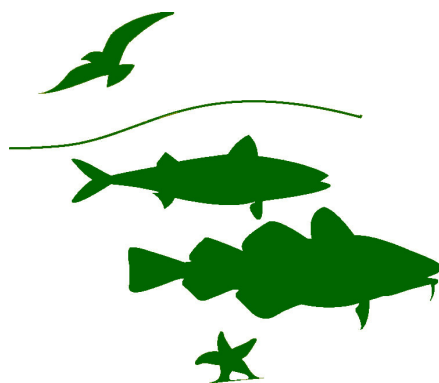




**Fisheries Science Services,  
Rinville, Oranmore,  
Co. Galway, Ireland**

# THE STOCK BOOK

**Report to the Minister for Agriculture, Fisheries and Food  
Annual Review of Fish Stocks in 2007  
with Management Advice for 2008**



*Throughout 2007 the FSS Team were Involved in Data Collection, Data Analysis, Conducting Assessments,  
Formulating and Providing Advice and Carrying out Scientific Research on Fish Stocks,  
both Nationally and Internationally.  
The Results of this Work are Presented in the 2007 Stock Book*

***NOVEMBER 2007***

***In the 2007 Stock Book, every effort has been made to use the most up to date version of the ICES and STECF advice. However, the final official ICES ACFM and STECF Reports should be consulted for the definitive advice. For more detailed information on specific stocks the relevant ICES Working Group Reports should be consulted. The official EU journal should be consulted for definitive TAC's and Quotas for 2007.***

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## Table of Contents

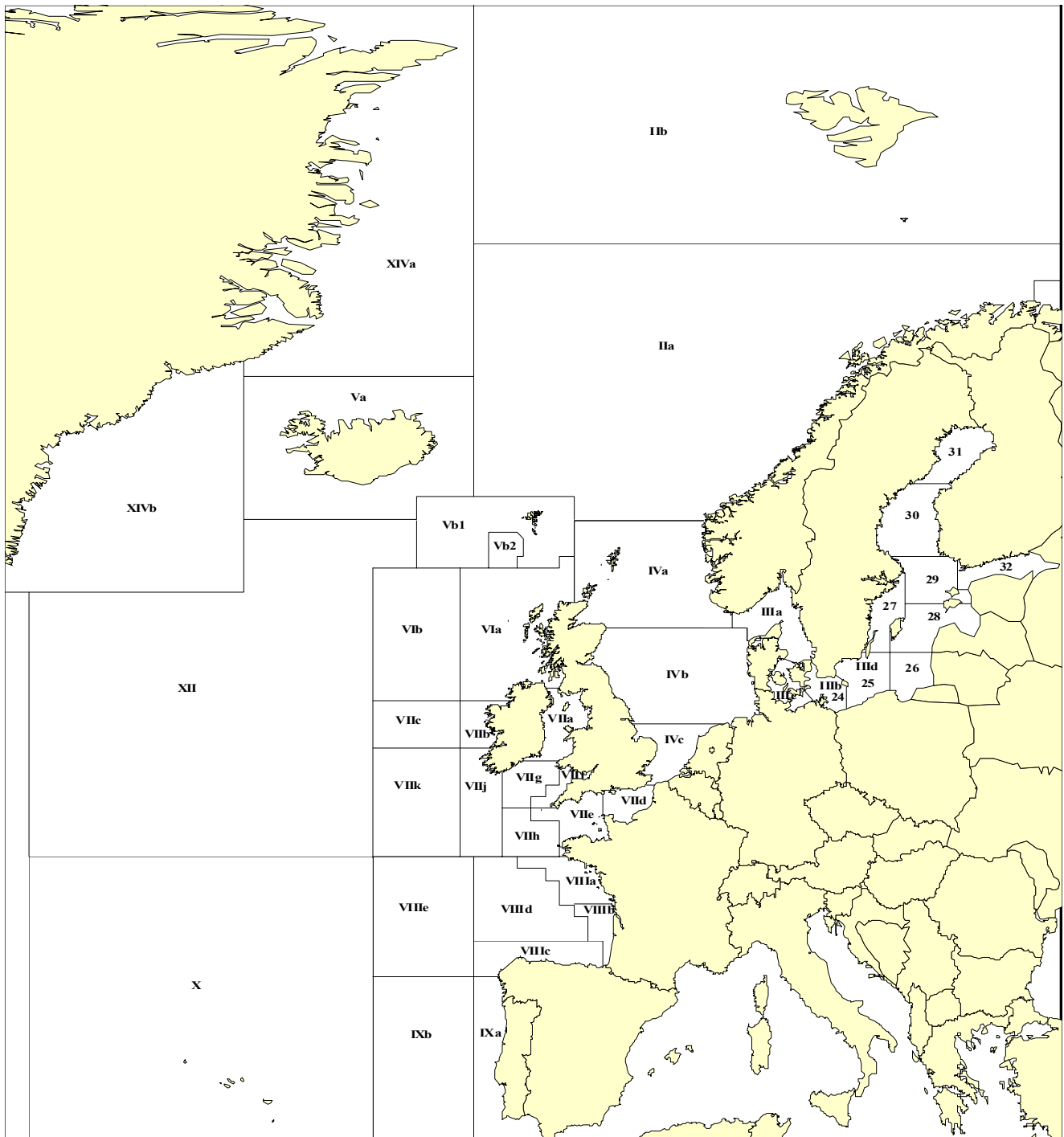
Table of Contents	1
ICES Fishing Areas	4
Introduction	5
A New Strategic Direction for the Irish Seafood Sector	11
Spatial and Temporal Trends in Landings Around Ireland	13
Importance of Sampling to Fisheries Advice	30
Industry – Science Partnership Programmes	33
The Evolving European Policy for Reducing Discards	35
Marine Protected Areas: Why, how and for whom?	38
Reforming ICES Advice and Changes in the timing of ICES Advice	40
EC Proposal on Fishing Opportunities for 2008	42
Summary of 2007 TAC's with Scientific Advice for 2008	45
<b>Ecosystem Overview for Widely Distributed and Migratory Species</b>	<b>52</b>
FSS Advice for Widely Distributed and Migratory Populations.	54
HERRING - North Sea Herring (Sub-area IV, Divisions VIIId, Division IIIa)	56
HERRING - Norwegian Spring Spawning Herring (Sub-areas I & II)	58
MACKEREL - North East Atlantic Mackerel	66
HORSE MACKEREL - Western Horse Mackerel	77
HORSE MACKEREL - North Sea Horse Mackerel	86
BLUE WHITING - Combined Stock (Sub-areas I-IX, XII and XIV)	91
ALBACORE TUNA - North Atlantic	104
BLUEFIN TUNA - East Atlantic and Mediterranean	106
PELAGIC SHARKS - North East Atlantic	108
<b>Ecosystem Overview for the Irish Sea</b>	<b>109</b>
FSS Advice on Mixed Fisheries in the Irish Sea	111
COD - Irish Sea Cod (Division VIIa)	117
WHITING - Irish Sea Whiting (Division VIIa)	124
HADDOCK - Irish Sea Haddock (Division VIIa)	129
NEPHROPS - FU 15 Irish Sea <i>Nephrops</i>	133
PLAICE - Irish Sea Plaice (Division VIIa)	136
SOLE - Irish Sea Sole (Division VIIa)	143
HERRING - Irish Sea Herring (Division VIIa North)	150
SPRAT - Irish Sea Sprat (Division VIIa)	154

<b>Ecosystem overview for West of Scotland and Rockall</b>	<b>155</b>
FSS Advice on Mixed Fisheries for West of Scotland and Rockall	157
COD - West of Scotland Cod (Division VIa)	163
COD - Rockall Cod (Division VIb)	170
HADDOCK - West of Scotland Haddock (Division VIa)	172
HADDOCK - Rockall Haddock (Division VIb)	180
WHITING - West of Scotland Whiting (Division VIa)	188
WHITING - Rockall Whiting (Division VIb)	194
MEGRIM - West of Scotland and Rockall Megrim (Sub-area VI)	195
ANGLERFISH - West of Scotland, Rockall and North Sea Anglerfish (Sub-areas IV and VI)	200
<i>NEPHROPS</i> - FU 11-13 West of Scotland <i>Nephrops</i>	210
PLAICE - West of Scotland Plaice (Sub-area VI)	212
SOLE - West of Scotland and Rockall Sole (Sub-area VI)	214
POLLACK - West of Scotland and Rockall Pollack (Sub-area VI)	216
SAITHE - North Sea Saithe (Sub-areas IV, VI and Divisions IIa, IIIa-d)	218
HERRING - West of Scotland Herring (Division VIa North)	226
SPRAT - West of Scotland Sprat (Sub-area VIa)	233
 <b>Ecosystem Overview for the Celtic Sea</b>	 <b>234</b>
FSS Advice on Mixed Fisheries in the Celtic Sea	236
HAKE - Northern Hake (Divisions IIa, IIIa-d, Vb, VIIIabde Sub-areas IV, VI, VIII, XII and XIV)	240
COD - Celtic Sea and Western Channel Cod (Divisions VIIe-k)	250
COD - West of Ireland Cod (Divisions VIIb,c)	259
HADDOCK - West of Ireland and Celtic Sea Haddock (Divisions VIIb-k)	261
WHITING - Celtic Sea and Western Channel Whiting (Divisions VIIe-k)	266
WHITING - West of Ireland Whiting (Divisions VIIb,c)	272
ANGLERFISH - Celtic Sea and Bay of Biscay Anglerfish (Divisions VIIb-k and VIIIa,b)	274
MEGRIM - Celtic Sea and Bay of Biscay Megrim (Sub-area VII and Divisions, VIIIa,b,d,e)	283
PLAICE - Celtic Sea Plaice (Divisions VIIf,g)	288
PLAICE - Southwest of Ireland Plaice (Divisions VIIh-k)	296
PLAICE - West of Ireland Plaice (Divisions VIIb,c)	299
SOLE - Celtic Sea Sole (Divisions VIIf,g)	302
SOLE - Southwest of Ireland Sole (Divisions VIIh-k)	309
SOLE - West of Ireland Sole (Divisions VIIb,c)	313
<i>NEPHROPS</i> - FU 16 Porcupine Bank <i>Nephrops</i>	316
<i>NEPHROPS</i> - FU 17 Aran Grounds <i>Nephrops</i>	319
<i>NEPHROPS</i> - FU 19 West of Ireland and inshore south of Ireland <i>Nephrops</i>	321
<i>NEPHROPS</i> - FU 20-22 Southern Irish Sea and Celtic Sea <i>Nephrops</i>	322
POLLACK - West of Ireland and Celtic Sea Pollack (Sub-area VII)	324
SAITHE - West of Ireland and Celtic Sea Saithe (Sub-area VII)	326
HERRING - Celtic Sea Herring (Division VIIaS, VIIg-h, VIIj-k)	328
HERRING - North west of Ireland Herring (Divisions VIa South & VIIb,c)	335
HERRING - Bristol and English Channels Herring (Divisions VIIef)	340
SPRAT - West of Ireland and Celtic Sea Sprat (Divisions VIIb-k)	341



<b>Ecosystem Overview for Deepwater</b>	<b>342</b>
FSS Advice on Deepwater Species	345
DEEPWATER STOCKS SOUTH OF 63o N	345
<b>Other Stocks of Interest to Ireland</b>	<b>351</b>
REDFISH FISHERIES ( <i>Sebastes spp.</i> ) - North East Atlantic	351
INDUSTRIAL FISHERIES	353
ARCTIC STOCKS - Cod, Haddock and Saithe	356
SNOW CRAB - In West Greenland	358
CAPELIN - (Sub-areas V and XIV and Division IIa west of 5°W)	360
SARDINES - (Sub-areas VII and Divisions VIIIa, b, d & e)	361
Developing Scientific Advice for New MOU Species	363
<b>Inshore Fisheries Overview</b>	<b>367</b>
Bass on all Coasts (Sub-areas VI and VII)	372
Conger Eel on all Coasts (Sub-areas VI and VII)	375
Whelk Fishery on all Coasts (Sub-areas VI and VII)	376
Periwinkle on all Coasts (Sub-areas VI and VII)	381
Common Cockle in the Irish Sea (Division VIIa)	382
Surf Clams on South and West Coasts (Sub-area VII)	385
King Scallop and Queen Scallop	387
Palourde on West Coast (Divisions VIa, VIIb, j)	392
Razor Clams on Mainly East Coast (Division VIIa)	394
Purple Sea Urchin on West Coast (Divisions VIa, VIIb,j)	397
Green Crab on all Coasts (Sub-areas VI and VII)	398
Spider Crab on Mainly West and South Coasts (Sub-area VII)	399
Velvet Crab on all Coasts (Sub-areas VI and VII)	402
Brown Crab on all Coasts - (Sub-areas VI and VII)	404
Lobster on all Coasts (Sub-areas VI and VII)	409
Crawfish on Mainly Western Coasts (Sub-areas VI and VII)	411
Shrimp on South and West Coasts (Divisions VIa, VIIa (South Coast), b,g and j)	413
<b>Appendices</b>	<b>415</b>
Appendix I - <i>Nephrops</i> Functional Units (FUs) and Management Areas (MAs) around Ireland	415
Appendix II - Restrictions on Mackerel & Herring	416
Appendix III - Cod and Hake Recovery Boxes in 2007	417
Appendix IV - Days at Sea Regulations Areas VIa and VIIa in 2007	418
Definition of Fisheries Technical Terms and Acronyms.	419

## ICES Fishing Areas



An explanation of the acronyms and technical terms used in the Stock Book is found in the appendices.

## Purpose of the Stock Book

The purpose of the Stock Book is to provide the most up to date stock status and scientific advice on those fish stocks exploited by the Irish fleet. The Stock Book is produced annually by the Marine Institute's Fisheries Science Services (FSS) team. It contains impartial scientific advice developed by the team (working with other international scientists) from the latest available research, assessments and advice on the fisheries resource. The book is produced for the Marine Institute's main client, the Department of Agriculture Fisheries and Food (DAFF) (formerly the Department of Communications Marine and Natural Resources (DCMNR)). It is also available to the fishing industry, third level institutes, semi state agencies and the general public. The Stock Book is also available electronically on compact disc and on the Marine Institute's web site at [www.marine.ie](http://www.marine.ie).



The information in the Stock Book is of vital importance in serving Ireland during the annual TAC negotiations at the EU Council of Minister's meeting in December each year. It also serves as a valuable reference throughout the year at other fisheries management meetings with the EU. The Stock Book is of interest to a wider audience, including the fishing industry, fisheries scientists, managers, third level institutes, financial institutions and others with an interest in the status and management of marine fisheries resources in the waters around Ireland.

While every effort has been made to ensure that the Stock Book contains the most up to date and accurate information, the final ICES, ICCAT, STECF reports and various cited reports should be consulted for the official and definitive advice. More detailed information on specific stocks is available in the relevant ICES Working Group Reports. Definitive information on TAC areas and quota allocations should be obtained from the official EU Journal.

## Impartial Scientific Advice for an Important Resource

The waters around Ireland contain some of the most productive fishing grounds and biologically sensitive areas in the EU. There are major spawning areas for mackerel, horse mackerel, blue whiting, hake and cod in Ireland's Exclusive Economic Zone (EEZ) and the biological sensitivity of Irish waters has been recognised in the establishment of the 'Biologically Sensitive Area' in EU Council Regulation (EC) No. 1954/2003. Effort exerted within the BSA by the vessels of each member State may not exceed their average annual effort (calculated over the period 1998-2002).

In 2004 (last available complete data), an estimated 700,000 tonnes of fish were harvested by the international fleets from the Irish EEZ, with an estimated value of € 500 million. Irish landings from the Irish EEZ amounted to 190,000 tonnes (TAC and Inshore -27% of total) with a landed value of € 137 million (27% of total). Total Irish landings in 2004 from all sea areas were estimated at 324,000 tonnes (including TAC and inshore species) valued at €194 million. The Irish fishing industry makes a significant contribution to the economic and social fabric of coastal communities around Ireland's 7,500km coastline.

Fish stocks (excluding the Inshore stocks) are managed by the EU under the Common Fisheries Policy. The main instrument of the CFP are Total Allowable Catches (TAC's) supplemented by various technical measures (e.g. effort control; mesh size). The provision of timely and accurate fisheries advice on the resource base underpins the management framework of the CFP.

## Organisation of the Stock Book

The information contained in the Stock Book focuses on the fish stocks managed by the EU under the Common Fisheries Policy and which are subjected to a Total Allowable Catch (TAC). However, advice on other exploited living resources, of interest to Ireland, are also included (e.g. Inshore stocks). The Stock Book format continues to evolve and this year the organisation of the stock book reflects the move to develop more integrated mixed fisheries and ecosystem advice.

The advice for the TAC stocks is principally based on ICES advice and information. STECF also review fish stocks and their advice generally follows the ICES advice. In such cases, the stock book will not refer to the STECF advice. However, in instances where STECF and ICES advice are different, comment is made on both sets of advice before FSS gives its advice.

The Stock Book is divided into the following parts;

- Introduction
- A new strategic direction for the Irish Seafood Sector
- Spatial and temporal trends in landings around Ireland
- Importance of Sampling to Fisheries Advice
- Industry – Science Partnership Programmes
- The evolving European Policy for reducing discards
- Marine Protected Areas, Why, How and for Whom?
- Reforming ICES Advice and Changes in the timing of ICES Advice
- EC Proposal on fishing opportunities for 2008
- Summary of scientific advice for 2008 with 2007 TAC's
- Summary Ecosystem Overviews for Widely Distributed & Highly Migratory Species, Irish Sea, Celtic Sea, West of Scotland and Deepwater
- FSS Advice for Widely Distributed and Migratory Populations
- FSS Advice for the Mixed Fisheries in the Irish Sea
- FSS Advice for Mixed Fisheries in the West of Scotland and Rockall
- FSS Advice for Mixed Fisheries in the Celtic Sea
- FSS Advice for Deep Water Fisheries
- FSS Advice for other Stocks of Interest to Ireland
- FSS Advice for Inshore Fisheries

#### (1) Area based Ecosystem Overviews

This section provides a general area based ecosystem overview including

- Ecosystem Descriptions
- Physical and Chemical Oceanography
- Human use of the ecosystem
- Ecosystem impacts on fisheries
- Future considerations in developing Ecosystem Advice

#### (2) FSS Advice on Mixed Fisheries

This section gives precautionary approach advice for each area. The advice is driven by the critical stocks in the area.

- FSS Precautionary Approach Advice for Management in 2008 and Implementation Issues related to the advice (contained in the Yellow Box)
- Qualitative Descriptions of the Fisheries
- Decommissioning Schemes
- Recent changes in Fishing Effort
- Fisheries Interactions
- Technical Interactions

#### Single Stock Considerations

The area based ecosystem overviews and FSS advice on mixed fisheries are followed by information on each individual stock. This advice is given in relation to three considerations (1) Long Term Yield (using an  $F_{msy}$  Proxy); (2) Existing Management Plans; (3) Precautionary Reference Points. The individual stock information includes;

- FSS single stock considerations (stock advice from an Irish perspective – contained in the yellow Box). STECF advice is only considered if different from ICES the advice. A new feature of the advice this year is the FSS perspective on the EU decision rules for Fishing opportunities for 2008
- Map of the Fish Stock Assessment and Management Area
- Pie Chart of the Percentage share of the stock TAC's
- Additional information on the stock from an Irish perspective
- Notes on current management
- Summary of Length Frequency profile, Age Profile and Growth profile for the stock (if data are available)
- A summary of the current state of the stocks
- Relevant information on the biology, management, fisheries and assessment of these stocks.
- Short term forecast tables
- Trends in landings, fishing mortality, recruitment and spawning stock biomass in relation to target and limit reference points if available ( $B_{pa}$ ,  $B_{lim}$ ,  $F_{pa}$  and  $F_{lim}$ ).
- FSS considers the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for many of the stocks (see table on page 45).



**Current Management** gives the management and assessment area for the stock and provides the TAC and Irish quota for 2007. Any important points gleaned from ICES advice are highlighted in this section. A map indicates the assessment area in relation to the management area for the demersal and pelagic fish stocks. A pie chart gives the percentage national quota allocation for the TAC.



The **additional information** section provides extra information on aspects of each stock, mainly from an Irish perspective, including information that does not appear in the ICES advice – derived from the FSS stock monitoring programmes and comments from the relevant ICES Working Groups. The complete ICES advice for the stock then follows.

**Special comments** appear in certain stocks that warrant them in relation to the state of the stock or special measures that need to be considered. The special comments highlight important additional information that may have a significant impact on management considerations.

The length frequencies for the international catches (including discards when available) are also plotted for each stock together with the age profile and the size (length) at age of Irish catches. These plots are not included when data were not available (e.g. due to restricted access to samples).

For all the key stocks, FSS have produced plots of the historic trends in biomass, catches, recruitment, and fishing mortality, together with the short term predictions. The short term predictions are not included in these graphs if they are considered to be a poor basis for management advice. The precautionary reference points have been shown on these plots where possible, in order to track the historic trends in each stock relative to the reference points.

These plots are not included if no assessment is available for the stock.



## The Language of Fisheries Advice

The framework used to phrase the advice in relation to the precautionary approach relies on the assessment of the status of the stock relative to precautionary reference points. When an assessment estimates that the spawning biomass is below  $B_{pa}$  ICES classifies the stock as being “**outside safe biological limits**”, regardless of the fishing mortality rate.

When a stock is below  $B_{pa}$ , ICES will provide advice to increase the spawning biomass above  $B_{pa}$ , which may involve reducing fishing mortality to levels below  $F_{pa}$ , possibly by a large amount. If  $B_{pa}$  cannot be achieved in the short term, ICES will recommend the development of a “**recovery plan**” specifying measures to increase SSB above  $B_{pa}$  in an appropriate time scale, depending on the biological characteristics of the stock and other relevant factors.



When an assessment shows that the stock is above  $B_{pa}$  but that the fishing mortality is above  $F_{pa}$ , the stock is classified as “**harvested outside safe biological limits**”. ICES will then recommend that the fishing mortality be reduced below  $F_{pa}$  in the short term.

However, referring to “**safe biological limits**” has in some cases mislead clients and other stakeholders to consider stocks described as being “**outside safe biological limits**” to be biologically threatened (i.e. close to extinction). The term “**outside safe biological limits**” is used in international agreements and has been used by ICES in the past to classify stocks for which the spawning biomass is below  $B_{pa}$ . While ICES considers this language to be perfectly justified and in accordance with international practices the attention of ICES has also been drawn to instances of confusion in the public debate where “**outside biological limits**” has been equated to biological extinction.

ICES has therefore from 2004 used a phrasing which more specifically refers to the concept on which this classification is based by referring to the “**reproduction capacity**” of the stock in relation to spawning stock biomass, and “**sustainable harvest**” in relation to fishing mortality. It should be emphasised that the expressions “**outside safe biological limits**” and “**being at risk of reduced reproductive capacity**” or “**suffering reduced reproductive capacity**” are considered entirely equivalent by ICES and that the change in language does not imply any change in judgement of the seriousness of the situation when a stock is outside safe biological limits and thereby outside precautionary limits.



The present ICES classification scheme is equivalent to the terminology used before:

- Biomass:
  - o stock is **“having full reproductive capacity”** is equivalent to **“inside safe biological limits”**;
  - o stock is **“being at risk of reduced reproductive capacity”** or **“suffering reduced reproductive capacity”** is equivalent to **“outside safe biological limits”**.
- Fishing mortality:
  - o stock is **“harvested sustainably”** is equivalent to **“harvested inside safe biological limits”**;
  - o stock is **“harvested outside precautionary limits”** is equivalent to **“harvested outside safe biological limits”**.

The following terminology for the **“State of the stock”** is used in this report:

For the status relative to SSB: “Based on the most recent estimates of SSB, ICES classifies the stock as ...”

If  $SSB > B_{pa}$  : **“having full reproductive capacity.”**

If  $B_{lim} < SSB < B_{pa}$  : **“being at risk of reduced reproductive capacity.”**

If  $SSB < B_{lim}$  : **“suffering reduced reproductive capacity.”** OR **“at a level where the stock dynamics is unknown and therefore risking reduced reproductive capacity.”** (in the case where  $B_{lim}$  is the lowest observed)

The two last categories were earlier referred to as **“outside safe biological limits”**.

For the status relative to fishing mortality: “Based on the most recent estimates of fishing mortality ICES classifies the stock to be...”

If  $F < F_{pa}$  : **“harvested sustainably.”**

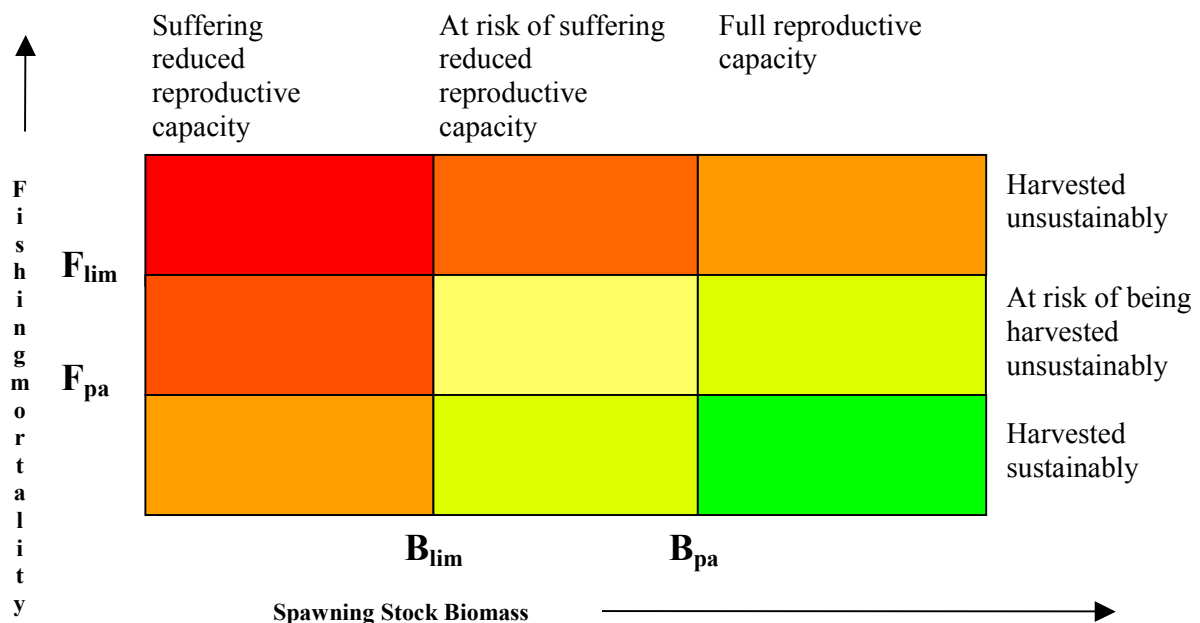
If  $F_{lim} > F > F_{pa}$  : **“at risk of being harvested unsustainably.”**

If  $F > F_{lim}$  : **“harvested unsustainably.”**

Also here the two last categories were earlier referred to as **“outside safe biological limits”**

The introduction of target reference points will necessitate an expansion of categories to include situations relative to targets. This remains to be developed in concert with the development of a framework for target reference points.

## REFERENCE POINTS FOR THE STATUS OF FISH STOCKS



## Fisheries Science Services

Fisheries Science Services (FSS) is one of seven service teams within the Marine Institute. Its mission is to 'research, assess and advise' on marine fisheries in order to ensure the sustainable exploitation of this renewable resource. The provision of impartial scientific advice is critical to achieving this. Data Collection, Data Management, Assessment, Advice and Research form the raw material for the scientific advice. FSS conduct stock assessment and formulate advice with other international scientists at various international fora including the International Council for the Exploration of the Seas (ICES), North East Atlantic Fisheries Commission (NEAFC) and the EU's Scientific, Technical and Economic Committee for Fisheries (STECF). FSS provide scientific advice to the DCMNR on the status and management of these stocks. FSS also conduct a wide variety of fisheries research programmes (both in-house and with third level institutes) aimed at both improving the advice and increasing our understanding of the fisheries resource and the ecosystem.



The detailed data and information required for stock assessment and collated by FSS includes:

- The length distribution of landings
- A profile of the age structure of landings
- Discard information
- The number of boats fishing in a particular area over time
- The catch, time spent fishing, gears used (fleet activity)
- Information on the annual landings into each port
- Data from various research surveys carried out by FSS

Landings are sampled at ports, fishermen's Co-operatives, fish processors and auction sites around the coast by contracted port samplers employed by FSS, as well as other FSS staff. Discards are assessed by a number of Fisheries Assessment Analysts based in the Institute's port facilities at Killybegs, Greencastle, Rossaveal, Castletownbere, Dunmore East and Howth. In 2006 and 2007

there were problems with access to samples in the ports which restricted data availability for many stocks. Research surveys are carried out either on contracted commercial fishing vessels, or on the Institute's own research vessels *Celtic Explorer* and *Celtic Voyager*. These data collection programmes are conducted under the EC Data Collection Regulation (EC Council Regulation 1543/2000) for which the Marine Institute is the Irish National Coordinator, working closely with DCMNR and An Bord Iascaigh Mhara.

FSS sea-going missions include acoustic studies of pelagic stocks, the distribution of fish eggs, larvae and juveniles, under water TV surveys for *Nephrops*, ground fish surveys and fish tagging studies. Summaries on the status of each commercial stock are presented annually to the appropriate ICES Working Group for examination and validation by international experts. This information is then pooled with data from other countries to perform annual stock assessments.

These assessments provide scientific advice on each commercial stock, which, which are then reviewed by the ICES Advisory Committee on Fisheries Management (ACFM) and the EU Scientific Technical and Economic Committee on Fisheries (STECF).

The final scientific advice is then delivered to the EU Commission who manage EU fish stocks under the Common Fisheries Policy

Recently, two very important initiatives have greatly improved the transparency of the ICES advisory process and increased stakeholder participation in the management of EU fish stocks. The first initiative is the opening up of the ICES advisory process to stakeholders (e.g. observers at ACFM). This has been a very positive experience and is an evolving process within ICES. The second initiative is the establishment of Regional Advisory Councils (RAC's) for EU waters. The two RAC's that cover the waters around Ireland are the North Western Waters RAC and the Pelagic RAC. The interaction between scientists and stakeholders will increase co-operation and promote healthy debate on the formulation of scientific advice and on future directions of EU fisheries policy.

## Final Comment

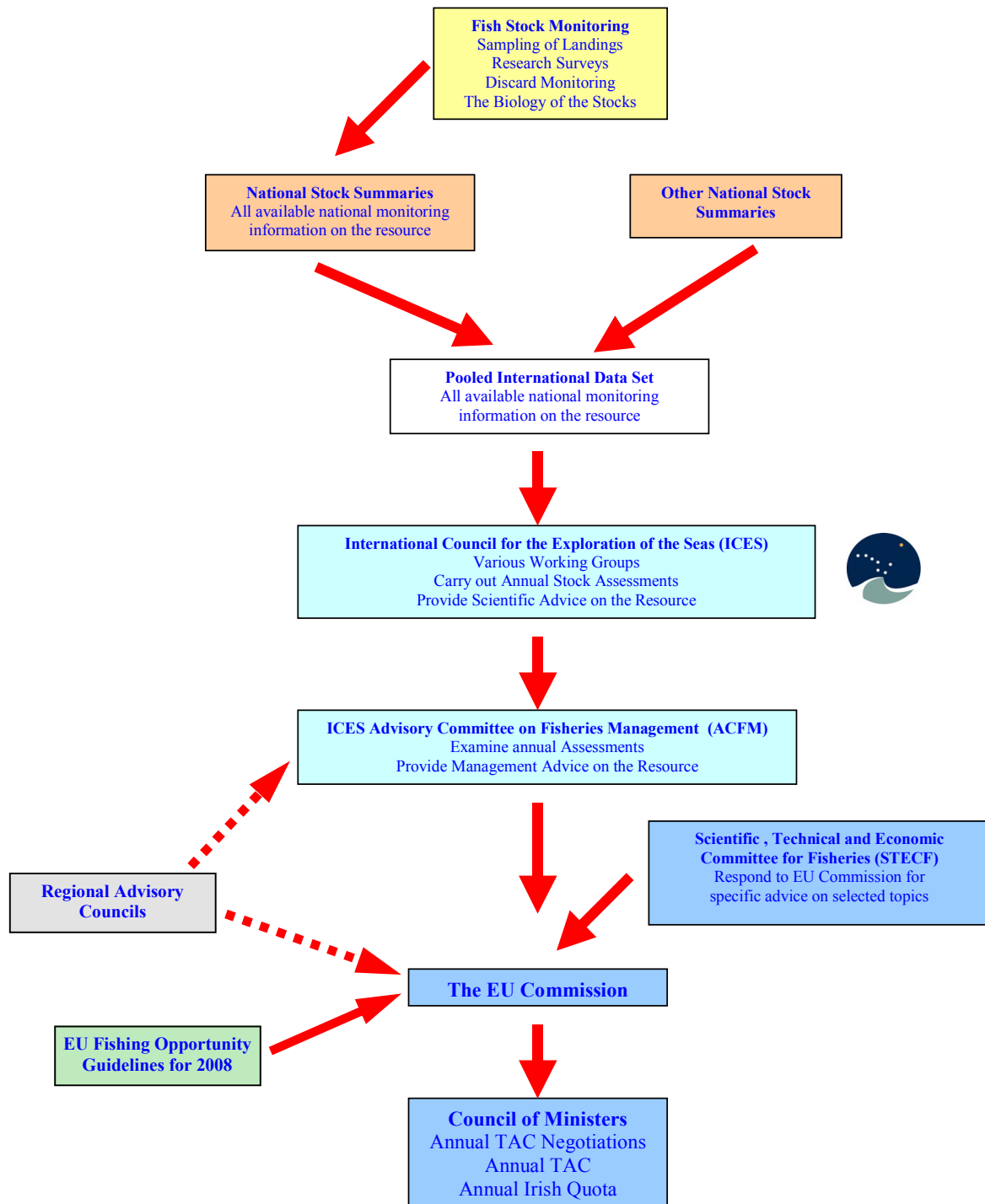
In 2006, the EU have asked ICES to provide their advice earlier in the year so that there can be an extended consultation process between the EU and stakeholders. Currently ICES advice is produced in May and October. The new timing will involve ICES producing advice by June. ICES have revised its Work Programme for 2008 to accommodate the new timing request by the main Client Commission. (see Page 40)

In order to improve the consultation process in community fisheries management the Commission established a

new policy in 2007 whereby fishing opportunities for the following year are set out as early as possible in the year preceding (June). Com (2007) 295 was circulated in June 2007 and set out guidelines for fishing opportunities for 2008. The aim of this approach is to allow for a full consultation with all stakeholders and to ensure equitable and stable fishing opportunities, while having due regard for biological risk (see Page 42) .

This is a time of great change for scientists, industry and for managers. Against a background of climate change, declining fish stocks, fleet overcapacity, reform of ICES scientific and advisory processes, changes in the timing of advice, and the establishment of the RAC's, scientists, industry and managers all face great challenges. The need for 'all of us' to work closely together is greater than ever.

### The Steps involved in the formulation of the annual TAC's





# A New Strategic Direction for the Irish Seafood Sector

Generating total annual income of over €702 million and providing direct employment for some 11,615 people, the Irish Seafood industry is a vital indigenous industry making a significant contribution to the economy in terms of output, employment and exports (Anon 2006a).

