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

18 - 22 March 2013

ICES HQ, Copenhagen, Denmark

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CIEM Conseil International pour l'Exploration de la Mer

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Executive Summary

The ICES Working Group on Assessment of New MoU Species met at ICES Headquarters in Copenhagen, Denmark, during 18–22 March 2012. There were 9 participants from 7 countries. The main task of WGNEW is to provide information on the new species and stocks of the MoU between ICES and the EC: Each year, different stocks are being dealt with, including but not limited to sea bass, striped red mullet, red gurnard, tub gurnard, grey gurnard, turbot, brill, dab, flounder, lemon sole, witch flounder, pollack and John dory. 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. This year, WGNEW collated information on Brill in Subarea IV and Divisions IIIa and VIId,e, Dab in Subarea IV and Division IIIa, Flounder in Division IIIa and Subarea IV, Lemon sole in Subarea IV and Divisions IIIa and VIId, Witch in Subarea IV, Division IIIa and VIId, Sole in Divisions VIIIc and IXa, Tub gurnard in all areas, Turbot in Division IIIa, Sea bass in Divisions VIIIa,b, Sea bass in Divisions VIIIc and IXa.

1 Introduction and Terms of Reference of WGNEW

1.1 Terms of Reference

2012/2/ACOM21 The **Working Group on Assessment of New MoU Species** (WGNEW), chaired by Jan Jaap Poos, The Netherlands will meet at ICES Headquarters 18–22 March 2013 to:

a) Address generic ToRs for Regional and Species Working Groups for the stocks in the table below. For stocks for which Advice should be drafted, the assessment and draft advice should be available to the respective ecoregion assessment expert group, for further improvements. For stocks without an advice request, development on stock identity and data compilation should be undertaken as far as possible.

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 10 April 2012 to ACOM and SSGSUE, and relevant ecoregions assessment working groups.

Fish Stock	Stock name	Stock Coord.	Assess. Coord.	Advice
bll-nsea	Brill in Subarea IV and Divisions IIIa and VIId,e	Belgium	Belgium	Prepare advice for WGNSSK
dab-nsea	Dab in Subarea IV and Division IIIa	Germany	Germany	Prepare advice for WGNSSK
fle-nsea	Flounder in Division IIIa and Subarea IV	Netherlands	Netherlands	Prepare advice for WGNSSK
lem-nsea	Lemon sole in Subarea IV and Divisions IIIa and VIId	United Kingdom	United Kingdom	Prepare advice for WGNSSK
wit-nsea	Witch in Subarea IV, Division IIIa and VIId	Sweden	Sweden	Prepare advice for WGNSSK
sol-8c9a	Sole in Divisions VIIIc and IXa	Portugal	Portugal	Multiyear 2nd year
ple-89a	Plaice in Subarea VIII and Division IXa	-	-	Multiyear 2nd year
whg-89a	Whiting in Subarea VIII and Division IXa	-	-	Multiyear 2nd year*
	Tub gurnard in all areas	Netherlands	Netherlands	No advice
	John dory in all areas	-	-	No advice
Tur-kask	Turbot in Division IIIa	Sweden	Sweden	Prepare advice for WGNSSK
Bss-8ab	Sea bass in Divisions VIIIa,b	France	France	Prepare advice for WGHMM
Bss-8c9a	Sea bass in Divisions VIIIc and IXa	France	France	Prepare advice for WGHMM
Bss-wosi	Sea bass in Divisions VIa, VIIb, VIIj	-	-	Prepare advice for WGCSE

The generic ToRs applying to assessment Expert Groups were the following :

The working group should focus on:

For all stocks:

a) If no stock annex is available this should be prepared prior to the meeting, based on the previous year advice basis or on the data limited advice basis proposed as the basis for advice this year.

b) Audit the assessments and forecasts carried out for each stock under consideration by the Working Group and write a short report.

c) Propose specific actions to be taken to improve the quality and transmission of the data (including improvements in data collection).

d) Propose indicators of stock size (or of changes in stock size) that could be used to decide when an update assessment is required and suggest threshold % (or absolute) changes that the EG thinks should trigger an update assessment on a stock by stock basis.

e) Consider target categories for stocks in the medium term as proposed and revise as needed

f) Consider ecosystem overviews where available, and propose and possibly implement incorporation of ecosystem drivers in the analytical basis for advice

g) For the ecoregion or fisheries considered by the working group, produce a brief report summarising for the stocks and fisheries where the item is relevant:

   i) Mixed fisheries overview and considerations;

   ii) Species interaction effects and ecosystem drivers;

   iii) Ecosystem effects of fisheries;

   iv) Effects of regulatory changes on the assessment or projections;

h) Prepare planning for benchmarks next year, and put forward proposals for benchmarks of integrated ecosystem, multi or single species for 2015

i) Draft the required elements of the Popular Advice for each stock.

j) In the autumn, where appropriate, check for the need to reopen the advice based on the summer survey information and the guidelines in AGCREFA (2008 report). The relevant groups will report on the AGCREFA 2008 procedure on reopening of the advice before 14 October and will report on reopened advice before 29 October.

For <u>update</u> advice stocks:

k) Produce a first draft of the advice on the fish stocks and fisheries under considerations according to ACOM guidelines and implementing the generic introduction to the ICES advice (Section 1.2). If no change in the advice is needed, one page 'same advice as last year' should be drafted.

l) For each stock , when possible prior to the meeting:

   i) Update, quality check and report relevant data for the stock:

      1. Load fisheries data on effort and catches (landings, discards, bycatch, including estimates of misreporting when appropriate) in the IN-

TERCATCH database by fisheries/fleets, either directly or, when relevant, through the regional database. Data should be provided to the data coordinators at deadlines specified in the ToRs of the individual groups. Data submitted after the deadlines can be incorporated in the assessments at the discretion of the Expert Group chair;

2. Abundance survey results;

3. Environmental drivers.

ii) Produce an overview of the sampling activities on a national basis based on the INTERCATCH database or, where relevant, the regional database,

iii) Update the assessment using the method (analytical, forecast or trends indicators) as described in the stock annex.

iv) Produce a brief report of the work carried out regarding the stock, summarising for the stocks and fisheries where the item is relevant:

1. Input data (including information from the fishing industry and NGO that is pertinent to the assessments and projections);

2. Where misreporting of catches is significant, provide qualitative and where possible quantitative information and describe the methods used to obtain the information;

3. Stock status and catch options for next year;

4. Historical performance of the assessment and brief description of quality issues with the assessment;

5. In cooperation with the Secretariat, update the description of major regulatory changes (technical measures, TACs, effort control and management plans) and comment on the potential effects of such changes including the effects of newly agreed management and recovery plans. Describe the fleets that are involved in the fishery.

m) On basis of the outcomes of WKMSYREF calculate Fmsy for stocks where the information exists but the calculations have not been done yet, resolve inconsistencies between Fmsy and MSY $B_{trigger}$/Blim and if possible, fill in the Precautionary Approach reference points where they are missing

For <u>re-examine</u> advice stocks

n) Consider the advice for 2013 and review data and/or method to ascertain if there is reason to update advice for 2014.

i) Where an update is required, revert to an update procedure

ii) Where no advice update is required, produce a brief report of the work carried out regarding the stock, indicating why the advice is not updated. A one page, 'same advice as last year' should be drafted.

For stocks with <u>multiyear</u> advice or <u>biennial</u> 2nd year advice

o) In principle, there is no reason to update this advice. The advice should be drafted as a one page version referring to earlier advice. If a change in the advice (basis) is considered to be needed, this should be agreed by the working group on the first meeting day and communicated to the ACOM leadership.

Agreement by the ACOM leadership will revert the stock to an update procedure.

1.2 Background

ToR a) is discussed in the individual chapters on the stocks in the report. However, for ple-89a,
whg-89a, and Bss-wosi, no experts were attending the working group, and these stocks were thus not dealt with. The other stocks: bll-nsea, dab-nsea, fle-nsea, lem-nsea, wit-nsea, sol-8c9a, Tur-kask, Bss-8ab, and Bss-8c9a are discussed in chapters 2-12. Note that Bss-8ab and Bss-8c9a are combined in a single chapter.

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.

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 European 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.

Several stocks could be benchmarked in the next few years. In section 1.3 we present a table with proposed timings for such benchmarks. In addition, the working group collated a table with data problems for each stock in the report. An overview of the issues is given in section 1.6.

Finally, the working group has a single recommendation about the stock annexes: we suggest creating a database for those stock annexes, because currently it is almost impossible to track the latest version of stock annexes. The recommendation is summarized in section 1.5 and filed on the ICES Sharepoint.

1.3 Planning future benchmarks

Last year, two of the stocks in WGNEW went through a benchmark. This year, no benchmarks are planned for WGNEW stocks. We propose to add the Tur-kask stock to the benchmark for flatfish stocks in the Baltic. That benchmark should focus on the stock structure and the options for doing future assessments. In 2015, two stocks are candidates for a benchmark: Wit-nsea and Lem-nsea. Much work has been done on witch flounder in the North Sea in terms of doing an age-based analytical stock assessment. Importantly, the age structuring of the landings that is currently used in the assessment is based on Swedish samples only, while other countries have considerable contributions to the landings. The assessment work should be consolidated in a benchmark group. Prior to the benchmark group, the available data on surveys, landings and discards should be collated, especially the available age structure information.

Likewise, for lemon sole in the North Sea, much work has been done on interpreting the length structure in surveys and catches to derive reference points. Prior to the benchmark group the available data on surveys, landings and discards should be collated.

Stock	**Benchmark next year**	**Planning Year +2**	**Further planning**	**Comments**
	Agreed by ACOM	Proposal to ACOM	Future proposals for internal use	WHY?!
Sol-8c9a				
Dab-nsea				
Bll-nsea			2016	
Fle-nsea				
Lem-nsea		2015		Consolidate ongoing work and collect international data
Wit-nsea		2015		Consolidate ongoing work and collect international data
Tur-kask	2014			To be added to Baltic flatfish benchmark
Bss-8ab				
Bss-8c9a				
Bss-wosi				

1.4 Participants

The following persons attended the meeting :

Ana Moreira	Portugal
Mickael Drogou	France
Kelle Moreau	Belgium
Max Cardinale	Sweden
Francesca Vitale	Sweden
Bill Lart	UK
Holger Haslob	Germany
Tessa van der Hammen	Netherlands
Jan Jaap Poos (chair)	Netherlands

1.5 Recommendations

To ICES secretariat: Make a database with stock annexes. For a group like WGNEW, it is very difficult to keep track of where the most recent versions of stock annexes are. A central repository for all stock annexes on the Sharepoint would allow easy tracking of stock annexes including a version history. (to be filled into database).

1.6 Data issues

The table below lists the data issues that were encountered during the working group:

Stock	Data Problem	How to be addressed in	By who[1]
Stock name	***Data problem identification***	***Description of data problem and recommend solution***	***Who should take care of the recommended solution and who should be notified on this data issue.***
bll-nsea	Biological data	Fishery-independent surveys catch very few old/big individuals, more info on these could be compiled from commercial sampling programmes/surveys using commercial vessels.	DEN (IIIa), NED (IV), BEL (IV, VIId), FRA (VIIde), UK (VIIde) SSGESST
fle-nsea dab-nsea	Discards	Discard rates substantial, but discard weights unavailable. Raised discard data time series to be constructed and delivered to WG.	BEL, DEN, GER, NED, UK
fle-nsea dab-nsea	Biological data	Length/age/maturity information only from surveys, more info on these could be compiled from commercial sampling programmes/ surveys using commercial vessels (for landings and discards).	BEL, DEN, GER, NED, UK SSGESST
lem-nsea	Discards	Discard rates substantial, but discard weights unavailable. Raised discard data time series to be constructed and delivered to WG.	BEL, DEN, FRA, GER, NED, UK
	Biological data	Length/age at maturity information is currently available from survey data which is collected in quarters 1 and 3 outside the main summer spawning time. These data and available UK discard data suggests that the length at maturity is in the size range which is discarded. Thus sampling the discarded portion of the catch for length/age at maturity samples during the summer would improve this situation	BEL, DEN, FRA, GER, NED, UK

[1] Recommendations on surveys for be addressed by the SCICOM Steering Group on Ecosystem Surveys, Science and Technology (SSGESST)

Stock	Data Problem	How to be addressed in	By who[1]
wit-nsea	Biological data	Only a short data series of Length/age/maturity information from surveys and market sampling and mainly from Division IIIa, collected by Sweden and Denmark. Moreover the surveys are not developed for catching witch -> more info could be compiled from commercial sampling programmes/ surveys using commercial vessels (for landings and discards) by the other countries exploiting this species in Subarea IV.	DEN, SWE, UK(E&W + SCO) SSGESST
tur-kask	Biological data	Fishery-independent surveys catch very few old/big individuals, more info on these could be compiled from commercial sampling programmes/surveys using commercial vessels.	DEN, SWE
bss-8ab	Commercial landings	No landings from Spain are available in ICES-Fishstat for 2012. Spain to provide these estimates.	ESP
bss-8ab	Recreational catches	Recreational catch estimates only available for France, but with very low precision; size and age composition of recreational catches unknown. France and Spain to set up recreational surveys to fill these gaps.	FRA, ESP?
bss-8ab	Biological data	No time series of catch composition (size/age/ maturity) available. France, Spain and UK to set up sampling programmes to collect these.	FRA, ESP, UK
bss-8ab	Surveys	No time series of relative abundance, and no recruitment information available. France and Spain to set up sampling programmes to collect these.	FRA, ESP SSGESST
bss-8c9a	Commercial landings	No landings from Spain are available in ICES-Fishstat for 2012. Spain to provide these estimates.	ESP
bss-8c9a	Recreational catches	No recreational catch estimates are available; size and age composition of recreational catches unknown. Spain and Portugal to set up a pilot project for recreational surveys to fill these gaps.	ESP, POR
bss-8c9a	Biological data	No time series of catch composition (size/age/ maturity) available. France, Spain and UK to set up sampling programmes to collect these.	FRA, ESP, UK
bss-8c9a	Surveys	No time series of relative abundance, and no recruitment information available. France and Spain to set up sampling programmes to collect these.	FRA, ESP SSGESST

Stock	Data Problem	How to be addressed in	By who[1]
sol-8c9a	All of the above	Virtually no data are available, only Portuguese landings were presented to WGNEW 2013. No landings from Spain are available in ICES-Fishstat for the last two years. Spain to provide these estimates.	ESP, POR

2 Brill in Subarea IV, Subdivision IIIa and VIIde

2.1 General biology

Brill (*Scophthalmus rhombus*) 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 meters to 73 meters, 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 distribution in the North Sea, Skagerrak and Kattegat, based on presence/absence in a number of surveys, is shown in Figure 9-1.

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).

2.2 Stock identity and possible assessment 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 show almost no differentiation between potential biological populations and/or management units. Therefore, WGNEW 2013 suggests treating brill in IIIa, IV and VIIde as a single stock.

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 delineation of potential brill stocks can be found in Annex 5 of WGNEW(2010).

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

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.

Historical overview of combined TACs for brill *Scophthalmus rhombus* and turbot *Scophthalmus maximus* in Division IIa and Subarea IV

YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
TAC	9000	9000	6750	5738	4877	4550	4323	4323	5263	5263	5263	4642	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, …).

2.4 Fisheries data

Landings

Table 2.1 and Figure 2.1.a summarise the official brill landings from the Greater North Sea, subdivided into Subarea IV, Division IIIa and Divisions VIIde (Source: ICES Fishstat, updated with national submissions to WGNEW 2013 for Belgium, Germany and the UK for 2012). Over the period 1950 – 1970, total landings ranged from 582 t to 947 t per year, followed by a gradual increase to 2121 t in 1977. During 1978 – 2010, total landings varied between 1517 t (in 1980) and 3141 t (in 1993). Since 2000, annual total landings fluctuated around an average of 2371 t (range: 2142 t – 3141 t). The North Sea (IV) accounts for the major part of these landings (Figure 2.1.b), on average generating 68% of the totals over the time series (range: 50-86%). The English Channel and the Skagerrak are responsible for average contributions to the international brill landings of 19% and 13% respectively.

Landings in the Skagerrak/Kattegat (IIIa)

International landing series from the Skagerrak/Kattegat were updated for brill (source: ICES Fishstat) and can be consulted in Table 2.2 and Figure 2.2.

Over the period 1950-2012, these landings ranged from 59 t to 388 t per year. On average, Denmark landed 85% of the Skagerrak/Kattegat 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 national submissions from Belgium, Germany and the UK to WGNEW 2013) and can be consulted in Table 2.3 and Figure 2.3.

During 1950-1970, total landings were about half of the values reached during 1971-1990, 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 1971-2012, brill landings from the North Sea ranged from 893 t to 2439 t per year. The Netherlands landed on average 70% 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 (VIIde)

International landing series from the English Channel were updated for brill (source: ICES Fishstat and national submissions from Belgium and the UK to WGNEW 2013) and can be consulted in Table 2.4 and Figure 2.4. 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 1977-2012, 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 33% respectively, over the entire time-line), with Belgium in third place (23%). The Netherlands, Ireland and Denmark landed negligible quantities.

More details on the Belgian, Dutch, French and UK fisheries catching brill, and information on length- and age-distributions of Belgian brill landings can be found in Annex 5 of WGNEW(2010).

Discards

Due to its high value and the absence of a European Minimum Landing Size, brill is not expected to be discarded easily by fishermen catching the species as long as the quota have not been fully taken. The fact that the species is characterised by a fast growth, quickly reaching commercially interesting lengths (unfortunately at relatively young ages and while still immature), smaller individuals are rather rare in commercial catches, which contributes to the low numbers of discards.

Although no discard data that were raised to fleet levels were available to WGNEW 2013, discard rates from the Belgian (ILVO) discard observer programme in the beam trawl fishery (mesh size range 70-99) for the years 2008 – 2012 in IV, VIId and VIIe (Table 2.5) indeed illustrate very limited discarding (0-0.7% in IV, 0-0.1% in VIId, 0% in VIIe). Keeping in mind these low numbers in beam trawls that are traditionally known for their aselective properties and large proportions of discards, and that other gear types are expected to exhibit even lower discard rates/quantities of this species, the amount of discarding of brill does not seem to be a substantial problem for the assessment of the state of the species's stocks in terms of data quality : landings can be considered to be a reliable proxy for total catch.

From a biological perspective, it's a very different story, as most of the discarded fish have not reached sexual maturity yet, and as such have not had the chance to reproduce and contribute to the future generations. The low numbers of discards at low lengths in the Belgian observer programme are illustrated by quarter for Subarea IV and Divisions VIId and e in Figures 2.5 – 2.7.

More details on the numbers at length discarded per hour in the Dutch beam trawl fleet (North Sea) can be found in Annex 5 of WGNEW(2010).

Commercial LPUE series

Landings of brill from the North Sea, the accompanying effort and a corrected LPUE series from the Dutch beam trawl fleet > 221 kW were presented to WGNEW 2013. The landings (Figure 2.8) fluctuated with little variation between ca 600 and ca 800 tonnes beween 2002 and 2009, and stabilized at a slightly higher level (900-1000 tonnes) in 2010-2012. Combined with an effort series (days at sea; Figure 2.9) that shows a consistent decline from 2002 to 2008 (with the biggest decline in the last year of this period) and a stabilization from 2008 to 2012, this results in a CPUE series (kg/day; Figure 2.10 and Table 2.6) that illustrates an increase from 22.3 brill/day in 2002 to 55.3 brill/day in 2012. Given the facts that the majority of the brill landings from the greater North Sea originate from Subarea IV, and that around 70% (on averae) of these are landed by the Netherlands, this LPUE series may be considered a reliable time series when evaluating the stock trend of brill in the Greater North Sea stock area.

The Landings Per Unit of Effort (LPUE) were standardised for engine power and corrected for targeting behavior in a way similar to those used to analyse commercial LPUE data for North Sea plaice. The standardization for engine power is relevant as trawlers are likely to have higher catches with higher engine powers, as they can trawl heavier gear or fish at higher speeds. The correction for targeting behavior relies on reducing the effects of spatial shifts in fishing effort by calculating the fishing effort by ICES rectangle and subsequently averaging these over the entire fishing area.

More information on the data that were used (EU logbook auction data and, market sampling data), the calculation of the LPUEs, the standardization of engine power, the correction for targeting behavior and the results can be found in van der Hammen *et al*. (2011).

2.5 Survey data, recruit series

General

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.

WGNEW 2012 tested four surveys 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 and the Channel are depicted in WGNEW 2012 (Figures 9.5-9.7), but only the 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. WGNEW 2013 did not go into these surveys again, with exception for the BTS_ISI_Q3. For the Skagerrak/Kattegat, WGNEW 2013 dug into the data of the Danish IBTS_HAF_Q1&4 for the first time, and found the data of both quarters of this survey usefull to the evaluation of brill abundance in this area.

North Sea (Subarea IV)

The ALK, length distributions (per 5 years) and length-at-maturity for the BTS_ISI_Q3 in IV are illustrated in Figures 2.11 – 2.13. These show that mainly brill of ages 1-2 and lengths of 20-45cm are caught in this survey and that no obvious shifts in length distributions are apparent over the time series (1987-2012). All brill under 30 cm are immature, and all above 40 cm are mature, with a mix of mature and immature individuals between 30 and 40 cm.

The corresponding abundance indices (numbers per hour) are spatially plotted per rectangle in Figure 2.14 and over time in Figure 2.15 and Table 2.7. These seem to illustrate a recovery of the species in IV since 2009 after a period of consistent lower catches during 2001-2008. The inter-annual variation between all other years is so big that no real trend is apparent over the entire time series. Therefore, the lower catches per hour in 2012 (1.2/hr) in comparison with the higher values in the three preceding years (1.5-2.5/hr) are not considered to represent an alarming signal so far.

Skagerrak/Kattegat (IIIa)

Data on brill from the Danish BITS-survey in the Kattegat (BITS_HAF_Q1&4) were analysed separately for the two quarters in which this survey runs, revealing almost identical patterns for Q1 and Q4. Therefore, it was decided to combine the data from both quarters for the evaluation of the brill substock in IIIa, and only the results of this combined analysis are presented in this report. The fact that this survey only covers the Kattegat (IIIaS) and not the Skagerrak (IIIaN) was not considered to be a problem by WGNEW 2013 as the deeper northern waters don’t harbour important numbers or densities of brill, that generally prefers more shallow waters.

The ALK, length distributions (per 5 years) and length-at-maturity for the BITS_HAF_Q1&4 in IIIa are illustrated in Figures 2.16 – 2.18. These show that mainly brill of ages 1-3 and lengths of 10-40cm are caught in this survey and that no alarming shifts in length distributions (no obvious loss of larger/older individuals from the population) are apparent over the time series (1996-2012). All brill under 30 cm are immature, but there is a much bigger overlap in length between the immature and mature stages compared to the North Sea (Figure 2.13), with mature individuals of lengths lower than 20 cm. This illustrates the general phenomenon of slower growth at higher lattitudes that was also published for brill by Delbare & Declerck (1999), that didn’t include the Skagerrak/Kattegat in their overview.

The corresponding abundance indices (numbers per hour) are spatially plotted per rectangle in Figure 2.19 and over time in Figure 2.20 and Table 2.7. These illustrate a period with higher catches (2006-2011) after a period of consistent lower catches (1996-2005). In 2012, the numbers caught per hour dropped to the level of 2004-2005 again but given the noise in the data (large inter-annual variations) it may be preliminary to interprete this as a sign of a decreasing stock.

English Channel (Divisions VIIde)

No usefull survey index was identified for the evaluation of the brill substock in the English Channel during WGNEW 2013.

2.6 Biological sampling

No new information was obtained compared to the report of WGNEW2010.

2.7 Population biology parameters and a summary of other research

No new information was obtained compared to the report of WGNEW2010.

2.8 Analyses of stock trends and potential status indicators

DLS – category 6

The ICES Data Limited Stocks methodological document (draft version 2012) mentions brill in the Greater North Sea as the example of a stock Category 6: "This category includes stocks where landings are negligible in comparison to discards, and stocks that are part of stock complexes and are primarily caught as by-catch species in other targeted fisheries; e.g. North Sea brill in the targeted North Sea plaice and sole fishery. The development of indicators may be most appropriate for such stocks."

WGNEW 2013 feels that this stock can be upgraded to a higher category as there is available information that allows this, and explored the possibilities for an upgrade to categories 4 and 3.

DLS - category 4

This category includes stocks for which a time series of catch can be used to approximate MSY. Although raised discard estimates are currently unavailable to WGNEW 2013, landings can be safely used as discards are negligible in brill.
When a sufficient catch history is available to determine a suitable exploitation rate, the
methodological document prescribes to apply the Depletion-Corrected Average Catch
(DCAC) model (MacCall, 2009).

DCAC is calculated as:

$$\text{DCAC} = \frac{\sum C_t}{n + \Delta\left\lfloor B_{peak}\left(F_{msy}/M\right)M\right\rfloor^{-1}}$$

Where:

C_t is the catch during year t,

n is the length of catch time-series in years,

Δ is the relative stock status,

B_{peak} is the biomass that corresponds to maximum sustainable yield relative to carrying capacity (B_{msy}/K),

M is the instantaneous rate of natural mortality, and

F_{msy}/M is the ratio between the fishing mortality rate that corresponds to B_{peak} and M.

With exception of C_t and n, all other parameters are not know for brill in the Greater North Sea, but standard settings and/or typical values for other flatfish can be used as described by the help function on http:\\ntf.nefsc.noaa.gov, where the DCAC model can be downloaded from the NOAA Toolbox. The major problem is created by the relative stock status Δ, also known as the depletion factor. This is a measure of the amount of change in abundance that occurred between the first and last year of the catch series, expressed as a fraction of unfished biomass, i.e., (Blast-Bfirst)/Bunfished. In most data-poor cases, the value of Depletion Delta requires an "educated guess."

For brill in the Greater North Sea, the DCAC-model was run with a range of input parameters, but the results varied greatly and the model proved to be very sensitive to these in this case. Additionally, the results were not in line with the signals that emerged from survey analyses (see below). Therefore WGNEW 2013 decided not to base its advice for this stock on the DCAC-results.

DLS - category 3

Method 3.2.0 in the ICES Data Limited Stocks methodological document specifies that catch advice can be derived from the survey-adjusted status-quo catch in situations where there are survey data on abundance (e.g. CPUE over time), but survey-based proxies for MSY $B_{trigger}$ and F values are not known. Also other indicators of stock size can be used.

Three time series that are considered indicative of the stock trend of brill in the Greater North Sea are presented by WGNEW 2013 : two survey indices (BTS Q3 and BITS Q1&4) and one commercial LPUE series (Dutch beam trawl fleet > 221 kW). These time series of abundance indicate increasing stock trends over the last decade although there is high inter-annual variability in the survey indices. The exploitation status remains unknown.

Landings are stable and considered a reliable approximation of catches as only little discarding of brill occurs. Effort in the main fleets (beam trawls) with brill catches have declined almost 50% between 2002 and 2012.

An assessment of brill in the English Channel fisheries using the data sampled by France tonnes.

Conclusion

WGNEW 2013 recommends that brill in the Greater North Sea be treated as a Category 3 stock, and that method 3.2.0 be applied to calculate catch advice for this stock. Three time series of abundance have been identified as usefull for this purpose : 1) numbers per hour from the BTS Q3 (ISIS), 2) numbers per hour from the BITS Q1&4 (Havfisken) and 3) kg per day from the corrected LPUE series for the Dutch beam trawl fleet. Because of the large interannual variability (a lot of noise) in the survey series, it is not recommended to use the ratio of the average of the last two years over the average of the last three years for the calculation, as this would give too much weight to the noise and drive quota to go up and down too much in consecutive years. Calculations over longer periods of time are recommended.

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Table 2.1. Total international landings (t) of brill in Subarea IV, Divisions IIIa and VIId&e (Source: ICES Fishstat, updated with national submissions to WGNEW 2013 for Belgium, Germany and the UK for 2012).

Year	IIIa	IV	VIIde	TOTAL
1950	319	384	59	**762**
1951	337	511	78	**926**
1952	236	565	72	**873**
1953	246	589	62	**897**
1954	234	529	60	**823**
1955	212	571	61	**844**
1956	213	516	60	**789**
1957	148	468	70	**686**
1958	203	480	67	**750**
1959	233	424	59	**716**
1960	318	486	52	**856**
1961	305	581	47	**933**
1962	207	591	55	**853**
1963	120	620	51	**791**
1964	106	565	60	**731**
1965	155	535	48	**738**
1966	187	546	53	**786**
1967	106	409	67	**582**
1968	100	579	57	**736**
1969	99	658	190	**947**
1970	97	618	59	**774**
1971	104	1073	66	**1243**
1972	120	994	75	**1189**
1973	131	989	90	**1210**
1974	200	1152	81	**1433**
1975	187	1222	137	**1546**
1976	224	1208	285	**1717**
1977	388	1410	323	**2121**
1978	216	1375	411	**2002**
1979	184	1366	459	**2009**
1980	82	1033	402	**1517**
1981	59	1218	490	**1767**
1982	74	1294	487	**1855**
1983	83	1448	526	**2057**
1984	97	1522	531	**2150**
1985	109	1709	494	**2312**
1986	106	1207	456	**1769**
1987	103	970	493	**1566**
1988	101	1085	452	**1638**
1989	97	1302	425	**1824**
1990	127	893	543	**1563**
1991	99	1682	470	**2251**
1992	146	1810	463	**2419**
1993	212	2439	490	**3141**
1994	220	1916	490	**2626**
1995	150	1434	558	**2142**
1996	111	1247	608	**1966**
1997	105	957	501	**1563**
1998	131	1283	451	**1865**
1999	156	1280	240	**1676**
2000	140	1508	678	**2326**
2001	98	1573	738	**2409**
2002	89	1302	716	**2107**
2003	128	1346	759	**2233**
2004	155	1249	666	**2070**
2005	133	1160	611	**1904**
2006	139	1175	649	**1963**
2007	160	1240	741	**2141**
2008	182	1004	593	**1779**
2009	146	1162	591	**1899**
2010	122	1500	695	**2317**
2011	131	1495	622	**2248**
2012	121	1515	617	**2253**

Table 2.2. Total international landings (t) of brill in the Skagerrak/Kattegat (Division IIIa) by country over the period 1950-2012 (source: ICES Fishstat).

Year	BEL	DEU	DNK	NLD	NOR	SWE	TOTAL
1950	0	0	234	0	0	85	319
1951	0	0	260	0	4	73	337
1952	0	0	170	0	1	65	236
1953	0	0	175	0	0	71	246
1954	0	0	155	0	1	78	234
1955	0	0	150	0	0	62	212
1956	0	0	163	0	0	50	213
1957	0	0	110	0	0	38	148
1958	0	0	166	0	0	37	203
1959	0	0	175	0	0	58	233
1960	0	0	272	0	0	46	318
1961	0	0	255	0	0	50	305
1962	0	0	207	0	0	0	207
1963	0	0	120	0	0	0	120
1964	0	0	106	0	0	0	106
1965	0	0	155	0	0	0	155
1966	0	0	187	0	0	0	187
1967	0	0	106	0	0	0	106
1968	0	0	100	0	0	0	100
1969	0	0	99	0	0	0	99
1970	0	0	97	0	0	0	97
1971	0	0	104	0	0	0	104
1972	0	0	120	0	0	0	120
1973	0	0	131	0	0	0	131
1974	0	0	200	0	0	0	200
1975	0	0	167	1	0	19	187
1976	1	0	185	26	0	12	224
1977	1	0	276	99	0	12	388
1978	0	0	178	27	0	11	216
1979	0	0	156	17	0	11	184
1980	2	0	69	1	0	10	82
1981	0	0	54	0	0	5	59
1982	1	0	64	1	0	8	74
1983	0	0	73	3	0	7	83
1984	0	0	89	0	0	8	97
1985	0	0	100	0	0	9	109
1986	0	0	94	0	0	12	106
1987	0	0	93	0	0	10	103
1988	0	0	91	0	0	10	101
1989	0	0	88	0	0	9	97
1990	1	0	116	0	0	10	127
1991	1	0	81	0	7	10	99
1992	1	0	123	0	7	15	146
1993	2	0	184	0	10	16	212
1994	0	0	191	0	12	17	220
1995	0	0	124	0	13	13	150
1996	0	0	94	0	12	5	111
1997	0	0	83	0	11	11	105
1998	0	0	108	0	10	13	131
1999	0	0	126	0	13	17	156
2000	0	0	112	0	12	16	140
2001	0	0	73	0	13	12	98
2002	0	0	66	0	12	11	89
2003	0	0	99	1	12	16	128
2004	0	0	119	4	15	17	155
2005	0	0	101	3	16	13	133
2006	0	1	105	3	16	14	139
2007	0	1	119	3	15	22	160
2008	0	2	138	1	13	28	182
2009	0	1	98	1	14	32	146
2010	0	1	95	1	9	16	122
2011	0	1	103	0	15	12	131
2012	0	0	90	0	16	15	121

Table 2.3. Total international landings (t) of brill in the North Sea (Subarea IV) by country over the period 1950-2012 (source: ICES Fishstat, updated with national submissions to WGNEW 2013 for Belgium, Germany and the UK for 2012).

Year	BEL	DEU	DNK	FRA	GBR	NLD	NOR	SWE	TOTAL
1950	34	0	39	0	183	108	1	19	**384**
1951	23	0	53	0	322	93	1	19	**511**
1952	21	0	65	0	350	117	3	9	**565**
1953	23	0	49	0	376	130	0	11	**589**
1954	19	0	53	0	330	106	14	7	**529**
1955	23	0	51	0	357	137	3	0	**571**
1956	28	0	47	0	276	156	0	9	**516**
1957	32	0	27	0	247	154	0	8	**468**
1958	43	0	42	0	223	162	0	10	**480**
1959	41	0	30	0	219	125	0	9	**424**
1960	55	0	37	0	235	150	1	8	**486**
1961	102	0	40	0	264	166	0	9	**581**
1962	97	0	42	0	238	214	0	0	**591**
1963	79	0	59	0	307	175	0	0	**620**
1964	79	0	46	0	161	279	0	0	**565**
1965	71	0	56	0	127	281	0	0	**535**
1966	100	0	63	0	119	264	0	0	**546**
1967	138	0	29	0	105	137	0	0	**409**
1968	152	0	43	0	110	274	0	0	**579**
1969	145	0	47	0	102	364	0	0	**658**
1970	114	0	42	0	76	386	0	0	**618**
1971	187	0	72	0	94	720	0	0	**1073**
1972	213	0	65	0	51	665	0	0	**994**
1973	185	0	55	0	39	710	0	0	**989**
1974	135	0	68	0	44	905	0	0	**1152**
1975	164	0	76	13	44	925	0	0	**1222**
1976	148	0	65	10	45	940	0	0	**1208**
1977	166	0	88	17	60	1079	0	0	**1410**
1978	175	0	123	26	84	967	0	0	**1375**
1979	188	0	154	10	103	908	0	0	**1366**
1980	129	0	104	8	45	747	0	0	**1033**
1981	148	0	66	5	42	957	0	0	**1218**
1982	182	0	53	11	41	1007	0	0	**1294**
1983	182	0	62	23	28	1153	0	0	**1448**
1984	190	0	73	30	29	1200	0	0	**1522**
1985	187	0	71	35	46	1370	0	0	**1709**
1986	131	0	76	4	46	950	0	0	**1207**
1987	140	0	50	17	48	715	0	0	**970**
1988	102	0	33	18	52	880	0	0	**1085**
1989	112	0	43	9	58	1080	0	0	**1302**
1990	168	0	139	24	82	480	0	0	**893**
1991	205	38	145	28	147	1111	8	0	**1682**
1992	203	59	77	34	218	1196	22	1	**1810**
1993	291	63	118	38	268	1647	14	0	**2439**
1994	208	90	109	28	235	1235	11	0	**1916**
1995	194	67	55	24	145	943	6	0	**1434**
1996	206	47	64	15	175	732	8	0	**1247**
1997	129	48	38	1	135	590	16	0	**957**
1998	160	58	58	11	172	808	16	0	**1283**
1999	161	51	91	0	156	805	16	0	**1280**
2000	167	77	93	16	141	998	16	0	**1508**
2001	182	66	67	12	158	1075	13	0	**1573**
2002	145	58	52	10	120	907	10	0	**1302**
2003	145	70	57	9	119	934	12	0	**1346**
2004	140	66	77	7	168	772	19	0	**1249**
2005	120	62	89	7	138	716	28	0	**1160**
2006	105	55	75	9	154	765	12	0	**1175**
2007	110	47	52	12	156	854	9	0	**1240**
2008	117	42	86	5	93	650	11	0	**1004**
2009	109	54	96	8	105	786	4	0	**1162**
2010	104	75	97	12	136	1072	4	0	**1500**
2011	101	57	122	11	137	1061	6	0	**1495**
2012	111	72	127	12	102	1084	7	0	**1515**

Table 2.4. Total international landings (t) of brill in the English Channel (Divisions VIIde) by country over the period 1950-2012 (source: ICES Fishstat, updated with national submissions to WGNEW 2013 for Belgium and the UK for 2012).

year	BEL	DNK	FRA	GBR	IRL	NLD	XCI	TOTAL
1950	11	0	0	48	0	0	0	**59**
1951	8	0	0	70	0	0	0	**78**
1952	6	0	0	66	0	0	0	**72**
1953	2	0	0	60	0	0	0	**62**
1954	1	0	0	59	0	0	0	**60**
1955	4	0	0	57	0	0	0	**61**
1956	2	0	0	58	0	0	0	**60**
1957	4	0	0	66	0	0	0	**70**
1958	2	0	0	65	0	0	0	**67**
1959	1	0	0	58	0	0	0	**59**
1960	6	0	0	46	0	0	0	**52**
1961	1	0	0	46	0	0	0	**47**
1962	3	0	0	52	0	0	0	**55**
1963	1	0	0	50	0	0	0	**51**
1964	0	0	0	60	0	0	0	**60**
1965	2	0	0	46	0	0	0	**48**
1966	0	0	0	53	0	0	0	**53**
1967	1	0	0	66	0	0	0	**67**
1968	3	0	0	54	0	0	0	**57**
1969	2	0	121	67	0	0	0	**190**
1970	10	0	0	49	0	0	0	**59**
1971	18	0	0	48	0	0	0	**66**
1972	20	0	0	52	0	3	0	**75**
1973	20	0	0	70	0	0	0	**90**
1974	25	0	0	56	0	0	0	**81**
1975	24	0	55	56	0	0	2	**137**
1976	41	0	170	72	0	0	2	**285**
1977	45	0	197	77	0	0	4	**323**
1978	58	3	227	120	0	0	3	**411**
1979	55	0	262	140	0	0	2	**459**
1980	64	2	213	118	3	0	2	**402**
1981	83	0	271	130	0	0	6	**490**
1982	105	0	225	149	0	1	7	**487**
1983	107	0	234	181	0	1	3	**526**
1984	114	0	226	186	0	0	5	**531**
1985	94	0	213	177	0	0	10	**494**
1986	115	0	183	147	0	0	11	**456**
1987	126	0	216	141	0	0	10	**493**
1988	112	0	202	133	0	0	5	**452**
1989	89	0	213	121	0	0	2	**425**
1990	99	0	249	187	0	0	8	**543**
1991	81	0	249	140	0	0	0	**470**
1992	82	0	223	151	0	0	7	**463**
1993	78	0	256	152	0	0	4	**490**
1994	88	0	227	170	0	0	5	**490**
1995	91	0	248	200	1	0	18	**558**
1996	105	0	240	253	0	0	10	**608**
1997	107	0	185	198	1	0	10	**501**
1998	70	0	196	173	0	2	10	**451**
1999	97	0	0	127	0	3	13	**240**
2000	164	0	260	232	1	4	17	**678**
2001	212	0	256	251	0	2	17	**738**
2002	204	0	268	227	0	1	16	**716**
2003	217	0	287	238	1	1	15	**759**
2004	165	0	259	223	1	3	15	**666**
2005	138	0	267	183	0	2	21	**611**
2006	180	0	281	170	0	3	15	**649**
2007	205	0	325	199	0	1	11	**741**
2008	154	0	225	199	0	2	13	**593**
2009	131	0	278	171	0	1	10	**591**
2010	145	0	340	198	0	1	11	**695**
2011	141	0	277	204	0	0	0	**622**
2012	121	0	263	232	0	1	0	**617**

Table 2.5. Discard rates from the Belgian (ILVO) discard observer programme 2008-2012 for brill in the North Sea (IV) and the Eastern (VIId) and Western English Channel (VIIe).

Year	Discard Rate		
	IV	VIId	VIIe
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	0.07	0.01	0
2012	0.04	0.01	0

Table 2.6. Commercial LPUE (kg/day) for brill *Scophthalmus rhombus* in the Dutch beam trawl fleet, Subarea IV.

Year	LPUE
2002	22.3
2003	27.8
2004	26.8
2005	25.8
2006	26.5
2007	32.2
2008	39.1
2009	39.2
2010	46.4
2011	51.1
2012	55.3

Table 2.7. Survey index (N°/hr) for brill in the BTS_ISI_Q3, Subarea IV and BITS_HAF_Q1&4, Division IIIa.

	BTS_ISI_Q3	BITS_HAF_Q1&4
Year	**N/hr**	**N/hr**
1987	1.49	
1988	0.81	
1989	1.16	
1990	1.46	
1991	0.83	
1992	2.41	
1993	2.36	
1994	1.39	
1995	0.82	
1996	0.52	1.91
1997	1.32	0.39
1998	1.36	0.50
1999	0.83	1.83
2000	2.52	0.56
2001	0.67	1.04
2002	0.77	1.80
2003	1.12	1.36
2004	0.82	2.20
2005	0.61	2.08
2006	0.87	3.82
2007	1.10	3.62
2008	0.51	4.05
2009	1.48	3.09
2010	2.18	3.89
2011	2.52	3.61
2012	1.16	2.27

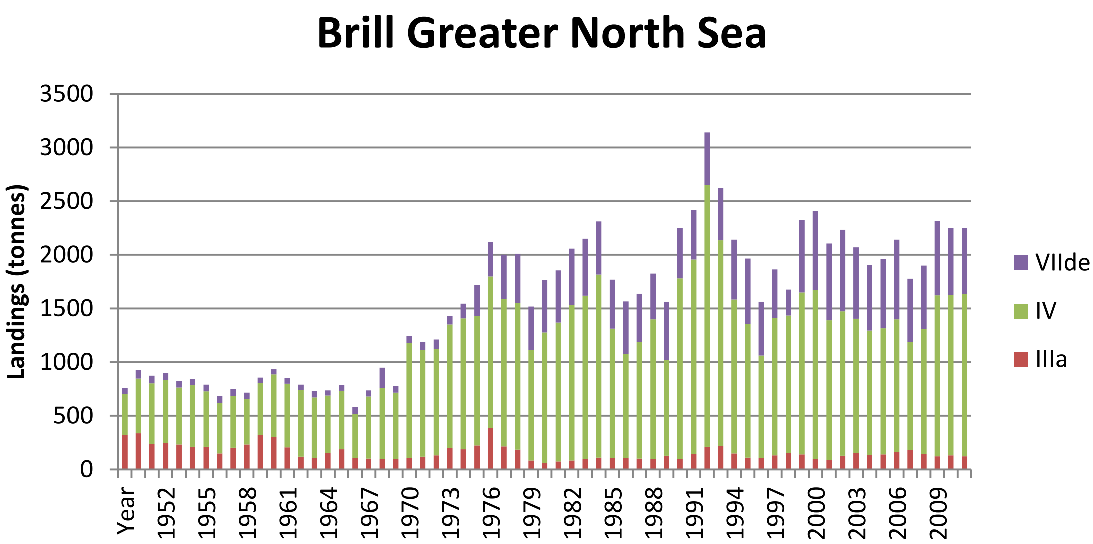

Figure 2.1.a. Total international landings (t) of brill in the Greater North Sea over the period 1950-2012, subdivided into Subarea IV, Division IIIa and Divisions VIIde (Source: ICES Fishstat, updated with national submissions to WGNEW 2013 for Belgium, Germany and the UK for 2012).

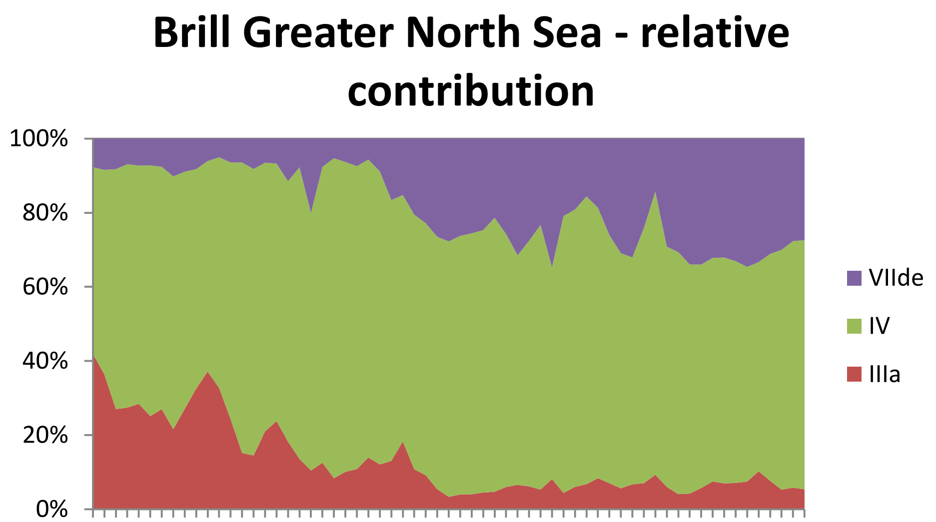

Figure 2.1.b. Relative contribution of landings of brill from Subarea IV, Division IIIa and Divisions VIIde to the total international landings (t) in the Greater North Sea over the period 1950-2012 (Source: ICES Fishstat, updated with national submissions to WGNEW 2013 for Belgium, Germany and the UK for 2012).

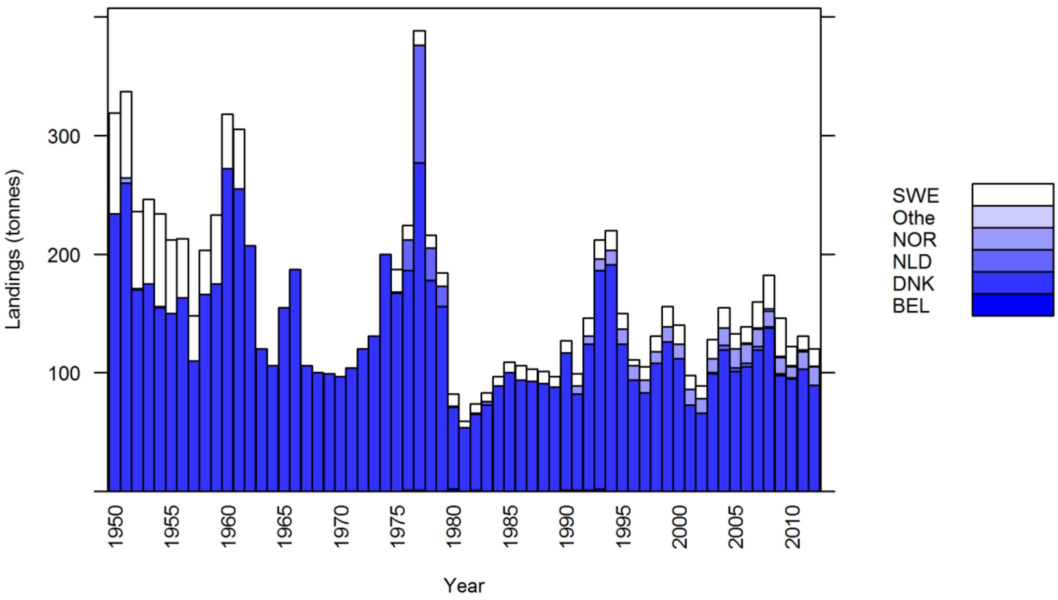

Figure 2.2. Total international landings (t) of brill in the Skagerrak/Kattegat (Division IIIa) by country over the period 1950-2012 (source: ICES Fishstat).

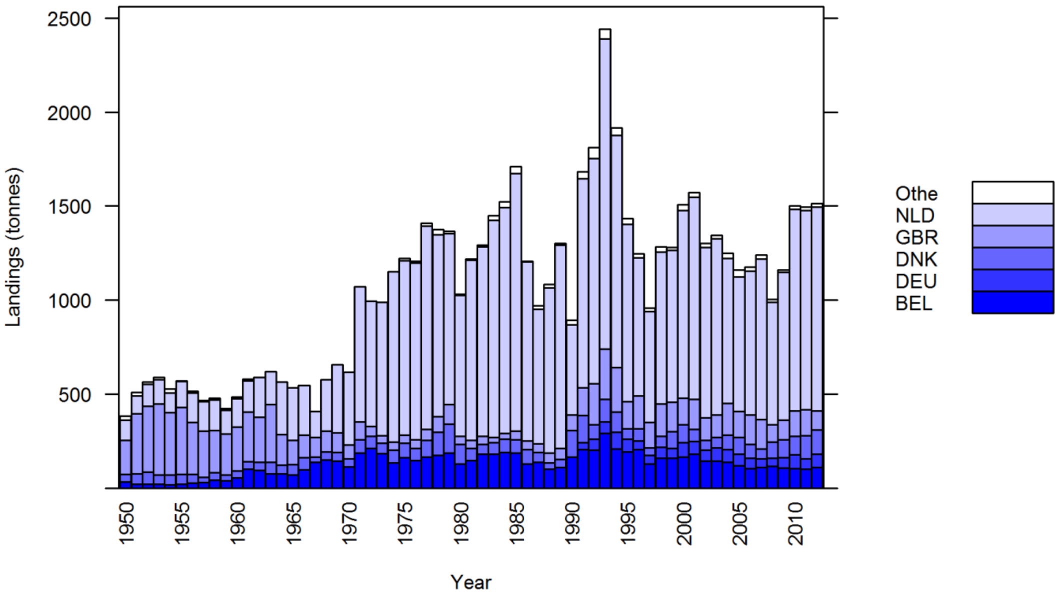

Figure 2.3. Total international landings (t) of brill *Scophthalmus rhombus* in the North Sea (Sub-area IV) by country over the period 1950-2012 (source: ICES Fishstat, updated with national sub-missions to WGNEW 2013 for Belgium, Germany and the UK for 2012). The lower landings prior to 1971 are probably attributable to incomplete statistics.

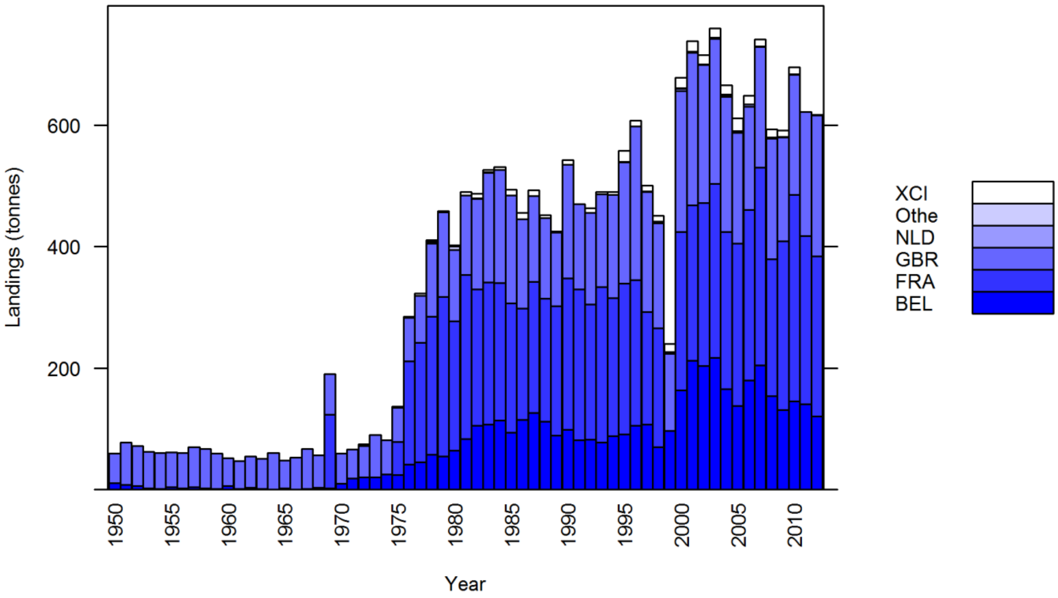

Figure 2.4. Total international landings (t) of brill in the English Channel (Divisions VIIde) by country over the period 1950-2012 (source: ICES Fishstat, updated with national submissions to WGNEW 2013 for Belgium and the UK for 2012). The lower landings prior to 1976 are probably attributable to incomplete statistics.

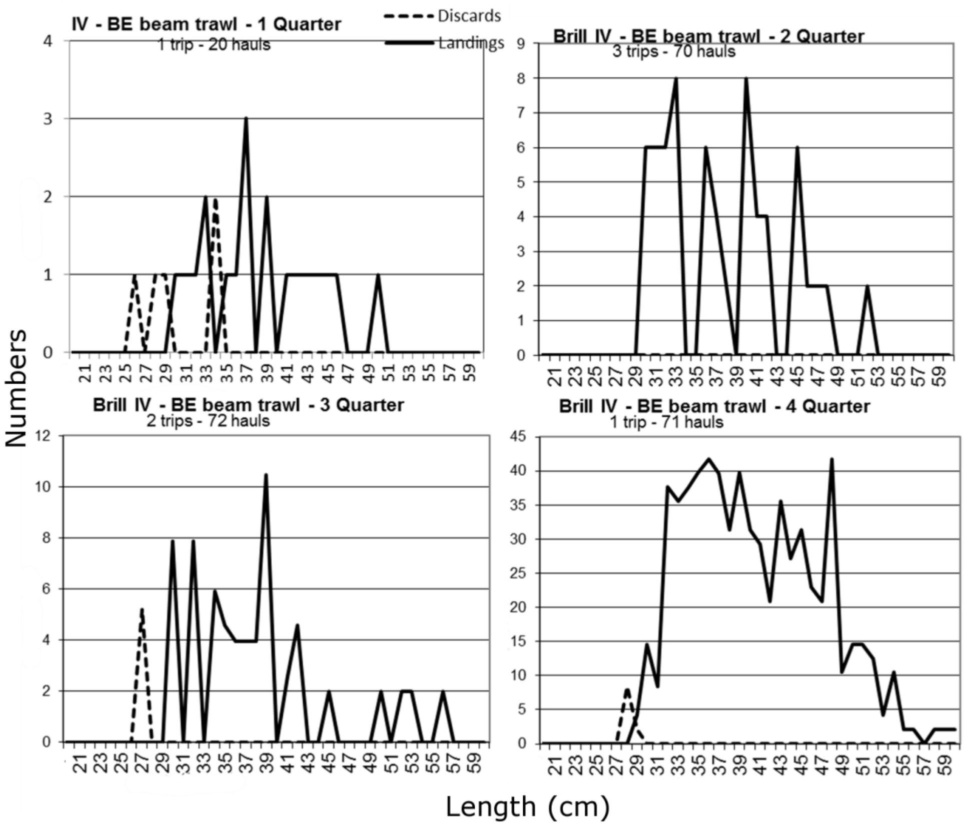

Figure 2.5. Numbers at length of landings and discards of brill *Scophthalmus rhombus* in the Belgian (ILVO) 2012 observer program in the North Sea (IV).

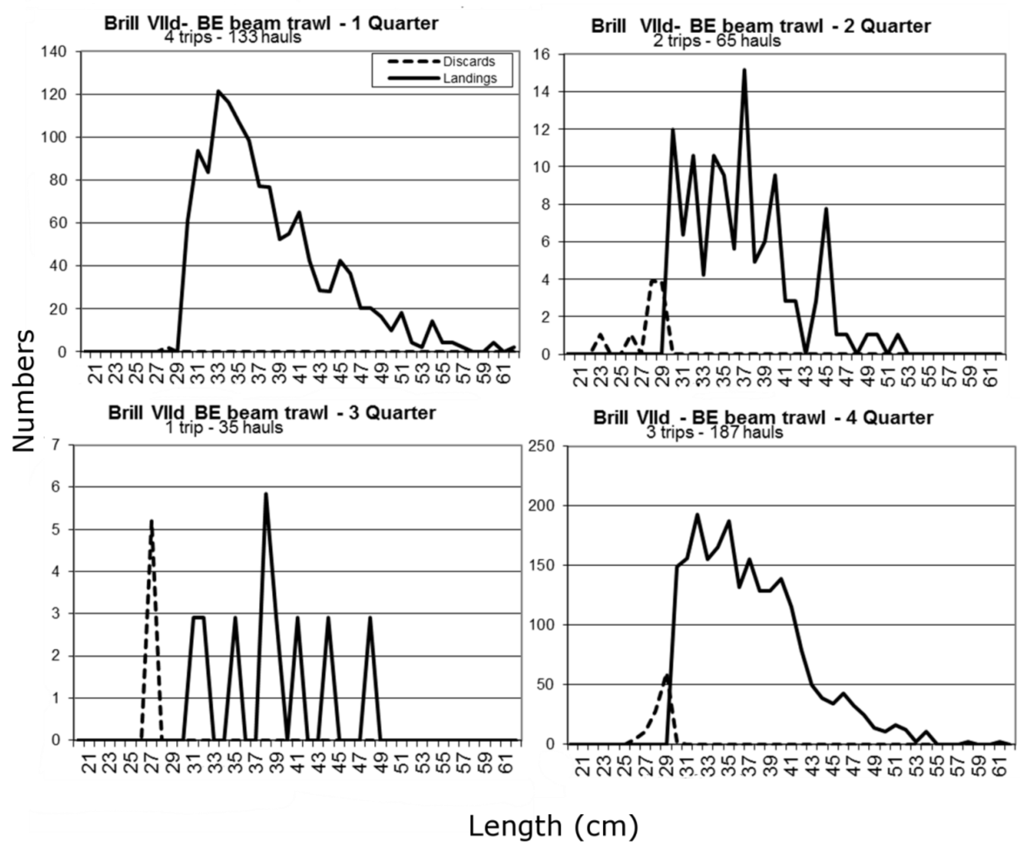

Figure 2.6. Numbers at length of landings and discards of brill in the Belgian (ILVO) 2012 observer program in the Eastern English Channel (VIId).

