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Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP)

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1 Executive Summary

In 2008, WGDEEP assessed the status of deepwater fish stocks in the ICES area and gave advice on their management. Exploratory assessments were carried out for a number of stocks (roundnose grenadier in the Celtic Sea, ling in the Faroes and red sea bream in sub-area IX) but, for most stocks, trends in abundance indicators were used as the basis for assessment.

Ling (Molva molva)

Commercial cpue for Norwegian longliners in sub-areas I and II has in recent years been lower than observed in the 1970s and 80s. There is some evidence of a recent increase but not to previous levels. In division Va, survey biomass index shows increasing abundance since 2000. The levels are currently at a similar high level as in the start of the series and there are indications that fishing mortality may have declined in recent years. In division Vb, abundance indices suggest that the stock is stable at a low level compared with the 1970s and 80s. Catch curve analysis indicates that total mortality on fish 7 years and older is at 0.5. The cpue series of the main fleet in Divisions IVa, VIa, and VIb suggest that the abundance has remained at a reduced level after the decline in the 1970s to 1990s

Blue ling (Molva dypterygia)

Based on cpue from Iceland trawlers the abundance of blue ling in Va and XIV has steadily declined from 1991 to 2000 and has remained at a low level since then. In Vb, VI, and VII CPUE information suggests that the abundance of blue ling remains at a low level. In other areas (Subdivisions I, II, IIIa, IVa, VIII, IX, and XII) Trends in landings suggest serious stock depletion, at least in Subareas IIa and IIb.

Tusk (Brosme brosme)

Based on the recommendations of WGDEEP in 2007, tusk is now assessed under five new stock units; Arctic (sub-areas I and II), Iceland (Va and XIV), the Mid-Atlantic Ridge (XIIa1), Rockall (VIb), and a combined unit for other areas (IIIa, IVa, Vb, VI, VII, VIII, IX, XII, and XIV).

In all these areas, the state of the stocks remains uncertain. In the Arctic, CPUE has in recent years been well below historical levels. In Iceland, survey indices show that abundance has been increasing in recent years, although it is still lower than in the mid-1980s. On the Mid-Atlantic ridge catches of tusk are very minor and there is insufficient information on which to assess the state of the stocks. At Rockall, CPUE indices show no apparent trend. In other areas, the cpue series of the main fleet in Divisions IVa, VIa, and VIb suggest that the abundance has remained at a reduced level

Greater silver smelt (*Argentina silus*)

There is insufficient information on which to determine the state of argentine abundance in either of the two areas considered by WGDEEP, subdivision Va and other areas (I, II, IIIa, IV, Vb, VI, VII, VIII, IX, X, XII, and XIV). Catches increased considerably in recent years, but were reduced in 2003 in some areas, partly due to introduction of TAC management in EU waters. In Sub-area VI the frequency of old fish (20+) in the catches declined significantly after a few years of target fisheries. Such changes suggest high exploitation rates.

Orange roughy (Hoplostethus atlanticus)

In Subarea VI orange roughy catches increased rapidly in the in the late 1980s and subsequently dropped to a low level. It is presumed that the aggregations were fished out. Orange roughy fisheries in Subarea VII have exhibited a similar pattern to that in VI. High catches have not been sustained by individual fleets and have dropped to low levels, suggesting sequential depletion. It is not clear if there are unfished aggregations remaining in Subarea VII. Overall, landings have declined to very low levels in each management area (VI, VII and other).

Roundnose grenadier (Coryphaenoides rupestris)

The drastic increase in in exploitation of roundnose grenadier in Division IIIa the years 2003-2005 gave rise for serious concern, even if no clear signs of the increasing fishing pressure were observed in recent years. No directed fishery has taken place since 2007, due to retirement of the fishers. A decrease in mean length of the in the catch from 1987 to 2004 &2005 indicates heavy exploitation on this stock.

The stock status in Vb, VI, VII and XIIb is uncertain but there are some evidences of biomass depletion. The apparent decline in CPUE in the reference area appears inconsistent with the presence of older fish in the current landings. However, this fishery in Vb, VI, VII and XIIb has expanded spatially with time and it is possible that sequential depletion of components of the stock may be occurring. Little is known about migration or mixing within the stock. The results of an exploratory age-structured assessment indicate that the total biomass has

The state of the stock on the Mid-Atlantic Ridge is uncertain. Soviet data suggest a high stock biomass (400,000-700,000 t) in 1970-1980s but a decreasing trend of the CPUE indicate that the abundance was reduced to a low level in recent years. Moreover, Russian trawl acoustic survey in 2003 showed relatively low biomass of the pelagic component of stock, an increasing depth of the aggregations, and a higher number of small immature fish.

Black scabbard fish (*Aphanopus carbo*)

In the absence of clear evidence on stock discrimination two units have been considered: northern (Subareas V, VI, VII, and XII) and southern (Subareas VIII and IX).

In the northern area, the state of stock remains uncertain but the available CPUE data indicate a decline in abundance since 1990 (Fig. 9.4.16.1). Longline cpue in Division IXa has been relatively stable during the past decade (Fig. 9.4.16.2).

Greater forkbeard (*Phycis blennoides*)

There is no information available that allows for evaluation of the stock trends. The state of the stock is unknown.

Alfonsino (*Beryx spp.*)

The stock structure of the alfonsinos is unknown and possible fish movements between areas, (seamounts, coastal areas of the islands and slope continental areas) are also not known. However these species are known to aggregate around the seamounts areas. Areas, north and south of the Azores EEZ are highly exploited with a regime of operation that suggests a sequential depletion of the explored seamounts. Standardized cpue from the Azores longline commercial fishery indicates an overall slowly decreasing trend for *Beryx decadactylus*.

Red (blackspot) seabream (*Pagellus bogaraveo*)

Available information, particularly genetics and tagging, seems to support the current assumption of three assessment units (VI – VIII, IX and X).

Based on historical catches, the stock in VI, VII, and VIII appears to be severely depleted. The stock in sub-area IX is depleted and there is no evidence of a significant recovery of the stock resulting from the local recovery plan. The status in Subarea X is uncertain but there are signs of increases in indices of abundance from surveys and stable CPUE from the fishery. It is possible that sequential depletion of local populations may be occurring and this may be contributing to the stability of observed commercial CPUE series.

2 Introduction

2.1 Participants

Ole Thomas Albert	Norway
Tom Blasdale (Chair)	UK
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Einar Hjorleifsson	Iceland
Eydna ì Homrum	Faroes
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Pascal Lorance	France
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2.2 Background

The first ICES Study Group on the Biology and Assessment of Deep-Sea Fisheries Resources was held in 1994 (ICES C.M. 1995/Assess:4). It provided the background information on what was known about deep-water fisheries within the ICES area and compiled landings data from both official statistics, where available, and from individual members of the Study Group. The report also summarised the current status of knowledge on the biology of these deep-water species. At this time ling, blue ling and tusk were the responsibility of the Northern Shelf Working Group.

The Study Group met by correspondence in 1995 (ICES C.M.1995/Assess:21) but had little to report. The next meeting of the Study Group was in February 1996 (ICES C.M.1996/Assess:8). Its terms of reference were to: (a) compile and analyse available data on a number of deep-water species (namely argentines, orange roughy, roundnose grenadier, black scabbard fish, golden eye perch (*Beryx splendens*) and red (blackspot) seabream (*Pagellus bogaraveo*)) in the ICES area and, if possible, provide assessments of the state of the stocks and the level of exploitation, and (b) provide information on the stocks and state of exploitation of the stocks of blue ling, ling, and tusk in Sub-areas IIa, IVa, V, VI, VII and XIV and identify outstanding data requirements. The Study Group met by correspondence in 1997 (ICES C.M.1997/Assess:17) and, in addition to updating descriptions of fisheries, the available information on length/age at maturity, growth and fecundity of deep-water species, including blue ling, ling and tusk, was presented in tabular form. The available information on discards was also compiled.

The terms of reference for the 1998 meeting of the Study Group included the additional request to consider the possibility of carrying out assessments of fisheries for deep-sea resources and developing advice consistent with the precautionary approach. The layout of the report (ICES CM 1998/ACFM:12) was modified to conform to the format of an assessment working group report and the existing data were reformatted to allow for year on year updating. The possibilities for carrying out age-structured assessments were very limited, but several provisional assessments were carried out using DeLury constant recruitment and Schaefer production models. The catch and effort assessment methods used by the Group suggested that time series of effort and CPUE may be particularly valuable for the assessment of deep-water species. The Study Group therefore recommended that member states maintain and refine long-term data series and where possible collate historical data. The Study Group recommended that the members be encouraged to provide discard and fish community data.

The Study Group worked by correspondence in 1999 and updated landings statistics and data on biological characteristics. The next (and final) meeting as a Study Group was held in 2000 (ICES CM 2000/ACFM:8), and in addition to carrying out the tasks requested in the previous years, more attempts were made to carry out assessments using catch and effort methods. This was successful for some of the species in some areas, and the results were used for evaluations consistent with the precautionary response. The report was structured so that species-specific sections were provided for those species for which sufficient information was available to provide evaluations of stock status was possible, at least in some areas. As in previous years, it was recognised that the input data remain generally unsatisfactory and that the assessment results should be interpreted with caution. However, it was also concluded that available information showed that many stocks were very probably being exploited at too high levels and some were depleted. An evaluation of the state of the deep-sea stocks was provided by ACFM later that year (ICES 2000, ICES Coop. Res. Rep. 242 (2)).

In 2001 the Study Group was re-established as the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP), and again worked by correspondence to update landings, fisheries descriptions, discard and biological data, but assessments were not updated. The Working Group was requested to provide a document on the applicability of fishery-independent surveys for assessment purposes. This document was an integral part of the report (ICES CM 2001/ACFM:23). The report should also address issues raised in special requests to ICES from NEAFC, the Government of Norway, and the EU. These requests were considered by ACFM in the May and October sessions (ICES 2001, ICES Coop. Res.rep. 246(3), p. 625-641).

The Terms of Reference for the 2002 meeting of WGDEEP included the evaluation of stock status, and it was therefore a central aim to carry out or update assessments for as many stocks as possible. Data constraints limited the assessment efforts at the meeting held in Horta in the Azores, but the general status descriptions were updated based on whatever data were provided (ICES CM 2002/ACFM:16).

In 2003 the Group worked by correspondence and updated landings and other data sets, and furthermore considered special requests from NEAFC regarding baseline levels of effort underlying advice in 2002, new reporting areas, and geographical distribution of aggregation areas for selected species . Prior to the 2004 meeting a stronger effort was made to stimulate intersessional efforts on data collection and compilation, and the running of preliminary assessments.

In 2004, WGDEEP updated fisheries descriptions, biological parameters and time series of abundance indices. Assessments were attempted for some stocks and preliminary results were shown (ICES CM 2004/ACFM:15, Ref :G).

In 2005, WGDEEP was initially due to meet by correspondence with the main aim of updating landings statistics and the scientific basis underlying the population dynamics of deep-water species. However, due to requests from the NEAFC and the EC, a plenary meeting was organized in the end of the year. No assessment were carried out (ICES CM 2005/ACFM:07, Ref :D,G).

In 2006, WGDEEP has provided assessments and management recommendations for deep-sea stocks and fisheries, and it has also addressed specific issues related to area closures, mixed fisheries and the identification of survey needs (ICES CM 2006/ACFM:28). The methods applied were very much dependent on data availability. These included XSA (red seabream in X), separable VPA (red seabream in IX, roundnose grenadier in Vb, VI & VII), CSA (blue ling in Vb, VI & VII), and also plain examination of trends in survey abundance indices, CPUE, length and depth distributions. The format of the report was modified, so assessments and recommendations were as much as possible structured by ecoregion and stock, and not by species. RGDEEP, the group which reviewed the WGDEEP report, generally supported this approach, but it also noted the lack of scientific evidence underlying the identification of deep-sea stocks.

In 2007, in addition to updating fisheries information, WGDEEP had a TOR to hold a three day workshop on stock discrimination. The group evaluated techniques that could be use for stock discrimination in deepwater species and examined the available information to identify stock units in the ICES area. Information for most species was not sufficient to discriminate stocks and the WG recommended that there was no reason to change from the current practice in ICES. However, for tusk there was genetic evidence available that allowed five separate stock units to be identified. WGDEEP recommended that these be adopted for future assessments.

The group also addressed a request from NEAFC to consider coordination of deepwater surveys. Surveys be coordinated in three group; arctic fisheries, the North East Atlantic Continental Slope and the Mid-Atlantic Ridge and offshore seamounts.

2.3 Terms of reference and special requests

The terms of reference of the Working Group adopted at the 2006 Annual Science Conference (94^{th} Statutory Meeting) were as follows (C. Res. 2007/2ACOM14):

a) compile an inventory of data sources available on landings and effort of deepwater species, including blue ling, ling, and tusk, by ICES Sub-area, Division or preferable by subdivisions; evaluate the quality of these data;

b) compile the data available from these data sources on the finest scale possible;

c) update descriptions of deep-water fisheries including mapping out deep water fisheries in preparation for collation of fisheries-based catch and effort statistics using among other data sources VMS information. Provide information on as high spatial and temporal resolution as possible on all current deep-water fisheries in the NE Atlantic.

d) carry out analytical assessments of ling, red (blackspot) seabream, roundnose grenadier, and assessments of other species if possible;

e) update the data on length/age at maturity, growth and fecundity and document other relevant biological information on deep-water species;

f) update information on quantities of discards by gear type for the stocks and fisheries considered by this group and make an inventory of deep-water fish community data;

In addition to these terms of reference, three NEAFC requests were directed to WGDEEP:

i. NEAFC requests ICES to evaluate the use and quality of VMS data and records of catch and effort to be received from NEAFC in order to provide information on the spatial and temporal extent of current deep-water fisheries in the NE Atlantic. If data quality allows such analyses, these should be provided with particular emphasis on activity in the NEAFC Regulatory Area.

ii. NEAFC reiterates its request that ICES develop suitable criteria for differentiating fisheries into possible management types (e.g. directed deep-water fisheries, by-catch fisheries etc.) and to apply these criteria to categorise individual fisheries in order to enable NEAFC to develop fishery-based management initiatives. Shortcomings in data quality that impede this exercise should appear in the evaluation under pt 1.

iii. ICES is also asked to compile data on documented historical or present spawning/aggregation areas of blue ling in the NEAFC Convention area.

3 Overview

3.1 Data availability

3.1.1 Landings

Most landings data for 2007 were provided by working group members because official statistics available to ICES were incomplete. In particular, official landing statistics were unavailable in 2007 for some major species investigated by the WG, such as roundnose grenadier, orange roughy, black scabbardfish, and also non-target species for which landings may be relatively small and scattered. The reporting for such species depends to a large extent on the efforts of individual members of the group, and changes of membership appears to affect this reporting. This may result in inconsistency, and lack of reporting makes compilation of data very difficult.

Because of the early date of the meeting in 2008 relative to previous years, landings data from some countries were unavailable at the time of the meeting.

3.1.2 Discards

Several EU countries have initiated observer programs as in accordance with their obligations under EC regulations 2347/2002 (regulating deep water fisheries) and 1639/2000 (minimum and extended sampling programs). Only France and Portugal supplied discard data to the working group in 2008 (see section 3.4 for details). Discarding is known to be high in some deepwater fisheries and it is imperative that such data is collected and made available to the working group..

3.1.3 Fishing effort

Log-book data

- Fishing effort time series were reported for :
- Icelandic trawlers and longliners harvesting blue ling, ling, tusk and greater argentine in Division Va;
- Faroese longliners and pair-trawlers harvesting ling in Division Vb;
- Norwegian longliners from a reference fleet harvesting ling and tusk, mainly in Sub-areas I and II;
- Portuguese (mainland) longliners harvesting black scabbardfish in Sub-areas VIII and IX
- Azorean longliners harvesting red (blackspot) seabream and alfonsinos in Division Xa

VMS data

WGDEEP had in the past stressed the need of getting access to VMS data, in relation to some terms of references (e.g. stock assessment) and specific NEAFC requests (e.g. evaluation of the impact of area closures). In 2008, NEAFC provided ICES with a full extraction of its VMS database over the period 2001-2006. This comprised the geo-localisation of fishing vessels' positions in the international waters within the NEAFC regulatory area. In 2007, the NEAFC sent to ICES an update of this database, also including catch data which potentially could be linked with VMS records. However, these data were submitted close before the start of WGDEEP07, and there was no sufficient time for the group to make use of them in relation to the 2007 NEAFC requests (see Sections 14-17).

During the 2008 meeting, WGDEEP commenced exploratory analysis of these data. some shortcomings in data quality were encountered but in general, the data will make a valuable contribution to ICES understanding of fisheries in this area. The data proved useful in corroborating information received from other sources on the location of blue ling spawning aggregations and has potential for use in the differentiation of fisheries for management purposes. A fuller analysis of the quality and use of the data is presented in section 16.

In national waters, access to VMS data continues to be problematic.

3.1.4 Research surveys

In 2007, WGDEEP reviewed the deep-water surveys currently conducted in the iCES area and made recommendations for coordination of surveys. The ICES Planning Group for the North East Atlantic Continental Slope Survey (PGNEACS) met for the first time in 2008 and made considerable progress in coordinating the Scottish and Irish surveys. Recommendations were made for the coordination of Portuguese French and Norwegian surveys under this group.

The text below summarises the national surveys, which were made available to WGDEEP08.

Faroe Islands

The Faroese groundfish surveys for cod, haddock and saithe is a fixed station trawl survey conducted annually on the Faroe Plateau. The spring surveys (conducted in February-Mars) began in 1994 and cover 100 stations while the autumn survey (conducted in August) began in 1996 covering 200 stations. The surveys also yield useful information on many other species. It needs to be kept in mind that the spring surveys are restricted to depths shallower than 500 m, so it only covers a part of the distribution area of deep-water species. The autumn survey was expanded in 2000 to cover depths to 1200m.

Greenland

Greenland has conducted stratified random bottom trawl surveys in ICES XIVb since 1998 (except 2001) covering depths between 400 and 1500 m. The survey is aimed at Greenland halibut but estimates of biomass and abundance and length frequencies on roundnose and roughhead grenadier are also available. Information on sex, length and weight on the very few tusk, ling, smoothheads, argentines and different species of elasmobranchs have also been recorded. The utility of this survey for assessment purposes can not yet be evaluated.

Iceland

The Icelandic groundfish survey, which has been conducted annually since 1985, yields information on the variation in time of the fishable biomass of many exploited stocks in Division Va, and also useful information on many other species. More than 500 stations are fished annually, but the survey depth is restricted to the shelf and slope shallower than 500 m. Therefore the survey area only covers part of the distribution area of ling and blue ling as their distribution extends into greater depths. Another annual deep-water groundfish survey has been carried out all around Iceland since 1996. Although the main target species in this survey are Greenland halibut (Reinhardtius hippoglossoides) and deepwater redfish (Sebastes mentella), data for all species are collected. These data include length distributions and number of all species caught as well as weight, sex and maturity stages of selected ones.

Ireland

The Marine Institute ran 10 deepwater surveys along the northeastern shelf edge between 1992 and 1999, five each by trawl and longline. This survey programme was an important source of information on the distribution and abundance of deepwater fishes during the early development of the commercial fishery, and provided samples of deepwater fish for biological analysis. The surveys have also produced catch per unit effort (CPUE) and discarding information.

In 2006 the Marine Institute recommenced its deepwater survey programme with a slope survey covering the continental slope in area VIa and the northern Porcupine Bank in area VIIc. Overall, 27 hauls were carried out at four depths, 500m, 750m, 1000m and 1500 meters. The survey attempted to standardise gear, sampling strategy and protocols with the scottish survey as much as possible. As part of this standardisation and intercomparison, RV Celtic Explorer carried out eight comparative tows with the Scottish research vessel, RV Scotia. The objective of the survey was to collect abundance data and biological information on the main deepwater fish species, including weight, length and maturity, and also to collect benthic invertebrates and bottom sediment samples. CTD transects, grab sampling, and cetacean studies were also carried out. It is envisaged that this survey will provide a time series for CPUE for the main deepwater species in the survey area in the future.

Portugal (Azores)

Since 1995, a longline survey has been conducted annually by the Department of Oceanography and Fisheries at the University of the Azores (DOP), during springtime, covering the main areas of distribution of demersal species (the coast of the islands, and the main fishing banks and seamounts), with the primary objective of estimating fish abundance for stock assessment (Pinho, 2003).

The survey has supplied information needed to estimate the relative abundance of commercially important deep-water species, from ICES area X, based on the common assumption that catch rate (CPUE) is proportional to species abundance, CPUE=q.N, where q is catchability, which is assumed constant, and N is the abundance.

Bottom longline was adopted as a sampling survey technology in the Azores because the sea-bottom is very rough, which does not permit use of other gears (e.g. trawl), and also due to a combination of behavioral and physiological factors of the demersal species (e.g. deep-water species are difficult to detect acoustically, particularly those living near the sea bed, and mark recapture studies are ineffective for some of the species because they die when brought to surface).

Spain

From 2001 a new bottom trawl survey started in the Porcupine bank to estimate abundance indices of commercial species and the distribution patterns of the demersal and benthic species in the area. Porcupine 2005 survey was organized by the IEO and counted with the collaboration on board the cruise of scientists from the Marine Institute of Ireland and from AZTI. The area covered in Porcupine 2005 survey is the Porcupine bank extending from longitude 12° W to 15° W and from latitude 51° N to 54° N, covering depths between 150 and 800 m. The cruise was carried out between September and October on board R/V "Vizconde de Eza. Trawling time was set to 30 minutes between the end of wire shutting and starting to pull it back and towing speed was set to 3.5 kn.

UK (Scotland)

A deepwater trawl survey of the continental slope to the west of Scotland has been carried out biennially in September by FRS, The Marine Laboratory since 1998. In 2005, it was combined with the Rockall Haddock survey, upgrading both to annual status. A TV sled survey for deepwater Nephrops burrows is carried out at night at selected sites on Rockall and the slope, and TV drop frame deployments are also carried out as part of collaboration with JNCC (Joint Nature Conservation Committee) to map habitat in these areas. The survey contains stations extending from the Wyville-Thomson Ridge in the north to south of the Hebridean Terrace, although coverage has varied from year to year. Fishing is stratified by depth and currently ranges from 400-1900m.

3.1.5 Abundance indices

Due to the sparsity of survey data currently available, the WGDEEP has relied heavily on CPUE to reflect changes in stock abundance. Although new deep-water surveys are expected to provide abundance indicators in the long term, the WG will still have to rely on commercial CPUE trends in the coming years.

WG members have adopted different strategies to standardise fishing effort and CPUE. Sumarised below

CPUE from logline fisheries in the Azores

GLM was used as the standardization method to adjust the CPUE trends of several species from the Azores bottom longline fishery, namely of blackspot seabream, alfonsino, golden eye perch, bluemouth rockfish and greater forkbeard. Factors for year, month, boat class and target species effects were used to adjust the nominal catch per unit of effort. Once the effects of the month, boat class and target species are removed, the remaining year effect was assumed to be proportional to abundance. Trips with zero catches were not included in the calculations. The analysis were conducted for CPUE in biomass (kg of fish per 1000 hooks) and for CPUE in number (number of fish per 1000 hooks).

GLMs are convenient as they make use of accepted methods to select variables in models, and also since the coefficients derived from these analyses can be directly used to standardise fishing effort and catch rates. However, GLMs are subject to a number of limitations. First, fisheries data are generally unbalanced (e.g. not all vessels are present over all time series). Second, the underlying functional form is linear, by construction. However, the linkage between CPUE and stock abundance could be of a more complex nature, e.g. including non-linear effects. Hinton and Maunder (2004) reviewed non-linear modelling alternatives which have been or could be used in relation to CPUE analyses. These include non-linear models such as General Additive Models (Bigelow et al., 1999), neural networks (Warner and Misra, 1996), regression trees (Watters and Deriso, 2000), and also habitat-based models (Bigelow et al., 2002; Maunder et al., 2002).

CPUE from the French trawl fishery to the West of the British Isles.

Several problems have been seen previously in the French time series of CPUEs.

In the 1990s, i.e. the first decade of the mixed fishery targeting roundnose grenadier, black scabbardfish and sikis sharks, CPUEs were shown to vary of over 3 different French sub-fleets. Only the CPUE for a sub-fleet of large high-sea trawlers prosecuting a pure deep-water activity was considered as a reliable indicator of stocks abundance (Lorance and Dupouy, 2001). Due to disruption of the time series of French catch statistics database, such CPUE could not be updated in the 2000s.

In 2006, a working document showed that several factors affected the French CPUEs. In particular the fishery have been exploiting new fishing grounds in the 2000s and the CPUEs in these new grounds were higher that in grounds fished since the early 1990s, driving an increase in global CPUEs. The CPUE per small areas showed different trends (Figure 3.1.2) (Biseau, 2006WD). In addition, due to changes in the national fishery statistics system, the effort data before and after 1999 was not fully consistent.

Use of total CPUE for all the French fleet is problematic because the composition of the fleet has varied over time with changing proportions of large high-sea trawlers (more than 45 m overall length and 1400 kw power) and medium size high-sea trawlers (28-40 m overall length, less than 1000 kw).

Nevertheless, for each of roundnose grenadier, black scabbardfish and orange roughy, 4 time series of CPUE have been computed:

1) total annual catch divided by total effort;
2) total annual catch in a reference area divided by total effort in the same area;
3) the same as (2) by a reference fleet;
4) the same as (2) for the reference fleet considering only directed effort (i.e. effort from sub-trip where the species makes at least 10% of the total catch).

The reference area was defined based upon the working paper from Biseau (2006) as represented on figure):

CPUE from Norwegian longline fisheries

This procedure was adopted to derive catch rates for a reference Norwegian fleet harvesting blue ling, ling and tusk. This reference fleet, which comprises 4 vessels, has been used to provide abundance indices, in the form of catch rates, since 2001. Data from the reference fleet were combined with log-book data for the entire high-seas long-liners fleet, which were available over the period 2000-2006 (see WGDEEP06 WD3 for full details). A similar approach has been undertaken to identify a reference Faroese fleet in relation to the ling and tusk assessments.

3.1.6 Stock structure

This report presents the status and advice of deep-sea species by individual stock component. The identification of stock structure has been based upon the best available knowledge to date (see the species specific chapters for more details). However, it has to be stressed that overall, the scientific basis underlying the identity of deep-sea stocks is currently weak. In most of the cases, the identification of stock is based on either theoretical considerations on the mixing of populations in relation to the hydrological and geological characteristics of fishing grounds, or comparison of trends in catch rates, or consistency with management units. Therefore, the WG considers that the stock definitions proposed in this report are only preliminary. There are currently genetic studies on-going to improve the knowledge of the stock structure of a number of species. The WG recommends that increased research effort be devoted to clarify the stock identity of the different deep-sea species investigated by ICES.

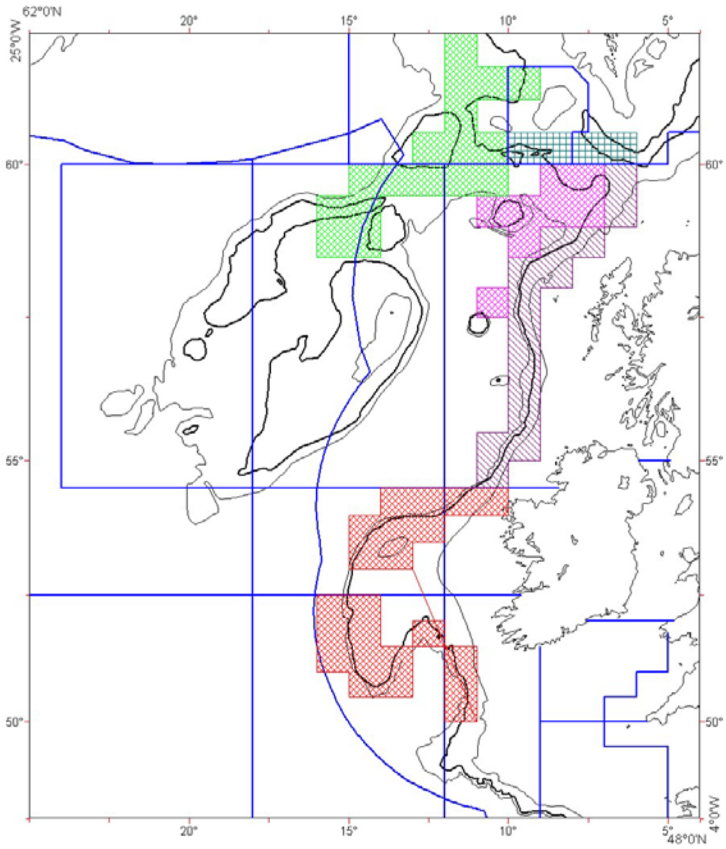


Figure3.1.1. Areas used to compute CPUE of French vessels (green: New grounds in Vb and VI; dark green: reference area in Vb; pink: others in VI; purple: continentalslope in VI; red reference in VII).

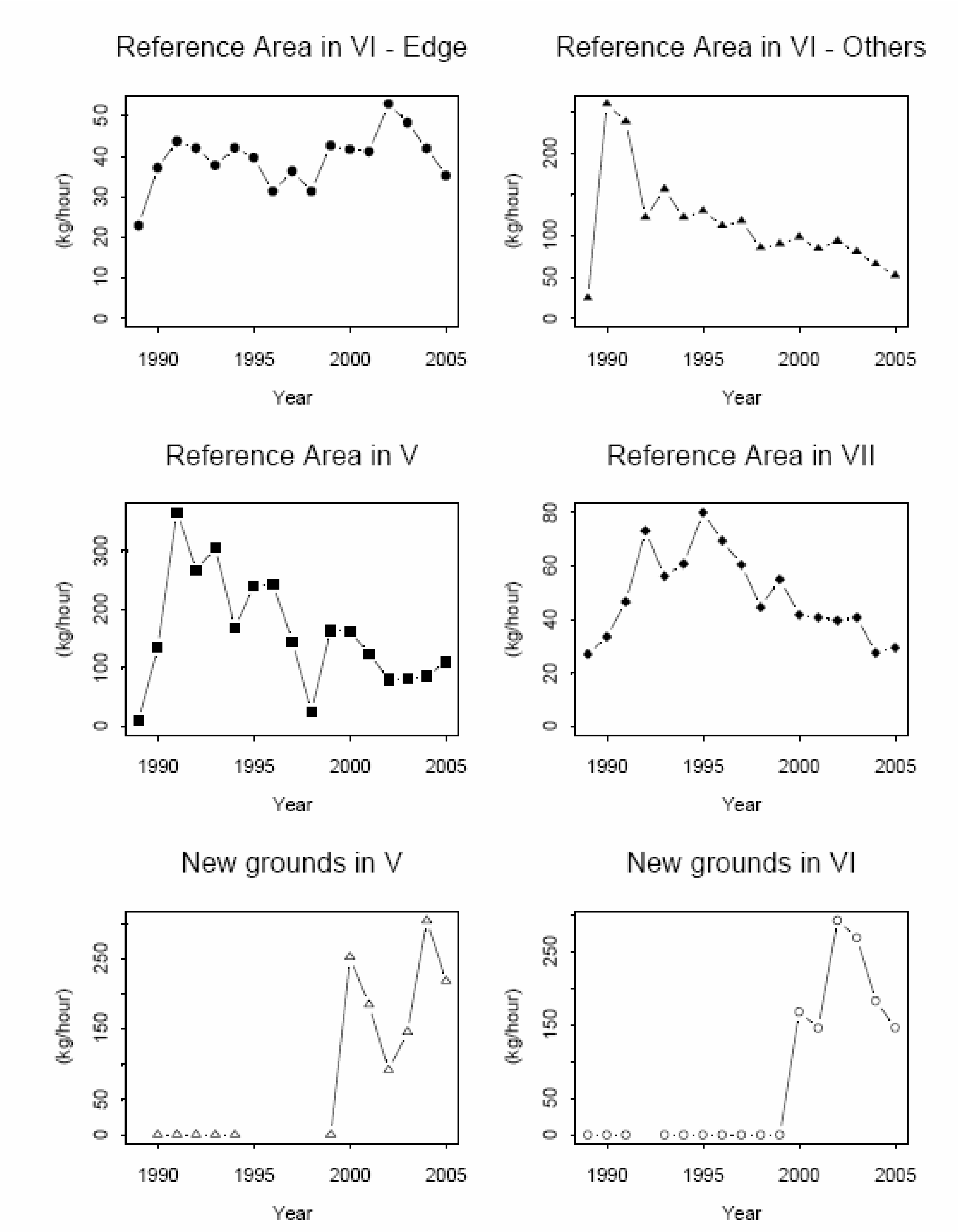


Figure 3.1.2. CPUEs of roundnose grenadier in different parts of division Vb and sub-areas VI and VII. Reference areas were exploited since the begining of the fishery in the late 1980s, new grounds have not been intensively exploited by French trawlers before the 2000s (see figure 3.x.2 for a map).

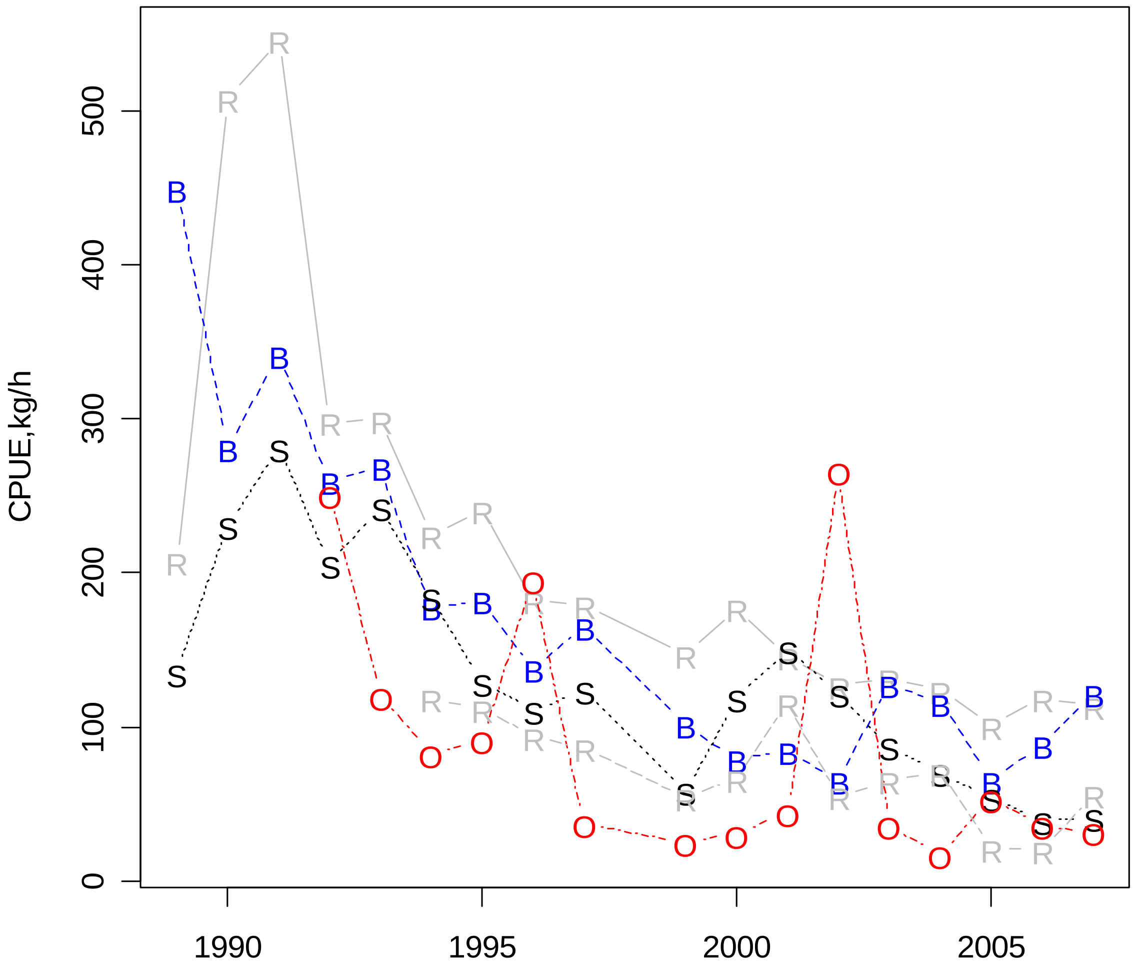


Figure 3.1.3; Directed CPUE from the reference fleet (a fleet of large high-sea trawlers doing a pure deepwater fishing). R: roundnose grenadier, B: blue ling; S: black scabbardfish; O: orange roughy

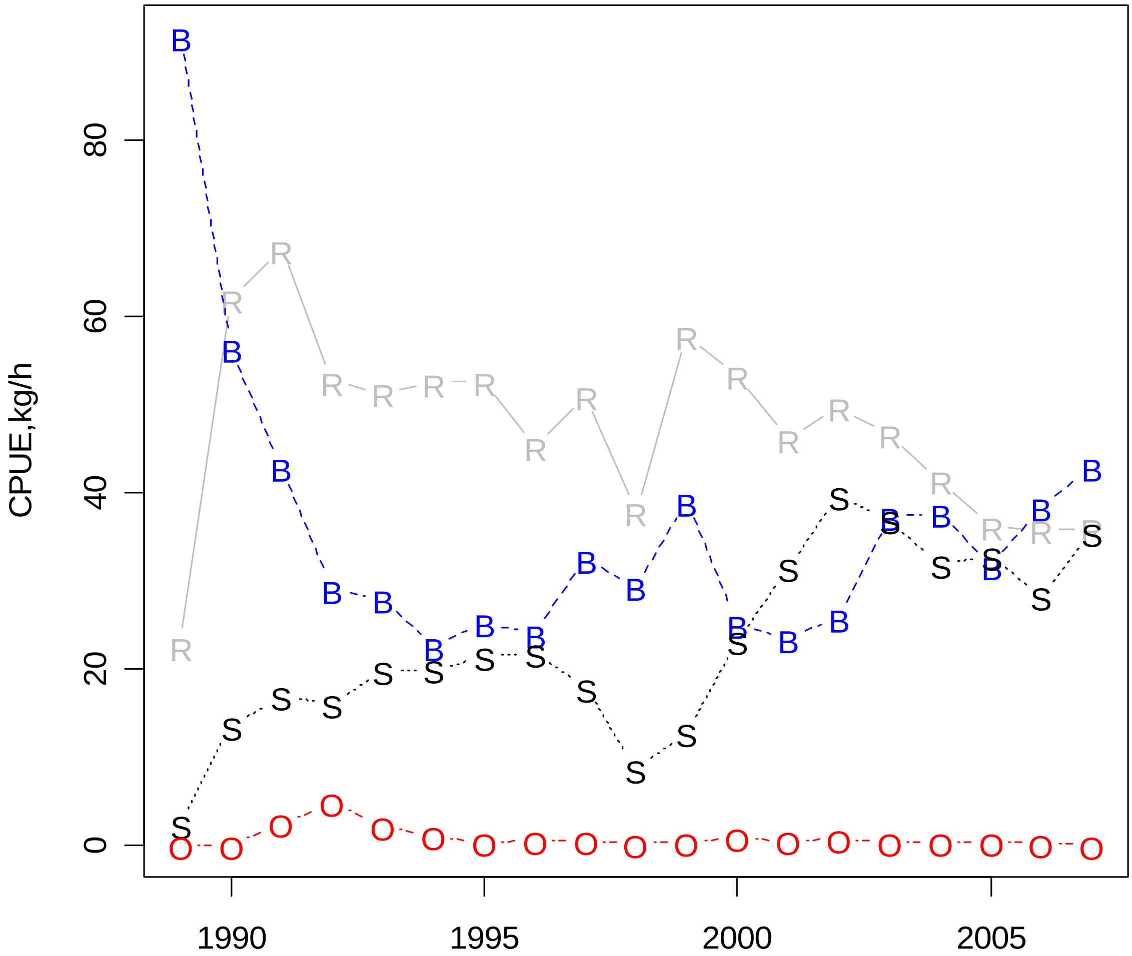


Figure 3.1.4. Total CPUE for all French vessels in the reference area. R: roundnose grenadier, B: blue ling; S: black scabbardfish; O: orange roughy

3.2 Methods and software

This section summarises the methods and software used by the Working Group in recent years.

3.2.1 Methods

3.2.1.1 Catch curve analysis

The Group were aware of the assumption of constant recruitment implied when constructing catch curves within years. Lack of historical data frequently required this course of action rather than the preferred option of analysing individual year classes by cohort.

3.2.1.2 Depletion models

A catch and effort data analysis package (CEDA) was used to apply modified Delury constant recruitment models when sufficient data were available. The Working Group recognised that depletion models in general assume that data are from a single stock (i.e., there is no immigration or emigration) and that this approach should not be applied to components of stocks or fisheries. Notwithstanding these assumptions, and the lack of knowledge regarding the stock structure of deep-water species, the Group still felt these methods were worth trying as an investigative tool. The general procedure adopted was to use sensitivity analysis to evaluate the effect on results (residual plots, goodness of fit, parameter estimates- principally carrying capacity, catchability and current population size) of a range of assumptions for stock size in the first year as a proportion of carrying capacity and error models. Indexed recruitment depletion models could not be attempted because of a lack of recruit data.

3.2.1.3 Production models

ASPIC and CEDA was also used to fit dynamic (ie non-equilibrium) production models. Again sensitivity analysis of outputs was used to evaluate the effect of error models and ratio of initial to virgin biomass and time lag. For some of the stocks assessed, available time-series data of CPUE comprise a gradual decline across the time period studied. The Working Group was aware that the results from production models in these circumstances (the so called 'one way trip') can be unreliable.

Attempts have been made to apply a Bayesian approach to a Schaefer model using WINBUGS free software. There are uncertainties about the key population parameters for deep-water fish species and a Bayesian approach is a natural way to portray those uncertainties and to express the risks that are associated with alternative management measures. It is becoming commonly accepted that Bayesian methods can produce less biased estimates when compared with frequentist approaches based on maximum likelihood estimators (Nielsen and Lewi, 2002).

3.2.1.4 VPA analysis

The Lowesoft VPA package has been used to carry out Shepherd /Laurec analyses to detect trends in catchability, and separable VPA and extended survivors analysis (XSA) to produce estimates of stock, where possible.

3.2.1.5 Stock reduction models

Stock reduction analysis is a developed form of a delay-difference model (Quinn and Deriso, 1999). The method uses biologically meaningful parameters and information for time delays due to growth and recruitment to predict the basic biomass dynamics of the populations without requiring information on age structure. Thus it can be considered to be a conceptual hybrid between dynamic surplus production and full age based models (Hilborn and Walters, 1992). A full description of the general approach can be found in Kimura and Tagart (1982), Kimura et al (1984), Kimura (1985,1988).

The stock reduction model used is part of program suite (PMOD) developed by Francis (1992, 1993) and Francis et al (1995). Simple deterministic and enhanced stochastic models are included, but given the paucity of the available data it was decided to use the former. The method requires time-series data of annual catches, one or more abundance index and a range of biological parameters. A Beverton and Holt stock and recruitment relationship with a steepness of 0.75 was used throughout (Francis, 1993).

The method provides an estimate of virgin biomass (B0) and current biomass from which a depletion ratio can be calculated. The stock reduction model developed by Francis also provides an estimate of the annual mean catch that can be taken, consistent with a 10% probability of spawning stock biomass falling below 20% of virgin SSB. In New Zealand and Australian fisheries this catch is termed the maximum constant yield (MCY). Given that age of recruitment and age of maturity are reasonably similar for some species e.g.blue ling, 20% of virgin SSB can be considered to be broadly equivalent to 20% of virgin exploitable biomass. It should be possible, therefore, to estimate a sustainable constant catch broadly consistent with a high probability of maintaining exploitable biomass above the limit reference level for deep-water stocks in the ICES area.

3.2.1.6 Catch Survey Analysis (CSA)

CSA (Mesnil 2003) is an assessment method that aims to estimate absolute stock abundance given a time series of catches and relative abundance indices, typically from research surveys. This is done by filtering measurement error in the latter through a simple two-stage population dynamics model known as the Collie-Sissenwine (1983) model. The population dynamics are described by the following model:

$$N_{y+1} = (N_y + R_y)e^{-M} - C_y e^{-M(1-\tau)} \qquad [1]$$

where:

y : time step, typically annual. Years may be defined either on a calendar basis or as the interval between regular surveys. The year range is [1, Y].

Ny : population size, in number, of fully recruited animals at start of year y;

Ry : population size, in number, of recruits at start of year y;

Cy : catch in number during year y (known);

M : instantaneous rate of natural mortality (equal for both stages, assumed);

Error! Objects cannot be created from editing field codes. : fraction of the year when the catch is taken, e.g. 0 if the fishing season is early in the year, or 0.5 if the catch is taken midway through the year or, by resemblance with Pope's (1972) cohort approximation, evenly over the year.

Estimating the time series of Ny and Ry given the catches is the basic task of any assessment but, as with other methods, this requires additional information in the form of relative indices ny and ry of abundance for each stage, typically from surveys, which are assumed to be proportional to absolute population sizes Ny and Ry. The indices are deemed to be measured with some (log-normal) observation error:

$$n_y = q_n N_y \exp(\eta_y); y = 1, Y \quad [2]$$

$$r_y = q_r R_y \exp(\delta_y); y = 1, Y - 1 \quad [3]$$

where:

qn and qr : catchability coefficients of fully-recruited and recruits, respectively, in the survey, supposed to be constant with time;

η and δ : normally distributed random variables.

A constraint must be imposed whereby the survey catchability of the recruits is some fraction s of that of the fully-recruited:

$$s = q_r / q_n \quad [4]$$

3.2.1.7 *Ad hoc* methods

Where ad hoc methods have been used these are described in the relevant species assessment sections.

3.2.2 Software

Assessment software used at recent Working Groups includes CEDA (Catch Effort data analysis, produced by MRAG Ltd, 27 Campden Street, London W8 7EP, UK.) ASPIC, PMOD (stock reduction program), the Lowestoft VPA package,Winbugs (version 1.4 http://www.mrc-bsu.cam.ac.uk/bugs/winbugs) and CSA.

3.3 Biological Reference Points and Harvest Control Rules

3.3.1 Biological Reference Points

In 2005, WGDEEP reviewed the biological reference points (BRPs) used in the WG since 1998. These were proposed for data poor situation by ICES SGPA and NAFO in 1997 and are as follows:

$U_{lim} = 0.2 * U_{max}$ (may be a smoothed abundance index)

$U_{pa} = 0.5 * U_{max}$

Where U is the index of exploitable biomass.

$\mathbf{F}_{lim} = F_{35\ \%SPR}$

$\mathbf{F}_{pa} = M$

WGDEEP has applied these BRPs to all stocks, but the F reference points have not been used because reliable estimates of F have not been available. In 2005, the WG proposed that that the F reference points should remain unchanged but the biomass reference points should be adjusted to take into account differences in life history characteristics between species (e.g growth rate, age of maturity etc.). Table 3.3.1 provides some background to group species according to these biological characteristics. The WG grouped the different species into 2 categories, one including slow-growing late-maturing species (category 1: orange roughy, roundnose grenadier, deep-water squalids), and another one including relatively quick-growing early-maturing species (category 2: all other species).

It was suggested that the current 50% and 20% thresholds might be reasonable to define the PA BRPs of category 2 species. As for category 1 species, the WG was of the opinion that thresholds should reflect the specific vulnerability of these species to exploitation and their capacity to recover. To quantify these thresholds, two different options were suggested in 2005:

1. The thresholds should be higher than those suggested for category 2 species (respectively 50% and 20% of the virgin biomass for U_{pa} and U_{lim}), and their values should be decided by managers;
2. The thresholds should be set provisionally at 75% and 50% of the virgin biomass for U_{pa} and U_{lim} respectively, to accommodate the PA approach in a data poor context;

The WG could not agree on which option to choose and to date no guidance from managers or ICES (from ISGMAS, for example) was available.

At the 2006 WG, the WG again could not agree a way forward and decided to request advice from ACFM on this issue. The WG recognized that it is desirable that BRPs based on SSB and F levels, instead of CPUE levels, should be introduced as more reliable stock assessments become available.

In recent years ACFM have not specified biological reference points for deep-water species because of concerns that U_{max} (usually the initial value of an abundance index) may not represent virgin biomass when fishing has taken place previously.

The WG consider that this is a valid comment for some species, however for others, where abundance indices commence at the start of the fishery, orange roughy for example, the reference points used previously by WGDEEP remain useable.

Biological indicators such as trends in mean length, ratio of mature/immature continue to provide a valuable insight of the state of stocks.

In the longer term, the WG considers, in line with other ICES assessment WGs, that ICES should develop an MSY-based positive target strategy, rather than current risk avoidance strategies. Experience from around the world suggests that strategies building in positive targets can control fishing mortality more effectively. However, it is recognized that the current level of information available on deep-water species does not allow the calculation of MSY-based BRPs in the short term. When data become available in the longer term, MSY-based BRPs should be calculated and used as benchmarks in substitution to the current U_{pa} and U_{lim}.

3.3.2 Harvest Control Rules

In the short term, for both category 1 and 2 species (as defined in Section 3.3.1), ICES advice could in principle be provided in a similar way to that given for other stocks for which stock assessments are routinely carried out. For example,

- If $U < U_{lim}$, fishery should cease
- If $U_{lim} < U < U_{pa}$, exploitation should be reduced until $U > U_{pa}$,
- If $U > U_{pa}$, exploitation should be set so that U remains above U_{pa}

The main difference in advice between species belonging to categories 1 and 2 would be the recovery time. For category 2 species, multi-annual HCR may be contemplated, so the recovery time of stocks should be allowed to exceed 1 year. For category 1 species, multi-annual plans for stock recovery should not be contemplated.

The above HCRs can also be applied to mixed-species fisheries. From a biological point of view, and more precisely for the sake of biodiversity preservation, the WG suggests that the poorest or the most vulnerable stock should be a reasonable candidate to set the HCR. However, the WG was of the opinion that the decision weight allocated to each stock should be left to managers. In the longer term, HCR should be elaborated on the newly calculated BRPs, as described above. In addition, HCR should accommodate pertinent environmental issues in a quantitative way.

Table 3.3.1. Deep-water species in the ICES area ranked according to (1) longevity and (2) growth rate (summarized from WGDEEP 2001). Species have been clustered into 2 groups according to their biological characteristics. The numbers given are only indicative as age-reading is poor for most of these species (cf WGDEEP 2001).

Species	Longevity (years)	Growth rate (k (y^{-1}))	Cluster
Orange roughy	125	0.06-0.07	1
Roundnose grenadier	>60	0.06-0.13	1
Deep-water squalid sharks: *Centroscymnus coelolepis* *Centrophorus squamosus*	 Not known 60-70	 Not known Not known	1
Blue ling	30	Not known	2
Argentine	35	0.17-0.20	2
Ling	20	Not known	2
Tusk	20?	Not known	2
Black scabbardfish	8-12 from whole otoliths 25 from sections	0.25	2
Red (blackspot) seabream	16	0.10-0.17	2
Greater forkbeard	15?	Not known	2
Alfonsino: *Beryx decadactylus* *Beryx splendens*	 13 11	 0.11-0.17 0.13-0.14	2

3.4 Community and Discard data

3.4.1 Community data

The list of references to community studies was provided in the 2001 WGDEEP report (ICES CM 2001/ACFM:23). This list should not be considered a complete bibliography, but it may serve as a starting point for explorations of the full literature on this topic.

Data on available community data from deepwater fisheries presented to WGDEEP in 1993-2008 are given in Table 3.4.1. It showed that studies on community structure for deepwater fisheries remain scarce and cover several selected areas only.

Some new community data were presented to WGDEEP 2008 from otterboard trawl, midwater and bottom trawl, and longline fisheries off the Faroe Islands; Spanish "Baka" bottom trawl and longline fisheries in sub-areas VI, VII and VIII; "voracera" fleet operating in the Strait of Gibraltar, and Portuguese black scabbardfish longline fishery in subarea IXa.

Faroe Islands

Preliminary logbook data on species composition (Eydna i Homrum, pers. comm.) obtained from 4507 otterboard trawl hauls (mean depth 456 m) show high level of species diversity (Fig. 3.4.1). Saithe (44.9%) was primarily caught by this kind of fishery. The rest of catches was represented by redfish (9.9%), blue ling (9.1%), cod (7.7%), roundnose grenadier (6.9%), black scabbardfish (5.9%), Greenland halibut (3.6%), haddock (2.6%), ling (1.5%), anglerfish (0.9%), tusk (0.5%), greater silver smelt (0.2%) and other species (6.3%). Traditionally this fleet has performed mixed deep-sea fishery for blue ling, redfish, black scabbardfish and roundnose grenadier. But also there has been a fishery for saithe, cod and haddock in shallower waters. The material presented here includes both these fisheries.

Midwater pair trawl fishery within Faroese waters (mean depth 458 m) seems monospecific with the majority of catches (98.3%) composed of greater silver smelt (276 hauls analysed). The bycatch in this fishery comprised insignificant portion with 1.2% of saithe, 0.3% of redfish and 0.1% of other species.

Species composition of bottom pair trawl catches (mean depth 194 m) based on the analysis of 2217 hauls seems more diverse but their bulk (89.8%) was represented by saithe. Small bycatch fraction was composed of haddock (2.6%), cod (2.0%), ling (0.9%), greater silver smelt (0.6%), anglerfish (0.6%), redfish (0.4%), and other species (3.0%).

The analysis of 923 longline hauls (mean depth 232 m) showed that the majority of catches consisted of haddock (33.7%), cod (28.8%), tusk (14.9%) and ling (12.5%). The proportion of other fish was insignificant: saithe 1.3%, anglerfish 0.7%, Greenland halibut 0.7%, redfish 0.5% and other species 4.6%.

Portugal

The 2005-2007 data on catch composition from longline fishery targeting black scabbardfish in the sub-area IXa were presented (WD 17). At least 25 species were recorded in these catches (Table 3.4.2). Deepwater sharks *Deania calcea* and *Etmopterus pusilus* were most frequently co-occurring species. Other common bycatch species were *Alepocephalus bairdi, Centroscymnus coelolepis, C. crepidapter, Phycis blennoides, Scymnodon ringens* and *Synaphobranchus kaupi*.

Spain

Updated information is also available on the catch composition of red seabream fishery in the Strait of Gibraltar. This is almost a monospecific fishery with single target species that represents 74.5% of the total landings over the period 1993-2006 (Figure 3.4.2). The most common bycatch species are Atlantic pomfret (10.4%), silver scabbardfish (6.3%), bluefin tuna (4.4%), horse mackerel (1.1%) and bluemouth (0.5%). More detailed long-term landing information (Table 3.4.3) showed that proportion of species was not constant during the reference period. In 1996-1998, bluefin tuna composed considerable portion of bycatch (13-20%). Atlantic pomfret was important component of landings in 1995-1997 contributed 11-35% by weight and comprised the half of catch landed in 2000. Subsequently, importance of these two species decreased and they were almost completely replaced by silver scabbardfish, which contribution during 2001-2006 made up 4-31% of total landings.

New information on the species composition of catches in the Spanish Basque Country mixed species fisheries in the northeast Atlantic was presented to the group (Guzman Diez, pers. comm.). The "Baka" trawl and longline fisheries in sub-areas VI, VII and VIII take a number of deepwater species and their catch compositions are diverse and depend on gear type and area fished.

Composition of deepwater fraction of "Baka" trawl catches during reference period (1996-2007) was not constant. In the sub-area VI, during the entire period greater forkbeard and ling were among most important species (Fig. 3.4.3). In 1996-2002, scorpionfishes Scorpaena spp. composed significant part of the catches. Since 2000 blue ling and since 2002 bluemouth became important component of deepwater bycatch. Bottom trawl catches of deepsea species in the sub-area VII were mostly represented by grater forkbeard, European conger and ling. During 2000-2003, argentine played considerable role in this fishery. Since 2002 bluemouth became important fishery target in this area. There were significant changes of species composition of bottom trawl catches in the sub-area VIII. Until 2000 European conger composed the bulk of deepwater fraction of catches (up to 60%). During this period greater forkbeard, blue ling and grenadiers were also of considerable importance. Since then proportions of four above-mentioned species in catches decreased and they were gradually replaced by argentine which share during recent years composed up to 70% while that of European conger 17-20% only.

Ling is one of most important deepsea species of longline fishery in the sub-area VI (Figure 3.4.4). During 2000-2003 33-83% of catches composed of forkbeards. During recent years European conger (9-20%) and scorpionfishes (10-11%) play an important role in fishery considered. Prior to 2000 ling was the most important target species (41-85%) of longline fishery in the sub-area VII. Since 1996 catches of European conger gradually increased and this species prevails in catches since 1999 comprised 59-82% by weight (61-65% recently). In 2006-2007 forkbeards became commercially important in this fishery contributing 20-26% of total catch. European conger is the most important target of longline fishery in the sub-area VIII contributing 21-83% to total catch. Proportion of ling in 1996 catch was 39% and subsequently decreased gradually reaching 4% in 2007. Since 2001 squalid sharks became important fishery target comprising 15-67% of the total catch.

3.4.2 Discards

There remains an urgent need for more quantitative information on levels of discarding from deepwater fisheries. A considerable number of discard studies have been undertaken during recent years, however many of these studies have been short-lived, often as a result of being driven by funding from EU projects. Moreover, due to the heterogeneous nature of many fisheries in relation to depths fished and the limited coverage that can be achieved within the budget of most studies, it has rarely been possible to achieve the level of sampling coverage that would be necessary to provide reliable estimates of discards at the level of fisheries. Consequently, most of the information that currently exists can best be regarded as qualitative or indicative of levels of discarding rather than providing reliable estimates of absolute levels of discarding.

Available data on discards in deepwater fisheries during the period of 1993-2001 were presented in the 2002 report of WGDEEP (ICES CM 2002/ACFM:16).

Recently, several EU countries have conducted observer programs as in accordance with their obligations under EC regulations 2347/2002 (regulating deepwater fisheries) and 1639/2000 (minimum and extended sampling programs). The preliminary results of these investigations have been presented to WGDEEP 2006, and these were summarised in ICES CM 2006/ACFM:28.

The analysis of existing data on discards (Table 3.4.3) showed that the volume of research on discards in deepsea fisheries decreases from year to year and only single ongoing project, studying discards in Portuguese longline fishery for black scabbard fish (WD 17), still exists. The results of this study conducted by observers during 2005-2007 are summarized below.

Portugal

The onboard sampling on Portuguese longline vessels included the counting of all the fish hooked, by categories (target, bycatch and discarded species), and observation on the bait loss in the remaining hooks. The data on catch composition for part of the target species and all bycatch were also obtained and discarded species were sampled for processing in the laboratory. In the end of the trip information on landed species (target and bycatch) was also taken. The data analysis showed that the most discarded species were *Etmopterus pusillus*, *Alepocephalus bairdii, Centroscymnus crepidater, Synaphobranchus kaupi* and also *Aphanopus carbo*. While the four former species are discarded due to their low or null market value, black scabbardfish was discarded because of the damage. The percentage of damaged target species (discarded) in relation to its total catch ranged from 6% to 17.5% with the average of 10.3%. Only single individual of undersized targeted species was discarded. The discards of bycatch species were due to their small sizes. Longline discards continue to seem insignificant in relation to the total catch.

France

A data set of 555 fishing hauls collected in the French observer program (EC regulation No 2347/2002) was analyzed.

The main results for the French trawl fishery in sub-areas VI and VII, can be summarized as follow:

- among commercial deepwater species, a high proportion (20 to 25% by weight) of the catch of roundnose grenadier was discarded because juvenile fish were caught together with adult. For the other main deepwater species (black scabbardfish, orange roughy, blue ling, sikis sharks (leafscale gulper shark and Portuguese dogfish) there were no discards ;

- the main species in the discards was by far the Baird's smoothhead (*Alepocephalus bairdi*);
- several other species appeared in the discards were small macrourids (mainly *Trachyrincus murrayi* and *Coelorinchus labiatus*) and morids (Halagyreus johnsonii, Lepidion eques), some deepwater sharks (mainly Centroselachus crepidater and Deania calcea) and chimeras (mainly Harriotta raleighana);
- numerically dominant scavenging anguilliform *Synaphobrancus kaupii* was almost not caught by trawls.

Most species in the benthopelagic fish community are believed to be caught by bottom trawl and either marketed or discarded according to their palatability. The ecosystem effect on depleting of deepwater fish biomass and dumping the discarded fraction on the bottom is not known, but the depletion of dominant species can induce major changes to fish communities through removing key predatory or forage species. A study of the impacts of deepwater fishing to the West of Britain using historical survey data found some evidence for changes in size spectra and in decline of species diversity between pre- and post-exploitation data, but the scarce and unbalanced nature of the time series hampered firm conclusions (Basson et al. 2001).

Discarding of unwanted catch may impact the demersal community by benefit scavenging species over those with other foraging strategies and change the trophic flux. The impact of this short term increase in food resources for scavenging and predatory demersal fish in the deepwater environment is unknown, but may potentially alter the species as well as functional diversity of the community.

Table 3.4.1. - Summary of available community data from deepsea fisheries presented to WGDEEP in 2000-2008.

Period	Country	Fishery	Area	Summary source
1993, 1996, 1997	Norway	Experimental longline and trawl fisheries	Mid-Atlantic and Reykjanes Ridges	ICES CM 2000/ACFM:8
1999	Norway	Experimental longline fisery	Hatton Bank	ICES CM 2000/ACFM:8
2000	Spain	Experimental trawl fishery	Hatton Bank, Mid-Atlantic and Reykjanes Ridges	ICES CM 2001/ACFM:23
1993-2002	Spain	Bottom trawl fishery for red seabream (“voracera” fleet)	Strait of Gibraltar	ICES CM 2003/ACFM:25
1996-2002	Spain	“Baka” trawl and longline fisheries	VI, VI, VIIIabd	ICES CM 2004/ACFM:15
1993-2003	Spain	Bottom trawl fishery for red seabream (“voracera” fleet)	Strait of Gibraltar	ICES CM 2004/ACFM:15
2005-2007	Portugal	Black scabbardfish longline fishery	IXa	ICES CM 2008/ACOM:?
2007	Faroes	Otterboard trawl, midwater and bottom trawl and longline fisheries	Vb	ICES CM 2008/ACOM:?
1996-2007	Spain	“Baka” trawl and longline fisheries	VI, VI, VIIIabd	ICES CM 2008/ACOM:?
1993-2006	Spain	Bottom trawl fishery for red seabream (“voracera” fleet)	Strait of Gibraltar	ICES CM 2008/ACOM:?

Table 3.4.2 – Species caught in longline sampled trips by category (target, bycatch and discard) classified by the frequency of occurrence (R − rare species, 1 individual per trip; U − uncommon species, 2 to10 individuals per trip; C − common species; V − very common species).

Scientific name	Target	Bycatch	Discard
Aphanopus carbo	V	-	C
Alepissaurus ferox	-	-	R
Alepocephalus bairdii	-	-	C
Benthodesmus elongatus	-	-	R
Brama brama	-	R	-
Centrophorus granulosus		R	-
Centrophorus squamosus	-	V	U
Centroscymnus coelolepis	-	C	-
Centroscymnus crepidater		U	C
Coryphaenoides rupestris	-	-	R
Dalatias licha	-	U	-
Deania calcea	-	V	U
Deania profundorum	-	R	-
Dentex angolensis	-	U	-
Etmopterus pusilus	-		V
Etmopterus spinax	-	-	U
Lepidion guenhteri	-	-	R
Lepidion lepidion	-	-	R
Nesiarchus nasutus	-	-	U
Phycis blennoides	-	C	-
Prionace glauca	-	R	R
Raja spp.	-	R	R
Scymnodon ringens	-	C	U
Somniosus microcephalus	-	R	-
Synaphobranchus kaupi	-	-	C
Trachirynchus scabrus	-	-	R

Table 3.4.3. - Percentage of species landed by Spanish "voracera" fleet targeting red seabream in the Strait of Gibraltar, 1993-2006 (Juan Gil, pers. comm.).

Species	1993	1994	1995	1996	1997	1998	1999
Pagellus bogaraveo	76	95	59	74	61	70	93
Brama brama	0	1	35	11	26	5	5
Thunnus thynnus	5	0	5	14	13	20	1
Lepidopus caudatus	0	0	0	0	0	0	0
Trachurus spp.	0	0	0	0	0	0	0
Helicolenus dactylopterus	0	0	0	0	0	0	1
Polyprion americanus	0	0	0	0	0	0	0
Epinephelus guaza	0	0	0	0	0	0	0
Other fishes	19	4	1	1	0	5	0

Table 3.4.3. – Continued.

Species	2000	2001	2002	2003	2004	2005	2006
Pagellus bogaraveo	47	87	74	69	66	87	86
Brama brama	50	2	0	0	0	0	9
Thunnus thynnus	1	0	0	2	0	1	0
Lepidopus caudatus	0	7	16	21	31	10	4
Trachurus spp.	1	1	7	7	0	0	0
Helicolenus dactylopterus	0	1	0	0	2	3	0
Polyprion americanus	0	0	0	0	0	0	0
Epinephelus guaza	0	0	0	0	0	0	0
Other fishes	1	2	3	1	1	0	0

Table 3.4.4 - Summary of the data on discards in deepsea fisheries presented to WGDEEP in 2000-2008.

Period	Country	Survey/Fishery/Gear	Area	Summary source
1993-1997	Norway	Ling and tusk longline fishery	IVa, VIa, Norwegian Deep	ICES CM 2000/ACFM:8
1998	Norway	Experimental trawl fishery	Hatton Bank	ICES CM 2000/ACFM:8
1999	Norway	Exploratory longline fishery	Hatton Bank	ICES CM 2000/ACFM:8
1997	Ireland	Commercial deepwater rock hopper trawl	Rockall Trough	ICES CM 2000/ACFM:8
1998-1999	Ireland	Trawl multi-species fishery	Faroe-Shetland Channel	ICES CM 2000/ACFM:8
1997, 1999	Ireland	Longline survey	Porcupine Bank	ICES CM 2000/ACFM:8
2000	Spain	Commercial bottom trawl fishery	Hatton Bank, Reykjanes Ridge	ICES CM 2001/ACFM:23
2000	Russia	Bottom trawl and longline fisheries	I, II	ICES CM 2001/ACFM:23
2000	Ireland	Longline survey	Hatton, Rockall, Porcupine Banks	ICES CM 2001/ACFM:23
2001	France	Deepwater bottom trawl fishery	VI, VII	ICES CM 2002/ACFM:16
2001	Spain	Bottom trawl commercial fishery	Hatton Bank	ICES CM 2002/ACFM:16
1999, 2000	Spain	Bottom otter trawl, pair trawl and high vertical trawl fisheries	VI, VII, VIII, IXa	ICES CM 2002/ACFM:16
1996-2001	UK-Scotland	French and Scottish deepwater trawl fisheries	West off British Isles	ICES CM 2002/ACFM:16
2001-2003	France	Deepwater bottom trawl fishery	VI, VII	ICES CM 2004/ACFM:15
2002-2003	Spain	Commercial bottom trawl fishery	Hatton Bank	ICES CM 2004/ACFM:15
2002-2004	Spain	Commercial bottom trawl fishery	Hatton Bank	ICES CM 2005/ACFM:07
2004	Ireland	Bottom trawl fisheries for orange roughy and black scabbardfish	VIIck	ICES CM 2005/ACFM:07
2005	Portugal	Black scabbardfish longline fishery	IXa	Diane
2004-2005	France	Deepwater bottom trawl fishery	VI, VII	Diane
2002-2006	Spain	Commercial bottom trawl fishery	Hatton Bank	Diane
2005-2007	Portugal	Black scabbardfish longline fishery	IXa	ICES CM 2008/ACOM:?

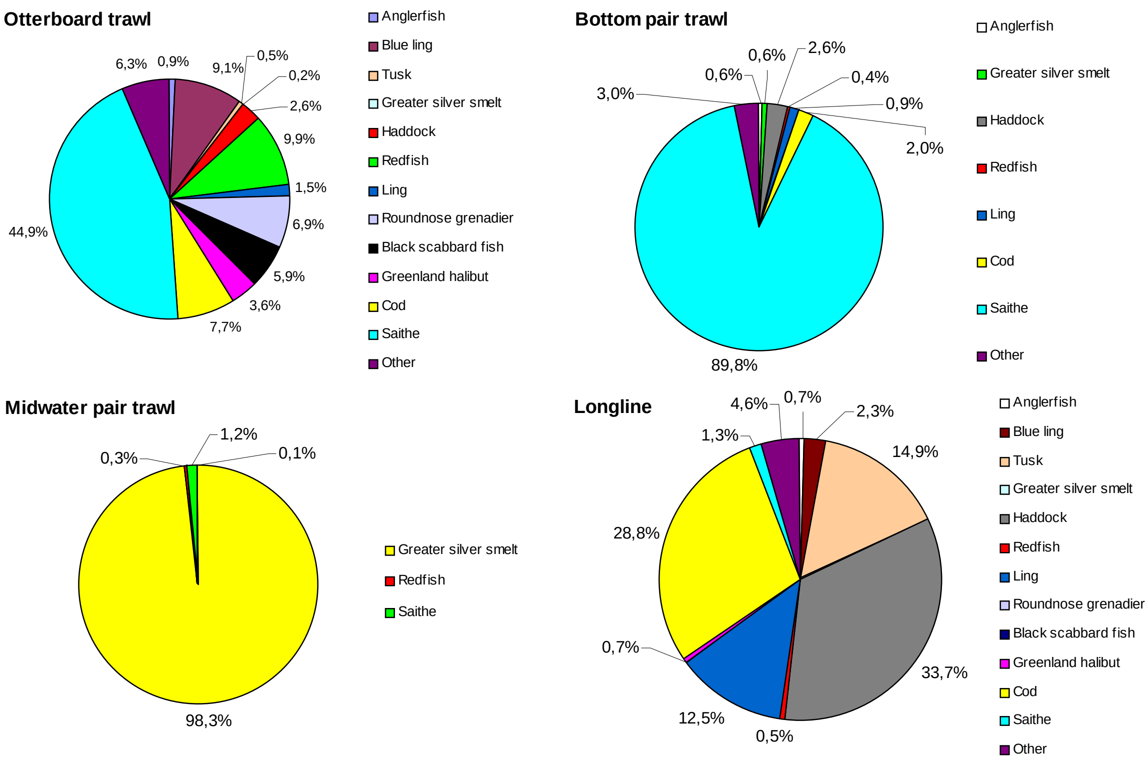


Figure 3.4.1. Species composition of catches from different fisheries in Faroese waters in 2007.

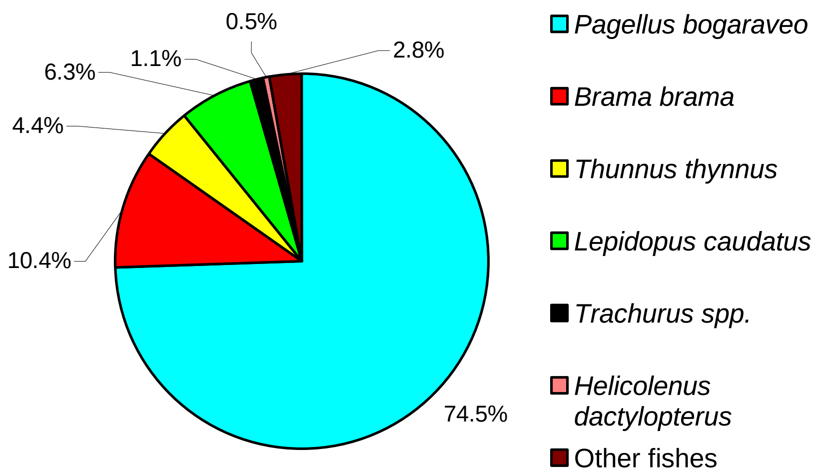
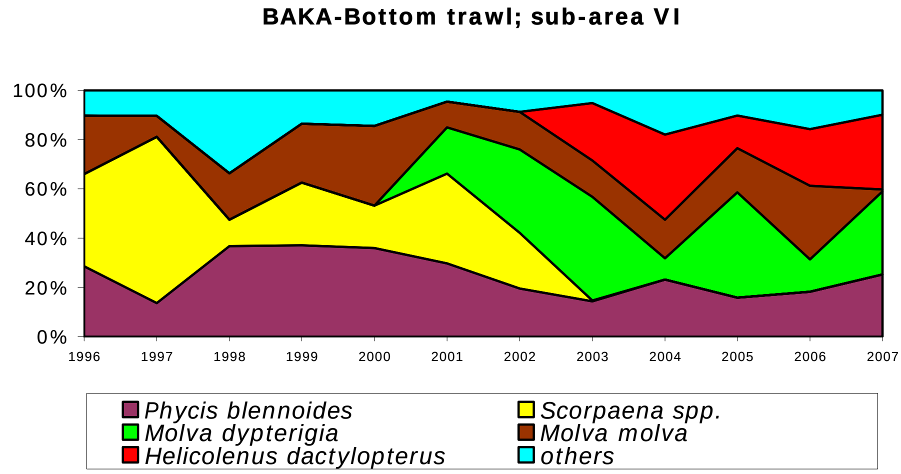


Figure 3.4.2. Average proportion of species landed during 1993-2006 by Spanish "voracera" fleet targeting red seabream in the Strait of Gibraltar.



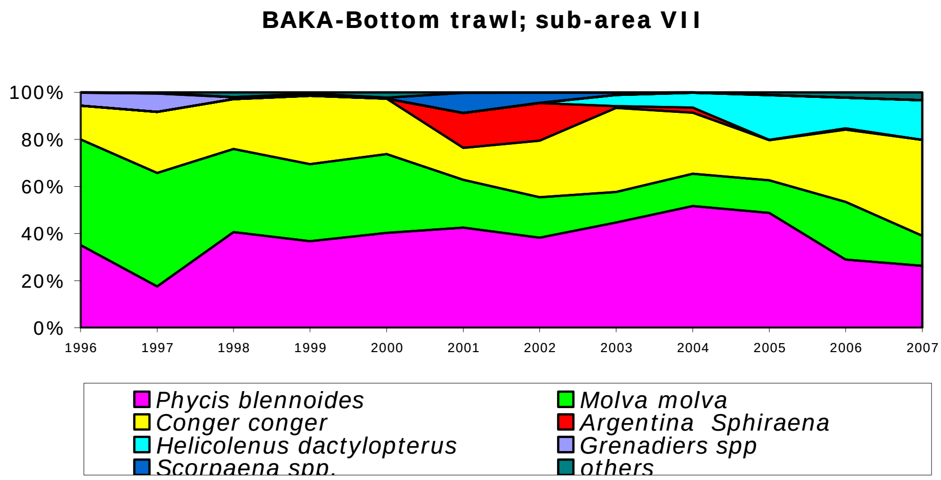


Figure 3.4.3. Composition of Spanish "Baka" bottom trawl catches, 1996-2007.

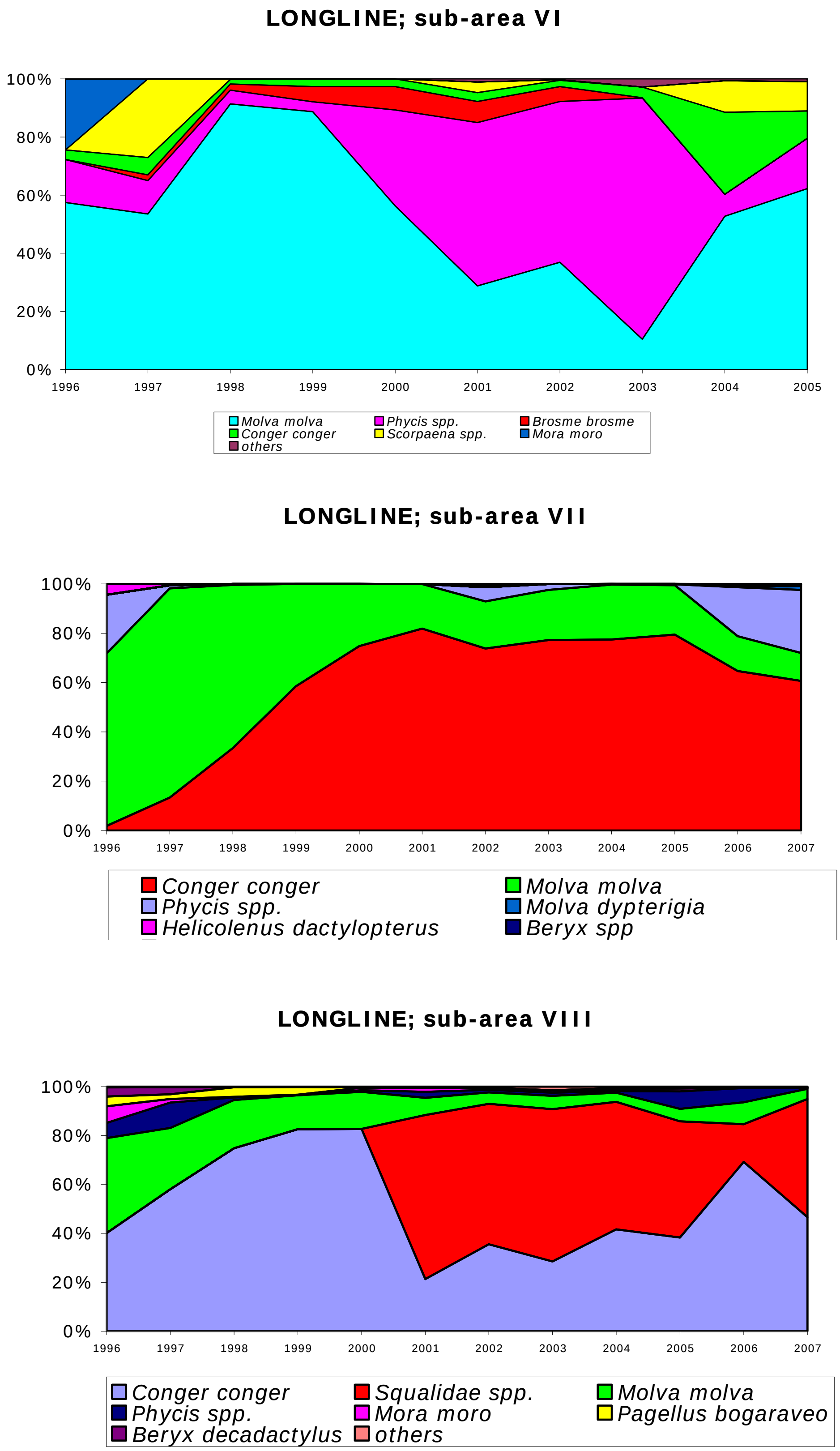


Figure 3.4.4. Composition of Spanish longline catches, 1996-2007.

3.5 Summary of working documents

There were 17 working documents presented to WGDEEP 2008. The data on authors, titles, countries, ICES divisions and sub-areas and topics are summarized in Table 3.6.1. Six working documents were provided by Portugal, three by Spain. Norway, Russia and Faroes presented two working documents, France and UK provided by single working document.

There were working documents with information on fishery and biological data on black scabbardfish (7 working documents) and blue ling (7 working documents), including two with information on location of blue ling spawning grounds in accordance with NEAFC request to ICES. Greater forkbeard and deepwater sharks were referred in 4 working documents and data on roundnose grenadier were presented in 3 working documents.

WD1

This document presents the French Industry Deepsea Fisheries (IDSF) database and a preliminary analysis of the data.

Prior to 2000, the IDSF database mostly contained information from vessels of around 34 meters long from Concarneau, while since 2000, the vessels were bigger (50 m) and from Boulogne and Lorient. For the entire period vessels involved in the IDSF database operated west off Scotland (ICES subarea VI), while the Faroe area (ICES subarea V) was only present in the database since 2000 (mostly vessels from Boulogne). Furthermore, prior to 2000 information in the IDSF was only partial (some trips or some hauls only) while since 2000, all the hauls from the involved vessels were documented in the database. IDSF contained available information for each haul: precise location, depth stratum (by 100m), date, duration of the haul, detailed catch.

The analysis of database showed that IDSF might be considered as representative of the French activity in the deepsea fishery since 2000. The analysis of number of hauls by depth does not provide any evidence of a shift of fishery activities to deeper waters. Furthermore, the mean depth was in the range 1010-1050m for 2000-2004, and 920-950m in 2005-2006, leading to the conclusion of a possible shift of fisheries to shallower waters.

Variance analysis of blue ling LPUEs showed that the main explanatory factor is the rectangle. The depth is the second most important one. The year effect appears to be rather small. This could be interpreted as a lack of contrast for one year to another, meaning a relative stability of the blue ling LPUE over the study period.

WD2

Commercial fisheries on southern blue ling in ICES Areas Vb, VI, VII and XIIb have mostly targeted spawning aggregations. EU logbook data from French, UK (England and Wales) and UK (Scotland) vessels, VMS data from UK (England and Wales) vessels and information collected from fishers and fisheries scientists under an EC-funded project “POORFISH” are analyzed to identify the maximum spatial and temporal bounds of spawning aggregations. Three main areas of spawning are identified: along the continental slope to the northwest of Scotland, on around and to the northwest of Rosemary Bank, and on the eastern and southern margins of Hatton Bank. These results are reasonably consistent with the results from a UK (England and Wales) Fisheries Science Partnership survey in February/March 2004 and with the limited information found in the scientific/gray literature. Closed areas to protect spawning aggregations may be large if based on the maximum spatial bounds of spawning, and would impact considerably on other fisheries. An alternative approach might be to restrict closed areas to where there has been intense fishing on spawning aggregations, as indicated by VMS records. This may lead to the displacement of fishing effort, however. Closed areas should have a clear, quantifiable aim and be accompanied by programmes to evaluate their efficacy.

WD3

This paper describes the blue ling fishery by Basque Country fleet in 1996-2007 west off British Isles (ICES subarea VIa).

The landings of mixed fishery in the period 1996-2007 in subarea VI include 13 main demersal and deepsea species. The 75 % of landings come from the "baka" trawler fleet and the rest from bottom long liners. Seven different trawlers have operated during the period 2001-2007, but only two remains since 2004. Four bottom long liners were active since 1996 but the fleet was quickly reduced year by year and finally in 2006 this fishing gear disappeared from the subarea VI.

The trawler fleet landed during the period the 76% of total species and the 73% of deep sea species. The amount of blue ling landed by trawlers reached a maximun of 285 t in 2002 but it has been strongly reduced since this year to 49 ton in 2007.

The 92% of the blue ling landings in this area occurred in this period from May to July. In the rest of the year the demersal species are the main component in the landings.

The analysis of the bathymetry showed a clear difference in the vertical distribution of blue ling and the other species. The majority of the blue ling landings (92%) are recorded below the 500 m, while the rest demersal and deepsea species showed a similar percentage of landings but above this depth.

WD4

This paper presents the results of a Generalized Linear Model (GLM) analysis of black scabbardfish LPUE (Landing-Per-Unit-Effort) data (1995 – 2006) from the Portuguese longline fleet operating in subarea IXa. The main purpose was to obtain standardized effort estimates of fleet which can be further used in Assessment Models.

LPUE values showed a large variation with vessel. While some presented an interquartile range located below 1.500 kg/trip, others had the average LPUE above that value. This could reflect different fishing powers within the fleet that capture the species.

There was variation of the estimated Year effects for the period 1996-2006. The inter-annual variation presented a slight decrease between 1996 and 2000 but since then has remained stable.

The Monthly LPUE estimates did not show any marked trend and seem to follow a seasonal pattern along the study period.

WD5

This paper presents the results of study on the growth pattern of black scabbardfish based on the comparison of age readings using both whole and sectioned otoliths (four different zones: rostrum, post-rostrum, dorsal and ventral were used).

The analysis of otoliths from smaller specimens (< 1100 mm) show a very high agreement between the number of growth bands read in both the whole and sectioned otoliths and between the four areas (rostrum, post-rostrum, dorsal and ventral). However, some difficulties were faced when ageing larger specimens with whole otoliths: the greater overlap between the growth bands than in sectioned otoliths, the high proximity because growth bands at the edge of the whole otolith, incapacity of reading ages higher than 12.

No statistical differences were found in the comparison of mean length by age group found between sexes.

Although whole otoliths have been more frequently used in black scabbardfish age studies the results of this paper showed that, in larger specimens, sectioned otoliths are the most adequate structures for age readings.

WD6

This working document presents the results of the study on black scabbardfish fecundity, based on females caught off Funchal, Madeira. Both the gravimetric and the stereological methods were used for fecundity estimation. No statistical differences were found between the fecundity estimated by the two methods used.

The existence of two groups of oocytes in pre-spawning ovaries, very low atresia levels (up to 7%) and the fact that very recent spent ovaries are characterized by the presence of a huge amount of recent post-ovulatory follicles and no late yolked oocytes, leads to consider black scabbardfish as a determinate spawner.

The stereological method is less time consuming and presents three other advantages when compared with the gravimetric method: one can estimated both the yolked and atretic oocytes present in the ovary; the post-ovulatory follicles can also be identified and quantified; the yolked oocytes can be easily distinguished from the atretic ones.

WD7

This paper summarizes results from 2007 survey on greater silver smelt within the primary area of distribution from 68ºN off North Norway to the eastern Skagerrak (in the Skagerrak, attention was also given to roundnose grenadier). The primary aim of the survey was to map the distributions of greater silver smelt and roundnose grenadier and, if possible, generate estimates of their abundance. In addition, samples were collected to study size- and age compositions.

There was a rather strong indication of a much reduced abundance of greater silver smelt compared with the 1980s and early 1990s. Bottom trawl catches of 100 kg/h or more over wide areas in all seasons were reported in the past periods. No such catches occurred in 2007 despite that the same depths were sampled with a similar sized trawl.

A comparison of age-distributions in the 1980s-early 1990s and in 2007 suggests that the proportion of old greater silver smelt in 2007 was somewhat but not drastically reduced compared with the 1980s and early 1990s. The more striking change in age compositions between the 1980s and 2007 was observed in the Skagerrak (IIIa). In previous years, proportions of fish aged 20+ in individual catches ranging from 40 to 80% (research vessel catches) and on average around 65% in commercial catches. The density appears to have declined and the age composition has changed. Due to the lack of continuous monitoring, it is unclear when these changes occurred. This is an issue that needs future study.

A notable change in IIa is that the greater silver smelt fishing season has shortened. The fishery usually starts in late February. In the early 1980s April-May were the best months, and the fishery continued into early. In recent years there has been almost no fishery in May. It remains unclear whether this reflects an overall reduced abundance and therefore a shortening of the season with profitable catch rates.

In previous bottom trawl surveys conducted deeper than 300m, the grenadier/greater silver smelt proportions were usually around 60/40. In 2007, the contribution of grenadier was much higher in all samples.

In the late 1980s, high densities were found over a much wider area of the Skagerrak basin, both by acoustics and bottom trawling. The shrinking of the present distribution area may be an indication of reduced abundance, but further analyses would be needed to determine if this is the case.

WD8

This paper presents time-series of effort and CPUE from two data sources: 1) electronic logbook database of longliners larger than 21 m that had a total landed catch of ling, tusk and blue ling that exceeded 8 tons in a given year; 2) data and biological samples directly from selected commercial longliners (reference fleet), compares the 2000-2006 data with previously submitted data for the period 1972-1994 and presents estimated mean length of ling, tusk and blue ling during the two periods.

Legislation has since 2000 resulted in a continuous reduction in the number of longliners participating in the fishery. Even though the number of vessels decreased, there was very little change in the number of hooks used per day. There was a large decline in number of days each vessel participated in the fishery and, therefore, a decline in the total number of hooks set.

During the period 1998 through 2003 the total catch declined from 32,675 to 19,000 tons while the catch per vessel was relatively stable. The data from 2004-2006 showed that the total catch has been relative stable while the average catch-per-vessel has increased considerable.

Caution must be exerted when using CPUE from long liners to study variation in abundance. The data presented here show clearly that the selection of the effort measure is critical. Comparatively crude measures such as “number of fishing days” would not reflect effort in this fishery correctly, and are inferior to “hooks-per-day,” which appears to be a much preferred measure of effort. “Hooks per day” is in essence a rather readily available measure based on compulsory logbook information. Not accounted for in the 2000-2006 data were changes in efficiency, e.g. by technological advances such as hook design, bait characteristics, affects of fishing practice, e.g., soak times etc., but in the recent period, technological changes appear to have been minor.

Given that other sources of information are lacking, the CPUE estimates may constitute the only source of information on temporal trends in abundance. It is a notable result that even though catch-per-vessel increased during the period 2004-2006, abundance in the subarea IIa may be constant or even declining. For the remaining areas the results were more positive. Even though there is a time gap of six to seven years between the old and the new time series, the recent CPUE estimates seem to correspond and reflect the trends in the fishery quite well and show that the CPUE was at a low level compared with the 1970s and 1980s.

WD9

This paper provides an updated summary of the current status of knowledge on the biology and fishery of read seabream in ICES area IX.

Fishery information was gathered for the period 1983-2007 from the sale sheets: monthly landings, monthly number of sales and the number of days in which those sales were carried out. In addition, *ad hoc* monthly length samplings from the different commercial sizes were carried out to estimate the landings length distribution.

Landing data showed that there was positive trend observed from 1983 to 1994. Period of 1992 to 1999 was characterized by high level of landings (over 400 t annually). There were decreasing in landings from 1998 to 2003 and since then landing gradually increase but are still lower than during 1992-1999.

Red seabream seems to have heterogeneous geographic and bathymetric distribution related to its length. This fact could explain different landed mean length between ports.

Landings comprised fish aged between 3 and 10 years. Respective age (yr) and length (cm) were as follows: 3 and 24-38, 4 and 27-40, 5 and 29-43, 6 and 34-44, 7 and 37-49, 8 and 42-58, 9 and 43-58, 10 and 50-62.

The relationship between the total weight (W, g) and length (TL, cm) was: $W = 0.014TL^{3.014}$.

Males are mature at L_{50}=30.1 cm, while females are maturing at L_{50}=35.1 cm. Thus, from age 5 all individuals could be considered mature ones. A mortality rate of 0.2 $year^{-1}$ has been adopted previously. This information allows to attempt VPA exploratory runs.

WD10

This working document is prepared in accordance with NEAFC request to ICES and summarizes all available Russian data regarding to definition of location of blue ling spawning grounds. This paper is based on cruise reports of the exploratory, research vessels and fishery vessels with observers onboard (1976-1990, 2000-2005), daily reports from Russian fishing vessels, Russian working documents presented to ICES in 2000-2008, and Russian and foreign scientific publications.

The analysis allows recommending the prohibition of the trawl and net blue ling fisheries in NEAFC Regulatory Area in the period from January to June in the following areas:

1) southwestern slope of the Lousy Bank between 59°59′- 60°10′N, from the boundary of UK 200-mile zone to 13°36′W;
2) southern slope of the Hatton Bank between corner points: 59°10′N, 14°55′W; 59°20′N, 14°55′W; 59°05′N, 16°10′W; 59°15′N, 16°10′ W.

In order to specify boundaries of suggested closed areas special observations of the inter-annual variations in the location of the blue ling spawning grounds and clarification of factors, which cause such variations, should be conducted.

Other blue ling spawning grounds can be found within the international waters west off British Isles. In this respect the area of the Hatton Bank located between 59°00′-59°10′N, 17°30′-18°00′W at depths of 700-1000m should be investigated from February to May.

WD11

This paper briefly reviews results of Russian deepwater fisheries and studies on the biology of deepwater species in 2007.

Russian targeted deep-sea fishery at greater depths in the Northeast Atlantic in 2007 was sporadically conducted by long-liners on the Reykjanes Ridge, in the areas of the

Hatton and Rockall Banks and in the Faroese Fishing Zone. In other areas deepwater species were mainly taken as by-catch. The deepwater investigations were scanty.

There were 885 t of deepwater species totally caught by Russian fleet of which 457 were taken in ICES division Vb, 151 t in division IIa and 103 t in sub-division XIIa1. Catches in other areas were insignificant. The main contribution in Vb catch was made by deepwater sharks (377 t), blue ling and tusk (36 and 37 t respectively). The main targets in division IIa were ling and tusk (55 and 85 t respectively), while those in sub-division XIIa1 were represented by deepwater sharks (58t), redfish (26 t) and tusk (19 t).

Russian longliners operated in 2007 in Faroese fishing zone, off Rockall and Hatton banks and off Reykjanes ridge. The most effort (982 x 10^3 hooks) was made up in Faroese fishing zone followed by Rockall bank (444 x 10^3 hooks) and Reykjanes ridge (231 x 10^3 hooks).

Due to the lack of observers aboard fishing vessels operated in other areas, the biological data were sampled off Eastern Greenland (sub-division XIVb2) only and were represented by information on length, weight, sex, maturity, and stomach fullness in regard to roughhead, roughnose and roundnose grenadiers, blue ling, orange roughy, smoothhead, spineback, black scabbardfish, black dogfish and two chimaeras.

WD12

This document resumes the available information, by species, from the Azores deepwater fishery for the 2006 and 2007.

The bulk of landings of deepwater species off the Azores during recent year was represented by red seabream (35.9%) followed by wreckfish (22.3%), European conger (11.4%), bluemouth (9.2%), alfonsinos (7.1%), and forkbeard (6.2%). The total landings of deepwater species in this area comprised about 3 thousand t. Analysis showed that 2007 landings were slightly higher than those in previous year but still less than those in 1992-1999.

Data available allow the analysis of multy-annual landings dynamics for 9 deepsea species since 1980. Present values of annual landings are significantly lower than those in the 1990s for alfonsinos, bluemouth, silver scabbardfish and Spanish ling. At the same time, there is well-pronounced positive trend during recent years of red seabream and wreckfish landings. Landings of offshore rockfish do not demonstrate any certain pattern and its recent landings are similar to those in the late 1980s or late 1990s.

The analysis of relative abundance indexes showed that during recent years positive trends observed in relation to red seabream, alfonsino, bluemouth, offshore rockfish, and wreckfish. At the same time, relative abundance of splendid alfonsino and silver scabbardfish considerably decreased recently.

Long-term landings data from 1946 showed that it is possible to distinguish three periods of red seabream fishery off the Azores: 1946 – early 1970s (predevelopment phase), early 1970s – early 1990s (growth phase), and early 1990s – present (probably fully exploited phase).

WD13

This paper presents the results on four of the most important deepsea fish species of the seven years (2001-2007) of the Porcupine Spanish surveys.

Biomass and abundance indexes, length frequencies, spatial and bathymetric distributions are presented. *Argentina* spp. (mostly *A. silus*) has been the second most abundant fish species in Porcupine surveys after blue whiting, although in the last four years its abundance has decreased markedly. Bathymetrically the large individuals are distributed in deeper grounds. Bluemouth has remained stable in abundance along the years, occupying mainly the western part of the bank within depths between 300-500 m. Greater forkbeard presented an important recruitment in 2002, which produced a remarkable boost in number in 2003 and could be traced in the biomass until 2005. Small individuals of *Phycis blennoides* are distributed in shallower waters (200-500 m), while the large ones extend their distribution down to the depth limit of survey (800 m). Blue ling presented a peak in abundance in 2004, with a good recruitment (<30 cm) that could be traced in 2005. Small blue lings dwell in waters shallower than 300 m moving later towards the deeper grounds in the western part of the bank.

WD14

This working document summarizes data on landings, relative abundance, spatial distribution, length frequencies, age and growth, and maturity of greater silver smelt in the Faroese waters (ICES division Vb) based on the material from three sources: spring and summer surveys, logbooks from commercial trawlers and the ongoing project.

Directed fisheries for greater silver smelt in Faroese waters started in 1994, when about 1,000 tons were landed. Since 1995 the landings have fluctuated between 3,000 and 13,000 tons, with the exception of 1998, when 18,000 tons were landed. Landings very much reflect the demands for the species on the market.

The CPUE data from pair trawlers during 1995-2007 showed a relatively stable trend at 2 000 – 2 500 kg/h.

In the groundfish surveys greater silver smelt seems to be more widely distributed on the plateau in summer. Catches are larger in west and south, and more widely distributed in northeast, in summer.

Mean weight of fish comprised 28.4 g at the age of 1 year, 231.7 g at age of 5 years, 441.4 g at age of 10 years, 622.6 g at age of 15 years and 858.9 g at age of 20+ years. Females are heavier than males of the same age in all age groups except for 1 year. Thus, mean weights of females and males are respectively 27.6 and 31.9 g at 1 yr, 227.7 and 233.3 g at 5 yr, 477.1 and 396.9 g at 10 yr, 660.9 and 548.6 g at 15 yr, and 927.5 and 804.7 g at 20+ yr.

Growth seems to be faster for females than for males, and females grow to bigger sizes ($L_\infty = 49.8$ cm) than males ($L_\infty = 46.6$ cm).

The length and age distribution of greater silver smelt in the landings showed a decrease in mean age in the last 12 years. This could reflect a natural reaction of a virgin stock to an introduced fishery but a clearer analysis is needed to investigate this reduction for the sustainability of the fishery.

Length and age at first maturity indicate that females mature at about 34 cm and 6 years, while males mature at about 35 cm and 8 years. Gonadosomatic index starts to rise at approximately 7 years and 33 cm for both sexes.

WD15

This working document contains information on Faroese landings, CPUE series from the ground fish surveys, CPUE series from logbooks from the commercial fleet and length distributions from the landings for different deepsea species.

Total landings by Faroese fishing vessels in 2007 comprised 12,778 t of which the majority (10,105 and 2,231 t respectively) was taken in divisions Vb and Va followed by division VIa (199 t) and division (174 t). The bulk of landings was composed of ling (5,079 t), tusk (3751 t), blue ling (2087 t), roundnose grenadier (852 t), black scabbardfish (719 t), and dogfish sharks (260 t).

Spring and summer survey demonstrated different blue ling CPUE trends. CPUEs of spring surveys showed quite stable trend during 2003-2007 period while those of summer surveys expressed significant decreasing during two last years (1.27-1.65 kg/h) as compared to 2003-2004 (4.13-4.23). At the same time, CPUE data from otterboard trawlers demonstrate quite clear upward trend during the entire reference period from 1994 to 2007.

Ling CPUE series from spring and summer surveys differ considerably and both showed downward trends during recent years. According to data on CPUE of longline ling fishery there is possible to distinguish several periods: 1986-1996 – rather stable phase with CPUE 30-50 kg/h; 1996-1997 – dramatic CPUE increasing up to 90 kg/h; 1997-2002 – gradual CPUE decreasing down to 12 kg/h; 2002-2005 – gradual CPUE increasing up to 65 kg/h; since 2005 to present – gradual CPUE decreasing.

Recent tusk CPUE values significantly differ in spring and summer surveys. Spring 2006-2007 CPUE values (3.86-3.91 kg/h) were considerably higher than those of previous years (1.04-3.38 kg/h) with exception for 1994 (4.71 kg/h). 2006-2007 summer survey CPUEs were contrarily lower (1.96-2.14 kg/h) than those in 2004-2005 (3.54-4.84 kg/h), 1996 (2.34) and 1998 (2.30 kg/h) but higher than in rest years (0.62-1.66 kg/h). Long-term data from longliners showed gradual CPUE decreasing during 1986-1996, increasing in the period 1996-2002, dramatic fall in 2003 and subsequent rise toward 2006. Since the data for 2007 is preliminary, direction of current trend is unclear.

CPUE of roundnose grenadier from otterboard trawlers demonstrates well-pronounced upward trend during the entire reference period of 1991-2007.

Black scabbardfish CPUE values were insignificant prior to 1999 and then started to increase toward 2002. Subsequently, until 2005 decreasing of CPUE were observed. Two recent years are characterized by gradual CPUE increasing.

WD16

This paper presents landing of deepsea species of mainland Portugal by species, type of fisheries and areas, and also provides length frequency distribution of black scabbard fish in 2007 landings.

The artisanal segment of the commercial fishing fleet of mainland Portugal continues to be responsible for the largest landings' quantities on deep-water species. The majority of these landings are due to fisheries operating in the Portuguese continental slope along the west coast of mainland Portugal. Total catch of deepsea species in mainland Portugal in 2007 comprised 6,958 t of which 6,293 t were taken by artisanal fisheries followed by trawl fisheriy (599 t) and pur-seine fishery (60 t). The bulk of artisanal fishery landings were composed from black scabbard fish (3,453 t), European conger (1,337 t), axillary seabream (439 t) and wreckfish

(491 t). Axillary seabream (345 t), red seabream (62 t), sharks (54 t), and bluemouth (48 t) made up the majority of trawl catches.

WD17

This document presents a basic study on Portuguese longline fleet discards based on onboard sampling on co-operative commercial vessels during the period 2005 to 2007.

The onboard sampling on longline vessels included the counting of all the fish hooked, by categories (target, bycatch and discarded species), and observation on the bait loss in the remaining hooks. Observers also obtained data on catch composition for part of the target species and all bycatch and sampled discarded species for processing in the laboratory. In the end of the trip landed species (target and bycatch) information was also taken.

The data analysis showed that the most discarded species were *Etmopterus pusillus*, *Alepocephalus bairdii*, *Centroscymnus crepidater*, *Synaphobranchus kaupi* and also *Aphanopus carbo*. While the four former species are discarded due to their low or null market value, black scabbardfish was discarded because its damage. The percentage of damaged target species (discarded) in relation to its total catch ranging from 6% to 17.5% with the average of 10.3%. Only one individual of undersized targeted species was discarded. The discards of bycatch species were due to their small sizes.

Table 3.5.1 - Summary of working documents presented at the WGDEEP 2008 (3-10 March 2008).

№ of WD	Author(s)	Title	Country	ICES division and sub-area	Topic
WD1	Alain Biseau	French Fishing Industry – Science partnership. Preliminary analysis of the French Industry database on the deepsea fishery	France	V, VI	Fishery data analysis
WD2	Philip A. Large, Andrew B. South and Graham M. Pilling	The spatial and temporal distribution of spawning aggregations of blue ling (*Molva dypterygia)* to the west and	UK	Vb, VI, VII, XIIb	Definition of blue ling spawning aggregations
WD3	Guzmán Diez, Estanis Mugerza, Jon Ruiz, Ane Iriondo, Marina Santurtún,	An overview of the Basque country (Spain) blue ling fishery in Subarea VI in the period 1996-2007	Spain	VI	Blue ling fishery analysis
WD4	Pedro Bordalo-Machado, Ines Farias and Ivone Figueiredo	Fishing effort standardization of black scabbardfish commercial data from ICES division IXa - period 1995-2006	Portugal	IXa	Black scabbardfish fishery data analysis
WD5	Ana Rita Vieira, Ines Farias, Leonel Serrano Gordo and Ivone Figueiredo	Age and growth of black scabbardfish	Portugal	IXa	Black scabbardfish biology
WD6	Ana Rita Vieira, Ines Farias, Leonel Serrano Gordo and Ivone Figueiredo	Fecundity of black scabbardfish	Portugal	IXa	Black scabbardfish biology
WD7	Odd Aksel Bergstad, Åge S. Høines, Hege Øverbø Hansen, Thomas de	Norwegian investigations on greater silver smelt (*Argentina silus*) and roundnose grenadier (*Coryphaenoides ruspestris*) in	Norway	II, III, IV	Abundance, distribution and biology of greater silver smelt
WD8	Kristin Helle and Michael Pennington	Updated estimates of effort and CPUE, and mean length for the Norwegian commercial catch of ling, blue ling and tusk	Norway	I, IIa, IIb, IIIa, IVa, IVb, Va, Vb, Via, VIb,	Ling, blue ling and tusk fishery data analysis
WD9	Juan Gil, Jesus Canoura, Candelaria Burgos, Carlos Farias and Virginia	Red seabream (*Pagellus bogaraveo*) assessment of the ICES IX from the information available of the fishery in the Gibraltar	Spain	IX	Red seabream fishery data analysis
WD10	Vladimir Vinnichenko	About spawning areas of blue ling (*Molva dypterygia*) in the open part of the North-East Atlantic	Russia	Vb1, VIb	Definition of blue ling spawning aggregations
WD11	Vladimir Vinnichenko	Russian deep-sea investigations and fisheries in the Northeast Atlantic in 2007	Russia	I, IIa, IIb, Vb, VIb1, XII, XIV	Catch data and general biology of deepwater species

Table 3.5.1. - Continued.

WD12	Mário Rui Pinho	Fishery and survey data of selected species from the Azores (Xa2)	Portugal	Xa2	Landings data, relative abundance trends of selected species , age structure of red seabream catches
WD13	F. Baldo, F. Velasco, M. Blanco and J. Gil	Results on argentine (*Argentina* spp.), bluemouth (*Helicolenus dactylopterus*), greater forkbeard (*Phycis blennoides*) and blue ling (*Molva dypterygia*) from the 2001-2007 Porcupine Bank (NE Atlantic) bottom trawl surveys	Spain	VIIc2, VIIk2	Spatial and vertical distributions, relative abundance, length frequencies of argentines, bluemouth, greater forkbeard and blue ling
WD14	Eydna í Homrum and Lise H. Ofstad	Data on greater silver smelt *Argentina silus* in Faroese waters	Faroes	Vb	Landings, distribution and biology of greater silver smelt
WD15	Eydna í Homrum, Lise H. Ofstad and Jákup Reinert	Data on Faroese deep sea fisheries	Faroes	Vb	Landings and survey data on deepwater species and length frequencies of ling, blue ling and tusk
WD16	Pedro Bordalo-Machado and Ivone Figueiredo	Information on deep-water species from mainland Portugal	Portugal	IXa	Landings data on deepwater species
WD17	Ana Cláudia Fernandes, Dina Silva, Ana Ferreira and Graça Pestana	Discards of the Portuguese black scarbbardfish longline fleet	Portugal	IXa	Discards of black scabbard longline fishery

Table 3.5.2. - Species information included in working documents presented at the WGDEEP 2008 (3-10 March 2008).

Species Common name Scientific name	WD1	WD2	WD3	WD4	WD5	WD6	WD7	WD8	WD9	WD10	WD11	WD12	WD13	WD14	WD15	WD16	WD17
Smoothhead *Alepocephalus agassizii*											■						
Baird's smoothhead *Alepocephalus bairdi*																	■
Black scabbardfish *Aphanopus carbo*				■	■	■					■				■	■	■
Greater silver smelt *Argentina silus*							■							■			
Argentines *Argentina* spp.													■			■	
Alfonsinos *Beryx* spp.												■				■	
Tusk *Brosme brosme*								■							■		
European conger *Conger conger*												■				■	
Roundnose grenadier *Coryphaenoides rupestris*							■				■				■		
Angola dentex *Dentex angolensis*																	■

Black cardinalfish *Epidonus telescopus*																	
Bluemouth *Helicolenus dactylopterus*																	
Orange roughy *Hoplostethus atlanticus*																	
Silver scabbardfish *Lepidopus caudatus*																	
Roughhead grenadier *Macrourus berglax*																	
Blue ling *Molva dypterygia*																	
Spanish ling *Molva macrophthalma*																	
Ling *Molva molva*																	
Common mora *Mora moro*																	
Black gemfish *Nesiarchus nasutus*																	
Spineback *Notacanthus chemnitzii*																	
Axillary seabream *Pagellus acarne*																	
Red seabream *Pagellus bogaraveo*																	

Greater forkbeard *Phycis blennoides*																	
Forkbeard *Phycis phycis*																	
Forkbeards *Phycis* spp.																	
Wreckfish *Polyprion americanus*																	
Offshore rockfish *Pontinus kuhlii*																	
Kaup's arrowtooth eel *Synaphobranchus kaupi*																	
Roughnose grenadier *Trachyrhynchus murrayi*																	
Largehead hairtail *Trichiurus lepturus*																	
Deepwater sharks																	
Deepwater shrimps																	

4 Area Overviews

4.1 Stocks and fisheries of Greenland and Iceland Seas

4.1.1 Fisheries overview

There is no directed fishery for any of the species dealt with in this working group in ICES XIV. A number of the species are, however, taken as very small by catches in the fishery for Greenland halibut in XIVb. Roundnose grenadier is the only species for which catches have been reported though the years. There were no catches reported by Greenland in 2006 and other countries (EU, Norway) fishing in the area have reported catches of in total 79 tons of roundnose grenadier in 2006 to the Greenland authorities.

Since the mid-seventies stocks in division Va have mainly been exploited by Icelandic vessels. However, vessels of other nationalities have also operated in the pelagic fishery on capelin, herring and blue whiting and few trawlers and longliners targeting for deep-sea redfish, tusk and ling have been operating in the region.

Fisheries in Icelandic waters are characterised by the most sophisticated technological equipment available in this field. This applies to navigational techniques and fish-detection instruments as well as the development of more effective fishing gear. The most significant development in recent years is the increasing size of pelagic trawls and with increasing engine power the ability to fish deeper with them. There have also been substantial improvements with respect to technological aspects of other gears such as bottom trawl, longline and handline. Each fishery uses a variety of gears and some vessels frequently shift from one gear to another within each year. The most common demersal fishing gear are otter trawls, longlines, seines, gillnets and jiggers while the pelagic fisheries use pelagic trawls and purse seines. At present there are approximately 1400 Icelandic vessels operating in the fisheries. The definition of types of vessels may be very complicated as some vessels are operating both as large factory fishing for demersal species and as large purse seiners and pelagic trawlers fishing for pelagic fishes during different time of the year.

Demersal fisheries take place all around Iceland including variety of gears and boats of all sizes. The most important fleets targeting them are:

Large and small trawlers using demersal trawl. This fleet is the most important one fishing cod, haddock, saithe, redfish as well as a number of other species. This fleet is operating year around; mostly outside 12 nautical miles from the shore.

- Boats (< 300 GRT) using gillnet. These boats are mostly targeting cod but cod haddock and a number of other species are included. This fleet is mostly operating close to the shore.
- Boats using longlines. These boats are both small boats (< 10 GRT) operating in shallow waters as well as much larger vessels operating in deeper waters. Cod and haddock are the main target species of this fleet but a number of deep sea species are also caught, some of them in directed fisheries.
- Boats using jiggers. These are small boats (<10 GRT). Cod is the most important target species of this fleet with saithe following as the second most important species.
- Boats using Danish seine. (20-300 GRT) The most important species for this fleet are cod and haddock but this fleet is the most important fleet fishing for a variety of flat fishes like plaice, dab, lemon sole and witch.

The total catch in Icelandic waters in 2006 amounted to 874 thousands tonnes where pelagic fishes amounted to 357 thousands tonnes, and deep sea species amounted to around 18 000 tonnes (Figure 4.1.1; Table 4.1.1).

Total of 603 vessels reported landed of deep sea species in 2006, from less than 10 kg to more than 1 100 t, as can be seen in the table below:

2006	Ling	Blue ling	Tusk	Gr. silver smelt
No vessels	528	220	535	43
max catch	308	125	450	1143
min catch	< 0.1	< 0.1	< 0.1	< 0.2
Mean	11.9	7.9	9.5	113.5

4.1.2 Trends in fisheries

Tusk, ling and blue ling remains the most important "deep-sea species" in Icelandic waters. In recent years, about 120 vessels were engaged in these fisheries with registered catches from less than 100 kg to nearly 1 000 tonnes. In 2007 about 7 000 tonnes of deep water species were caught in bottom trawl, whereof 4 100 were greater silver smelt. There has been an increase in the landings of ling, tusk and blue ling in the last four years (Figure 4.1.1), the increase in the two former stocks due to increase in quota (a TAC is not set for blue ling). Table 4.1.1 gives the catches of the Icelandic fleet of the most important deep-sea species taken by different gears in 2007 and Table 4.1.2 gives the total landings of deep-sea species from sub-division Va since 1988.

4.1.3 Technical interactions

The ling, blue ling and tusk in Icelandic waters constitute only a minor portion of the total demersal removal from the Icelandic Ecosystem (Figure 4.1.2). These three species are to a large extent by-catch in fisheries targeting other species; both in the long line (Figure 4.1.3) and the bottom trawl (Figure 4.1.4) fisheries.

The geographical distribution of bottom trawl catches of ling and blue ling overlap to a large extent with those that are the main target species, among other being Greenland halibut, Sebastes sp., saithe and cod (Figure 4.1.5).

However some limited targeted long line fishery of ling and in particular tusk takes place. For the latter species, there are indications that the fishery in the southwest of the Icelandic fishing area on the Reykjanes is directed at tusk, with relatively little catch of other species (Figure 4.1.6).

4.1.4 Ecosystem considerations

A number of recent initiatives have attempted to map the presence of cold-water corals in Icelandic waters through questionnaires to fisherman and ROV surveys (ICES 2004, 2005 and 2006). *Lophelia pertusa* occurs near the shelf break off the south and western coasts at a depth range of 100-800m in water temperatures of 5.5-7.3°C. Large coral areas are known on the Reykjanes Ridge, in the Hornafjarðardjúp deep and in the Lónsdjúp deep (SE Iceland). However, there were indications that the coral distribution has been significantly reduced in the last 20-30 years. Since January 1st 2006, 5 areas, covering 80km^2 have been closed to all fishing except those targeting pelagic fish.

4.1.5 Management measures

The Ministry of Fisheries is responsible for management of the Icelandic fisheries and implementation of the legislation. The Ministry issues regulations for commercial fishing for each fishing year, including an allocation of the TAC for each of the stocks subject to such limitations.

A system of transferable boat quotas was introduced in 1984. The agreed quotas were based on the Marine Research Institute's TAC recommendations, taking some socio-economic effects into account, as a rule to increase the quotas. Until 1990, the quota year corresponded to the calendar year but since then the quota, or fishing year, starts on September 1 and ends on August 31 the following year. This was done to meet the needs of the fishing industry.

In 1990, an individual transferable quota (ITQ) system was established for the fisheries and they were subject to vessel catch quotas. The quotas represent shares in the national total allowable catch (TAC) for each species, and most of the Icelandic fleets operates under this system.

With the extension of the fisheries jurisdiction to 200 miles in 1975, Iceland introduced new measures to protect juvenile fish. The mesh size in trawls was increased from 120 mm to 155 mm in 1977. Mesh size of 135 mm was only allowed in the fisheries for redfish in certain areas. Since 1998 a mesh size of 135 is allowed in the codend in all trawl fisheries not using "Polish cover". A quick closure system has been in force since 1976 with the objective to protect juvenile fish. Fishing is prohibited for at least two weeks in areas where the number of small fish in the catches has been observed by inspectors to exceed certain percentage. If, in a given area, there are several consecutive quick closures the Minister of Fisheries can with regulations close the area for longer time forcing the fleet to operate in other areas. Such permanent closure took place at several places along the south-southeast area for tusk in 2003 (Figure 4.1.5). Inspectors from the Directorate of Fisheries supervise these closures in collaboration with the Marine Research Institute. In 2005, 85 such closures took place.

In addition to allocating quotas on each species, there are other measures in place to protect fish stocks. Based on knowledge on the biology of various stocks, many areas have been closed temporarily or permanently aiming at protect juveniles. Figure 4.1.7 shows map of such legislation that was in force in 2004. Some of them are temporarily, but others have been closed for fishery for decades.

Table 4.1.1. Overview of the Icelandic deep-sea landings (in tonnes) in Icelandic waters (Va) in 2007 by gear type.

SPECIES	FISHING GEAR	LANDINGS (TONNES)
Ling	Bottom trawl	1.395
	Danish seine	238
	Gillnet	633
	Lobster trawl	243
	Long-line	4.042
	Other gears	49
	Total	**6.600**
Blue ling	Bottom trawl	1.483
	Danish seine	44
	Gillnet	22
	Lobster trawl	55
	Long-line	374
	Other gears	17
	Total	**1.995**
Tusk	Bottom trawl	95
	Gillnet	38
	Hook	9
	Lobster trawl	9
	Long-line	4.833
	Other gears	2
	Total	**5.986**
Greater silver smelt	Bottom trawl	4.108
	Pelagic trawl	108
	Total	**4.226**

Table 4.1.2. Total landings of deep sea species in ICES sub-divison Va.

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
ARGENTINES	206	8	112	247	657	1255	613	492	808	3367	13387	6704	5657	3043	4960	2686	3637	4481	4775	4226
Argentina silus																				
BLUE LING	2167	2529	3018	1824	2880	5357	1921	1692	1323	1344	1154	2085	1635	942	1386	1155	1201	1583	1858	2082
Molva dypterigia																				
BLACK SCABBARDFISH							1			1		9	18	8	13	14	19	19	23	1
Aphanopus carbo																				
LING	5846	5547	5556	5781	5106	4840	4604	4192	4060	3925	4302	4598	3743	3344	4504	4262	4597	5189	7406	7634
Molva molva																				
ORANGE ROUGHY				65	382	717	158	64	40	79	28	14	68	19	10	1	28	9	2	1
Hoplostethus atlanticus																				
RABBITFISHES Chimaeridae				499	106	3	60	106	21	15	29	2	5	1		1			1	1
ROUGHHEAD GRENADIER Macrourus									15	4	1		2	1	4	33	3	5	7	2
berglax																				
ROUNDNOSE GRENADIER	2	4	7	48	210	276	210	398	140	198	120	129	67	57	60	57	181	76	62	13
Coryphaenoides rupestris																				
GREENLAND SHARK		31	54	58	70	39	42	45	65	70	87	45	45	57	47	62	66	54	29	2
Somniosus microcephalus																				
SMOOTHHEADS					10	3	1	1												
Alepocephalidae																				
TUSK	6864	7076	7291	8732	8009	6058	5827	6225	6102	5389	5171	7224	6388	4808	5549	5569	4818	5001	6601	7592
Brosme brosme																				
TOTAL	15085	15195	16038	17254	17430	18548	13437	13215	12574	14392	24279	20810	17628	12280	16533	13840	14550	16417	20764	21554

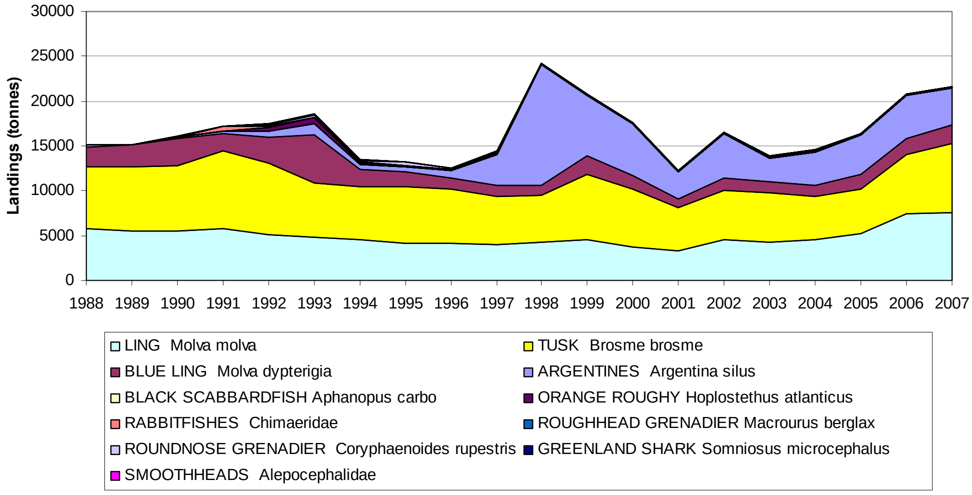


Figure 4.1.1. Fishery of deep-sea species in sub-Division Va 1988-2007, by species.

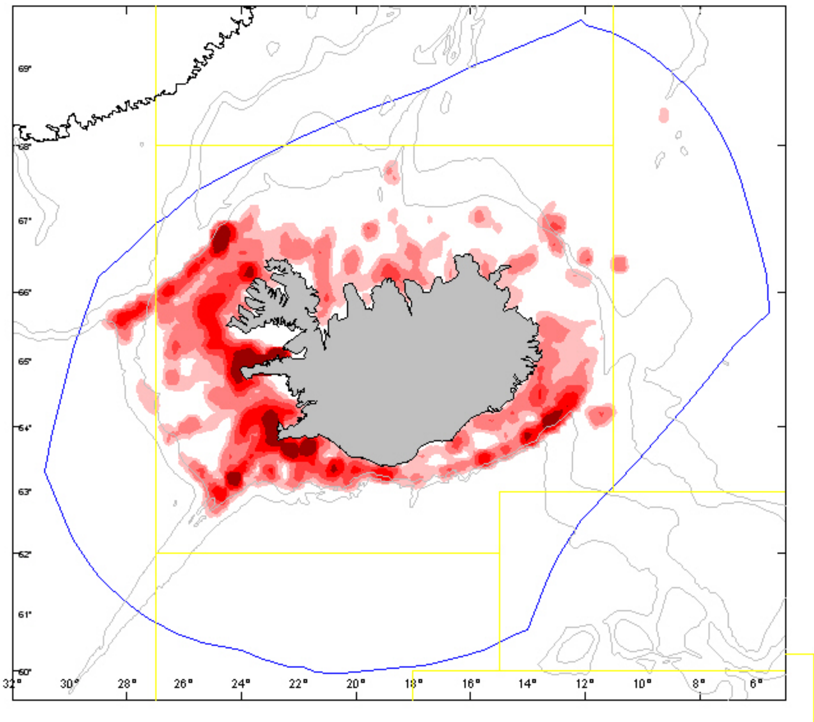


Figure 4.1.2. The spatial distribution of the total removal of all species by the Icelandic demersal fishing fleet in the Icelandic EEZ in 2007. The EEZ is shown as a blue line, regular thin lines show major ICES areas and contour lines indicate 500 and 1000 m depth.

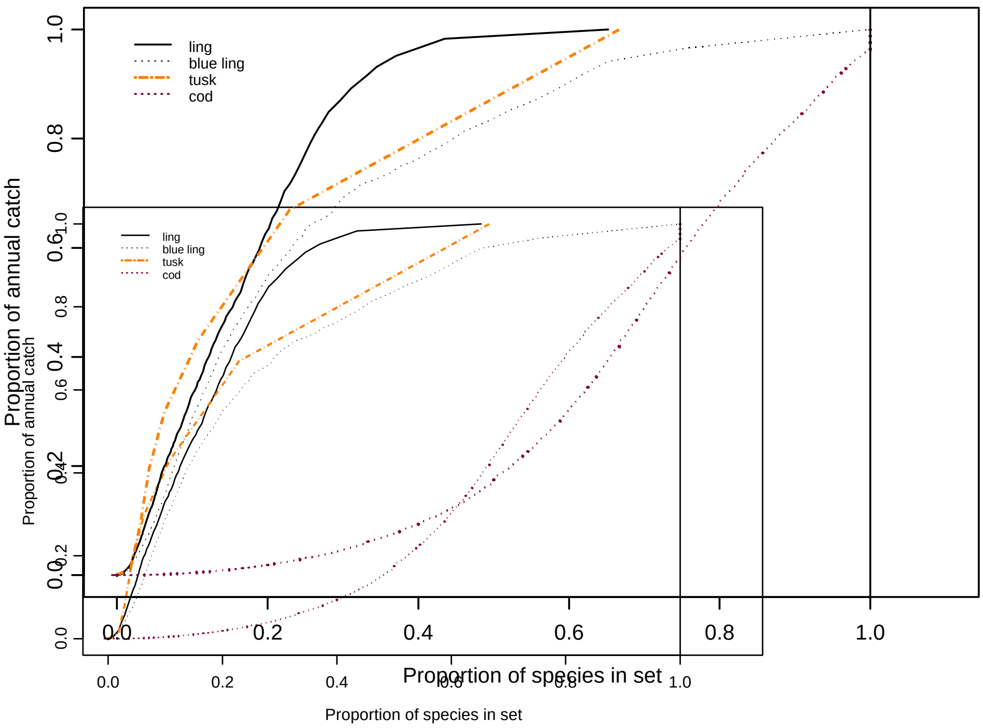


Figure 4.1.3. Cumulative plot for long line in 2005. An example describes this probably best. Looking at the figure above it can be seen from the solid line that 50% of the catch of ling comes from sets where tusk is less than 15% of the total catch while only unsignificant % of the catch of cod sets where it is less than 15% of the total catch in each set. Over 90% of ling catches are caught where ling is less than about 30% of total catches in given set. For omparioson, only around 15% of cod is caught in sets where cod is less than 50 % of the total catch.

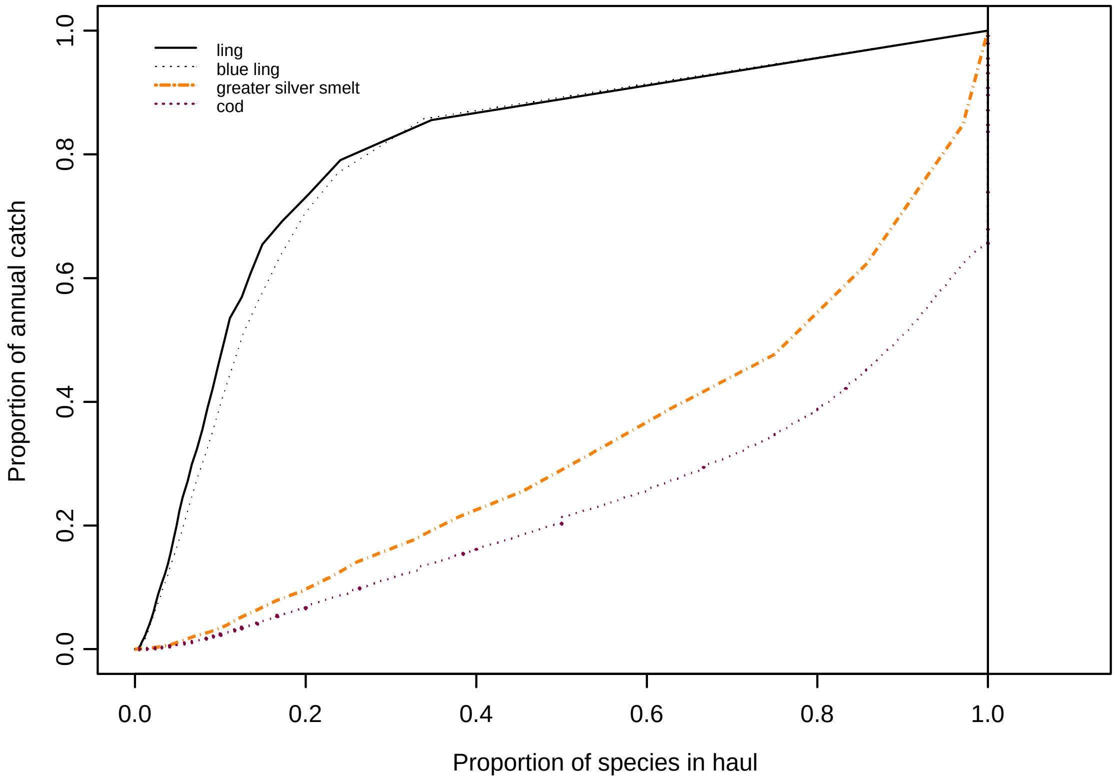


Figure 4.1.4. Cumulative plot for bottom trawl in 2005. See Figure 5.1.2 for explaination.

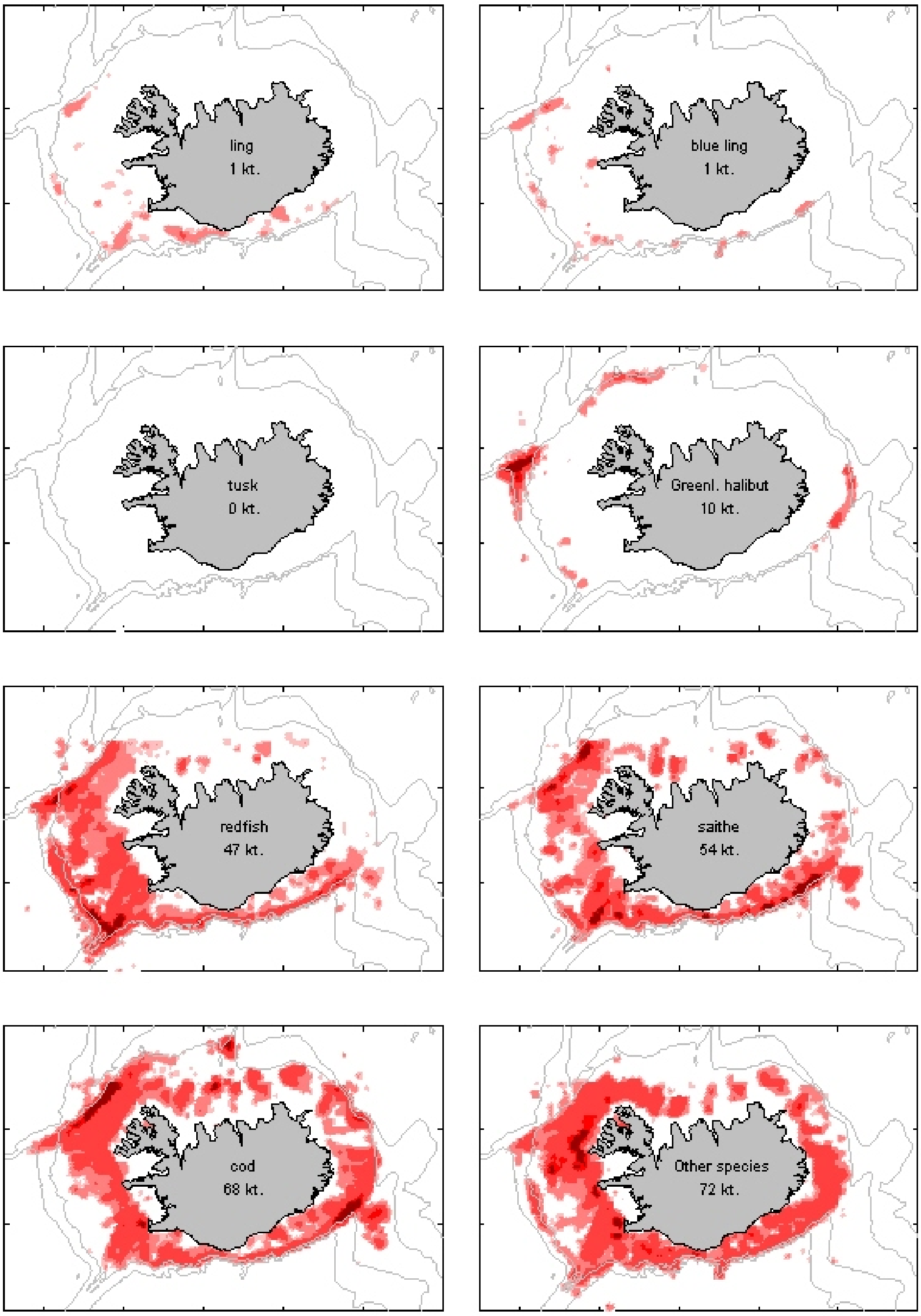


Figure 4.1.5. Spatial distribution of the removal of various species by the bottom trawling in 2007. The densities scale is comparable among the figures. The total catch by species is shown in units of thousand tonnes (kilotonnes). The grey lines correspond to 500 and 1000 meter depth contours.

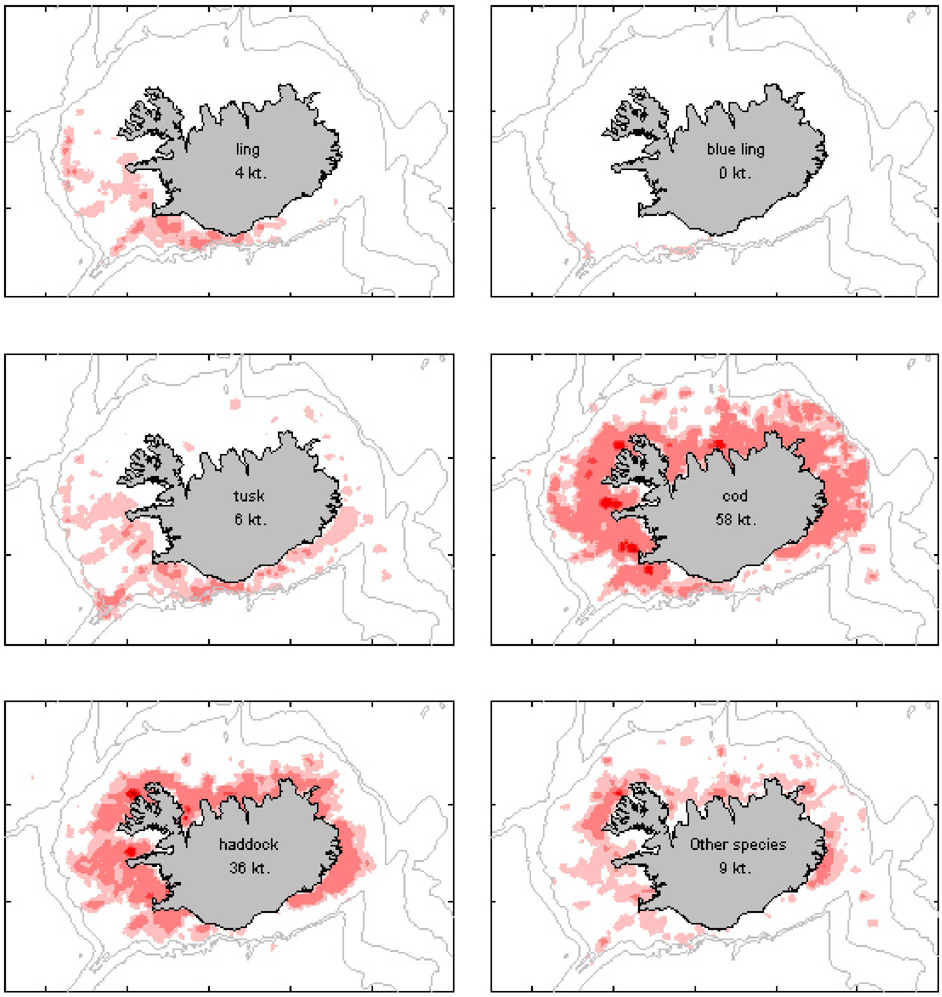


Figure 4.1.6. Spatial distribution of the removal of various species by the long lining in 2007. The densities scale is comparable among the figures. The total catch by species is shown in units of thousand tonnes (kilotonnes). The grey lines correspond to 500 and 1000 meter depth contours.

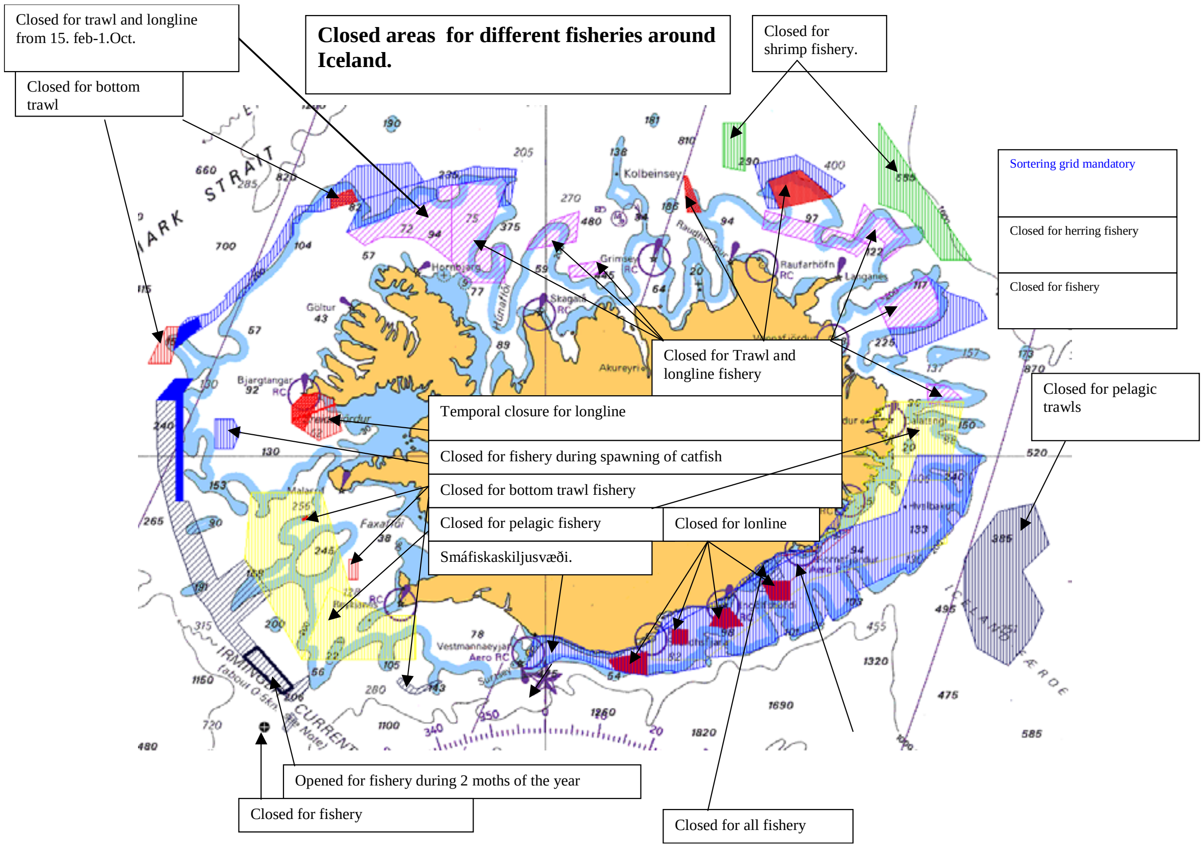


Figure 4.1.7. Overview of closed areas around Iceland. The boxes are of differnt nature and can be closed for differnt time period and gear type.

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4.2 Stocks and fisheries of the Barents Sea and Norwegian Sea

4.2.1 Fisheries Overviews I and II

In subareas I and II three species, ling (*Molva molva*), tusk (*Brosme brosme*) and Greater silver smelt (*Argentina silus*) make up almost 99 percent of the landed catches (Table 4.2.1 and Figure 4.2.1). Ling and tusk are mainly caught by long liners and a small proportion is caught in gillnets. Greater silver smelt are caught by bottom and mid-water trawls in almost equal amounts. Minor catches of other species, which are mainly taken as by-catches, include roughhead grenadier (*Macrourus berglax*), greater forkbeard (*Phycis blennoides*), roundnose grenadier (*Coryphaenoides rupestris*), rabbitfish (Chimaerids) and blue ling (*Molva dypterigia*). Norway lands by far the largest amount of the three species. The Faroes, France, Germany, Russia, Scotland, Ireland and England and Wales report small by-catch landings of ling, blue ling and tusk. Occasional landings of these species in the direct fishery for greater silver smelt were reported by the Netherlands and as by-catches by Germany, Russia, Scotland and the Faroes.

Longline fisheries

The longline fishery for ling (*Molva molva*) and tusk (*Brosme brosme*) has for many years been the most targeted deep-sea fishery in Norway (e.g. Bergstad and Hareide 1996). The number of fishing vessels over 21 m targeting ling, tusk and blue ling has declined from 72 in 2000 to 35 in 2006 but increased in 2007 to 38 (Table 4.2.2). The number of vessels declined during this period mainly due to changes in the laws concerning quotas for catching cod.

Trawl fisheries

Argentina silus has been targeted in trawl fisheries off mid-Norway (Division IIa) since the late 1970s. This fishery has continued, as described in ICES C.M. 1996/ Assess:8, but the effort directed at *A. silus* varies and is highly correlated with market demand. In Division IIa landings declined from approximately 10 000 –11 000 t in the mid 1980s to about half that level in the early 1990s and recently there was a large increase.

Intermittently there are minor trawl fisheries in mid-Norway (IIa) targeting roundnosed grenadier *Coryphaenoides rupestris* and *Argentina silus*. Six 120-140 foot trawlers have licenses. Details on this fishery were given in the report of the EC FAIR project (Gordon, 1999).

Gillnet fisheries

There is a targeted gillnet fishery for ling (*Molva molva*) on the upper slope off mid-Norway (Area IIa). This fishery started in 1979 as a targeted fishery for blue ling. The catches of blue ling declined throughout the following decade to the extent that the fishery has since the 1990s become almost entirely focused on ling.

4.2.2 Trends in fisheries

Landing statistics for sub-areas I and II for the period 1988-2007 are given in Table 4.2.1.

Tusk, ling and blue ling

There was a steady decline in the landings of tusk during the period 1988 through 2005 and the landed catches have declined from almost 20 000 tons at the end of the eighties to about 7 000 tons in 2005. In 2006 and 2007 the catches increased to 10 000 tons. The landings of ling have remained stable at between 7000 and 8000 tons, but also ling had an increase in the 2006 landings to almost 9000 tons and in 2007 the landings passed 10 500 tons. Blue ling landings declined markedly from 1988 through 1993, and the catches have been at a low level until 2007 (Figure 4.2.2).

Greater silver smelt

During the period 1988-2000 there was a slight downwards trend in the landed catches. In 2000, 2004 through 2006 there was a doubling in the landed catches to about 22 000 tons. Preliminary data show that the catches have declined to about 13 000 tons in 2007 (Figure 4.2.2).

4.2.3 Ecosystem considerations

Along the coast of northern Norway and in the Norwegian Sea a large number of coral reefs have recently been discovered. These are Lophelia reefs that represent an important natural resource with a high associated biodiversity and great abundance of fish. To protect the coral reefs from destruction caused by fishing activities the fishers have been urged to be careful when fishing close to the reefs. Five areas have also been closed to fisheries using towed gears, but long liners can fish in these areas.

Cold-water corals are particularly abundant along the Norwegian Continental shelf, between 200-400m depths. Fosså et al (2000) estimated that between 1500-2000km^2 of the Norwegian EEZ is covered by this habitat. Recent surveys using ROVs and manned submersibles have also found dense populations of gorgonian corals *Paragorgia arborea* and *Primnoa resedaeformis* associated with *Lophelia* pertusa (ICES, 2006). These reefs represent an important natural resource with a high associated biodiversity and a high abundance of fish. However, it was estimated that between 30 and 50% of the Norwegian reef areas have been impacted by trawling (Fosså et al., 2000). A number of areas have been closed to towed fishing gears although long lining is still permitted. Whilst such static gear has a smaller impact than trawling, increased intensity of such activity has the potential, over time, to cause significant damage through localized physical destruction of the coral structure from anchors and snagged gear.

A number of seamounts occur in these areas. Two are listed in the WGDEC 2006 report, Eistla and Gjalp, both with summit depths below the daytime depth of the deep-scattering layer, but at depths shallower than 2000m. Little is known about the fauna of these seamouts or the level of fishing activity, but such habitats are known generally to be areas where there are often higher levels of productivity with associated dense aggregations of fish.

4.2.4 Management measures

There is no regulation of the fishery for ling, tusk and blue ling in subareas I and II.

The EU sets TACs and quotas applicable to EC vessels fishing in community waters and international waters of sub-area I and II.

Table 4.2.1. Overview of landings in Sub-Areas I & II.

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
ALFONSINOS (Beryx spp.)																				
ARGENTINES (Argentina silus)	11351	8390	9120	7741	8234	7913	6807	6775	6604	4463	8261	7163	6293	14369	7407	8917	16162	17093	21685	12720
BLUE LING (Molva dypterigia)	3537	2058	1412	1479	1039	1020	422	364	267	292	279	292	252	209	150	148	175	198	202	263
BLACK SCABBARDFISH (Aphanopus carbo)																				
BLUEMOUTH (Helicolenus dactylopterus)																				
GREATER FORKBEARD (Phycis blennoides)			23	39	33	1								8	318	155	75	51	49	47
LING (Molva molva)	6126	7368	7628	7793	6521	7093	6322	5954	6346	5409	9200	7651	5964	4957	7132	6157	6560	6313	8845	10332
MORIDAE																				
ORANGE ROUGHY (Hoplostethus atlanticus)																				
RABBITFISHES (Chimaerids)												1	6	5	15	57	21	66	28	62
ROUGHHEAD GRENADIER (Macrourus berglax)			589	829	424	136				17	55		48	94	29	77	79	77	78	46
ROUNDNOSE GRENADIER (Coryphaenoides rupestris)		22	49	72	52	15	15	7	2	106	100	46		2	12	4	27	13	8	12
RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)																				
SHARKS, VARIOUS	37	15											1							
SILVER SCABBARDFISH (Lepidopus caudatus)																				
SMOOTHHEADS (Alepocephalidae)																				
TUSK (Brosme brosme)	14403	19350	18628	18306	15974	17585	12566	11617	12795	9426	15353	17183	14008	12061	12191	7940	7426	7050	9988	10732
WRECKFISH (Polyprion americanus)																				

Table 4.2.2. Number of vessels exceeding 21 m in the Norwegian long liner fleet during the period 1995-2007.

Year	Number of long liners
1995	65
1996	66
1997	65
1998	67
1999	71
2000	72
2001	65
2002	58
2003	52
2004	43
2005	39
2006	35
2007	38

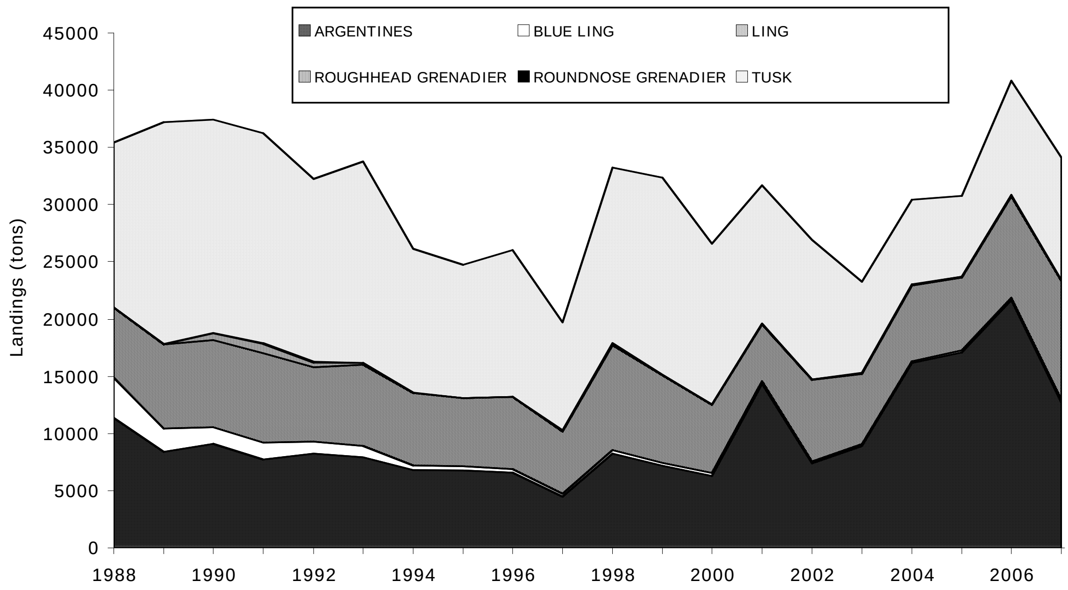


Figure 4.2.1. Trends in the landings in subareas I and II.

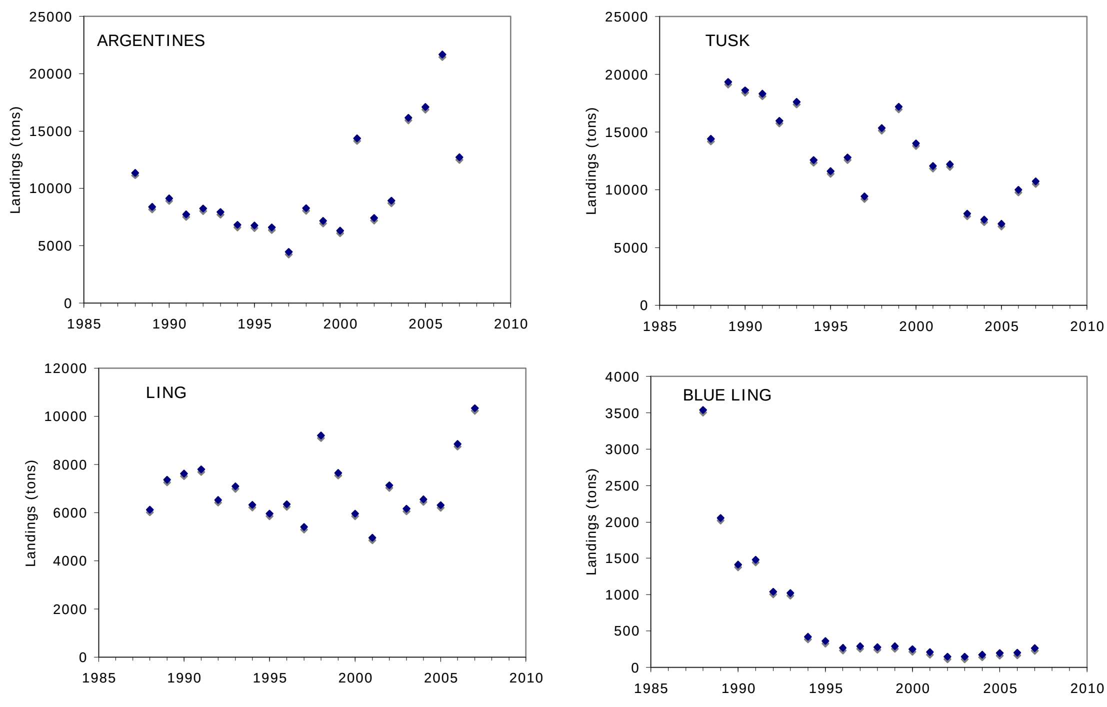


Figure 4.2.2. Trends in the landings of argentines, tusk, ling and blue ling in subareas I and II.

4.3 Stocks and fisheries of the Faroes

4.3.1 Fisheries overview

4.3.2 Fisheries in Faroese waters (Division Vb)

The fishery around the Faroe Islands has for centuries been an almost free international fishery involving several countries. Up to 1959, all vessels were allowed to fish around the Faroes outside the 3 nm zone. During the 1960s, the fisheries zone was gradually expanded, and in 1977 an EEZ of 200 nm was introduced in the Faroe area. The demersal fishery by foreign nations has since decreased and Faroese vessels now take most of the catches. The main fisheries in Faroese waters are mixed-species, demersal fisheries and single-species, pelagic fisheries. The demersal fisheries are mainly conducted by Faroese vessels, but vessels from other nations are still participating like Norwegian longliners and EU trawlers licensed through bilateral and multilateral agreements. The major part of the pelagic fisheries are conducted by foreign vessels through similar agreements.

4.3.3 Trends in fisheries

Except for the traditional long line fisheries for tusk and ling, which have been well established for decades, the Faroese deep-water fisheries started in the late 1970s following the expansion of the national EEZs to 200 nm and a wish to reallocate fishing effort from traditional shelf fisheries. In the first years all fishing was within the Faroese EEZ. Later, the fishery gradually expanded to more distant areas and to include more and more species/stocks.

The main deepwater fleet consist of about 13 otterboard trawlers with engines larger han 2000 Hp. They have traditionally targeted saithe, redfish *(Sebastes spp.)*, Greenland halibut, blue ling and to a lesser degree black scabbardfish *(Aphanopus carbo)* and roundnose grenadier *(Coryphaenoides rupestris)*. There has been an increased effort in recent years in Faroese waters as the deepwater fleet has reduced it's effort in other areas. This has resulted in increased effort on black scabbardfish, roundnose grenadier and blue ling in Vb with a corresponding increase in the landings of these species.

The traditional long line fleet fishing ling, tusk and blue ling consist of 24 longliners larger than 110 GRT; they are mainly targeting cod and haddock and in years where the availability of these species is high and market conditions satisfactory, they spend very little effort in deep water. Recently, a directed longline fishery with one vessel on deepwater sharks (*Centroscymnus coelolepis* and *Centrophorus squamosus*) was initiated; however, there has been no such fishery in 2002 and 2003 and the same applies for 2006 onwards.

In the 1990s, a gill net fishery directed at monkfish *(Lophius piscatorius)* and Greenland halibut *(Reinhardtius hippoglossoides)* developed in Vb and is now well established; by-catches in this fishery are among others deep-sea redcrab and blue ling. More recently exploratory trap fisheries for deep-sea red crab have been performed.

A trawl fishery for greater silver smelt (*Argentina silus*) has been expanding rapidly in recent years. Three pair trawlers, which otherwise mainly target saithe (*Pollachius virens*), hold licences to this fishery that mainly takes place in late spring and summer. Small quantities of Greater silver smelt is also taken as by-catch in the blue whiting fishery and in the deep-water fishery for e.g. red fish and blue ling.

Updated total international landings of deep sea species in Division Vb are given in Table 4.3.1 and Figure 4.3.1.

4.3.4 Technical interaction

As explained above, several fleets are fishing deep-sea species in Vb, either regularily targeting these species or now and then participate in such fisheries depending on availability of other targets. While greater silver smelt is taken only by 3 pair trawlers with special licenses for this fishery, grenadiers and black scabbard fish are targeted by the larger otter board trawlers (> 2000 HP).

The text table below shows the 2007 share by Faroese fleet categories of ling, blue ling and tusk, respectively.

2007	Longliners <110GRT	Longliners >110GRT	OB trawlers <1000HP	OB trawlers >1000HP	Pairtrawlers <1000HP	Pairtrawlers >1000HP	Others
Ling	9%	48%	2%	19%	5%	15%	2%
Blue ling	0%	16%	0%	83%	+	+	1%
Tusk	9%	74%	1%	10%	1%	3%	2%

Although the proportions by fleet of these 3 species do vary annually, ling is on average over many years a 60% line fishery and 40% trawl fishery; blue ling is mainly a trawl fishery whereas tusk is mainly taken by long lines. If Norwegian vessels are included, most of the ling is taken by long line.

4.3.5 Ecosystem considerations

The waters around the Faroe Islands are in the upper 500 m dominated by the North Atlantic current, which to the north of the islands meets the East Icelandic current. Clockwise current systems create retention areas on the Faroe Plateau (Faroe shelf) and on the Faroe Bank. In deeper waters to the north and east is deep Norwegian Sea water, and to the south and west is Atlantic water. From the late 1980s the intensity of the North Atlantic current passing the Faroe area decreased, but it has increased again since. The productivity of the Faroese waters was very low in the late 1980s and early 1990s. This applies also to the recruitment of many fish stocks, and the growth of the fish was poor as well. From 1992 onwards the conditions have returned to more normal values, which also is reflected in the fish landings. There has been observed a very clear relationship, from primary production to the higher trophic levels (including fish and seabirds), in the Faroe shelf ecosystem, and all trophic levels seem to respond quickly to variability in primary production in the ecosystem (Gaard *et al*. 2001).

Existing and former areas of *Lophelia* coral have been mapped around the Faroes through questionnaires to fishermen (Frederiksen *et al*. 1992; Jákupsstova *et al*. 2002). An estimated 11 000km^2 of living coral are found in Faroese waters, although this is estimated to be a significant reduction from earlier times (ICES, 2005). Some of these coral areas have in recent years been closed to fishing and mapping of these areas is ongoing with the purpose of a further expansion of closed areas.

4.3.6 Management measures

Since 1 June 1996, a management system based on a combination of area closures and individual transferable effort quotas in days within fleet categories have been in force. The individual transferable effort quotas apply to 1) the longliners less than 110

GRT, the jiggers, and the single trawlers less than 400 HP, 2) the pair trawlers and 3) the longliners greater than 110 GRT. One fishing day by longliners less than 100 GRT is considered equivalent to two fishing days for jiggers in the same gear category. Longliners less than 110 GRT could therefore double their allocation by converting to jigging. The allocation of number of fishing days is based on areas shallower than about 200 m. Holders of individual transferable effort quotas who fish in deeper waters can fish for 3 days for each day allocated. The single trawlers greater than 400 HP are not regulated through number of fishing days, but the number of fishing licenses have been settled for this fleet as well as for the gill netters and they are regulated by depth of fishing as well. Trawlers are not allowed to fish within the 12 nautical mile limit and large areas on the shelf are closed to them. Inside the 6 nautical miles limit only longliners less than 110 GRT and jiggers less than 110 GRT are allowed to fish. The Faroe Bank shallower than 200 m is closed to all trawl and gill net fisheries.

Technical measures such as area closures during the spawning periods, to protect juveniles and young fish and mesh size regulations are a natural part of the fisheries regulations.

As mentioned above, vessels from other nations are licensed to fish in Faroese waters through bilateral and multilateral agreements. Only Norway and EU have permission to fish deep water species. There TAC's for 2007 and 2008 are shown in the text table below. In the agreement with Norway it is stated that the maximum by-catch of roundnose grenadier/black scabbardfish in the blue ling/ling fishery is 25%. The TAC for blue ling/ling is then reduced correspondingly.

	2007		2008	
	Norway	EU	Norway	EU
Blue ling / ling	2406	3065	2525	3065
Tusk	1759		1847	
Roundnose grenadier / Black scabbardfish	602	1080	631	1080

Table 4.3.1. Deep-sea landings in Division Vb.