In late 2006, two very important strategic documents, that will have a major impact on the Irish Seafood sector were published. The Cawley Report (Anon 2006a) set out a strategic direction for the seafood sector for 2007 to 2013 while Sea Change (Anon 2006b) set out a strategic direction for marine research and innovation from 2007 to 2013.

In launching the Cawley report on 26<sup>th</sup> January 2007, the Taoiseach stated that “the bedrock of the fishing industry is the state of the fish stocks in our waters and the Government is committed to working nationally and at EU level to seek to ensure that the stocks are managed sustainably and rebuilt. Beyond that, we need to restructure the sector to put it on a sustainable development path where it can maximise its potential into the future .”

These two strategic documents will have a major impact on research funding on the fisheries resource.

## Cawley Strategy for Seafood Industry

[www.bim.ie/uploads/text\\_content/docs/96540154%20BIM%20Steering.pdf](http://www.bim.ie/uploads/text_content/docs/96540154%20BIM%20Steering.pdf)

This report sets out a vision for the sustainable, profitable and self reliant seafood industry that will maximise

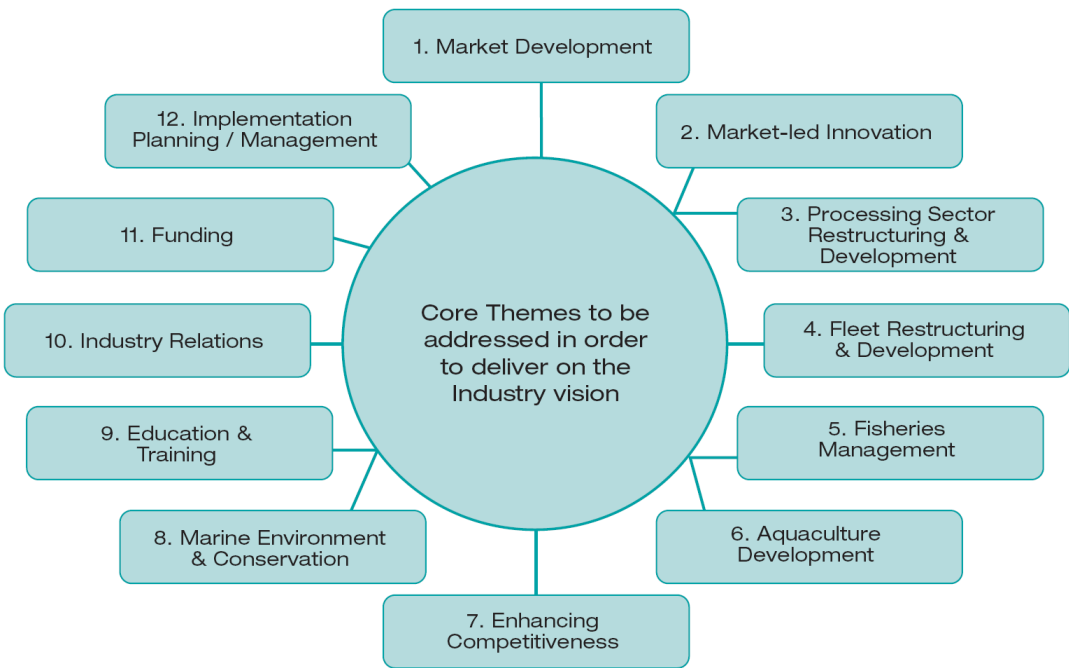
its long term contribution to coastal communities based on fish stocks restored to sustainable levels in the context of a healthy and diverse marine environment.

### Cawley Vision

A sustainable, profitable, competitive and market focused seafood industry making maximum long term economic and social contribution to coastal communities and Ireland as a whole.

This vision will require a more innovative and co-ordinated approach to the marketing of seafood, capitalising on its healthy and nutritious image and maximising the value of seafood at every stage from sea to table. Essential to the achievement of this vision will be a sharp reduction in fishing capacity and effort, more effective management and conservation of fisheries and a much bigger role for aquaculture in meeting the increasing demands for seafood. The Cawley report recognises that achieving these objectives will involve a painful adjustment process for the industry and will also require increased financial commitment by the Irish Government.

In order to ensure that the Irish seafood industry delivers on this vision, Cawley has made a series of recommendations which are focussed on addressing critical issues impacting on the industry’s development. These recommendations which are grouped under 10 core themes which are shown in the diagram below.



Cawley Key Recommendations For Seafood Industry Development

The implementation of the Cawley strategy recommendations and the proposed investment programme will result in a sizable direct and indirect benefit to the seafood industry, the Irish economy and in particular to the coastal/rural communities where the industry is mainly located.

## Sea Change Marine Research and Innovation Strategy

<http://www.marine.ie/home/SeaChange.htm>

This strategy covers the period 2007 – 2013 and provides the framework for a programme of selective and managed investment that will help to maximise the potential of the Irish maritime sector. It presents a knowledge agenda comprising science, research, innovation and management that is aimed at a complete transformation of the Irish maritime economy.

### Sea Change Vision

In 2020, the Irish marine sector will sell into specialised global and local markets in a dynamic, innovative and technologically driven manner, by means of a strong industry research partnership, a skilled workforce and a strategic capability that responds to markets and technology. It will be internationally recognised for its high quality marine environment and characterised by coherent policy and regulation.

The specific mechanisms (Measures; Innovation and Infrastructure Support) designed to implement the strategy are shown in the figure below.

These mechanisms are complimentary and provide a clear and structured implementation framework. The target impact of the strategy is a 50% increase in the size and economic significance of the Irish maritime economy. In addition there a specific North/South regional development, socio economic, public service, environmental and research capacity and capability impacts.

Sea Change addresses the fisheries resource under the Industry Measure. A key objective is to increase the transparency of scientific advice through increased stakeholder interactions and participation and the use of industry knowledge in the scientific advisory process. Other objectives include increasing our understanding of the life history, ecology and socio economic, dynamics and ecosystem role of fish stocks and to build integrated data capacity and knowledge management.

### Final Comment

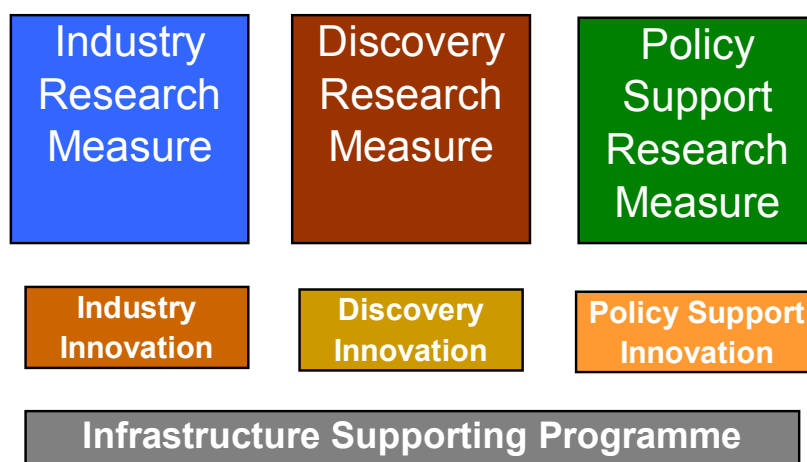
Cawley can be regarded as a “development plan for the seafood sector” incorporating a research component. Sea Change is a “research and innovation strategy for the marine” (including the Seafood Sector), incorporating a development component. It is very important that the two strategic plans work together to achieve their common vision for the seafood sector.

During 2007, many fisheries resource projects that address the objectives of Sea Change have secured funding from various sources and the research work will commence in 2008. In 2007, the major objective for Cawley was to get EU approval for the “Irish Strategic Plan for the Seafood Sector” and to implement the fleet decommissioning scheme. Further projects that will address the key recommendations of Cawley will be funded in 2008.

### REFERENCES

Anon. (2006a) Steering a New Course. Strategy for a restructured, Sustainable and Profitable Irish Seafood Industry 2007 – 2013. Report of the Seafood Industry Strategy Review Group. December, 2006.

Anon. (2006b) Sea Change (2007-2013) A Marine Knowledge, Research and Innovation Strategy for Ireland. Marine Institute, 2006.



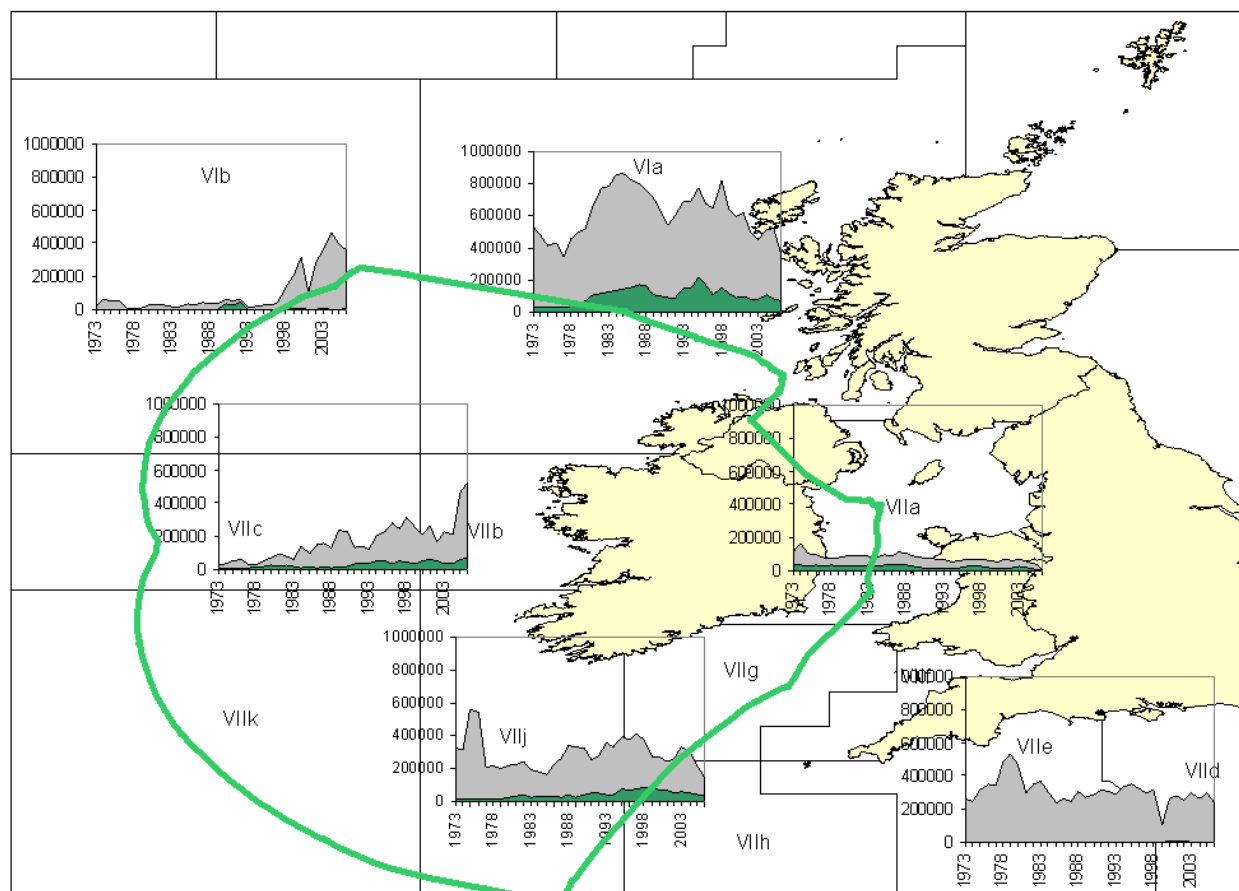
**Sea Change - Key Mechanisms Designed to Implement The Research & Innovation Strategy**

## *Spatial and Temporal Trends in Landings Around Ireland*

Official landings data are reported to ICES for all species, areas, years and countries in the North-eastern Atlantic since 1973-2006 (<http://www.ices.dk/fish/statlant.asp>). The official data may vary somewhat from the best estimates used in ICES assessment working groups where more accurate data is sometimes provided by national scientists. Nevertheless the data can be used as a best estimate of landings of all species from each area.

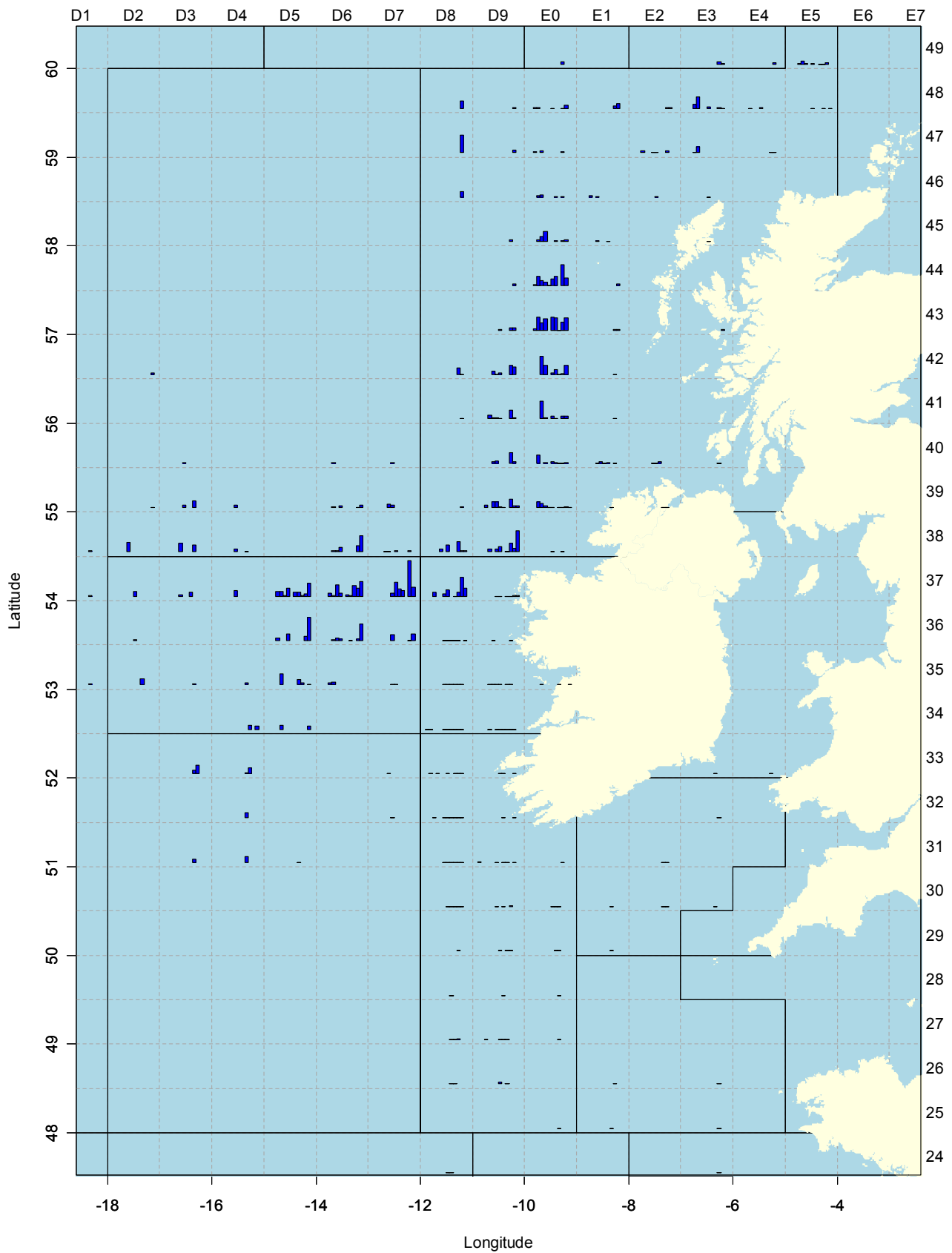
Total landings from waters around Ireland (VI and VII excluding the English Channel VIId&e) for 2006 are around 1.4 million tonnes, close to the average the last decade (1.5mT). The spatial distributions of these landings are shown in Figure 1. Finer scale spatial resolution of the landings, e.g. by statistical rectangle, is not collated internationally. In last years Stock Book some approximations were made to gestimate the volume and value of landings within the Irish EEZ. This work cannot be significantly improved upon this year so the focus has been on the finer scale spatial and temporal distribution of Irish landings.

The following figures show the annual reported landings by all Irish vessels by statistical rectangle for all TAC species as recorded in the daily operations section of the logbook. The time series available is from 1995-2006. For each species the graphs are scaled relative to the maximum landings reported in any individual rectangle over this time series. The objective is to give an impression of the relative importance of rectangles for each species and some indication of the temporal trends in each rectangle. Landings of the demersal species are concentrated around Ireland but for the small pelagic a wider distribution has been used to take into account landings in the northern parts of the North Sea.

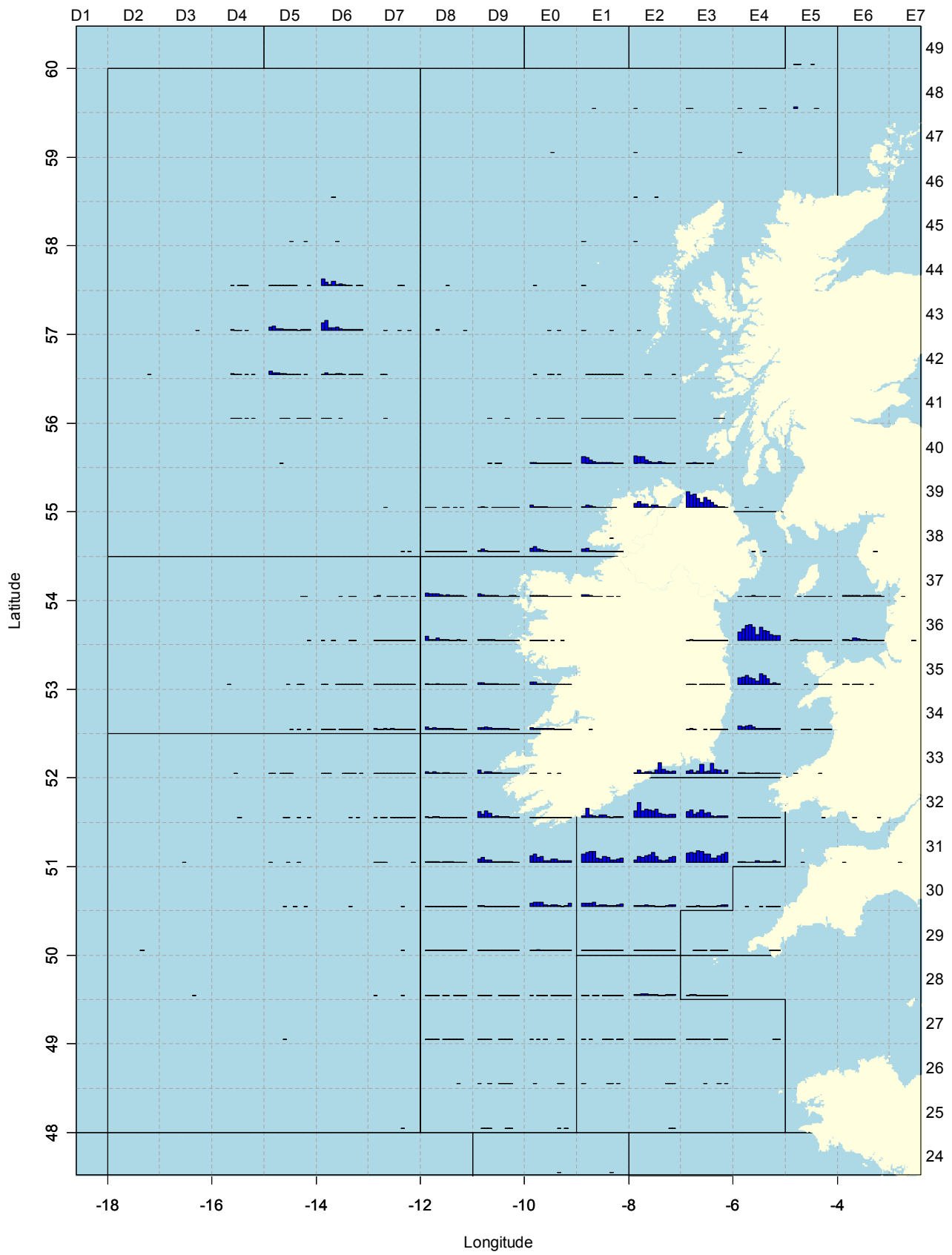


**Figure 1:** International and Irish landings as reported to ICES since 1973 by ICES Division. (note: Landings for France are not available for 1999 and landings are grouped for VIIbc, VIIf,g,h,j,k and VIId,e.).

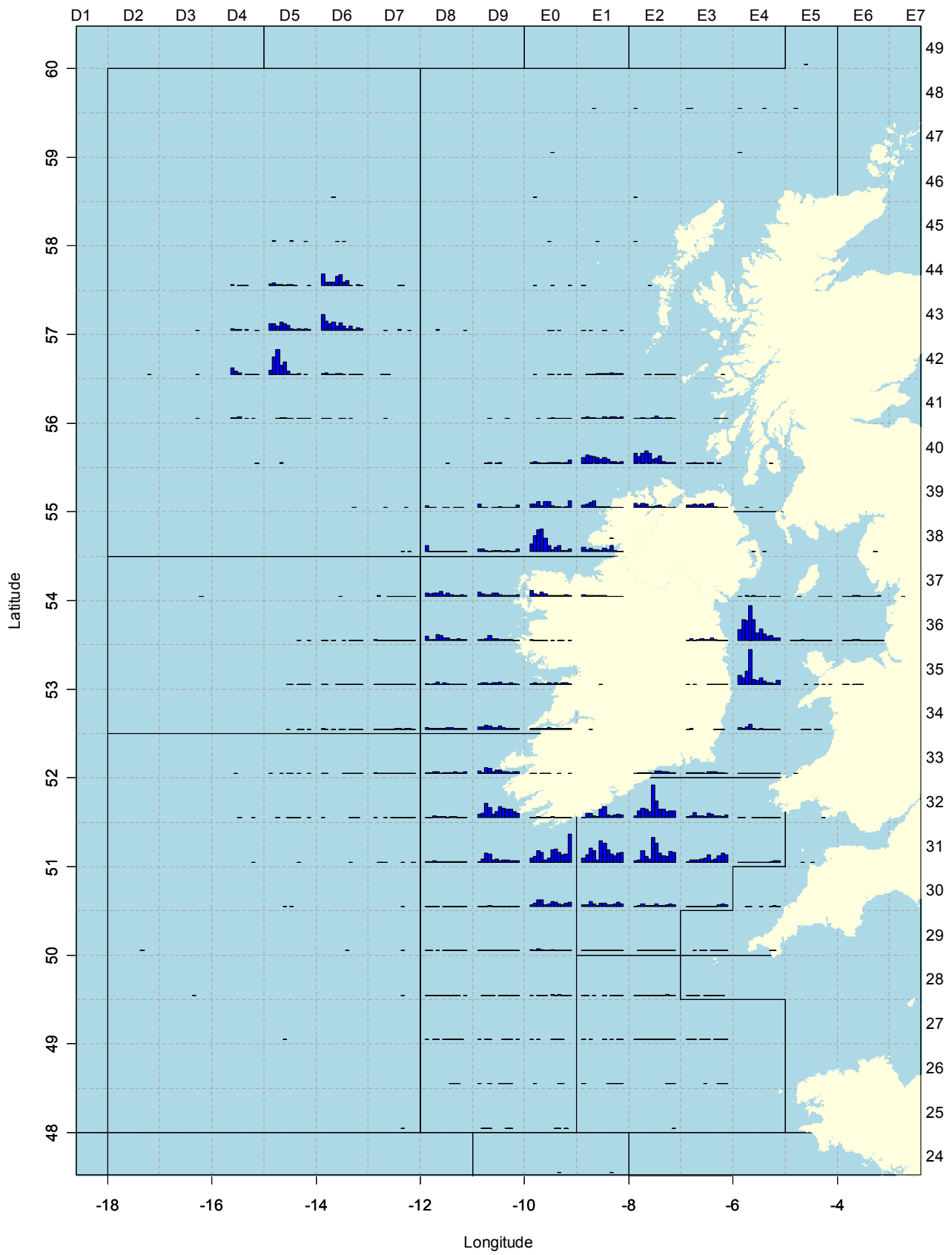
**Blue Whiting relative landings by rectangle 1995-2006**



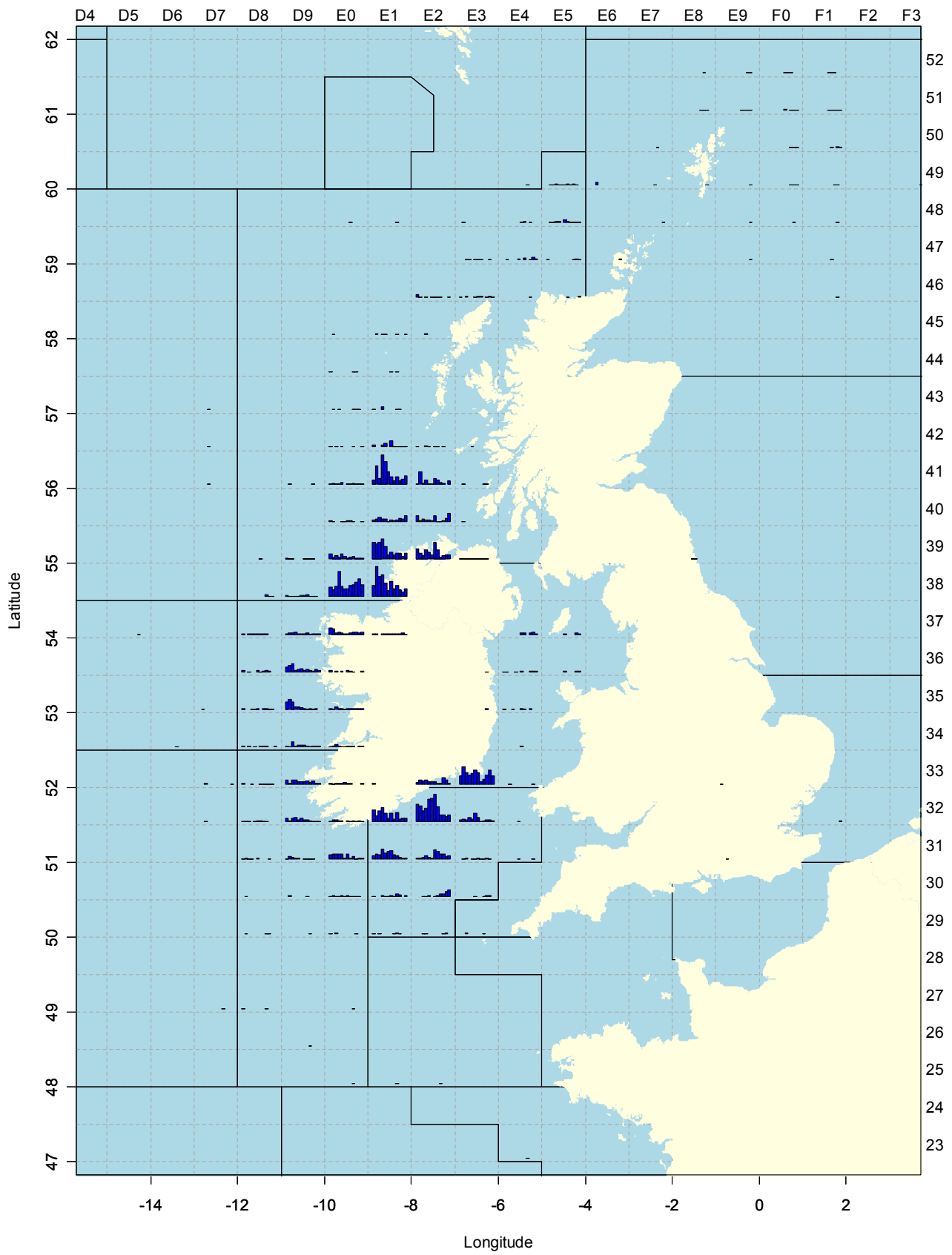
**Cod relative landings by rectangle 1995-2006**



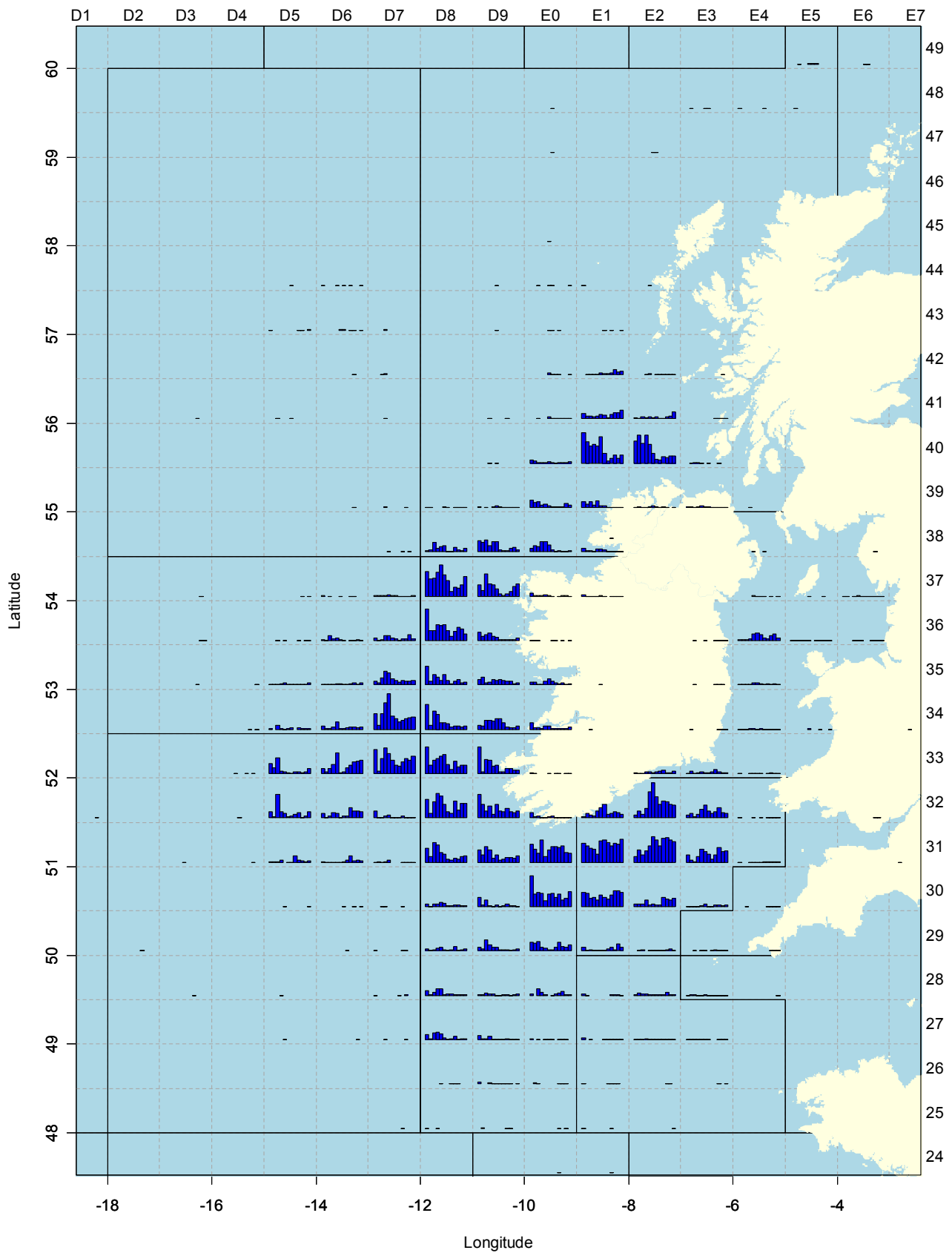
**Haddock relative landings by rectangle 1995-2006**