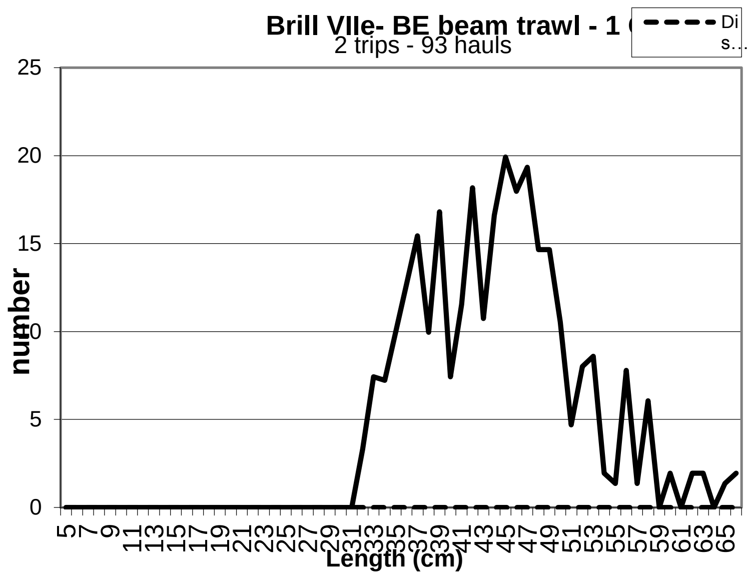

Figure 2.7. Numbers at length of landings and discards of brill in the Belgian (ILVO) 2012 observer program in the Western English Channel (VIIe).

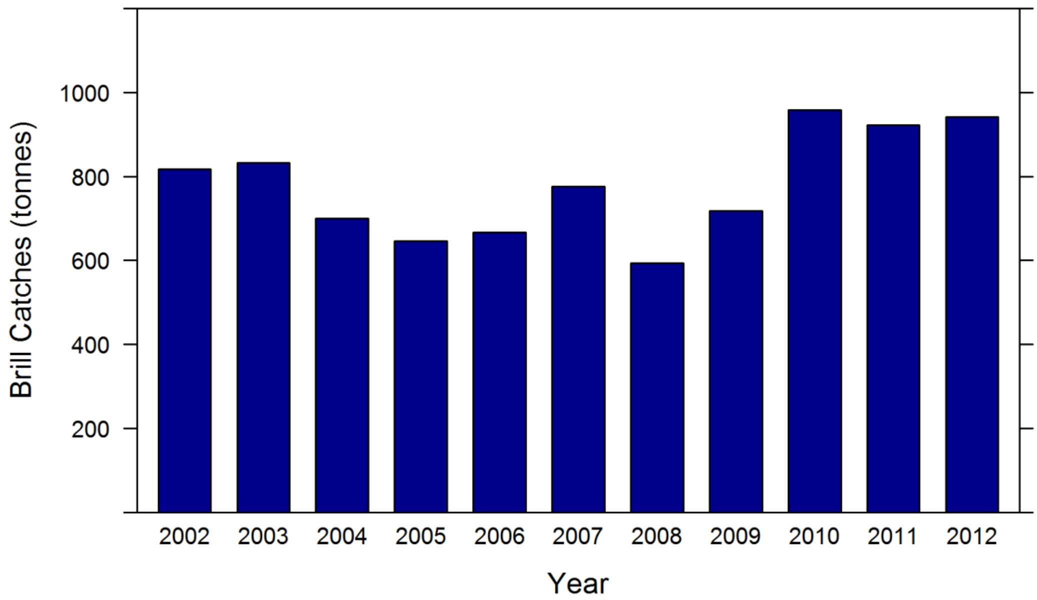

Figure 2.8. Landings (tonnes) of brill *Scophthalmus rhombus* by the Dutch beam trawl fleet > 221 kW over the period 2002-2012, Subarea IV.

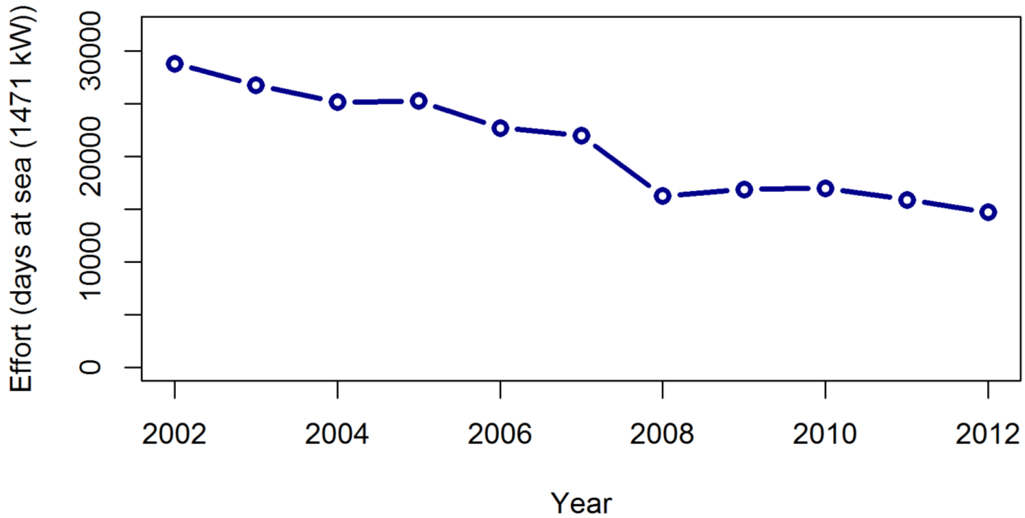

Figure 2.9. Effort (days at sea) of brill *Scophthalmus rhombus* for the Dutch beam trawl fleet > 221 kW over the period 2002-2012, Subarea IV.

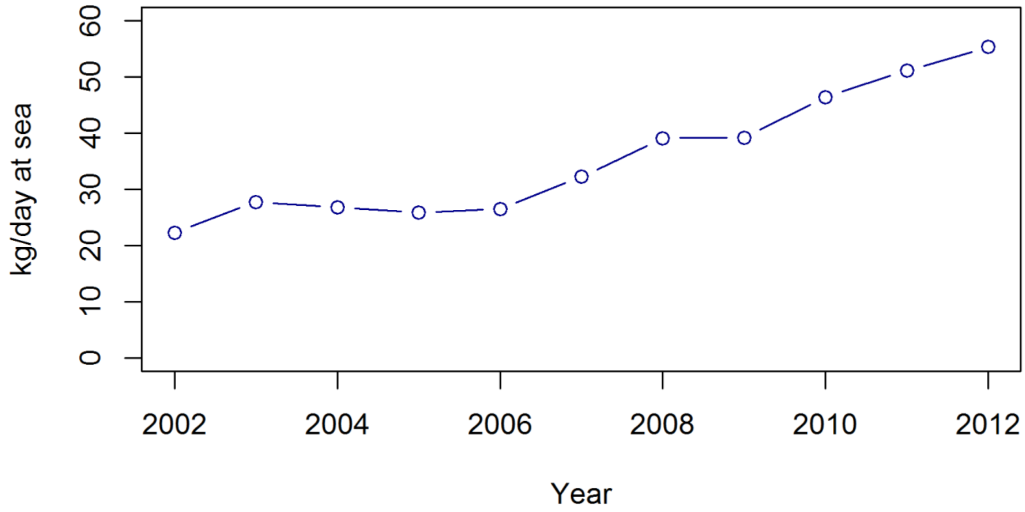

Figure 2.10. Corrected effort (kg/day at sea) of brill *Scophthalmus rhombus* for the Dutch beam trawl fleet > 221 kW over the period 2002-2012, Subarea IV.

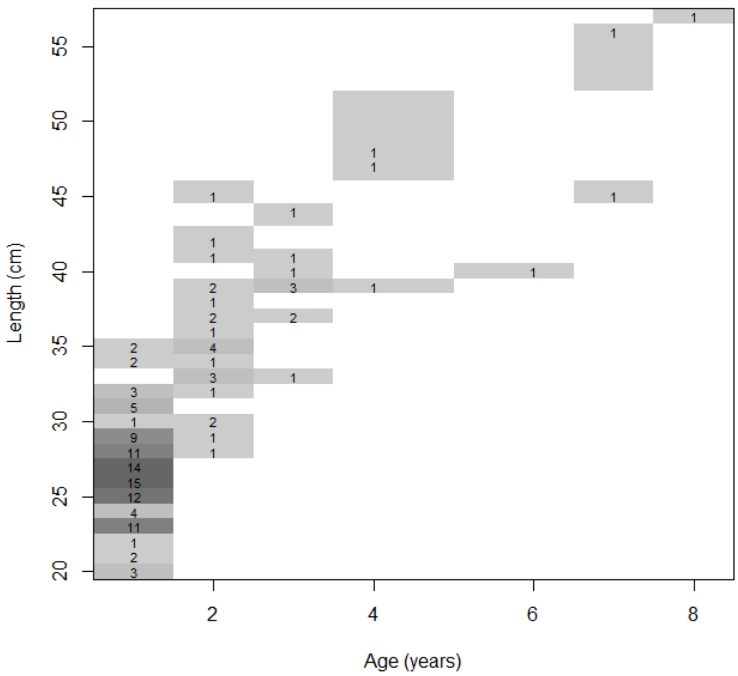

Figure. 2.11. ALK of brill *Scophthalmus rhombus* derived from the catches of BTS_ISI_Q3 in the North Sea (IV).

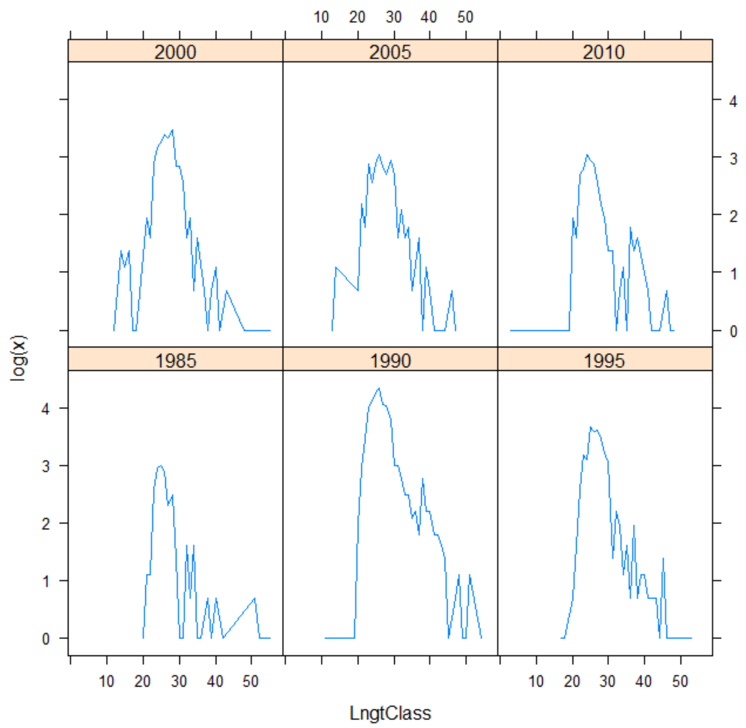

Figure. 2.12. Length distributions of brill *Scophthalmus rhombus* caught by BTS_ISI_Q3 in the North Sea (IV).

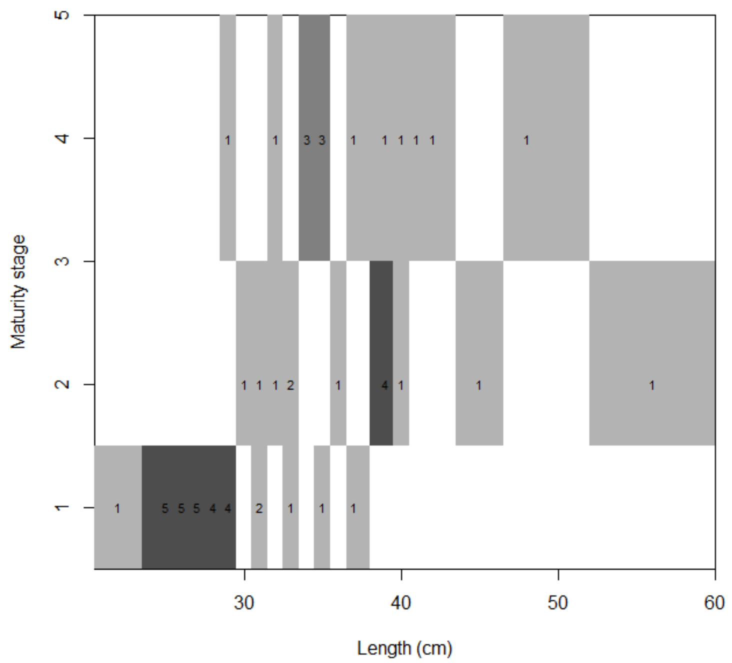

Figure. 2.13. Length at maturity of brill *Scophthalmus rhombus* derived from the catches of BTS_ISI_Q3 in the North Sea (IV).

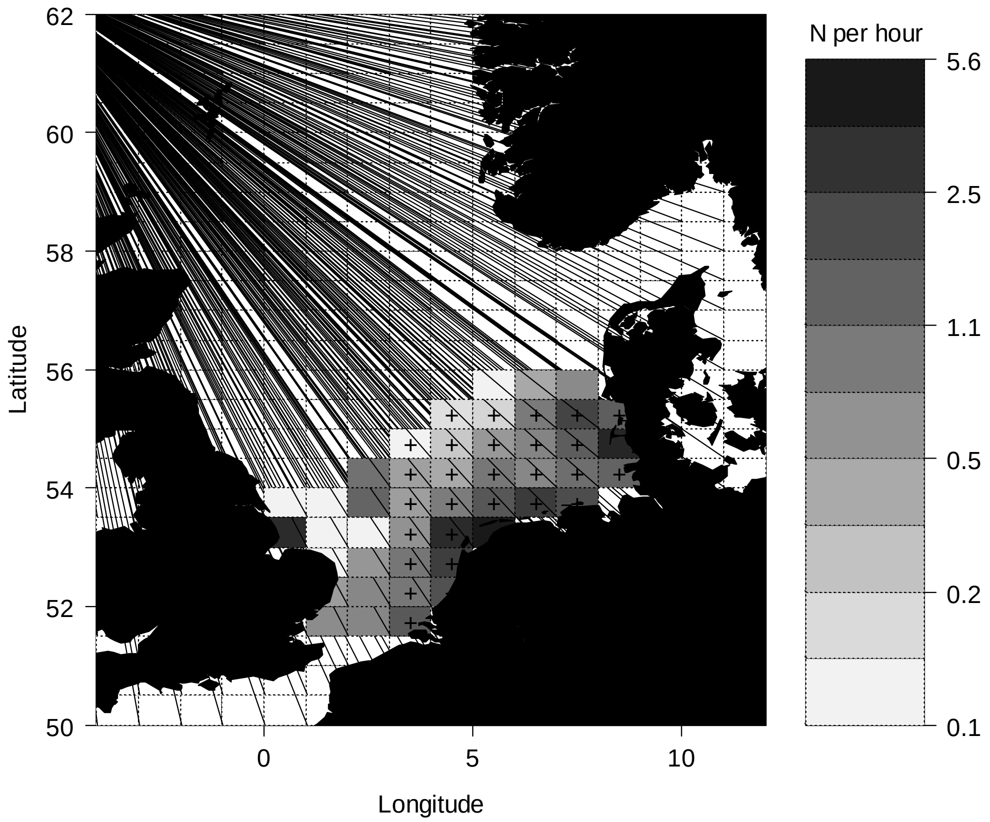

Figure. 2.14. Numbers of brill caught per hour and rectangle by BTS_ISI_Q3 in the North Sea (IV).

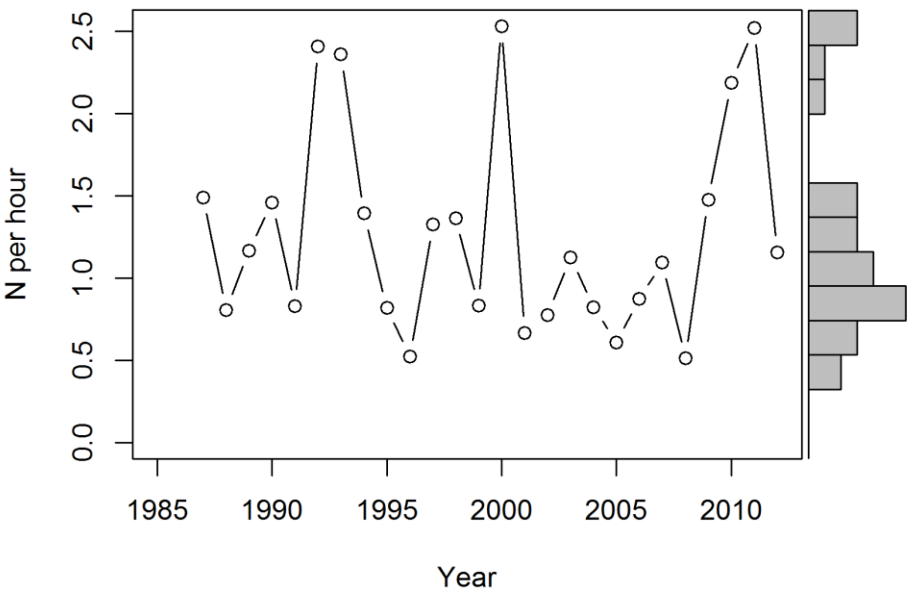

Figure. 2.15. Numbers of brill *Scophthalmus rhombus* caught per hour by BTS_ISI_Q3 in the North Sea (IV).

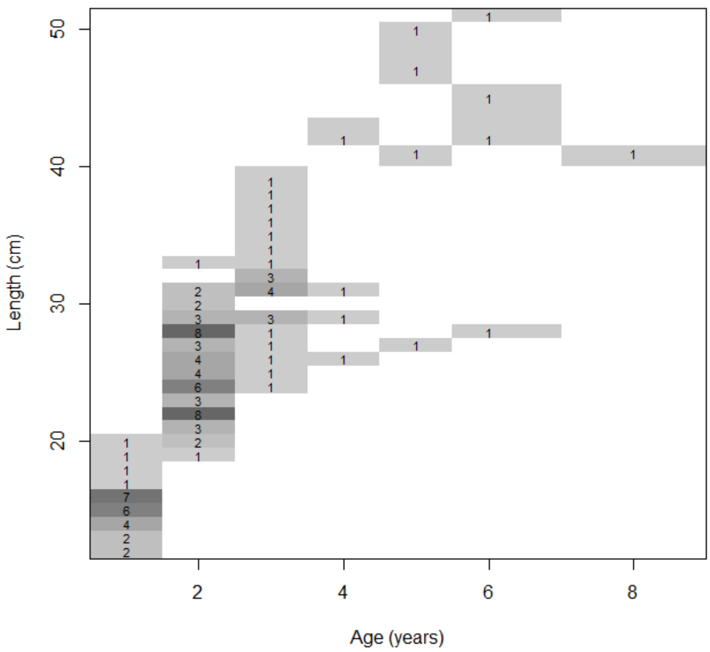

Fig. 2.16. ALK of brill *Scophthalmus rhombus* derived from the catches of BITS_HAF_Q1&4 in the Kattegat (IIIaS).

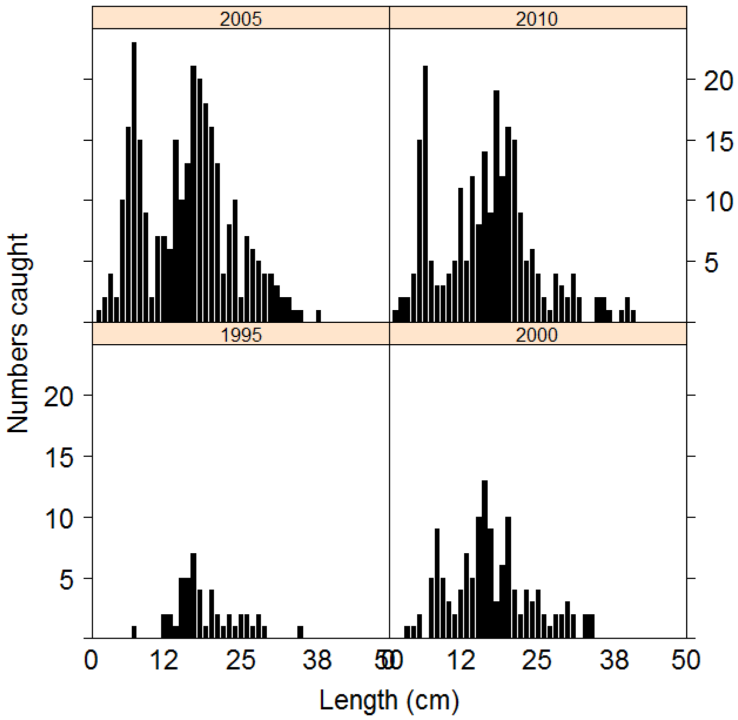

Fig. 2.17. Length distributions of brill *Scophthalmus rhombus* caught by BITS_HAF_Q1&4 in the Kattegat (IIIaS).

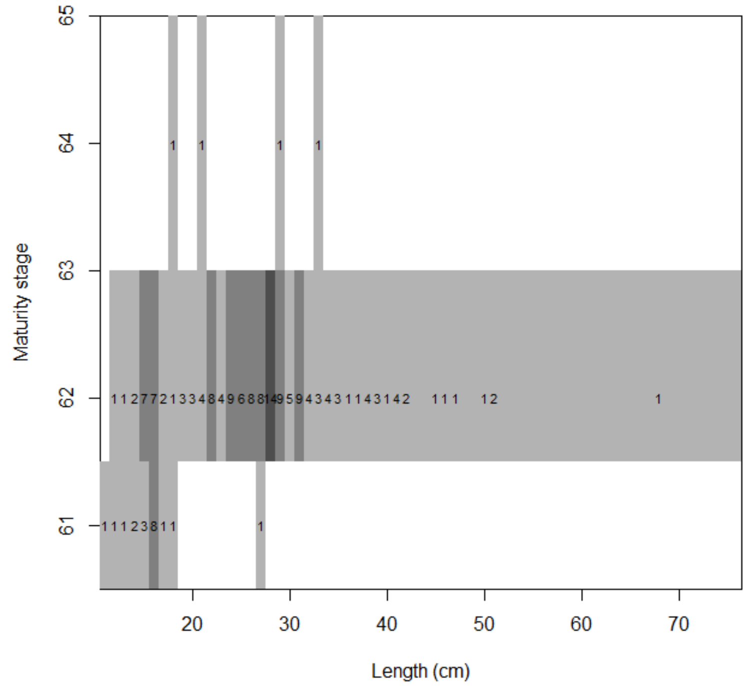

Fig. 2.18. Length at maturity of brill *Scophthalmus rhombus* derived from the catches of BITS_HAF_Q1&4 in the Kattegat (IIIaS).

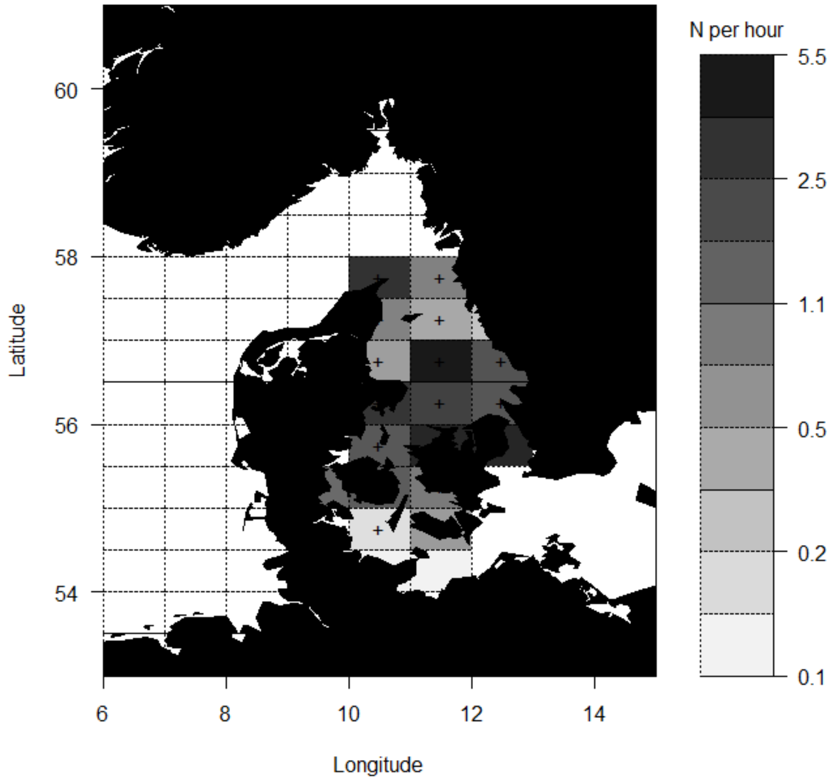

Fig. 2.19. Numbers of brill *Scophthalmus rhombus* caught per hour and rectangle by BITS_HAF_Q1&4 in the Kattegat (IIIaS).

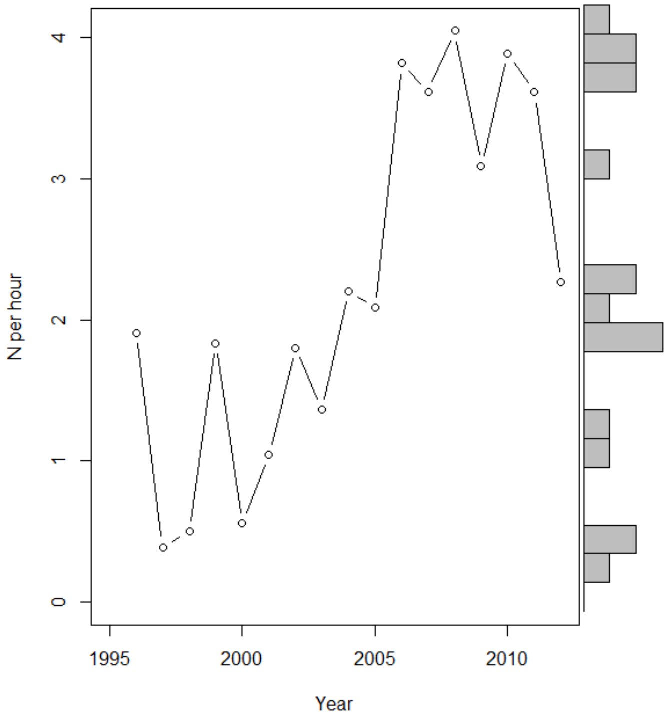

Figure. 2.20. Numbers of brill *Scophthalmus rhombus* caught per hour by BITS_HAF_Q1&4 in the Kattegat (IIIaS).

3 Dab

3.1 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 3-1)).

Spawning, pelagic development and settlement of postlarvae all occur within the spawning ground (Bohl 1959). Settled 0-group specimens migrate to nearby nursery grounds (Bolle et al. 1994). Recruitment success in terms of 0-group abundance in autumn is negatively related to spring water temperature (Henderson 1998). The 0-group shows a general preference for sheltered areas, but not for particular depth or salinity zones (Riley et al. 1981). Correspondingly, dab appears to be 'euyhaline' and 'eurytherme' (Bohl 1959; Henderson and Holmes 1991).

Dab is one of the most abundant species in the North Sea (Daan et al. 1990).

3.2 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, no further scientific evidence is available.

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

3.3 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.

3.4 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 3-2). In recent years landings in area IV and area IIIa decreased (Figure 3-2 and Figure 3-3). The main fishing gear in the North Sea is the beam trawl with mesh sizes between 80 and 100mm. In the Baltic the otter trawl is used with mesh sizes >100mm.

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 (e.g. van Helmond et al. 2012, Table 3-4).

3.5 Survey data, recruit series

Surveys providing information on distribution, abundance and length frequency for dab are the International Bottom Trawl Survey (IBTS) in quarter 1 and quarter 3 (Figure 1-4), the Beam Trawl Surveys (BTS) in quarter 3 (Figure 3-5; Figure 3-6) and the Baltic International Trawl Survey (BITS) in area IIIa (Figure 3-7). Length frequencies for the Dutch BTS in the North Sea are given in Figure 3-8. In some years a recruiting year class can clearly be seen. Age readings are available for several years for all surveys (Figure 3-9).

3.6 Biological sampling

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

Germany collects dab data on age and length by sex routinely during the Beam Trawl Survey (BTS). Age reading started in 1997 with BTS. Age readings are available from samples taken on board commercial vessels since 2007 also.

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.

3.7 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).

3.8 Analyses of stock trends and potential status indicators

High abundances can be found in the southeast North Sea along the German and Dutch coast, in the centre of the North Sea in the Doggerbank area and in the Kattegat. For the North Sea (area IV) the IBTS survey indices indicate that population size has increased in the long term and had a considerably high level in recent years (Figure 12-4). IBTS methodology was fully standardized since 1983, therefore indices before this year should be interpreted with caution. Similarly, the BITS abundance indices in area IIIa (Kattegat) increased since 1990. Highest abundance indices were recorded by the Dutch ISIS BTS (area IV) at the end of the 1980ies with an overall decreasing trend until 2004, with some higher records during the end of the 1990ies. Since 2005 the abundance index was increasing again which is corroborated by the BTS Tridens index.

Length composition has been relatively stable over the years (Figure 3-8). Age 1 and age 2 dab are most abundant.

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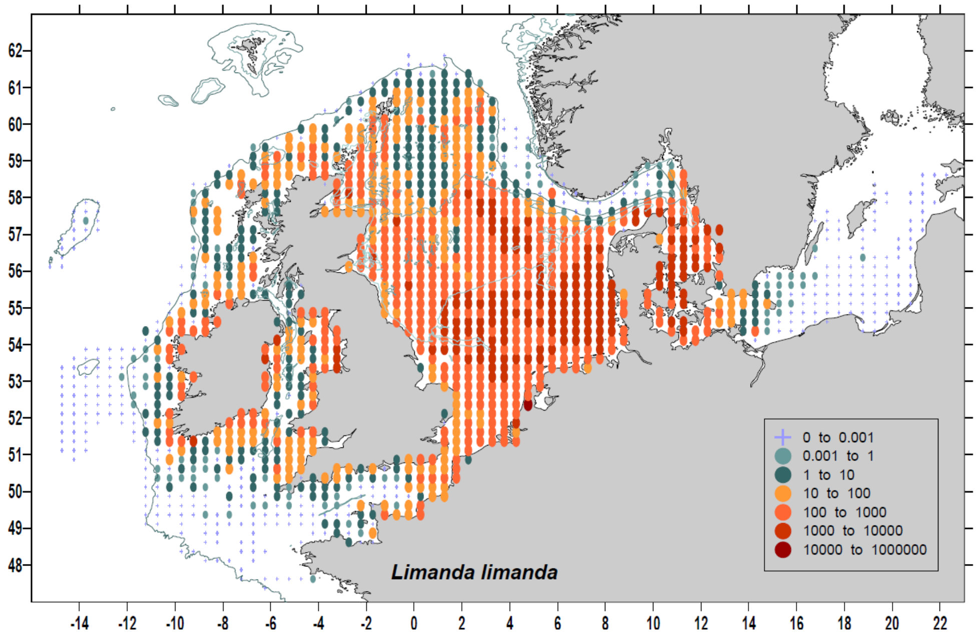

Figure 3-1: Spatial distribution of CPUE of dab in different trawl surveys. Taken from WD1 to WGNEW 2012 (Heesen, Ellis, and Daan).

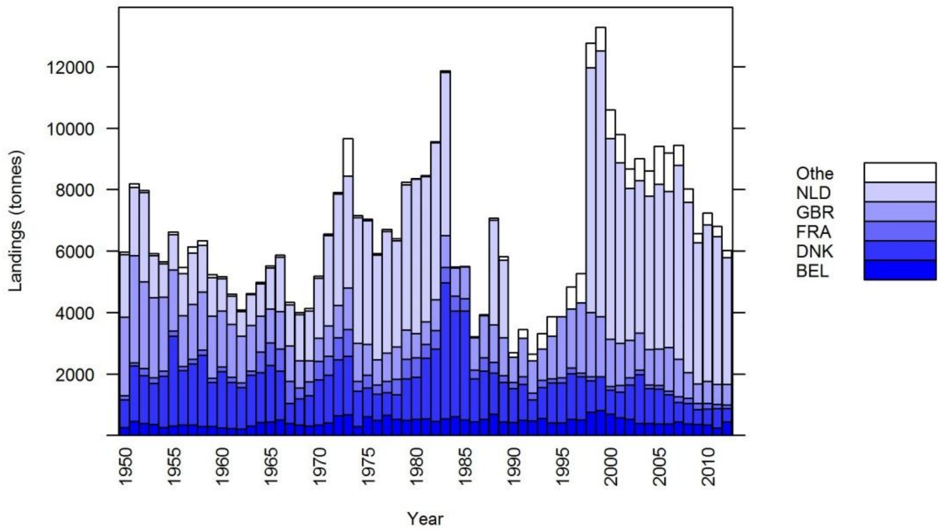

Figure 3-2. Dab landings in ICES IV by country. The period 1984- 1997 is characterized by lacking Dutch data.

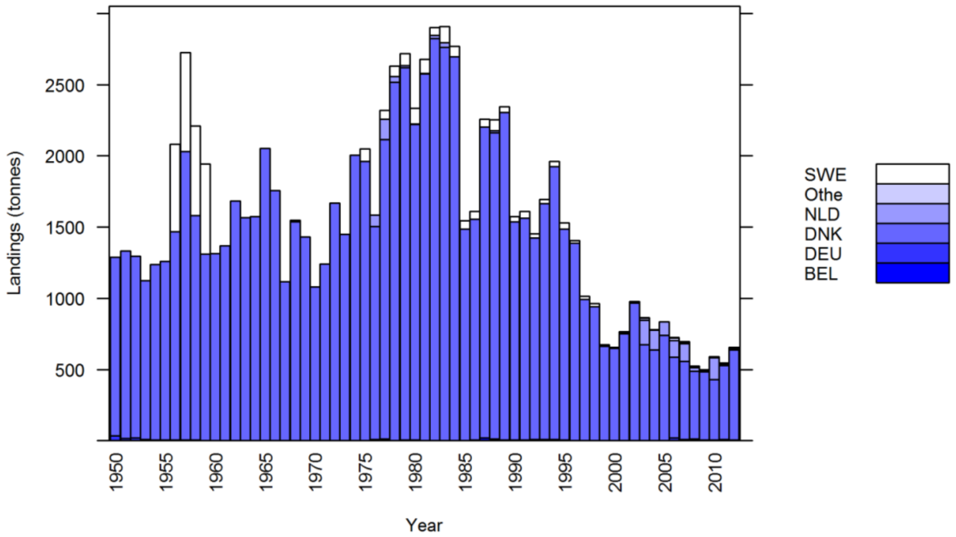

Figure 3-3. Dab landings in ICES IIIa by country. The period 1984- 1997 is characterized by lacking Dutch data.

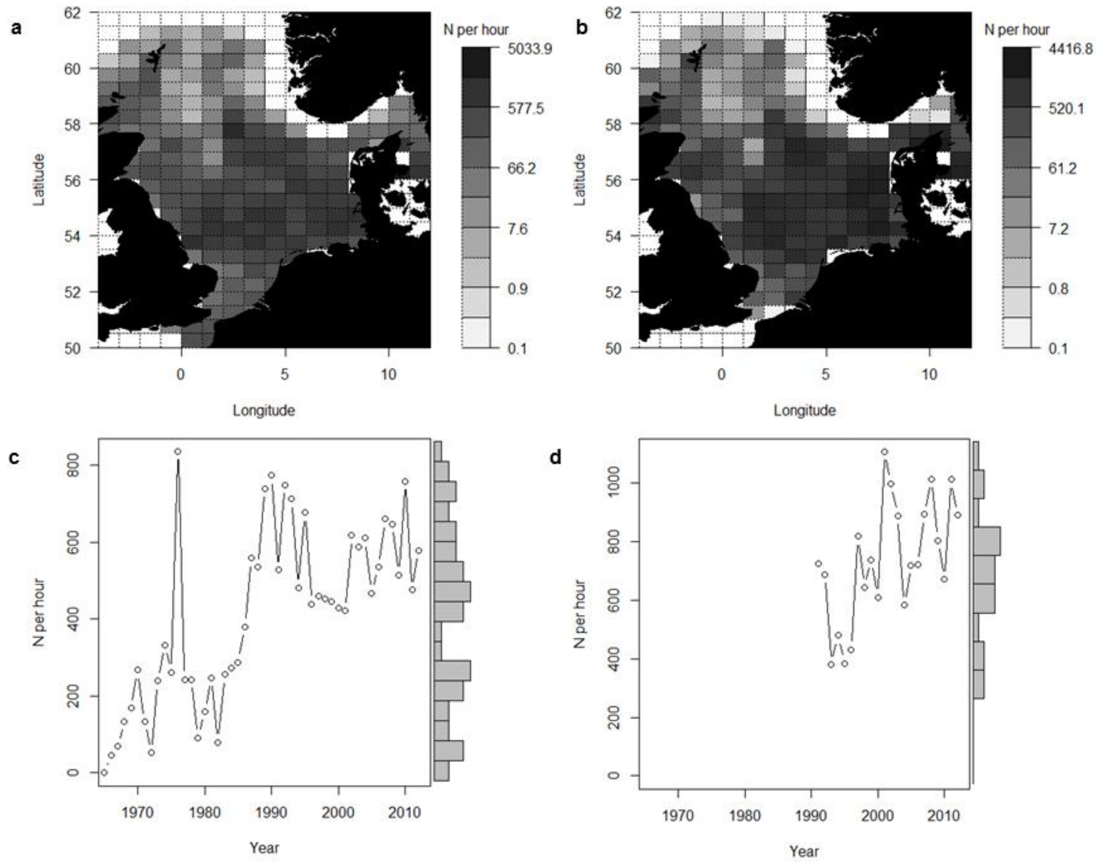

Figure 3-4: IBTS q1(a, c) and q3 (b, d) abundance indices in IV for common dab.

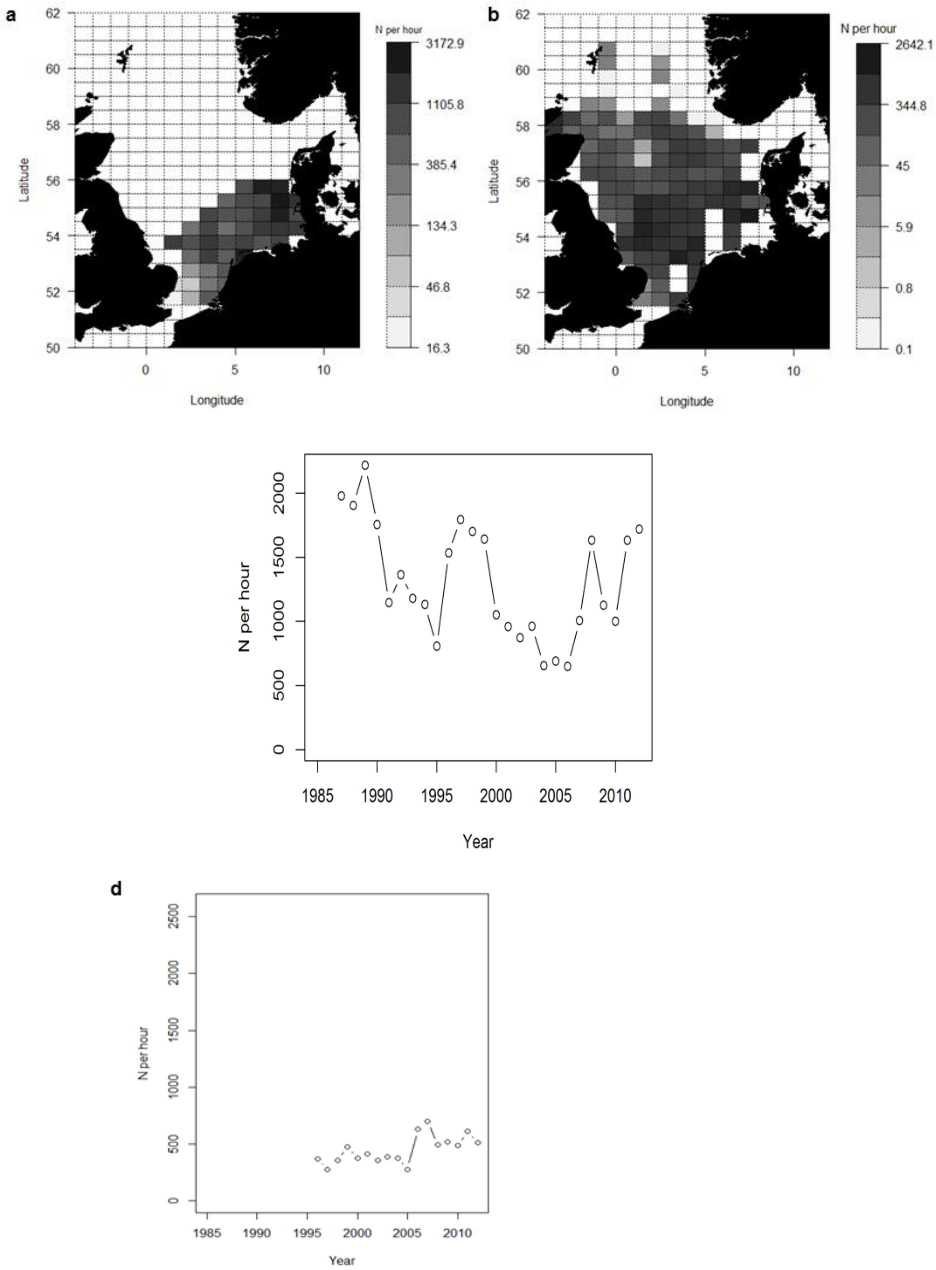

Figure 3-5: CPUE BTS q3 RV "Isis" (left) and RV "Tridens" (right) in IV for common dab.

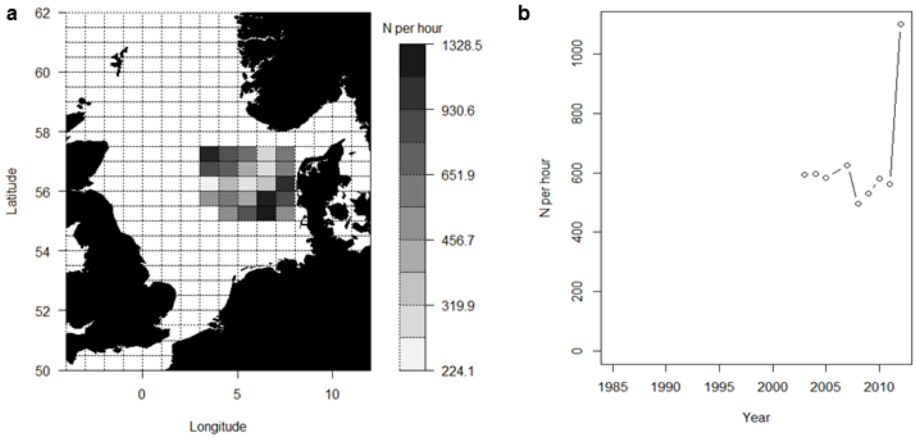

Figure 3-6: CPUE BTS q3 RV "Solea" in IV for common dab.

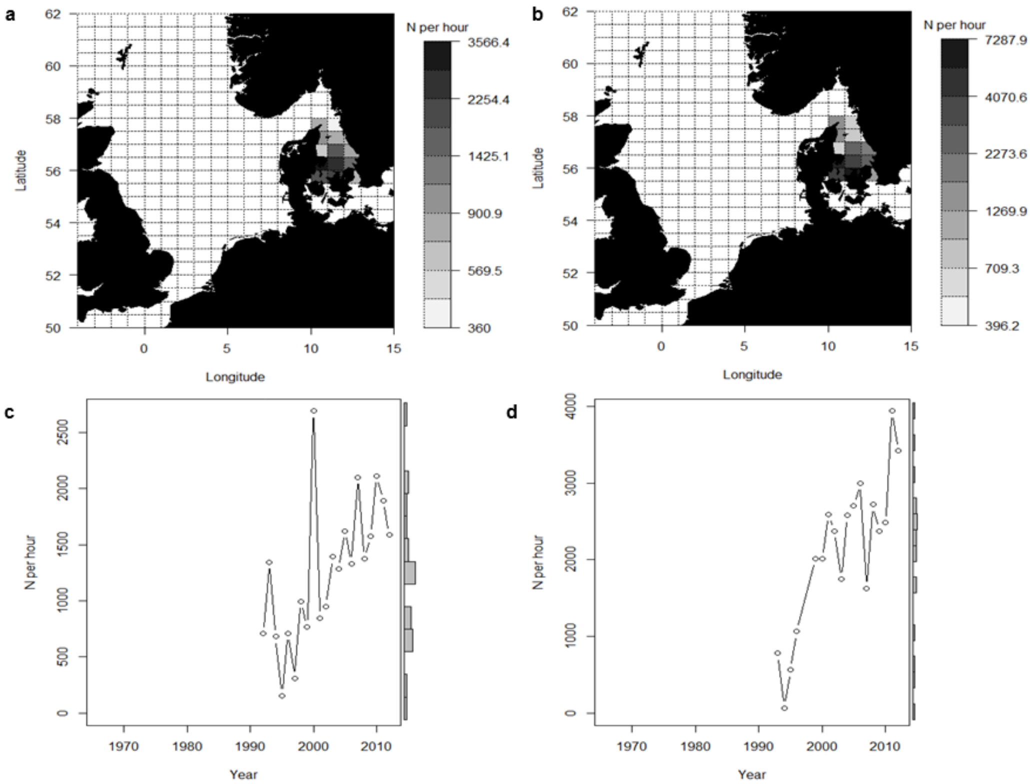

Figure 3-7: CPUE BITS q1 (a, c) and q4 (b, d) in IIIa (Kattegat) for common dab

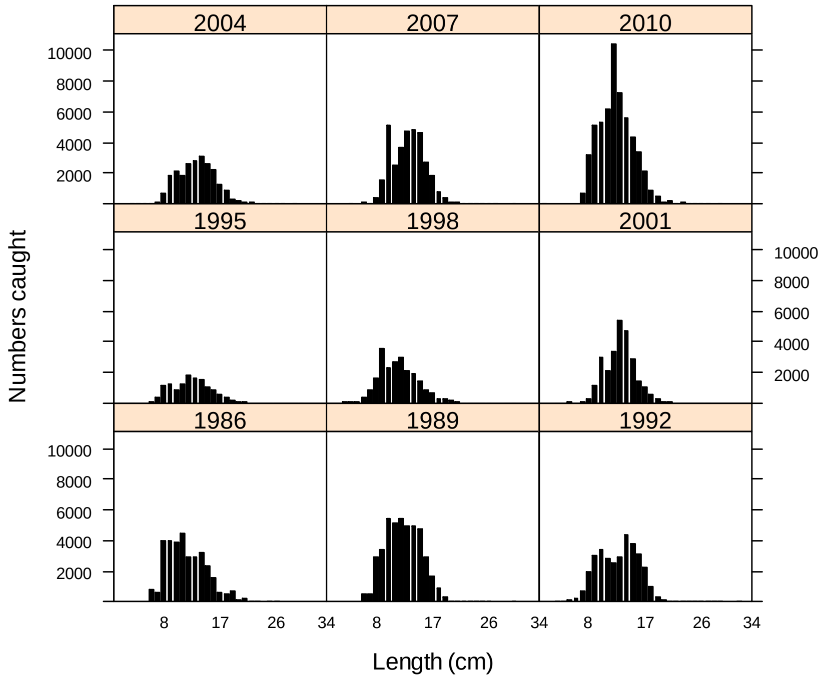

Figure 3-8: Length-frequency distribution (LFD) of common dab from the Dutch BTS (RV Isis), ICES area IVb. Data are grouped for three year intervals.

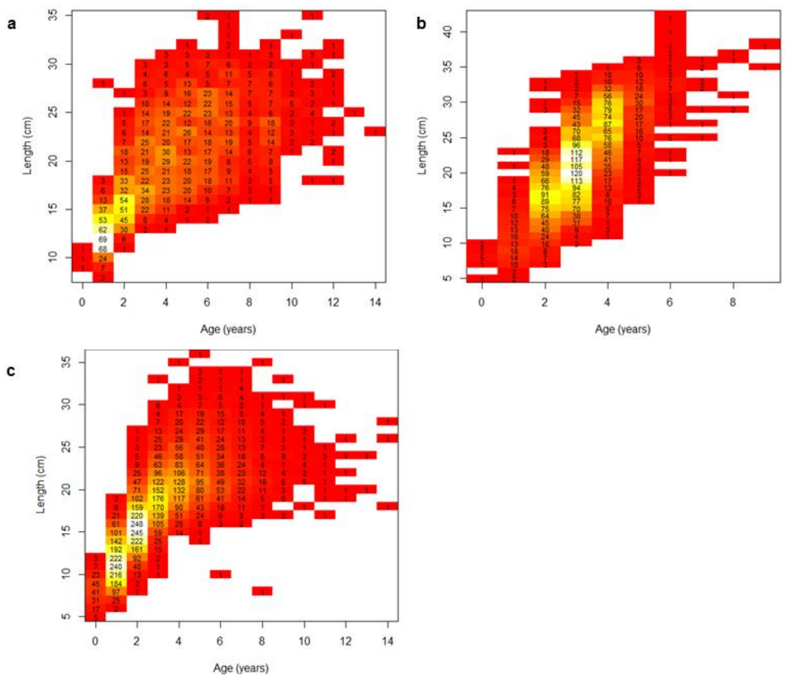

Fig. 3-9: Age-Length keys for common dab from the Dutch BTS q3 (a), the BITS q1 (b) and the German BTS q3 (c).

Table. 3-1: Landings (t) of common dab by country in area IV.

Year	BEL	DEU	DNK	FRA	FRO	GBR	NLD	NOR	SWE	Total
1950	254	92	900	139	0	2555	2031	0	0	5971
1951	462	114	1800	90	0	3503	2221	0	0	8190
1952	386	74	1562	227	0	2823	2904	0	0	7976
1953	357	58	1337	189	0	2591	1383	0	0	5915
1954	255	62	1666	177	0	2393	1099	0	0	5652
1955	305	92	2923	161	0	1993	1149	0	0	6623
1956	338	99	1766	138	0	1660	1368	0	99	5468
1957	336	73	1983	154	0	1785	1669	0	127	6127
1958	290	71	2320	175	0	1885	1517	0	84	6342
1959	285	93	1433	146	0	2011	1265	0	6	5239
1960	246	70	1833	154	0	1813	1052	0	0	5168
1961	227	67	1497	161	0	1734	916	0	0	4602
1962	205	54	1357	147	0	1524	795	0	0	4082
1963	306	40	1660	128	0	1481	1000	0	0	4615
1964	424	48	1612	672	0	1177	1049	0	0	4982
1965	432	64	1841	734	0	1099	1349	0	0	5519
1966	507	65	1589	719	0	1215	1767	0	0	5862
1967	384	77	659	716	0	1147	1341	0	0	4324
1968	334	57	861	350	0	877	1516	0	0	3995
1969	302	69	984	448	0	689	1630	0	0	4122
1970	338	71	1476	588	0	752	1958	0	0	5183
1971	409	46	1546	618	0	986	2941	0	0	6546
1972	638	46	1816	727	0	1057	3617	0	0	7901
1973	678	41	1899	873	0	1349	3638	1179	0	9657
1974	281	59	1168	310	0	1227	4101	0	0	7146
1975	600	45	944	418	0	992	4031	0	3	7033
1976	489	52	852	306	0	816	3402	0	0	5917
1977	652	70	743	371	0	907	3959	0	0	6702
1978	520	64	799	513	0	1038	3473	0	0	6407
1979	484	87	1366	630	0	951	4724	0	1	8243
1980	518	24	1376	639	0	777	5023	0	0	8357
1981	542	31	1968	447	0	737	4729	0	0	8454
1982	460	42	2356	594	0	1002	5111	0	0	9565
1983	541	49	4428	495	0	1034	5318	0	0	11865
1984	603	35	3438	486	0	920	0	0	0	5482
1985	509	24	3535	404	0	1030	0	0	0	5502
1986	445	34	1400	289	0	1036	0	0	1	3205
1987	514	36	1574	434	0	1373	0	0	0	3931
1988	697	72	1324	349	0	1221	3404	0	0	7067
1989	443	117	1280	223	0	1232	2521	0	0	5816
1990	416	162	1103	214	0	802	0	0	4	2701
1991	491	290	1160	258	0	1249	0	0	0	3448
1992	464	218	699	217	0	1049	0	0	0	2647
1993	548	493	1016	235	0	1017	0	0	0	3309
1994	397	626	1307	133	0	1398	0	0	0	3861
1995	410	0	1306	155	1	1993	0	0	0	3865
1996	527	718	1484	177	0	1928	0	0	0	4834
1997	507	945	1399	124	0	2284	0	0	0	5259
1998	757	796	1024	126	0	2085	7971	0	0	12759
1999	802	758	1101	0	0	1964	8651	0	0	13276
2000	684	892	785	124	0	1534	6527	49	0	10595
2001	575	878	839	206	0	1368	5886	47	0	9799
2002	516	582	1126	228	0	1224	4951	51	0	8678
2003	396	642	1580	154	0	1204	4955	77	0	9008
2004	382	767	1136	121	0	1158	4989	55	0	8608
2005	372	1105	1128	121	0	1193	5352	131	0	9402
2006	369	1149	949	130	0	1415	5071	107	0	9190
2007	436	526	634	195	0	1212	6313	118	0	9434
2008	371	375	670	161	0	847	5544	61	0	8029
2009	349	262	489	196	0	648	4588	29	0	6561
2010	337	365	523	178	0	724	5097	16	0	7240
2011	243	312	622	149	0	645	4808	29	0	6808
2012	446	252	421	126	0	665	4130	41	0	6019

Table. 3-2: Landings (t) of common dab by country for area IIIa.

YEAR	BEL	DEU	DNK	FRA	NLD	NOR	SWE	Totals
1950	0	34	1253	0	0	0	0	1287
1951	0	17	1315	0	0	0	0	1332
1952	0	21	1273	0	0	0	0	1294
1953	0	9	1114	0	0	0	0	1123
1954	0	4	1233	0	0	0	0	1237
1955	0	3	1254	0	0	0	0	1257
1956	0	5	1462	0	0	0	614	2081
1957	0	5	2025	0	0	0	694	2724
1958	0	4	1578	0	0	0	628	2210
1959	0	2	1307	0	0	0	634	1943
1960	0	1	1313	0	0	0	0	1314
1961	0	0	1367	0	0	0	0	1367
1962	0	2	1681	0	0	0	0	1683
1963	0	0	1565	0	0	0	0	1565
1964	0	1	1574	0	0	0	0	1575
1965	0	1	2051	0	0	0	0	2052
1966	0	0	1755	0	0	0	0	1755
1967	0	0	1115	0	0	0	0	1115
1968	0	0	1535	13	0	0	0	1548
1969	0	0	1430	0	0	0	0	1430
1970	0	0	1079	0	0	0	0	1079
1971	0	0	1242	0	0	0	0	1242
1972	0	0	1669	0	0	0	0	1669
1973	0	0	1449	0	0	0	0	1449
1974	0	0	2003	0	0	0	0	2003
1975	0	0	1959	0	2	0	88	2049
1976	10	0	1493	0	80	0	0	1583
1977	11	0	2105	0	142	0	60	2318
1978	2	0	2515	0	39	0	74	2630
1979	3	0	2616	0	15	0	82	2716
1980	3	0	2218	0	3	0	109	2333
1981	0	0	2574	0	5	0	100	2679
1982	1	0	2823	0	22	0	56	2902
1983	1	0	2759	0	34	0	112	2906
1984	0	0	2695	0	0	0	74	2769
1985	1	0	1486	0	0	0	58	1545
1986	5	0	1551	0	0	0	52	1608
1987	19	0	2182	0	0	0	57	2258
1988	13	0	2150	0	15	0	76	2254
1989	4	0	2302	0	0	0	40	2346
1990	3	0	1535	0	0	0	36	1574
1991	5	1	1556	0	0	0	47	1609
1992	10	0	1412	0	0	0	32	1454
1993	7	0	1656	0	0	0	32	1695
1994	9	0	1917	0	0	0	35	1961
1995	3	0	1482	0	0	0	45	1530
2 1996	0	0	1387	0	0	0	18	1405
3 1997	0	0	990	0	0	0	22	1012
4 1998	0	0	942	0	0	0	19	961
5 1999	0	0	661	0	0	0	12	673
6 2000	0	0	647	0	0	1	6	654
7 2001	0	0	751	0	0	7	7	765
8 2002	0	0	968	0	0	3	6	977
9 2003	0	0	674	0	173	14	4	865
0 2004	0	0	637	0	138	1	3	779
1 2005	0	0	738	0	95	0	3	836
2006	0	20	566	0	117	18	4	725
2007	0	9	547	0	126	3	9	694
2008	0	12	475	0	26	2	7	522
2009	0	4	478	0	3	1	12	498
2010	0	4	426	0	151	0	8	589
2011	0	10	517	0	0	11	7	545
2012	0	5	633	0	0	10	6	654

Table. 3-3: CPUE in N per hour for different surveys in the North Sea (IBTS, BTS) and Kattegat (BITS)

Year	IBTS q1	BITS q1	BTS ISIS q3	BTS Tridens q3	BTS Solea q3
1966	45.6				
1967	68.7				
1968	134.6				
1969	168.3				
1970	267.4				
1971	133.3				
1972	52.7				
1973	239.0				
1974	333.1				
1975	262.4				
1976	837.0				
1977	242.2				
1978	242.6				
1979	91.4				
1980	159.7				
1981	247.3				
1982	79.2				
1983	255.4				
1984	272.5				
1985	287.6		858.1		
1986	380.0		1062.1		
1987	559.5		1980.5		
1988	535.0		1905.9		
1989	739.7		2216.8		
1990	773.7		1755.1		
1991	528.2		1148.0		
1992	749.1	708.0	1365.2		
1993	712.5	1342.5	1180.2		
1994	482.1	682.0	1132.3		
1995	677.4	157.0	806.9		
1996	439.6	711.7	1534.2	357.9	
1997	458.9	310.2	1795.4	268.9	
1998	453.7	994.6	1702.8	346.4	
1999	446.3	767.8	1640.8	445.2	
2000	429.2	2689.6	1051.9	373.5	
2001	421.9	846.5	960.4	393.9	
2002	618.5	949.3	872.0	325.7	
2003	587.9	1393.1	961.7	326.5	595.1
2004	610.7	1283.5	655.5	326.1	597.3
2005	468.2	1621.0	691.2	258.9	583.1
2006	535.7	1329.4	648.7	577.9	
2007	661.0	2098.4	1007.5	604.5	626.8
2008	647.5	1374.2	1634.1	560.0	496.3
2009	514.9	1576.2	1125.6	541.1	529.6
2010	759.3	2112.7	1002.5	518.8	581.4
2011	476.1	1890.9	1632.9	620.5	562.8
2012	578.8	1584.7	1719.7	490.6	1100.5

Table. 3-4: Average weights (kg) and numbers per hour of landed (L) and discarded (D) dab (DAB) in the beam-trawl fisheries (TBB_DEF_70-99mm_>300hp) between 1976 and 2011. Nm: not measured; n/a: not available. From van Helmond et al. 2012.

