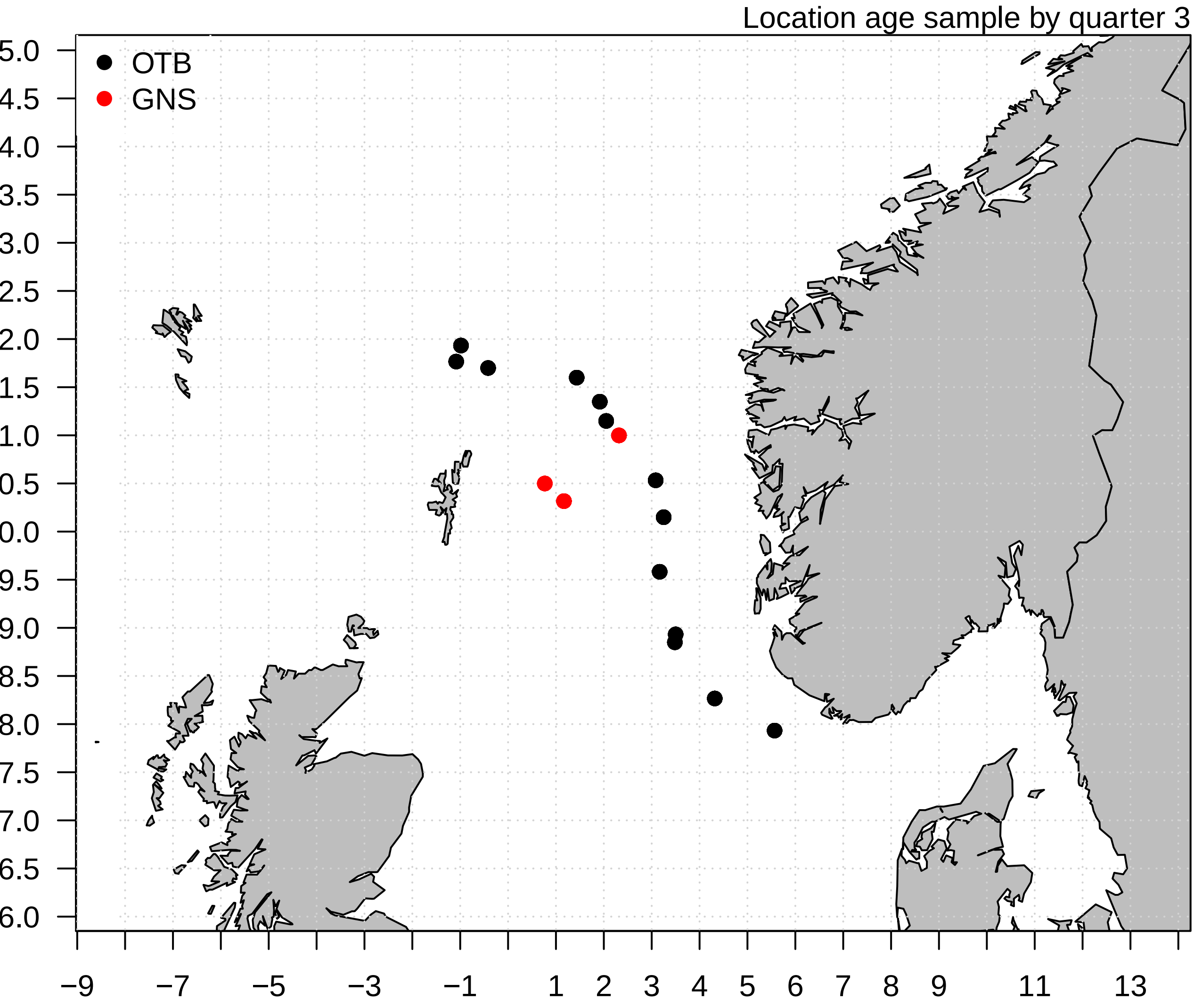

Location of all samples (age & length)
OTB
GNS
LLS
MIS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

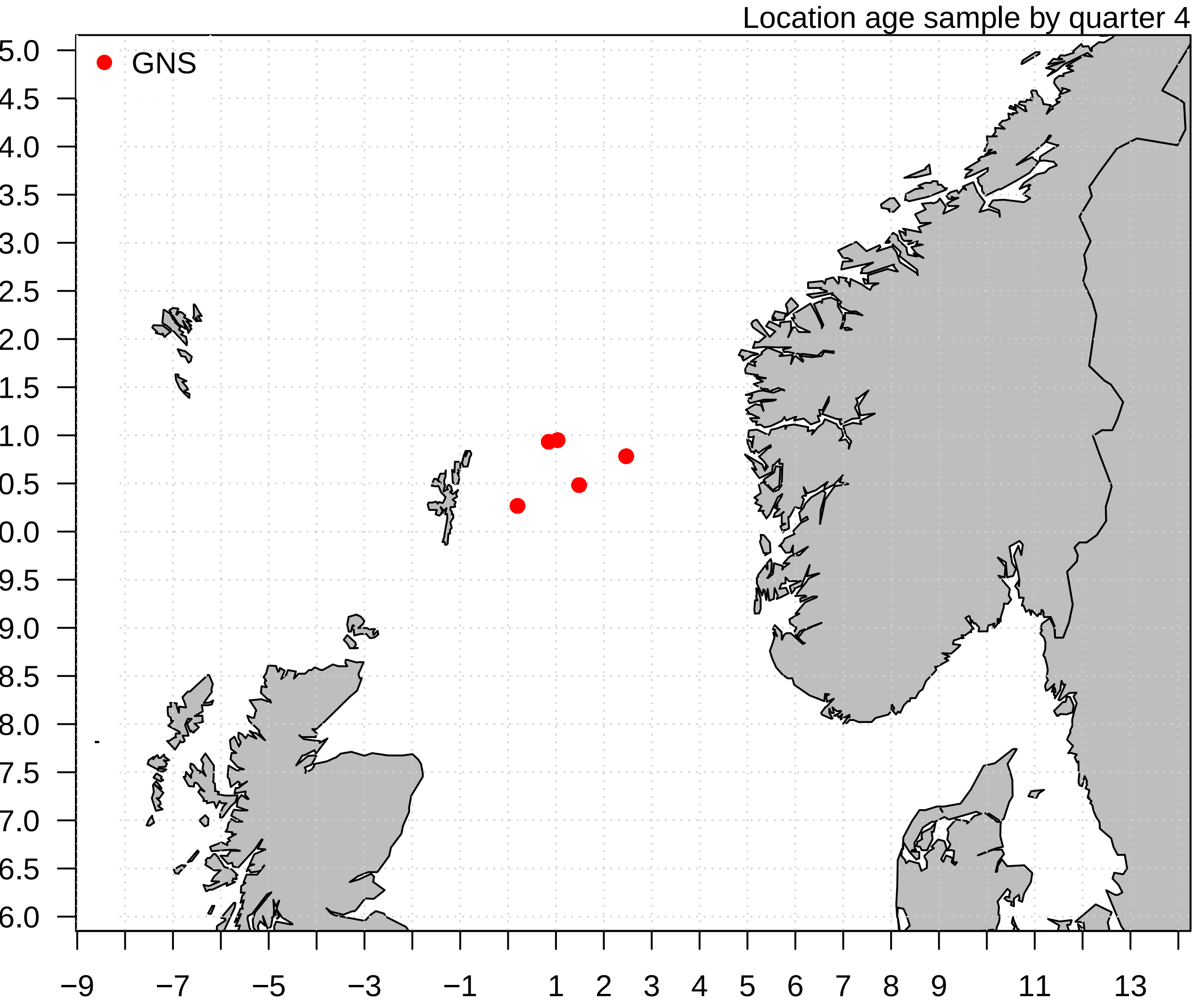

Location of age samples
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

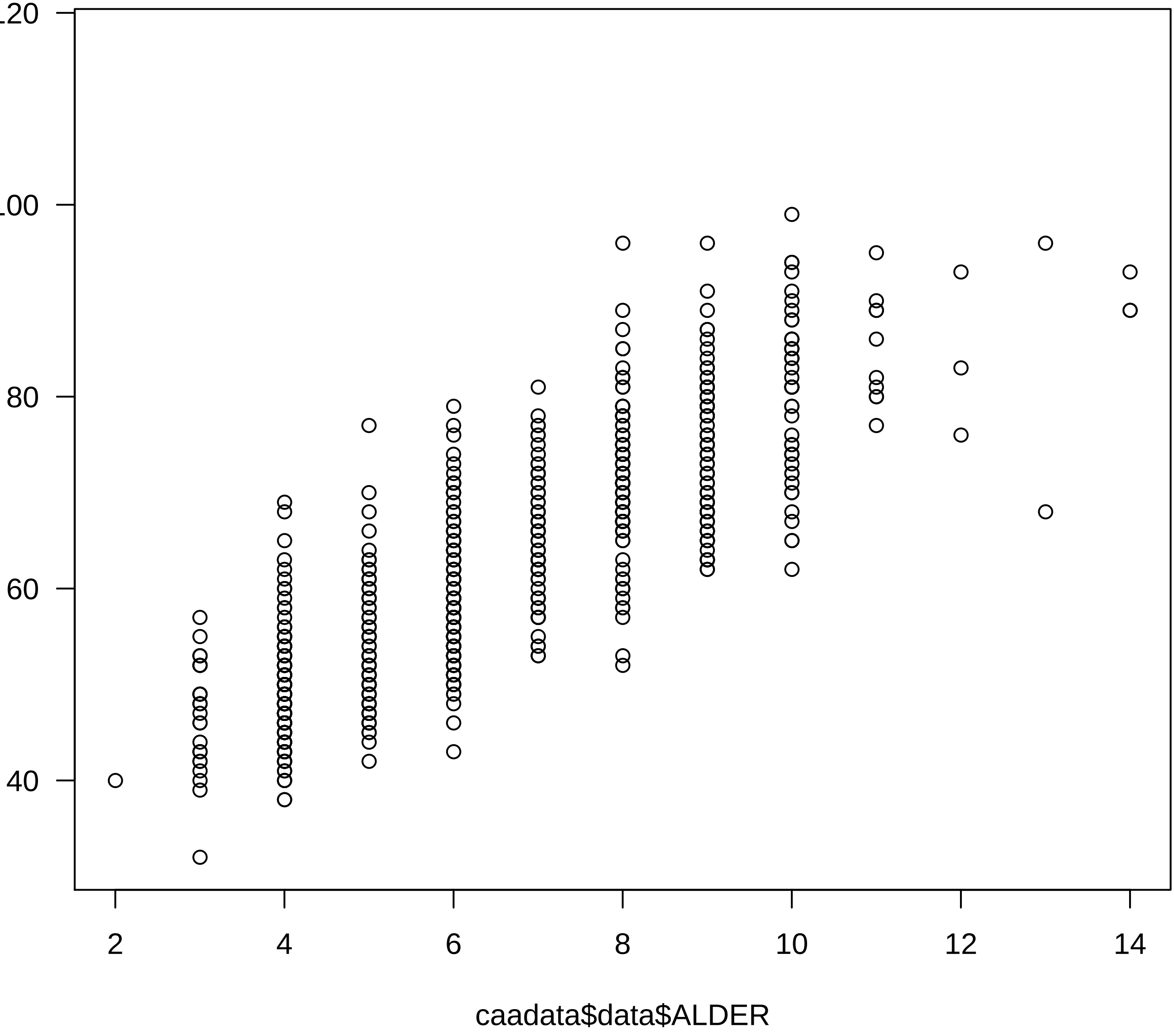
Location age sample by quarter 1

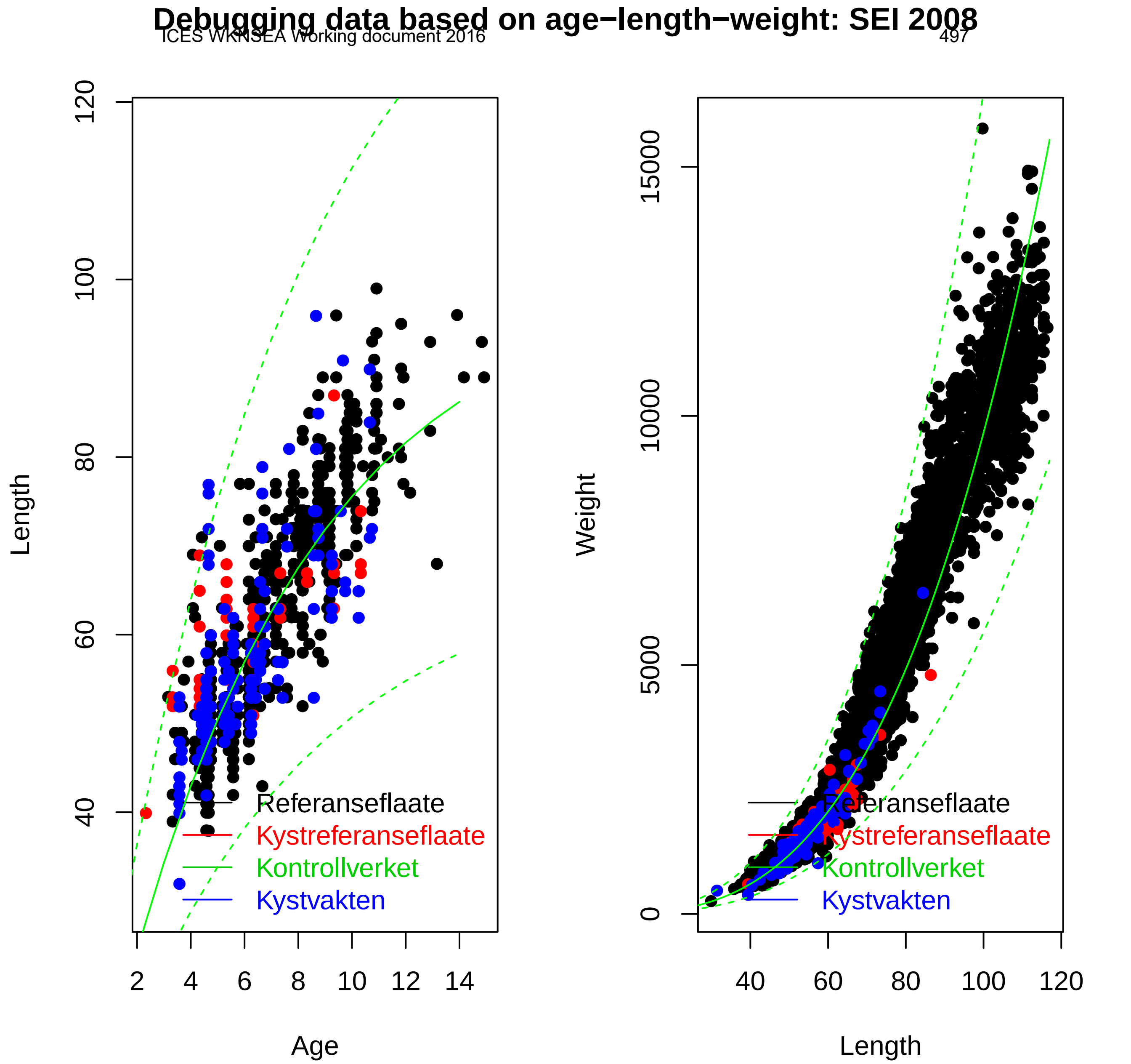



Location age sample by quarter 2
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 3
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 4
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


120
100
80
60
40
2
4
6
8
10
12
14
caadata$data$ALDER


Debugging data based on age−length−weight: SEI 2008
Length
Age
Weight
Length
Referanseflaate
Kystreferanseflaate
Kontrollverket
Kystvakten
Referanseflaate
Kystreferanseflaate
Kontrollverket
Kystvakten

2009 length samples

Gear	Q '\' A	9	8
31	1	176778 1, 1, 32	13732962.3 9, 54, 4166
31	2	469887.2 0, 0, 0	20842653.4 13, 111, 6472
31	3	190030.8 0, 0, 0	10817407.7 6, 30, 1484
31	4	127454.8 2, 2, 168	1729193.2 3, 3, 313
41	1	114717.6 2, 12, 615	3842075 4, 30, 1199
41	2	18922.1 1, 2, 101	439217 2, 10, 146
41	3	13817.1 0, 0, 0	364526.5 2, 43, 750
41	4	37731.6 1, 3, 132	730676.2 4, 17, 405
51	1	1718.4 0, 0, 0	7774.5 0, 0, 0
51	2	5177.2 0, 0, 0	155643.3 1, 20, 378
51	3	469.8 0, 0, 0	287449 1, 48, 1527
51	4	4054.2 0, 0, 0	66236 0, 0, 0
43	1	63071.8 0, 0, 0	153169.7 0, 0, 0
43	2	3975.2 0, 0, 0	2304606.7 2, 2, 289
43	3	15879.5 0, 0, 0	454651.2 0, 0, 0
43	4	40578 0, 0, 0	598350 0, 0, 0

Total catch= 57810855

Sampled catch=55722014.4(96)%

Sampled catch required for DB estimation=55545236.4(96)%

#Boats sampled= 54

#Serienr sampled= 388

#Fish sampled= 18177

2009 age samples

Gear	Q '\' A	9	8
31	1	176778 0, 0, 0	13732962.3 5, 5, 99
31	2	469887.2 0, 0, 0	20842653.4 9, 29, 575
31	3	190030.8 0, 0, 0	10817407.7 2, 4, 80
31	4	127454.8 0, 0, 0	1729193.2 0, 0, 0
41	1	114717.6 0, 0, 0	3842075 2, 4, 80
41	2	18922.1 0, 0, 0	439217 0, 0, 0
41	3	13817.1 0, 0, 0	364526.5 0, 0, 0
41	4	37731.6 0, 0, 0	730676.2 0, 0, 0
51	1	1718.4 0, 0, 0	7774.5 0, 0, 0
51	2	5177.2 0, 0, 0	155643.3 0, 0, 0
51	3	469.8 0, 0, 0	287449 0, 0, 0
51	4	4054.2 0, 0, 0	66236 0, 0, 0
43	1	63071.8 0, 0, 0	153169.7 0, 0, 0
43	2	3975.2 0, 0, 0	2304606.7 0, 0, 0
43	3	15879.5 0, 0, 0	454651.2 0, 0, 0
43	4	40578 0, 0, 0	598350 0, 0, 0

Total catch= 57810855

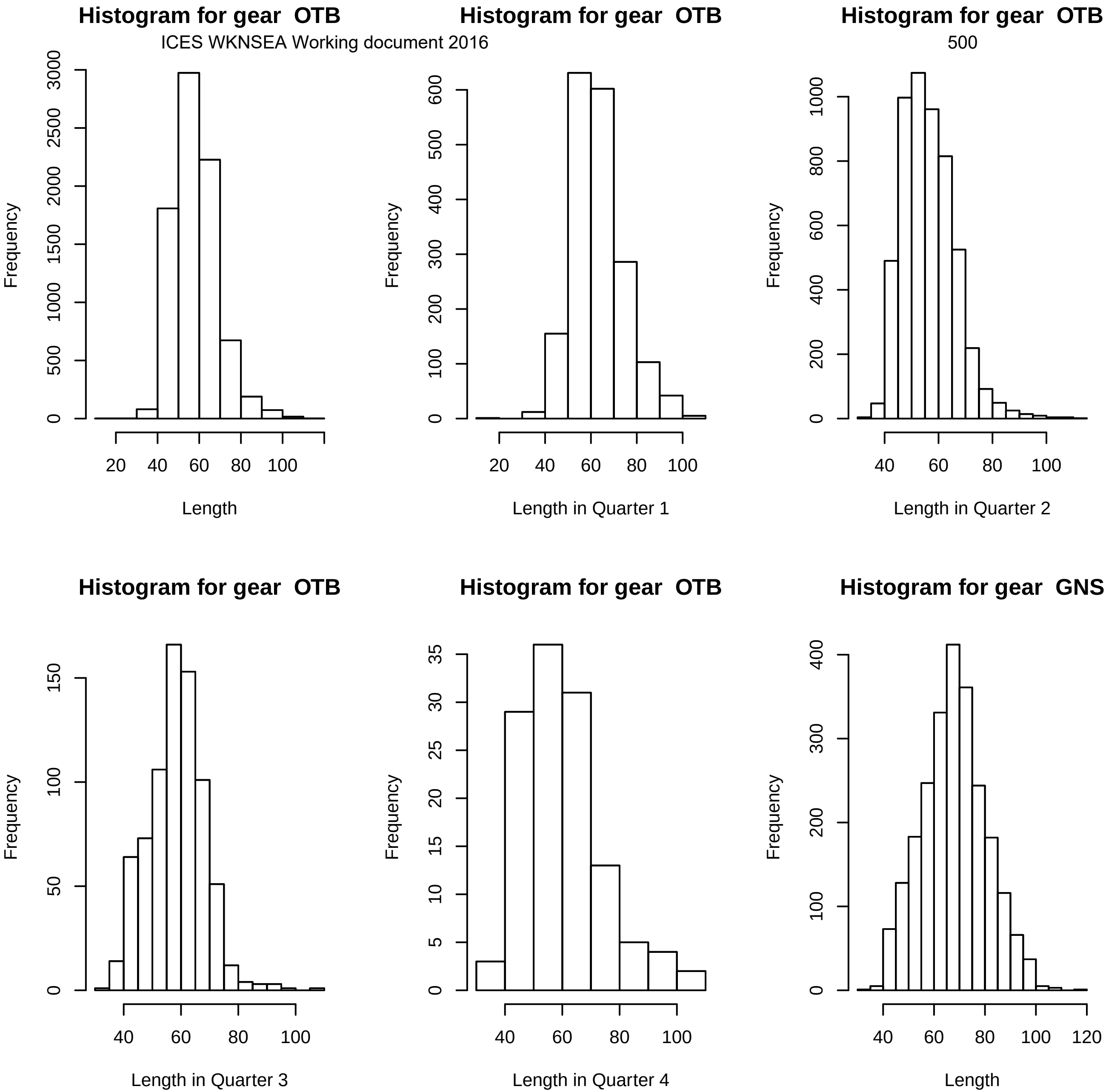
Sampled catch=49235098.4(85)%

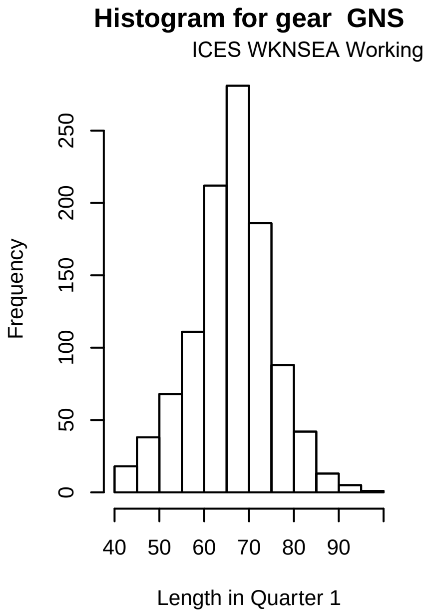
Sampled catch required for DB estimation=49235098.4(85)%

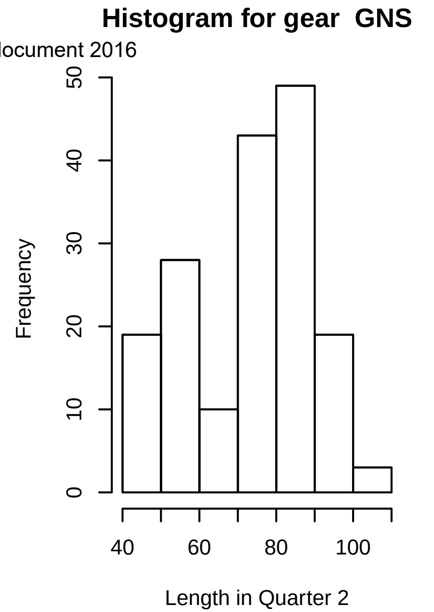
#Boats sampled= 18

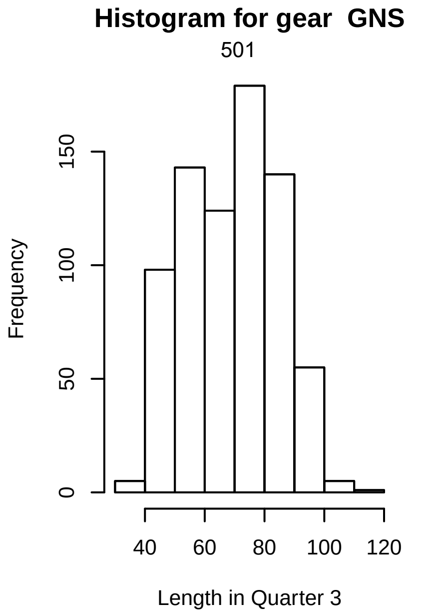
#Serienr sampled= 42

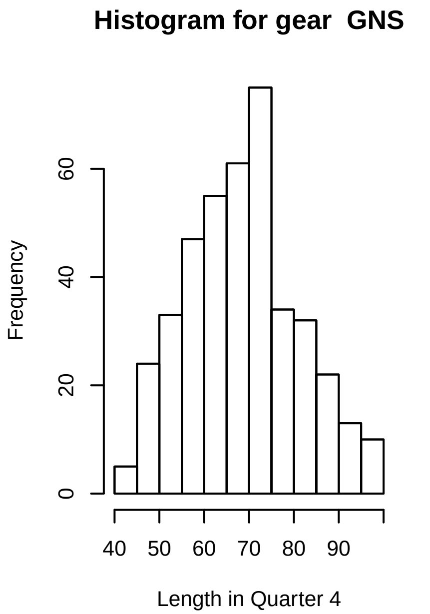
#Fish sampled= 834

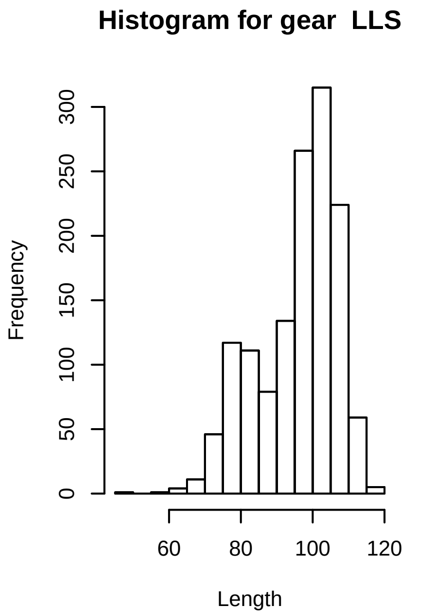

Histogram for gear OTB
Frequency
Length
Histogram for gear OTB
Frequency
Length in Quarter 1
Histogram for gear OTB
Frequency
Length in Quarter 2
Histogram for gear OTB
Frequency
Length in Quarter 3
Histogram for gear OTB
Frequency
Length in Quarter 4
Histogram for gear GNS
Frequency
Length

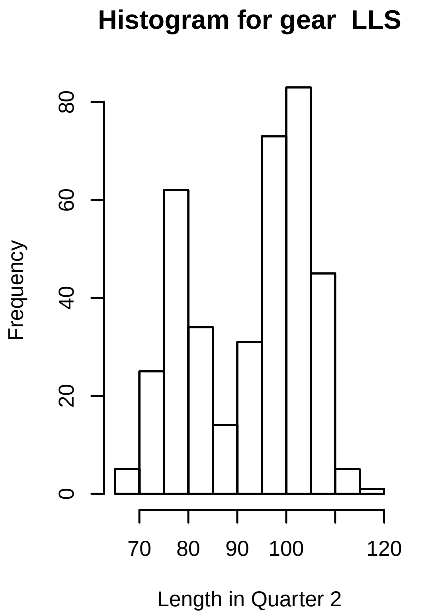

Histogram for gear GNS
Frequency
0
50
100
150
200
250
40
50
60
70
80
90
Length in Quarter 1

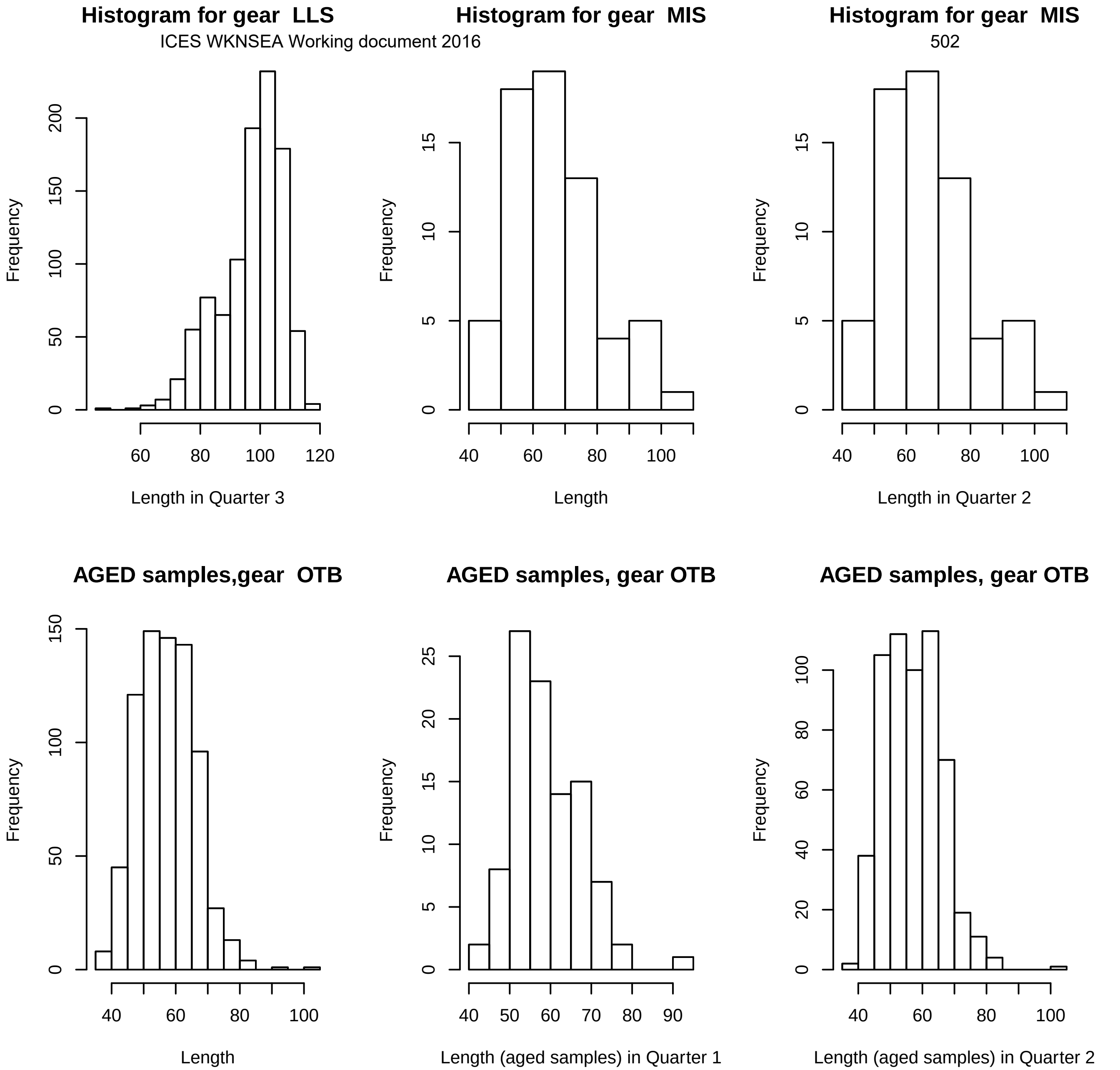

Histogram for gear GNS
Frequency
0
10
20
30
40
50
40
60
80
100
Length in Quarter 2

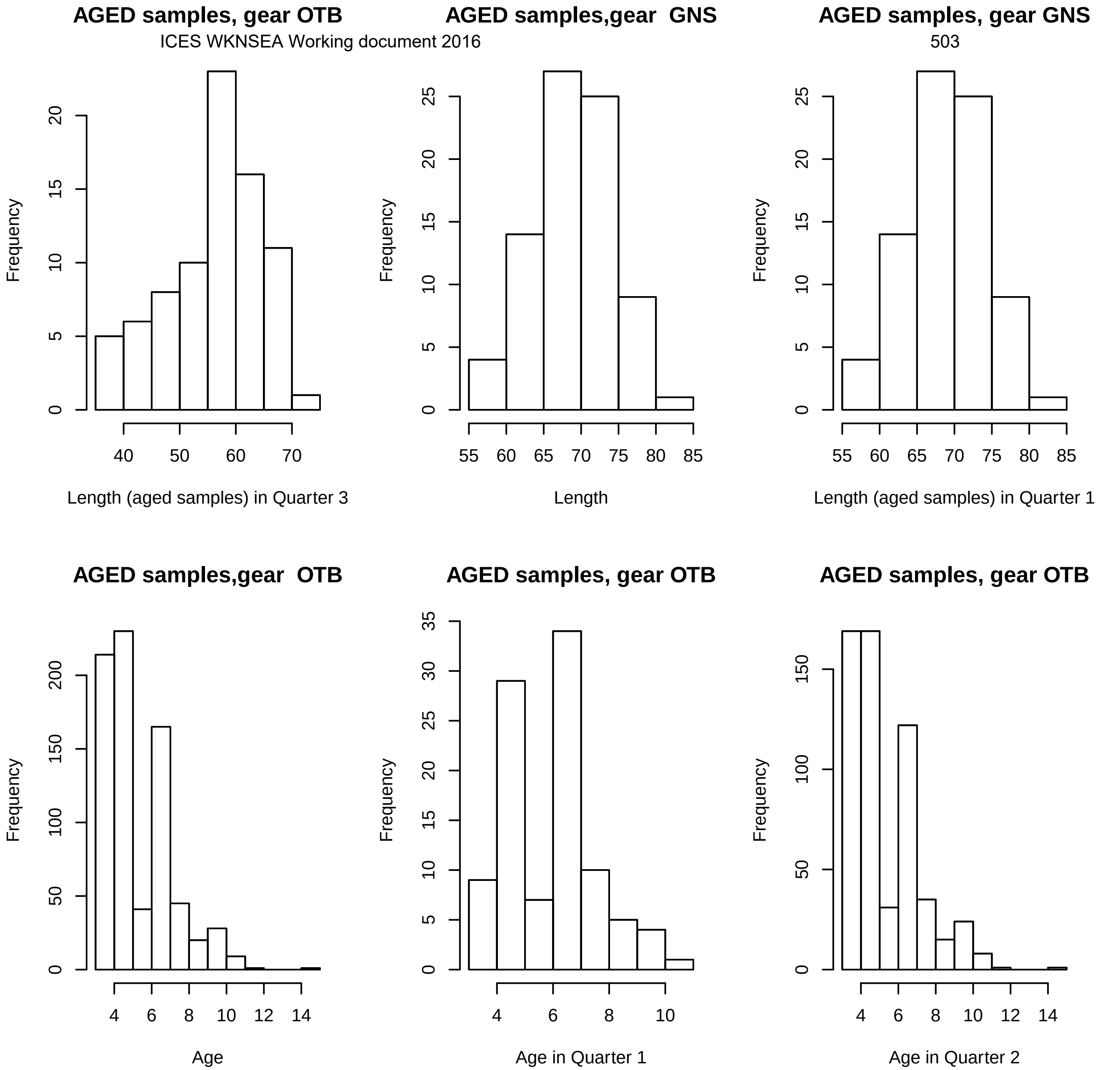

Histogram for gear GNS
Frequency
0
50
100
150
40
60
80
100
120
Length in Quarter 3

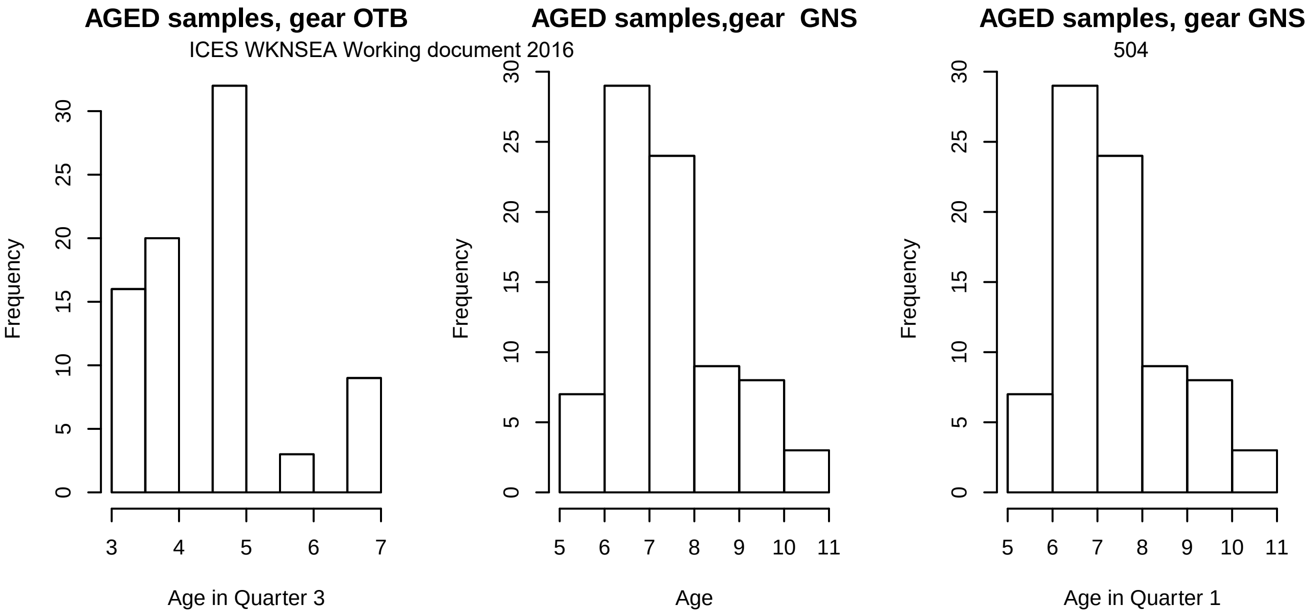

Histogram for gear GNS
Frequency
0
20
40
60
40
50
60
70
80
90
Length in Quarter 4


Histogram for gear LLS
Frequency
0
50
100
150
200
250
300
60
80
100
120
Length

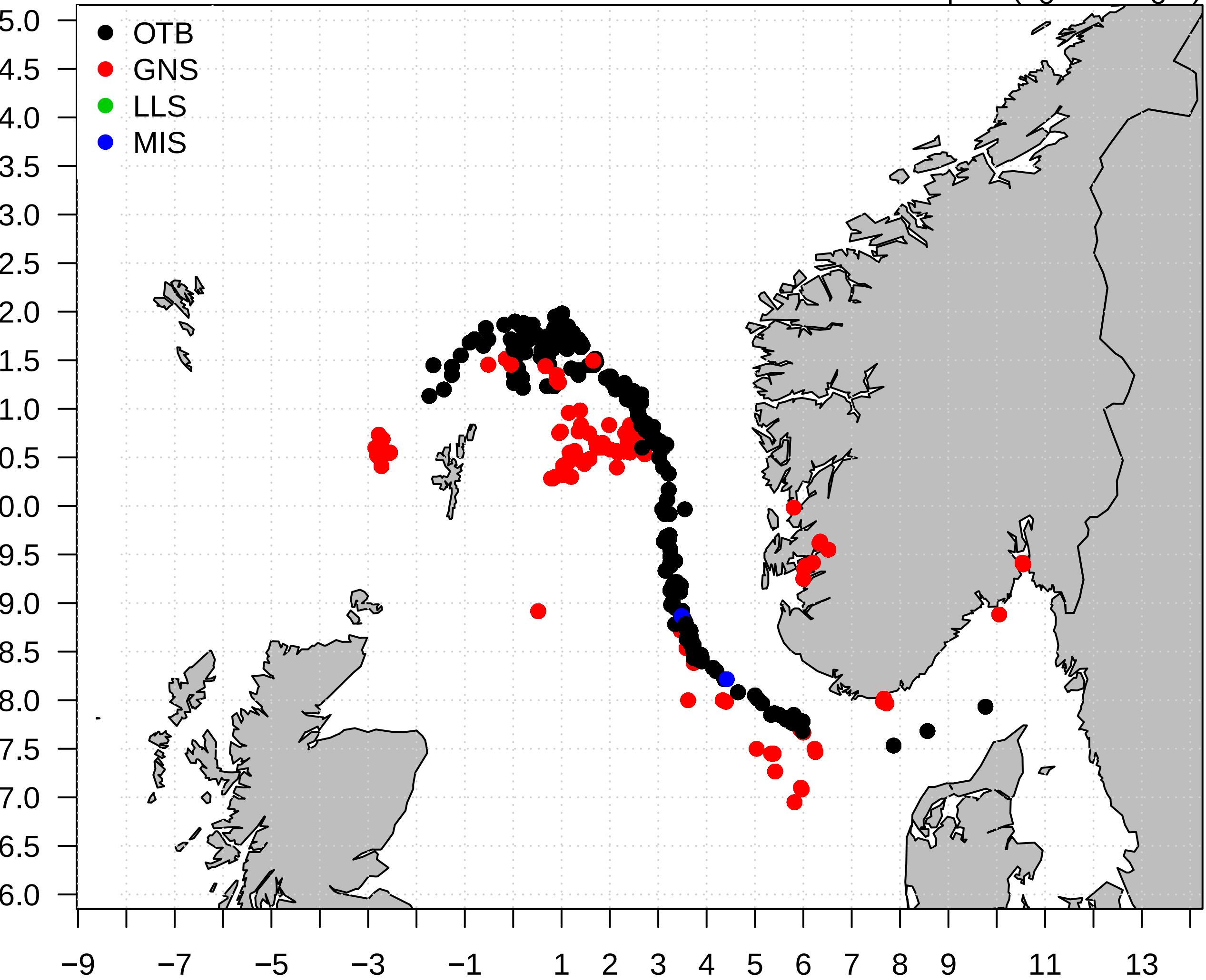

Histogram for gear LLS
Frequency
0
20
40
60
80
70
80
90
100
120
Length in Quarter 2

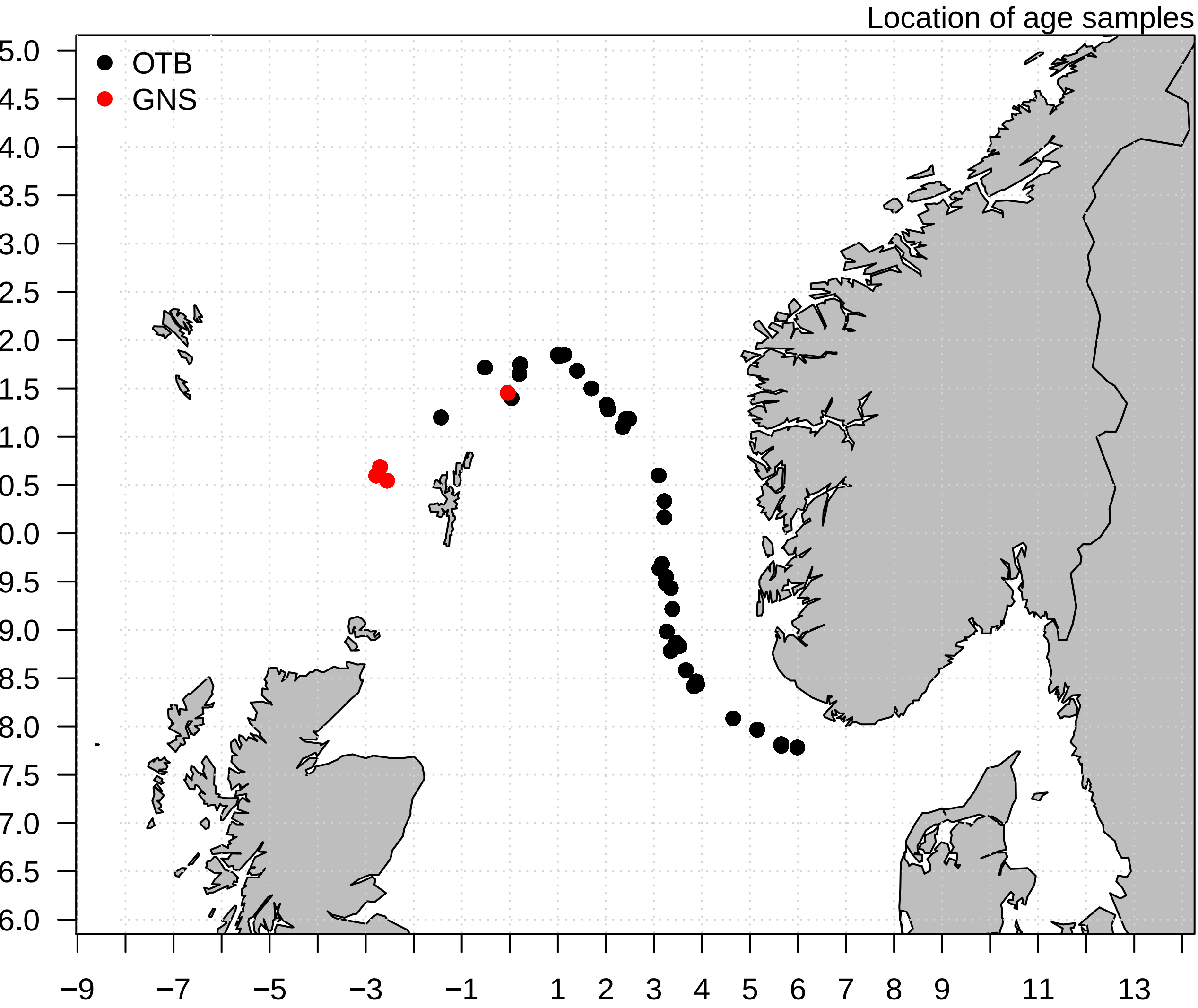

Histogram for gear LLS
Frequency
Length in Quarter 3
Histogram for gear MIS
Frequency
Length
Histogram for gear MIS
Frequency
Length in Quarter 2
AGED samples,gear OTB
Frequency
Length
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 1
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 2

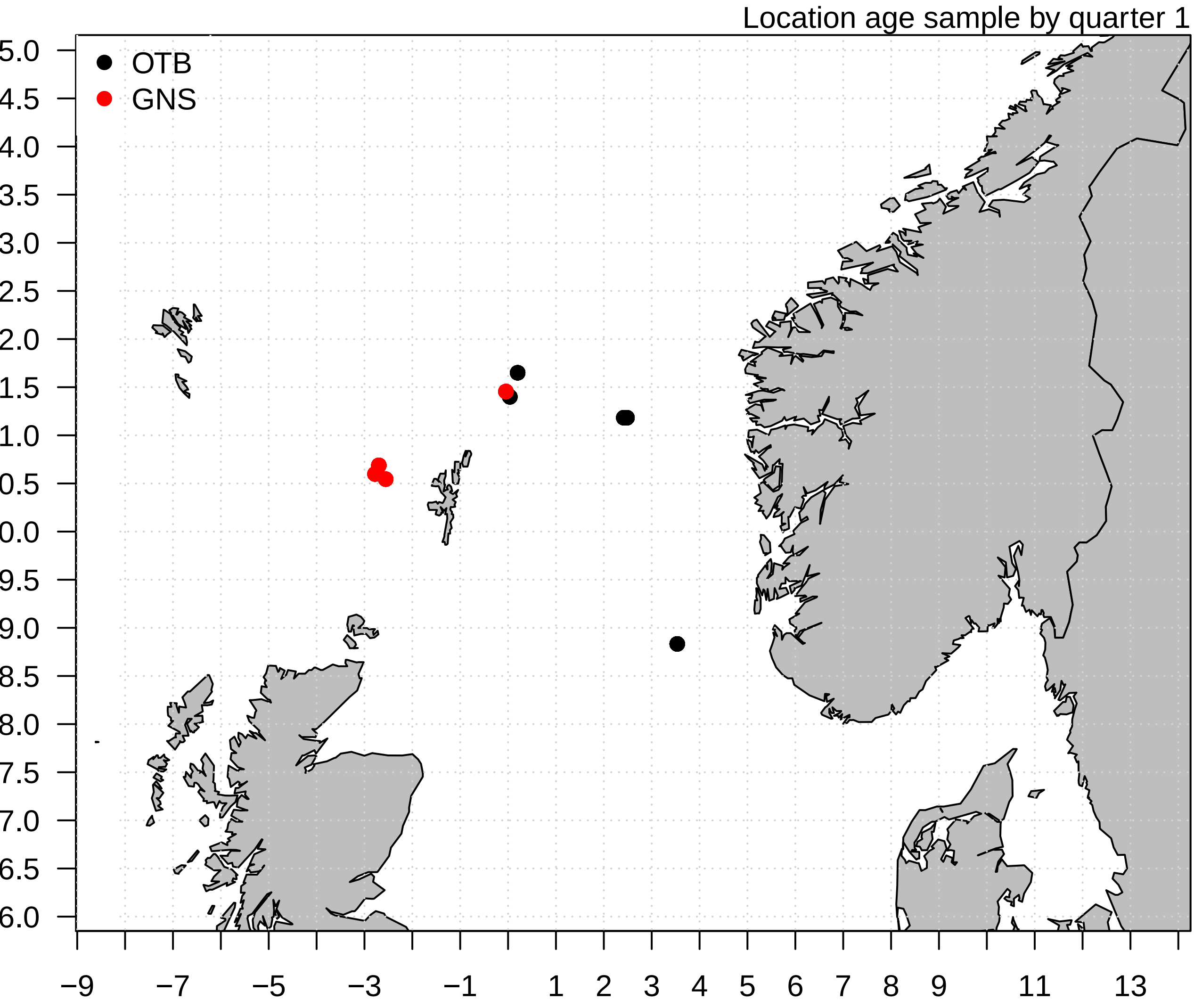

AGED samples, gear OTB
Frequency
0
5
10
15
20
40
50
60
70
Length (aged samples) in Quarter 3
AGED samples,gear GNS
Frequency
0
5
10
15
20
25
55
60
65
70
75
80
85
Length
AGED samples, gear GNS
Frequency
0
5
10
15
20
25
55
60
65
70
75
80
85
Length (aged samples) in Quarter 1
AGED samples,gear OTB
Frequency
0
50
100
150
200
4
6
8
10
12
14
Age
AGED samples, gear OTB
Frequency
0
5
10
15
20
25
30
35
4
6
8
10
Age in Quarter 1
AGED samples, gear OTB
Frequency
0
50
100
150
4
6
8
10
12
14
Age in Quarter 2

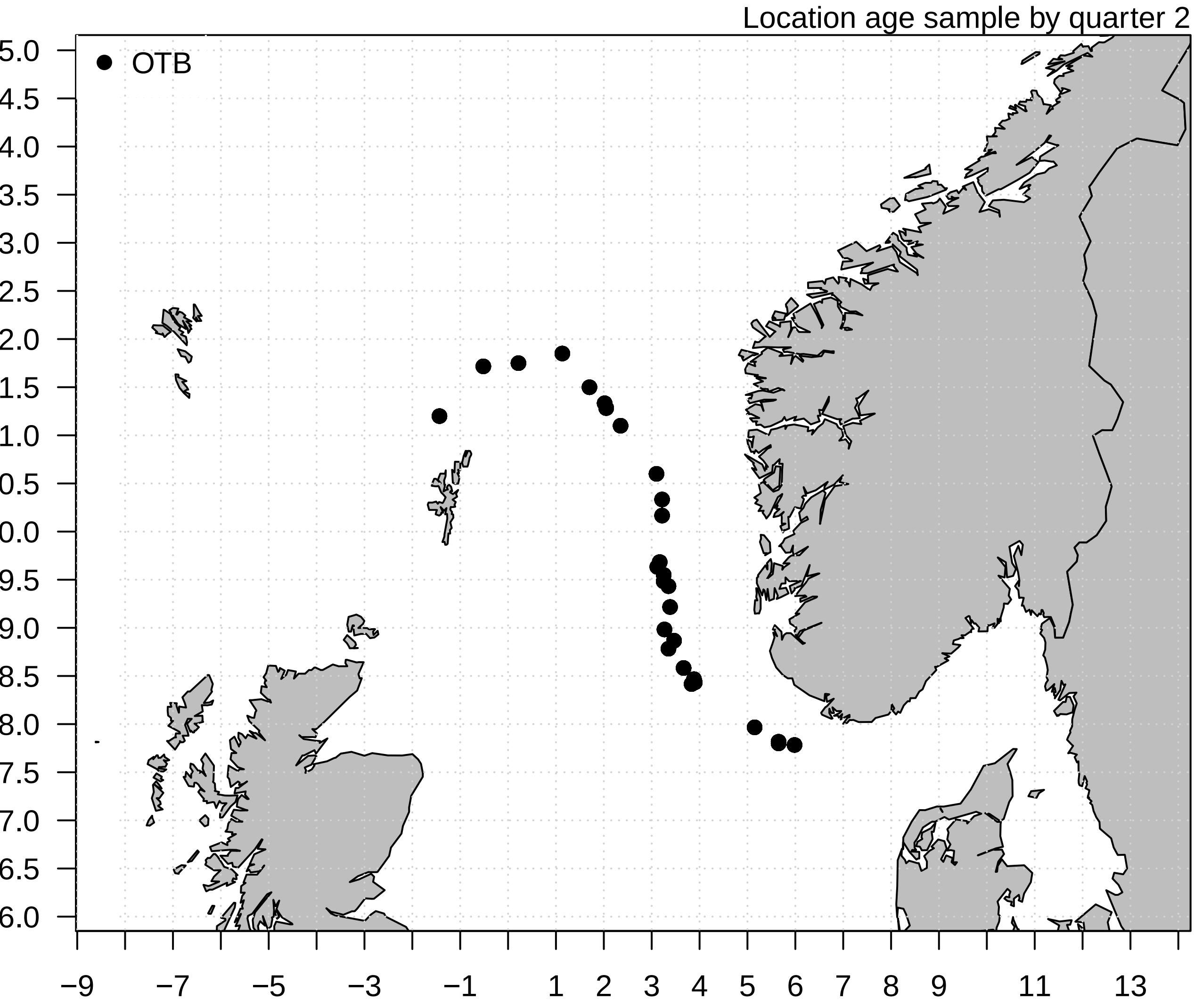

AGED samples, gear OTB
Frequency
Age in Quarter 3
AGED samples,gear GNS
Frequency
Age
AGED samples, gear GNS
Frequency
Age in Quarter 1

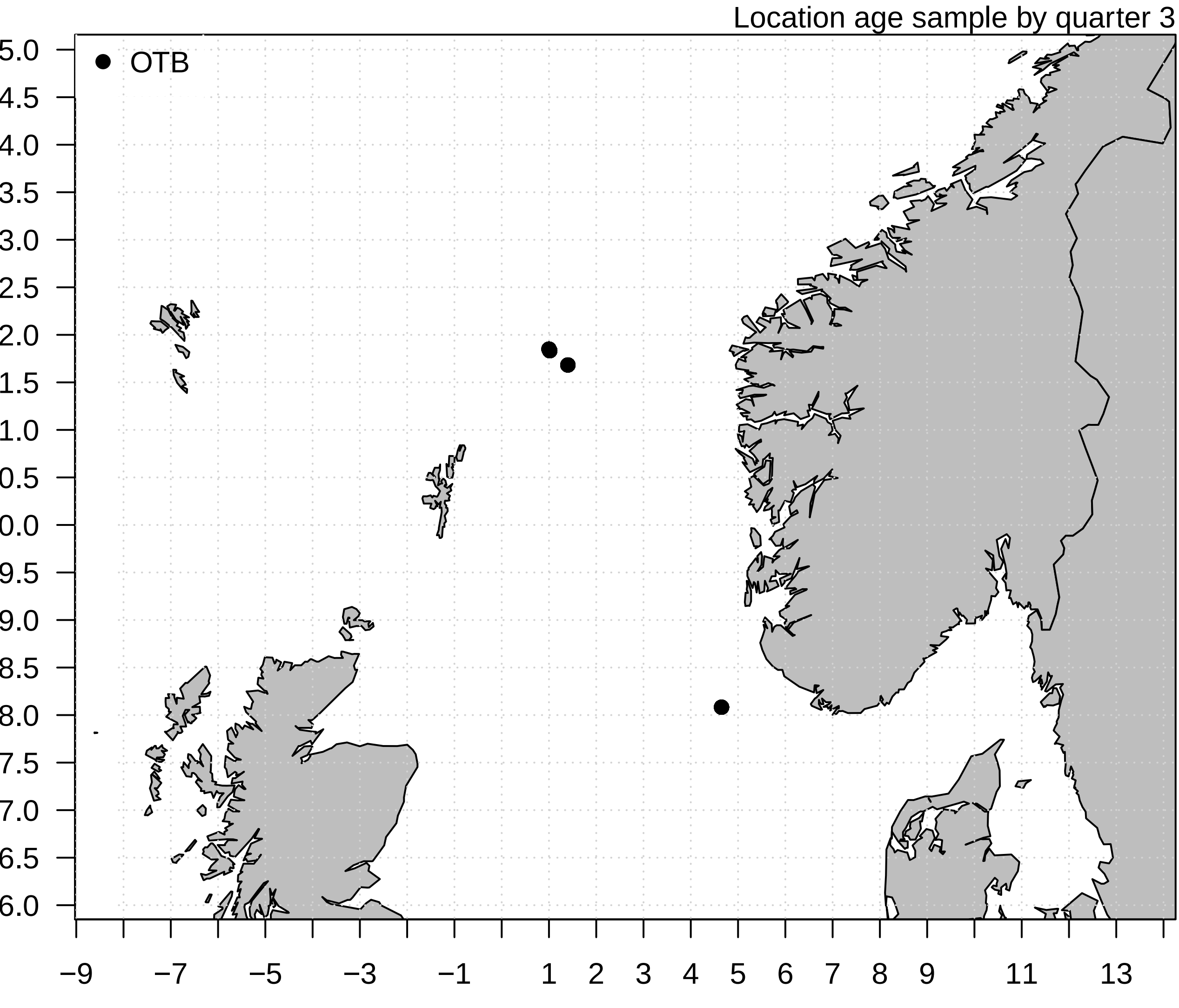
Location of all samples (age & length)

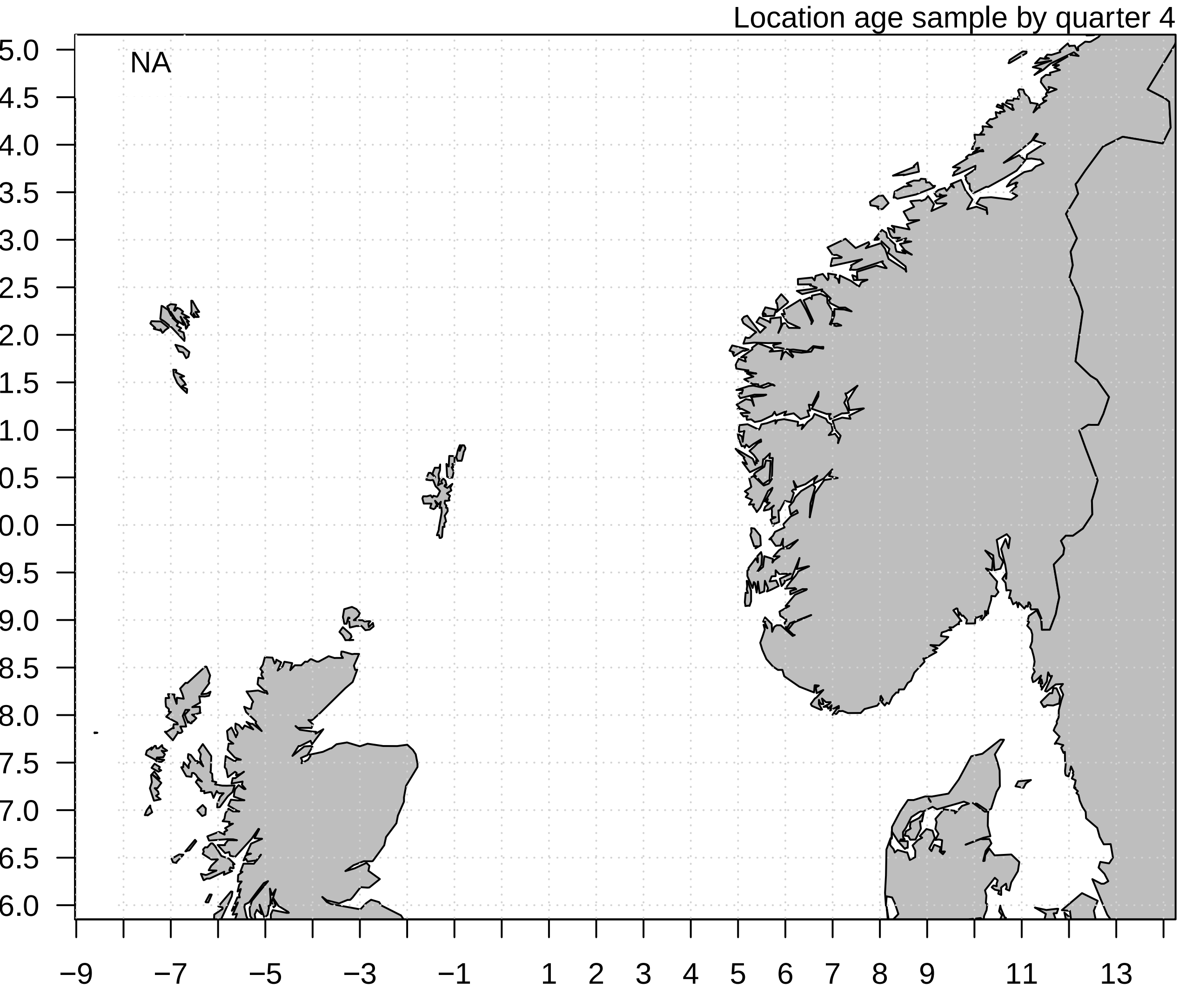


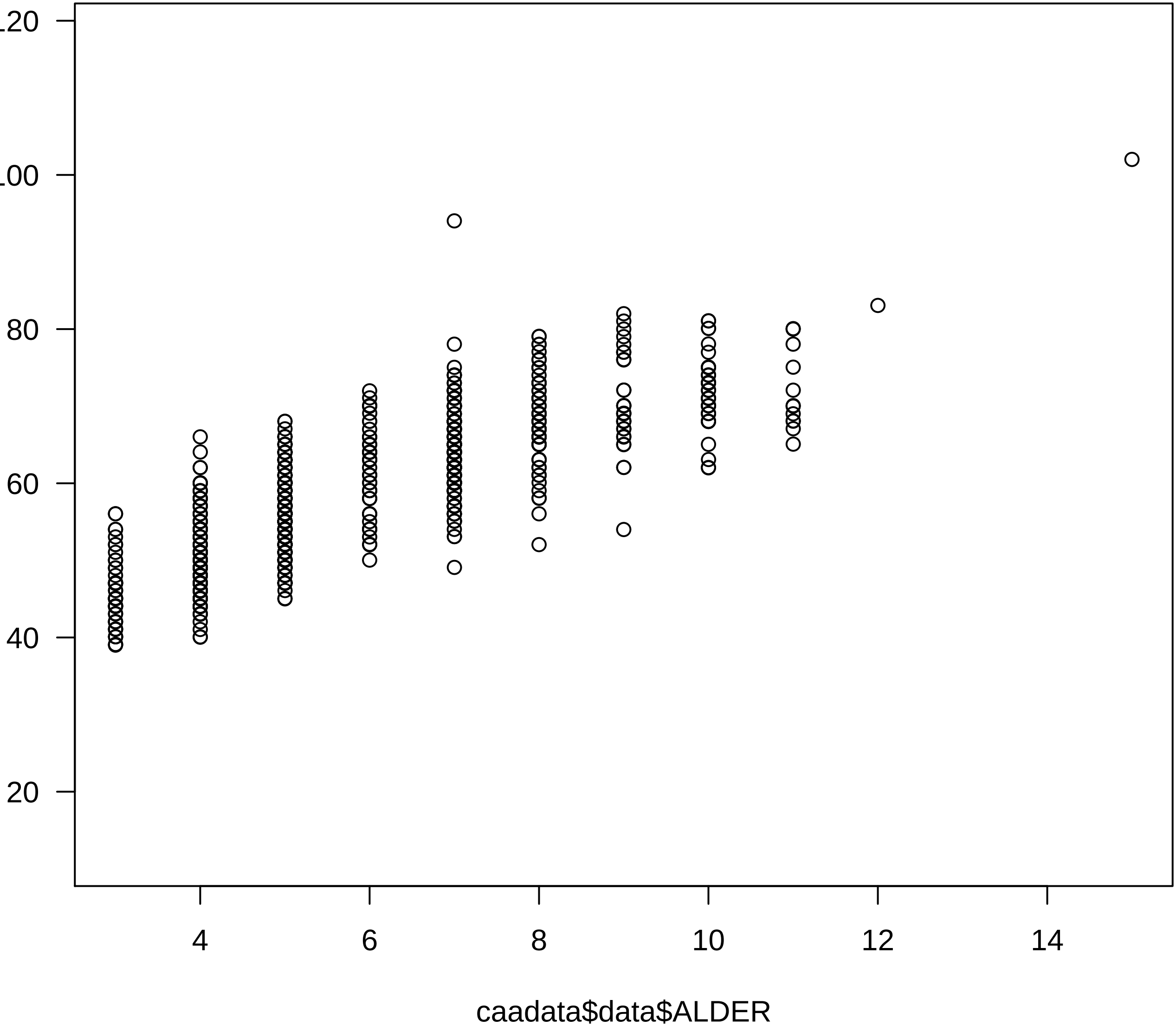

Location of age samples
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 1
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

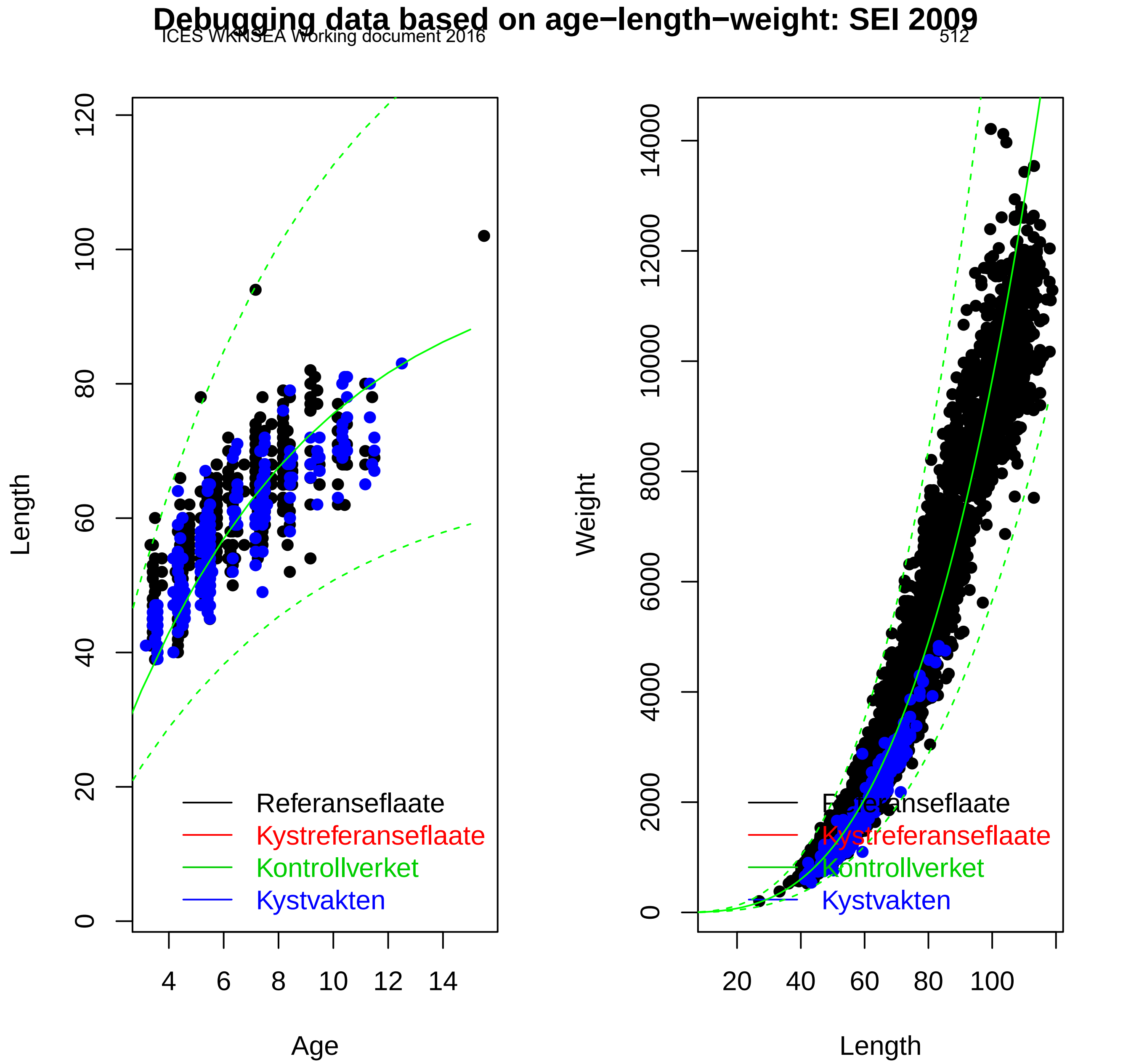

Location age sample by quarter 2
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 3
OTB
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 4
NA
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13



120
100
80
60
40
20
4
6
8
10
12
14
caadata$data$ALDER


Debugging data based on age−length−weight: SEI 2009
Length
Age
0
20
40
60
80
100
120
4
6
8
10
12
14
Referanseflaate
Kystreferanseflaate
Kontrollverket
Kystvakten
Weight
Length
0
2000
4000
6000
8000
10000
12000
14000
20
40
60
80
100
Referanseflaate
Kystreferanseflaate
Kontrollverket
Kystvakten

_length

2010 length samples

Gear	Q '\' A	9	8
31	1	77164 1, 1, 88	22963743.5 12, 70, 3087
31	2	236366 0, 0, 0	12996653.8 10, 52, 2392
31	3	376667.6 0, 0, 0	4633669.4 1, 1, 60
31	4	370805.6 0, 0, 0	1827759.6 3, 3, 189
41	1	58124.4 1, 7, 260	2602309.6 5, 41, 1130
41	2	41840.6 1, 3, 90	446543.8 2, 19, 272
41	3	19248.4 0, 0, 0	652141 3, 44, 945
41	4	60396 1, 9, 270	1759083 4, 74, 2042
51	1	161.4 0, 0, 0	35913.8 1, 12, 275
51	2	958.8 0, 0, 0	101134.9 2, 20, 516
51	3	663.6 0, 0, 0	496703.7 1, 31, 713
51	4	273.6 0, 0, 0	120151.8 0, 0, 0
43	1	46961 0, 0, 0	285481.8 1, 1, 30
43	2	22895.5 0, 0, 0	2565978.4 2, 2, 58
43	3	24844.6 1, 1, 32	494837.2 0, 0, 0
43	4	30773.2 0, 0, 0	22190.4 1, 1, 109

Total catch= 53372440

Sampled catch=51651676.3(97)%

Sampled catch required for DB estimation=46608326.1(87)%

#Boats sampled= 53

#Serienr sampled= 392

#Fish sampled= 12558

2010 age samples

Gear	Q '\' A	9	8
31	1	77164 0, 0, 0	22963743.5 5, 11, 219
31	2	236366 0, 0, 0	12996653.8 7, 11, 220
31	3	376667.6 0, 0, 0	4633669.4 0, 0, 0
31	4	370805.6 0, 0, 0	1827759.6 0, 0, 0
41	1	58124.4 1, 3, 60	2602309.6 4, 15, 227
41	2	41840.6 0, 0, 0	446543.8 0, 0, 0
41	3	19248.4 0, 0, 0	652141 2, 3, 42
41	4	60396 1, 2, 40	1759083 2, 7, 127
51	1	161.4 0, 0, 0	35913.8 0, 0, 0
51	2	958.8 0, 0, 0	101134.9 0, 0, 0
51	3	663.6 0, 0, 0	496703.7 1, 2, 47
51	4	273.6 0, 0, 0	120151.8 0, 0, 0
43	1	46961 0, 0, 0	285481.8 1, 1, 13
43	2	22895.5 0, 0, 0	2565978.4 2, 2, 46
43	3	24844.6 0, 0, 0	494837.2 0, 0, 0
43	4	30773.2 0, 0, 0	22190.4 0, 0, 0

Total catch= 53372440

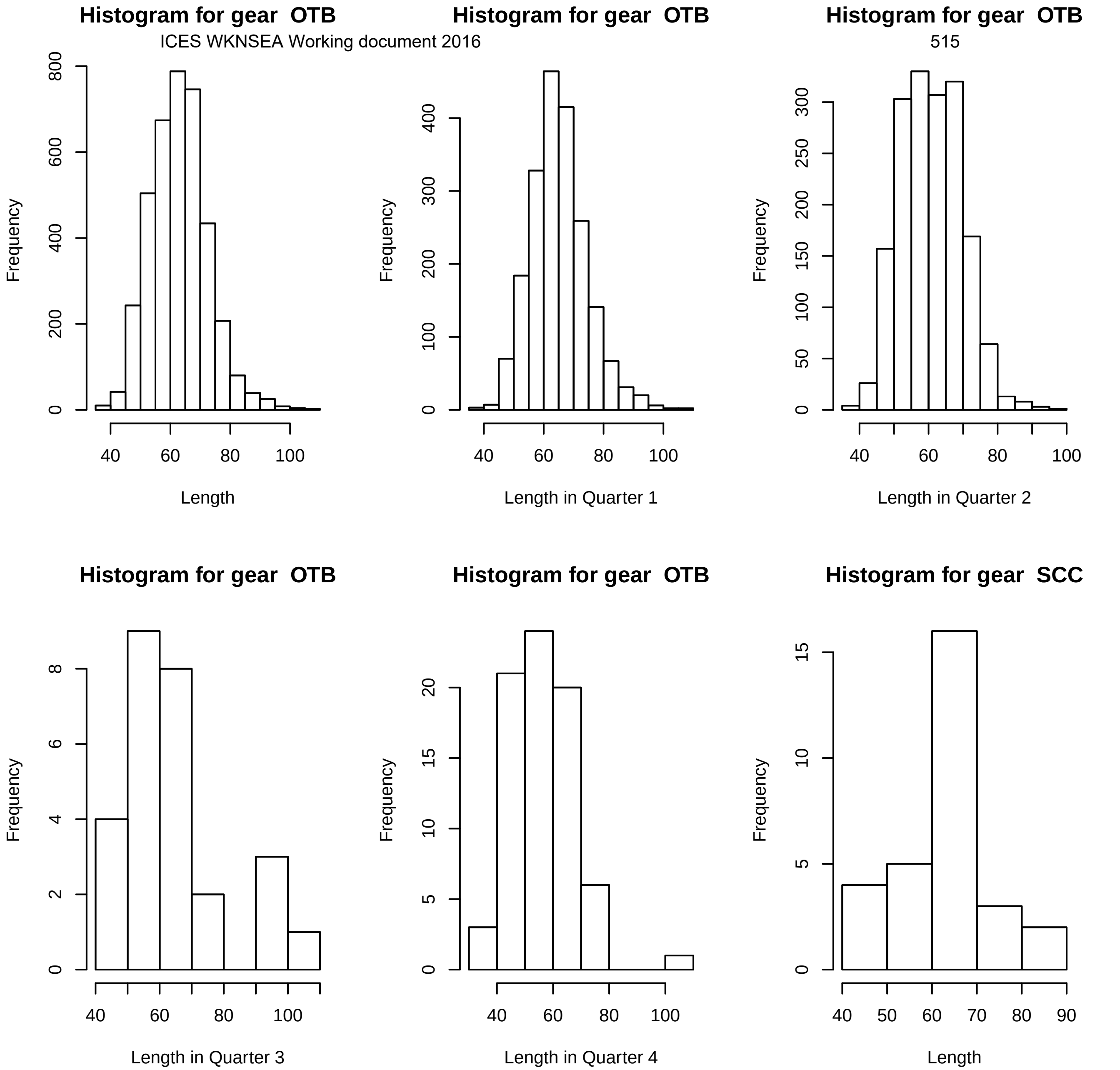
Sampled catch=44440615.2(83)%

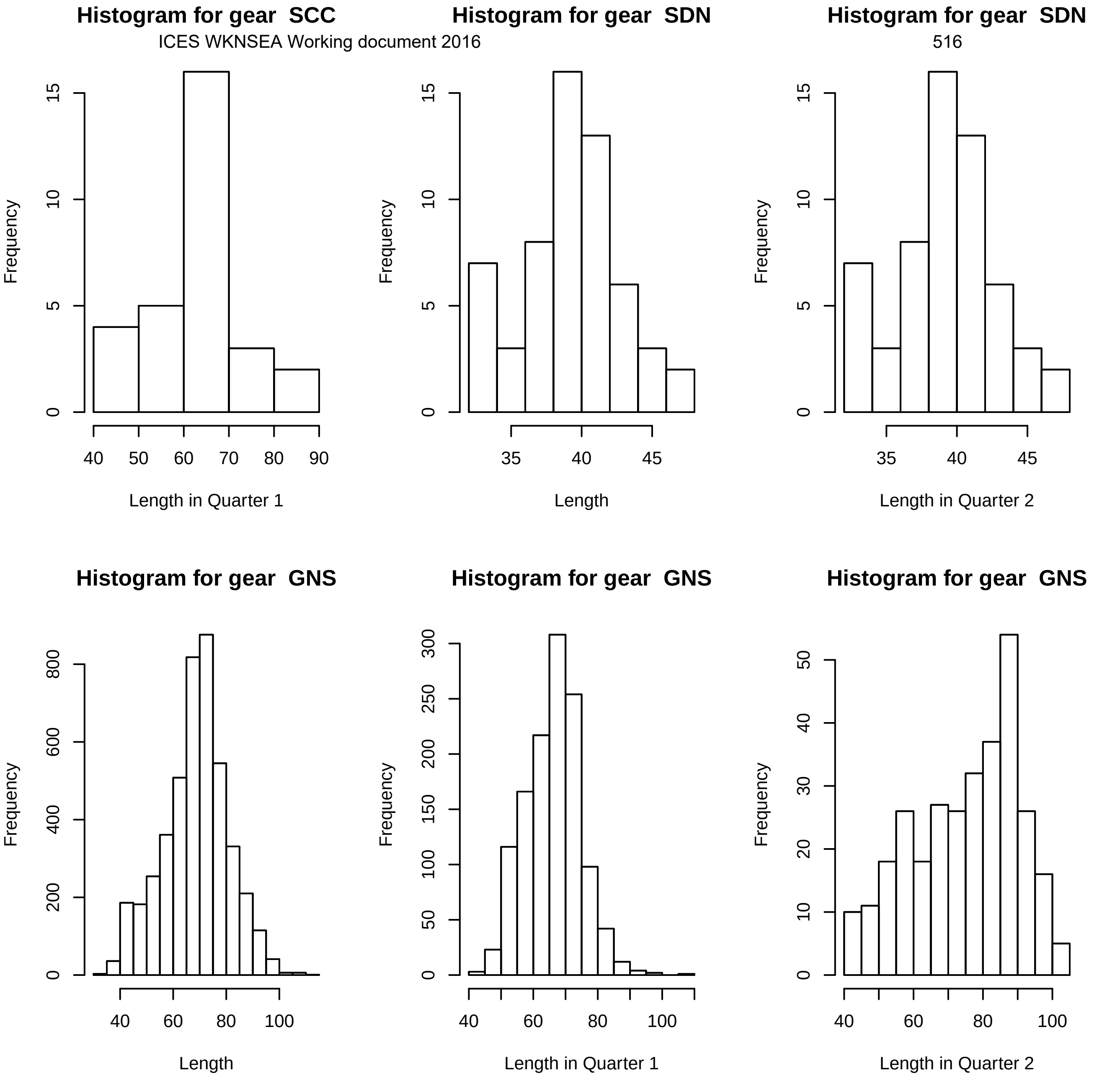
Sampled catch required for DB estimation=44155133.4(83)%

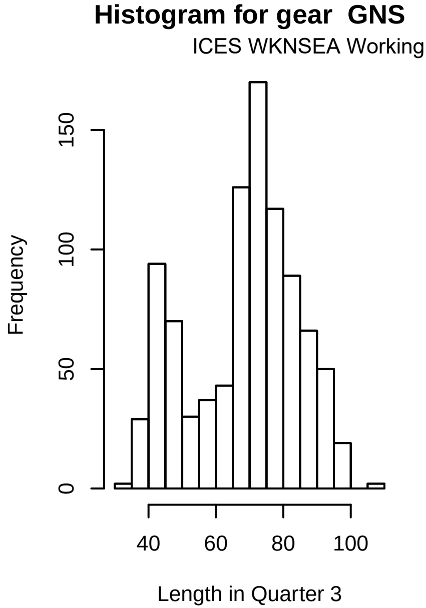
#Boats sampled= 26

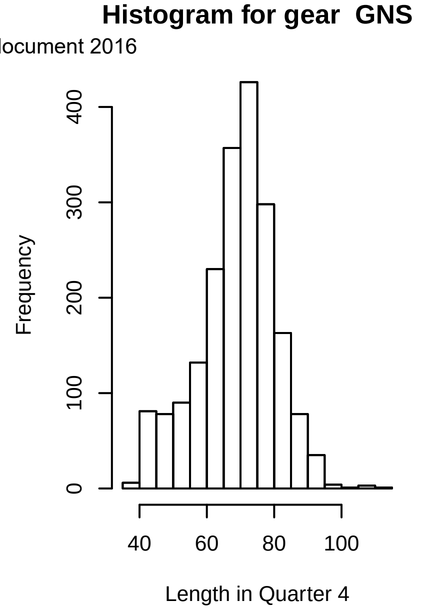
#Serienr sampled= 57

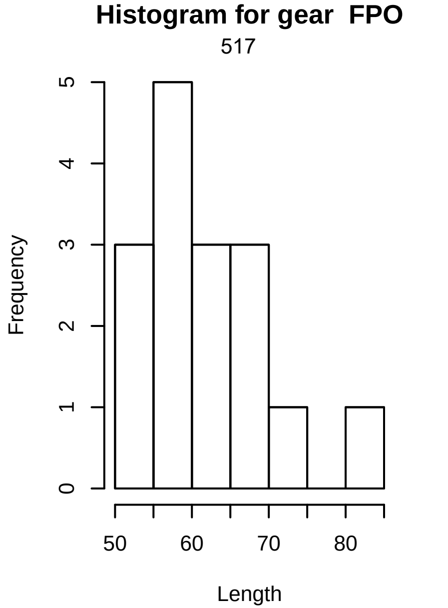
#Fish sampled= 1041

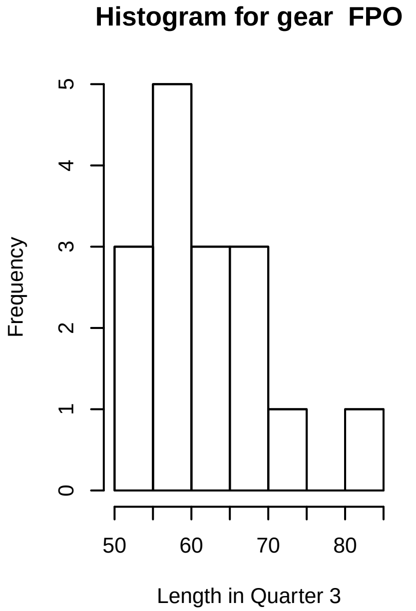

Histogram for gear OTB
Frequency
Length
Histogram for gear OTB
Frequency
Length in Quarter 1
Histogram for gear OTB
Frequency
Length in Quarter 2
Histogram for gear OTB
Frequency
Length in Quarter 3
Histogram for gear OTB
Frequency
Length in Quarter 4
Histogram for gear SCC
Frequency
Length

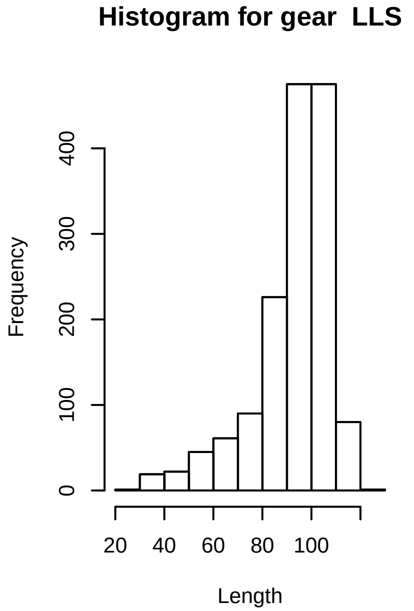

Histogram for gear SCC
Frequency
0
5
10
15
40
50
60
70
80
90
Length in Quarter 1
Histogram for gear SDN
Frequency
0
5
10
15
35
40
45
Length
Histogram for gear SDN
Frequency
0
5
10
15
35
40
45
Length in Quarter 2
Histogram for gear GNS
Frequency
0
200
400
600
800
40
60
80
100
Length
Histogram for gear GNS
Frequency
0
50
100
150
200
250
300
40
60
80
100
Length in Quarter 1
Histogram for gear GNS
Frequency
0
10
20
30
40
50
40
60
80
100
Length in Quarter 2

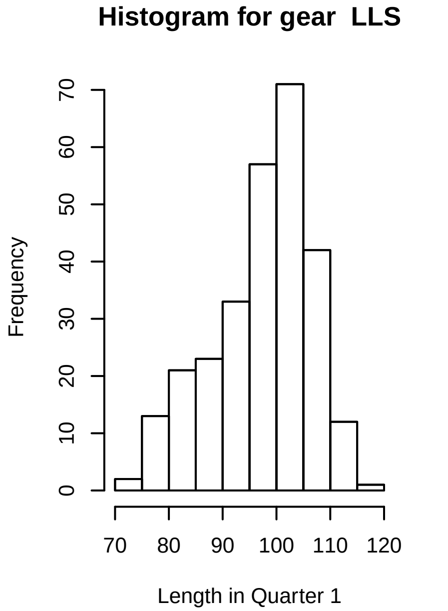

Histogram for gear GNS
Frequency
0
50
100
150
40
60
80
100
Length in Quarter 3

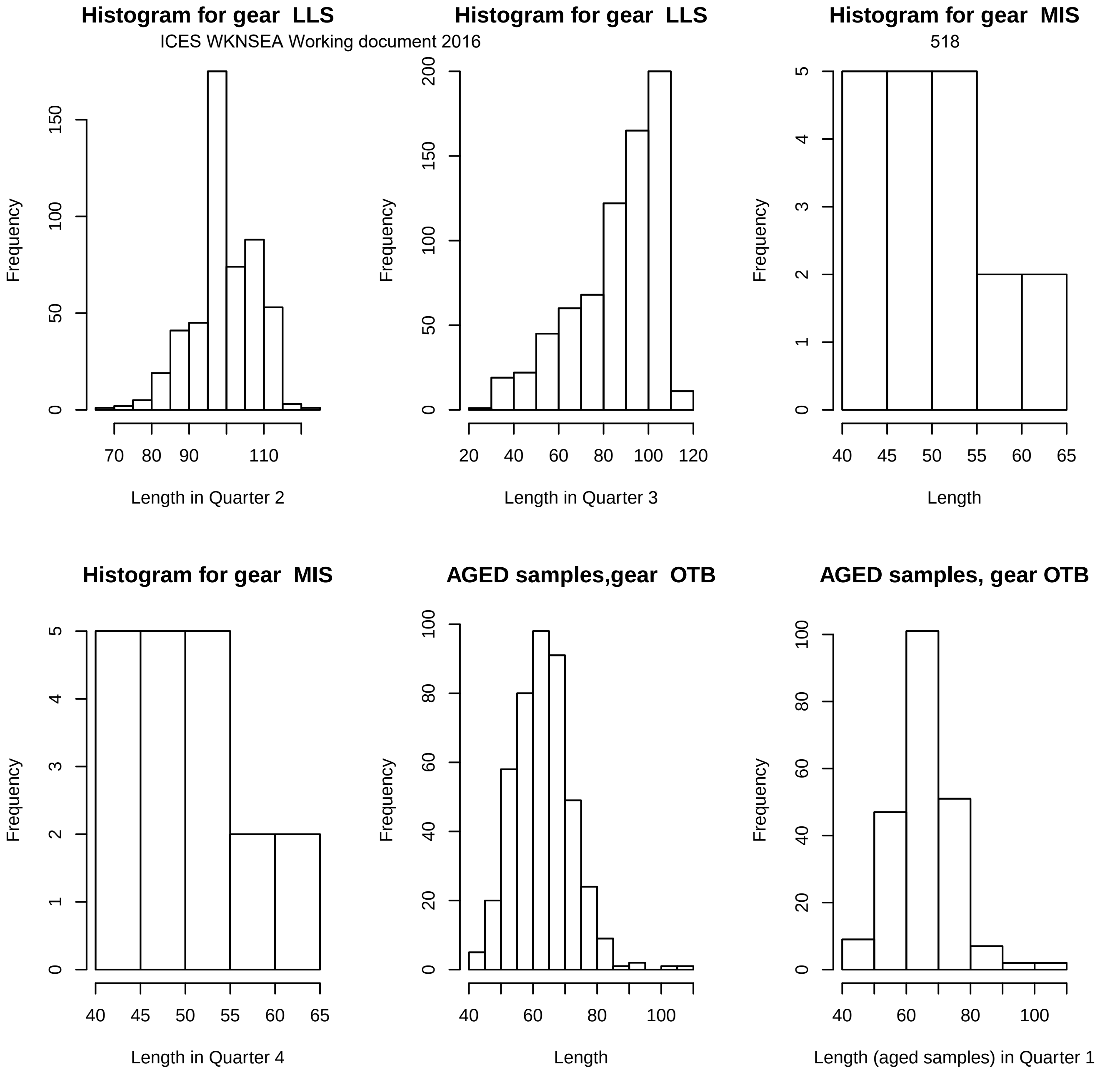

Histogram for gear GNS
Frequency
0
100
200
300
400
40
60
80
100
Length in Quarter 4

