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Report of the Working Group on Assessment of New MoU Species (WGNEW)

5 – 9 March 2012

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Executive Summary

The ICES Working Group on Assessment of New MoU Species met at ICES Headquarters in Copenhagen, Denmark, during 5–9 March 2012. There were 14 participants from 7 countries. The main task of WGNEW is to provide information on the new species of the MoU between ICES and the EC: sea bass, striped red mullet, red gurnard, grey gurnard, turbot, brill, dab, flounder, lemon sole, witch flounder, Pollack, and Blue jack mackerel. For most stocks, this information includes total international landings and research vessel survey data that are indicative of abundance trends. The International Bottom Trawl Survey (IBTS) was used often along other internationally coordinated surveys. The IBTS is held annually in the first and the third quarter of the year.

In addition, the Working Group was asked to prepare the benchmark assessment for turbot and sea bass that is planned in October 2012 and to evaluate the stock structure for the stocks listed above. Below, the main conclusions are summarised per species.

Witch flounder (*Glyptocephalus cynoglossus*): This species is particularly important in the Skagerrak-Kattegat area where it is a valuable bycatch in fisheries by Denmark and Sweden. Two different assessment models were run in an attempt to assess witch flounder in IV and IIIa. The results of these methods were considered as an exploratory analysis. However, the estimated landings in the last years (2007–2011) are considered accurate, although discard were not included in the analysis.

Flounder (*Platichthys flesus*): In the North Sea flounder is a bycatch in fisheries for flatfish. The information on flounder was updated. A considerable part of the catch is being discarded; landings are 3000 to 4000 t. Mainly data for surveys are available. Recently a market sampling programme started in The Netherlands, the main country landing flounder. The abundance of North Sea flounder in the IBTS quarter 1 survey increased between 1980 and 1990, and decreased again. In the last four years, 2008 to 2011, abundance was high.

Sea bass (*Dicentrarchus labrax*): The main countries landing sea bass are France (2/3 of the European landings) and the UK. The WG collated a large amount of data in preparation of the benchmark, including landings data, tagging data, genetics data, and survey data.

Striped red mullet (*Mullus surmuletus*): Landings were around 1500 t in 1985 and have increased to around 5000 t in recent years. The majority of the landings are by France and most fish is caught in the Eastern Channel. For management purposes, two areas could be considered for this species: the north area (III, IV and VIId), and the south area (VI, VIIa,e,g,h,j-VIIIa,b and IXa)

Red gurnard (*Aspitrigla cuculus*): The species is mainly found in the Channel and on the shelf around the British Isles. Between 2001 and 2010 landings fluctuated around 4000 t.

Grey gurnard (*Eutrigla gurnardus*): Only survey data are available. The species is widely distributed in Western Europe. In a pragmatic approach, the population could be split between 3 Ecoregions: North Sea including VIId, Celtic Seas and South European Atlantic. Both in the North Sea and in Skagerrak-Kattegat the IBTS survey indicates an abundance increase since the late 1980's.

Common dab (*Limanda limanda*): Common dab is a very common flatfish in the North Sea, where it is probably also the species with the highest discarding rate. Landings from the North Sea are around 10 000 t. Survey indices, e.g. the IBTS quarter 1 survey, indicate an increase in abundance in the 1980s.

Brill (*Scophthalmus rhombus*): brill is mainly a bycatch in the fishery for flatfish and demersal species. Many data on surveys and landings are available, but age data only exist for several short periods. Most of landings come from the North Sea, where between 1000 and 1600 t are caught annually in the last 10 years. Due to time constraints no assessment could be made.

Turbot (*Psetta maxima*): Turbot is mainly a bycatch in the fishery for flatfish and demersal species. For turbot many data from surveys and landings are available, but age data only exist for several short periods. The North Sea accounts for the major part of the landings. In the North Sea, landings have been decreasing in the last 10 years from about 4000 t to about 3000 t annually. Like for sea bass, the WG collated data in preparation of the benchmark, including landings data, tagging data, genetics data, and survey data.

Lemon sole (*Microstomus kitt*): Lemon sole is a bycatch in several demersal fisheries. In the North Sea recent landings were 2500 to 4000 t. The IBTS index in the first quarter has increased between 1980–2000, and is now fluctuating at a high level.

Pollack (*Pollachius pollachius*): Pollack is mainly a bycatch in various fisheries. For several areas, these landing estimates are clearly incomplete and erratic. WGNEW proposes to distinguish three different stock units: the southern European Atlantic shelf (Bay of Biscay and Iberian Peninsula), the Celtic Seas, and the North Sea (including VIId and IIIa). For most of the areas, very little information is available that can be used to infer stock trends, For Division IIIa (Skagerrak and Kattegat), the stock biomass of pollack is suggested to have increased from 1940 and to have reached a peak in the late 1950s. Since then the biomass has shown a decrease to reach a very low value around 2000.

1 Introduction

1.1 Terms of Reference

WGNEW has not met since October 2010. The WG TOR's for its 2012 meeting were:

a) Re-evaluate the stock identity, based on the best available science for the list of species* below:

BSS-COMB	EUROPEAN SEABASS IN THE NORTHEAST ATLANTIC
czs-comb	Red gurnard in the Northeast Atlantic
gug-comb	Grey gurnard in the Northeast Atlantic
mut-comb	Striped red mullet in the Northeast Atlantic
ple-89a	Plaice in Subarea VIII and Division IXa
pol-89a	Pollack in Subarea VIII and Division IXa
pol-celt	Pollack in Subareas VI and VII (Celtic Sea and West of Scotland)
pol-nsea	Pollack in Subarea IV and Division IIIa
sol-8c9a	Sole in Divisions VIIIc and IXa
spr-celt	Sprat in the Celtic Sea and West of Scotland
jaa-10	Blue jack mackerel (Trachurus picturatus) in Subdivision Xa2 (Azores)
whg-89a	Whiting in Subarea VIII and Division IXa

* geographic definition for the stocks listed above is based on the 2011 advice, and should by revised based on conclusions from this ToR a).

b) Address generic ToRs for Fish Stock Assessment Working Groups for the stocks in the table below. For stocks for with a specific ecoregion was identified in ToR a) the assessment and draft advice should be available to the respective ecoregion assessment expert group, for further improvements. For stocks with unclear stock identity, the draft advice should be available for ADGWIDE if the current stock definition is for whole ICES area, otherwise should go to the specific Ecoregion ADG.

c) Prepare the benchmark for Turbot and Eurpean seabass in October 2012.

Material and data relevant for the meeting must be available to the group no later than 14 days prior to the starting date.

WGNEW will report by 30 March 2012 to ACOM and SSGSUE, WGNSSK, WGCSE, WGHMM, WGHANSA.

FISH STOCK	STOCK NAME	STOCK COORD.	ASSESS. COORD.	ADVICE
tur-nsea	Turbot in Subarea IV and Division IIIa	Jan Jaap (NL)	N	Biennial 2nd year*
bll-nsea	Brill in Subarea IV and Divisions IIIa and VIId,e	Kelle (NL)	N	Biennial 2nd year*
dab-nsea	Dab in Subarea IV and Division IIIa	Kay (DE)	N	Biennial 2nd year*
fle-nsea	Flounder in Division IIIa and Subarea IV	Henk (NL)	N	Biennial 2nd year*
lem-nsea	Lemon sole in Subarea IV and Divisions IIIa and VIId	Sarah (UK)	N	Biennial 2nd year*
wit-nsea	Witch in Subarea IV, Division IIIa and VIId	Francesca (SE)	N	Biennial 2nd year*
pol-89a	Pollack in Subarea VIII and Division IXa	?	Y	Prepare advice for WGHMM

pol-celt	Pollack in Subareas VI and VII (Celtic Sea and West of Scotland)	?	Y	Prepare advice for WGCSE
pol-nsea	Pollack in Subarea IV and Division IIIa	?	Y	Prepare advice for WGNSSK
jaa-10	Blue jack mackerel (Trachurus picturatus) in Subdivision Xa2 (Azores)	POR	Y	Prepare advice for WGHANSA
bss-comb	European seabass in the Northeast Atlantic	Mickael, Sarah (FR, UK)	Y	Prepare advice for WGWIDE
czs-comb	Red gurnard in the Northeast Atlantic	Robert Bellail (FR)	Y	Prepare advice for WGNSSK, WGCSE, WGHMM
gug-comb	Grey gurnard in the Northeast Atlantic	?	Y	Prepare advice for WGNSSK, WGCSE, WGHMM
mut-comb	Striped red mullet in the Northeast Atlantic	Kelig (FR)	Y	Prepare advice for WGNSSK, WGCSE, WGHMM
	Tub gurnard in all areas	?	N	No advice
	John dory in all areas	?	N	No advice

* 2011 advice is valid for 2012 and 2013, time for further development for advice next year, unless sudden changes are found: then updated advice can be put forward.

1.2 Background

ToR a) is discussed in the individual chapters on the stocks in the report. This means that the stock identity of ple-89a, sol-8c9a, spr-celt, jaa-10, and whg-89a was not re-evaluated. For some stocks, scientific information was available to suggest management regions that are linked to stock identity. Generaly, this information was based on otolith shape or population genetic markers. For other species, there was no direct scientific evidence to support stock structure delineation within the "current" subdivision of regions. However, in the case of stocks such as the gurnards now covering the entire Northeast Atlantic, it seemed unlikely that population dynamic processes span such a vast region. Therefore, these stocks were split in ecoregions. More information on the decisions taken on individual stocks can be found in the chapters of the individual stocks.

Tor b) The working group added the available information that could be used for advice in the advice drafting sheets. Generally, this information included landings

from different sources (estimates by national labs or official landings as reported to ICES) and survey CPUE series. The survey information was generally taken from DATRAS, and calculated from the exchange files. Additional information from scientific literature was added if available.

Given that for some species this was the first time that advice was given, a decision had to be taken on the frequency of advice. For all stocks, it was decided to propose biennial advice. This is in line with the advice for other "new" species given last year, and results in atwo year cycle in which different stocks have to be dealt with each year. This will reduce the workload of the expert groups. For stocks that do not require advice in a certain year, the report only needs to be updated with the latest information on which the advice is based to evaluate if no sudden changes have occurred that warrant the reopening of advice

During the working group, the means of managing WGNEW stocks was discussed. Currently the advice is generally phrased in terms of "reducing catches". Many of the WGNEW stocks are bycathes in directed or mixed fisheries on other species. By translating "reducing catches" into setting or reducing TACs in the Eurpean fisheries context, the risk is that incentives are created for discarding these species without actually reducing catches. In that context, the effort reductions in management plans for target species in which these species are bycatches should be taken into account.

Tor c). Much data and information was collated in WGNEW that can be used in the benchmark for Turbot and European seabass in October 2012. WGNEW could thus be considered a data collection workshop for the benchmark. In the European Seabass and turbot sections, the data is presented, or at least its existence described. In the period between WGNEW 2012 and the benchmark, reuquests will be sent out to national labs to look into the contribution of additional data to the benchmark.

The working group decided that the best approach for this report would to create or update stock annexes for the stocks, like is done in other assessment expert groups. These annexes are meant to gather all the knowledge for each species and include material previously included in the former reports. These stock annexes allow reducing the size of the report, and make general information about the stocks more easily retrievable.

2 Witch flounder in Subarea IV, Division IIIa and VIId

2.1 Stock definition

Witch flounder (*Glyptocephalus cynoglossus*) is a rather stationary species and the knowledge about stock identity is limited and based on old investigations (Molander 1935). As mentioned above Molander (1935) distinguished 2 stocks in IIIa and IV, one in the Kattegat and one in the North Sea and Skagerrak. However, as already reported by Molander in 1935, catches in the Kattegat are small and irregular and only at scattered places at depth between 30 and 100 meters. From IBTS survey, the analysis of the distribution of the catches showed a continuum from IIIa into the Norwegian trench and the Northern part of Subarea IV (Figure 2.1). Considering the results from IBTS, that that catches in the Kattegat are sporadic and there are no firm indications of spawning grounds in this area, witch flounder is assessed as a single stock in Subarea IV, Division IIIa and VIId.

2.2 The Fishery

2.2.1 ICES advice and management applicable to 2011 and 2012

The advice 2012 for witch flounder is unchanged compared to 2011. The TAC for 2011 and 2012 was set for area II and IV and for lemon *sole (Microstomus kitt*) and witch flounder together and amounted to 6391 t.

2.2.2 Catches in 2011

Total landings and estimated catches are given in Figure 2.2 and Figure 2.3 for IV and IIIa, respectively. The total WG catch of all witch flounder in IV and IIIa in 2011 amounted to 1517 t. Landings in VII d are negligible.

In area IV, the total landings declined from about 2500 t in the middle of the 1980s to less than 1000 t in 2011. In the IIIa, the total landings also declined from about 2500 t in the beginning of the 2000s to less than 700 t in 2011.

2.2.3 Regulations and their effects

As a typical by-catch species, witch flounder has not been subject to any TAC limitations. There is no Minimum Landing Size (MLS) specified in EU waters. In some coastal areas of England and Wales MLSs are enforced and the landing of witch below 28 cm is prohibited. Also in Germany, Denmark, Scotland and Sweden the minimum landing size is 28 cm.

2.2.4 Fishing patterns

North Sea witch flounder is nowadays mainly landed by Denmark, Norway, Sweden and Germany in both areas (IIIa and IV) and UK mainly in Subarea IV. The Netherlands only show a small fraction of the total landings in subarea IV.

The Danish landings are taken in Skagerrak (IIIa) and in the Norwegian Deep (IVa East). At present, the majority of the landings are by-catches in mixed demersal trawl fisheries.

In Sweden, the fisheries where witch flounder are caught, apart from the witch flounder directed fishery, are mainly the *Pandalus,* and demersal fish fisheries.

In the UK fishery, witch flounder is mainly caught in IVa and IVb. Beam trawlers took a big proportion of landings between mid-1980's and mid 2000's. Recently, the majority of landings are by unspecified otter trawls, though some catches are from *Nephrops* trawls.

In Germany where flounder is mainly caught by otter bottom trawl, approximately 90% of the catches are taken with > 120 mm mesh opening. There are some minor catches with beam trawl and seine.

2.3 Biological composition of the catch

In 2009 witch flounder has been included as a mandatory species in the EU Data Collection Framework (DCF). Accordingly Denmark and Sweden started the regular sampling of biological data, i.e. length, weight, maturity status and age, in IIIa. Some additional length measurements have been collected during 2007–2008 by the Swedish Institute of Marine Research. Length data and length-weight relationship parameters were also available for UK samples since 2007.

German and Norwegian landings from IV and IIIa have been splitted inot length classes using the Danish individual length information from the respective areas. Also Dutch landings in subarea IV have been splitted into length classes using Danish biological sampling in the same area.

The numbers at age in the landings as obtained by sampling of commercial catches is given in Table 2.1. Data are given for the whole year.

The numbers at length from the total landings in 2007–2011 (Figure 2.4) were converted into numbers at age using a statistical slicing method (described in Scott *et al.*, 2011) and an age length key (ALK; Figure 2.5) derived from otolith reading of the Swedish commercial samples collected during 2009–2011. For all countries, ALK for 2009 were used to split 2007 and 2008 landings into number at length.

The statistical slicing assumes that the distribution of the numbers at length is composed of a mixture of distributions representing the different cohorts (or age classes) in the population. The statistical method estimates the parameters of each distribution.

A range of fitting options are available including different statistical distributions (i.e. normal, lognormal and gamma) and the possibility of fixing some of the parameters according to the Von Bertalanffy growth function. Thus, each age class can be separated into a single distribution. Each distribution has three parameters π, μ and σ, where: π is the proportion of the total numbers assigned to a single age class, μ and σ are the mean and standard deviation of the mean length of each age class and the spread (assumed constant at 0.07) of the lengths within each age class. Three different distributions were fitted to the data: normal, lognormal and a gamma distribution. The fit of the different distributions can be compared by a reduced X^2 test (X^2red=X^2/degrees of freedom). The rule of thumb is that the larger the X^2red the worse is the fit. The results of the X^2red for the different distributions are reported in Table 2.2.

For witch flounder in IV and IIIa, the statistical age slicing was performed as follows: Age classes 2–9 were statistically sliced, while the age 1, 10 and 11+ plus group were estimated using the Von Bertalanffy growth function. As detailed information on when the catches were taken was missing, we assumed that all the landings were taken in the middle of the year (expressed as timing 0.5 in the slicing function). The

timing mimics the period in which most of the landings occurred during the year. The results for the lognormal distribution only are presented in Figure 2.6.

2.3.1 Data revisions

No data revisions were applied in this year's assessment.

2.3.2 Quality of catch and biological data, discards

As mentioned above, the regular sampling of biological data has only recently started accordingly to the DCF and it is conducted by some of the countries landing this species. However, age reading and maturity staging of this species are not straightforward. Concerning the otoliths, several techniques were tried by Swedish technicians in order to find the optimal one and obtained results are described in the previous WGNEW report (ICES, 2010).

The maturity assessment is also problematic. The reproductive period is uncertain (ICES, 2010) and histological investigation of gonads is planned at the Swedish Institute of Marine Research for the near future in order to delineate the spawning season and be able to calculate accurate maturity ogives and spawning stock biomass. Thus the knowledge about the biology of this species is currently under improvement.

Information on discards is scarce and was not used in the assessment.

2.4 Fishery independent information

2.4.1 International Bottom Trawl Survey (IBTS-Q1)

The International Bottom Trawl Survey (IBTS) provides indices for the North Sea and IIIa performed every year during the first and third quarter of the year. IBTS data are available since 1975. Furthermore a time series of Dutch Beam Trawl Survey (BTS) data (1985–2008) in IV was also available.

Time series of abundance (CPUE, number per hours) for Q1 only, were standardized by haul position, depth and year through general linear models. The abundance of witch flounder observed during the first quarter of the IBTS has been fluctuating. A "maximum" was reached around 1995, and the abundance seems to have decreased since (Figure 2.7). However, results show a decline during the last decade matching the trend observed in landings. The spatial distribution of haul-specific CPUE averaged over 5-year time intervals, also show a reduction of both the abundance and spatial distribution of witch flounder in IV and IIIa (Figure 2.8).

Thus the IBTS catches seem to be the most valuable and promising data source to be used as tuning fleet, particularly during Q1 when more stations are usually fished and the time series is longer.

For what it concerns the length composition, IBTS-Q1 catch the whole size range of witch flounder from just below 10 cm to around 50 cm (Figure 2.9).

Regarding the distribution, witch flounder is a species that occurs in the deeper waters of the northern North Sea. There does not seem to be a significant difference in the distribution in winter and in summer (ICES 2010).

A yearly ALK was constructed using otolith collected during Swedish IBTS in Q1 (Figure 2.10). These were used to derive a number at age index from the IBTS survey for the period 2007–2011. The index was estimated summing the catches per hour for each length class per year and then dividing it by the number of hauls to standardize

for different numbers of hauls per year carried out during the IBTS survey. The index was multiplied per 1000 to facilitate readiness. The length at age was then transformed in number at age using an annual ALK derived from the Swedish IBTS. The age disaggregated index is presented in Table 2.3.

2.5 Mean weight-at-age and maturity-at-age

2.5.1 Mean weight-at-age

Table 2.4 shows the mean weights-at-age in the catch from 2007 to 2011. The weights-at-age were obtained from Swedish market samples collected in IIIa from 2009 to 2011 and averaged over the time period. Weight at age in 2007 and 2008 were assumed equal to the mean weight at age estimated between 2009 and 2011.

2.5.2 Maturity ogive

The percentages at age of witch flounder in IV and IIIa that were deemed mature were estimated from the Swedish market samples collected from 2009 to 2011 and averaged over the time period (Table 2.5). Maturity at age in 2007 and 2008 were assumed equal to the mean maturity at age estimated between 2009 and 2011.

2.6 Recruitment index

There are no information on recruitment index of witch flounder in IV and IIIa.

2.7 Assessment of Witch flounder in IV and IIIa

2.7.1 Exploratory Assessment for Witch flounder in IV and IIIa

The VIT program was designed to analyze exploited marine populations based on catch data only structured by ages or sizes. This method is especially suited for data poor situations in which long time series of age data on catches are lacking to perform a VPA kind of analysis. Using catch data with auxiliary parameters (i.e. natural mortality and growth parameters) and a cohort analysis, the program estimates the population numbers at age and fishing mortality at age. The main assumption is that of a steady state (i.e. constant recruitment) as the program uses the annual catch at age data and interprets the age structure of the catches as "pseudo cohorts".

The numbers at age in the landings of witch flounder derived from the statistical slicing and from the ALK (Table 2.1) for the period 2007–2011 were used as input to the VIT program. Biological input data were natural mortality (M= 0.2 and constant for all age classes and years), maturity at age (Table 2.5), together with the Von Bertalanffy growth parameters (Linf= 50 cm; k= 0.120 $year^{-1}$; t_0= -0.125) and length–weight parameters (a=0.0000001; b=3.5456). Terminal F was set at 0.41 in the VIT analysis, which is the average F of the last three years for the 11+ group estimated from a catch at age analysis using the number at age matrix derived from the ALK.

The VIT estimated stock numbers at age (Table 2.6) and fishing mortality at age by year 2007–2010 (Table 2.7) using the statistical slicing and age length key are shown. The reference fishing mortality was estimated for the age classes fully recruited to the fisheries, $F_{bar} = F_{4-8}$.

The exploration indicates that the catch at age matrix derived from the statistical slicing is rather different from the same matrix estimated using ALK information de-

rived from otolith reading. This obviously affects both the estimate of the number of fish in the stock and the associated fishing mortality at age as shown by the estimates of the VIT pseudo-cohort analysis

In particular, the estimates of F are rather low (generally less than 0.1 for all ages) when using the statistical slicing method. This was already highlighted by simulation done at STECF-SGMED, i.e. catch at age matrix derived from slicing is generally more flat than from otolith reading (Finlay *et al.*, 2011) and thus the F estimates are also generally lower for statistical slicing derived age matrix.

For these reasons, we also explored the possibility of fitting an XSA using the catch at age matrix derived from the ALK (Table 2.1) and tuned by IBTS Q1 index (Table 2.3). The same biological input data (weight at age, maturity at age and natural mortality) as used in the VIT were used to run an XSA. The results are presented in Figure 2.11. Due to time constraints, we only explored the effect of different q at age (q constant from age 6, 7 or 8, defined as CAA6, CAA7 and CAA8, respectively) in the XSA settings while we kept shrinkage constant at 0.5 and q independent by stock size from age 3 and onwards in all runs. The estimates of F_{curr} in 2011 from the different XSA vary from 0.37 to 0.59 for CAA6, CAA7 and CAA8, respectively (Table 2.8).

This is the first attempt to assess witch flounder in IV and IIIa and results should be considered as an exploratory analysis. However, the estimated landings in the last years (2007–2011) are considered accurate, although discard were not included in the analysis. Nevertheless, several sensitive analyses should be performed to verify the XSA (or any other model) settings, the natural mortality assumptions, the ageing accuracy as well as the extent and age structure of the discards in a future benchmark.

2.8 Precautionary and Limit Reference Points and FMSY targets

FMSY target

A yield per recruit analysis was run using the same input data as for the XSA but exploring the effect of the different F at age on the estimates of the reference points, F_{01} and F_{max}. The Yield per recruit analysis based on the results of the CAA6 run is shown in Figure 2.12. The F_{01} ranges from 0.17 to 0.18, while F_{max} varies from 0.63 to 0.65, when using XSA results from CAA6, CAA7 and CAA8, respectively. Nevertheless, estimates of current F, although uncertain, are above the estimates of a possible proxy of F_{msy}, F_{01}.

2.9 Quality of the assessment

The assessment is considered exploratory and only indicative of trends. From this preliminary analysis, it is evident that the shortness of the time series and the uncertainty linked to several aspects of the data collection, as for example the derivation of the ALK used to split the landings, are reflected in the estimation of SSB and F, and thus it precludes that the assessment is used for catch forecast at that stage. Therefore, a full exploratory analysis should be carried out in a future benchmark meeting, exploring different models and models settings but also the way the number at age and other input data are derived. The addition of more years, if trustworthy catch at age data can be estimated, would also likely improve the assessment of witch flounder in IV and IIIa.A full benchmark assessment would be necessary to identify an appropriate assessment model to be used into short term forecast in the future.

2.10 Management Considerations

No specific management considerations were provided.

2.11 Ecosystem considerations

No specific ecosystem considerations were provided.

2.12 Changes in the environment

No information on changes in the environment that can affect witch flounder in IV and IIIa were provided.

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Table 2.1. Witch flounder in IV and IIIa: Number at age from statistical slicing and from ALK, respectively.

Ages	2007	2008	2009	2010	2011
1	51	64	65	36	38
2	65	125	54	30	57
3	27	39	738	579	539
4	468	1331	1037	2446	2523
5	105210	130640	19363	54779	71079
6	1355600	1158600	475090	340660	624650
7	2213700	1897500	1547800	921180	1097300
8	1126300	1069700	1143000	796200	677540
9	840470	825230	906930	753950	591490
10	789220	721940	748240	671110	585910
11	2185300	1853800	1819700	1534400	1585000

Ages	2007	2008	2009	2010	2011
1	10	10	10	10	10
2	11	156	1563	11	2003
3	29804	56815	9105	226736	214319
4	2474625	2097767	1130806	299229	1305970
5	2276281	2011010	1900699	1967334	374008
6	1445372	1278398	1312730	1309785	1734566
7	1340041	1193516	1269104	699333	707424
8	813164	707875	735521	664821	618890
9	265430	214551	228447	410856	410590
10	335849	290568	286248	96291	248582
11+	117594	100870	80215	69337	104286

Table 2.2. Witch flounder in IV and IIIa: Summary of the X^2_{red} for the different distributions and years. In bold are the best fit according to the X^2_{red} statistics.

Year	norm	lnorm	gamma
2007	17959	**15000**	17274
2008	15781	16305	**14782**
2009	8012	**5047**	6063
2010	5252	**3623**	3963
2011	6438	**3821**	4510

Table 2.3. Witch flounder in IV and IIIa. Tuning indices derived from the IBTS Q1 survey. The index was estimated summing the catches per hour for each length class per year and then dividing it by the number of hauls to standardize for different numbers of hauls per year carried out in the IBTS survey. The index was multiplied per 1000. The length at age was then transformed in number at age using an annual ALK derived from the Swedish IBTS.

Ages	2007	2008	2009	2010	2011
4	234.3	262.7	107.5	47.9	285.6
5	84.1	161.6	98.3	40.7	45.1
6	118.6	156.6	95.3	41.2	50.3
7	98	121.7	64.6	23.4	24.7
8	35.8	56.2	31.1	28.8	35.4
9	14.3	16.7	17.3	28.4	42.7
10	22.3	18.7	15.8	3.4	8.8
11+	0	18.7	7.9	10.3	21.2

Table 2.4. Witch flounder in IV and IIIa: weight at age derived from the Swedish catches collected from 2009 to 2011 averaged over the time period.

Ages	2007	2008	2009	2010	2011
1	0.010	0.010	0.010	0.010	0.010
2	0.035	0.035	0.035	0.035	0.035
3	0.094	0.094	0.094	0.094	0.094
4	0.150	0.150	0.150	0.150	0.150
5	0.197	0.197	0.197	0.197	0.197
6	0.257	0.257	0.257	0.257	0.257
7	0.314	0.314	0.314	0.314	0.314
8	0.347	0.347	0.347	0.347	0.347
9	0.396	0.396	0.396	0.396	0.396
10	0.515	0.515	0.515	0.515	0.515
11+	0.520	0.520	0.520	0.520	0.520

Table 2.5. Witch flounder in IV and IIIa: maturity ogives derived from the Swedish catches collected from 2009 to 2011 averaged over the time period.

Ages	2007	2008	2009	2010	2011
1	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00
3	0.04	0.04	0.04	0.04	0.04
4	0.08	0.08	0.08	0.08	0.08
5	0.19	0.19	0.19	0.19	0.19
6	0.28	0.28	0.28	0.28	0.28
7	0.30	0.30	0.30	0.30	0.30
8	0.43	0.43	0.43	0.43	0.43
9	0.57	0.57	0.57	0.57	0.57
10	0.75	0.75	0.75	0.75	0.75
11+	1.00	1.00	1.00	1.00	1.00

Table 2.6. Witch flounder in IV and IIIa: number at age in the stock from statistical slicing and from ALK, respectively and estimated using VIT pseudocohort analysis.

Ages	2007	2008	2009	2010	2011
1	79990	69534	66055	53666	54433
2	65490	56930	54081	43938	44566
3	53618	46610	44278	35973	36488
4	43899	38161	36251	29452	29873
5	35941	31242	29679	24111	24456
6	29331	25461	24282	19691	19958
7	22788	19797	19450	15813	15775
8	16654	14492	14524	12113	11923
9	12616	10897	10857	9197	9148
10	9568	8175	8068	6848	6955
11+	7120	6040	5929	4999	5164

Ages	2007	2008	2009	2010	2011
1	30064	26202	23961	19858	20906
2	24614	21453	19618	16258	17117
3	20153	17564	16060	13311	14012
4	16473	14329	13141	10693	11278
5	11247	9833	9736	8484	8052
6	7149	6231	6251	5166	6254
7	4545	3945	3930	3044	3551
8	2509	2150	2069	1860	2267
9	1318	1120	1029	921	1296
10	839	723	636	382	690
11	383	329	261	226	340

Table 2.7. Witch flounder in IV and IIIa: F at age in the stock from statistical slicing and from ALK, respectively and estimated using VIT pseudocohort analysis.

Ages	2007	2008	2009	2010	2011
1	0.000	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.003	0.005	0.001	0.003	0.003
6	0.052	0.052	0.022	0.019	0.035
7	0.114	0.112	0.092	0.067	0.080
8	0.078	0.085	0.091	0.075	0.065
9	0.076	0.087	0.097	0.095	0.074
10	0.096	0.103	0.108	0.115	0.098
11	0.410	0.410	0.410	0.410	0.410

Ages	2007	2008	2009	2010	2011
1	0.000	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000
3	0.002	0.004	0.001	0.019	0.017
4	0.182	0.176	0.100	0.031	0.137
5	0.253	0.256	0.243	0.296	0.053
6	0.253	0.257	0.264	0.329	0.366
7	0.394	0.407	0.441	0.293	0.249
8	0.443	0.452	0.499	0.503	0.359
9	0.252	0.238	0.282	0.679	0.431
10	0.584	0.588	0.689	0.326	0.508
11	0.410	0.410	0.410	0.410	0.410

Table 2.8. Witch flounder in IV and IIIa. XSA results in terms of F at age estimated using the different settings (i.e. CAA6, CAA7 and CAA8) as described in the text above.

Ages	2007	2008	2009	2010	2011
3	0.002	0.005	0.003	0.016	0.011
4	0.228	0.235	0.130	0.135	0.119
5	0.244	0.294	0.347	0.350	0.250
6	0.263	0.210	0.318	0.430	0.601
7	0.573	0.361	0.333	0.278	0.438
8	0.419	0.691	0.397	0.292	0.427
9	0.208	0.184	0.497	0.404	0.295
10	0.332	0.372	0.398	0.402	0.460
11+	0.332	0.372	0.398	0.402	0.460

Ages	2007	2008	2009	2010	2011
3	0.003	0.006	0.003	0.013	0.016
4	0.231	0.256	0.157	0.123	0.099
5	0.256	0.298	0.390	0.450	0.223
6	0.275	0.224	0.324	0.514	0.946
7	0.599	0.385	0.362	0.286	0.585
8	0.452	0.754	0.436	0.328	0.444
9	0.222	0.204	0.585	0.467	0.347
10	0.333	0.406	0.459	0.526	0.580
11+	0.333	0.406	0.459	0.526	0.580

Ages	2007	2008	2009	2010	2011
3	0.003	0.007	0.003	0.014	0.021
4	0.246	0.276	0.172	0.121	0.101
5	0.268	0.324	0.434	0.510	0.220
6	0.287	0.237	0.364	0.611	1.262
7	0.619	0.408	0.391	0.337	0.810
8	0.490	0.805	0.478	0.366	0.568
9	0.245	0.228	0.667	0.541	0.405
10	0.389	0.467	0.539	0.668	0.757
11+	0.389	0.467	0.539	0.668	0.757

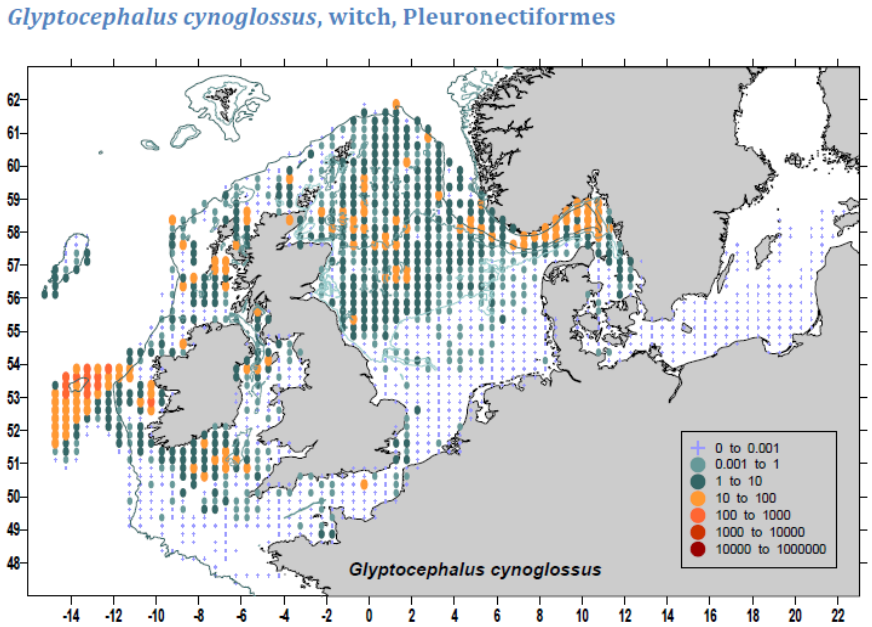

Figure 2.1. Witch flounder in IV and IIIa. Spatial distribution of the catches from IBTS Q1 and Q3 from 1975 to 2010 (From WD 1; Annex 2).

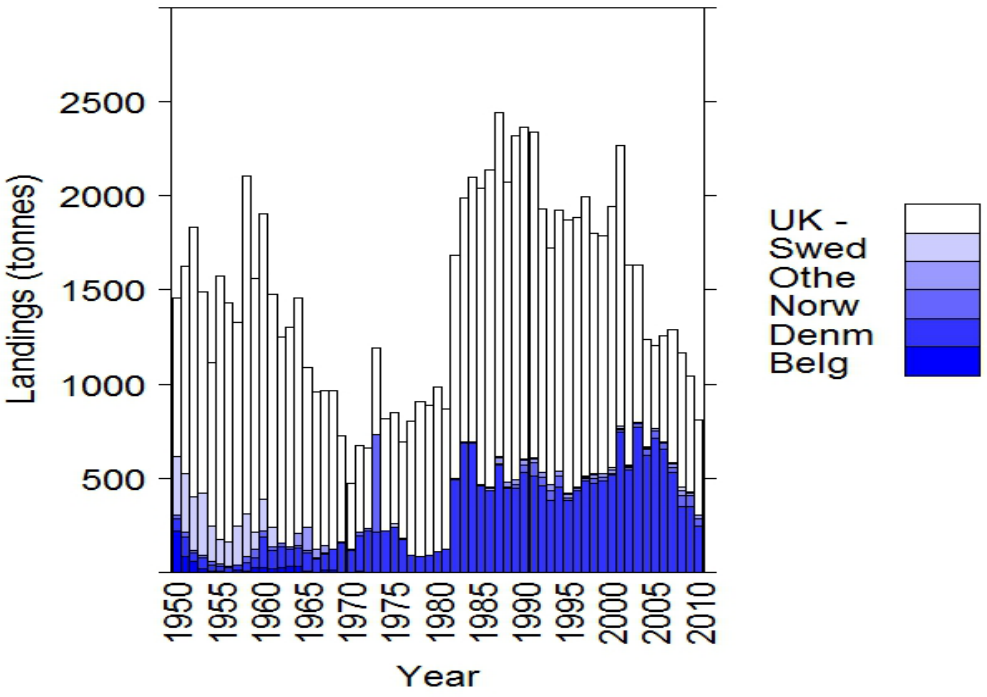

Figure 2.2. Witch flounder in IV: total landings of Witch flounder by country in IV from 1950 to 2011.

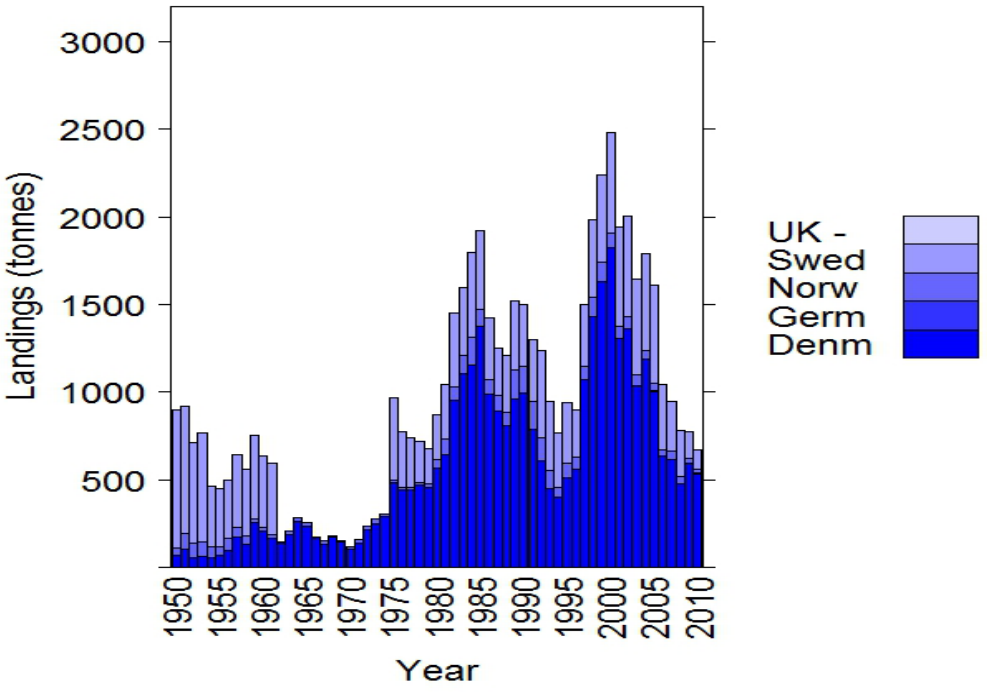

Figure 2.3. Witch flounder in IIIa: total landings of Witch flounder by country in IIIa from 1950 to 2011.

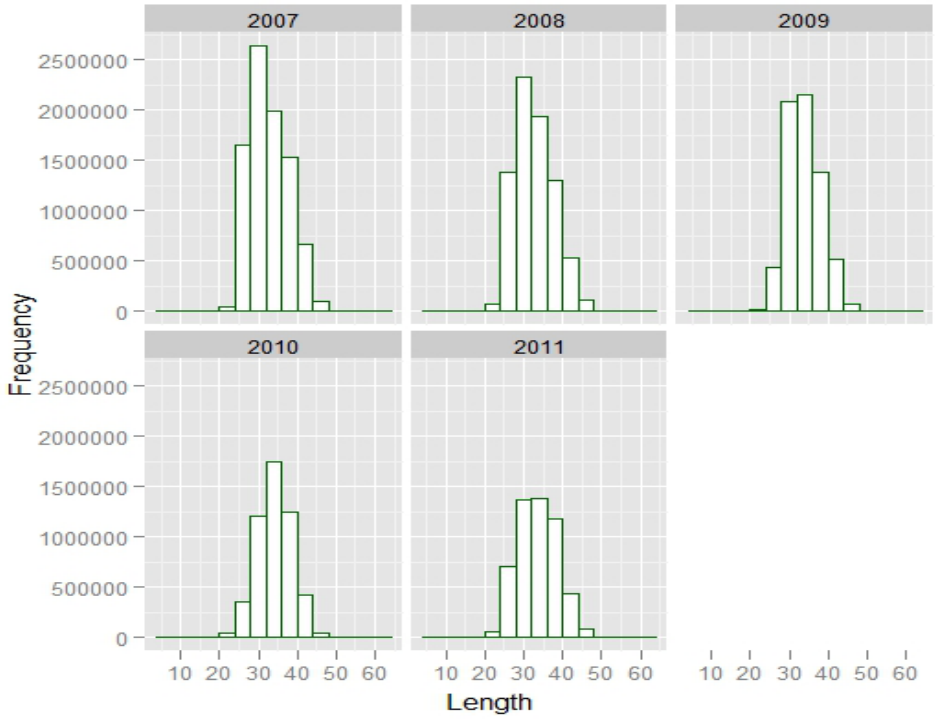

Figure 2.4. Witch flounder in IV and IIIa: length frequency distribution from 2007 to 2011.

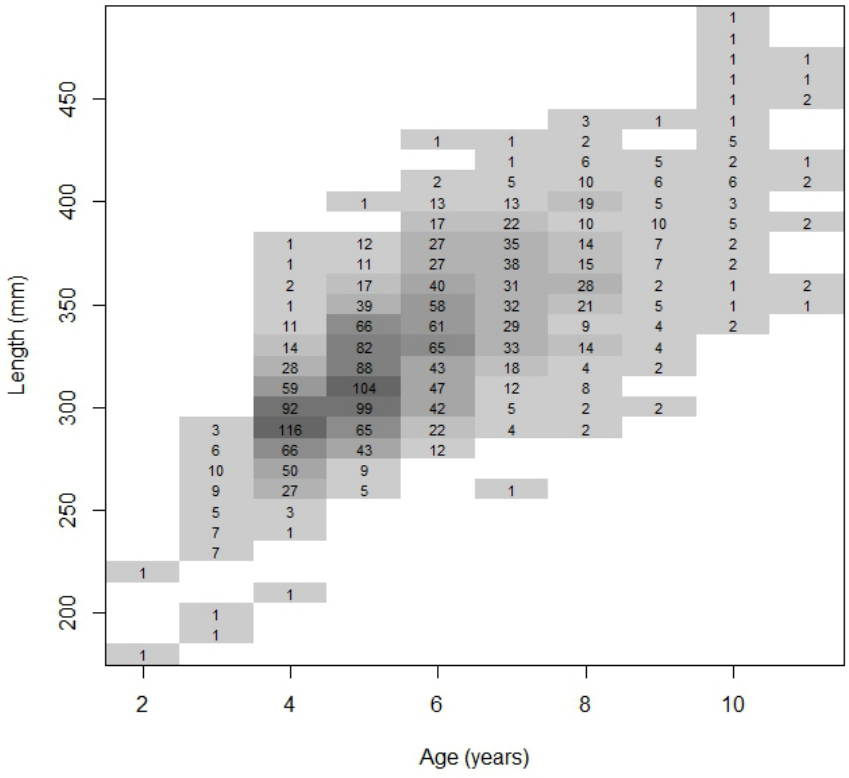

Figure 2.5. Witch flounder in IV and IIIa: age length keys (ALK) derived from otolith collected in 2009–2011 from market samples.

Figure 2.6. Witch flounder in IV and IIIa: Results of fitting the length frequency distribution from 2007 to 2011 using a lognormal distribution. The red triangles on the x-axis indicate the position of the mean of each cohort. The green vertical lines indicate the mean length for each cohort estimated by the von Bertalanffy growth curve. The blue line indicates the accumulated distribution by length for all age classes.

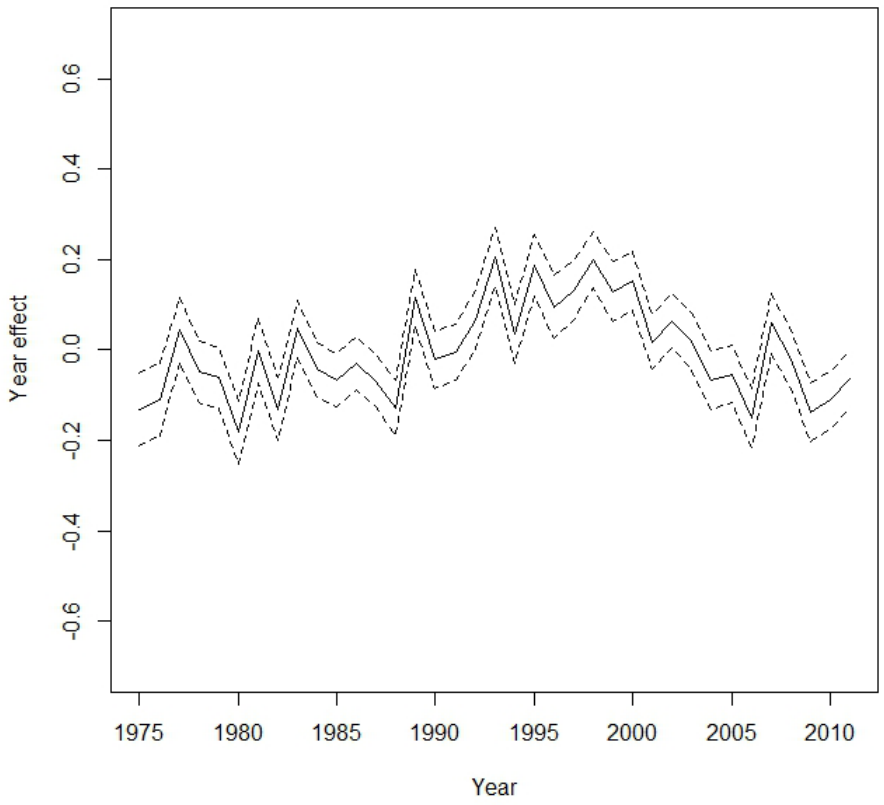

Figure 2.7. Witch flounder in IV and IIIa: year effect of a GLM model of the IBTS Q1 haul-specific CPUE (n/h) standardized by haul position and depth.

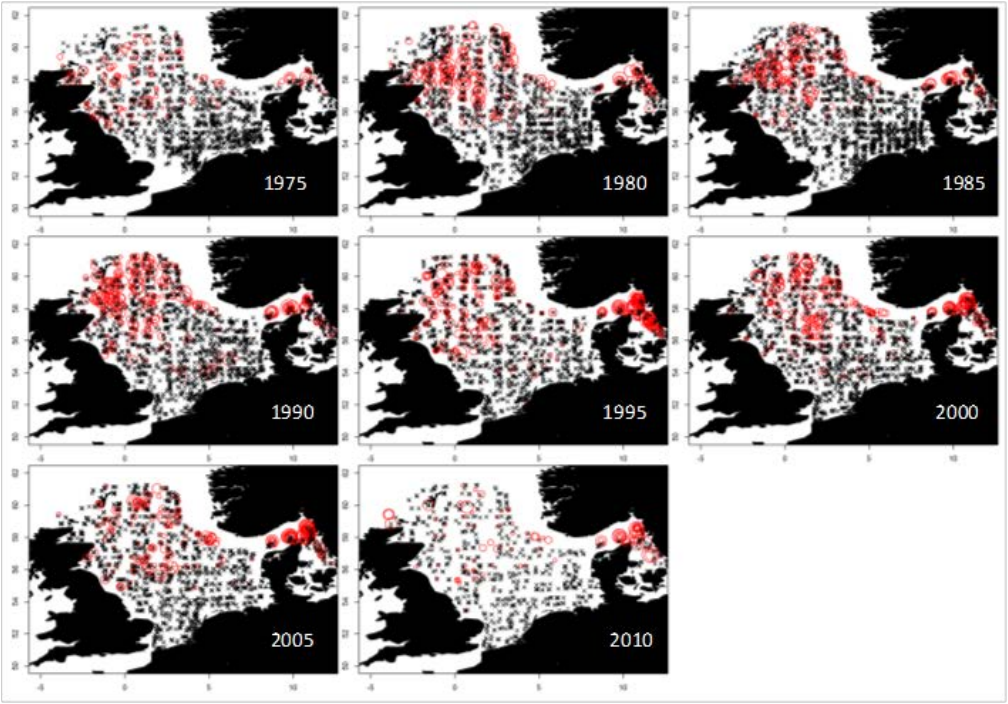

Figure 2.8. Witch flounder in IV and IIIa: haul-specific CPUE (n/h) standardized for depth and averaged over 5 years' time intervals during the first quarter, except for the last Figure which only includes 2010 and 2011.

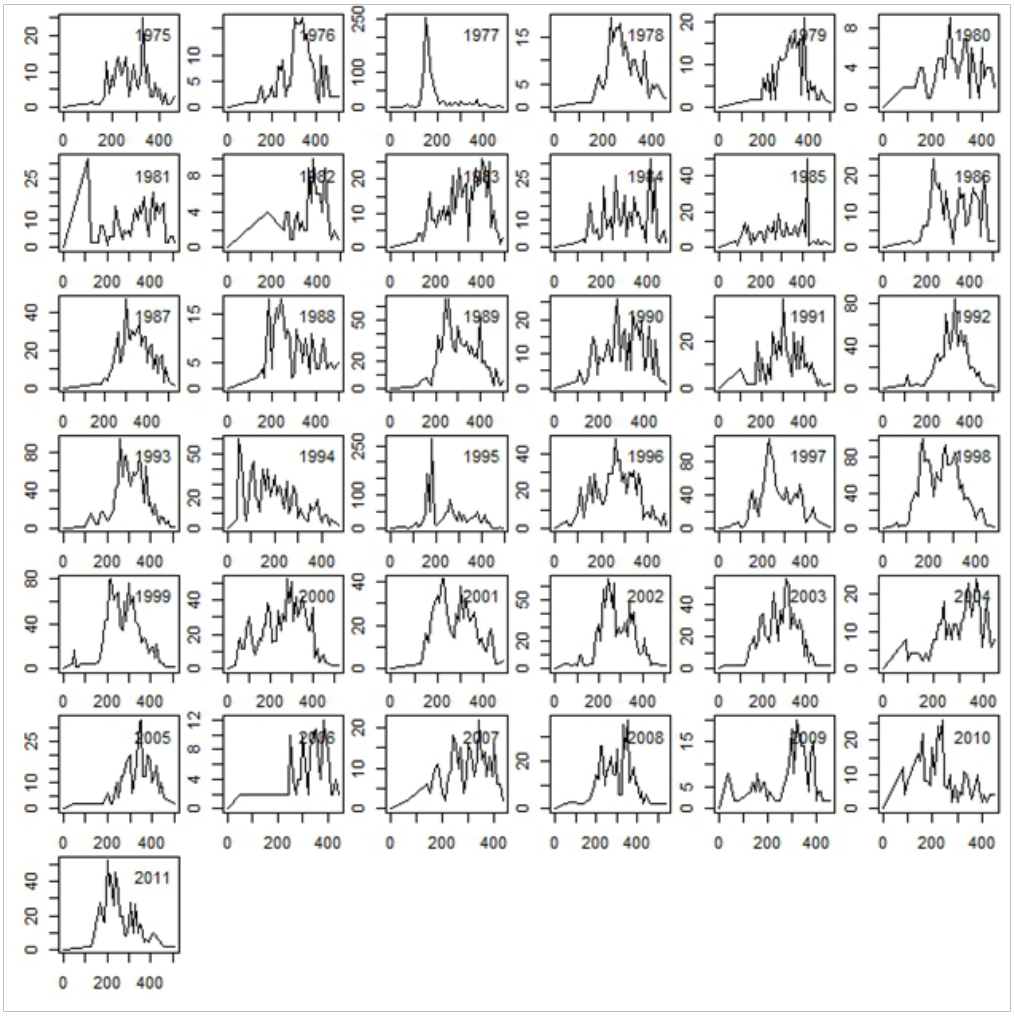

Figure 2.9. Witch flounder in IV and IIIa: length frequency distribution of the IBTS Q1 from 1975 to 2011.

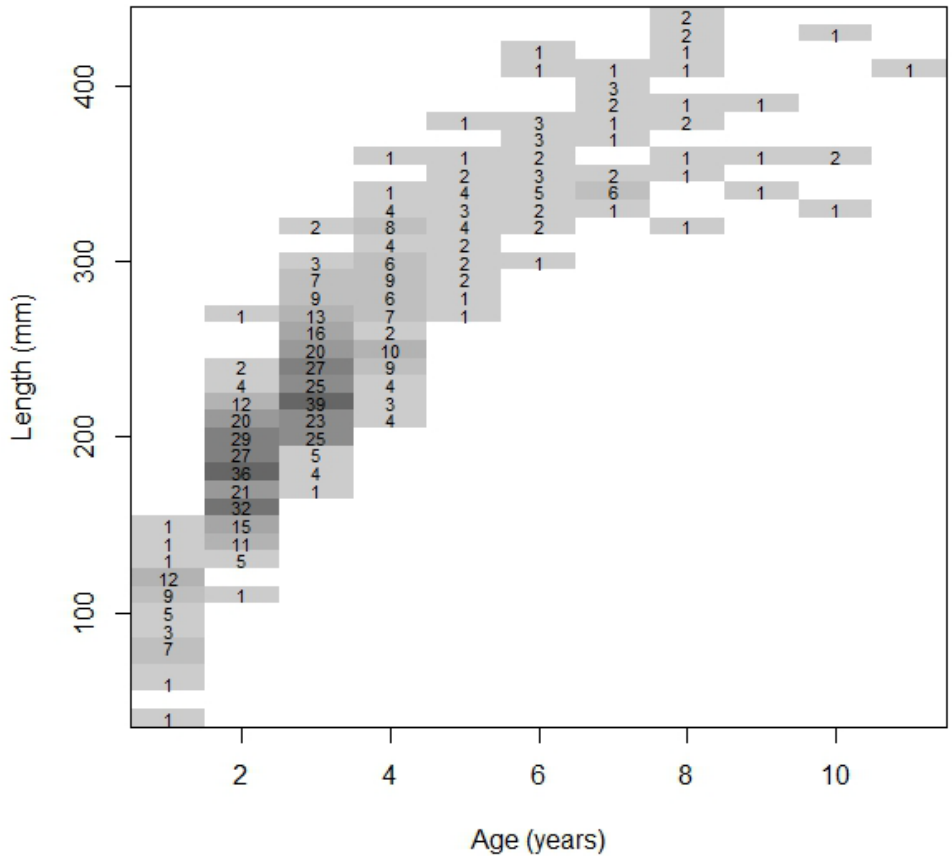

Figure 2.10. Witch flounder in IV and IIIa: age length keys (ALK) derived from otolith collected in 2009–2011 from IBTS survey.

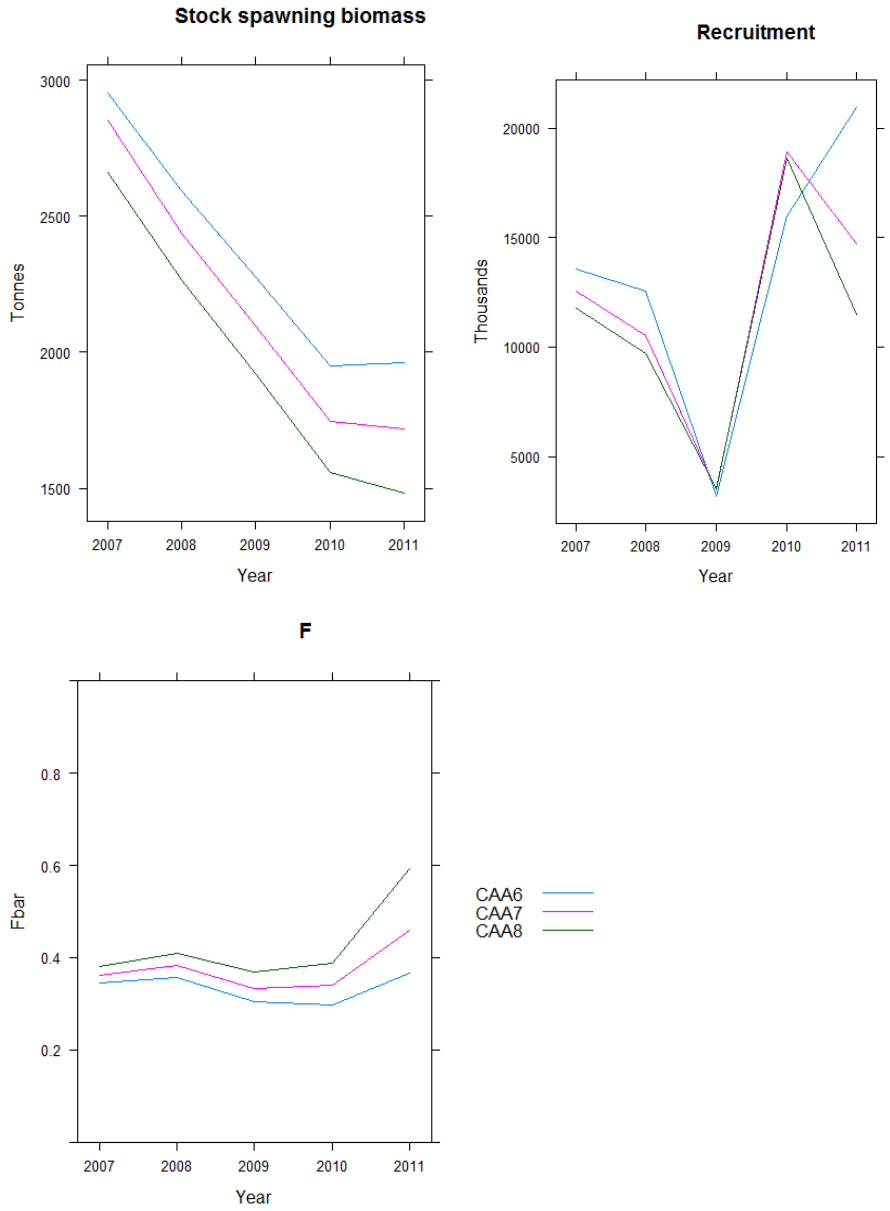

Figure 2.11. Witch flounder in IV and IIIa: Comparison of three different XSA run with different assumptions of q at age (q constant from age 6, 7 or 8, defined as CAA6, CAA7 and CAA8, respectively).

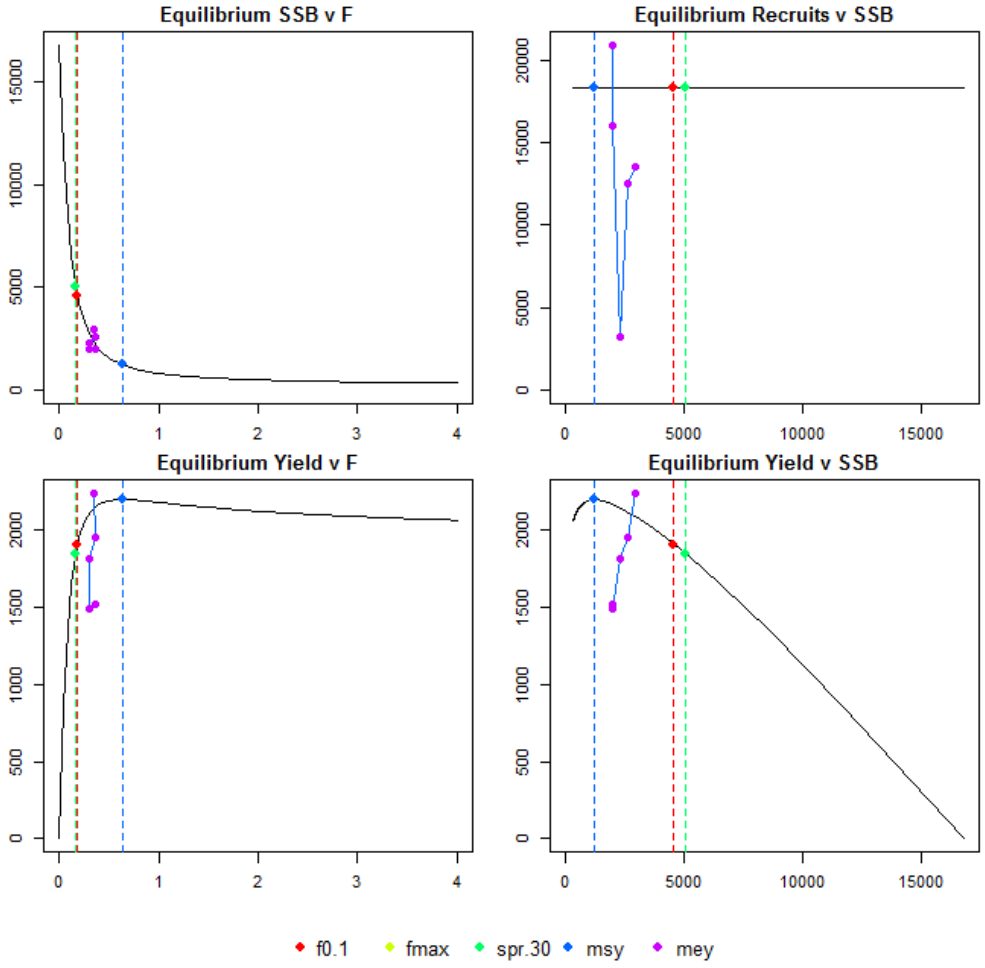

Figure 2.12. Witch flounder in IV and IIIa: Yield per recruit analysis based on the results of the CAA6 run.

3 Flounder in IV and IIIa

3.1 General

During the 2012 meeting of WGNEW only the landings data by country (Table 3.1 and 3.2, Figure 3.1) and the survey time series (Figure 3.2) data have been updated.

Table 3.1. Flounder. Landings by country in Division IIIa, as officially reported to ICES.

	ICES Division IIIa					
	Denmark	Germany	Netherl.	Norway	Sweden	Total
1975	1377	1			89	1467
1976	949	2	4		144	1099
1977	1036	<0.5	19		64	1119
1978	1560	10	14		64	1648
1979	1219	<0.5			100	1319
1980	426				135	561
1981	1831		<0.5		74	1905
1982	1236		<0.5		75	1311
1983	2352				160	2512
1984	2463				283	2746
1985	1203	<0.5			102	1305
1986	1585				166	1751
1987	1050				119	1169
1988	1164				149	1313
1989	996				133	1129
1990	650	1			57	708
1991	574				50	624
1992	455				52	507
1993	673	3			67	743
1994	865	1			77	943
1995	403	19			76	498
1996	429	9			104	542
1997	367	2			68	437
1998	637	5			83	725
1999	558	6			24	588
2000	609	17			30	656
2001	672	2		1	30	705
2002	493			1	30	524
2003	452	3		<0.5	18	473
2004	462	2		<0.5	14	478
2005	467				15	482
2006	380			<0.5	13	393
2007	419	3	1	<0.5	22	445
2008	326	4			16	346
2009	238	2		<0.5	33	273
2010	188				17	205

Table 3.1 Flounder. Landings by country in Subarea IV, as officially reported to ICES.

	ICES Subarea IV										
	Belgiu	Denmark	France	German	Irelan	Netherl	Norwa	Swe	UK	Ru	Total
1975	68	437		155		2191		1	87		2939
1976	94	575		209		2077		3	70	51	3079
1977	107	320		208	2	1732			127	9	2505
1978	122	203		198		1519			169		2211
1979	129	181	31	275		1260			201		2077
1980	190	300	33	229		806			140		1698
1981	164	669	14	200		1068			133		2248
1982	110	630	31	200		1597			121		2689
1983	88	564	36	197		2059			125		3069
1984	272	518	15	103					122		1030
1985	163	379	14	128					109		793
1986	155	456	1	91					111		814
1987	132	394	32	106					90		754
1988	160	509	44	105		682			98		1598
1989	200	632	28	95		916			80		1951
1990	153	467	69	147					45		881
1991	260	377	51	902					69		1659
1992	152	492	35	521					76		1276
1993	194	1812	47	356					136		2545
1994	196	642	57	921					247		2063
1995	301	628	103	843					250		2125
1996	262	1439	68	43					193		2005
1997	110	988	10	25					157		1290
1998	283	154	40	13		4938			132		5560
1999	326	123		11		3158			54		3672
2000	289	100	46	17		2656	5		52		3165
2001	241	92	42	4		2608	3		32		3022
2002	165	83	51	2		3531	3		55		3890
2003	206	94	33	3		3172	9		120		3637
2004	335	96	46	5		3720	18		74		4294
2005	241	171	17	5		3363	38		111		3946
2006	167	152	19	1		4020	39		216		4614
2007	298	166	56	46		2925	11		120		3622
2008	306	228	30	40		2231	3		57		2895
2009	272	274	38	46		2124	3		59		2816
2010	250	126	20	58		2612	6		87		3159

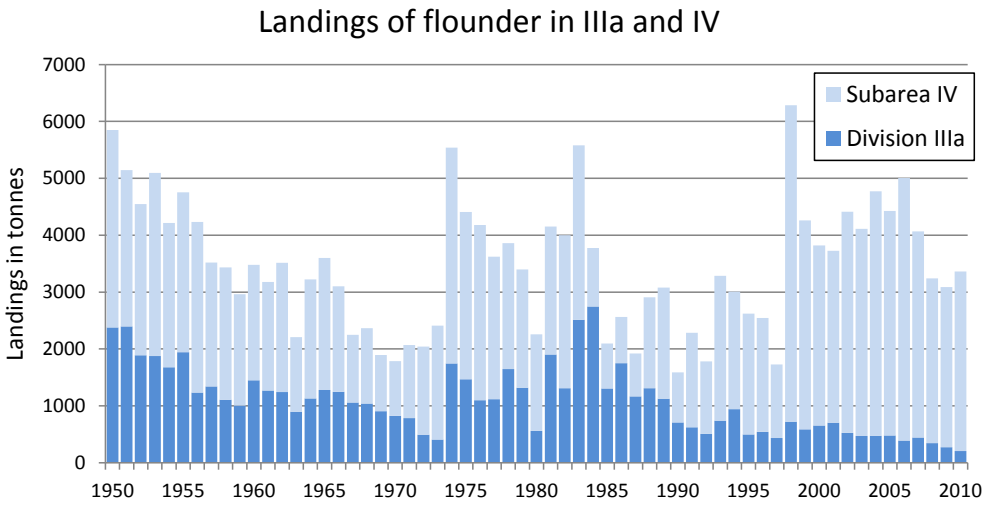

Figure 3.1. Landings (in t) of Flounder in Subarea IV and Division IIIa. Official landings statistics.

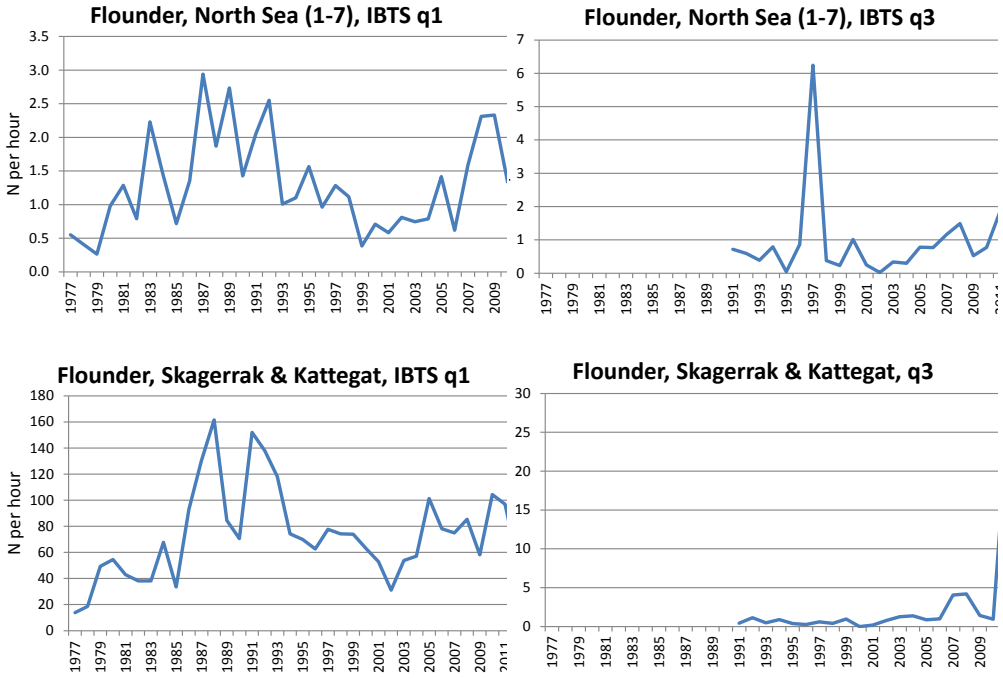

Figure 3.2. Flounder in IV and IIIa. Time series of abundance (N per hour with the GOV trawl) of flounder in the IBTS surveys in quarter 1 and quarter 3 in the North Sea (average for roundfish areas 1–7) and in Skagerrak/Kattegat (average for roundfish areas 8 and 9). Data from Datras.

4 Sea Bass in the Northeast Atlantic

4.1 General Biology

Sea bass *Dicentrarchus labrax* is widely distributed in shallow coastal and estuarine habitats of the northeast Atlantic, extending from southern Scandinavia down to the Mediterranean, Black Sea and North-west Africa. It is a predatory species highly prized by anglers and is also a high-value species for commercial fisheries using trawls, nets and lines. WGNEW deals only with the Northeast Atlantic component.

Mature sea bass aggregate on offshore spawning grounds during January to March in the Bay of Biscay and during February to May in the English Channel and eastern Celtic Sea. Sea bass have become more common towards the northern limit of their range since the 1990s, coinciding with the recent period of ocean warming, and spawning now extends more northerly in the North Sea (Pawson *et al.*, 2007). Larvae drift inshore and the first two years of life are spent in nursery areas in the brackish waters of estuaries. The fish range more widely within the estuaries as they grow and by their third year begin to migrate to over-wintering areas in deeper water, returning to larger estuaries in summer. When they reach 4 or 5 years they become more widely distributed in coastal waters and eventually adopt the adult feeding/spawning migration patterns on attainment of maturity (Pawson *et al.*, 1987).

Tagging studies show that individual sea bass have very strong site fidelity and are often recaptured very close to where they were tagged even after completion of a spawning migration (Pawson *et al.,* 2007). Site fidelity appears less well developed towards the edge of the range for example in the Irish Sea and North Sea.

Growth is relatively slow and the species is long-lived (up to 30 years of age). Maturity is attained at 4 - 7 years, which is around 35 cm for males and 42 cm for females (Pawson and Pickett 1996).

The life history characteristics of sea bass (slow growth, late maturity, spawning aggregation and strong site fidelity) increase their vulnerability to over-exploitation and localised depletion.

4.2 Stock ID and possible management areas

Stock identity of European sea bass was reviewed by WGNEW 2012 to address its ToR(a) (re-evaluate the stock identity, based on the best available science).

4.2.1 Evidence from genetics studies

Although Child (1992) suggested that there may be genetic differences between immature sea bass from the Irish Sea and elsewhere, other work (Tobin, Galway University, unpublished manuscript), using samples of 0-group sea bass from the Camel and Tamar Estuaries (SW England), the Scheldt Estuary in Belgium and two Irish samples, suggests that there is little, if any, sign of population structuring. In addition, work by Durand, Bonhomme and Morizur (2001) on adult sea bass captured at the main spawning grounds in VIIe, VIIf, VIIIa and VIIIb suggested that the genetic differentiation between spawning grounds is very limited, suggesting that mixing between generations is sufficient to homogenise the genetic make up of each subpopulation. Fritsch *et al*. (2007) investigated 8 microsatellite loci of juvenile and adult sea bass caught in the Bay of Biscay and the English Channel and of 5 loci of sea bass caught in Ireland and Scotland. Genetic data showed no significant population differentiation, indicting substantial gene flow. However, results suggested that Irish and

Scottish populations could be separated from the Bay of Biscay and Channel, but the sample size in this case was limited.

4.2.2 Evidence from tagging studies

Since 2001, various proposals have been made to structure the sea bass population and its migrations and to establish stock boundaries based largely on conventional tagging studies. The history of proposals by SGBASS (ICES, 2001, 2002 and 2004; Fritsh *et al*, 2007, Pawson *et al*, 2007) is shown in Figures 4.1 – 4.3.

The 2001 ICES Study Group on Sea Bass (SGBASS) proposed four stocks (North Sea and eastern-Channel; Biscay-western Channel; west coast of England and Wales, and Ireland (ICES, 2001). The SGBASS 2004 extended this to propose additional stock structuring in the eastern Channel and southern part of the western Channel (ICES 2004). They considered the eastern and western Channel have a mixture of resident and seasonal visiting sea bass and, although there is little evidence of a "biological" boundary between these stocks, the SGBASS suggested that the boundary between ICES Divisions VIId and VIIe be retained for assessment purposes because the respective fisheries are different in character. Very few sea bass appear to move north or south across the Hurd Deep within VIIe, which suggested to SGBASS (ICES 2004) that fish around North Brittany and the Channel Islands could be separated from UK stocks and possibly included with those in subarea VIII. The Study Group considered that for management purposes the sea bass population around Ireland could be regarded as a discrete stock. Finally, the sea bass population in the Bay of Biscay appeared to be relatively self-contained, and the Study Group proposed that this should be treated as a separate stock area.

Recent genetic and tagging studies led both Fritsch *et al.* (2007) and Pawson *et al.* (2007), to question the need for six stock areas. While these authors proposed separate stock units in the North Sea and Bay of Biscay, they suggested that the English Channel and Bristol Channel could be treated as a single stock unit, as could bass in Irish waters.

In a recent study conducted by CEFAS using electronic data-storage tags (Quayle *et al* 2009), sea bass tagged near the Channel Islands in VIIe (south of Hurd Deep) moved as far as the southern North Sea, and sea bass tagged on the NE coast of England and the Thames Estuary moved into VIId in the eastern Channel (Figure 4.4).

A recent electronic tagging study conducted in France in 2010–2011 (Figure 4.5) showed seasonal movements of sea bass between tagging sites off NW Brittany and the Bay of Biscay, which supports the idea of a stock in the Bay of Biscay. The study also showed the high degree of homing for sea bass on summer feeding areas (five sea bass were recaptured on the same rock one year after tagging, and at least two of them could have migrated to different offshore winter spawning areas).

4.2.3 Distribution of commercial fishing catches

The most intensive fishing areas for sea bass by the UK, France and Netherlands in Subareas IV and VII are spread across the North Sea – eastern Channel boundary (Figures 4.6 – 4.8), which together with tagging results suggests that this is not an appropriate boundary for delimiting separate stocks for management purposes. This does not in itself preclude the existence of separate stocks. However the lack of any clear spatial structuring, together with the known movements of tagged sea bass between ICES Divisions, would make the use of ICES Divisions in IV and VII to define stock boundaries rather subjective.

4.2.4 Similarities in stock trends between ICES areas

Previous WGNEW meetings have attempted to analyse the UK landings-at-age data separately for ICES Divisions IVb and c, VIId, VIIe and h, and VIIa,f and g, using simple approaches such as SURBA, as well as a complex statistical, fleet-disaggregated model (ICES 2008). The age compositions for these areas are derived from independent sampling for length and age. Historical recruitment trends were very similar for the four assessment areas, except for the most recent year classes which were estimated from only partial cohort data and without the use of recruit indices. This could reflect large-scale environmental variables affecting recruitment in all areas, but could also be an effect of stock mixing on the separate catch-at-age matrices.

4.2.5 Recommendations for stock identity to be used at benchmark assessments

It is clear that further studies are needed on sea bass stock identity, using conventional and electronic tagging, genetics and other individual and population markers (e.g. otolith microchemistry and shape), together with data on spawning distribution, larval transport and VMS data for vessels tracking migrating sea bass shoals, to confirm and quantify the exchange rate of sea bass between sea areas that could form management units for this stock.

The pragmatic view of WGNEW is to continue to assume the presence of discrete sea bass stocks off southern Ireland and in the Bay of Biscay / IXa. The October 2012 benchmark assessment of sea bass should evaluate the effect on model diagnostics of different degrees of disaggregation of the assessment data across IVb/c, VIId, VIIe,h and VIIa, f and g.

4.3 Management regulations

Sea bass are not subject to EU TACs and quotas. Commercial vessels catching sea bass within cod recovery zones are subject to days-at-sea limits according to gear, mesh and species composition.

Under EU regulation, the MLS of sea bass in the Northeast Atlantic is 36 cm total length, and there is effectively a banned range for enmeshing nets of 70 - 89 mm stretched mesh in Regions 1 and 2 of Community waters.

A variety of national restrictions on commercial sea bass fishing are also in place. These include:

- a landings limit of 5 t/boat/week for all French and UK trawlers landing sea bass;
- closure of 37 sea bass nursery areas in England and Wales to specified fishing methods;
- UK regional byelaws in Cornwall and South Wales stipulating a 37.5 cm MLS;
- a minimum gillnet mesh size of 100 mm in South Wales;
- a variety of control measures in Ireland that effectively ban commercial fishing for sea bass in Irish waters.
- a licensing system from 2012 in France for commercial gears targeting sea bass.
- voluntary closed season from February to mid-March for long-line and hand-line sea bass fisheries in Brittany;

Depending on country, measures affecting recreational fisheries include minimum landing sizes, restrictions on sale of catch, bag limits (Ireland), and gear restrictions (France; Netherlands).

4.4 Fisheries Data

The commercial sea bass fisheries in Areas IV and VII have two distinct components: an offshore fishery on pre-spawning and spawning sea bass during November to April, predominantly by pelagic trawlers from France and the UK, and small-scale inshore fisheries catching immature sea bass and mature fish returning to coastal areas following spawning.

The inshore fisheries include many small (10 m and under) vessels using a variety of fishing methods (e.g. trawl, handline, longline, nets, rod and line) and often taking sea bass as a by-catch with other species. Historical landings data for the small-scale fisheries have often been poorly recorded. The introduction of legislation requiring registration of Buyers and Sellers since 2006 has improved the accuracy of the reported landings in the UK.

The fisheries in Area VIII are prosecuted mainly by France and Spain and in Division IXa by Spain and Portugal. The Portuguese fleet is predominantly polyvalent with small catches also recorded for purse seines, trawls and gillnets.

Sea bass are a popular target for recreational fishing in Europe. Relatively little historical data are available on recreational fisheries although several European countries are now carrying out surveys to meet the requirements of the EU Data Collection Framework and for other purposes (ICES, 2009, 2010, 2011; Herfault *et al.*, 2010, Rocklin *et al*, 2012 in prep).

4.4.1 Commercial landings series

4.4.1.1 Data available

Landings series for use in the assessment are available from two sources:

i) Official statistics recorded in the Fishstat database since around the mid 1970s.

ii) French landings for 1999–2010 from a separate analysis by Ifremer of logbook and auction data.

Total international landings from the two sources combined increased from around 2000t in the late 1970s to over 8000 t by 2006, the bulk coming from areas IVb,c, VIIe and XIII (Table 4.1; Figure 4.9). An important driver of the increase in landings since the 1990s was the increased landings in Divisions IVb,c, VIId and VIIe,h, coinciding with the large 1989 year class and a northward expansion of the sea bass population in the North Sea during a period of increasing sea temperatures. Landings by country from each ICES area are given in Tables 4.2 – 4.8.

WGNEW has previously given separate (unofficial) estimates of 29 – 65 t for Spanish Basque countries for area VIII, but only for 1995 – 2005. These have not been updated but can be viewed in the ICES 2010 and 2011 advice sheets (ICES, 2011)

UK and French landings by gear type and area are shown in Figures. 4.10 and 4.11. A large fraction of the landings from VIIe,h are from the pelagic trawl fisheries on offshore sea bass

4.4.1.2 Quality of landings data

From 1999 onwards, French landings data from FishStat are replaced by more accurate Figures from a separate analysis of logbook and auction data carried out by Ifremer.

The accuracy of total landings statistics for subareas IV, VII and Div. VIIIa are expected to have improved further since 2006 since the introduction of the registration of Buyers and Sellers in the UK, particularly for small vessels that do not have to supply EU logbooks. Landings data for Div. IXa are more accurate since 2006 when sea bass *Dicentrarchus labrax* landed into Portugal started to be recorded as the correct species rather than mainly as part of a mixed sea bass category with the spotted sea bass *Dicentrarchus punctatu*. This resulted in a sharp increase in reported landings of *D. Labrax* in 2006 (Figure 4.12).

The UK has previously attempted to estimate the sea bass landings of inshore commercial and recreational fishing boats between 1984 and 2006 using a voluntary log book scheme in conjunction with a biennial census of vessels catching sea bass that covers different segments of coast in different years (Pickett 1990). The landings tables in previous WGNEW and ACOM advice included "unallocated" landings which are the difference between the voluntary logbook estimates and the official UK statistics in each ICES area. The coverage of the logbook scheme has declined substantially and the scheme is under review. Pending the outcome of the review, the "unallocated" landings series are withdrawn from the WGNEW report and are not included in any data series shown. Time-series of LPUE of individual logbook holders are reproduced in the Stock Annex.

Due to the species' high commercial value and demand in local restaurants, there might be some unreported catches of sea bass at specific areas, although its level is unknown.

Further information on availability and quality of landings data by country is provided by SGBASS (ICES, 2004).

4.4.2 Commercial discards

4.4.2.1 Data available

Estimates of sea bass discards by area and fleet were available to WGNEW for UK fleets from 2002 onwards and for French fleets from 2009. The UK and French sampling schemes involve vessel-list sampling frames and random selection of vessels within strata defined by area and fleet sector.

As sampling is targeted at all species, annual coverage of the sea bass fisheries is relatively limited. UK discard rates for samples aggregated over 2002 – 2008 are given in Table 4.9. The highest discard rates were for trawlers using 80–89mm mesh in the eastern Channel (VIId) and southern North Sea. Discard rates of gillnetters were very low. No trips were undertaken on vessels using lines, which are a significant component of the sea bass fishery. It is assumed that discards of line-caught sea bass in shallow inshore waters will have a high survival rate. Although beam trawlers using 80–89 mm mesh had a high discard rate in VIId, this fleet has very low catches of sea bass. No discards sampling has taken place on offshore pair trawlers, however as this fishery targets mature sea bass, discarding is expected to be low, as observed in the French offshore fishery.

French discard rates of sea bass in 2009 and 2010 were low in general (Tables 4.10 and 4.11). As with UK fleets, bottom trawlers had the highest discard rate mainly in the eastern English Channel (VIId) and southern North Sea (IVb,c). The total amount of discards estimated in 2009 and 2010 was 183 t and 157 t, mainly assigned to Division VIId. Data for some fleets and areas are indicative because of the low rates of sampling.

4.4.2.2 Quality of discards data

Discards estimates for UK and France are from vessel selections that for some areas and gears include relatively limited numbers of observed trips where sea bass is caught and discarded. A compilation of all available discards estimates by year, area and gear type, in terms of weight, length and age composition, with indicators of annual precision and bias, should be provided by all countries catching sea bass for the October 2012 benchmark assessment.

4.4.3 Recreational catches

4.4.3.1 Data available

Recreational marine fishery surveys in Europe are still at an early stage in development (ICES, 2010, 2011). Recent estimates will be compiled and evaluated for the benchmark assessment of sea bass in October 2012. The following information was available to WGNEW 2012.

4.4.3.1.1 France

The first national survey of recreational fishing in France (2006 to 2008) revealed that sea bass was the main target species for recreational fishermen, and that 378,500 people had fished recreationally for sea bass.

A new study targeting sea bass was conducted between 2009 and 2011. In 2009, 15 000 households were phoned in the targeted districts using random digit dialling (RDD). The main goal was to estimate the population of sea bass recreational fishers and their socio-demographic profiles in the Bay of Biscay and in the Channel. In 2010–2011 a panel of 121 recreational fishermen was recruited during the RDD screening survey and kept diaries of their catches for one year. The main goal was to obtain a detailed description of fishing trips (travel, area of fishing, gears, …) and the description of their catches (species, weight, length, …) to be used for assessment.

The estimated recreational catch of sea bass in the Bay of Biscay and in the Channel was 3170 t of which 2350 t was kept and 830 t released. The main gears used, in order of total catch, were fishing rod with artificial lure, fishing rod with bait, hand line, long line, net and spear fishing. Approximately 80% of the recreational catch was taken by sea angling (rod and line or handline) - 2610 t total catch and 1840t kept (29% release rate).

The precision of the estimate is relatively low (CV =-51%). Increasing the panel from 121 to 500 fishermen would be expected to improve precision to 25% and increasing this panel to 1000 would improve precision to 18%.

4.4.3.1.2 UK (Eand W)

Several attempts have been made in the past to estimate recreational sea angling catches of sea bass in England and Wales or more restricted areas of the UK (Dunn *et al*, 1989; Dunn and Potten, 1994). A new survey programme based on a statistically-

sound survey design commenced in 2012 to estimate fishing effort, catches (kept and released) and fish sizes for shore based and boat angling in England. The survey does not cover other forms of recreational fishing.

4.4.3.1.3 Netherlands

Sea bass are taken by recreational sea anglers in the Netherlands, and a recent survey is described in ICES (2011). The estimates from this survey were under review at the time of the ICES PGRFS report in 2011.

4.4.3.1.4 Other countries

Sea bass are a popular angling species in Ireland and are also caught in Belgium. WGNEW did not have any information on estimated recreational catches.

4.4.3.2 Quality of recreational catch estimates

Recreational catch estimates are not yet available as time series. The estimates for France are characterised by relatively poor precision. Sources and potential magnitude of bias were not provided to WGNEW. The 2012 ICES Working Group on Recreational Fisheries (WGRFS) will consider the development of data quality indicators for recreational fishery survey estimates.

4.4.4 Commercial catch–effort data

4.4.4.1 Data available

4.4.4.1.1 France

Fishing effort data are available for French fleets but will be biased by trends in the availability of logbook data. During 2000 - 2001 around 50% of the vessels that had auction sales slips on the Atlantic coast had no logbook data (Figure 4.13). This reduced to around 20% by 2007 due to increasing declaration of log books to the French administration, both for vessels >10 meters and for vessels of 10 m and under. The subsequent increase in percentage of vessels with no logbook data during 2009–2011 is due to logbook data not having been captured yet in the database (Figure 4.13). This tendency is apparent across areas and gears, and it means that effort and LPUE trends cannot at present be provided for sea bass based on logbook data. LPUE data could be obtained using the auction data: this will be explored for the benchmark assessment especially for coastal bottom trawl.