Species	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
ALFONSINOS (Beryx spp.)	1												
ARGENTINES (Argentina silus)	12286	9498	8433	17570	8214	5204	10081	7471	6552	6451	7009	12559	13389
BLUE LING (Molva dypterigia)	2440	1602	2798	2584	2932	2524	2119	2020	3815	2699	2516	2789	2987
BLACK SCABBARDFISH (Aphanopus carbo)	424	186	68	180	172	311	795	1751	1633	862	502	784	767
BLUEMOUTH (Helicolenus dactylopterus)					64	16				3			
DEEP WATER CARDINAL FISH (Epigonus telescopus)					8	2	7			1			
GREATER FORKBEARD (Phycis blennoides)	9	7	7	8	34	32	100	148	73	48	45	41	55
LING (Molva molva)	4070	4896	5657	5359	5238	3785	4588	4138	4893	5967	5744	5224	5591
MORIDAE					1		100	19	8	1	1	5	4
ORANGE ROUGHY (Hoplostethus atlanticus)	420	79	18	3	5	155	5	1	5	7	13	0	1
RABBITFISHES (Chimaerids)	1				3	54	96	64	61	96	57	10	0
ROUGHHEAD GRENADIER (Macrourus berglax)			6	9	58	1	4	3	12	9	6	0	2
ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	1223	1078	1112	1667	1996	1791	2016	1025	1532	1579	2336	1802	1453
RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)													
SHARKS, VARIOUS	262	380	308	433	470	409	543					303	380
SILVER SCABBARDFISH (Lepidopus caudatus)													
SMOOTHHEADS (Alepocephalidae)										6	1		
TUSK (Brosme brosme)	3978	3310	3319	2710	3964	2700	3993	3003	3292	3643	3544	3877	3879
WRECKFISH (Polyprion americanus)													
OTHERS	2	0	6	9	134	73	207	86	81	116	65	15	6

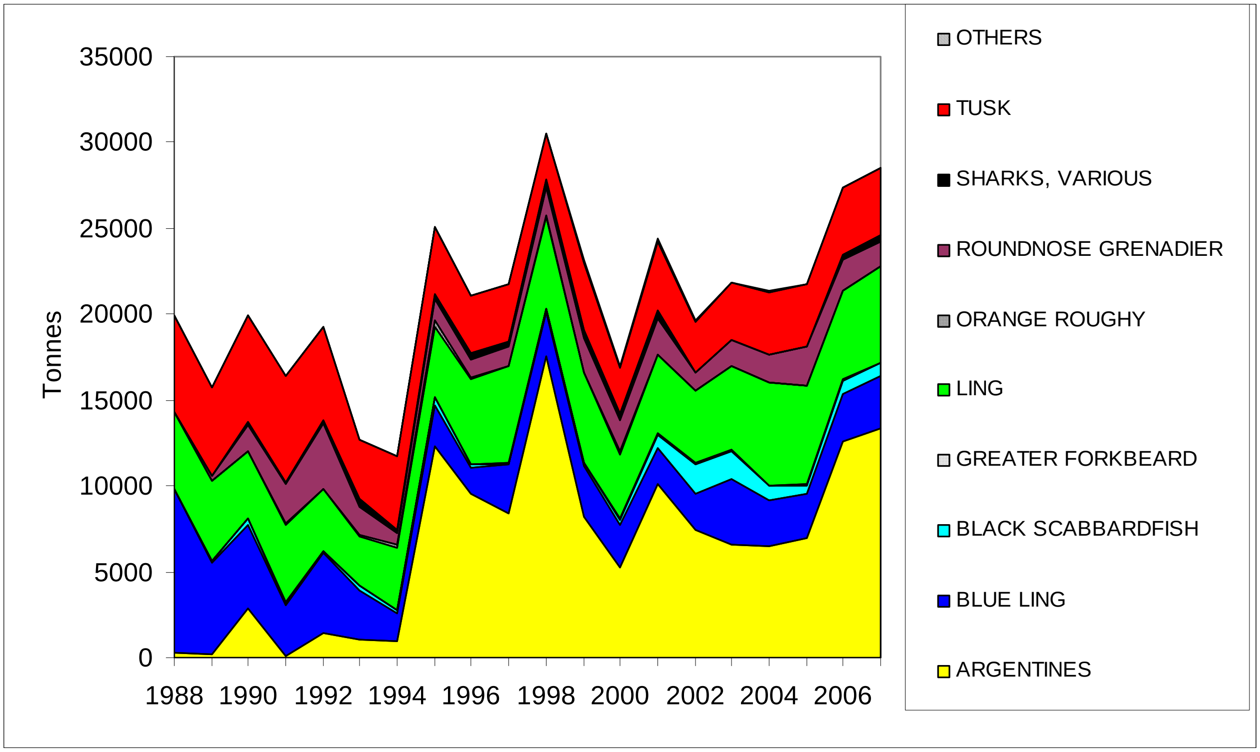


Figure 4.3.1. Deep-sea landings in Division Vb.

4.4 Stocks and fisheries of the Celtic Seas

4.4.1 Fisheries overview

Deepwater Trawl fisheries are conducted in areas VI and VII, principally by French, Irish Spanish and Scottish vessels. French vessels operate a mixed deepwater fishery mainly targeting roundnose grenadier, black scabbardfish and siki sharks on the continental slope and offshore banks of sub-area VI and VII. The Irish deepwater fishery is based on the flat grounds and targets orange roughy, black scabbard, roundnose grenadier and siki sharks. A number of Scottish vessels target monkfish (*Lophius spp)* on the continental slope of sub-area VIa and on the Rockall Bank. This fishery has a bycatch of deep-water species including ling, blue ling and siki sharks and a small number of these vessels occasionally fish in deeper water targeting roundnose grenadier, black scabbardfish and siki sharks. Spanish trawlers targeting Hake in area VII and VI have a bycatch of deep-water species including ling, blue ling, greater forkbeard and bluemouth.

A fleet of 29 Spanish stern bottom freezer trawlers fish in international waters of the Hatton Bank area (ICES XIIb & VIb1). The presence of the majority of the vessels in this area is discontinuous. Vessels conduct fishing trips of variable duration. Fishing operations are conducted in a depth range of 800-1600m, mainly at depths >1000m or deeper. Roundnose grenadier and Baird's smoothhead are the most important species in the catches. Black scabbardfish (1 000 t in 2002, then decreasing) and blue ling (600-1 000 t/year) are also caught in significant amounts. In 2005, landings of roughhead grenadier comparable to those of roundnose grenadier were reported to the working group. Concerns were expressed during the 2007 WGDEEP meeting that, in this area, roughhead grenadier is not known to occur at sufficient density to generate such landings. Catch data for this fleet in 2007 were not available.

A fleet UK registered gill-netters have, until recently, operated in areas VI and VII targeting hake, monkfish and deep-water sharks, this fishery was stopped or seriously reduced due to regulation of deep-water gillnetting (se below, management measures).

UK registered longliners target hake with a bycatch of ling and blue ling.

There is a UK trap fishery for Deepwater red crab *Chaceon affinis* in sub area VI and VII.

Trends in fisheries

Total landings of deep-water species from sub-areas VI and aII are given in table 4.4.1.

4.4.2 Technical interactions

Although a few of the French trawlers working in subareas VI and VII are dedicated to deep-water fishing, the majority also fish on the continental shelf targeting saithe with a by-catch of other demersal species (megrim, monkfish). The catch of ling is also most likely to come mainly from fishing activity on the shelf or shelf break between 200 and 400m depth than from fishing targeting deep-water species. Vessels can move rapidly between fisheries and often target both deepwater and shelf species in the course of a single trip. None of the Scottish vessels fishing deepwater stock is dedicated to deepwater trawling and vessels move between traditional fisheries for gadoid species on the shelf and in the North Sea, slope fisheries for monkfish and megrim, and genuine deep-water fisheries according to the availability of fishing opportunities. The Scottish bottom trawl fishery targeting monkfish and megrim extends to depths of 800m or more and has a bycatch deepwater species.

Although considered as deep-water species by this WG, the depth range of ling and tusk in sub-areas VI and VII extends onto the continental shelf and large quantities of these species are caught by a number of fleets and a variety of gears. Juveniles of some of the species considered by this WG are distributed in relatively shallow water and so are caught and discarded by other fisheries. This particularly applies to bluemouth, which is discarded in very large quantities by vessels fishing on the continental shelf in are VIa and on the Rockall Bank.

As a consequence of regulations banning deep-water gillnetting below 600m, interactions of the UK gillnet fishery with deepwater species are small.

The Spanish fleet fishing on the Hatton Bank is not exclusive to this area and also works on a variety of grounds in the North Atlantic (East and West).

4.4.3 Ecosystem considerations

The Rockall Trough lies in Sub-area VI to the west of Scotland and Ireland which is bounded to the North by the by the Wyville Ridge at a depth of about 500m. This is a major faunal barrier and there is little similarity between the fish assemblages on either side of the ridge (Bergstad *et al*. 1999; Gordon, 2001). To the west and north-west, the Rockall Trough is separated from the Icelandic basin by the Rockall Plateau and a chain of northern banks including the Rosemary, Bill Bailey and Hatton. To the south there is a gradual increase in depth onto the abyssal plain. To the west of Ireland the slope on the western edge of the Porcupine Bank is steep, whilst to the south, the Porcupine Seabight, has more gentle slopes. The fish populations have been relatively well described in this region compared to other deep-water areas (e.g. Gordon and Duncan, 1985a and b; Gordon, 1986, Gordon and Bergstad, 1992). At depths between about 400 and 1500 m there may be between 40 and 50 demersal species present in depending on gear type. Maximum species diversity occurs between 1000-1500m before declining markedly with depth. Deep water species, are typically slow growing, long lived, late maturing and have low fecundity. Fishing has a greater effect on species with such life history traits (Jennings *et al.* 1998; Jennings *et al*., 1999), making them particularly vulnerable to over-exploitation. This applies to both the target and non-target species. A large proportion of deep-water trawl catches (upwards of 50%) can consist of unpalatable species and numerous small species, including juveniles of the target species, which are usually discarded (Allain et al, 2003). The main species in the discards of the trawl fishery in by far the Baird's smoothhead (*Alepocephalus bairdii*) however, a large number of other non marketable benthopelagic species are discarded. The survival of these discards is unknown, but believed to be virtually zero due to fragility of these species and the effects of pressure changes during retrieval (Gordon, 2001). Therefore such fisheries tend to deplete the whole fish community biomass. Depletion of dominant species can induce major changes to fish communities through removing key predatory or forage species. A study of the impacts of deepwater fishing to the West of Britain using historical survey data found some evidence for changes in size spectra and a decline in species diversity between pre- and post-exploitation data, but the scarce and unbalanced nature of the time series hampered firm conclusions (Basson et al 2001). A presence/absence analyses indicated a very likely decline in the abundance of the Portuguese dogfish since the

1980s, which was consistent with assessments for this species. Deepwater sharks, which show a greater diversity on the slope compared to continental shelf, at temperate latitudes, are important predators and their removal through targeted fisheries and by-catch in trawl fisheries for other species such as roundnose grenadiers is likely to have a major impact on the eco-system. Although at worldwide scale there are more sharks species in shallow waters than at slope depths, in the north-East Atlantic and the Mediterranean the species richness of demersal sharks is higher along the slope (35 deep-water species vs 22 occurring on the shelf). Contrarily, ray species are more numerous on the shelf. Rays are caught is small numbers by deep-waters fisheries, as rather rare species they may be severely impacted by fishing but this is difficult to assess because as rare species they would require high sampling intensity. Lastly chimaeras (5 species) form a third group of Chondrichthyans which life history and populations'dynamics is poorly known or unknown and which occur only in deep-water. Despite historical studies of stomach contents, a full understanding of the food web dynamics of most deep-water eco-systems is still lacking and more studies are required. The general understanding is that slope fish tend to feed mainly on pelagic preys, amongst the species forming most of the total biomass, only chimaeras are known as epibenthic feeders (Mauchline and Gordon, 1983,1991).

Discarding of unwanted catch may impact the demersal community by benefit scavenging species over those with other foraging strategies and change the trophic flux. Shallow water studies have documented the active response of scavenging and predatory demersal fish to the increase in food resources left in the wake of a trawl and from discarded catch (Kaiser & Spencer, 1996; Fonds & Groenewold, 2000). The impact of this short term increase in food resources for scavenging and predatory demersal fish in the deep water environment is unknown, but may potentially alter the species as well as functional diversity of the community.

The effects of fishing on the benthic habitat relate to the physical disturbance by the gear used. This includes the removal of physical features, reduction in complexity of habitat structure and resuspension of sediment. Benthic fauna in deep waters are understood to be diverse but of low productivity. Little information is available on the effects of trawling on deep-sea soft sediment habitats. Cryer et al (2002) used suite of multivariate analyses to infer that trawling probably changes benthic community structure and reduces biodiversity over broad spatial scales on the continental slope in a similar fashion to coastal systems. More attention has been paid to biogenic habitat that occurs along the slope, mainly the cold-water corals, which, in the Northeast Atlantic include the azooxanthellate scleractinarian corals *Lophelia pertusa*, *Madrepora oculata*, *Solenosmilia variabilis*, *Desmophyllum cristagalli*, and *Enallopsammia rostrata*. The main reef building species is *L. pertusa*. The other coral species often occur in association with *Lophelia pertusa* and none has been found forming reefs without *L. pertusa* being present. No exhaustive description of the distribution of *L. pertusa* exists, but it is found on the continental slopes off Norway, Iceland, Faeroes, the UK, France, Spain and Portugal as well as the Mid Atlantic Ridge (ICES, 2003, 2004 and 2005; Rogers, 1999). The extent of individual reefs varies. Some biogenic seamounts are reported as up to 200m high, and several km long (Rogers, 1999; Freiwald, A. *et al.* 1999). A dense and diverse range of megafauna are associated to *Lophelia* reefs. This includes fixed (anthipatarians, gorgonians, sponges) and mobile invertebrates (echinoderms, crustaceans). The species richness of macrofauna associated to coral reefs has been found to be up to three times higher than on surrounding sedimentary seabed (Mortensen et al., 1995). Several species of deepwater fish occur associated with corals, some in more abundance than in surrounding non-coral areas, but the functional links between fish and coral are still to be fully elucidated (Husebø et al., 2002). However, it is accepted that generally, structurally complex habitats, such as corals, offer a greater diversity of food and physical shelter to fish and other macrofauna. Other deep-water biogenic habitats with structures that stand proud of the seabed include sponge and xenophyophore fields, seafans and seapens (octocorals). Any long-lived sessile organisms that stand proud of the seabed will be highly vulnerable to destruction by towed demersal fishing gear. There are a number of documented reports of damage to *Lophelia* reefs in various parts of the Northeast Atlantic by trawl gear where trawl scars and coral rubble have been observed (e.g. Hall- Spencer, *et al*, 2002). Damage can also be caused on a smaller scale by static gears such as gill nets and long lines (Grehan et al 2003). The degree of this damage depends on fishing effort (ICES, 2007b). The recovery rates for damaged coral are likely to be extremely slow (Risk, 2002). In Divisions VI, VII and XIIb there are a number of known areas of cold-water corals. These include the shelf break to the west and north of Scotland, Rockall Bank, Hatton Bank and the Porcupine Bank. The best known site is the Darwin Mounds, located at 1000m to the south of the Wyville Thompson Ridge. Some of these areas have been heavily impacted by deep-water trawling activities (Hall-Spencer, 2002, Grehan *et al*, 2004). In 2005, WGDEC recommended a number of areas on Rockall that would be appropriate for closure to protect cold-water corals from trawling activity. The choice of these sites was based on examination of scientific and anecdotal fishermen's records of coral occurrence and VMS data indicating where fishing activity occurred.

The above text on corals was drafted by WGDEEP in 2006 and may be updated by WGDEC meeting in 2008.

Seamounts are widely recognized to be areas of high productivity where dense aggregations of fish can occur. The special hydrographic conditions and good availability of hard bottom are favourable for sessile suspension feeders which often dominate the community on seamounts (Genin *et al*. 1986). Within ICES area VI there are three documented seamounts; Rosemary, Anton Dohrn and Hebrides Terrace. The first two of these have summits above the daytime depth of the deep scattering layer. All three have been heavily targeted by fishing vessels since the 1990s, probably associated with the orange roughy fishery.

4.4.4 Management measures

Since 2003, Black scabbardfish (*Aphanopus carbo*), Blue ling (*Molva dypterygia*), Greater silver smelt (*Argentina silus*), Ling (*Molva molva*), Orange roughy (*Hoplostethus atlanticus*), Red seabream (*Pagellus bogaraveo*), Roundnose grenadier (*Coryphaenoides rupestris*) and Tusk (*Brosme brosme*) have been subject to TACs and quotas in EC waters and for Community vessels fishing elsewhere.

Under Council Regulation (EC) No 2347/2002, Member States must ensure that fishing activities which lead to catches and retention on board of more than 10 tonnes each calendar year of deep-sea species by vessels flying their flag and registered in their territory are subject to a deep sea fishing permit. Member states are obliged to calculate the aggregate power and the aggregate volume of their vessels which, in any one of the years 1998, 1999 or 2000, landed more than 10 tonnes of any mixture of the deep-sea species. The aggregate volume of vessels holding deep sea fishing permits may not exceed this figure.

Council Regulation (EC) No 27/2005 obliged Member States to ensure that, for 2005, the fishing effort levels, measured in kilowatt days absent from port, by vessels holding deep-sea fishing permits did not exceed 90 % of the average annual fishing effort deployed by that Member State's vessels in 2003 on trips when deep-sea fishing permits were held and deep-sea species were caught. For 2006 this limit was further reduced to 80% of 2003 levels.

Council Regulation (EC) No 51/2006 banned the use of gill nets by Community vessels at depths greater than 200m in ICES Divisions VIa, b and VII b, c, j, k. In 2006 a derogation was introduced allowing the setting of gillnets with mesh sizes between 120 and 150mm down to depths of 600m. In 2008, this measure was extended to cover sub-areas III and IV. This remains a "*transitional measures to allow these fisheries to take place under certain conditions* [...] *until more permanent measures are adopted*" included in the general TAC regulation (Council regulation (EC) N° 40/2008 of the council of 16/01/2008) however it is expected that this will become a permanent provision in a Technical measures Regulation to be adopted later in 2008. NEAFC has also banned deep-water gill-netting in international waters at depth below 200 m, until management measures can be put in place. It was unclear to the WG whether this measure, effective from 01/02/2006 and still appearing on the NEAFC website as a 2008 measure was still valid or have been updated.

Landings of the main deepwater species caught in subareas VI and VII are managed by TACs since 2003 for black scabbardfish, argentine, tusk, blue ling, ling, roundnose grenadier, orange roughy and red(blackspot) seabream (EC regulation n° 2340/20024 of the council of 16 december 2002). In 2005, TACs were introduced for deepwater sharks and greater forkbeard (EC regulation n° 2270/2004 of the council of 22 december 2004). TACs are revised every second year and were set at lower levels for 2005/2006 and further reduced in 2007/2008 for these species.

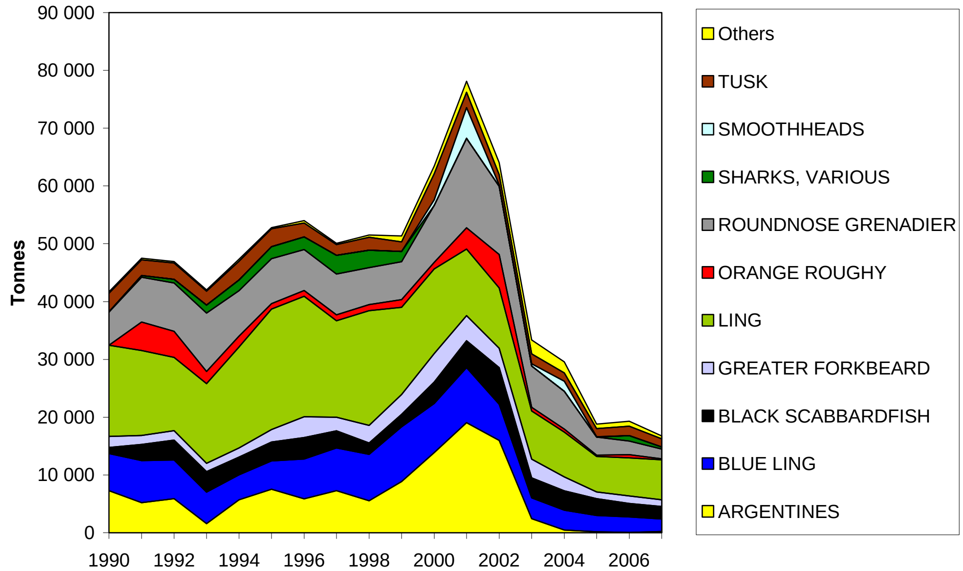


Figure 4.4.1. Landings of deepwater species from sub-areas VI and VII

Table 4.4.1. Deep-sea landings in Division VI and VII

Species	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
ALFONSINOS (Beryx spp.)	8		3	1	5	3	178	25	81	75	133	186	94	82	62	15	0	0
ARGENTINES (Argentina silus)	7294	5197	5906	1577	5707	7546	5863	7301	5555	8856	13863	19050	15985	2444	480	178	55	223
BLUE LING (Molva dypterigia)	6396	7319	6697	5471	4309	4892	6928	7361	8004	9472	8525	9534	6252	3605	3437	2839	2705	2158
BLACK SCABBARDFISH (Aphanopus carbo)	1060	2759	3436	3529	3101	3278	3689	2995	1967	2166	3712	4623	6327	3458	3355	2880	2320	2156
BLUEMOUTH (Helicolenus dactylopterus)	100	128	159	152	117	71	87	88	145	354	332	279	196	397	433	43	35	52
DEEP WATER CARDINAL FISH (Epigonus telescopus)				30	217	91	45	49	115	258	287	385	974	1075	869	684	330	219
GREATER FORKBEARD (Phycis blennoides)	1921	1574	1640	1462	1571	2138	3590	2335	3040	3430	4919	4349	3352	3257	2400	1176	1298	1163
LING (Molva molva)	15766	14684	12671	13763	17439	20856	20838	16668	19863	15087	14613	11528	10435	8321	7762	6154	6605	6937
MORIDAE		1	25							20	146	190	158	327	71	0	3	20
ORANGE ROUGHY (Hoplostethus atlanticus)	17	4908	4523	2097	1901	947	995	1039	1071	1337	1158	3692	5788	622	490	206	521	173
RABBITFISHES (Chimaerids)					2					236	355	722	573	474	433	6	24	49
ROUGHHEAD GRENADIER (Macrourus berglax)				18	5	4	13	12	10	34	10	44	19	12	13	2	75	18
ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	5730	7793	8338	10121	7860	7767	7095	7070	6364	6538	9845	15456	11777	7134	6548	3141	2360	1669
RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)	134	123	40	22	10	11	29	56	17	23	20	51	25	38	31	36	54	96
SHARKS, VARIOUS	43	254	639	1392	1864	2099	2176	3240	3023	1791	8		1				956	361
SILVER SCABBARDFISH (Lepidopus caudatus)				2						18	15		1				342	67
SMOOTHHEADS (Alepocephalidae)		31	17								978	5305	260	393	1765	45	3	
TUSK (Brosme brosme)	3216	2719	2817	2378	3233	3085	2417	1832	2240	1647	4504	2688	1794	1719	1411	1386	1601	1413
WRECKFISH (Polyprion americanus)	2	10	15				83		12	14	14	17	9	2	2			3

Table 4.4.2 Fishing effort (hours) of the French deepwater fleet, fishing effort directed to each of the four main species (defined as the sum of effort of fishing trips where each species represent more than 10% of the landings) and total fishing effort directed to the deepwater (defined as effort of fishing trips were the catch of the four species below and deepwater sharks represent more than80% of the landings). Number of vessels having more than 80% of deepwater species in their total landings.

Year	Roundnose grenadier	Black scabbardfish	Blue ling	Orange roughy	Main deepwater species	Number of vessels
1989	33 338	1 567	37 765	0	7 721	29
1990	62 119	6 299	41 130	0	8 774	28
1991	80 770	16 317	35 891	3 442	14 034	31
1992	95 679	28 829	40 184	21 993	22 731	30
1993	99 882	31 782	34 103	28 287	16 824	31
1994	96 447	29 799	26 892	24 217	21 329	35
1995	81 225	46 388	32 575	8 300	34 296	46
1996	80 526	52 575	38 810	7 365	42 896	43
1997	73 781	37 372	41 789	5 865	45 934	43
1998	71 444	24 377	44 019	5 662	36 418	40
1999	102 843	44 676	66 376	12 163	87 746	50
2000	100 800	62 179	57 350	15 272	86 309	52
2001	99 630	71 221	47 110	12 747	87 498	50
2002	86 906	66 605	47 222	7 585	82 842	47
2003	67 956	53 795	40 943	9 147	65 191	39
2004	71 056	56 122	41 364	8 894	65 596	33
2005	53 519	47 321	35 927	5 576	46 936	28
2006	43 499	37 013	31 803	8 590	33 343	33
2007*	28 885	29 170	24 976	3 234	23 340	22

(*) provisional

Table 4.4.3 Fishing effort (hours*1000kw) of the French deepwater fleet, fishing effort directed to each of the four main species (defined as the sum of effort of fishing trips where each species represent more than 10% of the landings) and total fishing effort directed to the deepwater (defined as effort of fishing trips were the catch of the four species below and deepwater sharks represent more than80% of the landings).

Year	Roundnose grenadier	Black scabbardfish	Blue ling	Orange roughy	Main deepwater species
1989	42 685	2 406	51 499	0	11 379
1990	76 162	8 982	53 397	0	12 421
1991	91 453	20 755	46 200	4 978	19 838
1992	112 285	37 211	44 534	27 698	32 251
1993	103 896	36 672	39 496	23 354	19 956
1994	93 399	33 683	31 047	21 467	25 922
1995	76 646	42 804	34 372	9 848	41 959
1996	82 085	54 400	41 690	7 716	51 637
1997	75 209	37 360	46 424	6 386	54 415
1998	69 313	23 306	44 519	5 146	39 412
1999	112 350	48 620	77 511	13 912	103 165
2000	116 728	71 130	70 743	18 139	109 697
2001	115 292	82 314	57 291	13 513	108 592
2002	100 795	73 593	58 172	6 838	100 750
2003	78 418	54 811	53 061	7 793	78 747
2004	82 432	56 896	52 442	8 293	78 525
2005	69 942	61 614	51 959	4 681	69 283
2006	49 771	40 113	41 021	5 816	44 751
2007*	33 529	34 427	32 816	2 445	33 360

(*) provisional

4.5 North Sea (IIIa and IV)

4.5.1 Fisheries overview

4.5.2 Trends in fisheries

A landings overview is shown in Figure 4.5.1. and table 4.5.1. At present, the main fisheries currently targeting deep sea species in the IIIa and IV are the following:

- By-catches of ling and tusk are taken in the U.K. demersal trawl fisheries.
- Fisheries for deep-sea shrimp (*Pandalus borealis*) carried out by Denmark, Norway and Sweden in Skagerrak and in the Norwegian Deep in the eastern part of the northern North Sea. The gears (trawls) used in these fisheries are small meshed (mesh size 35-45 mm). By-catches of deep-sea fish species, such as Anglerfish, tusk and witch flounder, are also landed. Also by-catches of Roundnose grenadier in this fishery have occasionally been landed for reduction, depending on the quantities. Introduction of sorting grids in recent years has probably reduced the amounts of some of this by-catch. Further information on these fisheries and the by-catches is found in the reports of NIPAG (NAFO-ICES Pandalus Assessment Group).
- Bottom trawl fisheries by Denmark and Norway and U.K. mainly in the northern and northeastern North Sea directed at mixed demersal species including ling, tusk and anglerfish and *Nephrops*.
- Minor fisheries in Skagerrak (IIIa) targeting witch flounder by Denmark and Sweden. Mainly trawl fisheries, but also Danish seine has been used. Further information is found in ICES WGNEW report.
- A Danish directed trawl fishery for roundnose grenadier in the deeper parts of Skagerrak was carried out by very few vessels from the 1980s up to 2006.
- A directed midwater trawl fishery for greater silver smelt, conducted mainly by Norway, in IVa.

Table 4.5.2 gives an overview of the landings by country for the area.

The fishery for roundnose grenadier in Skagerrak.

As mentioned above, minor catches of roundnose grenadier are taken as by-catch by shrimp (*Pandalus*) trawlers in IIIa (Skagerrak) and occasionally landed (mainly for reduction). However, since the 1980s a Danish directed fishery for roundnose grenadier has been conducted in the deeper part of Skagerrak. in depths of 400 – 650 meters, the geographical area of exploitation being very small constituting of only few ICES rectangles. This fishery for roundnose grenadier began in 1987 as an exploratory fishery, following exploratory efforts by Denmark and Norway for new fish resources in the 1980s. However, in Norway and Sweden directed fisheries for this species never developed.

During most of the period, up to 2002, the Danish directed fishery has mainly been conducted by the same single vessel accounting for more than 80% of the total landings. The gear (trawl) used is characterised by a mesh size < 70 mm in the codend, most often 55 mm has been recorded. Vessel sizes are around 30 m. Due to the prevailing market conditions the majority of the catch is landed for oil and meal. Almost all catches are landed in ports of Hirtshals and Skagen. In 2006 the economic value of the landings was around 225000 €.

The development of this fishery during the recent decade has been remarkable considering the small area. From a level of around 2000 t up to 2002, taken by a mainly a single vessel, total landings increased to more than 10000 t in 2005. Landing decreased, however, in 2006 to around 2300 tons due to catch restrictions following a revised EU Norway agreement. A total of only 2-3 vessels have participated significantly in the fishery during the period of peak catches, 2002-2005, see Sect.. In 2007 there was no directed fishery, not because catch restrictions or stock decline, but because the remaining one fisher retired without any successors.

4.5.3 Technical interactions

The mixed demersal trawl fisheries are directed at roundfish species (cod, saithe, ling and tusk). A considerable part of this fishery is carried out in the Norwegian Deep in the Norwegian EEZ.

The fishery for *Pandalus* is classified as a small meshed fishery and the by-catch landings are restricted by the general 10% (weight) regulation. Apart from the by-catch of the deep-sea species mentioned above, by-catches of cod, ling and saithe are common in this fishery.

The directed fishery for roundnose grenadier exploited the aggregations of this species in the deepest part of Skagerrak, and the reported by-catch in this fishery was rather insignificant, consisting of: Greater silversmelt, rabbitfish, blue ling and lantern shark.

4.5.4 Ecosystem considerations

The deep waters of division IIIa and sub-area IV are small and geographically isolated from other deep-sea areas. It is likely that the deepwater fauna in this region, such as Roundnose grenadier, constitute separate stocks to those in the North Atlantic (Bergstad 1990; Bergstad and Gordon 1994; Mauchline et al. 1994; Bergstad et al. 2003), and could therefore be particularly vulnerable to localized population depletion through heavy exploitation, see Section 10.3. There are a number sites in the north-east Skagerrak where the cold-water coral, *Lophelia pertusa* are known from and recent observations have suggested that some have been destroyed or severely damaged by trawling activities in relatively recent times (Lundälv and Jonsson, 2003). This damage was thought likely to be caused by trawling for *Pandalus borealis*.

4.5.5 Management measures

Management of fisheries in IIIa.

ICES Subdivision IIIa is shared between the EU and Norway. However, according to the tri-lateral treaty between Denmark, Norway and Sweden (Skagerrak Treaty) fishing vessels from each of the 3 countries may operate freely in each country’s waters. Normally, bi-lateral EU-Norway agreements on the shares of TACs for the exploited fish stocks are the bases for further national management of the fisheries in IIIa. The special case of the management of the Danish fishery for roundnose grenadier in IIIa and the development of this fishery in 2006 and 2007 is described in Section 4.5.2.

Management of fisheries in IV.

The North Sea is shared between the EU and Norway, and consequently the management in the EU zone are managed according to EU regulation, while the fisheries in the Norwegian zone IV are managed according to Norwegian regulations following the EU-Norway negotiations.

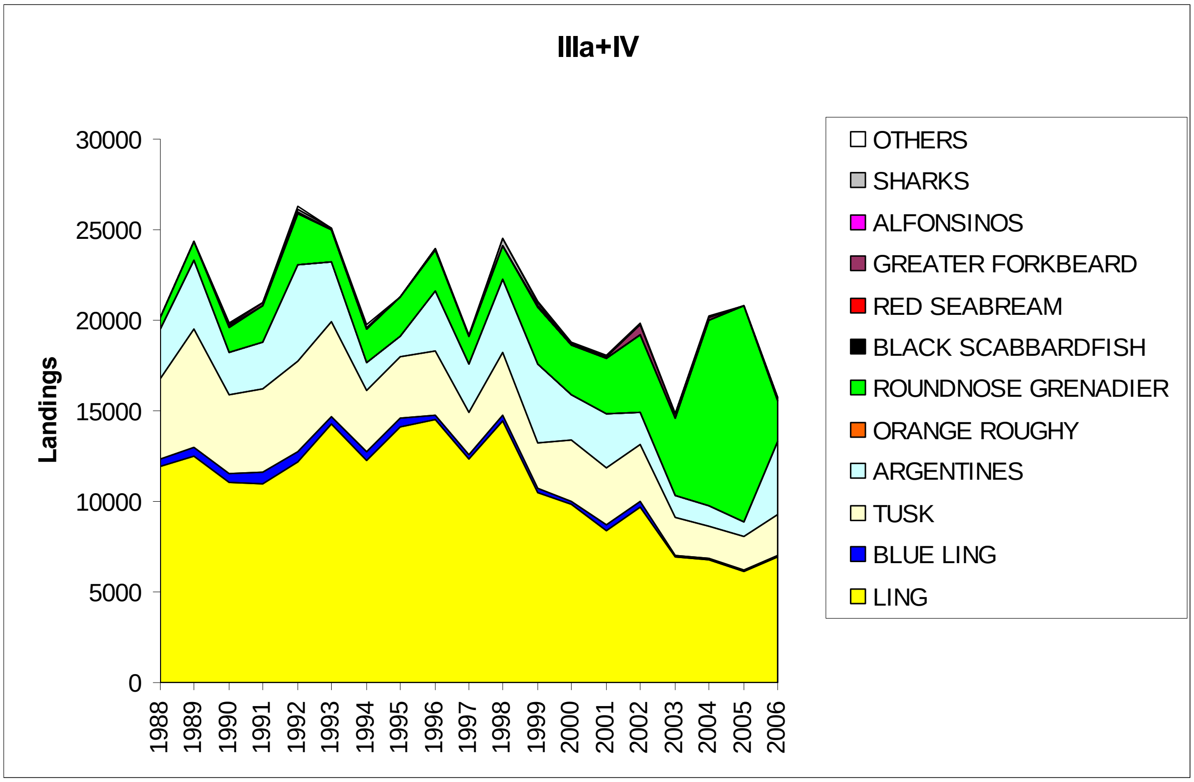


Figure 4.5.1. Overview of deep-sea species landings over 1988-2006 (tonnes).

Table 4.5.1. Deep-sea landings in Division III and IV

Species	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
ALFONSINOS (Beryx spp.)													
ARGENTINES (Argentina silus)	1082	3300	2598	3982	4319	2471	2925	1811	1166	1105	1021	4018	3438.1
BLUE LING (Molva dypterigia)	503	202	291	292	271	144	276	386	120	94	115	138	62
BLACK SCABBARDFISH (Aphanopus carbo)	2	4	2	9	7	5	12	24	4	4	2	13	1
BLUEMOUTH (Helicolenus dactylopterus)	2	2	1		8					2	0		
GREATER FORKBEARD (Phycis blennoides)	3	18	7	12	31	11	26	585	233	142	88	142	238
LING (Molva molva)	14112	14531	12325	14472	10472	9858	8396	9642	6928	6770	6653	6918	6215
MORIDAE												0	0
ORANGE ROUGHY (Hoplostethus atlanticus)											0	0	14
RABBITFISHES (Chimaerids)		14	38	56	45	33	20	24	25	40	168	14	15
ROUGHHEAD GRENADIER (Macrourus berglax)		4	5	1		4	10	3	2	1	38		0
ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	2165	2284	1533	1854	3187	2406	3121	4258	4319	10267	11942	2272	26
RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)											0	0	0
SHARKS, VARIOUS	20	14	32	359	201	36	62				16	22	31
SILVER SCABBARDFISH (Lepidopus caudatus)													
SMOOTHHEADS (Alepocephalidae)													
TUSK (Brosme brosme)	3405	3576	2341	3474	2498	3411	3204	3082	2056	1733	1839	2204	2202
WRECKFISH (Polyprion americanus)													

Table 4.5.2 Landings (t) by country, division and species in 2007 for Division IIIa and Subarea IV.

Contry	Division	Greater Silver smelt	Blue Ling	Ling	Roundnose Grenadier	Tusk	Witch Flounder	Lantern sharks	Rabbitfish	Sharks	Greater forkbeard	Others
DK	III a	0.0	0.0	81.7	0.1	1.3	617.7	0.0	0.2			
	IV a	338.0	4.8	411.8	0.0	94.9	329.6	9.9	0.4			94.9
	IV b	0.0	0.0	41.7	0.0	0.6	205.8	0.0	0.0			
	IV c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
UK-e+w												
	IVa			30.5		5.9						
	IVb			20.1						0.7		
	IVc											
UK-scot												
	IVa		0.0	1314.8		84.0			0.1	18.0	1.5	
	IVb			6.0						2.0		
	IVc											
FRO												
	IVa			0.2								
	IVb											
	IVc											
NOR												
	IIIa	0.0	0.4	67.9	0.0	19.1			2.1			
	IVa	3100.4	54.8	4108.9	1.1	1973.3			13.4		234.8	
	IVb	0.0		48.4		6.2			0.0		1.1	
	IVc											
FRA												
	IVa		1.5	81.3	10.2	17.3			3.3		0.6	
	IVb		0.6	1.2	14.7				0.0			
	IVc			0.0								
		3438.1	61.9	6214.6	26.1	2202.2	1315.4	9.9	15.5	40.6	238.0	56.6

4.6 Stocks and fisheries of the South European Atlantic Shelf

4.6.1 Fisheries overview

In ICES Subarea VIII there are two main **Spanish fishing fleets** defining the fisheries:

- ✓ The trawl fishery targets species such as hake, megrim, anglerfish, and *Nephrops* but also has variable by-catch of deepwater species. These include *Molva spp*., *Phycis phycis*, *Phycis blennoides*, *Conger conger*, *Helicolenus dactylopterus*, *Polyprion americanus*, *Beryx spp* and *Pagellus bogaraveo*.
- ✓ Longline fishery mainly targets deepwater species on conger, greater forkbeard, deepwater sharks and ling.

The **French trawler fishery** mainly target demersal and pelagic species on the shelf with a small by-catch of deep-water species such as bluemouth and greater forkbeard. To the north of sub-area VIII, **a small handline fishery** targeting mainly bass and pollack (Pollachius pollachius) has a by-catch of red(blackspot) seabream. In recent years, some landings of orange roughy caught to the north or sub-area VIII have occured, from artisanal trawlers targetting this species. This activity was stopped due to low quota.

In ICES Subarea IX on the contrary there is a main directed **Portuguese longline fishery** for black scabbard fish (*Aphanopus carbo*) with a bycatch of the deepwater sharks, and also and **Spanish longline** (Voracera) fishery for *Pagellus bogaraveo*. There is also a bottom trawl fishery at the southern part of the Portuguese continental coastal, targeting crustaceans some on deeper grounds such as *Nephrops norvegicus* and *Aristeus antennatus*. Typical by-catches species of this fishery are: bluemouth (*Helicolenus dactylopterus*), greater forkbeard (*Phycis blennoides*), conger eel (*Conger conger*), blackmouth dogfish (*Galeus melastomus*), kitefin shark (*Dalatias licha*), and gulper shark (*Centrophorus squamosus*).

There has been a small expansion of UK (England and Wales) gillnet fisheries into Subareas VIII and IX. In Subarea VIII but landings are on a small scale.

4.6.2 Trends in fisheries

Although since 1988 from six to seventeen deep species are usually landed historically in areas VIII and IX, the catches of *Aphanopus carbo* (45,3%) *Lepidopus caudatus* (20,7%) *Pagellus bogaraveo* (11,1%), *Molva molva* (10,4%), *Phycis blennoides* (4,8%), *Polyprion americanus* (3,5%) and *Beryx spp*.(1,5%) represent on average the 98 % of otal Subarea VIII and IX landings.

Since 1988 on average 7196 ton of these species are landed from these subareas, but in last 8 years this amount has been never reached (Table 4.6.1). In 1995 an important peak of 12678 ton is observed due to an increase of *L. caudatus* landings in Subarea IX.

Other deep species as *Conger conger* have been landed in last years by Spanish longline and trawlers in VIII and Portugal trawlers in IX, in comparable amounts to *Aphanopus carbo* landings in Subarea IX.

Black scabbardfish (*Aphanopus carbo*) *and* silver scabbardfish (*Lepidopus caudatus*)

*Aphanopus carb*o and *Lepidopus caudatus* are the main species landed in both subareas combined, but it is worthy of remark that most of *A. carbo* and *L. caudatus* landings come from Subarea IX. Landings of Black scabbard fish never has been lower than

2500 tons/year, and in 1993 reached its higher value (4524 tons). Since this year the trend indicates a decrease until 2002, and after this year the average landings have been 2834 ton/year.

The trend of Silver scabbard fish landings is very variable along the period 1988-2006. Landings have been often lower than 2500 tons, except in 1995 in which 5672 tons were reached. In 2000 only 16 tons are recorded but in 2006 the landings of this species were increased up to 620 ton and 654 ton in 2007 (Figure 4.6.1).

Red Seabream (*Pagellus bogaraveo*) and Ling (*Molva molva*)

Since the collapse of the Bay of Biscay stock in the early 1980's, the main landings of Red seabream come from Subarea IX (82% on average). From 1988 to 1998 the landings rank between 800 and 1000 tons, but, from 1999 to 2006 the total landings have been always below 700 ton, but in 2007 the landings have been increase to 745 ton

Almost the 100% of total landings of ling come from Subarea VIII. The series shows a continuous decrease of catches from 1991 to 1994. Since this year a clear increase is observed and in 1998 the peak of the series (1799 tons) is raised. However from 1999 to 2007 landings of this species have been decreased strongly (Figure 4.6.1).

Geater forkbeard (*Phycis blennoides*), Wreckfish (*Polyprion americanus*) and Alfonsinos (*Beryx spp*.)

Since 1997 the 85% of Greater forkbeard landings belongs to Subarea VIII. The landings in the combined areas show a clear increase from 1988 to 1998. From this year to 2006 the reported data rank between 400 and 600 tons/year but in 2007 a important decrease can be observed reaching only 197 ton.

The wreckfish landings don't not show a clear trend, in 1994 shows a peak of 440 ton but since this year the trend in landings is negative until 2004. Since this year the werckfish shows a important increase in the landings, reaching the peak of the series with 504 ton.

The most important landings of Alfonsinos in Subareas VIII and IX ware recorded in 1995. Although a noticeable decline in catches is recorded in 2003, from 1995 to 2005 an increase of landing trends is observed. Landings in 2007 decreased up to 75 ton, one of the lowest levels of the series (Figure 4.6.1).

Deep-Water red crab (*Chaceon spp*.)

For this species there are no historical landings in Subareas VII and IX until 2006. In this year the level of landings in Subarea VIII reached 22 tons and 283 tons in Subarea IX and 7 and 76 tons in 2007 respectivley. In 2006. The main by-catch of this new fishery in 2006 were the deep-water sharks, but on the contrary, in 2007 any catches of these species were reported.

4.6.3 Technical interactions

The new small England and Wales gillnet fisheries fishing deep-water crabs and sharks in Subareas VIII and IX are probably the consequence of the displacement of gillnet effort as result of the 2006 gillnet ban in depths greater than 600 m in ICES Subareas VI and VII. These fisheries are still active in 2007 but the level of catches are much lower than in 2006

An update of information of gear interaction of Spanish fleet and new information on UK (E & W) fishing deep-water species during the period 2005-2007 is shown in Tables 4.6.2, and 4.6.3 respectively.

4.6.4 Ecosystem considerations

Chaceon affinis is normally found on seamounts and escarpments at depths over 500 m., and has already been shown to be vulnerable in certain areas of the Atlantic.

Deep water conditions are more conducive to net loss, and there is strong evidence of net dumping and significant levels of ghost fishing in the deep water north east Atlantic fishery for monkfish. There is a need to evaluate the scale of this problem in Subareas VIII and IX.

In Subarea VIII there are historic records of impacts on deepwater ecosystems, in particular corals (Joubin 1922).

4.6.5 Management measures

TACs for orange roughy are set at low levels in sub-area VIII. TAC for black-scabbardfish is 3000t for sub-areas VIII, IX and X which is mainly allocated to Portugal. There is a similar situation for *Beryx* sp. TACs for roundnose grenadier, deep-water sharks and alfonsino are combined with other areas.

The ban on deep-water gill netting in depths greater than 600m does not apply to sub-areas VIII and IX. There are no TACs or quotas for Deep-water crab in sub-areas VIII and IX.

Table 4.6.1. Overview of landings in Sub-Areas VIII & IX.

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
ALFONSINOS (*Beryx spp.*)			1		1		2	82	88	135	269	201	167	229	237	109	280	191	94	75
ARGENTINES (*Argentina silus*)															191	37	23	202		1
BLUE LING (*Molva dypterigia*)										14	33	4	4	6	29	22	22	61	351	43
BLACK SCABBARDFISH (*Aphanopus carbo*)	2602	3473	3274	3979	4398	4524	3434	4272	3689	3555	3152	2752	2404	2767	2725	2664	2502	2770	2726	3507
BLUEMOUTH (*Helicolenus dactylopterus*)		2	5	12	11	8	4			1	3	29	33	34	18	124	135	206	279	356
DEEP WATER CARDINAL FISH (*Epigonus telescopus*)												3	5	4	8	5	10	9	11	4
GREATER FORKBEARD (*Phycis blennoides*)	81	145	234	130	179	395	320	384	456	361	665	377	411	494	489	422	482	337	316	197
LING (*Molva molva*)	1028	1221	1372	1139	802	510	85	845	1041	1034	1799	451	331	577	439	450	527	487	355	541
MORIDAE								83	52	88			26	20	8	12	11	15	9	5
ORANGE ROUGHY (*Hoplostethus atlanticus*)	0	0	0	0	83	68	31	7	22	24	15	40	52	20	20	31	43	27	43	2
RABBITFISHES (*Chimaerids*)												2	2	7	6	2	6	5	10	
ROUGHHEAD GRENADIER (*Macrourus berglax*)																			3	
ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*)			5	1	12	18	5		1		20	16	5	7	3	2	2	7	28	20
RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*)	826	948	906	666	921	1175	1135	939	1001	1036	981	647	691	553	489	560	574	584	656	745
SILVER SCABBARDFISH (*Lepidopus caudatus*)	2666	1385	584	808	1374	2397	1054	5672	1237	1725	966	3069	16	706	1832	1681	854	526	620	654
SMOOTHHEADS (*Alepocephalidae*)										7										
TUSK (*Brosme brosme*)	1										1								1	
WRECKFISH (*Polyprion americanus*)	198	284	163	194	270	350	410	394	294	222	238	144	123	167	156	243	141	196	333	504
DEEP WATER RED CRAB (*Chaceon spp*)*																			305	83
LESSER SILVER SMELT (*Argentina sphiraena*)**																131	189	223	264	180

* new species included for the WG2007

** new species included for the WG2008

Table 4.6.2. Quantitative description of fishing gears and deepwater species interaction of Spanish fleets in Subareas VIII and IX.

		2005		2006*		2007*				2005		2006*		2007*	
Species	Gear	VIII	IX	VIII	IX	VIII	IX	Species	Gear	VIII	IX	VIII	IX	VIII	IX
Molva molva	Hooks and (long)lines	47	0	48	0	60	0	*Beryx spp*	Hooks and (long)line	21	0	26	2	149	0
	Gillnets	16	0	8	0	25	0		Gillnets	35	0	13	0	42	0
	Bottom trawl	12	0	17	0	27	0		Bottom trawl	19	0	7	1	9	0
	Others	66	0	0	0	0	0		Others	62	6	1	2	0	3
Molva dypterygia	Hooks and (long)lines	3	0	4	0	4	0	*Macrourus berglax*	Hooks and (long)line	0	0	0	0	0	0
	Gillnets	7	0	8	0	9	0		Gillnets	0	0	0	0	0	0
	Bottom trawl	14	8	12	3	3	1		Bottom trawl	0	0	0	0	3	0
	Others	23	0	0	0	0	0		Others	0	0	0	0	0	0
Brosme brosme	Hooks and (long)lines	0	0	0	0	0	0	*Mora moro*	Hooks and (long)line	9	0	0	0	9	0
	Gillnets	0	0	0	0	0	0		Gillnets	0	0	0	0	0	0
	Bottom trawl	0	0	0	0	0	0		Bottom trawl	0	0	0	0	0	0
	Others	0	0	0	0	0	0		Others	0	0	1	0	0	0
Argentina silus	Hooks and (long)lines	0	0	0	0	0	0	*Chimaera monstrosa*	Hooks and (long)line	0	0	0	0	0	0
	Gillnets	0	0	0	0	0	0	*& Hydrolagus spp.*	Gillnets	0	0	0	0	0	0
	Bottom trawl	0	0	0	0	0	0		Bottom trawl	0	0	0	0	0	0
	Others	0	0	0	0	0	0		Others	0	0	0	0	0	0
Hoplostethus atlanticus	Hooks and (long)lines	0	0	0	0	0	0	*Alepocephalus bairdii*	Hooks and (long)line	0	0	0	0	0	0
	Gillnets	0	0	0	0	0	0		Gillnets	0	0	0	0	0	0
	Bottom trawl	0	0	0	0	0	0		Bottom trawl	0	0	0	0	0	0
	Others	0	0	0	0	0	0		Others	0	0	0	0	0	0
Coryphaenoides rupestris	Hooks and (long)lines	0	0	0	0	0	0	*Polyprion americanus*	Hooks and (long)line	15	0	2	1	13	0
	Gillnets	0	0	0	0	0	0		Gillnets	0	0	0	0	0	0
	Bottom trawl	0	0	1	0	0	0		Bottom trawl	0	1	0	2	1	1
	Others	0	0	0	0	0	0		Others	0	5	0	6	4	7
Aphanopus carbo	Hooks and (long)lines	0	0	0	0	0	0	*Helicolenus dactylopterus*	Hooks and (long)line	4	8	6	18	2	4
	Gillnets	0	0	0	0	0	0		Gillnets	3	0	1	1	7	1
	Bottom trawl	1	0	0	0	1	0		Bottom trawl	33	81	44	62	11	85
	Others	0	0	0	0	0	0		Others	8	3	3	5	0	6
Pagellus bogaraveo	Hooks and (long)lines	44	334	28	369	50	253	*Lepidopus caudatus*	Hooks and (long)line	0	449	0	563	0	627
	Gillnets	6	0	7	0	4	0		Gillnets	0	0	0	0	0	0
	Bottom trawl	16	2	21	4	28	4		Bottom trawl	0	0	0	51	0	0
	Others	24	29	1	66	0	41		Others	0	59	0	0	0	140
Phycis spp	Hooks and (long)lines	148	0	80	1	242	0	*Epigonus telescopus*	Hooks and (long)line	2	0	0	0	3	0
	Gillnets	8	0	21	1	28	0		Gillnets	0	0	0	0	2	0
	Bottom trawl	97	39	84	26	112	32		Bottom trawl	0	0	0	0	0	0
	Others	0	18	0	40	0	30		Others	0	0	0	0	0	0

Table 4.6.3. Quantitative description of fishing gears and deepwater species interaction of England and Wales fleets in Subareas VIII and IX.

Species	Gear	2005 VIII	2006 VIII	2006 IX	2007 VIII	2007 IX
Alfonsino (Beryx)	Nets		3			
Bairds Smoothhead	Nets		14			
Birdbeak dogfish	Nets		0	4		
Bluemouth redfish	Nets		8		1	
Conger eels	Bottom trawl	1				
	Lines	76	72		53	
	Nets	1	2		1	
Deepwater red crab	Nets		22	283	7	56
	Pots			6	0	20
Dogfish (scyliorhinidae)	Bottom trawl	3				
Greater forkbeard	Bottom trawl	0				
	Lines	0				
Gulper shark	Nets		0	9		
Kitefin shark	Nets		0	4		
Leafscale gulper shark	Nets		2	3		
Ling	Bottom trawl	0				
	Lines	17	30		4	0
	Nets	1	15		6	0
Livers and oils	Lines					
	Nets		3	31		
	Pots			1		
Longnose velvet dogfish	Lines			13		
	Nets		17	82	0	1
Portuguese dogfish	Lines			1		
	Nets		1	17	2	0
Sea breams	Lines		0			
	Nets		0			
Wreckfish	Nets				1	
Unidentified sharks	Nets		1	1		

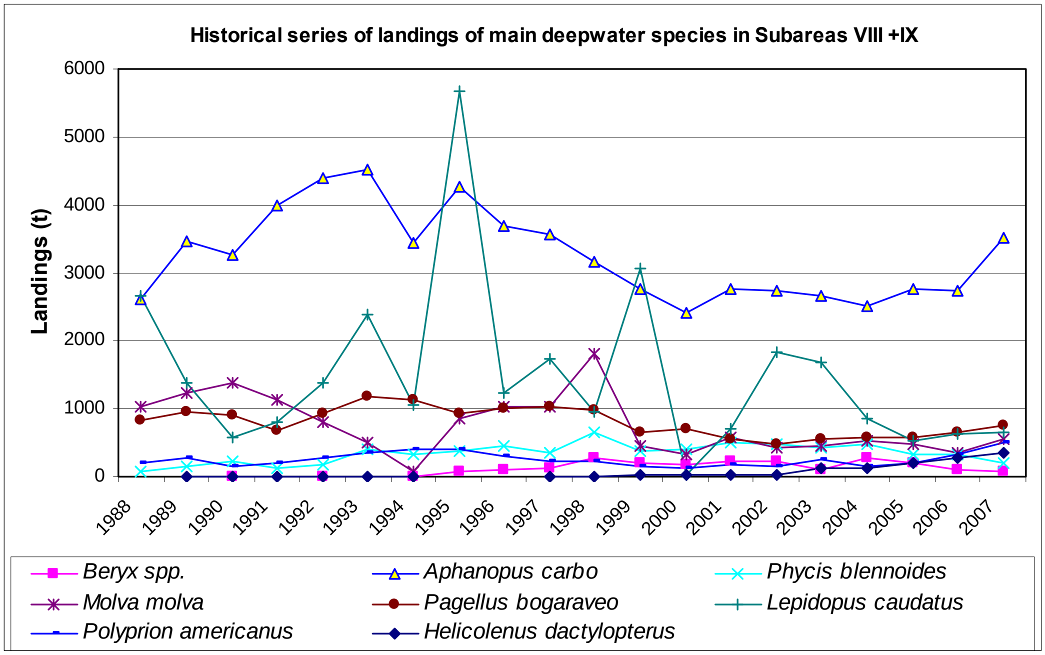


Figure 4.6.1. Historical series of seven main species landed in combined Subareas VIII + IX since 1988.

4.7 Stocks and fisheries of the Oceanic northeast Atlantic

4.7.1 Fisheries overview

The Mid-Atlantic Ridge (MAR) is the spreading zone between the Eurasian and American plate. The ridge is continually being formed as the two plates spread at a rate of about 2 cm/year. In the Ices area it extends over 1500 nautical miles from the Iceland to the Azores crossing the Azores archipelago between the Western and central islands groups. It is characterised by a rough bottom topography comprising underwater mountain chains, a central rift valley, recent volcanic terrain, fracture zones, and seamounts. In these areas two different type of fisheries occurs. Industrial oceanic fisheries in the central region and northern parts of the Mid-Atlantic ridge. There is an artisanal fishery inside the Azorean EZZ and this is targeted at stocks which may extend south of the ICES Area.

This section deals with fisheries on the Mid Atalntic Ridge and the Azores.

4.7.1.1 Azores EEZ

The Azores deep-water fishery is a multispecies and multigear fishery. The dynamic of the fishery seems to be dominated by the main target species *Pagellus bogaraveo*. However, others commercially important species are also caught and the target species change seasonally according abundance, species vulnerability and market.

The fishery is clearly a typical small scale one, where the small vessels (<12m; 90% of the total fleet) predominate, using mainly traditional bottom longline and several types of hand lines. The ecosystem is a seamount type with fishing operations occurring in all available areas, from the islands coasts to the seamounts within the Azorean EEZ. The fishery takes place at deeps until 1000 m, catching species from different assemblages, with a mode on the 200-600 m strata, the intermediate strata where the most commercially important species occur.

4.7.1.1.1 Trends in fisheries

Since mid-nineties the landings of deep water species show a decreasing tendency (Figure 4.7.1, Table 4.7.1), reflecting the change in the fleet behaviour, that has since started to target on blackspot seabream.

Since 2000, the use of bottom longline in the coastal areas has significantly been reduced, as a result of the interdiction by the local authorities of the use of longlines in the coastal areas on a range of 3 miles from the islands coast. As a consequence, the smaller boats that operate in this area have changed their gears to several types of handlines, which may have increased the pressure on some species. The deep water bottom longline is at present mostly a seamount fishery.

Also in one other fleet component, the medium size boats, ranging from 12 to 16 meters, a change from bottom longline to hand lines has been observed during the last 5 or 6 years. All this changes in the fishing pattern of the fleet may explain the changes in the landings of some species that were more vulnerable to the use of bottom longlines.

4.7.1.1.2 Technical interactions

The reported by-catch in this fishery seems rather insignificant, according to a pilot study conducted in 2004 (ICES, 2006). Fisheries occurring outside the ICES area to the south of the Azores EEZ may be exploiting the same stocks as considered here.

4.7.1.1.3 Ecosystem considerations

The Azores are considered a "seamount ecosystem area" because of its high seamount density. The Azores, as most of the volcanic islands don't have a coastal platform and are surrounded by extended areas of great depths, punctuated by some seamounts where the fisheries occur. The average depth in the Azores EEZ is of 3000 meters, and only 0.8% (7715 km^2) has depths less than 600 meters while 6.8% are between 600 and 1500 meters. The deep water fishery in the Azores is mostly a seamount fishery where only bottom longlines and hand lines are used.

4.7.1.1.4 Management of fisheries

The only known deep water fisheries in ICES Sub-div. Xa are those from the Azores. The fisheries management is based on regulations issued by the European Community, by the Portuguese government and by the Azores regional government. Under the E. C. Common Fisheries Policy, TAC's where introduced for some species, e.g. blackspot seabream, black scabbardfish, and deep-water sharks, in 2003 (EC. Reg. 2340/2002) and maintained in 2004 (EC. Reg. 2270/2004) and 2006 (EC. Reg. 2015/2006). A specific access requirements and conditions applicable to fishing for deep-water stocks was established (EC. Reg 2347/2002). Fishing with trawl gears is forbidden in the Azores region. A box of 100 miles limiting the deep-water fishing to vessels registered in the Azores was created in 2003 under the management of fishing effort of the common fishery policy for deep-water species (EC. Reg. 1954/2003). Some technical measures were also introduced by the Azores regional government since 1998 (including fishing restrictions by area, vessel type and gear, fishing licence based on landing threshold and minimum lengths).

In order to reduce effort on traditional stocks, fishermen are encouraged by local authorities to exploit the deeper strata (>700m), but the poor response of the market has been limiting the expansion of the fishery.

4.7.1.1.5 Mid-Atlantic Ridge

The Northern Mid-Atlantic Ridge (MAR) is a huge area located between Iceland and Azores. There are more then 40 seamounts of commercial importance (Table 4.7.2). The deepwater fishery on the MAR started in 1973, when dense concentrations of roundnose grenadier (*Coryphaenoides rupestris)* were discovered. Later aggregations of alfonsino *(Beryx splendens)*, orange roughy *(Hoplostethus atlanticus)*, cardinal fish *(Epigonus telescopus)*, tusk (*Brosme brosme*) and blue ling (*Molva dypterigia)* were found. Trawl and longline fisheries were conducted in Subareas XII, X, XIV and V (Figure 4.7.2) by Russian, Iceandic, Faroese, Polish, Latvian and Spanish vessels.

4.7.1.2 Trends in fisheries

The greatest annual catch of roundnose grenadier (almost 30,000 t) in that area was taken by the Soviet Union in 1975, fluctuating in subsequent years between 2,800 to 22,800 t. The fishery for grenadier declined after the dissolution of the Soviet Union in 1992. In the last 15 years, there has been a sporadic fishery by vessels from Russia (annual catch estimated at 200–3,200 t), Poland (500–6,700 t), Latvia (700–4,300 t) and Lithuania (data on catch are not available). Grenadier has also been taken as bycatch in the Faroese orange roughy fishery and Spanish blue ling fishery. During the entire fishing period to 2006, the catch of roundnose grenadier from the northern MAR amounted to more then 232,000 t, mostly from ICES Sub-area XII.

The deep-water fisheries off Iceland tend to be on the continental slopes although a short-lived fishery on spawning blue ling (*Molva dypterygia*) was reported on a "small steep hill" at the base of the slope near the Westman Islands. The fishery began in 1979, peaked at 8,000 t in 1980 and subsequently declined rapidly. French trawlers found small seamount in southerly areas of the Reykjanes Ridge and were fishing for blue ling there in 1993 with 390 t of catch. Maximum Icelandic catch in that area was more 3,000 t also in 1993, it declined sharply to 300 and 117 t for next two years and no fishery was reported later. Fishery on the seamount resumed by Spanish trawlers in 2000s with biggest catch about 1,000 t.

Orange roughy occurs in restricted areas of the Reykjanes Ridge, where it can be abundant on the tops and the slopes of narrow underwater peaks. These are generally difficult to fish, although in 1991 a single trawler made some noteworthy catches of orange roughy off the south coast of Iceland. In 1992 the Faroe Islands began a series of exploratory cruises for orange roughy beginning in their own waters and later extending into international waters. Exploitable concentrations were found in late 1994 and early 1995. Several vessels began a commercial fishery but only one vessel managed to maintain a viable fishery. Most of the fishery took place on 5 banks. In the northern area (ICES Sub area XII) catches peaked in 1995-1998 (570-802 t), and since then have generally been less than 300 t. Catches from 6 to 470 t per annum were also made in ICES Sub-area X in 1996-1998, 2000-2001 and 2004-2006.

In 1983-1987, dives with a Soviet submersible discovered aggregations of tusk and northern wolffish (*Anarhichas denticulatus)* on the Northern MAR seamounts, and a bottom longline fishery subsequently developed. Catches of tusk were taken on 20 seamounts in the area between 51-57° N. The highest catch rates were on a seamount named Hekate, with 813 kg per 1000 hooks.

In 1996 a small fleet of Norwegian longliners began a fishery for 'giant' redfish (ocean perch *Sebastes marinus*) and tusk on the Reykjanes Ridge. The fishery was mainly conducted close to the summits of seamounts and a new type of vertical longline was developed for the fishery. The fishery continued in 1997, but experienced an 84% decrease in CPUE. Norway carried out two exploratory longline surveys in 1996 and 1997. Fishery in that area was resumed in 2005-2006 by Russian longliners.

Spain carried out 5 limited exploratory trawl surveys to seamounts on the MAR between 1997-2000 and a longline survey in 2004 but except for sporadic fisheries in the northern area (ICES Division XIVb) there has been a decline in interest.

The first commercial catches of alfonsino in this area were taken by pelagic trawling on the Spectr seamount in 1977 and this and other seamounts were exploited in 1978 and 1979. No commercial fishing took place during the 1980s but 9 exploratory and research cruises yielded about 1000 t of mixed deepwater species, mostly alfonsino, but also commercial catches of cardinal fish, orange roughy, black scabbardfish and silver roughy (*Hoplostethus mediterrraneus)*. A joint Russian-Norwegian survey in 1993 used a bottom trawl to survey three seamounts and a catch of 280 t, mainly alfonsino and cardinal fish, was taken from two of them. Orange roughy, black scabbard fish and wreckfish *(Polyprion americanus)* were also of commercial importance. Commercial fishing yielded more than 2,800 t over the next 7 years. In recent years there have been no indications of fishable concentrations of alfonsino. Since the discovery of the seamounts in the North Azores area Soviet and Russian vessels have taken about 6,000 t, mainly of alfonsino. Vessels from the Faroe Islands and the U.K have also small catches of the species in the area.

4.7.1.2.1 Technical interactions

The possible interactions between local fishing grounds (e.g seamounts) and the status of the stocks at larger scale are unknown. In particular, seamount aggregating species such Alfonsinos and orange roughy are sensitive to sequential local depletion. However, no data were available to assess such effects. Little is understood about the stock structure of these species and it is possible that the industrial fleets fishing on the Mid-Atlantic Ridge may be fishing the same stocks that are exploited by the Azorean fishery.

The separation of fishing activities and catch on the Mid-Atlantic Ridge and Hatton Bank have been problematic as both these areas are parts of ICES sub-area XII. The Spanish fishery on the Hatton bank is not known to operate of the Mid-Atlantic Ridge. However, this fishery is operated by large high-sea freezer trawlers that also fish in the North west Atlantic (NAFO area) and could therefore do some fishing also on the northern Mid-Atlantic Ridge. The Spanish fishery produces only small landings of aggregating seamount species (orange roughy, alfonsinos) and target mainly roundnose grenadier. Therefore it is unlikely to interact with fisheries in the southern Mid-Atlantic Ridge and other fisheries for roundnose grenadier. Landings of non-aggregating species (mainly roundnose grenadier) on the northern ridge have been small over recent years.

4.7.1.2.2 Ecosystem considerations

Most of Divisions XIIa, XIIc, Xb, XIVb1, Va are covered in abyssal plain with an average depth of >ca 4000m which currently remains largely unexploited. The major topographic feature is the Northern part of the Mid-Atlantic Ridge, located between Iceland and the Azores. Numerous seamounts of variable heights occur all long this ridge along with isolated seamounts in other areas such as Altair and Antialtair. The physical structure of seamounts often amplify water currents and create unique hard substrata environments that are densely populated by filter-feeding epifauna such as sponges, bivalves, brittle stars, sea lilies and a variety of corals such as the reef-building cold-water coral *Lophelia pertusa*. This benthic habitat supports elevated levels of biomass in the form of aggregations of fish such as orange roughy, alfonsinos etc and a number of seamounts have been targeted by commercial fleets. Such habitats are however highly susceptible to damage by mobile bottom fishing gear and the fish stocks can be rapidly depleted due to the life-history traits of the species which are slow growing and longer-living than non-seamount species.

The MAR is isolated from the continental slope except for the relatively continuous shallower connections via the Greenland and Scotland ridges, and some seamount chains, e.g. the New England seamounts provide other linkages to the continents. Along with much of the general biology, the intraspecific status of species inhabiting the MAR is unclear. Based on geographical patterns it is probable that MAR stocks are isolated from the others in the North Atlantic and endemism, especially amongst benthic species may be high and therefore particularly vulnerable.

The recent efforts to study the distribution and biology of the MAR through the MAR-ECO project will yield a better insight into the status of this remote eco-system (http//:www.mar-eco.no).

4.7.1.2.3 Management of fisheries

EC vessels fishing on the Mid-Atlantic Ridge are covered by community TAC. There are NEAFC regulation of efforts in the fisheries for deepwater species and closed area to protect vulnerable habitats.

Table 4.7.1. Overview of landings in Sub-Areas X and XII

Species	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
ALFONSINOS (Beryx spp.)	631	550	983	229	175	229	199	242	172	139	4.933	192	211
ARGENTINES (Argentina silus)		1			2					4			
BLUE LING (Molva dypterigia)	602	814	438	451	1363	607	675	1270	1069	644	34.75	64.76	0.966
BLACK SCABBARDFISH (Aphanopus carbo)	304	455	203	253	224	357	134	1062	502	384	197.5	73.41	0.131
BLUEMOUTH (Helicolenus dactylopterus)	589	483	410	381	340	452	301	280	338	282		209	275
DEEP WATER CARDINAL FISH (Epigonus telescopus)						3		14	16	21		10.3	6.6
GREATER FORKBEARD (Phycis blennoides)	75	47	32	39	41	100	91	63	56	46	1.139	134	201
LING (Molva molva)	50	2	9	2	2	7	59	8	19		2.036	0.018	0.108
MORIDAE						1	88	113	140	91		127	86
ORANGE ROUGHY (Hoplostethus atlanticus)	676	1289	814	806	441	447	839	28	201	711	324.2	103.5	19.69
RABBITFISHES (Chimaerids)			32	42	115	48	79	98	81	128	193.3		
ROUGHHEAD GRENADIER (Macrourus berglax)					3	7	10	7	2	28	8	8	
ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	644	1739	8622	11979	9696	8602	7926	11468	10805	10748	513.3	86.39	2.219
RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)	1096	1036	1012	1114	1222	947	1034	1193	1068	1075		958	1070
SHARKS, VARIOUS	1385	1264	891	1051	50	1069	1208					104	62.57
SILVER SCABBARDFISH (Lepidopus caudatus)	789	815	1115	1186	86	28	14	10	25	29			31
SMOOTHHEADS (Alepocephalidae)		230	3692	4643	6549	4146	3592	12538	6883	4368	6872		
TUSK (Brosme brosme)	18	158	30	1	1	5	52	27	83	16	66.26	64.07	19
WRECKFISH (Polyprion americanus)	240	240	177	139	133	268	229	283	270	189		497	664
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007

Table 4.7.2. Summary data on seamount fisheries on the MAR

Main species	Discovery		No. of commercial seamounts	Maximum catch/yr ('000 t)
	Year	Country		
Coryphaenoides rupestris	1973	USSR	34	29.9
Beryx splendens	1977	USSR	4	1.1
Hoplostethus atlanticus	1979	USSR	5	0.8
Molva dypterigia	1979	Iceland	1	8.0
Epigonus telescopus	1981	USSR	1	0.1
Aphanopus carbo	1981	USSR	2	1.2?
Brosme brosme	1984	USSR	15	0.3
Sebastes marinus (giant)	1996	Norway	10	1.0

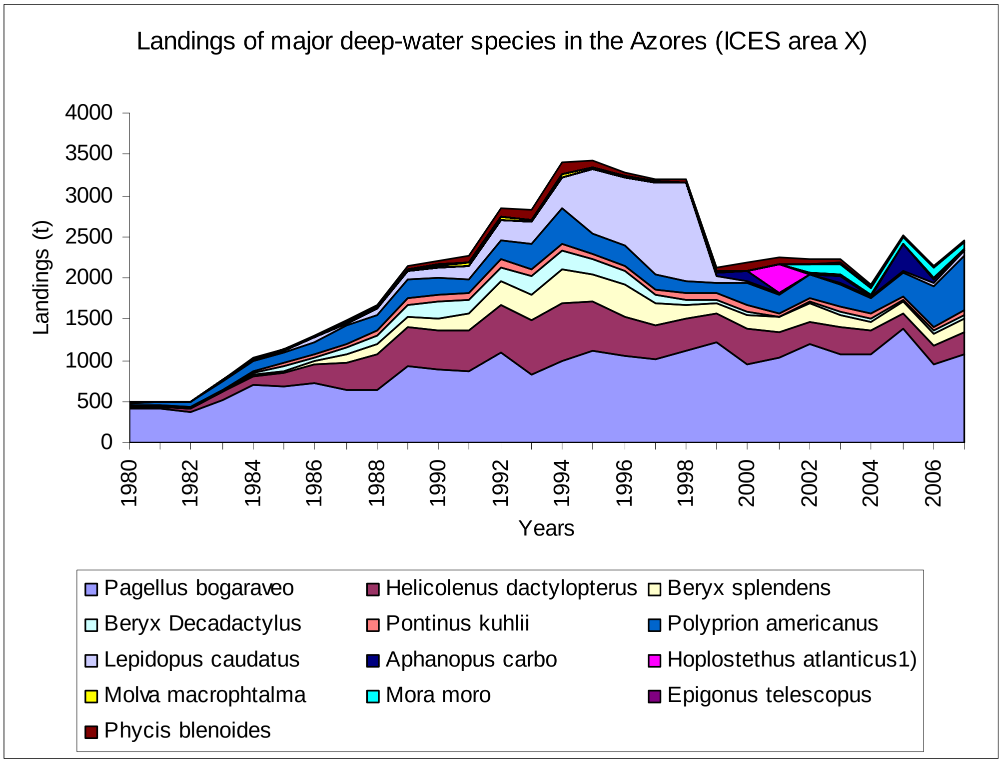
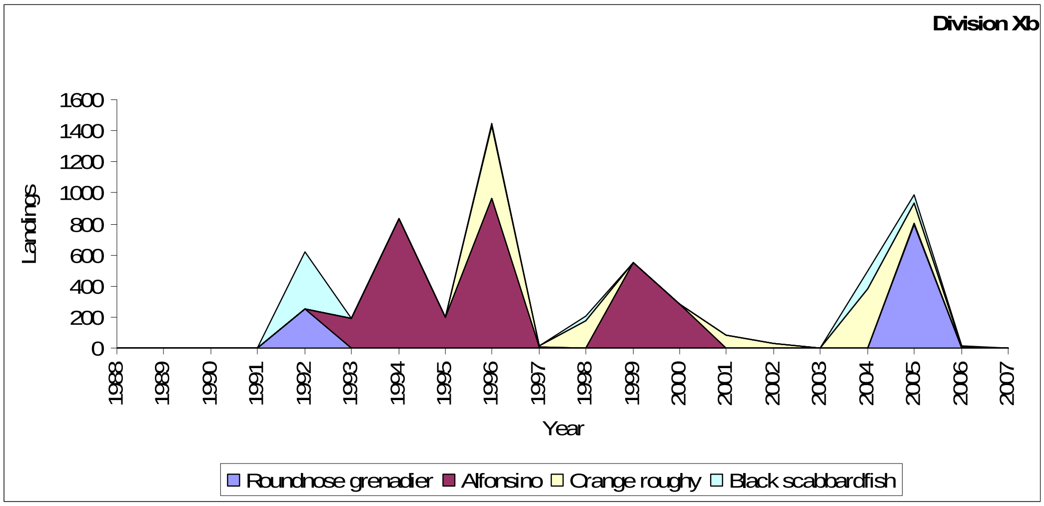
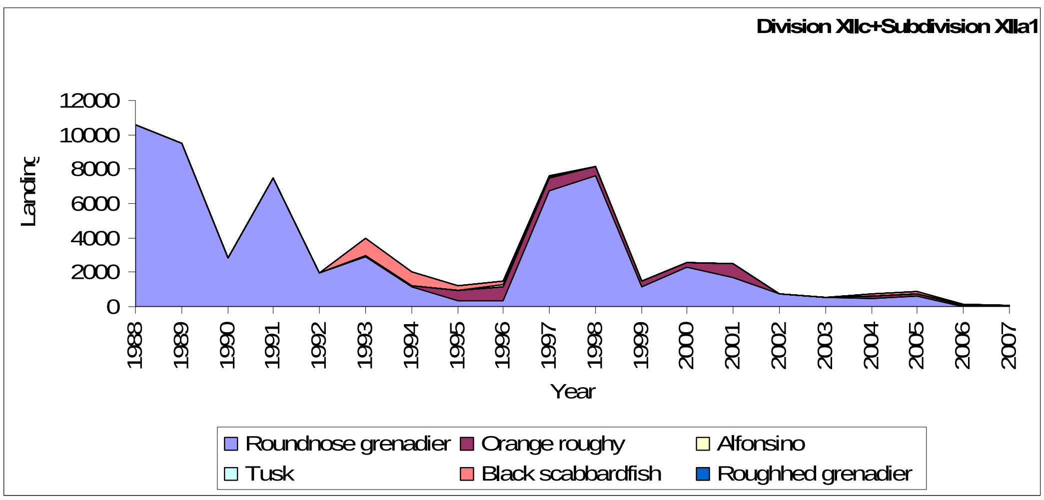


Figure 4.7.1. Annual landings of major deep water species in Azores from hook and line fishery (1980-2007).





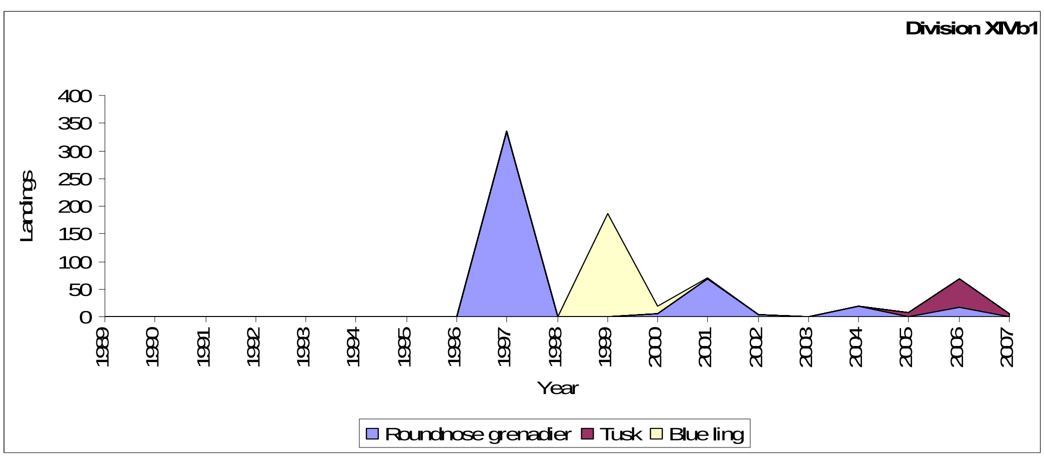


Figure 4.7.2. Annual catch of major deep water species on MAR in 1988-2007.

5 Ling (*Molva molva*) in the Northeast Atlantic

5.1 Stock Description and management units.

WGDEEP 2006 indicated – *'There is currently no evidence of genetically distinct populations within the ICES area. However, ling at widely separated fishing grounds may still be sufficiently isolated to be considered management units, i.e., stocks, between which exchange of individuals is limited and has little effect on the structure and dynamics of each unit. It was suggested that Iceland (Va), the Norwegian Coast (II), and the Faroes and Faroe Bank (Vb) have separate stocks, but that the existence of distinguishable stocks along the continental shelf west and north of the British Isles and the northern North Sea (Subareas IV, VI, VII and VIII) is less probable. Ling is one of the species included in a recently initiated Norwegian population structure study using molecular genetics, and new data may thus be expected in the future'.*

WGDEEP 2007 examined available evidence on stock discrimination and concluded that available information is not sufficient to suggest changes to current ICES interpretation of stock structure.

Catches data for ling in 2006 and 2007 aggregated at the level of statistical rectangle were provided to the working group by France, Ireland, the UK (England and Wales and Scotland) and Iceland. These are shown in figure 5.1.1 and 5.1.2.

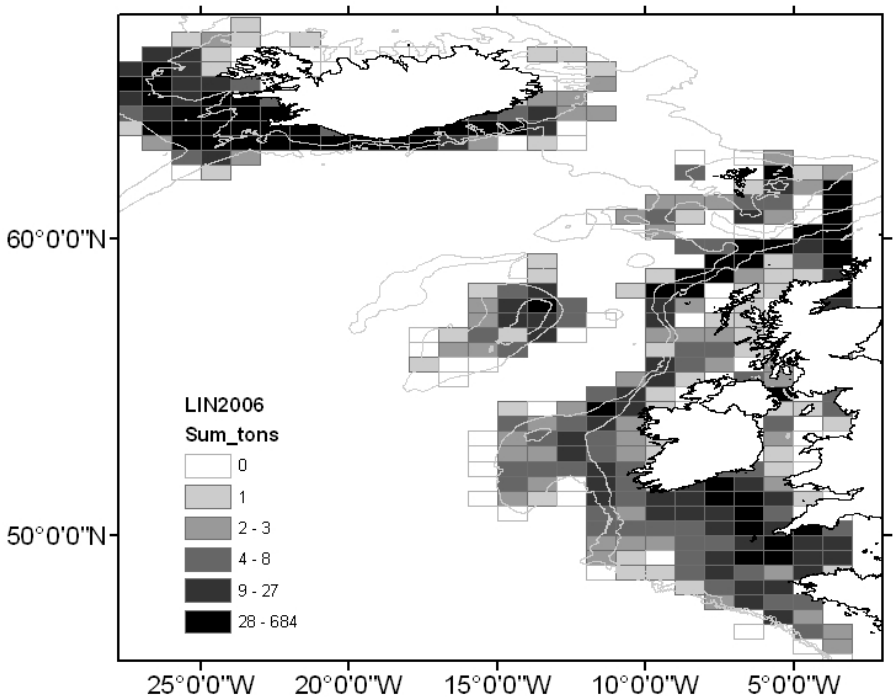


figure 5.1.1. Catches of ling by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2006.

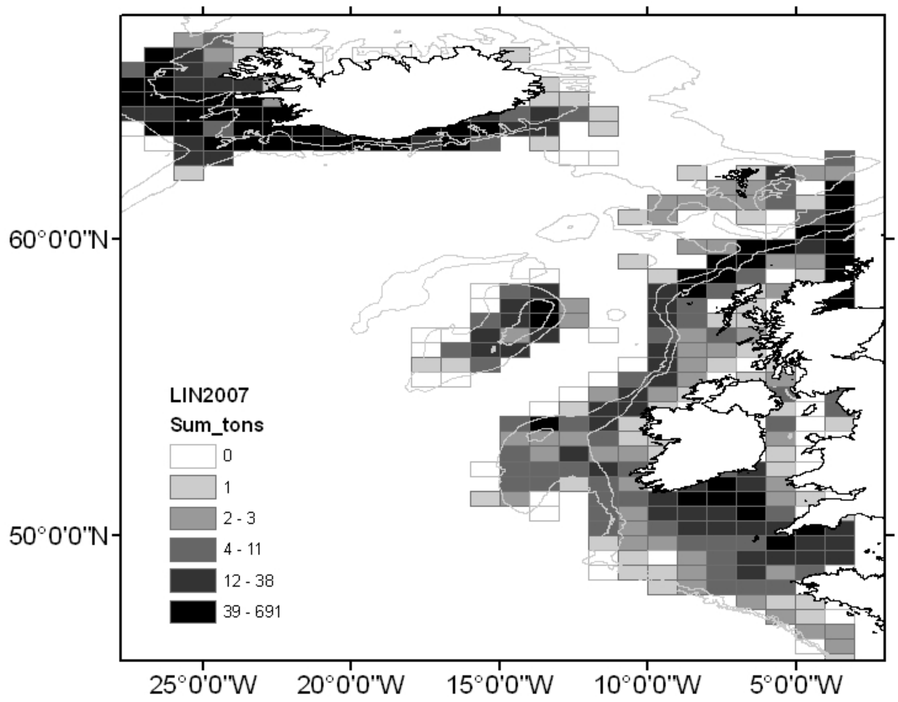


figure 5.1.2. Catches of ling by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2007.

5.2 Ling (*Molva molva*) in Division Vb

5.2.1 The fishery

Description of fisheries in this area is provided in section 4.3

5.2.1.1 Landings trends

Landings data for this stock are available from 1904 onwards (Figure 5.2.1); however, landing statistics for ling by nation are available for the period 1988-2007 and are given in Tables 5.2.0a-5.2.0c. Landings in Division Vb have varied between about 4 000 and 6 000 tonnes since 1980, except for low landings in 1993 (about 3000 tonnes). The preliminary landings of ling in 2007 are 5 600 tonnes, of which Norwegian longliners took about 1 400 tonnes and the Faroese fleets 4 100t. Other nations account for 100 tonnes.

The 2007 Faroese landings by fleet were:

Longliners <110GRT	Longliners >110GRT	OB trawlers <1000HP	OB trawlers >1000HP	Pairtrawlers <1000HP	Pairtrawlers >1000HP	Others
9%	48%	2%	19%	5%	15%	2%

5.2.1.2 ICES advice

ICES spring 2006: *For Division Vb, effort should not be allowed to increase compared with the present level.*

5.2.1.3 Management

For the Faroese fleets, there is no species-specific management of ling in Vb, although licenses are needed in order to fish. The minimum landing size is 60 cm. Other nations are regulated by TAC's. Details on management measures in Faroese waters are given in section 4.3.5.

5.2.2 Stock identity

No new information on stock separation was available. Relevant data were presented and discussed in reports of previous Norwegian and Nordic projects and summarised in the 1998 report of the study group (ICES C.M. 1998/ACFM:12). There is currently no evidence of genetically distinct populations within the ICES area. However, ling at widely separated fishing grounds may still be sufficiently isolated to be considered management units, i.e., stocks, between which exchange of individuals is limited and has little effect on the structure and dynamics of each unit.

It was suggested previously that ling in Division Vb could be considered as one unit, since spawning, nursery areas and feeding areas are in the Division; this remains uncertain, however. Ling from Faroese waters is included in an ongoing Norwegian population structure study using molecular genetics, and new data may thus be expected in the future.

5.2.3 Data available

There are data on length, weights and age available for ling from the Faroese landings; Table 5.2.1 gives an overview of the levels of sampling. There are also catch and effort data from logbooks for the Faroese longliners and pair trawlers, and from the two annual Faroese groundfish surveys are biological data (length, weight, sex) as well as catch and effort data available. In addition, there are also data available on catch, effort and mean length from Norwegian longliners fishing in Faroese waters (WD by Helle & Pennington, 2008). No further data for the latter were provided for 2007.

5.2.3.1 Landings and discards

Landings were available for all relevant fleets. No estimates of discards of ling are available. There is a ban on discarding in Vb and incentives for illegal discarding are believed to be low. The landings statistics are therefore regarded as being adequate for assessment purposes.

5.2.3.2 Length compositions

Length distributions are available for Faroese commercial landings (Figure 5.2.2) and two Faroese groundfish surveys in Division Vb. There are also length distributions from the Norwegian longliners "reference fleet" for the period 2003-2005 (see last years report). The length distributions for the Norwegian longliners fishing in Faroese waters, in the period 2003-2005, were almost the same as for the Faroese longliners in the same period. The trawlers have a slightly greater length distribution.

5.2.3.3 Catch at age

Catch-at-age data were provided for Faroese landings in Vb 1996-2007. Half yearly length distributions and ALKs were used and these were raised to give the annual catch-at-age in numbers for each fleet. As shown in Table 5.2.1, the number of otoliths in 2007 was very small. It was therefore necessary to include the ALK from 2006 in the one from 2007. Catches of some minor fleets were presumed to have the same relative catch-at-age in numbers as the sum of the longliners and trawlers. No catch-at-age data were available from other nations fishing in Vb. Therefore, catches by France, Germany and UK trawlers were assumed to have the same age composition as those from Faroese trawlers, and the Norwegian longliners catches were assumed to have the same age composition as the Faroese longliners. In a few years, a small number of 3 year old ling have been caught and these were excluded from the analysis. The resulting total catch-at-age in numbers is given in Table 5.2.2.

5.2.3.4 Weight at age

Mean weight-at-age data are provided for the Faroese fishery (Table 5.2.3). The mean weights at age for ages 4-11 are presented in Figure 5.2.5. Except for the youngest and oldest ages, they seem to be consistent showing small fluctuations throughout the period.

The mean weight-at-age data were used as input to catch weight at age, and it was also assumed for the stock weight-at-age.

5.2.3.5 Maturity and natural mortality

Ling become mature at ages 5-7 (60-75 cm lengths) in most areas, with males maturing at a slightly lower age than females (Magnusson *et al*., 1997). No annual measurements of maturity at age were available and knife-edge maturity for age 7 and older was assumed for the assessment.

A natural mortality of 0.15 was assumed for all ages.

5.2.3.6 Catch, effort and research vessel data

Commercial CPUE series. There are catch per unit effort (CPUE) data available for three different commercial series, for Faroese longliners, Faroese pair trawlers and Norwegian longliners (Figure 5.2.3). It was not possible to update the Norwegian series to 2007. All the CPUE series show a small increasing trend in the last 4-5 years.

The Faroese CPUE data are from all available logbooks, for the period 1986-2007, from 8 pair trawlers (HP>1000) and 5 long liners (GRT>110). These data are stored in a database at the Faroese Fisheries Laboratory. The data are corrected and quality controlled. The effort obtained from the logbooks is estimated as number of fishing (trawling) hours from the trawlers, 1000 hooks from the longliners and the catch as kg stated in the logbooks. The third series is data from the Norwegian longliners "reference fleet".

Sets where the catch of blue ling, ling and tusk combined represented more than 80% of the total catch and depth was >150 m were selected for the longliner CPUE series. The bycatch series for ling from the Faroese pair trawlers > 1000 HP is limited to hauls where the catch of Argentine is less than 20 % of the total catch in the haul and depth was >150 m.

Only the Faroese longline series (directed effort measured as number of 1000 hooks) was used as a tuning series in the exploratory assessment (Table 5.2.5).

Fisheries independent CPUE series. CPUE estimates (kg/hour) for ling are available from two annual groundfish surveys in Faroese waters (Figure 5.2.4). Both surveys are restricted to the area within the 500 m contour of the Faroe Plateau and do not cover the whole distribution area for ling. This series have so far not be used as a tuning series because no age data are available.

The spring survey has been carried out in February-March since 1982 (100 fixed stations), and the summer survey in August-September since 1996 (200 fixed stations). For the spring survey, however, data are only available for the period 1994-2007 due to problems with extraction of data from the database.

5.2.4 Data analyses

5.2.4.1 CPUE trends

The only information on abundance trends can be derived from the CPUE data from the Faroese longliners and Norwegian longliners (Figure 5.2.3) and from the Faroese groundfish surveys (Figure 5.2.4).

Norwegian longline CPUE suggests a decline in abundance between 1973 and 1989 and appears to be relatively stable at a lower level thereafter. This stability over the recent period is also seen in Faroese longline CPUE and the data from the Faroese surveys.

Norwegian and Faroese longliners are comparable and both have ling (and tusk) as target species.

5.2.4.2 Exploratory analysis

As in the 2006 WGDEEP report an analytical assessment exercise on ling in Vb was attempted. It must be kept in mind, that the assessment data series is only twelve years and the age range in the analysis is from age 4 to age 12+. Also it is assumed that ling in Vb can be treated as one stock unit, although such a status never has been scientifically verified.

A Separable analysis was run as (age 10 for unit selection, terminal F of 0.4 and S of 1) in order to test the catch data set for outliers. The separable analysis showed that the catch number-at-age data are noisy with many high residuals, especially for young and old fishes and the earlier years in the series (Table 5.2.4 and Figure 5.2.6).

Although the quality of the input data can be questioned, a tentative XSA was performed, with the same settings as presented in the 2006 report, and tuned with the same longliner fleet (Table 5.2.5). The diagnostics from the XSA showed that also the tuning data are noisy with year and age effects, and standard errors are high. The results are presented here for illustrative purposes only (Tables 5.2.6 – 5.2.9 and Figure 5.2.7). Other results from the XSA are presented here, but given the poor diagnostics from the XSA, the conclusion from the wg is, that the analysis should not be used as basis for the advice.

5.2.4.3 Catch at age analysis

The catch at age matrix indicates that cohorts do not disappear from the fisheries at a very high rate. Maximum numbers in the catches in recent years occur at age 7 and 8. The rate of disappearance for fish 7 years and older is in the order of 0.5 on a log scale. Given that there has not been any major change in fishing mortality in recent years, this value is an indicator of the total mortality (Z). Catch curve plots (Figure 5.2.8) show that year classes 1998 and younger are still entering the fisheries.

The catch at age abundance of the younger fish is increasing in recent years (Figure 5.2.2). Given the lack of independent survey information, it is unknown if this represent an increasing targeting on younger fish or a recruitment pulse.

5.2.5 Comments on assessment

The input data to the XSA assessment is short, 12 years only. The sampling is representative for only approximately half of the landings. The results are highly uncertain and presented for illustrative purposes only. The present assessment only covers a very short period in the history of this fishery for which landings have been reported back to 1904 (Figure 5.2.1).

The results from the catch curve analysis give the most reliable interpretation of the dynamics of the stock.

5.2.6 Management consideration

CPUE series suggest that the current abundance is at a low level compared with the historical records from the 1970s-80s. The XSA assessments that were attempted could not be used to evaluate the reliability of these trends.

ICES advice in 2006 was: *For Division Vb, effort should not be allowed to increase compared with the present level.* There is no clear evidence to suggest that the state of this stock has changed.

Table 5.2.0a. Ling in Vb1. Nominal landings (1988-2007) (* preliminary data).

Year	Denmark	Faroes	France	Germany	Norway	E&W	Scotland	Russia	Total
1988	42	1,383	53	4	884	1	5	-	2,372
1989	-	1,498	44	2	1,415	-	3	-	2,962
1990	-	1,575	36	1	1,441	+	9	-	3,062
1991	-	1,828	37	2	1,594	-	4	-	3,465
1992	-	1,218	3	+	1,153	15	11	-	2,400
1993	-	1,242	5	1	921	62	11	-	2,242
1994	-	1,541	6	13	1,047	30	20	-	2,657
1995	-	2,789	4	13	446	2	32	-	3,286
1996	-	2672	-	-	1,284	12	28	-	3,996
1997	-	3224	7	-	1,428	34	40	-	4,733
1998	-	2,422	6	-	1,452	4	145	-	4,029
1999	-	2,446	17	3	2,034	0	71	-	4,571
2000	-	2,103	8	1	1,305	2	61	-	3,480
2001	-	2,069	14	3	1,496	5	99	-	3,686
2002	-	1,638	6	2	1,640	3	239	-	3,528
2003	-	2,139	11	2	1,526	3	215	-	3,896
2004	-	2,733	15	1	1,799	3	178	2	4,731
2005	-	2,886	3	-	1,553	3	70	-	4,515
2006	3(2)	3,563	6	+	850	-	147(1)	-	4,569
2007*	2(2)	3,794	6	-	1,071	-	81(1)	-	4,954

Table 5.2.0b. Ling in Vb2. Nominal landings (1988-2007) (* preliminary data).

Year	Faroes	France	Norway	Total
1988	832	-	1,284	2,116
1989	362	-	1,328	1,690
1990	162	-	633	795
1991	492	-	555	1,047
1992	577	-	637	1,214
1993	282	-	332	614
1994	479	-	486	965
1995	281	-	503	784
1996	102	-	798	900
1997	526	-	398	924
1998	511	-	819	1,330
1999	164	4	498	666
2000	229	1	399	629
2001	420	6	497	923
2002	150	4	457	611
2003	624	6	927	1,557
2004	1,058	3	247	1,308
2005	575	7	647	1,229
2006	472	6	177	655
2007*	325	3	309	637

(1) Includes Vb_2.

(2) Greenland

Table 5.2.0c. Ling in Vb. Nominal landings (1988-2007) (* preliminary data).

Year	Vb1	Vb2	Vb
1988	2,372	2,116	4,488
1989	2,962	1,690	4,652
1990	3,062	795	3,857
1991	3,465	1,047	4,512
1992	2,400	1,214	3,614
1993	2,242	614	2,856
1994	2,657	965	3,622
1995	3,286	784	4,070
1996	3,996	900	4,896
1997	4,733	924	5,657
1998	4,029	1,330	5,359
1999	4,571	666	5,237
2000	3,480	629	4,109
2001	3,686	923	4,609
2002	3,528	611	4,139
2003	3,896	1,557	5,453
2004	4,731	1,308	6,039
2005	4,515	1,229	5,744
2006	4,569	655	5,224
2007*	4,954	637	5,591

Table 5.2.1. Ling in Vb. Overview of the sampling of the commercial landings.

Year:	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Lengths	6399	7900	5912	4536	3512	3805	4299	6585	6827	7167	6503	4031
Weights	410	541	538	360	360	420	180	360	1169	3217	4038	1713
Ages	1081	1526	1081	480	360	420	300	661	659	540	349	120

Table 5.2.2. Catch numbers at age Numbers*10**-3

YEAR,	1996,	1997,
AGE		
4,	90,	1,
5,	232,	219,
6,	329,	298,
7,	324,	490,
8,	213,	411,
9,	106,	266,
10,	61,	126,
11,	28,	41,
+gp,	21,	41,
0 TOTALNUM,	1404,	1893,
TONSLAND,	4896,	5657,
SOPCOF %,	101,	100,

Table 1 Catch numbers at age Numbers*10**-3

YEAR,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,	2006,	2007,
AGE										
4,	1,	18,	45,	20,	66,	39,	152,	75,	116,	225,
5,	59,	25,	123,	88,	73,	64,	147,	186,	153,	198,
6,	159,	9,	110,	310,	454,	326,	196,	290,	169,	338,
7,	284,	167,	57,	594,	489,	458,	440,	310,	355,	516,
8,	335,	399,	113,	194,	230,	422,	447,	349,	311,	379,
9,	369,	349,	177,	111,	68,	223,	224,	217,	229,	224,
10,	180,	176,	107,	80,	88,	67,	91,	106,	131,	114,
11,	70,	84,	57,	23,	2,	21,	54,	46,	94,	57,
+gp,	62,	87,	56,	38,	6,	53,	38,	75,	83,	56,
0 TOTALNUM,	1519,	1314,	845,	1458,	1476,	1673,	1789,	1654,	1641,	2107,
TONSLAND,	5359,	5238,	3785,	4588,	4524,	5374,	6039,	5744,	5224,	5591,
SOPCOF %,	98,	98,	100,	99,	99,	99,	100,	102,	100,	99,

Table 5.2.3. Catch weights at age (kg)

YEAR,	1996,	1997,
AGE		
4,	1.0530,	.6030,
5,	1.8420,	1.1470,
6,	2.5590,	1.7820,
7,	3.3800,	2.4040,
8,	4.0260,	3.2210,
9,	5.1810,	4.0580,
10,	7.5210,	5.1560,
11,	9.5140,	7.0620,
+gp,	12.5520,	9.0620,
0 SOPCOFAC,	1.0085,	.9969,

Table 2 Catch weights at age (kg)

YEAR,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,	2006,	2007,
AGE										
4,	1.1570,	1.0670,	1.3210,	1.0610,	1.2020,	.8060,	1.1040,	.8610,	.7330,	.8190,
5,	1.2030,	1.0880,	1.8260,	1.1220,	1.5120,	1.1900,	1.5010,	1.1180,	.9820,	1.0870,
6,	1.7990,	2.2160,	2.6170,	1.9210,	1.9590,	2.0880,	2.0540,	1.7910,	1.5370,	1.6090,
7,	2.4370,	2.3660,	3.1390,	2.6040,	2.8870,	2.7240,	2.7210,	2.5860,	2.1760,	2.2130,
8,	3.1320,	3.1180,	4.0550,	3.6380,	3.8720,	3.5020,	3.5700,	3.5860,	2.9780,	3.0080,
9,	4.0240,	4.0830,	5.0560,	5.1680,	5.4740,	4.0440,	4.7140,	4.7930,	3.9550,	3.9660,
10,	5.0180,	5.4800,	6.2810,	6.5870,	8.2420,	5.4820,	6.2320,	6.3450,	5.1160,	5.1490,
11,	6.4510,	6.2270,	7.6040,	7.5210,	5.1980,	6.2190,	8.1930,	7.7310,	6.4790,	6.5750,
+gp,	8.5550,	8.1160,	10.2740,	10.0980,	11.4340,	10.0200,	10.8460,	9.6470,	10.1630,	9.8000,
0 SOPCOFAC,	.9798,	.9838,	1.0001,	.9919,	.9926,	.9871,	.9963,	1.0190,	1.0004,	.9941,

1

Table 5.2.4. The tuning fleet

Ling in the Faroe Ground (Fishing Area Vb)
101
LL_04: 5lliners>100GRT (Catch: Numbers) (Effort: 1000 hooks)
1996 2007
1 1 0.0 1.0
4 11

66	116	298	423	416	273	136	78	36
1292	76	11252	15346	25195	21123	13701	6491	2093
840	16	1710	4634	8278	9756	10761	5260	2043
1861	1196	1617	610	11007	26209	22934	11551	5492
921	1291	3541	3173	1655	3254	5096	3088	1627
461	365	1490	5261	10082	3297	1878	1353	395
36	32	36	222	238	112	33	43	1
221	375	617	3152	4428	4078	2154	650	206
454	1618	1570	2096	4698	4767	2390	975	575
943	9868	15216	42928	62640	43206	24663	13331	4815
1721	6449	8510	9379	19697	17247	12705	7296	5194
1431	12847	11299	19295	29437	21661	12800	6480	3281

→

Table 5.2.5 Title : Faroe Ling ICES Division Vb)

LIN_IND

At 7/03/2008 19:06

Separable analysis

from 1996 to 2007 on ages 4 to 11
with Terminal F of .400 on age 10 and Terminal S of 1.000

Initial sum of squared residuals was 120.669 and
final sum of squared residuals is 54.198 after 64 iterations

Matrix of Residuals

Years, Ages	1996/97,
4/ 5,	.006,
5/ 6,	.899,
6/ 7,	.393,
7/ 8,	.103,
8/ 9,	-.211,
9/10,	-.291,
10/11,	.201,
TOT ,	.033,
WTS ,	.001,

Years,	1997/98,	1998/99,	1999/**,	2000/**,	2001/**,	2002/**,	2003/**,	2004/**,	2005/**,	2006/**,	TOT,	WTS,
4/ 5,	-3.386,	-2.511,	-1.430,	.390,	-1.130,	.731,	-.763,	.169,	-.198,	.068,	-.001,	.154,
5/ 6,	1.261,	2.832,	-.744,	.363,	-1.237,	-.557,	-.316,	-.061,	.863,	.063,	-.006,	.175,
6/ 7,	.617,	.520,	-1.490,	-.813,	-.458,	.539,	.108,	-.221,	.197,	-.627,	-.006,	.293,
7/ 8,	.478,	-.255,	.259,	-.864,	.420,	.199,	-.071,	-.020,	-.073,	-.041,	-.006,	.539,
8/ 9,	-.142,	-.314,	.317,	.006,	.116,	-.283,	.163,	.104,	.002,	.009,	-.005,	1.000,
9/10,	.002,	.324,	.540,	.632,	-.867,	-.447,	.274,	-.019,	-.054,	.241,	-.005,	.447,
10/11,	.117,	.262,	.399,	1.291,	2.494,	.885,	-.495,	-.172,	-.521,	.294,	-.005,	.228,
TOT ,	.023,	.014,	.003,	.001,	-.001,	-.001,	-.006,	-.004,	-.002,	-.001,	-.936,	
WTS ,	.001,	.001,	.001,	.001,	.001,	1.000,	1.000,	1.000,	1.000,	1.000,		

Fishing Mortalities (F)

,	1996,	1997,
F-values,	.2982,	.4025,

,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,	2006,	2007,
F-values,	.4451,	.5018,	.4552,	.7374,	.4856,	.5442,	.5329,	.4282,	.3962,	.4000,

Selection-at-age (S)

,	4,	5,	6,	7,	8,	9,	10,	11,
S-values,	.0385,	.0829,	.2389,	.5201,	.7940,	.9344,	1.0000,	1.0000,

Table 5.2.6. **Lowestoft VPA Version 3.1**

```
       7/03/2008  18:37

 Extended Survivors Analysis

 FAROE LING (ICES DIVISION Vb)                 LIN_IND

 CPUE data from file D:\Vpa\VPA2008ling\LL_04.dat

 Catch data for  12 years. 1996 to 2007. Ages  4 to  12.

      Fleet,            First, Last, First, Last, Alpha,  Beta
                   ,     year, year,  age ,  age
 LL_04: 5lliners>100G,   1996, 2007,    4,    11,   .000,  1.000

 Time series weights :

      Tapered time weighting applied
      Power =    3 over  20 years

 Catchability analysis :

      Catchability dependent on stock size for ages <    6

         Regression type = C
         Minimum of   5 points used for regression
         Survivor estimates shrunk to the population mean for ages <  6


      Catchability independent of age for ages >=    9


 Terminal population estimation :

      Survivor estimates shrunk towards the mean F
      of the final   5 years or the   5 oldest ages.

      S.E. of the mean to which the estimates  are shrunk =    .500

      Minimum standard error for population
      estimates derived from each fleet =    .300

      Prior weighting not applied

Tuning converged after   25 iterations

 Regression weights
       ,  .751,  .820,  .877,  .921,  .954,  .976,  .990,  .997, 1.000, 1.000

 Fishing mortalities
    Age,  1998,  1999,  2000,  2001,  2002,  2003,  2004,  2005,  2006,  2007

      4,  .000,  .005,  .012,  .006,  .021,  .011,  .034,  .014,  .025,  .040
      5,  .057,  .010,  .039,  .028,  .026,  .025,  .048,  .050,  .034,  .052
      6,  .174,  .010,  .054,  .124,  .189,  .150,  .093,  .119,  .056,  .094
      7,  .292,  .263,  .081,  .430,  .276,  .280,  .293,  .197,  .197,  .229
      8,  .429,  .807,  .270,  .403,  .277,  .383,  .456,  .376,  .294,  .315
      9,  .649, 1.045, 1.021,  .437,  .226,  .445,  .340,  .395,  .427,  .336
     10,  .564,  .705, 1.068, 2.694,  .703,  .343,  .309,  .252,  .415,  .369
     11,  .445,  .529,  .486,  .648,  .512,  .332,  .483,  .239,  .350,  .301
```

Table 5.2.6 (cont.)

XSA population numbers (Thousands)

YEAR	AGE 4	5	6	7	8	9	10	11
1998	3.06E+03	1.15E+03	1.08E+03	1.21E+03	1.04E+03	8.33E+02	4.50E+02	2.10E+02
1999	4.05E+03	2.64E+03	9.32E+02	7.78E+02	7.77E+02	5.80E+02	3.75E+02	2.20E+02
2000	3.99E+03	3.47E+03	2.25E+03	7.93E+02	5.14E+02	2.98E+02	1.76E+02	1.60E+02
2001	3.52E+03	3.39E+03	2.87E+03	1.83E+03	6.30E+02	3.38E+02	9.25E+01	5.20E+01
2002	3.36E+03	3.01E+03	2.84E+03	2.19E+03	1.02E+03	3.62E+02	1.88E+02	5.38E+00
2003	4.00E+03	2.83E+03	2.52E+03	2.02E+03	1.43E+03	6.69E+02	2.49E+02	8.01E+01
2004	4.91E+03	3.41E+03	2.38E+03	1.87E+03	1.32E+03	8.38E+02	3.69E+02	1.52E+02
2005	5.77E+03	4.08E+03	2.80E+03	1.86E+03	1.20E+03	7.17E+02	5.13E+02	2.33E+02
2006	5.02E+03	4.90E+03	3.34E+03	2.14E+03	1.32E+03	7.10E+02	4.16E+02	3.43E+02
2007	6.21E+03	4.22E+03	4.07E+03	2.72E+03	1.51E+03	8.45E+02	3.98E+02	2.37E+02

Estimated population abundance at 1st Jan 2008

0.00E+00	5.13E+03	3.45E+03	3.19E+03	1.86E+03	9.49E+02	5.20E+02	2.37E+02

Taper weighted geometric mean of the VPA populations:

3.84E+03	3.00E+03	2.34E+03	1.68E+03	1.06E+03	5.93E+02	2.90E+02	1.16E+02

Standard error of the weighted Log(VPA populations) :

.4182	.4084	.4296	.3963	.3503	.3857	.5147	1.1532

Log catchability residuals.

Fleet : LL_04: 5lliners>100G

Age	1996	1997
4	.85	.06
5	.69	2.24
6	-.07	.89
7	-.85	.50
8	-1.10	.16
9	-1.23	.13
10	-.82	.14
11	-.84	.01

Age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
4	-1.14	-.28	-.01	-.07	.01	.05	.09	.27	.08	.15
5	-.01	-2.30	-.07	-.35	-2.18	-.41	-.23	2.16	.00	.94
6	.58	-2.18	-.69	.30	-.28	.66	-.43	1.70	-.63	.10
7	.14	.06	-1.24	.59	-.86	.33	-.24	1.57	-.32	.04
8	.15	.80	-.41	.15	-1.22	.27	-.17	1.35	-.30	-.01
9	.38	.87	.73	.05	-1.61	.24	-.65	1.13	-.11	-.13
10	.25	.48	.77	1.84	-.48	-.02	-.74	.79	-.13	-.04
11	.01	.19	-.02	.45	-.77	-.04	-.30	.55	-.31	-.24

Mean log catchability and standard error of ages with catchability
independent of year class strength and constant w.r.t. time

Age	6	7	8	9	10	11
Mean Log q	-5.6919	-4.7387	-4.3688	-4.1848	-4.1848	-4.1848
S.E(Log q)	.9802	.7735	.7148	.8158	.7716	.4275

Table 5.2.6 (cont.)

```
Regression statistics :

 Ages with q dependent on year class strength

 Age, Slope , t-value , Intercept, RSquare, No Pts, Reg s.e, Mean Log q

  4,     .32,    2.035,      8.14,     .51,     12,     .43,   -7.91,
  5,    1.66,    -.570,      5.68,     .08,     12,    1.47,   -6.61,

 Ages with q independent of year class strength and constant w.r.t. time.

 Age, Slope , t-value , Intercept, RSquare, No Pts, Reg s.e,  Mean Q

  6,     .57,    1.032,      6.58,     .40,     12,     .56,   -5.69,
  7,     .70,     .653,      5.54,     .36,     12,     .56,   -4.74,
  8,     .90,     .158,      4.63,     .23,     12,     .68,   -4.37,
  9,     .78,     .400,      4.68,     .27,     12,     .66,   -4.18,
 10,    2.55,   -1.350,      1.40,     .08,     12,    1.83,   -4.00,
 11,     .87,    1.319,      4.34,     .92,     12,     .35,   -4.28,


 Terminal year survivor and F summaries :

 Age  4   Catchability dependent on age and year class strength

 Year class = 2003

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                  Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 LL_04: 5lliners>100G,      5961.,   .474,       .000,    .00,   1,  .300,     .034

   P shrinkage mean  ,      2996.,    .41,,,,                         .420,     .067

   F shrinkage mean  ,      9803.,    .50,,,,                         .280,     .021

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      5133.,       .26,      .37,    3,   1.391,   .040


 Age  5   Catchability dependent on age and year class strength

 Year class = 2002

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                  Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 LL_04: 5lliners>100G,      3978.,   .439,       .231,    .53,   2,  .338,     .045

   P shrinkage mean  ,      2335.,    .43,,,,                         .381,     .076

   F shrinkage mean  ,      4911.,    .50,,,,                         .281,     .037

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      3446.,       .26,      .21,    4,    .821,   .052
```

Table 5.2.6 (cont.)

```
 Age  6   Catchability constant w.r.t. time and dependent on age

 Year class = 2001

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                  Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 LL_04: 5lliners>100G,      3974.,   .417,       .063,    .15,   3,  .557,     .076

   F shrinkage mean  ,      2424.,    .50,,,,                         .443,     .122

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      3193.,       .32,      .19,    4,    .603,   .094

Age  7   Catchability constant w.r.t. time and dependent on age

 Year class = 2000

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                  Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 LL_04: 5lliners>100G,      2000.,   .364,       .290,    .80,   4,  .577,     .215

   F shrinkage mean  ,      1689.,    .50,,,,                         .423,     .249

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      1862.,       .30,      .20,    5,    .666,   .229


 Age  8   Catchability constant w.r.t. time and dependent on age

 Year class = 1999

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                  Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 LL_04: 5lliners>100G,      1064.,   .328,       .265,    .81,   5,  .572,     .286

   F shrinkage mean  ,       815.,    .50,,,,                         .428,     .359

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
       949.,       .28,      .20,    6,    .688,   .315


 Age  9   Catchability constant w.r.t. time and dependent on age

 Year class = 1998

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                  Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 LL_04: 5lliners>100G,       567.,   .314,       .271,    .86,   6,  .552,     .312

   F shrinkage mean  ,       467.,    .50,,,,                         .448,     .368

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
       520.,       .28,      .19,    7,    .675,   .336
```

Table 5.2.6 (cont.)

```
 Age 10   Catchability constant w.r.t. time and age (fixed at the value for age)  9

Year class = 1997

Fleet,                  Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                  Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
LL_04: 5lliners>100G,       269.,   .329,       .249,    .76,   7,  .481,     .331

  F shrinkage mean  ,       211.,    .50,,,,                         .519,     .406

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
      237.,       .30,      .17,    8,    .569,   .369


Age 11   Catchability constant w.r.t. time and age (fixed at the value for age)  9

Year class = 1996

Fleet,                  Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                  Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
LL_04: 5lliners>100G,       139.,   .299,       .136,    .46,   8,  .609,     .322

  F shrinkage mean  ,       171.,    .50,,,,                         .391,     .270

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
      151.,       .27,      .11,    9,    .409,   .301
```

Table 5.2.7

Terminal Fs derived using XSA (With F shrinkage)

Fishing mortality (F) at age

YEAR,	1996,	1997,
AGE		
4,	.0547,	.0008,
5,	.1176,	.1731,
6,	.1624,	.2060,
7,	.1931,	.3640,
8,	.2184,	.3767,
9,	.2301,	.4371,
10,	.3475,	.4422,
11,	.3378,	.3923,
+gp,	.3378,	.3923,
0 FBAR 6- 9,	.2010,	.3460,

Fishing mortality (F) at age

YEAR,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,	2006,	2007,
AGE										
4,	.0004,	.0048,	.0122,	.0061,	.0214,	.0106,	.0340,	.0141,	.0252,	.0399,
5,	.0571,	.0103,	.0389,	.0284,	.0265,	.0247,	.0476,	.0504,	.0343,	.0519,
6,	.1737,	.0105,	.0542,	.1236,	.1892,	.1500,	.0931,	.1185,	.0561,	.0937,
7,	.2921,	.2632,	.0806,	.4303,	.2758,	.2799,	.2926,	.1975,	.1971,	.2288,
8,	.4289,	.8070,	.2702,	.4033,	.2769,	.3834,	.4562,	.3758,	.2937,	.3151,
9,	.6486,	1.0446,	1.0209,	.4369,	.2260,	.4454,	.3399,	.3946,	.4274,	.3364,
10,	.5639,	.7049,	1.0677,	2.6942,	.7026,	.3429,	.3093,	.2518,	.4145,	.3687,
11,	.4447,	.5288,	.4865,	.6476,	.5119,	.3320,	.4829,	.2394,	.3496,	.3006,
+gp,	.4447,	.5288,	.4865,	.6476,	.5119,	.3320,	.4829,	.2394,	.3496,	.3006,
0 FBAR 6- 9,	.3858,	.5313,	.3565,	.3485,	.2420,	.3147,	.2955,	.2716,	.2436,	.2435,

1

Table 5.2.8

Run title : FAROE LING (ICES DIVISION Vb) LIN_IND

At 7/03/2008 18:37

Terminal Fs derived using XSA (With F shrinkage)

Stock number at age (start of year) Numbers*10**-3

YEAR,	1996,	1997,
AGE		
4,	1822,	1332,
5,	2254,	1485,
6,	2366,	1725,
7,	1989,	1731,
8,	1170,	1411,
9,	556,	810,
10,	224,	380,
11,	105,	136,
+gp,	79,	135,
0 TOTAL,	10566,	9146,

Stock number at age (start of year) Numbers*10**-3

YEAR,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,	2006,	2007,	2008,
AGE											
4,	3064,	4054,	3990,	3519,	3361,	4002,	4907,	5771,	5024,	6206,	0,
5,	1146,	2636,	3472,	3393,	3010,	2831,	3408,	4083,	4898,	4216,	5133,
6,	1075,	932,	2246,	2874,	2838,	2523,	2378,	2797,	3341,	4073,	3446,
7,	1208,	778,	793,	1831,	2187,	2022,	1869,	1865,	2139,	2719,	3193,
8,	1035,	777,	514,	630,	1025,	1428,	1315,	1201,	1317,	1511,	1862,
9,	833,	580,	298,	338,	362,	669,	838,	717,	710,	845,	949,
10,	450,	375,	176,	92,	188,	249,	369,	513,	416,	398,	520,
11,	210,	220,	160,	52,	5,	80,	152,	233,	343,	237,	237,
+gp,	185,	227,	156,	85,	16,	201,	106,	378,	302,	231,	298,
0 TOTAL,	9207,	10578,	11805,	12815,	12993,	14006,	15343,	17558,	18490,	20438,	15637,

1

Table 5.2.9

Stock Summary (without SOP correction)

Terminal Fs derived using XSA (With F shrinkage)

,	RECRUITS, Age 4	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR 6- 9,
1996,	1822,	30112,	17986,	4896,	.2722,	.2010,
1997,	1332,	21723,	16142,	5657,	.3505,	.3460,
1998,	3064,	21596,	14739,	5359,	.3636,	.3858,
1999,	4054,	21156,	11898,	5238,	.4402,	.5313,
2000,	3990,	27489,	10000,	3785,	.3785,	.3565,
2001,	3519,	23729,	10667,	4588,	.4301,	.3485,
2002,	3361,	28176,	14024,	4524,	.3226,	.2420,
2003,	4002,	28955,	17091,	5374,	.3144,	.3147,
2004,	4907,	33843,	18426,	6039,	.3277,	.2955,
2005,	5771,	35816,	21273,	5744,	.2700,	.2716,
2006,	5024,	32431,	18804,	5224,	.2778,	.2436,
2007,	6206,	36011,	19791,	5591,	.2825,	.2435,
Arith. Mean ,	3921,	28420,	15903,	5168,	.3358,	.3150,
0 Units,	(Thousands),	(Tonnes),	(Tonnes),	(Tonnes),		

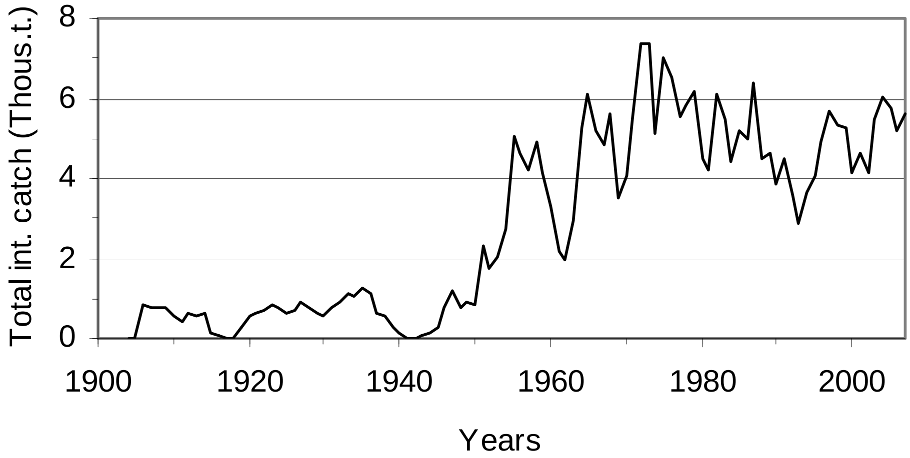


Figure 5.2.1. Ling in Vb. Nominal landings (thousand tonnes) 1904-2007.

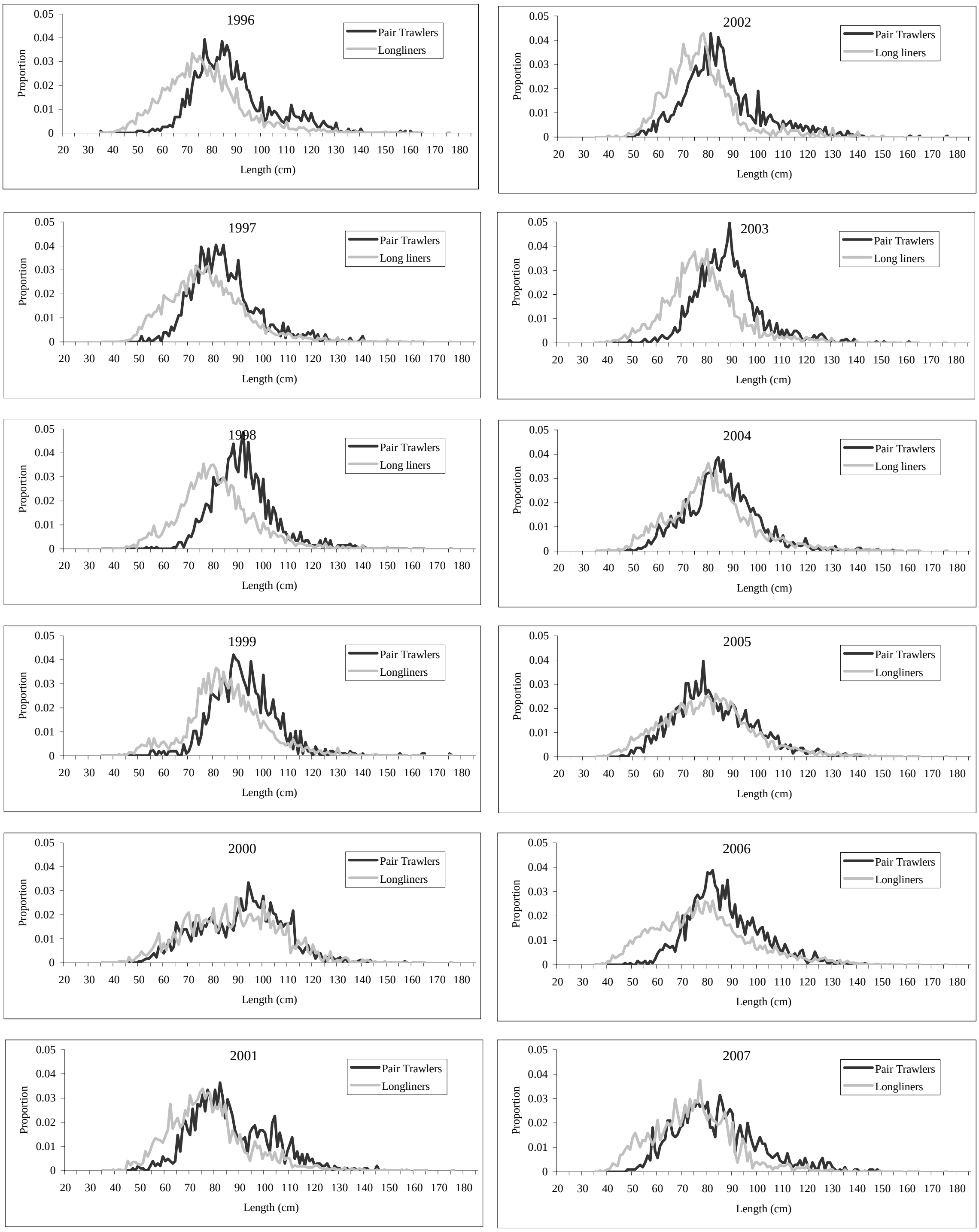


Figure 5.2.2. Ling in Vb. Length distribution in the landings from Faroese pair trawlers > 1000 HP and longliners > 110 GRT.

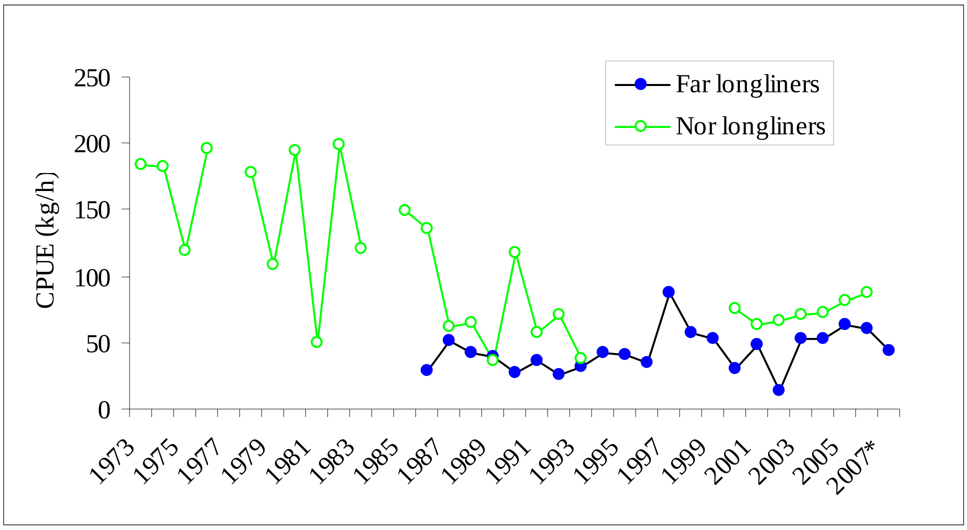


Figure 5.2.3. Ling in Vb. CPUE (kg/1000 hooks) from Faroese longliners >110 GRT and Norwegian longliners (Nor).

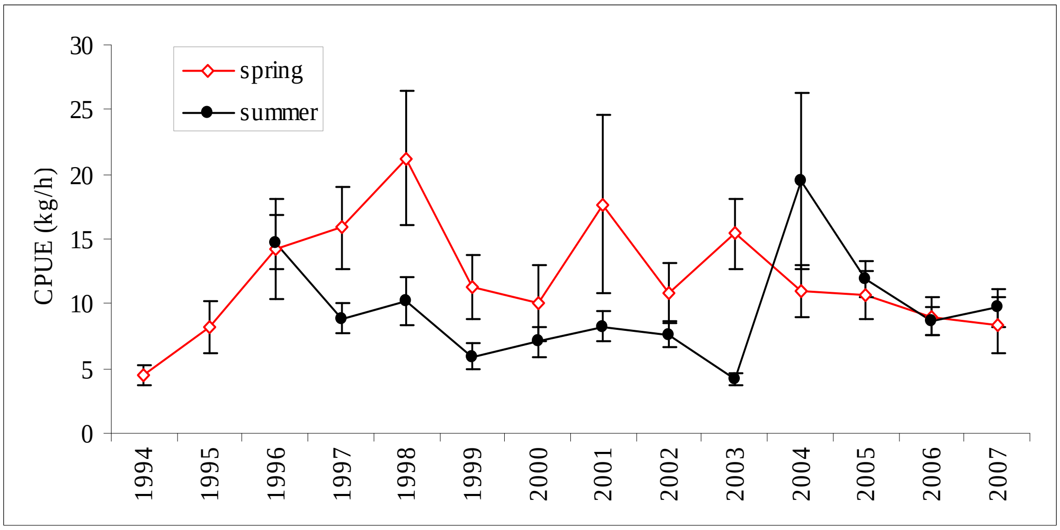


Figure 5.2.4. Ling in Vb. CPUE (kg/h) with SE in the two annual Faroese groundfish surveys.

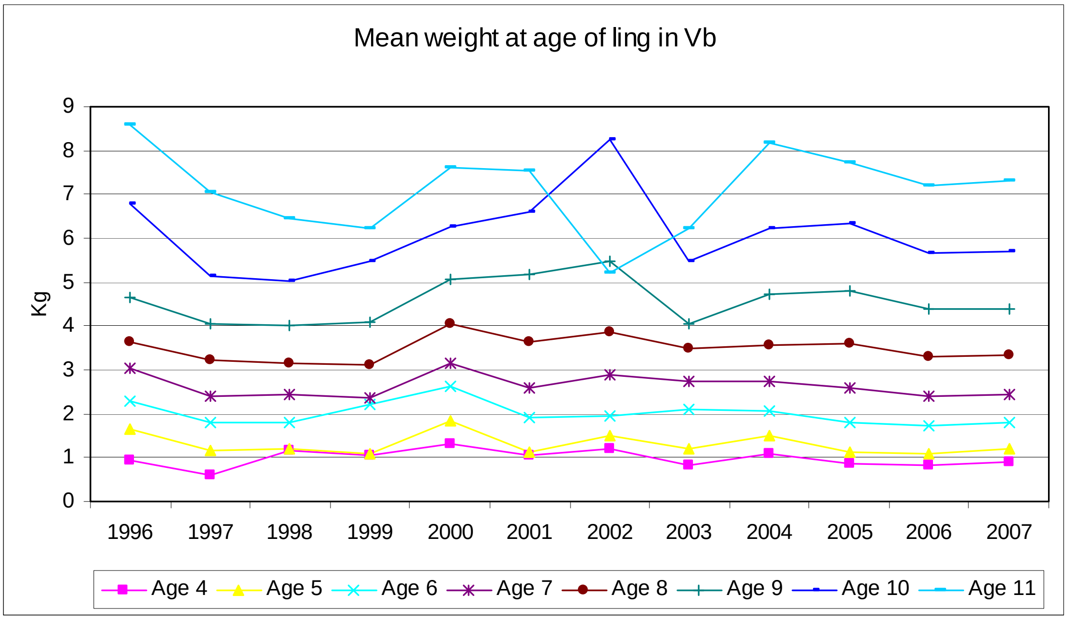


Figure 5.2.5. Ling in Vb. Mean weight at age .

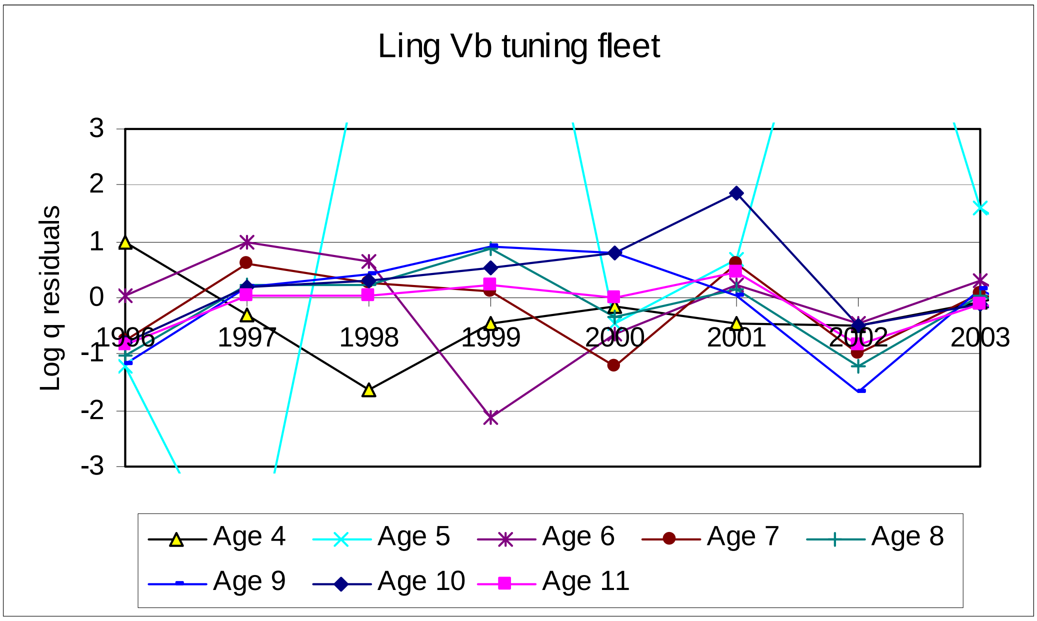


Figure 5.2.6. Ling in Vb.

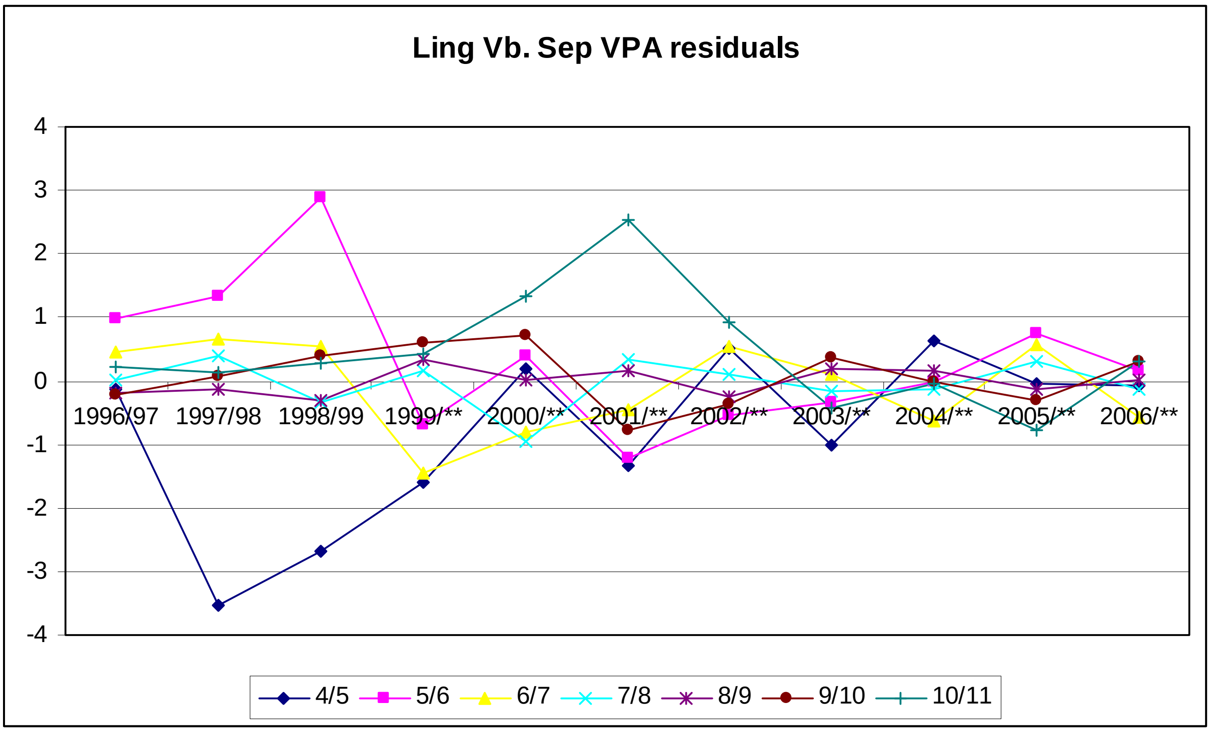


Figure 5.2.7. Ling in Vb.

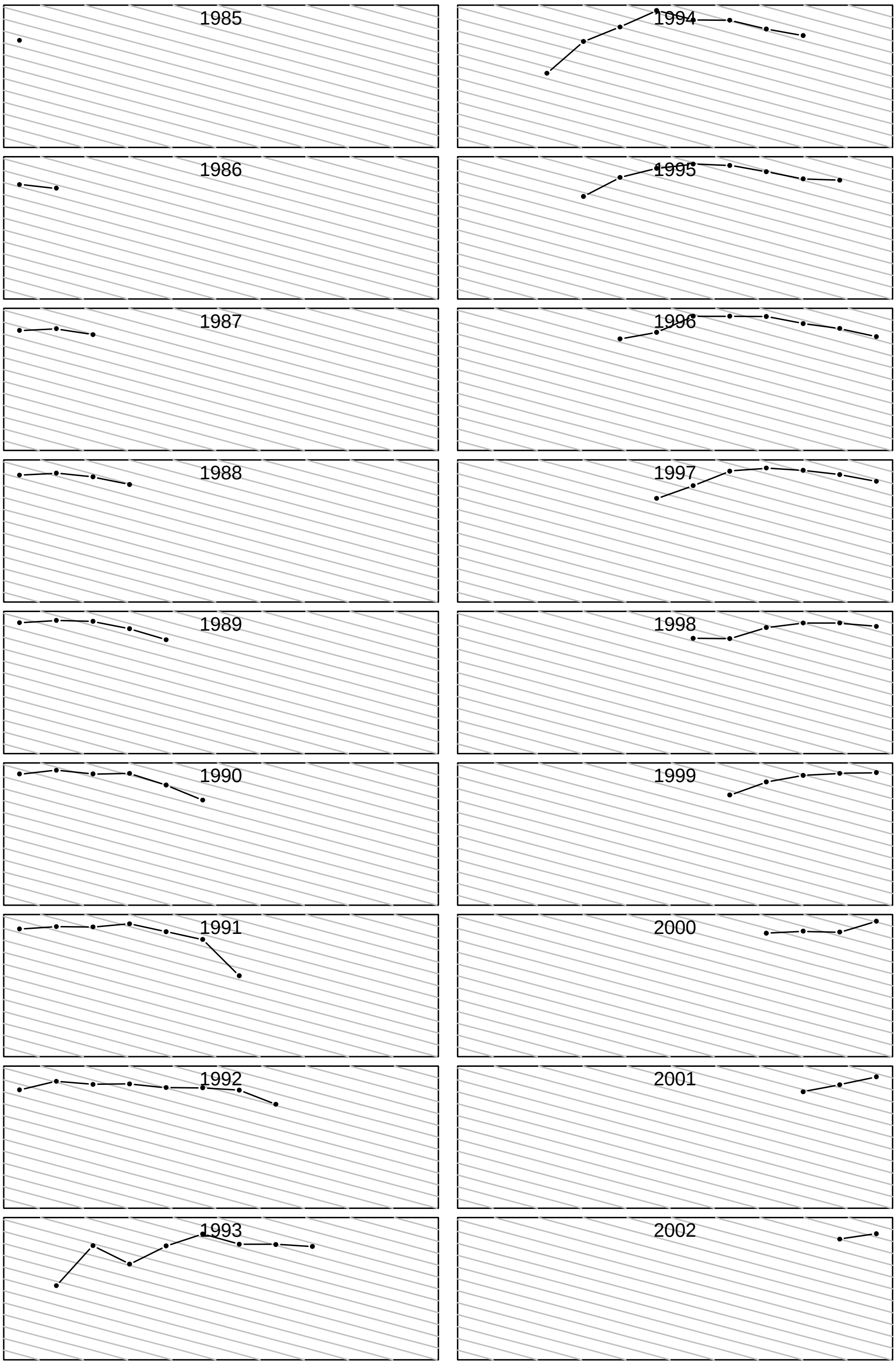


Figure 5.2.8. Ling in Vb. Catch curves for the year classes 1985-2002. Diagonal lines correspond to a slope of 1.0.

5.3 Ling (*Molva Molva*) in Subareas I and II

5.3.1 The fishery

Ling has been fished in this area for centuries, and the historical development is described in, e.g., Bergstad and Hareide (1996). In particular, the post-world war II increase, because of a series of technical advances is documented. Currently the major fisheries in Subareas I and II are the Norwegian longline and gillnet fisheries, but there are also by-catches by other gears, i.e., trawls and hand line. Around 50% of the Norwegian landings are taken by longlines and 45% by gillnets, partly in the directed ling fisheries and partly as by-catch in fisheries for other groundfish. Other nations catch ling as a by-catch in their trawl fisheries.

5.3.1.1 Landings trends

Landing statistics by nation in the period 1988-2007 are given in Tables 5.3.0a-d. During the period 2000-2005 the landings varied between 6,000 and 7,000 tonnes, which is about the same level as in the preceding decade. In 2006 the landings increased to 8845 tons and preliminary data show that the landings increased further to 10 332 tonnes in 2007.

5.3.1.2 ICES advice

The advice statement from 2006 was: *The overall fishing effort in Subarea II should be reduced by 30% compared with the 1998 level.*

5.3.1.3 Management

There is no species-specific management of the ling fishery in Subareas I and II. There is no quota set for the Norwegian fishery. The quota to EC in area I and II in the Norwegian zone for by-catch species such as ling and tusk is in 2008 set to 350 tonnes.

5.3.1.4 Landings and discards

The amount of landings was available for all relevant fleets. New discard data were not available, but within the Norwegian EEZ discarding is prohibited and assumed to be minor.

5.3.1.5 Length compositions

Length compositions and mean lengths from 1976 to the present, based on data from Norwegian long liners, are in Bergstad and Hareide (1996) and Helle and Pennington (WD6, 2007). During this period, when the ling was fully or heavily exploited, the mean length has varied but without any clear trend.

5.3.1.6 Age compositions

No new age compositions were available.

5.3.1.7 Weight at age

No new data were presented.

5.3.1.8 Maturity and natural mortality

No new data were presented.

5.3.1.9 Catch, effort and research vessel data

Catch and effort data for Norwegian long liners were presented, both from the overall fleet and for a set of 4 vessels, "the reference fleet", with which there is a special agreement on reporting measurements, etc., to the IMR. No research vessel data were available.

The extensive Norwegian long liner CPUE data, based on skippers' logbooks presented in the 1996 report, have not been updated after 1994. In the 1998 report (Table 6.5 of ICES C.M. 1998/ACFM:12), effort data were given for the period 1974-1996 based on official statistics.

In order to resume the CPUE-series Norway has adopted two approaches:

1) *Official logbooks from long liners.* Entering of data from official logbooks in an electronic database was begun in 2001 and data are now available for the period 2000-2006.(Because the WGDEEP meeting is relatively early this year, the logbook data, the reference fleet data and associated estimates are not yet available for 2007). Vessels were selected that had a total landed catch of ling, tusk and blue ling exceeding 8 tons in a given year. The logbooks contain records of the daily catch, date, position, and number of hooks used per day.
2) *Reference fleet information*. Since 2001 special agreements were made with selected vessels, "the reference fleet", providing data on the species composition of the catch (in weight), and number of hooks used per day (Helle and Pennington, WD8 2008). There are currently four longline vessels contributing data.

An analyses based on these two sources of data was presented in a WD by Helle and Pennington (WD8, 2008).

5.3.2 Data analyses

No analytical assessments were possible due to lack of age-structured data and/ or a tuning series.

The only source of information on abundance trends was the CPUE series from the Norwegian long liners presented by Helle and Pennington (WD8, 2008). The number of longliners has declined in recent years (Table 5.3.1), from 72 to 35 in the period 2000-2006. In 2007 the number increased to 38. In 2006 the number of fishing days with a ling catch declined when compared with the number of days in 2005 (Table 5.3.2). The number of hooks set per day remained rather stable in Subareas I and II (Table 5.3.3) while the total number of hooks set per year has declined considerably (Table 5.3.4).

In Table 5.3.5 are estimates of CPUE based on the Norwegian official logbooks and the reference vessels. In Figure 5.3.1, the data for 2000-2006 are shown together with the data for the period 1971-1994 (considered earlier by WGDEEP and presented in Bergstad and Hareide, 1996). There is a gap in the time series between 1995 and 2000, and because of data limitations it was not possible to estimate the CPUE for every year in the early period.

The CPUE varied strongly but generally declined in the 1970s and 1980s, and the level appears to have remained comparatively low from the early 1990s into the 2000-2006 period. There is an apparent increase in period 2002-2005 and then a decrease in 2006.

5.3.3 Comments on the assessment

The CPUE series of the main fleet landing ling suggest that the abundance has remained at a reduced level after the decline in the 1970s to 1990s.

5.3.4 Management considerations

It is uncertain whether the current management has effectively reduced effort by the main fleet, i.e. long liners, compared with the level in 1998 (ref. ICES advice from 2004). Despite the fact that the number of vessels has declined substantially, the number of hooks set per year remained more or less stable. However, in the more important fishing area (IIa) from which the most reliable data originated, there was a steady decline in number of hooks set per year since 2002. The current trend indicates a development in accordance with ICES advice from 2004, but since the precision of the effort estimates is low and the 1998 reference level is unknown, it is uncertain if the target reduction of 30% has been fully reached. Based on the current perception of the status and trends in the stock, there is no basis to suggest changing the 2004 advice statement.

Table 5.3.0a. Ling I. WG estimates of landings.

Year	Norway	Iceland	Scotland	Faroes	Total
1996	136				**136**
1997	31				**31**
1998	123				**123**
1999	64				**64**
2000	68	1			**69**
2001	65	1			**66**
2002	182		24		**206**
2003	89				**89**
2004	323			22	**345**
2005	107				**107**
2006	58				**58**
2007*	96				**96**

*Preliminary

Table 5.3.0b. Ling IIa. WG estimates of landings.

Year	Faroes	France	Germany	Norway	E & W	Scotland	Russia	Ireland	Total
1988	3	29	10	6070	4	3			**6119**
1989	2	19	11	7326	10	-			**7368**
1990	14	20	17	7549	25	3			**7628**
1991	17	12	5	7755	4	+			**7793**
1992	3	9	6	6495	8	+			**6521**
1993	-	9	13	7032	39	-			**7093**
1994	101	n/a	9	6169	30	-			**6309**
1995	14	6	8	5921	3	2			**5954**
1996	0	2	17	6059	2	3			**6083**
1997	0	15	7	5343	6	2			**5373**
1998		13	6	9049	3	1			**9072**
1999		11	7	7557	2	4			**7581**
2000		9	39	5836	5	2			**5891**
2001	6	9	34	4805	1	3			**4858**
2002	1	4	21	6886	1	4			**6917**
2003	7	3	43	6001		8			**6062**
2004	15		3	6114		1	5		**6138**
2005	6	4	6	6085	2		2		**6105**
2006	9	5	6	8685	6	1	11		**8723**
2007*	18	2	7	9965	1	6	55	1	**10055**

Table 5.3.0c. Ling IIb. WG estimates of landings.

Year	Norway	E & W	Faroes	**Total**
1988		7		**7**
1989		-		
1990		-		
1991		-		
1992		-		
1993		-		
1994		13		**13**
1995		-		
1996	127	-		**127**
1997	5	-		**5**
1998	5	+		**5**
1999	6			**6**
2000	4	**-**		**4**
2001	33	0		**33**
2002	9	0		**9**
2003	6	0		**6**
2004	77			**77**
2005	93			**93**
2006	64			**64**
2007*	180		1	**181**

***Preliminary**

Table 5.3.0d. Ling I & II. Total landings by sub-areas or Divisions.

Year	**I**	**IIa**	**IIb**	**All areas**
1988		6119	7	6126
1989		7368		7368
1990		7628		7628
1991		7793		7793
1992		6521		6521
1993		7093		7093
1994		6309	13	6322
1995		5954		5954
1996	136	6083	127	6346
1997	31	5373	5	5409
1998	123	9072	5	9200
1999	64	7581	6	7651
2000	69	5891	4	5964
2001	66	4858	33	4957
2002	206	6917	9	7132
2003	89	6062	6	6157
2004	345	6138	77	6560
2005	107	6105	93	6305
2006	58	8723	64	8845
2007	96	10055	181	10332

***Preliminary**

Table 5.3.1 Summary statistics for the Norwegian long liner fleet during the period 1995-2007 (vessels exceeding 21m). This list only includes vessels that landed 8 tonnes or more of ling, blue ling and tusk in a given year.

Year	Number of long liners
1995	65
1996	66
1997	65
1998	67
1999	71
2000	72
2001	65
2002	58
2003	52
2004	43
2005	39
2006	35
2007	38

Table 5.3.2 Estimated number of days that the Norwegian long liner fleet (selected using criteria described in the text) operated in Subareas I and II in the period 2000-2006.

All species	2000	2001	2002	2003	2004	2005	2006
I	6	5	10	12	20	23	8
IIa	42	64	74	73	75	81	73
IIb	2	9	2	3	11	14	3

Table 5.3.3. Estimated number of hooks that the Norwegian long liners set per day in Subarea I and II in the period 2000-2006. n= the total number of days with hook information contained in the logbooks.

All	2000		2001		2002		2003		2004		2005		2006	
	Average	n	Average	n	Average	n	Average	n	Average	n	Average	n	Average	n
I	32953	193	33325	163	35432	263	35045	376	32431	433	32671	316	32876	129
IIa	31512	1438	30703	2196	33431	2031	34766	1839	33475	1389	32861	1248	35140	1252
IIb	36354	65	34638	315	34756	45	34776	67	31859	217	35082	207	39259	54

Table 5.3.4. Estimated total number of hooks (in thousands) the Norwegian long liner fleet used in Subareas I and II for the years 2000-2005 in the fishery for tusk, ling and blue ling.

All	2000	2001	2002	2003	2004	2005	2006
I	14236	10831	20551	21868	27891	29306	9205
IIa	95292	127724	143486	131972	107957	103808	89783
IIb	5235	20263	4032	5425	15069	19155	4122

Table 5.3.5. Estimated mean CPUE ([kg/hook]x1000) in IIa based on log book data. standard error (se) and number of catches sampled (n) is also given.

All vessels submitting logbooks

	2000			2001			2002			2003			2004			2005			2006		
Area	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se
IIA	26,2	727	1	21,9	1352	0,6	24,2	1345	0,5	29,1	924	0,7	37,3	630	0,9	49,8	775	1,1	42,3	928	0,9

Reference vessels:

Ling	2001			2002			2003			2004			2005			2006		
Area	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se
IIA	9,4	19	2,17	27	88	2,08	33	134	2,03	47,12	183	2,46	54,4	275	2,4	54,94	366	2,33

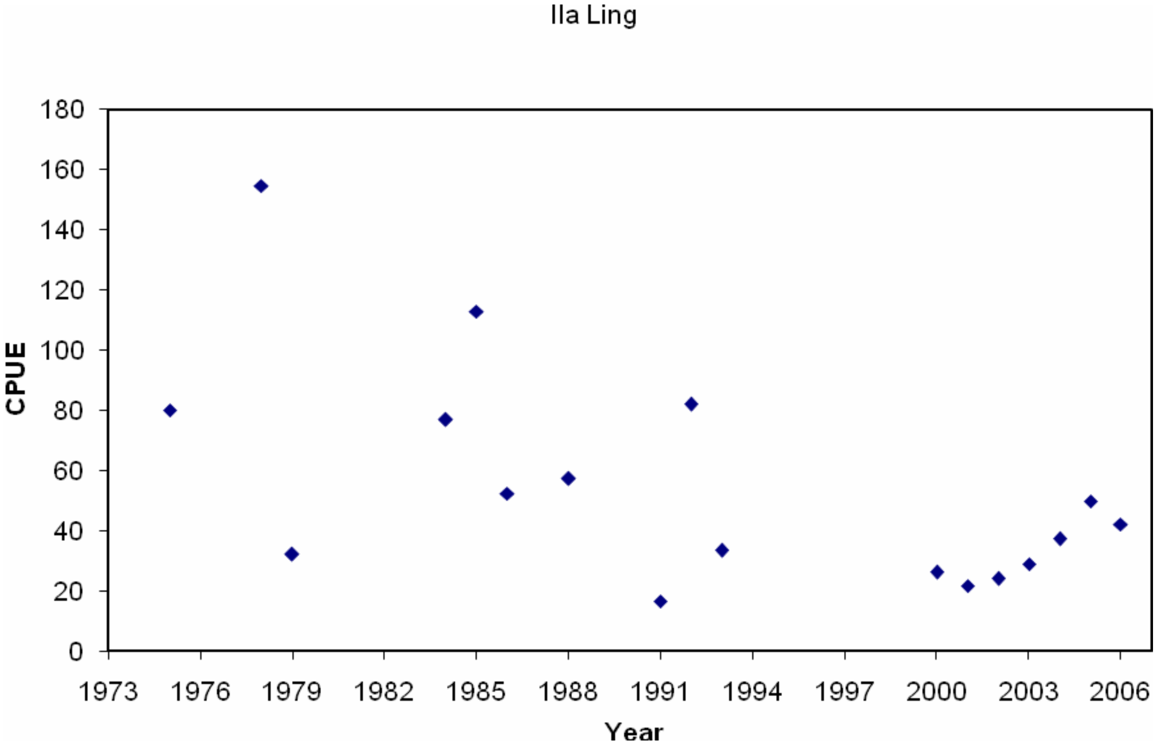


Figure 5.3.1 Ling in IIa. Estimates of CPUE (kg/1000 hooks) based on skipper's logbooks (pre-2000) and official logbooks (post 2000). Combination of data from Bergstad and Hareide (1996) and WD8 by Helle and Pennington (2008)

5.4 Ling (*Molva Molva*) in Division Va

5.4.1 The fishery

The fishery for ling in Va has not changed substantially in recent years. Ling has been a by-catch by the Icelandic fleet where the main target species are cod, haddock and other demersal species. In recent years, over Icelandic 550 vessels have been reporting catches of ling, from less than 0.1 t to over 170 t per year. Ling is largely a bycatch in the fisheries targeting other species, being taken by a mixture gear type but in recent years, with around 50% being caught by longline, 25% by trawlers and about 20% by gillnets. 50% of the native longline catches in 2007 were taken within the depth rage of 100-300 m, with 90% of the catches taken at depths less than 275 m. In the native bottom trawl, 50% of the 2007 catches were taken within the depth range of 100-230 m, with 90% of the catches taken at depths less than 400 m.

Since 1980's, Icelandic vessels have, on average caught 85% of the ling in Va, but in 1950-1970, vessels from other nations caught more than 50%. The fishing grounds in 2000, 2003, 2006 and 2007, as recorded in logbooks, are shown in Figure 5.4.1a. There are indication that ling catches in the area off the northwest Icelandic coast may have increased compared with that observed in 1996 and 2000.

5.4.1.1 Landings trends

In 1950's and 1960's, the total international landings in Va were between 9 000 and 15 000 tonnes but after with the extension of the Icelandic EEZ to in the early 1970's it declined to a level of between 3 000 and 7 000 t. Since 1980, the catches have been varied between 3 200 t and 5 200 t, lowest in 2002 (Table 5.4.1 and figure 5.4.2). The Icelandic fishing fleet has been restricted by a ling TAC since the quota year 2001/2002 and landings in recent years thus largely a reflection of those measures.

In 2007, total of 6 600 tonnes were landed by around 500 Icelandic vessels, whereof 4 042 tonnes with logline, 633 tonnes with gillnets and 1 395 tonnes with bottom trawl. In addition to above mention landings, there are reported 1 034 tonnes of ling in Icelandic waters taken by Faroe Islands and Norwegian vessels. The preliminary total international landings in 2007 amounted therefore to 7 634 t. Link trends to TAC

5.4.1.2 ICES advice

The latest advice is from ICES ACFM in May 2006. *ICES advised maintaining catches at the recent average (2001 – 2004) of about 3800 t, at which level the stock has increased*.

5.4.1.3 Management

The Icelandic Ministry of Fisheries is responsible for management of the Icelandic fisheries and implementation of the legislation. The Ministry issues regulations for commercial fishing for each fishing year (1. September – 31. August), including an allocation of the TAC for each of the stocks subject to such limitations. For ling, the national TAC for the quota year 1. September 2007 – 31. August 2008 was set to 6 000 tonnes. In addition vessels from Norway and Faroe Island have rights to catch deep sea species in Icelandic waters, but the amount of ling is not set. The annual catch of vessels from Norway and Faroe Island has varied between 500 and 1 000t tonnes in last 5 years.

5.4.2 Stock identity

No new information on stock separation was available. Relevant data were presented and discussed in reports of previous Norwegian and Nordic projects and summarised in the 1998 report of the study group (ICES C.M. 1998/ACFM:12). There is currently no evidence of genetically distinct populations within the ICES area. However, ling at widely separated fishing grounds may still be sufficiently isolated to be considered management units, i.e., stocks, between which exchange of individuals is limited and has little effect on the structure and dynamics of each unit. It was suggested that Iceland (Va), the Norwegian Coast (II), and the Faroes and Faroe Bank (Vb) have separate stocks, but that the existence of distinguishable stocks along the continental shelf west and north of the British Isles and the northern North Sea (Subareas IV, VI, VII and VIII) is less probable. Ling is one of the species included in a recently initiated Norwegian population structure study using molecular genetics, and new data may thus be expected in the future.

5.4.3 Data available

5.4.3.1 Landings and discards

Landings by Icelandic vessels are given by the Icelandic Directorate of Fisheries. Landings of Norwegian and Faroese vessels are given by the Icelandic Coast Guard. Discard is banned in the Icelandic demersal fishery and there are no information on possible discard of ling.

5.4.3.2 Length compositions

Detail overview of the sampling in the catches and surveys was given in WGDEEP 2007 report. The sampling intensity in 2007 was similar as in recent years. The length distributions from Icelandic commercial catches and the Icelandic spring and autumn surveys are shown in Figures 5.4.3 and Figure 5.4.6, respectively.

5.4.3.3 Age compositions

No data available. Otoliths have been collected randomly from the catch since 1980's, but no age readings have been done since 1998.

5.4.3.4 Weight at age

No data available.

5.4.3.5 Maturity and natural mortality

The estimated length at which 50% of the ling becomes mature (L_{50}) was estimated 75.7 cm (Figure 5.4.4). All available data since 1986 was used in the analysis.

5.4.3.6 Catch, effort and research vessel data

Icelandic survey data

The Icelandic spring groundfish survey, which has been conducted annually in March since 1985, gives trends on fishable biomass of many exploited stocks on Icelandic fishing grounds. In total, about 550 stations are taken annually at depths down to 500 meters. The survey area does cover the most important distribution area of the ling fishery (Figure 5.4.1.b). Figure 5.4.5 show both a recruitment index and the trends in biomass. Survey length distributions are shown in Figure 5.4.6.

In addition, the autumn survey was commenced in 1996 covering 150 stations of the 550 stations that have been taken in spring survey (i.e. shallower than 500 m). From its commencement in 1996 to 1999 an additional xxx stations were taken in deeper waters off the west, north, east and southeast continental slopes off Iceland (primarily targeting Greenland halibut). In 2000, yyy stations were added to the survey, covering the continental slopes to the south of Iceland and the Reykjanes ridge. Thus since 2000, the autumn survey has consisted of 381 stations, covering the continental shelf and slopes of Icelandic waters, to a depth down to 1 200 m (The stations taken since 2000 are presented in Figure 6.2.1b). Figure 5.4.5 show both a recruitment index and the trends in biomass. Survey length distributions are shown in Figure 5.4.6.

The survey index for each species is a biomass index of the fishable stock, computed by using a fishable stock ogive. The index (see Pálsson *et. al*, 1989) is depth stratified.

Catch per unit of effort and effort data from the commercial fleets

Figures 5.4.9 shows catch per unit of effort of ling in the Icelandic trawl and long-line fisheries. The longline CPUE is calculated using all long-line data where catches of the species was registered, with no standardization attempted.

5.4.4 Data analyses

An increase in the proportion of smaller fish from 2004 to 2007 is observed in the catches (Figure 5.2.3). It is likely that this is a result of increased abundance of smaller fish (as observed in the spring survey, see later), rather than being a result of increasing targeting of smaller fish. The peaks in the length distributions are usually varying between 75 and 110 cm throughout the time series.

Ling commercial LPUE has been relatively stable over the time period since 1991, with the highest observed values in the last two years. There are however very few recordings of ling where ling is more than a small fraction of the total catches in each set. The LPUE data are thus considered to be a poor reflector of stock dynamics.