		Numbers			Weight		
Year/Period	N trips	L	D	%D	L	D	%D
1976-1979	21	12	917	99%	4	65	95%
1980-1983	24	31	796	96%	7	60	90%
1989-1990	6	15	2147	99%	2	123	98%
1999	3	112	1411	93%	13	106	89%
2000	12	58	951	97%	6	49	89%
2001	4	125	2268	95%	12	97	89%
2002	6	92	934	91%	11	57	84%
2003	9	60	1166	95%	8	64	89%
2004	8	54	1037	95%	7	51	87%
2005	8	25	492	95%	6	52	90%
2006	9	46	2335	98%	9	79	90%
2007	10	81	1196	94%	12	62	83%
2008	10	51	905	95%	8	49	87%
2009	48	31	1221	98%	33	62	65%
2010	74	48	11778	96%	10	65	87%
2011	67	Nm	1350	n/a	12	74	86%

4 Flounder in IV and IIIa

4.1 General biology

Flounder (*Platichthys flesus*) is a euryhaline flatfish: the life cycle of each individual usually includes marine, brackish, and freshwater habitats. It has a coastal distribution in the Northeast Atlantic, ranging from the White Sea and the Baltic in the north, to the Mediterranean and Black Sea in the south (Whitehead *et al.* 1986). In the North Sea flounder is mainly found in the southeastern part and in lower abundance off the eastern UK coast. Flounder can live in low salinity water but they reproduce in water of higher salinity. In the North Sea, Skagerrak and Kattegat flounder spawn between February and April.

Flounder settle at a size of 8-10 mm. The bottom-living stages appear by the end of April in brackish water near river mouths. The juveniles either stay in the brackish environment or migrate further up the rivers.

During autumn, both mature and immature flounder withdraw from the inshore and estuarine feeding areas. The immatures migrate into coastal areas, where they spend the winter. The adults move further offshore to the 25 – 40 m deep spawning grounds, the most important of which are situated along the coasts of Belgium, the Netherlands, Germany, and Denmark. An area of potential importance for spawning is the eastern part of the English Channel, while small areas off the English and Scottish coasts are probably of minor significance (Rijnsdorp & Vethaak 1989).

4.2 Stock identity and possible assessment areas

There is no information about stock identity and possible stock assessment areas in the North Sea, Skagerrak and Kattegat. Within the North Sea there may exist a number of sub-populations.

4.3 Management regulations

There is no minimum landing size for this species in EC waters.

In the EC waters of area IIIa and IV there is a combined TAC for flounder and dab. Since 2006 this TAC was:

2006	17,100 t
2007	17,100 t
2008	18,810 t
2009	18,810 t
2010	18,810 t
2011	18,434 t
2012	18,434 t
2013	18,434 t

4.4 Fisheries data

In the North Sea and in Skagerrak-Kattegat flounder is mainly a by-catch in the fishery for commercially more important flatfish such as sole and plaice and in the mixed demersal fisheries. Landings in ICES Division IIIa and IV by country are shown in Figures 4.1 and 4.2 and in Tables 4.1 and 4.2. From Figure 4.1 it can be seen that the landings data are not complete: there is a gap in Dutch landings data from 1984 to 1997.

Since 1950, annual landings form the North Sea have fluctuated, without a clear pattern (Figure 4.1). In the last years, landings seem to decline. In area IIIa, annual landings have been fluctuating from 2700 t in 1984 to 118 t in 2012 (Figure 4.2). In the beginning of the timeseries the landings seem to be fluctuating without a clear trend, however in last two decennia the trend is declining. Flounder is of relatively little commercial importance in the North Sea and the Kattegat. In the North Sea and the Kattegat the landings data may be misreported in years that quota for commercially more important species are limited. The amount of misreporting however is not known. In addition, the North Sea landings may not reflect the catches very well. Flounder is often discarded and discarding is influenced by the prices and the availability of other, commercially more important species.

Discards from the Dutch discard sampling program from 2009-2011 (van Helmond en Heessen 2010, van Helmond et al. 2011) show that flounder discarding is highest in beamtrawlers with meshsizes between 70-99mm (Table 4.4). Numbers per hour between 2004 and 2011 vary between 1 and 20, with the highest discarding numbers in 2010 and 2011. These absolute numbers are not very high (for comparison, discarding of dab and plaice by beamtrawlers is often > 1000 per hour), however, the ratio between landings and discards is unknown.

4.5 Survey data

Several surveys in the North Sea, Skagerrak and Kattegat provide information on distribution, abundance and length composition of flounder. Most relevant for flounder is probably the International Bottom Trawl Survey IBTS in quarter 1 (Figure 4.5). However, the IBTS Q1 uses a bottom trawl which is not very well suited to catch demersal flatfishes. The BTS surveys use a beamtrawl, but they are carried out in quarter 3, in a time of year in which flounder is usually distributed in more coastal, shallow and brackish waters.

Length frequency distributions for IBTS Q1 and the BTS Q3 are presented in Figures 4.6 and 4.7. Roundfish area 1 and 2 are excluded from the analysis because flounder is as good as absent in these areas.

The IBTS Q1 age length key shows that lengths >20 are mature (Figure 4.3)

Time series of abundance are shown in Figure 4.4. The abundance in area IIIa is much higher than in area IV. Numbers per hour in the IBTS Q1 in area IIIa increased from <1 in 1975 and peaked in 1988 with 163. The abundance of North Sea flounder in the quarter 1 IBTS survey increased slightly between 1980 and 1990, and decreased again. In recent years the abundance seemed to be fluctuating without a clear trend. Abundance in the BTS Q3 peaks in 1991, decreases again and fluctuates without a clear trend in later years.

4.6 Biological sampling

Historically, biological sampling for this species was poor. A summary of the number of samples available is given in WGNEW-2007. In 2009 the Netherlands started the collection of market samples under the DCF. Every year from ~ 900 individuals otoliths and biological data are sampled.

The Netherlands collect biological samples for flounder routinely during a number of flatfish surveys (DFS, SNS and BTS).

4.7 Population biological parameters and other research

Von Bertalanffy growth parameters and length weight parameters were estimated in 2 studies (Table 4.5).

4.8 Analyses of stock trends / assessment

Time series that can be used to describe the state of the flounder in the North Sea are landings, Dutch discard estimates, IBTS Q1 and BTS-isis Q3 abundance and DFS recruitment indices from the Wadden Sea. Landings data are not complete, and are probably not always indicative of catches. In addition, the total number of discards should be estimated. The IBTS1 uses a bottom trawl which is not very well suited to catch demersal flatfishes. The BTS survey(s) are carried out in quarter 3, in a time of year in which flounder is usually distributed in more coastal, shallow and brackish waters. BTS catches are therefore not necessarily a good indicator of the stock size.

4.9 Data requirements

Only the Netherlands collects biological data for flounder in the North Sea under the DCF. For 2009-2012 the sampling level of otoliths from commercial landings was ~ 900. In addition otolith data are being collected during the BTS and DFS surveys. The sampling effort for this species is at a low level (in comparison, for plaice 3840 otoliths are sampled). In order to follow trends in the age structure, an increase in sampling intensity should be considered. In addition, biological data from area IIIa should be collected.

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Table 4.1 Flounder. Landings by country in Division IIIa, as officially reported to ICES.

year	Denmark	Germany	Netherlands	Norway	Sweden	sum
1950	1632	92	0	0	657	2381
1951	1548	88	0	0	759	2395
1952	1161	48	0	0	683	1892
1953	1135	17	0	0	724	1876
1954	1138	13	0	0	528	1679
1955	1265	11	0	0	667	1943
1956	1229	6	0	0	0	1235
1957	1331	12	0	0	0	1343
1958	1099	12	0	0	0	1111
1959	1003	3	0	0	0	1006
1960	875	10	0	0	566	1451
1961	821	9	0	0	442	1272
1962	812	3	0	0	0	815
1963	554	0	0	0	0	554
1964	822	1	0	0	0	823
1965	1016	0	0	0	0	1016
1966	1027	0	0	0	0	1027
1967	811	3	0	0	0	814
1968	808	2	0	0	0	810
1969	721	0	0	0	0	721
1970	667	0	0	0	0	667
1971	611	1	0	0	0	612
1972	365	0	0	0	0	365
1973	346	0	0	0	0	346
1974	1656	2	0	0	0	1658
1975	1377	1	0	0	89	1467
1976	949	2	4	0	144	1099
1977	1036	0	19	0	64	1119
1978	1560	10	14	0	64	1648
1979	1219	0	0	0	100	1319
1980	426	0	0	0	135	561
1981	1831	0	0	0	74	1905
1982	1236	0	0	0	75	1311
1983	2352	0	0	0	160	2512
1984	2463	0	0	0	283	2746
1985	1203	0	0	0	102	1305
1986	1585	0	0	0	166	1751
1987	1050	0	0	0	119	1169
1988	1164	0	0	0	149	1313
1989	996	0	0	0	133	1129
1990	650	1	0	0	57	708
1991	574	0	0	0	50	624
1992	455	0	0	0	52	507
1993	673	3	0	0	67	743
1994	865	1	0	0	77	943
1995	403	19	0	0	76	498
1996	429	9	0	0	104	542
1997	367	2	0	0	68	437
1998	637	5	0	0	83	725
1999	558	6	0	0	24	588
2000	609	17	0	0	30	656
2001	672	2	0	1	30	705
2002	493	0	0	1	30	524
2003	452	3	0	0	18	473
2004	462	2	0	0	14	478
2005	467	0	0	0	15	482
2006	380	0	0	0	13	393
2007	419	3	1	0	22	445
2008	326	4	0	0	16	346
2009	238	2	0	0	33	273
2010	188	0	0	0	17	205
2011	129	0	0	0	16	145
2012	110	0	0	0	8	118

*2012 data is preliminary

Table 4.2 Flounder. Landings by country in Subarea IV, as officially reported to ICES. Dutch data between 1984 and 1997 was not reported correctly and is missing or incomplete.

year	Belgium	Denmark	France	Germany	Netherlands	Norway	UK	Other	sum
1950	67	1514	0	641	937	0	67	241	3467
1951	119	1143	0	329	949	0	81	127	2748
1952	91	1210	0	257	841	0	71	186	2656
1953	270	1372	0	397	886	0	92	203	3220
1954	142	1225	0	281	696	0	71	121	2536
1955	145	1244	0	353	871	0	88	109	2810
1956	132	1389	0	277	1097	0	102	2	2999
1957	81	910	0	250	825	0	112	0	2178
1958	99	784	0	257	1088	0	94	0	2322
1959	62	533	0	424	857	0	79	1	1956
1960	82	614	0	540	733	0	49	8	2026
1961	68	776	0	390	579	0	81	13	1907
1962	37	1146	0	313	717	0	53	2	2268
1963	16	501	0	263	467	0	65	0	1312
1964	30	1141	0	305	563	0	48	6	2093
1965	121	1349	0	248	549	0	54	3	2324
1966	32	946	0	229	573	0	71	2	1853
1967	43	540	0	193	331	0	57	25	1189
1968	75	894	0	152	160	0	43	1	1325
1969	54	582	0	158	161	0	33	0	988
1970	50	316	0	135	405	0	57	0	963
1971	60	685	0	173	297	0	70	0	1285
1972	63	991	0	159	275	0	60	0	1548
1973	63	290	0	172	1424	0	53	0	2002
1974	115	766	0	190	2661	0	58	0	3790
1975	68	437	0	155	2191	0	87	1	2939
1976	94	575	0	209	2077	0	70	54	3079
1977	107	320	0	208	1732	0	127	11	2505
1978	122	203	0	198	1519	0	169	0	2211
1979	129	181	31	275	1260	0	201	0	2077
1980	190	300	33	229	806	0	140	0	1698
1981	164	669	14	200	1068	0	133	0	2248
1982	110	630	31	200	1597	0	121	0	2689
1983	88	564	36	197	2059	0	125	0	3069
1984	272	518	15	103	0	0	122	0	1030
1985	163	379	14	128	0	0	109	0	793
1986	155	456	1	91	0	0	111	0	814
1987	132	394	32	106	0	0	90	0	754
1988	160	509	44	105	682	0	98	0	1598
1989	200	632	28	95	916	0	80	0	1951
1990	153	467	69	147	0	0	45	0	881
1991	260	377	51	902	0	0	69	0	1659
1992	152	492	35	521	0	0	76	0	1276
1993	194	1812	47	356	0	0	136	0	2545
1994	196	642	57	921	0	0	247	0	2063
1995	301	628	103	843	0	0	250	0	2125
1996	262	1439	68	43	0	0	193	0	2005
1997	110	988	10	25	0	0	157	0	1290
1998	283	154	40	13	4938	0	132	0	5560
1999	326	123	0	11	3158	0	54	0	3672
2000	289	100	46	17	2656	5	52	0	3165
2001	241	92	42	4	2608	3	32	0	3022
2002	165	83	51	2	3531	3	55	0	3890
2003	206	94	33	3	3172	9	120	0	3637
2004	335	96	46	5	3720	18	74	0	4294
2005	241	171	17	5	3363	38	111	0	3946
2006	167	152	19	1	4020	39	216	0	4614
2007	298	166	56	46	2925	11	120	0	3622
2008	306	228	30	40	2231	3	57	0	2895
2009	272	274	38	46	2124	3	59	0	2816
2010	250	126	20	58	2612	6	87	0	3159
2011	262	112	15	25	2566	1	65	0	3046
2012	346	100	11	19	1673	0	38	0	2187

*2012 data is preliminary

Table 4.3 Flounder. Average numbers per hour of catches in the European Flounder in IBTS Q1 survey (in area IV the roundfish area's 1 and 2 were excluded) and BTS Isis Q3 survey.

Year	IBTS Q1 IV & IIIa	IBTS Q1 IV	IBTS Q1IIIa	BTS-isis Q3
1975	0.98	1.06	0.44	NA
1976	1.90	2.09	1.08	NA
1977	3.13	1.09	15.75	NA
1978	5.09	0.73	25.64	NA
1979	8.10	0.33	49.33	NA
1980	10.55	1.56	58.71	NA
1981	7.94	2.53	33.86	NA
1982	6.86	1.39	42.40	NA
1983	8.36	3.67	35.54	NA
1984	11.81	2.06	67.69	NA
1985	6.12	1.79	33.59	NA
1986	15.03	1.78	89.54	NA
1987	23.91	4.34	130.37	2.29
1988	27.08	3.93	162.64	3.53
1989	16.56	5.06	76.91	5.67
1990	13.56	2.55	70.63	17.54
1991	28.47	3.74	152.07	22.94
1992	28.88	4.63	138.00	12.00
1993	21.73	1.77	118.2	13.63
1994	14.11	1.78	74.35	10.06
1995	14.67	2.69	69.88	9.65
1996	11.92	1.76	62.73	12.17
1997	15.58	2.42	77.71	12.26
1998	13.94	2.03	74.21	8.44
1999	12.67	0.68	74.03	3.42
2000	11.63	1.81	63.04	5.89
2001	9.27	1.02	52.96	6.37
2002	7.06	2.36	31.11	8.66
2003	10.27	2.04	53.85	6.04
2004	9.73	0.77	57.18	6.04
2005	17.49	1.83	101.36	8.05
2006	13.68	1.37	78.15	4.06
2007	13.76	2.45	74.95	5.82
2008	15.38	2.28	85.48	9.39
2009	10.82	1.97	58.15	6.93
2010	17.31	1.21	104.43	12.65
2011	16.19	1.25	97.07	10.73
2012	11.96	4.41	52.35	NA

Table 4.4 Flounder. Average numbers per hour of discarded European Flounder in Dutch bottom beam-trawl (TBB), Dutch bottom otter-trawl (OTB) and Scottish seine (SSC) fisheries targeting demersal fish (DEF) or mixed crustaceans and fish (MCD).

Métier	TBB_DEF	TBB_DEF*	TBB_DEF	TBB	SSC_DEF	OTB_MCD	OTB_DEF	OTB_DEF
Mesh size year	70-99	70-99	100-119	undefined	>120	70-99	70-99	100-119
2011	6	20	0		0	0	0	0
2010	11	16	0		NA	0	3	1
2009	1	4	0		NA	0	NA	<0.5
2008	NA	2.7**	NA		NA	NA	NA	NA
2007				1.1				
2006				3.1				
2005				3.4				
2004				1.7				

*≤300 hp segment

** 80mm cod-end mesh size

Table 4.5 Flounder. Length weight parameters

gender	*a*	*b*	*Source*
female	0.016	2.89	van der Hammen en Poos 2012
male	0.024	2.75	
all	0.012	2.98	
female	0.024	2.78	Van Overzee (2010)
male	0.024	2.77	

Table 4.6 Flounder. Von Bertalanffy growth parameters

	Linf	*K*	*t0*	*Source*
female	44.9	0.27	-2.58	van der Hammen en Poos 2012
male	35.7	0.73	-0.16	
female	36.2	0.72	0	Van Overzee (2010)
male	29.6	1.04	0	

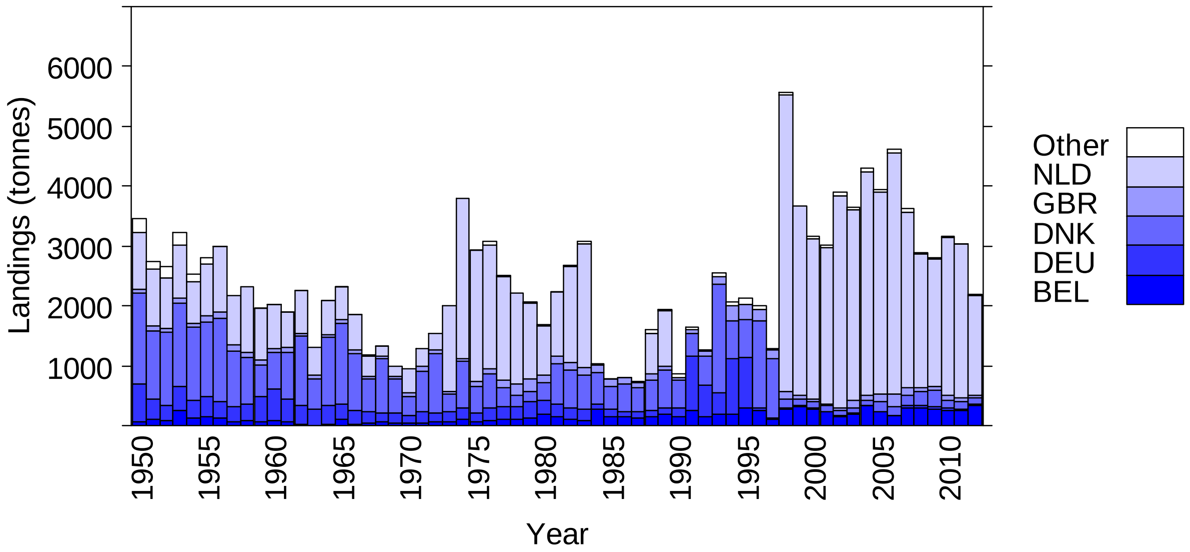


Figure 4.1 Flounder. Landings (tonnes) in Subarea IV (ICES). Note that Dutch landings are missing from 1984 to 1987 and from 1990 to 1997. 2012 data is preliminary.

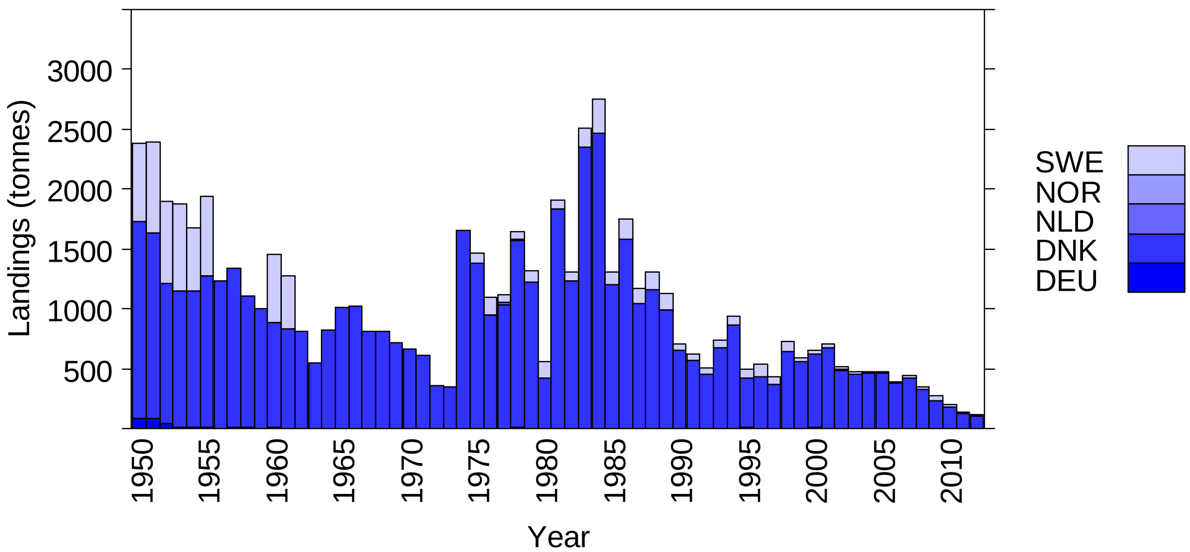


Figure 4.2 Flounder. Landings (in t) of Flounder in Subarea IIIa (ICES). 2012 data is preliminary.

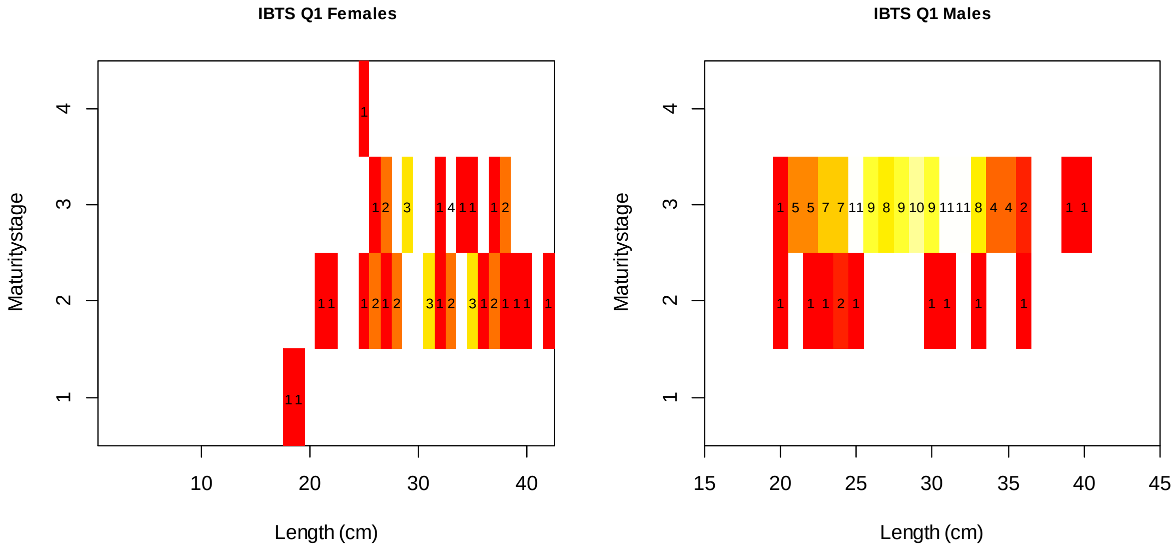


Figure 4.3 Flounder. Maturity oogive (IBTS Q1). The numbers represent the number of individuals. Stage2: immature. Stage2: maturing. Stage3: spawning. Stage4: spent.

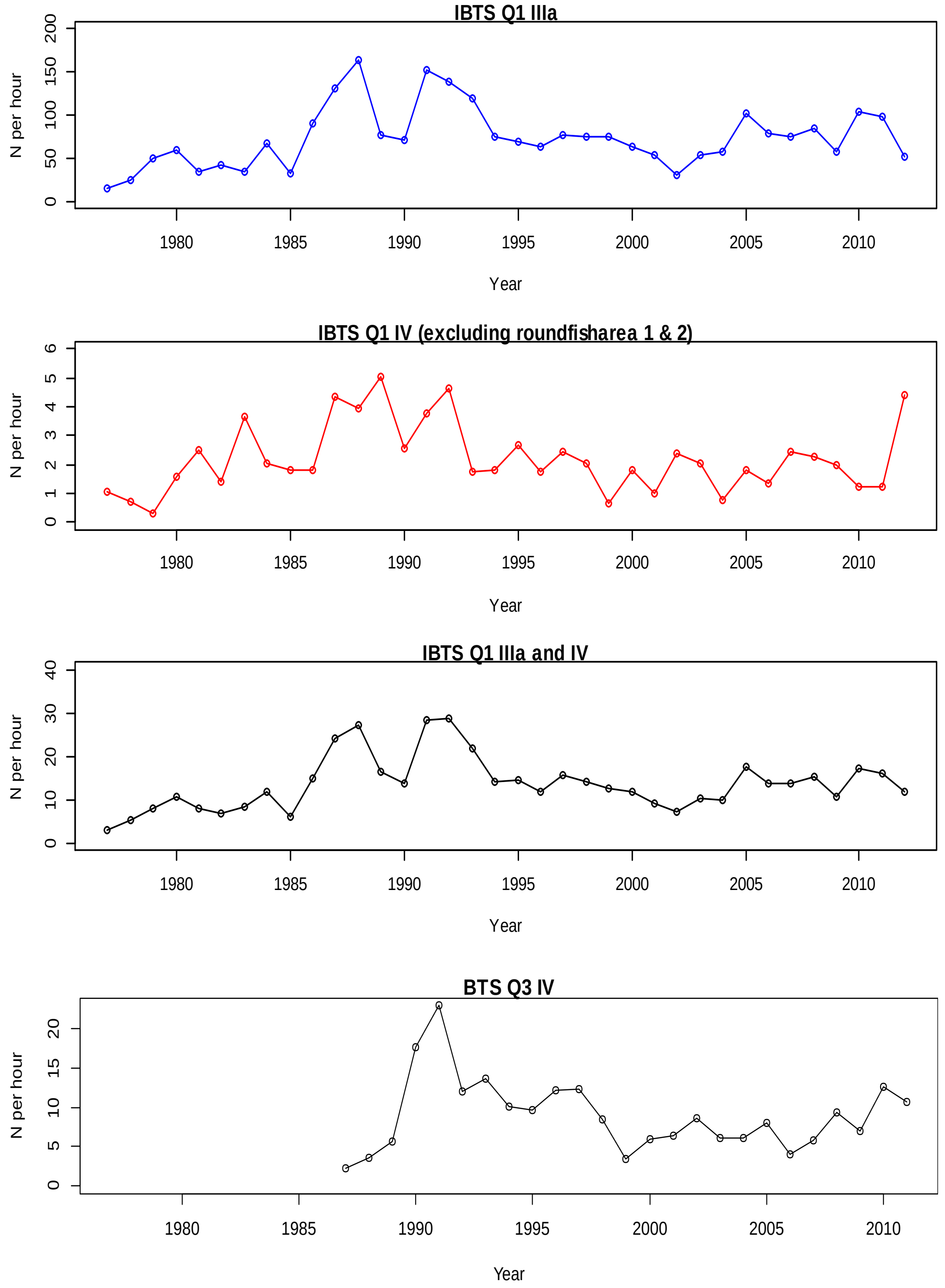


Figure 4.4 Flounder. CPUE (number per hour) in the IBTS Q1 (excluding roundfish areas 1 & 2) and in the BTS-isis Q3.

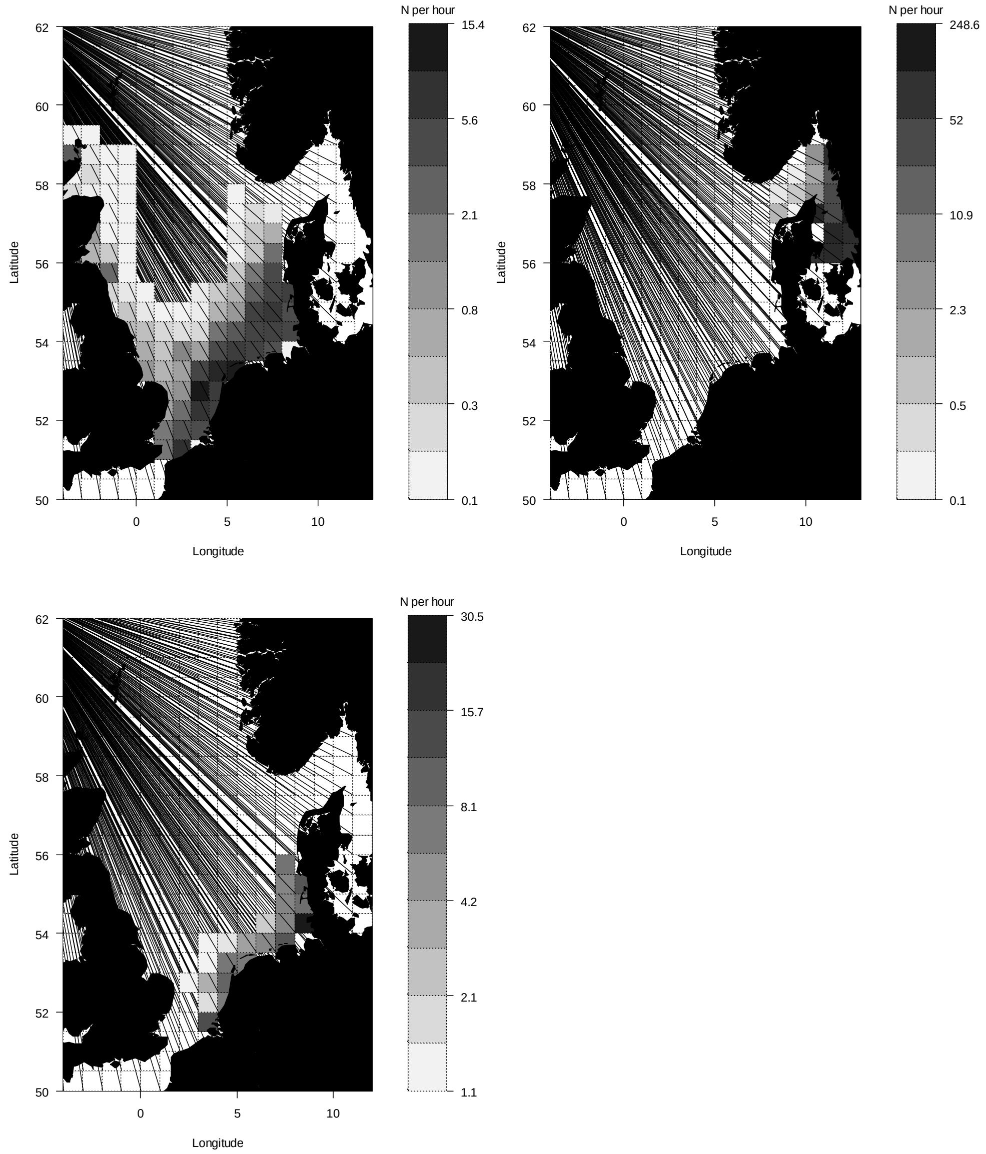


Figure 4.5 Flounder. Mean CPUE (number per hour). Top left: IBTS Q1 area IV (excluding roundfish areas 1 and 2, 1975-2012), Top right: IBTS Q1 area IIIa (1975-2012). Bottom left: BTS-isis Q3 (1987-2012).

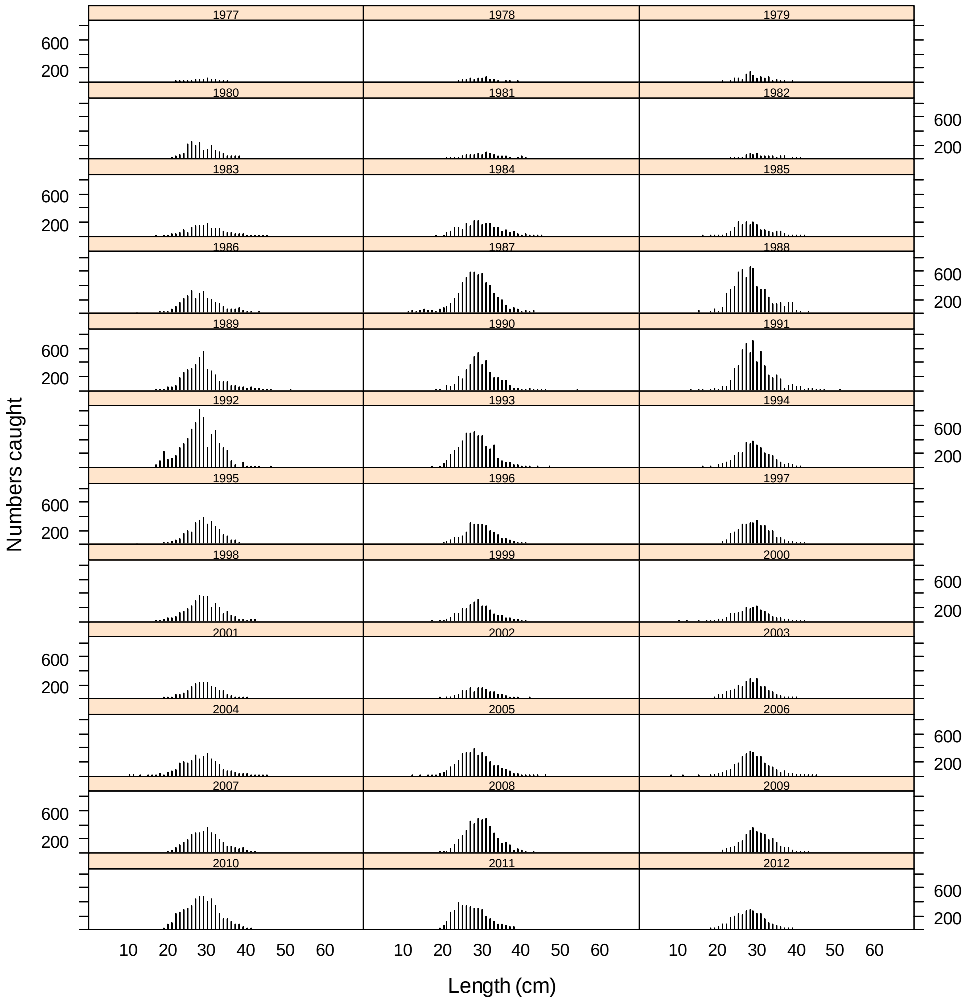


Figure 4.6 Number caught per length class per year (IBTS Q1).

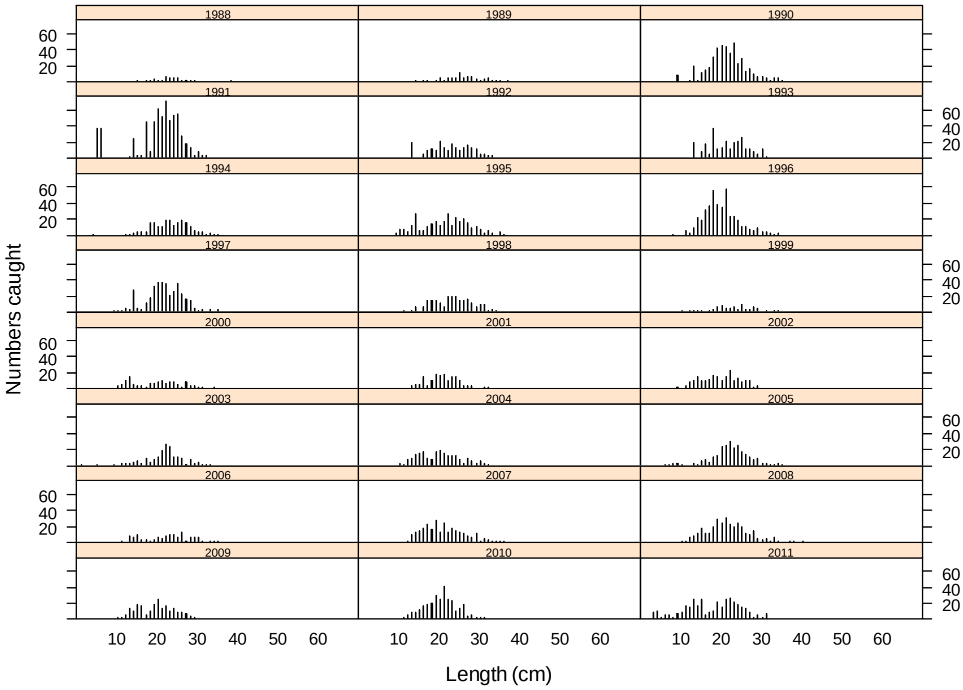


Figure 4.7 BTS-isis Q3. Number caught per length class per year.

5 Lemon Sole in Subarea IV and Divisions IIIa and VIId

This year's WGNEW report updates the time series of fishery landings data and research vessel indices. It includes an illustrative length based assessment on using CEFAS' UK data using methods derived in WKLIFE2.

5.1 Update of fisheries landings data

Anual landings of lemon sole in ICES Divisions IIIa, IV and VIId are given in Figures 5.1 – 5.3 and Tables 5.1 – 5.3.

Landings in Division IIIa were below 200 t per annum (pa) between 1950 and 1974, after which a sharp increase to over 600 t was seen in 1976. Landings averaged between 500 and 600 t pa until 2000, since when they have declined. The catch of 254 t in 2011 was the lowest sonce 1974 (183 t). The majority of lemon sole from IIIa are caught by Denmark.

Landings in Sub Area IV between 1950 and 2000 averaged between 3000-5000t pa, with successive peaks, followed by declines in landings, but between 2000 and 2011 averaged at around 3500 t pa. Landings in 2010 were at a series low of 2625 t, but increased in 2011 to 3365 t. The majority of landings from Division IV are made by UK vessels, although landings by Danish and Netherlands vessels contributed a high proportion of total landings in 2011.

Total landings from Division 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. Between 1978 and 2000, France took approximately 50 % of the landings, with Belgium and the UK taking approximately 20 % each. These three countries have landed the majority of the catch in Division VIId since that time.

5.2 Survey data

International Bottom Trawl Surveys

Heessen and Daan reviewed the data of the Quarter 1 (Q1) International Bottom Trawl Survey (IBTS) in the North Sea between 1970 and 1993 (Heessen & Daan 1996). During the time period investigated, juvenile lemon sole were generally caught along the UK east coast, especially the north east coast. Larger lemon sole were more widespread, but again, the highest abundance was in the western parts of the North Sea.

Indices of abundance (Figure 5.4) and mature biomass (Figure 5-5) were calculated annually from the Q1 IBTS data for the period 1975-2012. The abundance index was calculated from the total catch in numbers of the survey per annum divided by the number of stations fished per annum. For mature biomass index, the total weight per hour by centimetre length group was calculated using the length-weight relationship from Bedford et al (1986);

$$Wt(g) = 0.00756*L(cm)^{3.142}$$

The length-maturity ogive (Figure 5-8) was applied to this weight distribution to calculate the total catch in weight (g) of mature fish of the survey and the index was calculated by dividing by the total number of stations fished.

The survey abundance index increased through the survey series, reaching a peak in 2003. Abundance then declined until 2009, since when it has increased again to its highest level in 2012. Mature biomass has fluctuated without trend since the early 1980s.

UK (East &West)

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 5.5). In the eastern Channel, abundance has been variable with a large peak observed in 1995 and 2011 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 has increased again since that time. 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 which is in agreement with the other North Sea survey indices.

Netherlands

The Netherlands has beam trawl surveys in the the central North Sea between 1998 and 2009 (Tridens) and in southeast North Sea between 1985 and 2009 (Isis). Abundance indices for these surveys are given in Figure 5-7**Error! Reference source not found.**. In both surveys, abundance has generally increased through the series. However abundance in the central North Sea, has more than doubled since the survey began.

Maturity Ogive

Lemon sole are reported to spawn in the west central North Sea during the period May to November with peak spawning during July-August (Rae, 1965; derived from www.Fishbase.org). Therefore most spawning occurs between the Q 1 and Q 3 IBTS surveys. For this reason, maturity ogive shown in Figure 5-8 was derived from the age at maturity data (2006 – 2012) from both these surveys (see stock annex for maturity-length key). Information from around spawning time would improve the accuracy of these estimates.

Length and age compositions of the Q1 IBTS survey catches

The decadal length composition of lemon sole catches of the Q1 IBTS survey are shown in Figure 5-9. These show increasing dominance of the catches by 20-25 cm fish which correspond to fish of 3 years old (Figure 5-10) or less.

5.3 Illustrative length based assessment

WKLIFE2 (ICES 2012 in prep) examined the use of DATRAS sex, maturity, length- and weight-at-age data for ICES stocks that lack full assessments; these data are available under the SMALK on ICES DATRAS files. WKLIFE2 describes how this information together with published life history traits such as compiled in FishBase, can be used to estimate the following population characteristics: length at maturity (Lmat), length-weight relationship, von Bertalanffy growth parameters (Linf (L_∞), K, t_0), mean length at first capture (Lc), length where growth rate in weight is maximum (Lopt), and the theoretical length resulting from fishing with F = M ($L_{(F=M)}$).

With weighted mean length in the catch (Lmean) as indicator, several of these population characteristics can be used as reference points to infer relative exploitation and relative stock status. In other words, these length-based reference points can be used as proxies when fishing mortality and biomass are unknown. These derivations are fully described in WKLIFE2 (ICES in prep) where illustrative assessments of turbot, brill, lemon sole, witch flounder, dab are made using ICES N-S IBTS survey data. References are given to appropriate methods originating with equation 5.11 on page 41 (1st edition) of Beverton and Holt (1957) relating Lmean to F, M and K.

However, these assessments are better carried out on commercial catches because these provide a better estimate of the length at first capture and the length distribution of the catches. This analysis illustrates how this type of assessment can be made on the raised catch length frequency distribution from UK vessels for 2011.

The results of these analyses are shown in Table 5-4 and Figure 5.11.

Main points;

- These results are illustrative only and based only on UK (England and Wales) discard sampling data for 2011.
- Lmat (Length of maturity) less than Lc (Length at first capture) which increases risk of recruitment overfishing. However there is clear evidence that recruitment has increased over recent years, with a dominance of small fish in the survey catches Figure 5-9. Estimates of Lmat could be improved by samples from the main spawning period other sources give length at maturity at a larger size
- Lmean = $L_{(F=M)}$ indicating that F = M which is the proxy for Fmsy; therefore these results suggest that the stock is fished at this proxy
- The closer Lmean is to Lopt, the more optimal the fishing is because this would be the size at which the biomass is maximum in an unexploited stock. This would be expected for a lightly exploited stock, or one where the fishery has succeeded in optimal harvesting.

The assumption is that the fishery and stock is at equilibrium; a length frequency distribution based on a longer period; a generation time or 3-5 years would be more valid. Further analysis could be carried out on a time series of years of catch data, in order to estimate trends.

References

Bedford, B.C., L.E Woolner and B.W. Jones (1986) Length-Weight relationships for commercial fish species and conversion factors for various presentations. MAFF Directorate of fisheries Research data report No 10

Beverton, R.J.H and Holt, S.J (1957) On the Dynamics of Exploited Fish Populations Fishery Investigations Series II Volume XIX London HMSO; Reprinted by Blackburn press 2004

Heessen, H.J.L. & Daan, N. (1996) Long-term changes in ten non-target North Sea fish species. ICES Journal of Marine Science, 53: 1063-1078.

ICES (in prep) report on WKLIFE2; Workshop to finalize the ICES data limited stock (DLS) methodologies documentation in an operational form for the 2013 advice seasonand to make recommedations on target categories for data limited stocks

Table 5-1 Lemon Sole. Nominal landings of Lemon sole in ICES Division IIIa

Year	Belgium	Denmark	Germany	Netherlands	Sweden	Other	Total
1950	0	100	1	0	206	0	307
1951	0	74	1	0	173	0	248
1952	0	64	0	0	179	0	243
1953	0	35	0	0	97	0	132
1954	0	33	0	0	95	0	128
1955	0	29	0	0	73	0	102
1956	0	33	0	0	63	0	96
1957	0	27	0	0	51	0	78
1958	0	38	0	0	56	0	94
1959	0	71	0	0	59	0	130
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
2011	0	223	0	0	12	16	254

Table 5-2 Lemon Sole. Nominal landings of Lemon sole in ICES Sub area IV

Year	Belgium	Denmark	France	Germany	Netherlands	Norway	UK	Other	Total
1950	112	435	139	31	156	0	2855	26	3754
1951	115	845	90	21	167	0	3430	42	4710
1952	98	391	227	26	168	0	3953	59	4922
1953	73	409	189	18	132	0	4590	29	5440
1954	2	272	177	24	112	0	3368	17	3972
1955	49	311	0	15	78	0	3374	9	3836
1956	48	222	0	19	58	0	3034	14	3395
1957	39	249	0	24	64	0	3032	11	3419
1958	30	171	0	13	43	0	2835	12	3104
1959	85	242	0	40	43	0	3226	11	3647
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
2011	387	999	56	96	641	27	1157	2	3365

Table 5-3 Lemon Sole. Nominal landings of Lemon sole in ICES Division VIId

Year	Belgium	Denmark	France	Netherlands	UK	Other	Total
1950	10	0	174	0	24	0	208
1951	5	0	262	0	47	0	314
1952	10	0	188	0	100	0	298
1953	7	0	196	0	183	0	386
1954	9	0	361	0	164	0	534
1955	9	0	0	0	132	0	141
1956	4	0	0	0	99	0	103
1957	7	0	0	0	95	0	102
1958	1	0	0	0	81	0	82
1959	2	0	0	0	80	0	82
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
2011	153	0	178	15	57	0	403

Table 5-4 Lemon Sole. Variables used for illustrative length based assessment of North Sea lemon sole stock

Variable	Derivation	Estimate (cm)	Comment
Lc	Lc= Length where N= Nmax/2; Nmax is the mode of the length frequency distribution	21.5	Length at first capture; defined as where 50% of the individuals are vulnerable and retained by the gear
Lmean	Mean length of fish larger than Lc in the catches	27.3	Derived from whole catch data 2011
Lmaturity	From ogive in Figure 5-8 derived from NS-IBTS data	23	Where at least 90% of fish are stage 2 (maturing) or above. However, there are larger values for length at 50% maturity quoted from the literature (see stock annex)
Linf	From NS-IBTS data	45	Can be a difficult variable to define, since large fish may be rare in exploited populations
L(F=M)	L(F=M)= (3*Lc + Linf)/4	27.9	From formula in WKLIFE2 report (ICES in prep)
Lopt	Lopt = 2/3*Linf	31.3	From formula in WKLIFE2 report (ICES in prep)

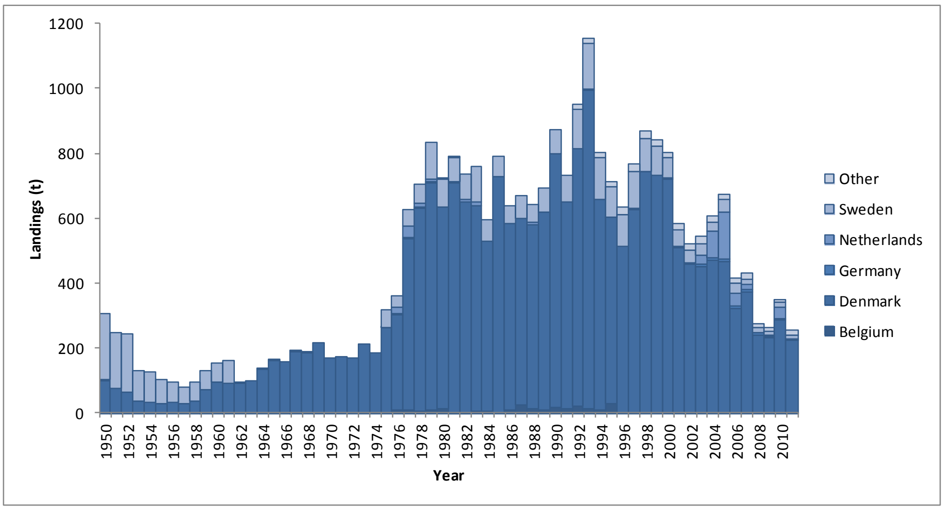


Figure 5-1. Lemon Sole. Total landings (t) of lemon sole for ICES Area IIIa 1950 – 2011. Source: FishStat

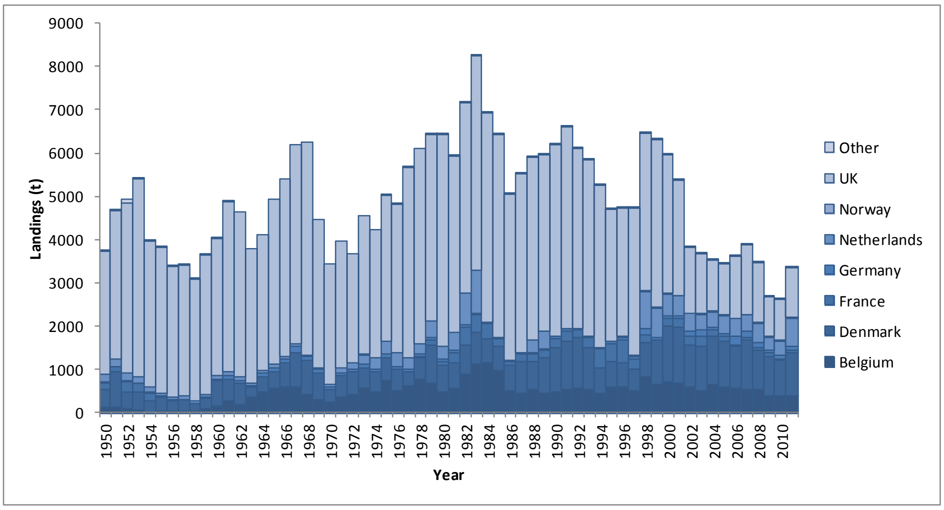


Figure 5-2. Lemon Sole. Total landings (t) of lemon sole for ICES Area IV 1950 – 2011. Source: FishStat.

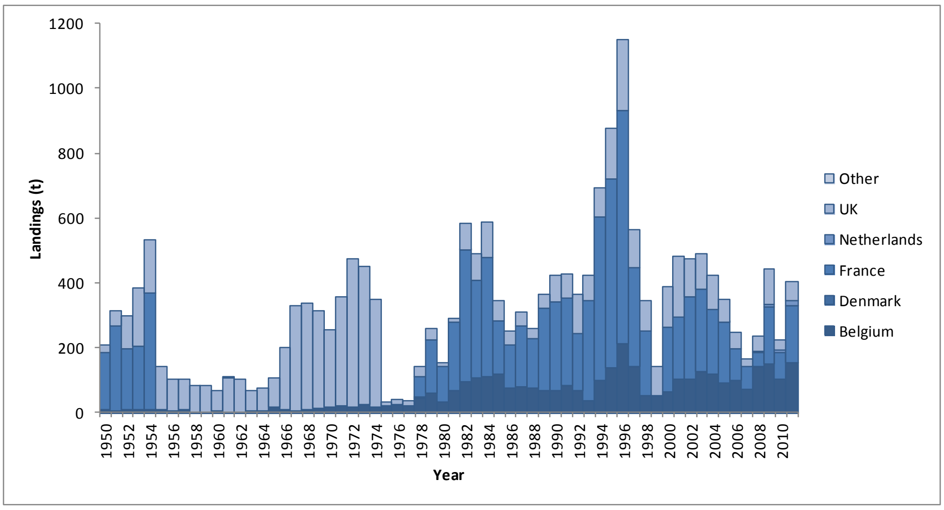


Figure 5-3. Lemon Sole. Total landings (t) of lemon sole for ICES Area VIId 1950 – 2011. Source: FishStat.

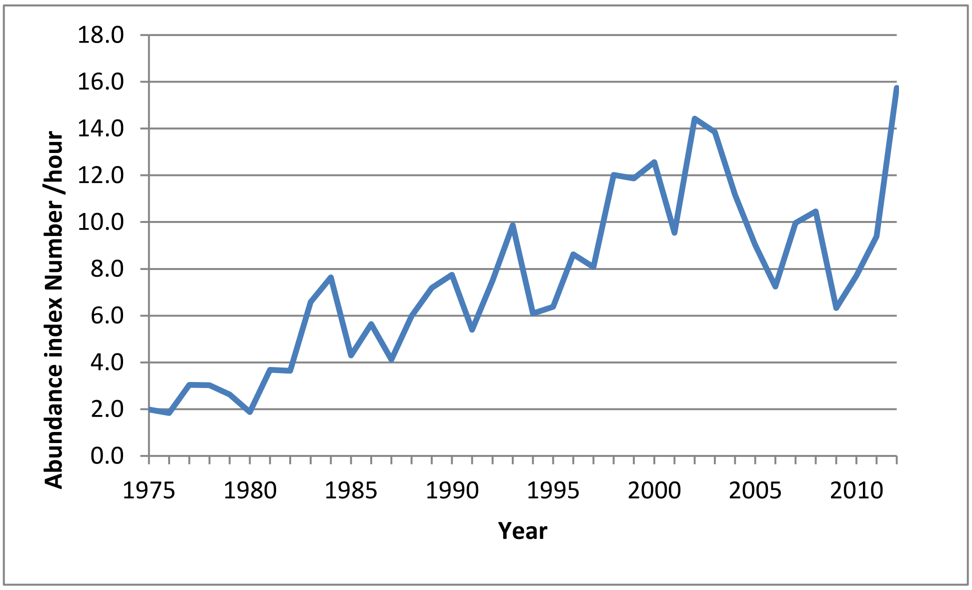


Figure 5-4. Lemon Sole. Index of abundance (number per hour) of lemon sole caught in the Q1 International Bottom Trawl survey between 1975 and 2012.

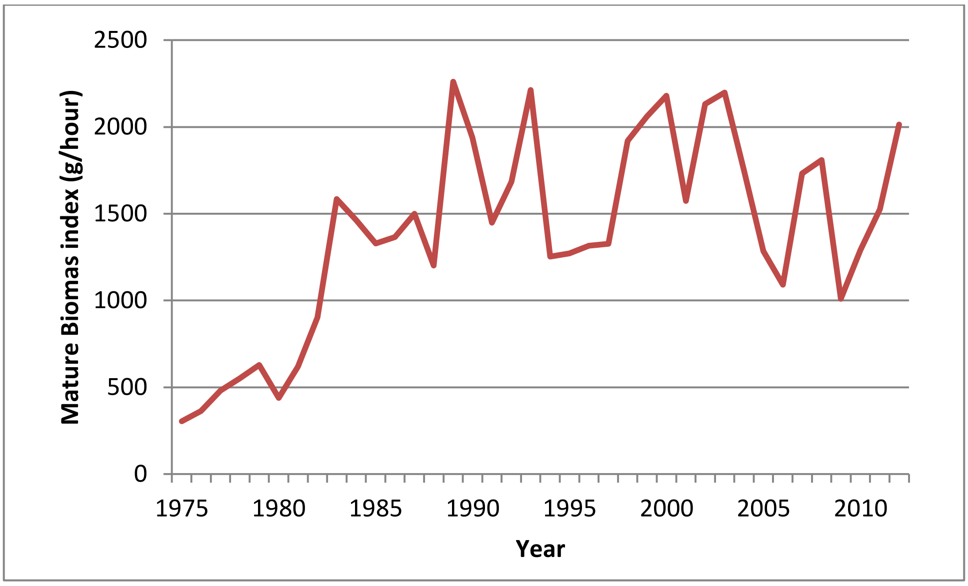


Figure 5-5. Lemon Sole. Index of mature biomass (grams per hour) of lemon sole caught in the Q1 North Sea International Bottom Trawl survey between 1975 and 2012.