Data on LPUE of sea bass is available from the personal fishing records of six coastal vessels fishing with lines in Division VIIe (Figure 4.14). It shows a mean decline of 33% of their LPUE from 2007 to 2009. More recent data were not available to WGNEW, although the fishermen reported a continued downward trend with a more recent levelling off. Reports from fishermen indicate that this trend isn't apparent in VIId and IVbc.

4.4.4.1.2 UK (Eand W)

The exploratory assessment of sea bass conducted by WGNEW in 2010 used effort data to tune a statistical, fleet disaggregated catch-at-age model applied only using UK data updated to 2008. The assessment has not been updated this year, as the stock will be subject to a benchmark stock assessment in October 2012. Intersessional work is proposed to re-evaluate the effort and LPUE data for sea bass as potential input to assessment and no trends are presented here. The LPUE trends from individual fish-

ermen can be derived from the Cefas logbook scheme, and can be obtained for the three weight categories recorded (examples are given in the Stock Annex). This will be explored further for the benchmark assessment.

4.4.4.1.3 Spain

LPUE data for Spanish fleets operating in ICES areas VI-VIII and landing into Basque Country ports were provided to WGNEW in 2005, and the best indicator of sea bass abundance trends (LPUE) in the period 1994 - 2004 was considered to be from vessels of the 'baka' otter trawl fleet working in Div. VIIIa,b,d and landing into the Basque port of Ondarroa. Data for later years were not available to WGNEW, but will be requested for the benchmark assessment.

4.4.4.1.4 Quality of data

None of the fishing effort or LPUE data available to WGNEW are suitable for inclusion in the benchmark assessment without further evaluation. Development of LPUE series providing relative abundance data for adult sea bass is desirable because of the lack of survey data. LPUE for the offshore pelagic fishery may be biased due to targeting of aggregations. Sea bass are a by-catch in several other fisheries and catchability may drift due to changes in species targeting, areas fished and vessel fishing power. Subsetting of trips to exclude those where there is no expectation of sea bass catches (e.g. Stephens and MacCall, 2004), may be appropriate and will be investigated. French effort and LPUE will have to be based on auction data due to variable availability of logbooks.

4.5 Biological sampling: length and age compositions

4.5.1 Data available from commercial fishery landings

Length and age compositions of sea bass landings were available to WGNEW from sampling in the UK and France.

4.5.1.1 France

Quarterly landings age compositions are available for all metiers in Divs. VII e h from 2000 (annual age compositions are given in Tables 4.20 to 4.24). For VII d quarterly length distributions are available from 2003 for bottom trawl and pelagic trawl (Table 4.25 and 4.26). For IV b c length distributions are available from 2009 for various gears (Table 4.28). For VIII a b length distributions per metier are available from 2000 (Tables 4.29 to 4.32).

4.5.1.2 UK

Length and age compositions are supplied by the UK since 1985 for IV b and c, VII d, VIIe,h and VII a,fand g, disaggregated by five gear types: otter trawl, pelagic pair trawl, driftand gill nets, lines, and other gears. Although separate ALKs are derived for the five areas, the same ALK is applied to all gear groups meaning that the age composition estimates for the different gears are not independent.

Landings age compositions by gear and area are given in Tables 4.33 to 4.44. Age data are currently provided with a plus group (12+). If possible the data should be provided to the oldest true age to allow more flexibility to investigate the most appropriate plus group.

4.5.1.3 Other countries

Fishery sampling data from other countries catching sea bass will be sourced for the benchmark assessment but were not available to WGNEW 2012.

4.5.1.4 Comparison of age and length compositions for UK and French fisheries by area and gear

Age compositions of sea bass landings in the UK and French fisheries in VIIe-h for the years 2000 – 2010 are compared in Figures. 4.17 to 4.19. The compositions of bottom trawl landings are quite similar in most years (Figure 4.17) with some exceptions such as 2008 and 2010. Age compositions in the net fisheries differ substantially in some years (Figure 4.18). The French longline fishery appears to take younger sea bass than the handline fishery which has a very high component in the 12+ group in some years (Figure 4.19). The UK line fishery age compositions (combined line gears) are more similar to the French handline fishery than the longline fishery.

Length compositions of UK and French fleets are compared for 2010 in Figures 4.20 and 4.21. The length compositions For IV b c nets and lines and VII d bottom trawl were very similar (Figure 4.20), as were bottom trawls and pair trawls in VIIe,h (Figure 4.21). Samples from the UK and French line fisheries in VII e and h had very different length compositions.

4.5.2 Quality of commercial fishery length and age composition data

UK Sampling rates for length compositions have been very variable between area, gear and year strata. Most strata have some sampling coverage with the exception of pair trawls which have had zero or very low coverage in many years despite large catches, although sampling has improved recently (Tables 4.12 to 4.15; Figure 4.15). The sampling rate (trips sampled per tonne landed) has declined for all gears since the mid 2000s (Figure 4.15).

Sampling of sea bass in France has also been very variable between areas and gears, with greatest consistency between years in VIIIa,b. There has been a general increase in numbers of trips sampled for length since 2009 (Tables 4.16 to 4.19 and Figure 4.16).

The sampling of fishery landings is sufficient to clearly demonstrates strong and weak year classes that can be tracked over many years (Figure 4.22b; Table 4.45), for example the 1989 year class which was a major contributor to the growth in fishery landings in Subareas IV and VII in the 1990s. This indicates plenty of contrast in the catch-at-age data to help in fitting an age-based assessment model. The overall age compositions of UK fisheries has changed little between 1985–97 and 1998–2010 (Figure 4.22a).

WGNEW was not in a position to compute effective sample sizes for annual length or age compositions to be input to stock assessment models such as Stock Synthesis. The numbers of trips sampled for age compositions was not available. Metadata on numbers of sampled trips and numbers of fish measured and aged will be required for the benchmark assessment.

The statistical design of fishery sampling schemes has undergone change in recent years in the UK and France, following recommendations from ICES workshops on sampling survey design, with a move towards more representative sampling across trips within fleet segments. This can result in sampling more trips that have small catches of sea bass, and is one reason for the increase in numbers of sampled trips

with sea bass since 2009 in France which does not imply an increase of the proportion in numbers of fish measured per trip

4.5.3 Data available from commercial fishery discards

Although discards data are provided to WGNEW for UK and French vessels (Table 4.9 to 4.11), information on sampling for length or age compositions was not available. A compilation of all available discards estimates by year, area and gear type, in terms of weight, length and age composition, with indicators of annual precision and bias, should be provided by all countries catching sea bass for the October 2012 benchmark assessment.

4.5.4 Data available from recreational fisheries

Length compositions of sea bass reported for the recent recreational fishery survey in France was available to WGNEW. These will be evaluated at the benchmark assessment.

4.6 Biological parameters and other research

A review of sea bass population biology and fisheries is given by Pickett and Pawson (1994), and some updates are provided by ICES SGBASS (2004) and previous WGNEW. However there is an absence of parameters that can be directly incorporated in the assessment process and work is needed to compile and analyse data to provide this information prior to the benchmark assessment.

4.6.1 Accuracy and validation of age estimates

4.6.1.1 Age–reading consistency

The first small-scale otolith and scale exchange for sea bass *(Dicentrarchus labrax*) took place in 2011. A total of 155 fish from Eastern English Channel (ICES Div.VIId) was sampled. The length range of the fish was between 17 and 74 cm, with a mean length at 47 cm. For each fish, the *Sagittae* otoliths and few scales were used to compare the age estimation between both calcified pieces. Four readers participated from the UK and France. Only images were used during this exchange.

There was a low mean precision of age estimate for individual fish with Coefficient of Variation (CV) of 13.1% and percent agreement to modal age of 54.1%. Only two of the 155 fish were read with 100% agreement (1.3%). The results showed the same precision of age estimation from the otolith (60% agreement; CV = 12%) or the scale (62% agreement; CV = 12%). However, this exchange showed that the age estimation from the otoliths was different than this from the scales. A large-scale exchange is planned for 2012 to further investigate the consistency of sea bass ageing.

4.6.1.2 Age validation

WGNEW was not aware of specific studies to validate absolute ages of sea bass derived from otolith or scale readings. Strong and weak year classes can be followed clearly to over 20 years of age (Table 4.45) although it is not known to what extent the elevated numbers of sampled fish in immediately adjacent year classes is a true reflection of year class strength or a "bleeding" of data due to the types of age errors discussed in the previous section. There is also some confusion in year class tracking in the younger ages 3 – 5 (see Figure 4.22b), although this will be affected by gear selectivity and changes in fish behaviour.

4.6.2 Growth parameters

Pickett and Pawson, 1994, provide plots of growth curves for female and male sea bass based on samples collected in the 1980s, and give some estimates of Von Bertalanffy growth parameter from other studies (L_{inf} ~ 72 cm and k ~0.14 for combined-sex data). There is some sexual dimorphism of growth, with females attaining mean lengths 5–10cm greater than males from around eight years of age onwards. Growth will vary regionally, and Pickett and Pawson (1994) also highlight influence of inshore and estuarine temperature variation on growth of immature sea bass.

4.6.3 Maturity

Collection of maturity data are difficult as few adult sea bass are caught in surveys and sea bass are typically landed whole and are extremely expensive to purchase. The most commonly cited information is from Pickett and Pawson (1994). These and other data need to be retrieved for statistical analysis.

SGBASS (ICES, 2004) reported that around Britain and Ireland, male sea bass mature at a length of 31–35 cm, aged 4–7 years, and females at 40–45 cm, aged 5–8 years, (Kennedy and Fitzmaurice, 1972; Pawson and Pickett, 1996), and data from the southern part of the Bay of Biscay (Lam Hoai, 1970 [ref not provided by SGBASS], Stequert, 1972) indicate that male sea bass mature at a length of 35 cm (age 4) and females at 42 cm (age 6). Data provided by Masski (1998) from samples taken from VIIe bottom trawlers (41 females) indicate that 40 % and 82 % of females were mature at age 6 and 7 respectively, with a very small percentage mature at age 5.

In 2009 the maturity of sea bass caught by the UK fishery was investigated using samples of 981 fish (male = 339, female = 642) caught by commercial trawl and nets in the northeast, the southeast and the southwest UK during April- June (ICES, 2010). Maturity ogives fitted to the combined data for females indicated L50 at approximately 40 cm TL and first maturity around 35 cm (Figure 4.23). This contrasts with the data of Pawson and Pickett, (1996) who reported that females were not becoming ripe to spawn at lengths of < 42 cm TL, and may suggest that females may be maturing at a smaller size than was previously reported. In addition, separate model fits to the four area/gear sample sets suggest that the onset of maturity may differ by geographic location, with females in the North Sea maturing at a larger size than those in the southeast. For males, the data indicated that L50 was approximately 34 cm TL, but that there were uncertainties due to the small sample size and outliers in the data. However, it appeared that gravid and running individuals were larger than previously reported.

4.6.4 Natural mortality M

There are no direct estimates of natural mortality available for Northeast Atlantic sea bass. Predation up to around age 4 will be in and near estuaries and bays. As with other fish species it is expected that M will be relatively high at the youngest ages, particularly given the slow growth rate in sea bass. For the benchmark assessment WGNEW proposes the compilation of life-history based inferences in the general value of M, based on maximum observed age, VB growth parameters, age at maturity and age of cohort biomass peak in relation to maturity. Age composition data from France since 2000 (Tables 4.20 to 4.24) and the UK since 1985 (Table 4–45) indicate maximum recorded ages from 22 (French data) to 28 (UK data). The probability of encountering very old sea bass is partly a function of the interaction of year class

strength and sampling rates, as well as mortality, however the occurrence of sea bass to almost 30 years of age suggests low rates of mortality.

4.6.5 Data sourcing and evaluation for benchmark assessment

The distribution of sampling in relation to distribution of mature and immature fish at different times of year needs to be evaluated for a species such as sea bass which undertakes spawning migrations. All existing data on maturity at size / age from surveys and fisheries, and individual length-at-age data, needs to be sourced and analysed for the October 2012 benchmark assessment in order to estimate growth parameters and maturity ogives for use in possible assessment models. WGNEW has compiled age data out to the truest age for UK sampling (1985 onwards) and French sampling (2000 onwards) but should source earlier data if available, for periods or areas of much lower fishing activity on sea bass.

4.7 Survey data

4.7.1 UK

4.7.1.1 Solent and Thames pre-recruit surveys

The UK has conducted pre-recruit trawl surveys in the Solent and the Thames Estuary since 1981 and 1997 respectively. These surveys all ended in 2009 although the Solent survey was repeated as a one-off survey in autumn 2011 to help provide recruitment indices for the sea bass benchmark assessment. The location of the surveys and the tow positions are shown in Figure 4.24. Both surveys use a high headline sea bass trawl, although in the Thames it is deployed as a twin rig and in the Solent as a single rig.

The Solent survey has previously been presented as a combined index across ages in each year class. The index was derived by firstly rescaling the annual mean catch rate per age class to the mean for that age in the survey series, then taking the average of the rescaled values for ages 2 – 4 in each year class from surveys in May-July and September (i.e. up to six values per year class represented in the combined index). The Thames survey data are worked up in the same way, although using a different age range for the combined index (ages 0 – 3). WGNEW has this year provided the survey data in the more conventional tuning-file format, giving the standardised catch rates (numbers per 10 minute tow) by year and age, separately for the two surveys (Tables 4.46 and 4.47).

The mean-standardised indices from the Solent survey show very large variations from year to year as may be expected given the large variation in year class strength evident in the commercial catch data (Figure 4.25). Strong year classes are apparent in 1989, 1995 and 1997, but in the last decade, year class strength has been less variable, a pattern also seen in the commercial fishery (Figure 4.22 b). The survey indicates a general trend of increasing recruitment since the early 1990s. The most recent survey in 2011 indicates very weak 2008 and 2009 year classes.

Some year-effects (where all or most age classes show a reduced or elevated index in a year) are evident in 2007 in the September survey and in 1996 and 2003–07 in the May-July survey (Figure 4.25). Year-class effects are not consistent across the survey and age range, and this is also shown by low correlation coefficients in the internal consistency plots (index for age i, year y plotted against age i-1, y-1; Figure 4.26)

The Thames survey shows fewer year effects and better internal consistency than the Solent survey (Figures 4.27 and 4.28). The overall trend is closer to the Solent September survey than to the Solent May-July survey, showing a trend of increasing recruitment in the 1990s although with a dip in the mid 1990s.

4.7.1.2 Other 0-gp and 1-gp surveys

The UK has undertaken a seine net survey in the Tamar Estuary, since 1985. Additional data are available from power stations in the Thames and Severn Estuary. Abundance indices for these surveys are given in Tables 4.48.

4.7.2 Netherlands

The Netherlands has data from a 3m beam trawl survey in the Westerscheldt. From 1972 to 1990, sea bass catches were rare, but since 1990 catch rates increased with large peaks in 1994 and 2004.

4.7.3 France

Sea bass are caught in small numbers in the French Evhoe trawl survey, which extends to the shelf edge in Subareas VII and VIII but also extends into coastal areas of the Bay of Biscay and the Celtic Sea where sea bass may be caught. Less than 10% of the stations have sea bass catches in most years. The percentage of stations with sea bass catches, and the catch rate at positive stations, have both shown a slight increasing trend since 1997 (Figure 4.29; Table 4.49). The data should be reworked for the benchmark assessment to separate out the catch rates for Subareas VIII and VII.

4.8 Analyses of stock trends

No formal analyses of stock trends are presented pending the benchmark assessment in October 2012.

4.9 Data recommendations: benchmark assessment preparation

4.9.1 Summary of data available for benchmark assessment

A summary of the data available for the October 2012 benchmark assessment of sea bass is provided in tables 4.50 to 4.56, together with an indication of the quality of the data. A traffic-lights indicator is shown, in the spirit of the ICES WKACCU scorecard although not derived formally using the detailed WKACCU criteria.

4.9.2 Tasks for further data compilation and evaluation for the benchmark assessment

A workplan to prepare for the October benchmark assessment is given below, using the headings and guidelines for data compilation and evaluation provided by the 2011 meeting of the ICES Planning Group on Commercial Catches, Discards and Biological Sampling. The objective is to produce a detailed Working Document for the benchmark assessment describing and evaluating the data sets and parameters on which an assessment can be carried out. This will be based on the sea bass Section 4 from WGNEW 2012 with additional data and evaluation recommended by WGNEW and should be made available by end of June 2012 to allow sufficient time for intersessional work on developing suitable assessment models.

The following intersessional work is recommended, covering data compilation and evaluation not already included in WGNEW 2012.

4.9.2.1 Review stock structure and unit stock definitions and consider if changes to existing definitions are required.

This is covered by WGNEW 2012

4.9.2.2 Review and recommend life history parameters (e.g. growth parameters, maturity ogives, fecundity, natural mortality), for use in assessments.

- Compile historical length-at-age data sets for each area; estimate Von Bertalanffy growth parameters and investigate if changes in growth are apparent (year class effects).
- Compile historical length – age- maturity data; explore appropriate models for maturity ogives.
- Develop and recommend values for natural mortality based on life history information and comparison with other stocks.
- Provide ranges of uncertainty for life history parameters to allow sensitivity testing.

4.9.2.3 Develop time-series of commercial and recreational fishery catch estimates, including both retained and discarded catch, with associated measures or indicators of bias and precision.

- Complete review of UK sea bass logbook scheme, and recommend exclusion or inclusion in assessment.
- Review the recreational fishery catch estimates for France in the light of the findings of the 2012 meeting of the ICES Working Group on Recreational Fishery Surveys.
- Obtain sea bass commercial discards estimates from all countries / areas / fleets and information on sampling design, coverage and numbers of trips sampled.

4.9.2.4 Estimate the length and age distributions of fishery landings and discards if feasible, with associated measures or indicators of bias and precision.

- Compile and evaluate any length and age composition data for landings / discards for countries other than UK and France.
- Tabulate nos. trips sampled on shore and at sea for length and age, and numbers of fish sampled for length and age, by country, year, area and gear.
- Develop annual estimates or proxies for effective sample size for length/age composition input series.
- Compile raised length and age compositions for landings and discards by area and fleet in the format necessary for input to Stock Synthesis 3 (age compositions to oldest true age)
- Evaluate internal consistency of catch-at-age data series.
- Describe any methods of imputation of missing values and their impact on estimates.

4.9.2.5 Develop recommendations for addressing fishery selectivity (pattern of catchability at length or age) in the assessment model.

- Review existing information on selectivity characteristics of the main types of fishing gears used for sea bass, including inferences on relative selectivity from available length and age composition information.

4.9.2.6 Recommend values for discard mortality rates, where appropriate, and indicate the range of uncertainty in values.

- Review available research and published literature on discard mortality rates that might be appropriate to sea bass.

4.9.2.7 Review all available and relevant fishery dependent and independent data sources on fish abundance, and recommend which series are considered adequate and reliable for use in stock assessments. Provide measures or indicators of bias and precision over the time series.

- Compile existing survey data into the necessary input data files.
- Investigate the use of the Stephens and MacCall (2004) or similar method of sub-setting commercial LPUE data to exclude trips where catch compositions indicate the trips are in areas where sea bass do not occur.
- Investigate use of individual LPUE from fishermen participating in Cefas logbook scheme.
- Document important technological developments in vessels and gears that could result in trends in catchability.
- Describe methods of analysis of fishery LPUE /CPUE data including any statistical modelling carried out.

4.9.2.8 Review progress on existing recommendations for research to develop and improve the input data and parameters for assessments, and develop and prioritise new proposals.

- Compile any previous research recommendations relating to sea bass, review progress, and develop and prioritise new proposals for discussion at the benchmark assessment meeting.

4.9.2.9 Develop a spreadsheet of assessment model input data that reflects the decisions and recommendations of the Data Workshop. Review and approve the contents of the input spreadsheet by end June 2012.

- Develop spreadsheet.

4.9.2.10 No later than end June 2012, prepare the benchmark data Working Document and all input files in the required format.

- Produce data compilation and evaluation report, and data files.

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Table 4.1. Nominal landings (t) of bass by stock area. Source: FishStat except landings for France in 1999--2010 supplied to WGNEW 2012 by Ifremer.

AREA	IVBC VIID	VIIEH	VIIAFG	IVA VIA VIIBCJ XII	VIIIABD	VIIIC	IXA	TOTAL ICES
1975	92	190	7	20	0	0	0	309
1976	67	44	3	0	0	0	0	114
1977	68	45	9	0	0	0	0	122
1978	172	372	11	0	1146	0	576	2277
1979	316	458	7	0	1132	0	550	2463
1980	210	616	30	0	1086	0	460	2402
1981	158	738	44	0	0	0	370	1310
1982	172	565	50	0	0	0	691	1478
1983	261	569	40	2	1363	0	522	2757
1984	400	508	27	1	2886	0	681	4503
1985	219	469	55	1	2477	0	475	3696
1986	387	579	14	0	2607	0	401	3988
1987	264	1049	53	1	2479	0	410	4256
1988	308	569	48	3	2292	14	208	3442
1989	366	478	74	5	2215	326	196	3660
1990	281	505	37	1	1679	396	236	3135
1991	390	494	97	0	1796	303	187	3267
1992	287	551	67	0	1776	254	147	3082
1993	429	518	47	0	1613	247	161	3015
1994	636	423	118	0	1728	308	189	3402
1995	815	594	169	8	1549	334	154	3623
1996	850	1357	123	3	1473	376	206	4388
1997	811	1131	123	0	1428	290	223	4006
1998	688	1042	249	50	1294	258	153	3734
1999	980	1176	32	1	1130	221	171	3711
2000	894	1406	106	4	2362	241	139	5152
2001	962	1402	137	5	2309	166	111	5092
2002	1214	1220	188	14	2398	83	89	5206
2003	1761	1582	116	2	2626	75	86	6248
2004	1934	1634	163	4	2386	221	141	6483
2005	2123	2143	161	2	2800	197	256	7683
2006	1852	2483	212	2	2877	155	576	8157
2007	2207	1754	241	6	2758	116	772	7853
2008	2176	1774	302	5	2746	142	513	7658
2009	2370	1437	211	5	2354	138	501	7016
2010	2352	2205	179	9	2258	200	577	7779

Table 4.2: Sea bass in Divisions IVb,c, and VIId. Official landings by country and ICES estimates of catches (t),

	Belgium	Denmark	France	France[1] (ICES)	Netherlands	UK(Sco)	UK(E,Wand NI)	Total (ICES)
1984	0	0	324	324	0	0	76	400
1985	0	0	144	144	0	0	75	219
1986	0	0	295	295	0	0	92	387
1987	0	0	180	180	0	0	84	264
1988	0	0	199	199	8	0	101	308
1989	0	1	272	272	2	0	91	366
1990	0	<0.5	210	210	0	0	71	281
1991	0	<0.5	222	222	0	0	168	390
1992	0	<0.5	204	204	0	0	83	287
1993	0	1	282	282	0	0	146	429
1994	0	<0.5	279	279	0	0	357	636
1995	0	1	339	339	0	<0.5	475	815
1996	0	1	527	527	4	<0.5	318	850
1997	0	1	487	487	1	<0.5	322	811
1998	0	2	372	372	32	<0.5	282	688
1999	0	1	0	611	32	3	333	980
2000	0	5	701	612	60	<0.5	217	894
2001	0	2	701	681	74	0	205	962
2002	0	1	858	868	94	6	245	1214
2003	133	1	1206	1197	158	3	269	1761
2004	119	1	1159	1318	188	0	308	1934
2005	149	1	1126	1377	319	1	276	2123
2006	150	2	1086	1145	299	6	250	1852
2007	128	1	1340	1429	373	24	252	2207
2008	118	<0.5	1020	1290	375	41	352	2176
2009	125	<0.5	1623	1483	389	20	353	2370
2010	175	4	1452	1363	391	26	393	2352

Source: ICES Bulletin Statistique.

1Landings for 1999 – 2010 supplied to WGNEW by Ifremer.

Table 4.3. Sea bass in Divisions VIIe,h. Official landings by country and ICES estimates of catches (t)

	Belgium	Denmark	France[1]	Channel Is.-	Netherlands	Spain	UK(Sco)	UK(E,Wand NI)	Total (ICES)
1984	0	0	444	25	0	0	0	39	508
1985	0	0	432	18	0	0	0	19	469
1986	0	0	543	15	0	0	0	21	579
1987	0	0	1019	14	0	0	0	16	1049
1988	0	18	509	12	0	0	0	30	569
1989	0	1	390	48	0	0	0	39	478
1990	0	0	389	25	0	0	0	91	505
1991	0	0	434	16	0	0	0	44	494
1992	0	0	475	36	0	0	0	40	551
1993	0	0	422	45	0	0	0	51	518
1994	0	0	306	49	0	0	0	68	423
1995	0	0	424	69	0	0	0	101	594
1996	0	0	1135	56	4	0	0	162	1357
1997	0	0	907	74	0	0	0	150	1131
1998	0	0	784	79	16	0	0	163	1042
1999	0	0	752	108	0	0	4	312	1176
2000	0	0	1137	130	0	0	0	139	1406
2001	0	0	1149	80	3	0	0	170	1402
2002	0	0	902	73	2	0	0	243	1220
2003	2	0	1258	84	5	0	0	233	1582
2004	4	0	1237	159	3	0	0	231	1634
2005	3	0	1750	220	8	0	0	162	2143
2006	6	0	2075	193	9	0	1	199	2483
2007	6	0	1314	160	3	0	28	243	1754
2008	7	0	1402	143	5	<0.5	<0.5	217	1774
2009	2	0	1140	103	6	0	3	183	1437
2010	2	0	1825	144	8	0	35	191	2205

Source: ICES Bulletin Statistique.

1Landings for 1999 – 2010 supplied to WGNEW by Ifremer.

Table 4.4. Sea bass in Divisions VIIa,fand g. Official landings by country and ICES estimates of catches (t).

	BELGIUM	FRANCE[1]	IRELAND	UK(SCO)	UK(E,WAND NI)	TOTAL	TOTAL(ICES)
1984	0	0	0	0	27	27	27
1985	0	44	0	0	11	55	55
1986	0	3	0	0	11	14	14
1987	0	27	3	0	23	53	53
1988	0	6	0	0	42	48	48
1989	0	13	0	0	61	74	74
1990	0	10	0	0	27	37	37
1991	0	70	0	0	27	97	97
1992	0	42	0	0	25	67	67
1993	0	14	0	0	33	47	47
1994	0	8	0	0	110	118	118
1995	0	38	0	<0.5	131	169	169
1996	0	41	0	<0.5	82	123	123
1997	0	35	0	<0.5	88	123	123
1998	0	207	0	<0.5	42	249	249
1999	0	0	0	<0.5	32	32	32
2000	0	56	0	<0.5	50	228	106
2001	0	54	0	0	83	301	137
2002	0	55	0	0	133	261	188
2003	19	16	<0.5	0	81	162	116
2004	36	49	0	3	75	217	163
2005	54	34	0	1	72	260	161
2006	55	39	<0.5	0	118	257	212
2007	44	28	0	1	168	284	241
2008	63	58	0	1	180	334	302
2009	46	26	0	1	138	237	211
2010	38	49	0	1	91	228	179

Source: ICES Bulletin Statistique.

1Landings for 1999 – 2010 supplied to WGNEW by Ifremer.

Table 4.5 Seabass in Divisions IVa, VIa, and VIIb,c,jand k, and Subarea XII. Official landings by country (t).

	BELGIUM	DENMARK	FRANCE	IRELAND	NETHERLANDS	NORWAY	SPAIN	UK(SCO)	UK(E,W and NI)	TOTAL
1984	0	0	1	0	0	0	0	0	0	1
1985	0	0	1	0	0	0	0	0	<0.5	1
1986	0	0	0	0	0	0	0	0	<0.5	0
1987	0	0	0	1	0	0	0	0	0	1
1988	0	0	0	0	3	0	0	0	0	3
1989	0	0	4	1	0	0	0	0	0	5
1990	0	0	0	1	0	0	0	0	0	1
1991	0	0	0	0	0	0	0	0	<0.5	0
1992	0	0	0	0	0	0	0	0	<0.5	0
1993	0	0	0	0	0	0	0	0	<0.5	0
1994	0	0	0	0	0	0	0	0	<0.5	0
1995	0	0	0	0	0	0	0	<0.5	8	8
1996	0	0	0	0	0	0	0	<0.5	3	3
1997	0	0	0	0	0	0	0	0	<0.5	0
1998	0	<0.5	0	0	0	0	40	<0.5	10	50
1999	0	0	0	0	0	0	0	<0.5	1	1
2000	0	0	1	0	0	0	3	<0.5	<0.5	4
2001	0	0	2	0	0	0	3	0	0	5
2002	0	0	2	0	0	0	<0.5	0	12	14
2003	0	0	1	0	1	<0.5	0	0	<0.5	2
2004	<0.5	0	3	0	0	<0.5	1	0	<0.5	4
2005	0	0	2	0	0	0	0	0	0	2
2006	0	0	2	0	0	<0.5	0	<0.5	<0.5	2
2007	0	<0.5	6	0	0	<0.5	0	<0.5	<0.5	6
2008	0	0	5	0	0	<0.5	<0.5	0	<0.5	5
2009	0	0	4	1	0	<0.5	0	0	0	5
2010	0	0	9	0	0	0	0	0	0	9

Source: ICES Bulletin Statistique

Table 4.6. Seabass in Division VIIIa,band d. Official landings by country and ICES estimates (t).

	Belgium	France[1]	Netherlands	Spain	UK(Sco)	UK(E,Wand NI)	Total (ICES)
1984	0	2886	0	0	0	0	2886
1985	0	2477	0	0	0	0	2477
1986	0	2607	0	0	0	0	2607
1987	0	2474	0	0	0	5	2479
1988	0	2277	0	0	0	15	2292
1989	0	2215	0	0	0	0	2215
1990	0	1679	0	0	0	0	1679
1991	0	1779	0	17	0	0	1796
1992	0	1762	0	14	0	0	1776
1993	0	1599	0	14	0	0	1613
1994	0	1711	0	17	0	0	1728
1995	0	1549	0	0	0	0	1549
1996	0	1459	0	0	0	14	1473
1997	0	1416	0	0	0	12	1428
1998	0	1263	0	27	0	4	1294
1999	0	1117	0	11	0	2	1130
2000	0	2295	0	67	0	<0.5	2362
2001	0	2238	3	68	0	0	2309
2002	0	2216	0	182	0	0	2398
2003	<0.5	2497	0	127	0	2	2626
2004	<0.5	2284	0	96	0	6	2386
2005	0	2722	0	74	0	4	2800
2006	0	2707	0	168	0	2	2877
2007	1	2677	0	79	0	1	2758
2008	0	2600	0	146	<0.5	<0.5	2746
2009	1	2152	0	201	0	0	2354
2010	0	2089	0	167	2	0	2258

Source: ICES Bulletin Statistique.

[1]Landings for 1999 – 2010 supplied to WGNEW by Ifremer.

Table 4.7. Sea bass in Division VIIIc. Official landings by country (t).

	FRANCE	PORTUGAL[1]	SPAIN	TOTAL
1984	0	0	0	0
1985	0	0	0	0
1986	0	0	0	0
1987	0	<0.5	0	0
1988	14	<0.5	0	14
1989	0	1	325	326
1990	1	<0.5	395	396
1991	2	1	300	303
1992	0	<0.5	254	254
1993	0	<0.5	247	247
1994	0	2	306	308
1995	0	<0.5	334	334
1996	0	<0.5	376	376
1997	0	<0.5	290	290
1998	0	<0.5	258	258
1999	0	<0.5	221	221
2000	2	<0.5	239	241
2001	<0.5	<0.5	166	166
2002	8	<0.5	75	83
2003	1	1	73	75
2004	39	1	181	221
2005	57	1	139	197
2006	2	2	151	155
2007	1	1	114	116
2008	0	1	141	142
2009	6	6	126	138
2010	2	2	196	200

Source: ICES Bulletin Statistique.

[1]Contains mixed landings of two seabass species particularly before 2006

Table 4.8. Seabass in Division IXa. Official landings by country (t).

	DENMARK	FRANCE	PORTUGAL[1]	SPAIN[1]	TOTAL
1984	0	0	431	250	681
1985	0	0	311	164	475
1986	0	0	219	182	401
1987	0	0	216	194	410
1988	0	0	115	93	208
1989	0	0	104	92	196
1990	0	0	90	146	236
1991	0	0	76	111	187
1992	0	0	53	94	147
1993	0	0	57	104	161
1994	0	0	55	134	189
1995	0	0	42	112	154
1996	0	0	48	158	206
1997	0	0	39	184	223
1998	0	0	38	115	153
1999	0	0	37	134	171
2000	0	0	49	90	139
2001	0	0	42	69	111
2002	0	0	43	46	89
2003	<0.5	0	46	40	86
2004	0	0	66	75	141
2005	0	0	176	80	256
2006	0	0	459	117	576
2007	0	0	544	228	772
2008	0	0	402	111	513
2009	0	2	413	86	501
2010	0	0	487	90	577

Source: ICES Bulletin Statistique.

[1]Contains mixed landings of two sea bass species Particularly before 2006

Table 4.9. Sea bass in the Northeast Atlantic. Percentage of bass catch discarded (by number and by weight) on UK (England and Wales) observed trips for all years combined (2002 - 2008), by gear, mesh and ICES Division.

Gear	Mesh	ICES Div.	% Discarded by number	% Discarded by weight	Number of observed trips
Beam trawl	80–99	VIId	30	13	9
		VIIe	8	8	46
		VIIf	0	0	2
		VIIg	0	0	4
Otter trawl	80–89	IVb,c	34	15	15
		VIId	63	49	9
		VIIe	9	5	127
		VIIf	9	4	35
		VIIg	4	2	8
	90–99	VIIe	3	1	24
		VIIf	20	14	3
	100–119	IVc	10	2	1
		VIId	2	1	1
Gill net	90–99	IVc	3	2	5
	100–119	IVc	0	0	4
		VIIe	2	2	1
	120–149	VIIe,f,g	3	2	9

Table 4.10. Sea bass in the Northeast Atlantic. Retained and discarded weight of seabass taken by French vessels using different gear types in 2010.

2010	ICES area	number of samples	Weight of discards (t) estimated	total weight landings (t)	% discarded
bottom trawl	IVbc	8	2	81	2
bottom trawl	VIId	29	140	507	28
bottom trawl	VIIeh	8	1	209	0
bottom trawl	VIIIab	42	<1	414	0
long line	VIIIab	2	<1	543	0
net	IVbc	6	<1	33	0
net	VIId	13	<1	68	0
net	VIIeh	6	<1	58	0
net	VIIIab	22	<1	419	0
pelagic trawl	VIId	14	11	505	2
pelagic trawl	VIIeh	6	1	1319	0
pelagic trawl	VIIIab	10	<1	365	0

Table 4.11. Sea bass in the Northeast Atlantic. Retained and discarded weight of seabass taken by French vessels using different gear types in 2009.

2009	ICES area	number of samples	Weight of discards (t) estimated	total weight landings (t)	% discarded
bottom trawl	IVbc	16	34	155	22
bottom trawl	VIId	29	78	683	11
bottom trawl	VIIeh	9	9	189	5
bottom trawl	VIIIab	72	29	391	7
long line	VIIeh	17	1	71	1
long line	VIIIab	34	5	538	1
net	IVbc	3	<1	5	0
net	VIId	26	1	56	2
net	VIIeh	12	<1	33	0
net	VIIIab	159	5	523	1
pelagic trawl	IVbc	1	<1	1	0
pelagic trawl	VIId	15	12	404	3
pelagic trawl	VIIeh	7	4	693	1
pelagic trawl	VIIIab	89	6	401	1

Table 4.12. Sea bass in the Northeast Atlantic. UK(Eand W) sampling of bass landings for length composition in Divisions IVb, c.

	Otter trawls			Pair trawl			Drift and gill nets			Lines			Other gears		
Year	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured
1985	2.2	4	20	0.0	1	42	9.6	6	52	2.5	4	47	0.1	0	0
1986	2.8	2	7	0.0	0	0	16.6	3	13	6.8	3	31	0.2	0	0
1987	7.6	9	11	0.0	0	0	20.0	19	116	1.6	17	100	0.0	0	0
1988	8.8	3	4	0.0	0	0	21.5	14	347	4.1	20	118	0.0	0	0
1989	2.9	6	25	0.0	0	0	19.4	16	395	3.9	14	46	0.0	0	0
1990	2.7	3	13	0.0	0	0	13.3	3	98	6.0	13	27	0.1	0	0
1991	2.7	3	3	0.0	0	0	9.6	3	38	7.9	13	98	1.1	0	0
1992	4.5	2	2	0.0	0	0	12.1	8	140	4.8	34	171	0.0	6	23
1993	6.4	2	2	0.0	0	0	24.9	14	177	1.8	37	130	0.5	0	0
1994	26.7	18	154	0.0	0	0	87.1	26	1207	3.2	27	200	1.8	0	0
1995	29.7	6	11	0.0	0	0	103.2	19	501	2.2	35	124	0.9	0	0
1996	33.1	2	11	0.0	0	0	52.8	7	133	2.9	13	35	0.6	0	0
1997	18.1	6	37	0.0	0	0	47.6	12	44	2.7	72	140	0.0	0	0
1998	17.5	0	0	0.0	0	0	28.8	18	521	2.5	33	147	0.1	0	0
1999	16.2	6	90	0.0	0	0	48.1	18	725	12.9	51	266	0.4	0	0
2000	22.3	3	43	0.0	0	0	25.9	19	569	3.9	11	51	0.5	0	0
2001	15.2	4	25	0.0	0	0	19.6	18	808	9.5	17	285	0.5	0	0
2002	19.9	4	35	0.4	0	0	38.3	144	2847	18.0	33	137	1.0	0	0
2003	24.1	6	48	0.0	0	0	52.1	160	3052	8.2	0	0	0.5	1	22
2004	27.2	2	4	0.0	0	0	50.9	6	123	4.7	5	57	0.8	0	0
2005	23.0	5	146	0.0	0	0	42.9	12	318	3.4	1	12	0.7	0	0
2006	24.6	6	154	0.1	0	0	46.0	35	642	1.6	5	35	0.6	0	0
2007	18.1	7	168	0.0	0	0	39.6	7	438	3.8	6	124	0.6	0	0
2008	25.5	6	21	0.0	0	0	71.1	12	948	10.7	1	1	0.5	0	0
2009	40.5	0	0	0.0	0	0	62.1	8	1105	4.3	0	0	1.3	0	0
2010	43.8	1	3	0.0	0	0	95.9	8	492	9.4	22	291	1.2	0	0

Table 4.13. Sea bass in the Northeast Atlantic. UK(Eand W) sampling of bass landings for length composition in Divisions VIId.

	Otter trawls			Pair trawl			Drift and gill nets			Lines			Other gears		
Year	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured
1985	0.0	0	0	0.0	0	0	13.0	1	68	3.3	3	164	0.0	0	0
1986	5.4	6	57	0.0	0	0	35.9	8	282	19.5	14	216	0.0	0	0
1987	23.1	6	199	0.0	0	0	24.6	5	101	9.1	7	29	0.1	1	7
1988	37.4	7	163	0.0	0	0	15.2	5	160	13.5	6	606	0.0	0	0
1989	36.1	3	14	4.9	0	0	20.9	6	242	2.6	1	8	0.0	1	42
1990	9.8	4	100	0.0	0	0	6.1	3	27	3.1	4	123	0.0	0	0
1991	22.9	9	59	0.0	0	0	74.1	17	129	49.6	18	378	0.0	0	0
1992	22.5	4	54	0.0	0	0	30.4	11	944	9.3	27	1273	0.2	2	9
1993	49.0	17	355	0.0	0	0	19.0	54	881	41.3	34	651	0.4	17	48
1994	72.0	46	2274	0.1	0	0	96.1	103	2711	68.0	54	1082	3.3	16	177
1995	66.3	37	545	0.0	0	0	78.6	76	3227	97.2	18	331	31.6	18	273
1996	47.2	23	396	0.1	0	0	76.8	52	1312	94.3	32	569	10.9	18	177
1997	56.6	37	1907	0.0	0	0	96.6	31	396	88.4	21	766	11.2	7	49
1998	75.6	20	868	0.0	0	0	52.6	19	450	92.6	20	1114	11.6	5	23
1999	91.6	18	333	1.9	4	114	64.0	31	1380	80.6	27	1247	19.2	8	24
2000	54.9	16	267	0.0	0	0	43.6	52	3533	31.4	16	665	27.5	1	2
2001	69.3	25	960	0.0	0	0	48.8	36	1120	27.8	12	435	0.0	0	0
2002	51.3	25	257	0.0	0	0	90.3	52	3016	36.1	23	512	6.2	1	3
2003	73.3	33	771	7.6	1	102	60.4	31	1284	36.6	15	668	0.0	0	0
2004	70.6	9	230	0.0	0	0	106.6	11	939	46.1	15	374	0.2	2	2
2005	30.9	3	251	0.0	0	0	101.7	4	214	37.1	7	192	0.0	0	0
2006	55.0	3	173	0.0	0	0	86.1	5	237	24.4	7	136	0.0	0	0
2007	44.3	4	46	3.9	0	0	93.4	8	188	49.7	6	157	2.4	0	0
2008	70.1	8	570	0.0	0	0	137.4	33	1378	34.8	11	382	4.9	0	0
2009	48.0	6	478	0.9	0	0	141.9	72	1182	42.1	5	125	10.3	1	4
2010	46.3	11	350	0.0	0	0	128.9	39	1228	47.0	0	0	17.5	0	0

Table 4.14. UK(Eand W) sampling of bass landings for length composition in Divisions VIIe,h.

	Otter trawls			Pair trawl			Drift and gill nets			Lines			Other gears		
Year	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured
1985	7.0	9	175	0.6	1	1	3.4	4	35	8.0	6	23	0.5	0	0
1986	9.8	16	2465	2.2	0	0	4.3	2	749	4.4	7	551	1.0	4	119
1987	7.4	50	1064	0.0	1	589	5.7	18	1020	3.0	30	250	0.1	0	0
1988	11.4	17	310	7.7	0	0	6.0	7	1838	4.5	6	266	0.2	0	0
1989	22.8	5	356	4.2	1	832	9.5	3	566	2.6	10	254	0.4	0	0
1990	50.7	7	266	22.8	0	0	16.9	3	243	0.5	1	15	0.1	0	0
1991	16.5	6	289	14.5	0	0	13.1	6	1689	0.3	0	0	0.2	2	41
1992	18.6	7	336	7.9	0	0	7.1	6	343	6.2	29	133	0.1	0	0
1993	21.7	42	834	1.0	0	0	11.2	10	261	16.5	14	334	0.1	1	26
1994	28.5	52	1788	0.0	0	0	19.1	20	703	19.0	35	658	0.3	0	0
1995	43.3	25	916	1.1	1	19	28.9	21	584	26.9	30	619	0.6	0	0
1996	36.9	32	1210	87.2	1	214	19.1	14	618	13.4	25	466	5.6	0	0
1997	45.9	14	400	71.4	0	0	18.9	10	477	9.9	22	474	4.0	0	0
1998	40.3	14	375	84.7	0	0	19.1	19	373	17.9	28	672	0.4	0	0
1999	24.7	13	599	216.2	0	0	18.7	16	952	49.7	39	1161	0.4	0	0
2000	55.9	21	1455	52.1	0	0	14.2	19	2862	12.7	9	528	1.8	0	0
2001	46.4	23	1240	95.5	0	0	18.2	19	1475	6.6	27	783	0.7	0	0
2002	74.9	19	1016	108.6	0	0	40.9	22	1175	1.8	45	1269	8.3	0	0
2003	87.2	9	403	119.2	0	0	15.5	22	1411	10.7	45	1447	0.8	0	0
2004	58.7	8	334	130.8	0	0	38.1	8	568	3.6	12	293	0.2	0	0
2005	63.9	17	1284	78.3	2	299	12.4	5	387	7.4	13	475	0.1	0	0
2006	72.0	5	429	27.8	0	0	41.5	4	272	44.1	44	479	0.2	0	0
2007	82.1	7	507	60.0	4	489	41.8	13	606	67.8	7	232	0.6	0	0
2008	68.2	19	1158	19.7	9	1302	56.3	8	535	61.6	3	94	1.5	0	0
2009	46.2	7	329	10.2	6	625	52.5	12	663	67.9	10	560	1.6	0	0
2010	35.5	23	1118	41.9	3	376	50.9	17	612	90.3	9	408	1.8	1	3

Table 4.15. Sea bass in the Northeast Atlantic. UK(Eand W) sampling of bass landings for length composition in Divisions VIIa,f,g.

	Otter trawls			Pair trawl			Drift and gill nets			Lines			Other gears		
Year	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured	Landings (t)	No. trips sampled	No. fish measured
1985	5.9	4	37	0.0	0	0	4.1	4	26	0.8	6	51	0.1	6	16
1986	3.4	6	91	0.0	0	0	3.9	5	88	2.8	7	96	1.1	0	0
1987	7.4	4	86	0.0	0	0	4.7	2	84	4.4	15	178	6.7	0	0
1988	12.1	6	883	0.0	0	0	21.5	16	736	8.1	21	375	0.4	0	0
1989	29.3	34	377	0.0	0	0	11.7	23	664	19.7	1	2	0.8	0	0
1990	11.6	38	588	0.0	0	0	10.9	2	88	4.8	4	95	0.0	0	0
1991	6.5	17	466	0.0	0	0	16.2	5	217	2.8	22	487	0.0	0	0
1992	5.2	6	68	0.0	0	0	14.8	5	41	3.4	21	500	0.7	0	0
1993	17.8	7	203	0.0	0	0	10.2	16	367	2.8	38	311	1.2	0	0
1994	12.8	20	505	0.3	0	0	26.6	10	643	64.8	39	1843	5.4	1	51
1995	39.3	16	843	0.2	0	0	51.5	35	2012	42.5	24	419	6.5	3	338
1996	26.4	2	240	0.0	0	0	37.6	42	1463	18.0	36	720	0.2	0	0
1997	37.9	13	435	0.0	0	0	31.8	52	1830	18.5	22	692	0.2	1	78
1998	23.8	13	349	0.0	0	0	7.8	30	924	8.2	30	887	2.3	0	0
1999	17.4	16	366	1.4	0	0	5.6	14	565	4.5	32	1119	3.3	1	70
2000	23.0	9	313	0.0	0	0	19.3	28	981	4.8	29	723	2.6	0	0
2001	30.1	17	293	0.0	0	0	34.6	24	597	14.2	58	1432	2.2	1	57
2002	41.3	14	1007	0.0	0	0	63.6	35	989	19.3	45	1113	7.3	0	0
2003	45.2	8	458	0.0	0	0	18.0	17	882	9.2	31	1051	0.5	1	7
2004	45.4	4	350	0.0	0	0	10.4	3	42	18.0	8	262	0.4	2	14
2005	46.2	12	904	0.0	0	0	14.9	13	260	11.0	4	242	0.3	0	0
2006	49.3	6	211	4.9	1	100	24.3	4	154	37.2	15	404	2.6	0	0
2007	57.3	7	242	0.0	0	0	63.9	15	655	45.7	12	575	0.2	0	0
2008	67.0	7	1284	0.0	0	0	57.0	11	597	54.5	18	1050	0.5	1	3
2009	50.4	0	0	0.0	0	0	55.7	8	297	31.5	4	272	1.1	0	0
2010	29.5	0	0	0.0	0	0	23.4	7	234	33.4	11	342	0.7	0	0

Table 4.16. Sea bass in the Northeast Atlantic. Sampling of bass landings in France for length composition in Divisions IVb,c (from 2009, because of non- specific seabass sampling at sea, high level of sampling can appear although fish samples is very low).

No. OF TRIPS SAMPLED FOR LENGTH

Gear	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Handlines	0	0	0	0	0	0	0	0	0	0	0
Longlines	0	0	0	0	0	0	0	0	0	0	0
Nets	0	0	0	0	0	0	0	0	0	3	15
Bottom trawl	0	0	0	0	0	0	0	0	0	19	10
Pelagic trawl	0	0	0	0	0	0	0	0	0	1	1
Purse seine	0	0	0	0	0	0	0	0	0	0	0
Danish seine											
Other gears											

LANDING (TONNES)

Gear	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Handlines	0	0	2	0	1	0	2	8	14	0	5
Longlines	2	4	2	6	4	5	4	0	0	0	5
Nets	10	12	14	10	16	15	18	15	14	5	33
Bottom trawl	39	64	136	121	120	128	74	80	92	155	81
Pelagic trawl	0	1	4	9	1	2	1	0	8	1	1
Purse seine	0	0	0	0	0	0	0	0	0	0	0
Danish seine	0	0	0	0	0	0	0	0	0	0	0
Other gears	0	0	0	0	0	0	0	0	0	0	1

Table 4.17. Sampling of bass landings in France for length composition in Division VIId (from 2009, because of non-specific seabass sampling at sea, high level of sampling can appear although fish samples is very low).

No. OF TRIPS SAMPLED FOR LENGTH

Gear	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Handlines	0	0	0	0	0	0	0	0	0	0	0
Longlines	0	0	0	0	0	0	0	0	0	0	0
Nets	0	0	0	0	0	0	0	0	0	13	20
Bottom trawl	0	0	4	6	10	7	4	3	7	52	37
Pelagic trawl	0	0	0	1	1	7	4	2	3	43	16
Purse seine	0	0	0	0	0	0	0	0	0	0	0
Danish seine	0	0	0	0	0	0	0	0	0	0	0
Other gears	0	0	0	0	0	0	0	0	0	0	0

LANDING (TONNES)

Gear	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Handlines	9	70	70	108	79	89	105	142	82	89	93
Longlines	5	6	7	11	11	13	16	26	11	8	8
Nets	52	63	80	101	98	85	81	89	53	56	68
Bottom trawl	397	375	443	688	710	645	594	807	749	683	507
Pelagic trawl	89	76	104	131	272	391	242	246	254	404	505
Purse seine	0	0	0	0	0	0	0	0	0	0	0
Danish seine	0	0	0	0	0	0	0	0	0	23	27
Other gears	9	11	6	12	6	4	9	15	13	58	28

Table 4.18. Sea bass in the Northeast Atlantic. Sampling of sea bass landings in France for length composition in Division VIIe,h (from 2009, because of none specific seabass sampling at sea, high level of sampling can appear although fish samples is very low).

No. OF TRIPS SAMPLED FOR LENGTH

Gear	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Handlines	39	99	76	72	71	23	63	35	23	11	5
Longlines	14	2	3	6	7	11	10	34	18	22	5
Nets	2	1	0	1	6	4	11	28	25	9	14
Bottom trawl	2	0	0	2	2	7	7	8	11	22	17
Pelagic trawl	2	0	3	3	5	4	12	6	5	11	11
Purse seine	0	0	0	0	0	0	0	0	0	0	2
Danish seine	0	0	0	0	0	0	0	0	0	0	0
Other gears	0	0	0	0	0	0	0	0	0	0	0

LANDING (TONNES)

Gear	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Handlines	192	141	133	169	128	149	189	173	168	83	84
Longlines	97	154	137	144	158	182	239	211	151	71	84
Nets	45	35	33	40	35	48	41	53	61	33	58
Bottom trawl	204	226	280	262	358	433	403	273	246	189	209
Pelagic trawl	588	577	303	632	548	925	1177	596	749	693	1319
Purse seine	1	8	6	3	4	5	21	4	22	20	13
Danish seine	0	0	0	0	0	0	0	0	0	3	11
Other gears	10	8	9	7	7	8	5	4	6	49	48

Table 4.19. Sea bass in the Northeast Atlantic. Sampling of sea bass landings in France for length composition in Division VIIIa,b (from 2009, because of non-specific seabass sampling at sea, high level of sampling can appear although fish samples is very low).

No. OF TRIPS SAMPLED FOR LENGTH

Gear	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Handlines	0	0	31	14	19	16	23	20	14	0	0
Longlines	47	40	57	52	30	30	12	9	14	49	28
Nets	31	47	50	50	32	42	31	18	37	208	220
Bottom trawl	32	28	47	44	57	63	55	58	50	144	182
Pelagic trawl	0	0	2	3	3	3	0	1	1	135	53
Purse seine	0	0	0	0	0	0	0	0	0	1	4
Danish seine	0	0	0	0	0	0	0	0	0	0	0
Other gears	0	0	0	0	0	0	0	0	0	0	0

LANDING (TONNES)

Gear	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Handlines	104	101	103	127	132	88	111	139	105	175	168
Longlines	530	549	540	686	749	721	764	781	684	538	543
Nets	731	569	553	539	524	535	581	688	556	523	419
Bottom trawl	433	332	334	286	408	492	456	524	546	391	414
Pelagic trawl	464	635	612	814	410	803	752	507	658	401	365
Purse seine	10	35	57	21	36	55	16	19	42	5	14
Danish seine	0	0	0	0	0	0	0	0	0	1	37
Other gears	22	17	18	24	26	28	27	19	9	119	128

Table 4.20. Sea bass in the Northeast Atlantic. Estimated age compositions of sea bass landings in France in Division VIIe,h: PELAGIC TRAWLS (nos. fish). Oldest true age shown.

	age structure VIIeh, France, pelagic trawl Dicentrarchus labrax										
age/year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
3		620	79	4473		873	78	138			
4	108040	7988	4636	26634	8483	3126	1173	2669	1161	1401	
5	148225	9118	36523	97630	96952	27211	65020	15828	52379	18818	39208
6	92367	118961	27945	57335	109808	170081	95570	114736	85183	44291	110542
7	63498	115731	85134	123192	92182	97148	366472	33786	320095	47525	255097
8	22817	46506	26156	77230	20735	174180	56697	90070	64429	76455	249813
9	29767	20408	10268	28258	55237	12600	191486	39421	52990	14771	184333
10	23931	12967	3840	10952	36376	65355	6974	35003	29458	62887	45410
11	6123	17769	3596	10833	4993	31896	71267	11391	22727	24746	18823
12	3443	20477	4139	2850	4778	12384	19364	30888	13456	28922	43252
13	1176	11125	9728	5542	1613	12026	9488	24153	8579	696	13680
14	387	3193	9563	5258	2314	9847	1356	10347	967	63392	13543
15	68	2509	1172	392	2891	12729	5447	4531	1150	4284	2521
16	161	755	710	318	697	14390	3535	583	509	3066	2558
17	33	1250	21	47	39	2722	4128	587	725	11782	2402
18	36	772		26	14	1906	85	538	279		1649
19		300			73		37	58	260		
20		639			0		72		56		
21		765			361	71	14		2		1199
22						535	37	41	126		

Table 4.21. Sea bass in the Northeast Atlantic. Estimated age compositions of sea bass landings in France in Division VIIe,h: BOTTOM OTTER TRAWLS (nos. fish). Oldest true age shown.

age structure VIIeh, France, bottom trawl Dicentrarchus labrax											
age/year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
3		443		1955		252					
4	1007	4897	4167	42700	4739	1116	694	9584	7333	1667	
5	29011	7337	34698	49227	108884	25523	14132	35926	25446	40007	1740
6	55080	65625	26374	72167	109609	158181	28520	126756	40514	50846	24235
7	32567	56254	96253	14107	72991	66370	125619	22235	64311	25702	31905
8	17263	21425	32007	37896	15317	122375	28925	17466	23441	41472	27233
9	8574	10331	15036	16485	31098	6843	72497	13945	29433	5572	13150
10	9616	4530	3528	10179	12085	20284	5754	6932	9463	17184	11527
11	8572	4918	3725	3063	931	4815	14527	4133	12528	8895	16426
12	2057	4886	4065	2751	403	1999	8697	6573	3885	1996	16805
13	786	1699	4350	1694		1308	1629	6315	4398	498	9266
14	207	327	1661	1474	116	675	542	1282		4347	3568
15	280	222	212	386		593	2036	861	6	895	
16	128	113	105	24		272	1808	160	218	224	
17	42	56	28	0			1265		69	224	
18	52	7		0					218		
19		0		0							
20		0		21							
21		30									

Table 4.22. Sea bass in the Northeast Atlantic. Estimated age compositions of sea bass landings in France in Division VIIe,h: HAND LINES (nos. fish). Oldest true age shown.

age structure VIIeh, France, hand line Dicentrarchus labrax											
age/year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
3		31	93			18	51	113			
4	79	3034	1881	2141	524	2086	51	2973	325	213	
5	9997	1933	9189	6066	9261	2896	9088	6059	3978	1814	101
6	24418	19924	8999	17048	11671	18723	10252	25720	4136	5210	1234
7	13725	22221	33236	6279	10785	13396	40487	5527	17326	4687	1709
8	7570	10522	13046	25627	4715	23317	6841	11152	12654	13324	1357
9	8826	5967	4716	15541	11789	3441	15982	8922	13898	7166	2914
10	8729	3341	4129	8698	10062	16192	717	9350	6140	8957	2421
11	11801	5761	3744	4745	5154	8241	13098	4236	6656	4472	4579
12	8562	5983	3068	3602	3211	3562	11906	11289	6040	2569	2979
13	3971	3560	4151	4069	3633	2701	2988	11246	7366	3596	3438
14	2218	984	2389	4156	2978	2133	1834	2748	6969	4723	3488
15	2274	1430	1394	1705	1992	2601	1222	1835	1193	3364	319
16	1673	626	59	738	859	1262	2025	621	1489	2723	186
17	868	669	77	133	201	338	1096	554	1763	747	135
18	1422	422	215	119	89	298	254	267	100	689	
19	192	164	135	131	22		196	174		480	
20	121	155	84	121	118				55		
21	217	80	33			33		169			
22		41						97			

Table 4.23. Sea bass in the Northeast Atlantic. Estimated age compositions of sea bass landings in France in Division VIIe,h: LONG LINES (nos. fish). Oldest true age shown.

age structure VIIeh, France, long line Dicentrarchus labrax											
age/year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
3		9873	6419	232		25		102	7437		
4	993	39882	47290	43430	7496	2635		12390	3845	1491	
5	46818	20948	18684	58710	73006	13320	20729	21134	17492	10023	101
6	42025	75085	11021	43413	31235	43484	26933	74288	22609	24268	1234
7	9708	28695	38413	7526	22212	22883	73108	17836	34904	8924	1709
8	4290	9315	13929	14815	3126	26624	9514	17272	10613	16523	1357
9	1877	2354	6420	4548	6969	2994	14160	12556	15027	4165	2914
10	1693	1648	3652	2752	6949	13807	471	8542	4210	6356	2421
11	1538	2158	1191	842	1645	9485	19158	5268	5698	1767	4579
12	923	1201	1242	1696	2651	3082	7030	8519	2866	660	2979
13	218		1594	470	2830	2329	3286	9962	4901	1054	3438
14	307		833	1261	528	2617	1213	928	3154	1643	3488
15	246			683	2490	1604	576	760	1213	960	319
16	337				162	502	1691	214	360	396	186
17	132				138	442	239	251	527	166	135
18	250							59		19	
19	55							70		168	
20	4										
21						103					
22											

Table 4.24. Sea bass in the Northeast Atlantic. Estimated age compositions of sea bass landings in France in Division VIIe,h: FIXED/DRIFT NETS (nos. fish). Oldest true age shown.

age structure VIIeh, France,net, Dicentrarchus labrax											
age/year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
3								757	870		
4		174			137		59	4044	6434	4700	
5		174			2978		4201	6554	12962	20400	5219
6	18	3542			2919		6960	18911	11466	39304	11548
7	88	4686			3498		15062	4795	20053	25235	9055
8	420	3044			2300		2638	4139	5484	29366	7720
9	497	1249			5561		2326	2760	5079	1145	3157
10	815	646			2806		39	2043	1075	10085	1294
11	2649	1781			503		926	946	793	6922	657
12	1522	1170			531		245	1858	552	1779	378
13	1699	745			154		115	1809	833	954	303
14	1276	174			203		29	411		265	5
15	1161	667			667		88	274	306	866	
16	662	365			70		103	100			5
17	428						69	75	448		
18	457						20	100			
19	311							75			
20	218										
21	41										

Table 4.25. Sea bass in the Northeast Atlantic. Estimated length compositions of sea bass landings in France in Division VIId: PELAGIC TRAWL (nos. fish)

length structure VIId, France, pelagic trawl dicentrarchus labrax									
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
35	0	0	539	1672	0	0		15	
36	0	0	0	1672	0	534		8353	
37	0	0	1561	0	215	2135	263	11451	
38	0	0	4440	3530	130	3141	1155	13574	
39	358	364	8870	5015	559	6442	2893	13318	
40	596	1819	17452	6966	429	6193	7975	24005	
41	715	728	11657	10136	1202	12294	7446	19450	
42	953	2547	12207	11059	2132	12101	16200	13476	
43	358	2547	22370	15337	2681	12140	15209	14299	
44	477	4367	24614	19749	4501	8593	13119	17551	
45	948	3395	25620	15698	5233	12774	29272	15778	
46	1033	2788	23959	13808	5815	17404	22228	14695	
47	1033	4118	17441	8244	4534	16074	17678	24109	
48	885	2301	24719	11795	4535	7455	11801	28355	
49	1475	4359	15006	11650	5774	14579	19908	6834	
50	590	4359	13782	7350	7182	13531	38594	19189	
51	1033	5812	12408	13515	3542	6360	20099	10595	
52	1033	2422	12301	6863	4947	6029	10955	11649	
53	738	1937	10858	6963	2482	3171	17700	2268	
54	814	3391	4783	3022	3077	4757	7385	8910	
55	527	1333	3572	1138	3187	2523	14335	6911	
56	970	484	7418	2273	2087	5227	4979	6551	
57	675	2667	4677	1170	1907	2807	13009	3395	
58	304	1943	3894	1043	962	3407	6621	2697	
59	152	1219	2355	888	2041	4410	2175	15473	
60	532	490	4664	1267	544	1500	736	1020	
61	532	245	2492	904	612	1037	5866	1597	
62	228	1958	1665	522	622	2070	1726	420	
63	275	1713	2050	468	1089	865	5919	347	
64	503	979	2757	812	885	1360	1748	6327	
65	143	598	1145	260	457	467	475	1657	
66	294	353	1089	568	269	355	1225	520	
67	456	706	691	304	156	128	690	161	
68	238	1004	842	507	97	10	113	578	
69	190	325	828	368	198	102	561	313	
70	95	434	1115	32	140	105	525	1944	
71	48	108	867	32	244	87		1388	
72	95	108	464	32	46	249		1549	
73	143	108	636	235	92	53		7599	
74	48	0	287	133	16	109		161	
75	143	0	223	0	92	40			
76	0	434	272	197	26	79	55	1990	
77	48	0	171	267	13	36		117	
78	0	108	0	235	13	33			
79	0	0	117	0	26	11			
80	0	0	105	32	0	0			
81	0	0	235	0	0	10		117	
82	0	0	53	0	0	0		6094	
83	0	0	53	0	13	0			
84	0	0	0	0	0	0		322	
85	0	0	0	0	26	0		117	

Table 4.26. Sea bass in the Northeast Atlantic. Estimated length compositions of bass landings in France in Division VIId: BOTTOM OTTER TRAWL (nos. fish).

length structure VIId, France, bottom trawl dicentrarchus labrax									
	2003	2004	2005	2006	2007	2008	2009	2010	2011
21								717	
22									
23									
24									
25									
26									
27									
28									
29	3455	0	0	0	0	0			
30	2688	0	0	0	0	0	473		
31	10366	0	0	15689	0	0			
32	13239	1621		0	0	0		4739	
33	45478	11350	9149	32459	0	579	947	5072	
34	40303	24780	3739	100708	0	6008	473	8153	
35	62396	50220	24623	76691	2017	19632	686	20029	
36	36704	60042	53145	124862	8319	88046	11162	60805	
37	57782	40956	37401	150253	16639	115212	49466	73130	
38	49669	36951	29670	121311	28404	87502	55836	49336	
39	16671	33525	31452	59622	21597	75570	50159	46810	
40	13955	65438	44036	41734	18978	68261	66055	35956	
41	10787	41529	24949	35648	24930	50780	34705	46015	
42	12022	53065	58402	27410	20742	47585	25401	40282	
43	7758	46153	24128	8976	17848	24227	26414	46441	
44	7776	33087	43618	16771	16106	35347	23792	29891	
45	9202	35180	61769	14417	7946	18845	51953	23473	
46	10134	27261	29068	11818	3469	21081	36321	12667	
47	7501	23374	15405	9022	2040	13959	54566	16665	
48	5193	16126	20902	7848	0	8652	31645	12288	
49	9966	10906	15340	7796	1008	12068	28921	6409	
50	6334	9890	10751	5144	0	6245	27897	25979	
51	3160	5131	10051	8429	0	7318	11845	6111	
52	4122	6197	8640	6807	0	3841	14422	4416	
53	5963	1594	14090	2348	0	2648	5487	9631	
54	4956	3271	4254	1174	0	4429	14639	8422	
55	1782	2433	1418	2935	0	2768	3265	2827	
56	6369	1591	2312	5046	0	1695	18084	3175	
57	3973	1102	1418	4109	0	715	10331	86	
58	3728	1308	2438	2348	0	1609	7456	2501	
59	1466	627	92	1174	0	1280	9888	171	
60	3154	682	0	1174	0	4141	9474	3551	
61	2686	2638	3982	587	0	1073	6104		
62	2247	682	3515	0	0	1073	10953	1580	
63	1432	910	709	0	0	1788	686		
64	1042	1536	709	1174	0	207	3116	2520	
65	3419	3146	0	0	0	358	2318		
66	911	1591	709	0	0	358	941	214	
67	0	0	709	0	0	358	2348		
68	521	648	1636	1174		207	1159		
69	391	2446	0	0	0	0	947		
70	911	682	0	0	0	0			
71	0	0	0	0	0	0			
72	1432	682	0	0	0	0		4560	
73	0	0	0	0	0	0	473		
74	0	682	0	0	0	0	473		
75	1432	682	0	0	0	0		917	
76	391	1102	0	0	0	0	473		
77	0	0	0	0	0	0			
78	0	0	0	0	0	0			
79	0	0	0	0	0	0	292		
80	391	0	0	0	0	0			
81									
82							947		
83									
84									
85									

Table 4.27. Sea bass in the Northeast Atlantic. Estimated length compositions of sea bass landings in France in Division IVb,c VARIOUS GEARS (nos. fish). No data prior to 2009.

	Bottom otter trawl		Pelagic trawl	Nets	Long line	Handline
Length	2009	2010	2010	2010	2010	2010
28						No data
29						
30						
31						
32						
33	1001					
34						
35	4280			13		
36	14281	575		1398	8	
37	24651			1124	8	
38	14892	162	8	1243	67	
39	19816		20	2483	100	
40	13149	845	47	4797	59	
41	14746	2760	33	2454	119	
42	6757	1554	99	4322	202	
43	15229	5715	61	4685	303	
44	14866	3822	97	2275	185	
45	9392	575	32	2474	194	
46	6918	3660	39	1133	176	
47	6993	5135	28	2959	318	
48	1672	1935	25	277	139	
49	2189	1610	31	605	147	
50	1407	710	31	674	173	
51	1141	3825	22	224	132	
52	41	1522	20	598	85	
53	874	487	16	37	101	
54	1448	812	16	288	100	
55	105	812	30	196	185	
56	35	1369	7	761	135	
57	35	871	5	104	84	
58	3031	719	9	92	121	
59	1508	789	5	15	163	
60		1132	2		95	
61	35	1086	2		136	
62		162	4		99	
63	35	1346	4		141	
64	35	2004	3	461	138	
65		1103	2		119	
66		1183	7	5	101	
67	35	394	1		155	
68		2405	1		57	
69		893	2	92	27	
70			1		96	
71		394	0		74	
72	35		1	5	34	
73			6		27	
74			1		36	
75			0		10	
76			0			
77			0			
78			0			
79			0		10	
80			0			
81					8	
82						
83			0			
84						
85						
86						
87						
88		394	0			

Table 4.28. Sea bass in the Northeast Atlantic. Estimated length compositions of sea bass landings in France in Division VIIIa,b: PELAGIC TRAWL (nos. fish).

length structure VIIIab, France, pelagic trawl dicentrarchus labrax										
ength/yea	2000	2002	2003	2004	2005	2006	2007	2008	2009	2010
20									6	
21									25	
22										
23									6	
24								121		
25		3938						0		
26		5907						0	24	
27		3938						121	105	
28		5907						492	270	
29		19691						861	179	
30		7876						1704	106	
31		11814						242	293	
32		7876		1270	8725	5234		1833	202	
33		25598		0	0	0		856	197	
34		30590	1419	1371	0	0	7845	960	295	22
35		8930	13428	6970	39264	25687	10157	5158	732	391
36		28900	22598	11433	34902	21900	4101	9428	2092	4198
37	9937	13923	21944	8463	43627	28723	10424	29665	936	5845
38	13467	15117	25436	13422	39375	24892	13050	39671	2855	6793
39	13303	18419	41703	13037	13199	12862	5262	26059	6419	7408
40	16670	6326	29694	28886	30870	30124	13712	29701	7269	12104
41	3367	14620	14551	18483	22493	24931	14270	14611	7289	11885
42	6733	10264	17686	14889	26221	23987	9201	46926	9939	12311
43	10376	11179	9319	13785	25316	29359	30242	27746	7518	15051
44	17273	23726	30793	13115	28386	29913	36333	33469	7621	19701
45	10376	40539	20397	20204	20440	29406	35614	46356	21411	16304
46	7173	30186	34931	8149	7580	17873	25747	32972	12955	17751
47	10816	43559	35672	19466	14887	25127	30092	15052	11674	15159
48	11243	40486	66746	15910	28273	27842	19829	24940	12509	14107
49	0	22580	69462	41889	25477	17057	3683	8031	11923	11125
50	7613	19875	28677	8563	33155	33896	23680	24096	19470	12646
51	3630	16256	46513	9988	21084	21395	19179	13860	13809	10017
52	3905	16256	16506	7763	23575	19737	8258	15732	8797	7770
53	3630	6502	6243	8428	18593	15502	5502	13275	15227	7263
54	3905	6502	16111	4272	7474	10957	7333	12557	8821	10095
55	3806	920	12858	5823	10845	12705	6876	14151	9708	3652
56	0	0	8681	7376	23994	14799	1981	7849	13016	4984
57	3905	2698	5191	4458	18314	11925	1663	14865	11379	5554
58	3905	0	8918	4434	7097	10077	7487	5865	3173	5174
59	11715	1778	672	1793	6931	7372	4379	2386	4294	3078
60	7810	920	672	3758	8478	5096	7540	5800	4600	1490
61	0	0	4518	2793	11393	10782	6527	1031	2668	4958
62	3905	4476	8364	238	1771	3070	3034	16655	11623	1626
63	3905	5396	3940	1506	4860	4904	2881	8687	2712	1846
64	11715	3618	0	856	937	1591	8652	208	2449	3583
65	7810	3618	0	2904	1822	1360	7341	8668	3345	2446
66	0	1778	3940	538	2276	2127	2636	329	1095	1023
67	3905	1778	0	3600	885	1502	2577	329	4729	1775
68	0	3556	0	0	885	581	439	3502	3614	680
69	4235	3556	5577	889	937	582	381	104	1323	479
70	0	0	1345	1427	2656	1676	240	3015	4172	755
71	0	0	0	0	5466	3287	181	0	270	199
72	8469	1840	9809	0	2759	1655	152	104	1730	1414
73	0	1778		0	885	537	0	0	1868	996
74	4235	0		538	4529	2729	152	1454	921	301
75	4235	920		0	0	143	342	0	165	194
76	8469			889	885	537	0	121	223	318
77	0			0	0	0	0	104	90	145
78	0			0	1873	1118	381	0		
79	0			0	1087	537	152	0		22
80	0			889	885	537	0	208		443
81	8469			158		143	189			50
82						0	0			23
83						0	146			
84						110	0		65	178
85						0	0		97	103
86						0	0			
87						110	146			

Table 4.29. Estimated length compositions of bass landings in France in Division VIIIa,b: BOTTOM OTTER TRAWL (nos. fish).

length structure VIIIab, France, bottom trawl dicentrarchus labrax											
length/year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
20											168
21											168
22											168
23											
24					2316						336
25					9058						336
26					16523						1177
27					22034					205	753
28					12047					205	376
29				489	1339				612	308	1257
30			72	1467	0				0	809	753
31			0	489	0				0	263	941
32		359	72	489	450	695		224	0		2152
33	1555	82	365	1646	2416	406	490	0	0	630	3544
34	2853	6009	1632	6812	11105	9542	8650	7379	5481	176	5925
35	16288	12763	12834	20519	21537	27565	30002	20341	20235	2724	12757
36	43685	31205	22986	15675	29578	49860	48764	39865	78684	9865	18876
37	39346	28780	37674	40694	42508	54911	51108	53252	80904	43350	27913
38	55891	37517	29380	54049	43546	39797	56214	45737	77069	41248	19345
39	29613	40616	28455	22667	46606	27628	52632	52125	71205	43261	23333
40	30863	42038	23755	29910	41636	20989	60532	39432	91407	43516	20896
41	31249	34881	24345	29757	30468	23076	39274	44148	62794	28394	26666
42	34480	32892	20811	29307	26774	26015	42862	42004	45757	16219	24440
43	30184	30397	15742	16142	24795	22472	35745	30449	46076	22322	28157
44	20848	10525	11433	14729	22401	30323	37729	36413	19581	23170	24266
45	20762	17267	20270	10176	16561	32427	23882	27955	17877	36254	20977
46	19643	15521	8161	11225	12828	15262	22852	20208	15243	28927	17724
47	15205	11858	5986	8536	8978	29198	16902	16879	8716	26778	18267
48	12805	10022	7545	6133	10939	5191	20425	11820	9015	16168	6710
49	14632	2305	4431	5065	4807	11833	8613	12426	6563	15993	11115
50	11940	3510	5825	3012	5022	7444	7682	7690	5630	8842	18246
51	5436	1456	5356	3194	6038	5266	6330	4963	4007	4125	4458
52	7501	3215	5400	2471	6507	3591	3078	3922	3432	4997	9260
53	2531	3076	4402	2976	5111	8905	3318	3254	3057	3100	7967
54	2531	882	3939	2493	2762	4677	3611	4295	4056	9744	9797
55	1093	2440	2563	2936	2428	3277	1778	2922	1687	1577	5716
56	3229	2313	2225	1799	2344	6488	2523	3023	1863	11049	4676
57	1664	865	4524	2680	5800	1928	2861	3568	3263	2159	3979
58	1516	3333	3103	1887	2468	3665	1127	3285	2139	4374	3527
59	3876	328	3471	1306	1087	2469	2110	1482	3010	3403	2817
60	3185	3550	2978	3328	3604	2282	1722	17090	1816	879	2385
61	1988	185	1415	1150	1788	2141	1488	2221	1510	1104	753
62	2043	369	385	1372	1724	2205	2932	2171	1351	1431	3231
63	379	0	1454	682	2367	3260	2391	2274	523	284	1011
64	1812	3756	743	432	1859	2031	1956	16240	2281	1102	3439
65	491	1656	2733	654	1198	2334	2452	3020	834	795	2606
66	2746	369	1627	117	1908	3336	1634	707	773	588	706
67	331	554	438	342	1879	1535	1913	1984	1019	1938	1377
68	703	82	652	225	838	2024	2459	3047	621	40	1347
69	1549	349	1355	117	1273	1350	1109	2845	1133	176	3358
70	331	369	216	234	240	945	325	889	1029	86	335
71	578	1656	1658	342	0	2197	742	1093	733	496	574
72	331	0	1214	223	305	2429	1360	771	1137	270	4429
73	181	0	837	457	1087	0	403	217	213	181	455
74	185	0	329	1269	240	551	325	492	2283		448
75	595	1574	710	225	305	1067	215	1577	0	272	377
76	219		0	117		270	215	1185	0	181	376
77	0		214	225		945	448	0	1704	91	188
78	219		385	0		0	448	435	1469		565
79	0		0	0		257	523	0	0	209	
80	219		154	351		0	558	442	0	91	188
81	219		0	0		1266	0	0	302		
82	219		0	0		0	0	217			
83	0		0	0		0	0	0			
84	219		0	80		0	0	243			
85	0		72			0	0				
86	0					0	0				
87	219					984	0				
88							110				231

Table 4.30. Sea bass in the Northeast Atlantic. Estimated length compositions of bass landings in France in Division VIIIa,b: NETS (nos. fish)

length structure VIIIab, France, net dicentrarchus labrax											
ength/yea	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
20			3701								
21			0								
22			0								
23			0							59	
24	2234		0		2115					211	
25	372		0		2115						86
26	745		0		1410		890				
27	745		0		1410		3561			164	
28	372		2623		705		6232	3685		35	
29	745		3950		0		6232	0			
30	1328		2765		0		4451	0			86
31	0		1185		0		6232	0		164	36
32	0		0		0		0	0		152	3478
33	372	303	920	732	0		1068	1672		328	7909
34	0	532	3680	2238	0	95	0	7029	142	569	4962
35	7070	1376	7815	7567	0	1065	1313	45209	755	1477	3295
36	5169	4017	5232	8346	2044	3089	5258	37229	1009	6723	5918
37	11594	3488	13940	9338	5667	3346	4650	30079	2799	8937	9769
38	1849	8579	11868	9410	2643	3792	7710	20507	9295	16871	13920
39	25531	7474	14547	15541	16311	10367	8316	22842	24063	27551	8702
40	24147	14569	41409	14274	27432	9470	13087	38090	24940	28389	13445
41	41817	32082	29208	17870	27847	11906	27569	65245	59387	37385	26110
42	68757	32508	18729	33197	49376	18006	31702	66664	50278	37469	33961
43	67135	45018	30768	30123	45628	27008	32665	42713	49263	43313	47773
44	56978	39461	31686	41215	50467	41566	35071	33709	93497	40561	30194
45	92286	51614	19004	29172	25114	32418	36353	21024	33360	38296	25459
46	52539	53088	36814	36887	37789	35617	35123	76214	20115	24537	27823
47	53165	20838	36676	26092	19690	38339	22629	54961	19991	27792	21063
48	20845	32704	58090	21813	33646	39695	36956	21925	15706	19953	20891
49	32135	27768	18107	16607	28084	28050	20681	65526	20375	15771	14548
50	18563	18584	19584	22044	15067	25130	18498	33357	15237	18484	9100
51	16471	9840	6725	17364	10465	20542	15768	8486	17273	9893	9438
52	10539	11123	11254	14544	10247	6032	23289	22636	9956	11255	15667
53	17139	10888	10261	13766	8919	10243	5848	18340	8809	10404	11156
54	8241	3743	3019	15877	7545	8817	5428	14999	11870	6387	6265
55	6919	4823	445	7202	7624	5620	4054	15177	7692	4430	4769
56	2387	10807	5217	8365	6977	9230	8957	3218	5512	6208	3893
57	6285	5960	637	3548	4929	4861	1581	13157	9622	3284	3465
58	2690	4780	8938	2606	5337	2536	13868	15077	4544	4187	2030
59	2364	3332	2811	3211	1543	4771	12628	578	3748	3707	3560
60	2979	1517	445	5259	3289	2214	8381	3891	6028	3093	1099
61	3982	1983	698	5356	2200	3326	9286	3762	4814	3681	1827
62	4022	3211	96	4470	5139	1990	13022	2464	3078	2960	1220
63	3758	1222	341	5455	3305	1260	2145	6283	949	3051	1851
64	3762	750	253	1700	418	277	12438	7864	2503	1546	1025
65	1135	4743	4203	348	1390	3032	4597	1124	2420	2178	1159
66	2288	691	96	1329	1450	1556	580	979	940	741	1532
67	1168	869	2123	1931	1430	2351	832	3590	342	1650	949
68	0	390	96	2768	333	392	1228	3038	671	731	297
69	650	1269	1870	892	998	3227	1395	835	624	384	152
70	1248	0	3284	609	1390	1860	803	3183	1271	3129	554
71	1015	3268	5503	0	1529	930	1965	145	1558	1318	618
72	598	390	3998	428	0	550	268	0	443	520	560
73	365	536	349	0	0	2068	420	2201	599	513	1151
74	0	2786	8026	739	534	1206	613	690	479	458	543
75	598	1260	1679	478	665	0	1219	676	1639	1437	36
76	598	0	0	0	1430	930	168	690	341	1125	92
77	0	0	0	0	0	95	412	0	283	305	
78	0	89	96	261	139	0	320	690	43	70	57
79	650	89		181	333	368	0		0		56
80	1299	0		348	472	0	0		0	229	71
81		0		0		0	0		0	35	
82		536		181		0	0		0		
83		0				0	0		0		86
84		0				0	84		43		
85		0				75					
86		0									
87		0								164	
88		301									366
89											
90										164	

Table 4.31. Sea bass in the Northeast Atlantic. Estimated length compositions of sea bass landings in France in Division VIIIa,b: HAND LINES (nos. fish)

length structure VIIIab, France, hand line dicentrarchus labrax											
ength/yea	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
33	NA	NA		677			142			NA	NA
34	NA	NA	223	1454		205	369	931	263	NA	NA
35	NA	NA	1039	5354	1004	1065	2933	1523	200	NA	NA
36	NA	NA	2511	6470	2790	692	3057	5268	910	NA	NA
37	NA	NA	3972	10521	4164	757	2186	3800	1831	NA	NA
38	NA	NA	6309	10207	4164	631	3421	5119	1592	NA	NA
39	NA	NA	4222	11888	7281	964	4000	6595	2788	NA	NA
40	NA	NA	7107	14519	7286	2324	4582	7116	979	NA	NA
41	NA	NA	4021	9844	7025	1721	7409	4455	2850	NA	NA
42	NA	NA	5335	7624	1109	2603	3884	2698	4323	NA	NA
43	NA	NA	3832	6709	8276	2024	5268	2446	2804	NA	NA
44	NA	NA	3707	6158	5784	4197	2098	4301	3020	NA	NA
45	NA	NA	3407	3223	3578	1187	3295	3134	3292	NA	NA
46	NA	NA	2980	7058	2914	897	3528	2117	3223	NA	NA
47	NA	NA	3287	3849	2562	1756	4013	3187	1996	NA	NA
48	NA	NA	3005	5176	2512	2396	2611	2804	2171	NA	NA
49	NA	NA	3702	4349	1308	1284	3699	3507	9929	NA	NA
50	NA	NA	2421	2696	4280	631	3947	4079	2094	NA	NA
51	NA	NA	3504	3901	3077	1946	1875	2636	5159	NA	NA
52	NA	NA	1868	1780	3783	861	844	3045	2086	NA	NA
53	NA	NA	2033	2495	2776	784	2552	3562	9910	NA	NA
54	NA	NA	1671	1164	2622	784	1571	3135	5089	NA	NA
55	NA	NA	1395	1345	4200	1907	652	4102	5200	NA	NA
56	NA	NA	1644	392	606	2559	1714	2754	1877	NA	NA
57	NA	NA	862	1536	1135	1307	1468	4387	1185	NA	NA
58	NA	NA	725	957	1949	451	2156	2289	783	NA	NA
59	NA	NA	1897	2198	562	1348	401	1197	2192	NA	NA
60	NA	NA	919	916	2488	958	1408	552	9385	NA	NA
61	NA	NA	671	238	1201	120	2031	3082	836	NA	NA
62	NA	NA	694	719	401	1573	2458	1292	6813	NA	NA
63	NA	NA	863	715	482	656	913	1870	9151	NA	NA
64	NA	NA	642	477	2438	386	1621	2465	5122	NA	NA
65	NA	NA	307	242	237	265	865	3817	383	NA	NA
66	NA	NA	529	477	2177	571	17	1686	1295	NA	NA
67	NA	NA	826	238	646	346	702	255	741	NA	NA
68	NA	NA	307	242	0	20	75	1000	1073	NA	NA
69	NA	NA	789	677	0	1244	209	1513	305	NA	NA
70	NA	NA	783	0	1949	797	822	526	455	NA	NA
71	NA	NA	0	0	0	386	351	570	870	NA	NA
72	NA	NA	112	0	1622	0	200	144	236	NA	NA
73	NA	NA	306	0	562	732	200	272	698	NA	NA
74	NA	NA	0	238	237	962	27	963	1337	NA	NA
75	NA	NA	112		164	205	373	251	895	NA	NA
76	NA	NA	307		318	20	0	126	0	NA	NA
77	NA	NA	224			40	157	0	104	NA	NA
78	NA	NA	0			20	0	310	104	NA	NA
79	NA	NA	0			0	0		0	NA	NA
80	NA	NA	0			20	0		0	NA	NA
81	NA	NA	111				0		0	NA	NA
82	NA	NA	0				157		104	NA	NA
83	NA	NA	0						0	NA	NA
84	NA	NA	83						0	NA	NA
85	NA	NA	0						36	NA	NA
86	NA	NA	0							NA	NA
87	NA	NA	0							NA	NA
88	NA	NA	0							NA	NA
89	NA	NA	112							NA	NA