**Herring relative landings by rectangle 1995-2006**

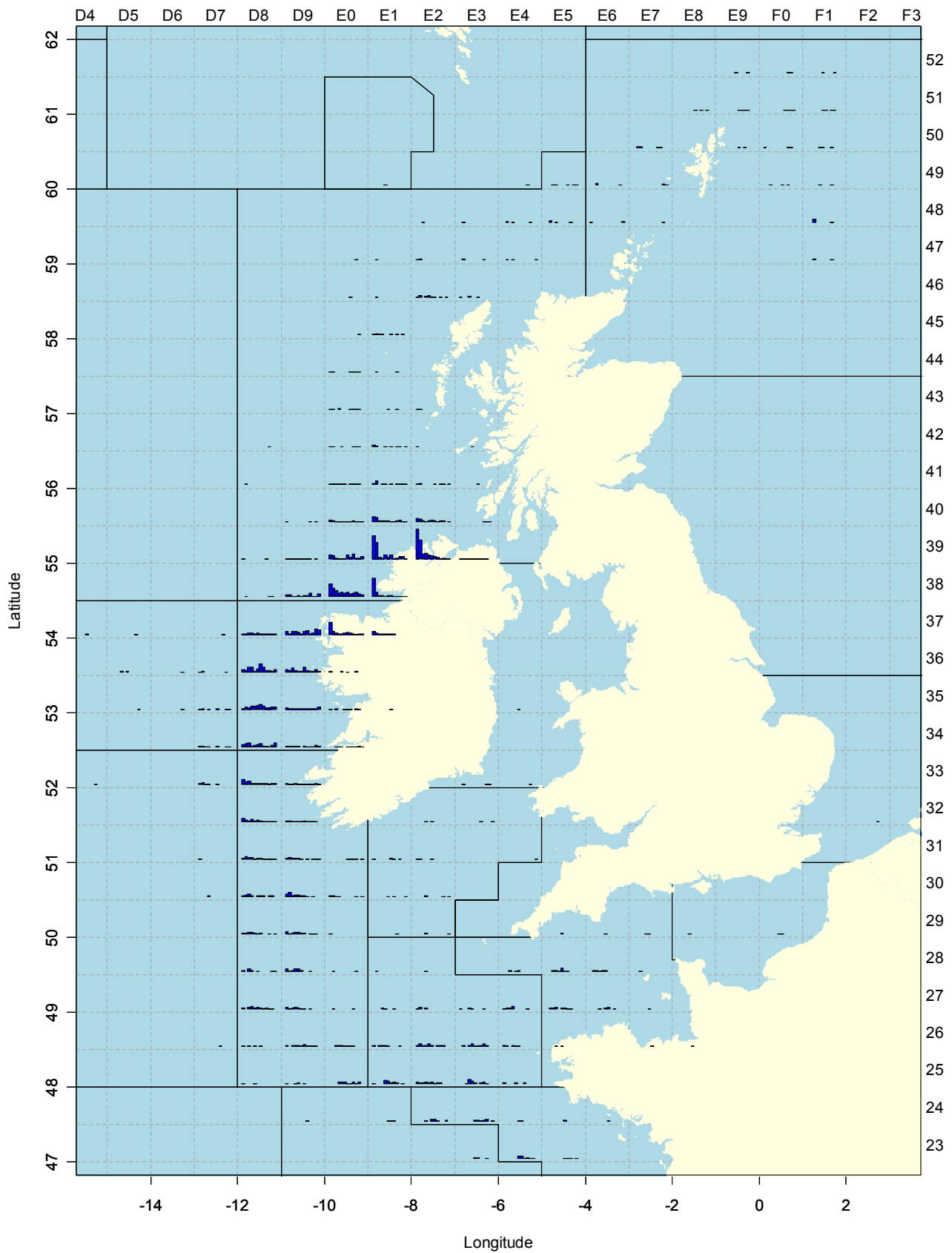


**Hake relative landings by rectangle 1995-2006**

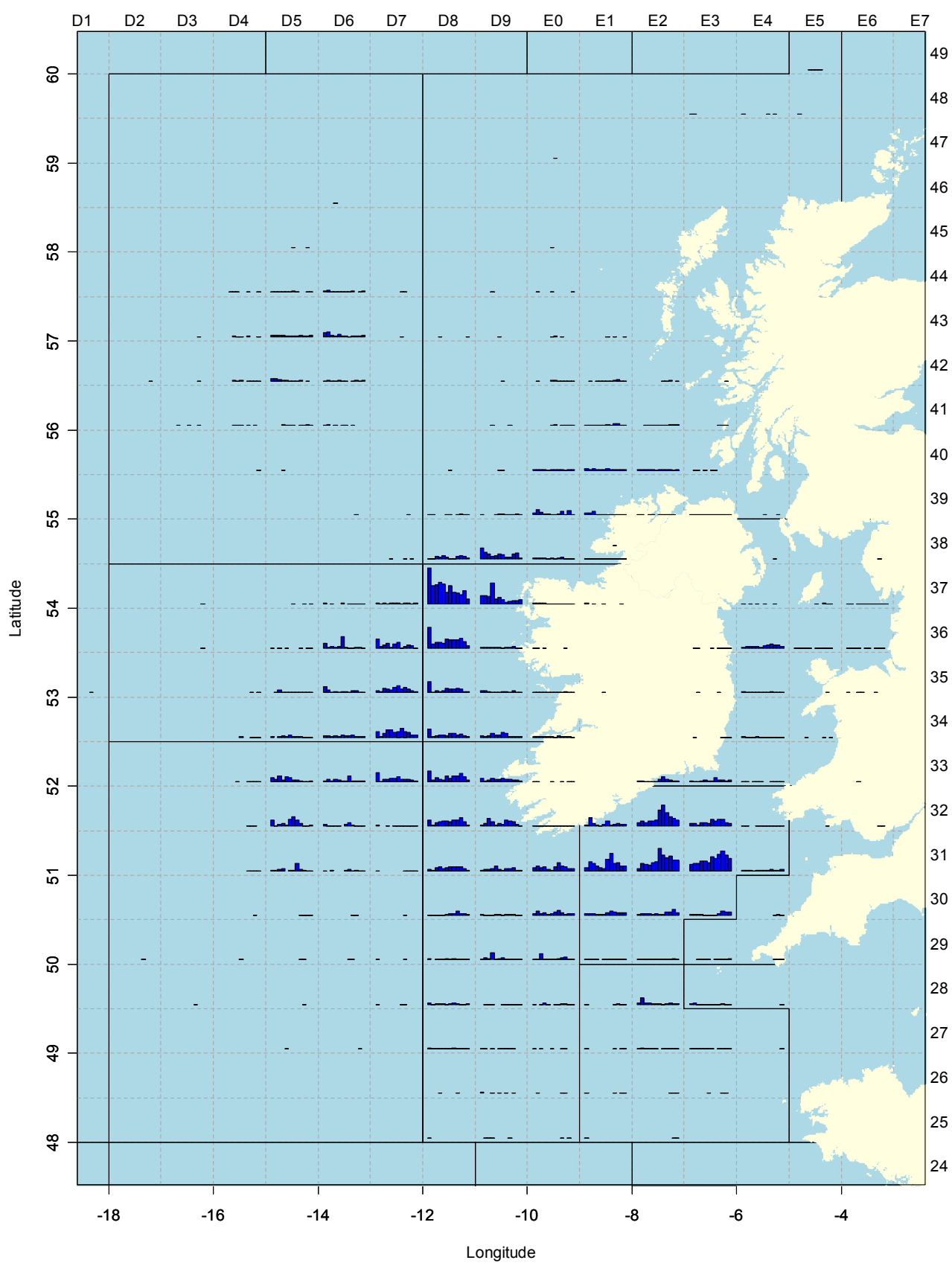




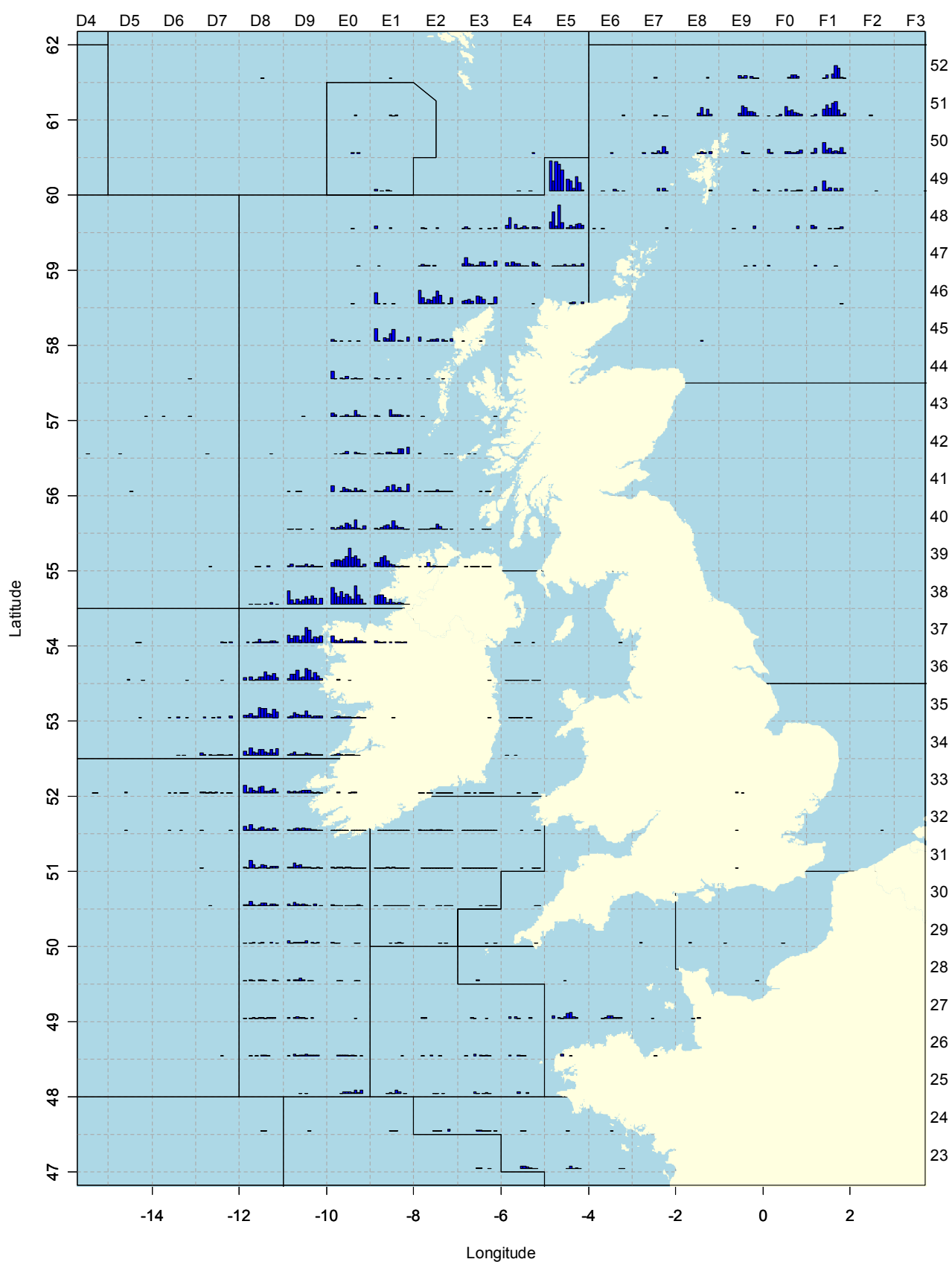
**Horse Mackerel relative landings by rectangle 1995-2006**



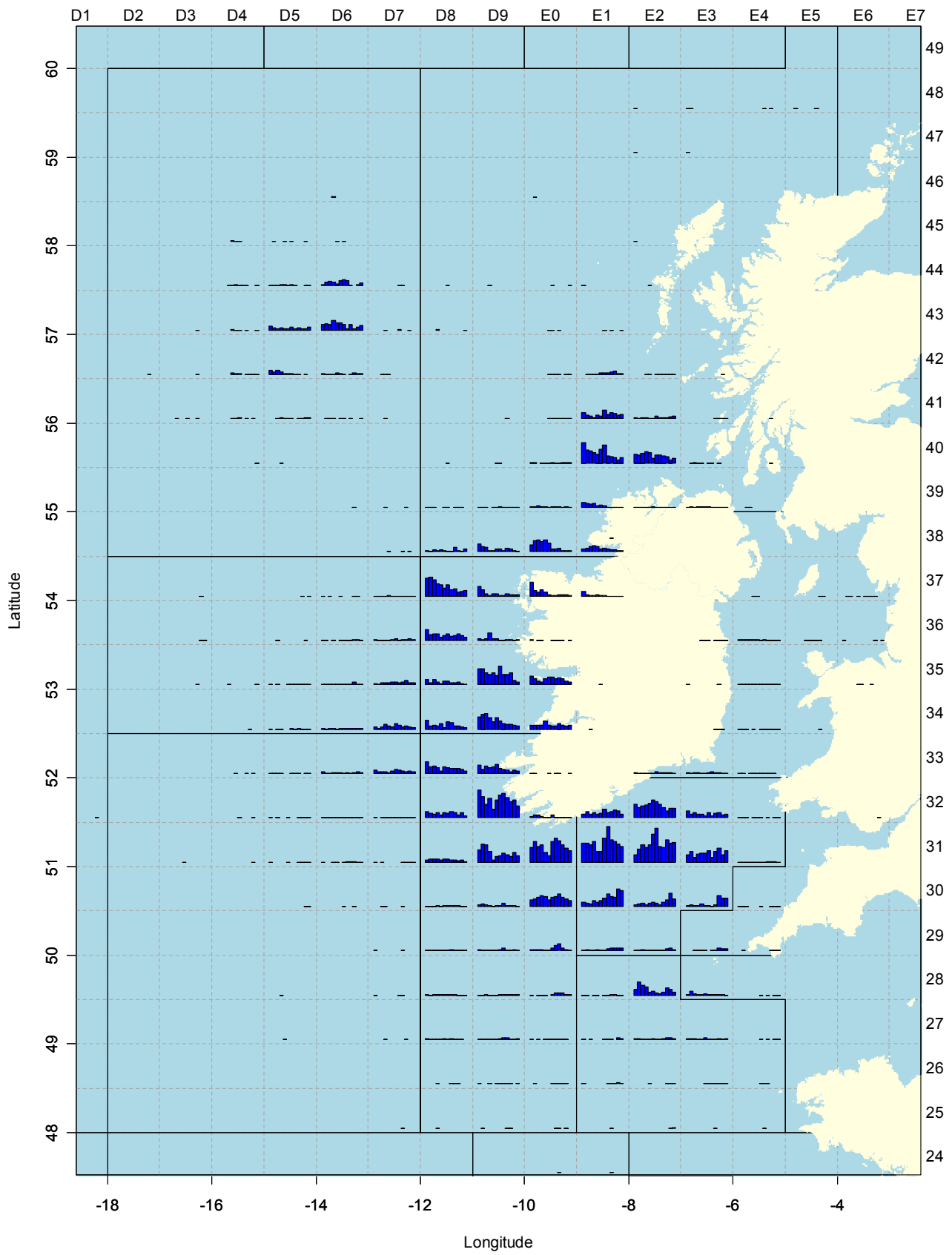
**Ling relative landings by rectangle 1995-2006**



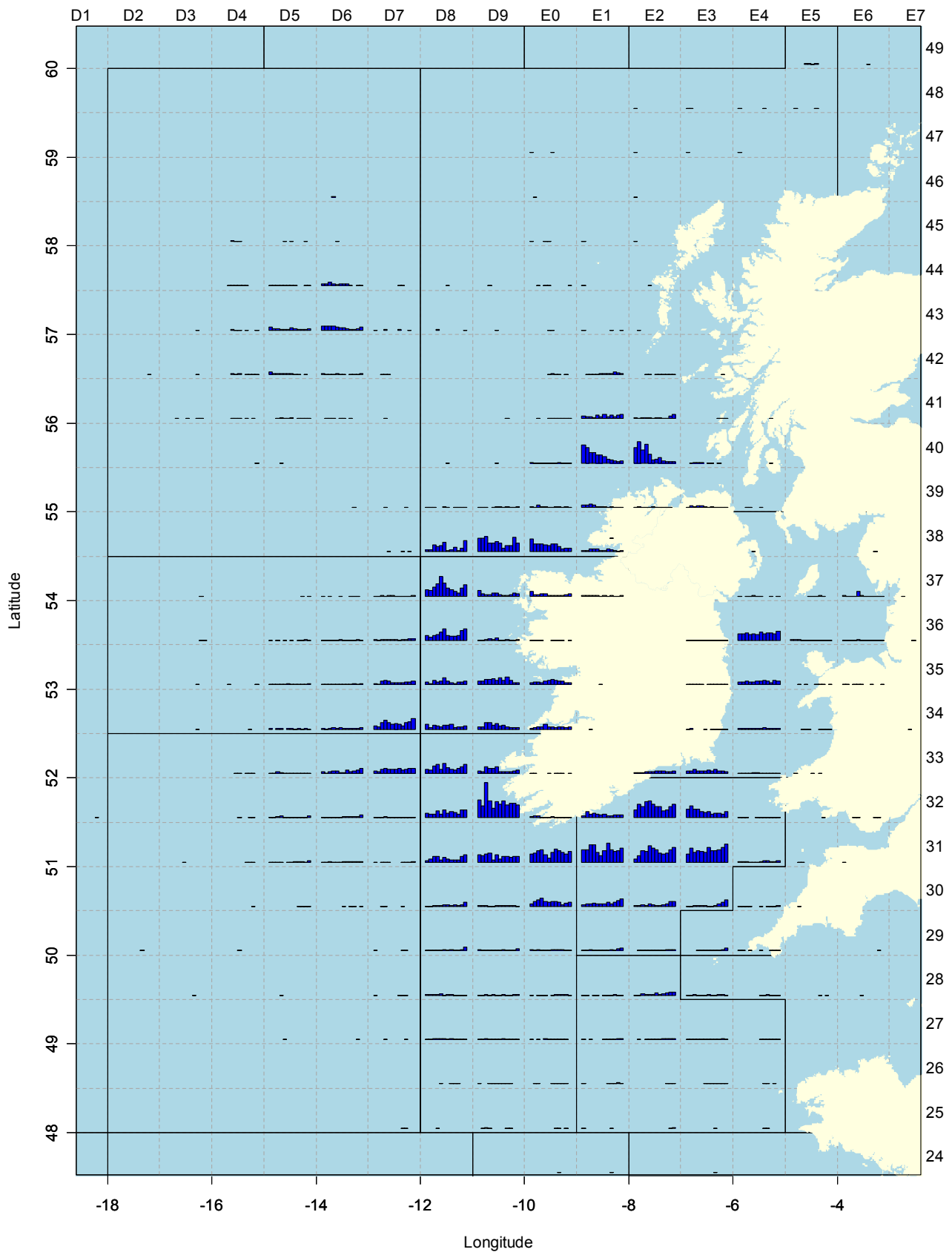
**Mackerel relative landings by rectangle 1995-2006**



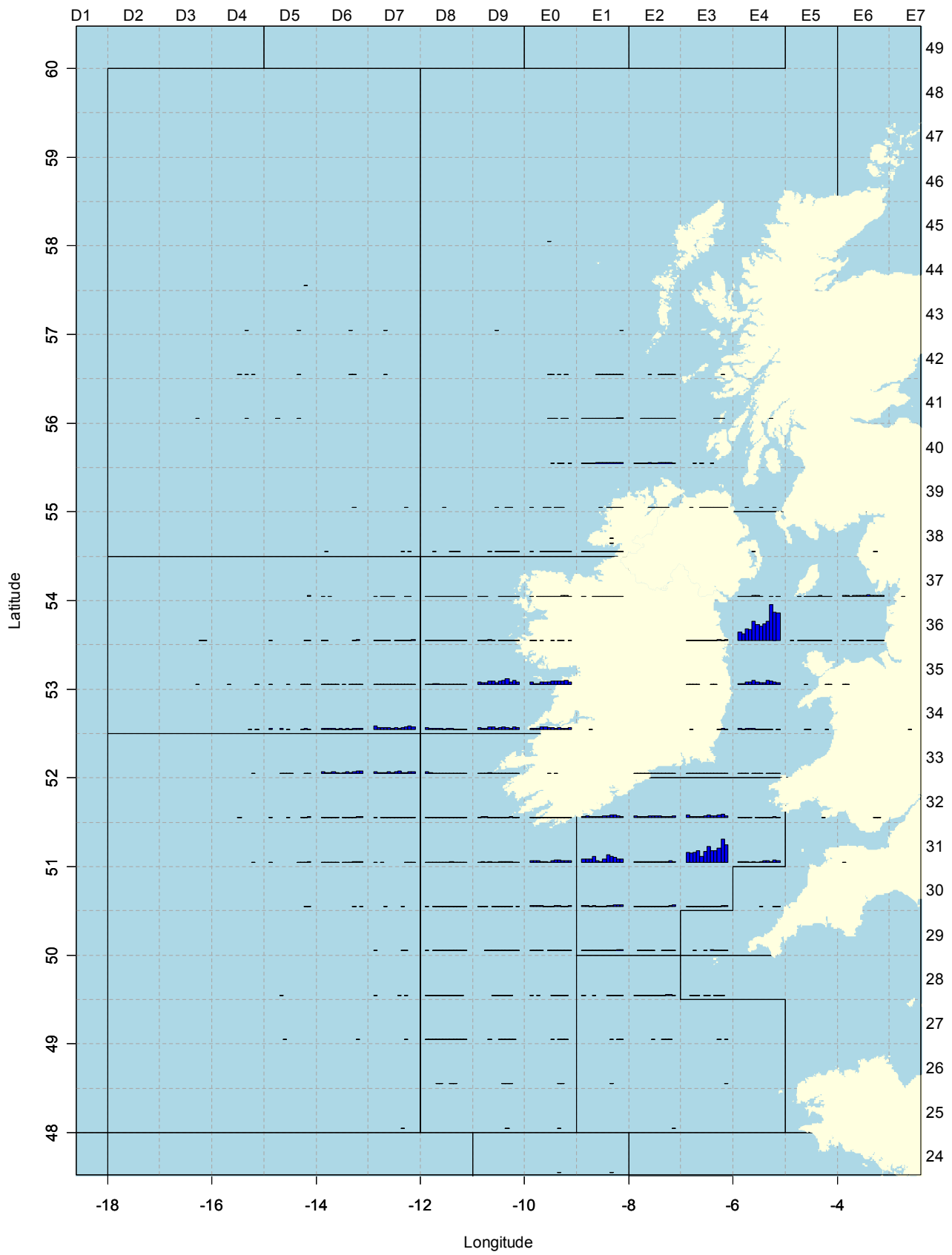
**Megrim relative landings by rectangle 1995-2006**



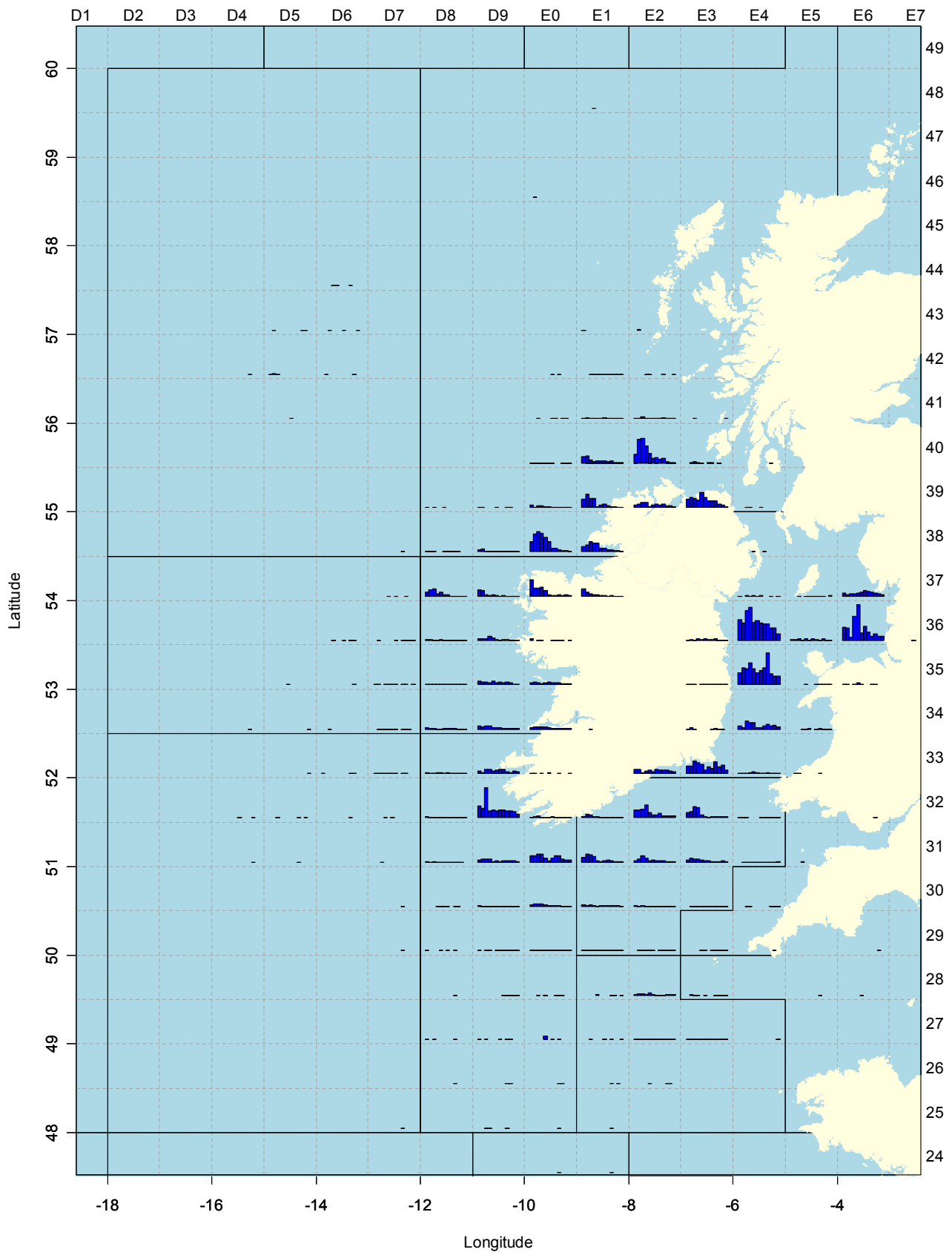
**Monk/Angler relative landings by rectangle 1995-2006**



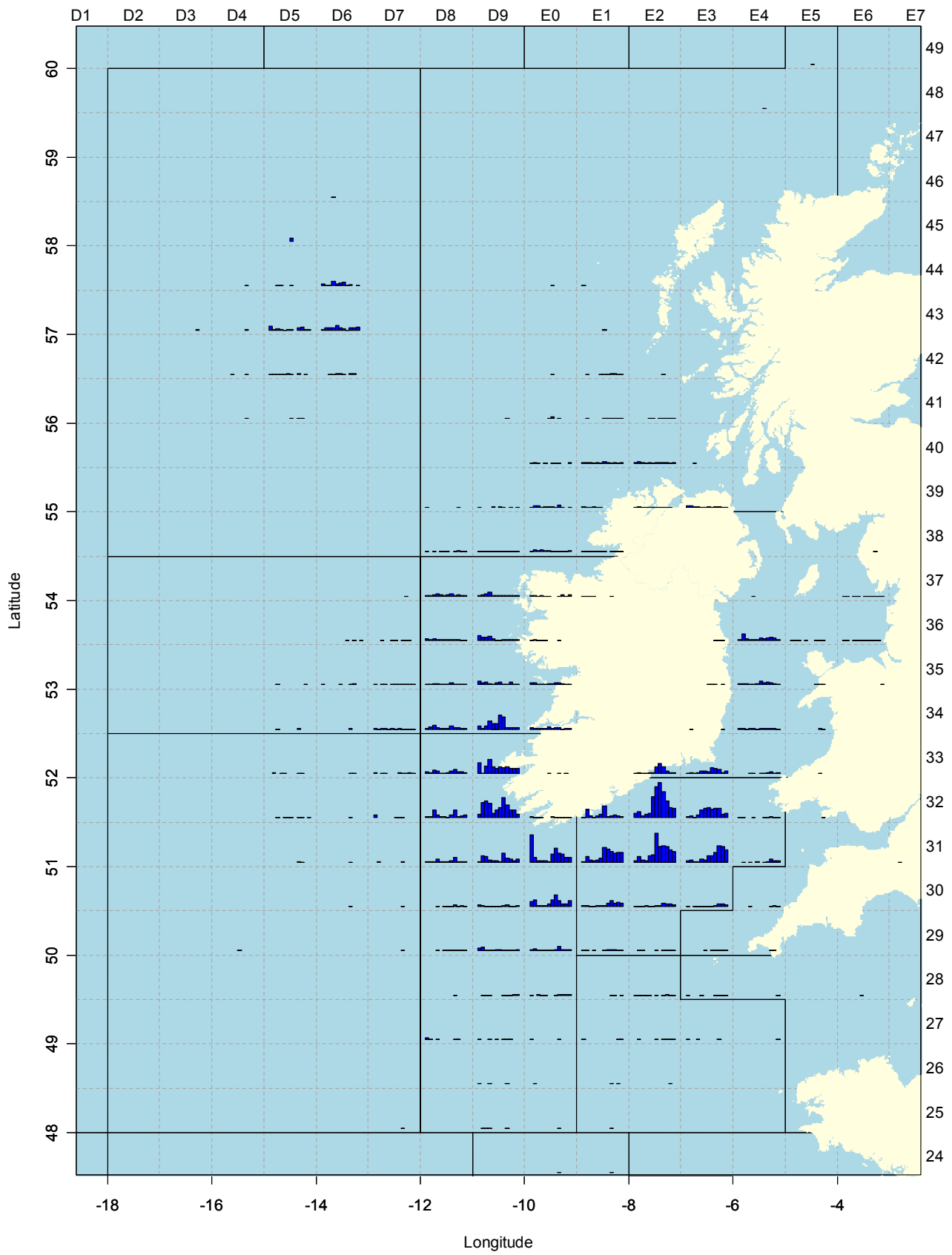
**Nephrops relative landings by rectangle 1995-2006**



**Plaice relative landings by rectangle 1995-2006**

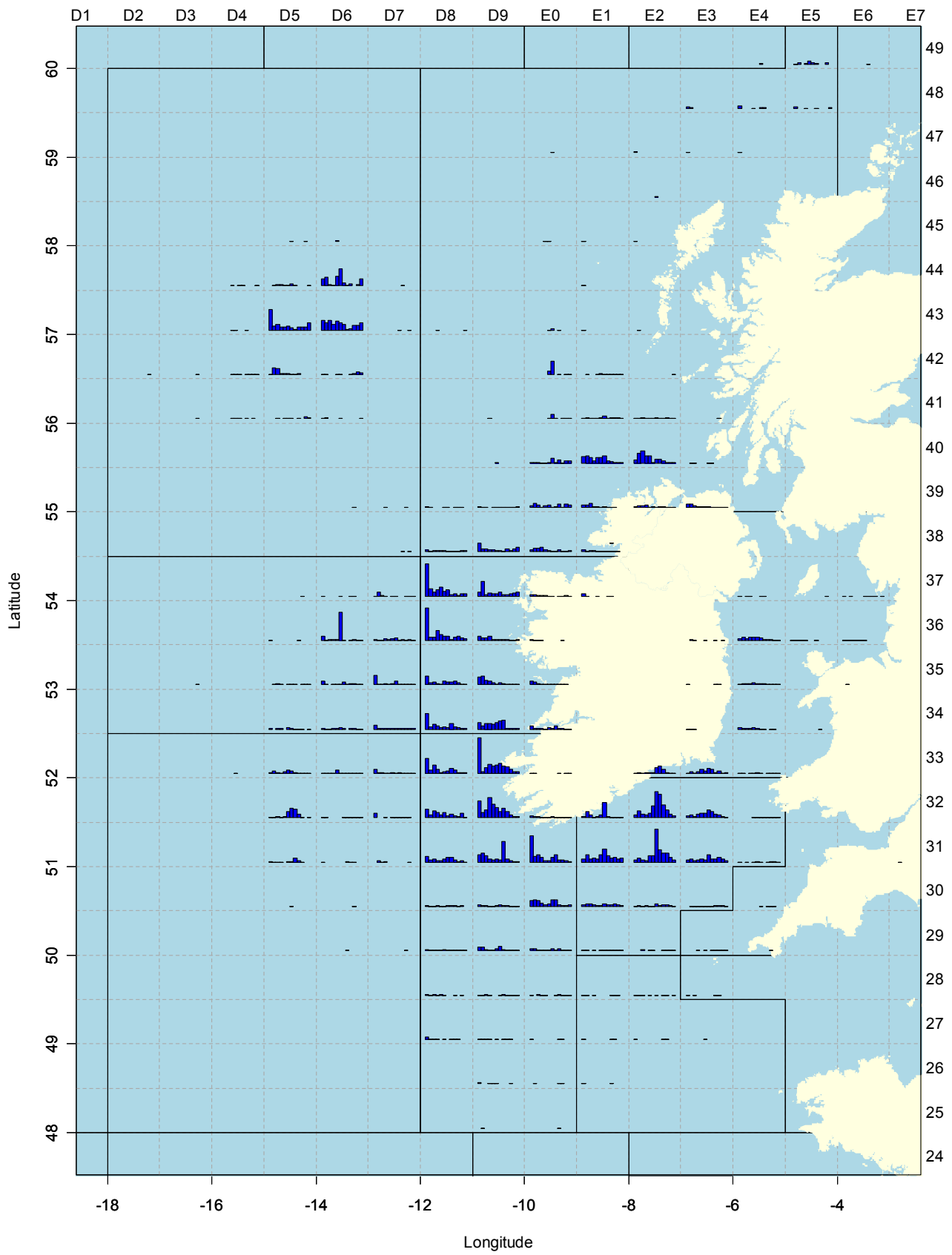


**White Pollock relative landings by rectangle 1995-2006**

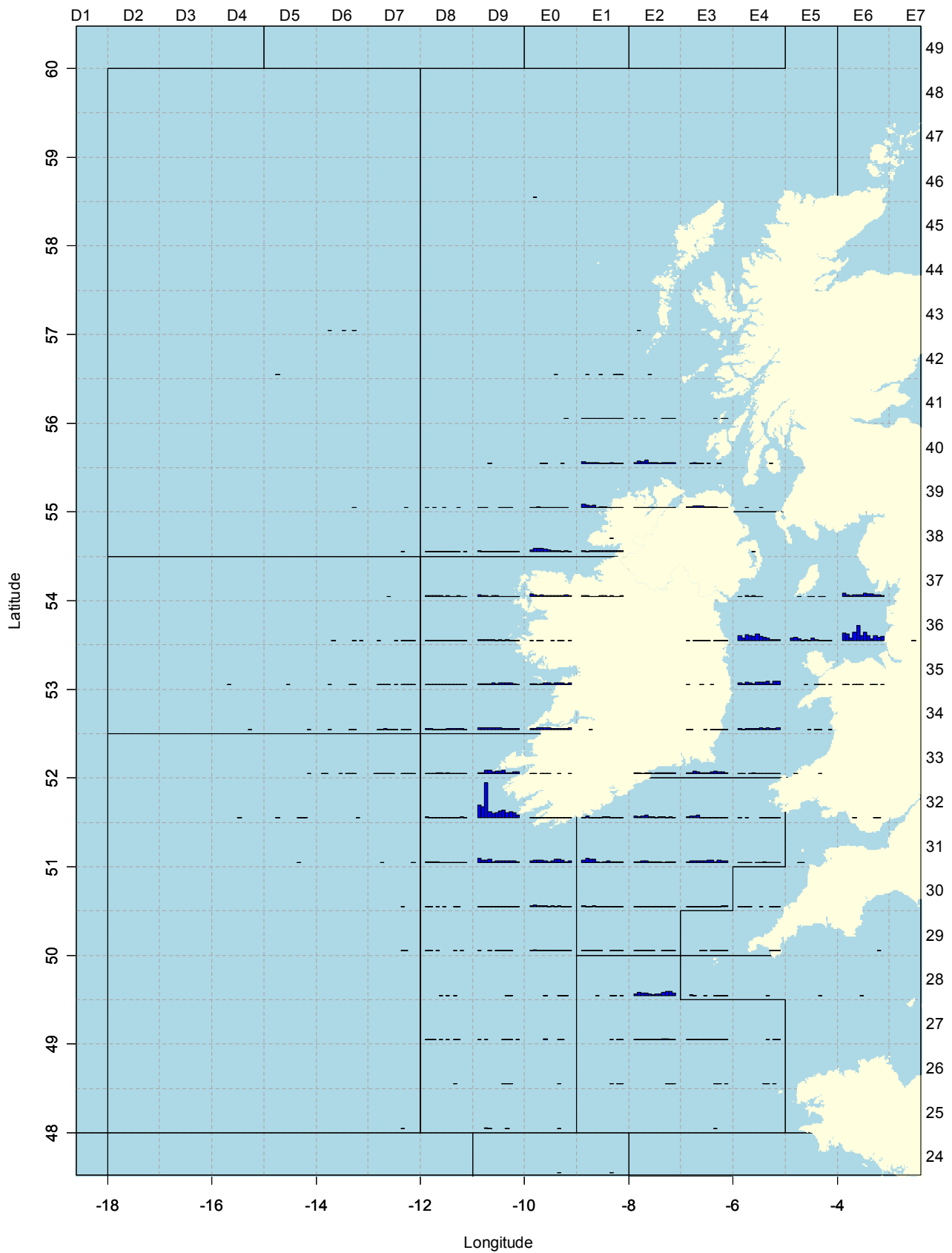




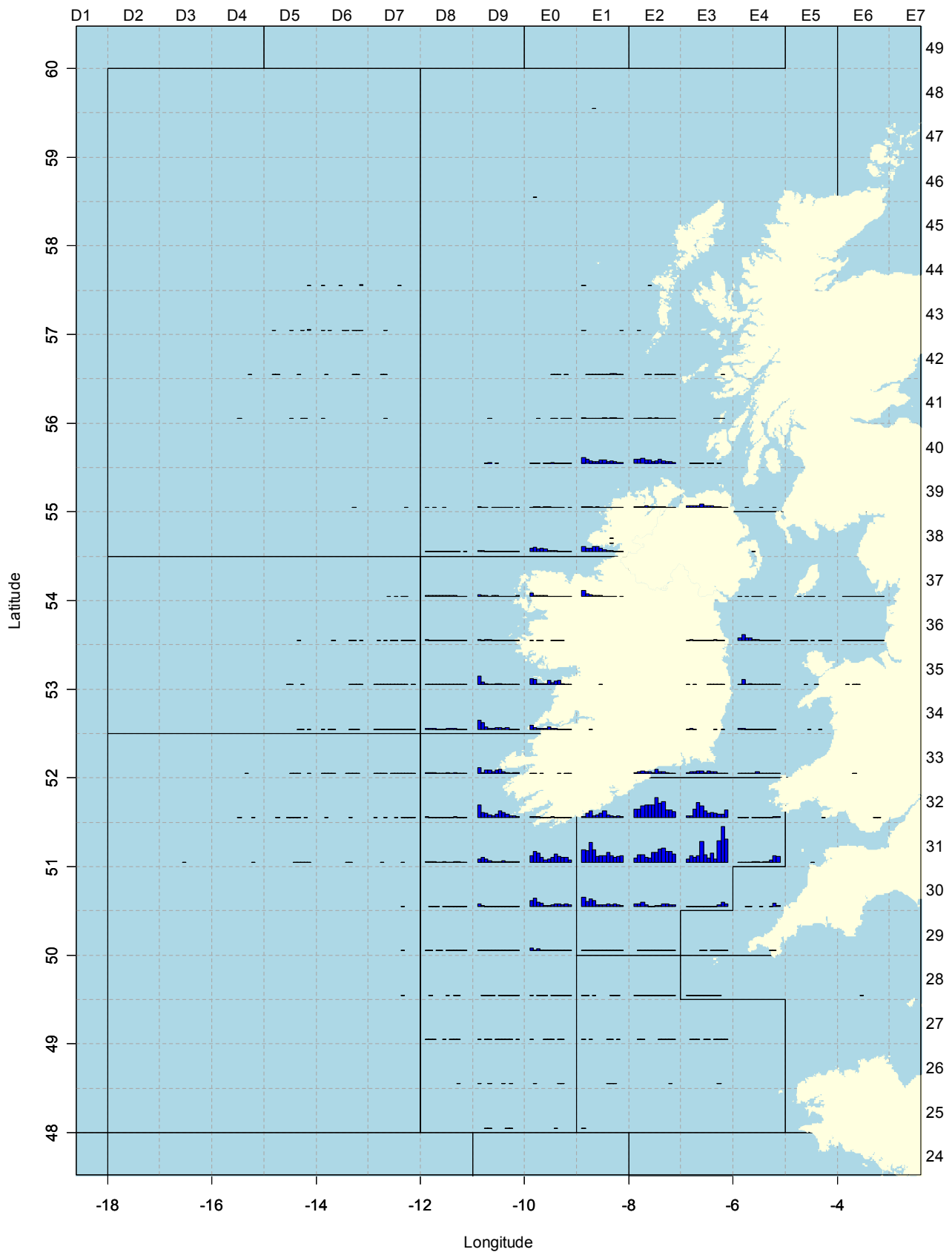
**Saithe relative landings by rectangle 1995-2006**



**Common Sole relative landings by rectangle 1995-2006**



**Whiting relative landings by rectangle 1995-2006**



## *Importance of Sampling to Fisheries Advice*

A key objective of fisheries science is to collect good data and information on the various stocks exploited by the industry. This data and information are collected through various sampling programmes and the data and information are used to assess the status of the resource and provide scientific advice on their sustainable exploitation.