Ling in both in the spring and autumn surveys are mainly found in the deeper waters south and west off Iceland (Figures 5.2.7 and 5.2.8).

Both the total biomass index and the index of the fishable biomass (>40 cm) in the March survey declined by half from the late 1980's5 to 1989, but gradually decreased until 1995 (Figure 5.4.5 a and b). In the years 1995 to 2003 these indices were half of the mean from 1985-1989 (Figure 5.4.5 a and b). Since 2003, the indices have increased sharply and are now the highest observed, being about 2 times higher than that observed in the late 1980's. The index of the large ling (90 cm and bigger) shows similar trend as the total biomass index (Figure 5.4.5. c). The recruitment index of ling, defined here as ling smaller than 40 cm, also shows a sharp increase in recent years and is now about 4 times higher than it was in 1987 (Figure 5.4.5 d).

The shorter autumn survey shows that biomass indices were low from 1996 to 2000, but have increased since then (Figure 5.4.5 a, b, c). There is a consistency between the two survey series except for the recruitment indices (< 40 cm), where the autumn survey show much lower recruitment, in absolute term compared with the spring survey (Figure 5.4.5 d). This discrepancy is likely a result of much lower catchability of small ling (due to different gears) in the autumn survey, where ling less than 40 cm rarely been caught.

Due to the above mentioned problems with the lpue series and the overall consistency in the survey indices, the working group has concluded that the fishery independent data are the best indicator of stock trends of ling. Although the spring survey may not cover the full distributional depth range of ling in Icelandic waters, it has in the past been used as the basis of the ICES advice, since it covers longer historical time span than the autumn survey.

In theory, if biomass (Bt) and catches (Yt) are known, fishing mortality (Ft) can be estimated from the fundamental fishing equation:

$Y_t = F_t B_t$

If survey biomass estimates (Ut) are thought to reflect true biomass (Bt), and if we use the common assumption that:

$U_t = qB_t$

then a proxy for fishing mortality can be obtained by:

$F_t/q = Y_t / U_t$

Since the catchability (q) is unknown the catch divided by biomass provides only an indicator of relative changes in fishing mortality over time. The relative changes fishing mortality for ling in Va (Figure 5.4.10) indicates that the fishing mortality increased in the period from 1985 until the end of the century but may have declined in the most recent years.

5.4.5 Comments on the assessment

No analytical assessment could be conducted. Both the Icelandic March and October surveys series suggest that ling abundance has been increasing considerable since 2001.As mentioned in chapter 5.4.4, the group suggest using survey indices as indicators of stock trends.

5.4.5.1 Management considerations

The biomass indices from the March groundfish survey for the years 1985 to 2007 shows a clear increase since 2001 and is now two times higher than the survey indices in 1986.

Ling is caught as a by-catch in the Icelandic trawl fishery that is mainly directed at cod.

Reference points that were previously assigned to ling were:

U_{lim}= 0.2* U_{max},

U_{pa}= 0.5* U_{max},

However, as available indices do not go back to the start of the fishery, these are considered inappropriate as reference points.

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Table 5.4.1. Ling. Landings in ICES division Va. Source: STATLANT database, except bold values which are WG best estimates.

Year	Belgium	Faeroe Is.	France	Germany	Iceland	Norway	UK (E,W,NI)	UK (Sco)	Total
1950					**3551**				**10497**
1951					**3278**				**10929**
1952					**4420**				**11454**
1953					**3325**				**11470**
1954					**3442**				**13095**
1955					**3972**				**11693**
1956					**3823**				**11525**
1957					**3591**				**9687**
1958					**4195**				**11663**
1959					**2681**				**8700**
1960					**6774**				**13770**
1961					**6032**				**10066**
1962					**7073**				**12117**
1963					**5607**				**10492**
1964					**4976**				**10374**
1965					**4811**				**10658**
1966					**4559**				**10032**
1967					**7531**				**13152**
1968					**8697**				**14526**
1969					**8677**				**14138**
1970					**8345**				**14362**
1971					**8867**				**15391**
1972					**6085**				**10177**
1973	1080	984	0	586	3564	418	819	10	7461
1974	681	890	0	486	3868	318	511	21	6775
1975	736	732	23	375	3748	522	541	21	6698
1976	431	498	0	404	4538	502	259	9	6641
1977	442	613	0	254	3433	506	0	0	5248
1978	541	534	0	0	3439	484	0	0	4998
1979	508	536	0	0	3759	399	0	0	5202
1980	445	607	0	0	3149	423	0	0	4624
1981	196	489	0	0	3348	415	0	0	4448
1982	116	524	0	0	3733	612	0	0	4985
1983	128	644	0	0	4256	115	0	0	5143
1984	103	450	0	0	3304	21	0	0	3878
1985	59	384	0	0	2980	17	0	0	3440
1986	88	556	0	0	**2948**	4	0	0	3596
1987	157	657	0	0	**4154**	6	0	0	4974
1988	134	619	0	0	**5083**	10	0	0	5846
1989	95	614	0	0	**4833**	5	0	0	5547
1990	42	399	0	0	**5115**	0	0	0	5556
1991	69	530	0	0	**5182**	0	0	0	5781
1992	34	526	0	0	**4546**	0	0	0	5106
1993	20	501	0	0	**4319**	0	0	0	4840
1994	3	548	0	0	**4053**	0	0	0	4604
1995	0	463	0	0	3729	0	0	0	4192
1996	0	358	0	0	3670	20	**12**	0	4060
1997	0	299	0	0	**3626**	0	0	0	3925
1998	0	699	0	0	3603	0	0	0	4302
1999	0	500	0	0	3973	120	**4**	1	4598
2000	0	**452**	0	0	**3221**	67	3	0	3743
2001	0	362	0	2	**2863**	116	1	0	3344
2002	0	1629	0	0	**2830**	45	0	0	4504
2003	0	565	0	2	**3584**	108	**2**	1	4262
2004	0	739	0	1	**3718**	139	0	0	4597
2005	0	682	0	1	**4307**	180	**0**	19	5189
2006	0	960	0	1	**6287**	158	0	0	7406
2007[1)]	0	**849**	0	0	**6600**	**185**	0	0	7634

[1)] **Provisional figures.**

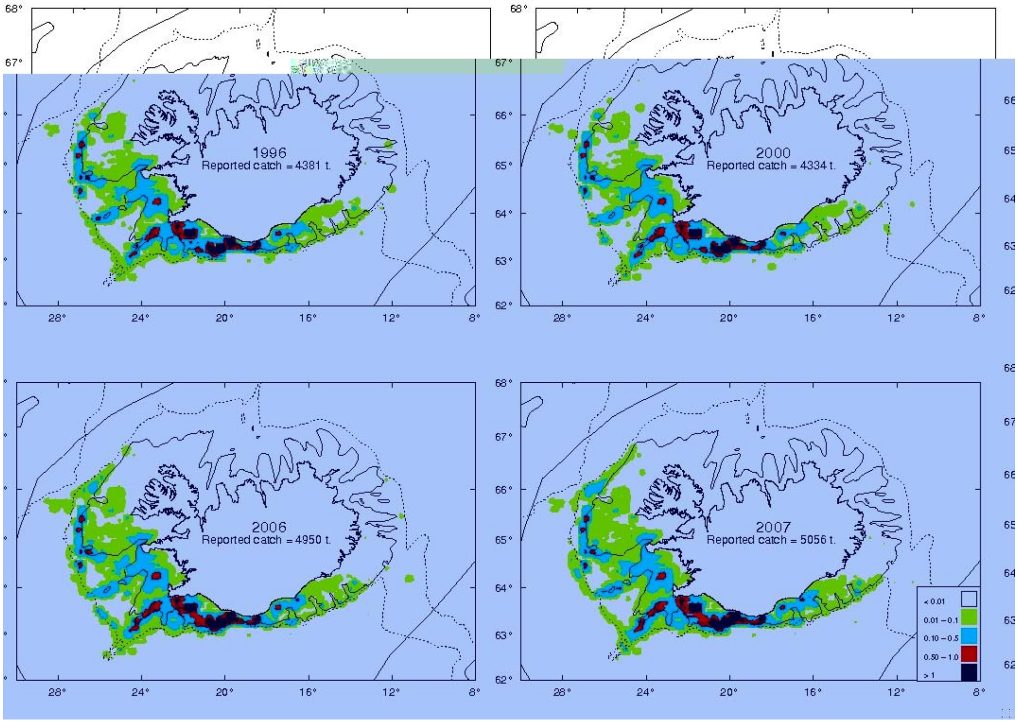

Figure 5.4.1a. Ling. Geographical distribution (tonnes/square mile) of the Icelandic ling fishery in 1996, 2000, 2006 and 2007 as reported in the logbooks. All gear types combined.

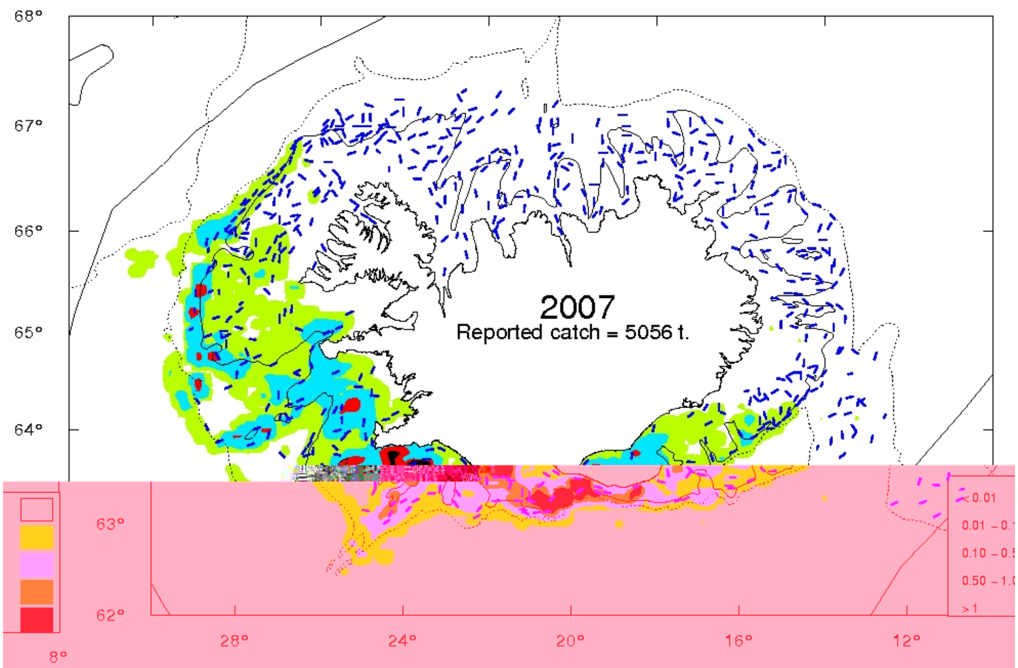

Figure 5.4.1b. Ling. Location of the spring trawl survey and geographical distribution (tonnes/square mile) of the Icelandic ling fishery in 2007 as reported in the logbooks. All gear types combined. The contours show 200 and 500 meters depth lines.

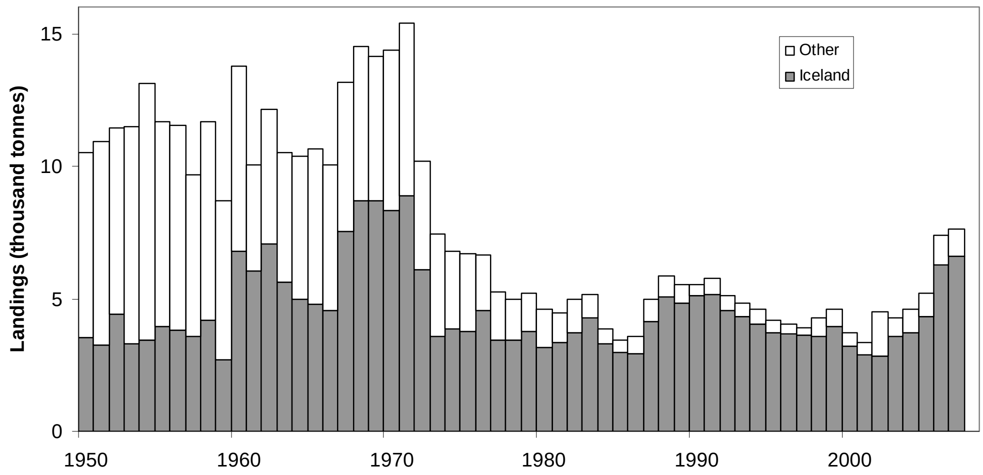

Figure 5.4.2. Ling in Va. Estimated total landings.

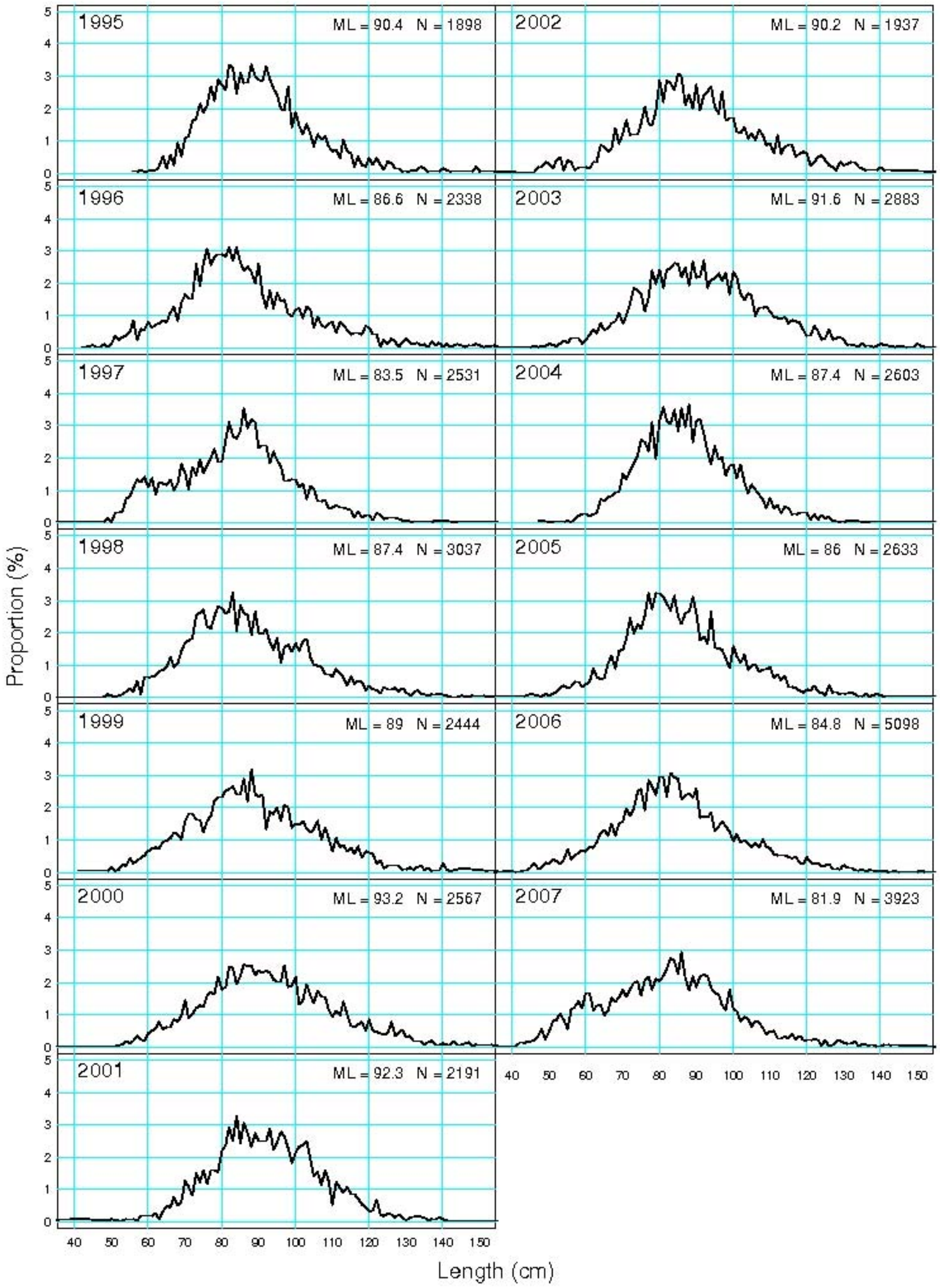

Figure 5.4.3. Length distribution of ling in the commercial landings of the Icelandic fleet in Va 1996-2007. The number of measured fish (N) and mean length (ML) is also given.

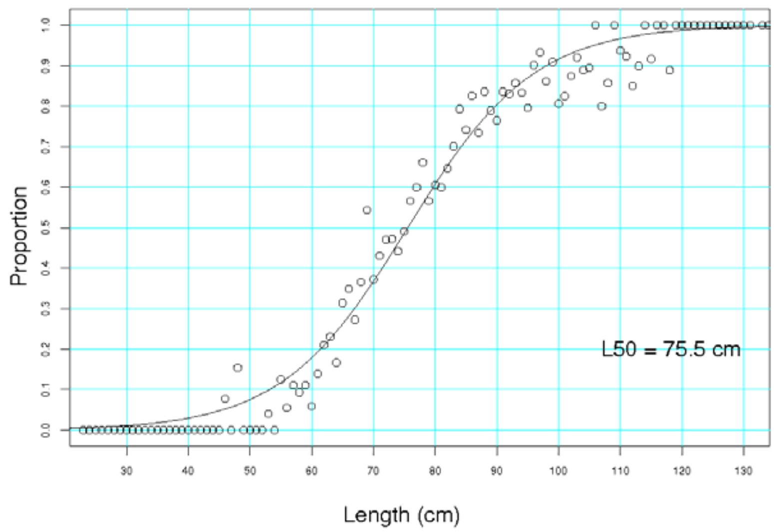

Figure 5.4.4. The proportion of mature of ling as a function of length in the Icelandic catches. The data points show the observed proportion mature and the lines the fitted maturity. Also given is L_{50}.

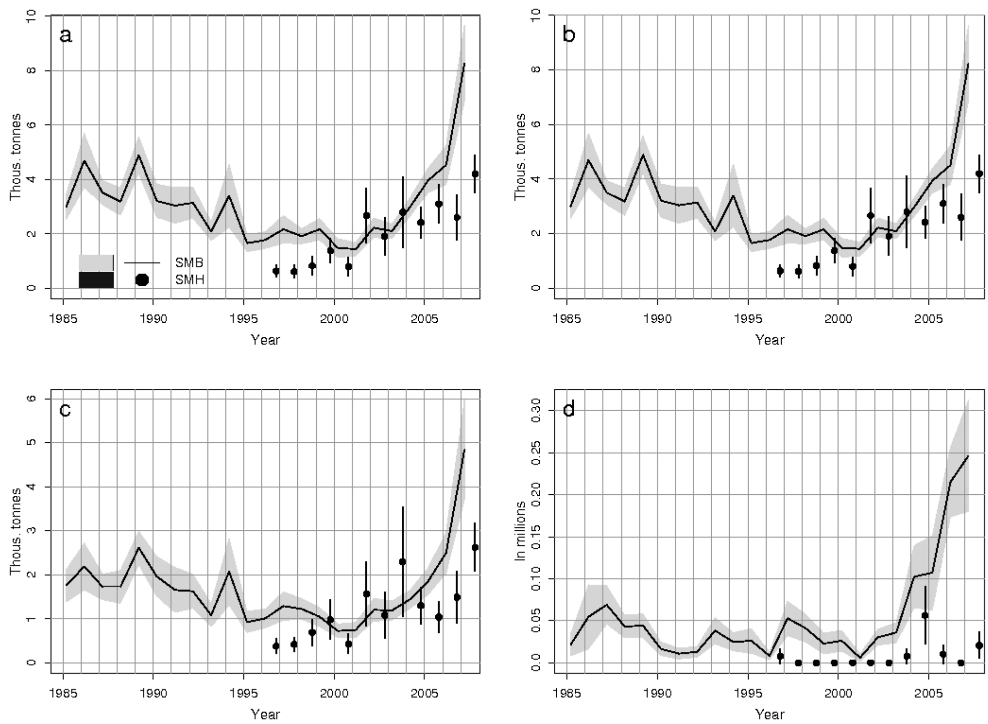

Figure 5.4.5. Ling. Indices from the groundfish survey in March 1985-2007 (SMB, line, shaded area) and October 1996-2007 (SMH, points, vertical lines). a) Total biomass index, b) Biomass of 40 cm and larger, c) Biomass 90 cm and larger, d) Abundance of < 40 cm. The shaded area and the vertical bar show ±1 standard error of the estimate.

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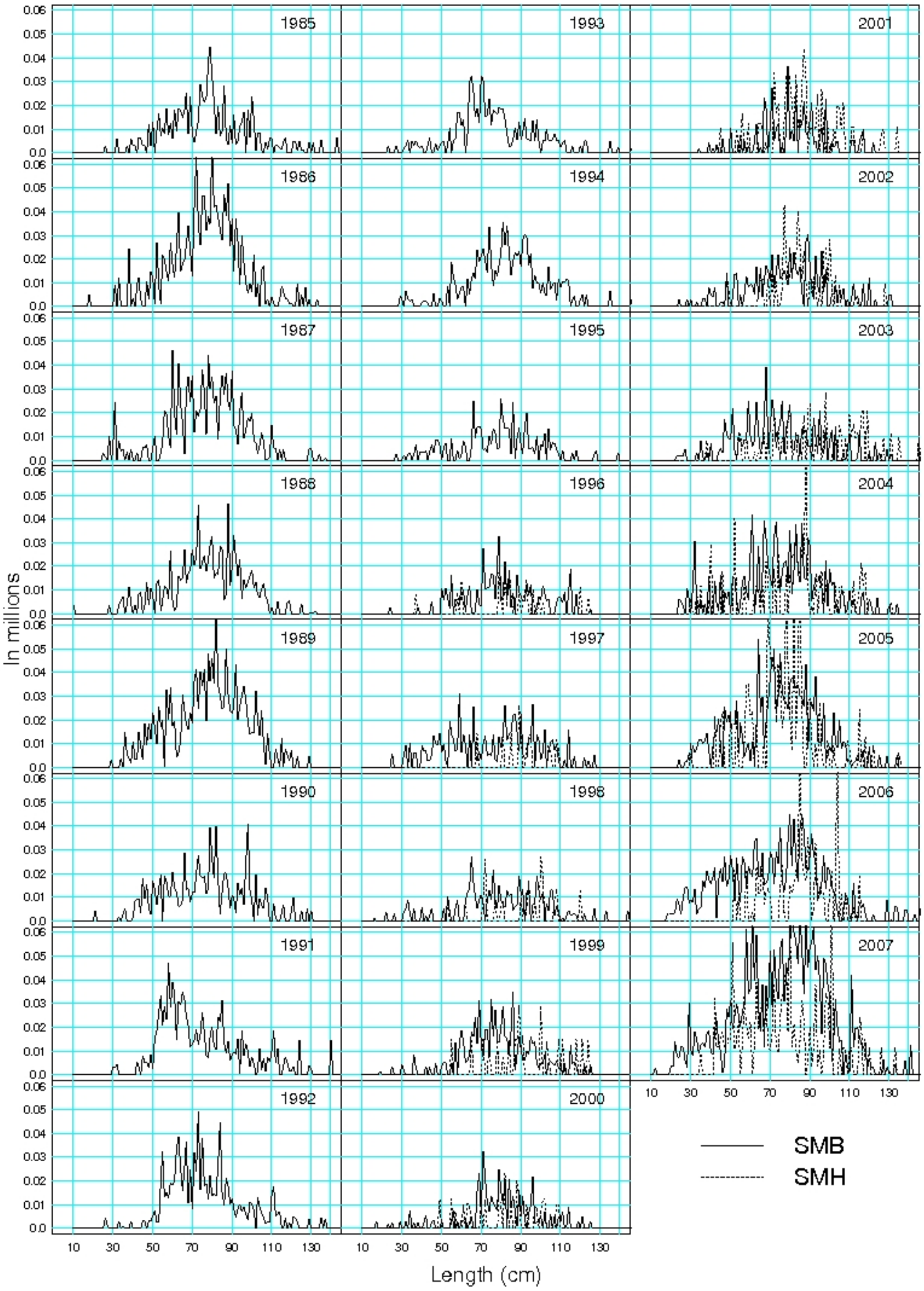

Figure 5.4.6. Length distributions of ling in the Icelandic groundfish survey in March 1985-2007 (SMB, solid line) and in October 1996-2007 (SMH, dotted line).

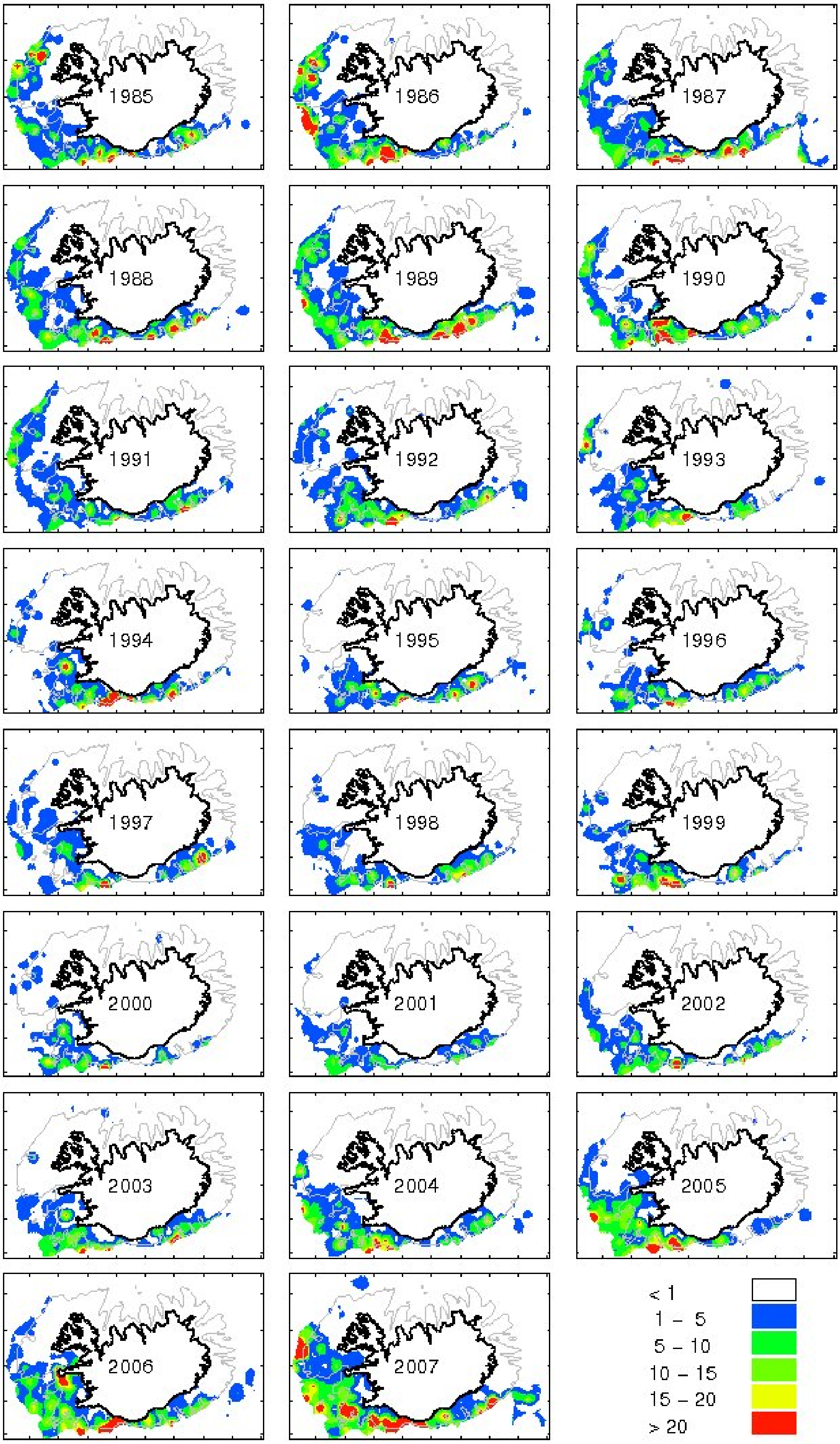

Figure 5.4.7. Distribution of ling (kg per standardized) in the groundfish survey in March 1985-2007.

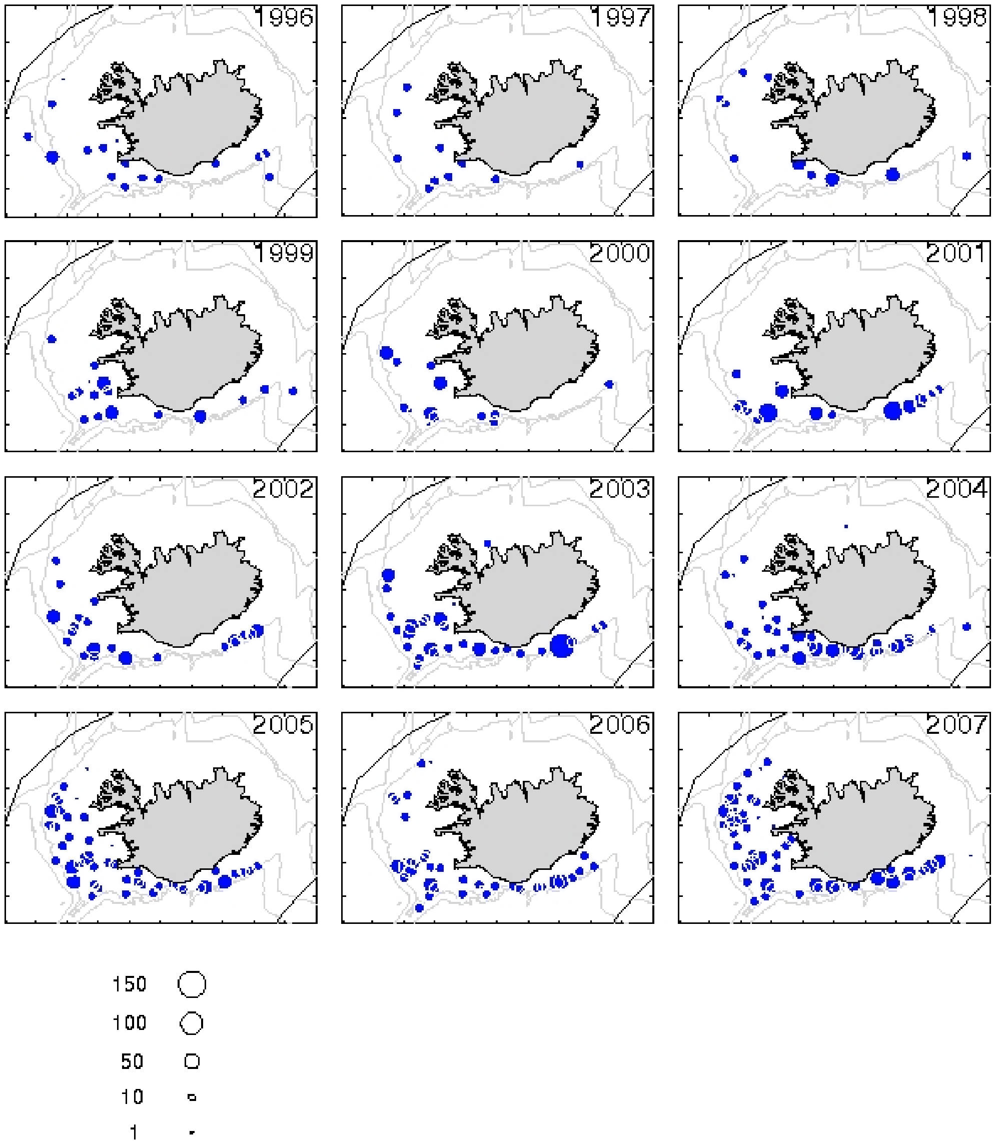

Figure 5.4.8. Distribution of ling in the groundfish survey in October 1996-2007. The sizes of the circles indicate kg/station.

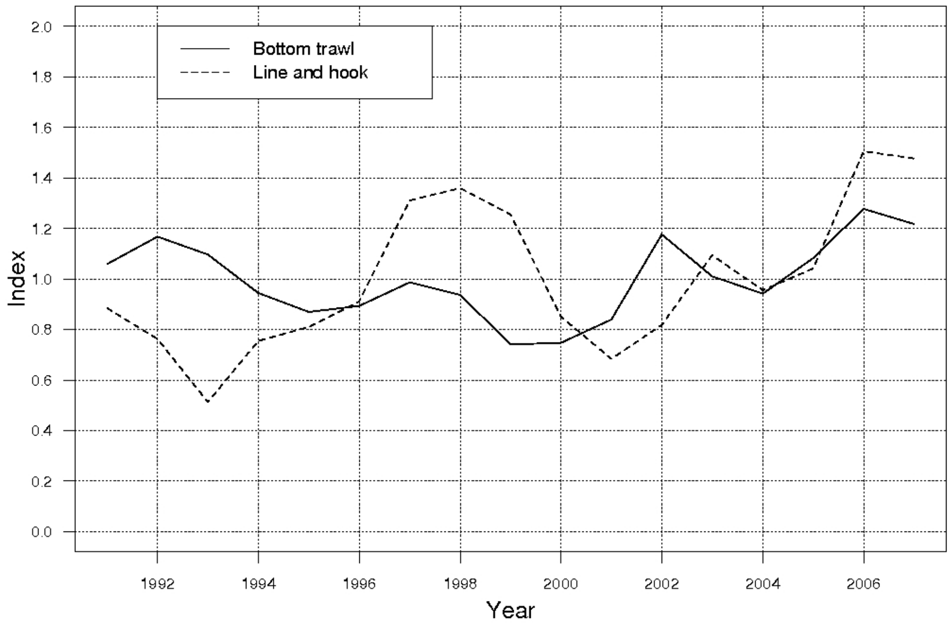

Figure 5.4.9. Index of raw CPUE (sum(yield)/sum(effort)) of ling from the Icelandic bottom trawl fishery (solid line) and the long-line fishery (dotted line) 1991-2007. The criteria for the calculations were all tows or sets where tusk was reported in the log-books.

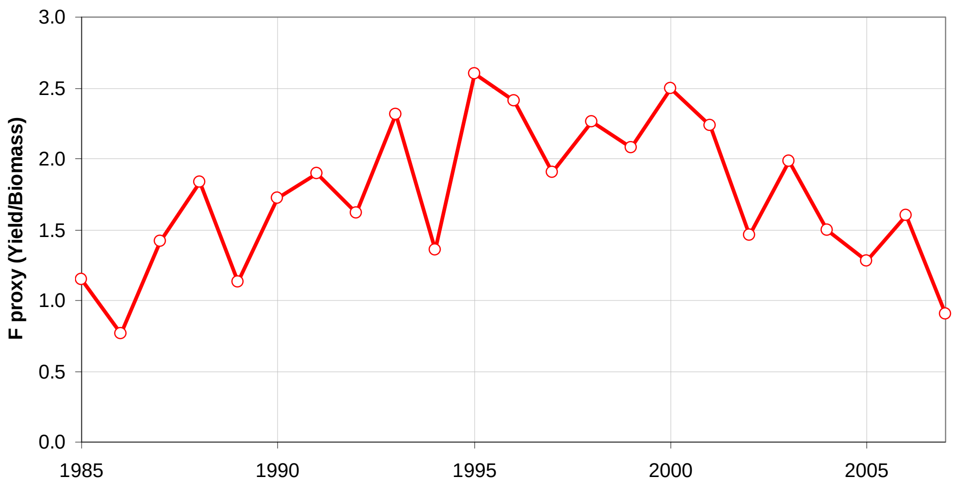

Figure 5.4.10. LING in Va. Estimates of trends in relative fishing mortality (Yield / Survey biomass)

5.5 Ling (*Molva Molva*) in other areas (IIIa, IV, VI, VII, VIII, IX, X, XII, XIV)

5.5.1 The fishery

Significant fisheries for ling have been conducted in Subarea III and IV at least since the 1870s, pioneered by Swedish longliners. Since the mid-1900s and presently, the major aimed ling fishery in IVa is the Norwegian longlining conducted around Shetland and in the Norwegian Deep. There is little activity in IIIa. Of the total Norwegian landings about 75% are taken by longline, 15% by gillnet, and the remainder by trawl. The bulk of the landings from other countries were taken by trawl as by-catches in other fisheries, and the landings from the United Kingdom (Scotland) are the most substantial. The comparatively low landings from the central and southern North Sea (IVb,c), are by-catches in various other fisheries.

The major directed ling fishery in VI is the Norwegian longline fishery. Trawl fisheries by the United Kingdom (Scotland) and France primarily take ling as by-catch.

In Sub-area VII the Divisions b, c, and g-k provide most of the landings of ling. Norwegian landings, and some of Irish and Spanish are from targeted longline fisheries, whereas other landings are primarily by-catches in trawl fisheries. Data split by gear type was not available for all countries, but the bulk of the total landings (at least 60-70%) are taken by trawl in these areas.

In Sub-area VIII and IX, XII and XIV all landings are by-catches in various fisheries.

5.5.1.1 Landings trends

Landing statistics by nation in the period 1988-2006 are given in Table 5.5.1. In Division IVa the total landings has varied between near 10,000 and 13,000 t until 1998, declined until 2003 to about half that level, and has remained stable since.

In Division VIa the statistics are incomplete for the period 1989-1993. In the period 1994-2007 when the data are complete, they show a declining trend towards a level less than half that in the 1990s. The Norwegian landings declined substantially since the mid-1990s compared with earlier years. In Division VIb landings decreased in the late 90s and reach a minimum in 2002, after which a gradual increase has occurred.. In the last two years landings were about 65% of the mean annual landings for the period 1988-1995.

In Subarea VII landings were around 10 000t in the period 1995-1998. After this a gradual decrease has occurred to around 4000t in later years. Preliminary data for 2007 is only 2613 t.

In Subarea VIII annual ling landings have been only a few hundred tons since 1999, and in Subareas IX, XII, and XIV the landings have remained minor.

5.5.1.2 ICES advice

The advice statement from 2006 was: *Landings of ling have declined in recent years and the overall cpue on ling has remained at a reduced level. ICES recommends to reduce catches to 10 000 t (about 30%) and to monitor if the indicators show that stock sizes increase.*

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5.5.1.3 Management

Since 2003, the European Union has set TACs for EU vessels fishing in community waters and waters not under the control of Third Countries. Between 2003 and 2007, ling was covered by the biennial regulations for deep-water water species, however, from 2008 it has been included in annual TAC regulation covering other species.

EU TACs for ling in 2008 are:

Subarea IIIa & EC waters of IIIc,d:	100 tonnes
EC waters of Subarea IV:	2856 tonnes
Subarea VI, VII, VIII, IX, X, XII, XIV:	10776 tonnes

There is no species-specific regulation in the Norwegian EEZ, but a TAC is negotiated for Norwegian vessels fishing in EU waters. The quota of ling to Norway in the EC zone is for 2008 set to5 638 tonnes. The quota to EC in area IV is set to 850 tonnes.

5.5.2 Data available

5.5.2.1 Landings and discards

Landings were available for all relevant fleets. New discard data were not available, but within the Norwegian EEZ discarding is prohibited and assumed to be minor. Discard data from some fleets have been reported previously to WGDEEP.

5.5.2.2 Length compositions

No new data were presented.

5.5.2.3 Age compositions

No new age compositions were available.

5.5.2.4 Weight at age

No new data were presented.

5.5.2.5 Maturity and natural mortality

No new data were presented.

5.5.2.6 Catch, effort and research vessel data

Catch and effort data for Norwegian longliners were updated for the period up to 2006. Data for 2007 were not available in time for the WG meeting. Trends from Danish and Basque trawlers were presented. No research vessel data were available.

The extensive Norwegian longliner CPUE data based on private skipper's logbooks presented in the 1996 report were not updated after 1994. In the 1998 report (Table 6.5 of ICES C.M. 1998/ACFM:12), effort data were given for the period 1974-1996 based on official statistics.

In order to resume the CPUE-series Norway has adopted two approaches:

1) *Official logbooks from longliners.* Entering of data from official logbooks in an electronic database was begun in 2001 and data are now available for the period 2000-2006. Vessels were selected that had a total landed catch of ling, tusk and blue ling

exceeding 8 tons in a given year. The logbooks contain records of the daily catch, date, position, and number of hooks used per day.

2) *Reference fleet information*. Since 2001 special agreements were made with selected vessels, “the reference fleet”, providing data for the species composition of the catch (in weight), and number of hooks used per day (Helle and Pennington, WD 2004). There are currently four longline vessels contributing data.

An analyses based on these two sources of data was presented in a WD by Helle and Pennington (2007). And both the analysis from the 1990s and after 2000 include data from Subareas IV, VI and VII.

LPUE data for the period 1994-2003 were presented for the Basque “Baka” trawlers fishing in VI and VII.

CPUE for Danish trawlers fishing in IIIa and IV were available for the period 1992-2007.

5.5.3 Data analyses

No analytical assessments were possible

A source of information on abundance trends was the CPUE series from the Norwegian longliners presented by Helle and Pennington (WD8, 2007). The number of high-seas longliners has declined in recent years from 72 to 35 in the period 2000-2006. The remaining vessels have maintained an annual landing level of 300-550 tonnes/vessel and the vessels operate in the entire Northeast Atlantic.. However, the number of fishing days with ling catch has increased in the same period with almost 50 % (Table 5.5.1). The number of hooks set per day and the total set per year has remained rather stable in the relevant Subareas (Table 5.5.2 and 5.5.3), but summed over all areas the total number of hooks declined in the last three years.

Table 5.5.4 gives estimates of CPUE based on the Norwegian official logbooks and the reference vessels. In Figure 5.5.1 the data for 2000-2006 are shown, and in Figure 5.5.2 these recent data are given together with the data for the period 1971-1994 (considered earlier by WGDEEP and presented in Bergstad and Hareide, 1996). There is a gap in the time series between 1995 and 2000, and due to data limitations it was not possible to estimate CPUE for all years in the early period. The data are most extensive and presumably most reliable from the more important Subareas IV and VI.

The CPUE varied strongly, but declined markedly in the 1970s and 1980s, and the level appears to have remained comparatively low from the early 1990s into the 2000-2006 period. There is an apparent increase in the most recent years, but this must be interpreted with caution since it is based on few logbooks. Data on landings per fishing days from the Basque “Baka” trawlers show decreasing trends in recent years both in areas VI, VII and VIII (Figure 5.5.3).

5.5.4 Comments on the assessment

The CPUE series of the main fleet landing ling (Norwegian longliners) suggest that the abundance has remained at a reduced level after the decline in the 1970s to 1990s. An upward trend in most Subareas in the most recent years may indicate a certain increase in abundance.

The Danish series from trawlers extending back to 1992 display variation without any apparent trends (Figure 5.5.4).

5.5.5 Management considerations

A major fleet in the ling fishery is the Norwegian high-seas longliners. The number of vessels has declined markedly in recent years. Although estimates suggest a decline in number of hooks set per year in Subareas IV, VI, VII, and VIII, it is uncertain if the current management has effectively reduced effort by 30% compared with the level in 1998 (ref. ICES advice from 2004). It is furthermore uncertain if the current management of by-catch fisheries by e.g. trawlers is in accordance with ICES advice from 2004. Based on the current perception of status and trends in the stock(s), there is no basis to suggest amendment of the advice statement from 2004.

Reference points that were previously assigned to ling were:

U_{lim}= 0.2* U_{max},

U_{pa}= 0.5* U_{max},

where U is a smoothed relative abundance index. As available indices do not cover the entire period of the fishery, U_{max} cannot be reliably estimated, therefore, these reference points cannot be used.

Table 5.5.0. Ling IIIa, IVa, VI, VII, VIII, IX, XII and XIV. WG estimates of landings.

LING III

Year	Belgium	Denmark	Germany	Norway	Sweden	E & W	**Total**
1988	2	165	-	135	29	-	**331**
1989	1	246	-	140	35	-	**422**
1990	4	375	3	131	30	-	**543**
1991	1	278	-	161	44	-	**484**
1992	4	325	-	120	100	-	**549**
1993	3	343	-	150	131	15	**642**
1994	2	239	+	116	112	-	**469**
1995	4	212	-	113	83	-	**412**
1996		212	1	124	65	-	**402**
1997		159	+	105	47	-	**311**
1998		103	-	111	-	-	**214**
1999		101	-	115	-	-	**216**
2000		101	+	96	31		**228**
2001		125	+	102	35		**262**
2002		157	1	68	37		**263**
2003		156		73	32		**261**
2004		130	1	70	31		**232**
2005		106	1	72	31		**210**
2006		95	2	62	29		**188**
2007*		82	3	68	21		**174**

*Preliminary

LING IVa

Year	Belgium	Denmark	Faroes	France	Germany	Neth.	Norway	Sweden[1)]	E&W	N.I.	Scot.	**Total**
1988	3	408	13	1143	262	4	6473	5	55	1	2856	**11223**
1989	1	578	3	751	217	16	7239	29	136	14	2693	**11677**
1990	1	610	9	655	241	-	6290	13	213	-	1995	**10027**
1991	4	609	6	847	223	-	5799	24	197	+	2260	**9969**
1992	9	623	2	414	200	-	5945	28	330	4	3208	**10763**
1993	9	630	14	395	726	-	6522	13	363	-	4138	**12810**
1994	20	530	25	n/a	770	-	5355	3	148	+	4645	**11496**
1995	17	407	51	290	425	-	6148	5	181		5517	**13041**
1996	8	514	25	241	448		6622	4	193		4650	**12705**
1997	3	643	6	206	320		4715	5	242		5175	**11315**
1998	8	558	19	175	176		7069	-	125		5501	**13631**
1999	16	596	n.a.	293	141		5077		240		3447	**9810**
2000	20	538	2	147	103		4780	7	74		3576	**9246**
2001		702		128	54		3613	6	61		3290	**7854**
2002	6	578	24	117			4509		59		3779	**9072**
2003	4	779	6	121	62		3122	5	23		2311	**6433**
2004		575	11	64	34		3753	2	15		1852	**6306**
2005		698	18	47	55		4078	4	12		1537	**6449**
2006		637	2	73	51		4443	3	55		1455	**6719**
2007*		412	-	81	60		4109	3	31		1327	**6023**

***Preliminary. [(1)] Includes IVb 1988-1993.**

Table 5.5.0. (continued)

LING IVbc,

Year	Belgium	Denmark	France	Sweden	Norway	E & W	Scotland	Germany	Netherlands	**Total**
1988					100	173	106	-		**379**
1989					43	236	108	-		**387**
1990					59	268	128	-		**455**
1991					51	274	165	-		**490**
1992		261			56	392	133	-		**842**
1993		263			26	412	96	-		**797**
1994		177			42	40	64	-		**323**
1995		161			39	301	135	23		**659**
1996		131			100	187	106	45		**569**
1997	33	166	1	9	57	215	170	48		**699**
1998	47	164	5		129	128	136	18		**627**
1999	35	138	-		51	106	106	10		**446**
2000	59	101	0	8	45	77	90	4		**384**
2001	46	81	1	3	23	62	60	6	2	**284**
2002	38	91		4	61	58	43	12	2	**309**
2003	28	0		3	83	40	65	14	1	**234**
2004	48	71		1	54	23	24	19	1	**241**
2005	28	56		5	20	17	10	13		**149**
2006	26	53		8	16	20	8	13		**144**
2007*	28	42	1	5	48	20	8	10		**162**

***Preliminary**

LING VIa

Year	Belgium	Denmark	Faroes	France [1]	Germany	Ireland	Norway	Spain [2]	E&W	IOM	N.I.	Scot.	**Total**
1988	4	+	-	5381	6	196	3392	3575	1075	-	53	874	**14556**
1989	6	1	6	3417	11	138	3858		307	+	6	881	**8631**
1990	-	+	8	2568	1	41	3263		111	-	2	736	**6730**
1991	3	+	3	1777	2	57	2029		260	-	10	654	**4795**
1992	-	1	-	1297	2	38	2305		259	+	6	680	**4588**
1993	+	+	-	1513	92	171	1937		442	-	13	1133	**5301**
1994	1	1		1713	134	133	2034	1027	551	-	10	1126	**6730**
1995	-	2	0	1970	130	108	3156	927	560	n/a		1994	**8847**
1996			0	1762	370	106	2809	1064	269			2197	**8577**
1997			0	1631	135	113	2229	37	151			2450	**6746**
1998				1531	9	72	2910	292	154			2394	**7362**
1999				941	4	73	2997	468	152			2264	**6899**
2000	+	+		737	3	75	2956	708	143			2287	**6909**
2001				774	3	70	1869	142	106			2179	**5143**
2002				402	1	44	973	190	65			2452	**4127**
2003				315	1	88	1477	75	108			1257	**3321**
2004				252	1	96	791	43	8			1619	**2810**
2005			18	423		89	1389	61	1			1108	**3089**
2006			5	499	2	121	998	61	137			811	**2634**
2007*			88	586	2	50	1544	1	29			932	**3232**

***Preliminary. [1] Includes VIb until 1996 [2] Includes minor landings from VIb.**

Table 5.5.0. (continued)

LING VIb

Year	Faroes	France [2]	Germany	Ireland	Norway	Spain [3]	E & W	N.I.	Scotland	Russia	**Total**
1988	196		-	-	1253		93	-	223		**1765**
1989	17		-	-	3616		26	-	84		**3743**
1990	3		-	26	1315		10	+	151		**1505**
1991	-		-	31	2489		29	2	111		**2662**
1992	35		+	23	1713		28	2	90		**1891**
1993	4		+	60	1179		43	4	232		**1522**
1994	104		-	44	2116		52	4	220		**2540**
1995	66		+	57	1308		84		123		**1638**
1996	0		124	70	679		150		101		**1124**
1997	0		46	29	504		103		132		**814**
1998		1	10	44	944		71		324		**1394**
1999		26	25	41	498		86		499		**1175**
2000	+	18	31	19	1172		157		475	7	**1879**
2001	+	16	3	18	328		116		307		**788**
2002		2	2	2	289		65		173		**533**
2003		2	3	25	485		34		111		**660**
2004	+	9	3	6	717		6		141	182	**1064**
2005		31	4	17	628		9		97	356	**1142**
2006	30	4	3	48	1171		19		130	6	**1411**
2007*	4	10	35	60	971		6		225	50	**1361**

***Preliminary. (1) Includes XII. (2) Until 1966 included in VIa. (3) Included in Ling VIa.**

LING VII

Year	France	Total
1988	5,057	5,057
1989	5,261	5,261
1990	4,575	4,575
1991	3,977	3,977
1992	2,552	2,552
1993	2,294	2,294
1994	2,185	2,185
1995	-1	
1996	-1	
1997	-1	
1998	-1	
1999	-1	

***Preliminary**

Table 5.5.0. (continued)

LING VIIa

Year	Belgium	France	Ireland	E & W	IOM	N.I.	Scotland	Total
1988	14	-1	100	49	-	38	10	**211**
1989	10	-1	138	112	1	43	7	**311**
1990	11	-1	8	63	1	59	27	**169**
1991	4	-1	10	31	2	60	18	**125**
1992	4	-1	7	43	1	40	10	**105**
1993	10	-1	51	81	2	60	15	**219**
1994	8	-1	136	46	2	76	16	**284**
1995	12	9	143	106	1	-2	34	**305**
1996	11	6	147	29	-	-2	17	**210**
1997	8	6	179	59	2	-2	10	**264**
1998	7	7	89	69	1	-2	25	**198**
1999	7	3	32	29		-2	13	**84**
2000	3	2	18	25			25	**73**
2001	6	3	33	20			31	**87**
2002	7	6	91	15			7	**119**
2003	4	4	75	18			11	**112**
2004	3	2	47	11			34	**97**
2005	4	2	28	12			15	**61**
2006	2	1	50	8			27	**88**
2007*	2	0	36	1			10	**49**

***Preliminary. (1) French catches in VII not split into divisions, see Ling VII. (2) Included with UK (EW)**

LING VII b,c

Year	France (1)	Germany	Ireland	Norway	Spain (3)	E & W	N.I.	Scotland	Total
1988	-1	-	50	57		750	-	8	**865**
1989	-1	+	43	368		161	-	5	**577**
1990	-1	-	51	463		133	-	31	**678**
1991	-1	-	62	326		294	8	59	**749**
1992	-1	-	44	610		485	4	143	**1286**
1993	-1	97	224	145		550	9	409	**1434**
1994	-1	98	225	306		530	2	434	**1595**
1995	78	161	465	295		630	-2	315	**1944**
1996	57	234	283	168		1117	-2	342	**2201**
1997	65	252	184	418		635	-2	226	**1780**
1998	32	1	190	89		393		329	**1034**
1999	51	4	377	288		488		159	**1366**
2000	123	21	401	170		327		140	**1182**
2001	80	2	413	515		94		122	**1226**
2002	132	0	315	207		151		159	**964**
2003	128	0	270			74		52	**524**
2004	133	12	255	163		27		50	**640**
2005	145	11	208			17		48	**429**
2006	173	1	311	147		13		23	**668**
2007*	136	5	75	27		67		20	**330**

***Preliminary. (1) See Ling VII. (2) Included with UK (EW). (3) Included with VIIg-k.**

Table 5.5.0. (continued)

LING VIId,e

Year	Belgium	Denmark	France (1)	Ireland	E & W	Scotland	Ch. Islands	**Total**
1988	36	+	-[1]	-	743	-		**779**
1989	52	-	-[1]	-	644	4		**700**
1990	31	-	-[1]	22	743	3		**799**
1991	7	-	-[1]	25	647	1		**680**
1992	10	+	-[1]	16	493	+		**519**
1993	15	-	-[1]	-	421	+		**436**
1994	14	+	-[1]	-	437	0		**451**
1995	10	-	885	2	492	0		**1389**
1996	15		960		499	3		**1477**
1997	12		1049	1	372	1	37	**1472**
1998	10		953		510	1	26	**1500**
1999	7		545	-	507	1		**1060**
2000	5		454	1	372		14	**846**
2001	6		404		399			**809**
2002	7		536		386	0		**929**
2003	5		532	1	250	0		**788**
2004	13		585	1	214			**813**
2005	11		666		236			**913**
2006	9		470		208			**687**
2007*	15		377	0	266			**658**

***Preliminary**

LING VIIf

Year	Belgium	France (1)	Ireland	E & W	Scotland	**Total**
1988	77	-[1]	-	367	-	**444**
1989	42	-[1]	-	265	3	**310**
1990	23	-[1]	3	207	-	**233**
1991	34	-[1]	5	259	4	**302**
1992	9	-[1]	1	127	-	**137**
1993	8	-[1]	-	215	+	**223**
1994	21	-[1]	-	379	-	**400**
1995	36	110	-	456	0	**602**
1996	40	121	-	238	0	**399**
1997	30	204	-	313		**547**
1998	29	204	-	328		**561**
1999	16	108	-	188		**312**
2000	15	91	1	111		**218**
2001	14	114	-	92		**220**
2002	16	140	3	295		**454**
2003	15	79	1	81		**176**
2004	18	74	5	65		**162**
2005	36	65	7	82		**190**
2006	10	42	14	64		**130**
2007*	16	48	2	55		**121**

***Preliminary. (1) See Ling VII.**

Table 5.5.0. (continued)

LING VIIg-k

Year	Belgium	Denmark	France	Germany	Ireland	Norway	Spain [2]	E&W	IOM	N.I.	Scot.	**Total**
1988	35	1	[1]	-	286	-	2652	1439	-	-	2	**4415**
1989	23	-	[1]	-	301	163		518	-	+	7	**1012**
1990	20	+	[1]	-	356	260		434	+	-	7	**1077**
1991	10	+	[1]	-	454	-		830	-	-	100	**1394**
1992	10	-	[1]	-	323	-		1130	-	+	130	**1593**
1993	9	+	[1]	35	374			1551	-	1	364	**2334**
1994	19	-	[1]	10	620		184	2143	-	1	277	**3254**
1995	33	-	1597	40	766	-	195	3046		[3]	454	**6131**
1996	45	-	1626	169	771		583	3209			447	**6850**
1997	37	-	1574	156	674		33	2112			459	**5045**
1998	18	-	1362	88	877		1669	3465			335	**7814**
1999	-	-	1220	49	554		455	1619			292	**4189**
2000	17		1062	12	624		639	921			303	**3578**
2001	16		1154	4	727	24	559	591			285	**3360**
2002	16		1025	2	951		568	862			102	**3526**
2003	12		1240	5	808		607	382			38	**3092**
2004	14		988		686		530	335			5	**2558**
2005	15		842	12	539		484	313			4	**2209**
2006	10		676		935		571	264			18	**2474**
2007*	11		631	1	480		109	217			6	**1455**

***Preliminary. (1) See Ling VII. (2) Includes VIIb,c. (3) Included in UK (EW).**

LING VIII

Year	Belgium	France	Germany	Spain	E & W	Scot.	**Total**
1988		1018			10		**1028**
1989		1214			7		**1221**
1990		1371			1		**1372**
1991		1127			12		**1139**
1992		801			1		**802**
1993		508			2		**510**
1994		n/a		77	8		**85**
1995		693		106	46		**845**
1996		825	23	170	23		**1041**
1997	1	705	+	290	38		**1034**
1998	5	1220	-	543	29		**1797**
1999	22	234	-	188	8		**452**
2000	1	227		106	5		**339**
2001		245		341	6	2	**594**
2002		316		141	10	0	**467**
2003		333		147	36		**516**
2004		385		112	53		**550**
2005		339		141	19		**499**
2006		324		73	45		**442**
2007*		250		30	10		**290**

Table 5.5.0. (continued)

LING IX

Year	Spain	**Total**
1997	0	**0**
1998	2	**2**
1999	1	**1**
2000	1	**1**
2001	0	**0**
2002	0	**0**
2003*	0	**0**

***Preliminary**

LING XII

Year	Faroes	France	Norway	E & W	Scotland	Germany	Ireland	Total
1988				-				0
1989				-				0
1990				3				3
1991				10				10
1992				-				0
1993				-				0
1994				5				5
1995	5			45				50
1996	-		2					2
1997	-		+	9				9
1998	-	1	-	1				2
1999	-	0	-	-	+	2		2
2000		1	-		6			7
2001		0	29	2	24		4	59
2002		0	4	4	0			8
2003			17	2	0			19
2004								
2005				1				1
2006	1							1
2007*								0

Table 5.5.0. (continued)

LING XIV

Year	Faroes	Germany	Iceland	Norway	E & W	Scotland	**Total**
1988		3	-	-	-	-	**3**
1989		1	-	-	-	-	**1**
1990		1	-	2	6	-	**9**
1991		+	-	+	1	-	**1**
1992		9	-	7	1	-	**17**
1993		-	+	1	8	-	**9**
1994		+	-	4	1	1	**6**
1995	-	-		14	3	0	**17**
1996	-			0			**0**
1997	1			60			**61**
1998	-			6			**6**
1999	-			1			**1**
2000			26	-			**26**
2001	1			35			**36**
2002	3			20			**23**
2003				83			**83**
2004				10			**10**
2005							**0**
2006							**0**
2007*				5			**5**

*Preliminary

Ling. Total landings by Sub-area or Division.

Year	I	IIa	IIb	III	IVa	IVbc	Va	Vb1	Vb2	VIa	VIb	VII	VIIa	VIIbc	VIIde	VIIf	VIIg-k	VIII	IX	XII	XIV	**All areas**
1988		6119	7	331	11223	379	5861	2372	2116	14556	1765	5057	211	865	779	444	4415	1028		0	3	**57531**
1989		7368		422	11677	387	5612	2962	1690	8631	3743	5261	311	577	700	310	1012	1221		0	1	**51885**
1990		7628		543	10027	455	5598	3062	795	6730	1505	4575	169	678	799	233	1077	1372		3	9	**45258**
1991		7793		484	9969	490	5805	3465	1047	4795	2662	3977	125	749	680	302	1394	1139		10	1	**44887**
1992		6521		549	10763	842	5116	2400	1214	4588	1891	2552	105	1286	519	137	1593	802		0	17	**40895**
1993		7093		642	12810	797	4854	2242	614	5301	1522	2294	219	1434	436	223	2334	510		0	9	**43334**
1994		6309	13	469	11496	323	4604	2657	965	6730	2540	2185	284	1595	451	400	3254	85		5	6	**44371**
1995		5954		412	13041	659	4192	3286	784	8847	1638		305	1944	1389	602	6131	845		50	17	**50096**
1996	136	6083	127	402	12705	569	4060	3996	900	8577	1124		210	2201	1477	399	6850	1041		2	0	**50859**
1997	31	5373	5	311	11315	699	3933	4733	924	6746	814		264	1780	1472	547	5045	1034	0	9	61	**45096**
1998	123	9072	5	214	13631	627	4302	4029	1330	7362	1394		198	1034	1500	561	7814	1797	2	2	6	**55003**
1999	64	7581	6	216	9810	446	4647	4576	662	6899	1175		84	1366	1060	312	4189	452	1	2	1	**43549**
2000	69	5891	4	228	9246	384	3743	3386	399	6909	1879		73	1182	846	218	3578	339	1	7	26	**38408**
2001	66	4858	33	262	7854	284	3346	4112	497	5143	788		87	1226	809	220	3360	594	0	59	36	**33634**
2002	206	6917	9	263	9072	309	4518	3682	457	4127	533		119	964	929	454	3526	467	0	8	23	**36583**
2003	89	6062	6	261	6433	234	4264	3966	927	3321	660		112	524	788	176	3092	516		19	83	**31533**
2004	345	6138	77	232	6306	241	4605	5728	247	2810	1064		97	640	813	162	2558	550		0	10	**32623**
2005	107	6105	93	210	6449	149	5170	5401	647	3089	1142		61	429	913	190	2209	499		1	0	**32864**
2006	58	8723	64	188	6719	144	7405	5032	177	2634	1411		88	668	687	130	2474	442		1	0	**37045**
2007*	96	10055	181	174	6023	162	7634	5263	309	3232	1361		49	330	658	121	1455	290		0	5	**37398**

***Preliminary**

Table 5.5.1. Estimated number of days that the Norwegian long liner fleet (selected using criteria described in the text, Ch 4.2) operated in Subareas III to VII (not V) in the period 2000-2006

All species	2000	2001	2002	2003	2004	2005	2006
IIIa	+			1			
IVa	19	22	29	20	22	25	38
IVb	1	+		1			
VIa	13	13	11	12	14	23	13
VIb	4	5	7	4	5	8	7
VIIc	3	1			1	+	

Table 5.5.2. Estimated number of hooks that the Norwegian long liners set per day in Subarea III-IV and VI-XIV in the period 2000-2006. n= the total number of days with hook information contained in the logbooks.

All	2000		2001		2002		2003		2004		2005		2006	
	Average	n	Average	n	Average	n	Average	n	Average	n	Average	n	Average	n
IIIa	30250	4					33037	27						
IVa	29395	664	30553	727	32291	667	33484	510	30934	439	34039	331	34561	673
IVb	30263	38	33500	10	33867	15	32559	34						
VIa	22808	433	24419	447	21484	186	29421	302	25636	308	24807	369	22504	248
VIb	31023	178	30340	140	31557	149	31325	97	31559	111	35949	137	32273	139
VIIc	29383	81	33108	37					25250	28	33429	7		
XII	13500	4	17548	175			13063	48						
XIVa	28333	6												
XIVb	2815	191	2465	135	9458	251	11515	228	12474	105	18960	91		

Table 5.5.3. Estimated total number of hooks (in thousands) the Norwegian long liner fleet used in Subareas III-IV and VI-XIV for the years 2000-2006 in the fishery for ling (with a by-catch of tusk and blue ling).

All	2000	2001	2002	2003	2004	2005	2006
IIIa	653			1718			
IVa	42329	43691	54313	36565	29264	33188	45966
IVb	2179			1693			
VIa	21348	22221	14953	18359	15433	24187	10239
VIb	11168	11833	14642	9773	6785	11216	7907
VIIc	4231	2152			1086	521	
XII	292	5703		2038			
XIVb	1216	481	4389	5389	4827	3697	

Table 5.5.4. Estimated mean CPUE ([kg/hook]x1000) in IIIa-IV and VI-XIV based on log book data. Standard error (se) and number of catches sampled (n) is also given.

Official logbook data:

Ling

	2000			2001			2002			2003			2004			2005			2006		
Area	**CPUE**	**n**	**se**	**CPUE**	**n**	**se**	**CPUE**	**n**	**se**	**CPUE**	**n**	**se**	**CPUE**	**n**	**se**	**CPUE**	**n**	**se**	**CPUE**	**n**	**se**
IIIA	5.6	4	13.5							2.4	25	4.4									
IVA	58.7	597	1.1	48.1	729	0.8	55.5	618	0.7	57.2	505	1.0	78.5	439	1.1	85.1	328	1.7	92.5	672	1.0
IVB	8.3	25	5.4	2.4	12	6.0	1.4	3	11.0	2.9	29	4.1									
VIA	8.3	103	1.6	4.5	140	3.2	8.9	46	1.1	7.4	125	1.7	7.7	110	1.0	7.6	162	0.6	13.6	156	0.9
VIB	61.3	8	5.7	16.9	11	11.5	2.6	13	2.1	113.1	12	5.5							1.9	6	4.8
XII	212.9	17	3.9	137.3	123	3.5				25.1	36	3.1									
XIVB							4.8	3	4.5				14.7	5	4.7						

Reference fleet data:

Ling	**2001**			**2002**			**2003**			**2004**			**2005**			**2006**		
Area	**CPUE**	**n**	**se**	**CPUE**	**n**	**se**	**CPUE**	**n**	**se**	**CPUE**	**n**	**se**	**CPUE**	**n**	**se**	**CPUE**	**n**	**se**
IIA	9,4	19	2,17	27	88	2,08	33	134	2,03	47,12	183	2,46	54,4	275	2,4	54,94	366	2,33
IVA							31,1	40	3,71	99,8	83	3,66	82,6	99	4	78,2	90	4,71
VIA							83,3	43	3,58									
VIB				59,4	5	8,71	31,1	34	4,02							113,83	32	7,9

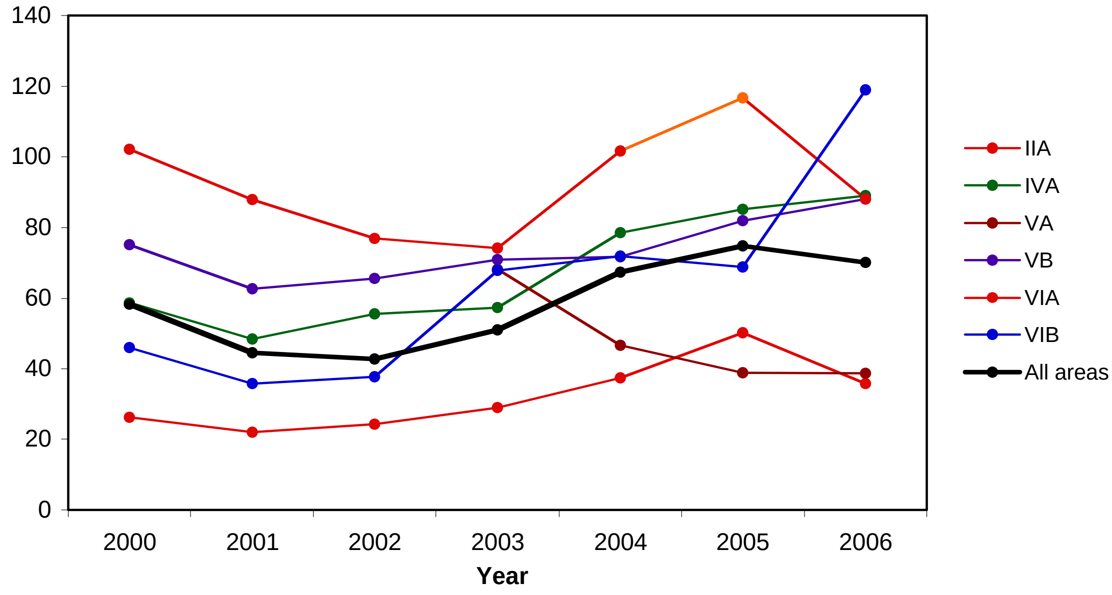

Figure 5.5.1. Estimated mean CPUE ([kg/hook]x1000) based on data from the official log books for tusk and ling in each ICES Subarea and all areas combined for the years 2000- 2006.

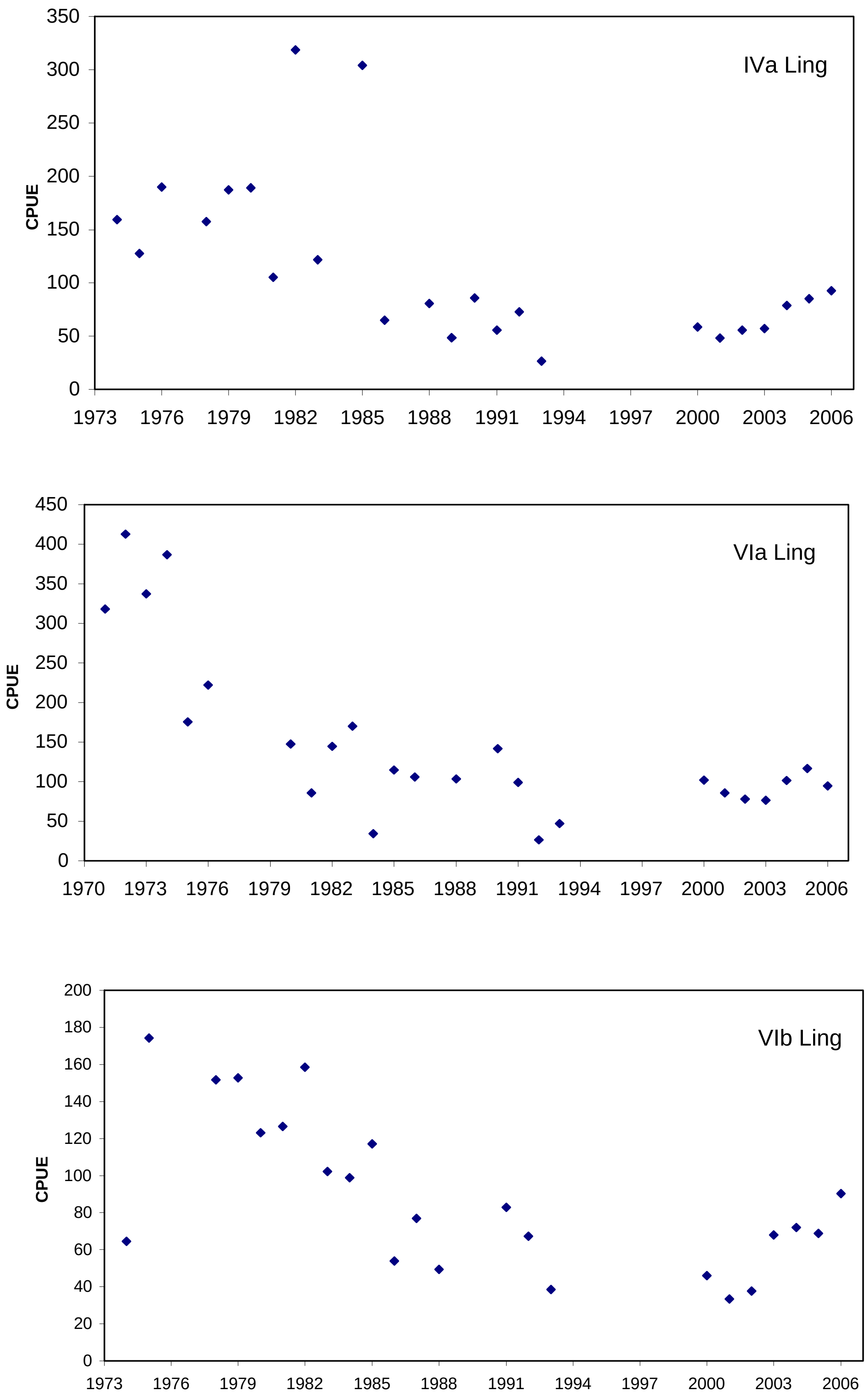

Figure 5.5.2. Estimates of CPUE (kg/1000 hooks) of ling based on skipper's logbooks (pre-2000) and official logbooks (post 2000). Combination of data from Bergstad and Hareide (1996) and WD3 by Helle and Prnnington (2007). Note gap in time series between 1993 and 2000, and the differences in CPUE scale between areas.

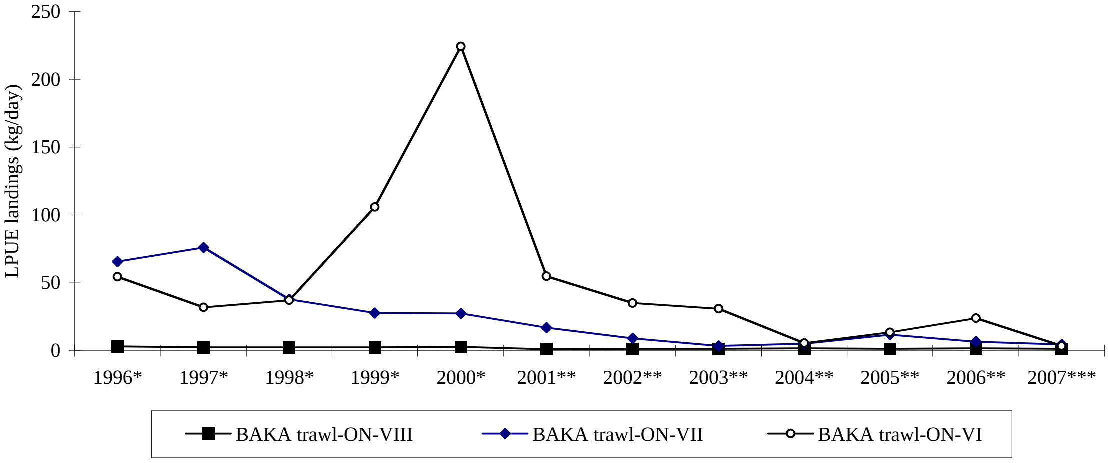

Figure 5.5.3. Landings per fishing effort of ling in ICES Sub-area VI, VII and VIII, of "Baka" trawlers of the Basque Country, in 1994-2007. LPUE = kg/(Nº trip*(mean fishing days/trip) = kg/day). *) from 1996 to 2000 EFFORT and LANDINGS OF Baka Otter trawl of Ondarroa fishing port; **) from 2001 to 2006 EFFORT and LANDINGS of Baka Otter trawl of all fishing ports.; *) Preliminary data**

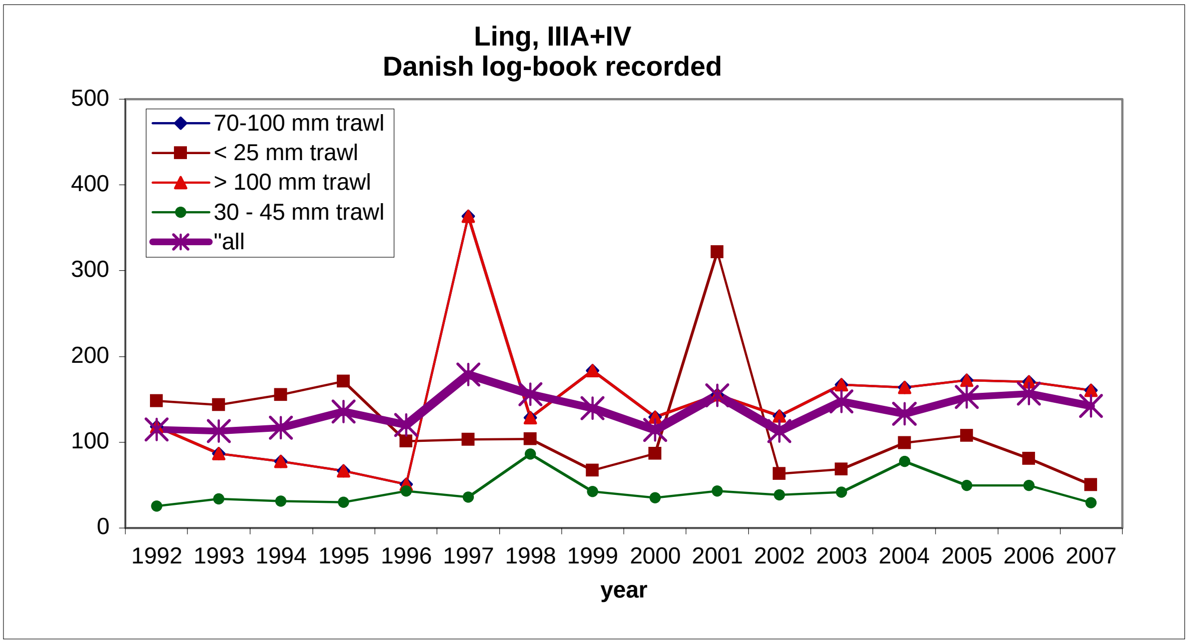

Figure 5.5.4. CPUE of ling for Danish trawlers in Subareas IIIa and IV. Based on logbook data.

6 Blue Ling (*Molva dypterygia*) In the Northeast Atlantic

6.1 Stock description and management units.

Biological investigations in the early 1980s suggested that at least two adult stock components were found within the area, a northern stock in Subarea XIV and Division Va with a small component in Vb, and a southern stock in Subarea VI and adjacent waters in Division Vb. However, the observations of spawning aggregations in each of these areas and elsewhere suggest further stock separation. This is supported by differences in length and age structures between areas as well as in growth and maturity. Egg and larval data from early studies also suggest the existence of many spawning grounds. The conclusion is that stock structure is uncertain within the areas under consideration.

However, as in previous years, on the basis of similar trends in the CPUE series from Division Vb and Subareas VI and VII, blue ling from these areas has been treated for assessment purposes as a single southern stock. Blue ling in Va and XIV has been treated as a single northern stock. All remaining areas are grouped together as "other areas.

Catches data for blue ling in 2006 and 2007 aggregated at the level of statistical rectangle were provided to the working group by France, Ireland, the UK (England and Wales and Scotland) and Iceland. These are shown in Figure 6.1.1 and 6.2.2.

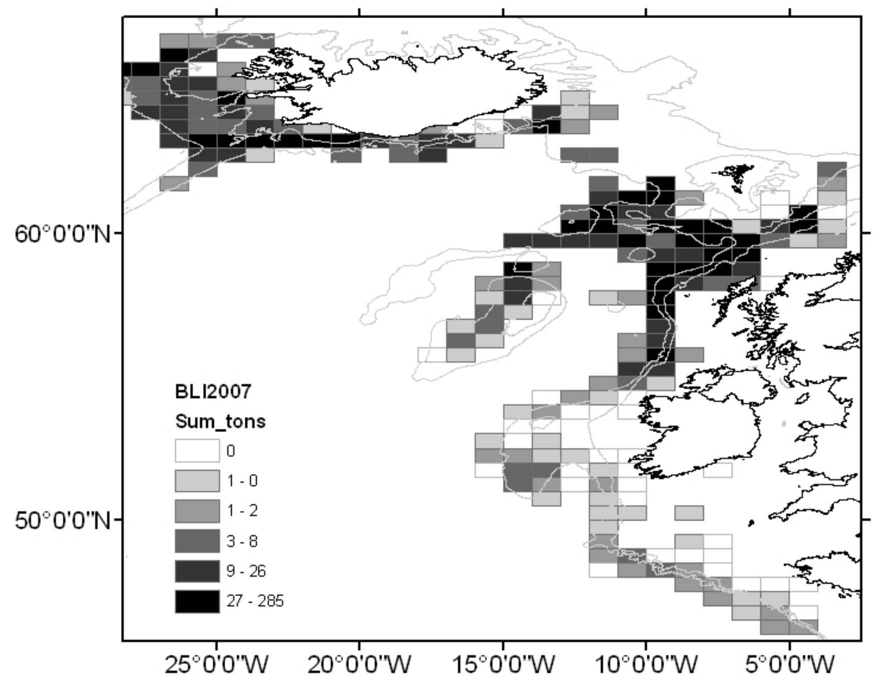

Figure 6.1.1. Catches of blue ling by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2006.

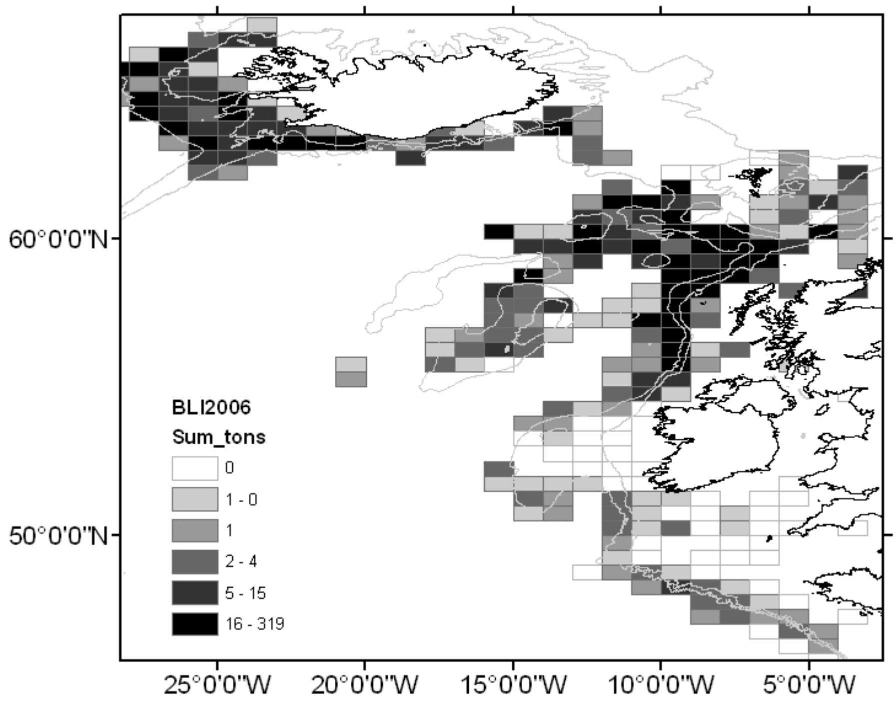

Figure 6.1.2. Catches of blue ling by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2007.

6.2 Blue Ling (*Molva Dypterygia*) In Division Va and Subarea XIV

6.2.1 The fishery

The geographical distribution of the Icelandic blue ling fisheries in 1996, 2000, 2006 and 2007 (Figure 6.2.1a) indicate that there has been an increase in catches of blue ling in north-western waters in the most recent period. This increase is likely a result of increased availability of blue ling in that area, rather than being a result of increase in effort or reporting.

The fishery for blue ling in Va changed substantially in nature and extent in the early 1980s. At the start of this period catches were high (Figure 6.2.3), in part because of fisheries on spawning aggregations. These aggregations diminished relatively quickly and since the mid 1980s the blue ling has largely been a by-catch in the redfish and Greenland halibut fishery. In 1993, the Icelandic fleet fished on aggregations of spawning blue ling in a small area on the Reykjanes ridge at the border between Subareas Va and XIV (Figure 6.2.2). This was a transient fishery that declined rapidly in the years thereafter.

In recent years major portion of the landings are taken by bottom trawl fisheries, as by-catch where the main target species are cod, haddock and other demersal species. 50% of the bottom trawl catches in 2007 were taken within the depth range of 300-700 m, with 50% of the catches taken at depths greater than 400 m.

Historically the fisheries in Subarea XIV have been relatively small.

6.2.1.1 Landings trends

The gross fluctuation in historical landing is most likely a reflection transient fishery on spawning grounds (Figure 6.2.3).

As a result of depletion of fish on spawning grounds (, total international landings in Va declined from around 8500 t in 1980 to a level of between 2000 and 3000 t in the late 1980s. Landings were at a historical low in the late 1990's, but have increased in recent years (Table 6.2.1a and Figure 6.2.3). The preliminary total international landings in 2007 were 2 082 t and these included 1483 t and 374 t from Icelandic bottom trawlers and long-liners, respectively

Total international landings from XIV (Table 6.2.1b) have been highly variable over the years, ranging from a few tonnes in some years to around 3700 t in 1993 and 950 t in 2003. Most of the landings in 2003 were taken by Spanish trawlers (390 t), but there is no further information available on this fishery. These larger landings are very occasional and in most years total international landings have been between 50 and 200 t. Preliminary landings in 2007 were 20 t.

6.2.1.2 ICES advice

The latest advice is from ICES ACFM in May 2006, stating that there should be no directed fisheries, measures put in place to minimized bycatch of blue ling and spawning areas should remained closed.

6.2.1.3 Management

In 2007 there is an EC TAC for EU vessels fishing in EU and international waters in II, IV and V of 95 t per annum. These in 2008 this was reduced to 78 t. EU landings from II, IV and Va were less than the EU TAC in II, IV and V (see below).

EU TAC area	EU TAC in 2007 (t)	EU landings in 2007 (t)
II, IV and V	95	83 (Va)

The Icelandic fishery is not regulated by a national TAC or ITQs. A national management measure specific to blue ling has been the introduction is closed areas to protect the spawning locations shown in Figure 6.2.2. These were introduced in 2003.

6.2.2 Data available

6.2.2.1 Landings and discards

Landings data are given in Tables 6.2.1a-6.2.1c. Discarding is banned in the Icelandic fishery and the level of discarding is unknown. There is no information on possible discarding of blue ling in XIV

6.2.2.2 Length compositions

Length distributions from the Icelandic trawl catches for the period 1996-2007 is shown in Figure 6.2.4 and from the Icelandic groundfish surveys (described later) in Figure 6.2.7. Detail overview of the sampling in the catches and surveys was given in WGDEEP 2007 report. The sampling intensity in 2007 was similar as in recent years.

6.2.2.3 Age compositions

No new data were available. Existing data are not presented due to the difficulties in the ageing of this species.

6.2.2.4 Weight at age

No new data were available. Existing data are not presented because of difficulty with ageing.

6.2.2.5 Maturity and natural mortality

Length at maturity from available data since 1986 is shown in Figure 6.2.5. L_{50} was estimated 77 cm.

No information was available on natural mortality (M). However, an estimate of M is can be estimated using the relationship:

M = LN(100)/maximum age

The maximum age can be set at the age where 1% of a year class is still alive. Based on age readings from the 1980s and 1990s, it is reasonable to assume the maximum age for blue ling in Va and XIV is around 30 years. Given this and the relationship above, M may be in the order of 0.15.

6.2.2.6 Catch, effort and RV data

Effort and CPUE data from the Icelandic trawl fleet are given in Table 6.2.1 and Figure 6.2.10.

The Icelandic spring groundfish survey, which has been conducted annually in March since 1985, gives fisheries-independent data for many exploited stocks in Va including blue ling (Figure 6.2.8) A total of more than 550 stations are taken annually in the survey at depths down to 500 meters. However, the spring survey area does not cover the most important distribution area of blue ling as their distribution area goes to greater depths.

In addition, an autumn survey was commenced in 1996 covering 150 stations of the 550 stations that have been taken in spring survey (i.e. shallower than 500 m). From its commencement in 1996 to 1999 an additional 150 stations were taken in deeper waters off the west, north, east and southeast continental slopes off Iceland (primarily targeting Greenland halibut). In 2000, 74 stations were added to the survey, covering the continental slopes to the south of Iceland and the Reykjanes ridge. The station coverage of the autumn survey from the year 2000 is thought to represent a reasonable coverage of the distribution of the blue ling by-catch fishery (figure 6.2.12)

Time-series stratified abundance and biomass indices from the spring and autumn trawl surveys are shown in Figure 6.2.6.

6.2.2.7 Data analyses

The annual number of length measurements from the Icelandic commercial trawl catches (Figure 6.2.4) are low, only about 1 200 fishes on average. The low sampling may thus not reflect the actual lengths of the catches. Notwithstanding, there is no evidence of an overall trend in the mean length.

Length distribution data from the spring trawl survey (Figure 6.2.7) are very different from those in the commercially fishery, comprising of a greater proportion of younger fish and a low proportion of larger fish (stock abundance for blue ling in Va peaks at depths at around 700 to 900m).

CPUE data derived from commercial trawl trips where blue ling accounts for more than 10% of catch are considered to be a reliable index of abundance and show a persistent decline during the 1990s to a stable but very low level in recent years (Figure 6.2.11). Another cpue series based on hauls directed at blue ling (where blue ling accounts for more than 50%) shows strong perturbations driven by fisheries on spawning aggregations. However, a cpue series where blue ling can be considered as bycatch (using hauls where blue ling is present, but less than 50% of the catch) is relatively stable.

The spring survey covers only the shallower part of the depth distributional range of blue ling and shows high interannual variance (Figure 6.2.6). It is thus unknown to what extent the spring indices reflect actual changes total ling biomass, given that is does not cover the depths were largest abundance of blue ling occur. It is however not driven by isolated large catches at a few survey stations (Figure 6.2.8). It decreased by 90% from 1985-1995. It remained very low until 2003, but in three last surveys (2004-2007) the index has increased from being 20% of the 1985 value to be similar to what it was in the 1980's. However, given the above, the recent increase observed in the spring survey should be treated with caution.

The shorter autumn survey, which is more likely in reflecting true biomass dynamics than the spring survey do not indicate that there has been significant changes in the blue ling biomass in recent years. (Figure 6.2.6).

This year no analytical assessments were attempted.

The annual number of measurements from the Icelandic commercial trawl catches (Figure 6.2.4) are low, only about 1 200 fishes on average. The low sampling may thus not reflect the actual lengths of the catches. Notwithstanding, there is no evidence of an overall trend in the mean length.

Length distribution data from the spring trawl survey (Figure 6.2.7) are very different from those in the commercially fishery, comprising of a greater proportion of younger fish and a low proportion of larger fish (stock abundance for blue ling in Va peaks at depths at around 700 to 900m).

CPUE data derived from commercial trawl trips where blue ling accounts for more than 10% of catch are considered to be a reliable index of abundance and show a persistent decline during the 1990s to a stable but very low level in recent years (Figure 6.2.10). Another cpue series based on hauls directed at blue ling (where blue ling accounts for more than 50%) shows strong perturbations driven by fisheries on spawning aggregations. However, a cpue series where blue ling can be considered as bycatch (using hauls where blue ling is present, but less than 50% of the catch) is relatively stable.

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The shorter autumn survey, which is more likely in reflecting true biomass dynamics than the spring survey do not indicate that there has been significant changes in the blue ling biomass in recent years. (Figure 6.2.6).

This year no analytical assessments were attempted.

6.2.2.8 Comments on the assessment

Generating a CPUE index that may reflect changes in abundance for blue ling is difficult (Figure 5.3.10), given the occasional opportunistic fisheries on discovered spawning grounds in some years. In such cases using tows where the proportion of blue ling is larger than a certain percentage may not be valid, when attempting to derive a reliable stock index. However, by using tows where the blue ling is only a bycatch (using tows were blue ling is less than 50% of catch) one may exclude these transient fisheries on spawning aggregations. However, due to time contraints, detailed work on establishing a cpue based on different criterion than has been done in the past was not possible prior to the commencement of the WG meeting this year.

At the 2004 WG, exploratory runs of Delury, surplus production and stock reduction models were carried out using total international catch data for Division Va and Subareas XIV combined (1966-2003) and CPUE data from Icelandic spring groundfish trawl survey (1985 – 2003) (see above). Although the survey data are fisheries independent and are considered to be a better indicator of changes in stock abundance than long-line and trawl data from Icelandic commercial vessels, the fits from the models were generally poor reflecting a high variability in the survey series, particularly in the early years

The Icelandic autumn groundfish survey covers the full depth range of blue ling and should in years to come provide a reasonable basis for the assessment of this stock. Suitable assessments methods may be stock reduction or possibly CSA.

6.2.3 Management considerations

The view was expressed that CPUE from commercial fishing vessels, which is derived largely from data from spawning aggregations, is not a reliable indicator of exploitable biomass for this species because of sequential depletion. The Group were aware of this problem but felt that the important issues were the large scale of the decline in CPUE in some areas and the fact that under the Precautionary Approach we have a responsibility to interpret the available data.

CPUE data from the Icelandic trawl fleet suggest that the abundance of blue ling in Va in recent years is about 25% of that observed at the start of the series in the early 1990s. These data and those from the autumn groundfish survey from 2002 onwards show no evidence of a recovery in stock.

At previous Working Groups, available evidence has indicated that blue ling in Va is at a low level. Taking into account the relative merits of available abundance indices, and the uncertainty regarding estimates of abundance in recent years, this view is unchanged.

Closed areas to protect spawning aggregations should be maintained and expanded where appropriate.

Table 6.2.0a. Blue ling: Landing in ICES division Va. WG estimates of landings. Source: STATLANT database, except bold values which are WG best estimates.

Year	Belgium	Faeroe Islands	France	Germany	Iceland	Norway	UK (E,W,NI)	UK (Sco)	Total
1966					**134**				**3545**
1967					**191**				**2842**
1968					**199**				**2730**
1969					**339**				**2438**
1970					**394**				**2557**
1971					**705**				**3778**
1972					**586**				**2916**
1973	0	74	0	1678	548	6	61	0	2367
1974	0	34	0	1959	331	140	32	0	2496
1975	0	69	0	1418	434	366	89	0	2376
1976	0	29	0	1222	624	135	28	0	2038
1977	0	39	0	1253	700	317	0	0	2309
1978	0	38	0	0	1237	156	0	0	1431
1979	0	85	0	0	2019	98	0	0	2202
1980	0	183	0	0	8133	83	0	0	8399
1981	0	220	0	0	7952	229	0	0	8401
1982	0	224	0	0	5945	64	0	0	6233
1983	0	1195	0	0	5117	402	0	0	6714
1984	0	353	0	0	3122	31	0	0	3506
1985	0	59	0	0	1407	7	0	0	1473
1986	0	69	0	0	**1771**	8	0	0	1848
1987	0	75	0	0	**1687**	8	0	0	1770
1988	0	271	0	0	**1889**	7	0	0	2167
1989	0	403	0	0	**2121**	5	0	0	2529
1990	0	1029	0	0	**1989**	0	0	0	3018
1991	0	241	0	0	1582	**1**	0	0	1824
1992	0	321	0	0	**2558**	**1**	0	0	2880
1993	0	40	0	0	**5317**	0	0	0	5357
1994	0	89	0	1	**1831**	0	0	0	1921
1995	0	113	0	3	**1576**	0	0	0	1692
1996	0	36	0	3	1284	0	0	0	1323
1997	0	25	0	0	1319	0	0	0	1344
1998	0	59	0	9	1086	0	0	0	1154
1999	0	31	0	8	**2027**	8	8	3	2085
2000	0	**36**	0	7	**1560**	25	**7**	0	1635
2001	0	95	0	12	**763**	49	22	1	942
2002	0	28	0	**0**	**1274**	74	6	4	1386
2003	0	16	0	**15**	**1095**	6	15	**8**	1155
2004	0	38	0	9	**1085**	49	20	0	1201
2005	0	24	0	**20**	**1495**	20	19	**5**	1583
2006	0	63	0	**23**	**1736**	27	7	2	1858
2007		73	0	0	1995	4	10	0	2082

Table 6.2.0b. Blue ling: Landing in ICES division XIV. WG estimates of landings. Source: STATLANT database, except bold values which are WG best estimates.

Year	Faeroe Is.	France	Germany	Greenland	Iceland	Norway	Russia	Spain	UK (E, W, NI)	UK (SCO)	Total
1973	0	0	50	0	10	0	0	0	0	0	60
1974	0	0	90	0	6	0	0	0	0	0	96
1975	0	0	285	0	90	3	0	0	0	0	378
1976	0	0	65	0	21	0	0	0	13	0	99
1977	0	0	491	0	0	0	0	0	6	0	497
1978	0	0	933	0	0	4	0	0	0	0	937
1979	0	0	1026	0	0	0	0	0	0	0	1026
1980	0	0	746	0	0	0	0	0	0	0	746
1981	0	0	1206	0	0	0	0	0	0	0	1206
1982	0	0	1946	0	0	0	0	0	0	0	1946
1983	0	0	621	0	0	0	0	0	0	0	621
1984	0	0	537	0	0	0	0	0	0	0	537
1985	0	0	315	0	0	0	0	0	0	0	315
1986	214	0	149	0	0	0	0	0	0	0	363
1987	0	0	199	0	0	0	0	0	0	0	199
1988	21	0	218	3	0	0	0	0	0	0	242
1989	13	0	58	0	0	0	0	0	0	0	71
1990	0	0	64	5	0	0	0	0	10	0	79
1991	0	0	105	5	0	0	0	0	45	0	155
1992	0	0	27	2	0	50	0	0	**27**	4	110
1993	0	**390**	16	0	**0**	**173**	0	0	**21**	1	3725
1994	1	0	15	0	300	11	0	0	57	0	384
1995	0	0	5	0	117	0	0	0	16	3	141
1996	0	0	12	0	0	0	0	0	2	0	14
1997	1	0	1	0	0	0	0	0	2	0	4
1998	48	0	1	0	0	1	0	0	6	0	56
1999	0	0	0	0	0	1	0	**0**	7	0	8
2000	0	0	0	0	4	0	0	**526**	2	0	532
2001	1	0	0	0	**0**	**0**	0	**91**	6	0	98
2002	0	0	0	0	**0**	1	0	**18**	0	0	19
2003	0	0	0	0	**0**	36	0	**909**	4	**0**	949
2004	0	0	0	0	**0**	1	0	**177**	3	4	185
2005	2	0	0	0	**0**	1	0	**0**	0	**18**	21
2006	0	0	0	0	**0**	**3**	1	**0**	0	0	4
2007	19					1					20

Table 6.2.0c. Blue ling: Landing in ICES division Va and XIV. Estimate for XIV prior to 1973 have not been compiled.

Year	Va	XIV	Total
1966	3545		
1967	2842		
1968	2730		
1969	2438		
1970	2557		
1971	3778		
1972	2916		
1973	2367	60	2427
1974	2496	96	2592
1975	2376	378	2754
1976	2038	99	2137
1977	2309	497	2806
1978	1431	937	2368
1979	2202	1026	3228
1980	8399	746	9145
1981	8401	1206	9607
1982	6233	1946	8179
1983	6714	621	7335
1984	3506	537	4043
1985	1473	315	1788
1986	1848	363	2211
1987	1770	199	1969
1988	2167	242	2409
1989	2529	71	2600
1990	3018	79	3097
1991	1824	155	1979
1992	2880	110	2990
1993	5357	3725	5958
1994	1921	384	2305
1995	1692	141	1833
1996	1323	14	1337
1997	1344	4	1348
1998	1154	56	1210
1999	2085	8	2093
2000	1635	532	2167
2001	942	98	1040
2002	1386	19	1405
2003	1155	949	2104
2004	1201	185	1386
2005	1583	21	1604
2006	1858	4	1862
2007	2082	20	2102

Table 6.2.1. Blue ling. Registered catch, hours trawled and CPUE from the Icelandic trawler fleet. Tows used for calculations of CPUE are those where blue ling was more than 10% of total catch in each particular haul.

YEAR	CATCH (KG)	HOURS	CPUE
1991	514700	963	534
1992	643129	1197	537
1993	3586509	2805	1279
1994	658941	1571	419
1995	405686	1135	357
1996	184792	764	242
1997	186010	924	201
1998	267140	1015	263
1999	710714	2048	347
2000	235869	1485	159
2001	132391	979	135
2002	228278	1834	124
2003	201215	1518	133
2004	199109	1327	150
2005	297542	2205	135
2006	334839	2769	121
2007	422680	2300	184

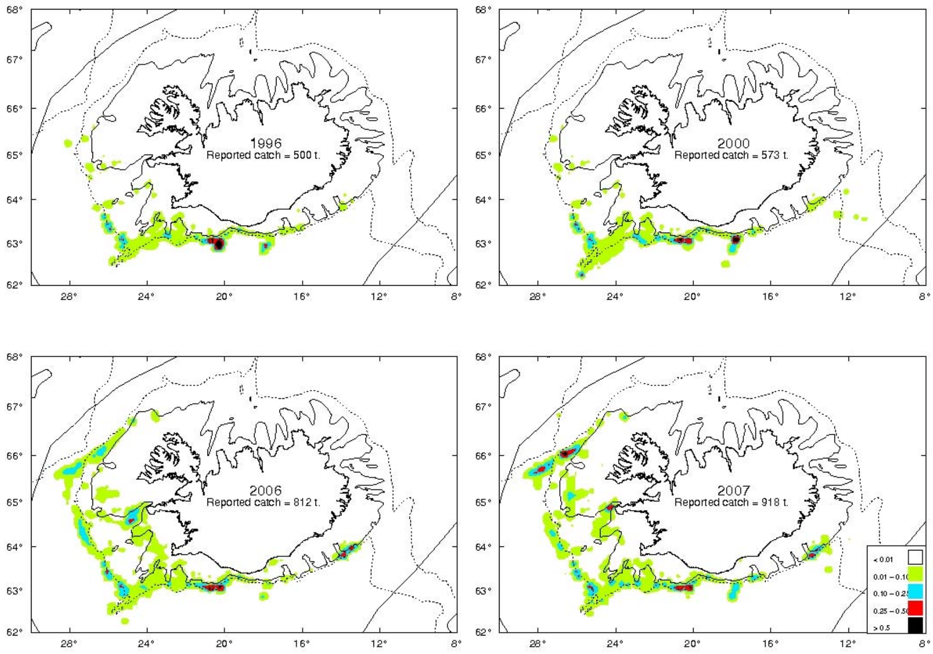

Figure 6.2.1a. Geographical distribution (tonnes/square mile) of the Icelandic blue ling fishery in 1996, 2000, 2006 and 2007 as reported in the logbooks. All gear types combined.

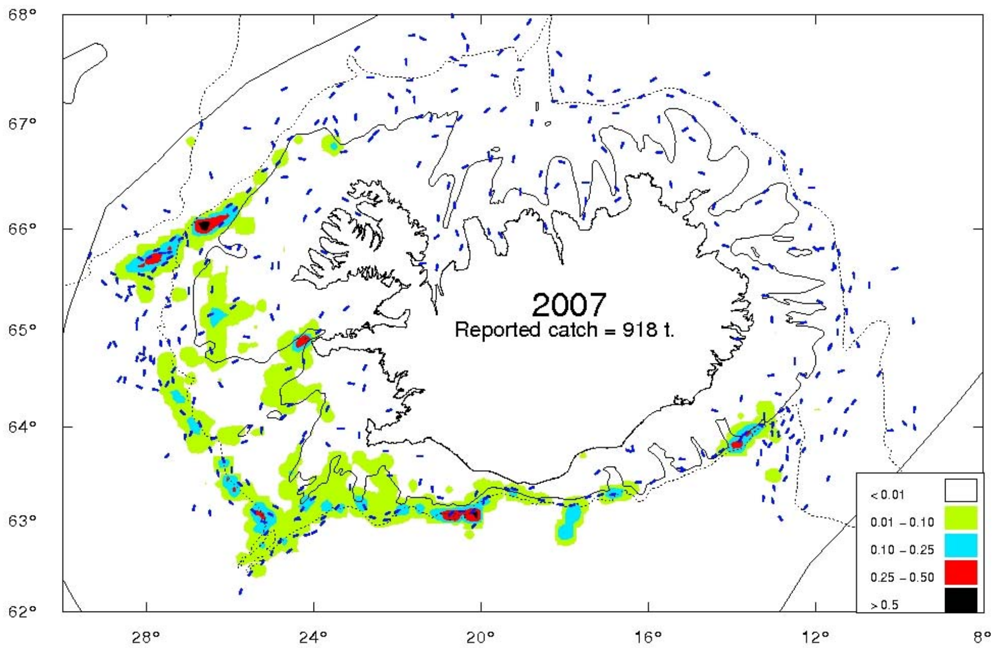

Figure 6.2.1b. Location of the autumn trawl survey and geographical distribution (tonnes/square mile) of the Icelandic blue ling fishery in 2007 as reported in the logbooks. All gear types combined.

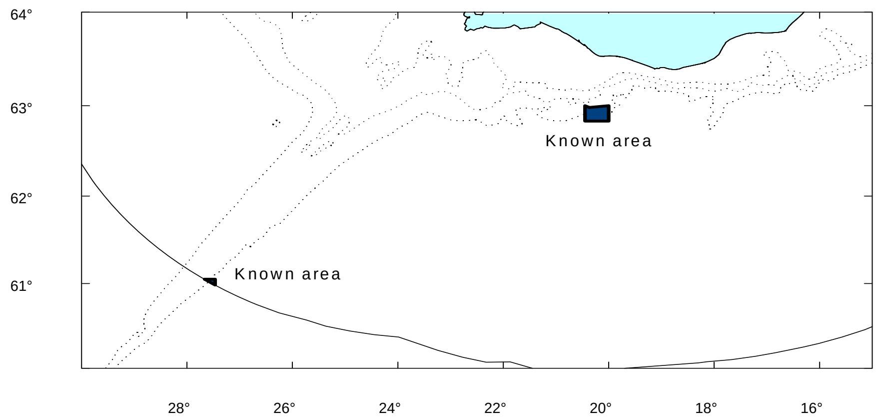

Figure 6.2.2. Known spawning grounds for blue ling in Icelandic waters

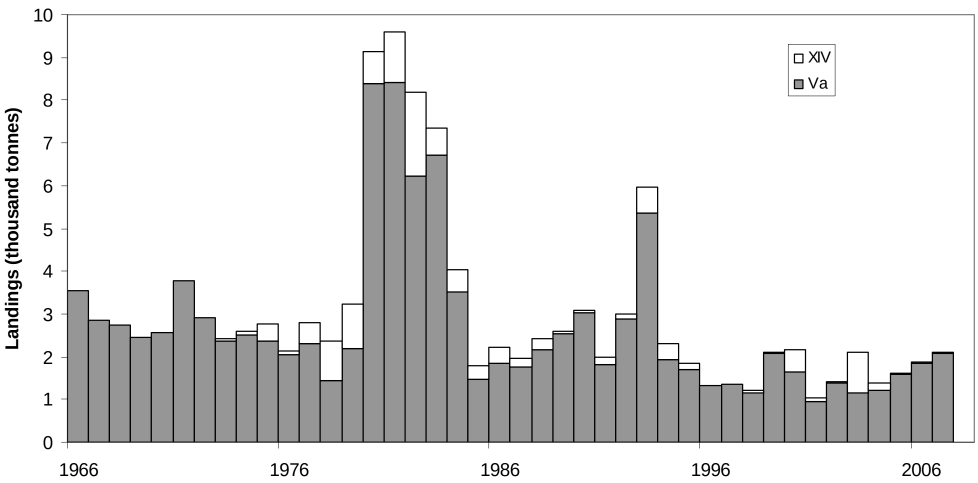

Figure 6.2.3. Blue ling in Va and XIV. Estimated total landings. Estimate for XIV prior to 1973 have not been compiled.

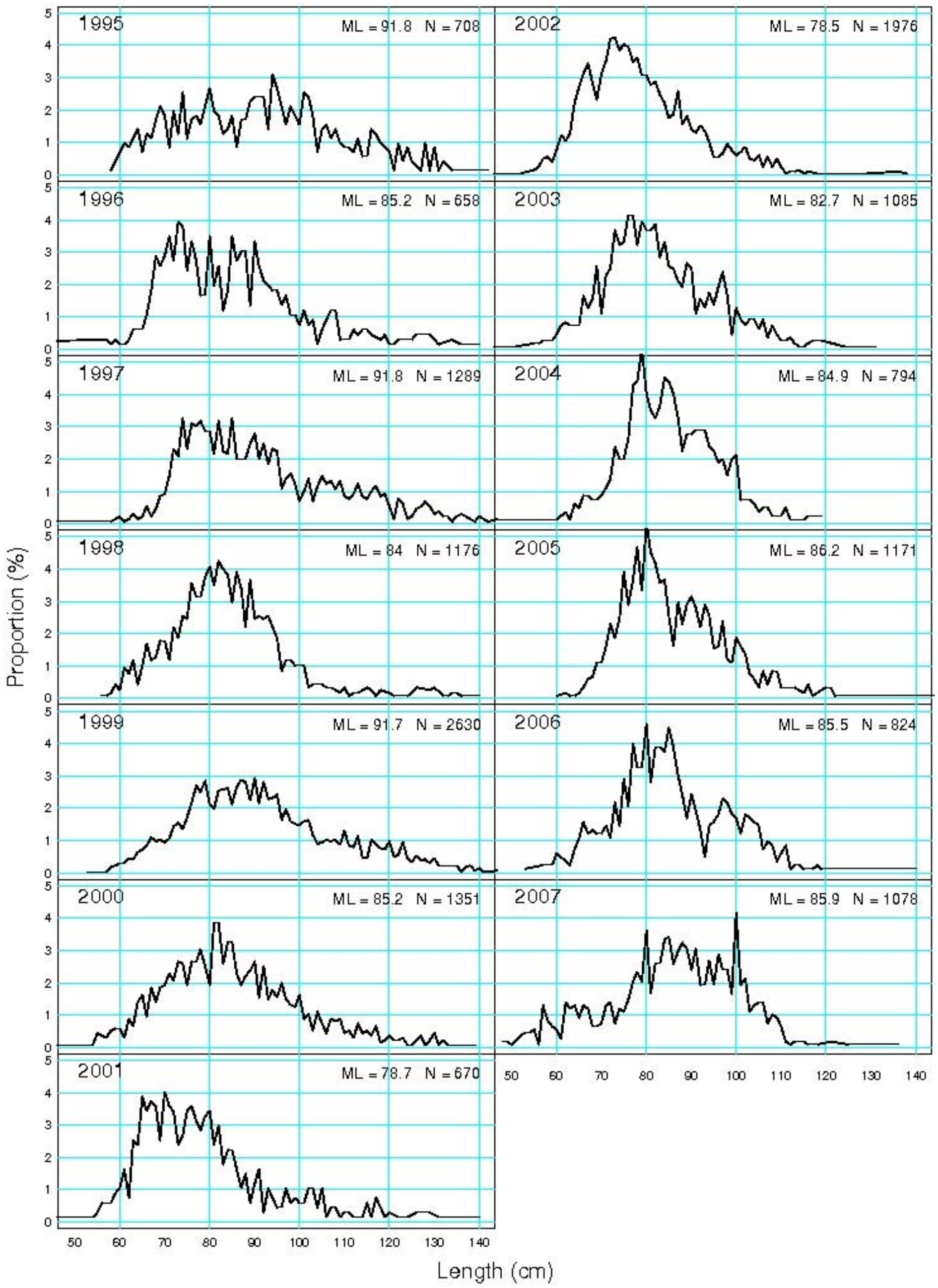

Figure 6.2.4. Length distribution of blue ling in the commercial landings of the Icelandic fleet in Va 1996-2007. The number of measured fish (N) and mean length (ML) is also given.

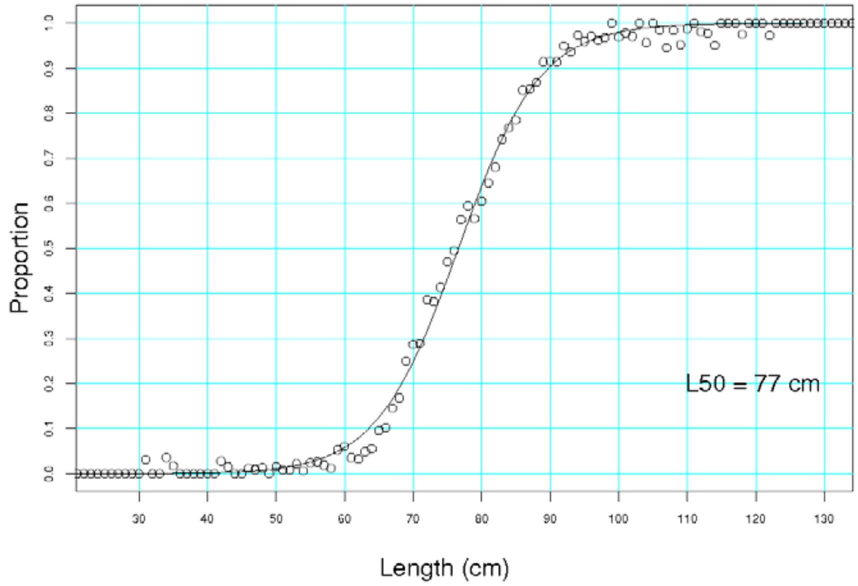

Figure 6.2.5. The proportion of mature of ling as a function of length in the Icelandic catches. The data points show the observed proportion mature and the lines the fitted maturity. Also given is L50.

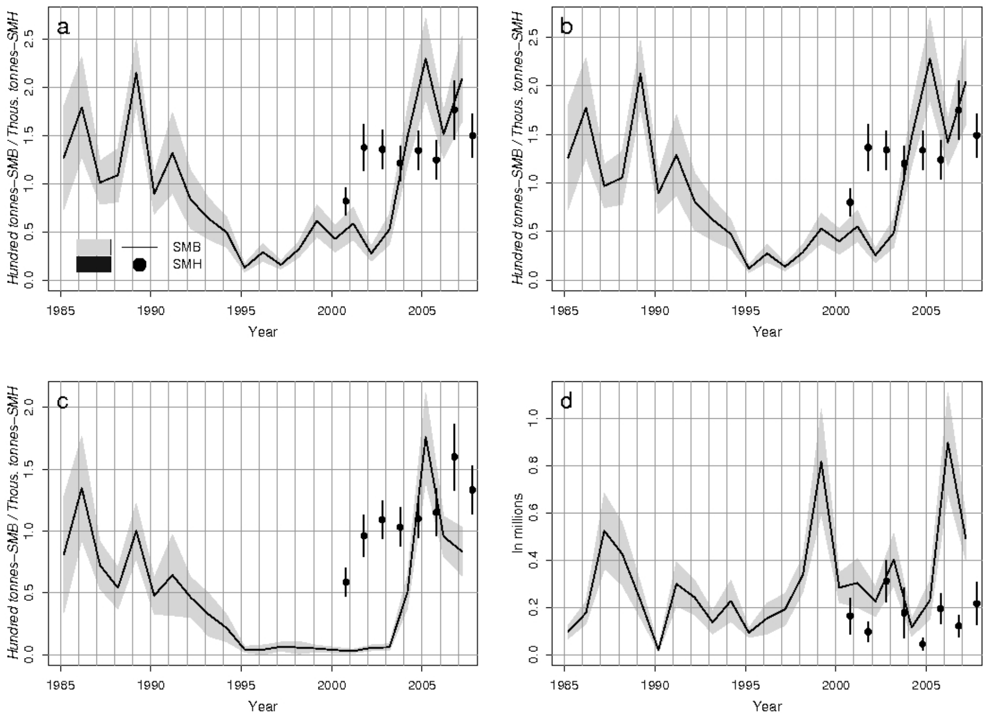

Figure 6.2.6. Abundance indices for blue ling in Icelandic groundfish survey in March 1985-2007 (SMB, line, shaded area) and October 1996-2007 (SMH, points, vertical lines). a) Total biomass index, b) Biomass of 40 cm and larger, c) Biomass 70 cm and larger, d) Abundance of < 40 cm. The shaded area and the vertical bar show ±1 standard error of the estimate.

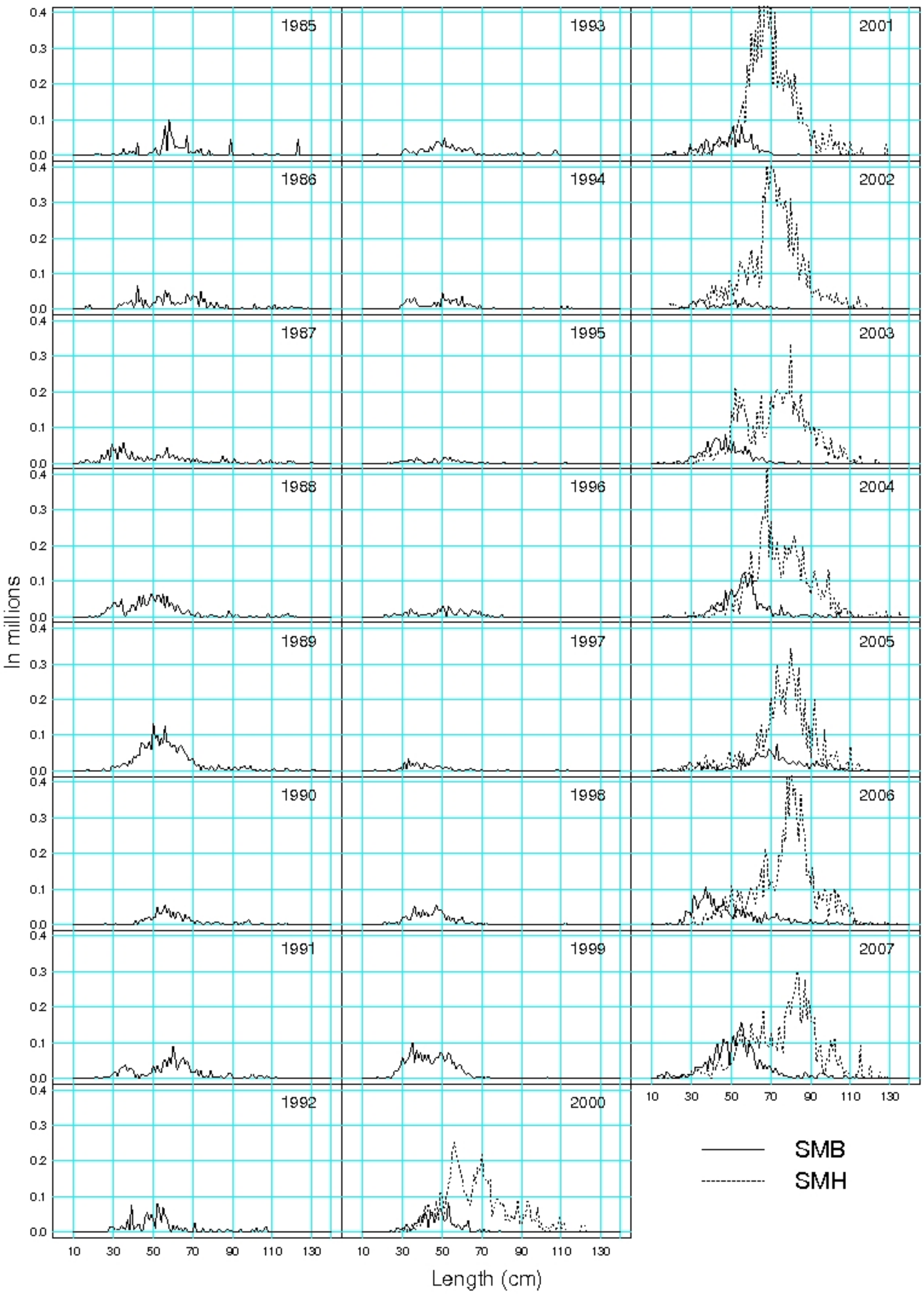

Figure 6.2.7. Length distributions of blue ling in the Icelandic groundfish survey in March 1985-2007 (SMB, solid line) and in October 1996-2007 (SMH, dotted line).

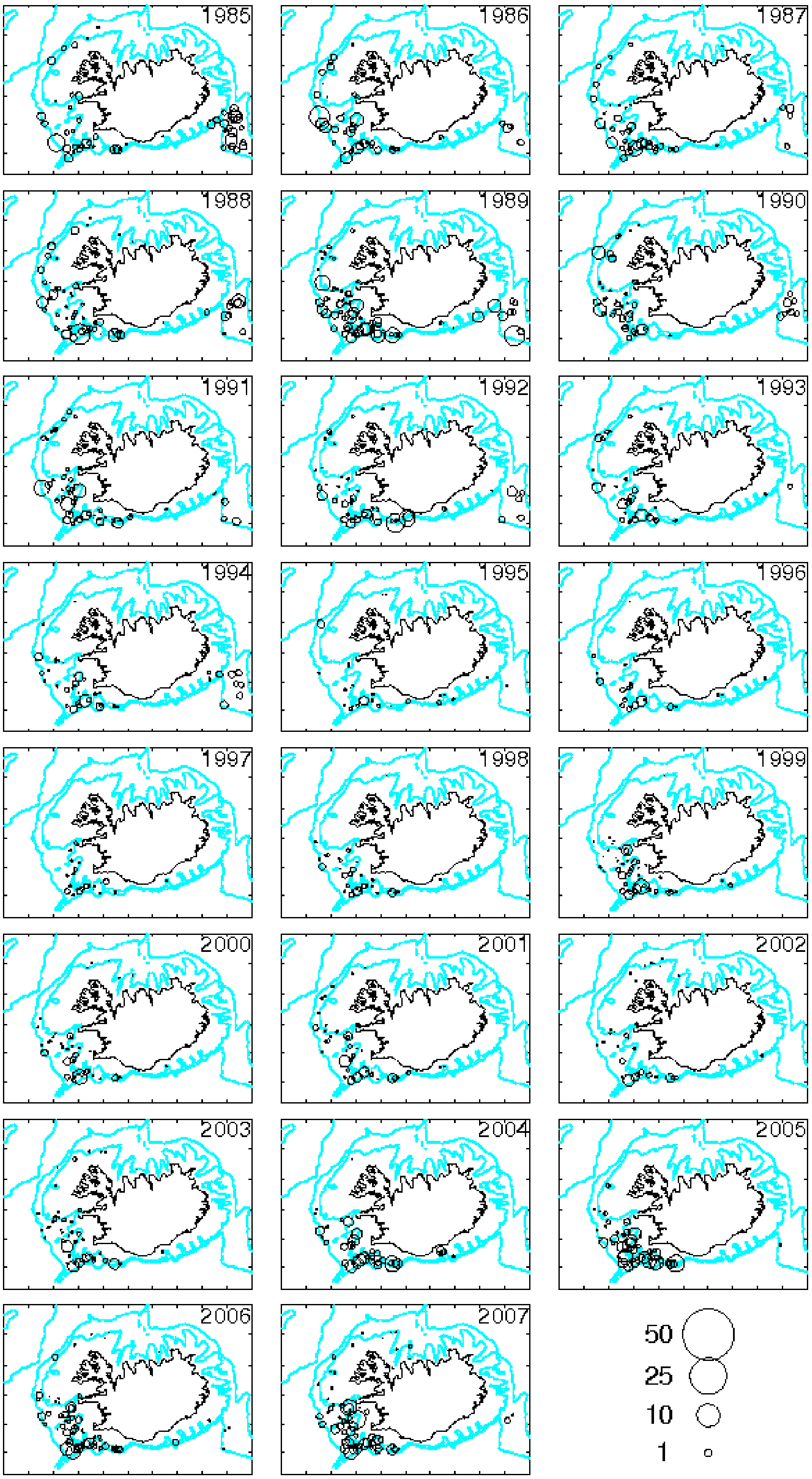

Figure 6.2.8. Blue ling. Distribution of CPUE in the groundfish survey in March 1985-2007. The size of the circles indicate kg/station.

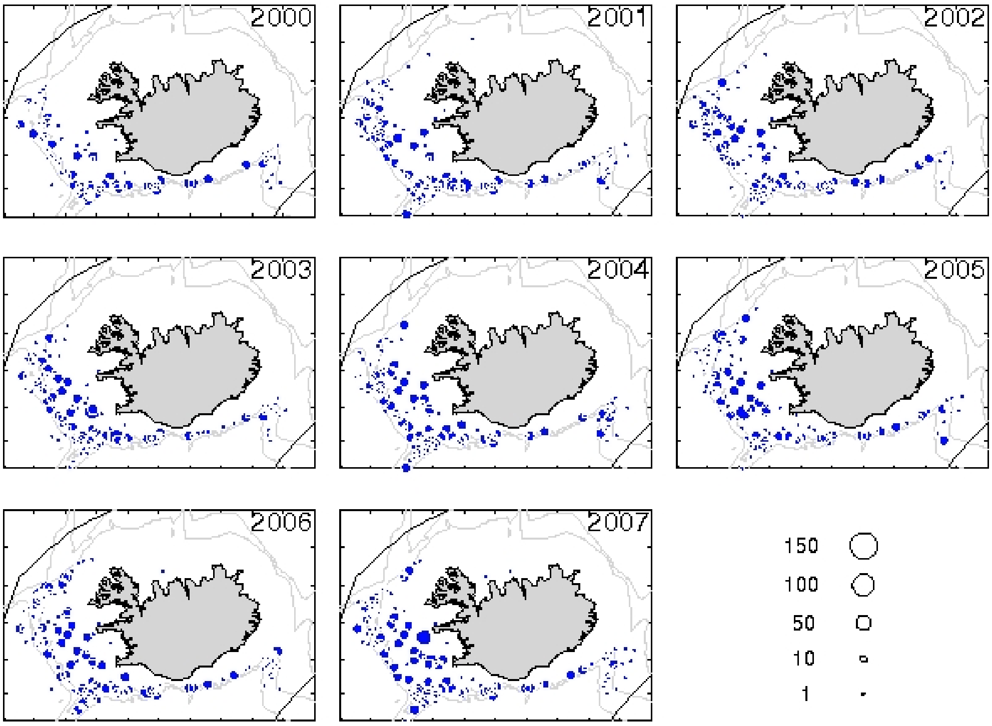

Figure 6.2.9. Distribution of blue ling in the groundfish survey in October 1996-2007. The sizes of the circles indicate kg/station.

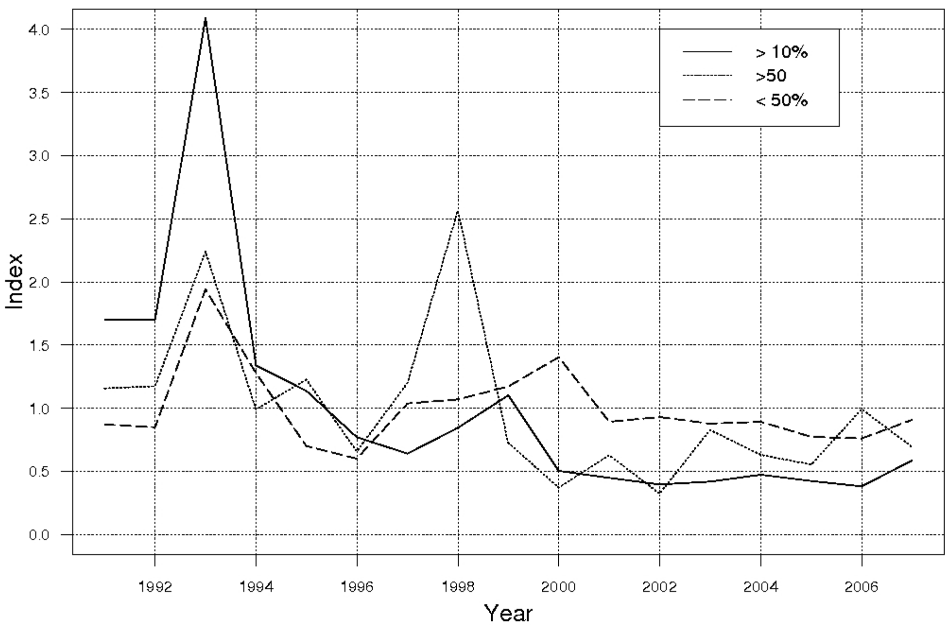

Figure 6.2.10. Index of raw CPUE (sum(yield)/sum(effort)) of blue from the Icelandic bottom trawl fishery based on log-books 1991-2007. The criteria for the calculations were tows where blue ling composed at least 10% and 50% as well as less than 50% of the total catch.

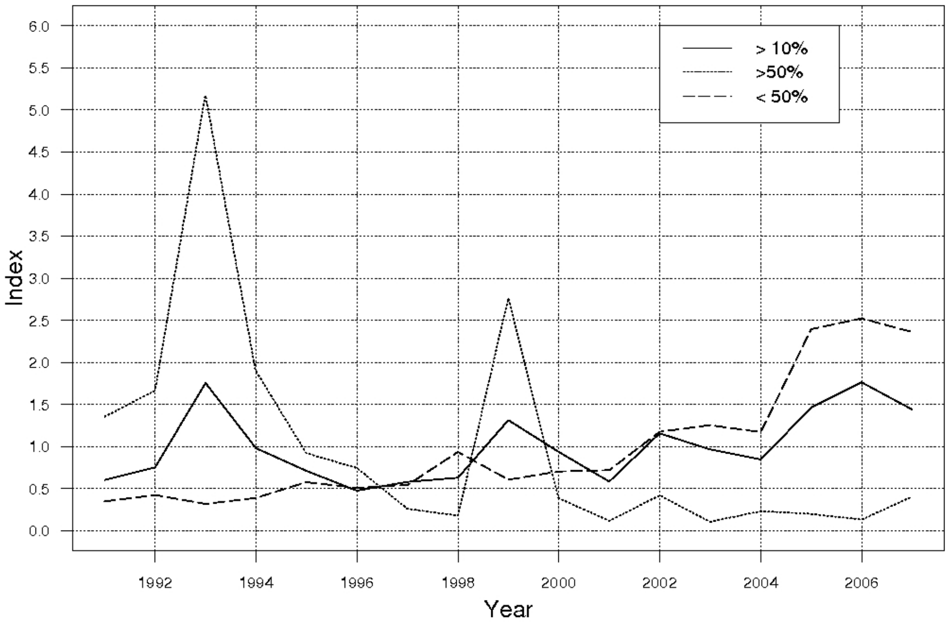

Figure 6.2.11. Index of fishing effort of blue ling from the Icelandic bottom trawl fishery based on log-books 1991-2007. The criteria for the calculations were tows where blue ling composed at least 10% and 50% as well as less than 50% of the total catch.

6.3 Blue Ling (*Molva Dypterygia*) in Division Vb, Subarea VI & VII

6.3.1 The fishery

The main fisheries are those by Faroese trawlers in Vb and French trawlers in VI and, to a lesser extent, Vb. Total international landings from Subarea VII are very small and are by-catches in other fisheries.

Landings by Faroese trawlers are mostly taken in the spawning season. Historically, this was also the case for French trawlers fishing in Vb and VI. However, in recent years blue ling has been taken mainly as a by-catch in French trawl fisheries for roundnose grenadier, black scabbardfish and deep-water sharks.

6.3.2 Landings trends

The rapid increase in the size of this fishery in the early 1970s is believed to be related to the expansion of national fisheries limits to 200 nautical miles and the resultant displacement of fishing effort and the associated development of markets.

Total international landings from Division Vb (Table 6.3.0a-e and Figure 6.3.1) peaked in the late 1970s at around 10-13,000 t, stabilised in the 1980s at around 5-9000 t and have since declined to a stable low level of around 3000 t.

The landings from Subarea VI peaked at about 18,000 t in 1973-74 and fluctuated throughout the 1980s within the range of 5-13,000 t. and have since declined to a stable low level of 2-3000 t.

Landings from Subarea VII are comparatively small and are mostly less than 500 t per annum

The overall trend in total international landings for all areas combined shows a series of peaks in the 1970s and 1980s, and then a strong decline until a smaller peak in the late 1990s and stability at a very low levels thereafter. It should be noted that EU TACs were introduced in 2003 and this may have had a limiting factor on landings by EU member states.

6.3.2.1 ICES advice

The latest advice is from ICES ACFM in October 2006 is:

Cpue information suggests that the abundance of blue ling remains at a low level.

There should be no directed fisheries and measures should be implemented to reduce/minimise catches in mixed fisheries. Closed areas to protect spawning aggregations should be maintained and expanded where appropriate.

6.3.2.2 Management

EU TACs for these stocks are set on a biennial basis. TAC for subareas II, IV and V has been set at 95 t in 2007 and 78 t in 2008 and in VI and VII, 2510t for 2007 and 2009 t for 2008. In Subareas VI and VII, EU vessels that landed more than 30t in must give prior notification of landing and may not land more than 25 tonnes of blue ling per fishing trip. Quotas for other countries are for bycatch only.

According to landings data supplied to ICES WGDEEP, the TAC in VI and VII in 2007 was not fully taken and the TAC in II, IV V may have been substantially exceeded by landings from Vb alone (although quota swaps have not been taken into consideration).

EU TAC area	EU TAC in 2007(t)	EU landings in 2007 (t)
VI and VII	2510	2164
II, IV and V	95	906 (Vb only)

There is minimum landing size of 60cm for blue ling landings into the Faroes.

6.3.3 Data availability

6.3.3.1 Landings and discards

The landings time series from the southern blue ling stock was extended back to 1966 based upon North Western Working Group reports from 1989-1991 and data in Moguedet (1988). It is known that landings data in the 1980s for French freezer trawlers may be underestimated in some years.

Large French catches were reported as ling at the start of the fishery in 1973-1975. In order to derive a best estimate of blue ling landings, the average ling landings in the years preceding the start of the French blue ling fishery were deducted from estimates of blue ling and ling combined.

Landings data are given in Table 6.3.0a-e. Landings data were provided by France, Scotland and Ireland at the level of ICES statistical rectangles and these have been aggregated by quarter and plotted to display the geographical distribution of the fishery in Figure 6.1.1 and 6.1.2

Information collected under the French deep-water sampling programme indicates there are no discards of this species in the French trawl fishery. There is no information available on discards in other fleets.

6.3.3.2 Length compositions

Length composition data of blue ling from Faroese trawlers in Division Vb are presented in Figure 6.3.2. Further details can be found in WGDEEP08 WD 15. Information on the mean length in annual landings was not available.

Time-series data (1984-2007, excluding 1985,86) of the raised length composition of French trawl landings of blue ling in Vb, VI, and VII are given in Figure 6.3.3. The trend in annual mean length in Division VIa is shown in Figure 6.3.4

Length composition of catches of blue ling taken in September on Spanish bottom trawl surveys at Porcupine Bank, 2001-2007, are presented in Figure 6.3.5. Catches each year were very small (< 1% of total catch biomass), so care should be exercised when interpreting these data. Information on the mean length in annual catches was not available. The length composition of catches (all years combined) is shown by depth in Figure 6.3.6.

Mean lengths of blue ling from the Norwegian reference fleet in divisions Vb, VIa, VIb and Subarea XII are given Table 6.3.1. Details of sampling can be found in WGDEEP08 WD8.

6.3.3.3 Age compositions

No new data were available but existing data are available for some years and ICES areas. These are not presented due to the difficulties in the ageing of this species.

6.3.3.4 Weight at age

No new weight at age data were available. Existing data are sparse and are not presented because of difficulty with ageing.

6.3.3.5 Maturity and natural mortality

No new data on maturity were available. Existing data are not presented because of difficulty with ageing.

No information was available on natural mortality (M). However, an estimate of M is can be estimated using the relationship:

M = LN(100)/maximum age

The maximum age can be set at the age where 1% of a year class is still alive. Based on Faroese and French age readings, it is reasonable to assume the maximum age for blue ling is around 30 years. Given this and the relationship above, M may be in the order of 0.15.

6.3.3.6 Catch, effort and RV data

CPUE data are available for Faroese trawlers in Division Vb 1994-2007 (Figure 6.3.7)

Catch, effort and CPUE data from Faroese trawl surveys (1994-2007) are shown in Table 6.3.2 and Figure 6.3.8. Numbers of juvenile blue ling (<80 cm) caught during these surveys are shown in Figure 6.3.9.

Revised time-series (1989-2007) of LPUE data from French trawlers in Vb and VI are given in Figure 6.3.10 (a description of the methodology used is given in the general section on data availability).

New CPUE time-series data were available from a Spanish trawl survey on the Porcupine Bank (2001-07) (Figure 6.3.11)

Times-series length distributions of the juvenile blue ling (<80 cm) caught during an Irish trawl survey on the Porcupine Bank, 2004-07, are given in Figure 6.3.12.

6.3.4 Data analyses

An updated assessment for this stock was not attempted this year and was deferred until the French abundance index (used in previous assessments) can be extended back in time pre-1989.

The trend in time-series data of international landings for this stock (Figure 6.3.1) shows a number of short-lived peaks and these probably reflect the location and fishing down of spawning aggregations.

There appears to have been an increase in CPUE of blue ling in the Faroese trawl summer survey in Vb in 2004 and 2005 (Figure 6.3.8), however this trend was not continued in 2006 and 2007. The CPUE trend from both the spring and summers surveys should be treated with caution because blue ling is usually taken in low numbers as the surveys are targeted at cod, haddock and saithe.

CPUE data for Faroese trawlers in Subarea Vb (Figure 6.3.7) must also be treated with caution because there have been shifts in species-directivity during the time period. For example, there was a shift away from saithe and redfish towards deep-water species between 1995 and 1999, and this is reflected by a large increase in CPUE for blue ling across these years. Data for recent years shows evidence of a slight increase in abundance but this should be interpreted in the context of the entire history of this stock. Previous assessments have indicated a strong decline in stock over the period of the fishery, so Faroese abundance data for recent years may reflect small perturbations or possibly a small increase from a very low historical level.

Although French trawl abundance data is currently only available back to 1989 (Figure 6.3.10), these data show evidence of this strong decline.

Mean length in French trawl landings (Figure 6.3.4) shows a strong decline until the mid-1990s and stability thereafter, and this is consistent with the fishing down of stock, particularly as fisheries have in the past targeted spawning aggregations .

Information regarding trends in recruitment has not been available for previous assessments, and time-series data of juvenile blue ling from Faroese, Spanish and Irish surveys (Figures 6.3.9 and 6.3.12) presented this year may be a potential source of a recruit indices for future assessments.

6.3.5 Comments on assessment

No assessment was carried out this year

6.3.6 Management considerations

The WG is aware that CPUE data for blue ling from commercial fishing vessels, which are derived largely from data from spawning aggregations, may not be a reliable indicator of exploitable biomass for this species because of sequential depletion. However, the Group felt that the important issues were the large scale of the decline in French CPUE and the fact that under the Precautionary Approach there is a responsibility to interpret the available data.

Previous assessments carried out in 2004 (using stock reduction) and 2006 (using CSA) indicated that current exploitable biomass was at a historically low level. The information presented this year indicates that there is no reason to change this interpretation.

It should be noted that landings reported from the southern parts of Subarea VII southwards as blue ling (*Molva dypterygia*) may comprise a related species *Molva macrophthalma*.

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Table 6.2.0a Landings of Blue ling in sub-division Vb1

Year	Faroes	France(2)	Germany(2)	Norway(3)	E & W(2)	Scotland (1)	Ireland	Russia (2)	Total
1966		839		430					**1269**
1967			1006	238					**1244**
1968			1838	823					**2661**
1969			303	798					**1101**
1970			348	2718					**3066**
1971			1367	557					**1924**
1972			2730	1203					**3933**
1973	51	80	3009	4003	4				**7147**
1974	43	390	1808	1554	3				**3798**
1975	17	2147	1528	2492	1				**6185**
1976	42	10475	896	1482					**12895**
1977	23	6977	870	858	4				**8732**
1978	423	3369	744	237	35				**4808**
1979	1072	2683	691	331					**4777**
1980	1187	2427	5905	304		1			**9824**
1981	1481	371	2867	167					**4886**
1982	2761	843	2538	121					**6263**
1983	3933	668	222	256					**5079**
1984	6453	515	214	105					**7287**
1985	4038	1193	217	140					**5588**
1986	4830	2578	197	94					**7699**
1987	3361	3246	152	81					**6840**
1988	3487	3036	49	94					**6666**
1989	2468	1802	51	228					**4549**
1990	946	3073	71	450					**4540**
1991	1573	1013	36	196	1				**2819**
1992	1918	407	21	390	4				**2740**
1993	2088	192	24	218	19				**2541**
1994	1065	147	3	173					**1388**
1995	1606	588	2	38	4				**2238**
1996	1100	301	3	82					**1486**
1997	778	1656		65	11				**2510**
1998	1026	1411	0	24	1				**2462**
1999	1730	1068	4	38	4				**2844**
2000	1677	575	1	163	33			1	**2450**
2001	1407	433	4	130	11		2		**1987**
2002	1003	574		274	8				**1859**
2003	2465	1133		12	1				**3611**
2004	751	1131		20				13	**1915**
2005	1028	781		15	1				**1825**
2006	1230	839		21	1			16	**2107**
2007*	1276	796		116	8			36	**2232**

*Preliminary. (1) Included in Vb2. (2) Includes Vb2 (3) includes Vb2 up to 1974

Table 6.3.0b Landings of Blue ling in sub-division Vb2

Blue ling Vb2

Year	Faroes	Norway	Scotland (1)	E & W	Total
1966					0
1967					0
1968					0
1969					0
1970					0
1971					0
1972					0
1973					0
1974					0
1975	1				1
1976	6	37			43
1977		86			86
1978	7	83			90
1979	14	87			101
1980	36	159			195
1981	48	93			141
1982	128	66			194
1983	463	182			645
1984	757	50			807
1985	396	70			466
1986	81	41			122
1987	209	90			299
1988	2788	72			2860
1989	622	95			717
1990	68	191			259
1991	71	51	21		143
1992	1705	256	1		1962
1993	182	22	91		295
1994	239	16	1		256
1995	162	36	4		202
1996	42	62	12		116
1997	229	48	11		288
1998	64	29	29		122
1999	15	49	24		88
2000	0	37	37		74
2001	0	69	63		132
2002		21	140		161
2003		84	120		204
2004	710	6	68		784
2005	609	14	68		691
2006	632	34	16		682
2007*	647	6	102		755

Table 6.3.0c Landings of Blue ling in divisionVIa

Year	Faroes	France	Germany	Ireland	Norway	Spain (2)	E & W	Scotland	Lithuania(1)	**Total**
1966					20					**20**
1967			37		35					**72**
1968					126					**126**
1969			6		112					**118**
1970					176					**176**
1971					15					**15**
1972		696			14					**710**
1973		18000			25					**18025**
1974	33	15000	1218		371		164			**16786**
1975		5000	2941		20		8			**7969**
1976		5462	818		10		1			**6291**
1977		7940	470		16		556			**8982**
1978		5495	2498		19		21			**8033**
1979		3064	993		2		279			**4338**
1980		2124	773		10					**2907**
1981		3338	335		11			1		**3685**
1982		3430	79		16		99			**3624**
1983		5233	11		118		13			**5375**
1984		3653	183		45		5			**3886**
1985	56	5670	5		75		2			**5808**
1986		8254	7		47		2	1		**8311**
1987		9389	45		51		1			**9486**
1988	14	6614	2		29		2	1		**6662**
1989	6	7382	2		143					**7533**
1990		4882	44		54			1		**4981**
1991	8	4261	18		63		1	35		**4386**
1992	4	5483	4		129			24		**5644**
1993		4311	48	3	27		13	42		**4444**
1994		2999	24	73	90	433	1	91		**3711**
1995	0	2835		11	96	392	34	738		**4106**
1996	0	4115	4		50	681	9	1407		**6266**
1997	0	3845		1	29	190	789	1021		**5875**
1998	0	4644	3	1	21	142	11	1416		**6238**
1999	0	3730		10	55	119	5	1105		**5024**
2000		4443	94	9	102	108	24	1300		**6080**
2001		2693	6	52	117	797	116	2136		**5917**
2002		2005		62	61	285	16	2027		**4456**
2003	7	2000		2	106	195	3	428		**2741**
2004	10	2259		1	24	24	1	482		**2801**
2005	17	2031		2	33	210		390	29	**2712**
2006	13	1804		1	49	27	3	433		**2330**
2007*	13	1784			31	49		130	1	**2008**

*Preliminary. (1) Includes VIb for all countries up to (and including) 1974, (2) Includes VIb

Table 6.3.0d Landings of Blue ling in divisionVIb

Year	Poland	Russia	Faroes	France	Germany	Norway	E & W	Scotland	Iceland	Ireland	Estonia	**Total**
1975			1			37						**38**
1976			13			6						**19**
1977			6	36		7						**49**
1978			3	58		8						**69**
1979			4	652	187	28						**871**
1980				3827	5526	8						**9361**
1981				534	3944	5						**4483**
1982				263	554	13		1				**831**
1983				243	38	50		2				**333**
1984			133	3281		43						**3457**
1985			11	7263	31	38						**7343**
1986			1845	2928	39	66	7	1				**4886**
1987			350	10	356	76	3	10				**805**
1988			2000	499	37	42	9	14				**2601**
1989			1292	61	22	217		16				**1608**
1990			360	703		127		2				**1192**
1991			111	2482	6	102	5	15				**2721**
1992			231	348	2	50	2	14				**647**
1993			51	373	109	50	66	57				**706**
1994			5	89	104	33	3	25				**259**
1995			1	305	189	12	11	38				**556**
1996			0	87	92	7	37	74				**297**
1997			138	331		6	65	562	1			**1103**
1998			76	469		13	190	287	122	11		**1168**
1999			204	690		9	168	2411	610	4		**4096**
2000				508		184	500	966		7		**2165**
2001			238	202	1	256	337	1803		4	85	**2926**
2002		3	79	319		273	141	497		1		**1313**
2003	4	2		510		102	14	113			5	**750**
2004	1	5	4	486		2	10	96			3	**607**
2005		15	1	234		1	9	80				**340**
2006			15	313		2	4	29				**363**
2007*		1	3	109		4	5	35				**157**

*Preliminary.

Table 6.3.1e Blue ling landings in division Vb and Subareas VI and VII

Blue ling	**Vb**	**VI**	**VII**	**Total**
1966	1269	20	22	**1311**
1967	1244	72	293	**1609**
1968	2661	126	223	**3010**
1969	1101	118	212	**1431**
1970	3066	176	406	**3648**
1971	1924	15	321	**2260**
1972	3933	710	339	**4982**
1973	7147	18025	230	**25402**
1974	3798	16786	365	**20949**
1975	6186	8007	383	**14576**
1976	12938	6310	598	**19846**
1977	8818	9031	352	**18201**
1978	4898	8102	280	**13280**
1979	4878	5209	691	**10778**
1980	10019	12268	483	**22770**
1981	5027	8168	114	**13309**
1982	6457	4455	58	**10970**
1983	5724	5708	59	**11491**
1984	8094	7343	67	**15504**
1985	6054	13151	51	**19256**
1986	7821	13197	0	**21018**
1987	7139	10291	0	**17430**
1988	9526	9263	22	**18811**
1989	5266	9141	293	**14700**
1990	4799	6173	223	**11195**
1991	2962	7107	212	**10281**
1992	4702	6291	406	**11399**
1993	2836	5150	321	**8307**
1994	1644	3970	339	**5953**
1995	2440	4662	230	**7332**
1996	1602	6563	365	**8530**
1997	2798	6978	383	**10159**
1998	2584	7406	598	**10588**
1999	2932	9120	352	**12404**
2000	2524	8245	280	**11049**
2001	2119	8843	691	**11653**
2002	2020	5769	483	**8272**
2003	3815	3491	114	**7420**
2004	2699	3408	58	**6165**
2005	2516	3052	59	**5627**
2006	2789	2693	67	**5549**
2007*	2987	2165	51	**5203**

*Provisional

Table 6.3.1. Unweighted estimates of the mean length of blue ling during 2003-2006, along with its standard error (se) and number of fish measured.

Blue ling ICES-area		2003	2004	2005	2006
IIa	Mean	89,44	77,46	91,91	79,5
	se	1,52	3,73	1,9	1,7
	N	61	13	56	146
IVa	Mean			54,19	74,9
	se			3,56	4,5
	N			16	20
Va	Mean		58,72		
	se		0,62		
	N		460		
Vb	Mean		96,35	107,79	104,5
	se		1,32	3,81	5,2
	N		103	14	15
VIa	Mean	83,6			
	se	1,88			
	N	40			
VIb	Mean	91,26			
	se	0,16			
	N	5743			
XII	Mean	91,07			
	se	0,56			
	N	445			
All areas	Mean	91,18	87,434	87,48	81,33

Table 6.3.2. Blue ling catch, effort and CPUE in the Faroese trawl surveys in Vb

	Spring surveys			Summer surveys		
	Catch (kg)	Effort (h)	CPUE (kg/h)	Catch (kg)	Effort (h)	CPUE (kg/h)
1994	83	91	0.91			
1995	82	91	0.90			
1996	122	100	1.22	710	200	3.55
1997	199	98	2.03	237	200	1.19
1998	79	99	0.80	477	201	2.37
1999	8	100	0.08	287	199	1.44
2000	45	100	0.45	203	200	1.02
2001	70	100	0.70	350	200	1.75
2002	36	100	0.36	119	199	0.60
2003	119	100	1.19	156	200	0.78
2004	105	100	1.05	825	200	4.13
2005	95	100	0.95	846	200	4.23
2006	110	100	1.10	330	200	1.65
2007	115	100	1.15	253	199	1.27

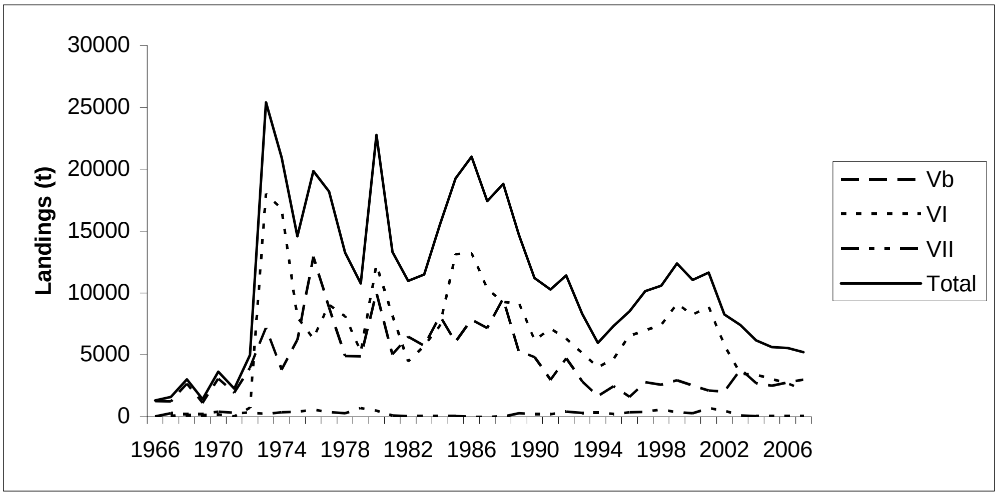


Figure 6.3.1. Trends in total international landings for southern blue ling (Vb, VI, VII)

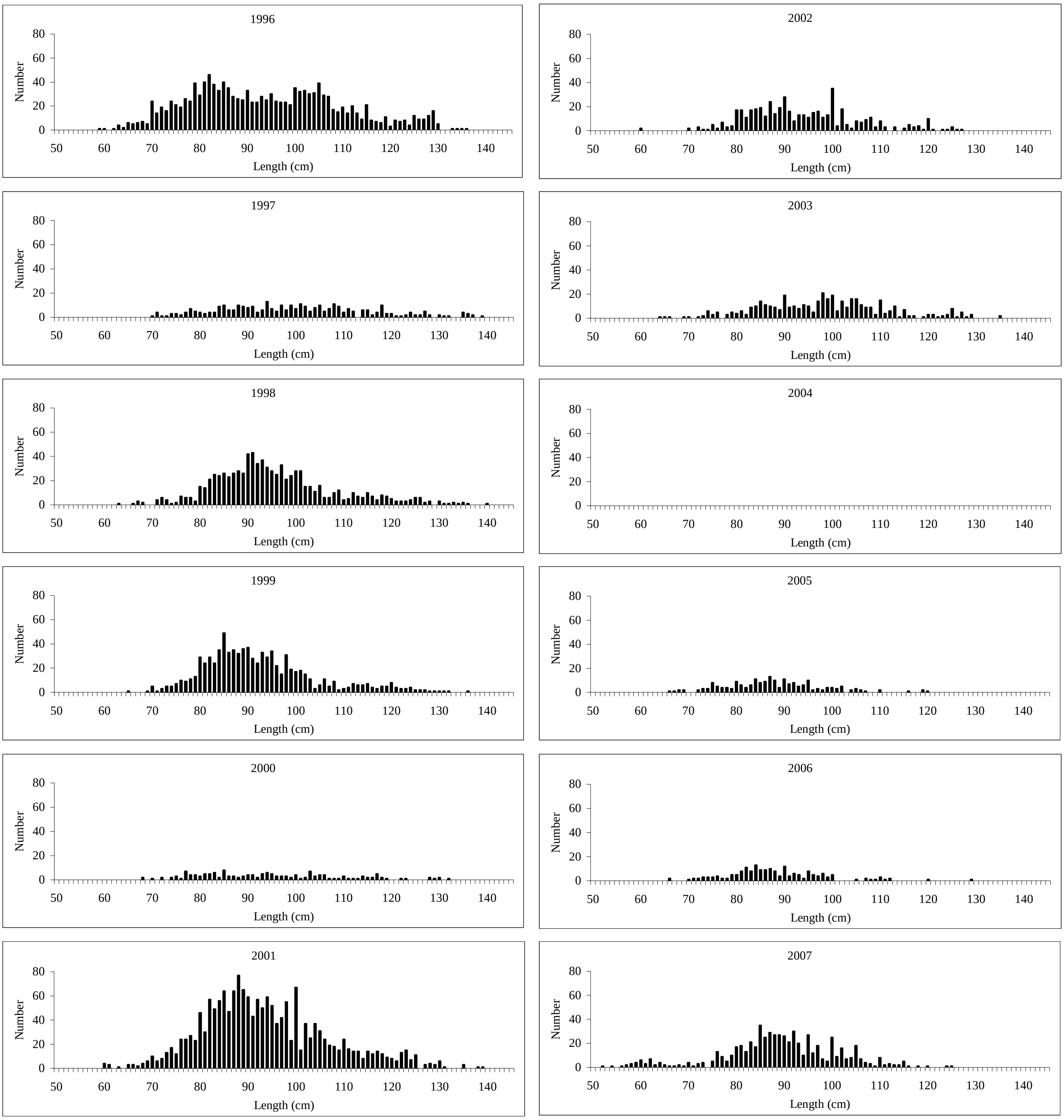


Figure 6.3.2 Blue ling in Vb (Faroes). Length distribution in the landings from Faroese otterboard trawlers >1000 HP.

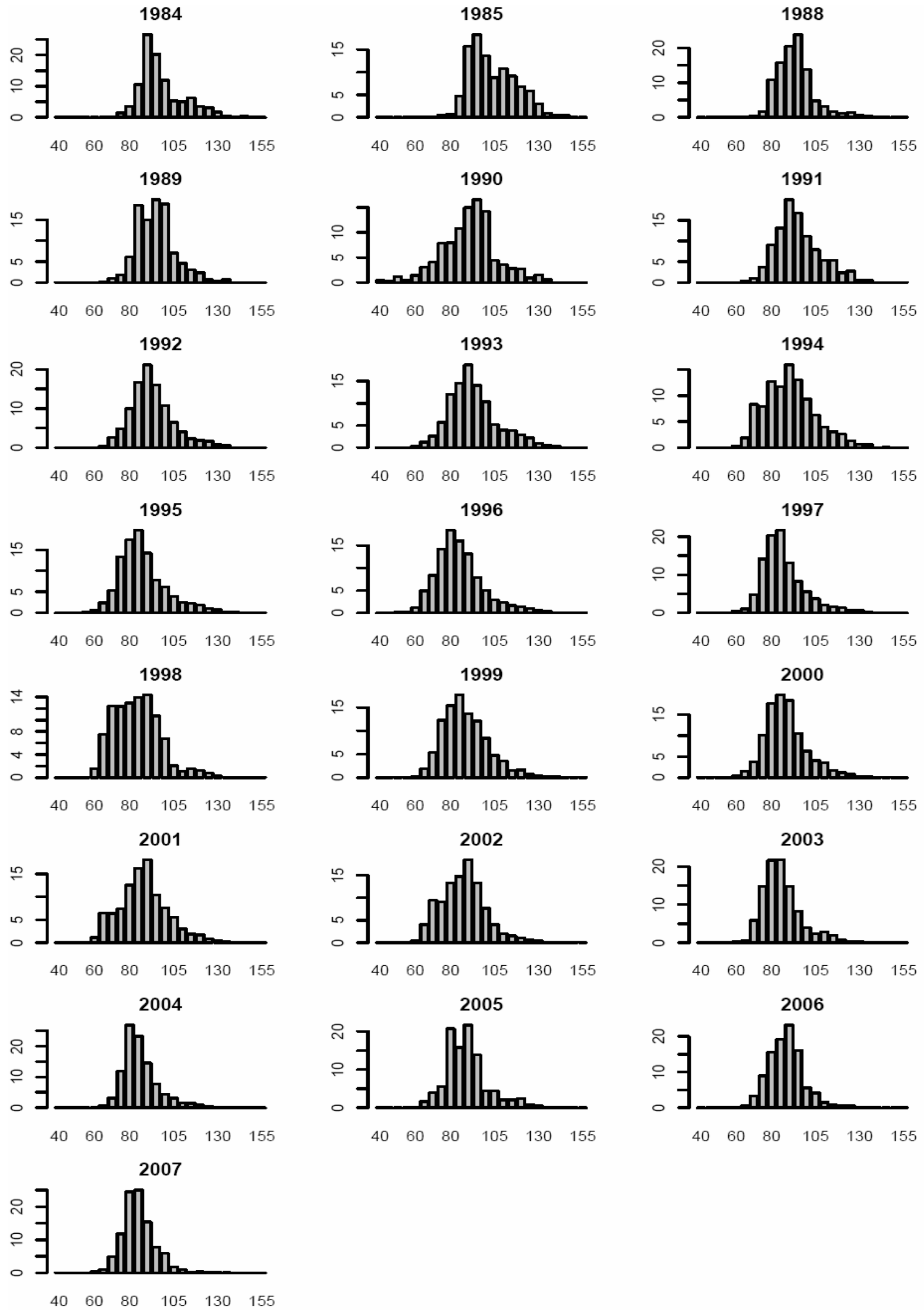


Figure 6.3.3. Length distribution in the landings of blue ling from French otter fishing in Vb, VI and VII.