Table 4.32. Sea bass in the Northeast Atlantic. Estimated length compositions of sea bass landings in France in Division VIIIa,b: LONG LINES (nos. fish)

length structure VIIIab, France, long line dicentrarchus labrax											
ength/yea	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
29		701									
30		0		598							
31		409		598							
32		901		598			2069				
33		1737	734	2291	815		6208		1011		
34	2069	2142	1872	2479	1275		4139		0		
35	8691	4429	7995	2107	4481	2778	63240		2023	176	
36	8608	6362	12370	8012	9669	12745	50783		10136	5274	
37	13878	14684	12812	8617	16900	5912	42625		16893	7917	4436
38	13033	12538	21554	9493	19090	32915	14706	3561	20939	11800	5897
39	23028	13075	20387	14182	27027	9980	20189	7735	33787	14663	14387
40	23219	19690	24255	19138	31848	9962	96953	2531	27880	18399	13999
41	21038	24950	19465	17999	32422	37186	47051	750	43052	27134	5904
42	15506	22385	20571	26777	33688	23169	40515	7124	42567	23768	18633
43	26017	18054	23199	25863	36487	39521	16745	5247	42750	27649	13561
44	20951	26588	16773	29056	38857	32576	40545	16049	34455	21206	31613
45	20949	27507	14273	27759	33318	18319	43320	4498	41718	25657	17839
46	20470	14989	14224	30451	20580	20618	36667	10218	12826	15606	20124
47	16114	26410	14775	20859	22242	11940	15095	27692	10115	19950	18082
48	14879	16486	15769	24506	21089	15763	11998	10126	19562	22099	21755
49	14436	17262	11998	20138	20151	23063	41961	19785	12321	18293	9365
50	14754	11380	14819	18238	17006	12518	8486	21567	9103	15910	22319
51	16457	17453	10670	14003	12571	14012	15540	14439	11148	14021	18663
52	10775	13198	7447	15182	15115	11585	18488	12657	10459	13081	14508
53	6275	7366	8082	20572	9647	9384	13115	17254	5057	14257	23447
54	9829	7583	12906	11814	10157	14835	7234	2998	13494	13122	18856
55	6372	4835	11394	9765	8985	11940	4421	4031	9286	8602	17668
56	8309	6921	10807	11376	11963	6490	4556	7594	5402	9426	13069
57	5038	6986	8231	12324	8206	6023	4522	2531	1011	8830	9919
58	4630	6583	7028	8780	10458	5912	9720	6845	1011	7403	6075
59	5248	6632	5768	7576	6565	16101	0	15435	5240	9184	3391
60	5239	3294	2694	5936	7378	1045	2278	8061	5240	5665	3388
61	4839	2813	2950	7373	11043	10896	7008	3281	1011	5946	3342
62	5363	3308	4550	7846	4485	4867	2886	3748	4046	4397	5621
63	5083	3923	4185	5674	5776	4401	5164	1782	4229	5650	2571
64	2654	2374	4059	4610	6661	8340	0	2531	0	7800	5122
65	4362	1650	5118	2733	1749	9273	2069	5063	5240	2491	11706
66	1442	657	2780	3124	5632	3245	0	2531	5240	5938	4642
67	1850	2327	3583	3877	2551	3245	0	1499	0	1364	734
68	3810	2228	2103	2782	3208	1156	0	0	0	5758	2929
69	1717	1815	1798	2266	1275	1156	0	13936	0	2274	1929
70	2124	1393	3567	1379	4156	3712	0	12436	1011	1531	7508
71	1056	2678	3935	1768	1834	2778	0	0	1011	1362	8899
72	1312	3260	697	2550	946	578	0	2531	0	1487	8662
73	131	3514	1316	1172	2078	4517	2278	1499	0	1278	1448
74	2172	82	1370	1379	2882	2200	0	0	1011	553	4128
75	524	1857	505	1354	802		2886	0	0	1536	275
76	662	709	0	366	473		0	0	0		801
77	0	0	345	366	802		2278	750	0	370	491
78	0	165	345	414	0				1011	2320	275
79	391			0	815				0	183	1253
80	391			0					1011	276	5491
81	503			0						1061	620
82	391			366						477	275
83	795			0							
84	0			0							275
85	391			366							
86										276	
87											
88											898

Table 4.33. Sea bass in the Northeast Atlantic. Estimated numbers at age for bass landed into the UK from Division IVb,c: TRAWLS (nos. fish)

	3	4	5	6	7	8	9	10	11	12+
1985	61	19	47	134	11	22	422	166	78	132
1986	41	742	0	0	73	0	0	997	0	286
1987	0	738	2560	235	40	0	28	0	302	1020
1988	0	0	0	213	240	0	107	0	0	1041
1989	0	0	20	324	365	82	7	31	11	676
1990	0	0	3	5	150	126	37	62	26	421
1991	218	1747	0	0	0	981	273	0	0	654
1992	531	1142	1115	186	0	0	0	0	0	0
1993	212	14052	0	0	0	0	0	0	0	0
1994	115	4823	27763	1459	1190	74	0	93	575	562
1995	1051	3932	4648	13630	3001	922	0	0	0	0
1996	909	4278	758	2628	11680	1915	1006	0	0	0
1997	519	739	2243	1634	1824	5486	748	567	0	536
1998	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1999	0	1979	6159	2956	828	904	528	2038	215	168
2000	2728	291	4271	5909	931	724	1109	546	1010	0
2001	3606	8944	315	990	1272	218	715	281	21	478
2002	1064	3877	10646	419	1550	1728	507	276	128	526
2003	3939	19137	4340	2812	187	464	767	60	118	474
2004	125	2081	10962	5834	4535	0	0	0	691	0
2005	1669	11627	10743	9306	781	43	0	18	58	0
2006	4370	11069	7288	2285	1680	669	91	0	0	1630
2007	356	1271	11835	4909	1061	502	448	125	0	119
2008	145	2372	9563	7092	3169	372	1211	572	191	0
2009	61	2558	12767	21177	6004	1256	166	100	0	0
2010	0	566	13317	19346	15618	3753	0	0	0	0

Table 4.34. Sea bass in the Northeast Atlantic. Estimated numbers at age for bass landed into the UK from Division IVb,c: GILL / DRIFT NETS (nos. fish)

	3	4	5	6	7	8	9	10	11	12+
1985	300	202	153	277	57	180	1813	552	706	1424
1986	13	181	1406	0	0	0	0	1670	800	3364
1987	0	1679	5824	2212	534	588	174	90	2514	1683
1988	0	636	6072	12355	2349	423	489	74	31	977
1989	666	152	472	7779	6476	1296	23	163	143	1415
1990	298	72	263	689	3581	2469	357	299	280	731
1991	12476	4870	326	0	0	439	192	0	0	982
1992	4523	10135	5617	229	0	605	286	443	56	200
1993	163	16958	5030	2811	506	64	24	402	363	1233
1994	383	19675	100954	5301	2238	24	0	46	315	343
1995	3883	19269	32920	57259	2834	1165	0	92	92	917
1996	10223	26970	4300	8033	11141	27	27	0	0	1808
1997	3205	2154	3656	3862	4969	15073	702	866	0	1654
1998	578	9555	2922	4053	2772	2197	3891	173	49	164
1999	0	7530	21487	11714	2110	2481	1195	3598	157	314
2000	2863	429	8226	9025	1023	809	757	346	1209	218
2001	4993	13685	362	1243	1811	275	717	226	171	238
2002	5258	13749	24085	805	1626	1588	233	284	78	262
2003	6004	38686	13797	8451	294	556	545	202	28	241
2004	1523	12939	31116	5813	3104	16	195	125	119	441
2005	2633	16183	14813	13842	4020	909	0	235	312	129
2006	5726	17561	15153	3929	3930	665	1713	16	65	1076
2007	648	3282	28985	13597	2414	1503	668	66	0	255
2008	821	8873	56065	22637	6194	995	839	581	58	0
2009	94	3928	19602	32514	9218	1928	256	153	0	0
2010	0	10019	29343	29683	13619	4890	3574	1256	1873	1664

Table 4.35. Sea bass in the Northeast Atlantic. Estimated numbers at age for sea bass landed into the UK from Division IVb,c: LINES (nos. fish)

	3	4	5	6	7	8	9	10	11	12+
1985	700	445	249	101	223	12	406	209	134	234
1986	196	3483	825	255	726	0	0	1978	246	0
1987	0	36	110	37	18	21	6	10	129	296
1988	0	5	40	279	136	14	87	10	11	976
1989	0	0	0	88	76	107	21	48	61	1196
1990	150	13	6	79	252	316	145	122	94	1082
1991	30	54	48	40	40	644	436	137	0	2731
1992	82	191	322	86	0	78	106	267	160	693
1993	28	318	103	87	22	10	6	70	74	268
1994	2	78	843	182	115	7	0	25	66	566
1995	8	70	108	297	71	92	0	20	20	336
1996	28	59	85	270	1109	26	9	0	33	297
1997	32	26	71	93	113	487	57	76	17	285
1998	33	629	173	181	111	130	367	52	6	97
1999	0	263	1518	750	567	811	603	2270	246	749
2000	4	4	102	254	65	88	165	144	819	112
2001	575	1551	41	491	810	204	1184	160	222	535
2002	493	1119	1395	187	714	1484	432	984	406	1782
2003	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2004	56	216	714	771	294	19	66	6	79	671
2005	22	104	107	178	43	85	0	67	67	135
2006	1	46	116	70	85	28	37	17	0	255
2007	17	59	1172	949	219	203	155	53	0	138
2008	0	0	0	1325	3533	883	883	0	0	0
2009	7	273	1362	2259	641	134	18	11	0	0
2010	0	21	336	784	870	655	1070	340	660	456

Table 4.36. Sea bass in the Northeast Atlantic. Estimated numbers at age for sea bass landed into the UK from Division VIId: TRAWLS (nos. fish)

	2	3	4	5	6	7	8	9	10	11	12+
1985	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1986	0	107	346	245	101	357	106	173	853	200	641
1987	0	166	13311	17414	4492	270	530	0	179	917	2218
1988	0	166	10555	32067	7671	2321	74	258	346	0	1936
1989	31571	4227	253	2500	8142	2525	943	472	483	144	4660
1990	0	86	147	207	400	3182	1993	595	182	110	788
1991	0	22	4995	211	37	160	1021	1673	786	0	3268
1992	0	3045	15040	7230	230	0	350	1160	178	0	1042
1993	0	128	26660	35848	10173	177	114	229	1159	565	755
1994	0	681	3174	104074	7011	1845	113	15	59	444	1134
1995	0	60	1738	7273	68607	2552	1417	131	68	0	1362
1996	0	160	2703	7322	9832	33535	1495	737	46	59	817
1997	0	95	1867	14380	11902	5322	30344	927	339	55	567
1998	0	190	10361	14699	26963	11289	3941	12082	469	140	139
1999	87	0	39939	64483	12941	9821	2388	905	3868	99	0
2000	0	2062	1147	55484	19123	1659	1046	298	74	157	385
2001	223	1325	42460	8778	41547	6513	995	1532	300	382	1186
2002	0	920	9805	62835	1399	5793	1665	410	413	239	284
2003	0	207	18864	14624	27649	2213	9497	4095	2118	798	1831
2004	0	991	6722	61321	15618	12795	409	1458	953	470	1133
2005	0	3297	35226	11504	2309	994	21	0	0	0	0
2006	0	9795	46538	32078	8515	1306	153	0	0	0	0
2007	0	0	14186	33363	11666	2060	1062	0	0	0	0
2008	0	1385	34169	51369	10347	3680	1877	728	80	0	0
2009	0	535	14815	28034	20782	2812	613	58	72	66	966
2010	0	0	12496	28558	16700	8602	775	39	51	48	0

Table 4.37. Sea bass in the Northeast Atlantic. Estimated numbers at age for bass landed into the UK from Division VIId: GILL / DRIFT NETS (nos. fish)

	2	3	4	5	6	7	8	9	10	11	12+
1985	0	5217	13315	1470	109	39	163	342	0	466	0
1986	0	11401	12160	14107	2561	4473	53	828	2210	121	3042
1987	0	80	4886	19009	2131	478	228	228	98	293	3024
1988	0	0	23	3417	610	771	387	490	370	26	3695
1989	776	265	316	3307	20552	3013	1035	164	35	0	0
1990	0	188	244	273	231	1806	1195	201	230	73	182
1991	0	98	17852	1016	0	1968	8469	7801	3768	211	9893
1992	0	6759	25548	19772	286	44	69	71	47	18	94
1993	0	67	10957	10592	2956	79	17	102	383	262	482
1994	2	91	3244	91351	8857	3467	280	31	264	1126	4610
1995	0	484	7270	19948	88207	1213	550	18	4	66	651
1996	0	94	7162	16793	14011	44994	2297	1144	70	51	858
1997	0	195	1838	14645	12847	4994	50786	2856	876	592	1126
1998	0	221	15078	20693	13217	5352	2089	7317	610	181	256
1999	22	0	18930	41202	10205	6696	1328	529	1957	88	457
2000	0	885	440	42392	14705	1293	888	236	67	488	282
2001	119	693	24311	2737	24775	7317	1243	1194	884	286	948
2002	0	1572	8507	125382	3612	9601	1456	221	118	18	140
2003	0	148	14163	12787	23309	886	1937	580	315	157	293
2004	0	1014	5899	71297	23602	26500	1733	4191	1218	407	1182
2005	0	3808	21767	27456	57048	9627	4276	0	699	0	0
2006	0	5210	42273	41874	16074	7852	1356	1377	128	384	386
2007	0	0	3344	19759	9992	13623	6455	1316	3286	8887	733
2008	0	1386	45971	99042	21883	6294	3797	2714	819	988	1290
2009	0	1306	27408	50180	46195	17362	5502	2374	1590	487	851
2010	0	0	46483	50000	17977	14920	7804	2102	919	2168	1638

Table 4.38. Sea bass in the Northeast Atlantic. Estimated numbers at age for bass landed into the UK from Division VIId: LINES (nos.. fish)

	2	3	4	5	6	7	8	9	10	11	12+
1985	0	710	906	299	474	48	186	719	172	101	311
1986	0	353	2032	1549	360	1011	236	407	2247	526	3810
1987	0	8	778	1858	855	260	223	301	204	561	1473
1988	0	0	1252	10869	1859	1155	249	432	151	132	1928
1989	0	0	0	0	0	90	202	67	135	0	583
1990	0	8	28	48	134	852	578	198	88	67	343
1991	0	116	8793	408	36	574	4113	3989	1767	48	11778
1992	0	1328	5424	3117	78	29	87	366	265	75	329
1993	0	25	4699	6536	6018	349	80	532	2699	2094	5200
1994	0	38	2809	55467	8927	6046	345	34	274	1685	3610
1995	0	104	5531	14745	52409	2268	2520	111	462	243	10871
1996	0	198	9046	12773	8297	37894	3919	4050	100	347	7062
1997	0	349	3014	16365	11637	5213	46585	2119	1159	610	2239
1998	0	193	6797	9848	15664	7021	4696	20431	1915	778	3449
1999	17	0	11558	26152	8525	7711	3146	2111	9009	944	2401
2000	0	343	242	15082	9349	1701	1952	828	331	2174	787
2001	42	180	5392	897	9730	3761	811	1123	685	519	2216
2002	0	194	1333	9649	1670	9981	4119	1033	2329	485	1603
2003	0	65	5524	5205	12852	1205	4823	1775	872	535	1721
2004	0	240	1273	10497	4466	9681	1567	4836	2003	616	3169
2005	0	141	1113	3024	9074	2895	3027	0	3916	1400	1255
2006	0	31	1580	2230	2764	3452	990	2709	678	843	1219
2007	0	0	4048	7769	4979	3879	5929	1746	2650	2767	812
2008	0	102	1815	6257	7293	4265	2030	2165	798	499	1995
2009	0	290	6029	10606	10385	5007	2305	1819	955	623	784
2010	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

Table 4.39. Sea bass in the Northeast Atlantic. Estimated numbers at age for bass landed into the UK from Division VIIe,h: TRAWLS (nos. fish)

	3	4	5	6	7	8	9	10	11	12+
1985	0	178	385	1698	255	483	1610	229	197	609
1986	0	1654	586	275	842	72	677	1955	257	970
1987	0	1050	1634	1226	134	709	54	111	703	603
1988	0	18	4989	4900	1005	446	413	30	186	680
1989	0	0	286	3574	5492	1606	537	1063	258	2219
1990	0	128	280	3335	10928	9213	2257	657	380	3498
1991	155	1609	533	473	1227	3090	3475	1410	153	3235
1992	847	5935	3865	411	635	420	1075	1139	323	1535
1993	0	5374	7346	1761	276	225	292	728	901	1742
1994	74	316	20952	8100	1993	183	68	283	546	782
1995	61	567	2512	33932	5068	1216	232	80	126	2040
1996	0	1354	877	3309	21137	1745	560	77	151	2042
1997	14	496	7570	4344	6559	16023	1949	464	138	1299
1998	45	2816	6159	12908	4093	3175	8062	581	285	706
1999	7	5472	4921	1703	2487	981	1411	3371	347	727
2000	1124	336	27566	17334	3241	3061	1002	1781	2906	882
2001	0	855	740	16305	8408	2803	2039	1170	2195	4636
2002	380	1434	11582	4471	24560	5182	2885	3048	861	7578
2003	194	6623	12256	25172	2319	16937	5424	1203	1357	4274
2004	90	4601	18781	13468	18780	675	3636	1603	91	866
2005	321	1298	4503	14205	11261	11025	1140	5161	820	2928
2006	56	15004	23471	13720	13689	5517	6954	526	1204	302
2007	0	4451	39390	24241	11809	10880	3760	1921	704	864
2008	2225	11674	23181	24117	9227	4203	2729	705	728	868
2009	0	1921	10817	13717	9917	3029	4088	1049	771	1222
2010	125	1020	6659	7679	7116	4578	2405	1068	1107	1025

Table 4.40. Sea bass in the Northeast Atlantic. Estimated numbers at age for sea bass landed into the UK from Division VIIe,h: GILL / DRIFT NETS (nos. fish)

	3	4	5	6	7	8	9	10	11	12+
1985	84	263	132	391	94	144	1106	162	155	175
1986	0	3847	887	230	992	0	566	1149	36	620
1987	0	6130	2894	358	63	215	9	34	261	155
1988	0	51	902	707	220	67	67	5	26	1048
1989	0	189	690	1121	293	40	12	58	114	1322
1990	1067	34	2014	10295	4416	2284	192	55	4	9
1991	880	2659	285	280	947	1607	1931	609	64	356
1992	208	2685	2231	8	132	200	311	694	223	460
1993	0	1718	1693	376	101	111	225	749	1042	1234
1994	62	395	10496	1865	628	145	85	790	1187	2093
1995	47	468	1628	14079	1367	908	312	181	597	4017
1996	0	774	509	2072	9450	896	407	51	90	1225
1997	13	263	3679	1766	2466	4633	727	149	45	1251
1998	11	642	1216	2376	764	1147	5057	712	192	420
1999	0	3887	4663	1254	1563	577	1057	2564	260	330
2000	362	60	12507	6132	604	188	2	2	2	10
2001	41	1076	435	5102	993	537	414	388	1342	2576
2002	1013	2160	15641	1996	9377	2117	1169	1212	200	3157
2003	45	1176	2159	4119	352	2904	1177	371	426	860
2004	101	2695	10421	9031	13148	475	2524	724	40	485
2005	103	886	3193	4339	2265	1580	211	455	188	71
2006	0	16389	17281	6625	5283	1682	1789	353	1156	378
2007	0	2362	16221	9360	4734	5196	1676	1342	578	927
2008	4264	14007	19389	18011	5280	2268	1693	769	911	994
2009	102	8722	27469	28221	9023	779	378	191	319	279
2010	190	2115	13061	11591	6784	3432	1710	2528	441	4651

Table 4.41. Sea bass in the Northeast Atlantic. Estimated numbers at age for sea bass landed into the UK from Division VIIe,h: LINES (nos. fish)

	3	4	5	6	7	8	9	10	11	12+
1985	7591	7968	1985	3378	354	145	392	0	0	78
1986	4	1883	308	124	271	14	155	488	60	344
1987	0	253	467	229	48	181	15	54	317	480
1988	0	0	622	1033	586	177	319	19	141	488
1989	0	594	2756	1538	299	23	2	4	0	9
1990	4	0	8	55	22	6	0	0	0	0
1991	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1992	49	611	885	109	142	128	189	492	161	771
1993	76	4285	4450	1173	292	229	327	946	959	1318
1994	38	191	8164	2592	866	193	82	724	1049	1989
1995	106	741	1575	15625	2742	1128	204	99	226	2145
1996	0	793	647	2237	5998	602	290	45	45	697
1997	169	200	1252	522	891	3047	571	168	49	550
1998	6	982	876	1373	638	778	3634	782	205	1935
1999	274	16433	13482	3969	4741	1108	1976	4574	448	2172
2000	66	36	3924	3387	767	864	327	475	1021	233
2001	0	194	113	1784	678	348	227	188	516	1075
2002	15	47	439	138	1182	330	171	162	39	345
2003	2	350	901	3366	283	2461	885	201	231	735
2004	6	191	700	543	943	98	663	203	42	267
2005	23	105	343	839	660	800	100	1203	226	649
2006	1	14310	30011	6887	5934	694	1389	162	839	839
2007	0	964	7563	8295	5078	6558	3971	4574	1467	7333
2008	95	1675	5065	11186	5458	5047	5783	2577	3392	3747
2009	0	1555	6350	11660	10624	5158	5089	1886	2413	5282
2010	592	4138	27976	30082	18316	7800	1134	210	1040	705

Table 4.42. Sea bass in the Northeast Atlantic. Estimated numbers at age for sea bass landed into the UK from Division VIIa, f and g: TRAWLS (nos. fish)

	3	4	5	6	7	8	9	10	11	12+
1985	226	1096	654	1874	245	843	1197	382	52	332
1986	0	510	687	188	511	198	507	605	131	57
1987	144	450	2758	1479	311	158	89	99	463	232
1988	1955	10518	8273	3872	641	113	194	6	86	425
1989	0	0	343	4168	6532	2866	1364	1041	883	8302
1990	1082	1435	0	1717	4077	1398	520	56	155	1407
1991	0	10981	859	516	3286	2204	898	445	102	147
1992	646	1486	2032	63	149	732	1886	1145	294	604
1993	48	8325	7861	3309	166	140	983	1722	890	481
1994	0	231	10039	2962	1210	84	13	139	519	697
1995	0	3223	12672	40610	1579	602	0	0	48	353
1996	0	205	180	5263	7290	102	6	0	0	0
1997	0	766	9002	5478	7724	16909	453	137	0	1072
1998	59	6382	4360	10107	1325	2444	4386	180	11	370
1999	88	1916	3281	2991	5101	1285	911	2065	85	193
2000	0	0	2665	2142	2492	3645	1528	2095	3348	160
2001	145	4099	2407	16256	2965	1167	1807	894	1095	1483
2002	1660	4527	30315	2975	10107	1532	896	894	288	1199
2003	0	2164	6654	37076	1738	6797	759	505	317	1192
2004	0	2136	26306	13849	21001	313	1089	314	34	130
2005	215	4569	7946	25633	7317	9965	1361	802	117	176
2006	0	3794	10710	5821	18050	6566	10056	852	507	446
2007	0	2287	21515	16398	6425	4432	1962	2049	476	1189
2008	0	688	43973	27482	10663	3258	4015	1681	2271	341
2009	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2010	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

Table 4.43. Sea bass in the Northeast Atlantic. Estimated numbers at age for sea bass landed into the UK from Division VIIa, f and g: GILL / DRIFT NETS (nos. fish)

	3	4	5	6	7	8	9	10	11	12+
1985	4210	480	483	1609	76	752	608	270	92	26
1986	0	1548	1301	264	423	172	326	430	16	154
1987	0	1315	3573	1070	134	149	53	85	330	5
1988	0	304	2720	13786	5452	482	423	42	188	625
1989	0	0	31	859	4298	2283	982	660	387	1684
1990	0	0	0	42	155	404	275	85	156	1341
1991	0	2089	150	500	1695	4002	3022	1220	142	1336
1992	390	719	466	34	117	449	1654	2297	595	1799
1993	19	3923	5950	2428	99	43	170	150	244	427
1994	0	60	15881	5560	3255	200	70	619	1482	1652
1995	0	212	2216	38747	1499	498	0	3	6	4743
1996	24	721	1369	11187	29376	361	59	0	27	316
1997	0	400	4343	3759	5850	18946	305	731	0	263
1998	2	825	882	2958	480	822	1647	118	18	105
1999	0	1874	1619	1187	1575	231	165	360	8	4
2000	201	127	11148	4424	2178	2536	711	681	763	103
2001	90	2680	1514	14187	3199	1225	1686	1203	1536	2986
2002	389	1826	19746	3169	15616	3451	2583	3523	1415	6832
2003	0	773	2667	16132	519	1288	149	91	52	466
2004	0	200	1746	1611	6707	254	631	185	102	153
2005	0	69	321	4361	2035	6071	495	841	130	238
2006	0	296	1093	561	1844	471	765	46	167	155
2007	0	1527	13844	13236	6183	7833	4109	6229	1070	3149
2008	0	1407	14130	19924	7896	5037	4922	3773	1414	687
2009	0	244	2822	9223	8335	5038	3949	4810	4913	2245
2010	0	580	2929	4734	4187	1746	1434	919	220	271

Table 4.44. Sea bass in the Northeast Atlantic. Estimated numbers at age for bass landed into the UK from Division VIIa, f and g: LINES (nos. fish)

	3	4	5	6	7	8	9	10	11	12+
1985	9	9	1	17	3	31	112	34	15	92
1986	29	856	529	123	251	97	155	502	124	158
1987	106	274	1510	778	189	107	89	231	663	343
1988	23	434	1653	1449	387	114	202	33	189	1977
1989	0	0	503	3065	123	0	0	0	0	0
1990	0	0	0	288	766	557	220	38	83	550
1991	43	780	57	227	490	1177	965	287	21	275
1992	438	481	435	12	41	160	497	634	195	367
1993	4	555	426	208	11	17	75	234	248	422
1994	0	1330	70318	8437	2597	195	72	755	1972	1901
1995	0	2154	10912	39045	1065	572	0	20	72	745
1996	9	327	502	5197	14836	157	77	0	0	86
1997	0	218	1259	1370	3070	10435	265	44	0	870
1998	2006	1848	899	2440	400	870	1949	85	4	34
1999	0	1024	608	420	761	150	227	923	90	159
2000	44	33	2422	769	323	423	149	223	478	86
2001	21	685	391	6145	2058	680	1056	565	536	893
2002	64	307	3593	887	5571	1856	916	1528	401	1918
2003	0	213	734	5691	352	1661	231	201	76	677
2004	0	195	2609	2647	6475	417	946	1169	324	1352
2005	0	113	1116	4613	1626	3577	447	450	114	208
2006	0	1813	7136	4280	13325	4030	6744	410	921	730
2007	0	1473	15056	14110	5424	5269	2675	3673	961	851
2008	0	1490	15905	22076	8209	4220	3637	2039	1013	1218
2009	0	332	2075	10706	9133	3741	1872	1706	1282	394
2010	0	938	4696	8795	9506	3032	1568	1191	458	276

Table 4.45. Sea bass in the Northeast Atlantic. Number of bass sampled annually from UK(Eand W) fishery landings and other sources, by age, over the period 1985 – 2010, illustrating tracking of weak and strong year classes and oldest ages recorded. Numbers are % age composition of the age samples by year (total number of fish is in the final column) Cells are shaded according to percentage. Oldest true age recorded = 28.

	Age class																											
year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	No. fish
1985			3.5	19.3	16.6	6.9	12.2	1.8	5.9	17.5	4.8	3.3	3.0	0.8	1.8	0.6	0.1	0.3	0.8	0.5	0.1	0.1	0.1				0.2			1014
1986			0.1	2.6	25.2	17.4	3.7	10.2	2.2	4.9	17.3	3.3	2.4	3.3	1.7	1.9	1.0	0.8	0.4	0.6	0.5	0.2		0.1		0.1				1015
1987		0.1		4.2	17.4	33.4	10.2	1.8	3.2	0.9	1.9	11.7	3.1	3.0	1.4	2.0	1.0	0.7	1.4	0.4	0.7	0.7	0.4		0.1		0.1	0.1	0.1	1354
1988				0.4	4.6	27.0	24.8	11.1	2.6	3.9	0.8	1.8	8.7	3.2	3.0	2.0	1.8	1.5	0.6	0.8	0.7	0.3				0.1	0.1	0.1			1427
1989	1.2	7.4	10.3	0.5	1.7	5.9	17.8	15.7	6.3	2.3	3.2	1.6	2.8	12.1	1.9	1.9	3.2	1.1	1.1	0.5	0.5	0.6	0.2	0.1		0.1		0.1		1870
1990		17.7	17.9	12.4	1.1	1.7	6.1	14.2	10.7	3.5	1.4	1.1	0.8	1.1	6.1	0.4	1.0	0.9	0.7	0.3	0.1	0.7		0.0						2097
1991		6.5	36.6	10.3	10.7	1.0	0.8	2.8	9.4	8.1	3.5	0.5	1.1	1.1	0.6	4.5	0.6	0.7	0.5	0.1	0.4	0.1	0.2							3367
1992	0.7	2.6	1.9	28.8	24.3	17.9	0.8	0.7	1.8	5.3	6.9	2.2	0.5	0.7	0.4	0.6	2.9	0.2	0.3	0.1	0.2	0.0	0.1	0.1						3982
1993	0.0	3.1	4.0	2.7	32.3	20.0	12.0	0.9	0.7	2.0	6.3	5.9	2.1	1.0	1.2	1.1	0.8	2.8	0.3	0.3	0.3	0.2	0.0	0.0						4609
1994	0.4	0.7	2.7	2.8	5.2	64.3	9.2	4.6	0.5	0.1	1.1	3.1	2.4	0.7	0.4	0.3	0.3	0.2	0.8	0.1	0.1	0.1								6620
1995		0.2	0.1	0.7	2.7	7.8	72.4	4.8	3.1	0.2	0.3	0.5	2.2	1.8	1.0	0.5	0.2	0.2	0.4	0.4	0.2	0.1	0.1	0.1	0.1	0.1	0.0			3704
1996		0.1	0.3	0.2	6.9	9.4	15.6	53.1	3.9	2.2	0.2	0.4	0.6	2.3	1.7	0.7	0.4	0.3	0.4	0.3	0.4	0.3	0.1	0.1	0.1	0.1		0.0			3896
1997			0.2	1.2	3.1	21.5	12.9	10.8	41.1	2.8	1.4	0.3	0.2	0.2	1.6	0.9	0.4	0.2	0.6	0.1	0.0	0.3	0.0	0.0							4423
1998		0.1	0.0	1.8	13.1	13.1	22.4	8.5	8.2	26.0	2.4	0.8	0.1	0.2	0.7	1.1	0.7	0.4	0.0	0.0		0.1	0.1		0.0					3388
1999			0.4	0.5	13.5	24.1	10.5	11.2	5.4	6.1	20.0	2.1	1.8	0.3	0.7	0.6	1.6	0.4	0.2	0.1	0.1	0.1	0.0	0.2	0.0					3359
2000		0.1	0.1	1.9	0.6	32.8	26.1	7.4	8.6	3.1	4.0	12.4	1.0	0.4	0.1	0.3	0.2	0.4	0.2	0.1	0.1	0.1	0.0	0.0	0.0					4759
2001			0.2	2.8	18.9	3.7	37.1	13.5	3.8	5.9	2.8	3.2	6.2	0.6	0.4	0.1	0.2	0.0	0.2	0.1	0.0	0.0	0.0			0.0					4985
2002		0.3	0.3	5.5	10.4	42.1	3.4	16.1	6.6	2.3	3.7	1.2	1.9	5.1	0.4	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0			0.0				4759
2003			0.0	1.7	14.2	11.8	34.6	2.7	15.6	5.4	2.3	2.1	1.7	1.5	5.0	0.6	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0							3438
2004			0.0	1.0	5.2	29.2	15.3	28.6	2.1	8.4	3.7	1.0	1.4	0.9	0.4	2.5	0.2	0.0						0.0	0.0					2383
2005			0.1	3.1	12.1	15.8	29.9	12.6	14.4	1.4	5.2	1.4	1.6	0.5	0.2	0.5	1.2		0.1				0.1							1824
2006				1.7	14.2	21.7	14.3	17.6	7.5	12.2	1.5	4.0	1.8	0.6	0.4	0.7	0.1	1.6		0.1										1339
2007			0.1	0.4	5.6	27.8	23.4	12.0	12.6	5.9	5.8	2.1	2.5	0.8	0.4	0.3	0.2	0.4	0.1											1944
2008				0.6	6.5	28.7	31.6	13.8	5.6	5.9	2.6	2.1	0.8	0.8	0.4	0.2	0.2	0.0	0.1	0.2											3056
2009			0.1	0.4	6.8	26.5	38.1	17.8	4.5	2.2	1.4	1.0	0.9	0.1	0.2		0.0				0.1										3385
2010				0.1	9.8	24.3	24.6	20.5	9.7	5.0	1.4	2.6	0.7	0.4	0.3	0.2		0.1	0.0	0.0		0.0	0.0								2165
																														80162

Table 4.46. Sea bass in the Northeast Atlantic. Abundance indices from the UK(England) trawl surveys of juvenile bass in the Solent (VIId) in May-July and September (nos. per 10-minute tow).

	MAY-JULY			SEPTEMBER		
Year	age 2	age 3	age 4	age 2	age 3	age 4
1981	0.00	0.30	0.25			
1982	0.51	2.17	0.16	3.25	10.10	0.38
1983				9.87	0.91	1.88
1984	0.95	2.66	0.43	1.38	0.65	0.09
1985	0.00	10.33	2.56			
1986				0.27	4.26	1.31
1987	0.00	0.42	3.18	0.05	0.28	2.27
1988	0.00	0.02	0.47			
1989				6.68	0.37	0.00
1990	2.84	2.48	0.00	2.81	1.15	0.02
1991	5.78	0.62	0.09	3.08	0.21	0.03
1992	0.11	7.04	0.35	0.95	18.59	0.16
1993	0.05	7.33	14.02	6.65	3.59	4.39
1994	0.04	1.63	1.14	3.33	1.84	0.29
1995	0.05	1.57	0.97	4.83	4.69	0.72
1996	1.43	4.09	3.36	5.52	0.43	0.11
1997	0.27	1.94	0.11	33.62	4.52	0.06
1998	0.00	6.75	5.79	1.22	5.50	0.61
1999	0.61	0.95	12.30	19.37	0.67	0.87
2000	0.49	37.03	1.06	9.06	16.94	0.16
2001	1.71	6.33	3.43	34.42	3.92	1.57
2002	0.63	1.62	0.29	7.42	3.87	0.40
2003	0.06	0.32	0.38	8.37	4.60	0.59
2004	0.17	0.28	0.16			
2005	0.05	0.42	0.35	13.12	7.98	0.84
2006	0.44	2.47	1.03	9.51	9.21	1.02
2007	0.33	0.50	0.50	3.42	1.78	0.30
2008				18.52	6.66	0.34
2009	0.72	1.03	0.13	13.25	6.25	0.33
2010						
2011				2.25	1.39	0.42

Table 4.47. Sea bass in the Northeast Atlantic. Abundance indices from the UK(England) trawl surveys of juvenile sea bass in the Thames Estuary (IVc) in November (nos. per 10-minute tow).

YEAR	AGE 0	AGE 1	AGE 2	AGE 3
1997	7.737	0	0.048	0.41
1998				
1999	19.54	6.033	0.764	0
2000	4.015	14.74	0.832	0.089
2001	121.5	11.47	5.108	0.171
2002	469	20.71	2.716	1.093
2003	225.6	35.76	4.429	0.159
2004	238.92	44.99	7.32	1.03
2005	37.04	14.49	6.86	0.75
2006	245.54	11.26	3.46	0.94
2007				
2008	107.55	50.69	1.86	0.2
2009	95.43	7.79	13.59	0.91

Table 4.48. Sea bass in the Northeast Atlantic. Abundance indices for 0-gp and 1-gp sea bass. († discontinued)

COUNTRY	UK (ENGLAND AND WALES)				IRELAND
Area	(Tamar)	(Tamar)	(Camel)	(Severn)	
Division	VIIe	VIIe	VIIf	VIIf	VII
	0-group	1-group	0-group	0 group	0 group
Year Class	Seine survey	Seine survey	Seine survey	Power station screens	Seine/ Stop-net
1972				3	
1973				4	
1974				1	
1975				15	
1976				127	
1977				-	
1978				-	
1979				-	
1980				9	
1981			2	216	
1982			123	83	
1983			30	226	
1984		0.13	134	8	
1985	0.66	0.38	22	11	
1986	0.00	0.01	1	3	
1987	0.03	0.06	31	96	
1988	1.48	1.28	48	98	
1989	2.35	2.39	112	446	
1990	1.04	1.52	89	25	
1991	0.08	0.06	50	300	
1992	2.22	2.43	25	280	
1993	1.01	0.91	22	202	
1994	1.13	0.35	134	-	
1995	2.36	1.29	-	-	
1996	0.10	0.05	119	242	15
1997	1.12	1.30	102	†	1
1998	2.08	3.17	264		5
1999	1.22	0.94	56		2
2000	0.34	1.18	133		0
2001	0.35	0.13	†		3
2002	2.10	3.18			93
2003	0.97	1.07			1
2004	1.45	0.26			‡
2005	0.52	0.17			
2006	0.19	0.20			
2007	0.47	1.31			
2008	1.28	1.23			
2009	0.46				

Table 4.49. Sea bass in the Northeast Atlantic. Seabass indices from Evohe French survey from 1997 to 2010. Bay of Biscay and Celtic sea area mixed.

	ALL STATIONS			POSITIVE STATIONS		
Year	Total nos. stations	Nos. seabass caught	Mean Nos.per station	Nos. stations with seabass	% of stations with seabass	Mean Nos. per positive station
1997	129	42	0.3	11	9	**3.8**
1998	125	32	0.3	13	10	**2.5**
1999	119	46	0.4	17	14	**2.7**
2000	121	12	0.1	7	6	**1.7**
2001	151	55	0.4	6	4	**9.2**
2002	153	28	0.2	11	7	**2.5**
2003	148	45	0.3	10	7	**4.5**
2004	138	29	0.2	13	9	**2.2**
2005	143	65	0.5	12	8	**5.4**
2006	129	47	0.4	14	11	**3.4**
2007	145	99	0.7	14	10	**7.1**
2008	147	115	0.8	24	16	**4.8**
2009	136	42	0.3	10	7	**4.2**
2010	139	398	2.9	15	11	**26.5**

Table 4.50. Sea bass in the Northeast Atlantic. Sea bass data availability up to 2010 for benchmark assessment: North Sea (Divisions IVband c)

Area: IVb,c : main countries 2010 : Netherlands, UK, France																							
				Netherlands (334 tons in 2010)						UK (151 tons in 2010)						France (126 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments	85-89	90-94	95-99	00-04	2005+	comments	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	OTB						ask tabs (P18 Imares report)						<10m data poor pre 2006						
			Pelagic trawl						ask tabs (P18 Imares report)						no landings						low using of this gear in this area
			Nets						ask tabs (P18 Imares report)						<10m data poor pre 2006						
			Lines						ask tabs (P18 Imares report)						<10m data poor pre 2006						low using of this gear in this area
	Commercial	Discards weight	OTB						Data ?						period available (2002-2008)						period available (2009-2010)
			Pelagic trawl						Data ?												period available (2009-2010)
			Nets						Data ?						period available (2002-2008)						period available (2009-2010)
			Lines						Data ?						no sampling						period available (2009-2010)
	Recreational	Retained catches							only 2010												only 2010
		Ruterned catches																			only 2010
Effort	Commercial	Fishing effort	OTB						no distinction per gear ASK						Effort series to be revised						methodology has to be discussed
			Pelagic trawl						no distinction per gear ASK						no landings						low using of this gear in this area
			Nets						no distinction per gear ASK						Effort series to be revised						
			Lines						no distinction per gear ASK						Effort series to be revised						low using of this gear in this area
	Recreational	Fishing effort																			
Catch composition	Commercial	Landings Length compositions	OTB						Data ?						very low landings pre 1995						period 2009-2010
			Pelagic trawl						Data ?						no landings						low using of this gear in this area
			Nets						Data ?												period 2009-2010
			Lines						Data ?						Low sample nos. some yrs						period 2009-2010
		Landings Age compositions & wts	OTB						Data ?						Sampled trips to be provided						no data
			Pelagic trawl						Data ?						no landings						no data
			Nets						Data ?						Sampled trips to be provided						no data
			Lines						Data ?						Sampled trips to be provided						no data
		Discards Length compositions	OTB						Data ?						From 2002 on to be provided						period available (2009-2010)
			Pelagic trawl						Data ?						no landings						low using of this gear in this area
			Nets						Data ?						From 2002 on to be provided						period available (2009-2010)
			Lines						Data ?						no sampling						period available (2009-2010)
		Discards Age compositions & wts	OTB						Data ?						From 2002 on to be provided						no data
			Pelagic trawl						Data ?						no landings						low using of this gear in this area
			Nets						Data ?						From 2002 on to be provided						no data
			Lines						Data ?						no sampling						no data
	Recreational	Length compositions							Data ?												2010 only
		Age composition							Data ?												
Abundance indices	Commercial	LPUE	OTB						Data ?						LPUEseries to be revised						methodology has to be discussed
			Pelagic trawl						Data ?												low using of this gear in this area
			Nets						Data ?						LPUEseries to be revised						
			Lines						Data ?						LPUEseries to be revised						low using of this gear in this area
	Surveys	pre-recruit													from 1997						
	Surveys	post recruit																			
Biological parameters	All	Growth							from UK						from UK						from UK
	All	Maturity Ogives							from UK												from UK
	All	Fecundity																			
	All	Natural mortality							to be determined						to be determined						to be determined

	good data quality
	data quality has to be disccussed
	poor quality of data
	question to ask
	no data

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Table 4.51. Sea bass in the Northeast Atlantic. Sea bass data availability for benchmark assessment: Eastern Channel (Division VIId)

Area: VIId : main countries 2010 : France, UK																	
				France (1237 tons in 2010)						UK (268 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	OTB						<10m data poor pre 2006						<10m data poor pre 2006
			Pelagic trawl						<10m data poor pre 2006						zero / low landings most yrs
			Nets						<10m data poor pre 2006						<10m data poor pre 2006
			Lines						<10m data poor pre 2006						<10m data poor pre 2006
	Commercial	Discards weight	OTB						period available (2009-2010)						period available (2002-2008)
			Pelagic trawl						period available (2009-2010)						no sampling
			Nets						period available (2009-2010)						
			Lines						period available (2009-2010)						
	Recreational	Retained catches							only 2010						
		Ruterned catches							only 2010						
Effort	Commercial	Fishing effort	OTB						methodology has to be discussed						Effort series to be revised
			Pelagic trawl						methodology has to be discussed						zero / low landings most yrs
			Nets						methodology has to be discussed						Effort series to be revised
			Lines						methodology has to be discussed						Effort series to be revised
	Recreational	Fishing effort													
Catch composition	Commercial	Landings Length compositions	OTB												Low sample nos. in some yrs
			Pelagic trawl												zero / low landings most yrs
			Nets												
			Lines												Low sample nos. in some yrs
		Landings Age compositions & wts	OTB												Sampled trips to be provided
			Pelagic trawl												zero / low landings most yrs
			Nets												Sampled trips to be provided
			Lines												Sampled trips to be provided
		Discards Length compositions	OTB						period available (2009-2010)						From 2002 on to be provided
			Pelagic trawl						period available (2009-2010)						
			Nets						period available (2009-2010)						From 2002 on to be provided
			Lines						period available (2009-2010)						no sampling
		Discards Age compositions & wts	OTB												From 2002 on to be provided
			Pelagic trawl												
			Nets												From 2002 on to be provided
			Lines												no sampling
	Recreational	Length compositions							2010 only						
		Age composition													
Abundance indices	Commercial	LPUE	OTB						methodology has to be discussed						LPUEseries to be revised
			Pelagic trawl						methodology has to be discussed						zero / low landings most yrs
			Nets						methodology has to be discussed						LPUEseries to be revised
			Lines						methodology has to be discussed						LPUEseries to be revised
	Surveys	pre-recruit													
	Surveys	post recruit													
Biological parameters	All	Growth							from UK						
	All	Maturity Ogives							from UK						
	All	Fecundity													
	All	Natural mortality							to be determined						to be determined

	good data quality
	data quality has to be disccussed
	poor quality of data
	question to ask
	no data

Table 4.52. Sea bass in the Northeast Atlantic. Sea bass data availability for benchmark assessment: Western Channel and approaches (Division VIIe,h)

Area: .VIIeh : main countries 2010 : France, UK																	
				France (1940 tons in 2010)						UK (335 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	OTB						<10m data poor pre 2006						<10m data poor pre 2006
			Pelagic trawl						<10m data poor pre 2006						
			Nets						<10m data poor pre 2006						<10m data poor pre 2006
			Lines						<10m data poor pre 2006						<10m data poor pre 2006
	Commercial	Discards weight	OTB						period available (2009-2010)						period available (2002-2008)
			Pelagic trawl						period available (2009-2010)						
			Nets						period available (2009-2010)						period available (2002-2008)
			Lines						period available (2009-2010)						no sampling
	Recreational	Retained catches							only 2010						
		Ruterned catches							only 2010						
Effort	Commercial	Fishing effort	OTB						methodology has to be discussed						Effort series to be revised
			Pelagic trawl						methodology has to be discussed						Effort series to be revised
			Nets						methodology has to be discussed						Effort series to be revised
			Lines						methodology has to be discussed						Effort series to be revised
	Recreational	Fishing effort													
Catch composition	Commercial	Landings Length compositions	OTB												low sampling in some yrs
			Pelagic trawl												almost no sampling pre 2007
			Nets												low sampling in some yrs
			Lines												low sampling in some yrs
		Landings Age compositions & wts	OTB												Sampled trips to be provided
			Pelagic trawl												Sampled trips to be provided
			Nets												Sampled trips to be provided
			Lines												Sampled trips to be provided
		Discards Length compositions	OTB						period available (2009-2010)						From 2002 on to be provided
			Pelagic trawl						period available (2009-2010)						no sampling
			Nets						period available (2009-2010)						From 2002 on to be provided
			Lines						period available (2009-2010)						no sampling
		Discards Age compositions & wts	OTB						period available (2009-2010)						From 2002 on to be provided
			Pelagic trawl						period available (2009-2010)						no sampling
			Nets						period available (2009-2010)						From 2002 on to be provided
			Lines						period available (2009-2010)						no sampling
	Recreational	Length compositions							2010 only						
		Age composition							2011 only						
Abundance indices	Commercial	LPUE	OTB						methodology has to be discussed						LPUEseries to be revised
			Pelagic trawl						methodology has to be discussed						LPUEseries to be revised
			Nets						methodology has to be discussed						LPUEseries to be revised
			Lines						methodology has to be discussed						LPUEseries to be revised
	Surveys	pre-recruit							Evhoe (very low sampling rate)?						
	Surveys	post recruit							Evhoe (very low sampling rate)?						
Biological parameters	All	Growth							from UK						
	All	Maturity Ogives							from UK						
	All	Fecundity													
	All	Natural mortality							to be determined						to be determined

	good data quality
	data quality has to be disccussed
	poor quality of data
	question to ask
	no data

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Table 4.53. Sea bass in the Northeast Atlantic. Data availability for benchmark assessment: Celtic Sea and Irish Sea (Division VIIa,fand g)

Area: VIIafg : main countries 2010 : UK, France, Belgium																							
				UK (92 tons in 2010)						France (49 tons in 2010)						BELGIUM 38 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments	85-89	90-94	95-99	00-04	2005+	comments	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	OTB						<10m data poor pre 2006												
			Pelagic trawl						almost zero landings						low using of this gear in this area						
			Nets						<10m data poor pre 2006						low using of this gear in this area						
			Lines						<10m data poor pre 2006						low using of this gear in this area						
	Commercial	Discards weight	OTB																		
			Pelagic trawl																		
			Nets																		
			Lines																		
	Recreational	Retained catches																			
		Ruterned catches																			
Effort	Commercial	Fishing effort	OTB						Effort series to be revised						methodology has to be discussed						
			Pelagic trawl						almost zero landings												
			Nets						Effort series to be revised												
			Lines						Effort series to be revised												
	Recreational	Fishing effort																			
Catch composition	Commercial	Landings Length compositions	OTB						low sampling in some yrs												
			Pelagic trawl						almost zero landings												
			Nets						low sampling in some yrs												
			Lines						low sampling in some yrs												
		Landings Age compositions & wts	OTB						Sampled trips to be provided												
			Pelagic trawl						almost zero landings												
			Nets						Sampled trips to be provided												
			Lines						Sampled trips to be provided												
		Discards Length compositions	OTB						From 2002 on to be provided												
			Pelagic trawl						almost zero landings												
			Nets						From 2002 on to be provided												
			Lines						no sampling												
		Discards Age compositions & wts	OTB						From 2002 on to be provided												
			Pelagic trawl						almost zero landings												
			Nets						From 2002 on to be provided												
			Lines						no sampling												
	Recreational	Length compositions																			
		Age composition																			
Abundance indices	Commercial	LPUE	OTB						LPUEseries to be revised						methodology has to be discussed						
			Pelagic trawl						almost zero landings												
			Nets						LPUEseries to be revised												
			Lines						LPUEseries to be revised												
	Surveys	pre-recruit																			
	Surveys	post recruit																			
Biological parameters	All	Growth													from UK						from UK
	All	Maturity Ogives													from UK						from UK
	All	Fecundity																			
	All	Natural mortality							to be determined						to be determined						to be determined

	good data quality
	data quality has to be disccussed
	poor quality of data
	question to ask
	no data

Table 4.54. Sea bass in the Northeast Atlantic. Data availability for benchmark assessment: Bay of Biscay (Division VIIIaand b)

Area: VIIIab : main countries 2010 : France, Spain																
				France (2333 tons in 2010)						SPAIN (167 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	OTB						ask tabs (P18 Imares report)						Landings aggregate (all gear)
			Pelagic trawl						ask tabs (P18 Imares report)						Landings aggregate (all gear)
			Nets						ask tabs (P18 Imares report)						Landings aggregate (all gear)
			Lines						ask tabs (P18 Imares report)						Landings aggregate (all gear)
	Commercial	Discards weight	OTB						period available (2009-2010)						
			Pelagic trawl						period available (2009-2010)						
			Nets						period available (2009-2010)						
			Lines						period available (2009-2010)						
	Recreational	Retained catches							only 2010						
		Ruterned catches							only 2010						
Effort	Commercial	Fishing effort	OTB						methodology has to be discussed						
			Pelagic trawl						methodology has to be discussed						
			Nets						methodology has to be discussed						
			Lines						methodology has to be discussed						
	Recreational	Fishing effort													
Catch composition	Commercial	Landings Length compositions	OTB												
			Pelagic trawl												
			Nets												
			Lines												
		Landings Age compositions & wts	OTB												
			Pelagic trawl												
			Nets												
			Lines												
		Discards Length compositions	OTB						period available (2009-2010)						
			Pelagic trawl						period available (2009-2010)						
			Nets						period available (2009-2010)						
			Lines						period available (2009-2010)						
		Discards Age compositions & wts	OTB												
			Pelagic trawl												
			Nets												
			Lines												
	Recreational	Length compositions							2010 only						
		Age composition													
Abundance indices	Commercial	LPUE	OTB						methodology has to be discussed						
			Pelagic trawl						methodology has to be discussed						
			Nets						methodology has to be discussed						
			Lines						methodology has to be discussed						
	Surveys	pre-recruit													
	Surveys	post recruit							validity (very low sampling rate)?						
Biological parameters	All	Growth							from UK						from UK
	All	Maturity Ogives							from UK						from UK
	All	Fecundity													
	All	Natural mortality							to be determined						to be determined

good data quality
data quality has to be disccussed
poor quality of data
question to ask
no data

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Table 4.55. Sea bass in the Northeast Atlantic. Data availability for benchmark assessment: Division VIIIc

Area: VIIIc : main countries 2010 : SPAIN									
				SPAIN (196 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	OTB						Landings aggregate (all gear)
			Pelagic trawl						Landings aggregate (all gear)
			Nets						Landings aggregate (all gear)
			Lines						Landings aggregate (all gear)
	Commercial	Discards weight	OTB						
			Pelagic trawl						
			Nets						
			Lines						
	Recreational	Retained catches							
		Ruterned catches							
Effort	Commercial	Fishing effort	OTB						
			Pelagic trawl						
			Nets						
			Lines						
	Recreational	Fishing effort							
Catch composition	Commercial	Landings Length compositions	OTB						
			Pelagic trawl						
			Nets						
			Lines						
		Landings Age compositions & wts	OTB						
			Pelagic trawl						
			Nets						
			Lines						
		Discards Length compositions	OTB						
			Pelagic trawl						
			Nets						
			Lines						
		Discards Age compositions & wts	OTB						
			Pelagic trawl						
			Nets						
			Lines						
	Recreational	Length compositions							
		Age composition							
Abundance indices	Commercial	LPUE	OTB						
			Pelagic trawl						
			Nets						
			Lines						
	Surveys	pre-recruit							
	Surveys	post recruit							
Biological parameters	All	Growth							
	All	Maturity Ogives							
	All	Fecundity							
	All	Natural mortality							to be determined

	good data quality
	data quality has to be disccussed
	poor quality of data
	question to ask
	no data

Table 4.56. Sea bass in the Northeast Atlantic. Data availability for benchmark assessment: Division IXa

Area: IXA : main countries 2010 : Portugal and spain															
				Portugal (487 tons in 2010)						SPAIN (90 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	OTB												Landings aggregate (all gear)
			Pelagic trawl												Landings aggregate (all gear)
			Nets												Landings aggregate (all gear)
			Lines												Landings aggregate (all gear)
	Commercial	Discards weight	OTB												
			Pelagic trawl												
			Nets												
			Lines												
	Recreational	Retained catches													
		Ruterned catches													
Effort	Commercial	Fishing effort	OTB												
			Pelagic trawl												
			Nets												
			Lines												
	Recreational	Fishing effort													
Catch composition	Commercial	Landings Length compositions	OTB												
			Pelagic trawl												
			Nets												
			Lines												
		Landings Age compositions & wts	OTB												
			Pelagic trawl												
			Nets												
			Lines												
		Discards Length compositions	OTB												
			Pelagic trawl												
			Nets												
			Lines												
		Discards Age compositions & wts	OTB												
			Pelagic trawl												
			Nets												
			Lines												
	Recreational	Length compositions													
		Age composition													
Abundance indices	Commercial	LPUE	OTB												
			Pelagic trawl												
			Nets												
			Lines												
	Surveys	pre-recruit													
	Surveys	post recruit													
Biological parameters	All	Growth													
	All	Maturity Ogives													
	All	Fecundity													
	All	Natural mortality							to be determined						to be determined

	good data quality
	data quality has to be disccussed
	poor quality of data
	question to ask
	no data

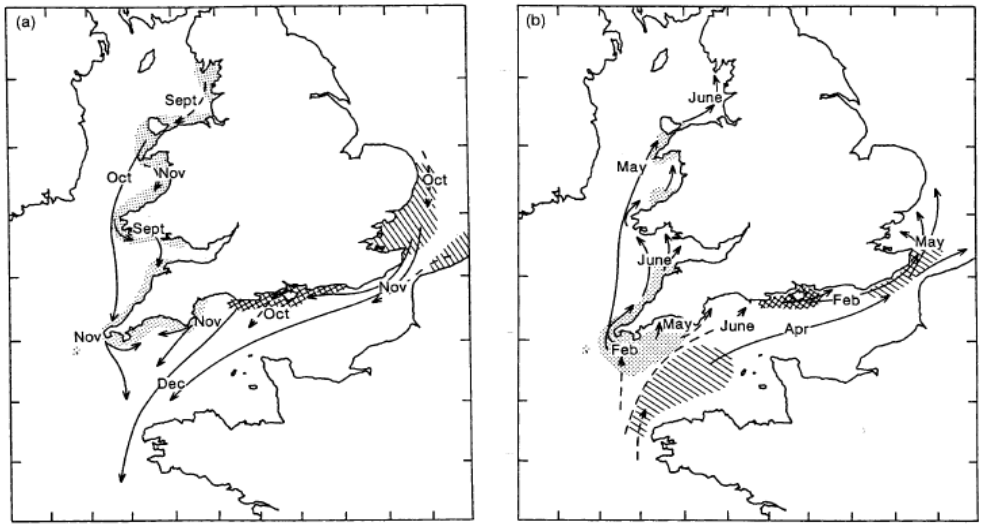


Figure 4.1 Sea bass in the Northeast Atlantic: seasonal movements and migrations of adult bass in three populations around England and Wales (shaded areas) as proposed by SGBASS 2001 (ICES 2001): (a) autumn movements from summer feeding areas; (b) spring movements from spawning areas.

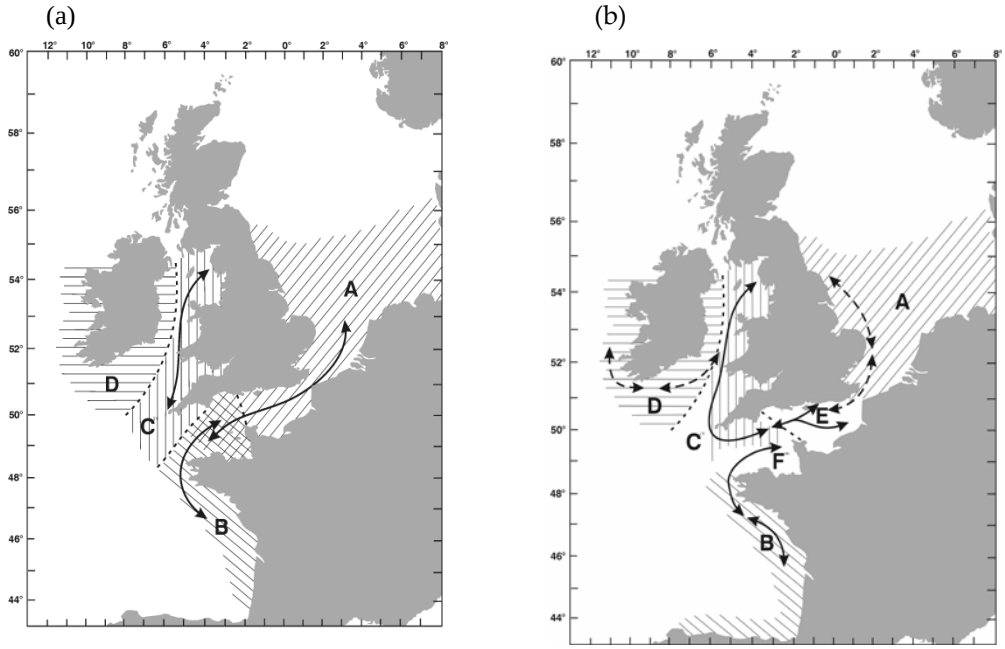


Figure 4.2. Sea bass in the Northeast Atlantic. (a) SGBASS 2001 tentative proposal for four stocks of seabass in A) North Sea-Channel; B) Biscay-Western Channel; C) west coast of England and Wales and D) Ireland (ICES 2001); (b) further structuring proposed by SGBASS 2004 (ICES 2004) to include additional stock components in E) eastern Channel, and F) western Channel, south part. Arrows indicate the main range of movement of adult bass in each "stock".

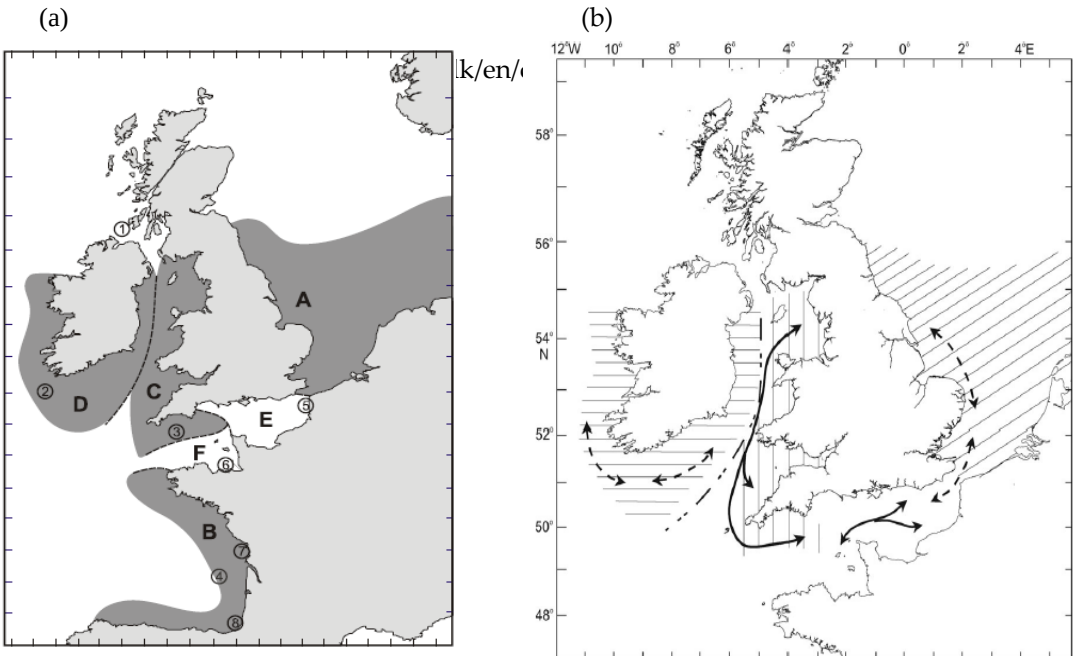


Figure 4.3. Sea bass in the Northeast Atlantic. (a) Distribution of seabass stocks given by Fritsch *et al.* (2007); (b) putative stock structure and movements of seabass in ICES Subareas IV and VII proposed by Pawson (2007).

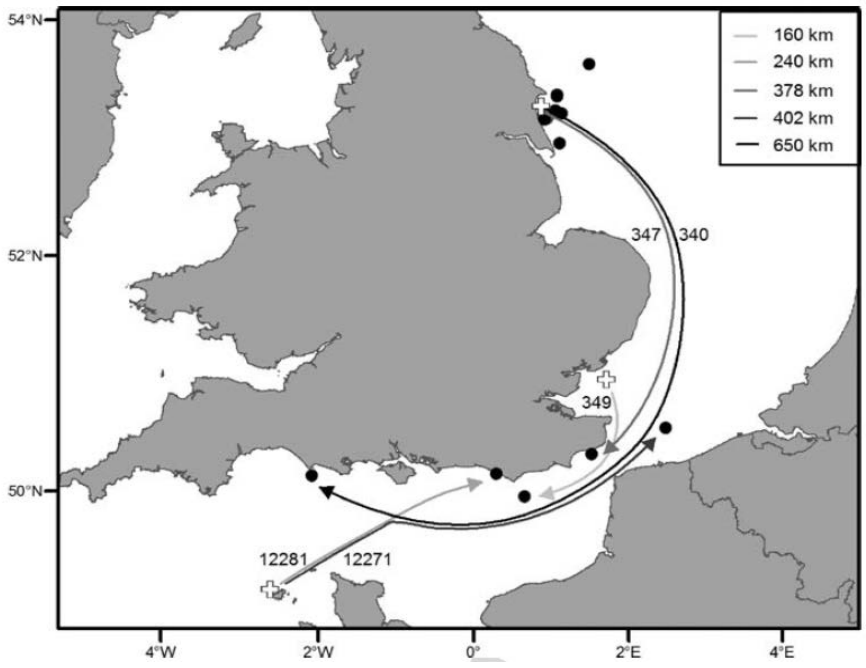


Figure 4.4. Sea bass in the Northeast Atlantic. (a) Release and recapture positions of seabass tagged with data-storage tags (Quayle *et al.* 2009). Release positions shown by white crosses and recapture positions shown by black circles.

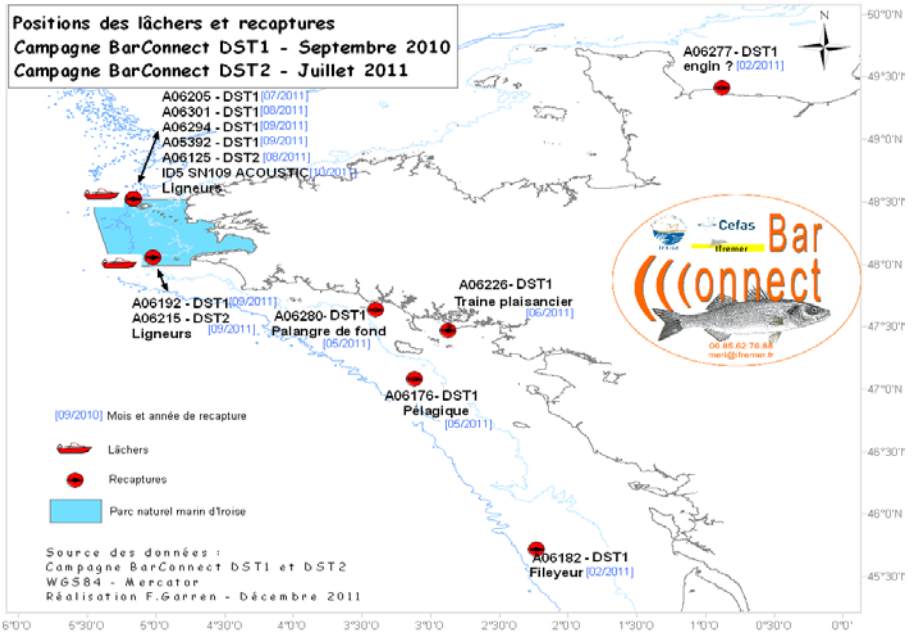


Figure 4.5. Sea bass in the Northeast Atlantic. Ifremer "Bar Connect" electronic tagging study. Catch and release ( ) area : DST1 at Ushant (98 seabass tagged) and DST2 at Sein Island (74 seabass tagged). Dates and total number of recaptures ( ) are listed above (10 recaptures for DST1 and 2 recaptures for DST2 at present).

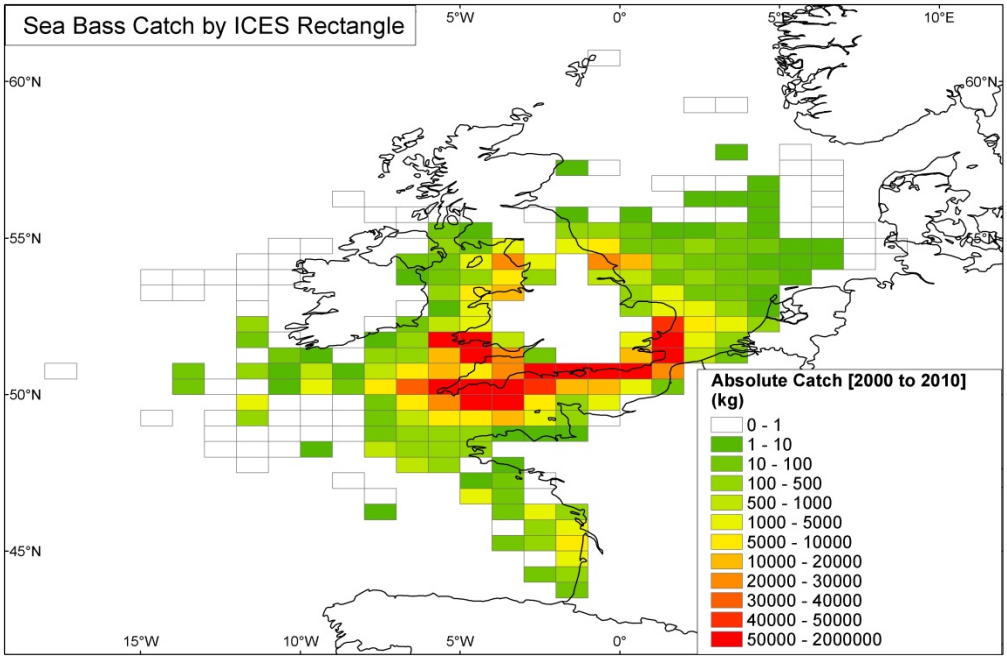


Figure 4.6. Sea bass in the Northeast Atlantic. Distribution of UK landings of sea bass by ICES rectangle, aggregated over 2000 – 2010 for all gear types.

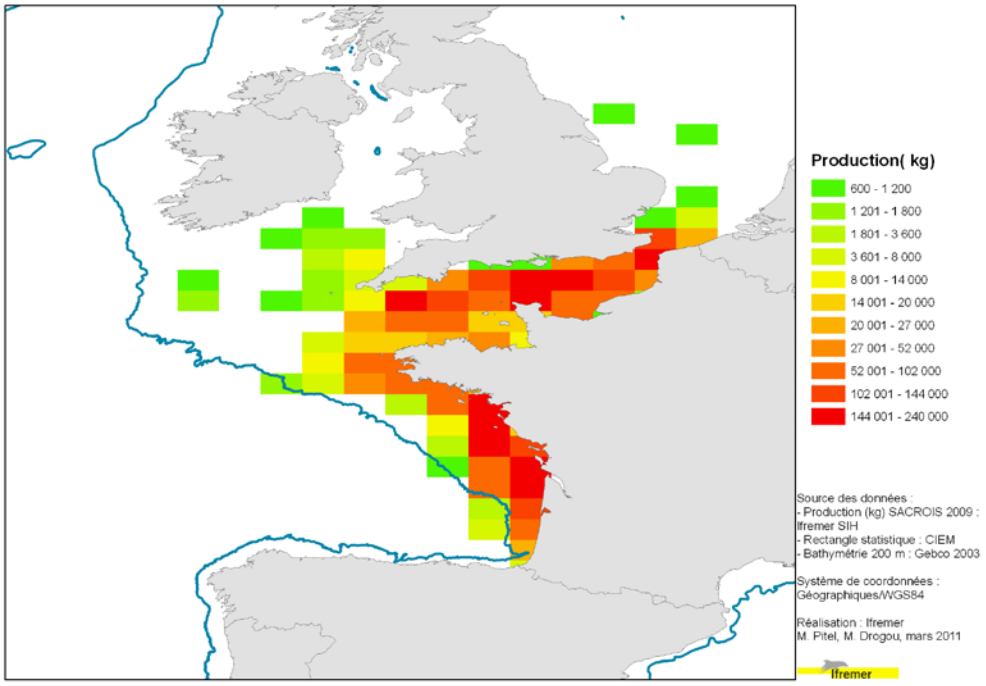


Figure 4.7. Sea bass in the Northeast Atlantic. Distribution of French landings of sea bass by ICES rectangle for all gear types in the year 2009.

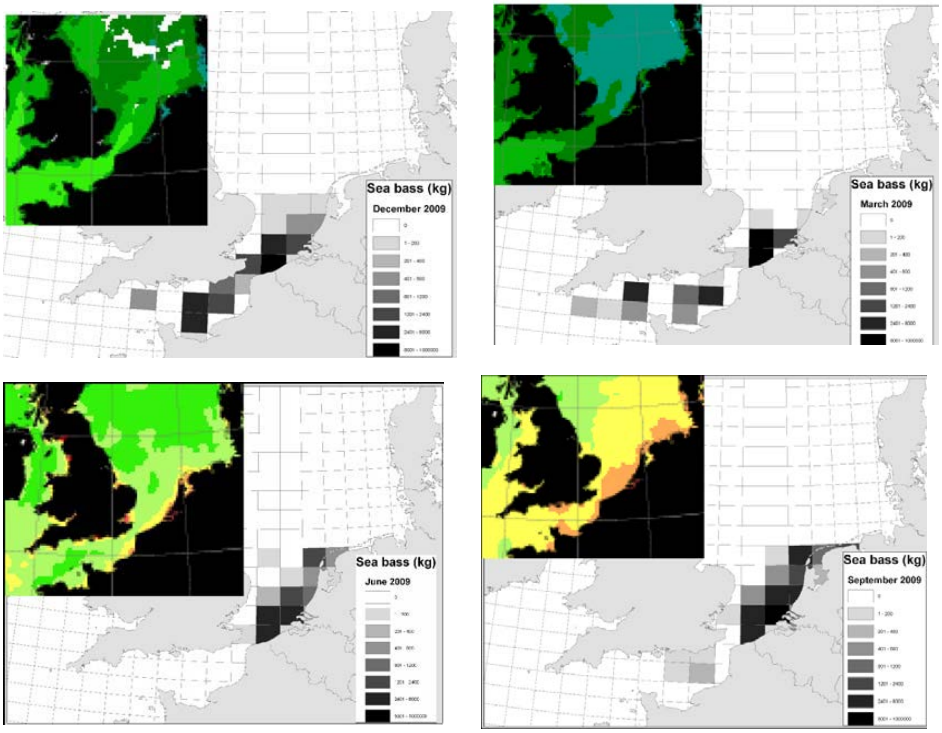


Figure 4.8. Sea bass in the Northeast Atlantic. Total landings of sea bass in kg. By the Dutch fleet in the year 2009 for the months December (a), March (b), June (c) and September (d) per ICES quadrant (Reproduced from Nijboer, 2011 -Data from VIRIS database).

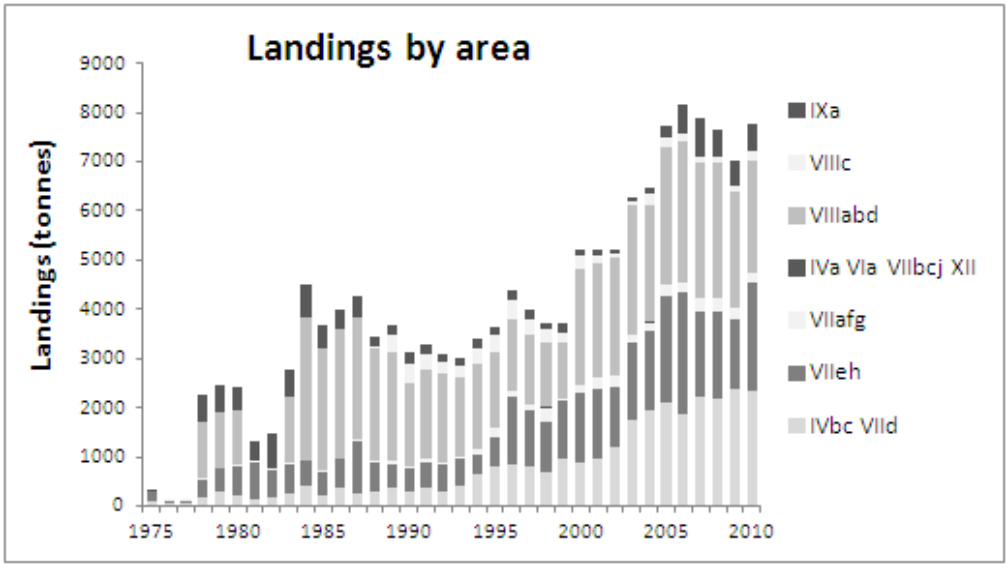


Figure 4.9. Sea bass in the Northeast Atlantic. ICES landings (tonnes).

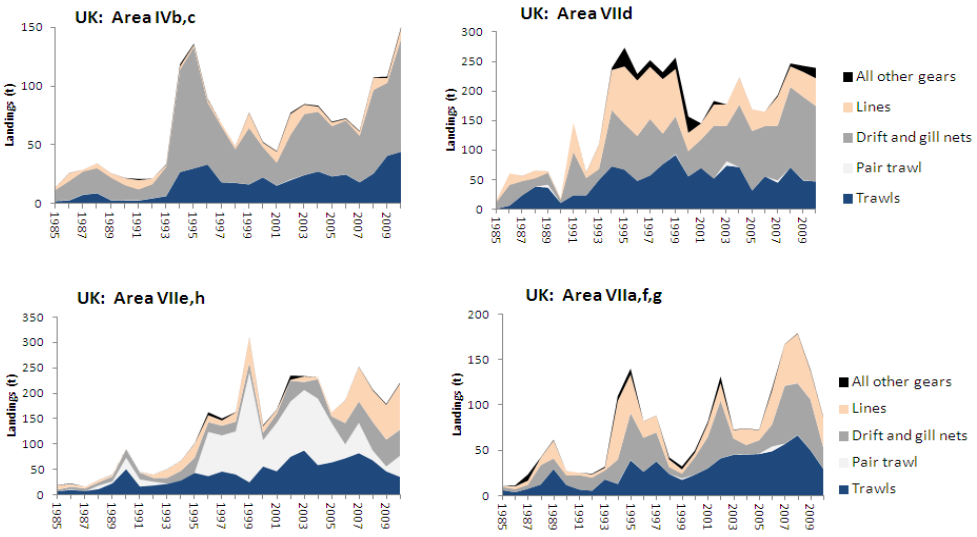


Figure 4.10. Sea bass in the Northeast Atlantic. Landings by area and gear type for UK commercial fishing fleets (pair trawl = offshore pelagic trawl fishery).

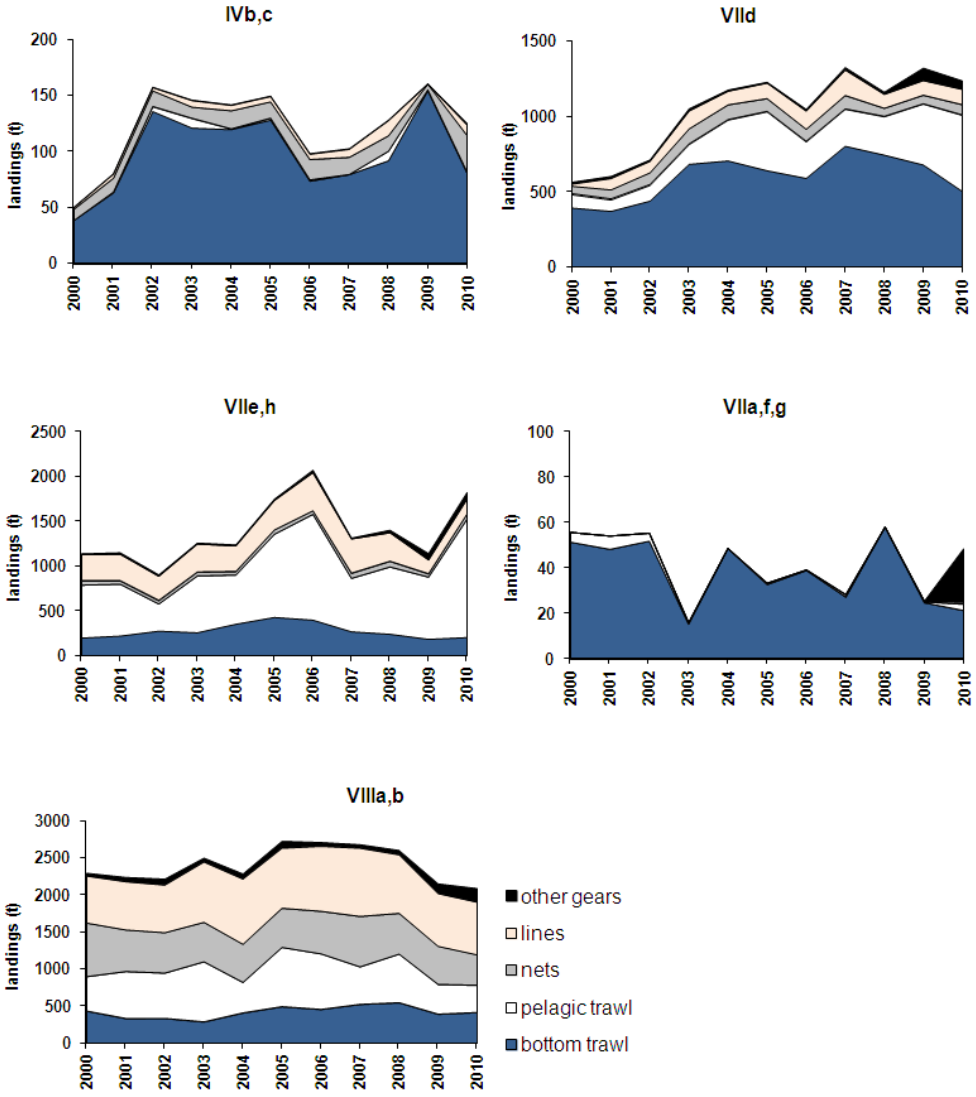

IVb,c
VIId
VIIe,h
VIIa,f,g
VIIIa,b
landings (t)
other gears
lines
nets
pelagic trawl
bottom trawl

Figure 4.11. Sea bass in the Northeast Atlantic. Landings by area and gear type for French commercial fishing fleets.

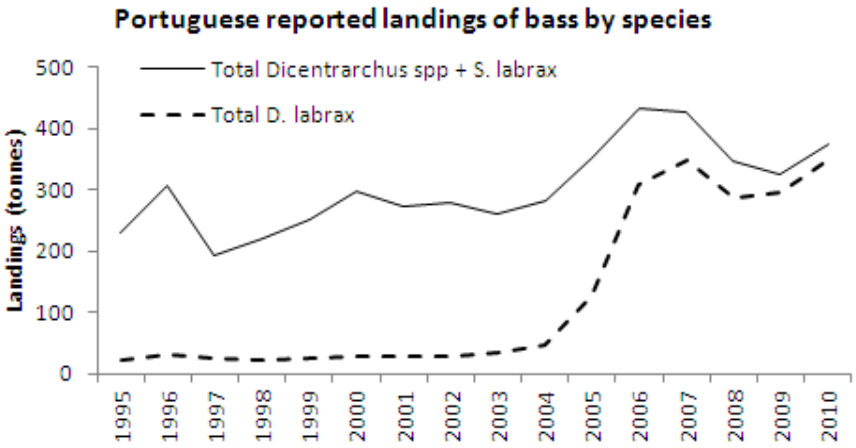


Figure 4.12. Sea bass in the Northeast Atlantic. Landings by area and gear type for Portuguese commercial fishing fleets.

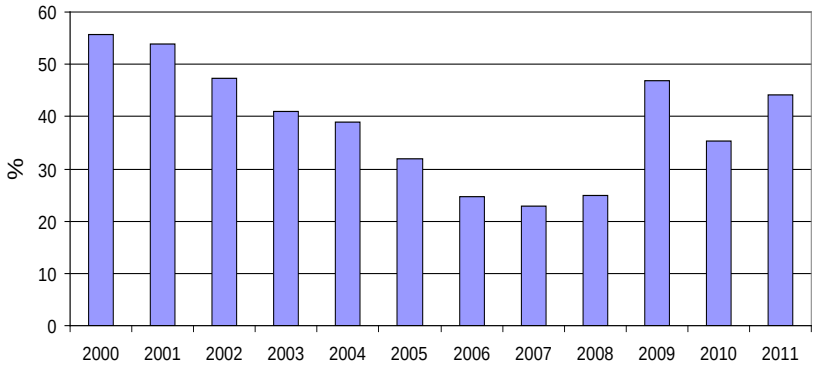


Figure 4.13. Sea bass in the Northeast Atlantic. Percentage of vessel/month for fishing vessels in France (NE Atlantic area), where there are no logbook data when there are sales market records. 2011 data are provisional.

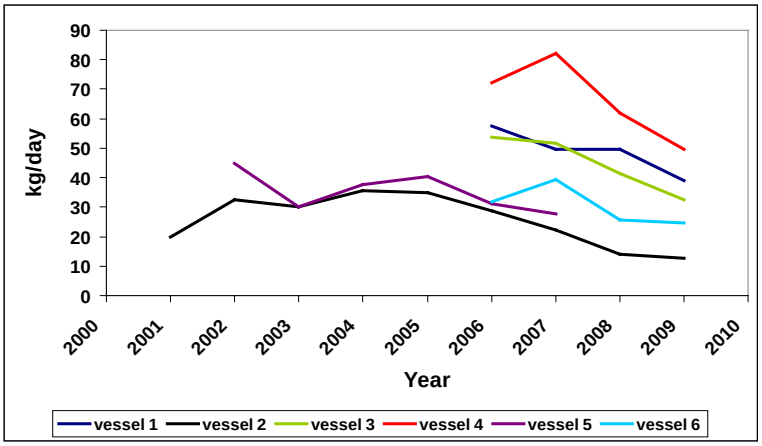


Figure 4.14. Sea bass in the Northeast Atlantic. LPUE (Kg/day) from personal fishing notebooks of six French coastal vessels fishing with lines in Division VIIe.

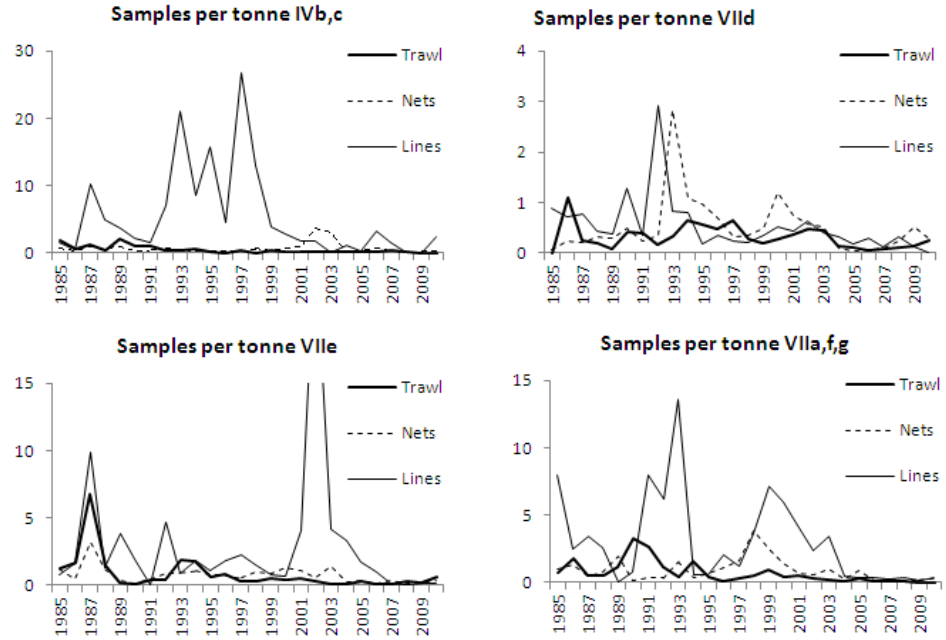


Figure 4.15. Sea bass in the Northeast Atlantic. Annual sampling of UK(Eand W) sea bass landings for length compositions: nos. trips sampled per tonne of bass landed, by area and gear.