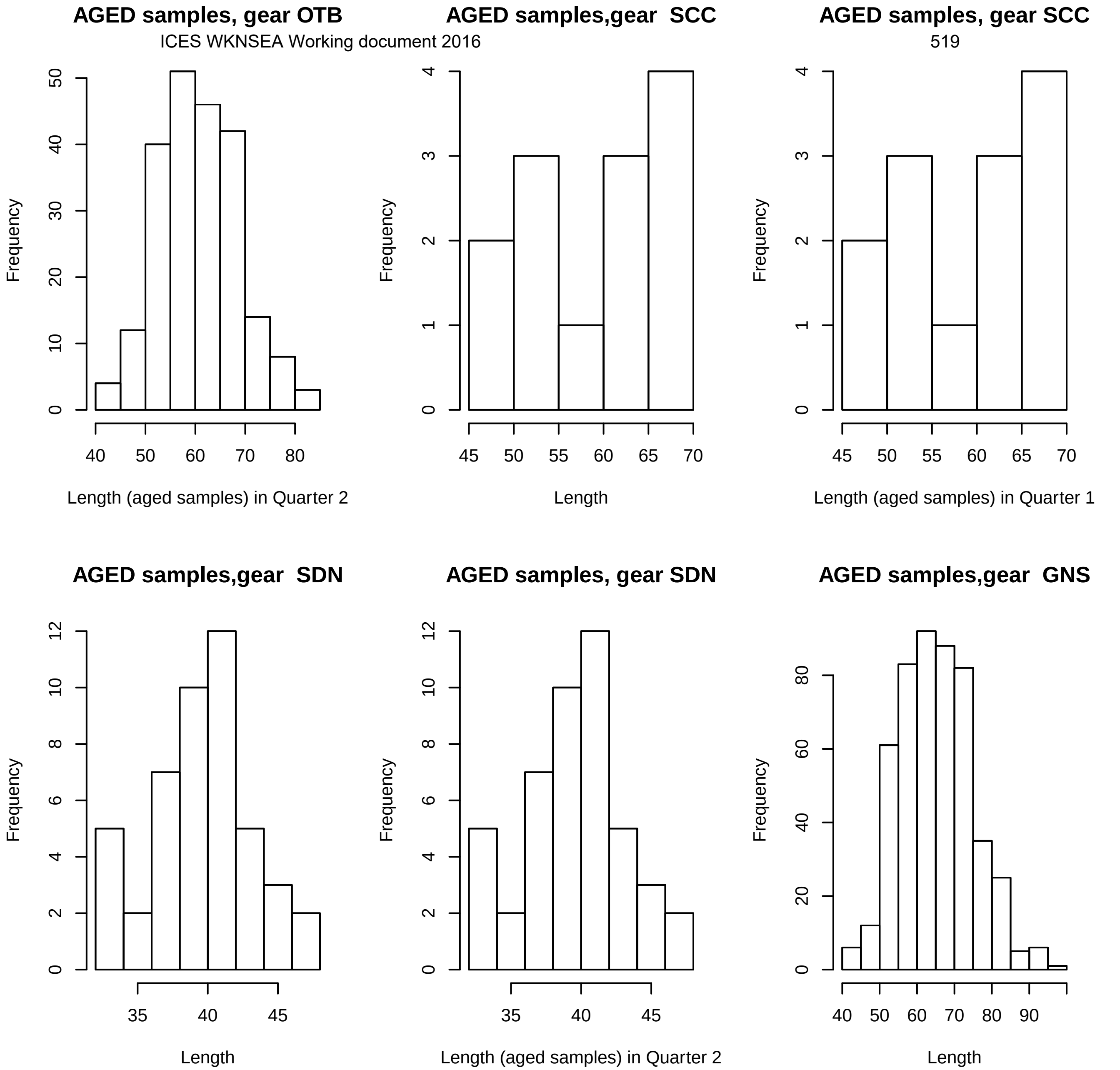

Histogram for gear FPO
Frequency
0
1
2
3
4
5
50
60
70
80
Length

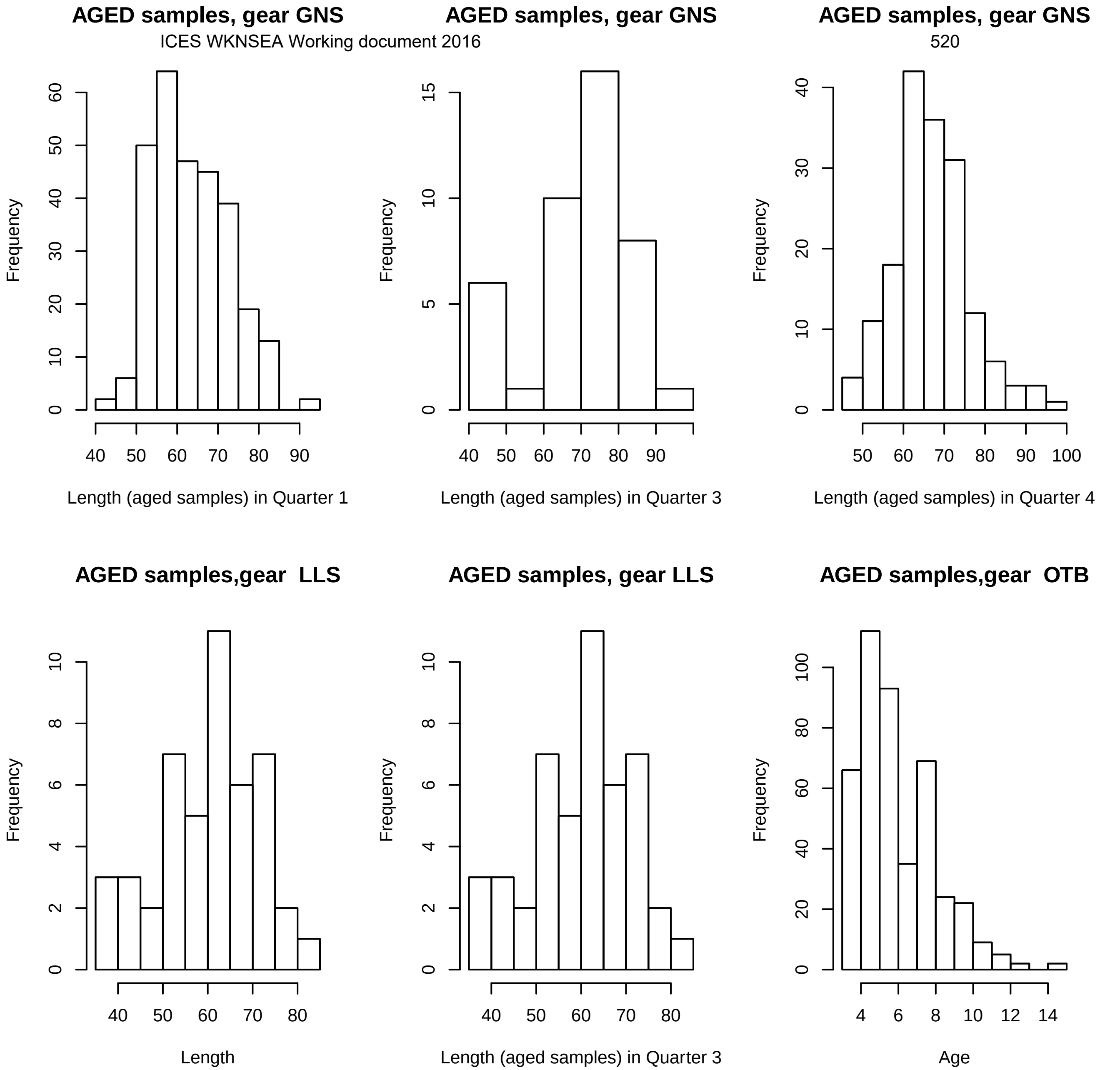

Histogram for gear FPO
Frequency
0
1
2
3
4
5
50
60
70
80
Length in Quarter 3

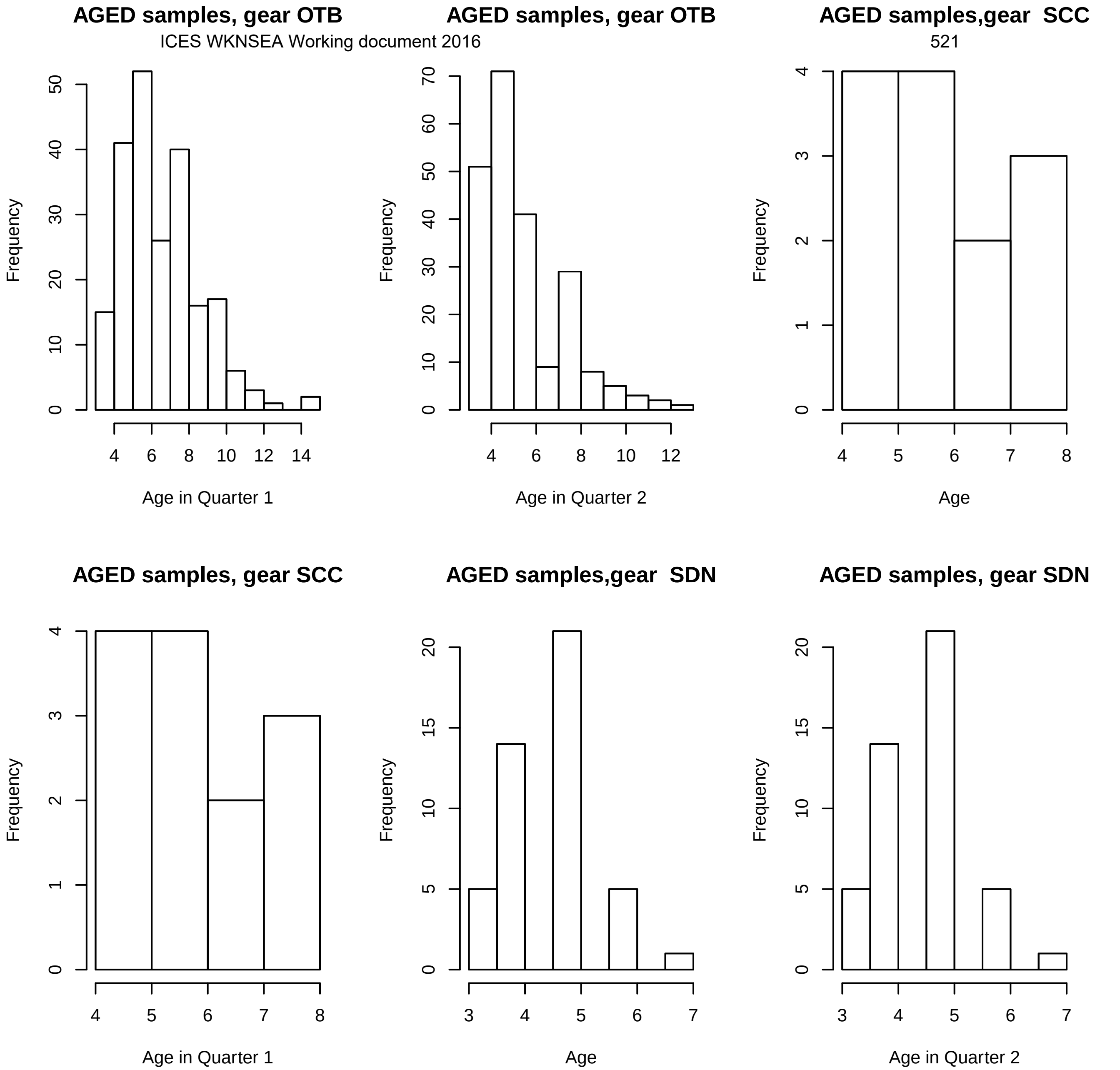

Histogram for gear LLS
Frequency
0
100
200
300
400
20
40
60
80
100
Length

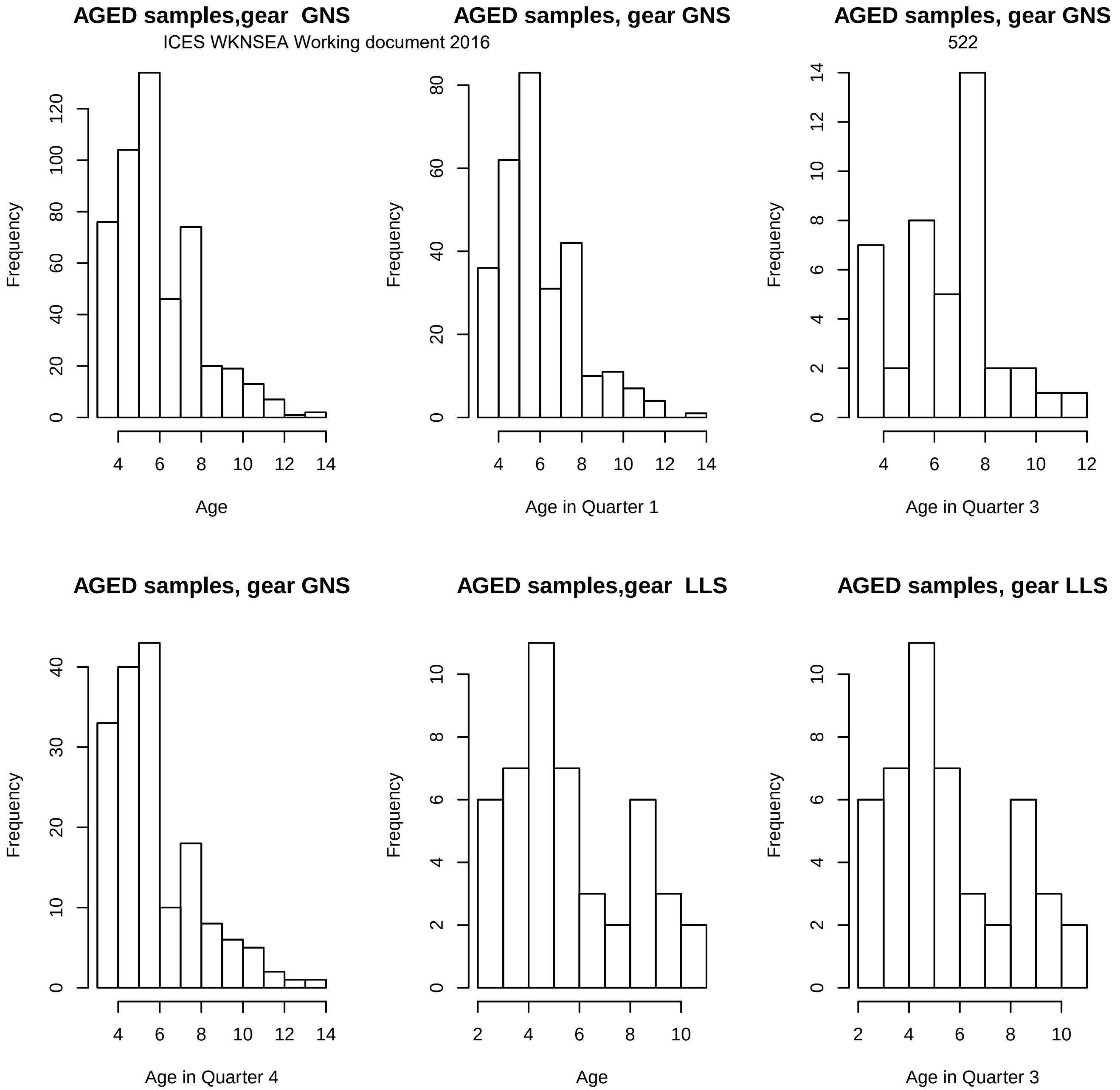

Histogram for gear LLS
Frequency
0
10
20
30
40
50
60
70
70
80
90
100
110
120
Length in Quarter 1

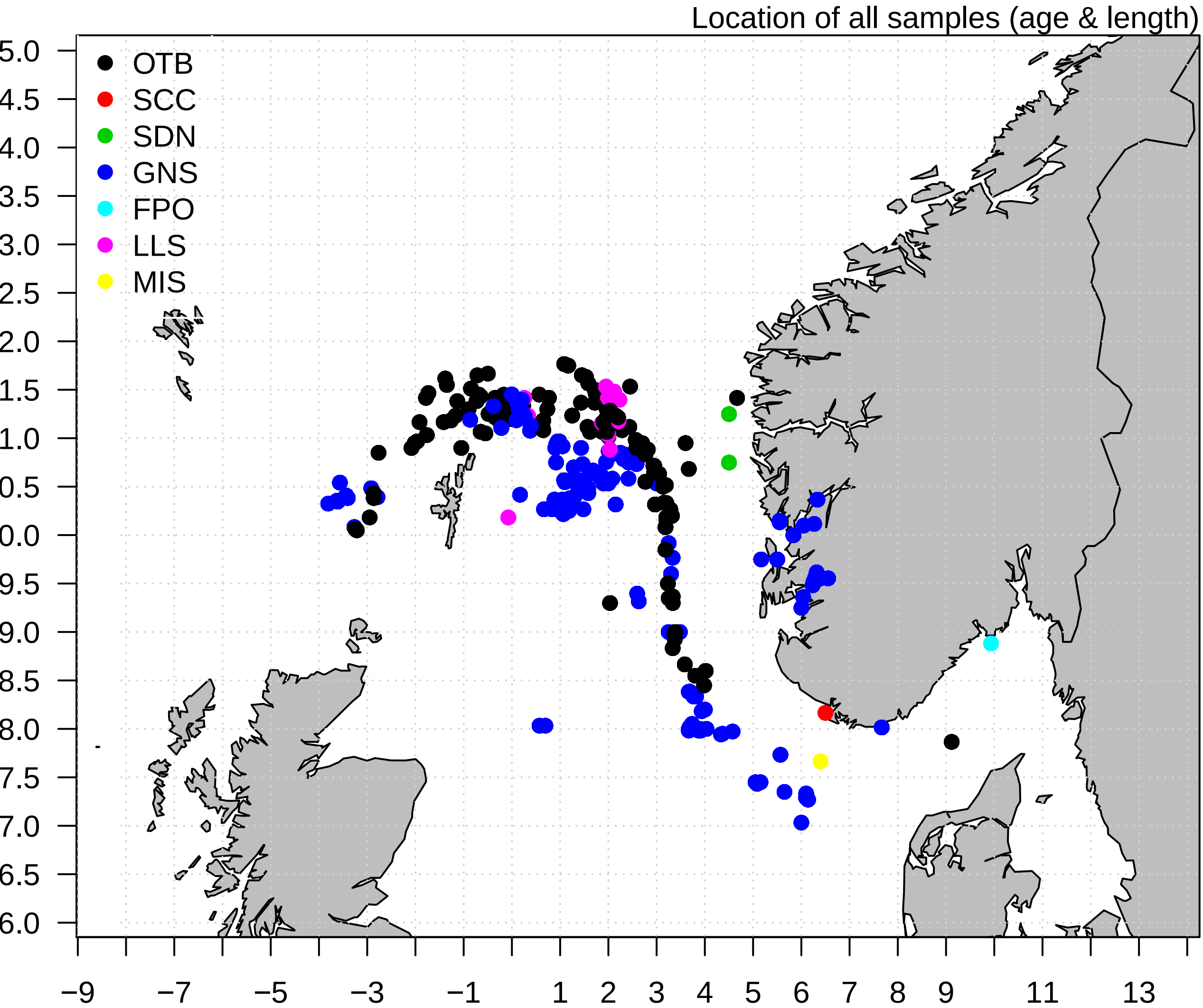

Histogram for gear LLS
Frequency
Length in Quarter 2
Histogram for gear LLS
Frequency
Length in Quarter 3
Histogram for gear MIS
Frequency
Length
Histogram for gear MIS
Frequency
Length in Quarter 4
AGED samples,gear OTB
Frequency
Length
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 1

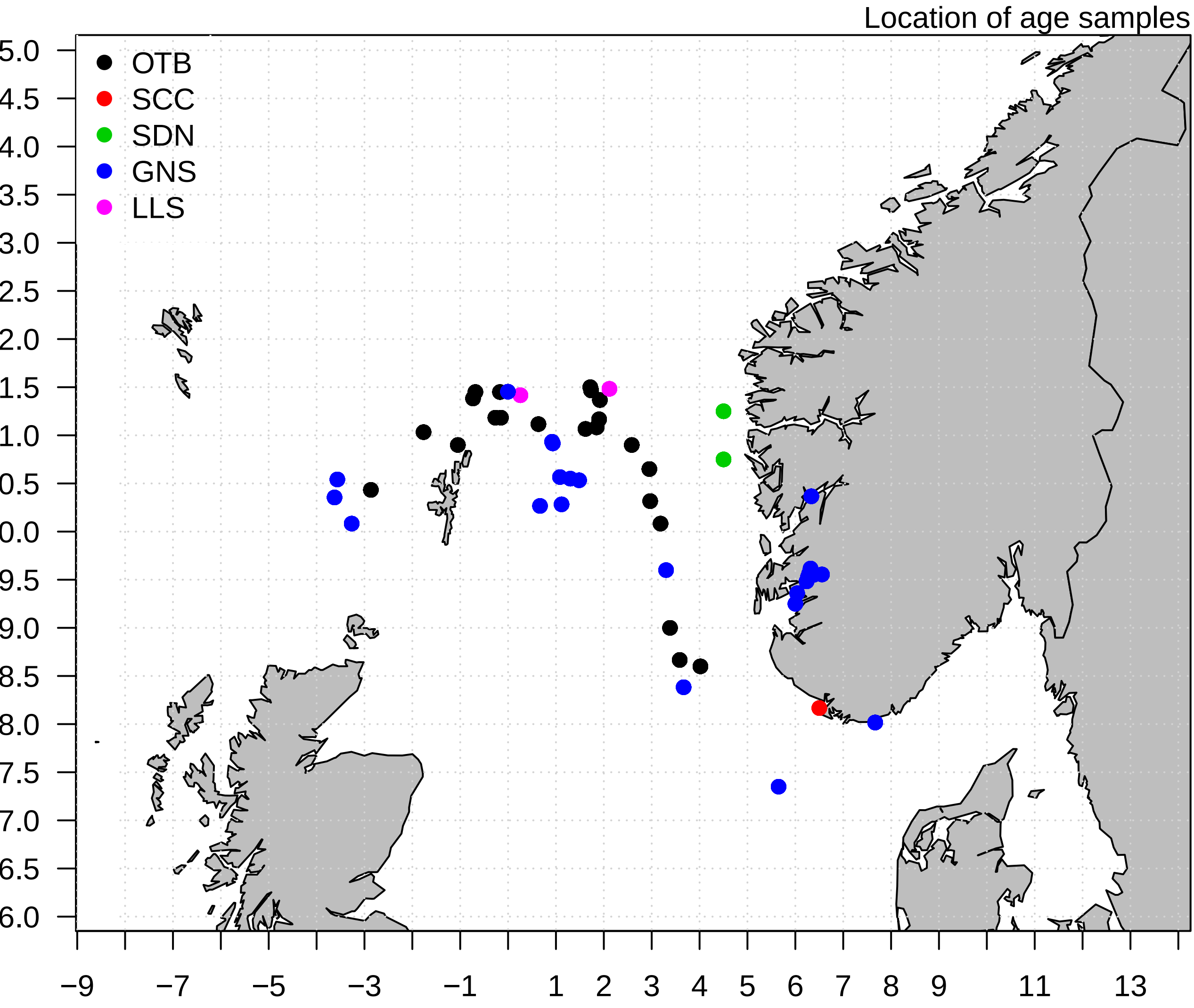

AGED samples, gear OTB
Frequency
0 10 20 30 40 50
40 50 60 70 80
Length (aged samples) in Quarter 2
AGED samples,gear SCC
Frequency
0 1 2 3 4
45 50 55 60 65 70
Length
AGED samples, gear SCC
Frequency
0 1 2 3 4
45 50 55 60 65 70
Length (aged samples) in Quarter 1
AGED samples,gear SDN
Frequency
0 2 4 6 8 10 12
35 40 45
Length
AGED samples, gear SDN
Frequency
0 2 4 6 8 10 12
35 40 45
Length (aged samples) in Quarter 2
AGED samples,gear GNS
Frequency
0 20 40 60 80
40 50 60 70 80 90
Length

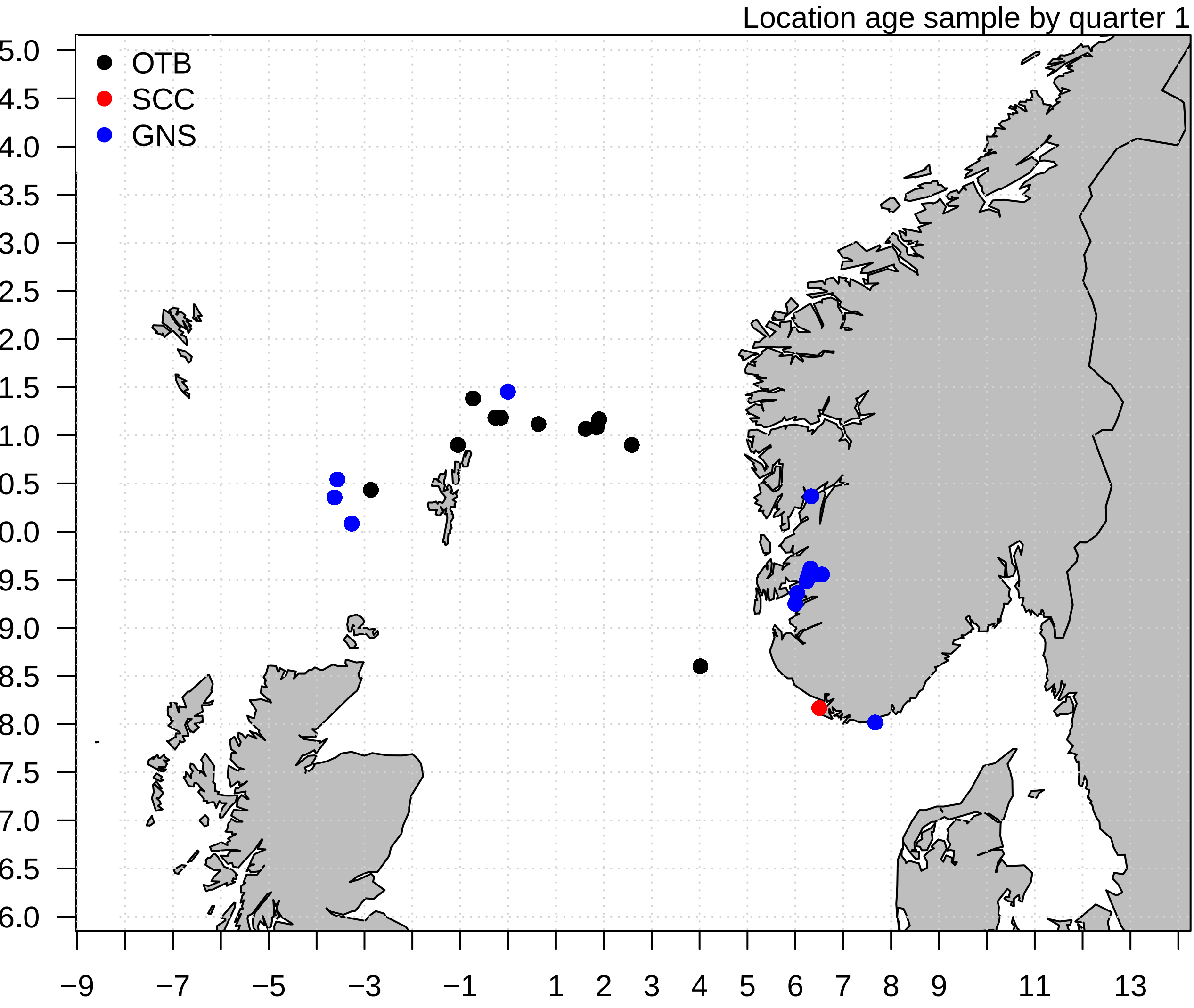

AGED samples, gear GNS
Frequency
Length (aged samples) in Quarter 1
AGED samples, gear GNS
Frequency
Length (aged samples) in Quarter 3
AGED samples, gear GNS
Frequency
Length (aged samples) in Quarter 4
AGED samples,gear LLS
Frequency
Length
AGED samples, gear LLS
Frequency
Length (aged samples) in Quarter 3
AGED samples,gear OTB
Frequency
Age

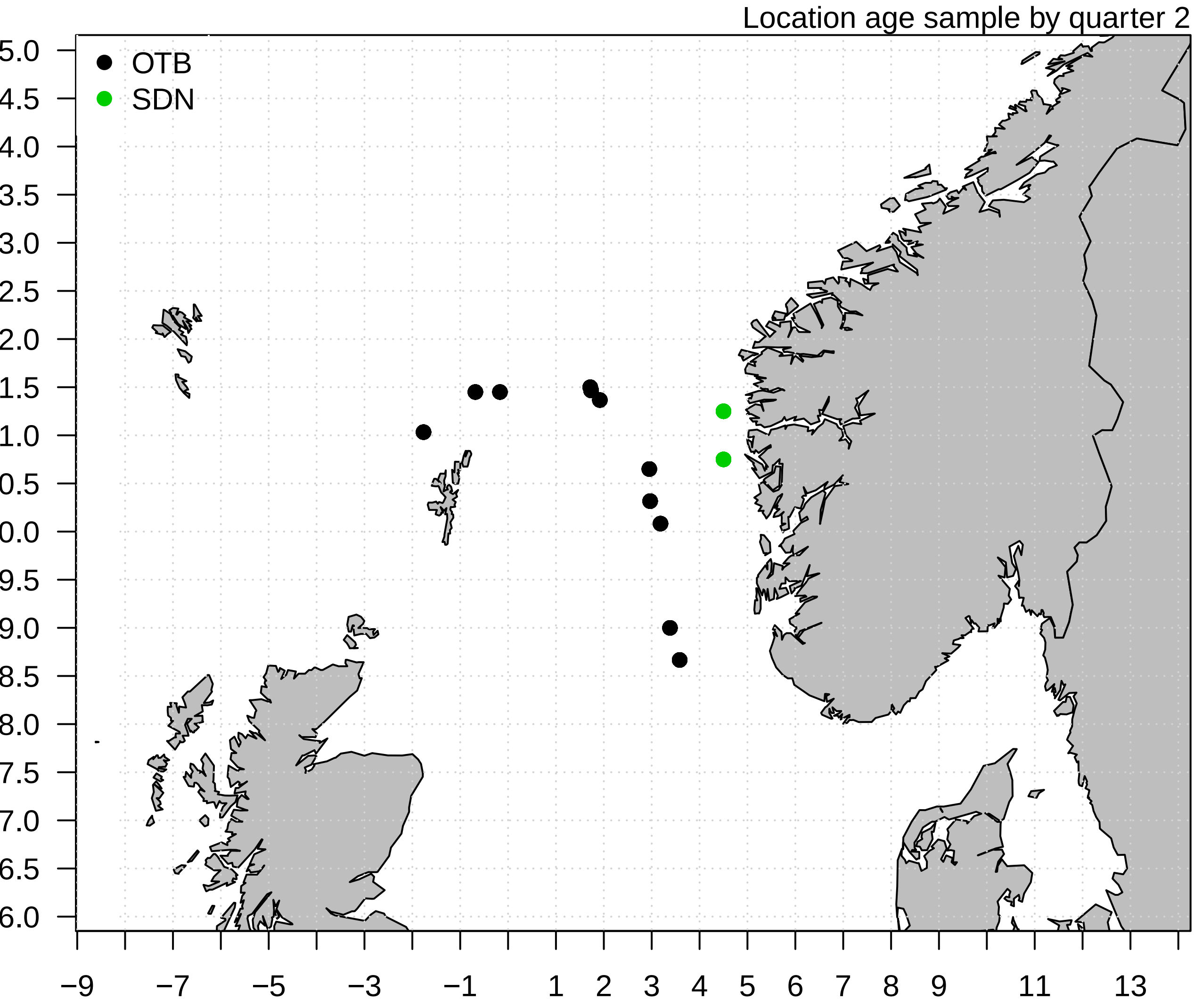

AGED samples, gear OTB
Frequency
Age in Quarter 1
AGED samples, gear OTB
Frequency
Age in Quarter 2
AGED samples,gear SCC
Frequency
Age
AGED samples, gear SCC
Frequency
Age in Quarter 1
AGED samples,gear SDN
Frequency
Age
AGED samples, gear SDN
Frequency
Age in Quarter 2

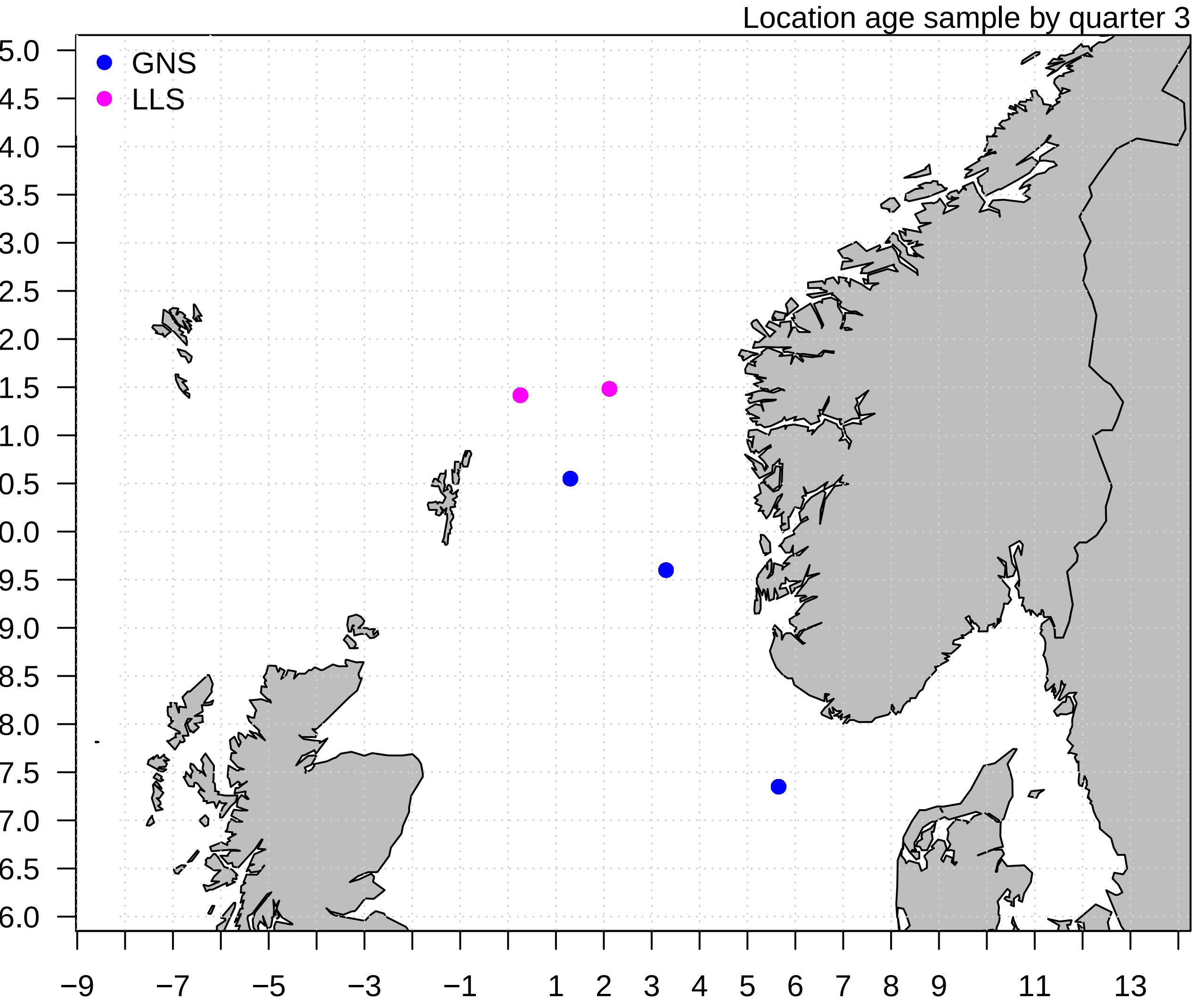

AGED samples,gear GNS
Frequency
Age
AGED samples, gear GNS
Frequency
Age in Quarter 1
AGED samples, gear GNS
Frequency
Age in Quarter 3
AGED samples, gear GNS
Frequency
Age in Quarter 4
AGED samples,gear LLS
Frequency
Age
AGED samples, gear LLS
Frequency
Age in Quarter 3

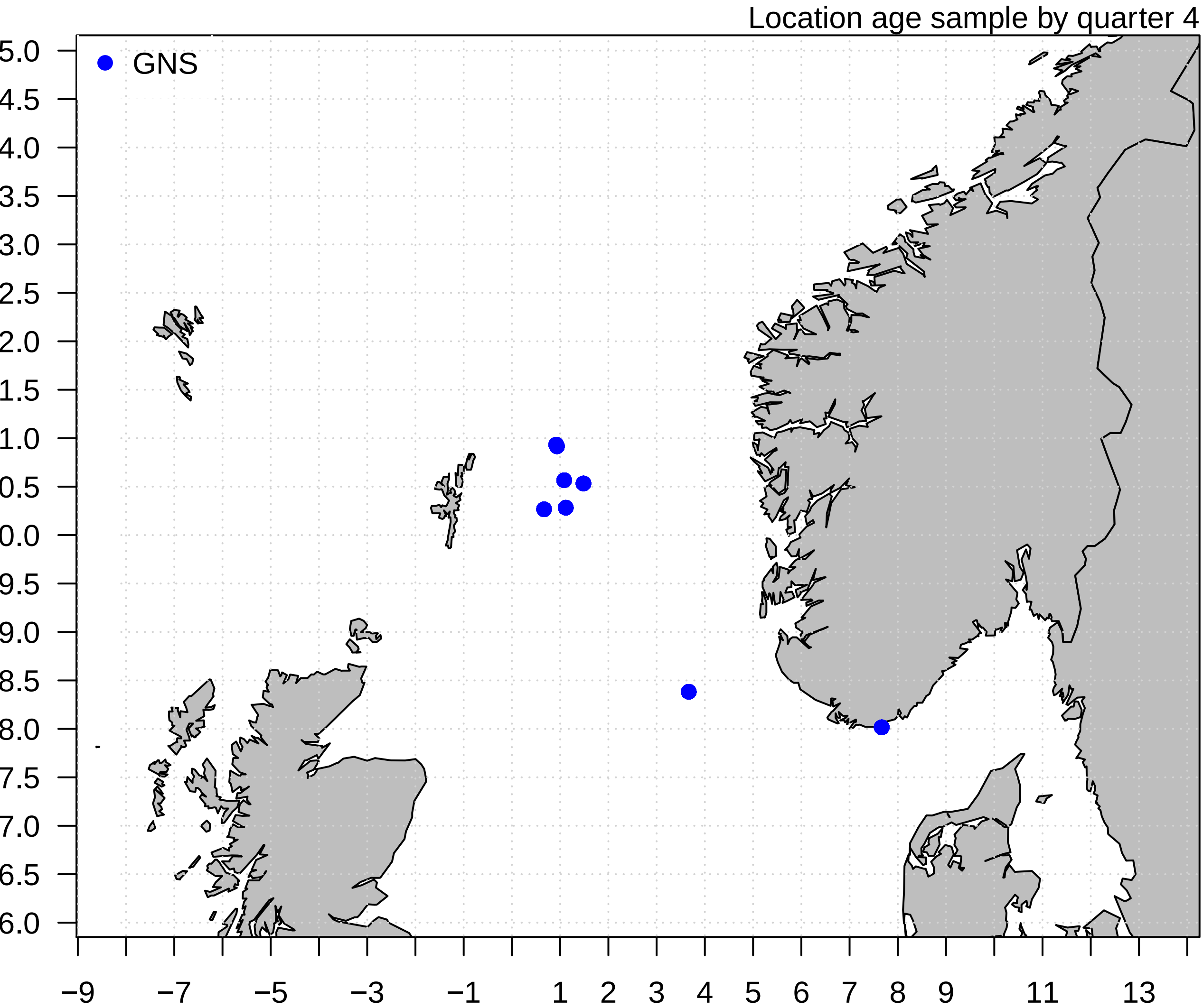

Location of all samples (age & length)
OTB
SCC
SDN
GNS
FPO
LLS
MIS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

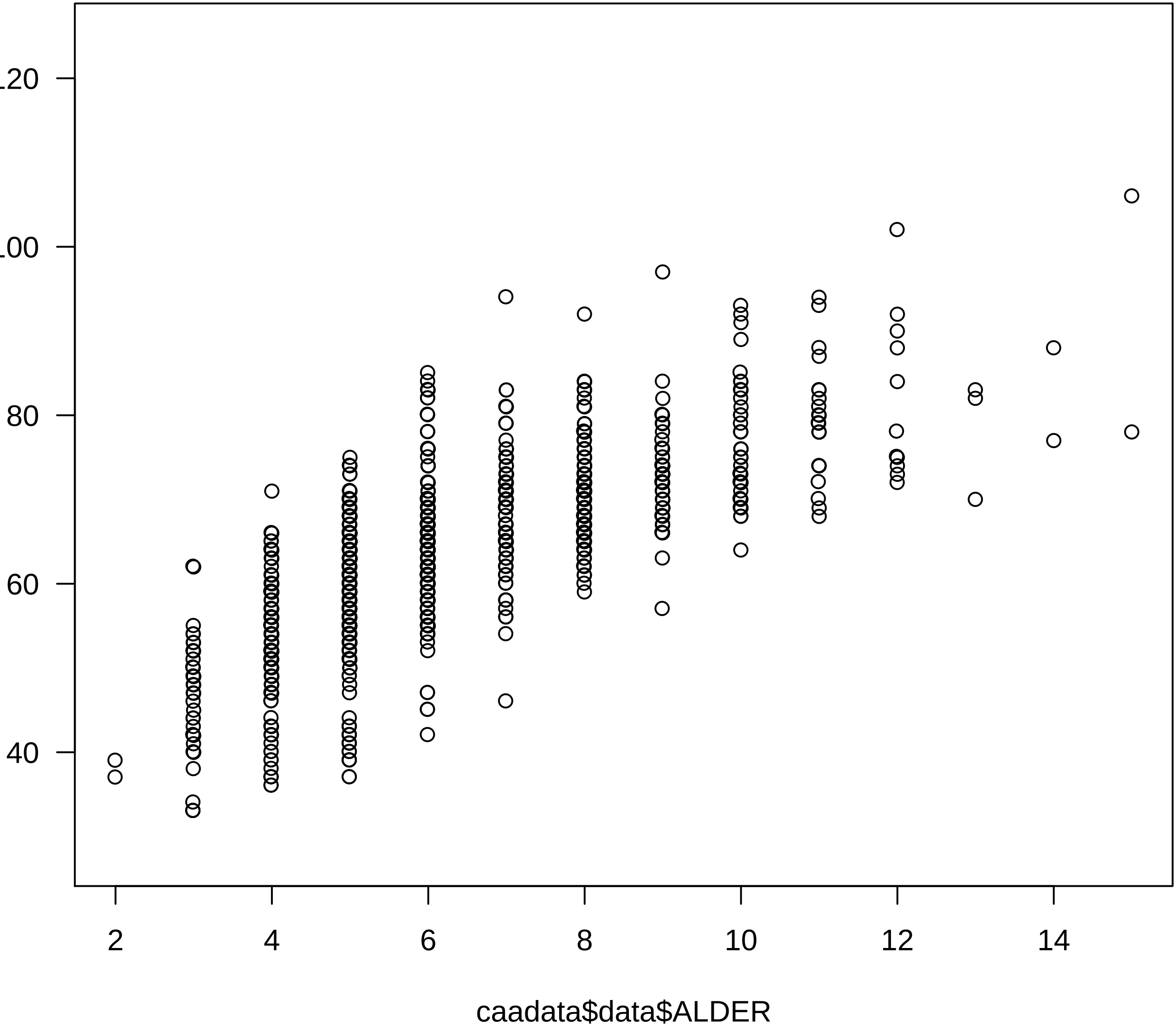

Location of age samples
OTB
SCC
SDN
GNS
LLS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

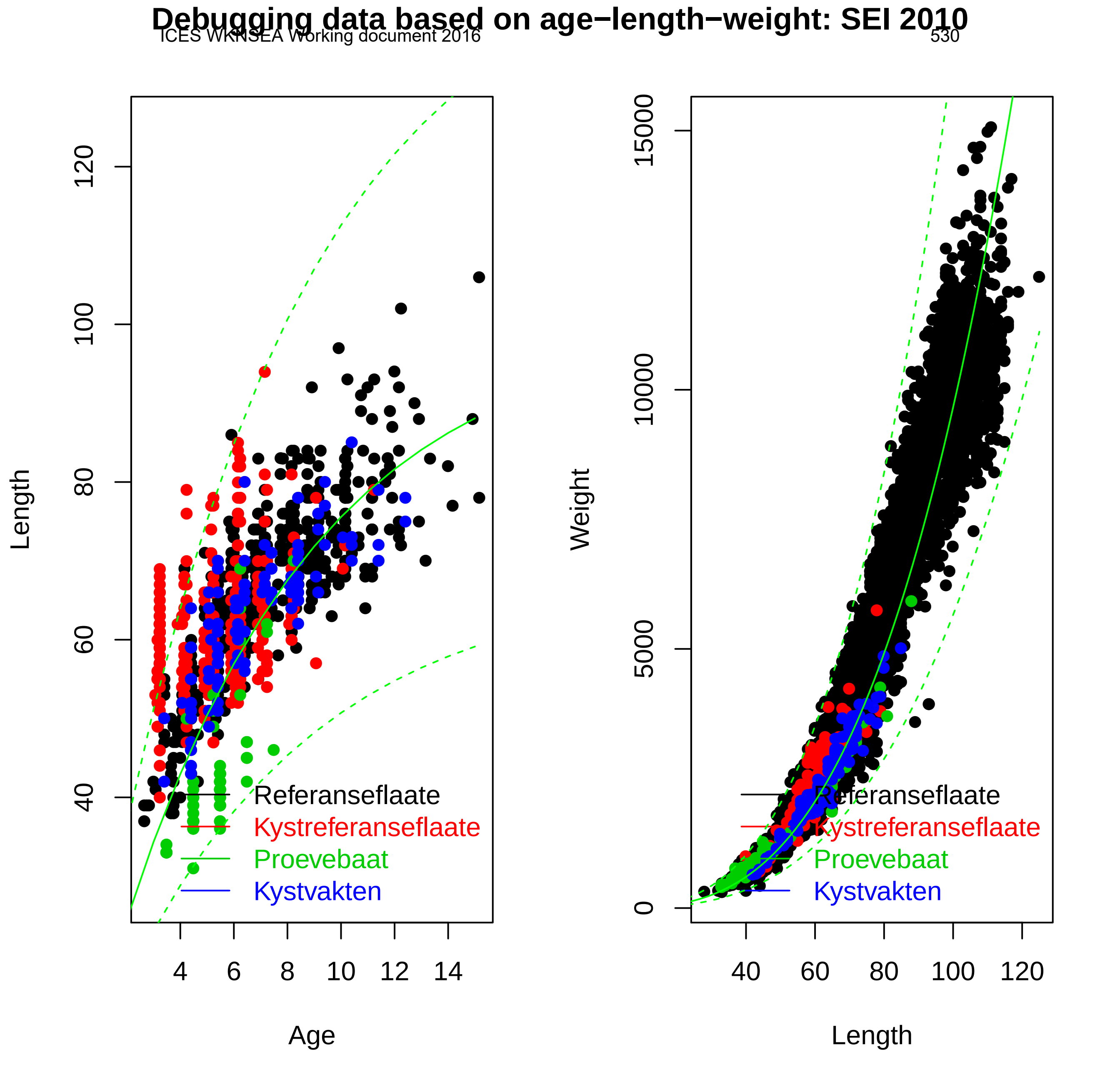

Location age sample by quarter 1
OTB
SCC
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 2
OTB
SDN
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 3
GNS
LLS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 4
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


120
100
80
60
40
2
4
6
8
10
12
14
caadata$data$ALDER



Debugging data based on age−length−weight: SEI 2010
Length
Age
120
100
80
60
40
4
6
8
10
12
14
Referanseflaate
Kystreferanseflaate
Proevebaat
Kystvakten
Weight
Length
15000
10000
5000
0
40
60
80
100
120

2011 length samples

Gear	Q '\' A	9	8
31	1	2538 0, 0, 0	12804743.8 11, 60, 3185
31	2	400.8 0, 0, 0	11693219.8 13, 49, 5090
31	3	115878 0, 0, 0	10692741.7 8, 9, 1237
31	4	387118.8 0, 0, 0	2417606.3 3, 3, 402
41	1	91614.3 2, 30, 733	3758963 5, 62, 1739
41	2	19662.7 1, 1, 20	527116.1 4, 51, 818
41	3	17197.3 0, 0, 0	572983 3, 75, 1452
41	4	35150.9 1, 12, 228	546643.1 5, 56, 1174
51	1	1.8 0, 0, 0	27911.8 0, 0, 0
51	2	1398 0, 0, 0	56864.5 0, 0, 0
51	3	2277.6 0, 0, 0	259585.9 2, 9, 275
51	4	2665.2 0, 0, 0	107691.5 1, 5, 133
43	1	36574.5 0, 0, 0	241383.7 1, 5, 562
43	2	22192.6 0, 0, 0	1325808.1 3, 6, 133
43	3	25486.8 0, 0, 0	1339888.3 1, 1, 20
43	4	27545.9 0, 0, 0	139018.8 0, 0, 0

Total catch= 47299872.6

Sampled catch=46434802.2(98)%

Sampled catch required for DB estimation=45075251.2(95)%

#Boats sampled= 64

#Serienr sampled= 434

#Fish sampled= 17201

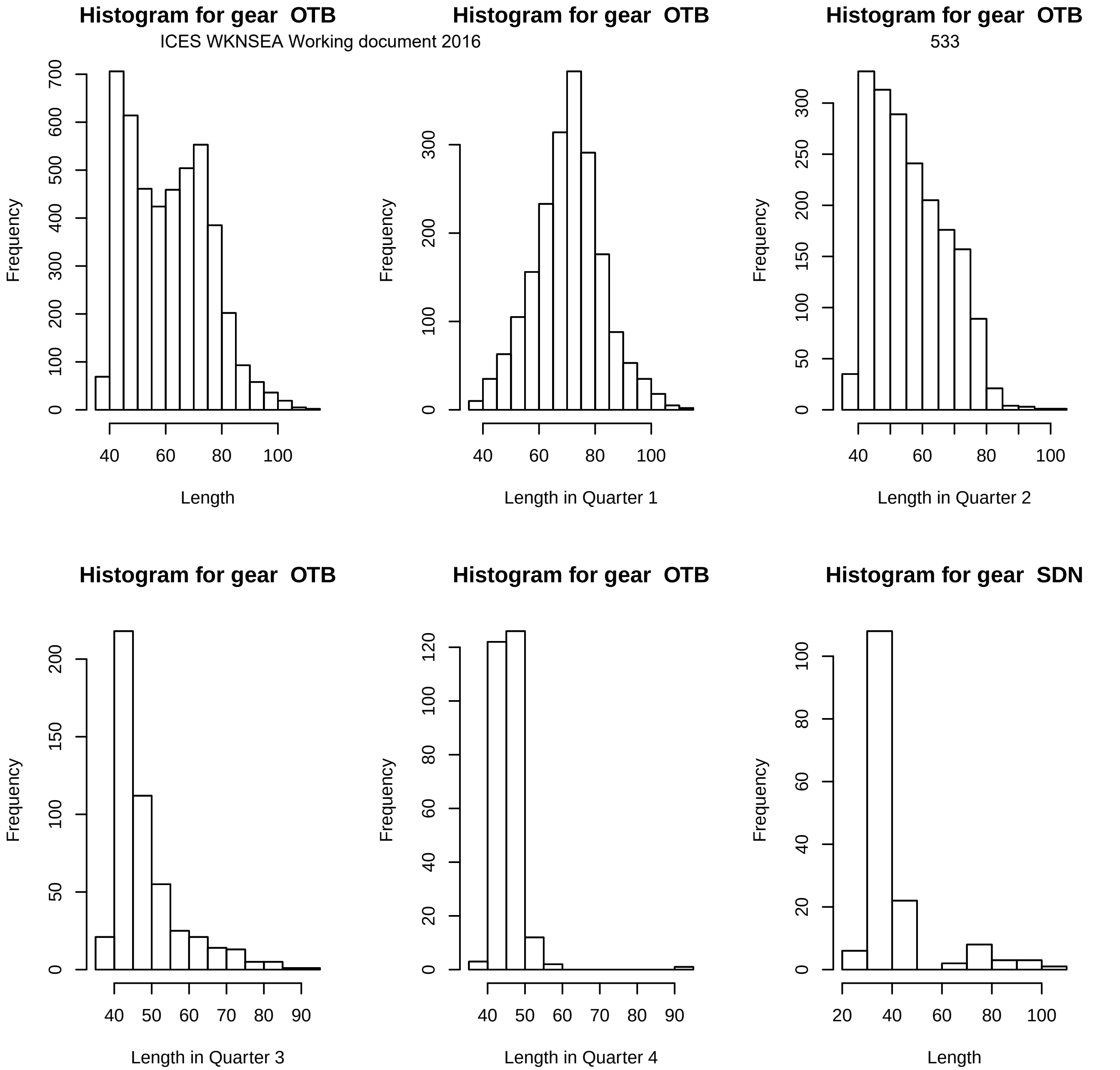
2011 age samples

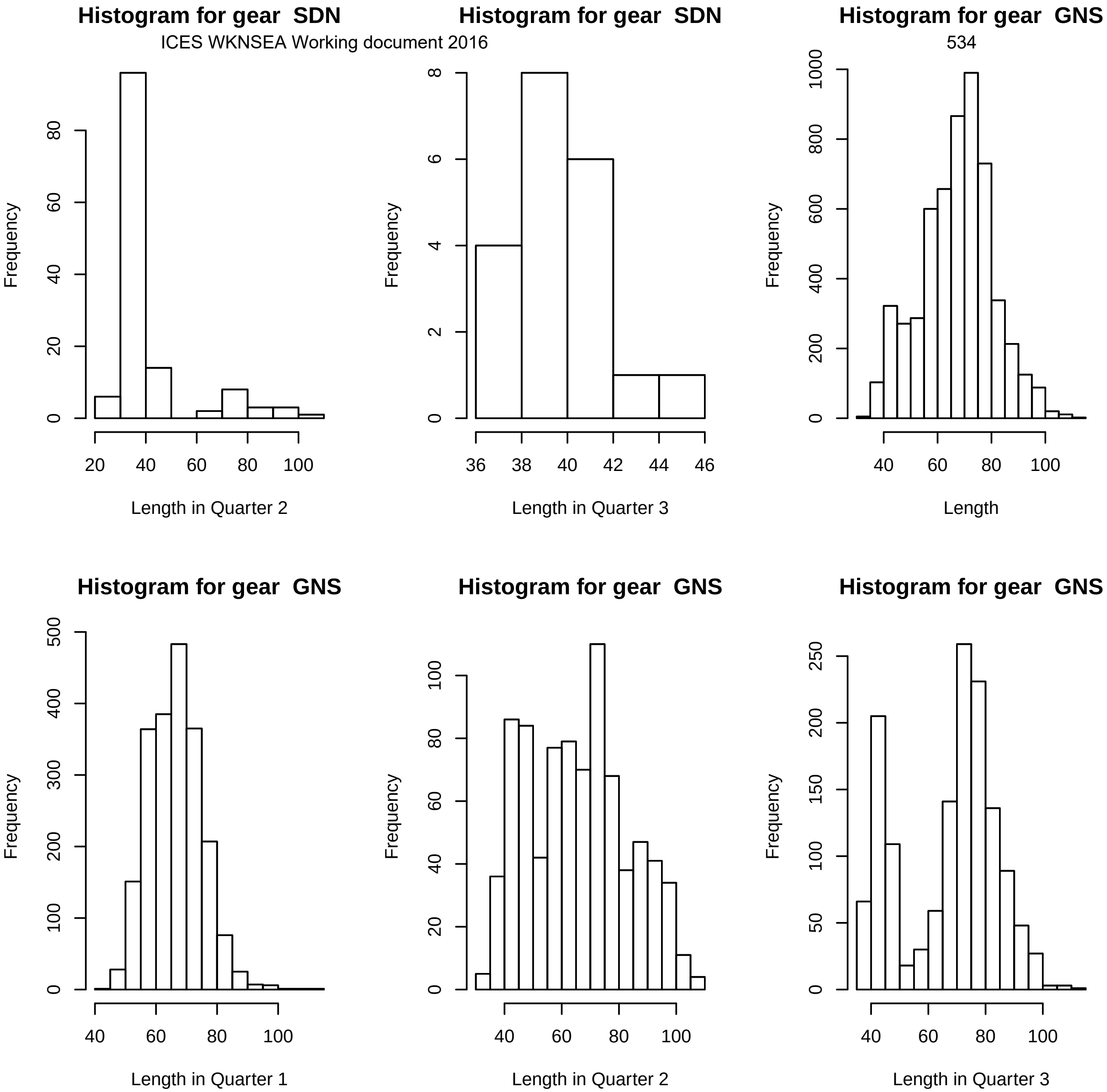
Gear	Q '\' A	9	8
31	1	2538 0, 0, 0	12804743.8 1, 11, 243
31	2	400.8 0, 0, 0	11693219.8 5, 5, 91
31	3	115878 0, 0, 0	10692741.7 3, 3, 51
31	4	387118.8 0, 0, 0	2417606.3 2, 2, 38
41	1	91614.3 2, 11, 217	3758963 5, 24, 422
41	2	19662.7 1, 1, 20	527116.1 4, 7, 91
41	3	17197.3 0, 0, 0	572983 3, 11, 183
41	4	35150.9 1, 2, 40	546643.1 4, 17, 294
51	1	1.8 0, 0, 0	27911.8 0, 0, 0
51	2	1398 0, 0, 0	56864.5 0, 0, 0
51	3	2277.6 0, 0, 0	259585.9 2, 3, 50
51	4	2665.2 0, 0, 0	107691.5 1, 1, 20
43	1	36574.5 0, 0, 0	241383.7 0, 0, 0
43	2	22192.6 0, 0, 0	1325808.1 2, 5, 100
43	3	25486.8 0, 0, 0	1339888.3 1, 1, 20
43	4	27545.9 0, 0, 0	139018.8 0, 0, 0

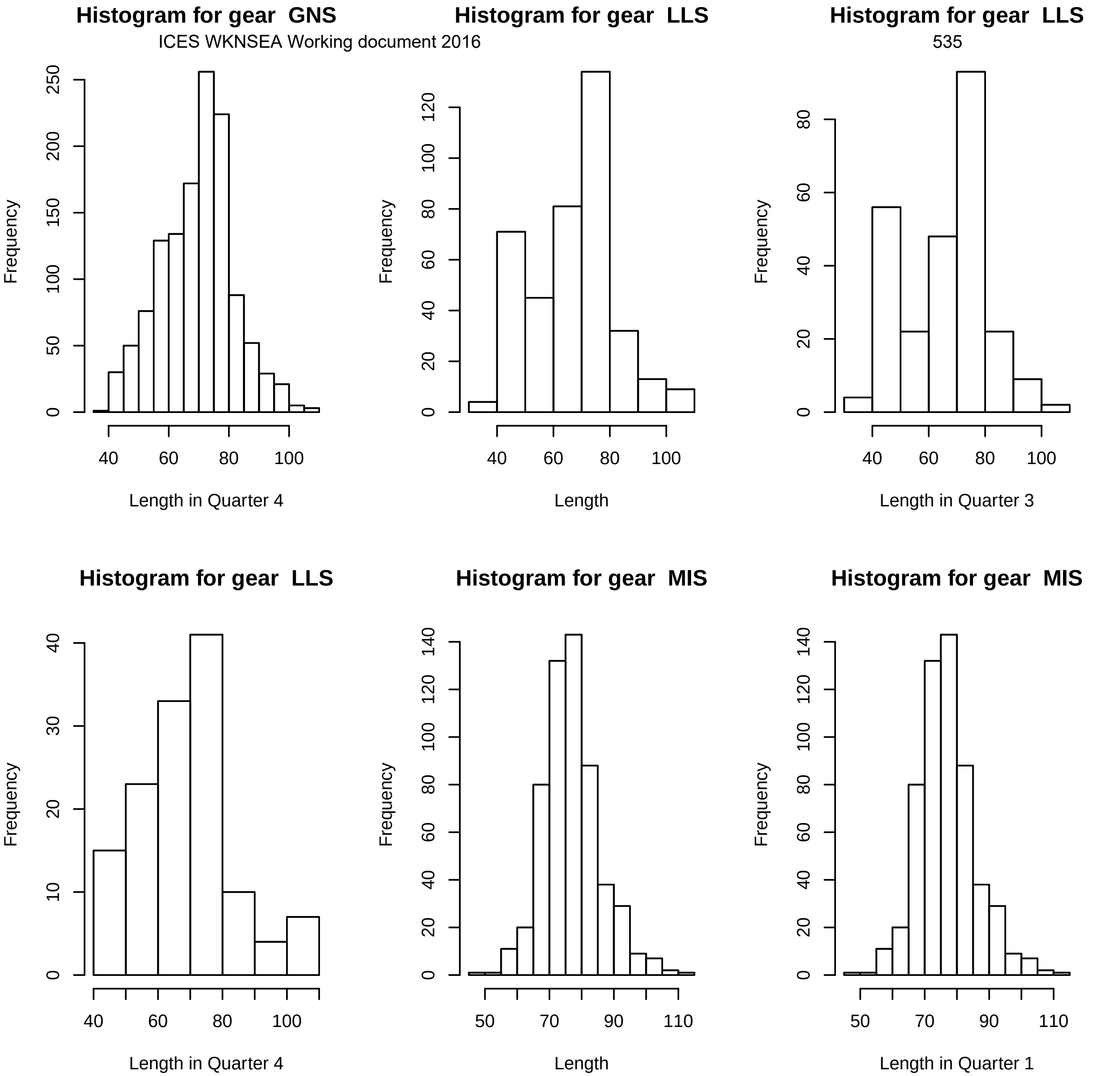
Total catch= 47299872.6 — #Boats sampled= 37

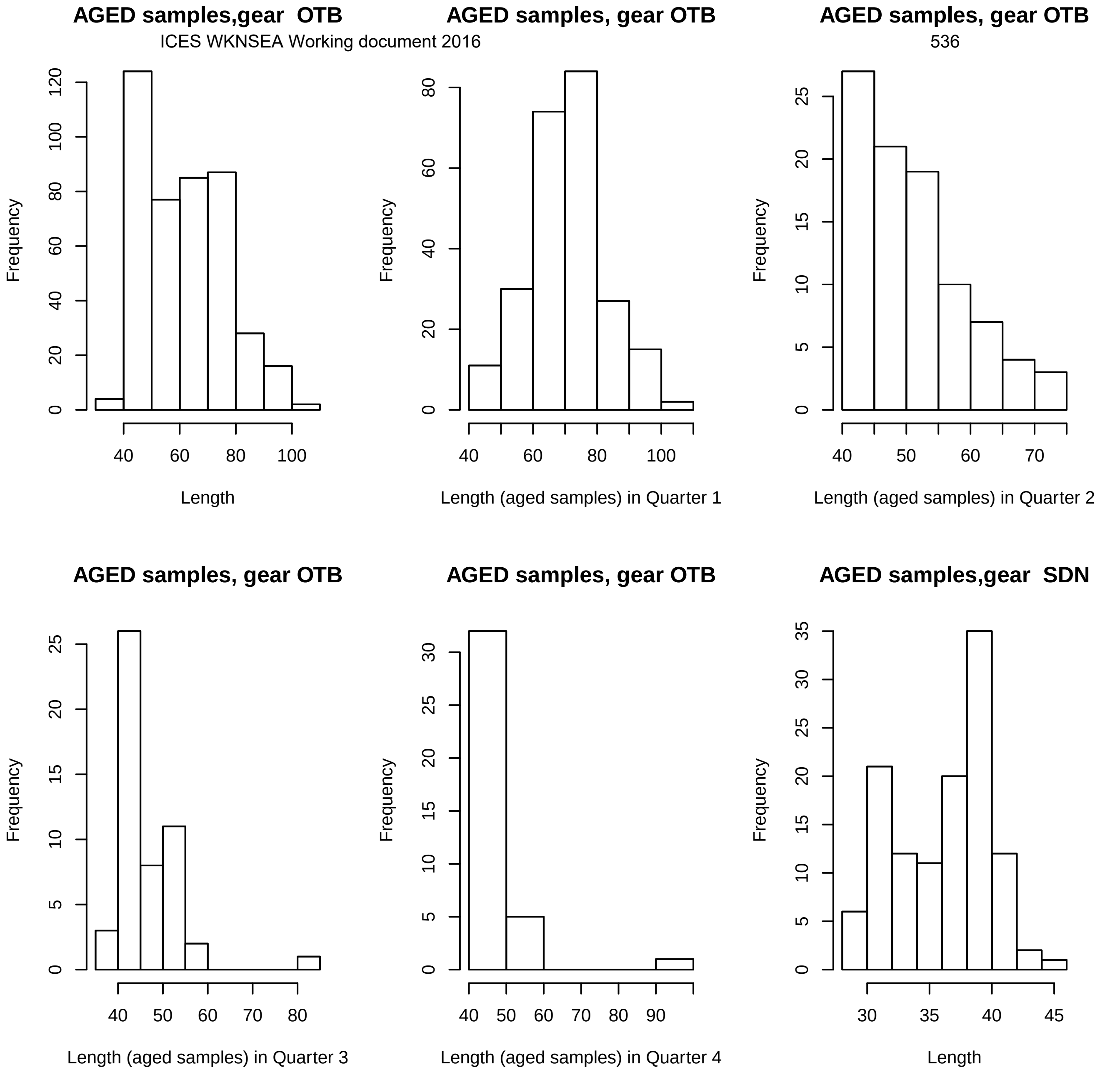
Sampled catch=46193418.5(98)% — #Serienr sampled= 104

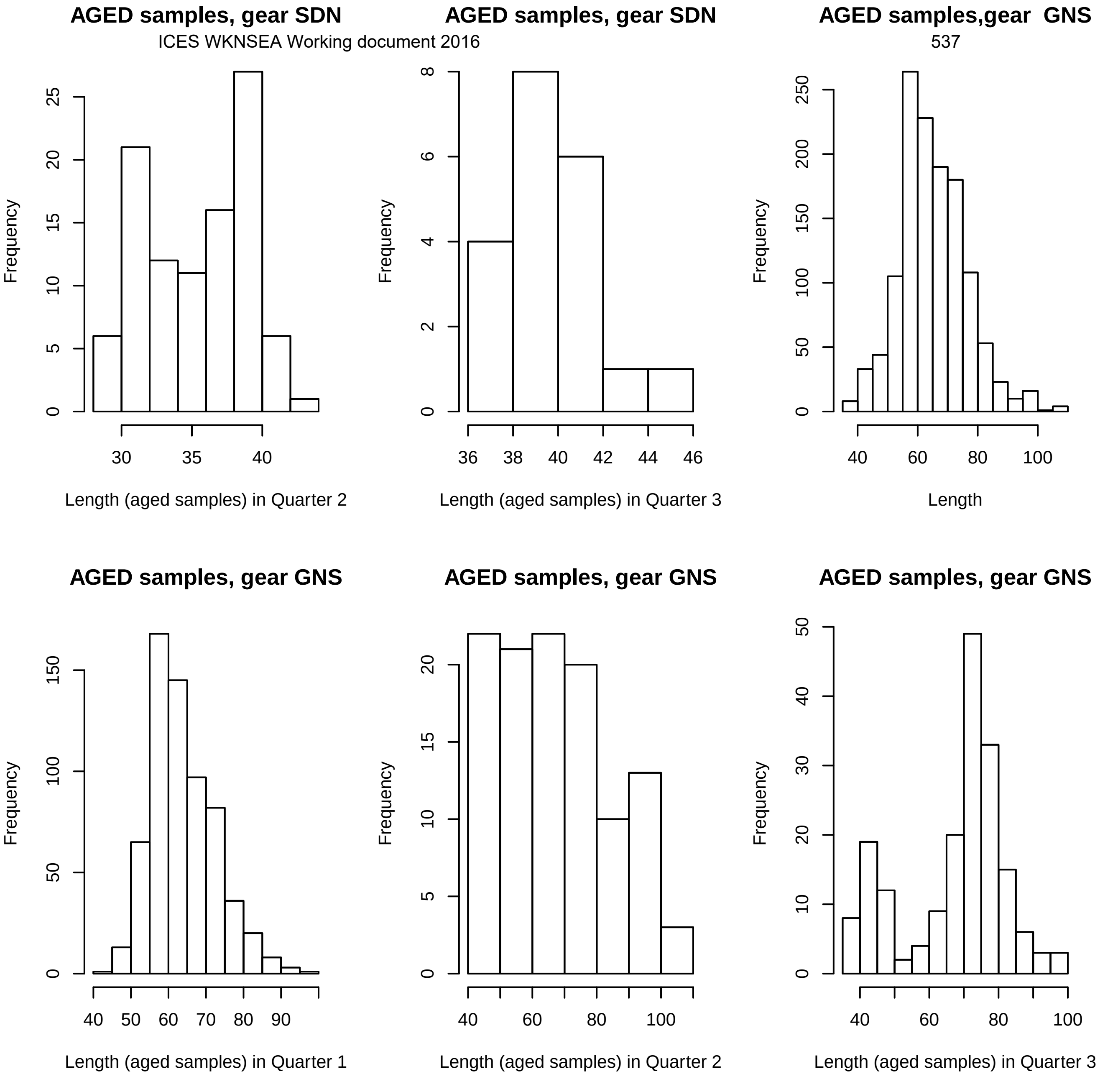
Sampled catch required for DB estimation=44726176(95)% — #Fish sampled= 1880

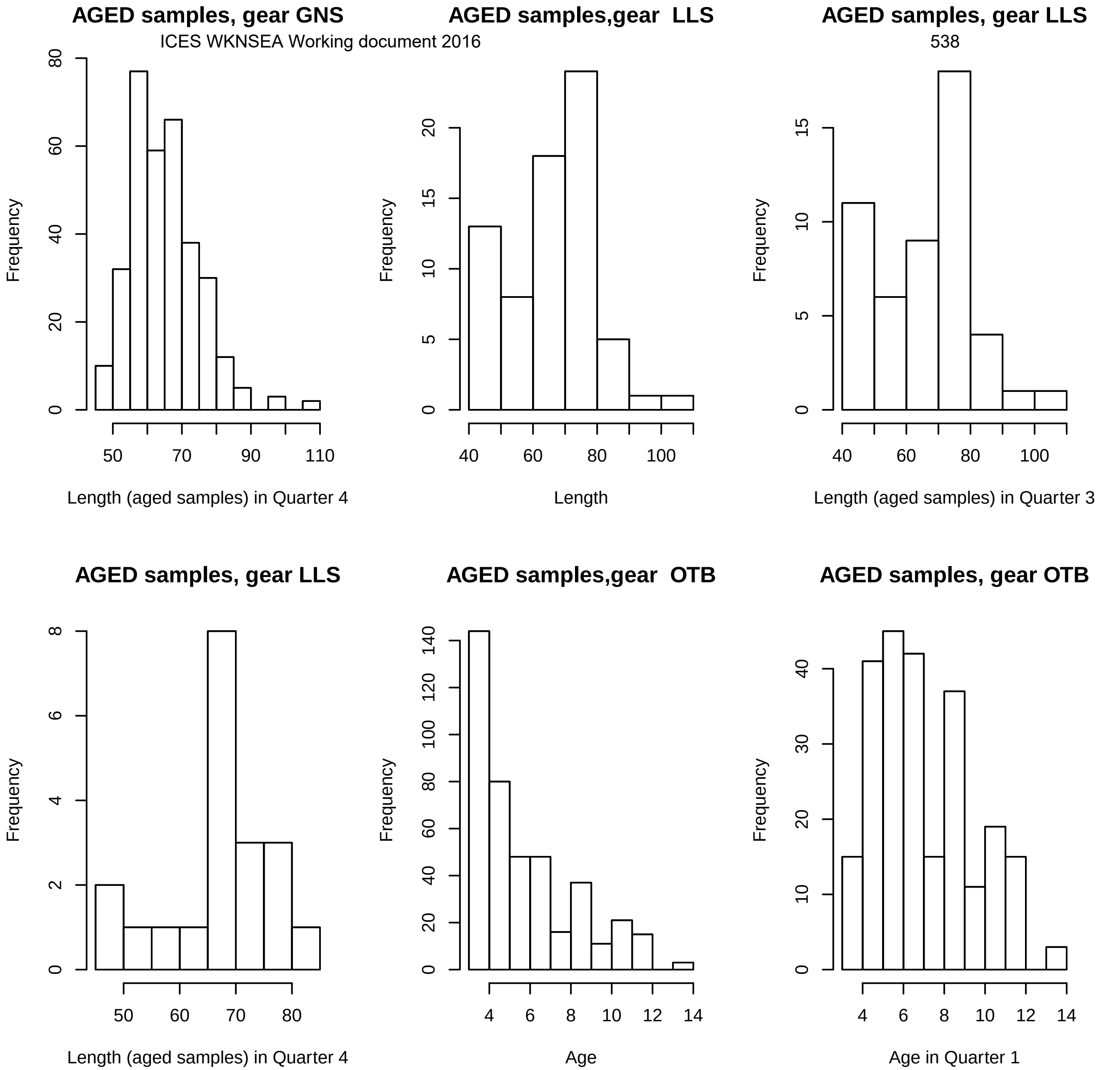

Histogram for gear OTB
Frequency
Length
Histogram for gear OTB
Frequency
Length in Quarter 1
Histogram for gear OTB
Frequency
Length in Quarter 2
Histogram for gear OTB
Frequency
Length in Quarter 3
Histogram for gear OTB
Frequency
Length in Quarter 4
Histogram for gear SDN
Frequency
Length

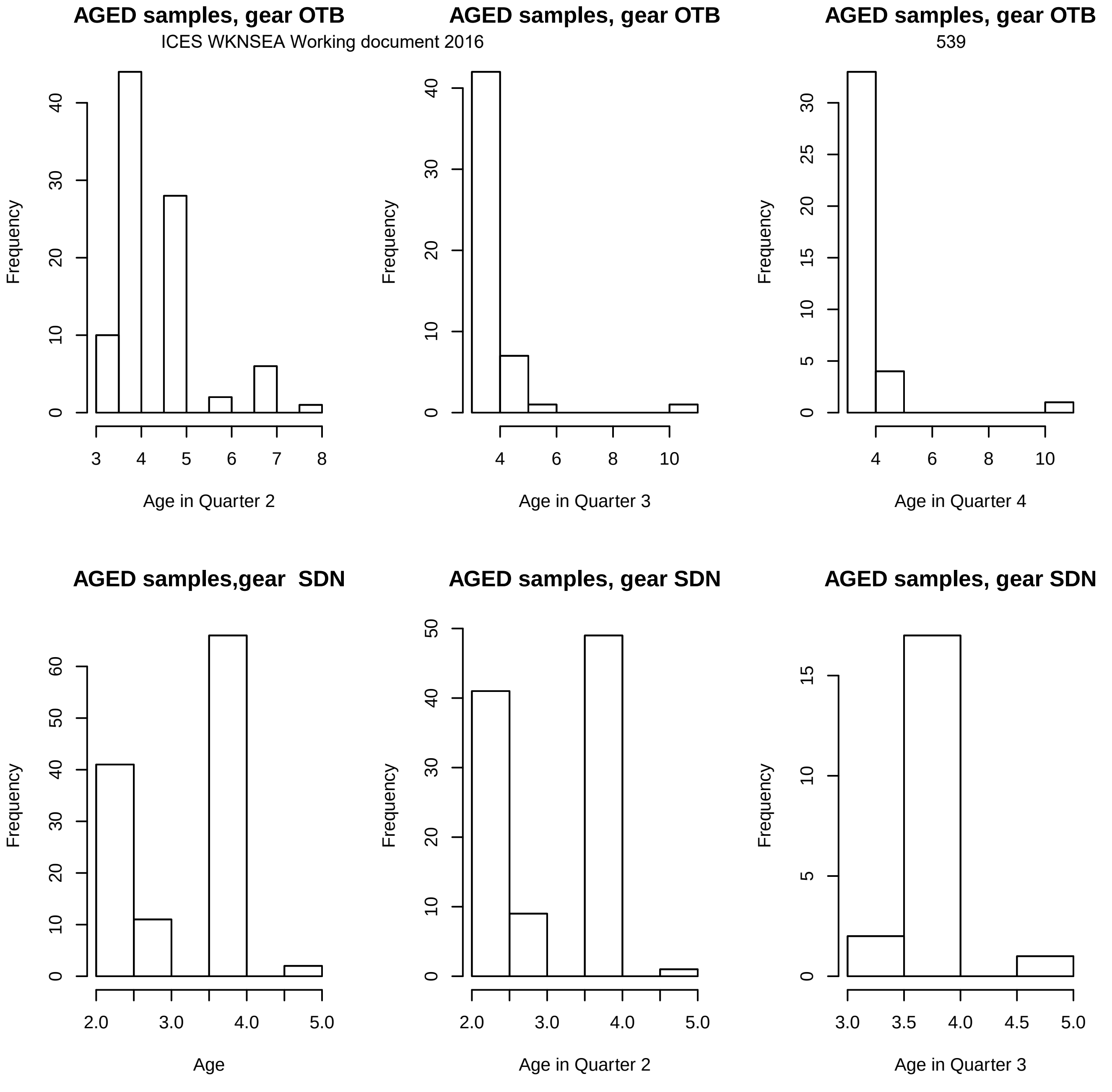

Histogram for gear SDN
Frequency
Length in Quarter 2
Histogram for gear SDN
Frequency
Length in Quarter 3
Histogram for gear GNS
Frequency
Length
Histogram for gear GNS
Frequency
Length in Quarter 1
Histogram for gear GNS
Frequency
Length in Quarter 2
Histogram for gear GNS
Frequency
Length in Quarter 3

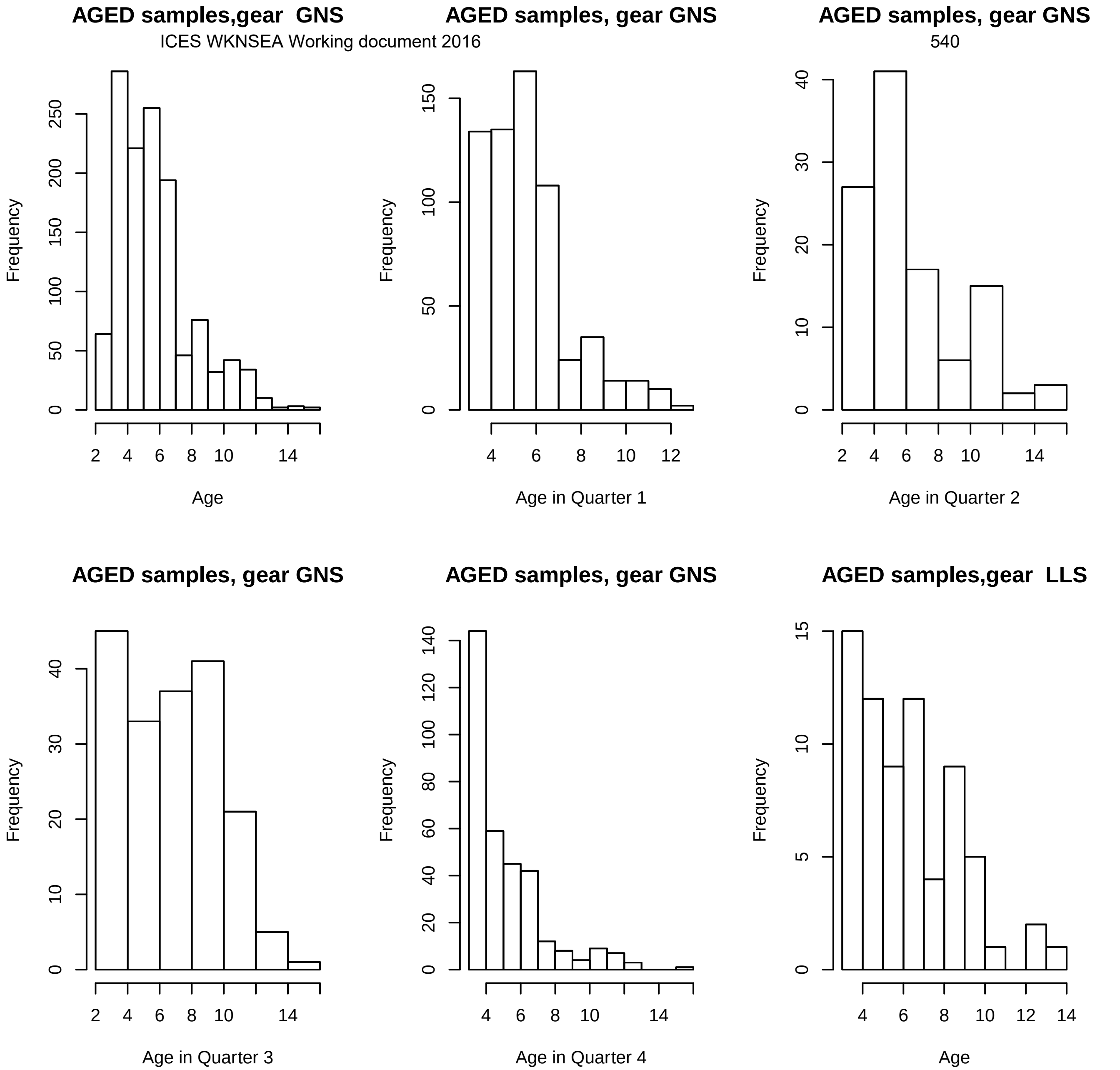

Histogram for gear GNS
Frequency
Length in Quarter 4
Histogram for gear LLS
Frequency
Length
Histogram for gear LLS
Frequency
Length in Quarter 3
Histogram for gear LLS
Frequency
Length in Quarter 4
Histogram for gear MIS
Frequency
Length
Histogram for gear MIS
Frequency
Length in Quarter 1

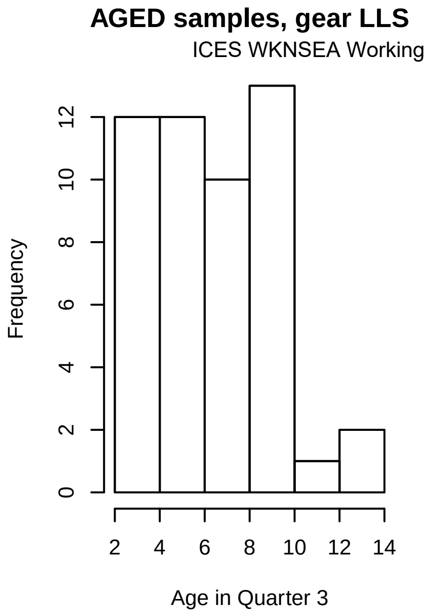

AGED samples,gear OTB
Frequency
Length
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 1
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 2
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 3
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 4
AGED samples,gear SDN
Frequency
Length

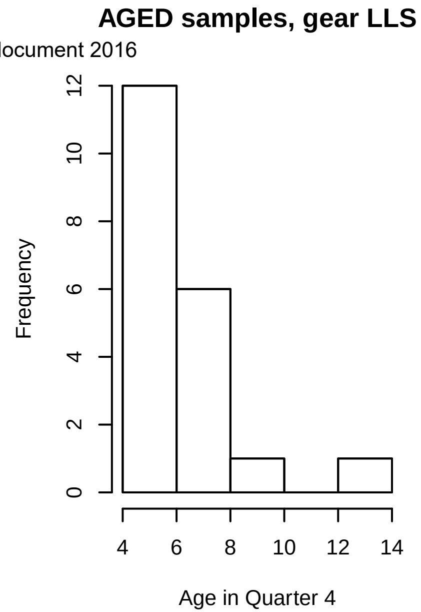

AGED samples, gear SDN
Frequency
Length (aged samples) in Quarter 2
AGED samples, gear SDN
Frequency
Length (aged samples) in Quarter 3
AGED samples,gear GNS
537
Frequency
Length
AGED samples, gear GNS
Frequency
Length (aged samples) in Quarter 1
AGED samples, gear GNS
Frequency
Length (aged samples) in Quarter 2
AGED samples, gear GNS
Frequency
Length (aged samples) in Quarter 3

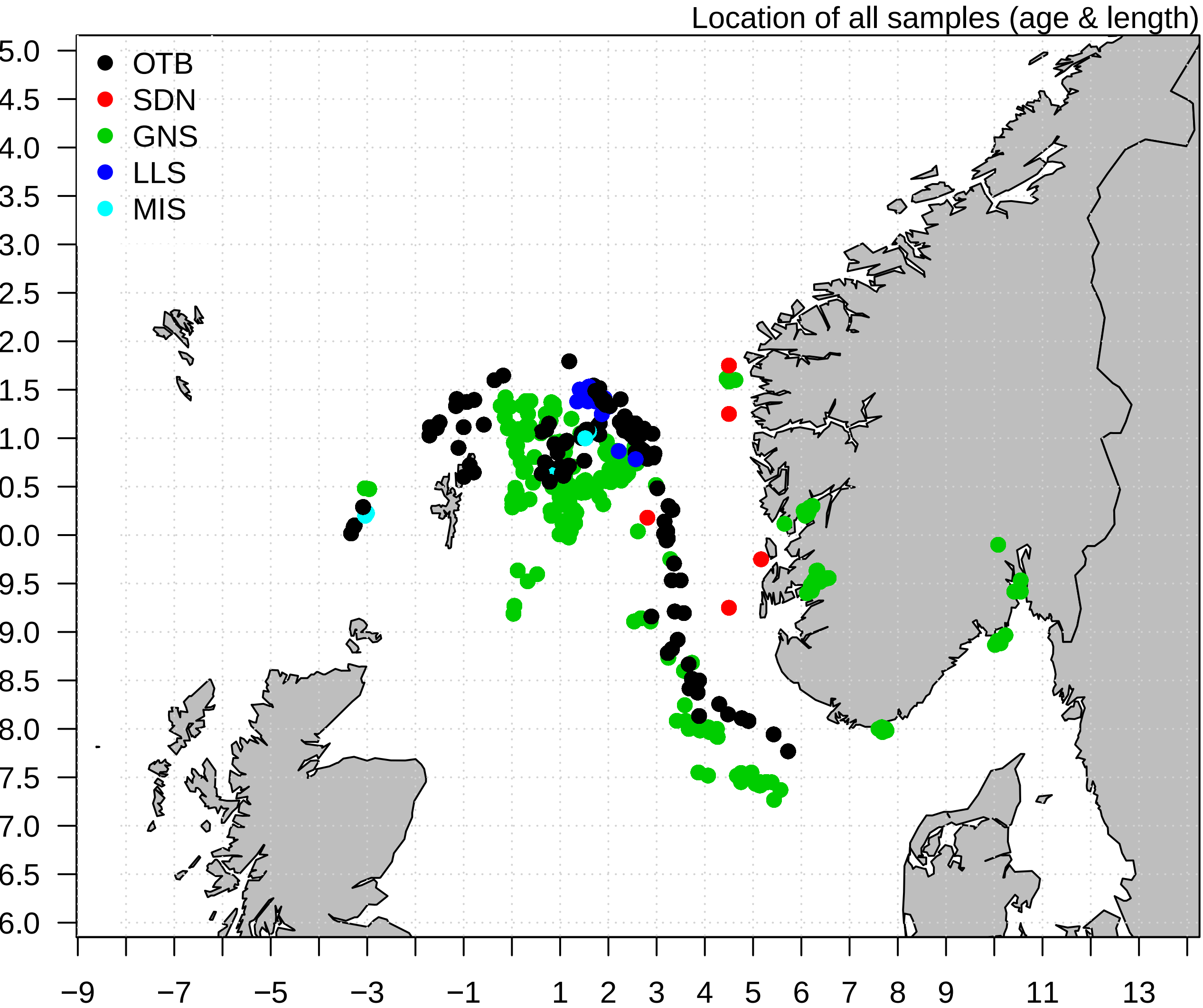

AGED samples, gear GNS
Frequency
0
20
40
60
80
50
70
90
110
Length (aged samples) in Quarter 4
AGED samples,gear LLS
Frequency
0
5
10
15
20
40
60
80
100
Length
AGED samples, gear LLS
Frequency
0
5
10
15
40
60
80
100
Length (aged samples) in Quarter 3
AGED samples, gear LLS
Frequency
0
2
4
6
8
50
60
70
80
Length (aged samples) in Quarter 4
AGED samples,gear OTB
Frequency
0
20
40
60
80
100
120
140
4
6
8
10
12
14
Age
AGED samples, gear OTB
Frequency
0
10
20
30
40
4
6
8
10
12
14
Age in Quarter 1

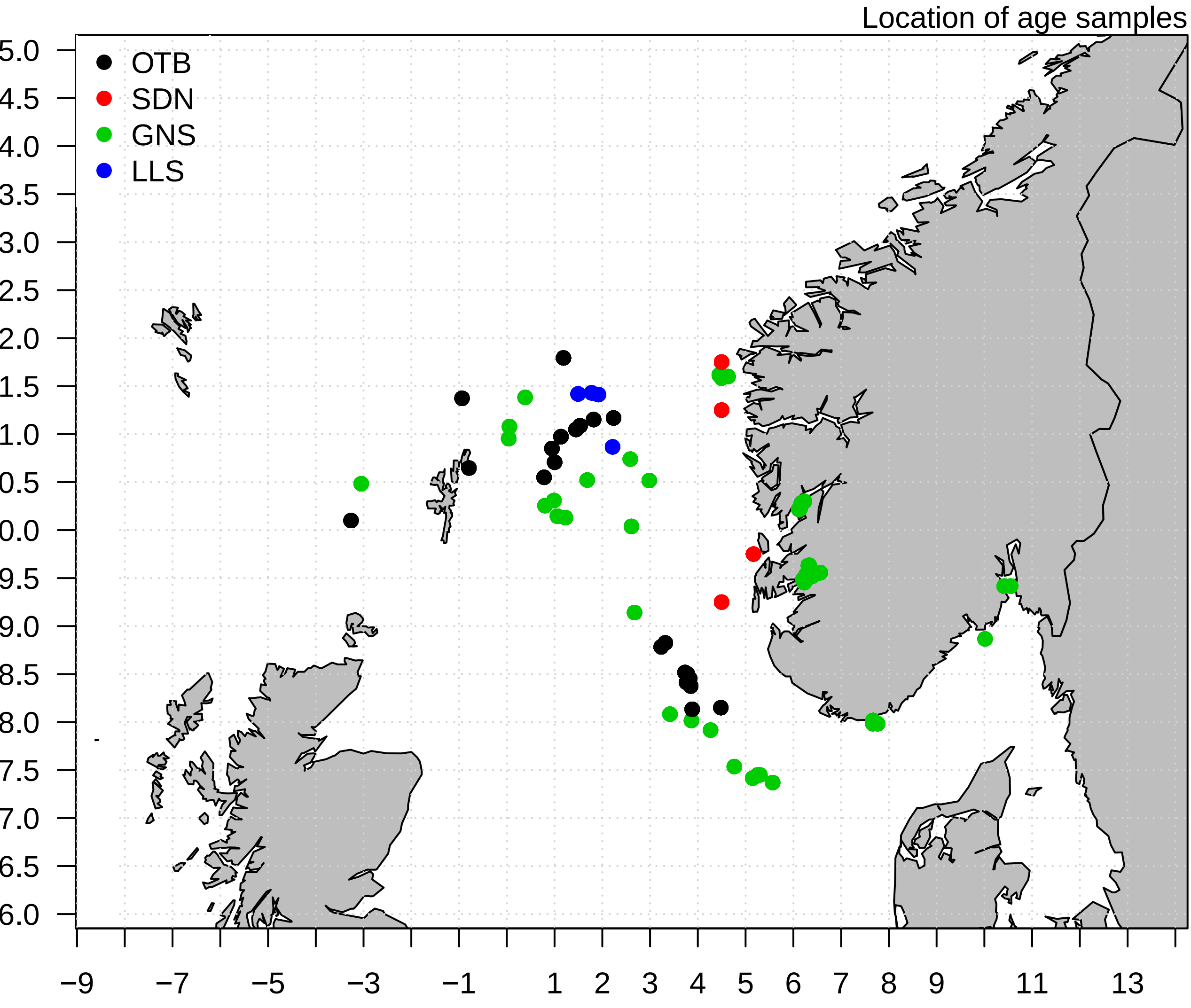

AGED samples, gear OTB
Frequency
Age in Quarter 2
AGED samples, gear OTB
Frequency
Age in Quarter 3
AGED samples, gear OTB
Frequency
Age in Quarter 4
AGED samples,gear SDN
Frequency
Age
AGED samples, gear SDN
Frequency
Age in Quarter 2
AGED samples, gear SDN
Frequency
Age in Quarter 3