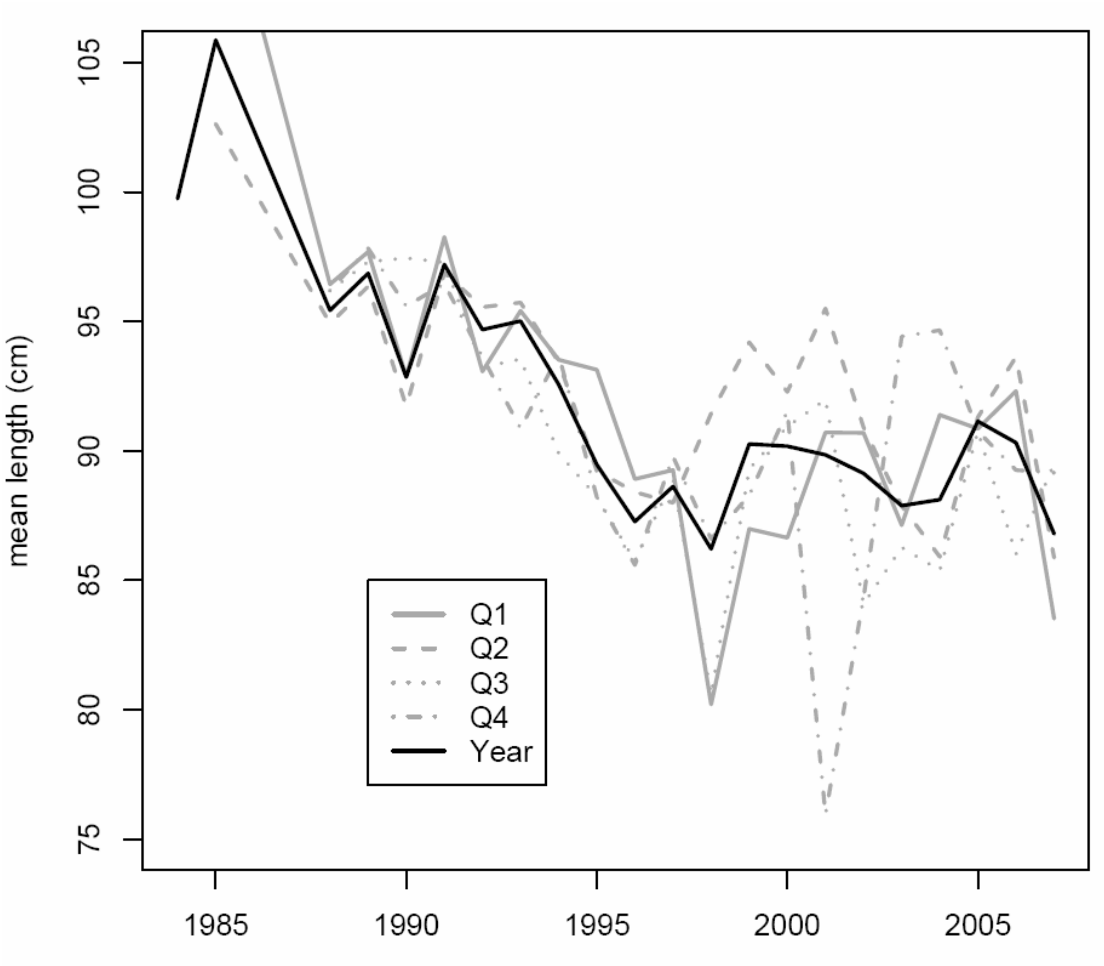


Figure 6.3.4. Mean length in French trawl landings from Vb, VI and VII

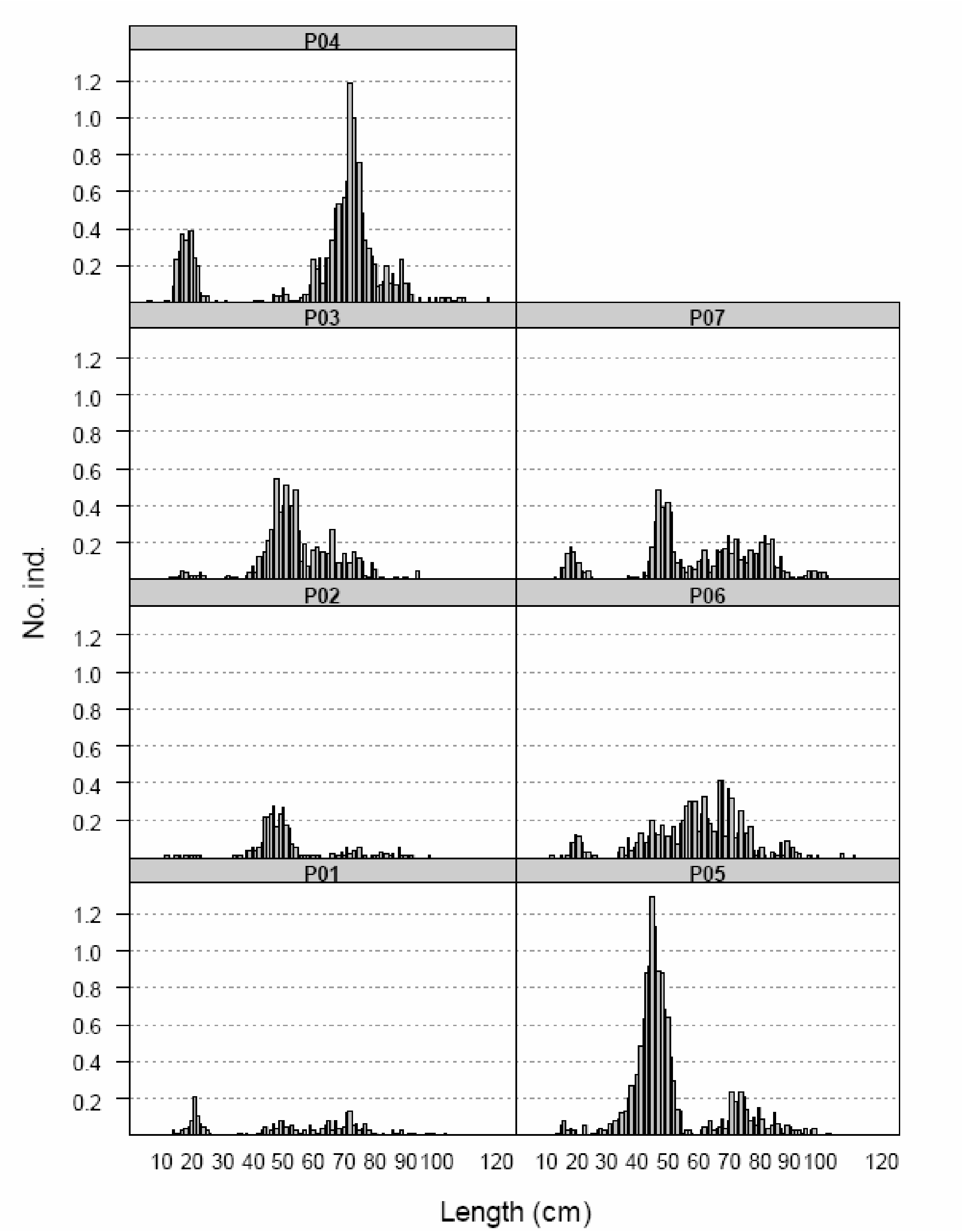


Figure 6.3.5. Length distributions of blue ling in Spanish bottom trawl surveys at Porcupine Bank, 2001-2007.

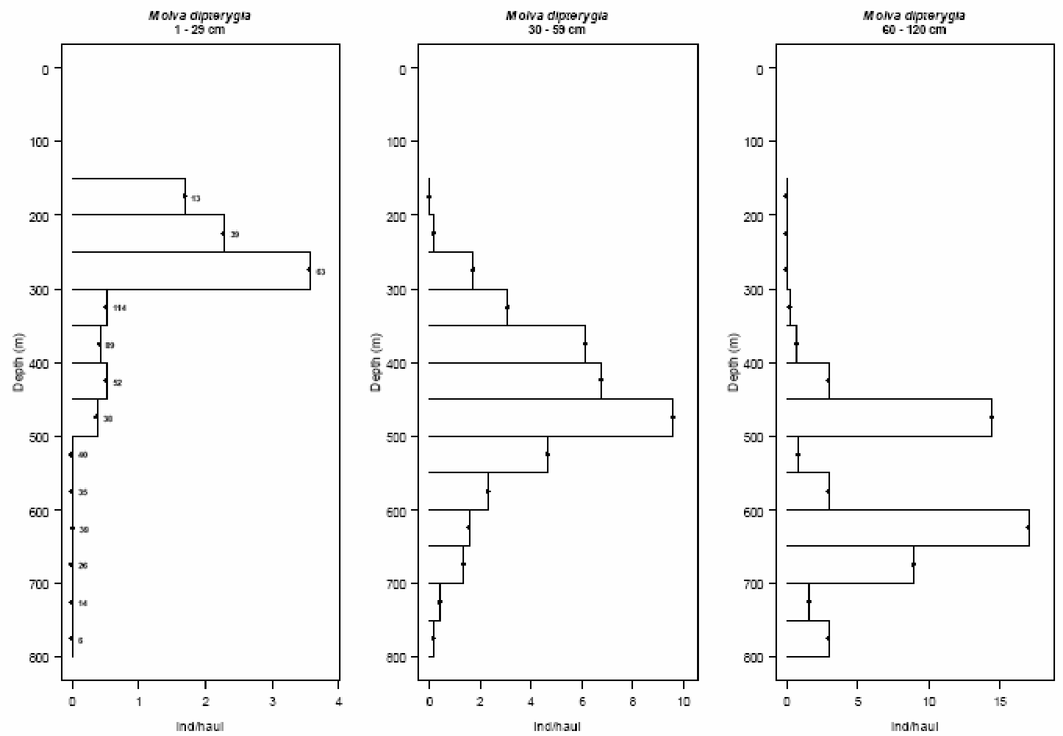


Figure 6.3.6. Bathymetric distribution of blue ling catches (numbers/30 min haul – x axis) by size range in Spanish bottom trawl surveys on Porcupine Bank (2001-2007 combined). The number of hauls is given to the right of each column in the lefthand graph. Note differences in scale of X axis between graphs

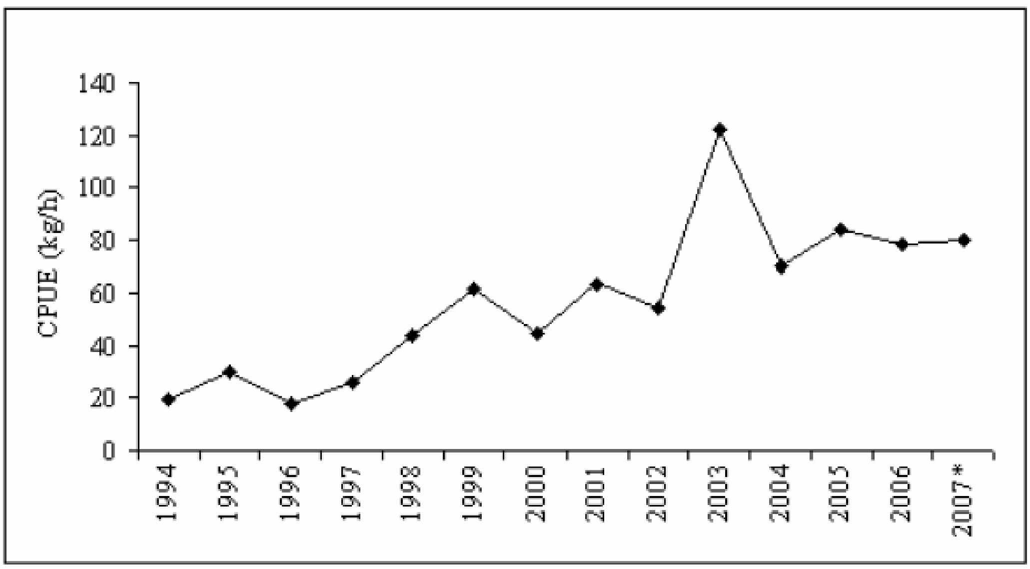


Figure 6.3.7. Blue ling CPUE in Vb from Faroese otter trawlers >1000 HP (data for 2007 are provisional).

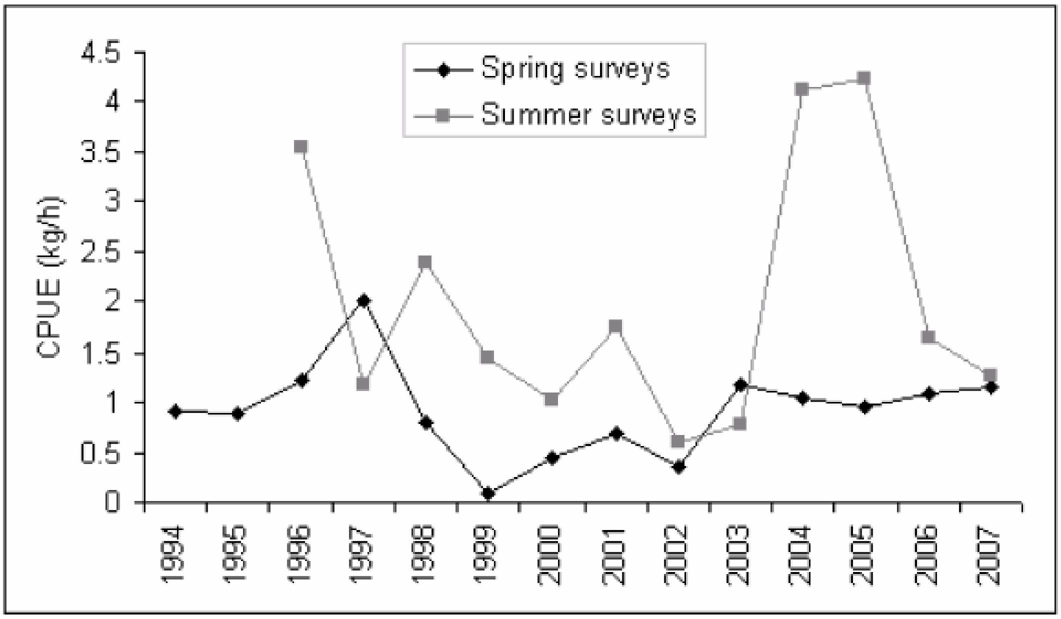


Figure 6.3.8. Blue ling CPUE series from Faroese trawl surveys in Vb.

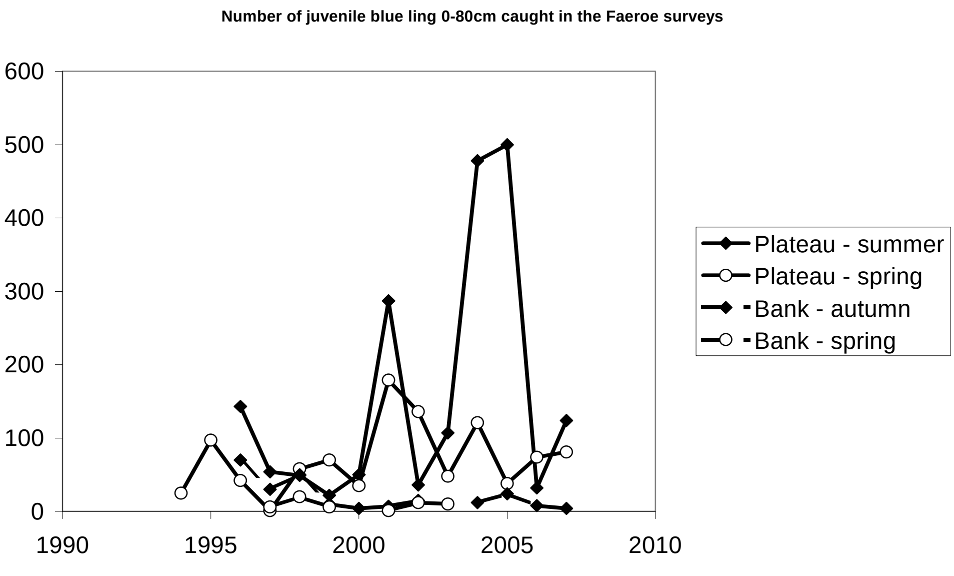


Figure6.3.9. Juvenile blue ling (<80 cm) caught during Faroese surveys in Vb.

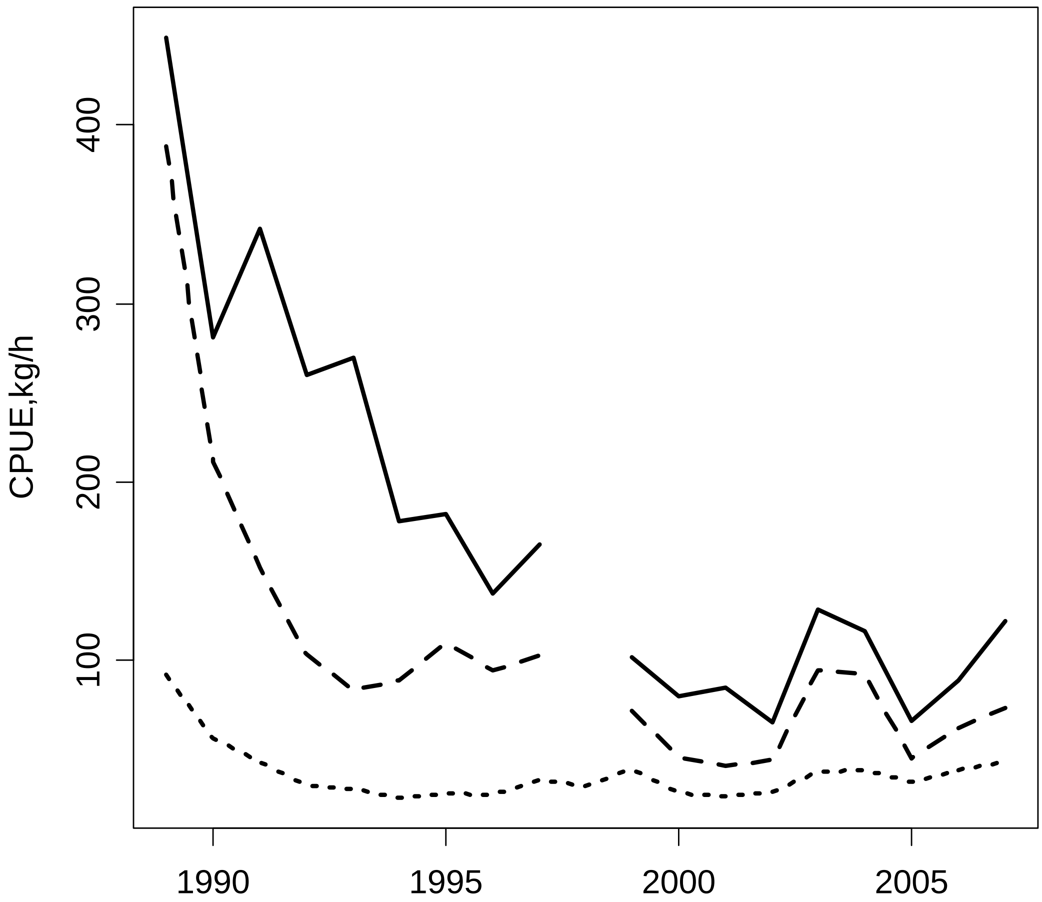


Figure 6.3.10. Blue ling LPUEs for French trawlers fishing in Vb and VI.(i) dotted line: LPUE all vessels, (ii) dashed line: LPUE of the reference fleet and (iii) solid line: directed LPUE of the reference fleet (landings for fishing trip where blue ling>10% of total landings).

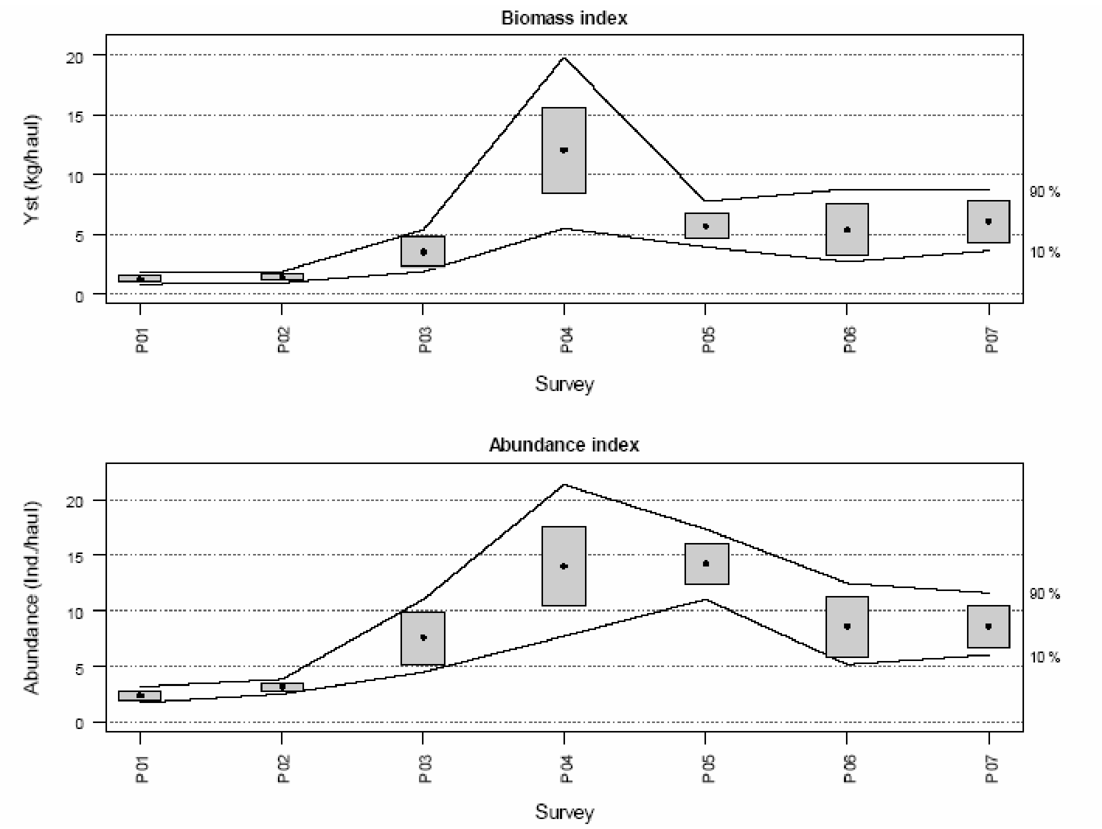


Figure 6.3.11. Changes in *Molva dypterigia* biomass and abundance indices during Spanish Porcupine Survey time series (2001-2007). Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals (α = 0.80, bootstrap iterations = 1000).

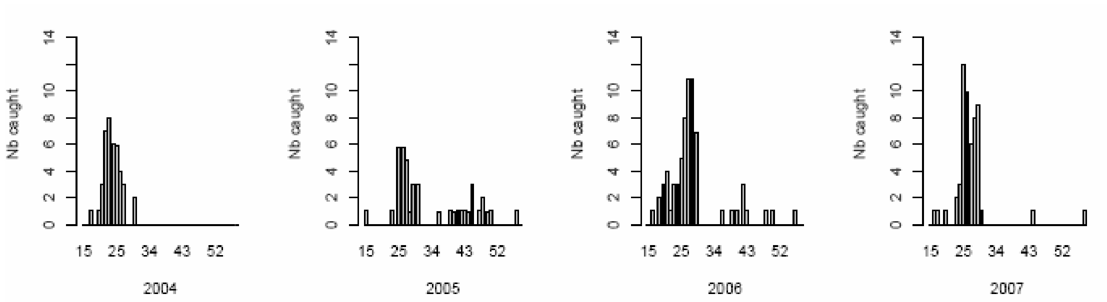


Figure 6.3.12. Length distributions and abundance of the juvenile blue ling (< 80 cm) caught during Irish trawl surveys on the Porcupine Bank, 2004-07.

6.4 BLUE LING (*MOLVA DYPTERYGIA*) in I, II, IIIa, IV, VIII, IX, X, XII

6.4.1 The fishery

Blue ling has been an important by-catch in trawl fisheries for mixed deep-water species on Hatton Bank (Division XIIb). In other areas blue ling is taken in small quantities.

6.4.1.1 Landings trends

Landings data are shown in Table 6.4.0a-f. Both historically as well as in recent years, around 90% or more of the total landings in other areas were taken in areas II, IV and XII combined. In area II reported landings decreased all through the available time series from 1988 until an apparent stabilizing in the last 5-6 years at 10% of the mean for the years 1988-1993, and 5% of the 1988 level. In Area IV a reduction in landings appears from mid 90's to a stable level in the last four years at 16% of pre 1995 level. In Area XII landings have been very variable throughout the time series and the only apparent trend is a dramatic reduction during the last five years from well above the average landing to below 10% of this average in the last two years.

6.4.1.2 ICES advice

The latest advice is from ICES in 2006 is:

"Trends in abundance from all areas indicate declines of varying gravity. In Iceland the decline appears to have halted, west of the British Isles it is stable but at a very depleted level, while it appears seriously depleted in Subdivisions I and II. In all areas the species is at a low level of abundance relative to when the fisheries commenced.

In most cases advice is given to stop directed fishing. Where blue ling is taken as a bycatch, seasonal closed areas can be an effective means of reducing exploitation."

6.4.1.3 Management

In 2006 there was an EC TAC for EU vessels fishing for blue ling in EU and international waters in II, IV and V of 119 t per annum

EU TAC area	EU TAC in 2007 (t)
II, IV and V	95

6.4.1.4 Data availability

6.4.1.5 Landings and discards

Landings data are shown in Table 6.4.1.

6.4.1.6 Length compositions

No length data are available.

6.4.1.7 Age compositions

No age data are available.

6.4.1.8 Weight at age

No weight at age data are available.

6.4.1.9 Maturity and natural mortality

No data were available.

6.4.1.10 Catch, effort and research vessel data

No data are available.

6.4.1.11 Data analyses

No data analyses were carried out.

6.4.1.12 Comments on assessment

Not applicable

6.4.1.13 Management considerations

Fisheries on blue ling in these areas should be permitted only when they are accompanied by programmes to collect data. Apart from this, there is no amend to current ICES advice for blue ling in these areas.

Table 6.4.0a Blue ling (Molva dypterygia). Working group estimates of landings (tonnes) in Subarea I

Year	Iceland	Norway	Germany	Total
1988				
1989				
1990				
1991				
1992				
1993				
1994		3		3
1995		5		5
1996				0
1997		1		1
1998		1		1
1999				0
2000		1		1
2000		3		3
2001		1		1
2002		1		1
2003				0
2004		1		1
2005		1		1
2006				0
2007*				0

*Preliminary.

Table 6.4.0b Blue ling (Molva dypterygia). Working group estimates of landings (tonnes) in Divisions IIa and b

Year	Faroes	France	Germany	Greenland	Norway	E & W	Scotland	Sweden	Russia	Total
1988	77	37	5		3416	2				3537
1989	126	42	5		1883	2				2058
1990	228	48	4		1128	4				1412
1991	47	23	1		1408					1479
1992	28	19		3	987	2				1039
1993		12	2	3	1003					1020
1994		9	2		399	9				419
1995	0	12	2	2	342	1				359
1996	0	8	1		254	2	2			267
1997	0	10	1		280					291
1998	0	3			272		3			278
1999	0	1	1		287		2			291
2000		2	4		240	1	2			249
2001	8	7			190	1	2			208
2002	1	1			129	1	17			149
2003	30				115		1	1		147
2004	28	1			144				1	174
2005	47	3			144	1			2	197
2006	49	4			149					202
2007*	102	3			154		4			263

*Preliminary.

Table 6.4.0c Blue ling (Molva dypterygia). Working group estimates of landings (tonnes) in Subarea III

Year	Denmark	Norway	Sweden	Total
1988	10	11	1	22
1989	7	15	1	23
1990	8	12	1	21
1991	9	9	3	21
1992	29	8	1	38
1993	16	6	1	23
1994	14	4		18
1995	16	4		20
1996	9	3		12
1997	14	5	2	21
1998	4	2		6
1999	5	1		6
2000	13	1		14
2001	20	4		24
2002	8	1		9
2003	18	1		19
2004	18	1		19
2005	48	1		49
2006	42			42
2007*				0

Table 6.4.0d Blue ling (Molva dypterygia). Working group estimates of landings (tonnes) in Division IVa

Year	Denmark	Faroes	France (IV)	Germany	Norway	E & W	Scotland	Ireland	Total
1988	1	13	223	6	116	2	2		363
1989	1		244	4	196	12			457
1990			321	8	162	4			495
1991	1	31	369	7	178	2	32		620
1992	1		236	9	263	8	36		553
1993	2	101	76	2	186	1	44		412
1994			144	3	241	14	19		421
1995		2	73		201	8	193		477
1996		0	52	4	67	4	52		179
1997		0	36		61	0	172		269
1998		1	31		55	2	191		280
1999	2		21		94	25	120	2	264
2000	2		15	1	53	10	46	2	129
2001	7		9		75	7	145	9	252
2002	6		11		58	4	292	5	376
2003	8		8		49	2	25		92
2004	7		17		45		14		83
2005	6		7		51		2		66
2006	6		6		82				94
2007*	5		2		55				62

Table 6.4.0e Blue ling (Molva dypterygia). Working group estimates of landings (tonnes) in Subarea XII

Year	Faroes	France	Germany	Spain	E & W	Scotland	Norway	Iceland	Poland	Lithuania	Russia	Total
1988		263										263
1989		70										70
1990		5										5
1991		1147										1147
1992		971										971
1993	654	2591	90									3335
1994	382	345	25									752
1995	514	47			12							573
1996	445	60		264		19						788
1997	1	1		411	4							417
1998	36	26		375	1							438
1999	156	17		943	8	43		186				1353
2000	89	23		406	18	23	21	14				594
2001	6	26		415	32	91	103	2				675
2002	19			1234	8		9					1270
2003		7		971		2	40		12	37		1069
2004		27		610							7	644
2005		10		636						8		654
2006		61									4	65
2007*	1											1

Table 6.4.0f Blue ling. Total landings by Subarea/division. (landings from areas VIII, IX and X given in previous reports are now considered to represent *Molva macropthalma*)

Year	I	II	III	IV	XII	Total
1988		3537	22	363	263	4185
1989		2058	23	459	70	2610
1990		1412	21	501	5	1939
1991		1479	21	627	1147	3274
1992		1039	38	554	971	2602
1993		1020	23	415	3335	4793
1994	3	419	18	424	752	1616
1995	5	359	20	483	573	1440
1996	0	267	12	190	788	1257
1997	1	291	21	270	417	1000
1998	1	278	6	286	438	1009
1999	0	291	6	265	1353	1915
2000	1	249	14	130	594	988
2001	3	208	24	252	675	1162
2002	1	149	9	377	1270	1806
2003	1	147	19	101	1069	1337
2004	0	174	19	83	644	920
2005	1	171	49	70	0	291
2006	0	202	42	94	65	403
2007*	0	263	0	62	1	326

***preliminary**

7 Tusk (*Brosme brosme*)

7.1 Stock description and management units.

In 2007, WGDEEP examined the available evidence for stock discrimination in this species. Based on the genetic investigation, the group suggests the following stock units:

Tusk in Va and XIV

Tusk on the Mid Atlantic Ridge

Tusk on Rockall (Vb)

Tusk in I,II

all other areas (IVa,Vb, VIa, VII,…) be assessed as one combined stock, until further evidence of multiple stocks become available in these areas purposes.

Catches data for tusk in 2006 and 2007 aggregated at the level of statistical rectangle were provided to the working group by France, Ireland, the UK (England and Wales and Scotland) and Iceland. These are shown in Figures 7.1.1 and 7.2.2.

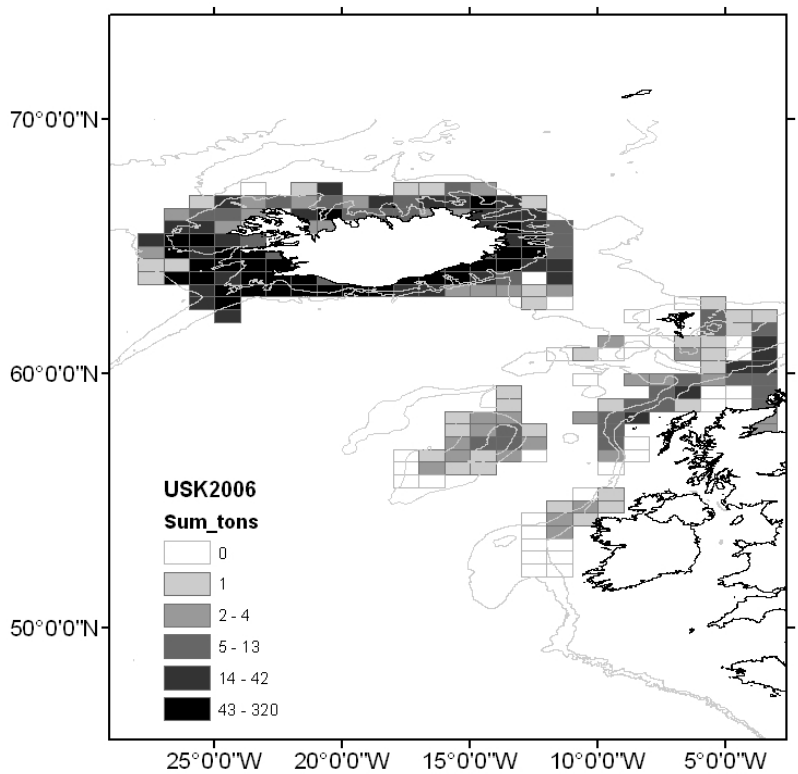


Figure 7.1.1. Catches of tusk by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2006.

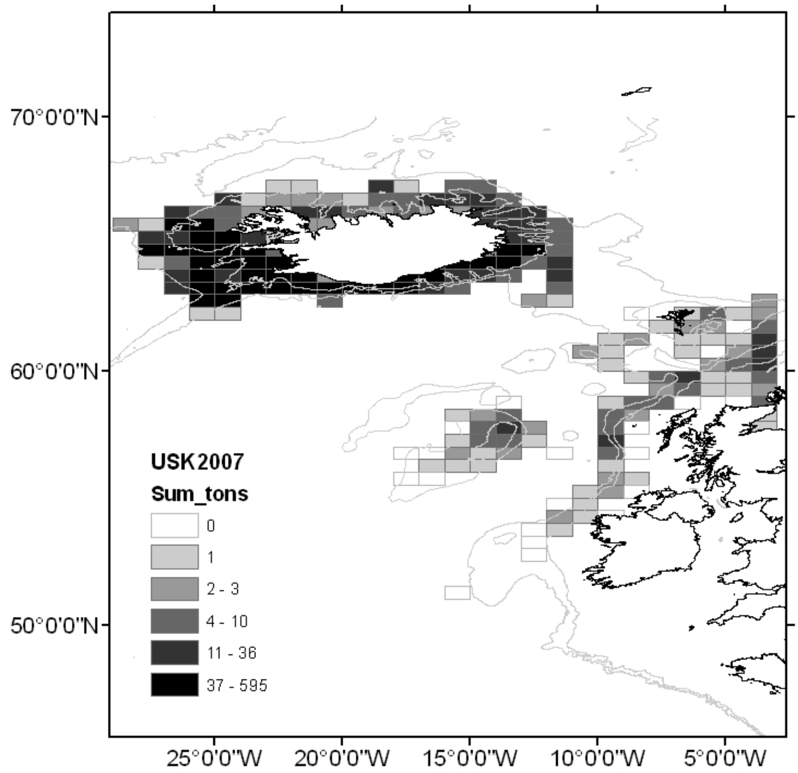


figure 7.1.1. Catches of tusk by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2007.

7.2 Tusk (*Brosme Brosme*) in Division Va and sub-area XIV

7.2.1 The fishery

The fishery for tusk in Va has not changed substantially in recent years. The fishery is primarily a long line fishery, conducted in order of importance by Icelandic, Faroes and Norwegian boats. Tusk is mainly a by-catch Icelandic fleetwhere the main target species are cod, haddock and other demersal species, but in some years there are direct fishery for tusk along the south and southwest coast of Iceland. In recent years, over 550-590 Icelandic vessels have been reporting catches of tusk, from less than 0.1 t to over 330 t per year. Most of the landings from Va (over 95%) come from longlines, but only partly from aimed fisheries. 50% of the Icelandic ling catches in 2007 were taken within the depth range of 100-300 m, with 80% of the catches taken at depth less than 400 m.

The fishing grounds in 2000, 2003 and 2006, as recorded in logbooks, are shown in Figure 5.4.1. In recent years, Icelandic vessels have, on average caught 75% of the tusk The Faroese (catch 1300 t in 2007) and Norwegian fisheries (300 t in 2007) are from long line fisheries primarily targeting ling.

7.2.1.1 Landings trends

In late 1980's directed effort towards tusk started and the landings increased to 8 700 and 8 000 tonnes in 1991 and 1992, respectively. Since then, the landings varied between 4 500 and 7 300 tonnes, highest in 1999 and lowest in 2001. Total landings in 2007 was about 7 600 tonnes. The total landings since 2001 have stabilized around 5000 tonnes, due to TAC restrictions and closure of juvenile areas. Landings by country in Va are given in Table 7.2.1a and in XIV in Table 7.2.1b. Total landings since 1963 are given in Table 7.2.1c and in Figure 7.2.2.

7.2.1.2 ICES advice

The latest advice is from ICES ACFM in May 2006. ICES advised maintaining catches at the recent average (2001 – 2004) of about 5000 t, under the assumption that this would permit an increase in abundance.

7.2.1.3 Management

The Icelandic Ministry of Fisheries is responsible for management of the Icelandic fisheries and implementation of the legislation. The Ministry issues regulations for commercial fishing for each fishing year (1. September – 31. August), including an allocation of the TAC for each of the stocks subject to such limitations. For tusk, the national TAC for the quota year 1. September 2007 – 31. August 2008 was set to 5 000 tonnes. In addition vessels from EU, Norway and Faroe Island have rights to catch deep sea species in Icelandic waters, but the amount of tusk is decided in bilateral agreements. The average catch of vessels from EU, Norway and Faroe Island has been 1 500 tonnes since 2000.

In addition to above mentioned management measures there are area closed for fishing where juvenile tusk has been observed in recent years along the south and southeast coast of Iceland. In addition, if measurements of observed results in a number of tusk smaller than 55 cm in catches exceeding 25%, and tusk is more than 30% of the catches in given set, then a immediate closure of that area will take place for 2 weeks.

7.2.2 Data available

7.2.2.1 Landings and discards

Landings by EU and Icelandic vessels are given by the Icelandic Directorate of Fisheries. Catches are only landed in authorised ports where all catches are weighed and recorded. Landings of Norwegian and Faroese vessels are given by the Icelandic Coast Guard. Discard is banned in the Icelandic demersal fishery and there is no information on possible discard of tusk.

7.2.2.2 Length compositions

Length distribution of tusk in the commercial landings of the Icelandic fleet in Va from 1996-2007 are shown in Figure 7.2.3. Detail overview of the sampling in the catches and surveys was given in WGDEEP 2007 report. The sampling intensity in 2007 was similar as in recent years.

7.2.2.3 Age compositions

No new data available. Otoliths have been collected randomly from the catch since 1980's, but no age readings have been done since 1998. Age readings from 1980's and 1990's show that tusk is slow growing fish that can be more than 20 years old.

7.2.2.4 Weight at age

No data available.

7.2.2.5 Maturity and natural mortality

No new data available. Earlier observations indicates that tusk becomes mature at age of about 8-10 years and at that time it is around 55 cm lengths (Figure.7.2.4). At 56 cm length, 50% of the tusk in Icelandic waters is mature the same length as is close to the mean length in the catches. This means that large proportion of the tusk is caught as juveniles.

7.2.2.6 Catch, effort and research vessel data

Icelandic survey data

The Icelandic spring Groundfish survey (see Pálsson *et. al*, 1989) which has been conduced annually in March since 1985 gives trends on fishable biomass of many exploited stocks on Icelandic fishing grounds. Total of more than 550 stations are taken annually in the survey at depths down to 500 meters, including the most important distribution area of the tusk fisheries (figure 7.2.6). Figure 7.2.5 show both recruitment index and the trend in the fishable biomass (> 40 cm) of tusk. Survey length distributions are shown on Figures 7.2.6.

The indices of total biomass and of fishable biomass (40 cm and bigger) of tusk has gradually increased from 2001, when it was below 50% of the 1985 value (Figure 7.2.5 a, b). In 2007, the biomass indices were around 85% of the mean in 1985-1989. The recruitment index (tusk less than 40 cm) was in 2007 the highest observed in the time series (Figure 7.2.5d).

Survey indices form Icelandic autumn survey are also shown in Figure 7.2.5. The autumn survey has been conducted since 1996 aiming at both continental shelf and deep sea species such as redfish and Greenland halibut, covering depths down to 1200 m with 381 stations. The results of the shorter autumn survey show similar trends as the spring survey (Figure 5.4.4). Although the recruitment index (< 40 cm fish) is much lower in the fall than in the spring survey, the relative trends are the same. The difference in the absolute term is most likely due to lower catchability (due to gear differences) of smaller tusk in the fall survey.

The geographical distribution of tusk in the spring and autumns surveys (Figures 7.2.7 and 7.2.8) has not changed markedly over the time period.

Catch per unit of effort and effort data from the commercial fleets

Figures 7.2.9 shows landings per unit of effort of tusk in the Icelandic long-line fishery. The LPUE is calculated using all long-line data where catches of the species was registered, but also for sets where tusk constituted to more than 10% and 30% of the catch, respectively. The trends, based on these different criteria are conflicting and the cause of the difference have not been explored.

7.2.3 Data analyses

No age-based assessments were possible due to lack of age-structured data.

Mean length of tusk in the commercial catches has decreased from 1999-2002 but has increased again since then, being similar as in the beginning of the time series. This decrease in mean length in 1999-2002 can partly be explained by the increased recruitment (see section 7.2.6).

The sources of information on abundance trends were the LPUE series from the Icelandic longliners and survey indices from the Icelandic groundfish survey. There is a conflicting trends across the time series, however there is an element of convergence in recent years.

Due to concerns regarding the reliability of the CPUE series (it is also un-standardised) the working group suggest using the fishery independent data as an indicator of stock trend.

In theory, if biomass (Bt) and catches (Yt) are known, fishing mortality (Ft) can be estimated from the fundamental fishing equation:

$Y_t = F_t B_t$

If survey biomass estimates (Ut) are thought to reflect true biomass (Bt), and if we use the common assumption that:

$U_t = qB_t$

Then a proxy for fishing mortality can be obtained by:

$F_t = q \;\; Y_t / U_t$

Since the catchability (q) of the survey is unknown the catch divide by survey indices provides only an indicator of relative changes in fishing mortality over time. The relative changes fishing mortality for tusk in Va (Figure 7.2.10) indicates that the fishing mortality increased in the period from 1985 until the end of the century but may have declined in the most recent years.

7.2.4 Comments on the assessment

It is not possible to make age-based assessments for tusk due to lack of time-series of age-structured data. The group noticed that material to run such analysis in Va have been collected, but otoliths have not been age read yet. The group encouraged efforts to work up the material needed to make such analyses.

7.2.5 Management considerations

The state of the stocks remains uncertain, but there are indications that both the adult stock (> 55 cm) and the fishable stock (> 40 cm) has started to recover from it´s record low level in 2001, and the recruitement signs are optimistic. Action have been taken to prevent the juveniles in Division Va by closing areas of the south and southeast coast of Iceland, and there is a TAC management. This has resulted in a decreased direct effort in recent years.

Reference points that were previously assigned to tusk were:

U_{lim}= 0.2* $U_{max,}$

U_{pa}= 0.5* $U_{max,}$

However, as available indices do not go back to the start of the fishery, these are considered inappropriate as reference points.

The working therefore however recommends that direct effort should further be kept low in order to further rebuild the adult stock. Add in text on quick closures

Table 7.2.1a. Tusk. Catches in Va since 1963. Source: STATLANT database, except bold values which are WG best estimates.

Year	Belgium	Faeroe	France	Germany	Iceland	Norway	UK (E	UK	Total
1963					5872				10297
1964					3532				7746
1965					2263				6610
1966					2107				4575
1967					2699				5132
1968					4604				6632
1969					4075				6218
1970					4357				6987
1971					3793				8112
1972					2815				6460
1973	0	3363	0	576	2366	911	387	4	7607
1974	0	3172	0	375	1857	893	224	6	6527
1975	0	2445	0	384	1673	975	244	10	5731
1976	0	2397	0	334	2935	1352	92	2	7112
1977	0	2818	0	212	3122	1796	0	0	7948
1978	0	2168	0	0	3352	812	0	0	6332
1979	0	2050	0	0	3558	845	0	0	6453
1980	0	2873	0	0	3089	928	0	0	6890
1981	0	2624	0	0	2827	1025	0	0	6476
1982	0	2410	0	0	2804	666	0	0	5880
1983	0	4046	0	0	3469	772	0	0	8287
1984	0	2008	0	0	3430	254	0	0	5692
1985	0	1885	0	0	3068	111	0	0	5064
1986	0	2811	0	0	2548	21	0	0	5380
1987	0	2638	0	0	2987	19	0	0	5644
1988	0	3757	0	0	3087	20	0	0	6864
1989	0	3908	0	0	3158	10	0	0	7076
1990	0	2475	0	0	4816	0	0	0	7291
1991	0	2286	0	0	6446	0	0	0	8732
1992	0	1567	0	0	6442	0	0	0	8009
1993	0	1329	0	0	4729	0	0	0	6058
1994	0	1212	0	0	4615	0	0	0	5827
1995	0	979	0	1	5245	0	0	0	6225
1996	0	872	0	1	5226	3	0	0	6102
1997	0	575	0	0	4814	0	0	0	5389
1998	0	1052	0	1	4118	0	0	0	5171
1999	0	1035	0	2	5795	391	0	1	7224
2000	0	1302	0	0	4711	374	1	0	6388
2001	0	1125	0	1	3392	285	5	0	4808
2002	0	1269	0	0	3906	372	1	1	5549
2003	0	1163	0	1	4030	373	1	1	5569
2004	0	1478	0	1	3124	214	1	0	4818
2005	0	1157	0	3	3534	303	4	0	5001
2006	0	1239	0	2	5060	299	1	0	6601
2007[1]	0	1305	0		5986	300	1	0	7592

[1] **Provisional figures.**

Table 7.2.1b. Tusk. Catches in XIV since 1973. Source: STATLANT database.

Year	Faroe	Germany	Iceland	Norway	Russia	Spain	UK (E, W, NI)	UK (SCO)	Total
1973	16	9	0	0	0	0	2	0	27
1974	259	2	15	0	0	0	1	0	277
1975	29	17	13	138	0	0	0	0	197
1976	0	5	89	47	0	0	1	0	142
1977	167	16	0	40	0	0	1	0	224
1978	0	47	0	38	0	0	0	0	85
1979	0	27	0	0	0	0	0	0	27
1980	0	13	0	0	0	0	0	0	13
1981	110	10	0	0	0	0	0	0	120
1982	0	10	0	0	0	0	0	0	10
1983	74	11	0	0	0	0	0	0	85
1984	0	5	0	58	0	0	0	0	63
1985	0	4	0	0	0	0	0	0	4
1986	33	2	0	0	0	0	0	0	35
1987	13	2	0	0	0	0	0	0	15
1988	19	2	0	0	0	0	0	0	21
1989	13	1	0	0	0	0	0	0	14
1990	0	2	0	7	0	0	0	0	9
1991	0	2	0	68	0	0	1	0	71
1992	0	0	3	120	0	0	0	0	123
1993	0	0	1	39	0	0	0	0	40
1994	0	0	0	16	0	0	0	0	16
1995	0	0	0	30	0	0	0	0	30
1996	0	0	0	157	0	0	0	0	157
1997	0	0	10	9	0	0	0	0	19
1998	0	0	0	12	0	0	0	0	12
1999	0	0	0	8	0	0	0	0	8
2000	0	0	11	11	0	3	0	0	25
2001	3	0	20	69	0	0	0	0	92
2002	4	0	86	30	0	0	0	0	120
2003	0	0	2	88	0	0	0	0	90
2004	0	0	0	40	0	0	0	0	40
2005	7	0	0	41	8	0	0	0	56
2006	3	0	0	19	51	0	0	0	73
2007[1)]				40	6				46

[1)] **Provisional figures.**

Table 7.2.1c. Tusk. Catches in Va and XIV. Estimates for XIV prior to 1973 have not been computed.

Year	Va	XIV
1963	10297	
1964	7746	
1965	6610	
1966	4575	
1967	5132	
1968	6632	
1969	6218	
1970	6987	
1971	8112	
1972	6460	
1973	7607	27
1974	6527	277
1975	5731	197
1976	7112	142
1977	7948	224
1978	6332	85
1979	6453	27
1980	6890	13
1981	6476	120
1982	5880	10
1983	8287	85
1984	5692	63
1985	5064	4
1986	5380	35
1987	5644	15
1988	6864	21
1989	7076	14
1990	7291	9
1991	8732	71
1992	8009	123
1993	6058	40
1994	5827	16
1995	6225	30
1996	6102	157
1997	5389	19
1998	5171	12
1999	7224	8
2000	6388	22
2001	4808	92
2002	5549	120
2003	5569	90
2004	4818	40
2005	5001	56
2006	6601	73
2007 1)	7592	46

1) **Provisional figures.**

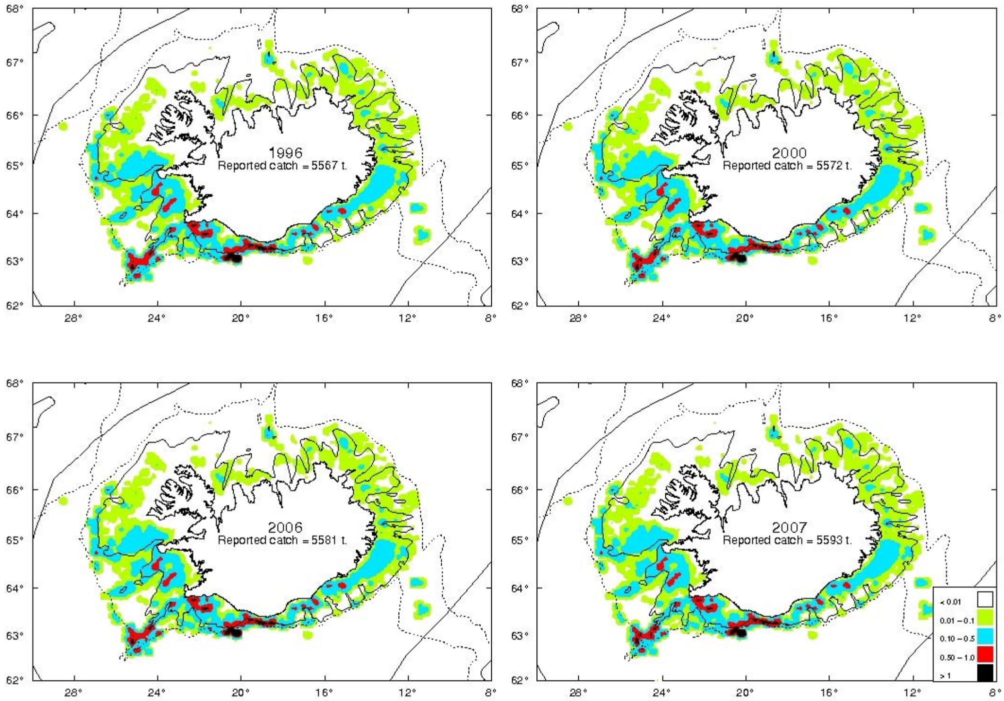


Figure 7.2.1a. Geographical distribution (tonnes/square mile) of the Icelandic tusk fishery in 1996, 2000, 2006 and 2007 as reported in the logbooks. All gear types combined.

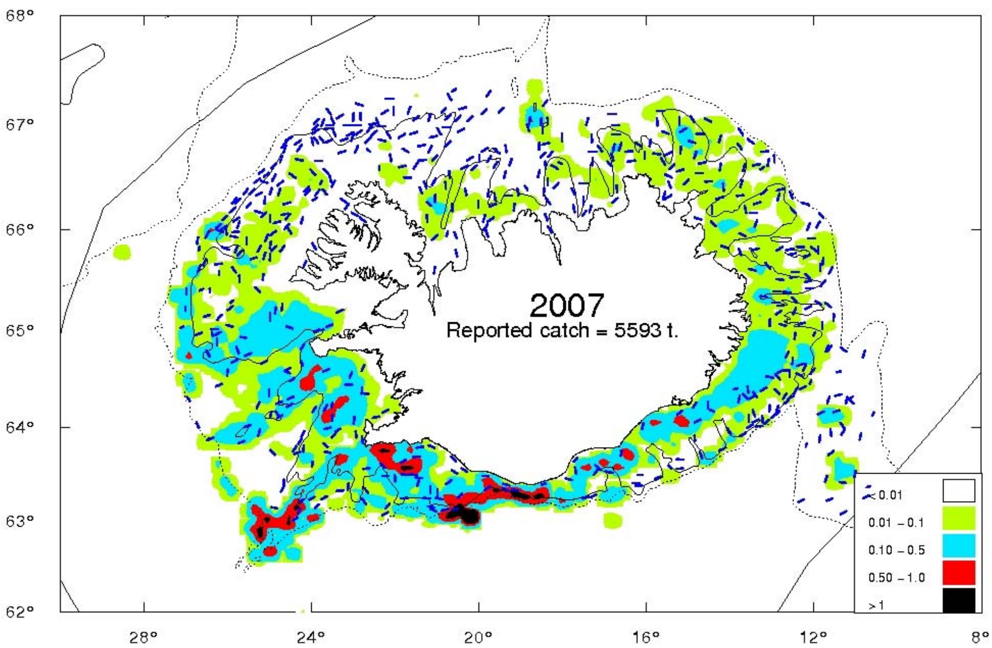


Figure 7.2.1b. Location of the spring groundfish surevey stations (blue lines) and geographical distribution (tonnes/square mile) of the Icelandic tusk fishery in 2007 as reported in the logbooks. All gear types combined.

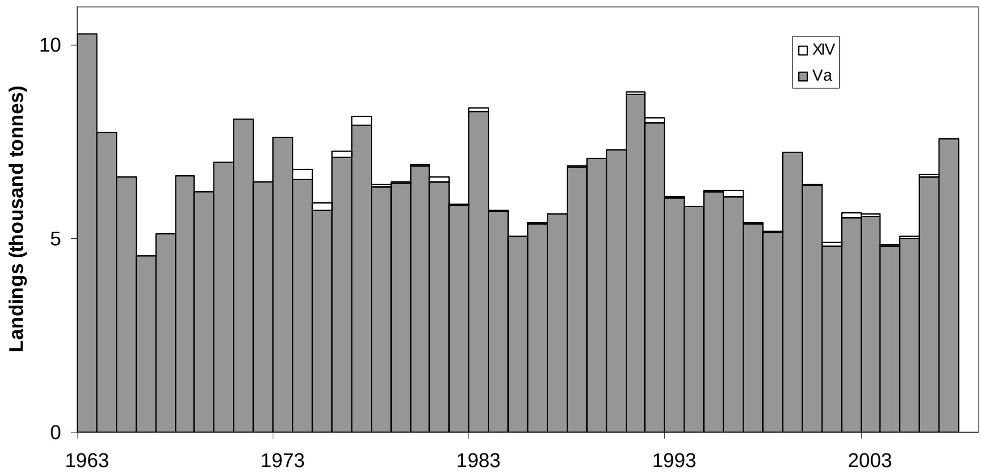


Figure 7.2.2. Tusk in Va and XIV. Estimated total landings (note that estimates for XIV prior to 1973 have not been compiled and are thus not included in the graph).

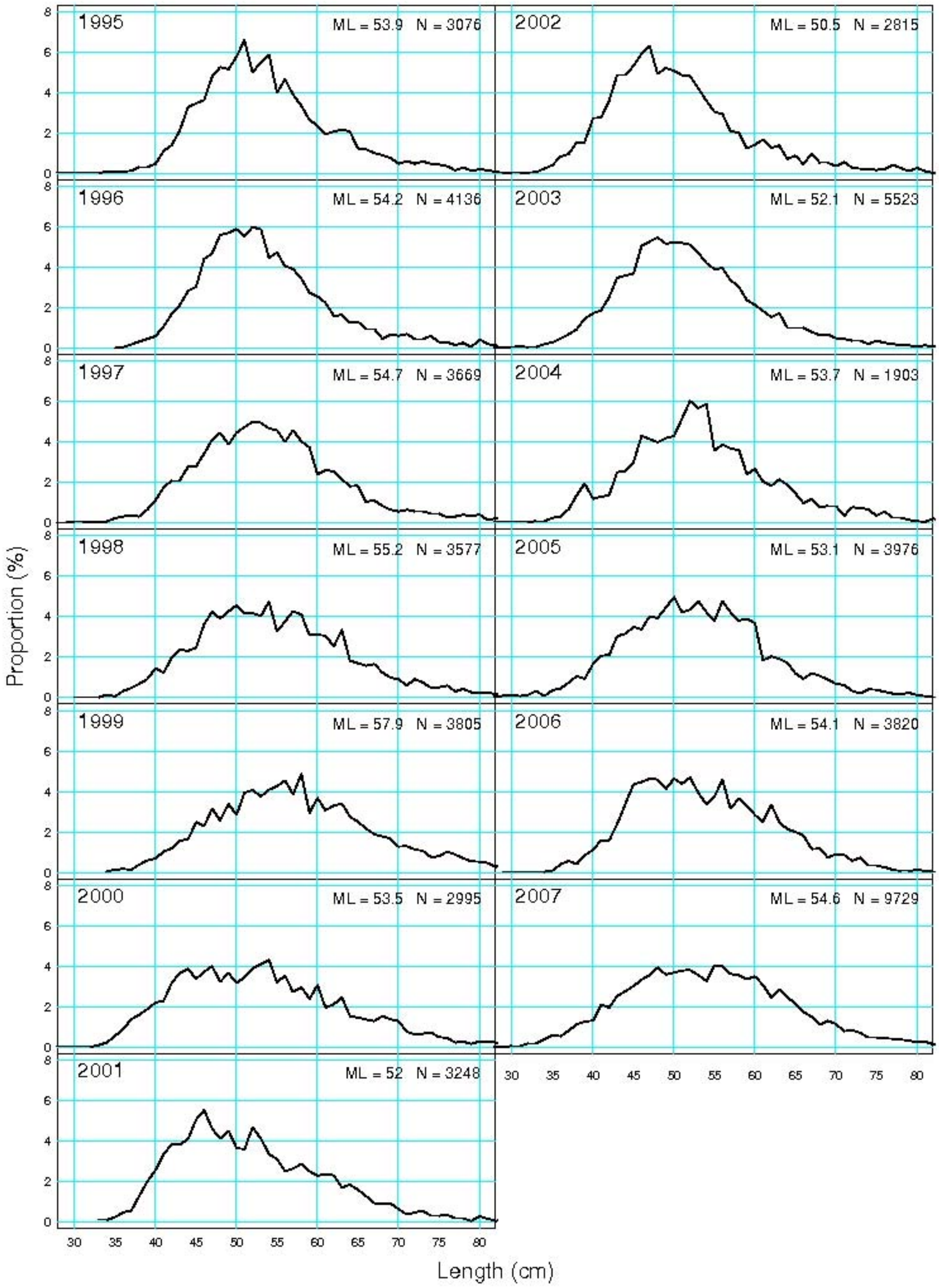


Figure 7.2.3. Length distribution of tusk in the commercial landings of the Icelandic fleet in Va 1996-2007. The number of measured fish (N) and mean length (ML) is also given..

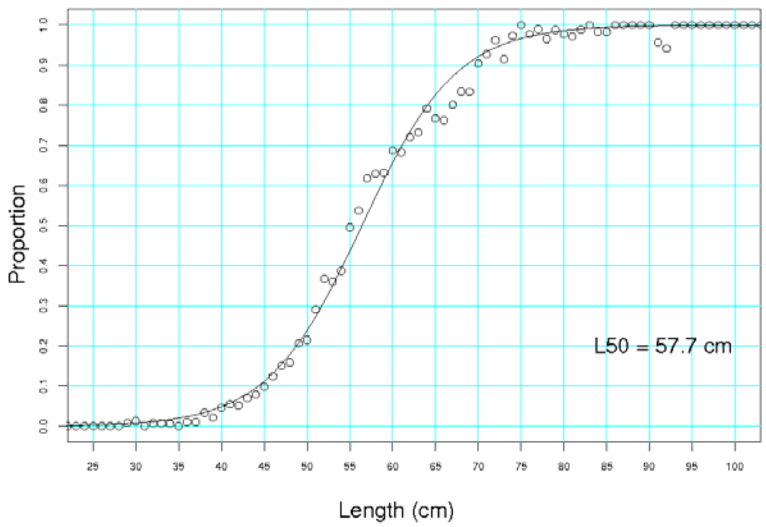


Figure 7.2.4. Tusk maturity. The figure shows average maturity at given length in the Icelandic catches. The fitted curve is also shown and the constants in the equation.

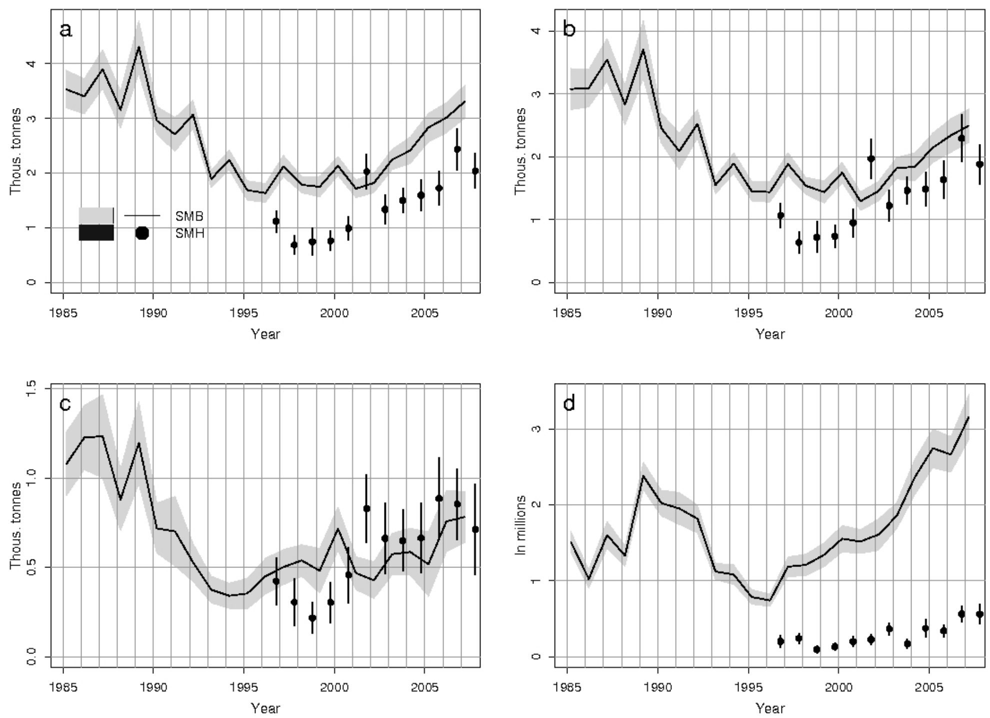


Figure 7.2.5. Abundance indices for tusk in the groundfish survey in March 1985-2007 (SMB, line, shaded area) and October 1996-2007 (SMH, points, vertical lines). a) Total biomass index, b) Biomass of 40 cm and larger, c) Biomass 55 cm and larger, d) Abundance of < 40 cm. The shaded area and the vertical bar show ±1 standard error of the estimate.

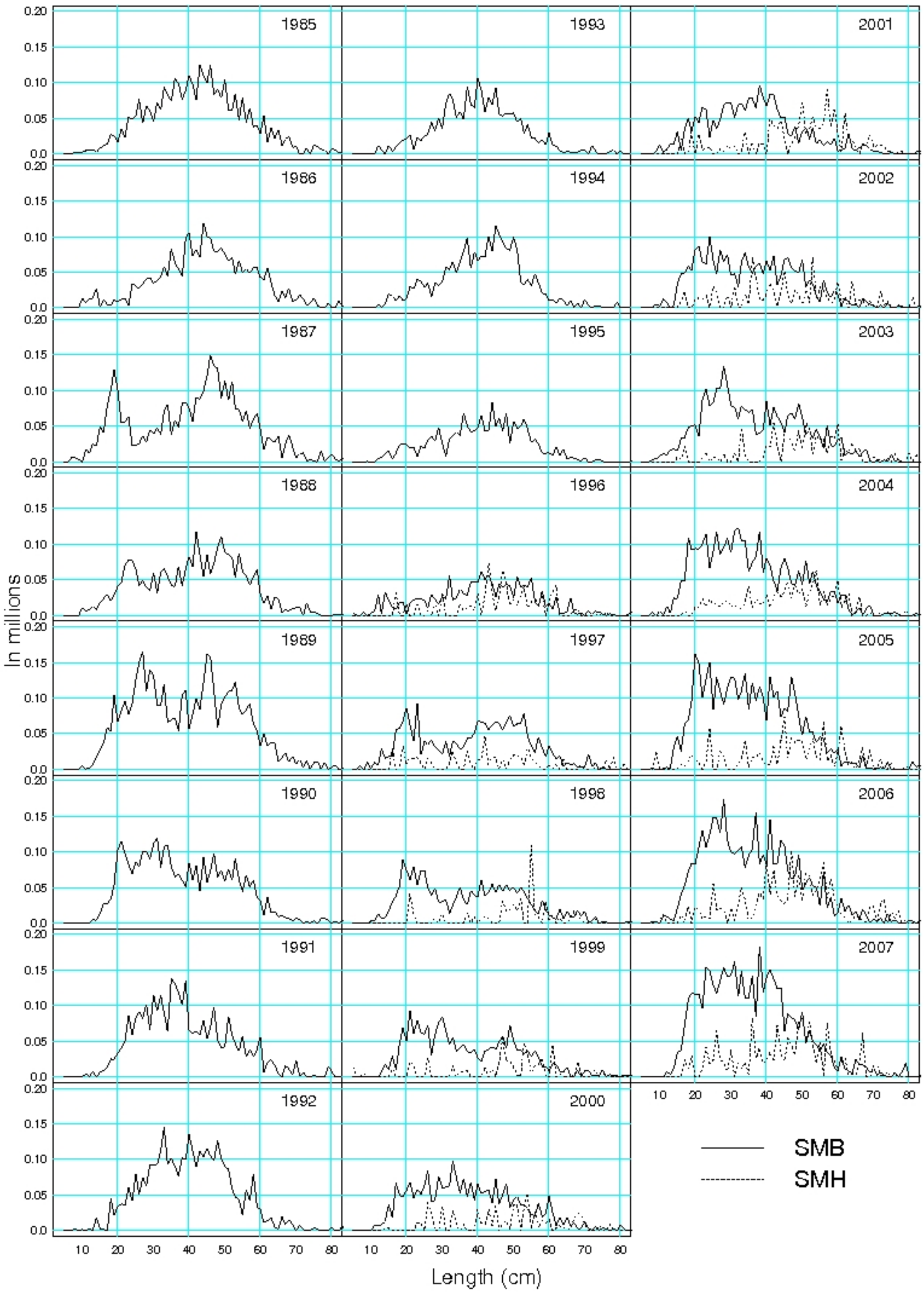


Figure 7.2.6. Length distributions of tusk in the Icelandic groundfish survey in March 1985-2007 (SMB, solid line) and in October 1996-2007 (SMH, dotted line).

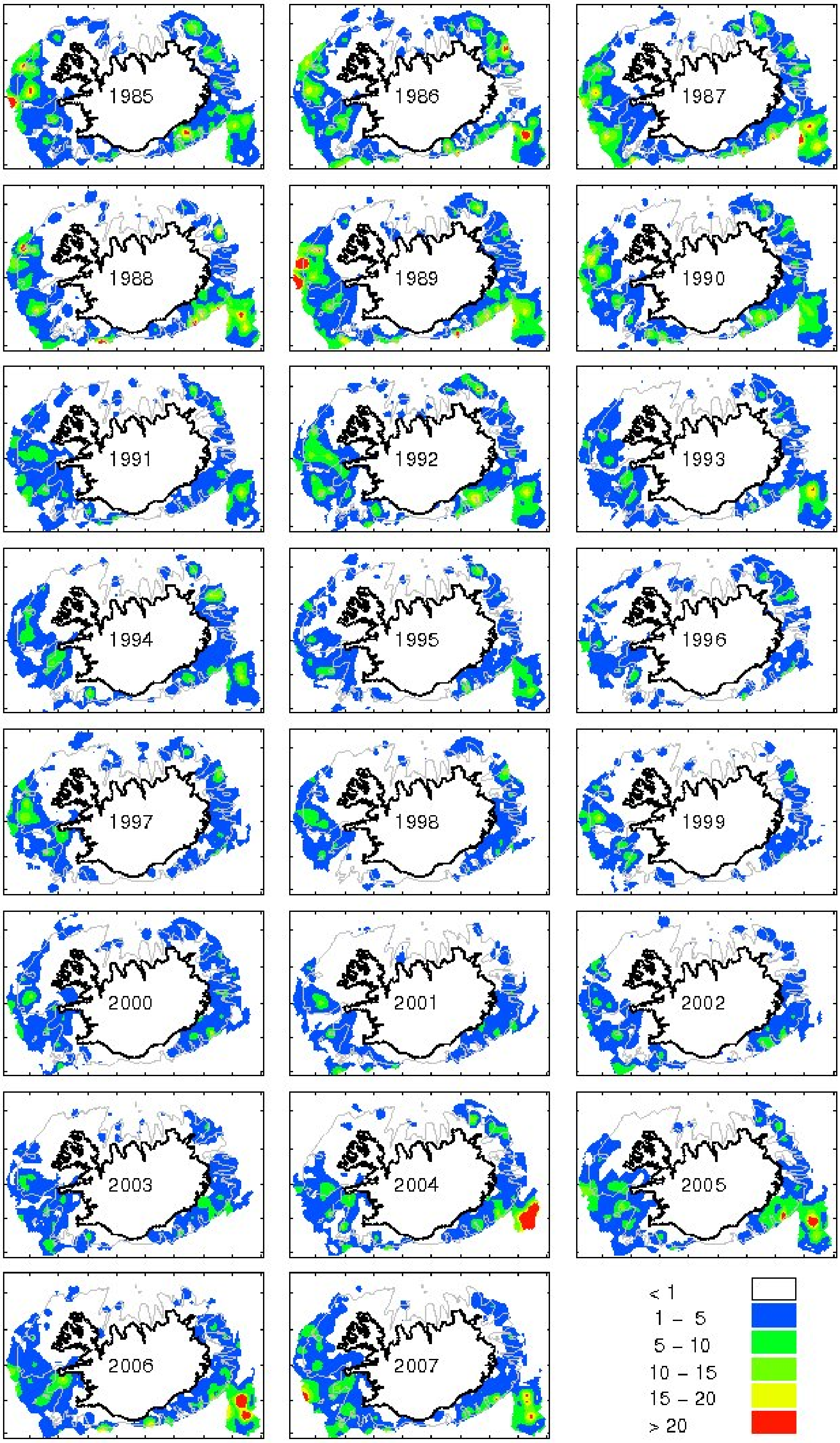


Figure 7.2.7. Distribution of tusk (kg per standardized tow) in the groundfish survey in March 1985-2007.

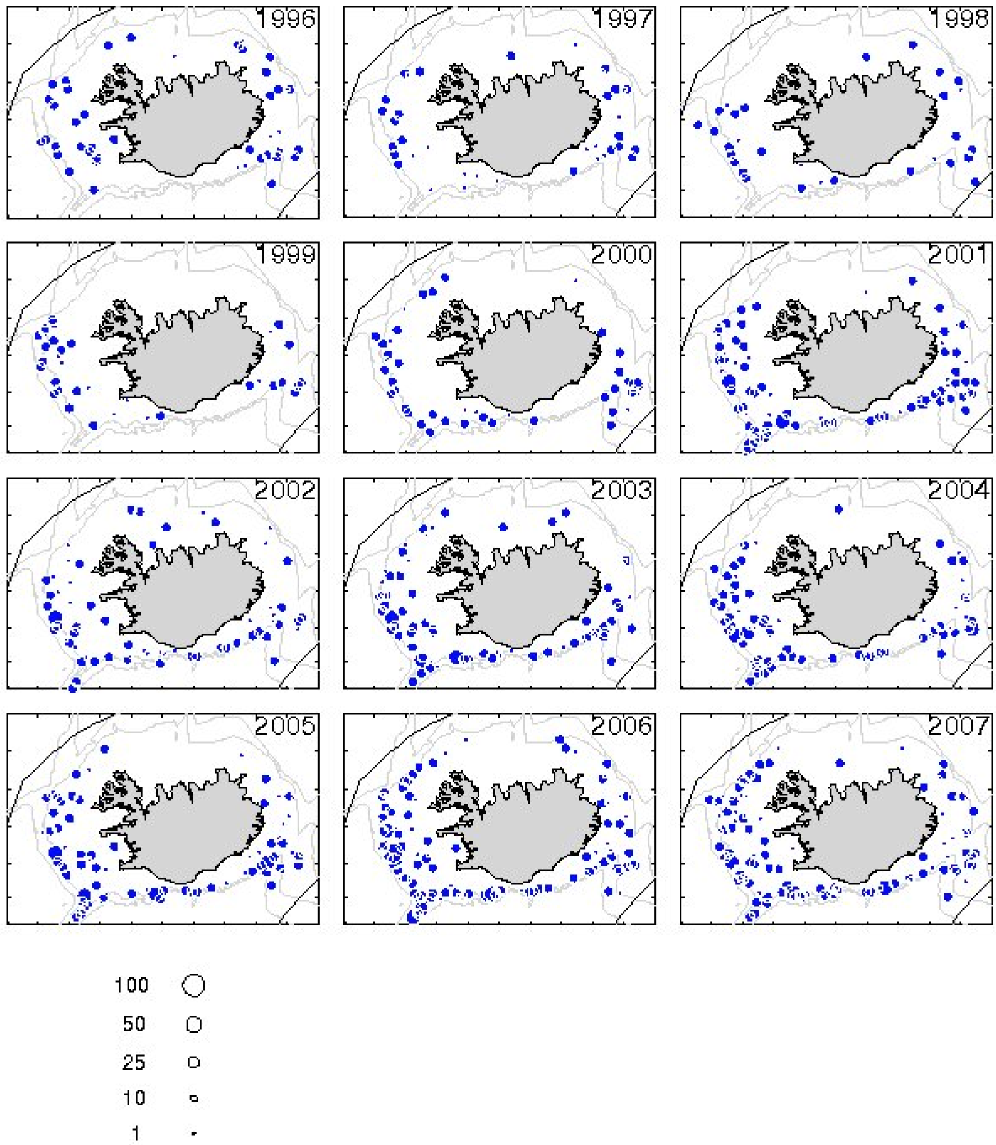


Figure 7.2.8. Distribution of tusk in the groundfish survey in October 1996-2007. The sizes of the circles indicate kg/station.

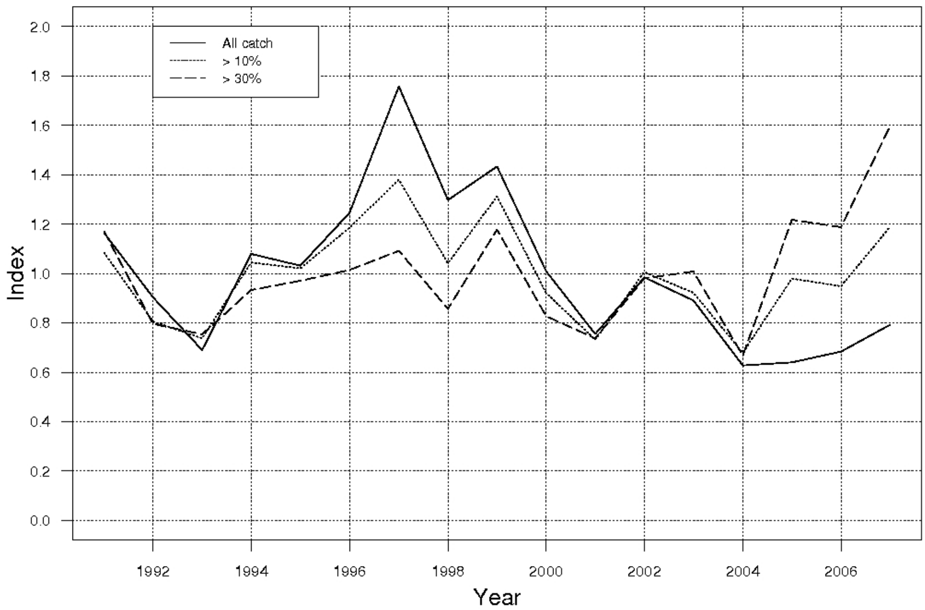


Figure 7.2.9. Index of raw CPUE (sum(yield)/sum(effort)) of tusk from the Icelandic long-line fishery based on log-books 1991-2007. The criteria for the calculations were all sets where tusk was reported in the log-books and where tusk composed at least 10% and 30% of the total catch in each set.

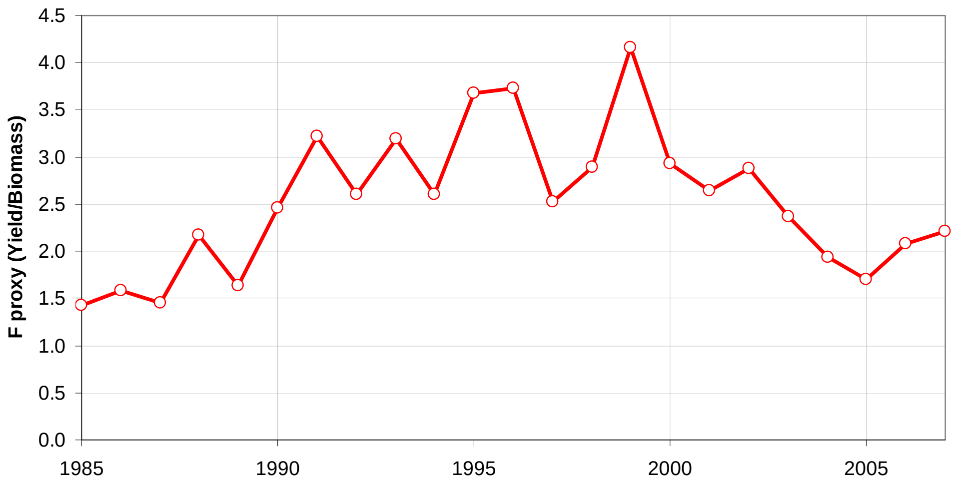


Figure 7.2.10. Tusk in Va. Estimates of trends in relative fishing mortality (Yield / Survey biomass)

7.3 Tusk (*Brosme Brosme*) in Subareas I and II

7.3.1 The fishery

Tusk has been fished, primarily as a by-catch in ling and cod fisheries, in this area for centuries, and the historical development was described by e.g. Bergstad and Hareide (1996), including the post-world war II increase due to a series of technical advances. Currently the major fisheries in Subareas I and II are the Norwegian longline and gillnet fisheries, but there are also by-catches by other gears, i.e., trawls and handline. Of the Norwegian landings, usually around 85% is taken by longlines, 10% by gillnets and the remainder by a variety of other gears. Other nations catch ling as a by-catch in trawl and long line fisheries.

Russian landings (102 tonnes) from Sub-Divisions IIa and IIb in 2007 were mainly taken as by-catch in long-line fisheries. In Subarea I, 2 t was taken (Vinnichenko WD?, 2008).

7.3.1.1 Landings trends

Landing statistics by nation in the period 1988-2007 are given in Table 7.3.0a-d. Compared with the pre-2000 landings level, recent landings were about halved. The preliminary landings for 2007 are 10 731 tonnes which is an increase compared to previous years.

7.3.1.2 ICES advice

The advice statement from 2006 was: Landings of tusk have declined in recent years and the overall cpue on tusk has remained at reduced levels. ICES recommends to reduce catches to 5000 t (about 30%) and to monitor whether the indicators show an increase in stock sizes.

7.3.1.3 Management

There is no species-specific management of the ling fishery in Subareas I and II. There is no quota set for the Norwegian fishery. The quota to EC in area I and II in the Norwegian zone for by-catch species such as ling and tusk is in 2008 set to 350 tonnes. There is no minimum landing size in the Norwegian EEZ.

There is no species-specific management of the tusk fishery in Subarea I and II, but the exploitation is influenced by regulations aimed at other groundfish species, e.g. cod and haddock (see section 4.2.1). There is no minimum landing size in the Norwegian EEZ.

EU TAC (for community vessels fishing in community waters and waters not under the sovereignty or jurisdiction of third countries in I, II and XIV): was set at 25 tonnes in 2007, reduced to 23 tonnes in 2008.

7.3.2 Data available

7.3.2.1 Landings and discards

Landings were available for all relevant fleets. New discard data were not available, but within the Norwegian EEZ discarding is prohibited and assumed to be minor.

7.3.2.2 Length compositions

Length compositions/mean lengths from 1988 to present based on data from the Norwegian longliners were presented in Bergstad and Hareide (1996) and Helle and Pennington (WD6, 2007). In this period, when the tusk has been fully or heavily exploited, the mean length has varied around 50cm without any clear trend.

7.3.2.3 Age compositions

No new age compositions were available.

7.3.2.4 Weight at age

No new data were presented.

7.3.2.5 Maturity and natural mortality

No new data were presented.

7.3.2.6 Catch, effort and research vessel data

Catch and effort data for Norwegian longliners were presented (Figure 7.3.1) No research vessel data were available.

The extensive Norwegian longliner CPUE data based on private skipper's logbooks presented in the 1996 report of SGDEEP were not updated after 1994. In the 1998 report (Table 6.5 of ICES C.M. 1998/ACFM:12), effort data were given for the period 1974-1996 based on official statistics.

In order to resume the CPUE-series Norway has adopted two approaches:

1) *Official logbooks from longliners.* Entering of data from official logbooks in an electronic database was begun in 2001 and data are now available for the period 2000-2006. (Because the WGDEEP meeting is relatively early this year, the logbook data, the reference fleet data and associated estimates are not yet available for 2007).Vessels were selected that had a total landed catch of ling, tusk and blue ling exceeding 8 tonnes in a given year. The logbooks contain records of the daily catch, date, position, and number of hooks used per day.

2) *Reference fleet information*. Since 2001 special agreements were made with selected vessels, "the reference fleet", providing data for the species composition of the catch (in weight), and number of hooks used per day (Helle and Pennington, WD8 2008). There are currently four longline vessels contributing data.

An analyses based on these two sources of data was presented in a WD by Helle and Pennington (WD6, 2007).

7.3.3 Data analyses

No analytical assessments were possible due to lack of age-structured data and/or tuning series.

The only source of information on abundance trends was the CPUE series from the Norwegian longliners presented by Helle and Pennington (WD8, 2008). The number of longliners has declined in recent years (Table 7.3.1.), from 72 to 35 in the period 2000-2006. In 2007 the number increased to 38. Compared with the previous years the number of fishing days decreased in 2006. (Table 7.3.2). The number of hooks set per day and the total set per year has remained rather stable in Subareas I and II (Table 7.3.3 and7.3.4).

Table 7.3.5 gives estimates of CPUE based on the Norwegian official logbooks and the reference vessels. In Figure 7.3.1. the data for 2000-2006 are shown together with the data for the period 1971-1994 (considered earlier by WGDEEP and presented in Bergstad and Hareide, 1996). There is a gap in the time series between 1995 and 2000, and due to data limitations it was not possible to estimate CPUE for all years in the early period.

The CPUE varied strongly, but generally declined in the 1970s and 1980s, and the level appears to have remained at a low level from the early 1990s into the 2000-2006 period. There was an increase in 2005 and 2006.

7.3.4 Comments on the assessment

The CPUE series used in this assessment are derived from longline fisheries but it is uncertain whether the fisheries were targeting tusk or other species. They may not provide a reliable indicator of abundance of tusk.

The CPUE series of the main fleet landing tusk suggest that the abundance has remained at a reduced level after a probable decline in the 1970s to 1990s. Between 2000 and 2004 there was a continued decline, followed by an increase in 2005 and 2006.

7.3.5 Management considerations

It is uncertain whether the current management has effectively reduced effort in the main fleet, i.e. longliners, compared with the level in 1998 (ref. ICES advice from 2004). Despite that the number of vessels has declined substantially, the number of hooks set per year remained more or less stable. However, in the more important fishing area (IIa) from which the most reliable data originated, there was a steady decline in number of hooks set per year since 2002. The current trend indicate a development in accordance with ICES advice from 2006. Based on the current perception of status and trends in the stock, there is no basis to suggest amendment of the advice statement from 2006.

Table 7.3.0a. Tusk I. WG estimates of landings

Year	Norway	Russia	Faroes	Iceland	Ireland	Total
1996	587					587
1997	665					665
1998	805					805
1999	907					907
2000	738	43	1	16		798
2001	595	6		13		614
2002	791	8	n/a	0		799
2003	571	5			5	581
2004	620	2			1	623
2005	562					562
2006	442	4				446
2007*	355	2				357

***Preliminary**

Table 7.3.0b. Tusk IIa. WG estimates of landings

Year	Faroes	France	Germany	Greenland	Norway	E & W	Scotland	Russia	Ireland	Total
1988	115	32	13	-	14241	2	-			14403
1989	75	55	10	-	19206	4	-			19350
1990	153	63	13	-	18387	12	+			18628
1991	38	32	6	-	18227	3	+			18306
1992	33	21	2	-	15908	10	-			15974
1993	-	23	2	11	17545	3	+			17584
1994	281	14	2	-	12266	3	-			12566
1995	77	16	3	20	11271	1				11388
1996	0	12	5		12029	1				12047
1997	1	21	1		8642	2	+			8667
1998		9	1		14463	1	1	-		14475
1999		7	+		16213		2	28		16250
2000		8	1		13120	3	2	58		13192
2001	11	15	+		11200	1	3	66	5	11301
2002		3			11303	1	4	39	5	11355
2003	6	2			7284		3	21		7316
2004	12	2			6607		1	61	1	6684
2005	29	6			6249			37	3	6324
2006	33	9			9246	1		51	11	9351
2007*	53	6			9845	1	4	85	12	10006

***Preliminary**

Table 7.3.0c. Tusk IIb. WG estimates of landings.

Year	Norway	E & W	Russia	Ireland	Total
1988		-			0
1989		-			0
1990		-			0
1991		-			0
1992		-			0
1993		1			1
1994		-			0
1995	229	-			229
1996	161				161
1997	92	2			94
1998	73	+	-		73
1999	26		4		26
2000	15	-	3		18
2001	141	-	5		146
2002	30	-	7		37
2003	43				43
2004	114		5		119
2005	148		16		164
2006	168		23		191
2007*	350		17	1	368

Table 7.3.0d. Tusk I & II. WG estimates of total landings by Sub-areas or Divisions.

Year	I	IIa	IIb	All areas
1988		14403	0	14403
1989		19350	0	19350
1990		18628	0	18628
1991		18306	0	18306
1992		15974	0	15974
1993		17584	1	17585
1994		12566	0	12566
1995		11388	229	11617
1996	587	12047	161	12795
1997	665	8667	94	9426
1998	805	14475	73	15353
1999	907	16250	26	17183
2000	798	13192	18	14008
2001	614	11301	146	12061
2002	799	11355	37	12191
2003	581	7316	43	7940
2004	623	6684	119	7426
2005	562	6324	164	7050
2006	446	9351	191	9988
2007*	357	10006	368	10731

***Preliminary**

Table 7.3.1. Summary statistics for the Norwegian long liner fleet during the period 1995-2006 (vessels exceeding 21m). This list only includes vessels that landed 8 tonnes or more of ling, blue ling and tusk in a given year.

Year	Number of long liners
1995	65
1996	66
1997	65
1998	67
1999	71
2000	72
2001	65
2002	58
2003	52
2004	43
2005	39
2006	35
2007	38

Table 7.3.2. Estimated number of days that the Norwegian long liner fleet (selected using criteria described in the text) operated in Subareas I and II and caught tusk in the period 2000-2006.

Tusk	2000	2001	2002	2003	2004	2005	2006
I	3	1	5	5	6	5	1
IIa	34	57	66	58	60	69	67
IIb	1		2		1	2	1

Table 7.3.3. Estimated number of hooks that the Norwegian long liners set per day in Subarea I and II in the period 2000-2006. n= the total number of days with hook information contained in the logbooks.

All	2000		2001		2002		2003		2004		2005		2006	
	Average	n	Average	n	Average	n	Average	n	Average	n	Average	n	Average	n
I	32953	193	33325	163	35432	263	35045	376	32431	433	32671	316	32876	129
IIa	31512	1438	30703	2196	33431	2031	34766	1839	33475	1389	32861	1248	35140	1252
IIb	36354	65	34638	315	34756	45	34776	67	31859	217	35082	207	39259	54

Table 7.3.4. Estimated total number of hooks (in thousands) the Norwegian long liner fleet used in Subareas I and II for the years 2000-2006 in the fishery for tusk, ling and blue ling.

All	2000		2001		2002		2003		2004		2005		2006	
	Average	n	Average	n	Average	n	Average	n	Average	n	Average	n	Average	n
I	32953	193	33325	163	35432	263	35045	376	32431	433	32671	316	32876	129
IIa	31512	1438	30703	2196	33431	2031	34766	1839	33475	1389	32861	1248	35140	1252
IIb	36354	65	34638	315	34756	45	34776	67	31859	217	35082	207	39259	54

Table 7.3.5. Estimated mean CPUE ([kg/hook]x1000) of tusk in Subarea I and II based on log book data. Standard error (se) and number of catches sampled (n) is also given.

All vessels submitting logbooks:

	2000			2001			2002			2003			2004			2005			2006		
Area	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se
I	8,7	101	3,2	18,8	43	4,5	4,2	115	2,0	11,9	141	1,7	3,8	122	2,2	3,5	73	5,1	7,8	18	9,5
IIA	62	1172	0,9	52,3	1959	0,5	47,0	1809	0,5	40,1	1453	0,5	36,7	1096	0,8	49,5	1060	1,0	56,3	1145	1,2
IIB	48,7	17	8	10,8	17	5,6				5,3	5	9,0	2,2	20	5,6	2,7	12	9,2	5,6	4	16,4

Reference vessels:

Tusk	2001			2002			2003			2004			2005			2006		
Area	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se
I				2,1	43	6,35	1,13	77	3,26	2,39	44	4,96	1,83	51	5,44	4,41	60	7
IIA	22,1	46	3,6	41,4	208	2,89	35,13	296	1,66	32,57	431	1,58	63,38	349	2,09	61,79	498	2,43
IIB										8,74	2	23,26	0,55	4	19,42	4,69	45	8,08

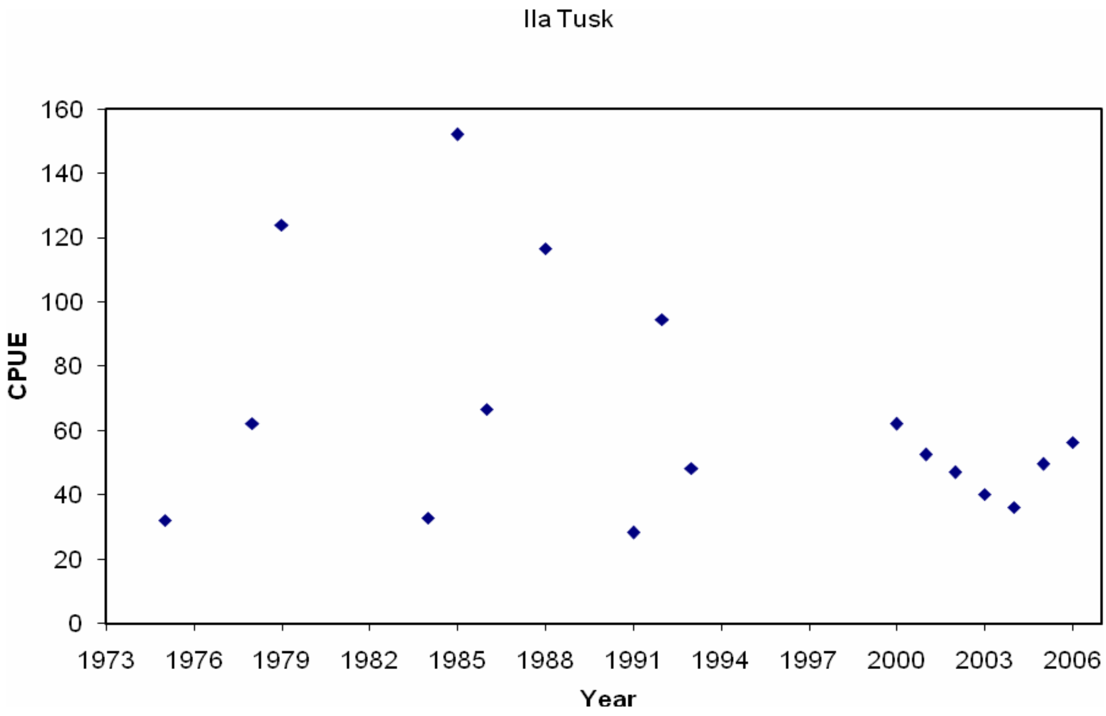


Figure 7.3.1. Estimates of CPUE (kg/1000 hooks) of tusk based on skipper's logbooks (pre-2000) and official logbooks (post 2000). Combination of data from Bergstad and Hareide (1996) and WD8 by Helle and Pennington (2008). Note interruption in time series in the period 1993-2000.

7.4 Tusk (*Brosme Brosme*) on the Mid-Atlantic Ridge (division XIIa1)

7.4.1 The fishery

Tusk is a by-catch species in the gillnet and long line fisheries in Subarea/Division XII. During the last two years only Russia reported catches of tusk. During the period 1996 to 2004 Norway also had a fishery in this area.

7.4.1.1 Landings trends

Landing statistics by nation in the period 1988-2007 are in Table 7.4.0.

It should be noted that catches in XIIb, Hatton Bank, may be included in these data.

The catches are generally very low from this area.

7.4.1.2 ICES advice

The advice statement from 2006 for combined management units was: *Effort should be reduced by 30% compared to the effort in 1998.*

7.4.1.3 Management

The effort in the NEAFC regulatory area was frozen in 2003. In 2004 NEAFC agreed a reduction of fishing effort of 30% and in 2007 this was cut by a further 5%.

7.4.2 Data available

7.4.2.1 Landings and discards

Landings were available for all the relevant fleets. New discard data were not available.

7.4.2.2 Length compositions

No length compositions were available.

7.4.2.3 Age compositions

No age compositions were available.

7.4.2.4 Weight at age

No data were available.

7.4.2.5 Maturity and natural mortality

No data were available.

7.4.2.6 Catch, effort and research vessel data

No data were available.

7.4.3 Data analyses

No analytical assessments were possible.

7.4.4 Comments on the assessment

No assessment was carried out this year

7.4.5 Management considerations

There are no directed fisheries in this area and current landings are small. Fisheries should only be permitted to develop where there is information to suggest that they are sustainable.

Table 7.4.0. Tusk XII. WG estimate of landings. It should be noted that catches in XIIb, Hatton Bank, may be included in these data

TUSK XII

Year	Faroes	France	Iceland	Norway	Scotland	Russia	Total
1988		1					1
1989		1					1
1990		0					0
1991		1					1
1992		1					1
1993		12	+				12
1994		1	+				1
1995	8	-	10				18
1996	7	-	9	142			158
1997	11	-	+	19			30
1998		1		-			1
1999		1		+	1		1
2000				5	+		5
2001		1		51	+		52
2002				27			27
2003				83			83
2004	2	2		7		5	16
2005	2	1					3
2006		0				64	64
2007*		0				19	19

***Preliminary**

Table 7.4.0 (continued).

Tusk, total landings by Sub-areas or Division.

Year	XII	All areas
1988	1	1
1989	1	1
1990	0	0
1991	1	1
1992	1	1
1993	12	12
1994	1	1
1995	18	18
1996	158	158
1997	30	30
1998	1	1
1999	1	1
2000	5	5
2001	52	52
2002	27	27
2003	83	83
2004	16	16
2005	3	3
2006	64	64
2007	19	19

***Preliminary**

7.5 Tusk (*Brosme Brosme*) in VIb

7.5.1 The fishery

Tusk is a by-catch species in the trawl, gillnet and long line fisheries in Subarea VIb. Norway has traditionally landed the largest percentage of the total catch. Long liners catch about 90% of the Norwegian landings. Since the 12th of January 2007 parts of the Rockall bank has been closed to fishing with bottom trawls, gillnets and long lines. The areas closed are traditional areas fished by the Norwegian long line fleet.

7.5.1.1 Landings trends

Landing statistics by nation in the period 1988-2007 are in Table 7.5.0.

For Subarea VIb catches declined in 2006 and more so in 2007 compared with previous years.

7.5.1.2 ICES advice

The advice statement from 2006 was: Effort should be reduced by 30% compared with the 1998 effort.

7.5.1.3 Management

There are no management measures that apply specifically to this area.

Norway, which also has a licensing scheme, could in 2006 catch 3400 tonnes and in 2007 catch 3 350 tonnes in EU waters. The effort in the NEAFC regulatory area was frozen for 2003 reduced by 30% in 2004 and by a further 5% in 2007.

EU TACs cover Subarea V, VI, VII and is set at 435 tonnes in 2008

7.5.2 Data available

7.5.2.1 Landings and discards

Landings were available for all relevant fleets. New discard data were not available.

7.5.2.2 Length compositions

Length compositions and mean lengths from 1988 to the present, based on Norwegian long liner data, are in Bergstad and Hareide (1996) and Helle and Pennington (WD8, 2008). During this period, when the tusk was fully or heavily exploited, the mean length varied around 60cm without any clear trend.

Length compositions based on Spanish experimental long lining in XIIb and VI are in WD18 by Muñoz (2006).

7.5.2.3 Age compositions

No new age compositions were available.

7.5.2.4 Weight at age

No new data were presented.

7.5.2.5 Maturity and natural mortality

No new data were presented.

7.5.2.6 Catch, effort and research vessel data

The extensive Norwegian long liner CPUE series, based on private skipper's logbooks, presented in the 1996 report was not updated after 1994. In the 1998 report (Table 6.5 of ICES C.M. 1998/ACFM:12), effort data were given for the period 1974-1996 based on official statistics.

In order to resume the CPUE-series Norway has adopted two approaches:

1) *Official logbooks from long liners.* Entering of data from official logbooks into an electronic database was begun in 2001 and data are now available for the period 2000-2006. Vessels were selected that had a total landed catch of ling, tusk and blue ling exceeding 8 tonnes in a given year. The logbooks contain records of the daily catch, date, position, and number of hooks used per day.

2) *Reference fleet information*. Since 2001 special agreements were made with selected vessels, "the reference fleet", providing data on the species composition of the catch (in weight), and number of hooks used per day (Helle and Pennington, WD 2004). There are currently four longline vessels contributing data.

An analyses based on these two sources of data is in Helle and Pennington (WD8, 2008).

CPUE from a Spanish experimental long line fishery in VI, VII and VII in 2005 was provided

7.5.3 Data analyses

No analytical assessments were carried out.

One source of information on abundance trends was the CPUE series based on the Norwegian long liners' data (see Helle and Pennington, 2007). The number of long liners has declined from 72 to 35 during the period 2000-2006. The number of vessels increased to 38 in 2007. The number of fishing days with a tusk catch in Division VIb has remained very stable in the period 2000-2006 (Table 7.5.1). The number of hooks set per day and the total set per year has remained rather stable in Subarea Vib (Table 7.5.2 and 7.5.3).

In Tables 7.5.4 and 7.5.5 and in Figure 7.5.1 are estimates of CPUE, which are based on the Norwegian official logbooks and the reference vessels. In Figure 7.5.2 the CPUE series for 2000-2006 is compared with the CPUE series for the period 1971-1994 (considered earlier by WGDEEP; see Bergstad and Hareide, 1996). There is a gap in the time series between 1995 and 2000, and due to data limitations it was not possible to estimate CPUE for every year in the early period.

The CPUE series shows no apparent trend in area VIb

7.5.4 Comments on the assessment

The only CPUE series available for VIb is based on the Norwegian long liners' data, and this series is very variable with no apparent trends.

7.5.5 Management considerations

The closure of parts of the Rockall bank area most likely caused the large reduction in Norwegian catch, but without the logbooks and reference fleet data for 2007 this is just a speculative conclusion. If the closing actually reduced fishing effort, then the management of this species would be in accordance with ICES advice from 2004.

Table 7.5.0. Tusk VIb. WG estimate of landings.

TUSK VIb

Year	Faroes	France	Germany	Ireland	Iceland	Norway	E & W	N.I.	Scot.	Russia	Total
1988	217		-	-		601	8	-	34		860
1989	41	1	-	-		1537	2	-	12		1593
1990	6	3	-	-		738	2	+	19		768
1991	-	7	+	5		1068	3	-	25		1108
1992	63	2	+	5		763	3	1	30		867
1993	12	3	+	32		899	3	+	54		1003
1994	70	1	+	30		1673	6	-	66		1846
1995	79	1	+	33		1415	1		35		1564
1996	0	1		30		836	3		69		939
1997	1	1		23		359	2		90		476
1998		1		24	18	630	9		233		915
1999				26	-	591	5		331		953
2000		2		22		1933	14		372	1	2344
2001	1	1		31		476	10		157	6	681
2002		8		3		515	8		88		622
2003		7		18		452	11		72	1	561
2004		9		1		508	4		45	60	627
2005		5		9		503	5		33	137	692
2006	10	1		16		431	2		25	2	487
2007*	4	0				231	1		34	25	295

***Preliminary**

Table 7.5.0 (continued).

Tusk, total landings in sub area VIb.

Year	VIb	All areas
1988	860	860
1989	1593	1593
1990	768	768
1991	1108	1108
1992	867	867
1993	1003	1003
1994	1846	1846
1995	1564	1564
1996	939	939
1997	476	476
1998	915	915
1999	953	953
2000	2344	2344
2001	681	681
2002	622	622
2003	561	561
2004	627	627
2005	692	692
2006	487	487
2007*	295	295

***Preliminary**

Table 7.5.1. Estimated number of days that the Norwegian long liner fleet (selected using criteria described in the text, Ch 6) operated in Subarea VIb in the period 2000-2006. Data from 2007 was not available to the working group.

Tusk	2000	2001	2002	2003	2004	2005	2006
VIb	4	6	8	5	5	8	7

Table 7.5.2. Estimated number of hooks that the Norwegian long liners set per day in Subarea VIb in the period 2000-2006. n= the total number of days with hook information contained in the logbooks. Data from 2007 was not available to the working group.

All	2000		2001		2002		2003		2004		2005		2006	
	Average	n	Average	n	Average	n	Average	n	Average	n	Average	n	Average	n
VIb	31023	178	30340	140	31557	149	31325	97	31559	111	35949	137	32273	139

Table 7.5.3. Estimated total number of hooks (in thousands) the Norwegian long liner fleet used in Subarea VIb for the years 2000-2006 in the fishery for ling, tusk and blue ling. Data from 2007 was not available to the working group.

All	2000	2001	2002	2003	2004	2005	2006
VIb	11168	11833	14642	9773	6785	11216	7907

Table 7.5.4. Estimated mean CPUE ([kg/hook]x1000) based on log book data along with its standard error (*se*) and number of catches sampled for tusk in Sub areaVIb.

	2000			2001			2002			2003			2004			2005			2006		
Area	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se
VIb	89,9	137	2,8	50,6	132	2,0	55,2	149	1,7	44,9	94	2,1	62,7	111	2,4	72,5	136	2,7	41,2	138	3,4

Table 7.5.5. Estimated mean CPUE ([kg/hook]x1000) based on data from the reference fleet, along with its standard error (*se*) and number of catches sampled for tusk in Sub area VIb.

	2001			2002			2003			2004			2005			2006		
Area	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se
VIb				36,7	29	7,34	31,19	61	3,66							34,01	26	10,64

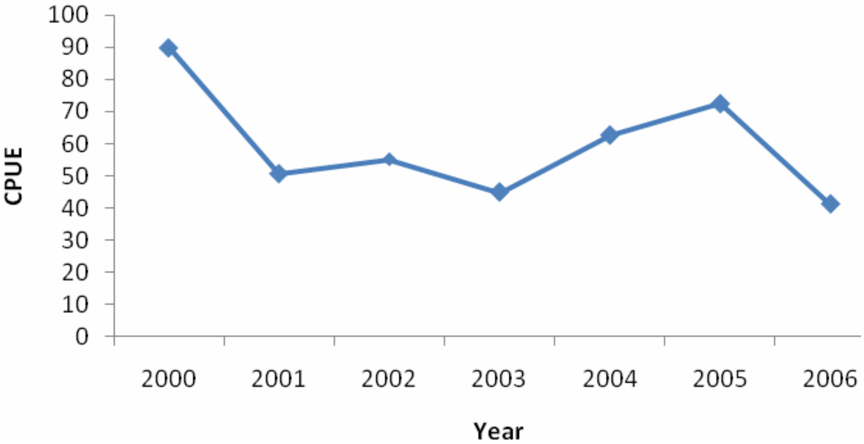


Figure 7.5.1. Estimated mean CPUE([kg/hook]x1000) based on data from the log books for tusk in ICES subarea VIb for the years 2000-2006. Data from 2007 was not available to the working group meeting.

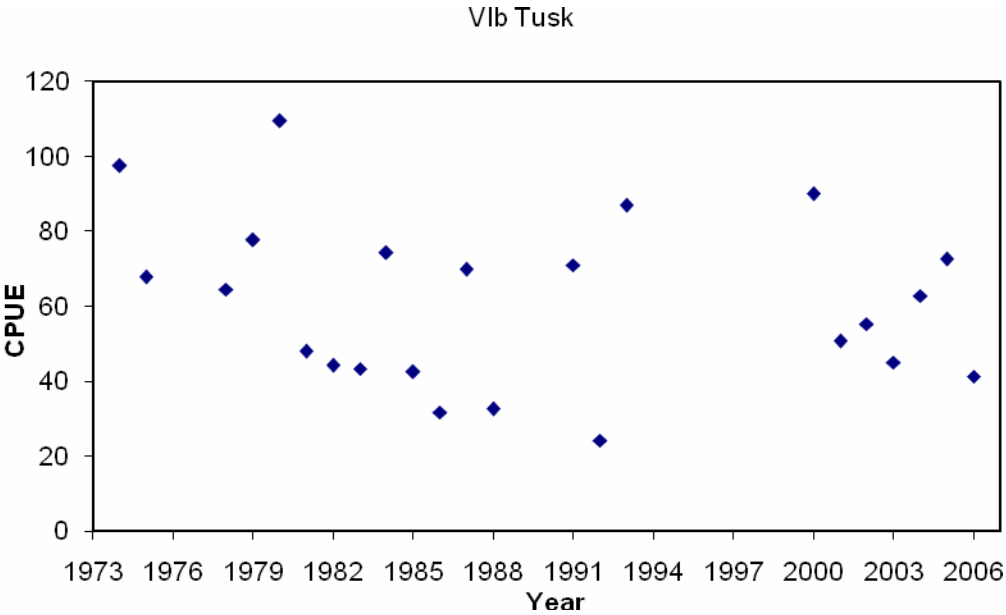


Figure 7.5.2. Estimates of CPUE (kg/1000 hooks) of tusk based on skipper's logbooks (pre-2000) and official logbooks (post 2000) in sub area VIb. Combination of data from Bergstad and Hareide (1996) and WD by Helle and Pennington (2007). Note gap in time series between 1993 and 2000, and the differences in CPUE scale between areas. Data from 2007 was not available to the working group meeting.

7.6 Tusk (*Brosme Brosme*) in other areas (IIIa, IVa, Vb, VIa, VII, VIII, IX and other areas of XII)

7.6.1 The fishery

Tusk is a by-catch species in trawl, gillnet and long line fisheries in these Subareas/Divisions. Norway has traditionally landed a dominant portion of the total, and around 90% of the Norwegian landings are taken by long liners.

7.6.1.1 Landings trends

Landing statistics by nation in the period 1988-2007 are given in Table 7.6.0.

For all Subareas/Divisions there was a declining trend in the catches. This is most pronounced in Division IVa where the catches has declined from about 4000 tonnes in the beginning of the 1990s to about 1500 tonnes/year during the last few years. However, in 2006 there was a slight increase of the catches in most ICES areas. In 2007 the landings were more or less as in 2006.

7.6.1.2 ICES advice

ICES advice in 2006 was; Landings of tusk have declined in recent years and the overall cpue on tusk has remained at a reduced level. There has been no response in the cpue series and a further reduction of 30% is advised. ICES recommends to limit catches to 5000 t and to monitor whether an increase in stock size is indicated.

7.6.1.3 Management

There is a licencing scheme and effort limitation in Vb. Norway, who also has a licensing scheme, could in 2006 and 2007 fish 4000 and 3400 tonnes respectively in EU waters.In 2008 the Norwegian quotas in the EC zone is 3350 tonnes. Norway also has bilaterally agreed quotas in Va and Vb (quota for 2008 1847 tonnes). The quota to EC in the Norwegian zone (area IV) is set to 170 tonnes.

The effort in the NEAFC regulatory area has been frozen for 2003 reduced by 30% in 2004 and by a further 5% in 2007. The minimum landing length for tusk in division Vb is 40 cm.

EU TACs for areas partially covered in this section are in 2008:

Subarea III: 28 tonnes

Subarea IV: 231 tonnes

Subarea V, VI, VII: 435 tonnes

7.6.2 Data available

7.6.2.1 Landings and discards

Landings were available for all relevant fleets. New discard data were not available.

7.6.2.2 Length compositions

Length compositions/mean lengths from 1988 to present based on data from the Norwegian longliners were presented in Bergstad and Hareide (1996) and Helle and Pennington (WD?, 2007). In this period, when the tusk has been fully or heavily exploited, the mean length has varied around 50cm without any clear trend.

Length distributions from Faroese longliners in Vb were presented for the period 1994-2006. No trend in the composition can be seen in this series (Figure 7.6.6).

Length compositions from Spanish experimental longlining in XIIb and VI was presented in a WD18 by Muñoz (2006).

7.6.2.3 Age compositions

No new age compositions were available.

7.6.2.4 Weight at age

No new data were presented.

7.6.2.5 Maturity and natural mortality

No new data were presented.

7.6.2.6 Catch, effort and research vessel data

Catch and effort data for Norwegian and Faroese longliners and Danish trawlers were presented. Abundance indices and length frequency data from the Faroese groundfish surveys were presented.

The extensive Norwegian longliner CPUE data based on private skipper's logbooks presented in the 1996 report were not updated after 1994. In the 1998 report (Table 6.5 of ICES C.M. 1998/ACFM:12), effort data were given for the period 1974-1996 based on official statistics.

In order to resume the CPUE-series Norway has adopted two approaches:

1) *Official logbooks from longliners.* Entering of data from official logbooks in an electronic database was begun in 2001 and data are now available for the period 2000-2006. Vessels were selected that had a total landed catch of ling, tusk and blue ling exceeding 8 tonnes in a given year. The logbooks contain records of the daily catch, date, position, and number of hooks used per day.

2) *Reference fleet information*. Since 2001 special agreements were made with selected vessels, "the reference fleet", providing data for the species composition of the catch (in weight), and number of hooks used per day (Helle and Pennington, WD 2004). There are currently four longline vessels contributing data.

An analyses based on these two sources of data was presented in Helle and Pennington (WD8, 2008).

CPUE from a Spanish experimental long line fishery in VIa, VIb and XIIb in 2005 was provided.Data for 2007 does not exist. CPUE for Danish trawlers fishing in IVa was available for the period 1992-2007.

Data from Faroese summer and autumn surveys were available for the period 1994 onwards. CPUE from the Faroese longliners (>100 GRT) for the period 1987-2007 was also available.

7.6.3 Data analyses

No analytical assessments were possible due to lack of age-structured data and/or tuning series.

Norwegian log book data were not available at the time to the working group and therefore no new effort data from 2007 was presented.

One source of information on abundance trends was the CPUE series from the Norwegian longliners presented by Helle and Pennington (WD8, 2008). The number of longliners has declined in recent years, from 72 to 35 in the period 2000-2006 but in 2007 the number of vessels increased to 38. However, the number of fishing days with tusk catch in Division VIa has increased in the same period (Table 7.6.1). The number of hooks set per day and the total set per year has remained rather stable in Subareas IVa, Vb and IV (Table 7.6.2 and 7.6.3).

Tables 7.6.4 and 7.6.5 gives estimates of CPUE based on the Norwegian official logbooks and the reference vessels, and the same results are shown in Figure 7.6.1. In Figure 7.6.2 the data for 2000-2006 are shown together with the data for the period 1971-1994 (considered earlier by WGDEEP and presented in Bergstad and Hareide, 1996). There is a gap in the time series between 1995 and 2000, and due to data limitations it was not possible to estimate CPUE for all years in the early period.

The CPUE varied strongly, but generally declined in the 1970s and 1980s, and the level appears to have remained comparatively low from the early 1990s into the 2000-2006 period. There is an apparent increase in CPUE for all areas in 2006.

CPUE of tusk for Danish trawlers in Subareas IVa based on logbook data show a declining trend in for the period 1992-2005 followed by a slight increase in 2006 and 2007. (Figure 7.6.3).

The Faroese groundfish survey series from Vb (Table 7.6.6, Figure 7.6.4) show a decreasing trend until 2000 and subsequently an increasing trend. For the longer series from commercial long liners, there is a general declining trend since 1986, perhaps with a levelling off in the last decade (Figure 7.6.5).

7.6.4 Comments on the assessment

The CPUE series of the main fleet landing tusk (Norwegian long liners) suggest that the abundance has remained at a reduced level after a probable decline in the 1970s to 1990s. This is strictly only valid for the Divisions for which there is sufficient data (IVa, Vb, VIa,). There was an increase in CPUE for these areas in 2006.

The Danish CPUE for VIa trawlers for the last two decades show a recent levelling off of the and this corresponds with the Norwegian long line data from the same period and area.

In Vb the groundfish survey series indicate a recent increase in abundance, but this is not reflected in the long line CPUE series for commercial vessels. Norwegian long liner data suggest that the CPUE is currently about 50kg/1000 hooks compared with around 125kg/1000 hooks in the 1970s.

The only CPUE series available for VIa are the Norwegian longliners, and these show a very variable pattern and the declining trend in the historic data is not as pronounced as in other areas . The new time series show a relatively stable trend for the years 2000 to 2005 with an increase in the CPUE for 2006 and especially 2007.

7.6.5 Management considerations

Although the number of hooks set per year has declined somewhat since 2000-2001, it is uncertain if current management has effectively reduced effort in the main fleets, i.e. Norwegian longliners and Faroese vessels compared with the level in 1998 (ref.

ICES advice from 2004). Management may thus not be in accordance with ICES advice from 2004. Albeit that positive signs of recovery are seen in some areas, the current perception of status and trends remains that stock(s) is at reduced levels and hence there is no basis to suggest amendment of the advice statement from 2004.

Recent CPUE in IVa may be around half that in the 1970s or somewhat higher

Table 7.6.0. Tusk IIIa, IV, Vb, VI, VII, VIII, IX. WG estimate of landings.

TUSK IIIa

Year	Denmark	Norway	Sweden	Total
1988	8	51	2	61
1989	18	71	4	93
1990	9	45	6	60
1991	14	43	27	84
1992	24	46	15	85
1993	19	48	12	79
1994	6	33	12	51
1995	4	33	5	42
1996	6	32	6	44
1997	3	25	3	31
1998	2	19		21
1999	4	25		29
2000	8	23	5	36
2001	10	41	6	57
2002	17	29	4	50
2003	15	32	4	51
2004	18	21	6	45
2005	9	30	5	44
2006	4	21	4	29
2007*	1	19	1	21

***Preliminary**

TUSK IVa

Year	Denmark	Faroes	France	Germany	Norway	Sweden(1)	E & W	N.I.	Scotland	Ireland	Total
1988	83	1	201	62	3,998	-	12	-	72		4,429
1989	86	1	148	53	6,050	+	18	+	62		6,418
1990	136	1	144	48	3,838	1	29	-	57		4,254
1991	142	12	212	47	4,008	1	26	-	89		4,537
1992	169	-	119	42	4,435	2	34	-	131		4,932
1993	102	4	82	29	4,768	+	9	-	147		5,141
1994	82	4	86	27	3,001	+	24	-	151		3,375
1995	81	6	68	24	2,988		10		171		3,348
1996	120	8	49	47	2,970		11		164		3,369
1997	189	0	47	19	1,763	+	16		238	-	2,272
1998	114	3	38	12	2,943		11		266	-	3,387
1999	165	7	44	10	1,983		12		213	1	2,435
2000	208	+	32	10	2,651	2	12		343	1	3,259
2001	258		30	8	2443	1	11		343	1	3095
2002	199		21		2438	1	8		294		2961
2003	217		19	6	1560		4		191		1997
2004	137	+	14	3	1370	+	2		140		1666
2005	123	17	11	4	1561	1	2		107		1826
2006	155	8	14	3	1854		5		120		2159
2007*	95	49	17	4	1973	1	6		84	3	2232

(1) Includes IVb 1988-1993 *Preliminary

Table 7.6.0 (continued).

TUSK IVb

Year	Denmark	France	Norway	Germany	E & W	Scotland	Ireland	Total
1988		n.a.		-	-			
1989		3		-	1			4
1990		5		-	-			5
1991		2		-	-			2
1992	10	1		-	1			12
1993	13	1		-	-			14
1994	4	1		-	2			7
1995	4	-	5	1	3	2		15
1996	4	-	21	4	3	1		33
1997	6	1	24	2	2	3		38
1998	4	0	55	1	3	3		66
1999	8	-	21	1	1	3		34
2000	8		106	+	-	2		116
2001	6		45(1)	1	1	3		56
2002	6		61	1	1	2		71
2003	2		5	1				8
2004	2		19	1		1		23
2005	2		4	1				7
2006	2		30					32
2007*	1		6				8	15

(1) Includes IVc. *Preliminary

TUSK

Year	Denmark	Faroes(4)	France	Germany	Norway	E & W	Scotland	Russia	Total
1988	+	2827	81	8	1143	-			4059
1989	-	1828	64	2	1828	-			3722
1990	-	3065	66	26	2045	-			5202
1991	-	3829	19	1	1321	-			5170
1992	-	2796	11	2	1590	-			4399
1993	-	1647	9	2	1202	2			2862
1994	-	2649	8	1 (2)	747	2			3407
1995		3059	16	1 (2)	270	1			3347
1996		1636	8	1	1083				2728
1997		1849	11	+	869		13		2742
1998		1272	20	-	753	1	27		2073
1999		1956	27	1	1522		11(3)		3517
2000		1150	12	1	1191	1	11(3)		2367
2001		1916	16	1	1572	1	20		3526
2002		1033	10		1642	1	36		2722
2003		1200	11		1504	1	17		2733
2004		1705	13		1798	1	19		3536
2005		1838	12		1398		24		3272
2006		2736	21		778		24	1	3559
2007*		2349	21		1108	2	19	37	3499

(1)Included in Vb_2 until 1996. (2)Includes Vb_2. (3)Reported as Vb.(4) 2000-2003 Vb1 ans Vb2 combined. *Preliminary

Table 7.6.0 (continued).

TUSK Vb2

Year	Faroe	Norway	E & W	Scotland (1)	Total
1988	545	1061	-	+	1606
1989	163	1237	-	+	1400
1990	128	851	-	+	979
1991	375	721	-	+	1096
1992	541	450	-	1	992
1993	292	285	-	+	577
1994	445	462	+	2	909
1995	225	404	-2	2	631
1996	46	536			582
1997	157	420			577
1998	107	530			637
1999	132	315			447
2000		333			333
2001		469			469
2002		281			281
2003		559			559
2004		107			107
2005		360			360
2006		317			317
2007*		344			344

(1)Includes Vb1. (2)See Vb1. (3)Included in Vb1. *Preliminary

Year	Denmark	Faroes	France	Germany	Ireland	Norway	E & W	N.I.	Scot.	Spain	Total
1988	-	-	766	1	-	1310	30	-	13		2120
1989	+	6	694	3	2	1583	3	-	6		2297
1990	-	9	723	+	-	1506	7	+	11		2256
1991	-	5	514	+	-	998	9	+	17		1543
1992	-	-	532	+	-	1124	5	-	21		1682
1993	-	-	400	4	3	783	2	+	31		1223
1994	+		345	6	1	865	5	-	40		1262
1995		0	332	+	33	990	1		79		1435
1996		0	368	1	5	890	1		126		1391
1997		0	359	+	3	750	1		137	11	1261
1998			395	+		715	-		163	8	1281
1999			193	+	3	113	1		182	47	539
2000			267	+	20	1327	8		231	158	2011
2001			211	+	31	1201	8		279	37	1767
2002			137		8	636	5		274	64	1124
2003			112		4	905	3		104	13	1141
2004		1	140		22	470			93	17	743
2005		10	204		7	702			96	16	1035
2006		5	239		10	674	16		115	15	1074
2007*		39	261			703	9		80		1092

Not allocated by divisions before 1993. *Preliminary

Table 7.6.0 (continued).

TUSK VIIa

Year	France	E & W	Scotland	Total
1988	n.a.	-	+	+
1989	2	-	+	2
1990	4	+	+	4
1991	1	-	1	2
1992	1	+	2	3
1993	-	+	+	+
1994	-	-	+	+
1995	-	-	1	1
1996	-	-		
1997	-	-	1	1
1998	-	-	1	1
1999	-	-	+	+
2000		-	+	+
2001		-	1	1
2002	n/a	-	-	-
2003		-	-	-
2004				
2005				
2006				
2007*				

***Preliminary**

TUSK VIIb,c

Year	France	Ireland	Norway	E & W	N.I.	Scotland	Total
1988	n.a.	-	12	5	-	+	17
1989	17	-	91	-	-	-	108
1990	11	3	138	1	-	2	155
1991	11	7	30	2	1	1	52
1992	6	8	167	33	1	3	218
1993	6	15	70	17	+	12	120
1994	5	9	63	9	-	8	94
1995	3	20	18	6		1	48
1996	4	11	38	4		1	58
1997	4	8	61	1		1	75
1998	3		28	-		2	33
1999	-	16	130	-		1	147
2000	3	58	88	12		3	164
2001	4	54	177	4		25	263
2002	1	31	30	1		3	66
2003	1	19		1			21
2004	1	19					20
2005	4	18				1	23
2006	4	23	63			0	90
2007*	2	4	7				13

***Preliminary**

Table 7.6.0 (continued).

TUSK VIIg-k

Year	France	Germany	Ireland	Norway	E & W	Scotland	Spain	Total
1988	n.a.		-	-	5	-		5
1989	3		-	82	1	-		86
1990	6		-	27	0	+		33
1991	4		-	-	8	2		14
1992	9		-	-	38	-		47
1993	5		17	-	7	3		32
1994	4		12	-	12	3		31
1995	3		8	-	18	8		37
1996	3		20	-	3	3		29
1997	4	4	11	-		+	0	19
1998	2	3	4	-		1	0	10
1999	2	1	-	-		+	6	8
2000	2		5	-	-	+	6	13
2001	3		-	9	-	+	2	14
2002	1				1		3	5
2003	1		1				1	3
2004	1						0	1
2005	1						1	2
2006	1		1				2	3
2007*	1							1

***Preliminary**

TUSK VIIIa

Year	E & W	France	Total
1988	1	n.a.	1
1989	-	-	-
1990	-	-	-
1991	-	-	-
1992	-	-	-
1993	-	-	-
1994	-	-	-
1995	-	-	-
1996	-	-	-
1997	+	+	+
1998	-	1	1
1999	-	-	0
2000	-		-
2001	-		-
2002	-	+	+
2003	-	-	-
2004		1	
2005			
2006			
2007*			

***Preliminary**

Table 7.6.0 (continued).

Tusk, total landings by Sub-areas or Division.

Year	III	IVa	IVb	Vb1	Vb2	VIa	VIIa	VIIb,c	VIIg-k	VIIIa	All areas
1988	61	4429	0	4059	1606	2120		17	5	1	12298
1989	93	6418	4	3722	1400	2297	2	108	86		14130
1990	60	4254	5	5202	979	2256	4	155	33		12948
1991	84	4537	2	5170	1096	1543	2	52	14		12500
1992	85	4932	12	4399	992	1682	3	218	47		12370
1993	79	5141	14	2862	577	1223		120	32		10048
1994	51	3375	7	3407	909	1262		94	31		9136
1995	42	3348	15	3347	631	1435	1	48	37		8904
1996	44	3369	33	2728	582	1391		58	29		8234
1997	31	2272	38	2742	577	1261	1	75	19		7016
1998	21	3387	66	2073	637	1281	1	33	10	1	7510
1999	29	2435	34	3517	447	539		147	8	0	7156
2000	36	3259	116	2367	333	2011		164	13		8299
2001	57	3095	56	3526	469	1767	1	263	14		9248
2002	50	2961	71	2722	281	1124		66	5		7280
2003	51	1997	8	2733	559	1141		21	3		6513
2004	45	1666	23	3536	107	743		20	1		6141
2005	44	1826	7	3272	360	1035		23	2		6569
2006	29	2159	32	3559	317	1074		90	3		7263
2007*	21	2232	15	3499	344	1092		13	1		7217

***Preliminary**

Table 7.6.1. Estimated number of days that the Norwegian long liner fleet (selected using criteria described in the text, Ch 6) operated in Subareas III to IX (not Va,VIb) in the period 2000-2006.

Tusk	2000	2001	2002	2003	2004	2005	2006	
IVa	18	21	21	16	22	21	39	
IVb	1			2				
Vb	11	16	16	17	35	23	14	
VIa	12	12	6	10	15	23	19	
VIIc	2	1			1	0		
All areas	44	50	43	45	73		67	72

Table 7.6.2. Estimated number of hooks that the Norwegian long liners set per day in Subarea III-IX (not Va and VIb) for the period 2000-2006. n= the total number of days with hook information contained in the logbooks.

All	2000		2001		2002		2003		2004		2005		2006		
	Average	n	Average	n	Average	n	Average	n	Average	n	Average	n	Average	n	
IIIa	30250	4					33037	27							
IVa	29395	664	30553	727	32291	667	33484	510	30934	439	34039	331	34561	673	
IVb	30263	38	33500	10	33867	15	32559	34							
Vb	24409	381	26760	613	25939	475	29513	515	31804	693	29885	374	27943	159	
VIa	22808	433	24419	447	21484	186	29421	302	25636	308	24807	369	22504	248	
VIIc	29383	81	33108	37					25250	28	33429	7			
All areas	166508	1601	148340	1800	113581	1343	158014	1388	113624	1468	122160	1081		85008	1080

Table 7.6.3. Estimated total number of hooks (in thousands) the Norwegian long liner fleet used in Subareas III-IX (not Va and VIb) for the years 2000-2006 in the fishery for ling, tusk and blue ling.

All	2000	2001	2002	2003	2004	2005	2006
IIIa	653			1718			
IVa	42329	43691	54313	36565	29264	33188	45966
IVb	2179			1693			
Vb	19332	31309	30089	38367	46497	24476	10758
VIa	21348	22221	14953	18359	15433	24187	10239
VIIc	4231	2152			1086	521	
All areas	68724	99373	99355	96702	92280	82372	66963

Table 7.6.4. Estimated mean CPUE ([kg/hook]x1000) based on log book data along with its standard error (*se*) and number of catches sampled for tusk.

	2000			2001			2002			2003			2004			2005			2006		
Area	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se
IVa	32,6	596	1,4	32,6	721	0,8	25,0	649	0,9	29,8	496	0,9	49,3	437	1,2	36,4	329	1,8	44,6	664	1,6
IVb	18,1	17	8	16,5	2	12,4				7,2	13	5,6									
Vb	53,1	375	1,7	50,2	608	1,0	50,1	473	1,0	53,7	514	0,9	59,3	693	0,9	66,5	374	1,7	98,9	159	3,2
VIa	47,6	420	1,6	40,7	444	1,1	45,9	186	1,6	36,1	300	1,2	50,26	307	1,4	59,1	368	2,7	106,3	247	2,6
VIIc	62,7	60	4,3	4,8	25	4,6							7,05	23	5,2	15,9	7	12,0			

Table 7.6.5. Estimated mean CPUE ([kg/hook]x1000) based on data from the reference fleet, along with its standard error (*se*) and number of catches sampled for tusk.

	2001			2002			2003			2004			2005			2006		
Area	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se	CPUE	n	se
IVa							73,73	40	4,52	13,7	83	3,61	21,76	99	3,9	37,53	90	5,72
Vb							60,08	12	8,25	71,63	71	3,9	57,26	84	4,24	80,84	54	7,38
VIa							13,07	45	4,26									

Table 7.6.6. Tusk in Vb (Faroes). Abundance index from spring and summer survey.

	Spring survey			Summer survey		
	Catch (kg)	Effort (h)	CPUE (kg/h)	Catch (kg)	Effort (h)	CPUE (kg/h)
1994	429	91	4.71			
1995	300	91	3.29			
1996	142	100	1.42	467	200	2.33
1997	331	98	3.38	311	200	1.56
1998	261	99	2.63	463	201	2.31
1999	143	100	1.43	157	199	0.79
2000	104	100	1.04	163	200	0.81
2001	198	100	1.98	331	200	1.66
2002	245	100	2.45	167	199	0.84
2003	302	100	3.02	123	200	0.62
2004	201	100	2.01	708	200	3.54
2005	210	100	2.10	968	200	4.84
2006	386	100	3.86	427	200	2.14
2007	391	100	3.91	391	199	1,96

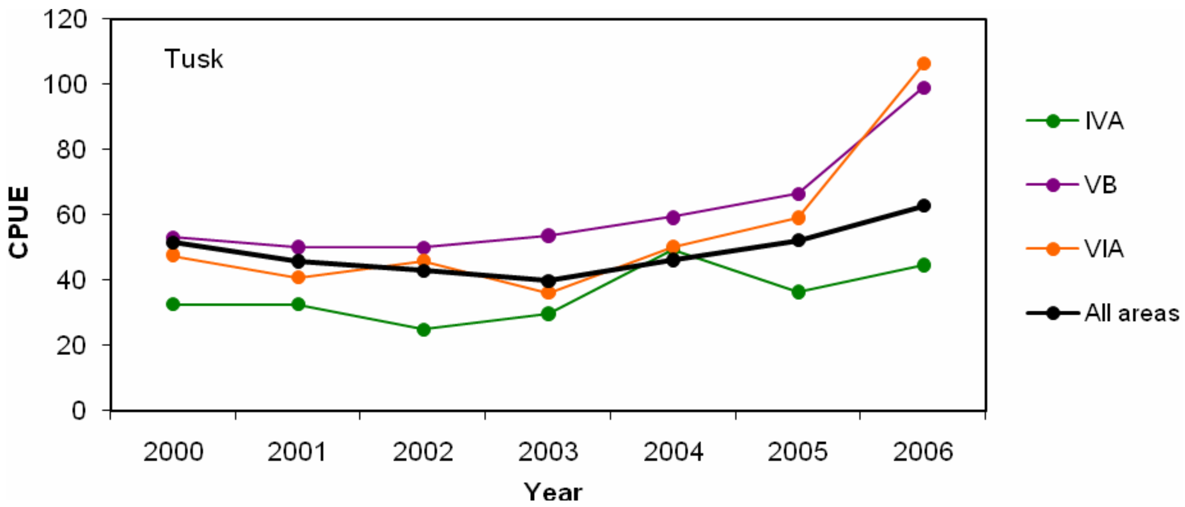


Figure 7.6.1. Estimated mean CPUE([kg/hook]x1000) based on data from the Norwegian log books for tusk in each ICES subarea III to IX (except Va, VIb) and all areas combined for the years 2000-2006. Data from 2007 was not available to the working group.

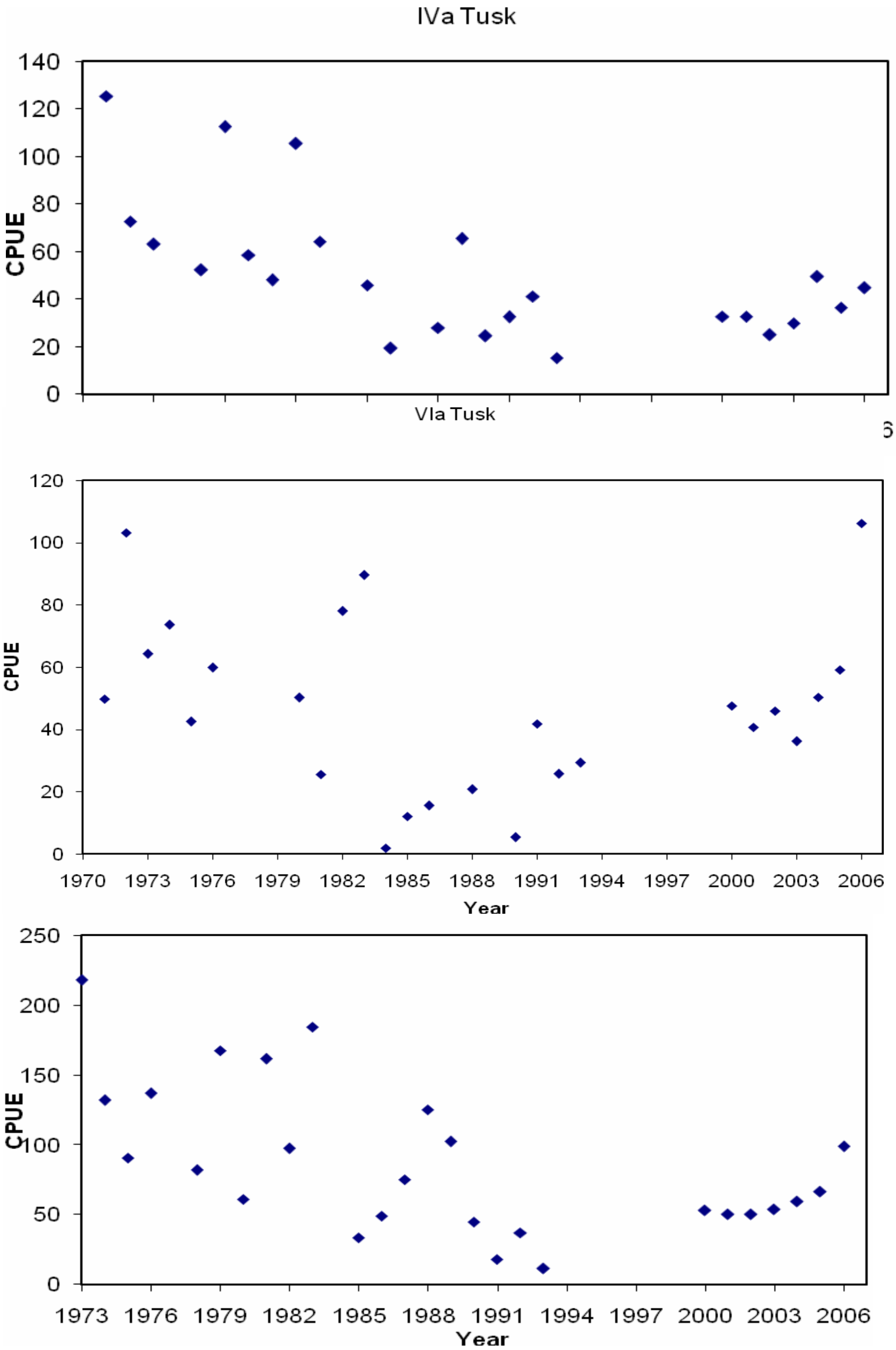


Figure 7.6.2. Estimates of CPUE (kg/1000 hooks) of tusk in Sub areas III to IX (except Va and VIb) based on skipper's logbooks (pre-2000) and official logbooks (post 2000). Combination of data from Bergstad and Hareide (1996) and Helle and Pennington (WD8, 2008). Note gap in time series between 1993 and 2000, and the differences in CPUE scale between areas. Data from 2007 was not available to the working group.

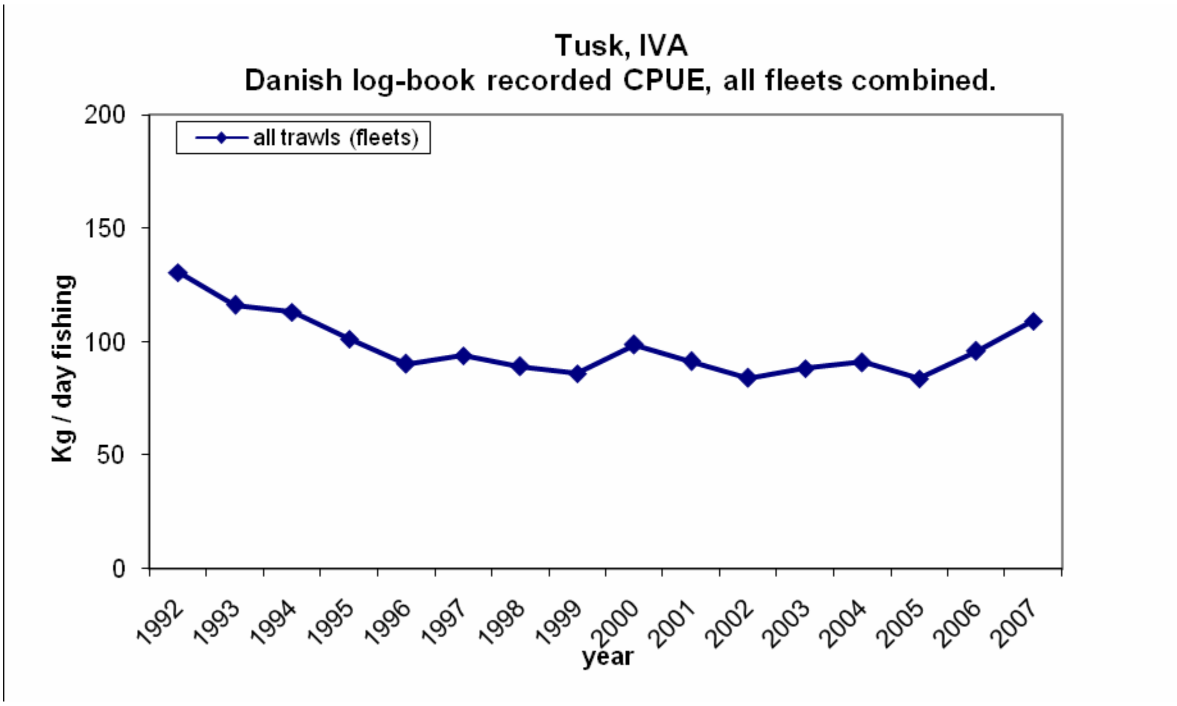


Figure 7.6.3. Tusk in IVa. CPUE of tusk for Danish. Based on logbook data.

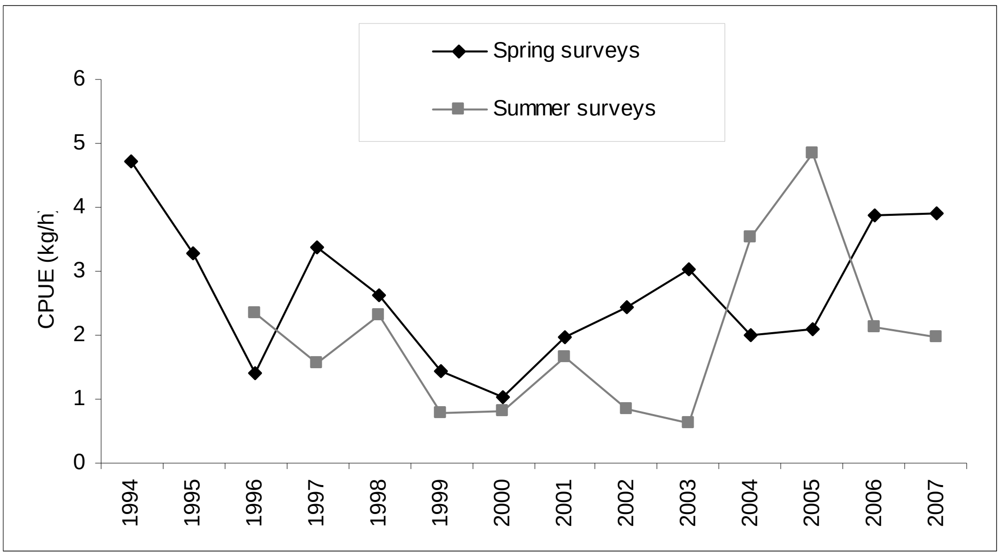


Figure 7.6.4. Tusk in Vb (Faroes). CPUE in spring and autumn bottom trawl survey.

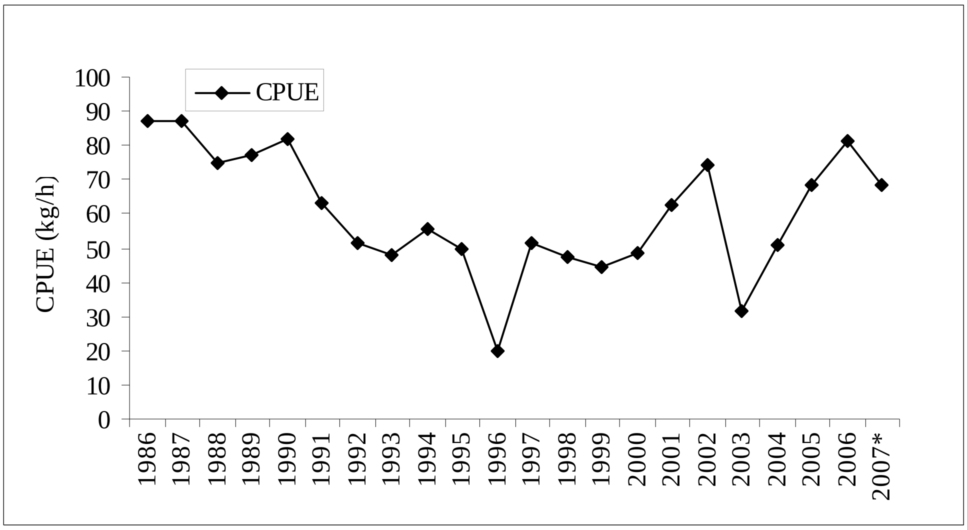


Figure 7.6.5. Tusk in Vb (Faroes). CPUE (kg/1000hooks) from long liners > 100 GRT.

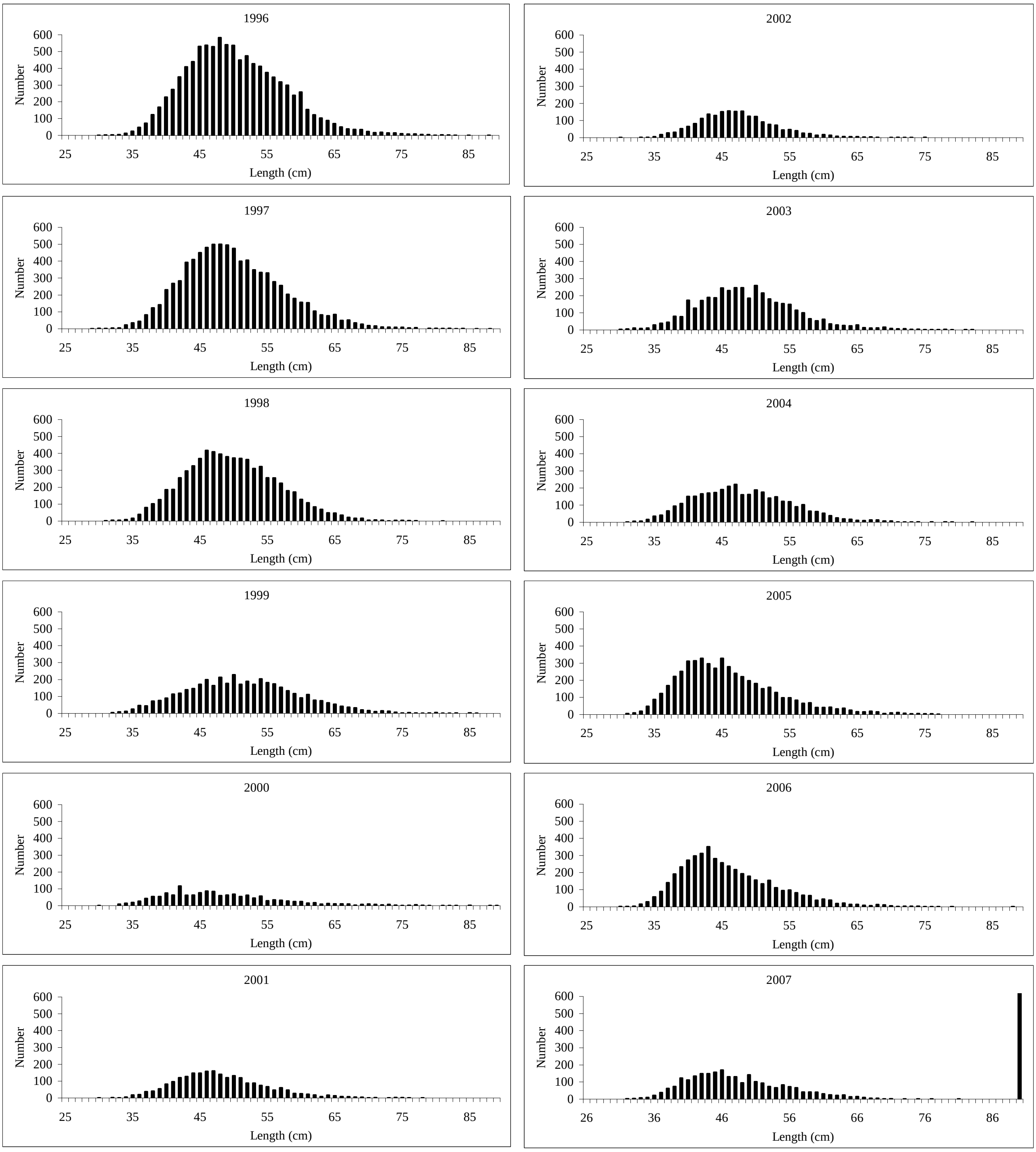


Figure 7.6.6. Tusk in Vb (Faroes). Length distribution from the Faroes groundfish survey

8 Greater Silver Smelt

8.1 Stock description and management units.

8.1.1 Current ICES structure

The current ICES structure for greater silver smelt is that ICES Subareas I, II, IV, VI, VII, VIII, IX, X, XII and XIV and Divisions IIIa and Vb, are treated as one stock. Only the greater argentine around Iceland (Division Va) is treated as a local stock.

The limited and hypothetical information on possible stocks was reported in the 1998 Study Group report (CM 1998/ACFM:12), quote: "*Icelandic life history studies suggest that a separate stock might exist in Subarea Va. Irish investigations on stock discrimination in areas VI and VII are inconclusive. A study by Ronan et al. (1993), using morphometrics (box truss analysis) and meristic measurements, suggests that populations from the north of Subarea VI and the south of Subarea VII form either end of a shape cline with fish in intermediary populations exhibiting a mixture of northern and southern morphologies. Norwegian investigations in 1984–1987 in Divisions IIa, IIIa and IVa appear to show two separate populations in the winter but in the summer the species is widely distributed (Bergstad, 1993)*". No new information was presented to the Working Group.

Available information is not sufficient to suggest changes to current ICES interpretation of stock structure. In order to evaluate the stock structure further, sampling for genetic studies from the whole distribution area of greater silver smelt is needed. It is therefore recommended that such work should be initiated as soon as possible.

Catches data for ling in 2006 and 2007 aggregated at the level of statistical rectangle were provided to the working group by France, Ireland, the UK (England and Wales and Scotland) and Iceland. These are shown in Figures 8.1.1 and 8.2.2.

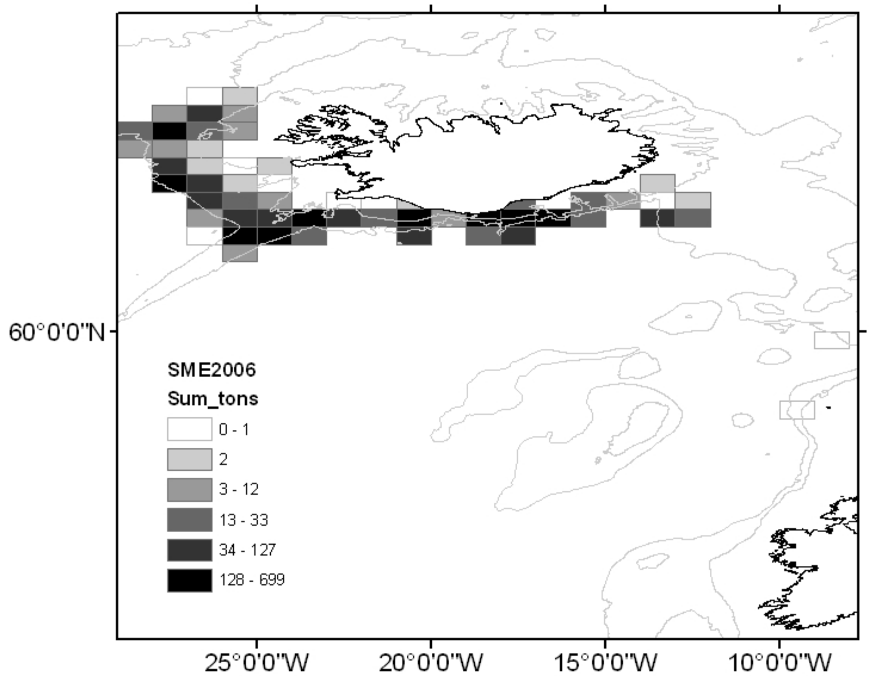


Figure 8.1.1. Catches of greater silver smelt by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2006.

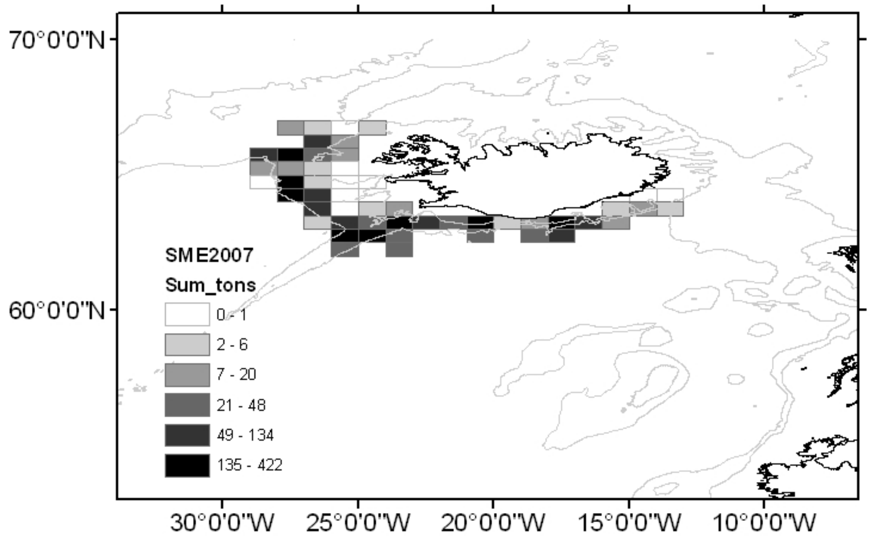


Figure 8.1.2. Catches of Greater silver smelt by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2007.

8.2 Greater Silver Smelt (*Argentina Silus*) in Division Va

8.2.1 The fishery

Greater silver smelt have been caught in bottom trawls for years as by-catch in the redfish fishery. Only small amounts were reported prior to 1996 as most of the fish was discarded. Since 1997, direct fishery for greater silver smelt has been ongoing and the landings increased significantly. The greater silver smelt is taken both in directed fishery with a small mesh size belly and codends (80 mm), but also as bycatch in the redfish fishery.

Total of 43 vessels landed the species in 2006 and the range of the landed catch by vessel were from only few kilos to 1143 tonnes. Greater silvers smelt is mostly fished along the south and southwest coast of Iceland, at depths between 500 and 800 m. The fishing grounds in 2000, 2003 and 2006, as recorded in logbooks, are shown in Figure 8.2.1.

8.2.1.1 Landings trends

Landings are shown in Table 8.2.0. Since directed fishery started in 1996, the landings increased from 800 tonnes in 1996 to 13000 tonnes in 1998. In 1999 and 2000, the landings were close to 6000 tonnes, but decreased to only 3000 tonnes in 2001. The landings in 2002 increased again to almost 5000 tonnes where the dominant gear was bottom trawl and further down to 2700 tonnes in 2003. Total landings in 2006 were about 4800 t which was similar as in 2005. The variations in the catches are largely due to market situations.

8.2.1.2 ICES advice

Current ICES advice: *Greater silver smelt can only sustain low rates of exploitation. Fisheries on such species should be permitted only when they are accompanied by programmes to collect data on both target and bycatch fish.*

8.2.1.3 Management

The Icelandic Ministry of Fisheries is responsible for management of the Icelandic fisheries and implementation of the legislation. The management on Greater silver smelt fisheries has been in the form of research licences that the Ministry of Fisheries has issued. The licences are issued for short time only.

8.2.2 Data available

8.2.2.1 Landings and discards

Landings by Icelandic vessels are given by the Icelandic Directorate of Fisheries. Discard is banned in the Icelandic demersal fishery and there are no information on possible discard of greater silver smelt. It is however likely that greater silver smelt has been discarded in the past, prior to 1996, but the quantity is unknown.

8.2.2.2 Length compositions

The length distributions from the catches are shown in Figure 8.2.2.

8.2.2.3 Age compositions

No data available. Otoliths have been collected randomly from the catch since 1980's, but no age readings have been done since 1998. The group encouraged efforts to work up the material in order to facilitate age-based ssessment for this stock.

8.2.2.4 Weight at age

No data available

8.2.2.5 Maturity and natural mortality

No data available

8.2.2.6 Catch, effort and research vessel data

Icelandic survey data

In the Icelandic groundfish survey which has been conduced annually in March since 1985 gives trends on fishable biomass of many exploited stocks on Icelandic fishing grounds. Total of more than 500 stations are taken annually in the survey at depths down to 500 meters. Therefore the survey area does not cover the most important distribution area of greater silver smelt. Survey length distributions of greater silver smelt are shown on Figure 8.2.3.

Catch per unit of effort and effort data from the commercial fleets

Figure 8.5.5 shows catch per unit of effort of greater silver smelt in the Icelandic trawl fishery since 1996. The CPUE is calculated using all data where catches of the species was more than 30, 50 and 70% of total registered catch in each haul. CPUE of greater silver smelt has been rather stable in the trawl fishery throughout the period.

8.2.3 Data analyses

The only sources of information on abundance trends were the CPUE series from the Icelandic trawler fleet. The CPUE indices does not show any clear trend since the fishery started in 1996. Further, as greater silver smelt is a benthopelagic species it is unknown if the indices reflects abundance.

The mean length in the catches has decreased by more than 5 cm since 1996. There could be a several explanations to this decrease:

- Direct fishery has only been for few years on the species. Therefore these changes could indicate an overfishing of large fish.
- The allowed mesh size in direct fishery has changed from being 120 mm in mesh size in the codend in the first years of the fishery to being 80 mm. It is not known the actual mesh size used by each vessel and therefore the effect of such changes could not be evaluated.
- The mean depth of the hauls where the species is has been caught has decreased since the fishery started from being 652 m on average in 1997-1998 to being 585 m on average in 2004-2005. It is well known that the size of greater silver smelt decreases as the depth becomes shallower and this might therefore affect the decrease of the size in the landings. The log-book data also confirm that higher proportion of greater silver smelt is now taken at shallower water than was in the beginning of the fishery (Table 8.2.1).

Overall, the observed changes in the length distribution could both be due to changes in the fishery and overexploitation.

8.2.4 Comments on the assessment

No analytical assessment that could be conducted and the available data does not allow any assessment on the stock status.

8.2.5 Management considerations

The status of the greater silver smelt stock is highly uncertain and the data presented could not be used to assess the stock status. The decrease in length in the commercial catches may have resulted from exploitation.

Greater silver smelt can only sustain low rates of exploitation. Fisheries on such species should be permitted only when they are accompanied by programmes to collect data on both target and bycatch fish.