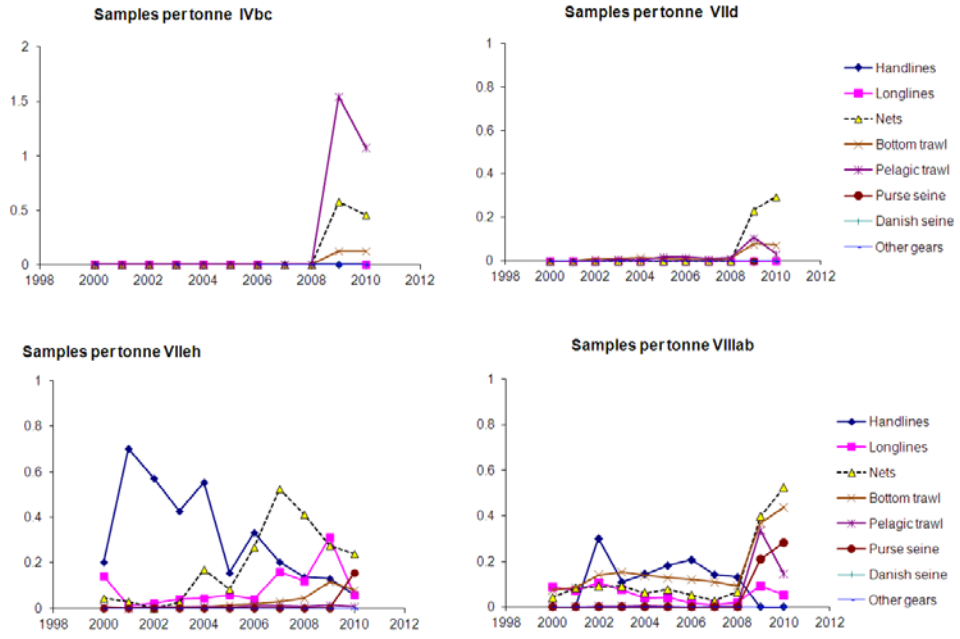


Figure 4.16. Sea bass in the Northeast Atlantic. Annual sampling of bass landings in France for length compositions: nos. trips sampled per tonne of bass landed, by area and gear.

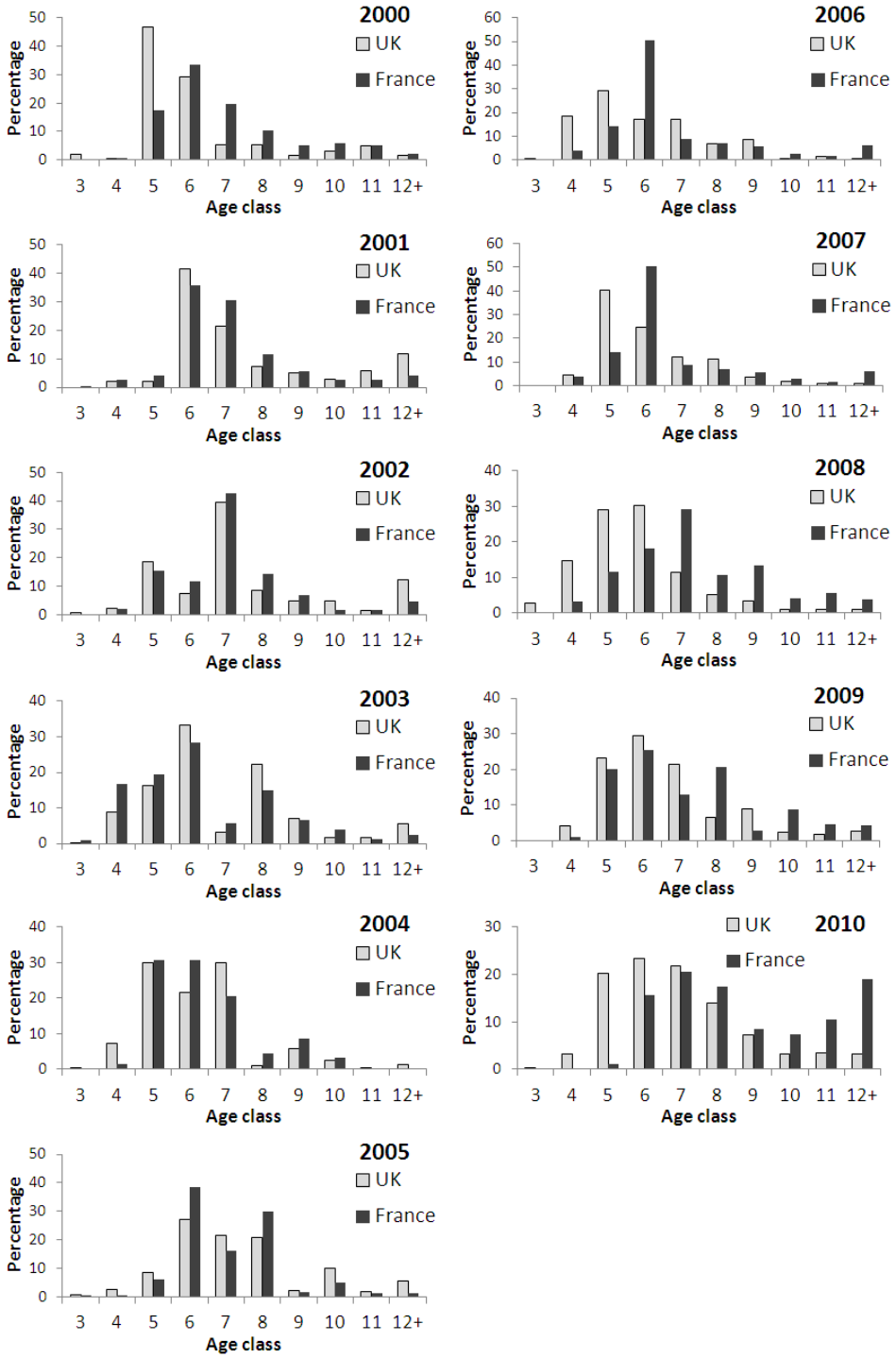


Figure 4.17. Sea bass in the Northeast Atlantic. Seabass in Divisions VIIe,h: Comparison between percentage age composition of annual landings of UK and French bottom trawlers.

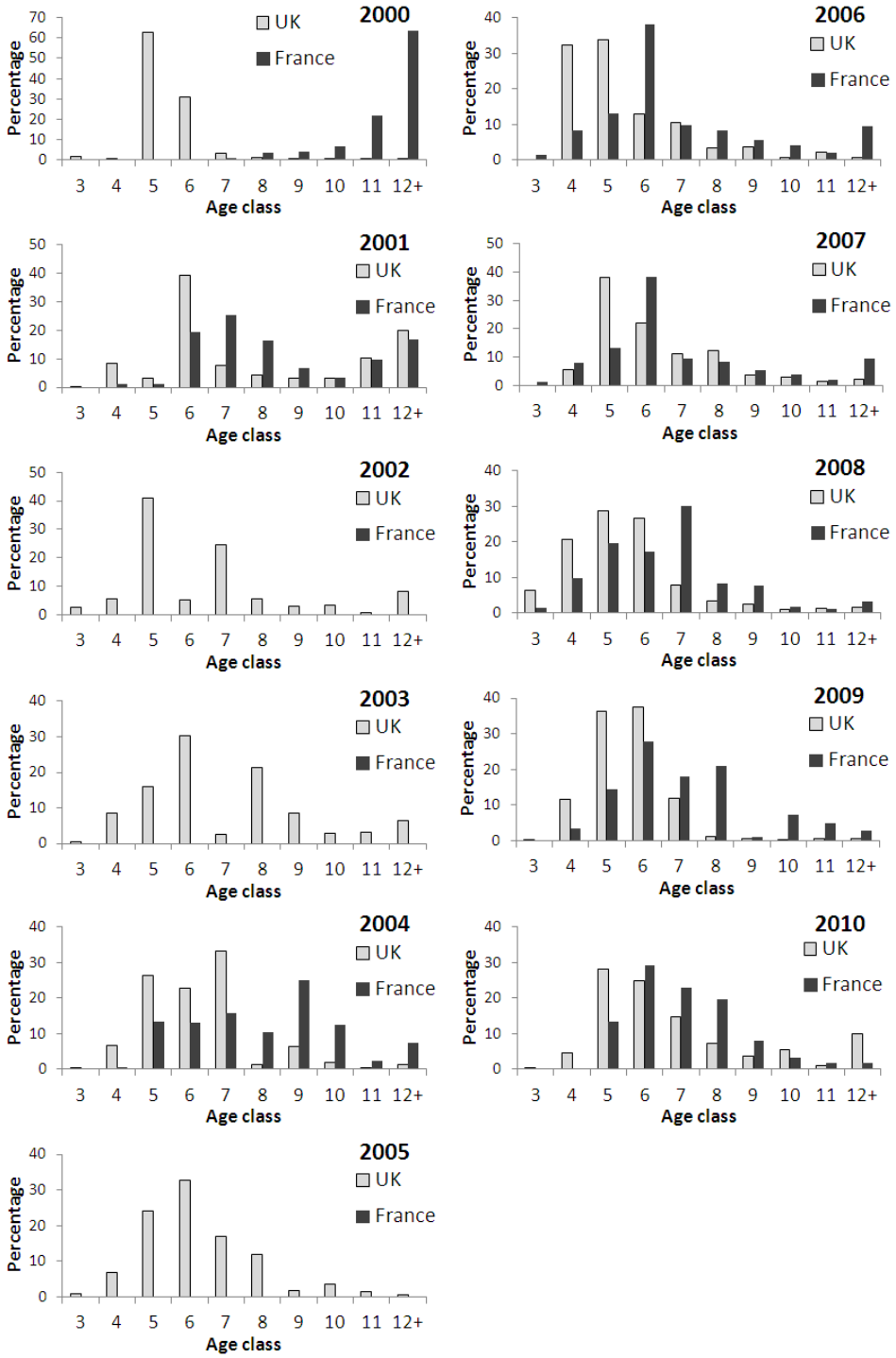


Figure 4.18. Sea bass in the Northeast Atlantic. Seabass in Divisions VIIe,h: Comparison between percentage age composition of annual landings of UK and French vessels using fixed/drift nets

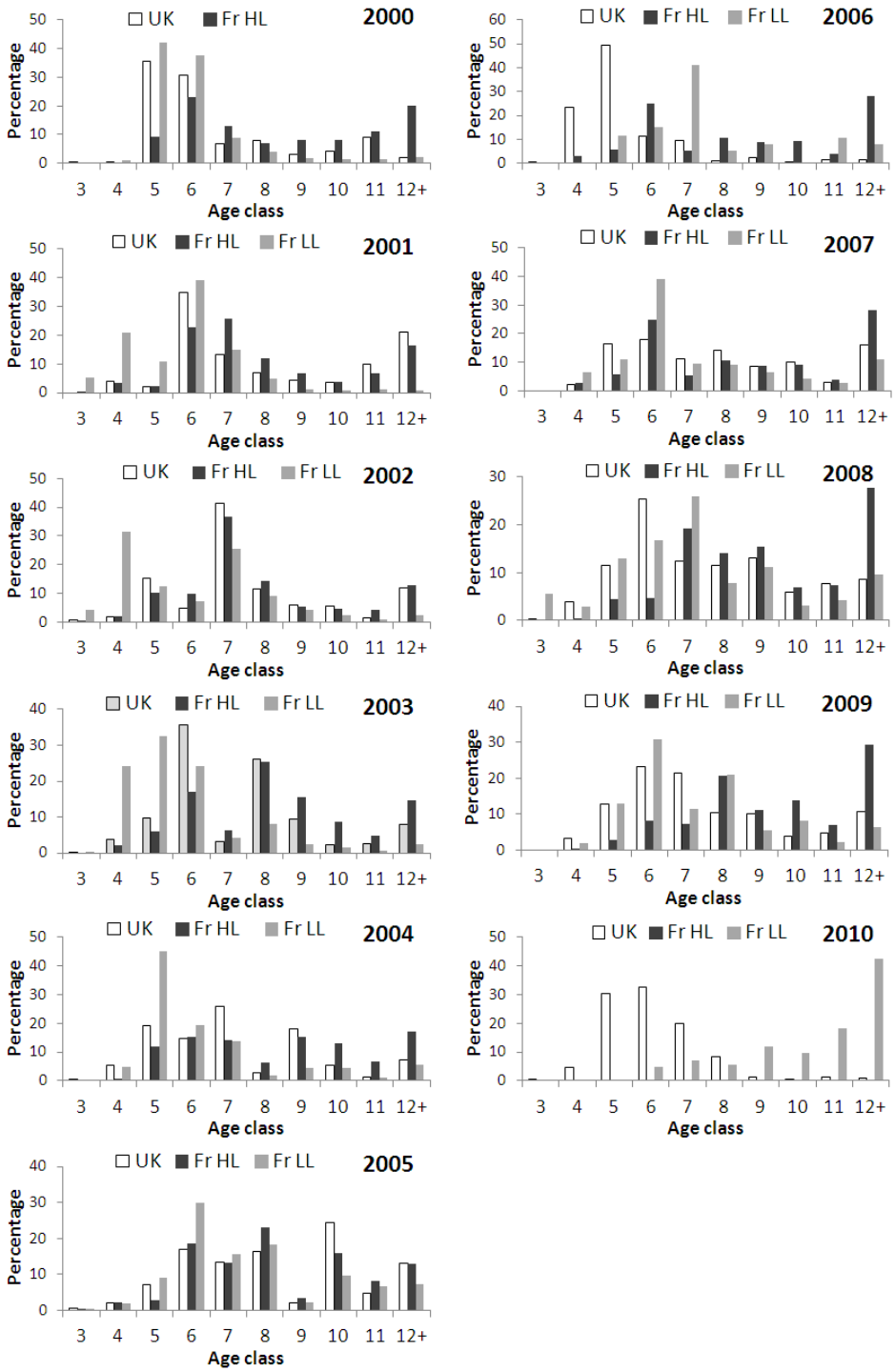


Figure 4.19. Sea bass in the Northeast Atlantic. Sea bass in Divisions VIIe,h: Comparison between percentage age composition of annual landings of UK and French vessels using lines. French data are given separately for handlines (Fr HL) and longlines (Fr LL).

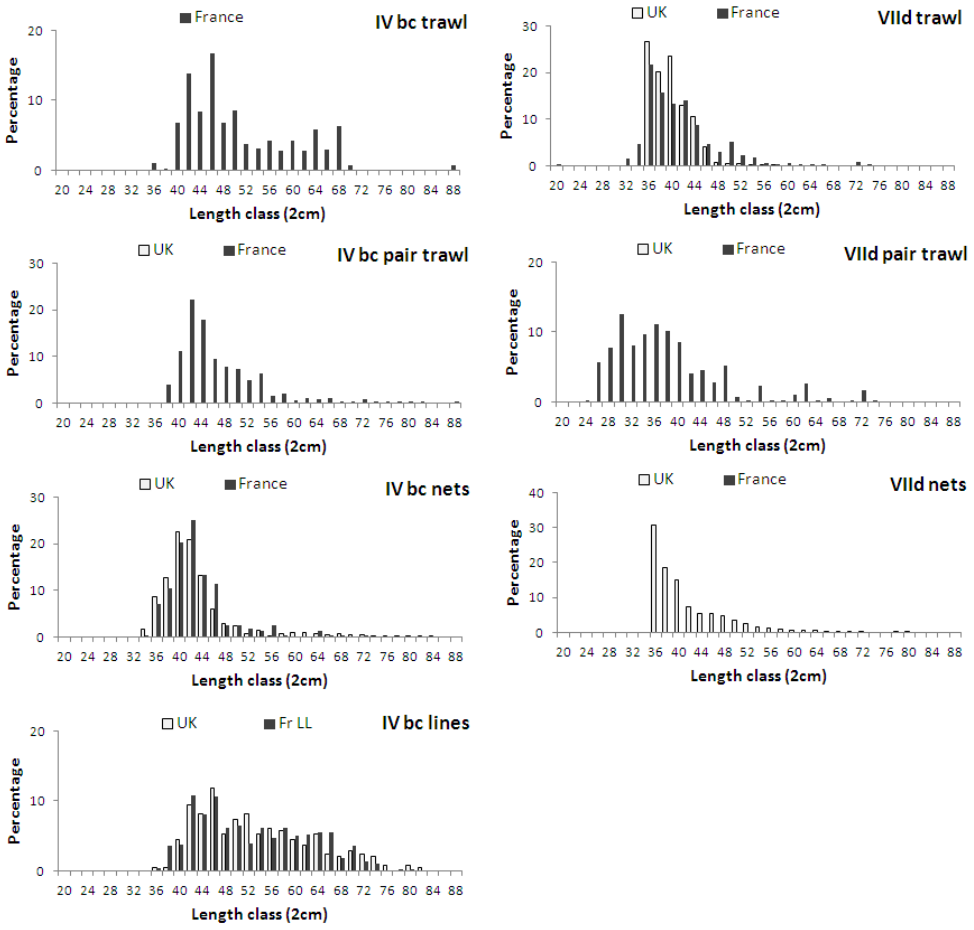


Figure 4.20. Sea bass in the Northeast Atlantic. Sea bass in Divisions IVb,c and VIId: Comparison between percentage length composition of annual landings of UK and French vessels using different gear types (Fr LL = French longlines).

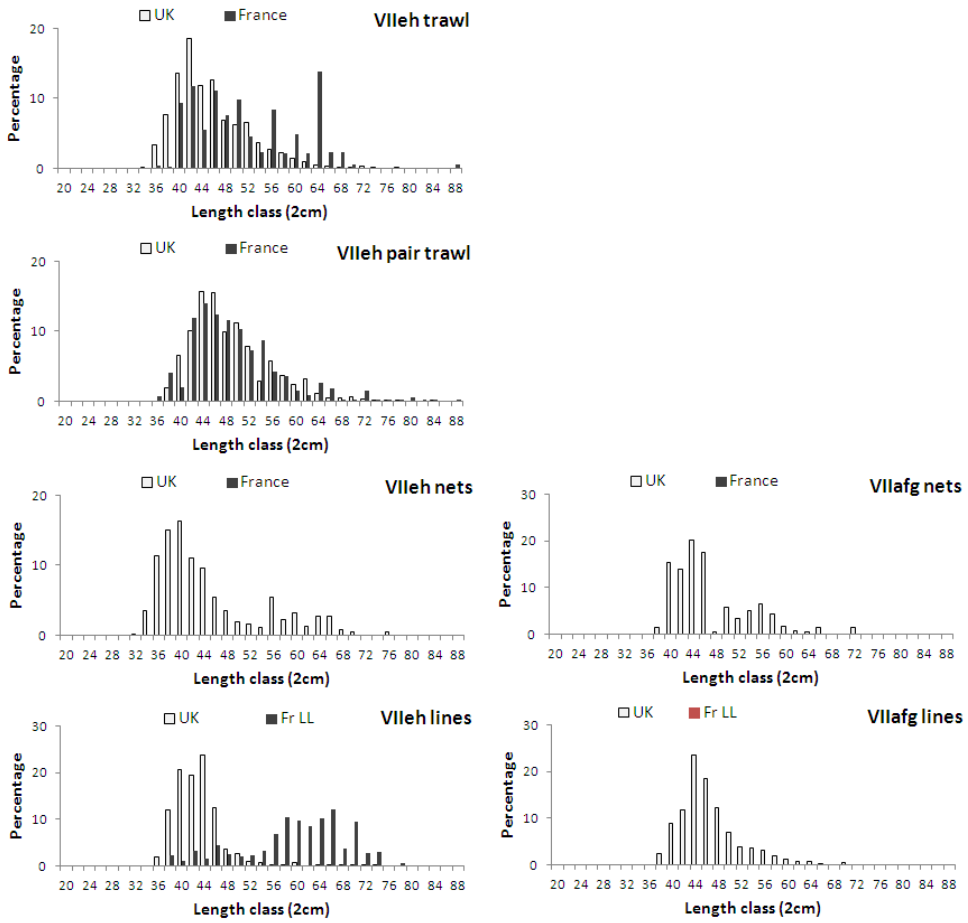
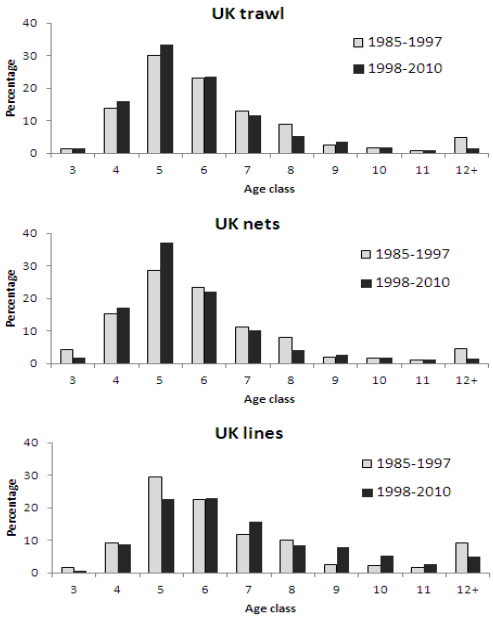


Figure 4.21. Sea bass in the Northeast Atlantic. Sea bass in Divisions VIIe,h and VIIa,f,g: Comparison between percentage length composition of annual landings of UK and French vessels using different gear types (Fr LL = French longlines).

(a)



(b)

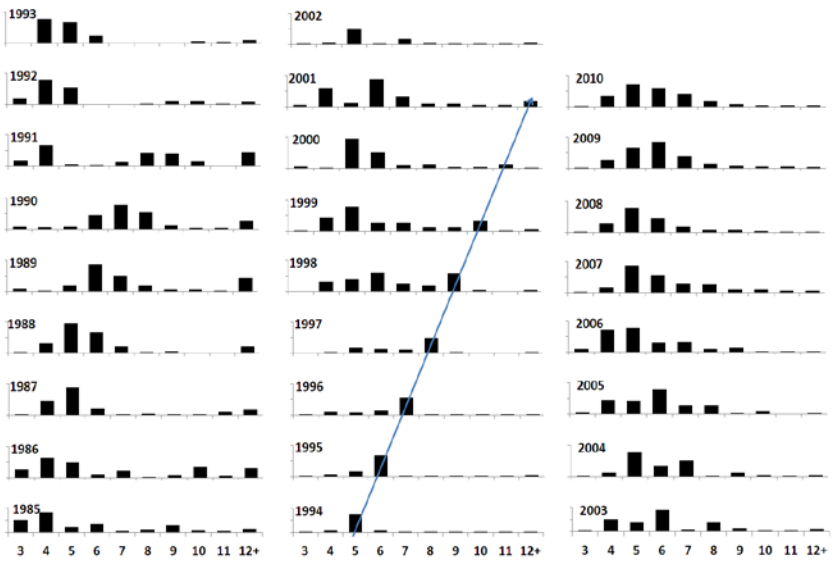
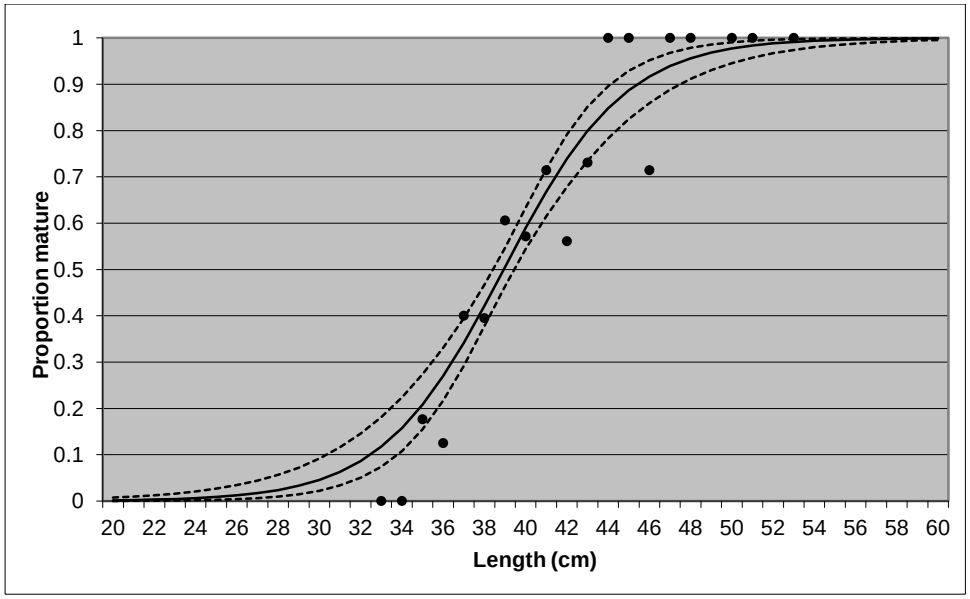


Figure 4.22. Sea bass in the Northeast Atlantic. (a) Average age compositions of UK landings during 1985–1997 and 1998–2010 for trawls, nets and lines in Areas IV and VII; (b) Age composition (percentage) of UK landings of sea bass from all areas, 1985 – 2010. Arroe indicates progression of 1989 year class.

Female bass: all areas and gears sampled in April – June 2009



Maturity ogives for female bass fitted to samples from four area/gear combinations

Top: Northeast trawls (April) **Top: Southeast trawls (April)**

Bottom: Southwest trawls (April) **Bottom: Southwest nets (June)**

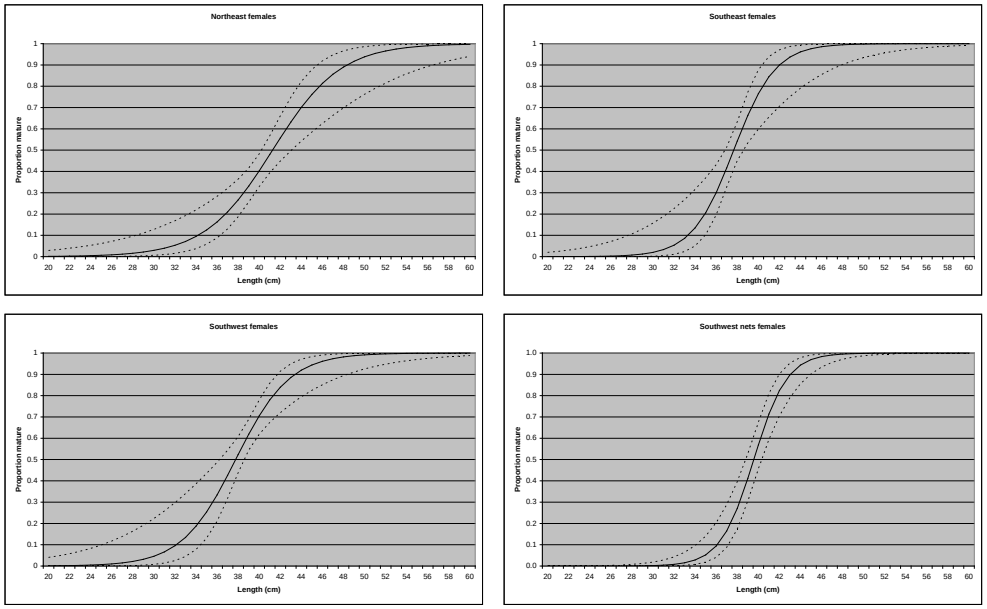


Figure 4.23. Sea bass in the Northeast Atlantic. UK(England). Maturity ogives for female sea bass fitted to proportions mature in 1-cm length classes: (a) from combined sample of three trawl and one gillnet landing from NE, SE and SW England in April – June 2009 (total of 642 fish); (b) separate ogives fitted to data for females from the four samples.

Figure 1. Location of bass nursery areas in England and Wales, showing those in the Solent area where the trawl surveys were conducted (ringed)

Figure 5. Solent bass - current core station positions

Figure 4.24. Sea bass in the Northeast Atlantic. Location and tow positions for UK(England) Solent and Thames sea bass surveys.

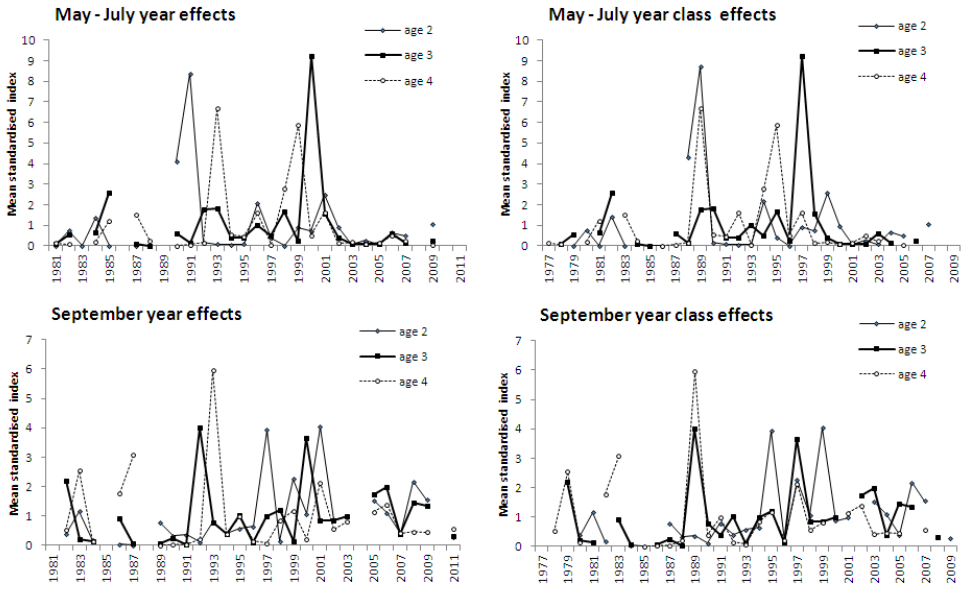


Figure 4.25. Sea bass in the Northeast Atlantic. UK(England) Solent sea bass survey: mean-standardised indices at ages 2, 3 and 4 plotted against year (left-hand plots) and year-class (right-hand plots) for surveys in May-July (top) and September (bottom).

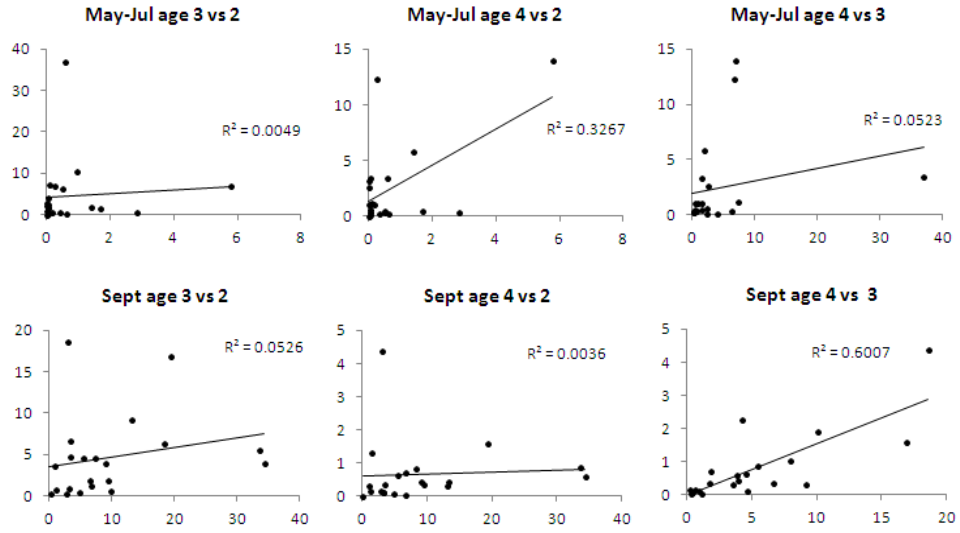


Figure 4.26. Sea bass in the Northeast Atlantic. UK(England) Solent sea bass survey: Internal consistency plots of abundance indices at successive ages in year classes: surveys in May-July (top) and September (bottom).

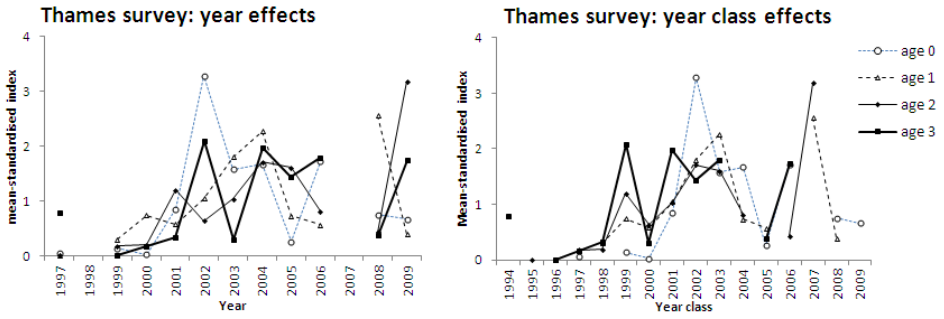


Figure 4.27. Sea bass in the Northeast Atlantic. UK(England) Thames sea bass survey in November: mean-standardised indices at ages 0 - 3 plotted against year (left-hand plots) and year-class (right-hand plots)

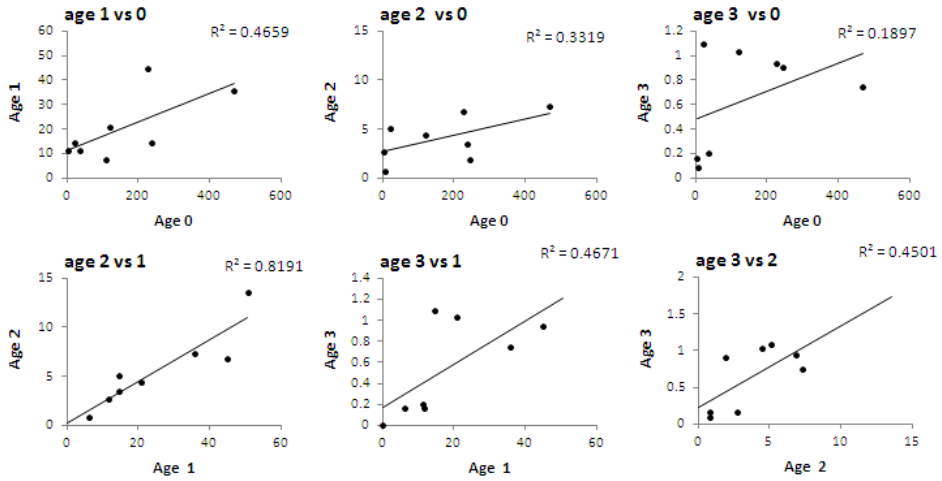


Figure 4.28. Sea bass in the Northeast Atlantic. UK(England) Thames sea bass survey in November: Internal consistency plots of abundance indices at successive ages in year classes.

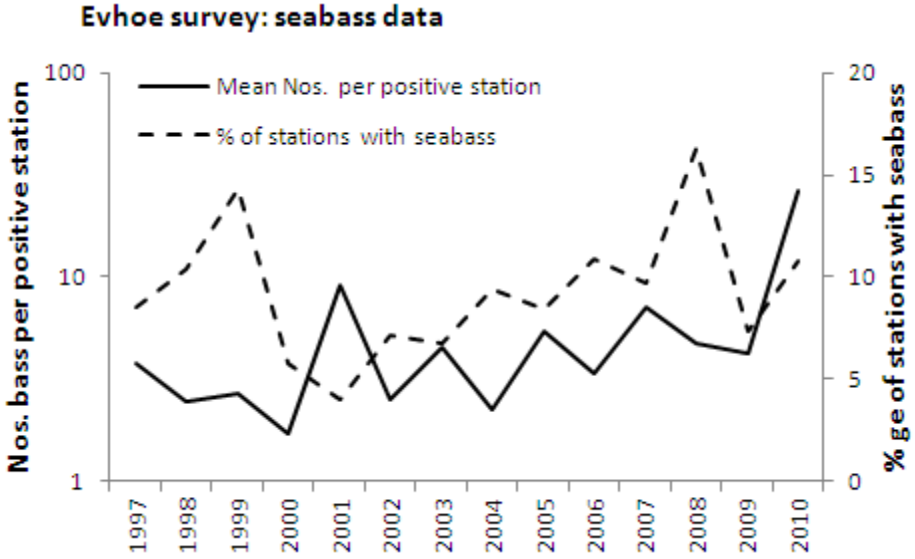


Figure 4.29. Sea bass in the Northeast Atlantic. Incidence and catch-rate of sea bass (all sizes) in the French Evhoe survey, 1997 – 2010. Data are for all areas in VII and VIII covered by the survey. Data are shown as percentage of stations with sea bass, and log of mean catch numbers per positive tow.

5 Striped red mullet

5.1 General biology

The striped red mullet (*Mullus surmuletus*) is a benthic fish, which is found along the European coasts from the South Norway and North Scotland including the Faroe Islands in the North, to the Strait of Gibraltar in the South. This species is also found in the northern part of western Africa and in the Mediterranean and Black Seas (Quéro and Vayne, 1997). Striped red mullet is considered occasional off Norway, around Ireland, at the north coasts of England and in the West of Scotland (Davis and Edward, 1988; Gibson and Robb, 1997).

Analysis of British commercial landings revealed a strong concentration of this species in the central pit of the western Channel during winter (Dunn, 1999). The scientific survey CGFS (Channel Ground Fish Survey), carried out every year by Ifremer in the eastern Channel since 1988, showed that young individuals are distributed in coastal areas, while adults exhibit preferentially an offshore distribution in the eastern part (Carpentier *et al.*, 2009).

Finally, nurseries are located in the Bay of Saint-Brieuc and at the Falklands coasts (Morizur *et al.*, 1996). Striped red mullet is accommodated to deep water and elevated temperatures (ICES, 2007b), and tolerates weak and high salinity (corresponding respectively to juvenile and adult habitats) and is rarely found in the transitions zones of intermediate salinity. This species is met mostly on sandy substratum (Carpentier *et al.*, 2009). Food of striped red mullet is primarily composed of crustaceans and molluscs.

In the English Channel, the first sexual maturity was identified on fish of 16.2 cm for the male and 16.7 cm for the female (Mahé *et al.*, 2005).

5.2 Management regulations

Before 2002, a minimum landing size was set at 16 cm in France. Since, this minimal size requirement has been removed and it resulted on catch of immature individuals (< 14 cm), which has recently been targeted and landed.

5.3 Stock ID and possible management areas

Due to the presence of the striped red mullet in catches all year-round, Dunn (1999) suggested that a single stock should exist within the English Channel, although he could not determine whether this stock was distinct from other western stocks. He also suggested that it might be a newly established stock in the North Sea.

In 2004 and 2005, a study using fish geometrical morphometry was carried out in the Eastern English Channel and the Bay of Biscay. It pointed out a morphological difference on striped red mullets between those from the Eastern English Channel and those from the Bay of Biscay.

In 2010, in the Nespman project, a study based on the shape of the otoliths has been conducted to differentiate stocks. The study area was divided into six geographic sectors: the NS (North Sea; ICES Division IVab), the EEC (Eastern English Channel; ICES Division VIId), the WEC (Western English Channel ; ICES Division VIIe), the CS (Celtic Sea ; ICES Division VIIh), the NBB (North Bay of Biscay ; ICES Division VIIIa) and the SBB (South Bay of Biscay ; ICES Division VIIIb) (Figure 5.1).

In this work, three techniques have been applied: a Fourier, a PCA and a Geodesic approach (In Benzinou *et al.*, submitted). Among these 3, Geodesic approach reached the highest mean correct classification rate (30%). The confusion matrix of Geodesic approach on dataset with six geographic sectors, achieved by K-Nearest Neighbours classifier (*In* Benzinou *et al.*, submitted) showed that populations of striped red mullet of Western English Channel and Eastern English Channel could be separated (Table 5.1).

In the north, it appears a continuum between the North Sea and the Eastern English Channel. In the same way, a continuum has been identified between the north and the south of the Bay of Biscay. Currently, we do not have enough data to separate the Bay of Biscay from the Celtic sea or the Eastern English Channel.

Therefore, for management purposes, two areas could be considered for this species:

- the north area (III, IV and VIId)
- the south area (VI, VIIa,e,g,h,j-VIIIa,b and IXa)

5.4 Fisheries data

According to ICES statistics, in the Atlantic Ocean, fishery of this species was only conducted by Spain and Portugal from 1950 to 1975, then France also part of it. From 1950 to 1975, fishing of striped red mullet was carried out nearby the Spanish coasts and in the bay of Biscay. From 1990, catches strongly increased, essentially due to France, but also to England and Netherlands fisheries. It could be explained by the beginning of exploitation of the striped red mullet in the English Channel and in the North Sea (Figure 5.2).

Currently, the main country that catches striped red mullet is France. The striped red mullet is a target species for this country and is mainly caught (> 90%) by bottom trawlers with a mesh size of 70–99 mm in the Eastern Channel and south of the North Sea (Figure 5.2). In the Eastern English Channel and south of the North Sea, the complementary gears are essentially represented by various trawlers and in Western English Channel by various gears and gillnets. Striped red mullet catches, achieved by these complementary metiers, remain accessory.

The trawlers concerned by striped red mullet fishery have a length and a power respectively of about 20 meters and 400 kilowatts yearly average. This has remained stable since 1991. Among this fleet, 71% of the ships which fish in the south of the North Sea, show to fish also in the Eastern English Channel. Only 24% of ships fishing in the Western English Channel frequented the Eastern English Channel.

Main areas for the striped red mullet exploitation are areas IV, VIId,e and VIIIa,b. French catches are the most important in the entire zone. Other important countries are the Netherlands and the United Kingdom with regard to the English Channel (VIId,e) and the North Sea (IV), where catches are concentrated in the south (IVb,c). The north of the Bay of Biscay (VIIIa,b) is exploited by France and Spain. The south (VIIIc) is only exploited by Spain. Other countries concerned by this fishery for small catches are Germany, Scotland, Denmark and Ireland.

Since 2008, landings decrease in the north area (IV-VIId) (Figure 5.3, Figure 5.4 and Figure 5.5). One observed a reverse trend in the south.

This species is not discarded by French vessels. Striped red mullet was rare in the discard samples of Portuguese bottom otter trawl fleet (OTB) in ICES Division IXa

and, when present, were found in low strength (Fernandes and Prista, 2012). More investigations on potential discarding should be carried out in other countries areas.

5.5 Survey data, recruit series

Since 1988, striped red mullet abundance indices are currently available for the Bay of Biscay (EVHOE survey), the Celtic sea (EVHOE survey), the western English Channel (UK-WCBTS survey), the eastern English Channel (CGFS survey), and for the North Sea (IBTS survey Q1 and Q3) (Figure 5.6).

In the north area (III, IV and VIId), abundance indices (CGFS survey and IBTS surveys Q1 and Q3) of 3 surveys were used. During the last decade, variable abundance during CGFS survey has been observed with 3 large peaks in 2003, 2007 and 2009 (from 50 to 70 per hour, Figure 5.6). For the years 2003 and 2007, a peak of abundance has been observed too, during IBTS survey Q3 in the North sea. Abundance indices of IBTS-Surveys Q3 are more higher than these of IBTS-Survey Q1 (Figure 5.7). Abundance of striped red mullet during of IBTS-Surveys Q3 presented trend to increase from 1990 to 1995 and after this date, abundance trend to decrease. The maps of these surveys show the different spatial distributions with the fish close to the UK coasts during Quarter 1 and in the south-eastern of the North sea (coasts of Belgium and the Netherlands) during Quarter 3 (Figure 5.8). Abundance indices of striped red mullet per age class during FR-CGFS from 2006 to 2011 presented Age groups from 0 to 2 only (Figure 5.9). In consequently, the abundance of this survey give recruitment index. Correlation between Abundance indices of striped red mullet per age class during FR-CGFS and landings in ICES Subareras IV and VIId showed that the landings are strongly correlated to the recruitment (Figure 5.10). The Age Length Key of striped red mullet in the north Sea during the IBTS-Q1 survey did not show the recruitment only with mainly age groups between 1 and 3 (Figure 5.11).

In the south area (VI, VIIa,e,g,h,j-VIIIa,b and IXa), abundance indices (EVHOE survey and UK-WCBTS survey) of 2 surveys were used. These 2 surveys do not present trend (Figure 5.6). There are few peaks of abundance of striped red mullet in Celtic sea and the bay of Biscay (EVHOE-WIBTS Q4) and the Eastern English Channel (UK-WCBTS Survey). During EVHOE-WIBTS-Q4 Survey, 2001, 2003, 2005 and 2009 present peaks of abundance of striped red mullet (from 16 to 23 per hour, Figure 5.6). Abundance indices per size class during EVHOE-WIBTS-Q4 show mainly fish between 8 to 17 cm (TL). In consequently, the abundance of this survey give recruitment index. UK-WCBTS survey in the Eastern English Channel

Since 1979, the PGFS (Portuguese Autumn Groundfish Survey) covers the whole Portuguese continental coast, within depths ranging from 20 to 500m. The PCTS (Portuguese Crustacean Trawl Survey) covers the Southwestern and the South regions of the Portuguese continental coast, with depths ranging from 200 to 750m. Data from these surveys shows that striped red mullet distributes along the Portuguese coast, at depths ranging between 20 and 700 m deep. Some investigations on potential distribution of this species should be carried out in the Spanish coasts between the Portuguese coasts and the bay of Biscay.

5.6 Biological sampling

The Netherlands sampled 31 fishes in 2009 during Quarter 3 and 223 fishes in 2010 (month 5 : 60; month 6 : 60; month 7 : 60 ; month 10 : 45) for age estimation in the North sea. The Azti institute carried out sexual maturity and measures in length in 2009, in the bay of Biscay.

An inventory of the French data collected from the bay of Biscay to the North Sea is given in Table 5.2. French samplings started in 2004 in the Eastern Channel and in south North sea, and since 2008 in the bay of Biscay.

A French study on the sampling optimisation (IVc; VIId) was presented in the WGNEW 2010 (ICES, 2010). The results showed a strong yearly adequacy between sampling and catches (Mahé *et al.*, 2007).

5.7 Biological parameters and other research

Since 2004, data (age, length, sexual maturity) are usually collected by France for the Eastern English Channel and the southern North sea (Table 5.2). France started to collect data for VIIIa,b at the end of 2007. In 2007–2008, the striped red mullet otolith exchange had for goal to optimise age estimation between countries (ICES, 2009).

In 2011, an Otolith Exchange Scheme has been realised, which was the second exercise for the Striped red mullet *Mullus surmuletus*. Four readers of this exchange interpreted an images collection coming from the Bay of Biscay, the Spanish coasts and the Mediterranean coasts (Spain and Italy). A set of *Mullus surmuletus* otoliths (N=75) from the Bay of Biscay presented highest percentage of agreement (82%). On 75 otoliths, 34 were read with 100% agreement (45%) and thus a CV of 0%. Modal age of these fishes was comprised between 0 and 3 years (Mahé *et al.*, 2012).

5.8 Analysis of stock trends / assessment

Currently, age structured analytical stock assessment is not possible due to a too short time series of available data.

By comparing landings from ICES Subareas IV and VIId with the abundance indices of CGFS-survey by age-group, one can noticed that abundance indices of Age-group 1 have the same trend as the landings (Figure 5.7). This analysis should be supplemented but these results showed that landings were essentially constituted by young fish (Age group 1). These results confirm the analysis of landings composition by age group from 2004 to 2008 from ICES Subareas IV and VIId.

5.9 Data requirements

Regular sampling of striped red mullet catches must be continued under DCF. Sampling in the Eastern Channel and in south North Sea started in 2004. The effort of sampling (700 otoliths) in these zones is sufficient (ICES, 2007) but must be continued. Effort of sampling in the North sea (IV b and c), the Western Channel, the Celtic Sea and in the bay of Biscay started in 2009. In 2010 and 2011, a sampling level for age and maturity data was diminished compared to 2009, due to the end of the Nespman project.

Since 2009, a concurrent sampling design carried out, should provide more data (length compositions) than in recent years.

The FR-CGFS and FR-EVHOE surveys would continue to provide abundance indice series at age. However, The FR-CGFS survey is not funded by DCF. In the same way, there do not exist any surveys in the Western Channel (VIIe) which extend to French and English waters, whereas catches of the striped red mullet in this geographical area in particular, are as significant as catches in the Celtic sea.

5.10 References

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Table 5.1. Striped red mullet. Confusion matrix (in %) for Geodesic approach on dataset (1) achieved by K-Nearest Neighbours classifier (*In* Benzinou *et al.*, submitted). Mean correct classification rate was 30% (25% for PCA approach and 19% for Fourier approach).

Geodesic approach on Dataset (1)						
	Actual Class					
Estimated Class	NS	EEC08	WEC	CS	NBB	SBB
NS	**15**	20	11	8	5	11
EEC08	28	**44**	17	23	5	5
WEC	9	9	**22**	11	7	9
CS	24	15	24	**32**	15	13
NBB	10	5	16	13	**27**	22
SBB	14	7	10	13	41	**40**

Table 5.2. Striped red mullet. Biological sampling in France.

YEAR	LENGTH		AGE		MATURITY		INDIVIDUAL WEIGHT	
	Fish number	Sample number	Fish number	Sample number	Fish number	Sample number	Fish number	Sample number
1994	181	23	-	-	-	-	-	-
1995	246	32	-	-	-	-	-	-
1996	-	-	-	-	-	-	-	-
1997	-	-	-	-	-	-	-	-
1998	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-
2002	65	9	-	-	-	-	-	-
2003	147	17	-	-	-	-	-	-
2004	142	17	372	12	620	12	1401	12
2005	536	10	301	3	196	3	301	3
2006	1941	10	646	4	646	4	646	4
2007	5053	129	740	4	740	4	740	4
2008	4396	124	447	5	447	5	190	2
2009	8648	334	1221	11	1221	11	1076	9
2010	7931	328	779	8	779	8	528	4
2011	8138	326	585	7	445	6	375	4

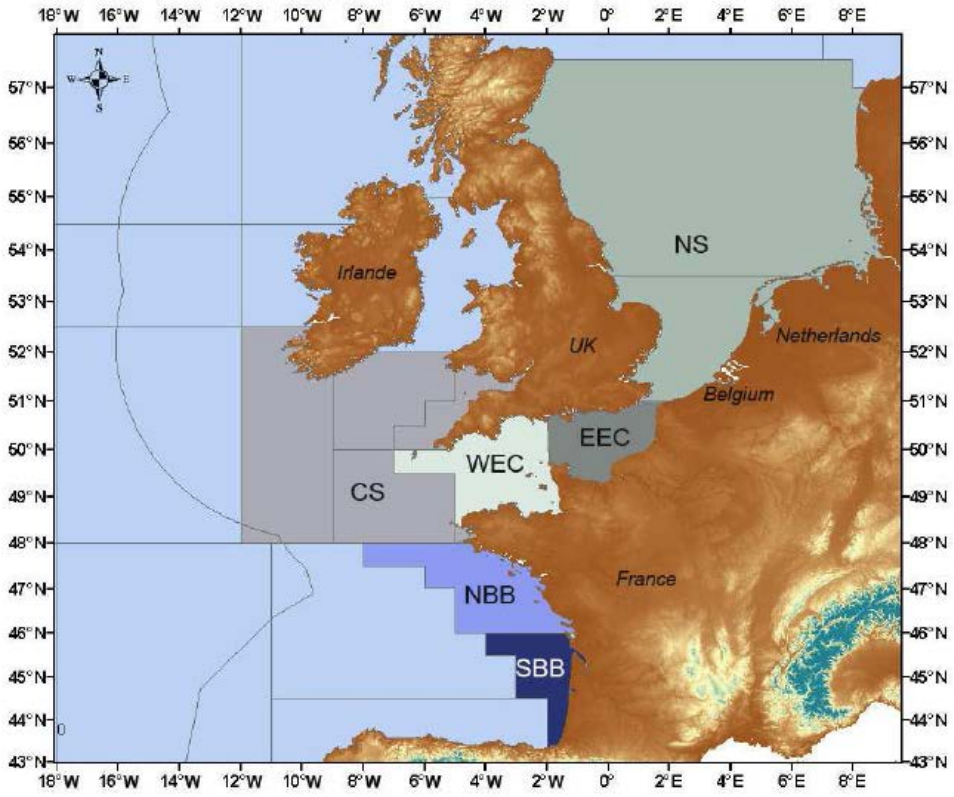


Figure 5.1. Striped red mullet. Map divided into 6 geographic sectors.

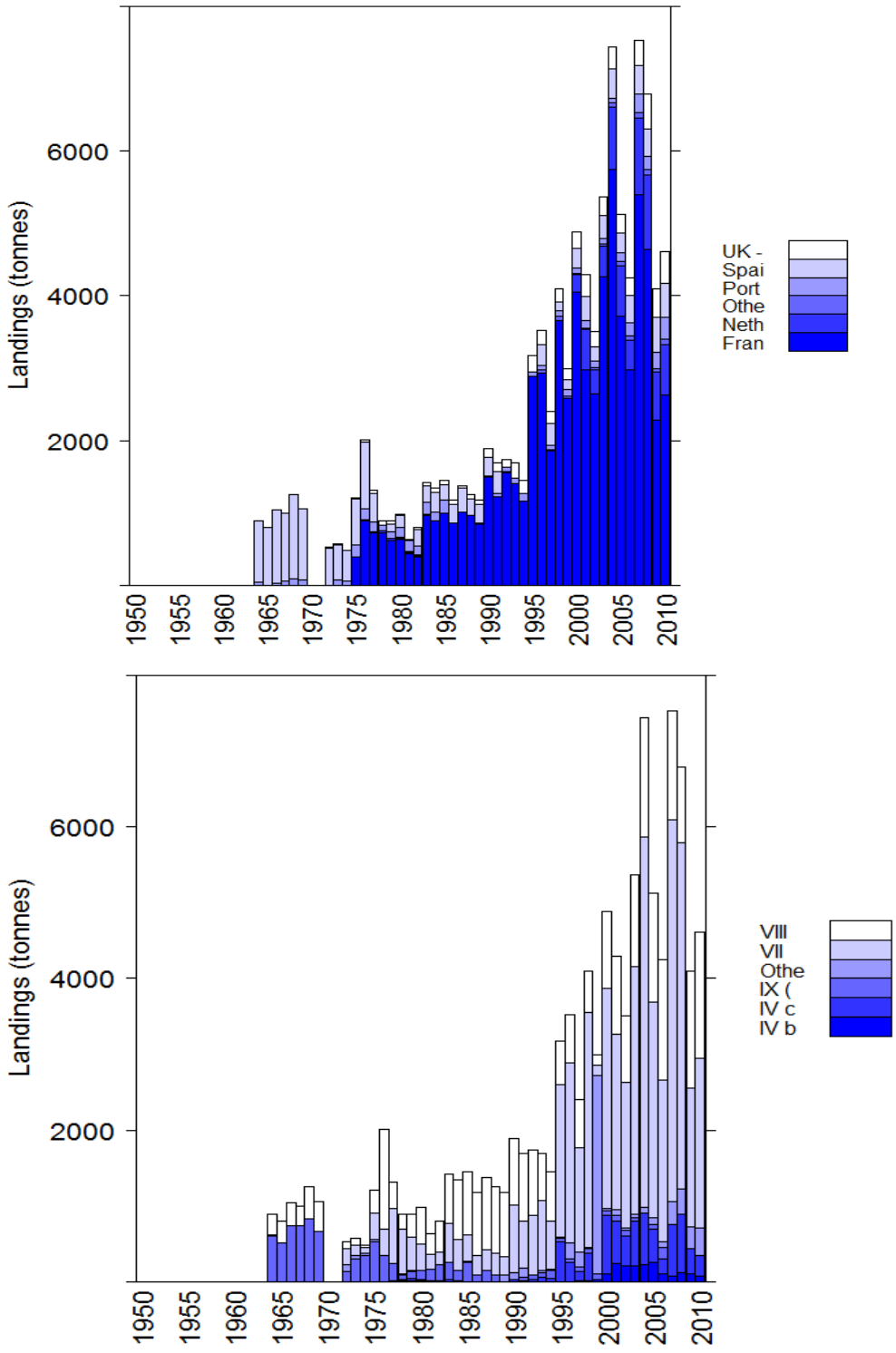


Figure 5.2. Striped red mullet. Landings per country (top panel) and per ICES area (bottom panel). As officially reported.

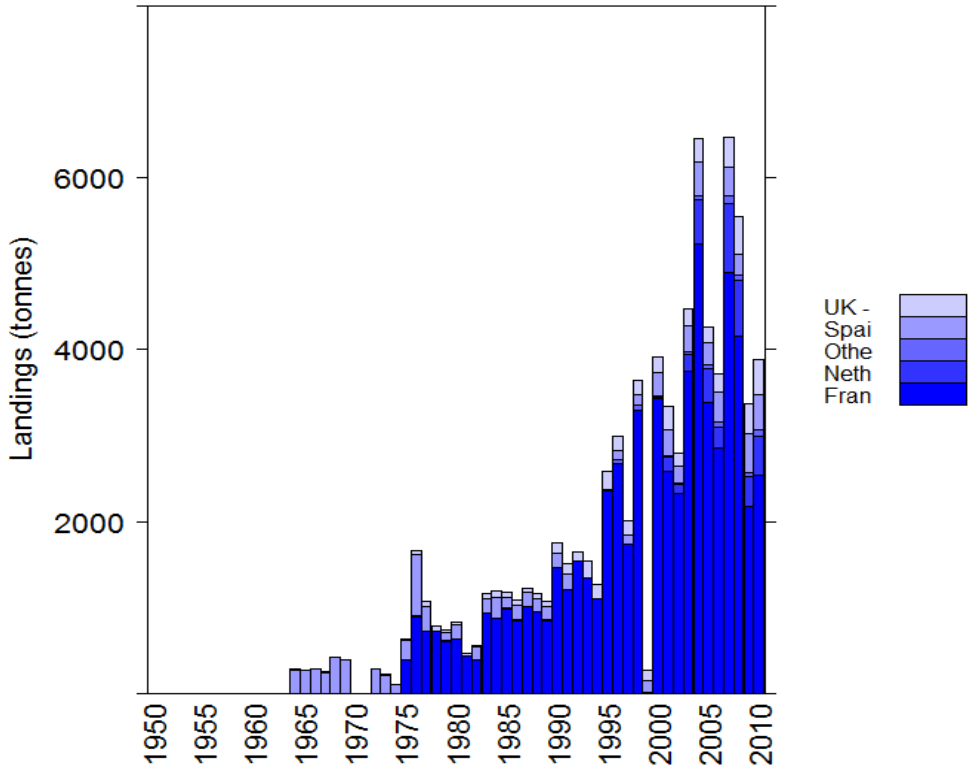


Figure 5.3. Striped red mullet. Landings in ICES area VIId by country. As officially reported.

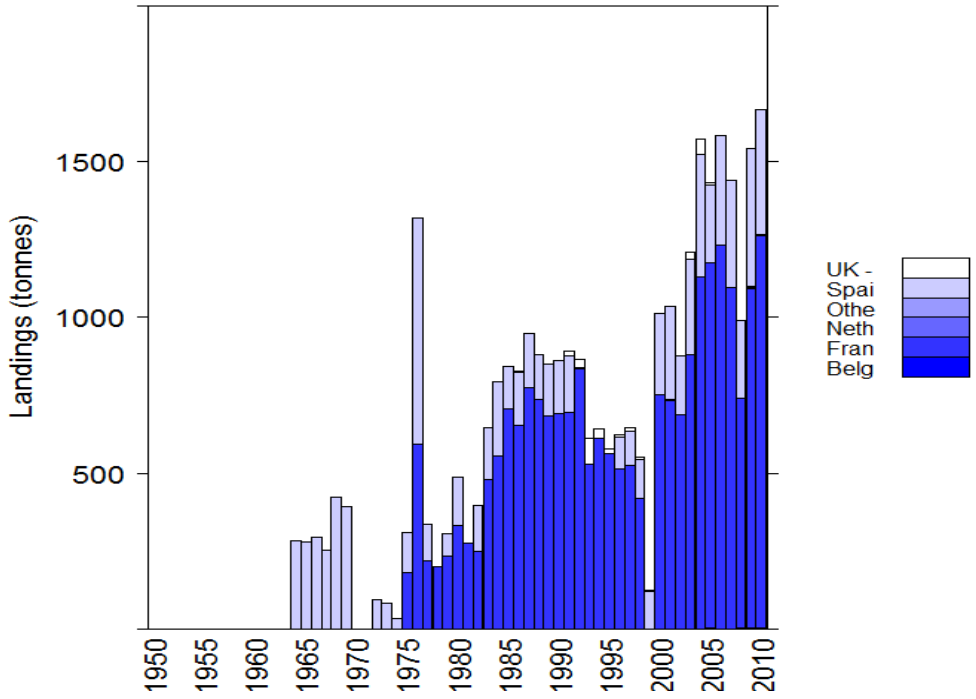


Figure 5.4. Striped red mullet. Landings in ICES area VIII by countriy. As officially reported.

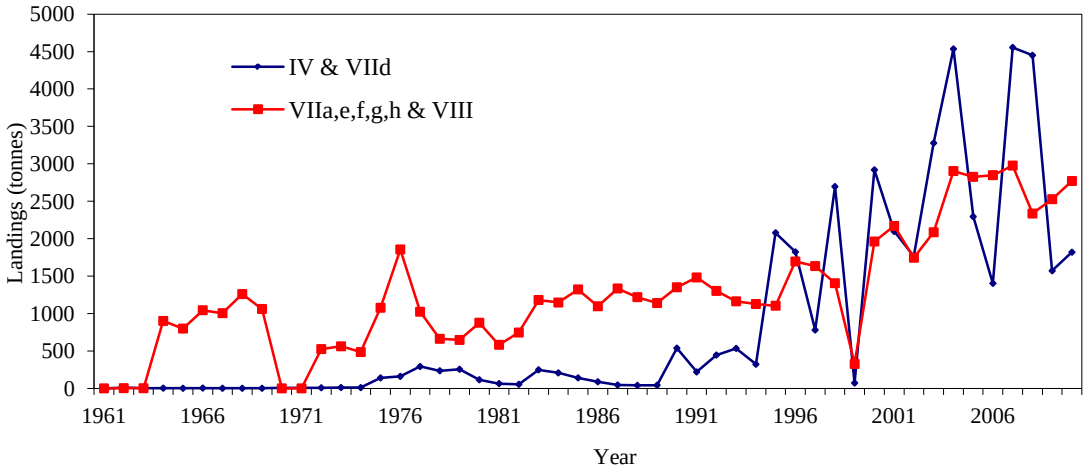


Figure 5.5. Striped red mullet. Landings from 1960 to 2010 in the north zone (ICES areas : VIId and IV) and in the south zone (ICES areas : VIIa,d,g,h, j and VIII). As officially reported.

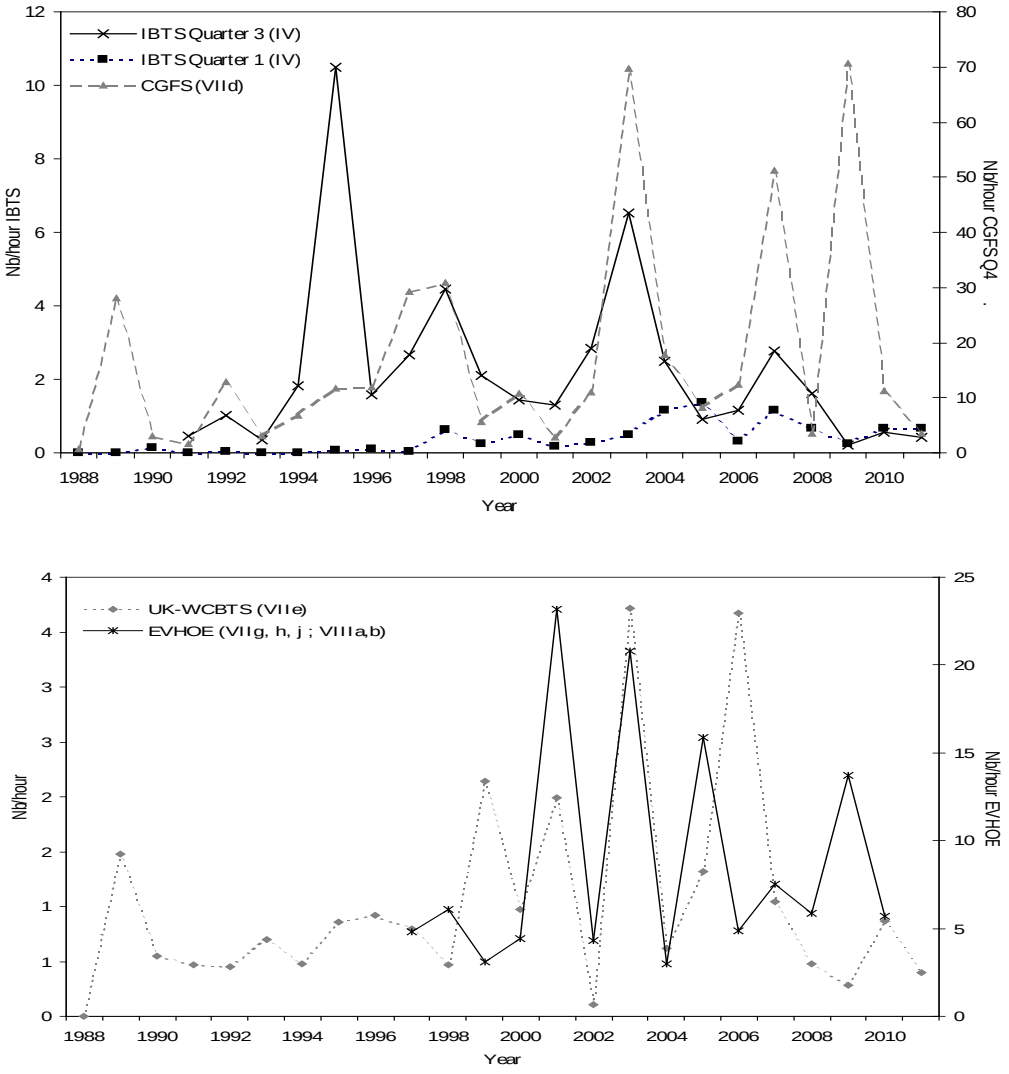
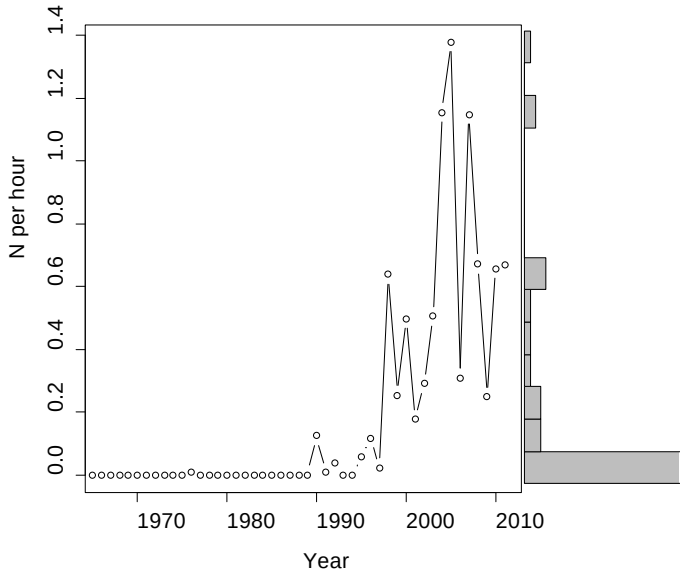
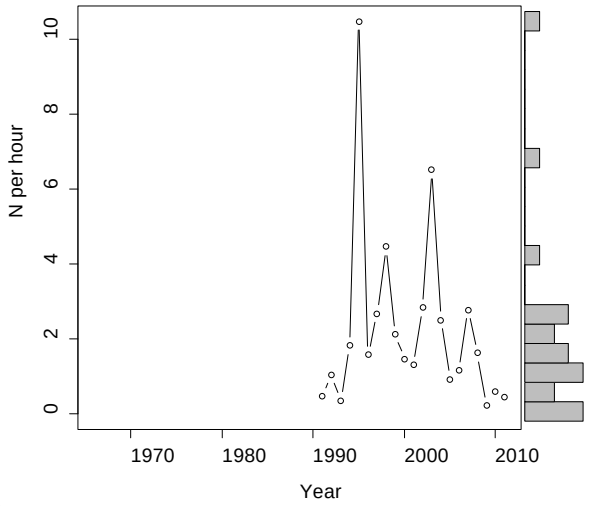


Figure 5.6. Striped red mullet. Time series of abundance (Nb/hour) of striped red mullet base on Surveys (International Bottom Trawl Survey (IBTS, IV), Channel Ground Fish Survey (FR-CGFS, VIId), UK-WCBTS (VIIe), EVHOE-WIBTS survey (VIIg, h, j ; VIIIa,b) from 1988 to 2011.

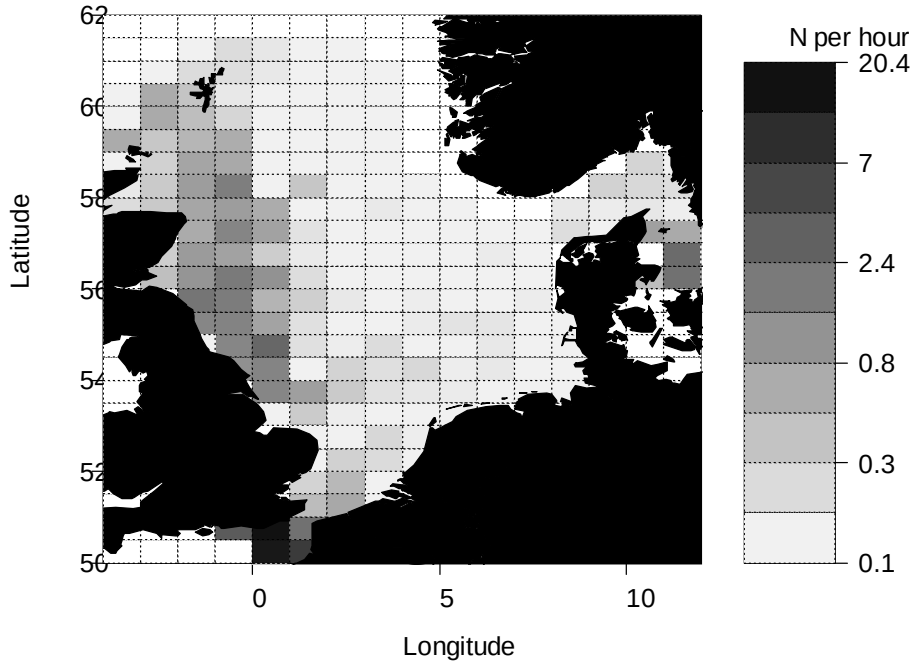


IBTS Q1

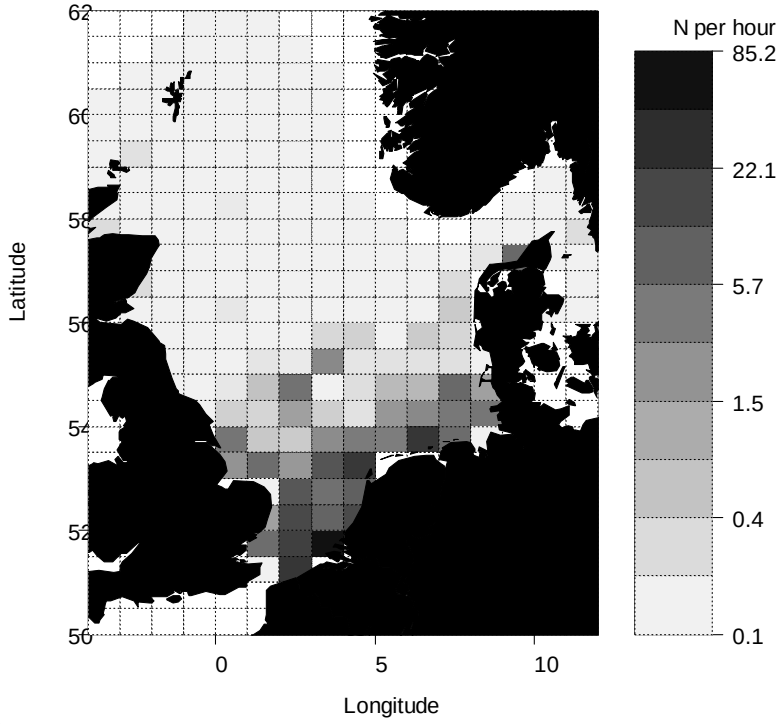


IBTS Q3

Figure 5-7. Striped red mullet. Time series of abundance (Nb/hour) of striped red mullet base on International Bottom Trawl Survey (IBTS, IV) during Q1 (top panel)and Q3 (bottom panel), Width of grey rectangle is proportional to the occurrence of striped red mullet.



IBTS Q1



IBTS Q3

Figure 5.8. Striped red mullet. Map of abundance index (Nb/hour) of striped red mullet during the IBTS survey Q1 (top panel) and Q3 (bottom panel).

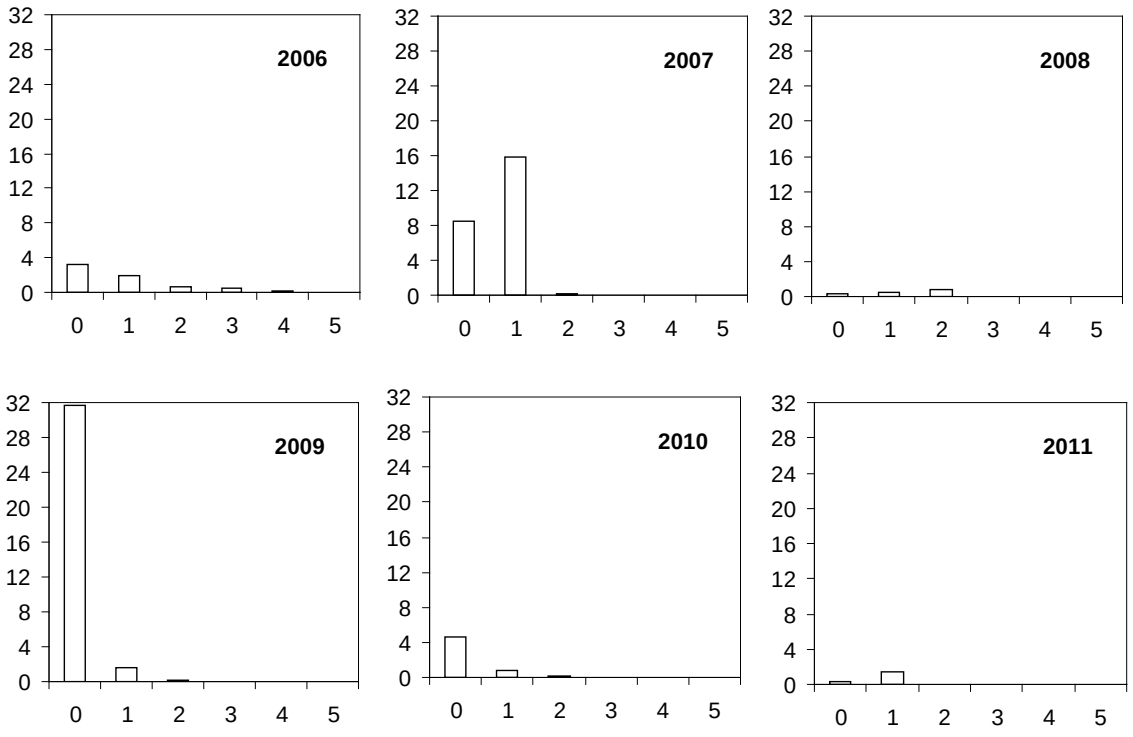


Figure 5.9. Striped red mullet. Abundance indices (Nb/30 min Trawl) of striped red mullet per age class (Length, cm.) during FR-CGFS from 2006 to 2011.

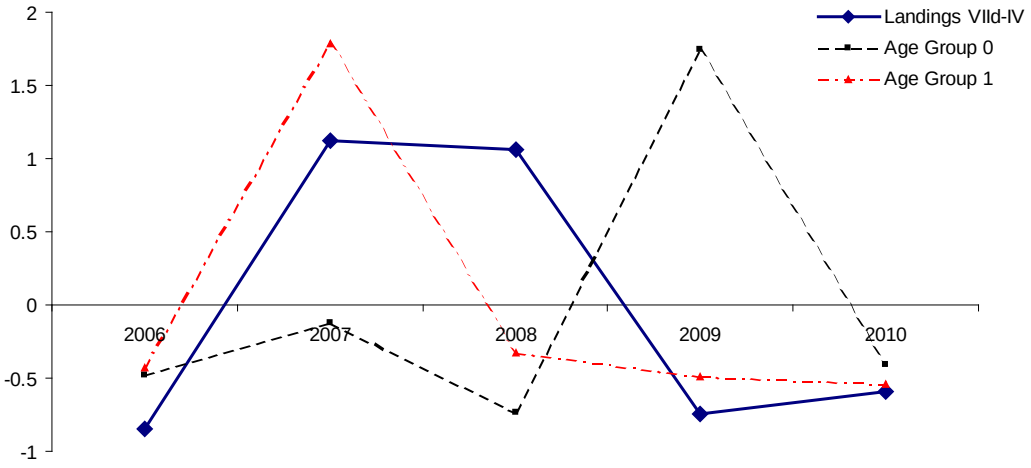


Figure 5.10. Striped red mullet. Mean standardised of Abundance indices base on CGFS survey (ICES Subarea VIId) from 2006 to 2010 per age class and total landings (ICES Subareas VIId-IV) of striped red mullet.

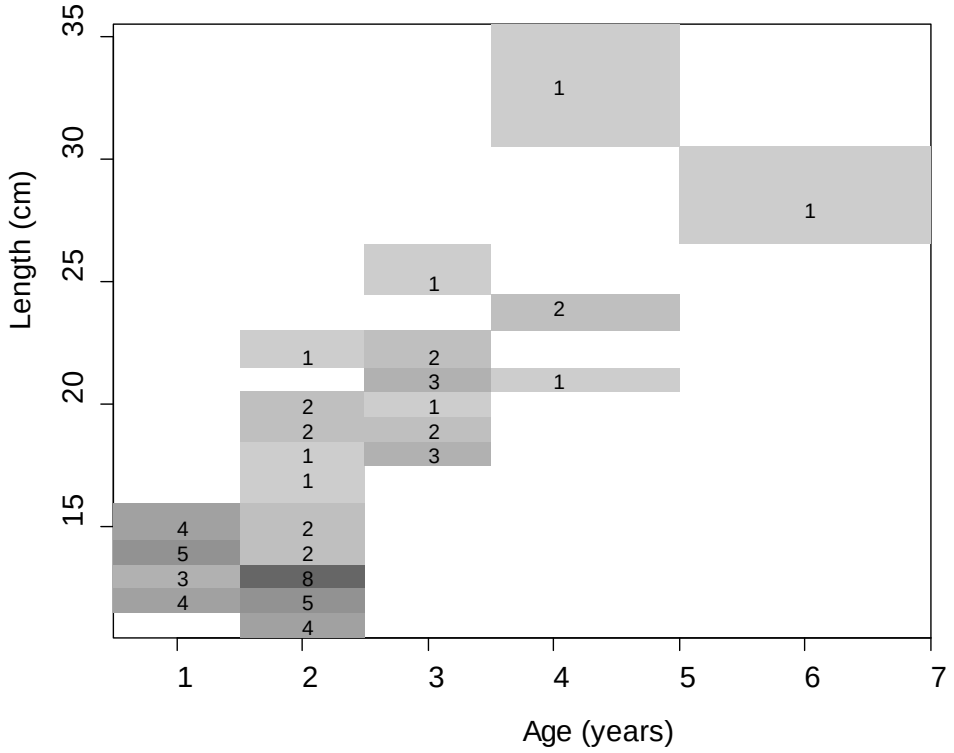


Figure 5.11. Striped red mullet. Age Length Key of striped red mullet in the north Sea during the IBTS-Q1 survey.

6 Red gurnard

6.1 General Biology

The main biological features known for red gurnard (*Aspitrigla (Chelidonichthys) cuculus*) are described in annex 3. This species is widely distributed in North-East Atlantic from South Norway and North of the British Isles to Mauritania on grounds between 20 and 250 m. This benthic species is abundant in the Channel (VIIde) and on the shelf West of Brittany (VII h, VIII a), living on gravel or coarse sand. In the Channel, the size at first maturity is ~25 cm at 3 years old.

6.2 Stock identity and possible assessments areas

A compilation of datasets from the IBTS and BTS surveys undertaken within the project 'Atlas of the marine fishes of the northern European shelf' (Heessen *et al.*, WD 1) has produced a distribution map of red gurnard (Figure 6.1). Higher occurrences of red gurnard with patchy distribution have been observed along the Western Approachs from the Shetlands Islands to the Celtic Seas and the Channel.

A distribution patch crossing the Channel and the West of Brittany does not militate for a separation of the Divisions VII d from VII e and VII h. Therefore a split of the population between the Ecoregions do not seem appropriate.

Further investigations are needed to progress on stocks boundaries such as morphometric studies, tagging and genetic population studies.

6.3 Management regulations

There is currently no technical measure specifically applied to red gurnard or other gurnard species. The exploitation of red gurnard is submitted to the general regulation in the areas where they are caught. There is no minimum landing size set.

6.4 Fisheries data

Red gurnard is mainly caught as by-catch by demersal trawlers in mixed fisheries, mainly in Divisions IV b c, VIId j and VIII a,b.

6.4.1 Historical landings

Official landings reported at ICES are available in table 6.1 and shown in Figures 6.2 and 6.3. Before 1977, red gurnard was not specifically reported. In the past the species of gurnards were not always reported by species and data for Triglidae also occurred.

French data are unavailable in 1981 and 1999. International landings have fluctuated between 4 000 t 6500 t since 2000. France is the main contributor of so-called 'red gurnard'.

The main area of production is the ICES area VII. In 1999 and 2001, higher productions from the Netherlands in IVbc are recorded.

A focus on the recent years 2000–2010 of the Official landings by Division and country is shown in the Stock Annex. In the North Sea red gurnard is mainly harvested in Divisions IVb,c. A continuous area which comprises The Channel, the shelf West of Brittany and the North of Bay of Biscay produces the bulk of International landings and the Divisions VIId,e are the main contributing areas.

For Spain, landings reported by ICES Divisions are mainly available for all species of gurnards combined and not usable specifically for red gurnard.

6.4.2 Discards

French discards data for gurnards have been recorded from at-sea observers within the EU Data Collection Framework. For the French trawlers, the 2010 length compositions of the catch of red gurnard in Divisions VIId and VIIe have been estimated using the COST R packages. In the Stock Annex are shown the intensity of sampling and the length compositions of landings and discards and their confidence intervals.

The erratic length structure in the 2nd quarter (Figures 6.4 and 6.5) shows that the sampling level is not yet at the optimum. The discards rate is estimated at 63% and 55% in VIId and VIIe respectively.

In the table below are shown the numbers per hour of discarded non-target fish species in Dutch bottom-trawl fisheries in North Sea and Eastern Channel for the series 2006–2010. The rates are generally very low even for the beam trawlers using a smaller mesh size.

Métier	TBB_DEF	TBB_DEF*	TBB_DEF	OTB_MCD	OTB_DEF	OTB_DEF
Mesh size	70-99	70-99	100-119	70-99	70-99	100-119
Species						
2006 Red gurnard	2.2				0	
2007 Red gurnard	0.4					
2008 Red gurnard	<0.1					
2009 Red gurnard	0	0	0	0	<0.5	0
2010Red gurnard	2	0	0	0	0	0

*≤300 hp segment

From the Portuguese programme of observers at sea under DCF, a time series 2004–2011 of length compositions of sampled red gurnards discarded in IXa is shown in table 1. The number of measured fish has decreased in last years.

6.4.3 Catch and effort data by sea area and country

The French Statistics database has been redesigned in 2009, occasioning strong disturbance in that particular year. Concurrently, an engineering system has been developed to merge all information from logbooks, sales notes and VMS for each fishing trips. This promising system will soon be mature enough to work the French statistics back in time, where the VMS could be included to better spatialize the catches back to 2005 (year of implementation of the VMS). In the mean time there is no updating of the series presented in previous reports and those previous values are shown in the stock annex.

6.5 Survey data, recruit series

The time series of the IBTS-Q1 survey in the North Sea and the French EVHOE-WIBTS survey in the Celtic Sea and Bay of Biscay and CGFS in Division VIId have been analysed during the NESPMAN project and presented in the previous report. These Figures have been updated. Results from the Portuguese PGFS in Division IXa are also presented.

- IBTS-Q1 series

Before 2006, red gurnard was scarce in North Sea and the abundance index (Nb/hour) was close to 0. The appearance of red gurnard in the index in recent years is in line

with an increase of the abundance in the northern border of the North Sea (Iva). Since then the index has widely fluctuated in a range of low values (Figure 6.6).

- CGFS-Q4 series

Over the time series 1988–2011, the abundance index (Nb/30 mn) has widely fluctuated, peaked in 1994 and has been declining since 2008 (Figure 6.7). The time series of abundance index at length is shown in the stock annex. We can notice the quasi absence of 0 group (under 15 cm) in the catches, 1989 and 2002 excluded.

- EVHOE-WIBTS-Q4 series

Over the time series 1997–2011, the abundance index in Nb or kg/30 mn and their confidence intervals are shown in Figure 6.8. Red gurnard is more abundant in Celtic sea than in Bay of Biscay. In Celtic Sea the index have increased in 2001 and then have fluctuated around this high value and declined in 2011. In Bay of Biscay, the index has shown a small trend to increase with wide fluctuations since 2000.

The distribution maps of red gurnard in the Celtic Sea and the bay of Biscay caught by EVHOE-WIBTS-Q4 survey from 1997 to 2011 are shown in stock annex. Clearly the greater abundance is located offshore of Brittany in the south of Division VIIh and in the north of Division VIIIa quite in a geographical continuity with Division VIIe where the bulk of the landings comes from.

The time series of abundance index at length from the EVHOE-WIBTS-Q4 survey has been updated and is shown in stock annex. For some years, bimodal distributions from the EVHOE survey series show clearly an abundant 0 group in the period 2001–2005. They are poorly represented in recent years.

The presence in the southern Celtic Sea and northern Bay of Biscay area of younger individuals than seen in the eastern Channel may suggest an eastward migration of the species as it gets older. Data from the western Channel are lacking to improve the resolution of this pattern.

Age reading of red gurnards caught during EVHOE survey has been carried out in 2006 and routinely since 2008. Therefore abundance index at age are available in 2006 and continuously from 2008. They indicate that the individuals caught are mainly of age 1 and 2.

- PGFS series

The PGFS covers the whole Portuguese continental coast, within depths range from 20 to 500 m; Over the time series 2005–2011, the abundance index (NB/hour) has fluctuated at low value (Figure 6.9).

6.6 Biological sampling

There was a lack of regular sampling for red gurnard in commercial landings and discarding to provide series of length or age compositions usable for a preliminary analytical assessment.

Since 2003, under EU DCR sampling programme at sea, length data have been collected, in a sporadic way during the first years by observers at sea but more intensively since 2009 when the new DCF came into force. As mentioned in Section 6.4.2 a first use of the COST tools on the data set available in 2010 has been exploited to produce length compositions of landings and discards for the main metier in Divisions VIId and e.