There are two main sources of data collected and used by fisheries scientists, fishery independent and fishery dependent data. The first usually involves monitoring the temporal and spatial changes in the relative or absolute abundance of fish populations using surveys in a way that is not subject to the biases inherent in commercial fishery data. Fishery dependant data involves collecting and analysing biological data (age, length etc..) of the fish caught, together with data on the quantities of fish caught and the fishing effort.

All age structured assessment models used by scientists require accurate estimates of the number, weights and age of all fish removed from the population by various fisheries. These should include both landed and discarded fish. The main aim of a discard sampling programme is to characterise fish catches in terms of numbers at age and mean weight at age.

Length distributions of landed fish can be obtained from samples taken in the auction halls, at ports, on quays sides, or at sea on commercial vessels. Generally, the length sampling is carried out by area, gear and time to ensure that the estimated size distribution is accurate. In addition, Marine Institute scientists collect data on the age and weight-at-length from these samples. Sampling allows scientists to monitor differences in growth and age from year to year

Discard sampling allows scientists to quantify that part of the catch that is not landed at the ports. The Marine Institute currently carries out a discard observer scheme. At-sea sampling of fishermen's catches provides the most reliable method of acquiring data on the quantity and species composition of discards. Collecting information on discards facilitates the re-construction of the whole catch for a particular species, which is extremely important in stocks where the discards are a substantial part of the catch. Without this, the data collected would be based solely on information from the commercial markets. Size and age samples of discards permit the estimation of the discard size at age composition of the discarded catch, which often differs considerably from that of the landings.

The sampled length frequency information for either landings or catch can be converted to ages using age-length keys derived from the relationship between age and length. Ages are estimated using a small bone found

in the head of fish called the otolith. Counting the rings on these otoliths gives an estimate of the age of the fish (similar to the rings of a tree). The total numbers of fish caught at each age group in each year are combined to produce annual catch numbers-at-age for each assessed stock. Looking at the age structure of the catches or landings over a number of years reveals important information about the dynamics of the stock. For example an increase in younger fish entering the stock may signal strong recruitment or a decrease in the older fish in the catches may signal over exploitation.

Stock dynamics can be captured in age based stock assessments where a good time series of data allows recruitment, fishing mortality, stock size and yield (catch or landings) to be estimated over a longer time scale (10+ years normally). Scientists can then advise stakeholders on the biological risk to the stock and appropriate levels of exploitation, which would allow long-term sustainability of the stock and the industry.



In late 2005 a section of the Irish fishing industry withdrew its co-operation with the Marine Institute for sea and market sampling in several ports across the country. This non co-operation had considerable consequences for the Irish sampling programme. Essentially no market sampling was possible from ICES Divisions VIa, VIb and VIIb, resulting in no data being made available for a wide range of commercially important species including *Nephrops*, monkfish, hake, haddock and cod. Extremely limited data on the fisheries was presented to the major ICES stock assessment working groups convening in 2007. Table 1 gives the number of sea sampling trips carried out between 2003 and 2006. Sea sampling in 2006 was severely curtailed. Table 2 outlines the port sampling data collected for the main commercial species for 2003 to 2006. In 2006 no Irish data were available to the working groups for a large number of stocks.

However limited discard sampling recommenced in 2007, in ICES Divisions VIIa, VIIb, VIIg and VIIj. and during the year the situation has continued to improve, with many skippers and Co-operatives now re engaging with Marine Institute sampling programmes. By year end the discard programme should achieve 75% of its sampling targets. In terms of market sampling there are still outstanding issues that need to be resolved to ensure access to sampling sites in certain areas. It is envisaged that on going dialogue between the Institute and the Irish industry will result in full sampling programmes in 2008

The consequences of a breakdown in the provision of sampling data cannot be under estimated, as it severely hampers the provision of accurate stock assessments and efforts to produce management advice. This is not just a problem for 'scientists'. The inability to track stock dynamics inherently increases the perceived biological risks of exploitation. This increasing uncertainty will ultimately result in more conservative advice and reduced TACs. This is already the case for several stocks where the assessments are based on surveys, providing only relative information on stock trends. In these situations it is not possible to give accurate indications of catch levels consistent with management targets agreed by stakeholders. Additionally the trend towards the sourcing of fish for consumers from sustainably managed fisheries is becoming increasingly more important. An essential element of the accreditation programmes attached to sustainably managed fisheries, is the provision of good scientific data from which the stock health can be assessed.

The importance of sampling is illustrated for West of Ireland and Irish Sea cod stocks. In these stocks EC now proposes a year-on-year reduction of 25% in TAC and effort until the stock situation improves. Therefore, the resumption of a full and comprehensive sampling pro-

gramme is needed to assess whether the stock situation has improved or not. The TAC and effort reductions applied to cod (or potentially other critical stocks) could also be applied to other species where mixed fisheries linkages exist. Only comprehensive port and at sea sampling programmes can prove that fisheries do not catch cod or other critical stocks. Another important example is where stocks may be increasing but it is not possible to show if an expansion of the fishery is sustainable e.g. *Nephrops* or Haddock in VIIb-k. In such situations unnecessarily restrictive TACs may be applied in the absence of better scientific information.

The Marine Institute considers that fishers need to be an integral part of the sampling and data collection process. Given the state of many fish stocks it is essential that scientists, managers and industry work closely together. The Irish industry together with the Marine Institute and BIM have set up self-sampling projects for the collection of detailed catch data from vessels operating in the Irish Sea (VIIa). During 2006/2007, in collaboration with the Irish and UK industry, the NWWAC, national Irish and UK laboratories and administrations, the Irish Sea Enhanced Data Collection Programme was initiated. The consortium secured additional days at sea allocations from the EC to encourage vessels to participate in the voluntary programme. Progress has been good, with a number of skippers delivering biological samples and diary information on a regular basis. It is intended that this programme is carried over into 2008. The Marine Institute and BIM have also recently resourced several other Industry-Science Partnership projects aimed at providing new survey data for Celtic Sea cod and Western Waters anglerfish (see section on Industry – Science Partnership Programmes)

**Table 1: Number of Sea Sampling Trips conducted by Marine Institute**

	Number of Demersal Sea Sampling Trips									Total
	Vla	Vlb	VIIa	VIIb	VIIc	VIIe	VIIg	VIIj	VIIk	
2003	7	0	9	11	1	0	11	13	1	53
2004	10	0	11	24	7	0	18	18	1	89
2005	7	0	8	15	3	0	14	16	1	64
2006	1	1	6	4	0	0	2	5	0	19

	Number of Pelagic Sea Sampling Trips (includes tuna trips)									Total
	Vla	Vlb	VIIa	VIIb	VIIc	VIIe	VIIg	VIIj	VIIk	
2003	0	0	0	0	0	0	0	2	2	4
2004	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	1	0	0	0	0	1

Table 2: Port Sampling conducted by Marine Institute

MARINE INSTITUTE PORT SAMPLING	2003	2004	2005	2006
<b>Widely Distributed and Migratory Populations</b>				
HERRING - Norwegian Spring Spawning Herring (Sub-areas I & II)				
MACKEREL - North East Atlantic Mackerel				
HORSE MACKEREL - Western Horse Mackerel				
HORSE MACKEREL - North Sea Horse Mackerel				
BLUE WHITING - Combined Stock (Sub-areas I-IX, XII and XIV)				
ALBACORE TUNA - North Atlantic				
BLUEFIN TUNA - East Atlantic and Mediterranean				
PORBEAGLE - North East Atlantic Porbeagle				
SPURDOG - North East Atlantic Spurdog				
BLUE SHARK - North Atlantic				
<b>Irish Sea</b>				
COD - Irish Sea Cod (Division VIIa)				
WHITING - Irish Sea Whiting (Division VIIa)				
HADDOCK - Irish Sea Haddock (Division VIIa)				
NEPHROPS - Irish Sea Nephrops (FU15)				
PLAICE - Irish Sea Plaice (Division VIIa)				
SOLE - Irish Sea Sole (Division VIIa)				
HERRING - Irish Sea Herring (Division VIIa North)				
<b>West of Scotland and Rockall</b>				
COD - West of Scotland Cod (Division VIa)				
COD - Rockall Cod (Division VIb)				
HADDOCK - West of Scotland Haddock (Division VIa)				
HADDOCK - Rockall Haddock (Division VIb)				
WHITING - West of Scotland Whiting (Division VIa)				
WHITING - Rockall Whiting (Division VIb)				
MEGRIM - West of Scotland and Rockall Megrim (Sub-area VI)				
ANGLERFISH - West of Scotland, Rockall and North Sea Anglerfish (Sub-areas IV and VI)				
NEPHROPS - West of Scotland Nephrops (Division VIa) FU11-13				
PLAICE - West of Scotland Plaice (Sub-area VI)				
SOLE - West of Scotland and Rockall Sole (Sub-area VI)				
POLLACK - West of Scotland and Rockall Pollack (Sub-area VI)				
SAITHE - North Sea Saithe (Sub-areas IV, VI and Divisions IIa, IIIa-d)				
HERRING - West of Scotland Herring (Division VIa North)				
<b>Celtic Sea</b>				
HAKE - Northern Hake (Divisions IIa, IIIa-d, Vb, VIIIabde Sub-areas IV, VI, VIII, XII and XIV)				
COD - Celtic Sea and Western Channel Cod (Divisions VIIe-k)				
COD - West of Ireland Cod (Divisions VIIb,c)				
HADDOCK - West of Ireland and Celtic Sea Haddock (Divisions VIIb-k)				
WHITING - Celtic Sea and Western Channel Whiting (Divisions VIIe-k)				
WHITING - West of Ireland Whiting (Divisions VIIb,c)				
ANGLERFISH - Celtic Sea and Bay of Biscay Anglerfish (Divisions VIIb-k and VIIIa,b)				
MEGRIM - Celtic Sea and Bay of Biscay Megrim (Sub-area VII and Divisions, VIIIa,b,d,e)				
PLAICE - Celtic Sea Plaice (Divisions VIIf,g)				
PLAICE - Southwest of Ireland Plaice (Divisions VIIh-k)				
PLAICE - West of Ireland Plaice (Divisions VIIb,c)				
SOLE - Celtic Sea Sole (Divisions VIIf,g)				
SOLE - Southwest of Ireland Sole (Divisions VIIh-k)				
SOLE - West of Ireland Sole (Divisions VIIb,c)				
NEPHROPS - Porcupine bank (FU16)				
NEPHROPS - Aran Grounds (FU17)				
NEPHROPS - Inshore south of Ireland Nephrops (FU19)				
NEPHROPS - Southern Irish Sea and Celtic Sea Nephrops (FU20-22)				
POLLACK - West of Ireland and Celtic Sea Pollack (Sub-area VII)				
SAITHE - West of Ireland and Celtic Sea Saithe (Sub-area VII)				
HERRING - Celtic Sea Herring (Division VIIaS, VIIg-h, VIIj-k)				
HERRING - North west of Ireland Herring (Divisions VIa South & VIIb,c)				

	Data available for WGs (Working Groups)
	Incomplete Data for WGs.
	No Data for WGs.



## Industry-Science Partnership (ISP) Programmes

Industry-Science Partnership (ISP) programmes aim to foster collaboration between the fishing industry and scientists through the co-commissioning of scientific projects. The selection of projects and their scientific objectives also provide an opportunity for industry to identify and discuss their priority issues. In addition, they have been used to test the current views of the status of stocks and to address perceived gaps in scientific surveys and sampling programmes. They are intended to complement and strengthen fisheries science programmes and engage the industry in the collection of fisheries data. Since their inception in the early 2000's, the UK ISP programmes have largely focussed on the use of commercial vessels and gears for the development of new survey data and the testing of gear selectivity. Information from surveys are now increasingly used to supplement fisheries data for stock assessment purposes. During 2006 and 2007, the Marine Institute together with BIM, the Irish Industry and the NWWVRAC, initiated and resourced several national and international ISP projects:

- Irish Sea Data Enhancement Project (VIIa)
- Anglerfish Tagging and Stock Survey (VI and VII)
- Celtic Sea Cod and Herring Recruitment Survey (VIIg,i)

### Irish Sea Data Enhancement Project (ISDEP)

#### Objectives:

- **Collection of detailed catch (landing and discards) and effort data**
- **Develop a fisher self-sampling programme**
- **Development of alternative management strategy**
- **Collection and analysis of fishers knowledge**

The ISDEP aims to gather robust, accurate and detailed information on catches (landings and discards) from the prawn and whitefish trawl fisheries from the Irish Sea. This was initiated by the Irish and UK fishermen's organisations and the North Western Waters Regional Advisory Council to provide improved data on catch and discards for stock assessment purposes and to investigate alternative management approaches for Irish Sea fisheries. It is supported by the Irish and UK fisheries administrations and science laboratories and funded through Ireland's NDP Supporting measures for Sea Fisheries Development Programme. To provide additional incentive, the Irish and UK national administrations have obtained additional days at sea allocations for vessels participating in the project. The Marine Institute has recently employed additional staff to work on the project and this will augment the existing observer programme as well as train

skippers and crews to collect and record catch and discard data. In addition to the collection of catch information, the project is also developing methods for the collection and inclusion of fisher's knowledge of the stocks and views on fisheries management, ultimately it is intended that this information is used to support the science and advisory process.



### Anglerfish Survey

#### Objectives

- **Provide absolute abundance estimates for VI<sub>a</sub> (south) and VII<sub>b-k,j</sub> Angler stocks**
- **Obtain information on Anglerfish movement through tagging experiments**

The fisheries for anglerfish around Ireland are highly important to a number of key fleets. However, due to data issues, largely as a result of restrictive quotas and recent changes in fishing patterns in recent years, the quality of anglerfish assessments and the management perception of the distribution of the stock are considered unreliable. In 2005 the Marine Laboratory in Aberdeen initiated a pilot stock abundance survey in the North Sea, Rockall and the Northern Part of the West of Scotland. In addition, the Scottish Fishermen's Organisation set up a diary programme for the collection of accurate catch data. In 2006, Irish funding through the NDP funded the extension of the Scottish survey into the southern part of VI<sub>a</sub>, the waters to the west (including the Porcupine) and south of Ireland. In order to ensure that the results from the survey being conducted by the Aberdeen lab are directly comparable with the Irish data, it was necessary to use the same procedures and gear used by the Marine Laboratory. As part of the Irish survey it was decided to tag as many fish as possible. To date 750 fish have been released, two tags have been returned. The 2007 survey will be conducted in November and December. In addition to the standard tags used in 2006, 100 fish are due to be fitted with electronic data storage tags (DST). If recaptured, these will provide detailed information on the movements of the fish. A €100 reward is given for the

return of the fish and the DST tag, while €20 (plus the value of the fish) is given for the return of the normal ribbon tagged fish.



### Celtic Sea Cod and Herring Recruit Survey

#### Objectives

- **Design and development of a suitable demersal survey trawl to track cod recruitment**
- **Design and development of a suitable pelagic survey trawl to track herring recruitment**
- **Identification of key survey areas using fishers knowledge of stock**
- **Provide additional information on cod movement through tagging experiments**

Industry has ongoing concerns about the quality and reliability of the assessments of Celtic sea and herring. From a scientific view, there appears to be a number of issues associated with the commercial catch data for cod due to discarding (undersize fish and high grading) as well as access to market sampling. In addition, for both cod and herring, current scientific surveys do not track the strength of juvenile fish coming into the fishery (recruitment) particularly well. In recognition that surveys that adequately monitors the strength of the incoming recruitment to both fisheries is needed, MI and BIM together with the ISWPO, ISEPO and commercial net makers have set up a project to design and test a new survey trawl for this purpose. The design of the new survey trawl will closely follow existing commercial designs and commercial vessels used for the annual surveys. Interviews of fishers will be conducted in early 2008 to determine the appropriate design of surveys, this is central to the project. The group would like to obtain information from fishers on the location of juvenile cod and herring, the times of year and local conditions that may affect changes in catches.

### Future Irish ISP projects

It is important that Ireland continues to build on the ISP work that has been done by Federation of Irish Fishermen, the Marine Institute, BIM and DAFF (DCMNR) over the past two years. The projects have fostered better communication between the industry and scientists, highlighted the need for good quality data and provide fisher's with a better understanding of the scientific process. It should be noted that for stock assessment purposes, it is necessary to build up a time series before ISP surveys can be used. Therefore for the full benefit of these programmes to be realised, a long term resource commitment is necessary.



# The Evolving European Policy for Reducing Discards

## The discard problem

The FAO defines discards as that part of the catch returned to the sea as a result of economic, legal or other considerations. This definition, adopted by the EU, includes both commercial and non-commercial species and while non-commercial species may be of no economic interest, their mortality can have significant ecological impact. A recent evaluation by the FAO estimates that over 7.3 million tonnes are discarded annually across the world with almost 18% (1.3 million tonnes) of this attributed to fisheries in the North East Atlantic (Kelleher, 2005).

FSS has been monitoring discarding in Irish demersal fisheries since 1993 (see Borges et al. 2005). For the sampled portion of the Irish demersal fleet, around 20,000 tonnes of fish caught (or 1/3 of the total catch) are discarded (Table I). Approximately one-quarter of the catch of otter trawlers and “Scottish” seiners is discarded, while two-thirds of the catch of beam trawls is discarded. Furthermore, otter trawl fleet components (defined by the area visited, targeted species and gear used) discard between 20 and 60% of their catch. Discards usually comprise 11 fish species per haul in the 3 gears types studied. This constitutes a minimum estimate for the Irish demersal fleet given that not all fisheries were sampled. A significant proportion of discards is small commercial species and given the poor status of many of these, reducing discarding would clearly be of benefit to the stocks and the fleets that exploit them.

The reasons for discarding are many and varied and complex comprising legal, economic, environmental and biological factors (Figure 1). The FAO (Kelleher, 2005) have highlighted the problem within EU waters succinctly: *There is greater species diversity in waters under the jurisdiction of EU members than the more northerly European wa-*

*ters. The dominance of demersal trawl gear and high discards by the important shrimp, Nephrops, and flatfish trawl fisheries are major factors that contribute to high aggregate discard rates in EU Atlantic fisheries. Overfishing of demersal stocks is also a primary contributing factor to the high level of discards in many of these fisheries. MLS and quota regulations, weak market conditions for smaller-sized fish and a diminishing proportion of larger-sized fish in some fisheries contribute to regulatory discards and highgrading in EU waters. A lack of definition of manageable fishery units and the wide geographical range of many important stocks throughout the waters of several member states mitigate against the formulation of bycatch and discard management plans.*

## Discard Policy Options for the EU

Clearly, there is room for reducing discard levels in EU fisheries and increasing political appetite to reduce discards (Anon, 2002; 2004). The EC are signatories to a number of binding international agreements that require reductions in discards and unwanted by-catches. The Commission considers that the discard issue undermines attempts to progress other EC obligations e.g. Convention on Biological Diversity and the World Summit on Sustainable Development. The recent FAO evaluation of global discards notes that fisheries managed under the auspices of the CFP suffer from a disproportionate level of discards in comparison to neighbouring Nordic fisheries. In 2007, the EC released a number of consultation documents (2007a; 2007b; 2007c) which outline policy options to be considered by member states and stakeholders. Three possible policy options are:

- i. Adapting the existing CFP management framework together with supplementary measures
- ii. A discard ban as a stand alone measure

**Table I. Discard levels for main Irish fleets after Borges et. al 2005.**

	Total discards (Tonnes)	Catch discarded (%)
<b>Beam trawl fleet</b>		
VIIa	1806	67
<b>Otter trawl fleets</b>		
VIa Stanton Bank	3436*	34*
VIIb Rockall Bank	402	17
VIIa <i>Nephrops</i>	1833*	25*
VIIb Aran Isles <i>Nephrops</i>	2077	43
VIIb West of Achill	4966	60
VIIc Porcupine Bank	285	20
VIIg Smalls <i>Nephrops</i>	1945*	25*
VIIj	3019*	26*
<b>Scottish seine fleet</b>		
<b>All areas</b>	<b>2158</b>	<b>25</b>

- iii. A discard ban combined with supplementary measures

### **Option 1 – Adapting the existing management framework**

This would rely on further technical regulations to fishing gears, such as the mandatory introduction of sorting grids or increases in mesh size, in combination with real time closures, closed boxes and an obligation to move fishing ground. From reviewing the consultation documents, this appears to be the least favoured approach by the EC. Regulations pertaining to technical measures have become overly prescriptive and complex and earlier technical measures have failed to live up to expectations (as have closed areas) in so much that we still have high discards in many fisheries.

#### **Potential Impact on Irish Fisheries:**

- A need for real time quantification of discards by metier/fleet
- Increased capital costs for new gear to comply with new regulations
- Increasing complexity of technical regulations

### **Option 2 – Introduction of a stand alone Discard Ban**

From a policy point of view the introduction of a discard ban is desirable since it creates considerable incentive for fishers to reduce unwanted by-catches. However, there are several significant challenges to effective implementation. In addition a discard ban will introduce economic costs associated with the retention of unwanted catches. In some Irish fisheries this could be substantial given the current level of discarding. Undoubtedly a phased approach would be necessary.

#### **Implications for Irish Fisheries**

- Increased surveillance and monitoring
- Impact on fishing activity and profitability due to on-board handling and storage
- New onshore infrastructure required to process and dispose of non-marketable catches
- Gradual reduction in discard rates through modification in fishers tactics
- Inconvenience and costs associated with storage and landing of discard

### **Option 3 – Discard ban supported by supplementary measures**

The combined effect of a discard ban and supplementary measures such as closed areas, potentially accelerate reductions in discards in contrast to a stand-alone discard ban. Regulating the *catch* composition can encourage the use of more selective gears. The Commissions view is that this approach is the most desirable as it achieves reductions in discards at a quicker rate and promotes the

use of more selective gears. This has the added benefit that it is in the individual fisher's interest to maximise the selectivity in order to ensure that a lucrative fishery remains open.

#### **Impact for Irish fisheries**

- Increased surveillance and monitoring
- Increased capital costs for purchase of new gears
- A need for quantification of discards by metier/fleet
- Inconvenience and costs associated with storage and landing of discards
- Onshore processing and disposal of non-marketable catches

### **FSS Conclusions**

Current discarding practices are unsustainable in the majority of cases. It is difficult to decouple the discard and over-fishing problem in fisheries around Ireland and both should be solved together. Introducing a discard ban will introduce a strong incentive for fishers to move towards more selective fishing methods. However, given the mixed nature of many fisheries and scale of the problem currently, if a total ban is introduced many Irish fisheries will probably not be able to continue to operate as they do now. The implications of a ban should be evaluated on a fishery basis and if a ban is to be introduced a phased approach would be desirable. The biological and economic consequences of reducing discards are complex and require a national debate with all stakeholders. FSS is ready to engage in such a debate.

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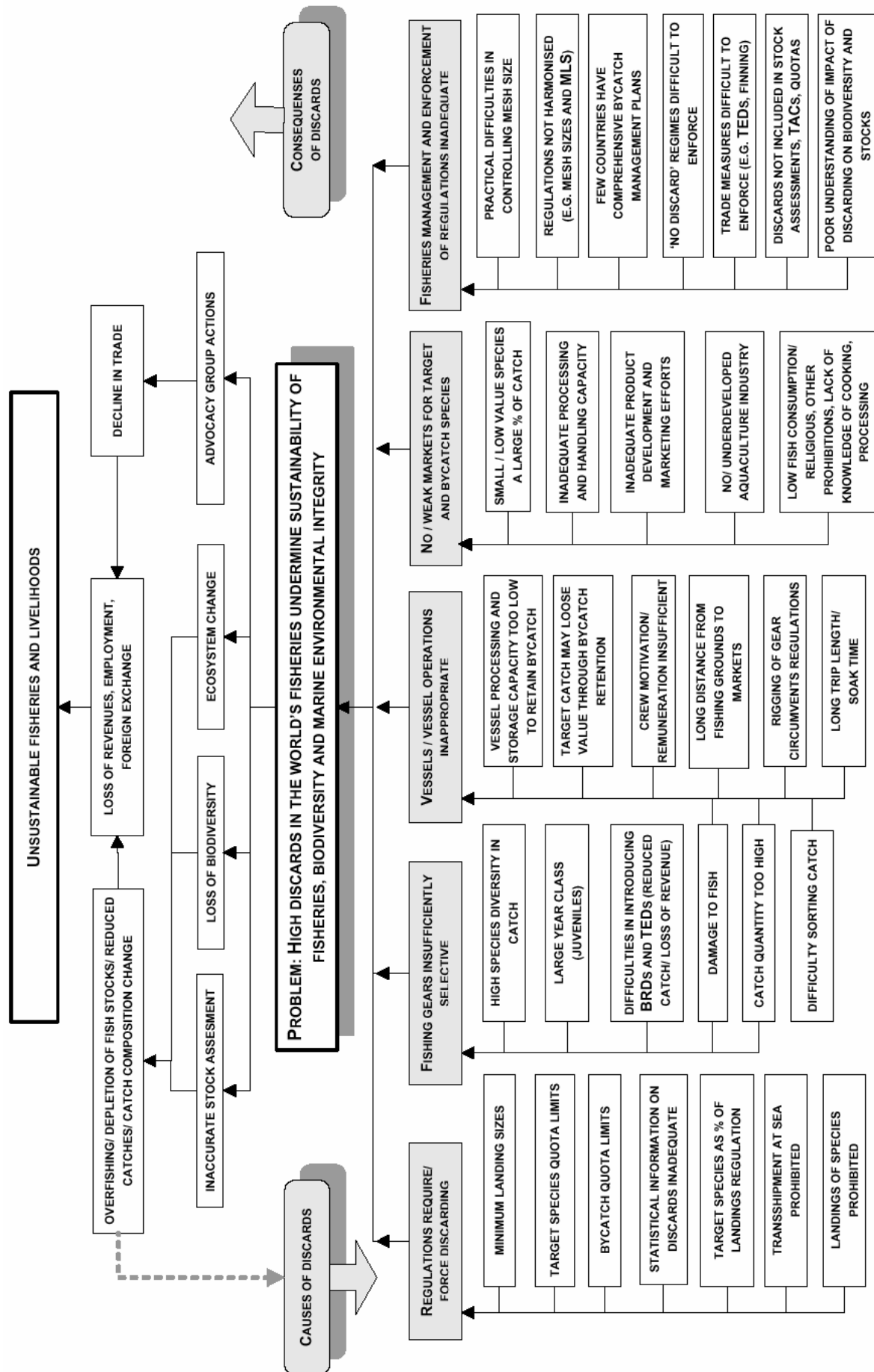


Figure 1: Some causes and consequences of discarding taken from (Kelleher, 2005).

## Marine Protected Areas: Why, how and for whom?

The Term Marine Protected Area (MPA) is often used as an umbrella term covering a wide range of marine areas where some level of restrictions are imposed to protect living, non-living, cultural, and/or historic resources. The term "MPA" has been used widely around the globe, and the terms SPA (Specially Protected Area), MR (Marine Reserve), MP (Marine Park), NTZ (No Take Zone), or ASC (Area of Special Conservation) are often used interchangeably. MPAs can be established for a multitude of reasons: to protect a certain species, to benefit fisheries management, or to protect full ecosystems, rare habitat, or nursing grounds for fish.

### Definition and legal framework:

The use and definition of marine protected areas (MPAs) has varied widely and MPAs can differ in the extent of their protection, and the activities allowed occurring in them. Their overriding objective is however common, they are designated areas that aim to conserve a marine habitat and/or the species that live in it. The WWF definition of an MPA is: *An area designated to protect marine ecosystems, processes, habitats and species. MPAs can contribute to the restoring and replenishment of resources for social, economic and cultural enrichment.* (WWF 2005). In most cases, MPAs are established under legislation, whereby the activities permitted and prohibited in the area are legally regulated.



The European Union signed up to the Johannesburg Declaration on sustainable development, which calls for the establishment of a network of marine protected areas by 2012. Another convention that has influenced European law to set up MPAs is the OSPAR convention for the protection of the marine environment in the Northeast Atlantic. Contracting parties of this convention entered a commitment to establish a network of MPAs by 2010 to protect species or habitats that are already adversely affected by human activities, prevent the damage to habitats or species following the precautionary principle and to protect and conserve areas that best represent a range of species or habitats. The European Union thus committed itself to setting up networks of MPAs and several le-

gal frameworks are present within the EU under which MPAs need to be established.

There are two European directives that provide legal tools for the establishment of MPAs. The Birds Directive (79/409/EEC) calls for Special Protected Areas (SPAs) for birds while Special Areas of Conservation (SACs) for habitats or species are implemented through the habitat directive *Natura 2000* (92/43/EEC). Member states are legally obliged to implement these directives, and use this legislation for the protection of the marine environment under their jurisdiction. The main aim of the *Natura 2000* habitat directive is to create a network of sites that protect threatened, endangered and or declining species or habitats. It further aims to stop the decline in marine biodiversity, and to preserve the structure and function of the marine ecosystem. The timeline for the implementation of the *Natura 2000* network of MPAs is in accordance with the Johannesburg declaration. The network is to be set up by 2008 with all MPAs to be established by 2012.

The European Union regulates fisheries management through the medium of European community law. The basic fisheries management regulation under the CFP (Council Regulation 2371/2002) provides a legal basis for the adoption of measures concerning conservation, management of resources and limitation of the environmental impact of fishing. It can legislate for recovery plans for overexploited fish stocks and areas of protection for vulnerable habitats that have been or are in danger of being damaged by fishing activities. The technical conservation regulation (Council Regulation 850/98) sets technical measures that aim to minimise effect of fishing on the environment or to protect spawning stock and can be amended to implement protected areas within the CFP. Thus, the prohibition of bottom trawling to protect of cold water coral habitats such as the Darwin Mound has been implemented through an amendment of this regulation (EC 1475/2003).

### Perceived Benefits of MPAs:

MPAs can protect vital habitats by eliminating practices that are destructive to the vulnerable components of their ecosystem. In addition MPAs can reduce the impact of fishing on target and non target species by protecting species for a part of their life cycle, or in areas of their distribution to give them a chance to recover from overfishing. The utility of MPAs is very much dependant on what they aim to protect: vulnerable habitats and/or species of limited motility benefit from spatial protection and conservation objectives can be established relatively easily. It becomes more difficult to apply spatial protection to motile species or species that have a large stock distribution, as this would require extensive areas to contain

significant proportions of their population. One of the problems when addressing the benefits of closed areas, especially when it relates to the protection of fish stocks, is that their effectiveness is difficult to evaluate. So far there is only limited scientific evidence supporting the effectiveness of closed areas.

### Good planning with best scientific knowledge:

In order for MPAs to be successful, they require good planning based on best scientific knowledge, stakeholder involvement and effective control and enforcement. The basis for the designation of an MPA is the establishment of conservation objectives for the site. This should address the key threatened species or habitat features that should be protected; their spatial distribution; major threats to the population and their present and acceptable level of mortality (in the case of target or by-catch species).

The next step in devising effective management measures is an analysis of the potential conflicts between the conservation objectives and the human utilisation of the site- ie what are the activities carried out in the area, that interfere with the conservation objective and how should they be modified or regulated to allow to safeguard or restore the favourable conservation status of the site.

Important in the process is good quality data that allow for assessing the conflict between different human activities and the conservation targets. In terms of assessing the impact of fishing on the sites, information is needed on fishing fleets from all countries participating in activities in the proposed sites, including fishing effort and impact of fishing on species and habitats. This requires fine scaled information on the temporal and spatial extent of the distribution of species and/or habitat type and fishing activities. These data requirements provide a new challenge in fisheries and environmental science as historically, fisheries data is collected on a stock unit basis which does not provide sufficient spatial resolution for conduct aerial management. Thus to fulfil the data needs requires a rethinking of how data is collected and how it is used in spatial management. In addition, considerations need to be given to the effects of a closure, and whether and how after an area is closed, the displacement of fishing effort affects the biota in adjacent areas. This contributes to the decision on which management measures to choose and whether an area closure is sufficient or requires additional measures such as effort control.