Table 8.2.0. Greater silver smelt Va. WG estimates of landings

Year	Iceland	E & W	TOTAL
1988	206		206
1989	8		8
1990	112		112
1991	247		247
1992	657		657
1993	1255		1255
1994	613		613
1995	492		492
1996	808		808
1997	3367		3367
1998	13387		13387
1999	6681	23	6704
2000	5657		5657
2001	3043		3043
2002	4960		4960
2003	2686		2686
2004	3637		3637
2005	4481		4481
2006	4775		4775
2007*	4226		4226

Table 8.2.1. Greater silver smelt in division Va. Cumulative catches by depth intervals from 1998-2005. The data are extracted from log-books of the Icelandic trawler fleet. As an example, 46% of the catches in 1998 where taken at shallower water than 700m as 75% of the catches in 2005 were taken shallower than that.

	1998	1999	2000	2002	2003	2004	2005
100-200 m	0%	0%	0%	0%	1%	0%	1%
200-300m	1%	2%	3%	2%	4%	3%	3%
300-400m	1%	3%	7%	4%	5%	6%	6%
400-500m	6%	9%	9%	21%	12%	28%	12%
500-600m	15%	33%	21%	41%	34%	51%	29%
600-700m	46%	62%	49%	86%	78%	93%	75%
700-800m	75%	79%	70%	92%	87%	95%	86%
800-900m	98%	97%	97%	100%	100%	98%	99%
900-1000m	100%	99%	100%	100%	100%	98%	100%
> 1000m	100%	100%	100%	100%	100%	100%	100%

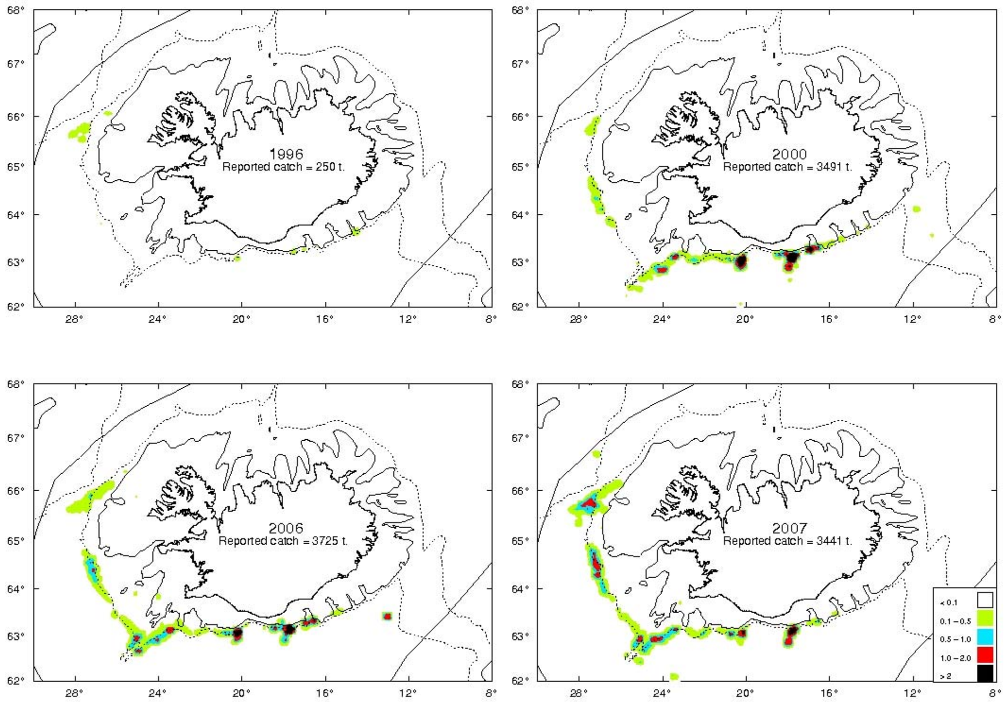


Figure 8.2.1. Greater silver smelt in Va. Geographical distribution (tonnes/square mile) of the Icelandic greater silver smelt fishery in 1996, 2000, 2006 and 2007 as reported in the logbooks. All gear types combined.

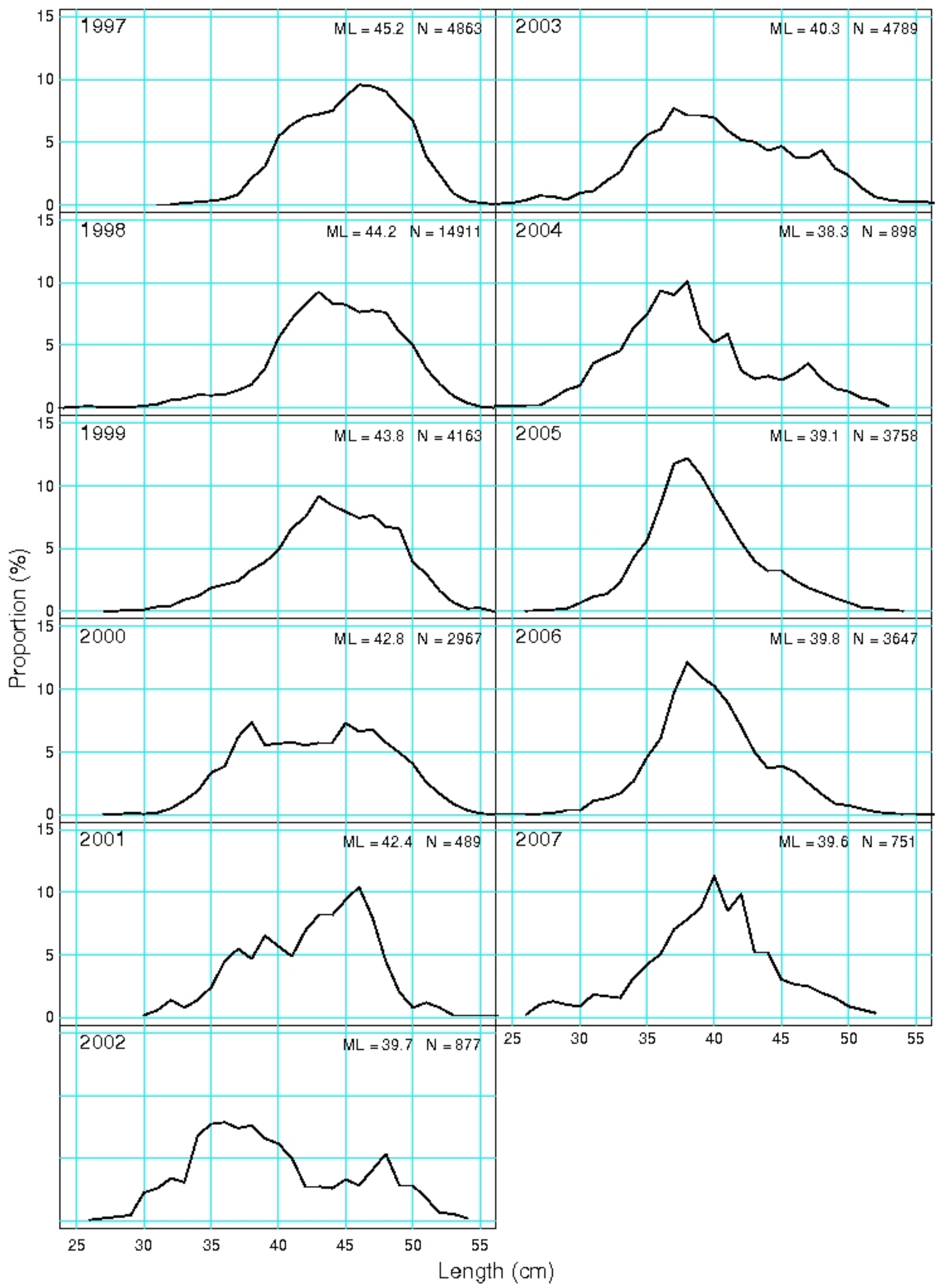


Figure 8.2.2. Length distribution of greater silver smelt in the Icelandic catches since 1996. The number of measured fishes and mean length is also given.

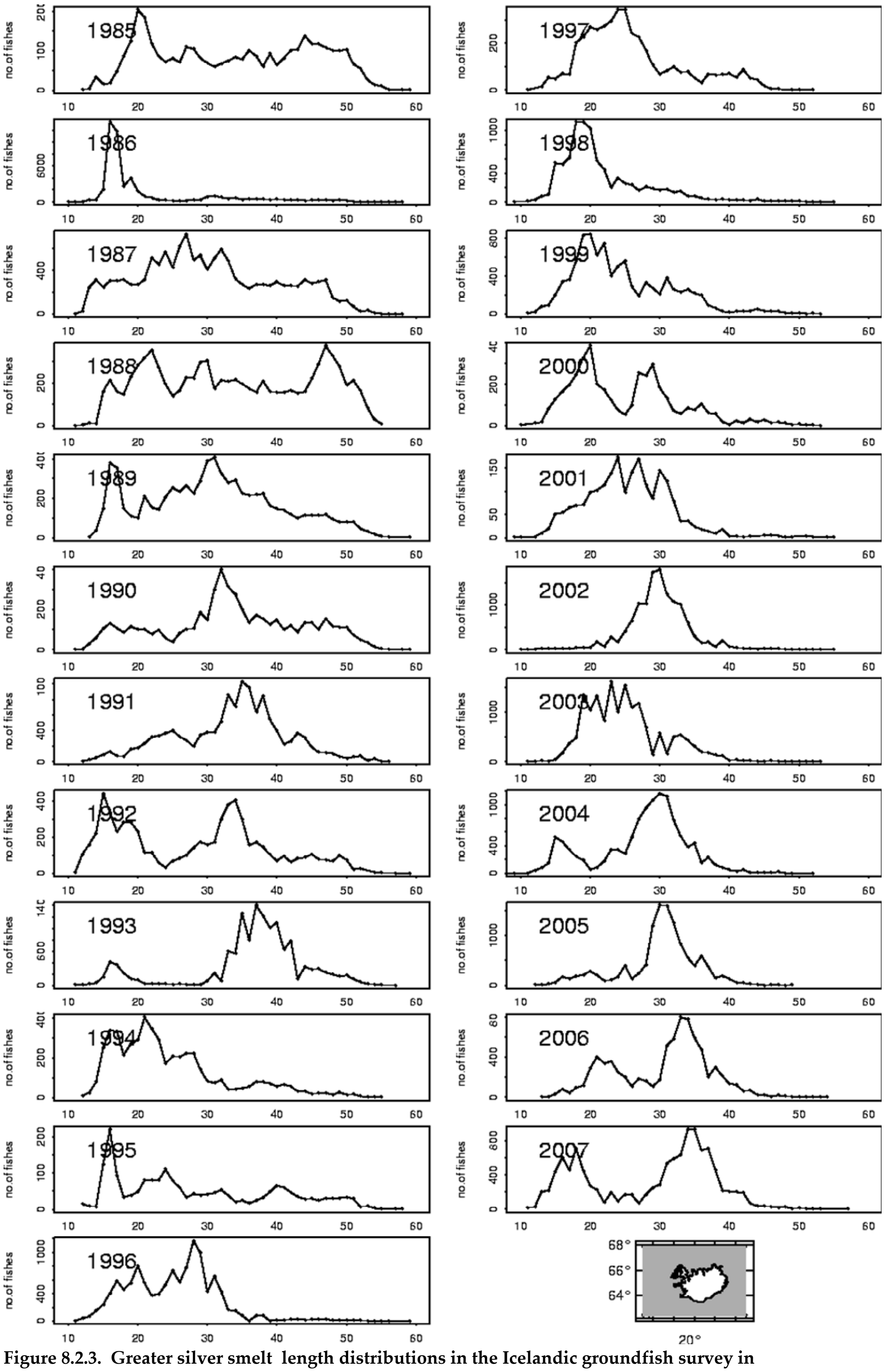


Figure 8.2.3. Greater silver smelt length distributions in the Icelandic groundfish survey in March 1985-2007.

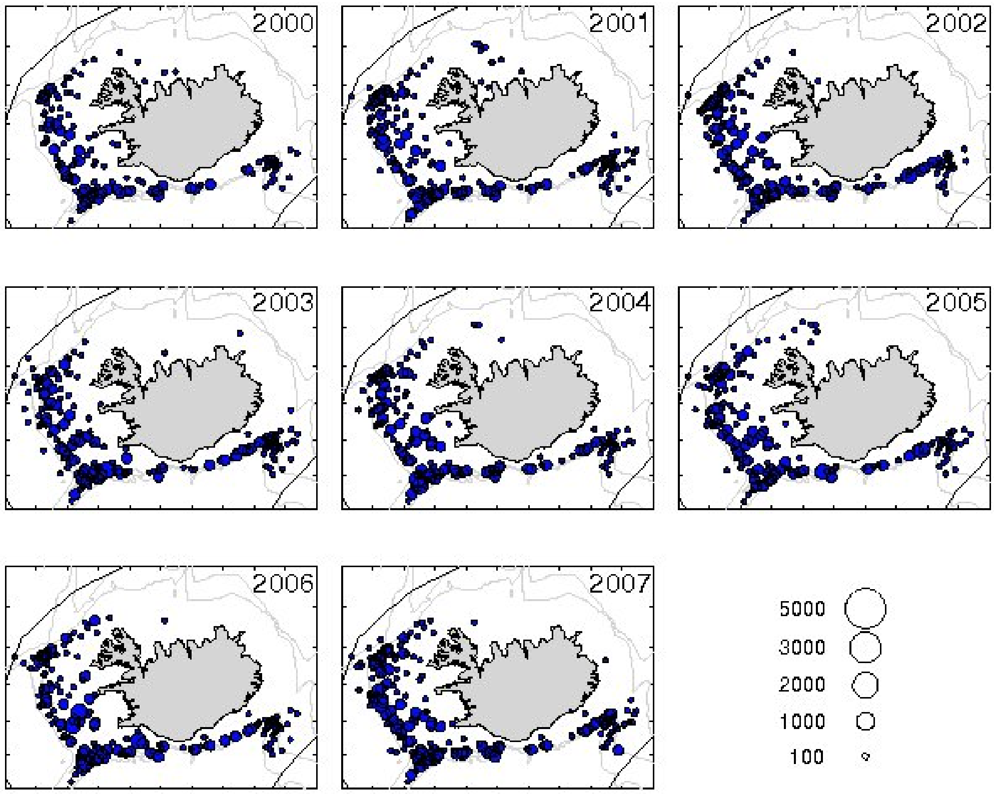


Figure 8.2.4. Distribution of Greater silver smelt in the groundfish survey in October 1996-2007. The sizes of the circles indicate number/station.

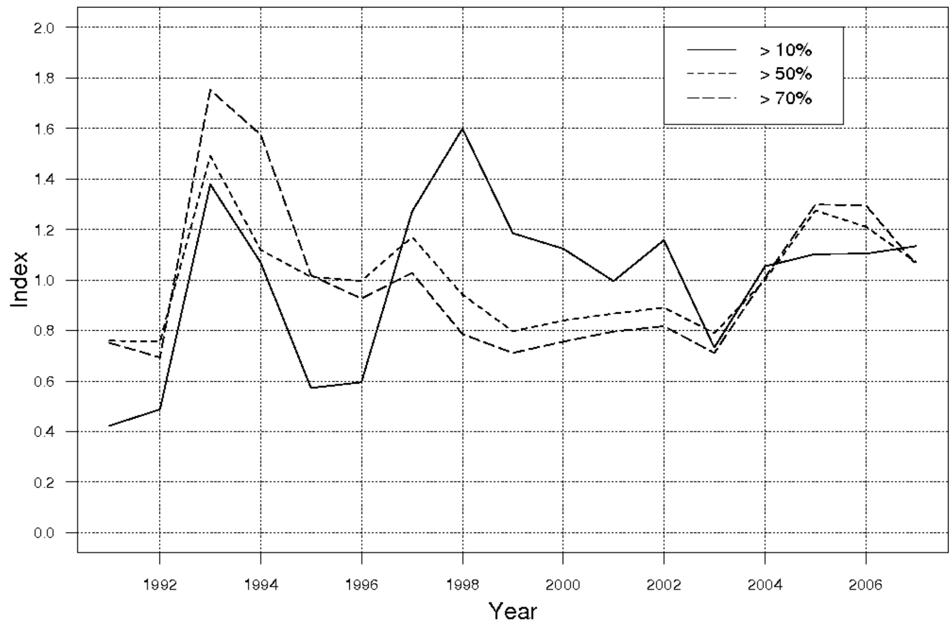


Figure 8.2.5 Index of raw CPUE (sum(yield)/sum(effort)) of Greater silver smelt from the Icelandic bottom trawl fishery 1991-2007. The criteria for the calculations were tows where Greater silver smelt composed at least 10%, 50% and 70% of the total catch.

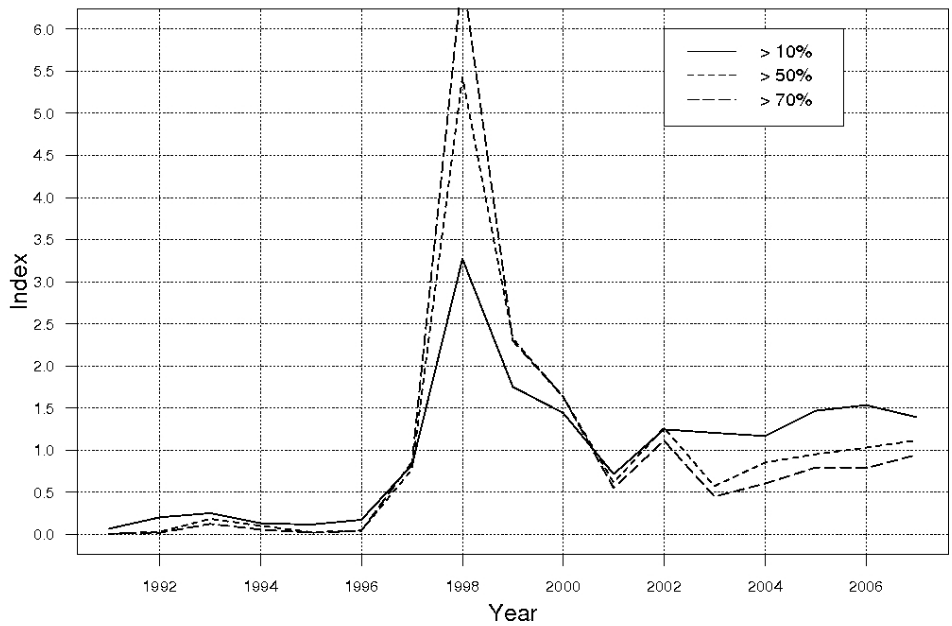


Figure 8.2.6. Index of fishing effort of greater silver smelt from the Icelandic bottom trawl fishery 1991-2007. The criteria for the calculations were tows where Greater silver smelt composed at least 10%, 50% and 70% of the total catch.

8.3 Greater Silver Smelt (*Argentina Silus*) in I, II, IIIa, IV, Vb, VI, VII, VIII, IX, X, XII, XIV

8.3.1 The fishery

The present targeted fisheries for greater silver smelt are conducted with pelagic trawl operated very close to the seabed and depend on localization of aggregations.

In Subarea I and II the fishery for greater silver smelt is primarily prosecuted by licensed Norwegian trawlers that have this species as target. In 2004 an apparently exceptional Dutch fishery occurred. In recent years this fishery has normally ceased in late April due to rapidly declining catch rates (Bergstad *et al*., 2008, WD 7). This is a notable change, as April-May were regarded the best months in Subarea II in the early 1980s.

In the Skagerrak IIIa, the greater silver smelt has periodically been targeted by Norwegian, Danish and Swedish bottom trawlers. During the last 10 years it is primarily a few Danish vessels that have conducted targeted fisheries for roundnose grenadier and greater silver smelt. However, there is also a by-catch in the Norwegian and Danish small-mesh bottom trawl fisheries along the Norwegian Deep (primarily in IVa) that land the catch for reduction. In area IV the Norwegian landings have increased from 11 tonnes in 2005 to over 3000 tonnes in 2006 and 2007.

In the Faroes (Division Vb) especially two pairs of pair-trawlers have had a direct fishery for greater silver smelt, from early summer to autumn, for several years. There is a minor bycatch of greater silver smelt in the pelagic fishery in area Vb.

8.3.1.1 Landings trends

Table 8.3.0 lists the landings data for greater silver smelt (or argentine) *Argentina silus* by ICES Subareas/Divisions *Argentina sphyraena* may in some cases have been included in the landing figures (particularly in Subareas III and IV).This is because juveniles of the dominant species *Argentina silus* and the much smaller and less abundant *Argeninta sphyraena* may be difficult to separate in catches. Confusion arises because fleets tend to report all small specimens as *A. sphyraena* and big specimens as A. *silus*, and/or use the different names interchangeably depending on regional variations in vernacular names. Bergstad et al. (2008, WD 7) reported that not a single specimen of *A. sphyraena* was caught in a survey on greater silver smelt in Subarea II, III and IV in 2007, and concluded, that the amount of lesser silver smelt would be insignificant in this area.

Landings by Norway from Subareas I and II declined in the 1990s from peak levels of 10 000 to 11 000 t in the 1980s. Landings have been stable at 6 – 8 000 tonnes, but do reach high levels some years (e.g. 14 357 tonnes in 2001). The last four years the landings have increased to around 15 000 tonnes, with the exception of 2006 when 21 700 tonnes were landed. It is thought that these fluctuations reflect variation in the market demands rather than changes in abundance of *A. silus*.

Landings in Subareas III and IV varied between 1 000 and almost 4 500 t. The Danish quota (part of EU TAC) for 2003 onwards was 1 388 t, and the annual landings are below this level. Due to the introduction of the sorting grid to the shrimp fishery the bycatch of fish is very low in the Danish, Norwegian and Swedish fishery for *Pandalus borealis*. The Norwegian bycatch in the industrial fishery for Norway pout and blue whiting, based on sampling at fishmeal factories, is very variable. The annual estimated quantities of both greater and lesser silver smelt in 2002-2005 and 2007 are 926, 376, 786, 1348 and 2172. The Norwegian landings in Subarea IV in the same period were less than 20 tonnes, but in 2006 and 2007 they were 3 500 and 3 100 respectively.

The landings of *A. silus* in Divisions Vb increased considerably from 1994-1998 as a direct fishery for the species started. Since 1998 when 18 000 tonnes were landed, the landings have been 7 000 tonnes on average. In 2006 and 2007 the landings have increased to 12 500 and 13 300 tonnes respectively. The variations in the catches are largely due to market demands. Greater silver smelt is also taken as by-catch in the blue whiting fishery and in the deep-water fishery for e.g. red fish and blue ling. These bycatches are not recorded in the landings.

There has been a considerable decline in the landings of *A. silus* from Subareas VI and VII from a peak in the late 1980s to the mid 1990s, with the exception of the years 2000 – 2002, when the landings were between 14 000 and 19 000 tonnes. The landings have been restricted by TACs in this area. A main fleet producing catches of greater silver smelt is Dutch freezer trawlers operating in Vb, VI and VII, west and north-west of the Hebrides, from depths ranging from 600-700 m, and west of Ireland (Porcupine Bank) where smelt is a minor by-catch in the fishery directed at blue whiting (*Micromesistius poutassou*). The Dutch fleet apparently also operated in IIa in 2004. In 2004 the landings significantly exceeded the TAC for the Netherlands for V and VI.

Irish landings were very high in the late 1980s when an exploratory fishery was developed by large pelagic trawlers. However by the early 1990s landings had declined to a few hundred tonnes and directed fishing had ceased by 1993. There was some directed fishing for the species in subsequent years. In 2000 larger Irish pelagic trawlers began to direct effort at this species on the shelf edge of Subarea VI a (N). Landings reached over 4700 t in 2000 and were estimated at around 7500 t in 2001 and 2002. Figures for 2003 showed a very low landing of only 95 t. Because of a restrictive quota there was no Irish directed fishery for greater silver smelt. The landings by Scottish vessels also increased in 2000-2002 and between 65 and 75 % of these landings were outside the UK. The Scottish landings also dropped abruptly to a very low level in 2003. In some of the years where landings are very high, there is possibly some misreporting but no documentation of quantities is available.

The Russian by-catch statistic of greater silver smelt in the commercial blue whiting fishery in Division Vb demonstrates considerable catch decline during recent years. Details on the Russian catch and observations were given in a WD by Vinnichenko (WD9, 2007).

8.3.1.2 ICES advice

ICES advised in 2006: *Due to its low productivity greater silver smelt can only sustain low rates of exploitation. Fisheries on such species should always be accompanied by programmes to collect data on both target and bycatch fish. The fishery should not be allowed to expand unless it can be shown that it is sustainable.*

8.3.1.3 Management

In IIa there is no TAC before 2007. In 2007 and 2008 a 12 000 t TAC was introduced as a precautionary measure to reduce an increased fishery. In addition there is a licensing system that regulates number of trawlers that can take part in the aimed fishery, equipment restriction and an area- and time restriction.

There is no species-specific management of greater silver smelt in Vb, only minimum landing size (28 cm) and a licensing system. At present licenses are issued to three pairs of pair trawlers. More information about management measures in Faroese waters in section 4.

The EU introduced TAC management in 2003, and for each year quotas were set for greater silver smelt. EU TACs as valid for community vessels fishing in community waters and waters not under the sovereignty or jurisdiction of third countries are in the table below.

	2003/2004	2005	2006	2007	2008
Subarea III, IV	1566	1331	1331	1331	1331
Subarea V,VI, VII	6247*	5310	5310	5310	5310

of which 4971 was allocated to the Netherlands

8.3.2 Data available

8.3.2.1 Landings and discards

Argentina silus can be a very significant discard of the trawl fisheries of the continental slope of Subareas VI and VII particularly at depths 300-700m (e.g. Girard and Biseau, WD 2004). No new information was provided.

8.3.2.2 Length compositions

Length distributions were presented from a Norwegian survey on greater silver smelt in Subarea II, III and IV (Figure 8.3.1) (Bergstad *et al.*, 2008, WD 7).

Length distributions were available for two Faroese surveys in Vb (1994 onwards) (Ofstad, 2006, WD 1). There was no obvious trend in either series. If these lengths are divided into 100 m depth strata, it is clear that the length distribution for greater silver smelt in Vb changes with depth (Table 8.3.1). The average length in Faroese commercial catches has decreased in the last 12 years (Figure 8.3.2).

Length frequency distributions from Russian trawl fisheries and research surveys from a number of areas for 2006 were also presented in WD9, Vinnichenko, 2007. In Faroese waters (area Vb), in April, the greater silver smelt were captured in small numbers in fishery for blue whiting conducted by pelagic trawl. Individuals of 30-40 cm in length occurred in catches (Figure 8.3.3), males mainly 32-36 cm long, females – 36-38 cm long.

Figure 8.3.4 presents the comparison between length frequency distributions from the 2001-2007 Spanish bottom trawl surveys on the Porcupine bank (Subarea VII) . There seem to be two main modes at about 22-23 and 26-27 cm through out the time series. The length distribution in 2007 is similar to the 2001 survey. In the 2005 length distribution there seems to be an additional mode at about 16 cm (Baldo et al., 2008, WD 13).

The bathymetric distribution of greater silver smelt on Porcupine bank is clearly size-related with larger individuals dominating in the deeper areas (Figure 8.3.5).

8.3.2.3 Age compositions

The age distribution of greater silver smelt in the landings in area Vb show a decrease in mean age in the last twelve years (Figure 8.3.6). This could reflect a natural reaction for a virgin stock to an introduced fishery, but a clearer analysis is needed to investigate this reduction for the sustainability of the fishery.

Age distribution from a Norwegian survey on greater silver smelt is presented in Figure 8.3.1. Compared to age-distributions in the same areas in the 1980s and early 1990s, the Subarea II showed a marked decline in 20+ specimens (7% in 2007 compared to up to 26% in the 1980s). The low sample size (26 specimens) in Subarea III in 2007 rendered the age compositions unsatisfactory, but nonetheless it is remarkable, that no fish older than 15 years were observed. Several observation in the 1980s documented, that 20+ fish dominated the catches in Subarea III, which supported a target fishery for greater silver smelt at that time. The 2007 age distribution from IVa resembled those observed in the early surveys (Bergstad *et al.*, 2008, WD 7).

8.3.2.4 Weight at age

No new data were presented.

8.3.2.5 Maturity and natural mortality

Data on greater silver smelt maturity and diet composition from areas area Vb in April are presented in WD9, Vinnichenko, 2007. Preliminary data on growth and first maturity for greater silver smelt in Division Vb are presented in Figures 8.3.7, 8.3.8 and Table 8.3.2. These data were sampled from the commercial fleet and a research vessel, and the length range was from 10 to 53 cm). The growth data showed that females grow faster than males. Estimated length at maturity indicated that females mature at a smaller length (33 cm) than males (36 cm). Age at first maturity for females was estimated at about 6 years and for males 8 years.

8.3.2.6 Catch, effort and research vessel data

Logbook catch and corresponding effort data for the Danish fleet in Division IIIa are available for the period 1992-2006, but a closer evaluation is necessary before accepting these CPUEs as indicators (see Table 8.3.3, Figure 8.3.9). The figure for 2003 is based on 2 fishing days only, and should be regarded as unreliable.

CPUE indices for greater silver smelt were presented from two Faroese surveys for cod, haddock and saithe in Vb (1994 onwards, Figure 8.3.10). The two series do not show any significant trend. The greater silver smelt is not a target species, however, and this may not be used as a measurement of stock changes. These are also bottom trawl surveys and it is uncertain if the indices reflect abundance for greater silver smelt which is a benthopelagic species. The distribution of greater silver smelt for the two surveys is shown in Figure 8.3.11.

Logbooks from three pairs of pair trawlers (>1000 HP) fishing greater silver smelt in Faroese waters (area Vb) are available (Homrum and Ofstad, 2008, WD 14). The longest of these series is from 1995 to 2003. In Figure 8.3.12 CPUE for these series is shown, where catches of greater silver smelt contribute with more than 50% of total catch in each haul. In the years in which the series overlap, there is a good correspondence between the series. The CPUE shows a relatively stable trend at 2 000 – 2 500 kg/h, but the level of the two current pairs seems to be higher than of the pair, that has left the silver smelt fishery.

Logbook data reveals that greater silver smelt is fished mostly in the area west of the Faroes and on the continental slope north and north-west of the Faroe Bank, at depths around 300-700 meters. To some extent, there is also being trawled on the Bill Bailey Bank and Lousy Bank and north of the Faroes.

Spanish research bottom trawl surveys have been carried out in Subarea VII (Porcupine) since 2001. Figure 8.3.13 shows the catch rate of greater silver smelt and Figure 8.3.14 the geographical distribution. Blue whiting is the most abundant species in the survey area.

In early summer 2007 a Norwegian survey on greater silver smelt and roundnose grenadier was conducted in ICES Subareas II, III and IV. The vessel track is shown in Figure 8.3.15. Hydroacoustic mapping was combined with trawl sampling. Allocation of the acoustic recordings had to rely on trawl sampling alone, seldom helped by recognition of typical aggregations of greater silver smelt as described from earlier surveys. The survey was conducted later than intended, i.e. in May-June when the aimed fishery for silver smelt had virtually closed. This is a likely explanation to the low densities of greater silver smelt found in all investigated waters. Conclusions could not be drawn with regards to distribution and abundance of greater silver smelt in the areas surveyed.

8.3.3 Data analyses

The CPUE series for the Danish fishery in Division IIIa shows no clear pattern. Obviously the results from the Norwegian survey of 2007 do not justify very reliable assessments of the state of the resources in Division IIIa. But they sharply contrast what has been observed in the area earlier. Bergstad (1993) reported bottom trawl catches of 100 kg/h or more over wide areas in all seasons. The state of the stock in the Skagerrak-North Sea is not known, and the exploitation rate is uncertain.

The Faroese survey CPUE series (Figure 8.3.10) from Division Vb showed conflicting results, and there were also concerns with regards to their reliability as indices of abundance of this benthopelagic species. There were no obvious trends in the length distribution data. If these lengths are divided into 100 m depth strata it is clear that the length distribution for greater silver smelt in Vb changes with depth. Both length- and age distributions in catches in area Vb have decreased since 1995. This could reflect a natural reaction for a virgin stock to an introduced fishery, but a clearer analysis is needed to investigate this reduction for the sustainability of the fishery. Greater silver smelt has seen an unsustainable fishing pressure at other fishing grounds, and it is very important at an early stage to set sustainable reference values for the fishery, in order to prevent the Faroese stock from being over-fished.

Argentina spp. biomass and abundance index from the Porcupine Survey (area VII) show a decreasing trend in recent years (Figure 8.3.13). It is likely that abundance indices do not reflect closely the level of abundance of this benthopelagic and aggregating species. But the decreasing trend shown is clear, and also the geographical distribution is rather consistent between areas and years, suggesting that relative abundances could be represented by the values of the survey. A similar decreasing trend has been found in the abundance index of blue whiting, which is the most abundant species in the survey area.

8.3.4 Comments on the assessment

Catch trends and CPUE in different areas are unlikely to reflect the level of abundance of this benthopelagic species, therefore it is difficult to evaluate the stock status with the available information.

8.3.5 Management considerations

In 2002 the WG expressed concern about the apparent increase in the directed fishery in several Subareas and especially the increased landings in Subarea VI. It was noted that the age range had been truncated which suggested high levels of exploitation. No new data could be used to determine if that trend had continued. Following years of very high landings, the reported landings dropped considerably in 2003, actually below the quota set for those areas. The Irish fleet discontinued target fisheries due to the restricted quota. Other fleets continued to pursue the fishery.

In 2003 quota management was introduced in EU waters. The total landing by EU vessels from Subareas V, VI and VII in 2004 was 6770 tonnes, somewhat exceeding the TAC of 6247t. In addition, a very exceptional 4600 tonnes was taken by EU-vessels in IIa where no TAC applied. The group was unable to determine if this was misreporting or landings produced by a fishery in the Norwegian EEZ not restricted by the EU TAC or Norwegian regulations. In 2005 there was only a very minor EU landing from IIa. From 2005 onwards the TAC in Subareas V, VI and VII is 5310 tonnes. The landings of EU-vessels have not exceeded the TAC.

A licensing scheme has been in place for several years in Norway and the Faroes. In IIa the current management has been in place for more than a decade and the fishery appears to be sustainable and essentially regulated by market demand.

Greater silver smelt can only sustain low rates of exploitation. Fisheries on such species should be permitted only when they are accompanied by programmes to collect data on both target and bycatch fish.

Table 8.3.0. Greater Silver Smelt I, II, IIIa, IV, Vb, VI, VII, VIII, IX, X, XII, XIV. WG estimates of landings in tonnes. *) landings in 2007 are preliminary.

Greater silver smelt (*Argentina silus*) I and II

Year	Germany	Netherlands	Norway	Poland	Russia/USSR	Scotland	France	Faroes	TOTAL
1988			11332	5	14				11351
1989			8367		23				8390
1990		5	9115						9120
1991			7741						7741
1992			8234						8234
1993			7913						7913
1994			6217			590			6807
1995	357		6418						6775
1996			6604						6604
1997			4463						4463
1998	40		8221						8261
1999			7145			18			7163
2000		3	6075		195	18	2		6293
2001			14357		7	5			14369
2002			7405			2			7407
2003		555	8345		7	2	4	4	8917
2004		4601	11557		4				16162
2005			17063		16			14	17093
2006			21681		4				21685
2007*			13272		1				13273

Greater silver smelt (*Argentina silus*) III and IV

Year	Denmark	Faroes	France	Germany	Netherlands	Norway	Scotland	Sweden	Ireland	TOTAL
1988	1062			1		1655				2718
1989	1322				335	2128	1			3786
1990	737			13		1571				2321
1991	1421		1		3	1123	6			2554
1992	4449			1	70	698	101			5319
1993	2347				298	568	56			3269
1994	1480					4	24			1508
1995	1061					1	20			1082
1996	2695	370				213	22			3300
1997	1332			1		704	19	542		2598
1998	2716			128	277	434		427		3982
1999	3772		82		7	5	452		2	4320
2000	1806		270			32	78	273	12	2471
2001	1653		28			3	227	1011	3	2925
2002	1161					1	161	484	4	1811
2003	1119				42	6	20		1	1188
2004	1036			4	42	17	12		46	1157
2005	733			1	28	11			18	791
2006	548					3468				4016
2007*	243					3100				3343

Table 8.3.0 (continued).

Greater silver smelt (*Argentina silus*) Vb

Year	Faroes	Russia/USSR	UK (Scot)	UK(EWN)	Ireland	France	Netherlands	Norway	TOTAL
1988	287								287
1989	111	116							227
1990	2885	3							2888
1991	59		1						60
1992	1439	4							1443
1993	1063								1063
1994	960								960
1995	5534	6752							12286
1996	9495		3						9498
1997	8433								8433
1998	17570								17570
1999	8186		15	23		5			8214
2000	3713	1185	247			64			5209
2001	9572	414	94		1				10081
2002	7058	264	144				5		7471
2003	6261	245	1				42		6549
2004	3441	702	42				2266		6451
2005	6939	59					11		7009
2006	12524	35							12559
2007*	13354	3						32	13357

Greater silver smelt (*Argentina silus*) VI and VII

Year	Faroes	France	Germany	Ireland	Netherl	Norway	E & W	Scotland	N.I.	Russia	Spain	TOTAL
1988				5454		4984						10438
1989	188			6103	3715	12184	198	3171				25559
1990	689		37	585	5871			112				7294
1991		7		453	4723			10	4			5197
1992		1		320	5118			467				5906
1993					1168			409				1577
1994			43	150	4137			1377				5707
1995	1597		357	6	4136			146				6242
1996			1394	295	3953			221				5863
1997			1496	1089	4695			20				7300
1998			463	405	4687							5555
1999		21	24	394	8025			387		5		8856
2000		17	482	4703	3636			4965		29	34	13866
2001		12	189	7494	3659			7620		76		19050
2002			150	7589	4020			4197		29		15985
2003			164	95	1933			89		163	7	2451
2004		147	652	46	3731			526		12	19	5133
2005	103	10	131	1	3465			75		4	19	3808
2006	53				1062							1115
2007*	220					3						223

Table 8.3.0 (continued).

Greater silver smelt (*Argentina silus*)
VIII

Year	Netherlands	TOTAL
2002	191	191
2003	37	37
2004	23	23
2005	202	202
2006		
2007*		

SPA WG data zero in all years 97-2001

Greater silver smelt (*Argentina silus*) XII

Year	Faroes	Iceland	Russia	Netherlands	TOTAL
1988					
1989					
1990					
1991					
1992					
1993	6				6
1994					
1995					
1996	1				1
1997					
1998					
1999					
2000		2			2
2001					
2002					
2003					
2004			4		4
2005				322	322
2006					
2007*					

Table 8.3.0 (continued).

Greater silver smelt (*Argentina silus*) XIV

Year	Norway	Iceland	TOTAL
1988			
1989			
1990	6		6
1991			
1992			
1993			
1994			
1995			
1996			
1997			
1998			
1999			
2000		217	217
2001	66		66
2002			
2003			
2004			
2005			
2007*			

Greater silver smelt (*Argentina silus*) (all areas)

Year	I + II	III + IV	Va	Vb	VI + VII	VIII	XII	XIV	Total
1988	11351	2718	206	287	10438				25000
1989	8390	3786	8	227	25559				37970
1990	9120	2321	112	2888	7294			6	21741
1991	7741	2554	247	60	5197				15799
1992	8234	5319	657	1443	5906				21559
1993	7913	3269	1255	1063	1577		6		15083
1994	6807	1508	613	960	5707				15595
1995	6775	1082	492	12286	6242				26877
1996	6604	3300	808	9498	5863		1		26074
1997	4463	2598	3367	8433	7300				26161
1998	8261	3982	13387	17570	5555				48755
1999	7163	4320	6704	8214	8856		2		35259
2000	6293	2471	5657	5209	13866			217	33713
2001	14369	2925	3043	10081	19050			66	49534
2002	7407	1811	4960	7471	15985	191			37825
2003	8917	1188	2683	6549	2451	37			21825
2004	16162	1157	3645	6451	5133	23	4		32575
2005	17093	791	4481	7009	3808	202	322		33706
2006	21685	4016	4775	12559	1115	0	0		44150
2007*	13273	3343	4226	13357	223	0	0		34422

Table 8.3.1. Length distribution divided on depth intervals for greater silver smelt in the Faroese spring- and summer surveys (area Vb).

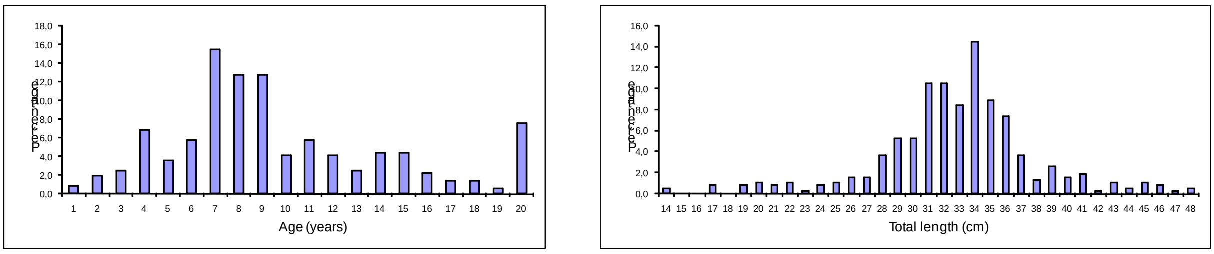
Depth (m)	<100	100-199	200-299	300-399	400-499	>500
Average length (cm)	20	25	30	30	38	40
Number	11	3330	4564	3087	2029	621

Table 8.3.2. Data on growth, length- and age at first maturity of greater argentine in area Vb.

	Growth				Length at first maturity		Age at first maturity	
	L_{inf}	K	t_0	N	L_{50}	N	A_{50}	N
Female	49.8	0.13	- 1.5	783	32.8	1280	5.7	450
Male	46.6	0.13	- 1.8	680	35.6	1135	7.8	310

Table 8.3.3. Danish CPUE for *Argentina silus* in Division IIIa for 1992 to 2006. Data from logbooks do not represent the entire landings.

Year	Mesh size in trawl									
	70 - 100 mm			30 - 45 mm			<25 mm			All trawls
	Kg	days	CPUE	Kg	days	CPUE	Kg	days	CPUE	CPUE
1992	592430	62	9555				77601	10	7760	9306
1993	885880	71	12477	720000	36	20000	77200	4	19300	15163
1994	978300	78	12542	212000	7	30286				14004
1995	647140	67	9659	423848	98	4325	10000	1	10000	6512
1996	1303420	84	15517							15517
1997	808360	69	11715				136000	4	34000	12936
1998	703180	56	12557							12557
1999	885900	65	13629	907900	66	13756	22000	1	22000	13756
2000	767300	89	8621	169000	9	18778	27600	4	6900	9450
2001	788520	103	7656							7656
2002	791000	92	8598							8598
2003	182000	30	6067	669000	80	8363				7736
2004	100000	11	9091	830000	108	7685				7815
2005				454200	67	6779				6779
2006				324000	51	6353				6353



Figur 8.3.1 a). Size and age distributions of greater silver smelt north of 62º N (ICES Div. IIa) based on a Norwegian survey conducted in 2007. Number of specimens measured and aged: 368. Age-group 20 is a plus-group.

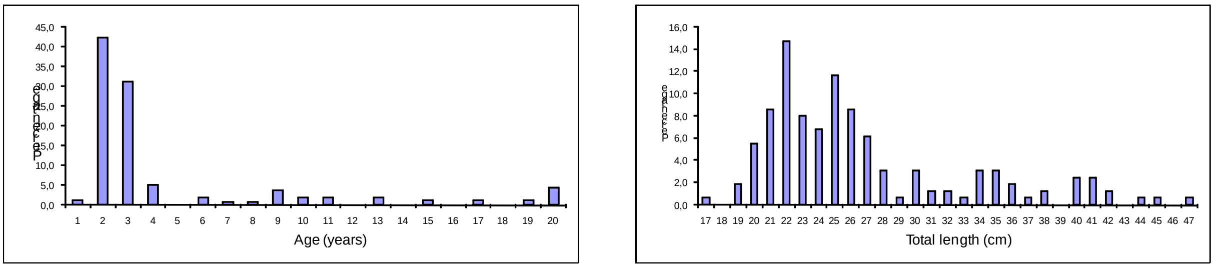


Figure 8.3.1 b). Size and age distributions of greater silver smelt in ICES Div. IVa based on a Norwegian survey conducted in 2007. Number of specimens measured and aged: 153. Age-group 20 is a plus-group

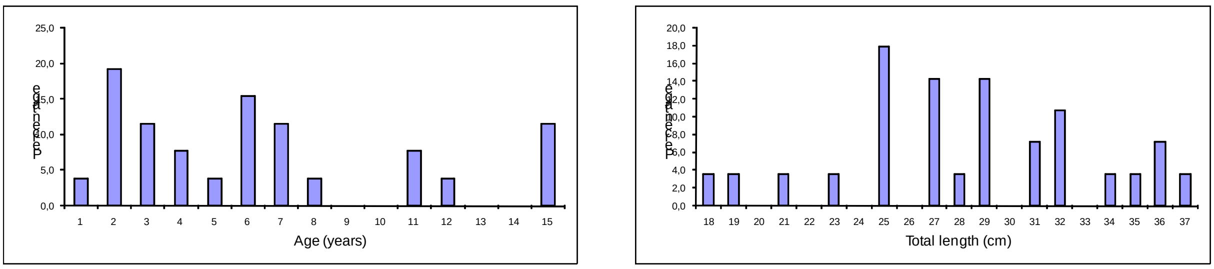


Figure 8.3.1 c). Size and age distributions of greater silver smelt in ICES Div. IIIa based on a Norwegian survey conducted in 2007. Number of specimens measured and aged: 26.

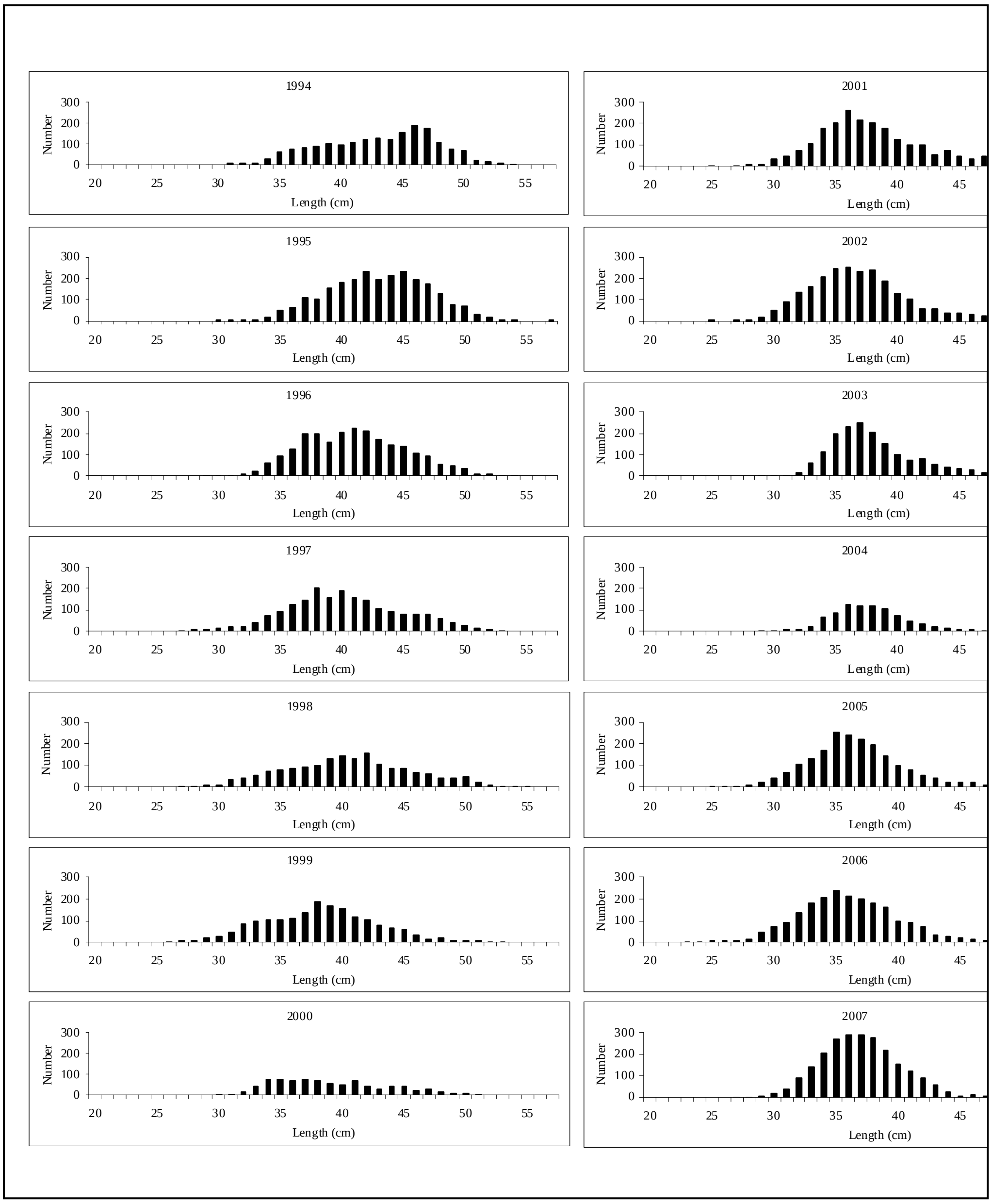


Figure 8.3.2 Length distribution of greater silver smelt in Faroese landings in the period from 1994 to 2007.

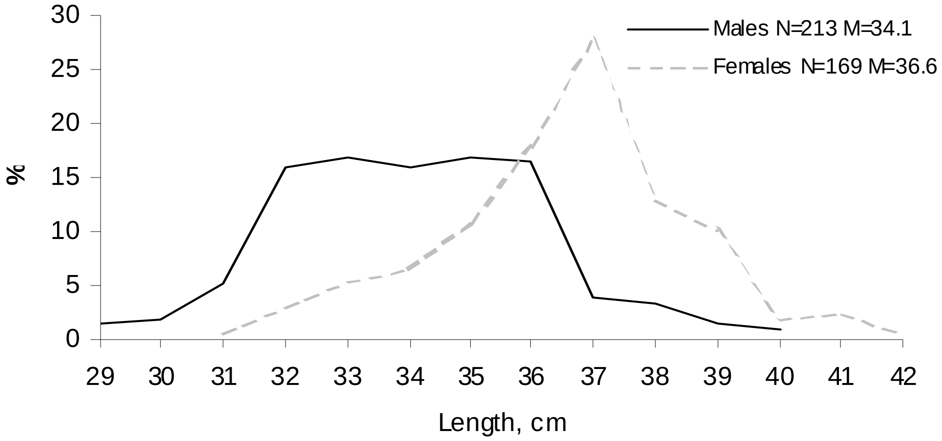


Figure 8.3.3. Length composition of greater silver smelt as bycatch from Russian blue whiting fishery in Faroese zone (Div. Vb) in April 2006.

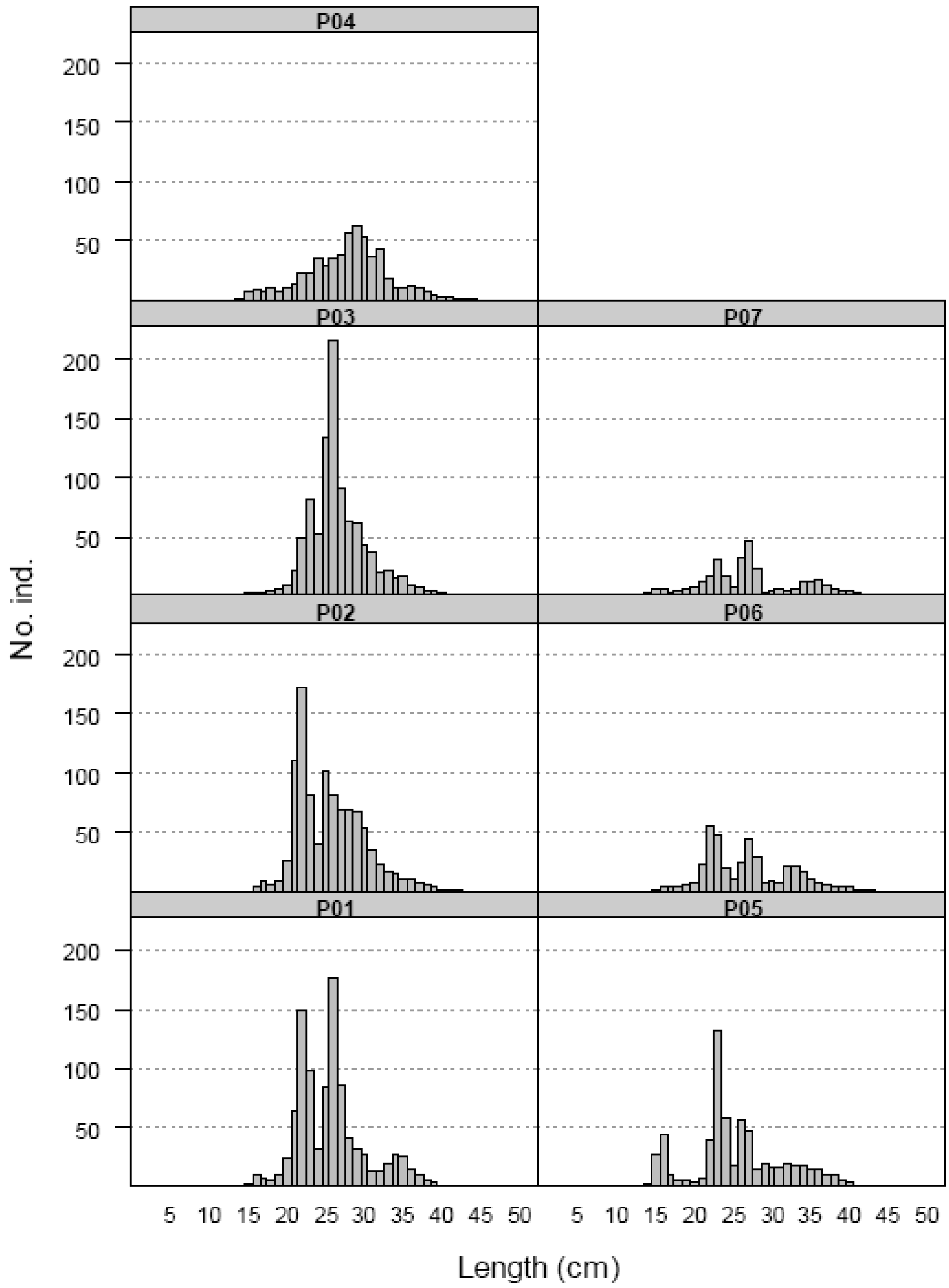


Figure 8.3.4. Mean stratified length distributions of *Argentina* spp. in Porcupine surveys (2001-2007).

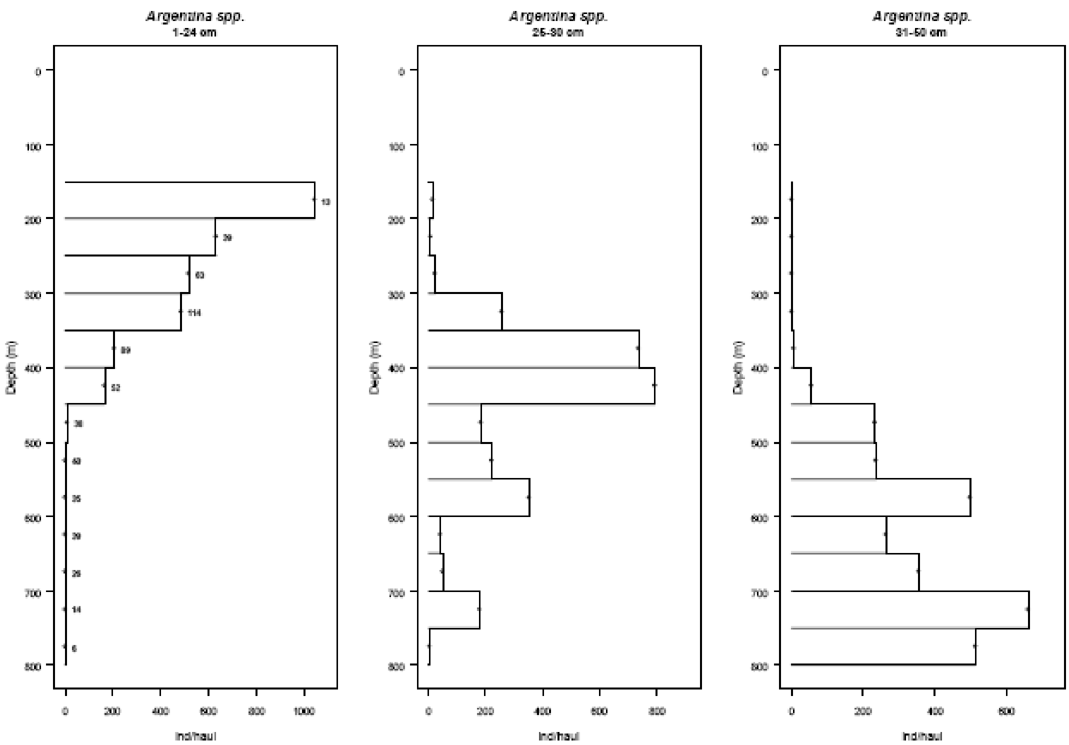


Figure 8.3.5. Bathymetric distribution of *Argentina* spp. catches (ind./30 min haul) by size range in Porcupine surveys as a whole. Numbers to the right of each column in the fist graph correspond with the number of hauls per depth intervals.

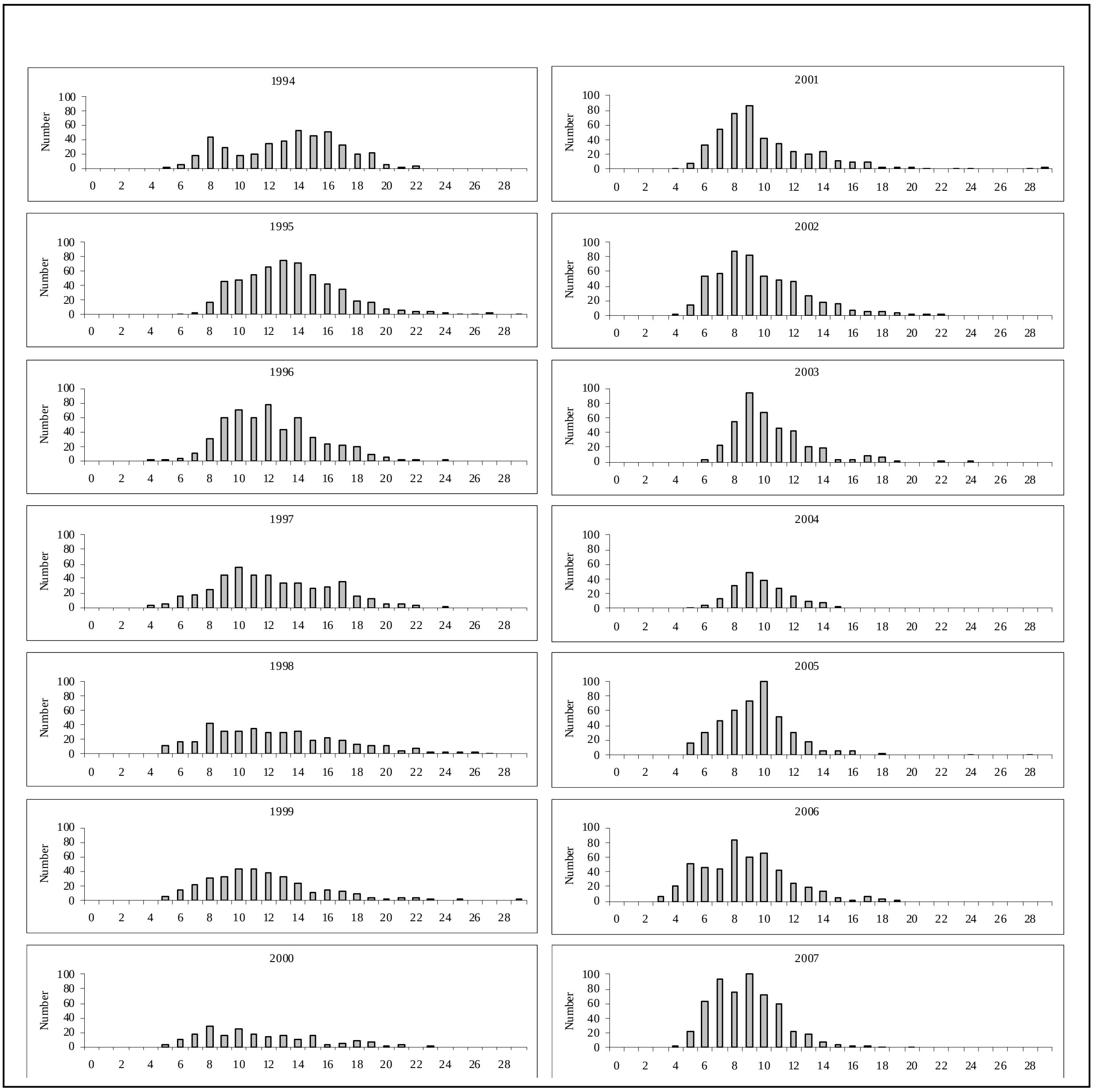


Figure 8.3.6. Age distribution of greater silver smelt in Faroese landings in the period from 1994 to 2007

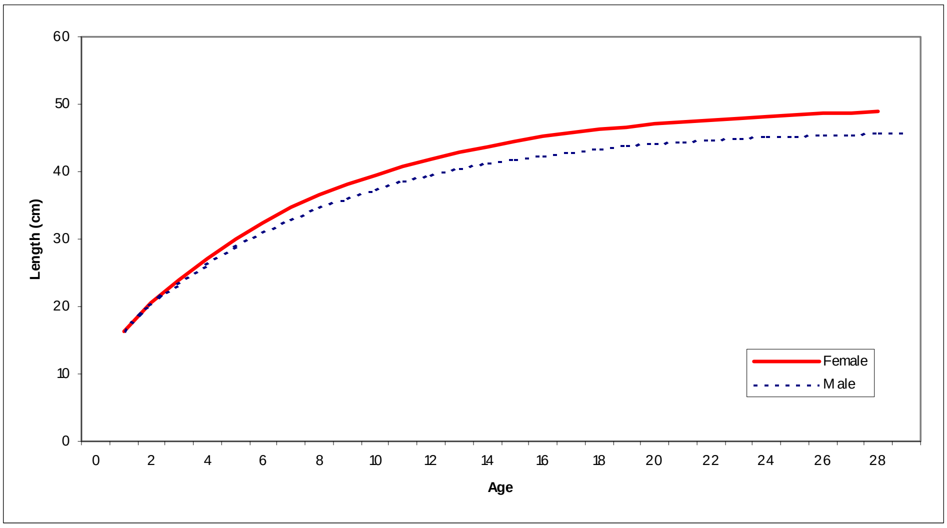


Figure 8.3.7. Growth of greater argentine in area Vb.

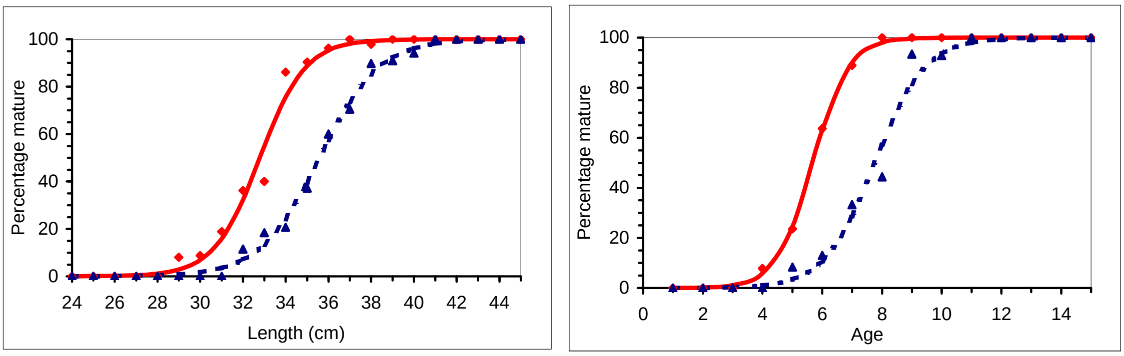


Figure 8.3.8. Length- and age at first maturity of greater argentine in area Vb.

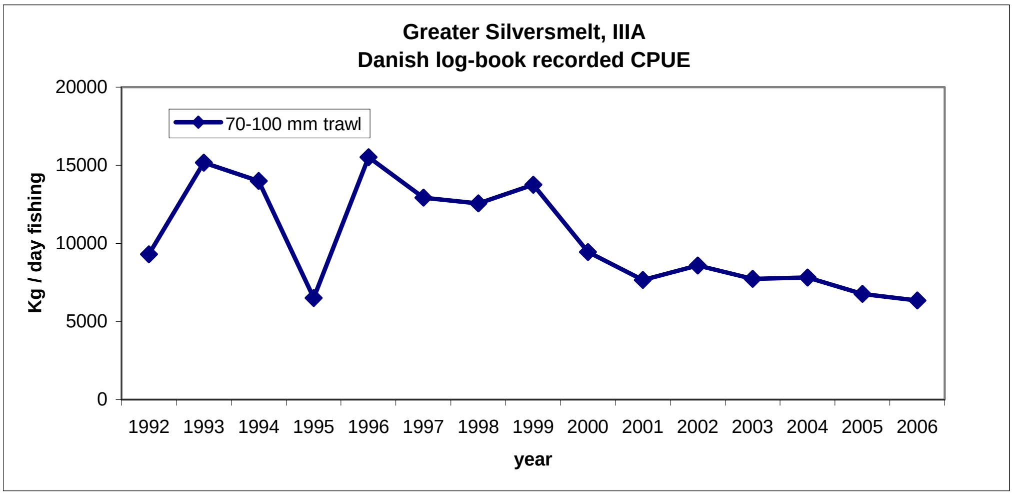


Figure 8.3.9. CPUE from Danish trawl fisheries in Division IIIa for 1992-2006.

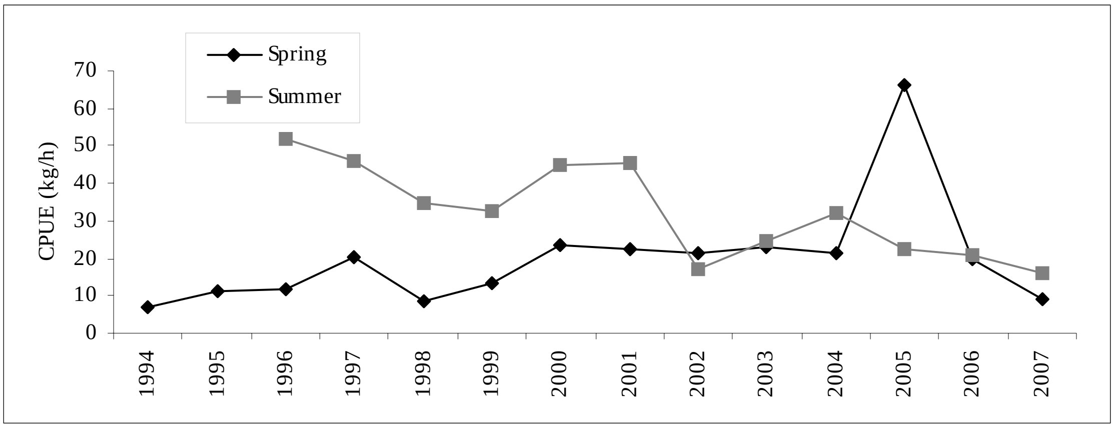
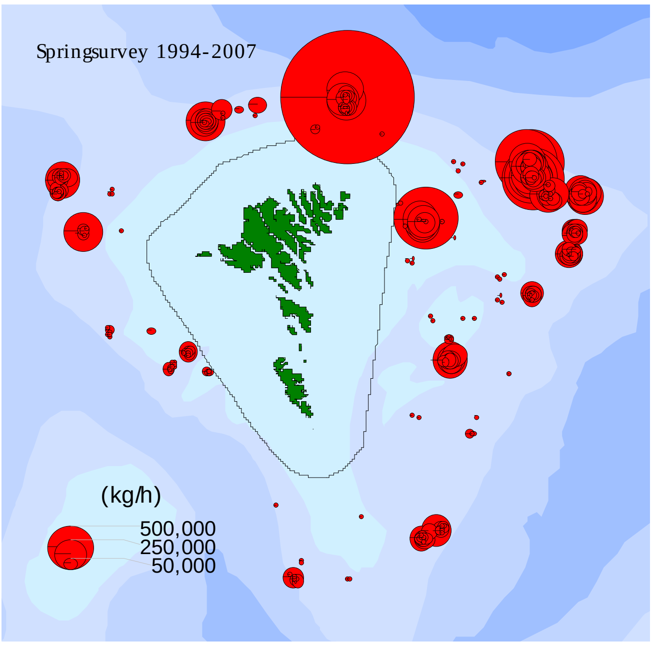


Figure 8.3.10. CPUE from Faroese surveys in Vb.



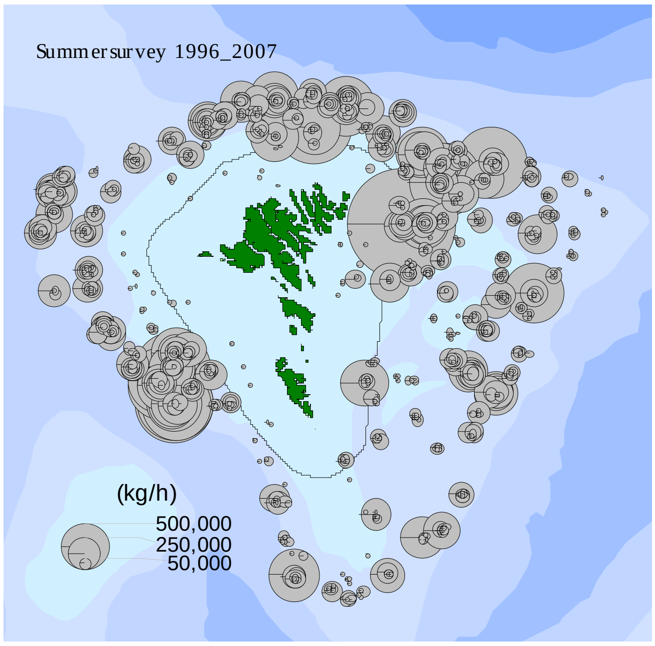


Figure 8.3.11. Distribution of greater silver smelt (kg/h) on the Faroe plateau (area Vb) from spring- (1994-2007) and summer survey for cod, haddock and saithe (1996-2007).

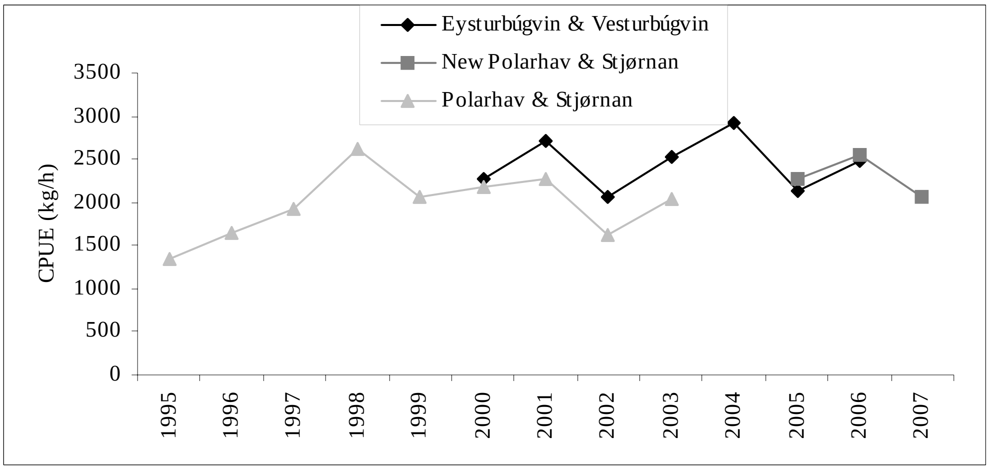


Figure 8.3.12. Catch per unit effort (kg/h) for three pairs of Faroese pair-trawlers (area Vb). Only hauls where greater silver smelt is more that 50% of the total catch are used.

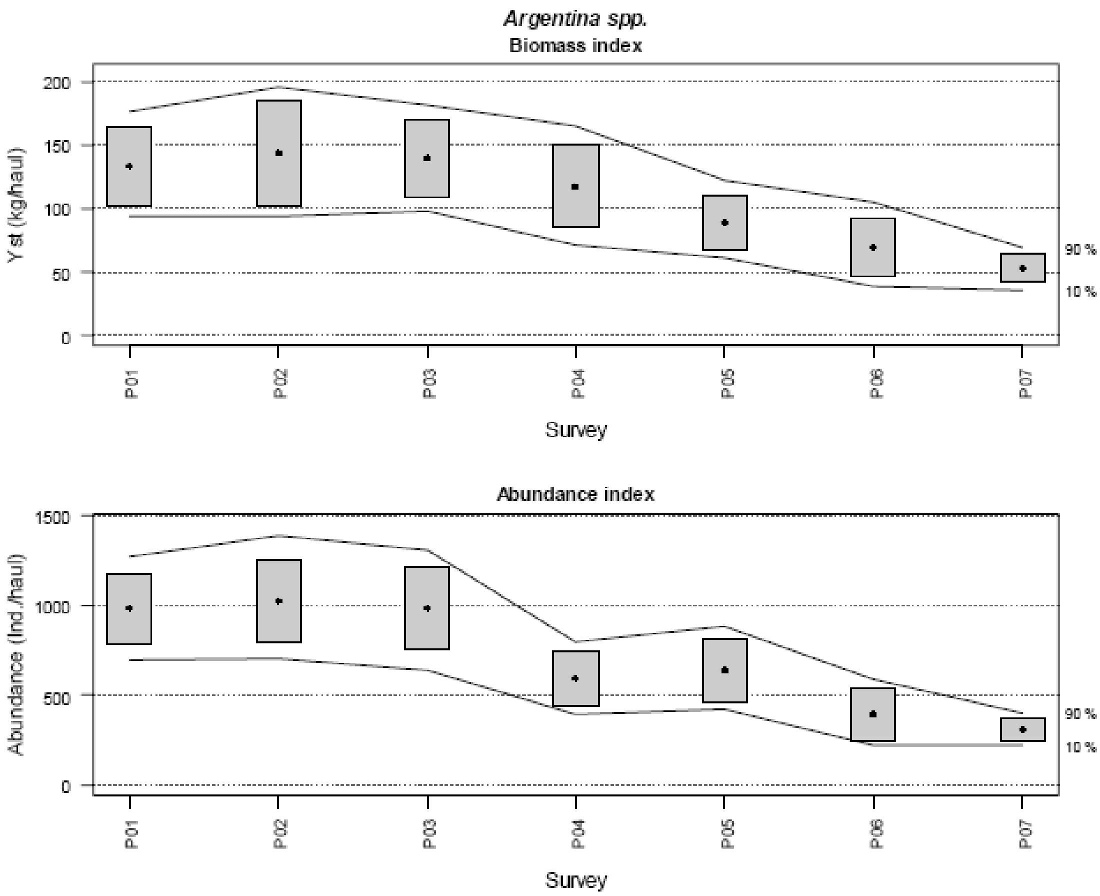


Figure 8.3.13. Changes in *Argentina* spp. biomass and abundance indices during Porcupine Survey time series (2001-2007). Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals (α = 0.80, bootstrap iterations = 1000).

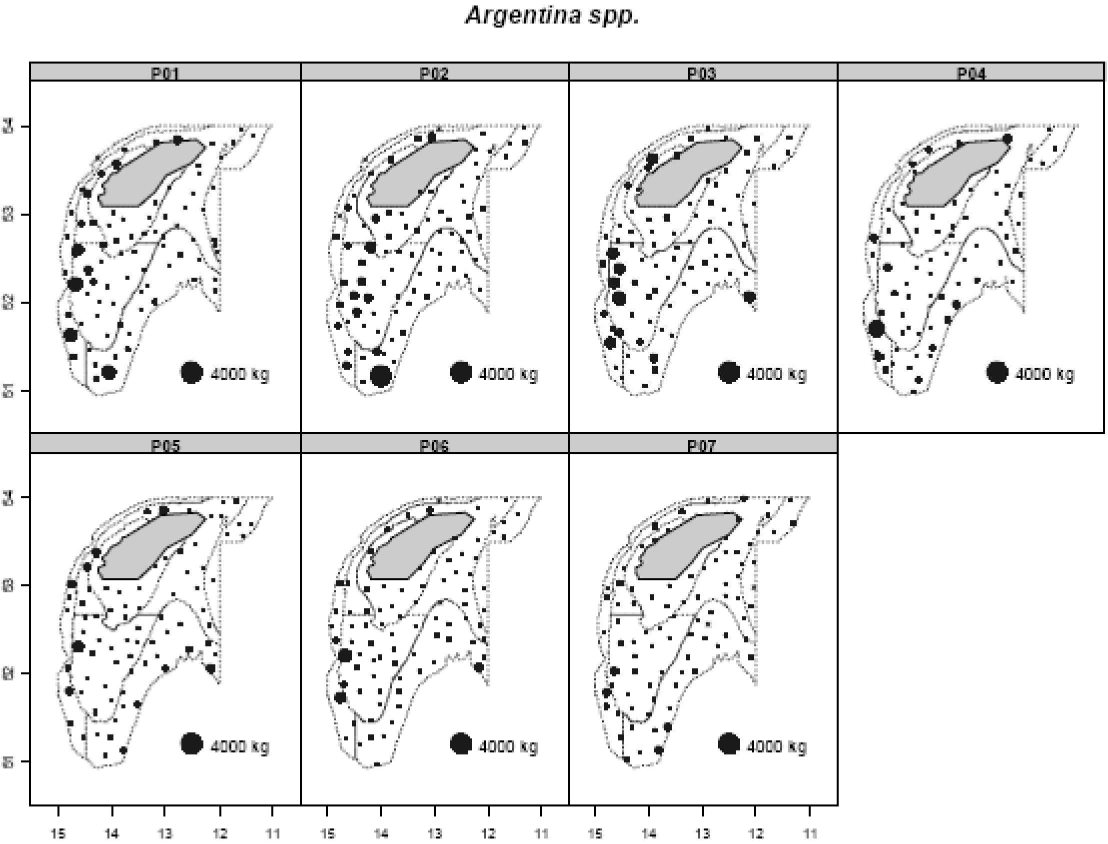


Figure 8.3.14. Geographic distribution of Argentina spp. catches (kg/30 min haul) in Porcupine surveys between 2001 and 2007.

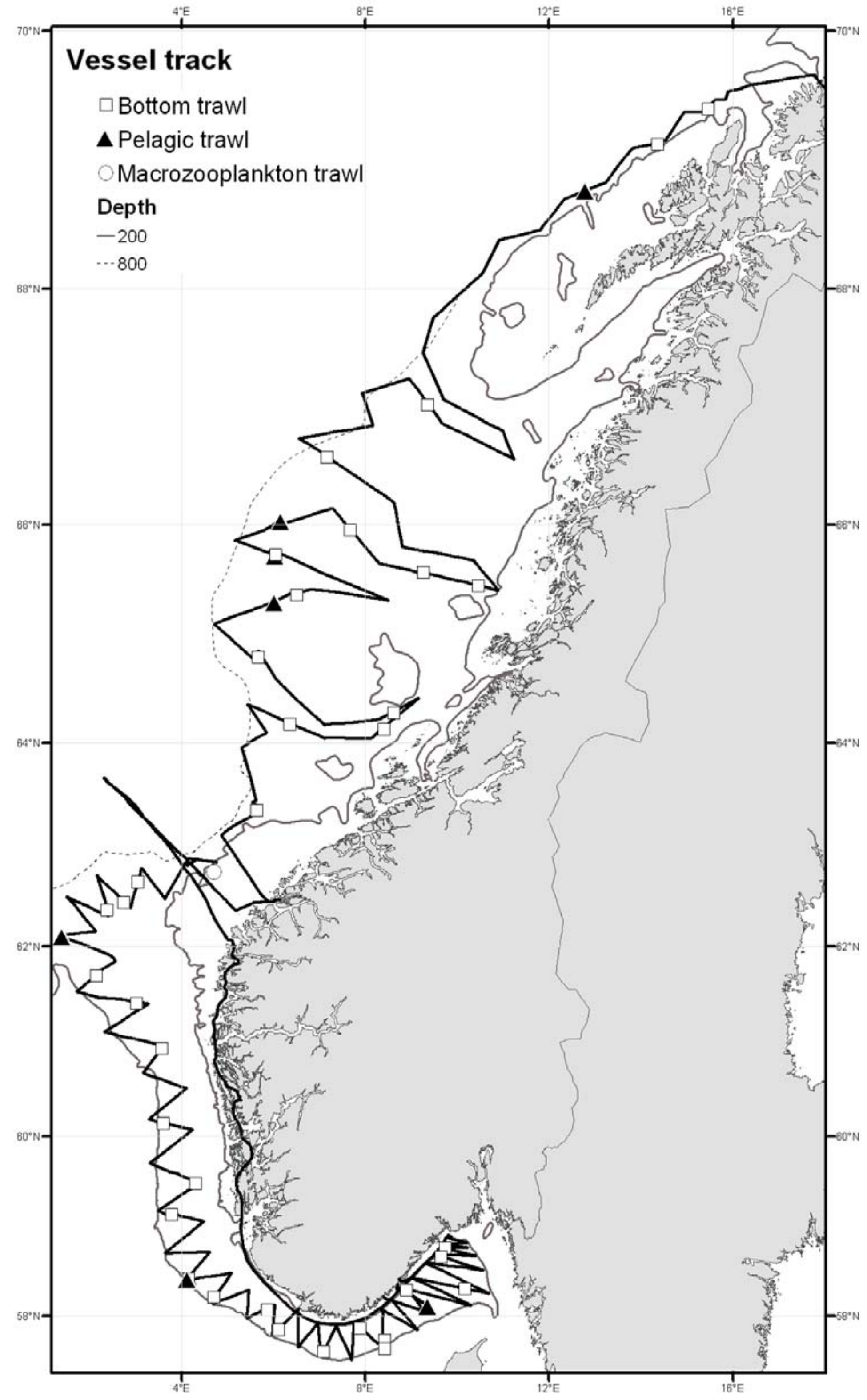


Figure 8.3.15. Vessel track with trawl stations. Cruise No 2007 611, RV *Håkon Mosby*, 7 May-3 June 2007.

9 Orange Roughy (*Hoplostethus Atlanticus*) in the Northeast Atlantic

9.1 Stock description and management units

Orange roughy are typically associated with seamounts or other topographical features e.g. pinnacles or slopes. Because these features tend to be sequentially depleted by fisheries, there is potential for the fishery to expand out of Subareas VI and VII as fisheries decline. It is likely that exploratory fisheries will take place in Subareas VIII-XII.

Current stock units are completely inadequate for orange roughy. Experience from around the world shows that stock units need to be small as topographical features may be inhabited by separate populations. ICES recommended that where the small-scale distribution is known, this be used to define smaller and more meaningful stock units. Where such information is lacking, such as in international waters, the ICES statistical rectangle is a more meaningful spatial stock unit.

However, recent information to ICES does not have a sufficient level of spatial resolution to identify individual exploited aggregations either within Subareas VI and VII or outside them. Because of this, and the very low quotas involved, it is not currently practical to manage at the level of statistical rectangle and therefore larger stock areas are used.

The current practise is to assume 3 stock units;-

Subarea VI

Subarea VII

Orange roughy in all other areas

Given the sparcity of spatial fisheries data and genetics data etc, WGDEEP in 2008 saw no reason to change this.

Catches data for orange roughy in 2006 and 2007 aggregated at the level of statistical rectangle were provided to the working group by France, Ireland, the UK (England and Wales and Scotland) and Iceland. These are shown in figure 9.1.1 and 9.1.2.

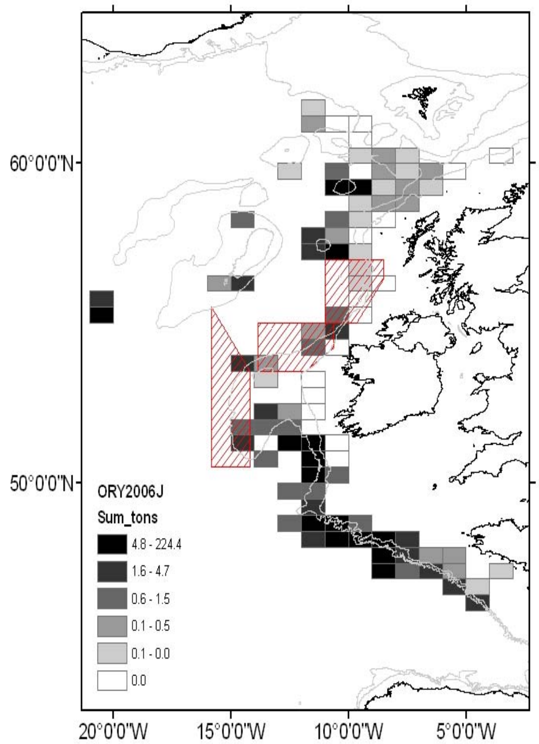


Figure 9.1.1. Catches of Orange roughy by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2006.

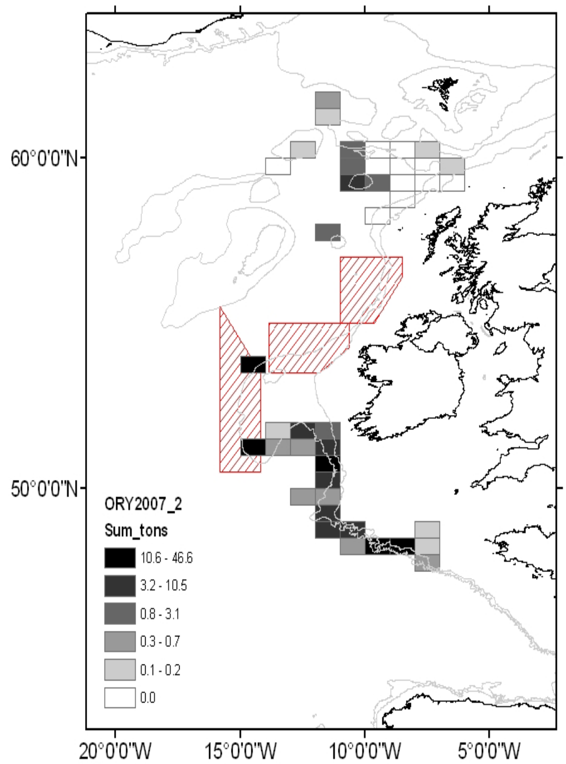


Figure 9.1.2. Catches of Orange roughy by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2007.

9.2 Orange Roughy (*Hoplostethus Atlanticus*) in Subarea VI

9.2.1 The fishery

There was a French target fishery, centred on spawning aggregations around the Hebrides Terrace Seamount. Irish vessels fished there for two years starting in 2001, but they have now effectively abandoned it.

9.2.1.1 Landings trends

Table 9.2.0 shows the landings data for orange roughy for the ICES area as reported to ICES or as reported to the Working Group.

The fishery began in 1989 with landings peaking at 3,500 t in 1991, and 5,300 t removed from the stock by the end of 1993. This stock is now severely depleted (ICES, 2006) and some of the landings from France and Ireland starting in 2001 have been from further south in this Subarea and increased to over 300 t in 2002. It is not clear if over-reporting was a feature of the fishery in this area, in the years preceding the introduction of TAC's. Reported landings since 2003 are decreasing and are consistently below the TAC. Reported landings of Orange Roughy in VI in 2007 were 10 tons.

9.2.1.2 ICES advice

The advice statement from 2006 was:

Orange roughy can only sustain very low rates of exploitation. Currently, it is not possible to manage a sustainable fishery for this species. Hence, ICES recommends no fishery for this species. Bycatches in mixed fisheries should be limited as far as possible.

9.2.1.3 Management

In 2003 a TAC was introduced for Orange Roughy in VI, this TAC remained at 88 tons until 2006. Landings in relation to TAC are shown in the table below. This table illustrates that in the last number of years the reported landings were substantially lower than the set TAC.

		Landing (t)	
Year	TAC (t)	EC vessels	Total
2003	88	81	81
2004	88	56	56
2005	88	45	45
2006	88	33	33
2007	51	10	10
2008	34		

In order to align the TAC with landings, the TAC for EC vessels in area VI was reduced to 51 tons for 2007 with a further reduction to 34 tons for 2008.

In addition to a TAC, a number of Orange Roughy protection areas have been introduced in 2005, from which EU vessels have no permission to land or retain any catches of Orange Roughy. These areas are shown in Fig. 9.1.1 and 9.1.2: Although the plots appear to show catches inside the protection areas, the boundaries of these areas do not correspond with ICES rectangles and therefore these catches could have occurred outside the protection areas. Given this, there may be a need to review the boundaries of these protection areas so that they cover entire ICES rectangles.

9.2.2 Data available

9.2.2.1 Landings and discards

Landings are in Table 9.2.0. Landings data were provided by UK (England and Wales and Scotland) France and Ireland at the level of ICES statistical rectangles to display the geographic distribution of the fishery in Figures 9.1.1 and 9.1.2.

9.2.2.2 Length compositions

No new data. Available information is combined with data for subarea VII and is presented in section 9.3.

9.2.2.3 Age compositions

No new data. Available information is combined with data for subarea VII and is presented in section 9.3.

9.2.2.4 Weight at age

No new data. Available information is combined with data for subarea VII and is presented in section 9.3.

9.2.2.5 Maturity and natural mortality

No new data.

Available information is combined with data for subarea VII and is presented in section 9.3.

9.2.2.6 Catch, effort and research vessel data

Historical French CPUE series (Anon., 2000; 2002) are shown in Figure 9.2.1 The data shows that there is a strong declining trend in the CPUE from the early nineties onwards. CPUE data is also available from observed fishing trips as part of the Irish Sea Fisheries Board Deepwater Programme (BIM, WD, 2002a). These data are presented in Table 9.2.2.

9.2.3 Data analyses

No assessment has been performed during WGDEEP 2008.

9.2.4 Management consideration

Previously, this stock was considered to be seriously depleted and there is no new information to suggest that this has changed.

ICES reiterates the advice from 2006 that Orange roughy can only sustain very low rates of exploitation. Currently, it is not possible to manage a sustainable fishery for this species. Hence, ICES recommends no fishery for this species. By-catches in mixed fisheries should be limited as far as possible

There may be a need to review the boundaries of orange roughy protection areas so that they cover entire ICES rectangles.

Table 9.2.0. Orange roughy catch in Subarea VI

Year	Faroes	France	E & W	Scotland	Ireland	Spain	Total
1988	-	-	-	-	-	-	0
1989	-	5	-	-	-	-	5
1990	-	15	-	-	-	-	15
1991	-	3,502	-	-	-	-	3502
1992	-	1,422	-	-	-	-	1422
1993	-	429	-	-	-	-	429
1994	-	179	-	-	-	-	179
1995	40	74	-	2	-	-	116
1996	0	116	-	0	-	-	116
1997	29	116	1	-	-	-	146
1998	-	100	-	-	-	2	102
1999	-	175	-	-	0	1	176
2000	-	136	-	-	2	-	138
2001	-	159	-	11	110	-	280
2002	n/a	152	-	41	130	-	323
2003	-	79	-	-	2	-	81
2004	-	54	-	-	2	-	56
2005	-	41	-	-	6	-	47
2006		32			1		33
2007*		10					10

* Preliminary.

Table 9.2.2. VI CPUE from observed trips on Irish trawlers in 2001 and 2002, from data made available by BIM. Catch in kg, effort in hours, CPUE in kg per hour and kg per haul. Hauls with zero catches are removed for ease of comparison between years, as zero haul data unavailable for 2001.

Year	Effort	Catch	CPUE kg per hour	No. hauls	Kg per haul
2001	47.2	7090	150.3	9	788
2002	3.5	10	2.9	1	10
2002	5.8	40	6.9	5	8

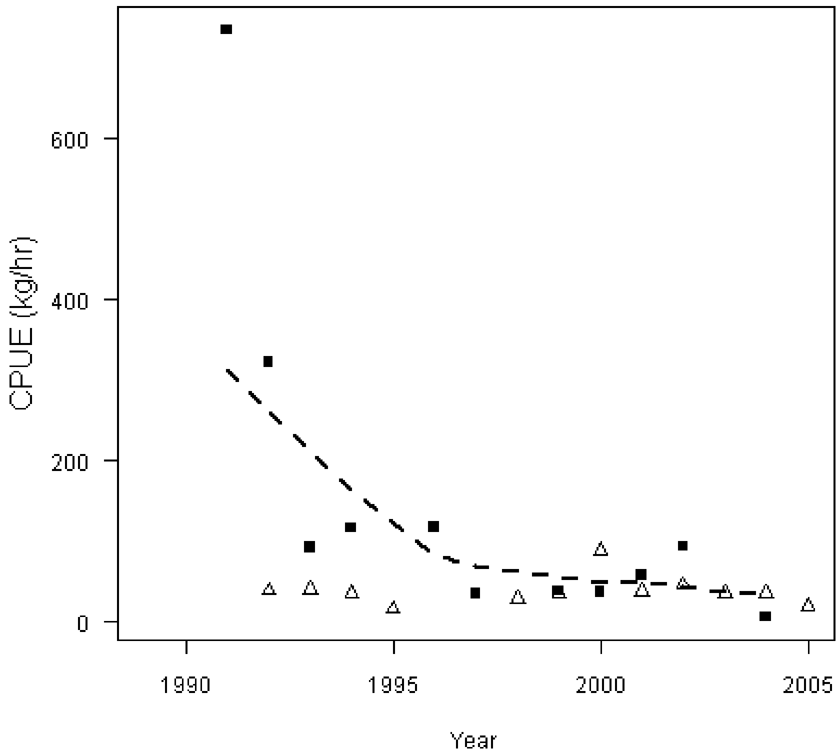


Figure 9.2.1. French 2006 CPUE series (VIa) for 400-600 kw power vessels (open triangles) and for 1400-1600 kw vessels (solid squares). The line is a smooth curve through the latter series.

9.3 Orange Roughy (*Hoplostethus Atlanticus*) in Subarea VII

9.3.1 The fishery

Since the collapse of the VI fishery, the main fishery for orange roughy in the northern hemisphere is in this subarea. French vessels used to prosecute this fishery alone, but in 2001, new Irish vessels became heavily involved in this fishery for a short number of years. Orange roughy aggregations are mainly associated with seamounts, but they are also found close to other features. Initially, trawlers targeted orange roughy at the base of seamounts, but since 2000 there has been a shift to fishing down the slopes of seamounts. In the past, as catch rates declined, new features were found to replace them, but finding new features is now unlikely. Large (~50 m) high-sea French trawlers targeted orange roughy in subarea VII up to 2001. These large trawler, have reduced their activity in VII. In recent years, small catch of orange roughy are a by-catch of some remaining deep-water fishing by large trawler and some targeted fishing from a few or even one single artisanal trawlers.

9.3.1.1 Landings trends

Table 8.4.1 shows the landings data for orange roughy as reported to ICES or as reported to the Working Group. The preliminary landing for 2007 is 164 t, which is the lowest in the time series. Over-reporting is likely to have been a feature of this fishery prior to the introduction of TACs. The restrictive quotas that have been introduced from 2003 onwards may have resulted in under-reporting and misreporting at other areas and species, specifically cardinal fish.

A French fishery developed in 1989, and landings peaked at over 3,000 t in 1992. By the end of 2000 the French fleet had removed over 13,500 t of orange roughy from this Subarea. An Irish fishery commenced in 2001, and since then the combined Irish and French accumulated landings (preliminary data) have amounted to a further 10,800 t. There are two fisheries for Orange Roughy in the area. A single targeted peak fishery that has been occurring on distinct topographical features and a mixed trawl flat fishery that occurs along the continental slope and has Orange Roughy as a bycatch.

Historic landings data suggest several pulses in landings. The first occurred in 1992 when over 3,000 t were landed. Landings declined until 1995, but then increased again to the highest in the series in 2002. A restrictive quota was introduced in 2003 and resulted in a decrease in declared landings.

9.3.1.2 ICES advice

The ICES advice statement from 2006 was:

Orange roughy can only sustain very low rates of exploitation. Currently, it is not possible to manage a sustainable fishery for this species. Hence, ICES recommends no fishery for this species. Bycatches in mixed fisheries should be limited as far as possible.

9.3.1.3 Management

A TAC for Orange Roughy in area VII was first introduced in 2003. .Landings in relation to TAC are shown in the table below and illustrates that reported landings were substantially lower than the set TAC:

		Landing (t)	
Year	TAC (t)	EC vessels	Total
2003	1 349	541	541
2004	1 349	467	467
2005	1 149	255	255
2006	1 149	489	489
2007	193	164	
2008	130		

For 2007 and 2008 the TAC for Orange Roughy in VII has been fixed to 193 t and 130 t respectively. Further to a TAC, a number of Orange Roughy protection areas have been introduced in 2005, from which EU vessels have no permission to land or retain any catches of Orange Roughy. These areas are shown in Figures 9.1.1 and 9.1.2. Although the plots appear to show catches inside the protection areas, the boundaries of these areas do not correspond with ICES rectangles and therefore these catches could have occurred outside the protection areas.

9.3.2 Data available

Landings were available for all fleets. French CPUE series is available. Landings data for 2006 and 2007 per quarter by statistical rectangle were available and are shown in Figures 9.1.1 and 9.1.2.

9.3.2.1 Landings and discards

Landings shown are in Table 9.3.0. Distribution maps of the landings by statistical rectangle per quarter for 2006 and 2007 are shown 9.1.1 and 9.1.2. Discard information is available from two discard trips in 2004. One discard trip was in the mixed fishery on the flats and it gave 1 t of discarded orange roughy. The other trip was for directed orange roughy fishing on seamounts and no discards were reported.

9.3.2.2 Length compositions

Updated length frequency information is available from the 2005 acoustic survey (Figure 9.3.1) and the 2006 and 2007 Irish deepwater trawl surveys (Figure 9.3.2). In addition there are a number of historic length frequencies available for both areas VI and VII. These include commercial data from the 2002 BIM Irish developmental programme, (Figure 9.3.3), the Irish MI observer programme in 2003 (Figure 9.2.4) and the French fishery during the nineties (Figure 9.3.5). Survey data show that the length frequency distribution on bathymetric features is mainly between 38 and 55cm while on gentle slopes it has a dual peak between 7 and 23cm and 45-65cm suggesting the presence of juveniles. Length frequencies from most of the commercial catches show a distribution between 45 and 65cm,

Standard length weight relationships for orange roughy caught in the Irish developmental fishery in 2001 were presented in 2002 by BIM (WD, 2002a). This includes data from VI also. The relationships are as follows:

Both sexes:	$y = 0.3108x^{2.3959}$	$R^2 = 0.743$	N = 320
Females:	$y = 0.0136x^{3.2174}$	$R^2 = 0.9237$	N = 23
Males	$y = 1.1410x^{2.0531}$	$R^2 = 0.7643$	N = 58

A relationship between total individual size (L in cm) and weight (W in g) has been derived from French landings taken off the British Islands:

$W = 0.022\ L^{2.95}$

9.3.2.3 Age compositions

Age data was available from sampling at-sea on commercial trawlers operating on the Porcupine Bank during September 2003-April 2004 and February 2005 (Sheppard and Rogan 2006). Most otolith samples were of juvenile fish (< 30 cm SL). Otoliths were prepared and sectioned according to Tracey and Horn (1999). Age estimates (6-169 years) were obtained from a total of 151 otoliths. The Von Bertalanffy growth model was fitted to the data (R^2=0.92) (Figure 9.3.6). Estimated growth parameters were: L_∞=47.6 cm, k=0.039 yr^{-1} and t_0=2.61 years.

Age estimates were presented by Talman *et al*. (2002) based on samples taken from the Irish developmental fishery in 2001, in VI and VII (BIM, WD 2002). Age estimates from sectioned otoliths ranged from 20 to 187 years (Standard Lengths 30 to 68 cm). Empirical growth curves presented by Talman *et a*l. (2002) suggests that growth slows and reaches an asymptote at about 55cm SL and 37 years. This asymptote is far greater than estimate above and the cause of this is unknown (it possibly could be TL rather than SL).

These age estimates, though unvalidated, were obtained using the most accepted technique used for New Zealand and Australian fisheries. The orange roughy in the area west of Ireland appear to reach the greatest age of any populations so far examined. Though these data cannot be used to infer the age structure of the stocks in this area, they do indicate that the populations consist of a great many age groups.

9.3.2.4 Weight at age

No data.

9.3.2.5 Maturity and natural mortality

Recently estimated maturity L_{50} was 34 cm SL for Orange Roughy collected from the flat fishery and 37 cm SL from hill aggregations on the Porcupine Bank (Sheppard and Rogan, 2006). This is similar to the estimate from the west of Ireland of 36 cm SL (Minto and Nolan, 2003) These are higher than that estimated for orange roughy in New Zealand and Australia.

Based on Tasman et al.'s (2002) age estimates, an estimate of natural mortality of 0.025 is obtained for orange roughy caught in the Irish fishery, from the following equation:

M = ln100 / maximum age (187 years).

This is only a very approximate estimate, but it is consistent with the estimates obtained by using amore statistically precise method on New Zealand data (0.045, Sullivan *et al*., 2005).

9.3.2.6 Catch, effort and research vessel data

Acoustic survey, 2005

In 2005 the Marine Institute, together with University College Cork and Bord Iascaigh Mhara carried out an orange roughy acoustic survey on the slopes to the west and north of the Porcupine Bank. This used a scientific echosounder system mounted within a deep towed vehicle operated from the *RV Celtic Explorer*. Estimates of biomass were considered to be unreliable due to concerns over target strength.

Biological samples collected by the *MFV Mark Ama*y and multibeam echosounder and a ROV were used on selected sea-mounds to map the orange roughy habitats. (O'Donnell et al, 2007). Since 2006 the Marine Institute carried out an annual deepwater trawl survey in area VI and VII where biological samples are collected from the flat slope habitats.

9.3.3 Data analyses

No assessment has been carried out for Orange Roughy in VII during WGDEEP 2008.

9.3.4 Management consideration

ICES reiterates the advice from 2006 that "Orange roughy can only sustain very low rates of exploitation. Currently, it is not possible to manage a sustainable fishery for this species. Hence, ICES recommends no fishery for this species. Bycatches in mixed fisheries should be limited as far as possible"

From length frequency there is evidence of the occurrence of juveniles in some slope areas. however, there are no discard data to indicate whether these are taken in fisheries.

There may be a need to review the boundaries of orange roughy protection areas so that they cover entire ICES rectangles.

Table 9.3.0. Working Group estimates of landings of orange roughy, *Hoplostethus atlanticus,* by nation in Subarea VII

Year	France	Spain	E & W	Ireland	Scotland	Faroes	Total
1988	-	-	-	-	-	-	0
1989	3	-	-	-	-	-	3
1990	2	-	-	-	-	-	2
1991	1,406	-	-	-	-	-	1406
1992	3,101	-	-	-	-	-	3101
1993	1,668	-	-	-	-	-	1668
1994	1,722	-	-	-	-	-	1722
1995	831	-	-	-	-	-	831
1996	879	-	-	-	-	-	879
1997	893	-	-	-	-	-	893
1998	963	6	-	-	-	-	969
1999	1,157	4	-	-	-	-	1161
2000	1,019	-	-	1		-	1020
2001	1022	-	1	2367	22	-	3412
2002	300		14	5114	33	4	5465
2003	369			172			541
2004	279			188			467
2005	165			90			255
2006	451			37			489
2007*	136			28			164

*Preliminary.

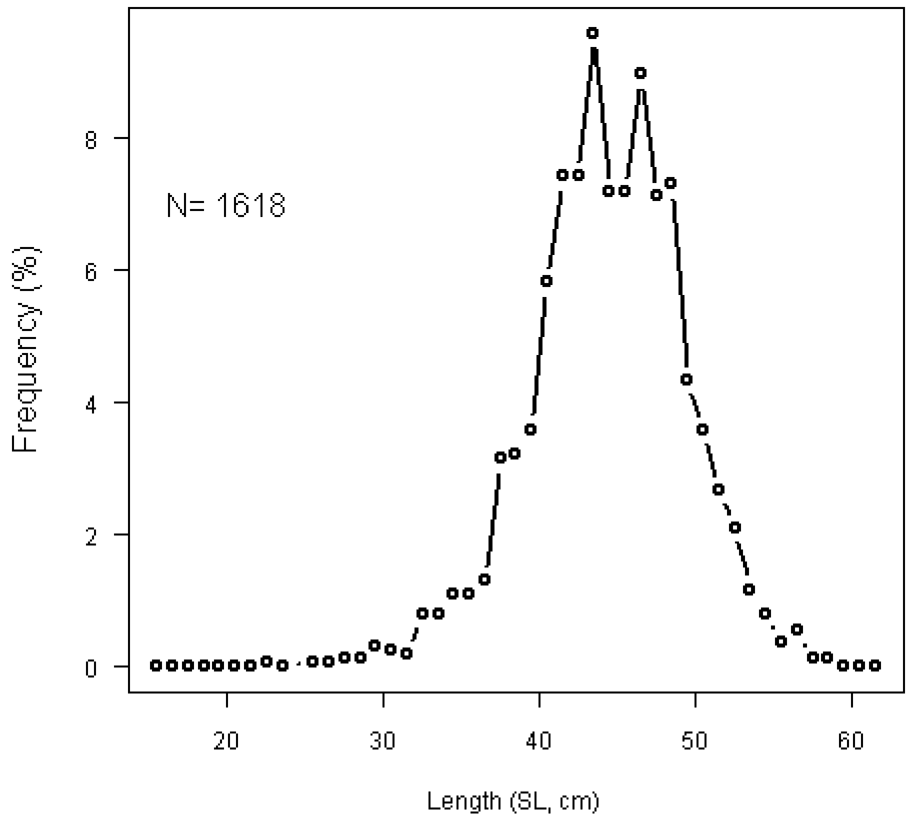


Figure 9.3.1. Length frequency from bathymetric feature trawl data sampled on the 2005 acoustic survey, VII.

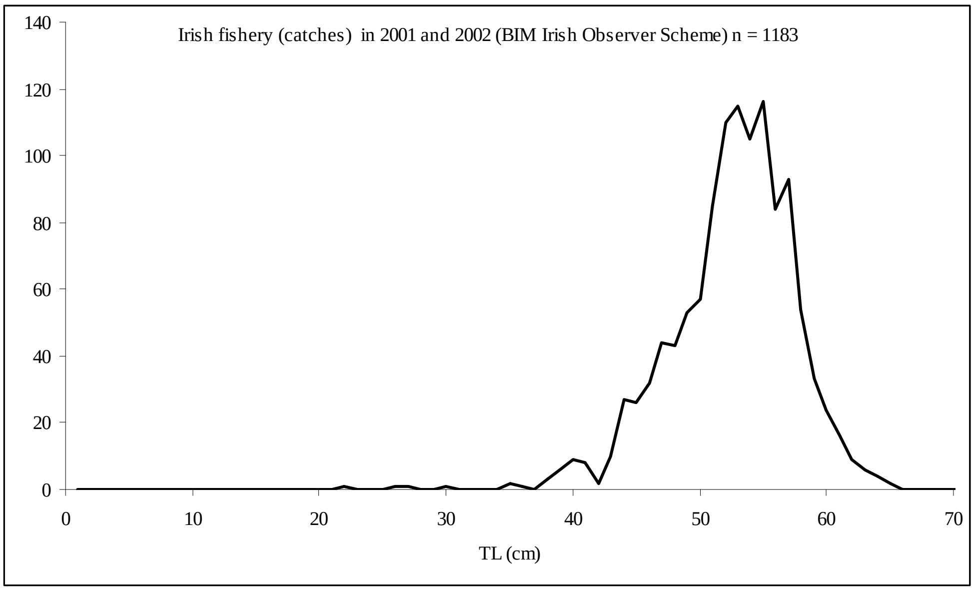


Figure 9.3.2. Length frequencies from Irish fisheries in 2001 and 2002, data from Irish Sea Fisheries Board observer scheme (BIM, WD 2002). VI and VII data.

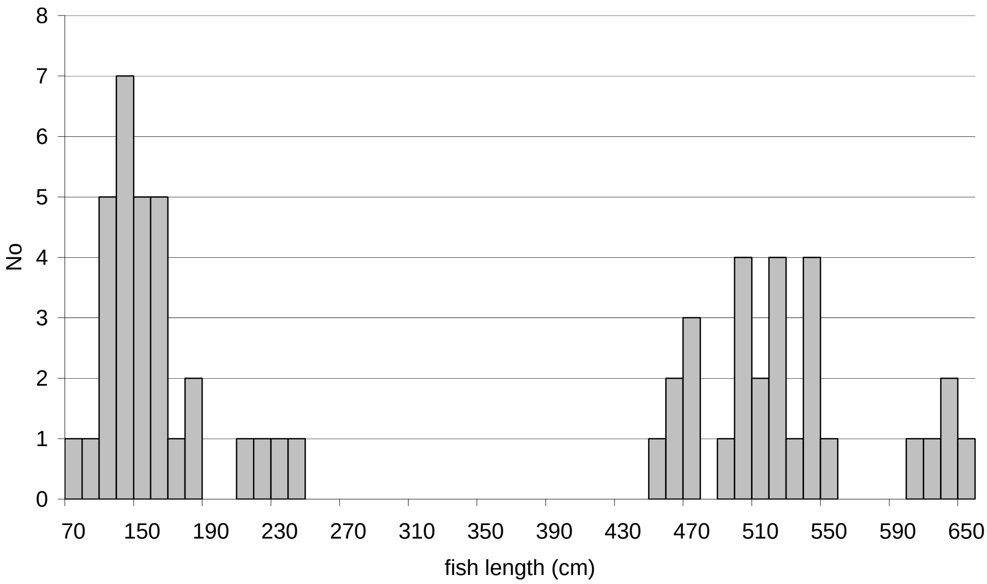


Figure. 9.3.3 Length frequency distribution of Orange Roughy from the gentle slopes areas along the NW Porcupine Bank during the Irish Deepwater trawl surveys, 2006 and 2007

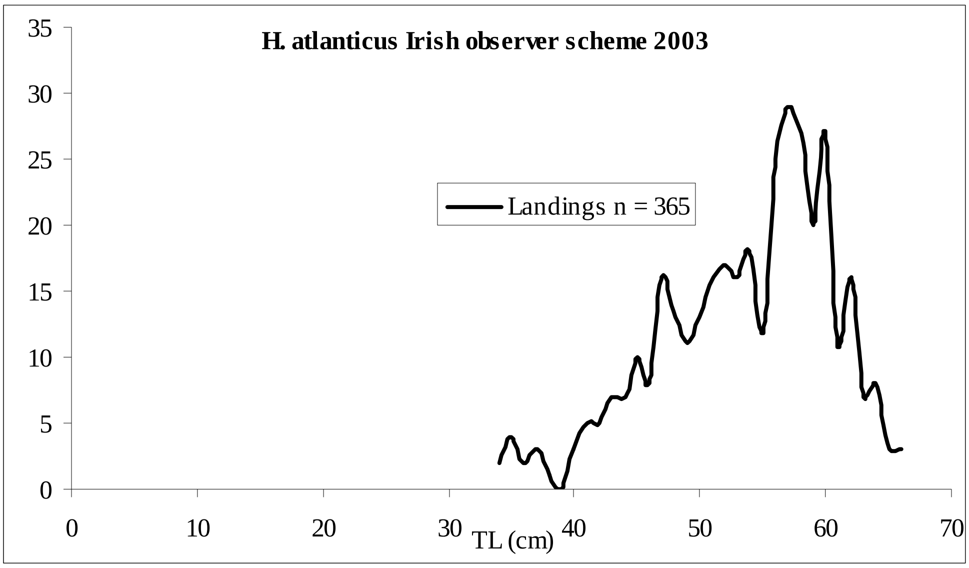


Figure 9.3.4. Length frequencies from Irish fishery in 2003 (VI and VII) from Irish Marine Institute observer scheme.

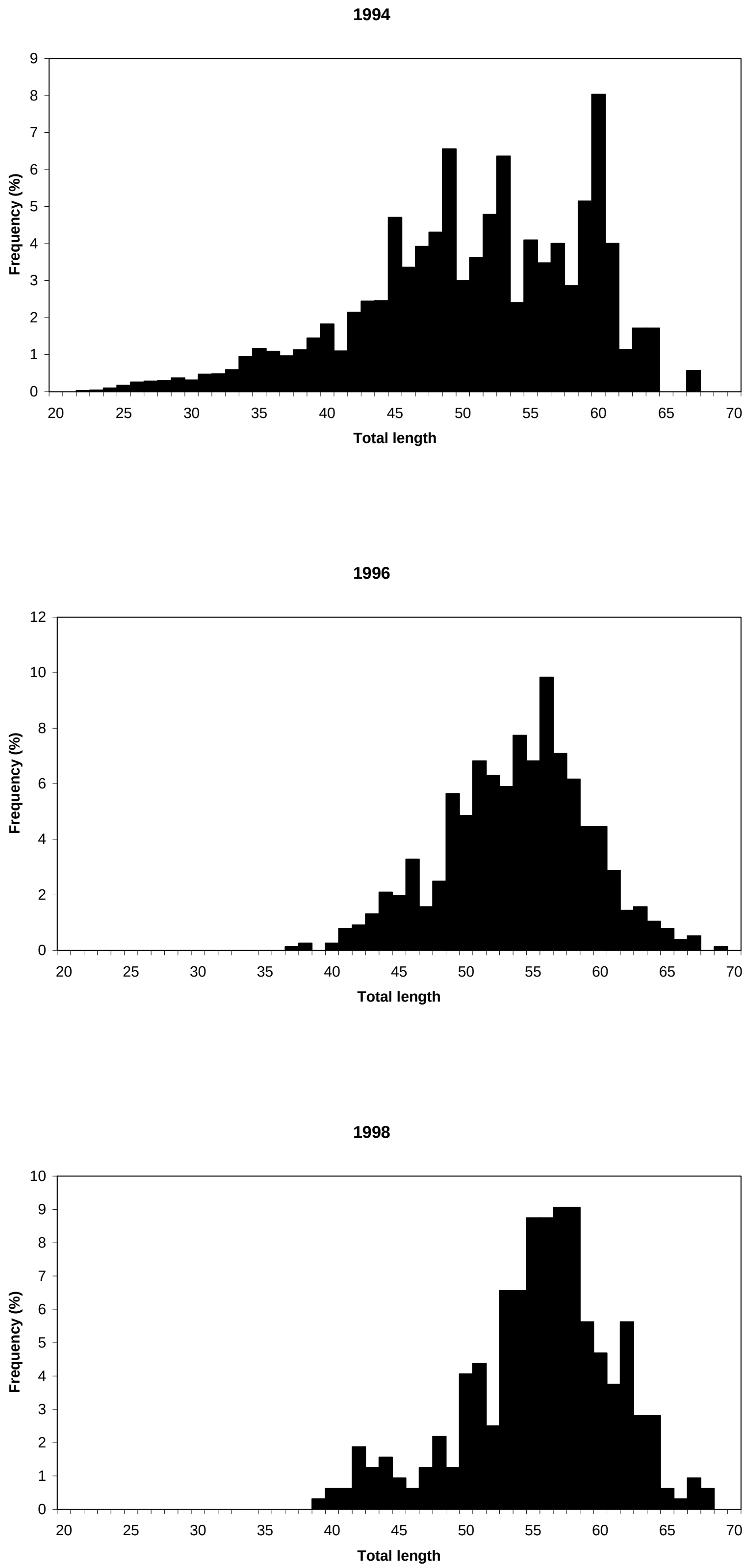


Figure 9.3.5. Length distribution of French landings of orange roughy from 1994 to 1998.

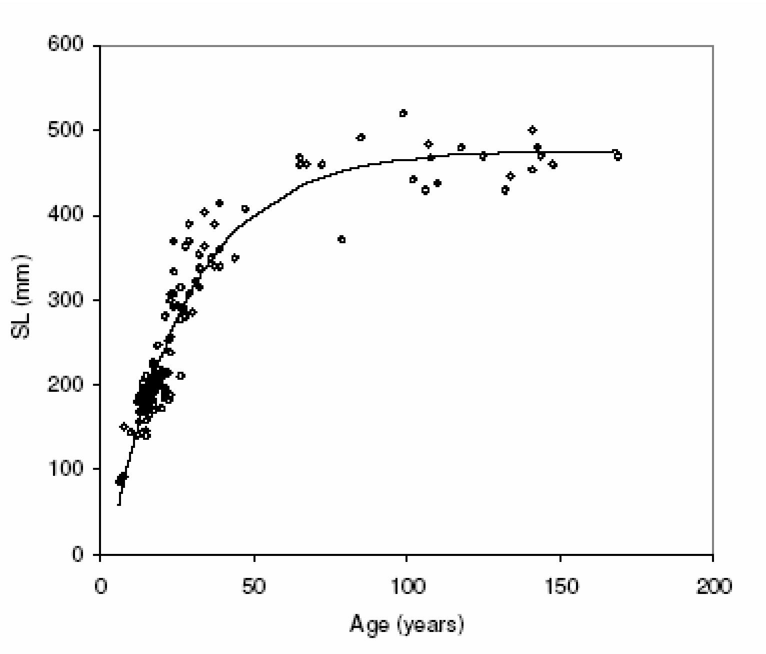


Figure 9.3.6. Age estimates and the estimated Von Bertalanffy growth curve (WGDEEP,2006). Note that the y axis refers to standard length rather than total length as used elsewhere.

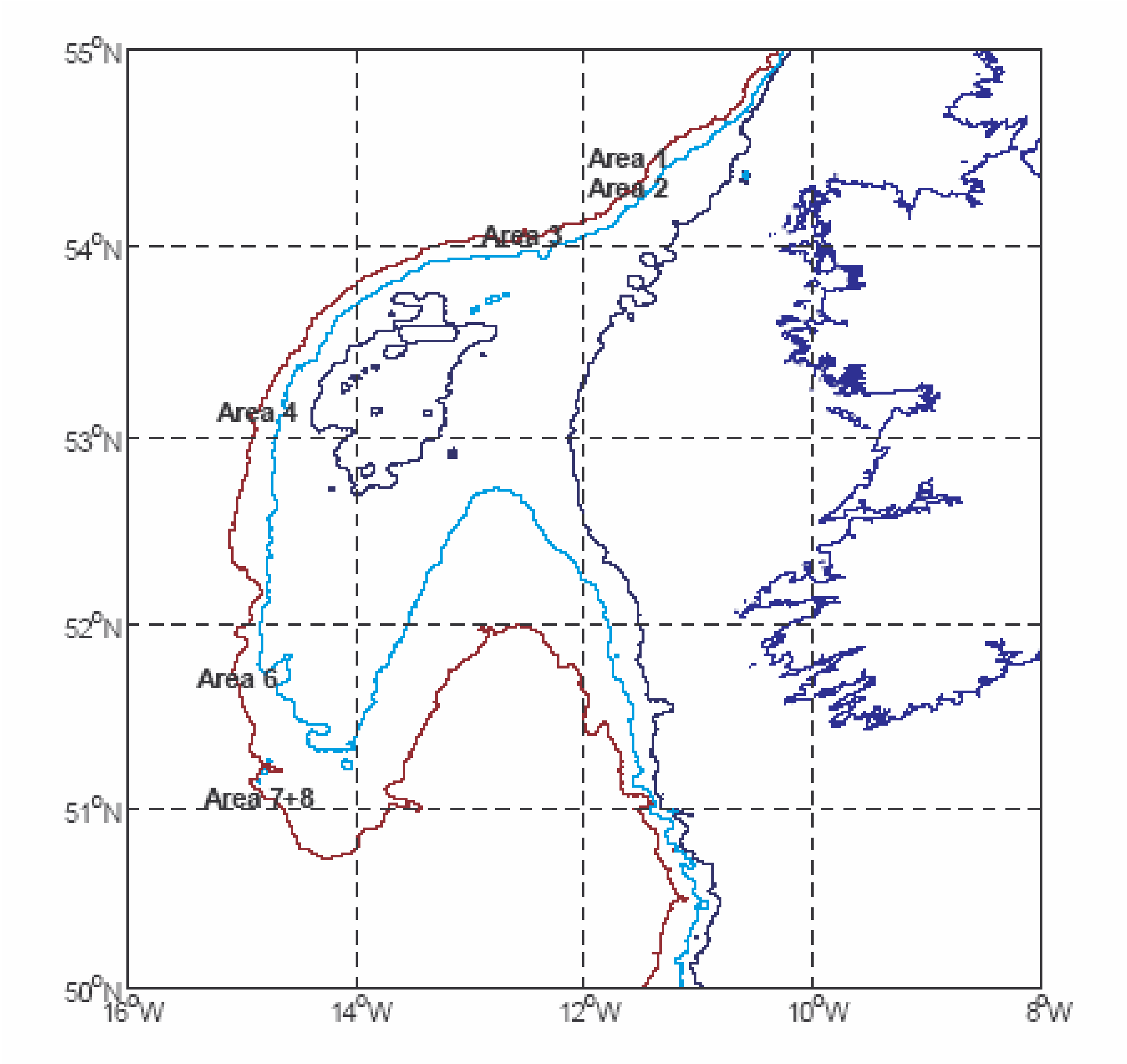
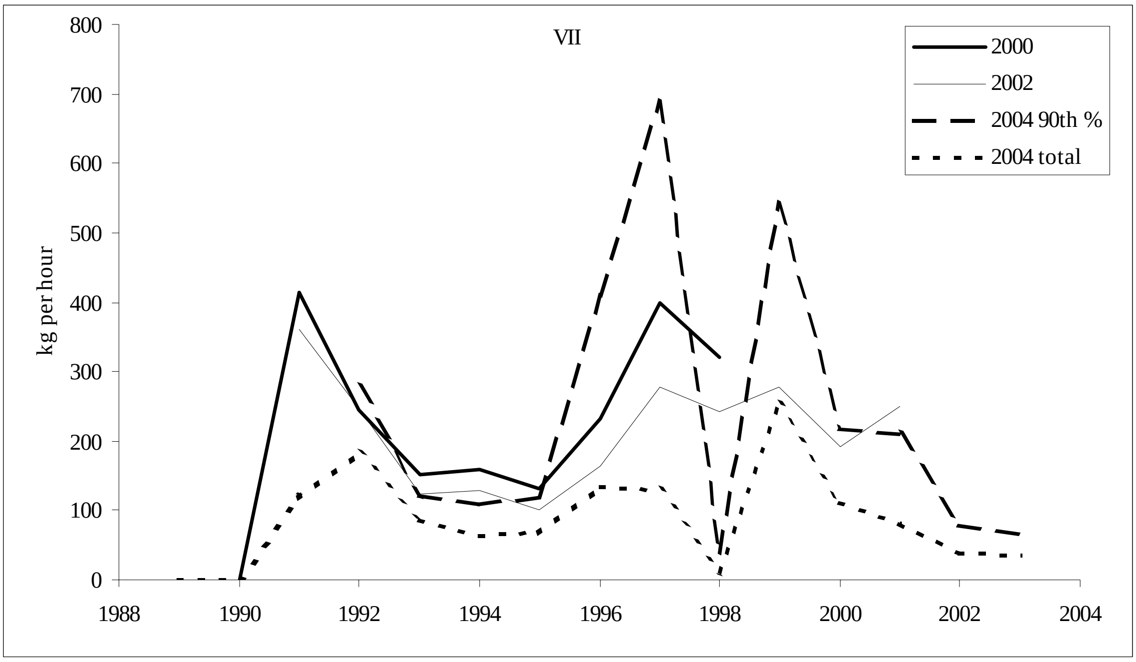


Figure 9.3.7. Acoustic survey of VII, 2005. Survey subareas.



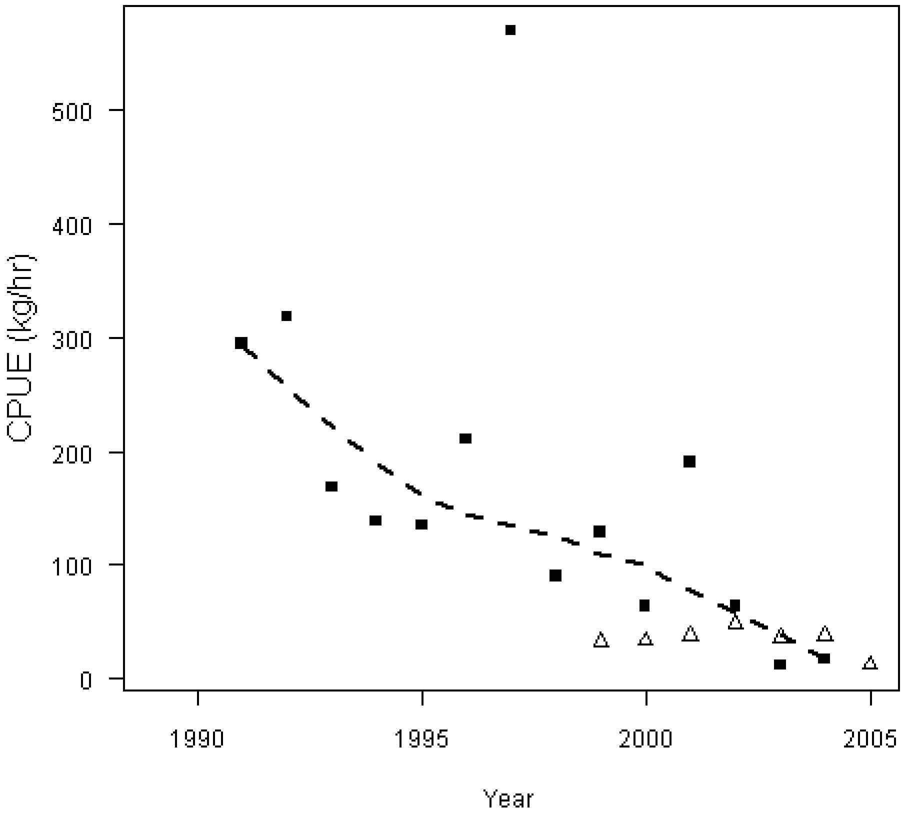


Figure 9.3.8. Top: Comparison of four old series of CPUE from French trawlers in Subareas VII. Note that there in no data in 1988 so that point is spurious in the plot. Bottom: 2006 CPUE series for 400-600 kw power vessels (open triangles) and for 1400-1600 kw vessels (solid squares). The line is a smooth curve through the latter series excluding the high 1997 point.

9.4 Orange Roughy (*Hoplostethus atlanticus*) IN I, II, IIIa, IV, V, VIII, IX, X, XII, XIV

9.4.1 The fishery

Small fisheries have existed in subareas Va, Vb, VIII, and X, and a relatively modestly sized one in XII. Most started in the early 1990s, the exception being subarea X which started in 1996. There has been no real fishery in IX, just a few tonnes caught over a few years.

9.4.1.1 Landing trends

Table 9.4.0 shows the landings data for orange roughy for the ICES area as reported to ICES or as reported to the Working Group. Figures 9.1.1 and 9.1.2 shows the landings by statistical rectangle for 2006 and 2007.

In Division Va, the fishery peaked with landings of over 700 t in 1993, and landings have declined to very low levels by 2002. In Division Vb, landings were highest in 1995, at 420t, but since 1997 they have been small in recent years except for in 2000.

In Subarea VIII, there have been small landings by France since the early 1990's. In Subareas VIII and IX, Spain has recorded small landings in some years.

In Subarea X, there were fluctuating Faroese landings, and in 2000, there was an experimental fishery by the Azores (Portugal). This fishery has not been continued.

In Subarea XII, the Faroes dominated the fishery throughout the 1990's, with small landings by France. In one year each, New Zealand and Ireland have targeted orange roughy in this area. There are many areas of the Mid-Atlantic Ridge where aggregations of this species occur, but the terrain is very difficult for trawlers.

9.4.1.2 ICES advice

The advice statement from 2006 was:

Orange roughy can only sustain very low rates of exploitation. Currently, it is not possible to manage a sustainable fishery for this species. Hence, ICES recommends no fishery for this species. Bycatches in mixed fisheries should be limited as far as possible.

9.4.1.3 Management measures

For 2005 and 2006 , an overall TAC of 102 t was set for EC vessels that covered the zones: I, II, III, IV, V, VIII, IX, X, XII, XIV. This TAC was reduced to 44 in 2007 and 30t on 2008. The TAC applies to Community waters and international waters. Landings in relation to TAC were as follows,

		Landing (t)	
Year	TAC (t)	EC vessels	Total
2005	102	71	278
2006	102	58	149
2007	44	16	36
2008	30		

9.4.2 Data available

9.4.2.1 Landings and discards

Landings are in Table 9.4.0.

9.4.2.2 Length composition

Details on length composition for Orange Roughy in area VI and VII are given in section 9.3. The relationship between standard individual size (Ls in cm) and weight (W in g) has also been derived in Subarea X, based on the Azorean exploratory cruise (Anom. 2002):

W = 0.08 Ls2.74 (females)

W = 0.10 Ls2.76 (males)

9.4.2.3 Age composition

No data.

9.4.2.4 Weight at age

No data.

Maturity and natural mortality

No specific data for this subarea.

9.4.2.5 Catch, effort and research vessel data

For Division Vb, French CPUE were presented to WGDEEP in 2002 (Anon. 2002). These data are not informative of stock abundance as they represent very small catches.

For Subarea XII there are CPUE data are available from observed fishing trips as part of the Irish Sea Fisheries Board Deepwater Programme (BIM, WD, 2002a). These data are presented by ICES Division in Table 12.5.2. Irish CPUE are available from Subarea XIIb for 2002 only. No other CPUE data are available for other areas.

9.4.3 Data analysis

No assessment has been carried out during WGDEEP 2008.

9.4.4 Management considerations

ICES reiterates the advice from 2006 that orange roughy can only sustain very low rates of exploitation. Currently, it is not possible to manage a sustainable fishery for this species. Hence, ICES recommends no fishery for this species. Bycatches in mixed fisheries should be limited as far as possible.

Table 9.4.0a. Working Group estimates of landings of orange roughy, *Hoplostethus atlanticus*, in division Va

Year	Iceland	Total
1988	-	0
1989	-	0
1990	-	0
1991	65	65
1992	382	382
1993	717	717
1994	158	158
1995	64	64
1996	40	40
1997	79	79
1998	28	28
1999	14	14
2000	68	68
2001	19	19
2002	10	10
2003	0	0
2004	28	28
2005	9	9
2006	2	2
2007	0	0

Table 9.4.0b. Working Group estimates of landings of orange roughy, *Hoplostethus atlanticus*, in division Vb

Year	Faroes	France	Total
1988	-	-	0
1989	-	-	0
1990	-	22	22
1991	-	48	48
1992	1	12	13
1993	36	1	37
1994	170	+	170
1995	419	1	420
1996	77	2	79
1997	17	1	18
1998	-	3	3
1999	4	1	5
2000	155	0	155
2001	1	4	5
2002	1	0	1
2003	2	3	5
2004		7	7
2005	3	10	13
2006	0	0	0
2007	0	1	1

Table 9.4.0c. Working Group estimates of landings of orange roughy, *Hoplostethus atlanticus*, in subarea VIII

Year	France	Spain VIII & IX	E & W	Total
1988	-	-	-	0
1989	0	-	-	0
1990	0	-	-	0
1991	0	-	-	0
1992	83	-	-	83
1993	68	-	-	68
1994	31	-	-	31
1995	7	-	-	7
1996	22	-	-	22
1997	1	22	-	23
1998	4	10	-	14
1999	33	6	-	39
2000	47	-	5	52
2001	20	-	-	20
2002	20	-	-	20
2003	31			31
2004	43			43
2005	29			29
2006	43			43
2007	1			1

Table 9.4.0d. Working Group estimates of landings of orange roughy, *Hoplostethus atlanticus*, in subarea IX

Year	Spain	Total
1990	-	0
1991	-	0
1992	-	0
1993	-	0
1994	-	0
1995	-	0
1996	-	0
1997	1	1
1998	1	1
1999	1	1
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007*	0	0

Table 9.4.0e. Working Group estimates of landings of orange roughy, *Hoplostethus atlanticus*, in subarea X

Year	Faroes	France	Norway	E & W	Portugal	Ireland	Total
1989	-	-	-	-	-		0
1990	-	-	-	-	-		0
1991	-	-	-	-	-		0
1992	-	-	-	-	-		0
1993	-	-	1	-	-		1
1994	-	-	-	-	-		0
1995	-	-	-	-	-		0
1996	470	1	-	-	-		471
1997	6	-	-	-	-		6
1998	177	-	-	-	-		177
1999	-	10	-	-	-		10
2000	-	3	-	28	157		188
2001	84	-	-	28	343		455
2002	30	-	-	-	-		30
2003		1					1
2004	384					19	403
2005	128	2					130
2006	8						8
2007*	0						0

Table 9.4.0f. Working Group estimates of landings of orange roughy, *Hoplostethus atlanticus*, in subarea XII

Year	Faroes	France	Iceland	Spain	E & W	Ireland	New Zealand	Russia	Total
1989	-	0	-	-	-			-	0
1990	-	0	-	-	-			-	0
1991	-	0	-	-	-			-	0
1992	-	8	-	-	-			-	8
1993	24	8	-	-	-			-	32
1994	89	4	-	-	-			-	93
1995	580	96	-	-	-			-	676
1996	779	36	3	-	-			-	818
1997	802	6	-	-	-			-	808
1998	570	59	-	-	-			-	629
1999	345	43	-	43	-			-	431
2000	224	21	-	-	2			12	259
2001	345	14	-	-	2		450	-	811
2002	+	6	-	-	-		0	-	6
2003		64				136	0	-	200
2004	176	131					0		307
2005	158	36					0		193
2006	81	15							96
2007*	20								20

Table 9.4.0g. Orange roughy total international landings in the ICES Area, excluding VI and VII.

Year	IV	Va	Vb	VIII	IX	X	XII	All areas
1988		0	0	0	0	0	0	0
1989		0	0	0	0	0	0	0
1990		0	22	0	0	0	0	22
1991		65	48	0	0	0	0	113
1992		382	13	83	0	0	8	486
1993		717	37	68	0	1	32	855
1994		158	170	31	0	0	93	452
1995		64	420	7	0	0	676	1167
1996		40	79	22	0	471	818	1430
1997		79	18	23	1	6	808	935
1998		28	3	14	1	177	629	852
1999		14	5	39	1	10	431	500
2000		68	155	52	0	188	259	722
2001		19	5	20	0	455	811	1310
2002		10	1	20	0	30	6	67
2003		+	5	31	0	1	200	237
2004		28	7	43	0	403	307	788
2005		9	13	29	0	83	193	327
2006		2	0	43	0	8	96	149
2007*	14		1	1			20	36
Total	14	1683	1002	526	3	1833	5387	10447

*prelininary

Table 9.0.1. CPUE from observed trips on Irish trawlers in 2002, from data made available by BIM. Catch in kg, effort in hours, CPUE in kg per hour and kg per haul. Hauls with zero catches are removed for ease of comparison between years, as zero haul data unavailable for 2001 (this applies to other subareas VI and VII which had data for both years).

Year	ICES	Effort	Catch	CPUE kg per hour	No. hauls	Kg per haul
2002	XIIb	29.5	5440	184.4	20	272

10 Roundnose grenadier (Coryphaenoides rupestris)

10.1 Stock description and management units

ICES WGDEEP has in the past proposed three stocks of roundnose grenadier in the NE Atlantic:

Skagerrak (IIIa).

The Faroe-Hatton area, Celtic sea (Divisions Vb and XIIb, Subareas VI, VII).

On the Mid-Atlantic Ridge (Divisions Xb, XIIc, Subdivisions Va1, XIIa1, XIVb1).

The current perception is based on what is believed to be natural restrictions to the dispersal of all life stages. The Wyville-Thomson Sill may separate populations further south on the banks and slopes off the British Isles and Europe from those distributed to the north along Norway and in the Skagerrak. Considering the general water circulation in the North Atlantic, populations from the Icelandic slope may be separated from those distributed to the west of the British Isles. It has been postulated that a single population occurs in all the areas south of the Faroese slopes, including also the slopes around the Rockall Trough and the Rockall and Hatton Banks but the biological basis for this remains hypothetical.

In 2007, WGDEEP examined the available evidence for stock discrimination in this species but, on the available evidence, was not able to make further progress in discriminating stocks. On this basis WGDEEP concluded there was no basis on which to change current practice.

Catches data for roundnose grenadier in 2006 and 2007 aggregated at the level of statistical rectangle were provided to the working group by France, Ireland, the UK (England and Wales and Scotland) and Iceland. These are shown in figure 12.1.1 and 10.1.2.

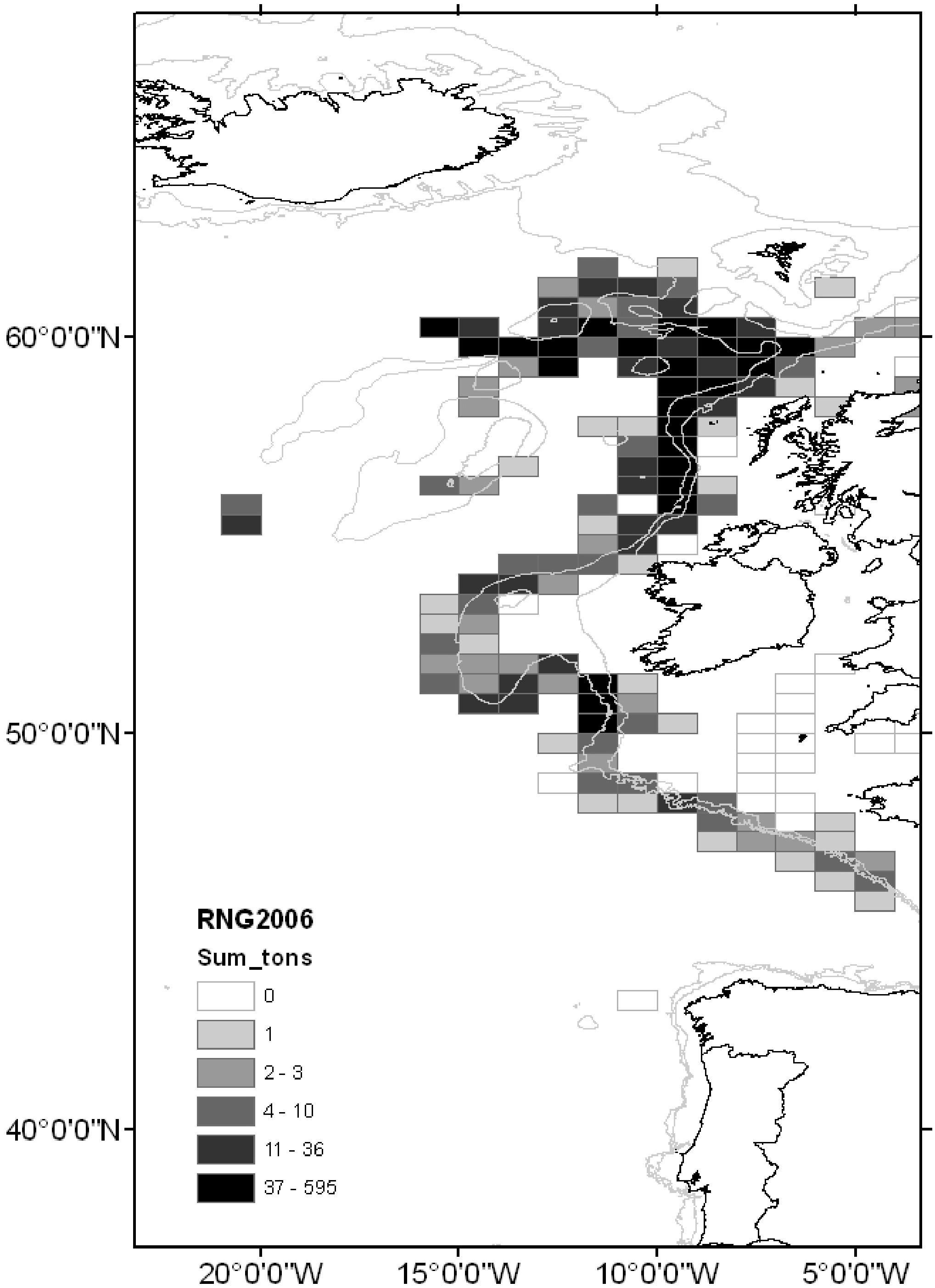


Figure 10.1.1. Catches of roundnose grenadier by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2006.

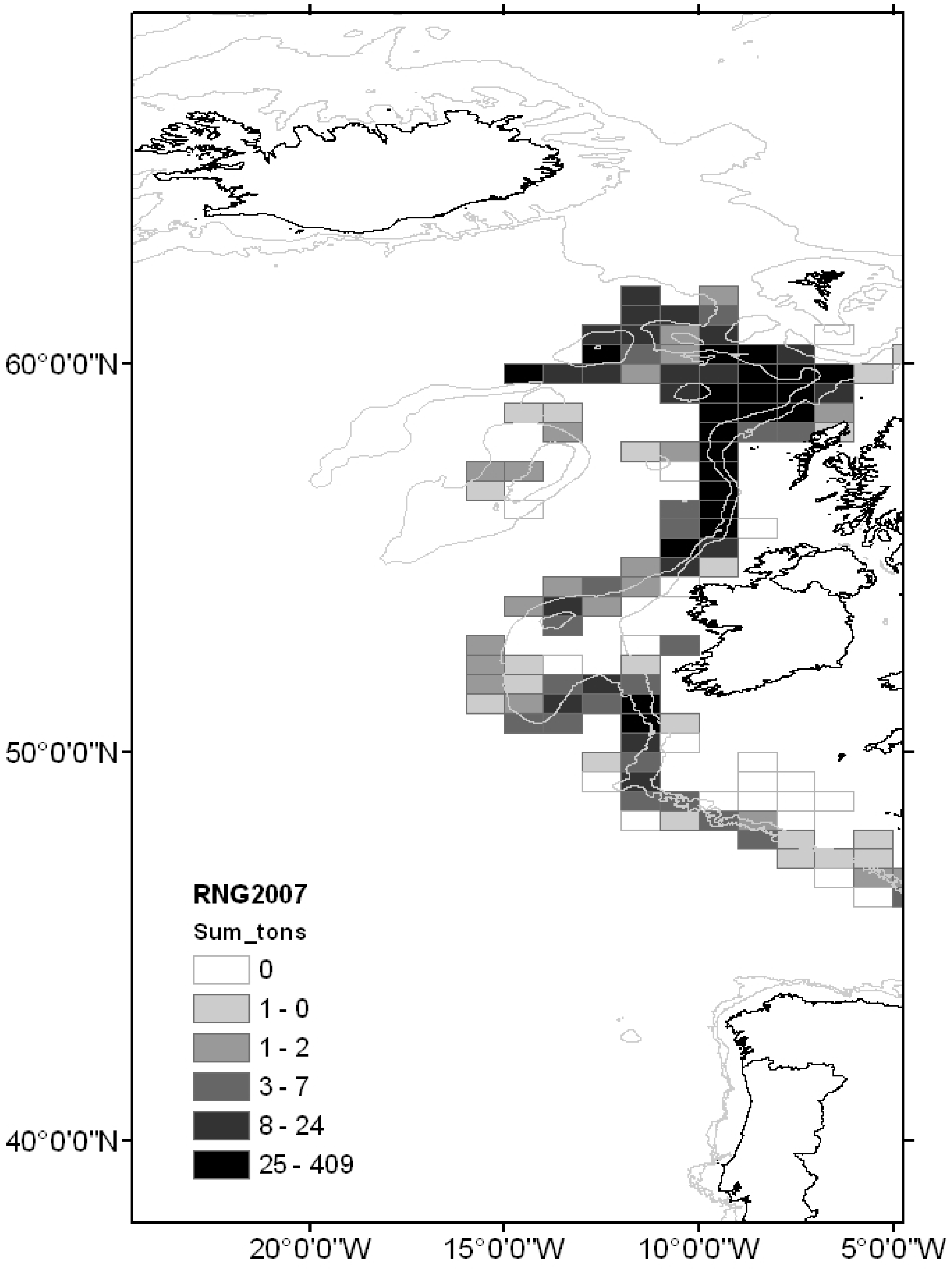


Figure 10.1.1. Catches of roundnose grenadier by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2007.

10.2 Roundnose Grenadier (*Coryphaenoides rupestris*) in Division Vb and XIIb, Subareas VI and VII

10.2.1 The fishery

The majority of landings of roundnose grenadier from this area are taken by bottom trawlers. To the west of the British Isles, in divisions Vb, VIa, VIb2 and sub-areas VII, French trawlers catch roundnose grenadier in a multispecies deepwater fishery. The Spanish trawling fleet operates further offshore along the western slope of the Hatton Bank in ICES divisions VIb1 and XIIb.

10.2.1.1 Landings trends

Over the past two decades, in division Vb, the landings have reached more than 3 800 t in 1991 and more than 2000 t in 2001. Between these two periods, the landings were low in the mid-1990s (less than 700 t in 1994). After 2001, it decreased to about 1 000 t in 2002 but increase further to about 1800t in both 2005-2006 and 1 500t in 2007. These landings are almost exclusively from French and Faroese trawlers (Table 10.2.0a-f).

In sub-area VI, the highest landings were observed in 2001 (close to 15 000 t) and has decreased to less than 1500 t in 2007. Most of these landings are caught by French trawlers.

In sub-area VII, landings close to 2 000 t were recorded in 1993-94, recent annual landings are much lower (from 200 to 400 t/year in 2005-2007).

In ICES division XIIb, the main fishery is by far from Spanish trawlers. After a peak to more than 32 000 t in 2001, the reported landings have decreased to about 6000 t in 2005 and 5260 t in 2006. There was significant Faroese landings in the mid-1990s, but this fishery disappeared in the 2000s, French landings has varied over time with a maximum of 1 700 t in 2004 and has strongly decreased since that year to 85 t in 2006. At the time of the meeting, there were no report of French landings in 2007 and Spanish data in XII were not available for this year. Only 2 t were reported by Faroese fleet for division XIIb.

The landings data are considered uncertain in division XIIb, because unreported landings may occur in international waters. In addition to this, all national landings data were not reported by new ICES divisions and some landings were allocated to divisions according to knowledge of the fisheries from the working group. Lastly significant unallocated landings occurred in 2005 (Table 10.2.0e).

10.2.1.2 ICES advice

In 2006, the ICES advice was: For the fishery in Divisions Vb, VI, VII, and XIIb, the fishing pressure should be reduced considerably to low levels and should only be allowed to expand again very slowly if and when reliable indicators show that increased harvests are sustainable. ICES recommends a 50% reduction of effort compared to the level before the expansion of the fishery started (1990-1996). This is interpreted as a reduction in catches of 50% over that period. This means that the catch level in 2007 should be at most 6 000 t.

10.2.1.3 Management

TACs for EU vessels for deepwater species has been set since year 2003. These TACs are revised every second year. The EU TAC and national quotas from member countries apply to all vessels in EU EEZ and to EU vessels in international waters.

For division Vb and sub-areas VI and VII, a TAC 4600 t in 2007 and 2008.

In sub-areas VIII, IX, X, XII and XIV the TAC was set at 6114 t in 2007-2008. This TAC covers areas with minor roundnose grenadier catches (VIII, IX and X), part of the assessment area (division XIIb, the western slope of the Hatton bank) and the mid-Atlantic ridge (divisions XIIa,c and sub-area XIV). The main countries having quotas allocations under this TAC are Spain and Poland. Therefore these quota allocations are based upon historical landings in XIIb for Spain and in XIIa,c (mid-Atlantic ridge) for Poland.

The table below summarizes the TACs in the two management areas and landings in the assessment area.

	Vb, VI, VII		VIII, IX, X, XII, XIV		Total international
	EU TAC	EU Landings	EU TAC	EU Landings XIIb	Landings Vb, VI, VII, XIIb
2005	5253	4963	7190	5926	10890
2006	5253	3710	7190	5285	8995
2007	4600	2472*	6114	0*	2472*
2008	4600		6114		

* data available to the working group were incomplete

After the introduction of TACs in 2003 and 2005, the reported landings have decreased. However, the reported decrease may not be real as significant misreporting is likely to have occurred.

In addition to TACs, further management measures applicable to EU fleets are a licensing system, fishing effort limits, the obligation to land the fish in designated harbours and a regulation for on-board observations according to Council Regulation (EC) No 2347/2002 of 16 December 2002. In the Faroes waters, the catch of roundnose grenadier is subject to a minimum size of 40 cm total length, other regulations that may apply to roundnose grenadier are detailed in the overview section.

10.2.2 Data available

10.2.2.1 Landings and discards

Landings time series data per ICES areas are presented in Tables 10.2.1 and 10.2.2.

Landings data by new ICES areas were available from France, Norway and UK (England and Wales and Scotland) from 2005. No other country provided data by new ICES area. Catch in sub-area XII were allocated to division XIIb (western Hatton bank) or XIIa,c (mid-Atlantic ridge) according to knowledge of the fisheries from WG members. The time series of Spanish landings from division XIIb was revised according to Statland data where very high landings were reported for some years (e.g. 31000 t in 2001). Statland reports landings in sub-area XII consistently with what this working group did in the past. All these landings were allocated to sub-area XIIb because the Spanish fleet is not known to operate significantly on the mid-Atlantic ridge.

Landings per ICES rectangle were available from France, UK (England and Wales and Scotland) and Ireland and were plotted to display the geographical distribution of the fishery (Figures 10.2.0a-f).

Catch and discards by haul were available from observer programs. From the French observer program, total catch, landings and discards and catch, landings and discards of roundnose grenadier were available on a haul by haul basis for 2004-2006.

Discard data (quantities and length distribution) were also available from the on-board observation of the French fishery, 2004-06, from French on-board observations on French vessels in 1997-98 and from Scottish observers on-board of French vessels, 1997-2001. The length distribution of discards from all these observation seem quite consistent

Based on EU observer program 2004-05, about 30% by weight and 50% by number of the catch of roundnose grenadier is discarded, due to small size. This figure is higher than in previous sampling where the discarding rate in the French fisheries was estimated slightly above 20% from sampling in 1997-98 (Allain et al., 2003). The change may come from a combination of changes in the depth distribution of the fishing effort and a decrease in the abundance of larger fish as visible in the landings.

The modal discarded length has remained constant. (Figures 10.2.1-10.2..4)

The mode of the length distribution of the discards from the Spanish fleet in divisions VIb and XIIb is slightly smaller, probably due to different sorting habits in relation to different markets (Figure 10.2.6). It is therefore important that length distribution of the landings and discards are provided to the working by all fleets exploiting the stock.

10.2.2.2 Length composition of the landings.

Size frequency data (and corresponding weight data) for roundnose grenadier were available for French catches landed in France, 1990-2007 (Figure 10.2.6).

10.2.2.3 Age composition

Age estimates were available from France. This data set may be heterogeneous, because 3 different readers estimated the age over these different years and also because measuring the fish on-board may lead to different age-length relationship than measuring the landed fish that may have lost water for some days in ice. Large discrepancies between readers were observed in a recent otolith exchange (ICES 2007).

Age composition of the French landings have been routinely estimated since 2001. Formerly age length keys were derived from a cruise in 1999 and from sampling on-board of commercial trawler in 1996-97 (Lorance et al., 2001,2003). Preliminary analysis of the length at age data showed that age length key (ALK) are very stable over years. ALK for years 1999 and 2001-04 were very similar, the ALK for 2005 appeared different and the change was ascribed to a change of the reader.

This data is based upon ALK from age estimates in 1996, 1999 and 2002-2005. Otoliths from 1996 and 1999 were collected respectively on board of commercial trawlers and during a scientific cruise; otoliths for 2002-05 were routinely sampled from the landings.

Catch at age tables from 1996 to 2007 were prepared using two methods, both based on available datasets in division Vb, sub-areas VI and VII. Method 1 was based on landings datasets (weight and length distribution) not including discards as in previous reports (WGDEEP 2004 and 2006). Method 2 was based on estimates of catch by merging together the available discards and landings datasets. For both methods, catch at ages were computed with weights at age estimated for each year.

For method 2, length distributions and percentage of discards in the total weight were missing for 1996, 2002, 2003, 2007. Values for those years were assumed to be equals to the neighboring years in 1996 and 2007 and interpolated with data from 2001 and 2004 for the years 2002-2003.

The two catch at age tables are presented in tables 10.2.1 and 10.2.2. In both tables, the age landed in highest numbers are 20 to 30 years old. The table built from catch estimates has in average 37% more individuals than its equivalent based on landings. Catch at age table based on landings have individuals ranging from 9 to 54 years old while the table based on catch estimates ranges from 3 to 54 years old. The 3-8 years old classes however account for 0.2% of the total number of individuals.

10.2.2.4 Weight at age

No new data.

10.2.2.5 Maturity and natural mortality

No new data on maturity and natural mortality was collected in recent years. Natural mortality was previously estimated from catch curves and an estimated M=0.1 was used by the working group since 2002. It should be kept in mind than this estimate is based on limited data.

10.2.2.6 Research vessel survey and CPUE

Research Vessel survey

Only one cruise relevant to roundnose grenadier is currently carried out on a yearly basis by FRS (Scotland). This survey covers only a small area relative to the total distribution of the stock. Catch rate per depth band and year from this survey were computed (Figure 10.2.6). Due to small number of hauls in each depth stratum/year, the confidence intervals in each stratum are wide. Further analysis of this data is required to derive a time series of stratified estimated of the catch rates.

Although still a relatively short time series, this is the only known current trawl survey in the region and therefore represent vital fisheries-independent monitoring of the fish populations in the region.

The length composition observed from the same survey (Figure 10.2.7) seems consistent with formerly published data about the length composition of the roundnose grenadier to the west of Scotland. These pre-exploitation data indicate that roundnose grenadier to the west of Scotland comprise mainly adults in the shallowest (500-750m) part of the range, mixing with juveniles in the mid-range (~ 1000 m), at greater depth, fish of intermediate size become increasingly dominant (Gordon, 1979). However, this pattern was not observed in recently analysed archive data from the slope of the Porcupine Bank (Figure 10.2.8).

CPUE from the French trawl fishery to the West of the British Isles.

French CPUE series available from a reference area were available for total catch, total catch of the reference fleet and catches from the reference fleet where roundnose grenadier made up more than 10% of total landings. See section 3.1.5 for a general description of methods.

10.2.2.6.1 Effort data

French effort data series were updated with 2007 data.

10.2.3 Data Analyses

10.2.3.1 CPUE trends

The increasing CPUE trends in early years are considered to reflect improvements in skipper expertise and vessel equipment. The strong decline from 1991 may reflect substantial depletion of roundnose grenadier in the reference area from which the abundance indices are derived.

10.2.3.2 Separable VPA

Separable VPAs were performed on method 1 and 2 catch at age tables. As the stock assessment software VPA95 is limited to 25 age groups, both types of run were tested on the 16-40+ and 10-34+ ranges of ages. Reference age was set to the actual age group 25 of the stock in both types of runs and the program was used with the default settings. Exploratory runs were done for F=0.05, F=0.1 and F=0.15. For each of these values, three selectivity factors were tried (S=0.6, S=0.8, S=1).

The residuals patterns were different for each type of runs. SVPAs from landings estimates (method 1) provided higher residuals (figure 10.2.11).

For both methods, the fishing mortality at age showed a similar pattern than those obtained during the 2006 WGDEEP meeting, with an increasing fishing mortality with age (figure 10.2.12) and a strong peak of fishing mortality at age 32 before decreasing for older ages. This peak may be related to discrepancies in the Age Length Key for older ages. Runs from catch estimates show, in comparison to runs based on landings, lower fishing mortality for individuals older than 22-23 and higher F for younger fishes. Stock biomass was also higher for runs based on catch estimates. (figure 10.2.13)

Overall, the group considered the outputs inconsistent for both methods. A sensitivity analysis was carried on F and S for method 1. Selectivity factors do not affect significantly model outputs (figure 10.2.14). Changing terminal fishing mortality from 0.05 to 0.9 with a 0.1 increment showed a strong sensitivity of the model to this parameter.

Annual fishing mortality plots (figure 10.2.15) showed a rise of F from 0.07 in 1996 to 0.2-0.4 in 2001. After 2001, F depends upon the input terminal F.

Biomass estimates strongly decrease over time regardless of the value of terminal F (figure 10.2.16).

10.2.4 Comments on assessment

Given that only a small number of years were covered by the assessment and roundnose grenadier live up to age 60, the results should be interpreted with considerable caution.

Additionally it is probably necessary to prepare tuning data taking account depth and seasonal factors when developing time series of abundance indices.

The apparent decline in CPUE in the reference area appears inconsistent with the presence of older fish in the current landings. However, this fishery in Vb, VI, VII and XIIb has expanded spatially with time and it is possible that sequential depletion of components of the stock may be occurring. Little is known about migration or mixing within the stock.

10.2.5 Management considerations

Overall the stock status is uncertain but there are some evidences of biomass depletion for Vb, VI and VII. Due to the lack of landings data for XIIb in 2007, assessment was carried out on areas Vb, VI and VII while the stock is believed to cover also division XIIb.

Given the uncertainty and the fact that there is evidence of depletion, the advice should be precautionary until more data is available.