Sampling red gurnard at fish market is not carried out in France. The reason is that red gurnard is listed in group 2 (as specified in appendix VII of the Comm. Dec. 2010/93/EU) and the concurrent sampling in place since 2009 in France implies the sampling of all species of Group 1, and a few group 2 species of special interest, such as sea bass, meagre, red mullet, depending on the region.

For surveys, length data were available and age compositions are now available since 2008 at least for the EVHOE-WIBTS-Q4 survey, but this survey is carried out outside the area where the bulk of landings are harvested. The abundance index per age from this survey was obtained by sampling in average ~200 otoliths per annual survey.

6.7 Biological parameters and other research

There is no update of growth parameters presented at WGNEW and available parameters from several authors are summarized in the Stock Annex. They vary widely.

Available length-weight relationships are also shown in Stock Annex.

A maturity ogive is not available and a knife-edge at age 3 is proposed. Biological parameters collected during EVHOE survey since 2008 could provide a first estimate in the Celtic Sea but in a period which does not match with the spawning season.

Natural mortality has not been estimated in the areas studied at this Working Group.

6.8 Analyses of stock trends.

Stocks limits are not currently defined.

Overall, Official catch statistics reported to ICES have shown a decreasing trend over the period 2001–2010 from ~6 500 t to ~4 000 t. One can note that only two high values have been recorded at rather the same level, in 1977 and in 2001(Figure 1.2).

A focus by Division in recent years 2000–2010 has shown that in VIId the annual catches have fluctuated in a narrow range, ~900 t in 2000 and ~1 500 t in 2010. In VIIe, catches have levelled above ~2 400 t and dropped to ~1 500 t in 2009 and 2010. In Division VIIh, the production has fluctuated around ~500 t. These three Divisions concentrate the major part of the production of red gurnard.

These datasets show a rather consistent signal from landings which show some indication of stability in recent years.

In North Sea, the appearance of red gurnard in the index of the IBTS Survey since 2006 is in line with an increase of the abundance in IVa. Since then the index has widely fluctuated in a range of low values.

In Eastern Channel, the abundance index of the CGFS-Q4 survey has widely fluctuated, peaked in 1994 and has been declining since 2008. Indices at length also show that 0 group (under 15 cm) are generally scarce since 2003.

In Celtic Sea the index of the EVHOE-WIBTS-Q4 survey has increased in 2001 and then have fluctuated around this high value and declined in 2011.

In Bay of Biscay, the index of the EVHOE-WIBTS-Q4 survey have shown since 2000 a small trend to increase with wide fluctuations.

In the combined area Celtic Sea and Bay of Biscay, length abundance indices from EVHOE-WIBTS-Q4 survey have remained at lower values up to 2000 and then they have peaked in 2004. Indices of recruitment (age 0 set under 15 cm) have been also lower from 2008. The stronger year classes shown in 2001, 2002 and 2004 are probably

now almost fished out. The available abundance indices at age from this survey since 2006 have shown rather the same structure from year to year and therefore without signal of any stronger year class.

Along the whole Portuguese continental coast, the abundance index of the PGFS survey has fluctuated at low value.

6.9 Data requirements

Regular sampling of red gurnard catches is continuing by observations at sea under DCF at least to estimate by metier and areas weight and length compositions of retained and discarded catches but the priority given to this species should be discussed taking into account its lower economical importance compared to those of valuable species harvested in the same areas which also need more data for their assessment .

Indices of red gurnard from UK (Scotland) and Irish surveys in the Celtic Seas Ecoregion should be made available.

Extending the studied area by a survey in VIIe and collecting length and age data of red gurnard in the main area of production should help in better understanding the biology and dynamics of this species in the area.

Table 6.1. Red gurnard. Official landings (tonnes) of red gurnard reported to ICES by main areas

IV year	Belg	Fran	Neth	UK
1977	0	184	0	0
1978	0	29	0	0
1979	0	53	0	0
1980	0	24	0	0
1981	0	0	0	0
1982	0	78	0	0
1983	0	135	0	0
1984	0	74	0	0
1985	35	50	0	0
1986	0	40	0	0
1987	74	77	0	0
1988	61	68	0	0
1989	107	111	0	7
1990	59	136	0	24
1991	19	65	0	25
1992	11	58	0	30
1993	20	81	0	28
1994	19	75	0	32
1995	14	71	0	42
1996	17	75	0	23
1997	10	48	0	6
1998	12	70	0	0
1999	11	0	0	0
2000	16	54	45	4
2001	27	111	1642	150
2002	42	43	51	217
2003	41	39	41	254
2004	83	27	48	222
2005	33	26	44	96
2006	31	12	41	76
2007	33	18	29	108
2008	26	15	27	84
2009	28	35	41	104
2010	7	38	52	131

VI year	Belg	Fran	Irel	Russ	UK
1977	0	246	0	0	0
1978	0	26	0	0	0
1979	0	360	0	0	0
1980	0	149	0	0	0
1981	0	0	0	0	0
1982	0	96	0	0	0
1983	0	130	0	0	0
1984	0	99	0	0	0
1985	0	166	0	0	0
1986	0	124	0	0	0
1987	1	88	0	0	0
1988	1	93	0	0	0
1989	1	64	0	0	72
1990	0	91	7	0	41
1991	0	65	10	0	32
1992	0	26	11	0	17
1993	1	23	5	0	39
1994	0	10	0	0	20
1995	0	15	0	0	34
1996	0	11	0	0	18
1997	0	15	0	0	7
1998	0	25	7	0	0
1999	0	0	0	2426	0
2000	0	10	0	0	0
2001	0	6	0	0	19
2002	0	7	0	0	46
2003	0	2	0	0	29
2004	0	2	0	0	23
2005	0	8	0	0	10
2006	0	17	0	0	16
2007	0	7	0	0	14
2008	0	6	0	0	25
2009	0	5	0	0	92
2010	0	1	0	0	146

VIIa year	Belg	Fran	Irel	Isle of Man	Othe	UK
1977	0	134	0	0	0	0
1978	0	58	0	0	0	0
1979	0	113	0	0	0	0
1980	0	79	0	0	0	0
1981	0	0	0	0	0	0
1982	0	30	0	0	0	0
1983	0	14	0	0	0	0
1984	0	21	0	0	0	0
1985	32	49	0	0	0	0
1986	0	36	0	0	0	0
1987	20	30	0	0	0	0
1988	13	15	0	0	0	0
1989	9	13	0	0	0	2
1990	12	14	0	0	0	2
1991	5	50	0	1	0	3
1992	12	23	0	0	0	3
1993	15	10	8	0	0	2
1994	16	8	0	0	0	2
1995	15	4	0	0	0	3
1996	26	5	0	0	0	2
1997	23	5	0	0	0	2
1998	21	2	10	0	0	0
1999	40	0	0	0	0	0
2000	33	6	0	0	1	0
2001	26	15	0	0	0	3
2002	22	12	0	0	0	5
2003	24	2	0	0	0	12
2004	8	0	0	0	0	11
2005	11	2	0	0	0	0
2006	10	0	0	0	0	0
2007	7	0	0	0	0	0
2008	5	0	0	0	0	0
2009	3	0	0	1	0	0
2010	13	0	0	0	0	1

VIIb,c year	Fran	Irel	UK
1977	35	0	0
1978	22	0	0
1979	61	0	0
1980	21	0	0
1981	0	0	0
1982	47	0	0
1983	53	0	0
1984	49	0	0
1985	77	0	0
1986	92	0	0
1987	69	0	0
1988	36	0	0
1989	32	0	0
1990	23	7	1
1991	25	9	0
1992	12	0	0
1993	5	1	0
1994	5	0	0
1995	3	0	2
1996	4	0	3
1997	9	0	1
1998	11	0	0
1999	0	0	0
2000	38	0	0
2001	24	0	14
2002	12	0	6
2003	4	0	2
2004	30	0	2
2005	15	0	0
2006	21	0	0
2007	22	0	0
2008	22	0	1
2009	13	0	0
2010	18	0	0

Table 6.1 continued

VIId

year	Belg	Fran	Neth	UK
1977	0	2112	0	0
1978	0	802	0	0
1979	0	1040	0	0
1980	0	1157	0	0
1981	0	0	0	0
1982	0	893	0	0
1983	0	1701	0	0
1984	0	1484	0	0
1985	56	1384	0	0
1986	0	1226	0	0
1987	61	977	0	0
1988	75	1171	0	0
1989	88	1214	0	0
1990	70	1574	0	0
1991	71	1292	0	0
1992	93	1376	0	0
1993	64	1143	0	0
1994	68	1132	0	0
1995	65	1239	0	0
1996	80	1424	0	0
1997	67	1178	0	0
1998	90	1000	0	0
1999	97	0	0	0
2000	94	800	0	0
2001	107	1119	63	0
2002	98	1183	2	0
2003	162	1043	4	0
2004	133	1005	14	0
2005	143	1039	16	0
2006	171	898	16	17
2007	191	971	35	32
2008	223	894	64	55
2009	153	971	105	63
2010	159	1116	177	79

VIIe

year	Belg	Chan	Fran	Neth	UK
1977	0	0	2619	0	0
1978	0	0	536	0	0
1979	0	0	2249	0	0
1980	0	0	724	0	0
1981	0	0	0	0	0
1982	0	0	1693	0	0
1983	0	10	2017	0	0
1984	0	5	631	0	0
1985	27	6	1122	0	0
1986	0	5	2290	0	0
1987	14	3	2237	0	0
1988	27	0	1990	0	0
1989	22	3	1642	0	0
1990	8	3	1199	0	0
1991	3	0	2112	0	0
1992	11	7	2106	0	0
1993	4	0	2194	0	0
1994	5	0	2189	0	0
1995	7	6	2199	0	0
1996	5	10	2269	0	0
1997	7	8	2614	0	0
1998	10	6	2303	0	0
1999	0	10	0	0	0
2000	2	0	2499	0	0
2001	6	0	2575	2	0
2002	6	15	2968	0	0
2003	24	15	2728	0	0
2004	45	15	2436	0	0
2005	45	0	2951	0	0
2006	73	10	2714	0	6
2007	62	3	2603	2	3
2008	60	10	2382	1	0
2009	21	0	1513	14	2
2010	34	2	1546	22	4

VIIf-k

year	Belg	Fran	Irel	UK	
1977	0	1756	0	0	
1978	0	458	0	0	
1979	0	1455	0	0	
1980	0	1227	0	0	
1981	0	0	0	0	
1982	0	538	0	0	
1983	0	557	0	0	
1984	0	187	0	0	
1985	29	639	0	0	
1986	0	852	0	0	
1987	31	748	0	0	
1988	21	759	0	0	
1989	21	657	0	0	
1990	18	634	0	0	
1991	11	667	0	0	
1992	13	533	0	0	
1993	9	513	2	0	
1994	9	640	0	0	
1995	13	721	0	0	
1996	14	789	0	0	
1997	18	731	0	0	
1998	23	885	0	0	
1999	12	0	0	0	
2000	8	1051	0	0	
2001	12	1073	0	0	
2002	17	1044	0	1	
2003	27	1146	0	0	
2004	47	1576	0	0	
2005	49	1357	0	0	
2006	27	1111	0	0	
2007	33	1103	0	0	
2008	37	1037	0	0	
2009	20	1135	0	0	
2010	22	999	0	0	

VIII

year	Belg	Fran	Neth	Port	UK
1977	0	237	0	0	0
1978	0	39	0	0	0
1979	0	289	0	0	0
1980	0	106	0	0	0
1981	0	0	0	0	0
1982	0	80	0	0	0
1983	0	183	0	0	0
1984	0	413	0	0	0
1985	0	211	0	0	0
1986	0	241	0	0	0
1987	2	332	0	0	0
1988	0	274	0	0	0
1989	2	236	0	0	0
1990	0	206	0	0	0
1991	0	189	0	0	0
1992	1	190	0	0	0
1993	2	153	0	0	0
1994	1	224	0	0	0
1995	2	165	0	0	0
1996	3	174	0	0	0
1997	2	176	0	0	0
1998	1	191	0	0	0
1999	1	0	0	0	0
2000	1	143	0	0	0
2001	1	141	3	0	0
2002	1	152	0	0	0
2003	1	166	0	0	0
2004	2	169	0	0	8
2005	2	203	0	0	3
2006	1	218	0	0	0
2007	1	202	0	0	0
2008	2	93	0	0	0
2009	2	139	0	1	0
2010	3	133	0	0	0

Table 6.1 continued

IX year	Port	Spai
1977	0	0
1978	0	0
1979	0	0
1980	0	0
1981	0	87
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	1	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	46	0
2006	124	0
2007	125	0
2008	109	0
2009	148	0
2010	114	0

Table 6. 2. Red gurnard. Time series of Portuguese datasets collected under DCF. Length composition of samples of red gurnard discarded by OTB-DEF operating in Division IXa, from trips observed at sea.

Length cm	2004	2005	2006	2007	2008	2009	2010	2011
5	2							
6	3				1			
7	17							
8	4		1					
9	3							
10	3							
11	6	1						
12	18	0			1		1	
13	21	3				2	1	
14	8	2			1	2	1	
15	6	8				1	1	
16	8	11	2	1	10		1	
17	8	2	1		10	2	1	
18	1	6	1				1	2
19	1	1	2		3		2	4
20	4		4	3	1		3	2
21	2	4	2	1	3		5	3
22	3	5	2	1	1	1	4	5
23	2		2		2		3	1
24	1						2	
25		1						1
Total	121	44	17	6	33	8	26	18

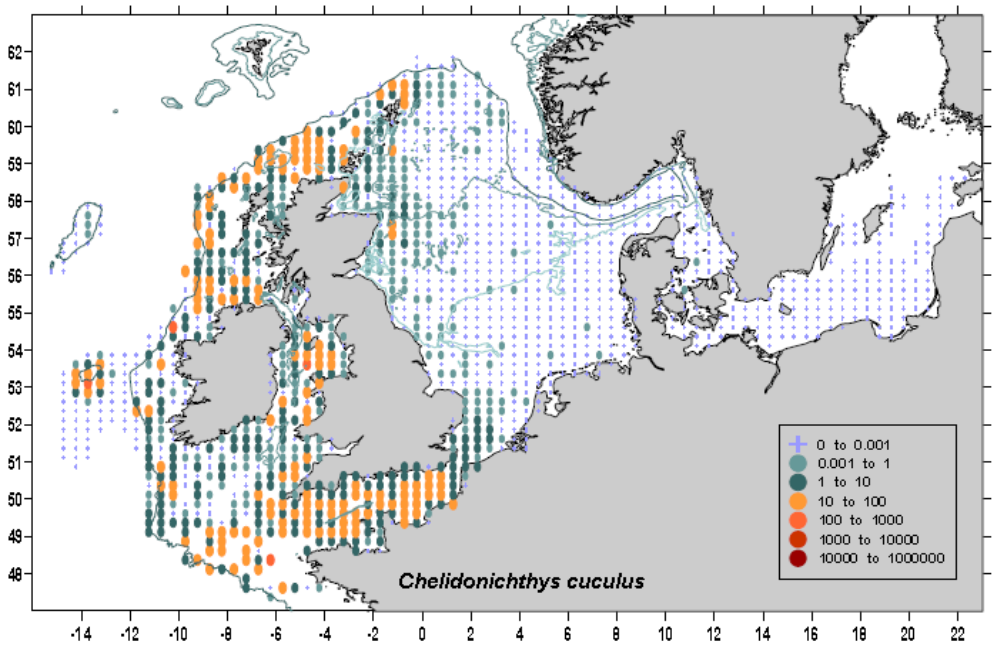


Figure 6.1. Red gurnard. Distribution map of red gurnard in the northern European shelf (From WD1; Annex 2)

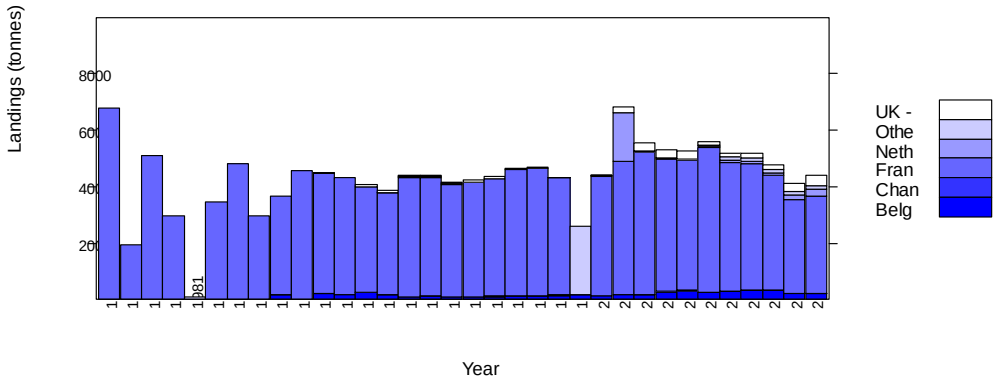


Figure 6.2. Red gurnard. Official landings reported to ICES of Red gurnard by country.

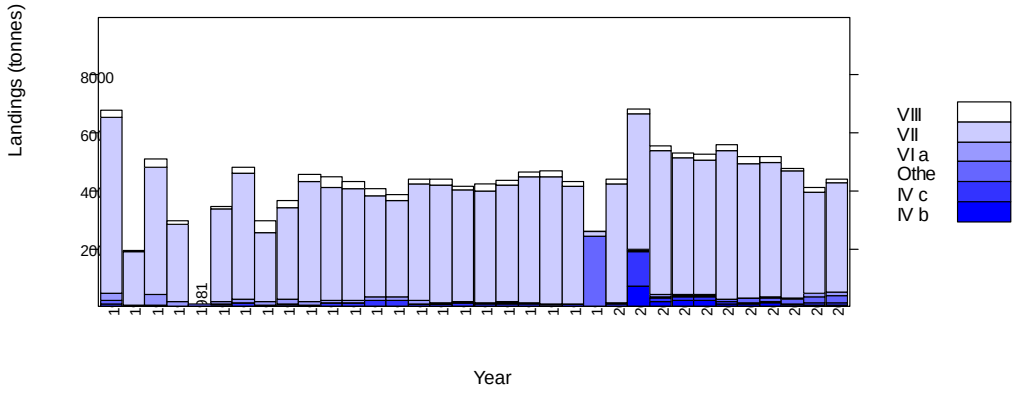


Figure 6.3. Red gurnard Official landings reported to ICES of Red gurnard by area.

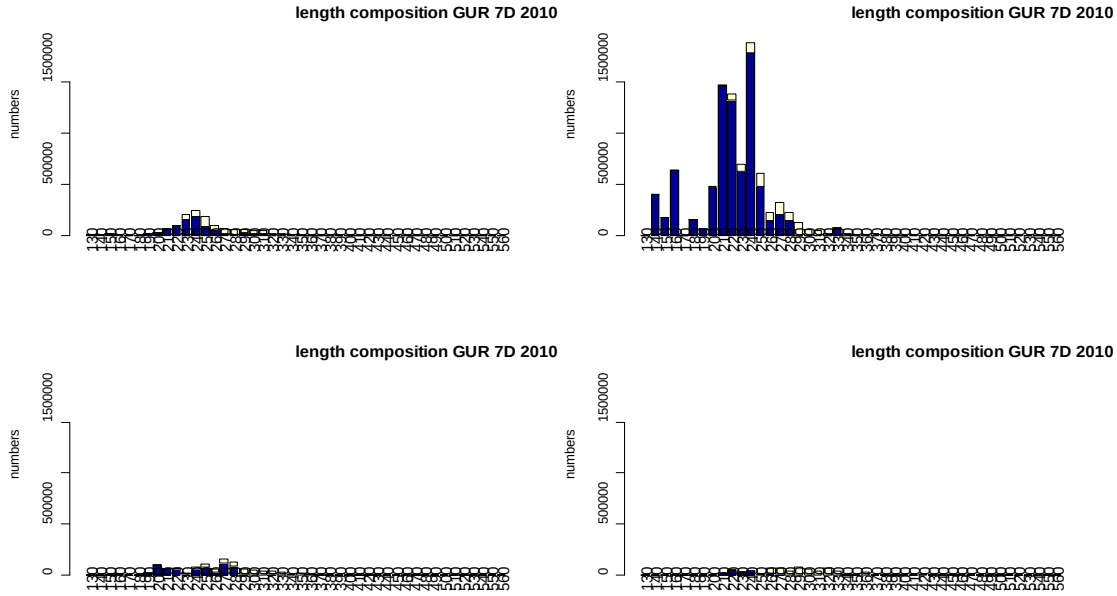


Figure 6.4. Red gurnard. Quarterly length compositions of the 2010 French catch of red gurnard in VIId of OT._DEF strata composed of 711 t of landings and 1215 t estimated of discards. Histogram of discards in dark blue.

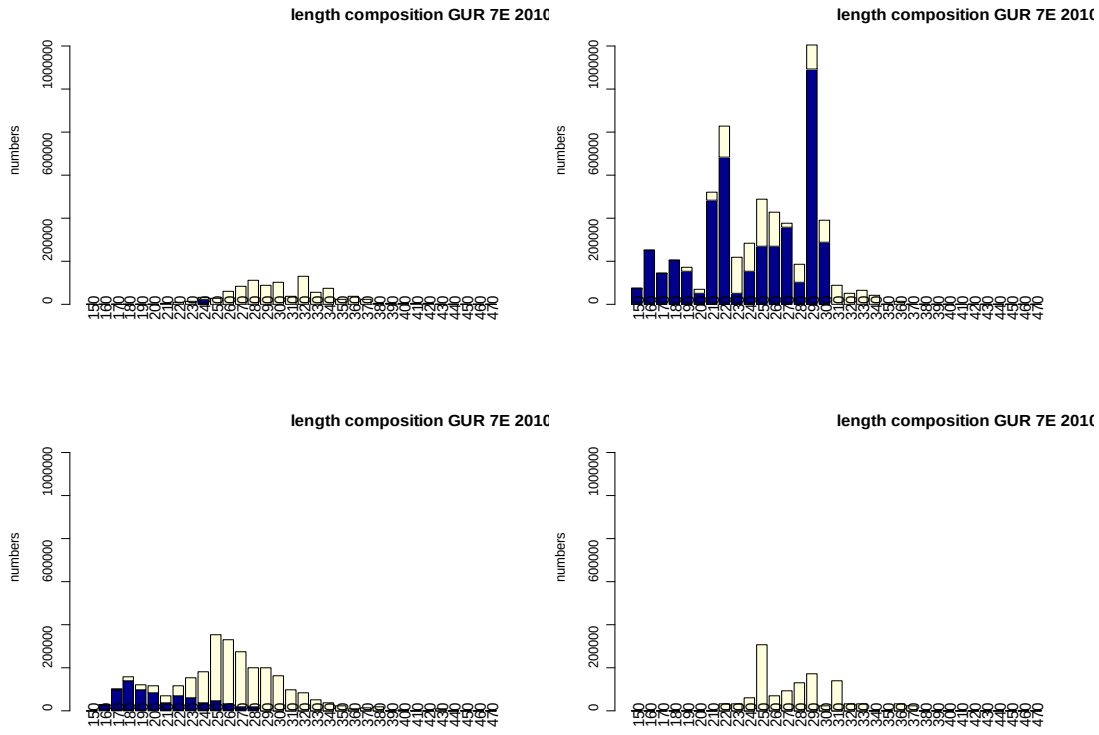


Figure 6.5. Red gurnard. Quarterly length compositions of the 2010 French catch of red gurnard in VIIe of OT._DEF strata composed of 1340 t of landings and 1632 t estimated of discards. Histogram of discards in dark blue.

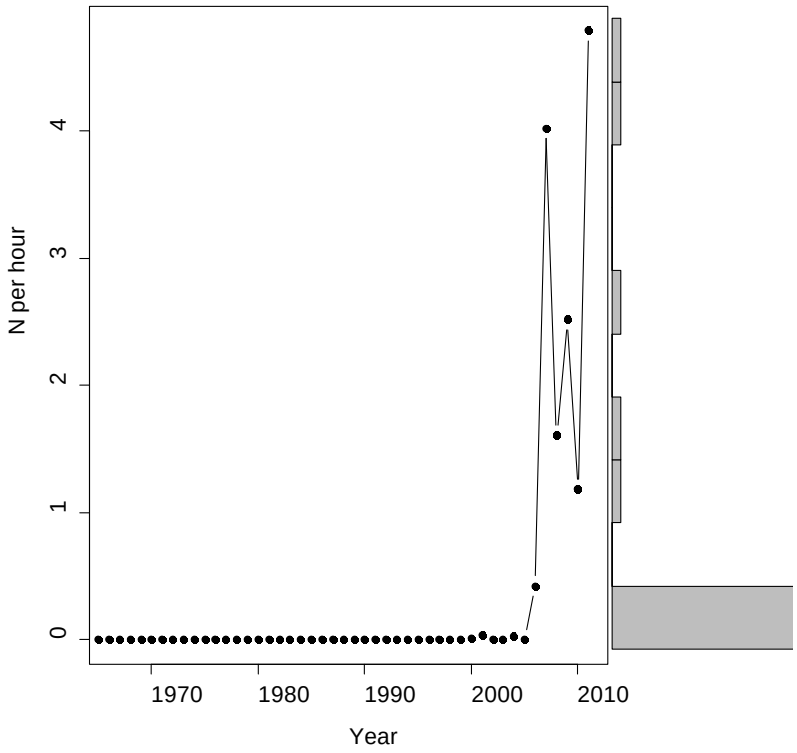


Figure 6.6. Red gurnard. Time series of abundance index of red gurnard from IBTS-Q1 in the North Sea.

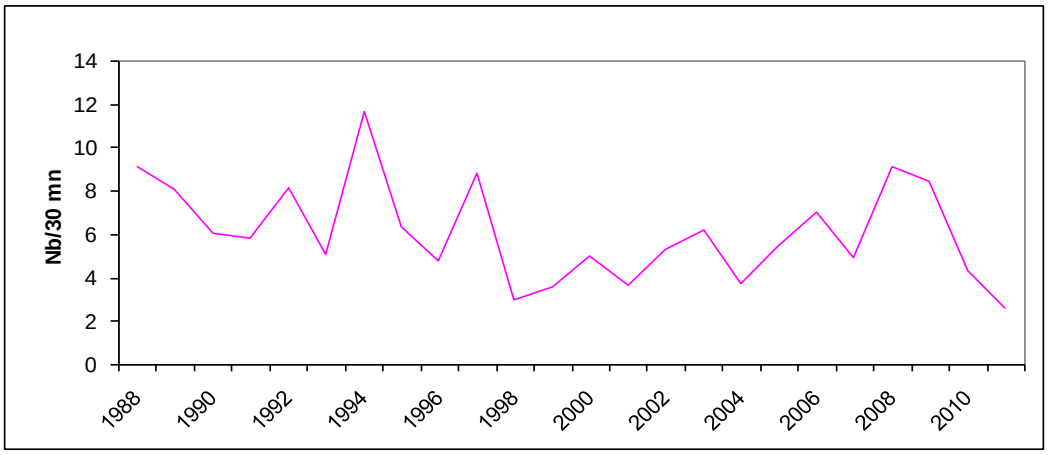


Figure 6.7. Red gurnard. Time series of abundance index of red gurnard from CGFS-Q4 series in VIId.

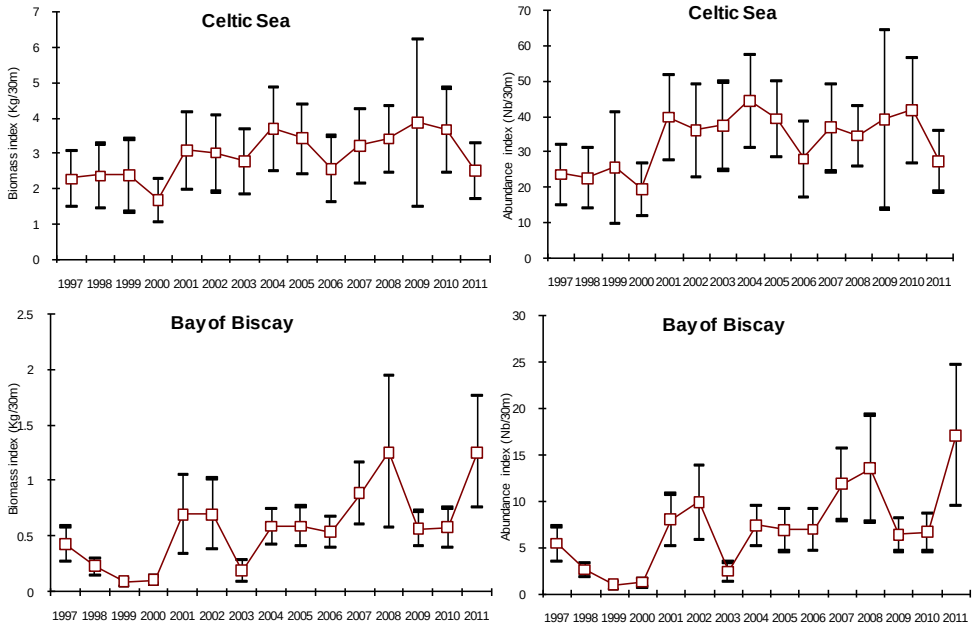


Figure 6.8. Red gurnard. Time series of abundance index (Nb and Weight(kg)/30 min) of red gurnard in the Celtic Sea and in the Bay of Biscay from EVHOE-WIBTS-Q4 survey.

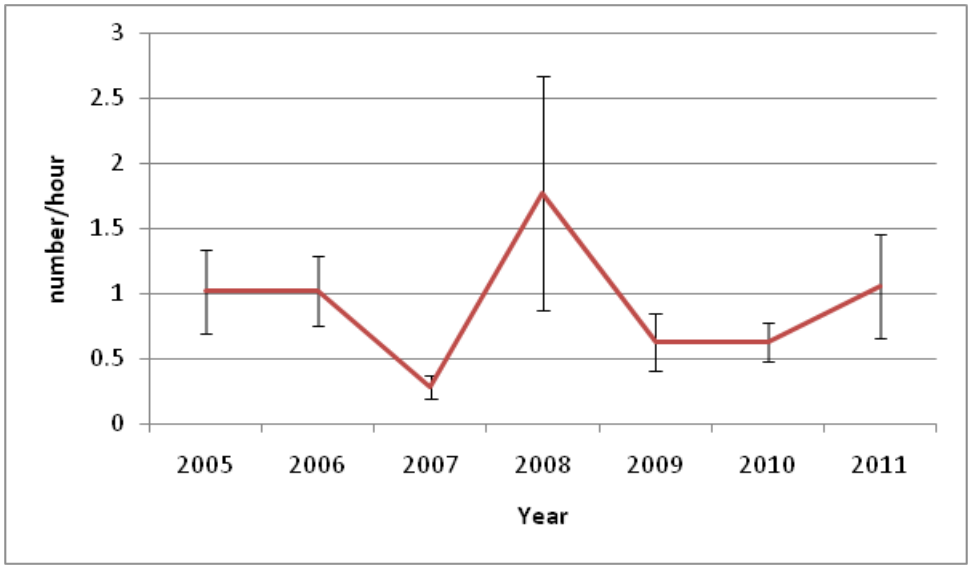


Figure 6.9. Red gurnard. Time series of abundance index of red gurnard from the PGFS survey in Division IXa.

7 Grey gurnard

7.1 General biology

Grey gurnard *Eutrigla gurnardus* occurs in the Eastern Atlantic from Iceland, Norway, southern Baltic, and North Sea to southern Morocco, Madeira. It is also found in the Mediterranean and Black Seas.

In the North Sea and in Skagerrak/Kattegat, grey gurnard is an abundant demersal species. In the North Sea, the species may form dense semi-pelagic aggregations in winter to the northwest of the Dogger Bank, in summer it is more widespread. The species is less abundant in the Channel, the Celtic Sea and in the Bay of Biscay.

Spawning takes place in spring and summer. There do not seem to be clear nursery areas. Grey gurnard can reach a maximum length of approximately 50 cm.

7.2 Stock ID and possible assessment areas

No studies are known of the stock ID of grey gurnard. The observations reported at the WGNEW2010 (ICES, 2010) which have not led to separate stocks are in the stock annex.

The individual behaviour of grey gurnard does not militate to maintain the population in a single stock. In a pragmatic approach, the population could be split between 3 Ecoregions: North Sea including VIId, Celtic Seas and South European Atlantic. This proposal should be discussed considering the low levels of catches reported in recent years in Celtic Seas and South European Atlantic.

7.3 Management regulations

There is no minimum landing size for this species and there is no TAC.

7.4 Fisheries data

7.4.1 Historical landings

In the past, gurnards were often not sorted by species when landed and reported into one generic category of "gurnards". In recent years the official statistics seem to improve gradually, however, also obvious that the catch statistics are incomplete for several years: some countries reporting no landings at all, other countries reporting exceptionally high landings (Table 7.1–7.3; Figure 7.1, 7.2).

Official landings reported by Ecoregion are shown in Figure 7.3.

Grey gurnard from the North Sea is mainly landed for human consumption purposes. North Sea landings decreased gradually before World War II. After an initial post-war peak of 4000 t, annual landings stayed well below 2000 t until the early 1980s, when annual catches increased to around 40 000 t (Figure) because of Danish landings for reduction purposes. In the same period, however, there was some misreporting as well. After a few years the Danish landings dropped again to a low level. The Netherlands did not report gurnards during the years 1984–1999. Recent international landings have been very low at around 300 to 500 t per year only. The average 2000–2010 is at 361 t.

In Celtic Seas, influenced by high landings reported by Russia in VIb in the period 2000–2006, the production of grey gurnard peaked above 20 000 t. In average the total

catches in VIa were around 3 t since 2000. In area VII (without VIId), in average 65 t of grey gurnard have been reported since 2000.

In South European Atlantic (VIII and IX), official landings have fluctuated at low level and were in average 63 t since 2000.

Historically, grey gurnard is mainly taken as a by-catch in mixed demersal fisheries for flatfish and roundfish. However, the market is limited and the larger part of the catch appears to be discarded (see also stock Annex). Owing to the low commercial value of this species, landings data will usually not reflect the actual catches very well.

7.4.2 Discards

Some samples collected in France under DCF regulation by observations at sea in 2010 have been exploited with the COST tools.

Samples were aggregated for an area composed of IV c and VII d and VII e to obtain measured fish enough in the retained and in the discarded part of the catch and in the same way data from all trawlers were used. Only the quarter 1 and 3 of 2010 data sets have allowed estimates of catch and discards. Results are shown in Figure 7–4. Almost all the catches have been discarded.

In Table 7.4 the numbers per hour of discarded non-target fish species in Dutch bottom-trawl fisheries in North Sea and Eastern Channel are shown for 2006–2010. The rates are highly variable.

7.5 Survey data / recruit series

For the North Sea and Skagerrak/Kattegat, data are available from the International Bottom Trawl survey. The IBTS-Q1 and Q3 can provide information on distribution and the length composition of the catches. Grey gurnard occurs throughout the North Sea and Skagerrak/Kattegat. During winter, grey gurnards are concentrated to the northwest of the Dogger Bank at depths of 50–100 m, while densities are low off the Danish coast, in the German Bight and eastern part of the Southern Bight (Figure 7. and 7.6). The distribution pattern changes substantially in the spring, when the whole area south of 56°N becomes densely populated and the high concentrations in the central North Sea disappear until the next winter.

The near absence of grey gurnard in the southern North Sea during winter and the marked shift in the centre of distribution between winter and summer suggests a preference for higher water temperatures (Hertling, 1924; Daan *et al.* 1990).

During winter, grey gurnard occasionally form dense aggregations just above the sea bed (or even in midwater, especially during night time) which may result in extremely large catches. Within one survey, these large hauls may account for 70 percent or more of the total catch of the species. Bottom temperatures in high-density areas usually range from 8 to 13°C (Sahrhage, 1964).

Spawning occurs in spring and summer and, perhaps, in autumn (Russel, 1976), and may also explain the observed seasonal movements (Van der Land, 1990).

A time series of abundance index of grey gurnard in the IBTS-Q1 survey has shown a strong increase pattern from the beginning of 90's. The drawn line excludes the exceptional abundance observe occasionally as proposed in Heessen and Daan (1996) (Figure 7.7).

IBTS-Q3 series shows the same strong increase of the index during the 90's and stabilized at high level since then (Figure 7.8).

The length distributions index presented in the WGNEW2010 (ICES, 2010) Report have not been updated and are now in the stock annex. They showed that a bi modal structure occured in Skagerrak and Kattegat (IIIa) which was not observed in North Sea where smaller fish were only found in relatively small numbers.

The CGFS survey series in VIId from 1988 have shown low level of abundance index except in 1999 where a shoal effect might occur (Figure 7–8). In recent years, abundance index at length have indicated some higher abundance of smaller fish in 2005 (Figure 7–9).

The time series of abundance index of EVHOE-WIBTS-Q4 survey in Celtic Sea and Bay of Biscay has clearly shown a higher abundance in Celtic Sea than in Bay of Biscay but in some years the signal is noisy (Figure 7.11). The trends in both areas are relatively similar. The time series of abundance at length by area have shown that the last higher but uncertain abundance of smaller fish was observed in 2007 in Celtic sea and in 2004 in Bay of Biscay(Figures 7.12 and 7.13). Spatial distribution of grey gurnard from this survey series is available in the stock annex. It shows that the higher abundances are observed in the northern part of Celtic Sea.

The index of the short time series from the autumn PGFS survey has fluctuated at low value and was at 0 in 2010 and 2011 (Figure 7.14).

7.6 Biological sampling

Biological data for this species are still scarce (see also the stock annex). In North Sea, individual data have been collected during the 2010 IBTS-Q1 survey.

An ALK from otoliths collected has shown that grey gurnard displays a significant number of individuals over a large span of ages (up to group 14). The ALK is shown in Figure 7.14.

A maturity length key of Grey gurnard sampled shows that above 19–20 cm almost all the individuals can be considered mature. The sampling was not carried out during the spawning which takes place in spring and summer.

Both these two datasets suggest that grey gurnard is early maturing in North Sea and a proportion of fish at age 1 are mature.

7.7 Population biological parameters and other research

The information delivered at the WGNEW 2010 (ICES 2010) are now in the stock annex.

7.8 Analysis of stock trends / assessment

Information from landings is very poor, due to poor reporting (gurnard species are not always identified in the data, and probably also misreporting has occurred) and also because the low value of the species leads to massive discarding.

The status of the populations in the Ecoregions which cover the Northern European Shelf is not known but some indications of trend are delivered by the survey series available.

The time series based on catches from the IBTS survey in the North Sea and in Skagerrak-Kattegat both show an increase since the late 1980s (Figure 7.15).

In Celtic Seas Ecoregion, the CGFS survey indicates that since 2006 the abundance has remainded at lower level. In Celtic Sea, the index from the EVHOE-WIBTS-Q4 survey tend to slightly increase in 2010 and 2011 but remain at lower level.

In Bay of Biscay and Southern European shelf, both the EVHOE-WIBTS-Q4 and the PGFS surveys indicate very low levels of abundance.

7.9 Data requirements

For management purposes information should be available on catches and landings. The quality of landings data has been poor for this species because in the past only landings of "gurnards" were reported and also because there is some indication that this species is highly discarded.

Given the high level of discarding, observation at sea under DCF seems the main source of information to better estimate the catches. A way to obtain specific samples of grey gurnard could be a self-sampling program but it could be difficult to persuade fishermen of an extra work to sample a species they are used to discard.

Availability of the time series of UK(Scotland) and Irish surveys abundance index of grey gurnard should give more information on the population in areas covered by these surveys.

For a better understanding of this species an increase in our knowledge of biological parameters is required.

From the information presented here, it can be concluded that grey gurnard is currently of very limited commercial interest excepted in North Sea.

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Table 7.1. Grey gurnard. Official landings (tonnes) of grey gurnard in area VI and VII as reported to ICES.

VI &VII	Official landings in tonnes						
	Belgium	Denmark	France	Ireland	Netherlands	Russian Fed.	UK
1950	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0
1978	0	0	206	0	0	0	0
1979	0	0	165	0	0	0	0
1980	0	0	155	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	407	0	0	0	0
1983	0	0	271	0	0	0	0
1984	0	0	157	0	0	0	2
1985	35	0	130	0	0	0	2
1986	0	0	280	0	0	0	0
1987	37	0	216	0	0	0	0
1988	30	0	211	0	0	0	21
1989	34	0	646	0	0	0	0
1990	18	0	538	16	0	0	0
1991	17	0	298	15	0	0	4
1992	13	0	123	17	0	0	0
1993	11	0	113	10	0	0	1
1994	11	0	107	0	0	0	2
1995	7	0	101	0	0	0	0
1996	6	0	117	0	0	0	2
1997	8	0	61	0	0	0	2
1998	13	0	59	38	0	0	0
1999	11	0	0	0	0	0	0
2000	13	0	109	0	7	26081	0
2001	3	0	116	0	0	3155	13
2002	7	0	81	0	0	60	11
2003	3	0	66	0	1	263	0
2004	5	0	61	0	7	1401	0
2005	9	0	59	0	8	2456	0
2006	4	0	28	0	10	138	6
2007	4	0	24	0	1	0	4
2008	7	0	1	0	3	0	1
2009	11	0	33	0	1	0	8
2010	14	0	45	0	5	0	12

Table 7.2. Grey gurnard. Official landings (tonnes) of grey gurnard in area IIIa, IV, and VIId as reported to ICES.

IIIa,IV,VIId	Official landings in tonnes						
	Belgium	Denmark	France	Netherlands	Norway	Sweden	UK
1950	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0
1957	0	0	0	0	0	308	0
1958	0	0	0	0	0	387	0
1959	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0
1963	0	0	0	202	0	0	0
1964	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0
1972	0	0	0	0	0	51	0
1973	0	0	0	0	0	58	0
1974	0	0	0	0	0	64	0
1975	0	0	0	0	0	14	0
1976	0	0	0	0	0	131	0
1977	0	0	0	0	0	74	0
1978	0	0	15	0	0	108	0
1979	0	0	944	0	0	98	0
1980	0	0	993	0	0	74	0
1981	0	0	0	0	0	92	0
1982	0	446	480	0	0	86	0
1983	0	1096	553	0	0	15	0
1984	0	4103	197	0	0	13	0
1985	102	2361	187	0	0	18	0
1986	0	320	283	0	0	20	0
1987	77	46611	122	0	0	12	0
1988	86	38296	389	0	0	5	22
1989	82	26758	135	0	0	9	0
1990	91	22110	134	0	0	6	0
1991	75	14564	122	0	0	10	0
1992	104	8158	106	0	0	20	10
1993	113	858	74	0	0	18	24
1994	67	111	54	0	0	24	22
1995	50	83	62	0	0	11	21
1996	112	88	62	0	0	7	54
1997	52	49	103	0	0	10	57
1998	34	83	47	0	0	16	0
1999	36	109	0	0	0	137	0
2000	37	128	72	452	0	10	0
2001	28	319	60	277	0	7	33
2002	55	82	64	286	0	3	29
2003	34	124	47	319	0	8	26
2004	35	107	9	299	0	7	23
2005	29	94	7	242	0	10	22
2006	18	87	4	155	2	4	21
2007	14	59	5	166	5	6	50
2008	9	72	5	120	5	13	78
2009	16	36	3	157	1	7	83
2010	20	28	12	259	1	4	77

Table 7.3. Grey gurnard. Official landings (tonnes) of grey gurnard in area IIIa, IV, and VIId as reported to ICES.

VIII, IXa	Official landings in tonnes		
	Belgium	France	Netherlands
1950	0	0	0
1951	0	0	0
1952	0	0	0
1953	0	0	0
1954	0	0	0
1955	0	0	0
1956	0	0	0
1957	0	0	0
1958	0	0	0
1959	0	0	0
1960	0	0	0
1961	0	0	0
1962	0	0	0
1963	0	0	0
1964	0	0	0
1965	0	0	0
1966	0	0	0
1967	0	0	0
1968	0	0	0
1969	0	0	0
1970	0	0	0
1971	0	0	0
1972	0	0	0
1973	0	0	0
1974	0	0	0
1975	0	0	0
1976	0	0	0
1977	0	0	0
1978	0	1	0
1979	0	9	0
1980	0	24	0
1981	0	0	0
1982	0	8	0
1983	0	28	0
1984	0	46	0
1985	0	54	0
1986	0	73	0
1987	2	94	0
1988	0	54	0
1989	3	60	0
1990	1	31	0
1991	1	22	0
1992	1	30	0
1993	2	53	0
1994	1	33	0
1995	1	41	0
1996	4	41	0
1997	4	53	0
1998	3	53	0
1999	1	0	0
2000	1	43	0
2001	1	40	4
2002	2	34	0
2003	1	46	0
2004	1	62	0
2005	1	58	0
2006	3	71	0
2007	2	68	0
2008	3	5	0
2009	3	96	0
2010	8	147	0

Table 7.4. Grey gurnard. Discards per hour of grey gurnard by different metiers in the Netherlands.

Numbers per hour of discarded non-target fish species in Dutch bottom-trawl fisheries

Métier	TBB_DEF	TBB_DEF*	TBB_DEF	OTB_MCD	OTB_DEF	OTB_DEF
Mesh size/hp power 7	**0-99**	**70-99**	**100-119**	**70-99**	**70-99**	**100-119**
2006 Grey gurnard	68.3				92	
2007 Grey gurnard	60.2					
2008 Grey gurnard	34.3					
2009 Grey gurnard	55	17	37	111	77	15
2010 Grey gurnard	81	10	109	47	52	110

*≤300 hp segment

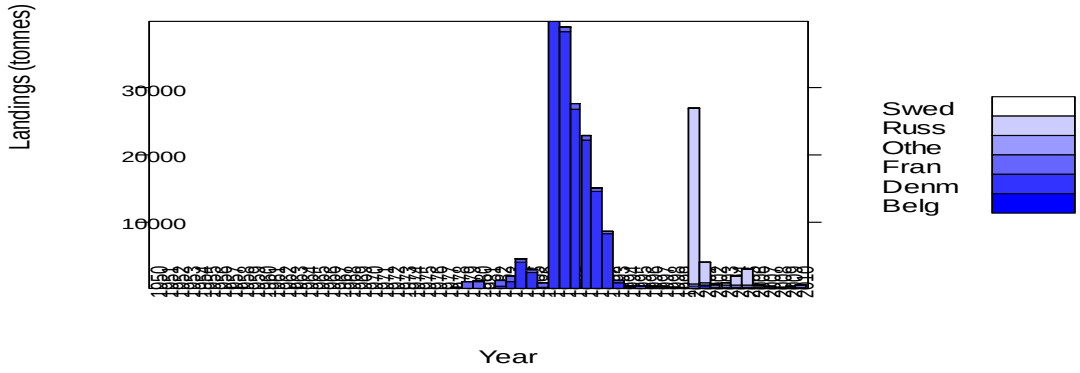

Figure 7.5. Grey gurnard. Official catches of grey gurnard reported at ICES from 1950 to 2010.

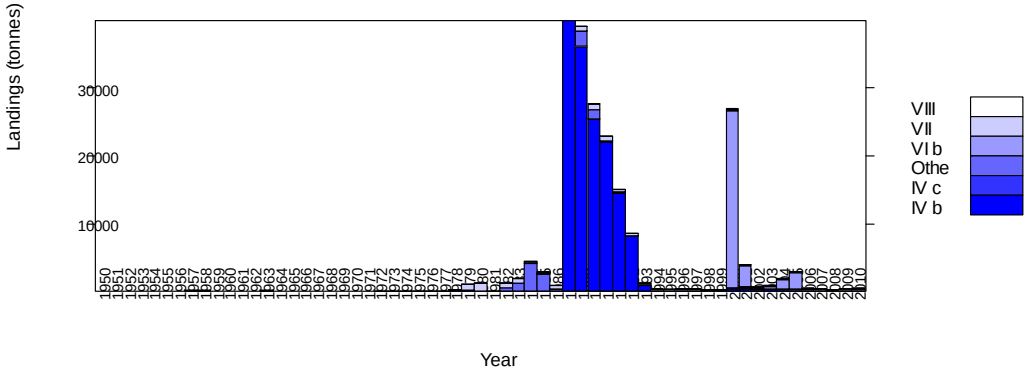

Figure 7.6. Grey gurnard. Official catches of grey gurnard reported at ICES from 1950 to 2010 in the main areas.

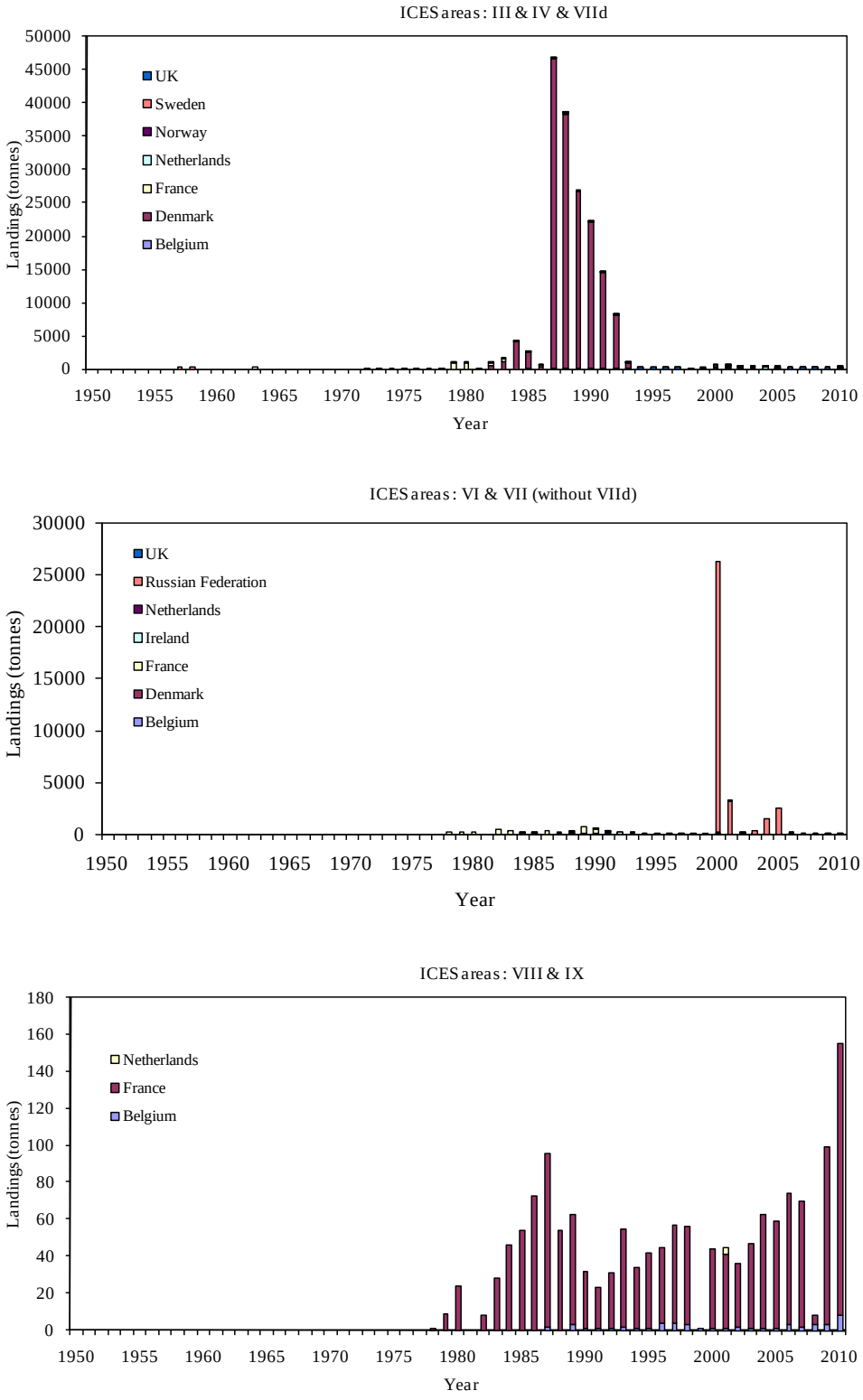

Figure 7.7. Grey gurnard. Official landings of grey gurnard reported at ICES from 1950 to 2010 by area covering the Ecoregions.

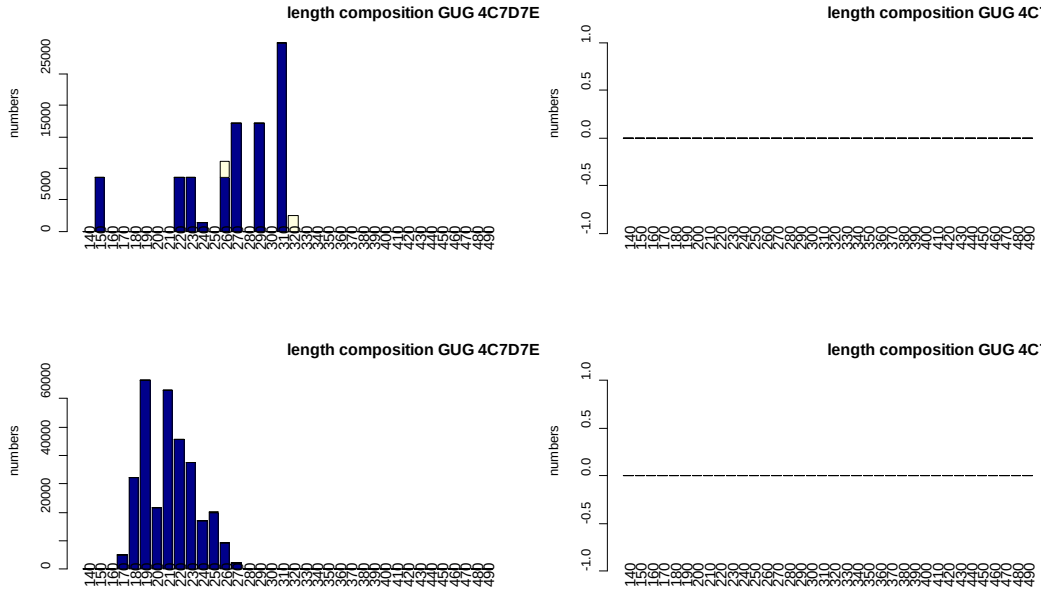

Figure 7.8. Grey gurnard. 2010 Length compositions of catch and discard of grey gurnard by French trawlers in Divisions IVc+VIId+VIIe. Datasets available from DCF only support the estimation in quarter 1 and quarter 3. Almost all the catches have been discarded.

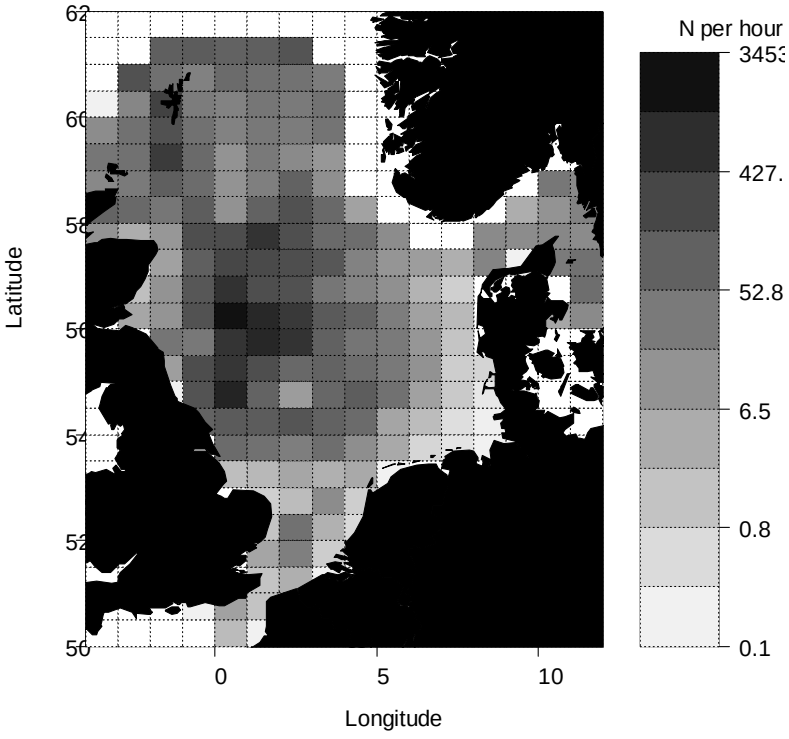

Figure 7.9. Grey gurnard. Spatial distribution of grey gurnard from IBTS-Q1 survey .

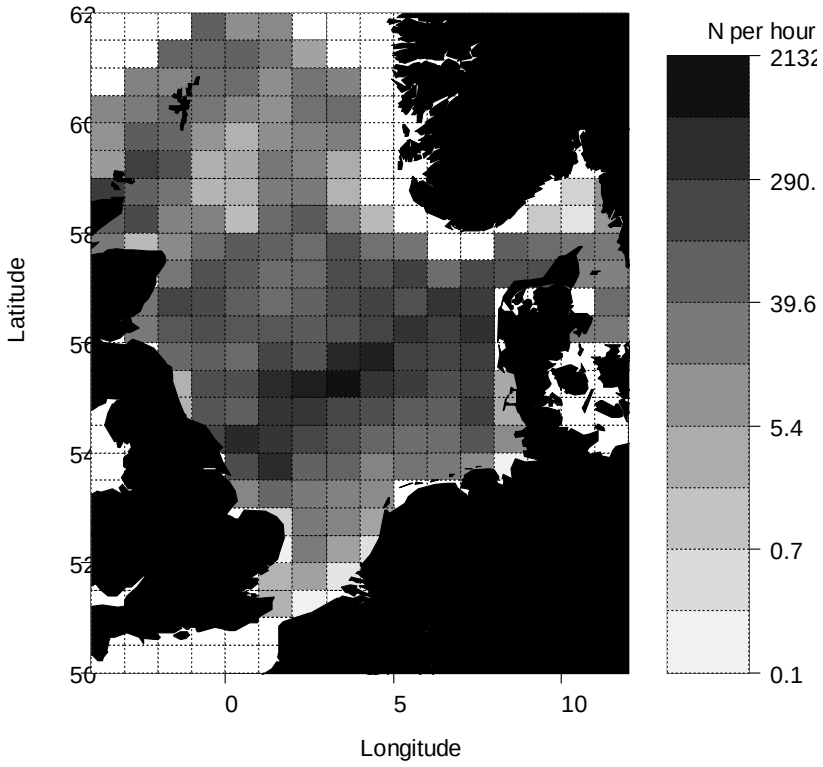

Figure 7.10. Grey gurnard. Spatial distribution of grey gurnard from IBTS-Q3 survey .

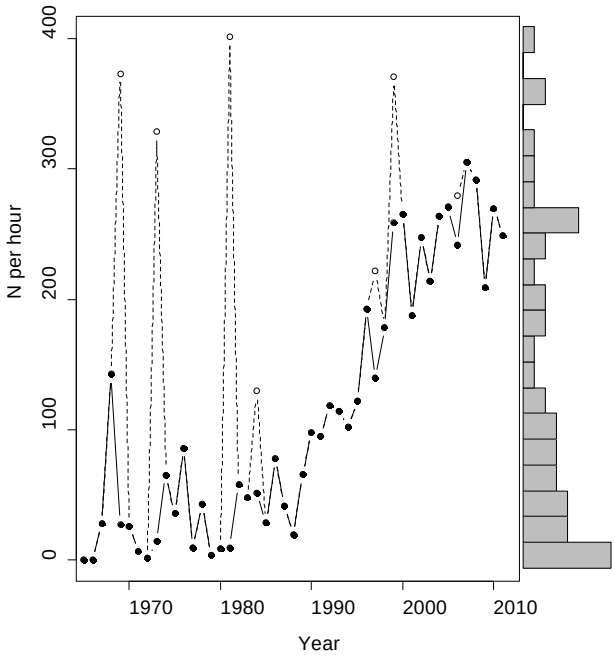

Figure 7.11. Grey gurnard. Abundance index of grey gurnard from IBTS-Q1 survey time series . The plain line excludes the exceptional abundance observed occasionally in a single rectangle by shoal behaviour.

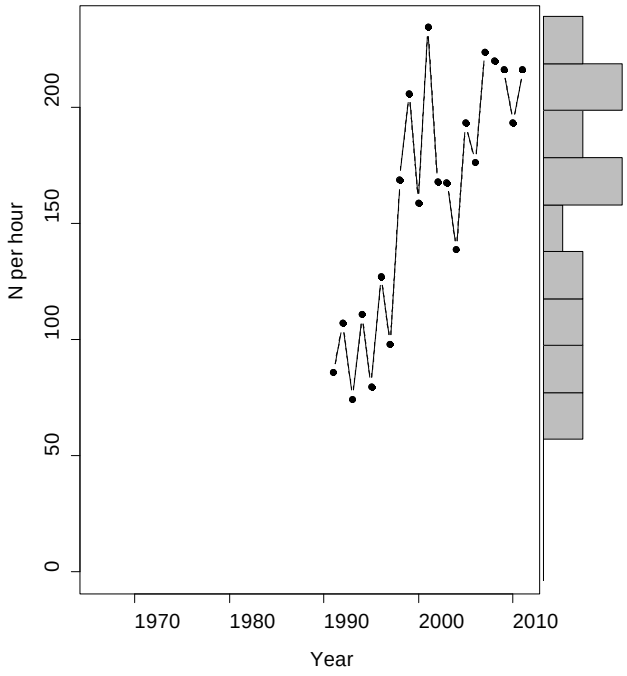

Figure 7.12. Grey gurnard. Abundance index of grey gurnard from IBTS-Q3 survey time series .

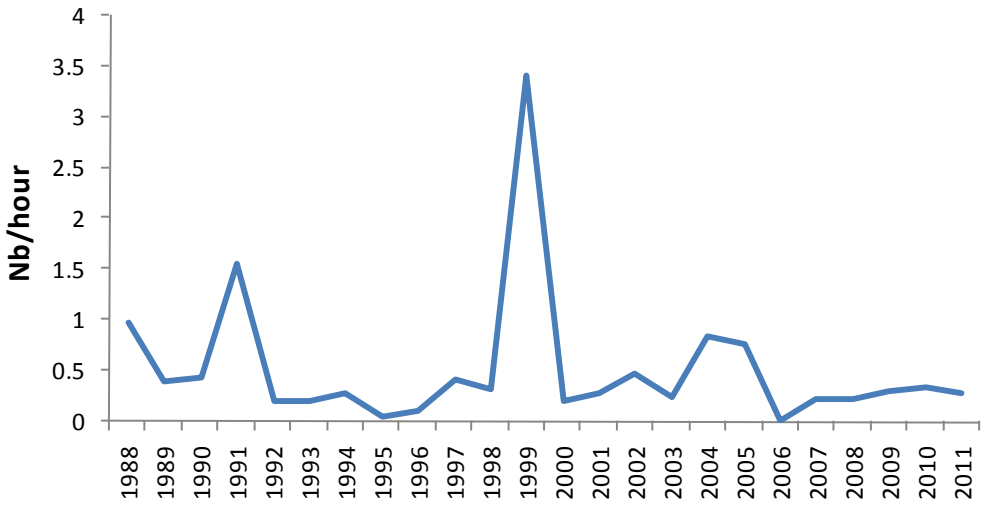

Figure 7.13. Grey gurnard. Abundance index of grey gurnard from CGFS-Q4 survey time series in Eastern Channel .

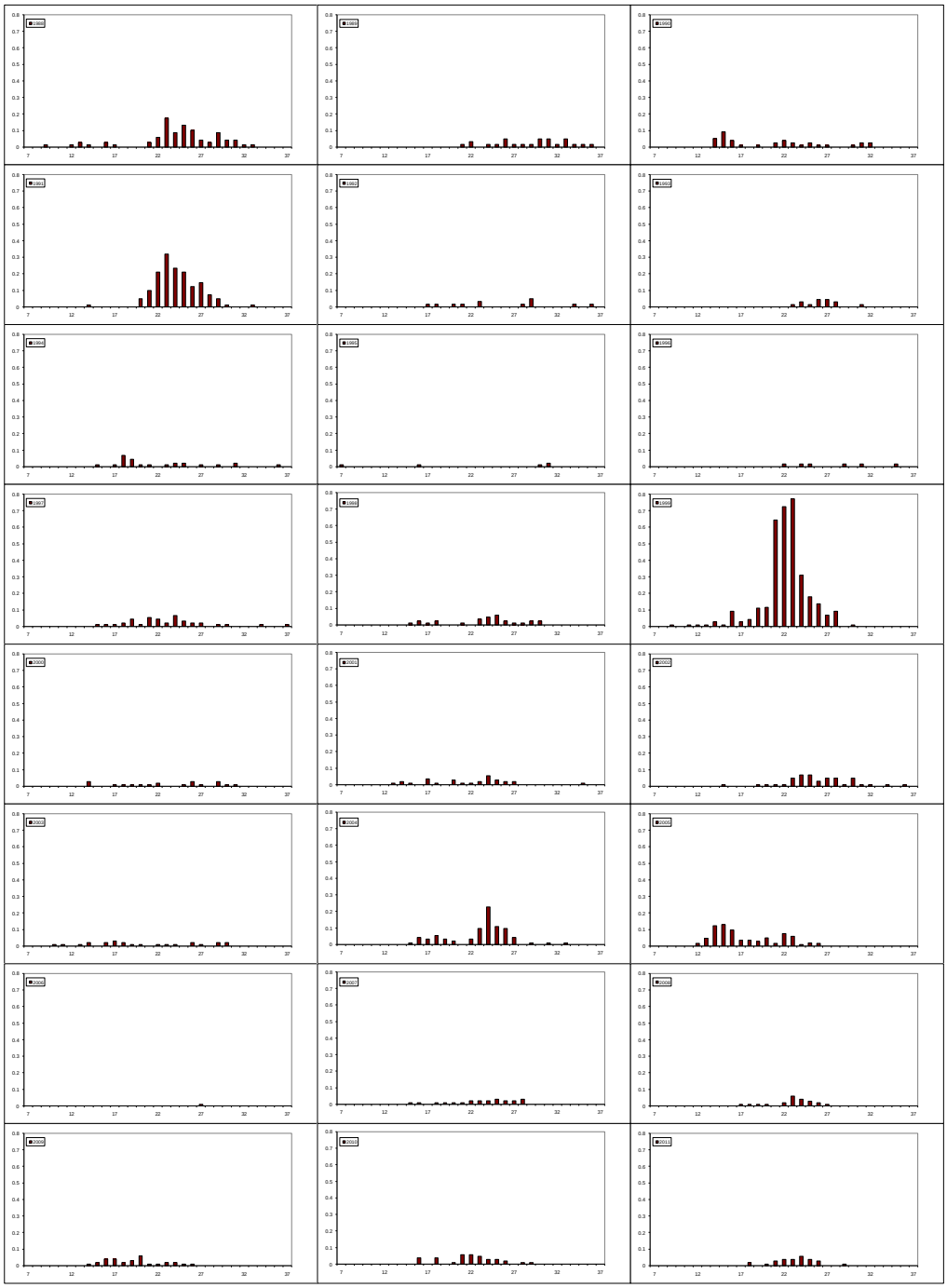

Figure 7.14. Grey gurnard. Abundance index at length of grey gurnard from CGFS-Q4 survey time series in Eastern Channel. 1999 indicates sporadic higher abundances.

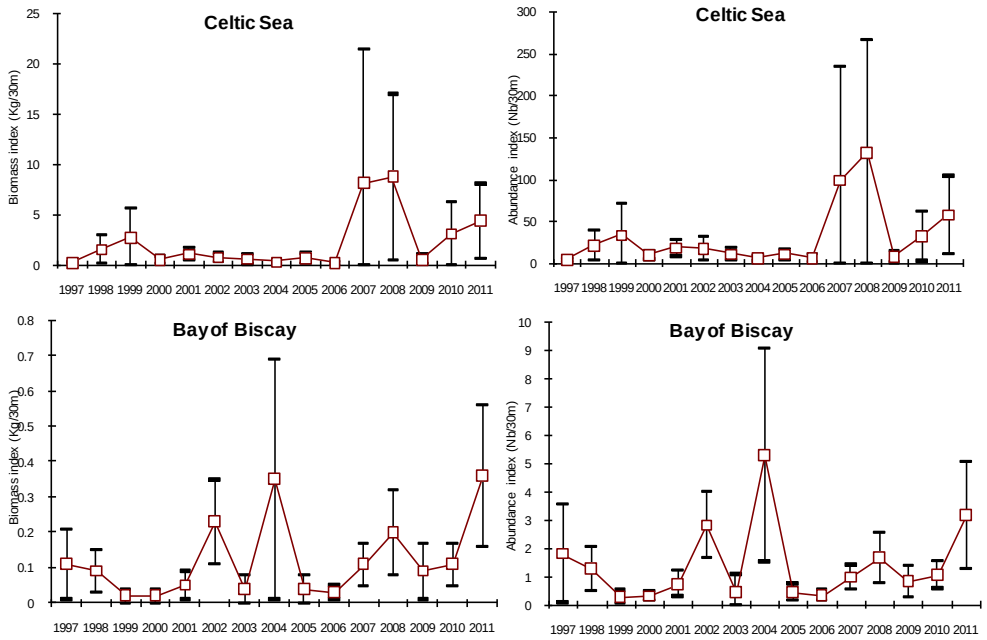

Figure 7.15. Grey gurnard. Abundance index (Nb/30mn and Weight/30 mn) of grey gurnard and their confidence interval from EVHOE-WIBTS-Q4 survey time series in Celtic sea and Bay of Biscay.

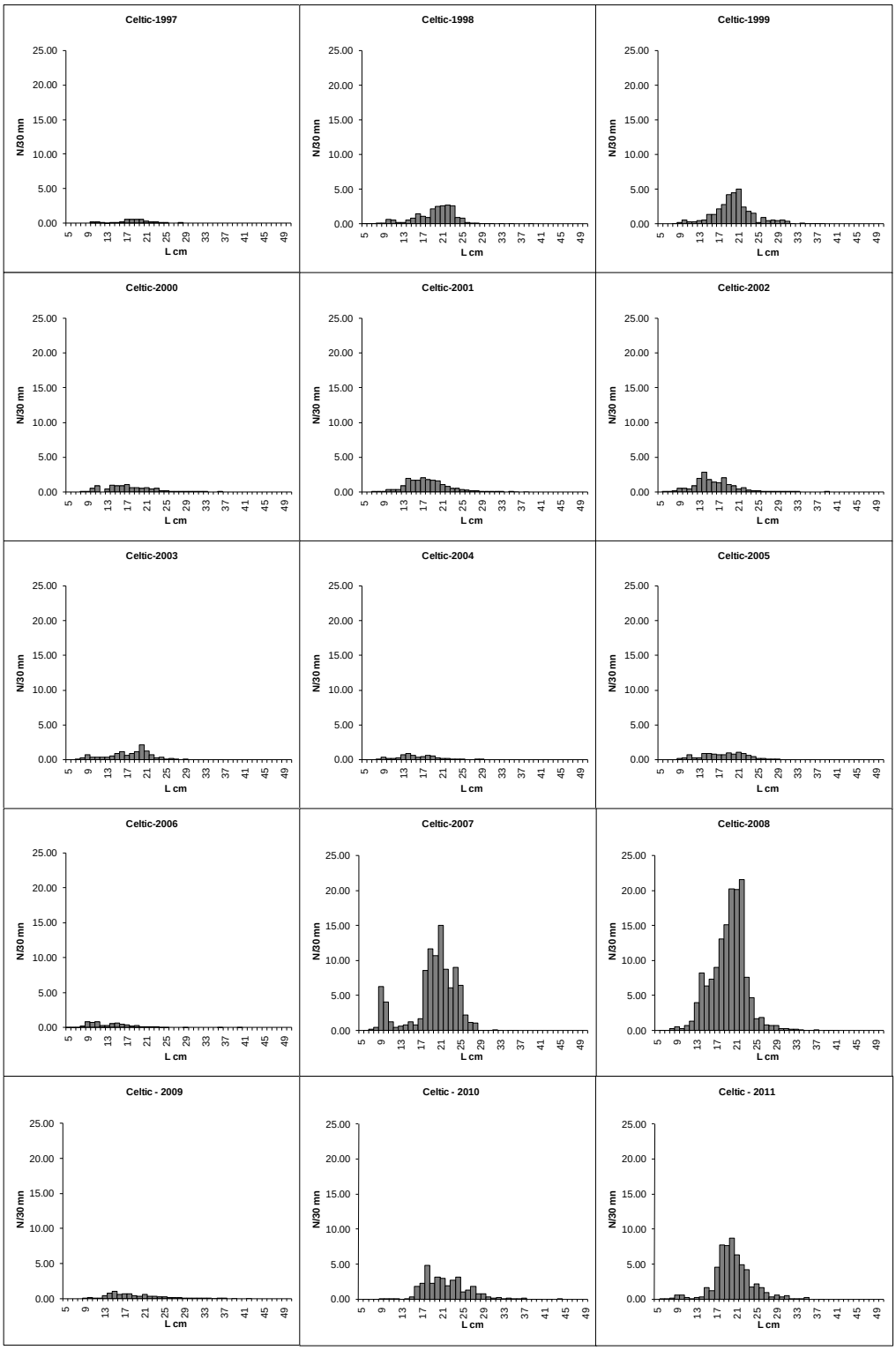

Figure 7.16. Grey gurnard. Abundance index at length of grey gurnard from EVHOE-WIBTS-Q4 survey time series in Celtic sea.

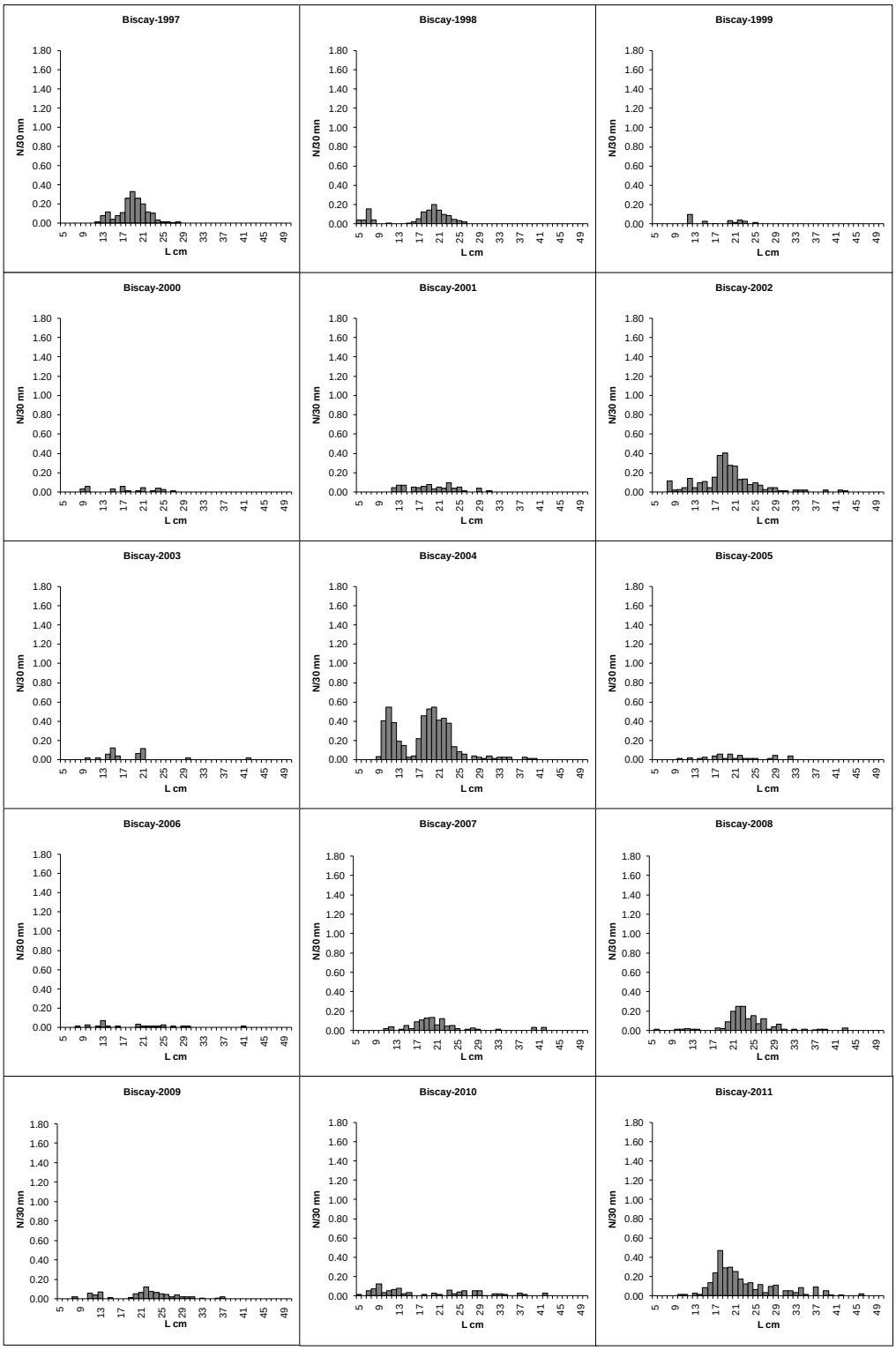

Figure 7.17. Grey gurnard. Abundance index at length of grey gurnard from EVHOE-WIBTS-Q4 survey time series in the Bay of Biscay.

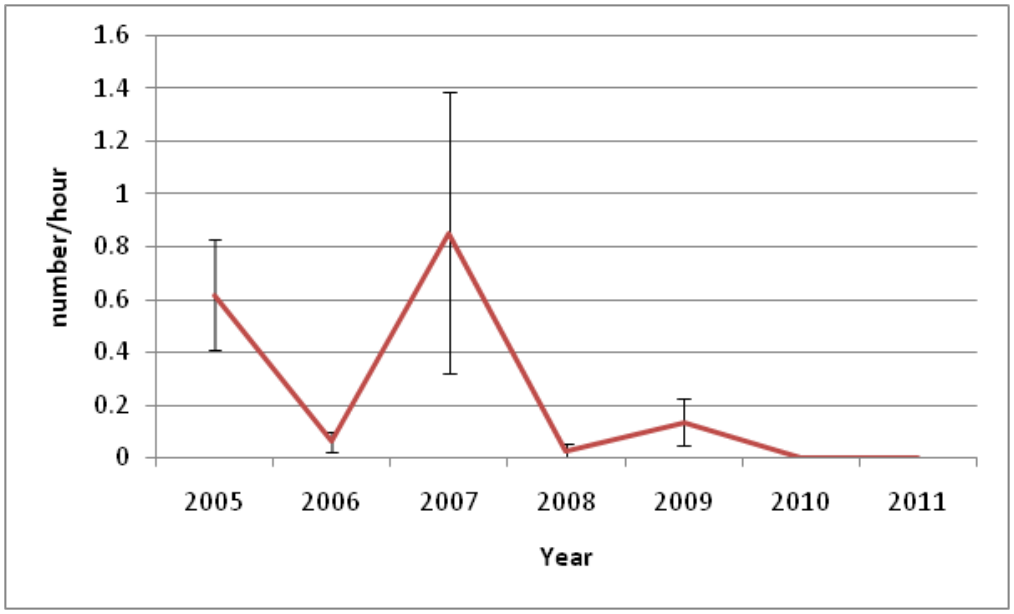

Figure 7.18. Grey gurnard. Abundance index of grey gurnard from PGFS-Q4 survey time series on the Western shelf of Portugal (the survey does not catch any grey gurnard in 2010 and 2011).

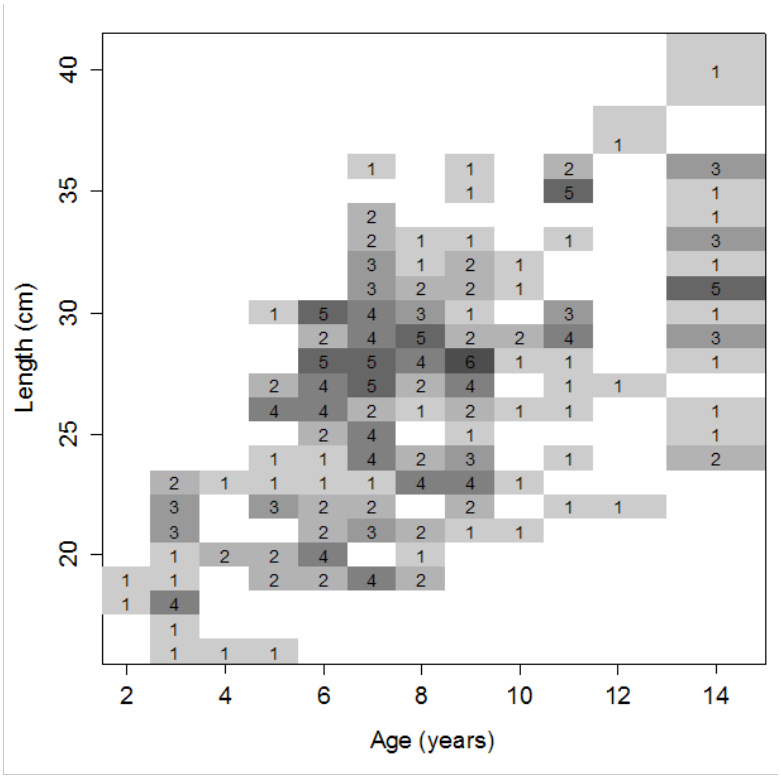

Figure 7.19. Grey gurnard. ALK from otoliths of Grey gurnard collected during 2010 IBTS-Q1 survey showing that grey gurnard displays a significant number of individuals over a large span of ages (up to 14).

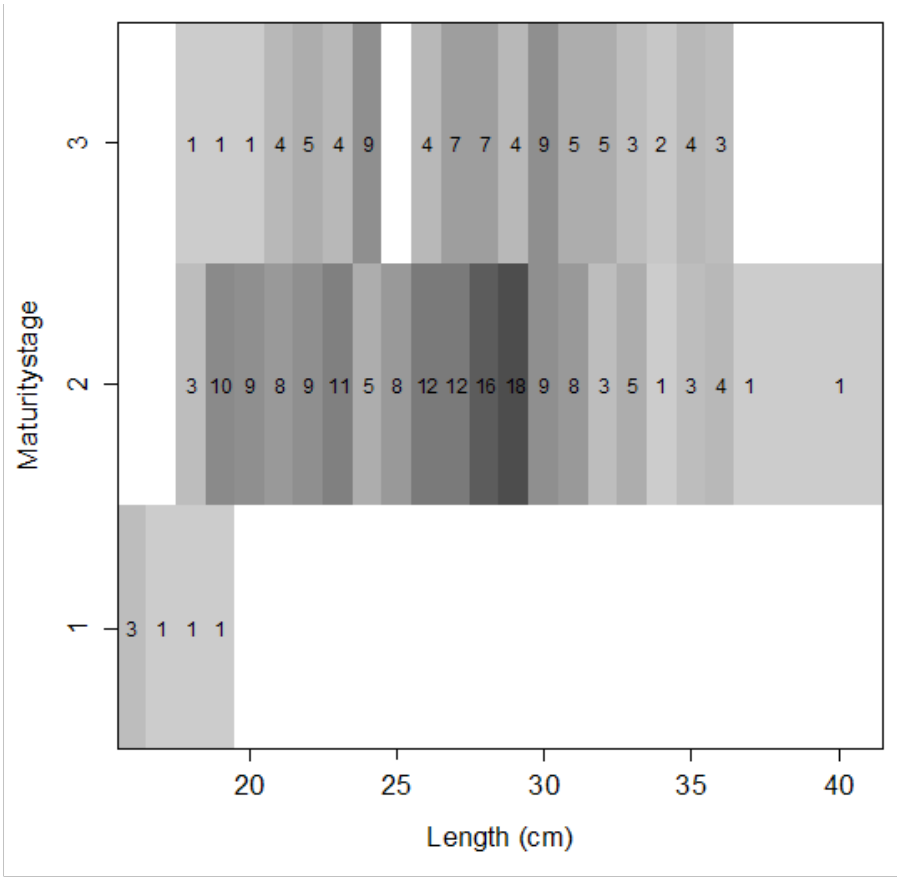

Figure 7.20. Maturity length key of Grey gurnard sampled during IBTS-Q1 surveys . which shows that above 19–20 cm almost all the individuals can be considered mature.

8 Dab

8.1 General biology

Dab (*Limanda limanda*) is a widespread demersal species on the Northeast Atlantic shelf and distributed from the Bay of Biscay to Iceland and Norway; including the Barents Sea and the Baltic. Its centre of distribution in the North Sea is located in the southern North Sea (Lozán 1988; Daan *et al.* 1990, ICES 2010 (Figure 8.1)). It is the secondmost abundant species in the North Sea (Daan *et al.* 1990).

8.2 Stock identity and possible assessment areas;

The 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. Further, tagging experiments and significant meristic differences within Baltic populations led Temming *et al,* (1989b) to propose an individual stock around Bornholm, separated from IIIc22. However, currently no further scientific evidence is available to distinguish between different stocks for management purposes.

Based on the data of Lozan and a visual inspection of the spatial distribution of CPUE from different trawl surveys, the Working Group proposes three different assessment areas, corresponding to the ICES ecoregions. These are: The Celtic Seas ecoregion, the North Sea ecoregion, and the Bay of Biscay ecoregion

8.3 Management regulations (TAC's, minimum landing size)

According to EU-Regulations a precautionary TAC is given in EU waters of IIa and IV together with flounder (*Plathichthys flesus*). The TAC decreased from 2002 to 2012 from about 27 000 to 18 400 t. No minimum landing size is defined.

8.4 Fisheries data

Dab is a by-catch species in fisheries for plaice, sole and demersal roundfish. According to ICES catch statistics, annual landings of dab in ICES Divisions III, IV, and VII has been well above 10 000 t since 1973. The apparent decreases in official landings in the 1980's and 1990's are due to unreported catches by the Netherlands, Norway and Spain (Figure 8.2.2 and Figure 8.3.3). The main fishing gear in the North Sea is the beam trawl with mesh sizes between 80 and 100 mm. In the Baltic the otter trawl is used with mesh sizes >100 mm.