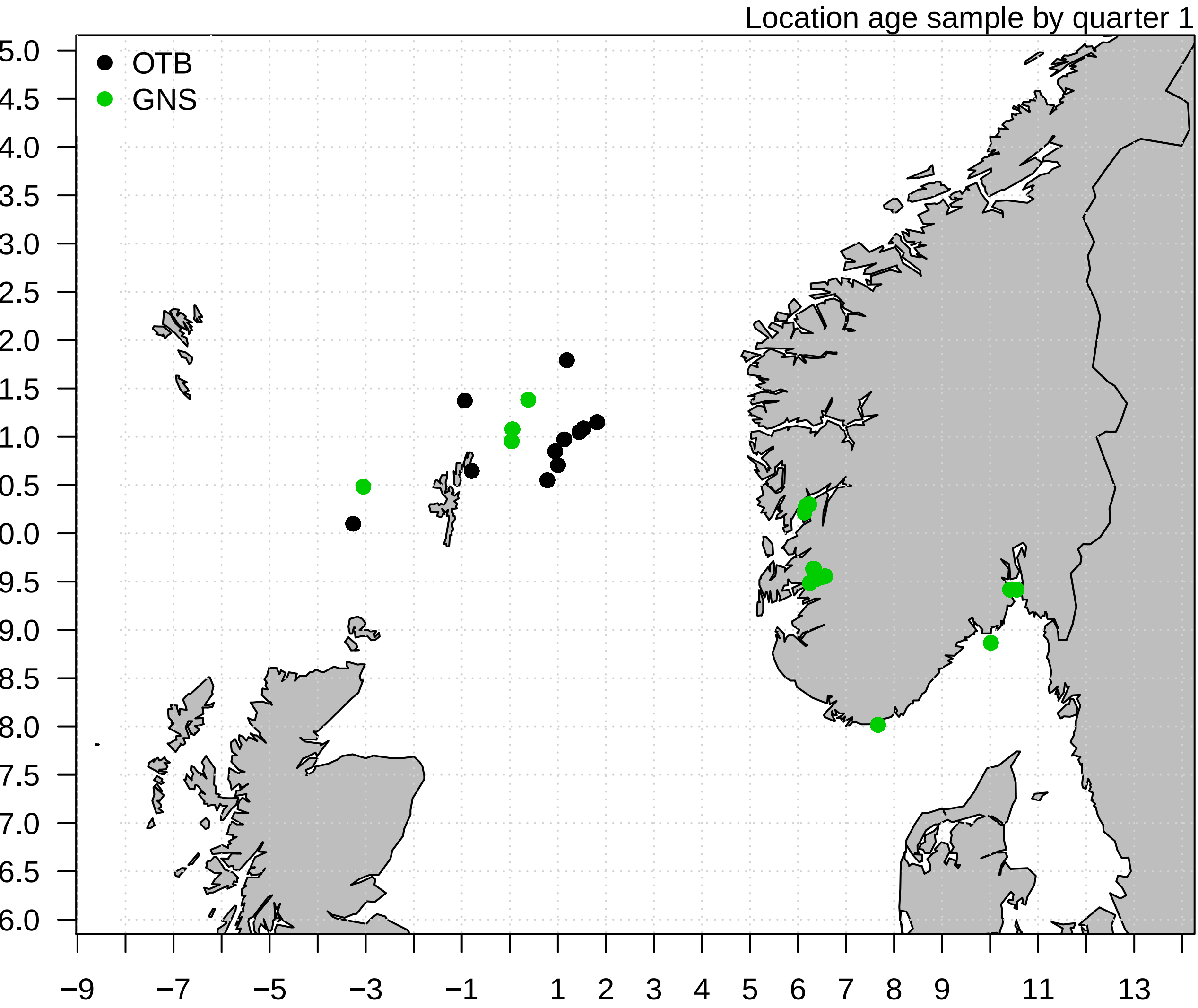

AGED samples,gear GNS
Frequency
0
50
100
150
200
250
2
4
6
8
10
14
Age
AGED samples, gear GNS
Frequency
0
50
100
150
4
6
8
10
12
Age in Quarter 1
AGED samples, gear GNS
Frequency
0
10
20
30
40
2
4
6
8
10
14
Age in Quarter 2
AGED samples, gear GNS
Frequency
0
10
20
30
40
2
4
6
8
10
14
Age in Quarter 3
AGED samples, gear GNS
Frequency
0
20
40
60
80
100
120
140
4
6
8
10
14
Age in Quarter 4
AGED samples,gear LLS
Frequency
0
5
10
15
4
6
8
10
12
14
Age

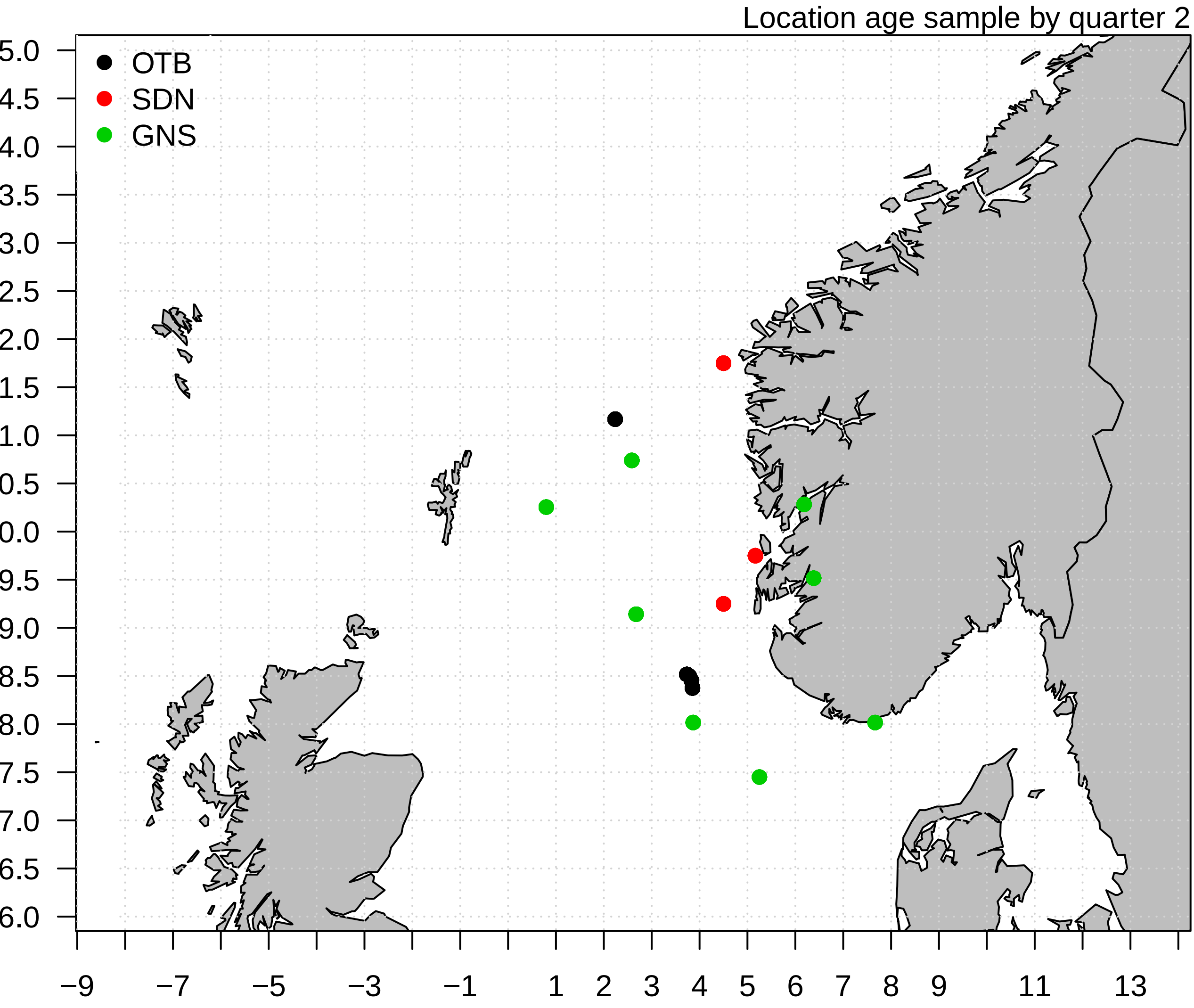

AGED samples, gear LLS
Frequency
0
2
4
6
8
10
12
2
4
6
8
10
12
14
Age in Quarter 3

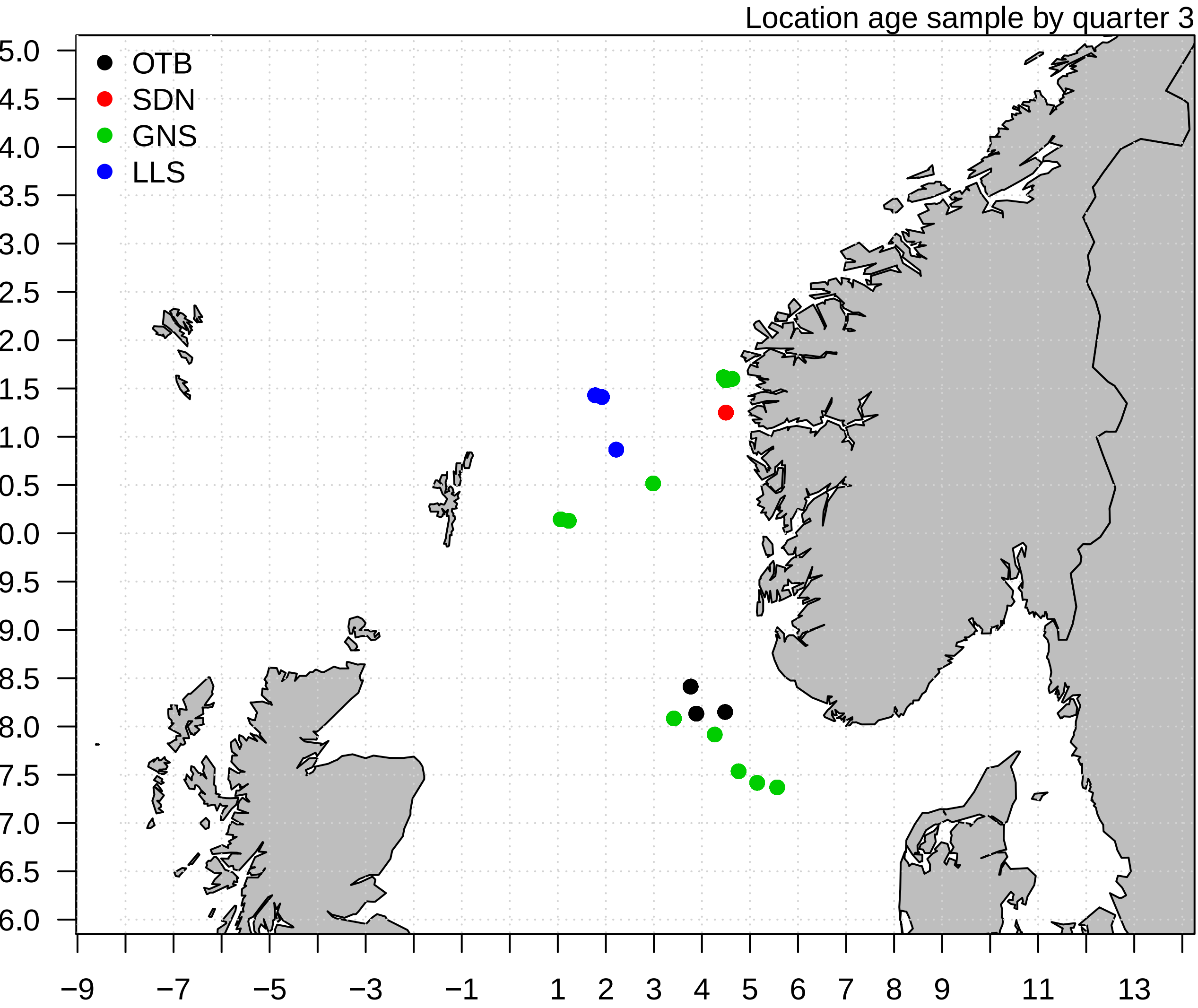

AGED samples, gear LLS
Frequency
0
2
4
6
8
10
12
4
6
8
10
12
14
Age in Quarter 4


Location of all samples (age & length)
OTB
SDN
GNS
LLS
MIS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

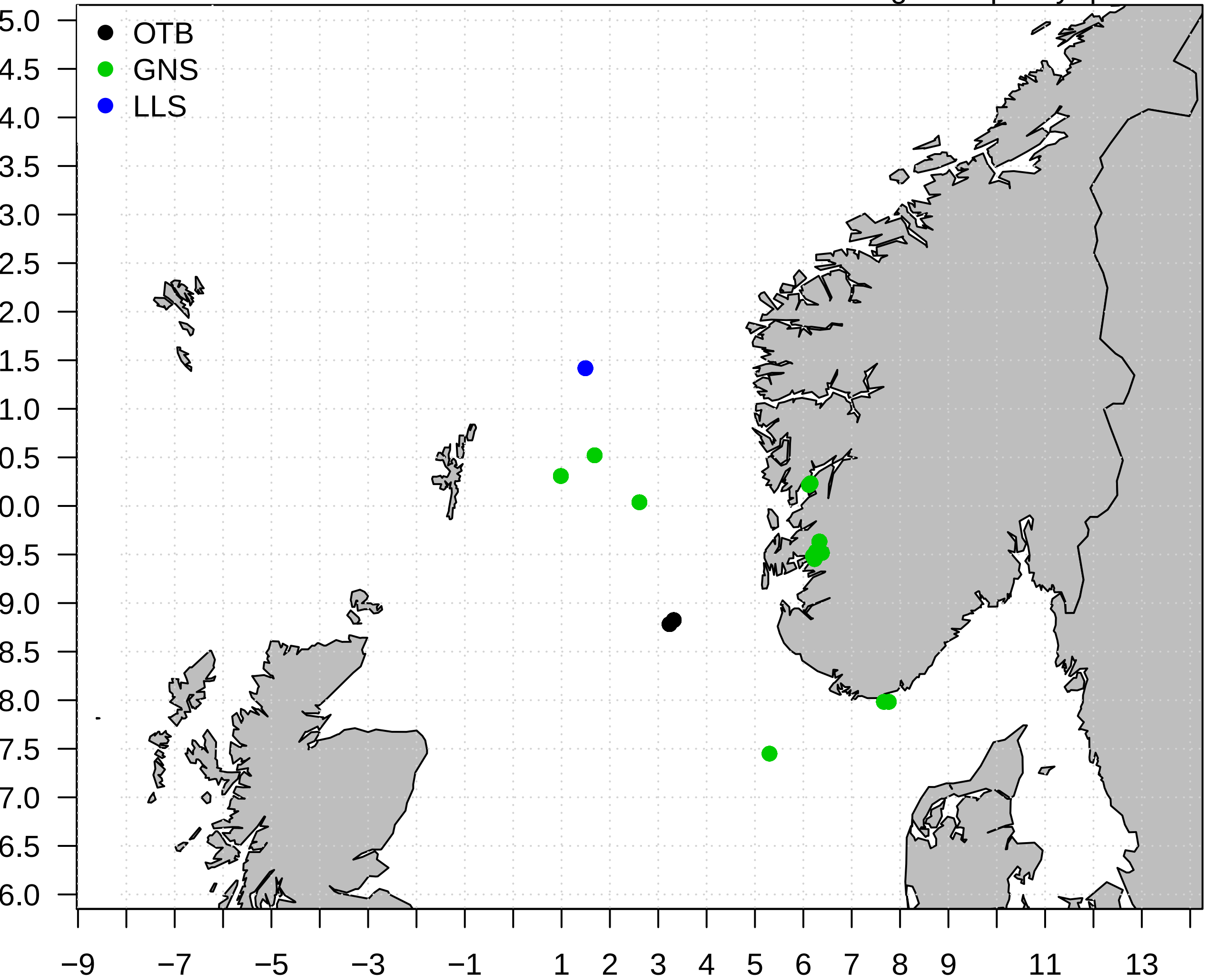

Location of age samples
OTB
SDN
GNS
LLS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

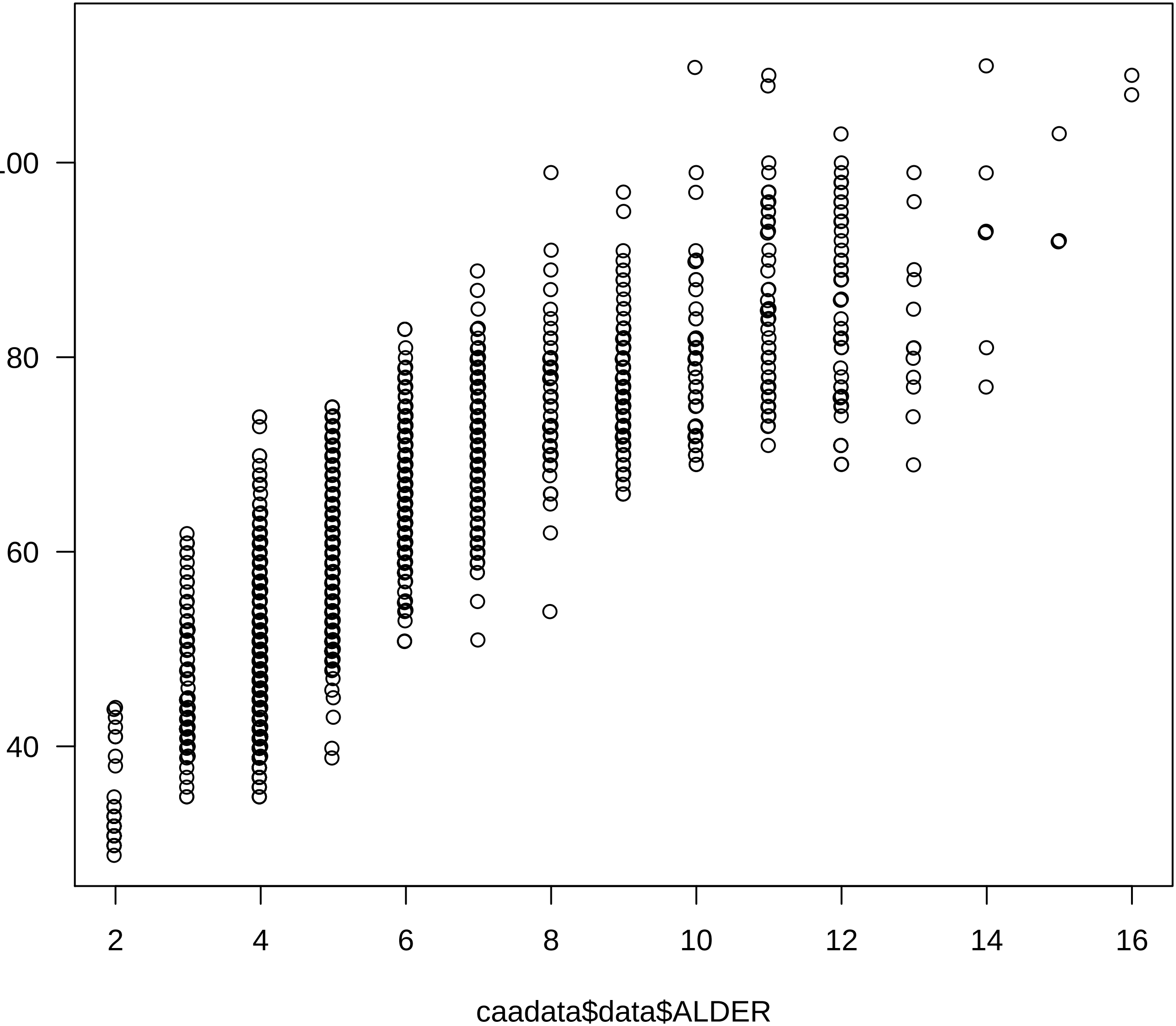

Location age sample by quarter 1
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 2
OTB
SDN
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

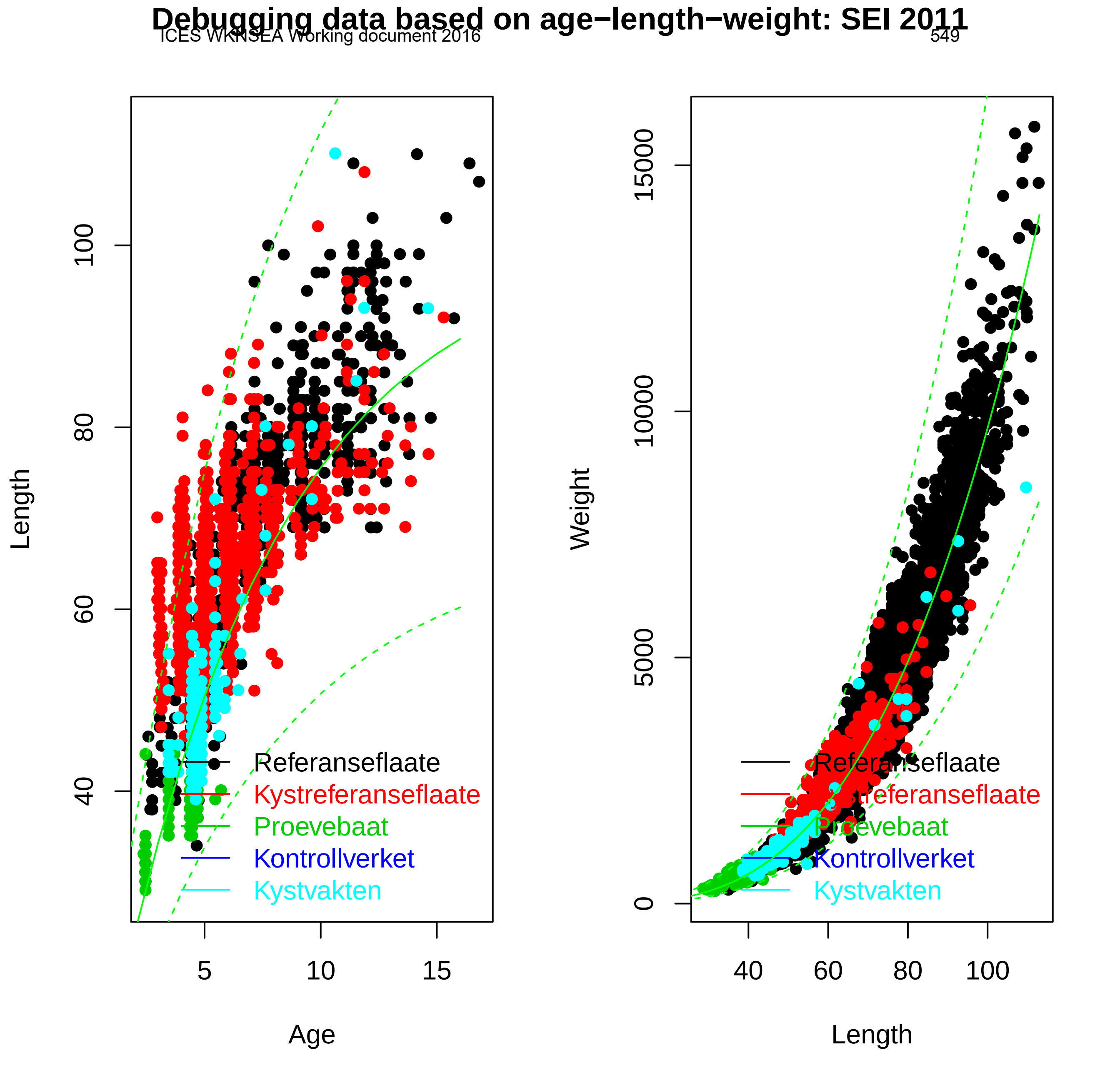

Location age sample by quarter 3
OTB
SDN
GNS
LLS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13

Location age sample by quarter 4





100
80
60
40
2
4
6
8
10
12
14
16
caadata$data$ALDER



Debugging data based on age−length−weight: SEI 2011
Length
Age
5
10
15
40
60
80
100
Weight
Length
0
5000
10000
15000
40
60
80
100
Referanseflaate
Kystreferanseflaate
Proevebaat
Kontrollverket
Kystvakten
Referanseflaate
Kystreferanseflaate
Proevebaat
Kontrollverket
Kystvakten

2012 length samples

Gear	Q '\' A	9	8
31	1	17589.8 0, 0, 0	7428743.7 5, 21, 906
31	2	3897 0, 0, 0	11582987.7 5, 14, 709
31	3	28333.2 0, 0, 0	2418768.6 9, 36, 1604
31	4	92383 0, 0, 0	942363.1 1, 1, 105
41	1	55048.8 2, 7, 140	3344193.3 9, 128, 3452
41	2	16798.7 0, 0, 0	282317.1 7, 57, 982
41	3	4719 0, 0, 0	470476.6 4, 72, 1344
41	4	8332 2, 15, 295	749604 4, 100, 2479
51	1	3049.2 0, 0, 0	21747.4 0, 0, 0
51	2	7251.6 0, 0, 0	129044.5 3, 42, 1077
51	3	21142.2 0, 0, 0	416254.6 4, 87, 2091
51	4	2214 0, 0, 0	143670.7 0, 0, 0
43	1	26931.1 0, 0, 0	348964 0, 0, 0
43	2	21588.6 0, 0, 0	4389214.4 4, 6, 196
43	3	43445.4 1, 1, 87	83712.8 0, 0, 0
43	4	52635.5 0, 0, 0	136041.3 0, 0, 0

Total catch= 33293462.9

#Boats sampled= 60

Sampled catch=32260793.8(97)%

#Serienr sampled= 587

Sampled catch required for DB estimation=31274985.3(94)%

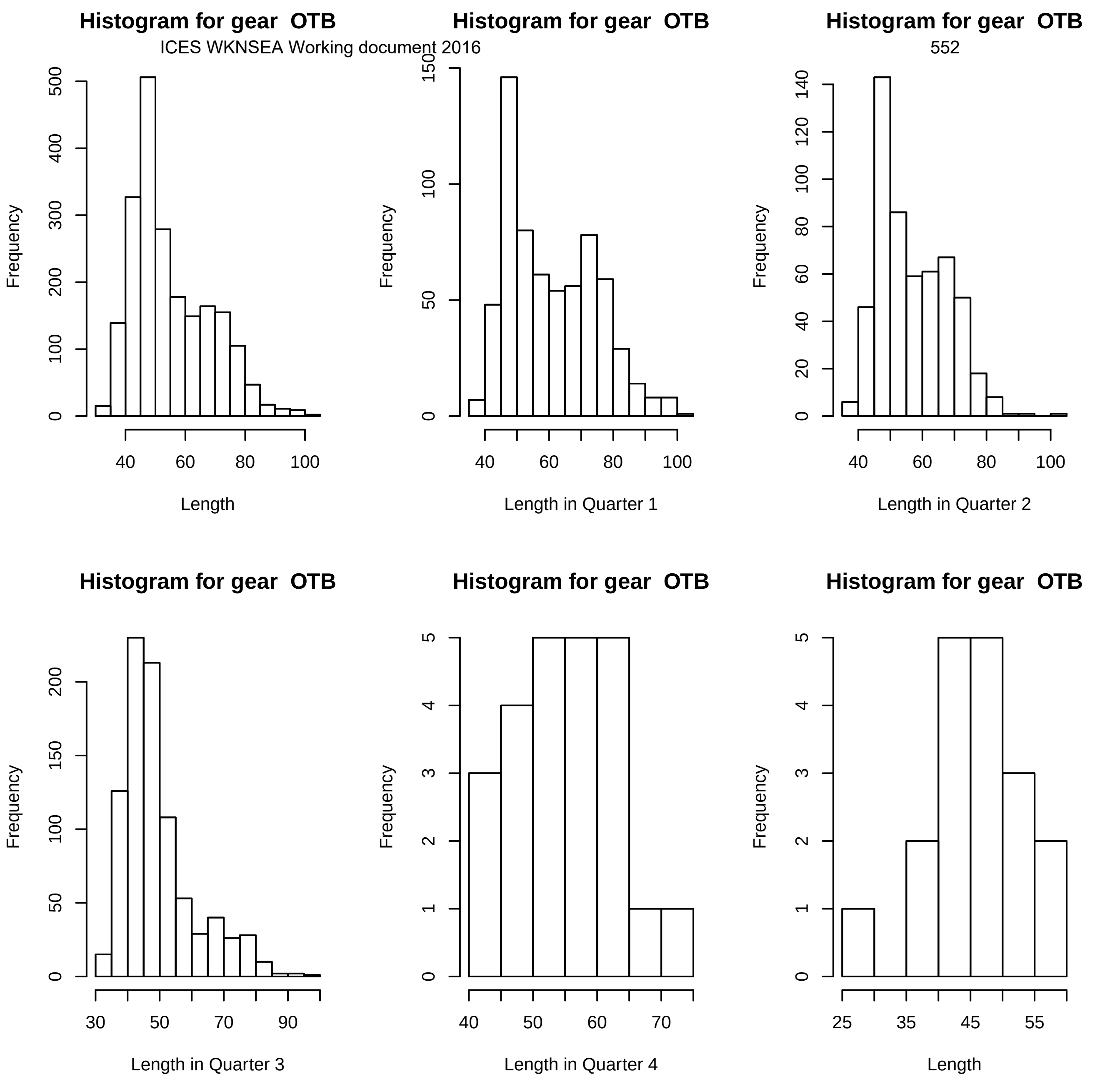
#Fish sampled= 15467

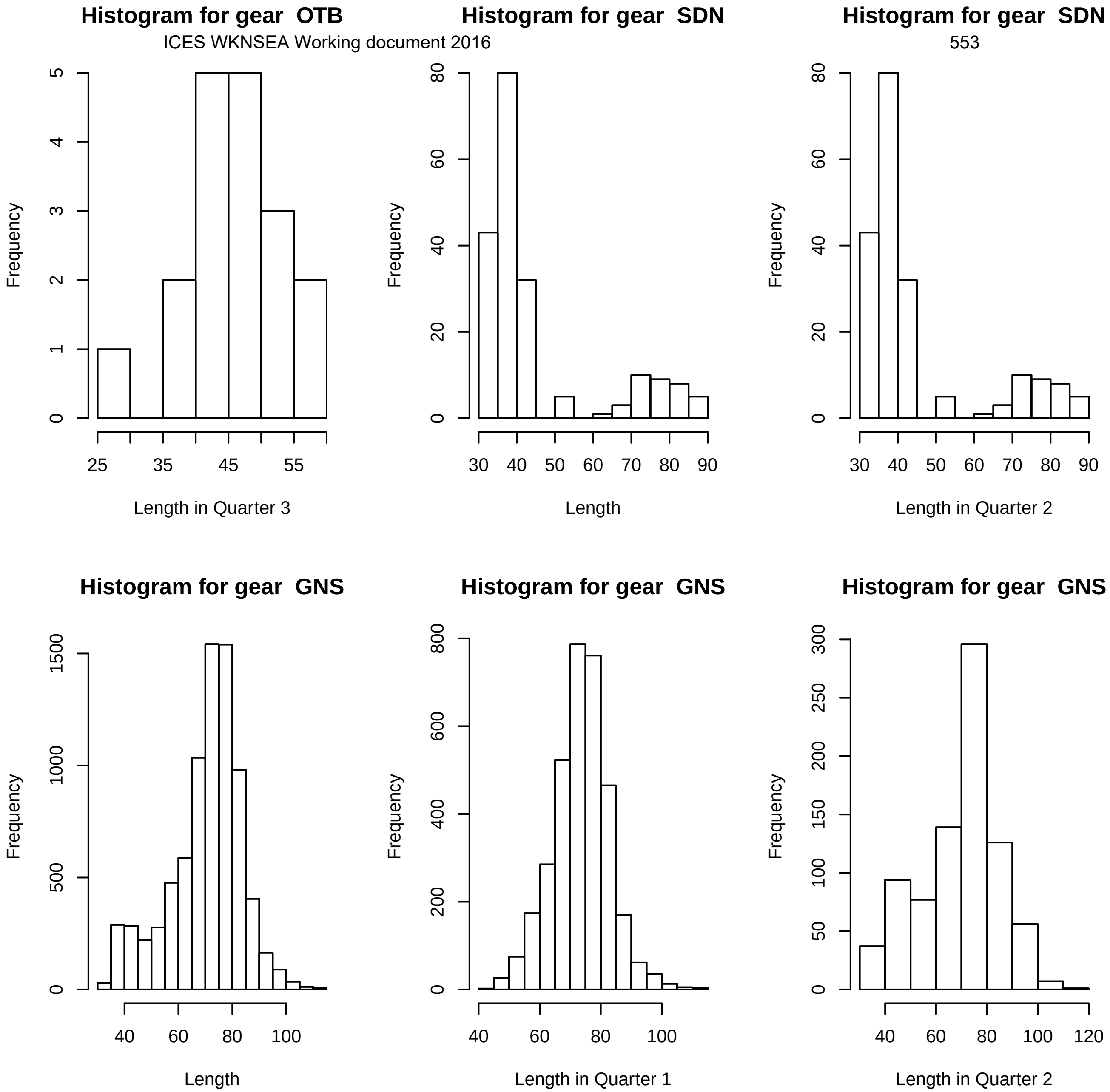
age_SamplesTablesDetailedSEI2012

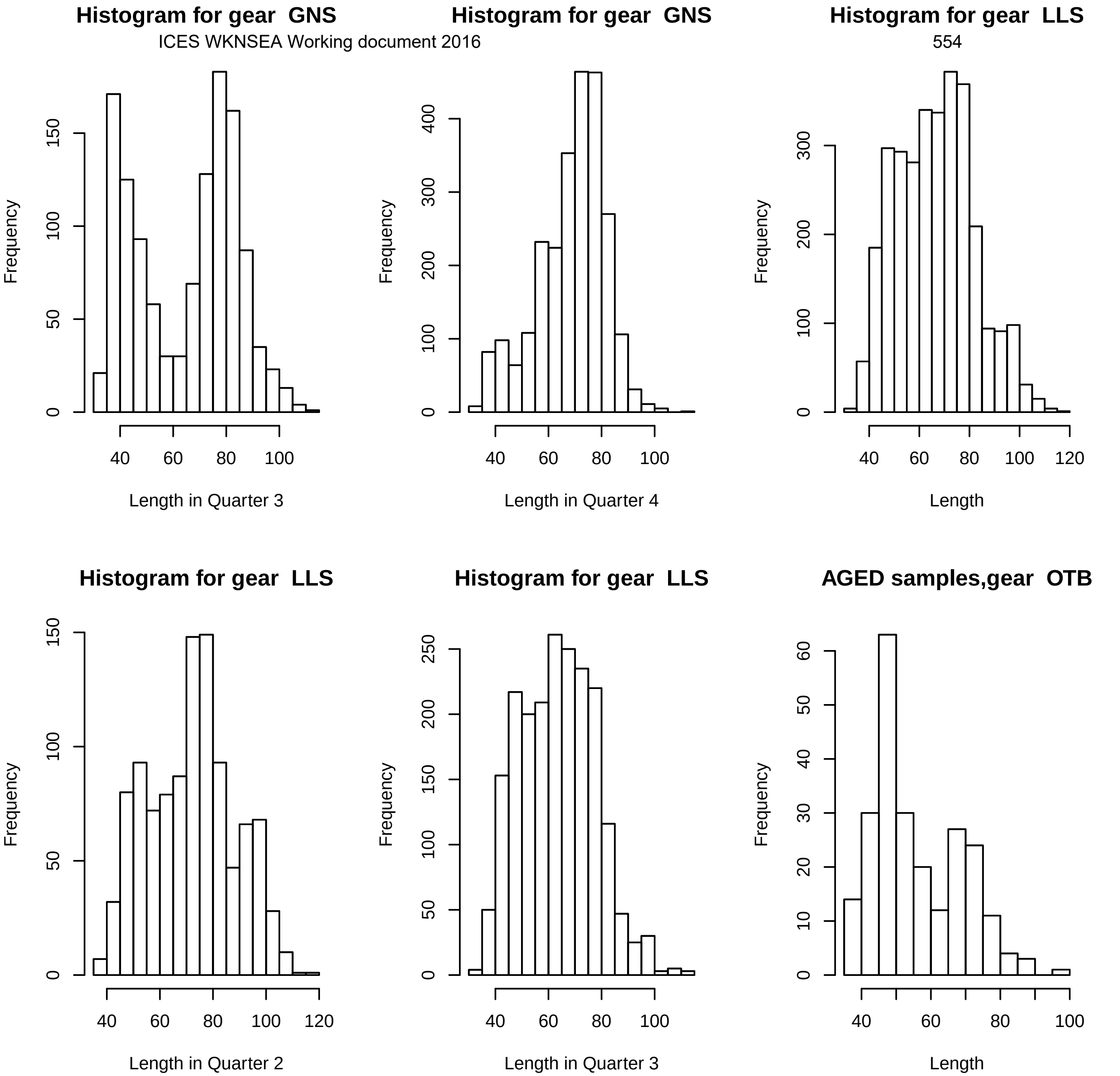
Gear	Q '\' A	9	8
31	1	17589.8 0, 0, 0	7428743.7 2, 5, 100
31	2	3897 0, 0, 0	11582987.7 2, 3, 59
31	3	28333.2 0, 0, 0	2418768.6 2, 4, 80
31	4	92383 0, 0, 0	942363.1 0, 0, 0
41	1	55048.8 2, 4, 79	3344193.3 7, 40, 706
41	2	16798.7 0, 0, 0	282317.1 4, 18, 231
41	3	4719 0, 0, 0	470476.6 3, 15, 226
41	4	8332 2, 9, 179	749604 4, 27, 520
51	1	3049.2 0, 0, 0	21747.4 0, 0, 0
51	2	7251.6 0, 0, 0	129044.5 1, 6, 118
51	3	21142.2 0, 0, 0	416254.6 2, 10, 189
51	4	2214 0, 0, 0	143670.7 0, 0, 0
43	1	26931.1 0, 0, 0	348964 0, 0, 0
43	2	21588.6 0, 0, 0	4389214.4 3, 4, 80
43	3	43445.4 0, 0, 0	83712.8 0, 0, 0
43	4	52635.5 0, 0, 0	136041.3 0, 0, 0

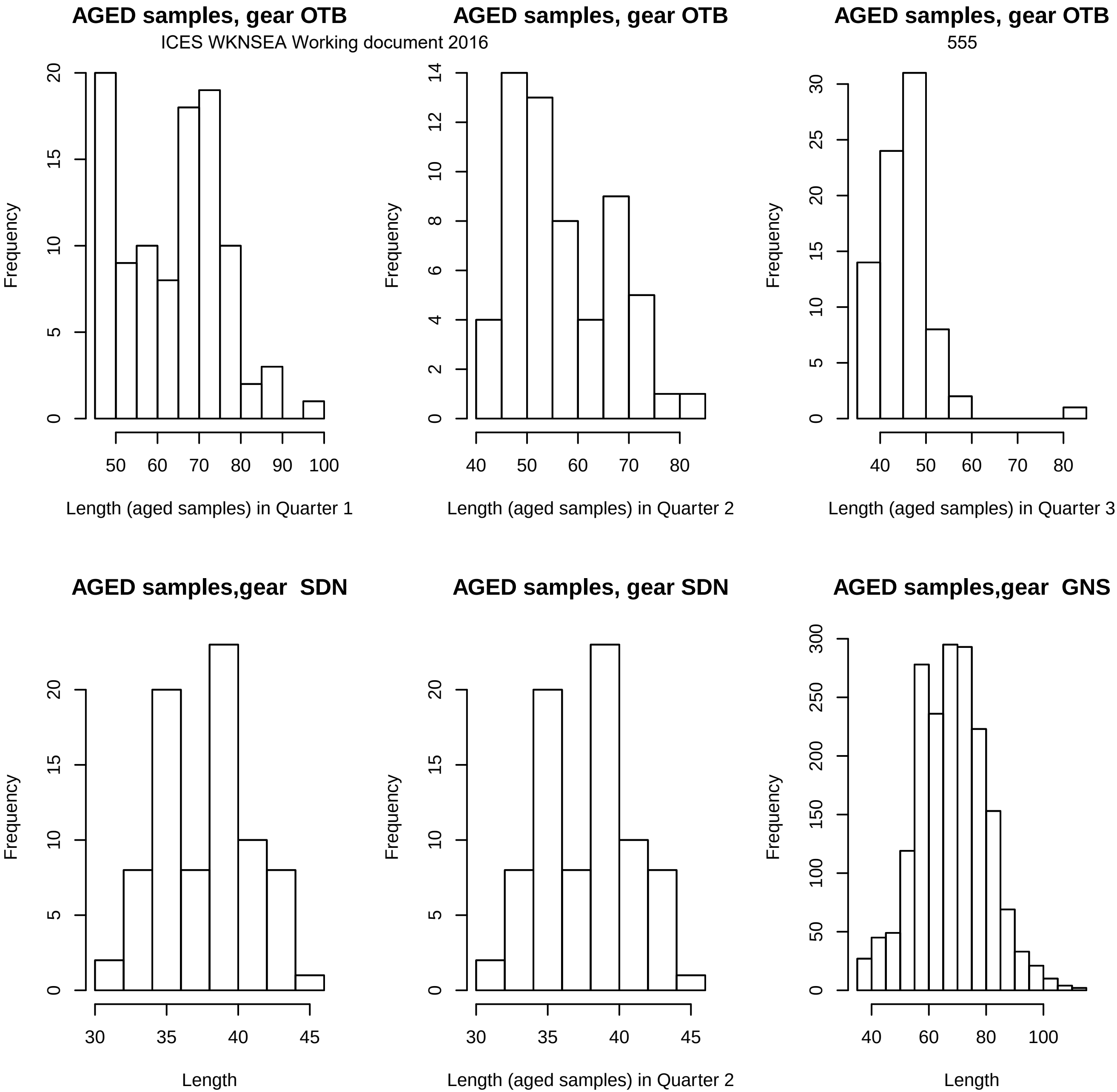
Total catch= 33293462.9
Sampled catch=31274985.3(94)%
Sampled catch required for DB estimation=31274985.3(94)%

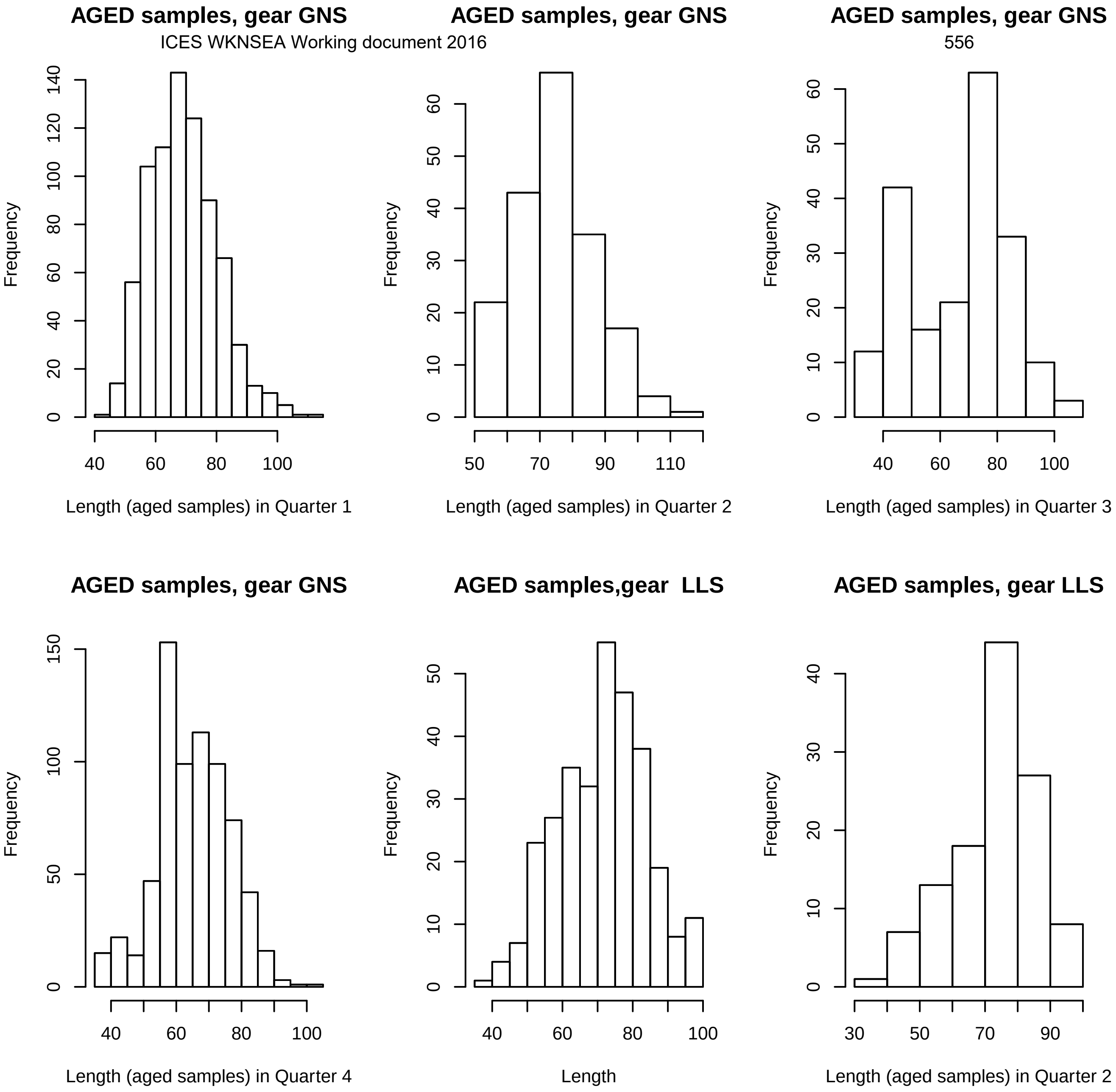
#Boats sampled= 34
#Serienr sampled= 145
#Fish sampled= 2567

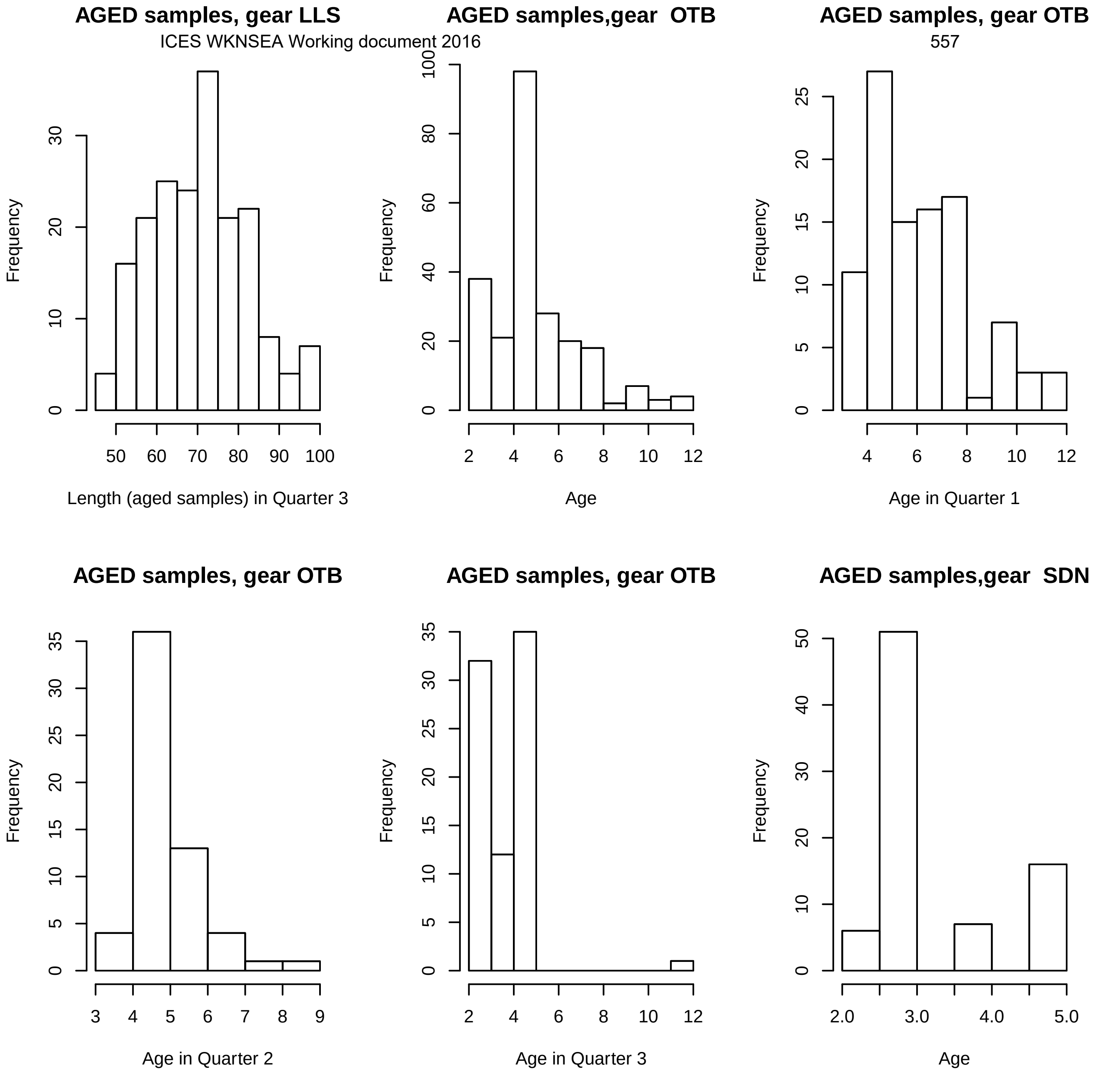

Histogram for gear OTB
Frequency
Length
Histogram for gear OTB
Frequency
Length in Quarter 1
Histogram for gear OTB
Frequency
Length in Quarter 2
Histogram for gear OTB
Frequency
Length in Quarter 3
Histogram for gear OTB
Frequency
Length in Quarter 4
Histogram for gear OTB
Frequency
Length

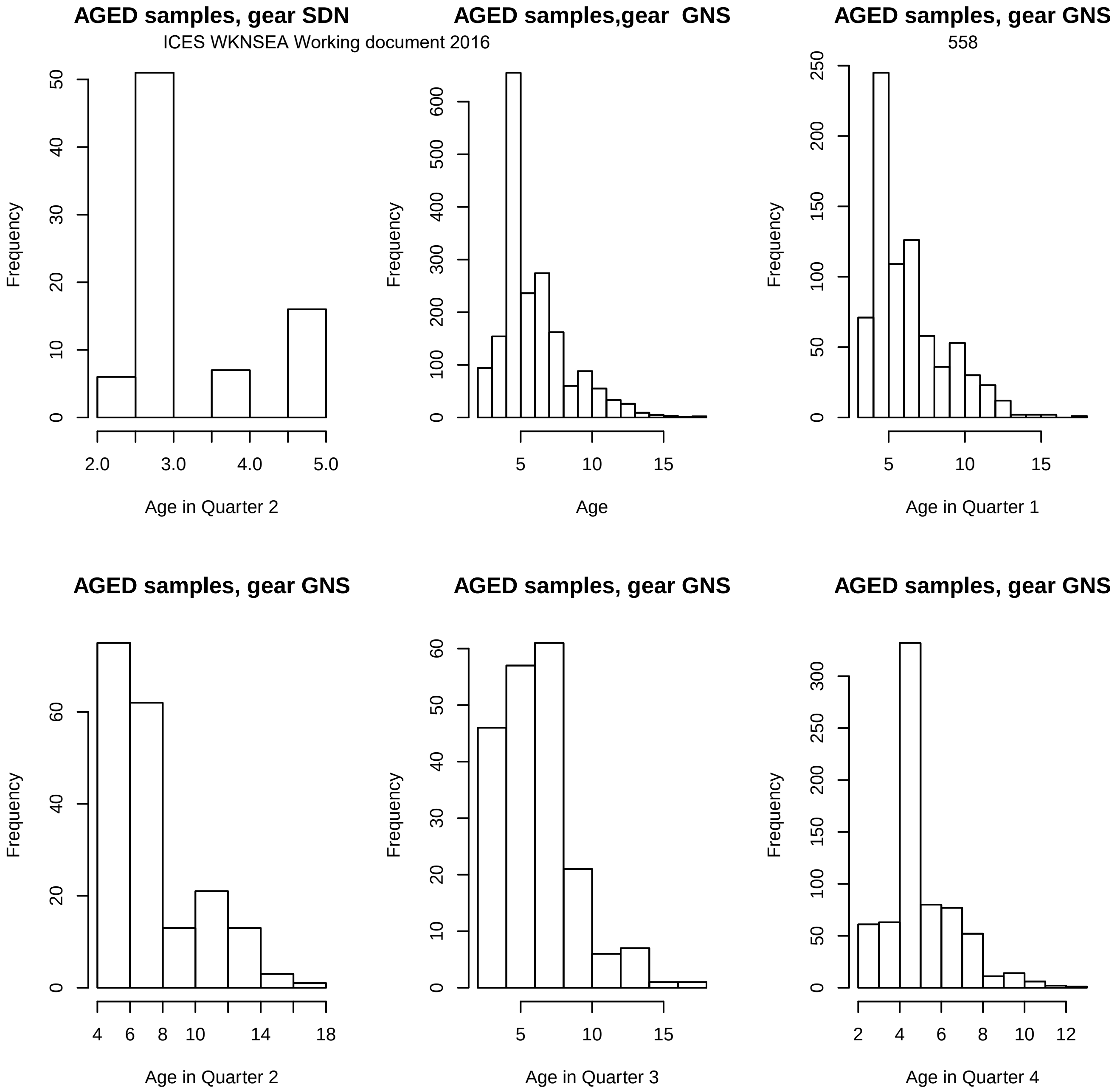

Histogram for gear OTB
Frequency
0 1 2 3 4 5
25 35 45 55
Length in Quarter 3
Histogram for gear SDN
Frequency
0 20 40 60 80
30 40 50 60 70 80 90
Length
Histogram for gear SDN
Frequency
0 20 40 60 80
30 40 50 60 70 80 90
Length in Quarter 2
Histogram for gear GNS
Frequency
0 500 1000 1500
40 60 80 100
Length
Histogram for gear GNS
Frequency
0 200 400 600 800
40 60 80 100
Length in Quarter 1
Histogram for gear GNS
Frequency
0 50 100 150 200 250 300
40 60 80 100 120
Length in Quarter 2

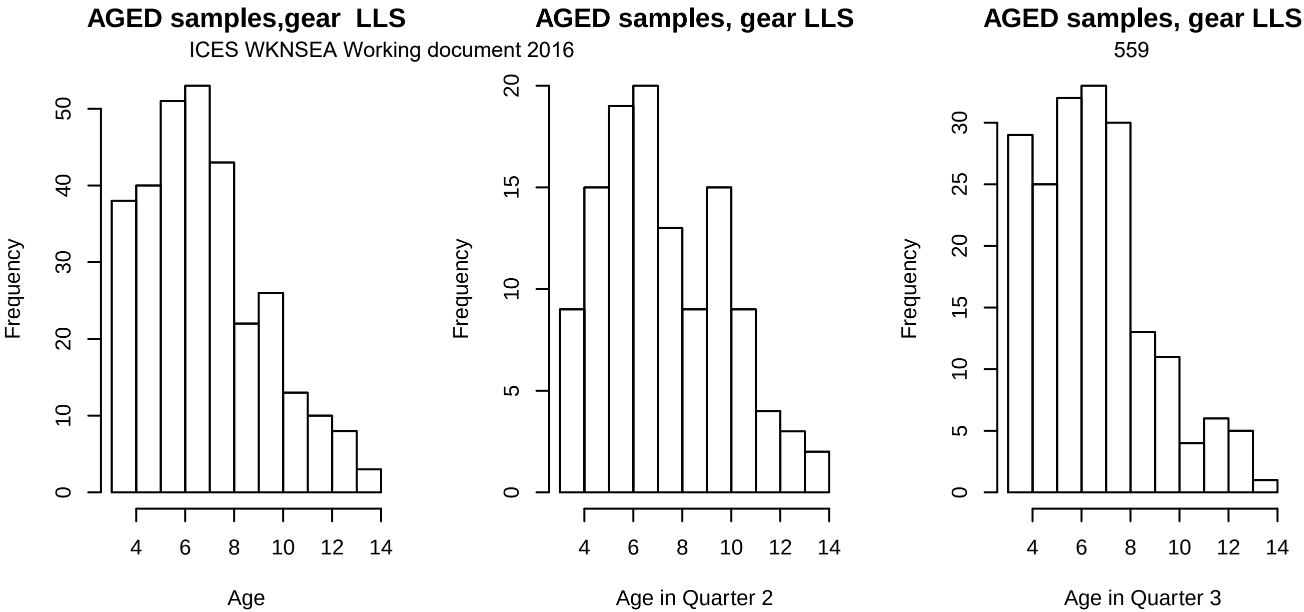

Histogram for gear GNS
Frequency
Length in Quarter 3
Histogram for gear GNS
Frequency
Length in Quarter 4
Histogram for gear LLS
Frequency
Length
Histogram for gear LLS
Frequency
Length in Quarter 2
Histogram for gear LLS
Frequency
Length in Quarter 3
AGED samples,gear OTB
Frequency
Length

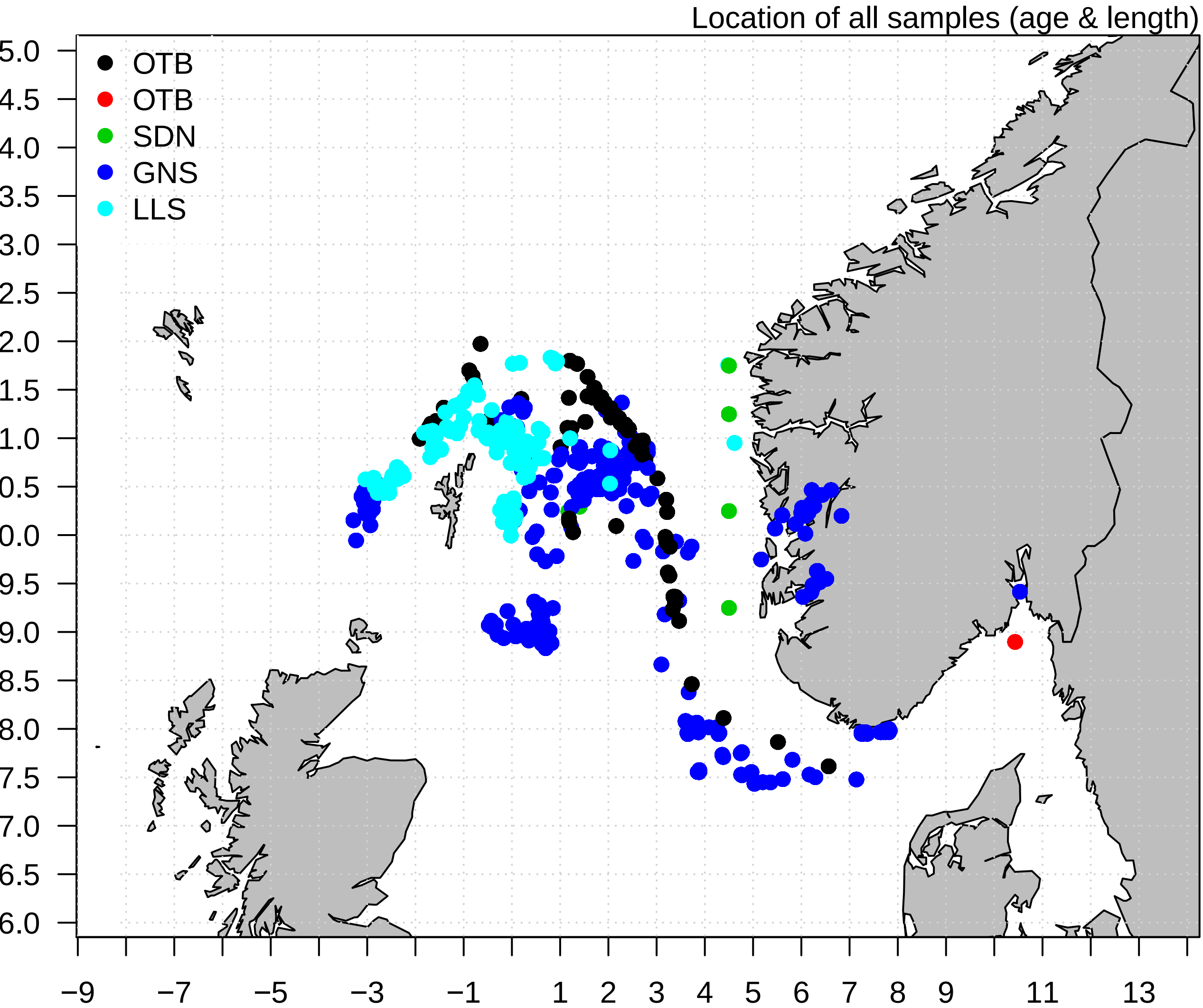

AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 1
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 2
AGED samples, gear OTB
Frequency
Length (aged samples) in Quarter 3
AGED samples,gear SDN
Frequency
Length
AGED samples, gear SDN
Frequency
Length (aged samples) in Quarter 2
AGED samples,gear GNS
Frequency
Length

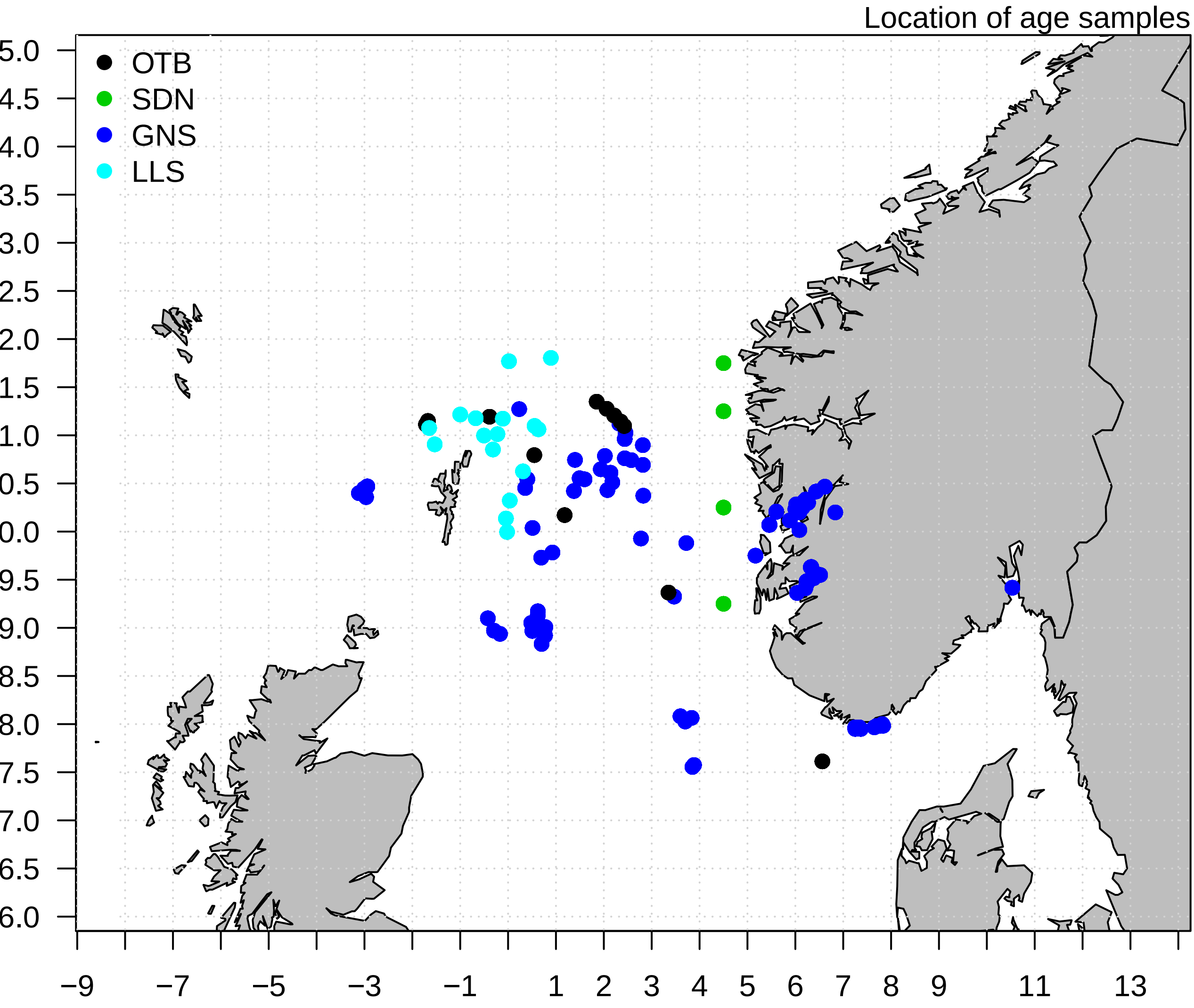

AGED samples, gear GNS
Frequency
Length (aged samples) in Quarter 1
AGED samples, gear GNS
Frequency
Length (aged samples) in Quarter 2
AGED samples, gear GNS
Frequency
Length (aged samples) in Quarter 3
AGED samples, gear GNS
Frequency
Length (aged samples) in Quarter 4
AGED samples,gear LLS
Frequency
Length
AGED samples, gear LLS
Frequency
Length (aged samples) in Quarter 2

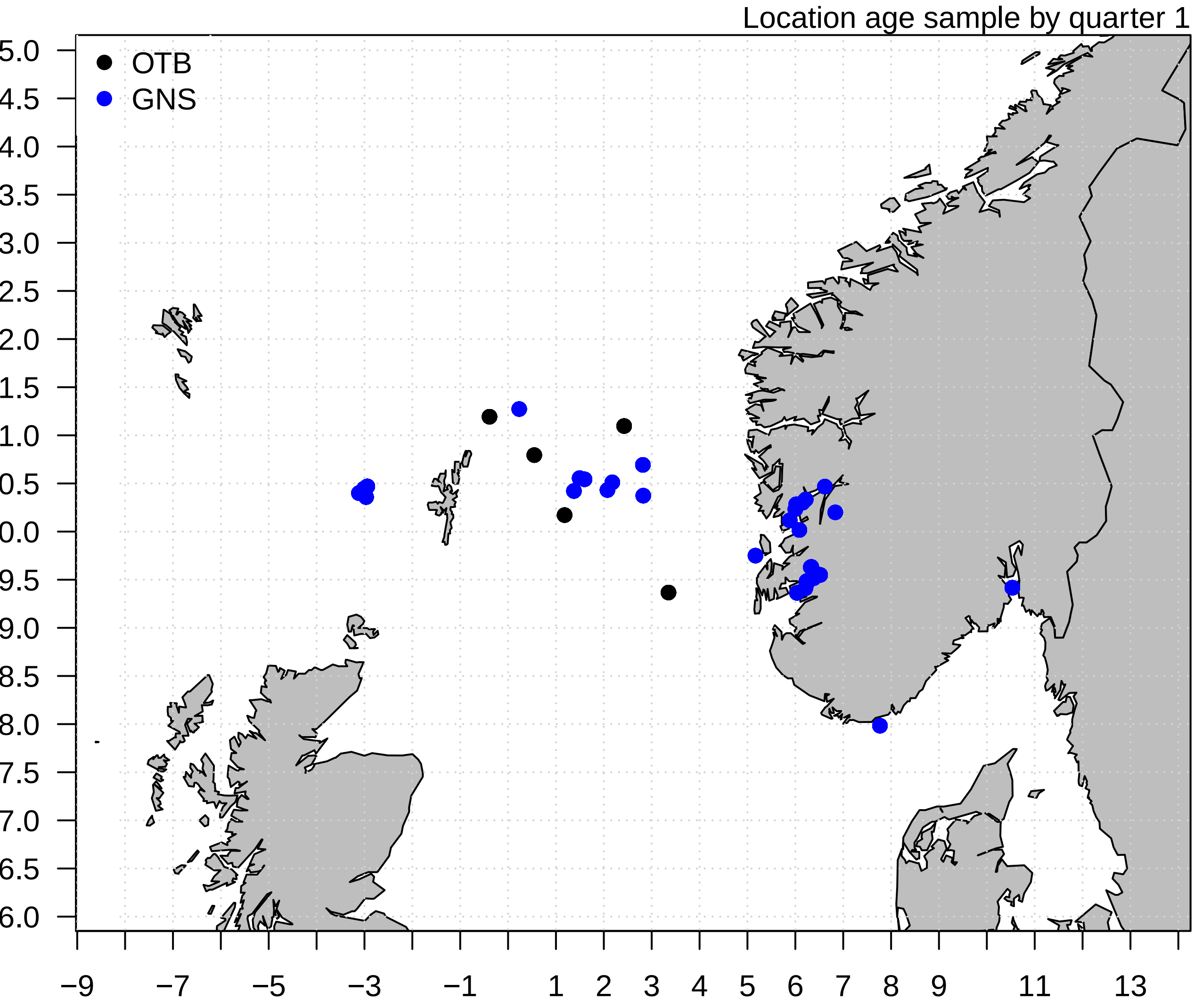

AGED samples, gear LLS
Frequency
0
10
20
30
50
60
70
80
90
100
Length (aged samples) in Quarter 3
AGED samples,gear OTB
Frequency
0
20
40
60
80
100
2
4
6
8
10
12
Age
AGED samples, gear OTB
Frequency
0
5
10
15
20
25
4
6
8
10
12
Age in Quarter 1
AGED samples, gear OTB
Frequency
0
5
10
15
20
25
30
35
3
4
5
6
7
8
9
Age in Quarter 2
AGED samples, gear OTB
Frequency
0
5
10
15
20
25
30
35
2
4
6
8
10
12
Age in Quarter 3
AGED samples,gear SDN
Frequency
0
10
20
30
40
50
2.0
3.0
4.0
5.0
Age

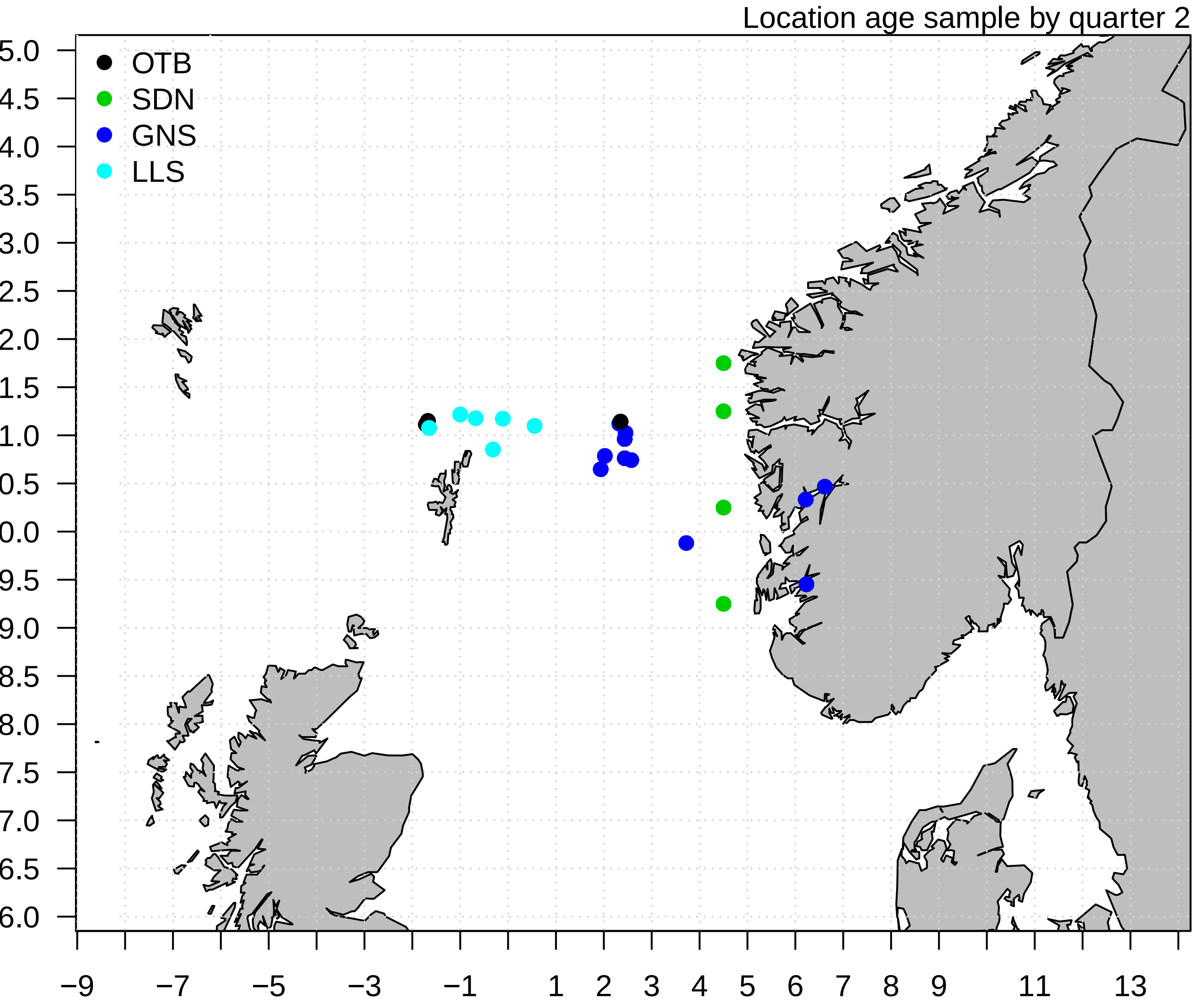

AGED samples, gear SDN
Frequency
Age in Quarter 2
AGED samples,gear GNS
Frequency
Age
AGED samples, gear GNS
Frequency
Age in Quarter 1
AGED samples, gear GNS
Frequency
Age in Quarter 2
AGED samples, gear GNS
Frequency
Age in Quarter 3
AGED samples, gear GNS
Frequency
Age in Quarter 4

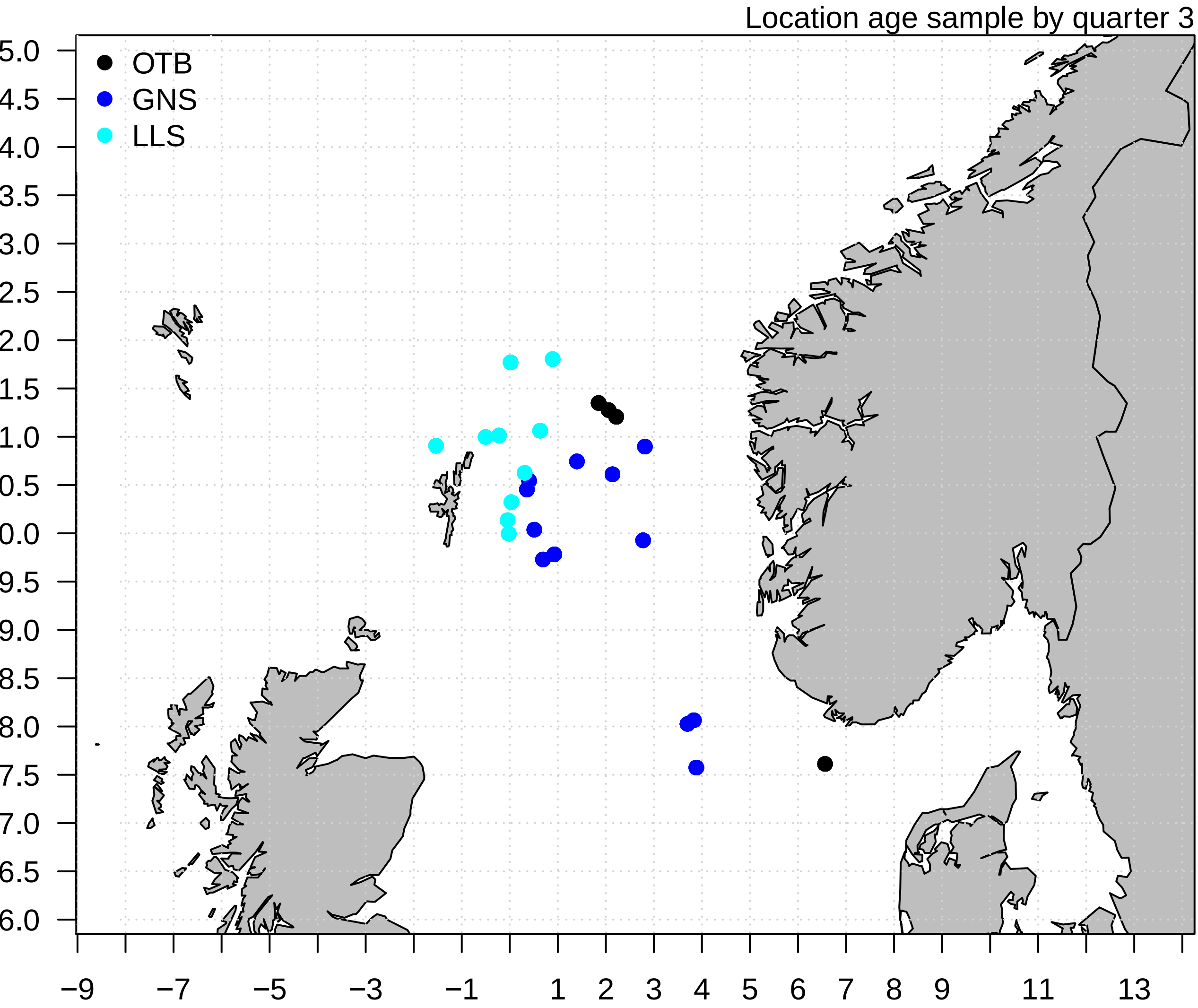

AGED samples,gear LLS
Frequency
Age
AGED samples, gear LLS
Frequency
Age in Quarter 2
AGED samples, gear LLS
Frequency
Age in Quarter 3


Location of all samples (age & length)
OTB
OTB
SDN
GNS
LLS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location of age samples
OTB
SDN
GNS
LLS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 1
OTB
GNS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13


Location age sample by quarter 2
OTB
SDN
GNS
LLS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
−9
−7
−5
−3
−1
1
2
3
4
5
6
7
8
9
11
13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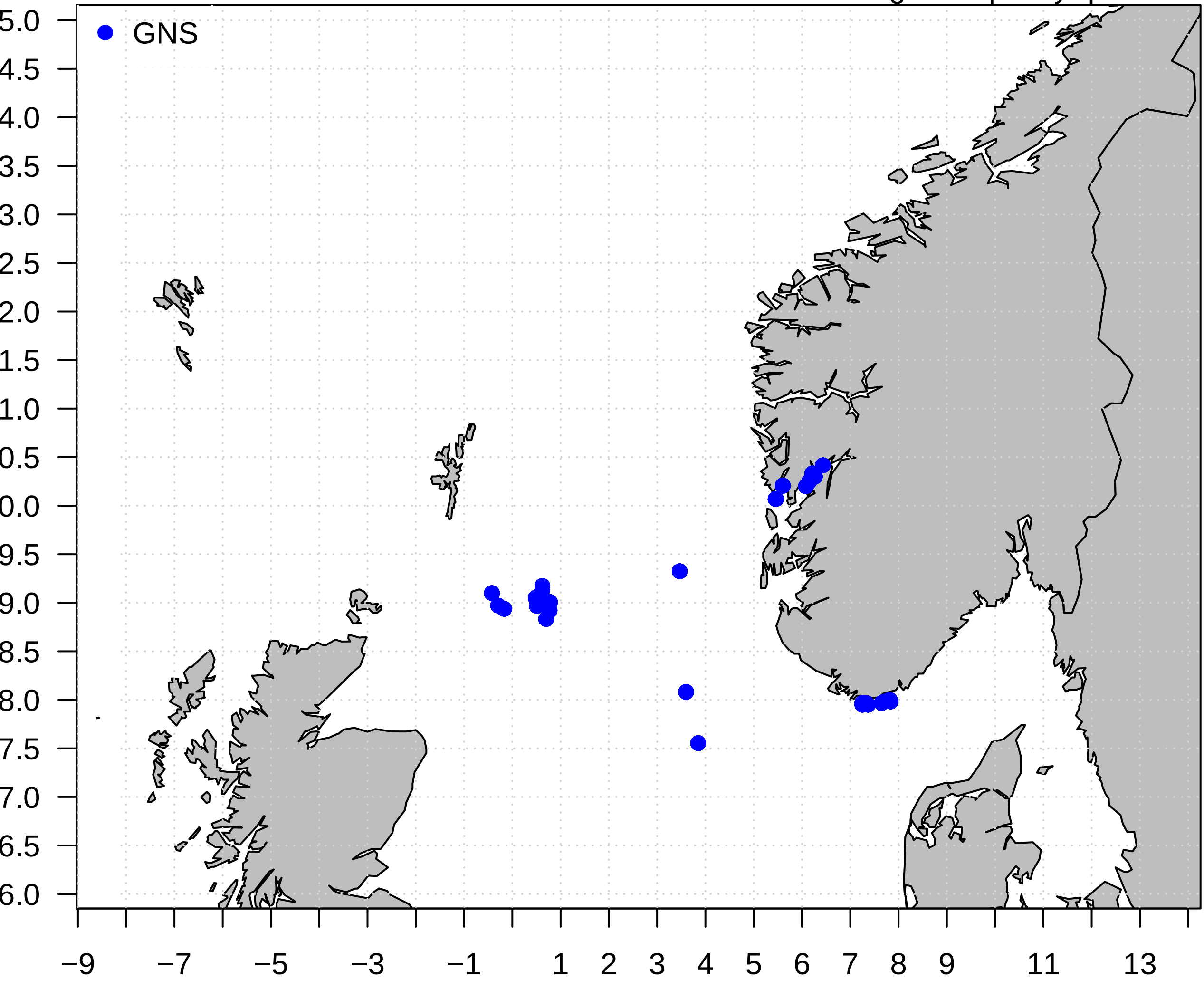
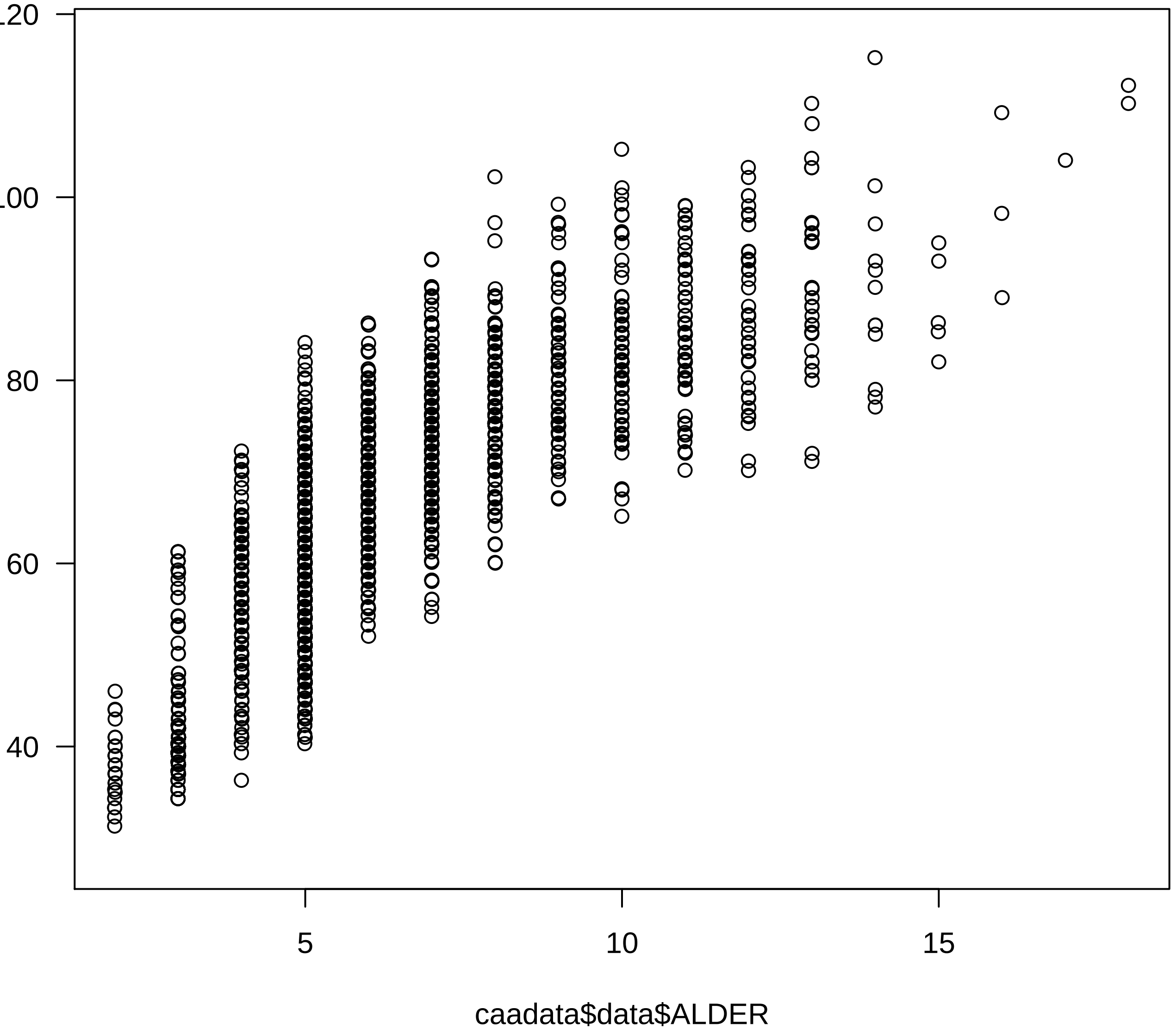
Location age sample by quarter 4

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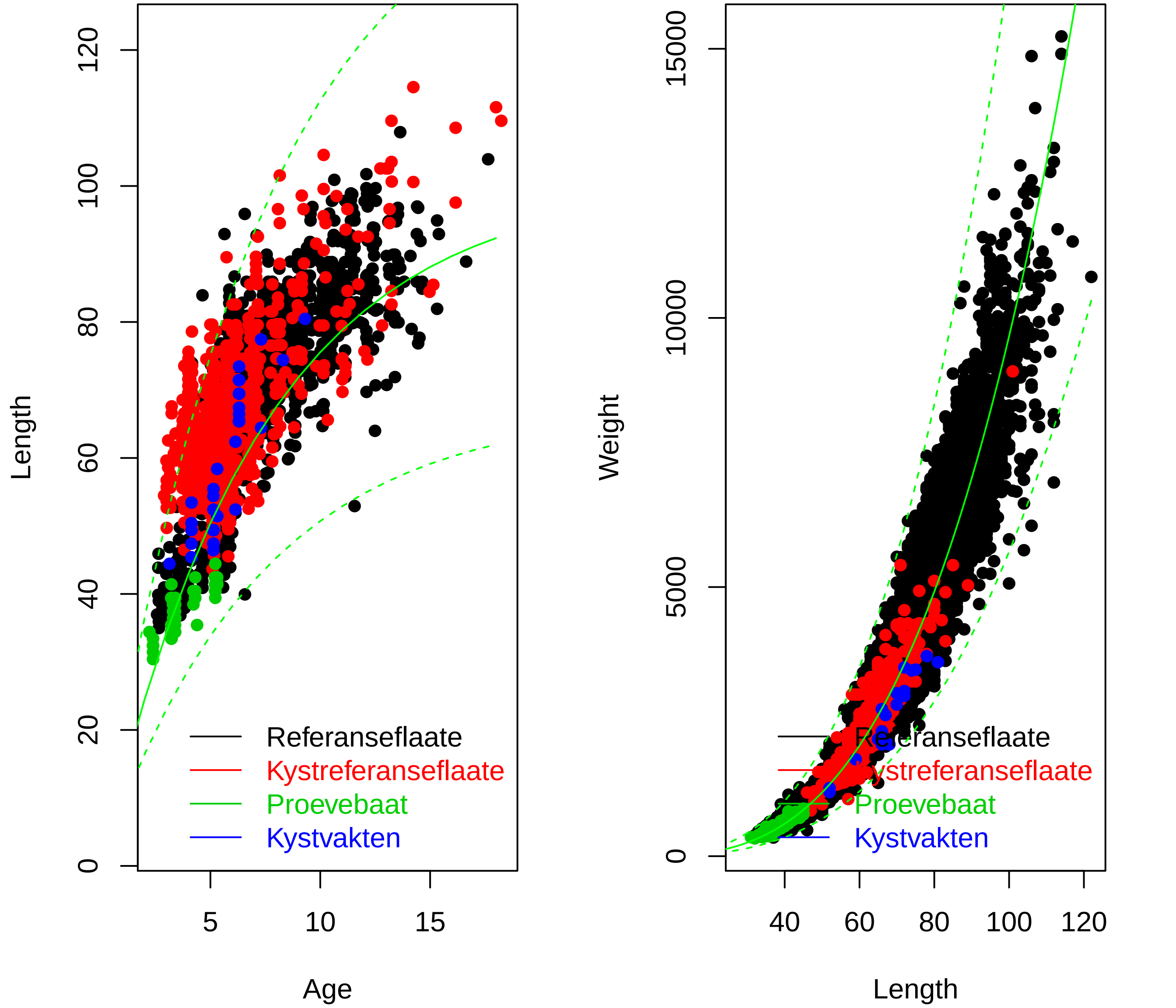
Debugging data based on age−length−weight: SEI 2012



WD 7: Biological data for saithe

Jennifer Devine

Choice of data

The North Sea IBTS Q1, Q3, Q4 and Scottish West Coast Q1, Q4 surveys were used for the biological data for saithe. For all surveys, data were screened to include stations with haul durations between 15-34 minutes. IBTS protocol clearly states that tows of 15 minutes duration are considered valid. Countries are allowed to reduce the duration when necessary (ICES-IBTSWG 2015) and reduced tow times are not necessarily an indication of reduced tow quality (i.e., trawl showed signs of instability). Haul duration is reduced if there is an indication of trawl instability (but the catch is considered valid), but are also reduced when daytime is short (squeezing in one last tow before sunset) or for tow duration experiments (2015 Q1 Norway, 2015 Q3 all nations). Preliminary analyses of the tow duration experiments showed that there was no difference in catch weights, numbers, or richness when reducing haul duration from 30 to 15 minutes in the IBTS surveys (Q1, Q3; preliminary results IBTSWG) or numerous publications elsewhere (e.g., Godø et al. 1990, Walsh 1991, Pennington & Vølstad 1991, Ehrich & Stransky 2001, Pennington et al. 2002, Wieland & Storr-Paulsen 2006).

Individual weight data for saithe were not available in the DATRAS data for years prior to 2003. Maturation data were very limited before 1991.

Survey data

IBTS Q1

The GOV used consistently from 1980; to ensure a consistent period with standardized gear, earlier years were therefore omitted from the time series. Scotland used 60 min tows until 1998, when they reduced to the standard 30 min tow. The Scottish survey area is one of the main areas for saithe and the only country sampling west of Shetland (known saithe habitat), therefore excluding this data could have an effect on the ALK, maturation, and stock weights-at-age. Two data sets were created to test this, one which included tows of haul duration 15-34 minutes and Scottish 60-minute tows, the other only tows of hauls duration between 15-34 minutes.

Data set (a) included the Scottish 60-minute tows. Data were sparse after age 10, therefore, age 10 was a plus group. Data set (b) excluded the Scottish 60-minute tows conducted 1993-1998. The result of omitting these tows was reflected in the weights-at-age; fish were generally smaller for a given age for the older age classes. This is not surprising, since Scotland surveys a large portion of the saithe habitat and is the only nation surveying west of Shetland.

This data set was used for ALKs, weight-at-age, and maturity ogives.

IBTS Q3

Scotland used 2 other gears in addition to the GOV during the IBTS Q3 survey. One of the gears (Dutch herring trawl) was used at only one station and removed from the data. The other gear, Aberdeen 18 ft trawl, was retained. Tows of haul duration between 15–34 minutes were used. No age data for saithe existed for 1991, therefore, ALKs were fit on data 1992-2015.

This data set was used for ALKs and weight-at-age estimation.

SCOTTISH WEST COAST Q1 (SWC-IBTS)

Although the data set was downloaded from the DATRAS website 03.02.16, the 2015 Q4 data were not yet uploaded, therefore the data that included measurements on saithe were from 2001-2014.

This data set was used for weight-at-age and maturity-at-age estimation.

SCOTTISH WEST COAST Q4 (SWC-IBTS)

Although the data set was downloaded from the DATRAS website 03.02.16, the 2015 Q4 data were not yet uploaded, therefore the data were from 1990-2014. Tow duration was 60 minutes until 1997, when Scotland moved to 30-minute tows; therefore, haul duration between 15-62 minutes was retained. As with other IBTS surveys, hauls of 15-minutes are considered valid. Age data were collected on saithe during the period 1996–2009 and 2011–2014, while maturity data were from 1996–2007. ALKs were fit on data 1996–2014 (without 2010), for ages 1–4+. Individual weight information was only available for 2011-2014.