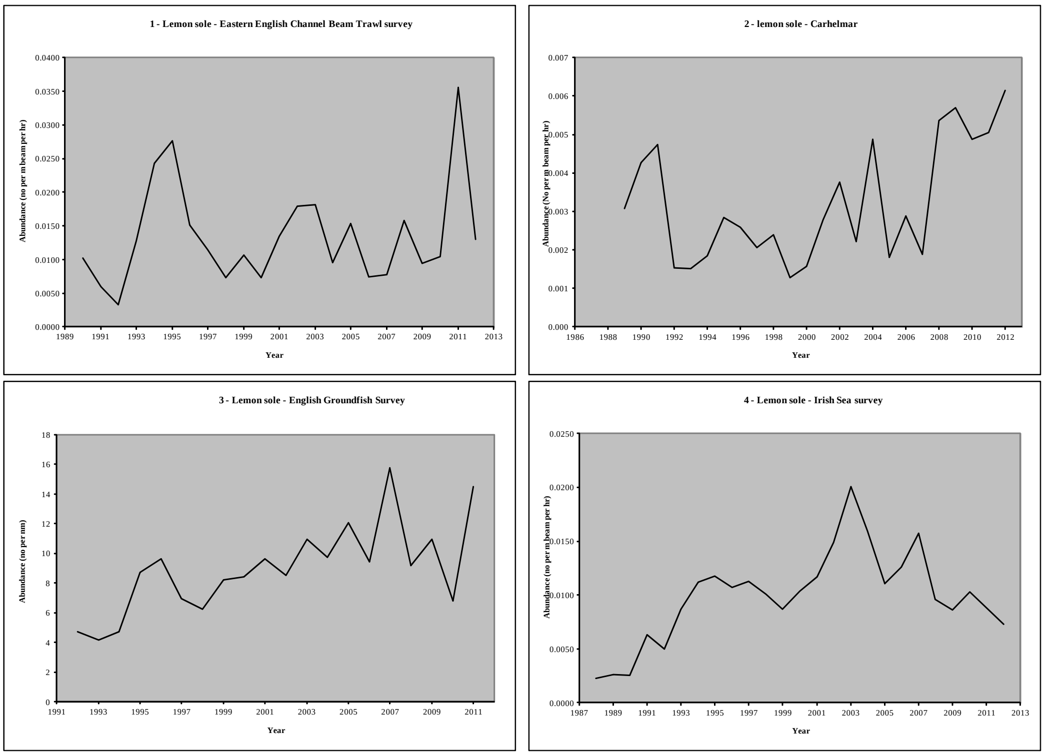
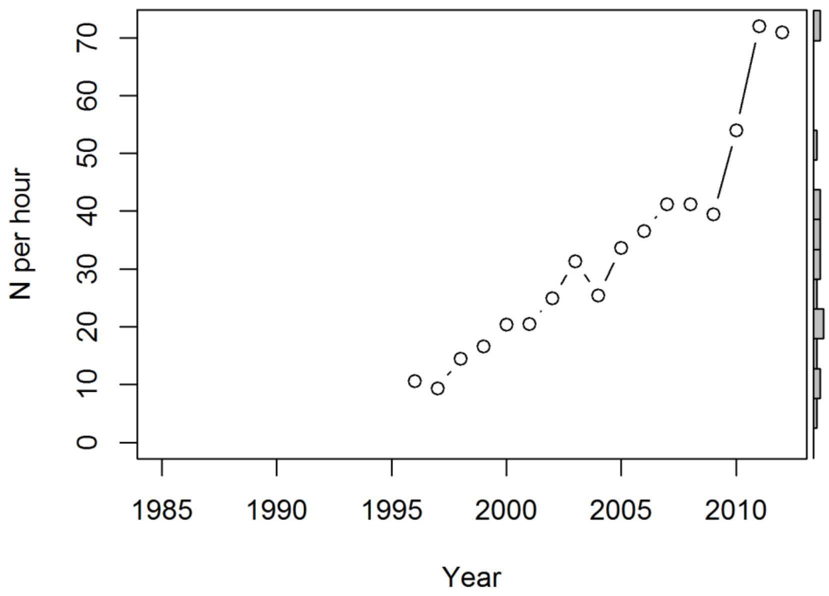


Figure 5-6. Lemon Sole. Indices of abundance of lemon sole caught in 4 Cefas surveys: 1 - the eastern Channel Beam Trawl survey (July), 2 – the western Channel (VIIe) (Carhelmar) Beam Trawl survey (October), 3 - the 3rd Quarter North Sea English Groundfish Survey (August), and 4 – the Irish Sea/Bristol Channel (VIIa, f, g) Beam Trawl survey (September). Abundances are given as number of fish per m beam per hour for the beam trawl surveys and as number of fish per nm for the groundfish survey.

a) Tridens survey Central North Sea



b) Isis SE North Sea

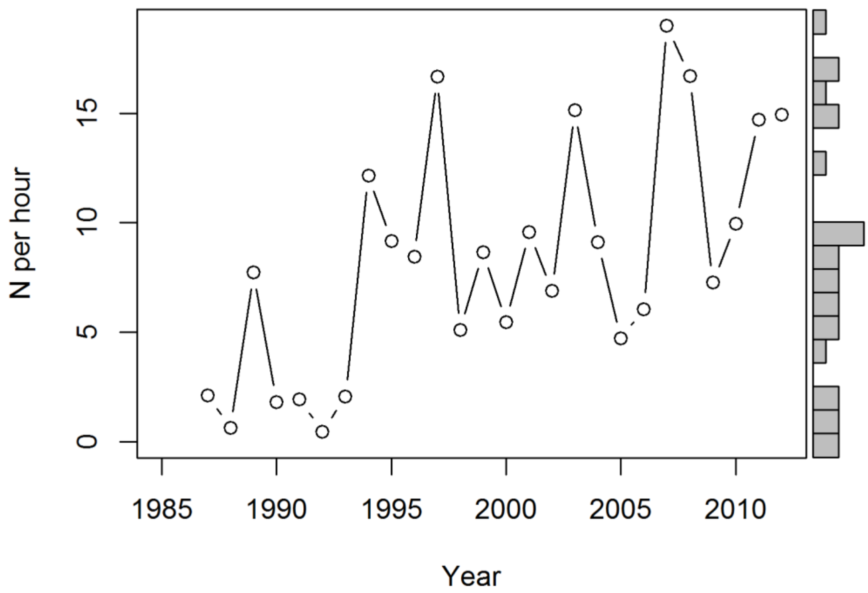


Figure 5-7. Lemon sole abundance (number per 30 minute tow) in Dutch Beam Trawl Surveys a) Tridens (Central North Sea) and b) Isis (SE north Sea).

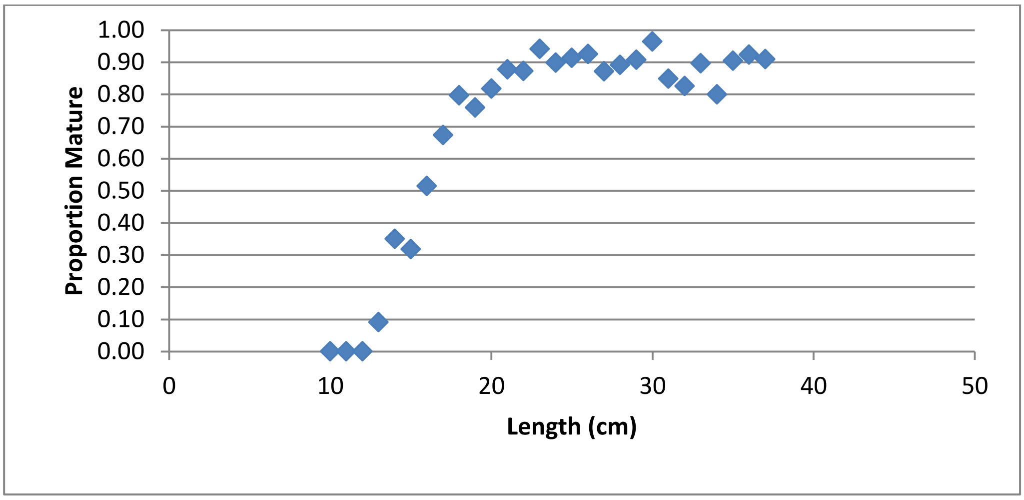


Figure 5-8. Lemon Sole. Length vis maturity ogive for combined male and female fish from IBTS SALK data 2006 to 2012.

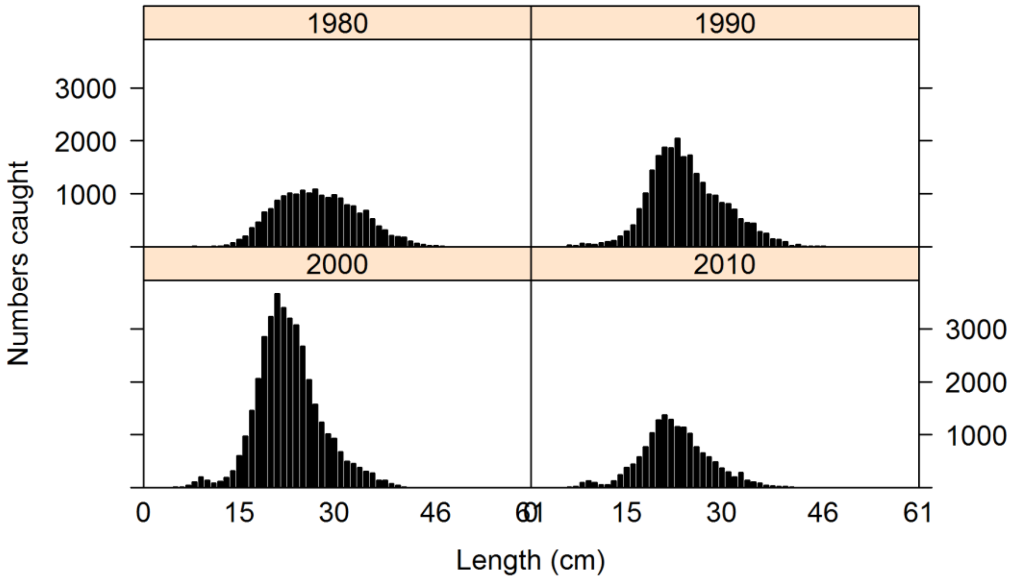


Figure 5-9. Lemon sole. Length-frequency distributions by decade for NS-IBTS Q1 lemon sole catches.

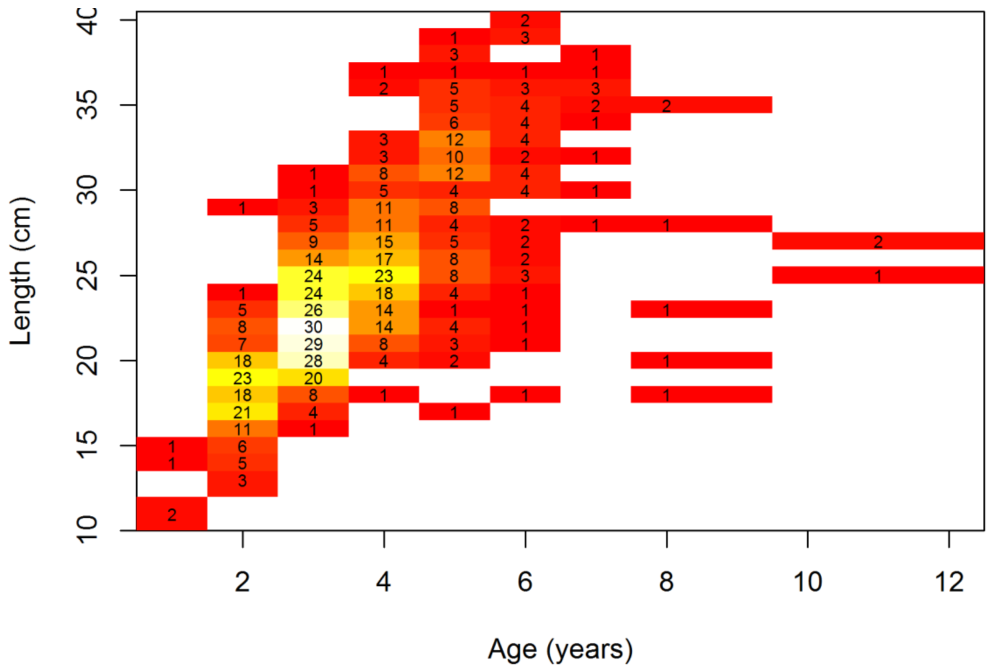


Figure 5-10. Lemon sole. Age-length key for lemon soles from NS-IBTS data for otoliths read during the period 2006 to 2012.

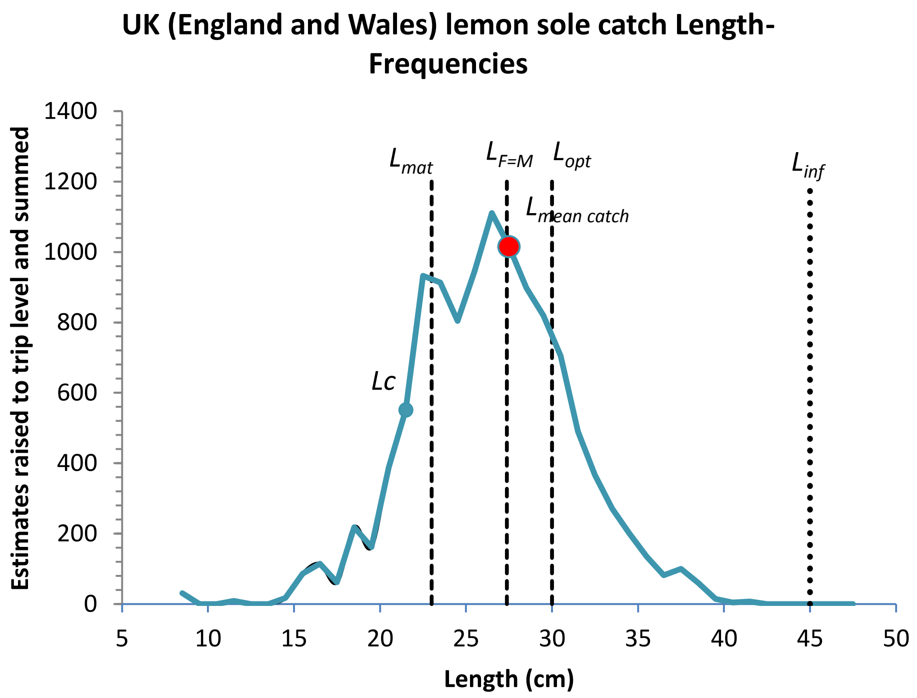


Figure 5-11. Lemon Sole. Length-frequency distribution of lemon sole Sub-area IV derived from the UK England and Wales discard sampling for 2011. Also shows length based indicators from Table 5-4.

6 Witch flounder in Subarea IV, Division IIIa and VIId

6.1 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). Molander (1935) distinguished in IIIa and IV 2 stocks, one in the Kattegat (IIIaS) 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 usually between 30 and 100 meters. The distribution of the survey catches showed a continuum from IIIa into the Norwegian trench and the Northern part of Subarea IV (Figure 6.1). Considering the results from IBTS, the fact that catches in the Kattegat are sporadic and that 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.

6.2 The Fishery

6.2.1 ICES advice and management applicable to 2011 and 2012

The advice given in 2012 for witch flounder was 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.

6.2.2 Catches in 2012

Total landings for IV, IIIa, and VIId are given in Figure 6.2 and Tables 6.1-6.3. The total landings of all witch flounder in IV and IIIa in 2012 amounted to 1808 t. Landings in VIId are negligible. Discard information were not available to the WG.

In area IV, the total landings declined from about 2500 t in the middle of the 1980s to 788 t in 2012. In the IIIa, the total landings also declined from about 2500 t in the beginning of the 2000s to just above 1100 t in 2012.

6.2.3 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 applied is 28 cm.

6.2.4 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 reports only 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 the mixed demersal trawl fisheries.

In Sweden, the fisheries where witch flounder are caught, apart from the occasional 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 the landings is by unspecified otter trawls, though some catches are taken by *Nephrops* trawls.

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

No information was available to the WG on the characteristics of the witch flounder fishery in Norway in recent years.

6.2.5 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 from UK samples since 2007. The number of biological samples in the Swedish and Danish commercial catches for the period 2009-2012 is displayed in Table 6.4.

The numbers at age landed in 2007-2012 (Table 6.5) were estimates using otolith reading of the Swedish and Danish (Q1 only) commercial samples collected during 2009-2011. For all countries, ALK for 2009 were used to split 2007 and 2008 number at length landed into number at age.

6.2.6 Data revisions

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

6.2.7 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 (see WGNEW report 2010) and histological investigation of gonads is in progress at the Swedish Institute of Marine Research in order to define the spawning season and be able to calculate accurate maturity ogives. 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.

6.3 Fishery independent information

6.3.1 International Bottom Trawl Survey (IBTS-Q1)

The International Bottom Trawl Survey (IBTS) performed every year during the first and third quarter since 1975 provides indices for the North Sea and IIIa (Figure 6.3). Furthermore a time series of Dutch Beam Trawl Survey (BTS) data (1985-2008) in IV is also available but it was not explored during the current assessment.

The IBTS seem to be the most valuable and promising data source to be used as tuning fleet for the assessment, 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 6.5).

Regarding the spatial 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 (Figure 6.6, ICES 2010).

A yearly ALK was constructed using otolith collected during Swedish IBTS in Q1 (Figure 6.4). These were used to derive a number at age index from the IBTS survey for the period 2007-2012. The index was estimated summing up 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 then multiplied per 1000 to facilitate readiness. The length at age was finally transformed in number at age using an annual ALK derived from the Swedish IBTS. The age disaggregated index used as tuning fleet in the exploratory XSA assessment is presented in Table 6.6.

6.4 Mean weight-at-age and maturity-at-age

6.4.1 Mean weight-at-age

Tables 6.7 and 6.8 show the mean weights-at-age in the catch and in the stock from 2007 to 2012. The weights-at-age in the catches were obtained from the Swedish market samples collected in IIIa from 2009 to 2012, except for quarter 1, for which also Danish samples were used (i.e. weight at age for quarter 1 were weighted for the abundance of the Danish and Swedish catches in the same quarter). The weights-at-age in the stock were obtained from Swedish IBTS collected in IIIa from 2009 to 2012. Weight at age in 2007 and 2008 were assumed equal to the mean weight at age estimated between 2009 and 2012.

6.4.2 Maturity ogive

The maturity ogives of witch flounder in IV and IIIa were assumed constant for the entire period and estimated using an average from the Swedish market samples collected in 2010 and 2012, considered as the most reliable (Table 6.9).

6.4.3 Recruitment index

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

6.5 Assessment of witch flounder in IV and IIIa

6.5.1 Exploratory Assessment for witch flounder in IV and IIIa

An XSA was fit using the catch at age matrix derived from otolith reading (Table 6.5), the biological input data, and tuned by the IBTS Q1 index (Table 6.6). The exploratory XSA settings are presented in Table 6.10. The input data of the XSA assessment were explored using graphical methods. The standardised age disaggregated IBTS index shown a rather similar pattern for most of the age classes, with a decline until 2010 and an increase thereafter (Figure 6.7). The IBTS tuning fleet internal consistency plot is presented in Figure 6.8. The plot shows that the IBTS index is rather consistent for age classes 3 to 6 but it has a reduced ability to follow the cohorts for age classes 7 to 11+. The standardised catch at age plot (Figure 6.9) shows that only some of the cohorts are clearly evident in the catch at age matrix, notably cohorts born from 1997 to 2003.

The detailed estimates for stock numers-at-age anf F-at age are presented in tables 6.11 and 6.12. The summary results are shown in Figure 6.13. The reference fishing mortality was estimated for the age classes fully recruited to the fisheries, $F_{bar} = F_{4\text{-}8}$. The estimate of F_{curr} in 2012 was 0.29 and it declined from the largest values (0.36) estimated in 2008 (Table 6.13). The SSB declined from the highest observed value in 2007 (around 4300 t) until the minimum in 2010 (2900 t) and increased thereafter (Figure 6.11). Recruitment showed three relatively large year classes between 2009 and 2012.

The analysis of the residuals of the exploratory XSA (Figure 6.10) shows an apparent pattern, with positive values in the first part of the time series and negative values in the latest years, with the exception of 2012. Nevertheless, the residuals are reasonably small. The retrospective analysis (Figure 6.12) shows a rather large retrospective error for SSB and F, while recruitment is less variable and more consistently estimated by the different assessments. F estimates were fairly stable between years but always larger than the F_{MSY} estimate.

It is important to highlight that this is the second attempt to assess witch flounder in IV and IIIa and results should be considered as an exploratory analysis only. Several sensitivity analyses should be performed in a future benchmark to verify the XSA settings (or any other appropriate model), the natural mortality assumptions, the ageing accuracy as well as the extent and age structure of the discards. The estimated landings in the last years (2007-2012) are considered reasonably accurate, although discard were not included in the analysis.

6.6 Precautionary and Limit Reference Points and FMSY targets

FMSY target

A yield per recruit analysis was run to estimate exploitation reference points using the same input and output data used for the XSA. The F_{01} was estimated around 0.18, while F_{max} was around 0.77 (Figure 6.13). The F_{01} values is very similar to these estimated in the 2012 assessment (e.g. F_{01} = 0.17; ICES 2012). However, the YPR curve was rather flat and therefore F_{max} is not informative and cannot be used. As a result, F_{01} (0.18) was considered the most appropriate proxy for F_{MSY}.

6.7 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 age proportion 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. However, the F estimates derived from the exploratory XSA were considered robust enough to give advice on the status of current F compared to the F_{MSY} value.

6.8 Management Considerations

No specific management considerations were provided.

6.9 Ecosystem considerations

No specific ecosystem considerations were provided.

6.10 Changes in the environment

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

References

ICES 2010. Report from the Working Group of Assessment of New MOU Species. ICES CM 2010/ACOM: 21. 603 pp.

Heessen, H. Ellis, J., and Daan, N. (in prep) Atlas of the marine fishes of the northern European shelf: based on 60 000 hauls made during research vessel surveys.

Table 6.1. Witch in IV, IIIa and VIId: total landings by country in IV from 1950 to 2012.

Year	BEL	DEU	DNK	FRA	FRO	GBR	IRL	NLD	NOR	SWE	Totals
1950	224	20	63	0	0	840	0	0	17	313	1477
1951	88	17	100	0	0	1101	0	0	31	308	1645
1952	60	6	44	0	0	1432	0	1	15	283	1841
1953	21	7	61	0	0	1066	0	1	11	329	1496
1954	10	11	34	0	0	865	0	0	16	191	1127
1955	9	4	28	0	0	1395	0	0	11	130	1577
1956	5	2	24	0	0	1268	0	1	8	126	1434
1957	16	20	28	0	0	1080	0	0	0	204	1348
1958	8	12	43	0	0	1795	0	0	37	224	2119
1959	28	20	52	0	0	1344	0	0	47	90	1581
1960	29	16	159	0	0	1519	0	0	36	164	1923
1961	21	24	98	0	0	1231	0	0	20	105	1499
1962	29	19	109	0	0	1093	0	0	21	0	1271
1963	34	9	94	0	0	1165	0	0	12	0	1314
1964	37	15	92	61	0	1249	0	0	18	0	1472
1965	12	4	91	122	0	853	0	0	14	0	1096
1966	5	3	71	45	0	831	0	0	7	0	962
1967	15	7	85	41	0	822	0	0	3	0	973
1968	15	21	108	0	0	840	0	0	5	0	989
1969	3	9	153	0	0	563	0	0	7	0	735
1970	5	5	112	0	0	348	0	0	9	0	479
1971	6	6	191	0	0	462	0	0	16	0	681
1972	0	12	221	0	0	424	0	0	16	0	673
1973	0	25	215	0	0	461	0	0	516	0	1217
1974	0	18	221	0	0	592	0	0	3	0	834
1975	0	20	242	0	0	585	0	0	2	20	869
1976	0	24	175	0	0	511	0	0	3	5	718
1977	0	73	92	0	0	713	0	0	2	0	880
1978	0	37	87	1	0	819	0	0	1	0	945
1979	0	7	91	3	0	792	0	0	1	0	894
1980	0	23	111	2	0	871	0	0	2	0	1009
1981	0	17	123	0	0	747	0	0	2	0	889
1982	0	16	495	0	0	1185	0	0	2	4	1702
1983	0	19	685	5	0	1296	0	0	2	1	2008
1984	0	11	687	4	0	1399	0	0	3	3	2107
1985	0	21	460	1	0	1571	0	0	2	3	2058
1986	0	18	436	12	0	1682	0	0	2	3	2153
1987	0	7	571	35	0	1827	0	0	5	3	2448
1988	0	6	447	13	0	1593	0	9	9	3	2080
1989	0	5	452	14	0	1821	0	10	15	4	2321
1990	0	3	532	20	0	1759	0	4	40	6	2364
1991	0	3	512	9	0	1727	0	2	75	12	2340
1992	0	5	460	13	0	1391	0	7	46	5	1927
1993	0	3	383	14	0	1255	0	13	52	3	1723
1994	0	5	458	2	1	1385	0	14	57	3	1925
1995	0	9	384	0	4	1451	0	7	14	2	1871
1996	0	7	434	0	0	1431	0	0	14	2	1888
1997	0	9	488	0	1	1480	0	1	10	3	1992
1998	0	13	476	0	1	1275	0	4	27	4	1800
1999	0	8	486	0	1	1256	0	9	23	2	1785
2000	0	13	517	0	0	1388	0	7	12	8	1945
2001	0	8	744	0	0	1486	0	1	16	12	2267
2002	0	5	543	0	0	1062	0	0	16	8	1634
2003	0	2	771	0	0	836	0	0	23	3	1635
2004	0	3	623	0	0	575	0	1	36	3	1241
2005	0	4	715	0	0	443	0	4	40	2	1208
2006	0	6	654	0	0	564	0	3	31	2	1260
2007	0	10	531	0	0	705	0	7	28	6	1287
2008	0	6	351	0	0	717	0	19	58	19	1170
2009	0	5	350	0	0	615	0	12	57	6	1045
2010	0	7	251	0	0	507	0	9	40	1	815
2011	0	25	245	0	0	523	0	18	25	1	837
2012	0	3	246	0	0	498	0	19	19	2	788

Table 6.2. Witch in IV, IIIa and VIId: total landings by country in IIIa from 1950 to 2012.

Year	DEU	DNK	GBR	NOR	SWE	Totals
1950	0	70	0	43	789	902
1951	0	106	0	89	728	923
1952	0	57	0	82	574	713
1953	0	65	0	81	621	767
1954	0	58	0	59	346	463
1955	0	71	0	48	331	450
1956	0	96	0	72	334	502
1957	0	176	0	52	415	643
1958	0	137	0	43	379	559
1959	0	257	0	24	471	752
1960	0	208	0	22	410	640
1961	0	165	0	21	408	594
1962	0	138	0	10	0	148
1963	0	187	0	22	0	209
1964	0	262	0	26	0	288
1965	0	236	0	24	0	260
1966	0	166	0	9	0	175
1967	0	136	0	16	0	152
1968	0	173	0	12	0	185
1969	0	150	0	6	0	156
1970	0	108	0	10	0	118
1971	0	142	0	20	0	162
1972	0	219	0	16	0	235
1973	0	253	0	24	0	277
1974	0	291	0	13	0	304
1975	0	484	0	14	474	972
1976	0	441	0	18	319	778
1977	0	444	0	13	281	738
1978	0	473	0	14	232	719
1979	0	456	0	21	201	678
1980	0	569	0	49	256	874
1981	0	643	0	94	307	1044
1982	0	953	0	79	421	1453
1983	0	1108	0	99	391	1598
1984	0	1158	0	158	480	1796
1985	0	1374	0	98	449	1921
1986	0	992	0	82	352	1426
1987	0	894	0	86	272	1252
1988	0	810	0	74	326	1210
1989	0	963	0	164	393	1520
1990	0	994	0	157	347	1498
1991	0	789	0	160	352	1301
1992	0	609	0	134	494	1237
1993	0	453	0	100	397	950
1994	0	400	0	61	310	771
1995	0	513	0	86	340	939
1996	0	563	0	66	273	902
1997	0	1074	0	76	352	1502
1998	0	1430	0	112	444	1986
1999	0	1629	0	111	499	2239
2000	0	1821	0	85	571	2477
2001	0	1304	0	72	563	1939
2002	0	1364	0	66	576	2006
2003	0	1036	0	64	546	1646
2004	0	1188	0	51	549	1788
2005	0	1006	0	42	557	1605
2006	2	635	0	37	369	1043
2007	2	618	0	45	284	949
2008	1	476	0	46	260	783
2009	0	593	0	28	152	773
2010	1	537	0	25	112	675
2011	1	565	0	23	104	693
2012	0	922	0	32	153	1107

Table 6.3. Witch in IV, IIIa and VIId: total landings in IV, IIIa and VIId from 1950 to 2012.

Year	IIIa	IV	VIId	Totals
1950	902	1477	0	2379
1951	923	1645	0	2568
1952	713	1841	0	2554
1953	767	1496	0	2263
1954	463	1127	0	1590
1955	450	1577	0	2027
1956	502	1434	0	1936
1957	643	1348	0	1991
1958	559	2119	0	2678
1959	752	1581	0	2333
1960	640	1923	0	2563
1961	594	1499	0	2093
1962	148	1271	0	1419
1963	209	1314	0	1523
1964	288	1472	0	1760
1965	260	1096	0	1356
1966	175	962	0	1137
1967	152	973	0	1125
1968	185	989	0	1174
1969	156	735	0	891
1970	118	479	0	597
1971	162	681	0	843
1972	235	673	0	908
1973	277	1217	0	1494
1974	304	834	0	1138
1975	972	869	0	1841
1976	778	718	0	1496
1977	738	880	0	1618
1978	719	945	0	1664
1979	678	894	0	1572
1980	874	1009	43	1926
1981	1044	889	0	1933
1982	1453	1702	0	3155
1983	1598	2008	0	3606
1984	1796	2107	0	3903
1985	1921	2058	0	3979
1986	1426	2153	0	3579
1987	1252	2448	0	3700
1988	1210	2080	0	3290
1989	1520	2321	0	3841
1990	1498	2364	0	3862
1991	1301	2340	0	3641
1992	1237	1927	0	3164
1993	950	1723	0	2673
1994	771	1925	0	2696
1995	939	1871	0	2810
1996	902	1888	0	2790
1997	1502	1992	0	3494
1998	1986	1800	0	3786
1999	2239	1785	1	4025
2000	2477	1945	0	4422
2001	1939	2267	0	4206
2002	2006	1634	0	3640
2003	1646	1635	0	3281
2004	1788	1241	0	3029
2005	1605	1208	0	2813
2006	1043	1260	0	2303
2007	949	1287	1	2237
2008	783	1170	1	1954
2009	773	1045	0	1818
2010	675	815	0	1490
2011	693	837	0	1530
2012	1107	788	1	1896

Table 6.4. Witch in IV, IIIa and VIId: number of biological samples in the Swedish and Danish commercial catches from IIIa, divided by quarter and year.

Year	Quarter	Sweden	Denmark
2009	1	477	
	2	480	
	3		
	4	221	145
2010	1		54
	2	230	45
	3		33
	4	263	74
2011	1	316	62
	2	341	
	3		
	4		138
2012	1	145	71
	2	409	35
	3	119	
	4	301	26

Table 6.5. Witch in IV, IIIa and VIId: Number at age in the catches.

Ages	2007	2008	2009	2010	2011	2012
3	29	55	9	215	223	261
4	2402	2037	1117	283	1363	2757
5	2209	1952	1878	1862	390	1999
6	1403	1241	1297	1240	1811	582
7	1301	1159	1254	662	738	971
8	789	687	727	629	646	409
9	257	209	225	389	429	233
10	326	282	283	91	260	126
11	115	98	79	65	109	97

Table 6.6. Witch in IV, IIIa and VIId: Age disaggregated tuning indices derived from the IBTS Q1 survey.

Ages	2007	2008	2009	2010	2011	2012
3	32.5	80.1	11.2	308.7	543.4	359.5
4	234.3	262.7	107.5	47.9	285.6	435.9
5	84.1	161.6	98.3	40.7	45.1	204.1
6	118.6	156.6	95.3	41.2	50.3	69.6
7	98	121.7	64.6	23.4	24.7	62.4
8	35.8	56.2	31.1	28.8	35.4	52.4
9	14.3	16.7	17.3	28.4	42.7	12.3
10	22.3	18.7	15.8	3.4	8.8	18.8
11	0	18.7	7.9	10.3	21.2	9.3

Table 6.7. Witch in IV, IIIa and VIId: weight at age (kg) in the catches derived from the Swedish and Danish market samples collected from 2009 to 2012.

Ages	2007	2008	2009	2010	2011	2012
3	0.101	0.101	0.101	0.095	0.103	0.107
4	0.161	0.161	0.155	0.153	0.160	0.177
5	0.203	0.203	0.208	0.200	0.179	0.227
6	0.262	0.262	0.265	0.275	0.228	0.280
7	0.309	0.309	0.308	0.343	0.282	0.304
8	0.363	0.363	0.335	0.367	0.364	0.387
9	0.409	0.409	0.402	0.401	0.370	0.464
10	0.527	0.527	0.51	0.572	0.510	0.516
11	0.575	0.575	0.545	0.706	0.542	0.506

Table 6.8. Witch in IV, IIIa and VIId: weight at age in the stock (kg) derived from the Swedish IBTS from 2009 to 2012.

Ages	2007	2008	2009	2010	2011	2012
3	0.080	0.080	0.093	0.063	0.079	0.083
4	0.150	0.150	0.171	0.146	0.125	0.157
5	0.212	0.212	0.22	0.22	0.192	0.217
6	0.308	0.308	0.286	0.342	0.311	0.294
7	0.337	0.337	0.331	0.295	0.333	0.388
8	0.404	0.404	0.403	0.342	0.460	0.411
9	0.370	0.370	0.340	0.336	0.329	0.474
10	0.562	0.562	0.656	0.571	0.485	0.536
11	0.575	0.575	0.545	0.706	0.542	0.509

Table 6.9. Witch in IV, IIIa and VIId: maturity ogives based on an averaged value obtained using the Swedish catches collected in 2010 and 2012.

Ages	2007	2008	2009	2010	2011	2012
3	0.05	0.05	0.05	0.05	0.05	0.05
4	0.03	0.03	0.03	0.03	0.03	0.03
5	0.26	0.26	0.26	0.26	0.26	0.26
6	0.4	0.4	0.4	0.4	0.4	0.4
7	0.53	0.53	0.53	0.53	0.53	0.53
8	0.75	0.75	0.75	0.75	0.75	0.75
9	0.8	0.8	0.8	0.8	0.8	0.8
10	1	1	1	1	1	1
11	1	1	1	1	1	1

Table 6.10. Witch in IV, IIIa and VIId: XSA input settings.

Tol	1.00E-20
Maxit	200
min.nse	0.3
Fse	0.75
Rage	3
Qage	6
shk.n	TRUE
shk.f	TRUE
shk.yrs	2
shk.ages	3
Window	100
Strange	20
Tspower	3
Vpa	FALSE

Table 6.11. Witch in IV, IIIa and VIId: F-at-age estimated by the exploratory XSA model

Ages	2007	2008	2009	2010	2011	2012
3	0.002	0.004	0.002	0.009	0.006	0.01
4	0.234	0.218	0.116	0.066	0.071	0.099
5	0.247	0.303	0.321	0.288	0.123	0.141
6	0.266	0.213	0.338	0.364	0.504	0.272
7	0.583	0.368	0.348	0.289	0.384	0.56
8	0.428	0.714	0.416	0.294	0.509	0.382
9	0.213	0.19	0.539	0.411	0.335	0.346
10	0.325	0.382	0.424	0.435	0.536	0.154
11	0.325	0.382	0.424	0.435	0.536	0.154

Table 6.12. Witch in IV, IIIa and VIId: Number at age in the stock estimated using the exploratory XSA model.

Ages	2007	2008	2009	2010	2011	2012
3	14063	13852	5956	27088	39902	29159
4	12741	11488	11291	4869	21983	32468
5	11157	8258	7562	8234	3730	16765
6	6637	7136	4995	4492	5057	2701
7	3256	4165	4720	2916	2556	2501
8	2503	1488	2361	2729	1788	1425
9	1482	1336	597	1275	1665	880
10	1298	981	904	285	692	975
11	455	338	250	202	287	748

Table 6.13. Witch in IV, IIIa and VIId: Exploratory XSA Model's summary table.

	recruitment	SSB	catch	landings	TSB	fbar4-8	Y/SSB
2007	14063	4316	2237	2237	11094	0.351	0.52
2008	13852	3777	1953	1953	10025	0.363	0.52
2009	5956	3523	1816	1816	9023	0.307	0.52
2010	27088	2996	1489	1489	8293	0.26	0.5
2011	39902	3053	1517	1517	10902	0.318	0.5
2012	29159	3728	1808	1808	14826	0.29	0.48

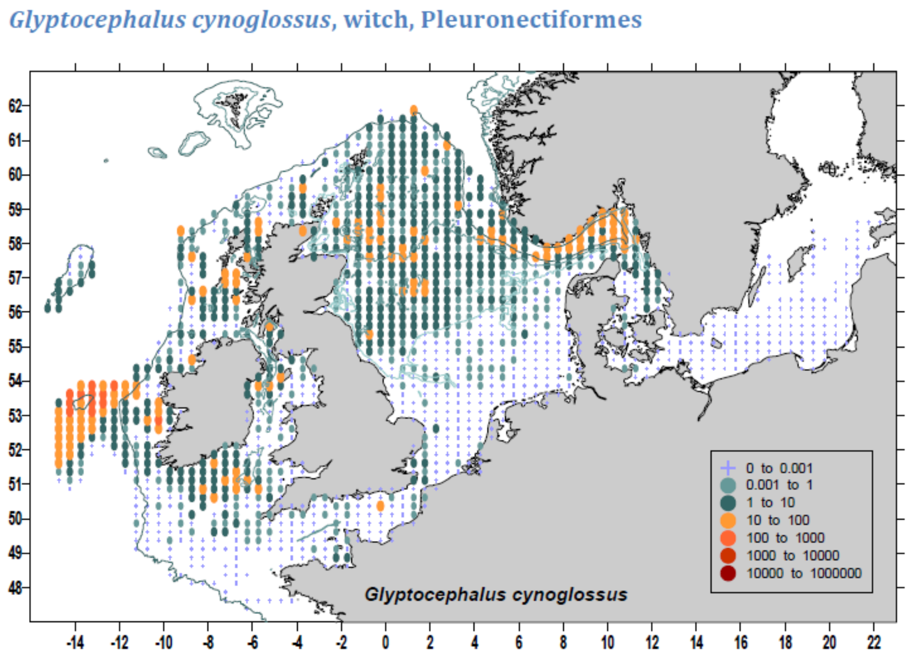


Figure 6.1. Witch in IV, IIIa and VIId: Distribution of the combined survey catches from 1975 to 2010 (Heessen et al., in prep).

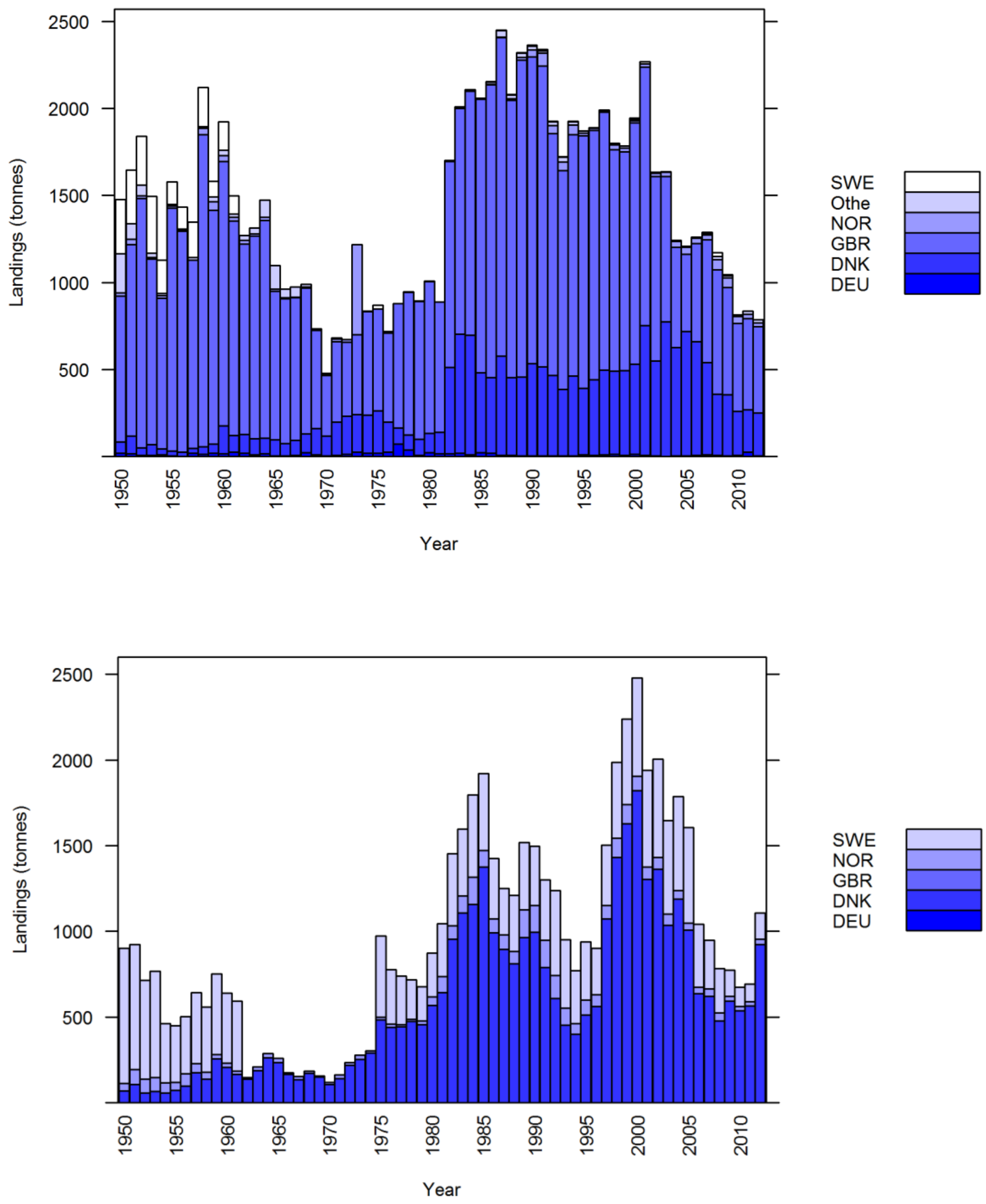


Figure 6.2. Witch flounder in IV (upper) and IIIa (lower): total landings by country in IV from 1950 to 2012.

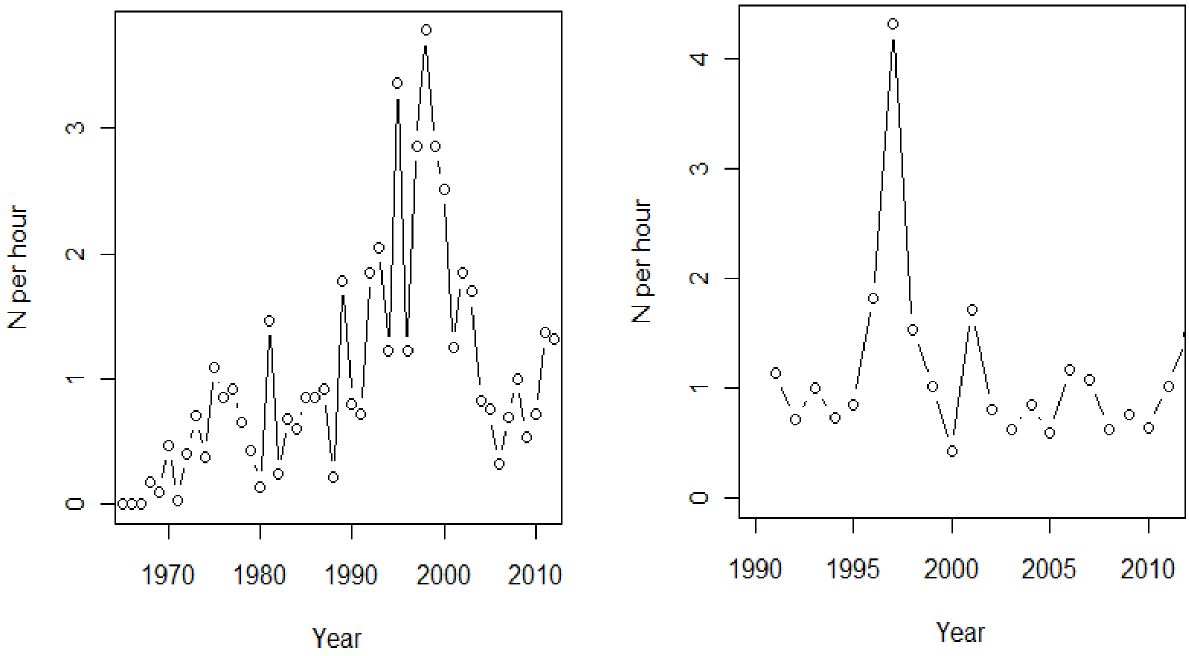


Figure 6.3. Witch in IV, IIIa and VIId:: Trend in cpue (n/h) estimated from IBTS survey from 1968 to 2012 in quarter 1 (left) and from 1991 in quarter 3 (right)

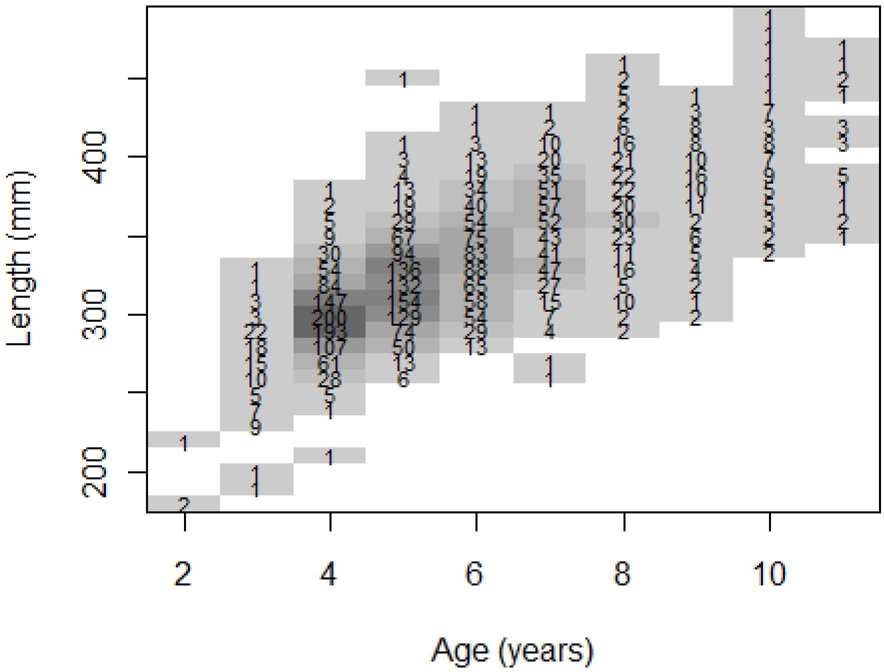
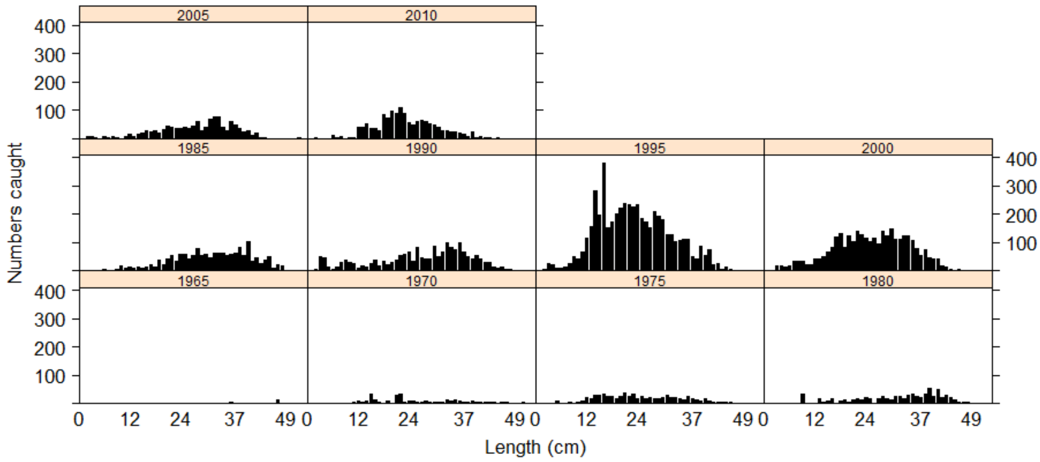


Figure 6.4. Witch flounder in IV and IIIa: age length keys (ALK) derived from otolith collected in 2009-2012 from Swedish market samples.



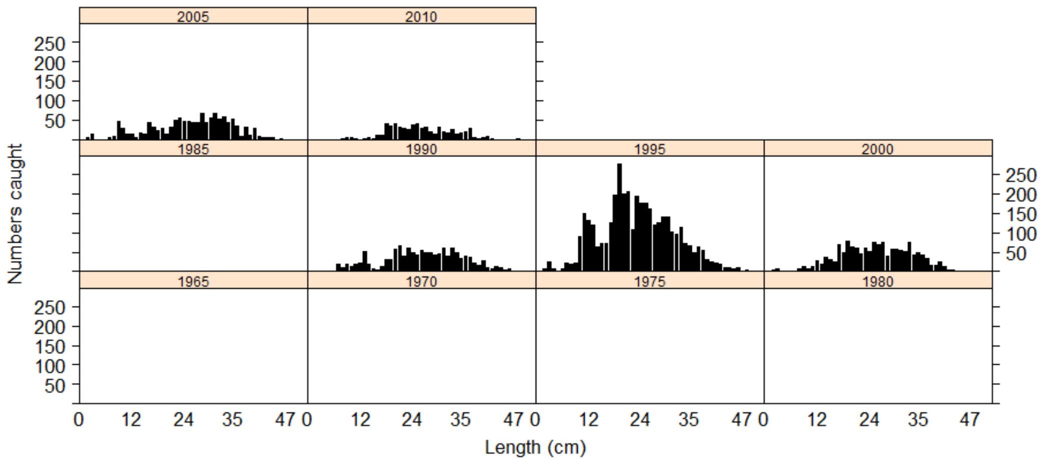


Figure 6.5. Witch flounder in IV and IIIa: Length frequency distribution of the IBTSQ1 (above) and IBTSQ3 (below), averaged over 5 years' time intervals.

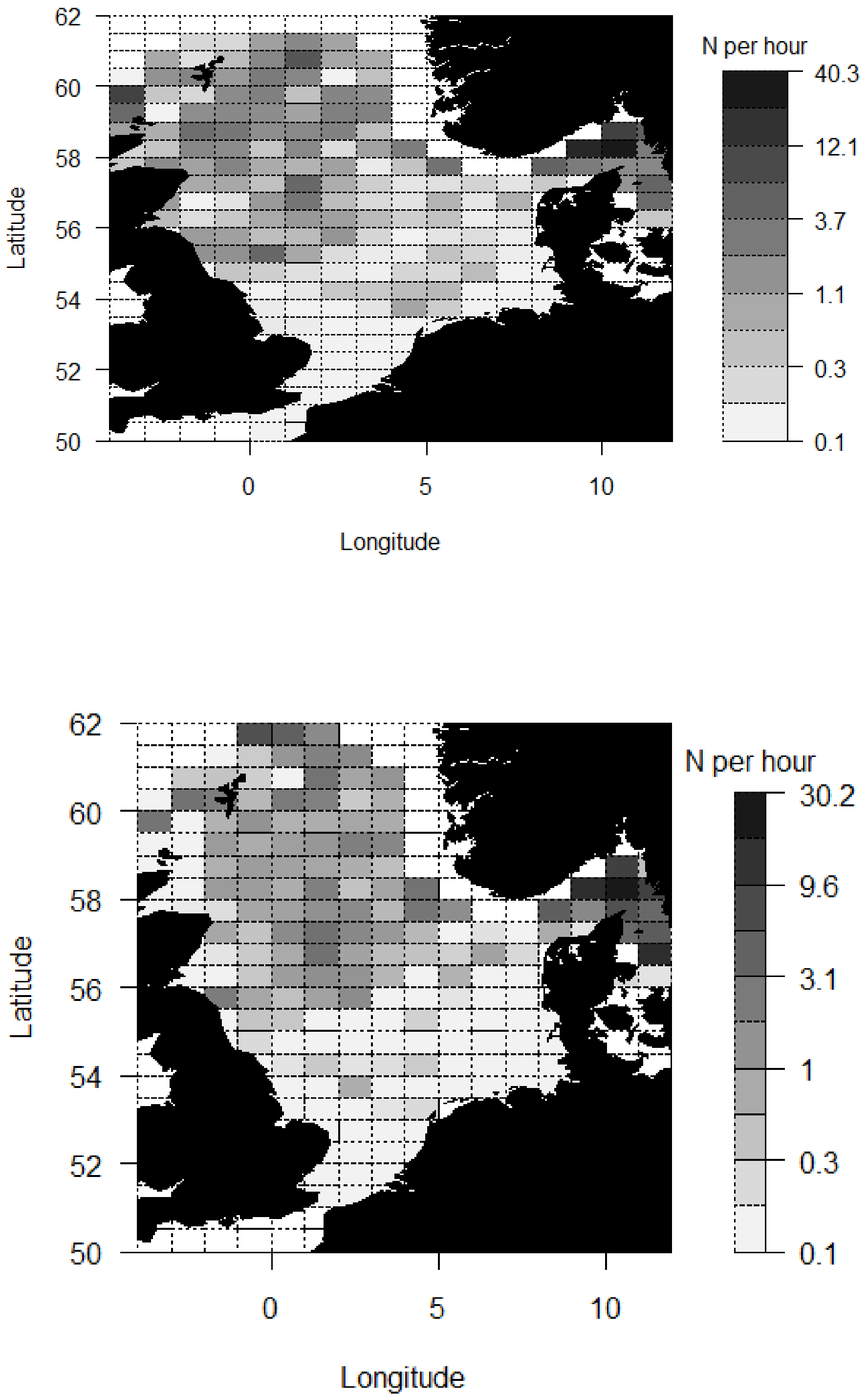


Figure 6.6. Witch flounder in IV and IIIa: spatial distribution of the standardized haul-specific CPUE (n/h) derived from IBTS trawl surveys in quarter 1 (upper) and quarter 3 (lower).

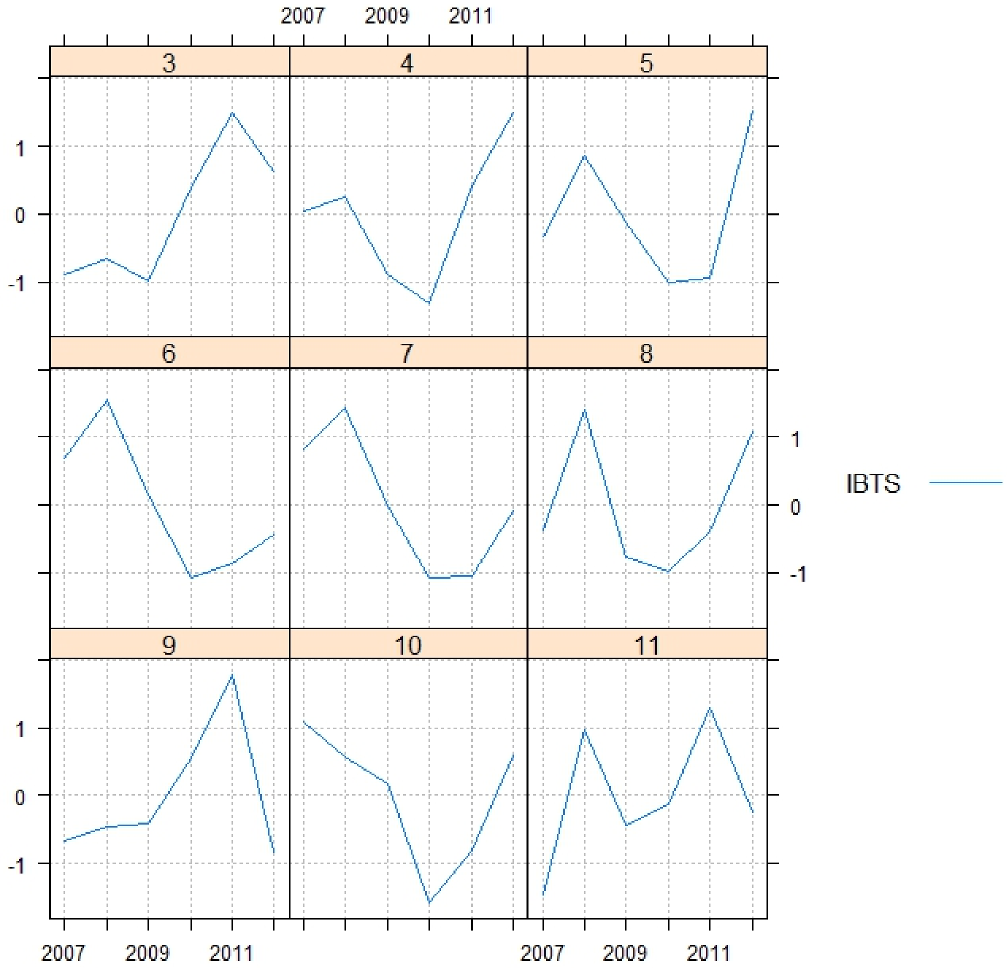


Figure 6.7. Standardised CPUE (n/h) per age class derived from the IBTS trawl surveys.