Due to technical interactions the group considered that the management of this fishery should take account of advice given for other species caught in the fishery such black scabbardfish.

Table 10.2.0a. Working group estimates of landings of roundnose grenadier from division Vb

Year	Faroes	France	Norway	Germany	Russia/USSR	UK (E+W)	UK (Scot)	TOTAL
1988				1				1
1989	20	181		5	52			258
1990	75	1470		4				1549
1991	22	2281	7	1				2311
1992	551	3259	1	6				3817
1993	339	1328		14				1681
1994	286	381		1				668
1995	405	818						1223
1996	93	983		2				1078
1997	53	1059						1112
1998	50	1617						1667
1999	104	1861	2			29		1996
2000	48	1699		1		43		1791
2001	84	1932						2016
2002	176	774				81		1031
2003	490	1032				10		1532
2004	508	986	0	0	6	0	76	1576
2005	903	912	1	0	1	0	48	1865
2006	900	875	0	0	0	0	0	1775
2007*	867	636	0	0	0	0	0	1503

Table 10.2.0b. Working group estimates of landings of roundnose grenadier from sub-area VI

Year	Estonia	Faroes	France	Germany	Ireland	Lithuania	Norway	Poland	Russia	Spain	UK (E+W)	UK (Scot)	TOTAL
1988		27		4							1		32
1989		2	2211	3								2	2218
1990		29	5484	2									5515
1991			7297	7									7304
1992		99	6422	142			5				2	112	6782
1993		263	7940	1								1	8205
1994			5898	15	14							11	5938
1995			6329	2	59							82	6472
1996			5888									156	6044
1997		15	5795		4							218	6032
1998		13	5170				21			3			5207
1999			5637	3	1					1			5642
2000			7478		41		1			1002	1	433	8956
2001	680	11	5897	6	31	137	32	58	3	6942	21	955	14773
2002	821		7209		12	1817		932			6	741	11538
2003	52	32	4924		11	939		452	3			185	6598
2004	26	12	4577	0	8	961	0	13	72	251	0	72	5992
2005	80	24	2899	0	17	92	1	0	71	468	0	44	3696
2006	0	25	1931	0	5	112	0	0	0	0	0	15	2088
2007*	0	10	1427	0	0	0	0	0	0	0	0	0	1437

Table 10.2.0c. Working group estimates of landings of roundnose grenadier from sub-area VII

Year	Faroes	France	Ireland	Spain	UK (Scot)	TOTAL
1988						0
1989		222				222
1990		215				215
1991		489				489
1992		1556				1556
1993		1916				1916
1994		1922				1922
1995		1295				1295
1996		1051				1051
1997		1033		5		1038
1998		1146		11		1157
1999		892		4		896
2000		859				859
2001		938	416			1354
2002	1	449	605		3	1058
2003		373	213		1	587
2004	0	247	320	0	0	567
2005	0	146	55	0	0	201
2006		248	138	0	0	386
2007*		177	28	0	0	205

Table 10.2.0d. Working group estimates of landings of roundnose grenadier from sub-area XIIb

Year	Estonia*	Faroes	France**	Germany	Iceland	Ireland	Lithuania	Spain***	USSR/Russia	UK (E+W)	UK (Scotl.)	Norway	Total
1988													0
1989			0						52				52
1990			0										0
1991			14						158				172
1992			13										13
1993		263	26	39									328
1994		457	20	9									486
1995		359	285										644
1996		136	179		77			1136					1528
1997		138	111					2476					2725
1998		19	116					3829					3964
1999		29	287					6171	6				6493
2000		6	374	9				13418		9	6		13822
2001		2	159			3		31602			7	1	31774
2002			14				18	5359		1	2		5394
2003			539			1	31	18173			1		18745
2004		8	1,693				120	8151	91		4		10067
2005	20	5	508				13	5035	81		350		6012
2006	27	1	85				6	5167					5286
2007****		2	0					0					2

Table 10.2.0e. Working group estimates of landings of roundnose grenadier unallocated landings in Vb VI and VII

Year	Unallocated
1988	
1989	
1990	
1991	
1992	
1993	
1994	
1995	
1996	
1997	
1998	
1999	
2000	
2001	208
2002	504
2003	952
2004	0
2005	5003
2006	0
2007*	0

Table 10.2.0f. Working group estimates of landings of roundnose grenadier Vb, VI, VI and XIIb

Year	Vb	VI	VII	XIIb	Unallocated	Vb,VI,VII	Overall total
1988	1	32	0	0	0	33	33
1989	258	2218	222	52	0	2698	2750
1990	1549	5515	215	0	0	7279	7279
1991	2311	7304	489	172	0	10104	10276
1992	3817	6782	1556	13	0	12155	12168
1993	1681	8205	1916	328	0	11802	12130
1994	668	5938	1922	486	0	8528	9014
1995	1223	6472	1295	644	0	8990	9634
1996	1078	6044	1051	1528	0	8173	9701
1997	1112	6032	1038	2725	0	8182	10907
1998	1667	5207	1157	3964	0	8031	11995
1999	1996	5642	896	6493	0	8534	15027
2000	1791	8956	859	13822	0	11606	25428
2001	2016	14773	1354	31774	208	18143	49917
2002	1031	11538	1058	5394	504	13627	19020
2003	1532	6598	587	18745	952	8717	27461
2004	1576	5992	567	10067	0	8136	18203
2005	1865	3696	201	6012	5003	5763	11775
2006	1775	2088	386	5286	0	4249	9535
2007*	1503	1437	205	2	0	3144	3146

Table 10.2.1 Catch at age table based on method 1 (landings not including discards)

Age	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	3	12	4	2	1	1	2	2
10	0	0	0	0	2	11	4	0	0	0	3	2
11	1	1	0	1	13	57	17	7	3	2	10	10
12	2	3	1	4	24	82	26	13	8	5	15	14
13	5	7	4	13	40	128	44	24	18	11	23	19
14	5	6	4	12	45	152	50	26	17	10	27	24
15	18	24	15	44	121	308	113	65	56	31	58	48
16	38	55	34	96	255	644	240	143	124	68	121	98
17	75	95	69	159	357	829	337	205	188	107	161	128
18	115	145	109	241	508	1102	472	290	277	157	221	171
19	183	207	179	364	652	1290	613	376	393	225	272	202
20	209	234	209	369	632	1263	626	387	388	232	264	198
21	338	357	339	565	809	1351	813	496	553	339	316	224
22	277	303	275	503	802	1440	762	478	516	304	319	231
23	390	409	392	665	917	1493	921	562	640	392	353	247
24	454	458	458	670	870	1352	942	577	631	405	333	232
25	465	475	469	645	826	1306	933	569	604	397	318	227
26	434	442	432	595	779	1301	876	530	545	364	302	222
27	358	365	361	493	631	996	706	437	462	305	240	173
28	342	316	338	456	533	839	637	386	394	271	209	148
29	362	359	344	450	540	790	621	378	400	278	202	141
30	254	247	258	314	360	545	454	274	273	194	142	100
31	300	286	301	332	395	593	489	310	290	211	149	104
32	280	260	275	288	373	605	472	296	270	194	145	105
33	250	242	230	173	219	315	322	210	165	134	80	59
34	147	152	152	133	167	242	225	144	125	94	60	43
35	151	139	133	106	125	166	178	112	97	82	43	33
36	95	96	96	61	83	123	129	87	62	51	29	23
37	105	101	105	60	80	117	129	91	61	52	28	22
38	61	67	63	53	70	97	87	63	52	38	24	17
39	48	49	49	32	48	74	66	46	32	26	16	12
40	37	33	35	27	35	49	47	31	28	22	12	9
41	54	50	56	39	48	74	75	52	36	30	18	13
42	31	30	30	22	26	34	37	25	20	17	9	7
43	47	57	51	16	39	46	46	45	23	20	10	7
44	25	24	26	11	17	27	30	23	12	11	6	4
45	38	44	39	17	30	39	44	31	21	18	9	7
46	23	23	23	18	17	27	34	19	15	13	7	6
47	2	2	2	4	4	5	4	2	3	2	1	1
48	9	9	9	10	10	14	14	9	8	6	4	3
49	8	11	10	3	6	8	10	8	3	3	1	1
50	8	14	11	3	6	7	9	9	2	3	1	1
51	6	5	5	1	3	3	4	3	2	2	1	1
52	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0
54	4	7	6	1	3	3	4	4	1	1	1	0
55	0	0	0	0	0	0	0	0	0	0	0	0

Table 10.2.2. Catch at age table based on method 2 (combined landings and discards)

Age	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	1	1	1	1	2	3	2	1	1	1	1	0
4	1	1	2	3	4	6	3	2	2	2	1	1
5	3	3	3	6	9	12	7	4	4	3	3	2
6	2	2	2	3	5	7	4	2	2	2	1	1
7	2	2	2	4	6	8	5	3	3	2	2	1
8	5	5	5	9	14	19	11	7	6	5	4	3
9	10	10	10	20	30	46	26	15	13	11	10	7
10	25	25	27	49	73	105	62	35	32	27	23	17
11	46	47	49	92	141	214	123	69	61	52	46	34
12	45	46	48	91	142	223	127	70	61	51	47	36
13	52	54	55	105	167	274	156	85	75	60	57	43
14	62	64	66	127	200	328	186	101	88	72	68	51
15	92	95	95	189	312	522	296	162	141	107	108	81
16	152	156	152	312	528	920	518	282	243	178	188	142
17	191	197	191	385	639	1118	638	352	310	221	231	174
18	255	262	253	509	844	1463	842	470	419	292	306	228
19	304	312	311	633	999	1693	1001	576	532	357	365	264
20	327	336	332	609	946	1620	961	555	515	351	348	253
21	417	428	427	776	1111	1796	1121	683	670	442	410	293
22	379	389	384	733	1116	1848	1125	668	638	416	408	294
23	432	444	443	827	1153	1872	1182	728	722	464	432	306
24	480	493	504	815	1096	1763	1135	713	720	476	417	297
25	511	524	524	790	1055	1706	1101	693	701	473	401	292
26	504	517	510	766	1031	1694	1073	663	660	456	387	288
27	399	410	409	606	815	1314	850	537	545	367	306	225
28	330	339	362	552	677	1109	719	455	462	320	269	193
29	411	422	386	535	697	1051	698	451	467	335	258	184
30	269	276	286	389	484	768	506	324	333	235	191	136
31	334	342	348	407	533	832	545	347	356	263	199	141
32	301	309	325	375	515	849	546	343	346	252	198	146
33	328	336	288	229	344	514	345	225	235	190	125	93
34	189	194	187	168	239	369	243	156	161	122	85	63
35	186	191	174	140	197	265	188	128	139	118	65	51
36	125	128	125	86	131	210	138	88	91	73	46	38
37	139	142	140	85	138	212	142	93	97	79	47	38
38	93	95	86	67	108	154	105	69	73	52	35	26
39	69	70	68	46	77	120	76	47	47	39	25	19
40	42	43	43	33	52	78	54	36	38	29	17	14
41	62	64	69	52	74	123	80	50	51	41	28	21
42	41	42	39	28	43	58	42	29	31	25	14	11
43	96	99	85	28	81	97	65	43	44	37	19	13
44	34	35	36	18	32	51	33	20	20	18	11	8
45	64	66	57	27	55	74	50	32	34	30	15	13
46	27	28	27	25	27	47	31	20	21	17	11	10
47	2	2	2	4	4	6	4	3	3	2	2	1
48	10	10	10	12	13	21	15	10	10	8	5	4
49	18	18	15	6	12	18	11	6	6	6	3	3
50	24	24	19	6	15	18	10	6	5	6	3	2
51	8	8	7	2	6	7	5	4	4	4	1	1
52	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0
54	12	12	10	3	8	9	5	3	2	3	1	1
55	0	0	0	0	0	0	0	0	0	0	0	0

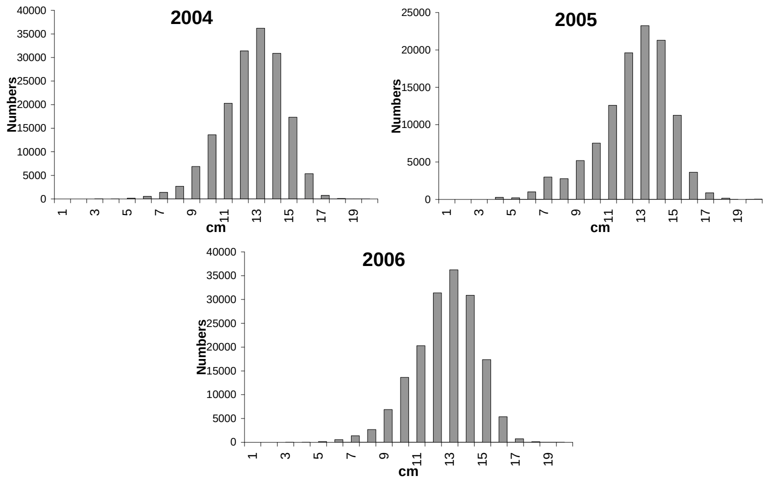


Figure 10.2.1. Length distribution of the discards of roundnose grenadier from 2004 to 2006, from observer program,

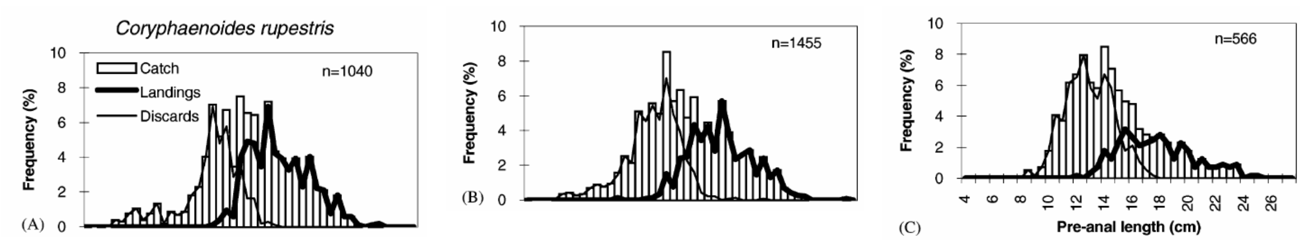


Figure 10.2.2. Length distribution of the discards and landings of roundnose grenadier in 1996-97 by depth, left: 800-1000m, centre: 100-1200m, right: 1200-1400 m, sampled on-board French vessels, (redrawn from Allain, 2003).

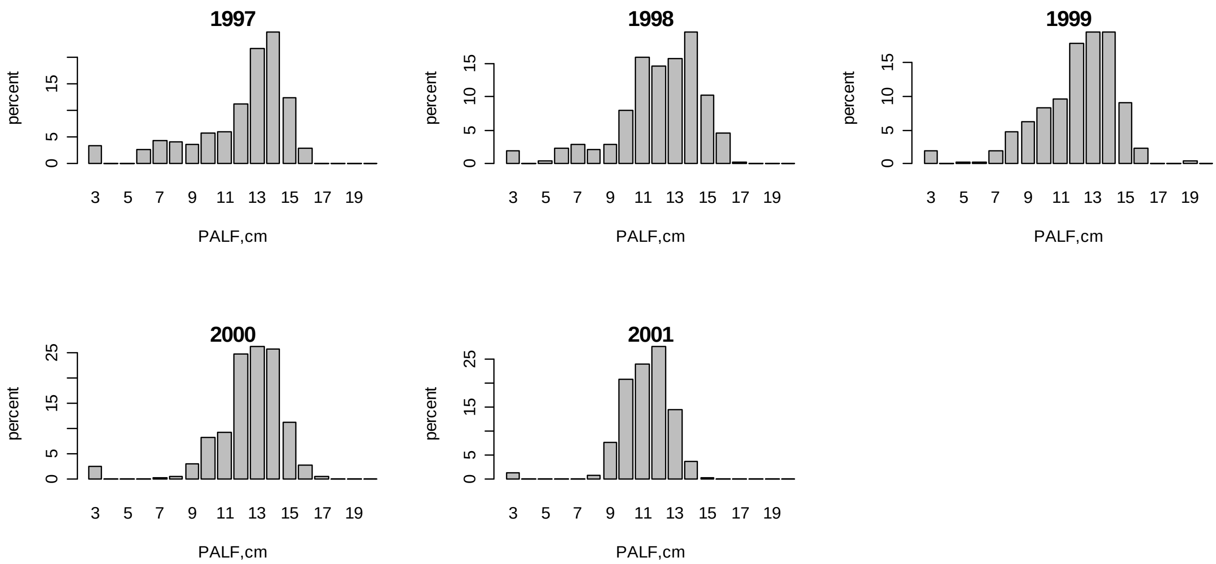


Figure 10.2.3. Length distribution of the discards of the French fleet, sampled on-board French vessels by Scottish observers, 1997-2001.

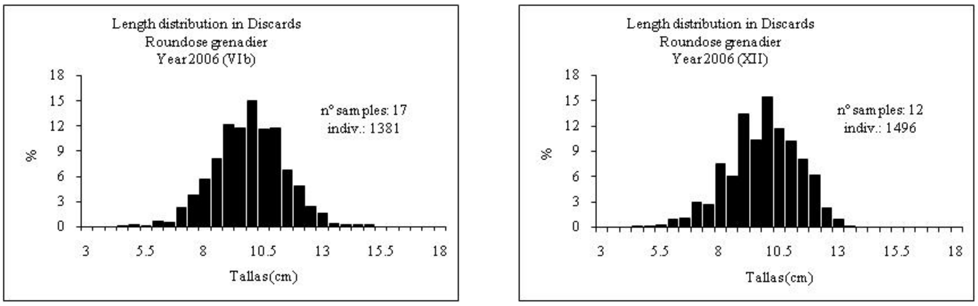


Figure 10.2.4. Length distribution of the discards of the Spanish fleet in divisions VIb and XIIb based on on-board observations in 2006.

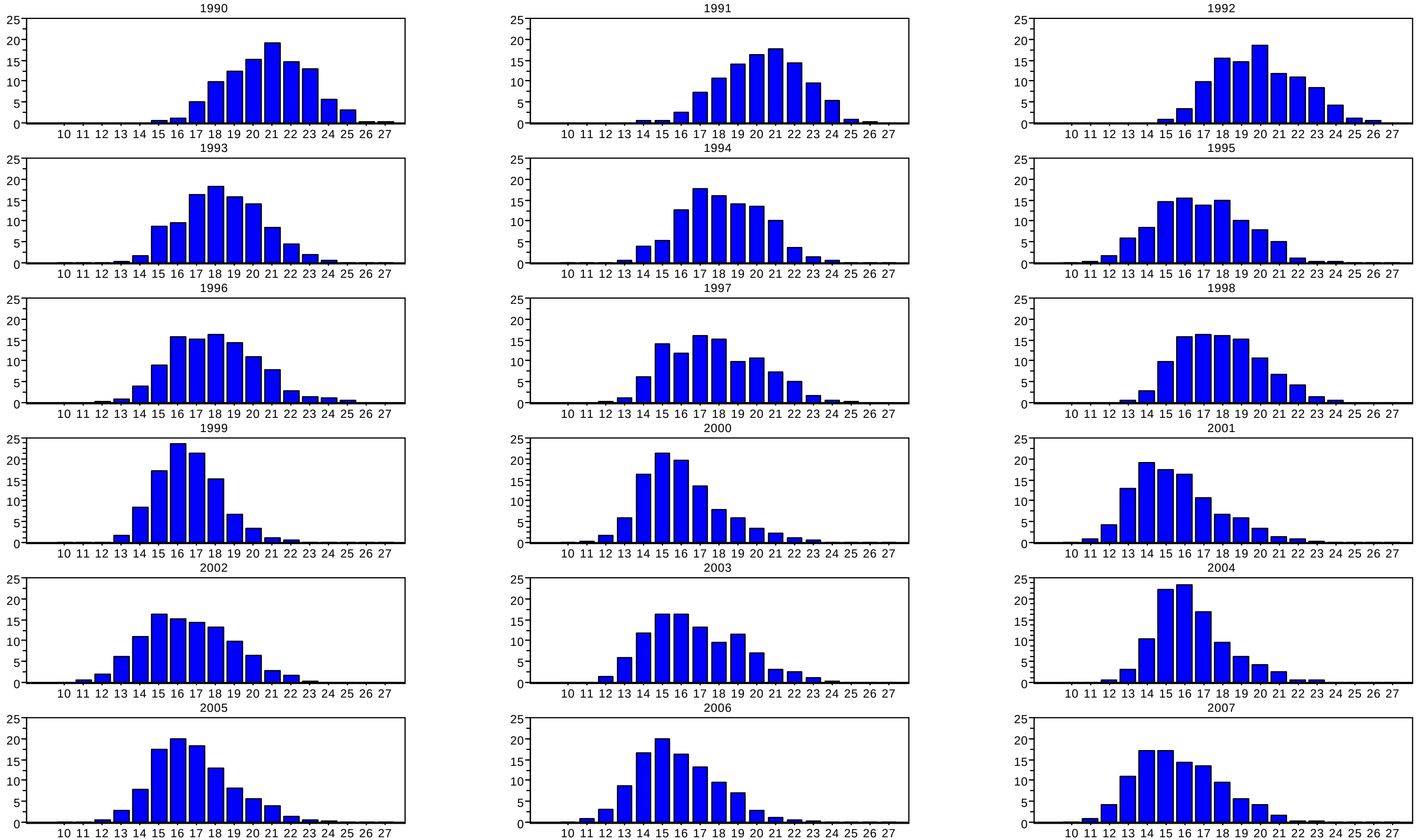


Figure 10.2.5. Length distribution of the discards of the French fleet, sampled on-board French vessels by Scottish observers, 1997-2001.

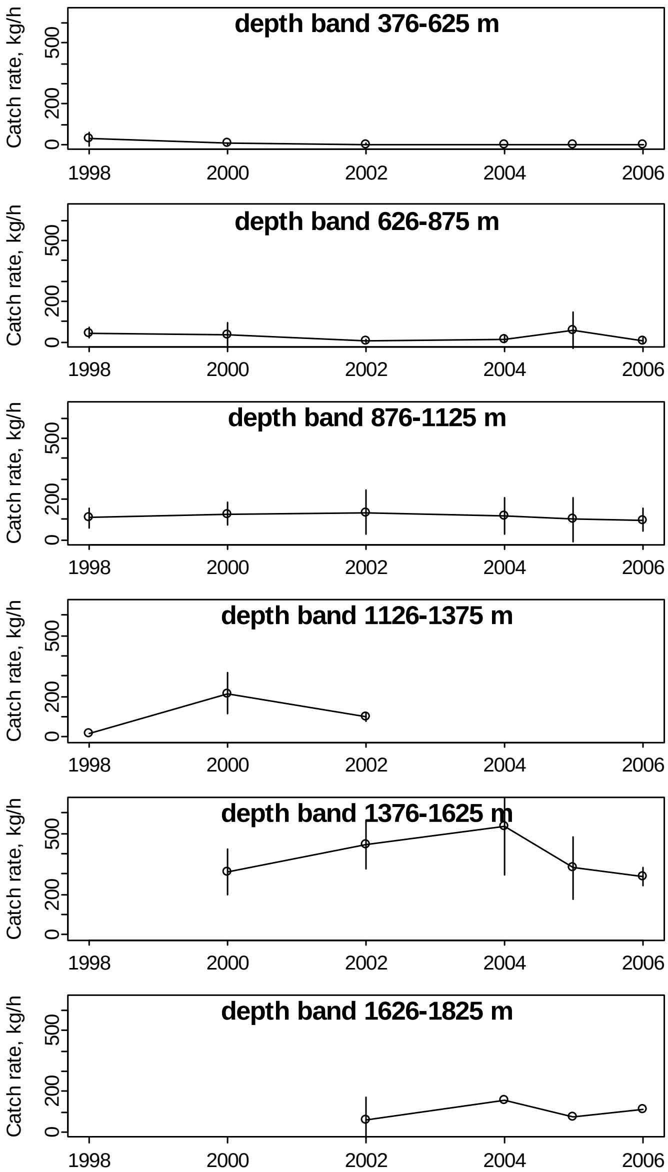


Figure 10.2.6. Catch rates of roundnose grenadier in FRS survey, 1998-2006 per depth band.

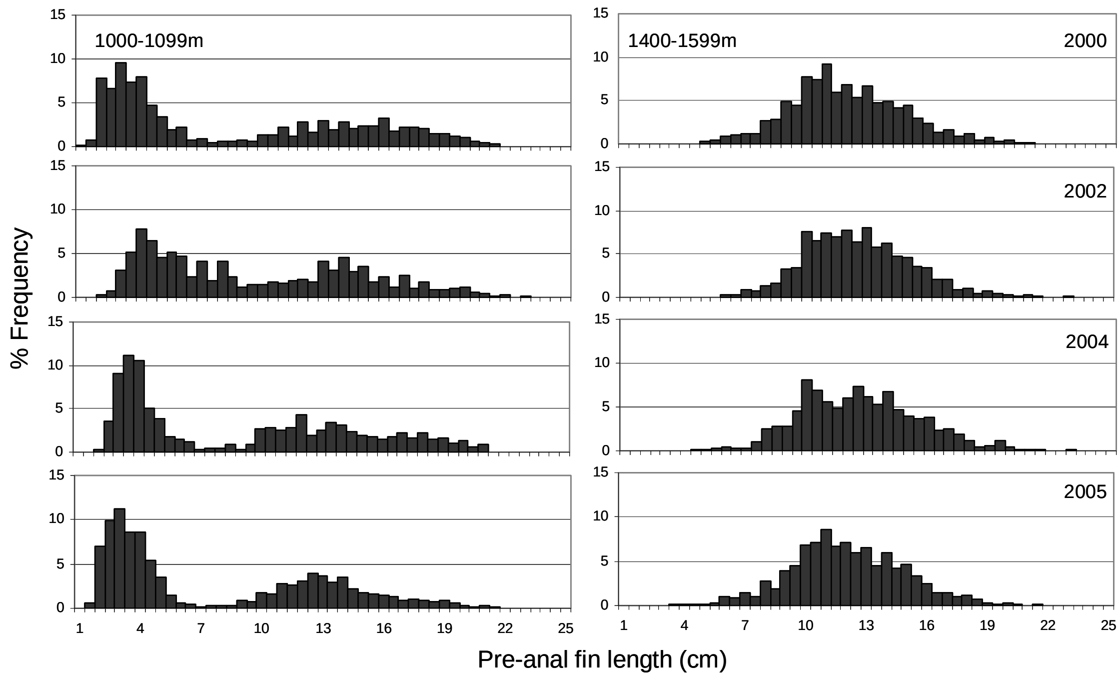


Figure 10.2.7. FRS survey, length frequency distribution (Pre-anal fin length) for *C. rupestris* caught at 1000-1099m and 1400 – 1599m between 55.5 and 58.5° N.

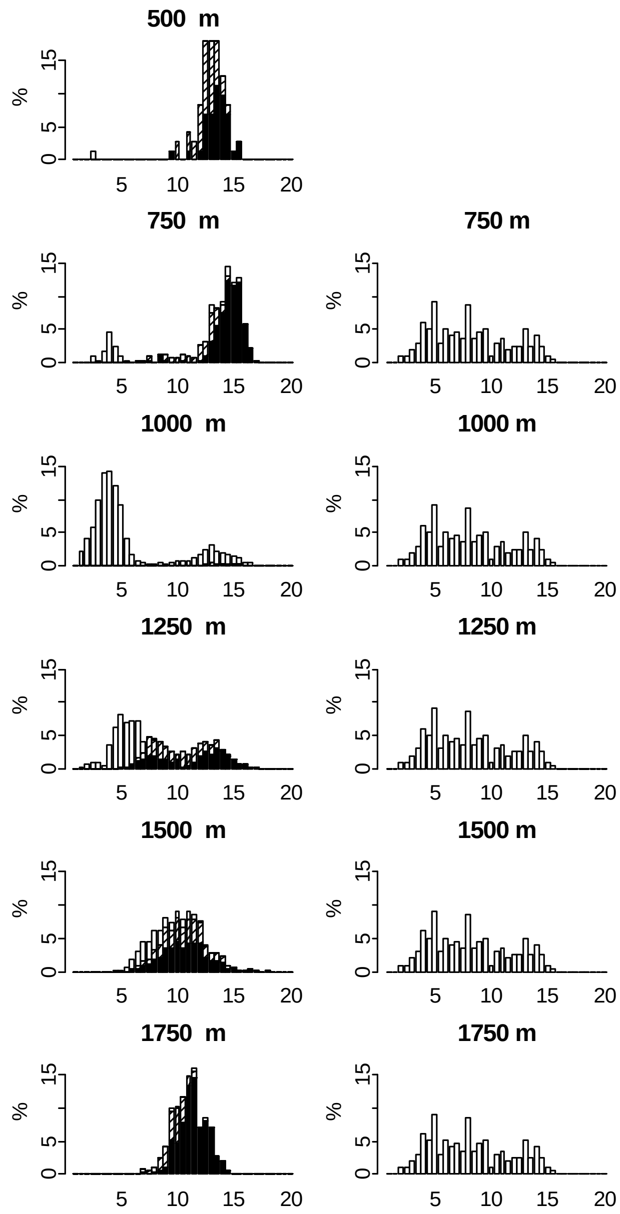


Figure 10.2.8. Length distribution (Head Length) of roundnose grenadier from pre-exploitation period (before the 1980s) per depth band in the Rockall Trough (left) and the Porcupine Seabight (right). Full black bars: females, hatched bars: males; white: immature or unsexed (from Gordon 1979 and SAMS, unpublished data).

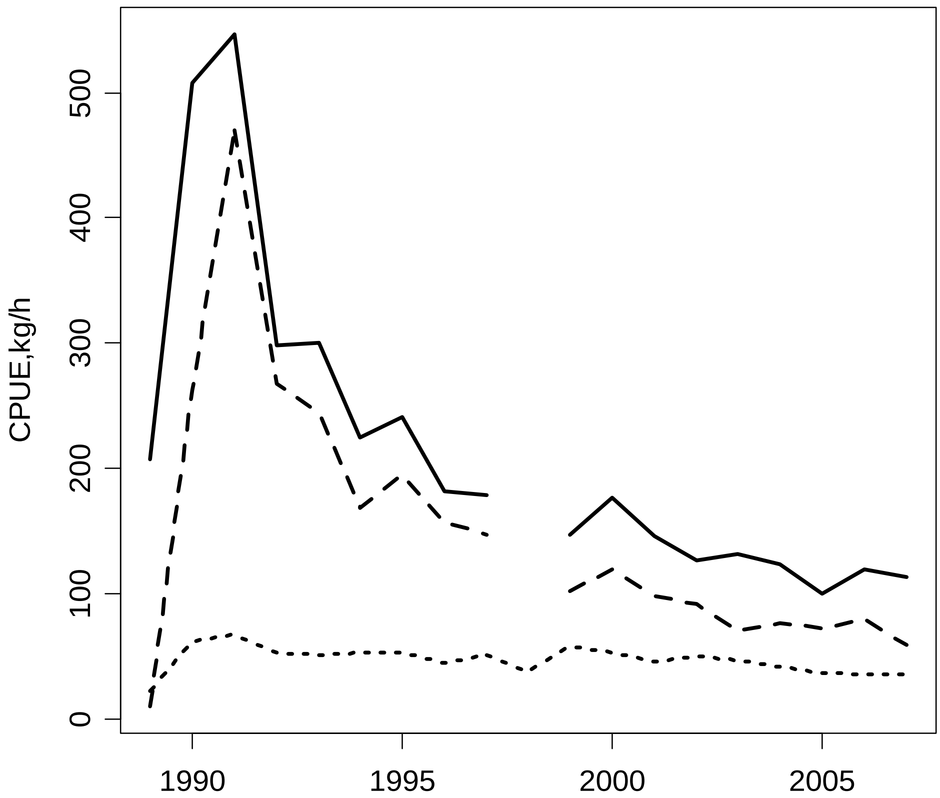


Figure 10.2.9. Roundnose grenadier LPUEs in the reference area. Dotted line: total LPUE (total French landings of Roundnose grenadier area vs total effort (fishing hours), dashed line: total LPUE of the reference fleet (Roundnose grenadier catch of the reference fleet vs total effort of the same fleet), solid: directed LPUE of the reference fleet (landings for fishing trip where Roundnose grenadier >10% total landings vs corresponding effort).

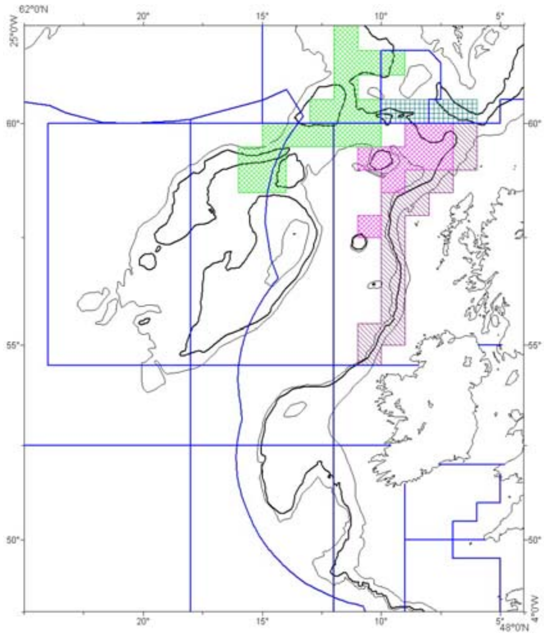


Figure 10.2.10. Reference area for the CPUE, The reference area is the combination of the 3 areas represented in purple, pink and dark green. The area in light green are new fishing grounds not exploited by the French fleet before the 2000s.

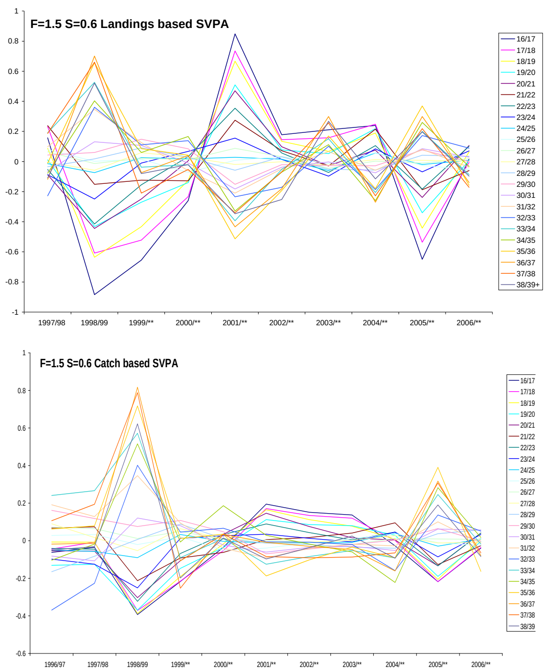


Figure 10.2.11: Roundnose grenadier residuals from the separable VPA based on methods 1 and 2.

Method 1 based on estimate of landings (without discards) ; Method 2 based on estimate of catch.

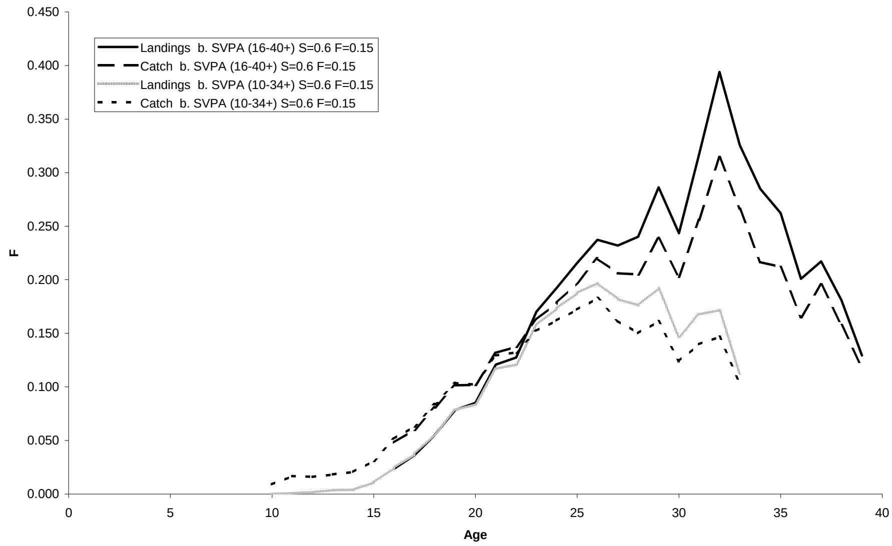


Figure 10.2.21 : Fishing mortality at age for Roundnose grenadier in Vb, VI, VII for methods 1 et 2 and different ranges of ages used with SVPA. Terminal F is set to 0.15 and S to 0.6.

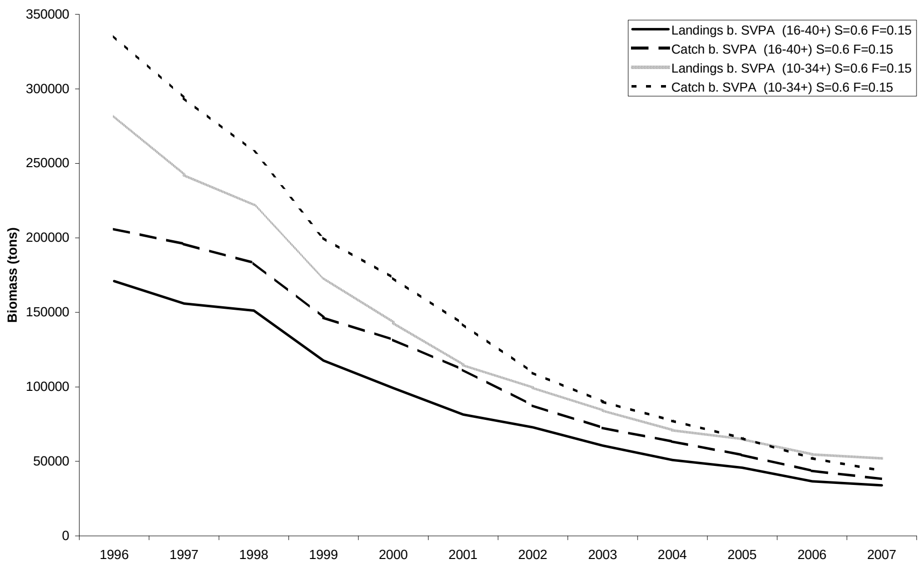


Figure 10.2.13 : Estimates of stock biomass from the separable VPAs for methods 1 et 2 and different ranges of ages. Terminal F is set to 0.15 and S to 0.6.

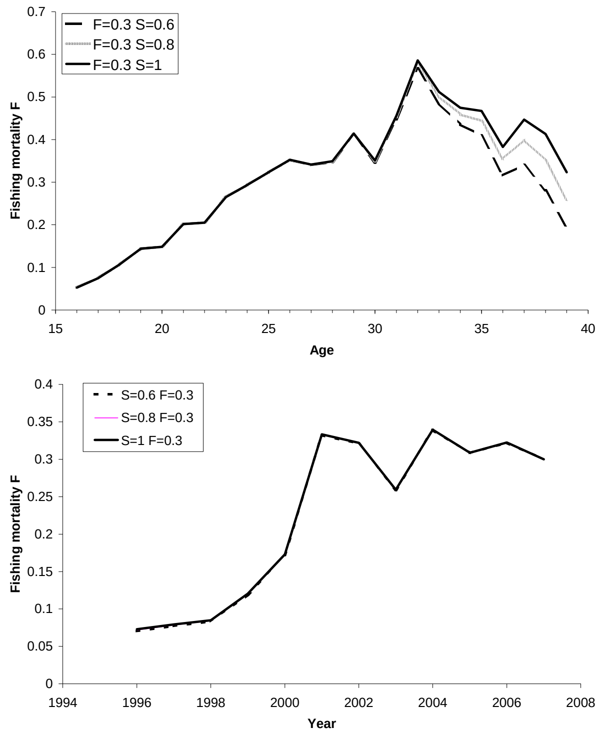


Figure 10.2.14 : Effects on different values of S on fishing mortalities for method 1. Terminal F is set to 0.3.

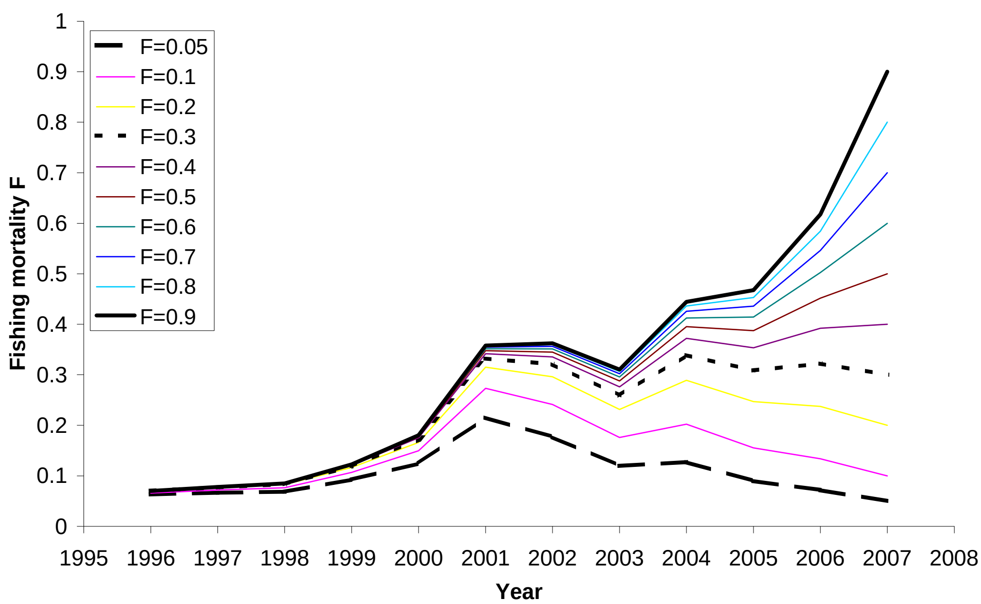


Figure 10.2.15: Year by year fishing mortalities for different terminal F and for S=0.6.

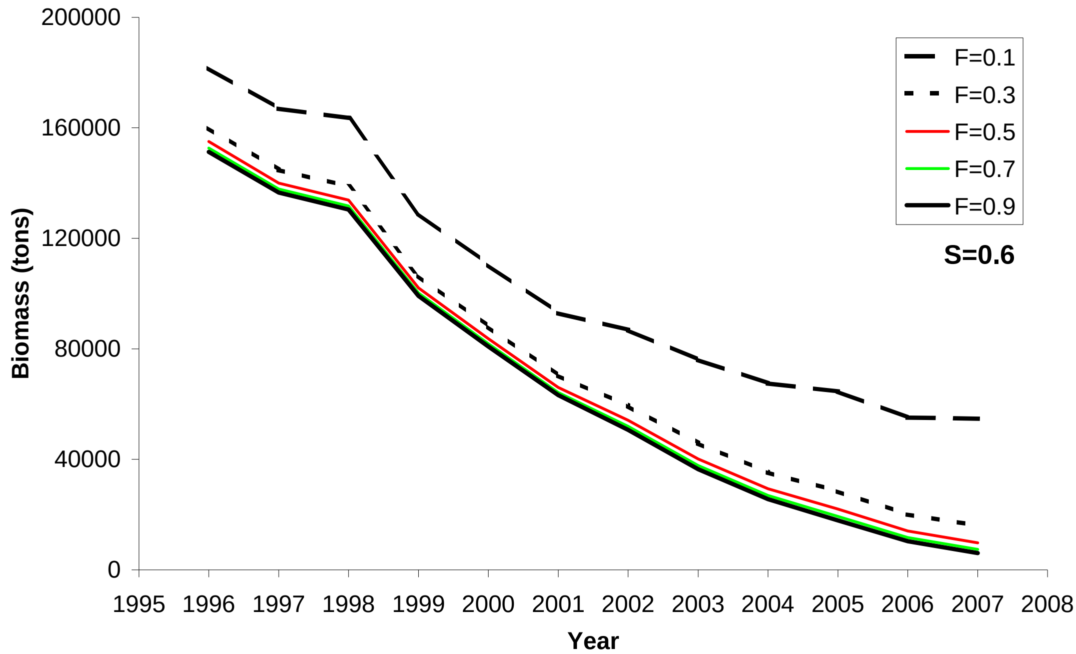


Figure 10.2.16: Estimates of stock biomass for different terminal fishing mortalities and S=0.6.

10.3 Roundnose Grenadier (*Coryphaenoides rupestris*) in Division IIIa

10.3.1 Fishery

The stock of roundnose grenadier has been the basis for commercial exploitation by a few Danish vessels since the late 1980s, in some years mainly by a single vessel. This directed fishery began in 1987 as an exploratory fishery. Up to 2003 landings fluctuated between 1000 and 3000 t. The recent geographical distribution of the fishery is shown in Fig. 10.3.1 and Tables 10.3.2 a-c. It is seen that a major part of the catches is taken in the Norwegian zone of Skagerrak. However, this directed fishery stopped in 2007 due to retirement of the single fisher conducting this metier, and until now no other fishers have taken up this fishery. By-catch of roundnose grenadier is also taken in the fisheries for Pandalus, also in IVa. However, the landings of this by-catch (for reduction) are generally insignificant, see Table

10.3.1.1 Landings trends

WG figures for total landings, 1988-2006, by all countries are shown in Table 10.3.0. It is seen that only Denmark has contributed significantly to this fishery. Table 10.3.1 shows the total Danish landings of this species split in landings for H.C. and for reduction. These landings figures have been estimated on basis of reported logbook records combined with samples of the landed catches for reduction. They differ slightly from the logbook recorded catches, which generally overestimate the true landings. For the period 2001 – 2006 peak landings within a year were recorded in March – April.

The development of this fishery in recent years has been remarkable considering the small area (Table 10.3.0 and Fig. 10.3.2) From a level of around 2000 t up to 2002, taken by a mainly a single vessel, total landings increased to more than 11000 t in 2005. In 2006 landings decreased again to 2261 tons, but this was due to special management agreements restricting the catch level in this area. In the years of peak catches., a total of only 2-3 vessels participated significantly in the fishery. In 2007, the landings reduced to zero from the directed fishery.

There is negligible by-catch in the *Pandalus* fishery.

10.3.1.2 ICES advice

No assessment of stock status was possible in the 2004 WGDEEP meeting and no alarming new development in the fishery had been observed. Therefore, ICES could only give a general species relevant statement for this stock in 2004:

Due to its biological parameters, the species can only sustain low fishing mortality and recovery of depleted stock(s) can only be slow.

For roundnose grenadier ICES recommended:

"For sub-areas VI and VII and Divisions Vb and IIIa a reduction in effort by 50% from 2000-2002 effort is required. In all other areas, the expansion of fisheries should not be allowed until reliable assessments indicate that increased harvests are sustainable"

Based on the high fishing pressure in Division IIIa in 2004 and 2005 ICES (ACFM) in 2006 advised*: For this fishery, the fishing pressure should be reduced considerably to low levels and should only be allowed to expand again very slowly if and when reliable indicators show that increased harvests are sustainable. ICES recommends a 50% reduction of effort compared to the level before the fishery expanded (1991–1999). This is interpreted as a reduction of 50% in landings and corresponds to a catch level around 1000 t in 2007.*

10.3.1.3 Management

The directed fishery for grenadier is mainly carried out in the Norwegian EEZ, and the fishery has been largely unregulated and unrestricted. The EC introduced unilateral TACs for IIIa in 2004 - 2006, but this restriction did not apply in the Norwegian EEZ, for which the trilateral Skagerrak treaty between Denmark, Norway and Sweden is in force. The Skagerrak treaty allows Danish and Swedish vessels to operate freely in the Norwegian zone, and Norway has not set any TAC or introduced other regulations on grenadier fishing in IIIa or IVa. Therefore, the Danish (and Swedish) fleet(s) could in principle fish unrestricted by the (EU) TAC for grenadier in these waters.

At the consultative meeting in Oslo 31 January 2006, the EC and Norway agreed that "fishing opportunities on this stock should be limited to a "sustainable level", which in this case was set to average landings for the period 1996-2003. Following this agreement, a TAC of 2700 t for the EU in 2006 was set for IIIa including the Norwegian EEZ. In fact, because of this constraint, the fishery in 2006 was closed in April 2006.

10.3.2 Data available.

10.3.2.1 Length compositions.

Length frequency data for roundnose grenadier in IIIa are available for 1987 from resource surveys by the Danish and Norwegian research vessels and an experimental Danish fishery in the same year. Following the increasing focus on fisheries for deep sea species samples from the current commercial fishery for roundnose grenadier are available for 2004 - 2006. These samples have been obtained in two ways:

- Samples from landed catch of roundnose grenadier have been collected and analysed by the fishery inspection and the data is sent to DIFRES
- Samples taken at-sea by observers, who have been participating in fishing trips on board the vessels.

The number of samples collected in 2004 - 2006 is shown in the text table below.

Sampling type	Year			Total
	2004	2005	2006	
Sampling in harbour	46	29	7	82
Sampling at sea	1	2	10	13
Total	47	31	17	95

Figs. 10.3.3 A-D show the size distribution of roundnose grenadier in 1987 and 2004 - 2006. Note that both in 1987 and 2004 there appear to be two clearly distinguishable components in the length composition. With the current lack of knowledge of the age structure, it is impossible to say whether the smaller one represents recruits to the fishery. In the 2005 and 2006 distribution no such clear mode of small individuals is seen.

10.3.2.2 Age composition

No recent age composition data are available. However, the investigation by Bergstad (1990) based on data for 1987 in Skagerrak suggests very slow growth and consequently the age distributions in the catches could span over 20-30 years, both in 1987 and in 2004 - 2006.

10.3.2.3 Effort and CPUE.

Tables 10.3.2 A-C and Fig. 10.3.2 show the overall trends in logbook recorded catch, effort and CPUE for the directed fishery on this stock. A number of different mesh sizes have been used in the fishery. The CPUE series has been recalculated in 2007 using mesh seizes between 35 mm and 70 mm only. The estimated catch per day has increased but the trend in the series has not changed. The catch figures shown here differ slightly from the final (adjusted) landings figures (Table 10.3.0) due to the species allocation procedures in the recording the industrial landings.

10.3.3 Data analyses.

10.3.3.1 Trends in effort and CPUE.

The catch, effort and CPUE remain more or less at the same level up to and including 2002 (Tables 10.3.2 A-C). Catches and effort increased in 2003 while CPUE was stable. In 2004 and 2005 the catches increased dramatically. The CPUE decreased between 2003 and 2004 but increased again between 2004 and 2005 to the second highest level in the time series. 2005 saw a decline in recorded effort, while CPUE increased slightly to the highest level in the time series compared to 2004. In 2006 catches decreased to the level before 2003 and the effort was reduced to a little above ½ the effort before 2003, while the CPUE increased slightly. The overall (average) CPUE figures could, however, be blurred by a shift in the geographical distribution of the fishery in the last years possibly including hitherto unexploited parts of the stock in the fishery (Tables 10.3.2 A-C).

Part of the explanation of the increasing CPUEs may reflect enhanced skills or recent technological improvements in the fishery.

Another explanation could be enhanced production in the stock. An increase in recruitment and growth conditions may have happened, perhaps facilitated by favourable environmental conditions or other environmental changes, e.g. changes in species composition. Currently there is no information on recruitment variation for grenadier.

Given our knowledge of the biology of the species, the latter explanation appears unlikely.

The directed fishery in 2006 was closed in April.

10.3.3.2 Stock situation

Considering the limited geographical distribution of this stock and the (likely) slow growth of the individuals in the stock on the one side and increasing fishing effort on the other one would expect some responding signals from the stock to the increasing fishing pressure in recent years. However the insufficient data available for the stock do not give conclusive signals on the stock situation:

Assuming that the larger of the two size groups contains many age groups the decrease in mean length, observed by comparison of the 1987 size distribution with the ones for 2004 - 2006, could indicate an increasing fishing pressure on the stock during this period.

Independent of the number of age groups in the each of the two distinct size groups the difference of the 2004 and 2005 size distribution suggests that recruitment to the fishery was larger in 2004 than in 2005 and 2006.

The trends in the Danish CPUEs based on logbook records (Table 10.3.2 C) does not indicate any signs of decline in stock abundance.

Thus, even if more biological and fisheries data for this stock were available to WGDEEP in 2008 than in previous years for this stock, it was not possible assess the status of the stock.

It is not known if the level of exploitation in recent years was sustainable.

The group therefore stress the urgent need for further biological information to elucidate the dynamics of this stock. Such investigations should include 1)fishery independent abundance estimates (Norwegian survey data exist) with special focus on the recruiting size (age) groups, 2)analyses of the current age composition in the stock with special reference to growth, production and exploitation. In this connection WGDEEP points out that this stock is particular suited for such investigations, since it is geographically isolated from other stocks of roundnose grenadiers.

10.3.4 Management considerations

Until further information to clarify the status of this stock is available, a precautionary management strategy is required, and ICES has previously recommended (for the stocks of roundnose grenadier in IIIa, Vb, VI & VII) a 50% reduction of effort compared with the 2000-2002 level. However, contrary to this ACFM recommendation the effort in IIIa seems to have increased drastically during 2004-2005. However, in 2006, following agreement between the EU and Norway, effort was reduced in line with ICES previous advice, and in 2007 there was no fishery.

Management consultations in 2005 between the EC and Norway have called for restrictions of fisheries that would facilitate reduction in fishing opportunities to a sustainable level. The Group was unable to quantify what would be a sustainable catch level. However, the historical records from 1987 to 2002 did not suggest any negative development of abundance under the exploitation level at that time, and a level of total international catch as in that period may thus be regarded as sustainable. The catches were reduced to 2272 tons in 2006, which is slightly above the average for 1987-2002.

Table 10.3.0 Roundnose grenadier in Division IIIa & IVa. WG estimates of landings.

Year	Denmark	Norway	Sweden	TOTAL
1988	612		5	617
1989	884		1	885
1990	785	280	2	1067
1991	1214	304	10	1528
1992	1362	211	755	2328
1993	1455	55		1510
1994	1591		42	1633
1995	2080		1	2081
1996	2213			2213
1997	1356	124	42	1522
1998	1490	329		1819
1999	3113	13		3126
2000	2400	4		2404
2001	3067	35		3102
2002	4196	24		4220
2003	4302			4302
2004	9874	16		9890
2005	11922			11922
2006	2261	4		2265
2007*	+	1		1

* Preliminary data

Table 10.3.1. Danish landings, 1996-2006 of roundnose grenadier split into H.C. landings and landings for reduction.

	Landings of roundnose grenadier (kg)		
year	H. C.	Reduction	Total landings (tons)
1996	6493	2207000	2213
1997		1356280	1356
1998	635	1489000	1490
1999		3113000	3113
2000	315	2400000	2400
2001	6401	3061000	3067
2002	4	4195738	4196
2003	7	4301661	4302
2004	3129	9870664	9874
2005	17056	11904545	11922
2006	2448	2259000	2261

Table 10.3.2 A-C. The Danish fishery for roundnose grenadier in IIIa. Trends in catch, effort and CPUE by major ICES rectangle, see text.

	Total catch (tons) by ICES rectangle					
year	44F8	44F9	45F8	45F9	46F9	total
1996	80	40	25	709	98	951
1997	28	0	115	1088	163	1393
1998	238	235	180	1483	1112	3248
1999	0	25	61	704	1353	2143
2000	0	0	40	893	854	1787
2001	105	11	65	862	956	1999
2002	165	79	0	928	1531	2702
2003	0	120	545	1223	1769	3657
2004	1104	5786	215	1704	1721	10529
2005	518	4073	682	4739	2823	12834
2006	26	517	40	1067	487	2136
	Total effort (days) by ICES rectangle					
year	44F8	44F9	45F8	45F9	46F9	total
1996	5	23	2	59	6	95
1997	3		7	67	5	82
1998	7	9	4	54	32	106
1999		2	4	43	65	114
2000		2	4	57	48	111
2001	5	8	3	49	65	130
2002	11	7		42	70	130
2003		5	17	70	96	188
2004	99	391	9	74	65	638
2005	47	178	9	107	77	418
2006	2	19	2	24	20	67
	Total CPUE (tons/day) by ICES rectangle					
year	44F8	44F9	45F8	45F9	46F9	Average
1996	16.0	1.7	12.5	12.0	16.3	10.0
1997	9.2		16.4	16.2	32.5	17.0
1998	34.0	26.1	45.0	27.5	34.8	30.6
1999		12.5	15.3	16.4	20.8	18.8
2000		0.0	10.0	15.7	17.8	16.1
2001	21.0	1.4	21.7	17.6	14.7	15.4
2002	15.0	11.3		22.1	21.9	20.8
2003		24.0	32.1	17.5	18.4	19.5
2004	11.2	14.8	23.9	23.0	26.5	16.5
2005	11.0	22.9	75.7	44.3	36.7	30.7
2006	12.8	27.2	20.0	44.5	24.3	31.9

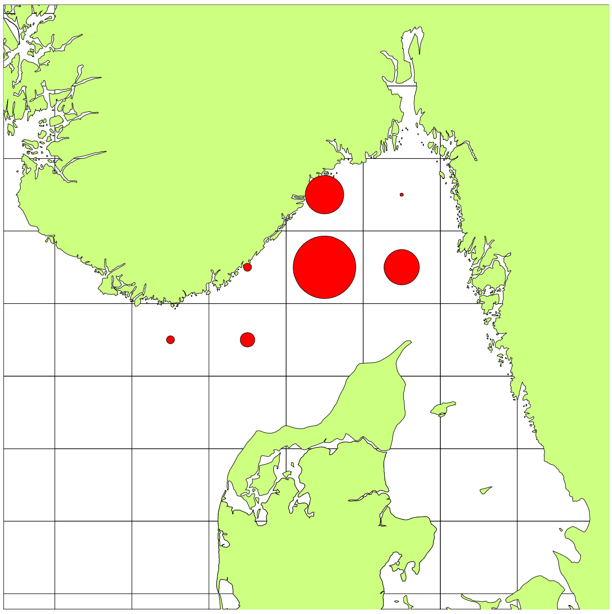


Figure 10.3.1 Geographical distribution of the fishery for roundnose grenadier in IIIa in 2006.

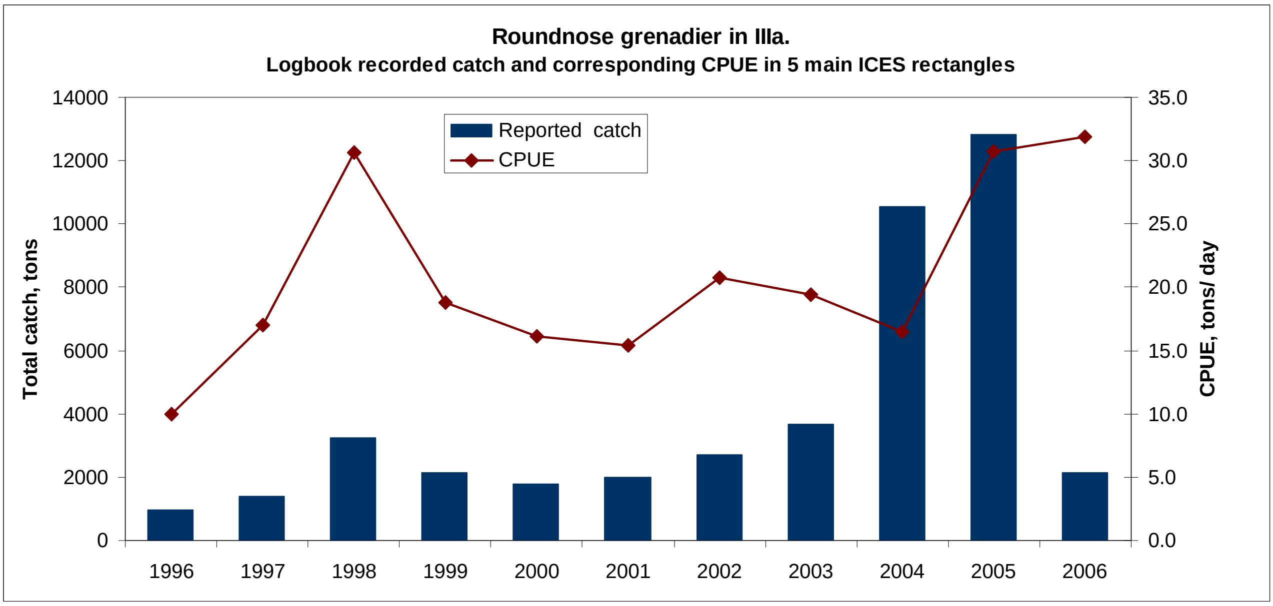


Figure 10.3.2. Danish catches and CPUE by main ICES rectangle. Based on logbook records.

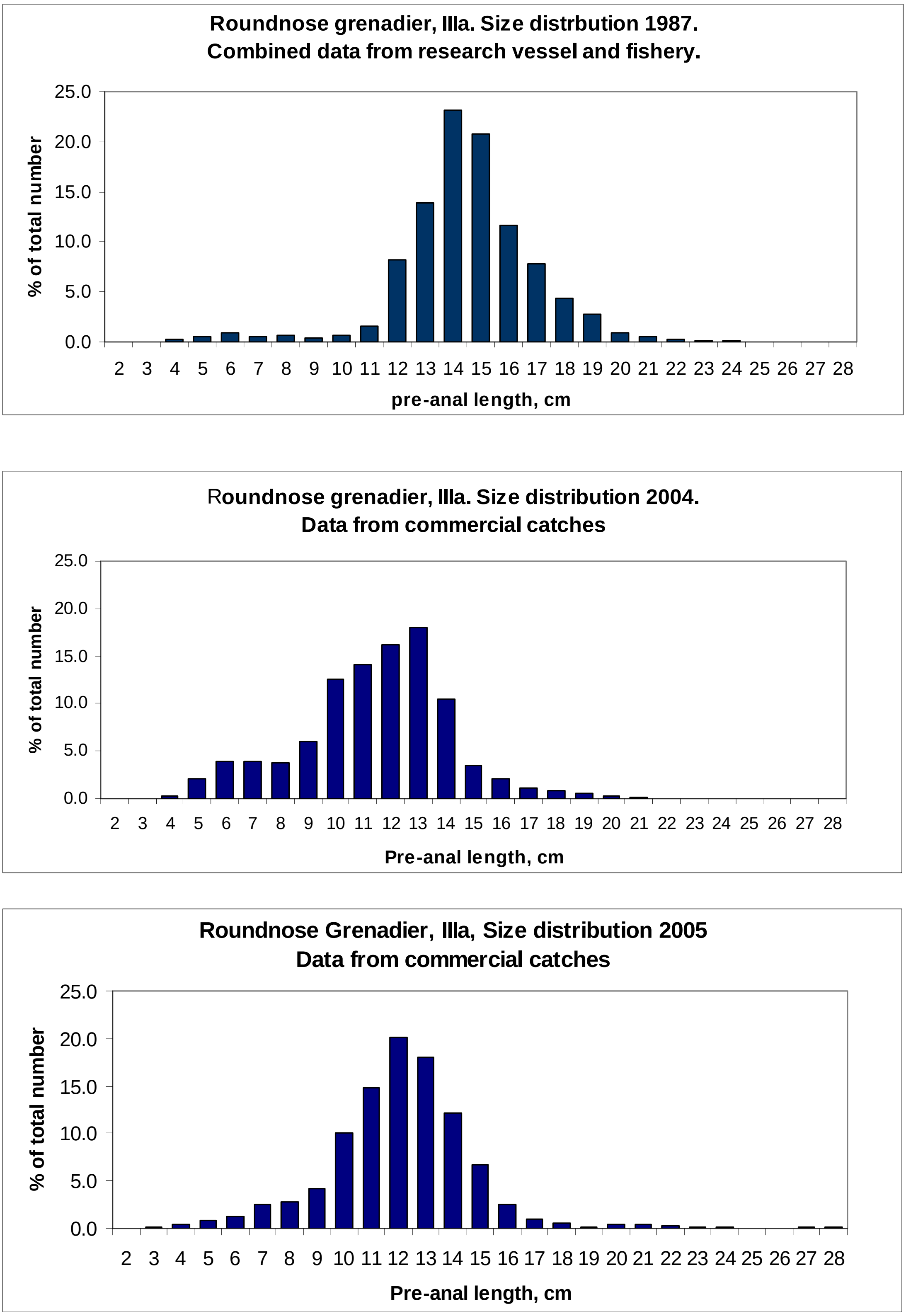


Figure 10.3.3 A-C. Length distribution Danish catches of roundnose grenadier.

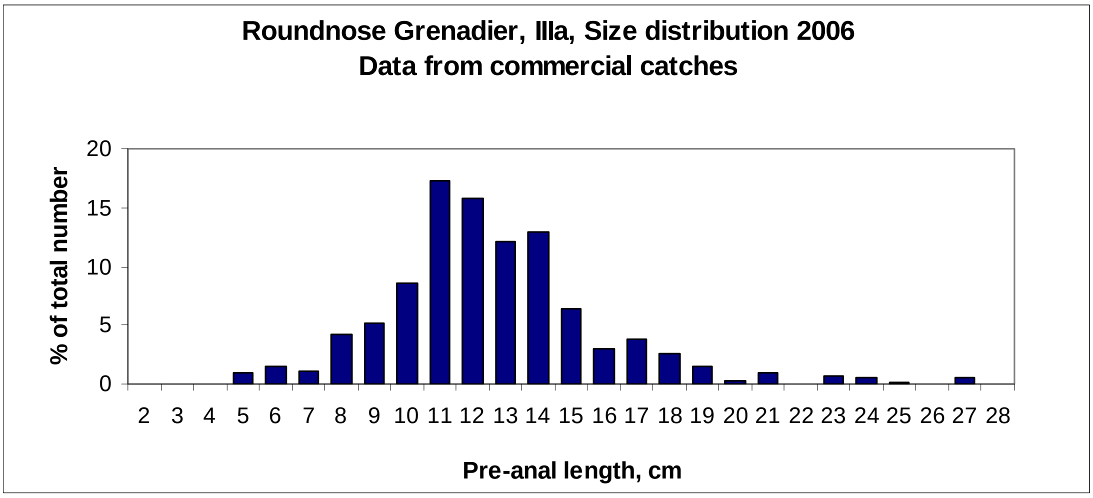


Figure 10.3.3 D. Length distribution Danish catches of roundnose grenadier.

10.4 Roundnose Grenadier (*Coryphaenoides Rupestris*) in Divisions Xb, XIIc and Subareas Va1, XIIa1, XIVb1

10.4.1 The fishery

The fishery on the Northern Mid-Atlantic Ridge (MAR) started in 1973, when dense concentrations of roundnose grenadier were discovered by USSR exploratory trawlers. Roundnose grenadier aggregations may have occurred on 70 seamount peaks between 46-62° N but only 30 of them were commercially important and subsequently exploited. The fishery is mainly conducted using pelagic trawls although on some seamounts it is possible to use bottom gear.

10.4.1.1 Landings trends

The greatest annual catch (almost 30,000 t) in that area was taken by the Soviet Union in 1975 (Table 10.4.1, Fig. 10.4.1) and in subsequent years the Soviet catch varied from 2,800 to 22,800 t. The fishery for grenadier declined after the dissolution of the Soviet Union in 1992. In the last 15 years, there has been a sporadic fishery by vessels from Russia (annual catch estimated at 200–3,200 t), Poland (500–6,700 t), Latvia (700–4,300 t) and Lithuania (data on catch are not available). Grenadier has also been taken as bycatch in the Faroese orange roughy fishery and Spanish blue ling fishery.

There is no information about target fishery of roundnose grenadier on the MAR in 2006 and 2007.

10.4.1.2 ICES advice

Due to absent of an assessment ICES could only give a general recommendation for MAR stock in 2006: *…Fishery on such species should be permitted only when accompanied by programmes to collect data. The expansion of the fisheries should not be allowed until reliable assessments indicate that increased harvests are sustainable*.

10.4.1.3 Management

There is TAC-based species-specific management of the roundnose grenadier fisheries in Subareas VIII, IX, X, XII, XIV for European Community vessels (Tab. 10.4.2). In the international waters there are NEAFC regulation of efforts in the fisheries for deepwater species.

10.4.2 Data available

10.4.2.1 Landings and discards

Data on catches are given in Table 10.4.1. There were no discards of roundnose grenadier on Russian trawlers where smallest fish and waste were used for fish meal processing. There is no information on discards by other countries vessels.

10.4.2.2 Length compositions

No new data on length compositions were available.

10.4.2.3 Age compositions

No new data on age compositions were presented.

10.4.2.4 Weight at age

No new weight at age data are available.

10.4.2.5 Maturity and natural mortality

New data on maturity and natural mortality are unavailable.

10.4.2.6 Catch, effort and research vessel data

Catch and CPUE data are given in Table 10.4.1 and Figure 10.4.1. The data for 2000-2005 are shown together with the data for the period 1973-1999. There are gaps in the CPUE time series due to lack of catch statistics for 1973 and 1982 and absence of target fishery in 1994-1995 and 2006-2007. Effort data separated by Sub-areas are available for Russian fleet in 2003-2005 only (Table 10.4.1). There were no research vessel data presented for 2007.

10.4.3 Data analyses

The only source of information on abundance trends was the CPUE series from the Soviet/Russian official data (Table 10.4.1, Figure 10.4.1). The CPUE varied strongly, but generally declined in the 1978, then the level appears to have remained comparatively stable till to 1990. Further declining took place in 1991-1993 and 1998-2000. There is some increasing of CPUE in 2004-2005 but it remained at a low level, almost half that observed in the early 1970s when a virgin stock was exploited. These data must be treated with caution because the fishery on MAR is very difficult and its effectiveness depends on many factors (distribution of pelagic concentrations, experience of vessel crew, environmental conditions, etc.) that could not be taken in account during current analysis of CPUE dynamics.

According to Soviet trawl acoustic survey data and analytical assessments in the 1970-1980s a stock size was estimated as 400,000-800,000 t, and the possible annual catches were estimated to be 30,000-200,000 t (Baidalinov 1979; Pavlov et al. 1991; Shibanov 1998). In the 1990s no research surveys were conducted.

The most recent Russian trawl acoustic survey was carried out in 2003 in the area between 47° and 58°N. According to results of this survey the biomass of the pelagic component of the grenadier only amounted to about 130,000 t (Gerber et al., 2004). It was concluded that the distribution and structure of grenadier aggregations on MAR have changed considerably as compared to 1970-1980s. The depths of aggregations and the number of small immature fish may have increased.

10.4.4 Comments on the assessment

No analytical assessments were carried out.

10.4.5 Management considerations

The state of the stock is uncertain. Soviet data suggest a high stock biomass (400,000-700,000 t) in 1970-1980s but a decreasing trend of the CPUE indicate that the abundance of roundnose grenadier was reduced to a low level in recent years. Moreover, Russian trawl acoustic survey in 2003 showed relatively low biomass of the pelagic component of stock, an increasing depth of the aggregations, and a higher number of small immature fish. As the fishery on the MAR has been limited in recent two decades, these changes may have natural causes. According to the Soviet estimates the annual possible catch of roundnose grenadier on MAR was estimated to 30,000-200,000 t in 1970-1980s. The only more recent estimate was a single trawl acoustic survey in 2003. It is currently impossible to provide an advice for roundnose grenadier fishery on MAR owing to lack of information. Consistent with a precautionary approach the expansion of fisheries should not be allowed until reliable assessments indicate that increased harvests are sustainable.

Table 10.4.1. Roundnose grenadier catches (t) by area, nation and Soviet/Russian efforts and CPUE on the MAR

Year	ICES Sub area and Division	Catch, t						Number of fishing days	Catch per fishing day, t
		USSR/ Russia	Poland[2]	Latvia[2]	Faroes[2]	Spain[2]	Total		
1973	XIIa1+XIIc	226					226		
	Va1	820					820		
1974	XIIa1+XIIc	5874					5874		35.2
	Va1	12561					12561		
1975	XIIa1+XIIc	29894					29894		36.6
1976	XIIa1+XIIc	4545					4545		24
	XIVb1	11					11		
	Xb	170					170		
1977	XIIa1+XIIc	9347					9347		17.3
1978	XIIa1+XIIc	12310					12310		17
1979	XIIa1+XIIc	6145					6145		19.6
1980	XIIa1+XIIc	17419					17419		17.3
1981	XIIa1+XIIc	2954					2954		18.4
1982	XIIa1+XIIc	12472					12472		
	XIVb1	153					153		
1983	XIIa1+XIIc	10300					10300		17.3
1984	XIIa1+XIIc	6637					6637		18
1985	XIIa1+XIIc	5793					5793		18.5
1986	XIIa1+XIIc	22842					22842		21
1987	XIIa1+XIIc	10893					10893		17.3
1988	XIIa1+XIIc	10606					10606		21.8
1989	XIIa1+XIIc	9495					9495		15.6
1990	XIIa1+XIIc	2838					2838		18.4
1991	XIIa1+XIIc	3214[1]		4296			7510[1]		14.5
1992	XIIa1+XIIc	295		1684			1979		12.9
1993	XIIa1+XIIc	473		2176	263		2912		10.7
	Xb				249		249		
1994	XIIa1+XIIc			675	457		1132		
1995	XIIa1+XIIc				359		359		
1996	XIIa1+XIIc	208			136		344		22.2
	Xb				3		3		
1997	XIIa1+XIIc	705	5867		138		6710		20.3
	XIVb1	336[1]					336[1]		
	Xb				1		1		
1998	XIIa1+XIIc	812	6769		19		7600		6.8
	Xb				1		1		
1999	XIIa1+XIIc	576	546		29		1151		8.8
	Xb				3		3		
2000	XIIa1+XIIc	2325					2325		9.1
	XIVb1	5					5		

[1]– revised catch data [2]– official ICES data [3]– preliminary data

Tabble 10.4.1 continued.

Year	ICES Sub area and Division	Catch, t						Number of fishing days	Catch per fishing day, t
		USSR/ Russia	Poland[2]	Latvia[2]	Faroes[2]	Spain[2]	Total		
2001	XIIa1+XIIc	1714			2		1716		15.8
	XIVb1	69					69		
2002	XIIa1+XIIc	737					737		13.2
	XIVb1	4				235	239		
2003	XIIa1+XIIc	510					510	51	10.1
	XIVb1					272	272		
2004	XIIa1+XIIc	436			8		444	25	16.1
	XIVb1	20[1]					20[1]		
	Xb				1		1		
2005	XIIa1+XIIc	600					600	42	17.7
	Xb	799					799	37	
2006	XIIc				1		1		
2007[3]	XIIc				2		2		
Total		208143	13182	8831	1672	507	232335		

[1]– revised catch data [2]– official ICES data [3]– preliminary data

Table 10.4.2 Fishing opportunities applicable for European Community vessels for roundnose grenadier fisheries by countries and by areas in 2007-2008 (EC and international waters)

Country	TAC, t
Areas VIII, IX, X, XII, XIV	
Germany	40
Spain	4 391
France	202
Ireland	9
United Kingdom	18
Latvia	71
Lithuania	9
Poland	1 374
Total for EC vessels	6 114

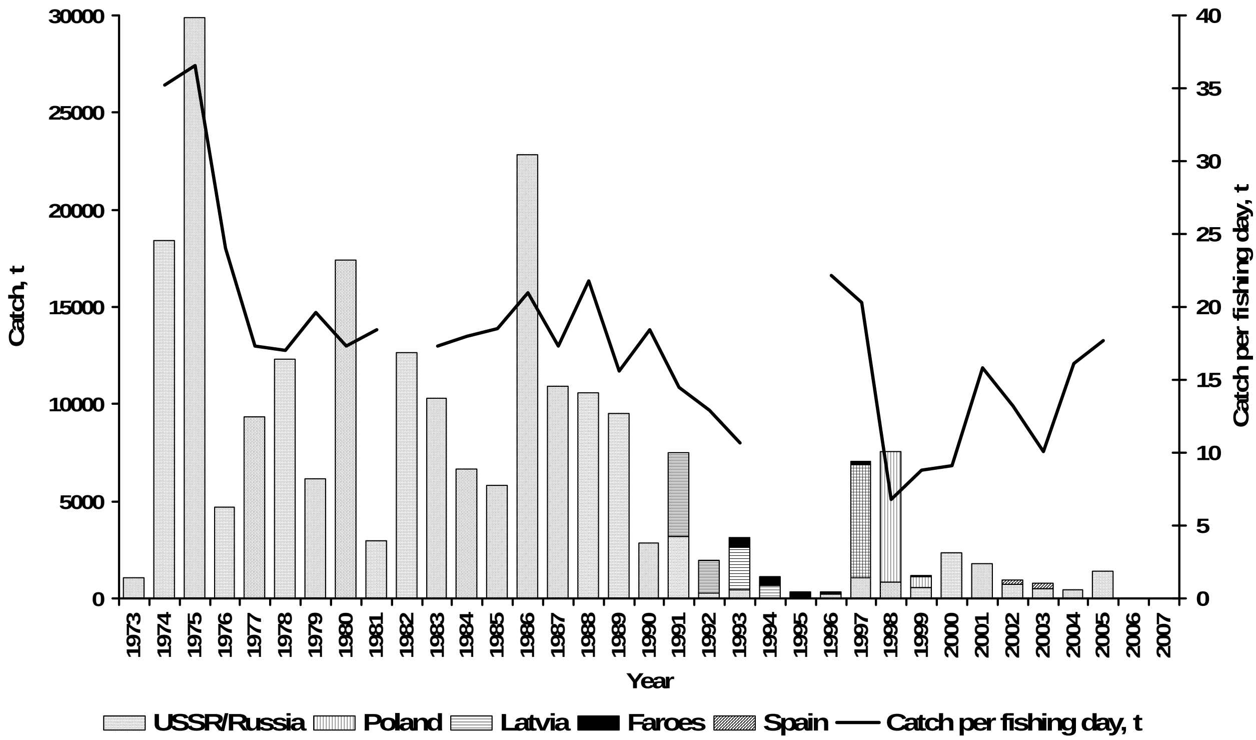


Figure 10.4.1 International catch and Soviet/Russian CPUE of roundnose grenadier on the MAR in 1973-2007

10.5 Roundnose Grenadier (*Coryphaenoides rupestris*) in other areas (I, II, IV, Va2, VIII, IX, XIVa, XIVb2)

10.5.1 The fishery

Outside of the main fisheries dealt upon in other sections catches of roundnose grenadier were insignificant.

10.5.1.1 Landings trends

Landing statistics by nations in the period 1988-2007 are presented in Table 10.5.1.

In the Subareas I and II, the total catch of roundnose grenadier in 2007 amounted 12 t only. During 1988-2007 catches varied from 0 to 106 t (Fig. 10.5.0 a). France substantially contributed to the total catch in 1990-1992, when roundnose grenadier was taken as by-catch in the fisheries for saithe *Pollachius virens* and other gadoids. In 1997-1998, when total catch exceeded 100 t, the major contribution was made by Norway. Roundnose grenadier was partly taken in mixed deepwater fisheries; directed local fisheries in Norwegian fjords for this species also exist.

In subarea IV, the total catch of roundnose grenadier in 2007 comprised 25 t which was taken by the French fleet. During 1988-2007 catches in this area varied between 1 and 525 t (Fig. 10.5.0b). The main contribution to the total catch in 1989-1994 (167-521 t) was made by the French fleet that conducted directed fishery in division IVa off Shetland Islands. Roundnose grenadier is caught as incidental by-catch in this area by Scottish vessels in insignificant amount as well. In this area, reported catch may include a high proportion of misreported roughhead grenadier.

In 2004, the major part of the total catch (371 of 377 t) was taken by Danish fleet in the northeastern corner of IVb Division during directed trawl fishery. The WG notes that catches coming from this location in IV probably are taken from the same stock as the one in IIIa.

Total roundnose grenadier catch in Icelandic waters (Division Va) in 2007 amounted 16 t. Similar to previous years, the major contribution to the total catch was made by Iceland. During 1988-2007, the catches within Icelandic waters varied 2 to 398 t (Fig. 10.5.0c). Maximum catches were registered in 1992-1997 when 198-398 t were caught annually as by-catch in mixed deepwater fisheries. In recent years, roundnose grenadier is taken in Icelandic waters as by-catch in trawl fisheries for Greenland halibut and redfish.

Roundnose grenadier catches in Subareas VIII and IX during 1988-2007 were minor and amounted 0 to 28 t annually (Fig. 10.5.0d). The main contribution to the total catch in 2006 and 2007 (27 and 10 t respectively) was made by France. In other years, the main catch was from Spain as occasional by-catch in mixed deepwater fisheries.

Total catch in Greenland waters (Subdivision XIVb2) in 1998-2007 amounted 15-126 t (Fig. 10.5.0e). There is no directed fishery for roundnose grenadier in these areas. The majority of catches is taken as by-catch by Greenland, Norway and Russia during Greenland halibut bottom trawl fisheries. Recently (prior to 2005), Germany also contributed to roundnose grenadier by-catch in Greenland waters, especially in 1998 and 1999, when 116 and 105 t were caught respectively.

10.5.1.2 ICES advice

ICES advice applicable to 2003 and 2004 was: *In all other areas, the expansion of fisheries should not be allowed until reliable assessments indicate that increased harvests are sustainable*.

10.5.1.3 Management

There is a TAC management of the roundnose grenadier fisheries in Subareas I, II, IV, VIII, IX, Division Va and Subdivision XIVb1 for European Community vessels (Table 10.4.1). In international waters there are NEAFC regulation of efforts in the fisheries for deepwater species.

10.5.2 Data available

10.5.2.1 Landings and discards

Landings are given in Table 10.5.0a-f. No discard data are available.

10.5.2.2 Length compositions

No data.

10.5.2.3 Age compositions

No data.

10.5.2.4 Weight at age

No data.

10.5.2.5 Maturity and natural mortality

No data.

10.5.2.6 Catch, effort and research vessel data

No data.

10.5.3 Data analyses

No stock assessment.

10.5.4 Management considerations

In these area, roundnose grenadier is taken as a by-catch in fisheries for other species (saithe, Greenland halibut, redfish, deepwater species, etc.).

Due to its biological parameters, the species can only sustain a low fishing mortality and recovery of depleted stock(s) can only be slow.

The landings in Subareas I, II, IV, VIII, IX, Division Va and Subdivision XIVb1 have varied notably from year to year and it is believed that landings statistics does not reflect the level of species' abundance.

Fisheries for roundnose grenadier in these areas should be permitted only when there are programs to collect data and should expand very slowly until reliable assessment indicate that increased harvests are sustainable.

Table 10.5.0a Working group estimates of landings of roundnose genadier from sub-areas I and II

Year	Faroes	Denmark	France	Germany	Norway	Russia/USSR	Germany	UK (E+W)	UK (Scot)	TOTAL
1988										0
1989			1	2		16	3			22
1990			32	2		12	3			49
1991			41	3	28					72
1992		1	22		29					52
1993			13		2					15
1994			3	12						15
1995			7							7
1996			2							2
1997	1		5		100					106
1998					87	13				100
1999					44	2				46
2000										0
2001								2		2
2002					11	1				12
2003					4					4
2004					27					27
2005			1		12					13
2006					6	2				8
2007*					11	1				12

Table 10.5.0b Working group estimates of landings of roundnose genadier from sub-area IV

Year	France	Germany	Norway	UK (Scot)	Denmark	TOTAL
1988		1				1
1989	167	1		2		170
1990	370	2				372
1991	521	4				525
1992	421			4	1	426
1993	279	4				283
1994	185	2			25	212
1995	68	1		15		84
1996	59			5	7	71
1997	1			10		11
1998	35					35
1999	56		5			61
2000	2					2
2001	2				17	19
2002	11		1	26		38
2003	5		1	11		17
2004	5			1	371	377
2005	18		2			20
2006	7		4			11
2007*	25					25

* Preliminary data

Table 10.5.0c Working group estimates of landings of roundnose genadier from division Va

Year	Faroes	Iceland**	Norway	Russia	UK (E+W)	TOTAL
1988		2				2
1989	2	2				4
1990		7				7
1991		48				48
1992		210				210
1993		276				276
1994		210				210
1995		398				398
1996	1	139				140
1997		198				198
1998		120				120
1999		129				129
2000		54				54
2001		40				40
2002		60				60
2003		572				57
2004		181				181
2005		76				76
2006		62				62
2007*	1	13	2			16

** includes other grenadiers from 1988 to 1996

Table 10.5.0d Working group estimates of landings of roundnose genadier from sub-areas VIII and IX

Year	France	Spain	TOTAL
1988			0
1989			0
1990	5		5
1991	1		1
1992	12		12
1993	18		18
1994	5		5
1995			0
1996	1		1
1997			0
1998	1	19	20
1999	9	7	16
2000	5		5
2001	7		7
2002	3		3
2003	2		2
2004	2		2
2005	7		7
2006*	27	1	28
2007*	10		10

* Preliminary data

Table 10.5.0e Working group estimates of landings of roundnose genadier from division XIVb2

Year	Faroes	Germany	Greenland	Iceland**	Norway	UK (E+ W)	UK (Scot)	Russia	Spain	TOTAL
1988		45	7							52
1989	3	42								45
1990		45	1			1				47
1991		23	4			2				29
1992		19	1	4	6		1			31
1993		4	18	4						26
1994		10	5							15
1995		13	14							27
1996		6	19							25
1997	6	34	12		7					59
1998	1	116	3		6					126
1999		105	0		19					124
2000		41	11		5					57
2001		11	5		7	2	72			97
2002		25	5		15	1	1			47
2003			15		5	1				21
2004		27	3							30
2005			7		6	1				14
2006*		35	0		17					53
2007*	1				1					2

Table 10.5.0 f Working group estimates of landings of roundnose grenadier from I, II, IV, Va2, VIII, IX, XIVa, XIVb2

Year	I+II	IV	Va	VIII+IX		XIVb2	Unallocate	Total
1988	0	1	2	0		52	0	55
1989	22	170	4	0		45	0	241
1990	49	372	7	5		47	0	480
1991	72	525	48	1		29	0	675
1992	52	426	210	12		31	0	731
1993	15	283	276	18		26	0	618
1994	15	212	210	5		15	0	457
1995	7	84	398	0		27	0	516
1996	2	71	140	1		25	0	242
1997	106	11	198	0		57	0	373
1998	100	35	120	20		126	0	402
1999	46	61	129	16		124	0	382
2000	0	2	54	5		57	0	118
2001	2	19	40	7		97	208	373
2002	12	38	60	3		47	504	664
2003	4	17	57	2		21	952	1 054
2004	27	377	181	2		30	0	618
2005	13	20	76	7		14	0	130
2006	8	7	62	0		53	0	130
2007*	12	25	16	10		2	0	65

* Preliminary data

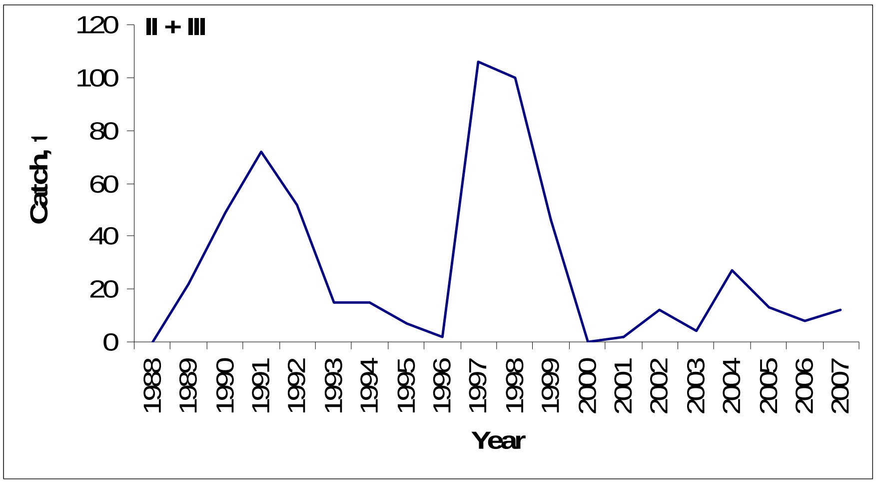


Figure 10.5.1Roundnose grenadier catches in Subareas I and II, 1988-2007 (data for 2007 is preliminary).

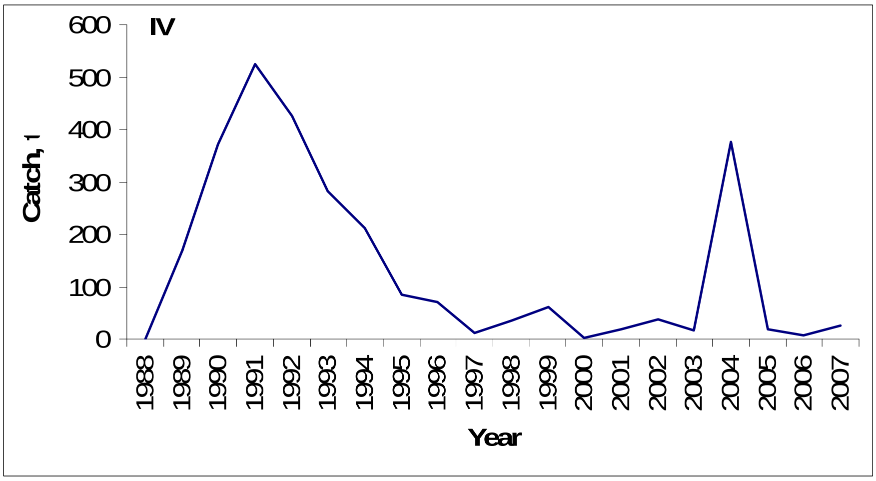


Figure 10.5.2. Roundnose grenadier catches in Subarea IV, 1988-2007 (data for 2007 is preliminary).

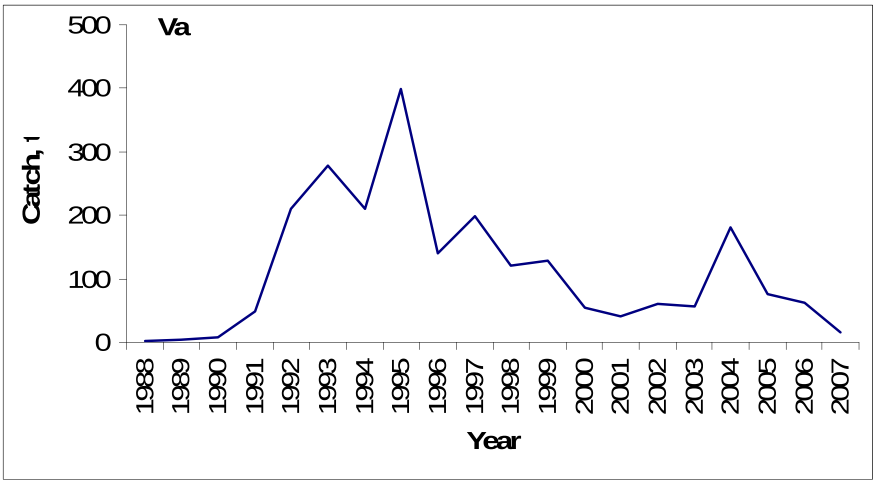


Figure. 10.5.3. Roundnose grenadier catches in Division Va, 1988-2007 (data for 2007 is preliminary).

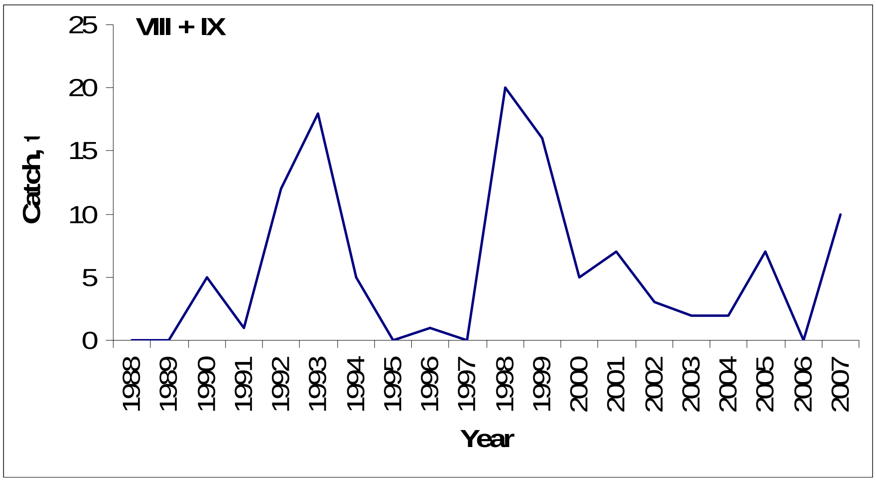


Figure 10.5.4. Roundnose grenadier catches in Subareas VIII and IX, 1988-2007 (data for 2007 is preliminary).

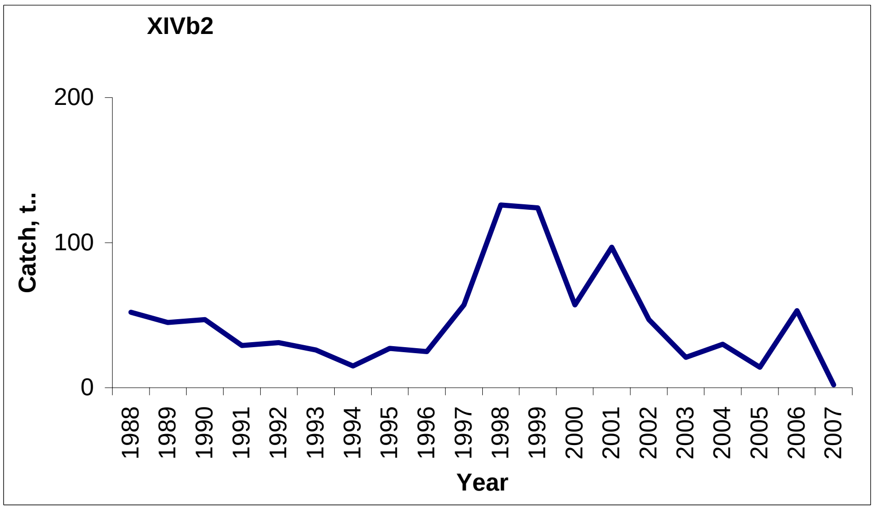


Figure 10.5.5. Roundnose grenadier catches in Subarea XIVb2, 1988-2007 (data for 2007 is preliminary).

11 Black scabbard fish (Aphanopus carbo) in the Northeast Atlantic

11.1 Stock description and management units

The species is distributed on both sides of the North Atlantic and on seamounts and ridges south to about 30ºN. It occurs only sporadically north of the Scotland-Iceland-Greenland ridges. Juveniles are mesopelagic and adults are benthopelagic. It is admitted that the species life cycle is not completed in just one area and also that either small or large scale migrations occur seasonally. It has been postulated that fish caught to the west of the British Isles are pre-adults that migrate further south (possibly down to Madeira) as they reach maturity. Due to the uncertainty of stock structure a single stock in NE Atlantic is considered. However because of the different nature of fisheries in the northern and southern areas and lack of information on migration, the stock has traditionally been divided into northern and southern components for management purposes.

The northern component comprises fish exploited by trawl fisheries in Subareas V, VI, VII and XII, the southern component being exploited by a longline fishery in Sub-area IX.

Catches data for black scabbard fish in 2006 and 2007 aggregated at the level of statistical rectangle were provided to the working group by France, Ireland, the UK (England and Wales and Scotland) and Iceland. These are shown in figures 11.1.1 and 11.1.2.

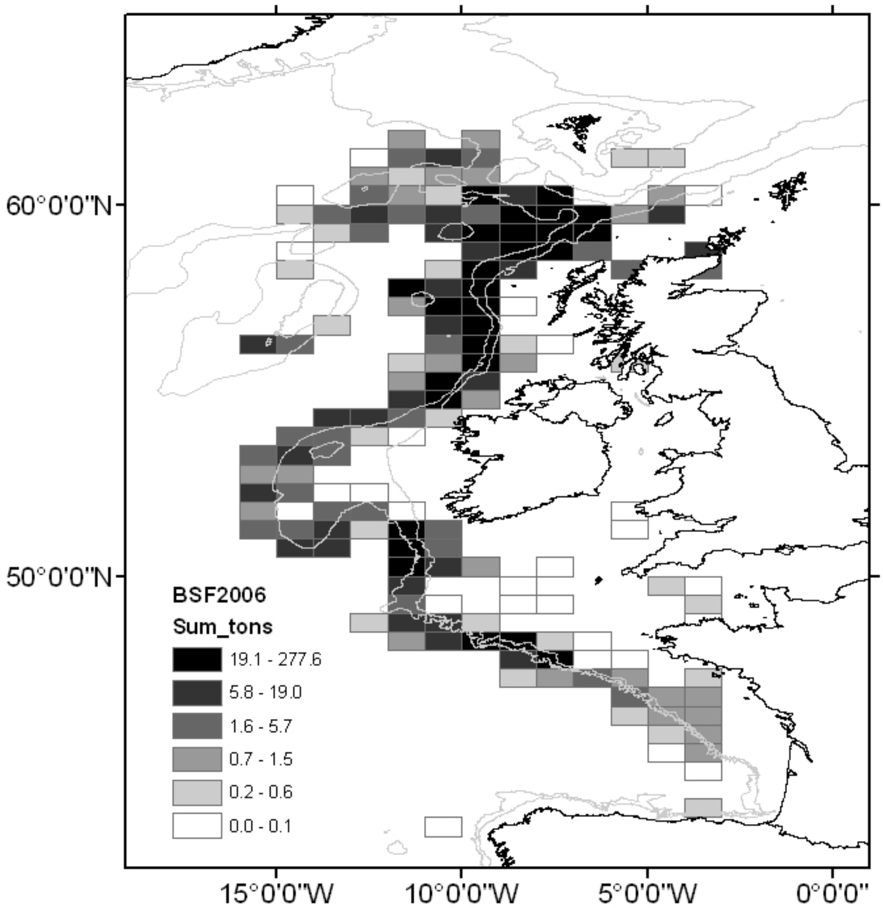


figure 11.1.1. Catches of black scabbard fish by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2006.

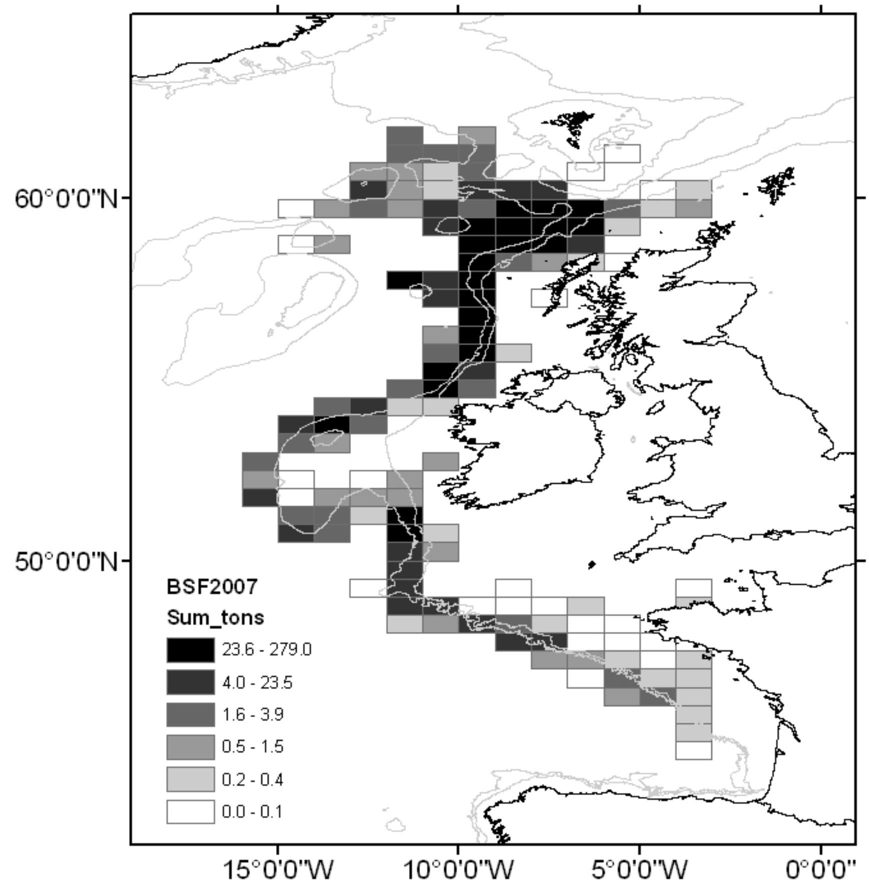


figure 11.1.2. Catches of black scabbard fish by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2007.

11.2 Black scabbard fish in sub-areas Vb and XIIb and divisions VI and VII

11.2.1 The fishery

The Faroese fisheries take mostly place in division Vb with a minor activity in sub-area VI. Black scabbardfish is taken mainly as a by-catch of a fleet of 13 large deepwater trawlers (power>2000 hp) which target primarily blue ling, Greenland halibut and redfish.

A small Scottish mixed deepwater trawl fishery included some catches of black scabbard fish between the mid 1990s and early 2000s however this has decreased greatly since the introduction of TACs in 2003.

Following the decline of target orange roughy Irish trawl fishery, black scabbardfish became one of the main target species. Landings reached more than 1000 t in 2002 and have been low since then.

The French deepwater fishery operates mainly in sub-areas VI and VII targeting roundnose grenadier, black scabbardfish, blue ling and deepwater sharks. Over recent years, the landings of black scabbardfish have declined but landings of other deepwater species (roundnose greandier, orange roughy, deepwater sharks) have declined in a larger proportion. As a result, black scabbardfish is now landed in comparable quantities as blue ling and roundnose grenadier and more than deepwater sharks and grenadier.

The Spanish fisheries carried out by 29 stern bottom freezer trawlers in VIb1 and XIIb (Hatton Bank) targets primarily roundnose grenadier but lands a significant by-catch of black scabbardfish.

11.2.1.1 Landings trends

Landings from the subareas Vb, VI, VII and XII showed a markedly increasing trend from 1999 to 2002 followed by a decreasing trend (Figure 11.2.1). In Subareas VI and VII, French landings represent more than 90% of the total landings.

In response to quotas, French landings in sub-area VI since 2002 have been lower than in previous years (Figure 11.2.2).

11.2.1.2 ICES advice

The most recent ICES advice, in 2006, was: *Given the perceived decrease in stock abundance in the northern areas, ICES recommends a reduction in exploitation to the level before the expansion of the fishery started (1990–1996) in Subareas V, VI, VII, and XII, corresponding to landings of no more than 3500 t.*

11.2.1.3 Management

Since 2003, management of black scabbardfish by EU vessels fishing in EU and international waters includes a combination of TAC and licensing system. The TACs for 2007 and 2008 and the total landings in Subareas V, VI, VII and XII in 2006 and 2007 are presented in the table below.

Year	EU TAC 2008 V, VI, VII & XII	EU Landinds Vb, VI, VII and XII (including catches from faroes EEZ)
2006	3042	3145
2007	3042	3002
2008	3042	

* 2007 landing estimates are preliminary

11.2.2 Data available

11.2.2.1 Landings and discards

Landing data were available for all fleet. The time series of the Spanish catch in subarea XII was revised according to Statlant data. No catch data was available for the Spanish trawling fleet operating on the Northern and Western Hatton Bank (divisions VIb1 and XIIb) in 2007.

No new data on discards was made available.

Black scabbardfish is not known to be discarded. During the French observer program (data from 2004-06) on the trawl fishery, no discards of black scabbardfish were recorded. This is consistent with all the fish caught being of commercial size. The absence of discards implies that LPUEs are equivalent to CPUEs for black scabbardfish.

11.2.2.2 Length compositions

No new data on length frequency distributions was presented.

11.2.2.3 Age compositions

No new data on age composition was presented.

11.2.2.4 Weight at age

No new data on weight at age was presented.

11.2.2.5 Maturity and natural mortality

No new information was made available nevertheless it is important to stress that so far the information available for ICES subareas Vb, VI, VII and XII consistently points out to the predominance of immature small specimens.

11.2.2.6 Catch, effort and research vessel data

France presented a preliminary analysis of French industry database on the deepsea fishery and CPUE from a reference fleet in a reference area in VIa and Vb (Figure 11.2.3).

French data based on Industry DeepSea Fishery (IDSF) database show that black scabbardfish is mainly caught between 700 and 1200 m (Figure 11.2.4). The CPUE of French trawlers display a strong seasonal pattern which may come from different factors such as variations in the seasonal targeting towards different deepwater species and fish catchability (Figure 11.2.5).

11.2.3 Data analyses

No assessment trials were performed.

Data from the French fishing industry will provide more reliable estimates of CPUE. However, at present time series are too short to be useful in stock assessments. Therefore, CPUEs from French logbook data are presently used. However, several factors, such as seasonal (Figure 11.2.5) and depth effects and species directivity (Figure 11.2.6) affect commercial CPUEs and these can be very difficult to interpret.

However the index for directed fisheries (solid line) is for reference fleet in a reference area and these factors are considered to be less of a concern. This index indicates a fairly strong overall declining trend in abundance from 1991 to present.

11.2.4 Comments on the assessment

No assessment was carried out

11.2.5 Management considerations

For this species, it is unclear whether the start of the fishery in the late 1980s corresponds to the start of exploitation as earlier catches of this species may have been taken and discarded. However, since recent observations of targeted blue ling fisheries show low bycatch of black scabbard fish, this may not have been the case.

The state of stock remains uncertain but the available CPUE data indicate a decline in abundance since 1990. We do not know what the sustainable level of fishing is for this stock. There has been a reduction in fishing effort since 2000 and further reductions may be required.

However in order to account to the mixed nature of the fisheries any measure taken to manage this species should take into account the advice given for other species, e.g. roundnose grenadier, caught by the same fishery.

Table 11.2.0a Landings of black scabbard fish from division Vb. Working group estimates

Year	Faeroe Islands			France	Germany	Scotland	E&W&NI	**Total**
	Vb 1	Vb 2	Vb		Vb1			
1988					-	-	-	**0**
1989	-	-		170	-	-	-	**170**
1990	2	10		415	-	-	-	**427**
1991	-	1		134	-	-	-	**135**
1992	1	3		101	-	-	-	**105**
1993	202	-		75	9	-	-	**286**
1994	114	-		45	1	-	-	**160**
1995	164	85		175	-	-	-	**424**
1996	56	1		129	-	-	-	**186**
1997	15	3		50	-	-	-	**68**
1998	36	-		144	-	-	-	**180**
1999	13	-		135	-	6	-	**154**
2000			116	186	-	9	-	**311**
2001	122	281		447	-	20	0	**870**
2002	222	1138		311	-	80		**1751**
2003	222	1230		171	-	11		**1634**
2004	80	625		93	-	70		**868**
2005	65	363		106	-	20		**553**
2006	54	637		93	-			**784**
2007	78	596		93				**767**

Table 11.2.0b Landings of black scabbard fish from division VIa. Working group estimates

	France	Faroes	Germany	Ireland	Scotland	Netherlands	**Total**
1988			-				
1989	138	46	-		-	-	**46**
1990	971		-		-	-	
1991	2244		-		-	-	
1992	2998	3	-		-	-	**3**
1993	2857		48		-	-	**48**
1994	2331		30		2	-	**32**
1995	2598		-		14	-	**14**
1996	2980		-		36	-	**36**
1997	2278		-		147	-	**147**
1998	1553		-		142	-	**142**
1999	1610		-		133	11	**144**
2000	2695		-		333	7	**340**
2001	3269		-		486	-	**486**
2002	3473	2	-		603	21	**626**
2003	2830	45	-		78	-	**123**
2004	2595	59	-		100	-	**159**
2005	2533	38	-		18	-	**56**
2006	1714	59	-	1	63		**122**
2007	1804	44		+	57		**101**

Table 11.2.0b Landings of black scabbard fish from division VIb. Working group estimates

Year	France	Faroes	Germany	Scotland	Lituania	Estonia	Poland	Russia	**Total**
1988			-						**0**
1989	0		-	-	.	.	-	.	**0**
1990	53		-	-	.	.	-	.	**53**
1991	62		-	-	.	-	-	.	**62**
1992	113		-	-	-	-	-	-	**113**
1993	87	62	-	-	-	-	-	-	**149**
1994	55		15	-	-	-	-	-	**70**
1995	15		3	4	-	-	-	-	**22**
1996	1		2	<0.5	-	-	-	-	**3**
1997	16	3	-	88	-	-	-	-	**107**
1998	7		-	6	-	-	-	-	**13**
1999	8		-	58	-	-	-	-	**66**
2000	25		-	41	-	-	-	-	**66**
2001	28	3	-	145	3	225	-	2	**406**
2002	131		-	300	9	-	2	-	**442**
2003	60		-	9	12	7	2	-	**90**
2004	98		-	24	85	5	-	-	**212**
2005	59		-	62	5	11	-	-	**138**
2006	36		-		-	-			**36**
2007	4								**4**

Table 11.2.0c Landings of black scabbard fish from sub-area VII. Working group estimates

Year	France	Ireland	UK (Scotland)	UK (England and wales)	Spain	**Total**
1990	10					**10**
1991	94					**94**
1992	322					**322**
1993	468					**468**
1994	662					**662**
1995	641					**641**
1996	658					**658**
1997	461					**461**
1998	388					**388**
1999	354					**354**
2000	524		3			**527**
2001	682		41			**723**
2002	303		53			**356**
2003	240		1			**241**
2004	262					**262**
2005	168				7	**175**
2006	372	71		2	1	**446**
2007	347	71	1		1	**419**

Table 11.2.0d Landings of black scabbard fish from sub-areas VI and VII. Working group estimates

Year	Ireland	Spain	E&W&NI	**Total**
1988				
1989				**0**
1990				**0**
1991				**0**
1992				**0**
1993	8			**8**
1994	3			**3**
1995				**0**
1996			1	**1**
1997	0	1	2	**3**
1998	0	3	1	**4**
1999	1	0	1	**2**
2000	59	1	40	**100**
2001	68	150	37	**255**
2002	1050	0	43	**1093**
2003	159	0	5	**164**
2004	293	17	2	**312**
2005	79	0	0	**79**
2006		-		**0**
2007				**0**

Table 11.2.0e Landings of black scabbard fish from division XIIb. Working group estimates

Year	France	Spain	Scotland	**Total**
1988				**0**
1989	0			**0**
1990	0			**0**
1991	2			**2**
1992	7			**7**
1993	24			**24**
1994	9			**9**
1995	8			**8**
1996	7	41		**48**
1997	1	106		**107**
1998	324	127		**451**
1999	3	117	0	**120**
2000	6	880		**886**
2001	3	1221		**1224**
2002	0	908	1	**909**
2003	7	163		**170**
2004	10	141	1	**152**
2005	14	107		**121**
2006	0	127		**127**
2007	-			**0**

Table 11.2.0f Landings of black scabbard fish from sub-area XII. Working group estimates

Year	Faroes	Germany	Ireland	E&W&NI	Iceland**	Lituania	Estonia	Poland	**Total**
1988									**0**
1989						.	.	-	**0**
1990						.	.	-	**0**
1991						.	-	-	**0**
1992						-	-	-	**0**
1993	1051	93				-	-	-	**1144**
1994	779	45				-	-	-	**824**
1995	301					-	-	-	**301**
1996	187				0	-	-	-	**187**
1997	102					-	-	-	**102**
1998	20					-	-	-	**20**
1999						-	-	-	**0**
2000	1					-	-	-	**1**
2001						-	-	-	**0**
2002				0		-	-	-	**0**
2003			1			1	-	1	**3**
2004	95					1	-	-	**96**
2005	127		0			-	1	-	**128**
2006	8								**8**
2007	0								

Table 11.2.0g Landings of black scabbard fish from sub-area VI, VII and XII and division Vb. Working group estimates

	Vb	VI	VI+VII	VII	XII	**Total**
1988						
1989	170	184				**354**
1990	427	1023		10		**1461**
1991	135	2307		94	2	**2537**
1992	105	3113		322	7	**3547**
1993	286	3054	8	468	1168	**4984**
1994	160	2433	3	662	833	**4091**
1995	424	2634		641	309	**4008**
1996	186	3019	1	658	235	**4099**
1997	68	2533	3	461	209	**3273**
1998	180	1708	4	388	471	**2751**
1999	154	1820	2	354	120	**2451**
2000	311	3101	100	527	887	**4925**
2001	870	4162	255	723	1224	**7233**
2002	1751	4541	1093	356	909	**8650**
2003	1634	3043	164	241	173	**5255**
2004	868	2967	312	262	248	**4657**
2005	553	2727	79	175	250	**3784**
2006	784	1873		446	135	**3238**
2007	767	1909		419		**3095**

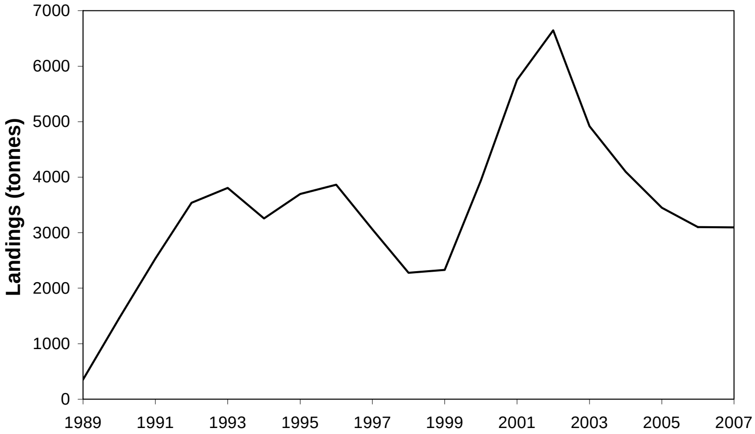


Figure 11.2.1 – Black scabbardfish, total landings in ICES division Vb and subareas VI and VII.

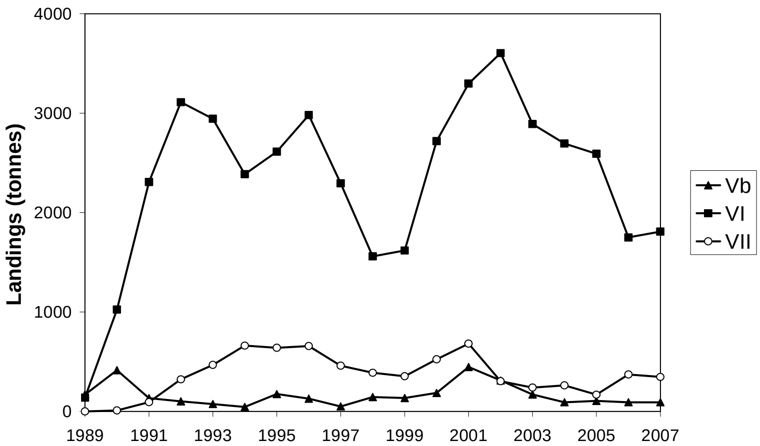


Figure 11.2.2 – Black scabbardfish French total landings estimates in ICES division Vb and subareas VI and VII.

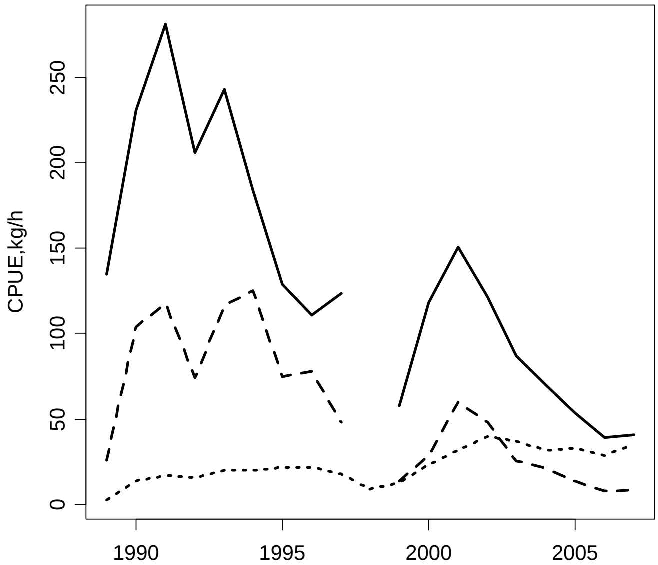


Figure 11.2.3. Black scabbardfish LPUEs for French trawlers in a reference area (28 statistical rectangles to the northwest of Scotland) in Vb and VI.(i) dotted line: LPUE all vessels, (ii) dashed line: LPUE of the reference fleet and (iii) solid line: directed LPUE of the reference fleet (landings for fishing trip where blue ling>10% of total landings).

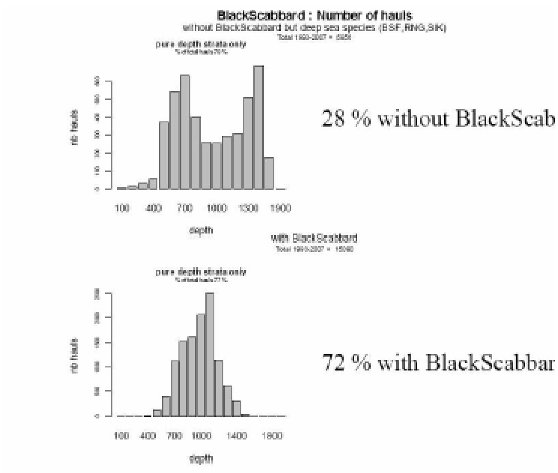


Figure 11.2.4. Occurrence of Black scabbardfish in fishing hauls by depth 2000-2006 (Biseau, 2008 WD). Upper graph shows depth range of hauls with no black scabbard fish catches, lower graph shows hauls with black scabbard fish.

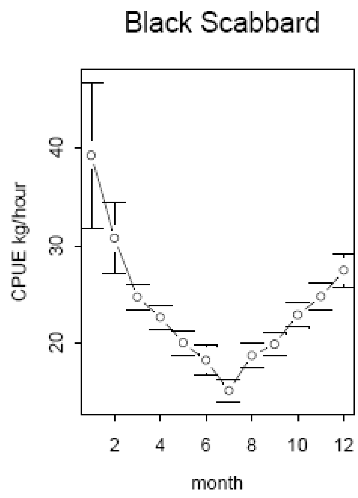


Figure 11.2.5. Monthly pattern in the CPUE of black scabbardfish in the French trawl fishery 1989-2005 (from Biseau, 2006WD).

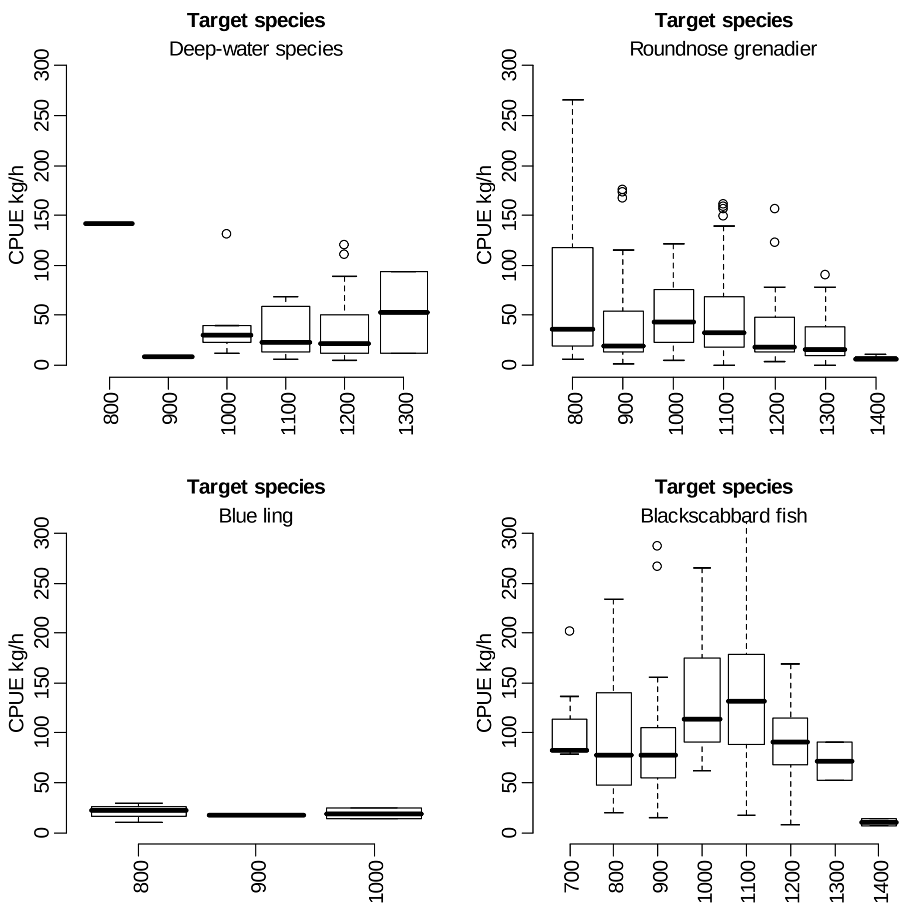


Figure 11.2.6. CPUEs from the French observer program. CPUE of Blackscabbard fish per hour hauling and per depth when targeting deepwater species (upper left), roundnose grenadier (upper right), blue ling(lower left) and blacksccardfish (lower right).

11.3 Black scabbard fish in sub-areas VIII, IX

11.3.1 The fishery

The main fishery taking place in these sub-areas is derived from the Portuguese longliners. This fishery was described in last´ year report (Bordalo_Machado and Figueiredo, 2007 WD). The French bottom trawlers operating in sub-areas mainly VI and VII have a small marginal activity in subarea VIII.

11.3.1.1 Landings trends

Landings in sub-areas VIII and IX are almost all from the Portuguese longline fishery that takes place in subarea IXa (more than 99% of the total landings). (Figure 11.3.1).

11.3.1.2 ICES advice

In 2006, ICES advised: *In Division VII and IX the adoption of a status quo exploitation level is advised.*

11.3.1.3 Management

Since 2003, management of black scabbardfish by EU vessels fishing in EU and international waters includes a combination of TAC and licensing system. The TAC adopted for 2007 and 2008 as well as the total landings in Subareas VIII, IX and X are next presented. The TACs has not been fully taken in recent years suggesting that it is not restrictive.

VIII, IX & X	
Uptake in 2006	2791
Uptake in 2007	3480
TAC (2007 & 2008)	4 000

11.3.2 Data available

11.3.2.1 Landings and discards

The artisanal segment of the commercial fishing fleet of mainland Portugal is responsible for the largest landings' quantities of deep-water species. The onboard discard sampling for longline Portuguese commercial fleet started in mid 2005 and is integrated in the Portuguese Discard Sampling programme, included in the EU DCR/NP. Onboard sampling in longline commercial vessels is carried out in a monthly basis to get discards and trip information.

Results from 12 sampled trips held between 2005 and 2007 showed that longline catches targeting black scarbbardfish are almost composed 90% black scabbard fish in number and 84% in weight. Total discards were less than 2% in weight of total catch (Fernandes et al., 2008WD).

11.3.2.2 Length compositions

In the scope of the National Minimum Landings Sampling Program, length frequency and biological samples from Portuguese landing port at Sesimbra were collected on a monthly basis during 2007. Length range varied between 71 and 135 cm with a mean around 106 cm (Figure 11.3.2) and it was similar to those obtained in previous years (ICES 2007).

11.3.2.3 Age compositions

New results on the comparison of age readings using both whole and sectioned otoliths were presented by Farias et al. (2008 WD). In smaller specimens (< 110 cm) there was a high agreement on the number of growth bands between whole and sectioned otoliths. In larger specimens the agreement was reduced and sectioned otolith proved to be more adequate for ageing purposes. However, no time series age data were available

11.3.2.4 Weight at age

No new data were available.

11.3.2.5 Maturity and natural mortality

No information available.

11.3.2.6 Catch, effort and research vessel data

Standardized black scabbardfish LPUE from the longline fleet operating in sub-area IXa were estimated for the period 1995 – 2006 (Bordalo-Machado et al., 2008 WD).

11.3.3 Data analyses

Standardized black scabbardfish LPUE from the longline fleet operating in sub-area IXa were estimated for the period 1995 – 2006 (Bordalo-Machado et al., 2008 WD). GLM models were adjusted in which YEAR, MONTH and VESSEL were considered as factor. A Gamma distribution was admitted for the response variable and the identity and logarithmic functions as link function. The quality of model adjustment was evaluated by quantile residuals analysis. The model with more number of significant coefficients and more explained LPUE variability was selected.

Figure 11.3.3 shows the variation of the estimated Year effects for the selected model during the period 1996-2006. The monthly LPUE estimates and the corresponding 95% confidence intervals are shown in Figure 11.3.4. LPUE did not show any marked trend and seem to follow a seasonal pattern along the period in analysis.

No assessment trials were performed.

11.3.4 Comments on the assessment

No assessment was performed

11.3.5 Management considerations

There is no new relevant information demonstrating changes on the stock. So the 2006 advice "In Division IXa the adoption of a status quo exploitation level is advised " is maintained.

Table 11.3.0a Black scabbard fish from sub-area VIII; working group estimates of landings

Year	France			Spain	
	VIIIa	VIIIb,c	VIIId		**Total**
1988					**0**
1989	0	0	0		**0**
1990	0	0	0		**0**
1991	1	0	0		**1**
1992	4	0	4		**9**
1993	5	0	7		**11**
1994	3	0	2		**5**
1995	0	0	0		**0**
1996	0	0	0	3	**3**
1997	1	0	0	1	**2**
1998	2	0	0	3	**5**
1999	7	0	4	0	**11**
2000	11	0	21	1	**33**
2001	15	0	7	1	**23**
2002	16	2	14	1	**33**
2003	25	0	8	1	**34**
2004	24	0	13	1	**39**
2005	19	0	6	1	**26**
2006	30	2	19	0	**52**
2007	14	1	13		**27**

Table 11.3.0b Black scabbard fish from sub-area IXa; working group estimates of landings

Year	Portugal	**Total**
1988	2602	**2602**
1989	3473	**3473**
1990	3274	**3274**
1991	3978	**3978**
1992	4389	**4389**
1993	4513	**4513**
1994	3429	**3429**
1995	4272	**4272**
1996	3686	**3686**
1997	3553	**3553**
1998	3147	**3147**
1999	2741	**2741**
2000	2371	**2371**
2001	2744	**2744**
2002	2692	**2692**
2003	2630	**2630**
2004	2463	**2463**
2005	2746	**2746**
2006	2674	**2674**
2007	3453	**3453**

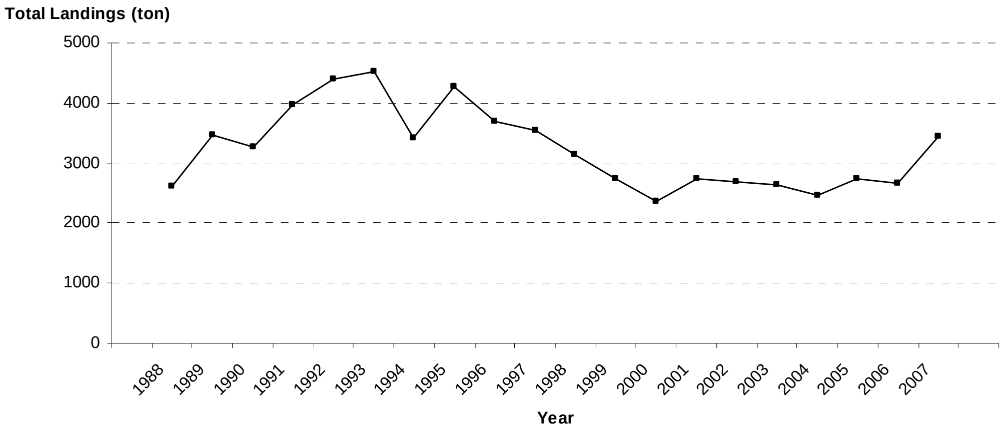


Figure 11.3.1 – Black scabbardfish Portuguese total landings estimates in ICES subareas IXa.

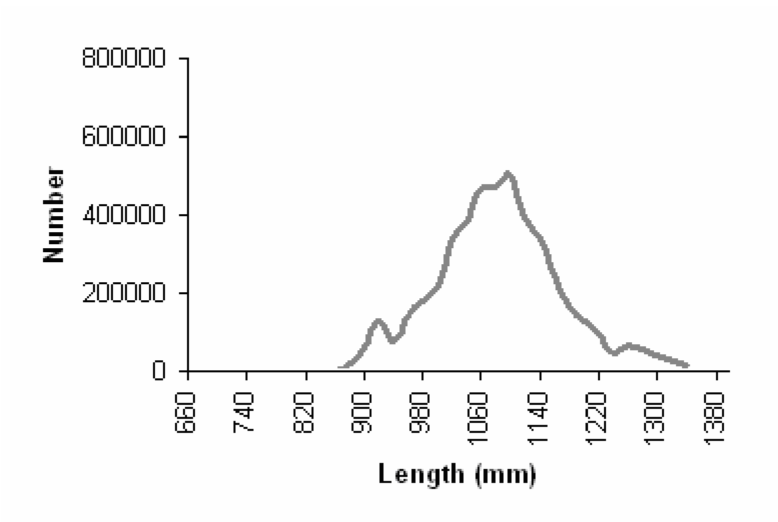


Figure 11.3.2 – Black scabbardfish length frequency distribution of 2007 total landings in ICES subarea IXa.

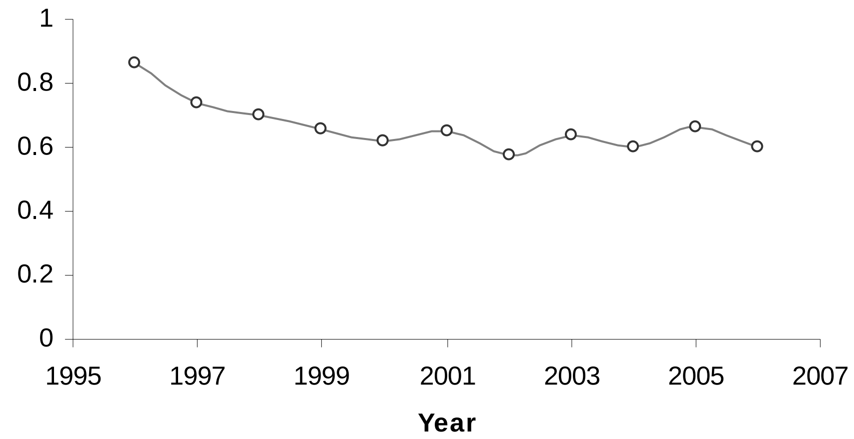


Figure 11.3.3 – Black scabbardfish Year effects resulting from the GLM based on Portuguese longline fishery

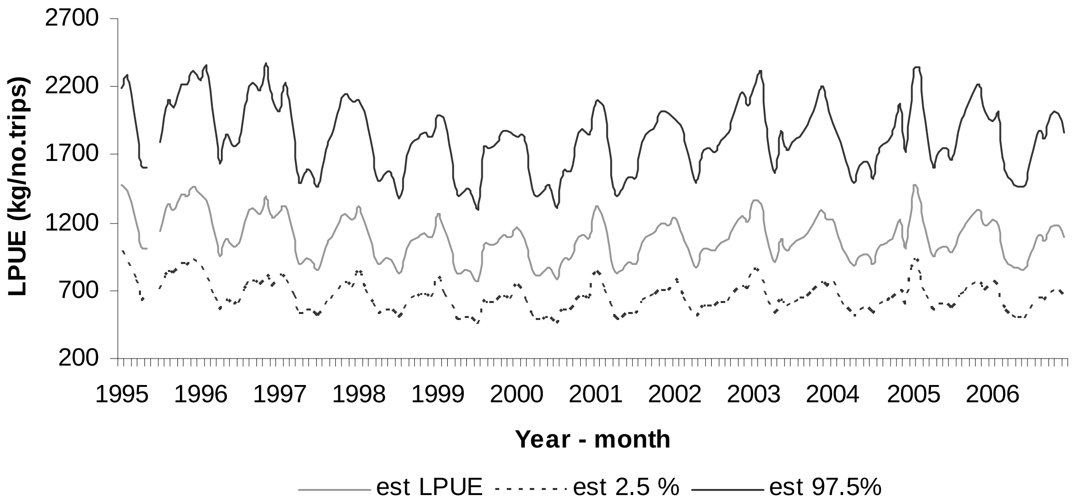


Figure 11.3.4 – Black scabbardfish. Monthly LPUE estimates with 95% confidence intervals from the adjusted GLM model to the Portuguese longline data.

11.4 Black scabbard fish other areas (I, II, IIIa, IV, X, Va, XIV)

11.4.1 The fishery

There is almost no fishery in these areas.

11.4.1.1 Landings trends

Landings in these areas are mostly negligible. However, landings from sub-area X have fluctuated between 2 and 400t per year between 1990 and 2007.

11.4.1.2 ICES advice

There was no advice in 2007 and the advice stated in 2006 was: *Any measure taken to manage this species in these areas should take into account the advice given for other species taken in the same mixed fishery. Fisheries on black scabbard should be accompanied by programmes to collect data on both target and bycatch fish. The fishery should not be allowed to expand unless it can be shown that it is sustainable.*

11.4.1.3 Management

Since 2003, management of black scabbardfish by EU vessels fishing in EU and international waters includes a combination of TAC and licensing system. The TAC adopted for 2007 and 2008 by sub-areas are next presented

TAC 2007 & 2008	
I, II, III & IV	15t

11.4.2 Data available

11.4.2.1 Landings and discards

Landings are given in table 11.4.0.

11.4.2.2 Length compositions

Length frequency distribution of black scabbardfish based on samples collected during Azorean longline exploratory fishing surveys in Subarea X in 2004 and 2005 is presented in Figure 11.4.1.

11.4.2.3 Age compositions

No data

11.4.2.4 Weight at age

No data

11.4.2.5 Maturity and natural mortality

In Azorean waters females in spawning condition (GSI > 3 up to 9) with total lengths between 108 and 137 cm occurred predominantly in October and in November (J. Pereira, pers comm.). The length 108 cm corresponds to the estimate of first maturity determined for for Madeira specimens. Spawners were observed around the Azores from November to April (Vinnichenko, 2002).

11.4.2.6 Catch, effort and research vessel data

No new data

11.4.3 Data analyses

No analysis was performed

11.4.4 Comments on the assessment

No assessment was performed

11.4.5 Management considerations

No new relevant information is available, so the 2006 advice; *Fisheries on black scabbard should be accompanied by programmes to collect data on both target and bycatch fish. The fishery should not be allowed to expand unless it can be shown that it is sustainable* is maintained.

Table 11.4.0 Black scabbard fish other areas (I, II, IIIa, IV, X, Va, XIV). Working group estimates of landings

	II	IV	Va	X	XIV	Total
1988	0	0	0	0	0	**0**
1989	0	3	0	0	0	**3**
1990	1	70	0	0	0	**71**
1991	0	107	0	166	0	**273**
1992	0	219	0	370	0	**589**
1993	0	34	0	2	0	**36**
1994	0	45	1	0	0	**46**
1995	1	8	0	3	0	**12**
1996	0	7	0	11	0	**18**
1997	0	2	1	3	0	**6**
1998	0	11	0	99	2	**112**
1999	0	7	9	112	0	**128**
2000	0	5	10	113	90	**218**
2001	0	11	5	16	0	**32**
2002	0	24	13	2	8	**47**
2003	0	4	14	91	2	**111**
2004	0	5	19	113	0	**137**
2005	0	2	19	379	0	**400**
2006	0	13	23	65	0	**101**
2007	0	1	1	0	0	**2**

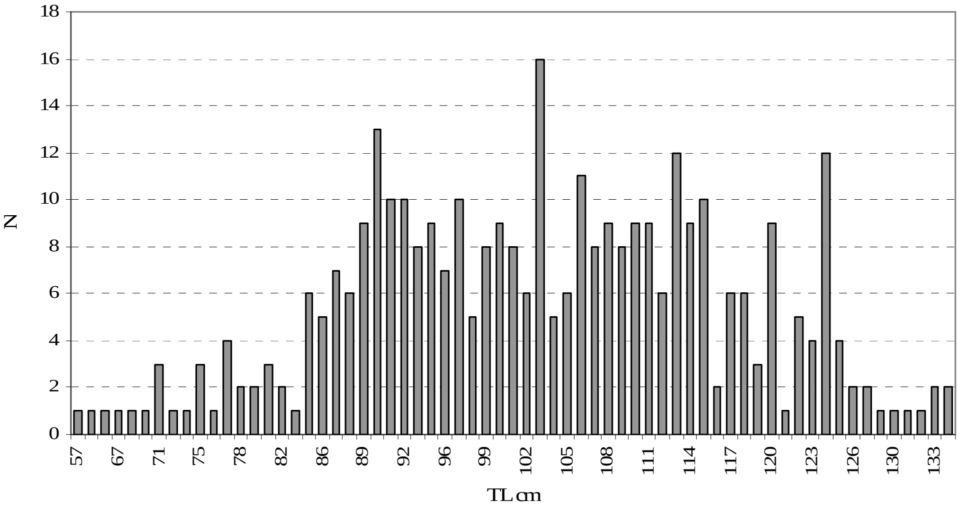


Figure 11.4.1- Length frequency distribution (in numbers) from samples obtained during Azorean longline exploratory fishing surveys in Subarea X (2004 and 2005)

12 Greater Forkbeard (*Phycis Blennoides*) in all Eco-Regions

12.1 The fishery

Greater forkbeard may be considered as a by-catch species in the traditional demersal trawl and longline mixed fisheries targeting species such as hake, megrim, monkfish, ling, blue ling.

Since 1988, around 80% of landings came from the Subareas VI and VII. Spanish, French and UK trawlers and long liners are the main fleets involved in this fishery. The Irish deepwater fishery around Porcupine Bank is based on the flat grounds and targets orange roughy, black scabbard, roundnose grenadier and deepwater siki sharks. The Russian fishery in the North-East Atlantic targeting roundnose grenadier, tusk and ling fish small quantities of greater forkbeard as by-catch of the trawler fleet in Hatton and Rockall Banks.

The rest of landings in that period (11%), come from Subarea s VIII and IX (mainly from VIII) by the trawler and longliner Spanish and French fleet. In Subarea IX since 2001 small amounts of Phycis spp (probably P. phycis) are landed in ports of Strait of Gibraltar by the longliner fleet targeting scabbardfish in Algeciras, Barbate and Conil.

Minor quantities of P. blennoides from X subdivision and Vb Subarea are landed by Portuguese and Norwegian vessels respectively. The Azores deep-water fishery is a multispecies (up to 15) and multigear fishery dominated by the main target species Pagellus bogaraveo. Target species can change seasonally according to abundance and market prices, but landings of Phycis blennoides representing less than 3% and can be considered as by-catch.

Catches data for greater forkbeard in 2006 and 2007 aggregated at the level of statistical rectangle were provided to the working group by France, Ireland, the UK (England and Wales and Scotland) and Iceland. These are shown in Figure 5.1.1 and 5.1.2.

12.1.1 Landing trends

The Table 12.0 shows greater forkbeard (P. blennoides and in some cases Phycis spp.) landings by Subarea and country.

From 2000 to 2005, landings in Subareas VIII and IX were higher than in previous years, but since 2006 they decreased. In this sense a reduction of landings of Spanish long liners is observed since 2005.

In Subarea s I, II, III, IV and V only Norwegian landings are significant especially in 2002 and 2003. The Norwegian longliners which fish in these areas catch P. blennoides as a bycatch in the ling fishery. The quantity of this bycatch depends on market price. After eight years without P. blennoides records, in 2002 the Norwegian fleet reported 315 t of landings in Subareas I and II, but since this year the landings of this country have been reduced importantly to reach only 41 tonnes in 2007. In Subareas III and IV a strong decrease in landings is observed from 1992 to 2001, but like in Subareas I and II landings since 2002 show an important increase. Although the landings in Subarea Vb are lower than Subareas III and IV the historical trends are very similar.

The trend in VI and VII subdivision shows an important increase in landings from 1994 to 2000. In this year the total landings reported reached a peak of 4972 tons.

Since 2001 a continuous and notable decrease is observed and in 2007 only 1548 tonnes are recorded. That is a value similar to the landings recorded in years from 1991 to 1994 (Figure 12.3).

In subarea s VIII and IX the historical series of landings since 1993 remains always above 300 tonnes, with a peak in 1998 of 668 tonnes. In 2007 reached only 195 tonnes, one of the lowest values of the series.

Although In the Subarea X landings of greater forkbeard show ups and downs (is not a target species of the Portuguese demersal fleet), a continuous decrease can be observed since 2000.

Landings by subarea and gear of Spanish fleet from 2003 to 2007 are shown in Table 12.1. In this period the landings of Phycis spp of Spain comes from bottom trawler and longliner fleet (65% and 29% respectively) operating mainly in Subarea s VII and VIII.

12.1.2 ICES advice

In 2006, ICES advised; *The landings of greater forkbeard are mainly bycatch from traditional demersal trawl and longline fisheries targeting species such as hake, megrim, monkfish, ling, blue ling, etc. Fluctuations in landings are probably the result of changing effort on different target species and/or market prices and are not necessary linked with changes in the resource abundance. The species should not be managed in a single-species context and any advice should take into account advice on other species/fisheries.*

12.1.3 Management

The Council Regulation (EC) No 2015/2006 maintained for Phycis blennoides the same TAC for 2007 and 2008 as in two previous years. In the next table a summary of P. blennoides international TAC by Subarea s and also landings in 2006 and 2007 are shown. Due to in some cases international landings are not available by species, these summary table could include significant landings of Phycis spp. In 2007 the landings in Subarea s V, VI, VII, in VIII IX, and in X, XII are above the TAC.

Phycis Blennoides	EU TAC	EU landings	
SUBAREA	2007-2008	2006	2007
I, II, III, IV	36	188	285
V, VI, VII	2028	2121	1603
VIII, IX	267	321	195
X, XII	63	15	17
Total	2394	2645	2100

12.2 Stock identity

The Greater forkbeard is a gadoid fish which is widely distributed in the North-Eastern Atlantic from Norway and Iceland to Cape Blanc in West Africa and the Mediterranean (Svetovidov, 1986; Cohen et al., 1990). It is distributed along the continental shelf and slope in depths ranging between 60 and 800 meters but recent observations on board of commercial longliners and research surveys extend the depth range to below 1000 m (Stefanescu et al, 1992). Unfortunately very little is known about stock structure of the species.

Since the began of the SGDEEP the information has been split into four different components according to the importance of the catches and their geographical distribution. However, this separation does not pre-suppose that there are four different stocks of Greater forkbeard and only offers a way of recording the available information.in ICES area.

- Greater forkbeard in Subarea s I, II, III, IV and V.
- Greater forkbeard in Subarea s VI, VII and XII (Hatton Bank).
- Greater forkbeard in Subarea s VIII and IX.
- Greater forkbeard in Subarea X (Azorean region)

12.3 Data available

12.3.1 Landings and discards

Landings are presented in table 12.0a-g

12.3.2 Length compositions

The Figure 12.4 presents the comparison between length frequency distributions from 2001-2007 Spanish bottom trawl surveys in Porcupine (Baldó et al 2008). There is some evidence of modal progression across years and this is may reflect the recruitment of individual year classes.

12.3.3 Age compositions

No data on age composition are available.

12.3.4 Weight at age

No weight at age data are available.

12.3.5 Maturity and natural mortality

No data on maturity and natural mortality are available.

12.3.6 Catch, effort and research vesssel data

Data of abundance of Greater forkbeard are provided from 2001 to 2007 for Spanish bottom trawl surveys in Porcupine (Baldó et al 2008). Biomass and abundance indices have fluctuated without any obvious trend. (Figure 12.5).

A geographic representation of Phycis blennoides catches in Porcupine bank is shown in Figures 12.6 and 12.7. Notice the notable abundance in 2003 in all geographic area covered by the survey coincides with an important increase of sizes from 22 to 32 cm in this year (figure 12.4).

A historical data series of Effort (days at sea) and LPUEs of Phycis spp. of commercial Baka trawler of Basque Country in VI, VII and VIII Subarea s is shown in table 12.3. This is a bycatch fishery and abundance indices should be treated with caution.

12.4 Data analyses

No data analysis were carried out by the Working Group.

12.5 Comments on the assessment

Not applicable.

12.6 Management considerations

The landings of greater forkbeard are mainly bycatch from traditional demersal trawl and longline fisheries targeting species such as hake, megrim, monkfish, ling, blue ling, etc. Fluctuations in landings are probably the result of changing effort on different target species and/or market prices and are not necessary linked with changes in the resource abundance. The species should not be managed in a single-species context and any advice should take into account advice on other species/fisheries

Table 12.0a greater forkbeard (*phycis blennoides*) in Subareas I and II. Working group estimates of landings

Year	Norway	France	Russia	UK (Scot)	Germany	TOTAL
1988	0					0
1989	0					0
1990	23					23
1991	39					39
1992	33					33
1993	1					1
1994	0					0
1995	0					0
1996	0					0
1997	0					0
1998	0					0
1999	0	0				0
2000	0	0				0
2001	0	1	7			8
2002	315	0		1	2	318
2003	153	0			2	155
2004	72	0	3	0		75
2005	51	0				51
2006	46	0	3			49
2007	41	0	5	1		47

Table 12.0a greater forkbeard *(phycis blennoides*) in Subareas III and IV. Working group estimates of landings

Year	France	Norway	UK (EWNI)	UK (Scot)(1)	Germany	TOTAL
1988	12	0	3	0		15
1989	12	0	0	0		12
1990	18	92	5	0		115
1991	20	161	0	0		181
1992	13	130	0	2		145
1993	6	28	0	0		34
1994	11			1		12
1995	2			1		3
1996	2	10		6		18
1997	2			5		7
1998	1		0	11		12
1999	3		5	23		31
2000	4		0	7		11
2001	6		1	19	2	27
2002	2	561	1	21	0	585
2003	1	225	0	7		233
2004	2	138		3		143
2005	2	81	0	1		83
2006	1	134	3			139
2007	1	236	0	1		238

(1) Includes Moridae, in 2005 only data from January to June

Table 12.0c greater forkbeard (*phycis blennoides*) in division Vb. Working group estimates of landings

Year	France	Norway	UK (Scot)(1)	UK (EWNI)	Faroe Islands	Russia	TOTAL
1988	2	0					2
1989	1	0					1
1990	10	28					38
1991	9	44					53
1992	16	33					49
1993	5	22					27
1994	4						4
1995	9						9
1996	7						7
1997	7	0					7
1998	4	4					8
1999	6	28	0				34
2000	4	26	1	0			32
2001	9	92	1	0			102
2002	10	133	5	0			149
2003	11	55	7	0			73
2004	9	37	2	2			50
2005	7	39		0,3			46
2006	8	26			6		39
2007	10	34	0	0	9	2	55

(1) Includes Moridae, in 2005 only data from January to June

Table 12.0d greater forkbeard *(phycis blennoides*) in Subareas VI and VI. Working group estimates of landings

Year	France	Ireland	Norway	Spain(1)	UK (EWNI)	UK (Scot)(2)	Germany	Russia	Faroe Islands	TOTAL
1988	252	0	0	1584	62	0				1898
1989	342	14	0	1446	13	0				1815
1990	454	0	88	1372	6	1				1921
1991	476	1	126	953	13	5				1574
1992	646	4	244	745	0	1				1640
1993	582	0	53	824	0	3				1462
1994	451	111		1002	0	7				1571
1995	430	163		722	808	15				2138
1996	519	154		1428	1434	55				3590
1997	512	131	5	46	1460	181				2335
1998	357	530	162	530	1364	97				3040
1999	317	686	183	824	929	518	1			3458
2000	676	743	380	1613	731	820	8	2		4972
2001	685	663	536	1332	538	640	10	4		4408
2002	613	481	300	1049	421	545	9	0		3417
2003	469	319	492	1100	245	661	1	1		3287
2004	441	183	165	1131	288	397		1		2607
2005	598	237	128	941	179	164		5		2252
2006	626	68	162	1075	148			2	0	2082
2007	549	41	188	454	111	203		2	0	1548

(1) Phycis spp.

(2) Includes Moridae, in 2005 only data from January to June

Table 12.0e greater forkbeard (*phycis blennoides*) in Subareas VIII and IX. Working group estimates of landings

Year	France	Portugal (1)	Spain(1)	UK (EWNI)	TOTAL
1988	7	0	74		81
1989	7	0	138		145
1990	16	0	218		234
1991	18	4	108		130
1992	9	8	162		179
1993	0	8	387		395
1994		0	320		320
1995	54	0	330		384
1996	25	2	429		456
1997	4	1	356		361
1998	3	6	655		664
1999	5	10	361		376
2000	32	6	374		412
2001	34	8	454		496
2002	67	8	418		493
2003	28	11	388		427
2004	44	10	444		498
2005	57	14	312	0	383
2006	54	10	257		321
2007	32	44	120	0	195

(1) Phycis spp.

Table 12.0f greater forkbeard (*phycis blennoides*) in Subarea X. Working group estimates of landings

Year	Portugal(1)	TOTAL
1988	29	29
1989	42	42
1990	50	50
1991	68	68
1992	91	91
1993	115	115
1994	136	136
1995	71	71
1996	45	45
1997	30	30
1998	38	38
1999	41	41
2000	91	91
2001	83	83
2002	57	57
2003	45	45
2004	37	37
2005	22	22
2006	15	15
2007	17	17

(1) from 1988 to 2005 Phycis spp.

Table 12.0g greater forkbeard (*phycis blennoides*) in sub- XII. Working group estimates of landings

Year	France	UK (Scot)(1)	Norway	UK (EWNI)	Spain(2)	TOTAL
1988						0
1989						0
1990						0
1991						0
1992	1					1
1993	1					1
1994	3					3
1995	4					4
1996	2					2
1997	2					2
1998	1					1
1999	0	0				0
2000	2	4				6
2001	0	1	6	1		8
2002	0		2	4		6
2003	3		8	0		11
2004	3		6		34	43
2005	1	0	0	0	3	4
2006*	0					0
2007	0	0		0	0	0

(1) Includes Moridae, in 2005 only data from January to June

(2) Phycis spp.

* Preliminary data

Table 12.0h greater forkbeard *(phycis* blennoides) in the north east Atlantic. Working group estimates of landings

Year	I+II	III+IV	Vb	VI+VII	VIII+IX	X	XII	TOTAL
1988	0	15	2	1898	81	29	0	2025
1989	0	12	1	1815	145	42	0	2015
1990	23	115	38	1921	234	50	0	2381
1991	39	181	53	1574	130	68	0	2045
1992	33	145	49	1640	179	91	1	2138
1993	1	34	27	1462	395	115	1	2035
1994	0	12	4	1571	320	136	3	2046
1995	0	3	9	2138	384	71	4	2609
1996	0	18	7	3590	456	45	2	4118
1997	0	7	7	2335	361	30	2	2742
1998	0	12	8	3040	664	38	1	3763
1999	0	31	34	3458	376	41	0	3940
2000	0	11	32	4972	412	91	6	5524
2001	8	27	102	4408	496	83	8	5132
2002	318	585	149	3417	493	57	6	5025
2003	155	233	73	3287	427	45	11	4232
2004	75	143	50	2607	498	37	43	3452
2005	51	83	46	2252	383	22	4	2841
2006	49	139	39	2082	321	15	0	2645
2007	47	238	55	1548	195	17	0	2100

Table 12.1. Phycis spp Spanish landings (t) by Subarea and gear in the period 2003-2005

Phycis spp

	2003						2004					
Gear	**VI**	**VII**	**VIII**	**IX**	**XII**	**XIV**	**VI**	**VII**	**VIII**	**IX**	**XII**	**XIV**
Hooks and (long)lines	64	359	103	5	0	0	1	157	242	0	0	0
Gillnets	0	43	37	1	0	0	0	26	28	0	0	0
Bottom trawl	66	541	167	34	71	0	57	891	112	32	34	0
Others	0	27	10	31	0	0	0	0	0	30	0	0

	2005						2006					
Gear	**VI**	**VII**	**VIII**	**IX**	**XII**	**XIV**	**VI**	**VII**	**VIII**	**IX**	**XII**	**XIV**
Hooks and (long)lines	1	180	148	0	0	0	0	376	80	1	0	0
Gillnets	0	10	8	0	0	0	0	9	21	1	0	0
Bottom trawl	146	699	97	39	3	0	37	653	84	28	0	0
Others	0	0	0	18	0	0	0	0	0	42	0	0

	2007*					
Gear	**VI**	**VII**	**VIII**	**IX**	**XII**	**XIV**
Hooks and (long)lines	0	138	31	1	0	0
Gillnets	0	0	2	1	0	0
Bottom trawl	37	279	45	22	0	0
Others	0	0	0	18	0	0

*** Preliminary**

Table 12.3. Phycis spp landings (t), effective effort (fishing days = trips*(days/trip)) and LPUE (landings in kg/day) of different fleets landing in the Basque Country (Spain) ports in the period 1996-2007.

-. from 1996 to 2000 Effort and Landings OF Baka Otter trawl of Ondarroa fishing port in Divisions VIIIa,b,d, Subarea VII and Subarea VI.

-. from 2001 to 2006 Effort and Landings of Baka Otter trawl of all fishing ports in Divisions VIIIa,b,c d, Subarea VII and Subarea VI.

(a)	BAKA trawl-ON-VIII			BAKA trawl-ON-VII			BAKA trawl-ON-VI		
Year	Landings (t)	Effort (days)	LPUE (kg/days)	Landings (t)	Effort (days)	LPUE (kg/days)	Landings (t)	Effort (days)	LPUE (kg/days)
1996	5,3	4378	1,2	63,2	1170	54,0	45,7	695	65,7
1997	6,7	4286	1,6	15,4	540	28,6	36,2	710	51,0
1998*	0,9	3002	0,3	52,5	1196	43,9	54,1	750	72,2
1999*	1,5	2337	0,6	42,2	1384	30,5	140,7	855	164,7
2000*	7,4	2227	3,3	59,6	1850	32,2	190,8	763	250,0
2001**	4,1	2707	1,5	58,7	1531	38,3	183,7	1171	156,9
2002**	11,3	3617	3,1	23,6	1055	22,4	164,1	1592	103,1
2003**	11,7	3363	3,5	13,4	1060	12,7	65,1	827	78,8
2004**	10,1	4232	2,4	17,0	1074	15,8	52,8	510	103,5
2005**	8,6	3697	2,3	26,7	663	40,3	49,9	484	103,1
2006**	13,0	3275	4,0	3,9	501	7,9	37,1	449	82,7
2007***	8,3	2805	3,0	4,5	476	9,5	36,7	373	98,6

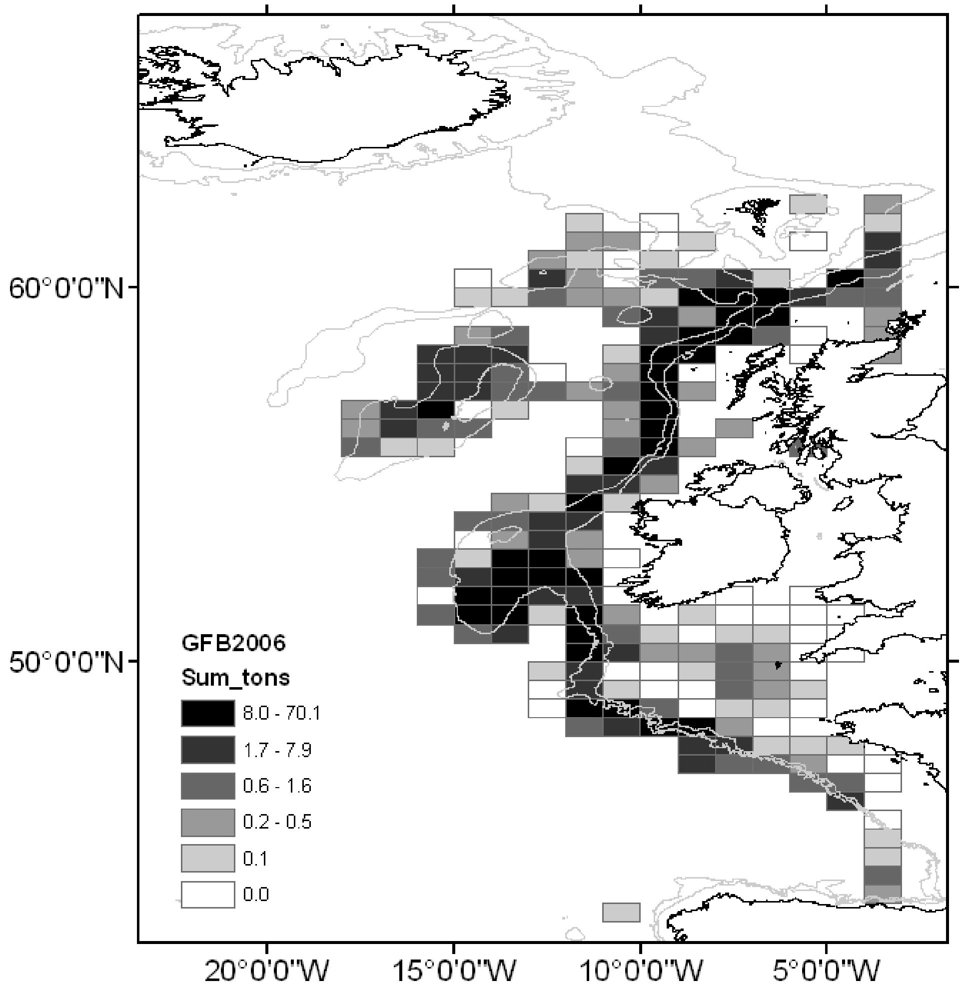


Figure 12.1. Catches of greater forkbeard by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2006.