### The involvement of stakeholders

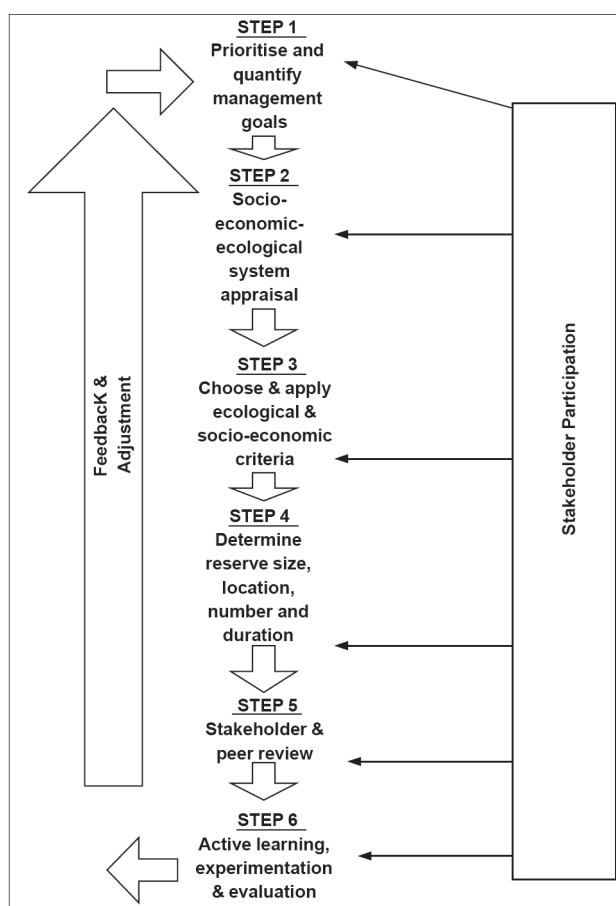
It is important that throughout the process of designating a site, evaluating the impact and deciding on management strategies, stakeholders are fully involved. This gives them the option to feed into the process and contribute vital knowledge to improve the information on the spatial and temporal extent of their activities. It further allows feedback on what the preferred management strategies are – eg changing gear, redistribution of fishing effort and fishing time and how this in turn can lead to less impact and or lower fishing mortality. As a result, management measures can be implemented in cooperation and once there is support of the people that are most affected by them there is a higher chance of compliance.

### Enforcement and evaluation of effectiveness

An MPA is only as effective as the enforcement of its legislation. Thus the management measures chosen for the MPAs need to be enforceable and the resources need to be made available to enforce them. In order to evaluate the effectiveness of an MPA, clear goals need to be set which determine the success criteria. Ongoing monitoring programmes which measure case specific indicators can then be used to evaluate the success of the management strategies in the different sites. Effective management of protected areas often requires an adaptive approach where strategies and tools are adjusted according to their success. This enables the management body to react to unprecedented pressures, changes in human impact and other unforeseen events. It further allows continued dialogue with the stakeholders.

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**Fig. 1** Six steps for active and adaptive management of marine protected areas for fishery purposes, from Grafton and Kompas (2005).



## Reform of ICES Advice – Structures and Timing

Throughout 2007 a considerable amount of work was carried out by MCAP (ICES Management Committee for the Advisory Process) on the reform of the ICES advisory system. These reforms were focused on two general areas; the Structures and Processes of the advisory system within ICES and the Timing of the ICES Advice.



The governing body of ICES is the Council made up of national delegates. This section draws on the documentation from the ICES Council held in October 2007. It is a brief summary of the decisions made in relation to the ICES Advisory Reforms.

These reforms will have major implications for FSS work programmes in 2008 and beyond and will impact the way in which FSS operates in relation to advice formulation. They will also have major implications for the future format and timing of the Stock Book.

### Structures and Processes

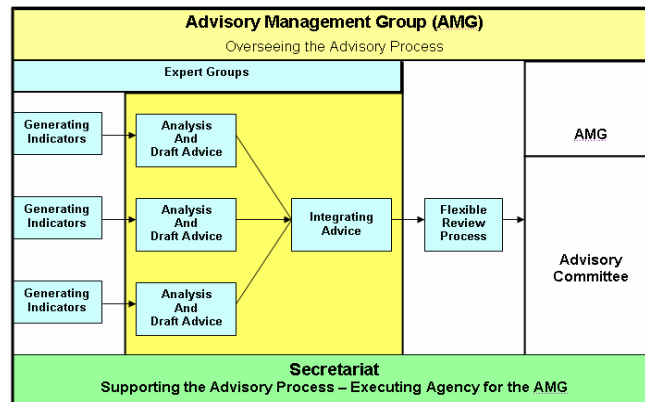
At the 2006 ICES Council meeting, MCAP was asked to develop an Implementation Plan (IP) to make major reforms to the ICES advisory system. A number of important drivers for reform of the ICES Advisory System were identified as follows;

- Integrated Fisheries Advice
- Ecosystem effects of other human activities other than fishing
- Holistic ecosystem based advice
- Changing framework for marine science
- Limited scientific resources – competition with other organisations
- Excessive workloads and inadequate support for Expert Groups
- Poor linkage with ICES science programmes
- Insufficient review process
- Flexible response mechanisms
- Improve communications with clients
- Inefficient use of human and financial resources
- Improved transparency of the advisory process

Following an extensive consultation process throughout 2007, the MCAP IP was finalised and proposed that a new ICES advisory services be established that contains the following groups and responsibilities;

- A single **Advisory Committee (AC)** that is responsible for the overall quality and appropriateness of the advice and for the strategic direction of the Advisory Services.
- A professional **Advisory Management Group (AMG)** that is responsible for the management of the Advisory Services and for communication of the advice
- A flexible review process using **Review Groups (RG)** that is responsible for the final drafts of the advice
- **Expert Groups (EG)** that are responsible for bringing the scientific information together and for drafting the advice
- **Research Laboratories (RL)** in ICES member countries that will have more responsibilities in providing certain routine analyses that are required as input for the Expert Groups

### MCAP Proposal for the ICES Advisory Services

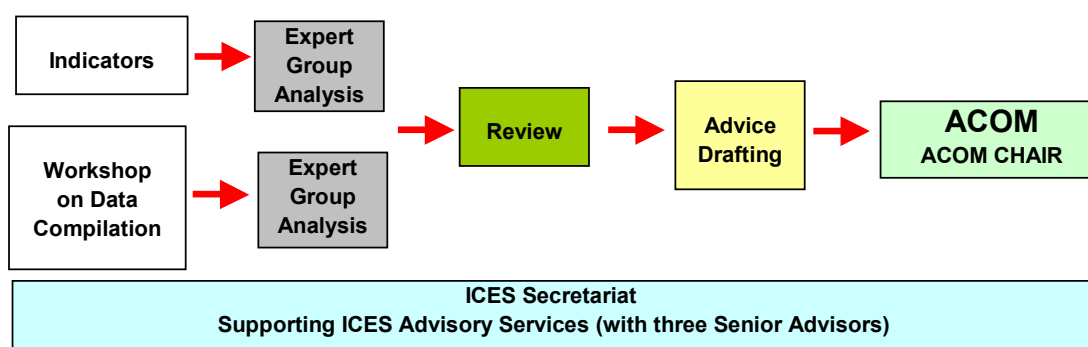


The meeting of the ICES Council in October 2007 established the **ICES advisory Services** to be led by an **Advisory Committee (AC)** authorised to give advice on behalf of the Council. The main tasks of the AC are in the governance and oversight of the Advisory Services.

However, there were some changes to the MCAP IP as follows ;

A **Review** process will provide a technical review of the analytical and science input to the advice formulation. The review will be conducted by scientific peers who were not involved in producing the analytical and science input. ACOM will approve members based on the proposals by the ACOM chair.

## The New Proposal for ICES Advisory Services Adopted by Council in October 2007



**Advice Drafting Group** : a flexible system of advice drafting groups will be the major source of the advice text. These groups are established by ACOM and will base their advice on peer reviewed evidence prepared by expert groups.

**Expert Groups**; Advice will be based on evidence prepared by expert groups in response to terms of reference provided by ACOM.

**Workshops on Data Compilation**: The ACOM shall invite stakeholders to workshops on data compilation as input to the work of the expert groups. Stakeholders are invited to contribute data, including data from non traditional sources.

Implementation of the new ICES Advisory Services will be from 1<sup>st</sup> January 2008. The present structures (i.e. MCAP) will remain in place until ACOM decides that this parallel structure is no longer required

The Council has established a special Working Group that will report to the Council by mid January 2008 to finalize the detailed mandate and criteria under which ICES Advisory Services will operate. It will also propose the most appropriate governance model for the senior advisers that will ensure the best professional management support for the Advisory Services. The ICES Council recognise that the new advisory system will require adjustment especially during the first years of operation.



## Timing of Advice

In 2006, ICES received a request from the EU Commission (DG Fisheries and Maritime affairs) to explore the possibility of providing fisheries advice in June of each year. In the current system in ICES, The Advisory Committee on Fisheries Management (ACFM) provide advice each May and October. The shift in timing of advice to June has major implications for ICES work programmes. There was considerable debate within the ICES scientific community about the logistical problems this would create especially for ICES Working Groups in terms of data availability. In late 2006, ICES agreed to explore “ in an open minded way “ the possibility of providing advice to the EU Commission in May.

Following a formal request from the Commission to provide advice in May 2008, ICES revised its work programme for 2008. Several Working Groups were moved to the Spring. Thus, the May 2008 advice will consist of a mix of updated advice from 2007 and new advice from 2008.

It was not necessary to move some Working Groups to the Spring and these will continue to take place in Autumn. The Autumn Working Groups will generally feed into the EU Norway or EU Coastal States negotiations.

The timing of advice issue will have a major impact on the earlier provision of data from many National Laboratories. Together, the advisory reforms and the revised timing of advice will have major implications for the work programmes of ICES and National Laboratories.



# EC Proposal on Fishing Opportunities for 2008

## FSS interpretation of communication from the Commission to the Council on a policy statement on fishing opportunities for 2008

The Commission has followed up the policy statement on setting fishing opportunities for 2007, with a communication on policy for fishing opportunities for 2008.

This year's communication indicates a shift in the Commission's stance in how to approach issues such as the Johannesburg declaration in achieving MSY by 2012. For example last year the policy (Comm. (2006) 499) stated that it was "considered acceptable to take relatively high biological risk in short term decisions" and that annual fishing opportunities should be set in accordance with the objectives of the CFP (having regard for stability of fishing opportunities), and should account for international policy commitments (such as the move towards MSY) by not causing a further deterioration of stocks in relation to MSY. Whereas in this year's policy statement the Commission admits that the application of the CFP has not improved the general status of stocks (80% remain outside safe biological limits), and that consistently setting TACs at much higher levels than advised has meant that fisheries have been taking a high risk. The document then concludes that, in order to comply with the principles of the CFP, the proposals of fishing opportunities should lead to a **reduction** in the number of stocks outside of safe biological limits. This shift in approach could be summarised simply by saying that the Commission now considers that is not sufficient to simply not make things worse, but that the application of fishing opportunities through CFP must actually improve the general status of fish stocks.

The shift in stance is further evident in the reaffirmation of the Commission's commitment to consulting stakeholders and member states about setting fishing opportunities. In this year's policy statement it qualifies the commitment by stating that these consultations will be about *long term* methods and rules. The implication here is that the priority is the application of good science (having regard for socio-economic consequences), whereas last year it was the maintenance of continuity of fishing opportunity (having regard for biological sustainability).

The review of the effort limitations concludes that on average the scheme has not constrained the activity of the fleet, and thus it is not contributing to stock recovery. The Commission considers that the wider use of selective devices (initially proposed to gain derogation from the effort controls), may be the most promising development arising from the scheme.

In summary; the 2008 policy statement reiterates the Commission's commitment to management under long

term plans, and states that it is for stocks not covered by such plans that the decision rules were developed. The 2008 policy states that the principles and rules applied in 2007 remain valid for 2008. It then sets out to address questions where the rules in the 2007 document are unclear (see below). Notwithstanding this clarification, FSS notes that the following anomalies still exist in the decision rules: In the case of category XI (where the stock is inside safe biological limits), following the decision rules would result in applying an unchanged  $F$  where  $F$  is higher than  $F_{MSY}$ . This is not consistent with the 2008 policy aspiration of proactively moving towards commitments under the Johannesburg declaration. In the case where safe biological limits are not defined (thus the status of the stock is unknown) and there are indications of stock decrease, following the decision rules would lead to no change in the TAC if the TAC is fully taken. With the exception of virgin stocks, this would result in a failure to take action where the fishery may be having a deleterious effect on the stock. A flow diagram of the updated decision tree for fishing opportunities in 2008 is given in Fig. I.

### No quantitative advice available

The Commission now clarifies that where advice is not quantitative it should be treated as seriously as quantitative advice. This means that even if there is no quantitative forecast the following general rules should apply;

- Where the advice is for a catch limitation, then this should be applied in steps of up to 15%.
- Where the advice is for effort limitation but no effort data exist, then the TAC should be reduced by steps of up to 15%, while the relevant studies are completed.
- Where there is a non-quantified indication of stock increase or decrease then the TAC should be adjusted by + or -15% respectively (having regard for socio economic circumstances)
- Where there is a very strong indication that a stock is depleted and there is advice for zero catch or lowest possible level, that there should be a proposal for a reduction in TAC that is as large as is compatible with mixed fishery and relevant socioeconomic considerations. If a recovery plan is in place the best possible approximation to the rules should be proposed where the reduction should be no less than that outlined above.

### No Scientific advice available

If no scientific advice is available the guiding principle is that there should be no expansion of the fishery, and where current TACs are substantially higher than the re-

cent *real* catches, then they should be adapted towards the real catches at a rate of 15%. However this is at odds with the 2007 policy statement. In last years document, under the same scenario of catches well below the TAC, (if there is scientific advice but the status of the stock is unknown and the scientific advice does not give any management measures), the proposal is that the TAC should be adapted to the catches at a rate of 20% and scientific advice should be taken into account if this proposes something different (see Comm. (2006) 499 section 4.6).

FSS have interpreted this contradiction as follows; the definition of scientific advice is stock or fishery specific advice from ICES for any fishery control measures. Under this definition, FSS interprets the EC proposal where there is advice and the status of the stock is unknown and the catches are well below the TAC, as the adaption of the TAC to the catches at a rate of 15%, and to take the scientific advice into account. By corollary if ICES produce a summary sheet that contains no advice on stock or fishery specific control measures, then this should be considered to fit into the category of “no scientific advice”

### **Stocks outside safe biological limits**

In the case of setting TACs for stocks outside safe biological limits the Commission concede that reductions greater than the 15% limit are likely to be needed. Experience has shown that when this reduction is decided by stakeholder consultation, the agreed reductions have not resulted in improvements in stock status. In these cases the policy statement proposes that measures should be implemented which move the stock towards safe biological limits, rather than as in last years policy which rather passively stated that fishing opportunities would not be proposed which would lead to further deteriorations in stock status. FSS interprets this section of the policy document as follows;

- That the determination of “outside safe biological limits” is a scientific judgment and not necessarily established by a quantitative measure.
- That the “movement [of the stock] towards safe biological limits at a reasonably rapid rate”, can be promoted by a number of measures not only by a TAC measure.
- That the effect of the measures must be to reduce exploitation reasonably rapidly, this implies that technical measures may be applied **in addition** to a reduction in TAC which is a minimum of greater than 15%.

### **Setting TACs for Cod stocks covered by the cod recovery plan**

In the case of setting TACs for stocks covered by the cod recovery plan the policy statement reiterates the intention to directly follow the plan. However this produces a paradox where no stock measure is available to allow the direct application of the plan. In this case the Commission says that it would take into account lessons learned from

the Cod symposium held in Edinburgh. The Commission produced a non paper on cod recovery following the Edinburgh meeting. The main thrust of this document was to signal a move away from biomass-increase targets to effect cod recovery, and to rely more on technical measures, in order to effect an improvement in stock status. FSS notes that while the change of strategy to achieve direction rather than targets may be more realistic, any future amendment of the recovery plans will still have to achieve a measurable change in stock status, in order that their success can be evaluated. Given a fundamental requirement of a recovery plan (to establish performance criteria) the application of measures on the basis that they *can* have an effect, may not be sufficient to make the recovery plans a success. FSS further notes that performance criteria of plans based on input controls need to be realistic in terms of timescale and performance measures. For example, if a 4 year time frame is set to achieve a particular objective, that managers must accept that the magnitude of change or even the direction of change may not be measurable every year, and that if an improvement in a stock indicator (eg. F) is part of the performance measurement, then the required change must be within the resolution of measurement for the stock. FSS has shown previously for Irish Sea Cod that changes in exploitation in the order of 15% are not measurable annually by assessment and that in order to effect stock recovery changes in the order of 80% are likely to be required.

### **Effort management**

The Commission intends to propose adjustments to effort in line with long term management and recovery plans (where such plans exist). In addition it will establish common rules covering existing regimes. FSS notes that there have been no proposals put forward to date in 2007.

### **Technical measures**

The number of Technical measures in this years fishing opportunities regulations is to be reduced by moving measures to three other regulations;

- Measures for the NAFO area
- Technical measures for fisheries in Atlantic waters (EC No 850/98)
- Measures recommended by ICCAT

In addition Annex III of the 2008 fishing opportunities regulation will contain transitional measures for the use of deep-sea gill nets and also initial measures to reduce discarding.

### **Other issues**

The Commission intends to propose a TAC for spurdogs to address the depleted state of the stock, and to propose conservation measures for porbeagle. It also intends to develop a long term management plan for hake.



## 2007 TAC's with Scientific Advice for 2008

Stock	Area	2007 (EC) TAC	FSS Advice 2008	FSS interpretation of EC Com(2006)499
COD	Vb(1), VI, XII, XIV	490	0	417 plus 25% effort reduction
COD	VIIa	1,462	0	1,243 plus 25% effort reduction
COD	VIIb-k	4,743	0	2,700
HADDOCK	VIa	7,200	4,200	7,200
HADDOCK	VIb	4,615	10,640	NA
HADDOCK	VII , VIII, IX, X, CEEAF 34.1.1 (EC waters)	11,520	No increase in effort & reduce discarding	11,520
Special condition	Max catch in VIIa	1,179	No increase in effort & reduce discarding	1,179
SAITHE	Vb(1), VI, XII, XIV	12,787	13,500	13,500
SAITHE	VII, VIII, IX, X, CEEAF 34.1.1(1)	3,790	1,100	3,222
POLLOCK	Vb(1), VI, XII, XIV	450	114	383
POLLOCK	VII	15,300	13,217	13,005
WHITING	VI	1,020	Lowest possible level & technical measures to reduce discarding	867 and take science advice into account
WHITING	VIIa	371	Lowest possible level & technical measures to reduce discarding	315 and take science advice into account
WHITING	VIIb-k	19,940	reduce landings and discards	16,950
PLAICE	Vb(1), VI, XII, XIV	786	96	668
PLAICE	VIIa	1,849	1,740	1,740
PLAICE	VIIbc	122	40	104
PLAICE	VIIfg	417	240	354
PLAICE	VIIhjk	337	177	286
SOLE	Vb(1), VI, XII, XIV	68	19	58
SOLE	VIIa	816	0	670
SOLE	VIIbc	65	50	55
SOLE	VIIfg	893	1,000	920
SOLE	VIIhjk	650	300	553
HAKE	Vb(1), VI, VII, XII, XIV	29,541	30,281	30,281
ANGLERFISH	Vb(1), VI, XII, XIV	5,155	No increase in effort	5,155
ANGLERFISH	VII	28,080	26,194	28,080
MEGRIM	Vb(1), VI, XII, XIV	2,880	1,400	2,448
MEGRIM	VII	18,300	13,560	15,555
NEPHROPS	Vb(1), VI	19,885	No increase in effort	19,885
NEPHROPS	VII	25,153	Manage at appropriate scale	25,153

(1) EC waters

(2) non EC waters



= Decreasing TAC based on advice

= Increasing TAC based on advice



=Status quo TAC based on advice

## 2007 TAC's with Scientific Advice for 2008 continued

Stock	Area	2007 (EC) TAC	FSS Advice 2008	FSS interpretation of EC Com(2006)499
ALBACORE TUNA	Northeast Atlantic	34,500	30,000	30,000
MACKEREL	IIa(2), Vb(1), VI, VII, VIIIabde, XII, XIV	502,000	349-456,000	456,000 <sup>a</sup>
HERRING	I,II	1,280,000	1,518,000	1,518,000 <sup>a</sup>
HERRING	Vb, VIaN(1), VIb	33,340	15,000	15,000
HERRING	VIaS, VIIbc	13,860	no fishing without rebuilding plan	less than 11,781 consistent with socioeconomic considerations
HERRING	VIIa	4,800	4,400	4,800
HERRING	VIIg,h,j,k	9,393	no fishing without rebuilding plan	less than 7,984 consistent with socioeconomic considerations
HORSE MACKEREL	IV, IIa (1)	42,727	18,000 <sup>b</sup>	42,727
HORSE MACKEREL	Vb(1), VI, VII, VIIlabde, XII, XIV	137,000	180,000 <sup>c</sup>	180,000 <sup>c</sup>
BLUE WHITING	I, II, III, IV, V, VI, VII, VIIIabde, XII, XIV	1,700,000	835,000	1,250,000 <sup>a</sup>

<sup>a</sup> International TAC already agreed

<sup>b</sup> TAC would apply to to VIId, IVbc

<sup>c</sup> TAC area II, IVa, Vb,VI, VIIa-c,e-k, VIII

(1) EC waters

(2) non EC waters

 = Decreasing TAC based on advice  
 = Increasing TAC based on advice

 = Status quo TAC based on advice

Single-stock exploitation boundaries and critical stocks in the Celtic Seas

The state and the limits to exploitation of the individual stocks are presented in the stock sections. The state of stocks and single-stock exploitation boundaries are summarised in the table below:

Stock	State of the stock			ICES considerations in relation to single-stock exploitation boundaries				Upper limit corresponding to single-stock exploitation boundary – Tonnes or effort in 2008 and % reduction in F.
	Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to high long-term yield	In relation to agreed management plan	in relation to high long-term yield	in relation to precautionary limits		
Anglerfish in Divisions VIIb–k and VIIa,b ( <i>L. piscatorius</i> and <i>L. budegassa</i> )	Unknown	Unknown	Unknown	Not applicable	Unknown	The current stock status is unknown relative to precautionary reference points, but indicators point to the stocks being stable. Therefore, landings in 2008 should not exceed the average landings of 2004–2006.	TAC < 33 000 t	
Anglerfish in Division IIIa, Subarea IV, and Subarea VI	Unknown	Unknown	Unknown	Not applicable	Unknown	The effort in fisheries that catch anglerfish should not be allowed to increase and the fishery must be accompanied by mandatory programmes to collect catch and effort data.	No increase in effort	
Cod West of Scotland	Reduced reproductive capacity	Unknown	Unknown	ICES is not in a position to give quantitative forecasts.	Unknown	Given the very low SSB estimates, the high fishing mortalities and low recruitment in this stock, ICES advises zero catch of cod in 2008.	Zero TAC	
Cod in Division VIIb (Rockall)	No assessment							
Cod in Division VIIa	Reduced reproductive capacity	Harvested unsustainably	Overexploited	ICES is not in a position to give quantitative forecasts	F is above $F_{0.1} - F_{max}$	It is not possible to identify any non-zero catch which would be compatible with the precautionary approach.	Zero TAC	
Cod in Divisions VIIe-k	Reduced reproductive capacity	Harvested sustainably	Overexploited	Not applicable	F is above $F_{max}$	It is not possible to identify any non-zero catch which would be compatible with the Precautionary Approach.	Zero TAC	
Haddock West of Scotland	Full reproductive capacity	Risk of being harvested unsustainably	Overexploited	Not applicable	F is above $F_{max}$	In order to maintain SSB above $B_{pa}$ in 2009, total catches (including discards and unallocated catches) should be less than 4 200 t in 2008.	Total catches < 4 200 t	
Haddock in Division VIIb (Rockall)	Full reproductive capacity	Harvested sustainably	Underexploited	Not applicable	F is above $F_{max}$	Fishing mortality should be less than $F_{pas}$ corresponding to total catches (including discards and unallocated catches) of less than 10 640 t in 2007.	Total catches < 10 640 t	
Haddock VIIa	Undefined	Unknown	Overexploited	Not applicable	F is above $F_{0.1} - F_{max}$	Fishing effort should not be allowed to increase.	No increase in effort	
Haddock in Divisions VIIb-k	Undefined	Undefined	Unknown	Not applicable	Unknown	Effort not allowed to increase, rather than TAC management.	No increase in effort	
Herring in VIIa south and VIIb,c (Advice June 2007)	Uncertain	Uncertain	Unknown	Not applicable	Unknown	A rebuilding plan should reduce catches. No fisheries without a rebuilding plan.	Rebuilding plan with reduced catches, or Zero TAC	

Continued Single-stock exploitation boundaries and critical stocks in the Celtic Seas

The state and the limits to exploitation of the individual stocks are presented in the stock sections. The state of stocks and single-stock exploitation boundaries are summarised in the table below:

Stock	State of the stock				ICES considerations in relation to single-stock exploitation boundaries			Upper limit corresponding to single-stock exploitation boundary – Tonnes or effort in 2008 and % reduction in F.
	Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to high long-term yield	In relation to agreed management plan	in relation to high long-term yield	in relation to precautionary limits		
Herring in VIa south and VIIb,c (Advice June 2007)	Uncertain	Uncertain	Unknown	Not applicable	Unknown	A rebuilding plan should reduce catches. No fisheries without a rebuilding plan.	Rebuilding plan with reduced catches, or Zero TAC	
Herring in Division VIa North (advice June 2007)	Undefined	Undefined	Overexploited	Fishing according to the proposed management plan imply catches up to 15 000 t	Fishing mortality is in the range of the target of the management plan harvest control rule of F 0.25	Precautionary reference points for fishing mortality have not been defined. Any management measure should have a high probability of avoiding B <sub>lim</sub> .	F proposed management plan, TAC < 15 000 t	
Celtic sea and Division VIIj herring (Advice June 2007)	Uncertain, but likely at risk of reduced reproductive capacity	Unknown	Unknown	Not applicable	Unknown	No targeted fishing should be allowed until a rebuilding plan is in place.	Reduced catches	
Irish Sea herring (Division VIIa N)	Unknown	Unknown	Unknown	Not applicable	Unknown	The recent (2005-2006) catches as 4400 t do not appear to have been detrimental to the stock	TAC < 4 400 t	
Megrim in Divisions VIIb,c,e-k and VIIa,b,d ( <i>L. whiffiagonis</i> and <i>L. boscii</i> )	Unknown	Unknown	Unknown	Not applicable	Unknown	Landings of <i>L. whiffiagonis</i> in 2008 should not exceed the average landings of 2004–2006. This corresponds to 13 000 tonnes.	TAC < 13 000 t	
Megrim in Subarea VI (West of Scotland and Rockall)	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches in 2008 should be no more than the recent (2004–2006) landings of about 1 400 t. This includes landings in Division VIa and VIb and unallocated landings in Subarea IV.	TAC < 1 400 t	
<i>Nephrops</i> in Divisions VIIb,c,j,k (biannual advice, same as 2006)	Unknown	Unknown	Unknown	Not applicable	Unknown	<i>Nephrops</i> fisheries should be constrained to recent levels of effort at an appropriate geographical scale (FU).	No increase in effort	
<i>Nephrops</i> in Divisions VIIf,g,h, FU20-22 (biannual advice, same as 2006)	Unknown	Unknown	Unknown	Not applicable	Unknown	<i>Nephrops</i> fisheries in this area should be constrained at recent levels of effort.	No increase in effort	



Continued... Single-stock exploitation boundaries and critical stocks in the Celtic Seas

The state and the limits to exploitation of the individual stocks are presented in the stock sections. The state of stocks and single-stock exploitation boundaries are summarised in the table below:

Stock	State of the stock			ICES considerations in relation to single-stock exploitation boundaries			Upper limit corresponding to single-stock exploitation boundary – Tonnes or effort in 2008 and % reduction in F.
	Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to high long-term yield	In relation to agreed management plan	In relation to high long-term yield	In relation to precautionary limits	
<i>Nephrops</i> in Division VIIa (FUs 11, 12, 13) (biannual advice, same as 2006)	Unknown	Unknown	Unknown	Not applicable	Unknown	Effort should not be allowed to increase relative to the past three years. In addition the exploitation ratio in this stock should be no more than 15%. This corresponds to landings less than 3200 t for North Minch, 7200 t for the South Minch and 3800 t for the Firth of Clyde stock. Landings from other areas in Division VIIa should be below the average of 2003–2005, corresponding to landings of 2100 t.	No increase in effort and - for North Minch (FU11) TAC < 3200 t - for South Minch (FU12) TAC < 7200 t - for Firth of Clyde (FU13) TAC < 3800 t - for other VIIa stocks TAC < 2100 t
<i>Nephrops</i> FU 15 & FU 14 (biannual advice, same as 2006)	Unknown	Unknown	Unknown	Not applicable	Unknown	Effort in this fishery should not be allowed to increase from 2003–2005 levels.	No increase in effort
Norway pout West of Scotland	No assessment						
Plaice VIIa	Full reproductive capacity	Harvested sustainably	Underexploited	Not applicable	F is below $F_{max}$ and $F_{0.1}$	Fishing mortality should be kept below $F_{pa}$ (0.45). This corresponds to catches of less than 5 200 t in 2008.	TAC < 5 200 t
Plaice West of Ireland (Division VIIb, c)	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches in 2008 should be no more than the recent average (2004–2006) of around 40 t.	TAC < 40 t
Plaice in Division VIIe (Western Channel)	Increased risk	Increased risk	Overexploited	Not applicable	F is above $F_{0.1} - F_{max}$	Substantial reduction in catch until the estimate of SSB is above $B_{pa}$ or other strong evidence of rebuilding is observed.	Substantial reduction in catch
Plaice in the Celtic Sea (Divisions VIIIf and g)	Reduced reproductive capacity	Undefined	Overexploited	Not applicable	F is above $F_{0.1} - F_{max}$	A 60% reduction in F is needed to increase SSB to around $B_{pa}$ in 2009. This corresponds to landings of less than 240 tonnes in 2007.	TAC < 240 t or Recovery plan
Plaice Southwest of Ireland (Division VIIIf-k)	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches in 2008 should be no more than the recent average (2004–2006) of around 177 t.	TAC < 177 t
Sandeel in Division VIIa	No assessment						
Sole VIIa	Reduced Reproductive Capacity	Harvested unsustainably	Overexploited	Not applicable	F is above $F_{0.1}$	It is not possible to identify any non-zero catch compatible with the precautionary approach.	Zero TAC
Sole West of Ireland (Division VIIb, c)	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches in 2008 should be no more than the recent average (2004–2006) of around 50 t.	TAC < 50 t
Sole in Division VIIe (Western Channel)	Increased risk	Harvested unsustainably	Overexploited	Above target	F is above $F_{0.1}$	Landings of around 260 tonnes in 2008 to bring SSB above $B_{pa}$	TAC < 260 t

Continued ..... Single-stock exploitation boundaries and critical stocks in the Celtic Seas

The state and the limits to exploitation of the individual stocks are presented in the stock sections. The state of stocks and single-stock exploitation boundaries are summarised in the table below:

Stock	State of the stock				ICES considerations in relation to single-stock exploitation boundaries			Upper limit corresponding to single-stock exploitation boundary – Tonnes or effort in 2008 and % reduction in F.
	Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to high long-term yield	In relation to agreed management plan	in relation to high long-term yield	in relation to precautionary limits		
Sole in the Celtic Sea (Divisions VIIf and g)	Full reproductive capacity	Harvested sustainably	Overexploited	Not applicable	F is above $F_{0.1} - F_{max}$	F should be kept below $F_{pa}$ . This corresponds to landings of less than 1000 tonnes in 2007.	TAC < 1000 t	
Sole Southwest of Ireland (Division VIIh-k)	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches in 2008 should be no more than the recent average (2004–2006) of around 300 t.	TAC < 300 t	
Sprat in divisions VII d,e (Advice June 2007)	Unknown	Unknown	Unknown	Not applicable	Unknown	No advice.	No advice	
Whiting in Division VIIa	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches of whiting in 2007 should be the lowest possible.	Zero TAC	
Whiting in Divisions VIIe–k	Unknown	Unknown	Unknown	Not applicable	Unknown	Fishing mortality should be reduced to reverse the downward trend in the SSB.	Reduce fishing effort	
Whiting West of Scotland	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches in 2008 should be reduced to the lowest possible level.	Zero TAC	
Whiting in Division VIIb (Rockall)	No assessment							

Single-stock exploitation boundaries and critical stocks in the North Sea

The state and the limits to exploitation of the individual stocks are presented in the stock sections. The state of stocks and single-stock exploitation boundaries are summarised in the table below:

Stocks	State of the stock				ICES considerations in relation to single-stock exploitation boundaries			Upper limit corresponding to single-stock exploitation boundary. Tonnes or effort in 2008
	Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to high long-term yield	Fishing mortality in relation to agreed management target	In relation to agreed management plan	in relation to precautionary limits	in relation to high long-term yield	
Spring spawning herring in IIIa and Subdivisions 22-24	Undefined	Overexploited	Undefined	No agreed target	No management plan	Reduce F by 20% to reach $F_{0.1}$ in 3-5 yrs: 71 000 t. in 2008	F is above candidates for $F_{0.1}$ .	TAC 71 000 t
Mackerel in the North Sea	Unknown	Unknown	Unknown	Unknown	No management plan	ICES advises that the existing measures to protect the North Sea spawning component remain in place.	Unknown	No fishing for mackerel in IIIa and IVb,c
Horse mackerel in the North Sea	Unknown	Unknown	Unknown	Unknown	No management plan	Limit catches to below the 1982-1997 average of 18 000 t.	Unknown	TAC < 18 000 t

**Single-stock exploitation boundaries: Exploitation boundaries in relation to widely distributed and migratory species**

Species	State of the stock			ICES considerations in relation to single-stock exploitation boundaries			Upper limit corresponding to single-stock exploitation boundary for agreed management plan or in relation to precautionary limits. Tonnes or effort in 2008
	Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to high long-term yield	In relation to agreed management plan	In relation to precautionary limits	in relation to high long-term yield and low risk to the stock	
Hake – Northern stock	Full reproductive capacity	Harvested sustainably	Over exploited	Applying a fishing mortality of $F = 0.25$ as defined in Article 5.2 of the agreed recovery plan is expected to lead to an SSB of 160 500 t in 2009, with estimated landings in 2008 of 54 000 t. This would imply an increase in TAC of 3%.	Fishing at $F_{pa}$ is expected to lead to landings of 54 000 t in 2008 and SSB around 160 500 t in 2009.	Fishing mortality is above $F_{0.1}$ and $F_{max}$ .	54 000 t
Northeast Atlantic Mackerel	Uncertain	Harvested unsustainably	Over exploited	The agreed management plan implies catches between 349 000 t and 456 000 t in 2008.	None.	None.	349 000 t / 456 000 t
Western Horse Mackerel	Unknown	Unknown	Unknown	Proposed management plan: 180 000 t in 2008	The proposed management plan is considered to be precautionary	None.	180 000 t
Blue Whiting	Full reproductive capacity	Harvested with increased risk	Over exploited	The maximum catch in 2008 corresponding to the existing management plan is 1.2 million tonnes.	Fishing at $F_{pa}$ implies catches of 835 000 t in 2008.	Fishing mortality is above $F_{0.1}$	835 000 t
Norwegian spring-spawning herring	Full reproductive capacity	Harvested sustainably	Unknown	The management plan implies maximum catches of 1 266 000 t in 2008.	The current long-term management plan is considered to be precautionary.	The target defined in the management plan is consistent with high-term yield and have a low risk of depletion production potential	1 266 000 t

# Ecosystem Overview for Widely Distributed and Migratory Species

This description covers the ecosystem that is associated with widely distributed and migratory species. For the benthic deepwater habitat please refer to the deepwater section.