This data set was used for ALKs, weight-at-age, and maturity-at-age estimation. This survey mainly captures young fish.

ALKs

Using the continuation ratio logit (CRL) method and model formulations as outlined in Berg & Kristensen (2012); models were fit using the DATRAS R package (Kristensen & Berg 2010). Aging data tended to be sparse in the early years of the survey series and for some of the older ages (Table A1); this caused issues when fitting the models. Survey year range, max age (which is treated as a plus group), and model fits are detailed in Table 1. As in Berg & Kristensen (2012), the best model was a smooth spatial varying ALK fitted using GAMS with the smoothness selection by AIC, where the intercepts were allowed to vary with location (latitude and longitude, Table 1).

Weights-at-age

The data used to generate the mean weight-at-age came from the IBTS Q1 (including Scottish 60-minute tows), IBTS Q3, and the SWC-IBTS quarters 1 and 4 (Table A2). The Scottish West coast survey gives valuable information about the saithe population in Area VI, which is not covered in the IBTS Q1 or Q3 surveys. Data from the SWC-IBTS surveys included only those stations north of 54.5° N (i.e., the southern boundary of Area VI). Individual weight data for saithe were not available in the DATRAS data for years prior to 2002.

Weights-at-age were generated two ways: accounting for the length-stratified subsampling of age by applying a GAM smoother to the age-length key (see above, Berg & Kristensen 2012; Table 1) and as raw (unsmoothed ALK) estimates. Within the SAM model, the stock weights can be smoothed (over the entire time series) to avoid annual variations that can only be due to noise/subsampling issues (e.g., stock weights will not change by 1kg between years within the same age class).

Maturity at age

Maturity at age were summarized directly from the length stratified samples taken for the 1st and 4th quarter NS-IBTS and SWC-IBTS SMALK databases (DATRAS, Table A3). Other quarters were not included because staging is too uncertain further from the spawning period. As stated previously, the SWC-IBTS survey gives valuable information for a part of the population not covered in the IBTS surveys. Data from the SWC-IBTS surveys included only those stations north of 54.5° N (i.e., the southern boundary of Area VI). Maturation stages 2/62 (and up) were considered mature. Stage 2/62 is maturing and is used when oocytes are present, but hydrated eggs are not yet visible (i.e., fish will spawn at the next spawning period). The spawning period for saithe is from January to March (typically), but can be still occurring through May in some areas and years (Russel 1976; Munk & Nielsen 2005). Maturation data did not exist in DATRAS prior to 1991.

Proportion mature (M) was estimated using a logistic generalized linear model according to:

$$\text{logit}(M) \sim \text{length} + \text{age} + \text{cohort} \text{ ,}$$

where *age* and *cohort* were treated as factors with maturity state (immature or mature) as a proportion, where weights were number-at-ALK. A quasi-binomial family was used due to a problem with over dispersion in the survey data. Interactions (length:age and length:cohort) improved the model fit.

A static ogive was also estimated using all data

$$\text{logit}(M) \sim \text{length} + \text{age} \text{ ,}$$

where age was treated as a factor. A quasi-binomial family was again used due to a problem with over dispersion. The interaction (length:age) did not improve the model fit.

Natural mortality

Natural mortality was not estimated due to lack of time. This should be investigated at the next benchmark (or inter-benchmark).

There was a brief discussion regarding whether the stochastic multi species model SMS (Lewy and Vinther 2004) could be used; it cannot because saithe is included only as a predator in that model. A new M of 0.26 (all ages) was estimated using the longevity equation (following Then et al., 2014), where M = 5.109/tmax, and tmax was 25. The expert group agreed to leave M as 0.2. Exploration of alternate natural mortality rates was noted as needing exploration before the next benchmark.

Results

Weights-at-age

The low number of measurements for the younger ages resulted in poor estimates for age 1 (Table 2, Figure 1). This is not unexpected since North Sea saithe are generally in the nursery areas (coastal areas around Scotland and in the Norwegian fjords) until between the ages 3 to 5 and are unavailable to capture in the surveys.

Although the ALK model that allowed for spatial variation being the better fit in terms of AIC, it seemed to include more noise (estimates were quite variable for younger ages). The model using the common ALK may be the ‘safer’ choice when estimating weight-at-age due to the limited amount of data for a combination of years-ages-area (Table 2, Figure 1). Confidence intervals should have been bootstrapped to get an idea of the variability in the estimated series, to aid in model choice, but time was limited and this was omitted.

Prior to the benchmark, the stock assessment used catch weights-at-age for stock weights-at-age. Table 3 and Figure 2 give the newly estimated catch weights-at-age for comparison (for details on catch weight estimation, see Working Document 5). Stock weights were less than catch weights for ages 1 to 5 and higher than catch weights after age 7. This was discussed and believed to be plausible; faster growing and thus heavy fish will be selected for by the fishery for the younger age classes, whereas fishers may target saithe of an average size with the older age classes (e.g., due to restrictions with onboard processing, price). To generate stock weights for the period 1967–2002, the average ratio of stock weight to catch weight by age (2003–2014) was used (Figure 3).

Maturity-at-age

A static maturity ogive, estimated at WKBENCH 2011, is currently used in the assessment (Table 4). Table 5 shows the new maturity ogive. Figure 4 shows the variable maturity ogive. Because the ogive showed large jumps between years for some of the ages, a GAM smoother was applied within the SAM model, where the maturity at age was the average of 2003-2007 (Figure 4). These data were used in the model as the varying maturity ogive. To avoid a jump in maturity between 2002 and 2003 (to allow a smooth transition), data can be smoothed over a slightly longer time period than 2003-2015. A new static maturity ogive was also estimated (Table 5).

After much discussion, it was agreed that the ogive including cohort showed too much variability that was unlikely over such a short time period, even after smoothing was applied. The newly estimated static ogive, with some modification based on expert knowledge within the group, was agreed upon (Table 6). This modification was because the proportions mature at age estimated from the survey data showed large fluctuations between years for ages 3 and 4, which was assumed to be due to variability in the amount of fish that migrate into the survey area. Proportions of age 3 and 4 year old fish that migrate from coastal areas to the North Sea varies annually and it is generally assumed that larger (and thus faster maturing) fish migrate out earlier. The proportion of 3 and 4 year olds can be low, such that using observed proportions mature without correcting for the large amount of immature fish outside the survey area will introduce a bias in the ogive. The discussion at this benchmark meeting concluded that using a slightly conservative approach was best. Proportions mature at age 3 were set to zero and proportions at age 4 to half of the estimated average proportion mature. A yearly update of the maturity ogives may give a more accurate assessment of SSB; the implications for realized spawning potential are not known.

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Table 1. ALK model fits for each data set and 5 of the models as described (and numbered) in Berg and Kristensen (2012); model #2, which was a formulation where the North Sea was split into several subareas, was omitted.

Data set	Model AIC					Max. age
	1	3	4	5	6	
(a) IBTS Q1 incl. Scottish 60 min tows 1992:2015	25392	**23392**	23703	24012	24319	10
(b) IBTS Q1 excl. Scottish 60 min tows 1993:2015	22611	**20697**	20974	21212	22157	8
(c) IBTS Q3 1992:2015	31946	**29957**	30401	30579	33394	8
(d) Scottish West Coast Q4 1996:2009, 2011:2014	1655	**1545**	1570	1615	1573	4
(e) Weight-at-age 2003:2015	53887	**47707**	49004	48849	74020	10

Table 2. Weight-at-age. (top) Raw estimates and (bottom) smoothed and using a common ALK for the entire North Sea.

Year/Age	1	2	3	4	5	6	7	8	9	10+
2003	283	634	740	855	977	1567	2450	4271	4722	7322
2004	163	571	673	787	925	1220	2298	2843	4948	6571
2005	164	614	755	954	1176	1459	1945	3076	3830	6800
2006	149	621	830	903	1156	1735	2183	3425	4120	6183
2007	260	419	702	913	1080	1727	2273	3166	3832	7603
2008	140	510	718	996	1391	1679	2855	3518	4692	6506
2009	190	682	887	989	1374	2011	2451	3703	3973	4745
2010	148	500	916	1453	1946	2464	3515	3929	4896	5999
2011	182	352	585	960	1668	2710	3637	4218	4296	5683
2012	161	475	628	930	1098	2408	3663	4778	5189	6034
2013	66	499	705	890	1313	1637	3224	4627	5378	7212
2014	135	350	861	1073	1501	2198	2863	4445	6108	7777
2015	109	554	742	1086	1563	2127	2754	3537	6283	7603

Year/Age	1	2	3	4	5	6	7	8	9	10+
2003	401	602	749	857	977	1462	2392	4132	4834	7246
2004	161	598	666	786	927	1190	2176	2969	4821	6566
2005	74	607	763	958	1162	1454	1936	3103	3844	6927
2006	183	610	831	905	1164	1665	2167	3406	4212	6667
2007	270	397	702	916	1079	1636	2361	3351	4338	7360
2008	134	591	714	1000	1381	1675	2825	3491	4798	6356
2009	220	684	876	997	1338	2153	2421	3721	3973	4826
2010	147	501	922	1452	1961	2446	3656	4014	4964	6022
2011	161	351	590	958	1650	2777	3570	4213	4260	5776
2012	91	466	634	937	1111	2342	3626	4786	5287	6000
2013	66	499	709	890	1295	1658	3221	4601	5364	7225
2014	66	351	860	1071	1500	2230	2888	4532	6168	7755
2015	109	553	743	1086	1561	2131	2776	3584	6215	7522

Table 3. Catch weight-at-age for 2002–2014, estimated for the benchmark (details in Working Document 5).

Year/Age	1	2	3	4	5	6	7	8	9	10+
2002	–	665	923	1035	1478	1769	2947	3426	4407	5674
2003	442	713	833	980	1173	1810	2368	3176	3768	5065
2004	–	731	918	1084	1392	1896	2860	3687	4814	7059
2005	–	774	921	1155	1325	1710	2132	3026	3622	5713
2006	814	796	945	1069	1514	1906	2424	3058	4318	5734
2007	611	698	837	1143	1317	1840	2328	2887	3600	4975
2008	393	802	944	1193	1565	1720	2226	2795	3206	4565
2009	247	887	1036	1340	1664	1992	2563	3084	3648	4793
2010	891	819	1036	1479	2034	2597	3164	3488	3968	5199
2011	690	813	1007	1207	1783	2573	3068	3404	3717	4284
2012	587	825	1015	1321	1408	2201	3223	3536	4177	4482
2013	411	672	898	1156	1614	1976	3078	3841	4541	5647
2014	345	830	1126	1300	1607	2384	2617	4013	5530	6679

Table 4. The static maturity ogive currently used in the assessment for all years, as estimated at WKBENCH 2011.

	1	2	3	4	5	6	7+
Proportion mature	0.0	0.0	0.0	0.15	0.7	0.9	1.0

Table 5. Estimated percent mature by age.

Year	1	2	3	4	5	6	7	8	9+
Static	0.00	0.06	0.20	0.40	0.65	0.84	0.97	1.00	1.00
1991	0.03	0.04	0.21	0.64	0.93	0.96	0.99	1.00	1.00
1992	0.03	0.14	0.37	0.52	0.83	0.97	0.99	1.00	1.00
1993	0.01	0.05	0.31	0.48	0.77	0.95	1.00	1.00	1.00
1994	0.01	0.05	0.22	0.49	0.75	0.94	0.99	1.00	1.00
1995	0.01	0.07	0.22	0.44	0.77	0.94	0.99	1.00	1.00
1996	0.02	0.05	0.23	0.34	0.66	0.93	0.99	1.00	1.00
1997	0.00	0.20	0.54	0.28	0.52	0.79	0.99	1.00	1.00
1998	0.00	0.35	0.22	0.36	0.47	0.70	0.94	1.00	1.00
1999	0.00	0.10	0.26	0.39	0.53	0.77	0.95	0.99	1.00
2000	0.00	0.19	0.37	0.49	0.62	0.82	0.95	1.00	1.00
2001	0.00	0.12	0.59	0.64	0.72	0.90	0.98	1.00	1.00
2002	0.00	0.04	0.33	0.53	0.78	0.90	0.99	1.00	1.00
2003	0.00	0.06	0.22	0.55	0.74	0.94	0.99	1.00	1.00
2004	0.00	0.15	0.26	0.42	0.70	0.89	0.99	1.00	1.00
2005	0.01	0.07	0.34	0.51	0.77	0.94	0.97	1.00	1.00
2006	0.00	0.24	0.43	0.49	0.74	0.94	1.00	1.00	1.00
2007	0.00	0.15	0.55	0.59	0.68	0.95	0.99	1.00	1.00
2008	0.00	0.05	0.22	0.58	0.82	0.89	0.99	1.00	1.00
2009	0.00	0.02	0.17	0.37	0.75	0.93	0.98	1.00	1.00
2010	0.00	0.03	0.20	0.47	0.71	0.91	0.99	1.00	1.00
2011	0.00	0.04	0.11	0.24	0.63	0.85	0.98	1.00	1.00
2012	0.00	0.05	0.12	0.28	0.31	0.74	0.95	0.99	1.00
2013	0.00	0.05	0.25	0.31	0.57	0.57	0.93	0.98	1.00
2014	0.00	0.01	0.22	0.40	0.56	0.83	0.89	0.98	1.00
2015	0.00	0.04	0.20	0.33	0.60	0.80	0.96	0.99	1.00

Table 6. Maturity ogive agreed upon in WKNSEA.

	1	2	3	4	5	6	7	8	9+
Proportion mature	0.0	0.0	0.0	0.20	0.65	0.84	0.97	1.00	1.00

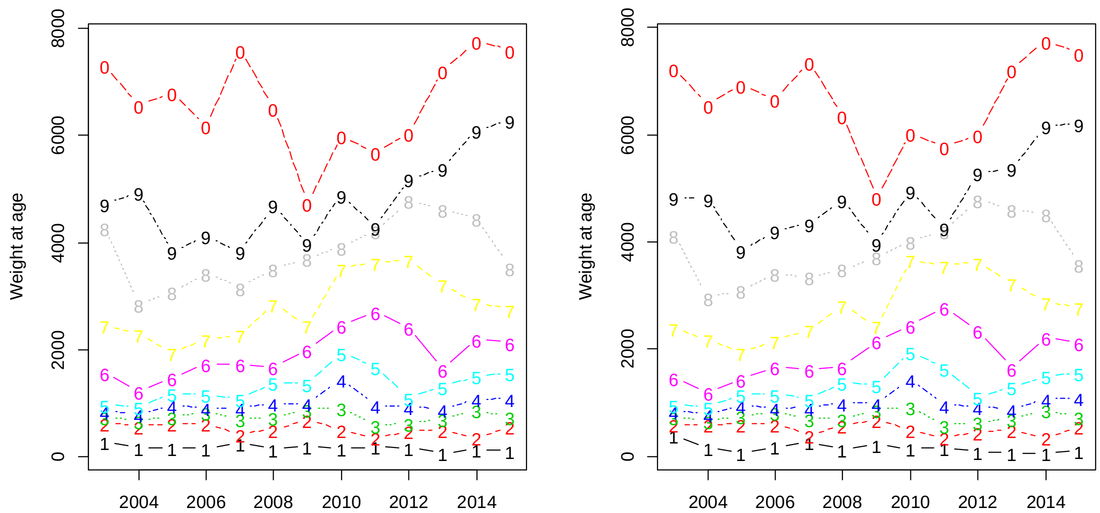


Figure 1. Weight-at-age for ages 1 to 10 as estimated from IBTS Q1, IBTS Q3, and Scottish West coast surveys Q1 and Q4 for the period 2003–2015. (left) Estimated using a raw ALK and (right) estimated with a common ALK (smoothed). The red line (uppermost) is age 10.

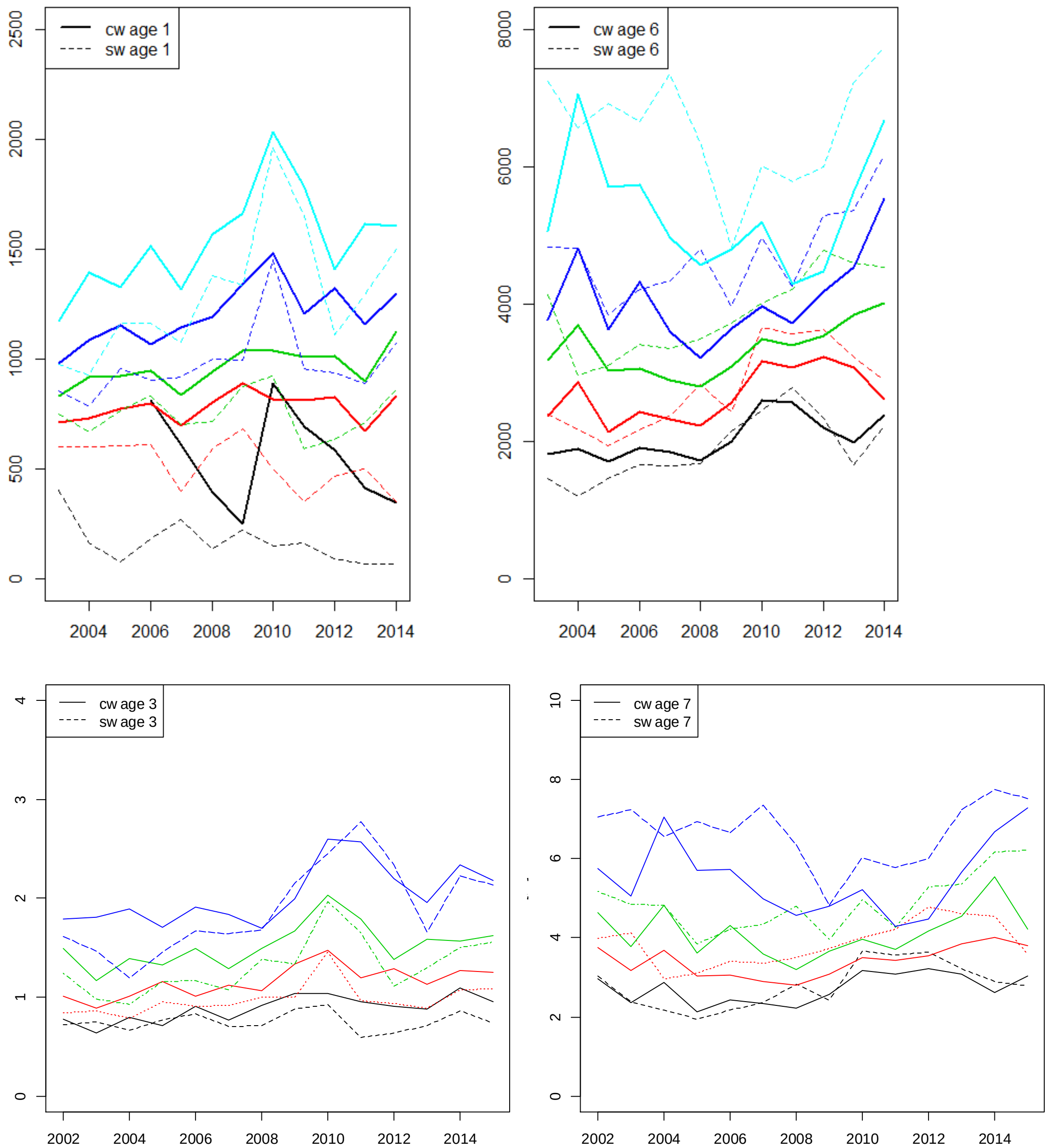


Figure 2. Stock weights (dashed lines) and catch weights (solid lines) for ages 1-10+. The left panel shows age 1 (black lines) to age 5 (light blue lines), while ages 6-10+ are in the right panel. Top figures are prior to bug in InterCatch being fixed. Bottom figure: post re-raising and changing of raising procedure for discards. See WD-5 for a description of the InterCatch and re-raising issues.

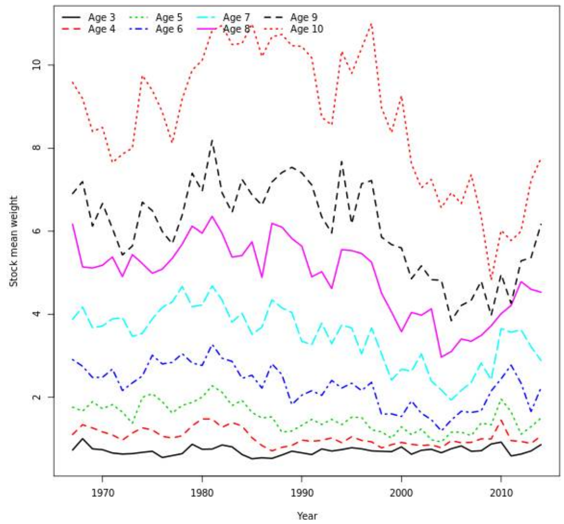


Figure 3. Stock weights at-age for the entire time period, 1967-2014.

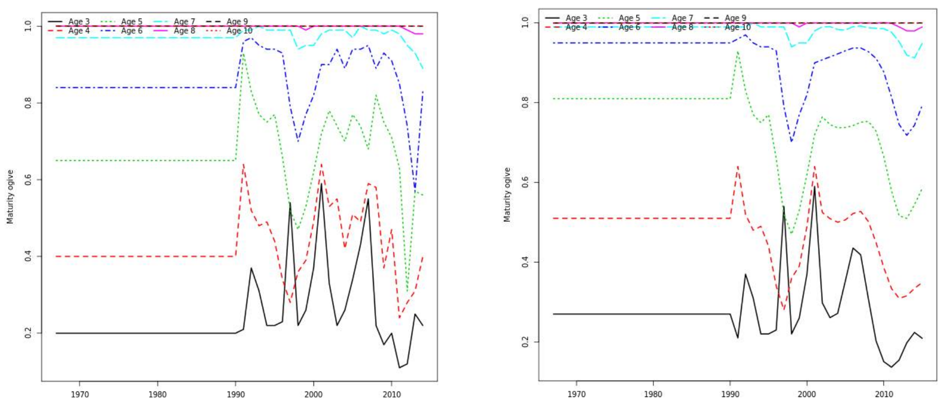


Figure 4. (Left) Plots of estimated maturity-at-age, where estimates prior to . (Right) Smoothed estimates, after a GAM model was applied in SAM model to data in left panel; 1967-2002 was a five-year average (2003-2007).

Appendix 1: Tables of the amount of data available for the analyses.

Table A1. Counts of age measurements by year for each of the 4 survey datasets: (a) Q1 including Scottish 60-minute tows; (b) Q1 where haul duration is between 15–34 minutes; (c) Q3 where haul duration is between 15–34 minutes; and (d) Scottish West coast Q4 survey.

(a)

Year/Age	1	2	3	4	5	6	7	8	9	10+
1992	0	10	17	67	21	6	13	12	9	7
1993	1	8	52	133	141	55	17	18	13	17
1994	5	20	78	146	52	35	7	3	4	12
1995	0	1	55	109	132	47	42	11	4	7
1996	0	7	13	106	32	15	3	2	1	3
1997	0	0	1	30	91	17	10	6	1	6
1998	0	2	20	163	110	156	26	13	7	6
1999	0	1	24	69	179	67	78	6	10	2
2000	3	4	54	26	38	61	23	28	8	3
2001	2	1	12	52	135	43	54	20	16	5
2002	2	5	64	155	98	139	32	66	26	20
2003	1	30	47	112	162	44	26	10	12	9
2004	5	1	57	154	171	116	17	16	7	10
2005	1	10	17	94	138	118	73	12	10	3
2006	6	4	4	98	82	87	76	25	2	4
2007	16	11	50	79	204	65	49	33	8	11
2008	3	5	126	161	62	103	36	44	20	19
2009	14	9	19	133	130	33	85	23	24	36
2010	20	15	29	75	117	84	26	32	23	43
2011	7	185	371	76	43	46	33	17	28	37
2012	17	28	243	148	241	50	41	18	16	52
2013	65	33	97	411	116	216	64	32	22	67
2014	29	57	30	112	142	44	68	31	11	52
2015	17	5	55	91	148	116	57	57	11	39

(b)

Year/Age	1	2	3	4	5	6	7	8+
1993	0	1	37	114	131	35	12	40
1994	5	19	77	138	50	29	4	8
1995	0	1	55	109	132	46	42	17
1996	0	5	10	78	26	11	3	1
1997	0	0	1	30	90	17	10	7
1998	0	2	20	157	108	155	24	23
1999	0	1	24	69	179	67	78	18
2000	3	4	54	26	38	61	23	39
2001	2	1	12	52	135	43	54	41
2002	2	5	64	155	98	139	32	112
2003	1	30	47	112	162	44	26	31
2004	5	1	57	154	171	116	17	33
2005	1	10	17	94	138	118	73	25
2006	6	4	4	98	82	87	76	31
2007	16	11	50	79	204	65	49	52
2008	3	5	126	161	62	103	36	83
2009	14	9	19	133	130	33	85	83
2010	20	15	29	75	117	84	26	98
2011	7	185	371	76	43	46	33	82
2012	17	28	243	148	241	50	41	86
2013	65	33	97	411	116	216	64	121
2014	29	57	30	112	142	44	68	94
2015	17	5	55	91	148	116	57	107

(c)

Year/Age	0	1	2	3	4	5	6	7	8+
1992	1	9	13	43	77	20	8	3	11
1993	0	5	33	126	73	39	17	1	23
1994	1	0	15	39	44	32	30	6	12
1995	0	1	22	147	75	55	19	13	12
1996	0	1	35	42	127	26	20	11	7
1997	0	1	19	73	73	149	16	17	21
1998	0	2	10	51	195	96	143	15	23
1999	0	1	16	100	99	179	55	61	28
2000	0	2	28	121	280	70	80	17	26
2001	1	1	63	374	201	234	42	50	73
2002	0	13	29	195	344	79	86	19	61
2003	10	38	57	252	256	186	24	24	37
2004	1	82	22	155	249	195	92	13	26
2005	16	1	26	234	182	170	103	76	55
2006	0	10	78	148	437	124	92	43	57
2007	1	25	66	318	104	279	59	46	69
2008	0	22	26	204	282	57	146	33	81
2009	2	15	36	90	113	56	11	22	38
2010	0	55	211	131	116	71	37	6	55
2011	1	8	226	223	389	90	91	34	49
2012	28	22	85	405	160	278	73	65	117
2013	0	99	78	510	635	122	198	56	89
2014	17	32	51	144	358	339	67	80	50
2015	0	18	62	419	284	348	162	33	75

(d)

Year/Age	0	1	2	3	4+
1996	0	4	44	12	8
1997	0	1	5	10	7
1998	0	1	4	3	2
1999	0	0	17	5	2
2000	0	1	2	1	1
2001	0	1	58	40	8
2002	0	4	22	17	4
2003	0	1	58	14	5
2004	0	0	27	19	4
2005	0	1	12	23	9
2006	1	2	23	15	21
2007	0	2	69	24	24
2008	0	0	13	13	10
2009	0	9	20	4	9
2011	0	0	107	79	3
2012	0	3	19	147	90
2013	0	0	12	25	66
2014	0	1	5	6	54

Table A2. Counts of individual weight measurements by year for the combined IBTS Q1, IBTS Q3, and Scottish West coast Q1 and Q4 surveys.

Year/Age	0	1	2	3	4	5	6	7	8	9	10+
2003	9	39	7	61	32	42	7	4	2	1	1
2004	0	75	11	85	261	231	138	21	22	8	12
2005	2	2	33	169	173	207	163	110	20	24	20
2006	0	9	51	112	408	162	153	105	47	9	22
2007	0	41	39	302	156	402	106	81	54	26	31
2008	0	22	25	225	396	107	211	56	66	22	38
2009	0	25	27	80	207	165	39	103	42	30	48
2010	0	73	220	156	191	186	119	31	54	24	64
2011	1	14	523	867	480	142	140	67	25	44	70
2012	28	42	132	877	424	522	125	108	63	35	116
2013	0	165	133	654	1204	278	429	123	59	48	133
2014	17	62	117	206	509	564	127	172	65	32	136
2015	0	35	67	475	375	495	278	90	100	23	59

Table A3. Counts of maturity measurements by cohort and age for the NS-IBTS and SWC-IBTS, Q1 and Q4 surveys.

Cohort/Age	0	1	2	3	4	5	6	7	8	9	10+
1967	0	0	0	0	0	0	0	0	0	0	1
1968	0	0	0	0	0	0	0	0	0	1	1
1971	0	0	0	0	0	0	1	0	0	0	1
1972	0	0	0	0	0	22	0	0	0	2	0
1973	0	0	0	0	63	0	4	0	9	0	0
1974	0	0	0	3	0	4	0	11	0	0	1
1975	0	0	0	0	5	0	21	1	0	0	0
1976	0	0	0	3	0	23	3	0	0	0	2
1977	0	0	0	0	5	2	0	0	0	0	3
1978	0	0	0	0	17	0	0	0	0	0	3
1979	0	0	1	18	0	0	0	0	0	0	4
1980	0	0	16	0	0	0	0	0	0	0	10
1981	0	1	0	0	0	0	0	0	0	0	10
1982	0	0	0	0	0	0	1	1	1	6	15
1983	0	0	0	0	0	3	3	1	4	12	36
1984	0	0	0	0	3	2	0	5	18	8	13
1985	0	0	1	1	4	1	16	23	14	4	6
1986	0	0	1	10	0	24	17	17	4	8	0
1987	0	0	0	0	38	62	47	12	20	5	6
1988	0	0	1	57	131	114	57	59	5	1	8
1989	0	0	14	79	121	82	63	9	6	7	6
1990	0	4	27	147	176	148	44	10	13	9	9
1991	1	5	83	124	135	59	16	24	6	8	17
1992	2	24	48	163	235	80	108	70	25	15	34
1993	3	5	10	104	29	76	59	20	20	25	23
1994	0	5	35	1	88	111	45	37	49	23	12
1995	2	15	0	18	50	35	33	30	20	7	7
1996	5	0	3	21	19	93	76	27	17	10	13
1997	0	0	1	32	47	68	38	20	12	2	19
1998	0	0	4	26	107	106	118	76	25	8	77
1999	0	3	5	84	72	176	118	76	33	52	66
2000	0	2	9	42	158	131	87	51	69	24	75
2001	0	2	27	95	104	89	68	48	23	23	60
2002	0	1	27	39	109	211	109	86	32	29	75
2003	0	5	10	21	94	62	33	27	17	18	36
2004	0	3	8	79	163	131	86	33	20	24	27
2005	0	8	75	120	133	134	49	44	34	21	12
2006	0	19	6	20	86	51	54	67	45	11	0
2007	0	4	9	35	91	259	226	84	57	0	0
2008	0	15	22	558	197	145	58	57	0	0	0
2009	0	21	207	337	511	217	115	0	0	0	0
2010	0	7	28	120	142	147	0	0	0	0	0
2011	0	16	43	56	91	0	0	0	0	0	0
2012	0	49	62	55	0	0	0	0	0	0	0
2013	0	30	5	0	0	0	0	0	0	0	0
2014	0	15	0	0	0	0	0	0	0	0	0

Appendix B.

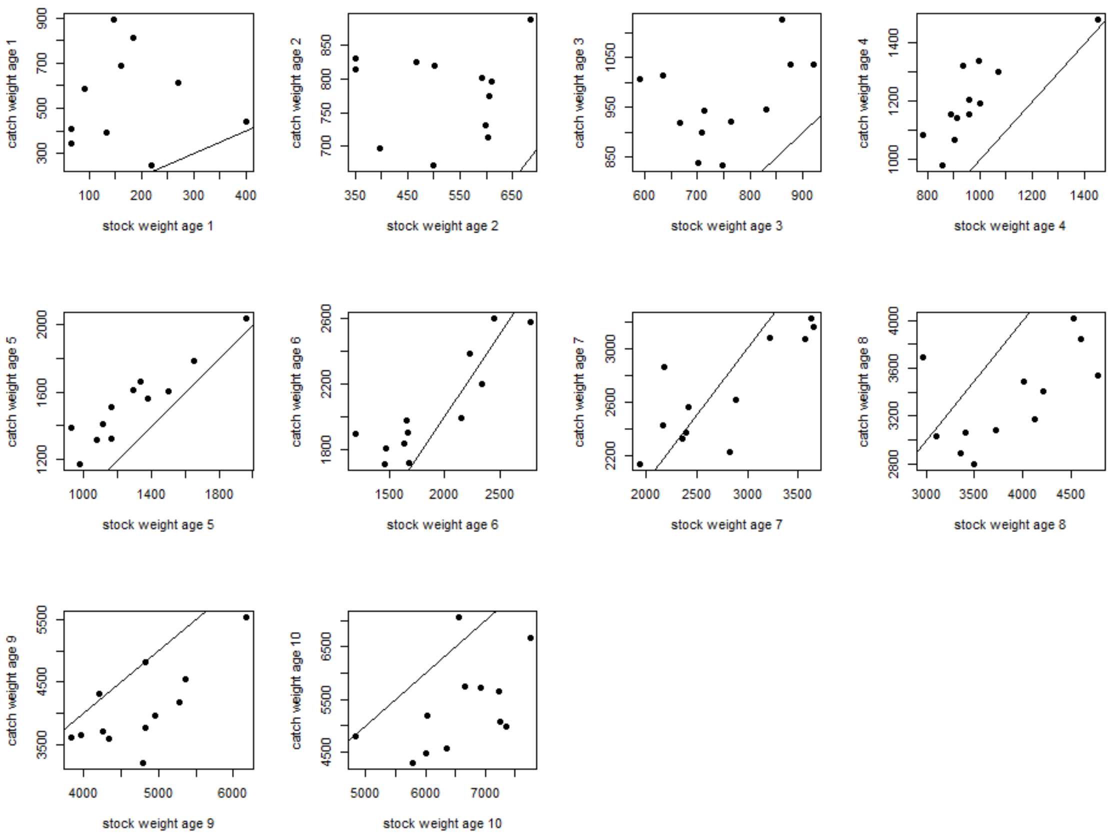


Figure B1. Catch weights versus stock weights for ages 1-10+, 2003-2014.

WD 8: Assessment models: SAM

Jennifer Devine (for now)

A SAM model using the same procedure as last year (SPALY) except that an AR(1) autocorrelation structure (instead of a random walk) and a random walk recruitment model was used as the base model. SAM models have been run as an 'exploratory analysis' alongside the XSA since 2013 (see previous WG reports). Within this model:

- 4 survey indices were used: 3 cpue indices (French, German, Norwegian trawler fleets) and 1 survey index (IBTS Q3)
- stock weights = catch weights = landings weights
- no discards
- Age range: 3–10+
- max age was considered a plus group
- fishing mortalities were a flat F from age 9, AR1 autocorrelation modeled the structure
- catchability parameters were coupled for ages 8-9 (flat) for the cpue (3 fleets) and not coupled for the IBTS Q3 survey
- log N random walk variances were coupled for age 4-10, but different for age 3
- observation variances were coupled within each tuning index (all ages)
- Random walk stock recruitment model was used (because first age in the model was age 3)
- catch data were not scaled to be similar for any years
- Age range for F was ages 3-6

Output of the base model are in Figures 1 – 3. Including an AR correlation structure and BH stock-recruitment model improved the negative log-likelihood from 658.33 to 640.32, while increasing the number of estimated parameters by only one.

Because there were so many revisions to the input data, SAM models were first run to test each of the new data inputs (Table 1). Models were first run to test different aggregation methods for allocating the age compositions in the landings data:

1. Updated 2002-2014 catch data using the aggregation 'by quarter and area'. Stock, catch, and landings weights were the same.
2. Updated 2002-2014 catch data using the aggregation 'by quarter. Stock, catch, and landings weights were the same.
3. Updated 2002-2014 catch data using the aggregation 'by all'. Stock, catch, and landings weights were the same.

All following scenarios were run with the revised 2002-2014 catch data that used the 'by quarter and area' aggregation for allocating age composition; this is referred to as the 'new base assessment model'. New data were trialed one at a time in continuity runs to determine how changes to the data changed perceptions of the stock. Most scenarios are outlined in Table 1. Changes to the input data are detailed in working documents 2, 3, 5, 6, and 7. Final model runs included changing the age range for the average F from 3-6 to 4-7 and exploring various model configurations to determine the most appropriate settings (e.g., coupling of variances).

Table 1. Table of the different scenarios, including the modifications to the input data. Data were run on ages 1-10+ and ages 3-10+. For models using ages 1-2, catch numbers were set to NA prior to 2002.

Scenario		Modified input data						
Base		Ages 3-10+						
1	catch: by Q&A	Ages 3-10+						
2	catch: by Q	Ages 3-10+						
3	catch: unstratified	Ages 3-10+						
4	catch: by Q&A	Ages 1-10+						
5	catch: by Q&A	Stock weights						
6	catch: by Q&A	Maturity-varying						
7	catch: by Q&A	Maturity-constant						
8	catch: by Q&A	Discards						
9	catch: by Q&A	GAM Q3 indices						
10	catch: by Q&A	GAM Q1 indices (incl. 60-min tows)						
11	catch: by Q&A	GAM Q1 indices (excl. 60-min tows)						
12	catch: by Q&A	Standardized cpue						
13	catch: by Q&A	M of 0.26						
14	catch: by Q&A	Stock weights	Maturity-varying					
15	catch: by Q&A	Stock weights	Maturity-constant					
16	catch: by Q&A	Maturity-constant	Discards					
17	catch: by Q&A	Stock weights	Discards					
18	catch: by Q&A	Stock weights	Maturity-constant	Discards				
19	catch: by Q&A	Maturity-constant	Stock weights	Discards	GAM Q3 indices (3-10)			
20	catch: by Q&A	Maturity-varying	Stock weights	Discards	GAM Q3 indices (3-10)			
21	catch: by Q&A	Standardized cpue	Maturity-varying	Stock weights	Discards	GAM Q3 indices (3-10)		
22	catch: by Q&A	Standardized cpue incl. std error of estimates		Maturity -varying	Stock weights	Discards	GAM Q3 indices (3-10)	
23	catch: by Q&A	New constant maturity ogive (final ogive)						
24	catch: by Q&A	Stock weights	Maturity (final)	Discards	GAM Q1 indices (5-8)			
25	catch: by Q&A	Stock weights	Maturity (final)	Discards	GAM Q3 indices (3-8)			
26	catch: by Q&A	Standardized cpue	Stock weights	Discards	Maturity (final)			
27	catch: by Q&A	Standardized cpue	Stock weights	Discards	Maturity (final)	GAM Q3 indices (3-8)	GAM Q1 indices (5-8)	
28	catch: by Q&A	3 cpue indices	Stock weights	Discards	Maturity (final)	GAM Q3 indices (3-8)	GAM Q1 indices (5-8)	
29	catch: by Q&A	Standardized cpue	Stock weights	Discards	Maturity (final)	GAM Q3 indices (3-8)	GAM Q1 indices (5-8)	Survey autocorrelation

Results

Effect of different aggregations for allocating the age samples on SSB, $F_{3\text{-}6}$, and recruitment

The SSB, recruitment, and $F_{3\text{-}6}$ of each of these scenarios is plotted against the base model (Figure 4). The updated catch information, regardless of the method used to aggregate the age samples, had a large effect on SSB estimates after 2000; SSB was as much as 60,000 t higher than previous estimates of SSB. Around 2009, the differences between the base model and the new data were not as great. Average fishing mortality rates for ages 3-6 were lower in the 2002-2008 period for all aggregation methods when compared to the base model; mortality estimates were similar (all scenarios) from 2009. No large changes in recruitment were observed between the 3 scenarios and the base model.

How the sampled data were allocated within InterCatch did not show huge differences in estimated SSB; the largest differences was how the data was treated prior InterCatch (i.e., in the period before InterCatch existed). This is rather worrying; there are no records of the method used by the previous stock coordinators, so it is unclear why the difference is so large. Currently, age 10 is treated as a plus group; if this was not treated as a plus group previously, this may partially explain the differences in catch weights for the plus group (Figure 5). Another reason may be the way sampled catches were allocated to unsampled catch, e.g., if catches were allocated samples based on métiers, not broadly allocated by quarter and area. The base model data appeared to have smoothed out large year-to-year variations; this was clearly seen in ages 7 to 9, during the period 2000-2005 (Figure 5).

The aggregation ‘by all’, where all sampled catch was used to allocate to all unsampled catch, had the largest (most positive) effect on SSB (Figure 4). The ‘by quarter and area’ method had the least effect, although it was still large when compared to the base model. The ‘by quarter and area’ aggregation is the method used in all modeling scenarios in the next sections.

Figure 6 shows the results of including ages 1-10+ in the assessment model. Adding the age groups 1-2 added very little information; the assessment was not that different from the model using only ages 3-10+.

Newly estimated stock weights from survey data

Adding in stock weights, as estimated from the North Sea IBTS Q1 and Q3, and the Scottish West Coast Q1 and Q4 surveys had a small effect on SSB (Figure 7). Estimates of SSB for the model including new stock weights showed a sharp decrease in 2004/2005 and a large increase in 2008 compared to the model using catch weights as stock weights. Stock weights in 2004 show a sharp decline that was not apparent in the catch weights-at-age, while in 2008, stock weights were high when catch weights sharply declined, especially in the older ages (Figure 8). Stock weights-at-age were generally smaller than catch weights for the younger ages, but the general pattern after 2003 (steady then slight increase from 2008) was similar between the two data sets. The large declines in catch weights for the older ages (8-10+) was not seen in the stock weights. Stock weights were poorly estimated for the age 9 and 10+ group in 2009; this is the year Norway did not take part in the IBTS Q3 survey. Norway’s part of the survey covers the bulk of the saithe distribution area in the North Sea (not west of Shetland) and their lack of participation could have had an effect on estimates.

Maturity ogives

Not surprisingly, new maturity ogives had a large effect on SSB estimates, increasing biomass between 24 000 – 142 000 t (Figure 9). The ogives were quite different than those used in the base model, predicting maturation at a younger age than the previous ogive; for example, new estimates showed that age 3 were maturing, whereas the previous ogive had all age 3 fish as immature. The varying maturity ogive had the greatest effect on SSB.

The Benchmark group decided to go with a static maturity ogive, which was a revision of the newly estimated static ogive based on expert knowledge (called ‘final ogive’ in Table 1, Figure 10). See WD 7 for details.

Natural mortality of 0.26

This model (not shown) resulted in extremely high SSB estimates in the final year.

Discards

Figure 11 shows the effect of including discards. Including the discards simply scales SSB, recruitment, and $F_{3\text{-}6}$ up. Note: because of the bug in InterCatch requiring a re-raising of discards, this figure is now outdated.

Survey indices

Figure 12 shows the effect of the new Q3 index (not spatial truncated) and using the Q1 index compared to the base model; including the survey indices resulted in less SSB until the last two years of the time series. Both the Q1 and Q3 indices show a large increase in these two years. Discussion regarding whether to include the variation of the survey indices concluded that because the CVs do not vary greatly with time within an age class (see WD 3), it should not have a large effect. This was therefore not done.

CPUE scaled to fishable biomass index

The combined cpue index, where cpue is scaled to exploitable stock biomass was compared to the base model (Figure 13); the three cpue indices for Germany, France, and Norway were removed. The effect of this new index is to decrease SSB and increase F.

Additional combinations

The model incorporating all new sources of data had coupled F for all ages. Parameterizing the model to estimate age 3 differently from other ages did not significantly improve fit of model (p=0.12). Including the standard errors of the new ‘cpue’ index (plus an additional parameter) did not differ greatly from incorporating all new sources of data, most likely because there was little variation in the standard errors (see WD 2). Additional couplings were trialed.

Effect on SSB, F_{3-6}, and recruitment for scenarios that combine multiple new data inputs are included in the Appendix A.

TSB

Plots of TSB for all scenarios are included in Appendix A.

Discussion

Change in catchability of age 3 has captured some of the dynamics in the fishery. In the 1980s, the Norwegian trawler fleet used mesh sizes around 90 mm, while the German and French fleet used mainly 85-90 mm mesh. Some areas of the North Sea had large amounts of smaller saithe. Factory trawlers also operated west of Shetland. In 2002, the 110 mm mesh size agreement occurred; Norway was using 120 mm at this time.

Additional plots requested by the external reviewers were (1) predicted abundance by age vs. survey index by age, (2) predicted recruitment at age vs. survey index, and (3) exploitation vs. survey indices by age (Appendix B). The first two types of plots were to verify strong correlations existed between the predicted abundance and survey information for a given age. In the Q3 surveys, if a big year class was appearing in the predicted abundance, the survey underrepresented the strength of it until age 5. In addition, younger ages were not well represented or modeled well. It was recommended to explore different variance couplings in the model and to trim ages 1, 2, 9, and 10 from the indices. For the Q1 survey, the correlation was weak for age 3, but this was expected since age 3 fish would be the very early migrators in this survey. Ages 4 to 8 were thought to look decent. Catchability over time was not constant in the surveys. The residuals showed a time trend in the Q1 survey (all ages) and in the Q3 survey for the older ages; the Q1 survey had a large effect because of the time trend. The exploitation plots did not have a strong 1:1 relationship, but there was some general agreement that the survey tracks with the modeled exploitation. The expectation was that as the survey index declines, exploitation should decline. The relationship was stronger for the Q3 survey and the model may place more weight on this index.

The selectivity of the last age class in the fishery was modified to allow more flexibility and dome-shaped selectivity.

Final candidate models

Four model scenarios were discussed as being the best candidate models. All candidate models used the updated catch information, discards, the final maturity ogives, constant M of 0.2, stock weights. The additional inputs to the 4 models were:

1. 3 cpue indices, GAM Q1 indices (ages 5-8), GAM Q3 indices (ages 3-8);
2. standardized cpue;
3. standardized cpue, GAM Q1 indices (ages 5-8), GAM Q3 indices (ages 3-8);
4. standardized cpue, GAM Q1 indices (ages 5-8), GAM Q3 indices (ages 3-8); accounting for autocorrelation structure in the survey indices following the method of Berg and Nielsen (2016).

The final year estimates for SSB, F_{4-7}, and recruitment are in Table 2. Historic stock trends are in Figure 14, retro patterns for SSB and F are in Figures 15 and 16, and residual patterns are in Figure 17. Model (3) gave a lot of weight to the survey indices, which, because they showed patterns, indicated they were not reliable. A major assumption of the model is independence between age classes in the survey; this assumption was likely incorrect. Model (1) is dominated by the 3 cpue indices, which, due to the lack of a retrospective pattern, appeared to be internally consistent. However, the cpue indices use the same age information at the catch-at-age matrix (re-use same information twice); the fisheries information may receive more weight than the survey information in the model.

The model approved by the benchmark reviewers was option 4: standardized cpue, GAM Q1 and Q3 indices, and accounting for the survey autocorrelation structure (between ages within years). The final model configuration is in Table 3.

Appendix C contains all the runs completed after WGNSSK 2016. The benchmark model was thrown out by the assessment working group. In addition, an error in InterCatch resulted in 5 years of discards needing to be re-raised. At this time, the way Norwegian discards were raised was also changed (see WD 5 for details).

References

Berg, CW; Nielsen, A; Kristensen, K. 2014. Evaluation of alternative age-based methods for estimating relative abundance from survey data in relation to assessment models. Fisheries Research 151: 91-99.

Berg, C.W. and A. Nielsen. 2016. Accounting for correlated observations in an age-based state-space assessment model. ICES J Mar Sci. *doi: 10.1093/icesjms/fsw046.*

Table 2. Final year estimates for SSB, F_{4-7}, and recruitment for the four final candidate models.

	Scenario	SSB	F_{4-7}	Recruitment ('000)
1	3 cpue indices, GAM Q1, GAM Q3	281813	0.282	68597
2	Standardized cpue	186435	0.404	46985
3	Standardized cpue, GAM Q1, GAM Q3	357542	0.171	101990
4	Standardized cpue, GAM Q1, GAM Q3, autocorrelation structure	289819	0.219	62545

Table 3. Final model configuration.

Min Age: 3
Max Age: 10
Max Age considered a plus group (Yes)
The following matrix describes the coupling of fishing mortality STATES, where rows represent fleets and columns represent ages:

1	2	3	4	5	6	7	7
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Use correlated random walks for the fishing mortalities: AR1
Coupling of catchability PARAMETERS

0	0	0	0	0	0	0	0
1	2	3	4	5	6	0	0
0	0	7	8	9	10	0	0

Coupling of power law model EXPONENTS (if used)

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Coupling of fishing mortality RW VARIANCES

1	2	3	4	4	4	4	4
0	0	0	0	0	0	0	0

Coupling of log N RW VARIANCES

1	2	3	4	4	4	4	4

Coupling of OBSERVATION VARIANCES

1	1	1	1	1	1	1	1
2	2	2	2	2	2	0	0
0	0	3	3	3	3	0	0

Stock recruitment model code (random walk)
Years in which catch data are to be scaled by an estimated parameter
0
Fbar range: 4 to 7
Observation correlation coupling (0 = uncorrelated). Rows represent fleets, columns represent adjacent age groups, i.e. the first column is the correlation between the first and 2nd age group. An NA in all non-empty age groups for a fleet specifies unstructured correlation. NA's and positive numbers cannot be mixed within fleets.

0	0	0	0	0	0	0
NA	NA	NA	NA	NA	0	0
0	0	NA	NA	NA	0	0

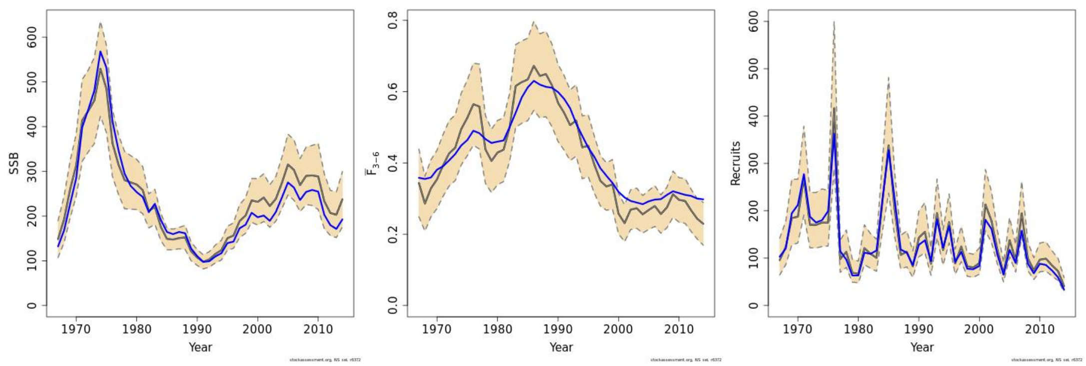


Figure 1. Plots of SSB, average F of ages 3-6, and recruitment for the base North Sea model. Black line and tan shading are the current model (with the AR(1) autocorrelation structure for fishing mortalities and Beverton-Holt recruitment model) and the blue line is the output from the 2015 assessment, using the random walk autocorrelation structure and recruitment model.

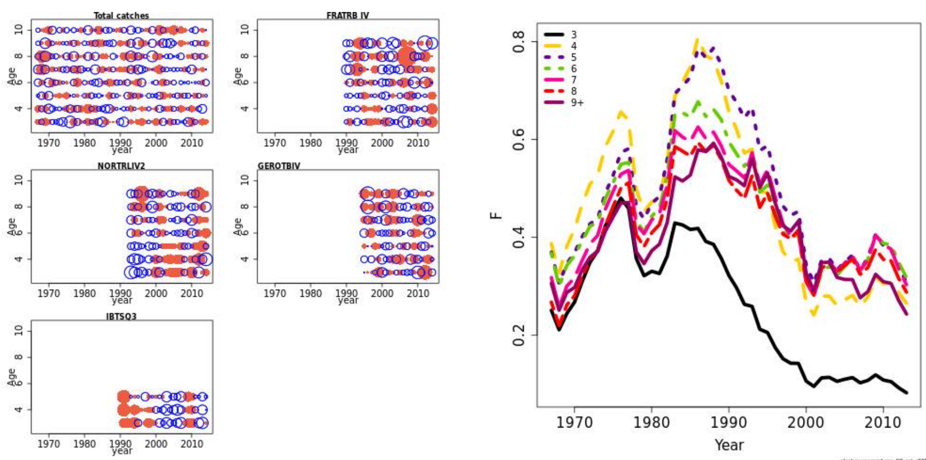


Figure 2. Residuals and fishing mortality at age estimated for the base model.

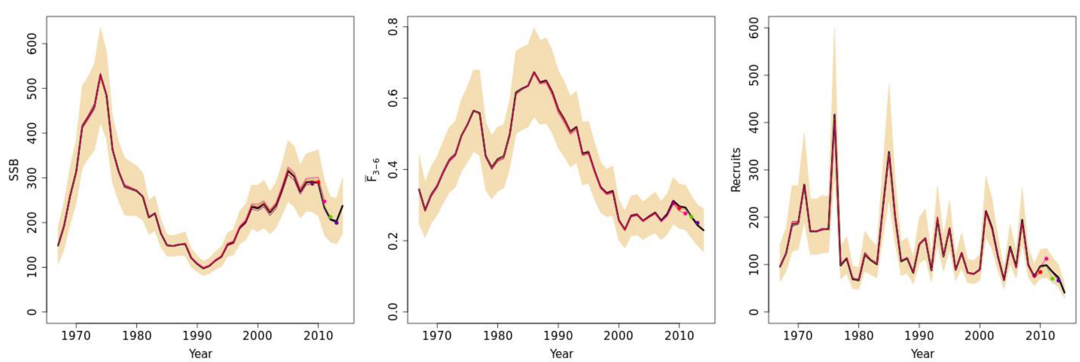


Figure 3. Retrospective estimates (5 years) for the base model.

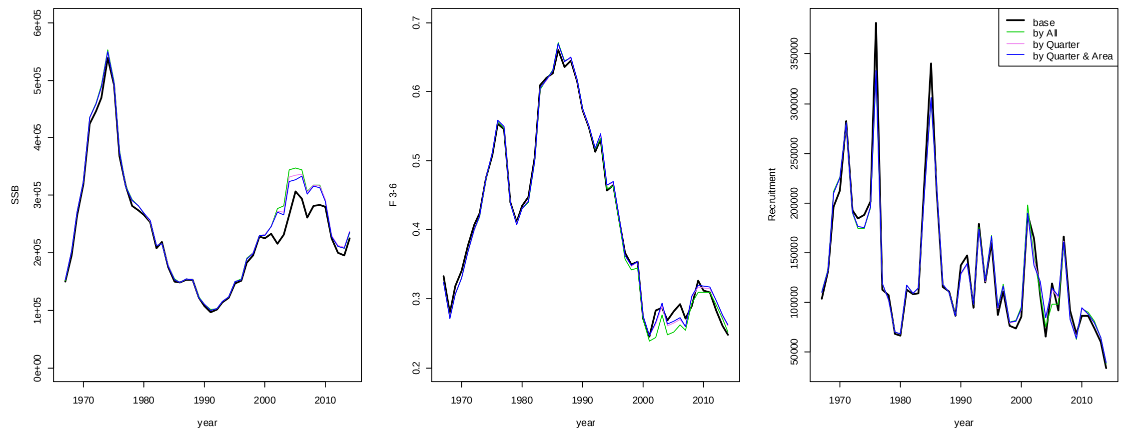


Figure 4. Plots of SSB, average F of ages 3-6, and recruitment. Comparing model scenarios 1-3, effect of aggregating sampled information within InterCatch (by quarter and area, by quarter, and by all), with the 2015 assessment output (base, black lines).

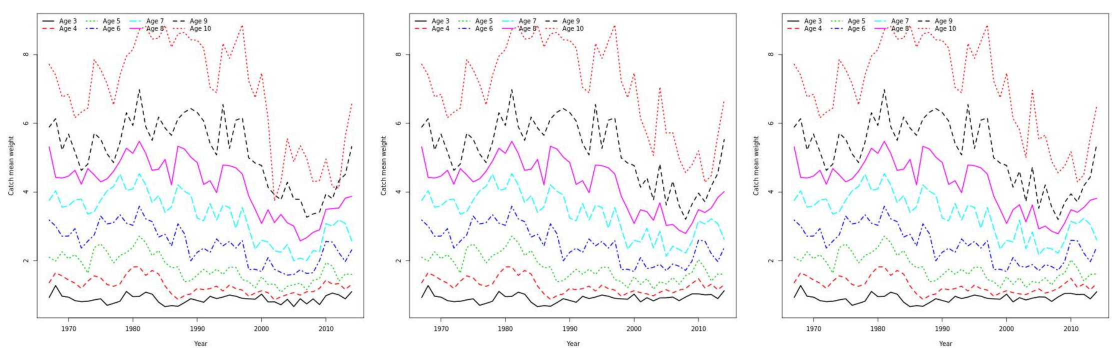


Figure 5. Plots of catch weights-at-age for the base model (left) and the update catch information, using the 'by quarter and area' aggregation (middle) and by quarter aggregation (right).

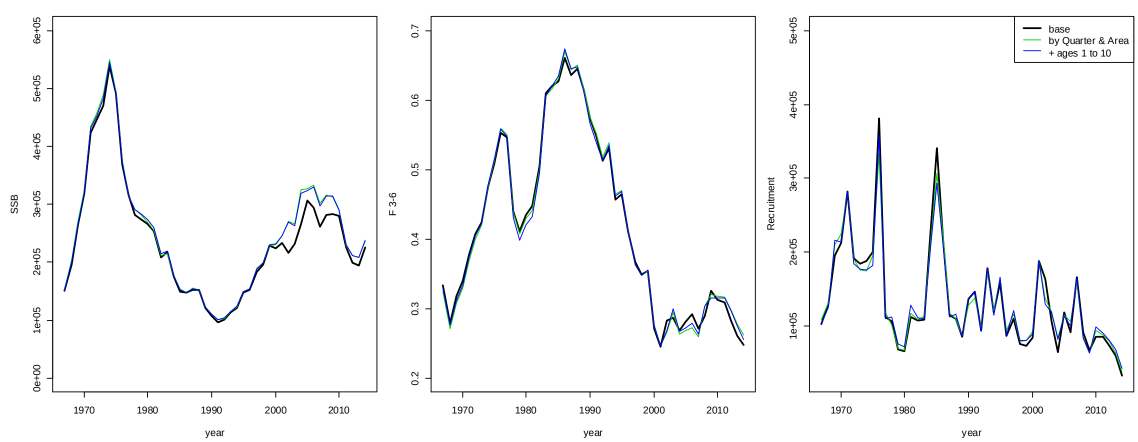


Figure 6. Plots of SSB, average F of ages 3-6, and recruitment. Comparing 2015 assessment output (base, black lines), model with new catch data (by quarter and area aggregation), and model using ages 1-10+.

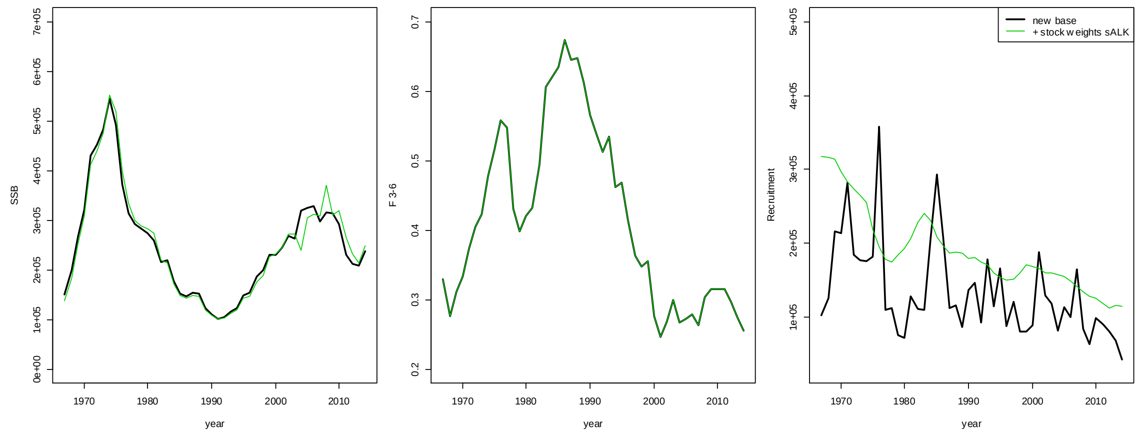


Figure 7. Plots of SSB, average F of ages 3-6, and recruitment. Comparing base assessment output (black lines, ages 1-10) to the model with new stock weights, estimated with the smoothed ALK. Stock weights do not have a smoother applied to the series.

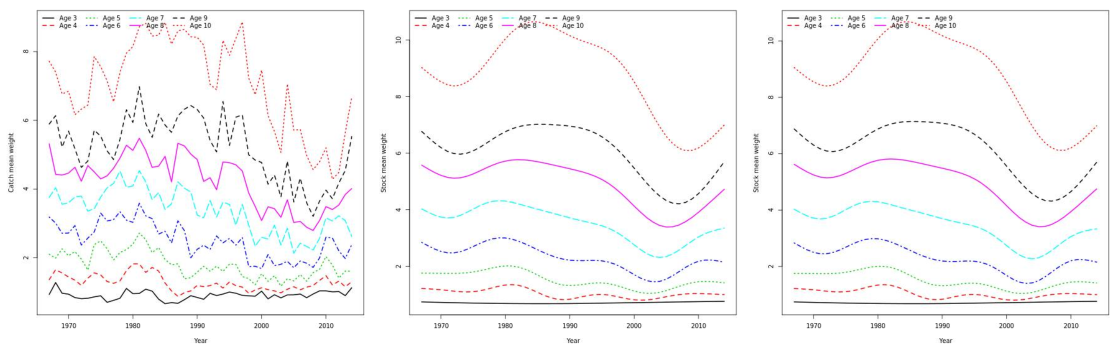


Figure 8. (left) Catch weights-at-age and (right) stock weights-at-age: stock weights are estimated with a raw ALK (middle) and smoothed (ALK) and then smoothed inside the SAM model.

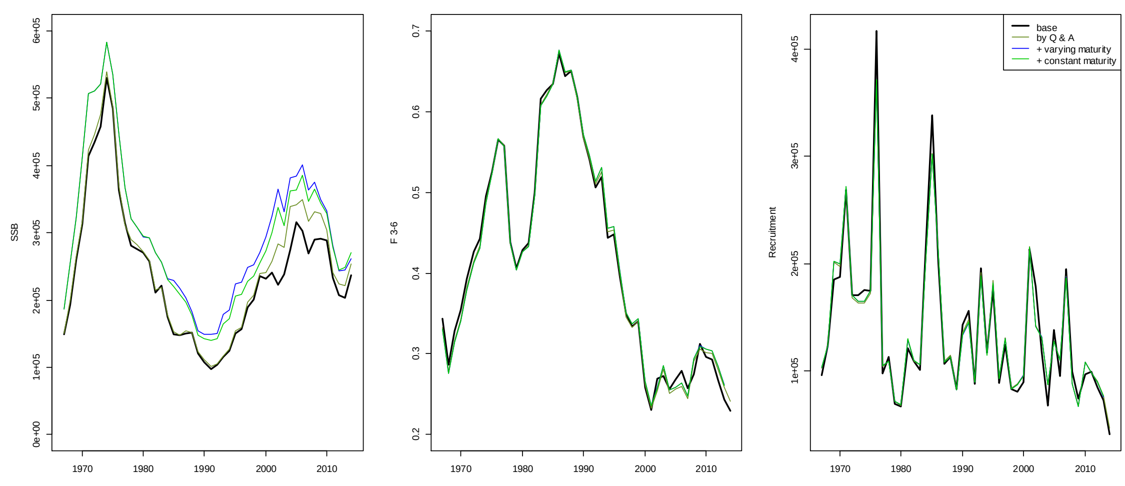


Figure 9. Plots of SSB, average F of ages 3-6, and recruitment. Comparing 2015 base assessment model output (black lines) with different maturity ogive estimations.

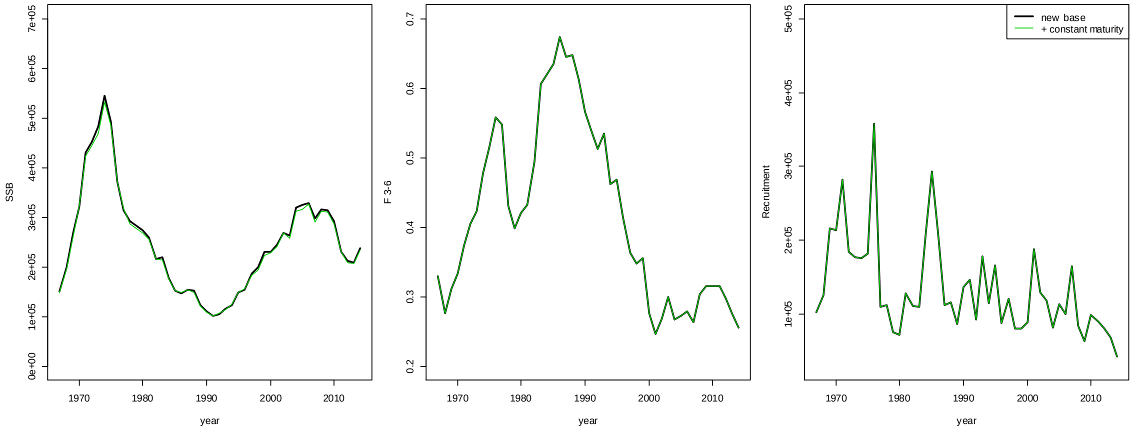


Figure 10. Plots of SSB, average F of ages 3-6, and recruitment. Comparing new base assessment output (black lines, ages 1-10, catch by Q&A) model with the new constant maturity ogive (final ogive).

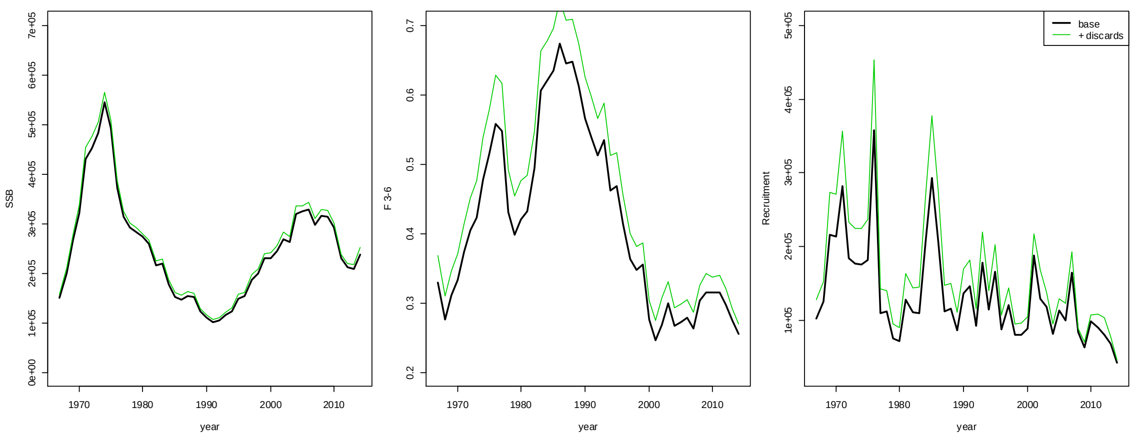


Figure 11. Plots of SSB, average F of ages 3-6, and recruitment. Comparing NEW base assessment output (black lines) to model with the discards.

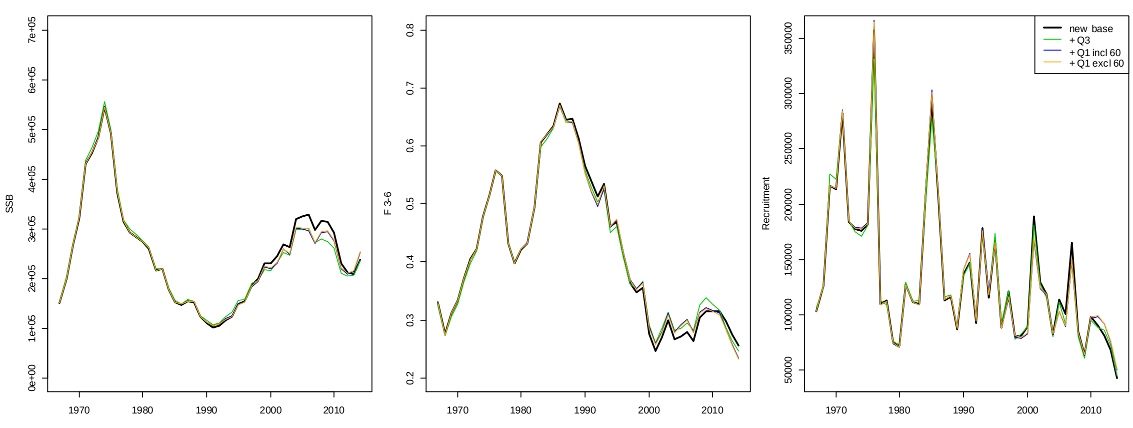


Figure 12. Plots of SSB, average F (3-6), and recruitment. Comparing base assessment (black line) to models with modified catch data (by quarter and area aggregation), IBTS Q3 index (ages 1-10+), IBTS Q1 index (ages 1-10+) including and excluding Scottish 60-min tows.

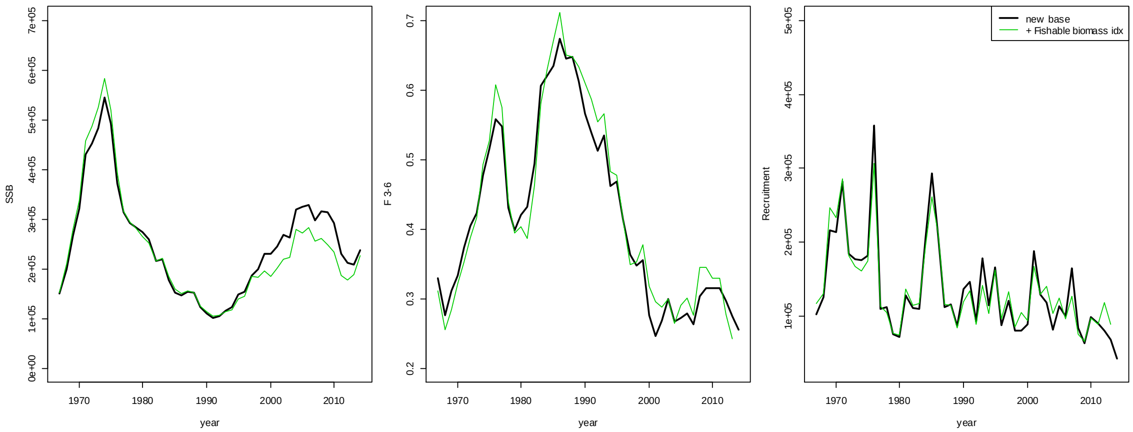
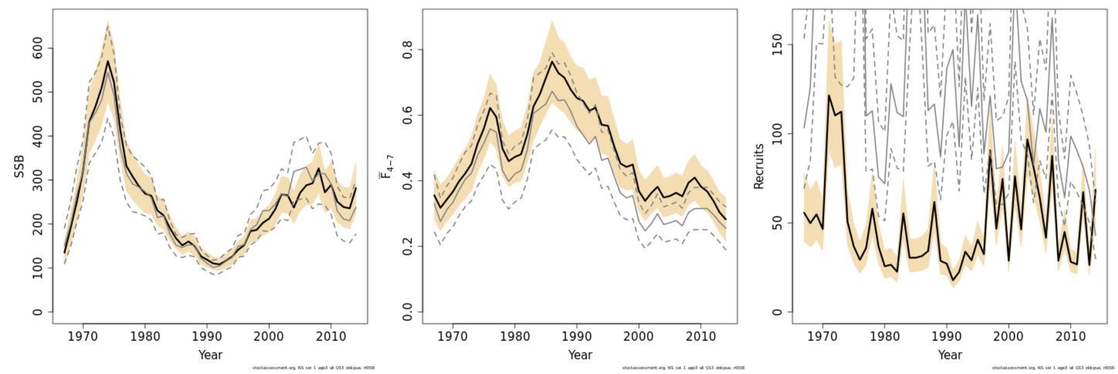
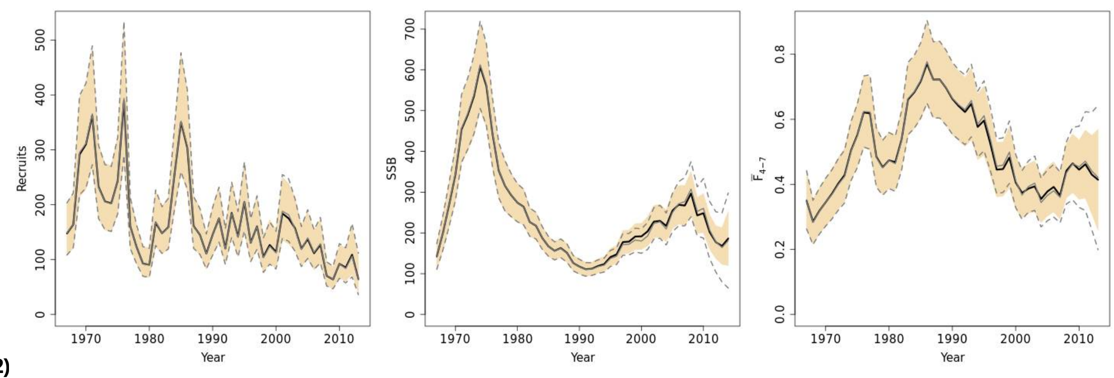


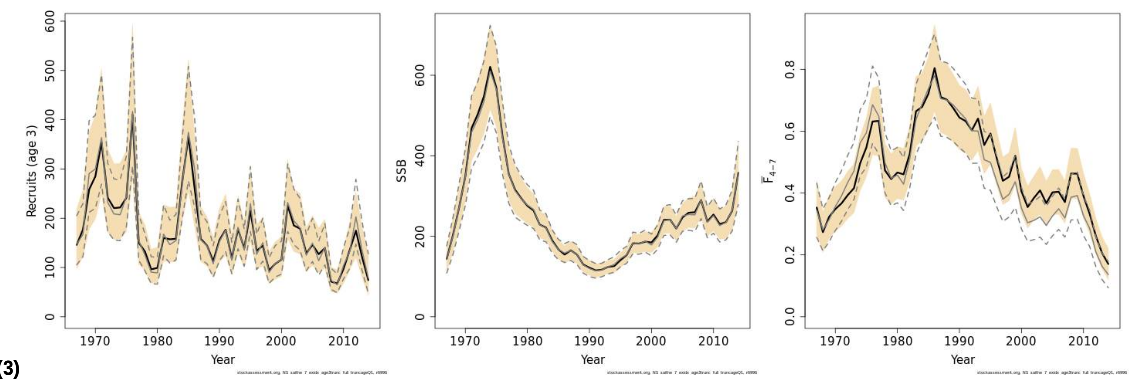
Figure 13. Plots of SSB, average F (3-6), and recruitment. Comparing new base assessment (black line) to model the new fishable biomass index.



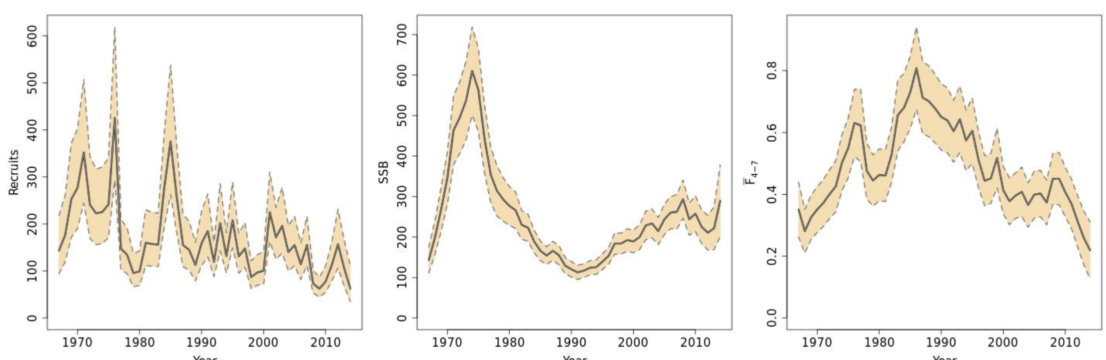
(1)



(2)



(3)



(4)

Figure 14. Plots of SSB, average F (4-7), and recruitment for models: (1) 3 cpue indices, GAM Q1, GAM Q3, (2) standardized cpue, (3) standardized cpue, GAM Q1, GAM Q3, and (4) standardized cpue, GAM Q1, GAM Q3, autocorrelation structure. Grey lines (solid and dashed) were previous base model (model unknown at this stage).

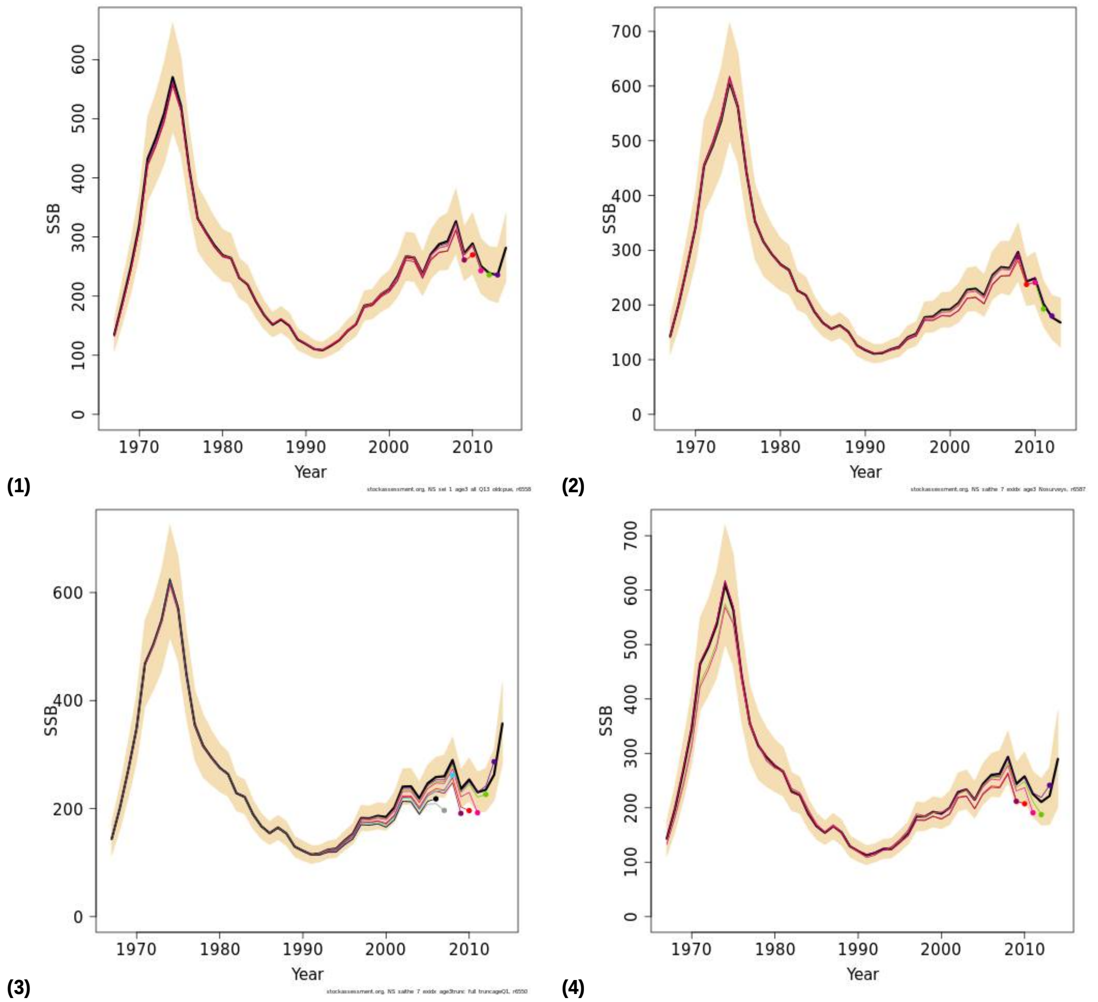


Figure 15. Retrospective pattern in SSB for models: (1) 3 cpue indices, GAM Q1, GAM Q3, (2) standardized cpue, (3) standardized cpue, GAM Q1, GAM Q3, and (4) standardized cpue, GAM Q1, GAM Q3, autocorrelation structure.

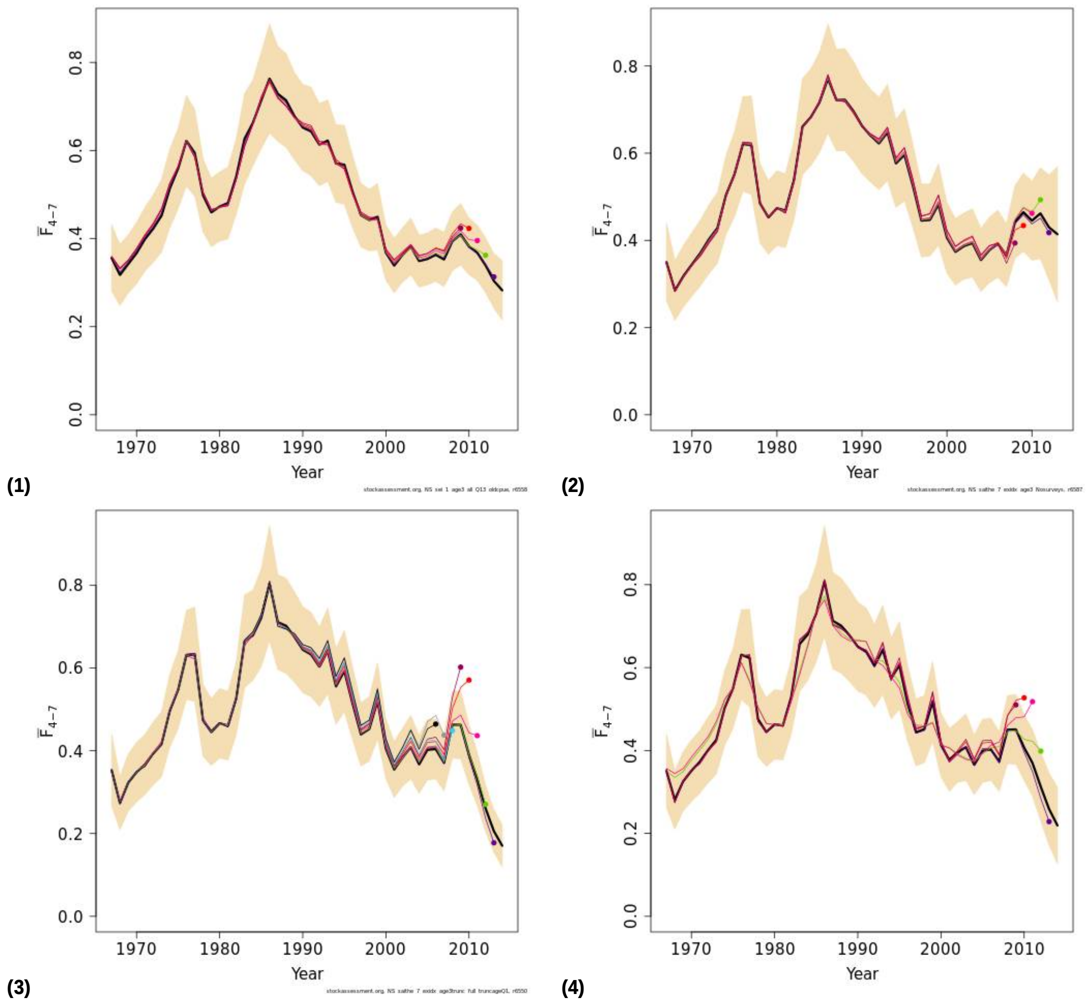


Figure 16. Retrospective pattern in F for models: (1) 3 cpue indices, GAM Q1, GAM Q3, (2) standardized cpue, (3) standardized cpue, GAM Q1, GAM Q3, and (4) standardized cpue, GAM Q1, GAM Q3, autocorrelation structure.

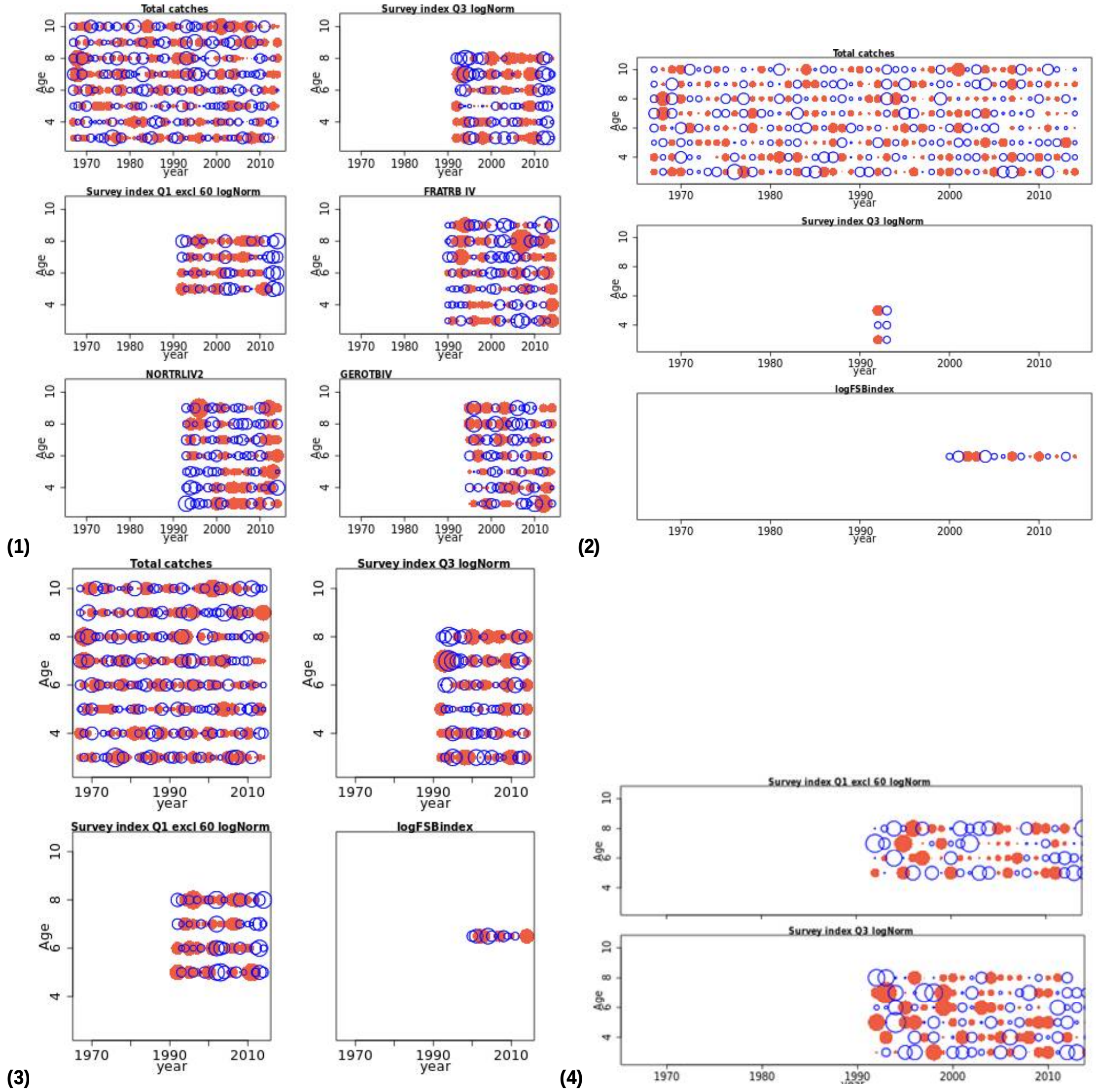


Figure 17. Residual patterns for models: (1) 3 cpue indices, GAM Q1, GAM Q3, (2) standardized cpue, (3) standardized cpue, GAM Q1, GAM Q3, and (4) standardized cpue, GAM Q1, GAM Q3, autocorrelation structure. Final model shows residuals for the two survey indices only.

Appendix A

Effect of update landings information (by quarter and area aggregations), stock weights, and new maturity ogives.

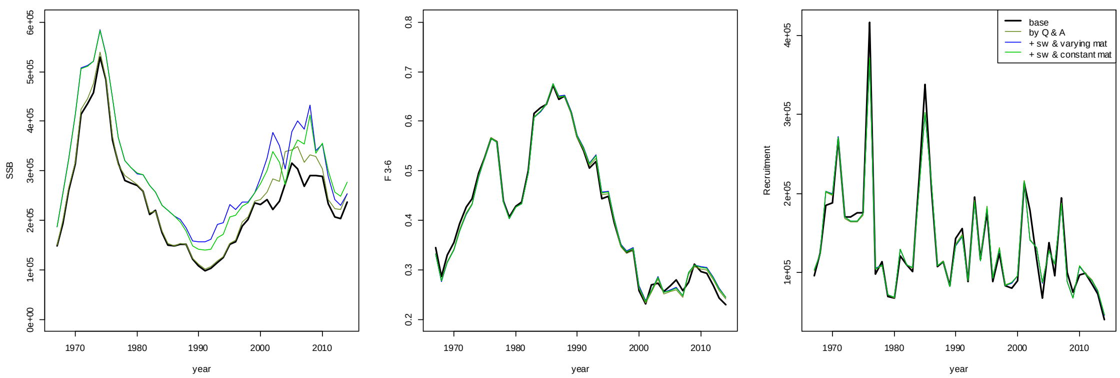
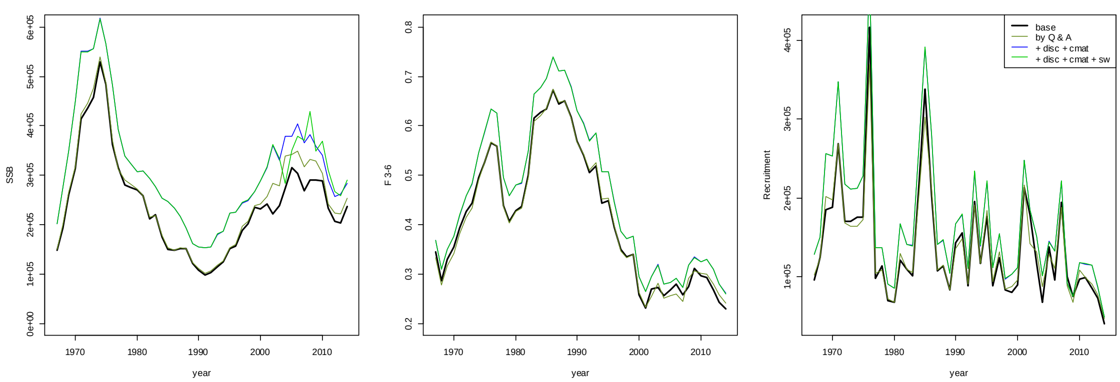


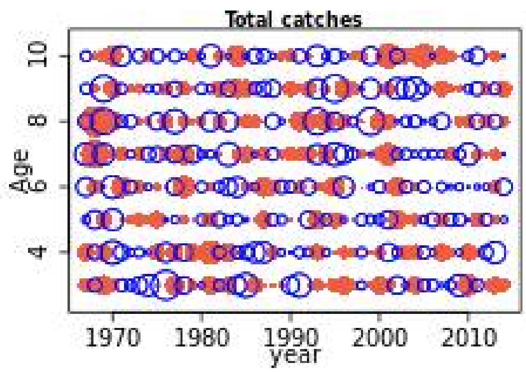
Figure 1B. Plots of SSB, average F of ages 3-6, and recruitment. Comparing base assessment output (black lines) to models with the modified catch data (by quarter and area aggregation), and stock weights-at-age (sw) + new maturity ogives (*varying* with time or *constant* over time), estimated from survey data.

Effect of update landings information (by quarter and area aggregations), discards, new constant maturity ogive, and stock weights.