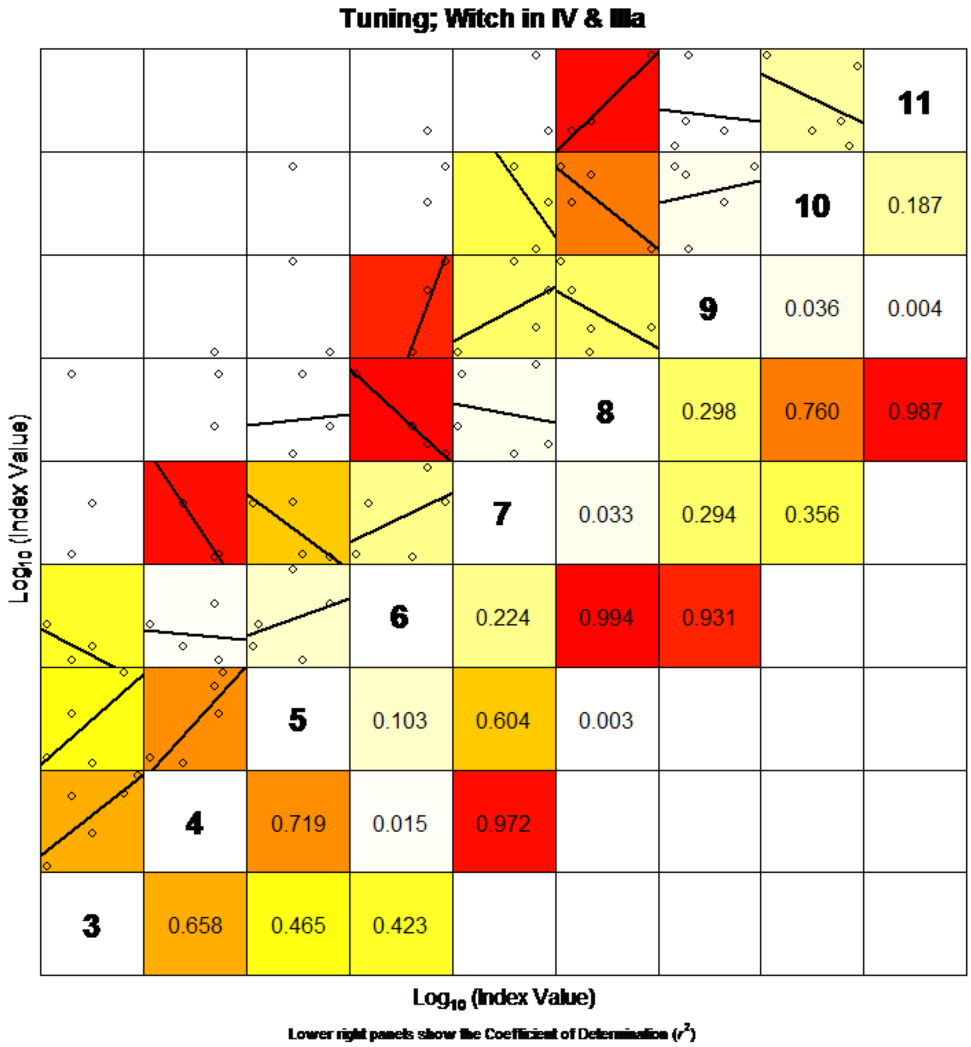


Figure 6.8. Witch flounder in IV and IIIa: IBTS internal consistency plot.

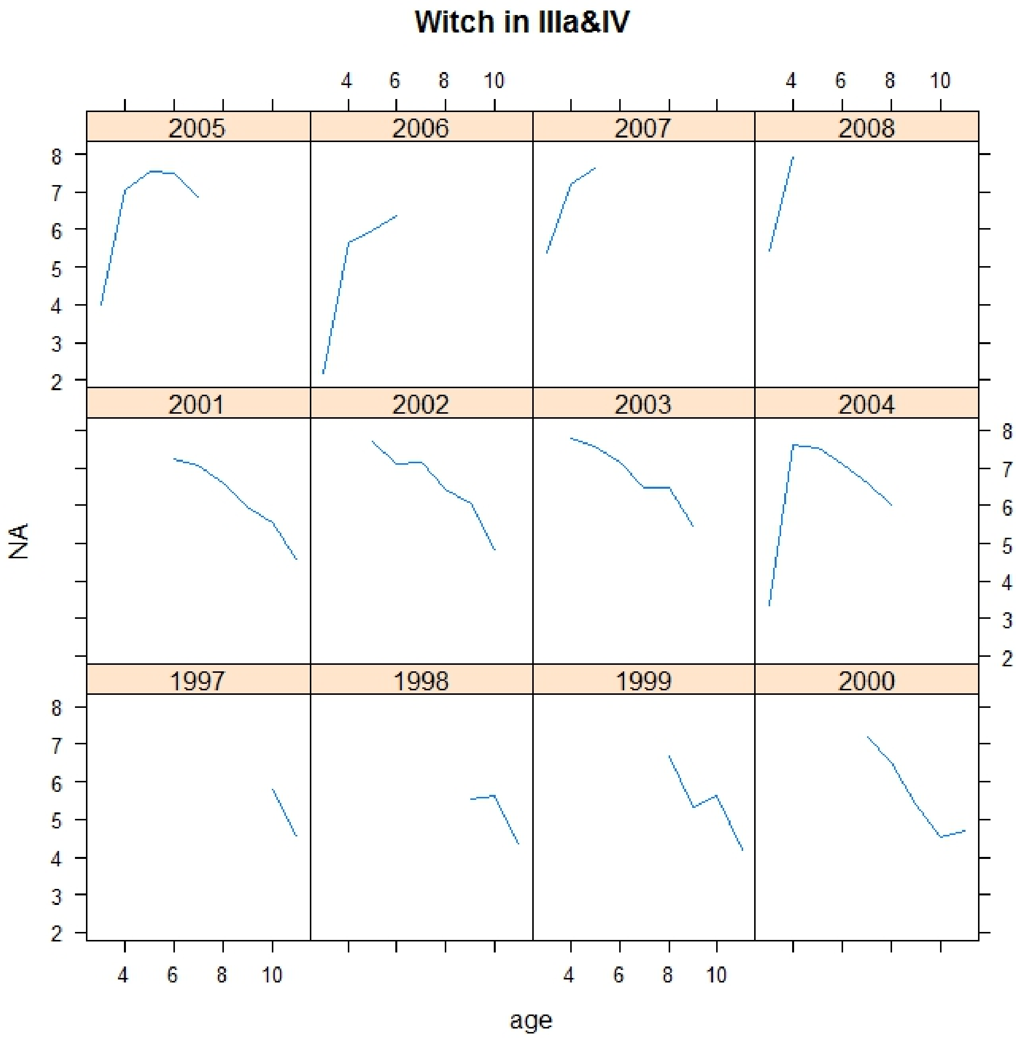


Figure 6.9. Witch flounder in IV and IIIa: Standardised catch at age per cohort.

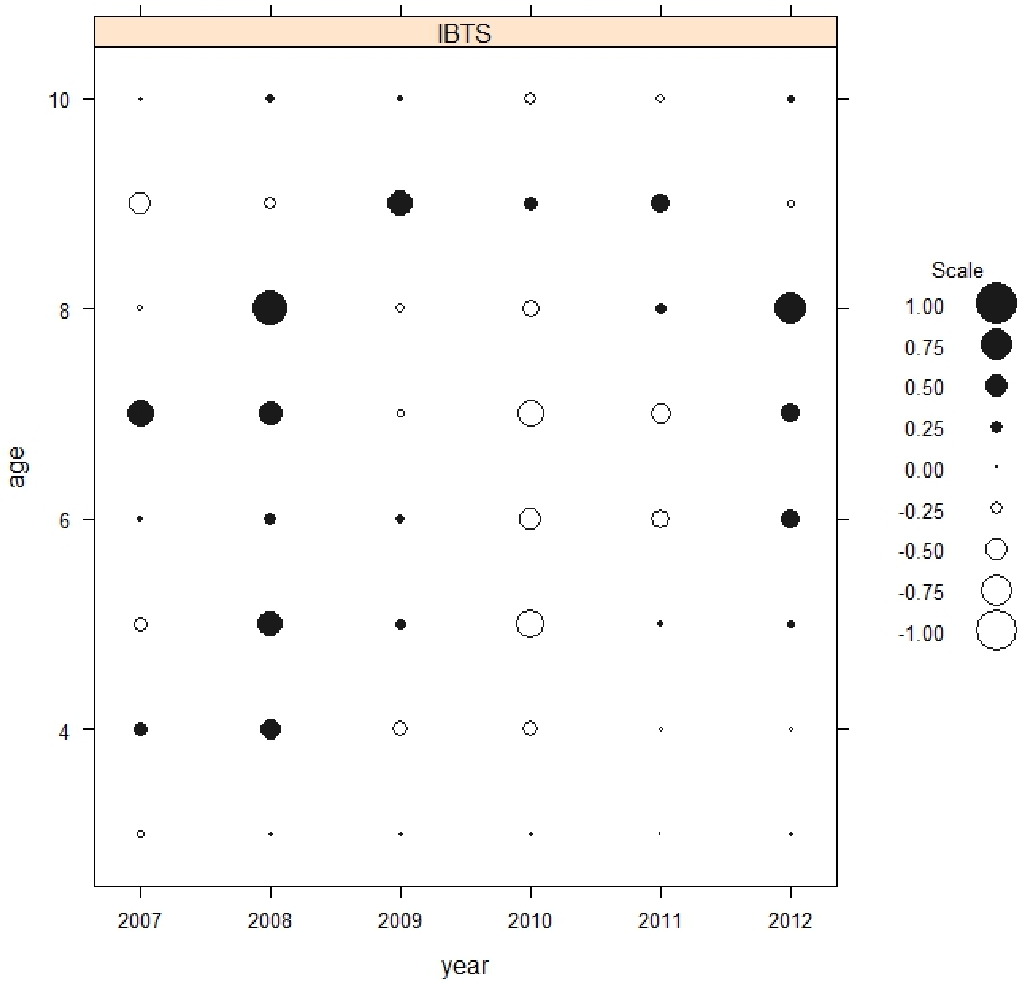


Figure 6.10. Witch flounder in IV and IIIa: residuals by fleet (IBTS) of the XSA exploratory model.

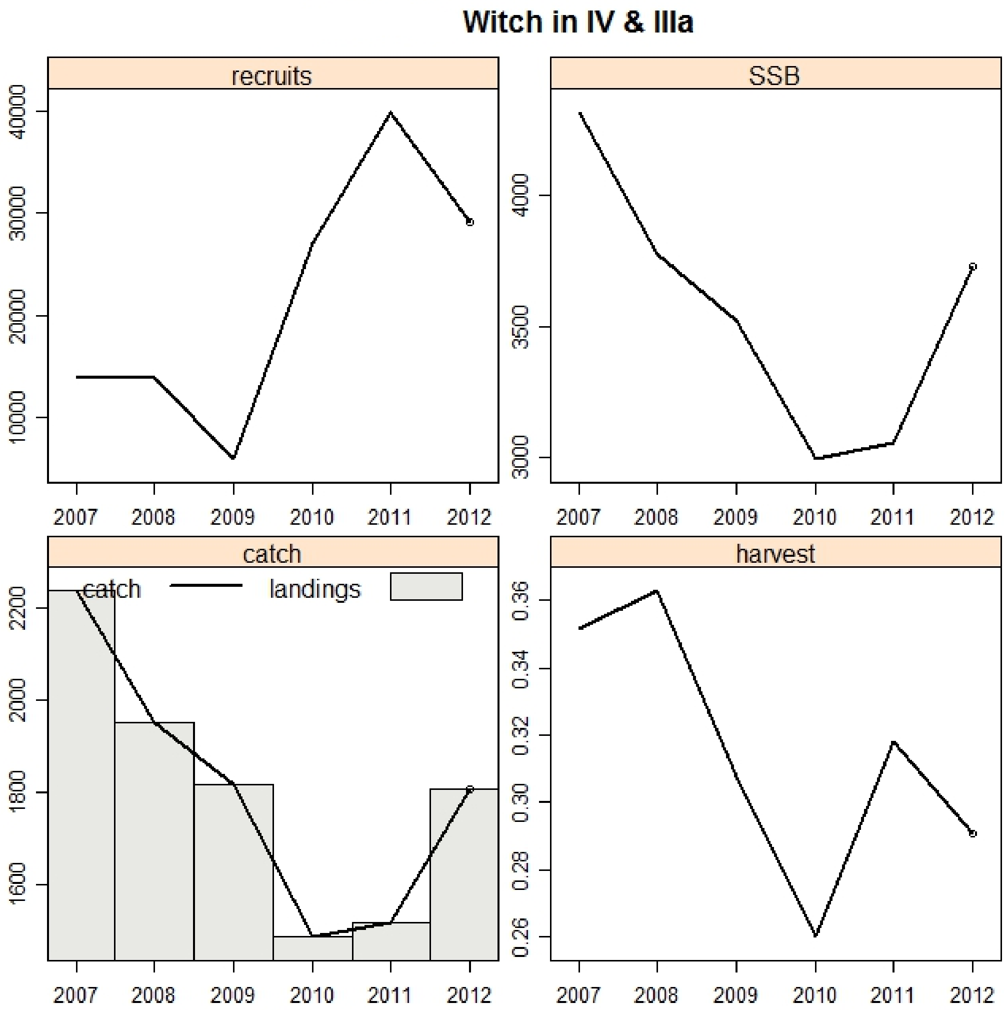


Figure 6.11. Witch flounder in IV and IIIa: summary results of the XSA exploratory model.

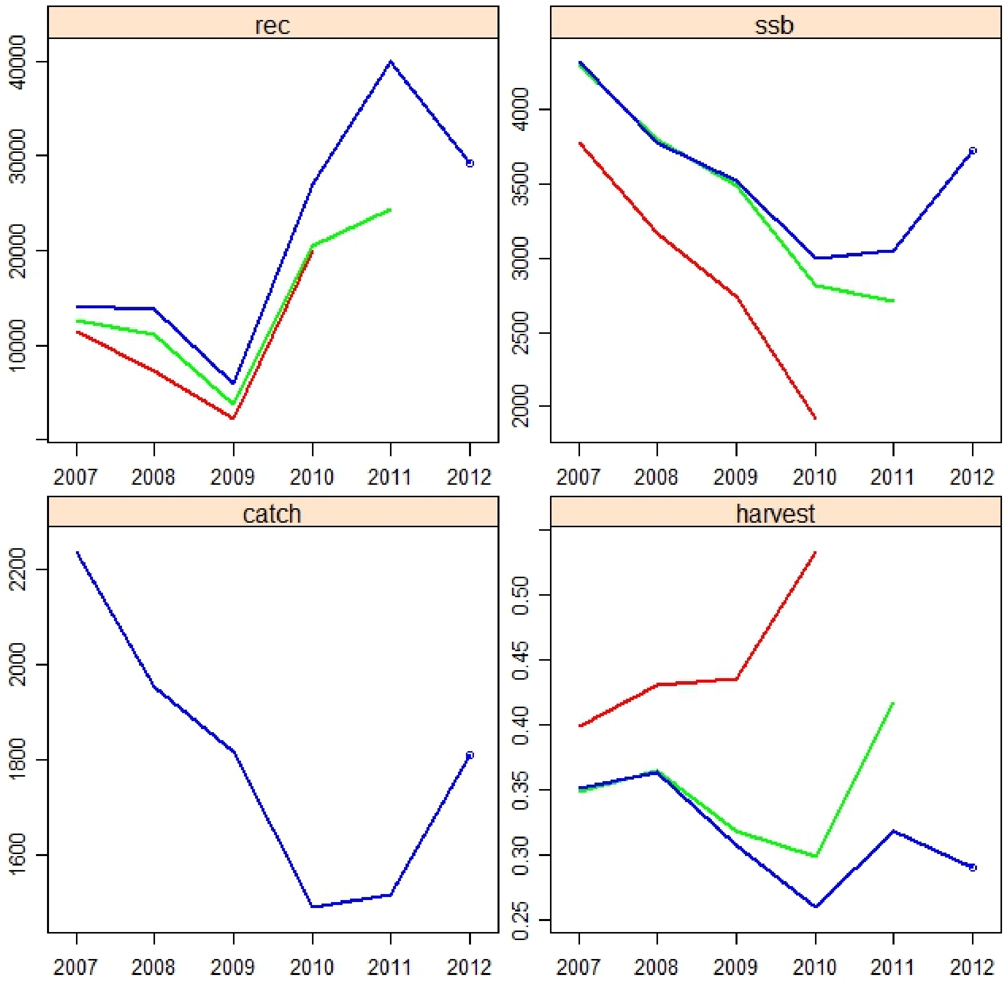


Figure 6.12. Witch flounder in IV and IIIa: Retrospective analysis of the XSA exploratory model.

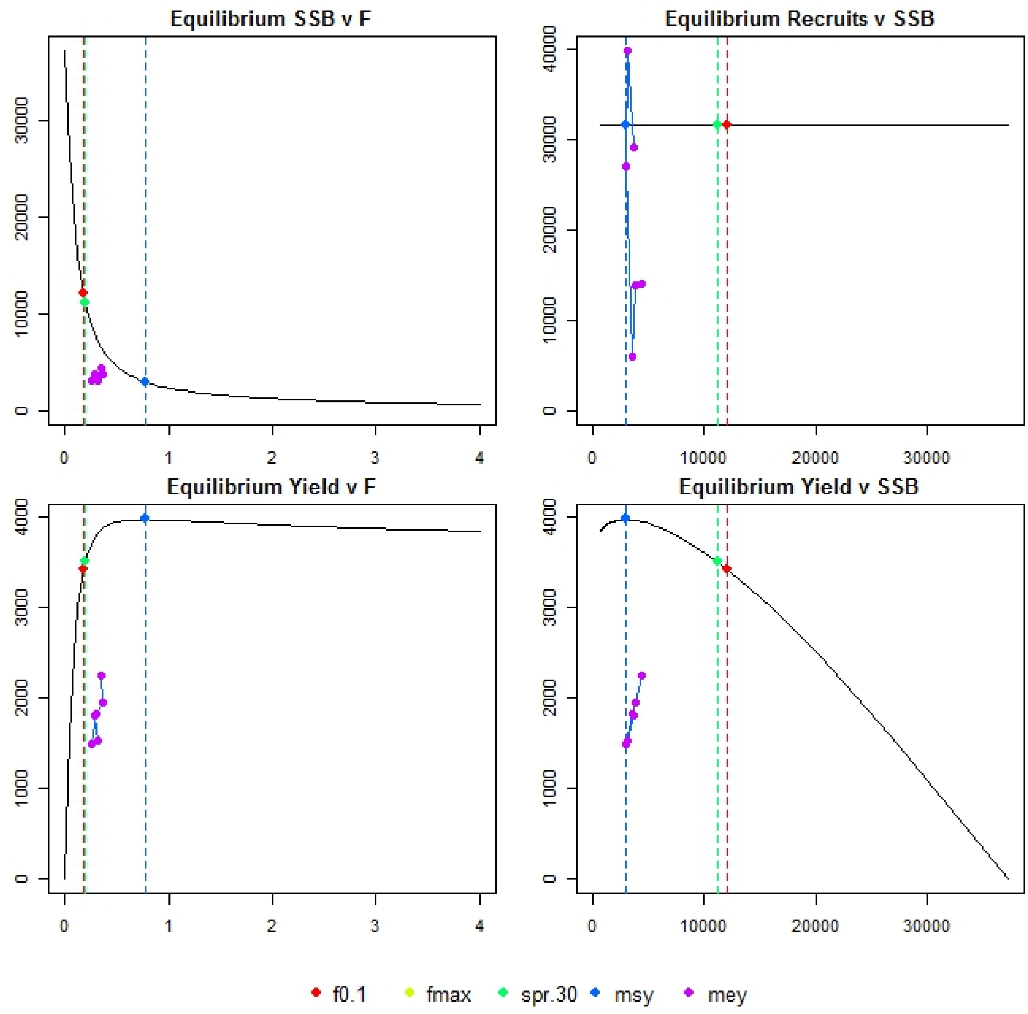


Figure 6.13. Witch flounder in IV and IIIa: Reference points derived from the XSA exploratory model.

7 Sole in subdivision VIIIc and IXa

7.1 General biology

Sole (*Solea solea*) spawning takes place in winter/early spring and varies with latitude starting earlier in the south. Larvae migrate to estuaries where juveniles concentrate until they reach approximately 2 years of age and move to deeper waters. Specimens attain maturity at 4 years of age. Sole is a nocturnal predator and therefore more susceptible to be captured by fisheries at night than in daytime. It feeds on polychaetes, molluscs and amphipods. *S. solea* is abundant in the Tagus estuary and uses this habitat as nursery ground. (Cabral and Costa, 1999).

Growth studies are mainly reported for specimens caught in estuaries, in the Tagus estuary, *S. solea* L_{inf} was estimated as 48.34cm and k was 0.0392 years^{-1} (Costa, 1990). Maximum length observed between 2004 and 2011 from the landings sampling program (PNAB-DCF) ranged from 26 to 60cm. According to Vinagre (2007) *S. solea* off the Portuguese coast presents higher growth rates in comparison with the northern European coasts.

7.2 Stock identity and possible assessment areas;

There is no clear information that supports the definition of the common sole stock for ICES subdivision VIIIc and IXa.

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

The minimum landing size of sole is 24 cm. There are other regulations regarding the mesh size for trammel and trawl nets, fishing grounds and vessel's size. A precautionary TAC was set for *Solea spp*. in ICES divisions VIIIc- e, subareas IX and X of 1072 t for the year 2012.

7.4 Fisheries data

The fisheries data presented here is the Portuguese data for *Solea solea* (sole) captured and landed in ICES division IXa.

Portuguese data available for the stock are the official landing data (table. 7.1 and7.2) and the data available from the DCF program. The data from the DCF is usually used to get a better accuracy of the official data. From the table it can be seen that since 2006 there as been an increase in Solea solea official landings and a decrease in the-category of mixed flatish species.

In this species the DCF data was used to obtain the corrected quantities of the *Solea solea*, *S. senegalensis* and *Pegusa lascaris* landings. In the Portuguese coast *S.solea* is caught mainly in the small-scale multi-gear coastal mixed fisheries together with other similar species *S. senegalensis* and *Pegusa lascaris*.

Figure 7.1 shows that after 2006 (DCF) the official portuguese landings are closer to the adjusted ones. The increse on the 2011 IPMA landings can be explained trough the better identification of the three sole species.

Figure 7.2 illustrates the catches from VIIc and IXa. The available data for the area VIIc are very scarce, for most of the years thera are no data from spain, making it very difficult to access the species in that area. The years of 2005 and 2006 shows the biggest landings in VIIIc division 240 and 154 tonnes respectively.

7.5 Survey data, recruit series

Solea solea is seldom caught during the Portuguese bottom trawl research surveys. This species may be found along the Portuguese coast mainly from very shallow waters and estuaries until a 100 m depth . This is just an indication because the data used to make this distribution becames from a series of research surveys with multiple sampling schemes and carried out at different seasons as was referred in the WGNEW 2012 report (Moura et al, 2012). Because of this the data is not suitable to use in fisheries independent information.

7.6 Biological sampling

There are no relevant biological sampling for the species.

7.7 Population biology parameters and a summary of other research

No relevant biological information derived from the catches of sole in IXa division were presented at the WG. No other relevant research are ongoing for sole in this division.

7.8 General problems

In Portugal *Solea solea* is caught together with and other similar species S. senegalensis and Pegusa lascaris and there are evidences of misreporting sole (Solea solea) with the other two species. However, since 2006 when the DCF was implemented, this misreporting have decreased and we have now a better identification of the species.

The results from the Portuguese DCF sampling program highlight the species misidentification in the official landings data from Portugal. The most important finding is that the species S. senegalensis, wich is not reported in the official landings contributes to a significant amount of sole nep. Annual landings which can be observed in figure 7.3.

References

ICES. 2012. Report of the Working Group on Assessment of New MoU Species (WGNEW), 5 - 9 March 2012, . ICES CM 2012/ACOM:20. 258 pp.

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Costa M.J. 1990. Age and growth studies of the Sole (*Solea vulgaris vulgaris* Quensel,1806) in the Tagus Estuary, Portugal. Boletim do Instituto Nacional de Investigação das Pescas, 15:63-67.

Table 7.1 Official landings for Sole (Solea solea) in subdivision VIIIc and IXa

year	ESP	FRA	IRL	PRT	totals
1950	0	0	0	377	377
1951	0	0	0	377	377
1952	0	0	0	356	356
1953	0	0	0	519	519
1954	0	0	0	556	556
1955	0	0	0	581	581
1956	0	0	0	595	595
1957	0	0	0	503	503
1958	0	0	0	528	528
1959	0	0	0	719	719
1960	0	0	0	647	647
1961	0	0	0	704	704
1962	0	0	0	618	618
1963	0	0	0	451	451
1964	0	0	0	0	0
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	0	0
1971	0	0	0	0	0
1972	0	0	0	0	0
1973	0	0	0	0	0
1974	0	0	0	0	0
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	0	0
1983	0	0	0	0	0
1984	0	0	0	0	0
1985	0	1	0	0	1
1986	0	0	0	0	0
1987	0	1	0	0	1
1988	0	1	0	0	1
1989	0	0	0	0	0
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	1	0	0	1
1993	0	1	0	0	1
1996	0	0	0	0	0
1997	0	0	0	1	1
1998	0	0	0	1	1
1999	0	0	0	0	0
2000	0	7	0	0	7
2002	0	0	0	0	0
2003	0	4	0	0	4
2004	0	0	0	164	164
2005	240	0	0	27	267
2006	154	1	0	22	177
2007	0	0	0	269	269
2008	0	0	0	321	321
2009	0	3	0	360	363
2010	0	2	0	380	382
2011	0	1	0	293	294
2012	0	4	0	388	392

Table 7.2 Landings (ton) of *S. solea* (SOL), *P. lascaris* (SOS) and mixed flatish species (SOX) by fleet/métier since 2003. Source DGRM (official landings).

	SOS				SOL				SOX			
Year	Dtrawl	Polyvalent	Pseine	Total	Dtrawl	Polyvalent	Pseine	Total	Dtrawl	Polyvalent	Pseine	Total
2003	3.5	94.2	0.0	97.7	1.4	109.9	0.0	111.3	26.5	385.0	2.2	413.7
2004	3.6	112.8	0.2	116.7	1.8	141.9	0.1	143.9	19.4	442.0	2.2	463.6
2005	5.4	143.2	0.1	148.7	5.5	269.9	0.7	276.2	11.3	387.9	3.0	402.2
2006	1.1	84.7	0.5	86.3	8.8	272.5	5.0	286.3	3.9	156.1	2.6	162.6
2007	1.7	52.4	0.1	54.1	16.7	247.1	2.8	266.5	1.6	56.5	0.0	58.1
2008	1.0	74.9	0.0	76.0	18.4	277.1	1.2	296.7	0.7	67.6	0.0	68.4
2009	1.2	132.3	0.1	133.6	16.9	315.3	1.8	334.1	0.2	55.2	0.0	55.4
2010	1.0	153.8	0.5	155.3	17.2	361.9	3.6	382.7	0.1	76.5	0.0	76.5
2011	1.7	171.2	0.1	173.0	27.9	402.2	2.3	432.4	0.1	86.3	0.0	86.4

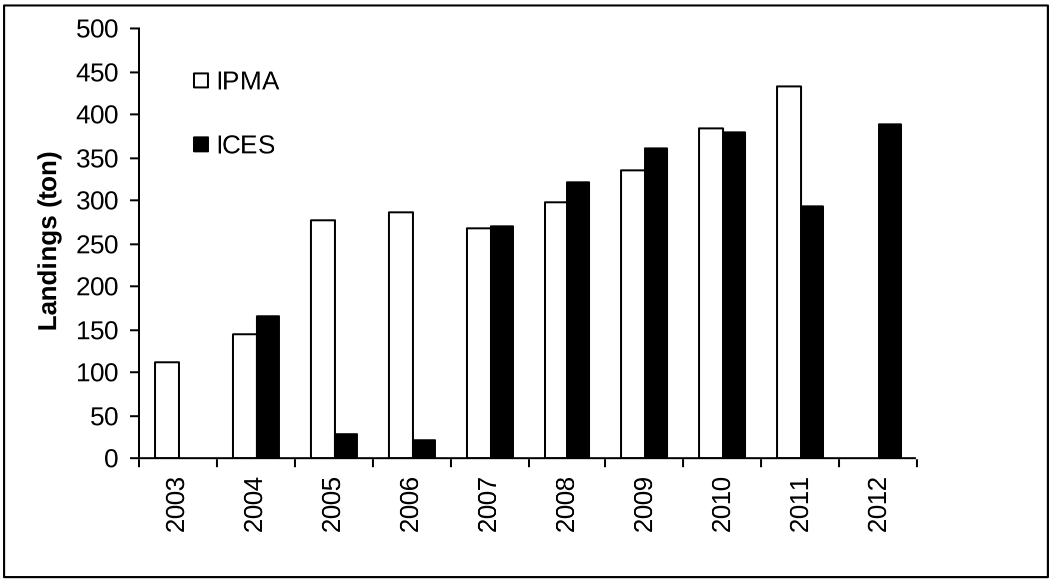

Figure 7.1- Solea solea in division IXa (only portugal) official landings (ICES) and landings after the adjustments made through the DCF (IPMA).

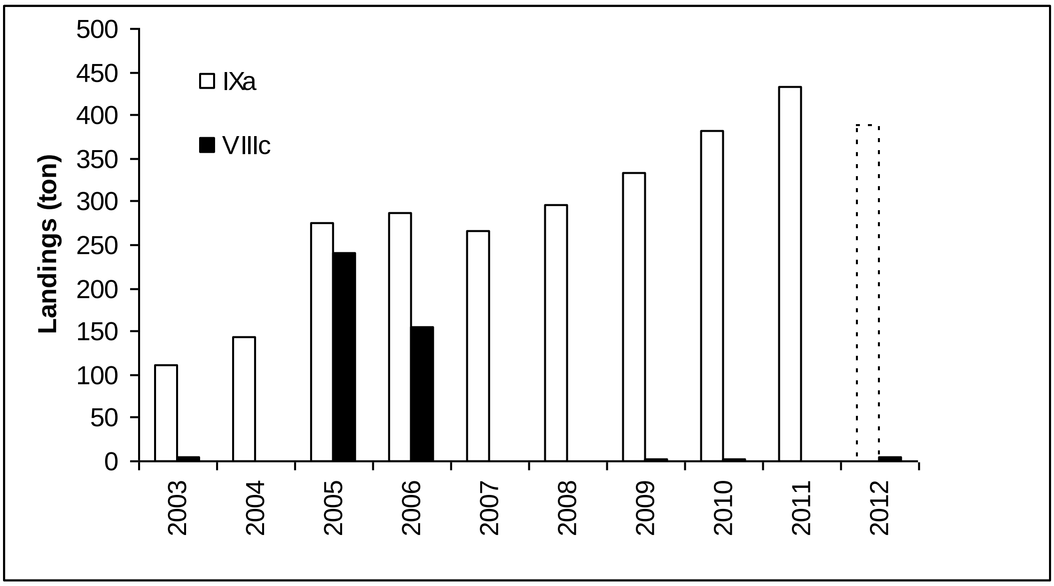

Figure 7.2- Solea solea in divisions VIIc and and IXa, for the years in which Spanish data is available. (2012 – Preliminary data)

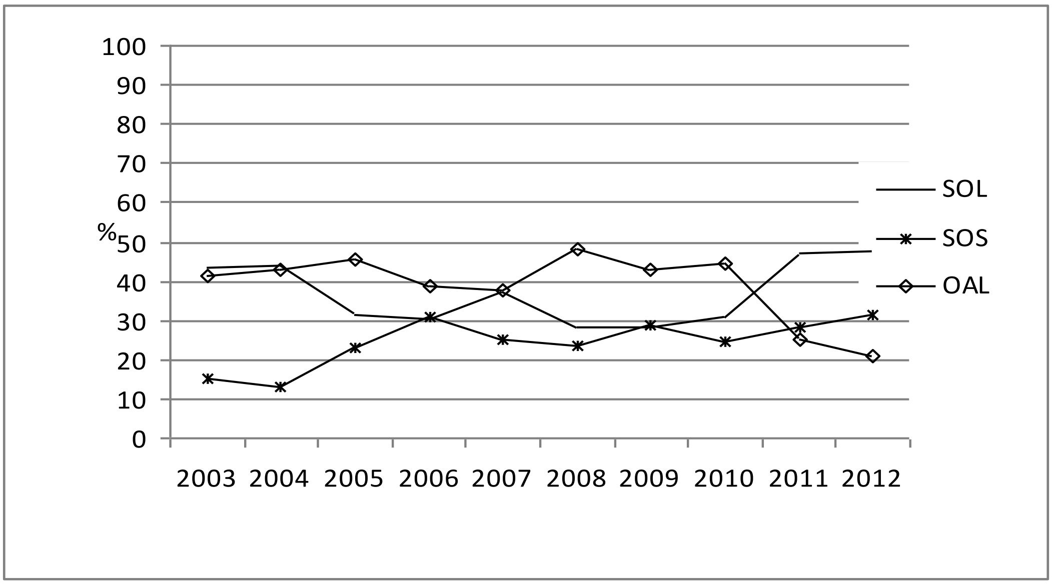

Figure 7.3- Proportions of Portuguese landings adjusted trough the DCF sampling program of *S. solea* (SOL), *S. senegalensis* (OAL) and *P. lascaris* (SOS) per year since 2003.

8 Tub gurnard in all areas

8.1 General biology

Tub gurnard *Trigla lucerna* or *Chelidonichthys lucernus* is a benthic species occurring in the Eastern Atlantic from Norway to Senegal, in the Mediterranean Sea and the coast of South Africa (Quero, 1984). Tub gurnard is relatively abundant in inshore waters of 20-150 m depth, extending in decreasing numbers to 200 m. Small specimens are frequent in shallow waters from 2-20 m. It lives on mud and muddy sand bottoms (Wheeler 1978).

In summer, tub gurnard occurs in inshore waters on sand, muddy sand and gravel grounds. It also occurs in estuaries (like the Gironde). In winter, it migrates to grounds deeper than 80 m. Juveniles smaller than 15 cm feed on a variety of small crustaceans, mainly copepods. Fish smaller than 30 cm eat mysids, shrimps, amphipods and crabs. The diet of larger specimens consists mainly of small fish and some cephalopods (Quero, 1984).

Spawning takes place from December to February in Mediterranean Sea and in May-June in the Celtic Sea. Younger fish migrate to coastal waters at the end of summer (Quero, 1984).

8.2 Stock identity and possible assessment areas;

No recent studies are known of the stock ID of tub gurnard at the time of the WG. Some genetic studies have only been carried out in Mediterranean Sea.

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

There is no minimum landing size set. There is no technical measures specifically dedicated to tub gurnard or others species of gurnards. The exploitation of tub gurnard is submitted to the general regulation in the areas where they are harvested.

8.4 Fisheries data

This species belongs to the bycatch species and is mainly caught by demersal fisheries and more particularly by trawlers. Tub gurnard is either landed for human consumption or fish could is used for baiting traps used to harvest large crustaceans.

8.4.1 Historical landings

Gurnards are often not sorted by species when they are landed. This is reflected in the catch statistics where different species of gurnards are often reported into one generic category of "gurnards". WGNEW 2010 highlighted the problem with gurnard landings in a series of plots of historic landings up to 2010 (Figure 8.1). Only the series from 2000 seems more reliable from year to year.

Among the fishing areas, the North Sea is most significant with 52% of the landings on average (1575 t) then the eastern English Channel with 37% (1113 t).

8.4.2 Discards

Under the DCF, National programs of sampling by observation at sea have collected data of tub gurnard since 2003 the sampling probably increased since 2009 when the concurrent sampling has been carried out.

Van Helmond & Heessen (2010) present in the NESPMAN report the discarded length compositions per fishing hour in the Dutch beam trawl fishery. They are shown in Figure 8.2. The size range of the discards is from 5 to 30 cm. Higher values of discarding were observed in 2005 and then they decline continuously, may be indicating no strong year class coming in or a change in the fishing strategy of this fleet.

8.5 Survey data, recruit series

For the NESPMAN Project, ter Hofstede et al. (2010) analysed data from several surveys in the North Sea:

IBTS Q1 : During quarter 1 the abundance is quite low. No clear trend is to be seen, although numbers (of overwintering fish) seem to increase in the last five years of the time series.

IBTS Q3 : This time series is relatively short, and the first year clearly is an outlier, possibly due to a wrong identification (grey gurnard identified as tub gurnard?). Slightly higher values occur during the last three years.

BTS Q3: The abundance in the stations covered by RV Isis gradually increased since 1985, but in the stations fished by RV Tridens numbers remain at a low level.

From this data it seems that tub gurnard enters the southern North Sea in spring, and leaves again in the autumn. The slight increase seen in IBTS Q1 may indicate an increase in the numbers of tub gurnard that remain in the North Sea in winter in recent years. This is similar to striped red mullet, another species that used to enter the North Sea in spring and leave in the autumn, but that now overwinters in the North Sea in increasing numbers. The most promising time series for tub gurnard seems to be from the Beam Trawl Surveys in quarter 3, and especially for the stations in the south-eastern North Sea covered by RV Isis (Figure 8.3).

The abundance during the CGFS survey, the general trend is stable. The length distribution is stretched and sometimes shows two modes separating juveniles and adults. The abundance of tub gurnard in the area covered by the EVHOE survey is too low to provide meaningful information.

8.6 Biological sampling

Under the DCF, sampling of tub gurnard has been carried out by observations at sea in Netherlands at least since 2004. Since 2009, the French concurrent sampling program by observation at sea under DCF should provide length compositions of catches by metier and area. Currently, the main source of biological data remains the surveys conducted in North Sea, Eastern Channel. The few catches from the survey conducted in Celtic Sea and Bay of Biscay are not able to provide some usable biological data series.

8.7 Population biology parameters

Growth parameters available are from a small southern part of Division VIIe (Bay of Douarne-nez) and have not been updated since the 1980s (Baron, 1983). They are shown in Table 8.1 and Table 8.2.

8.8 Analyses of stock trends and potential status indicators

Beare et al (2004), based on a long series of CPUEs (1925-2003) from FRS survey database, have suggested that in Division IVb, abundance of species having southern biogeographic affinities (tub gurnard included) increased in the period 1995-2004.

The analysis of survey data in the North Sea and Eastern Channel (Anon. 2010) suggest continuity between Division VIId and south-eastern part of Division IVc. There are mainly adults (above 24 cm) both in the CGFS survey in October and the BTS-3 in 3rd quarter. Then tub gurnard is almost not present during quarter 1 in North Sea (See IBTS-1 results) suggesting they enter the Southern North Sea later in the year.

The landings of tub gurnards as an indicator of stock trends or removals should be done with caution given the misclassifications that appear to exist in the gurnards.

The North Sea Beam Trawl Survey index (BTS ISIS Q3) showed an increase from 1985 to 1992 and has fluctuated at a relatively high level since (Figure 7 12). No update had been done for this time-series since 2009.

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Wheeler, A. 1978. Key to the fishes of northern Europe. Frederick Warne, London. 380 pp.

Table 8-1: Tub gurnard. Growth parameters in the English Channel

Authors	Area	Sex	Nb	L∝	K	T_0 (year)
Baron (1985)	VIIe	M	217	48.4	0.462	-0.41
		F	239	66.8	0.32	-0.46

Table 8-2: Tub gurnard. Length-weight relationships. W= live weight in g, L in cm

Authors	Area	Sex	Nb	a	b
Baron (1985)	VIIe	N	?	0.00431	3.21

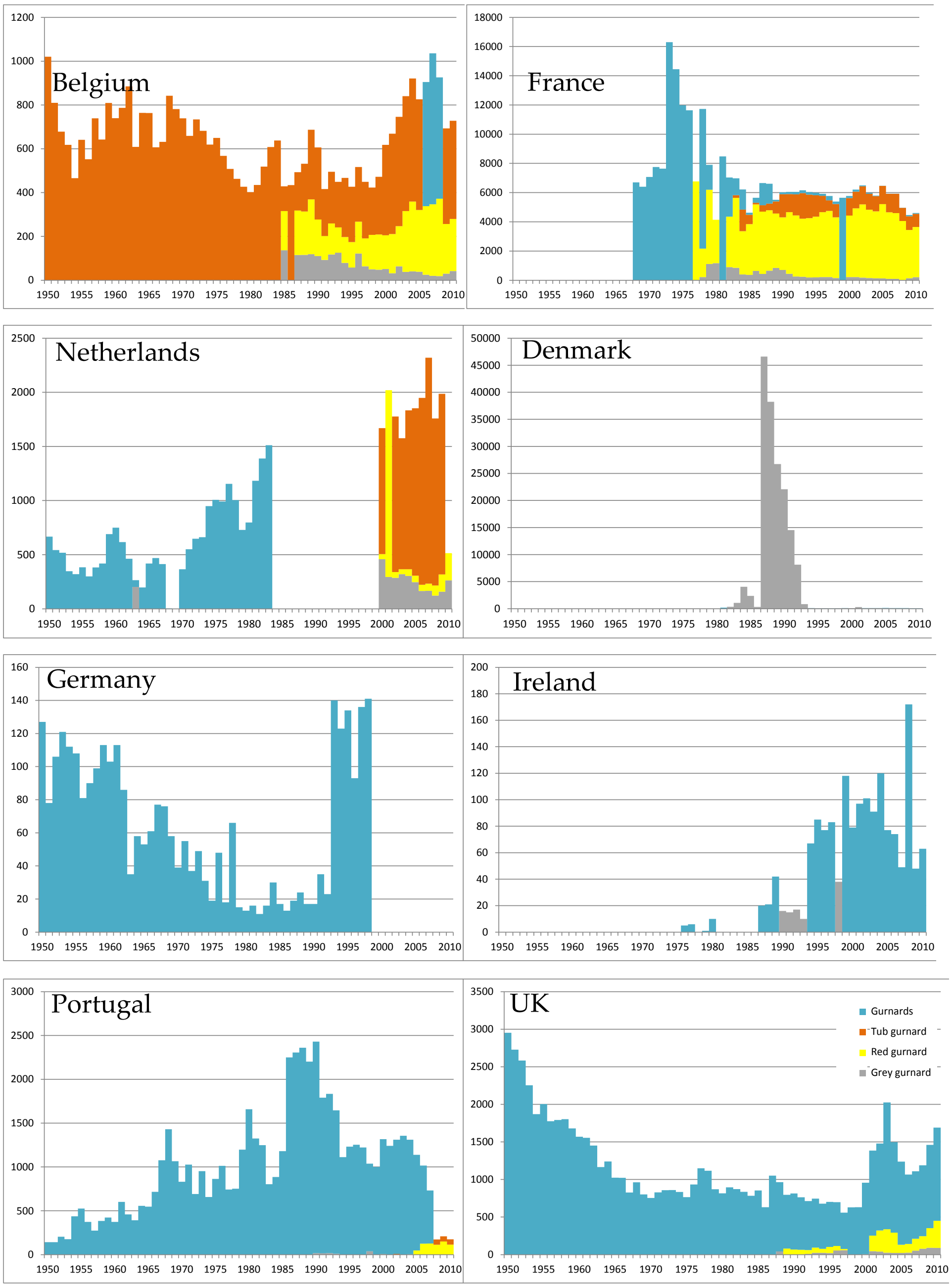

Figure 8.1: Official landings for the different gurnards (and mixed gurnards) for different countries (Source WGNEW 2010 report).

TUB GURNARD

length class	2004	2005	2006	2007	2008
0					
1					
2					
3					
4					
5				0.055	
6					
7					
8		0.085			
9	0.056	0.016			
10		0.062	0.148		
11	0.078	0.094	0.094	0.248	
12	0.286	1.710		0.358	0.026
13	0.662	2.188		0.060	0.067
14	0.300	1.209	0.246	0.453	0.153
15	0.186	1.304		0.446	0.134
16	0.312	1.823	0.145	0.253	0.217
17	0.332	1.443	0.523	0.742	0.229
18	0.319	2.041	0.559	0.586	0.457
19	0.559	0.716	1.000	0.556	0.405
20	0.354	0.303	1.001	0.571	0.288
21	0.414	0.340	0.843	0.467	0.359
22	0.436	0.262	1.156	0.586	0.686
23	0.943	0.519	0.948	0.933	0.274
24	0.663	0.793	1.367	1.517	1.285
25	0.718	0.501	1.061	0.727	0.431
26	0.245	0.137	0.667	0.384	0.365
27		0.278	0.225	0.475	0.539
28	0.112	0.056	0.059	0.091	0.020
29	0.030	0.024	0.043	0.167	0.019
30			0.197	0.081	0.078
31			0.058		
32					0.022
33					0.022
34					
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
sum	7.0	15.9	10.3	9.8	6.1

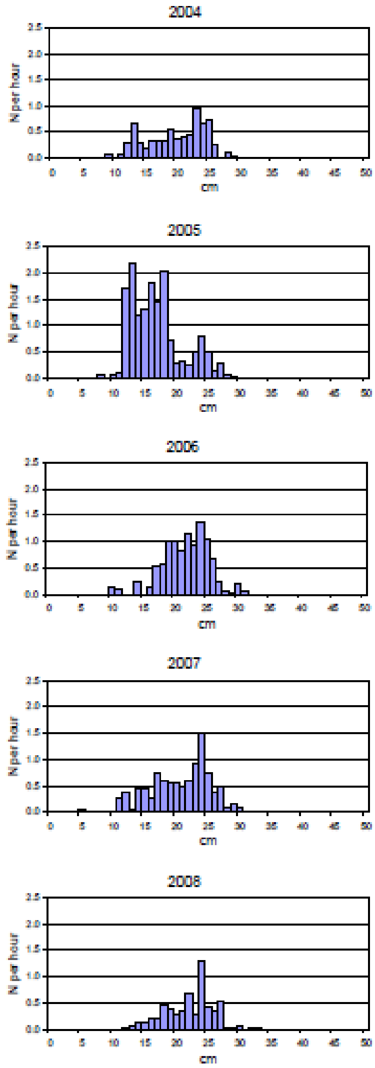

Figure 8.2. Tub gurnard. Number at length discarded per fishing hour in the Dutch beam trawl fishery in the years 2004-2008. (Source NESPMAN report).

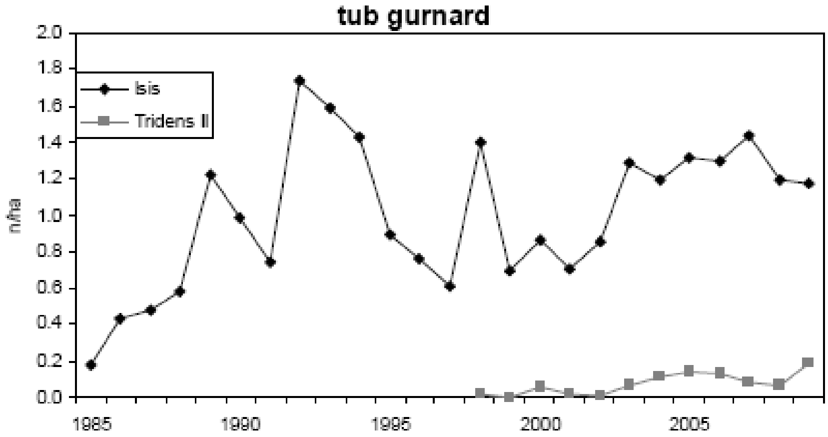

Figure 8.3: Time series of abundance of tub gurnard in the North Sea BTS Q3 survey by vessel. Note that the last year of the presented time series is 2009 (Source WGNEW 2010 report).

9 Turbot in IIIa (Kattegat-Skagerrak)

9.1 General biology and historical trends

Turbot (*Scophthalmus maximus*, Linnaeus 1758) is one of the fastest growing flatfish in the North East Atlantic and 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 & 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. A study in the northern Baltic by Aneer and Westin (1990) also indicated that adult turbot is very stationary. Turbot is a species potentially vulnerable to fisheries due to its ecological (distributed mostly in coastal shallow areas; Curry-Lindahl, 1985) and morphological characteristics (high gear vulnerability due to the particular body shape). However, despite its high commercial value, the stock status of turbot has not been assessed and it is not managed in the Kattegat-Skagerrak. The Swedish Species Information Centre (www.artdata.slu.se/rodlista) classifies the turbot in Swedish waters as "Near Threatened". Recent analysis have shown that that biomass in IIIa has declined by about 86% since 1925, the maximum body size has decreased 20 cm and the northern component (IIIaN; Skagerrak) of the population has virtually vanished over the same period (Cardinale *et al*., 2009).

9.2 Stock identity and possible assessment areas

Turbot shows life-history characteristics that make differentiation between biological units most likely: low larval dispersal, a strong spawning site fidelity and limited adult migration (and thus high residency) (Molander, 1964; Curry-Lindahl, 1985; Aneer and Westin, 1990; Støtterup *et al*., 2002; Voigt, 2002; Iglesias *et al*., 2003; Cardinale *et al*., 2009; Florin and Franzén, 2010). Furthermore, there are evidences of differences in stock dynamics between the Skagerrak/Kattegat (Cardinale *et al*., 2009) and the North Sea (ICES, 2012). Tagging studies from three different parts of the Baltic Sea all showed that adult turbot are very stationary, have high spawning site fidelity and that 95% of the fish moved less than 30 km from tagging site, although a few individual specimens showed displacements of 100´s of kms (Johansen 1916, Aneer & Westin 1990, Florin and Franzen 2010). Thus, turbot generally occur in spatially separated stock units as it spawns at specific localities in shallow areas during summer with low larval dispersal (Molander, 1964; Curry-Lindahl, 1985; Voigt, 2002; Iglesias *et al*., 2003, Florin and Franzén, 2010) and with restricted movements as adults (Aneer and Westin, 1990; Støttrup *et al*., 2002; Florin & Franzén, 2010), and exhibit strong spawning site fidelity (Florin and Franzén, 2010). Inspection of historical data from the Skagerrak-Kattegat area also indicates spatially separate stock structures, at least in terms of spawning components, which are persistent over time (Cardinale *et al*., 2009).

Genetic differentiations of turbot within the North Sea and Baltic Sea have been shown to be low, albeit significantly suggesting that turbot may consist of several local populations (Nielsen *et al*., 2004; Florin and Höglund 2007). In Florin and Höglund (2007), no isolation of distance pattern could be found between the Baltic

Sea and Kattegat but the study by Nielsen *et al*., (2004) shows a sharp cline in genetic differentiation when going from the low saline Baltic Sea to the high saline North Sea, where samples from Skagerrak and Kattegat are in the transition zone. This suggests that Skagerrak and Kattegat populations are inherently different from the turbot in the North Sea. A large population genetic study of turbot population structure is still ongoing (https://fishreg.jrc.ec.europa.eu/web/**fisheries-genetics**). Nevertheless, in the presence of strong natal homing, as it is the case for turbot, the question whether populations (i.e. aggregation of adult fish during spawning) are genetically distinguishable is not crucial for the existence of self-sustaining population units and for management (Waples *et al*. 2008). On the contrary, the existence of separated spawning aggregations is a key factor regulating the dynamic of the population (Svedäng *et al*. 2010) and thus they should be managed accordingly (Cardinale *et al*., 2011).

Therefore, following IPBNEW in 2012 (ICES, 2013), and considering the life-history characteristics of turbot (low larval dispersal, strong spawning site fidelity, limited migration of the species) and the observed genetic patterns (see https://fishreg.jrc.ec.europa.eu/web/**fisheries-genetics**), it was recommended that turbot from the Skagerrak/Kattegat not to be included in the North Sea stock, but treated separately or combined with the Baltic stock. However, future analysis should also elucidate the fine spatial structure of the species in the transition area of the Skagerrak-Kattegat and Belt Sea (i.e. SD 20-24) and the level of spatial disaggregation necessary in the assessment and sustainable management of the species in this area. For the time being, and before the next benchmark scheduled for 2014, turbot in IIIa is treated as a separate stock unit and assessed accordingly.

9.3 Management regulations

There is no TACs in place for turbot in area IIIa. So far, no analytical assessments leading to fisheries advice have been carried out for turbot in IIIa by ICES. No precautionary reference points have been proposed, and no management plans are in place for this stock.

There is no official EC minimum landing size, although in several geographical area Minimum Landing Sizes (MLS) have been installed by different authorities.

9.4 Fisheries data

In IIIa, a target fisheries for turbot probably only occurred when the stock was large (i.e. before 1960s; Cardinale *et al*., 2009), while today turbot is only caught as by-catch in the trawl and gillnet fisheries. **Error! Reference source not found.**1 and Figure 9.1 summarize turbot landings in ICES area IIIa. Over the period 1950 – 2012, total landings (IIIa) ranged from 64 t to 736 t per year, with the lowest landings during the end of 1960´s and the beginning of the 1970s, and the highest peak in 1977 and in the early nineties (**Error! Reference source not found.**). In the last two decades, the total landings of turbot in IIIa have declined from around 350 t pr year to less than 100 t per year (Figure 9.1), with the exception of 2012, which resulted in almost 200 t of turbot landed in IIIa.

9.5 Survey data, recruit series and analysis of stock trends

Two survey series catching turbot are available: the Internationl Bottom Trawl Survey (IBTS) using two Research Vessels: Argos and Dana, and the Baltic Internationl Trawl Survey (BITS) using the Danish Research Vessel Havfisken (KASU survey). The IBTS catches very little turbot (Figures 9.2-9.3) because the gear is designed to catch roundfish rather than flatfish. Hence, the IBTS was not further evaluated for use in the assessment of stock trends. On ther other hand, data from Havfisken trawl survey (BITS), which covers the Kattegat and the southern part of the Skagerrak showed much larger catches during the same time period and area (Figures 9.4-9.5). Thus Havfisken trawl survey (BITS) could be used to derive an index of abundance of turbot in IIIa. The estimated CPUE (n/h) does show a slight decline during the entire time series for both quarters (Figures 9.6-9.7). The proportion of decline in CPUE estimated for the last two years compared to the previous three years was 47% and 41%, for quarter 1 and quarter 4, respectively (Table 9.2). The length frequency distribution estimated from BITS surveys and aggregated every 5 years showed as large individuals are very rare in the catches being most of the fish caught under 30 cm (Figure 9.8-9.9).

9.6 Biological sampling

DCF-requirements and Member States sampling intentions

Appendix VII of Commission Decision 2010/93/EU lists biological variables with species sampling specifications for all ICES areas. 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.

No Member States included sampling of biological parameters for turbot in IIIa in their proposals.

General problems

Due to the relatively low numbers of turbot in commercial catches (per trip) and the high commercial value of this species, it is very difficult to collect data on biological variables in sufficient numbers for a meaningful analysis. Fishermen very often don't allow observers to take turbot otoliths on board of commercial vessels (even when informing them that it is possible to sample the otoliths through the operculum in this species, making it unnecessary to cut open the heads and thus not influencing the appearance of individual fish and their value to buyers in this way), set aside sampling gonads for maturity staging (although the fish are gutted on board anyhow). Buying turbot as part of the market sampling has neither been an option for most countries, because of the high prices. However, including the biological sampling in MS national proposals, and the subsequent generating of required funds through the DCF, should solve this problem. On surveys, catches of turbot are generally even lower than on commercial vessels. Most likely this is due to the lower 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).

9.7 Population biological parameters and other research

No relevant biological information derived from the catches of turbot in IIIa were presented at the WG. No other relevant researches are ongoing for turbot in IIIa.

9.8 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 for sampling of biological parameters for turbot in the Kattegat- Skagerrak, the following countries could be valid candidates to fill current data gaps, according to their importance in turbot fisheries;

- Denmark in the Kattegat-Skagerrak
- Sweden in the Kattegat-Skagerrak

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 Programs, thus generating requiment for funds through the DCF.

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Table 9.1. Turbot in IIIa: total landings by country from 1950 to 2011.