**Summary table of ICES Ecosystem overview for widely distributed and migratory species**  
(Information condensed from ICES WGRED, 2007 see WG report for further details and reference list)

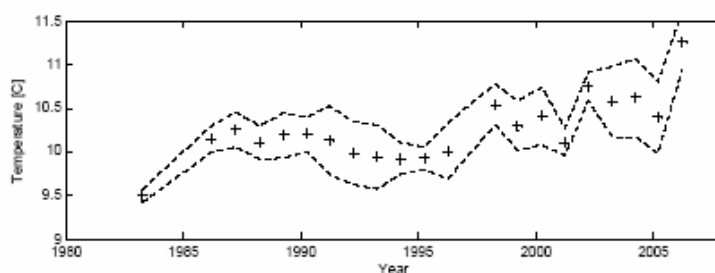
<b>Physics</b>	
<b>Bathymetry</b>	Most of the surface is abyssal plain with average depth >ca 4 000 m. The continental slope has rocky hard substrate from Ireland southwards and is covered by sediment west of the British Isles. Two offshore banks, the Rockall and Hatton Banks are separated from the continental shelf by the Rockall Trough. To the west is the mid-Atlantic Ridge (MAR), stretching from Iceland to the Azores. Isolated seamounts occur over the whole basin.
<b>Circulation</b>	The circulation of the North Atlantic Ocean is characterized by the <i>subpolar</i> and <i>subtropical</i> gyres. Part of the subtropical gyre flows eastwards and crosses the MAR in the Azores Current and the remainder forms the North Atlantic Current (NAC). Along the eastern boundary of the area there is a warm and saline slope current flowing northward from the Biscay to the Polar Ocean. The Norwegian Sea has the low salinity Norwegian Coastal Current to the east and an inflow of water from the north Atlantic through the Faroe-Shetland Ridge, most of it continuing northwards as the Norwegian Atlantic Current along the Norwegian shelf.
<b>Temperature Salinity</b>	There has been an increase in sea surface temperatures of up to 3°C at several locations in the NE Atlantic since the early 1980s. Surface waters of the Rockall Trough have been steadily warming for some years and are currently at an all time high. Equally, the deep water west of the Porcupine Bank displays an increase in temperature since 1994 with a record high in 2006 (see fig. 1). Salinity in this area in 2006 reached its highest value in over 20 years. In the Norwegian Sea, the water has also been extraordinarily warm and saline since 2002 with record values of both temperature and salinity. The volume transport of Atlantic water into the Norwegian Sea also increased considerably during 2005 and record-high transport values were observed during winter 2006.
<b>Biology</b>	
<b>Phytoplankton</b>	Phytoplankton abundance in the NE Atlantic increased in cooler regions (north of 55°N) and decreased in warmer regions (south of 50°N) in the last decades.
<b>Zooplankton</b>	Indicators of the NE Atlantic zooplanktonic community have shown broad scale changes over the last decade with a progressive increase in the presence of warm-water/sub-tropical species into the more temperate areas of the northeast Atlantic, with 2004 continuing with this trend.
<b>Distribution of widely distributed and migratory fish species</b>	<b>Blue whiting</b> are distributed from the western Mediterranean Sea to the Barents Sea, with the main spawning area extending from the Bay of Biscay along the slope to north of the Hebrides, including the Porcupine and Rockall Banks. Some blue whiting are also distributed off the Norwegian and Icelandic coast and in Faroese waters. The <b>Norwegian Spring Spawning herring</b> (NSS herring) has its distribution area in the Norwegian Sea, the Barents Sea and along the Norwegian coast south to 59°N. Overwintering occurs mostly in the open ocean off the northern Norwegian coast and spawning takes place on the Norwegian shelf. The overall distribution of the <b>North East Atlantic mackerel</b> stock ranges from the Iberian Peninsula to the Norwegian Sea. Spawning occurs in the North Sea and along the European shelf between the Iberian peninsula and the west of Scotland. After spawning, mackerel migrate to the Norwegian Sea in July and August to their feeding grounds and overwinter in the northern North Sea. The <b>Western horse mackerel</b> stock is distributed along the Bay of Biscay, west of the British Isles, in the western Channel, the northern North Sea, the Norwegian Sea and part of Skagerrak. Spawning occurs along the shelf edge from the Bay of Biscay to the west of Ireland, feeding areas are in the southern Norwegian Sea and the North Sea.

<b>Environmental signals &amp; implications</b>	Increasing temperature and changes in zooplankton communities are likely to have an impact on the life histories of many species, but particularly on migratory pelagic species. <b>Mackerel</b> and <b>horse mackerel</b> migrations are closely associated with the slope current, and warming of the slope current may affect the timing and the spatial extent of this migration. <b>Horse Mackerel</b> migrations are further known to be influenced by the inflow of Atlantic water into the Norwegian Sea, which varies with climate variation. Large inflow of warm Atlantic water into the Barents Sea coincides with high abundance of <b>blue whiting</b> in the Barents Sea one year later and an increased inflow of Atlantic water into the Norwegian Sea as, indicated by a positive temperature anomaly, coincides with increased local recruitment. For <b>Norwegian Spring Spawning herring</b> the inflow of Atlantic water into the Norwegian Sea and Barents Sea seems to influence the condition and hence fecundity of adult fish as well as the survival of larvae.
<b>Fishery effects on benthos and fish communities</b>	In most cases pelagic fisheries are directed at single species with limited bycatch of other species and no contact with the seabed. While mackerel and blue whiting are currently being overexploited, Norwegian Spring Spawning herring is being harvested sustainably. Discarding and slipping of pelagic fish does occur particular in cases of highgrading or where management restricts the percentage of by-catch.

## FSS ECOSYSTEM CONSIDERATIONS

FSS advises that the following considerations should be taken into account in developing ecosystem based fisheries advice for widely distributed and migratory species:

- Small pelagics, as described in this section, have a life history strategy that makes them particularly susceptible to environmental variability. Different parts of their lifecycle such as spawning, feeding and overwintering are in separate location and they undergo extensive migrations to link the different stages. This allows them to adjust to optimum environmental conditions and a change in their behaviour may frequently be in response to variable external conditions. In addition they are feeding at a low trophic level and have a large biomass. As a consequence, changes of prevalent oceanographic conditions are likely to alter their spatial and temporal distribution and their abundance.
- There has been an increase in water temperatures in their distributional area and this is likely to affect the timing and spatial extent of migration and spawning.
- In most cases pelagic fisheries are directed at single species with limited by-catch. This fishery is mainly conducted with midwater trawls and purseiners in the midwater and has no contact with the seafloor. As a consequence, their impact on biogenic reefs and other vulnerable habitats are not believed to be significant. This should be considered when devising management measures for closed areas.
- Pelagic discarding or slipping is difficult to evaluate due to its sporadic nature but could be large in some cases. Its effects on the species and the surrounding ecosystem has not been evaluated but may have significant local impact.



**Fig. 1.)** Annual mean temperature from 50-600m (crosses) of all stations west of Porcupine Bank bounded by 52 to 54 and 16-14W collected during Blue Whiting Survey. Dotted lines are drawn at plus-minus standard deviation of all observations in each box, each year (from ICES 2006).

### References:

- ICES. 2006b. Report of the Northern Pelagic and Blue Whiting Fisheries Working Group(WGNPBW), 24-30 August 2006, ICES Headquarters. ICES CM 2006 /ACFM:34.294 pp.
- ICES. 2006c. Zooplankton monitoring
- ICES. 2007. Report of the Working Group for Regional Ecosystem Description (WGRED), 19 - 23 February 2007, ICES Headquarters, Copenhagen. ICES CM 2007/ ACE:02. 153 pp.

# FSS Advice for Widely Distributed and Migratory Populations

## Mixed Fisheries

The fisheries on the widely distributed stocks are largely taken in single-stock fisheries. There are mixed fisheries interactions through by-catch and discarding issues and pelagic fleets targeting several stocks seasonally, but these are not that well documented. In the absence of a detailed understanding of the mixed fisheries dynamics this section reiterated the single-stock exploitation boundaries.

## FSS ADVICE

### Special Note - For Advice on

- **Herring Stocks around Ireland see Celtic Sea, Irish Sea and West of Scotland Overviews.**
- **Northern Hake – See Celtic Sea Overview.**

For **Blue whiting combined stock**: FSS agrees with ICES and STECF advice that fishing within the limits of the management plan i.e. a reduction of 100,000 t per year is not considered in accordance with the precautionary approach. FSS further agrees with ICES conclusions that the exploitation boundaries for this stock should be based on the precautionary limits and that fishing at less than  $F_{pa}$  implies catches of less than 835,000 t in 2008. This will result in a spawning-stock biomass (SSB) in 2009 above  $B_{pa}^*$ .

For **Norwegian spring-spawning herring**: FSS agrees with the ICES and STECF advice to follow the agreed management plan with a fishing mortality of no more than  $F = 0.125$ . This corresponds to landings of 1.518 million tonnes in 2008 which is expected to lead to a SSB of 12.4 million tonnes in 2009.

For **Northeast Atlantic mackerel**: FSS agrees with the ICES and STECF advice that fishing within the agreed management plan ( $F = 0.15-0.2$ ) would correspond to landings in 2008 of between 349,000 t and 456,000 t, with an expected increase in SSB of 3-9% in 2009, compared to 2007. FSS points out that to be consistent with the precautionary approach, fishing at  $F_{pa} = 0.17$  corresponds to catches of 392,000 t in 2008.

For **Western horse mackerel**: FSS agrees with ICES recommendations to implement the proposed management plan. This would imply that catches of horse mackerel in Divisions IIa, IIIa (western part), IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e be limited to 180,000 t. FSS further advises that the existence of a significant juvenile fishery reduces the potential yield per recruit (weight) of the stock. Finally FSS advises that the management area for this stock should be revised to make it consistent with where the stock is fished.

For **Northeast Atlantic spurdog**: FSS agrees with ICES advice that the stock is depleted and may be in danger of collapse. Target fisheries should not be permitted to continue, and by-catch in mixed fisheries should be reduced to the lowest possible level. A TAC should cover all areas where spurdog are caught in the northeast Atlantic. This TAC should be set at zero for 2008.

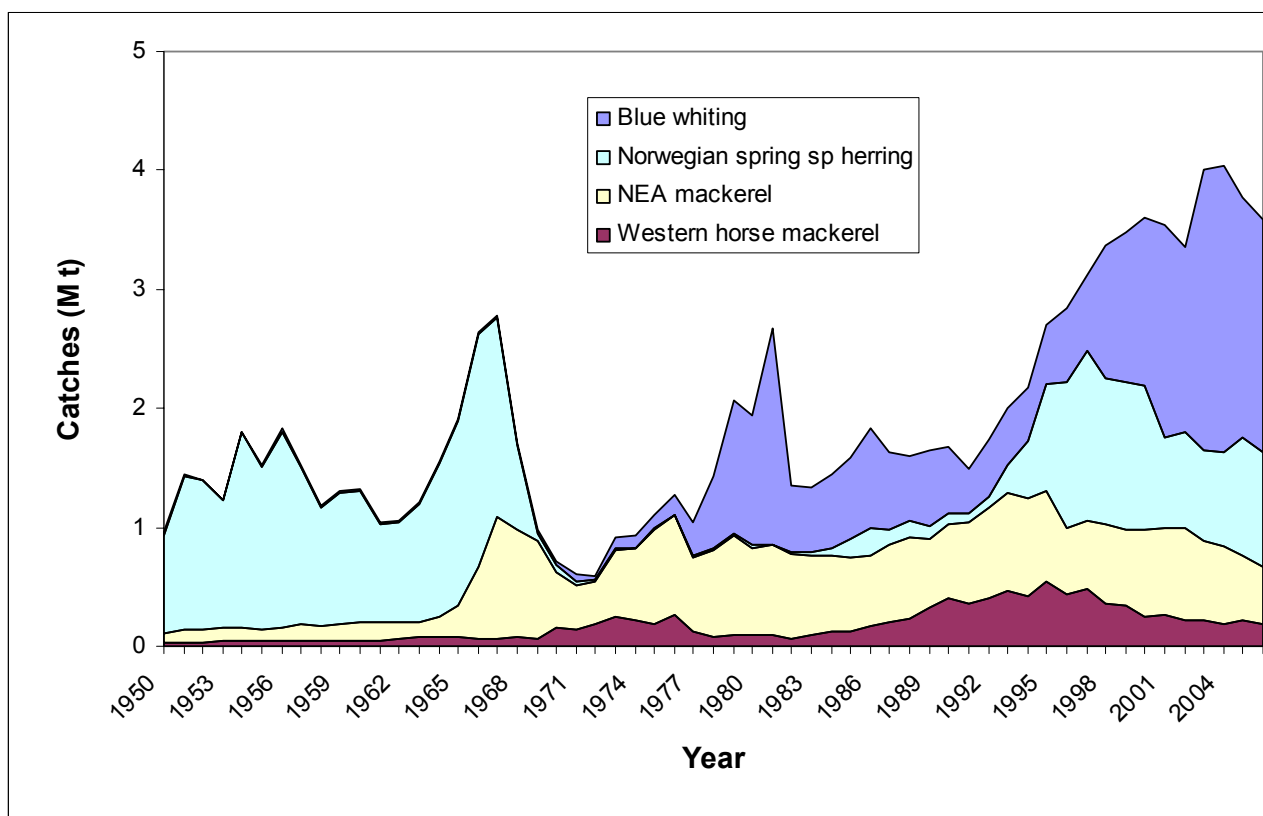
For **Northeast Atlantic porbeagle**: FSS agrees with ICES and STECF advice that no target fishery for porbeagle be permitted and that measures to reduce by-catch in mixed fisheries to the lowest possible level, should be introduced, particularly in the depleted northern areas. FSS further advises that no future fisheries for porbeagle should be permitted unless preceded by a programme to evaluate sustainable catches.

For **Northeast Atlantic Basking Shark**: FSS agrees with the ICES advice, that given the perceived depleted stock status, a zero TAC be set for the whole distribution area of basking shark. Further, FSS agrees with ICES advice that by-catch in mixed fisheries should be reduced to the lowest possible level.

For **Blue Shark**: ICCAT has responsibility for providing advice. According to the most recent assessment, the biomass of the North Atlantic blue shark stock is above the biomass that would support MSY. In many model runs the stock status appeared to be close to the unfished biomass levels, although these results are highly conditional on the initial assumptions used. ICCAT has not provided formal advice this year, but will in 2008. FSS agrees with ICCAT recommendations that precise catch records of blue shark are required for accurate assessments.

For Albacore tuna: FSS notes that ICCAT projections show that the stock will not recover if catches remain above 30,000 t per annum. Therefore FSS advises that the TAC for 2008 and subsequent years should be set lower than 30,000 t until the stock can be shown to have recovered.

For Bluefin tuna: FSS agrees with ICCAT that in order to reverse the decline of bluefin tuna substantial reductions in F and catch need to be implemented. This implies catches of about 15,000 t in the short term. In particular, FSS is concerned that these measures would not be effective if effort is displaced to other areas where the stock is taken. FSS is concerned that these measures will not be effective due to unregulated fishing and ranching activities in the Mediterranean.



**Fig.1** Catches (cumulative) by year of blue whiting, Northeast Atlantic mackerel, Western horse mackerel, and Norwegian spring-spawning herring. For horse mackerel data from 1950 and until 1979 includes all horse mackerel caught in the northeast Atlantic.



# North Sea Herring

## (Sub-area IV, Division VIIId and Div IIIa (autumn spawners))

No ACFM information has been included for this stock

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

### FSS –SINGLE STOCK CONSIDERATIONS

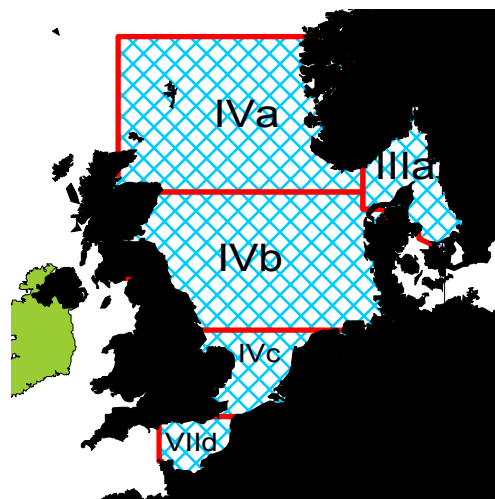
FSS agrees with ICES that this stock is at risk of reduced reproductive capacity and is at risk of being harvested unsustainably. SSB is expected to remain below  $B_{pa}$  in 2008. All year classes since 2001 are estimated to be among the weakest since the 1970s. Although there are some uncertainties in the data, the overall assessment gives a valid basis for advice.

FSS agrees with ICES that the TAC should be reduced by greater than 15% in 2008. In order to comply with the precautionary approach, a reduction in fishing mortality on juveniles and adults is needed to compensate for low recruitment in recent years and maintain SSB above  $B_{pa}$  (1.3 million tonnes). If the 15% constraint is applied, the SSB will remain well below  $B_{pa}$  in 2008 and continue to decline in 2009. Accordingly, ICES recommends that Paragraph 6 of the EU-Norway agreement be invoked. This states that, where considered appropriate, the Parties may reduce the TAC by more than 15% compared to the TAC of the previous year. The revised plan outlines TACs and corresponding allocations among fleets as indicated in the catch options table in the ACFM summary sheet. ICES advises a 50% reduction in TAC relative to 2007, corresponding to a catch of about 200,000 t for all fleets, including 175,000 t for fleet A.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS present an interpretation of how this proposal would be implemented for this stock (see table on page 46). For North Sea herring, FSS interpret that the proposal would result in a TAC in line with the EU Norway agreement.

### CURRENT MANAGEMENT

- The TAC is shared between EU and Norway and is divided between a number of different fleets operating in the North Sea, the English Channel and Division IIIa. The overall split of the TAC is 40% to Norway and 60% to the EU. The assessment covers the TAC areas. There is a separate allocation by EU in



Red Boxes-TAC/Management Areas Blue Shading-Assessment Area

operation for Divisions IVc and VIIId (Southern North Sea and English Channel).

- Ireland does not take part in this fishery and has no quota, but the availability of North Sea herring impacts on the prices attained by Irish herring in European markets.
- The agreed TAC for the fishery for 2007 is 341,000 t (including landings from the industrial fisheries and some landings taken under TACs from other ICES areas). The EU share of the TAC is 204,600 t.

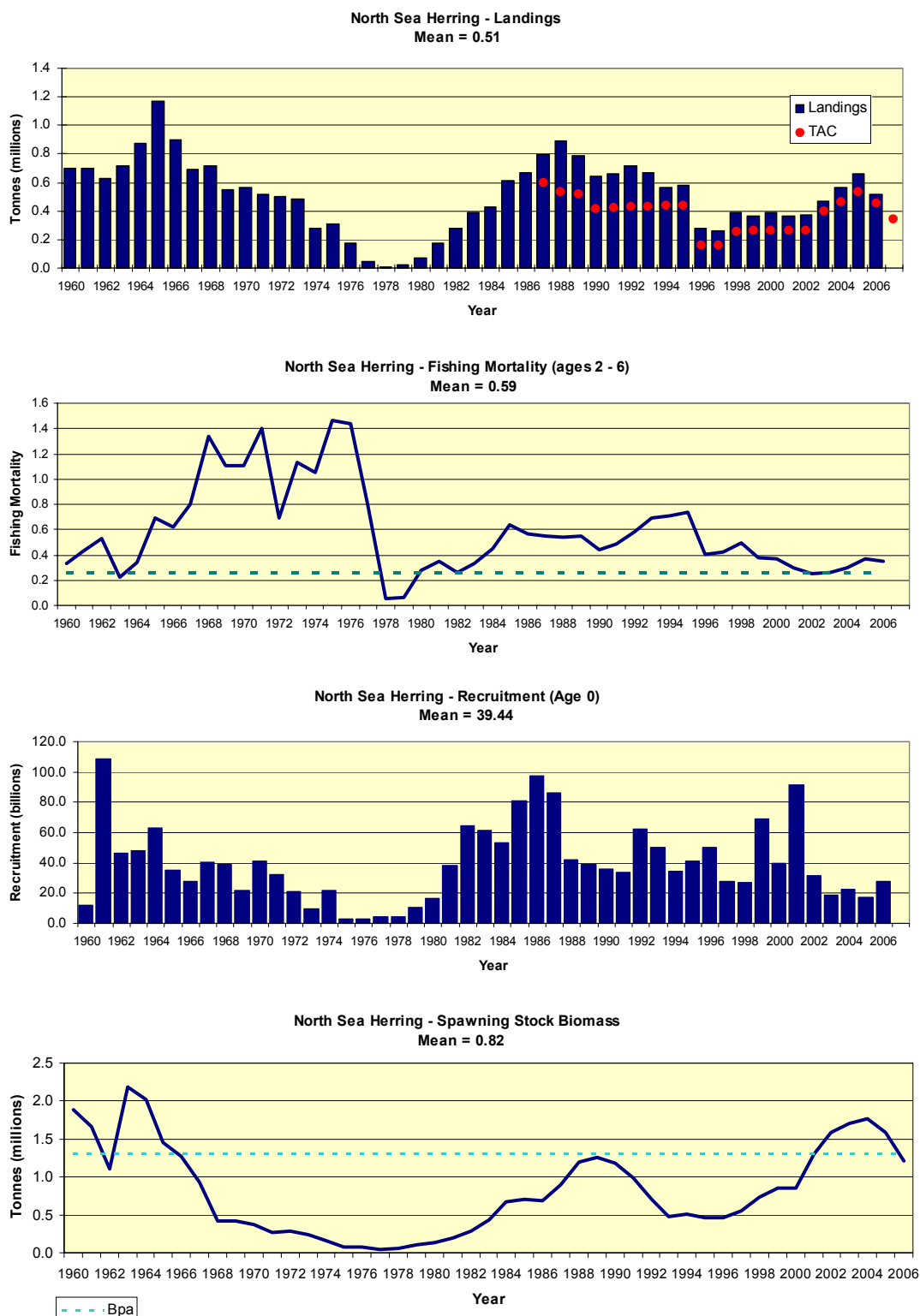
### ADDITIONAL INFORMATION

- ICES accepts the 2007 assessment but highlights that the area of reallocation of misreported and unallocated catches leads to assessment uncertainties.
- The total catch in 2006 was 515,000 t, compared to 664,000 t in 2005. This represents a TAC overshoot of 13%, a decrease compared to a 24% overshoot in 2005.
- This stock is considered to be at risk of reduced reproductive capacity and has recently produced five poor year classes in a row. Larval surveys have indicated an abundance of larvae in this area but survival appears to be very poor.
- An ICES study group has reviewed the hypotheses for the serial poor recruitment in North Sea herring (SGRECVAP, 2007). A change in the North Sea environment has occurred at the same time as the poor recruitment in herring and the downward trend in Norway pout. It is likely that the poor recruitment in North Sea herring is a result of poor survival of larvae from the central and northern components of the stock. Further investigation of the causes of the poor recruitment will require targeted research projects.
- Catches are taken by Denmark, Norway, Nether-

lands, Sweden, France, Germany and United Kingdom. These include directed fleets that land fish for human consumption and fleets where herring is taken as a by-catch in mixed industrial fisheries.

6. FSS notes that the TAC in Divisions IVc and VIId should not vary faster than that for the North Sea as a whole.
7. The internationally agreed harvest control rule for this stock, between the EU and Norway continues to operate.

8. The management of this fishery is complex and must take into consideration the variations in productivity of different components of the stock
9. ICES have evaluated the performance of the Harvest Control Rule for this stock and found that the strict application of the TAC change limit of 15% (rule number 5) is not consistent with the precautionary approach. Assuming that paragraph 6 would be invoked when SSB falls below  $B_{pa}$ , the revised HCR is in accordance with the precautionary approach.



# Norwegian Spring Spawning Herring

## Sub-areas I and II

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

ICES classifies this stock as having full reproductive capacity and being harvested sustainably. The estimate of SSB is uncertain but is well above  $B_{pa}$  and  $F$  is well below  $F_{pa}$ . The assessment is sensitive to the input data used, but this does not alter the overall perception of stock status.

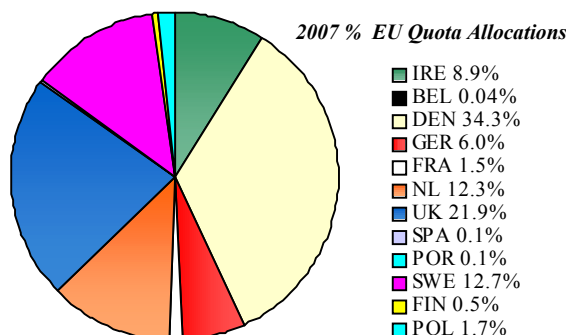
FSS agrees with the ICES and STECF advice to follow the agreed management plan with a fishing mortality of no more than  $F = 0.125$ . FSS notes that the Coastal States agreed a TAC, in October 2007. FSS notes that a revised ICES prediction has changed the maximum catch, consistent with the management plan to 1.51 million tonnes. FSS agrees with ICES that the management plan is consistent with the precautionary approach.

The targets defined in the management plan are consistent with high long term yield and low risk of depleting the production potential.

In comparison to last year the SSB is estimated to be 16% higher and  $F$  is estimated to be 12% lower. The increased SSB is due to higher estimates of three very strong year classes.

### CURRENT MANAGEMENT

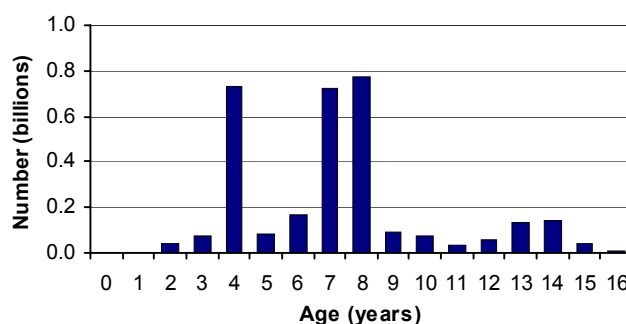
- A long term management plan has been agreed for this fishery since 1999 between the EU, Faroe Islands, Iceland, Norway and Russia. The plan aims at preventing SSB from falling below  $B_{lim}$  of 2.5 million tonnes, and restricting the TACs consistent with a fishing mortality of less than 0.125. Provisions are also made to reduce this  $F$ , should the SSB fall below  $B_{pa}$  of 5 million tonnes.
- ICES considers that this agreement is consistent with the precautionary approach.
- In 2007, the agreed TAC was in accordance with the management plan and was 1.28 million tonnes.
- In 2007 the EU TAC was 70,000 t, of which Ireland was allocated 6,209 t.
- The Irish quota is allocated to a small number of vessels on a lottery basis, when EU vessels are granted access to the Norwegian sector.
- In recent years, EU vessels have not had access to the Norwegian EEZ to target this stock.



### ADDITIONAL INFORMATION

1. The assessment in 2007 shows an upward revision of SSB. SSB in 2006 is estimated at just over 12.3 million tonnes, the highest since the early fifties. This is due to strong year classes entering the fishery and low fishing mortality. The stock appears to have full reproductive capacity and is being harvested sustainably.
2. The stock is characterised by large fluctuations in recruitment and depends on the appearance of sporadic strong year classes. In recent years, the stock has tended to produce strong year classes more regularly.
3. The stock has increased in biomass due to the incoming of strong year classes in 1998 and 1999. The 2002 year class also appears to be strong and is now considered to be fully mature. Surveys indicate that the 2003 year class is moderate. The 2004 year class is thought to be strong and comparable to the 1998 year class.
4. In the absence of good recruitment, overfishing can cause the stock to collapse, as happened in the 1970s. The stock did not recover until the mid 1990s.
5. The assessment has a history of overestimating the stock size.
7. The total catch in 2006 amounted to almost 969,000 tonnes and was mainly taken by Norway, Russia, Iceland and the Faroe Islands.
8. Ireland participated in this fishery for the first time in 1996 with landings of nearly 20,000 t. Landings have declined since then, with landings of over 4,600 t in 2006.

2006 Age Distribution: International Landings, Herring in II, IVa & V



# ICES ADVICE

## 9.4.5

Including Correction: 9 November 2007

The ICES advice for Norwegian Spring Spawning herring released in October 2007 included an error in the forecast for Norwegian Spring-spawning Herring (NSSH). The error affected the calculation of the weighted fishing mortality and meant that the 2008 catch in the forecast was too low. This has now been revised, the corrected forecast and implications for advice are included below.

### State of the stock

Spawning bio-mass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target F
Full reproductive capacity	Harvested sustainably	Unknown	Below target

Based on the most recent estimates of SSB and fishing mortality, ICES classifies the stock as having full reproductive capacity and being harvested sustainably. The estimate of the spawning-stock biomass, although uncertain, is well above  $B_{pa}$  in 2007. Fishing mortality is well below  $F_{pa}$ . The spawning stock is now dominated by the strong 1998, 1999, and 2002 year classes. Surveys indicate that the 2003 year class is moderate, while the 2004 year class is also strong (comparable to the 1998 year class).

### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	2.5 million t	MBAL
	$B_{pa}$	5.0 million t	$B_{lim} * \exp(0.4 * 1.645)$ .
	$F_{lim}$	not relevant for this stock.	-
	$F_{pa}$	0.15	based on medium-term simulations.
Targets	$F_y$	<0.125	Management Plan.

PA points unchanged since 1998.

### Single-stock exploitation boundaries

#### Exploitation boundaries in relation to existing management plans

The management plan implies maximum catches of 1 518 000 t in 2008, which is expected to leave a spawning stock of 12.4 million tonnes in 2009.

#### Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

The target defined in the management plan is consistent with high long-term yield and has a low risk of depleting the production potential.

### Management objectives

The EU, Faroe Islands, Iceland, Norway, and Russia agreed in 1999 on a long-term management plan. This plan consists of the following elements:

1. Every effort shall be made to maintain a level of Spawning Stock Biomass (SSB) greater than the critical level ( $B_{lim}$ ) of 2 500 000 t.
2. For the year 2001 and subsequent years, the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality rate of less than 0.125 for appropriate age groups as defined by ICES, unless future scientific advice requires modification of this fishing mortality rate.
3. Should the SSB fall below a reference point of 5 000 000 t ( $B_{pa}$ ), the fishing mortality rate referred to under paragraph 2, shall be adapted in the light of scientific estimates of the conditions to ensure a safe and rapid recovery of the SSB to a level in excess of 5 000 000 t. The basis for such an adaptation should be at least a linear reduction in the fishing mortality rate from 0.125 at  $B_{pa}$  (5 000 000 t) to 0.05 at  $B_{lim}$  (2 500 000 t).
4. The Parties shall, as appropriate, review and revise these management measures and strategies on the basis of any new advice provided by ICES.

ICES considers that this agreement is consistent with the precautionary approach.

## Short-term implications

### Outlook for 2008

Basis: Landings (2007) = 1280 (=TAC);  $F_w(2007)^{1)} = 0.100$ ; SSB(2007) = 11.9 million t.; SSB(2008)=11.9 million t.  
The fishing mortality applied according to the agreed management plan ( $F(\text{management plan})$ ) is 0.125.

Rationale	Landings (2008)	Basis	F(2008)	SSB(2009)
Zero catch	0	$F=0$	0	13.8
Status quo	1247	$F(2006)$	0.102	12.7
Agreed management plan	162	$F(\text{management plan}) * 0.1$	0.013	13.7
	395	$F(\text{management plan}) * 0.25$	0.031	13.5
	788	$F(\text{management plan}) * 0.50$	0.063	13.1
	1159	$F(\text{management plan}) * 0.75$	0.094	12.7
	1383	$F(\text{management plan}) * 0.90$	0.113	12.5
	1518	$F(\text{management plan})$	0.125	12.4
	1661	$F(\text{management plan}) * 1.1$	0.138	12.3
	1866	$F(\text{management plan}) * 1.25$	0.156	12.1
Precautionary limits	1801	$F_{pa}$	0.150	12.2

Landings weights in thousand tonnes, stock biomass weights in million tonnes.

<sup>1)</sup>  $F_w$  = Fishing mortality weighted by population numbers (age groups 5–14).

Shaded scenarios are not considered consistent with the precautionary approach.

## Management considerations

This stock has shown a large dependency on the occasional appearance of very strong year classes. In recent years, the stock has tended to produce strong year classes more frequently.

In recent years, the migration behavior of the stock has changed significantly, particularly in geographical locations of the overwintering and feeding areas. These, in turn, affect the distribution of the fisheries.

### Ecosystem considerations

Juveniles and adults of this stock form an important part of the ecosystems in the Barents Sea, the Norwegian Sea, and the Norwegian coast. Herring has an important role as food resource to higher trophic levels (e.g. cod, seabirds, and marine mammals). Recent changes in the herring migration have led to an increased proportion of the population feeding in Faroese and Icelandic waters. The growth of these herring is faster than those feeding further east and north.

## Factors affecting the fisheries and the stock

### The effects of regulations

In the rebuilding phase of the stock in the 1980s and beginning of the 1990s (SSB < MBAL = 2.5 million t), the objective was to keep the fishing mortality below 0.05. With the exception of a few years, this objective was achieved. A minimum landing size regulation of 25 cm has been in place since 1977. This has prevented the exploitation of young herring. These regulations have contributed to a rebuilding of the stock to levels well above precautionary limits. When the fishery expanded in the mid-1990s, a long-term management plan was agreed; this plan is cited above.

For 2006, the Parties exploiting the resources (European Union, Faroe Islands, Iceland, Norway, and Russia) did not reach agreement regarding the allocation of the quota and no TAC was agreed. However, the fishing mortality resulting from the sum of the coastal states quotas has not exceeded  $F_{pa}$ . For 2007 the parties did reach agreement on a TAC in accordance with the Management Plan and agreed on the allocation of the quota.

### Changes in fishing technology and fishing patterns

The main catches in 2006 were taken by Norway (567 000 t), Russia (121 000 t), Iceland (157 000 t), EU (60 000 t), and Faroe Islands (63 000 t). The fishery in general follows the migration of the stock closely as it moves from the wintering and spawning grounds along the Norwegian coast to the summer feeding grounds in the Faroese, Icelandic, Jan Mayen, Svalbard, and international areas. Due to limitations for some countries to enter the EEZs of other countries in 2005, the fisheries do not necessarily depict the distribution of herring in the Norwegian Sea and the preferred fishing pattern if the fleets were given free access to any zone. A special feature of the summer fishery in 2005 and especially in 2006 was the prolonged fishery in the Faroese and Icelandic zone during summer up to late August, where the oldest age groups were present. The usual pattern has been that the fishery moved gradually northwards towards the Jan Mayen zone in June. A further new observation in recent years is the increasing presence of adult mackerel in the southern part of the Norwegian Sea which was found mixed with the herring.

A large increase in fishing effort, new technology, and environmental changes contributed to the collapse of this stock around 1970. Recruitment failed in the second half of the 1960s when the SSB was reduced below 2.5 million t. Starting in 1989, a succession of above-average to very strong year classes were produced, promoting full recovery of the SSB and allowing an expansion of the fishery. Since 1992 the coastal fishery has increased sharply. Until 1994, the fishery was almost entirely confined to Norwegian coastal waters. During the summer of 1994 there were also catches in the offshore areas of the Norwegian Sea for the first time in 26 years. The geographical extent of this fishery increased in 1995, with nine nations participating and the total catch exceeding 900 000 t. The fishery expanded further in 1996 and the annual level of the fishery was in the order of 1.2–1.5 million t in the period 1996–2000. Management regulations have restricted landings in recent years.

### The environment

The Norwegian spring-spawning herring carries out extensive migrations in the NE Atlantic, and has often been linked to changes in ocean climate and in zooplankton distribution. ICES has shown that there was a weak relationship between zooplankton biomass in May and herring condition in the autumn during the years 1995–2005.

The March–April NAO index for 2004 and 2005 has been shown to predict the herring condition index in the winters of 2005 and 2006. Based on a link between SST in the first quarter in the Norwegian Sea and herring larval abundance with subsequent recruitment, recruitment was predicted to increase during the period from 2005 to 2007.