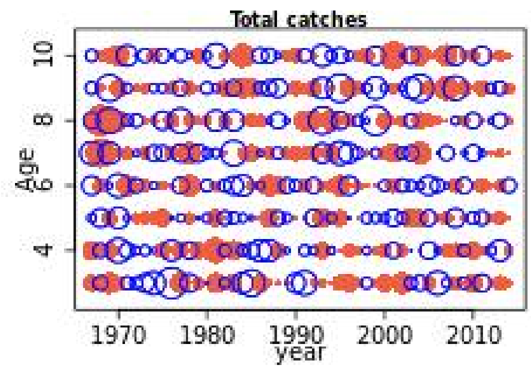


Figures 2B. Plots of SSB, average F of ages 3-6, and recruitment. Comparing base assessment output (black lines) to models with the modified catch data (by quarter and area aggregation), discards + constant maturity ogive (cmat), and discards + constant maturity ogive + stock weights-at-age (sw).

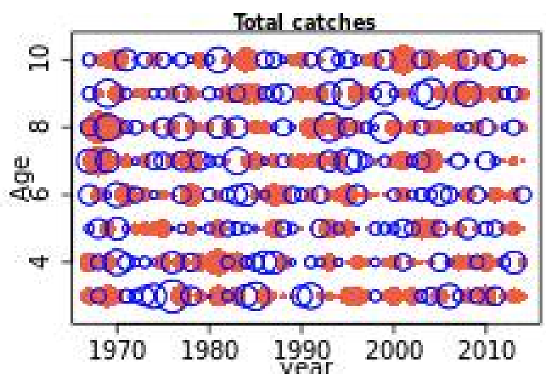
Residual plots of the catch



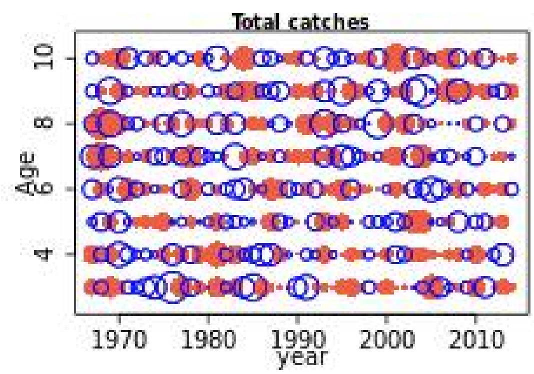
Base model. No discards.



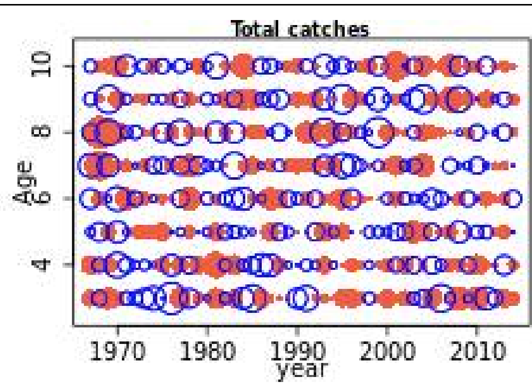
Catch 2002-2014 modified (by Quarter and area aggregation)



Catch 2002-2014 modified (by Quarter aggregation)



Catch 2002-2014 modified (unstratified aggregation)



Catch (by Q&A) + discards

Plots of TSB for each of the scenarios

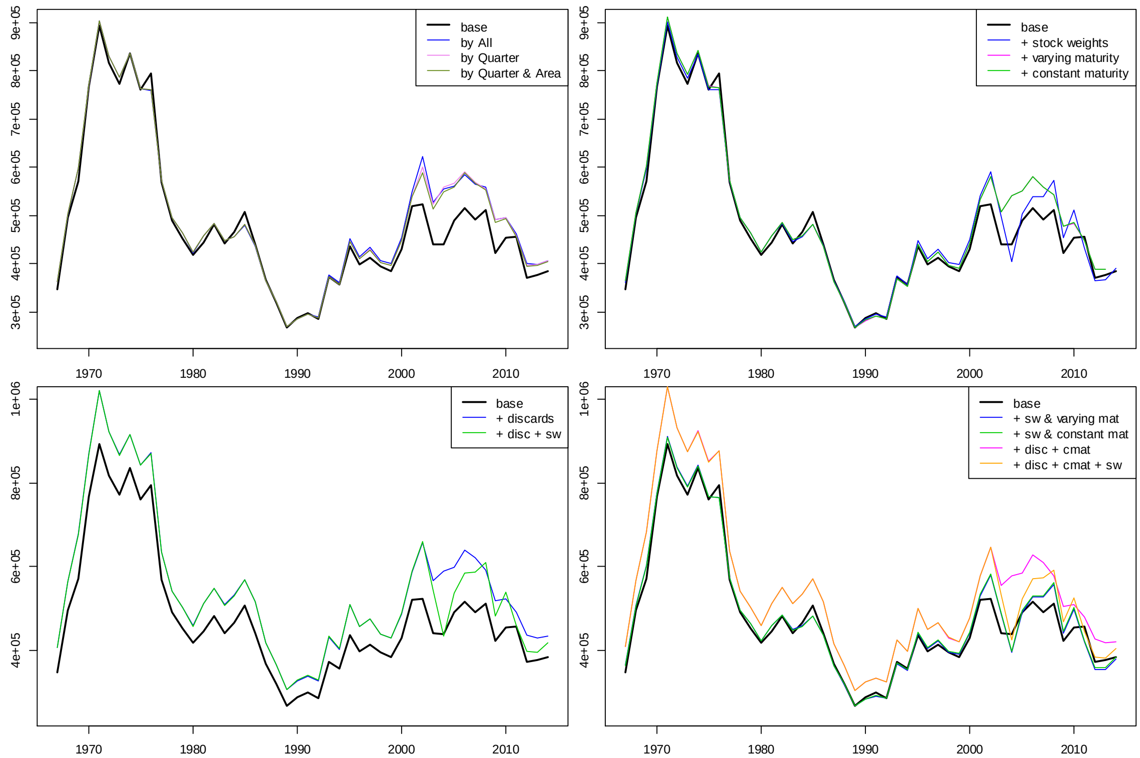


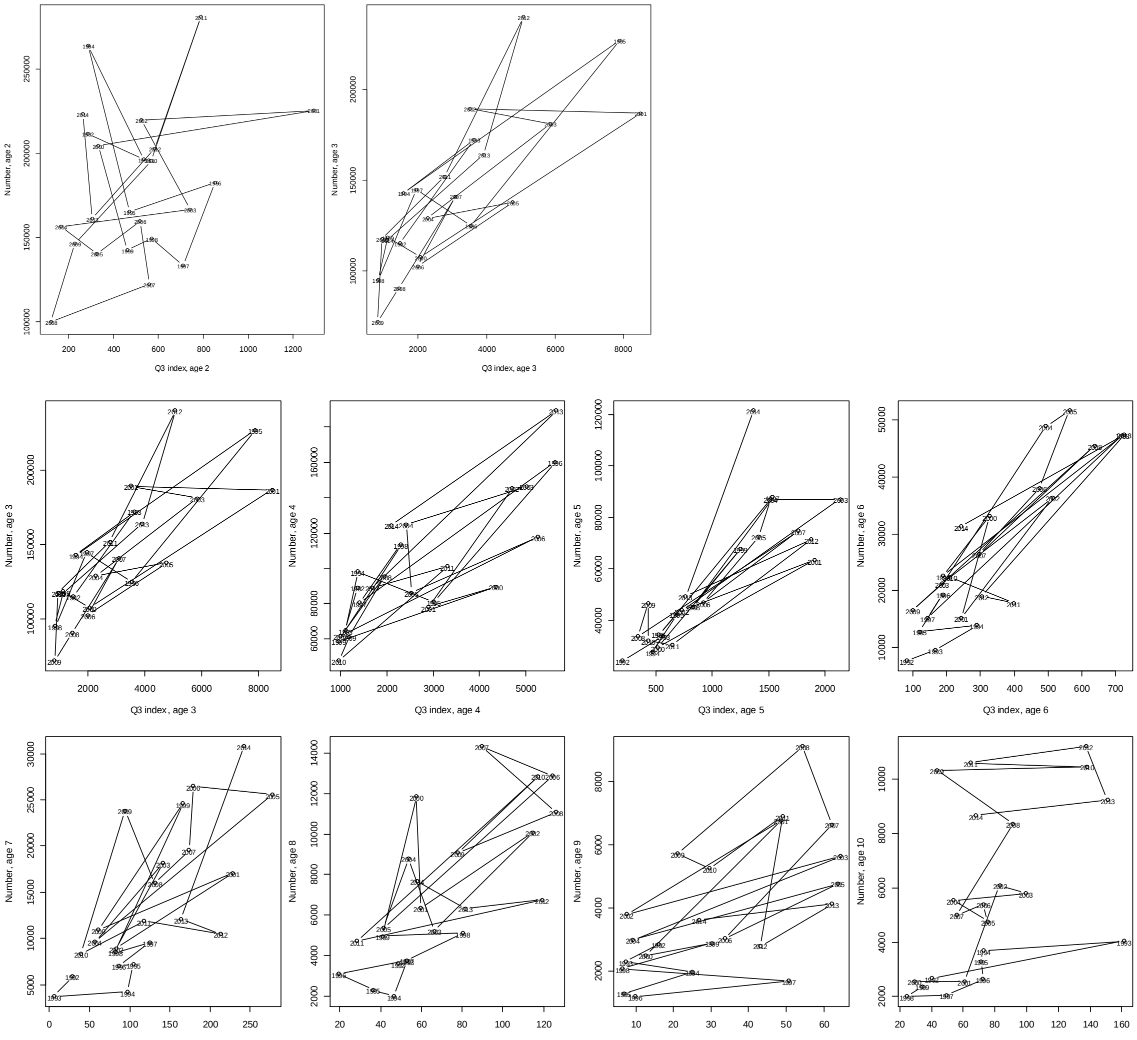
Figure 3B. Plots of predicted TSB compared to the base assessment model.

Appendix B

Requested plots of (1) predicted abundance by age vs. survey index by age, (2) predicted recruitment at age vs. survey index, and (3) exploitation vs. survey indices by age for the model using the standardized cpue index, new GAM Q1 and Q3 indices, updated catch information, discards, stock weights, and new maturity ogive.

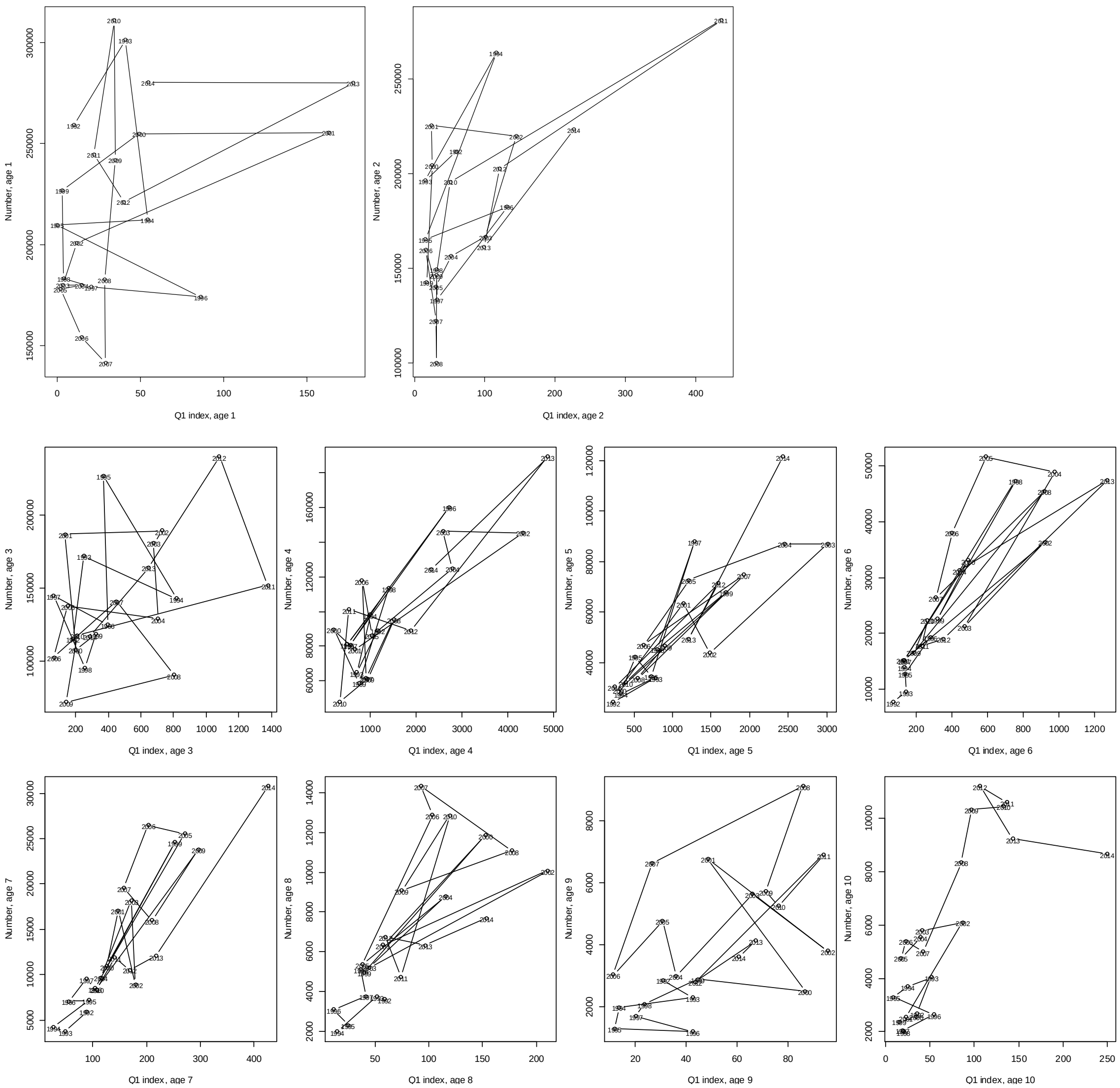
Predicted abundance by age vs. survey index by age

IBTS Q3

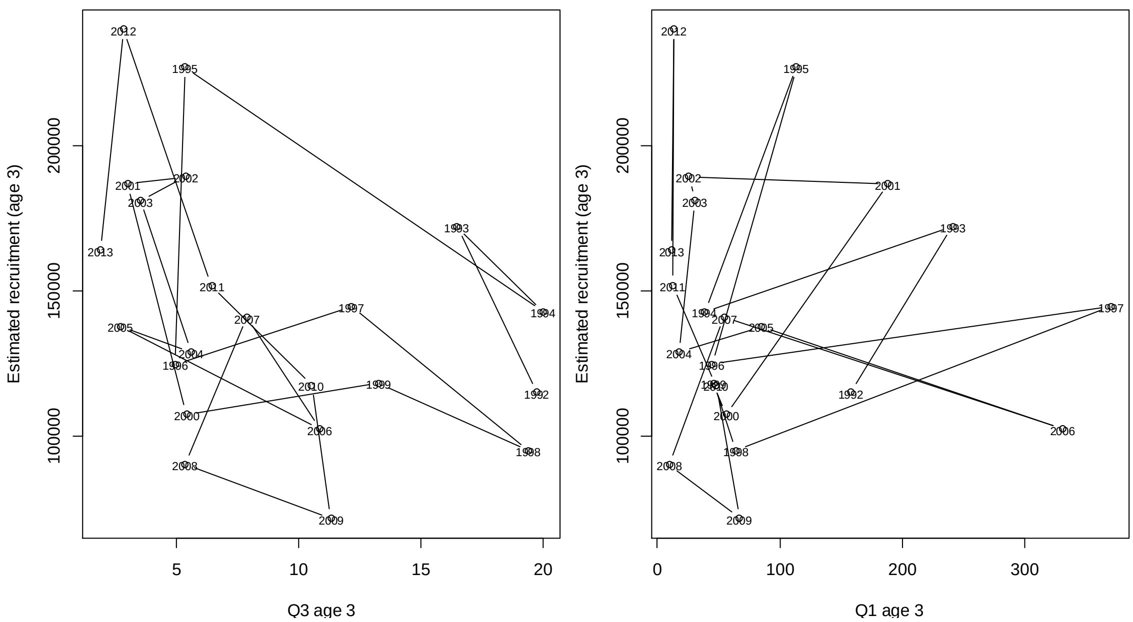


Predicted abundance by age vs. survey index by age

IBTS Q1

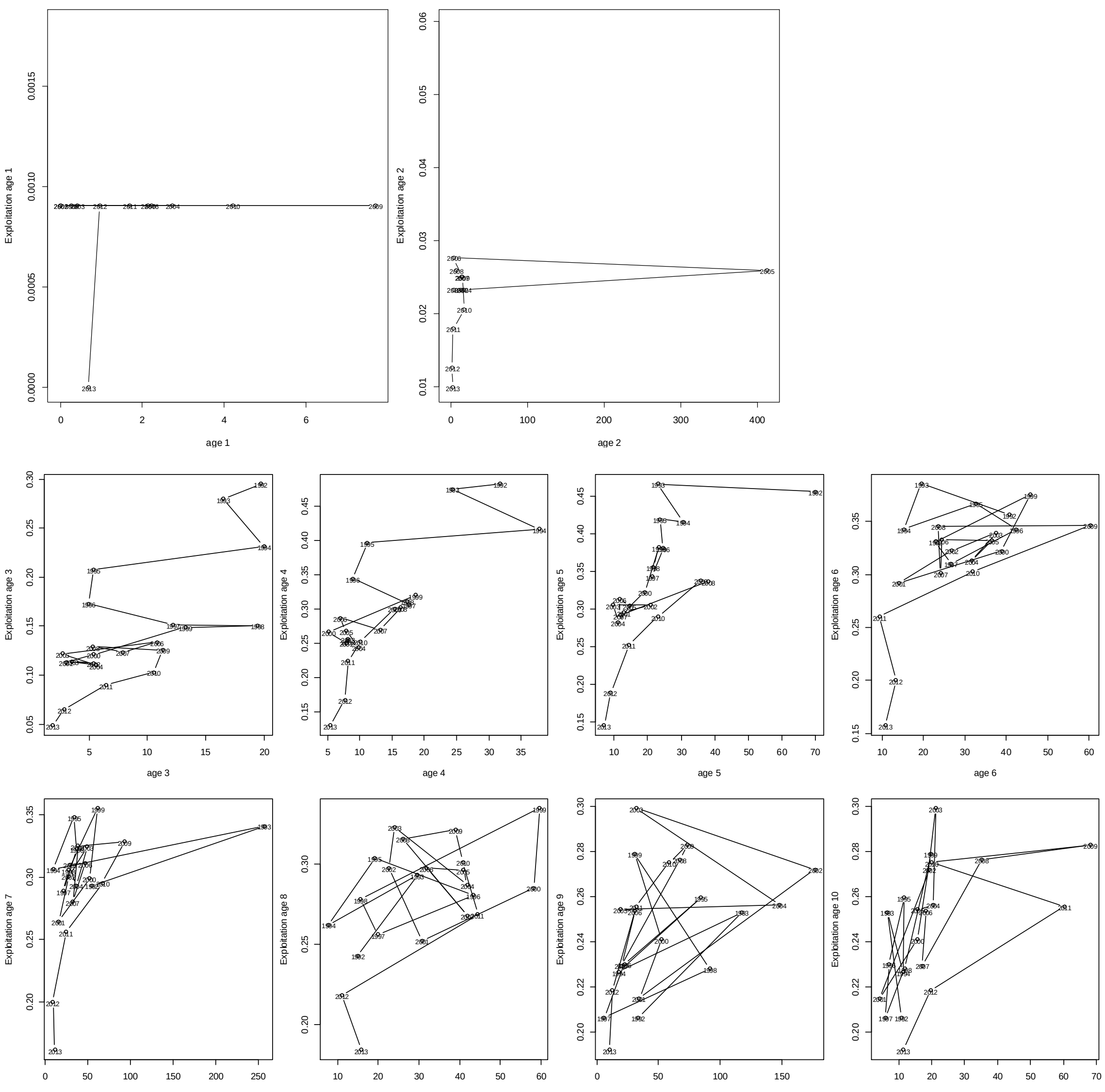


Predicted recruitment (age 3) vs survey index



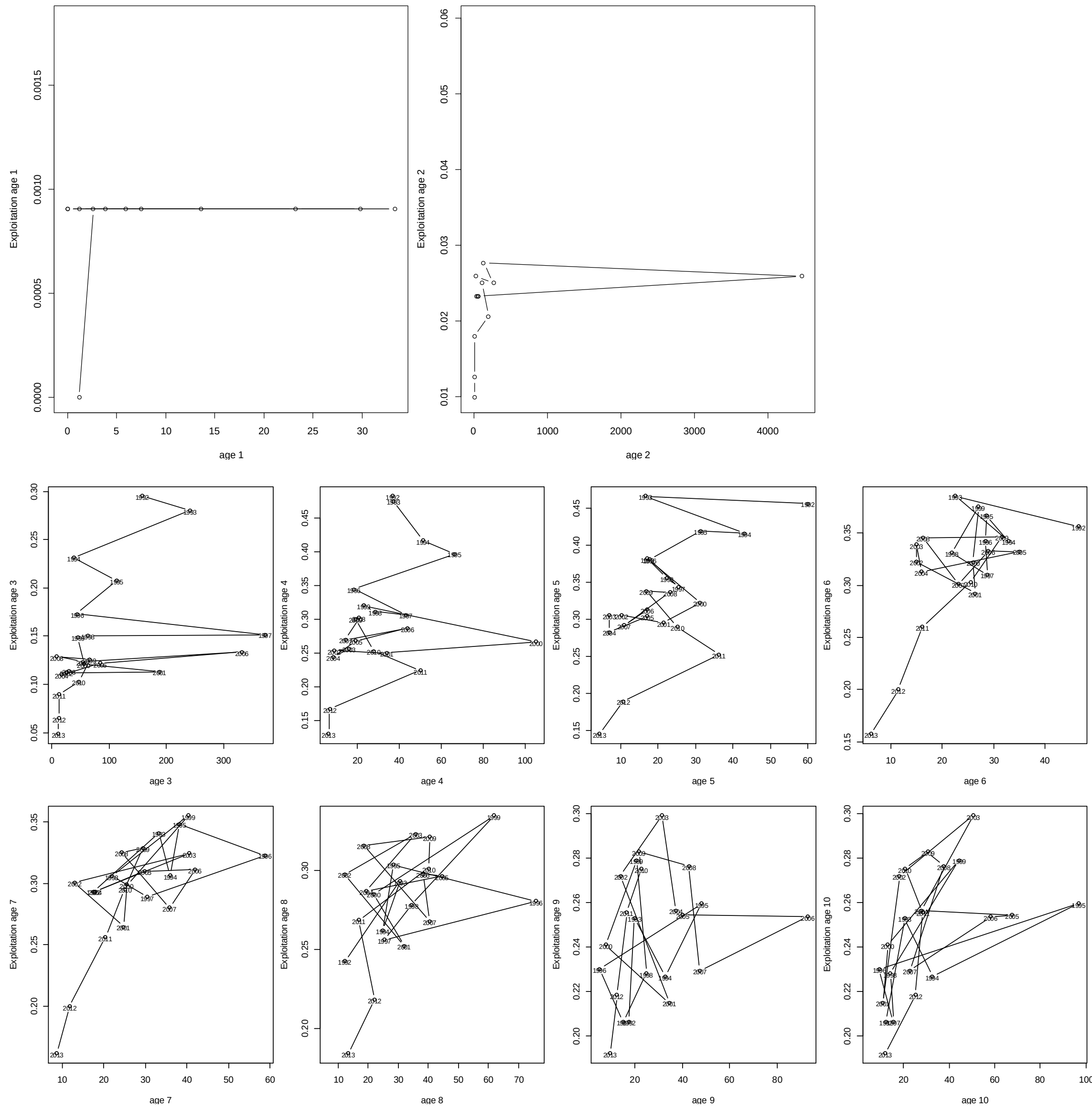
Predicted exploitation by age vs. survey index by age

IBTS Q3



Predicted exploitation by age vs. survey index by age

IBTS Q1



Appendix C

This appendix contains additional exploration of data and models following WGNSSK 2016. Documents are included as written for the meetings with the ICES WGNSSK chair, Benchmark chair, and new external reviewer.

Issues include:

1. Review the model using only the standardized cpue index (no survey indices).
2. Review a model using the standardized cpue index and Q3 survey indices (no Q1 indices).
3. Explore survey data: internal consistencies, cross-consistency with other data, coverage, spatial changes, ship effects, and modify spatial area from including entire North Sea and Skagerrak-Kattegat to a) truncating the southern North Sea and removing Skagerrak-Kattegat or b) truncating the southern North Sea and including the Skagerrak-Kattegat.
4. Determine the effect of various age groups in the surveys on the benchmark model.
5. Consider reverting back to XSA.
6. Re-raise discards because of bug in InterCatch.
7. Re-raise discards following a more strigent procedure.
8. Re-estimation of reference points for new model options.
9. Provide new catch options based on new models.
10. Exploration of using the DATRAS-generated Q3 indices instead of the indices generated with the delta-GAM approach

The list of documents is:

1. Benchmark issues summary
2. WD 8: SAM Assessment – AMENDMENT
3. Catchabilities of surveys in SAM
4. Alternate SAM models – including DATRAS Q3 indices

Mapping of the distribution by survey and year, internal consistencies, and delta-GAM model fits are included in WD 3. Information on re-raising of the discards is included in WD 5.

North Sea saithe: benchmark issues summary

There is a choice to be made on the model configuration for the North Sea saithe. This document outlines some of the choices that need to be made.

SAM vs. XSA

When XSA and SAM are run with the same datasets, the XSA results fall more-or-less within the confidence limits of SAM (Figure 1). It is therefore clear that the issue here is one of data rather than model choice. Reverting to XSA is therefore not appropriate, and would actually hamper our ability to investigate the uncertainties arising from the different datasets.

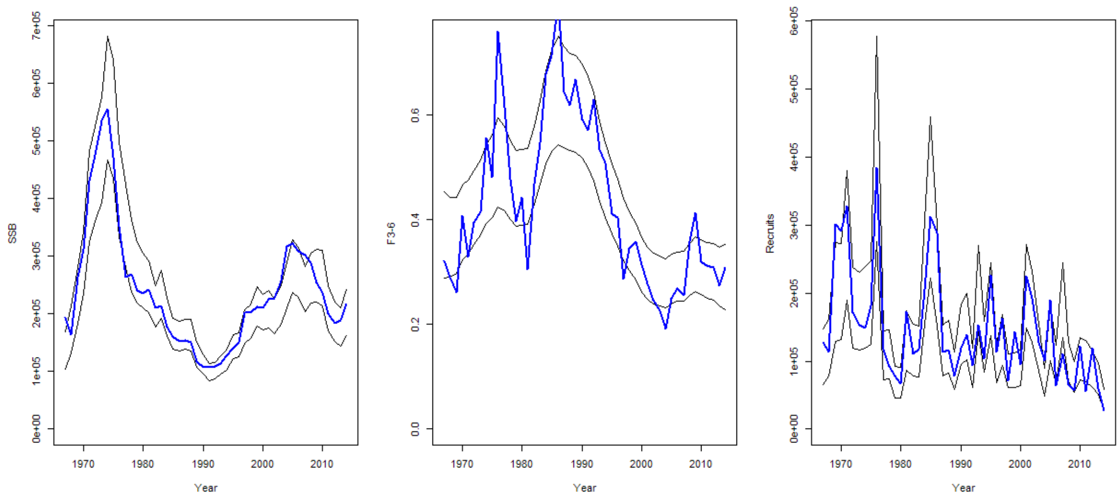


Figure 1. Comparison of the 2015 assessments. Blue lines: XSA assessment results. Black lines: 95% confidence interval of SAM assessment.

"Old" catch data vs. revised catch data

Changing the catch data, but not updating the time series, results in an increase of 4% SSB in 2014, with 10-20% increases between 2002–2007. Reverting to the old catch data is not good option. This would leave saithe as an outlier in the N. Sea assessment, and would make mixed fisheries analysis difficult. In any case, the revisions were conducted for a reason, and one should not reject an improved dataset on the grounds that it changes the model results

Choice of survey, in particular IBTS Q3

SSB_{2015} was 13% higher in the IBTS Q3+cpue model compared to the cpue-only model; prior to 2014, it was below the cpue-only model, indicating that something has happened in only the last 2 years. The choice of survey data to include should be based on the properties of that survey (e.g., internal consistency, cross-consistency with other data, coverage).

Internal consistency

Internal consistencies for the Q3 survey are decent, although slightly poorer for age 3 vs. age 4 (Table 1, Figure 2). There is no evidence in the internal consistencies that something has gone wrong in the survey.

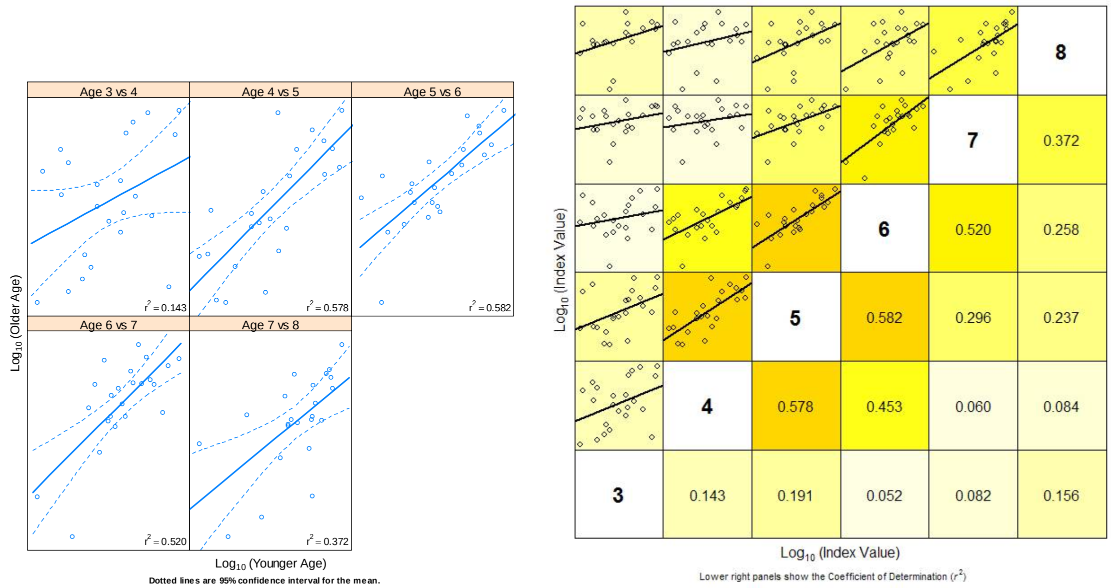


Figure 2. Internal consistencies as given by FLR. Note: FLR internal consistencies are estimated differently from Berg et al. 2014, as given in the WD 3 and the amendment to WD 8.

Cross consistency with other data sources

Despite the Q1 survey having limited coverage of the stock, the external consistencies between the Q3 and Q1 (in the following year and age), as well as catch numbers at age, were used to see if tracking of cohorts was possible (Table 1). Cohorts can be tracked between surveys (and ages). The external consistencies are not as strong when comparing the catch numbers at age with the Q3 index, however, they still track cohorts reasonably well. The external consistency for age 4, the age when fish are expected to be fully recruited to the fishery, is the lowest of all the age class comparisons.

Table 1. Internal and external consistencies. Internal consistencies are between age classes for the Q3 (spatially truncated) indices. External consistencies are between Q3 (ages 1-9, 1992-2014) and Q1 (year+1, age+1), and between catch numbers at age and Q3 (in the same year). This is identifying if cohorts can be tracked from Q3 to the next survey in Q1. Numbers in bold refer to the ages included in the IBTS Q3 tuning index in the assessment model.

Internal consistencies: Q3	External consistencies: Q3 vs. Q1	External consistencies: catch vs. Q3
Age 1 vs. 2 : 0.4287579	Q3 Age 1 vs. Q1 Age 2 : 0.3218696	Catch Age 1 vs. Q3 1 : -0.0165032
Age 2 vs. 3 : 0.1669562	Q3 Age 2 vs. Q1 Age 3 : 0.4586471	Catch Age 2 vs. Q3 2 : -0.1492027
Age 3 vs. 4 : 0.3777139	**Q3 Age 3 vs. Q1** Age **4 : 0.8203473**	**Catch Age 3 vs. Q3 3 : 0.5044318**
Age 4 vs. 5 : 0.759958	**Q3 Age 4 vs. Q1** Age **5 : 0.8739198**	**Catch Age 4 vs. Q3 4 : 0.3768049**
Age 5 vs. 6 : 0.7629555	**Q3 Age 5 vs. Q1** Age **6 : 0.8839688**	**Catch Age 5 vs. Q3 5 : 0.5894862**
Age 6 vs. 7 : 0.7211942	**Q3 Age 6 vs. Q1** Age **7 : 0.7743481**	**Catch Age 6 vs. Q3 6 : 0.5557922**
Age 7 vs. 8 : 0.6095779	**Q3 Age 7 vs. Q1** Age **8 : 0.696888**	**Catch Age 7 vs. Q3 7 : 0.5059279**
Age 8 vs. 9 : 0.08241081	**Q3 Age 8 vs. Q1** Age **9 : 0.625716**	**Catch Age 8 vs. Q3 8 : 0.4097457**
Age 9 vs. 10 : -0.262115	Q3 Age 9 vs. Q1 10 : 0.4047001	Catch Age 9 vs. Q3 9 : 0.05872988
		Catch Age 10 vs. Q3 10 : 0.4557988

To some extent, it is reasonable to use the model results as a sanity check on including each dataset in turn, however, there is nothing in these results to indicate a problem with the IBTSQ3 survey data. This was expanded upon further in the amendment to WD 8, where the effect of each survey as well as including different age ranges was investigated.

Coverage

Coverage of the survey was addressed in the amendment to WD 8. The amount of saithe found within the survey area differs between years, but the distribution has not changed over the time period. Stronger year classes are, for the most part, appearing in the survey when expected and persisting for at least 1 year. The increase in the last 2 years appears to be related to stronger recruitment.

Summary

The pre-benchmark assessment included the Q3 indices for ages 3-5. The internal consistencies, coverage, and comparison with other data all show no reason to exclude the survey from the assessment. It is only in the last two years that the assessment has shown SSB is higher than the cpue-only model; prior to 2013, the cpue-only model had consistently higher SSB (Figure 3).

The Q3 index shows large variability from year to year, however, keeping the stipulation from the EU-Norway management plan, where the TAC is not allowed to deviate by more than 15% from the TAC in the previous year should protect the stock from the uncertainty in the assessment.

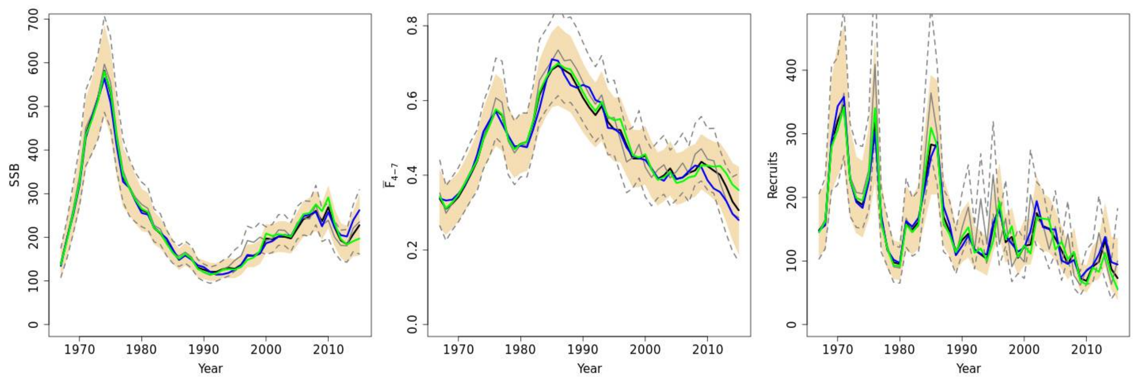


Figure 3. Trends in SSB, $F_{4\text{-}7}$, and recruitment for the 3 models. Blue line: Q1 + Q3 + cpue index model; green line: cpue-only model; black line: Q3 + cpue model; orange/tan shaded region: 95% confidence interval for the Q3 + cpue model; solid grey line (dashed): old Q3 + cpue model (95% confidence interval). The old Q3 model is estimated without removing the southern North Sea (where saithe are not found) and the Skagerrak (see amendment to WD 8 for details).

WD 8: SAM Assessment - AMENDMENT

WGNSSK had some concerns about the saithe assessment model.

- Running the forecast with the benchmark-approved model resulted in unrealistically high increases in TAC for the advice (119% increase, MSY approach). The working group asked to review the model with only the standardized combined cpue index tuned to the exploitable biomass.
- A model using both the standardized combined cpue index (FBI) and the IBTS Q3 survey was put forward as an alternate model. Because this model diverges from the cpue-only model, properties of the survey were investigated (e.g., internal consistency, cross-consistency with other data, coverage).
- This prompted a more thorough exploration of the survey data to:
    - Determine if spatial changes had occurred in the survey that could be the result of fish moving in and out of the survey area (unrelated to stock size).
    - Investigate the Q3 index models.
        - Include a ship effect to determine whether a newly added ship at the end of the time series might be causing the problem (e.g., Dana in Skagerrak).
        - Modify the spatial grid over which the indices are estimated so that it is roughly representative of the population (do not include large areas where there are almost no saithe). Two potential indices were explored: one that removed the Skagerrak/Kattegat and southern North Sea (south of 57° N); one that kept the Skagerrak but removed the Kattegat and southern North Sea.
        - Investigate consistencies for each model option.
    - Determine the effect of various age groups.
- There were questions regarding the use of SAM vs. XSA. Discussions via email may have put this option to rest, but are summarized as:
    - When XSA and SAM are run with the same datasets, the XSA results fall more-or-less within the confidence limits of SAM (Figure 1).
    - Reverting to XSA would actually hamper our ability to investigate the uncertainties arising from the different datasets.
    - The 3 cpue indices get a very high weight and the IBTS q3 has hardly any influence; this hides the issue that the assessment relies nearly entirely on the commercial indices.
    - Would need to revert back to the age-based cpue indices because XSA cannot handle the combined standardized index, that is fit to the exploitable biomass (within the model). This reverts back to the issue of using the age information twice – once for the catch data, once for the cpue tuning indices.
    - The XSA cannot handle the correlation between ages with years in the survey indices; SAM can, as outlined in Berg & Nielsen (2016).

A bug in InterCatch resulted in the re-raising of discards for 2003, 2006, 2011, and 2014, which were done following the procedure in WD 5; 2002 was also re-raised as it seemed oddly high. After re-raising the data, several years still appeared to be atypical, so the raising for all years was re-done following a modification to the rules used for the benchmark:

- No discard ratio >= 25% was used in the raising of any fleet. Previously, ratios > 30% were omitted.
- Norwegian trawler fleet discards were raised using German or French (or both) discard information. Previously, they were raised with other OTB_DEF fleets, using discard information from all OTB_DEF fleets for a given area and quarter.

Results

Spatial changes in the surveys

Spatial plots of the catches (all ages combined) showed that, for the Q1 survey, saithe were mainly on the shelf edges and the survey was unlikely to be sampling much of the population (see Appendix: Q1 plots are catch weight per station per year, not age specific). At the time of the benchmark, this was discussed, but it was thought that, for the older ages, the amount of the population surveyed should be fairly consistent over time. A month parameter had been added to the delta-GAM model to account for changes in survey timing and any effect of fish movement in and out of the survey area. However, closer inspection of the figures showed that, in some years, fish are found further up on the shelf, while in other years, they are only along the shelf boundary (200 m contour). This does call into question using the Q1 index in the assessment.

For the Q3 surveys, saithe are found on the northern part of the shelf, along the shelf boundary, and in the Skagerrak (see Appendix: Q3 plots are catch weight per station per year, not age specific). The amount of saithe found within the area differs, but the distribution appeared fairly consistent. Stronger year classes are, for the most part, appearing in the survey when expected and persisting for at least 1 year (e.g., 1995, 2001, 2005).

Q3 index models

A ship effect was included in the index estimation. Sweden had begun using a new vessel in 2011 in the Skagerrak. Including ship in the model resulted in a higher AIC and BIC, and slightly worse internal consistencies (Tables 1, 2).

The spatial grid was truncated to a) exclude the area east of 8° E and south of 57° N, i.e., Skagerrak/Kattegat and southern North Sea information were removed, and b) exclude south of 57° N and the Kattegat (but include the Skagerrak). Saithe are not found in the southern North Sea; excluding this area mainly truncates the zeros and keeps the spatial spline of the GAM model from attempting to put fish where they are typically not found. Mainly young fish (the ages not included in the assessment model) are found in the Skagerrak, but the German fleet fishes in this area; therefore, datasets including and excluding this region were trialed. Ship was included in the final model.

Truncating the spatial area improved the model fit (Table 1). Removing the Skagerrak improved the fit of the model the most, but the indices were larger for a given age class and more variable for many of the age classes, especially at the beginning of the time series (Figure 2). Average internal consistencies were higher for the model including the Skagerrak, but the fit was not as good as the model excluding the Skagerrak (Tables 1, 2). Figure 3 shows the internal consistency plot, as given by FLR (note: correlations are reported differently using FLR); there is no evidence in the internal consistencies that something has gone wrong in the survey. The time series of indices by age (including confidence intervals and comparison to the DATRAS indices) for the full survey area, excluding the southern North Sea and Skagerrak/Kattegat, and excluding the southern North Sea and Kattegat are in Figures 4-6.

The effect seen at the start of the time series cannot be due to ship; it would have been captured within the model or also seen from 2001, when Sweden changed its research vessel. The indices (all ages) with and without the Skagerrak show similar trends and values.

Until 2003, Sweden did not take age samples, only lengths. This resulted in the age-length key for the North Sea (subarea 4) being applied to the Skagerrak. Whether fish in the Skagerrak were different from the North Sea was not thoroughly investigated, so it is questionable whether the age-length key from the North Sea should be applied to the Skagerrak. In addition, Sweden did not survey in 2000; this year had incomplete coverage of the entire survey area. Finally, the Skagerrak was never included in the old index estimation (in DATRAS). There is no documentation of why the Skagerrak was included and the IBTSWG was unable to answer this question.

Survey properties

Internal consistencies

Internal consistencies for the Q3 survey are decent, although slightly poorer for age 3 vs. age 4 (Table 2, Figure 3). There is no evidence in the internal consistencies that something has gone wrong in the survey.

Cross consistency with other data sources

Despite the Q1 survey having limited coverage of the stock, the external consistencies between the Q3 and Q1 (in the following year and age), as well as catch numbers at age, were used to see if tracking of cohorts was possible (Table 3). Cohorts can be tracked between surveys (and ages). The external consistencies are not as strong when comparing the catch numbers at age with the Q3 index, however, they still track cohorts reasonably well. The external consistency for age 4, the age when fish are expected to be fully recruited to the fishery, is the lowest of all the age class comparisons.

Coverage

The amount of saithe found within the survey area differs between years, but the distribution has not changed over the time period. Stronger year classes are, for the most part, appearing in the survey when expected and persisting for at least 1 year. The increase in the last 2 years appears to be related to stronger recruitment.

Effect of age groups and research surveys on the assessment

Only the Q3 index was used to assessing the influence of the different age classes. The decision was made that it is not appropriate to continue to include the Q1 indices in the assessment model (see above).

Q3 indices without truncating spatial grid or including ship in the model

The assessment results when including only the Q3 + FBI indices show SSB in the final years not as optimistic as the model including the Q1 index (Figure 7). It is, however, much more optimistic than the FBI-only model or the model using the DATRAS-estimated indices for ages 3-5. When looking at the effect of removing the oldest age classes one at a time, ages 5-8 have the largest effect on the assessment outcome (Figure 8). Using only the age ranges 3-4 or 3-9 has a large effect on the estimated SSB; ages 3-9 result in a lower SSB over the entire time series, while using only ages 3-4 has a mixed effect (lower SSB after 2010). The effect of changing the age range on F_{bar} and recruitment are shown in Figure 9.

Q3 indices with truncation of spatial grid + including ship in model

Figure 10 shows the effect of the Q3 (without Skagerrak) index on assessment model outputs. SSB and F are much closer to the DATRAS outputs and below that of the previous Q3 indices. Figures 11 and 12 detail the effects of changing the age range included in the Q3 index on SSB, F_{4-7}, and recruitment.

The effect of the Q3 with Skagerrak indices on the assessment model are in Figure 10. Including the Skagerrak in the Q3 index resulted in output that was similar to the model using the Q3 indices estimated from the entire North Sea dataset (Q3 + FBI model). Figures 13 and 14 show the effect of changing the age range included in the model on SSB, F_{4-7}, and recruitment.

Discard estimation

The change in discard amounts are in Table 4. The years that had the greatest percentage difference due to the modifications noted above were the years that had very few reported discards; Norwegian discards had to be estimated using poor data. Norway takes 50% of the catch and this therefore resulted in high raised discards amounts. Because there is no information on the discarding practices of Norwegian fleets, the truth is expected to lie somewhere between estimate (3) and estimate (2); these estimates should be treated as upper and lower bounds on discards. It is doubtful that Norwegian discards are at the low levels estimated in option 3. However, when low recruitment is seen (2008–2010), discards should be low. This is seen in Table 3 using raising option (3), but not in option (2). While raising option (3) may be under-estimating discards, it appears to be more likely than option (2).

The comparison of assessments (old raising procedure vs. option (3)) for the benchmark model (FBI + Q1 + Q3), FBI index-only model, and new Q3 model, where the Skagerrak/Kattegat/southern North Sea were truncated from the spatial grid are in Figures 15-17. Results of all 3 models using revised discards data are in Figure 18.

Retrospectives using the newly estimated catch are in Figure 19 for the benchmark model (FBI + Q1 + Q3) without discard revisions. Figure 20 is the benchmark model including discard revisions, Figure 21 is the FBI-only model (including discards revisions), and Figure 22 for the FBI+ new Q3 model (including discard revisions). The retrospective pattern is much worse for the benchmark model with the revised catch information. The retrospective pattern in F is particularly bad. The model with only the exploitable biomass index shows the best performance in the retrospective analysis.

All models converge to approximately similar F and SSB values for the 2005-2010 period (Figure 18). Therefore, by going back with the retro analysis before 2010 gives an idea which assessment would have been more in line with the final converged values. The assessment with FBI as only index would have assessed F around the converged values for 2005-2010. The retrospective indicates all other models would have assessed F well above the converged values for this period (with the FBI + new Q3 model being the worst). In recent years the retro patterns became less, however each of the assessments show F at a different level. It remains unclear whether the current FBI only assessment will be again closer to the converged estimates in a few years. Reference points and catch option tables are in the Appendix for the 3 models with revised catch information.

Conclusions

The Q1 index should not be included as a tuning series because the survey does not adequately cover the distribution of saithe. Saithe are spawning on the slope and their movement into (or out of) the survey area does not appear to be linked to recruitment or expected abundance.

For the Q3 index, the spatial distribution of saithe has not changed within the survey area. Truncating the spatial grid to be remove the southern North Sea (where saithe are not found) and the Skagerrak should be done. The arguments for excluding the Skagerrak include: no age-length key in the Skagerrak until after 2003, incomplete coverage of the survey area due to Skagerrak not surveyed in 2000, and exclusion of the Skagerrak in the previous (DATRAS) index estimation (even though the reason is not known).

Removing the Skagerrak and southern North Sea resulted in a less optimistic assessment when compared to the benchmark model. The assessment using Q3 indices that included the Skagerrak, but removing the Kattegat and southern North Sea, was (not surprisingly) similar to the benchmark assessment. The data from the Skagerrak appears to be creating an issue with the index estimation. The reason for this is not clear (biological or a survey effect, due to the lack of age information from this area). The reason for the large discrepancy in the indices including/excluding the Skagerrak for the beginning of the series should be investigated in the near future.

Because Norway lacks information on discards and takes 50% of the catch, the raising of discards in InterCatch must be handled carefully. Raising discards for the Norwegian trawlers based on reported discards from the French and German trawlers may result in underestimating the discards, but it is the best information available at this time. Germany, France and Norway have a targeted saithe fishery. Fisheries in countries like Scotland and Denmark are mixed demersal fisheries with higher discard rates compared to the sampled fisheries targeting saithe.

The pre-benchmark assessment included the Q3 indices for ages 3-5. The internal consistencies, coverage, and comparison with other data all show no reason to exclude the survey from the assessment. It is only in the last two years that the assessment has shown SSB is higher than the cpue-only model; prior to 2013, the cpue-only model had consistently higher SSB (Figure 18). There is a lot of uncertainty in the assessment regardless of the model chosen. The choice of survey data to include should be based on the properties of that survey (e.g., internal consistency, cross-consistency with other data, coverage).

The retrospective patterns, particularly for F, were very poor, especially for the assessments with IBTS data included. This is worrying as it casts doubt on our ability to assess the stock should conditions change again. Furthermore, the cause for the poor ability to estimate F is unknown (and could occur again). There is some doubt that the FBI + new Q3 model is the better model compared to the FBI-only model in light of the retrospective patterns.

Keeping the stipulation from the EU-Norway management plan, where the TAC is not allowed to deviate by more than 15% from the TAC in the previous year should protect the stock from the uncertainty in the assessment. Furthermore, including catch options based on probabilistic forecasts, e.g., 5% and 25% probability of being above F_{MSY} and F_{lim}, is another option for dealing with the uncertainty in the assessment.

Table 1. Model diagnostics for the Q3 indices. The models are the benchmark model (no truncation of spatial grid); benchmark model including Ship (no truncation of spatial grid); removing the Skagerrak/Kattegat and southern North Sea and including Ship; removing the Kattegat and southern North Sea and including Ship.

Model	AIC	BIC	IC (all ages)
Year+s(lon,lat)+s(Depth)+ HaulDur	34460	42834	0.3948
Year+Ship+s(lon,lat)+s(Depth)+HaulDur	34274	43476	0.4358
Truncated spatial range (57°N, 8°E): Year+Ship+s(lon,lat)+s(Depth)+HaulDur, ages 1-10	28122	36032	0.40527
Truncated spatial range (57°N, no Kattegat): Year+Ship+s(lon,lat)+s(Depth)+HaulDur, ages 1-10	32565	40590	0.4264

Table 2. Internal consistencies between ages classes for the four different Q3 indices.

Model/Data	IC	Average IC all ages	Average IC ages 3-8
Benchmark model: Year+s(lon,lat)+s(Depth)+ HaulDur, ages 0-10	Age 0 vs. 1 : 0.3231104 Age 1 vs. 2 : -0.1937066 Age 2 vs. 3 : 0.03960032 Age 3 vs. 4 : 0.4954253 Age 4 vs. 5 : 0.7447504 Age 5 vs. 6 : 0.7943942 Age 6 vs. 7 : 0.750217 Age 7 vs. 8 : 0.6407721 Age 8 vs. 9 : 0.4044236 Age 9 vs. 10 : -0.05130193	0.3948	0.6851
Benchmark model + Ship: Year+Ship+s(lon,lat)+s(Depth)+HaulDur, ages 0-10	Age 0 vs. 1 : 0.4646722 Age 1 vs. 2 : -0.1081123 Age 2 vs. 3 : 0.05023302 Age 3 vs. 4 : 0.4406976 Age 4 vs. 5 : 0.7406408 Age 5 vs. 6 : 0.8363853 Age 6 vs. 7 : 0.7676941 Age 7 vs. 8 : 0.5378916 Age 8 vs. 9 : 0.3850141 Age 9 vs. 10 : 0.2426996	0.4358	0.6647
Truncated spatial range (no Skagerrak/Kattegat or southern North Sea): Year+Ship+s(lon,lat)+s(Depth)+HaulDur, ages 1-10	Age 1 vs. 2 : 0.4287579 Age 2 vs. 3 : 0.1669562 Age 3 vs. 4 : 0.3777139 Age 4 vs. 5 : 0.759958 Age 5 vs. 6 : 0.7629555 Age 6 vs. 7 : 0.7211942 Age 7 vs. 8 : 0.6095779 Age 8 vs. 9 : 0.08241081 Age 9 vs. 10 : -0.262115	0.4053	0.6463
Truncated spatial range (no Kattegat or southern North Sea): Year+Ship+s(lon,lat)+s(Depth)+HaulDur, ages 1-10	Age 1 vs. 2 : -0.3264555 Age 2 vs. 3 : -0.02738525 Age 3 vs. 4 : 0.4273828 Age 4 vs. 5 : 0.7532319 Age 5 vs. 6 : 0.8270072 Age 6 vs. 7 : 0.7994671 Age 7 vs. 8 : 0.6195003 Age 8 vs. 9 : 0.3514482 Age 9 vs. 10 : 0.4138057	0.4264	0.6853

Table 3. External consistencies between Q3 (ages 1-9, 1992-2014) and Q1 (year+1, age+1), and between catch numbers at age and Q3 (in the same year). This is identifying if cohorts can be tracked from Q3 to the next survey in Q1. Numbers in bold refer to the ages included in the IBTS Q3 tuning index in the assessment model.

External consistencies: Q3 vs. Q1	External consistencies: catch vs. Q3
Q3 Age 1 vs. Q1 Age 2 : 0.3218696	Catch Age 1 vs. Q3 1 : -0.0165032
Q3 Age 2 vs. Q1 Age 3 : 0.4586471	Catch Age 2 vs. Q3 2 : -0.1492027
Q3 Age 3 vs. Q1 Age **4 : 0.8203473**	**Catch Age 3 vs. Q3 3 : 0.5044318**
Q3 Age 4 vs. Q1 Age **5 : 0.8739198**	**Catch Age 4 vs. Q3 4 : 0.3768049**
Q3 Age 5 vs. Q1 Age **6 : 0.8839688**	**Catch Age 5 vs. Q3 5 : 0.5894862**
Q3 Age 6 vs. Q1 Age **7 : 0.7743481**	**Catch Age 6 vs. Q3 6 : 0.5557922**
Q3 Age 7 vs. Q1 Age **8 : 0.696888**	**Catch Age 7 vs. Q3 7 : 0.5059279**
Q3 Age 8 vs. Q1 Age **9 : 0.625716**	**Catch Age 8 vs. Q3 8 : 0.4097457**
Q3 Age 9 vs. Q1 10 : 0.4047001	Catch Age 9 vs. Q3 9 : 0.05872988
	Catch Age 10 vs. Q3 10 : 0.4557988

Table 4. Amount of discards (estimated and reported) following 3 procedures: (1) as outlined in WD-5 during the benchmark, (2) after fixing the bug in InterCatch (bolded years), and (3) after the modification noted above. Differences are percentage.

Year	2015 assessment	(1) Benchmark estimate	(2) InterCatch bug correction	(3) Modification to Norway & reduced ratio estimate	Reported	Difference 2015 to (1)	Difference (1) to (2)	Difference (2) to (3)
2002		24812	**21620**	21544	21440	100	-13	0
2003		26377	**12898**	11438	11044	100	-51	-11
2004		9600	9656	8088	7850	100	1	-16
2005		8571	8571	8196	8072	100	0	-4
2006		15950	**9498**	8585	8340	100	-40	-10
2007		12050	12078	12413	11353	100	0	3
2008		9436	9436	8359	7891	100	0	-11
2009		14216	14216	4296	4170	100	0	-70
2010		10937	10937	4484	3009	100	0	-59
2011		12729	**4951**	4362	4285	100	-61	-12
2012	7585	9415	9415	9278	7471	24	0	-1
2013	8083	8173	8173	7777	7311	1	0	-5
2014	6289	6362	**6356**	6337	6068	1	0	0
2015		5060	5060	5003	4914		0	-1

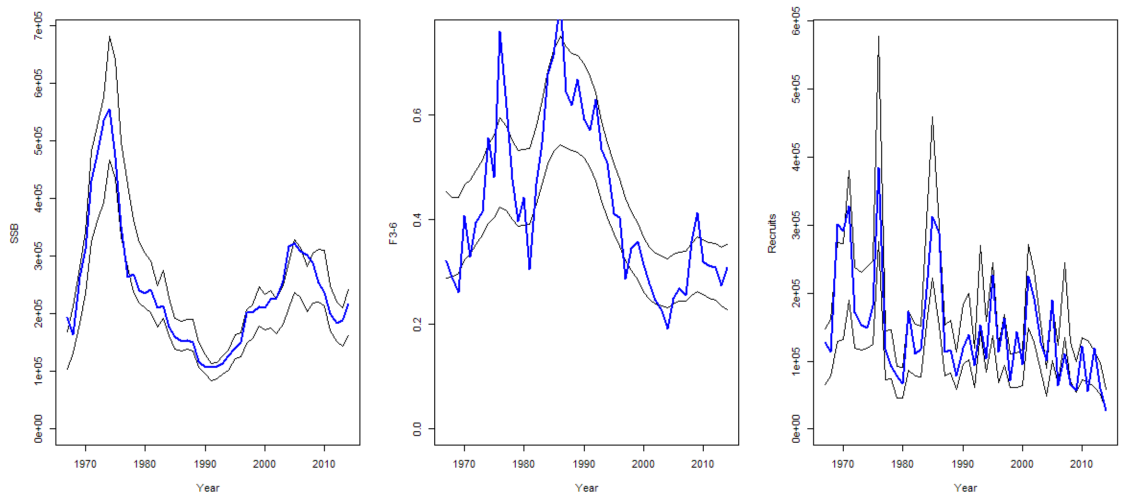


Figure 1. Comparison of the 2015 assessments. Blue lines: XSA assessment results. Black lines: 95% confidence interval of SAM assessment.

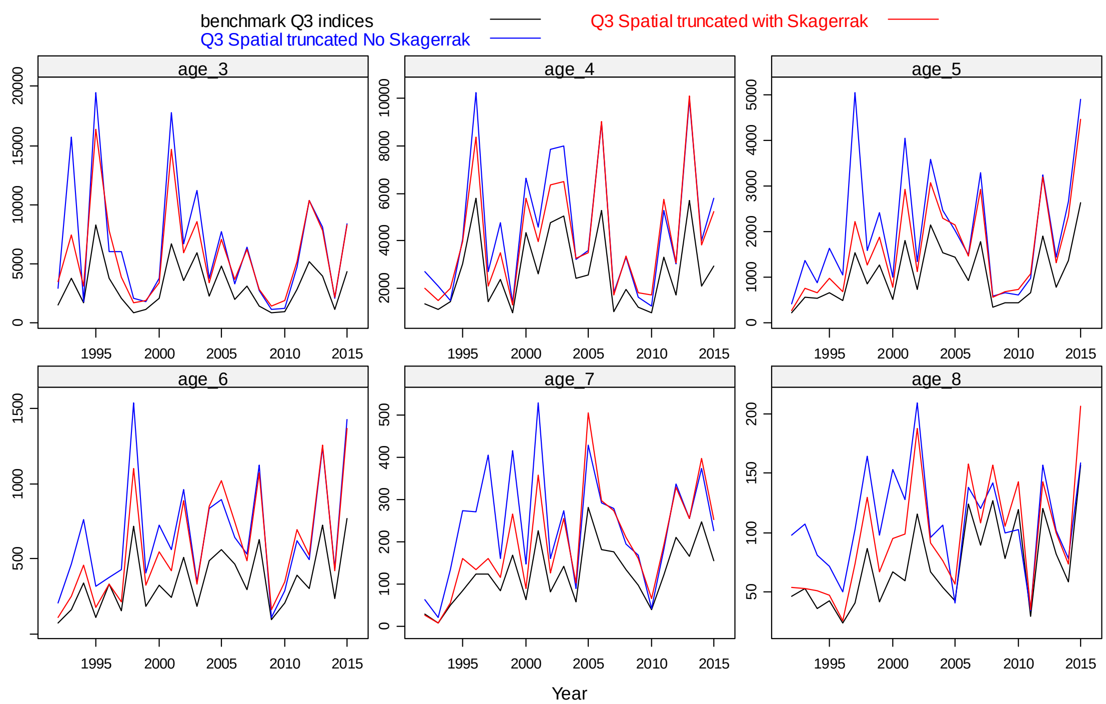


Figure 2. Comparison of IBTS Q3 indices, 1992-2015. Black lines: benchmark Q3 indices (no spatial truncation, without 'Ship' in model); blue lines: truncated spatial grid (No Skagerrak) + 'Ship' in model; red lines: truncated spatial grid (including Skagerrak) + 'Ship' in model.

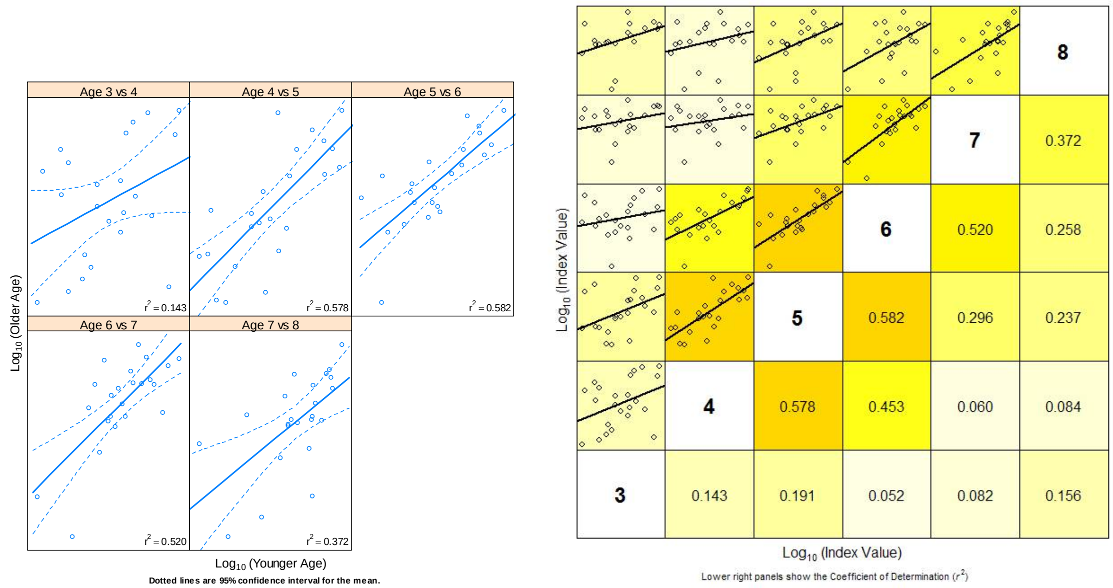


Figure 3. Internal consistencies as given by FLR. Note: FLR internal consistencies are estimated differently from Berg et al. 2014, as given in the amendment to WD 8.

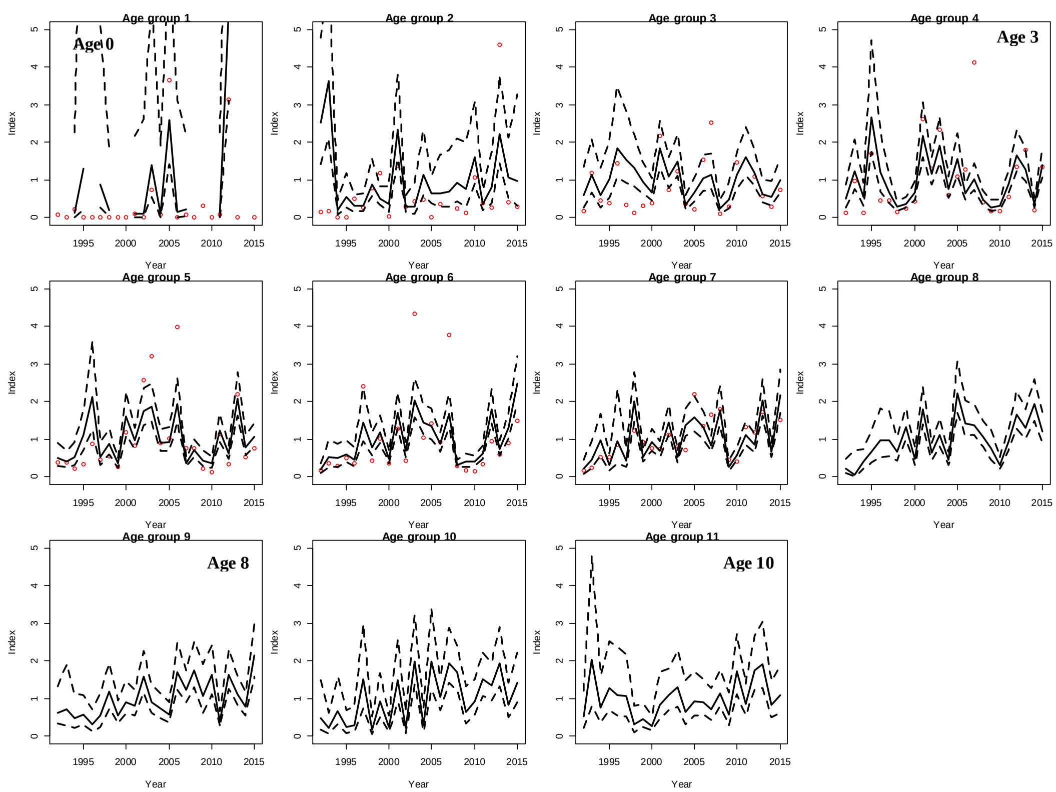


Figure 4. IBTS Q3 indices, ages 0-10, 1992-2015. Comparing survey indices by age (and confidence interval) to DATRAS indices for the full spatial range-no ship delta-GAM model (Q3 index as presented in the benchmark and WGNSSK).

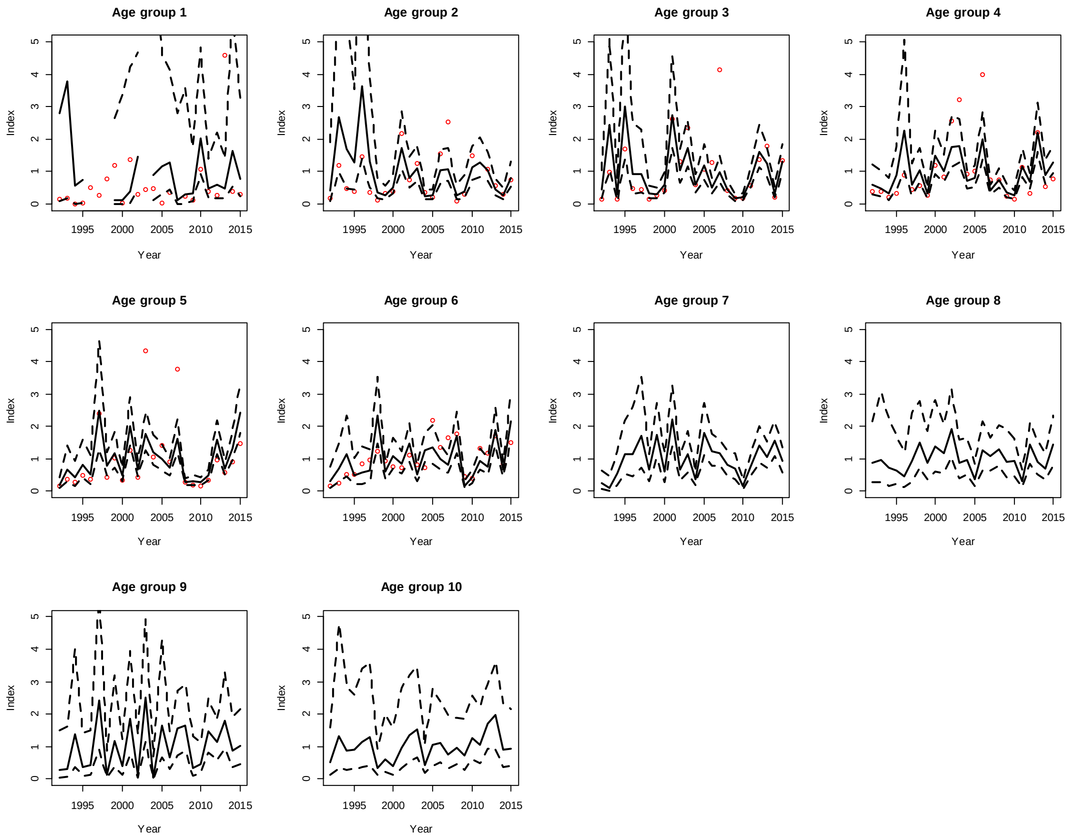


Figure 5. IBTS Q3 indices, ages 1-10+, 1992-2015. Comparing survey indices by age (and confidence interval) to DATRAS indices (ages 1-6+) for the truncated spatial grid-with ship delta-GAM model; this data excludes the Skagerrak-Kattegat and southern North Sea.

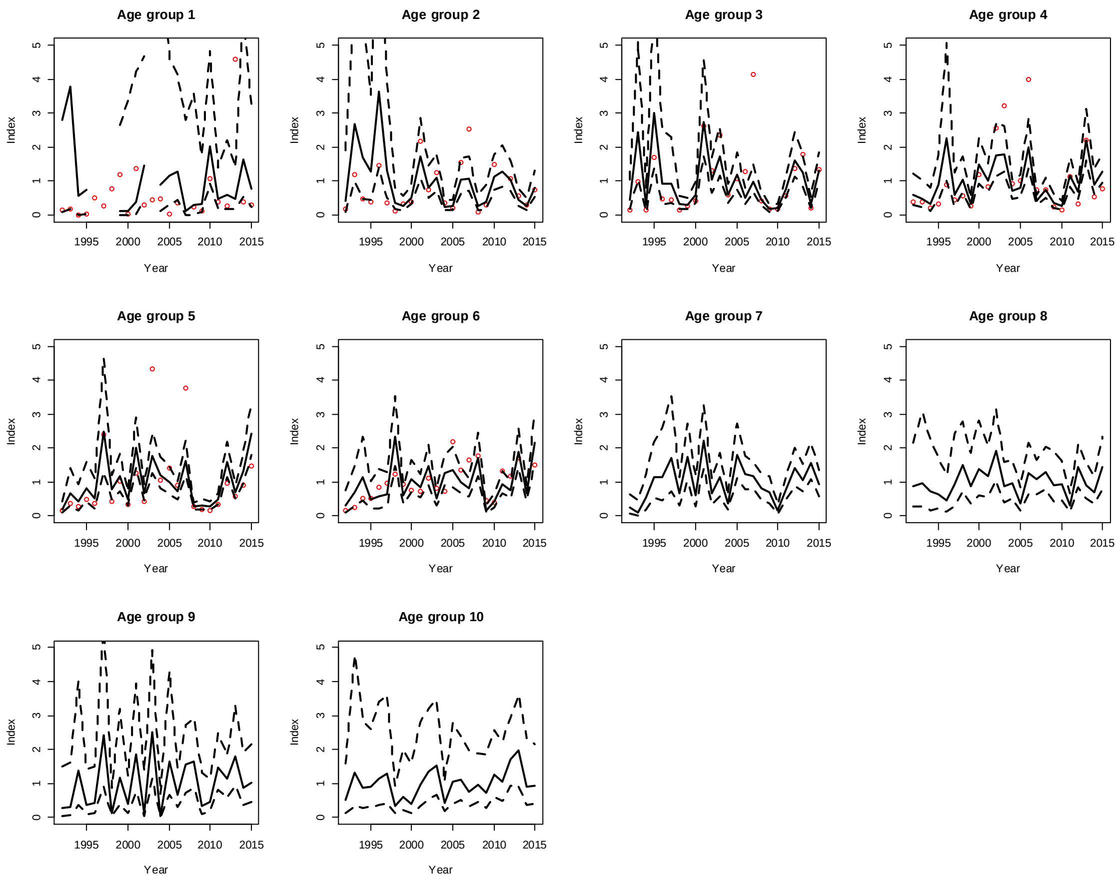


Figure 6. IBTS Q3 indices, ages 1-10+, 1992-2015. Comparing survey indices by age (and confidence interval) to DATRAS indices (ages 1-6+) for the truncated spatial grid-with ship delta-GAM model; this data includes the Skagerrak and excludes the southern North Sea and Kattegat.

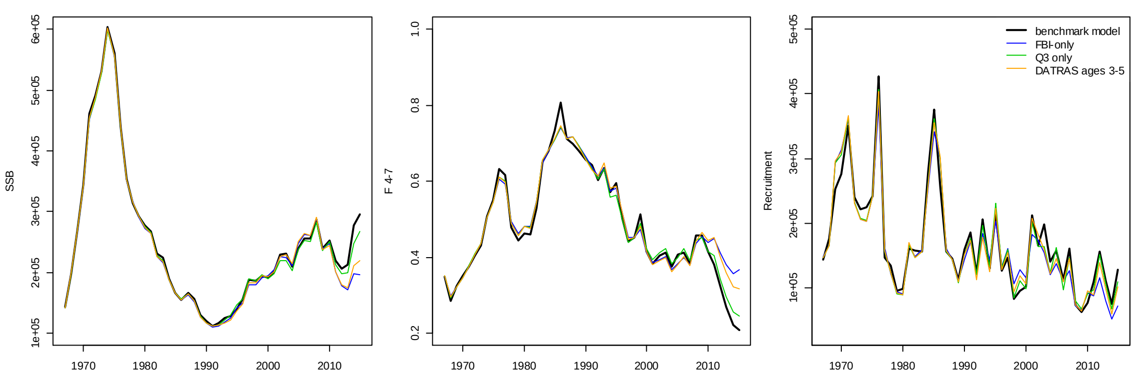


Figure 7. Affect of different indices on SAM assessment: black line = benchmark model (Q3 + Q1 + FBI indices); blue line = FBI index only (no surveys); green line = Q3 + FBI indices (no Q1); orange line = DATRAS Q3 (ages 3-5) + FBI indices. The Q3 indices estimated from the delta-GAM are those used in the benchmark meeting (no truncation of the survey area, without Ship in the model). Note: this was conducted before the bug in InterCatch was found and discards had not been re-raised.

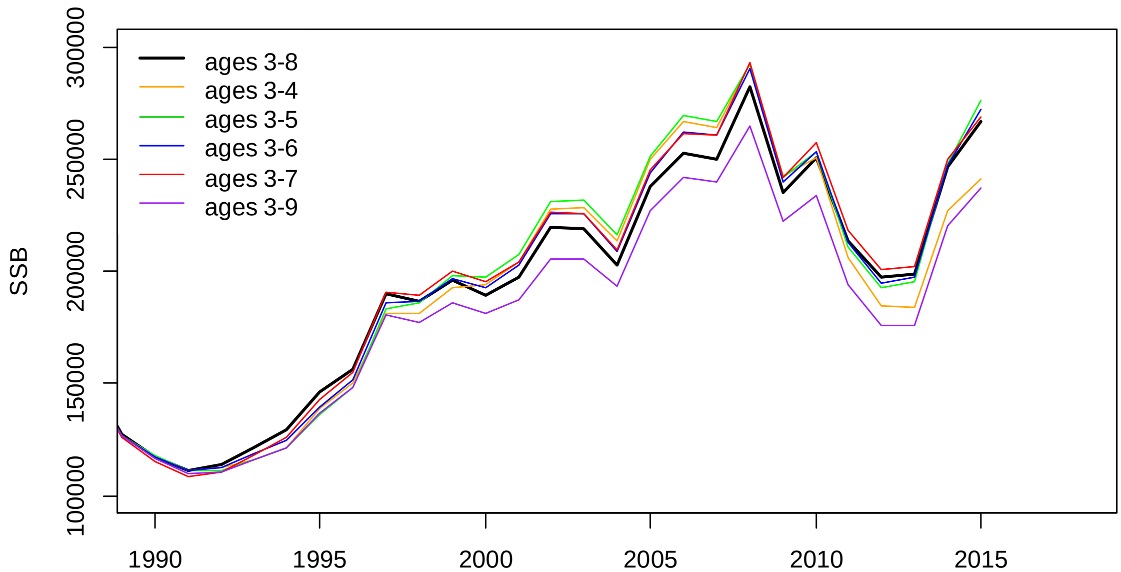


Figure 8. Effect of adding an changing age range of the Q3 index on estimated SSB. The Q3 indices were estimated using data from the entire North Sea. Note: this was conducted before the bug in InterCatch was found and discards had not been re-raised.

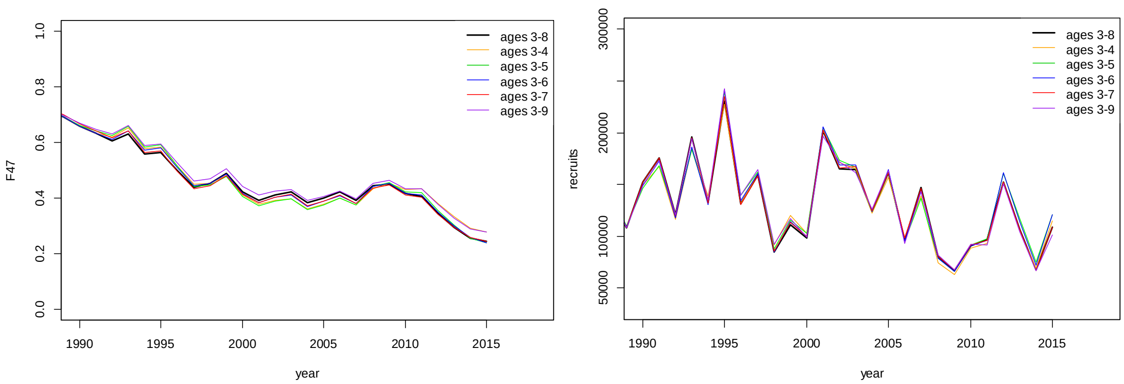


Figure 9. Effect of adding an changing age range of the Q3 index on estimated (left) $F_{bar\ 4\text{-}7}$ and (right) recruitment. Note: this was conducted before the bug in InterCatch was found and discards had not been re-raised.

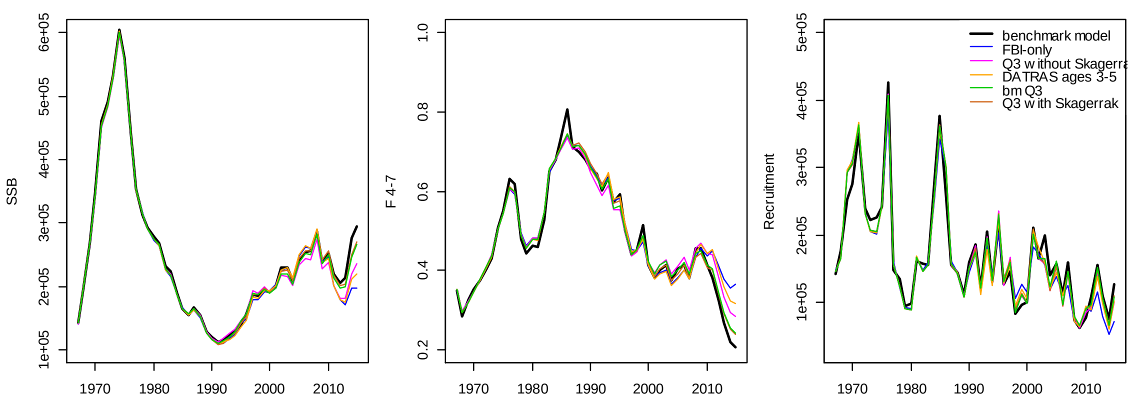


Figure 10. Affect of different indices on SAM assessment: black line = benchmark model (Q3 + Q1 + FBI indices); blue line = FBI index only (no surveys); green line = bm_Q3 + FBI indices (no Q1); orange line = DATRAS Q3 (ages 3-5) + FBI indices; magenta line = new Q3 + FBI indices (no Q1); brown line = Q3 including Skagerrak (without Kattegat or southern North Sea) + FBI. The bm_Q3 indices are those used in the benchmark meeting (no truncation of the survey area, without Ship in the model), while the new Q3 indices include truncating

the spatial grid + ship in the delta-GAM model. Note: this was conducted before the bug in InterCatch was found and discards had not been re-raised.

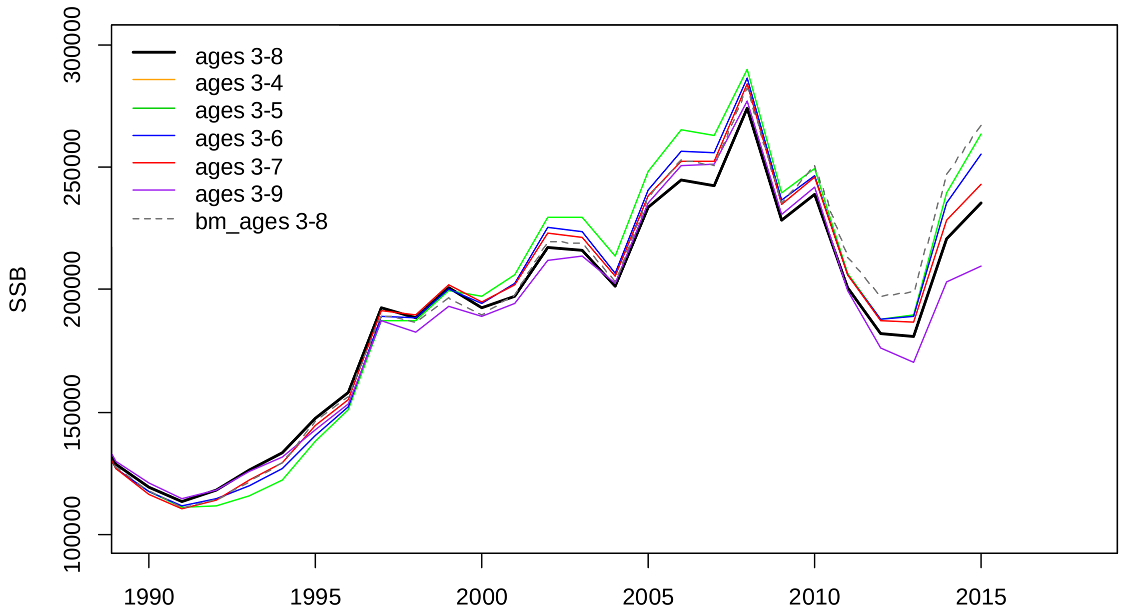


Figure 11. Effect of adding an changing age range of the Q3 index (truncated to remove the southern North Sea and Skagerrak/Kattegat) on estimated SSB. Model bm_ includes the Q3 indices estimated without truncation of the survey area or ship in the model. Note: this was conducted before the bug in InterCatch was found and discards had not been re-raised.

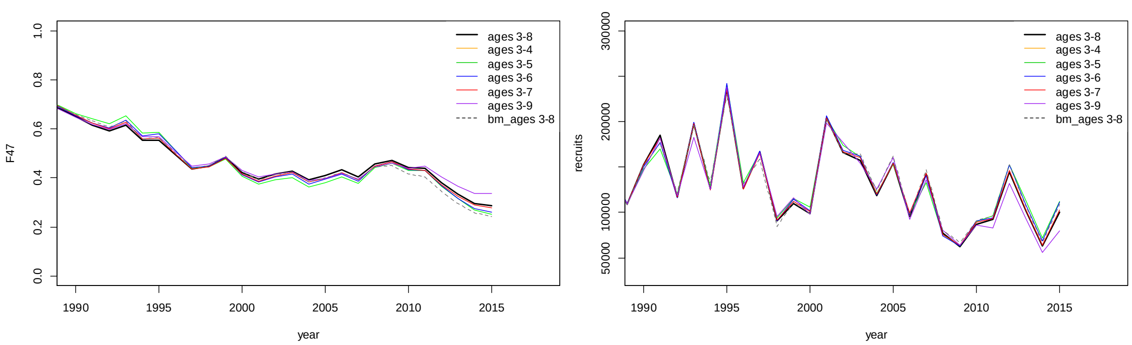


Figure 12. Effect of adding an changing age range of the Q3 indices (truncated to remove the southern North Sea and Skagerrak/Kattegat) on estimated (left) $F_{bar\ 4\text{-}7}$ and (right) recruitment. Model bm_ includes the Q3 indices estimated without truncation of the survey area or ship in the model. Note: this was conducted before the bug in InterCatch was found and discards had not been re-raised.

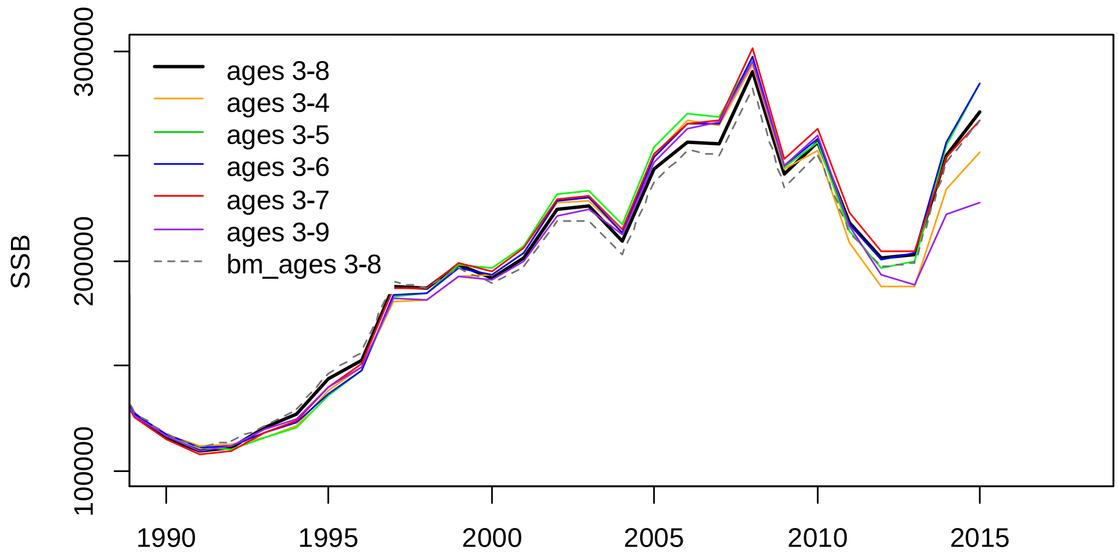


Figure 13. Effect of adding an changing age range of the Q3 indices (truncated to exclude the southern North Sea and Kattegat) on estimated SSB. Model bm_ includes the Q3 indices estimated without truncation of the survey area or ship in the model. Note: this was conducted before the bug in InterCatch was found and discards had not been re-raised.

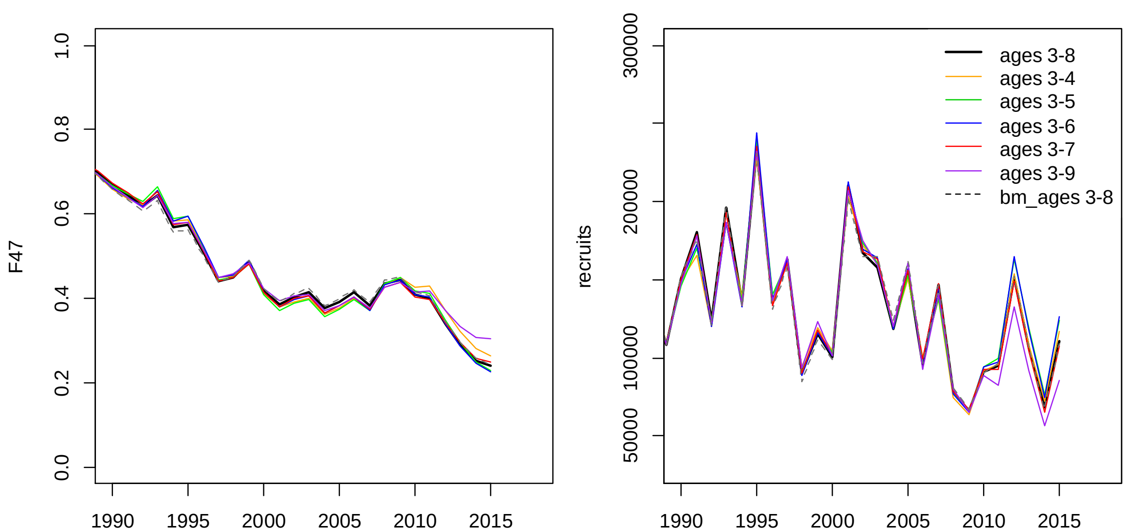


Figure 14. Effect of adding an changing age range of the Q3 indices (truncated to exclude the southern North Sea and Kattegat) on estimated (left) $F_{bar\ 4\text{-}7}$ and (right) recruitment. Model bm_ includes the Q3 indices estimated without truncation of the survey area or ship in the model. Note: this was conducted before the bug in InterCatch was found and discards had not been re-raised.

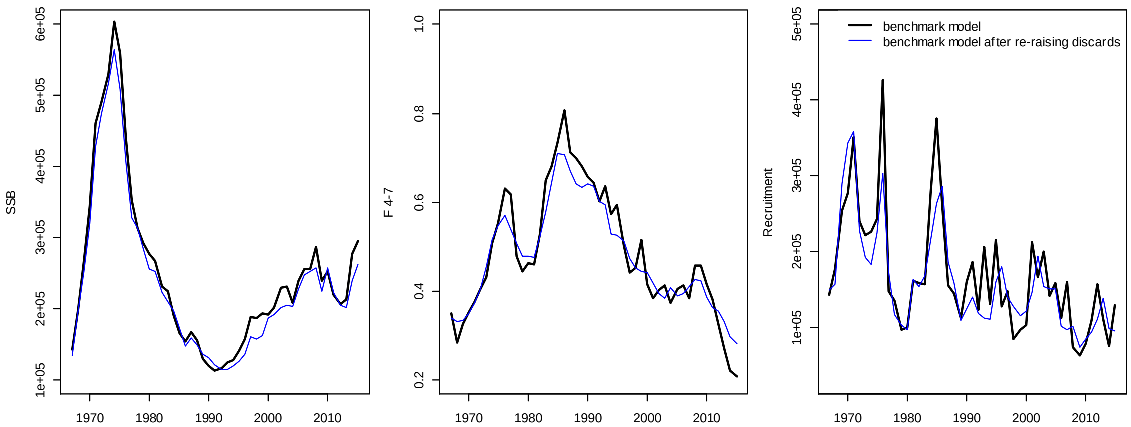


Figure 15. Effect of raising discards under assumption that Norway has low to zero discarding. Comparison of benchmark model (Q1 + Q3 + FBI) before and after changing raising procedure.

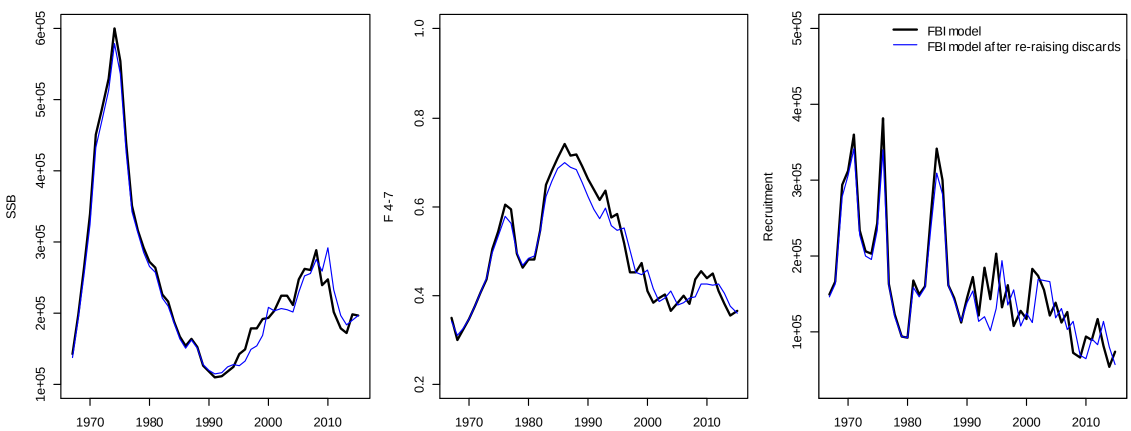


Figure 16. Effect of raising discards under assumption that Norway has low to zero discarding. Comparison of FBI index only model (no surveys) before and after changing raising procedure.