YEAR	BEL	DEU	DNK	GBR	NLD	NOR	SWE	TOTAL
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1951	0	6	191	0	0	6	62	265
1952	0	6	114	0	0	3	58	181
1953	0	4	80	0	0	4	51	139
1954	0	0	78	0	0	1	61	140
1955	0	4	77	0	0	0	49	130
1956	0	7	75	0	0	0	41	123
1957	0	3	108	0	0	0	30	141
1958	0	7	112	0	0	0	41	160
1959	0	6	132	0	0	3	43	184
1960	0	11	115	0	0	2	46	174
1961	0	4	130	0	0	0	45	179
1962	0	5	157	0	0	0	0	162
1963	0	4	124	0	0	0	0	128
1964	0	5	89	0	0	0	0	94
1965	0	6	79	1	0	0	0	86
1966	0	2	104	0	0	0	0	106
1967	0	4	68	1	0	0	0	73
1968	0	0	64	0	0	0	0	64
1969	0	1	75	0	0	0	0	76
1970	0	1	76	0	0	0	0	77
1971	0	1	100	0	0	0	0	101
1972	0	2	130	0	0	0	0	132

1973	0	2	98	0	0	0	0	100
1974	0	1	116	0	0	0	0	117
1975	0	2	167	0	7	0	7	183
1976	7	2	178	0	190	0	6	383
1977	7	4	331	0	389	0	5	736
1978	2	4	327	0	186	0	6	525
1979	8	0	307	0	87	0	4	406
1980	7	0	205	1	14	0	6	233
1981	2	0	183	2	12	0	8	207
1982	1	0	164	1	9	0	7	182
1983	4	0	171	0	24	0	10	209
1984	0	0	176	0	0	0	12	188
1985	1	0	224	0	0	0	16	241
1986	2	0	180	0	0	0	11	193
1987	5	0	147	0	0	0	9	161
1988	2	0	115	0	11	0	10	138
1989	2	0	173	0	0	0	9	184
1990	5	0	363	0	0	0	18	386
1991	4	0	244	0	0	7	21	276
1992	4	0	278	0	0	8	19	309
1993	3	0	336	0	0	10	0	349
1994	2	0	313	0	0	15	22	352
1995	4	0	268	0	0	17	11	300
1996	0	0	185	0	0	13	11	209
1997	0	0	200	0	0	9	11	220
1998	0	0	148	0	0	7	8	163
1999	0	0	139	0	0	10	6	155
2000	0	0	180	0	0	6	6	192
2001	0	0	227	0	0	8	3	238
2002	0	0	205	0	0	11	5	221
2003	0	0	128	0	13	14	4	159
2004	0	0	119	0	14	7	7	147
2005	0	0	108	0	7	6	6	127
2006	0	1	95	0	8	8	9	121
2007	0	1	138	0	15	7	12	173
2008	0	1	121	0	4	6	11	143
2009	0	1	94	0	2	6	17	120
2010	0	0	72	0	6	4	13	95
2011	0	1	78	0	0	7	13	99
2012	0	0	168	0	0	8	14	189

Table 9.2. Average CPUE (n/h) estimated from BITS (KASU) surveys for quarter 1 and quarter 4 between 1996 and 2012.

Year	Quarter 1	Quarter 4
1996	1.95	
1997	0.42	
1998	2.50	
1999	1.23	1.73
2000	1.00	0.67
2001	1.82	1.19
2002	0.62	1.52
2003	1.85	0.52
2004	1.03	2.26
2005	0.89	1.20
2006	1.23	0.47
2007	0.89	1.00

2008	1.79	0.87
2009	0.63	0.61
2010	1.53	2.23
2011	0.80	0.71
2012	0.59	0.74

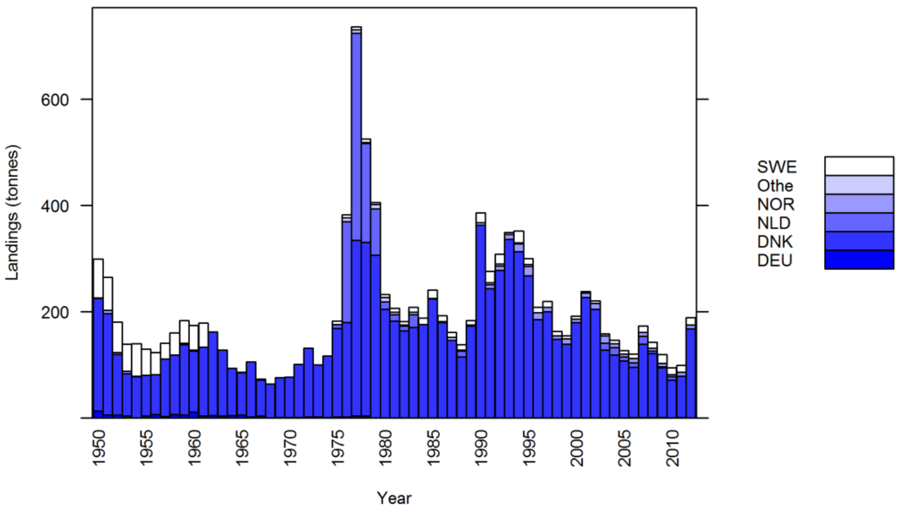


Figure 9.1. Turbot in IIIa: total landings by country from 1950 to 2011.

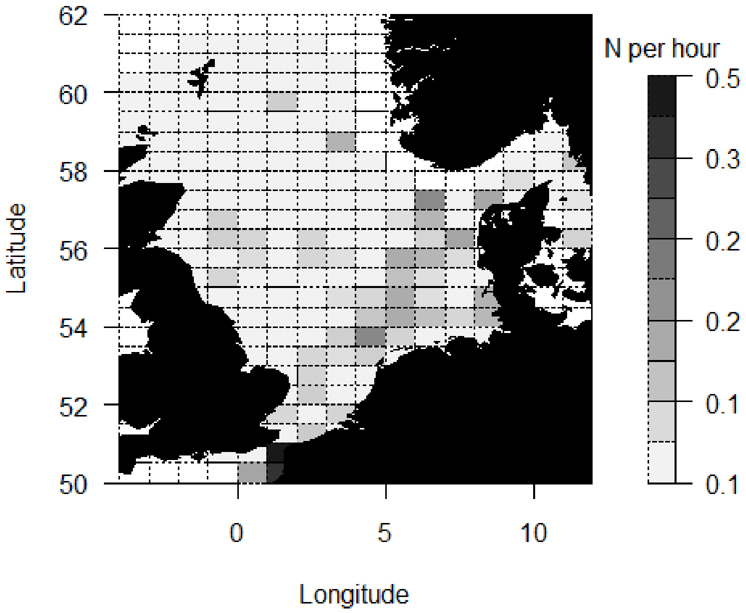


Figure 9.2. Turbot in IIIa. Spatial distribution of the CPUE (n/h) estimated from IBTS trawl surveys during quarter 1 using the entire time series (1966-2012). North Sea is also shown for comparison.

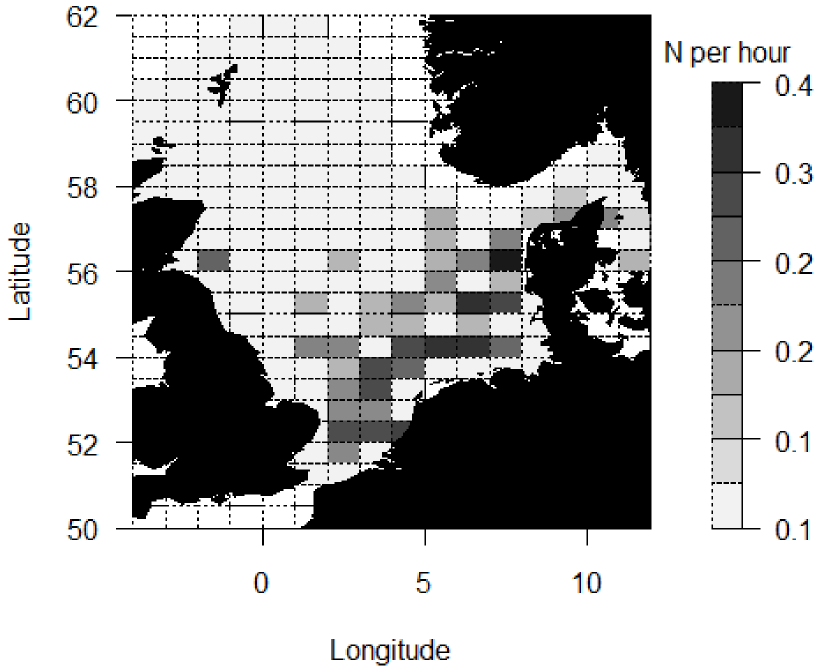


Figure 9.3. Turbot in IIIa. Spatial distribution of the CPUE (n/h) estimated from IBTS trawl surveys during quarter 3 using the entire time series (1991-2012). North Sea is also shown for comparison.

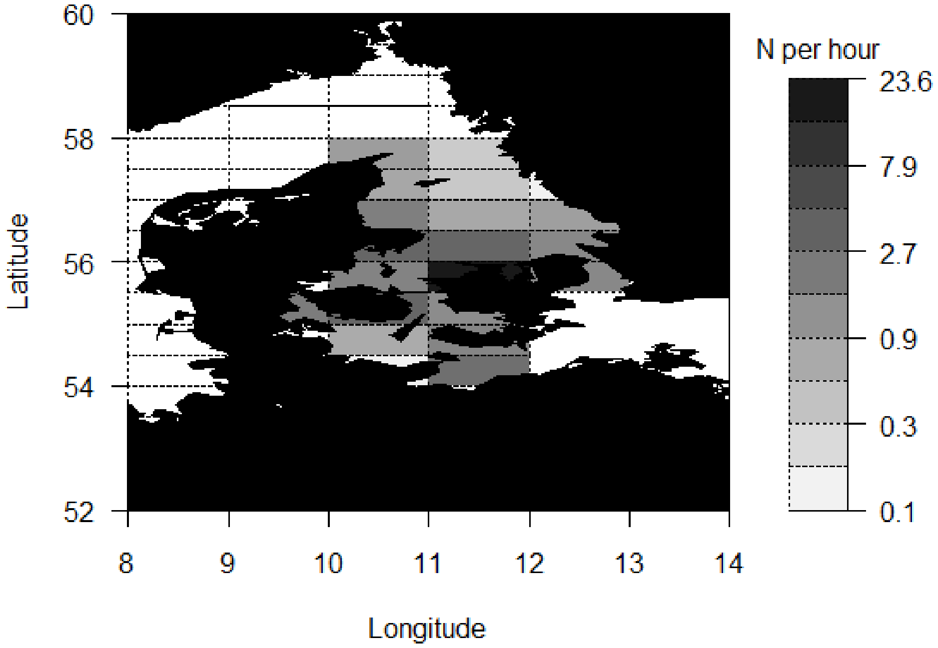


Figure 9.4. Turbot in IIIa. Spatial distribution of the CPUE (n/h) estimated from BITS trawl survey during quarter 1 using the entire time series (2004-2012). Western Baltic Sea is also shown for comparison.

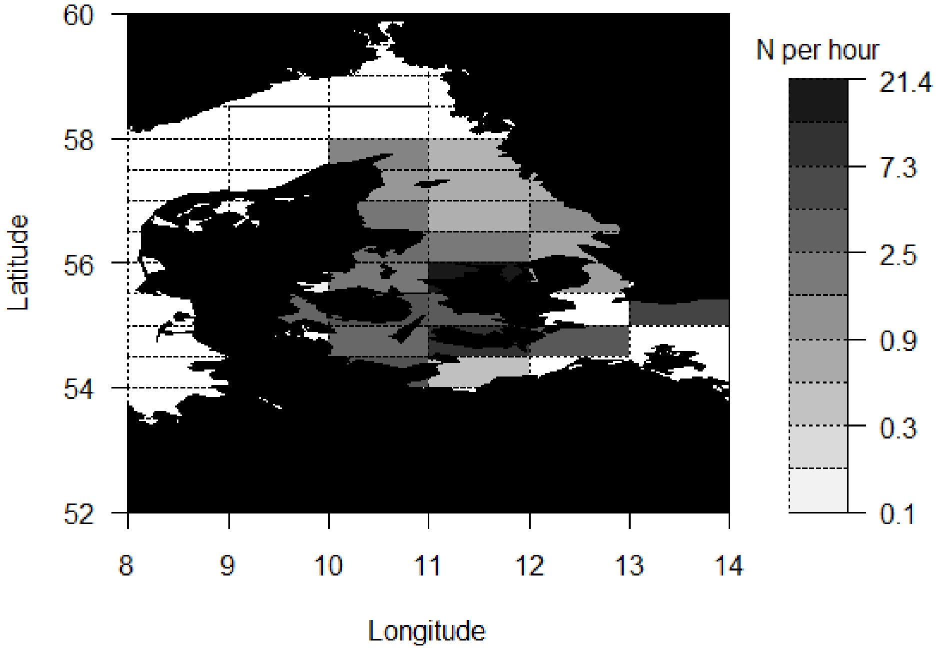


Figure 9.5. Turbot in IIIa. Spatial distribution of the CPUE (n/h) estimated from BITS trawl survey during quarter 4 using the entire time series (2004-2012). Western Baltic Sea is also shown for comparison.

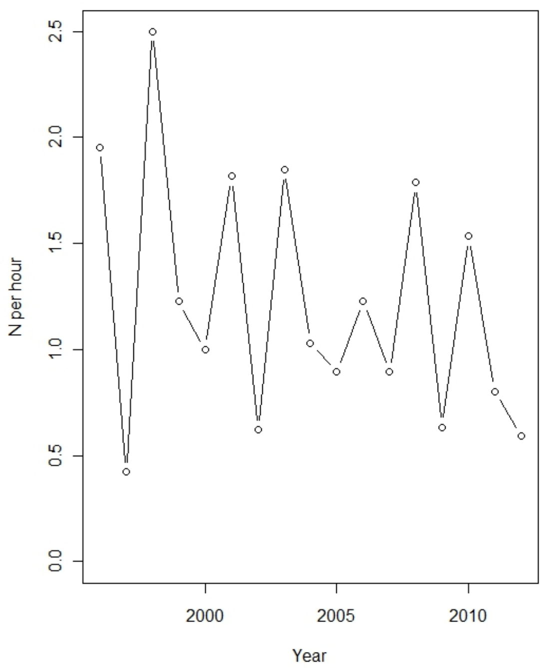


Figure 9.6. Turbot in IIIa. Trend in cpue (n/h) estimated from BITS survey between 2004 and 2012 in quarter 1.

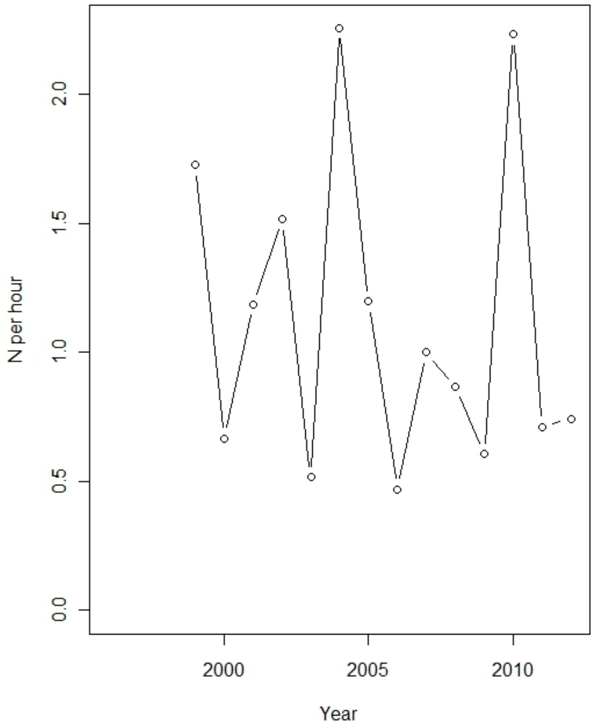


Figure 9.7. Turbot in IIIa. Trend in cpue (n/h) estimated from BITS survey between 2004 and 2012 in quarter 4.

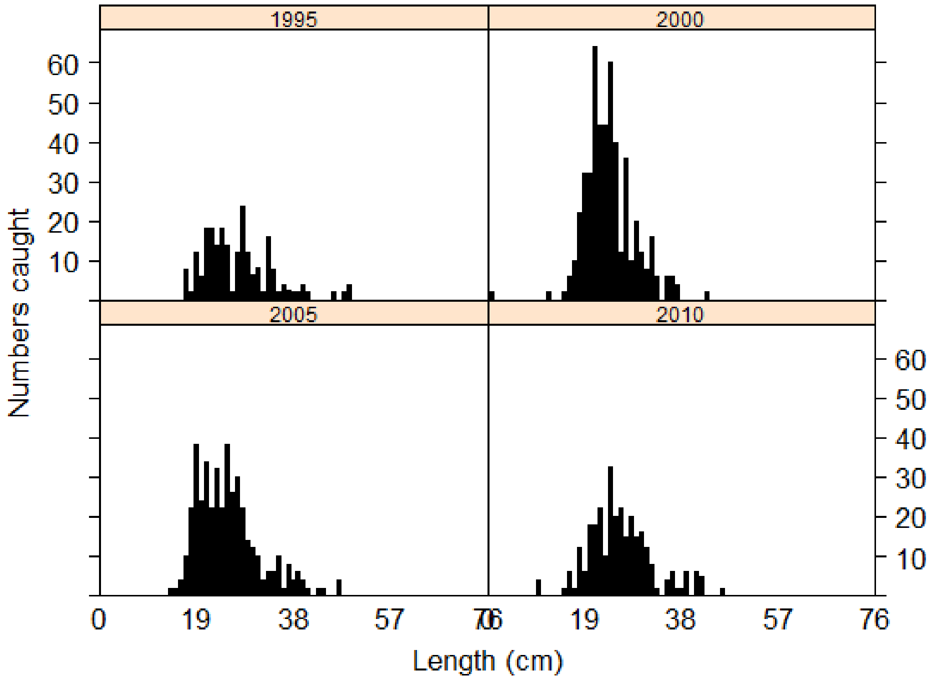


Figure 9.8. Turbot in IIIa. Length frequency distribution derived from BITS surveys in quarter 1 and aggregated every 5 years.

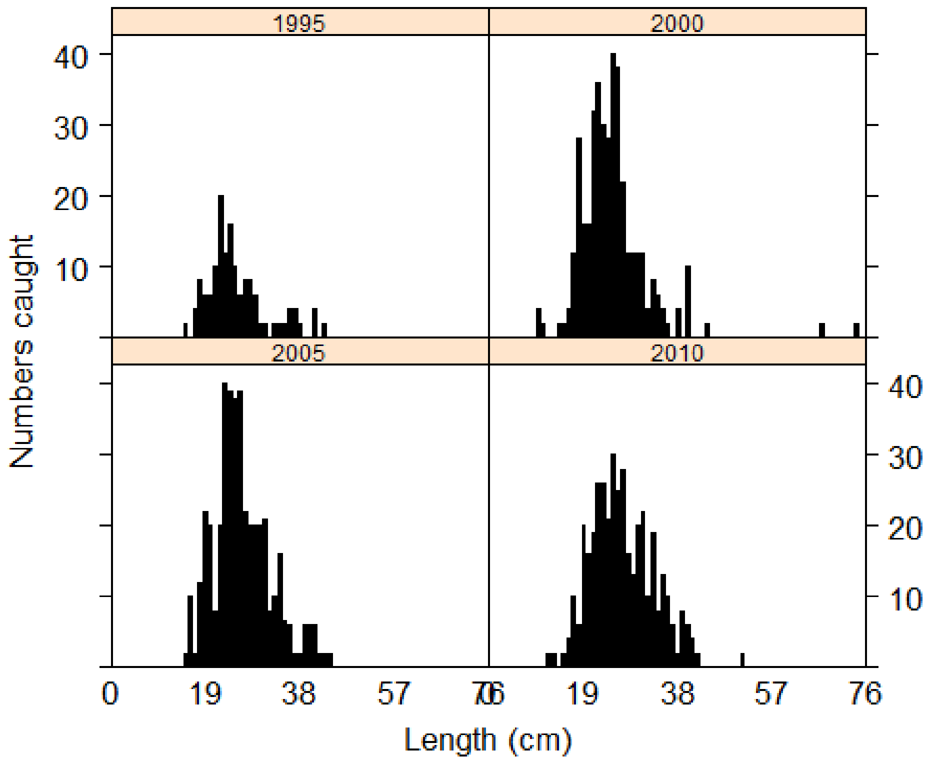


Figure 9.9. Turbot in IIIa. Length frequency distribution derived from BITS surveys in quarter 4 and aggregated every 5 years.

10 Sea Bass in the Bay of Biscay and Iberics waters

10.1 General Biology

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. Off Portugal, coastal geomorphology and distribution of transition waters influence the species relative distribution, with bass being less abundant in southwestern and southern Portugal It is a predatory species highly prized by anglers and is also a high-value species for commercial fisheries using trawls, nets, lines.

Mature bass aggregate on offshore spawning grounds during January to March in the Bay of Biscay. 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).

Based on back-calculated birthdates of juveniles caught in 4 Portuguese estuaries, Vinagre et al (2009) support the above latitudinal trend; successful spawning in SW Portugal seems to concentrate from December to February, becoming progressively later (January to April or February to April) as moving towards estuaries in NW Portugal, although temperature seasonality is not the trigger for this local pattern. An earlier study by Sobral et al (2000) identifies February as the main spawning month for bass off the Ria de Aveiro (NW Portugal), based on the macroscopic staging of gonads from fish caught by "majoieiras" (small bits of old trammel nets fixed perpendicularly on the beach at low tide). Off Portugal, there is evidence that juvenile bass colonize transition waters during the summer and stay there for at least the first year (Gordo 1989; Cabral and Costa 2001). Although fish in the second year of life and even third have been found within such protected and semi-enclosed systems, no mature fish have ever been registered there, whereas there is little known on the movements of bass while at sea. Off western Portugal (where temperature is not a limiting factor for the definition of potential spawning habitat and continental shelf is narrow), there is no evidence of inshore-offshore migrations (sea bass is almost exclusively caught in the inner shelf and often at depths <10 m), and there is evidence of spawning at very shallow waters (Sobral et al 2000 and blog reports by recreational line fishers operating from land). Additionally, there is evidence of large pre-spawning and spawning aggregations found inshore, as verified by the occasional purse seine sets with up to 3-4 t of sea bass in the catch.

Tagging studies show that individual 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; Ifremer french tagging study outstanding).

Growth is relatively slow and the species is long-lived (up to 30 years of age). In the Channel, maturity is attained at 4 - 7 years, which is around 35 cm for males and 42 cm for females (Pawson and Pickett 1996). Nevertheless, although bass is an eurythermic species (registered tolerance from 5-33o C) maximal somatic growth occurs around 22-24oC (Vinagre et al. 2012), thus contributing to pronounced latitudinal gradients in length at age and daily growth rates. Values from Pawson and Picket could thus be revised downwards to the North area in the Bay of Biscay and in Iberic waters.

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

10.2 Management regulations

Seabass are not subject to EU TACs and quotas. Commercial vessels catching 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 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 bass fishing are also in place. These include:

- a landings limit of 5 t/boat/week for all French trawlers landing bass;
- 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 bass fisheries in Brittany; France
- A minimum size landing of 42cm for recreationnal fisheries

Depending on country, measures affecting recreational fisheries include minimum landing sizes, restrictions on sale of catch, gear restrictions.

- The measures affecting recreational fisheries in Portugal include gear restrictions, a minimum landing size equal to the commercial fishery MLS (36 cm), the total catch of fish and cephalopods by each fisher must be less than 10 kg per day, and prohibition on the sale of catch.

10.3 Stock ID and sub-stock structure

Bass *Dicentrarchus labrax* is a widely distributed species in northeast Atlantic shelf waters with a range from southern Norway, through the North Sea, the Irish Sea, the Bay of Biscay, the Mediterranean and the Black Sea to North-west Africa. The species is at the northern limits of its range around the British Isles and southern Scandinavia. Stock identity of European seabass was reviewed by WGNEW 2012 and further considered at ICES IBP-NEW 2012.

10.4 Evidence from genetics studies

Although Child (1992) suggested that there may be genetic differences between immature bass from the Irish Sea and elsewhere, other work (Tobin, Galway University, unpublished manuscript), using samples of 0-group 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 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 sub-population. Fritsch *et al.* (2007) investigated 8 microsatellite loci of juvenile and adult bass caught in the Bay of Biscay and the English Channel and of 5 loci of 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. Chavanne et al (2008) report that numerous studies based on molecular markers have allowed the definition of three main genetic groups: the north-eastern Atlantic Ocean, the western Mediterranean and the eastern Mediterranean (with overlapping zones at the Almeria-Oran front and at the Siculo-Tunisian strait). The Atlantic and western Mediterranean groups are quite homogeneous populations, while the eastern group is more heterogeneous and structured into subpopulations that reflect the different basins of the region. Under the current delimitation of “stocks” for sea bass management along the European Atlantic coast, Portuguese continental waters (within ICES Division IXa) are not even contemplated. Evidence from tagging studies does not exist off Portugal, while Castilho and MacAndrew (1998) appoint to small but significant genetic differences among juveniles from five Portuguese nurseries (especially the one from S Portugal). Vasconcelos et al (2008) used otolith fingerprinting to show that bass caught in 4 marine sites off western Portugal had previously occupied diverse Portuguese estuaries as juveniles and that the estuary of Mondego (and eventually Tejo) could be considered a nursery for the species. With such paucity of biological evidence it is difficult to defend any particular stock delimitation option. However, according to Portugal, the arguments used to support the maintenance of several stocks further to the north can also be applied off Portugal, where exploitation (inshore and artisanal with static gears) and dynamics (winter spawning by the coast, lack of pronounced inshore/offshore seasonal migration) are distinct from those reported in the French part of the Bay of Biscay (Fritsch et al 2007) and further north (Pawson et al 2007a and b).

10.5 Evidence from tagging studies

Since 2001, various proposals have been made to structure the seabass population and its migrations and to establish stock boundaries based largely on conventional tagging studies. The 2001 ICES Study Group on Sea Bass (SGBASS) proposed four stocks (North Sea & eastern-Channel; Biscay-western Channel; west coast of England & 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 seabass 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 seabass 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 Sub-area VIII. The Study Group considered that for management purposes the bass population around Ireland could be regarded as a discrete stock. Finally, the 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), seabass tagged near the Channel Islands in VIIe (south of Hurd Deep) moved as far as the southern North Sea, and seabass tagged on the NE coast of England and the Thames Estuary moved into VIId in the eastern Channel. An electronic tagging study conducted in France in 2010-2011, presented to IBP-NEW 2012 (H. de Pontual, Ifremer) showed seasonal movements of bass between tagging sites off NW Brittany and the Bay of Biscay, which supports the idea of a stock in the Bay of Biscay which can mix with sea bass in the North Brittany area. State space modelling is being developed to reconstruct individual migration routes. Preliminary results show two different patterns: either winter spawning migration towards "warm" waters (Bay of Biscay) or, more scarcely, towards colder waters (Celtic sea or western Channel).

Tagging studies presented by Pawson et al (2008) show that sea bass show strong site fidelity on feeding areas and after spawning migrations are often recaptured close to the initial tagging site (55% of recaptures within 16km of tagging site). This prompted Pawson et al (2008) to suggest that management of sea bass could include selected sites designated only for catch & release sea angling to allow survival to larger sizes. The recent French tagging study also showed a high degree of homing for sea bass on summer feeding areas. Whether site fidelity also occurs on spawning grounds needs to be further investigated.

10.6 Recommendations for stock identity to be used at benchmark assessments

The IBP New reports that 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 con-firm and quantify the exchange rate of sea bass between sea areas that could form management units for this stock.

In the absence of new information the pragmatic view of WGNEW2013 is to continue to assume the presence of discrete sea bass stocks off southern Ireland and in the Bay of Biscay / IXa. It should be discussed in WGHMM 2014 for this component.

10.7 Note on stock definitions in benchmark 2012 assessment

Further studies are needed on seabass 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 bass shoals, to confirm and quantify the exchange rate of seabass between sea areas that could form management units for this stock. Such information is critical to support development of models to describe the spatial dynamic of the species under environmental drivers (eg. temperature and food). Such a modelling work is being carried out in France in the framework of a PhD study (R. Lopez)

The pragmatic view of IBP-NEW 2012 was to structure the baseline stock assessments into four units:

- Assessment area 1. Sea bass in ICES areas IVbc, VIId, VIIe,h and VIa,f&g (lack of clear genetic evidence; concentration of area IV bass fisheries in the southern North Sea; seasonal movements of bass across ICES Divisions). This is a relatively data-rich area with data on fishery landings and length/age composition by fleet; discards estimates; growth and maturity parameters; juvenile surveys, fishery LPUE trends.
- Assessment area 2. Sea bass in Biscay (ICES Sub area VIIIa,b). Available data are fishery landings, with length compositions from 2000; discards from 2009; some fishery LPUE.
- Assessment area 3. Sea bass in VIIIc and IXa (landings, effort, discards)
- Assessment area 4. Sea bass in Irish coastal waters (VIa, VIIb, VIIj). Available data: Recreational fishery catch rates; no commercial fishery operating.

Fishery landings of sea bass are extremely small in Irish coastal waters of VIIa and VIIg and the stock assessment for assessment area 1will not reflect the sea bass populations around the Irish coast, which may be more strongly affiliated to the population in area 4 off southern, western and northern Ireland.

Tagging shows movements of sea bass between VIIIa and southern parts of VIIh/VIIe. A sensitivity analysis of the stock assessment for sea bass includes a combined IV, VII and VIII assessment (assessment areas 1 & 2 excluding Irish populations for which there are no commercial fisheries).

10.8 Multispecies and mixed fisheries issues

No information was available to WGNEW-2013 to evaluate impacts on sea bass populations of predation or competition with other species, or the impacts of sea bass on other ecosystem components.

Although sea bass are caught by many commercial vessels, the bulk of the catch in Spain and Portugal looks to be taken by artisanal fleet. In France, in the Bay of Biscay, landings are equally shared between pelagic trawlers, bottom trawlers, nets and lines.

10.9 Ecosystem drivers

Recruitment of sea bass is highly variable, and the fisheries have often in the past been dominated by individual very strong year classes or have been negatively affected by periods of very poor recruitment. Expansion of sea bass populations in the North Sea in the 1990s coincided with a period of ocean warming as well as the growth of the very strong 1989 year class. Temperature appears to be a major driver for bass production and distribution (Pawson, 1992). Reynolds *et al*. (2003) observed a positive relationship between annual seawater temperature during the development phases of eggs and larvae of sea bass and the timing and (possibly) abundance of post-larval recruitment to nursery areas. In addition, early growth is related to summer temperature, and survival of 0-groups through the first winter is affected by body size (and fat reserves) and water temperature (Lancaster 1991; Pawson 1992). Prolonged periods of temperatures below 5 - 6°C may lead to high levels of mortality in 0-groups in estuaries during cold winters, and may be a contributory factor to a recent decline in abundance of young bass shown by surveys included in the benchmark assessment.

10.10 Fisheries data

10.10.1 Fisheries data Areas VIa, VIIb, VIIj

The most recent fisheries data for areas VIa, VIIb, VIIj are described in IBPNew 2012 report

10.10.2 Fisheries data in the Bay of Biscay (division VIIIa, VIIIb)

10.10.2.1 Commercial landings data

Landings series are given from 1978 in Figure 10.12 and Table 10.1 and are derived from :

i) Official statistics recorded in the Fishstat database since around the mid-1980s.

ii) French landings for 2000-2012 from a separate analysis by Ifremer of log-book and auction data.

iii) Spanish landings for 2007-2011 from sale notes

iv) Portuguese estimated landings from 1986 to 2011

French vessels take around 90% of the total annual landings in the area VIIIa and VIIIb with a a fishery including nets, bottom trawlers, pelagic trawlers (and also Danish seiners since 2010 in small proportion) who essentially operate during quarter 1 and 4 (prespawning and spawning season) and lines who operate essentially during quarter 3 and 4 (Figure 10.2).

Figure 10.14 shown the spatial activity of French fleet by metier in the Bay of Biscay. Declines observed in landings are certainly due to poor statistics from 1984 to 1999, which are more reliable since 2000.

Spanish bass landings from Division VIIIa,b,d have increased to around 20 tons in the 90's to around 150 tons in the middle of the 2000's, then to 278 tons in 2011. Spanish commercial landings by gear type are shown in Figure 10.15. UK landings from this area are very low, usually inferior to 5 tons per year.

Quality of landings data

The official landings data for sea bass available to WGNEW 2013 are subject to several uncertainties that can affect the accuracy of assessments:

- Incomplete reporting of landings in the 1970s and early 1980s when the fisheries were developing;
- Poor reporting accuracy for small vessels that do not supply EU logbooks.

10.10.2.2 Commercial discards

France

Discarding of sea bass by commercial fisheries can occur where fishing takes place in areas with bass smaller than the minimum landing size (36cm in most European countries), and where mesh sizes <100mm are in use. Numbers of fishing trips sampled on French vessels from 2009 to 2012 and numbers of seabass discarded during sampling, are given in Table 10.2. For 2009 it's estimated to be 44 tons, for 2010 44 tons, for 2011 20 tons, and 2012 37 tons (

Table 10.3).

Spain

Observer data from Spanish vessels fishing in Areas VIII, have shown there was no seabass discard from 2003 (Table 10.4).

Quality of discards estimates

Precision is low at current sampling rates weighting and raising of France discards estimates was carried out using COST tools, which have limited flexibility to match raising procedures to the sampling stratification, including where vessels are stratified by LOA. There is therefore a large potential for bias in the discards estimates. However discard rates are low in general in the fishery.

10.10.2.3 Biological Sampling Bay of Biscay

10.10.2.3.1 Length and age compositions of commercial landings

Length compositions of sea bass landings, are only available from sampling in France from 2000 in the Bay of Biscay, area VIIIa and VIIIb. Shorter time series of length compositions were supplied by Spain for Areas VIII for bottom trawlers in 2010 and 2011.

France

Length and age compositions

Length compositions are supplied by France since 2000 for VIIIab, disaggregated by seven gear types: bottom trawl, pelagic pair trawl, nets, handlines, longlines purseiners and danish seiners from 2012. French sampling rates for length compositions have been very variable between area, gear and year strata (Table 10.5 and Figure 10.16). Sampling 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. The french landings length compositions are given in Table 10.6. An attempt of building a catch at age matrix is proposed in WGNEW 2013 (Table 10.7) but should be discussed and analysed to conclude that the use or not. If such is the case, because of age validation (see below) a 9 or 10+ group should be adopted. The matrix has been built on the assumption that stock delimitation for seabass is still uncertain, and with scales sampling from 2000 to 2005 from coastal fisheries of Audierne (boundary between VIIIa and VIIeh), with sampling from 2006 and 2007 from in shore and off shore fisheries in VIIeh, and with sampling from 2008 to 2011 from all the Bay of Biscay.

Accuracy and validation of age estimates

Age-reading consistency

Consistency in age reading of sea bass between four operators in Cefas and Ifremer was examined during a limited exchange of otolith and scale images between laboratories in 2011, organised by the ICES Planning Group on Commercial Catches, Discards and Biological Sampling (Mahé et al. 2011). A total of 155 fish of 17 -74 cm was sampled on board French research vessels during two international surveys. The precision of ageing was similar for scales and otoliths. The coefficient of variation of age readings for individual fish was around 12% implying a standard deviation of +/- 1 year for a 10-year-old fish, with relatively few fish having identical readings by all four operators. However it was noted by the operators that photographic images were more difficult to evaluate than original age material, which was likely to have a negative effect on the consistency of ageing. These results provide no indication of the validity of ages, only the consistency between operators, and cannot indicate data quality in earlier years when different operators provided the age data. A more extensive age exchange is to be carried out in 2012.

Age validation

WGNEW was not aware of specific studies to validate absolute ages of seabass derived from otolith or scale readings. Strong and weak year classes can be followed clearly to over 20 years of age in UK sample data 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 consequence of age errors discussed in the previous section. Year class tracking is less clear in the younger ages 3 – 5 although this will be affected by gear selectivity and changes in fish behaviour.

Sea bass show relatively broad length-at-age distributions, and it has been noted in French data (Laurec et al. 2012 WD to IBP-NEW) that the length-at-age distributions can have unusual patterns including some multiple modes that could indicate age errors. This will result in some smoothing of age data across neighbouring year classes. In the UK data, unusual patterns in length-at-age distributions for some younger ages appear related more to effects of minimum landing size on data from the fishery.

Spain

Length compositions

Spanish landings of *Dicentrarchus labrax*, which is not a target species for any Spanish fleet, were not sampled for length structure before the implementation of concurrent sampling in 2009. Length information is scarce for most part of the Spanish metiers. For this reason length structure is presented only for bottom trawl activity in the Bay of Biscay in 2010 and 2011 where enough individuals have been sampled to allow an adequate extrapolation (Table 10.8 and Table 10.9).

Comparison length compositions for Spanish and French trawler fisheries

Length compositions of sea bass landings in the Spanish and French bottom trawl fisheries in VIIIab for the years 2010-2011 are compared in Figure 10.17. Compositions of french bottom trawl landings appear smaller.

10.10.2.4 Survey data

France : Evhoe survey

Seabass 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 bass may be caught (cf the station map, **Error! Reference source not found.**). Less than 10% of the stations have bass catches in most years. A mean of 0.5 seabass per trawl has been recorded from 1987. Abundance indices are calculated as stratified means.

Spain

Information of Dicentrachus labrax catches in the series of research surveys conducted by the IEO since 1983 is showed in Table 10.10. There are also a very few seabass caught.

10.10.2.5 Commercial catch-effort data

10.10.2.5.1 France

IBP-NEW2012 evaluated a range of commercial fishery LPUE series for French and UK fleets operating in Areas IV and VII, including the LPUE trends for participants in the Cefas voluntary logbook scheme. A methodology on french bottom trawlers has been tested from auctions sales in area VII, IV and VIIIab : time series have been calculated for bottom trawlers <18m, which don't target seabass. French and UK (>10m) trawlers in areas IVb,c, VIId and VIIef could have been compared, and it shows very similar LPUE trends. With some exceptions (e.g. trawlers in VIId), UK >10m vessels tend to show different LPUE trends to 10m and under vessels. For the VIIIa and VIIIb, there is unlikely no possible comparison for the french results with other countries or other data set, and so will not be used at present.

10.10.2.5.2 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. Landings and effort data were provided to WGNEW by Spain, though not in the form of LPUE indices.

10.10.3 Biological parameters and other research in Bay of Biscay: weights, maturities, growth

This section provides biological parameters, discussed during IBPNew 2012 from Northern area of growth, maturity and natural mortality required for stock assessment of sea bass. Further information can be found in IBP-NEW 2012 and in working documents by Armstrong (2012) and Armstrong & Walmsley (2012b,c)

10.10.3.1 Growth parameters in Bay of Biscay

For area VIIIa,b no growth curve is available yet, especially because af the lack of information on youngest age which are needed to calibrate the growth curve. IBPNew 2012 discussed this section but because of the difference in environmental condition between the Channel and Bay of Biscay, further studies are needed to present a growth curve in this area.

10.10.3.2 Maturity at length and age in the Bay of Biscay

Available data are from samples from all around the coast of England and Walesans are discussed in the IBPNew 2012 report. Nos specific data from The Bay of Biscay are available.

10.10.3.3 Natural mortality in the Bay of Biscay

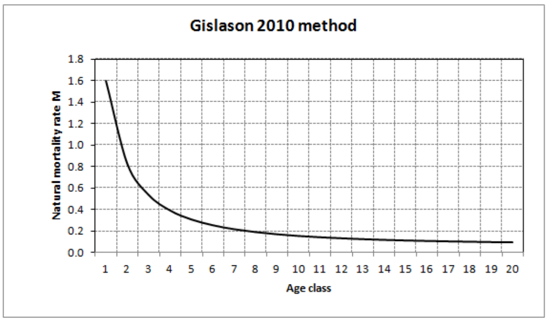
A variety of methods are given in the literature relating natural mortality rate M to life history parameters such as von Bertalanffy growth parameters k and Linf (asymptotic length), length or age at 50% maturity and apparent longevity particularly in an unexploited or very lightly exploited population. These methods were applied to the following sea bass life history parameters by Armstrong (2012):

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 2012 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 and the UK since 1985 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.

The probability of encountering very old bass is partly a function of the interaction of year class strength and sampling rates, as well as mortality, however the occurrence of seabass to almost 30 years of age suggests low rates of mortality. The observed maximum age of 28 years in sea bass samples in the UK was recorded in the early 1980s, following a period of relatively low fishery landings. Age compositions of recreational fishery caught bass in southern Ireland, presented by stakeholders at IBP-NEW 2012, also show ages up to 26 years. This stock has been subject to a commercial fishery ban for many years.

Inferences on natural mortality rates are given below:

Source	Formulation	Combined sex M		
Hoenig 1983	variety of taxa ln(M) = 1.44-0.982*ln(tmax);	0.160		
	teleosts ln(M) = 1.46-1.01*ln(tmax)	**0.149**		
Alverson and Carney 1975	M = 3k/(exp(0.38*tmax*k)-1)	**0.161**		
Pauly 1980	M=exp(-0.0152+0.6543*ln(k)-0.279*ln(Linf,cm)+0.4634*lnT(oC))	0.196	temperature C	12
		0.211		14
		0.224		16
Ralston 1987	M=0.0189+2.06*k	**0.219**		
Beverton 1992	M=3k/(exp(*am* *k)-1) am = age at 50% maturity	0.369	female *am* ; comb sex k	
		0.614	male *am* , comb sex k	
Jensen (1997)	M=1.5K	**0.146**		
Gislason 2010	M = exp(0.55-1.61*Ln(L) + 1.44* Ln (Linf)+ Ln(K))	**Age class**	Length	M
		1	13.1	1.599
		2	19.7	0.827
		3	25.7	0.539
		4	31.1	0.395
		5	36.1	0.312
		6	40.5	0.258
		7	44.6	0.221
		8	48.3	0.195
		9	51.6	0.175
		10	54.7	0.159
		11	57.5	0.147
		12	60.0	0.138
		13	62.2	0.130
		14	64.3	0.123
		15	66.2	0.117
		16	67.9	0.113
		17	69.4	0.109
		18	70.8	0.105
		19	72.1	0.102
		20	73.2	0.100



The inferred values of M, with the exception of the Beverton method, are in the range 0.15 – 0.22. The average of the Gislason estimates for ages 3 – 20 is 0.19.

10.10.3.3.1 Hooking mortality, and mortality of discarded bass from commercial vessels

The NMFS in the US has in the past used an average hooking mortality of 9% for striped bass, estimated by Diodati and Richards 1996. Striped bass are very similar to European sea bass in terms of morphology, habitats and angling methods. A literature review of hooking mortality for a range of species compiled by the Massachusetts Division of Marine Fisheries included a total of 40 different experiments by 16 different authors where striped bass hooking mortality was estimated over two or more days (Gary A. Nelson, Massachusetts Division of Marine Fisheries, pers. comm.) The mean hooking mortality rate was 0.19 (standard deviation 0.19). Direct experiments are needed on European seabass to estimate hooking mortality for conditions and angling methods typical of European fisheries.

A fraction of sea bass discarded from commercial line vessels and netters may survive depending on the extent of injury or stress. This will affect the calculation of fishing mortality reference points that are conditional on selectivity patterns. Trawl-caught undersized bass are less likely to survive. Unfortunately no estimates of survival rates of commercial bass discards is available.

10.10.4 Fisheries data in the Iberic waters (division VIIIc and IXa)

10.10.4.1 Commercial landings data

Landings series are given in Figure 10.19 and **Error! Reference source not found.** and are derived from :

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

ii) Spanish landings for 2007-2011 from sale notes

iii) Portuguese estimated landings from 1986 to 2011 including distinction between Dicentrarchus labrax and punctatus.

Spanish and Portuguese vessels represent almost of the total annual landings in the area IXa and VIIIc. Commercial landings represent 772 tons in 2011. A peak of landings is observed in the early 90's reaching more than 1000 tons, and lowest landings (637 tons) have been observed in 2004. Portuguese and Spanish commercial landings by gear type and area are shown in Figure 10.20 and Figure 10.21. Artisanal fisheries are mainly observed in this area. Off Portugal, estimated total landings of sea bass (hereafter refers only to European sea bass) average 421 tons for the period 1986-2012. Landings had a maximum of 610 tons in 1989, followed by a slight decrease and another increase to a second maximum of 633 tons in 2006. Most landings come from the polyvalent mixed fishery (80-99%) using mostly gill nets (GNS_DEF_80-99_0_0), trammel nets (GTR_DEF_>=100_0_0) and long-line or hand-line (LLS_DEF_0_0_0). The landings by purse seiners and trawlers represent a small amount.

Quality of landings data

Portugal : With the regulations introduced with the DCF, landings by species are now more accurate, especially since 2006. Additionally, market sampling enabled the estimation of the remaining misidentification and correction of total landings by species. Official landings underestimate total catch to an unknown degree. Landings series for use in the assessment are available from the Portuguese official statistics since 1986. Landings of sea bass from the ICES division IXa are reported in three categories: the European sea bass (Dicentrarchus labrax, FAO code BSS), the spotted sea bass (Dicentrarchus punctatus, FAO code PSU) and also a mix of the above two species under the category Dicentrarchus sp. (FAO code BSE). From DCF market sampling it was possible to estimate that the spotted sea bass represents only ca. 2.5% of sea bass species total landings, and produce a time series of corrected landings for Dicentrarchus labrax.

Spain : Landings from the sales notes are detailed for the 2007-2011 period. This source of information was chosen as the accuracy of the landings for D. labrax improves with respect to logbook data. Main reason seems to be the role of small scale fisheries that do not have to supply logbooks data.

Commercial discards

Portugal : Sea bass discards are recorded by the DCF on-board sampling programme. The Portuguese on-board sampling is not covering the Sea Bass fishery.No discards are observed.

Spain : No bass discards were observed for any metier in the 2003-2011 period. Number of sampled hauls per metier and area are presented in Table 10.12 for the IX and VIIIc area.

Quality of discards estimates

Portugal As sampling is targeted at all species, annual coverage of the sea bass catches is relatively limited. The low numbers of sea bass in retained catches show that the Portuguese on-board sampling is not covering the sea bass fishing area. Nevertheless, the species is of high value and discards are probably negligible.

10.10.4.2 Biological Sampling Iberian waters

In Portugal, quarterly length compositions of seabass landings from division IXa are available from DCF concurrent sampling since 2009 for the polyvalent fleet.

10.10.4.2.1 Length and age compositions of commercial landings

Portugal : The number of animals sampled is small, N=2229 for the 4 years (

Table 10.12: Spanish discards in VIIIc, IXa area: number of sampled hauls (ns : not sampled that year; (blank) :no metier activity in that area). No sea bass discards observed.

	Metier	VIIIc	IXaS
2003	OTB_DEF_100-119_0_0		
2003	OTB_DEF_70-119_0_0		
2003	OTB_MPD_>=55_0_0	44	
2003	OTB_DEF_>=55_0_0	78	
2003	PTB_DEF_>=55_0_0	6	
2003	GNS_DEF_>=100_0_0	ns	
2003	GNS_DEF_60-99_0_0	ns	
2003	PTB_DEF_>=70_0_0		
2003	OTB_MCF_>=70_0_0		
2003	OTB_DEF_>=70_0_0		
2003	OTB_SPF_>=70_0_0		
2003	OTB_MDD_>100_0_0		
2003	OTB_DEF_>100_0_0		
2004	OTB_DEF_100-119_0_0		
2004	OTB_DEF_70-119_0_0		
2004	OTB_MPD_>=55_0_0	41	
2004	OTB_DEF_>=55_0_0	15	
2004	PTB_DEF_>=55_0_0	1	
2004	GNS_DEF_>=100_0_0	ns	
2004	GNS_DEF_60-99_0_0	ns	
2004	PTB_DEF_>=70_0_0		
2004	OTB_MCF_>=70_0_0		
2004	OTB_DEF_>=70_0_0		
2004	OTB_SPF_>=70_0_0		
2004	OTB_MDD_>100_0_0		
2004	OTB_DEF_>100_0_0		
2005	OTB_DEF_100-119_0_0		
2005	OTB_DEF_70-119_0_0		
2005	OTB_MPD_>=55_0_0	45	
2005	OTB_DEF_>=55_0_0	148	
2005	PTB_DEF_>=55_0_0	25	
2005	GNS_DEF_>=100_0_0	ns	
2005	GNS_DEF_60-99_0_0	ns	
2005	OTB_MCD_>=55_0_00		47
2005	PTB_DEF_>=70_0_0		
2005	OTB_MCF_>=70_0_0		
2005	OTB_DEF_>=70_0_0		
2005	OTB_SPF_>=70_0_0		
2005	OTB_MDD_>100_0_0		
2005	OTB_DEF_>100_0_0		
2006	OTB_DEF_100-119_0_0		
2006	OTB_DEF_70-119_0_0		
2006	OTB_MPD_>=55_0_0	52	
2006	OTB_DEF_>=55_0_0	1	
2006	PTB_DEF_>=55_0_0	24	
2006	GNS_DEF_>=100_0_0	ns	
2006	GNS_DEF_60-99_0_0	ns	
2006	OTB_MCD_>=55_0_00		72
2006	PTB_DEF_>=70_0_0		
2006	OTB_MCF_>=70_0_0		
2006	OTB_DEF_>=70_0_0		
2006	OTB_SPF_>=70_0_0		
2006	OTB_MDD_>100_0_0		
2006	OTB_DEF_>100_0_0		
2007	OTB_DEF_100-119_0_0		
2007	OTB_DEF_70-119_0_0		
2007	OTB_MPD_>=55_0_0	46	
2007	OTB_DEF_>=55_0_0	123	
2007	PTB_DEF_>=55_0_0	44	
2007	GNS_DEF_>=100_0_0	ns	
2007	GNS_DEF_60-99_0_0	ns	
2007	OTB_MCD_>=55_0_00		59
2007	PTB_DEF_>=70_0_0		
2007	OTB_MCF_>=70_0_0		
2007	OTB_DEF_>=70_0_0		
2007	OTB_SPF_>=70_0_0		
2007	OTB_MDD_>100_0_0		
2007	OTB_DEF_>100_0_0		
2008	OTB_DEF_100-119_0_0		
2008	OTB_DEF_70-119_0_0		
2008	OTB_MPD_>=55_0_0	99	
2008	OTB_DEF_>=55_0_0	86	
2008	PTB_DEF_>=55_0_0	32	
2008	GNS_DEF_>=100_0_0	9	
2008	GNS_DEF_60-99_0_0	31	
2008	PS_SPF_0_0_0	6	
2008	OTB_MCD_>=55_0_00		58
2008	PTB_DEF_>=70_0_0		
2008	OTB_MCF_>=70_0_0		
2008	OTB_DEF_>=70_0_0		
2008	OTB_SPF_>=70_0_0		
2008	OTB_MDD_>100_0_0		
2008	OTB_DEF_>100_0_0		
2009	OTB_DEF_100-119_0_0		
2009	OTB_DEF_70-119_0_0		
2009	OTB_MPD_>=55_0_0	65	
2009	OTB_DEF_>=55_0_0	116	
2009	PTB_DEF_>=55_0_0	51	
2009	GNS_DEF_>=100_0_0	24	
2009	GNS_DEF_60-99_0_0	39	
2009	OTB_MCD_>=55_0_00		56
2009	PTB_DEF_>=70_0_0		
2009	OTB_MCF_>=70_0_0		
2009	OTB_DEF_>=70_0_0		
2009	OTB_SPF_>=70_0_0		
2009	OTB_MDD_>100_0_0		
2009	OTB_DEF_>100_0_0		
2010	OTB_DEF_100-119_0_0		
2010	OTB_DEF_70-119_0_0		
2010	OTB_MPD_>=55_0_0	86	
2010	OTB_DEF_>=55_0_0	168	
2010	PTB_DEF_>=55_0_0	36	
2010	GNS_DEF_>=100_0_0	14	
2010	GNS_DEF_60-99_0_0	29	
2010	OTB_MCD_>=55_0_00		57
2010	PTB_DEF_>=70_0_0		
2010	OTB_MCF_>=70_0_0		
2010	OTB_DEF_>=70_0_0		
2010	OTB_SPF_>=70_0_0		
2010	OTB_MDD_>100_0_0		
2010	OTB_DEF_>100_0_0		
2011	OTB_DEF_100-119_0_0		
2011	OTB_DEF_70-119_0_0		
2011	OTB_MPD_>=55_0_0	65	
2011	OTB_DEF_>=55_0_0	282	
2011	PTB_DEF_>=55_0_0	35	
2011	GNS_DEF_>=100_0_0	15	
2011	GNS_DEF_60-99_0_0	13	
2011	OTB_DEF_100-119_0_0		85
2011	PTB_DEF_>=70_0_0		
2011	OTB_MCF_>=70_0_0		
2011	OTB_DEF_>=70_0_0		
2011	OTB_SPF_>=70_0_0		
2011	OTB_MDD_>100_0_0		
2011	OTB_DEF_>100_0_0		

Table 10.13: Summary of the sea bass fisheries length composition sampling in Portuguese waters (ICES div IXa). Sampling rate is expressed in numbers of trips by ton landed.

) and concerned only the area IXa. The sample rate (trips sampled per tonne landed) was around 0.2 in 2009, 2010 and 2011. Most specimens measured were landed from trammel nets (GTR_DEF_>=100_0_0), gill nets (GNS_DEF_80-99_0_0), and long-line (LLS_DEF_0_0_0). Annual and quarterly length compositions are presented for area IXa for aggregated metiers (polyvalent fleet) in

Figure 10.22 and Figure 10.23. The quarterly length compositions show that recruitment to the fishery is seasonal starting during the second quarter of the year. Annual length compositions and mean length (TL, cm) for the gear types "nets" (gill nets and trammel nets) and "lines" are compared in Figure 10.24Figure 10.23 for area IXa. Length compositions derived from fisheries with the two main gear types show that the fisheries with gill nets and trammel nets catch smaller animals (mean = 48 cm) of a narrow length range, mainly animals between 40 and 55 cm (80%); whereas the line fishery catches animals bigger animals (mean = 51 cm) and of a wider size range. There is no significant trend in the mean length of sea bass over the 4 years period analysed. No age sampling is available

10.10.4.3 Survey data

Portugal

No sea bass are caught in the Portuguese trawl survey cruises. Nevertheless, juvenile sea bass are regularly caught in surveys within estuaries (e.g. Gordo 1989; Cabral and Costa 2001). Monitoring efforts under the Water Framework Directive (e.g. Ramos et al 2012) could thus be used also to construct series of sea bass recruitment indices, at least in the main nurseries for the species in Portugal (Vasconcelos et al 2008), at no additional cost.

Spain

Information of Dicentrachus labrax catches in the series of research surveys conducted by the IEO since 1983 is showed in Table 10.10. There are also a very few seabass caught.

10.10.4.3.1 Commercial catch-effort data

1.1.1.1.1 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. Landings and effort data were provided to WGNEW by Spain, though not in the form of LPUE indices.

10.10.4.3.2 Portugal

Commercial catch-effort data was analysed for the Portuguese polyvalent fishery for the years 1995 to 2011 from auction daily landings data. The unit of effort is given as the number of trips that deliver sea bass. There is no apparent trend in the sea bass

LPUE for the period analysed, but the unit of measure is probably not reflecting sea bass abundance (

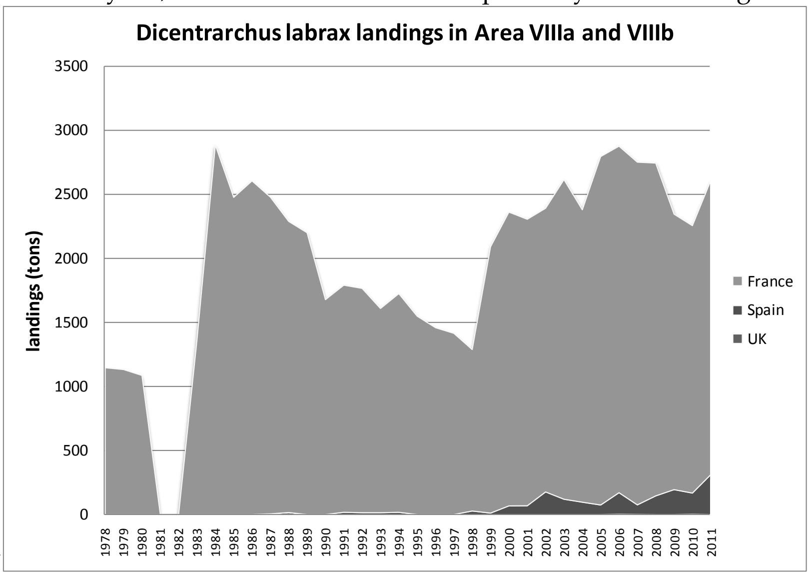


Figure 10.12 : Sea bass in the VIIIab area. ICES landings (tonnes).

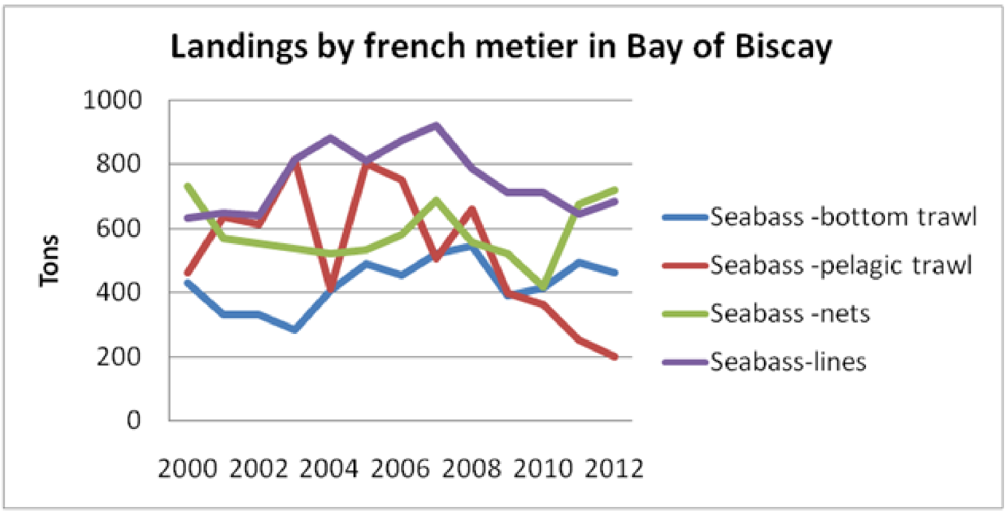


Figure 10.16: Sea bass in Bay of Biscay. Landings (t) by gear type for French commercial fishing fleets. Source : Ices Landings

Figure 10.14: Spatial activity of the French fleet by metier (2009). Source : ICES Landings

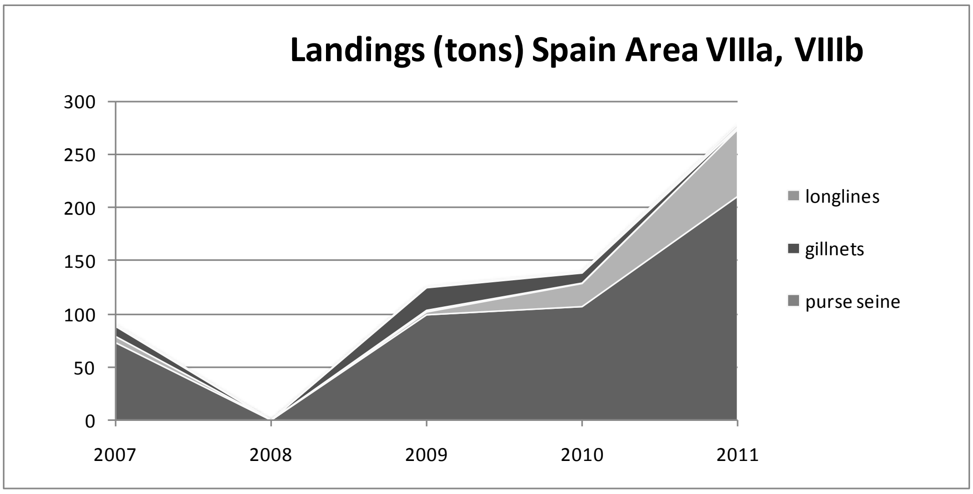


Figure 10.15: Sea bass in Bay of Biscay. Landings by gear type for Spanish commercial fishing fleets. Source: Spanish Sales Notes.