Dab is among the most discarded fish species in ICES Division IV. In the beam trawl fishery on sole and the otter trawl fishery on plaice about 95% of the catches on dab are discarded.

8.5 Survey data, recruit series

Surveys providing information on distribution, abundance and length frequency for dab are the International Bottom Trawl Survey IBTS and the Beam Trawl Survey in quarter 3. Abundance indices from IBTS and BTS are shown in Figures 8.4 and 8.5. The abundance in IBTS Q1 increases since 1980. Length frequencies for the German BTS in the North Sea are given in Figure 8.6. In some years a recruiting year class can clearly be seen, as e.g. in 1999, 2005, and 2008.

8.6 Biological sampling

Biological information is collected for dab for most UK surveys. In addition, data on length distributions, distributions and abundance is available in Cefas technical reports for the English Channel and southern North Sea (Parker-Humphreys 2004b). Length information from market sampling for this species is available for 2000 – 2003 only. Biological samples for otoliths, weight, sex and maturity are only available for 2000 – 2002.

During different flatfish surveys by the Netherlands biological samples for dab are being collected since many years. These data include information on length, weight, sex and maturity stage. Market sampling is carried out since 2002.

Germany routinely measured dab by sex during surveys. Age reading started in 1997 with BTS. Market samples for dab are not available.

8.7 Population biology parameters and a summary of other research

Several extended 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 is reached at about 2 - 3 years. Maturity data are available in terms of combined age-at-maturity and length-at-maturity information (Deniel, 1990; Jennings *et al.* 1999) (Deniel and Tassel, 1986).

Mortality rates for 0-group dab during winter time have been calculated for 11 time series (Iles and Beverton 1991). Temperature is considered as a mortality factor for eggs (van der Land, 1991).

8.8 Analyses of stock trends and potential status indicators

For the North Sea, the IBTS survey indicate sthat the population size has increased in the long term and had a considerably high level in recent years (Figure 8.4). The Dutch BTS survey in quarter 3 shows different trends in different areas. The "Isis" index series indicates a decrease in abundance since the start of the survey series, with a comparatively small increase in the last 5 years. The "Tridens" series shows an overall increase. High abundances can be found in the southeast along the German and Dutch coast and in the centre of the North Sea in the Doggerbank area. Biomass indices are linked to the abundance indices. Length composition has been stable over the years showing a slight increase of the range of sizes in recent years. Age 1 and age 2 dab are most abundant.

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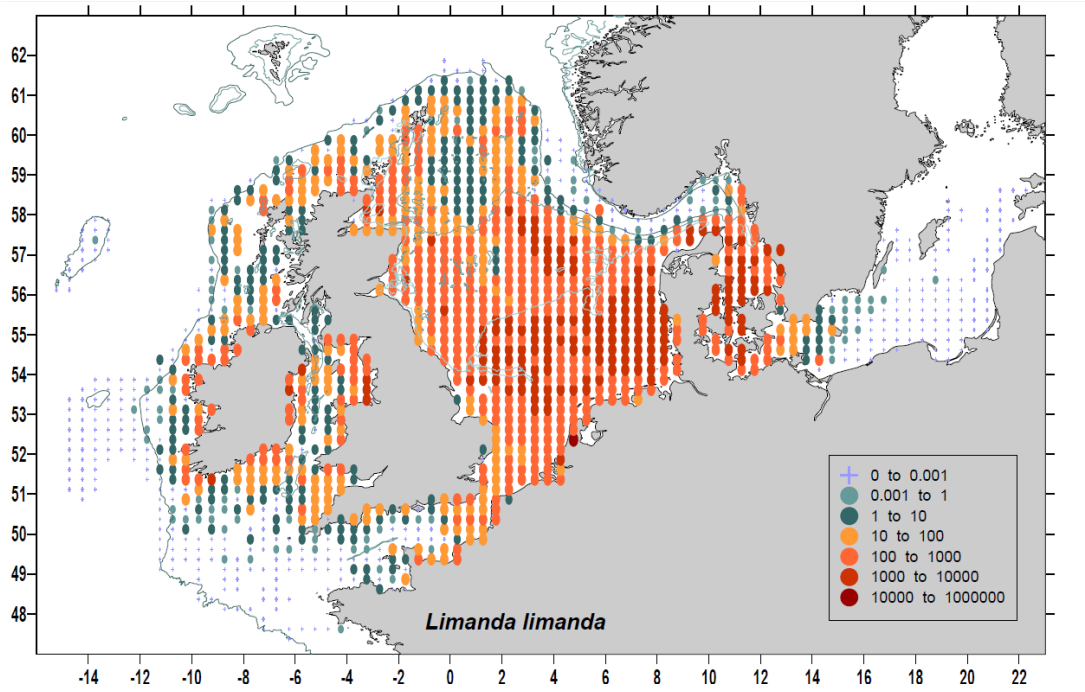

Figure 8.1. Spatial distribution of CPUE of dab in different trawl surveys. Taken from WD1 to WGNEW 2012 (Annex 2).

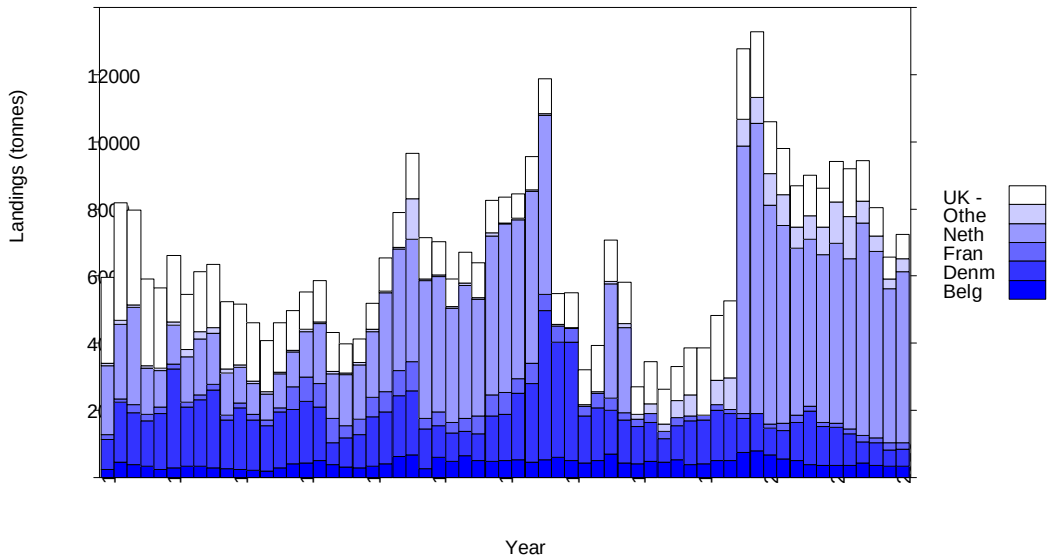

Figure 8.2. Dab landings in ICES IV by country. The period 1984- 1997 is characterized by lacking Dutch data.

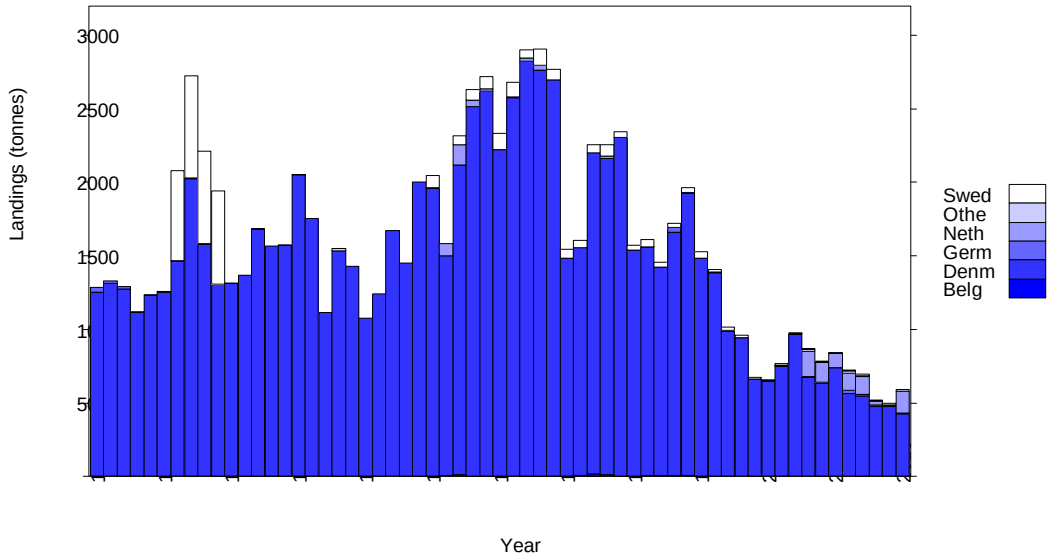

Figure 8.3. Dab landings in ICES IIIa by country. The period 1984- 1997 is characterized by lacking Dutch data.

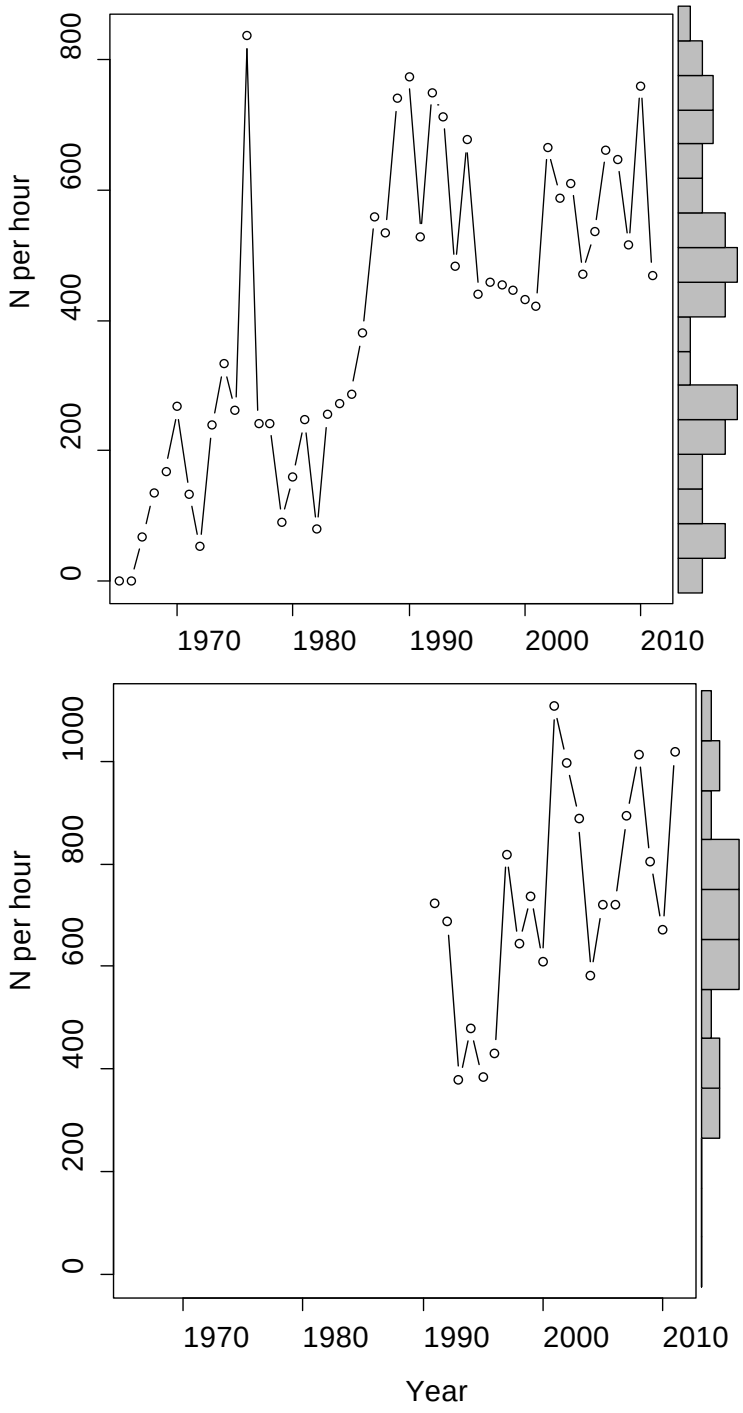

Figure 8.4. CPUE IBTS quarter 1 (left panel) and quarter 3 (right panel in ICES area IV for common dab.

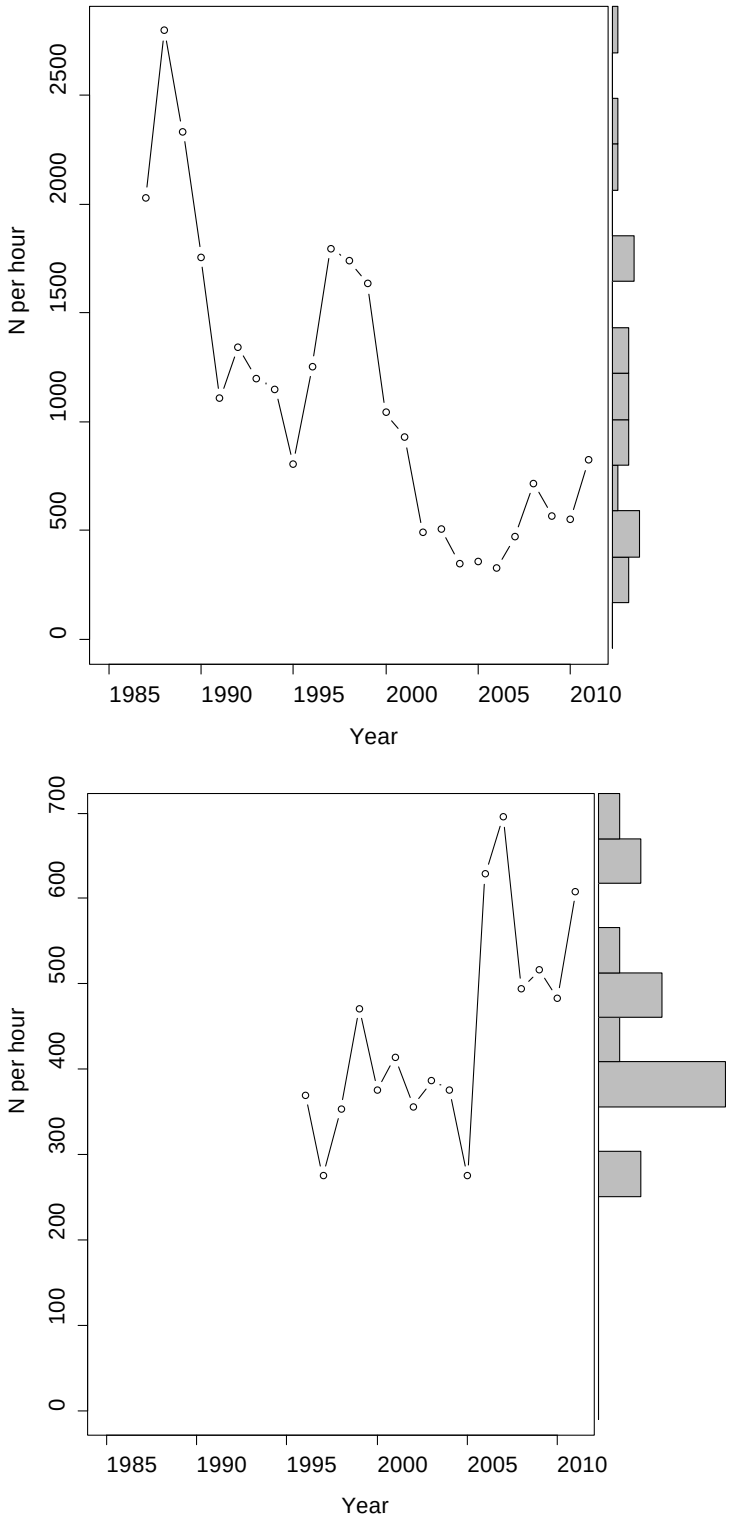

Figure 8.5. CPUE BTS quarter 3 for RV Isis (left panel) and RV Tridens (right panel) in ICES area IV for common dab.

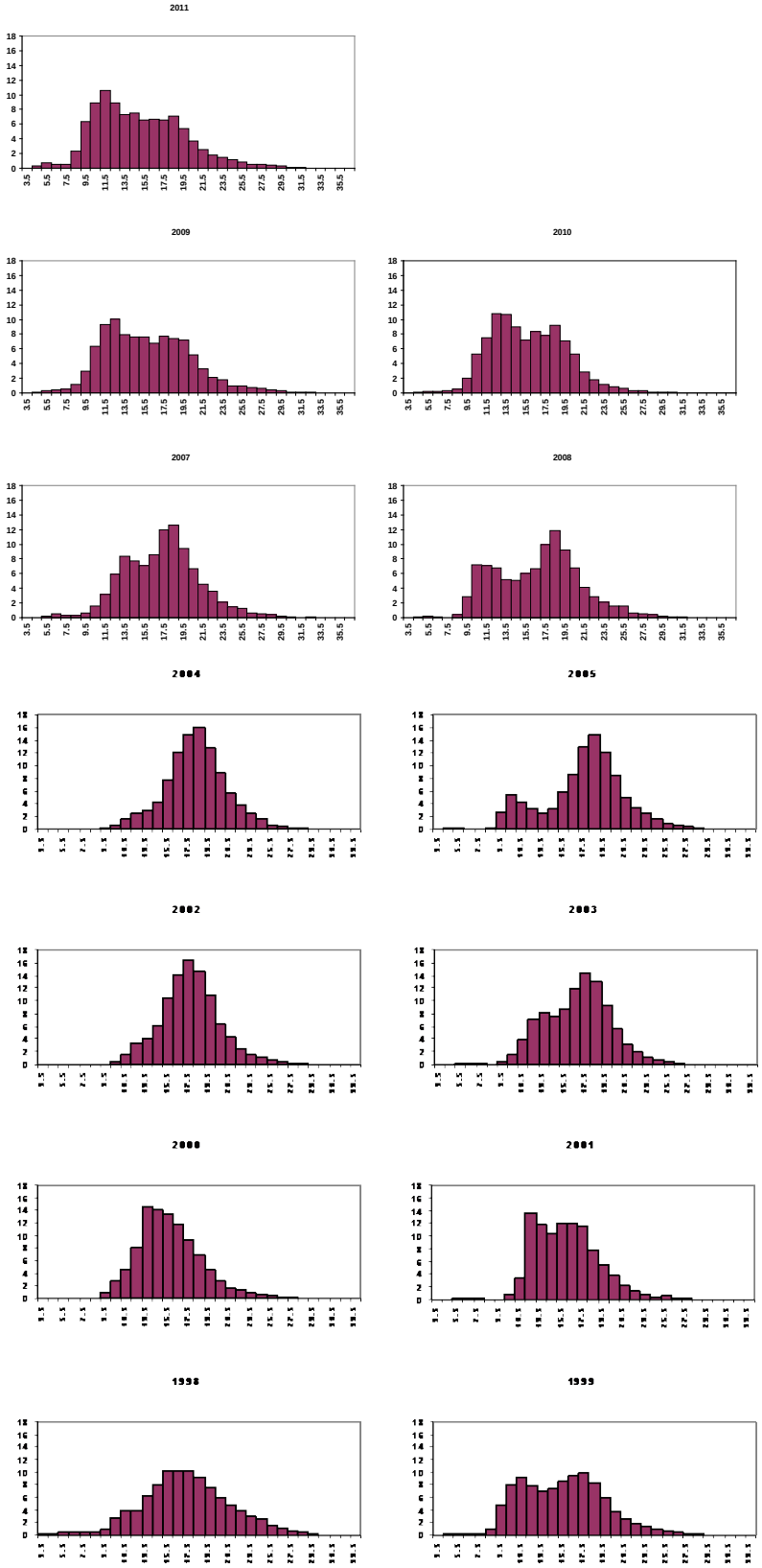

Figure 8.6. Length-frequency distribution (LFD) of common dab from the German BTS, ICES area IVb. Frequency in %.

9 Brill in Subarea IV, Subdivision IIIa and VIIde

9.1 General biology

Brill is a shallow-water flatfish mainly found in areas close inshore. It prefers sandy bottoms, but can sometimes also be found on gravel and muddy grounds. Its vertical distribution ranges from 4 m to 73 m, although small juvenile fish are often common in sand shore pools. Mature brill are rarely observed inshore, whereas immature specimens are often caught near the coast and even in estuaries.

The distribution of brill in the North Eastern Atlantic ranges along the European coastline from 64° N (the Lofotes) down to 30° N, extending into the Mediterranean and even into the Black Sea (Nielsen, 1986). Brill is also found in the Skagerrak, the Kattegat, and small quantities in the Baltic Sea. The western limit of its distribution area is reached in southern Iceland.

The feeding habits of this species closely resemble those of turbot and were extensively reviewed by de Groot (1971) and Wetsteijn (1981). The pelagic larvae feed primarily on copepod nauplii, decapod and mollusc larvae. With increasing size, this diet gradually changes from larger invertebrate prey and larvae of several fish species to small fish. Larger brill (> 40 cm) are primarily piscivorous.

More information on the biology of brill can be found in Annex 5 of WGNEW(2010).

9.2 Stock identity and possible management areas

The oldest study that could be found containing information on the genetic structure of brill was carried out by Blanquer *et al.* (1992), using allozyme electrophoresis. No genetic differentiation could be found between Atlantic and Mediterranean populations, suggesting that there are also very low levels of differentiation in brill from different areas.

In the EU funded study on 'Stock discrimination in relation to the assessment of the brill fishery' the following was concluded (Delbare and De Clerck, 1999): "As a final conclusion, biological parameters (composition of Belgian brill landings, growth rate and reproduction characteristics) and the sequencing of the D-loop resulted in insignificant differences between brill from the different areas. Therefore, arguments favour the hypothesis that brill from the NE Atlantic might be considered to be only one population: the North-eastern Atlantic brill population. Further research on spawning areas and migration through respectively egg surveys and tagging experiments, could generate valuable information about (sub-)population structures of brill throughout its entire distribution area. Therefore it is advisable to extend the sampling area to the Mediterranean Sea and the Black Sea."

Currently, the genetic structure of brill over its entire distribution area is being characterized by ILVO and the University of Leuven. Genetic variation was found to be of mean to high levels, but the results on differentiation between potential biological populations and/or management units, and on the levels of connectivity between these units, are not available yet. Also further research on brill spawning areas (egg surveys), and of migration of adult (tagging experiments) and especially immature brill (tagging experiments and genetic analysis of the immature population components) could still generate valuable information about (sub-) population structure of brill throughout its entire distribution area.

More information on the current research on the delineation of potential brill stocks can be found in Annex 5 of WGNEW(2010).

9.3 Management regulations

So far, no analytical assessments leading to fisheries advice have been carried out for brill by ICES. The available information is inadequate to evaluate stock trends. Therefore, the state of the stock(s) is unknown. No explicit objectives have been defined for potential stocks of this species, no precautionary reference points have been proposed, and no management plans are in place. However, for the EU-waters in Division IIa and Subarea IV, precautionary TACs have been defined for brill and turbot (combined) in the past. These TACs belong entirely to the EU-fisheries, and a historical overview is presented in the table below:

YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008
	2009	2010	2011	2012					
TAC	9000	9000	6750	5738	4877	4550	4323	4323	5263
	5263	5263	4642	4642					

No restriction on the minimum length for landing brill is imposed by the EC. In several geographical areas however, Minimum Landing Sizes (MLS) have been installed for brill by different authorities. The most frequently applied MLS is 30 cm (e.g., in Belgium, the Baltic, the English Sea Fisheries District Cornwall, …).

9.4 Fisheries data

Table 9.1 and Figure 9.1 summarise the official brill landings from the Greater North Sea (Subarea IV, Divisions IIIa and VIId,e) by country (Source: ICES Fishstat). Over the period 1950 – 1970, total landings ranged from 749 t to 1131 t per year, followed by a gradual increase to 2325 t in 1977. During 1978 – 2010, total landings varied between 1667 t (in 1980) and 3432 t (in 1993). Since 2000, annual total landings fluctuated around an average of 2236 t (range: 1985 t – 2591 t). The North Sea (IV) accounts for the major part of these landings, on average generating 71% of the totals over the time series (range: 51–88%). The English Channel and the Skagerrak are responsible for average contributions to the international brill landings of 17% and 12% respectively.

- Landings in the Skagerrak (IIIa)

International landing series from the Skagerrak were updated for brill (source: ICES Fishstat) and can be consulted in Table 9.2 and Figure 9.2. Over the period 1950–2010, these landings ranged from 59 t – 389 t per year. Denmark landed on average 81% of the Skagerrak brill (over the entire time series). Other countries contributing to the total landings were - in descending order of importance – Sweden, Norway, the Netherlands (mainly because of a peak in the second half of the seventies), Germany and Belgium. The Danish share has dropped to 75% of the landings in the last ten years, mainly due to an increase of Norwegian fisheries in the area.

- Landings in the North Sea (IV)

International landing series from the North Sea were composed for brill (source: ICES Fishstat) and can be consulted in Table 9.3 and Figure 9.3. During 1950–1970, total landings were about half of the values reached during 1970–1990, but as this is most likely attributable to incomplete statistics in the 50's and 60's (different reporting

regulations in this period compared to later in the time series) only the data from 1971 onwards were used to calculate the following Figures. Over the period 1971–2010, brill landings from the North Sea ranged from 1086 t – 2730 t per year. The Netherlands landed on average 62% of the North Sea brill. Other countries contributing to the total landings were – in descending order of importance – Belgium, UK, Denmark, Germany and France. Norway, Ireland and Sweden only land negligible quantities of North Sea brill.

- Landings in the English Channel (VIId,e)

International landing series from the English Channel were updated for brill (source: ICES Fishstat) and can be consulted in Table 9.4 and Figure 9.4. Due to a change in reporting regulations in 1977, landings before and after this point in time cannot be quantitatively compared to each other. As a result, the dramatic increase in brill landings from 1977 onwards rather reflects an increase in reporting of the landings than an a real increase in these landings. Prior to 1977, only the UK systematically reported brill landings from the English Channel, whereas later in the time series also France and Belgium have major contributions to the total landings. Therefore, only data from 1977 onwards were used for the calculation of the following Figures. Over the period 1977–2010, brill landings from the English Channel ranged from 240 t to 759 t per year. France and the UK have always been the main contributors to the brill landings from the English Channel (44% and 34% respectively, over the entire timeline), with Belgium in third place (22%). The Netherlands, Ireland and Denmark landed negligible quantities.

More details on the Belgian, Dutch, French and UK fisheries catching brill, information on length- and age-distributions of Belgian brill landings, and numbers at length discarded per hour in the Dutch beam trawl fleet (North Sea) can be found in Annex 5 of WGNEW(2010). Numbers discarded are very low and only fish with a length of less than 25 cm are being discarded.

9.5 Survey data

Catches of brill are generally very low on surveys. These low catch numbers very often result in an underrepresentation of some year-classes (mainly the older ones), leading to a poor quality of the resulting survey abundance series and indices, and poor agreement among different surveys.

Four surveys were tested for their potential use in describing stock trends of brill in the greater North Sea. Three of these surveys take place in the North Sea (IBTS_TRI_Q1, BTS_TRI_Q3 and BTS_ISI_Q3) and one in the English Channel (CGFS_Q4). Time series of total numbers of brill caught by the three North Sea surveys are depicted in Figure 9.5. Only BTS_ISI_Q3 was found to catch a sufficient number of individuals to be useful in the context of evaluating stock trends of North Sea brill, and the corresponding abundance indices (numbers per hour) are illustrated in Figure 9.6. Figure 9.7 shows the time series of the abundance index of the CGFS_Q4 in the English Channel. Both index series are evaluated as stable at a low level (keep the low numbers in mind!).

Length frequency distributions for the Dutch Beam Trawl Survey are shown in Figure 9.8.

9.6 Biological Sampling

No new information was obtained compared to the report of WGNEW2010 (ICES, 2010) .

9.7 Biological parameters and other research

No new information was obtained compared to the report of WGNEW2010 (ICES, 2010) .

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9.8 Analysis of stock trends / assessment

No new information was obtained compared to the report of WGNEW2010 (ICES, 2010) .

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9.9 Data requirements

No new information was obtained compared to the report of WGNEW2010 (ICES, 2010) .

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Table 9.1. Total international landings (t) of brill Scophthalmus rhombus in the Greater North Sea (IIIa + IV + VIIde) by country over the period 1960–2010 (source: ICES Fishstat).

	BEL	DNK	FRA	GER	IRL	NLD	NOR	SWE	UK	TOTAL
1960	61	364	0	51	0	150	1	54	281	962
1961	103	397	0	54	0	166	0	59	310	1089
1962	100	346	0	68	0	214	0	0	290	1018
1963	80	258	0	54	0	175	0	0	357	924
1964	79	231	0	45	0	279	0	0	221	855
1965	73	282	0	36	0	281	0	0	173	845
1966	100	350	0	27	0	264	0	0	172	913
1967	139	273	0	29	0	137	0	0	171	749
1968	155	295	0	41	0	274	0	0	164	929
1969	147	291	121	39	0	364	0	0	169	1131
1970	124	253	0	36	0	386	0	0	125	924
1971	205	363	0	46	0	730	0	0	142	1486
1972	233	398	0	16	0	668	0	0	103	1418
1973	205	371	0	16	0	710	0	0	109	1411
1974	160	403	0	17	0	905	0	0	100	1585
1975	188	407	68	22	0	926	0	19	102	1732
1976	190	398	180	18	0	966	0	12	119	1883
1977	212	530	214	38	0	1178	0	12	141	2325
1978	233	479	253	45	0	994	0	11	207	2222
1979	243	498	272	27	3	925	0	11	245	2224
1980	195	304	221	21	3	748	0	10	165	1667
1981	231	268	276	8	0	957	0	5	178	1923
1982	288	299	236	6	0	1009	0	8	197	2043
1983	289	317	257	7	0	1157	0	7	212	2246
1984	304	352	256	11	0	1200	0	8	220	2351
1985	281	358	248	4	0	1370	0	9	233	2503
1986	246	301	187	5	0	950	0	12	204	1905
1987	266	283	233	5	0	715	0	10	199	1711
1988	214	226	220	10	0	880	0	10	190	1750
1989	201	243	222	15	0	1080	0	9	181	1951
1990	268	423	273	30	0	480	0	10	277	1761
1991	287	431	277	38	0	1111	15	10	287	2456
1992	286	403	257	59	0	1196	29	16	376	2622
1993	371	593	294	63	0	1647	24	16	424	3432
1994	296	508	255	90	0	1235	23	17	410	2834
1995	285	373	272	68	1	943	19	13	363	2337
1996	311	364	255	47	0	732	20	5	438	2172
1997	236	250	186	49	1	590	27	11	343	1693
1998	230	326	207	59	0	810	26	13	355	2026
1999	258	378	0	52	0	808	29	17	296	1838
2000	331	372	276	79	1	1002	28	16	390	2495
2001	394	322	268	66	0	1077	26	12	426	2591
2002	349	263	278	58	0	908	22	11	363	2252
2003	362	301	296	71	1	936	24	16	372	2379
2004	305	336	266	67	1	779	34	17	406	2211
2005	258	310	274	62	0	721	44	13	342	2024
2006	285	285	290	56	0	771	28	14	339	2068
2007	315	281	337	48	0	858	24	22	367	2252
2008	271	341	230	44	0	653	23	28	305	1895
2009	240	304	286	54	0	788	18	32	285	2007
2010	249	296	352	76	0	1074	13	16	345	2421

Table 9.2. Total international landings (t) of brill Scophthalmus rhombus in the Skagerrak (Division IIIa) by country over the period 1960–2010 (source: ICES Fishstat).

	BEL	DNK	GER	NLD	NOR	SWE	UK	TOTAL
1960	0	272	23	0	0	46	0	341
1961	0	255	20	0	0	50	0	325
1962	0	207	15	0	0	0	0	222
1963	0	120	2	0	0	0	0	122
1964	0	106	3	0	0	0	0	109
1965	0	155	5	0	0	0	0	160
1966	0	187	1	0	0	0	0	188
1967	0	106	2	0	0	0	0	108
1968	0	100	1	0	0	0	0	101
1969	0	99	1	0	0	0	0	100
1970	0	97	1	0	0	0	0	98
1971	0	104	1	0	0	0	0	105
1972	0	120	1	0	0	0	0	121
1973	0	131	3	0	0	0	0	134
1974	0	200	2	0	0	0	0	202
1975	0	167	2	1	0	19	0	189
1976	1	185	3	26	0	12	0	227
1977	1	276	1	99	0	12	0	389
1978	0	178	2	27	0	11	0	218
1979	0	156	0	17	0	11	0	184
1980	2	69	0	1	0	10	0	82
1981	0	54	0	0	0	5	0	59
1982	1	64	0	1	0	8	0	74
1983	0	73	0	3	0	7	0	83
1984	0	89	0	0	0	8	0	97
1985	0	100	0	0	0	9	0	109
1986	0	94	0	0	0	12	0	106
1987	0	93	0	0	0	10	0	103
1988	0	91	0	0	0	10	0	101
1989	0	88	0	0	0	9	0	97
1990	1	116	0	0	0	10	0	127
1991	1	81	0	0	7	10	0	99
1992	1	123	0	0	7	15	0	146
1993	2	184	0	0	10	16	0	212
1994	0	191	0	0	12	17	0	220
1995	0	124	1	0	13	13	0	151
1996	0	94	0	0	12	5	0	111
1997	0	83	1	0	11	11	0	106
1998	0	108	1	0	10	13	0	132
1999	0	126	1	0	13	17	0	157
2000	0	112	2	0	12	16	0	142
2001	0	73	0	0	13	12	0	98
2002	0	66	0	0	12	11	0	89
2003	0	99	1	1	12	16	0	129
2004	0	119	1	4	15	17	0	156
2005	0	101	0	3	16	13	0	133
2006	0	105	1	3	16	14	0	139
2007	0	119	1	3	15	22	0	160
2008	0	138	2	1	13	28	0	182
2009	0	98	1	1	14	32	0	146
2010	0	95	1	1	9	16	0	122

Table 9.3. Total international landings (t) of brill Scophthalmus rhombus in the North Sea (Subarea IV) by country over the period 1960–2010 (source: ICES Fishstat).

	BEL	DNK	FRA	GER	IRL	NLD	NOR	SWE	UK	TOTAL
1960	55	92	0	28	0	150	1	8	235	569
1961	102	142	0	34	0	166	0	9	264	717
1962	97	139	0	53	0	214	0	0	238	741
1963	79	138	0	52	0	175	0	0	307	751
1964	79	125	0	42	0	279	0	0	161	686
1965	71	127	0	31	0	281	0	0	127	637
1966	100	163	0	26	0	264	0	0	119	672
1967	138	167	0	27	0	137	0	0	105	574
1968	152	195	0	40	0	274	0	0	110	771
1969	145	192	0	38	0	364	0	0	102	841
1970	114	156	0	35	0	386	0	0	76	767
1971	187	259	0	45	0	730	0	0	94	1315
1972	213	278	0	15	0	665	0	0	51	1222
1973	185	240	0	13	0	710	0	0	39	1187
1974	135	203	0	15	0	905	0	0	44	1302
1975	164	240	13	20	0	925	0	0	44	1406
1976	148	213	10	15	0	940	0	0	45	1371
1977	166	254	17	37	0	1,079	0	0	60	1613
1978	175	298	26	43	0	967	0	0	84	1593
1979	188	342	10	27	3	908	0	0	103	1581
1980	129	233	8	21	0	747	0	0	45	1183
1981	148	214	5	8	0	957	0	0	42	1374
1982	182	235	11	6	0	1,007	0	0	41	1482
1983	182	244	23	7	0	1,153	0	0	28	1637
1984	190	263	30	11	0	1,200	0	0	29	1723
1985	187	258	35	4	0	1,370	0	0	46	1900
1986	131	207	4	5	0	950	0	0	46	1343
1987	140	190	17	5	0	715	0	0	48	1115
1988	102	135	18	10	0	880	0	0	52	1197
1989	112	155	9	15	0	1080	0	0	58	1429
1990	168	307	24	30	0	480	0	0	82	1091
1991	205	350	28	38	0	1,111	8	0	147	1887
1992	203	280	34	59	0	1,196	22	1	218	2013
1993	291	409	38	63	0	1,647	14	0	268	2730
1994	208	317	28	90	0	1,235	11	0	235	2124
1995	194	249	24	67	0	943	6	0	145	1628
1996	206	270	15	47	0	732	8	0	175	1453
1997	129	167	1	48	0	590	16	0	135	1086
1998	160	218	11	58	0	808	16	0	172	1443
1999	161	252	0	51	0	805	16	0	156	1441
2000	167	260	16	77	0	998	16	0	141	1675
2001	182	249	12	66	0	1,075	13	0	158	1755
2002	145	197	10	58	0	907	10	0	120	1447
2003	145	202	9	70	0	934	12	0	119	1491
2004	140	217	7	66	0	772	19	0	168	1389
2005	120	209	7	62	0	716	28	0	138	1280
2006	105	180	9	55	0	765	12	0	154	1280
2007	110	162	12	47	0	854	9	0	156	1350
2008	117	203	5	42	0	650	10	0	93	1120
2009	109	206	8	53	0	786	4	0	104	1270
2010	104	201	12	75	0	1072	4	0	136	1604

Table 9.4. Total international landings (t) of brill Scophthalmus rhombus in the English Channel (Divisions VIId,e) by country over the period 1960–2010 (source: ICES Fishstat).

	BEL	DNK	IRL	FRA	NLD	UK	TOTAL
1960	6	0	0	0	0	46	52
1961	1	0	0	0	0	46	47
1962	3	0	0	0	0	52	55

1963	1	0	0	0	0	50	51
1964	0	0	0	0	0	60	60
1965	2	0	0	0	0	46	48
1966	0	0	0	0	0	53	53
1967	1	0	0	0	0	66	67
1968	3	0	0	0	0	54	57
1969	2	0	0	121	0	67	190
1970	10	0	0	0	0	49	59
1971	18	0	0	0	0	48	66
1972	20	0	0	0	3	52	75
1973	20	0	0	0	0	70	90
1974	25	0	0	0	0	56	81
1975	24	0	0	55	0	58	137
1976	41	0	0	170	0	74	285
1977	45	0	0	197	0	81	323
1978	58	3	0	227	0	123	411
1979	55	0	0	262	0	142	459
1980	64	2	3	213	0	120	402
1981	83	0	0	271	0	136	490
1982	105	0	0	225	1	156	487
1983	107	0	0	234	1	184	526
1984	114	0	0	226	0	191	531
1985	94	0	0	213	0	187	494
1986	115	0	0	183	0	158	456
1987	126	0	0	216	0	151	493
1988	112	0	0	202	0	138	452
1989	89	0	0	213	0	123	425
1990	99	0	0	249	0	195	543
1991	81	0	0	249	0	140	470
1992	82	0	0	223	0	158	463
1993	78	0	0	256	0	156	490
1994	88	0	0	227	0	175	490
1995	91	0	1	248	0	218	558
1996	105	0	0	240	0	263	608
1997	107	0	1	185	0	208	501
1998	70	0	0	196	2	183	451
1999	97	0	0	0	3	140	240
2000	164	0	1	260	4	249	678
2001	212	0	0	256	2	268	738
2002	204	0	0	268	1	243	716
2003	217	0	1	287	1	253	759
2004	165	0	1	259	3	238	666
2005	138	0	0	267	2	204	611
2006	180	0	0	281	3	185	649
2007	205	0	0	325	1	211	742
2008	154	0	0	225	2	212	593
2009	131	0	0	278	1	181	591
2010	145	0	0	340	1	209	695

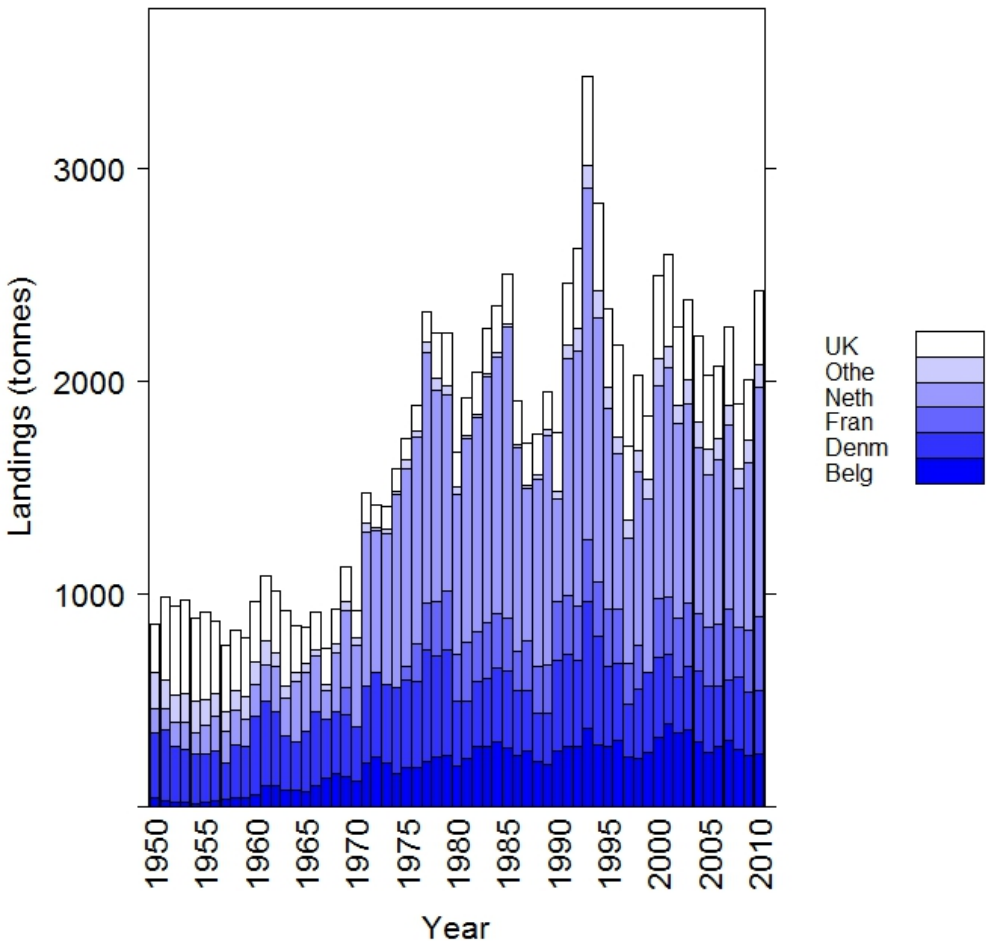

Figure 9.1. Total international landings (t) of brill Scophthalmus rhombus in the Greater North Sea (IIIa + IV + VIIde) by country over the period 1950–2010 (source: ICES Fishstat).

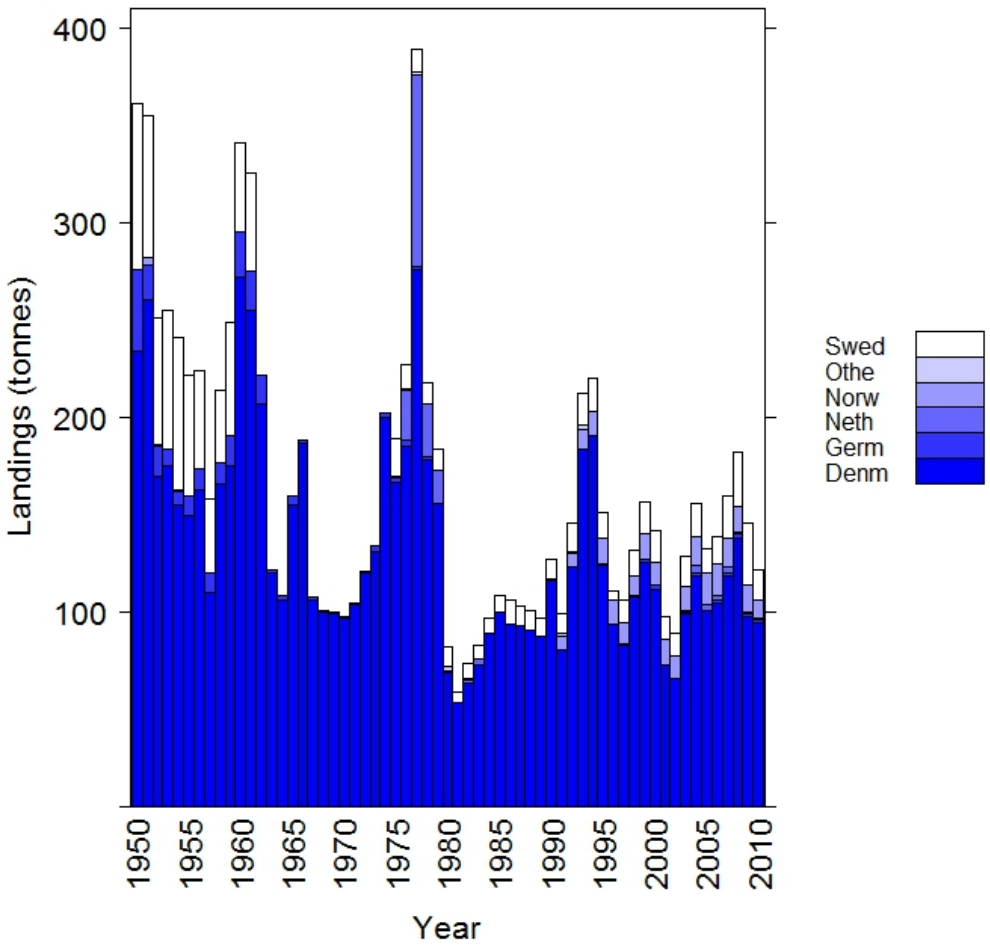

Figure 9.2. Total international landings (t) of brill Scophthalmus rhombus in the Skagerrak (Division IIIa) by country over the period 1950–2010 (source: ICES Fishstat).

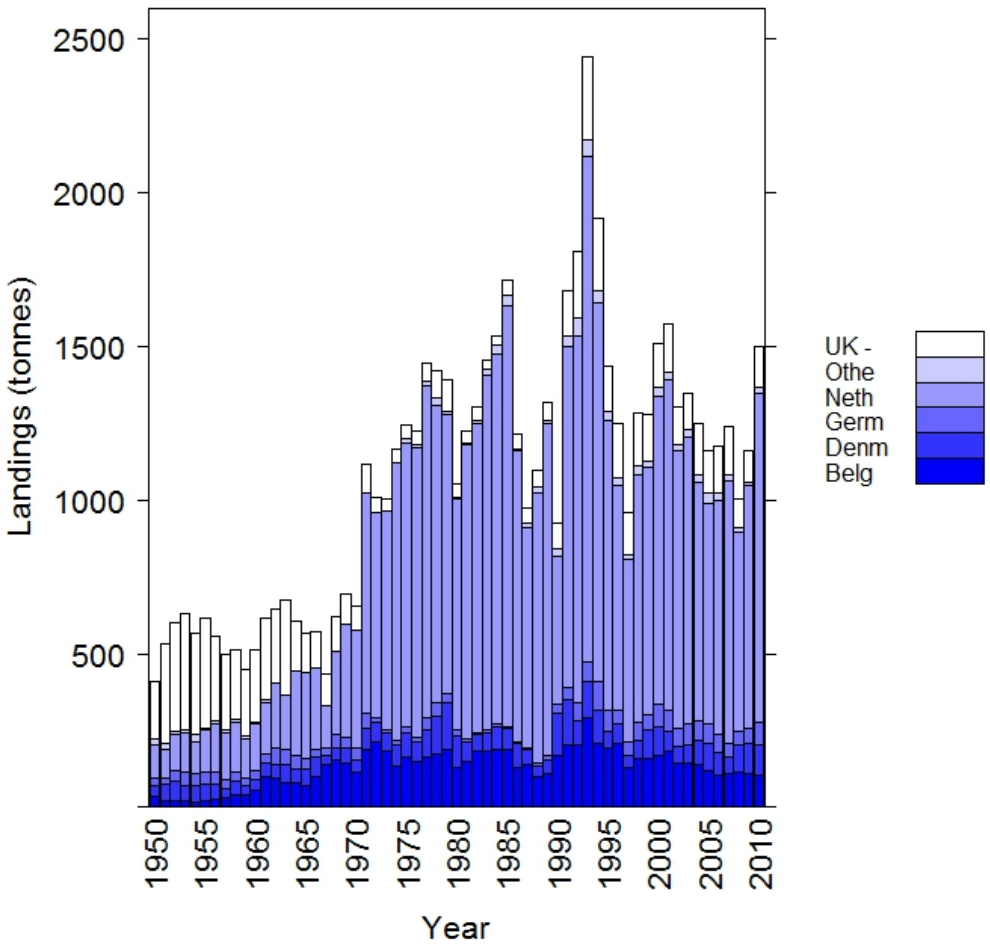

Figure 9.3. Total international landings (t) of brill Scophthalmus rhombus in the North Sea (Subarea IV) by country over the period 1950–2010 (source: ICES Fishstat).

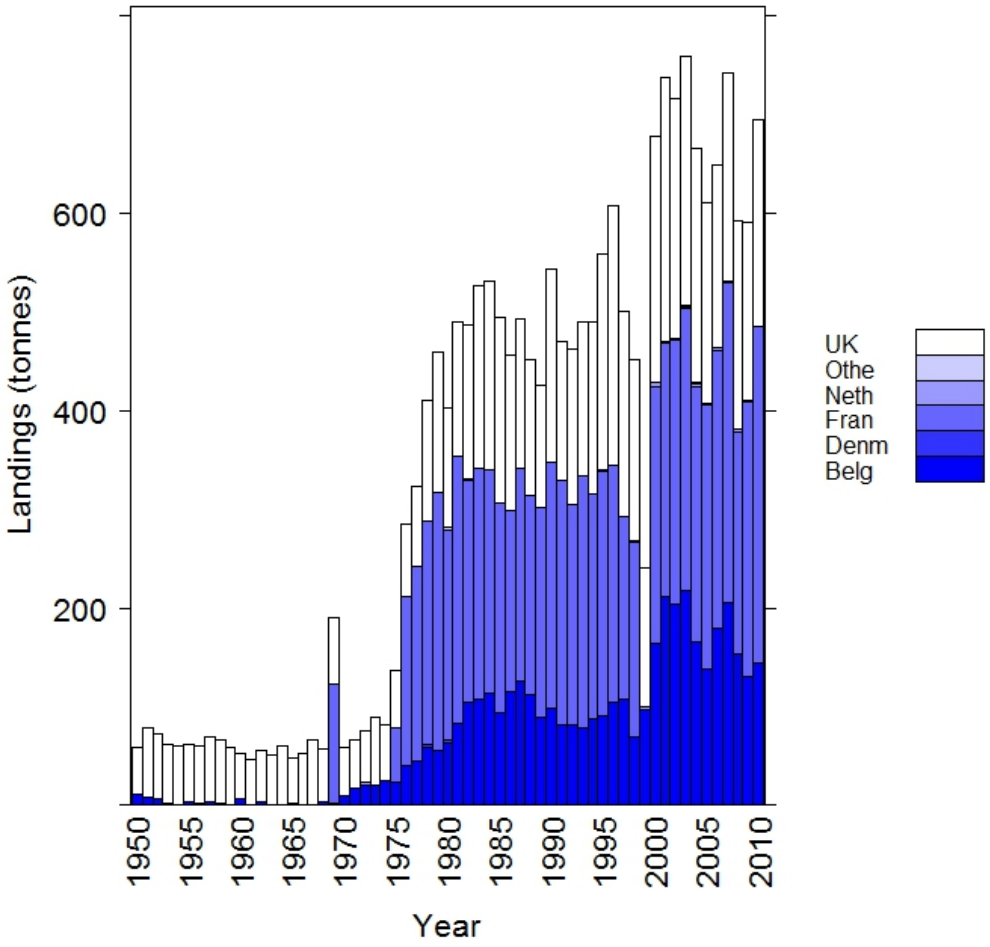

Figure 9.4. Total international landings (t) of brill Scophthalmus rhombus in the English Channel (Divisions VIId,e) by country over the period 1950–2010 (source: ICES Fishstat).

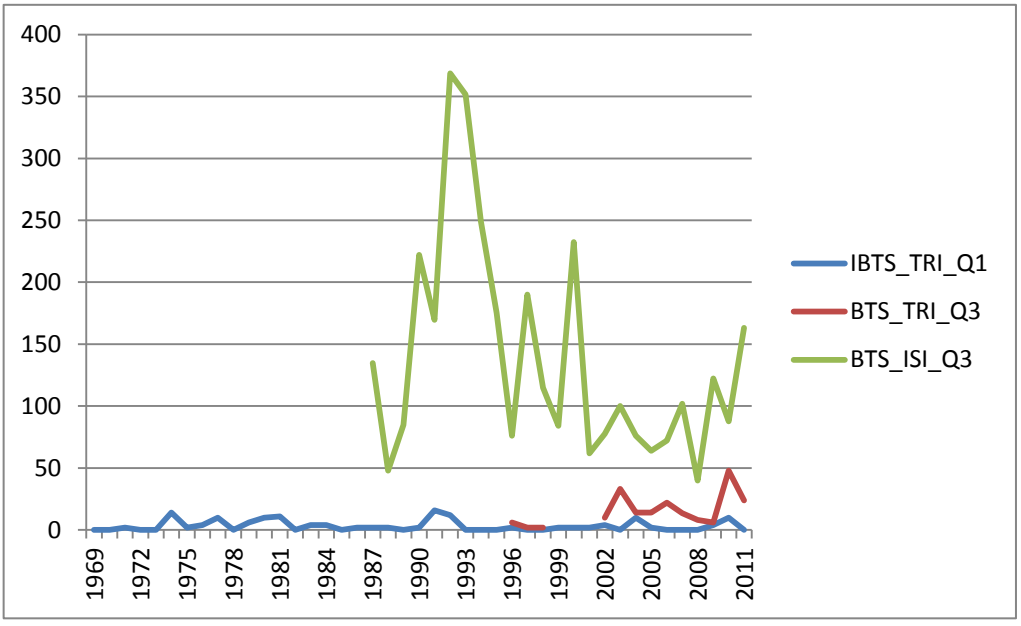

Figure 9.5. Total numbers of brill Scophthalmus rhombus caught by three surveys in the North Sea (Subarea IV).

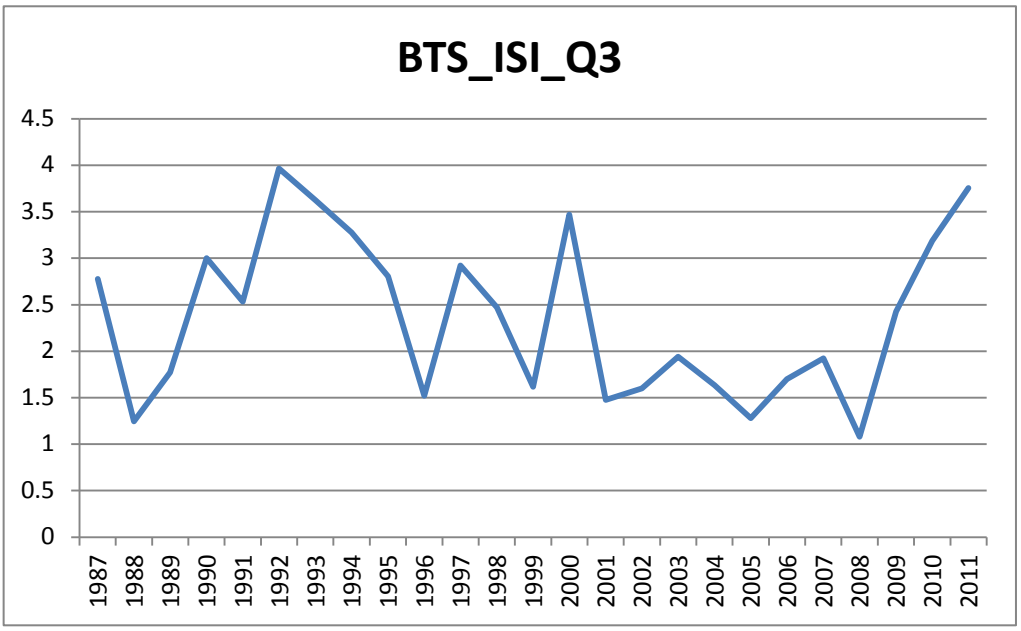

Figure 9.6. Abundance index (numbers per hour) of North Sea brill Scophthalmus rhombus in the BTS_ISI_Q3 survey (Subarea IV).

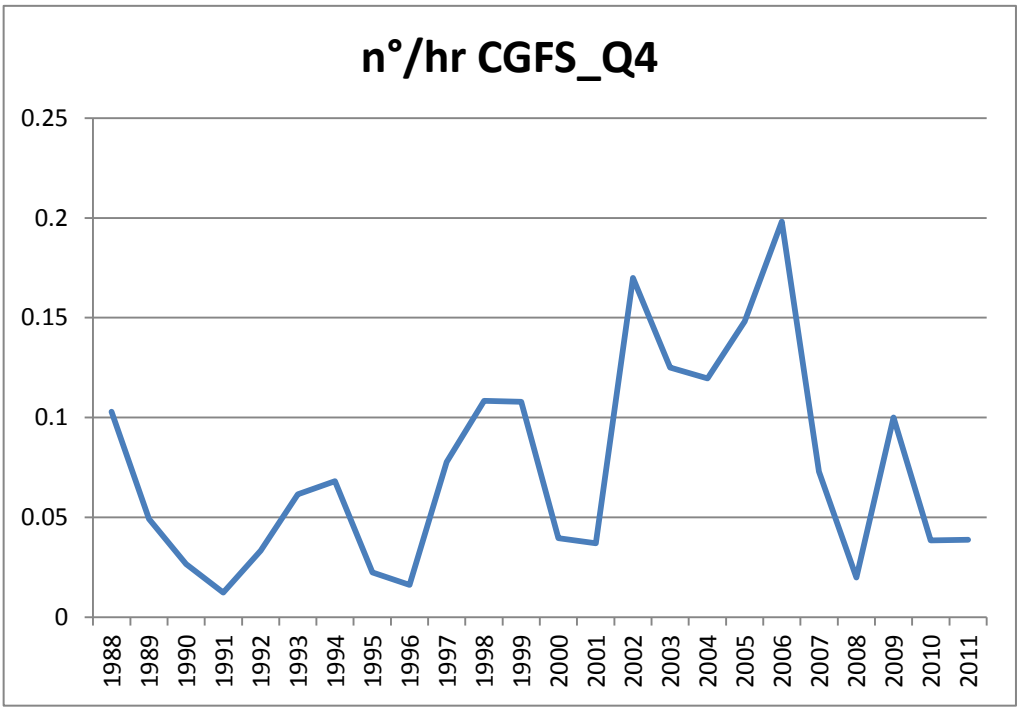

Figure 9.7. Abundance index (numbers per hour) of English Channel brill Scophthalmus rhombus in the CGFS_ Q4 survey (Subdivision VIIde).

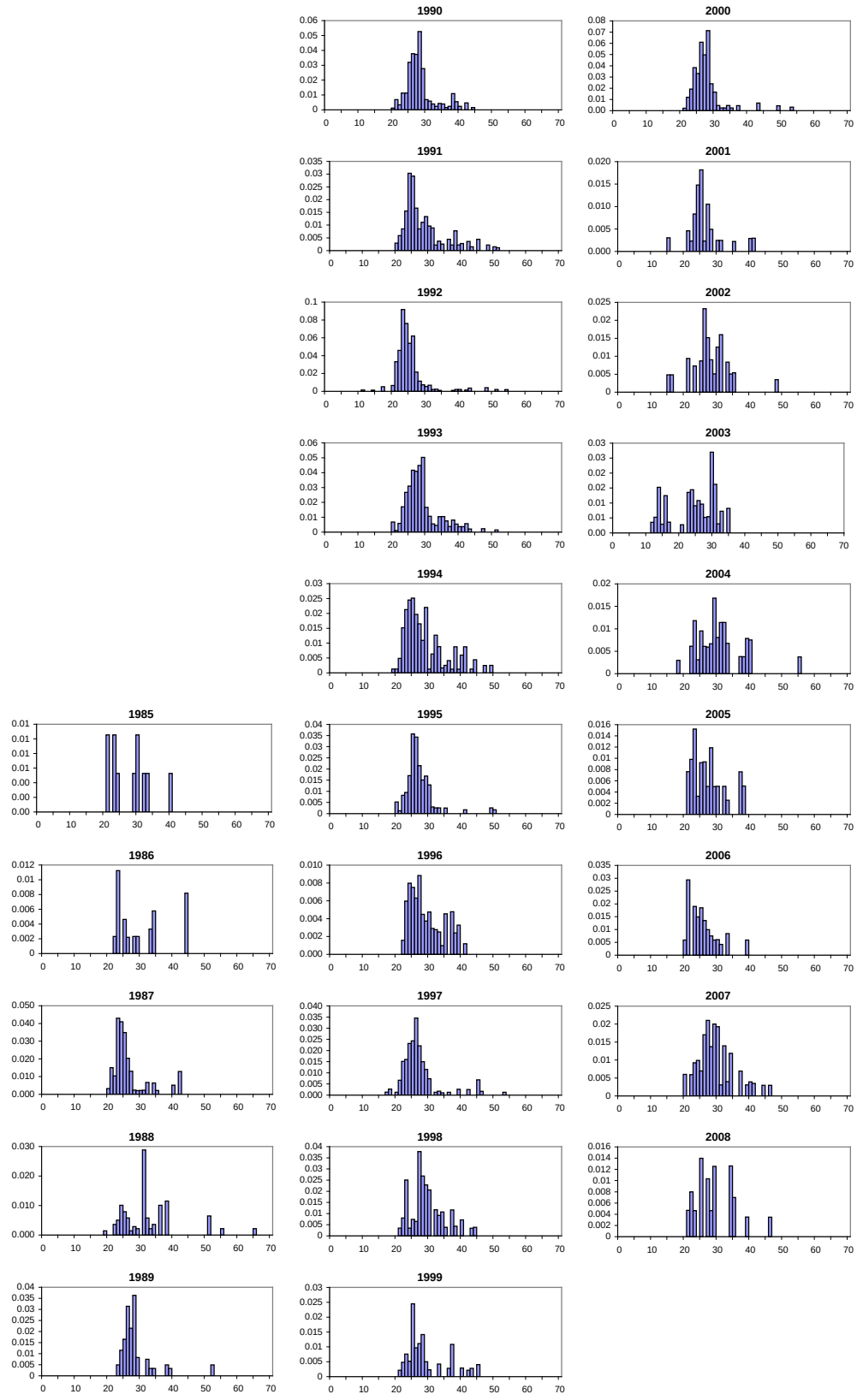

Figure 9.8. North Sea brill Scophthalmus rhombus: number at length for the Dutch contribution to the North Sea Beam Trawl Survey. Only data for RV Isis (Q3) are included.

10 Turbot

10.1 General biology

Turbot (*Psetta maxima*) is distributed along the European coastline, including the Faroe Islands, Iceland, Rockall Bank, the Skagerrak, the Kattegat, the Belt Sea and in the Baltic Sea. The distribution area extends into the Mediterranean and Adriatic Sea. It is typically found at a depth range of 10 to 70 m, on sandy, rocky or mixed bottoms. It is one of the few marine fish species that inhabits brackish waters.

Turbot is one of the fastest growing flatfish, it can reach 30 cm in the first three years of its life. Like other flatfish, females grow faster than males. Turbot is a typical visual feeder, feeding on bottom-living fishes, small pelagic fish and also on larger crustaceans and bivalves. Large turbot (40 to 70 cm) feed from March till May on herring and sprat (Rae and Devlin, 1972; Wetsteijn, 1981). During the other nine months 50 to 70 % of the animals were found to have empty stomachs. The diet of the juveniles has been shown to consist of copepods, shrimps, barnacle larvae and gastropod mollusc larvae (Jones, 1973).

Turbot is a rather sedentary species, but migratory patterns have been observed. In the North Sea, migrations from the nursery grounds in the south-eastern part to the more northern areas have been recorded. Adult turbot are more tolerant of the colder conditions in the northern areas of the North Sea where temperatures are too low for juveniles to survive. A study in the northern Baltic by Aneer and Weston (1990) also indicated that adult turbot is very stationary.

10.2 Stock identity and possible assessment areas

There are indications of distinct turbot populations in the Baltic Sea and in the Irish Sea. Also, there are indications that turbot from the North Sea, the southern coast of Iceland, the western coast of Scotland and Ireland, and the Celtic Sea (including the Western Approaches - 51°N, 10°W) forms another stock, the northern Atlantic stock, which is different from the stock originating from the Bay of Biscay and the Atlantic side of southern Europe, the southern stock. Transition zones between the northern stock and the southern stock are found in the English Channel and between the northern stock and the Baltic Sea in the Kattegat and the Belt Sea. The situation of turbot stocks in the Mediterranean is still unclear, although there are indications that samples from the Aegean Sea are genetically different from those originating from other areas (Figure 10.1).

A large population genetic study of turbot population structure is still ongoing. Results of this sudy can be used by the benchmark for turbot that will be held in October 2012.

10.3 Management regulations

TACs have been defined for turbot and brill combined for the EC-waters in Division IIa and Subarea IV. These TACs only apply to the EC-fisheries. A historical overview is presented in Table 10.1. No TACs are in place for area IIIa. So far, no analytical assessments leading to fisheries advice have been carried out for turbot by ICES. No explicit objectives have been defined for potential stocks of this species, no precautionary reference points have been proposed, and no management plans are in place.

There is no official EC minimum landing size. In several geographical areas however, Minimum Landing Sizes (MLS) have been installed by different authorities. The most

frequently applied MLS is 30 cm (e.g., in Belgium, the Baltic, the English Sea Fisheries District Cornwall, …).

10.4 Fisheries data

Table 10.2 and Figure 10.3 summarize turbot landings in ICES area IIIa. Over the period 1973 – 2008, total landings (all areas) ranged from 3504 t to 9361 t per year, with the lowest landings halfway the eighties and the highest peak in the early nineties (Figure 10.2). In the last decade, the total landings of turbot were between 5000 and 6500 t. The North Sea (Figure 10–3 and 10–4) accounts for the major part of these landings generating around 60% of the totals in the past ten years (70–80% from the early sixties to the early seventies).

The English Channel (VIId,e) and the Celtic Sea (VIIf and VIIg-k) are the second and third most important fishing grounds for turbot, but are already much less important than the North Sea (mean landings percentages of 8% and 7% respectively over the entire time-line). The importance of these fishing grounds increased slightly to almost 9% of the total landings (for each of these two areas) in the past ten years. Fishing grounds from where the landings represent on average between 2 and 5% of the total landings over the entire time-line are IIIa, IIIb-d, VIIa, VIII and IX. Landings from other areas are negligible.

10.5 Survey data, recruit series

The presence or absence of turbot in the catches of the BTS and IBTS survey is summarized in Figure 10.5. Turbot is mainly caught in the southern and eastern part of the North Sea. Also catches are made in the Kattegat and on the east coast of Scotland.

There are three Dutch trawl surveys for flatfish species that catch turbot in the North Sea: Sole Net Survey (SNS), BTS Isis survey, and BTS Tridens survey (Table 10–4 to 10–6). These surveys are held in autumn, but each covers a different area of the North Sea, and different gears are used. The SNS survey covers the coastal areas in the southern Bight and the German Bight. The BTS-Isis survey covers the south-eastern part of the North Sea. The BTS-Tridens covers the central and western part of the North Sea.

For the Dutch trawl surveys, data by length and age are available. Age structured survey indices are shown in Figure 10.6. However, the age composition in the age structured survey indices are derived from the length structure using an age-length key. This conversion from length- to age-structure of the survey indices for this series using the age length key has been done on a limited set of otoliths available from the survey, while almost all specimens caught in the survey are sampled for age. This means the age structure of the survey indices can be substantially improved by using all available age information. This improvement depends on the age data becoming available to ICES.

Cefas conducts several annual surveys in which turbot are routinely measured and biological information is retained. The most important surveys are the Irish Sea (VIIa, VIIfg) beam trawl survey, the Channel (VIId) beam trawl survey, the Carhelmar (VIIe) commercial beam trawl survey and the English groundfish (IVb, c) GOV trawl survey.

10.6 Biological sampling

Appendix VII of Commission Decision 2010/93/EU lists biological variables with species sampling specifications for all ICES areas. Table 10.9 gives an overview of what this implies for turbot (sampling for fecundity is optional). Turbot is classified as a Group 2 species under the DCF. These are internationally regulated species and major non-internationally regulated by-catch species, that don't drive the international management process and are not under EU management plans, EU recovery plans, EU long term multi-annual plans or EU action plans for conservation and management based on Council Regulation 2002/2371/EC. Group 2 species only require data on weight, sex-ratio and maturity to be collected every three years.

In Table 10.10 the sampling intentions of all Member States that inscribed sampling of biological parameters for turbot in their national proposals, were compiled, and can directly be compared to the required numbers. For the North Sea and the Eastern English Channel, the joint effort of Belgium, Denmark, the Netherlands and the UK leads to sufficient sampling for age, weight, sex-ratio and maturity of turbot (green fields; for these parameters only 250 individuals are required under the DCF). All of the countries mentioned above plan to collect this biological information every year in the period 2011–2013 (and not on the minimum required three-year basis). No Member States included sampling of biological parameters for turbot in the Irish Sea and the Skagerrak in their proposals.

On surveys, catches of turbot are generally low. This is because of the low fish densities and the low trawling speeds on surveys compared to commercial vessels, making it easier for bigger fish like turbot to actively escape the nets. Turbot grows relatively fast and generally reaches a certain length faster (at younger ages) than other flatfish species in the same areas, leading to a higher proportion of bigger fish in the younger age-classes than in slower growing species such as sole *Solea solea* and plaice *Pleuronectes platessa*. This also means that it is much more difficult to obtain sufficient information on the bigger length classes for turbot. Additionally, the shorter trawl durations on surveys decrease the chance to encounter an individual turbot, that occur more scattered over a given area than other co-occurring flatfish species because of their predatory feeding behaviour (turbot is piscivorous and could be regarded as a top predator, except for the smaller larval stages).

10.7 Population biological parameters and other research

Length

Length weight relationships for males and females are given in Figure 10.9. An analysis of time series of landings and data from sampling on board of commercial vessels by Belgium (Moreau, 2010a) provided information on length-distributions, but not much on age-distributions, of landings and discards of turbot.

Age

Growth parameters (L∞ and K) for North Sea turbot are shown in Figure 10–10. ILVO extracted already existing age-information on turbot from its own database (Moreau, 2010b), and collected similar information from relevant project partners and some other countries that were not involved in the NESPMAN-project. This resulted in only very few data.

Sex-ratio, maturity and other reproductive characteristics

A couple of studies on the reproductive characters of turbot have been carried out in the past by various authors (e.g., Dunn *et al*, 1996; Ongenae, and De Clerck, 1998, Boon *et al*, 2000, and references therein). Findings on sex-ratio and maturity of turbot (mainly females) are summarized in Table 10–9 (after Moreau, 2010b). Due to sampling outside the main spawning months no certain assumptions could be made on the length range during first maturation for turbot in the English Channel, Celtic and Irish Seas.

In the past, biological samples of turbot from the Danish fisheries in IIIa have been taken both from landed catches and through the national at-sea-sampling programme.

UK length information from market sampling for turbot from the Irish Sea and the English Channel is available for 1994–1996, and from 2000 onwards. Biological sampling for age, weight, sex and maturity has only been carried out since 2000 (Annex 6). The otoliths collected have not been aged.

France did collect length and age data on turbot (demographic structures per metier) in the areas VIId and VIIe during the years 1994–1996. These data were collected under an EU funded project carried out by France and the UK (Dunn *et al.*, 1996).

The Netherlands did sample North Sea turbot for age and length in 1982–1990, 1998 and from 2002 onwards. The number of length measurements varies between 3500 and 5500 per year, the number of aged fish between 400 and 2500 per year. The relative age distribution for the earliest sampling period is presented in Figure 10.7.

During the mid 1990s, Belgium took age and length samples of turbot caught in the Eastern English Channel, the Celtic Sea, the Irish Sea and the Bay of Biscay. The numbers measured vary between 200 and 600 individuals per year. The relative age distribution of turbot in the commercial landings of the Belgian beam trawl fleet for the period 1996–1997 is given in Annex 6. Since 2002, Belgium samples North Sea turbot as part of the DCR, although the sampling intensity has been rather low (<200 individuals per year).

Some biological sampling has been done in Germany for landings of turbot in the North Sea at the end of the 1970's. The age structured landings raised to the North Sea total are described by Weber (1979).

The different ageing programmes do not fully cover all years since the first observations presented in Weber (1979). The combined availability of age structured landings estimated is presented in Figure 10–8.

10.8 Analyses of stock trends

Dunn (1999) made an assessment of turbot in the Channel fisheries (UK and FR) by using a Pella-Tomlinson model to a cpue time series of the English beam trawlers (1984–1995). He concluded that fishing mortality has increased from 1984 to 1989 from 1 to 1.5 and decreased thereafter to 0.7 in 1995. The MSY was given by Dunn (1999) to be between 300 and 400 t, which was lower than the observed catches (550 t /year). Ulrich (2000) found a maximum sustainable production of 440 t/year.

For the North Sea, a stock assessment was developed based on the ideas presented in Aarts and Poos (2009). The available landings-at-age matrix spanning 1975–2008 is used (Table 10.7) The age range for the matrix is 1–9. The assessment incorporates the age structured survey indices for the SNS, BTS-Isis, and BTS-Tridens. In an initial

run, all surveys are included, each with an age range of ages 1–7. Figure 10.11 and 10.12 show the residuals of the survey indices and landings at age.

The assessment indicates that fishing mortality has increased between 1975 and 2000 (Figure 10.13). Since 2000, the increase has most likely stopped and fishing mortality has decreased. However, the 95% confidence limits for the estimates are very wide. The fishing mortality in 2008 is estimated to be between 0.40 and 0.77. The recent decrease in fishing mortality is most likely a response to the decrease in fishing effort by the beam trawl fleet in the North Sea. This decrease has also resulted in reductions in fishing mortality in the target species for this fishery, plaice and sole. The long term management plan for these two species will probably result in further reductions in fishing effort. Under the proviso that there is no increase in targeted fishing for turbot, the fishing mortality for turbot will likely further decrease in the future. The effects on the landings of this decrease in fishing effort is difficult to predict, given that there is no yield curve analysis available.

The recruitment in the North Sea is estimated to have been high at the beginning of the timeseries (Figure 10.14). No further trends are found. Recruitment appears slightly higher in the most recent period, but that may be an effect of the changes in the MLS discussed above. The Total Stock Biomass has likely decreased since the beginning of the time series, but the 95% confidence limits are very large (up to a factor 2 between lower and upper limit (Figure 10.15). The most recent estimate in TSB (at 1 January 2008) is estimated to be between 7.6 and 15.6 thousand tonnes.

10.9 Data recommendations

The collection of data needs to be continued in order to get a better understanding of the state of turbot stocks in the Northeast Atlantic, and to enable the evaluation of trends.

In order to meet the DCF-requirements (Table 10.9) for sampling of biological parameters for turbot in the Skagerrak, the English Channel, the Celtic Sea and the Irish Sea, the following countries could be valid candidates to fill in the gaps in Table 10–11, according to their importance in turbot fisheries;

- Denmark in the Skagerrak
- France and Belgium in the English Channel
- France, Belgium and Ireland in the Celtic Sea
- Ireland and Belgium in the Irish Sea

General recommendations

- EU to upgrade turbot from Group 2 to Group 1, forcing relevant Member States to collect biological information on a yearly basis
- Relevant Member States to include market sampling for turbot in their National Proposals, thus generating the required funds through the DCF.

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Table 10.1. Turbot in the North Sea. Landings in IV as officially reported to ICES (Source: fishstat database) and combined TACs for turbot and brill (Scophthalmus rhombus) in Division IIa and Subarea IV.

Year	Belgium	Denm	France	Germ	Netherl	Norway	UK	Other	total	TAC Tur+Brill
1965	201	510	208	393	1199	0	1711	0	4222	
1966	267	670	54	467	1384	0	1497	0	4339	
1967	293	536	48	457	864	0	1185	0	3383	
1968	275	799	30	401	1826	0	917	0	4248	
1969	219	830	23	322	2259	0	1017	0	4670	
1970	151	538	96	267	1921	0	1070	0	4043	
1971	178	529	62	189	2472	0	880	0	4310	
1972	164	539	34	203	2523	0	951	0	4414	
1973	135	412	50	194	2638	0	824	0	4253	
1974	113	247	12	135	2885	0	717	0	4109	
1975	158	387	21	169	3349	0	503	1	4588	
1976	146	588	38	156	3253	0	631	2	4814	
1977	145	474	37	172	2973	0	683	0	4484	
1978	170	693	50	173	3196	0	752	0	5034	
1979	187	1164	22	151	3999	0	838	3	6364	
1980	162	1360	17	146	3241	0	559	0	5485	
1981	142	1044	6	86	3073	0	404	0	4755	
1982	153	880	14	42	3029	0	335	0	4453	
1983	174	893	24	44	3163	0	277	0	4575	
1984	242	886	40	46	3800	0	282	1	5297	
1985	222	983	37	34	4600	0	312	0	6188	
1986	133	997	5	31	3810	0	287	0	5263	
1987	130	988	21	27	2760	0	345	0	4271	
1988	129	858	24	41	2660	0	328	1	4041	
1989	176	637	30	85	3666	0	333	0	4927	
1990	292	1046	52	184	3732	0	437	7	5750	
1991	350	1233	64	186	3780	30	688	9	6340	
1992	317	907	81	163	3495	65	902	3	5933	
1993	355	817	123	252	2939	47	1013	0	5546	
1994	330	862	141	263	2724	42	882	0	5244	
1995	315	761	108	275	2476	33	703	0	4671	
1996	210	618	160	157	1776	36	687	0	3644	
1997	169	479	1	215	1854	45	619	0	3382	
1998	198	392	22	164	1695	33	582	0	3086	
1999	224	411	0	224	1808	32	488	0	3187	
2000	302	469	21	349	2280	55	549	0	4025	9000
2001	333	506	17	297	2226	79	642	0	4100	9000
2002	243	677	15	280	1898	85	551	0	3749	6750
2003	192	486	18	289	1893	65	431	0	3374	5738
2004	207	518	15	278	1762	74	463	0	3317	4877
2005	159	429	18	274	1903	65	347	0	3195	4550
2006	146	338	22	221	1828	40	381	0	2976	4323
2007	173	310	32	203	2263	43	485	0	3509	4323
2008	182	457	21	199	1744	32	370	0	3005	5263
2009	172	548	24	197	1698	29	421	0	3089	5263
2010	118	466	37	191	1469	26	385	0	2692	5263

Table 10.2. Turbot in the North Sea. Landings in IIIa as officially reported to ICES (Source: fishstat database).

Year	Belgium	Denm	Germ	Norway	Sweden	Other	Total
1960	0	115	11	2	46	0	174
1961	0	130	4	0	45	0	179
1962	0	157	5	0	0	0	162
1963	0	124	4	0	0	0	128
1964	0	89	5	0	0	0	94
1965	0	79	6	0	0	1	86
1966	0	104	2	0	0	0	106
1967	0	68	4	0	0	1	73
1968	0	64	0	0	0	0	64
1969	0	75	1	0	0	0	76
1970	0	76	1	0	0	0	77
1971	0	100	1	0	0	0	101
1972	0	130	2	0	0	0	132
1973	0	98	2	0	0	0	100
1974	0	116	1	0	0	0	117
1975	0	167	2	0	7	7	183
1976	7	178	2	0	6	190	383
1977	7	331	4	0	5	389	736
1978	2	327	4	0	6	186	525
1979	8	307	0	0	4	87	406
1980	7	205	0	0	6	15	233
1981	2	183	0	0	8	14	207
1982	1	164	0	0	7	10	182
1983	4	171	0	0	10	24	209
1984	0	176	0	0	12	0	188
1985	1	224	0	0	16	0	241
1986	2	180	0	0	11	0	193
1987	5	147	0	0	9	0	161
1988	2	115	0	0	10	11	138
1989	2	173	0	0	9	0	184
1990	5	363	0	0	18	0	386
1991	4	244	0	7	21	0	276
1992	4	278	0	8	19	0	309
1993	3	336	2	10	0	0	351
1994	2	313	1	15	22	0	353
1995	4	268	1	17	11	0	301
1996	0	185	1	13	11	0	210
1997	0	200	0	9	11	0	220
1998	0	148	1	7	8	0	164
1999	0	139	1	10	6	0	156
2000	0	180	1	6	6	0	193
2001	0	227	0	8	3	0	238
2002	0	205	1	11	5	0	222
2003	0	128	0	14	4	13	159
2004	0	119	0	7	7	14	147
2005	0	108	0	6	6	7	127
2006	0	95	1	8	9	8	121
2007	0	138	1	7	12	15	173
2008	0	121	1	6	11	4	143
2009	0	94	1	6	17	2	120
2010	0	72	0	4	13	6	95

Table 10–3. Turbot in the North Sea. Individual weight of landed fish in quarter 2 (spawning season). Note that for the period 1981–1990 the age 10 estimates represent a plus group.

YEARS	1	2	3	4	5	6	7	8	9	10(+)
1975	NA	0.73	1.30	2.02	2.63	3.35	3.99	4.41	4.71	5.19
1976	NA	0.73	1.30	1.96	2.73	3.29	4.04	4.58	4.91	4.97
1977	NA	0.73	1.30	1.95	2.65	3.45	3.71	4.53	5.03	5.28
1978	NA	0.73	1.30	1.93	2.57	3.35	4.06	3.85	5.20	5.25
1979	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1980	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1981	NA	0.90	0.80	1.48	2.59	3.23	5.66	5.17	6.39	8.40
1982	NA	0.59	1.01	1.80	2.53	3.33	4.88	6.20	6.42	5.95
1983	NA	0.61	1.13	1.99	2.77	3.38	3.97	4.72	3.70	6.65
1984	NA	0.66	1.04	2.07	2.87	4.25	4.93	6.02	5.46	7.77
1985	NA	0.59	1.02	1.83	2.95	4.46	5.99	4.83	6.36	7.19
1986	NA	0.91	1.12	1.98	3.08	3.48	7.02	4.12	7.45	7.40
1987	0.70	0.72	1.25	1.87	3.60	3.24	5.36	8.60	6.58	9.72
1988	0.70	1.16	1.65	2.65	3.31	5.78	7.24	4.58	7.00	12.56
1989	NA	0.81	1.48	2.96	5.30	5.77	8.26	8.00	8.31	8.62
1990	0.90	0.84	1.79	3.09	3.02	5.34	3.47	7.02	10.66	8.66
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1995	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1996	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1997	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1998	NA	0.80	1.03	1.67	3.08	5.06	2.57	7.49	NA	NA
1999	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2004	NA	0.52	1.10	1.90	2.47	2.91	5.35	6.49	5.63	7.21
2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2007	NA	0.59	1.10	1.57	2.58	2.71	1.72	5.11	NA	4.65
2008	NA	0.65	1.14	1.44	2.10	5.16	6.01	NA	7.00	7.25
2009	NA	0.44	0.80	1.51	1.65	3.55	4.70	5.74	6.01	3.16
2010	NA	0.46	1.05	1.62	2.32	2.40	2.73	4.49	5.57	6.17
2011	NA	0.40	0.99	1.87	2.05	3.87	4.37	6.29	4.24	9.54

Table 10.4. Turbot in the North Sea. SNS survey index. Index numbers represent numbers of fish per 100 fishing hours.

age										
year	1	2	3	4	5	6	7	8	9	10
1970	53.919	81.176	24.546	5.436	1.299	0.549	0.168	0.030	0.030	0.070
1971	19.614	61.060	20.153	3.881	0.957	0.454	0.118	0.023	0.023	0.068
1972	17.932	63.716	23.035	5.423	1.057	0.484	0.104	0.079	0.039	0.131
1973	49.008	56.723	14.637	3.710	0.538	0.229	0.061	0.027	0.012	0.055
1974	91.445	61.564	14.032	3.341	0.555	0.289	0.067	0.037	0.018	0.063
1975	100.961	82.587	17.554	3.665	0.601	0.312	0.091	0.005	0.005	0.015
1976	49.880	54.755	11.343	2.498	0.384	0.131	0.067	0.006	0.000	0.031
1977	415.318	208.182	41.937	10.813	4.713	2.731	1.721	0.640	0.214	0.285
1978	38.322	134.257	43.781	10.013	2.169	0.980	0.330	0.066	0.044	0.133
1979	20.480	122.187	43.675	9.129	1.832	0.848	0.274	0.076	0.035	0.131
1980	117.129	71.836	22.152	5.118	1.059	0.445	0.138	0.035	0.027	0.062
1981	29.442	72.032	20.261	6.071	3.683	2.621	1.764	0.811	0.312	0.336
1982	88.932	40.048	7.767	2.118	0.348	0.138	0.021	0.025	0.016	0.031
1983	168.301	142.722	23.738	5.728	0.809	0.246	0.090	0.017	0.006	0.057
1984	94.616	80.057	26.305	6.248	1.211	0.635	0.250	0.065	0.058	0.110
1985	51.362	94.481	21.287	4.174	0.718	0.391	0.137	0.000	0.000	0.005
1986	23.971	17.256	5.537	3.605	1.831	1.167	0.363	0.116	0.039	0.117
1987	64.116	17.379	2.495	0.555	0.059	0.046	0.015	0.000	0.000	0.000
1988	166.951	103.470	17.632	4.129	0.573	0.231	0.096	0.846	0.421	6.761
1989	65.994	46.137	14.352	3.880	0.743	0.291	0.132	0.048	0.052	0.088
1990	241.772	99.383	18.937	5.152	1.031	0.248	0.000	0.071	0.035	0.035
1991	43.580	77.483	19.348	3.968	0.761	0.384	0.102	0.012	0.012	0.018
1992	266.424	111.891	30.347	7.379	1.122	0.585	0.281	0.037	0.030	0.094
1993	162.396	150.387	29.937	7.406	1.101	0.443	0.145	0.046	0.023	0.115
1994	100.188	49.915	19.045	5.215	1.022	0.596	0.254	0.064	0.053	0.093
1995	194.538	57.004	4.909	1.670	0.102	0.000	0.000	0.000	0.000	0.000
1996	89.867	76.786	14.828	3.019	0.550	0.221	0.063	0.000	0.000	0.000
1997	35.459	27.614	10.743	4.459	0.966	0.393	0.117	0.097	0.058	0.093
1998	57.746	41.561	9.366	2.061	0.310	0.186	0.057	0.015	0.008	0.023
1999	165.059	98.285	29.282	6.207	1.477	0.647	0.202	0.038	0.019	0.117
2000	155.615	38.400	4.323	1.325	0.112	0.010	0.010	0.000	0.000	0.000
2001	48.891	36.151	17.505	4.458	0.859	0.424	0.060	0.084	0.047	0.092
2002	133.338	49.316	13.082	2.848	0.735	0.439	0.088	0.015	0.000	0.046
2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2004	150.213	42.384	13.395	7.336	2.473	1.048	0.237	0.055	0.082	0.110
2005	148.462	86.209	14.937	3.832	0.583	0.183	0.058	0.022	0.015	0.033
2006	180.330	105.290	20.901	4.853	0.862	0.337	0.073	0.037	0.019	0.048
2007	80.278	77.989	25.292	6.340	1.305	0.424	0.056	0.061	0.046	0.059
2008	78.786	91.298	33.181	10.682	4.674	3.204	2.094	0.897	0.416	0.436
2009	25.791	24.357	14.252	4.678	1.053	0.624	0.292	0.085	0.093	0.107

Table 10.5. Turbot in the North Sea. BTS-Isis survey index. Index numbers represent numbers of fish per fishing hour.