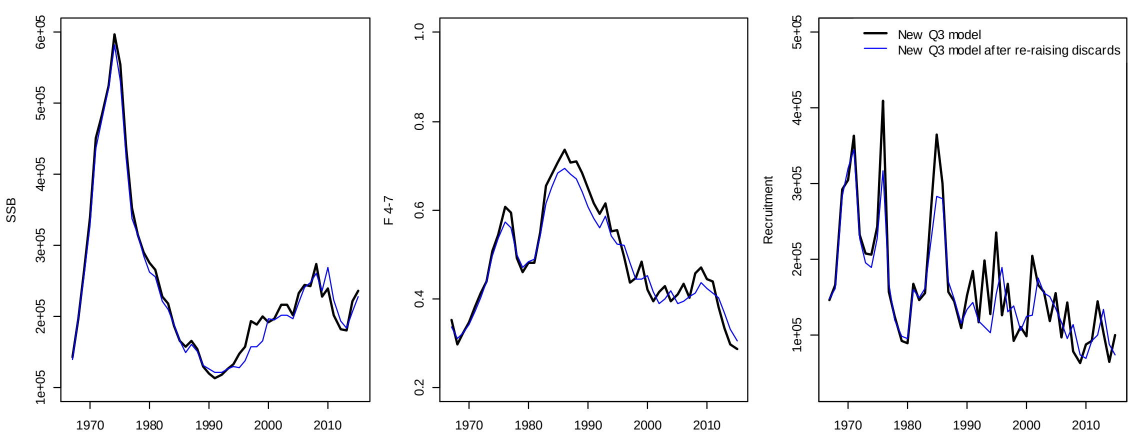


Figure 17. Effect of raising discards under assumption that Norway has low to zero discarding. Comparison of new Q3 model (FBI + Q3 - spatial truncation excludes Skagerrak/Kattegat and southern North Sea) before and after changing raising procedure.

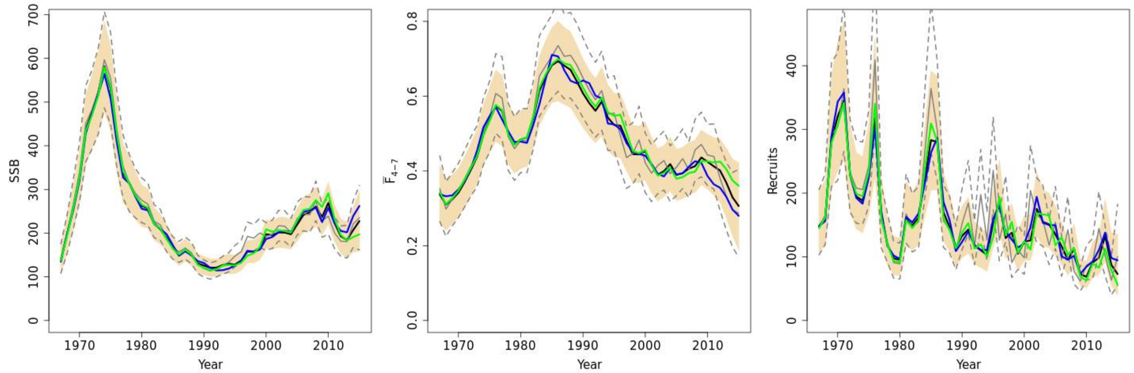


Figure 18. Trends in SSB, F_{4-7}, and recruitment for the 3 models. Blue line: Q1 + Q3 + cpue index model; green line: cpue-only model; black line: Q3 + cpue model; orange/tan shaded region: 95% confidence interval for the Q3 + cpue model; solid grey line (dashed): old Q3 + cpue model (95% confidence interval). The old Q3 model was estimated without removing the southern North Sea (where saithe are not found) and the Skagerrak (see amendment to WD 8 for details).

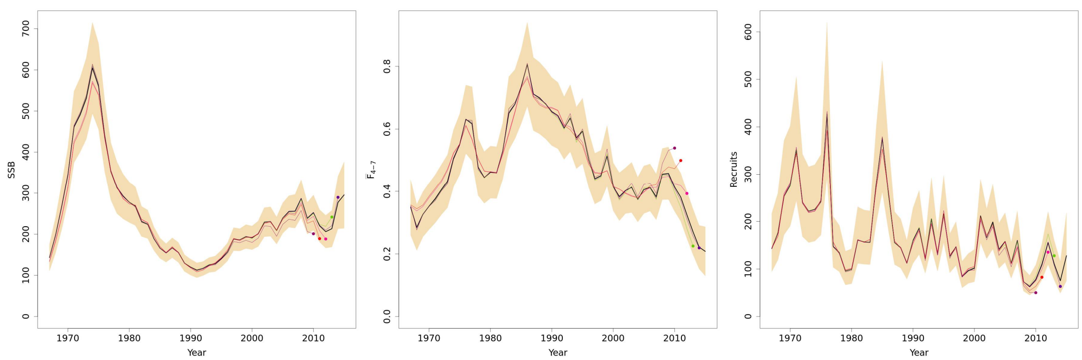


Figure 19. Five year retrospective pattern in SSB, F_{4-7}, and recruitment. Model is FBI + Q1 + Q3 (untruncated spatial area) and does not include the discard revisions.

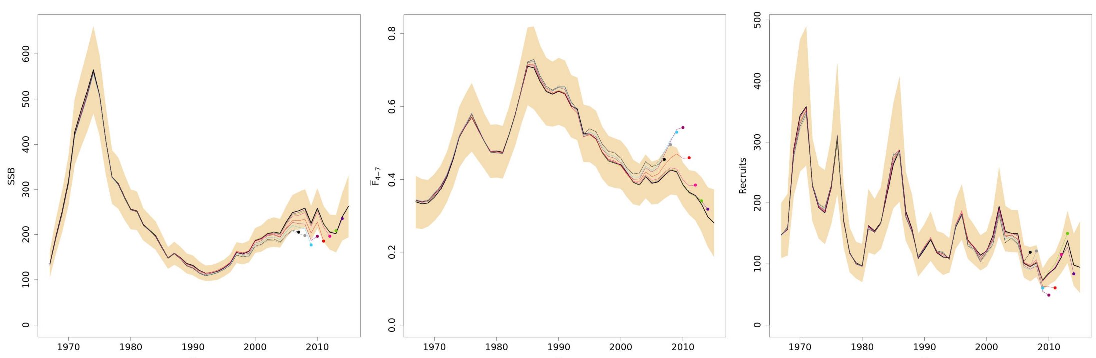


Figure 20. Eight year retrospective pattern in SSB, F_{4-7}, and recruitment. Model is FBI + Q1 + Q3 (untruncated spatial area) and includes the discard revisions.

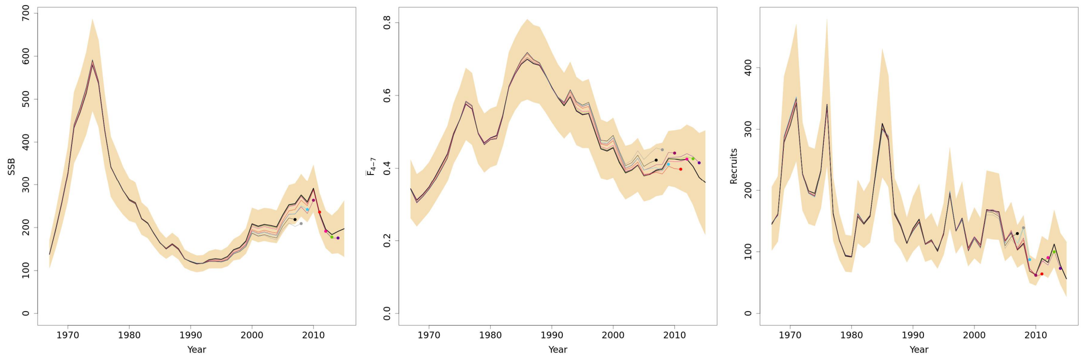


Figure 21. Eight year retrospective pattern in SSB, $F_{4\text{-}7}$, and recruitment. Model is FBI index only (no surveys) and includes the discard revisions.

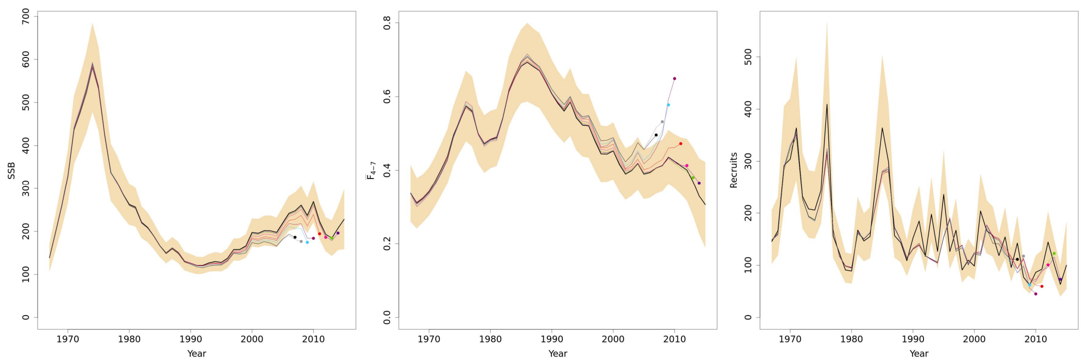


Figure 22. Eight year retrospective pattern in SSB, $F_{4\text{-}7}$, and recruitment. Model is FBI + new Q3 (excludes Skagerrak/Kattegat and southern North Sea) and includes the discard revisions.

APPENDIX

Reference Points and catch options

Reference Points estimated for the benchmark model, which includes the Q1, Q3 (untruncated spatially), and FBI indices are in Table A1; catch options are in Table A2 and basis for the catch options are in Table A3.

For the model that has only the FBI index (no surveys), reference points are in Table A4, catch options are in Table A5, and basis for the catch options are in Table A6.

Table A7 contains reference points estimated from the assessment model that includes the FBI and spatially truncated Q3 indices, where the Q3 indices do not include the southern North Sea or Skagerrak/Kattegat. Catch options are in Table A8 and basis for the catch options are in Table A9.

Table A1. Reference points estimated using the benchmark model (FBI + Q1+ Q3 no spatial truncation).

STOCK	
Reference point	Value
B_{lim}	115 000
$B_{pa\ (1.4)}$	161 000
$B_{pa\ (sigma)}$	142 000
$B_{trigger}$	182 000
F_{lim}	0.55
$F_{pa\ (1.4)}$	0.393
$F_{pa\ (sigma)}$	0.419
F_{MSY} without $B_{trigger}$	0.359
F_{MSY} lower without $B_{trigger}$	0.204
F_{MSY} upper without $B_{trigger}$	0.492
New $F_{P.05}$ (5% risk to B_{lim} without $B_{trigger}$)	0.422
F_{MSY} upper precautionary without $B_{trigger}$	0.393
$F_{P.05}$ (5% risk to B_{lim} with $B_{trigger}$)	0.534
F_{MSY} with $B_{trigger}$	0. 396
F_{MSY} lower with $B_{trigger}$	0.209
F_{MSY} upper with $B_{trigger}$	0.694
F_{MSY} upper precautionary with $B_{trigger}$	0.393
MSY (without HCR)	91 480
Median SSB at F_{MSY} (without HCR)	220 827
Median SSB lower precautionary (median at F_{MSY} upper precautionary; without HCR)	195 709
Median SSB upper (median at F_{MSY} lower; without HCR)	420 907

Sigma (F) = 0.1653818, sigma (SSB) = 0.1300388.

Table A2. Saithe in Subareas 4 and 6 and Division 3a. The catch options. All weights in tonnes.

Rationale	Total catches 2017 *	Wanted catch 2017 *	Wanted catch 3a & 4 2017 **	Wanted catch 6 2017 **	Basis	F (total catch) 2017	F (wanted catch) 2017	SSB 2018	% SSB change ***	% TAC change wanted catch^
MSY approach	133332	127631	115634	11997	F_{MSY}	0.36	0.34	322434	-3	86
EU-Norway management strategy	82261	78824	71415	7409	Paragraph 5 of management strategy	0.21	0.20	374902	13	15
Precautionary approach	298993	284409	257675	26734	SSB = min{1; $SSB_{2017}/B_{trigger}$}	1.08	1.03	161000	-51	315
Zero catch	0	0	0	0	F = 0	0	0	461461	39	-100
Other options	79730	76405	69223	7182	F_{2016}	0.20	0.19	377503	14	11
	71619	68601	62153	6448	TAC_{2016}	0.18	0.17	386190	17	0
	143773	137641	124703	12938	F_{pa}	0.39	0.38	311808	-6	101

Table A3. Saithe in Subareas 4 and 6 and Division 3a. The basis for the catch options.

Variable	Value	Source	Notes
F ages 4–7 (2016)	68601 t	ICES (2016a)	TAC constraint (F=0.20)
SSB (2016)	284887 t	ICES (2016a)	SSB in the intermediate year
SSB (2017)	331048 t	ICES (2016a)	SSB at the beginning of the TAC year
R_{age3} (2016)	101 billion	ICES (2016a)	Median recruitment resampled from 2003-2015
R_{age3} (2017)	101 billion	ICES (2016a)	Median recruitment resampled from 2003-2015
Total catch (2016)	71775 t	ICES (2016a)	Assuming 2015 landings fraction by age
Commercial landings (2016)	68601 t	ICES (2016a)	TAC 2015
Discards (2016)	3174 t	ICES (2016a)	Assuming 2015 discard fraction by age

Table A4. Reference points estimated using the FBI index only model (no surveys).

STOCK	
Reference point	Value
B_{lim}	115 000
$B_{pa\ (1.4)}$	161 000
$B_{pa\ (sigma)}$	151 000
$B_{trigger}$	161 000
F_{lim}	0.506
$F_{pa\ (1.4)}$	0.361
$F_{pa\ (sigma)}$	0.364
F_{MSY} without $B_{trigger}$	0.361 (was 0.405)
F_{MSY} lower without $B_{trigger}$	0.208
F_{MSY} upper without $B_{trigger}$	0.454
New $F_{P.05}$ (5% risk to B_{lim} without $B_{trigger}$)	0.384
F_{MSY} upper precautionary without $B_{trigger}$	0.361
$F_{P.05}$ (5% risk to B_{lim} with $B_{trigger}$)	0.447
F_{MSY} with $B_{trigger}$	0. 38
F_{MSY} lower with $B_{trigger}$	0.211
F_{MSY} upper with $B_{trigger}$	0.595
F_{MSY} upper precautionary with $B_{trigger}$	0.361
MSY (without HCR)	82 466
Median SSB at F_{MSY} (without HCR)	197 952
Median SSB lower precautionary (median at F_{MSY} upper precautionary; without HCR)	197 952
Median SSB upper (median at F_{MSY} lower; without HCR)	377 258

Sigma (F) = 0.1651571, sigma (SSB) = 0.1997418.

Table A5. Saithe in Subareas 4 and 6 and Division 3a. The catch options. All weights in tonnes.

Rationale	Total catches 2017 *	Wanted catch 2017 *	Wanted catch 3a & 4 2017 **	Wanted catch 6 2017 **	Basis	F (total catch) 2017	F (wanted catch) 2017	SSB 2018	% SSB change ***	% TAC change wanted catch^
MSY approach	91749	85822	77755	8067	F_{MSY}	0.36	0.34	221501	5	25
EU-Norway management strategy	84592	79134	71695	7439	Paragraph 5 of management strategy	0.33	0.31	228215	8	15
Precautionary approach	157658	147368	133515	13853	SSB = min{1; $SSB_{2017}/B_{trigger}$}	0.71	0.68	161000	-24	115
Zero catch	0	0	0	0	F = 0	0	0	309384	47	-100
Other options	80442	75253	68179	7074	F_{2016}	0.31	0.30	232171	10	10
	73037	68601	62153	6448	TAC_{2016}	0.28	0.26	240108	14	0
	91749	85822	77755	8067	F_{pa}	0.36	0.34	221501	5	25

Table A6. Saithe in Subareas 4 and 6 and Division 3a. The basis for the catch options.

Variable	Value	Source	Notes
F ages 4–7 (2016)	68601 t	ICES (2016a)	TAC constraint (F=0.31)
SSB (2016)	199173 t	ICES (2016a)	SSB in the intermediate year
SSB (2017)	211158 t	ICES (2016a)	SSB at the beginning of the TAC year
R_{age3} (2016)	103 billion	ICES (2016a)	Median recruitment resampled from 2003-2015
R_{age3} (2017)	103 billion	ICES (2016a)	Median recruitment resampled from 2003-2015
Total catch (2016)	72518 t	ICES (2016a)	Assuming 2015 landings fraction by age
Commercial landings (2016)	68601 t	ICES (2016a)	TAC 2015
Discards (2016)	3917 t	ICES (2016a)	Assuming 2015 discard fraction by age

Table A7. Reference points estimated using the FBI + Q3 (spatially truncated, excludes southern North Sea and Skagerrak/Kattegat) model.

Reference point	Value
B_{lim}	121 000
$B_{pa\ (1.4)}$	169 000
$B_{pa\ (sigma)}$	155 000
$B_{trigger}$	170 000
F_{lim}	0.514
$F_{pa\ (1.4)}$	0.367
$F_{pa\ (sigma)}$	0.376
F_{MSY} without $B_{trigger}$	0.363
F_{MSY} lower without $B_{trigger}$	0.205
F_{MSY} upper without $B_{trigger}$	0.461
New $F_{P.05}$ (5% risk to B_{lim} without $B_{trigger}$)	0.394
F_{MSY} upper precautionary without $B_{trigger}$	0.367
$F_{P.05}$ (5% risk to B_{lim} with $B_{trigger}$)	0.455
F_{MSY} with $B_{trigger}$	0. 382
F_{MSY} lower with $B_{trigger}$	0.208
F_{MSY} upper with $B_{trigger}$	0.607
F_{MSY} upper precautionary with $B_{trigger}$	0.367
MSY (without HCR)	87 658
Median SSB at F_{MSY} (without HCR)	209 632
Median SSB lower precautionary (median at F_{MSY} upper precautionary; without HCR)	206 489
Median SSB upper (median at F_{MSY} lower; without HCR)	402 573

Sigma (F) = 0.189643, sigma (SSB) = 0.1512602.

Table A8. Saithe in Subareas 4 and 6 and Division 3a. The catch options. All weights in tonnes.

Rationale	Total catches 2017 *	Wanted catch 2017 *	Wanted catch 3a & 4 2017 **	Wanted catch 6 2017 **	Basis	F (total catch) 2017	F (wanted catch) 2017	SSB 2018	% SSB change ***	% TAC change wanted catch^
MSY approach	114375	109057	98806	10251	F_{MSY}	0.36	0.35	275385	0	59
EU-Norway management strategy	82766	78909	71492	7417	Paragraph 5 of management strategy	0.25	0.24	307208	12	15
Precautionary approach	224186	212434	192465	19969	SSB = min{1; $SSB_{2017}/B_{trigger}$}	0.87	0.83	169000	-38	210
Zero catch	0	0	0	0	F = 0	0	0	391963	43	-100
Other options	79803	76084	68932	7152	F_{2016}	0.24	0.23	310253	13	11
	72198	68601	62153	6448	TAC_{2016}	0.21	0.20	315995	15	0
	115286	109922	99589	10333	F_{pa}	0.37	0.35	273885	0	60

Table A9. Saithe in Subareas 4 and 6 and Division 3a. The basis for the catch options.

Variable	Value	Source	Notes
F ages 4–7 (2016)	68601 t	ICES (2016a)	TAC constraint (F=0.24)
SSB (2016)	242142 t	ICES (2016a)	SSB in the intermediate year
SSB (2017)	274310 t	ICES (2016a)	SSB at the beginning of the TAC year
R_{age3} (2016)	99 billion	ICES (2016a)	Median recruitment resampled from 2003-2015
R_{age3} (2017)	99 billion	ICES (2016a)	Median recruitment resampled from 2003-2015
Total catch (2016)	72064 t	ICES (2016a)	Assuming 2015 landings fraction by age
Commercial landings (2016)	68601 t	ICES (2016a)	TAC 2015
Discards (2016)	3463 t	ICES (2016a)	Assuming 2015 discard fraction by age

Catchabilities of surveys in SAM

Benchmark model: Q1 + Q3 (untruncated) + combined cpue

	Fleet	Age	Estimate	Low	High
logFpar	Q3	3	27.0	21.3	34.4
logFpar	Q3	4	41.6	32.8	52.8
logFpar	Q3	5	30.5	24.0	38.8
logFpar	Q3	6	21.4	16.7	27.3
logFpar	Q3	7	14.3	11.0	18.4
logFpar	Q3	8	17.2	13.1	22.7
logFpar	Q1	5	22.1	17.6	27.7
logFpar	Q1	6	17.2	13.7	21.7
logFpar	Q1	7	14.0	11.1	17.8
logFpar	Q1	8	12.7	9.9	16.3

Model: Q3 (truncated, no Skagerrak) + combined cpue

	Fleet	Age	Estimate	Low	High
logFpar	Q3	3	52.4	38.4	71.5
logFpar	Q3	4	67.8	49.8	92.3
logFpar	Q3	5	56.4	41.4	76.9
logFpar	Q3	6	39.9	29.2	54.6
logFpar	Q3	7	27.1	19.6	37.4
logFpar	Q3	8	27.2	19.3	38.1

Model: DATRAS standard Q3 indices (no Skagerrak) + combined cpue

	Fleet	Age	Estimate	Low	High
logFpar	Q3	3	0.06	0.04	0.08
logFpar	Q3	4	0.09	0.06	0.13
logFpar	Q3	5	0.07	0.05	0.10
logFpar	Q3	6	0.05	0.03	0.07
logFpar	Q3	7	0.03	0.02	0.04
logFpar	Q3	8	0.03	0.02	0.05

Model: Q3 (no 2015, truncated, no Skagerrak) + combined cpue

	Fleet	Age	Estimate	Low	High
logFpar	Q3	3	50.9	37.2	69.7
logFpar	Q3	4	66.9	49	91.4
logFpar	Q3	5	55.4	40.5	75.8
logFpar	Q3	6	40.6	29.5	55.8
logFpar	Q3	7	27	19.5	37.5
logFpar	Q3	8	26.3	18.7	37.2

Model: Q3 (truncated, no Skagerrak) + combined cpue + sw=cw ages 7-10

	Fleet	Age	Estimate	Low	High
logFpar	Q3	3	52.7	38.6	71.8
logFpar	Q3	4	68.2	50.1	92.7
logFpar	Q3	5	56.7	41.6	77.2
logFpar	Q3	6	42.1	30.8	57.5
logFpar	Q3	7	26.9	19.5	37
logFpar	Q3	8	27.1	19.3	38

Catchabilities were estimated using the code provided by Anders. Because the code spit an error in SAM (which is why it was commented out at the benchmark), the code was slightly modified to work on the downloaded SAM objects and to create a table with 'age' set to the age range used.

```
## DATRAS Q3 (no Skagerrak) + combined cpue ##---------------------------------------------
conflines<-readLines("C:\\Users\\jenniferd\\Documents\\_2016\\WGNSSK\\Assessment\\__AFTER  2nd review\\NS_saithe_cortest2_DATRASQ3\\conf\\model.cfg")
fit.current<-read.fit("C:\\Users\\jenniferd\\Documents\\_2016\\WGNSSK\\Assessment\\__AFTER  2nd review\\NS_saithe_cortest2_DATRASQ3\\run")
idx1<-grep('Coupling of catchability PARAMETERS',conflines)
idx2<-grep('Coupling of power law model EXPONENTS',conflines)
num<-scan(conffile, skip=idx1, comment.char='#', quiet=TRUE, nlines=idx2-idx1)
a<-scan(conffile, comment.char='#', quiet=TRUE, n=2)
key<-matrix(num, ncol=diff(a)+1, byrow=TRUE)
o<-order(key[key>0])
fleet<-row(key)[key>0][o]
age<-c(3:8)             ## original code: age<-col(key)[key>0][o] ## gives ages as #1-6
cbind(fleet,age,round(exp(fit.current$logFpar[key[key>0][o],c(1,3,4)])*1000,2))
```

Alternate SAM models

DATRAS standard Q3 index

The standard DATRAS Q3 indices (DATRAS indies), ages 3-8, 1992-2015 were used instead of the GAM generated indices in the SAM assessment model. Figure 1 shows the indices and the internal consistencies. The standard indices do not include the Skagerrak/Kattegat, but do include the southern North Sea (where saithe are no found). The truncated GAM-derived Q3 index (no Skagerrak/Kattegat or southern NS were compared with the DATRAS estimates for the expanded age range (Figure 2). The GAM and standard DATRAS indices are (generally) very similar. However, ages 4 and 5, especially in the last 2 years, are over-estimated by the GAM (especially age 5).

Results of the SAM assessment are in Figure 3. Estimated SSB using the DATRAS indices closely mirrors estimates from the cpue-only model until around 2010, unlike the model with Q3 indices estimated with the GAM model. The DATRAS model shows slightly lower SSB than the Q3 GAM indices in 2015. Retrospective patterns show that SSB has been consistently underestimated, while fishing mortality has been mostly over-estimated. The retrospective patterns in F_{4-7} are not as poor as the model with the Q3 GAM indices. Residual plots are in Figure 5. Estimated catchabilities were very low for the DATRAS model, compared to the indices estimated with the GAM model.

GAM Q3 index but without 2015

Results of the SAM assessment are in Figure 6. Omitting the 2015 Q3 data resulted in SSB_{2015} estimates lying between those estimated by the cpue-only model and the GAM-estimated Q3 (with 2015) model. Retrospective patterns are in Figure 7; retrospectives are worse than the model including 2015 data (Figure 8). Residual patterns are in Figure 9.

GAM Q3 index but with stock weights=catch weights for ages 7-10+

Not finished – bounds for stock weights

Results of the SAM assessment are in Figure 10. Replacing stock weights with catch weights for ages 7-10+ (where stock weights were greater than catch weights) made a large difference in the SAM output. While SSB still increases in the last two years of the series, SSB is lower for this model until 2014 than all other models. Retrospective patterns are in Figure 11. Residual patterns are in Figure 12.

DATRAS Q3 index but with stock weights=catch weights for all ages

Results of the SAM assessment are in Figure 13; this is the model recommended as the final model based on the external review in early June. Replacing stock weights with catch weights for all ages had the effect of increasing SSB in comparison with the model where stock weights were replaced for ages 7-10+. This is because for ages 3-6, catch weights are higher than stock weights (Figure 14); these are the fish the make up the dominant part of the catch for the targeted trawl fisheries. Retrospective patterns are in Figure 15 and residuals are in Figure 16.

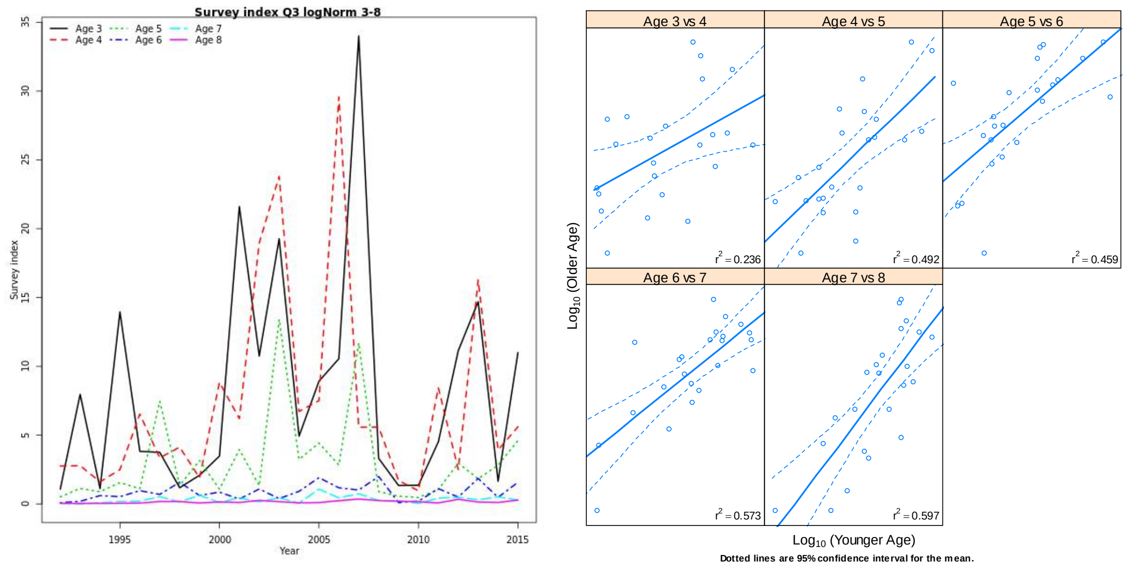


Figure 1. Standard DATRAS indices for Q3, 1992-2015, ages 3-8 and internal consistencies.

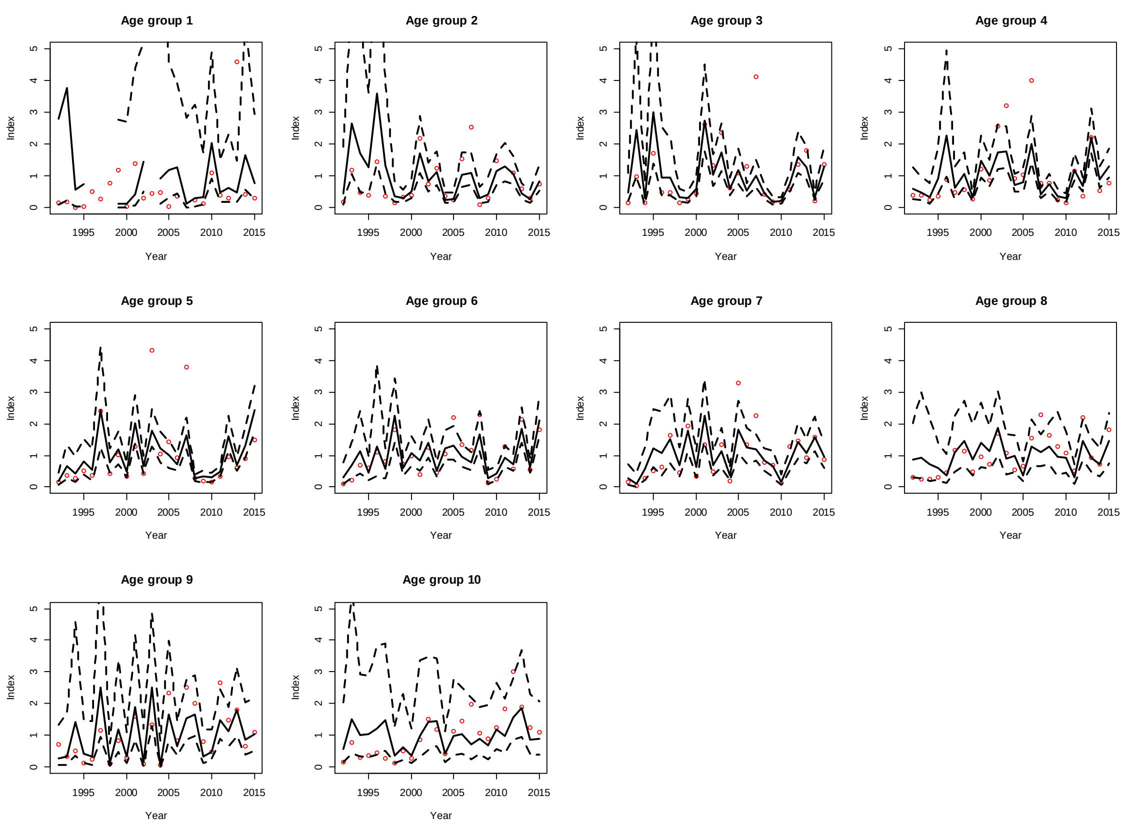


Figure 2. Standard DATRAS indices for Q3, 1992-2015, ages 3-8.

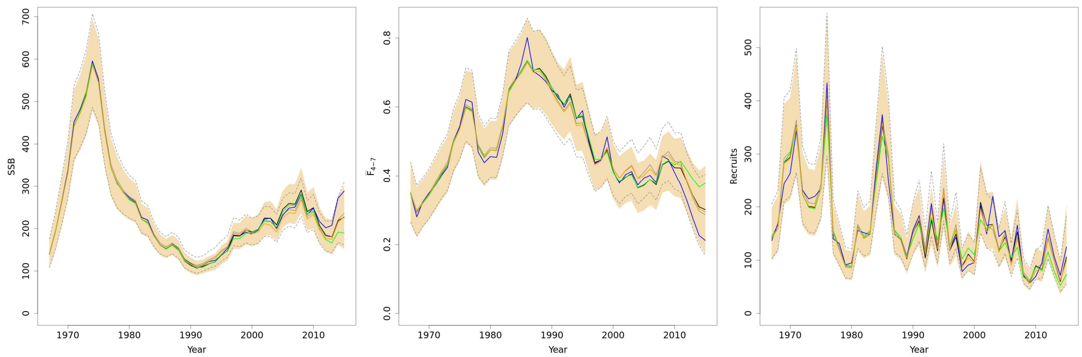


Figure 3. Trends in SSB, F_{4-7}, and recruitment for the 4 models. Blue line: Q1 + GAM-estimated Q3 + cpue index model; green line: cpue-only model; orange line: combined cpue + GAM-estimated Q3 (truncated to exclude Skagerrak/Kattegat and southern NS); black line: DATRAS Q3 + cpue model; orange/tan shaded region: 95% confidence interval for the DATRAS Q3 + cpue model; solid grey line (grey dashed confidence intervals) are the previously saved base model (unknown at this point).

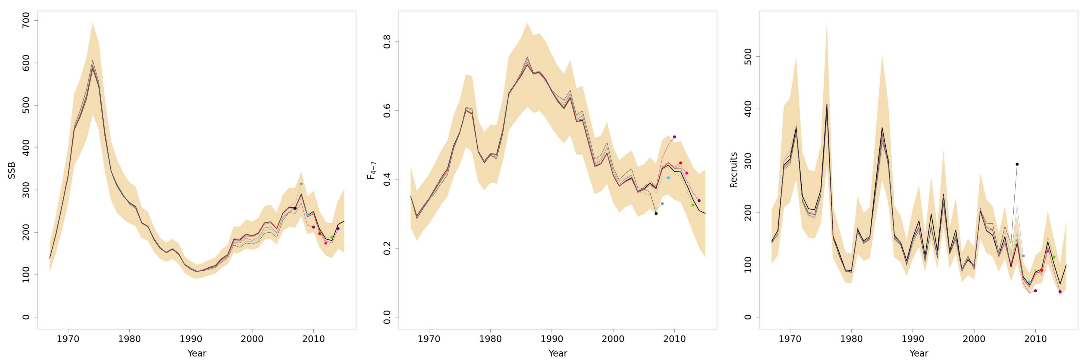


Figure 4. Eight year retrospective pattern in SSB, F_{4-7}, and recruitment. Model is combined cpue + DATRAS Q3 and includes the discard revisions.

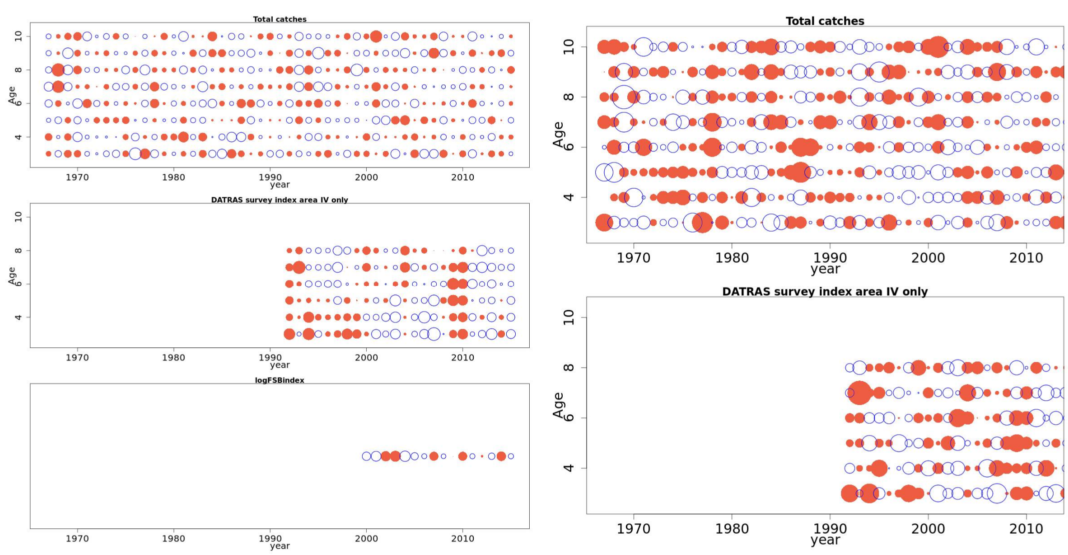


Figure 5. Residual patterns for the combined cpue + DATRAS Q3 assessment model. (left) Before correlation taken into account between ages, within years in the Q3 index; (right) after accounting for the correlation.

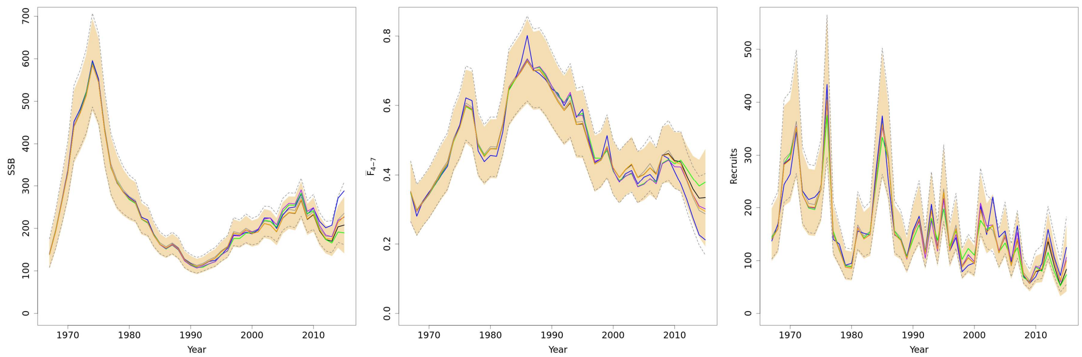


Figure 6. Trends in SSB, $F_{4\text{-}7}$, and recruitment for the 5 models. Blue line: Q1 + GAM-estimated Q3 + cpue index model; green line: cpue-only model; orange line: combined cpue + GAM-estimated Q3 (truncated to exclude Skagerrak/Kattegat and southern NS); purple line: DATRAS Q3 + cpue model; black line (orange/tan shaded region: 95% confidence interval): GAM-estimated Q3 indices without 2015 + cpue model; solid grey line (grey dashed confidence intervals) are the previously saved base model (unknown at this point).

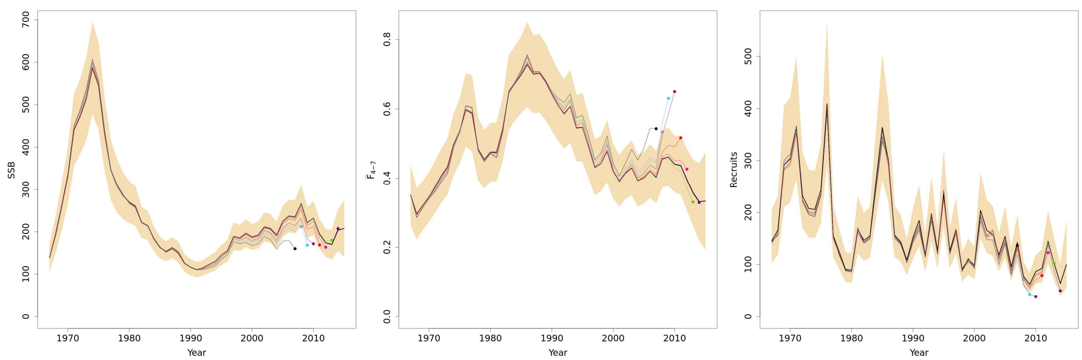


Figure 7. Eight year retrospective pattern in SSB, $F_{4\text{-}7}$, and recruitment. Model is combined cpue + GAM-estimated Q3 (without 2015, excludes Skagerrak/Kattegat and southern North Sea) and includes the discard revisions.

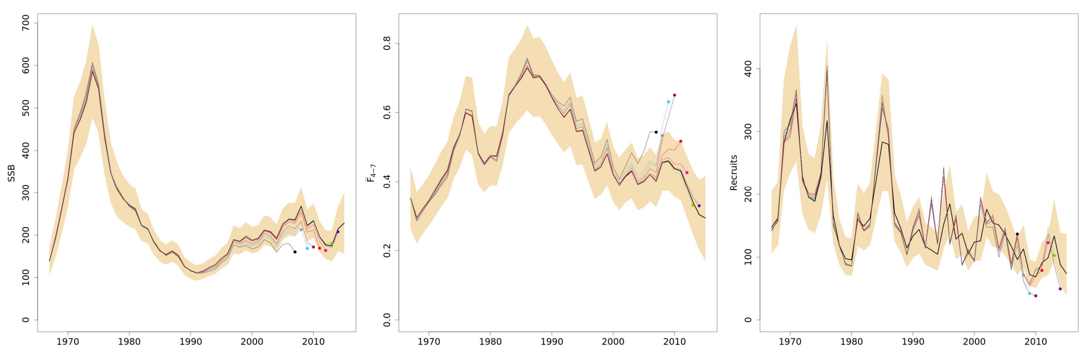


Figure 8. Eight year retrospective pattern in SSB, $F_{4\text{-}7}$, and recruitment. Model is combined cpue + GAM-estimated Q3 (excludes Skagerrak/Kattegat and southern North Sea) and includes the discard revisions.

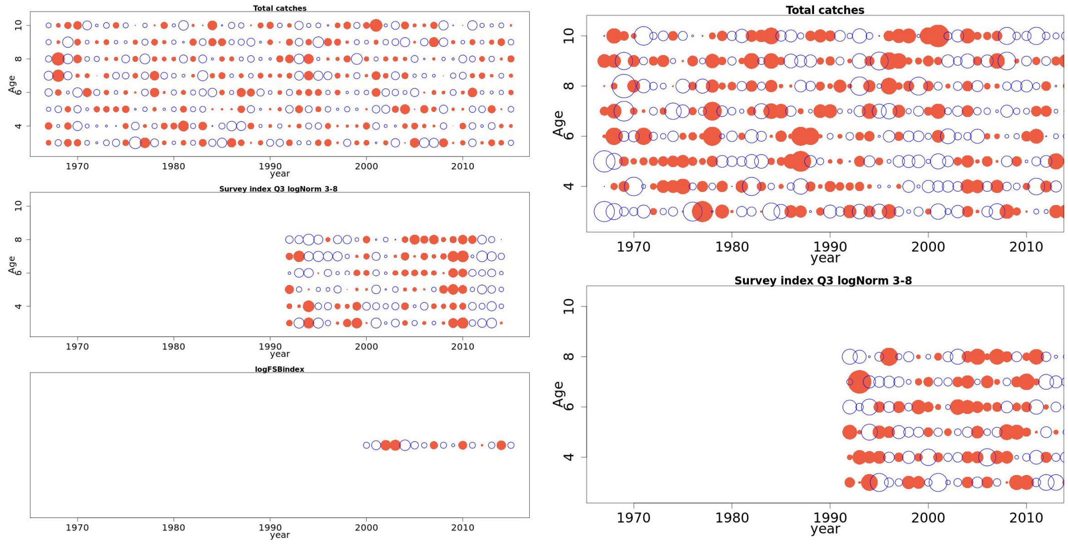


Figure 9. Residual patterns for the combined cpue + GAM-estimated Q3 assessment model (no 2015). (left) Before correlation taken into account between ages, within years in the Q3 index; (right) after accounting for the correlation.

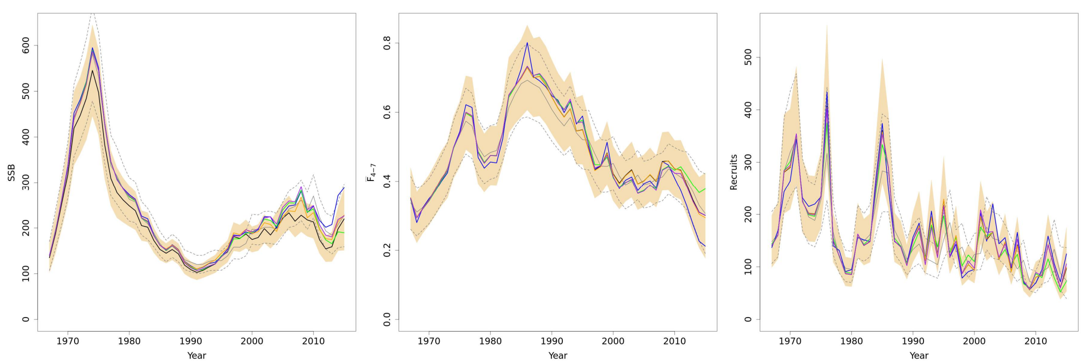


Figure 10. Trends in SSB, F_{4-7}, and recruitment for the 5 models. Blue line: Q1 + GAM-estimated Q3 + cpue index model; green line: cpue-only model; orange line: combined cpue + GAM-estimated Q3 (truncated to exclude Skagerrak/Kattegat and southern NS); purple line: DATRAS Q3 + combined cpue; black line (orange/tan shaded region: 95% confidence interval): GAM-estimated Q3 indices + cpue model + stock weights=catch weights for ages 7-10+; solid grey line (grey dashed confidence intervals) are the previously saved base model (unknown at this point).

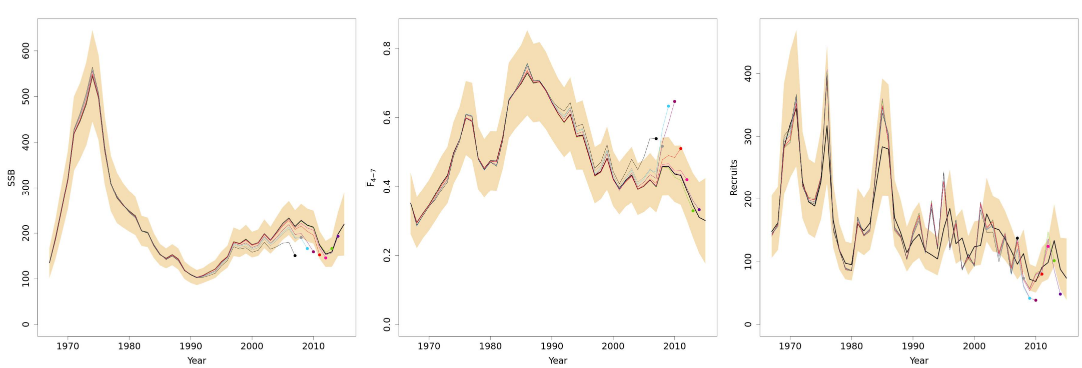


Figure 11. Eight year retrospective pattern in SSB, F_{4-7}, and recruitment. Model is combined cpue + GAM-estimated Q3 (excludes Skagerrak/Kattegat and southern North Sea) + stock weights=catch weights for ages 7-10+ (includes discard revisions).

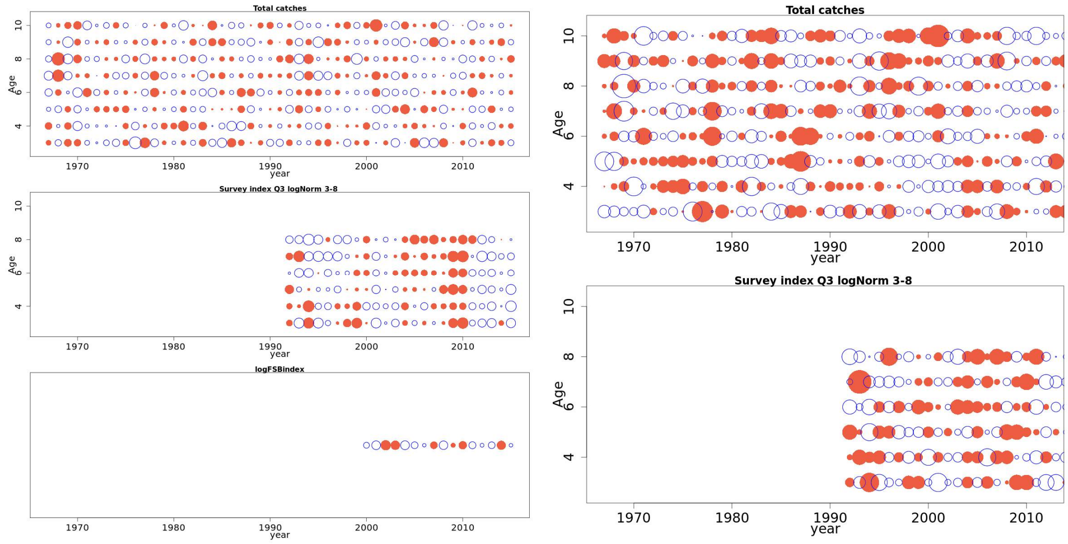


Figure 12. Residual patterns for the combined cpue + GAM-estimated Q3 + stock weights=catch weights for ages 7-10+ assessment model. (left) Before correlation taken into account between ages, within years in the Q3 index; (right) after accounting for the correlation.

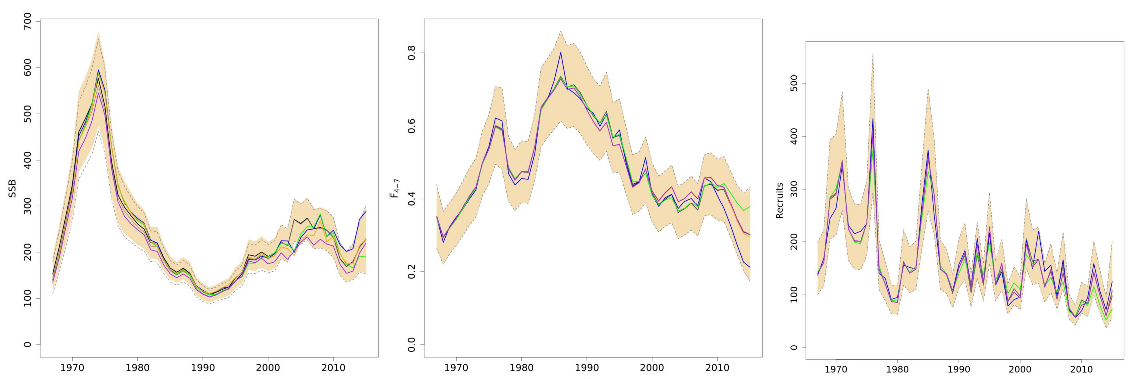


Figure 13. Trends in SSB, F_{4-7}, and recruitment for various models. Blue line: (benchmark model) Q1 + GAM-estimated Q3 + combined cpue index model; green line: combined cpue-only model; orange line: combined cpue + GAM-estimated Q3 (truncated to exclude Skagerrak/Kattegat and southern NS); purple line: GAM-estimated Q3 indices + combined cpue model + stock weights=catch weights for ages 7-10+; black line (orange/tan shaded region: 95% confidence interval): DATRAS Q3 indices + combined cpue, stock weights=catch weights for all ages.

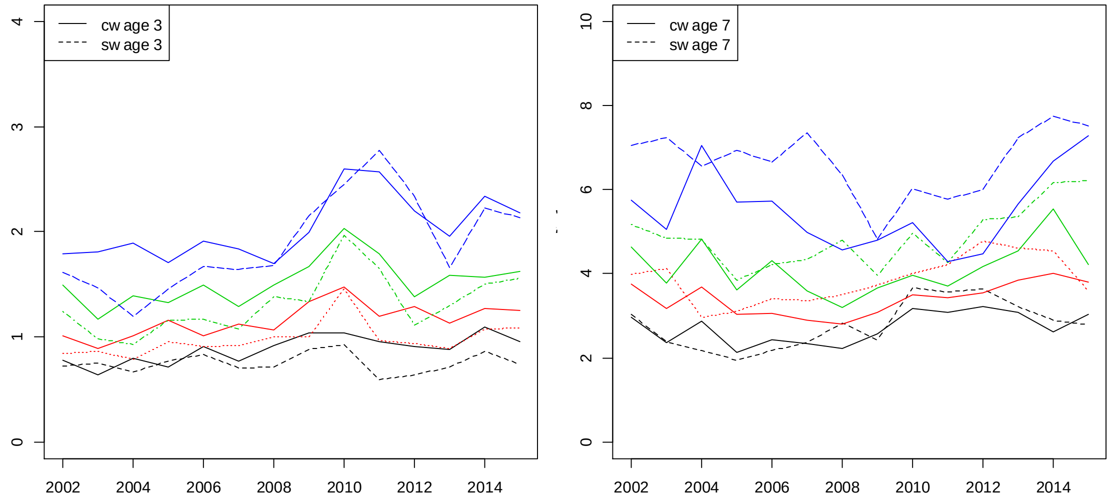


Figure 14. Stock weights (dashed lines) and catch weights (solid lines) for ages 1-10+. The left panel shows age 3 (black lines) to age 6 (light blue lines), while ages 7-10+ are in the right panel. This figure differs from the benchmark working document due to re-raising (InterCatch bug and changing of raising procedure for Norwegian discards).

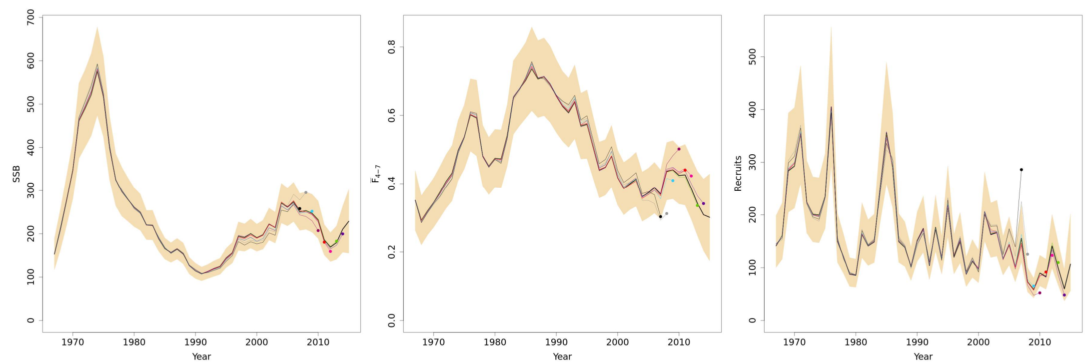


Figure 15. Eight year retrospective pattern in SSB, $F_{4\text{-}7}$, and recruitment. Model is combined cpue + DATRAS Q3 (excludes Skagerrak/Kattegat) + stock weights=catch weights for all ages (includes discard revisions).

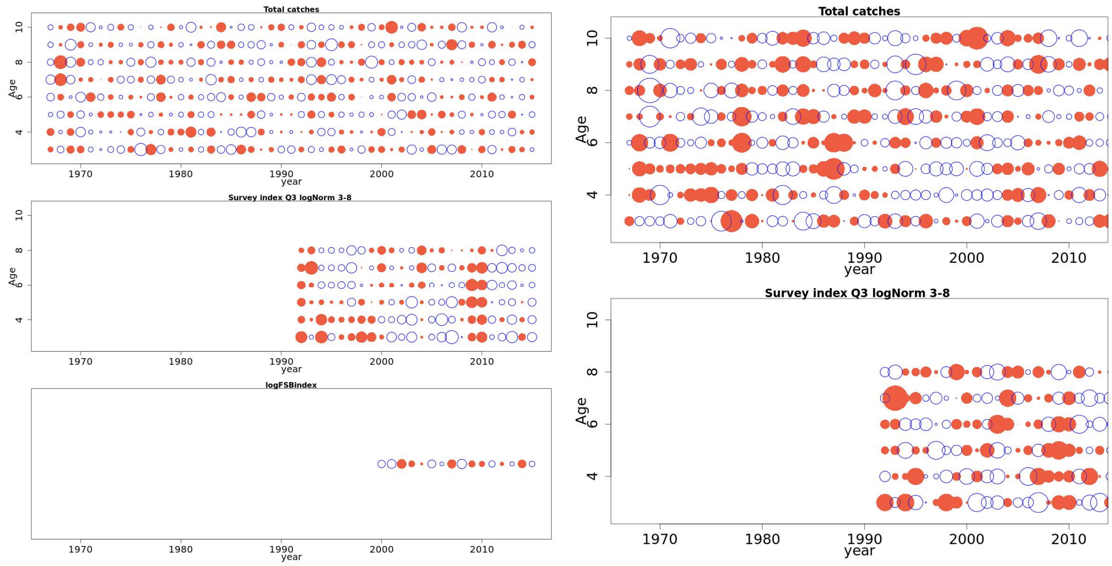


Figure 16. Residual patterns for the combined cpue + DATRAS Q3 (excludes Skagerrak/Kattegat) (stock weights=catch weights for all ages) assessment model. (left) Before correlation taken into account between ages, within years in the Q3 index; (right) after accounting for the correlation.

10. Recruitment data for saithe

Richard Nash, Jon Egil Skjæraasen, Jennifer Devine

Spawning areas for saithe are along shelf boundaries, typically at depths of 100–250 m. The North Sea saithe stock spawns predominantly along the shelf edge in the northern part of ICES divisions IV and VI (e.g. Jakobsen 1974; Figure 1). Egg surveys indicate saithe-type eggs are present these 'known' spawning areas.

The pelagic eggs generally drift east (e.g., Munk et al. 1999) and, within division IV, south-east. Planktonic dispersal is by ocean currents and physical processes at this stage, but at the late larval stage, distribution is also combined with vertical and horizontal behavior (see e.g. Fiksen et al. 2007, Staaterman & Paris 2013). Larvae occur over much of the northern North Sea during the early spring. Post-larval 0-groups of gadoids are often found in high concentrations in the same location and follow similar diel vertical migration patterns (Bromley et al. 1995), indicating that if all species passively drifted with the currents, they should be found within the same nursery areas. However, saithe are able to cross strong currents (e.g. Norwegian Coastal Current, Figure 1) to inshore areas, while other gadoid species are transported northwards before settling. Many juvenile saithe are found along the Norwegian coastline and within Norwegian fjords (e.g. Jakobsen 1976; Heino et al. 2012). Juvenile saithe originating from the North sea saithe spawning grounds are also found inshore along the coastline of the British Isles (Mente et al. 2008). Early work on saithe larvae distribution postulated that the Norwegian inshore nursery areas between 62° and 66° N were populated by saithe from the North Sea, west of Shetland, and Faroes spawning grounds, while those north of 66° N were from the grounds along the Norwegian shelf edge (Bjørdal & Skar 1992). More recent work has found that juveniles along Icelandic shores and off the Faroes Islands most likely originated from local spawning grounds in these areas (Armannsson et al. 2007, Homrom et al. 2015).

Surveys of O-group gadoids were undertaken in June-July in the northern North Sea between 1974 and 1983 using fine-meshed pelagic trawls (Holden 1981, Hislop et al. 1984). Saithe year class strength was not visible in the annual abundance estimates from these surveys (Heesen et al. 2015), i.e. year class strength was determined at a later date or these surveys were not appropriately timed or placed to indicate year class strength. Similarly, a 0-group survey of saithe was undertaken along the Norwegian coast from 58° N to 70° N from 1985-1993 (Figure 2, details in Nedreaas 1986, Nedreaas and *Smedstad* 1987, Bjørke and Sætre 1994). the Norwegian Institute of Marine Research (IMR) also conducted combined herring and saithe larval surveys from 1996-2014 (Figure 2). These indices were not useful for forecasting recruitment strength of the Northeast Arctic saithe (Nedreaas 1995), but did provide information on the distribution of larvae as well as show there was a clear mixing of stocks across management boundaries (Figure 3). Given that saithe as far north as 65° N may migrate southwards into the North Sea (see WD-1), these data may be useful if reanalysed, perhaps to serve as a guideline for how to design egg/larvae surveys targeted towards North Sea and North East Arctic saithe.

The IBTSWG, through WGEGGS2, has initiated an egg survey for determining the distribution of winter spawning in the North Sea, through simultaneous sampling with the MIK series (Figure 4; see ICES-WGEGGS2 2014, 2015). This survey utilises the MIK M attachments, with a mesh size suitable for fish eggs. Unfortunately, early stage gadoid eggs are identical and the only reliable identification method is through genetic techniques. Therefore, this survey can only give an indication of the abundance of eggs in the size range, which could be saithe, pollack, Norway pout, or whiting. This time series is short (begun in 2012) and must utilise external funding to work up the samples. Additional data exist on the abundance and distribution of larvae in the northern North Sea from egg and larvae surveys undertaken annually in April-May since 2012 by the Institute of Marine Research (see Figure 5). The samples are currently being worked up and the larvae identified, however, as with the MIK M survey, the time series is short and the sample processing is dependent on external funding sources.

Given the inability to create recruitment indices from 0-group surveys, data that might provide an indication of year class strength of saithe are most likely to be abundance indices from inshore areas, either at time of settlement or before migration out of the nursery area (i.e., the first three years of life). The nursery area for the North Sea stock encompasses the northern coastal area of the British Isles (including the west coast), the German Bight, around the Skagerrak, and along the Norwegian coast to (at minimum) the Møre district (Figures

1,6). Spawning of saithe does occur off the Møre district, but the nurseries are expected to be to the north and east of these spawning areas. This spawning area is currently not considered to be part of the North Sea saithe stock.

Surveys within the nursery area might provide good indices of recruitment because saithe tend to remain in these areas once they settle (Jakobsen 1978, Armannsson et al. 2007, Uglem et al. 2009). No large migrations between or amongst adjacent nursery grounds have been noted, indicating that saithe appear to have high fidelity to their nursery grounds (Bjordal & Johnstone 1993, Armannsson et al. 2007, Otterå & Skilbrei 2014). Tagging studies around aquaculture facilities within the nursery areas show that saithe tend to use these structures as the core of their home range, both in the short term (Bjordal & Johnstone 1993) and for longer periods (>1 year; Otterå & Skilbrei 2014), appearing to take advantage of improved feeding conditions provided by the excess food pellets (Mente et al. 2008) or other species (prey) that are attracted to these habitats.

Tagging studies from the 1970s and 1980s showed that migration of Northeast Arctic saithe from nursery areas to the coastal banks (recruitment to the ocean) began at age 2 and saithe of age 3 were rarely found inshore. North Sea populations are believed to conduct their outward migration between the ages of 2–5, first collecting at small underwater peaks along the Norwegian coastline from just south of Stavanger to just north of Bergen (Figure 7). The timing of the outward migration, which varies annually, is thought to be triggered by either prey migrations (e.g. krill) or starvation due to intraspecific competition when younger year classes migrate to inshore areas (Nedreaas 1985). A recent tagging study (Otterå & Skilbrei 2014) has shown that saithe in southern Norway are now migrating out of nursery areas at a larger size, which may indicate better growth due to better feeding conditions inshore (i.e. fish are larger for a given age) or that migration is delayed until fish are older. Changes in size and age at maturation, as a consequence of increased fishing pressure (e.g. Jørgensen et al. 2007) has not been investigated for saithe.

The NORASS survey, conducted 2006-2012 by IMR on the 'seiskalle' along the Norwegian coast from Stavanger to Bergen (Figure 7), was used as an index of recruitment in the North Sea saithe assessment for several years. This survey targeted young saithe after they migrated from the nursery areas (May-June), but before they entered into the North Sea. The index did not track cohorts well and the survey was discontinued in 2012. The survey was poorly designed and never meant to be used as a index of recruitment (in its form at the time of discontinuation). This information and that removing the index had no affect on the assessment resulted in its removal (ICES-WGNSSK 2013).

The Skagerrak beach seine survey, conducted 1919 to present (currently by IMR-Flødevigen) captures juvenile saithe (Figure 8). The saithe index from this survey is noisy, appears to be moderately influenced by dynamics in inflow water (Atlantic Water entering through the Norwegian Trench), and covers only a small portion of the saithe inshore habitat, so its usefulness may be limited. Johannessen (2014) gives complete details on the methods used for the beach seine work.

Norway (IMR) also maintains a coastal juvenile fish survey that is aimed, in part, at juvenile saithe. The first incarnation was the coastal bank survey (1985–2002, Figure 9), designed specifically to give an idea of saithe recruitment (age 3; see Nedreaas 1997). The survey covered mainly the trawl fishery grounds (ages 3-5+) and was thought to also partially represent age 2 fish (but was variable). Juvenile saithe were also partially surveyed in the coastal cod survey (1995–2002), but the index was limited due to the inshore distribution of saithe (difficult to survey with large vessels). These two surveys than became the current coastal survey, which surveys inside the fjords and along the outer banks, from the Norwegian-Russian border southwards to 62° N (Figure 9). Young saithe are not accessible to the large vessels inside the fjords, limiting the index. This index, or at least, the southernmost strata, might be useful to include as an index for North Sea saithe (for age 3, age at which they recruit to the fishery) since the stock boundary at 62° N is quite fluid (see WD-1). The final survey that is currently used in the assessment and for the autumn update (as an index of recruitment, age 3) is the IBTS Q3 survey (see ICES-IBTSWG 2015 for details).

The egg and larvae surveys are very unlikely to provide an index of recruitment. In general, egg surveys are considered good candidates for SSB indices. Larvae abundance or production indices, especially for gadoids, are likewise more likely to be indicators of SSB rather than recruitment.

Recommendations

1. A recruitment index should be initiated for this saithe stock.

2. The feasibility of a shallow water, inshore survey for 0-group saithe should be investigated, with the intention of providing an 0-group index. This could be in the form of a beach seine survey at selected sites in September/October each year. Depending on the objective, this may need to be co-ordinated to cover a range of locations e.g. Norway, Denmark/Sweden, and Scotland to provide an index for the whole stock.
3. Whilst not recruitment related, WGEGGS and IBTSWG should be encouraged to continue the egg surveys in conjunction with the MIK sampling as this will provide an indication of magnitude and location of spawning of gadoids in the North Sea, especially in the northern areas.

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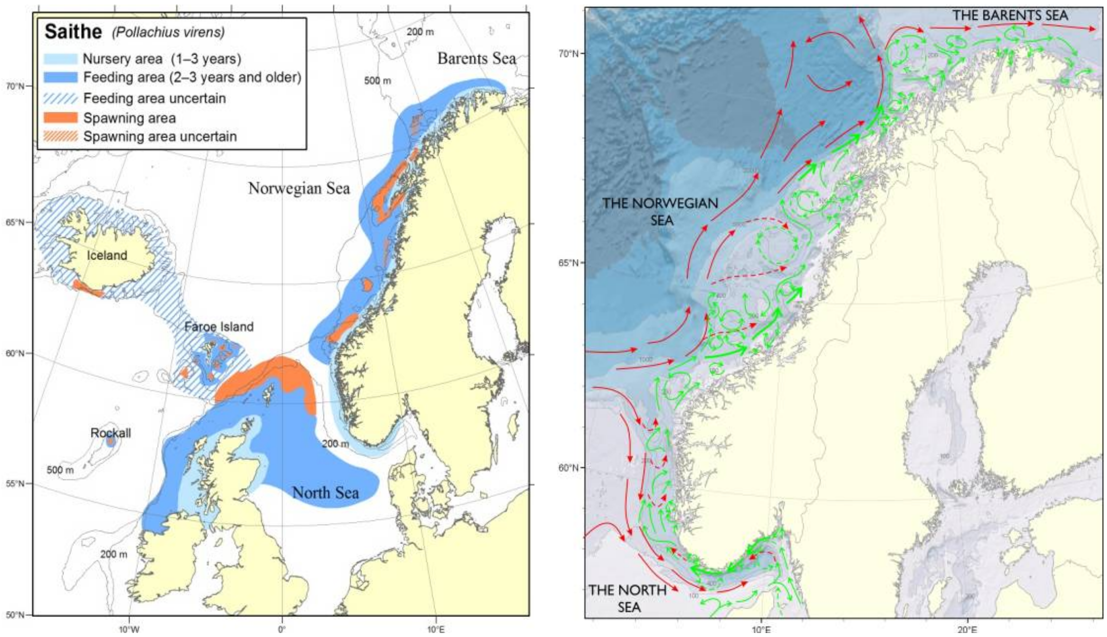


Figure. 1. (Left) Saithe spawning, nursery, and feeding areas in the northeast Atlantic (source: IMR). (Right) Norwegian coastal current (green) and Atlantic Water (red) currents along the Norwegian coast, through which larvae and early stage juveniles must navigate to reach nursery areas (source: IMR).

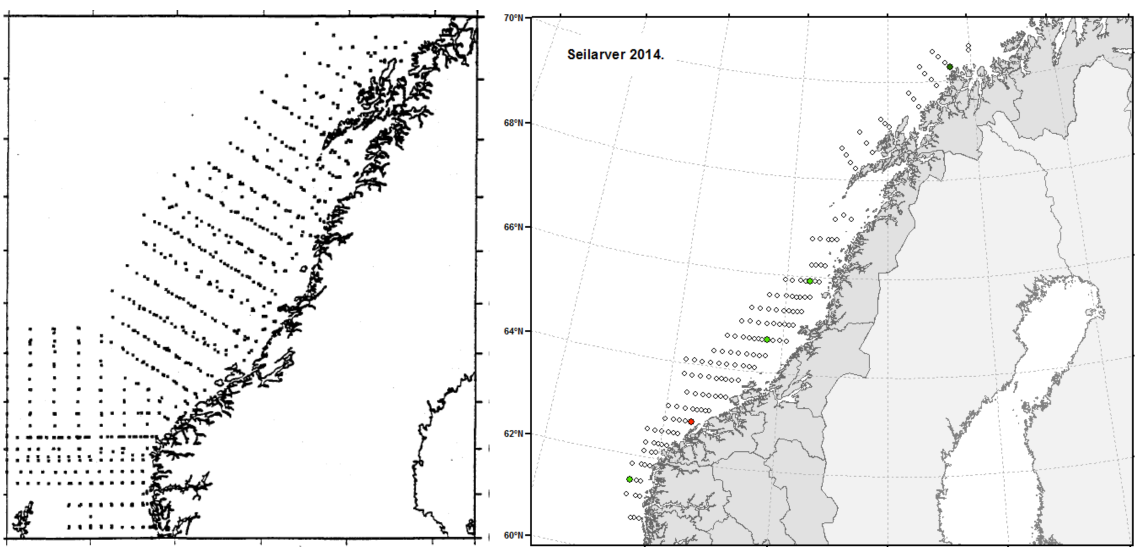


Figure 2. (Left) Location of the 1985–1993 0-group survey for saithe (taken from Bjørke and Sætre 1994). (Right) Location of the herring and saithe larval survey, conducted 1996-2014 by Norway's Institute of Marine Research.

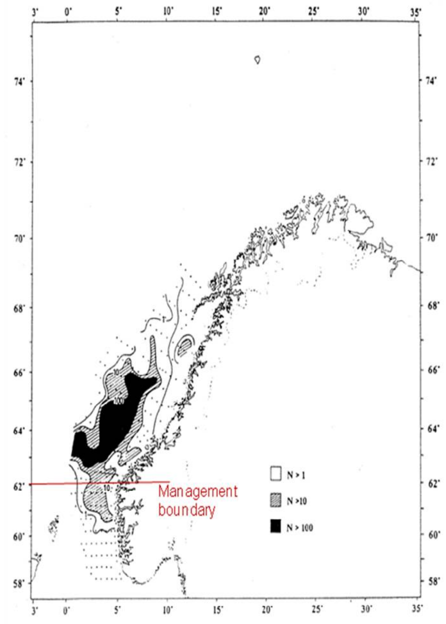


Figure 3. Distribution of 0-group saithe in 1986, taken from Bjørke and Sætre (1994).

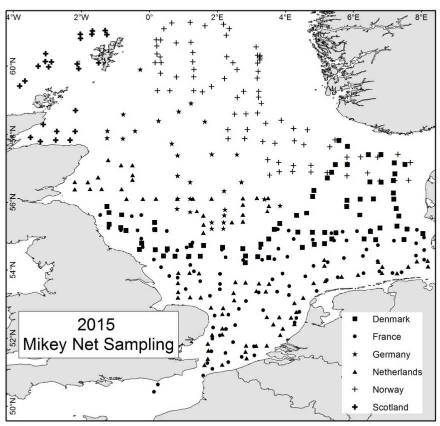


Figure 4. Coverage of the MIK M sampling in 2015 during the IBTS Q1 survey

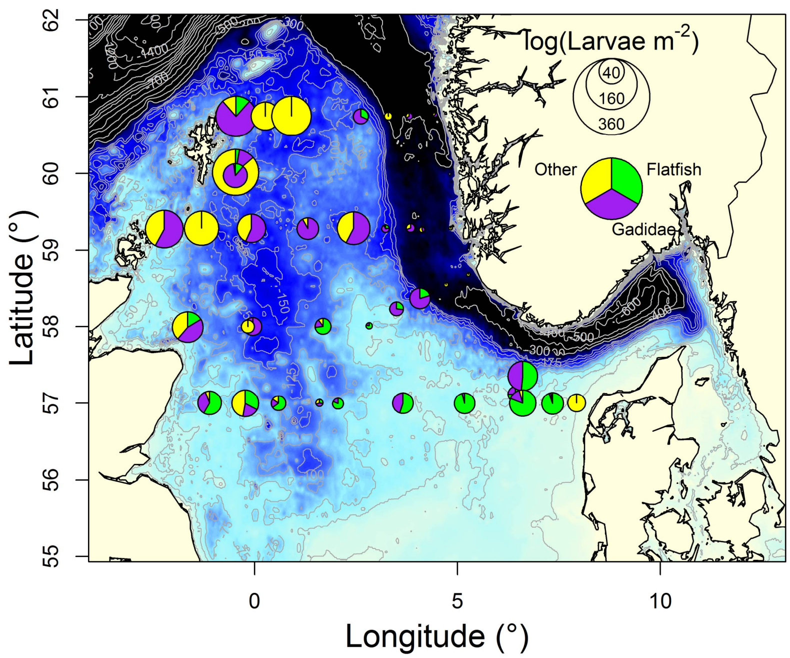


Figure 5. Survey coverage for larvae in April-May each year by the Institute of Marine Research, Norway. The data shown are for 2015.

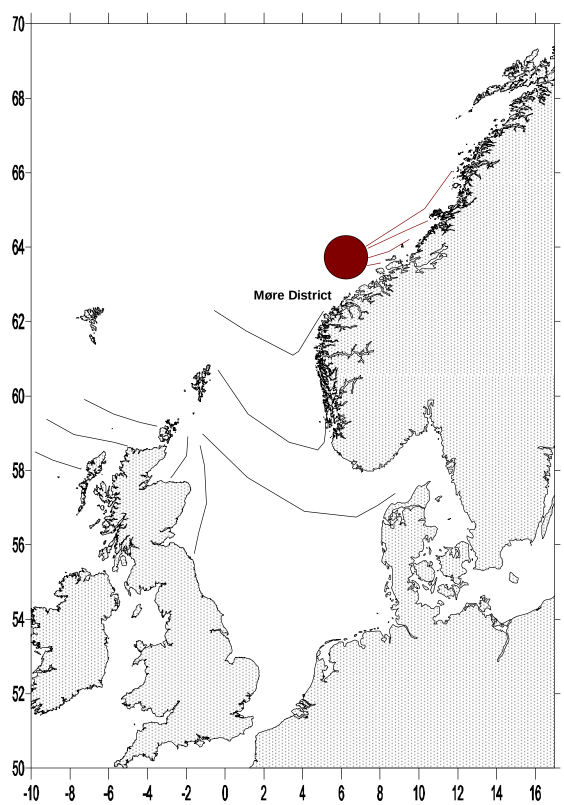


Figure 6. Linkages from spawning areas to nurseries for saithe. Red dot indicated a spawning area to the north of the Møre district of Norway and the northward location of its nursery areas.

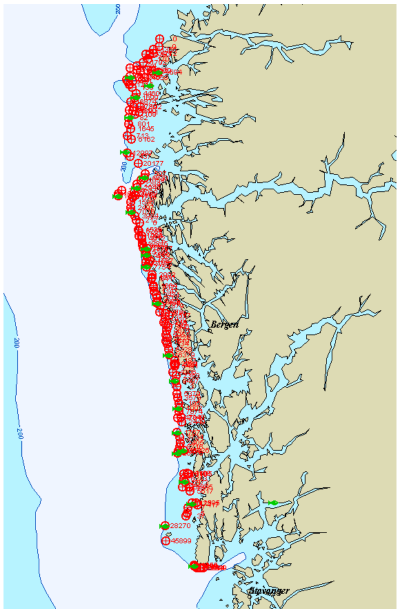


Figure 7. Location of small underwater peaks (seiskalle) along the Norwegian coast upon which, juvenile saithe congregate before recruiting to the North Sea (source: IMR).

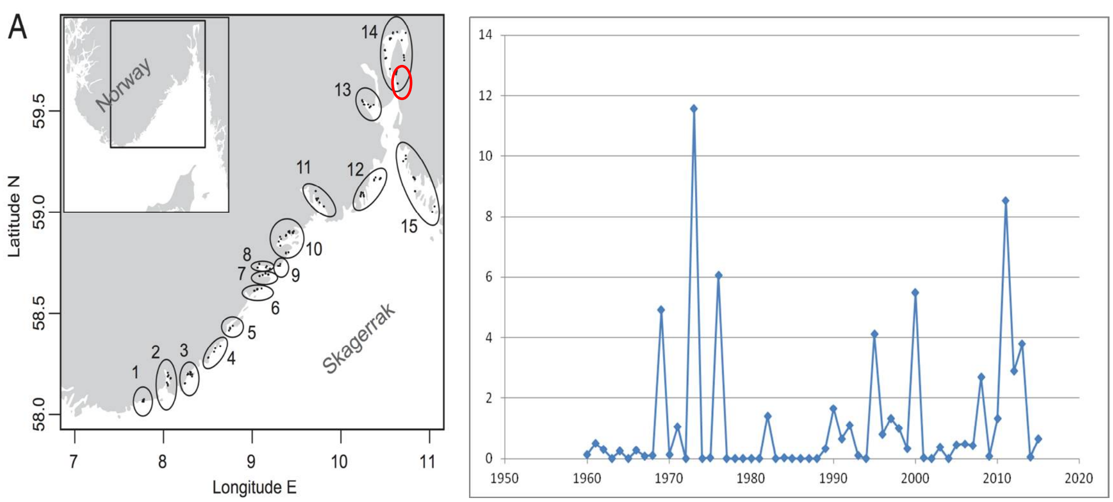


Figure 8. (Left) Location of the Norwegian beach seine survey in the Skagerrak, conducted 1919 to present (map taken from Johannessen 2014, chapter 2). Areas 11, 13 and 14 (with the exception of stations within the red circle) have been excluded from recent catches because there were ecosystem changes, e.g. major constructions, which would have seriously compromised the short time series. (Right) Mapped sites were used to create the index of 0-group saithe, 1960-2015.

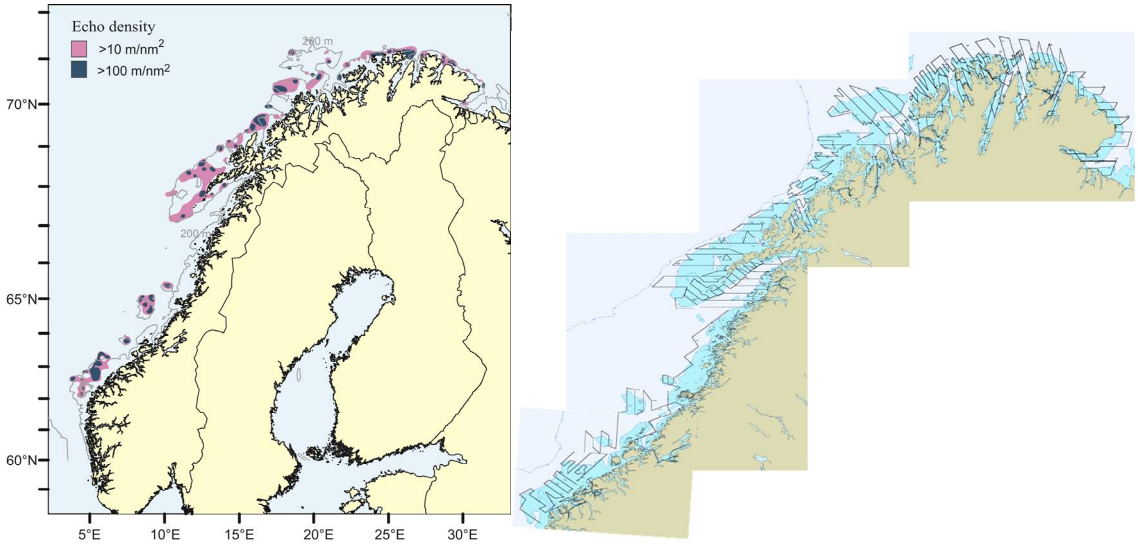


Figure 9. (left) Coastal bank acoustic survey (1985-2002) which was designed to cover the saithe trawl fishery grounds north of 62°N. (right) Survey transects of the coastal survey (2003-present), conducted by IMR, which extends from the Norwegian-Russian border to 62° N.

Annex 4: Dab Working Documents

The following working documents on dab were available to WKNSEA 2016 and are presented in full in this report:

Title	Description	Contributors
1. Survey indices for dab	Evaluation of different survey indices in order to inform the stock status of North Sea dab - combining BTS, ALKs from BTS to IBTS data, recruit survey results	H. Haslob, C. Berg, L. Bolle, I. de Boois
2. Catch data	Outcome and description of InterCatch raising (discards and landings)	H. Haslob, R. Verkempnyck, A. Kempf, D. Miller
3. Biological data	Evaluate and compile all available biological data for North Sea dab	H. Haslob, L. Bolle
5. Survey-based models	SURBA fits	H. Haslob, C. Needle

Working Document – Survey indices for dab in area IV and IIIa

H. Haslob, n.n.,

Introduction

A number of survey indices are available for dab (*Limanda limanda*) in the North Sea. However, since dab is not a target species in the fishery and is of only limited commercial value it has never been a target species on these surveys with respect to collecting biological data as age, individual weight or maturity (see WD03). The international coordinated surveys IBTS and BTS catching dab in reasonable amounts and the total catch in numbers, total catch in weight and length measurements for most of the time series were recorded. Probably the most suitable survey for dab is the International Beam Trawl Survey (BTS) targeting especially on flat fish species in the North Sea. The problem with this survey is that it is not fully standardized and not all data are already available via the DATRAS data portal. Further, the geographical coverage is limited compared to the International Bottom Trawl Survey (IBTS). The IBTS is not necessarily designed to catch flat fish. But the used bottom trawl is able to catch dab and the catchability seems to be reasonable and it should be possible to calculate a relative abundance or biomass index based on the IBTS for dab (ICES, 2015). However, the IBTS never collected any biological parameters of dab in a consistent way covering the whole distribution range of dab. Ideally one would have one standardized survey covering the whole distribution area of the stock and providing all data. Since this is obviously not the case different options were tested to make best use of the different data sources available: (1) compare abundance or biomass indices obtained by the different surveys, (2) combine the different BTS data to estimate one age based index covering most of the distribution range of dab, (3) apply the available age length keys from the BTS to IBTS dab length data (for quarter 3) to extend the coverage of the index to the whole stock area.

Material and methods

Only data available in the DATRAS data portal were used to calculate the distribution and abundance indices for dab (Figures 1 - 3). Age readings were only available for the Dutch and the German BTS. A combined age based index for dab without any gear corrections from both Dutch BTS was already available (Bolle, unpublished data). One index combining data from the two Dutch BTS and the German BTS was created taking the gear effect into account by applying the Delta-GAM method by Berg et al. (2014). In order to extend the index area to the Skagerrak and Kattegat (area IIIa) the IBTS quarter 3 data were used in combination with age length keys from the Dutch BTS quarter 3. For a comparison the different indices were standardized (Figure 4) and the internal consistency was checked (Figures 6-10).

Results

The distribution range of dab covers nearly the whole North Sea with decreasing densities towards the Northern parts (Fig. 1 and Fig. 2). High abundances can be found in the southeast North Sea along the German and Dutch coast, in the centre of the North Sea in the Doggerbank area and in the Kattegat. Highest abundance indices were recorded by the Dutch ISIS BTS (area IV, Fig. 1 and Fig. 3) at the end of the 1980ies with an overall decreasing trend until 2004, with some higher records during the end of the 1990ies. Since 2005 the abundance index was increasing again which is corroborated by the BTS Tridens index. The BTS Solea index shows and increasing trend for the years 2010 – 2014, but is the only survey showing a sharp decrease in abundance for 2015. Also the IBTS survey for the whole North Sea (area IV) indicates that population size has increased in recent years (quarter 1 and 3). IBTS methodology was fully standardized since 1983, therefore indices before this year should be interpreted with caution.

Figures 6-10 show the internal consistencies of the different surveys. The best consistencies are obtained by the combined BTS index (Fig. 9) applying the Delta-GAM method (Berg et al., 2014) while the worst consistencies were observed for the constructed IBTSQ3 index (Fig. 10).

Conclusion

In general all available abundance indices indicate an increasing trend in stock size for dab in the North Sea since 2005. This is probably due to an effort reduction in the bottom trawl fisheries for sole and plaice which was observed for this area in the last decade (STECF, 2014).

The obtained age based indices could be used as input for survey based assessment models (Needle, 2015). Given the high uncertainties in the available catch data for dab it seems that the fishery independent approach of SURBA seems to be a good alternative.

Unfortunately, the beam trawl surveys targeting flatfish are not fully standardized (ICES, 2014) and do not cover the whole distribution range of dab in the North Sea. Therefore in the past the IBTS quarter 1 was used to inform the stock status of dab (ICES, 2015; ICES, 2013). But since there are no dab age readings available for the IBTS surveys, this index cannot be used for any age based model approach. The constructed IBTS Q3 index covers even the whole North Sea but the internal consistency is rather bad. The two combined BTS indices cover most of the North Sea which should be sufficient to inform the stock status of dab. The index combing all three vessels and taking into account a possible gear effect also show the best internal consistency and should be the favored one for testing the SURBA model.

Figures

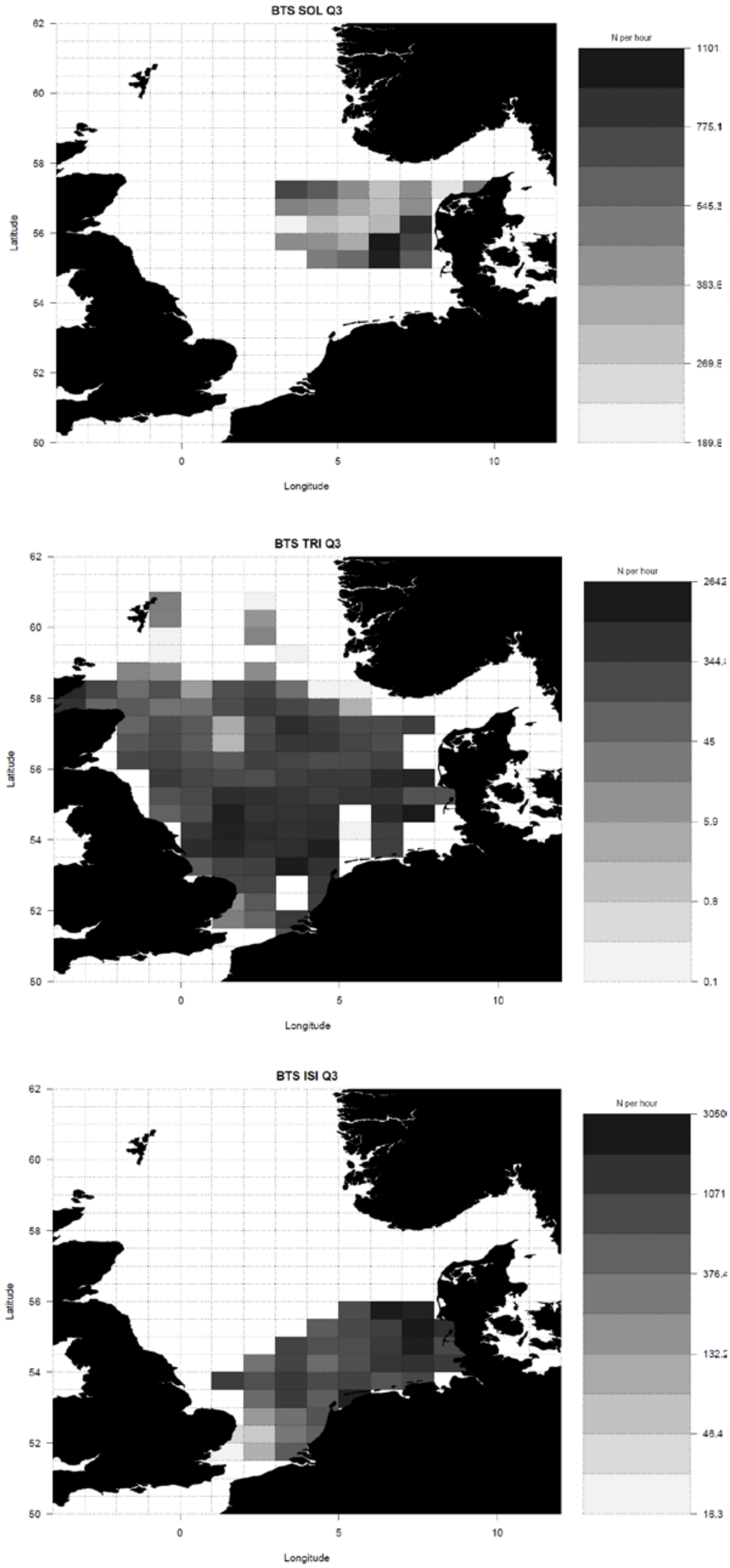


Figure 1: Mean abundance of dab per ICES rectangle obtained by Beam Trawl Surveys in area IV. Upper panel RV “Solea” (2002-2005, 2007-2015), middle panel RV “Tridens” (1996 – 2015), lower panel RV “Isis” (1987 – 2015).