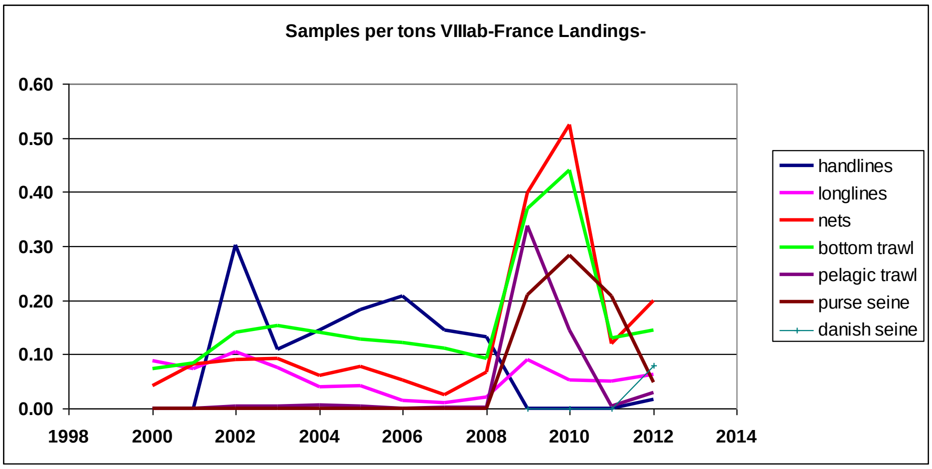


Figure 10.16: Sea bass in VIIIab. Annual sampling of French sea bass landings for length compositions: nos. trips sampled per ton of bass landed, by gear. (2012 provisional)

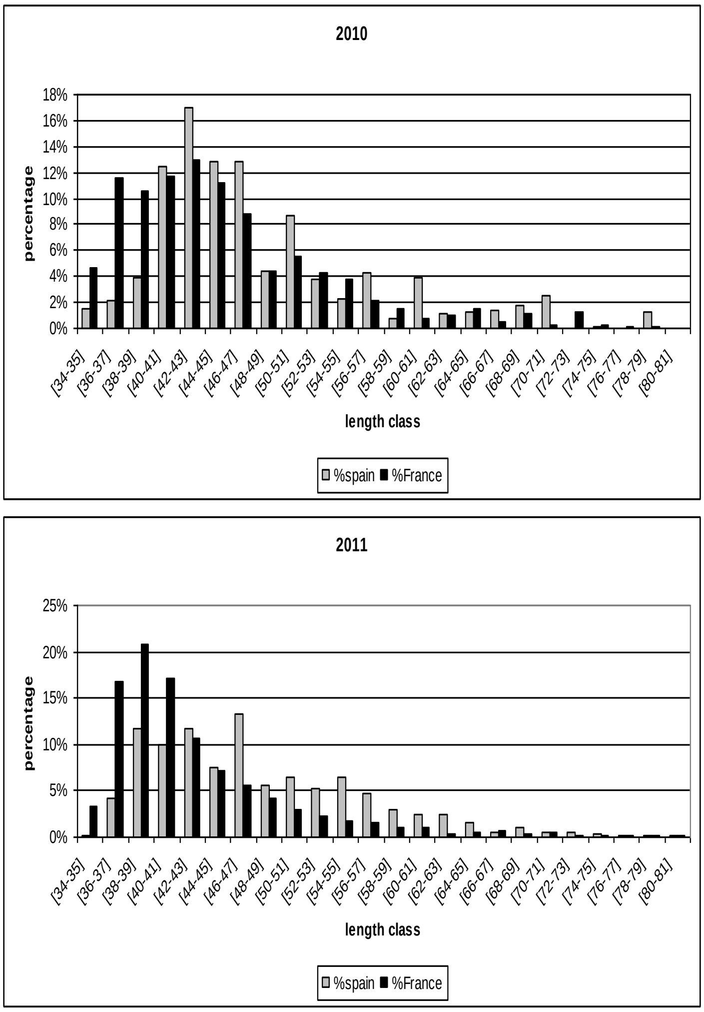


Figure 10.17 : Sea bass in the VIIIab divisions : Comparison between percentage age composition of annual landings of Spanish and French bottom trawlers for 2010 and 2011.

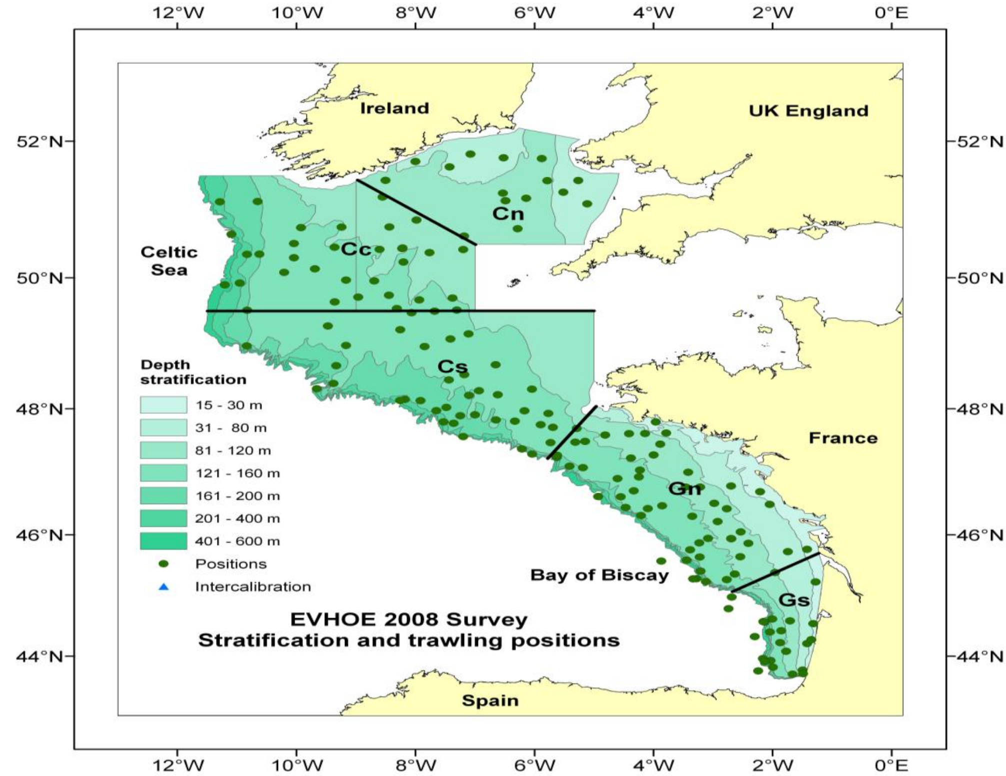


Figure 10.21 : station positions for French Evhoe bottom-trawl survey.

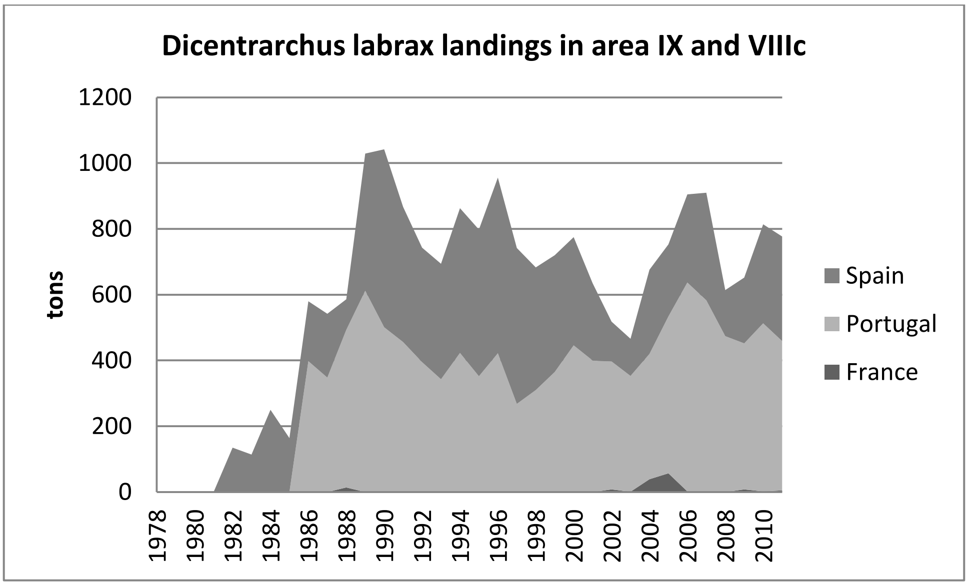


Figure 10.19 : Sea bass in the IX and VIIIc area. Source : official stats and ICES stats.

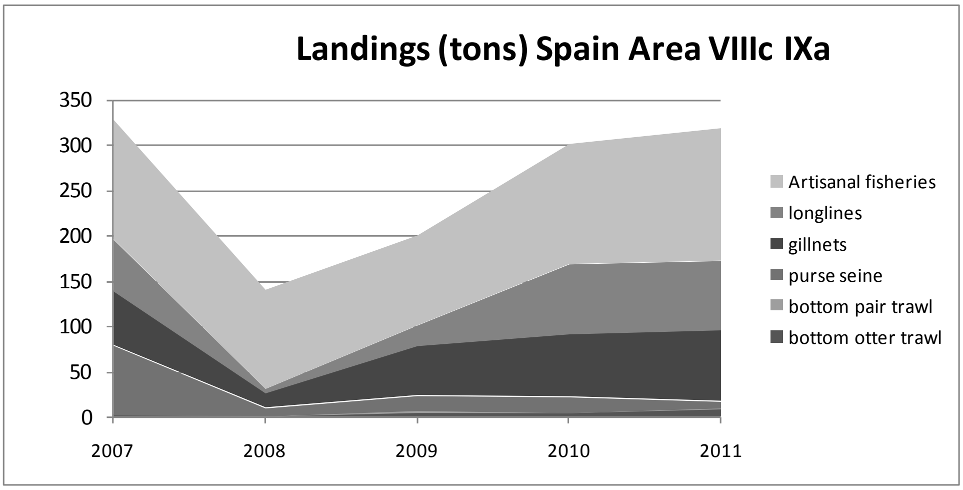


Figure 10.20: Sea bass in Iberian waters. Landings by gear type for Spanish commercial fishing fleets. Source : Spanish Sales Notes.

Figure 10.21: Landings of Sea bass from Portuguese waters ICES Div IXa by fleet for the period 1986 to 2012. Official landings of BSS increased substantially since 2006 in result of improved report by species (Dicentrarchus labrax vs punctatus).

Figure 10.22: Annual length compositions of sea bass in landings from Portuguese waters (Div. IXa) by the polyvalent fleet.

Figure 10.23: Quarterly length compositions of sea bass in landings from Portuguese waters (Div. IXa) by the polyvalent fleet for the period 2009-2012.

Figure 10.24: Length compositions of sea bass in landings from Portuguese waters (Div. IXa) by gear type for the period 2009-2012.

Figure 10.28: LPUE of Sea bass from Portuguese waters ICES Div IXa for the polyvalent fishery for the period 1995 to 2011.

				France (2333 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	OTB						
			Pelagic trawl						
			Nets						
			Lines						
	Commercial	Discards weight	OTB						period available (2009-2011)
			Pelagic trawl						
			Nets						
			Lines						
	Recreational	Retained catches							only 2010
		Ruterned catches							only 2010
Effort	Commercial	Fishing effort	OTB						methodology has to be discussed (see benchmark 2012)
			Pelagic trawl						
			Nets						
			Lines						
	Recreational	Fishing effort							
Catch composition	Commercial	Landings Length compositions	OTB						
			Pelagic trawl						
			Nets						
			Lines						
		Landings Age compositions & wts	OTB						see benchmark 2012 on pb of age reading
			Pelagic trawl						
			Nets						
			Lines						
		Discards Length compositions	OTB						period available (2009-2011)
			Pelagic trawl						period available (2009-2011)
			Nets						period available (2009-2011)
			Lines						period available (2009-2011)
		Discards Age compositions & wts	OTB						
			Pelagic trawl						
			Nets						
			Lines						
	Recreational	Length compositions							2010 only, low precision
		Age composition							
Abundance indices	Commercial	LPUE	OTB						methodology has to be discussed
			Pelagic trawl						
			Nets						
			Lines						
	Surveys	pre-recruit							
	Surveys	post recruit							validity (very low sampling rate)?
Biological parameters	All	Growth							see benchmark 2012
	All	Maturity Ogives							
	All	Fecundity							
	All	Natural mortality							

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

Figure 10.29: Sea bass data availability up to 2012 for WGNEW 2013: Bay of Biscay (Divisions VIIIa, VIIIb)-France

Area: VIIIab, Spain 167 tons in 2010									
				SPAIN (167 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	Bottom otter trawl						Landings by gear from 2007
			Bottom pair trawl						
			Purse seine						
			Gillnets						
			Longlines						
	Commercial	Discards weight	Bottom otter trawl						no discards observed
			Bottom pair trawl						
			Purse seine						
			Gillnets						
			Longlines						
	Recreational	Retained catches							ongoing study
		Ruterned catches							
Effort	Commercial	Fishing effort	Bottom otter trawl						fishing days, all gear
			Bottom pair trawl						
			Purse seine						
			Gillnets						
			Longlines						
	Recreational	Fishing effort							
Catch composition	Commercial	Landings Length compositions	Bottom otter trawl						only 2010 and 2011
			Bottom pair trawl						only 2010 and 2012
			Purse seine						
			Gillnets						
			Longlines						
		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							see benchmark 2012
	All	Maturity Ogives							
	All	Fecundity							
	All	Natural mortality							

Figure 10.30: Sea bass data availability up to 2012 for WGNEW 2013: Bay of Biscay (Divisions VIIIa, VIIIb)-Spain

Area: VIIIc, Ixa Spain 300tons in 2010									
				SPAIN (300 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	Bottom otter trawl						Landings aggregate before 2007
			Bottom pair trawl						
			Purse seine						
			Gillnets						
			Longlines						
			Artisanal fisheries						
	Commercial	Discards weight							
	Recreational	Retained catches							ongoing study
		Ruterned catches							
Effort	Commercial	Fishing effort	Bottom otter trawl						fishing days from 2007
			Bottom pair trawl						
			Purse seine						
			Gillnets						
	Recreational	Fishing effort	Longlines						
			Artisanal fisheries						
Catch composition	Commercial	Landings Length compositions	OTB						
			Pelagic trawl						
			Nets						
			Lines						
		Landings Age compositions & wts	OTB						
			Pelagic trawl						
			Nets						
			Lines						
		Discards Length compositions	OTB						No discards observed
			Pelagic trawl						
			Nets						
			Lines						
		Discards Age compositions & wts	OTB						No discards observed
			Pelagic trawl						
			Nets						
			Lines						
	Recreational	Length compositions							wait the end of 2013
		Age composition							
Abundance indices	Commercial	LPUE	OTB						
			Pelagic trawl						
			Nets						
			Lines						
	Surveys	pre-recruit							
	Surveys	post recruit							
Biological parameters	All	Growth							see benchmark 2012
	All	Maturity Ogives							
	All	Fecundity							
	All	Natural mortality							

Figure 10.31: Sea bass data availability up to 2012 for WGNEW 2013: Iberic waters (Divisions VIIIc, IXa)-Spain

Area: IXa Portugal (508tons in 2010)									
			Gear	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	Polyvalent fleet						
			D trawl						
			Pseiners						
	Commercial	Discards weight	Polyvalent fleet	board sampling is not covering the Sea Bass					
			D trawl						
			Pseiners						
	Recreational	Retained catches							ongoing study
		Ruterned catches							
Effort	Commercial	Fishing effort	D trawl						number of trips
			Pseiners						
			Nets						
	Recreational	Fishing effort							
Catch composition	Commercial	Landings Length compositions	D trawl						
			Pseiners						
			Nets						
		Landings Age compositions & wts	D trawl						
			Pseiners						
			Nets						
		Discards Length compositions	D trawl						
			Pseiners						
			Nets						
		Discards Age compositions & wts	D trawl						
			Pseiners						
			Nets						
	Recreational	Length compositions							
		Age composition							
Abundance indices	Commercial	LPUE	D trawl						
			Pseiners						
			Nets						
	Surveys	pre-recruit							
	Surveys	post recruit							
Biological parameters	All	Growth							see benchmark 2012
	All	Maturity Ogives							
	All	Fecundity							
	All	Natural mortality							

Figure 10.32: Sea bass data availability up to 2012 for WGNEW 2013: Bay of Biscay (Divisions IXa)-Portugal

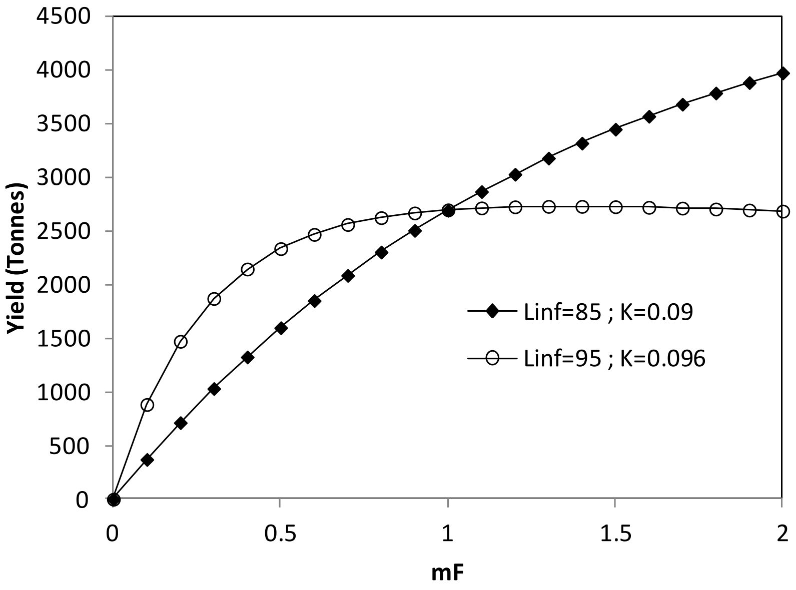


Figure 10.33: Equilibrium yields at various level of fishing mortality obtained under alternative hypothesis on Von Bertalanffy growth parameters.

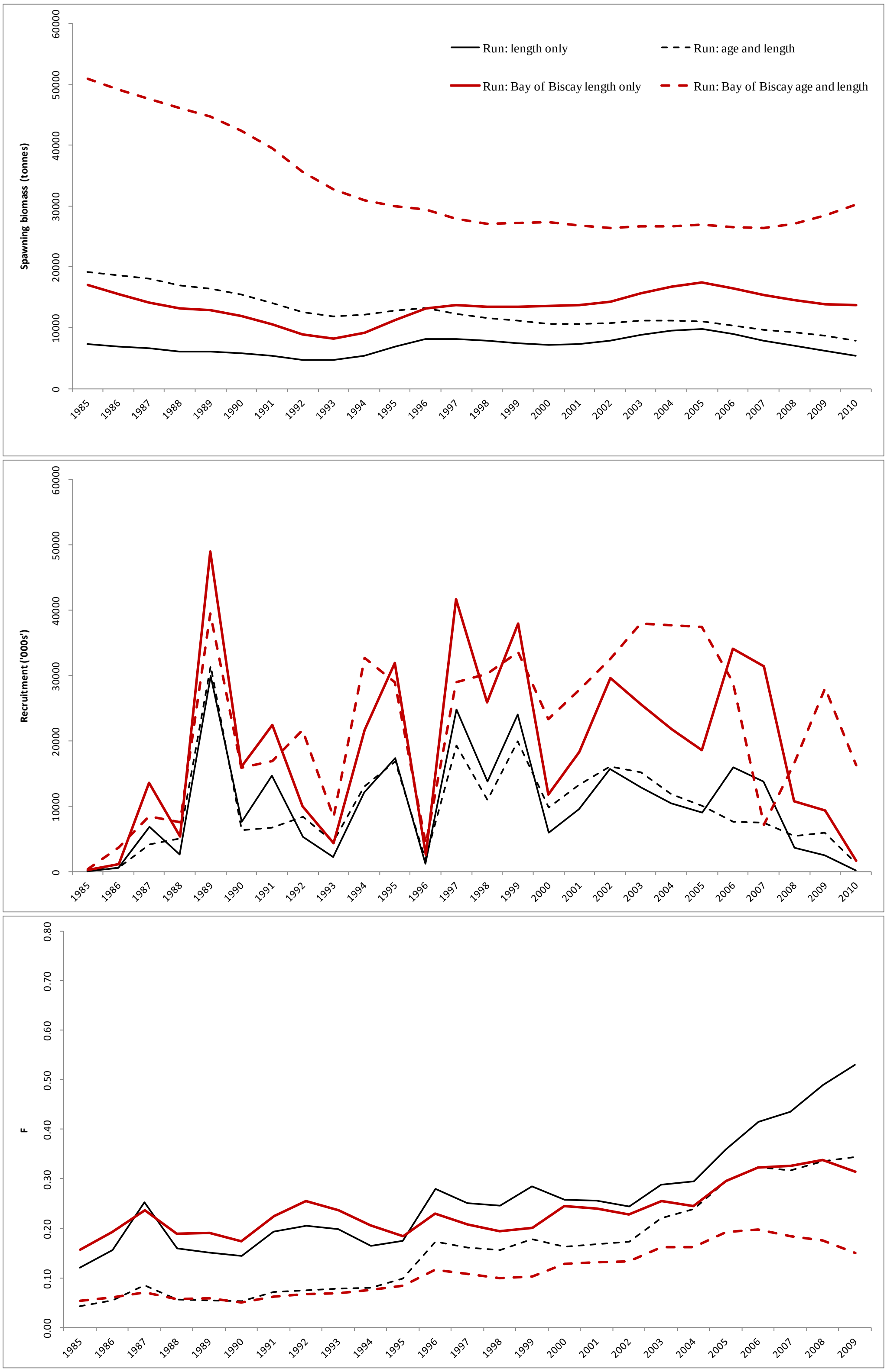


Figure 10.34: Comparison between the age-length and length based models with and without the Bay of Biscay for SSB, recruitment and F_{5-11}

14)

Quality of data : Sea bass are a by-catch in most polyvalent fisheries and catchability may drift due to changes in species targeting, areas fished and vessel fishing power. On the other hand, the unit of effort given as the number of trips that deliver sea bass is probably meaningless to reveal abundance

10.10.5 Biological parameters and other research in Iberian waters: weights, maturities, growth

This section provides biological parameters, discussed in a Portuguese Working Document for the ICES Working Group on Assessment of New MoU Species by Ana Moreno and Yorgos Stratoudakis (2013).

10.10.5.1 Spawning season

Bass spawning is limited within the 9-17o C water temperature range and has a latitudinal gradient in the Atlantic coast of Europe, with season placed progressively later in the year in more northerly latitudes (April-June off Ireland; February-May in the English Channel and eastern Celtic Sea; January-March in the Bay of Biscay and October-January in the Gulf of Cadiz). Based on back-calculated birthdates of juveniles caught in 4 Portuguese estuaries, Vinagre et al (2009) support the above latitudinal trend; successful spawning in SW Portugal seems to concentrate from December to February, becoming progressively later (January to April or February to April) as moving towards estuaries in NW Portugal, although temperature seasonality is not the trigger for this local pattern. An earlier study by Sobral et al (2000) identifies February as the main spawning month for bass off the Ria de Aveiro (NW Portugal), based on the macroscopic staging of gonads from fish caught by "majoieiras" (small bits of old trammel nets fixed perpendicularly on the beach at low tide).

10.10.5.2 Spawning grounds and seasonal migrations

Off western Portugal (where temperature is not a limiting factor for the definition of potential spawning habitat and continental shelf is narrow), there is no evidence of inshore-offshore migrations (sea bass is almost exclusively caught in the inner shelf and often at depths <10 m), and there is evidence of spawning at very shallow waters (Sobral et al 2000 and blog reports by recreational line fishers operating from land). Additionally, there is evidence of large pre-spawning and spawning aggregations found inshore, as verified by the occasional purse seine sets with up to 3-4 t of sea bass in the catch.

10.10.5.3 Ontogenetic movements

Off Portugal, there is evidence that juvenile bass colonize transition waters during the summer and stay there for at least the first year (Gordo 1989; Cabral and Costa 2001). Although fish in the second year of life and even third have been found within such protected and semi-enclosed systems, no mature fish have ever been registered there, whereas there is little known on the movements of bass while at sea.

10.10.5.4 Growth

Off Portugal, there are mean length at age data only for younger age groups (usually from studies with immature fish in estuaries and rias), appointing to intermediate sizes at age between the lower values in more northerly area and higher values in the Mediterranean and Atlantic Moroccan coast (Gordo 1989; Cabral and Costa 2001).

10.10.5.5 Maturation

In the northern range of the species distribution area, maturity is attained at around 4 - 7 years, which is around 35 cm for males and 42 cm for females. No information is available from Portugal. Nevertheless, Chavanne et al (2008) report from aquaculture experience that males complete maturation in the second year and females in the third (although recognize maturation as a problem for production only for fish reared for more than 3 years); it is thus likely that first maturation off Portugal occurs at intermediate ages between those reported from wild populations at the northern limit of the distribution and those from aquaculture.

10.10.6 Recreational catches (Bay of Biscay and Iberian Waters)

Recreational marine fishery surveys in Europe are still at an early stage in development (ICES WGRFS 2012).

France

A study targeting sea bass was conducted between 2009 and 2011 in VIIIa, VIIIb, VIIe, VIIh, VIId, Ivc. Estimates of sea bass catches were obtained from a panel of 121 recreational fishermen recruited during a random digit dialling screening survey of 15 000 households in the targeted districts (Atlantic and Chanel). The estimated recreational catch of bass in the Bay of Biscay and in the Channel was 3,170t of which 2,350t was kept and 830t released. The precision of the estimate is relatively low (CV =-51%). Around 60% of the recreational catch estimate was from Bay of Biscay. 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) - 2,610 t total catch and 1,840t 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%.

Spain

A recreational boat fishing survey was performed in the Basque Country to estimate the total catch of the target species of this fishery. Fishermen were asked about their catches in 2009, and 555 surveys were collected. Sea bass catch data were modeled with a two-step GLM, using type of boat and total boat length as covariables. The results were extrapolated to the total number of boats using an updated census. The estimated catch for seabass was in 2009 was 8183 Kg, with an associated standard error of 149 Kg. It is important to note that this estimation refers only to the fishing performed from boats. In order to estimate total recreational catches of sea bass, anglers fishing from coast and spear fishers need to be included in the survey. In 2012 a pilot study financed by the Data Collection Framework (DCF) was taking place in order to estimate total sea bass catches (taking into account all types of recreational fishing), and it is expected that the results if this study will increase significantly the estimated sea bass catch. Results were not available for WGNEW2013.

Portugal

It is recognized that a pilot study on recreational fishing of sea-bass should be carried out in order to determine the importance of this fishery in Portugal, whether it is necessary to monitor it regularly and if so how the monitoring could be carried out. Recreational fishery data have not been collected due to lack of resources and weak administrative information available. A pilot study addressed to the maritime touristic operators was implemented in 2010 in order to obtain the quantities of sea bass catches. The results of this study revealed very low quantities of sea bass catches (DCF, 2012).

Quality of recreational catch estimates

Recreational catch estimates from surveys (numbers or tonnes caught per year) are not yet available as time series. The estimates for France are characterised by relatively poor precision. The 2012 ICES Working Group on Recreational Fisheries initiated the development of data quality indicators for recreational fishery survey estimates, however sources and potential magnitude of bias in available estimates were not provided to WGNEW 2013.

10.11 Scorecard on data quality

Data quality is evaluated in relation to precision (relative standard errors or proxies for effective sample size) and critical forms of bias (e.g. coverage of surveys; biases in fishery catch data, natural mortality rate). Where possible, sensitivity analyses are conducted to evaluate the effect of these biases on the assessment results. WGNEW 2012 (udated in WGNEW 2013, **Figure 10.29**, Figure 10.30, Figure 10.31, Figure 10.32) highlighted blocks of national data using traffic lights colours to indicate potential quality issues, but IBP-NEW 2012 and WGNEW 2013 did not have time to conduct the detailed evaluation of biases in data quality required by the ICES scorecard.

10.12 Analysis of stock trends/assessment

This chapter refers to the work done during IBPNew2012 for the Bay of Biscay Area

10.12.1 Length cohort analysis for Bay of Biscay

Little information on sea bass biology and data on exploitation are available for areas VIIIab: there are no growth parameter estimates, ALKs are only available for 2008-2010 and no abundance indices (either survey or commercial fishery based) are readily available. It is thus not possible to carry out an assessment comparable to the one developed for area IV and VII.

An exploratory analysis of the length frequency data was carried out using a length cohort analysis (Jones, 1984) applied to the pooled-gears length frequency distributions from French fleets fishing in the Bay of Biscay. The main difficulty with length-cohort analysis is that its application requires estimates or assumptions about the underlying growth rates (Linf and K), and the choice of input growth parameters can critically influence the results obtained (Jones, 1990). As no growth parameters estimates are readily available for Bay of Biscay sea bass, two sets of values were used for comparison : i) a set of estimates obtained from area IV and VII and used in the stock assessment described above (Linf=85cm and K=0.09) and ii) a set of parameters obtained during the IBP-NEW 2012 from fitting a VB growth model to length-age data collected in the Bay of Biscay in 2009 and 2010 (Linf=95cm and K=0.10). The estimates of F at length and N at initial length were then used to calculate equilibrium yield under a series of fishing mortality levels using a length based Thompson and Bell model.

Results (Figure 10.33) clearly show the strong impact of assumptions on growth parameters on equilibrium yields which makes the use of this method very problematic with the limited biological knowledge available. Furthermore, this method relies on strong assumptions which may not be met in the case of seabass, namely that length composition data are sampled from a stock at equilibrium, with no variation in exploitation over time and no variation in year-class strength. This underlines, for this area, the critical need for data (biological and fishery related) to be able to carry out an analytical assessment of the stock, either as a separate stock or in a joint assessment with the more northern areas.

10.12.2 Inclusion of Bay of Biscay data in Stock Synthesis model

Runs 1A and 1B, the length only and age-length models for IVb,c and VIIa,d,e,f,g,h, were re-run to include a seventh fleet representing the French fleet in the Bay of Biscay. Length compositions for this fleet are provided for the years 2000 onwards. Tuning data for the Bay of Biscay are not included.

Inclusion of Bay of Biscay data (Figure 10.34) scales up the SSB and recruitment compared with SS3 runs 1A and 1B. Although a trend of increasing F is shown, the rate of increase is lower than in IV&VII and terminal F is much lower.

A potential problem with this simple extension of the SS3 model is the possibility for different growth patterns in the warmer waters of the Bay of Biscay, affecting the fit of the length-based model. The absence of any age composition data precludes a direct evaluation of year class variations, and it is therefore not possible to evaluate how well the Solent and Thames recruit surveys match recruitment patterns in the Bay of Biscay population.

10.12.3 Conclusions regarding Bay of Biscay area (IBP New 2012)

Further analysis of growth rates are needed to allow any interpretation of length composition data for this area. Inclusion of Bay of Biscay data in the SS3 model assumes that there is a single biological stock, a hypothesis which can neither be confirmed or disproved with current knowledge. Relative abundance indices for pre-recruit and recruited sea bass are also needed for this area. IBP-NEW 2013 considers that no assessment can at present be performed for sea bass in the Bay of Biscay.

10.12.4 Cohort analysis

At this stage, the available catch at age matrix is not validated, therefore no trend can be discussed yet at this time in WGNEW 2013.

10.12.5 Implications of missing recreational catches in assessment model

Recreational catch estimates for sea bass are currently available for only 2010, and only for France and the Netherlands. Data for surveys in the UK in 2012 are not yet available. For France and Netherlands, the combined estimates of recreational fishery removals for 2010, including an assumed hooking mortality of 20% for released fish, is 1,115t:

	All Areas IV - VIII			Areas IV & VII only				
	kept	released	CV	Proportion in IV&VII	kept	released	hooking mortality for re-leases	total removed
France 2010	2350	830	0.51	0.4	940	332	20%	1006
Netherlands 2010	96	65	0.31	1	96	65	20%	109
Total								1115

These removals would represent 19% of a combined fishery removal of 5,850t in 2010 (1,115t recreational + 4,736 t commercial), although this percentage will be imprecise due to the large CVs for the recreational catch estimates (for France, the CV for areas IV and VII will be larger than 0.51 as only 40% of the catch estimate is for this area). The addition of recreational catches from the UK, Belgium and other countries would increase this percentage, but addition of commercial discards weights for all international fleets would reduce the percentage. Estimates of discards weights of sea bass in areas IV&VII in 2010 for UK trawls and nets, and French fleets, are around 200t. These figures exclude discards from other national fleets or UK fleets not sampled. Retained catches of sea bass by UK sea angers were estimated in the late 1980s and early 1990s to be around 400 t per year (Dunn et al 1989; Dunn and Potten 1994), although these estimates are of unknown accuracy. It is possible, therefore, that recreational fisheries could potentially account for around 20% of the fishing mortality in recent years. It is not possible to evaluate how the recreational fishing mortality rate may have altered over time, and how this would affect the fit of the model, including initial depletion rate. Further work is needed at WGNEW 2013 to consider how to handle recreational data (recent estimates and missing historical data) in assessments and advice for sea bass.

10.12.6 Short term projections

Short term projections were not carried out, although the scenario of increasing F, declining SSB and very poor recruitment since 2008 would lead to an expectation of further SSB decline. Procedures for carrying out trends-only projections should be developed at WGNEW 2013.

10.12.7 Appropriate Reference Points (MSY)

IBP-NEW 2012 was not in a position to develop MSY reference points for seabass based on the SS3 runs. Further work is needed at WGNEW 2013 to develop biological reference points.

10.13 Future Research and data requirements

There are several important limitations to knowledge of sea bass populations, and deficiencies in data, that should be addressed in order to improve the assessments and advice for sea bass in the NE Atlantic. IBP-NEW2012 and WGNEW 2013 make the following recommendations:

- Robust relative abundance indices are needed for adult bass in all areas. Their absence is a major deficiency which will reduce the accuracy of the assessment and the ability to make meaningful forecasts. The establishment of dedicated surveys on spawning grounds could provide valuable information on trends in abundance and population structure of adult bass as well as providing material for investigating stock structure and linkages with recruitment grounds.
- Recruitment indices are needed for a wider geographic range including the Celtic/Irish Sea and Biscay areas.
- Further research is needed to better understand the spatial dynamics of sea bass (mixing between ICES areas; effects of site fidelity on fishery impacts; spawning site – recruitment ground linkages; environmental influences)

- Studies are needed to investigate the accuracy/bias in ageing, and errors due to age sampling schemes historically
- Continued estimation of recreational catches is needed across the stock range, and information to evaluate historical trends in recreational effort and catches would be beneficial for interpreting changes in age-length compositions over time.

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Table 10.1 : Sea bass in the VIIIab area. ICES and official landings (tons).

VIIIab	Belgium	France	France	Netherlands	Spain	Spain	UK(Eng+Wales+N.Irl+Scotland)
Source	official stats	official stats	Ices stats	official stats	official stats	Ices stats	official stats
1978	0	1146	1146	0	0		0
1979	0	1132	1132	0	0		0
1980	0	1086	1086	0	0		0
1981	0			0	0		0
1982	0			0	0		0
1983	0	1363	1363	0	0		0
1984	0	2886	2886	0	0		0
1985	0	2477	2477	0	0		0
1986	0	2606	2606	0	0		0
1987	0	2474	2474	0	0		5
1988	0	2274	2274	0	0		15
1989	0	2201	2201	0	0		0
1990	0	1678	1678	0	0		0
1991	0	1774	1774	0	17		0
1992	0	1752	1752	0	14		0
1993	0	1595	1595	0	14		0
1994	0	1708	1708	0	17		0
1995	0	1549	1549	0	0		0
1996	0	1459	1459	0	0		0
1997	0	1415	1415	0	0		0
1998	0	1261	1261	0	27		0
1999	0	0	2080	0	11		0

2000	0	2080	2295	0	67		0
2001	0	2020	2238	3	68		0
2002	0	1937	2216	0	176		0
2003	0	2812	2497	0	119		0
2004	0	2561	2284	0	96		0
2005	0	3184	2722	0	74		0
2006	0	3318	2707	0	168		2
2007	1	2984	2677	0	74	90	1
2008	0	1508	2600	0	145		0
2009	1	2339	2152	0	194	126	0
2010	0	2322	2089	0	165	140	2
2011	1	2295	2297	0	311	278	0
2012	0	2325	2348	0		201	

Area VIIIa, VIIIb France	2009				2010				2011				2012			
NB sampled fish by quarter and metier	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
handlines													0	1	0	0
longlines		24	13			2				11	4		17	1	7	5
nets	17	25	1	2	17	2	8	5	6	26	6		63	17	14	42
bottom trawl	44	167	109	11	50	114	157	60		20	54		0	1	9	0
pelagic trawl	11	2	54		10	2	4	92	46	1			0	0	5	0
purse seine																
Danish seine													1	0	0	1
TOTAL																
Numbers of seabass	480				523				174				184			

Table 10.2: Discarded numbers of seabass taken by French vessels using different gear types from 2009 to 2012

discarded by year				
Numbers of trip observed at sea with seabass caught (Landings and discards)	1481	1029	1471	1976

Table 10.3: estimated discarded numbers and weight of seabass taken by French vessels using different gear types from 2009 and 2012

FR, VIIIab, discards	**2009**		**2010**		**2011**		**2012**	
metier	Numbers	weight (tons)	Numbers	weight (tons)	Numbers	weight (tons)	Numbers	weight (tons)
bottom trawl	163473	29	73144	31	42445	12	19165	7
long lines	7643	5	3553	2	11174	4	24110	11
nets	7214	5	18005	8	6889	3	42799	17
pelagic trawl	25881	6	5938	3	2141	2	909	0.3
danish seine	NA	NA	NA	NA	NA	NA	1445	1
hand line	NA	NA	NA	NA	NA	NA	717	0.4
total	204211	**44**	100640	**44**	62648	**20**	89146	**37**

Table 10.4: Spanish discards in VIIIa,b,d area: number of sampled hauls (ns : not sampled that year; (blank) :no metier activity in that area)

	Metier	VIIIabd
2003	OTB_DEF_100-119_0_0	
2003	OTB_DEF_70-119_0_0	
2003	OTB_MPD_>=55_0_0	
2003	OTB_DEF_>=55_0_0	
2003	PTB_DEF_>=55_0_0	
2003	GNS_DEF_>=100_0_0	
2003	GNS_DEF_60-99_0_0	
2003	PTB_DEF_>=70_0_0	6
2003	OTB_MCF_>=70_0_0	
2003	OTB_DEF_>=70_0_0	6
2003	OTB_SPF_>=70_0_0	
2003	OTB_MDD_>100_0_0	
2003	OTB_DEF_>100_0_0	
2004	OTB_DEF_100-119_0_0	
2004	OTB_DEF_70-119_0_0	
2004	OTB_MPD_>=55_0_0	
2004	OTB_DEF_>=55_0_0	
2004	PTB_DEF_>=55_0_0	
2004	GNS_DEF_>=100_0_0	
2004	GNS_DEF_60-99_0_0	
2004	PTB_DEF_>=70_0_0	13
2004	OTB_MCF_>=70_0_0	
2004	OTB_DEF_>=70_0_0	4
2004	OTB_SPF_>=70_0_0	
2004	OTB_MDD_>100_0_0	
2004	OTB_DEF_>100_0_0	
2005	OTB_DEF_100-119_0_0	
2005	OTB_DEF_70-119_0_0	
2005	OTB_MPD_>=55_0_0	
2005	OTB_DEF_>=55_0_0	
2005	PTB_DEF_>=55_0_0	
2005	GNS_DEF_>=100_0_0	
2005	GNS_DEF_60-99_0_0	
2005	OTB_MCD_>=55_0_00	
2005	PTB_DEF_>=70_0_0	7
2005	OTB_MCF_>=70_0_0	
2005	OTB_DEF_>=70_0_0	11
2005	OTB_SPF_>=70_0_0	
2005	OTB_MDD_>100_0_0	
2005	OTB_DEF_>100_0_0	
2006	OTB_DEF_100-119_0_0	
2006	OTB_DEF_70-119_0_0	
2006	OTB_MPD_>=55_0_0	
2006	OTB_DEF_>=55_0_0	
2006	PTB_DEF_>=55_0_0	
2006	GNS_DEF_>=100_0_0	
2006	GNS_DEF_60-99_0_0	
2006	OTB_MCD_>=55_0_00	
2006	PTB_DEF_>=70_0_0	7
2006	OTB_MCF_>=70_0_0	
2006	OTB_DEF_>=70_0_0	10
2006	OTB_SPF_>=70_0_0	
2006	OTB_MDD_>100_0_0	
2006	OTB_DEF_>100_0_0	
2007	OTB_DEF_100-119_0_0	
2007	OTB_DEF_70-119_0_0	
2007	OTB_MPD_>=55_0_0	
2007	OTB_DEF_>=55_0_0	
2007	PTB_DEF_>=55_0_0	
2007	GNS_DEF_>=100_0_0	
2007	GNS_DEF_60-99_0_0	
2007	OTB_MCD_>=55_0_00	
2007	PTB_DEF_>=70_0_0	7
2007	OTB_MCF_>=70_0_0	
2007	OTB_DEF_>=70_0_0	12
2007	OTB_SPF_>=70_0_0	
2007	OTB_MDD_>100_0_0	
2007	OTB_DEF_>100_0_0	

	Metier	VIIIabd
2008	OTB_DEF_100-119_0_0	
2008	OTB_DEF_70-119_0_0	
2008	OTB_MPD_>=55_0_0	
2008	OTB_DEF_>=55_0_0	
2008	PTB_DEF_>=55_0_0	
2008	GNS_DEF_>=100_0_0	
2008	GNS_DEF_60-99_0_0	
2008	PS_SPF_0_0_0	
2008	OTB_MCD_>=55_0_00	
2008	PTB_DEF_>=70_0_0	7
2008	OTB_MCF_>=70_0_0	
2008	OTB_DEF_>=70_0_0	14
2008	OTB_SPF_>=70_0_0	
2008	OTB_MDD_>100_0_0	
2008	OTB_DEF_>100_0_0	
2009	OTB_DEF_100-119_0_0	
2009	OTB_DEF_70-119_0_0	
2009	OTB_MPD_>=55_0_0	
2009	OTB_DEF_>=55_0_0	
2009	PTB_DEF_>=55_0_0	
2009	GNS_DEF_>=100_0_0	
2009	GNS_DEF_60-99_0_0	
2009	OTB_MCD_>=55_0_00	
2009	PTB_DEF_>=70_0_0	7
2009	OTB_MCF_>=70_0_0	ns
2009	OTB_DEF_>=70_0_0	13
2009	OTB_SPF_>=70_0_0	ns
2009	OTB_MDD_>100_0_0	
2009	OTB_DEF_>100_0_0	
2010	OTB_DEF_100-119_0_0	
2010	OTB_DEF_70-119_0_0	
2010	OTB_MPD_>=55_0_0	
2010	OTB_DEF_>=55_0_0	
2010	PTB_DEF_>=55_0_0	
2010	GNS_DEF_>=100_0_0	
2010	GNS_DEF_60-99_0_0	
2010	OTB_MCD_>=55_0_00	
2010	PTB_DEF_>=70_0_0	8
2010	OTB_MCF_>=70_0_0	2
2010	OTB_DEF_>=70_0_0	7
2010	OTB_SPF_>=70_0_0	6
2010	OTB_MDD_>100_0_0	
2010	OTB_DEF_>100_0_0	
2011	OTB_DEF_100-119_0_0	
2011	OTB_DEF_70-119_0_0	
2011	OTB_MPD_>=55_0_0	
2011	OTB_DEF_>=55_0_0	
2011	PTB_DEF_>=55_0_0	
2011	GNS_DEF_>=100_0_0	
2011	GNS_DEF_60-99_0_0	
2011	OTB_DEF_100-119_0_0	
2011	PTB_DEF_>=70_0_0	8
2011	OTB_MCF_>=70_0_0	7
2011	OTB_DEF_>=70_0_0	7
2011	OTB_SPF_>=70_0_0	ns
2011	OTB_MDD_>100_0_0	
2011	OTB_DEF_>100_0_0	

ns : not sampled that year
(blank) : no metier activity in that area

Table 10.5: Sampling of bass landings in France for length composition in Division VIIIa and VIIIb (from 2009, because of non-specific seabass sampling at sea, high level of sampling can appear although fish samples is low)

8AB France	2000				2001				2002				2003				2004				2005			
NB sampled trip	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
handlines										14	12	5	2	4	7	1	3	3	9	4	4	5	7	
longlines	13	8	16	10	15	5	7	13	8	12	23	14	4	23	10	15	5	6	11	8	9	8	9	4
nets	8	11	9	3	8	22	6	11	10	26	11	3	11	20	12	7	12	9	8	3	15	14	9	4
bottom trawl	7	10	6	9	3	3	7	15	6	15	17	9	7	12	15	10	11	10	19	17	12	11	24	16
pelagic trawl									2				2	1			2	1			3			
purse seine																								
Danish seine																								

8AB France	2000				2001				2002				2003				2004				2005			
NB sampled fish	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
handlines										308	325	79	6	128	170	55	61	30	115	55	28	55	105	
longlines	317	87	326	255	498	175	222	161	125	180	348	385	120	422	267	394	102	132	265	234	84	132	183	45
nets	253	131	129	154	377	430	104	225	279	236	131	48	336	255	256	218	205	117	100	163	351	167	114	284
bottom trawl	231	131	137	296	88	10	167	356	302	116	271	315	349	95	294	236	461	147	318	472	307	137	288	236
pelagic trawl									266				182	17			356	141			274			
purse seine																								

8AB France	2006				2007				2008				2009				2010				2011				2012			
NB sampled trip	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
handlines	8	6		9	2	4	7	7	1	7	3	3	0	0	0	0	0	0	0	0					0	2	0	0
longlines	2	4	2	4	1	5	3		1	2	2	9	1	17	21	10	3	13	10	2	2	12	3	8	6	5	17	8
nets	5	12	3	11	5	5	4	4	4	19	9	5	67	90	26	25	73	62	29	56	32	19	12	18	48	34	30	31
bottom trawl	10	9	21	15	19	15	11	13	5	16	15	14	15	48	39	42	48	38	54	42	19	15	11	20	11	7	21	28
pelagic trawl					1							1	70	28	20	17	14	11	22	6	1				1	1	1	3
purse seine													0	1	0	0	0		1	3	2				0	0	1	1
Danish seine																									4	3	3	3

8AB France	2006				2007				2008				2009				2010				2011				2012			
NB sampled fish	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
handlines	133	191		423	96	122	233	199	63	79	102	125	0	0	0	0	0	0	0	0					304	137	62	294
longlines	17	60	19	97	7	111	70		26	15	80	218	30	568	905	302	96	169	107	61	34	366	242	258	365	96	653	597
nets	288	162	66	340	342	40	144	77	197	313	182	311	549	856	131	602	826	349	202	654	###	284	153	581	408	153	231	415
bottom trawl	192	198	510	485	494	342	265	306	113	208	364	415	119	671	267	604	565	321	257	384	393	121	156	343	71	47	143	328
pelagic trawl					85							55	755	543	176	530	352	388	289	451	4				211	15	31	73
purse seine													0	4	0	0	0	0	1	38	17				0	0	9	9
																									189	10	2	108

Table 10.6: Seabass in the Bay of Biscay. Estimated length compositions of seabass landings in France in Division VIIIa,b for all gear (nos.fish)

annual length structure France AREA VIIIa and VIIIb-all gear

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*	2012*
20	0	0	4599	0	2298	0	0	0	0	6	168	0	
21	0	0	0	0	3752	0	0	0	0	25	168	0	
22	0	0	0	0	10256	0	0	0	0		168	0	
23	0	0	0	0	20434	0	0	0	0	65		0	
24	2643	0	0	0	16238	0	0	0	122	211	336	0	
25	440	0	4017	0	9409	0	0	0	0		422	0	
26	881	0	6026	0	8750	0	900	0	0	24	1177	0	
27	881	0	4017	0	4773	0	3600	0	122	474	753	0	
28	440	0	8671	0	489	0	6301	6011	506	510	376	0	378
29	881	851	24069	491	2625	0	6301	0	1502	487	1257	0	
30	1570	0	10897	2116	9624	0	4500	0	1725	915	925	0	603
31	0	653	13246	1134	15666	0	6301	0	244	719	1323	0	
32	0	1903	8108	1134	21277	10378	7451	235	1866	354	5132	709	1824
33	2210	2924	28316	5516	28890	472	8051	1702	1889	1155	11453	4704	1351
34	5589	11049	39101	14771	26318	10853	13676	26895	7729	1040	10909	10693	12231
35	35091	23572	41186	50463	47850	78092	133901	105788	30112	5109	16443	21002	28120
36	61852	55106	76339	62764	65257	109237	137162	111784	110116	23955	28756	53756	63985
37	81135	66588	90705	94837	79000	117443	136844	128026	143054	61140	47711	75523	121018
38	89406	89327	91687	113093	88311	126235	110703	108969	161036	72774	45491	95305	93683
39	97641	94266	93152	109651	117432	68503	101498	116100	170194	91893	53825	82957	108528
40	101093	123752	115861	111594	144661	80398	222268	130487	189759	97573	60200	95191	164273
41	103303	147337	100016	94646	115441	103889	155249	166953	197926	100285	70549	124618	119687
42	132012	141759	83452	120333	115832	104052	151732	147309	205231	87395	89114	89458	103062
43	140961	158209	94683	93110	116984	127050	123816	123867	181227	100802	104540	85337	115172
44	123695	118814	96233	128951	120118	148807	153432	142551	203603	92640	105773	94130	116390
45	152072	156025	103602	95663	92753	114426	143907	108976	151212	121618	80578	81947	76910
46	105662	138401	97386	125993	86537	86431	123265	149676	91439	82107	83422	56053	85713
47	100236	89196	109791	99943	71613	103616	85671	144585	59237	86194	72571	56842	64940
48	63700	97048	133148	129083	81978	99013	102030	77428	76180	70729	63463	45002	49200
49	64805	73419	63807	118972	94867	97750	98608	118434	59632	61980	46152	40088	48018
50	56237	52240	65943	78128	47344	85912	74358	101403	60667	62706	62311	35743	45828
51	45429	41093	44925	87396	41826	67653	62136	55346	53131	41846	42576	30030	60887
52	34741	40608	44745	52554	43727	50178	66827	59950	44320	38131	47205	35669	42124
53	31577	32083	33820	48180	34825	52149	41284	55974	41689	42987	49833	28972	40480
54	26449	18119	30399	49430	29766	39749	29479	36654	49630	38074	45014	24817	35483
55	19852	19821	17869	35757	26486	36911	24235	40627	40950	24317	31805	20301	31161
56	15146	30844	20982	31865	29553	53543	33352	19846	23436	39698	26622	21773	35994
57	18220	18231	18225	26510	27605	35574	22928	26354	33091	25653	22917	13388	30070
58	13731	22839	22475	24264	22780	21662	37646	41368	16067	19138	16807	14790	32704
59	24773	15440	16876	15919	10791	34257	23003	23877	17271	20588	12847	13667	24339
60	20809	12596	8460	17059	19149	16568	19292	47241	29567	14237	8361	12675	17529
61	11848	6746	6043	19616	14287	30423	31247	19843	9731	13400	10880	12300	19870
62	16739	9478	10768	24000	11460	13683	24799	12987	34162	20412	11698	12798	16478
63	14481	7326	12959	17093	14573	15741	15893	17991	25397	11697	7279	8245	9147
64	21139	10562	9667	7646	12936	12799	18001	48007	10676	12981	13168	9635	15240
65	14821	12924	16791	4233	8403	18416	11611	21462	19163	8810	17917	7139	11417
66	6683	2955	7356	9364	12300	12119	4454	9085	8994	8361	7903	5098	10029
67	7735	6012	9306	6715	8528	9218	5077	10070	2655	9681	4835	10508	14984
68	5135	3974	7147	6396	1490	4815	4438	7738	6325	10142	5254	6104	8108
69	8700	4822	9772	9728	4586	8627	3385	20616	2284	4158	5918	6256	7751
70	3895	2750	8145	3723	8479	11185	3736	17704	7159	8918	9153	4285	4903
71	2984	11386	11559	2246	4497	12801	6481	2125	4242	3446	10289	4117	8673
72	11411	5370	8926	13307	3703	6919	3591	3731	2046	4007	15066	3221	4145
73	752	5372	4739	1727	3903	8696	3914	4278	1649	3841	4050	3087	2844
74	7057	3689	10091	3890	3582	10374	3789	2358	6816	1932	5420	1849	3723
75	6393	8412	4004	2205	992	1411	4988	3199	2612	3410	882	2389	5849
76	10484	954	329	534	2480	2356	939	2630	505	1529	1588	4155	1818
77	0	0	920	671	0	1211	3368	763	2509	855	824	5119	1993
78	259	464	916	712	145	2077	1931	1843	2791	2390	897	1490	1196
79	1122	142	0	194	1164	1866	1085	154	0	392	1330	2077	1683
80	2044	0	158	716	1398	993	1136	447	1269	595	6194	4373	2292
81	9623	0	114	0	160	1426	144	193	302	1096	670	137	875
82	716	1015	0	610	0	0	184	221	105	477	298	623	1030
83	940	0	0	0	0	0	0	148	0		86	98	121
84	259	0	103	86	0	0	197	247	44	65	453	684	136
85	458	0	74	416	0	78	0	0	44	97	103	0	
86	0	0	0	0	0	0	0	0	0	276		0	
87	259	0	0	0	0	1057	111	148	0	164		0	141
88	0	588	0	0	0	0	128	0	0		1495	1054	
89	0	0	113	0	0	0	0	0	0			0	
90	0	0	0	0	0	0	0	0	0	164		0	

* provisional

Table 10.7 : Sea bass in the Bay of Biscay. Estimated numbers at age for bass landed into the France from Division VIIIa,b (provisional). Because of problem in age validation a 9 or 10+ group could be adopted.