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## Scientific basis

### *Data and methods*

The advice is based on an analytical assessment, which takes into consideration catch data and eight surveys (acoustic surveys of adults and juveniles, larval survey, and 0-group survey).

ICES investigated the use of a number of different models. When appropriately formulated, they all gave a similar perception of the trajectory for stock size and fishing mortalities. On this basis, the SeaStar model was used, as in previous years.

### *Data and methods—November 2007*

The updated forecast has been quality checked with two other versions of forecast software that uses weighted mean fishing mortality.

Data used is the same as in the October 2007 forecast except for a very small correction in the weight in the stock for age 13. This correction of data has a minor effect on the estimated spawning stock.

### *Uncertainties in assessment and forecast*

The choice of the assessment model had a minor impact on the results, apart from the estimation of recruitment of the most recent year classes. The assessment appears to be more sensitive to the choice of the data used than to the choice of the model.

There has been an apparent shift in wintering areas for this stock since 2003. These distributional changes have affected the usefulness of winter surveys because the surveys do not cover the whole distribution area of the stock anymore. These surveys show a lower abundance of the 1998 and 1999 year classes since 2003, because these year classes did not enter the area covered by the survey. The decrease of these year classes is not observed in other surveys carried out later in the year on the feeding grounds. Because of the large change in wintering patterns of the herring, the results of the winter surveys from 2003–2007 were not used in the assessment. The design of the surveys has been adjusted to cover the area currently occupied by the whole stock at that time of year and can be reintroduced in future assessments.

### *Comparison with previous assessment and advice*

Compared to last year, the SSB for 2006 is estimated to be about 16% higher and the fishing mortality in 2005 to be about 12% lower (see Figure 9.4.5.1). In comparison to the forecast of the 2007 SSB last year, the SSB estimate from the present assessment for 2007 is 12% higher. The difference between this year's assessment and the previous assessment is smaller than last year. The main difference in the estimate of SSB in 2006 between this year and last year lies in higher estimates of three very strong year classes. The 1998 and 1999 year classes contribute 600 000 tonnes more while the 2002 year class contributes 800 000 tonnes more. The main source of data for the higher estimates of these strong year classes comes from the international survey on the feeding grounds in the Norwegian Sea.

Current catch advice at the target fish mortality is similar to the catch advice for 2007 even though the SSB is higher. The fishery exploits different year classes at different rates. The reduction in the exploitation at some abundant ages results in similar catch advice for a higher SSB, while maintaining the same overall exploitation rate.

Last year the recruitment was estimated at age 0; this year's assessment is based on recruitment-at-age 1.

### *Comparison with the October 2007 advice*

In the October 2007 forecast, the fishing mortality for 2007 assuming a TAC of 1 280 000 t in 2007 was estimated as  $WF_{5-14}=0.127$  but using a wrong calculation. This has now been corrected and this results in a lower estimated fishing mortality for 2007:  $WF_{5-14}=0.100$ .

In October 2007, the  $WF_{5-14}=0.125$  from the agreed management plan resulted in a calculated TAC for 2008 1 266 000 t. This has now been revised to 1 518 000 t. These changes have only minor effects on the spawning stock both in 2008 and 2009.

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## Source of information

Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, 27 August–1 September 2007 (ICES CM 2007/ACFM:29).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Catch
1987	TAC	150	115	127
1988	TAC	120–150	120	135
1989	TAC	100	100	104
1990	TAC	80	80	86
1991	No fishing from a biological point of view	0	76	85
1992	No fishing from a biological point of view	0	98	104
1993	No increase in F	119	200	232
1994	Gradual increase in F towards $F_{0.1}$ ; TAC suggested	334	450	479
1995	No increase in F	513	None <sup>1</sup>	906
1996	Keep SSB above 2.5 million t	-	None <sup>2</sup>	1 217
1997	Keep SSB above 2.5 million t	-	1 500	1 420
1998	Do not exceed the harvest control rule	-	1 300	1 223
1999	Do not exceed the harvest control rule	1 263	1 300	1 235
2000	Do not exceed the harvest control rule	Max 1 500	1 250	1 207
2001	Do not exceed the harvest control rule	753	850	770
2002	Do not exceed the harvest control rule	853	850	809
2003	Do not exceed the harvest control rule	710	711 <sup>3</sup>	773
2004	Do not exceed the harvest control rule	825	825 <sup>3</sup>	794
2005	Do not exceed the harvest control rule	890	1 000 <sup>3</sup>	1 003
2006	Do not exceed the harvest control rule	732	967 <sup>3</sup>	969
2007	Do not exceed the harvest control rule	1 280	1 280	
2008	Do not exceed the harvest control rule	1 518		

Weights in '000 t.

<sup>1</sup>Autonomous TACs totaling 900 000 t.

<sup>2</sup>Autonomous TACs totaling 1 425 000 t were set by April 1996.

<sup>3</sup>There was no agreement on the TAC, the number is the sum of autonomous quotas from the individual Parties.

Norwegian spring-spawning herring

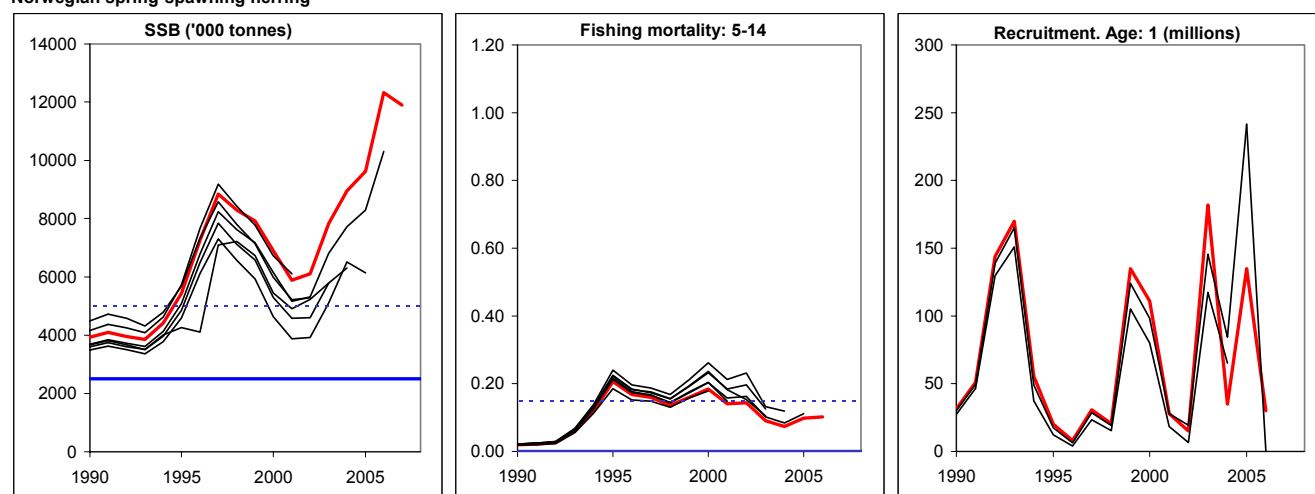


Figure 9.4.5.3 Norwegian spring-spawning herring. Historical performance of the assessment (SSB, fishing mortality, and recruitment).



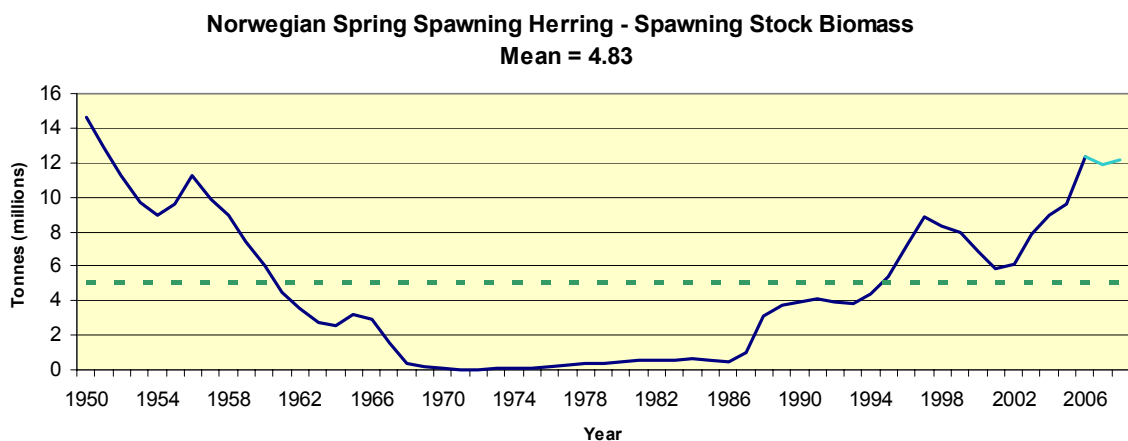
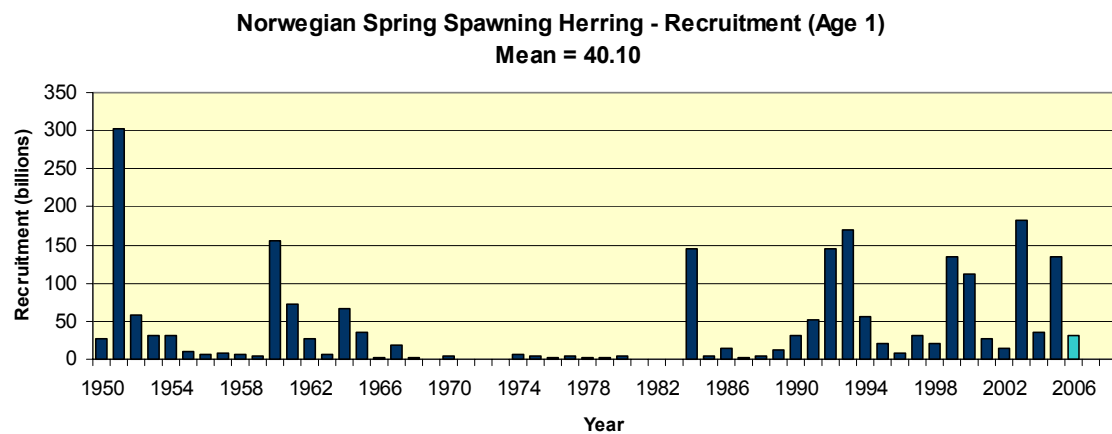
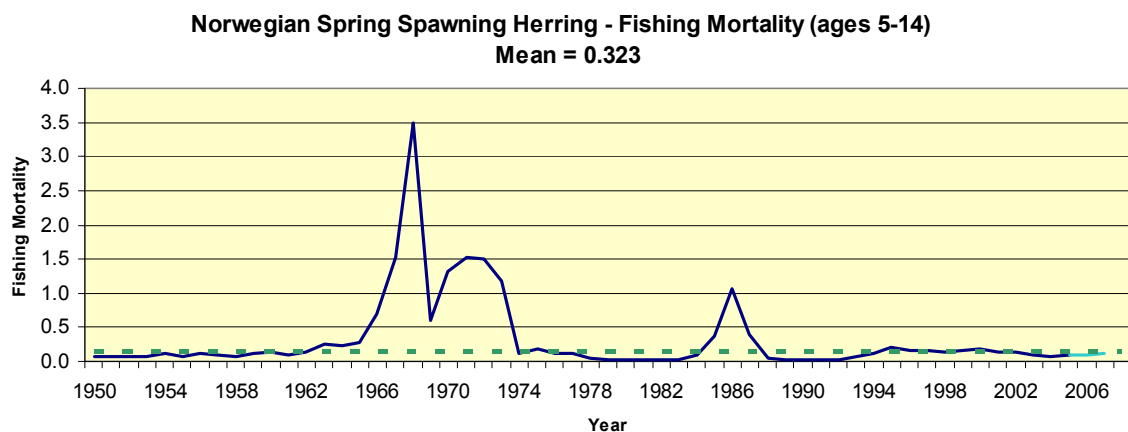
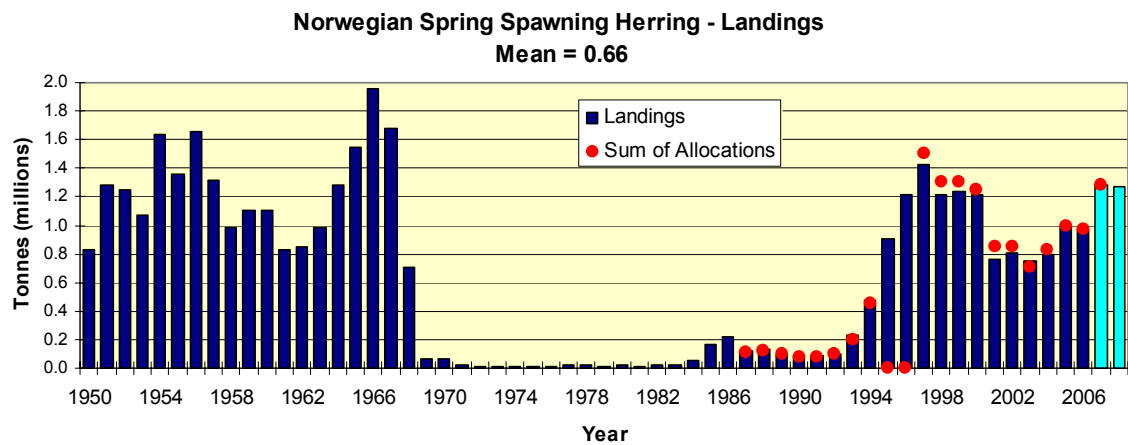


Table 9.4.5.1

Total catch of Norwegian spring-spawning herring (tonnes) since 1972. Data provided

Year	Norway	USSR/ Russia	Denmark	Faroes	Iceland	Ireland	Netherlands	Greenland	UK (Scotland)	Germany	France	Poland	Sweden	Total
1972	13,161	-	-	-	-	-	-	-	-	-	-	-	-	13,161
1973	7,017	-	-	-	-	-	-	-	-	-	-	-	-	7,017
1974	7,619	-	-	-	-	-	-	-	-	-	-	-	-	7,619
1975	13,713	-	-	-	-	-	-	-	-	-	-	-	-	13,713
1976	10,436	-	-	-	-	-	-	-	-	-	-	-	-	10,436
1977	22,706	-	-	-	-	-	-	-	-	-	-	-	-	22,706
1978	19,824	-	-	-	-	-	-	-	-	-	-	-	-	19,824
1979	12,864	-	-	-	-	-	-	-	-	-	-	-	-	12,864
1980	18,577	-	-	-	-	-	-	-	-	-	-	-	-	18,577
1981	13,736	-	-	-	-	-	-	-	-	-	-	-	-	13,736
1982	16,655	-	-	-	-	-	-	-	-	-	-	-	-	16,655
1983	23,054	-	-	-	-	-	-	-	-	-	-	-	-	23,054
1984	53,532	-	-	-	-	-	-	-	-	-	-	-	-	53,532
1985	167,272	2,600	-	-	-	-	-	-	-	-	-	-	-	169,872
1986	199,256	26,000	-	-	-	-	-	-	-	-	-	-	-	225,256
1987	108,417	18,889	-	-	-	-	-	-	-	-	-	-	-	127,306
1988	115,076	20,225	-	-	-	-	-	-	-	-	-	-	-	135,301
1989	88,707	15,123	-	-	-	-	-	-	-	-	-	-	-	103,830
1990	74,604	11,807	-	-	-	-	-	-	-	-	-	-	-	86,411
1991	73,683	11,000	-	-	-	-	-	-	-	-	-	-	-	84,683
1992	91,111	13,337	-	-	-	-	-	-	-	-	-	-	-	104,448
1993	199,771	32,645	-	-	-	-	-	-	-	-	-	-	-	232,457
1994	380,771	74,400	-	2,911	21,146	-	-	-	-	-	-	-	-	479,228
1995	529,838	101,987	30,577	57,084	174,109	-	7,969	2,500	881	556	-	-	-	905,501
1996	699,161	119,290	60,681	52,788	164,957	19,541	19,664	-	46,131	11,978	-	-	22,424	1,220,283
1997	860,963	168,900	44,292	59,987	220,154	11,179	8,694	-	25,149	6,190	1,500	-	19,499	1,426,507
1998	743,925	124,049	35,519	68,136	197,789	2,437	12,827	-	15,971	7,003	605	-	14,863	1,223,131
1999	740,640	157,328	37,010	55,527	203,381	2,412	5,871	-	19,207	-	-	-	14,057	1,235,433
2000	713,500	163,261	34,968	68,625	186,035	8,939	-	-	14,096	3,298	-	-	14,749	1,207,201
2001	495,036	109,054	24,038	34,170	77,693	6,070	6,439	-	12,230	1,588	-	-	9,818	766,136
2002	487,233	113,763	18,998	32,302	127,197	1,699	9,392	-	3,482	3,017	-	1,226	9,486	807,795
2003*	477,573	122,846	14,144	27,943	117,910	1,400	8,678	-	9,214	3,371	-	-	6,431	789,510
2004	477,076	115,876	23,111	42,771	102,787	11	17,369	-	1,869	4,810	400	-	7,986	794,066
2005*	580,804	132,099	28,368	65,071	156,467	-	21,517	-	-	17,676	0	561	680	1,003,243
2006**	567,237	120,836	18,449	63,137	157,474	4,693	11,625	-	12,523***	9,958	80	-	2,946	968,958

\*In 2003 the Norwegian catches were raised by 39,433 to account for changes in percentages of water content.

\*\*Preliminary, as provided by Working Group members.

\*\*\*Scotland and Northern Ireland combined.

**Table 9.4.5.2** Norwegian spring-spawning herring.

Year	Recruitment Age 1 billions	SSB 1st of January Million tonnes	Landings tonnes	F weighted Ages 5–14
1950	26.5	14.653	826,100	0.058
1951	302	12.913	1,277,900	0.070
1952	58.5	11.29	1,254,800	0.073
1953	30.5	9.671	1,074,400	0.066
1954	31.4	8.937	1,644,500	0.113
1955	10.3	9.556	1,359,800	0.078
1956	6.85	11.234	1,659,400	0.110
1957	8.72	9.913	1,318,500	0.103
1958	7.14	8.939	986,300	0.079
1959	3.23	7.392	1,111,100	0.113
1960	156	6.022	1,101,800	0.136
1961	72.1	4.515	830,100	0.104
1962	27	3.547	848,600	0.146
1963	5.37	2.746	984,500	0.253
1964	65.6	2.597	1,281,800	0.226
1965	35.9	3.164	1,547,700	0.278
1966	1.98	2.887	1,955,000	0.696
1967	18.4	1.515	1,677,200	1.519
1968	1.33	0.356	712,200	3.493
1969	0.972	0.151	67,800	0.590
1970	3.62	0.075	62,300	1.320
1971	0.193	0.034	21,100	1.525
1972	0.077	0.017	13,161	1.497
1973	0.168	0.088	7,017	1.173
1974	5.22	0.094	7,619	0.114
1975	3.47	0.082	13,713	0.190
1976	1.19	0.142	10,436	0.106
1977	4.08	0.294	22,706	0.111
1978	2.04	0.367	19,824	0.043
1979	2.51	0.398	12,864	0.024
1980	5.06	0.483	18,577	0.034
1981	0.595	0.517	13,736	0.022
1982	0.442	0.516	16,655	0.020
1983	0.938	0.589	23,054	0.029
1984	145	0.617	53,532	0.090
1985	4.67	0.529	169,872	0.379
1986	15.2	0.453	225,256	1.074
1987	2.45	0.982	127,306	0.404
1988	3.71	3.097	135,301	0.040
1989	12.9	3.772	103,830	0.026
1990	31.3	3.93	86,411	0.020
1991	51.2	4.096	84,683	0.022
1992	144	3.961	104,448	0.026
1993	170	3.857	232,457	0.060
1994	55.4	4.414	479,228	0.120
1995	20.1	5.439	905,501	0.206
1996	7.99	7.258	1,220,283	0.169
1997	30.7	8.839	1,426,507	0.160
1998	20.7	8.294	1,223,131	0.136
1999	135	7.918	1,235,433	0.160
2000	111	6.896	1,207,201	0.184
2001	27.9	5.89	766,136	0.141
2002	15.1	6.106	807,795	0.144
2003	182	7.84	750,077	0.091
2004	35.0*	8.955	793,666	0.074
2005	135.0 **	9.629	1,003,243	0.099
2006	30.1***	12.327	968,958	0.102
2007		11.898		
Average	42.8	4.575	664,781	0.323

\* original value 96.9 replaced in forecast by GM mean 1986–2005.

\*\* original value 225.0 replaced in forecast by year class similar as 1998 year class.

\*\*\* does not contribute to catch and is not used in predictions.

# North East Atlantic Mackerel

(combined Southern, Western and North Sea spawning components)

For latest information, see: <http://www.ices.dk>



Marine Institute  
Foras na Mara

Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

SSB is uncertain but declined from 1999 to 2002 and has been increasing since. This stock is being harvested unsustainably and  $F$  in 2006 is at  $F_{lim}$ . Fishing mortality in recent years has been above  $F_{lim}$  but is decreasing due to lower catches and rising biomass.

FSS agrees with the ICES and STECF advice that fishing within the agreed management plan ( $F = 0.15-0.2$ ) would correspond to landings in 2008 of between 349,000 t and 456,000 t, with an expected increase in SSB of 3-9% in 2009, compared to 2007. FSS points out that to be consistent with the precautionary approach, fishing at  $F_{pa} = 0.17$  corresponds to catches of 392,000 t in 2008.

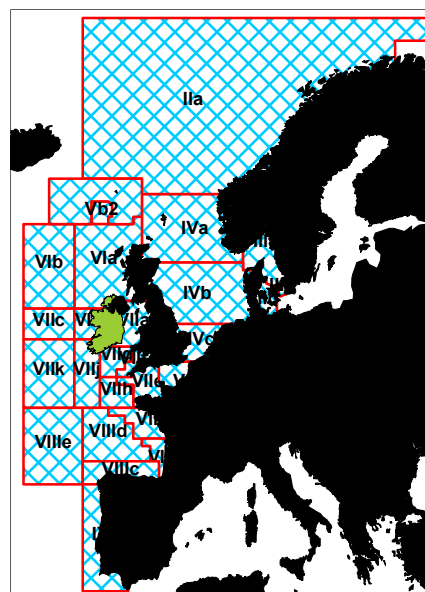
FSS agrees with the additional ICES and STECF advice that;

- The North Sea spawning component still needs the maximum possible protection;
- There should be no fishing for mackerel in Divisions IIIa and IVb,c at any time of the year;
- There should be no fishing for mackerel in Division IVa during the period 15 February-31 July;
- The 30 cm minimum landing size at present in force in Sub-area IV should be maintained;

There is now a provision in the coastal states agreement for observers to be placed on vessels with a licence to fish mackerel. FSS agrees with ICES that observer coverage should be 100%.

The TAC was decided in November 2007 at the coastal states meeting so the EC policy on fishing opportunities does not apply. The negotiations agreed to set a TAC based on an  $F$  at the upper end of the TAC setting arrangement. This agreement corresponds to a TAC of 456,000 t for 2008.

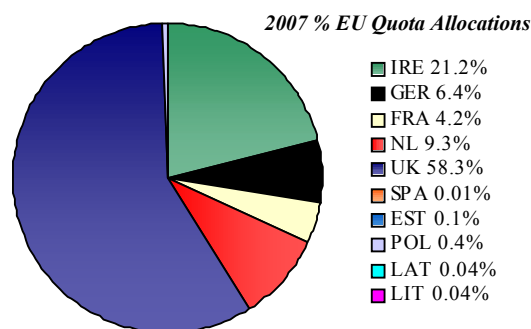
Recent work on the development of a long term management plan for NEA mackerel suggests that  $F$  associated with maximising long term yield and minimising risk to the stock is likely below the upper bound of the current coastal states agreement. This work also suggests that a safe trigger biomass for the long term management of this stock is likely to be above the 2.3 million tonnes agreed in the coastal states arrangement. Under these conditions the average long term yield is below 600,000 t.



Red Boxes- TAC/Management Areas    Blue Shading- Assessment Area

## CURRENT MANAGEMENT

- The TAC was agreed by the Coastal States (EU, Norway and Faeroe Islands). It is divided into a number of components: North Sea TAC (EU and Norway), Western TAC (EU, Norway and Faeroes), Southern TAC (EU only) and NEAFC TAC (Coastal States, Russia and Iceland). In addition, Norway grants 1,865 t of quota to Sweden.
- There is an ad-hoc agreement between the coastal states (EU, Norway and Faroe Is) for setting the TAC for the stock. This agreement is quoted overleaf in the ACFM advice summary.
- The total TAC set for 2007 was 472,000 t. The EU TAC was 319,141 t including the southern areas and the Irish share of the EU quota was 54,369 t.
- The Irish quota is allocated to the pelagic and polyvalent fleet segments in different ways. The polyvalent segment allocation is 7,000 t, and does not vary according to the size of the Irish quota. The remainder is allocated to the pelagic segment according to an allocation key.
- In 2007 Ireland agreed not to fish 3,687 t of its quota. This measure was in response to investigations which documented illegal landings into Scottish factories, by Irish and UK vessels in 2005.
- The Cornwall box remains closed to directed trawling for mackerel.



## ADDITIONAL INFORMATION

1. Misreporting of catches continues to be a serious problem. The estimate of SSB in 2006 may be biased due to unknown quantities of missing catch. This was estimated by ICES to be at least 60% of the figure used in the assessment in 2006. The status of the SSB relative to  $B_{pa}$  and the estimates of fishing mortality are not biased by missing catch so long as there have not been large changes in the quantities of missing catch over time.
2. FSS further notes that  $F$  in 2006 was at  $F_{lim}$  but is expected to fall in 2007 (based on assumed catches) to about 0.23, and may fall within the coastal states range in the near future if enforcement continues to improve and recruitment remains average.
3. Important improvements in enforcement have been taken by UK and Ireland in 2005 & 2006 and continued in 2007.
4. Over the past 4 years recruitment has fluctuated more widely than since the mid 1980s. The 2001 year class is the lowest observed, and the 2002 year class is the highest observed.
5. The fishery is dominated by Norway, United Kingdom (Scotland), Ireland and Russia. The main Irish catches are taken by refrigerated sea water (RSW) vessels.
6. The total catch in 2006 was 472,652 t while the Irish catch was about 40,664 t.
7. Discard and slipping estimates are only available from three countries (about 18,000 t in 2006) and are considered large underestimates. High-grading might be considered common practice as the Japanese market favours larger fish. In the last few years the market for smaller fish has improved.
8. Irish and Scottish fleets are thought to have similar patterns of discarding.

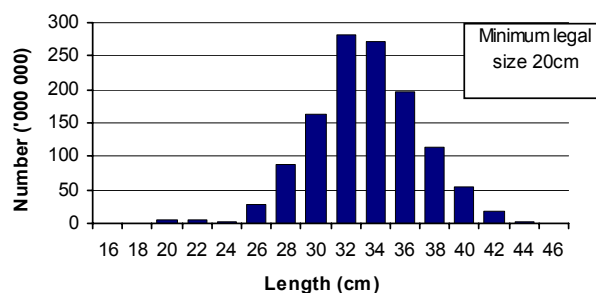
## ICES ADVICE

### 9.4.2

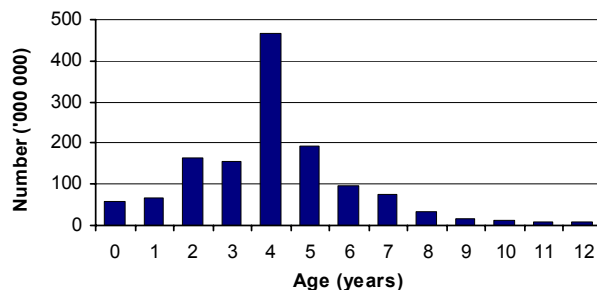
#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to target fishing mortality
Uncertain	Harvested unsustainably	Overexploited	Above target

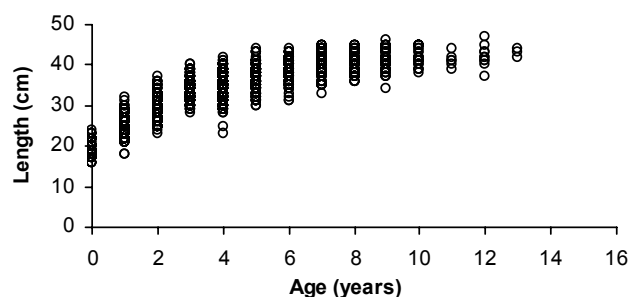
#### 2006 Length Distribution: International Landings, Mackerel in NEA



#### 2006 Age Distribution: International Landings, Mackerel in NEA



#### 2006 Size at Age: Irish Sampling, Mackerel in NEA



Based on the most recent estimates of fishing mortality, ICES classifies the stock as being harvested unsustainably. Fishing mortality in 2006 is estimated to be at  $F_{lim}$ . Because of the unknown levels of underreporting in the catch, SSB in recent years relative to  $B_{pa}$  cannot be accurately estimated, but indications are that SSB has increased since 2003 and has been stable for the last 3 years at around  $B_{pa}$ . The stock has been showing much more variable recruitment over the recent years compared to the past. The 2000 and 2003 year classes are estimated to be poor, while both the 2001 and the 2002 year classes are above average. The 2002 year class is estimated to be the highest in the time-series. There is insufficient information to confirm the sizes of the 2004, 2005, and 2006 year classes.

#### Management objectives

The agreed record of negotiations between Norway, Faroe Islands, and EU in 1999 states:

*"For 2000 and subsequent years, the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality in the range of 0.15 - 0.20 for appropriate age groups as defined by ICES, unless future scientific advice requires modification of the fishing mortality rate."*

*"Should the SSB fall below a reference point of 2 300 000 tonnes ( $B_{pa}$ ), the fishing mortality rate, referred to under paragraph 1, shall*

be adapted in the light of scientific estimates of the conditions prevailing. Such adaptation shall ensure a safe and rapid recovery of the SSB to a level in excess of 2 300 000 tonnes.”

“The Parties shall, as appropriate, review and revise these management measures and strategies on the basis of any new advice provided by ICES.”

ICES considers the agreement to be consistent with the precautionary approach, if F on average is kept below  $F_{pa} = 0.17$ . The rationale for

ICES proposing  $F_{pa} = 0.17$  is to have a high probability of avoiding exploiting the stock above  $F_{lim}$ . In addition, projections indicate that  $F = 0.17$  will optimize long-term yield and at the same time result in a low risk of the stock decreasing below  $B_{pa}$ . However, the management plan does not specify measures that would apply under poor stock conditions that preclude further evaluation. Furthermore, the management plan assumes that catch information is unbiased so that absolute estimates of SSB can be produced. This condition has not been met for a number of years.

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	no biological basis for defining $B_{lim}$	
	$B_{pa}$	2.3 million t	$B_{loss}$ in Western stock raised by 15%: = 2.3 million t
	$F_{lim}$	0.26, the fishing mortality estimated to lead to potential stock collapse 6	$F_{loss} = 0.26$ .
	$F_{pa}$	0.17	$F_{lim} * 0.65$ .
Targets	$F_y$ $B_y$	Between 0.15 to 0.20 > 2.3 million t	Management plan.

Unchanged since 1998, target reference points added in 1999.

#### Single-stock exploitation boundaries

ICES advises that any agreed TAC should cover all areas where Northeast Atlantic mackerel are fished. ICES advises that the existing measures to protect the North Sea spawning component remain in place. These are:

- There should be no fishing for mackerel in Divisions IIIa and IVb,c at any time of the year;
- There should be no fishing for mackerel in Division IVa during the period 15 February–31 July;
- The 30-cm minimum landing size at present in force in Subarea IV should be maintained.

#### Exploitation boundaries in relation to existing management plans

The agreed management plan (F between 0.15 and 0.20) would imply catches between 349 000 t and 456 000 t in 2008 with an expected increase in SSB of 4–9% in 2009 compared to 2007.

#### Yield and spawning biomass per Recruit F-reference points:

	Fish Mort Ages 4–8	Yield/R	SSB/R
Average last 3 years	0.32	0.17	0.55
$F_{max}$	0.72	0.17	0.30
$F_{0.1}$	0.17	0.15	0.81
$F_{med}$	0.24	0.16	0.67

#### Short-/medium-term implications

##### Outlook for 2008

Basis: Catch(2007) = 499 (TAC plus 18 reported discards minus 21 that the UK and Ireland have agreed not to fish);  
F(2007) = 0.2272; R72–03 = GM = 3696 million; SSB(2007) = 2231.

Rationale	Catches(2008)	F(2008 & 2009)	Basis	SSB(2008) Spawning time	SSB(2009) Spawning time	Implied change in catch
Zero catch	0	0	F=0	2395	2845	-100%
Status quo	578	0.26	2006	2180	2160	16%
	122	0.05	F(management plan upper bound) *0.25	2353	2695	-76%
	238	0.10	F(management plan upper bound) *0.5	2311	2554	-52%
	349	0.15	F(management plan lower bound)	2270	2422	-30%
	392	0.17	$F_{pa}$	2254	2372	-21%
	456	0.20	F(management plan upper bound)	2230	2299	-9%
	497	0.22	F(management plan upper bound) *1.1	2212	2251	0%
	558	0.25	F(management plan upper bound) *1.25	2188	2182	12%
	732	0.34	$F_{pa} *2$	2120	1990	47%

Weights in '000 t.

Catches for 2007 include minimum discards estimated at about 4%.

Shaded scenarios are not considered consistent with the management plan.

## Management considerations

The estimates of catches by ICES have exceeded the annual TACs in most years, sometimes by a considerable amount, in particular when the TACs were low. However, there are strong indications of substantial further underreporting of catches for this stock which is a matter of concern. Analyses carried out by ICES suggest an underestimation of catch by 60% or more over a period of at least 14 years up to 2001 compared to the ACFM catches. In some countries measures have been taken to improve the situation. However, the present analyses indicate that unreported catches are still a major uncertainty affecting the reliability of the assessment.

The incomplete information on the catches results in a large bias (underestimate) in the estimates of the spawning stock. The egg survey estimates indicate spawning biomasses with a factor of at least 1.4 higher. However, the trend in SSB, estimated by the assessment, is considered to be representative of the trend in the stock. The estimated fishing mortalities are also considered to be broadly representative of the fishery.

While the current catch used by ICES includes some recently documented previously unreported catch, the catch forecasts, provided by ICES, do not take into account the present practice of underreporting and assumes that apart from the predicted catches, additional unreported catches of similar magnitude to that taken in previous years will be taken in the future.

Reduction in underreporting of catches is expected to lead to a slow increase in SSB in the stock. The triennial egg survey provides the only direct source of data on SSB, and it may take two or more surveys before any increase in SSB can be detected in these surveys. Once observed, rises in SSB will result in increased catches.

Between 1992 and 2002, there was a downward trend in SSB, because removals from the stock have repeatedly exceeded the annual production of the stock. The current assessment indicates that the biomass has increased since 2002 due to a combination of high recruitment and lower fishing mortality.

Currently, the stock appears to be subject to increased variability in recruitment and, should this continue, the stock trajectory may be more variable in the future. This should be taken into consideration in developing a harvest control rule. ICES is preparing a response to a special request for a management plan evaluation for NE Atlantic mackerel.

Some surveys and fisheries for other species observe changes in the distribution of mackerel, with decreased abundance in the south and increasing numbers of mackerel to the north and the west and in the Skagerrak and Kattegat. These changes may have an impact on both fisheries and stock dynamics.