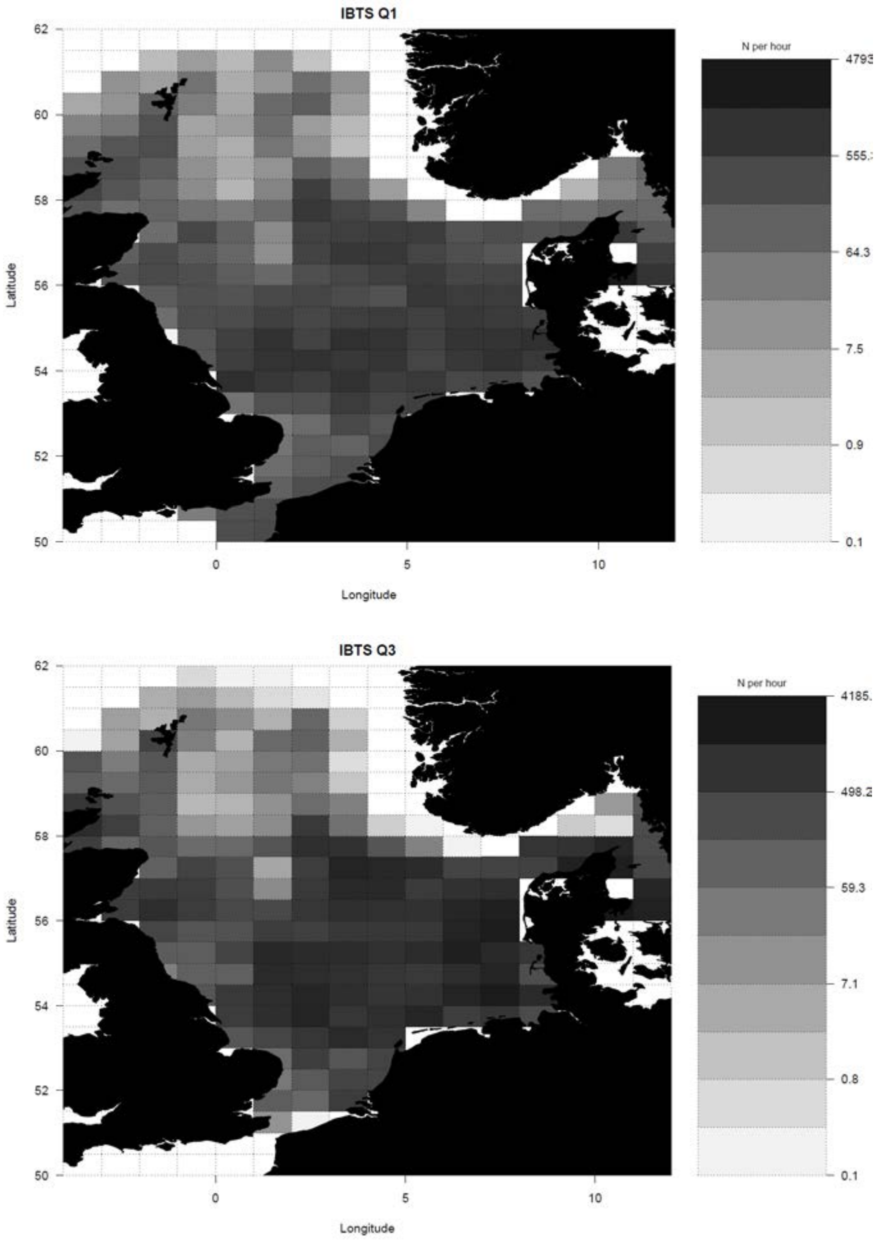
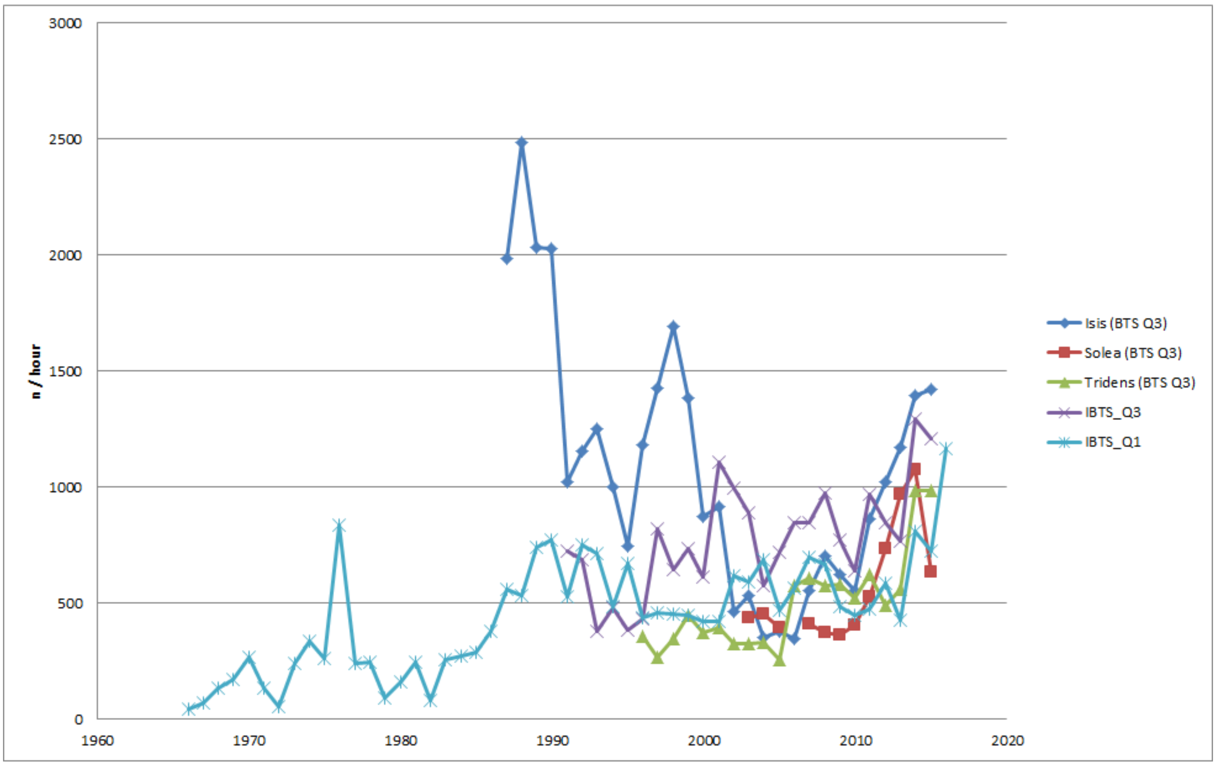


Figure 2: Mean abundance of dab per ICES rectangle obtained by the International Bottom Trawl Survey. Upper panel IBTS quarter 1 (1966 – 2015), lower panel IBTS quarter 3 (1991 – 2015).



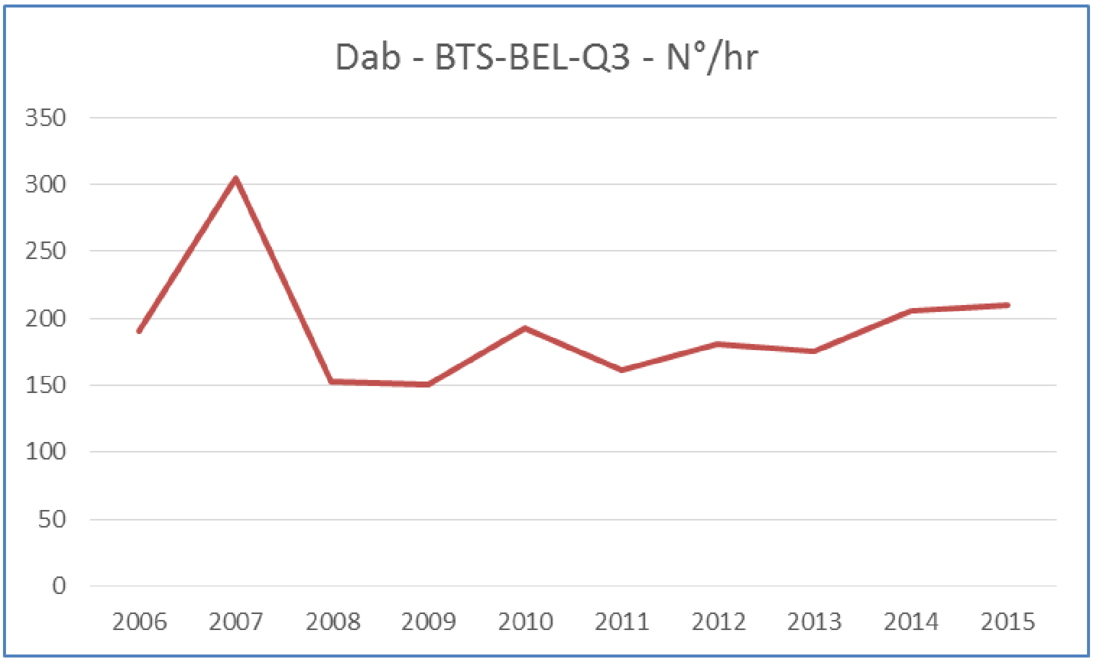


Figure 3: Dab abundance indices (number/hour) for different Bottom Trawl Surveys in the North Sea. Lower panel: BTS Belgium, south-western North Sea.

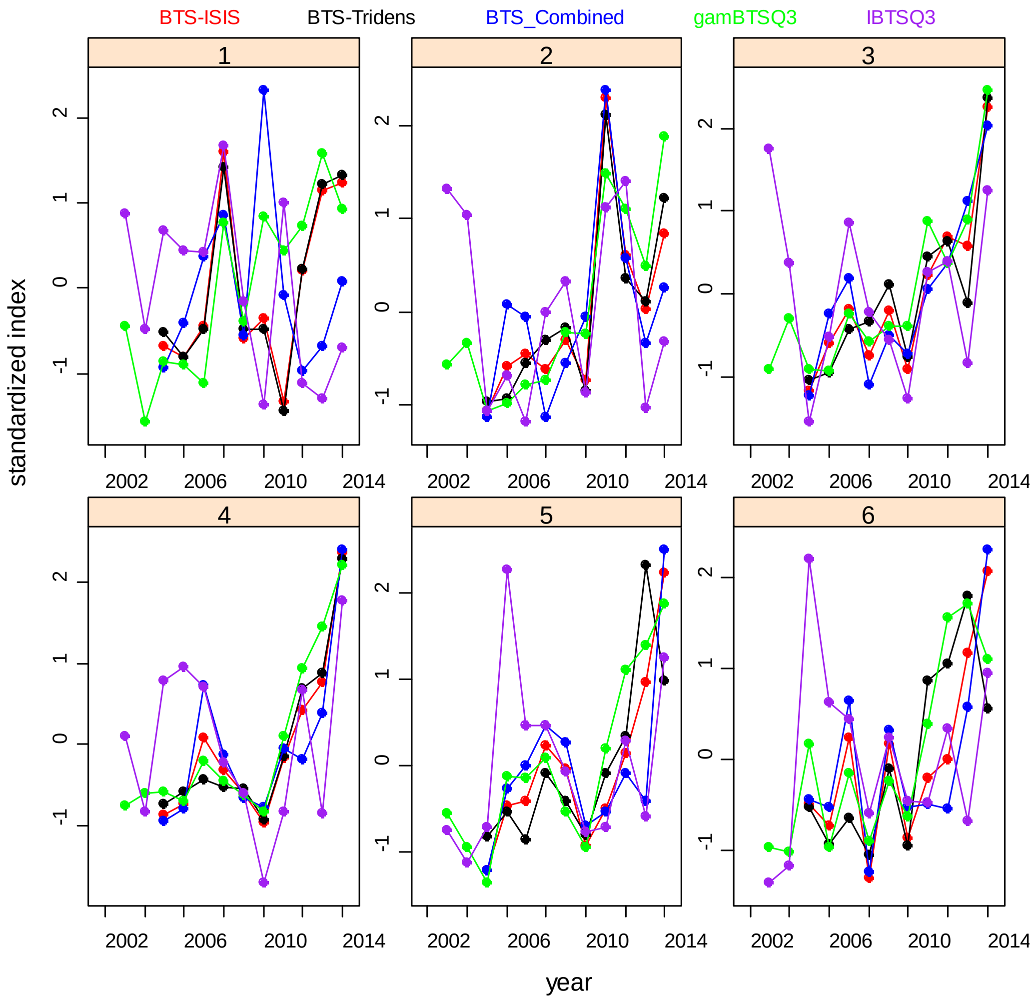


Figure 4: Standardized indices for dab by age group (ages 1 – 6).

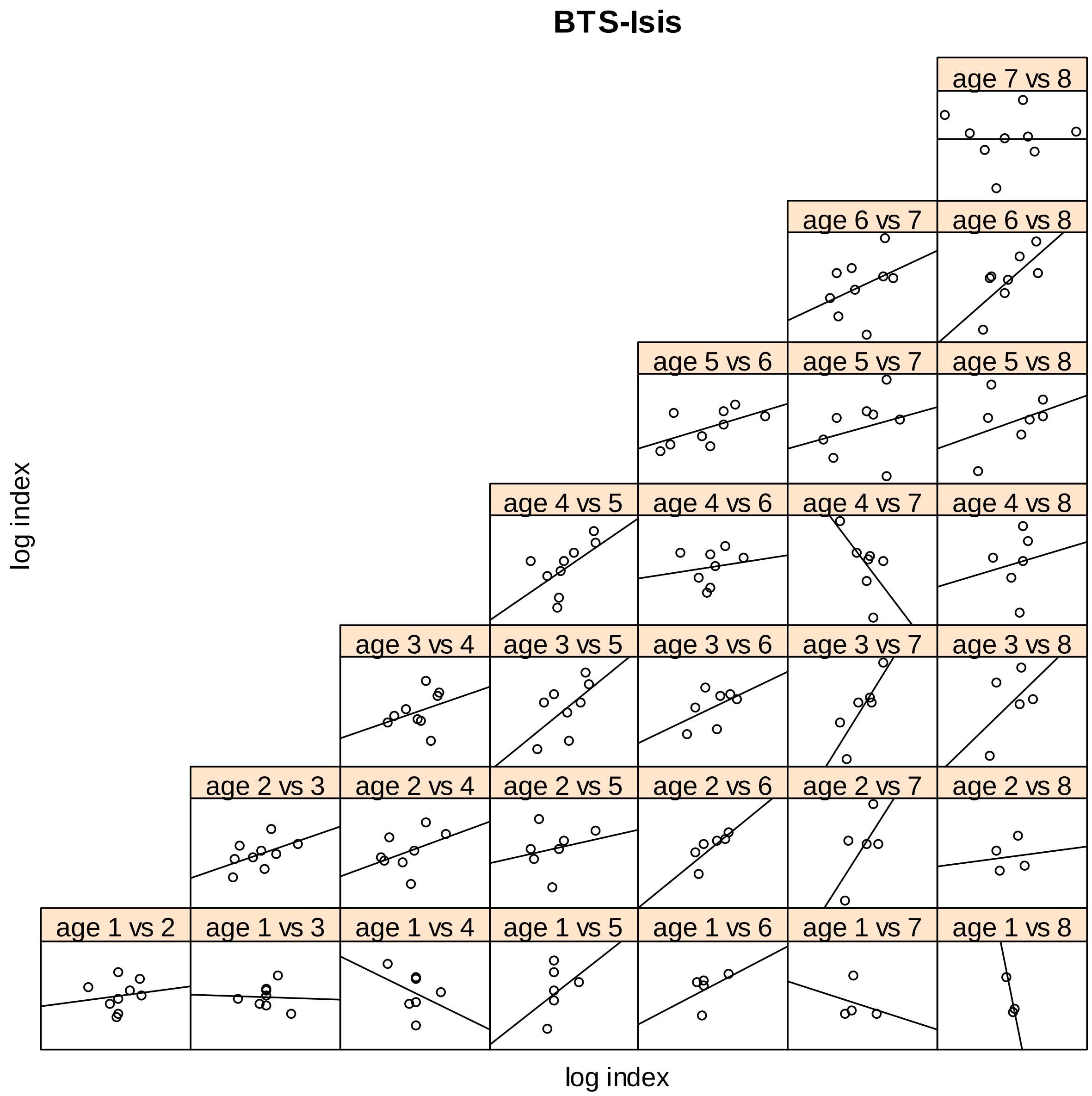


Figure 6: Within-survey correlations for the BTS-Isis survey index, comparing index values at different ages for the same year-classes (cohorts).

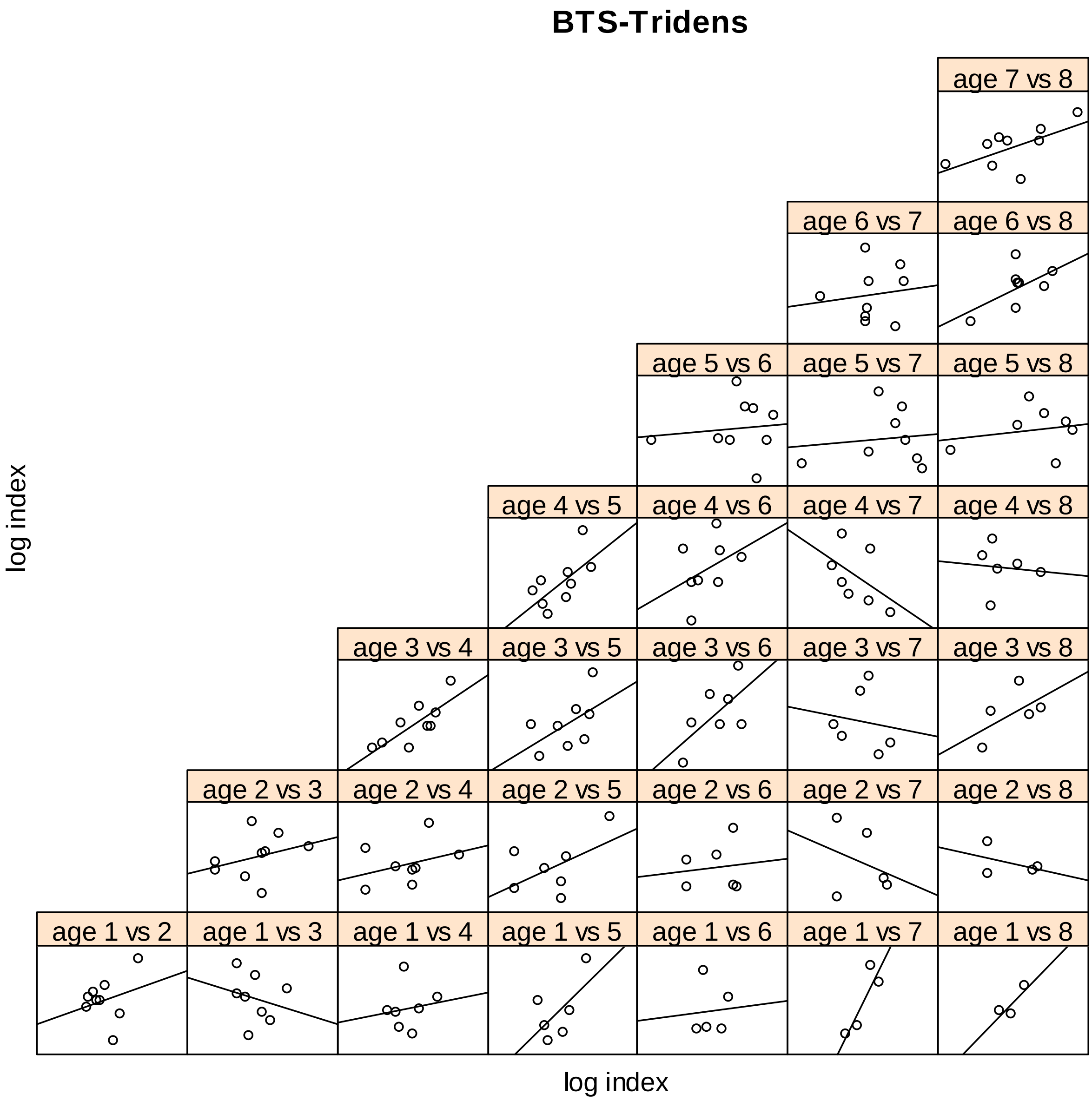


Figure 7: Within-survey correlations for the BTS-Tridens survey index, comparing index values at different ages for the same year-classes (cohorts).

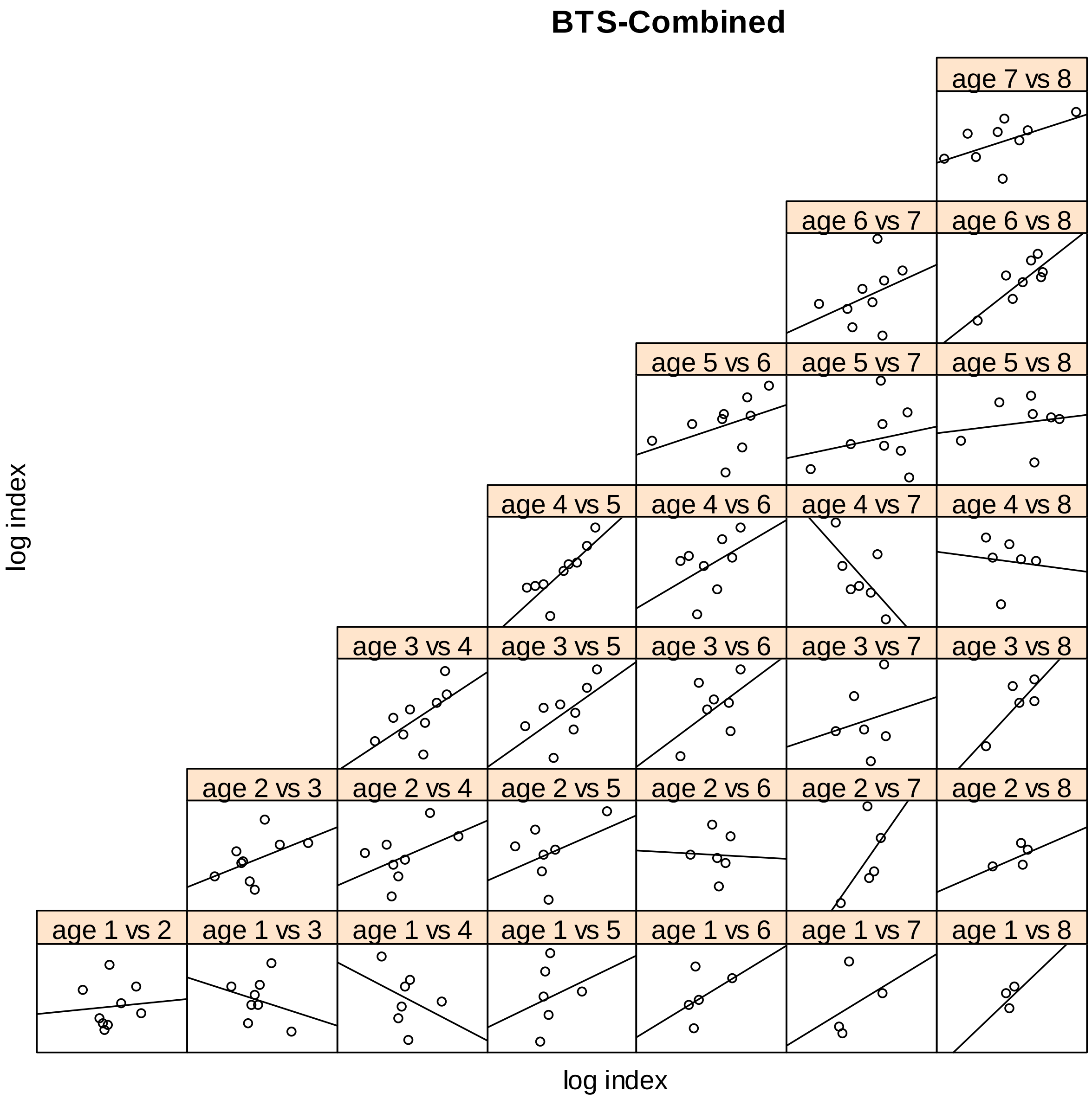


Figure 8: Within-survey correlations for the BTS-combined survey index, comparing index values at different ages for the same year-classes (cohorts).

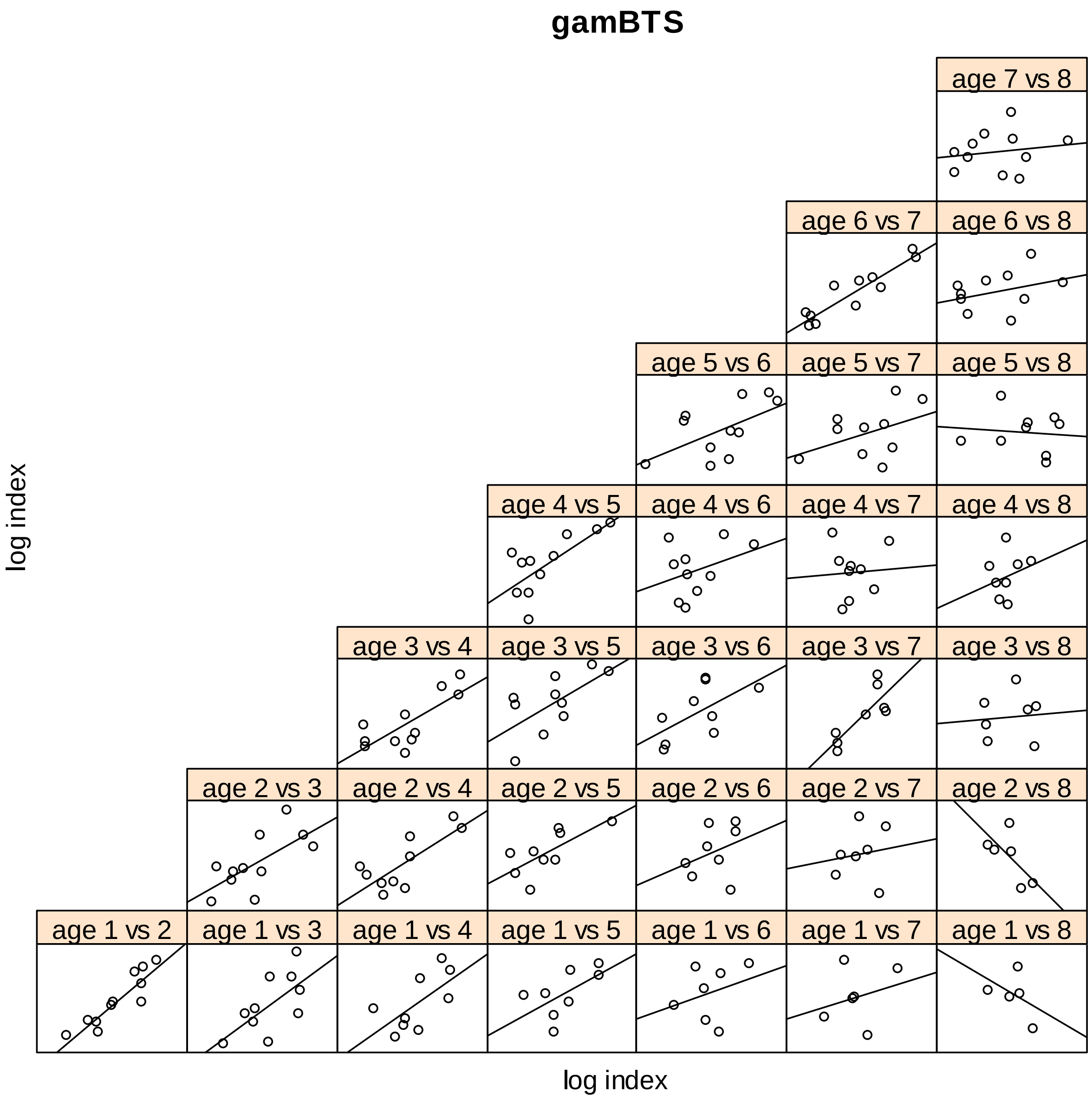


Figure 9: Within-survey correlations for the combined BTS (Isis, Tridens, Solea) survey index, comparing index values at different ages for the same year-classes (cohorts).

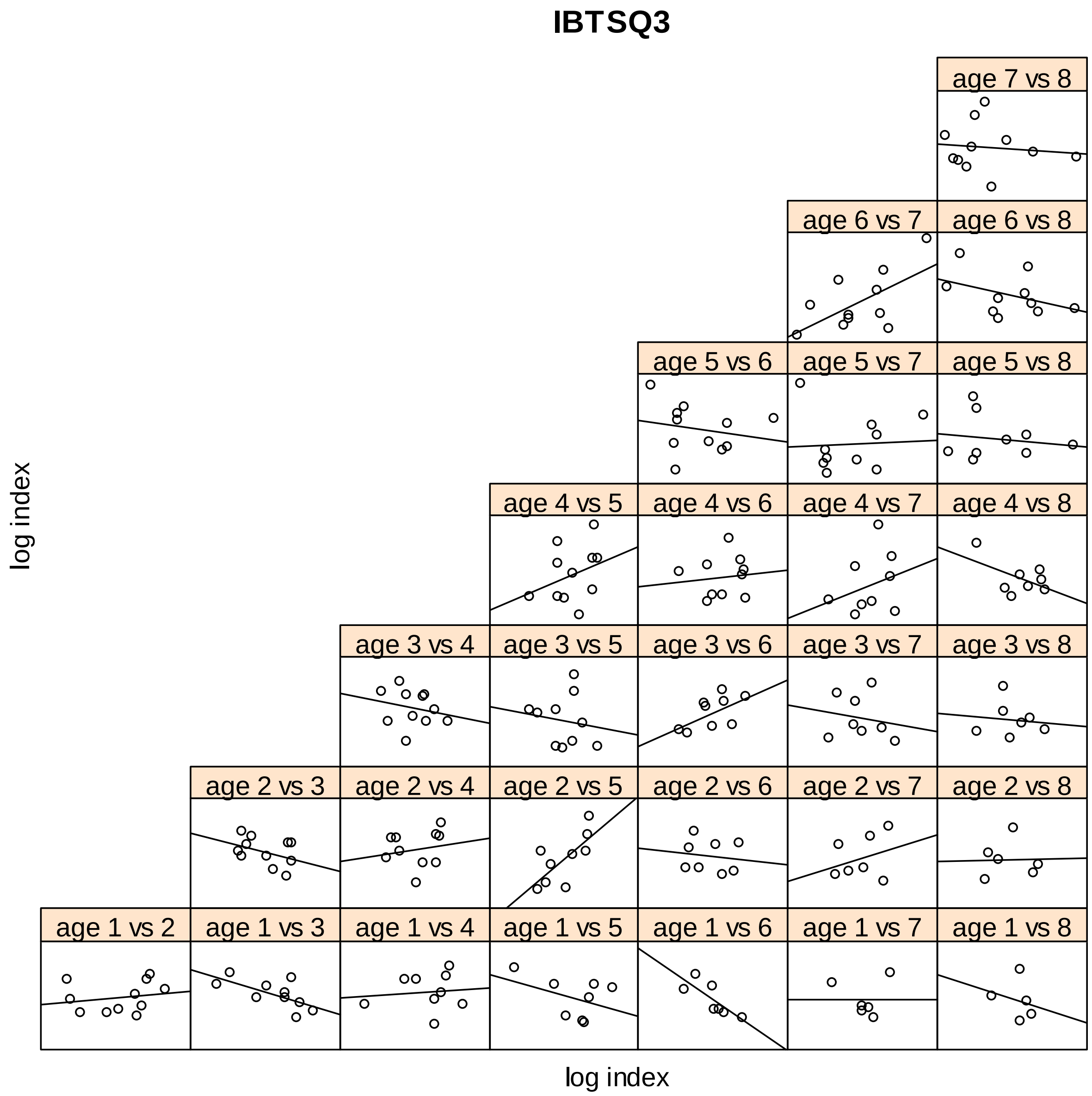


Figure 10: Within-survey correlations for the IBTSQ3 survey index, comparing index values at different ages for the same year-classes (cohorts).

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InterCatch raising procedures dab – WKNSEA2016

Holger Haslob, n.n.

For the WKNSEA 2016 benchmark work shop all nations imported dab data into the InterCatch system for the years 2002 – 2014. Before, only data for the most recent years 2012 – 2014 were available. Since some nations uploaded new data also for these years, the previous settings for discard raisings were partly revised. This changed somewhat the previous results but did not change the overall trend of discards being extremely high for dab. Some countries also imported age distributions for landings and discards from sampling the commercial fleets. However, in the early years (2002 – 2005) only The Netherlands provided a few age data. Since 2006 also Germany and since 2009 also Denmark provided age distributions. The fleet with by far the largest dab catches is the Dutch TBB_DEF_70-99_0_0_all métier for which age distributions are provided for nearly each year. Only for 2003 no age distribution was reported for the landings of this métier.

Table 1 shows an overview of all imported data. The countries with the most important fisheries for dab (NDL, DEN, UK (Eng), GER) imported landings as well as discard data for the whole time series, but the coverage of fleets is not the same for all years and increased for the most recent years. Table 2 show the total amount of discards, landings and the total catch. The percentage of discard from the total catch ranged between 47 and 88% with an increasing trend (Figure 2). This trend is mainly driven by the Dutch TBB_DEF_70-99_0_0_all métier.

Dab landings show a decreasing trend for most of the countries (Figure 1). The imported discards decreased for Germany and Denmark, while the imported Dutch discards sharply increased since 2007 (Figure 2). The raised discards do not show any clear trend. However, there are two peaks in the Dutch data (Figure 3) which might be due to some very high discard ratios observed for other fleets. Since most of dab catches were discarded the increasing trend in discards is also seen in the trend for total catches (Figure 4). Here, the relative high German catches, especially for the years 2005 and 2006, in comparison with the Dutch catches are surprising, given the high Dutch effort in the beam trawl fishery. This might be an indication that either the discard raising procedure overestimated the German catches and/or underestimated the Dutch catches. Or the imported German discards were overestimations, at least for the years 2005 and 2006. Although it was tried to be as much consistent with the discard raisings uncertainties remain in this procedure. This is especially the case for a species like dab with such high discard rates. Observed high discard ratios in one métier can easily lead to an overestimation of discards in another fishery of the same métier. On the other hand, for a number of métiers zero landings were reported, which is probably true, but with no additional information on the amount of discards for this métier it is not possible to raise any discards for these fleets. Some notes on the raising procedure and some general problems which occurred during the work with InterCatch are given in the Annex below.

The sample allocations applied by the InterCatch tool revealed the age distribution of discards and landings displayed in Figure 5. For the first years the age distribution of the discards seems not to make any sense. Since 2006 quite reasonable age distributions were obtained. However, a very strange pattern is that age group five is always represented by exceptional high numbers for the years 2002-2005 and also for the years 2008 – 2010. Also the weight at age in the catch obtained by the InterCatch tool does not seem to make any sense before 2006 (Figure 6 and 7). This is probably due to the low sample sizes in the early years of the time series.

Table 1: Overview of catch data imported into InterCatch for dab.

	2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014	
	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L
BEL		516		398		381		373		377		442		381		308		323		243	238	449	862	401	378	301
DEN	3957	2442	7398	2955	4214	2138	5745	2191	2329	2352	2105	1268	1778	1266	2221	1066	2646	1485	3625	1338	2768	1418	3156	1404	3395	976
FRA				155		131		137		144		192		243		209		181		166		174		83	205	72
GER	1211	583	4100	646	3773	770	7325	1105	7681	1169	2685	535	2226	387	4545	265	5369	369	2383	324	3412	257	1532	343	3429	294
NDL	7649	4411	9181	4560	8627	4582	7639	4879	5041	4651	1872	6097	6230	5451	10033	4506	13775	5174	20706	4659	22889	4021	29153	3676	24557	2853
NOR		55		91		56		131		125		127		63		30		16		41		50		51		25
SWE	262	6	555	4	246	3	201	3	284	4	463	7	346	6	394	9	455	8	283	7	476	12	432	6	462	21
UK(E.)	1369	493	918	502	1699	533	386	717	772	747	1811	634	4202	472	974	381	252	517	634	499	340	539	793	482	328	377
UK(N.I.)		56		111		37		1																		
UK(S.)		25		11		17				668		579		375	2485	267	1191	206	597	146	3097	127	927	164	2628	128

Table 2: Overview of discards, landings and total catch.

	Discards	Landings	Catch	% Discards
2002	14448	8588	23036	63
2003	22152	9433	31585	70
2004	18559	8647	27206	68
2005	21295	9537	30833	69
2006	16106	10236	26342	61
2007	8936	9881	18816	47
2008	14781	8645	23426	63
2009	20652	7040	27693	75
2010	23688	8279	31966	74
2011	28227	7422	35649	79
2012	33220	7047	40267	82
2013	36855	6611	43466	85
2014	35383	5047	40430	88

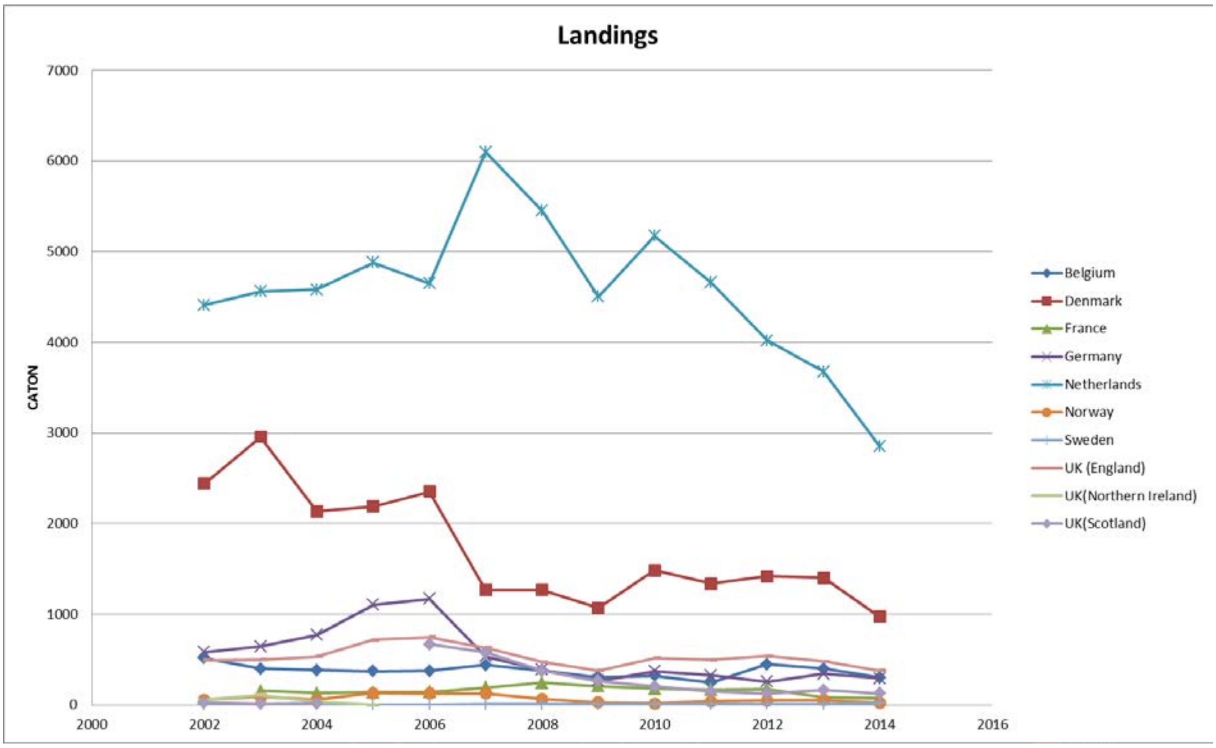

Fig. 1: Imported landings by country 2002 – 2014.

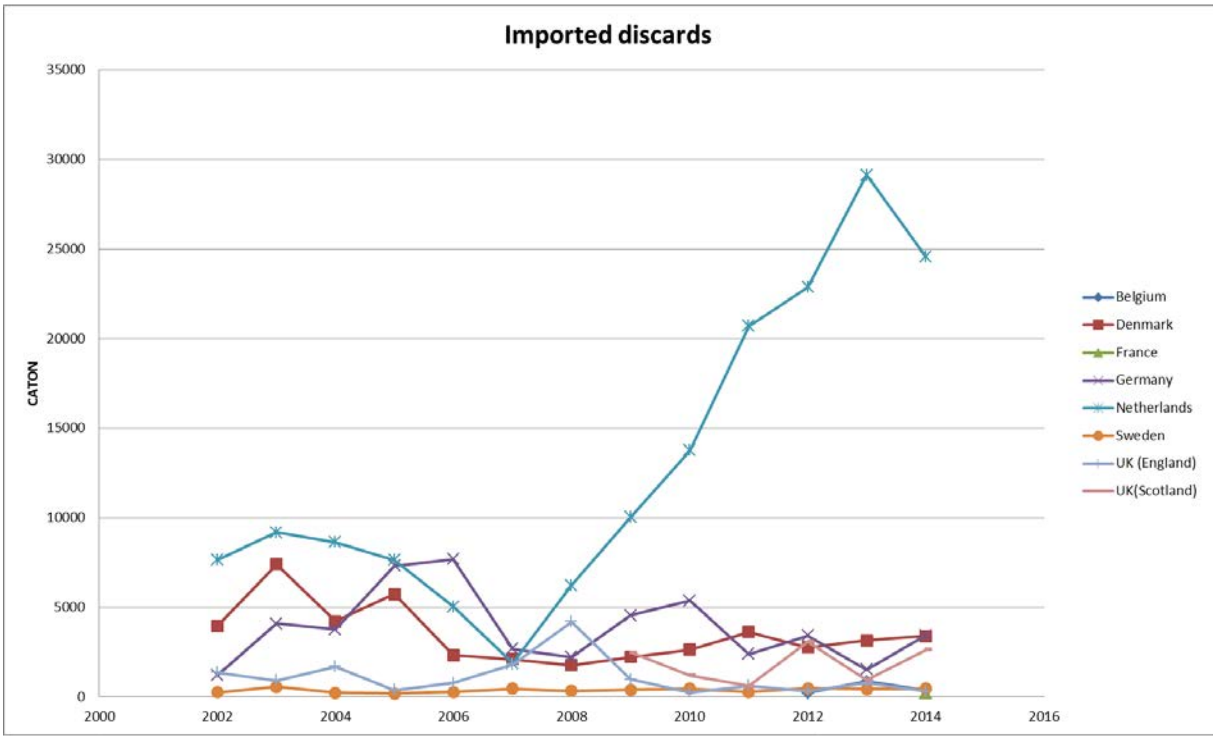

Fig. 2: Imported discards by country 2002 – 2014.

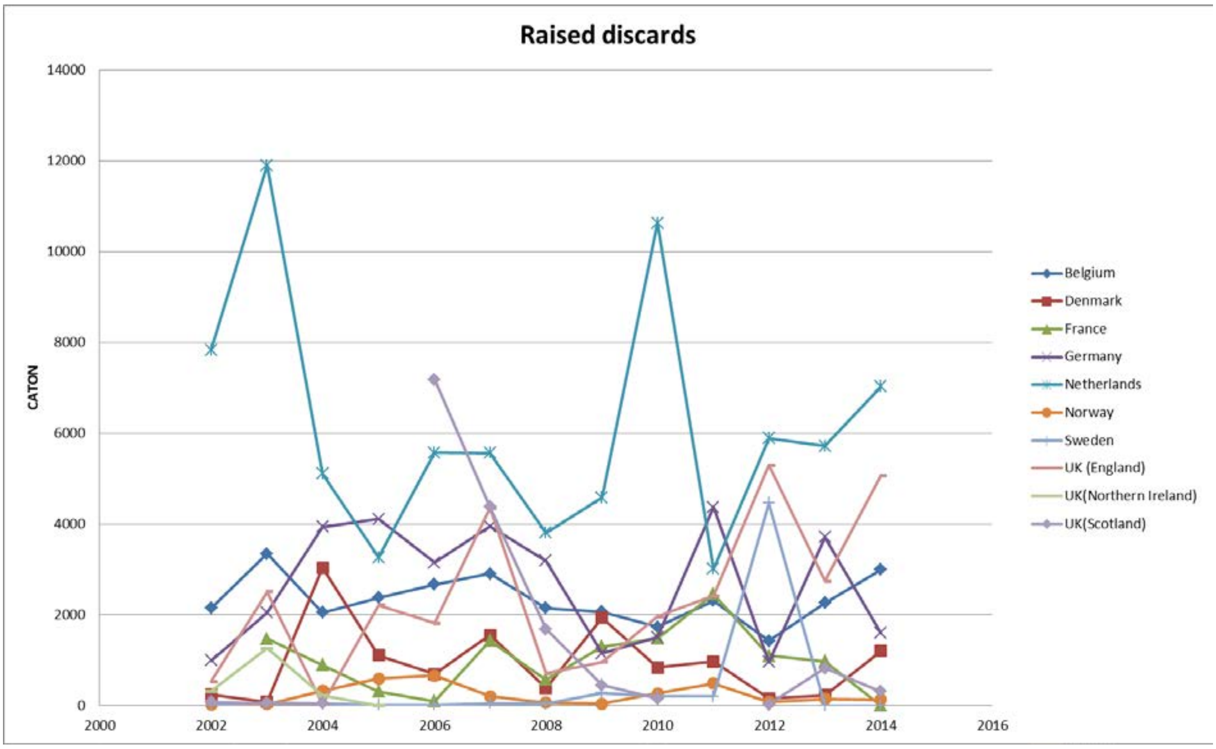

Fig. 3: Raised discards by country 2002 – 2014.

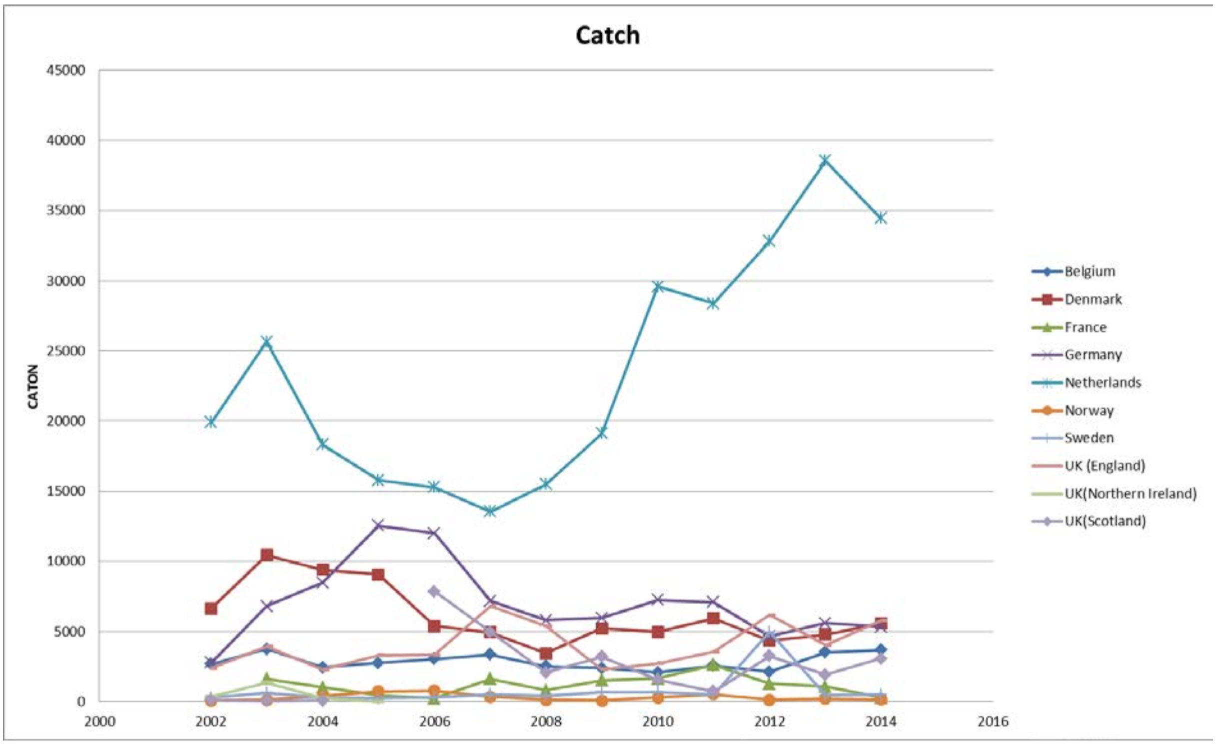

Fig. 4: Total catch by country 2002 – 2014.

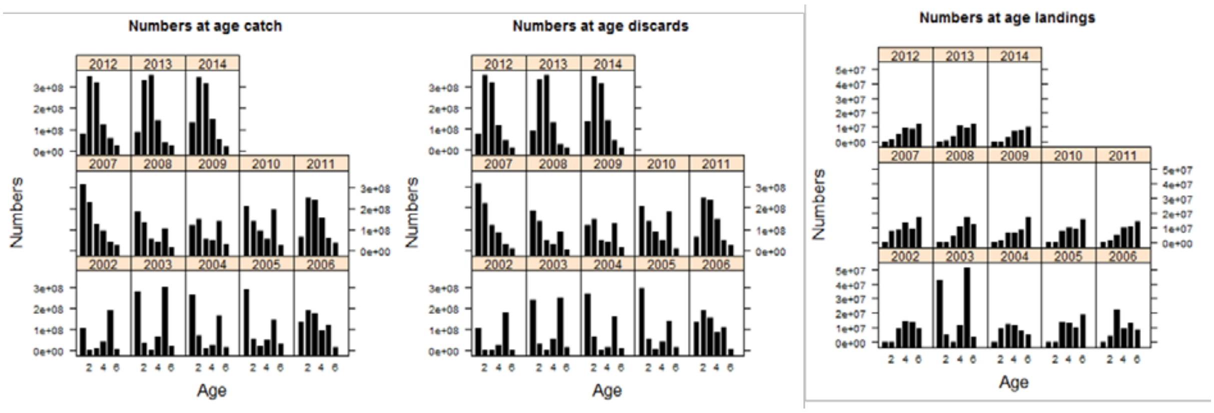

Fig. 5: Numbers at age for the total catch (left panel) and separated by catch category discards and landings.

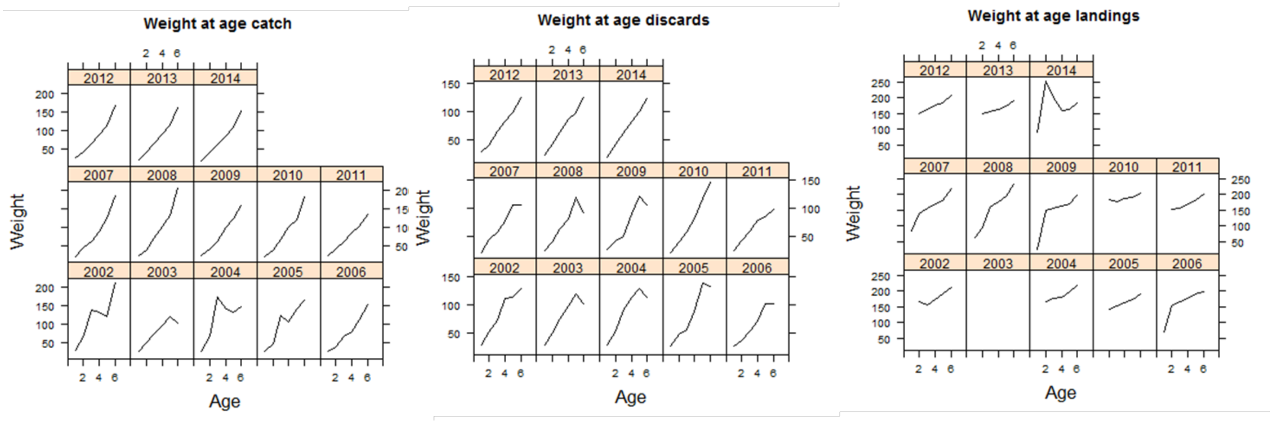

Fig. 6: Weight at age for the total catch (left panel) and separated by catch category discards and landings.

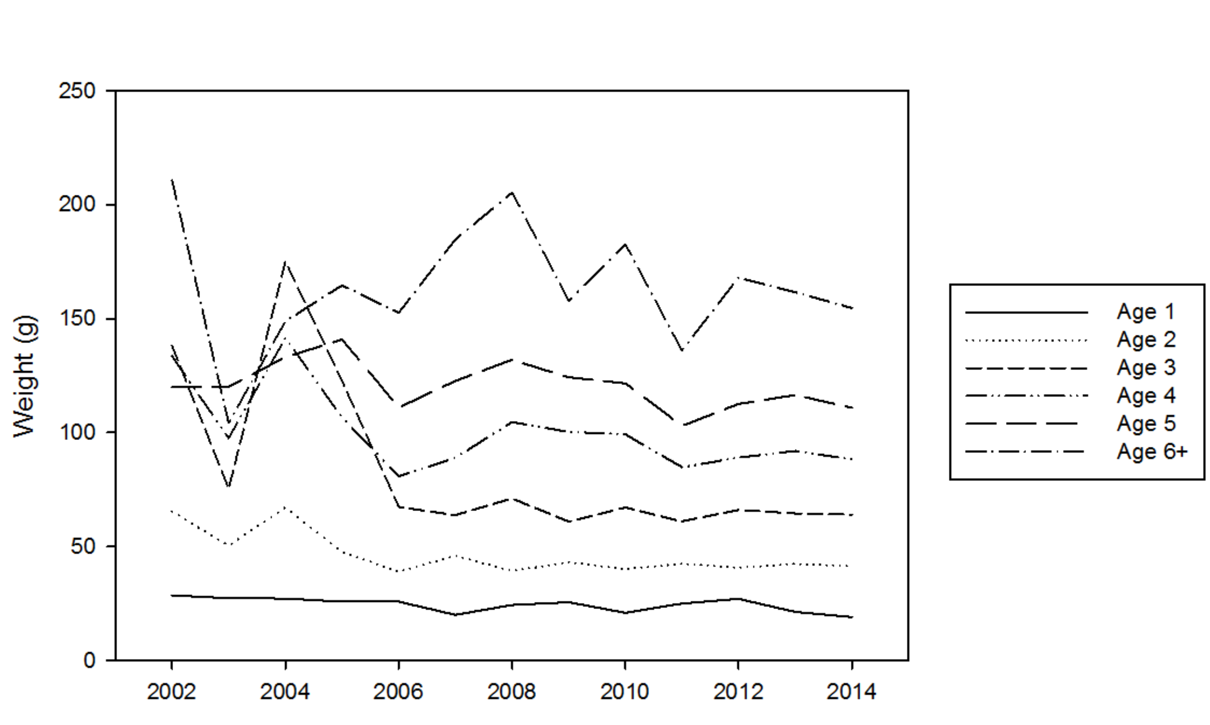

Fig. 7: Weight at age in the catch by age groups.

Annex – Notes about discard raisings and allocation scheme set up

General notes:

- By default „Discard CATON“ was used as weighing parameter because dab is a bycatch species with high discard rates for most of the fleets.
- Tried to be as much consistent as possible with regard to métier, nation, area, season. When this was not possible the most similar gears with respect to mesh size was used as a criteria to choose fleets for the raising procedure, e.g. TBB_DEF_>=120_0_0_all was raised with SSC_DEF_>=120 in some cases.
- Some discard fleets with unusual high discard ratios were excluded from raising procedure to avoid overestimations of discards.
- A number of fleets do report zero landings which is probably true. However, these fleets cannot be used for any raising procedures although high discards may occur.
- No discards were raised for the MIS_MIS_0_0_0_IBC métier although in some cases relatively high amounts of landings were reported. Probably discards do not occur in these fisheries because all the catch is landed, e.g. industrial sandeel fishery.
- TBB_CRU_16-31_0_0_all is not reported by the Netherlands. Highest landings are reported for the Belgian fleet. UK (England) and Germany reported landings and discards for some quarters. Denmark reported minor landings only. Because landings are extremely low in some of the reported cases extremely high discard ratios can occur. Using these discard ratios to raise e.g. the Belgian fleet is highly uncertain and will probably overestimate the discards of this fleet. Thus, to account for discards in this métier only the lowest observed discard ratios were chosen for the raising procedure.
- No discard information from Norway because of the discard ban in Norwegian fishery. Probably some of the catch is discarded regardless of that regulation. Therefore, Norway fleets were included into the raising procedures.
- MIS_MIS_HC_0_0_all area IV was difficult to raise because in most of the years no discard information was available for this métier in this area. In area IIIaS reported discard ratios were very high, while for area IIIaN low discard ratios for this métier were reported.

Specific notes:

2002:

- SWE active gear IIIaS Q4 raised with SWE active gear IIIaS Q1-3.
- GER GNS_all IIIaS raised with Danish MIS_MIS_0_0_0_HC metier in IIIaS.
- MIS_MIS_0_0_0_IBC <- in some quarters high landings, no discards -> probably all catch is landed (Sandeel fishery).
- Group 1 - SWE passive gear in IIIaS <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaS chosen.
- Group 2 - all passive gear in IIIaN <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaN chosen.
- Group 3 - all passive gear in IV <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IV chosen.
- Group 4 - Mis_Mis_0_0_0_HC area IV raised with Danish MIS_MIS_0_0_0_HC area IV.
- Group 5 - OTB_CRU_70-99_all raised with all availabel discards for this metier except danish fleet because of extremely high discard ratio.
- group 6 - OTB_CRU_90-119 raised with all available discrads of the same metier.
- group 7 - OTB_DEF_>120_all area IV - raised with all availabel discards of this metier in this area.
- group 8 - OTB_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- group 9 - SDN_SSC_DEF>120 area IIIaN - raised with all available discards of these metiers in area IV.
- group 10 - SDN_SSC_DEF>120 area IV - raised with all available discards of these metiers in area IIIaN.
- group 11 - TBB_DEF_70-99_all raised with all available fleets of the same metier.
- group 12 - TBB_DEF_>120 IIIaN raised with all availabe fleets of the same metier in IIIaN.
- group 13 - TBB_DEF_>120 VI raised with all availabe fleets of the same metier in VI.
- group 14 - TBB_DEF_90-99 riased with the same metier (only DK).
- group 15 - SDN_OTB_PTB_70-99_all raised with Dutch TBB_DEF_70-99_all.
- group 16 - TBB_OTB_SSC_100-119 raised with all TBB_DEF_70-99_all.
- group 17 OTB_CRU_32_89_all raised with all OTB_CRU_70-99_all metiers except danish fleet because of extremely high discard ratio.
- group 18 - TBB_OTB_CRU_DEF_16-31 raised with the lowest discard ratio of UK(ENG) TBB_CRU_16-31.

Quarter 1 landings: 25 age reads and 353 length measurements.
Quarter 2 landings: 50 age reads and 416 length measurements.
Quarter 3 landings: 50 age reads and 364 length measurements.
Quarter 4 landings: 25 age reads and 455 length measurements.

Quarter 1 discards: sampled strata, but no age reads or length measurements?
Quarter 2 discards: sampled strata, but no age reads or length measurements?
Quarter 3 discards: sampled strata, but no age reads or length measurements?
Quarter 4 no discard sampling: samples from Q1 and Q3 chosen for allocation.

NO FRANCE DATA for 2002! Official landings for IIIaN, IIIaS and IV has to be added manually!

2003:

- SWE active gear IIIaS Q4 raised with SWE active gear IIIaS Q1-3.
- Group 1 - all passive gear in IIIaS <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaS chosen.
- Group 2 - all passive gear in IIIaN <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaN chosen.
- Group 3 - all passive gear in IV <- raised with all available passive gears in IV.
- Group 4 - Mis_Mis_0_0_0_HC area IV raised with Danish MIS_MIS_0_0_0_HC area IV.
- Group 5 - OTB_CRU_70-99_all raised with all availabel discards for this metier.
- group 6 - OTB_CRU_90-119 (GER) raised with all available discrads of the same metier.
- group 7 - OTB_PTB_DEF_>120_all area IV - raised with all availabel discards of this metier in this area.
- group 8 - OTB_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- group 9 - SSC_DEF>120 area IV (NOR) - raised with all available discards of these metiers in area IV (DEN).
- group 10 - TBB_DEF_70-99_all raised with all available fleets of the same metier. Including TBB_DEF_90-99_0_0_all. Dutch fleet IIIa only raised with other Dutch fleets of this métier.
- group 11 - TBB_DEF_>120 all raised with all availabe fleets of the same metier.
- group 12 - SDN_SSC_PTB_OTB_90-99_0_0_all raised with Dutch TBB_DEF_70-99_all.
- group 13 - TBB_OTB_SSC_100-119 raised with all TBB_DEF_70-99_all.
- group 14 - TBB_OTB_CRU_DEF_16-31 raised with the lowest discard ratio of UK(ENG) TBB_CRU_16-31.
- group 15 - OTB_CRU_32_89_all raised with all OTB_CRU_70-99_all metiers

2004:

- Group 1 - all passive gear in IIIaS (only SWE) <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaS chosen.
- Group 2 - all passive gear in IIIaN <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaN chosen.
- Group 3 - all passive gear in IV <- raised with all available passive gears in IV (only one GER GNS fleet) and Danish MIS_MIS_0_0_0_HC.
- Group 4 - Mis_Mis_0_0_0_HC area IV raised with Danish MIS_MIS_0_0_0_HC area IV.
- Group 5 - OTB_CRU_70-99_all raised with all availabel discards for this metier.
- group 6 - OTB_CRU_90-119 (GER) raised with all available discrads of the same metier.
- group 7 - OTB_PTB_DEF_>120_all area IV - raised with all availabel discards of this metier in this area.
- group 8 - OTB_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- group 9 - SSC_SDN_DEF>120 area IV - raised with available discards of metier SSC_DEF_>=120 in area IIIaS (DEN).
- group 10 - TBB_DEF_70-99_all raised with all available fleets of the same metier. Including TBB_DEF_90-99_0_0_all. Except one ENG fleet with discard ratio 0.
- group 11 - TBB_DEF_>120 IIIaN raised with all SSC_SDN_DEF_>120 in IIIaN. No TBB_DEF_>=120 available.
- group 12 - TBB_DEF_>120 IV raised with all SSC_SDN_DEF_>120 in IV. No TBB_DEF_>=120 available.
- group 13 - SDN_SSC_PTB_OTB_90-99_0_0_all raised with Dutch TBB_DEF_70-99_all.
- group 14 - OTB_CRU_32_89_all raised with all OTB_CRU_70-99_all metiers
- group 15 - TBB_OTB_CRU_DEF_16-31 raised with MIS_MIS_0_0_0_HC, low discard ratios.
- group 16 - TBB_OTB_SSC_100-119 raised with all TBB_DEF_70-99_all.

2005:

- group 1 - Group 1 - all passive gear in IIIaS <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaS chosen.
- Group 2 - all passive gear in IIIaN <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaN chosen.
- Group 3 - all passive gear in IV <- raised with all available passive gears in IV (only one GER GNS fleet) and Danish MIS_MIS_0_0_0_HC.
- Group 4 - Mis_Mis_0_0_0_HC area IV and IIIaN raised with Danish MIS_MIS_0_0_0_HC area IV and area IIIaN.
- Group 5 - OTB_CRU_70-99_all area IV raised with all availabel discards for this metier in area IV.
- Group 6 - OTB_CRU_90-119 (GER) raised with all available discrads of the same metier.
- group 7 - OTB_PTB_DEF_>120_all area IV - raised with all availabel discards of this metier in this area.
- group 8 - OTB_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- group 9 - SSC_DEF>120 area IV - raised with available discards of metier SSC_DEF_>=120 in area IV (DEN).
- group 10 - TBB_DEF_70-99_all raised with all available fleets of the same metier. Including TBB_DEF_90-99_0_0_all. Except one ENG fleet with discard ratio 0.
- group 11 - TBB_DEF_>120 IIIaN raised with all SSC_DEF_>120 and SDN_DEF_>120. No TBB_DEF_>=120 available.
- group 12 - TBB_DEF_>120 IV raised with all SSC_DEF_>120 and SDN_DEF_>120 in IV. No TBB_DEF_>=120 available.
- group 13 - SSC_PTB_OTB_90-99_0_0_all raised with Dutch TBB_DEF_70-99_all.
- group 14 - OTB_CRU_32_89_all raised with all OTB_CRU_70-99_all metiers
- group 15 - TBB_OTB_CRU_SPF_DEF_16-31 raised with MIS_MIS_0_0_0_HC, low discard ratios.
- group 16 - TBB_OTB_SSC_90-119 raised with all TBB_DEF_70-99_all.

2006:

- group 1 - Group 1 - all passive gear in IIIaS <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaS chosen.

- Group 2 - all passive gear in IIIaN <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaN chosen.
- Group 3 - all passive gear in IV <- raised with all available passive gears in IV
- Group 4 - Mis_Mis_0_0_0_HC area IV raised with Danish MIS_MIS_0_0_0_HC area IV.
- Group 5 - OTB_CRU_70-99_all area IV raised with all availabel discards for this metier in area IV.
- Group 6 - OTB_CRU_90-119 (GER) raised with all available discrads of the same metier.
- group 7 - OTB_PTB_DEF_>120_all area IV - raised with all availabel discards of this metier in this area.
- group 8 - OTB_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- group 9 - TBB_DEF_70-99_all Dutch fleet Q3 raised with all Dutch fleets of the same metier.
- Group 10 - TBB_DEF_70-99_all others raised with all available fleets of the same metier. Including TBB_DEF_90-99_0_0_all.
- group 11 - TBB_DEF_>120 IIIaN raised with all SSC_DEF_>120 and SDN_DEF_>120. No TBB_DEF_>=120 available.
- group 12 - TBB_DEF_>120 IV raised with all SSC_DEF_>120 and SDN_DEF_>120 in IV. No TBB_DEF_>=120 available.
- group 13 - SSC_PTB_OTB_100-119_0_0_all area IV raised with Dutch TBB_DEF_70-99_all area IV.
- group 14 - OTB_CRU_32_89_all raised with all OTB_CRU_70-99_all metiers
- group 15 - TBB_OTB_CRU_SPF_DEF_16-31 raised with MIS_MIS_0_0_0_HC, low discard ratios.
- group 16 - TBB_OTB_SSC_DEF_90-119 (all Dutch) raised with all Dutch TBB_DEF_70-99_all.

2007:

- group 1 - Group 1 - all passive gear in IIIaS <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaS chosen.
- Group 2 - all passive gear in IIIaN <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaN chosen.
- Group 3 - all passive gear in IV <- raised with all available passive gears in IV (GTR UKeng)
- Group 4 - Mis_Mis_0_0_0_HC area IV/IIIaN raised with MIS_MIS_0_0_0_HC area IV/IIIaN.
- Group 5 - OTB_CRU_70-99_all area IV/IIIaS raised with all availabel discards for this metier in area IV.
- Group 6 - OTB_CRU_90-119 (GER) raised with all available discrads of the same metier.
- group 7 - OTB_DEF_>120_all area IV - raised with all availabel discards of this metier in this area.
- group 8 - OTB_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- Group 9 - TBB_DEF_70-99_all raised with all available fleets of the same metier. Including TBB_DEF_90-99_0_0_all.
- Group 10 - TBB_DEF_>120 IIIaN raised with all SSC_DEF_>120 and SDN_DEF_>120. No TBB_DEF_>=120 available.
- Group 11 - TBB_DEF_>120 IIIaN raised with all SSC_DEF_>120 and SDN_DEF_>120. No TBB_DEF_>=120 available.
- Group 12 – SSC_OTB_100-119 raised with all TBB_DEF_70-99 fleets
- Group 13 - OTB_CRU_32_89_all raised with all OTB_CRU_70-99_all métiers
- Group 14 – SSC_SDN_PTB_OTB_70-99_all raised with all fleets TBB_DEF_70-99_0_0_all
- Group 15 - TBB_OTB_CRU_DEF_16-31 raised with MIS_MIS_0_0_0_HC area IV, low discard ratios.
- Group 16 – TBB_DEF_90-119_0_0_all raised with all fleets TBB_DEF_70-99_0_0_all

2008:

- group 1 - Group 1 - all passive gear in IIIaS <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaS chosen.
- Group 2 - all passive gear in IIIaN <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaN chosen.
- Group 3 - all passive gear in IV <- raised with all available passive gears in IV
- Group 4 - Mis_Mis_0_0_0_HC area IV/IIIaN raised with MIS_MIS_0_0_0_HC area IV/IIIaN.
- Group 5 - OTB_CRU_70-99_all area IV/IIIaS raised with all availabel discards for this metier in area IV.
- Group 6 - OTB_CRU_90-119 (GER) raised with all available discrads of the same metier.
- Group 7 – OTB_DEF_>=120 raised with all availabel discards of this metier in this area. EXCLUDE UK(Eng) Q3 DISCARDS, extremely high!
- group 8 - OTB_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- group 9 - TBB_DEF_70-99_all Dutch fleet Q3 raised with all Dutch fleets of the same metier.
- Group 10 - TBB_DEF_>120 IIIaN raised with all SSC_DEF_>120 and SDN_DEF_>120. No TBB_DEF_>=120 available.
- Group 11 - TBB_DEF_>120 IIIaN raised with all SSC_DEF_>120 and SDN_DEF_>120. No TBB_DEF_>=120 available.
- Group 12 – SSC_OTB_TBB_DEF_100-119 raised with all TBB_DEF_70-99 fleets
- Group 13 - OTB_CRU_32_89_all raised with all OTB_CRU_70-99_all métiers
- Group 14 – SSC_SDN_PTB_OTB_70-99_all raised with all fleets TBB_DEF_70-99_0_0_all

- Group 15 - TBB_CRU__16-31 raised with MIS_MIS_0_0_0_HC area IV, low discard ratios. EXCLUDE GERMAN DISCARDS FROM THIS METIER!

2009:

- group 1 - Group 1 - all passive gear in IIIaS <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaS chosen.
- Group 2 - all passive gear in IIIaN <- raised with all available passive gears in IV
- Group 3 - all passive gear in IV <- raised with all available passive gears in IV
- Group 4 - Mis_Mis_0_0_0_HC area IV raised with MIS_MIS_0_0_0_HC area IIIaN, weighing factor CATON landings. Does not include discard fleets of IIIaS because very high discard ratios.
- Group 5 - OTB_CRU_70-99_all area IV raised with all available discards for this metier in area IV. Excluded UK (SCO) discard fleet.
- Group 6 - OTB_CRU_90-119 (GER) raised with all available discrads of the same metier.
- Group 7 – OTB_SSC_DEF_>=120 raised with all availabel discards of this metier in this area.
- group 8 - OTB_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- group 9 - TBB_DEF_70-99_all Dutch fleet Q3 raised with all Dutch fleets of the same metier. Excluded German TBB_DEF_70-99 Q3 discard fleet.
- Group 10 - TBB_DEF_>120 IIIaN raised with all SSC_DEF_>120 and SDN_DEF_>120. No TBB_DEF_>=120 available.
- Group 11 - TBB_DEF_>120 IIIaN raised with all SSC_DEF_>120 and SDN_DEF_>120. No TBB_DEF_>=120 available.
- Group 12 – SSC_OTB_TBB_DEF_100-119 raised with all TBB_DEF_70-99 fleets. Excluded German TBB_DEF_70-99 Q3 discard fleet.
- Group 13 - OTB_CRU_32_89_all raised with all OTB_CRU_70-99_all métiers
- Group 14 – SSC_OTB_70-99_all raised with all fleets TBB_DEF_70-99_0_0_all. Excluded German TBB_DEF_70-99 Q3 discard fleet.
- Group 15 - TBB_CRU__16-31 raised with MIS_MIS_0_0_0_HC area IIIaN, low discard ratios.
- Group 16 – SDN_TBB_100-119 raised with TBB_DEF_70-99_0-0_all. Excluded German TBB_DEF_70-99 Q3 discard fleet.
- Group 17 – SSC_DEF_ALL_0_0_ALL raised with all SSC_DEF fleets

2010:

- group 1 - Group 1 - all passive gear in IIIaS <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaS chosen.
- Group 2 - all passive gear in IIIaN <- raised with all available passive gears in IIIaN
- Group 3 - all passive gear in IV <- raised with all available passive gears in IV
- Group 4 - Mis_Mis_0_0_0_HC area IV raised with MIS_MIS_0_0_0_HC area IIIaN. Does not include discard fleets of IIIaS because very high discard ratios.
- Group 5 - OTB_CRU_70-99_all area IV raised with all available discards for this metier in area IV. Excluded UK (SCO) discard fleets.
- Group 6 - OTB_CRU_90-119 (GER) raised with all available discrads of the same metier.
- Group 7 – OTB_SSC_DEF_>=120 raised with all availabel discards of this metier in this area.
- group 8 - OTB_SSC_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- group 9 - TBB_DEF_70-99_all raised with all fleets of the same metier. Excluded German TBB_DEF_70-99 Q2 discard fleet.
- Group 10 - TBB_DEF_>120 IV raised with all SDN_DEF_>120 available in area IV.
- Group 11 - TBB_DEF_>120 IIIaN raised with all SDN_DEF_>120. No TBB_DEF_>=120 available in area IIIaN.
- Group 12 – SSC_OTB_TBB_DEF_100-119 raised with all TBB_DEF_70-99 fleets. Excluded German TBB_DEF_70-99 Q2 discard fleet.
- Group 13 - OTB_CRU_32_89_all raised with all OTB_CRU_70-99_all métiers
- Group 14 – SSC_OTB_70-99_all raised with all fleets TBB_DEF_70-99_0_0_all. Excluded German TBB_DEF_70-99 Q2 discard fleet.
- Group 15 - TBB_CRU__16-31 raised with MIS_MIS_0_0_0_HC area IIIaN, low discard ratios.
- Group 16 – SSC_DEF_ALL_0_0_ALL raised with all SDN_DEF fleets

2011:

- group 1 - Group 1 - all passive gear in IIIaS <- no other metier with passive gear available. Danish MIS_MIS_0_0_0_HC metier in IIIaS chosen.
- Group 2 - all passive gear in IIIaN <- raised with all available passive gears in IIIaN
- Group 3 - all passive gear in IV <- raised with all available passive gears in IV
- Group 4 - Mis_Mis_0_0_0_HC area IV raised with Danish MIS_MIS_0_0_0_HC area IIIaN. Excluded IIIaS fleets because very high discard ratios.
- Goup 5 – OTB_CRU_90-119 raised with all available fleets of this métier.
- Group 6 - OTB_CRU_70-99_all area IV raised with all availabel discards for this metier in area IV.
- group 7 - OTB_PTB_DEF_>120_all area IV - raised with all availabel discards of this metier in this area.
- group 8 - OTB_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- group 9 - TBB_DEF_70-99_all raised with all fleets of the same metier.
- Group 10 - TBB_DEF_>120 IIIaN raised with all SDN_SSC_DEF_>120 available in area IV. No TBB_DEF_>=120 available.
- Group 11 - TBB_DEF_>120 IV raised with all SDN_SSC_DEF_>120. No TBB_DEF_>=120 available.
- Group 12 – OTB_DEF_100-119 raised with Dutch OTB_DEF_100-119
- Group 13 – SSC_DEF_100-119 raised with Dutch SSC_DEF_100-119
- Group 14 – OTB_CRU_32-69 (NOR only) raised with OTB_CRU_32-69 and OTB_CRU_70-99. Excluded DK Q1 and UK(SCO) discard fleets because of exceptional high discard ratios.
- Group 15 – OTB_CRU_70-89_2_35 raised with the same métier.
- Group 16 - TBB_OTB_CRU_SPF_DEF_16-31 raised with lowest discard ratio of TBB_CRU_16-31
- Group 17 – TBB_DEF_100-119 raised with Dutch TBB_DEF_100-119 fleets.
- Group 18 – OTB_SDN_SSC_DEF_70-99 raised with Dutch OTB_DEF_70-99.
- Group 19 – SSC_DEF_>=120 all raised with SSC_SDN_DEF_>=120 fleets

2012:

- SWE Active area IIIaS raised with SWE Active IIIaS
- group 1 - Group 1 - all passive gear in IIIaS <- no other metier with passive gear available. Swedish MIS_MIS_0_0_0_HC metier in IIIaS used.
- Group 2 - all passive gear in IIIaN <- raised with all available passive gears in IIIaN
- Group 3 - all passive gear in IV <- raised with all available passive gears in IV
- Group 4 - Mis_Mis_0_0_0_HC IIIaN raised with passive gears IIIaN, weighing factor CATON landings.
- Goup 5 – OTB_CRU_90-119 raised with all available fleets of this métier.
- Group 6 - OTB_CRU_70-99_all area IV raised with all availabel discards for this metier in area IV. Excluded grouped discard fleets (Dutch and UK) and DK Q3.
- group 7 - OTB_PTB_DEF_>120_all area IV - raised with all availabel discards of this metier in this area.
- group 8 - OTB_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- Group 9 – SSC_SDN_>=120 area IV - raised with all availabel discards of this metier in this area.
- Group 10 - SSC_SDN_>=120 area IIIaN - raised with all availabel discards of this metier in this area.
- Group 11 - TBB_DEF_70-99_all raised with all fleets of the same metier.
- group 12 - TBB_DEF_>120 IV raised with all SDN_SSC_DEF_>120. No TBB_DEF_>=120 available.
- Group 13 - TBB_DEF_>120 IIIaN raised with all SDN_SSC_DEF_>120 available in area IIIaN. No TBB_DEF_>=120 available.
- Group 14 – OTB_DEF_100-119 raised with Dutch OTB_DEF_100-119
- Group 15 – SSC_DEF_100-119 raised with Dutch SSC_DEF_100-119
- Group 16 – OTB_CRU_32-69 (NOR only) raised with OTB_CRU_32-69 (DEN).
- Group 17 – OTB__DEF_70-99 raised with OTB_DEF_70-99. EXCLLUDED UK(SCO) from raising.
- Group 18 – SSC_DEF_70-99 raised with Dutch OTB_DEF_70-99
- Group 19 – SSC_DEF_ALL_0_0_ALL area IV raised with SSC_DEF_>=120 (DEN) area IV
- Group 20 – MIS_MIS_HC area IV raised with passive gears in area IV, weighing parameter CATON landings.
- Group 21 – MIS_MIS_HC area IIIaS raised with MIS_MIS_HC IIIaS

2013:

- Group 1 – MIS_MIS_HC all IIIaS raised with all MIS_MIS_HC all IIIaS.
- Group 2 – passive gears IIIaN raised with all passive gears IIIaN
- Group 3 – passive gears IV raised with all passive gears in IV. Weighing CATON Landings.
- Group 4 - OTB_CRU_70-99_all raised with OTB_CRU_70-99_all. Excluded NL fleets.
- Group 5 - OTB_CRU_90-119 raised with all available fleets of this métier.
- Group 6 - OTB_DEF_>120_all area IV - raised with all availabel discards of this metier in this area.

- Group 7 - OTB_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- Group 8 – SSC_SDN_DEF>120_all IV raised with all availabel discards of this métier
- Group 9 - SSC_SDN_DEF>120_all IIIaN raised with all availabel discards of this métier
- Group 10 – TBB_DEF_70-99 all raised with all fleets of the same métier.
- Group 11 – TBB_DEF_>=120 all areas raised with all fleets of the same métier.
- Group 12 - OTB_DEF_100-119 raised with Dutch OTB_DEF_100-119
- Group 13 - SSC_DEF_100-119 raised with Dutch SSC_DEF_100-119
- Group 14 - OTB_CRU_32-69 (NOR only) raised with OTB_CRU_70-99 all. Exclude NL discard fleet.
- Group 15 – OTB_SSC_SDN_DEF_70-99_all raised with Dutch OTB_DEF_70-99_all
- Group 16 – TBB_DEF_100-119 (NL in IIIaN) raised with TBB_DEF_100-119_all (NL area IV)
- No raising for MIS_MIS_HC area IIIaN and IV
- No raising for métiers TBB_OTB_CRU_16-31 and OTB_SPF_32-69

2014:

- Group 1 – MIS_MIS_HC all IIIaN raised with passive gears IIIaN, weighing factor CATON landings
- Group 2 – passive gears IIIaN raised with all passive gears IIIaN
- Group 3 – passive gears IV raised with all passive gears in IV
- Group 4 - OTB_CRU_70-99_all raised with OTB_CRU_70-99_all. Excluded UK(SCO) fleet because grouped for three quarters only.
- Group 5 - OTB_CRU_90-119 raised with all available fleets of this métier.
- Group 6 - OTB_DEF_>120_all area IV - raised with all availabel discards of this metier in this area.
- Group 7 - OTB_DEF_>120_all area IIIaN - raised with all availabel discards of this metier in this area.
- Group 8 – SSC_SDN_DEF>120_all areas raised with all available discards of this métier.
- Group 9 – TBB_DEF_70-99 all raised with all fleets of the same métier.
- Group 10 – TBB_DEF_>=120 all areas raised with all fleets of SSC_SDN_DEF_>=120.
- Group 11 – OTB_DEF_100-119 raised with Dutch OTB_DEF_100-119
- Group 12 - SSC_DEF_100-119 raised with Dutch SSC_DEF_100-119
- Group 13 - OTB_CRU_32-69 (NOR only) raised with OTB_CRU_70-99 all. Exclude UK(SCO) discard fleet.
- Group 14 - OTB_SSC_SDN_DEF_70-99_all raised with Dutch OTB_DEF_70-99_all and France OTB_DEF_70-99_all
- Group 15 - MIS_MIS_HC area IV raised with passive gears area IV, weighing factor CATON landings.

- No raising for métiers TBB_OTB_CRU_16-31 and OTB_SPF_32-69

Allocation schemes

General notes:

- In earlier years only Dutch age readings available, only few per quarter. Weight at age pattern seems very strange in some cases.
- Always grouped the allocations by catch category per quarter. Tried in 2014 also to group by area because of large differences in weight at age between Danish samples in area IIIaN. This approach did not result in any significant changes in the weight at age or age distribution.
- Weighing factor by default number at age. In most recent years CATON Discards used.
- Deleted the following sample data:
- DENMARK Discards Q1 MIS_MIS_HC_0_0_all -> very strange weight at age data

- 2011: removed Dutch discards from allocation scheme: Q1 TBB_DEF_70-99_0_0_all -> weight at age 1 not correct.

Working Document – Available Biological data for dab

H. Haslob, n.n.

Introduction

Dab (*Limanda limanda*) is a widespread demersal species on the Northeast Atlantic shelf and is distributed from the Bay of Biscay to Iceland and Norway, including the Barents Sea and the Baltic Sea. Its centre of distribution in the North Sea is located in the southern North Sea (Lozán 1988; Daan et al., 1990). Dab is the most abundant flat fish species in the North Sea (Daan et al., 1990).

Spawning, pelagic development and settlement of the post-larvae all occur within the spawning ground (Bohl, 1957). Settled 0-group specimens migrate to nearby nursery grounds (Bolle et al., 1994). Recruitment success in terms of 0-group abundance in autumn is negatively related to spring water temperature (Henderson, 1998). The 0-group shows a general preference for sheltered areas, but not for particular depth or salinity zones (Riley et al., 1981). Correspondingly, dab appears to be 'euyhaline' and 'eurytherme' (Bohl, 1957; Henderson and Holmes, 1991).

Several population studies provide regional age-length keys by sex, fecundity data and small scale distribution analyses for dab in the southern North Sea, the English Channel and the Bay of Biscay (Deniel 1990; Rijnsdorp et al. 1992; Jennings et al. 1999). Maturity data are available in terms of combined age-at-maturity and length-at-maturity information. Maturity is reached at about 2 - 3 years or at a length of 11cm and 14cm in males and females, respectively (Rijnsdorp et al., 1992).

Survey data

Surveys providing information on distribution, abundance and length frequency for North Sea dab are the Inter-national Bottom Trawl Survey (IBTS) in quarter 1 and quarter 3 (area IVC and IIIa, Figure 1) and the Beam Trawl Surveys (BTS) in quarter 3 (area IV, Figure 2). In this working document only data are shown which are available via the ICES DATRAS survey data portal (www.ices.dk).

Table 1 gives an overview of available dab data on age and individual weight. Length frequencies for different BTS in the North Sea are given in Figure 3 (RV "Isis"), Figure 4 (RV "Tridens") and Figure 5 (RV "Solea"). The length frequencies for the International Bottom Trawl Surveys (IBTS) are shown in Figures 6 and 7. In some years a strong recruiting year class can clearly be seen, especially from the BTS and the IBTS quarter 1 data. For both survey series (BTS and IBTS) an increasing trend of the mean length is visible (Figures 8 and 9).

Length-weight relations are available for the Dutch BTS since 2002 (Figure 10 and 11) and also for the IBTS Q3 (Figure 13). During the German BTS dab individual weights are only recorded since 2013 (Figure 12). For the IBTS quarter one only data for the years 2012 – 2014 are available, most of them collected on the French vessel in the southern North Sea (Figure 14).

Age readings are available for several years for all beam trawl surveys. Figures 15 – 16 show fitted growth curves for the years 2003 – 2014. Sex separated growth curves show different growth pattern for female and male dab (Figure 17). The weight at age data from the BTS show no clear trend over the years (Figure 18).

Maturity data

Maturity data were only recorded for a few years (2012 – 2014) during the IBTS quarter 1. These data indicate that probably a high proportion (up to 90%) of age group 1 is already mature (Figure 19).

Table 1: Overview of biological data for dab (*Limanda limanda*) available in the DATRAS data portal.

	BTS Isis Q3		**BTS Tridens Q3**		**BTS Solea Q3**		**IBTS Q1**		**IBTS Q3**	
year	IndWgt	Age	IndWgt	Age	IndWgt	Age	IndWgt	Age	IndWgt	Age
2002			474			434				
2003	301	286	482	473		494				
2004	276	274	522	504		977			366	
2005	391	373	549	534					391	
2006	345	341	496	482					374	
2007	400	394	544	517		620			387	
2008	312	285	529	515		585			388	
2009	272	269	549	538		975			384	2
2010	155	155	563	538		1022			419	
2011	485	476	620	613		1254			390	
2012	371	365	561	556		1074	452	445	364	13
2013	284	259	527	516	1994	1995	485	481	214	
2014	183	182	550	548	431	460	392	427	269	
2015	203		588						269	

Survey areas

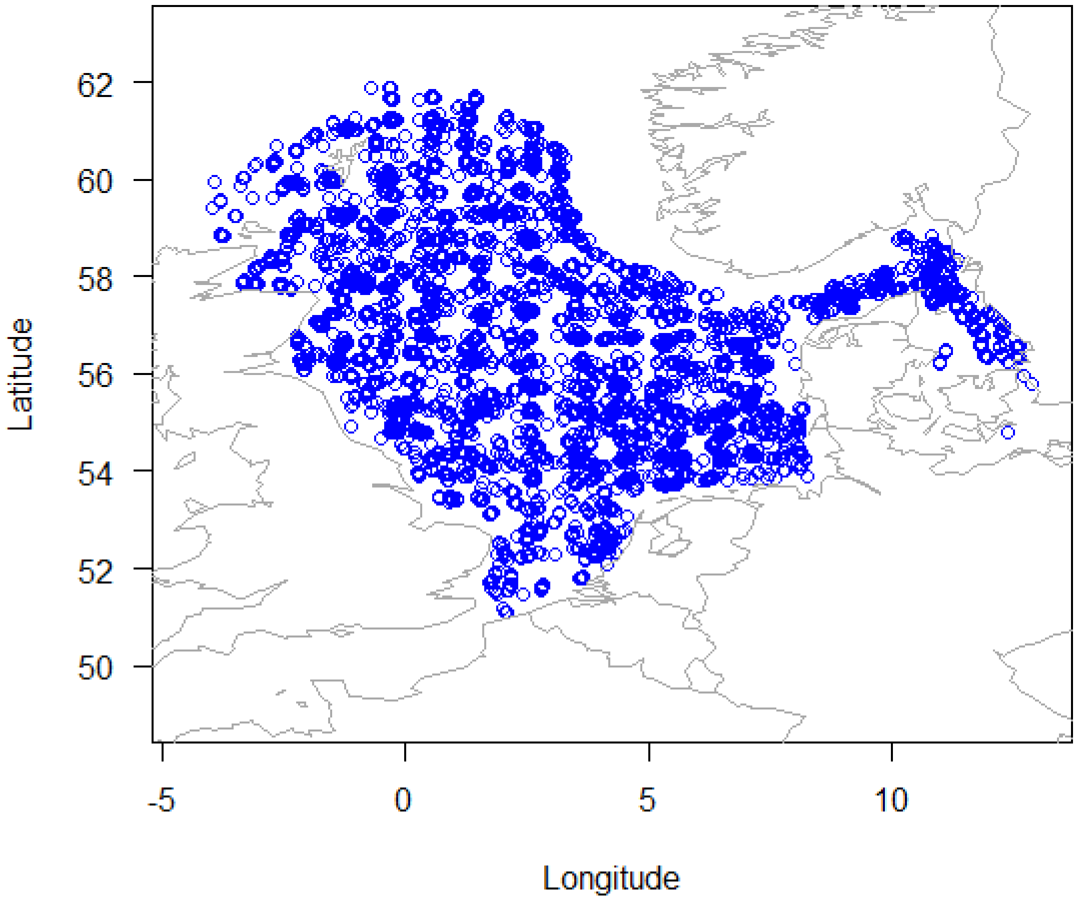

Fig. 1: Survey area of the International Bottom Trawl Survey (IBTS) in the North Sea (Quarter 1 and quarter 3).

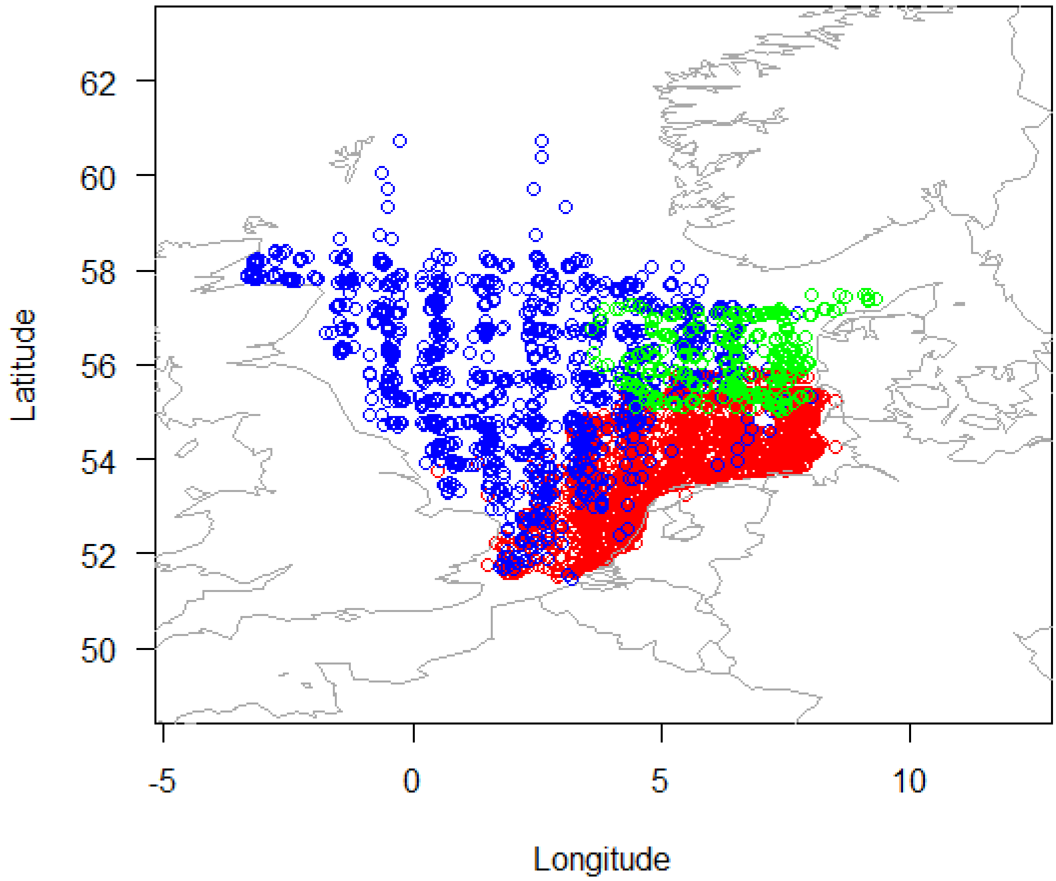

Figure 2: Survey areas of the Dutch Beam Trawl Surveys (blue circles, RV"Tridens"; red circles, RV"Isis") and the German Beam Trawl Survey (green circles, RV"Solea").