Source for ALK	ALK from Audierne coastal fisheries (boundary VIIIab/VIIeh)						ALK from Brest coastal fisheries (boundary VIIeh/VIIIab) and from offshore fisheries of the Channel		ALK from All Bay of Biscay			
age	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
4	23627	101682	254074	325037	68515	126533	45310	260983	403226	175821	122638	24991
5	504079	193579	384913	313717	638120	298498	539727	305377	1330794	750166	123745	130540
6	631261	810731	216682	534723	419140	657112	402374	902781	195093	160198	327589	401247
7	277028	458415	553193	174190	301419	283399	797076	197804	334152	307814	356221	336755
8	143361	164494	166564	406534	71539	384884	109855	227952	61232	59539	218741	194279
9	65572	59880	50164	153313	143338	35971	201929	127845	87409	69508	113094	168017
10	61325	28071	38960	68380	89498	161187	10906	106609	34886	27790	66170	59610
11	72756	43645	29006	33115	28994	81072	127820	50968	45266	42073	44900	45246
12	32612	40143	26216	24104	21103	30950	78744	103652	11050	10683	31565	26481
13	17385	20612	34643	19590	19657	21098	17291	130146	17599	18649	17670	20692
14	6578	3983	19011	23479	17875	24726	4621	19301	7777	5384	14879	7349
15	6546	6110	8050	5531	11143	18256	5976	21949	2571	3618	1076	5617
16	4047	1934	0	3719	2988	13325	6693	3354	0	0	1370	0
17	1661	1413	543	0	453	3079	6500	4138	0	0	0	0
18	3022	1413	1190	0	0	1067	0	3656	0	0	2195	0
19	0	0	0	286	0	0	0	0	0	0	0	0
20	0	0	595	0	0	0	0	0	0	0	0	0

Table 10.8: Seabass in the Bay of Biscay. Estimated Spanish (IEO + AZTI) length composition from sales notes, for 2010 in area VIIIabd for bottom trawl (OTB+PTB)

Length IEO + AZTI, sales notes, 2010, area VIIIabd, bottom trawl (OTB+PTB)

	Q1	Q2	Q3	Q4	**TOTAL**
34	0	0	12	504	**516**
35	0	0	23	1009	**1032**
36	0	0	23	1009	**1032**
37	0	0	23	1009	**1032**
38	451	28	29	797	**1305**
39	402	84	58	2039	**2582**
40	2421	305	104	1807	**4637**
41	1107	98	171	6260	**7637**
42	3211	603	160	3148	**7121**
43	2687	295	217	6489	**9688**
44	4668	469	151	1435	**6723**
45	4151	452	133	1214	**5950**
46	6940	690	201	1123	**8953**
47	2874	294	83	458	**3710**
48	1988	109	70	976	**3143**
49	29	6	26	1100	**1161**
50	3930	68	95	164	**4258**
51	3605	87	98	585	**4376**
52	1312	52	42	457	**1863**
53	1230	35	42	588	**1896**
54	147	31	10	256	**443**
55	1290	49	39	377	**1756**
56	531	32	20	293	**875**
57	2725	51	76	529	**3380**
58	265	16	8	84	**374**
59	322	22	9	44	**397**
60	2235	27	70	811	**3144**
61	88	18	15	569	**690**
62	43	9	13	499	**564**
63	307	19	11	176	**513**
64	617	44	17	89	**767**
65	307	19	11	160	**496**
66	1099	10	28	94	**1230**
67	32	7	2	59	**100**
68	1082	6	35	452	**1576**
69	0	0	3	119	**121**
70	1082	6	28	127	**1243**
71	1147	6	28	68	**1249**
72	0	0	0	0	**0**
73	0	0	0	0	**0**
74	17	4	0	0	**21**
75	17	4	1	33	**55**
76	0	0	0	0	**0**
77	0	0	0	0	**0**
78	0	0	1	35	**35**
79	1139	10	27	35	**1211**
80	0	0	0	0	**0**
81	31	7	1	0	**39**
82	0	0	0	0	**0**
83	0	0	0	0	**0**
84	0	0	0	0	**0**
85	0	0	1	35	**35**
total individuals:	**55528**	**4070**	**2216**	**37115**	**98930**
Nº samplings:	6	0	0	5	**11**
Sampled individuals:	169	0	0	131	**300**
Landings (sales notes), kg:	83285	4371	2893	38574	**129122**

Table 10.9: Seabass in the Bay of Biscay. Estimated Spanish (IEO + AZTI) length composition from sales notes, for 2011 in area VIIIabd for bottom trawl (OTB+PTB)

Length IEO + AZTI, sales notes, 2011, area VIIIabd, bottom trawl (OTB+PTB)

	Q1	Q2	Q3	Q4	TOTAL
34	120	0	5	15	**139**
35	120	0	6	37	**162**
36	1509	24	66	327	**1927**
37	6298	102	239	345	**6985**
38	10639	183	503	3349	**14673**
39	7199	121	353	2630	**10303**
40	1643	20	244	5205	**7112**
41	9987	168	485	3514	**14154**
42	4263	73	306	4304	**8946**
43	11943	208	560	3631	**16341**
44	2892	45	226	3439	**6602**
45	8109	135	330	1056	**9629**
46	10665	182	437	1469	**12753**
47	12755	223	538	2183	**15699**
48	2877	48	181	2172	**5277**
49	5453	94	226	829	**6602**
50	4724	80	222	1457	**6482**
51	5819	99	248	1087	**7254**
52	2543	40	119	771	**3473**
53	5396	91	272	2167	**7926**
54	5177	82	229	1189	**6677**
55	3152	53	241	3595	**7042**
56	1787	29	144	2256	**4217**
57	2272	35	206	3505	**6018**
58	1717	27	142	2265	**4151**
59	1300	19	79	908	**2306**
60	1211	16	88	1252	**2566**
61	1574	24	96	1100	**2794**
62	902	14	72	1121	**2109**
63	2363	40	110	685	**3198**
64	328	5	40	792	**1164**
65	931	15	71	1055	**2072**
66	196	3	8	29	**236**
67	615	11	37	404	**1066**
68	603	10	59	1054	**1726**
69	569	9	24	103	**704**
70	406	6	32	491	**936**
71	134	2	7	63	**205**
72	281	4	18	231	**534**
73	60	0	19	482	**562**
74	152	2	21	429	**604**
75	171	3	7	13	**194**
76	223	4	9	19	**255**
77	87	1	10	197	**296**
78	97	2	5	37	**141**
79	69	1	4	50	**125**
80	83	1	4	17	**105**
81	176	3	6	0	**186**
82	0	0	5	143	**148**
83	4	0	0	0	**4**
84	44	1	2	0	**46**
85	9	0	0	0	**10**
total individuals:	141645	2358	7360	63472	214835
Nº samplings:	12	1	0	13	26
Sampled individuals:	562	1	0	368	931
Landings (sales notes), kg:	170503	2812	9410	91966	274691

Table 10.10 : Dicentrarchus labrax : catches in the series of research surveys conducted by the IEO since 1985.

Dicentrachus labrax catches in the series of research surveys conducted by the IEO since 1983.

Survey	Gear	ICES Subdivision	Year	N Individuals	Length (cm)	Catch weight (Kg)	N. Total Hauls	N. Hauls with *D.labrax* presence	Frequency of occurrence (%)	Abundance (Kg/haul)	Comments
IBTS 1st quarter (IXa South) Gulf of Cádiz (ARSA)	Bottom trawl	IXa South	1993	0	-	0	34	0	0	0	
			1994	0	-	0	30	0	0	0	
			1995	0	-	0	29	0	0	0	
			1996	0	-	0	31	0	0	0	
			1997	0	-	0	30	0	0	0	
			1998	0	-	0	31	0	0	0	
			1999	0	-	0	38	0	0	0	
			2000	0	-	0	41	0	0	0	
			2001	0	-	0	40	0	0	0	
			2002	0	-	0	45	0	0	0	
			2003	-	-	-	0	-	-	-	No Survey
			2004	1	30	0.299	40	1	2.5	0.007	
			2005	0	-	0	40	0	0	0	
			2006	0	-	0	43	0	0	0	
			2007	0	-	0	41	0	0	0	
			2008	0	-	0	41	0	0	0	
			2009	0	-	0	40	0	0	0	
			2010	1	48	1.046	36	1	2.8	0.029	
			2011	0	-	0	42	0	0	0	
IBTS 4th quarter (IXa South) Gulf of Cádiz (ARSA)	Bottom trawl	IXa South	1997	0	-	0	27	0	0	0	
			1998	0	-	0	34	0	0	0	
			1999	0	-	0	38	0	0	0	
			2000	0	-	0	30	0	0	0	
			2001	0	-	0	39	0	0	0	
			2002	0	-	0	39	0	0	0	
			2003	0	-	0	41	0	0	0	
			2004	0	-	0	40	0	0	0	
			2005	0	-	0	42	0	0	0	
			2006	0	-	0	41	0	0	0	
			2007	0	-	0	37	0	0	0	
			2008	0	-	0	41	0	0	0	
			2009	0	-	0	43	0	0	0	
			2010	0	-	0	44	0	0	0	
			2011	0	-	0	40	0	0	0	
IBTS 4th quarter (VIII and IXa North) Cantabric Sea and Galicia (DEMERSALES)	Pelagic trawl	VIIIc IXa North	1983	2	45, 49	2.200	107 (+4*)	1	0.9	0.021	
			1984	0	-	0	94 (+1*)	0	0	0	
			1985	8	38, 42, 59, 62, 63, 64, 69, 72	15.900	97	2	2.1	0.164	
			1986	0	-	0	92	0	0	0	
			1987	-	-	-	0	-	-	-	No Survey
			1988	0	-	0	101 (+1*)	0 (+0*)	0	0	
			1989	0	-	0	91 (+1*)	0 (+0*)	0	0	
			1990	0	-	0	120 (+2*)	0 (+0*)	0	0	
			1991	0	-	0	107 (+1*)	0 (+0*)	0	0	
			1992	0	-	0	116 (+2*)	0 (+0*)	0	0	
			1993	0	-	0	109 (+1*)	0 (+0*)	0	0	
			1994	0	-	0	118 (+5*)	0 (+0*)	0	0	
			1995	0	-	0	116 (+6*)	0 (+0*)	0	0	
			1996	1	57	1.735	114 (+7*)	1 (+0*)	0.9	0.015	
			1997	0	-	0	113 (+10*)	0 (+0*)	0	0	
			1998	0	-	0	110 (+9*)	0 (+0*)	0	0	
			1999	2 (+1*)	(40*), 42, 66	3.670 (+645*)	112 (+12*)	2 (+1*)	1.8 (8.3*)	0.033 (0.054*)	One specimen coming from a special haul carried out less than 70 m (38.5)
			2000	0	-	0	114 (+8*)	0 (+0*)	0	0	
			2001	0	-	0	116 (+9*)	0 (+0*)	0	0	
			2002	0	-	0	116 (+10*)	0 (+0*)	0	0	
			2003	0 (+1*)	(83*)	0 (+4.900*)	117 (+8*)	0 (+1*)	0 (12.5*)	0 (0.613*)	Catch coming from a special haul carried out less than 70 m (44.5)
			2004	0 (+1*)	(37*)	0 (+0.590*)	114 (+6*)	0 (+1*)	0 (16.7*)	0 (0.098*)	Catch coming from a special haul carried out less than 70 m (38.5)
			2005	0	-	0	116 (+11*)	0 (+0*)	0	0	
			2006	0	-	0	116 (+11*)	0 (+0*)	0	0	
			2007	0	-	0	117 (+9*)	0 (+0*)	0	0	
			2008	0	-	0	115 (+29*)	0 (+0*)	0	0	
			2009	0	-	0	117 (+28*)	0 (+0*)	0	0	
			2010	0	-	0	114 (+14*)	0 (+0*)	0	0	
			2011	0 (+1*)	(43*)	0 (+0.675*)	111 (+11*)	0 (+1*)	0 (9.1*)	0 (0.061*)	Catch coming from a special haul carried out less than 70 m (44.5)
Sardine, Anchovy, Horse Mackerel Acoustic survey (PELACUS)	Bottom trawl	VIIIc IXa North	2000	1	58	2.140	37	1	2.7	0.058	
			2001	0	-	0	38	0	0	0	
			2002	0	-	0	46	0	0	0	
			2003	0	-	0	39	0	0	0	
			2004	1	45	0.890	52	1	1.9	0.017	
			2005	0	-	0	56	0	0	0	
			2006	0	-	0	57	0	0	0	
			2007	0	-	0	52	0	0	0	
			2008	0	-	0	60	0	0	0	
			2009	2	52-55	2.730	62	1	3.2	0.044	
			2010	0	-	0	63	0	0	0	
			2011	0	-	0	51	0	0	0	
IBTS 4th quarter Porcupine Groundfish Survey (PORCUPINE)	Bottom trawl	VIIIc-k	2001	0	-	0	80 (+3**)	0	0	0	
			2002	0	-	0	86	0	0	0	
			2003	0	-	0	80 (+1**)	0	0	0	
			2004	0	-	0	70	0	0	0	
			2005	0	-	0	76 (+2**)	0	0	0	
			2006	0	-	0	79 (+6**)	0	0	0	
			2007	0	-	0	80 (+5**)	0	0	0	
			2008	0	-	0	79 (+4**)	0	0	0	
			2009	0	-	0	80 (+5**)	0	0	0	
			2010	0	-	0	80 (+6**)	0	0	0	
			2011	0	-	0	80 (+5**)	0	0	0	

* Data coming from special hauls, carried out less than 70 m of depth during the research surveys "DEMERSALES". These data were not covered in the stratified abundance indices for these surveys.

**Data coming from special hauls during the "PORCUPINE" surveys. Some of them were repeated hauls in the same grid for calibrations. Other were carried out to fill voids outside the standard sampling. These data were not covered in the stratified abundance indices for these surveys.

Table 10.11 : Sea bass in the IX and VIIIc areas. ICES and official landings (tons).

Country	**France** official landings	**Portugal** official landings	**Spain** official landings	Total official landings**	Total ICES estimates***
1978	0	576	0	576	576
1979	0	550	0	550	550
1980	0	460	0	460	460
1981	0	370	0	370	370
1982	0	556	135	691	691
1983	0	408	114	522	522
1984	0	431	250	681	681
1985	0	311	164	475	475
1986	0	219	182	401	580
1987	0	216	194	410	542
1988	14	115	93	222	586
1989	0	105	417	522	1029
1990	1	90	541	632	1042
1991	2	77	411	490	867
1992	0	53	348	401	743
1993	0	57	351	408	694
1994	0	57	440	497	863
1995	0	42	446	488	798
1996	0	48	534	582	956
1997	0	39	474	513	742
1998	0	38	373	411	683
1999	0	37	355	392	720
2000	2	49	329	380	775
2001	0	42	235	277	635
2002	8	43	121	172	518
2003	1	47	113	161	466
2004	39	67	256	362	676
2005	57	177	219	453	753
2006	2	461	268	731	905
2007	1	545	342	888	910
2008	0	403	252	655	614
2009	8	414	212	634	652
2010	2	489	286	777	814
2011	5	441	313	759	777
2012*	2	271		273	701

* Preliminary

**-Official landings have been extracted from the Ices Official Catch Statistics Web page (15May 2013) for "BSS" and area VIIIc, IXa and IX (IX has been retained for Portuguese statistics because reported as IXa prior 2007).

***Difference between Ices Statistics and official Statistics are mainly due prior 2006 to Portugal statistics : before 2006 most of the sea bass catches were registered under the code BSE, i.e. (Dicentrarchus sp.). After the DCF implementation there was a progressive increase in the correct identification of species in the official statistics (BSS increase, BSE decrease) who consider Dicentrarchus sp landings minus 2.3% of Dicentrarchus punctatus based on DCF market and on-board sampling between 2008 and 2012)

Table 10.12: Spanish discards in VIIIc, IXa area: number of sampled hauls (ns : not sampled that year; (blank) :no metier activity in that area). No sea bass discards observed.

	Metier	VIIIc	IXaS
2003	OTB_DEF_100-119_0_0		
2003	OTB_DEF_70-119_0_0		
2003	OTB_MPD_>=55_0_0	44	
2003	OTB_DEF_>=55_0_0	78	
2003	PTB_DEF_>=55_0_0	6	
2003	GNS_DEF_>=100_0_0	ns	
2003	GNS_DEF_60-99_0_0	ns	
2003	PTB_DEF_>=70_0_0		
2003	OTB_MCF_>=70_0_0		
2003	OTB_DEF_>=70_0_0		
2003	OTB_SPF_>=70_0_0		
2003	OTB_MDD_>100_0_0		
2003	OTB_DEF_>100_0_0		
2004	OTB_DEF_100-119_0_0		
2004	OTB_DEF_70-119_0_0		
2004	OTB_MPD_>=55_0_0	41	
2004	OTB_DEF_>=55_0_0	15	
2004	PTB_DEF_>=55_0_0	1	
2004	GNS_DEF_>=100_0_0	ns	
2004	GNS_DEF_60-99_0_0	ns	
2004	PTB_DEF_>=70_0_0		
2004	OTB_MCF_>=70_0_0		
2004	OTB_DEF_>=70_0_0		
2004	OTB_SPF_>=70_0_0		
2004	OTB_MDD_>100_0_0		
2004	OTB_DEF_>100_0_0		
2005	OTB_DEF_100-119_0_0		
2005	OTB_DEF_70-119_0_0		
2005	OTB_MPD_>=55_0_0	45	
2005	OTB_DEF_>=55_0_0	148	
2005	PTB_DEF_>=55_0_0	25	
2005	GNS_DEF_>=100_0_0	ns	
2005	GNS_DEF_60-99_0_0	ns	
2005	OTB_MCD_>=55_0_00		47
2005	PTB_DEF_>=70_0_0		
2005	OTB_MCF_>=70_0_0		
2005	OTB_DEF_>=70_0_0		
2005	OTB_SPF_>=70_0_0		
2005	OTB_MDD_>100_0_0		
2005	OTB_DEF_>100_0_0		
2006	OTB_DEF_100-119_0_0		
2006	OTB_DEF_70-119_0_0		
2006	OTB_MPD_>=55_0_0	52	
2006	OTB_DEF_>=55_0_0	1	
2006	PTB_DEF_>=55_0_0	24	
2006	GNS_DEF_>=100_0_0	ns	
2006	GNS_DEF_60-99_0_0	ns	
2006	OTB_MCD_>=55_0_00		72
2006	PTB_DEF_>=70_0_0		
2006	OTB_MCF_>=70_0_0		
2006	OTB_DEF_>=70_0_0		
2006	OTB_SPF_>=70_0_0		
2006	OTB_MDD_>100_0_0		
2006	OTB_DEF_>100_0_0		
2007	OTB_DEF_100-119_0_0		
2007	OTB_DEF_70-119_0_0		
2007	OTB_MPD_>=55_0_0	46	
2007	OTB_DEF_>=55_0_0	123	
2007	PTB_DEF_>=55_0_0	44	
2007	GNS_DEF_>=100_0_0	ns	
2007	GNS_DEF_60-99_0_0	ns	
2007	OTB_MCD_>=55_0_00		59
2007	PTB_DEF_>=70_0_0		
2007	OTB_MCF_>=70_0_0		
2007	OTB_DEF_>=70_0_0		
2007	OTB_SPF_>=70_0_0		
2007	OTB_MDD_>100_0_0		
2007	OTB_DEF_>100_0_0		
2008	OTB_DEF_100-119_0_0		
2008	OTB_DEF_70-119_0_0		
2008	OTB_MPD_>=55_0_0	99	
2008	OTB_DEF_>=55_0_0	86	
2008	PTB_DEF_>=55_0_0	32	
2008	GNS_DEF_>=100_0_0	9	
2008	GNS_DEF_60-99_0_0	31	
2008	PS_SPF_0_0_0	6	
2008	OTB_MCD_>=55_0_00		58
2008	PTB_DEF_>=70_0_0		
2008	OTB_MCF_>=70_0_0		
2008	OTB_DEF_>=70_0_0		
2008	OTB_SPF_>=70_0_0		
2008	OTB_MDD_>100_0_0		
2008	OTB_DEF_>100_0_0		
2009	OTB_DEF_100-119_0_0		
2009	OTB_DEF_70-119_0_0		
2009	OTB_MPD_>=55_0_0	65	
2009	OTB_DEF_>=55_0_0	116	
2009	PTB_DEF_>=55_0_0	51	
2009	GNS_DEF_>=100_0_0	24	
2009	GNS_DEF_60-99_0_0	39	
2009	OTB_MCD_>=55_0_00		56
2009	PTB_DEF_>=70_0_0		
2009	OTB_MCF_>=70_0_0		
2009	OTB_DEF_>=70_0_0		
2009	OTB_SPF_>=70_0_0		
2009	OTB_MDD_>100_0_0		
2009	OTB_DEF_>100_0_0		
2010	OTB_DEF_100-119_0_0		
2010	OTB_DEF_70-119_0_0		
2010	OTB_MPD_>=55_0_0	86	
2010	OTB_DEF_>=55_0_0	168	
2010	PTB_DEF_>=55_0_0	36	
2010	GNS_DEF_>=100_0_0	14	
2010	GNS_DEF_60-99_0_0	29	
2010	OTB_MCD_>=55_0_00		57
2010	PTB_DEF_>=70_0_0		
2010	OTB_MCF_>=70_0_0		
2010	OTB_DEF_>=70_0_0		
2010	OTB_SPF_>=70_0_0		
2010	OTB_MDD_>100_0_0		
2010	OTB_DEF_>100_0_0		
2011	OTB_DEF_100-119_0_0		
2011	OTB_DEF_70-119_0_0		
2011	OTB_MPD_>=55_0_0	65	
2011	OTB_DEF_>=55_0_0	282	
2011	PTB_DEF_>=55_0_0	35	
2011	GNS_DEF_>=100_0_0	15	
2011	GNS_DEF_60-99_0_0	13	
2011	OTB_DEF_100-119_0_0		85
2011	PTB_DEF_>=70_0_0		
2011	OTB_MCF_>=70_0_0		
2011	OTB_DEF_>=70_0_0		
2011	OTB_SPF_>=70_0_0		
2011	OTB_MDD_>100_0_0		
2011	OTB_DEF_>100_0_0		

	Nets and traps			Lines			Other			sampling rate
Year	Landings kg	N trips	N Indiv	Landings kg	N trips	N Indiv	Landings kg	N trips	N Indiv	(n trips/ton)
2009	1869	68	761	301	26	130	3	2	2	0.21
2010	1661	80	570	63	14	93	8	2	2	0.18
2011	2571	104	846	47	7	48	0	0	0	0.24
2012	985	99	588	364	23	183	0	0	0	NA

Table 10.13: Summary of the sea bass fisheries length composition sampling in Portuguese waters (ICES div IXa). Sampling rate is expressed in numbers of trips by ton landed.

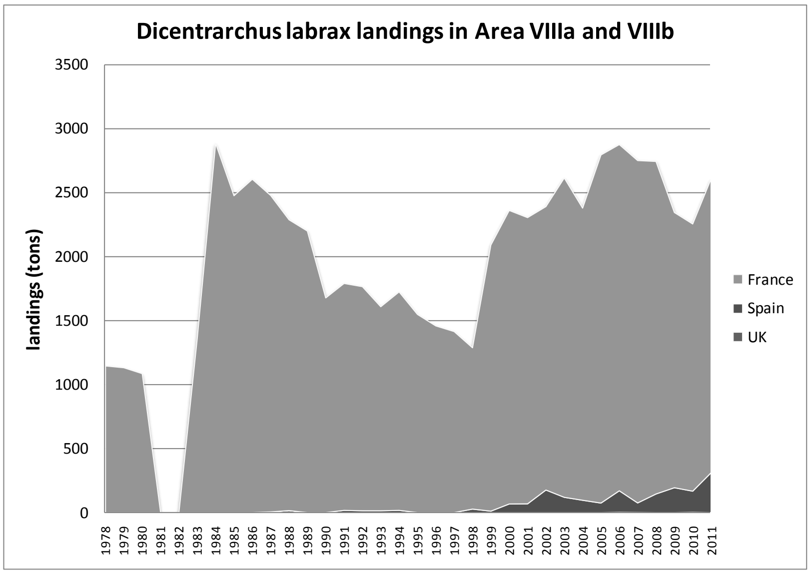

Figure 10.12 : Sea bass in the VIIIab area. ICES landings (tonnes).

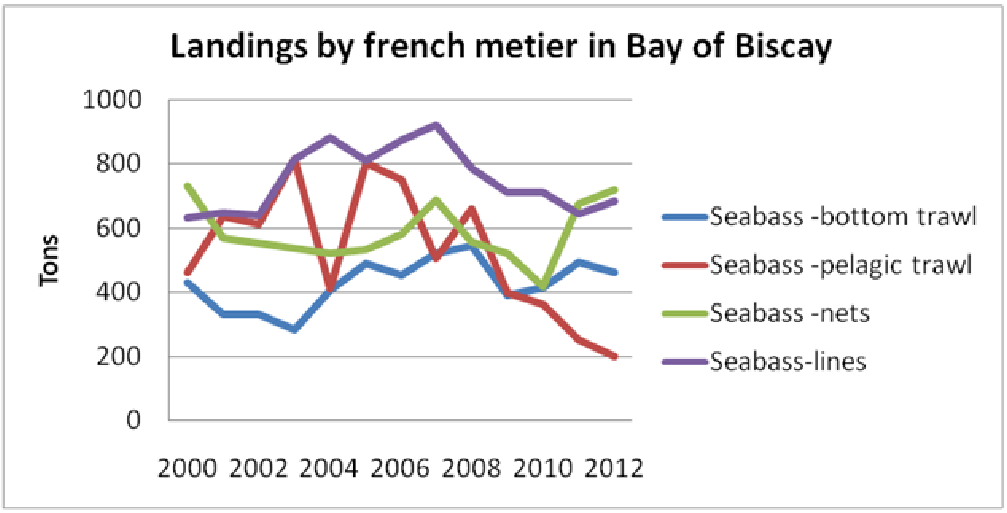

Figure 10.16: Sea bass in Bay of Biscay. Landings (t) by gear type for French commercial fishing fleets. Source : Ices Landings

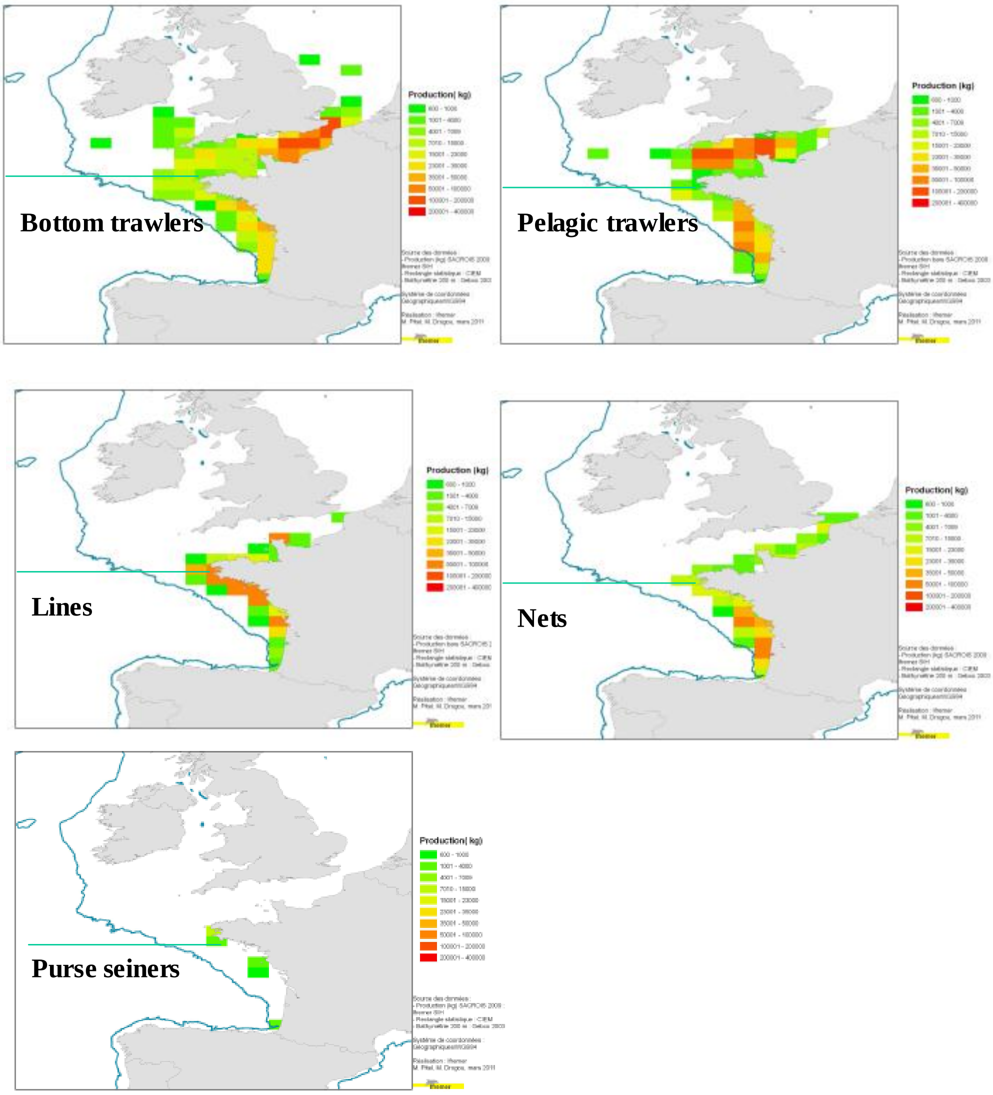

Figure 10.14: Spatial activity of the French fleet by metier (2009). Source : ICES Landings

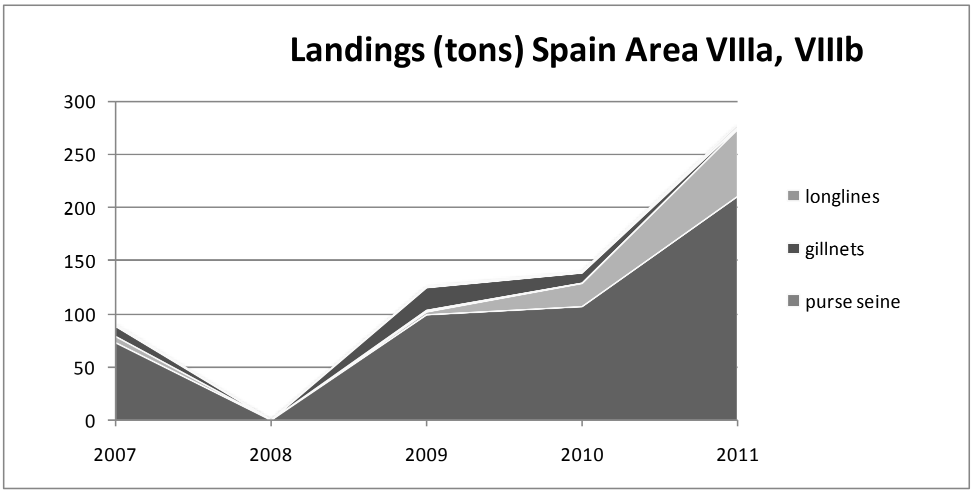

Figure 10.15: Sea bass in Bay of Biscay. Landings by gear type for Spanish commercial fishing fleets. Source: Spanish Sales Notes.

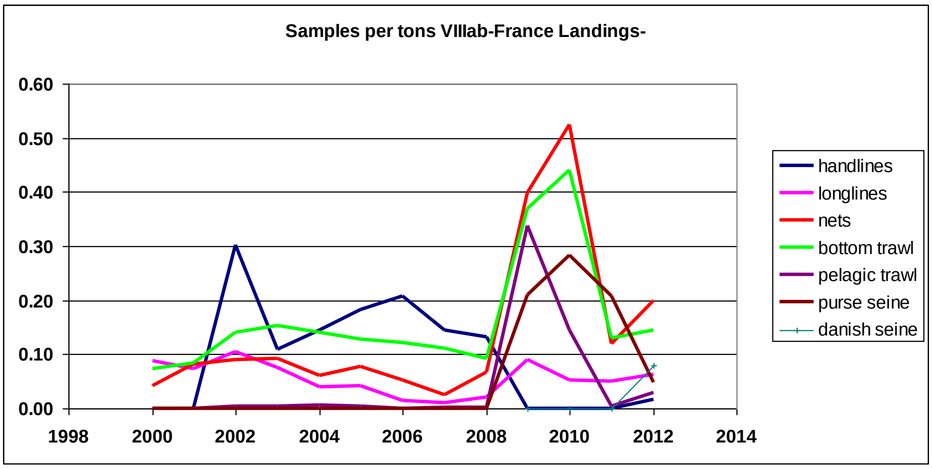

Figure 10.16: Sea bass in VIIIab. Annual sampling of French sea bass landings for length compositions: nos. trips sampled per ton of bass landed, by gear. (2012 provisional)

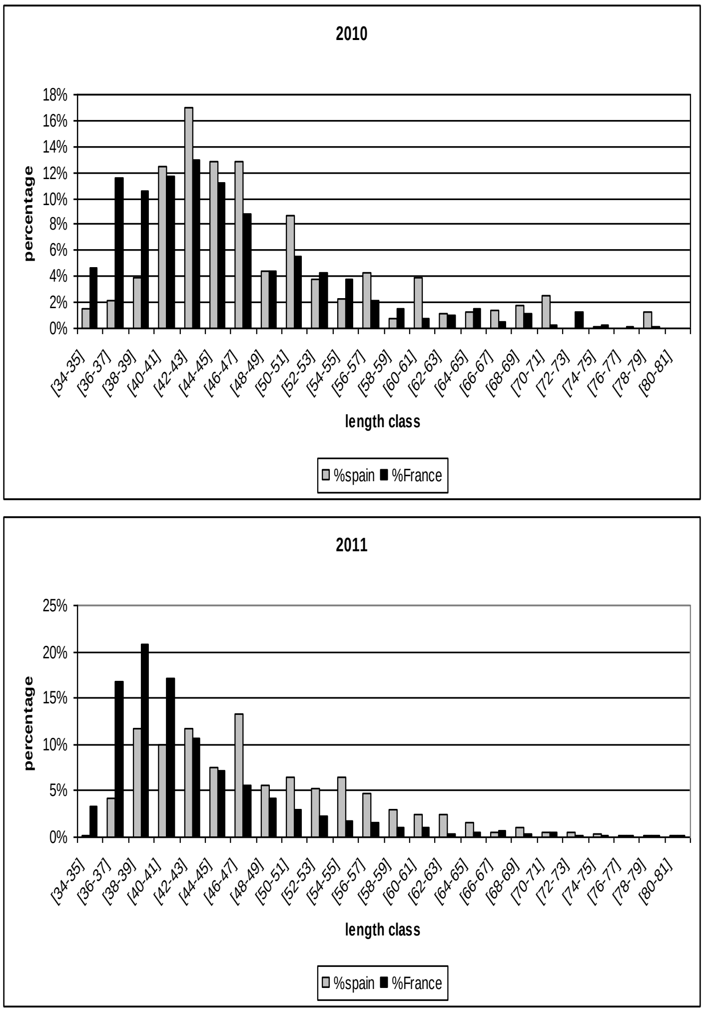

Figure 10.17 : Sea bass in the VIIIab divisions : Comparison between percentage age composition of annual landings of Spanish and French bottom trawlers for 2010 and 2011.

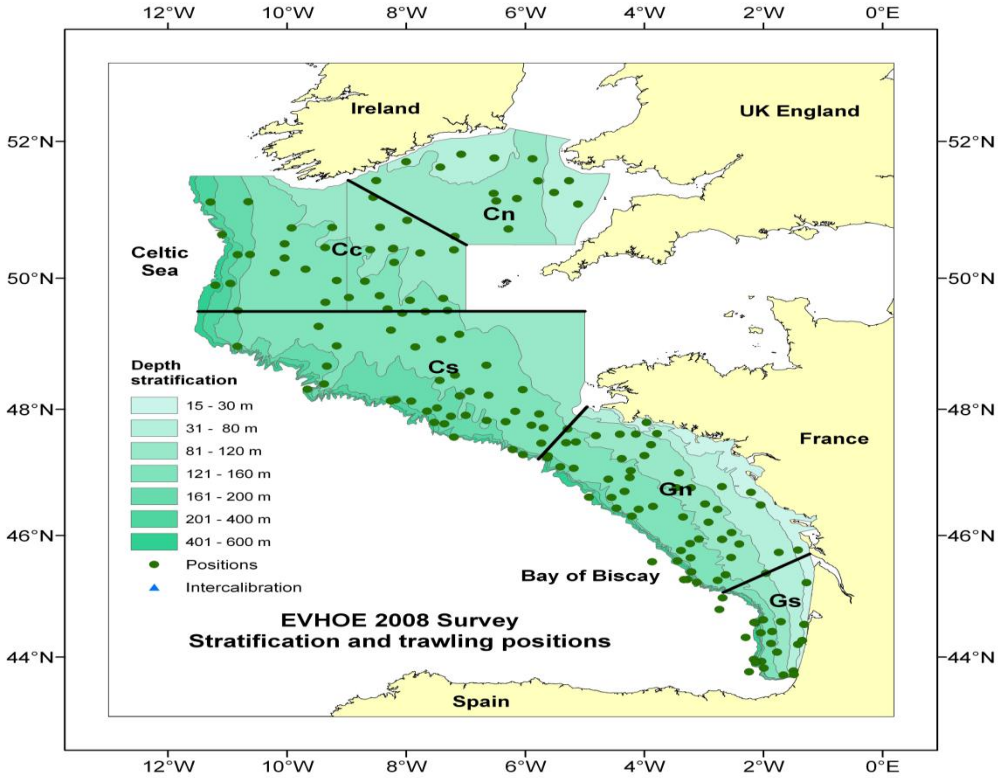

Figure 10.21 : station positions for French Evhoe bottom-trawl survey.

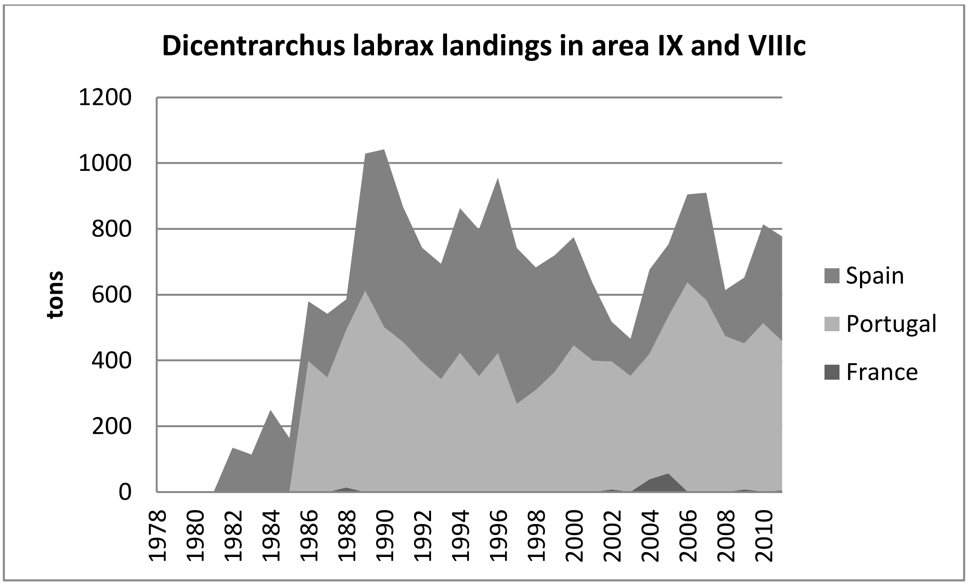

Figure 10.19 : Sea bass in the IX and VIIIc area. Source : official stats and ICES stats.

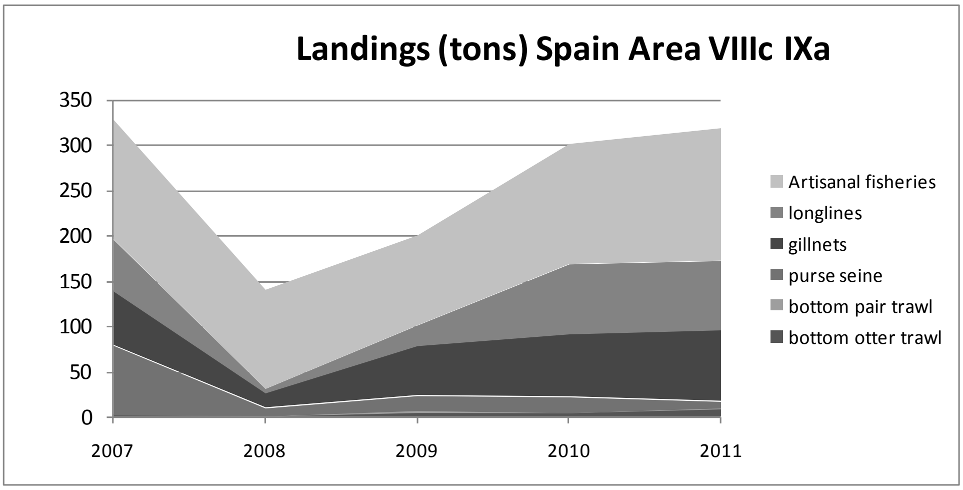

Figure 10.20: Sea bass in Iberian waters. Landings by gear type for Spanish commercial fishing fleets. Source : Spanish Sales Notes.

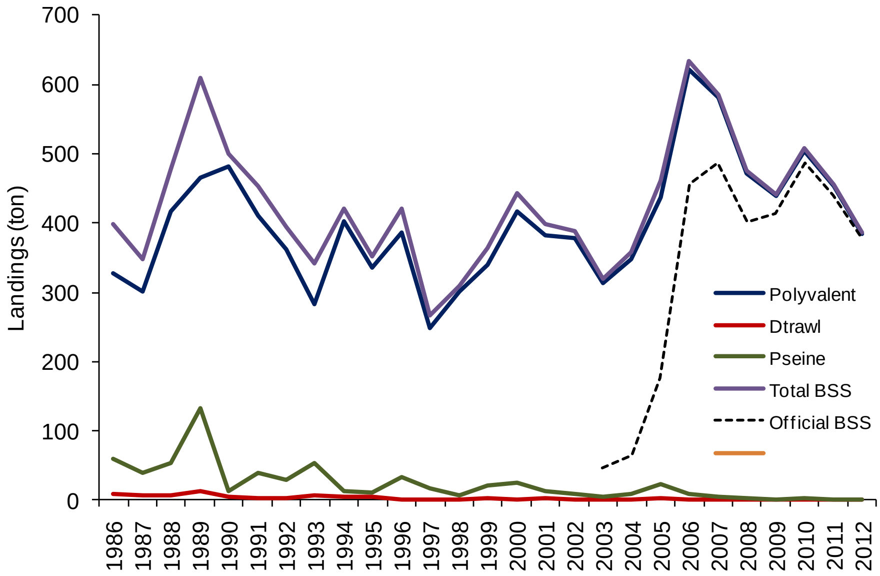

Figure 10.21: Landings of Sea bass from Portuguese waters ICES Div IXa by fleet for the period 1986 to 2012. Official landings of BSS increased substantially since 2006 in result of improved report by species (Dicentrarchus labrax vs punctatus).

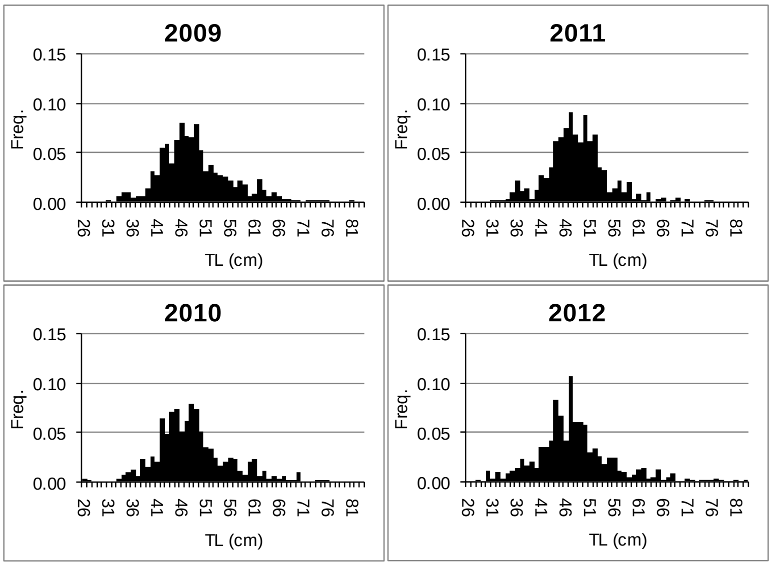

Figure 10.22: Annual length compositions of sea bass in landings from Portuguese waters (Div. IXa) by the polyvalent fleet.

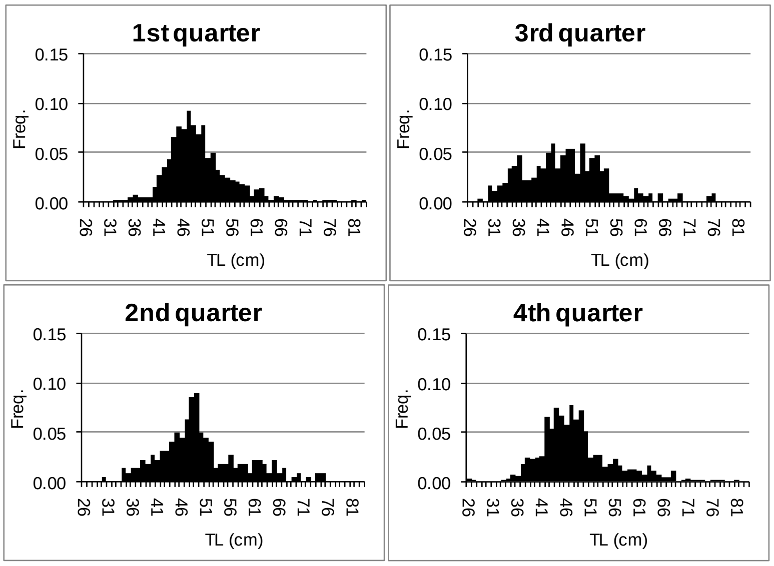

Figure 10.23: Quarterly length compositions of sea bass in landings from Portuguese waters (Div. IXa) by the polyvalent fleet for the period 2009-2012.

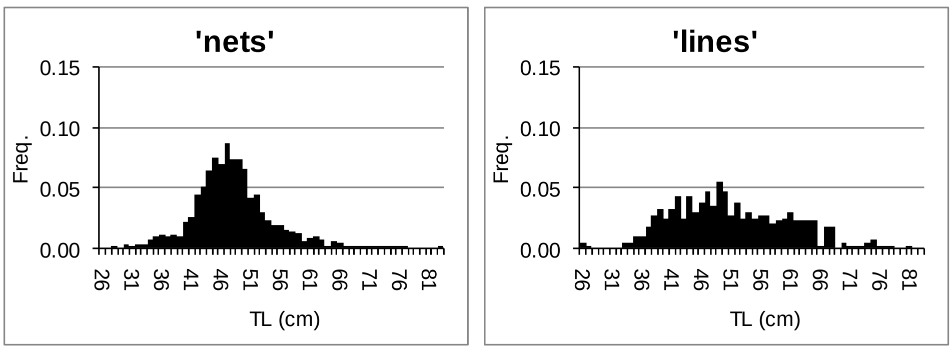

Figure 10.24: Length compositions of sea bass in landings from Portuguese waters (Div. IXa) by gear type for the period 2009-2012.

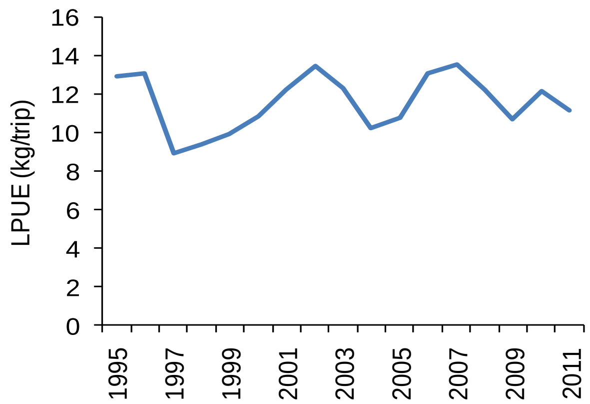

Figure 10.28: LPUE of Sea bass from Portuguese waters ICES Div IXa for the polyvalent fishery for the period 1995 to 2011.

				France (2333 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	OTB						
			Pelagic trawl						
			Nets						
			Lines						
	Commercial	Discards weight	OTB						period available (2009-2011)
			Pelagic trawl						
			Nets						
			Lines						
	Recreational	Retained catches							only 2010
		Ruterned catches							only 2010
Effort	Commercial	Fishing effort	OTB						methodology has to be discussed (see benchmark 2012)
			Pelagic trawl						
			Nets						
			Lines						
	Recreational	Fishing effort							
Catch composition	Commercial	Landings Length compositions	OTB						
			Pelagic trawl						
			Nets						
			Lines						
		Landings Age compositions & wts	OTB						see benchmark 2012 on pb of age reading
			Pelagic trawl						
			Nets						
			Lines						
		Discards Length compositions	OTB						period available (2009-2011)
			Pelagic trawl						period available (2009-2011)
			Nets						period available (2009-2011)
			Lines						period available (2009-2011)
		Discards Age compositions & wts	OTB						
			Pelagic trawl						
			Nets						
			Lines						
	Recreational	Length compositions							2010 only, low precision
		Age composition							
Abundance indices	Commercial	LPUE	OTB						methodology has to be discussed
			Pelagic trawl						
			Nets						
			Lines						
	Surveys	pre-recruit							
	Surveys	post recruit							validity (very low sampling rate)?
Biological parameters	All	Growth							see benchmark 2012
	All	Maturity Ogives							
	All	Fecundity							
	All	Natural mortality							

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

Figure 10.29: Sea bass data availability up to 2012 for WGNEW 2013: Bay of Biscay (Divisions VIIIa, VIIIb)-France

Area: VIIIab, Spain 167 tons in 2010									
				SPAIN (167 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	Bottom otter trawl						Landings by gear from 2007
			Bottom pair trawl						
			Purse seine						
			Gillnets						
			Longlines						
	Commercial	Discards weight	Bottom otter trawl						no discards observed
			Bottom pair trawl						
			Purse seine						
			Gillnets						
			Longlines						
	Recreational	Retained catches							ongoing study
		Ruterned catches							
Effort	Commercial	Fishing effort	Bottom otter trawl						fishing days, all gear
			Bottom pair trawl						
			Purse seine						
			Gillnets						
			Longlines						
	Recreational	Fishing effort							
Catch composition	Commercial	Landings Length compositions	Bottom otter trawl						only 2010 and 2011
			Bottom pair trawl						only 2010 and 2012
			Purse seine						
			Gillnets						
			Longlines						
		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							see benchmark 2012
	All	Maturity Ogives							
	All	Fecundity							
	All	Natural mortality							

Figure 10.30: Sea bass data availability up to 2012 for WGNEW 2013: Bay of Biscay (Divisions VIIIa, VIIIb)-Spain

Area: VIIIc, Ixa Spain 300tons in 2010									
				SPAIN (300 tons in 2010)					
			Gear	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	Bottom otter trawl						Landings aggregate before 2007
			Bottom pair trawl						
			Purse seine						
			Gillnets						
			Longlines						
			Artisanal fisheries						
	Commercial	Discards weight							
	Recreational	Retained catches							ongoing study
		Ruterned catches							
Effort	Commercial	Fishing effort	Bottom otter trawl						fishing days from 2007
			Bottom pair trawl						
			Purse seine						
			Gillnets						
	Recreational	Fishing effort	Longlines						
			Artisanal fisheries						
Catch composition	Commercial	Landings Length compositions	OTB						
			Pelagic trawl						
			Nets						
			Lines						
		Landings Age compositions & wts	OTB						
			Pelagic trawl						
			Nets						
			Lines						
		Discards Length compositions	OTB						No discards observed
			Pelagic trawl						
			Nets						
			Lines						
		Discards Age compositions & wts	OTB						No discards observed
			Pelagic trawl						
			Nets						
			Lines						
	Recreational	Length compositions							wait the end of 2013
		Age composition							
Abundance indices	Commercial	LPUE	OTB						
			Pelagic trawl						
			Nets						
			Lines						
	Surveys	pre-recruit							
	Surveys	post recruit							
Biological parameters	All	Growth							see benchmark 2012
	All	Maturity Ogives							
	All	Fecundity							
	All	Natural mortality							

Figure 10.31: Sea bass data availability up to 2012 for WGNEW 2013: Iberic waters (Divisions VIIIc, IXa)-Spain

Area: IXa Portugal (508tons in 2010)									
			Gear	85-89	90-94	95-99	00-04	2005+	comments
Catch weights	Commercial	Landings weight	Polyvalent fleet						
			D trawl						
			Pseiners						
	Commercial	Discards weight	Polyvalent fleet	board sampling is not covering the Sea Bass					
			D trawl						
			Pseiners						
	Recreational	Retained catches							ongoing study
		Ruterned catches							
Effort	Commercial	Fishing effort	D trawl						number of trips
			Pseiners						
			Nets						
	Recreational	Fishing effort							
Catch composition	Commercial	Landings Length compositions	D trawl						
			Pseiners						
			Nets						
		Landings Age compositions & wts	D trawl						
			Pseiners						
			Nets						
		Discards Length compositions	D trawl						
			Pseiners						
			Nets						
		Discards Age compositions & wts	D trawl						
			Pseiners						
			Nets						
	Recreational	Length compositions							
		Age composition							
Abundance indices	Commercial	LPUE	D trawl						
			Pseiners						
			Nets						
	Surveys	pre-recruit							
	Surveys	post recruit							
Biological parameters	All	Growth							see benchmark 2012
	All	Maturity Ogives							
	All	Fecundity							
	All	Natural mortality							

Figure 10.32: Sea bass data availability up to 2012 for WGNEW 2013: Bay of Biscay (Divisions IXa)-Portugal

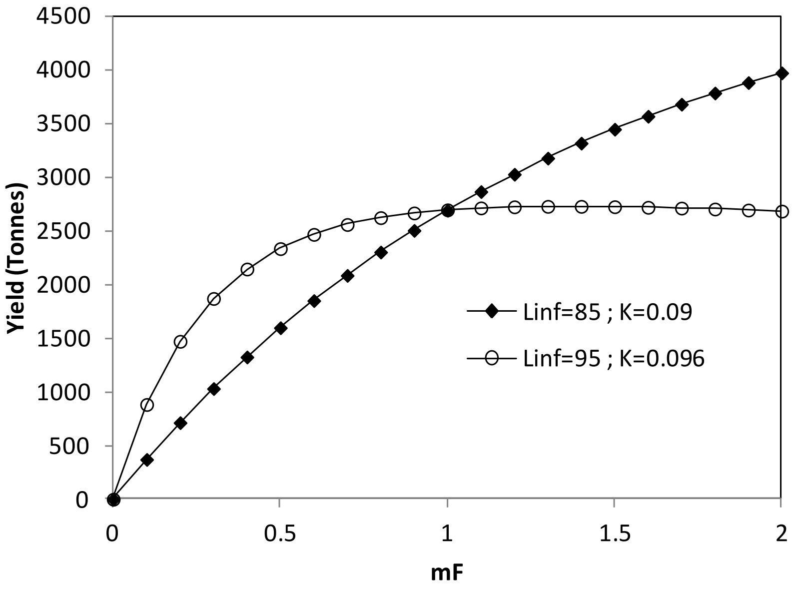

Figure 10.33: Equilibrium yields at various level of fishing mortality obtained under alternative hypothesis on Von Bertalanffy growth parameters.

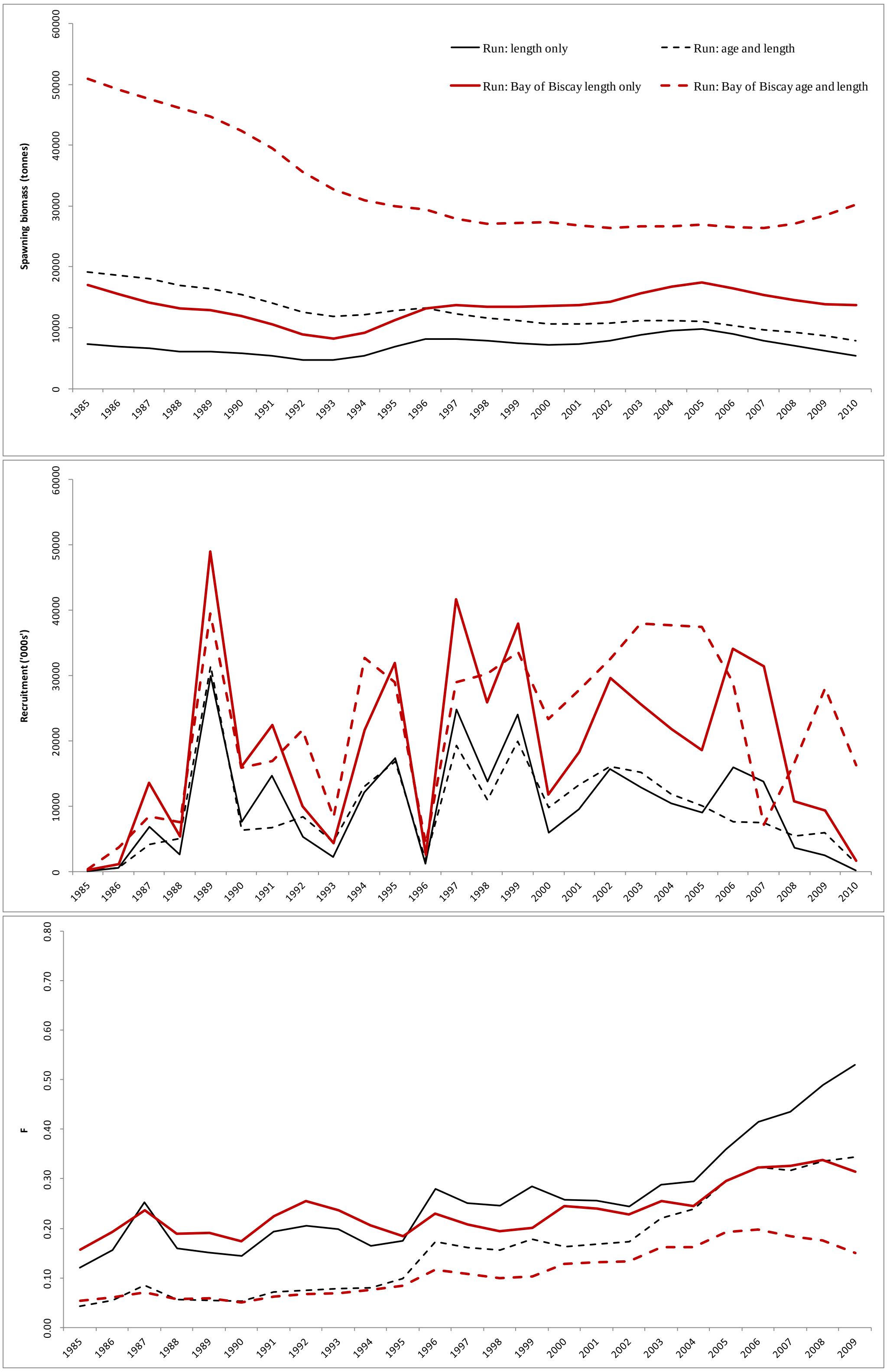

Figure 10.34: Comparison between the age-length and length based models with and without the Bay of Biscay for SSB, recruitment and $F_{5\text{-}11}$