	1	2	3	4	5	6	7	8	9	10
1985	0.547	1.104	0.344	0.105	0.025	0.011	0.003	0.001	0.001	0.002
1986	0.297	0.817	0.333	0.096	0.025	0.015	0.012	0.009	0.007	0.011
1987	0.362	0.956	0.350	0.114	0.029	0.016	0.006	0.008	0.004	0.013
1988	0.715	1.053	0.344	0.098	0.021	0.010	0.002	0.001	0.001	0.001
1989	0.461	1.240	0.460	0.118	0.036	0.023	0.016	0.010	0.007	0.011
1990	2.138	1.162	0.337	0.129	0.036	0.019	0.008	0.005	0.002	0.004
1991	1.387	1.140	0.439	0.116	0.035	0.021	0.012	0.007	0.004	0.006
1992	1.424	1.010	0.341	0.100	0.025	0.015	0.006	0.003	0.001	0.003
1993	1.632	1.248	0.327	0.092	0.034	0.022	0.013	0.006	0.002	0.003
1994	1.815	1.183	0.353	0.084	0.021	0.012	0.008	0.005	0.003	0.006
1995	1.667	0.615	0.195	0.051	0.015	0.010	0.005	0.003	0.001	0.002
1996	1.087	1.173	0.321	0.096	0.031	0.020	0.011	0.006	0.003	0.004
1997	0.936	1.006	0.348	0.101	0.029	0.016	0.007	0.002	0.001	0.002
1998	1.671	1.090	0.320	0.097	0.024	0.011	0.004	0.001	0.001	0.002
1999	1.430	0.900	0.279	0.087	0.021	0.010	0.003	0.001	0.001	0.001
2000	4.009	1.078	0.429	0.136	0.034	0.014	0.003	0.002	0.001	0.002
2001	1.246	1.017	0.340	0.105	0.031	0.017	0.007	0.002	0.001	0.002
2002	2.733	0.587	0.174	0.040	0.008	0.004	0.002	0.000	0.000	0.001
2003	1.387	0.861	0.260	0.074	0.015	0.007	0.002	0.001	0.001	0.001
2004	1.980	0.933	0.306	0.080	0.016	0.007	0.002	0.001	0.001	0.002
2005	1.647	1.179	0.404	0.101	0.021	0.010	0.003	0.001	0.001	0.001
2006	1.635	0.872	0.283	0.072	0.016	0.008	0.002	0.000	0.000	0.001
2007	1.263	1.234	0.494	0.175	0.041	0.018	0.005	0.002	0.002	0.003
2008	1.573	1.067	0.319	0.101	0.022	0.012	0.004	0.001	0.001	0.002
2009	0.980	0.686	0.364	0.132	0.033	0.016	0.006	0.002	0.002	0.003

Table 10.6. Turbot in the North Sea. BTS-Tridens survey index. Index numbers represent numbers of fish per fishing hour.

	1	2	3	4	5	6	7	8	9	10	
1996	0.0237	0.1128	0.0633	0.0156	0.0041	0.0017	0.0005	0.0001	0.0001	0.000	
1997	0.0002	0.0227	0.0545	0.0394	0.0166	0.0097	0.0035	0.0013	0.0008	0.001	
1998	0.0000	0.0005	0.0247	0.0371	0.0146	0.0077	0.0020	0.0006	0.0005	0.001	
1999	0.0000	0.0015	0.0230	0.0120	0.0030	0.0013	0.0006	0.0004	0.0004	0.000	
2000	0.0031	0.0840	0.0610	0.0153	0.0040	0.0017	0.0004	0.0003	0.0002	0.000	
2001	0.0469	0.0816	0.0651	0.0196	0.0049	0.0026	0.0008	0.0002	0.0001	0.000	
2002	0.0067	0.0599	0.0441	0.0118	0.0026	0.0017	0.0004	0.0001	0.0000	0.000	
2003	0.0026	0.0481	0.0520	0.0165	0.0040	0.0021	0.0011	0.0003	0.0004	0.000	
2004	0.0014	0.0589	0.0757	0.0306	0.0085	0.0037	0.0014	0.0005	0.0004	0.001	
2005	0.0134	0.1106	0.1345	0.0466	0.0117	0.0056	0.0017	0.0007	0.0004	0.001	
2006	0.0149	0.0870	0.0496	0.0135	0.0030	0.0012	0.0004	0.0002	0.0001	0.000	
2007	0.0256	0.1993	0.1008	0.0398	0.0106	0.0044	0.0012	0.0004	0.0003	0.001	
2008	0.0311	0.1104	0.0365	0.0310	0.0177	0.0134	0.0086	0.0062	0.0025	0.003	
2009	0.0165	0.2210	0.1469	0.0382	0.0089	0.0048	0.0017	0.0005	0.0004	0.001	

Table 10.7. Turbot in the North Sea. Landings at age matrix derived from the different data sources. Numbers are in thousands. Age 10 is a +group

	age									
year	1	2	3	4	5	6	7	8	9	10+
1975	0.8	427	1012	239	108	124.2	90.0	46.9	41.7	146.2
1976	0.0	350	1346	392	114	75.9	57.4	50.2	38.2	173.8
1977	18.2	895	644	531	166	43.8	30.5	42.0	36.6	142.0
1978	0.0	1324	1273	309	268	76.0	37.6	29.0	20.4	64.7
1979	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1980	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1981	0.0	299	755	532	458	175.0	67.0	35.0	40.0	32.0
1982	0.0	169	1046	267	167	292.0	98.0	49.0	41.0	65.0
1983	0.0	402	673	479	110	113.0	180.0	91.0	31.0	81.0
1984	0.0	1296	1223	311	157	60.0	57.0	74.0	51.0	70.0
1985	0.0	795	2415	654	179	109.0	26.0	38.0	48.0	74.0
1986	0.0	371	1470	697	183	67.0	29.0	16.0	18.0	90.0
1987	13.0	648	546	676	158	52.0	19.0	5.0	5.0	60.0
1988	36.0	1084	897	178	176	90.0	28.0	42.0	10.0	25.0
1989	0.0	594	1037	315	139	73.0	28.0	22.0	10.0	29.0
1990	43.0	957	1032	305	160	73.0	98.0	58.0	13.0	39.0
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1995	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1996	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1997	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1998	0.0	540	1158	476	97	39.3	11.3	10.1	0.9	8.0
1999	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2000	4.5	255	938	270	315	144.7	116.1	51.3	58.8	72.4
2001	0.0	478	1642	357	64	75.5	55.1	64.7	21.6	61.1
2002	0.0	67	1565	463	148	24.3	43.8	29.2	11.4	34.1
2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2004	453.6	2065	826	144	86	10	8	4	0.9	0.6
2005	269.9	1556	567	180	19	17	2	11	1.0	0.5
2006	657.3	1222	600	89	27	6	12	3	0.7	9.4
2007	76.5	2710	601	278	39	28	8	9	0.0	2.2
2008	182.1	1387	843	227	201	48	13	1	6.7	1.0
2009	115.9	1067	996	430	91	26	11	8	1.6	7.3
2010	246.4	1223	348	285	158	79	28	6	4.8	2.2

Table 10.8. Turbot in the North Sea. Summary of reproductive characteristics of female turbot *Psetta maxima* from different ICES areas (after Moreau, 2010b).

	North Sea/ Skagerrak	English Channel	Celtic Sea	Irish Sea
Proportion females (age 2 - 5 years)	50 - 80 %	30 - 50 %	40 - 60 %	40 - 50 %
Proportion females (age > 5 years)	60 - 80 %	10 - 100 %	35 - 100 %	30 - 100 %
Spawning period	Apr–Aug	May-Sep	Apr-Jul?	May–Aug?
Length at 0% maturity	30 cm	35 cm	35 cm	35 cm
Length at full maturity	47 cm	ND	ND	ND
Age at maturity males	3 years	3 years	3 years	3 years
Age at maturity females	4–5 years	4–5 years	4–5 years	4–5 years
Monthly variation in condition factor	NO	NO	NO	NO
ND* : not determined				

Table 10.9. Turbot in the North Sea. Overview of the requirements for biological sampling of turbot *Psetta maxima* under the DCF for the period 2011–2013 (EC/2010/93).

Area/Stock	Species Group	Age N°/1000 t	Weight	Sex	Maturity
IIIa	G2	250	T	T	T
IV, VIId	G2	250	T	T	T
all areas (NE Atlantic + W Channel)	G2	250	T	T	T

Table 10.11. Turbot in the North Sea. Compilation of the scheduled sampling effort of Member States for biological parameters in turbot *Psetta maxima* for the period 2011–2013 (source: reports RCM's 2010).

MS	2011	2012	2013	Fishing ground	Age (N / year)	Weight (N / year)	Sex-ratio (N / year)	Maturity (N / year)	Data sources
TOTAL					0	0	0	0	
BEL	X	X	X	IV	25	25	25	/	Comm.+Surveys
DNK	X	X	X	IV, VIId	300	300	100	100	Comm.+Surveys[a]
NLD	X	X	X	IV, VIId	720	720	720	720	Comm.+surveys
UK	X	X	X	IV, VIId	25	25	25	25	Market+surveys
TOTAL					1070	1070	870	845	

(a) DNK: sex-ratio and maturity only on surveys.

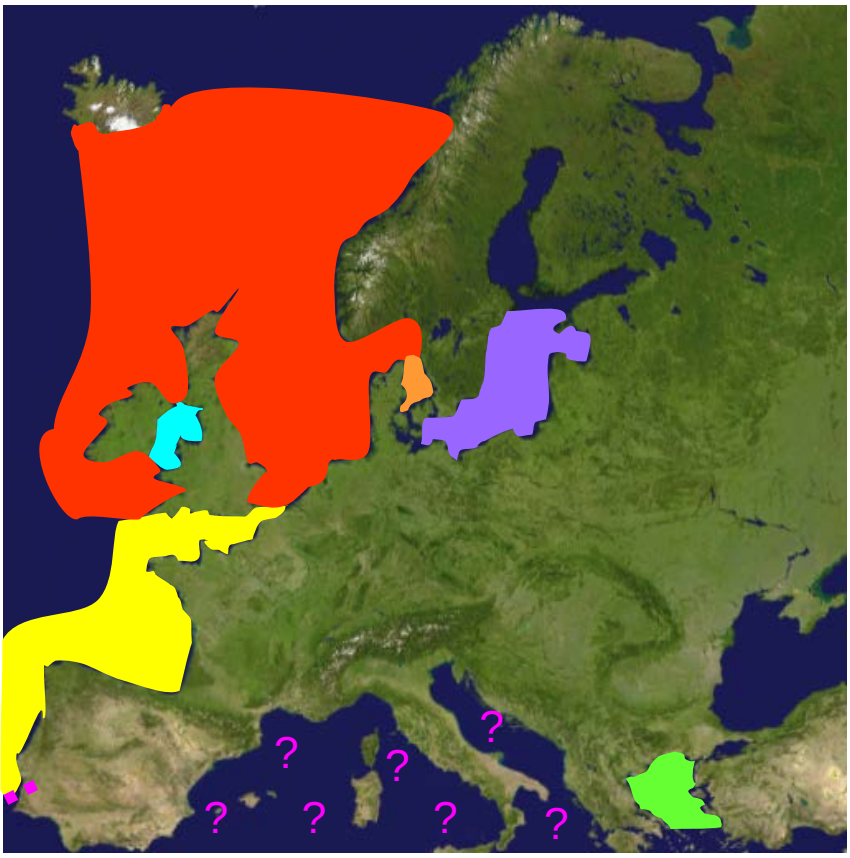

Figure 10.1. Turbot in the North Sea. Preliminary map of the population structure of turbot (From Annex 4, ICES, 2005).

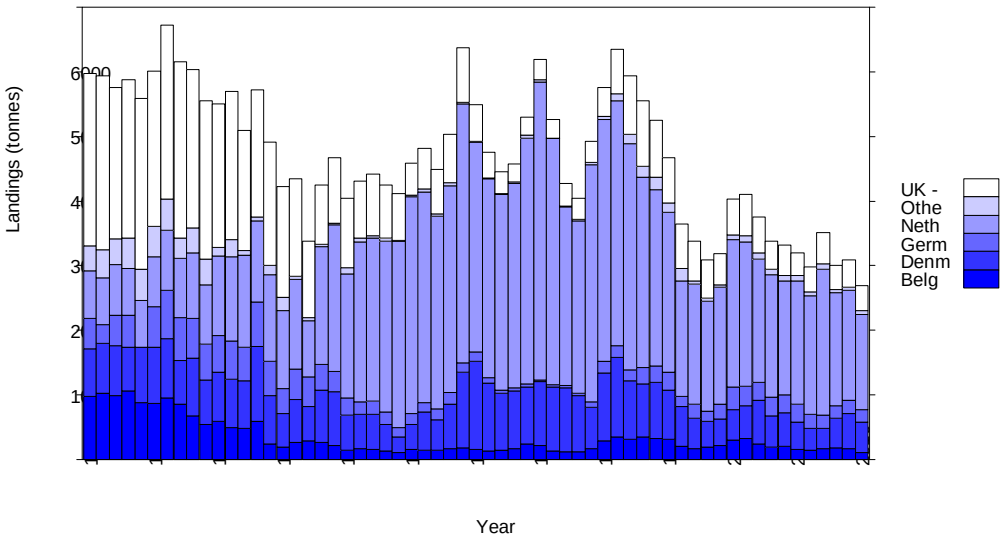

Figure 10.2. Turbot in the North Sea. Official international landings (t) of turbot *Psetta maxima* in the period 1950–2010 as reported to the EC and ICES (source: Eurostat database).

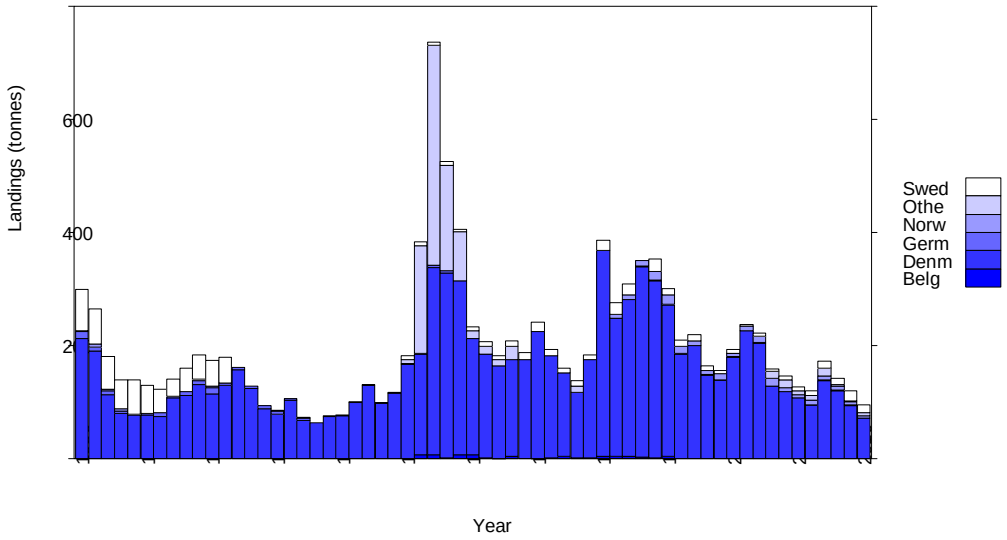

Figure 10.3. Turbot in the North Sea. Contribution of landings by country to North Sea total for the period 1950–2008.

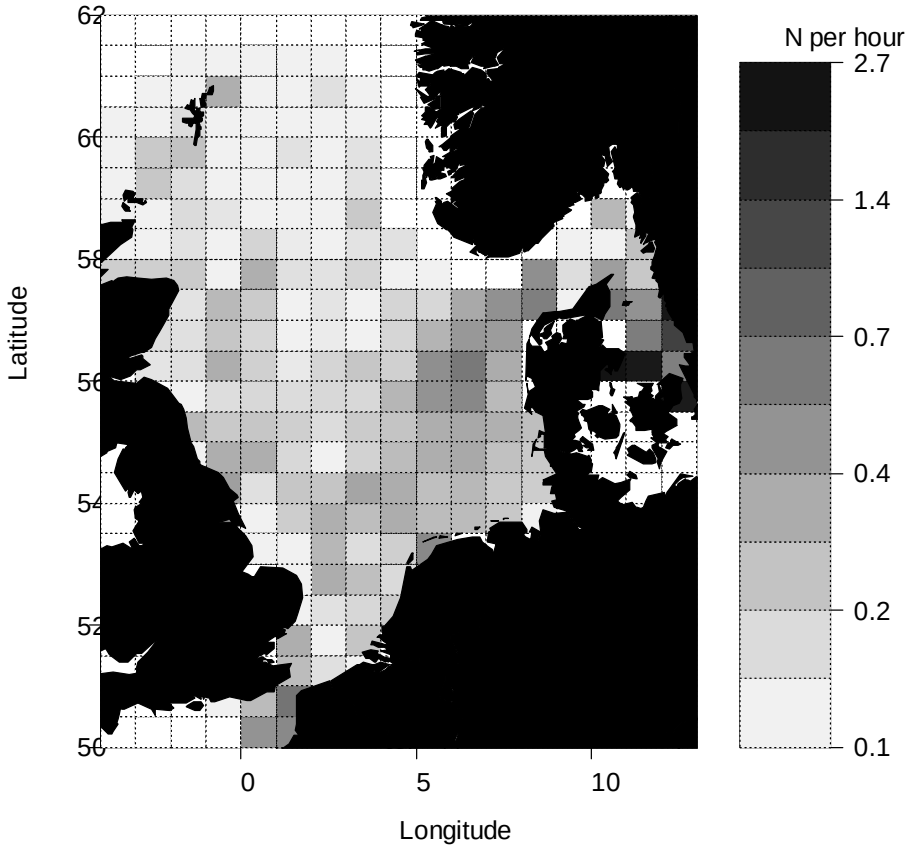

Figure 10.4. Turbot in the North Sea. Spatial distribution of IBTS quarter 1 CPUE index

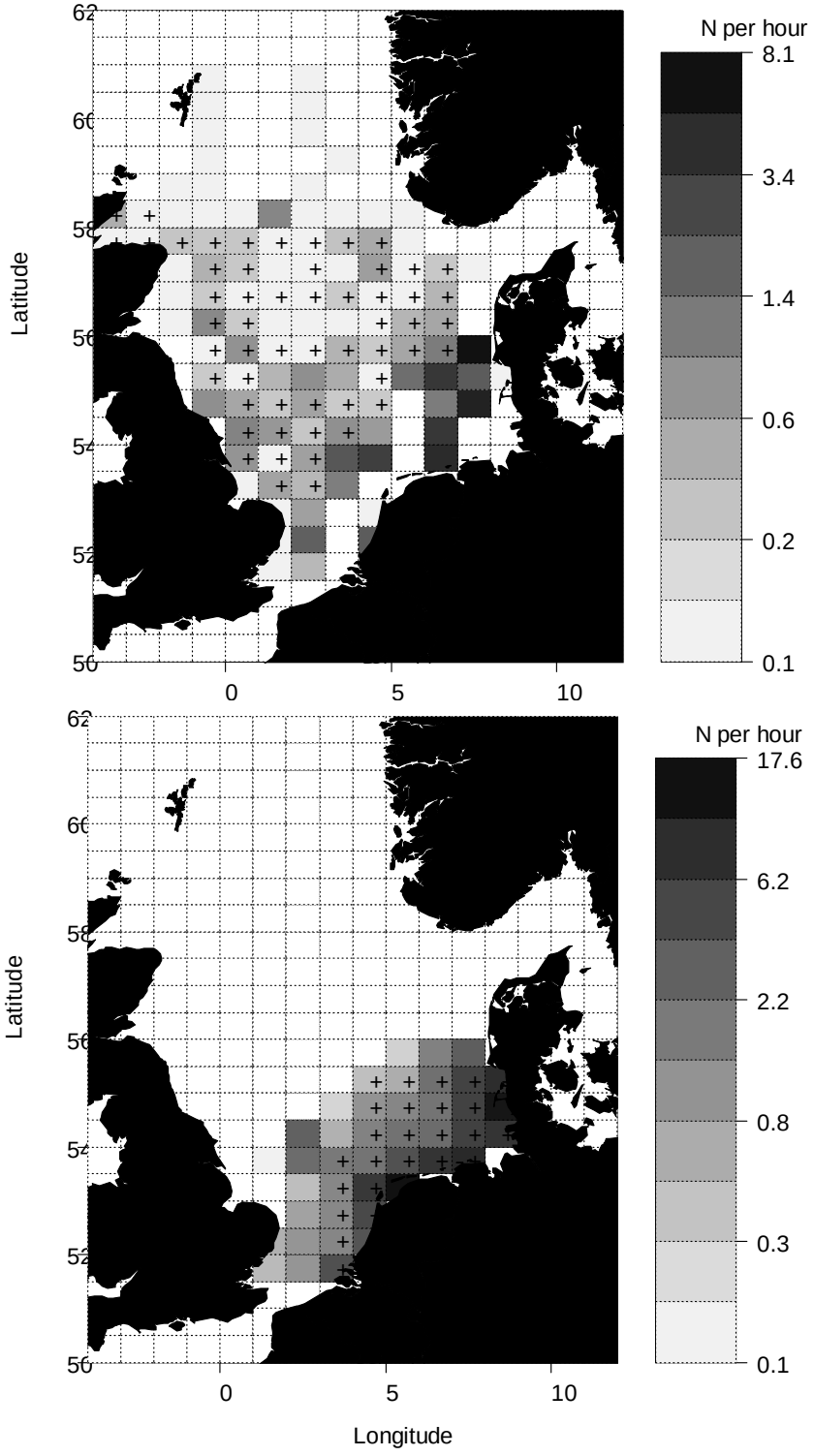

Figure 10.5. Turbot in the North Sea. Spatial distribution of Dutch BTS quarter 3 CPUE. Top panel represents BTS Tridens, bottom panel represents BTS ISIS. Rectangles used in the index calculation are indicated by a "+" sign.

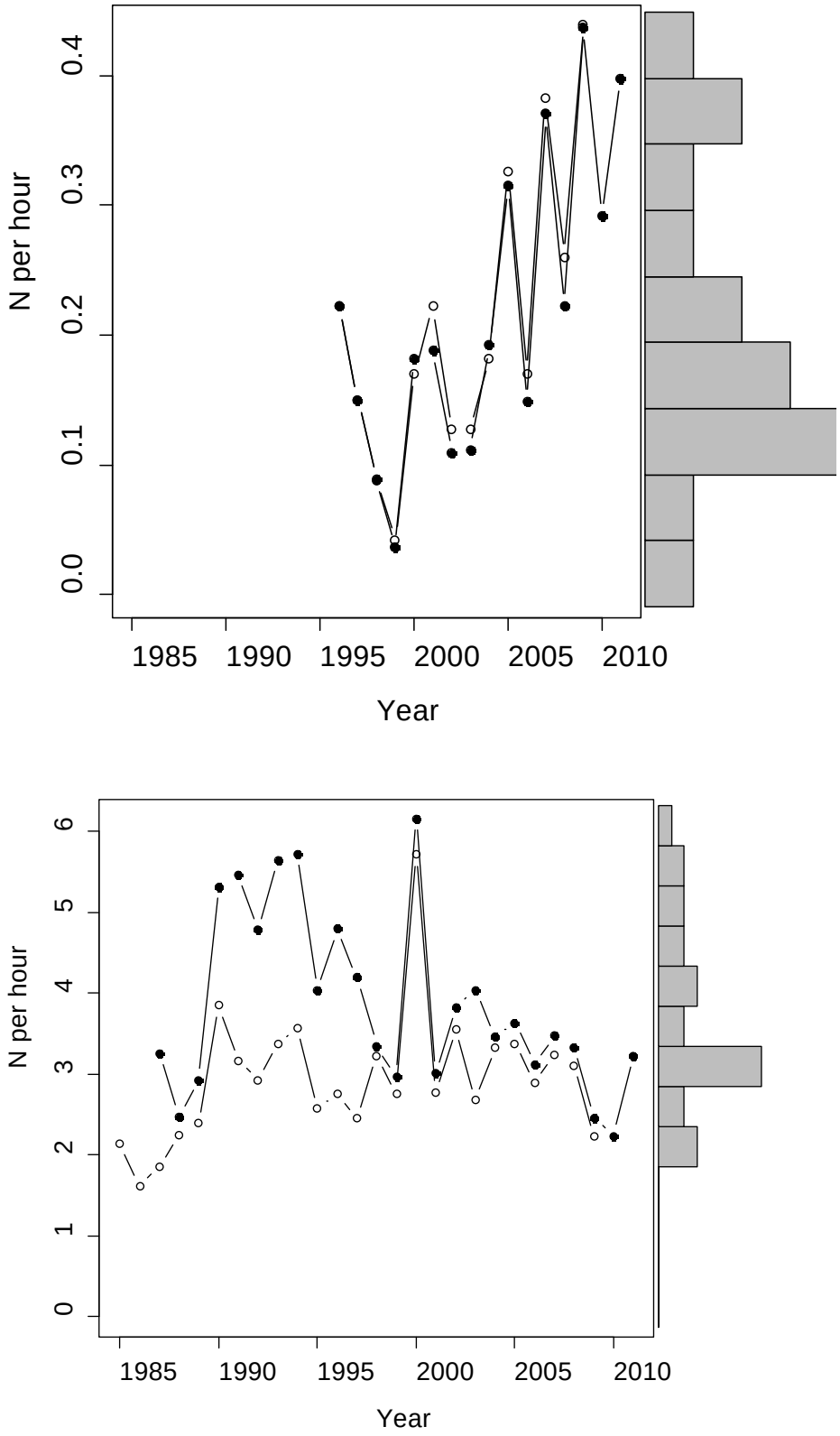

Figure 10.6. Turbot in the North Sea. Indices from Dutch BTS quarter 3 survey. Top panel represents BTS Tridens, bottom panel represents BTS ISIS.

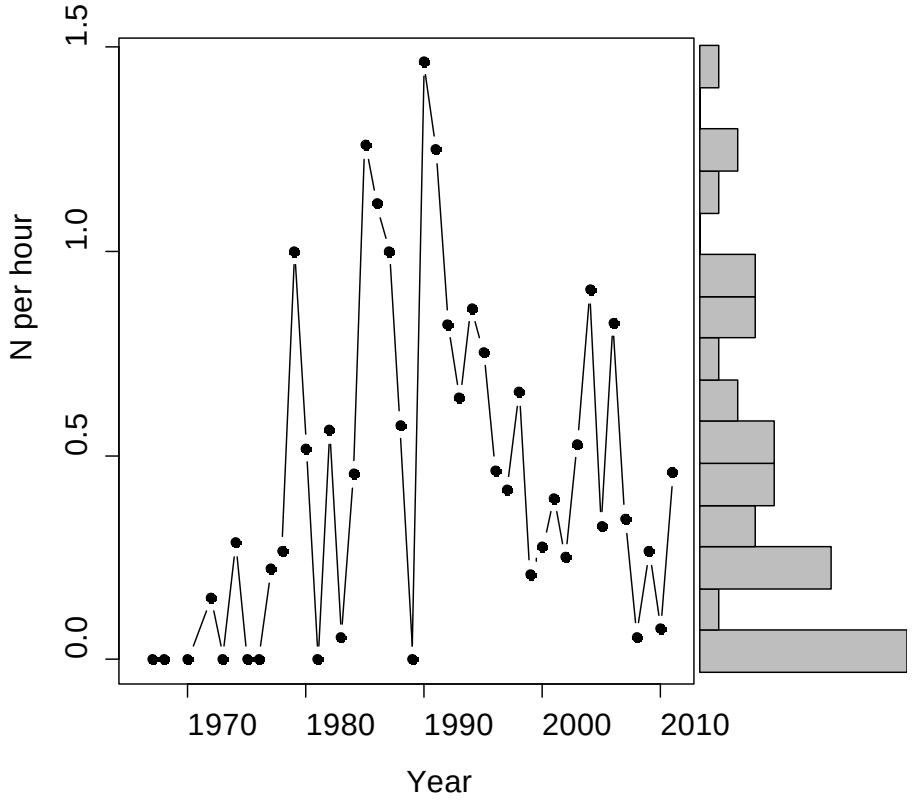

Figure 10.7. Turbot in the North Sea. CPUE index from IBTS in quarter 1 in ICES area IIIa.

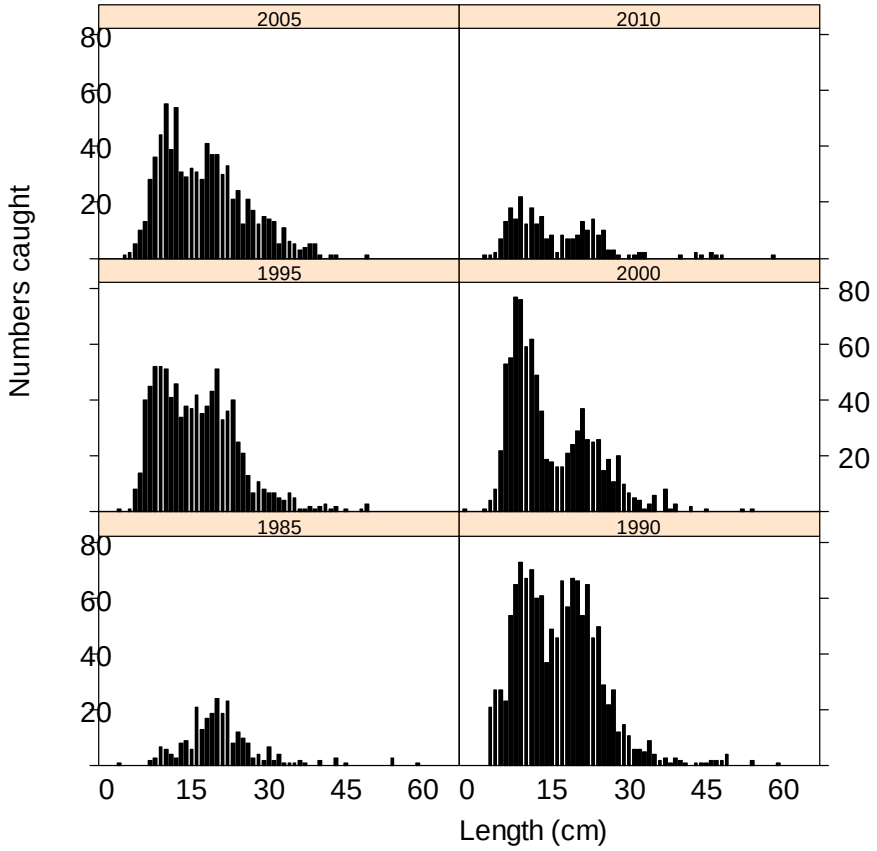

Figure 10.8. Turbot in the North Sea. Length frequency distribution in Dutch BTS quarter 3 survey.

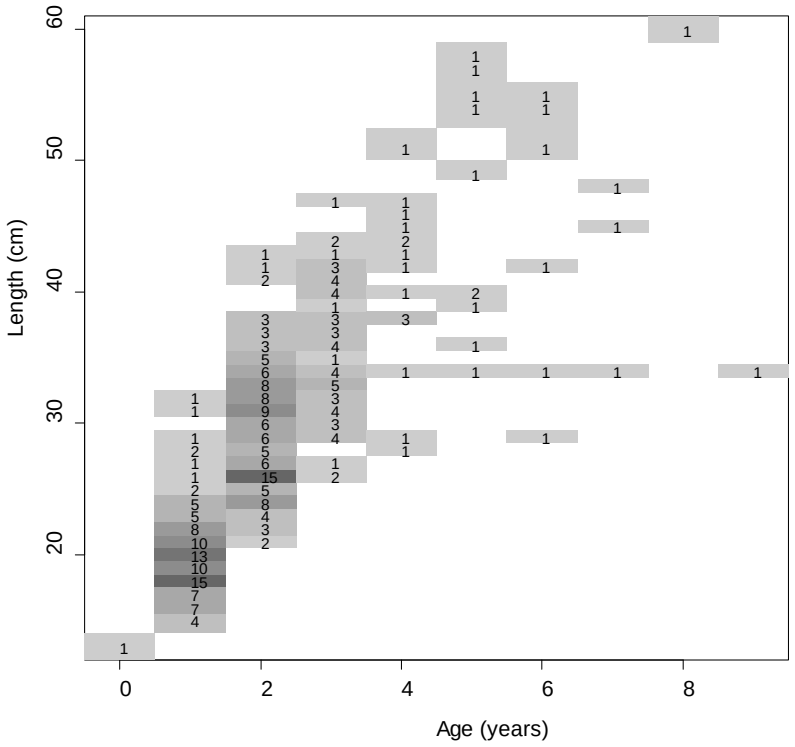

Figure 10.9. Turbot in the North Sea. Age Length Key from Dutch BTS survey data.

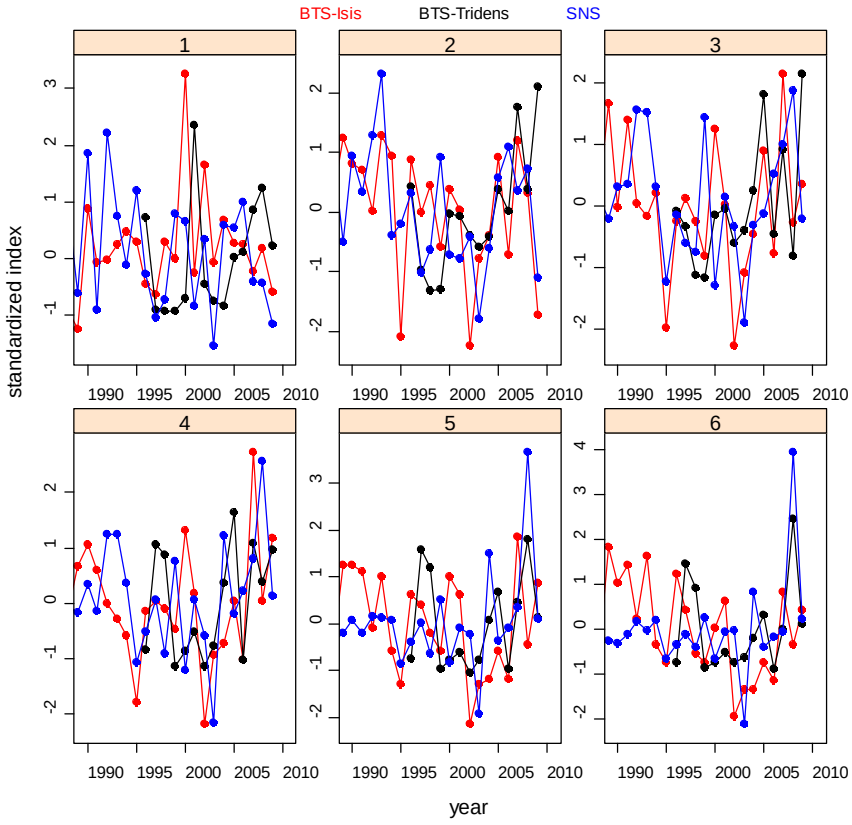

Figure 10.10. Turbot in the North Sea. Standardized time series for ages 1–6 of the three trawl surveys: BTS-Isis, BTS-Tridens, and SNS.

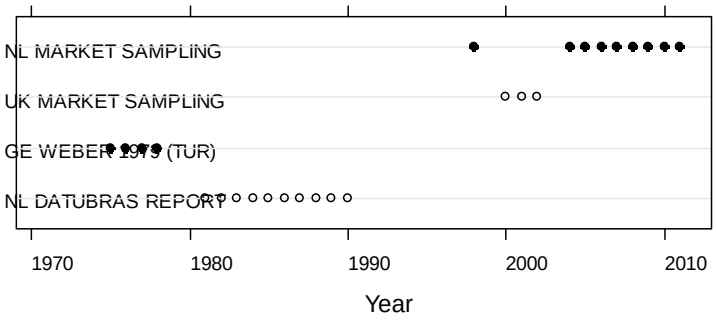

Figure 10.11. Turbot in the North Sea. Availability of market sampling data. Note that the Weber (1979) data is available for turbot only. Closed circles indicate availability of sex segregated data, open circles indicate sex separate data.

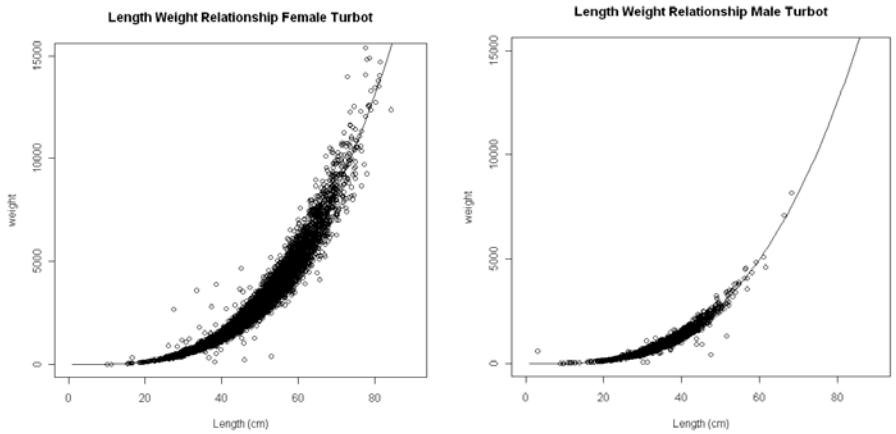

Figure 10.12. Turbot *Psetta maxima* in the North Sea. Length-weight relationship of female and male turbot for 1984–1990, 1998, 2004–2009 and corresponding fitted power functions. Based on survey and market data. Figure taken from NESPMAN report.

11 Lemon Sole in Subarea IV and Divisions IIIa and VIId

The ICES advice provided in 2011 was for 2012 and 2013, and remains unchanged. The basis for the advice can be found in WGNEW 2011 report (ICES, 2010).

This year's WGNEW report updates the time series of fishery landings data and research vessel indices.

11.1 Update of fisheries landings data

Annual landings of lemon sole in Divisions IIIa, IV and VIId are given in Tables 11.1 – 11.3 and Figures 11.1 – 11.3. Landings in Division IIIa were below 200 t between 1950 and 1974, after which a sharp increase to over 600 t was seen in 1976. Landings averaged between 500 and 600 t until 2000, since when they have declined. The majority of lemon sole from IIIa are caught by Denmark. Landings in Division IV have averaged between 3000–5000t, with successive peaks, followed by declines in landings. Landings in 2010 were at a series low of 2625 t. The majority of landings from Division IV are made by UK vessels. Total landings fromDivision VIId have fluctuated throughout the time series between a series low of 33 t in 1975 and a series high of 1151 t in 1996. . During the early part of the time series, the majority of landings were made by the UK fleet. However, since 1974, France has taken around 50% of the landings, with Belgium and the Uk taking approximately 20% each. In all three Divisions, landings have declined during the past decode.

11.2 Survey data

11.2.1 International Bottom Trawl Survey

The Q1 IBTS index of abundance for lemon sole between 1970 and 1993 suggested that abundance was stable in the early years between 1974 and the early 1980's, but increased up to 1983. Between 1983 and 1990, abundance was considered to be stable (Heessen and Daan 1996). Since the early 1990s, abundance increased to a series high in 2002, before declining to early 1990 levels in 2006 (Figure 11.4), where it has since fluctuated.

- UK (Eand W)

Lemon sole abundance indices are currently available for 4 survey series - the Irish Sea/Bristol Channel (September) (VIIa, f and g) beam-trawl survey, the Channel (VIId) beam-trawl survey (July), the Carhelmar (VIIe) beam-trawl survey (October) and the English groundfish (IVb - c) GOV trawl survey (August) (Figure 11.5). In the eastern Channel, abundance has been variable with a large peak observed in 1995 and smaller peaks in 2002, 2004 and 2008. In the Carhelmar survey lemon sole abundance was initially relatively high but decreased in the early 1990's until the early 2000's. This was followed by an increase to 2004, but abundance then decreased again. However, abundance increased again in 2008 and 2009. In the Irish Sea/Bristol Channel, lemon sole abundance steadily increased from the beginning of the time series to 2003, since when it has declined. In the North Sea, lemon sole abundance has generally increased through the time series.

- Netherlands

The Netherlands has beam trawl surveys in the southeast North Sea between 1985 and 2009 (Isis) and in the central North Sea between 1998 and 2009 (Tridens). Abundance indices for these surveys are given in Figure 11.6. In both surveys, abundance

has generally increased through the series. However abundance in the central North Sea, has almost doubled since the survey began.

Table 11.1. Lemon Sole in Subarea IV and Divisions IIIa and VIId. Official landings of Lemon sole in ICES Division IIIa

YEAR	BELGIUM	DENMARK	GERMANY	NETHERLANDS	SWEDEN	OTHER	TOTAL
1960	0	95	1	0	57	0	153
1961	0	90	0	0	71	0	161
1962	0	92	1	0	0	0	93
1963	0	99	0	0	0	0	99
1964	0	133	1	0	0	0	134
1965	0	163	1	0	0	0	164
1966	0	159	0	0	0	0	159
1967	0	189	1	0	0	1	191
1968	0	184	0	0	0	1	185
1969	0	215	0	0	0	0	215
1970	0	169	0	0	0	0	169
1971	0	173	0	0	0	0	173
1972	0	168	0	0	0	0	168
1973	0	214	0	0	0	0	214
1974	0	183	0	0	0	0	183
1975	0	263	1	1	52	0	317
1976	10	294	1	19	37	0	361
1977	9	528	2	37	51	0	627
1978	4	628	2	12	59	0	705
1979	7	704	1	10	111	0	833
1980	12	622	0	0	87	1	722
1981	1	710	0	3	75	4	793
1982	2	647	0	9	77	0	735
1983	3	636	0	10	110	0	759
1984	6	525	0	0	64	0	595
1985	0	729	0	0	64	0	793
1986	7	576	0	0	56	0	639
1987	24	577	0	0	68	0	669
1988	11	569	0	6	56	0	642
1989	8	610	0	0	75	0	693
1990	16	782	0	0	74	0	872
1991	11	640	0	0	83	0	734
1992	22	793	0	0	120	17	952
1993	14	980	4	0	141	17	1156
1994	10	648	2	0	127	16	803
1995	27	576	2	0	91	18	714
1996	0	513	1	0	97	24	635
1997	0	628	2	0	115	23	768
1998	0	743	3	0	100	22	868
1999	0	731	3	0	88	22	844
2000	0	722	1	0	65	15	803
2001	0	511	1	0	53	19	584
2002	0	457	4	0	41	20	522
2003	0	451	6	30	35	21	543
2004	0	472	5	82	29	19	607
2005	0	468	5	147	38	16	674
2006	0	321	8	40	32	16	417
2007	0	374	5	16	18	19	432
2008	0	239	7	3	15	12	276
2009	0	233	4	1	15	9	262
2010	0	286	3	35	19	7	350

Table 11.2. Lemon Sole in Subarea IV and Divisions IIIa and VIId. Official landings of Lemon sole in ICES Division IV

YEAR	BELGIUM	DENMARK	FRANCE	GERMANY	NETHERLANDS	NORWAY	UK	OTHER	TOTAL
1960	155	577	0	46	67	0	3178	12	4035
1961	286	488	0	79	102	0	3934	11	4900
1962	175	501	0	54	106	0	3794	0	4630
1963	365	222	0	36	71	0	3097	0	3791
1964	484	358	0	62	75	0	3142	0	4121
1965	562	385	0	91	93	0	3818	0	4949
1966	594	548	0	98	65	0	4110	0	5415
1967	601	791	0	136	61	0	4599	0	6188
1968	422	775	0	96	34	0	4943	0	6270
1969	292	639	0	80	36	0	3423	0	4470
1970	241	307	0	52	58	0	2776	0	3434
1971	348	514	0	54	122	0	2929	0	3967
1972	423	530	0	59	130	0	2530	0	3672
1973	566	478	0	73	217	16	3218	0	4568
1974	486	447	0	59	269	0	2966	0	4227
1975	748	521	0	83	299	0	3367	11	5029
1976	493	506	0	68	308	0	3443	12	4830
1977	618	321	0	71	262	0	4387	2	5661
1978	760	517	28	54	231	0	4518	0	6108
1979	674	876	136	41	390	0	4308	3	6428
1980	484	599	102	49	303	0	4885	2	6424
1981	555	605	237	39	412	0	4084	1	5933
1982	879	670	419	52	759	0	4386	3	7168
1983	1122	735	402	28	1009	0	4957	4	8257
1984	1144	567	344	22	0	0	4850	3	6930
1985	989	555	157	26	0	0	4703	5	6435
1986	511	577	103	16	0	0	3839	1	5047
1987	448	742	174	14	0	0	4137	1	5516
1988	539	639	184	14	301	0	4220	1	5898
1989	441	828	176	40	397	0	4083	2	5967
1990	491	1007	208	49	0	0	4431	4	6190
1991	544	1099	250	41	0	12	4666	6	6618
1992	577	1149	177	30	0	13	4175	5	6126
1993	525	966	240	37	0	9	4059	3	5839
1994	436	597	436	27	0	11	3754	1	5262
1995	588	585	412	70	0	9	3046	2	4712
1996	592	547	534	67	0	18	2976	3	4737
1997	504	499	224	76	0	29	3391	4	4727
1998	815	796	197	149	838	23	3643	5	6466
1999	662	1015	0	62	681	24	3866	6	6316
2000	711	1277	184	72	492	17	3222	5	5980
2001	694	1281	191	77	451	22	2666	7	5389
2002	604	971	190	116	402	17	1521	6	3827
2003	517	1008	239	136	369	16	1399	4	3688
2004	667	1113	120	81	355	12	1192	3	3543
2005	595	1057	102	85	402	13	1188	2	3444
2006	552	968	57	183	412	13	1440	2	3627
2007	542	1136	65	143	367	23	1610	6	3892
2008	527	925	47	120	434	26	1383	4	3466
2009	389	898	88	64	294	31	927	2	2693
2010	375	821	32	102	323	35	935	2	2625

Table 11.3. Lemon Sole in Subarea IV and Divisions IIIa and VIId. Official landings of Lemon sole in ICES Division VIId

YEAR	BELGIUM	DENMARK	FRANCE	NETHERLANDS	UK	OTHER	TOTAL
1960	4	0	0	0	62	0	66
1961	1	0	0	0	106	1	108
1962	2	0	0	0	99	0	101
1963	3	0	0	0	63	0	66
1964	5	0	0	0	72	0	77
1965	16	0	0	0	89	0	105
1966	7	0	0	0	194	0	201
1967	6	0	0	0	325	0	331
1968	8	0	0	0	329	0	337
1969	12	0	0	0	303	0	315
1970	16	0	0	0	240	0	256
1971	22	0	0	0	335	0	357
1972	18	0	0	0	457	0	475
1973	25	0	0	0	426	0	451
1974	16	0	0	1	334	0	351
1975	19	0	0	0	14	0	33
1976	24	0	0	0	18	0	42
1977	21	1	0	0	15	0	37
1978	45	2	63	0	31	0	141
1979	60	0	165	0	35	0	260
1980	33	0	109	0	10	0	152
1981	66	0	212	0	12	0	290
1982	96	0	406	1	81	0	584
1983	108	0	298	0	85	0	491
1984	110	0	367	0	109	0	586
1985	117	0	164	0	66	0	347
1986	77	0	133	0	41	0	251
1987	81	0	185	0	44	0	310
1988	74	0	155	0	29	0	258
1989	68	0	252	0	44	0	364
1990	68	0	272	0	83	0	423
1991	83	0	272	0	73	0	428
1992	66	0	176	0	122	0	364
1993	36	0	311	0	75	0	422
1994	97	0	505	0	93	0	695
1995	138	0	584	0	155	0	877
1996	213	0	720	0	218	0	1151
1997	143	0	305	0	115	0	563
1998	53	0	198	0	95	0	346
1999	50	0	0	0	90	0	140
2000	62	0	200	0	126	0	388
2001	104	0	191	0	188	0	483
2002	101	0	256	0	117	0	474
2003	128	0	251	0	112	0	491
2004	120	0	198	1	105	0	424
2005	90	0	187	2	71	0	350
2006	98	0	100	0	48	0	246
2007	70	0	72	1	21	0	164
2008	140	0	46	3	45	0	234
2009	149	0	176	9	108	0	442
2010	101	0	85	5	32	0	223

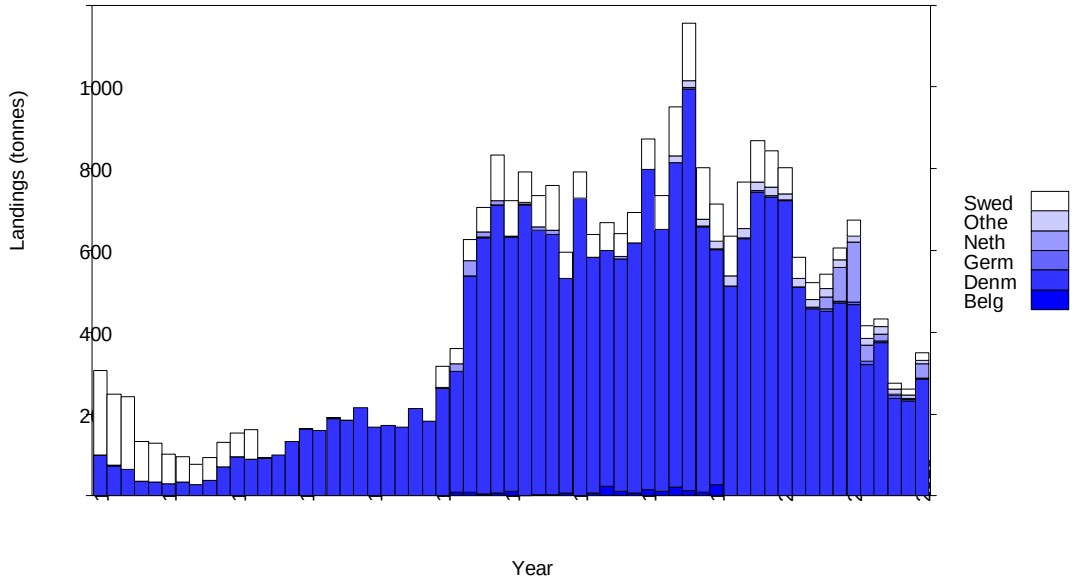

Figure 11.1. Lemon Sole in Subarea IV and Divisions IIIa and VIId. Official landings (t) of lemon sole for ICES Area IIIa 1950 – 2010. Source: FishStat

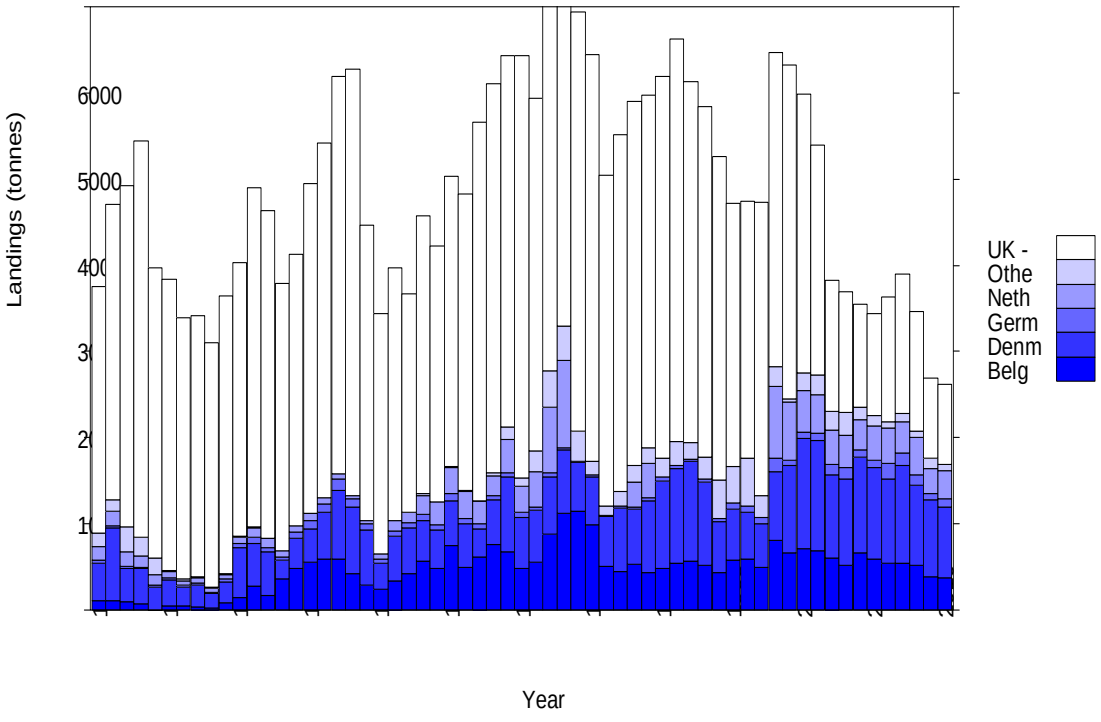

Figure 11.2. Lemon Sole in Subarea IV and Divisions IIIa and VIId. Official landings (t) of lemon sole for ICES Area IV 1950 – 2010. Source: FishStat

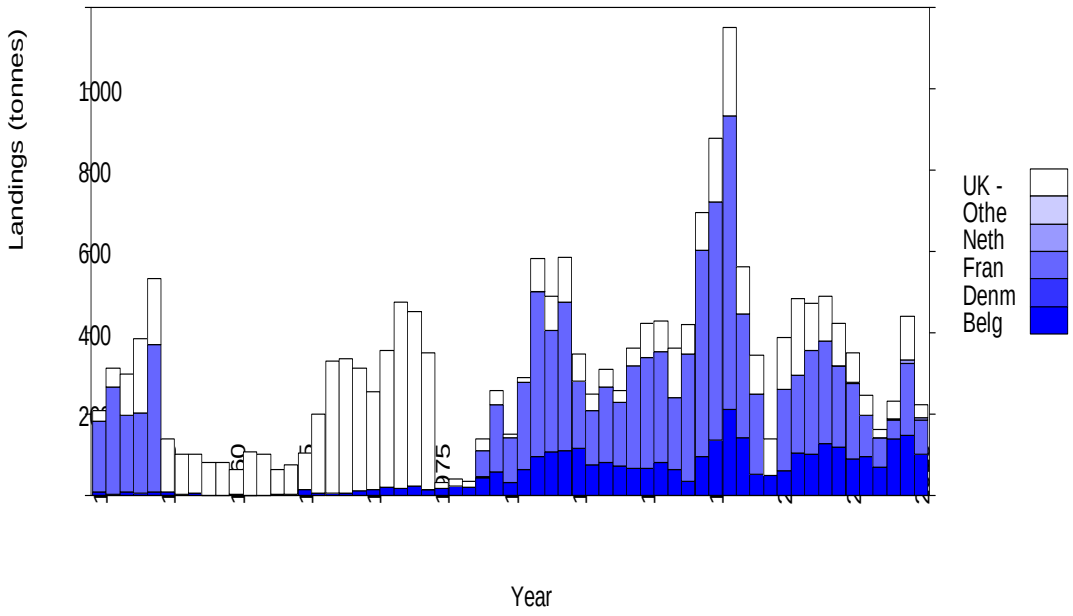

Figure 11.3. Lemon Sole in Subarea IV and Divisions IIIa and VIId. Official landings (t) of lemon sole for ICES Area VIId 1950 – 2010. Source: FishStat.

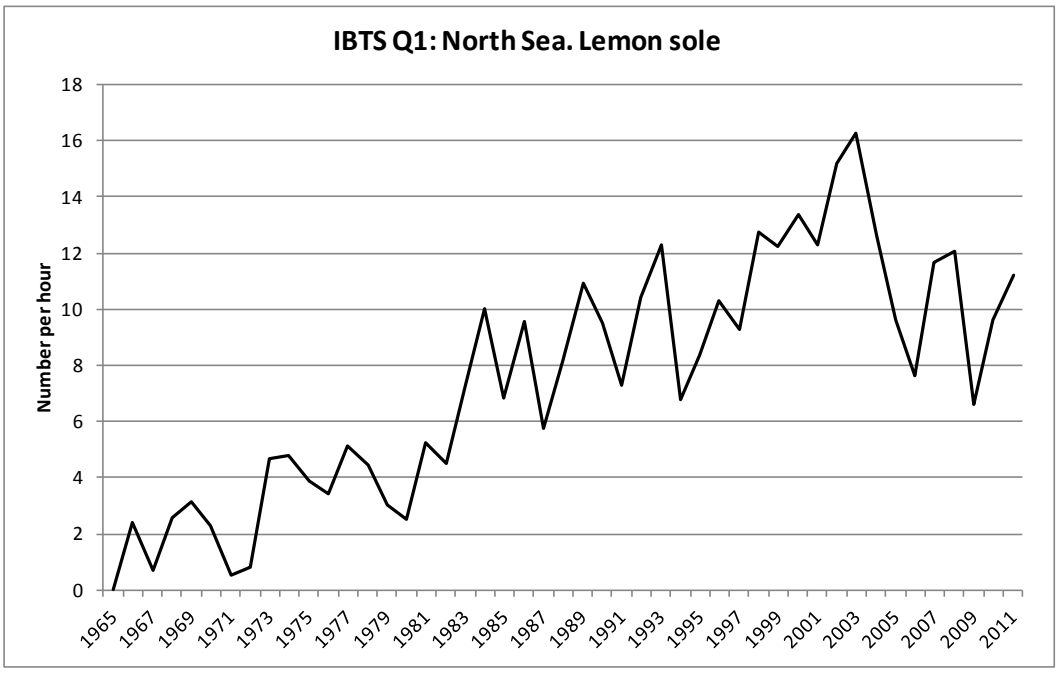

Figure 11.4. Index of abundance (number per hour) of lemon sole caught in the Q1 International Bottom Trawl survey between 1970 and 2011.

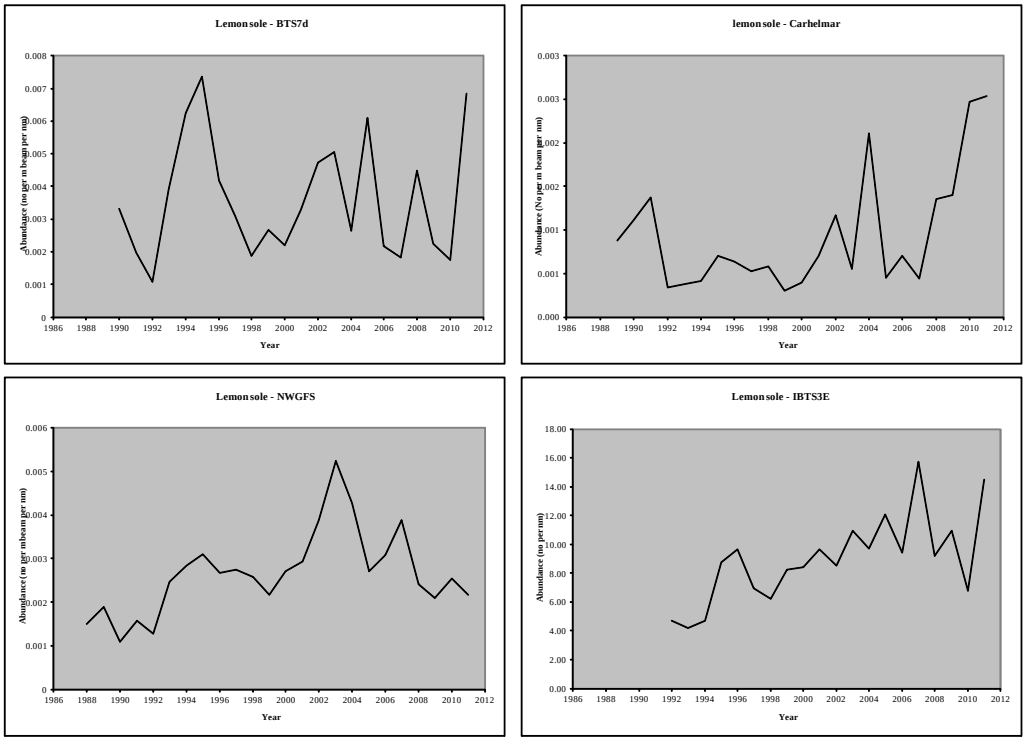

Figure 11.5. Lemon Sole in Subarea IV and Divisions IIIa and VIId. Indices of abundance of lemon sole caught in 4 Cefas surveys: the eastern Channel Beam Trawl survey (BTS7d)(July), the western Channel (VIIe) (Carhelmar) Beam Trawl survey (October), the Irish Sea/Bristol Channel (VIIa, f, g) Beam Trawl survey (NWGFS)(September) and the 3rd Quarter North Sea IBTS Groundfish Survey (IBTS3E)(August). Abundances are given as number of fish per m beam per nm for the beam trawl surveys and as number of fish per nm for the groundfish survey.

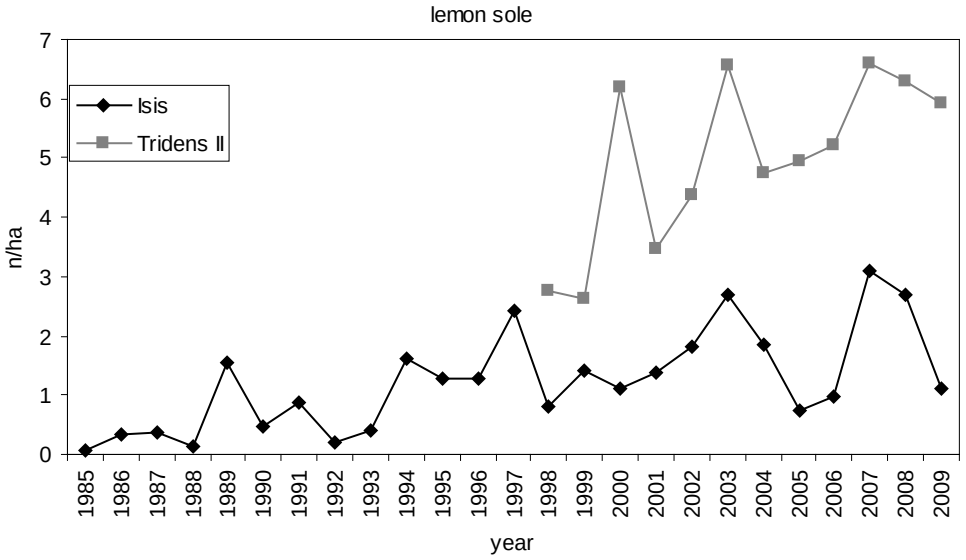

Figure 11.6. Lemon Sole in Subarea IV and Divisions IIIa and VIId. Lemon sole abundance (number per 30 minute tow) in Dutch Beam Trawl Surveys, Isis (SE north Sea) and Tridens (Central North Sea)

12 Pollack

12.1 General Biology

There is little published information on pollack (*Pollachius pollachius*, Linnaeus, 1758) biology. The species is restricted to the Northeast Atlantic with a main distribution from the Portuguese continental coast northwards around the British Isles, into the Skagerrak and along the Norwegian coast where it is fairly common up to the Lofoten Islands. It is rare at Faroe and Iceland and in the Baltic and was never registered in Spanish landings in IXa South (Gulf of Cádiz).

According to FAO Fishbase pollack is benthopelagic, found mostly close to the shore over hard bottom (Svetovidov, 1986) and wrecks and other obstacles (Quero and Vayne, 1997). It usually occurs at 40–100 m depth but is found down to 200 m. In the Cantabrian Sea and off Galicia it mainly occurs between 50 and 150 m deep (Rodriguez *et al.*, 2011). A long time series of hauls with a beach seine on the Skagerrak coast shows that 0-group pollack are regularly found in shallow areas close to the shore, but generally in more exposed areas than 0-group cod. O-group Pollack are therefore protected from the fisheries in the early life stages.

According to Fishbase spawning takes place from January to May, depending on the area, and mostly at 100 m depth. FAO Fishbase gives a maximum length of 130 cm, and maximum published weight of 18.1 kg and maximum reported age of 8 years based on Cohen *et al.* (1990). Female length-at-maturity was considered as 35 cm (Cardinale *et al*, 2012), at the age of 3 years. Feeding is mainly on fish, and incidentally on crustaceans and cephalopods.

French observations from the Western Channel/Celtic Sea region mainly support the information in Fishbase, although a higher maximum age (15 years) is found. Growth is thus fairly rapid, approaching 10 cm per year. Pollack moves gradually away from the coast into deeper waters as it grows. Maturity occurs at approximately 3 years, and spawning time is given as March-July, i.e. somewhat later than Fishbase states.

French observations also show that it is most available for fishing when it forms spawning aggregations. Otherwise its preference for wrecks and rocky bottom, makes it difficult to catch them with trawls. For this reason trawl surveys are probably not very well suited for monitoring this species.

12.2 Stock identity and possible assessment areas

Charrier *et al.* (2006) used six microsatellite markers to assess the stock structure of pollack in the NE Atlantic by comparing samples collected in four locations along the Atlantic French coast and from one location off southern Norway. Overall results showed the existence of limited genetic differentiation among samples which may be related: i) with the existence of gene flow between spawning units due to the larvae dispersal or ii) with a recent origin of populations which prevents significant genetic drift. However, authors remark that results should be carefully analysed due to the small sample sizes and the limited number of microsatellites used which might have hampered the detection of population differentiation for pollack. Nevertheless, a weak but significant genetic differentiation was detected between pollack from the Bay of Biscay and from the western English Channel. There are no morphological studies that allows to separate stocks for this species.

Data from the fishery indicate three main areas of exploitation : one in the northern North Sea/Skagerrak extending north along the Norwegian coast, one in the Western Channel extending into the Eastern Channel, the Celtic Sea, the Irish Sea, and the northern part of the French west coast (areas VIIe-j and VIII a,b - landings from the intermediate areas VIa and IVc are generally small), and one in the Iberian waters (areas VIIIc and IXa).

WGNEW proposes, based on a pragmatic approach, to distinguish three different stock units: the southern European Atlantic shelf (Bay of Biscay and Iberian Peninsula), the Celtic Seas, and the North Sea (including VIId and IIIa).

12.3 Management

A TAC has been adopted for the subarea VIII and division IXa in 2000. Since then, the TAC has been decreasing and according to the regulation for 2012 the fishing opportunities were fixed in 1482 t for the VIIIa,b,d,e, 231 t for VIIIc and 282 t for IX and X (precautionary TAC).

Also for VI and VII, TACs have been defined since 2000. For subarea VI, this TAC dropped from 1100 t in 2000 to 397 t in 2011 (including the EC waters of Vb and the international waters of XII and XIV). For subarea VII, the TAC decreased from 17000 t in 2000–2005 to 15300 t in 2006–2009, 13770 t in 2010 and 13495 t in 2011.

For IV and IIa there are no formal TACs for pollack, but catches of pollack should be counted against the quota for some other species when caught in Norwegian waters south of 62° North.

So far, no further management regulations have been defined for pollack in the Atlantic region, apart from a Minimum Landing Size of 30 cm in European Member States (Council Regulation (EU) 850/1998). No explicit objectives have been defined for potential stocks of this species, no precautionary reference points have been proposed, and no management plans are in place. Analytical assessments leading to fisheries advice have never been carried out for pollack in European waters.

12.4 Pollack in Subarea VIII and Division IXa

12.4.1 Fisheries data

No updates were available for pollack in the VIII and IXa since the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim (WGHMM) in May 2011. Pollack is mainly a bycatch in various fisheries in both VIII and IXa including small scale fisheries taking place in coastal waters. However, a target gillnet fishery started in 2006 mainly in VIIIa, by the UK (Readdy and Robinson, 2011). In France, pollack is mainly caught in nets. The Portuguese and Spanish fleets operating in both areas comprise a combination of different gears and a small amount by trawl gears (Jardim *et al.*, 2011; Rodriguez *et al.*, 2011).

Landings Figures were available through the EUROSTAT database. Data presented starts in 1950 altough reporting until 1977 can be unprecise. The introduction of the EEZs in 1977 represented a change in reporting and only from 1977 the data series appears to be reasonably consistent and adequate for allocating catches. For the IXa, landings are representative only from 1989 onwards. The TAC has decreased from 3850 t in 2000 to 1995 t in 2010, and landings have fluctuated between 1942 and 1302 t in the same time period. Thus landing Figures are likely to reflect at least the main trends in catches in the different areas.

The landings by country in are shown in Tables 12.1 and 12.2 and Figures 12.1–4. Landings assigned to division IX (unspecified) are also presented since are assumed to come from IXa. Total landings for both areas express mainly the French landings in subarea VIII (the majority from division VIIIa). Landings are apparently stable since 1989. Spanish landings on IXa represent almost the totality of the reported landings for this division. However it should be remarked that in Portuguese landings in the IXa pollack is commonly mididentified with whiting due to wrong use of the common names (Jardim *et al.*, 2011). Information available suggests that most Portuguese landings are pollack (Jardim *et al.*, 2011). However, this problem should not have major impact in landing series for both areas VIII and IXa combined (whiting and Pollock landings account approximately 200 t according to the Portuguese official landings). Portuguese landings of pollack and whiting presented at the meeting are shown in Figure 12.5. No evident trend is detectable.

Tables 12.3 to 12.5 present landing data by country by gear for all divisions combined (information from WGHMM 2011) (ICES, 2011a).

Portuguese discard data of pollock can be assumed null (WD2: Fernandes and Prista, 2012).

CPUE data is not available.

12.4.2 Survey data, recruit series

Spanish surveys record pollack in 1983 and then from 2004 onwards. Abundance and biomass indices of pollack in the Cantabrian Sea and off Galicia from these surveys are given in Figure 12.6. The time-series is short and pollack is not catch in sufficient quantity to evaluate trends in the abundance indices.

IPIMAR survey data for IXa shows that pollock was seldom observed (Jardim *et al.* 2011). There are no available time series of survey indices covering the division IXa.

12.4.3 Biological sampling

This information only started to be compiled in 2011 by Spain. Length samples were taken during UK scientific surveys until 2001.

12.4.4 Population biological parameters and other research

Cohen *et al.* (1990) report different spawning periods for Spain and Bay of Biscay, Februrary and March, respectively.

12.4.5 Analyses of stock trends /assessment

There are no sufficient data to carry out any analytical assessment.

12.4.6 Data requirements

Presently only landings are available for the stock assessment. In southern areas, landings statistics might be uncertain because of pollack being misclassified as whiting. More spatial detail on fisheries are needed, including information on length frequency composition and discards.

Further work is required on stock identity. The collection of data under DCF needs to be continued by the countries that already collect these, and taken up by some others, in order to get a better understanding of the state of the potential pollack stocks in the

area, and to enable the evaluation of trends. Special effort should also be done in order to get age, maturity and other biological data (surveys or commercial sampling).

12.5 Pollack in the Celtic Seas (ICES Subareas VI and VII)

12.5.1 Fisheries data

The nominal landings as reported to ICES are given in Tables 12.6 and 12.7 for ICES Subareas VI and VII respectively. These landing Figures are clearly incomplete and erratic (especially for the period prior to 1977, when a change in reporting requirements ensured more complete data) and further scrutiny is required. For example, Sweden is declaring substantial landings from subdivision VI in the period 1967–1972, while this is the case for Spain during the period 1981–1988, whereas both countries are largely absent from the rest of the landings time series (see Table 12.6 and Figure 12.7–8). France, a major contributor to the landings in both VI and VII, starts declaring in 1977 and has no declarations in 1999. For Ireland, another major contributor to pollock fisheries in the Celtic Seas Ecoregion, no landings were declared from 1973 until 1985. From 1977 onwards, the picture shows a long term downward trend, due mainly to the French threefold reduction of landings over the time period. In 2010, 98% of the landings originated from the Subarea VII, and Ireland, UK and France together comprised 99% of the official landings. Subarea VI has lost almost all of its past landings.

Landings are represented separately for VIIa, VIIbc, VIIde and VIIj-k (Figure 12.9). The Celtic Sea (VIIf-k) and the English Channel (VIIde) compose the majority of the landings (within the English Channel, an average of 83% of the landings consistently comes from VIIe over the period 1975–2010).

Most pollack in the Celtic Seas ecoregion is caught by trawls and gillnets, and other gears come to complement the landings, such as trolling lines, seine nets and beam trawls (see WGCSE(ICES, 2011b) for an overview of catches per gear for Ireland and France over the period 2003–2010). The overall gear contribution is unknown due to the lack of complete statistics.

It must be noted that pollack is also a target for recreational fisheries, especially by angling and spearfishing, both from shore and from boats. Apart from a survey conducted by France in 2006—2008, that estimated annual recreational catches of pollack to be 3500 t +/-2500 t (ICES, 2010), no other information on recreational pollack catches is known to us.

12.5.2 Survey data

Pollock has a preference for wrecks and rocky bottom, making it difficult to catch with trawls and therefore poorly suited for monitoring by research surveys using trawling gear. This is in general illustrated by low numbers of individuals caught by bottom-trawl surveys. Given the fact that the occurrence of pollack in survey catches is highly influenced by coincidence (e.g., accidental fishing near a wreck or another hard substrate), the occurrence of years with zero survey catches doesn't necessarily mean that there was no pollack in those years.

Data generated by CGFS-Q3, EVHOE-WIBTS-Q4, IGFS-WIBTS-Q4 and BTS-VIIa-Q3 were tested for their information content on pollack from Subdivisions VI and VII. Pollack proves to be a very rare species in the catches of all these surveys, making them not suitable for the calculation of abundance indices of this species. Only for EVHOE-WIBTS-Q4 (Celtic Sea, VIIghj), biomass and abundance indices were calcu-

lated (available from DATRAS) for pollack (Figure 12.10). With the coincidence factor and low survey catches in mind, pollack seems to be rather stable at a low level over the time series.

12.5.3 Biological sampling

Some length frequency data are available for recent years, but area specific data on life history parameters are missing.

12.5.4 Analysis of stock trends / assessment

No reliable assessment can be presented for this species in the Celtic Sea ecoregion, and no reference points have been defined. The main cause of this is lack of reliable data. Therefore, fishing possibilities cannot be projected.

12.5.5 Data requirements

Further work on stock identity of pollack needs to be carried out, mainly to investigate the differentiation between pollack in the advisory units VI-VII and IV-IIIa.

Landing statistics for this area are assumed to be of good quality, but the data collection on surveys encountering pollack should be more intensive to enable a better understanding of the stock structure. Especially the collection of age and maturity information should be added to the routine reporting of catches at length.

12.6 Pollack in Subarea IV and Division IIIa

12.6.1 Fisheries data

Historical landings statistics for pollack are available from ICES, but they are clearly incomplete in earlier years. The introduction of the EEZs in 1977 represented a change in reporting and from 1977 the data series appears to be reasonably consistent and adequate for allocating catches at least to ICES subareas. Considering that pollack is not subject to TAC regulations, a major incentive for mis- or underreporting is not present and landings Figures are thus probably reflecting at least the main trends in landings in the different areas.

Landings by country for the years 1977–2010 in Subdivision IIIa (Skagerrak/Kattegat) and Subarea IV (North Sea) are shown in Tables 12.8 and 12.9. Figure 12.11 shows total landings in Subarea IV and Division IIIa 1977–2010. Two periods with high catches can be seen, but catches are at a rather stable low level during the last 10 years.

Pollack is mainly a bycatch in various commercial fisheries. Monthly Norwegian catches, averaged over the years 1992–2011, show that catches peak in the months of March and April, coinciding with the spawning time, and this may be caused by fisheries targeting spawning aggregations. In Norway the most important gear is gillnets and otter trawl, responsible for 70 and 14 % of the catches respectively. When catches within and outside the 12 miles zone are compared it is seen that, for 2011, in Division IIIa 97% was from within the 12 miles zone (by gillnet and *Pandalus* trawl). In Subarea IV 66% of the catches was made within the 12 miles zone (again by gillnets), whereas in the area beyond the 12 miles zone the main catches were made by otter-trawl.

Pollack is also often caught in recreational fisheries, but no data about these catches are known to the working group.

12.6.2 Survey data / recruit series

Pollack is being caught in the IBTS survey in small numbers only. They are distributed mainly over the northweastern North Sea (along the Norwegian Deeps) and into the Skagerrak (Figure 12.12). Time series of abundance in the IBTS are shown for Subarea IV and Division IIIa separately, for quarter 1 (from 1977 onwards) and quarter 3 (from 1996 onwards) (Figure 12.13). The catches seem rather irregular, and no clear patterns emerge. A possible exception is the time series for quarter 1 in IIIa that may seem to mirror the decrease in abundance of pollack in this area, as also reported in Cardinale *et al.* (2012).

12.6.3 Biological sampling

There has been no recent collection of biological parameters in Subarea IV and Division IIIa.

12.6.4 Population biological parameters and other research

No information.

12.6.5 Analysis of stock trends / assessment

For Division IIIa (Skagerrak and Kattegat), Cardinale *et al.* (2012) analysed the spatial distribution and stock trends for the period 1906 – 2007, based on survey and commercial catches. The stock biomass of pollack is suggested to increase from 1940 to reach a peak in the late 1950ies. Since then the biomass has shown a decrease to reach a very low value around 2000.

12.6.6 Data requirements

Apart from reporting catches at length during routine surveys, such as the quarter 1 and quarter 3 IBTS in Subarea IV and Division IIIa, no biological data are collected for this species. In order to understand better their growth and maturity WGNEW recommends that otoliths and maturity information should be collected during these surveys for a few years.

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Table 12.1. Pollack. Landings by country in subarea VIII. As officially reported to ICES.

YEAR	BELGIUM	DENMARK	FRANCE	NETHERLANDS	PORTUGAL	SPAIN	UK	TOTAL
1965	0	0	0	0	0	1808	0	1808
1966	0	0	0	0	0	1951	0	1951
1967	0	0	0	0	0	2230	0	2230
1968	0	0	0	0	0	1960	0	1960
1969	0	0	0	0	0	1484	0	1484
1970	0	0	0	0	0	1953	0	1953
1971	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0
1977	0	0	1459	0	0	0	0	1459
1978	1	0	1661	0	0	0	0	1662
1979	0	1	2221	0	0	1021	0	3243
1980	1	0	2158	0	0	1576	0	3735
1981	1	0	2326	0	0	902	0	3229
1982	2	0	2185	0	0	85	2	2274
1983	0	0	2652	1	0	581	0	3234
1984	0	0	2351	0	0	1606	1	3958
1985	0	0	2769	0	0	2304	23	5096
1986	0	0	2127	0	0	437	5	2569
1987	0	0	2022	0	0	584	1	2607
1988	3	0	1761	0	0	476	6	2246
1989	13	0	1682	0	0	214	4	1913
1990	14	0	1662	0	0	194	2	1872
1991	1	0	1867	0	0	221	1	2090
1992	2	0	1735	0	<0.5	154	0	1891
1993	3	0	1327	0	0	135	0	1465
1994	3	0	1764	0	<0.5	157	0	1924
1995	6	0	1457	0	0	153	2	1618
1996	8	0	1164	0	0	137	0	1309
1997	2	0	1167	0	0	152	1	1322
1998	1	0	956	0	0	152	0	1109
1999	0	0	0	0	0	120	0	120
2000	0	0	1315	0	<0.5	121	0	1436
2001	0	0	1142	0	0	346	0	1488
2002	0	0	1467	0	0	170	0	1637
2003	0	0	1245	0	0	142	1	1388
2004	0	0	1145	0	<0.5	211	0	1356
2005	0	0	1311	0	0	306	0	1617
2006	0	0	1418	0	0	251	171	1840
2007	0	0	1238	0	0	198	62	1498
2008	0	0	814	0	0	265	64	1143
2009	0	0	1508	0	0	218	41	1767
2010	0	0	1269	0	0	265	44	1578

Table 12.2. Pollack. Landings by country in division IXa and subarea IX. Subarea IX includes landings assigned to the IXa and unspecified landings in IX, assumed to be from IXa. As officially reported to ICES.

	IXa		IX		
Year	Portugal	Spain	Portugal	Spain	Total
1965	0	0	0	0	0
1966	0	0	0	0	0
1967	0	0	0	0	0
1968	0	0	0	0	0
1969	0	0	0	0	0
1970	0	0	0	2	2
1971	0	0	0	0	0
1972	0	0	0	0	0
1973	0	0	0	0	0
1974	0	0	242	0	242
1975	0	0	0	0	0
1976	0	0	0	0	0
1977	0	0	0	0	0
1978	0	0	0	0	0
1979	0	0	0	0	0
1980	0	0	0	0	0
1981	0	0	0	0	0
1982	0	0	0	32	32
1983	0	0	0	203	203
1984	0	0	0	642	642
1985	0	0	0	636	636
1986	0	0	0	237	237
1987	0	0	3	308	311
1988	0	0	7	329	336
1989	0	57	3	57	60
1990	0	27	1	27	28
1991	0	76	2	76	78
1992	0	65	2	65	67
1993	0	47	1	47	48
1994	0	28	3	28	31
1995	0	59	2	59	61
1996	0	43	2	43	45
1997	0	54	2	54	56
1998	0	55	1	55	56
1999	0	36	1	36	37
2000	0	49	15	49	64
2001	0	81	41	81	122
2002	0	35	45	35	80
2003	0	39	31	39	70
2004	12	90	12	90	102
2005	0	132	6	132	138
2006	0	102	7	102	109
2007	5	103	5	103	108
2008	31	128	31	128	159
2009	3	68	3	68	71
2010	2	91	2	91	93

Table 12.3. Pollack. Official landings for the UK fleet (England and Wales component) in the VIIIc and IX (from Readdy and Robinson, 2011)

	Fixed nets	Longlines	Beam trawl	Bottom trawl
1985		19504		3759
1986				4589
1987				1004
1988				5903
1989				
1990	1802			
1991		341		307
1992				
1993			1	262
1994				
1995			8	1614
1996		9		
1997	934	3		
1998		5		
1999		1		
2000		33		6
2001		9		
2002		6		
2003		481	10	11
2004				
2005		5		57
2006	170918			
2007	6184			1
2008	64054			
2009	40942			
2010	43787			

Table 12.4. Pollack. Landings Figures based on logbook data only for the French fleet for the VIIIa,b,d (from Mahé, 2011). The usual procedure used to produce best estimates could not be applied).

	Trawl	Other	Nets	Lines
1999	203	5	260	73
2000	255	5	264	20
2001	173	5	358	36
2002	202	3	570	65
2003	151	4	542	57
2004	205	6	378	95
2005	294	11	498	92
2006	311	19	565	133
2007	263	12	557	138
2008	224	5	679	217

Table 12.5. Pollack. Official Portuguese landings for the Portuguese fleet in the IXa of pollack and whiting (from Jardim *et al.*, 2011)

	Pollachius pollachius			*Merlangius merlangus*		
Year	Dtrawl	Polyvalent	Pseiners	Dtrawl	Polyvalent	Pseiners
2003	0.1	60.0	0.0	17.1	70.0	0.7
2004	0.3	33.0	0.1	24.3	125.3	0.1
2005	1.2	15.5	0.0	14.0	139.3	0.0
2006	0.7	13.4	0.0	8.1	205.8	0.1
2007	0.3	9.0	0.5	21.4	190.6	1.2
2008	0.1	66.5	NA	10.5	183.4	0.2
2009	1.0	4.8	NA	14.3	207.1	0.0
2010	0.2	3.4	NA	10.2	212.9	0.0

Table 12.6. Pollack in the Subareas VI and VII. Official landings by country in Subarea VI.