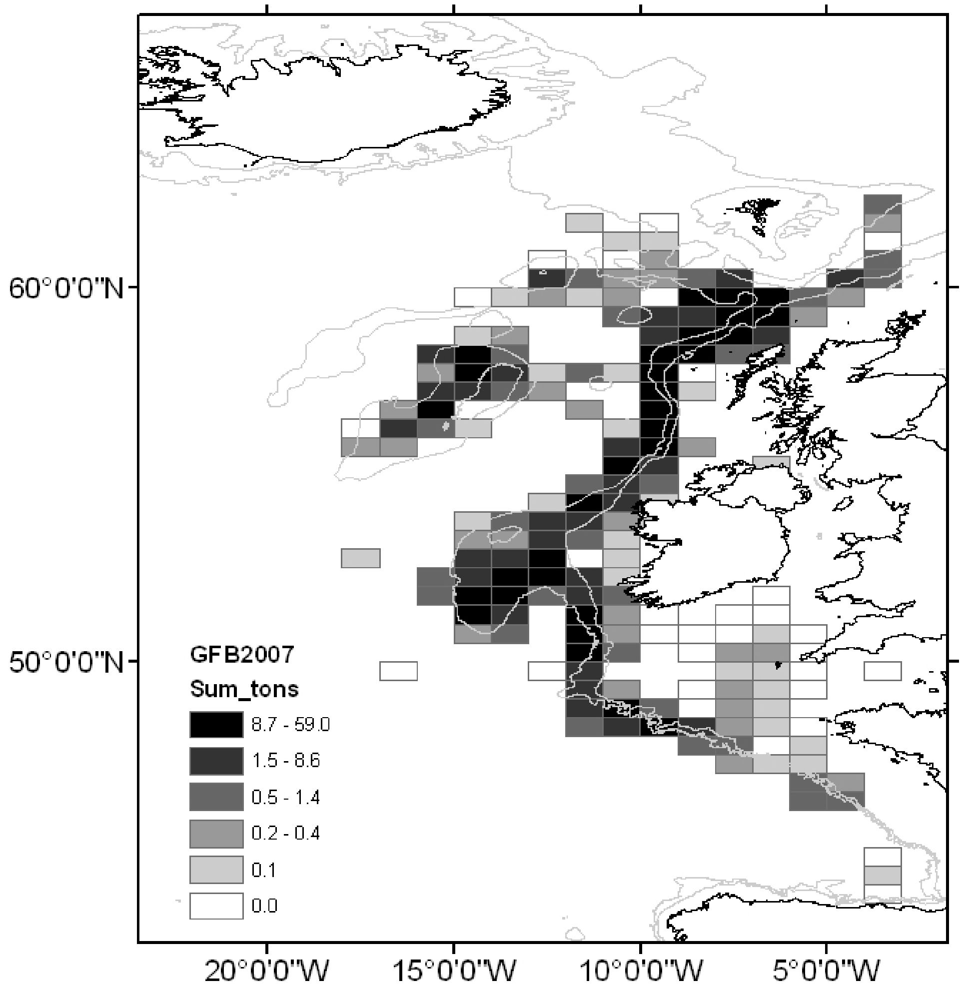


Figure 12.2. Catches greater forkbeard by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2007.

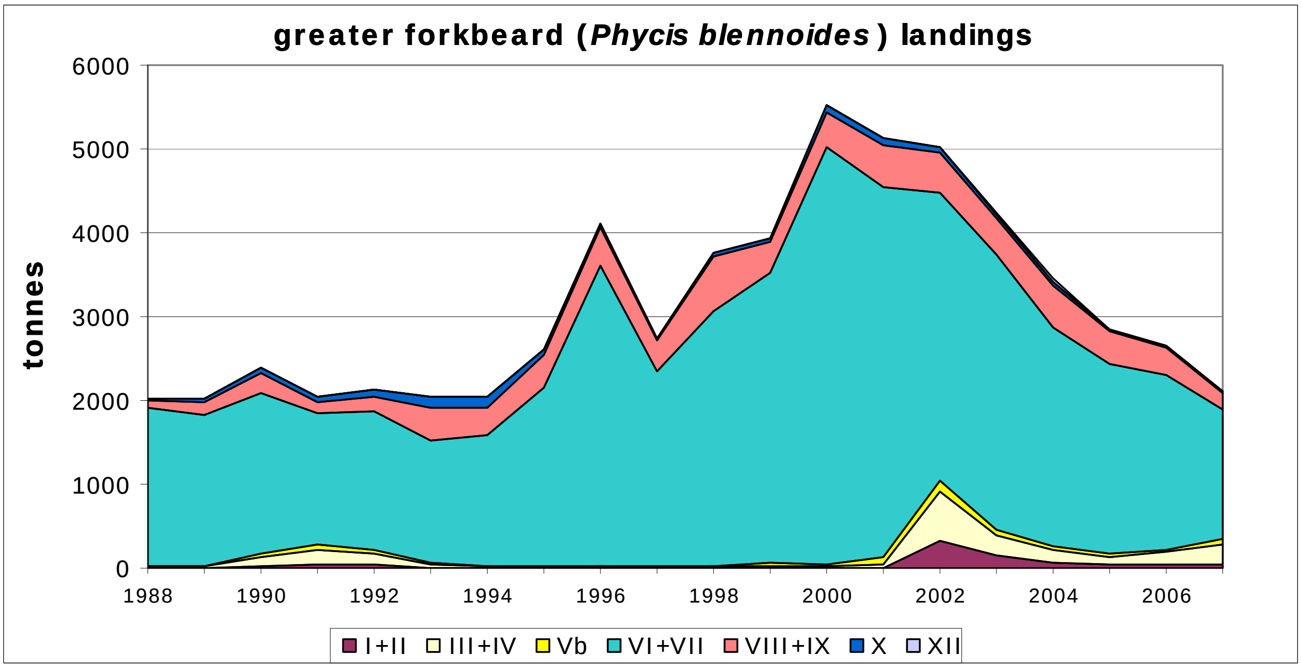


Figure 12.3. Greater forkbeard landing trends in all ICES Subareas since 1988.

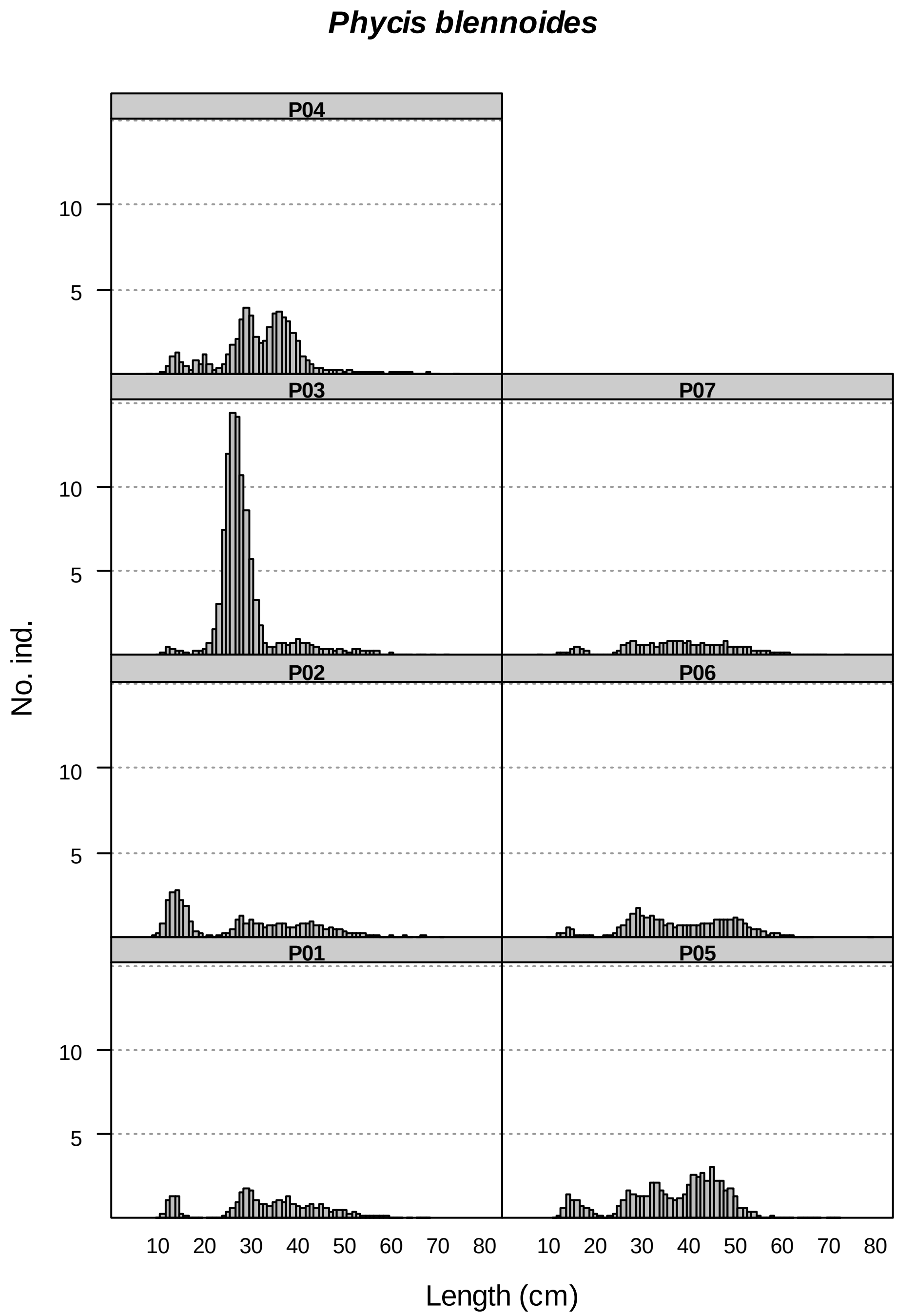


Figure 12.4. Mean stratified length distributions of Phycis blennoides in Porcupine surveys (2001-2007)

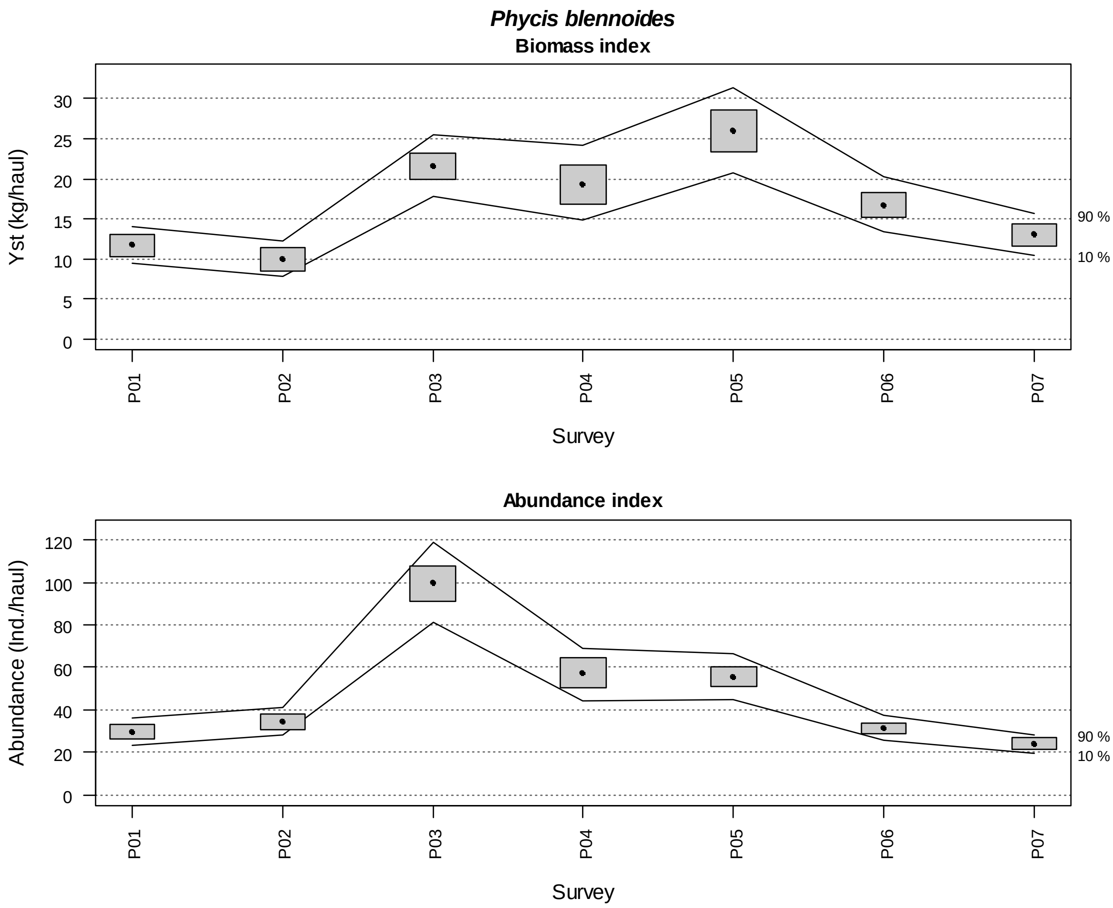


Figure 12.5. Changes in Phycis blennoides biomass and abundance indices during Porcupine Survey time series (2001-2007). Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals (a = 0.80, bootstrap iterations = 1000).

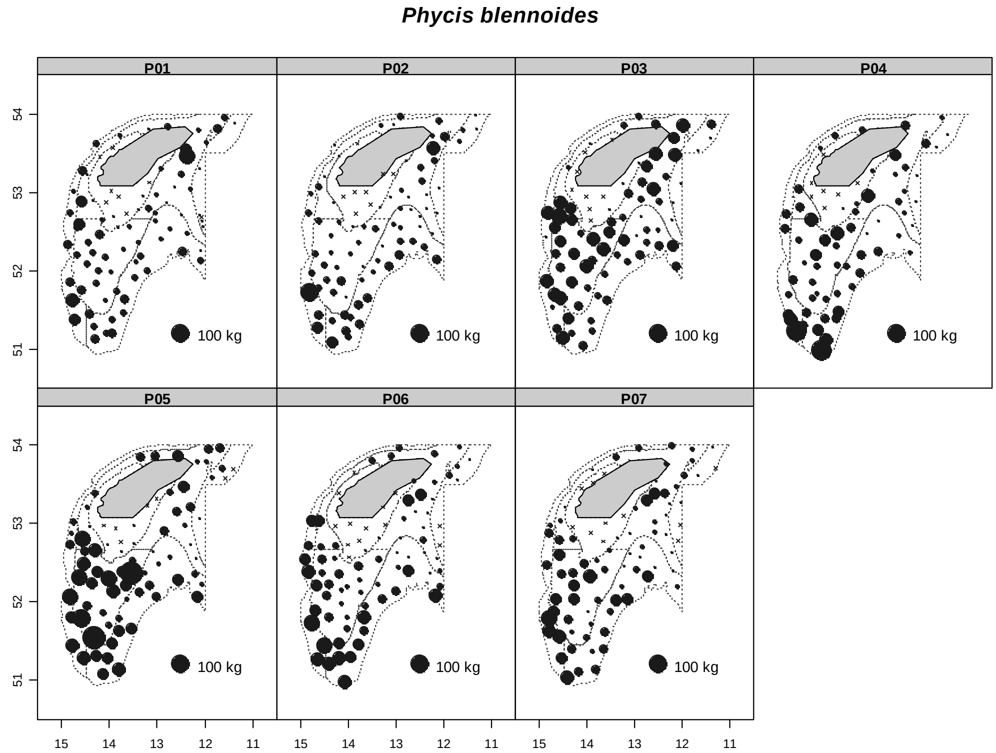


Figure 12.6. Geographic distribution of Phycis blennoides catches (kg/30 min haul) in Porcupine surveys between 2001 and 2007 (Baldó et al 2008).

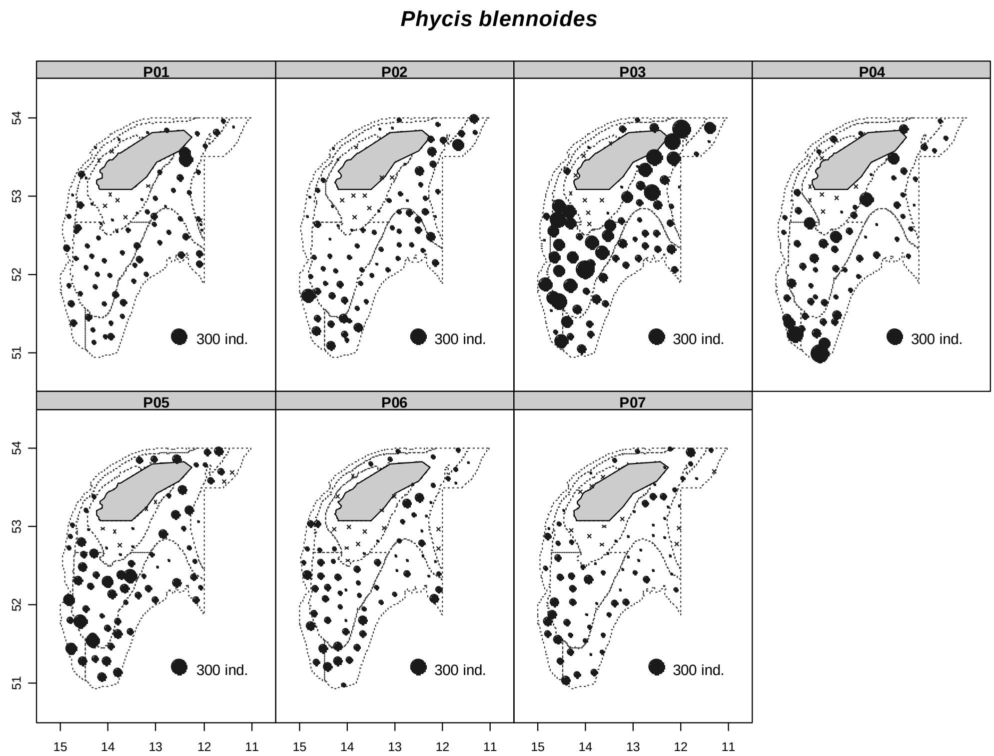


Figure 12.7. Geographic distribution of Phycis blennoides catches (n/30 min haul) in Porcupine surveys between 2001 and 2007 (Baldó et al 2008).

13 Alfonsinos/Golden Eye Perch (*Beryx* Spp.) in all Eco-Regions

13.1 The fishery

Alfonsinos, Beryx splendens and Beryx decadactylus, are generally considered as by-catch species in the demersal trawl and longline mixed fisheries targeting deep water species. For most of the fisheries, the catches of alfonsinos are reported under a single category, as Beryx spp.

The proportions of each species in the catches are not well known. Detailed landings data by species are available only for the Portuguese longline fishery in Division Xa, where the landings of B. decadactylus averaged 20% of the catches of both species in the last 10 years, and for the Russian trawl fishery, that targeted B. splendens.

Portuguese, Spanish and French trawlers and long liners are the main fleets involved in this fishery.

From 1988 to 1993 almost only the Azores (ICES area Xa) was involved on the fishery (representing 94% of the landings), duplicating the landings at the final of this period. Former USSR trawlers were responsible for high catches in area Xb during 1994 to 2000. Other areas with important catches are VI+VII, with an average contribution of around 20% of the total catch from 1996 onwards and areas VIII+IX, which catches averaged around 30% of the total from 1996 onward. In all the areas the catches present a high interannual variability, with a general decreasing trend.

The Azores deep-water fishery is a multispecies (up to 15) and multigear fishery dominated by the main target species Pagellus bogaraveo. Target species can change seasonally according to abundance and market prices, and landings of Beryx represents 5 to 10% of the deep water species caught in the region.

Catches data for alfonsino in 2006 and 2007 aggregated at the level of statistical rectangle were provided to the working group by France, Ireland, the UK (England and Wales and Scotland) and Iceland. These are shown in figure 13.1.1 and 13.1.2.

13.1.1 Landings trends

The available landings data for Alfonsinos, (Beryx spp), by ICES Subareas/Divisions as officially reported to ICES or to the Working Group, are presented in table 13.1 and 13.2 and figure 13.3. Data presented here are working group estimates and may differ from official landings for some countries. No data on discards have been presented. In most cases the statistics refer to both species combined (B. splendens and B. decadactylus). In general, it is not known if the annual variations in landings are due to changes in fish abundance, changes in the targeting of the fisheries or to more accurate reporting or monitoring of the landings. Alfonsinos are often a by-catch of demersal fisheries targeting other species.

The general trend of the total landings follows the Azorean trend (increase until 1996 and decrease thereafter) but is very affected by the Russian catches during the period 1994-2000. Landings increase from 225t in 1998 to 729t in 1993 mainly due to the contribution of the Azores. From 1994 to 2000 the total landings fluctuate considerably due to the catches of the Russian trawlers fishery from the Xb ICES area, with a peak in 1994 (837t) and 1996 (960t). In 2001 the total landings become at the same level of 1993 but with a decrease trend from 614t in 2001 to 317t in 2007.

Landings reported from Subareas IV-V are very small and most were taken by French and Spanish vessels.

The reported landings from Subareas VI-VII, were small and variable until 1995, ranging from 1 to 12 t. In 1996, landings increased to 178 t, taken mainly by longline fisheries in Subarea VII, but decreased in the following years. The higher catch was observed in 2001 (186 t), but decreased in the following years with a peak of 104t in 2006.

In Subareas VIII-IX, the reported landings were very small (1-2 t) and scattered until 1994, but they have increased continuously until 1998 and maintained thereafter around 200t, mainly due to the Spanish landings, with a drop from 2003 (109t) to 2007 (70t). Most of these landings can be regarded as by-catches of the Spanish and Portuguese demersal fisheries in these Subareas. Overall, most of the Beryx spp. landings are taken in Subarea X. They are mainly from longliners fishing within the Azorean EEZ and by trawlers fishing north of that area. Landings from the Azores increased steadily from 185 t in 1987 to 644 t in 1994, the highest value in the catch series, and then decreased to 175 t in 1999. In the following years they fluctuate between 139 and 243 t. During the last five years the landings fluctuated around 200 t. Landings of B. splendens by former USSR trawlers were estimated to be around 3028t during 1994–2000. From 2000 no catches were reported by Russia for the Subarea X.

Detailed information by species is available only for Division Xa (Azores area). Both species, B. splendens and B. decadactylus present a decreasing trend in their landings, which is partly explained by a change in target species in the fishery. The landings series in the period 1988-2007 for both species separately is presented in table 13.2 and in Figure 13.4.

13.1.2 ICES advice

In 2006, ICES advised; *Due to their spatial distribution associated with seamounts and their aggregation behaviour, alfonsinos are easily overexploited; they can only sustain low rates of exploitation. Fisheries on such species should be permitted only when they are accompanied by programmes to collect data on both target and bycatch fish.*

13.1.3 Management

Fishing with trawl gears was forbidden in the Azores region. A box of 100 miles limiting the deep-water fishing to vessels registered in the Azores was created in 2003 under the management of fishing effort of the common fishery policy for deep-water species (EC. Reg. 1954/2003). An EU TAC of 328 t for EC vessels is in force in 2008 (EC. Reg. 2015/2006).

There are NEAFC regulations of efforts in the fisheries for deepwater species and closed areas to protect vulnerable habitats.

13.2 Stock identity

The Alfonsinos Beryx spp. are deepwater species that occur throughout the world's tropical and temperate waters, in depths from 25 to 1300 meters. The 2004 report of the WGDEEP made reference to preliminary genetic results for B. splendens suggesting that significant genetic differentiation may occur between populations of the species within the North Atlantic, which may have some implications for future management of the fisheries. No further information is available. Since very little is known about stock structure of these species, the WG has assumed single stocks of both B. splendens and B. decadactylus in the north Atlantic.

13.3 Data available

13.3.1 Landings and discards

Tables 13.1a-i describe the alfonsinos landings by subarea and country. No information about discards of Beryx species was available during the WGDEEP meeting.

Information on discard, length composition and abundance indices exist from the discard trips carried out in Irish waters in 2004 and by the Spanish trawler surveys in Porcupine since 2001.

For the Azores longline fishery detailed information is available for both Beryx species for length composition of the catches, nominal and standardized cpue's, biological data on reproduction, sex ratio and weight-length relationships

13.3.2 Length compositions

Size data are available for the golden eye perch (B. decadactylus) and for alfonsino (B. splendens) from the Portuguese bottom longline fleet in divison Xa (Azores) for the years 1998 to 2005. The size distributions of the landings (catch at size) for both species is presented in Figure 13.5 for golden eye perch and in Figure 13.6 for alfonsino (ICES, 2006)

Mean annual length composition (1995-2005) from spring bottom longline surveys in Azores (ICES division Xa) for B. decadactylus are presented in Figure 13.7 and in Figure 13.8 for B. splendens (ICES, 2006).

13.3.3 Age compositions

No information about age compositions of Beryx species was available during the WGDEEP meeting

13.3.4 Weight at age

No information about weight at age of Beryx species was available during the WGDEEP meeting

13.3.5 Maturity and natural mortality

Information on the sex ratio and stage of maturity is available for both Beryx species from the Azores fisheries in division Xa (ICES, 2006). No new information was presented to the working group this year.

13.3.6 Catch, effort and research vessel data

Fishery standardized indices of abundance in weight are available for both species (ICES, 2006) and are presented in figure 13.9. for Beryx decadactylus and figure 13.10 Beryx splendens. This information was not updated for this meeting.

Updated (Pinho, WD12) annual bottom longline survey abundance index in number "Relative Population Number" (RPN) is also available for the golden eye perch (Beryx decadactylus) (figure 13.11) the alfonsino (Beryx splendens) (figure 13.12).

13.4 Data analyses

13.4.1 Beryx decadactylus

The size distribution of B. decadactylus landings shows a stability of the sizes caught along the period (Figure 13.5)

The standardized fishery CPUE in weight, presents an overall slow decreasing trend but with fluctuations around its mean (Figure 13.9). The observed tendencies in the CPUE series could be explained by the fact that the golden eye perch is not a target species of the fishery and its catches can be considered as a by catch of the deep water demersal fishery, where changes in the fishing pattern and in target species have been observed in recent years.

The distribution area of the resource may be broader than the survey's coverage area and depths, and caution must be taken when relating the surveys information to the stock status (ICES, 2006).

13.4.2 Beryx splendens

Alfonsino size frequencies show some interannual variability with a general stability of the sizes caught along the analyzed period (Figure 13.6).

The standardized fishery CPUE in presents an overall slow decreasing trend but with fluctuations around its mean (Figure 13.10). The trends in the standardized CPUE observed could be explained by the fact that the alfonsino is not a target species of the fishery and that its catches could be considered as a by catch in the demersal fishery.

Caution must be taken when relating the surveys information to stock status, since the distribution in depth and area of the resource may be much broader than the survey's coverage.

Due to the lack of suitable data for Beryx spp. in most ICES Subareas, no further analyses were carried out by the Working Group.

13.5 Comments on the assessment

The CPUE series considered here are derived from an artisanal fishery with limited spatial extent and may not be applicable to the wider fishery. Even within the area covered by the standardized CPUE series, area effects were not considered.

13.6 Management considerations

The stock structure of the alfonsinos is unknown and possible fish movements between areas, (seamounts, coastal areas of the islands and slope continental areas) are also not known. However this species seems to aggregate around the seamounts areas. These areas, north and south of the Azores EEZ, where highly exploited particularly by the Russian trawl fleet with a regime of operation that suggests a sequential depletion of the explored seamounts. The level of interaction of these depletions between areas is unknown. The working group has not a reasonable knowledge of the ecosystem and species dynamic and no data to access such interactions.

Table 13.1a. Landings (tonnes) of Beryx spp. IV

Year	France	TOTAL
1988	0	0
1989	0	0
1990	1	1
1991	0	0
1992	2	2
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007*	0	0

*Preliminary

Table 13.1.b. ALFONSINOS (Beryx spp.) Vb

Year	Faroes	France	TOTAL
1988			0
1989			0
1990		5	5
1991		0	0
1992		4	4
1993		0	0
1994		0	0
1995	1	0	1
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0
2007*	0	0	0

*Preliminary

Table 13.1.c ALFONSINOS (Beryx spp.) VI and VII

	France	E & W	Spain	Ireland	TOTAL
1988					0
1989	12				12
1990	8				8
1991					0
1992	3				3
1993	0		1		1
1994	0		5		5
1995	0		3		3
1996	0		178		178
1997	17	4	4		25
1998	10	0	71		81
1999	55	0	20		75
2000	31	2	100		133
2001	58	13	115		186
2002	34	15	45		94
2003	18	5	55	4	82
2004	13	3	46		62
2005	15	0	55	0	70
2006	53	0	51	0	104
2007*	33	1	3	0	36

*Preliminary

Table 13.1.d. ALFONSINOS (Beryx spp.) VIII and IX

Year	France	Portugal	Spain	E & W	TOTAL
1988					0
1989					0
1990	1				1
1991					0
1992	1				1
1993	0				0
1994	0		2		2
1995	0	75	7		82
1996	0	43	45		88
1997	69	35	31		135
1998	1	9	259		269
1999	11	29	161		201
2000	6	40	117	4	167
2001	7	43	179	0	229
2002	12	60	151	14	237
2003	9	0	100	0	109
2004	14	53	202	0	269
2005	9	45	202	0	256
2006	18	20	64	3	105
2007*	11	45	13	0	70

*Preliminary

Table 13.1.e. ALFONSINOS (Beryx spp.) X

	Xa	Xb				
Year	Portugal	Faroes	Norway	Russia**	E & W	TOTAL
1988	225					225
1989	260					260
1990	338					338
1991	371					371
1992	450					450
1993	533		195			728
1994	644		0	837		1481
1995	529	0	0	200		729
1996	550	0	0	960		1510
1997	379	5	0			384
1998	229	0	0			229
1999	175	0	0	550		725
2000	203	0	0	266	15	484
2001	199	0	0		0	199
2002	243	0	0		0	243
2003	172	0	0		0	172
2004	139	0	0		0	139
2005	157	0	0		0	157
2006	192	0	0		0	192
2007*	211	0	0		0	211

*Preliminary

** Not oficial data from ICES area Xb

Table 13.1.f. ALFONSINOS (Beryx spp.) XII

Year	Faroes	TOTAL
1988		
1989		
1990		
1991		
1992		
1993		
1994		
1995	2	2
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007*	0	0

*Preliminary

Table 13.1.g. ALFONSINOS (Beryx spp.) in Madeira (Portugal)

Year	Portugal	TOTAL
1988		0
1989		0
1990		0
1991		0
1992		0
1993		0
1994		0
1995	1	1
1996	11	11
1997	4	4
1998	3	3
1999	2	2
2000		
2001		
2002		
2003		
2004		
2005		
2006		
2007*		

13.1.h. ALFONSINOS (Beryx spp.). All areas.

Year	IV	Vb	VI+VII	VIII+IX	Xa	Xb	XII	TOTAL
1988				0	225	0		225
1989			12	0	260	0		272
1990	1	5	8	1	338	0		353
1991			0	0	371	0		371
1992	2	4	3	1	450	0		460
1993			1	0	533	195		729
1994			5	2	644	837		1488
1995		1	3	82	529	200	2	817
1996			178	88	550	960		1776
1997			25	135	379	5		544
1998			81	269	229	0		579
1999			75	201	175	550		1001
2000			133	167	203	281		784
2001			186	229	199	0		614
2002			94	237	243	0		574
2003			82	109	172	0		363
2004			62	280	139	0		481
2005			70	191	157	0		418
2006			104	105	192	0		402
2007*			36	70	211	0		317
*Preliminary								

Table 13.1.i. Landings (tonnes) of Beryx spp. (split by species) in Azorean waters (Portuguese EEZ in Subarea X)

Year	B. splendens	B. decadactylus	Total
1988	122	103	225
1989	113	147	260
1990	137	201	338
1991	203	168	371
1992	274	176	450
1993	316	217	533
1994	410	234	644
1995	335	194	529
1996	379	171	550
1997	268	111	379
1998	161	68	229
1999	119	56	175
2000	168	35	203
2001	182	17	199
2002	223	20	243
2003	150	22	172
2004	110	29	139
2005	134	23	157
2006	152	40	192
2007*	165	46	211

Table 13.2. Reported landings for the Alfonsinos, (Beryx spp), by ICES Subareas/Divisions.

Year	IV	Vb	VI+VII	VIII+IX	X	XII	TOTAL
1988				0	225		225
1989			12	0	260		272
1990	1	5	8	1	338		353
1991			0	0	371		371
1992	2	4	3	1	450		460
1993			1	0	728		729
1994			5	2	1481		1488
1995		1	3	82	729	2	817
1996			178	88	1510		1776
1997			25	135	384		544
1998			81	269	229		579
1999			75	201	725		1001
2000			133	167	484		784
2001			186	229	199		614
2002			94	237	243		574
2003			82	109	172		363
2004			62	280	139		481
2005			70	191	157		418
2006			104	105	192		402
2007*			36	70	211		317

Table 13.3. Reported landings of Beryx splendens and B. decadactylus in Azores (ICES division Xa).

Year	B. splendens	B. decadactylus
1988	122	103
1989	113	147
1990	137	201
1991	203	168
1992	274	176
1993	316	217
1994	410	234
1995	335	194
1996	379	171
1997	268	111
1998	161	68
1999	119	56
2000	168	35
2001	182	17
2002	223	20
2003	150	22
2004	110	29
2005	134	23
2006	152	40
2007	165	46

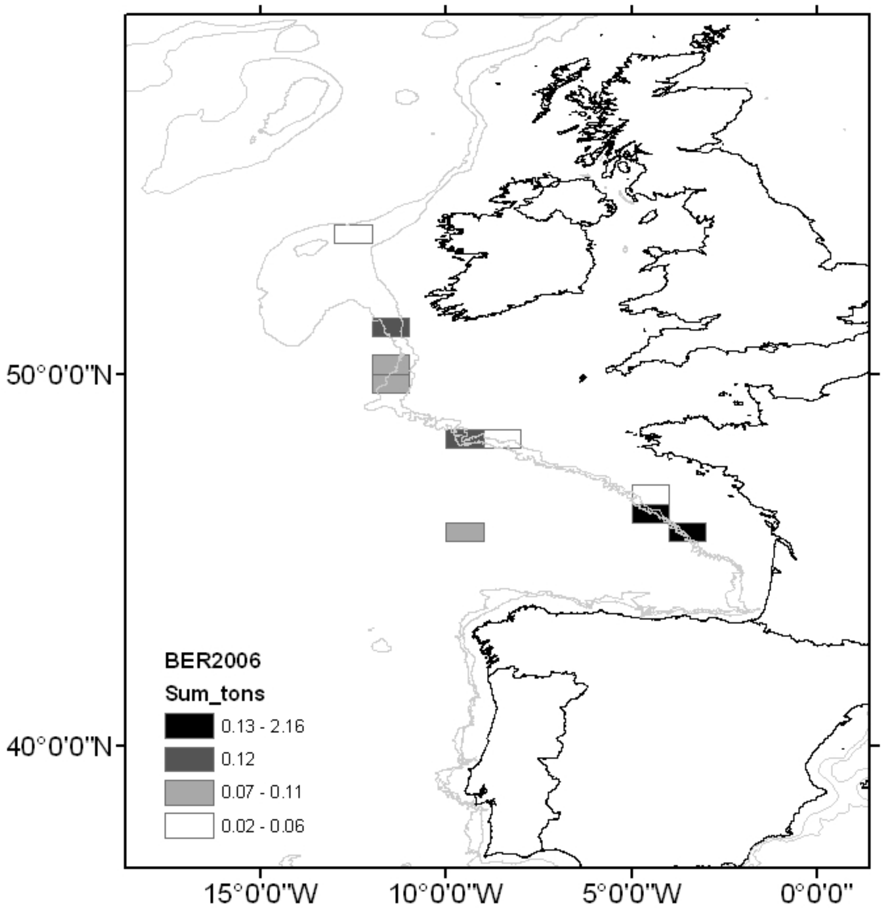


Figure 13.1. Catches of alfonsino by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2006.

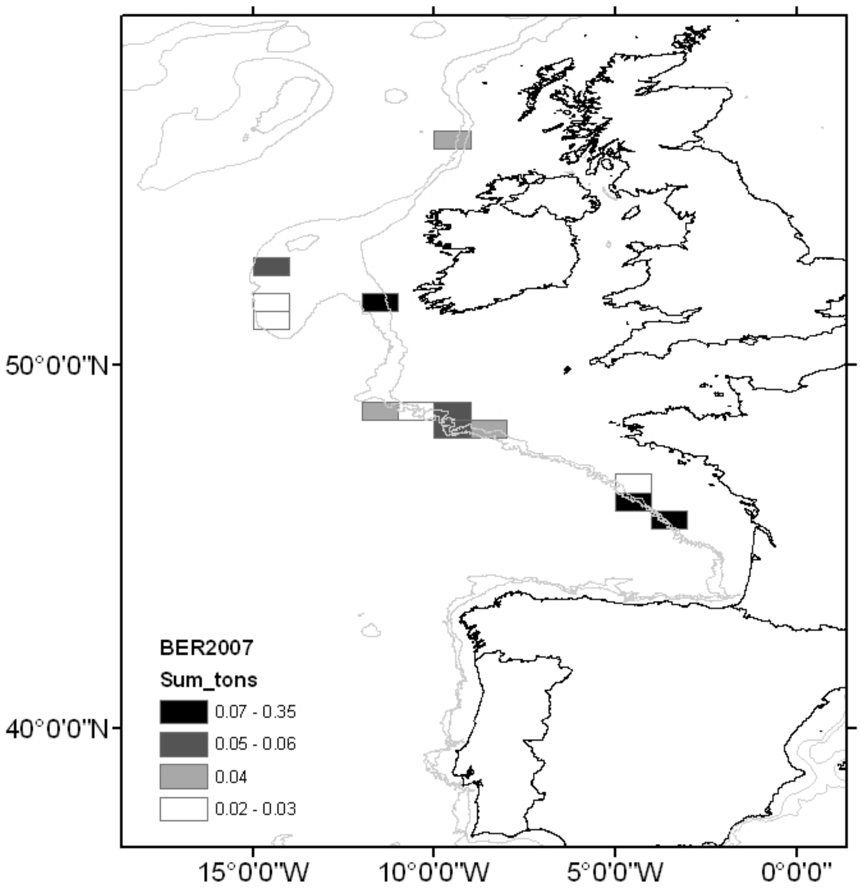


Figure 13.2. Catches of alfonsino by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2007.

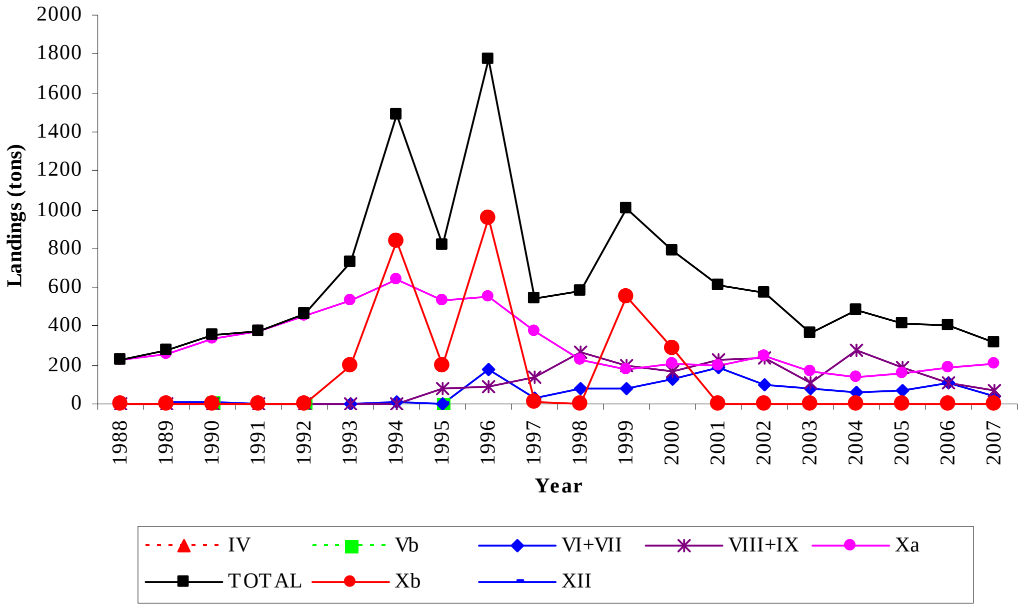


Figure 13.3. Reported landings for the Alfonsinos, (Beryx spp), by ICES Subareas/Divisions

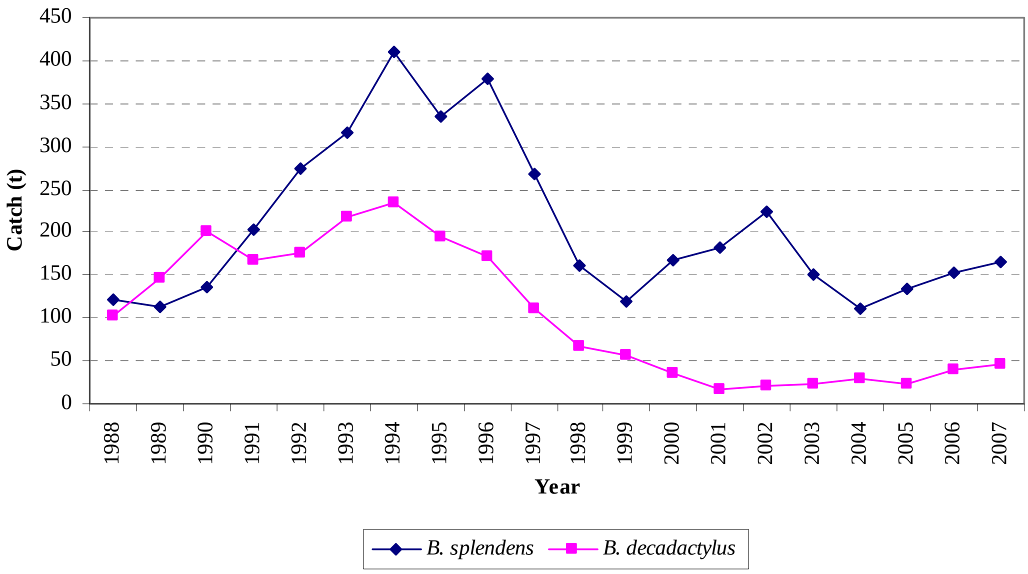


Figure 13.4. Landings of Beryx splendens and B. decadactylus in Azores (ICES Subarea X).

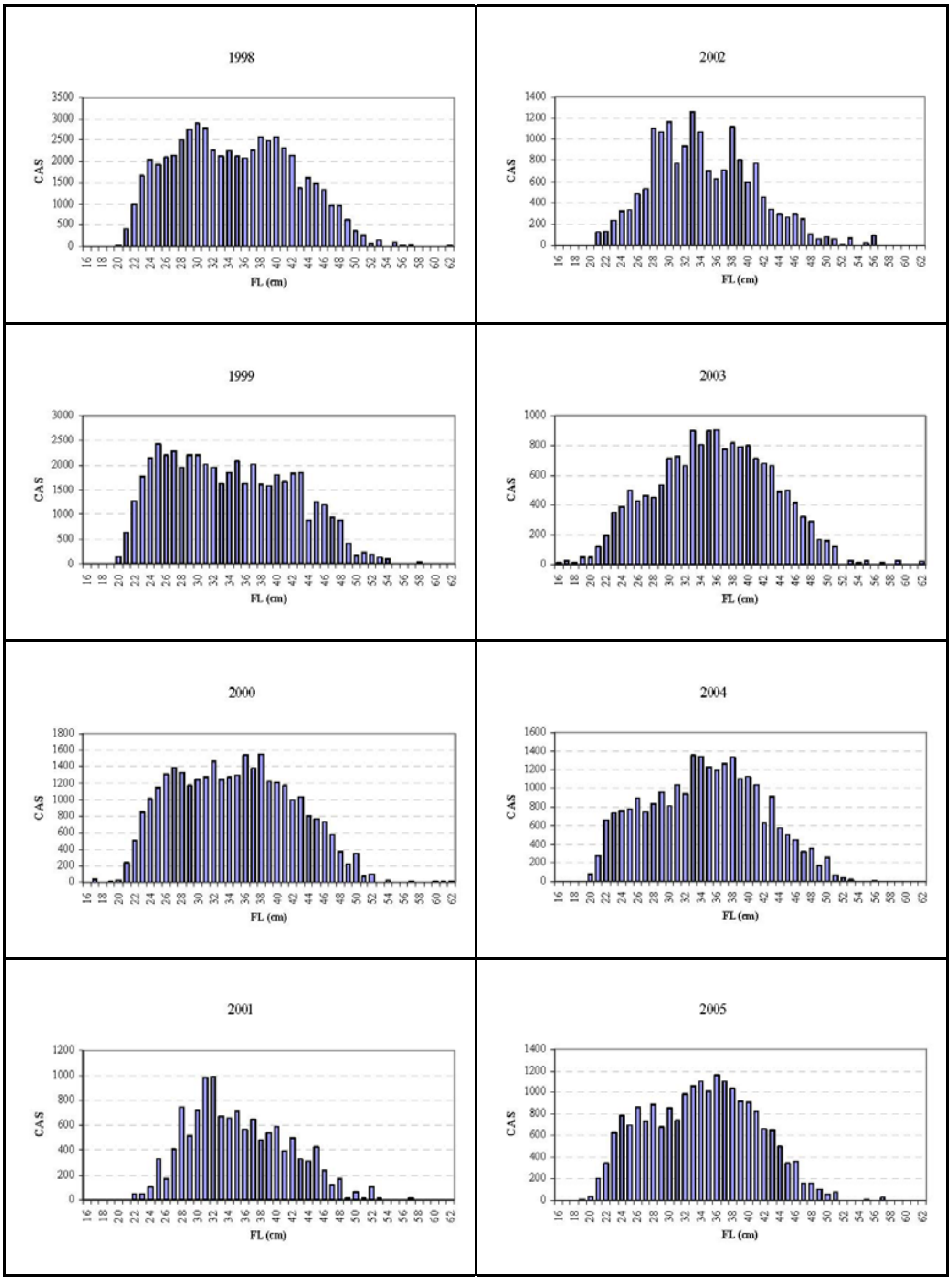


Figure 13.5. Size frequencies of the catches of the Golden eye perch (Beryx decadactylus) from the Azores longline fishery, from 1998 to 2005 (ICES Subarea X).

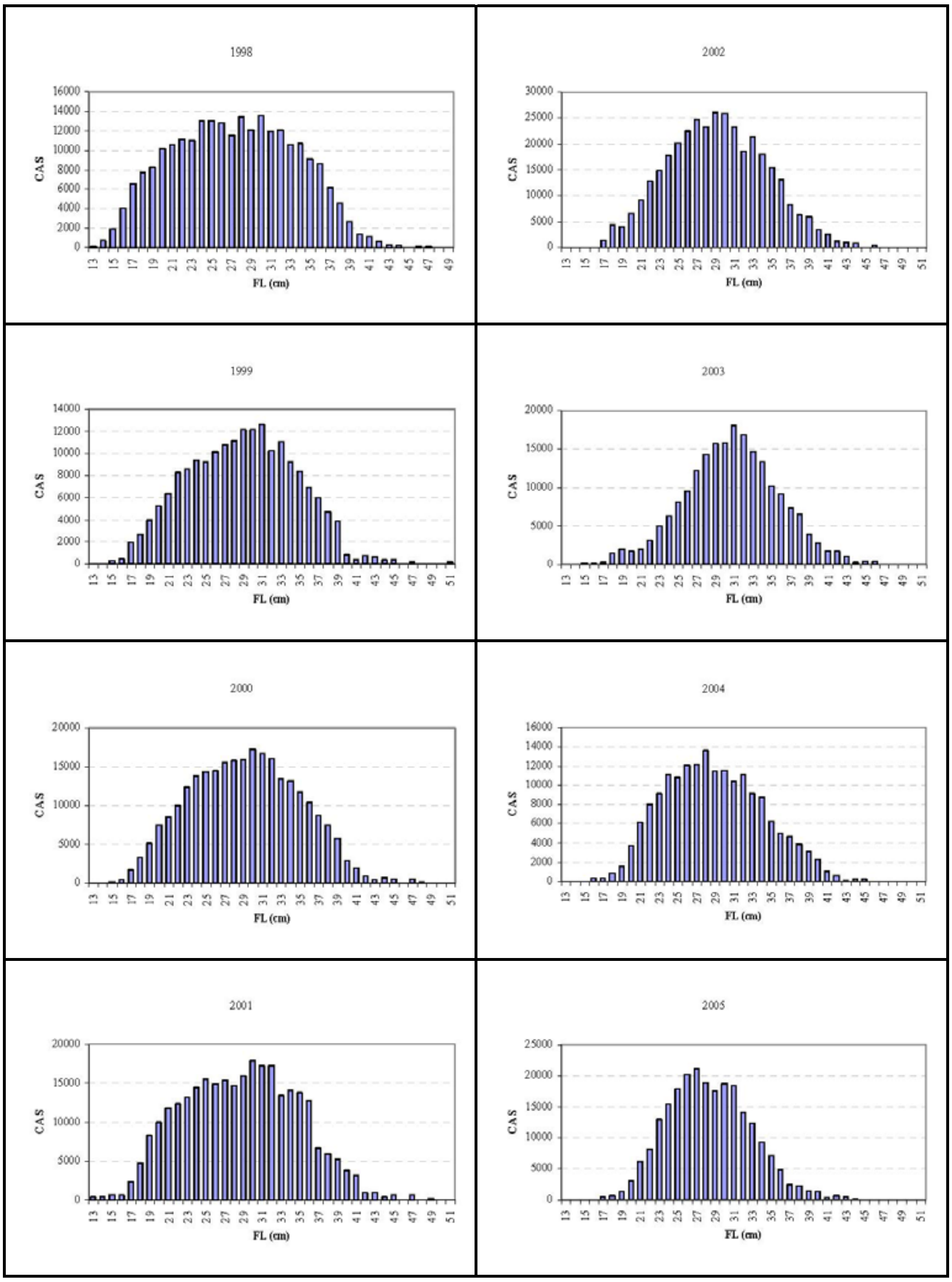


Figure 13.6. Size frequencies of the catches of alfonsino (Beryx splendens) from the Azores longline fishery, from 1998 to 2005 (ICES Subarea X).

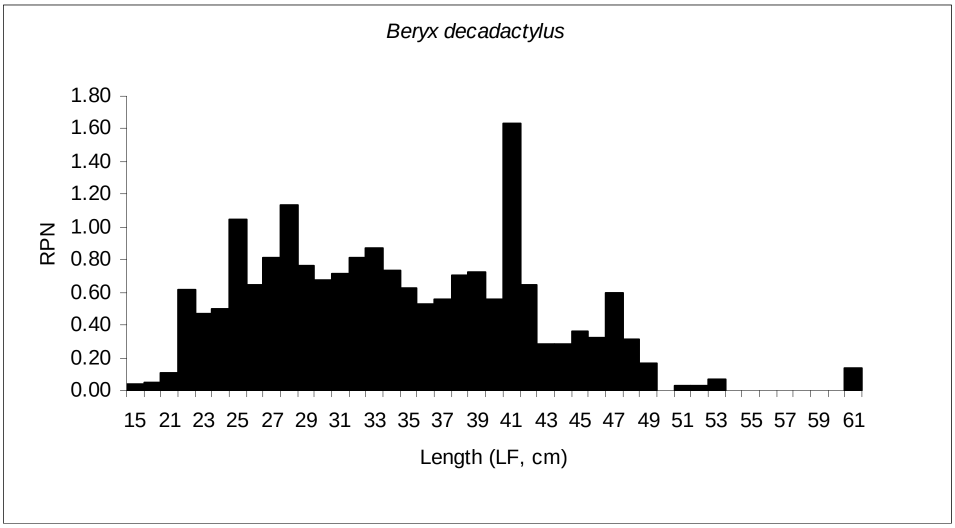


Figure 13..7. Mean annual length composition (1995-2005) from spring bottom longline surveys in Azores (ICES subarea X) for Beryx decadactylus.

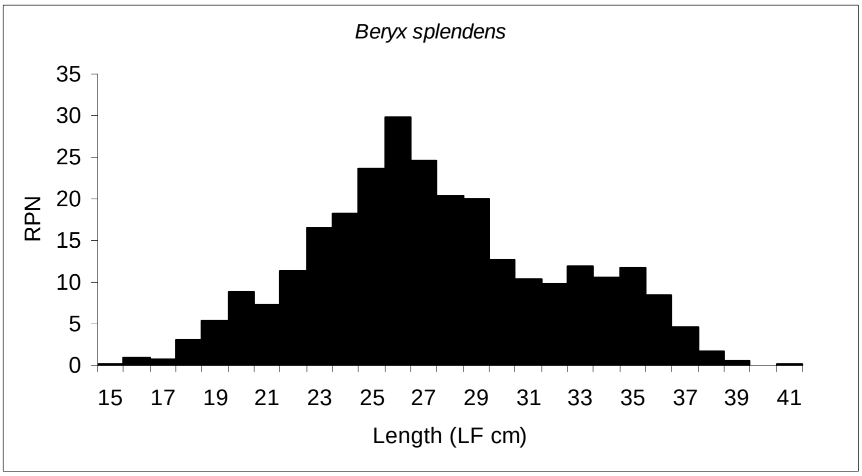


Figure 13.8. Mean annual length composition (1995-2005) from spring bottom longline surveys in Azores (Ices area X) for Beryx splendens.

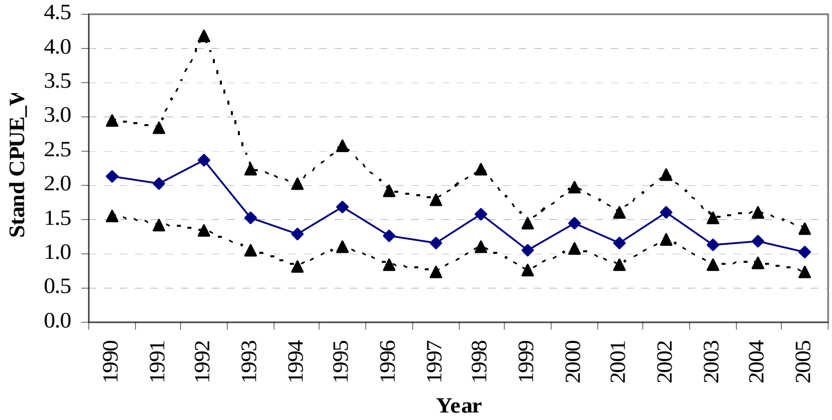


Figure 13.9. Annual standardized CPUE in biomass (kg per 1000 hooks) and upper and lower 95% confidence intervals for B. decadactylus from the Azores longline fishery (ICES X)

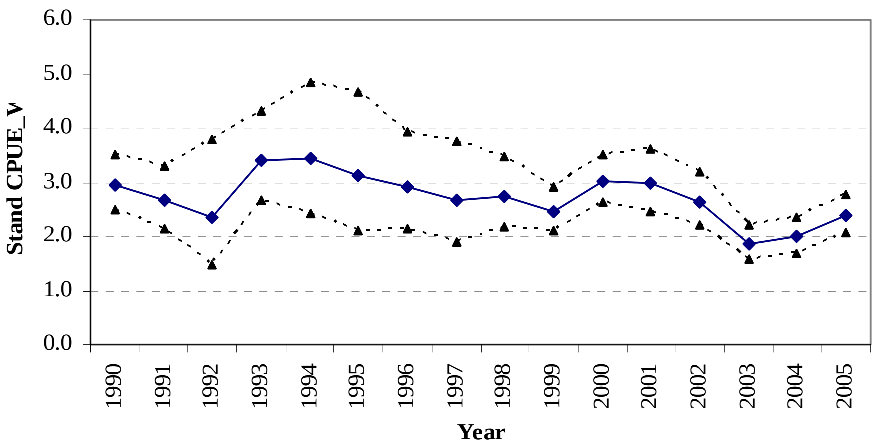


Figure 13.10. Annual standardized CPUE in biomass (kg per 1000 hooks) and upper and lower 95% confidence intervals for the Alfonsino (B. splendens) from the Azores longline fishery (ICES Subarea X).

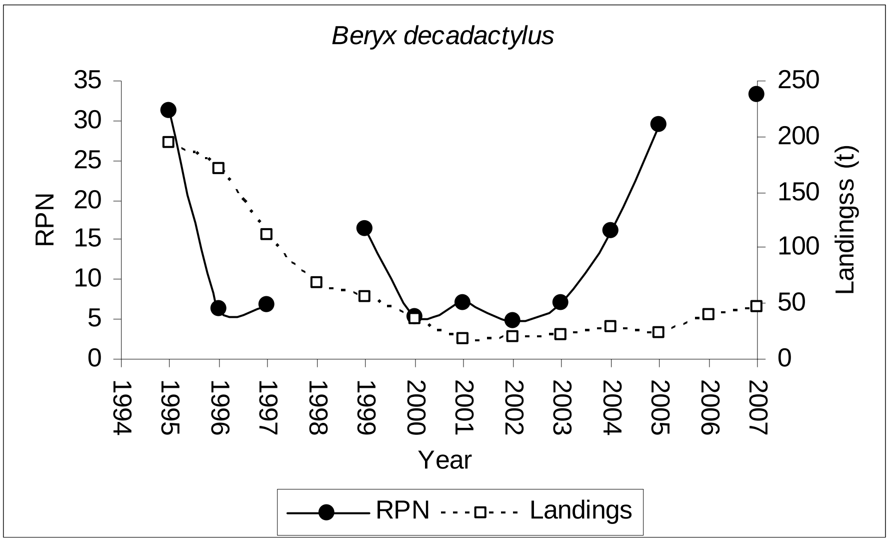


Figure 13.11. Annual bottom longline survey abundance index in number "Relative Population Number" (RPN) available for the golden eye perch (B. decadactylus) from the Azorean deep-water species surveys (ICES Subarea X). Annual landing are also presented in the graph for trend illustration.

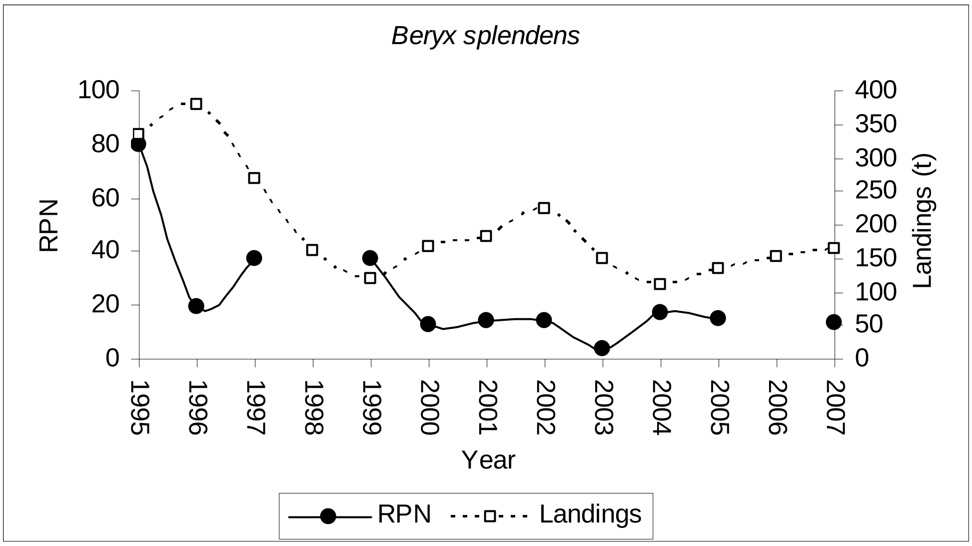


Figure 13.12. Annual bottom longline survey abundance index in number "Relative Population Number" (RPN) available for the Alfonsino (Beryx splendens) from the Azorean deep-water species surveys (ICES Subarea X). Annual landing are also presented in the graph for trend illustration

14 Red (black spot) seabream (*Pagellus bogaraveo*)

14.1 Current ICES stock structure

ICES considered three different components for this species: a) areas VI, VII, and VIII; b) area IX, and c) area X (Azores region), (ICES, 1996, 1998a). This separation does not pre-suppose that there are three different stocks of red (blackspot) seabream, but it offers a better way of recording the available information.

The inter-relationships of the (blackspot) seabream from areas VI, VII, and VIII, and the northern part of area IXa, and their migratory movements within these areas have been observed by tagging methods (Gueguen, 1974). However, there is no evidence of movement to the southern part of Ixa where the majority of the fishery occurs.

Recent studies show that there are no genetic differences between populations from different ecosystems within the Azores region (East, Central and West group of Islands, and Princesa Alice bank) but there are genetic differences between Azores (ICES area Xa2) and mainland Portugal (ICES area IXa) (Stockley *et al*., 2005). These results, combined with the known distribution of the species by depth, suggest that area X component of this stock can effectively be considered as a separate assessment unit.

Available information, particularly genetics and tagging, seems to support the current assumption of three assessment units (VI – VIII, IX and X).

Catches data for red sea bream in 2006 and 2007 aggregated at the level of statistical rectangle were provided to the working group by France, Ireland, the UK (England and Wales and Scotland) and Iceland. These are shown in Figures 14.1.1 and 14.1.2.

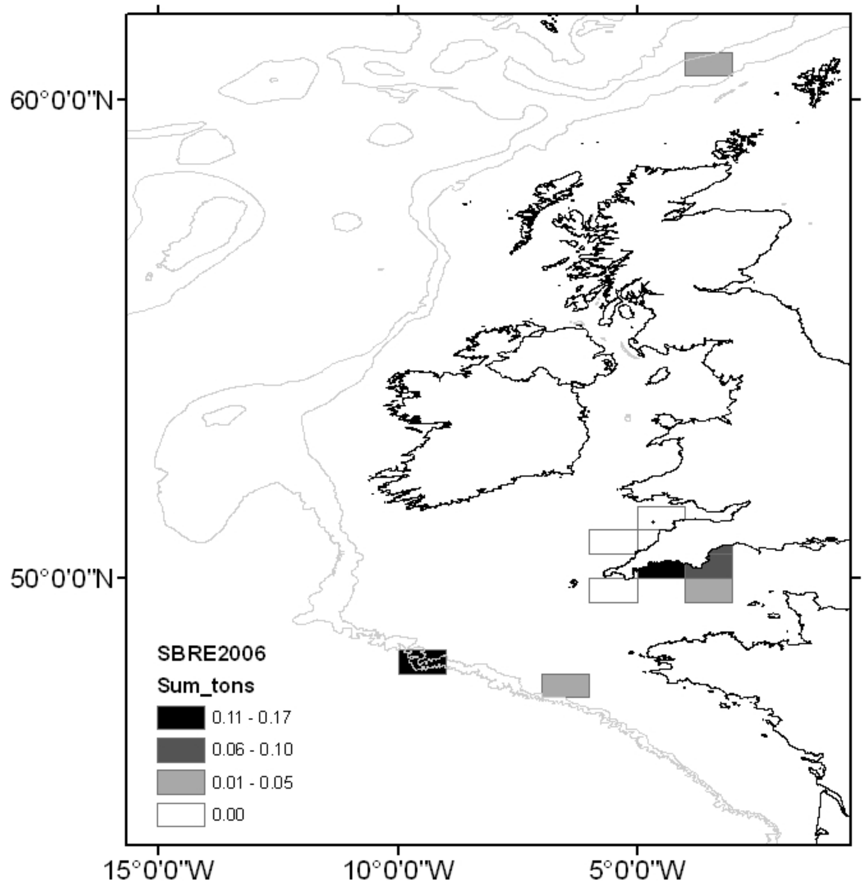


Figure 14.1.1. Catches of red sea bream by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2006.

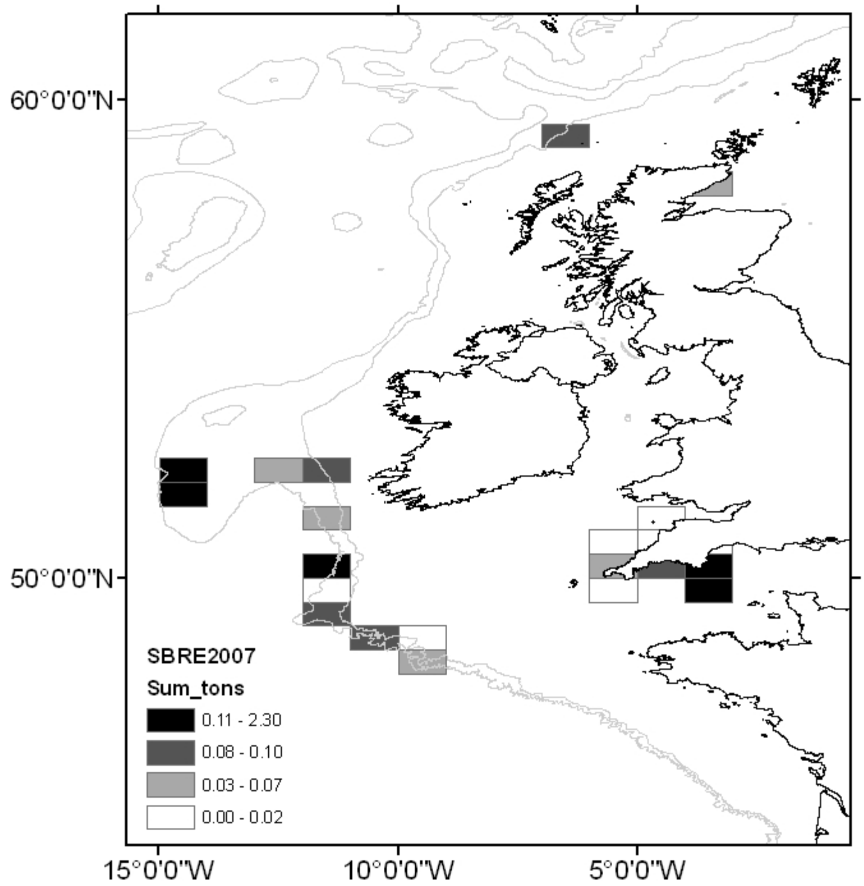


Figure 14.1.2. Catches of red sea bream by French, Irish, UK (England and Wales and Scotland) and Icelandic vessels, 2007.

14.2 Red Seabream (*Pagellus Bogaraveo*) in Subareas VI, VII & VIII

14.2.1 The fishery

This section includes a description of the Pagellus bogaraveo in Subareas VI, VII, VIII by the Spanish, French, UK fleets and Portugal in CECAF.

They are no important changes in this fishery since last report of WGDEEP. The fishery in sub-areas VI, VII and VIII strongly declined in the mid–1970s, and the stock is seriously depleted. Sincet 1988 years landings from sub-area VIII represents the 62% and VI and VII the 28% of total accumulated landings. At present most of the Spanish red seabream catches in this area, are almost all by-catches of longliner fleet, trawlers and also some landings for “other” unidentified fleets. The information reported from other areas is very scarce and only Portuguese fleet in CECAF reported significant landings in 2005.

It has been speculated that the collapse of this fishery has been the result of a combination of factors. Its peculiar reproductive biology makes red seabream specially vulnerable by a fishery concentrated in the spawning season and focused on the bigger fish, that are mainly females. Probably there was also an excessive increase of the fishing effort since the middle of the 60s. There was no monitoring of the fishery. The effort and the fishing activity was not controlled or regulated nor in relation to the traditional and artisanal gears, such as the bottom longline, nor in relation to the new trawl gears such as the pelagic trawl, that was implemented precisely at the beginning of the 80s above all in the Bay of Biscay and south of British Islands. And, finally, perhaps other oceanographic features and cyclic changes not yet identified, could have contributed decisively with some (or with all of the) factors above indicated to the sharp declining of this international fishery in the north eastern Atlantic (Lucio, 2002).

14.2.1.1 Landings trends

Landings data for red (blackspot) seabream, Pagellus bogaraveo, by ICES Subareas/Divisions as reported to ICES or to the Working Group are shown in Table 14.2.1. After a revision of French data since 1999 the landings of this country show an increase of 60% and 36% in the areas VI + VII and VIII respectively. For this three subareas combined landings fell from more than 461 tons in 1989 to 52 tons in 1996, then they increased until 2000 (237 tons), and from 2001 to 2006 a slight decrease is observed. This trend seems to change in 2007 because the landings reported reached 298 ton, the highest value since 1990. In the period considered (1988-2003), most of the estimated landings from the Subareas VI, VII and VIII were taken by Spain (62 %), followed by France (22 %), UK (14 %) and Ireland (2 %).

A Spanish, French and UK extended landing series in North East Atlantic have been improved from two sources, one of this from a table performed for P. Lucio in WGDEEP 2004 (S1) and the other from a compilation of statistic bulletins (S2). Some of the high historical catches could be included other species of Pagellus and/or other Sparidae, i.e. “seabream”, as some landings could be also misreported. Figure 14.2.1 tries to shows by means of these two sources the differences in the historical interpretation of the landings of red sea bream in subareas VI, VII and VIII. Although the landings estimated by both sources since sixties onwards are very diferent, .the trend of both sources coincides in that period, giving a clear perspective of the important decline of this fishery in North East Atlantic in last 30 years.

In relation to this they are no information about French landings in most of the years between 1950 and 1975, and the great peaks observed in 1950, 1960, 1965, 1970 and 1975 just coincide with the only French reports in this period. To be updated to reflect Pascal's new data.

In any case, and taking into account the constraints of data collected (specially in the first decade) it's very clear the important and fast decline of the fishery since 1977 onwards. Looking at in last 30 years no landings higher than 1000 tonnes are recorded after 1986 and in last 10 years the annual catches have been always below of 300 tonnes.

14.2.1.2 ICES advice

In 2006, ICES advised; *Red seabream can only sustain low rates of exploitation. Fisheries on such species should be permitted only when they are accompanied by programmes to collect data and should expand very slowly until reliable assessments indicate that increased harvests are sustainable.*

14.2.1.3 Management

The Council Regulation (EC) No 2015/2006 maintained for Pagellus bogaraveo the same TAC for 2007 and 2008 that in two previous years. In following table a summary of red sea bream international TACs since 2005 in Subareas VI, VII and VIII and 2005-2007 landings. Noticed that the TAC is by far never reached in last two years, and the landings and TAC coincides in 2007.

Pagellus bogaraveo	TAC		landings		TAC
SUBAREA	2005-2006	2005	2006	2007	2007-2008
VI, VII, VIII	298	153	146	298	298

14.2.2 Data available

14.2.2.1 Landings and discards

Historical series of landings data available to the Working Group have been described in text and tables of section 14.2.1. No discard data were available to the Working Group.

14.2.2.2 Length compositions

No length data were available to the Working Group.

14.2.2.3 Age compositions

No age data were available to the Working Group.

14.2.2.4 Weight at age

No weight at age data were available to the Working Group.

14.2.2.5 Maturity and natural mortality

No maturity and natural mortality at age data were available to the Working Group.

14.2.2.6 Catch, effort and research vessel data

No catch, effort and research vessel data were available to the Working Group.

14.2.3 Data analyses

No data analysis was carried out by the Working Group.

14.2.4 Management considerations

Even though in recent years a small directed fishery to P. bogaraveo has been developed in France most of the catches in Sub-areas VI, VII and VIII must be considered as very occasional by-catches of the fleets, mainly longliners, targeting other demersal species. The data reported to the group indicate that since the middle of 1980s the landings have been reduced dramatically. In 2006 the same TAC (289 tons) was established for 2007 and 2008 for the Sub-areas VI, VII, VIII, (together considered) for the Spanish, French, UK and Irish fleets. And extra quota of 9 tons in same sub-areas is available as by-catches for other countries. In relation to that it's noticeable that the TAC and quotas established have been never reached by far for any country in last three years.

In agreement with the ACFM advice saying that Red seabream can only sustain low rates of exploitation. Fisheries on such species should be permitted only when they are accompanied by programmes to collect data, the WG considers that studies focused to define juvenile aggregation areas must be carry out. The definition of such areas is a previous step necessary to establish in the future red seabream juvenile protection areas in North East Atlantic waters. Management considerations such as the implementation in of a minimum landing size and selectivity measures in order to reduced by-catches and juvenile landings are also recommended by the WG.

Table 14.2.1a. Red seabream in sub-areas VI and VII; WG estimates of landings by country.

Year	France*	Ireland	Spain	E & W	Ch. Islands	TOTAL
1988	52	0	47	153	0	252
1989	44	0	69	76	0	189
1990	22	3	73	36	0	134
1991	13	10	30	56	14	123
1992	6	16	18	0	0	40
1993	5	7	10	0	0	22
1994	0	0	9	0	1	10
1995	0	6	5	0	0	11
1996	0	4	24	1	0	29
1997	0	20	0	36		56
1998	0	4	7	6		17
1999	4	8	0	15		27
2000	8	n.a.	3	13		24
2001	3	11	2	37		53
2002	8	0	9	13		30
2003	26	0	7	20		53
2004	64		4	18		86
2005	59		4	7		70
2006	72	0	8	19		98
2007	73	0	8	57		138

Table 14.2.1b. Red seabream in sub-area VIII; WG estimates of landings by country.

Year	France*	Spain	England (1)	TOTAL
1988	37	91	9	137
1989	31	234	7	272
1990	15	280	17	312
1991	10	124	0	134
1992	5	119	0	124
1993	3	172	0	175
1994	0	131	0	131
1995	0	110	0	110
1996	0	23	0	23
1997	18	7	0	25
1998	18	86	0	104
1999	40	84	0	104
2000	24	189	0	213
2001	16	168	0	184
2002	41	111	0	152
2003	12	83	0	95
2004	75	82	8	166
2005	60	90	0	150
2006	40	57	0	97
2007	66	94	0	160

(1) in 2005 England & Wales

* updated since 1999

Table 14.2.1c. Red seabream in sub-areas VI, VII and VIII; WG estimates of landings by sub-area.

Year	VI+VII*	VIII*	TOTAL
1988	252	137	389
1989	189	272	461
1990	134	312	446
1991	123	134	257
1992	40	124	164
1993	22	175	197
1994	10	131	141
1995	11	110	121
1996	29	23	52
1997	56	25	81
1998	17	104	121
1999	27	104	131
2000	24	213	237
2001	53	184	237
2002	30	152	181
2003	53	95	148
2004	86	95	181
2005	70	150	220
2006	98	97	195
2007	138	160	298

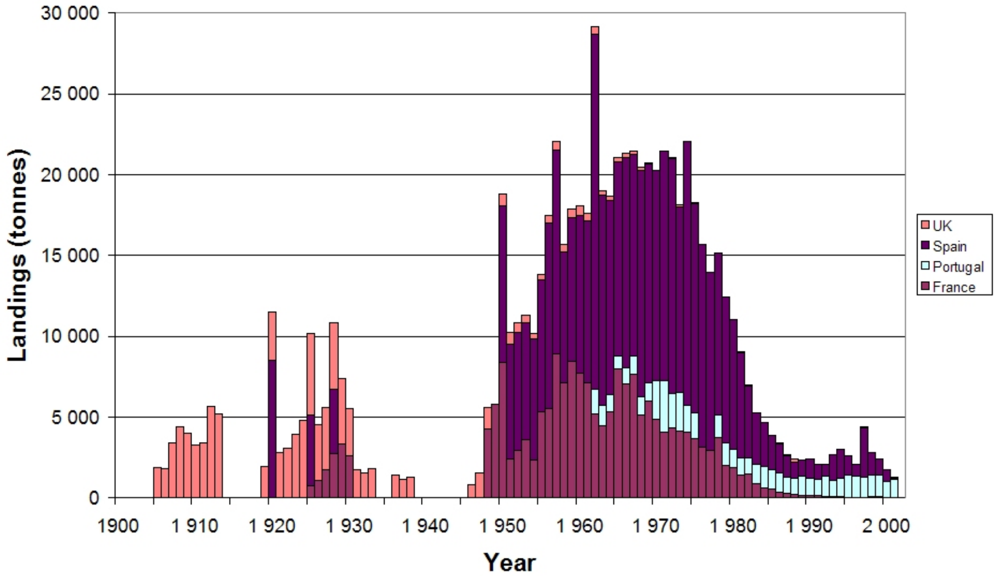


Figure 14.2.1. Historical series of Red Seabream landings since 1900 in North East Atlantic (sub-areas VI +VII + VIII)

14.3 Red Seabream (Pagellus bogaraveo) IN SUBAREA IX

14.3.1 The fishery

Although Pagellus bogaraveo is caught by Spanish and Portuguese fleets in Subarea IX, a complete description of only one of the fisheries has been provided to the Working Group; the Spanish fishery in the southern part of Subarea IX, close to the Strait of Gibraltar.

The majority of landings on deep-water species in mainland Portugal are conducted by the artisanal fleet, mainly longline fisheries. These operated in the Portuguese continental slope and located in ports as Peniche, Sesimbra and Sagres. Red seabream landings reflect a seasonal activity probably related with a larger availability of the species or market demands that lead fishermen to spend some time targeting this species (I. Figueredo, pers. com.).

In relation to the Spanish fishery in the southern ICES Subarea IXa, an updated description of it has been presented to the Working Group by Gil et al. (WD 9, 2008), that complete the information offered in the previous WGs (Gil et al., 2000; 2003, 2005, 2006 and 2007; Gil & Sobrino, 2001, 2002 and 2004). This artisanal longline fishery targeted red seabream has been developed along the Strait of Gibraltar area. Actually this fishery covers almost the 70 % of the landings for the species in the IXa. The “voracera”, a particular mechanised hook and line baited with sardine, is the gear used by the fleet. The base and landing ports are two: Algeciras and mainly Tarifa (Cádiz, SW Spain). Fishing is carried out taking advantage of the turnover of the tides in bottoms from 200 to 400 fathoms. Usually landings are distributed in categories due to the wide range of sizes and to market reasons. These categories have varied in time.

In the beginning of the 1980s, there were 25 small boats engaged in this fishery. Thereafter the fleet has increased to more than a hundred since the 1990s. The mean technical characteristics of this fleet by port are 8.95 and 6.52 meters length and 5.84 and 4.0 tons G.T.R. for Tarifa and Algeciras, respectively (from Gil et al., 2000).

From 2002 onwards artisanal boats from other port, Conil, have began to direct its fishing activity to P. bogaraveo in different fish grounds than the boats of Tarifa and Algeciras.

14.3.1.1 Landing trends

In Subarea IX, catches -most of them taken by longliners- correspond to Spain (70%) and Portugal (30%). Spanish landings data from this area are available from 1983 and Portuguese from 1988 onwards. The maximum catch in this period was obtained in 1993-1994 and 1997 (about 1 000 t) and the minimum in 2002 (359 t). Catches in 2007 amount to 586 t.

Almost all Spanish catches in this area are taken in waters close to the Gibraltar Strait. Until 2002 they were restricted to two ports (Tarifa and Algeciras), but from 2002 significant catches were obtained also by artisanal Spanish boats of a third port (Conil) in different fishing grounds of the same area. After arise its minimum value in 2002 an increasing trend was observed till lasts years.

In the Portuguese landings no clear tendency is observed. The maximum values took place in 1988 (370 t) and in 1998 (357 t) and the minimum one in 2000 (83 t). In more recent years there was a slight increasing trend till 2007 (185 t).

14.3.1.2 ICES advice

ICES 2006 advised; *Red seabream can only sustain low rates of exploitation. Fisheries on such species should be permitted only when they are accompanied by programmes to collect data and should expand very slowly until reliable assessments indicate that increased harvests are sustainable.*

14.3.1.3 Management

Since 2003, a regime of TAC and Quotas has been applied also to the P. bogaraveo fishery in Subarea IX. The following table shows a summary of P. bogaraveo TAC which is by far never reached in all these years.

P. bogaraveo	**2003-2004**		**2005-2006**		**2007-2008**	
ICES Subarea.	TAC	Landings	TAC	Landings	**TAC**	**Landings**
IX	**1271**	**471 - 480**	**1080**	**494 - 544**	**1080**	**586* -**

* Preliminary

Moreover, some technical measures have been set up by the Spanish Central Government, in 1998, and by the Regional Government of Andalucía since 1999, in order to regulate the fishing activity and to conserve the resource. Recently a Regional Recovery Plan of P. bogaraveo related to this Spanish fishery in the Strait of Gibraltar area has been implemented by the Regional Government of Andalucía for 2003-2008 Among the technical measures adopted by this Plan there are: closure of the fishing season during two and half months (15th January - 31st March), minimum size of fish retained or landed (33 cm total length), authorised vessels list, hook size, maximum hooks per line (100), maximum number of lines per boat (30), and maximum number of automatic machines for hauling per boat (3), restricted ports for landing the red seabream catches (only Tarifa and Algeciras)…

14.3.2 Data available

14.3.2.1 Landings and discards

Historical series of landings data available to the Working Group have been described in text and tables of section 14.3.1. No discard data were available to the Working Group, but for this species this could be considered minor. The landings data used in the assessment attempt of red seabream in IX included Spanish and Portuguese landings from 1990 onwards. The full time-series are presented in Table 14.3.1.

14.3.2.2 Length compositions

Length frequency data are only available for Spanish red seabream catches landed in the Strait of Gibraltar fishery (1990-2007) and it's raised to the total landings of the Sub-Area IX for the assessment exercise. Figure 14.3.2 reflects the updated information regards the mean length of landings from the Strait of Gibraltar fishery (WD 9, 2008).

14.3.2.3 Age compositions

A combined ALK was obtained by 1242 three agreed readings from otoliths collected from 2003 to 2007 presented by Gil et al. (WD 9, 2008). It covers lengths from 24 to 62 cm. and comprises ages between 3 and 10. Younger ages are well sampled while the older groups are susceptible to poorer estimates. Results are preliminary and are not validated yet. There is greater confidence for ages less than 6 years (partially validated by comparison with growth rates in captivity) while the aging of older fish may be unreliable and possible underestimated.

From ICES Sub-Areas VI, VII and VIII, Gueguen (1969) reported a maximum age of 20 years. In the Azores, ICES Subarea X, a maximum age of 15 years was observed in a 56 cm length fish (Krug, 1994). While, from the available information the maximum years observed is 10 in Sub-Area IX. However, the ages of older fish may be underestimated and it is possible that this species may be slower growing and longer-lived than current studies indicate.

Annual age frequencies (catch at age) were derived by the application of the combined ALK to the landings length distributions. Figure 14.3.2 shows the landings age distribution for the period considered. Age 4 individuals are the most represented in the landings, even in the early years.

14.3.2.4Weight at age

Weight at age were assumed to be the same in both the catch and the stock. These were estimated according to the ALK and the length-weight relationship presented by Gil et al. to this WG in 2006. As a result of the application of an unique ALK to all the series, the weights at age do not present a lot of variation along the years because differences are only related to the landings length distribution variability. For all the assessment exercise, mean weight at age in the stock was considered equal to the mean weight at age in the catch.

14.3.2.5Maturity and natural mortality

An annual reproductive cycle is defined for the species in this area by Gil in 2006: The spawning season seems to take place during the first quarter of the year. The smallest specimina are mainly males, maturing at a L50=30.15 cm. Around 32.5 cm total length an important part of individuals change it sex and became females. Females maturing at L50=35.73 cm. Thus, from age 5 all individuals could be considered mature ones.

The natural mortality of Pagellus bogaraveo is uncertain because there is no data available to estimate M directly. A mortality rate of 0.2 year-1 has been adopted by several authors in several studies from other areas (Silva, 1987; Silva et al., 1994; Krug, 1994, Pinho et al., 1999, Pinho, 2003) and also by Gil in 2006 for the Strait of Gibraltar.

14.3.2.6Catch, effort and research vesssel data

Figure 14.3.3 updated the catch and effort data available only for the Strait of Gibraltar fishery (J. Gil, pers. com.). It is important to emphasize also that the effort unit chosen (number of sales) can not be too appropriate as do not consider the missing effort. Thus, in the recent years this missing effort increases substantially (fishing vessels with no catches and no sale sheet to be recorded) and recent LPUE values may be over-estimated.

No research vessel data were available for the species in this Subarea.

14.3.3 Data analyses

Landings for the last 10 years have been relatively stable and mean length in catches shows no evidence of trend, however, the available LPUE data shows a decline over this period and it is possible that this decline may be under-estimated. A local recovery plan was implemented in 1999, largely based on increases in minimum landing size and closure of the fishery over spawning periods, however, this does not seem to have led to substantial changes in the abundance of the stock.

As in 2006, for the separable analysis, reference age=4 (which is the most represented in the landings) and weighting default values (6 recent years). Also the selection pattern adopted from S=0.4 seems to be reliable related to a hook fishery and F=0.3 was selected. The assessment exercise was attempted considering age 10 as a plus group (10+) and as a real age

The results from the separable were used to carry out a traditional VPA analysis. The results are very sensitive to the inclusion of a + group (Figure 14.3.4) and therefore WGDEEP consider them unreliable.

14.3.4 Comments on the assessment

The assessment exercise shown here has been carried out under some uncertainties. ALKs computed from one year must not be applied to samples taken in a different year, because they could give biased results (Westrheim and Ricker, 1978).

14.3.5 Management considerations

For 2007 and 2008 a regime of TAC (1080 t) was established for whole Subarea IX. This is more than the double of the total landings of the Subarea and still does not seems a relevant constraint.

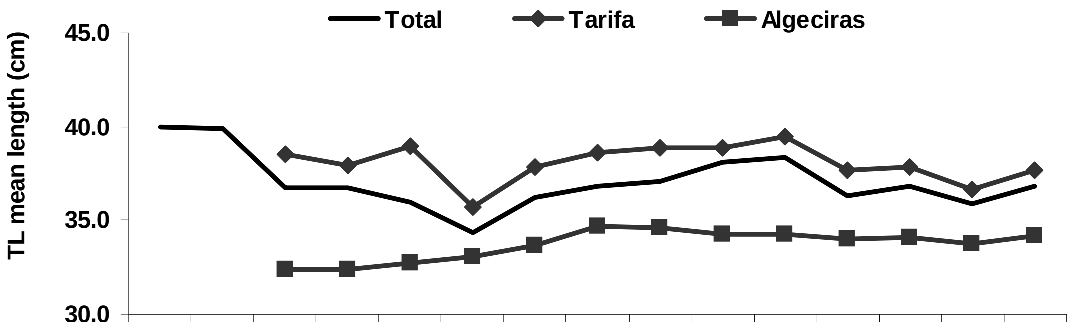
There is no evidence of a significant recovery of the stock resulting from the local recovery plan.

ICES advice: *Red seabream can only sustain low rates of exploitation. Fisheries on such species should be permitted only when they are accompanied by programmes to collect data. The WGDEEP Group was of the opinion that further management measures, including a reduction in TAC may be appropriate.*

Table 14.3.1 Red seabream (Pagellus bogaraveo) in Subarea IX: Working Group estimates of landings (tonnes)

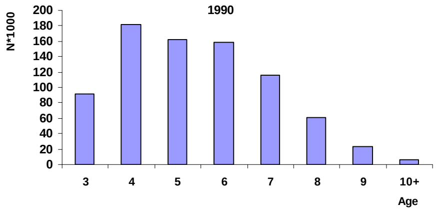
Year	Portugal	Spain	TOTAL
1988	370	319	**689**
1989	260	416	**676**
1990	166	428	**594**
1991	109	423	**532**
1992	166	631	**797**
1993	235	765	**1000**
1994	150	854	**1004**
1995	204	625	**829**
1996	209	769	**978**
1997	203	808	**1011**
1998	357	520	**877**
1999	265	278	**543**
2000	83	338	**421**
2001	97	277	**374**
2002	111	248	**359**
2003	142	329	**471**
2004	183	297	**480**
2005	129	365	**494**
2006	104	440	**544**
2007*	185	401	**586**

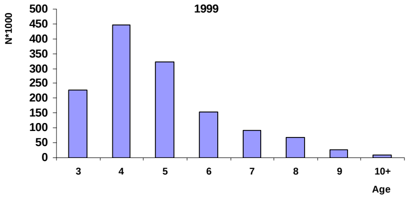
***provisional**

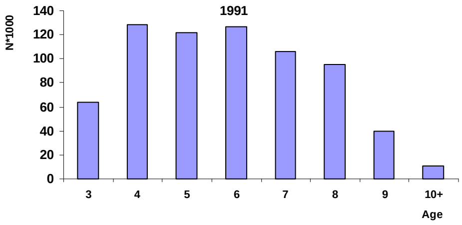


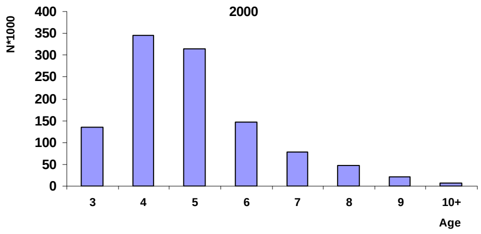
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total	40.0	39.9	36.7	36.7	36.0	34.3	36.2	36.8	37.1	38.1	38.4	36.3	36.8	35.9	36.8
Tarifa			38.5	37.9	38.9	35.7	37.9	38.6	38.9	38.9	39.5	37.6	37.8	36.6	37.7
Algeciras			32.4	32.4	32.7	33.1	33.6	34.7	34.6	34.3	34.3	34.0	34.1	33.8	34.2

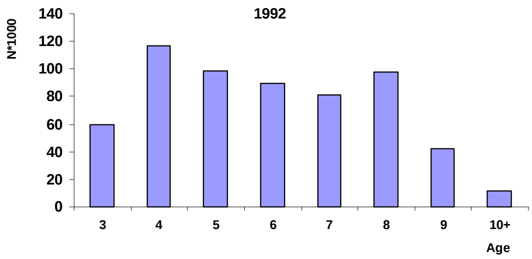
Figure 14.3.1. Red seabream fishery of the Strait of Gibraltar (ICES Subarea IX): 1993-2007 landings mean length distribution (from Gil et al., WD 9, 2008).

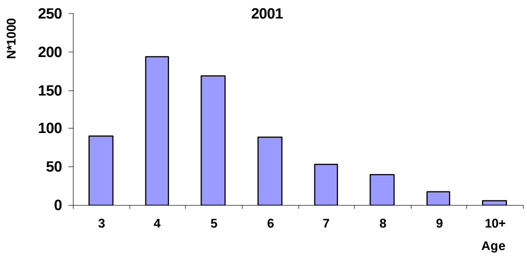

1990
N*1000
Age

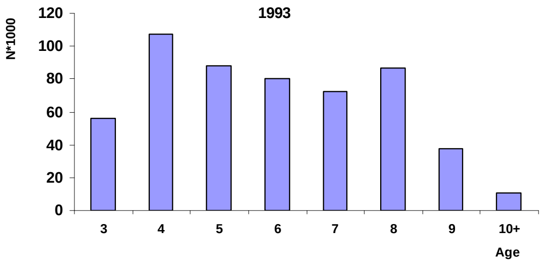

1999
N*1000
Age

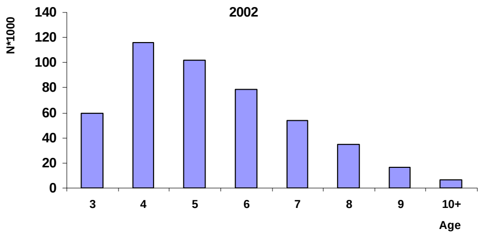

1991
N*1000
Age

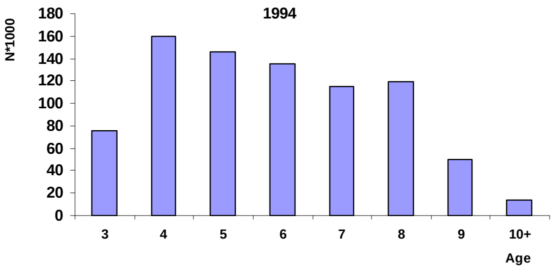

2000
N*1000
Age

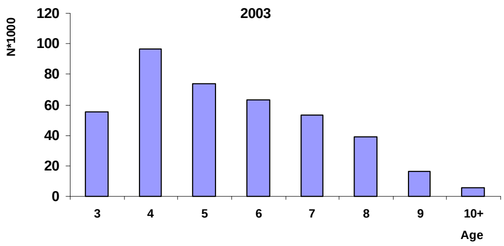

1992
N*1000
Age


2001
N*1000
Age


1993
N*1000
Age


2002
N*1000
Age


1994
N*1000
Age


2003
N*1000
Age

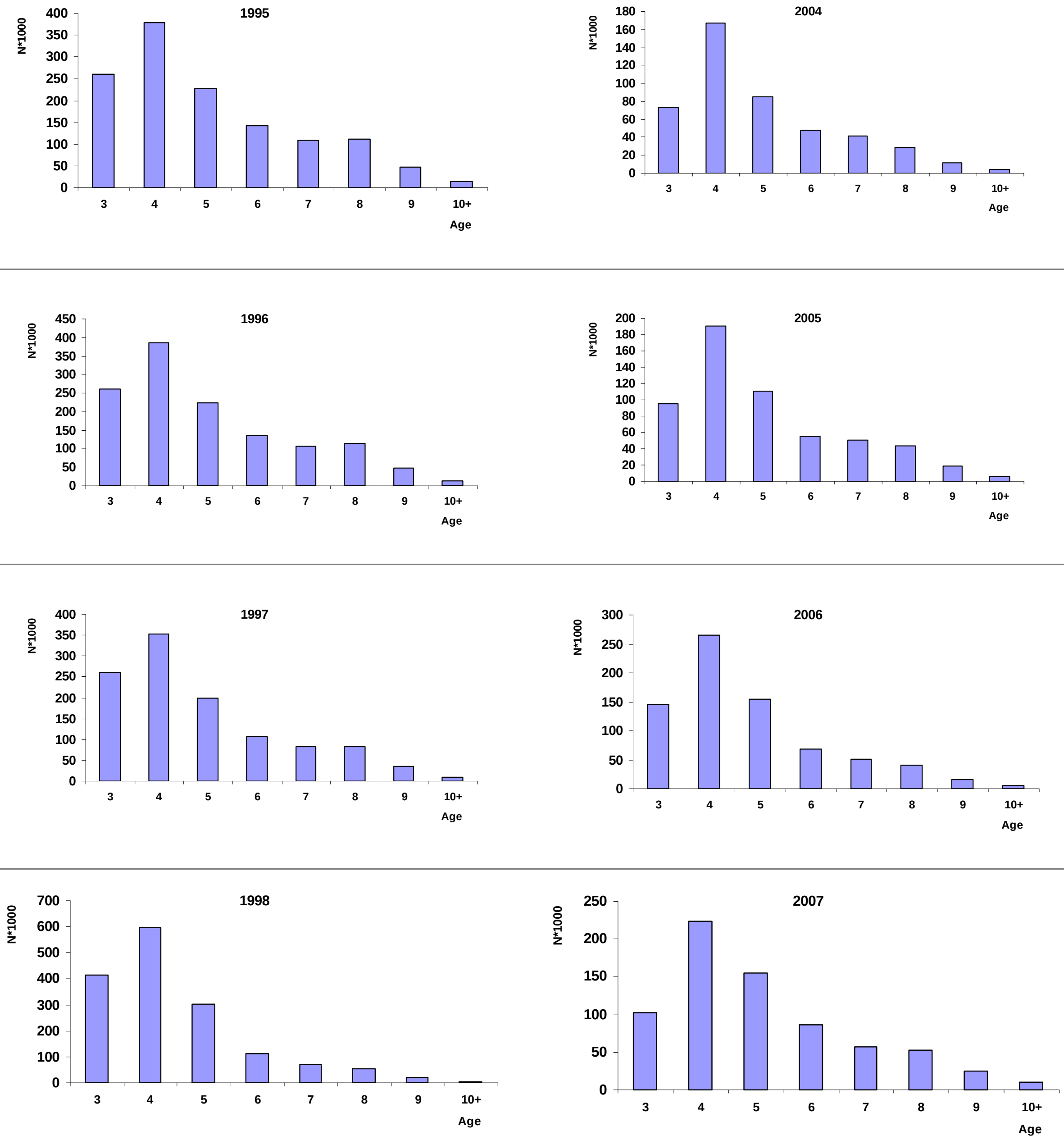


Figure 14.3.2. Red seabream (ICES Sub-Area IX): 1990-2007 landings age distribution (raised from the Strait of Gibraltar fishery).

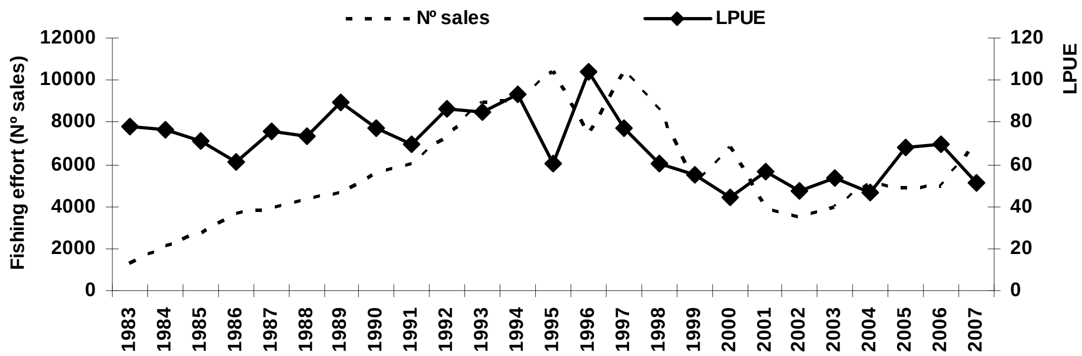


Figure 14.3.3. Red seabream fishery of the Strait of Gibraltar (ICES Subarea IX): Evolution of effort and LPUE in the period 1983-2007 (J. Gil, pers. com.).

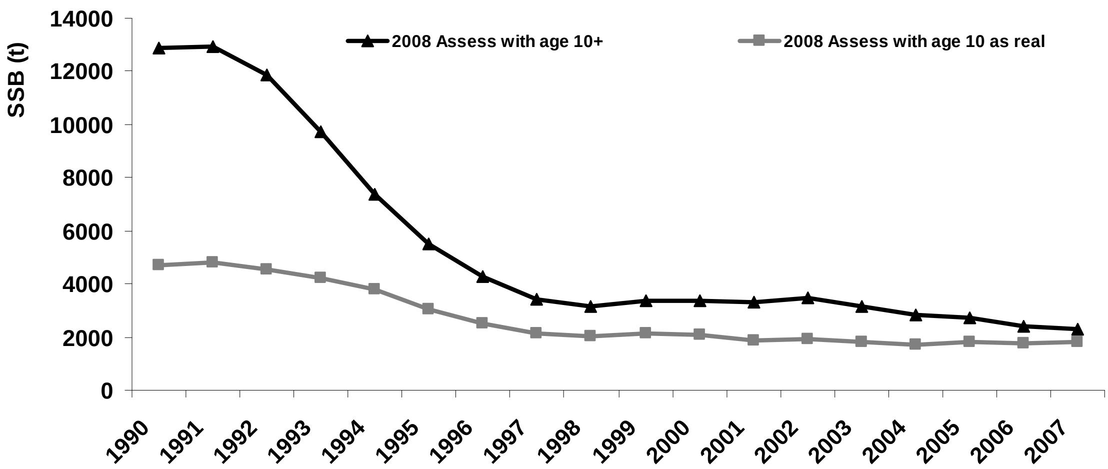


Figure 14.3.4. Red seabream (ICES Sub-Area IX): SSB estimates from traditional VPA (separable analysis with reference age:4, S=0.4, F=0.3, default weighting values and considering, or not, age 10 as a plus group).

14.4 Red Seabream (*Pagellus Bogaraveo*) in Division Xa

14.4.1 The fishery

Blackspot seabream has been exploited in the Azores (area Xa2), at least, since the XVI century, as part of the demersal fishery, and is actually one of the most important northeast Atlantic fisheries. The directed fishery is a hook-and-line fishery where two components of the fleet can be defined: the artisanal (hand lines) and the longliners (Pinho et al., 1999; Pinho, 2003). The artisanal fleet is composed of small open deck boats (<12m) that operate on local areas near the coast of the islands using several types of hand lines. Longliners are closed deck boats (>12m) that operate in all areas, including banks and seamounts. The tuna fishery caught, until the end of the nineties, juveniles (age 0) of blackspot seabream as live bait, but in a seasonal and irregular way because these catches are dependent on tuna abundance and on the occurrence of other preferred bait species like Trachurus picturactus (Pinho et al., 1995).

The Azorean demersal fishery is a multispecies and multigear fishery where P. bogaraveo is considered the target species. The effect of these characteristics on the dynamic of the target fishery is not well understood.

14.4.1.1 Landings trends

Historically the landings increased from 100t at the start of the seventies to proximally 1000t at the start of the nineties (Fig. 14.4.1), due to the development of new markets, increased fish value, entry of new and modern boats, better professional education of the fisherman, and introduction of bottom longline gear, permitting the expansion of the exploitable area to deeper waters, banks, and seamounts as well as, the expansion of the fishing season (ICES 2006). During the last 17 years the landings fluctuated around the 1000t.

14.4.1.2 ICES advice

ICES advised in 2006; *Red seabream can only sustain low rates of exploitation. Fisheries on such species should be permitted only when they are accompanied by programmes to collect data and should expand very slowly until reliable assessments indicate that increased harvests are sustainable.*

14.4.1.3 Management

Under the European Union Common Fisheries policy an analytical TAC of 1116 mt was introduced in 2003 (EC. Reg. 2340/2002) and maintained in 2004 (EC. Reg. 2270/2004) and 2006 (EC. Reg. 2015/2006).

P. bogaraveo	2003		2004		2005		2006		2007	
ICES Sub-Area	TAC	Landing	TAC	Landing	TAC	Landing	TAC	Landing	TAC	Landing
Xa2	1116	1068	1116	1075	1116	1113	1116	958	1116	1070

For the 2006 the Regional Government introduced a quota system by Island and vessel. A specific access requirements and conditions applicable to fishing for deep-water stocks was established (EC. Reg 2347/2002). Fishing with trawl gears was forbidden in the Azores region. A box of 100 miles limiting the deep-water fishing to vessels registered in the Azores was created in 2003 under the management of fishing effort of the common fishery policy for deep-water species (EC. Reg. 1954/2003).

A minimum size of capture of 25 cm (0.24 kg) was implemented during 2005.

14.4.2 Data available

14.4.2.1 Landings and discards

Total landings are available since 1980. However, detailed and precise landing data are available for the assessment since 1990 (ICES, 2006). Landings from area Xa2 are presented in the Table 14.4.1. Discards of blackspot seabream have not been reported or observed in the Azorean fleets. Bycatch were reported by boats of silver scabbardfish (Lepidopus caudatus) fishery from mainland (Portugal) operating in the Azores between 1991 and 1998 (Pinho et al., 1999). Red (blackspot) seabream was also caught by the kitefin shark (Dalatias licha) fishery, using bottom gillnets, but these catches were landed in the Azores ports. A recent study shows that almost no blackspot seabream is discarded on the target demersal fishery (Catarino, 2006).

14.4.2.2 Length compositions

Annual fishery length composition from ICES area Xa2 is available since 1990 (ICES, 2006) (Fig. 14.4.2). Length composition for the 2007 is not available on time for the working group. Length composition is stable along time with a mode in general on age 4 (30cm). However, for some years (e.g. 1999, 2000 and 2005) high amounts of large individuals were caught.

Length composition from the survey is presented in Fig. 14.4.5. No trends are observed in these data.

14.4.2.3 Age compositions

Fishery annual age composition from ICES area Xa2 is available since 1990 (ICES, 2006). Annual fishery age frequencies (catch at age) were created by slicing the fishery length frequencies using the von Bertalanffy equation (ICES 2006).

14.4.2.4 Weight at age

No new information was presented to the group. For the assessment propose catch weight at age is considered equal to stock weight at age (ICES. 2006).

14.4.2.5 Maturity, Sex-ratio and natural mortality

No new information was presented to working group. An annual reproductive cycle is defined for the species with spawning occurring between January and April. Mature males are found from November to March and females from December to March (ICES, 2006). For the assessment purpose a single logistic curve estimated for the female's sex ratio and a single female maturity ogive (ICES, 2006) was used for the entire time period. A natural mortality of 0.2 year-1 has been adopted for the assessment purposes (ICES, 2006).

14.4.2.6 Catch, effort and research vessel data

A standardized CPUE, using the generalized linear model (GLM) to adjust the CPUE trend of blackspot seabream stock was presented to the group during the 2006 meeting (ICES, 2006). This information was updated to add in the 2006 year to time series (Pinho, 2008 WD12)(Fig. 14.4.3).

Abundance indices from surveys are available since 1995 (Pinho, 2008, WD12) (Fig. 14.4.4). There is no data for 2006 because there was no survey during this year. Survey indices presented an increase trend with a high value every three years. These high values may be related with some sort of catchability variability (fish is more available to the gear in some years) as a function of the feeding behaviour (benthopelagic) and reproduction (protandric forming spawning aggregations) of the species.

14.4.3 Data analyses

Considering that for this meeting the time series were updated with only one additional year (2006) and no survey data is available for this year no significant changes are expected on the last assessment results as shown from the preliminary analysis using SVPA and ad hoc VPA tuning runs using the last assessment base case. Therefore no new analyses were carried out.

14.4.4 Comments on the assessment

The results from the exploratory assessment performed in 2006 were considered unreliable.

14.4.5 Management considerations

The status of Red blackspot seabream is uncertain but there are signs of increases in indices of abundance from surveys and stable CPUE from the fishery CPUE. The catches of red black spot seabream have been increased until the actual TAC plateau level.

Considering the uncertainty of the assessment fishing mortality should not be increased beyond the current level until validated assessments indicate that any harvest increase are sustainable.

It is possible that sequential depletion of local populations may be occurring and this may be contributing to the stability of observed commercial CPUE series.

Table 14.4.1. Pagellus bogaraveo landings in ICES division Xa2 since 1980.

Year	Azores (Xa2)	Total
1980	415	415
1981	407	407
1982	369	369
1983	520	520
1984	700	700
1985	672	672
1986	730	730
1987	631	631
1988	637	637
1989	924	924
1990	889	889
1991	874	874
1992	1090	1090
1993	830	830
1994	989	989
1995	1115	1115
1996	1052	1052
1997	1012	1012
1998	1119	1119
1999	1222	1222
2000	924	924
2001	1034	1034
2002	1193	1193
2003	1068	1068
2004	1075	1075
2005	1113	1113
2006	958	958
2007	1070	1070

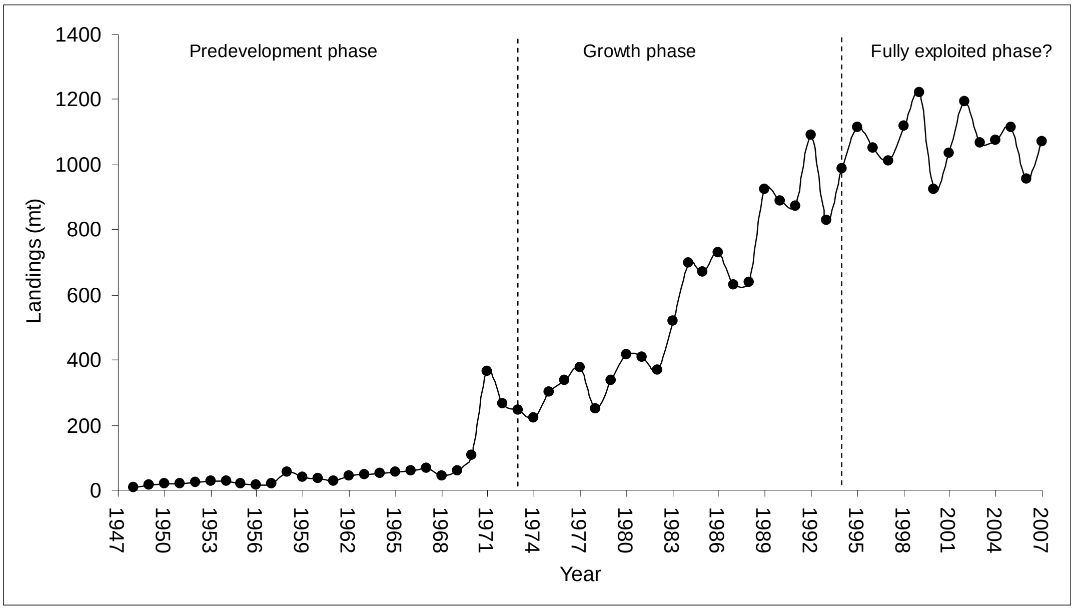
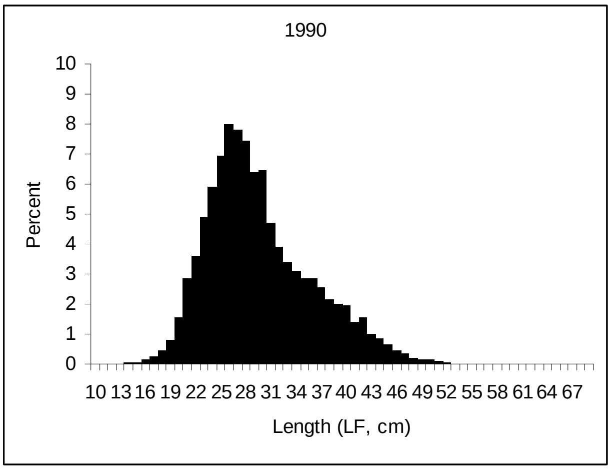
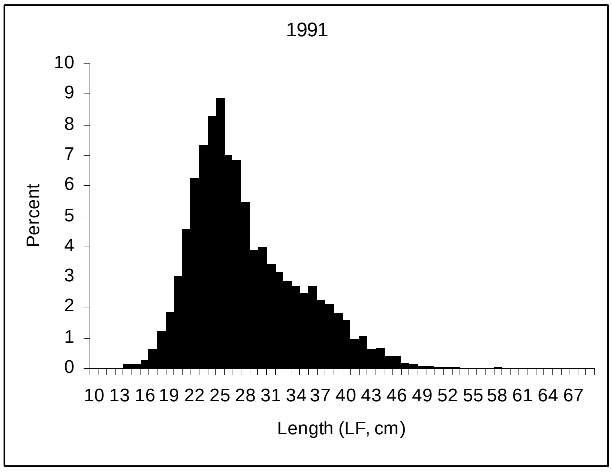
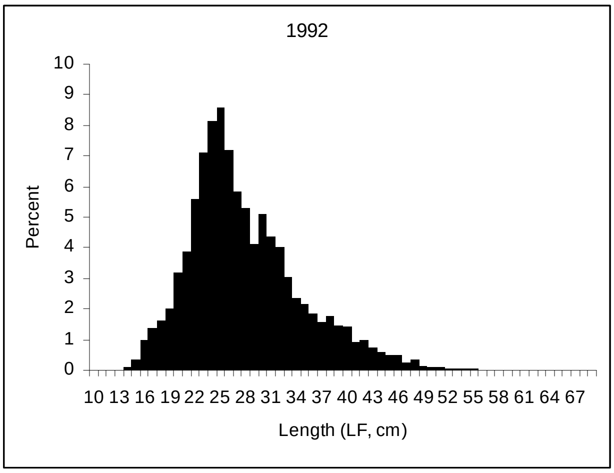
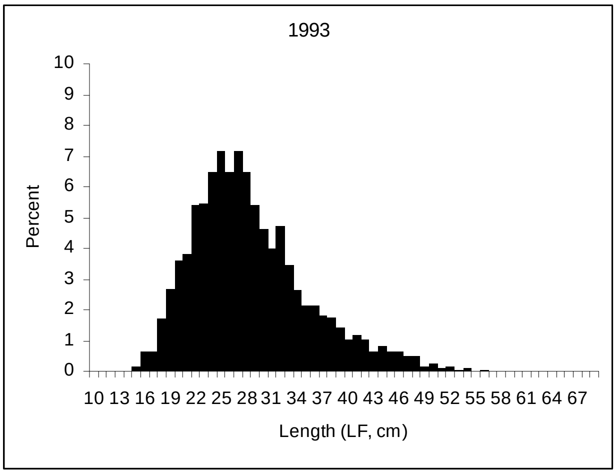


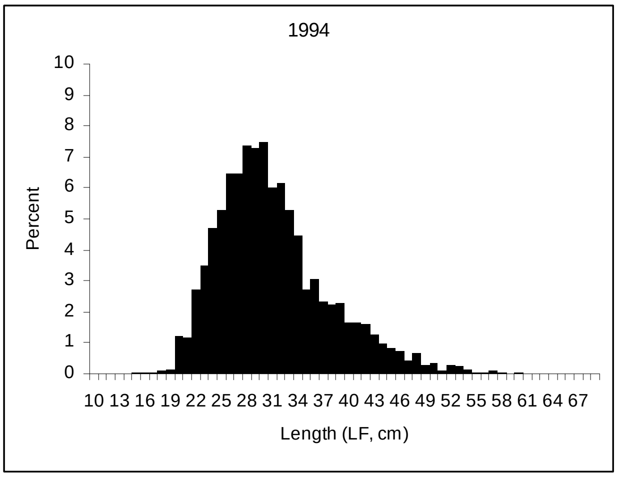
Figure 14.4.1. Historical landings of *Pagellus bogaraveo* from the Azores (ICES area Xa2).

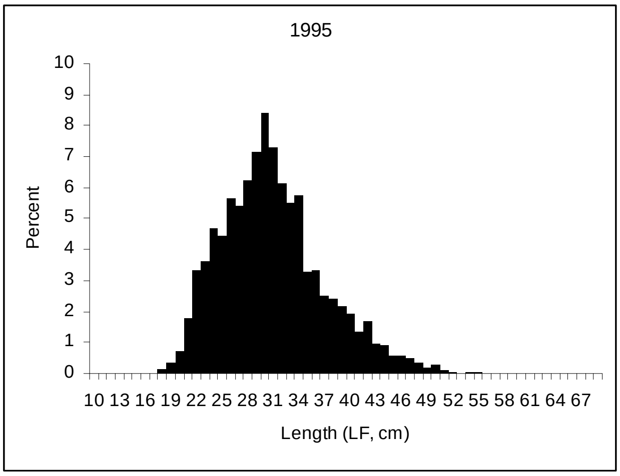

1990
Percent
Length (LF, cm)

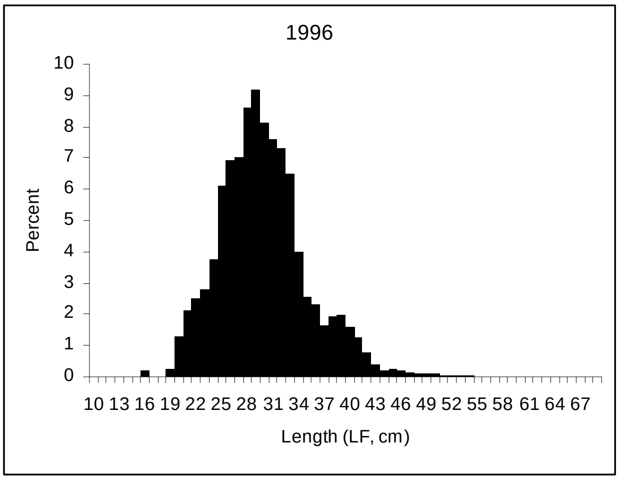

1991
Percent
Length (LF, cm)

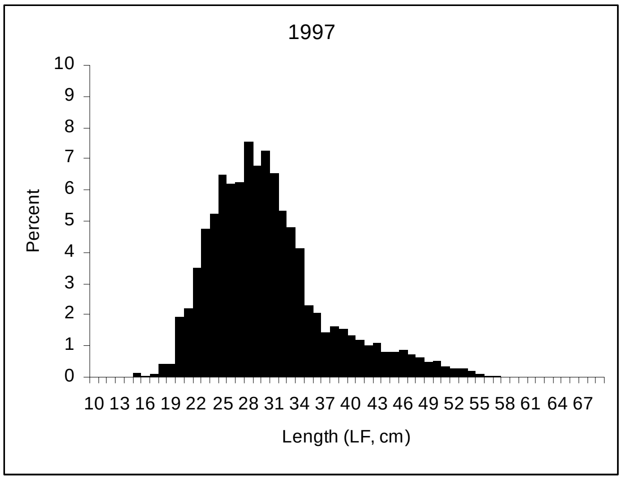

1992
Percent
Length (LF, cm)


1993
Percent
Length (LF, cm)


1994
Percent
Length (LF, cm)


1995
Percent
Length (LF, cm)


1996
10 9 8 7 6 5 4 3 2 1 0
Percent
10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67
Length (LF, cm)


1997
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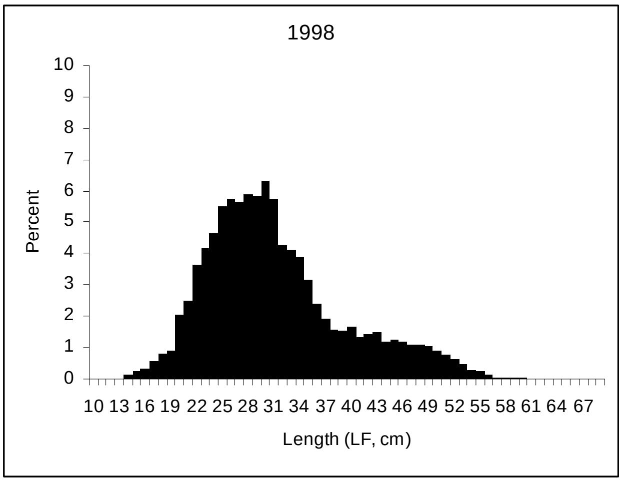
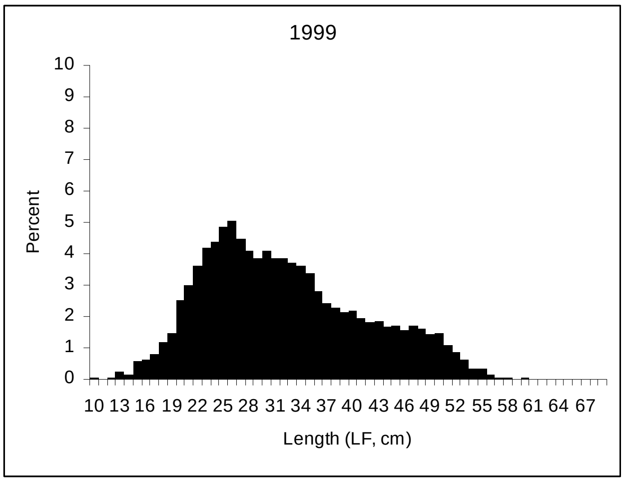
Percent
10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67
Length (LF, cm)


1998
10 9 8 7 6 5 4 3 2 1 0
Percent
10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67
Length (LF, cm)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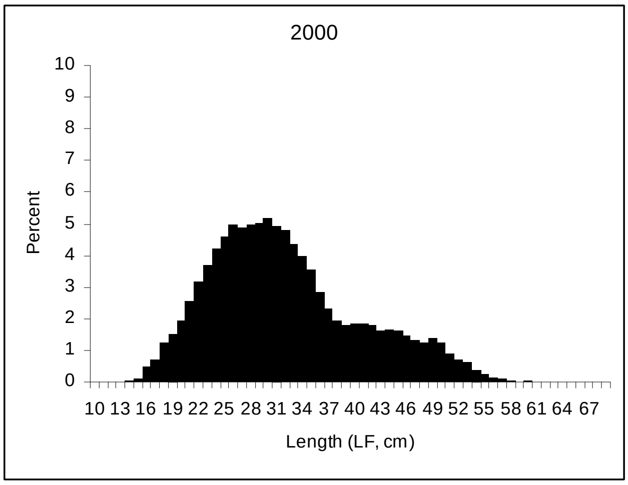
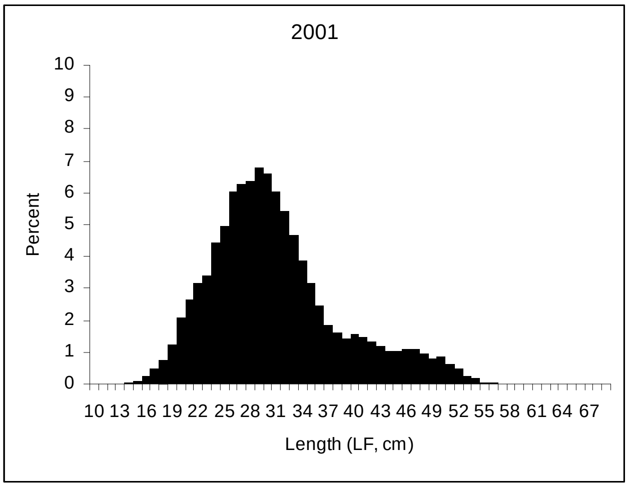
10 9 8 7 6 5 4 3 2 1 0
Percent
10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67
Length (LF, cm)


2000
10 9 8 7 6 5 4 3 2 1 0
Percent
10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67
Length (LF, cm)


2001
10 9 8 7 6 5 4 3 2 1 0
Percent
10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67
Length (LF, cm)

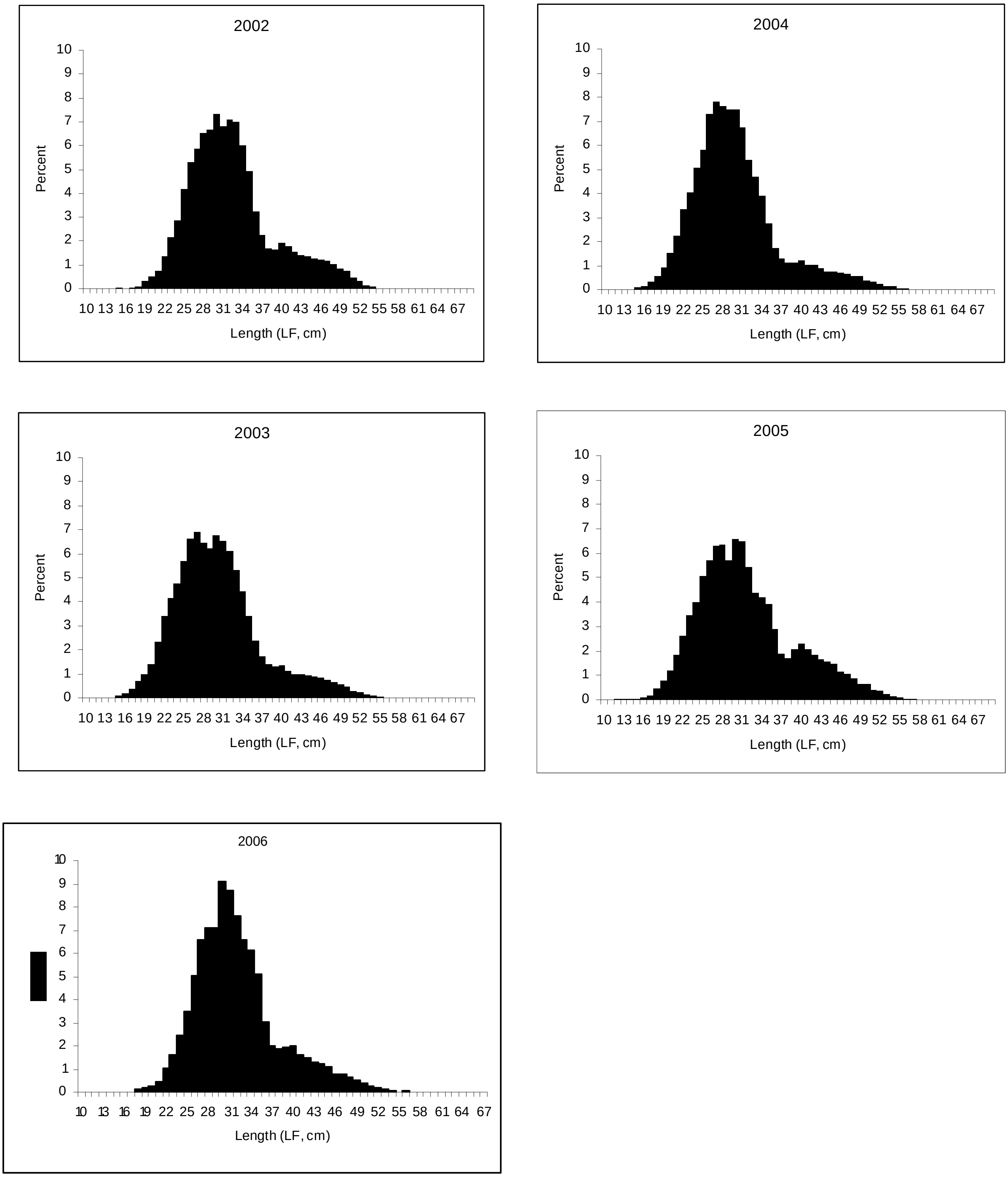


Figure 14.4.2. Fishery length composition of *Pagellus bogaraveo* from ICES area Xa2, (Azores).

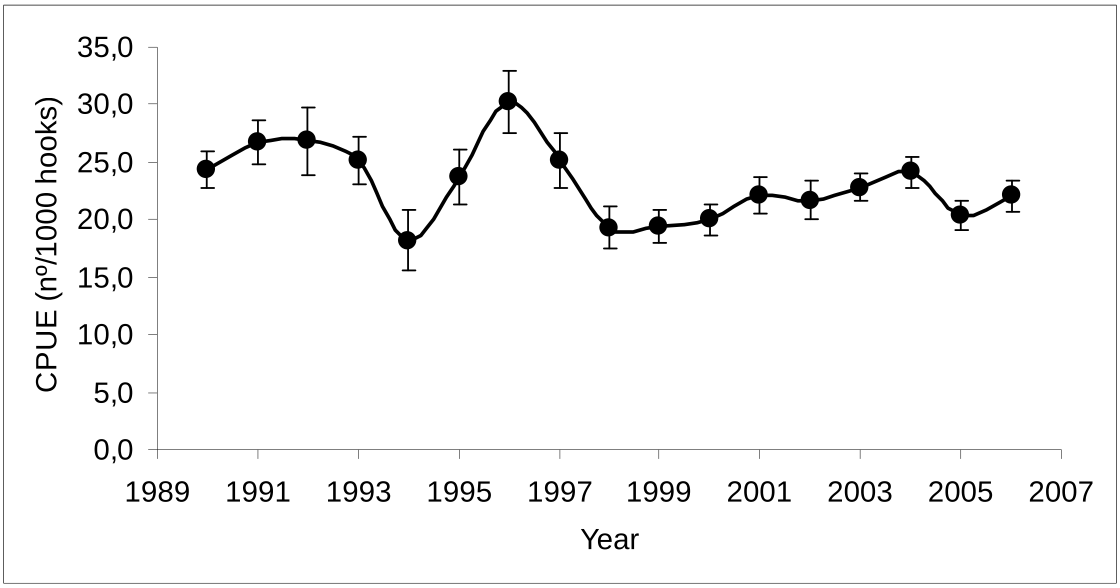


Figure 14.4.3. Annual standardized CPUE in number per thousand hooks and 95% confidence intervals for the Azores bottom longline blackspot seabream

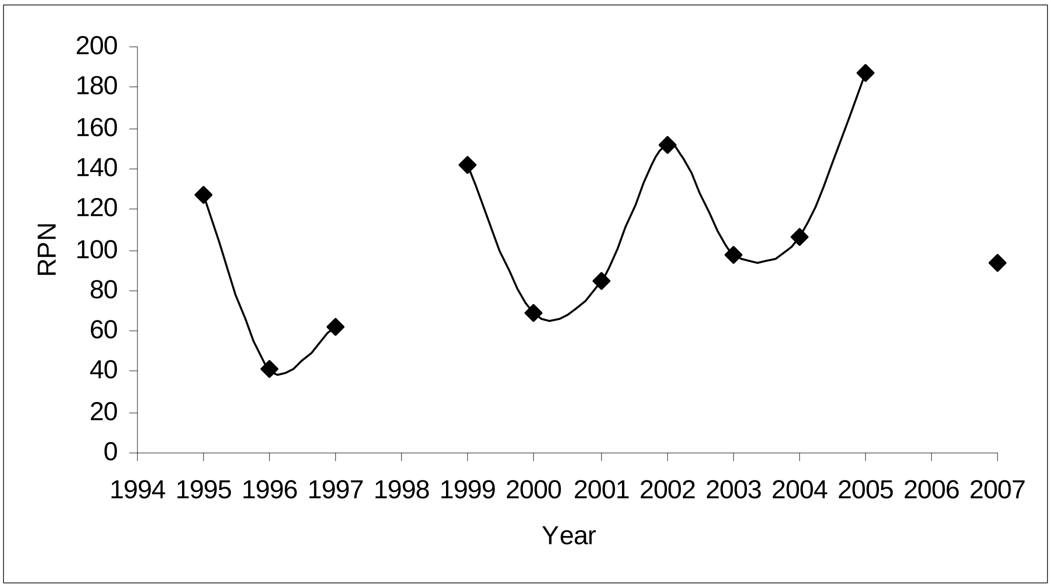


Figure 14.4.4. Annual abundance in number (Relative Population Number) and in weight (Relative Population Weight) of *Pagellus bogaraveo* from surveys for the ICES area Xa2.

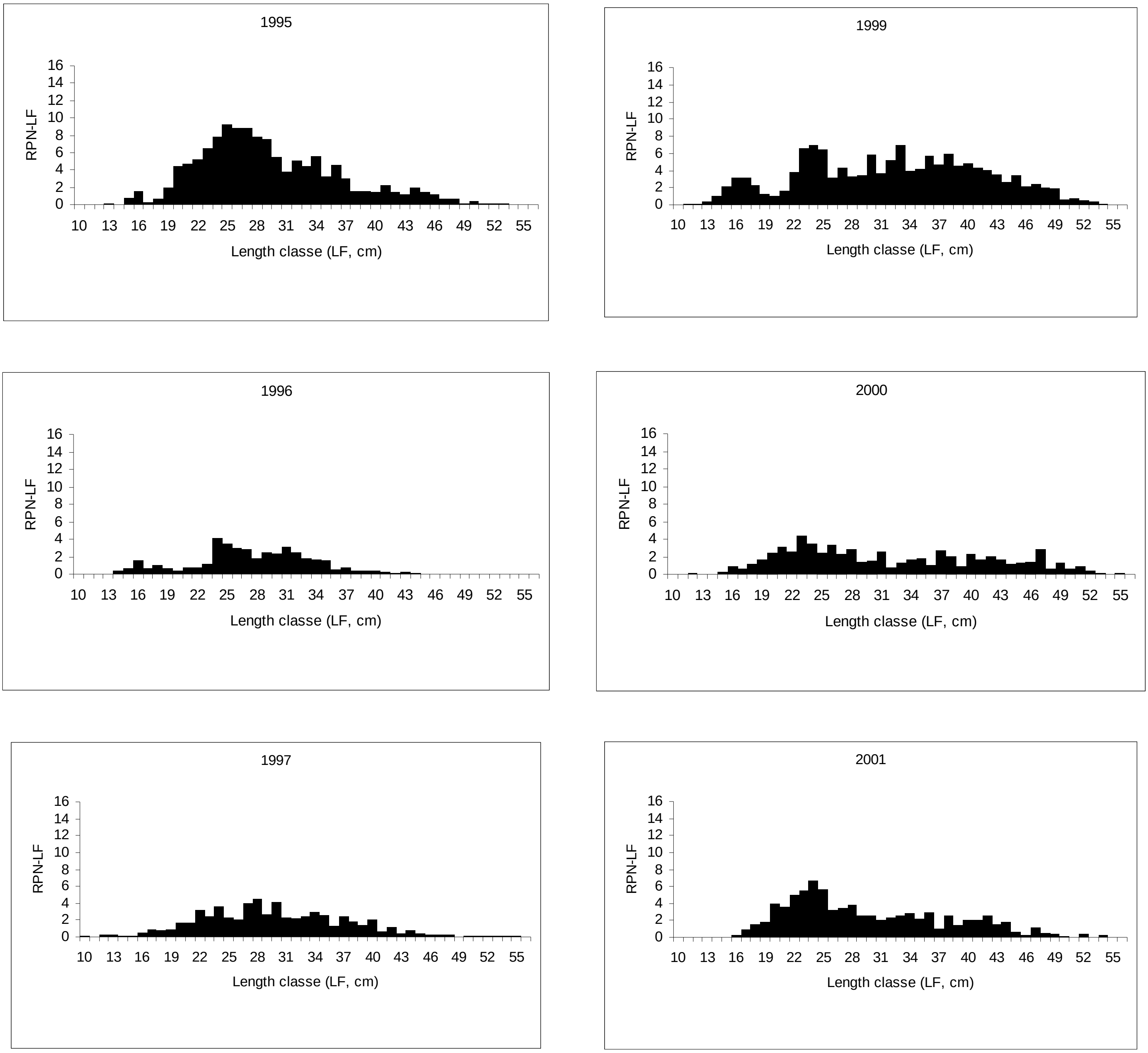


Figure 14.4.5. Annual length composition of *Pagellus bogaraveo* from the Azorean spring bottom longline survey for the period 1995-2005 (ICES area Xa2).

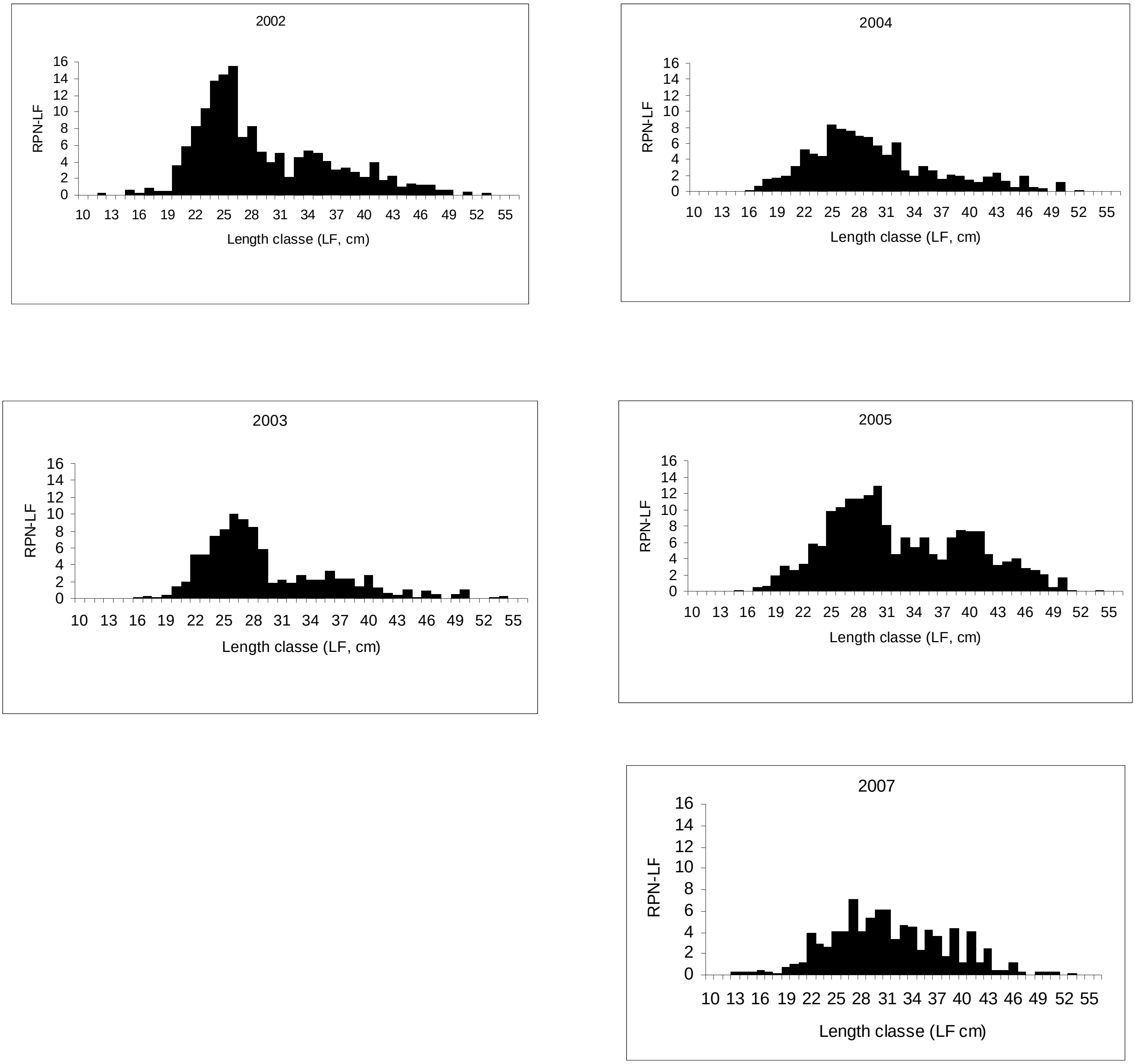


Figure 14.4.5. Cont. Annual length composition of *Pagellus bogaraveo* from the Azorean spring bottom longline survey for the period 1995-2007 (ICES area Xa2)

15 Other Deep-Water Species in the Northeast Atlantic

15.1 The fisheries

Building on information presented in previous Working Group reports, the following species are considered in this chapter: roughhead grenadier (Macrourus berglax), common Mora (Mora moro) and Moridae, rabbit fish (Chimaera monstrosa and Hydrolagus spp), Baird's smoothhead (Alepocephalus bairdii) and Risso's smoothhead (A. rostratus), wreckfish (Polyprion americanus), bluemouth (Helicolenus dactylopterus), silver scabbard fish (Lepidopus caudatus), deep-water cardinal fish (Epigonus telescopus) and deepwater red crab (Chaceon affinis)

Roughhead grenadiers are predominantly taken as bycatch in trawl and longline fisheries targeting Greenland halibut in sub-areas I and II. Mora, rabbitfish, smoothheads, bluemouth and deep-water cardinal fish are taken as bycatch in mixed-species demersal trawl fisheries in sub-areas VI, VII and XII and to a lesser extent, II, IV and V. Rabbitfish and smoothheads have low market value and, in some fisheries, the entire catch is usually discarded. Landings data therefore do not reflect the entire catch of these species and more data is needed on levels of discarding. A small bycatch of rabbitfish is taken in the Roundnose grenadier fishery in sub-area III.

Mora, wreckfish, bluemouth and silver scabbardfish are caught in targeted and mixed species longline fisheries in sub-areas VIII, IX and X.

Deep-water red crab are caught in directed tangle net and trap fisheries and as a bycatch in net fisheries for deep-water sharks, principally in sub-areas VI and VII but increasingly in other areas including sub-area IX.

15.1.1 Landings trends

Reported landings of roughhead grenadier increased dramatically from 433 tonnes in 2004 to 5295 tonnes in 2005. Prior to this increase, landings had remained more or less stable at less than 200 tonnes per annum. The increased landings came from the Spanish trawl fishery at Hatton Bank and were recorded as recorded as "Macrourus berglax and other grenadiers". If these data are accurate, it may indicate that effort has been reallocated to roughhead grenadier in response to more restrictive quotas on other species. It is however possible that these landings were not actually M. berglax and may result from misreporting of other species eg. roundnose grenadier. Landings data from 2006 does not confirm a trend concerning the increase reported in 2005 and further the landings were even smaller in 2007.

Reported landings of Mora decreased between 2002 and 2005 both in the trawl fisheries in subareas VI, VII and XII and in the longline fisheries in sub-areas VIII, IX and X. Data from 2006 indicates that this trend has not continued, with 2006 landings similar to pre-2002 levels. Preliminary data from 2007 indicates no changes from the situation in 2006. Some problems with data still exist as at least one country still mixes this species with greater forkbeard in landings and it is possible that the apparent decrease in landings from the trawl fisheries result from inadequate reporting, however, the decrease in the longline fishery appears to be genuine.

Total landings of rabbitfish increased rapidly between 1995 and 2005. This may be a result of increasing market acceptance of this species which was formerly discarded by most fleets. Data from 2006 shows a sharp decline and the preliminary data for 2007 shows landings that are strongly reduced and low compared to data from 2005.

Landings of smoothheads showed a general increasing trend from the mid 1980s to 2002 as a result of increasing retention in the fisheries, however, more recent landings show no clear trend.

Landings of wreckfish increased during the early 1990s but have since returned to their level of the late 1980s. Since 1997 there has been no clear trend in landings until 2005. The fishery is primarily executed in sub areas VIII, IX and X. In 2006 there was an increase in landings in sub areas VIII, IX and X. This increase seems to continue in 2007.

Bluemouth landings in sub-areas VI and VII increased in the late 1990s, probably as a result of increased retention in the fisheries, however, since 2000, landings have fluctuated without any obvious trend. In sub-area X, landings increased in the 1990s but have since declined steadily; this may be partly attributed to a change in the fishery towards targeting other species. Landings in sub-areas VIII and IX have been increasing since 2002.

Silver scabbardfish landings in sub-area X rose to a peak of 1180 tonnes in 1998 then declined very rapidly. Since 1999, landings in this area have remained at a low level of less than 100 tonnes per annum. Landings in sub areas VIII and IX declined from a peak of over 5000 tonnes in 1995 to 526 tonnes in 2005. For sub area VIII and IX no change in catch trends appears in 2007 and the catches remain at a stable level from the four last years. In 2006 it was reported catches in sub areas VI and VII which led to an increase in the total catch this year.

The largest catches of deepwater Cardinal fish came from sub-areas VI and VII and showed a increasing trend until 2003. The landings then have decreased in recent years. This may reflect the general reduction of effort resulting from management measures aimed at other species.

A fishery for deep-water red crab (Chaceon affinis) using nets and traps began in sub-areas V, VI and VII in 1995. This has recently been an increase in catches in other areas, including sub-area IX. Landings have fluctuated with an increasing trend. The increasing trend seems to continue in 2007. Many of the vessels involved in this fishery also target deep-water sharks and it is possible that changes in the spatial distribution of this fishery have been influenced by the current restrictions on deep-water gill-netting in sub-areas VI and VII.

15.1.2 ICES Advice

ICES has not previously given specific advice on the management of any of the stocks considered in this chapter. General advice on the management of existing deep-water fisheries given in 2005 was … *the fishing pressure should be reduced considerably to low levels and should only be allowed to expand again very slowly if and when reliable assessments indicate that increased harvests are sustainable.*

15.1.3 Management

No quotas are set for any of these species in EC waters or in the NEAFC Regulatory Area. None of these species are included in Appendix I of Council Regulation (EC) No 2347/2002 meaning that vessels are not required to hold a Deepwater Fishing Permit in order to land them; they are therefore not necessarily affected by EC regulations governing deepwater fishing effort.

15.2 Stock identity

No new information has been made available to the Working Group on the stock identity of these species.

15.3 Data available

15.3.1 Landings and discards

Landings for all of these species are presented in table 15.1 to 15.8

No new information on discarding of any of these species was made available to the working group.

15.3.2 Length compositions

New length data were provided to the Working Group for Spanish landings of Silver scabbard fish, Spanish survey data on bluemouth from the Porcupine Bank, and Russian survey data on roughhead grenadier from East Greenland (figures 15.1-3). This adds to data included in previous reports.

15.3.3 Age compositions

No new data on age compositions of any of these species were presented to WGDEEP in 2007.

15.3.4 Weight at age

No new data on weight at age for any of these species were presented to WGDEEP in 2007.

15.3.5 Maturity and natural mortality

New information was presented to the working group on maturities of male and female roughhead grenadier in Russian surveys in East Greenland (Figures 15.4).

15.3.6 Catch, effort and research vessel data

Variation in abundance indices of bluemouth in the Spanish Porcupine Bank Survey from 2001to 2007 is shown in Figure 15.5. CPUE has remained more or less stable throughout this period, but 2007 has the lowest value observed. The geographic and bathymetric distribution of catchrates are given in figures 15.6-7.

Abundance indices of bluemouth, wreckfish and silver scabbard fish from Portuguese survey at the Azores are given in Figure 15.8. No clear trends could be seen for bluemouth whereas a slight increase seemed to have occurred for wreckfish. There are no apparent changes for silver scabbard fish, which has been at a very low level since 2000.

Russian data on prey composition from stomach contents analyses of Roughhead grenadier are given in Figure 15.9

15.4 Data analyses

The data available to the working group on the species considered here were not considered sufficient to attempt any assessments.

15.5 Comments on the assessment

For most of the species considered in this chapter, data are not sufficient to give advice for management. It is likely that historic and recent data exists in many countries and effort should be made to make this available to the working group.

15.6 Management considerations

Many of the species included here are caught as bycatch in fisheries targeted towards other species or as minor components of mixed species fisheries. Effort in the mixed species trawl and longline fisheries in sub-areas VI, VII and XIIb has declined in recent years as a result of effort limitation on EC vessels and restrictive quotas for the main target species. This could be expected result in reallocation of effort towards targeting species in the other species group. The Working Group is concerned over high levels of under reporting of catches of smoothhead and rabbitfish due high levels of discarding.

No stock exploitation boundary can be suggested for any of these species due to lack of assessment. Furthermore, the knowledge of the biology of these species is insufficient, and it is unclear how vulnerable they are to exploitation. Fisheries on such species should be permitted only when they are accompanied by programmes to collect data.

Table 15.1 Working group estimates of landings of roughhead grenadier. Data from 2007 are provisional.

Year	I and	III and	Va	Vb	VI and	VIII	X	XII	XIV	TOTAL
1988										
1989										
1990	589									589
1991	829									829
1992	424	7								431
1993	136				18				52	206
1994					5				5	10
1995	1				4				2	7
1996	3	4	15		13					35
1997	21	5	4	6	12					48
1998	55	1	1	9	10				6	82
1999				58	34		3		14	109
2000	48	4	2	1	10			7		72
2001	94	10	1	4	44			10	26	189
2002	29	3	4	3	19			7	53	118
2003	77	2	33	12	12			324	665	1125
2004	79	1	3	9	13			28	300	433
2005	77	39	5	5	2582			2547	40	5295
2006	78		7		76	1		8	9	179
2007	50		2	2	18				10	79

Table 15..2 Working group estimates of landings of Mora moro and Moridae. Data from 2007 are provisional.

Year	Vb	VI and	VIII and	X*	XII	XIVb	TOTAL
1988				18			18
1989				17			17
1990				23			23
1991	5	1		36			42
1992		25		31			56
1993				33			33
1994				42			42
1995			83				83
1996			52				52
1997			88				88
1998							
1999	1	20					21
2000		156	26		1		183
2001	100	194	20	1	87		402
2002	19	159	8	100	13		299
2003	8	327	12	125	15	6	493
2004	1	71	11	87	4		174
2005	1	63	54	69			187
2006	4	428	51	127	1		560
2007	4	251	4	86	20		365

* source of data 1988 to 1994 unknown, may be unreliable

Table 15.3 Working group estimates of landings of rabbitfish (Chimaera monstrosa and Hydrolagus spp.) Data from 2007 are provisional.

Year	I/II	III/IV	Va	Vb	VI/VII	VIII	XII	XIV	TOTAL
1991			499						499
1992		122	106						228
1993		8	3						11
1994		167	60		2				229
1995			106	1					107
1996		14	21						35
1997		38	15				32		85
1998		56	29		2		42		129
1999	1	45	2	3	236	2	115		404
2000	6	33	5	54	358	2	48		506
2001	5	20		96	729	7	79		936
2002	15	24		64	573	6	98	1	781
2003	57	25		61	474	2	81	4	704
2004	21	40		96	433	6	128	5	729
2005	66	171		57	571	14	249	1	1129
2006	28	14	1	10	23	5		5	87
2007	63	65	1		49				178

Table 15.4 Working group estimates of landings of Wreckfish. Data from 2007 are provisional

Year	VI and VII	VIII and IX	X	TOTAL
1988	7	198	191	396
1989		284	235	519
1990	2	163	224	389
1991	10	194	170	374
1992	15	270	241	526
1993		350	314	664
1994		410	429	839
1995		394	240	634
1996	83	294	240	617
1997		222	177	399
1998	12	238	139	389
1999	14	144	133	291
2000	14	123	268	405
2001	17	167	229	413
2002	9	156	283	448
2003	2	243	270	515
2004	2	141	189	332
2005		195	279	474
2006		338	497	835
2007	2	504	664	1170

Table 15.5 Working group estimates of landings of bluemouth Data from 2007 are provisional

Year	III and IV	Vb	VI	VI*	VII	VII*	VIII and IX	X	TOTAL
1989			79		48		2	481	610
1990	4		69		31		5	480	589
1991	5		99		29		12	483	628
1992	3		112		47		11	575	748
1993	1		87		65		8	650	811
1994	2		62		55		4	708	831
1995	2		62		9			589	662
1996	2		77	47	10	2		483	572
1997	1		78	41	10	11	1	410	500
1998			53	79	92	4	3	381	529
1999	8	64	194	1	160	0	29	340	795
2000		16	213	191	119	3	33	452	833
2001			177	224	102	12	34	301	614
2002			81	91	115	1	18	280	494
2003			184		213		124	338	859
2004	2	3	142		291		135	282	855
2005			103		204		206	190	703
2006		12	50		167		288	209	726
2007			60		139		356	275	830

*: No landings of bluemouth were reported in Spanish landings prior to 2003. Only landings from Basque Country were available for the WG.

Table 15.6 Working group estimates of landings of silver scabbardfish Data from 2007 are provisional

	VI and VII	VIII and IX	X	XII	TOTAL
1988		2666	70		2736
1989		1385	91	102	1578
1990		584	120	20	724
1991		808	166		974
1992		1374	2160		3534
1993	2	2397	1722	19	4140
1994		1054	373		1427
1995		5672	789		6461
1996		1237	815		2052
1997		1725	1115		2840
1998		966	1186		2152
1999	18	3069	86		3173
2000	15	16	28		59
2001		706	14		720
2002	1	1832	10		1843
2003		1681	25		1706
2004		854	29		883
2005		527	31		558
2006	342	624	35		1001
2007	67	654	55		776

Table 15.7 Working group estimates of landings of deepwater cardinal fish. Data from 2007 are provisional

Year	Vb	VI	VII	VIII and IX	X	XII	TOTAL
1993		15	15				30
1994	4	35	182				221
1995	3	20	71				94
1996	8	13	32				53
1997	8	27	22				57
1998		86	29				115
1999	8	52	206	3			269
2000	2	108	179	5	3		297
2001	7	103	282	4			396
2002		90	884	8	14		996
2003	2	45	1030	5	15	1	1098
2004	1	28	841	10	21		901
2005		50	638	8	4		700
2006		1	14	7	10		32
2007			212		7		219

Table 15.8 Working group estimates of landings of deep-water red crab. Data from 2007 are provisional

	IV and V	VI	VII	VIII and IX	XII	Total
1995		6	4			12
1996	20	1288	77	2	17	1413
1997	58	139	48	11	4	437
1998	35	313	34	188	2	384
1999	642	289	46		3	980
2000	38	580	108			726
2001	13	335	20			368
2002	29	972	21		6	1028
2003	26	960	123		92	1201
2004	21	546	115		13	695
2005	94	626	184		15	1230
2006	16	185	19	310		530
2007	11	605	103	83	12	814

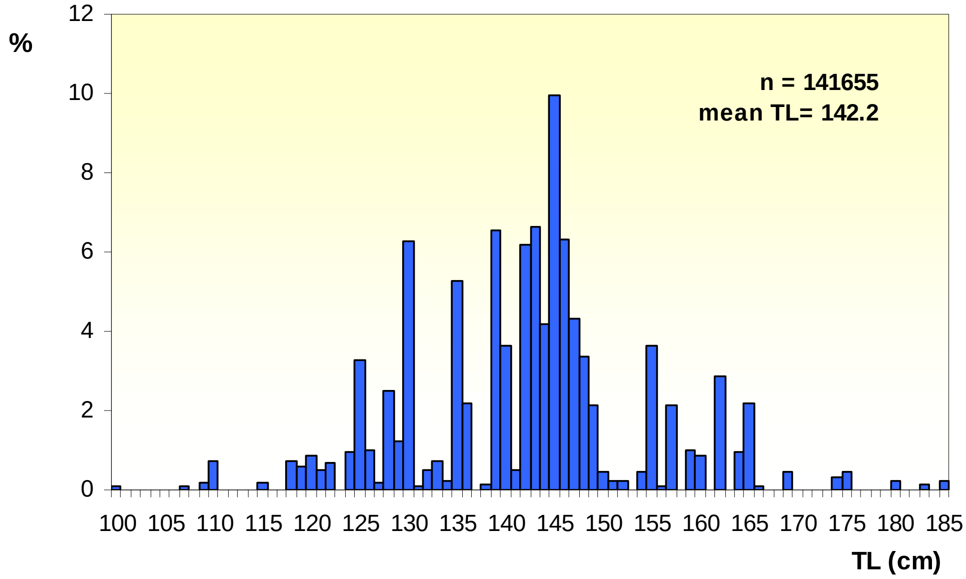


Figure 15.1 Length distributions of Silver scabbard fish (Lepidopus caudatus) in landings from the port of Barbate (Cádiz, Spain).