Length frequencies

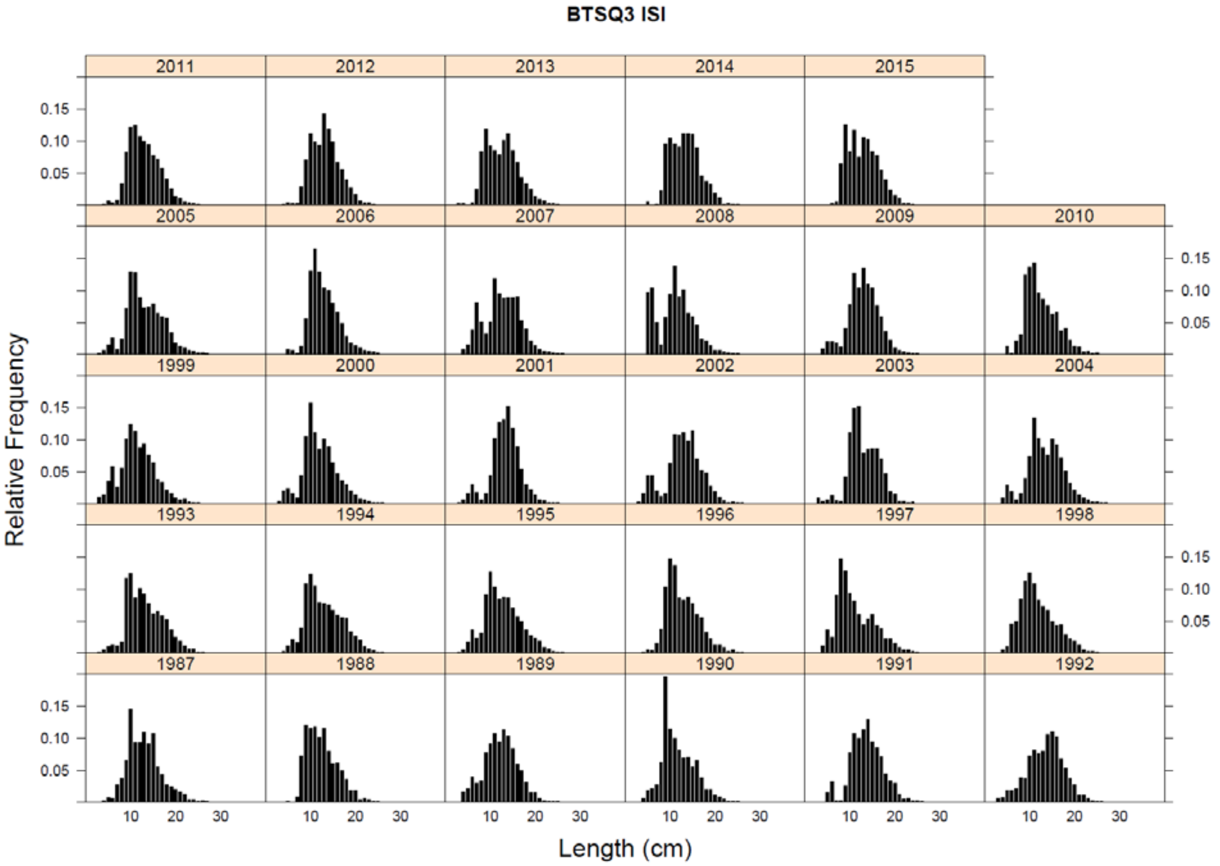

Fig. 3: Length frequency distributions of dab from the RV “Isis” BTS quarter 3 survey.

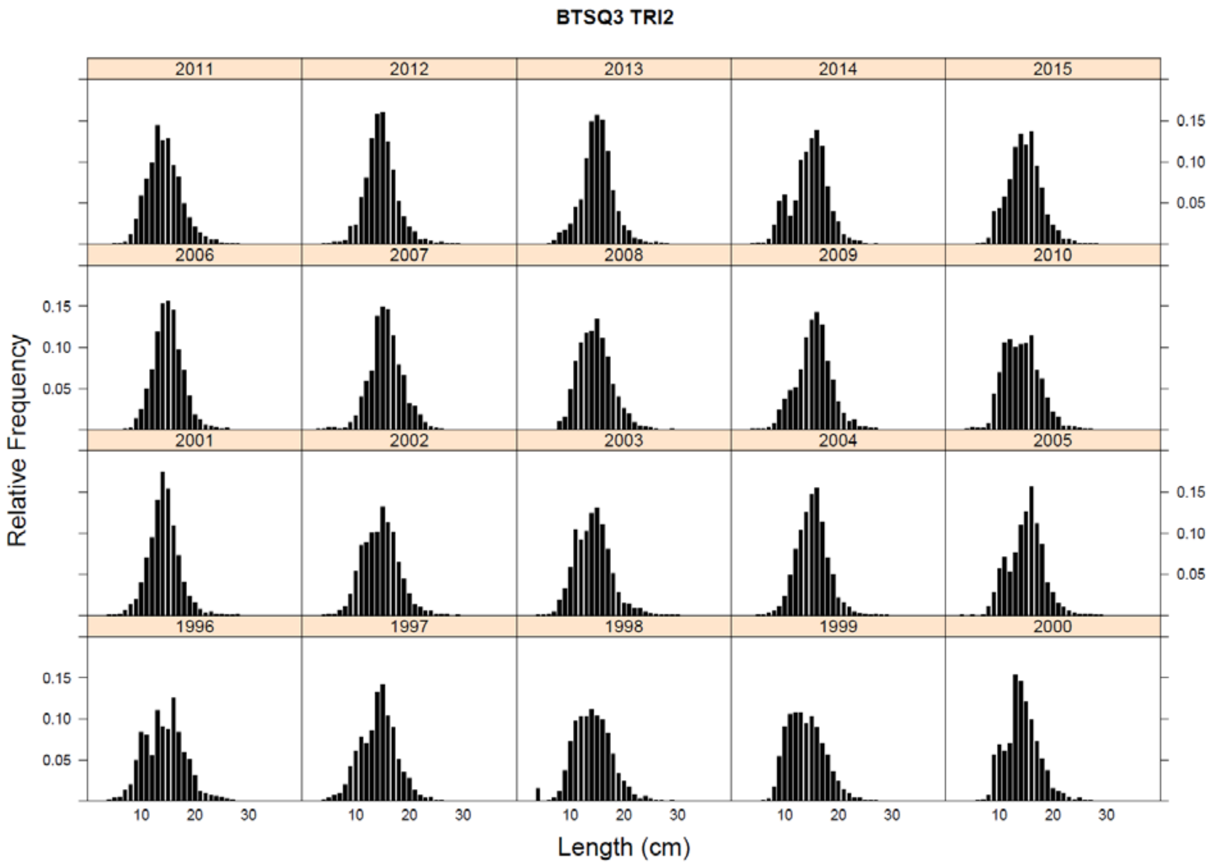

Fig. 4: Length frequency distributions of dab from the RV "Tridens" BTS quarter 3 survey.

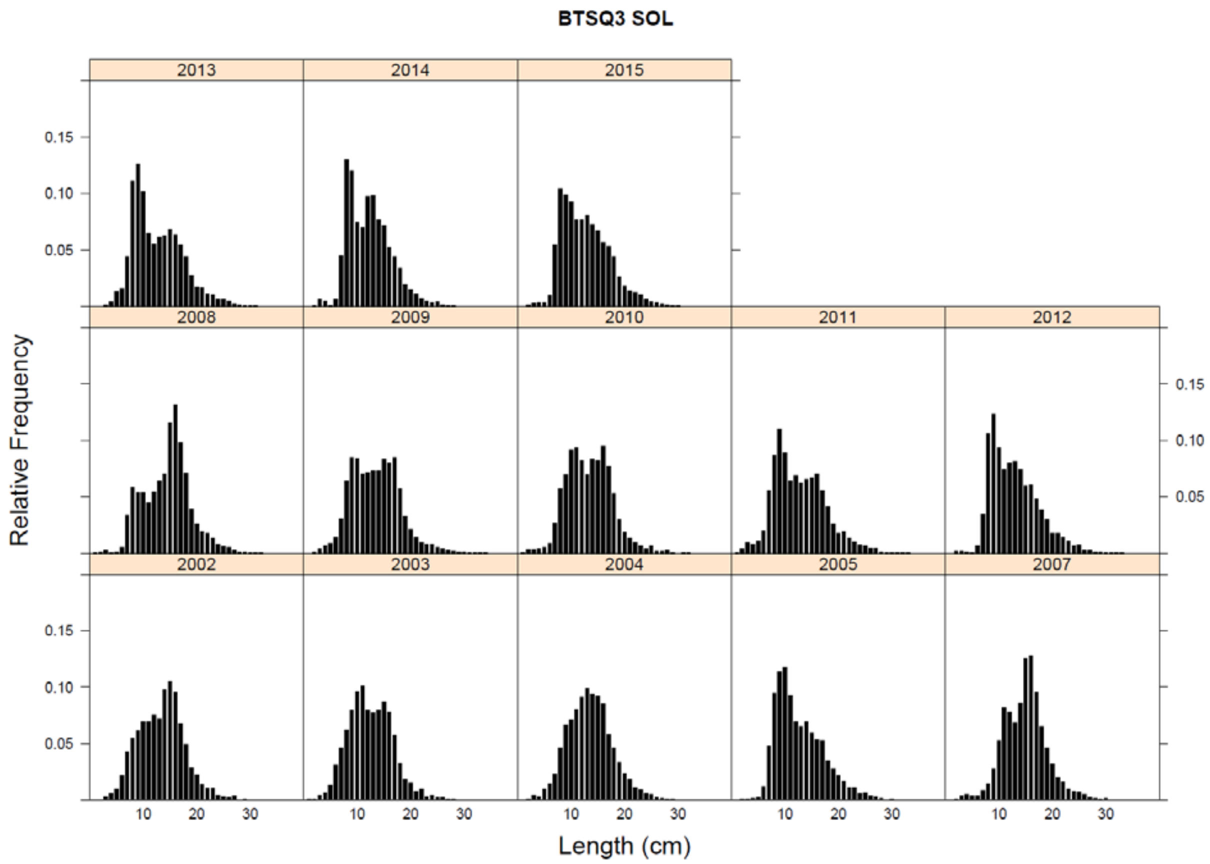

Fig. 5: Length frequency distributions of dab from the RV "Solea" BTS quarter 3 survey.

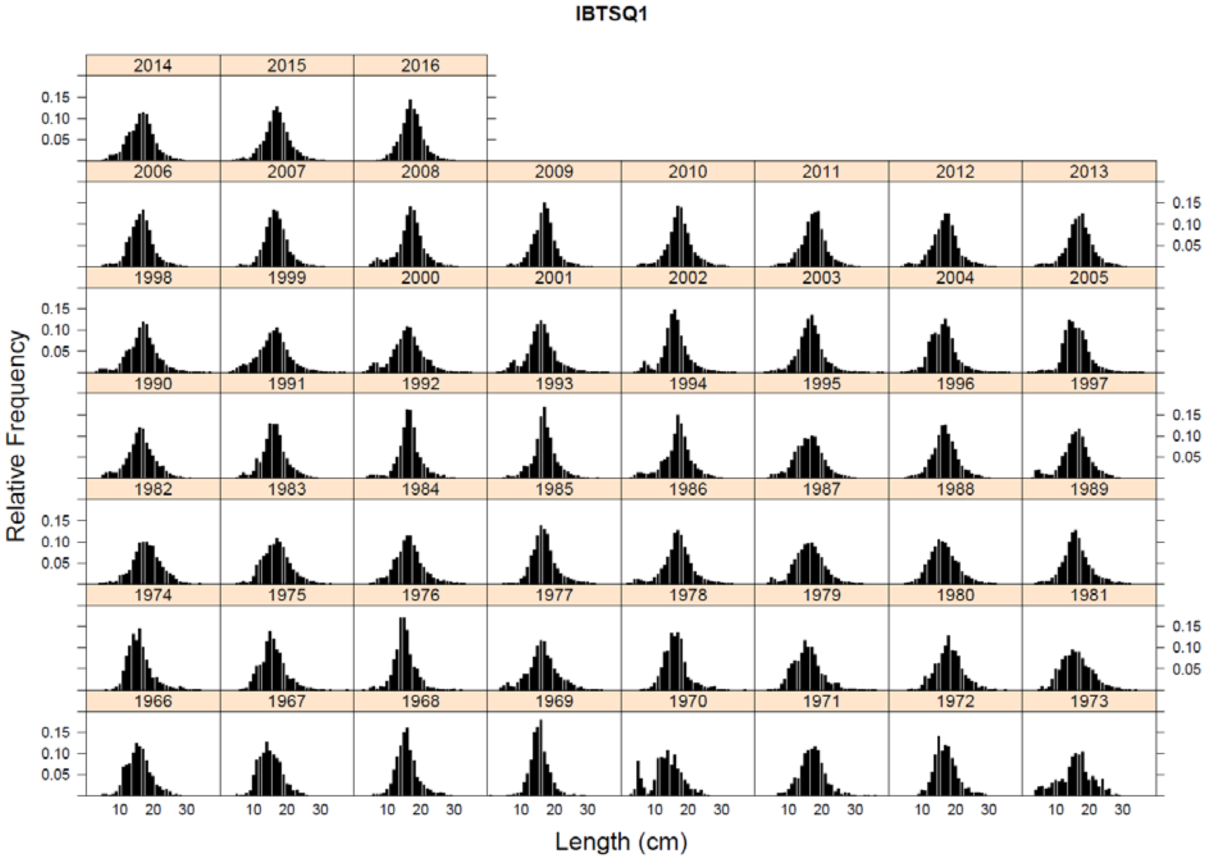

Fig. 6: Length frequency distribution of dab from the IBTS quarter 1 survey.

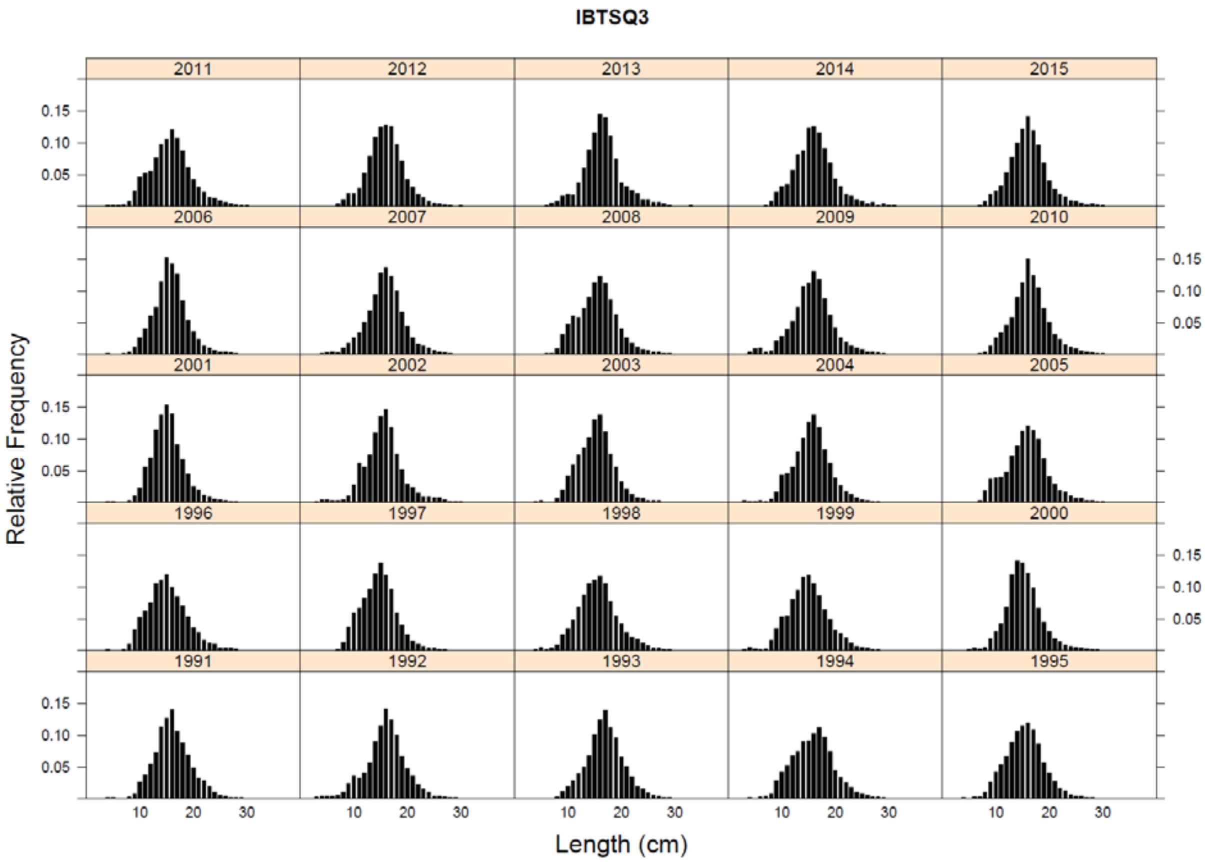

Fig. 7: Length frequency distribution of dab from the IBTS quarter 3 survey.

Mean length

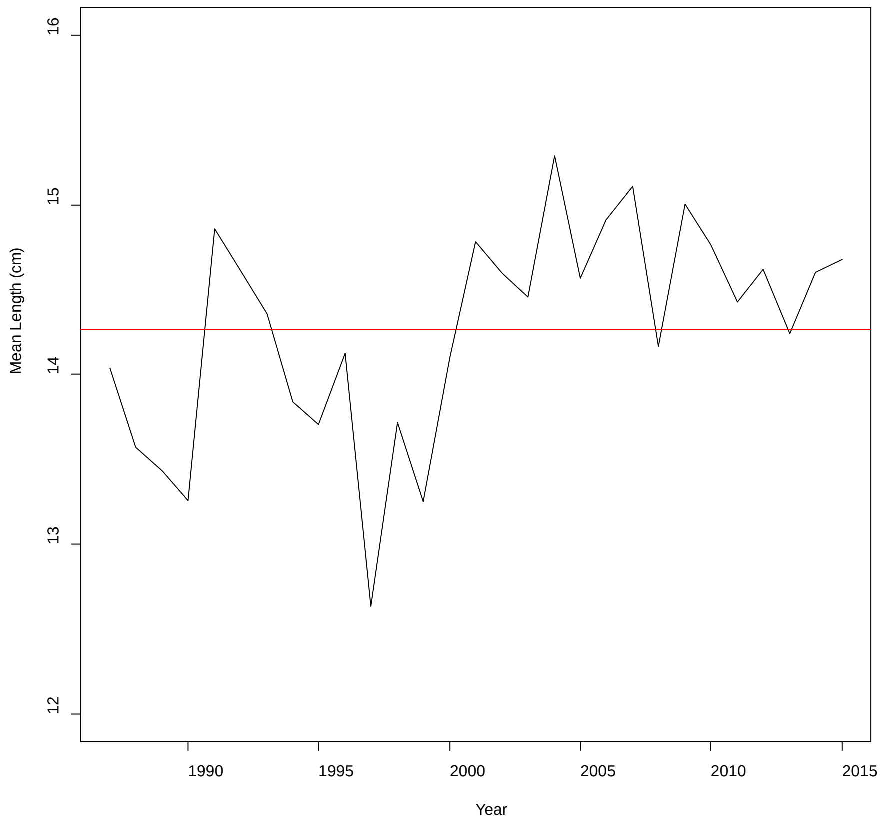

Fig. 8: Dab mean length from the International Beam Trawl Survey data (1987-2015, quarter 3).

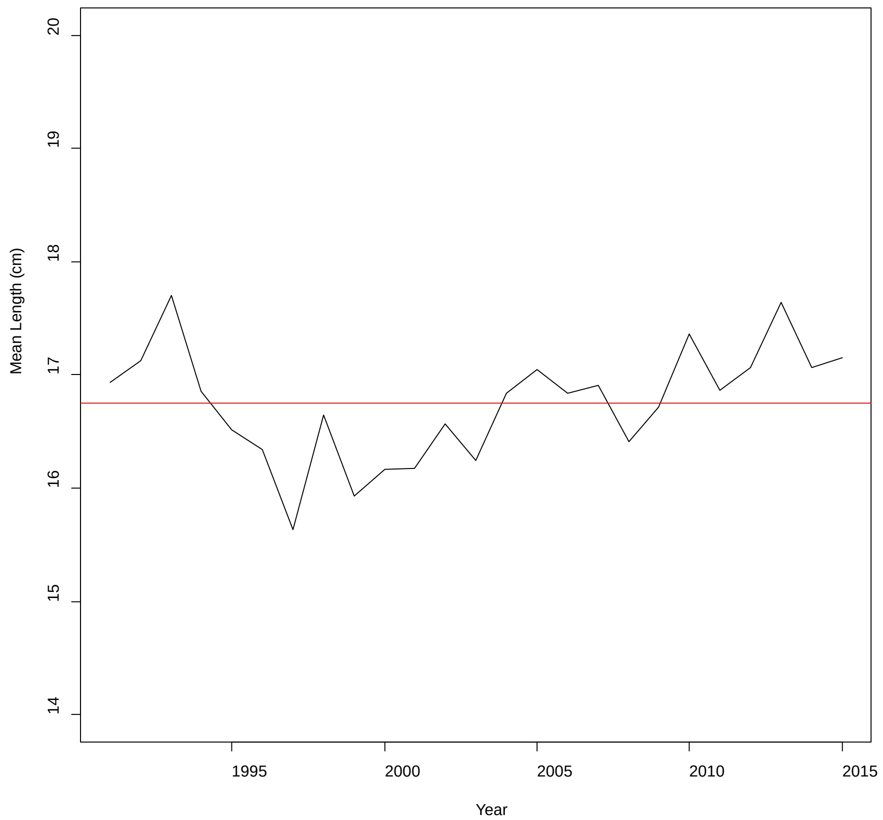

Fig. 9: Dab mean length from the International Bottom Trawl Survey Quarter 3 (1991 – 2015).

Length-weight relations

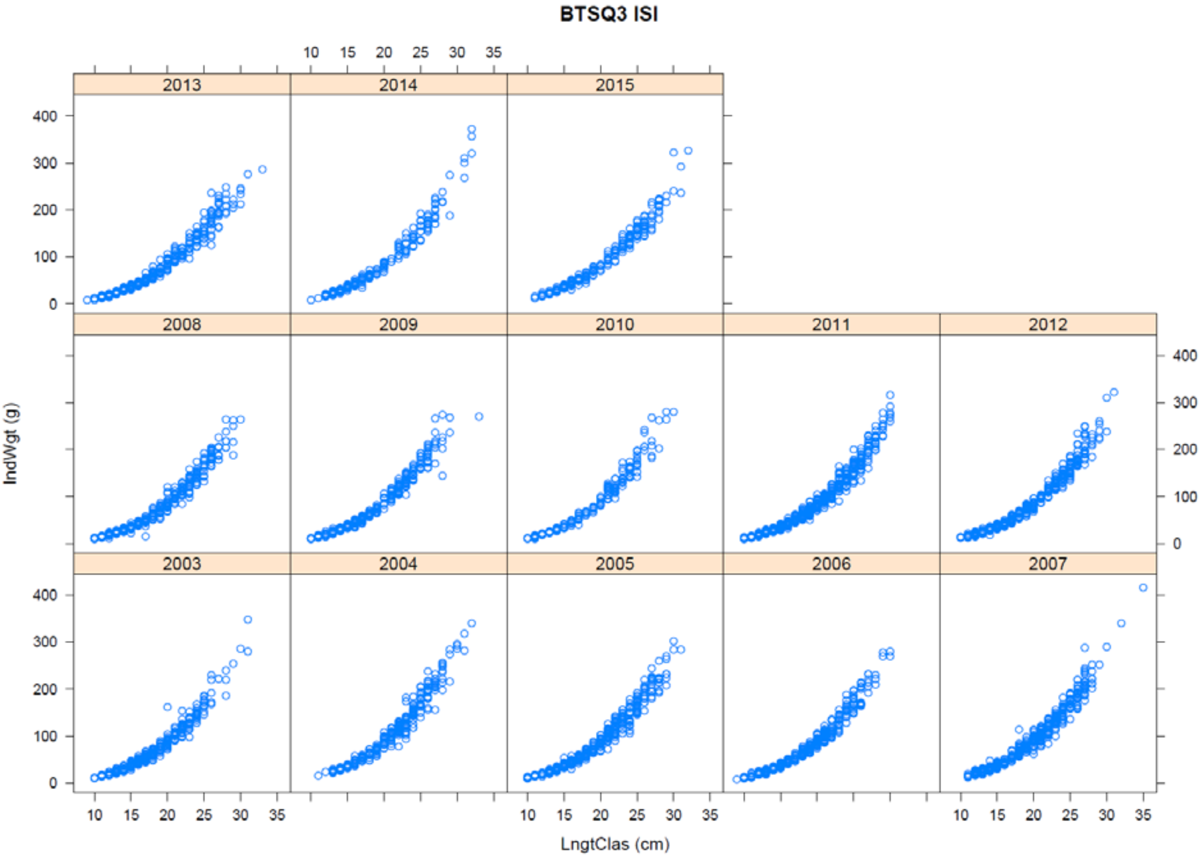

Fig. 10: Length-weight relations of dab from the BTS Q3 RV “Isis” survey.

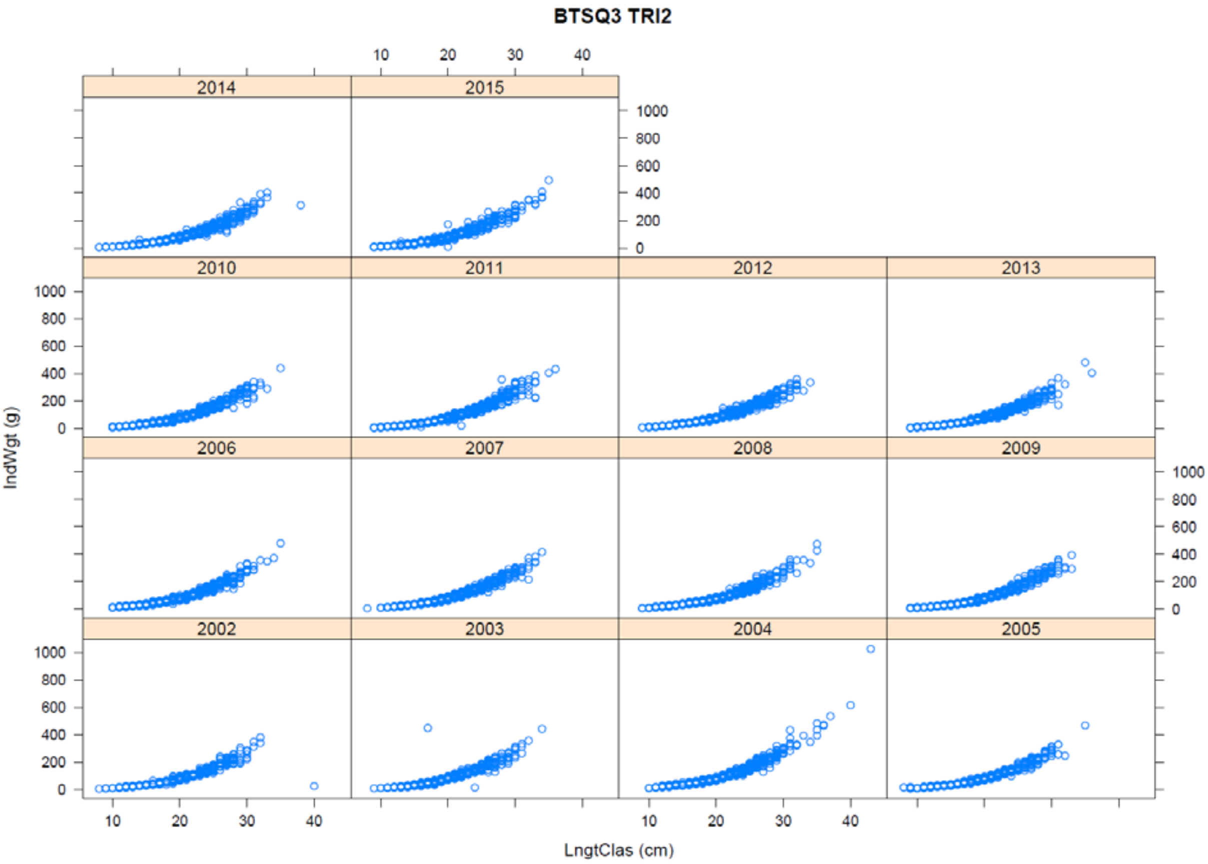

Fig. 11: Length-weight relations of dab from the BTS Q3 RV "Tridens" survey.

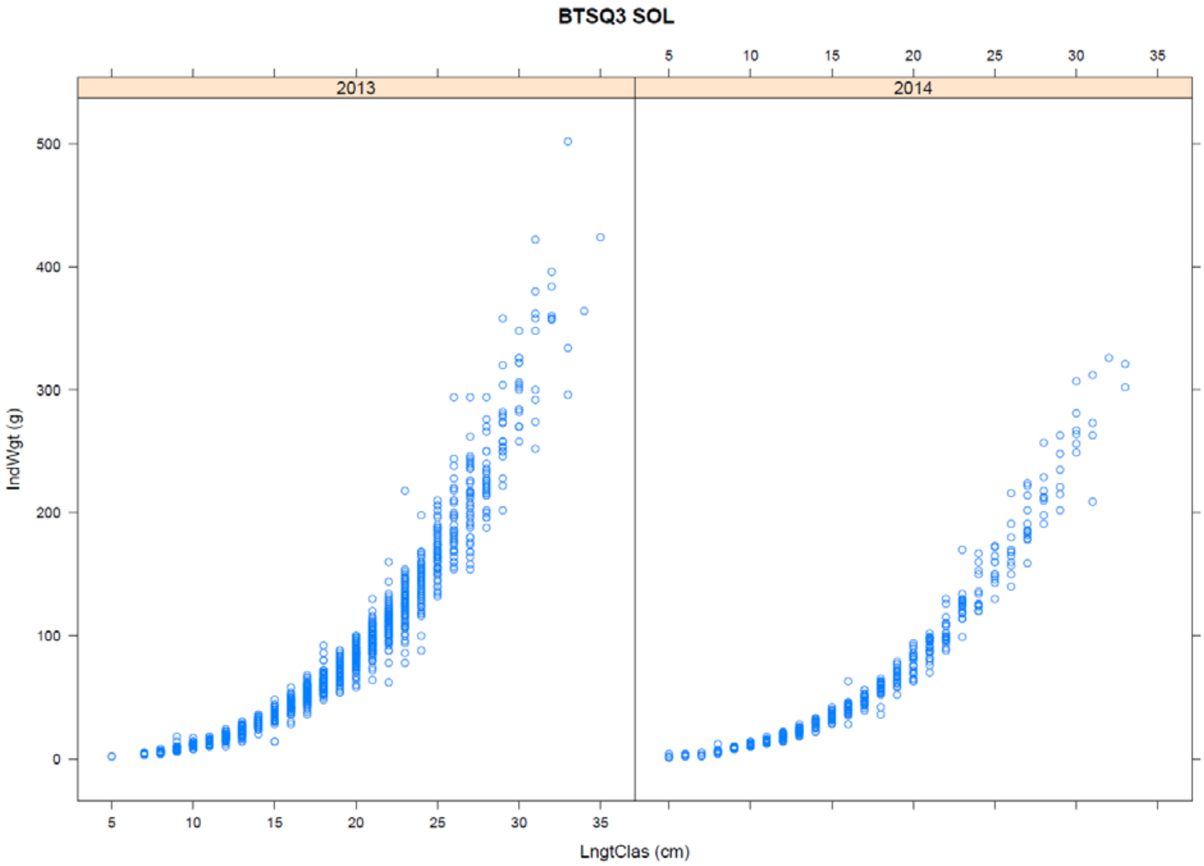

Fig. 12: Length-weight relations of dab from the BTS Q3 RV "Solea" survey.

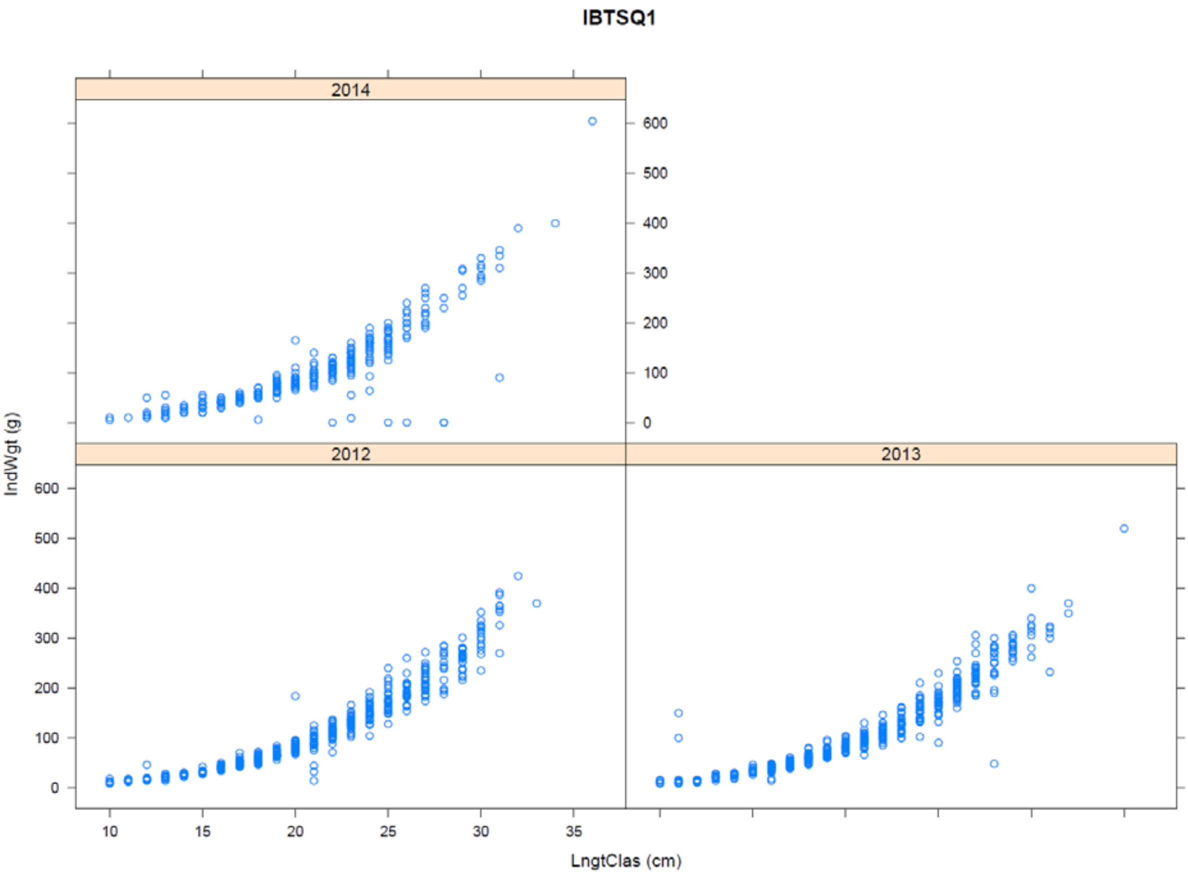

Fig. 13: Length-weight relations of dab from the IBTS Q1 survey.

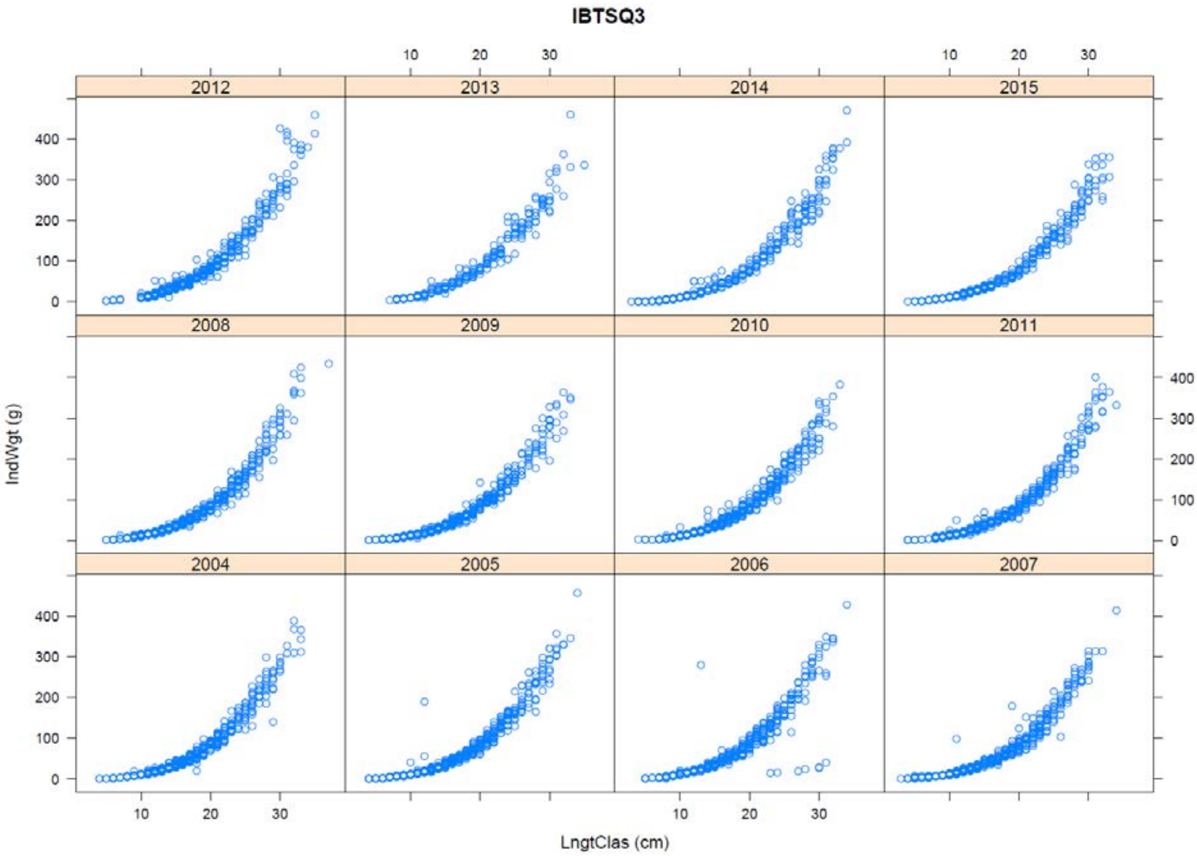

Fig. 14: Length-weight relations of dab from the IBTS Q3 survey.

Growth curves

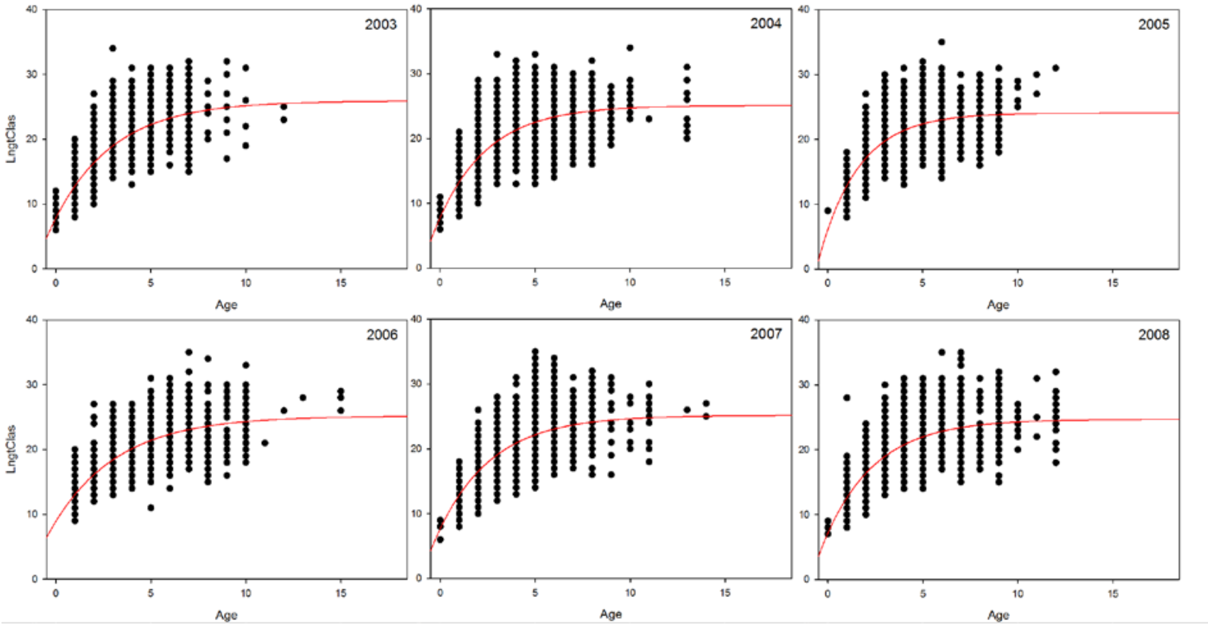

Fig. 15: Growth curves fitted to age-length data for dab from Beam Trawl Survey data 2003 – 2008.

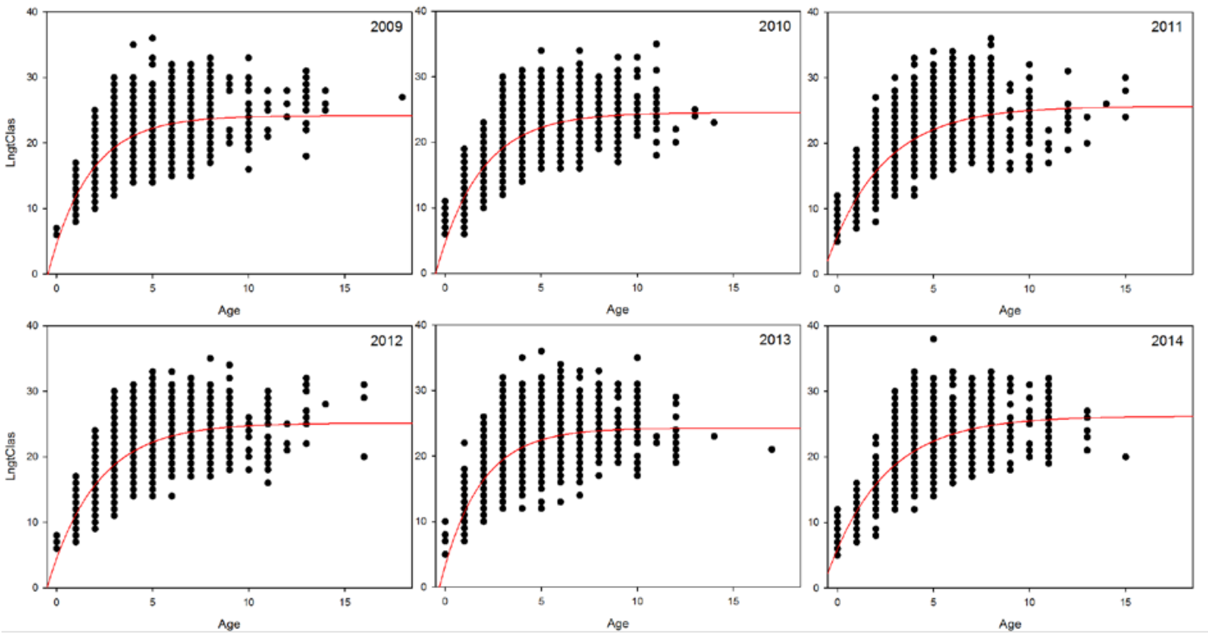

Fig. 16: Growth curves fitted to age-length data for dab from Beam Trawl Survey data 2009 – 2014.

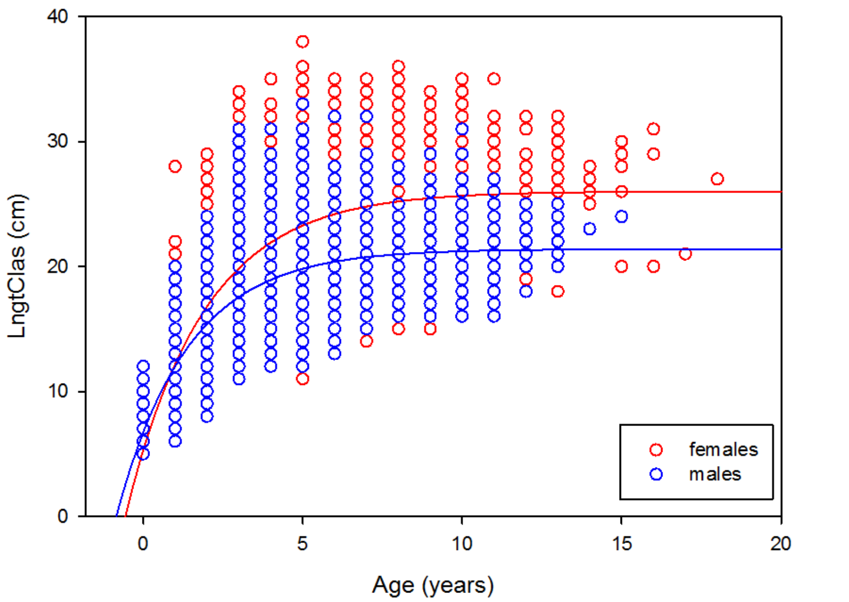

Fig. 17: Growth curves fitted to age length data by sex for dab from Beam Trawl Survey data 2003 – 2014.

Table 2: VBG-model parameters

	Linf	K	t0
female	25.79	0.44	-0.48
male	20.99	0.43	-1.01
combined	24.9	0.39	-0.7

Weight at age

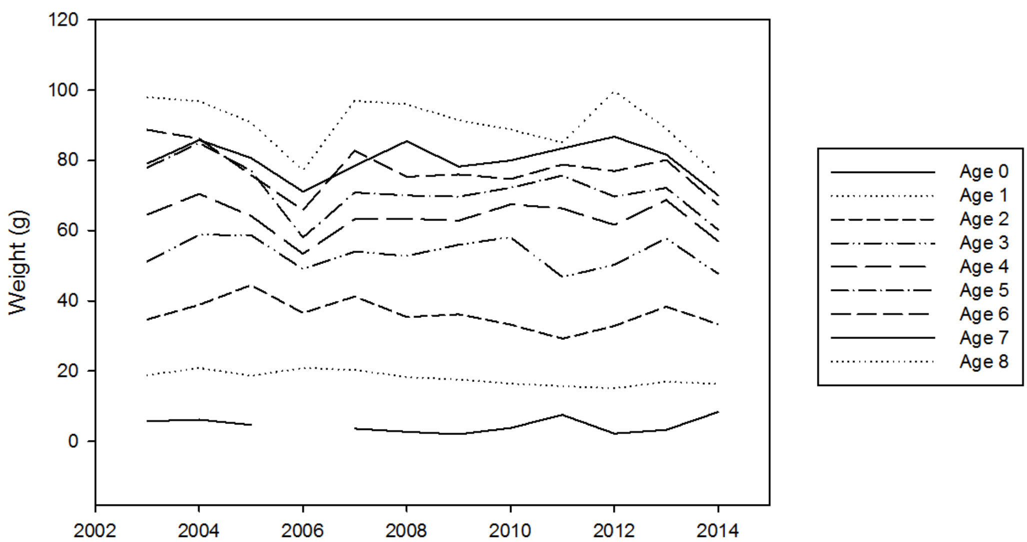

Fig. 18: Weight at age of dab from beam trawl survey data 2003 – 2014.

Maturity data

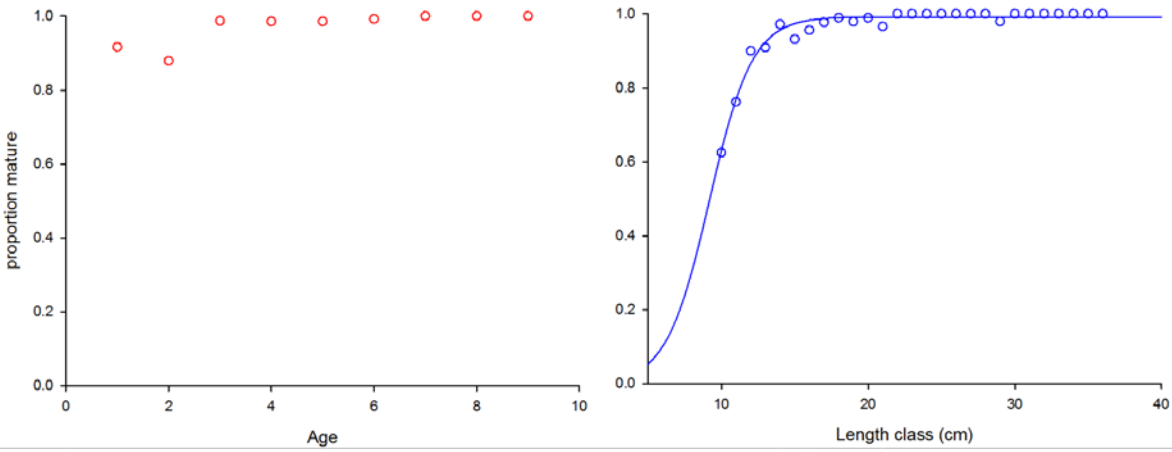

Fig. 19: Age (n=1335) and length (n=1360) based maturity ogives for dab from IBTS quarter 1 data (2012-2014).

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Survey Based Assessment runs (SURBA) for North Sea Dab – preliminary results

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Available age based indices were used to run survey based assessment models for North Sea dab applying the SURBA method (Needle, 2015). SURBA is used to indicate relative stock dynamics and might be useful to provide information for data-poor and stocks for which the catch data are not reliable enough.

The required input data are at least one age based survey index and weight at age data and maturity data for calculation of relative SSB and TSB. Weight at age data were estimated using the DATRAS R package. One fixed maturity ogive was used for all runs based on data from literature and maturity data collected during the IBTS Q1. The settings were the same for each run: zbar ages = 2-6, reference age=2, lambda=3. The used survey indices (including ages 1 – 8+) were the following:

- BTS-ISIS
- BTS-Tridens
- BTS-combined1 (combined Dutch BTS without gear correction)
- BTS-combined2 (combining Dutch BTS and German BTS with gear effect applying Delta-GAM method by Berg et al., 2014).
- IBTS Q3 (“borrowing” ALK from Dutch BTS quarter3)

All models using data from the beam trawl surveys indicate a decreasing mortality and an increasing stock trend (Fig. 2 – 6). The SURBA run using the IBTS Q3 index also indicates a decreasing z but a rather stable stock trend.

Figure 7 – 11 display the log residuals by age, Figure 12 – 16 the survey catch curves.

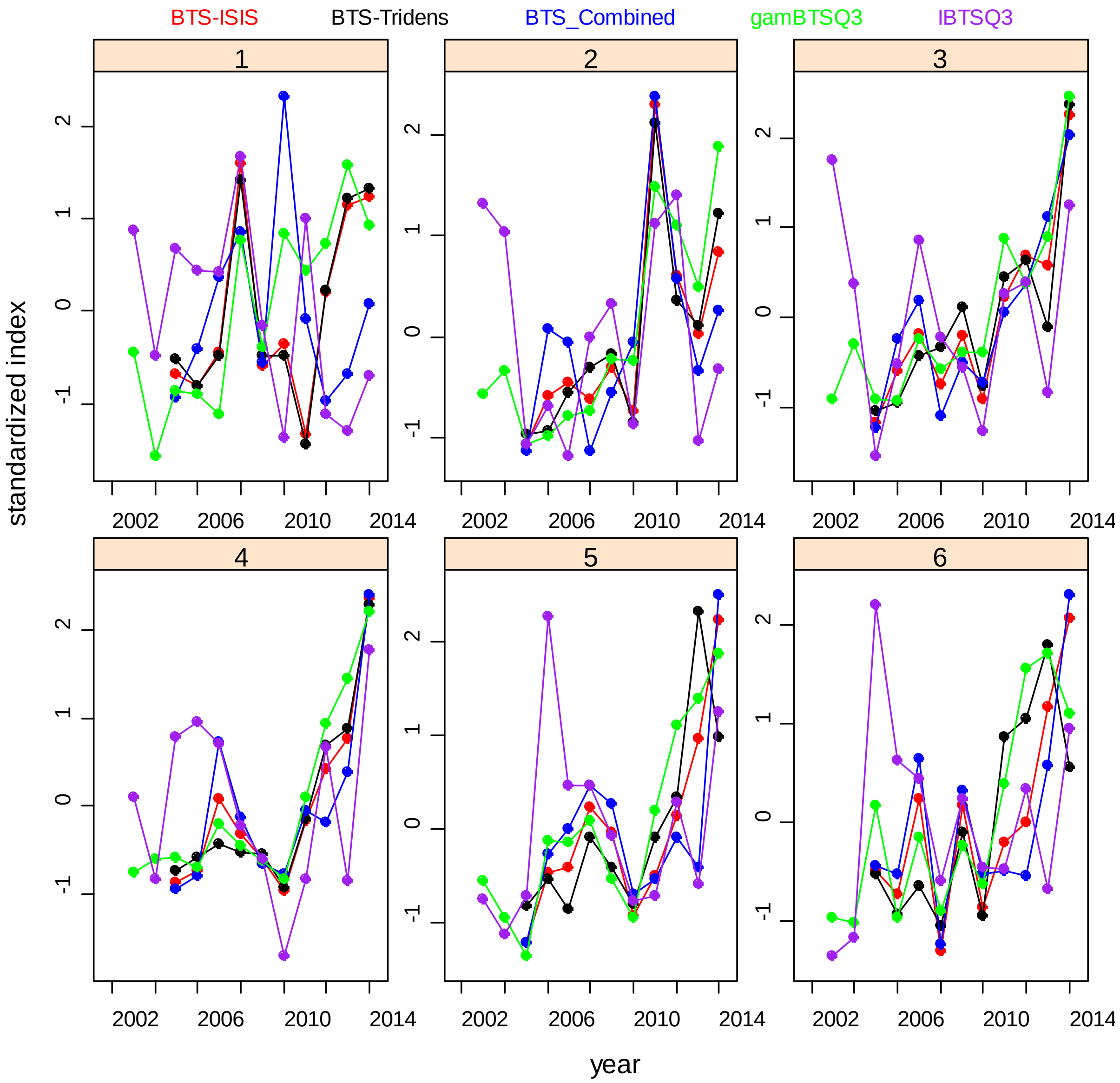

Figure 1: Used indices for survey based assessment models.

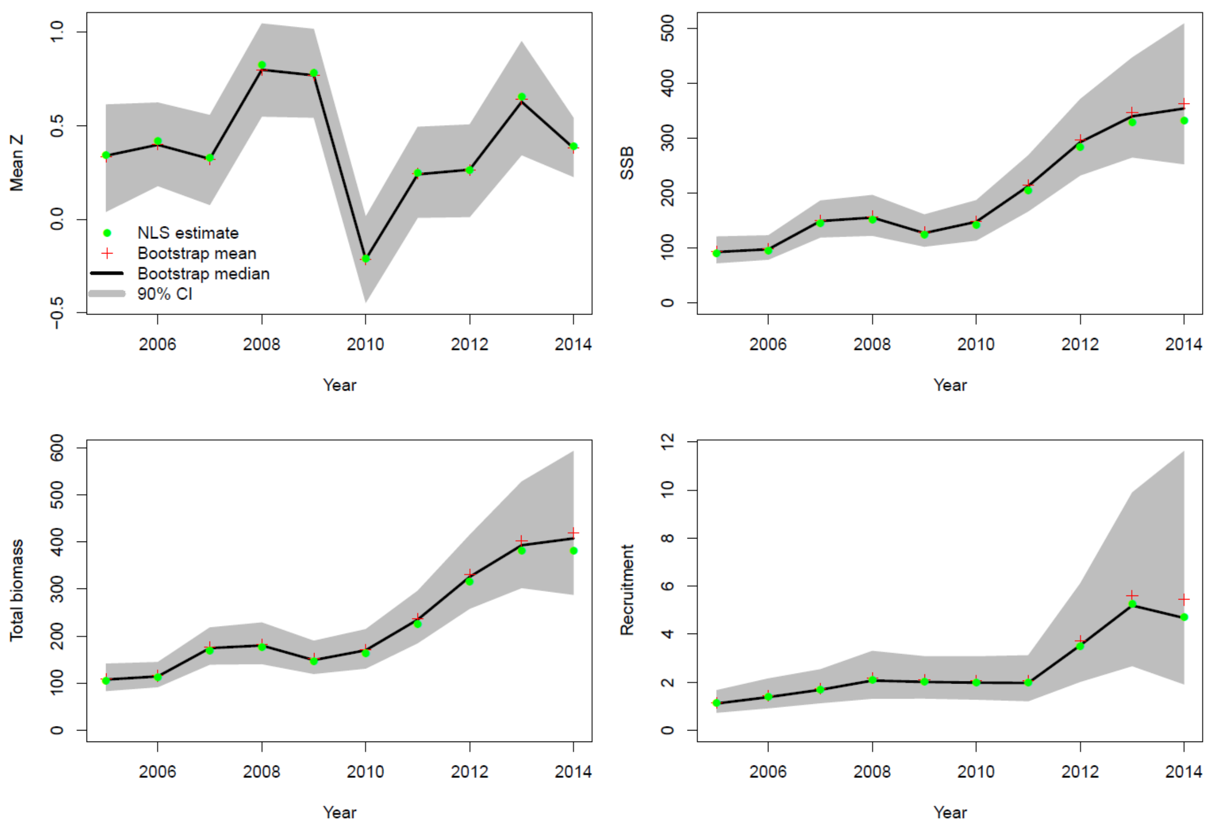

Figure 2: SURBA output BTS-Isis.

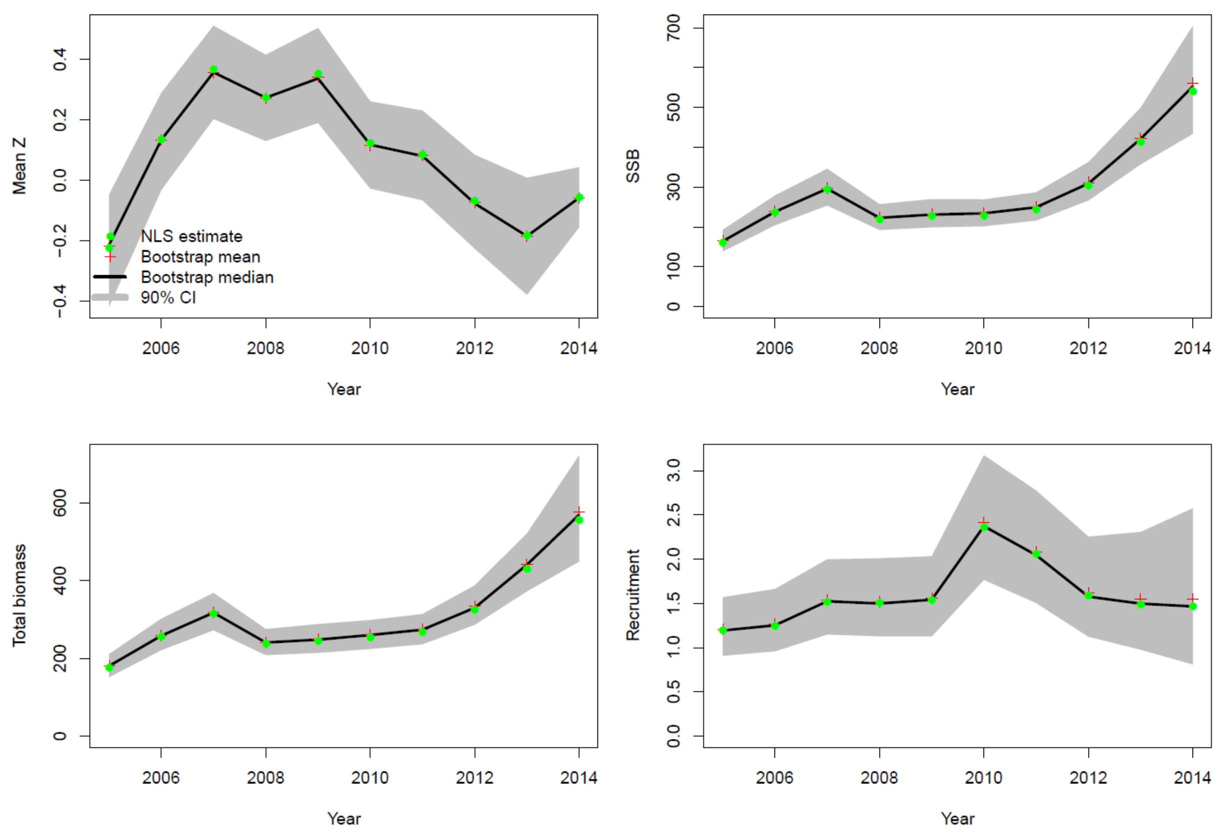

Figure 3: SURBA output BTS-Tridens.

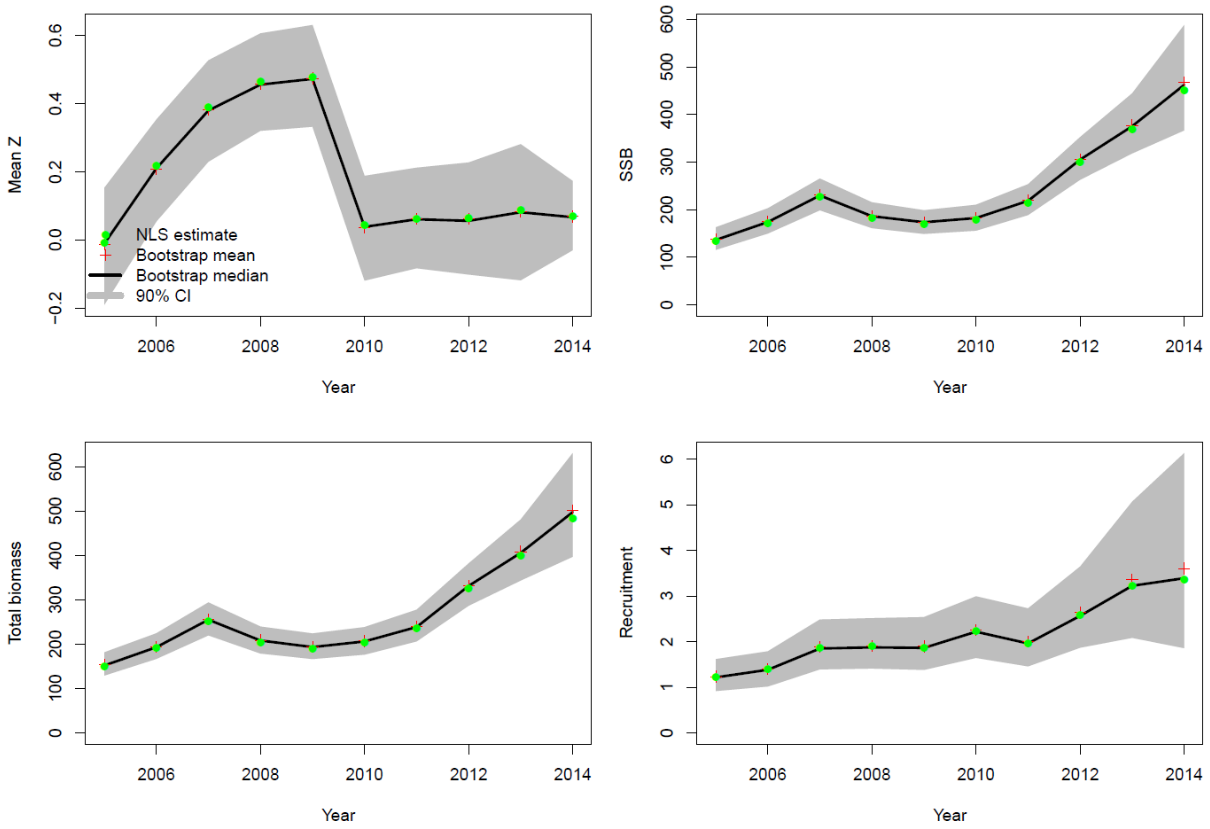

Figure 4: SURBA output BTS-combined1.

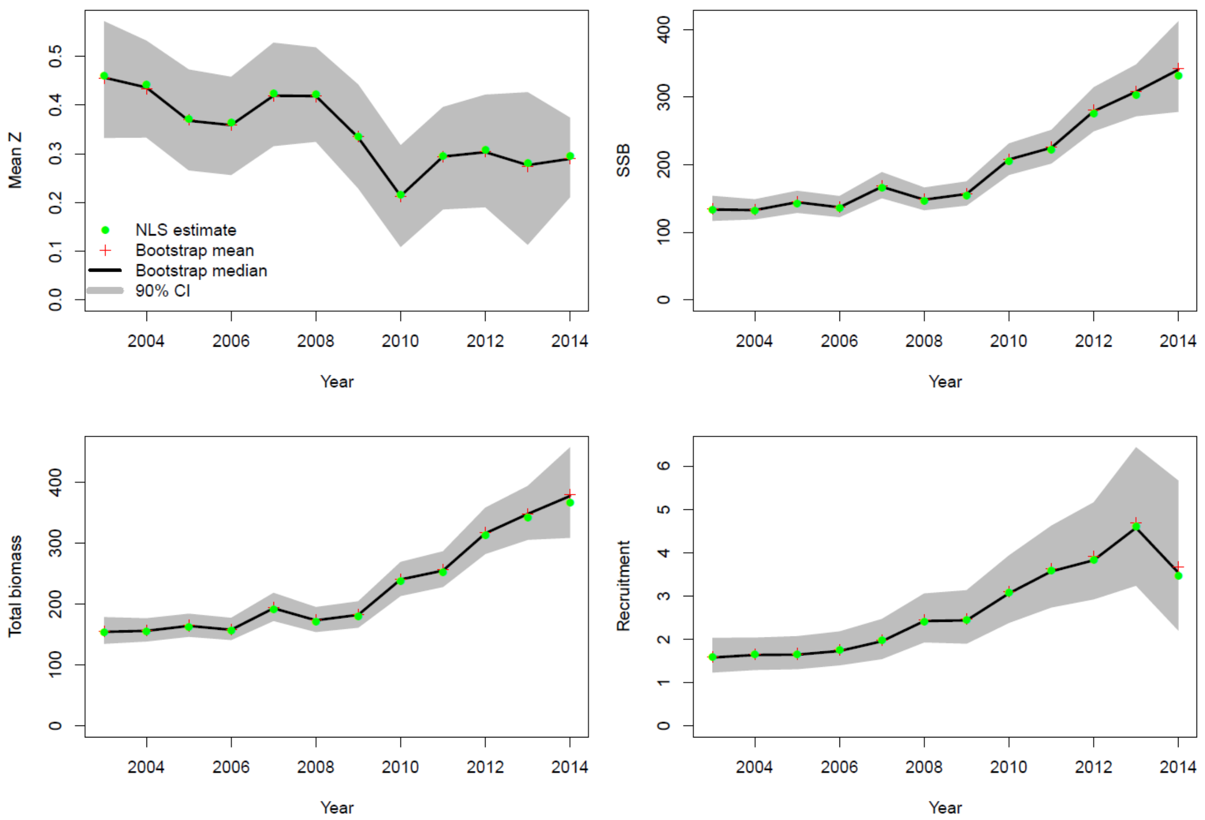

Figure 5: SURBA output BTS_combined2.

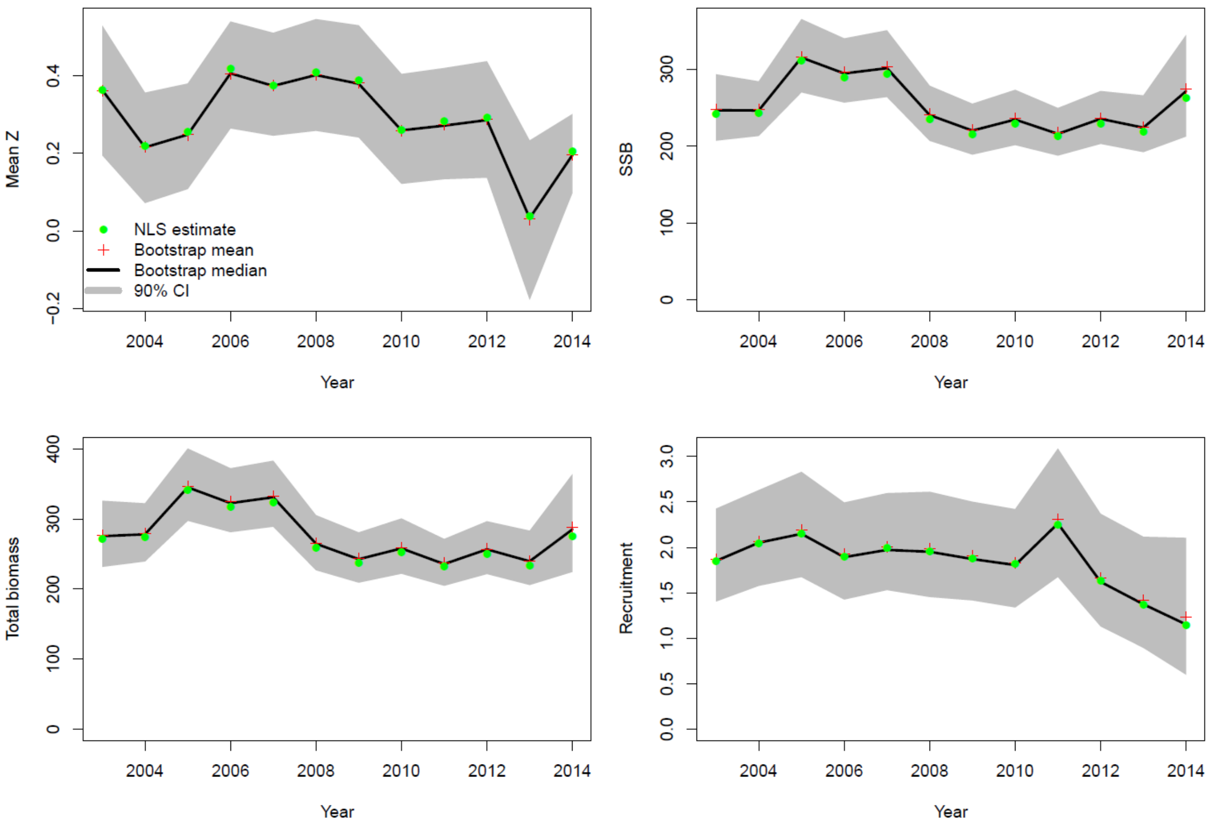

Figure 6: SURBA output IBTS Q3.

Fig. 7: SURBA output BTS-Isis. Age based LOG residuals.

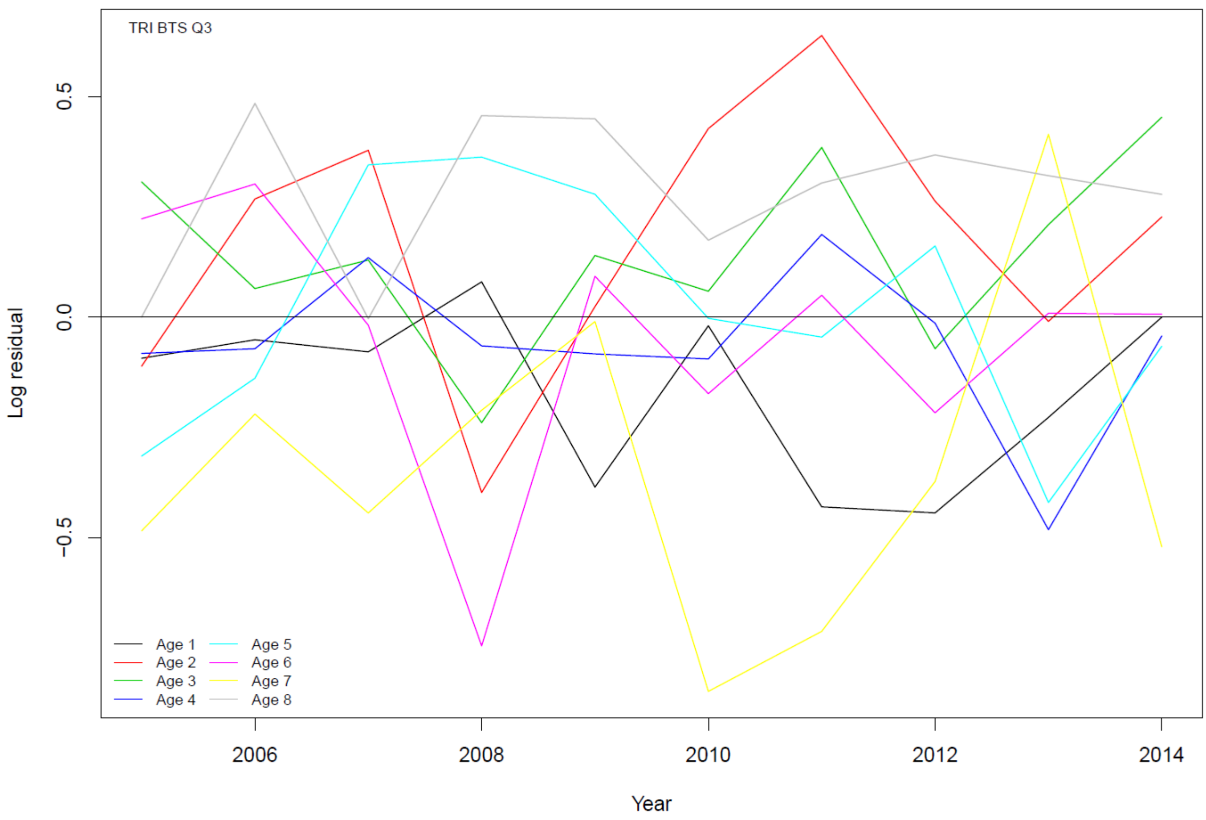

Fig. 8: SURBA output BTS-Tridens. Age based LOG residuals.

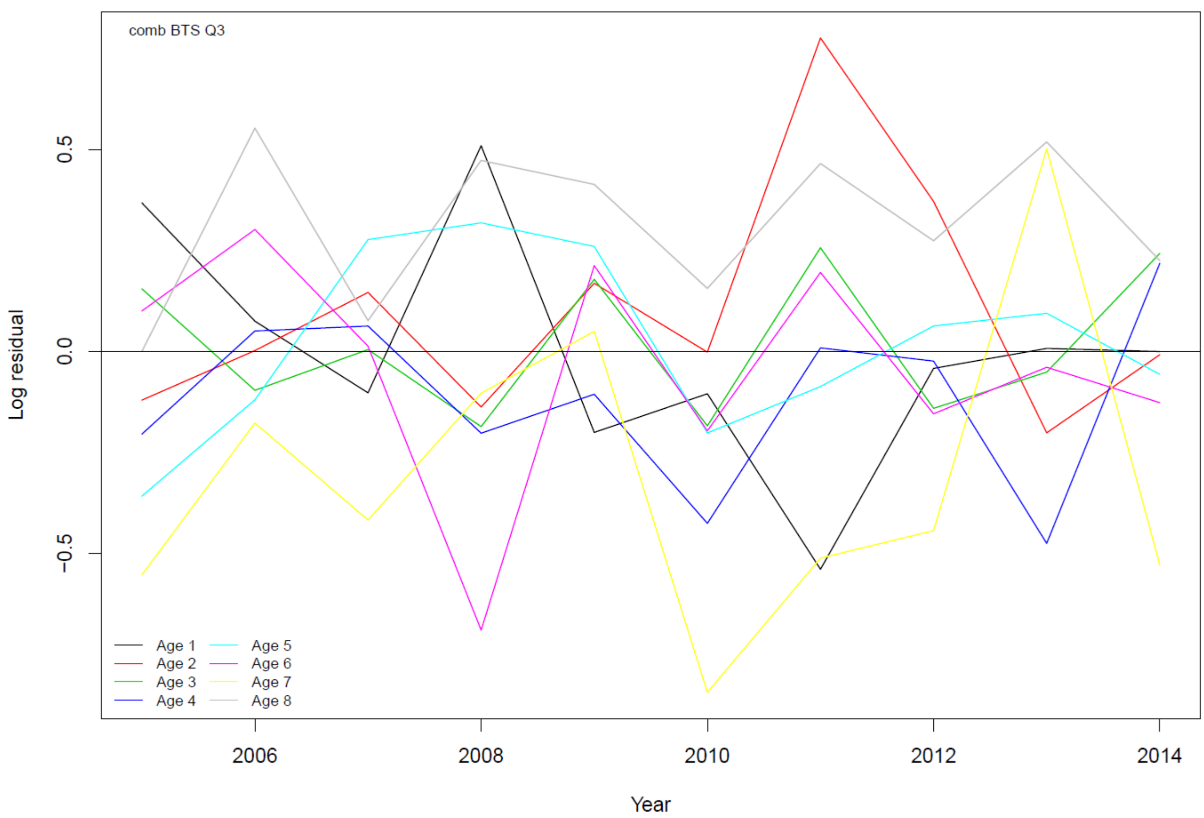

Fig. 9: SURBA output BTS-combined1. Age based LOG residuals.

Fig. 10: SURBA output BTS-combined2. Age based LOG residuals.

Fig. 11: SURBA output IBTS Q3. Age based LOG residuals.

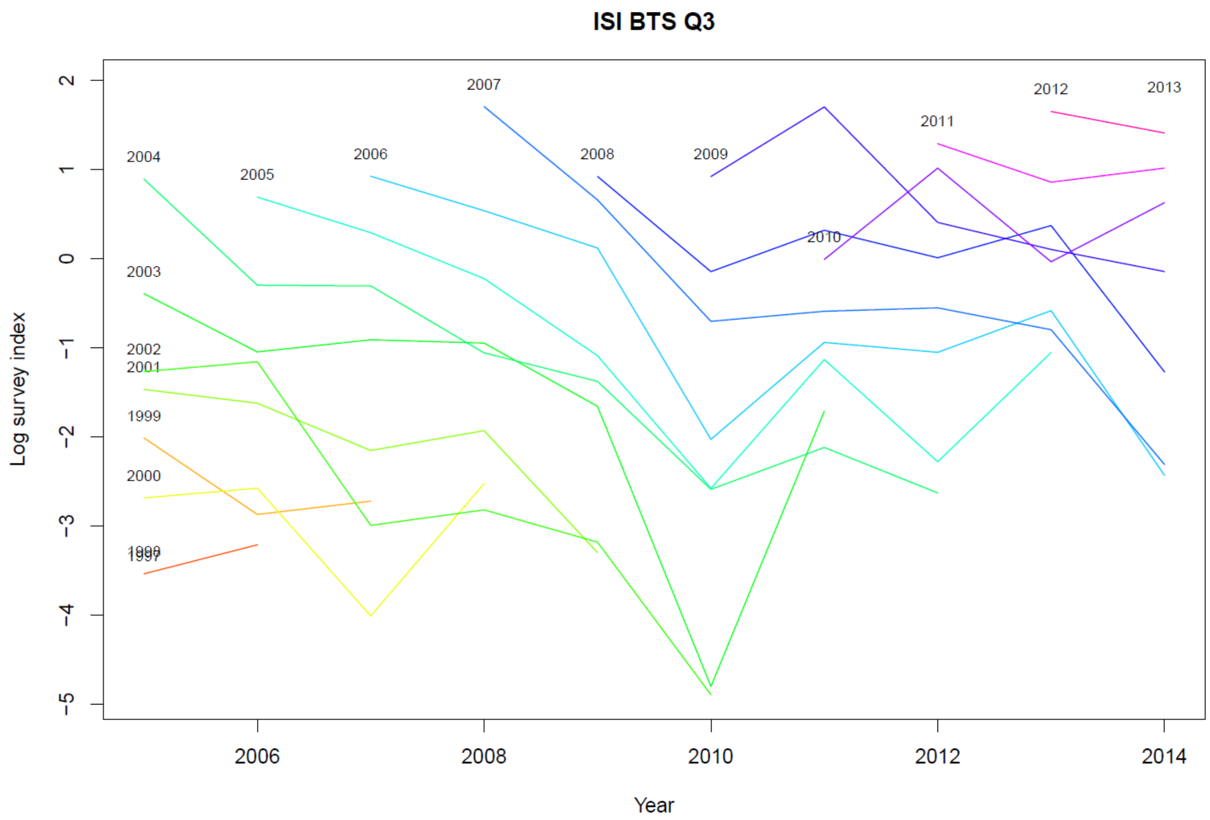

Fig. 12: BTS-Isis. Log abundance indices by cohort (survey “catch curves”).

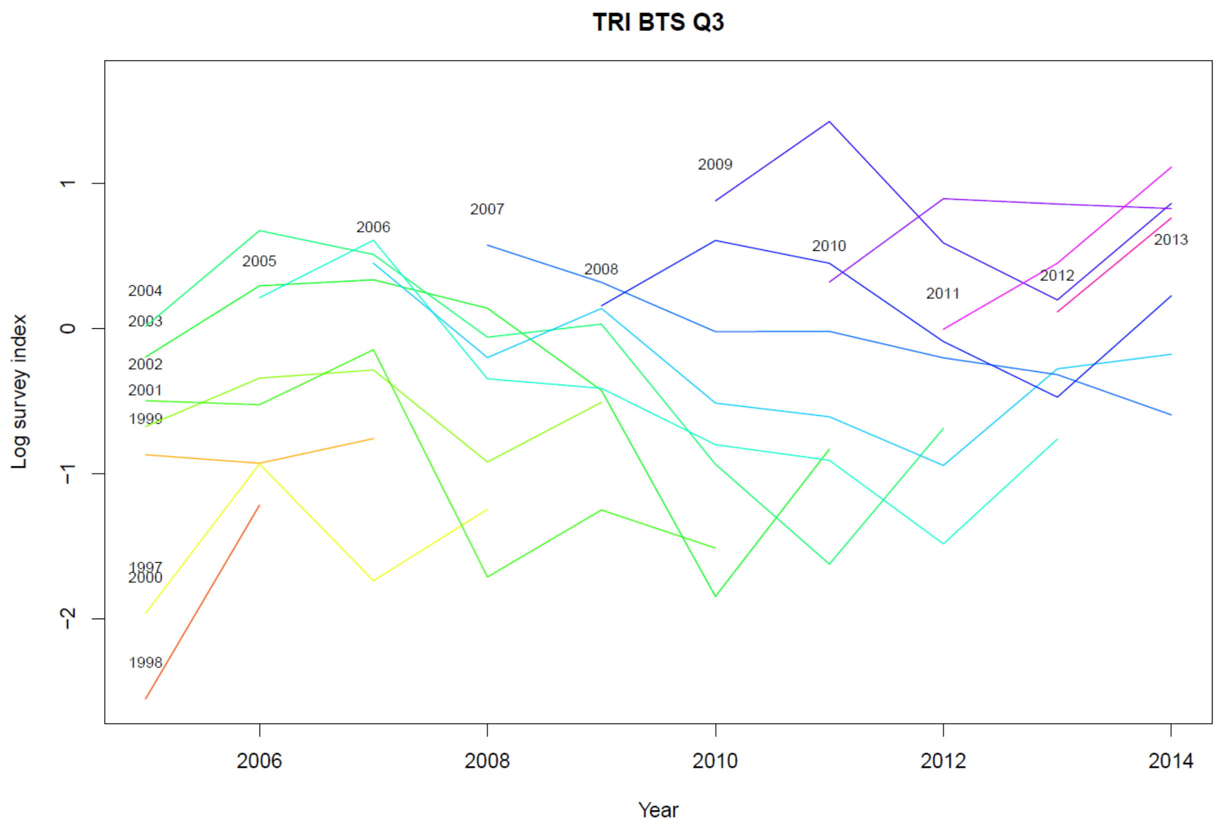

Fig. 13: BTS-Tridens. Log abundance indices by cohort (survey “catch curves”).

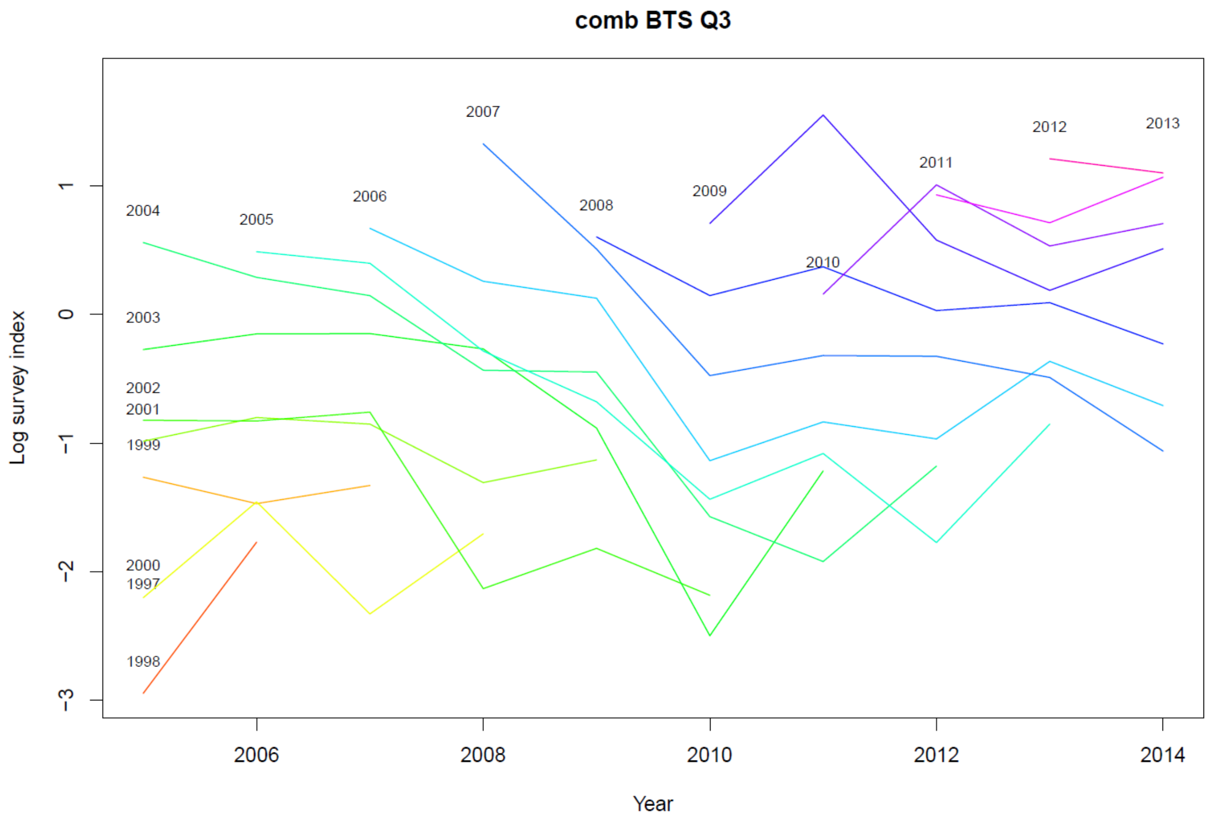

Fig. 14: BTS-combined1. Log abundance indices by cohort (survey "catch curves").

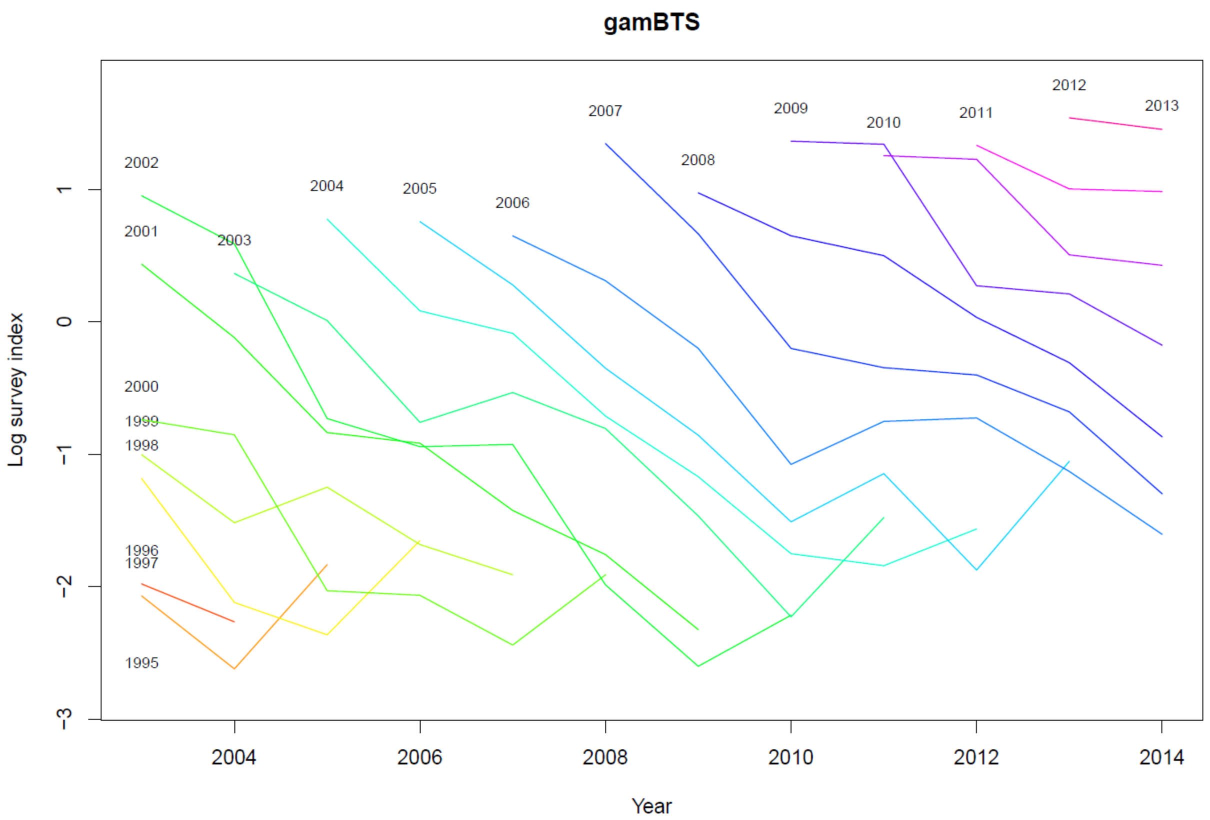

Fig. 15: BTS-combined2. Log abundance indices by cohort (survey "catch curves").

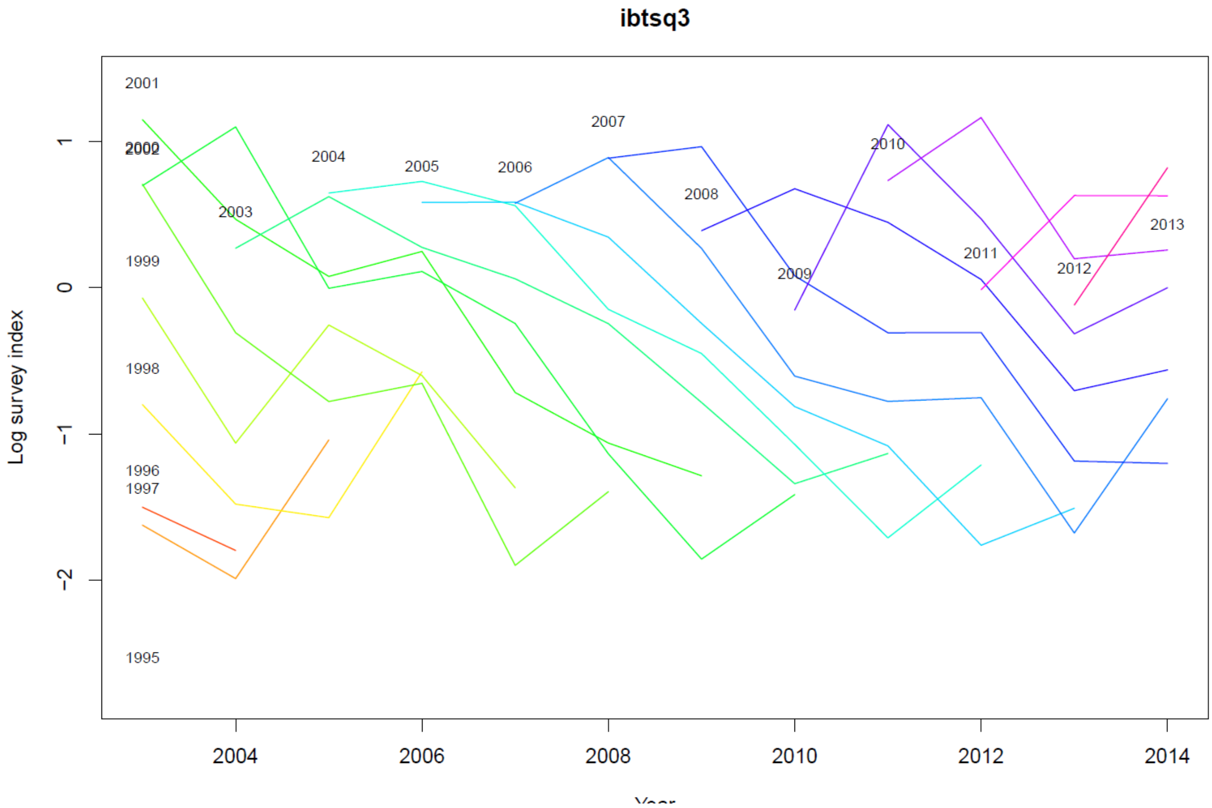

Fig. 16: IBTS Q3. Log abundance indices by cohort (survey “catch curves”).

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