	Belg.	Denm.	Fran.	Germ.	Irel.	Neth.	Norw.	Port.	Spain	Swed.	UK	Total IV
1970	2	-	-	1	398	-	-	-	-	756	447	1604
1971	1	-	-	5	75	-	-	-	-	750	256	1087
1972	1	-	-	1	127	-	-	-	-	779	317	1225
1973	2	-	-	-	-	-	-	-	-	-	503	505
1974	6	-	-	-	-	3	-	-	-	-	359	368
1975	<0.5	-	-	1	-	1	4	-	-	-	393	399
1976	7	-	-	-	-	1	-	-	-	-	519	527
1977	-	-	196	-	-	1	2	-	-	-	493	692
1978	-	-	196	-	-	-	4	-	-	-	553	753
1979	-	-	310	-	-	-	-	-	-	-	350	660
1980	-	-	36	-	-	-	-	-	-	-	233	269
1981	-	-	342	-	-	-	-	-	55	-	185	582
1982	-	<0.5	272	-	-	-	-	-	95	-	103	470
1983	-	-	331	-	-	-	-	-	86	-	148	565
1984	-	-	212	-	-	-	-	-	222	-	194	628
1985	<0.5	-	224	1	-	-	-	-	283	-	328	836
1986	-	-	145	-	223	-	-	-	2217	-	187	2772
1987	-	<0.5	108	-	103	-	-	-	860	-	259	1330
1988	-	<0.5	128	-	163	-	-	-	1925	-	221	2437
1989	-	<0.5	111	1	103	-	-	-	-	-	179	394
1990	-	-	76	-	150	-	1	-	-	-	192	419
1991	-	-	31	-	145	-	-	-	4	-	189	369
1992	-	<0.5	21	-	23	-	-	-	<0.5	-	203	247
1993	-	-	39	-	12	-	-	-	-	-	273	324
1994	-	-	34	<0.5	26	-	<0.5	-	-	-	276	336
1995	-	-	64	3	83	-	-	-	-	-	354	504
1996	-	<0.5	29	<0.5	97	-	1	-	-	-	210	337
1997	-	-	14	1	69	-	2	-	-	-	162	248
1998	-	-	21	-	60	-	-	<0.5	<0.5	-	147	228
1999	-	-	-	-	73	-	3	-	<0.5	-	136	212
2000	-	-	11	2	62	-	-	-	-	-	116	191
2001	-	-	8	-	108	-	-	-	-	-	101	217
2002	-	-	9	-	26	-	-	-	-	-	96	131
2003	<0.5	-	3	-	88	-	1	-	-	-	111	203
2004	<0.5	-	2	-	68	-	1	-	-	-	65	136
2005	-	-	23	-	28	-	-	-	-	-	16	67
2006	-	-	3	-	25	-	<0.5	-	4	-	5	37
2007	-	-	10	-	21	-	6	-	-	-	21	58
2008	-	-	8	-	21	-	1	-	-	-	23	53
2009	-	-	7	-	5	-	<0.5	-	-	-	25	37
2010	-	-	6	-	34	-	<0.5	-	-	-	38	78

Table 12.7. Pollack in the Subareas VI and VII. Official landings by country in Subarea VII.

	Belg.	Denm.	Fran.	Germ.	Irel.	Neth.	Norw.	Spain	UK	Total VII
1970	165	-	-	1	724	-	-	-	120	1010
1971	114	-	-	-	673	-	-	-	116	903
1972	142	-	-	-	1073	-	-	-	123	1338
1973	89	-	-	-	-	3	-	-	127	219
1974	299	-	-	-	-	13	-	-	223	535
1975	295	-	-	-	-	17	-	-	290	602
1976	339	-	-	-	-	4	-	-	421	764
1977	157	1	3569	-	-	1	-	-	465	4193
1978	186	21	5496	14	-	8	-	-	515	6240
1979	151	18	5119	76	-	1	-	-	696	6061
1980	237	7	5242	-	-	1	-	1	769	6257
1981	244	-	5814	-	-	3	-	23	780	6864
1982	154	-	4253	-	-	-	-	32	1022	5461
1983	167	-	6214	-	-	-	-	26	1045	7452
1984	207	-	3927	-	-	-	-	486	1100	5720
1985	269	-	3741	-	-	-	-	20	1022	5052
1986	241	-	4574	-	1335	-	-	17	1795	7962
1987	149	-	5213	-	848	-	-	19	2010	8239
1988	191	-	5211	-	1066	-	-	22	1740	8230
1989	145	-	3893	-	994	-	-	18	1487	6537
1990	133	-	4831	-	1066	-	-	26	1914	7970
1991	76	-	3211	-	1045	-	-	22	1962	6316
1992	62	-	2849	-	1014	-	-	19	1889	5833
1993	55	-	2325	-	1137	-	-	7	2135	5659
1994	94	-	2621	-	921	-	-	8	2391	6035
1995	88	2	2315	-	1107	-	-	4	2168	5684
1996	94	-	2684	-	1190	6	-	5	2519	6498
1997	99	-	2443	-	984	4	<0.5	7	2540	6077
1998	92	-	2375	-	886	1	-	11	2347	5712
1999	86	-	-	-	976	-	3	19	1703	2787
2000	71	-	2422	-	1069	-	-	5	1810	5377
2001	100	-	2515	-	1274	-	-	9	1987	5885
2002	117	-	2481	-	1308	-	-	17	1999	5922
2003	113	-	2284	-	1151	-	-	12	1788	5348
2004	104	-	1914	-	1049	1	-	13	1705	4786
2005	98	-	2198	-	728	1	-	16	1684	4725
2006	79	-	2213	-	809	1	-	28	1513	4643
2007	91	-	1970	-	782	3	-	1	1764	4611
2008	76	-	1579	-	738	1	-	14	1453	3861
2009	42	-	1670	-	828	4	-	3	1545	4092
2010	35	-	1846	-	942	2	-	3	1459	4284

Table 12.8. Pollack. Landings by country in Division IIIa as officially reported to ICES.

	ICES Division IIIa							
	Belgium	Denmark	Germany	Netherl.	Norway	Sweden	UK	Total
1977	10	1764	4	3	449	706		2936
1978	1	2077	4		556	794		3432
1979	13	1898	<0.5		824	1066		3801
1980	13	1860			987	1584	<0.5	4444
1981	5	1661			839	1187	1	3693
1982	1	1272			575	417	<0.5	2265
1983	2	972			438	288		1700
1984	2	930	<0.5		371	276		1579
1985	-	824	<0.5		350	356		1530
1986	4	759	<0.5		374	271		1408
1987	6	665			342	246		1259
1988	4	494			350	136		984
1989	3	554			313	152		1022
1990	8	1842	<0.5		246	253		2349
1991	2	1824			324	281		2431
1992	8	1228			391	320		1947
1993	6	1130	1		364	442		1943
1994	5	645	<0.5		276	238		1164
1995	10	497			322	271		1100
1996		680			309	273		1262
1997		364	<0.5		302	178		844
1998		299			330	105		734
1999		192			342	88		622
2000		199			268	33		500
2001		201	1		253	46		501
2002		228	3		202	44		477
2003		168	3	1	236	17		425
2004		140	2	4	179	34		359
2005		160	5	7	173	153		498
2006		103	10	3	178	36		330
2007		172	9		245	38		464
2008		161	5		247	33		446
2009		206	7		220	38	<0.5	471
2010		313	8	1	195	35		552

Table 12.9. Pollack. Landings by country in Subarea IV as officially reported to ICES.

	ICES Subarea IV										
	Belgium	Denmark	Faeroes	France	Germany	Netherl.	Norway	Poland	Sweden	UK	Total
1977	121	275		75	142	38	419	9	0	442	1521
1978	102	249		98	154	21	492	2	0	471	1589
1979	62	333		72	64	8	563	11	31	429	1573
1980	82	407		66	58	2	1095		38	355	2103
1981	59	500		173	21	2	1261		12	362	2390
1982	46	431		59	40	1	1169	33	23	270	2072
1983	58	481		79	44	1	1081		57	300	2101
1984	52	402		108	37	0	880	2	106	315	1902
1985	14	308		69	23	0	686		51	363	1514
1986	44	550		45	21	0	602		67	362	1691
1987	21	427		988	21	0	471		40	290	2258
1988	32	432		367	30	10	560		20	296	1747
1989	31	273		0	21	4	568		37	269	1203
1990	44	924		0	34	3	651		126	366	2148
1991	31	1464		0	48	4	887		153	684	3271
1992	49	794		18	59	7	1051		141	1310	3429
1993	46	1161		8	161	19	1429		217	1561	4602
1994	42	635		12	55	14	845		113	872	2588
1995	56	532	1	7	84	18	1203		175	1525	3601
1996	13	366		4	99	13	909		82	945	2431
1997	20	272	1	1	115	11	733		82	1185	2420
1998	21	265		7	44	5	567		75	780	1764
1999	21	288		0	62	5	768		72	636	1852
2000	45	291		24	38	5	880		91	877	2251
2001	36	156		6	40	1	860		63	809	1971
2002	27	234		6	112	0	879		68	711	2037
2003	13	191		9	82	1	971		36	837	2140
2004	28	162		5	57	0	517		16	612	1397
2005	26	173		3	128	3	511		46	477	1367
2006	18	152		4	80	1	545		12	587	1399
2007	18	192		130	137	2	754		43	905	2181
2008	15	150		129	114	1	840		46	999	2294
2009	13	121	2	6	50	1	668		32	658	1551
2010	12	163		10	129	0	599		32	540	1485

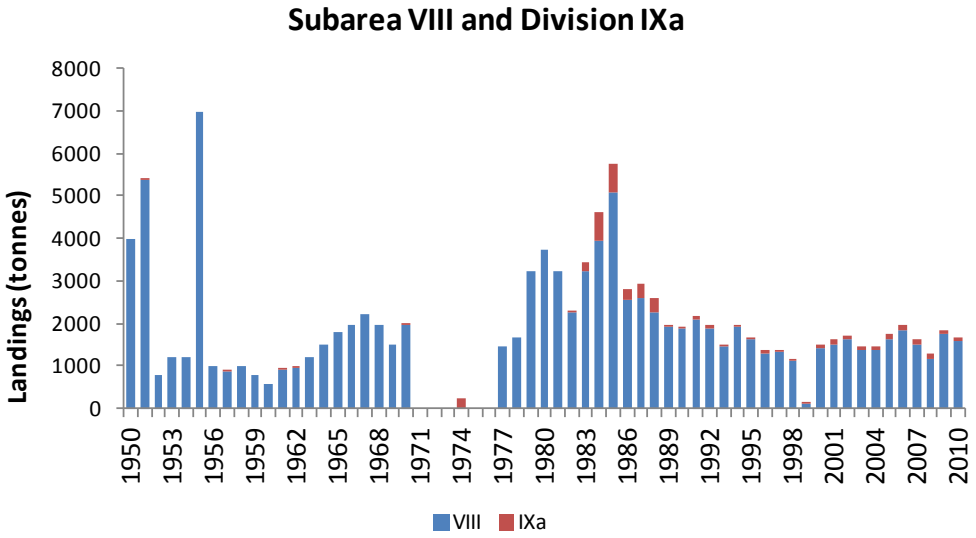

Figure 12.1. Pollack. Landings in subarea VIII and division IXa. As officially reported to ICES. IXa includes landings assigned to the IXa and unspecified landings in IX, assumed to be from IXa.

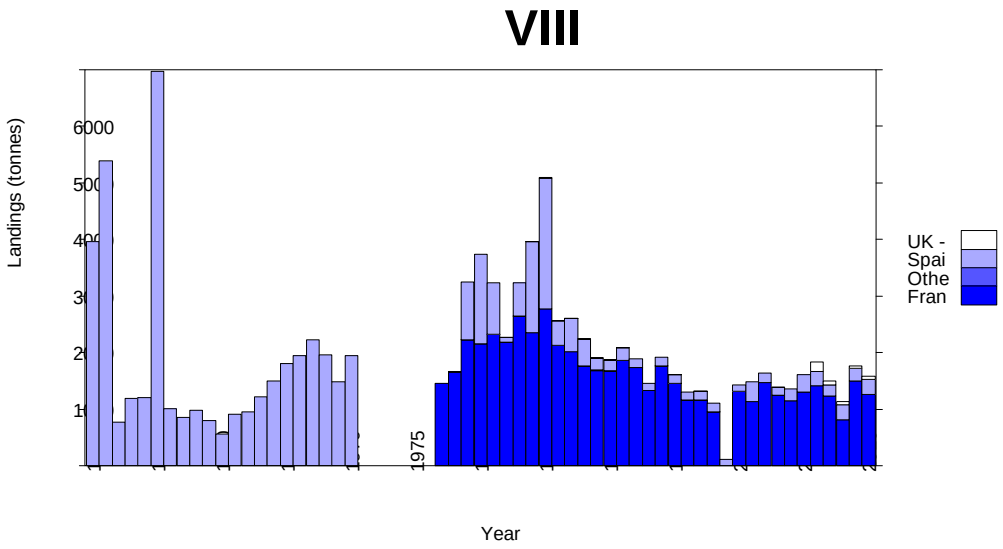

Figure 12.2. Pollack. Landings by country in subarea VIII. As officially reported to ICES. Previously to 1977 landings were never assigned to a division.

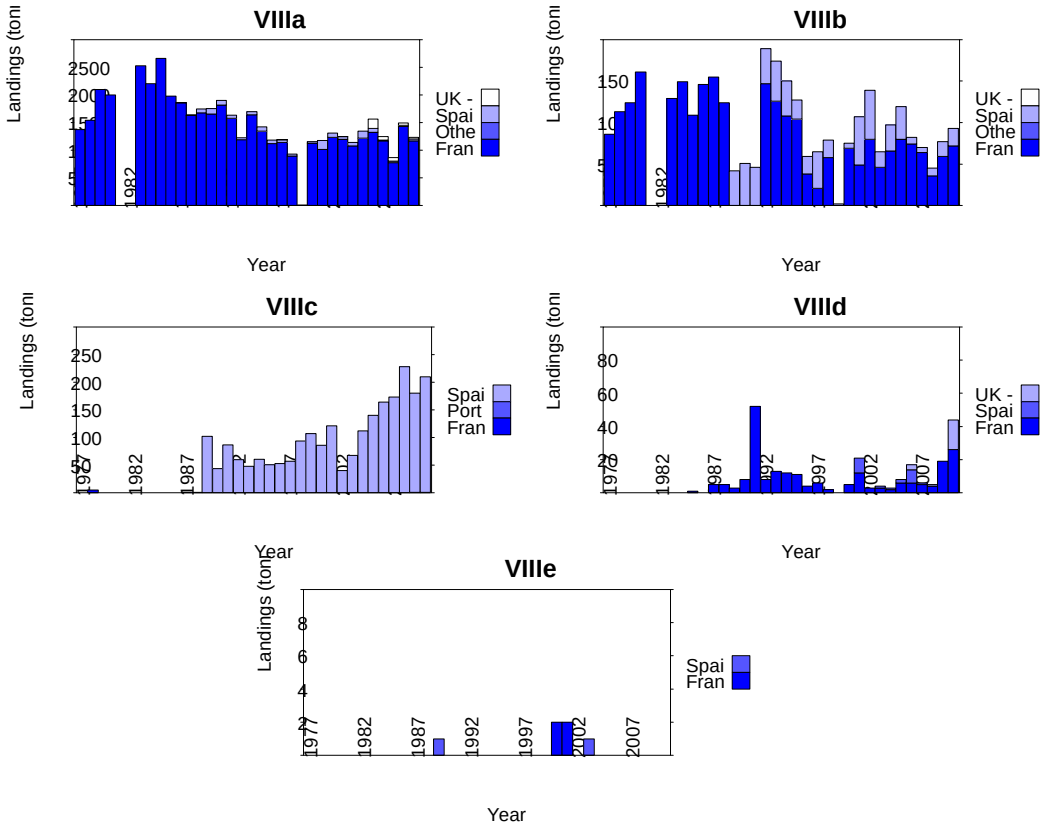

Figure 12.3. Pollack. Landings by country in subdivision VIIIa-e. As officially reported to ICES.

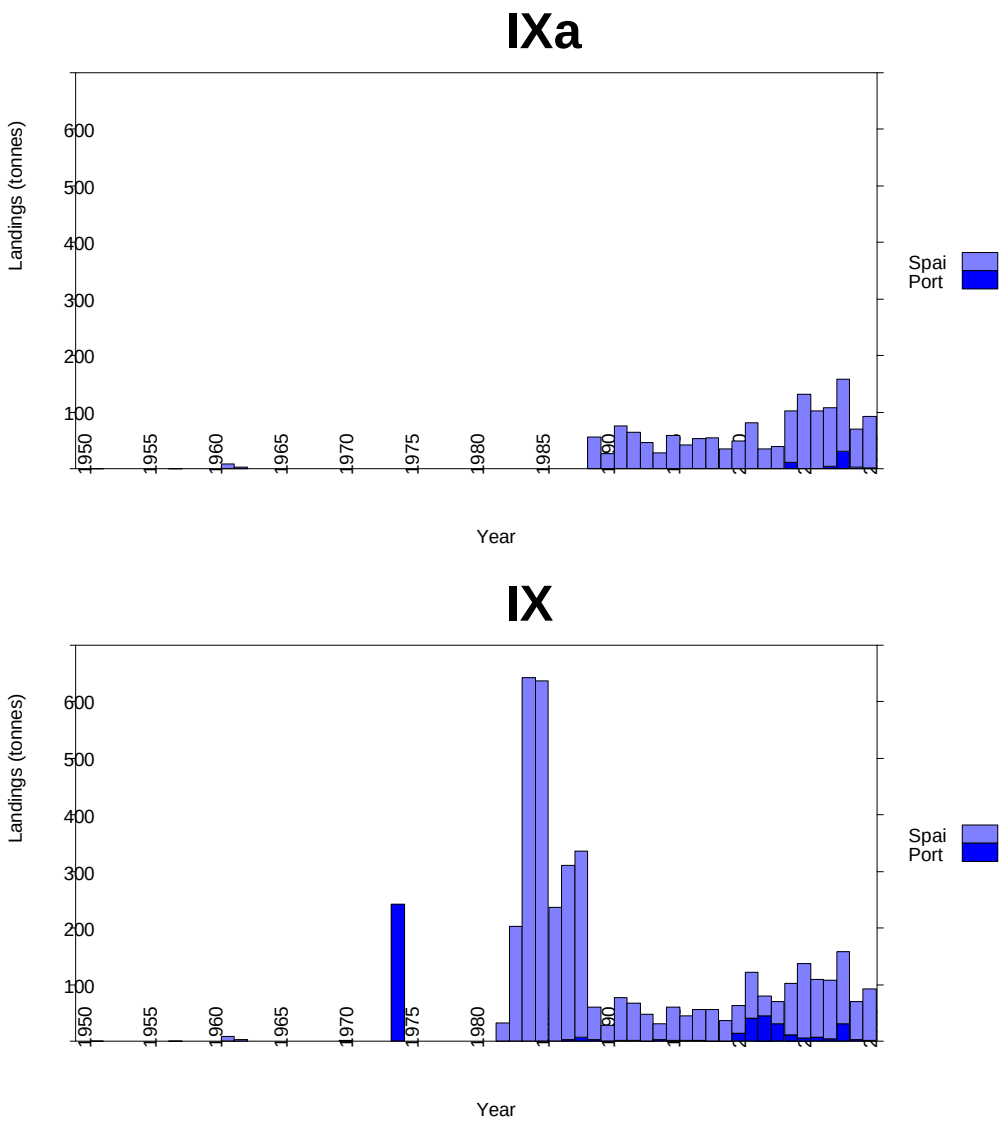

Figure 12.4. Pollack. Landings by country in division IXa and subarea IX. Subarea IX includes landings assigned to the IXa and unspecified landings in IX, assumed to be from IXa. As officially reported to ICES.

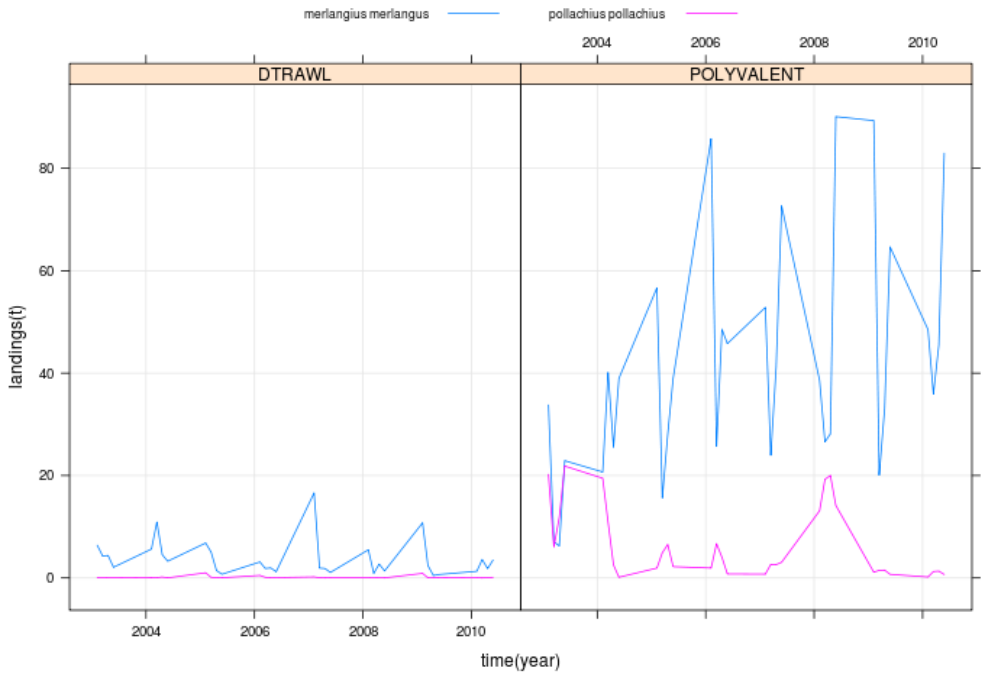

Figure. 12.5. Pollack. Portuguese official landings for pollack and whitting by gear (from Jardim *et al.*, 2011).

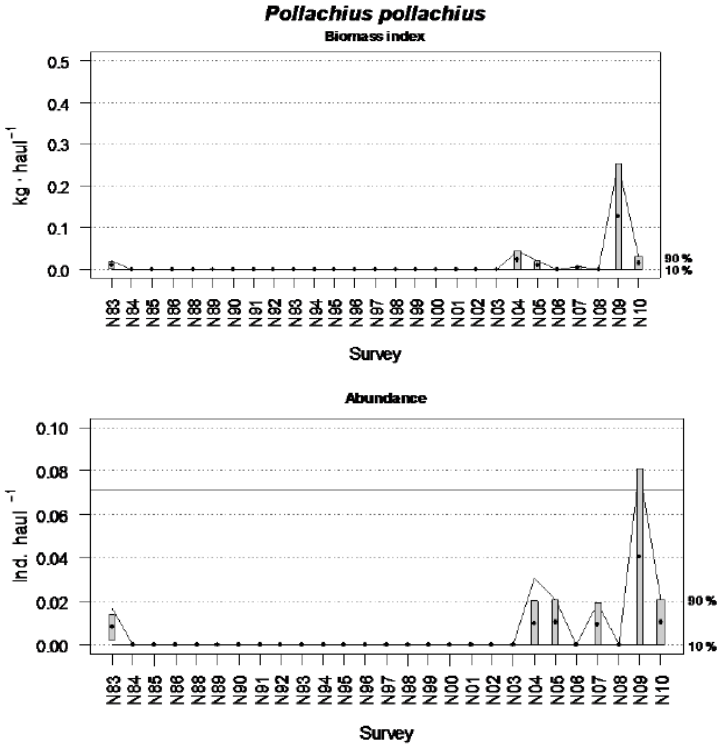

Figure 12.6. Pollack. Biomass and abundance indices of pollack from the time series of SP-GFS, 1983–2010 (no survey in 1987) (from Rodriguez *et al.*, 2011)

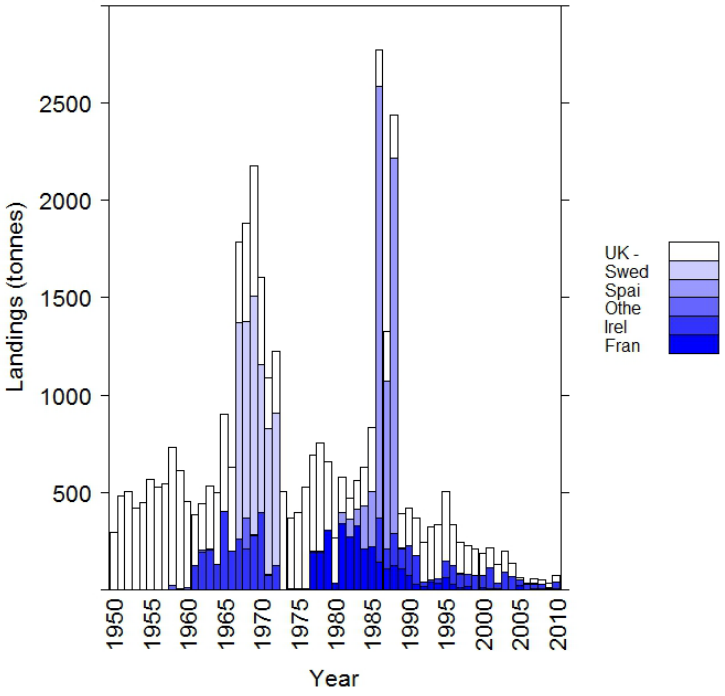

Figure 12.7. Pollack. Official international landings of pollack *Pollachius pollachius* by country in Subarea VI (source: ICES Fishstat).

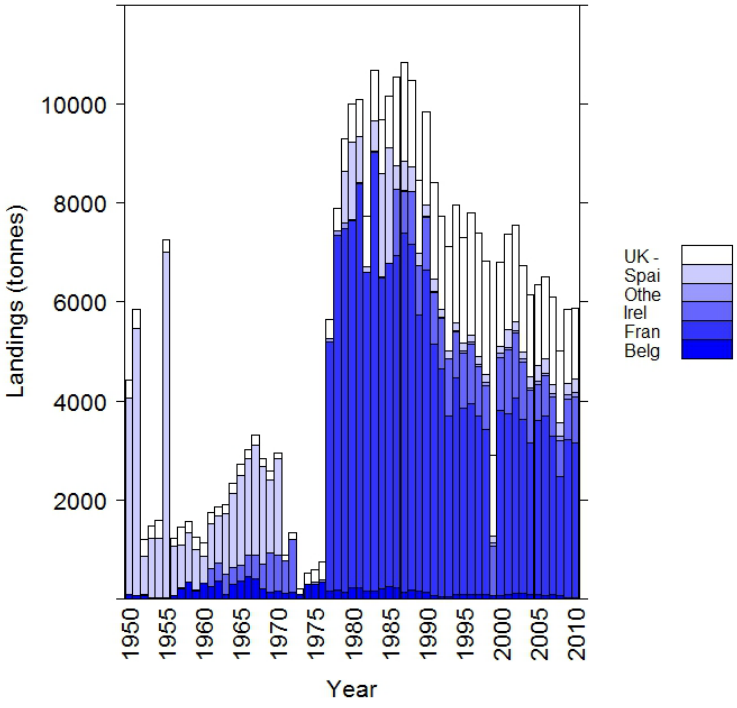

Figure 12.8. Official international landings of pollack *Pollachius pollachius* by country in Subarea VII (source: ICES Fishstat).

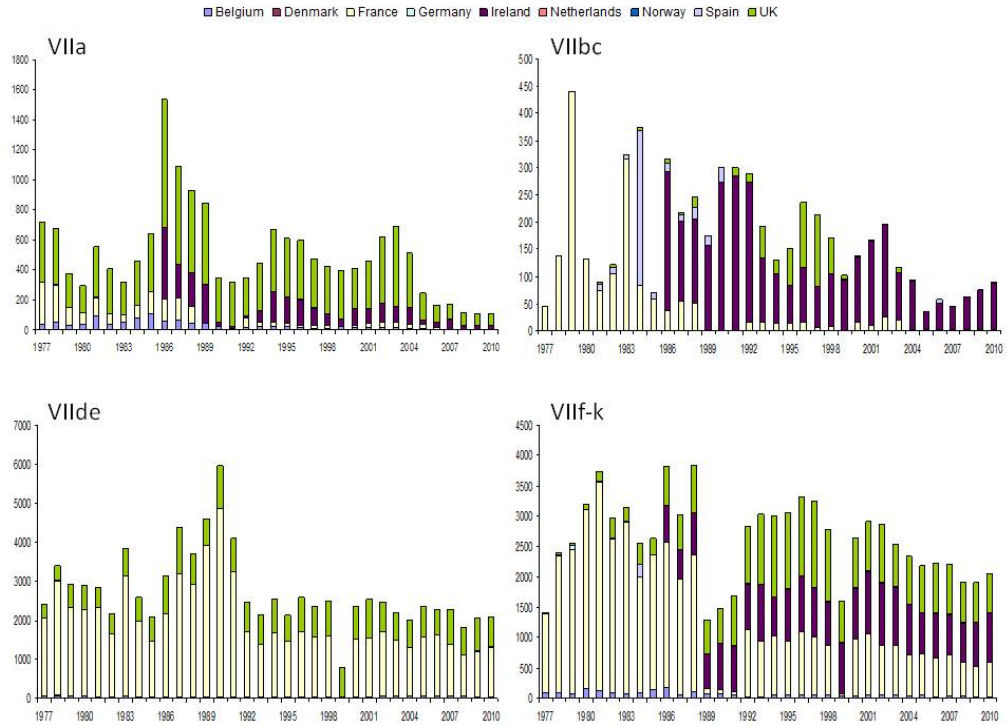

Figure 12.9. Official landings of pollack *Pollachius pollachius* by country in Divisions VIIa, VIIde, VIIbc and VIIf-k (source: ICES Fishstat).

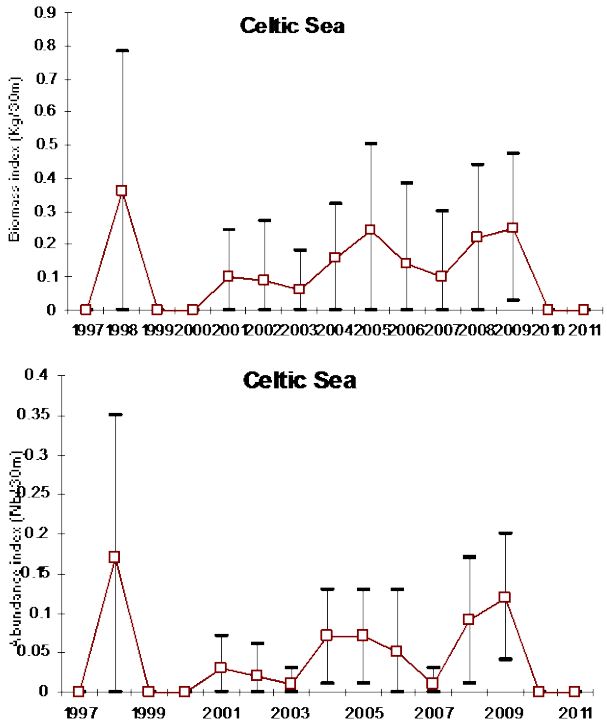

Figure 12.10. Biomass (kg/30 min) and abundance (number/30 min) indices of pollack in the Celtic Sea (EVHOE-WIBTS-Q4).

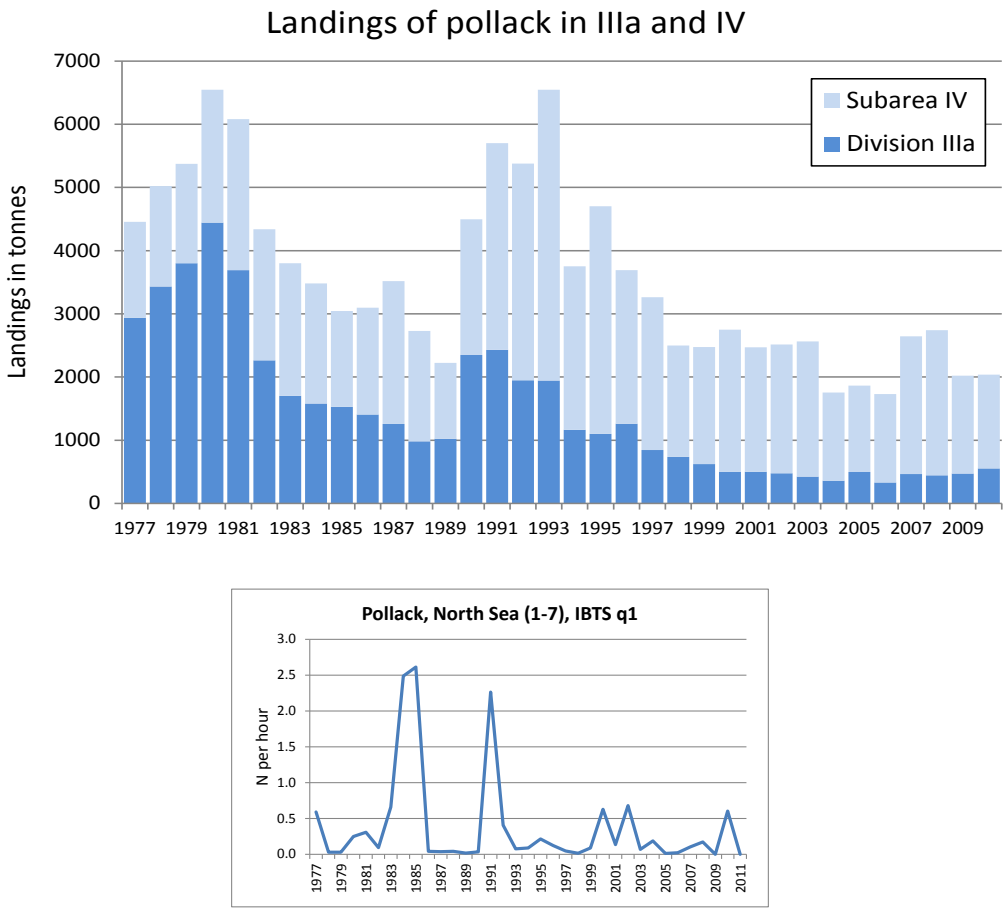

Figure 12.11. Pollack. Total landings of pollack in Division IIIa and Subarea IV as officially reported to ICES.

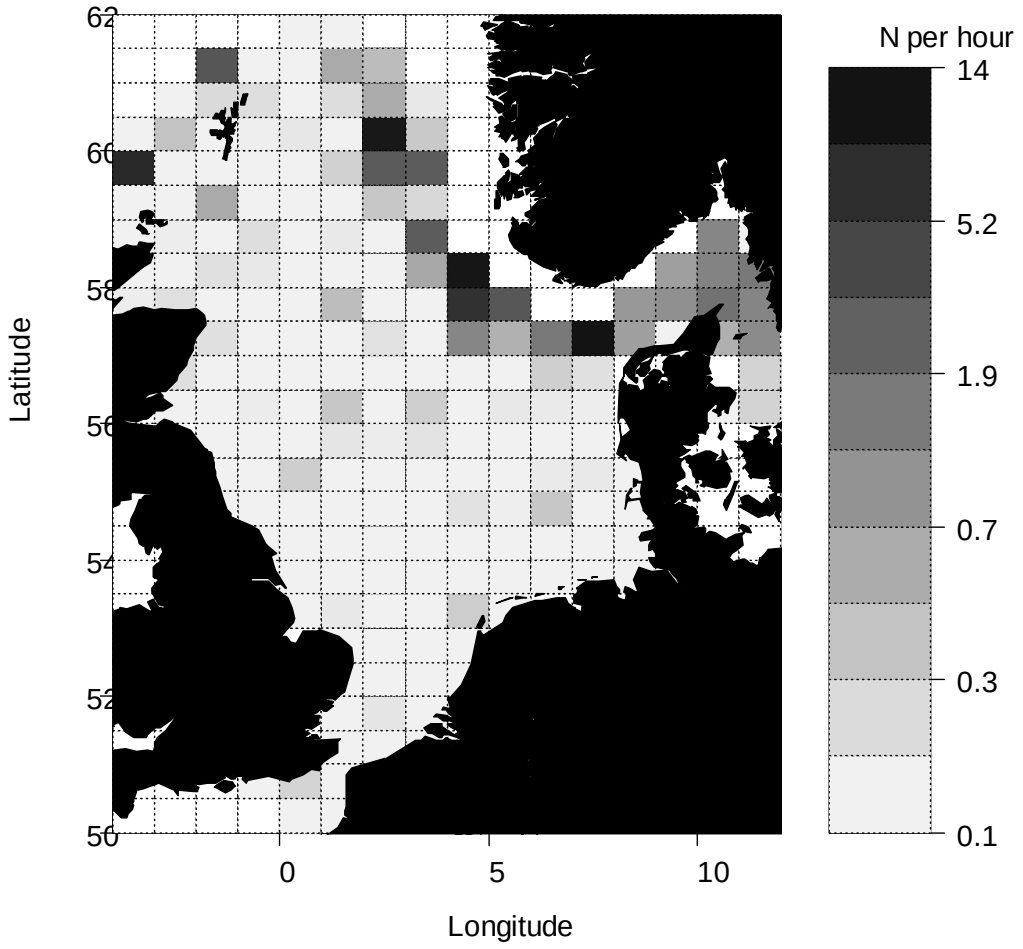

Figure 12.12. Pollack. Distribution of pollack in the North Sea. Abundance shown as N per hour caught in the GOV-trawl, based on all data available in Datras for quarter 1.

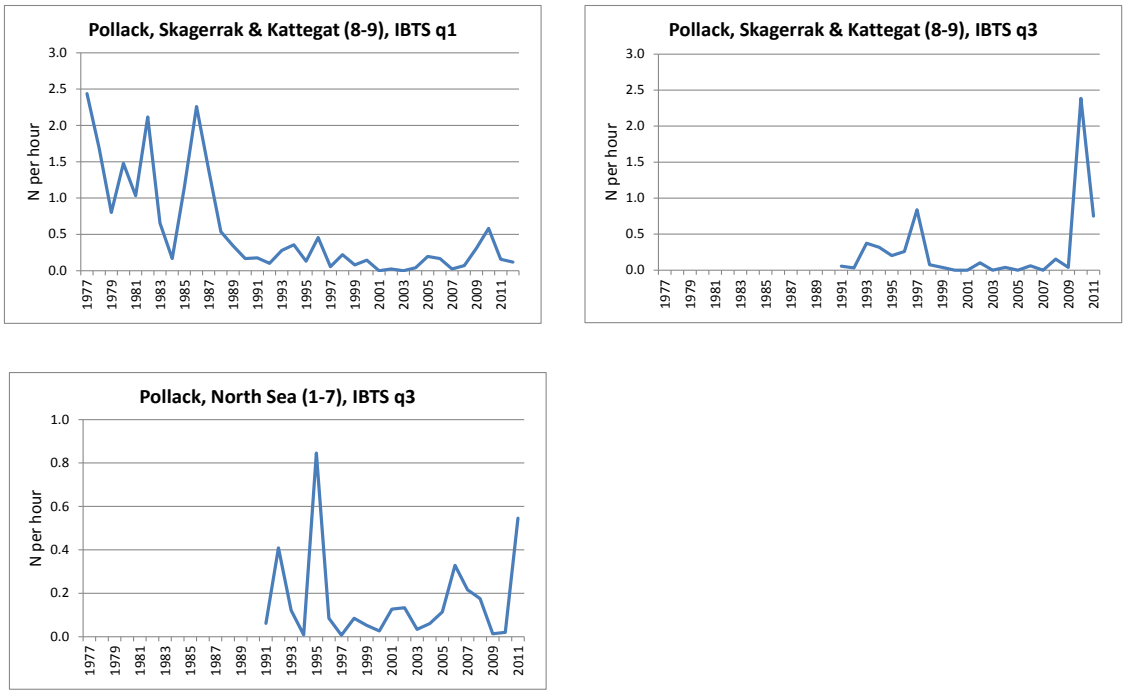

Figure 12.13. Pollack. Time series of abundance of pollack in the IBTS survey in the North Sea (roundfish areas 1–7) and in Skagerrak/Kattegat (roundfish areas 8 and 9), shown as N caught per hour with the GOV-traw

l. Data from Datras.

Annex 1 – List of participants

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Annex 2 –Working documents

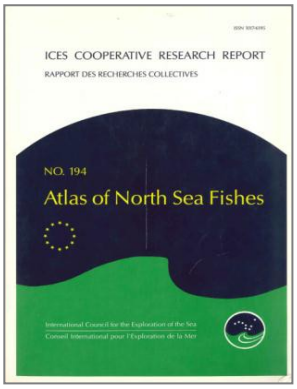
WD 1 Atlas of the marine fishes of the northern European shelf

based on 60 000 hauls made during research vessel surveys

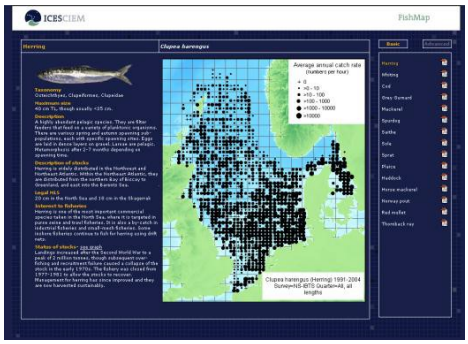
Henk Heessen (IMARES, IJmuiden, NL), Jim Ellis (CEFAS, Lowestoft, UK) and Niels Daan (Dreumel, NL)

History

In 1993, an Atlas of North Sea Fishes was published in a co-operative effort by IMARES (IJmuiden), CEFAS (Lowestoft) and the Marine Laboratory (Aberdeen), based on IBTS data for 1985–1987. Distribution maps were presented for 97 species for summer and winter, and where feasible, for juveniles and adults separately.



Atlas 1: ICES CRR 194



Atlas 2: ICES FishMap website

In 2005 an interactive atlas was launched on the ICES webpage resulting from a cooperative effort between IMARES, CEFAS and the ICES secretariat, funded by the EU (Specific Support Action, contract nr. 513661). Based on North Sea IBTS (GOV-trawl) and BTS (8m beam trawl), the user could make their own distribution maps for 15 species, by selecting years, quarters, age- and size-groups. In addition, the website provided general information on surveys, the North Sea ecosystem and the fish fauna. For each species a pdf could be downloaded with detailed biological information. Unfortunately, the mapping facility is no longer supported, but the detailed information is still available at http://www.ices.dk/marineworld/ices-fishmap.asp

Work in Progress

Atlas 3: Atlas of the northern European shelf

Although ICES-FishMap was meant to be the first phase of a much bigger project (covering a broader area and a larger number of species), no further funding was received, and the current authors decided to proceed nevertheless with limited resources by our institutes, and partly in our own time.

Since 1993, lots of data have become available and electronic exchange has become much easier, particularly through the ICES survey database DATRAS. Thanks to DATRAS and the cooperation of many colleagues, we have been able to assemble data over a large area of the northern European shelf running from the Porcupine Bank to the Baltic, and from Brittany to Shetland. The data span a period from 1977 to 2010/2011 and include close to 60,000 hauls.

Surveys included are: IBTS, BITS, BTS, the Norwegian Pandalus Surveys, the French Groundfish Survey, the Spanish Porcupine Bank survey, the Scottish Rockall Survey, etc .

We have analysed data for all species found on the shelf, down to a depth of 200 m, but in order to cover more of their distribution we have included information for hauls in deeper water.

For some 200 species, the distribution maps (cpue for commonly encountered species; presence- absence for rarer species) reveal fascinating patterns (see examples below). Apart from the geographical distribution of these species we will provide graphs for the distribution by depth-zone, length-frequency distributions and time series of abundance. If relevant this information will also be provided by either eco-region (Celtic Sea, North Sea, Baltic Sea) and/or winter and summer. Examples of the out-puts of our analyses are given for four species of interest to WGNEW in the second part of this WD.

Each species account will provide details on:

Family name; Scientific name; English name

Lmax; Depth range

Names in: French, German, Dutch, Norwegian, Spanish

Photo (life, dead, or drawing)

Distribution map

General

Taxonomy and identification (incl. recent synonyms) Biogeographical distribution

Trawl survey data

Spatial distribution in the Atlas area

Bathymetyric distribution

Size distribution

Time series of relative abundance

Biology

Habitat

Larval distribution Nursery areas Spawning areas

Movements and migration (incl. typical behaviour)

Reproduction

Age and growth (incl. growth curves, longevity) Age/length at maturity (ogives)

Fecundity (and egg stages)

Spawning behaviour, season

Other biological characteristics

Diet

Diseases/parasites

Stock structure

Exploitation

References (per family).

In a number of introductory chapters, background information will be provided on the marine environment, factors influencing the distribution of fishes, fish communities and assemblages, the different research vessel surveys and their methods.

The Atlas will be written for "intelligent laymen": policy makers, sea-anglers, fishermen, fishery scientists, marine managers, environmental consultants, NGO's. Our aim is to create a natural history book as well as an atlas. The Atlas will be published in The Netherlands by a combination of 2 publishers (full colour, A4 format, hardback, ± 500 pages, and also as an e-book). Publication is scheduled for the end of 2013/early 2014. We will soon approach several colleagues with a request to contribute text for a number of accounts. All authors will be clearly name in the Atlas.

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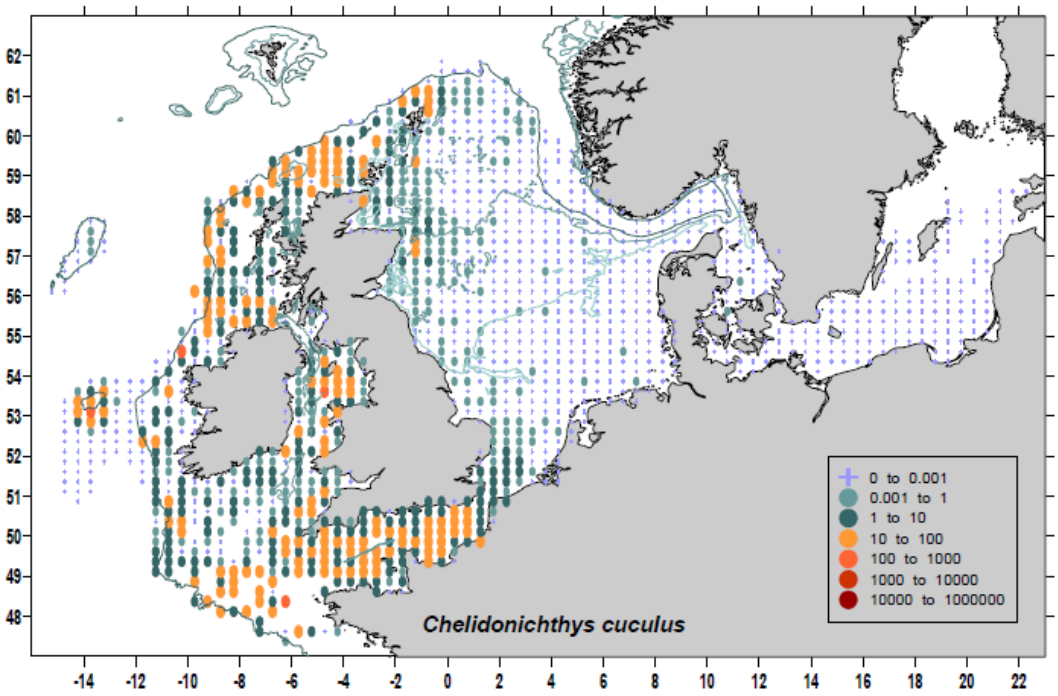
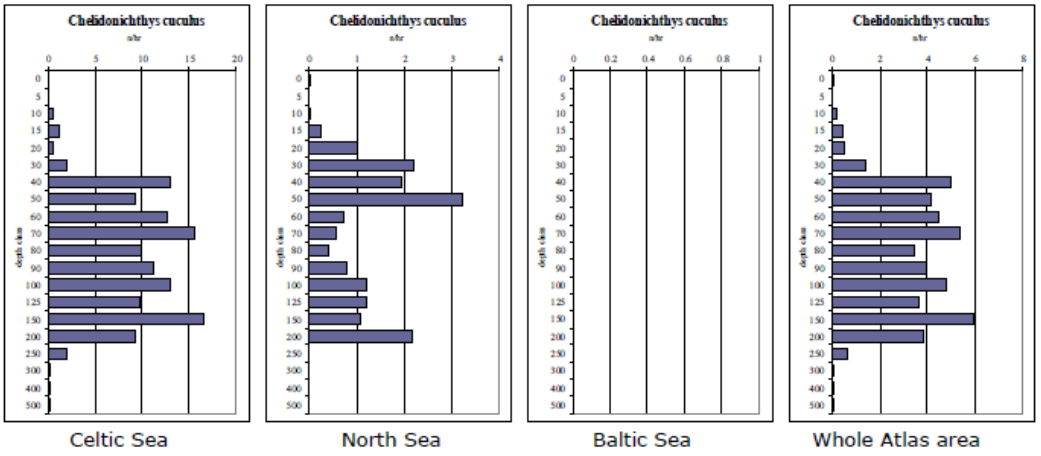
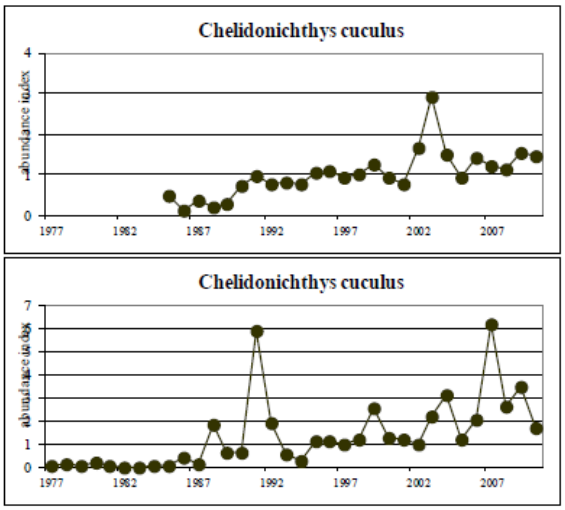
Aspitrigla (Chelidonichthys) cuculus, red gurnard, Scorpaeniformes

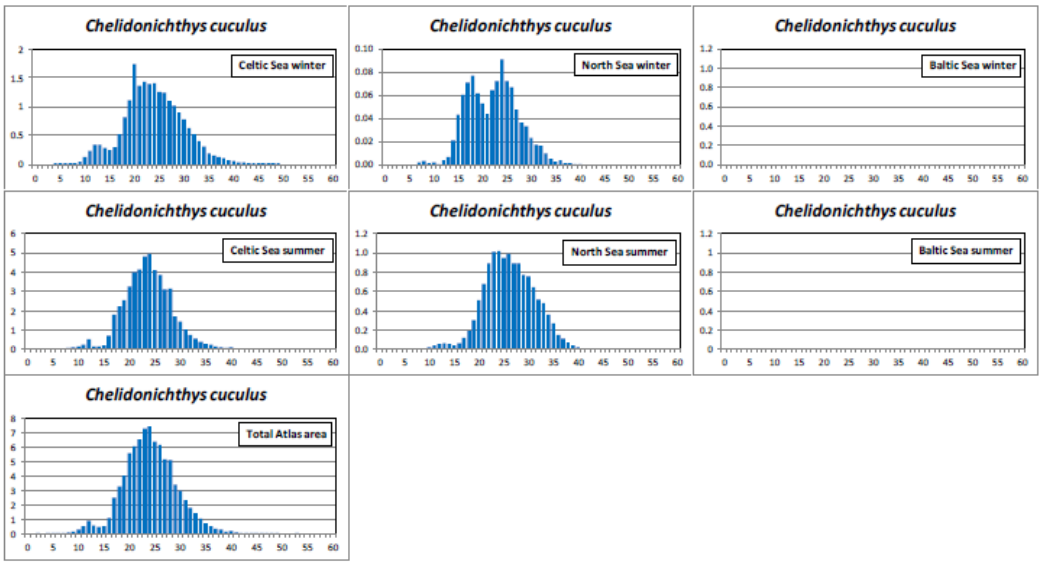




Bathymetric distribution

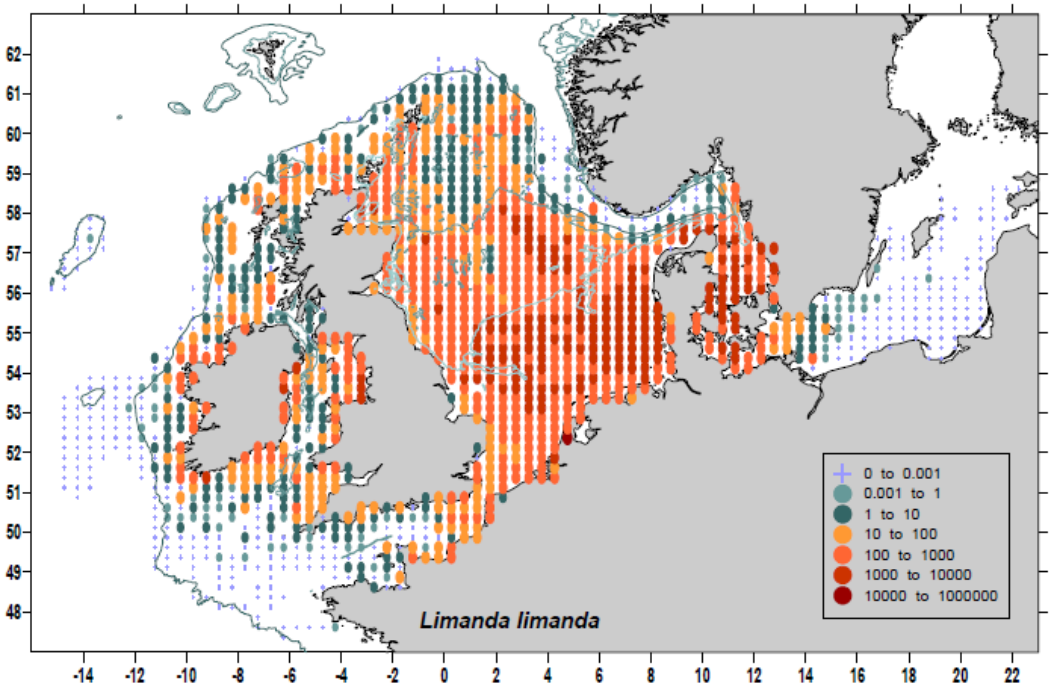


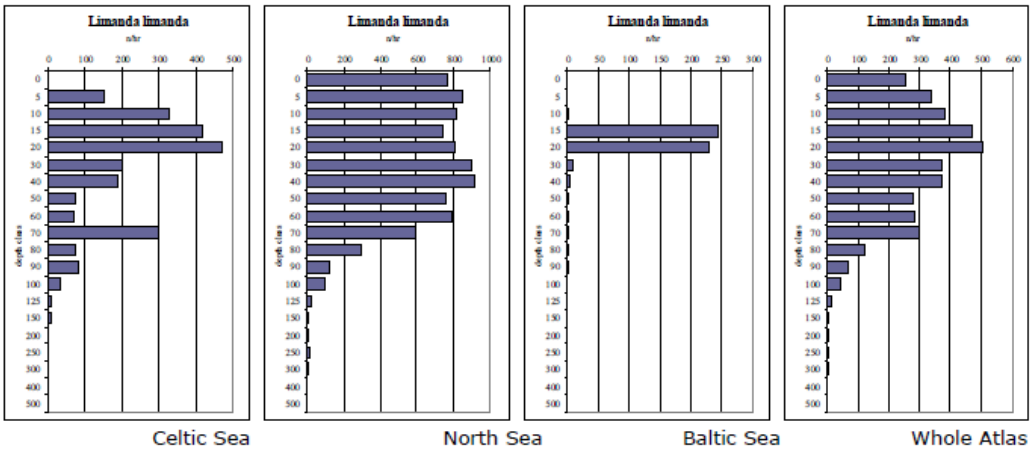
Time series of index of abundance for Celtic Sea (top) and North Sea



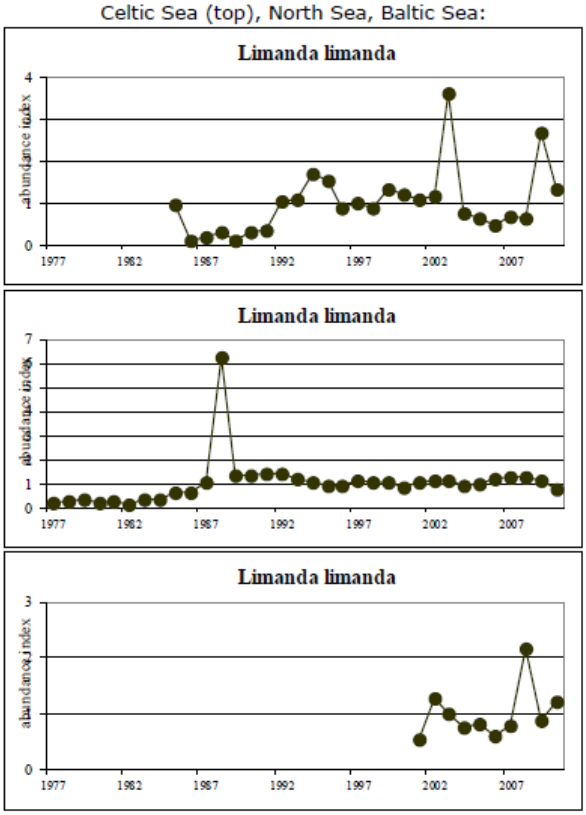
Length frequency distributions

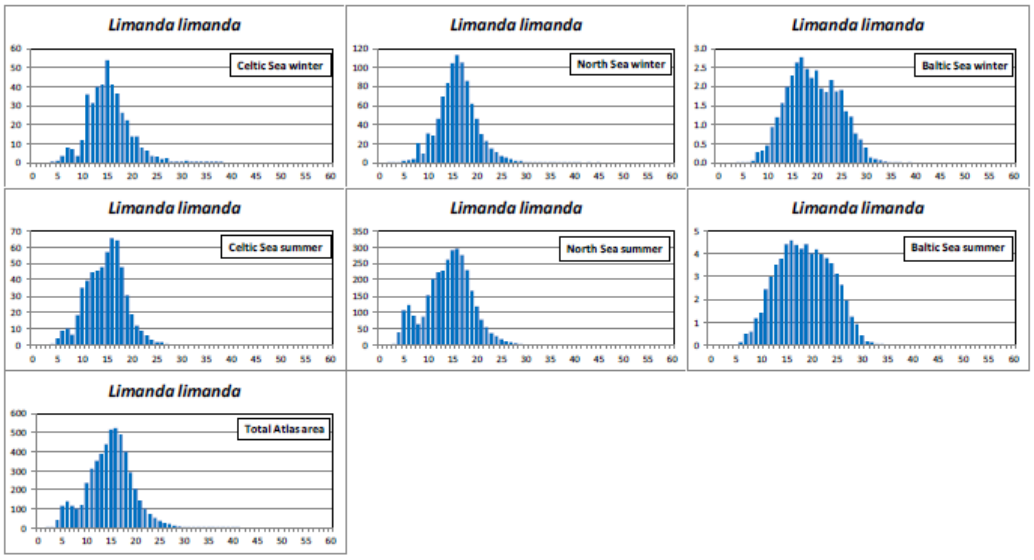
Limanda limanda, dab, Pleuronectiformes



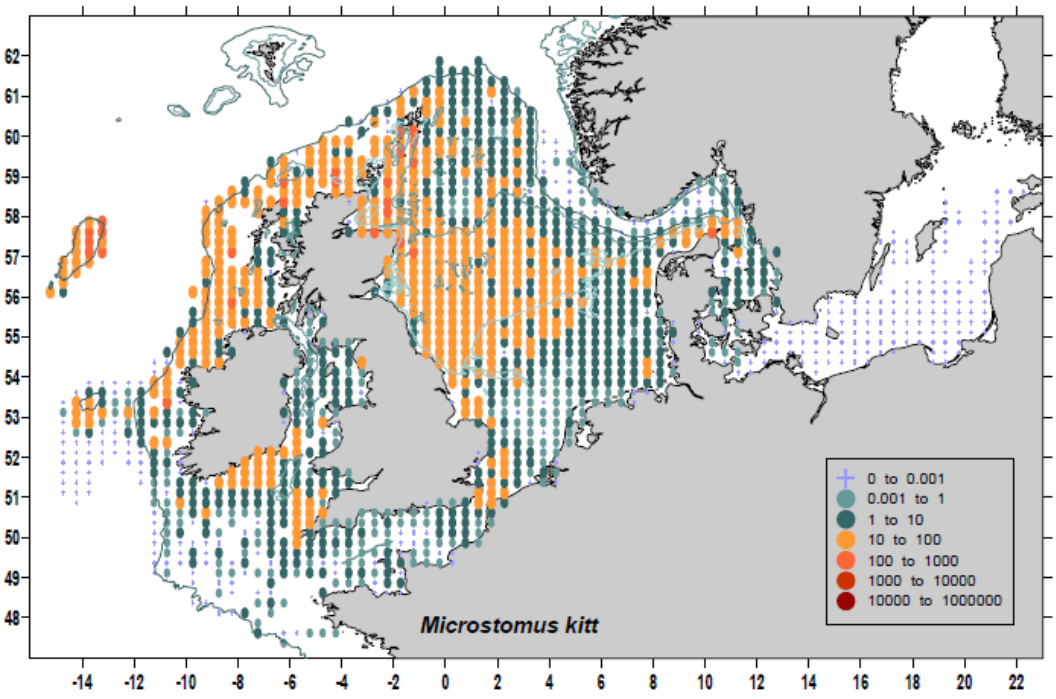


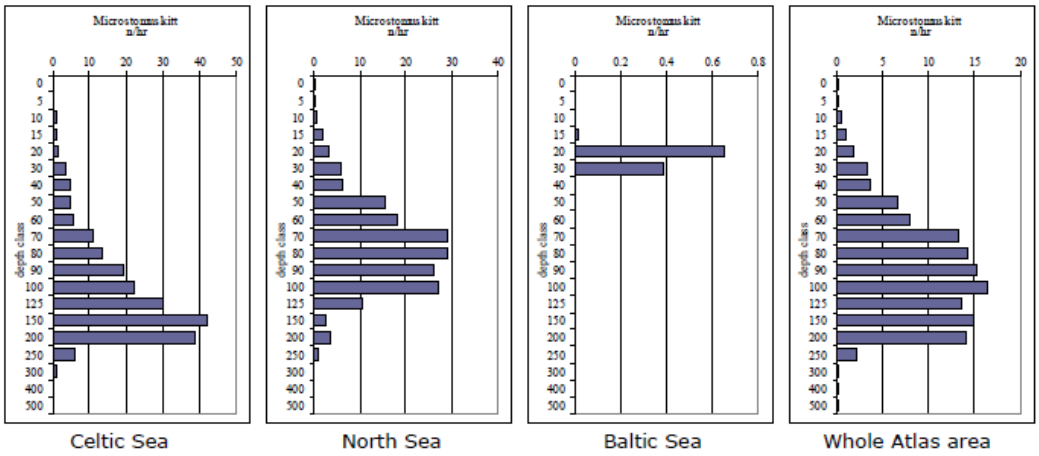
Celtic Sea (top), North Sea, Baltic Sea:



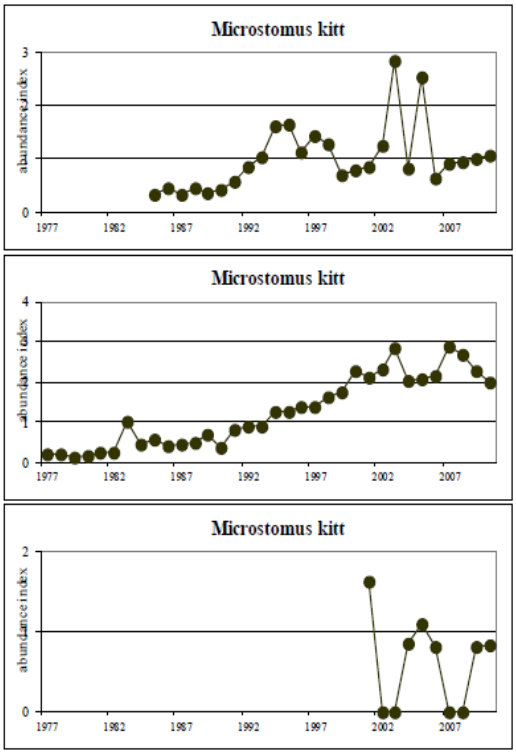


Microstomus kitt, lemon sole, Pleuronectiformes

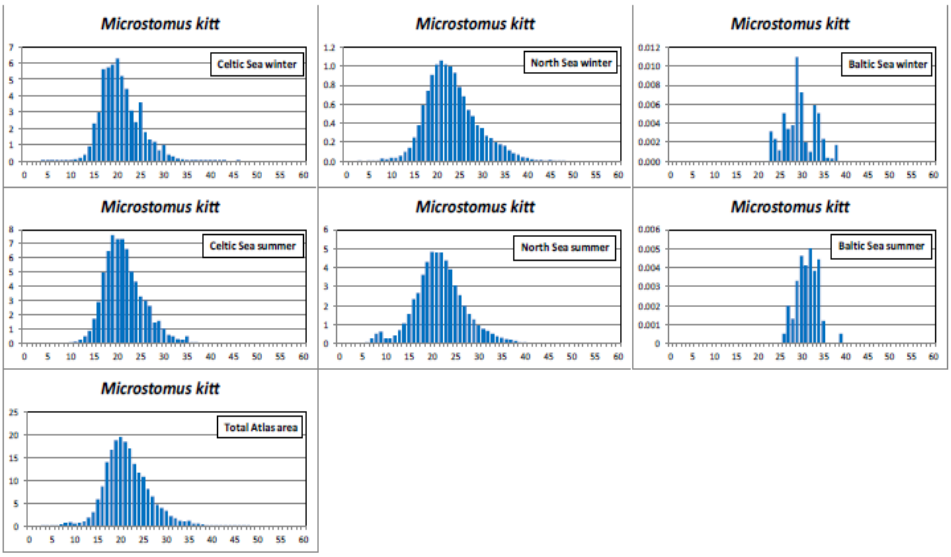




Bathymetric distribution

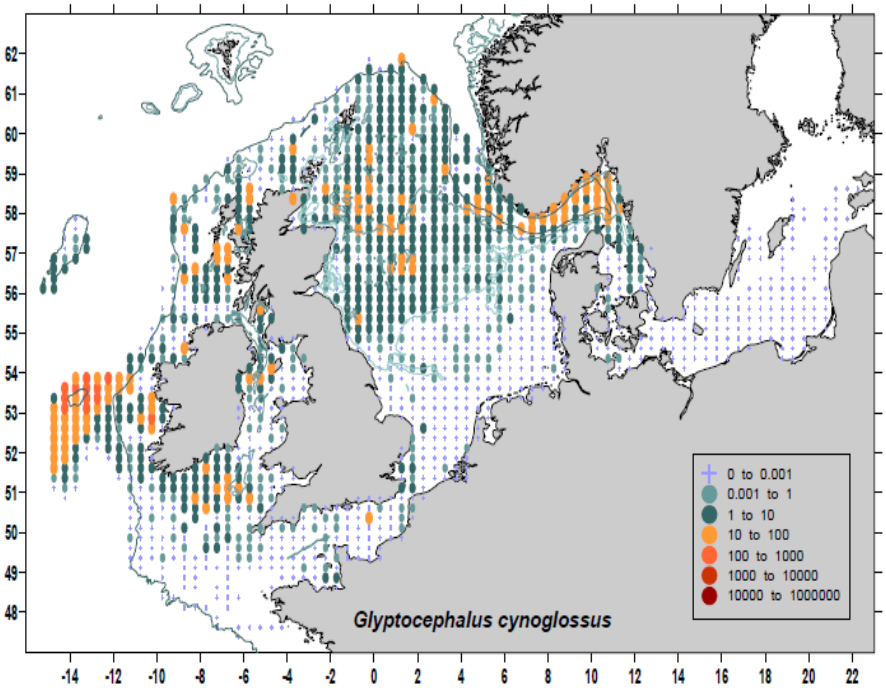


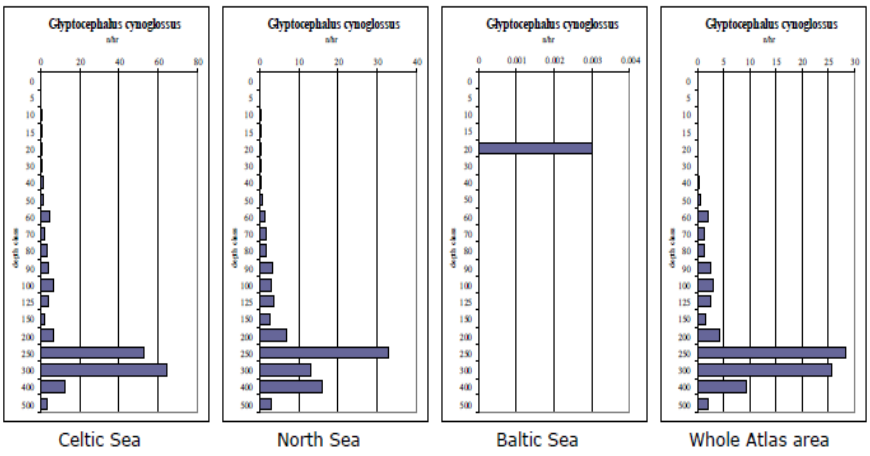
Time series of index of abundance for Celtic Sea (top), North Sea and Baltic Sea



Length frequency distributions

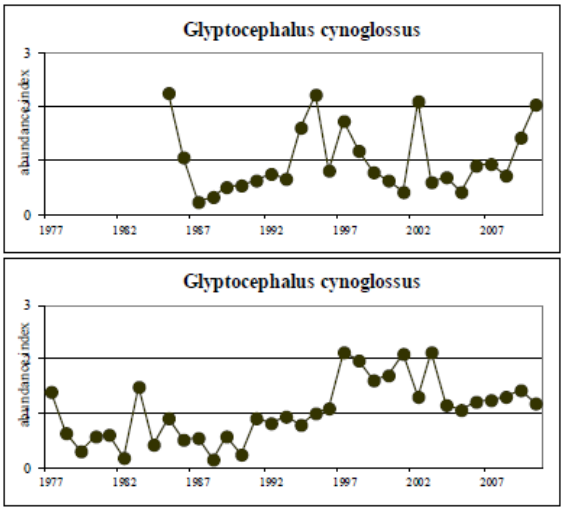
Glyptocephalus cynoglossus, witch, Pleuronectiformes



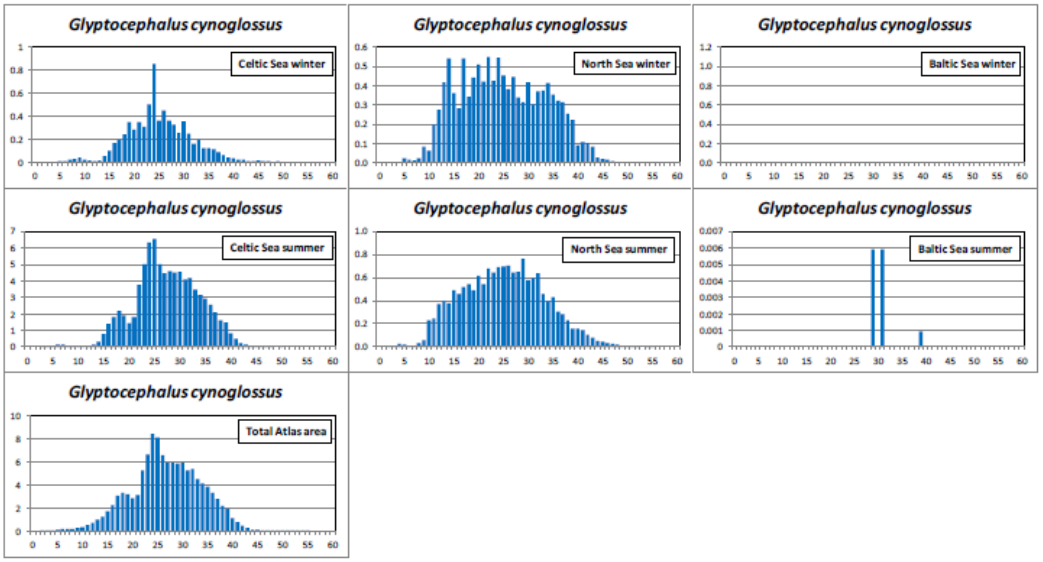


Celtic Sea | North Sea | Baltic Sea | Whole Atlas area

Bathymetric distribution



Time series of index of abundance for Celtic Sea (top) and North Sea



Length frequency distributions

WD2 Portuguese discard data on WGNEW 2012 species

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Abstract

We compile the information available on the discards of a set of species (European seabass, Dicentrarchus labrax; grey gurnard, Eutrigla gurnardus; red gurnard, Chelidonichthys cuculus; tub gurnard, Chelidonichthys lucerna; John dory, Zeus faber; striped red mullet, Mullus surmuletus; plaice, Pleuronectes platessa; pollack, Pollachius pollachius; sole, Solea solea; whiting, Merlangius merlangus) produced by Portuguese vessels operating with bottom otter trawl fleet (OTB) in the Portuguese reaches of ICES Division IXa. The data was collected by the Portuguese on-board sampling programme (EU DCR/NP) between 2004 and 2011. A description of the on-board sampling programme and details on the estimation algorithms and data quality assurance procedures are presented. Results on species' annual frequency of occurrence, total discard estimates and length composition are provided for two fisheries: the crustacean fishery (OTB_CRU) and the demersal fish fishery (OTB_DEF). Discards of European seabass, plaice, pollack, sole and whiting are null or negligible. The low frequency of occurrence of striped red mullet, grey gurnard, red gurnard, tub gurnard and John dory in discard samples ruled out estimates at fleet level. Preliminary information on discards of other Portuguese _eets operating in this geographical area is also provided.

Introduction

This working document compiles the information available on the discards of European seabass (Dicentrarchus labrax), grey gurnard (Eutrigla gurnardus), red gurnard (Chelidonichthys cuculus), tub gurnard (Chelidonichthys lucerna), John dory (Zeus faber), striped red mullet (Mullus surmuletus), plaice (Pleuronectes platessa), Pollack (Pollachius pollachius), sole (Solea solea), whiting (Merlangius merlangus) produced by the Portuguese bottom otter trawl fleet (OTB) operating in the Portuguese reaches of ICES Division IXa. The data was collected by the Portuguese onboard sampling programme (EU DCR/NP) between 2004 and 2011. The document starts with a description of the on-board sampling programme and details of the estimation algorithms and data quality assurance procedures (Section 2). Then, results on species' annual frequency of occurrence in discards, total discard estimates and length composition of discards are presented (Section 3). Finally, preliminary information on discards produced by other Portuguese fleets that operate in this geographical area is provided (Section 4).

On-board sampling and data analysis

The Portuguese on-board sampling program, included in the EU DCR/NP, is based on a quasi-random sampling of cooperative commercial vessels between 12 and 40 meters. The programme started in late 2003 and involves on-board sampling of several fishing métiers. These include, amongst other, bottom otter trawl, deep-water set longlines, gill and trammel nets (of various mesh sizes) and purse seines. From these, the bottom otter trawl fleet (OTB) constitutes the most comprehensively sampled fleet

(but see Section 4). For sampling purposes, the bottom otter trawl fleet is split into two different components: a crustacean fishery (OTB_CRU) that operates cod-end mesh sizes 55–59mm and >70mm and a demersal fish fishery (OTB_DEF) that operates cod-end mesh size 65–69mm. A detailed account of vessel characteristics in these components is found in Castro *et al.* (2007).

Trip selection

The EU DCR/NP (CR (EC) 199/2008; CD 2010/93/EU) establishes fishing trip as the sampling unit to be used by at-sea discard sampling programmes. The Portuguese onboard sampling programme targeting the bottom otter trawl fleet is based on a quasi-random sampling of trips from a set of cooperative vessels known to operate in each fishery. Annual sampling targets are _xed for each _shery, namely 12 trips in the OTB_CRU fishery and 27 trips in the OTB_DEF _shery. Sampling levels attained in the 2004–2011 period are presented in Table 1. In most years sampling attained or surpassed the annual sampling targets in both fisheries. The procedures used to collect data onboard and raise discard data from samples to annual _eet discards produced by each fishery have been previously described in Fernandes *et al.* (2010) and Prista *et al.* (2011), amongst other. A brief account follows.

Table 1: Discard sampling levels of the Portuguese on-board sampling programme per fishery (2004-2011).

	Sampling levels					
	Trips		Hauls		Hours fished	
Year	OTB_CRU	OTB_DEF	OTB_CRU	OTB_DEF	OTB_CRU	OTB_DEF
2004	17	24	111	125	479	315
2005	15	39	74	159	372	349
2006	7	42	30	194	133	376
2007	12	38	73	162	260	287
2008	12	34	66	128	267	250
2009	16	38	84	135	299	264
2010	16	31	103	116	372	192
2011	13	30	56	83	217	161

Catch sampling

The sampling protocols used in Portuguese onboard sampling of the OTB _sheries are detailed in Prista *et al.* (2011). Briefly, two observers are deployed in each trip and on each selected haul they take a sample from catch, sort the specimens into retained and discarded fraction and register the weight and length composition of each species fraction. Concurrently, observers also collect _shing e_ort information (hours fished) and register environmental information (GPS coordinates, depth, bottom type, etc.). The sampling protocol suffered only minor changes and adaptations between 2004 and 2010. In 2011 the size of samples was increased from 1 to 2 boxes (of catch) and the number of hauls sampled in each trip was standartized to "at least, every other haul".

Estimates of discards (haul level)

Total volume discarded (in kg) in each haul is estimated by multiplying the ratio of discard and retained sample weights (all species combined) by the total retained weight in the haul (all species combined). The volume of discards for each species in the sample (e.g., sole) is calculated a posteriori based on the proportion of discarded species in the sample and the total catch estimate calculated for each haul.

Estimates of discards (fleet level)

The procedure generally used to raise discards from haul to fleet level in the Portuguese trawl fisheries is adapted from Fernandes *et al.* (2010) (Jardim and Fernandes, in prep.). Using this procedure, species with low frequency of ocurrence or abundance in discards (i.e., a large number of 0s in the dataset) cannot be reliably estimated at fleet level (Jardim *et al.*, 2011). The frequency of occurrence and abundance of WGNEW 2012 species in the discards of the Portuguese bottom trawl _eet was below the 30% (see Section 3.1., 3.2). Consequently, annual discard volumes and length frequencies at fleet level were not estimated.

Quality assurance procedures

The Portuguese onboard database is programmed in Oracle and contains internal routines for the detection of basic errors (e.g., errors in dates). The database contains general trip information (vessel information, date, location, haul number, retained weight by species), along with sample information by fraction (retained, discarded) and species, namely weight, number of specimens and length composition. Quality checks involving the manual checking of (at least) 10% of annual trawl records have been routinely carried out since the beginning of the onboard sampling programme. In 2010–2011 a semi-automated R quality assurance procedure was designed and the entire trawl database was checked for additional undetected errors. Minor updates and data reviews have been performed since then. The data used in the current estimates was extracted from the database in 29/02/2012.

Species discards

Frequency of occurrence

The annual frequency of occurrence ofWGNEW 2012 species discards in the sampled hauls was low ranging between 0% and 4% in OTB_CRU and between 0% and 23% in OTB_DEF. European seabass, plaice and pollack were never recorded. Whiting, sole and striped red mullet were also very rare in samples. Complete data on the frequency of occurrence of these species in discards are displayed in Table 2 and Table 3.

Table 2: Frequency of occurrence (%) of species in the discards of hauls sampled in the OTB_CRU fishery (2004-2011). BSS = European seabass; GUG = grey gurnard; GUR = red gurnard; GUU = tub gurnard; JOD = John dory; MUR = striped red mullet; PLE = plaice; POL = pollack; SOL = sole; WHG = whiting; "–" = no occurrence

Year	BSS	GUG	GUR	GUU	JOD	MUR	PLE	POL	SOL	WHG
2004	–	–	–	–	–	–	–	–	–	–
2005	–	–	–	–	–	–	–	–	–	–
2006	–	–	–	3	–	–	–	–	–	–
2007	–	–	–	–	–	–	–	–	–	–
2008	–	–	–	–	–	–	–	–	–	–
2009	–	–	–	–	–	–	–	–	–	–
2010	–	–	–	–	–	4	–	–	–	–
2011	–	–	–	–	2	4	–	–	–	–

Table 3: Frequency of occurrence (%) of species in the discards of hauls sampled in the OTB_DEF fishery (2004-2011). BSS = European seabass; GUG = grey gurnard; GUR = red gurnard; GUU = tub gurnard; JOD = John dory; MUR = striped red mullet; PLE = plaice; POL = pollack; SOL = sole; WHG = whiting; "–" = no occurrence

Year	BSS	GUG	GUR	GUU	JOD	MUR	PLE	POL	SOL	WHG
2004	–	–	23	2	10	–	–	–	–	–
2005	–	1	12	1	8	–	–	–	1	–
2006	–	–	5	6	2	–	–	–	–	–
2007	–	1	2	2	–	1	–	–	–	1
2008	–	2	8	7	6	–	–	–	–	–
2009	–	3	5	2	8	–	–	–	–	–
2010	–	1	5	3	5	1	–	–	–	–
2011	–	–	8	7	8	1	–	–	–	–

Total volume of discards

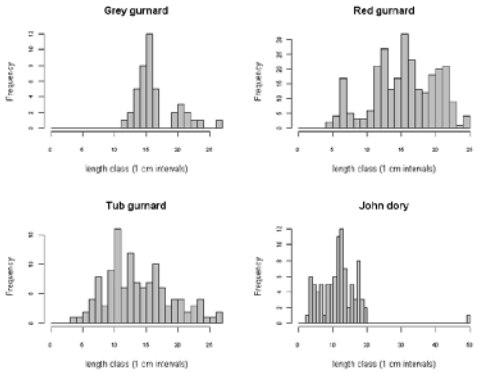
To accurately estimate the discard volume of rare species (i.e., species with low abundance and low frequency of occurrence in the sampled hauls) a large number of observations are generally required. European seabass, plaice, pollack were never recorded in discard samples (Table 2and 3) so their discard volume may be assumed negligible. Whiting, sole and striped red mullet were also rare in the discard samples and when present were found in low numbers and weight. In fact, in the more than 1500 hauls sampled in 2004–2011 period (> 20 tonnes total sample weight; > 10 tonnes total discard sample weight), only n=1 whitings (total weight: 0.04 kg), n=3 soles (total weight: 0.12 kg) and n=11 red mullets (total weight: 1.6 kg) were sampled in trawl discards. In what concerns grey gurnard, red gurnard, tub gurnard and John dory these species were present in slightly larger numbers (2004–2011 total: 43–271 specimens) but were also below 30% occurrence in the sampled hauls. Because the current estimation algorithm is thought sensitive to the large number of 0s in the dataset (Jardim *et al.*, 2011), discard estimates obtained in these species were considered unreliable and are not presented (trial runs of the algorithm provided fishery level CVs ranging 46–90% in striped red mullet, 50–119% in grey gurnard, 18–60% in red gurnard, 35–92% in tub gurnard, and 48–73% in John dory).

Length composition of discards

European seabass, plaice, pollack were never recorded in discard samples. Length data on whiting, sole and striped red mullet discards is given in Annex. In what concerns striped red mullet (the most abundant of the latter species), average length of discarded fish was 17.0 cm (SD = 3.9 cm, n=4) in OTB_DEF and 23.1 cm (SD = 3.0 cm, n=7) in OTB_CRU. The length frequencies of grey gurnard, red gurnard, tub gurnard and John dory in the discards sampled from the OTB_DEF _shery are given in Figure 1). In the OTB_DEF fishery, the average length of grey gurnard was 16.9 cm (SD = 3.3 cm, n=43), the average length of red gurnard was 15.8 cm (SD = 4.7 cm, n=271), the average length of tub gurnard was 14.4 cm (SD = 5.2 cm, n=124) and the average

length of John dory was 12.2 (SD = 6.0 cm, n=92). In the OTB_CRU _shery, no grey gurnards or red gurnards were ever recorded and only one tub gurnard and three John dory were measured (average total length: 22 cm and 14 cm, respectively; complete data in annex). Given the low sample size and the uncertainty in total discard estimates at annual level (section 3.2) estimates of length composition of discards at fleet level were not computed.

Figure 1: Length frequencies (in number) of grey gurnard, red gurnard, tub gurnard and John dory specimens sampled in the discards of the OTB_DEF fishery (2004-2011).



Discards from other fleets

The Portuguese on-board sampling program also includes the regular sampling of other fisheries that may target (or may potentially by-catch) the set o WGNEW 2012 species. These include vessels operating deepwater longlines targeting black scabbardfish (acronym: LLS_DWS; sampled from late 2005 onwards, sampling goals set at 12 trips per year) and multi-gear vessels using, amongst other, gill nets and trammel nets of various mesh sizes to target a variety of demersal species (acronym: GNS_DEF and GTR_DEF; sampled from late 2009 onwards, sampling goals set at 24 trips per year). The sampling methodologies used in these _sheries were only standardized (Prista and Jardim, 2011). To date no fleet level estimates have been performed. However, sample data indicates that in the 2005–2010 period, none of these species was registered in LLS_DWS trips. In what concerns the GNS_DEF and GTR_DEF _sheries, discards of WGNEW species are likely higher since some vessels have already been observed to target sole and John dory that present signi_cant by-catch of gurnards. Due to uncertainties in the accuracy of the spatio-temporal distribution of the sampling effort and difulties in raising data from multi-metier fishing trips to fleet level, estimates of discards on these fisheries have not been computed and will be provided in future Working Documents.

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Annex

Lengths of whiting (WHG), sole (SOL) and striped red mullet (MUR) sampled in the discards of the OTB_CRU and OTB_DEF fisheries (2004-2011)

Species	Fishery	Year	Quarter	Size Class (cm)	No.
WHG	OTB_DEF	2007	Q2	19	1
SOL	OTB_DEF	2005	Q3	17	1
SOL	OTB_DEF	2005	Q4	10	1
SOL	OTB_DEF	2005	Q4	12	1
MUR	OTB_CRU	2010	Q1	25	1
MUR	OTB_CRU	2010	Q1	28	1
MUR	OTB_CRU	2010	Q2	21	1
MUR	OTB_CRU	2010	Q4	24	1
MUR	OTB_CRU	2011	Q3	24	1
MUR	OTB_CRU	2011	Q4	20	2
MUR	OTB_DEF	2007	Q2	19	1
MUR	OTB_DEF	2007	Q2	21	1
MUR	OTB_DEF	2010	Q1	16	1
MUR	OTB_DEF	2011	Q4	12	1

Lengths of tub gurnard (GUU) and John dory (JOD) sampled in the discards of the OTB_CRU fisheries (2004-2011)

Species	Fishery	Year	Quarter	Size Class (cm)	No.
GUU	OTB_CRU	2006	Q4	22	1
JOD	OTB_CRU	2011	Q2	13	1
JOD	OTB_CRU	2011	Q2	14	1
JOD	OTB_CRU	2011	Q2	15	1