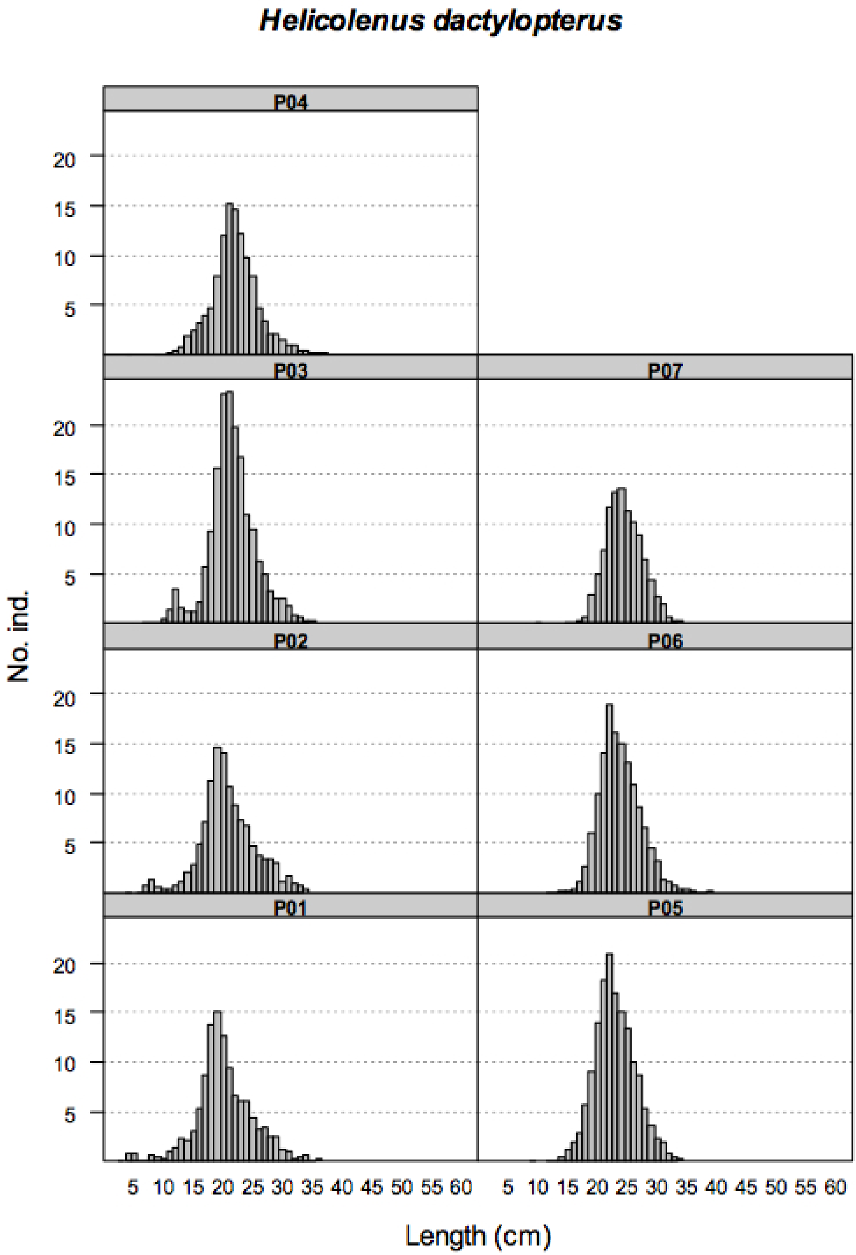


Figure 15.2. Length distributions ofBluemouth in the Spanish Porcupine Bank survey

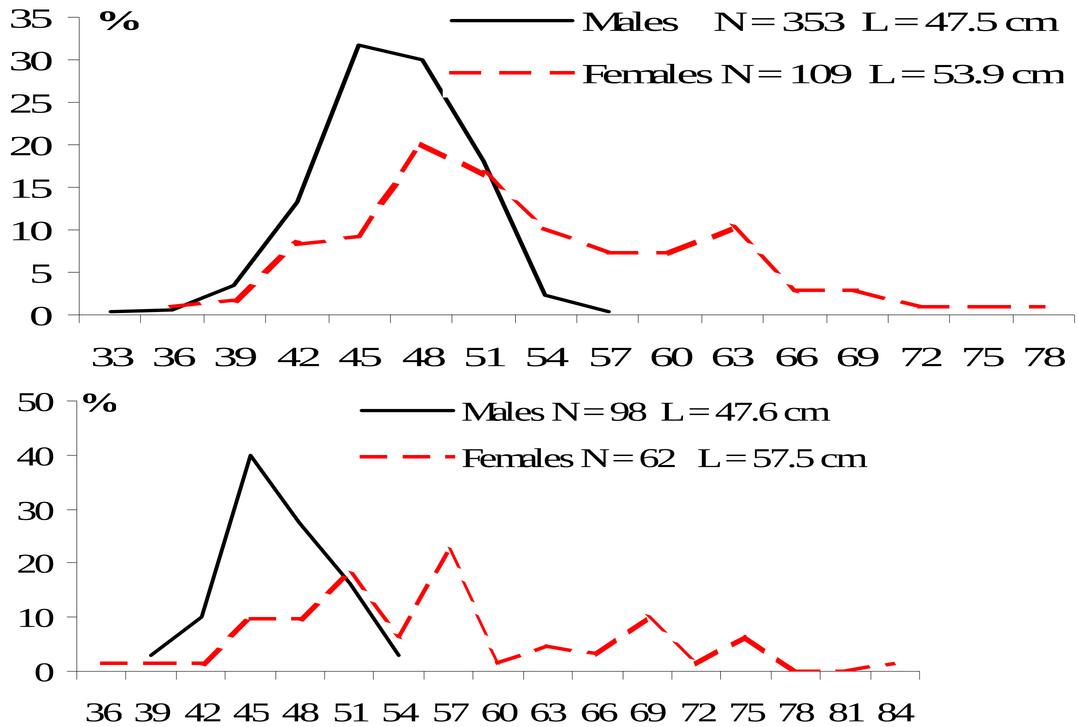


Figure 15.3.. Length composition of roughhead grenadier in catches of Russian trawlers at East Greenland in October-November (top) and December 2007 (bottom)

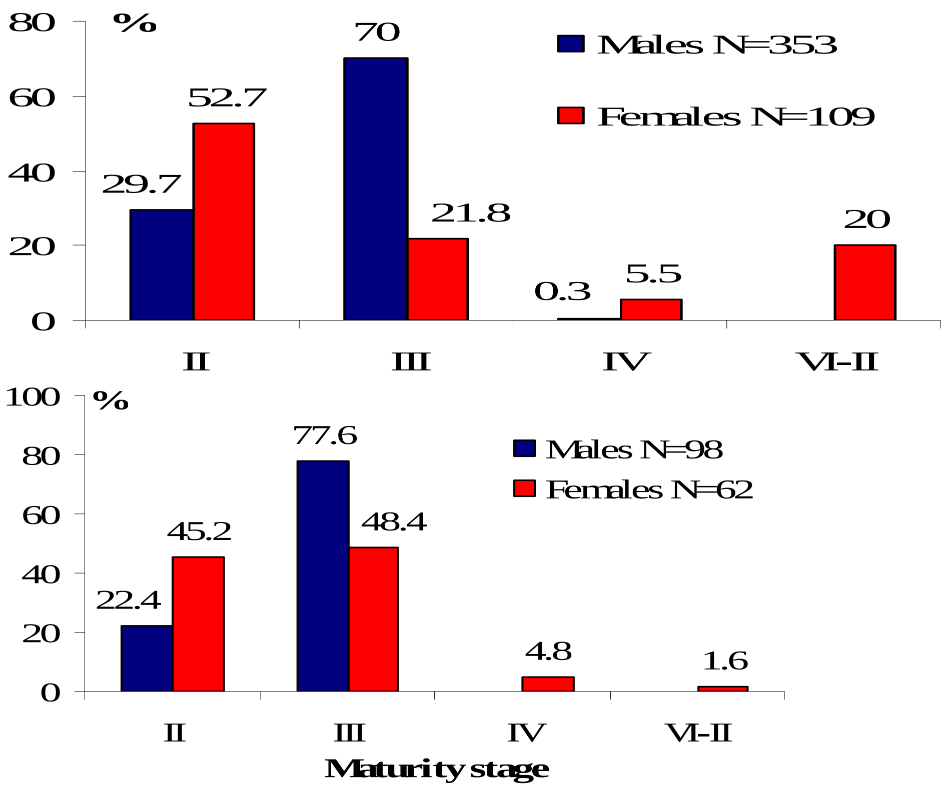


Fig 15.4. Maturity of roughhead grenadier in Russian surveys in East Greenland in October-November (Top) and December (bottom) 2007.

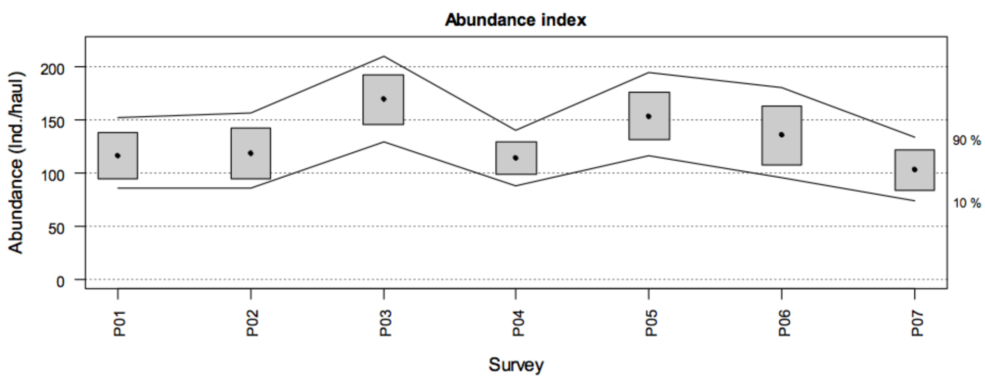


Figure 15.5. Abundance indices of Bluemouth form the Spanish Porcupine Bank Survey.

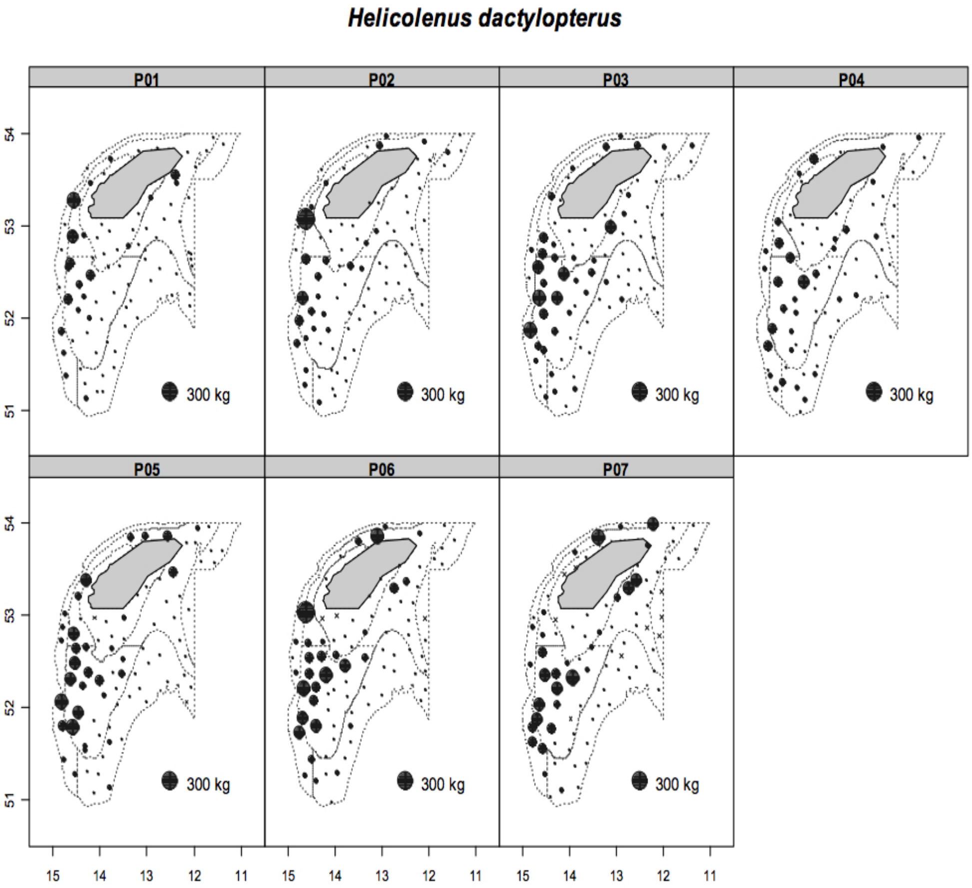


Figure 15.6.. Spatial distribution of bluemouth catches in Spanish Porcupine Bank survey

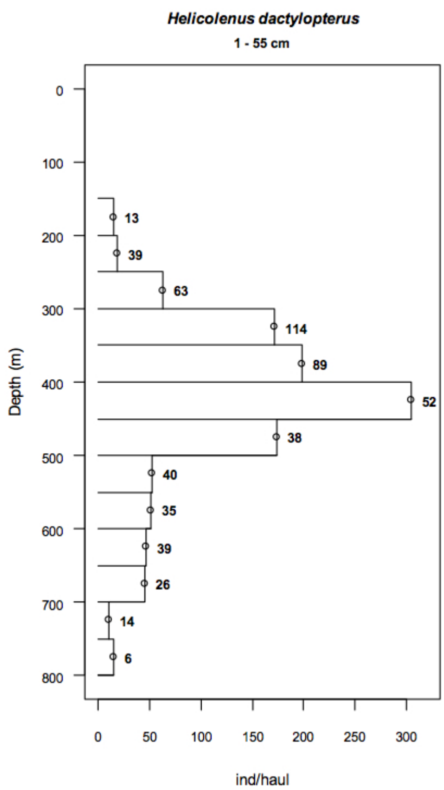
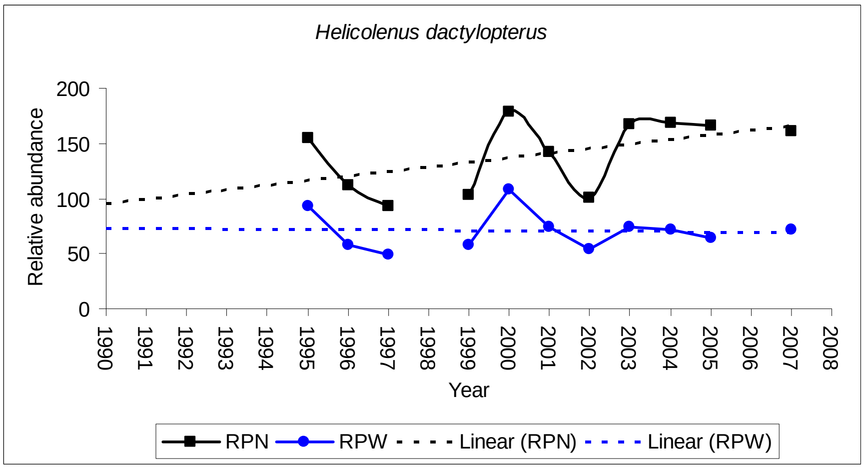


Figure 15.7.. Bathymetric distribution of bluemouth catches in Spanish Porcupine Bank survey



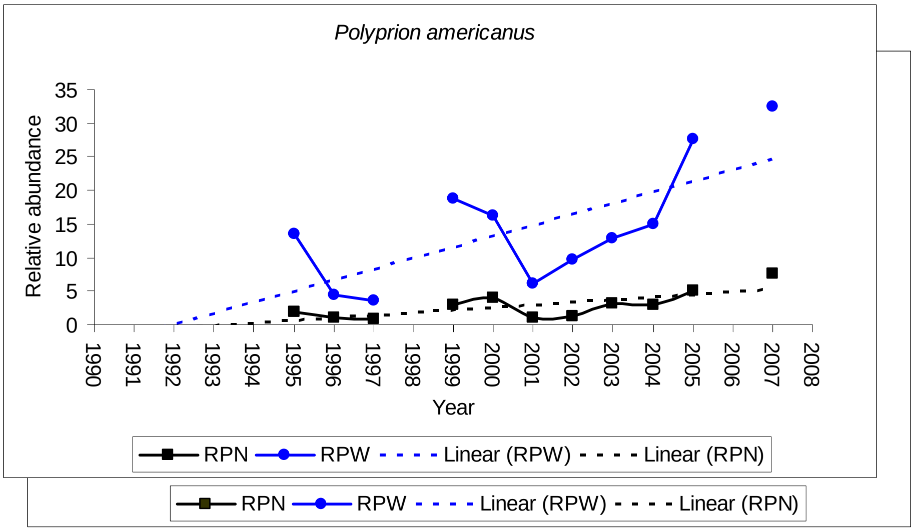
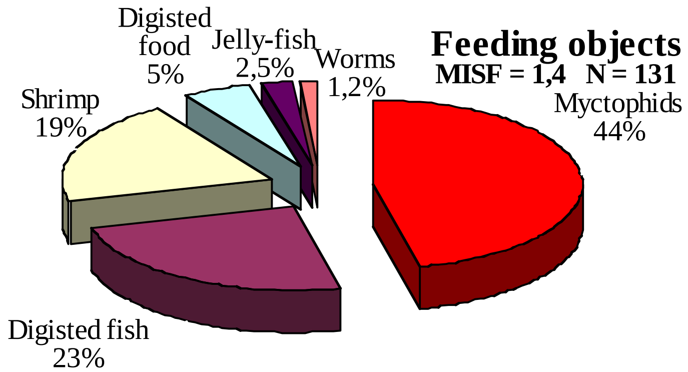


Figure 15.8.. Relative indices of abundance (RPN) and weight (RPW) of bluemouth, wreckfish and silver scabbard fish from Portuguese survey at the Azores



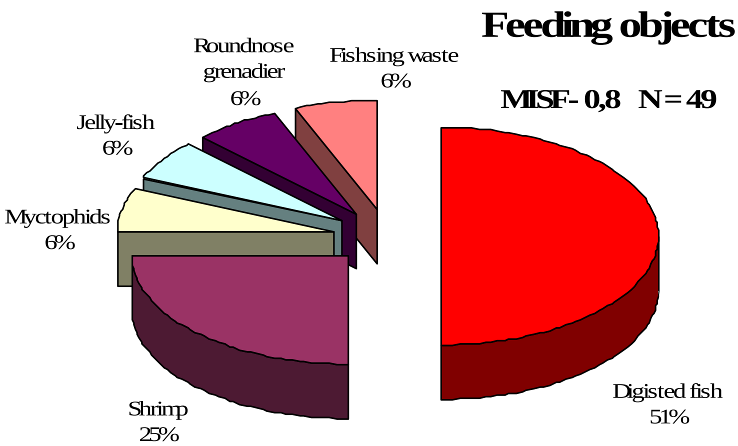


Figure 15.9. Feeding of roughhead grenadier in samples on the Russian survey near the eastern Greenland in October-November (top) and December 2007 (below)

16 NEAFC request on the use and quality of VMS and catch data.

NEAFC requests ICES to evaluate the use and quality of VMS data and records of catch and effort to be received from NEAFC in order to provide information on the spatial and temporal extent of current deep-water fisheries in the NE Atlantic. If data quality allows such analyses, these should be provided with particular emphasis on activity in the NEAFC Regulatory Area.

16.1 Evaluation of data use

ICES received VMS data as well as catch and effort data from NEAFC to perform spatial analysis and temporal extent of current deepwater fisheries in the NEAFC Regulatory Area. With this data it is possible to carry our following analysis:

By using their VMS signal, the position of fishing vessels can be displayed in a GIS environment and mapped to visualize the spatial distribution of vessel activity (fig.16.1). In addition, the break down of the information stored in the VMS data set allows to characterize the different fleets in a spatial and temporal content to give:

Number of fishing vessels entering the NEAFC areas with a breakdown of their nationalities.

Seasonal activity of spatial patterns by looking at the breakdown of vessels by months and/or quarter.

Historical development and behaviour of the fishing fleets by looking at the changes in spatial patterns over the period for which the VMS data is available.

The speed of the vessels is calculated by analysing the change from one position to the next with the time difference between the two points. This analysis is carried out in order to differentiate between steaming and fishing activities and allows to narrow down the spatial extend of actual fishing activity. Assumptions on the use of gear type can be made on the basis of the derived speed and direction. The analysis allows to derive spatial patterns of different gear category and has important application when linked to the environment, eg for gear - habitat interaction and gear specific environmental impact analysis of fishing activity.

The addition of logbook data to the VMS data increases the potential of the data analysis. The vessel and its positional data, ie the VMS data, can be linked to the catches they have declared with the weight of the species caught. The NEAFC logbook data contains a weekly breakdown of the weight and the species composition caught by vessels operating within the NEAFC area, with some vessels reporting more frequently. By linking this to the VMS positional data of the individual vessel and their assumed period of fishing allows to spatially locate specific fisheries. Data can be analysed in more depth for fleet activity, fishery specific behaviour and effort (see Figure 16.2). Catch and effort data can be spatially presented and density maps of fishing effort and fishing areas for different species can be shown. In addition, cluster analysis can be performed on the catch composition of the individual vessels to allow the characterization of fisheries in terms of single target species and bycatch species in mixed fisheries. Vessels can be grouped with similar catch composition and when combined to gear characterization, a métier analysis can be performed.

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16.2 Quality of data

WGDEEP in 2007 addressed the quality issues of the VMS data and identified a number of issues. These can be summarized as follows:

The data-set does not contain any gear information. Broad gear types can be estimated by their position and speed as explained above. This however can not be carried out with absolute certainty as it heavily depends on the frequency and regularity of the transmission.

The frequency of VMS records ranged from 1 to 2 hours. Preliminary studies indicate that this frequency of recording and reporting might not be unreasonable for trawlers, when the haul duration exceeds that interval, which is generally the case in deep-sea fisheries (Mills et al., 2007). However, there is some evidence that a 1-2 hour frequency does not allow to identify fishing operations and calculate fishing effort at a satisfactory precision for vessels using passive gear (WGDEEP-WD2). In this WD, a recording frequency of 10-15 minutes was recommended. In addition, a higher frequency of recording would be desirable for monitoring fishing activities in relation to protected areas.

Anecdotal evidence indicate that there may be an element of mis-reporting in the transmission of VMS data either by interrupting the signal or by spatially displacing the signal.

In addition there are certain limitations when linking the logbook data with the positional VMS data. The catch is only reported weekly, while the positional data is recorded on a two hourly basis. It is therefore not possible to ascertain the position of effort and catches at a higher resolution than a weekly window (or the specific period when the vessel enters and exits the NEACF area). The logbook data supplied by NEAFC only corresponds to ca. 50% of the vessel activity in the NEAFC regulatory area. A more in depth analysis of catch composition and fishing effort can therefore only be carried out on a subsection of vessels and it is not known whether these vessels are representative of all activities or whether such an analysis can bias certain gear types or nationalities.

16.3 Future analysis

WGDEEP aimed to summarise the potential and the limitations of the possible data analysis to map fishing activities with VMS data and logbook data in the NEAFC regulatory area. The actual analysis is beyond the scope of the working group. Comprehensive analysis of these data, including cluster analysis to identify different fisheries, is likely to require significant amounts of time. NEAFC may wish to consider commissioning a contract for this work and providing funding. ICES and various scientific institutes have good expertise in the analysis of VMS and logbook data. This work should be done in close liason with WGDEEP.

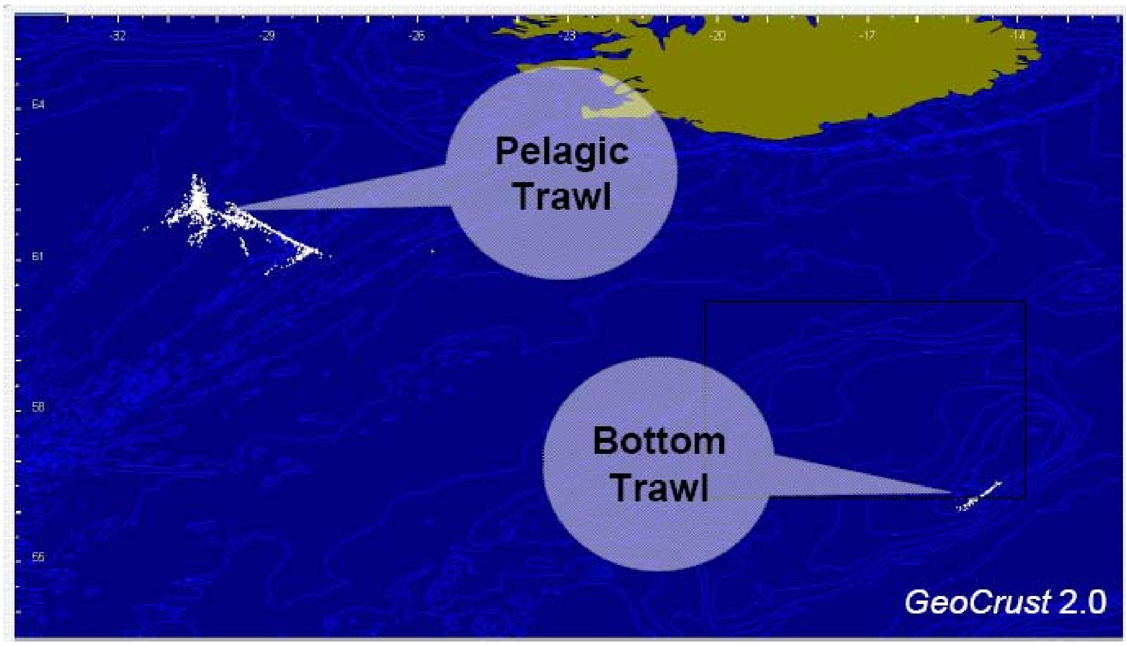

Figure 16.1. Activity maps using raw VMS data

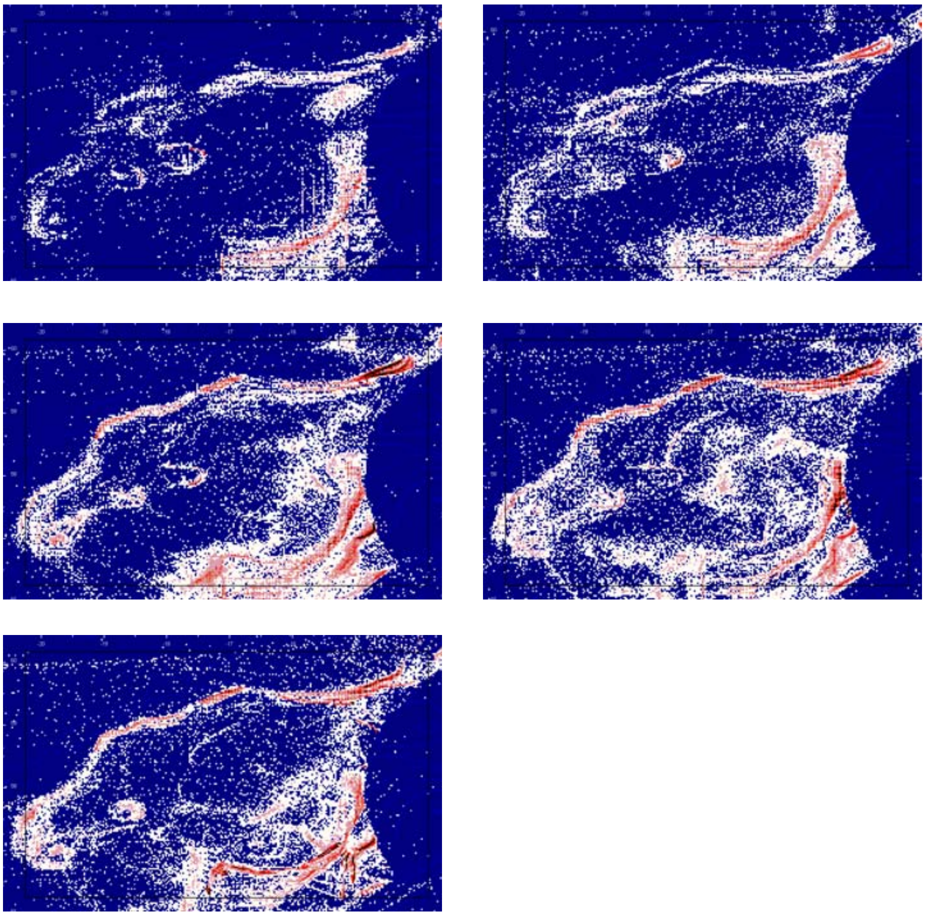

Figure 16.2. Maps showing the density of effort from VMS data of the Hatton Bank area by year from 2002 to 2005 respectively.

17 NEAFC request on the development of criteria for differentiating fisheries

NEAFC reiterates its request that ICES develop suitable criteria for differentiating fisheries into possible management types (e.g. directed deep-water fisheries, by-catch fisheries etc.) and to apply these criteria to categorise individual fisheries in order to enable NEAFC to develop fishery-based management initiatives. Shortcomings in data quality that impede this exercise should appear in the evaluation under pt 1.

In the above request it is suggested that VMS and logbook data are analysed using cluster/discriminant analysis to identify fishery types. Further information on gear types is considered essential. This would provide a useful first step, the results from which could be scrutinized by Contracting Parties in NEAFC.

18 NEAFC request to compile data on documented historical or present spawning/aggregation areas of blue ling in the NEAFC Convention Area

18.1 Summary

- Information from EU logbooks, VMS records, from fishers and from the scientific and gray literatures is presented. Five main areas of spawning for southern blue ling (Vb, VI, VII and XIIb) are identified:-
- along the continental slope to the NW of Scotland in VIa (EU waters).
- on, and around, and to the NW of Rosemary Bank mainly in VIa (EU waters).
- on the southern and SW margins of Lousy Bank in VIb and Vb (NEAFC Regulatory Area/EU waters/Faroese waters).
- on the NE margins of Hatton Bank (NEAFC Regulatory Area)
- eastern and southern margins of the Hatton Bank in VIb and XIIb (NEAFC Regulatory Area).

There is already a closed area on Hatton Bank to protect cold-water corals and this has recently been extended. This should be scrutinized to determine the extent of protection afforded to spawning aggregations of blue ling, and if necessary extended further.

Anecdotal information for Faroese fisheries indicates there may also be spawning aggregations on the south-western margins of Bill Bailey Bank and Faroe Bank, however detailed spatial information was not available

Using additional VMS data available to them, the EC may be able to define spawning areas on the continental slope to the NW Scotland in greater spatial detail. This is considered to be important to minimise the impact of closed areas on other fisheries in this area.

Notwithstanding, the enforcement of closed areas is likely to be achieved by monitoring VMS data, so it is important that closed areas are sufficiently large to prevent vessels fishing inside the areas between VMS signals. It is for the above reasons that we have not specified the spatial extent and exact locations of closed areas. We are of the opinion that this should be carried out by management bodies using the information presented below as a basis.

Candidate closure periods could be March to May for the areas in VIa, February to April for the area in Vb and March to April for areas in VIb.

Catches of spawning fish cited within the literature are mostly within the depth limits 500-1000 m, so to minimise the impact on other fisheries closed areas could be confined to this depth range.

It is proposed that closed areas should apply to all demersal gears, with the exception of traps fishing for deep-water red crab (Chaceon affinis) as these do not to catch blue ling.

18.2 Background

The blue ling in management unit Vb, VI, VII and XIIb is seriously depleted and ICES has repeatedly advised that for all management units, closed areas to protect spawning aggregations should be maintained and expanded where appropriate (ICES, 2004a, 2006). However, attempts to collate information on the spatial and temporal distribution ofspawning aggregations, in response to NEAFC and EU requests, have been largely unsuccessful because most of the general areas where blue ling spawn are not subject to scientific surveys and if they are, the surveys mostly take place at times when blue ling are not spawning. Attempts to obtain information directly from fishers have hitherto also been unsuccessful because the position of spawning aggregations is commercially sensitive (ICES, 2004b; 2007a).

ICES gave a preliminary answer to the above request in May 2007 and provided additional information in late autumn 2007 derived from a draft scientific paper completed as part the EC "POORFISH1" project: "The spatial and temporal distribution of spawning aggregations of blue ling (Molva dypterygia) to the west and northwest of the British Isles (ICES Areas Vb, VI ,VII and XIIb)", by Philip A. Large, Andrew B. South and Graham M. Pilling (all from the Cefas Laboratory). The information presented had not been evaluated by ICES and as such did not constitute ICES advice.

Here the final results from the paper are presented for scrutiny by ICES, along with new information from (i) Russian exploratory fishing trips, (ii) Spanish trawlers fishing in February to June in 2002-2006 (excluding 2003) along the continental slope to the northwest of Scotland, (iii) from Faroese fisheries in Vb (mostly trawlers) and (iv) VMS data (for all countries) for the NEAFC Convention Area supplied to ICES by NEAFC.

18.3 POORFISH Study

The initial approach was to extract and explore information from EU logbook data, on the assumption that landings from trips targeting spawning aggregations comprise substantial quantities of blue ling. This approach was considered appropriate because logbook data, certainly pre-2003 when the fisheries were unregulated, are considered to be reasonably reliable for most fleets. Logbook data were available from French deep-water trawlers (1998 - 2006), UK (England and Wales) trawlers (1982 - 2006)) and UK vessels landing in Scotland (2001 - 2005). The temporal (by month) and spatial (by ICES rectangle) distribution of these trips provides insights into the duration of spawning and geographical location of spawning aggregations.

The results from logbooks were then compared with VMS data from the same trips where available, both to verify the logbook data and to improve the spatial resolution

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1 Commission of the European Communities, specific RTD programme "Specific Support to Policies", SSP-2004-22745 "Probabilistic assessment, management and advice model for fishery management in the case of poor data availability" (POORFISH). The results should not be taken necessarily as reflecting the views of the European Commission, and in no way anticipates the Commission's future policies.

of indicated spawning aggregations. Information on spawning aggregations obtained from logbooks and VMS was then compared with knowledge obtained from a questionnaire designed to obtain expert opinion from a small cross section of fishery stakeholders in six countries, including fishers, Producer Organizations, scientists, senior scientific advisors, fishery managers and non-governmental organizations (NGOs). The results were used to help inform and provide direction for the study.

The results from logbook data and the questionnaires were compared with unpublished information on observations of spawning blue ling from a Defra Fisheries Science Partnership (FSP)2 trawl survey to the west and northwest of Scotland in February/March 2004 and with available information in the scientific and gray literature.

18.3.1 EU log-book data

The seasonal pattern in monthly landings of southern blue ling by French trawlers (Figure 18.1) indicate that peak landings in VIa are later (April) in than in VIb (March), whereas landings from Vb gradually increase throughout the year to peak in November.

However, historical landings from VIa are substantially larger than from VIb, whereas landings from Vb are much smaller. Landings from other ICES areas, such as VII, were negligible. A spatial plot of the trawl landings of blue ling by ICES rectangle, February to

June 1998 - 2006, based on rectangle/month records where landings exceeded 10 t is shown in Figure 18.2.

The pattern in landings by rectangle was reasonably consistent across years. Peak landings occurred in VIa from rectangles along the continental slope to the northwest of Scotland and to the north of Rosemary Bank, and to a considerably lesser extent in isolated rectangles in VIb and Vb.

The seasonal pattern in monthly landings of southern blue ling by UK (England and Wales) trawlers (Figure 18.3) indicates that landings peak in April in both VIa and VIb. Landings from other areas such as Vb and VII were negligible.

Although based on a long time-series of logbook data, these patterns are largely driven by a comparatively small number of trips with large landings of blue ling taken mostly in the late 1990s from a few ICES rectangles. A spatial plot of the total trawl landings of blue ling by ICES rectangle, February to June 1982-2006, based on vessel/rectangle/month records where landings exceeded 10 t (Figure 18.4), shows that landings were taken mostly from just six rectangles and in particular from rectangles E043 (continental slope NW Scotland) in VIa and D245 (eastern Hatton Bank) in VIb.

A spatial plot of the total landings of blue ling by UK vessels into Scotland (all gears combined) by ICES rectangle, January to June 2001-2006, based on rectangle/quarterly records where landings exceeded 10 t, is shown in Figure 18.5.

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2 The Fisheries Science Partnership (FSP) was established in 2003 to build relationships between fishers and scientists, and to involve fishers in the co-commissioning of science. The FSP is funded by the UK Department for Environment, Food and Rural Affairs (Defra).

Landings peaked along the continental slope and to the north of VIa, in central areas of VIb on and around the Rockall Bank, and, to a lesser extent to the east of Hatton Bank in VIb and XIIb.

18.3.2 VMS data

The VMS records3 for UK (England and Wales) trips are available from 2000 onwards (Figure 18.6), and broadly corroborate the spatial distribution of UK (England and Wales) trips targeting blue ling as mapped using data from EU logbooks. The only exceptions are trips carried out on the continental slope northwest of Scotland that took place in the late 1990s before the VMS system was introduced. Figures 18.7 and 18.8 show the areas with the most VMS records in greater spatial detail.

18.3.3 POORFISH questionnaires

A total of 50 questionnaires were distributed but just 8 replies were received; four from fishers, one from a Fishermen's Organisation and three from fisheries scientists. Spatial and temporal information on targeted fisheries was mostly provided, rather than the actual geographical positions of spawning aggregations. As this fishery is almost entirely targeted at spawning aggregations (which was evident from the temporal bounds of the data supplied), the reported positions of fisheries were treated as a proxy for the positions of spawning aggregations. Information was provided in a range of formats: by ICES rectangle and/or depth range, by fishing ground and/or latitude and longitude coordinates, or by a combination of these. Some of the more detailed information (ICES rectangle level and month) was provided by a commercial fisher. The latitude and longitude information provided by respondents was quite coarse lacking detailed spatial resolution.

The information collected on time of spawning and/or fisheries (Table 18.1) broadly suggests that the maximum temporal limits of spawning are February - June on the continental slope NW of Scotland (ICES Division VIa) and March - May on the offshore grounds east of Hatton Bank (ICES Division VIb).

Regarding a question on year-to-year variation in the timing of spawning, some respondees indicated that they did not know whether the timing of spawning varied by year and others commented that any variation observed was anyway small.

For presentational purposes, information on the spatial extent of spawning recorded on questionnaires is summarized in a single figure (Figure 18.9).

The main spawning areas identified are along the continental slope NW of Scotland and around Rosemary Bank (rectangle 47E9) in VIa and on the eastern and southern margins of Hatton Bank in VIb. The areas identified are quite large and to do not take into account the depth of spawning reported in questionnaires (500-1100 m) and should therefore be interpreted as an estimate of the maximum potential spatial bounds of spawning.

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3 VMS data were provided by the Defra in raw, uninterpreted form. The Secretary of State for the Environment, Food and Rural Affairs does not accept any liability whatsoever as to the interpretation of the data or any reliance placed thereon

18.4 Defra Fisheries Science Partnership trawl survey February/March 2004

The proportion of spawning blue ling in catches at each fishing ground each station (Figure 18.10 and Table 18.2), indicate that in February/March 2004 spawning blue ling were present east and southeast of Hatton Bank, at the Little Rose and Rosemary Banks, and on the continental slope NW of Scotland.

18.5 Scientific and gray literature

The areas identified above are reasonably consistent with the limited information found in the scientific literature. Spawning blue ling were found on an Irish Marine Institute trawl survey station carried out in April 1993 on the Hebridean Terrace (ICES rectangle 45EO) (ICES, 2004b, 2007a), along the continental slope to the NW of Scotland during a RV "Walter Herwig" trawl survey in February/March (Rainer, 1987), on the Faroe Bank, Bill Bailey Bank and Lousy Bank from February to May (Magnusson et al, 1997), and on the northern slope of Rockall, the southern slopes of the Lousy and Bill Bailey Banks, the eastern slope of Rosemary Bank and on the northern part of the Hebridean slope (59o 43'N, 6o 38'W) (Ehrich, 1983). In this last study, it was reported that spawning seemingly peaked from late February to late March.

In the gray literature there are records of spawning blue ling in several Russian papers presented as working documents to ICES WGDEEP (ICES, 2004b, 2006a). A total of 26 surveys or exploratory fishing expeditions were carried out between 1976-1990 and the results were summarised by Vinnichenko et al (2003). Figures of the spatial distribution or details of spatial coordinates of catches were not presented. Pre-spawning aggregations were found in late February 1977 on the south-western slope of Lousy Bank in depths 700-1200 m, with the densest aggregations in depths 700-900 m at water temperatures of around 7.5O C. In mid-March these aggregations covered an area of around 60 miles2 and by late March this had expanded to 120 miles2. Data collected in 1979-1980 indicated that pre-spawning fish started to aggregate on the Lousy and Hatton Banks at depths 600-1000m in late December. Spawning was largely considered to take place over a relatively short period (35-45 days) but this may vary by area. Spawning was mainly in March at Lousy Bank and slightly earlier at the Hatton Bank and George Bligh Bank (Klimenkov et al, 1977). Pre-spawning and spawning fish were found in Faroese waters (unspecified) in December to February (Shibanov et al, 1978). In more recent years at Hatton Bank, pre-spawning and spawning fish were found in March 2003 (Vinnichenko and Khlivnoy, 2004), immature, spawning (males) and post-spawning fish were found at depths 800-815 m in April 2004 (Vinnichenko et al, 2005a), and a very small number (< 20) of mainly spawning males were found in April 2005 (Vinnichenko et al, 2005b). During a FRS survey in May 2007, spawning blue ling were observed in low numbers on the continental slope (47E2, 59o 07'N, 07o 42' W, depth 1000 m) and on Rosemary Bank (47E0, 59o 06' N, 09o 55' W, depth 900 m) (pers. comm. Emma Jones4).

18.6 Russian exploratory and Spanish commercial fishing trips

The information presented here is a summary of Russian information on the spatial and temporal extent of spawning aggregations of blue ling in ICES Divisions Vb, VIa

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4 Fisheries Research Services, Marine Laboratory, PO Box 101, 375 Victoria Road, Aberdeen, Scotland AB11 9DB.

and b, and to a large extent summarizes much of the information in the gray literature presented above as part of the POORFISH study. The information is taken from a Russian Working Document submitted to ICES WGDEEP (Vinnichenko, 2008).

Spawning concentrations of the commercial importance were found on the south-western slope of the Lousy Bank (60° 02′ to 60° 07′ N, 13°03′-13°30′W) at depths 700-950 m and at the north-eastern slope of Hatton Bank (59° 08′ –59° 17′ N, 15° 00′ –16° 04′ W) at depths of 750-850 m (Figure 18.11).

Information from Spanish trawlers fishing on the continental slope to the NW of Scotland (taken from a WD by Diez et al submitted to ICES WGDEEP in 2008)

'Baka' trawlers from the Basque country fleet carry out a fishery targeted at hake, anglerfish and megrim along the continental slope to the northwest of Scotland and at times also take substantial quantities of deep-water species including blue ling. Around 90% of landings of blue ling are taken from May to June (Figure 18.12) almost all at depths from 500 –900 m.

Given the seasonality of these landings it is very likely that this fishery largely targets spawning aggregations. The spatial distribution of catches (Figure 18.13) indicates that almost all are taken from the continental slope to the northwest of Scotland.

18.7 Landings data from Faroese fisheries in Vb

These fisheries are mainly prosecuted by bottom trawlers. The seasonal pattern in landings (2000-2007 combined) (Figure 18.14) indicates a pronouced peak in landings from March to May, which is considered to be largely driven by fisheries on spawning aggregations.

Detailed information on the spatial distribution of these landings was not available, but fisheries on spawning aggregations were reported to take place on the south-western margins of Lousy bank, Bill Bailey Bank and Faroe Bank (pers. comm. Jacup Reinert) (see Figure 18.9 for locations of these fisheries grounds)

18.8 VMS data for the NEAFC Regulatory Area (from NEAFC)

These data were filtered to identify VMS records where >10 t of blue ling was landed.

The only records of this type indicated a small Faroese fishery on the southwestern slopes of Lousy Bank in March, in a similar location to the Russian fishery in this area (see Figure 18.11).

18.9 Overall conclusions

Here, information from EU logbooks, VMS records, from fishers and from the scientific and gray literatures is presented. Five main areas of spawning for southern blue ling are identified:-

- along the continental slope to the NW of Scotland in VIa (EU waters).
- on, and around, and to the NW of Rosemary Bank mainly in VIa (EU waters).on the southern and SW margins of Lousy Bank in VIb and Vb (NEAFC Regulatory Area/EU waters/Faroese waters).
- on the NE margins of Hatton Bank (NEAFC Regulatory Area)

- eastern and southern margins of the Hatton Bank in VIb and XIIb (NEAFC Regulatory Area).

There is also some evidence from UK (Scotland) log-books of fisheries on spawning aggregations taking place on and around Rockall Bank (Figure 18.5). However, this was not corroborated by information collected from fishers, and consequently, we suggest that a closed area on and around the Rockall Bank not be considered until these data are scrutinised in more detail and further information is available to confirm spawning there.

Anecdotal information for Faroese fisheries indicates there may also be spawning aggregations on the south-western margins of Bill Bailey Bank and Faroe Bank, however detailed spatial information was not available.

As regards the size and the exact locations of closed areas, if only blue ling is considered, the areas should cover all regions where there is evidence of blue ling spawning, which according to the information collated from POORFISH questionnaires are quite extensive. However, it is likely that such large areas would impact considerably on other major fisheries taking place to the west and northwest of Scotland.

An alternative approach would be to introduce much smaller closed areas based on VMS data from vessels catching substantial quantities of blue ling during the spawning period (Figures 18.7 and 18.8, above) and from others sources such as the information presented above for Spanish trawlers and from Russian exploratory fishing and other VMS data reported to the EC and NEAFC. Closed areas on and around Hatton Bank are in international waters and any proposals will have to be considered by NEAFC. There is already a closed area on Hatton Bank to protect cold-water corals and this has recently been extended (NEAFC, 2007). This should be scrutinized to determine the extent of protection afforded to spawning aggregations of blue ling, and if necessary extended further.

Using additional VMS data available to them, the EC may be able to define spawning areas on the continental slope to the NW Scotland in greater spatial detail. This is considered important to minimise the impact of closed areas on other fisheries in this area.

A further concern is that the maximum bounds of spawning shown in Figure 18.9 may include areas outside the reported depth range of spawning (500 to 1000 m) (Moguedet, 1988). Similar information based on directed scientific observation during exploratory fishery in 1977 and 1980 presented by Vinnichenko (2008), but it was concerned only for south-western slope of Lousy Bank and southern slope of the north-eastern part Hatton Bank. These limits are likely to be indicative rather than definitive, as they are not based on detailed surveys of spawning aggregations in all areas. Notwithstanding, catches of spawning fish cited within the literature are mostly within these limits, so to minimise the impact on other fisheries closed areas could be confined to this depth range.

The enforcement of closed areas is likely to be achieved by monitoring VMS data, so it is important that closed areas are sufficiently large to prevent vessels fishing inside the areas between VMS signals. An alternative approach would be to increase the frequency of VMS signals, however agreement and implementation of this could be a lengthy process.

It is for the above reasons that we have not specified the spatial extent and exact locations of closed areas. We are of the opinion that this should be carried out by management bodies using the information presented here.

Any closure areas introduced also need to be time-limited. The information presented here suggests that the maximum temporal bounds of spawning are from February6 to June7 and that spawning may be slightly later in VIa than in VIb. If only blue ling is considered, closed areas should be based on the maximum temporal bounds of spawning. However an alternative approach, again in order to reduce the impact of any closures on other fisheries, would be for the closed areas proposed to be shorter and to take into account that spawning may be slightly later in VIa than in VIb. Given this, candidate closure periods could be March to May for the areas in VIa, February to April for the area in Vb and March to April for areas in VIb.

The question also arises as to which fishing gears should be prohibited in the closed areas. Most blue ling are caught by bottom trawl and, to a lesser extent, by gillnet. Blue ling can also be taken as by-catch by longliners fishing for ling (Molva molva), tusk (Brosme brosme) and other species. There are some Russian evidences that blue ling almost does not feed during mass spawning period (Klimenkov et al, 1977) and its catch rate with long line was very low. However, to take a precautionary view, any area closure should apply to all demersal gears, with the possible exception of traps fishing for deep-water red crab (Chaceon affinis) as these do not catch blue ling.

It is important that the aims of any closed areas introduced should be clearly identified (minimise disturbance of and to reduce fishing mortality on spawning fish etc). The theoretical effects of closed areas on stock recovery will be modelled in summer 2008 as part of the POORFISH project, and this may give insights into the theoretical likely benefits of closed areas to the southern blue ling stock.

The blue ling is one of the few deep-water species in the NE Atlantic that is not slow-growing and very long-lived. However this stock is severely depleted and shows little signs of recovery. Further management measures such as closed areas to protect spawning aggregations and reductions in fishing effort and TACs are required. Regarding the former, a closed area to protect spawning cod in the North Sea has recently been introduced, so there is a precedent for this approach to be applied to gadoid species.

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6 There is evidence of spawning occurring as early as December in Faroese waters – but the grounds were not specified (Shibanov *et al*, 1978)

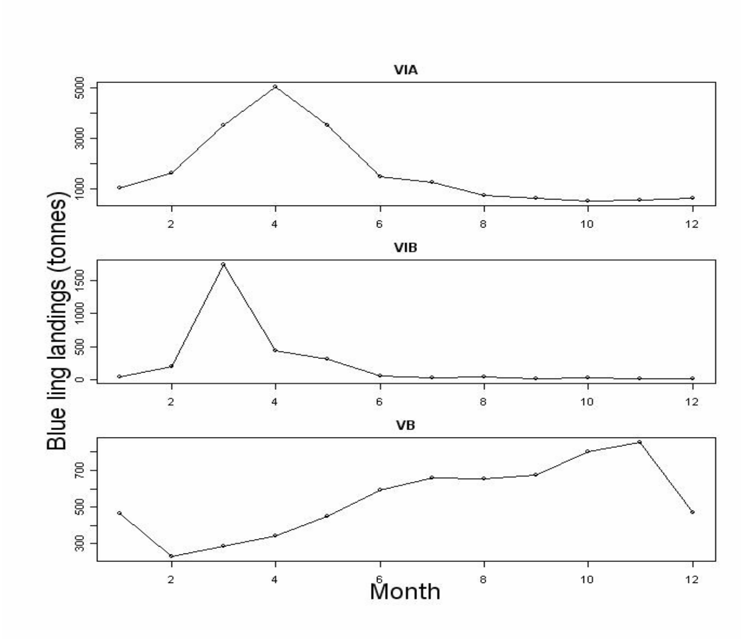
7 Catch records from Spanish Baka trawlers suggest that spawning on the continental may continue into July.

Table 18.1. Summary of responses on the timing of spawning of southern blue ling from POORFISH questionnaires.

Source of data	Hatton Bank (ICES Div VIb)	West of Scotland (ICES Div VIa)
Fisher 1	March	May-June
Fisher 2		Feb-May
Fisher 3		May-June
Fisher 4	March-May	April-June
Fish. Org.		April-June
Fisheries scientist 1		May-June
Fisheries scientist 2		Feb-April
Fisheries scientist 3		March-May

Table 18.2. Proportion of spawning fish in catches of blue ling – Farnella FSP survey 2004

Fishing Ground	Proportion spawning
E of Hatton Bank	31%
SE of Hatton Bank	46%
NE of Hatton Bank	Not Sampled
Little Rose Bank	68%
Rosemary Bank	42%
Continental Slope	67%



Fgure 18.1. Monthly trend in French trawl landings of blue ling from ICES areas Vb, VI and VII (data source French EU logbooks, 1998- 2006).

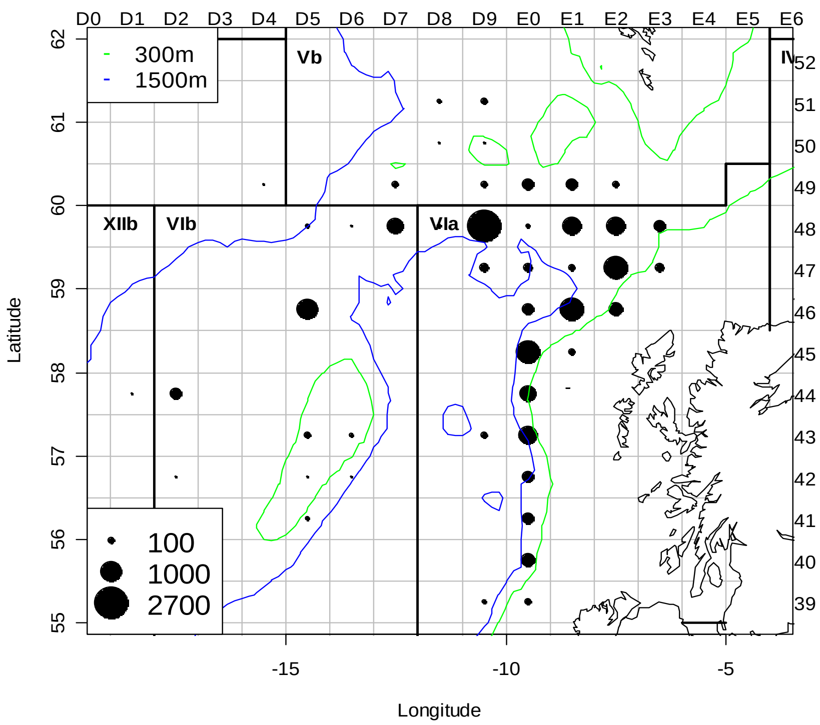


Figure 18.2. French trawl landings of blue ling by rectangle, February to June 1998-2006, based on rectangle/month records where landings of blue ling exceeded 10 t.

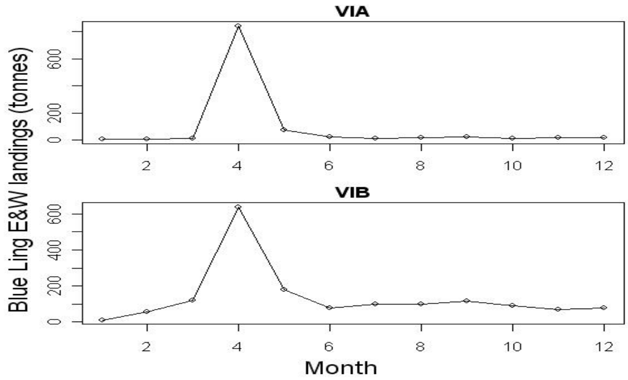


Figure 18.3. Monthly trend in UK(England Wales) trawl landings of blue ling from ICES Areas VIa and VIb (data source UK(England Wales) EU logbooks, 1982-2006). The peak in each area is influenced by a single trip in each area with an exceptionally large catch of blue ling.

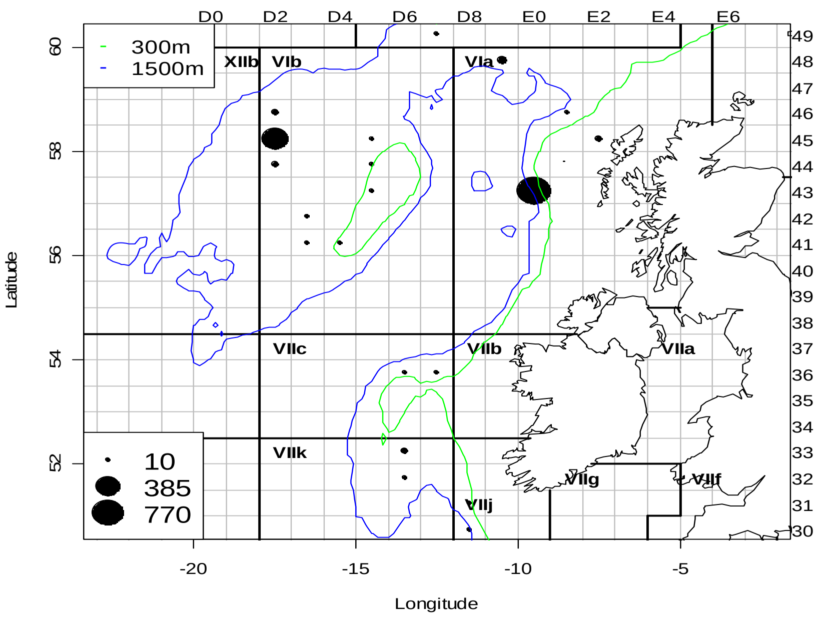


Figure 18.4. Total UK (England and Wales) trawl landings of blue ling by rectangle, February to June 1982 - 2006, based on vessel/rectangle/month record where landings of blue ling were >10 t. Note the two rectangles with the largest catches are each the result of single trips.

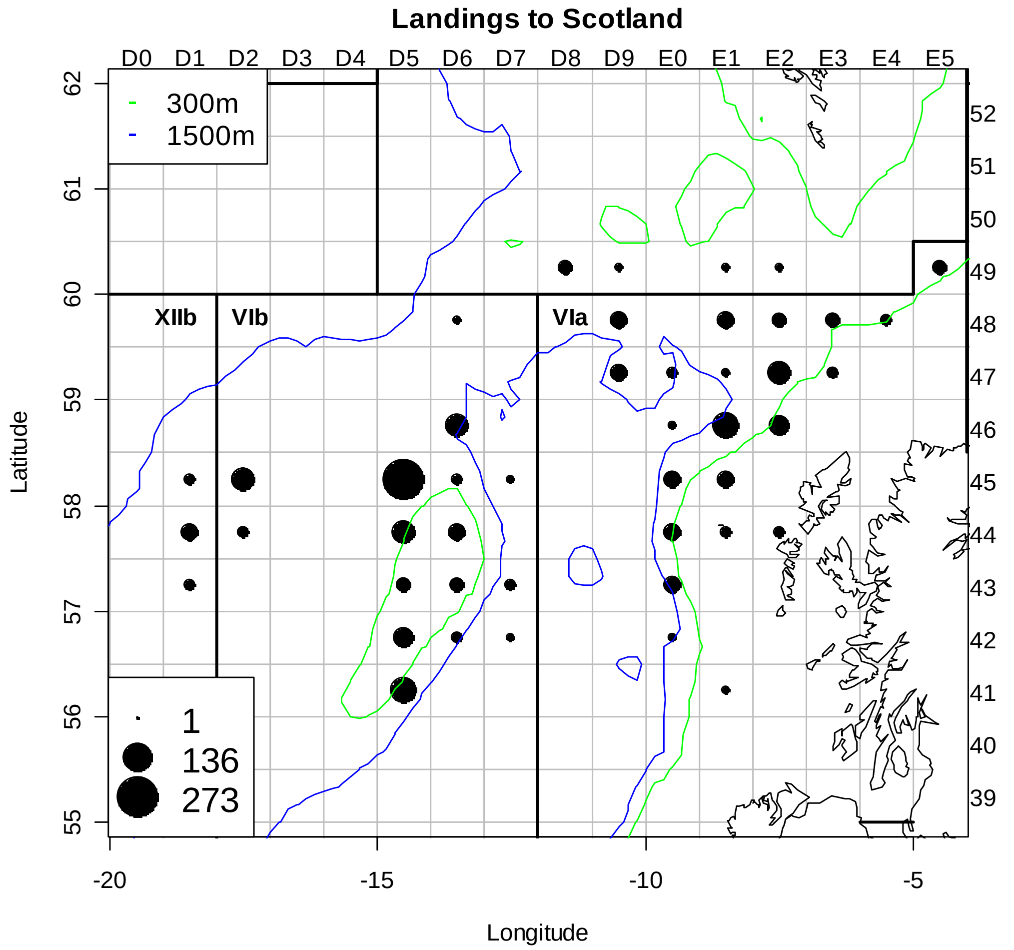


Figure 18.5. Total UK(Scotland) landings (all gears) of blue ling by rectangle, January to June 2001-2005, based on rectangle/month records where landings of blue ling exceeded 10 t.

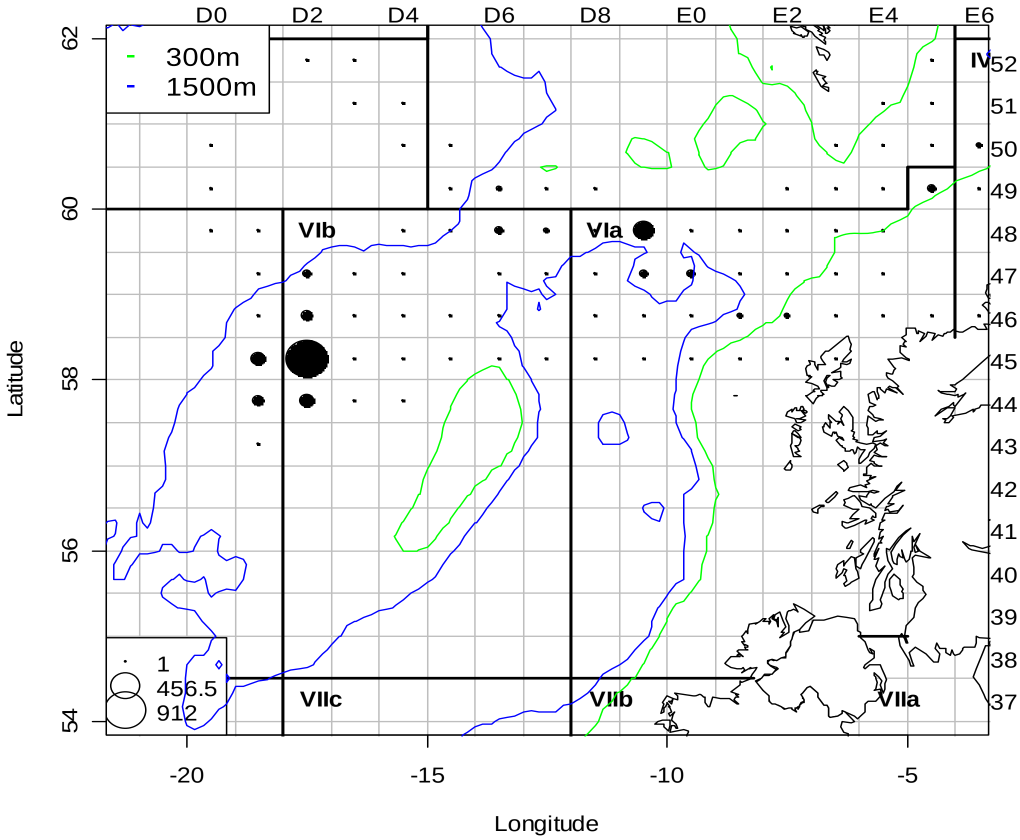


Figure 18.6. Number of VMS records by ICES rectangle for UK (England and Wales) trawlers, for trips where landings of blue ling exceeded 10 t (2000-2001) (all trips took place from Feb-May).

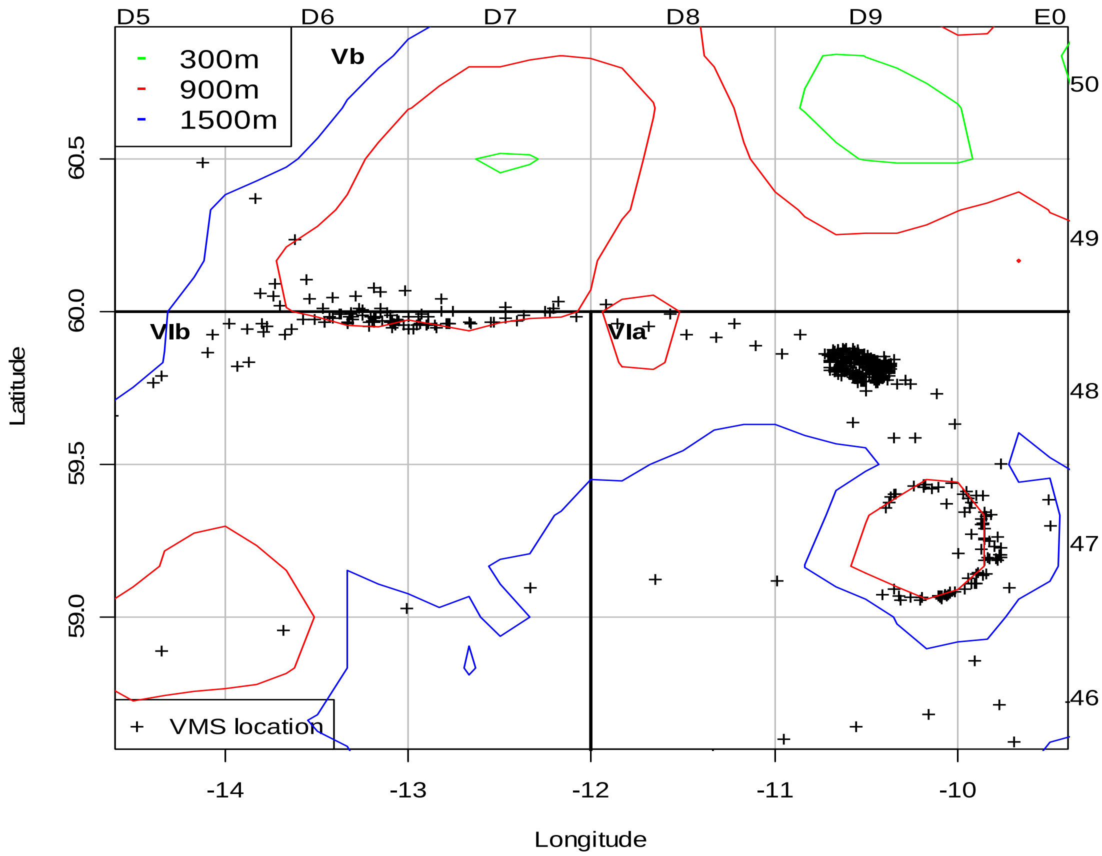


Figure 18.7. VMS records on and to the NW of Rosemary Bank (47D9, 47E0) for UK (England and Wales) trawlers, for trips where landings of blue ling exceeded 10 t (2000-2001).

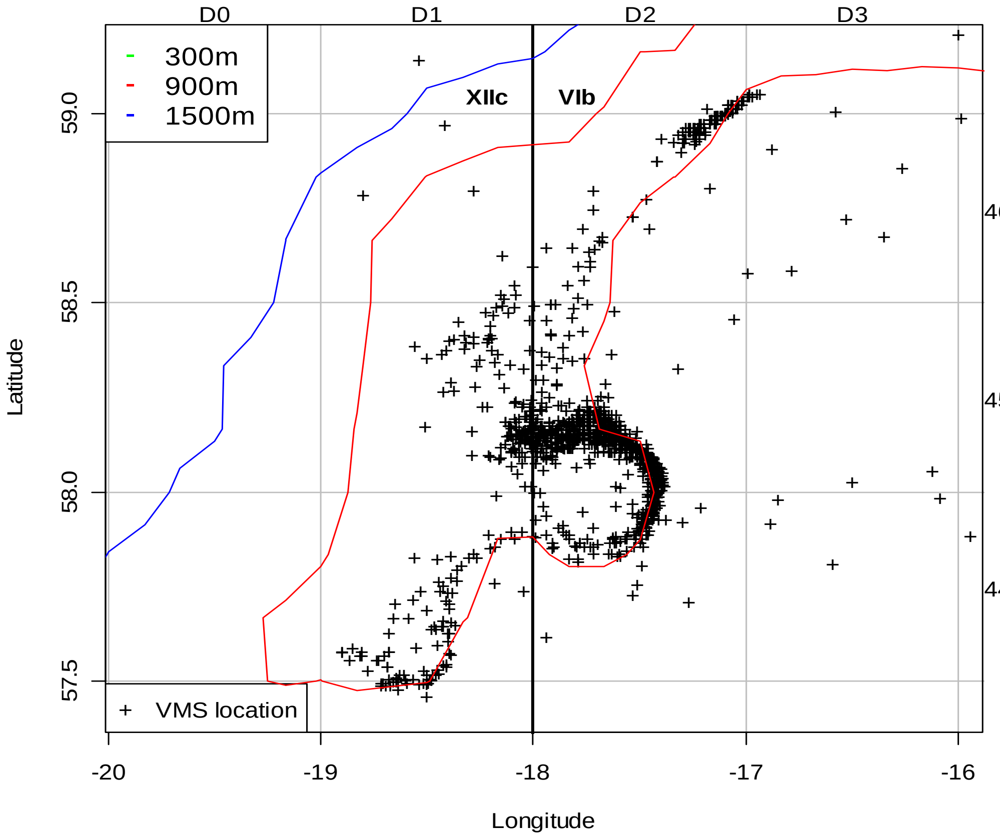


Figure 18.8. VMS records on and around Hatton Bank for UK (England and Wales trawlers, for trips where landings of blue ling exceeded 10 t (2000-2001) (note XIIb is labelled incorrectly as XIIc).

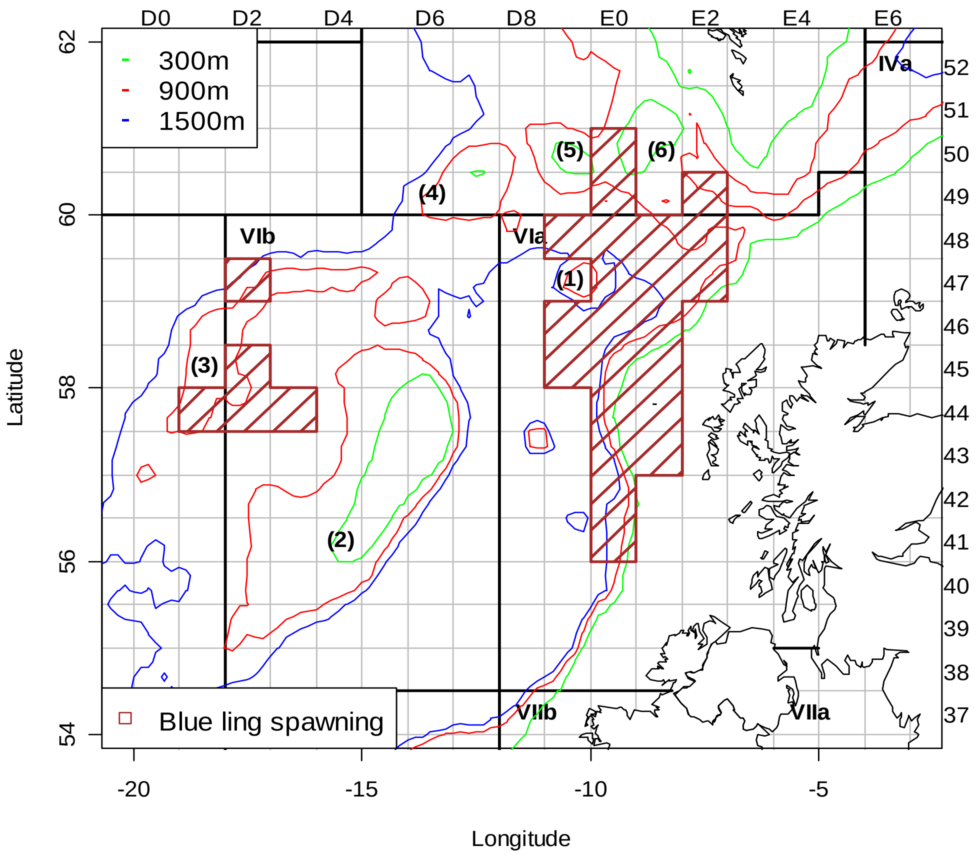


Figure 18.9. Spatial distribution of spawning grounds of southern blue ling, as identified/indicated from POORFISH questionnaires completed by fishers and fisheries scientists (numbers in brackets indicate the following banks : (1) Rosemary, (2) Rockall, (3) Hatton, (4) Lousy, (5) Bill Bailey and (6) Faroe).

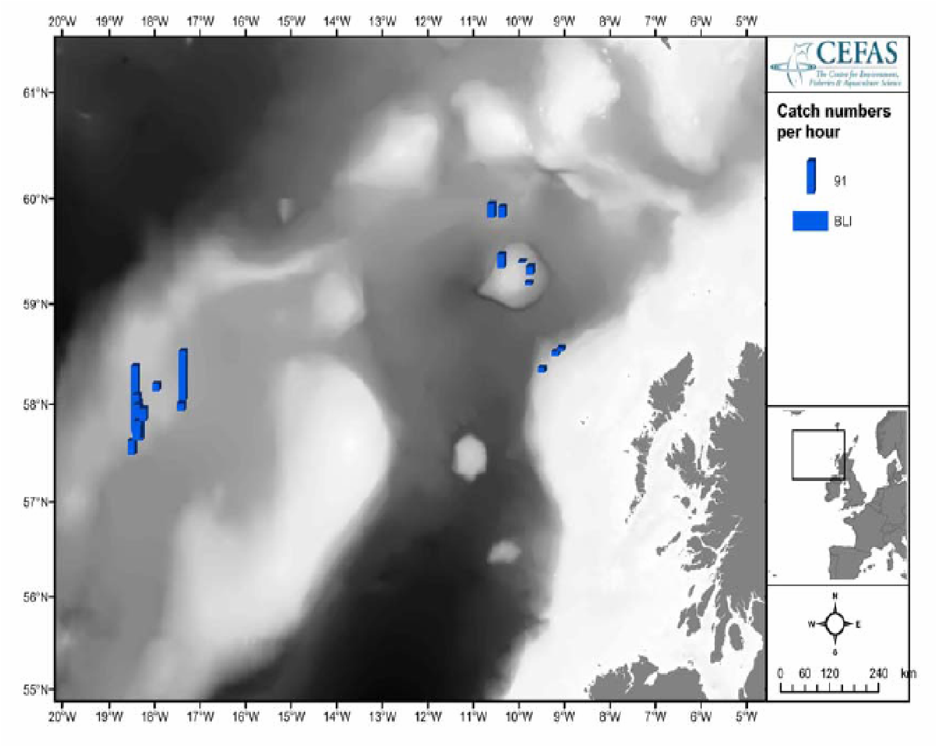


Figure 18.10. Catch numbers of blue ling per hour by station – Farnella FSP survey 2004.

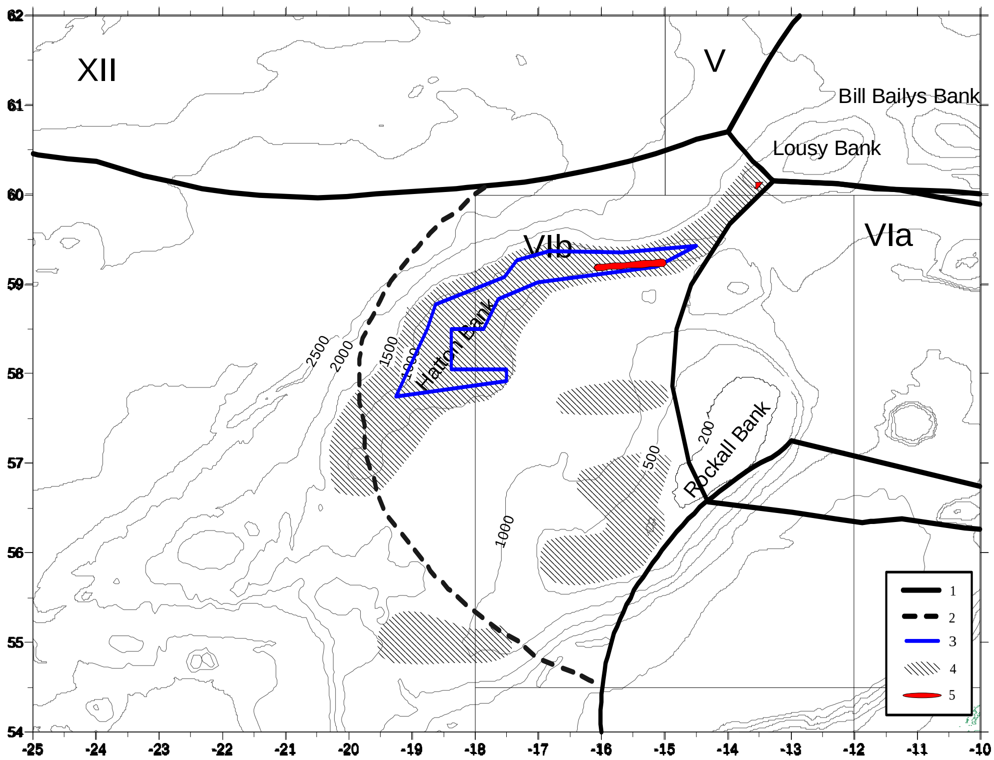


Figure 18.11. Distribution of the main spawning grounds of the blue ling in nternational waters west of the British Isles according to the data of Russian investigations and fishery. (From Vinnichenko, 2008). 1- boundary of 200-miles zones; 2- boundary of 200-miles zones from the Rockall; 3- boundary of the closed area, established by NEAFC for conservation of cold-water corals; 4- area of the general distribution of blue ling according to the data of Russian investigations and fishery; 5- spawning grounds of the blue ling according to the data of Russian investigations and fishery.

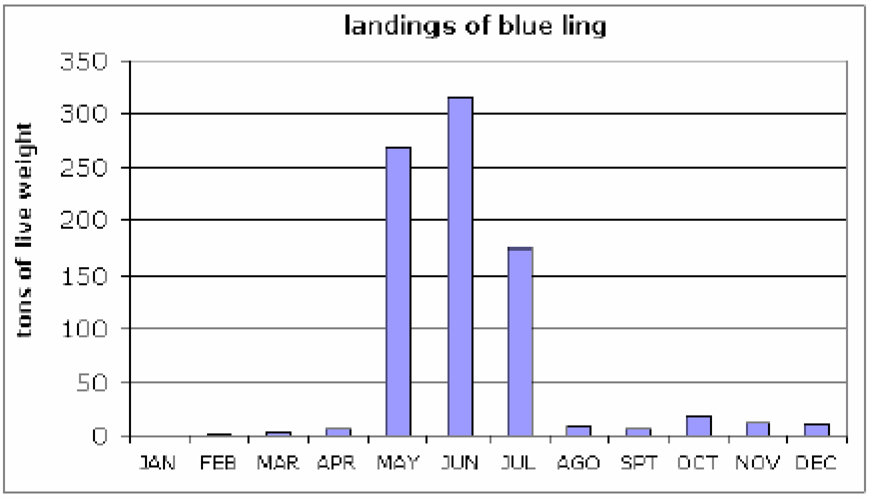


Figure 18.12. Monthly pattern of Spanish trawl landings of blue ling from ICES Sub-area VI (2001-2007 combined) (From Diez et al, 2008).

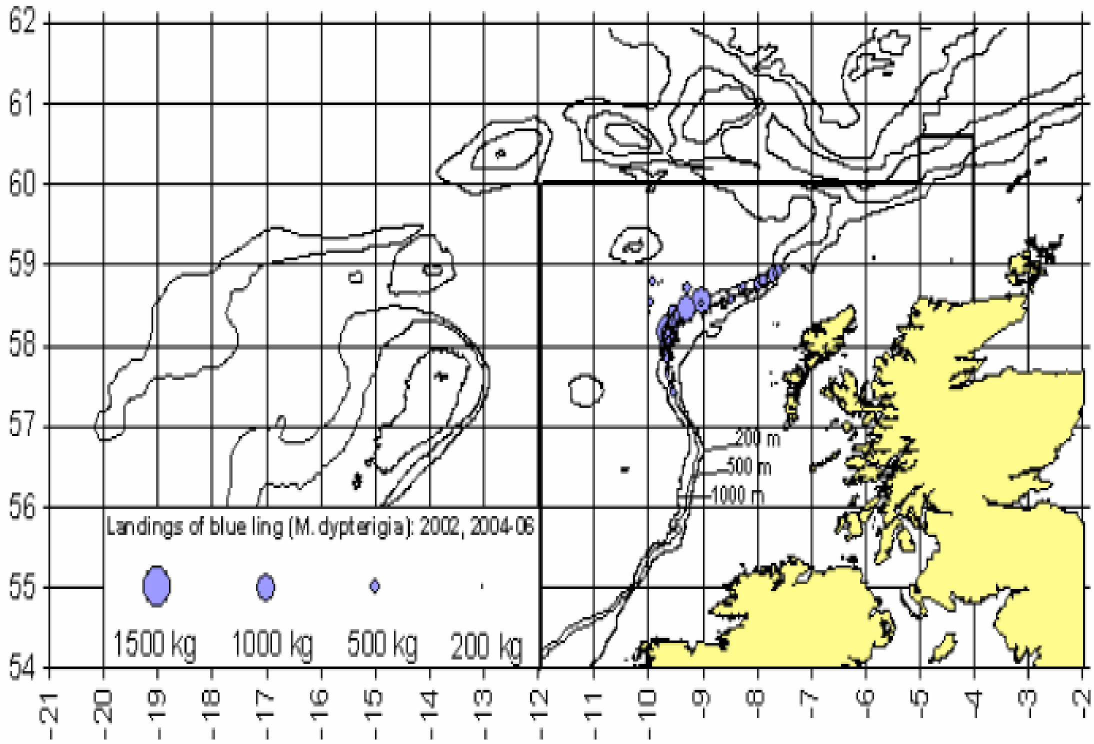


Figure 18.13. Spatial distribution of Spanish trawl landings of blue ling from ICES Sub-area VI (2001-2007 combined) (From Diez et al, 2008).

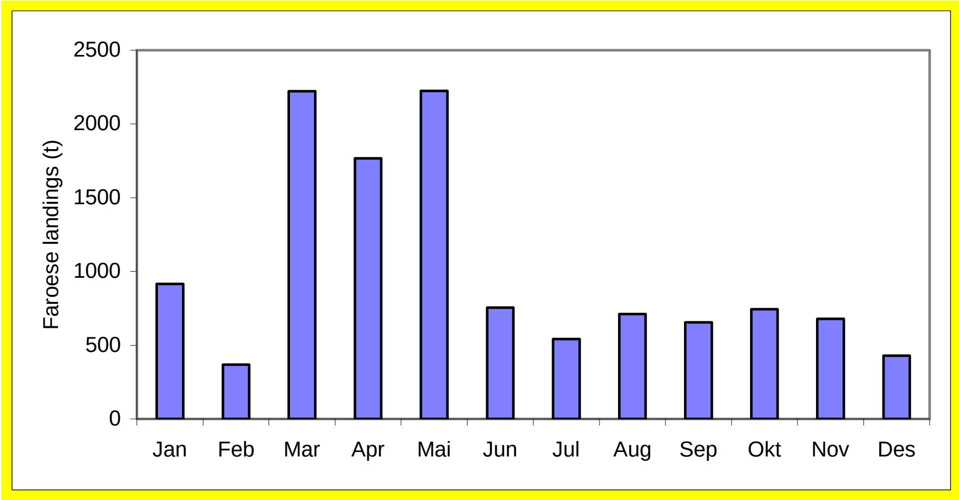


Figure 18.14. Monthly trend in Faroese landings of blue ling from ICES Sub-area Vb (2000-2007, combined).

19 Recommendations

WGDEEP 2008 recommends the following:

19.1 General

WGDEEP has discussed the basis for allocation of stocks to the working group with particular reference to ling, tusk, oceanic redfish (*S. mentella*), Greenland halibut and deep-water sharks. Ling and tusk occur at relatively shallow depths and are mainly caught in mixed shelf fisheries with other shelf species. Furthermore, EC TACs for these species have been moved away from deep-water TAC and Quota Regulations to general TAC and Quota Regulations. Conversely, oceanic redfish, Greenland halibut and deep-water sharks are caught in mixed fisheries with species currently covered by WGDEEP. There are good arguments for reallocating and for maintaining the *status quo* and WGDEEP has not been able to reach a conclusion. WGDEEP recommends that the relevant expert groups (WGDEEP, NWWG, WGNSDS, WGEF) re-evaluate the allocation of species during their 2009 meetings and that ACOM subsequently uses this as a basis to assign stocks to the most appropriate expert groups.

Considering the large number of stocks and eco-regions covered by WGDEEP, future assessment meetings need to be longer than the present 8 days to allow sufficient time adequately assess stocks and draft advice.

19.2 Improvement of data availability

WGDEEP has made some progress in mapping the spatial distribution of catches by statistical rectangle. In future, all countries should provide catch data to the WG aggregated to the level of ICES statistical rectangles. WGDEEP acknowledges that for highly aggregating species such as Orange roughy the spatial resolution of statistical rectangle is still too low to identify individual aggregations. WGDEEP therefore recommends the release of national VMS data to be used in combination with log-book data to improve the spatial resolution for fisheries targeting these species. This would further help the evaluation of the efficacy of the orange roughy closed areas.

Given that aging ling appears to be relatively straight-forward, countries with landings of this species should routinely age them.

19.3 Improvement of assessment methodologies

Given that stock assessment methodologies for deep-water species require considerable development, ICES should convene a benchmark assessment group for assessment methodologies for data-poor species including deep-water species.

WGDEEP requests that the deepwater review group should provide feedback on the methods used in assessments carried out this year.

19.4 Improvement of fisheries independent data.

WGDEEP recognises the valuable work done by PGNEACS and recommends that they should continue to work closely with WGDEEP to develop survey indices.

Referring to Recommendation number 1 and section 2.3.3 of the report from the 2008 meeting of PGNEACS about including surveys in areas II and V into the coordination of Northeast Atlantic deepwater surveys, WGDEEP recommends that this group expands its remit to include other surveys which may be a potential source of abundance indices and biological information for deep-water species. If agreed the name of this group should be revised.

PGNEACS should endeavour to work closely with the fishing industry through the RACs and, where appropriate, through national fisheries science partnerships, in particular, to get feedback on survey design.

Portugal (mainland) should consider including include trawl stations within any future deep-water longline surveys, even if only down to depths of 1000m (see email from Ivone). This would facilitate coordination with other surveys on the Continental Slope.

20 References and Working Documents

20.1 References

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20.2 Working Documents

For summaries of working documents supplied to WGDEEP.

WD1 Biseau A. 2009French Fishing Industry – Science partnership. Preliminary analysis of the French Industry database on the deepsea fishery

WD2 Large PA. South A B and Pilling G M. 2009. The spatial and temporal distribution of spawning aggregations of blue ling (Molva dypterygia) to the west and north-west of the British Isles (ICES Areas Vb, VI, VII and XIIb).

WD3 Diez G., Mugerza. E., Ruiz J., Iriondo A, Santurtún M, Zarauz L and Quincoces I. 2009. An overview of the Basque country (Spain) blue ling fishery in Subarea VI in the period 1996-2007

WD4 Bordalo-Machado P, Farias I and Figueiredo I. 2009. Fishing effort standardization of black scabbardfish commercial data from ICES division IXa - period 1995-2006

WD5 Vieira AR, Farias I, Gordo LS, Figueiredo I. 2009. Age and growth of black scabbardfish

WD6 Vieira AR, Farias I, Gordo LS and Figueiredo I. 2009. Fecundity of black scabbardfish

WD7 Bergstad OA, Høines AS, Øverbø Hansen H, de Lange Wenneck T and Svellingen I. 2009. Norwegian investigations on greater silver smelt (Argentina silus) and roundnose grenadier (Coryphaenoides ruspestris) in ICES Sub-areas II, III and IV in May-June 2007

WD8 Helle K and Pennington M, 2009. Updated estimates of effort and CPUE, and mean length for the Norwegian commercial catch of ling, blue ling and tusk

WD9 Gil J, Canoura J, Burgos C, Farias C and Polonio V, 2009. Red seabream (Pagellus bogaraveo) assessment of the ICES IX from the information available of the fishery in the Gibraltar Strait

WD10 Vinnichenko V, 2009. About spawning areas of blue ling (Molva dypterygia) in the open part of the North-East Atlantic

WD11 Vinnichenko V, 2009. Russian deep-sea investigations and fisheries in the Northeast Atlantic in 2007

WD12 Pinho MR, 2009 Fishery and survey data of selected species from the Azores (Xa2)

WD13 Baldo F, Velasco F, Blanco M and Gil J, 2009. Results on argentine (Argentina spp.), bluemouth (Helicolenus dactylopterus), greater forkbeard (Phycis blennoides) and blue ling (Molva dypterygia) from the 2001-2007 Porcupine Bank (NE Atlantic) bottom trawl surveys

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WD15 Homrum, E, Ofstad LH and Reinert J, 2009. Data on Faroese deep sea fisheries

WD16 Bordalo-Machado P and igueiredo I, 2009. Information on deep-water species from mainland Portugal

WD17 Fernandes AC, Silva D, Ferreira A and Pestana G, 2009, Discards of the Portuguese black scarbbardfish longline fleet

Annex 1: List of Participants

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Annex 2: WGDEEP Technical minutes

Working group	WGDEEP
Year	2008
Review group chair	Ciarán Kelly
WG chair	Tom Blasdale
Date of review	31 March – 4 April 2008

The reviewers appreciate the extensive efforts which are made by WGDEEP to compile the report, and are aware that that the timing of the EG at the start of the year makes it difficult to compile up to date catch and index data. In many cases the lack of up to date data from even a single country can critically affect the interpretation of stock status indicators. In this case WGDEEP need to decide whether it is possible to call for the data to be provided earlier, and if this is not the case then the EG needs to be held later in the year.

The reviewers are aware that there are many problems in assessing deep water species, but they note that just stating these problems does not provide for any better assessments. This seems to have been the case for some stocks over several years. The EG should prioritise the critical issues for each stock (e.g. stock id, catch data, valid indices, etc), and set about making progress on at least one of these issues for each stock, by the next meeting. Where age data is not available or is technically difficult to obtain, the EG should not waste time or report space commenting on the issue, rather it should move on from the aspiration of conducting an age based assessment and focus its efforts on analysing other potential stock indicators, even if such indicators are empirical. If CPUE is the only indicator available, the EG must attempt to standardise the index. The use of raw CPUE especially over a long period and in fisheries where fishing technology and skill may develop rapidly, is at least liable for misinterpretation. The WGDEEP should consider having a data compilation meeting (open to observers) before the next meeting.

A general criticism of the report is the statement of equivocal information. Without expert interpretation each piece of equivocal information simply undermines the other. Example 9.1 "*Current stock units are completely inadequate for orange roughy…….. ICES does not have a sufficient level of spatial resolution to identify individual exploited aggregations either within Subareas….. it is not currently practical to manage at the level of statistical rectangle and therefore larger stock areas are used.*" This tells a manager that we are giving advice on a unit which we believe to be completely inadequate. So the manager asks should I follow this advice? What is the consequence of using a larger management unit?

The following guidelines may prove helpful;

The primary function of the EG report is to communicate the bases for and analyses underpinning the advice

The primary reader of the EG report is the Review group

Each section should "tell a story", i.e. there should be a logical flow of information, analyses and conclusion.

Make sure plots illustrate clearly the point being made. Remove ancillary information from plots used to form the basis for any conclusions.

If information is untrustworthy and/or does not materially affect the analyses or conclusion, do not waste time or space dealing with it. Simply ignore it, or deal with the problem intersessionally.

Likewise if analyses are inconclusive, do not spend effort commenting on the shortcomings of the analyses. Simply present the relevant summary information.

The EG report is primary the knowledge base for the advice. If its conclusions are equivocal then this makes for a weak basis for advice.

If a particular analysis forms the basis for the conclusions (whether or not this analysis was presented previously), ALL the necessary supporting information must be presented in the report.

Use the reliable information you have to build a picture of the exploitation and/or stock status. If the information does not even support a conclusion on this, then come up with a strategy to get the required information. This strategy should be modified as required in order to make progress.

General Comments

For assessments of targeted fisheries that have standardized CPUE series extending back to the beginning of the fishery, I recommend that the Umax, Upa, Ulim framework for advice be applied as an interim to a more analytical stock assessment and reference points, along with caveats associated with the limitations of interpreting trends in biomass from CPUE.

Given that most of the resources in this report are 'data-poor,' some basic aspects of conventional fishery research cannot be taken for granted. For example, validation and quality of age determination should be described for all assessments that include age data.

Many of the assessments do not provide a plot of the landings series. I understand that many of these resources are discarded as bycatch in multispecies fisheries, and some catch is unreported. However, unless the series of landings is completely meaningless, a figure can provide a perception of fishery development that is essential for stock assessment. I recommend plotting all time series of data (landings, discards, effort, CPUE, length distributions, age distributions) as well as spatial distribution of these data (fishing effort, catch, survey catches).

ICES advice for many of these resources is that they can only sustain low levels of exploitation, but many sections do not justify that conclusion. The slow growth and low productivity of these populations should not be taken for granted and the evidence should be briefly summarized for each management unit.

Reviewer 3 comments

The data generally indicates that these fish populations are, at best, 'bumping along the bottom', are in a steady decline or are being sequentially depleted, therefore my comments are focused on these broader issues. The high degrees of uncertainty that run through all these assessments and the trends in stocks where data is available can only lead to critical concerns about these deep sea fish populations, especially as many of these species are taken as bycatch, that ICES advice is routinely ignored when setting TACs and given the impacts on VMEs of deep sea bottom trawling. I appreciate that this may not be the detailed scientific feedback you are seeking but my reading of these scientifically excellent assessments merely lends support to RCEP recommendation to ban deep sea trawling and the FAO initiative to restrict if not ban deep sea fisheries.

Reviewer 4 comments

In general, there is lack of consistency between the reports for different species. The contents of each section and sub-sections should be standardized. I had the feeling that the most important part of the reports should be highly improved. I'm referring to the sections on Management considerations that should be greatly improved in all the species reports. In general, it seems that the data is not fully explored and most recommendations seemed not fully supported by data. I agree with most comments in the sense that in data poor cases the precautionary approach should be implemented. However, I had some difficulties in understanding the reasoning for some of the comments. The problem of over-reporting, under-reporting, mis-reporting, etc are frequently stated in the different reports. Right reporting should be highly encouraged to member countries. Moreover, the argument of over-reporting, under-reporting, mis-reporting, etc should not be used as an excuse in failing to understand stock dynamics. If so, one could argue about validity of any assessment.

Section 5 Ling

Reviewer 1 comments

Stock structure (5.1) – the interim decision to consider isolated resources as separate management units until genetic results are available is reasonable. The different perceptions of recent stock development off the Faroes and off the Iceland support the conclusion of different harvest stocks. I recommend that the genetic results be considered in the context of all other stock identification information when they are available.

Ling in the Faroes, Vb (5.2)

Landings (5.2.1.1 and 4.1.1)

The description of historical development of the fishery is needed to interpret the landings series (when did bycatch, markets, targeting, and possibly regulatory discarding occur).

Spatial analysis of the fishery (e.g., maps of fishing effort) is needed to evaluate the appropriateness of using the Faroese surveys, which are limited to 500m depth.

Stock identity (5.2.2) – The approach of assessing the resource as a single unit until genetic research is available is reasonable. However, more information is need on the distribution of the resource (perhaps the species as a whole in the ICES area) to help understand the implications of using a survey that only samples to 500m.

Landings (5.2.3.1) – The conclusion that landings are adequate for assessment purposes are well justified. Such interpretations are valuable components of the WG report and similar quality assessments should be encouraged.

Discards (5.2.3.1) – It is difficult to believe that a legal size limit of 60cm in a trawl fishery does not result in substantial discards of sublegal-sized fish.

Natural Mortality (5.3.3.5) – What is the basis for M=0.15? Is this based on an oldest observed age?

CPUE (5.2.3.6)

The only justification for not using the two survey biomass series is that there is no age data available. Why not use the surveys as an aggregate index of abundance or biomass? Are the surveys too shallow to provide a reliable index? Section 5.4 reports that 90% of ling catch is taken in <275m on the Icelandic Shelf, and those depths are well sampled by the Faroese survey, which samples to 500m. Figure 5.1.1 also suggests that most catch is in <500m in Vb.

Similarly, the Faroese trawl CPUE was not used for tuning. All four series are relatively consistent and show a decade of stable biomass and should be considered as potential tuning indices.

More details are needed on the Norwegian reference fleet (e.g., time series, vessels, standardization), similar to the description of Faroese CPUE series.

Exploratory analysis (5.3.4.2)

If the analysis is considered to be illustrative, a brief summary of results is needed in the text (e.g., stable SSB, F in the range of 0.2 to 0.4) and summary figures to show trends.

Retrospective analysis should be completed as a routine diagnostic of any VPA-based method like XSA to evaluate consistency.

Given the historical series of catch and recent catch-at-age and tuning series that are available, a forward-projecting, statistical catch-at-age analysis may offer insights on current stock status in the context of historical productivity.

There is something wrong with Figure numbers in this section. The text on the separable VPS refers to Figure 5.3.6, but Figure 5.3.7 appears to be the separable VPA plot.

The age-5 residuals in Figure 5.3.6 are disconcerting, because there are no associated large residuals for age-4; these do not match the residuals in either the XSA or SVPA output. I'm not sure what these are or how to interpret them.

Catch at age analysis (5.3.4.3?) – I disagree with the conclusion that catch curves give the most reliable assessment method. There are no diagnostics of the catch curves provided (e.g., residuals from regressions). If catch curves are reliable, then the XSA should also be reliable, because both are based on the catch-at-age; and the calibrated VPA from XSA should be an improvement over simple catch curves, particularly given the consistent perception of a stable resource from all fishery CPUE and survey biomass series.

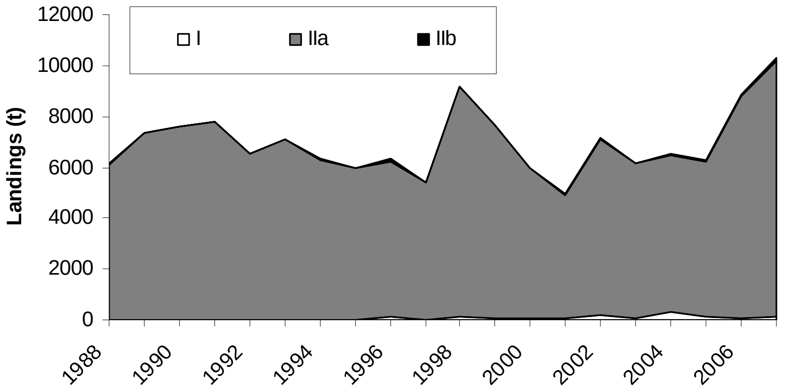
Reference points (no section) – It appears that all of the information needed to estimate conventional reference points is available, and analyses should be explored.

Ling in I and II (5.3) – This subsection does not fully consider the information content of the data that are available. Despite the availability of a landings series and multiple effort and CPUE series, there is only a single figure.

Landings trends (5.3.1.1)

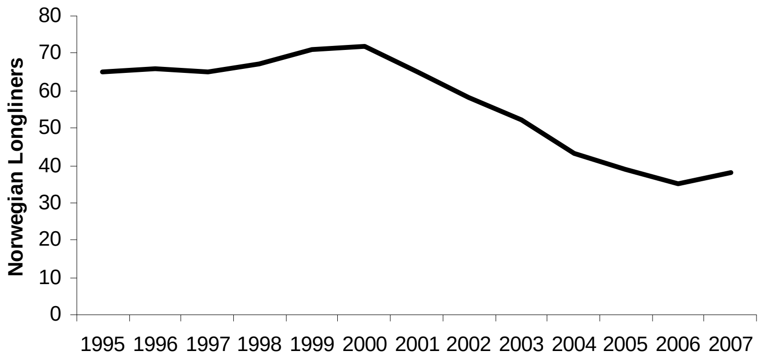
As reported in Table 5.4.0(?), 2007 landings the highest on record. However, there is no information provided on landings prior to 1988 to tell if this is truly superlative or well within the range of pre-1988 landings.

There has been a general increase in landings since 2001:



Length composition (5.3.1.5) – A figure of size composition by year would help to support the statement that mean length has varied without trend.

Effort (5.3.1.9) – Despite the fact that advice is based on an effort reduction strategy, there is no attempt to estimate total effort. Given the increase in hooks fished per vessel coinciding with the decrease in longline vessels, effort should be measured in units of hooks fished. Some attempt should also be made to estimate gillnet effort, because it comprises 45% of the catch.



Management considerations (5.3.4) – A statement that landings are the highest on record, or at least the highest since 1988 is needed.

Icelandic Ling, Va (5.4)

Landings (5.4.1.1) – The historic landings series is valuable for a qualitative assessment of fishery development and productivity.

Surveys (5.4.3.6)

There are some unfinished sections of the text referring to the number of stations added to the survey.

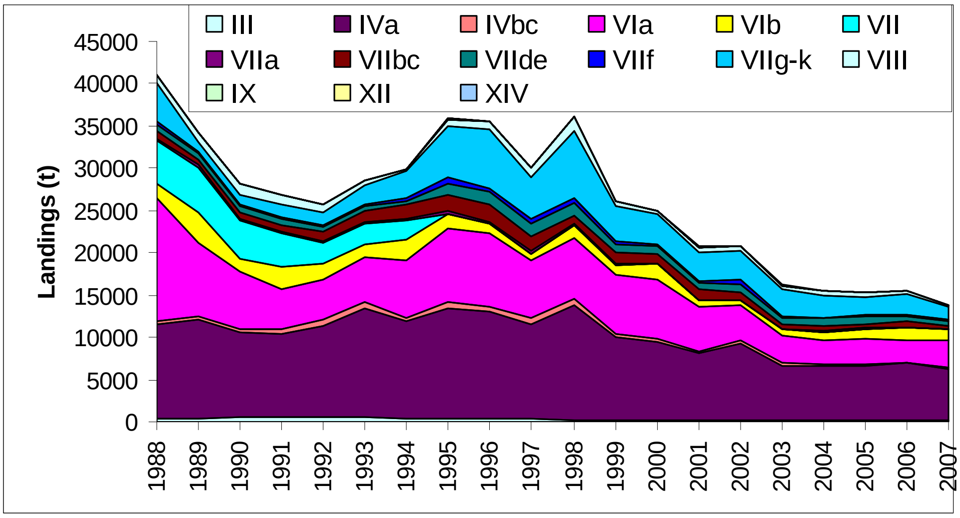
Some discussion of the 2007 spring survey index is needed to help interpret the substantial and rapid increase in biomass, when all other indicators of biomass are either stable or slowly increasing. The increase in smaller fish (5.4.4) suggests strong recruitment. Alternatively, Figure 5.4.7 suggests a shift in distribution of spring survey catches, with relatively greater catches on the southeast shelf in 2007.

Data analysis (5.4.4) – The conclusion that surveys are the best stock indicators are well justified (with the exception of explaining the 2007 spring observation, as mentioned above).

Management considerations (5.4.5.1) – I think that the stable or increasing stock indicators, in the context of historical landings, provide a useful qualitative assessment. Landings were stable from the 1950s to early 1970s (averaging 12kt) and after exclusion of foreign fishing, landings were similarly stable, at a substantially lower level (averaging 5kt). Together with survey and CPUE information that suggest stable or increasing stock biomass, it appears that the Icelandic ling fishery is more limited by mixed-fishery considerations than by stock productivity.

Ling in all other areas, III, IV, VI-XII, XIV ('earth ling?' 5.5) – This subsection does not fully consider the information content of the data that are available. Much of the available data (landings series, size compositions) are not shown or fully explored.

Landings trends (5.5.1.1) – Total landings have continually decreased since the late 1990s.



ICES advice (5.5.1.2) – There is a '?' in the year of advice.

Length composition (5.5.2.2) – It would help to show size distributions by year to support the statement that mean length has varied without trend.

CPUE (5.5.2.6) – Figure 5.5.1 plots trends in CPUE of combined tusk and ling, which is difficult to interpret as an index of ling biomass.

Management considerations (5.5.5)

I support the suggestions to consider CPUE from the 1970s as Umax, and recommend plotting Umax, Upa and Ulim on Figure 5.5.2 to support a more objective statement of stock status: biomass is 'at risk of reduced reproductive capacity,' because exploitable biomass is greater than Ulim, but less than Upa in areas IVa, VIa and VIb.

There is no information provided on exploitation level.

Reviewer 2 comments

5.1 Ling

"…However, ling at widely separated fishing grounds may still be sufficiently isolated to be considered management units,… It was suggested that Iceland (Va), the Norwegian Coast (II), and the Faroes and Faroe Bank (Vb) have separate stocks, but that the existence of distinguishable stocks along the continental shelf west and north of the British Isles and the northern North Sea (Subareas IV, VI, VII and VIII) is less probable…"

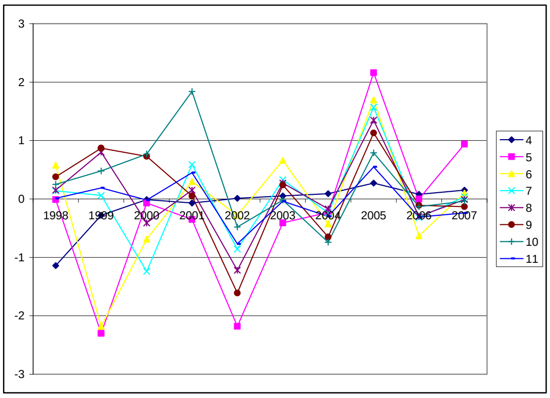
The WGDEEP did not consider that there was sufficient basis to change the bases for the stock definitions, however fig 5.1.1 and 5.1.2 show catches of ling around Faroe zone Vb contiguous with European shelf area (IV VI VII and VIII) but these are considered as 2 stocks, and ling in VIb is isolated geographically and by fishery but this is considered the same stock as that of the European shelf area?

5.2.3.2 "The trawlers have a slightly greater length distribution" should be trawlers show a modal length greater than longliners.

5.2.3.6 "All the CPUE series show a small increasing trend in the last 4-5 years" not substantiated by Figs 5.2.3 & 5.2.4, only Norwegian longliners show a slight increasing trend. Faroese longliners show no trend but fluctuating widely in some years and Groundfish surveys both show recent decreasing or long term decreasing trends.

5.2.4.2

Figure 5.2.6 and 5.2.7 mixed up. Fig 5.2.7 should look like



Small language detail "given the poor diagnostics from the XSA" the diagnostics are fine but they show that the fit to the data is poor.

XSA is just an exercise in fitting the catch to CPUE trends and allowing the catch to inform the stock size. It would really benefit from independent information from a scientific survey. Why is the groundfish survey not included in the assessment? Even if the fish are not aged could not an ALK from the commercial samples be applied? There should be more detail here from which to evaluate the performance of the XSA exercise, i.e. retrospective analysis. Even if the data are noisy there may be a consistent trend. Leaving the analysis as presented and just being critical of the diagnostics makes less of the information than could be gleaned.

5.2.5 Do the catch curves *really* give the most reliable interpretation of stock dynamics? There is very little information in them other than a mortality signal. The XSA exercise is criticised as the catch at age data comes only from half the landings, doesn't this criticism also affect the catch curves?

5.3 Ling in I & II

5.3.2 reference to total number of hooks in Table 5.3.4 but no totals given in this table.

EG conclusion that there is no basis to suggest changing advice for 30% reduction in effort based on available information. However EG also states that 1998 effort level is unknown, therefore this advice is not practically implementable. The information on decreasing number of vessels with a sudden increase in the success of the vessels from 2005-2006(hooks per tonne), commensurate with increase in the landings, suggest either the vessels remaining in the fishery have increased their efficiency or the stock is increasing. In these circumstances the conclusion of the EG for maintaining a 30% reduction in effort may be questioned, as either effort reductions are being offset with increased efficiency, or the stock is increasing.

5.4.1 Ling in Va

5.4.1.1 hanging sentence at bottom of section.

5.4.2 repeat of text in 5.1

5.4.3.3 Why are there no age readings? If there is a problem with the interpretation of the otoliths it should be stated.

5.4.4 "total biomass index and the index of the fishable biomass (>40 cm) in the March survey declined by half from the late 1980's5 to 1989," this statement is not substantiated by Fig 5.4.5b.

5.4.5.1 The information is clearly presented in this section 5.4 but there is no EG conclusion for management considerations, i.e. how is the increase in abundance to be handled by management? If the EG comments that the current reference points are inappropriate, it should come up with an alternative.

5.5 Ling in other areas

5.5.2.1 Why is it assumed, here and all through this report, that where discarding is illegal it is minor. This EG is aware that unreported landings are illegal in all waters but it does not always consider that they are always minor?

5.5.5 Similarly to section 5.3 if 1998 effort level is unknown, this advice is not practically implementable. Therefore the conclusion on management considerations should be reconsidered.

Section 6 Blue ling

Reviewer 1 comments

Management units (6.1) – the conclusion to provide advice based on northern and southern units until genetic data is available is reasonable. However, in my opinion the resources should be referred to as 'management units' rather than 'stocks.' Furthermore, when genetic information is available, it should be considered in the context of other information that is available on stock structure (e.g., location of spawning grounds, demographic differences among areas, geographic variation in growth and maturity).

Blue ling in Va and XIV (6.2)

Surveys (6.2.3.6) – There is some unfinished text ('xxx' and 'yyy') on the number of stations added to the survey.

Data analysis (6.2.4) – I don't see any response in the directed CPUE series (Figure 6.2.11) to support the statement that the series 'shows strong perturbations driven by the fisheries on spawning aggregations.' In fact, the lack of response in survey or CPUE series to the 1993 spike in landings suggests that the series are not reliable indicators of abundance or the fishery is not having much effect on the resource.

Comments on assessment (6.2.4.1) – the brief summary of past exploratory assessments is helpful.

Management considerations (6.2.5) – advocacy for closing spawning grounds is reasonable, and given the data uncertainties, it may be the only effective management that can help sustain the resource and fishery.

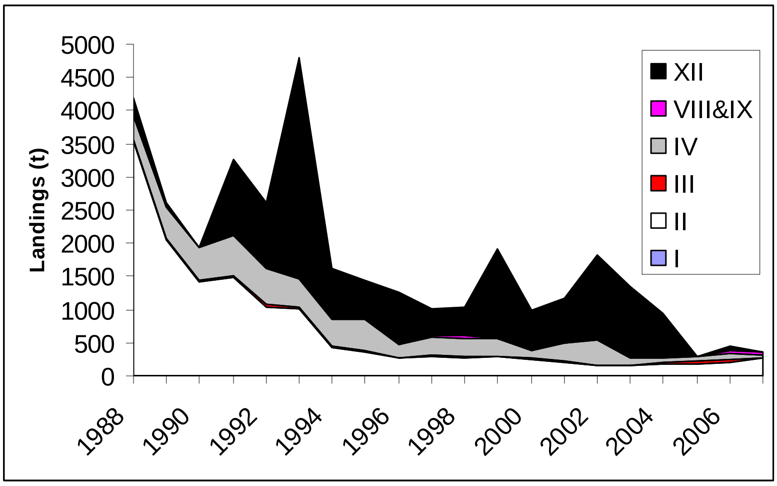
Blue ling in Vb, VI and VII (6.3)

Landings (1.2.3.1) – extension of the landings series bak to 1966 hels to document the fishery development and substantial expansion of the fishery in the early 1970s.

Data analysis (1.2.4) – a brief summary of previous exploratory assessments that indicate historically low stock sizes in recent years would help to support the advice.

Blue ling in I, II, IIIa, IV, VIII, IX, X, XII (6.4)

Landings (6.4.1.1) – Landings substantially declined, particularly in areas II during the late 1980s and early 1990s, and in areas IV and XII in recent years.



Reviewer 2 comments

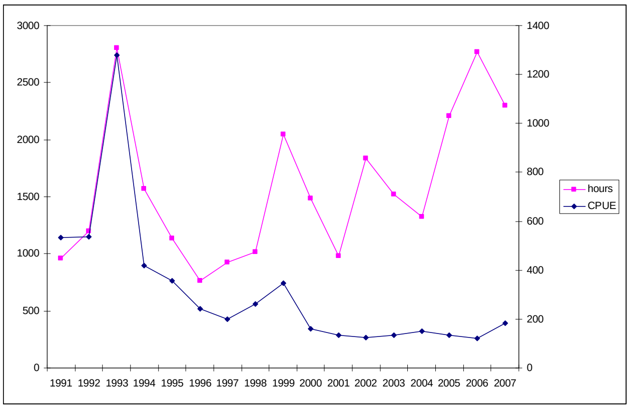
6 Blue ling

6.1 Why do the observations of several spawning aggregations suggest further stock separation? Herring stock units spawn in several aggregations, and each orange roughy aggregation is not considered a single stock by this group.

Comment for here and elsewhere in the report where the maps of catch distributions are presented; that it would be useful to have the ICES areas as a layer for reference for catch distribution across ICES areas.

6.2 Blue Ling in Va and XIV

6.2.1 Conclusion that the increase in catches is as a result of stock increase rather than effort increase is not shown by a plot of the data in Table 6.2.1



This suggests that after an initial rise in CPUE that CPUE declined and stabilised at a low level while effort has increased. I would not interpret this as a reflection that increasing catches were due to an increasing stock.

6.2.2.1 table references should be 6.2.0 not 6.2.1. “There is no information possible on blue ling discarding”? Does the EG mean available? If not why is it not possible?

6.2.2.6 reference to Fig 6.2.12 should be 6.2.10

6.2.2.7 Just a comment; The March survey is mainly picking up juvenile fish. Though there is a signal of increasing abundance of all sizes of fish on this survey there are very few adults in this signal relative to the Autumn survey. The total biomass from the spring survey is an order of magnitude lower than the Autumn survey. The Autumn survey is picking up the same size range (mainly adults) as the commercial fishery, and this survey does not how the same rapid increase in abundance. Thus I share the EG’s conclusion.

6.3. Blue ling in Vb VI and VII

Comment: Landings exceeding ICES advice as EU TAC is almost entirely taken by France and Faroes take about 2,000t. Fish in the fishery are almost all adults, but some juveniles present at shallower depths (150-300m) on porcupine bank.

6.3.6 Agree with EG conclusion

6.4 Blue ling in other areas

6.4.1.1. Faroese catches doubled in II from 2006-2007. Big decline in XII catches due to no landings from Spain for the past 2 years is this due to Gill net ban or just that data not available?

6.4.1.3 Comment: no TAC for III yet Danish landings from this area doubled and now almost equivalent to 50% of TAC for II IV and V.

6.4.1.1.3 Conclusion to permit targeted fisheries (even with data collection programmes) does not appear consistent with view of depleted stock in some areas i.e. Table 6.4.0.b shows depleted nature of Blue ling in II.

Section 7 Tusk

Reviewer 1 comments

Tusk (WGDEEP section 7)

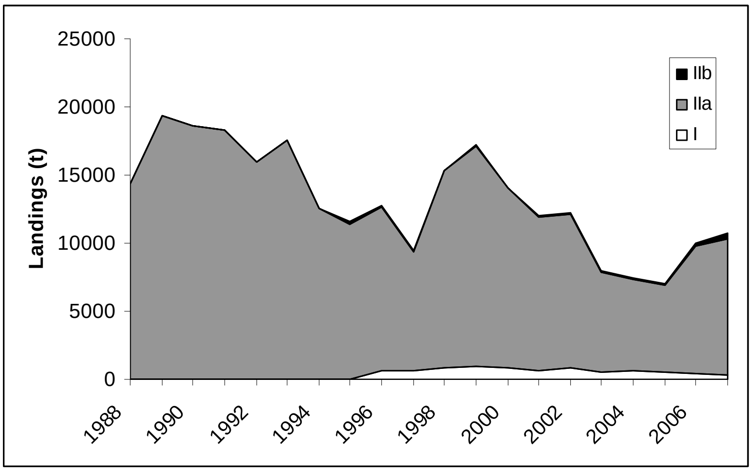
Management units (7.1) – A summary of the basis for management unit definition is needed. The 2007 SIMWG report summarized that genetic differences found among samples from Iceland-Greenland, the Mid-Atlantic Ridge, Rockall, the Faroes and the Norwegian coast was consistent with low mobility, and results suggest that tusk are probably made up of several population units.

Icelandic tusk, Va and XIV (7.2)

CPUE (7.2.3.6) – It appears that the 'conflicting trends' in the alternative CPUE series relates to targeting, and the conflicts are mostly in the last three years. Given the increasing trend in surveys in the last three years, the CPUE based on >30%tusk is the most reliable.

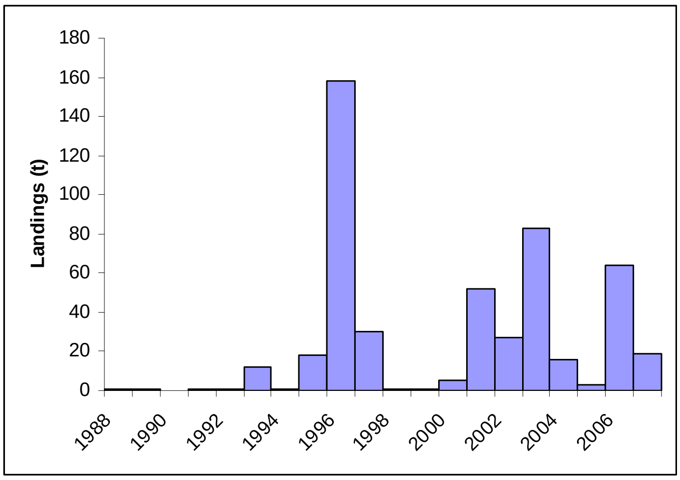
Management considerations (7.2.6) – There is some unfinished text.

Tusk in I and II (7.3) – Landings increased in the last two years to over 10,000t, despite the advice to reduce catch to <5,000t.



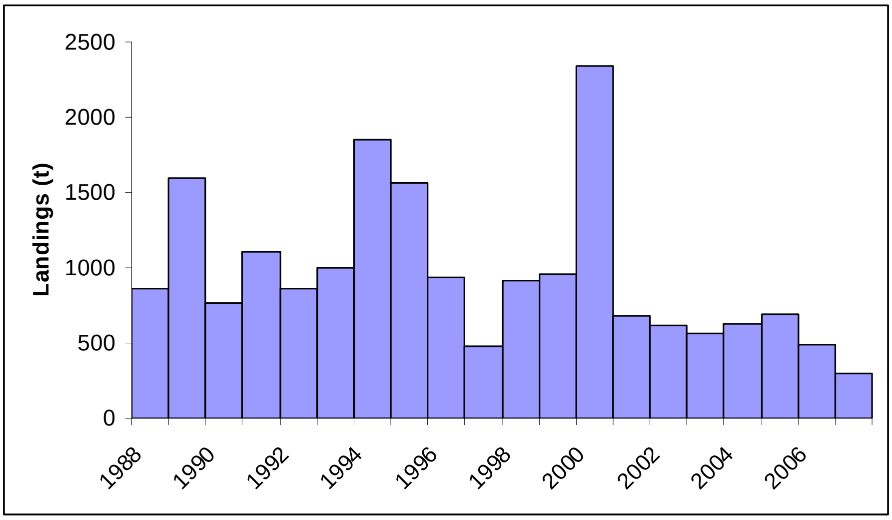
Tusk on the Mid-Atlantic Ridge (7.4)

Landings (7.4.1.1) – Landings are sporadic.



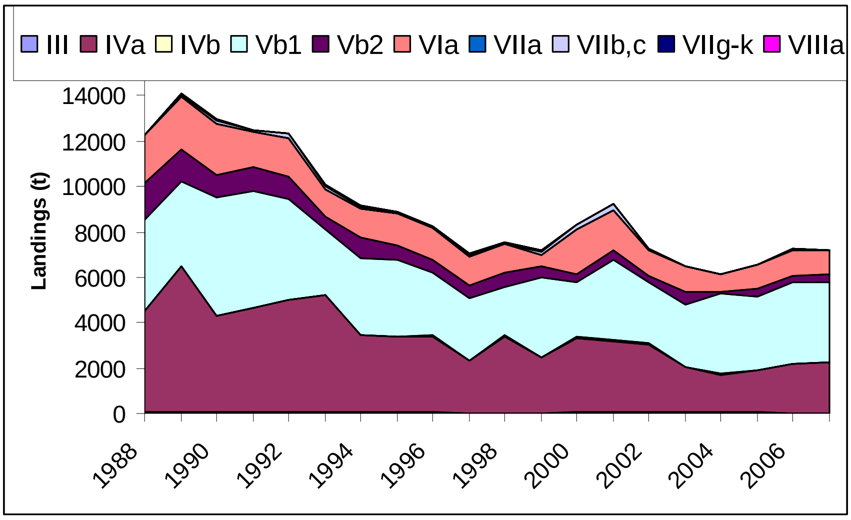
There are no effort data available, despite effort-based advice.

Rockall Tusk, VIb (7.5) – Landings in 2007 were record low.



Tusk in other areas IIIa, IVa, Vb, Via, VII, VIII, IX, XII (7.6)

Landings (7.6.1.1) – Although the text reports a declining trend in catches, total landings recently increased and was relatively stable from 2006 to 2007.



Length compositions (7.6.2.2) – The ~90cm mode in 2007 appears to be a plotting error in Figure 7.6.6.

Reviewer 2 comments

7.2 Tusk in Va and XIV

7.2.1 mention of ling catches on second last line should this be tusk?

7.2.1.1 header on table 7.2.1a not legible, no bold values apparent on table as per title. "Total landings have stabilised at around 5000t since 2001" this statement is not substantiated by table 7.2.1a which shows that landings have increased by 50% over the past 3 years from 5000t in 2005 to 7500t in 2007.

7.2.1.3 comment: ICES advice 5000t sum of permitted catches about 6500t

7.2.2.6 from figure 7.2.7 it appears that the survey was extended in the southeast in 2004, and that this area has the highest abundance. Id the assumption that the fish were distributed here prior to 2004? In Figure 7.2.9 the trends are the same but the rate of increase is different, thus trends are not conflicting.

7.2.5 there is no evidence presented to support the statement of "decreased directed effort in recent years". Sentence hanging at end of paragraph.

Comment: if effort is to be kept low it begs the question how low and what is current effort relative to previously? The Icelandic zone is managed by TAC so why should effort advice be applicable?

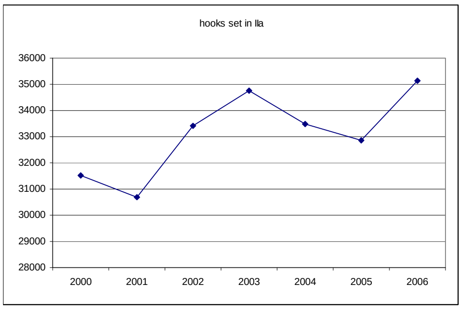
7.3 Tusk in I & II

7.3.1.1 pre 2000 average landings about 15,000t recent landings (2006-2007) about 10,000t. Thus the recent landings are not about half the pre 2000 levels.

7.3.1.3 first paragraph referring to ling?

7.3.2.2 If there is to be a comment on mean lengths it should be supported by a figure(s) in the report

7.3.5 The comment that the number of hooks set in IIa has declined since 2002 is not supported by Table 7.3.4 (see plot from this table below), rather the number of hooks set has increased since 2000 or is fluctuating around 34 million since 2002.



7.5 Tusk in VIb

7.5.2.2 Again if inferences are to be made to mean length the data should be presented in the report.

7.5.2.6 last sentence says that Spanish CPUE data was provided, but there is no data presented in the report.

7.5.3 With regard to the statement "CPUE shows no apparent trend in VIb" . The data pre 1994 were not available to test, but it looks like a decreasing trend in CPUE from the logbook series from all vessels.

7.6 Tusk in other areas

7.6.2.2 The referenced data from Bergstad and Hareide (2006) and Pennington WD (2007) should be presented in the report. To show any trend or otherwise in the mean length, a plot of mean length over time would be more informative than the frequency plots shown in Fig 7.6.6

Section 8 greater silver smelt

Reviewer 1 comments

Management units (8.1)

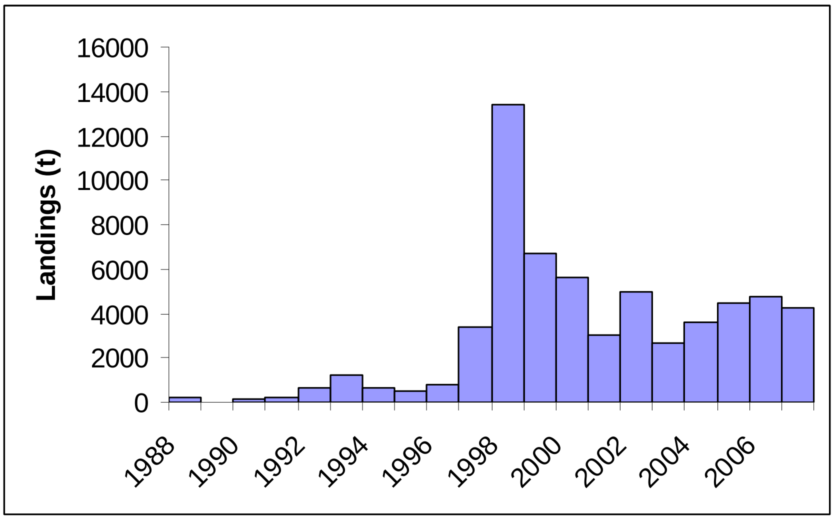
This section refers to the species as 'greater argentine,' but the rest of the section refers to it as 'greater silver smelt.' Synonyms should be defined in the introduction, and a single common name should be used throughout.

Given the lack of information on stock structure the two resources assessed in this section should be referred to as 'management units' or 'assessment units' rather than 'stocks.'

Icelandic greater silver smelt Va (8.2)

Landings (8.2.1)

Landings abruptly increased at the start of the directed fishery in 1998, but have been relatively stable since then.



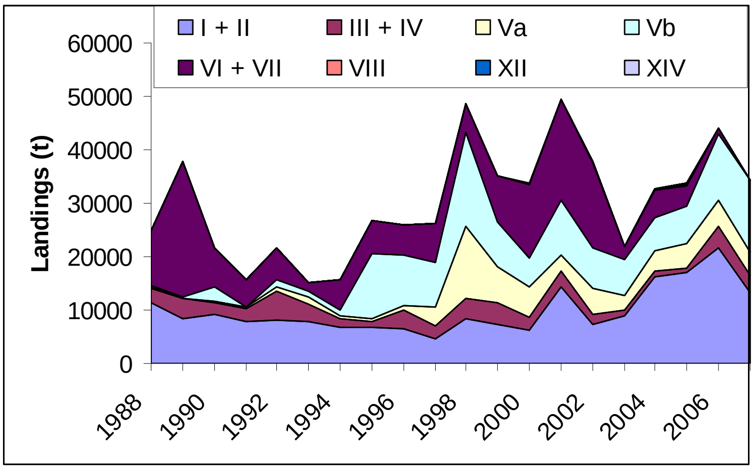
The discrepancy between landings tables needs to be investigated, and the catch by depth table needs to be updated.

Age composition (8.2.3.3) – The failure to process age samples does not comply with ICES advice that fisheries should only be permitted if accompanied by data collection programs.

Greater silver smelt in other areas I, II, IIIa, IV, Vb, VI, VII, VIII, IX, X, XII. XIV (8.3)

Landings (8.3.1.1)

Landings have increased in recent years, particularly in areas I, II, IV and Vb.



A brief history of the fisheries, markets and targeting in each area is needed. For example, the text in sections 8.3.3.3 and 8.3.4 suggests that the fishery off the Faroe Islands is relatively new (only 12 years). This is important information to assess fishery development.

Surveys (8.3.3.6) – I disagree with the statement that the two Faroese survey series "do not show any significant trend." The summer survey generally declined over the series, and the lowest observed value was in 2007 (Figure 8.3.10).

Management considerations (8.3.3.3) – The statement that 'no new data could be used' to confirm the trend in truncated age distribution is incorrect. Age data was collected in 2007 from the Faroese survey (Figure 8.3.6) and Norwegian surveys in IIa, IIIa and IVa (Figure 8.3.1). As reported in section 8.3.3.3 "in Sub-area III **in 2007… no fish older than 15 years were observed**. Several observations **in the 1980s docu-**

mented, that 20+ fish dominated the catches in Sub-area III.' If these observations are representative, they indicate an alarmingly rapid reduction in age structure. In my opinion, the conclusion about truncated age structure should be stronger.

Reviewer 2 comments

8.1 Greater silver smelt

I am not convinced of the rationale that a single stock exists in Va and another distributed from 70N to 40N

8.2 Silver smelt in Va

8.2.2.6 incorrect reference to fig 8.5.5 should be 8.2.5

8.3 Silver smelt in Va elsewhere

8.3.1.1 data from Va should not be in these tables. The comment that the species is a by-catch in the blue whiting fishery should be the focus of some attention to investigate the level, as even a 1% by-catch across the entire Blue whiting fishery could represent a significant volume of removal of this species.

8.3.2.2 second paragraph begs the question has the average fishing depth changed?

8.3.2.6 There is something wrong with the scale in the survey data fig 8.3.11 does 500,000 mean 500Kg? Referring to the commercial series 8.3.12 CPUE in the region of 2.5t/hour for a species with an average weight of less than 0.5kg indicates aggregating behaviour, and this would call into question the validity of any CPUE measure.

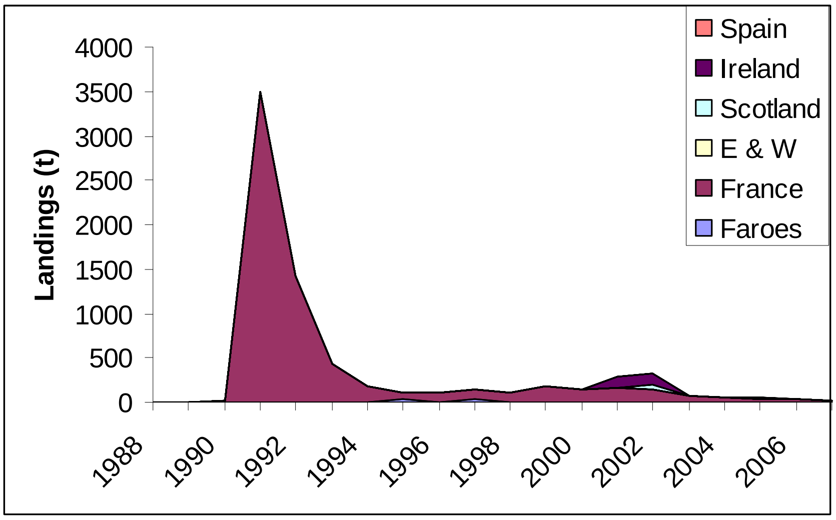
Section 9 Orange roughy

Reviewer 1 comments

Management units (9.1) – I agree that current management units are not adequate, and smaller management units would be more meaningful. Therefore, I suggest the term 'stock units' should be replaced with 'management units' or 'assessment units' for currently defined units.

Orange roughy in VI (9.2)

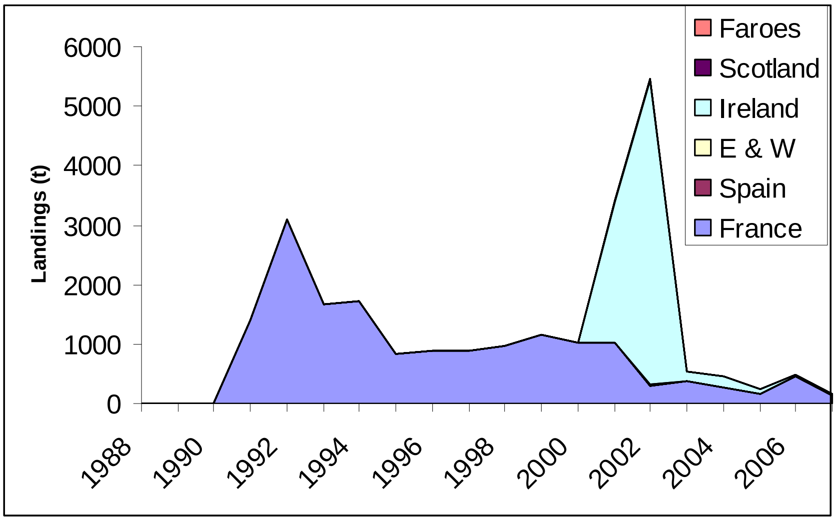
Landings (9.2.1.1) – The landings series is dominated by the French fishery, particularly in the early 1990s, with a brief Irish fishery in 2001 and 2002.



Management considerations (9.2.4) – I support the conclusion that the resource is severely depleted. I recommend considering French CPUE from the 1991 as Umax, and recommend plotting Umax, Upa and Ulim on Figure 9.2.1 to support a more objective statement of stock status: biomass is 'at reduced reproductive capacity,' because exploitable biomass is less than Ulim in area Via.

Orange roughy in VII (9.3)

Landings (9.3.1.1) – The landings series is dominated by the French fishery and a brief

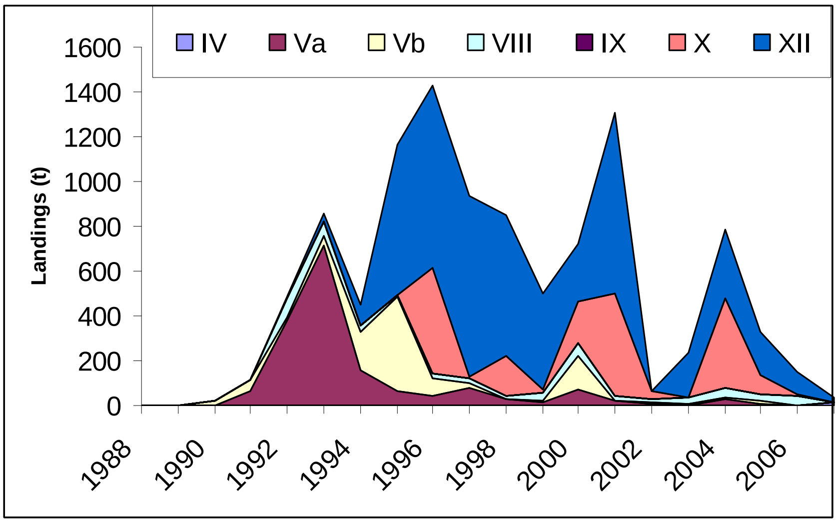


Irish fishery.

Management considerations (9.3.4) – A more conclusive statement about stock status is needed. I recommend considering French CPUE from the 1991 as Umax, and recommend plotting Umax, Upa and Ulim on Figure 9.3.8 to support a more objective statement of stock status: biomass is 'at reduced reproductive capacity,' because exploitable biomass is less than Ulim in area Via.

Orange roughy in other areas I, II, IIIa, IV, V, VIII, IX, X, XII, XIV (9.4)

Landings (9.4.1.1) – The landings series in Va reflects the trends in VI and VII. Annual landings in other areas is highly variable, particularly area XII.



CPUE (9.4.2.5) – The table referenced for Irish CPUE (12.5.2?) is missing.

Reviewer 2 comments

9.3.1.1 reference to Table 8.4.1 should be 9.3.0.

9.3.2.1 even though the discard information is from a single event and thus of limited use it would have been more useful to present as a rate, as without knowledge of the landing from the trip it is impossible to infer the significance of this.

9.3.2.2. Figure 9.3.3 x axis should probably be mm

9.3.2.6 even if there was no reliable TS a plot of the relative distribution of registrations would be informative

Reviewer 3 comments

There is no data to support the statement that more stock units are needed (9.1). Moreover, the assumption that different areas may be inhabited by different populations may be not correct since genetic studies seem to support an alternative hypothesis.

The recommendation that the boundaries of the protection area should be revised to cover the entire ICES rectangles do not seem to be supported by data (9.2). I may agree with an extension of the protection area but the argument should be biological.

I believe the reasoning for no fishing should be better explained. I agree there are some strong reasons for recommending no fishery for orange roughy. For example, the vulnerability of the species, the high longevity, little resilience, impact of the fishing gear in vulnerable ecosystems. Or just because we shouldn't eat fish older them our grandmother. In any case, the WG could have stated better the reasons for the recommendation.

Fig. 9.3.3 cm should read mm

Section 10 Roundnose grenadier

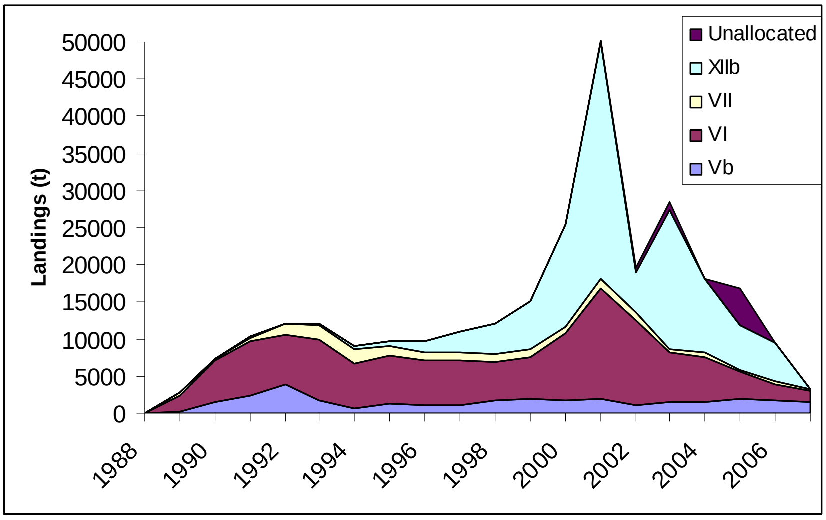
Reviewer 1 comments

Management units (10.1) – The definition of management units by bathymetric features that restrict dispersal is reasonable. Stock identification information should be examined to confirm these putative stock definitions.

Roundnose grenadier in Vb, VI, VII and XIIb (10.2)

The fishery (10.2.1) – Although the text states that roundnose grenadier are caught in multispecies fisheries, it is not clear if this is a target species or bycatch. The distinction is important for interpreting CPUE as an index of biomass.

Landings (10.2.1.1) – A figure would illustrate that the landings series includes the beginning and early development of the fishery, which is critical for evaluating fishery development and productivity. After peaking in 200, landings have quickly declined to near record low levels:



Discards (10.2.2.1) – The change in perception of proportion of discarded catch is not clear. Was the 20% estimate from Allain et al. (2003) based on weight or number? If it was weight, the new estimate is 30% (as compared to 50% by number).

Length and age composition (10.2.2.2-3)

With only the French fishery sampled, it should be stated that during the assessment period (1999-2007) French landings contributed 41% of total landings, with some years as low as 18% (2001). Other components should be sampled to obtain more representative estimates of catch-at-age.

Tables 10.2.1-2 need units (individual fish, thousand fish, million fish?).

Natural mortality (10.2.2.5) – The assumed value of 0.1 seems a bit high given observed ages of 54 years after a decade of fishing.

Effort (10.2.2.6.1) – Despite the fact that ICES advice is for an effort reduction, estimates of effort are not provided.

SVPA (10.2.3.2)

The SVPA is illustrative, and the results are promising enough that the analysis should be programmed to allow more ages.

The text accurately described large residuals, but there are also nonrandom patterns, with apparent 'year effects' (98/99, 01/02, 05/06); however, the SVPA with discards appears to have resolved the problem in 01/02 seen in the landings-only run. Based on residual diagnostics, the SVPA with discards has a better statistical fit of the model to the data.

I agree that the decreasing trend in stock biomass is robust to alternative assumptions of terminal F.

Comments on assessment (10.2.4)

I agree that the next step in the advancement of the stock assessment is to develop a tuning index.

I disagree that the decline in CPUE is inconsistent with the presence of old fish in the catch, because the fishery is relatively recent, and those old fish were produced before the fishery developed in the late 1980s.

Management considerations (10.2.5)

I agree that there is evidence of biomass depletion.

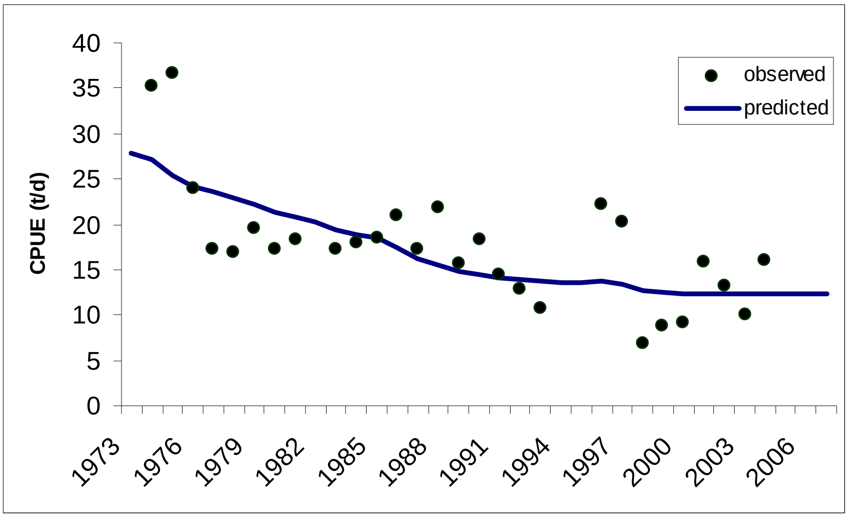
In the interim of an accepted analytical assessment, I propose that stock status be based on the Umax, Upa and Ulim framework. With corroboration from the trend SVPA in biomass estimates, the directed reference fleet LPUE appears to be a reliable index of exploitable biomass. According to Figure 10.2.9, Umax=500kg/h, Upa=250kg/h and Ulim=100kg/h; and the stock is greater than Blim, but less than Bpa, and 'at risk of reduced reproductive capacity.'

Roundnose grenadier in the Skagerrak IIIa (10.3) – With the retirement of the last vessel in the directed fishery in 2007, it appears that this fishery has effectively been reduced to a bycatch fishery. However, information from this brief directed fishery will be important baseline data for evaluating productivity.

Roundnose grenadier on the Mid-Atlantic Ridge Va1, Xb, XIIa1, XIIc XIVb1 (10.4)

Landings (10.4.1.1) – Landings extending back to the exploratory stage of the fishery is valuable baseline information for evaluating productivity.

Data analysis (10.4.3) – I agree that the CPUE series should be cautiously interpreted, but the decline in CPUE is consistent with the fishery development, and a simple biomass dynamics model of catch and CPUE confirms a 'one-way-trip' depletion from virgin biomass in the 1970s to less than Bmsy for the last decade. The estimated trajectory is also consistent with acoustic survey estimates. I recommend further development of biomass dynamics modeling using standardized CPUE and acoustic survey biomass estimates.



Management considerations (10.4.4) – In the interim of an accepted analytical assessment, I propose that stock status be based on the Umax, Upa and Ulim framework, based on the Soviet/Russian CPUE, which is consistent with the decrease in biomass estimates from acoustic surveys. According to Figure 10.4.1, Umax=36t/d, Upa=18t/d and Ulim=7t/d; and the stock is greater than Blim, but less than Bpa, and 'at risk of reduced reproductive capacity.'

Roundnose grenadier in other areas I, II, IV, Va2, VIII, IX, XIVa, XIVb2 (10.5) – I agree that catches outside the areas assessed in other sections are insignificant, because removals are limited to relatively low volumes of bycatch.

Reviewer 2 comments

10.2.2.1 Poland are reported to have a share of the largest TAC for grenadier but no landings are reported. Were there no Statlant data records? Why does misreporting occur if the reported catches are well below the TAC. Second last sentence on first paragraph, does "Statland" presumably means "Statlant"

10.2.2.6 For comparative purposes it would be more useful to convert the lengths in 10.2.8 to PAFL or whatever the standard length is used by the group.

10.3.2 Apart from the first three data years, about 95% of the catch is covered by the age range 10-34. less than 1% is excluded in the younger ages and the plus group contains only about 5% for most years. Therefore I would say that this is an appropriate age range for the analysis. The runs including the discards appear to give a better fit. The years that cause the large residuals at all ages 1998-1999 are due to a shift in the age distribution with an attenuation of the ages above 35 from 1999 onwards. Given that this may be a real feature of the data if the main catching fleet is shifting area/depth, the fit to the data appears not unreasonable. The rate of decline of the population is robust to the assumption of terminal F (vpa converged up to 2001), and when the full catch data are used the impression is of a biomass about 1/6 of the level before the fishery began to expand rapidly.

10.2.4 I don't think that the fact that the longevity of the species is up to 60 years affects materially the results of an assessment based on the age range 10-34+ (for the reasons given above). I think the assessment is useful for interpreting trends. Tuning data would help scale the biomass.

10.3 Grenadier in IIIa

10.3.1 table number missing

10.3.4 I do not see any information in the report to substantiate the statement "However, the historical records from 1987 to 2002 did not suggest any negative development of abundance under the exploitation level at that time".

10.4 Grenadier on MAR

10.4.3 what does the statement in the middle of the second paragraph "possible annual catches" mean? Last paragraph, is it that the proportion of younger fish have increased or the number?

10.4.4 what were the methods used for the biomass estimates in the 1970's? If you want to quote figures here I think you have to detail the methods and likely accuracy/precision. Again what does the annual possible catch mean? The last 2 sentences are a contradiction. To be more useful the EG should refer to some reference period or catch level beyond which the expansion of the fishery should not occur.

10.5 grenadier in other areas

No comment

Reviewer 3 comments

In general the report is well assembled and interpreted correctly. It seems that stock identification is a top priority for this species. The precautionary recommendation is supported by the data and apparently signal of stock depletion have been observe din different areas.

I got a bit worried with the statement (10.3.4) that historical catches from 87-02 could be regarded as sustainable because, at that time, a negative trend could not be detected. Can we extrapolate previous realities to current times? Is the stock structure the same?

In the case of the MAR, I got the feeling that the WG had some information that could be used for the assessment. In the recommendation sections they argue that there is lack of information so no advice is given.

Section 11 Black scabbard

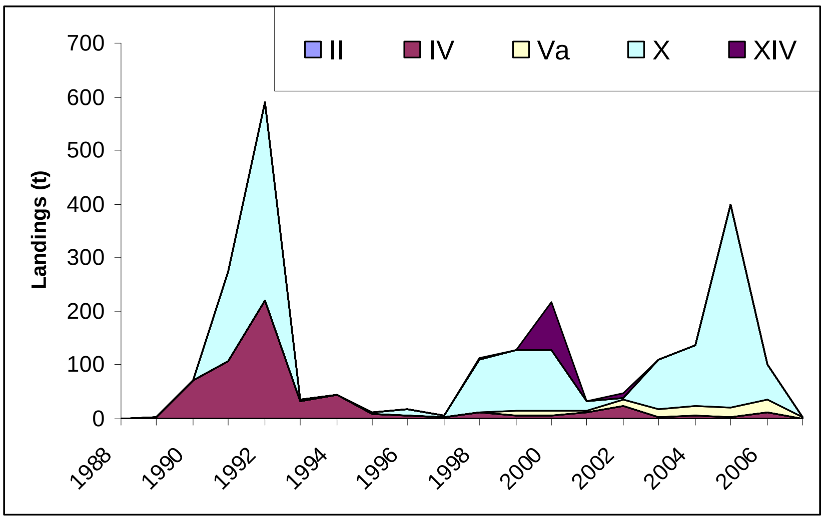
Reviewer 1 comments

Management units (11.1) – A strong case is made for assessing the entire northeast Atlantic as a single stock that supports two distinct fisheries.

Black scabbardfish in the north Vb, XIIb, VI VII (11.2) – In the interim, until a more standardized CPUE series is developed, I recommend that stock status be based on the Umax, Upa and Ulim framework, based on the French CPUE series. According to Figure 11.2.3, the stock is less than Blim and 'at reduced reproductive capacity.'

Black scabbardfish in the south VIII, IX (11.3) – I disagree with the statement in section 11.3.3 that 'LPUE did not show any marked trend.' According to Figure 11.3.4, LPUE steadily decreased from 1996 to 2000 and has fluctuated at a low level since then.

Black scabbardfish in other areas I, II, IIIa, IV, X, Va, XIV (11.4) – Landings are sporadic, and mainly from area X, particularly in recent years, with extremely low landings in 2007.



Reviewer 2 comments

11.2 Black scabbard in Vb VI VII and XIIb

11.2.5 statement on the reduction on fishing effort reduction since 2000, not qualified with a reference to any data and therefore not substantiated in the text.

11.3 Black scabbard in VIII and IX

11.3.2.1 were the discards black scabbard or a mixture of other fish species?

11.3.3 It would have been useful to present the method and fitting of the GLM in the report.

11.4 Black scabbard in other areas

No comment

Reviewer 3 comments

Stock description

Consideration of a single stock in the NA is doubtful since this is a data-poor species. Moreover, one may be assessing two different species at the same time (see Stefanni and Knutsen, 2007 *Mol Phylog Evol* 42: 38–46). However, in such data-poor case, I may found this consideration reasonable but the text should include more justifications for the aggregations proposed and a reference to the problems found in identifying this (these) species.

11.2 Black scabbard fish in sub areas Vb and XIIb and divisions VI and VII

In general, I found this section has been well assembled but more detail could have been given to the fisheries part. French observers have reported no discard of black scabbard fish but I'm not sure if this finding should be extrapolated to all areas and fisheries. Since this species is usually caught as small immatures I would guess many fishing boats would discard extremely small individuals. Moreover, since this species is "mostly caught as by-catch" I would expect some fishing vessels to discard it. I suggest not extrapolating the finding of the observers in French boats to the rest of the fleet.

In figure 11.2.3 there is a confusion between CPUE (y axis) and LPUE (legend) that should be clarified. These two measures mean different things. The figure 11.2.4 is unreadable.

In data analyses section, the language should be improved since it is difficult to read at its present form. A reference to a figure should be added to paragraph 3. Despite the fact of the scarcity of data, I believe the interpretation of declining trend in correct. I'm just not sure one can call it abundance, or if CPUE should be used here.

In the management section, the consideration on the start of exploitation is very valuable. However, there may be is a misinterpretation of the evidences regarding discards. Nowadays the blue ling fishery catches black scabbard fish as bycatch, thus there is no reason to believe that in the past it was different. So I would guess that in the past this species was caught and discarded.

11.3 Black scabbard fish in sub areas VIII and IX

There is a general lack of consistency between the previous section and this one. There probably is throughout the report. A major effort should be given to standardize the information presented in each section and sub-section so readers can easily understand, compare and make their judgment. For example, in the landing trends sub-section there is no consideration about the trends itself. In the landings and discard sub-section there is a reference to the total discards but no reference to discards of black scabbard fish, as in the previous section 11.2.

The data analyses sub-section needs to be further developed. Although the analyses seemed appropriated I'm not sure the lack of trends conclusion is correct. Moreover, at its present I cannot understand and interpret the year effect.

Management considerations sub-section points toward the lack of new relevant information demonstrating changes in the stock. I agree with this statement but would like to read also that efforts should be implemented towards a fully assessment of this species in this area.

11.4 Black scabbard fish in other areas

In general I agree with what is presented in this section, mainly about the maintenance of the recommendation. However, I would like to see this section further developed since I believe more data is available for some of the areas.

Section 12 Greater forkbeard

Reviewer 1 comments

Greater Forkbeard (WGDEEP section 12) – Management based on mixed-fisheries advice appears to be appropriate given the nature of the fisheries, and the data available do not indicate depletion.

Reviewer 2 comments

12.1 Fig 5.1.1 reference to Figs 5.1.1 &2 not correct, should be 12.1 & 12.2

Information on species productivity lacking to infer the likely impact of bycatch levels on the species.

Comment: only indicators show abundance and biomass peak approximating to peak fishery in main area (VII). This implies catches more likely affected by availability than anything else. No indication of low productivity as in other deep water species.

Reviewer 3 comments

In general, the report adequately presents the available information for this species. However, the language and the structure are sometimes confusing. For example, catch trends from Subareas VIII and IX are described twice (12.1.1). The first description probably refers to other species. The assumption that catches depended on market prices (of other species, I guess) would require more detailed information and analyses. For example, the level of association with other species should be presented so one could understand what species drives fluctuations in catches of greater forkbeard. The fact some countries present aggregated data prevents a more detailed evaluation of the trends. Since the vertical distribution of these species do not overlap extensively, it would be easy to infer the *Phycis* species through the associated catches.

The depth distribution in the stock identity section (12.2) looked unrealistic. The upper limit of 60m seems too shallow. I would guess, 300 meters to be more reasonable. I agree that limited knowledge on this species is currently available. Regarding management considerations, I guess theirs is not much to recommend for this data-poor species. Thus, I was wondering how the EC defined a TAC for such a species.

Section 13 Beryx

Reviewer 1 comments

Stock identity (13.2) – This section should state that the two species are assessed and managed as a single management unit.

Management considerations (13.6) – I recommend modifying the 2006 advice to states that Fisheries should be permitted only when accompanied by data collection programs, including the species composition of fisheries.

Reviewer 2 comments

13.3.1 why is no discard information presented if such exist?

13.3.2 Figs 13.7 and 13.8 difficult to interpret, what is meant by “mean annual length composition” in a frequency distribution plot? Is this an average proportion at length over the years? If so what is the information you are trying to communicate?

13.3.6 An explanation of how RPN is defined should be included in the report.

Reviewer 3 comments

In general, the report for this species reasonably compiles the available information in ICES areas. Some figures are mis-referred in the text and the tables’ format could be reformatted since some repeat information (13.1.i and 13.3; 13.i.h and 13.3) or seemed to be unnecessary.

The single stock assumption is valid due to the lack of more detailed knowledge. However, as stated in the report there is significant genetic differentiation between populations within the N. Atlantic. An effort could be given to better understand the connectivity of these populations and its implication to management.

I agree with the interpretation of the data provided. However, in the case of *B. decadactylus* the results presented in figure 13.11 should be better discussed. It seems that the abundance of this species (in the Azores, I guess) is increasing.

There are no management recommendations for these species.

Section 14 Red sea bream

Reviewer 1 comments

Stock structure (14.1) – The conclusion to treat the resource as three assessment units is reasonable, given information on distribution, movement and genetics, but stock identification information should continue to be examined to confirm these putative stock boundaries.

Red Sea Bream in VI, VII and VIII (14.2)

The fishery (14.2.1)

The intent of the statement that 'its peculiar reproductive biology makes red seabream specially vulnerable' is not clear. Is this referring to protantrous hermaphrodism? How does that make it more vulnerable (too few females from size-selective fishing)?

The statement about cyclic changes is not supported by the historical fishery development, which shows gradual expansion, interrupted by the two world wars, a peak in the 1960s and 1970s and a gradual depletion. This is a typical fishery development and does not appear to reflect cyclic changes.

Landings (14.2.1.1) – The series back to 1900 is impressive and valuable for long-term baseline information.

Management considerations (14.2.4) – If a directed fishery is being allowed despite advice, I recommend that compliance with the advised data collection should be included in assessment reports.

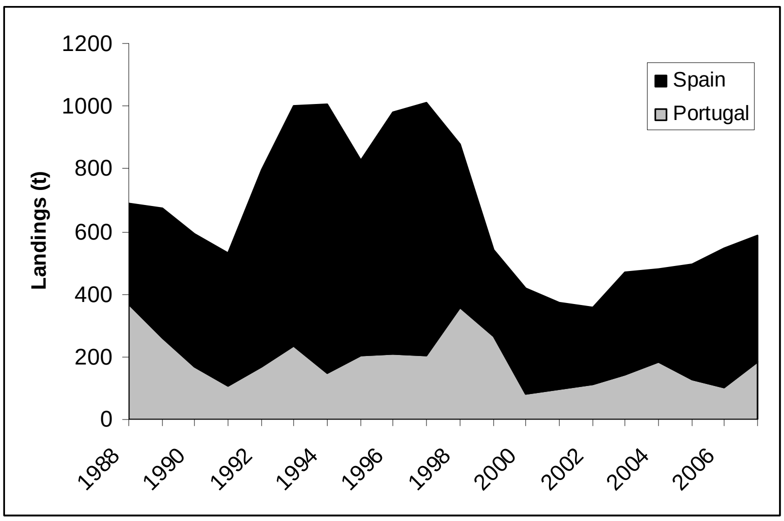
Red Sea Bream in IX (14.3)

The fishery (14.3.1)

The description of the Spanish fishery is informative and well written.

Is there any catch from countries outside the EU or ICES convention?

Landings (14.3.1.1) – A figure of landings would show that they have gradually increased since 2002.



Discards (14.3.2.1) – The conclusion that discards are 'minor' appears to contradict the imposition of a minimum size. Is the minimum hook size effectively avoiding catch of small fish?

Data analysis (14.3.3)

There is no model output or diagnostic figures from the separable analysis to judge model performance or reliability of results.

I agree that analysis of catch-at-age that is derived from a single age-length key can only be illustrative and not the basis for management advice.

The only figure shows sensitivity to the 'plus-group' assumption. Although results are sensitive to how old fish are modeled, this sensitivity it is not a diagnostic feature. Even the best model applications are sensitive to this decision.

Even though the age-length key only extends to age-10, ages of 15 and 20 were observed by different researchers (14.3.2.3), and surely there is <u>some</u> survival beyond age-10. If all large fish in the catch-at-length are classified to the oldest age, it should be modeled as a 'plus group.'

Management considerations (14.3.5) – If a directed fishery is being allowed despite advice, I recommend that compliance with the advised data collection should be included in assessment reports (e.g., samples of the Portuguese fishery).

Red Sea Bream off the Azores, Xa (14.4)

The fishery (14.4.1) – I think that the description as 'one of the most important northeast Atlantic fisheries' needs to be qualified, because it is not one of the most productive, valuable or even culturally important in the northeast Atlantic.

Landings (14.4.1.1) – Figure 14.4.1 illustrates fishery development well, but I think that the transition (dashed vertical line) from 'predevelopment' to 'growth' phases needs to be shifted to 1970 to be consistent with the text.

Data analysis (14.4.3) – A brief summary of the previously developed assessment would help to support the conclusions.

Management considerations (14.4.5) – I disagree that there are 'signs of increases in indices of abundance from surveys…' Figure 14.4.4 shows that the 2007 survey value is near the average of the series and substantially less than the previous survey index. I think that the survey data confirm the stable trend indicated by the CPUE series.

Reviewer 2 comments

14.2 Red sea bream VI VII VIII

14.2.1 The comment on serious depletion is out of place in the fishery section. The landings have declined, and the reasons for this are admittedly speculative and not presented in the report. The second paragraph here belongs to a state of the stock section (see general report comments).

14.2.1.1 references to S1 and S2 what are these? What are the two sources in Fig 14.2.1? I can only see one plot, which I interpret as a stacked bar plot by country. Therefore the statement "the landings estimated by both sources since sixties onwards are very different" is not substantiated.

Comment: decline in the landings since the mid 1970's is evident and significant, the question of whether this is related to effort decline or abundance is not clearly outlined (e.g. decline coincident with extension of EEZ's to 200 miles). The text infers that due to its peculiar reproductive biology it is more likely related to abundance, however what this peculiar biology is, is not explained.

14.2.4 The dramatic decline in landings occurred from the mid 1970's to the late eighties (fig 14.2.1), I don't find evidence to support the statement referring specifically to the dramatic reduction since the mid 1980's. What is the rationale in protecting juvenile areas of distribution, are juveniles caught and or discarded by the fishery in large numbers? There is no evidence presented. What is the rationale for a spatially explicit measure, (presuming there is a need for juvenile protection measures) are the juvenile areas easily identifiable, temporally stable and thus enforceable? Is the TAC restriction insufficient? If so why? There are many unanswered questions in this section. Without answers to these questions it is difficult to see any supporting information to the conclusions in 14.2.4 apart from the general.

14.3 Red sea bream IX

14.3.2 figure 14.3.2 shows ages not lengths. Presume reference to 14.3.1

14.3.3 It is not possible for a reviewer to evaluate the merit of this analysis without more detail. If plots of trends from exploratory analyses are to be presented there must be more information given in the report to evaluate the how these trends should be interpreted. Without interpretation fig 14.3.4 is equivocal, and the requirement for a rebuilding plan is not substantiated without some analysis of the current relative state of the stock.

14.4 The comment about evidence of recovery is predicated on the assumption that the stock is depleted and there is no evidence presented for this, which could be evaluated.

Comment: the landings are stable at about half the level of the peak fishery, there is no major decrease in mean size, and the age range is quite stable. The LPUE is stable over the past 10 years or so, and there are a raft of specific technical regulations limiting the exploitation by the main fishery. The TAC has been above the landings and is decreasing in line with the landings over the past number of years. I am not sure what "recovery" is expected of this stock?

14.4 Red sea bream X

14.4.2.3 were there no updates to the age composition of the landings since 2006 report?

14.4.2.6 A summary of the method and some more detail on the update of the fitting of the GLM should be presented in the report in order to allow evaluation of the 14.4.3

14.4.3 "as shown from the preliminary analysis using SVPA and ad hoc VPA tuning runs using the last assessment base case." What preliminary analyses nothing is presented?

14.4.5 some equivocal information presented here. The indication of increasing abundance is a long term trend and the only observation available since 2005 is not very strong evidence for the continuance of this trend. More information on how the surveys were conducted and the analysis behind the index is required for further evaluation. The commercial CPUE is stable but the EG comments that this may be due to sequential depletion? So what is the conclusion of the EG as to the state of the stock? For management purposes, is the conclusion that the fishery appears to be stable and controlled by the TAC?

Section 16 special requests

16.1 evaluation of use of VMS data for NEAFC request

This part of the response is thorough and well written

16.2 quality of records

This review relates only to potential issues and related difficulties. As no analyses were done the EG couldn't make specific comment as to the quality of the individual records

16.3The final part of the request asked that if quality of the data allowed ICES should provide the analyses. The EG has declared insufficient resources and suggested that this work be done under a funded contract. This is not a very satisfactory response from the client commissions point of view as this is at least the third time ICES have had to respond to this request and in the last response to NEAFC ICES said that they were "currently analyzing the data". There has been a miscommunication somewhere as this is patently not the case.

Section 17 development of criteria for differentiating fisheries

The EG suggest that this work by done from the analysis of the VMS data. No analyses presented

Section 18 Compile data on documented historical or present spawning aggregations of blue ling in NEAFC area

Thorough analysis presented. No technical comments.