The measures advised by ACFM to protect the North Sea spawning component aim at setting the conditions for making a recovery of this component possible. Before the late 1960s, the North Sea spawning biomass of mackerel was estimated at above 3 million tonnes. Due to overexploitation, recruitment has failed since 1969, leading to a decline in the stock. The North Sea spawning component has increased since 1999, but continued protection is needed as it is still very small. Given that the stock is currently increasing, it is recommended that a new management plan be developed.

The closure of the mackerel fishery in Divisions IVb,c and IIIa throughout the whole year is designed to protect the North Sea component in this area and also the juvenile Western mackerel which are

numerous, particularly in Division IVb,c during the second half of the year. This closure has unfortunately resulted in increased discards of mackerel in the non-directed fisheries (especially horse mackerel fisheries) in these areas as vessels at present are permitted to take only 10% of their catch as mackerel bycatch. No data on the actual amount of mackerel bycaught are available, but the reported landings of mackerel in Divisions IIIa and IVb,c from 1997 onwards might seriously underestimate catches due to discarded bycatch.

The advised closure of Division IVa for fishing during the first half of the year is based on the perception that the western mackerel enter the North Sea in July/August, and stay there until December before migrating back to their spawning areas. Updated observations taken in the late 1990s suggested that this return migration actually started in mid- to late February. This was believed to result in large-scale misreporting from the northern part of the North Sea (Division IVa) to Division VIa. It was recommended that the closure date for IVa be extended to the 15th of February. This was adopted for the 1999/2000 fishing season onwards. However, misreporting from IVa to VIa continues to occur.

In the southern part of the distribution area, Atlantic mackerel (*Scomber scombrus*) can be caught together with Spanish mackerel (*Scomber japonicus*). In recent years, catches of Spanish mackerel have increased. The catch in 2005 was the highest since 1982. Catches of both species are landed separately. ICES advice applies to Atlantic mackerel only.

## Factors affecting the fisheries and the stock

Mackerel is mainly exploited in a directed fishery for human consumption. This fishery tends to target bigger fish and there is evidence that this does cause discarding of smaller, marketable fish (highgrading).

### Regulations and their effects

Management has aimed at a fishing mortality in the range of 0.15–0.2 since 1998. The fishing mortality realized since then has been in the range of 0.26 to 0.45. The current assessment shows reduced *F* and increased biomass after the reductions in reported catches in 2003 and beyond.

### Other factors

**Stock components:** ICES currently uses the term “North East Atlantic Mackerel” to define the mackerel present in the area extending from ICES Division IXa in the south to Division IIa in the north, including mackerel in the North Sea and Division IIIa. The spawning areas of mackerel are widely spread, and only the stock in the North Sea is sufficiently distinct to be clearly identified as a separate spawning component. Tagging experiments have demonstrated that after spawning, fish from Southern and Western areas migrate to feed in the Norwegian Sea and the North Sea during the second half of the year. In the North Sea they mix with the North Sea component. Since it is currently impossible to allocate catches to the stocks previously considered by ICES, they are at present, for practical reasons, considered as one stock: the North East Atlantic Mackerel Stock. Catches cannot be allocated specifically to spawning area components on biological grounds, but by convention the catches from the Southern and Western components are separated according to the area in which they are taken.

In order to be able to keep track of the development of the spawning biomasses in the different spawning areas, the North East Atlantic mackerel stock is divided into three area components: the Western Spawning Component, the North Sea Spawning Component, and the Southern Spawning Component:

Northeast Atlantic Mackerel			
Distributed and fished in ICES Subareas and Divisions IIa, IIIa, IV, Vb, VI, VII, VIII, and IXa.			
Spawning component	Western	Southern	North Sea
Spawning Areas	VI, VII, VIIIa,b,d,e.	VIIIc, IXa.	IV, IIIa.



The Western Component is defined as mackerel spawning in the western area (ICES Divisions and Subareas VI, VII, and VIII a,b,d,e). This component currently comprises 81% of the entire North East Atlantic stock. Similarly, the Southern Component is defined as mackerel spawning in the southern area (ICES Divisions VIIIc and IXa). Although the North Sea component has been at an extremely low level since the early 1970s, ACFM regards the North Sea Component as still existing. This component spawns in the North Sea and Skagerrak (ICES Subarea IV and Division IIIa). Current knowledge of the state of the spawning components is summarized below.

**Western Component:** The catches of this component were low in the 1960s, but increased to more than 800 000 t in 1993. The main catches are taken in directed fisheries by purse-seiners and mid-water trawlers. Large catches of the western component are taken in the northern North Sea and in the Norwegian Sea. The 1996 catch was reduced by about 200 000 t compared with 1995, because of a reduction in the TAC. The catches since 1998 have been stable. The SSB of the Western Component declined in the 1970s from above 3.0 million t to 2.2 million t in 1994, but was estimated to have increased to 2.7 million t in 1999. A separate assessment for this stock component is no longer required, as a recent extension of the time-series of NEA mackerel data now allows the estimation of the mean recruitment from 1972 onwards. Estimates of the spawning-stock biomass, derived from egg surveys, indicate a decrease of 14% between 1998 and 2001 and a 6% decrease from 2001 to the 2004 survey. The preliminary results from 2007 indicate no change from 2004 to 2007.

**North Sea Component:** Very large catches were taken in the 1960s in the purse-seine fishery, reaching a maximum of about 1 million t in 1967. The component subsequently collapsed and catches declined to less than 100 000 t in the late 1970s. Catches during the last five years have been assumed to be about 10 000 t. The 2002 and 2005 egg surveys in the North Sea with limited spatial and temporal coverage both indicate a higher egg production in the North Sea area than in 1999. Though the North Sea spawning component has increased since 1999, it is still small.

**Southern Component:** Mackerel is a target species for the hand line fleet during the spawning season in Division VIIIc, during which about one-third of the total catches are taken. It is taken as a bycatch in other fleets. The highest catches (87%) from the Southern Component are taken in the first half of the year, mainly from Division VIIIc, and consist of adult fish. In the second half of the year catches consist of juveniles and are mainly taken in Division IXa. Catches from the Southern Component increased from about 20 000 t in the early 1990s to 44 000 t in 1998, and were close to 50 000 t in 2002. Estimates of the spawning-stock biomass, derived from egg surveys, indicate a decrease of about 50% between 1998 and 2001. However, the SSB estimated in 2001 is similar to the survey estimates in 1995. The SSB estimated in 2004 showed a decrease of 36% over the 2001 survey, while the preliminary results from the 2007 survey indicate a 13% increase in biomass from 2004 to 2007.

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## Scientific basis

### *Data and methods*

This assessment is based on catch numbers-at-age for the period 1972–2006 and triennial egg survey estimates of SSB from 1992 to 2007. Exploratory assessments using different assessment models gave comparable results. The estimate of total mortality in the past is in line with estimates from tag recapture studies.

Some sampling for discards has been carried out since 2000 and a formal requirement was initiated in the EU in 2002. Estimating proportions of catch discarded and slipped is problematic in pelagic fisheries due to high variability in discard and slipping practices. In some fleets no sampling for discards is carried out. Recently information on these practices has been improving; current estimates from sampled fleets indicate that discarding is a small percentage of the total.

Acoustic survey data have been available for this stock since 1999, but have not been used in the assessment because: 1) they do not cover the entire geographic range, 2) there are difficulties with the estimation of fish density, and 3) there could be species identification issues in some areas.

Recruit surveys provide information on the distribution of young mackerel, but are subject to high variability and have not proved useful in estimating year-class strength.

### *Information from the fishing industry*

The fishing industry has informed ICES that in all the EU fishing fleets targeting mackerel, large quantities of juvenile and adult mackerel are being seen on the fishing grounds. This is not confined to one area or to one member state's fleet. In addition the abundance of mackerel in the entire distribution area is creating major problems with unwanted bycatches for fleets not targeting mackerel. The fishing industry considers that appropriate mechanisms should be put in place with ICES to incorporate this information appropriately in the mackerel assessment.

### *Uncertainties in assessment and forecast*

Due to the lack of fishery-independent data, the absence of age-disaggregated information for the spawning-stock index and the uncertainty in the magnitude of catches, the levels of SSB are uncertain, but *F* and the trend in SSB appear to be better estimated.

There are conflicting signals concerning recent recruitment, between catch data and relatively noisy recruit surveys. Both the catch and surveys indicate a large 2002 year class, which the assessment estimates at about 20% above the previously observed highest recruitment. Year classes are not seen in catch data until they are at least 3 years old, therefore the 2004–2006 year classes are still poorly estimated. Recruit surveys are noisy and have been found in the past to be unreliable.

The assessment is sensitive to reported levels of catch that have been found to be substantially affected by underreporting (see above).

### *Comparison with previous assessment and advice*

This year's assessment was a benchmark assessment, incorporating a new triennial egg survey with only minor revision of catch. There has been a minor revision of –4% to the estimate of SSB in 2005 and a small upward revision in *F*. Comparative assessments performed with different models gave broadly similar results. This year's assessment indicates higher fishing mortality on older fish than assessments carried out over the last 5 years.

Some information on the level of discards is available and was included in the assessment, but the amount included does not appear to be sufficient to capture the full scale of discarding.

Inclusion of a new independent data point and re-evaluation of the data has resulted in a moderate downward revision of about 4% in the stock size, and 10% increase in recent fishing mortality, and consequently changes to catch predictions and TAC advice.

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## Source of information

Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine, and Anchovy, ICES Headquarters, Copenhagen 4–13 September 2007 (ICES CM 2007/ACFM:31).

### Catch data for combined area

Year	ICES Advice	Predicted catch corresp. to advice	Total Agreed TAC <sup>3</sup>	Official Landings <sup>5</sup>	Disc. <sup>1</sup> slip	ACFM catch <sup>2,4</sup>
1987	Given by stock component		442	616	11	655
1988	Given by stock component		610	622	36	680
1989	Given by stock component		532	576	7	590
1990	Given by stock component		562	580	16	628
1991	Given by stock component		612	609	31	668
1992	Given by stock component		707	729	25	760
1993	Given by stock component		767	784	18	825
1994	Given by stock component		837	794	5	821
1995	Given by stock component		645	729	8	756
1996	Significant reduction in F	-	452	509	11	564
1997	Significant reduction in F	-	470	517	19	570
1998	F between 0.15 and 0.2	498	549	627	8	667
1999	F of 0.15 consistent with PA	437	562	585	n/a	640
2000	F=0.17: $F_{pa}$	642	612	655	2	738
2001	F=0.17: $F_{pa}$	665	670	660	1	737
2002	F=0.17: $F_{pa}$	694	683	685	24	773
2003	F=0.17: $F_{pa}$	542	583	600	9	670
2004	F=0.17: $F_{pa}$	545	532	587	11	650
2005	F=0.15 to 0.20	[320–420]	422	447	20	543
2006	F=0.15 to 0.20	[373–487]	444	318 <sup>6</sup>	18	473
2007	F=0.15 to 0.20	[390–509]	502			
2008	F=0.15 to 0.20	[349–456]				

Weights in '000 t.

<sup>1</sup>Data on discards and slipping from only two fleets.

<sup>2</sup>Landings and discards from IIa, IIIa, IV, Vb, VI, VII, VIII, and IXa.

<sup>3</sup>All areas except some catches in international waters in II.

<sup>4</sup>Catches updated in 2003 with revisions from SGDRAMA in 2002.

<sup>5</sup>Updated from last year with ICES Fishbase data.

<sup>6</sup>Incomplete.

n/a = not available.

### Catch data for western component

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC <sup>1</sup>	Disc. slip	ACFM catch <sup>2,4</sup>
1987	SSB = 1.5 mill. t; TAC	380	405	11	633
1988	F = $F_{0.1}$ ; TAC; closed area; landing size	430	573	36	656
1989	Halt SSB decline; TAC	355	495	7	571
1990	TAC; F = $F_{0.1}$	480	525	16	606
1991	TAC; F = $F_{0.1}$	500	575	31	647
1992	TAC for both 1992 and 1993	670	670	25	742
1993	TAC for both 1992 and 1993	670	730	18	805
1994	No long-term gains in increased F	831 <sup>3</sup>	800	5	796
1995	20% reduction in F	530	608	8	728
1996	No separate advice	-	422	11	529
1997	No separate advice	-	416	19	529
1998	No separate advice	-	514	8	623
1999	No separate advice	-	520	0	597
2000	No separate advice	-	573	2	703
2001	No separate advice	-	630	1	694
2002	No separate advice	-	642	24	723
2003	No separate advice	-	548	9	644
2004	No separate advice	-	500	11	615
2005	No separate advice	-	397	20	494
2006	No separate advice	-	418 <sup>5</sup>	17	420
2007	No separate advice	-	472		
2008	No separate advice	-			

Weights in '000 t.

<sup>1</sup>TAC for mackerel taken in all areas VI, VII, VIIIa,b,d, Vb, IIa, IIIa, and IVa.

<sup>2</sup>Landings and discards of Western component; includes some catches of North Sea component.

<sup>3</sup>Catch at *status quo* F.

<sup>4</sup>Catches updated in 2003 with revisions from SGDRAMA in 2002. .

<sup>5</sup>Revised from last year (was 392).

### Catch data for North Sea component

Year	ICES Advice	Predicted catch cor- resp. to advice <sup>1</sup>	Agreed TAC <sup>2</sup>	ACFM catch <sup>3</sup>
1987	Lowest practical level	LPL	55	3
1988	Closed areas and seasons; min. landing size; bycatch regulations	LPL	55	6
1989	Closed areas and seasons; min. landing size; bycatch regulations	LPL	49.2	7
1990	Closed areas and seasons; min. landing size; bycatch regulations	LPL	45.2	10
1991	Closed areas and seasons; min. landing size; bycatch regulations	LPL	65.5	- <sup>4</sup>
1992	Closed areas and seasons; min. landing size; bycatch regulations	LPL	76.3	- <sup>4</sup>
1993	Maximum protection; closed areas and seasons; min landing size	LPL	83.1	- <sup>4</sup>
1994	Maximum protection; closed areas and seasons; min landing size	LPL	95.7	- <sup>4</sup>
1995	Maximum protection; closed areas and seasons; min landing size	LPL	76.3	- <sup>4</sup>
1996	Maximum protection; closed areas and seasons; min landing size	LPL	52.8	- <sup>4</sup>
1997	Maximum protection; closed areas and seasons; min landing size	LPL	52.8	- <sup>4</sup>
1998	Maximum protection; closed areas and seasons; min landing size	LPL	62.5	- <sup>4</sup>
1999	Maximum protection; closed areas and seasons; min landing size	LPL	62.5	- <sup>4</sup>
2000	Maximum protection; closed areas and seasons; min landing size	LPL	69.7	- <sup>4</sup>
2001	Maximum protection; closed areas and seasons; min landing size	LPL	71.4	- <sup>4</sup>
2002	Maximum protection; closed areas and seasons; min landing size	LPL	72.9	- <sup>4</sup>
2003	Maximum protection; closed areas and seasons; min landing size	LPL	62.5	- <sup>4</sup>
2004	Maximum protection; closed areas and seasons; min landing size	LPL	57.7	- <sup>4</sup>
2005	Maximum protection; closed areas and seasons; min landing size	LPL	44.9	- <sup>4</sup>
2006	Maximum protection; closed areas and seasons; min landing size	LPL	47.1	- <sup>4</sup>
2007	Maximum protection; closed areas and seasons; min landing size	LPL	53.1	- <sup>4</sup>
2008	Maximum protection; closed areas and seasons; min landing size	LPL		

Weights in '000 t.

<sup>1</sup>Subarea IV and Division IIIa.

<sup>2</sup>TAC for Subarea IV, Divisions IIIa, IIIb,c,d (EU zone), and Division IIa (EU zone).

<sup>3</sup>Estimated landings of North Sea component.

<sup>4</sup>No information.

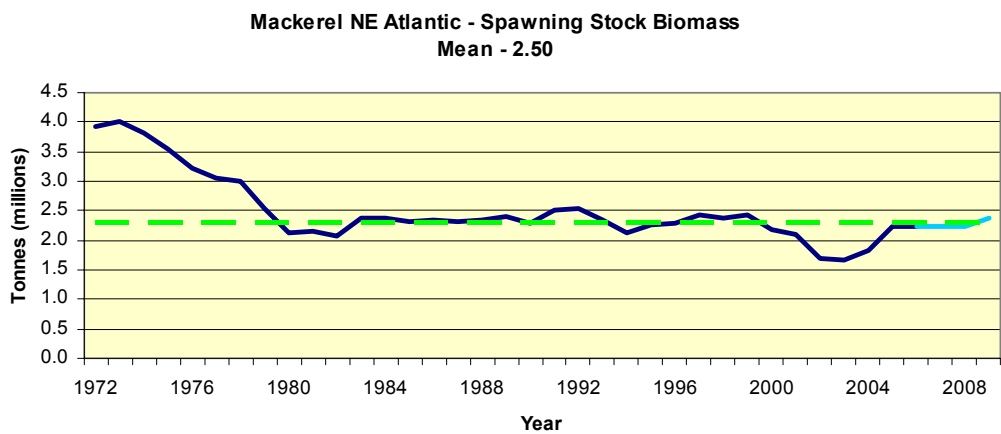
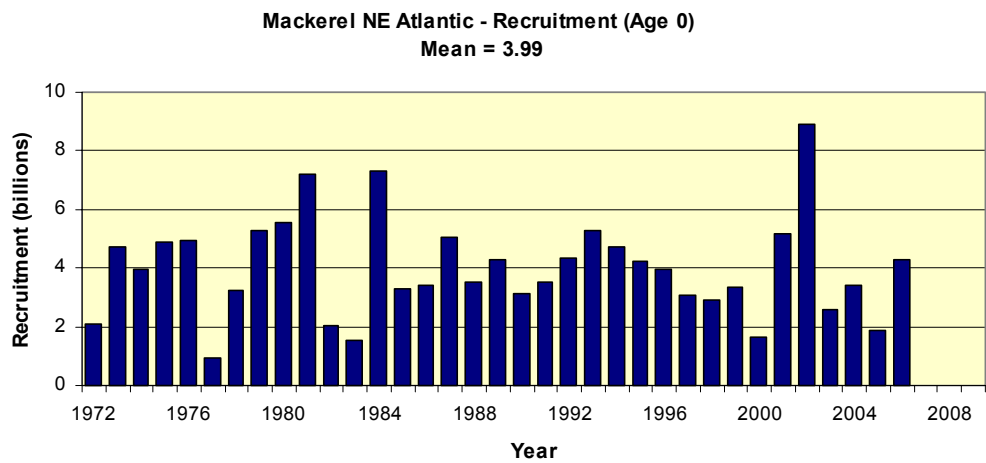
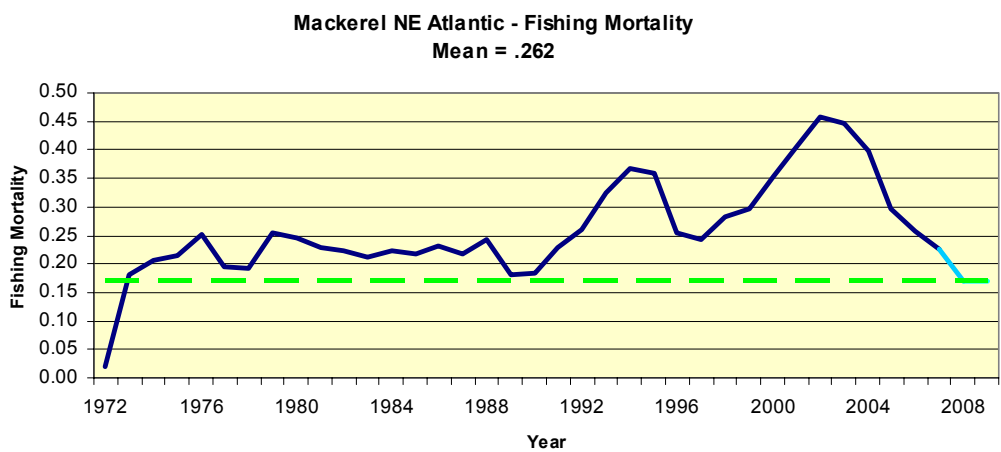
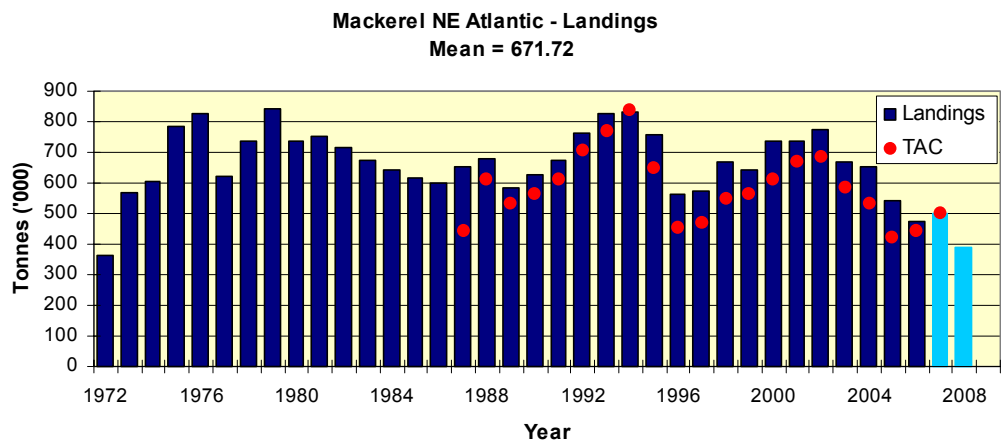
### Catch data for southern component

Year	ICES Advice	Predicted catch cor- resp. to advice	Agreed TAC <sup>1</sup>	ACFM Catch <sup>2</sup>
1987	Reduce juvenile exploitation	-	36.57	22
1988	Reduce juvenile exploitation	-	36.57	25
1989	No advice	-	36.57	18
1990	Reduce juvenile exploitation	-	36.57	21
1991	Reduce juvenile exploitation	-	36.57	21
1992	No advice	-	36.57	18
1993	No advice	-	36.57	20
1994	No advice	-	36.57	25
1995	No advice	-	36.57	28
1996	No separate advice	-	30.00	34
1997	No separate advice	-	30.00	41
1998	No separate advice	-	35.00	44
1999	No separate advice	-	35.00	44
2000	No separate advice	-	39.20	36
2001	No separate advice	-	40.18	43
2002	No separate advice	-	41.10	50
2003	No separate advice	-	35.00	26
2004	No separate advice	-	32.31	35
2005	No separate advice	-	24.87	50
2006	No separate advice	-	26.18	53
2007	No separate advice	-	29.61	
2008	No separate advice	-		

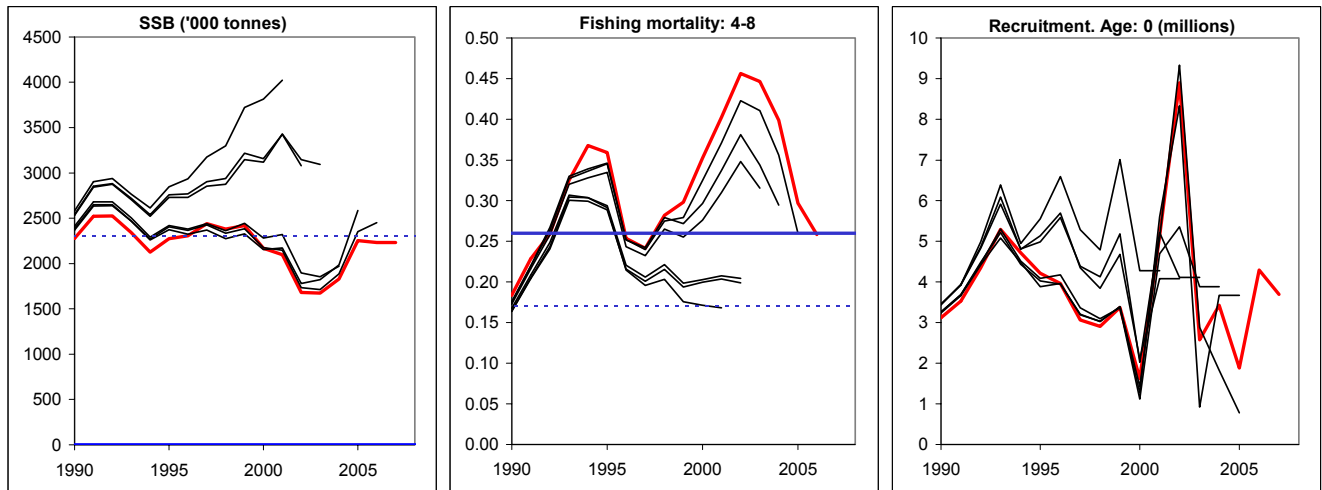
Weights in '000 t.

<sup>1</sup>Division VIIIc, Subareas IX and X, and CECAF Division 34.1.1 (EU waters only).

<sup>2</sup>Catches updated in 2003 with revisions from SGDRAMA in 2002.



Mackerel (combined Southern, Western & N.Sea spawn.comp.)



**Figure 9.4.2.3** Mackerel (combined Southern, Western, and N. Sea spawning components). Historical performance of the assessments.

**Table 9.4.2.1** NEA Mackerel catches by area. Discards not estimated prior to 1978. (Data submitted by Working Group members.)

Year	Sub-area VI			Sub-area VII and Divisions VIIIa,b,d,e			Sub-area IV and III			Sub-area I,II & Divs.V <sup>1</sup>	Divs. VIIIc, IXa	Total		
	Landings	Discards	Catch	Landings	Discards	Catch	Landings	Discards	Catch			Landings	Discards	Catch
1969	4,800		4,800	47,404		47,404	739,175		739,175	7	42,526	833,912		833,912
1970	3,900		3,900	72,822		72,822	322,451		322,451	163	70,172	469,508		469,508
1971	10,200		10,200	89,745		89,745	243,673		243,673	358	32,942	376,918		376,918
1972	13,000		13,000	130,280		130,280	188,599		188,599	88	29,262	361,229		361,229
1973	52,200		52,200	144,807		144,807	326,519		326,519	21,600	25,967	571,093		571,093
1974	64,100		64,100	207,665		207,665	298,391		298,391	6,800	30,630	607,586		607,586
1975	64,800		64,800	395,995		395,995	263,062		263,062	34,700	25,457	784,014		784,014
1976	67,800		67,800	420,920		420,920	305,709		305,709	10,500	23,306	828,235		828,235
1977	74,800		74,800	259,100		259,100	259,531		259,531	1,400	25,416	620,247		620,247
1978	151,700	15,100	166,800	355,500	35,500	391,000	148,817		148,817	4,200	25,909	686,126	50,600	736,726
1979	203,300	20,300	223,600	398,000	39,800	437,800	152,323	500	152,823	7,000	21,932	782,555	60,600	843,155
1980	218,700	6,000	224,700	386,100	15,600	401,700	87,931		87,931	8,300	12,280	713,311	21,600	734,911
1981	335,100	2,500	337,600	274,300	39,800	314,100	64,172	3,216	67,388	18,700	16,688	708,960	45,516	754,476
1982	340,400	4,100	344,500	257,800	20,800	278,600	35,033	450	35,483	37,600	21,076	691,909	25,350	717,259
1983	320,500	2,300	322,800	235,000	9,000	244,000	40,889	96	40,985	49,000	14,853	660,242	11,396	671,638
1984	306,100	1,600	307,700	161,400	10,500	171,900	43,696	202	43,898	98,222	20,208	629,626	12,302	641,928
1985	388,140	2,735	390,875	75,043	1,800	76,843	46,790	3,656	50,446	78,000	18,111	606,084	8,191	614,275
1986	104,100		104,100	128,499		128,499	236,309		236,309	101,000	24,789	594,697	7,431	602,128
1987	183,700		183,700	100,300		100,300	290,829		290,829	47,000	22,187	644,016	10,789	654,805
1988	115,600	3,100	118,700	75,600	2,700	78,300	308,550	29,766	338,316	120,404	24,772	644,926	35,566	680,492
1989	121,300	2,600	123,900	72,900	2,300	75,200	279,410	2,190	281,600	90,488	18,321	582,419	7,090	589,509
1990	114,800	5,800	120,600	56,300	5,500	61,800	300,800	4,300	305,100	118,700	21,311	611,911	15,600	627,511
1991	109,500	10,700	120,200	50,500	12,800	63,300	358,700	7,200	365,900	97,800	20,683	637,183	30,700	667,883
1992	141,906	9,620	151,526	72,153	12,400	84,553	364,184	2,980	367,164	139,062	18,046	735,351	25,000	760,351
1993	133,497	2,670	136,167	99,828	12,790	112,618	387,838	2,720	390,558	165,973	19,720	806,856	18,180	825,036
1994	134,338	1,390	135,728	113,088	2,830	115,918	471,247	1,150	472,397	72,309	25,043	816,025	5,370	821,395
1995	145,626	74	145,700	117,883	6,917	124,800	321,474	730	322,204	135,496	27,600	748,079	7,721	755,800
1996	129,895	255	130,150	73,351	9,773	83,124	211,451	1,387	212,838	103,376	34,123	552,196	11,415	563,611
1997	65,044	2,240	67,284	114,719	13,817	128,536	226,680	2,807	229,487	103,598	40,708	550,749	18,864	569,613
1998	110,141	71	110,212	105,181	3,206	108,387	264,947	4,735	269,682	134,219	44,164	658,652	8,012	666,664
1999 <sup>2,3</sup>	116,362	§	116,362	94,290	§	94,290	313,014	§	313,014	72,848	43,796	640,311	§	640,311
2000 <sup>2,3</sup>	187,595	1	187,595	115,566	1,918	117,484	285,567	165	304,898	92,557	36,074	736,524	2,084	738,608
2001 <sup>2,3</sup>	143,142	83	143,142	142,890	1,081	143,971	327,200	24	339,971	67,097	43,198	736,274	1,188	737,462
2002 <sup>2,3</sup>	136,847	12,931	149,778	102,484	2,260	104,744	375,708	8,583	394,878	73,929	49,576	749,131	23,774	772,905
2003 <sup>3</sup>	142,728	91	142,819	89,492		89,492	334,639	9,390	357,766	53,701	25,823	660,119	9,481	669,600
2004 <sup>3</sup>	134,251	240	134,491	99,922	1,862	101,784	300,768	8,870	316,620	62,486	34,840	639,248	10,972	650,221
2005	79,960	11,400	91,361	90,278	5,878	96,156	249,740	2,482	252,223	54,129	49,618	523,726	19,760	543,486
2006	88,077	6,031	94,108	66,209	6,556	72,765	200,929	5,383	206,312	46,716	52,751	454,682	17,970	472,652

<sup>1</sup>For 1976–1985 only Division IIa. Sub-area I, and Division IIb included in 2000 only <sup>2</sup> Data revised for Northern Ireland; <sup>3</sup> data revised for unallocated catch. <sup>§</sup> Discards reported as part of unallocated catches

**Table 9.4.2.2**

Mackerel (combined Southern, Western, and N. Sea spawning components).

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4–8
1972	2113060		361262	
1973	4747460		570719	
1974	3984480		607473	
1975	4905470		784329	
1976	4924410		828434	
1977	962280		620016	0.1941
1978	3226630		736519	0.1919
1979	5296700		842739	0.2551
1980	5544300	2126345	734950	0.2471
1981	7217130	2154721	754045	0.2295
1982	2018140	2073554	716987	0.2226
1983	1556260	2365511	672283	0.2133
1984	7327480	2382121	641928	0.2229
1985	3300360	2330749	614371	0.2184
1986	3408110	2345392	602201	0.2315
1987	5072850	2334065	654992	0.2181
1988	3502190	2341130	680491	0.2416
1989	4295480	2414506	585920	0.1823
1990	3120840	2275428	626107	0.1842
1991	3530270	2521361	675665	0.2286
1992	4353120	2525235	760690	0.2590
1993	5293640	2341163	824568	0.3253
1994	4721170	2127172	819087	0.3680
1995	4213380	2272126	756277	0.3592
1996	3960550	2304179	563472	0.2536
1997	3064290	2437464	573029	0.2416
1998	2908270	2378316	666316	0.2819
1999	3372670	2419853	640309	0.2982
2000	1627480	2167131	738606	0.3524
2001	5136440	2096782	737463	0.4027
2002	8898260	1680025	772905	0.4566
2003	2574960	1672050	669600	0.4465
2004	3430070	1827658	650221	0.3987
2005	1879130	2251451	543486	0.2972
2006	4292590	2231313	472652	0.2584
2007	3696720*	2231466		
Average	3985462	2492723	671432	0.2615

\* Geometric mean of R72–03.



# Western Horse Mackerel

(Divisions IIa, IVa, Vb, VIa, VIIa–c, e–k, VIIIa, b, d, e)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

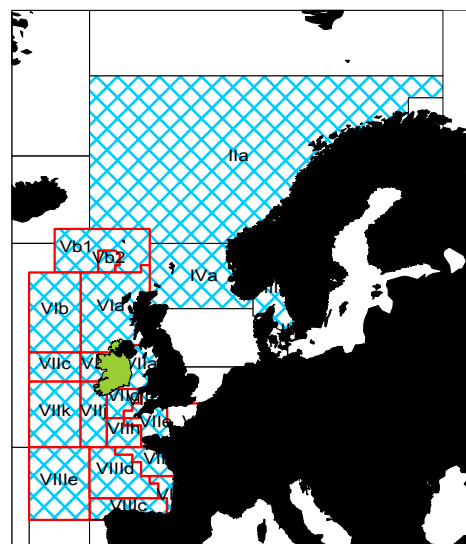
## FSS – SINGLE STOCK CONSIDERATIONS

The state of the stock is unknown, however the assessment is considered indicative of relative trends and shows fishing mortality to be low and SSB to be increasing in recent years. FSS notes that the increase in egg abundance observed in the 2007 survey is assumed to reflect an increase in SSB due to the maturation of the 2001 year class. However FSS also notes that the egg abundance estimate is provisional and that although larger than most recent recruitments, the strength of 2001 year class is not of the same order of magnitude as that of 1982.

ICES has evaluated a management plan proposed by the Pelagic RAC and found it to be consistent with the precautionary approach in the short term. FSS notes that the mean  $F$  arising from the application of the HCR in the management plan is close to that previously estimated for  $F_{0.1}$ . FSS agrees with ICES and STECF advice for a TAC of 180,000 t for 2008–2010 based on the proposed management plan. This would translate into an Irish quota of 36,829 t.

FSS points out that the current TAC management areas do not correspond to the TAC area in the proposed management plan. If the management area limits are revised along with the adoption of the management plan, measures should be taken to prevent misreporting of catch taken in Divisions VIIe, h and VIId (the latter then belonging to the North Sea stock management area). This could be done for example by imposing a separate TAC for the areas where juveniles occur for both neighbouring stocks. FSS endorses the proposal in the draft management plan industry participation in monitoring of by-catch and unaccounted mortality.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 46). For western horse mackerel, FSS interprets that the proposal would result in following the advised management plan (if it is adopted). This is consistent with the ICES, STECF and FSS advised TAC for 2008–2010.



Red Boxes–TAC/Management Areas Blue Shading– Assessment Area

## CURRENT MANAGEMENT

- The TAC does not correspond to the distribution and assessment area of the western Horse Mackerel stock. There are three TACs under which the western Horse Mackerel Stock is fished but these also cover parts of the North Sea and the Southern stocks: One TAC is set for Divisions Vb, (EU waters), Sub-areas VI and VII, and Divisions VIIIa, b, d, e. Another TAC is set for EU waters in Division IIa and Sub-area IV and the third TAC covers the area of the southern stock and parts of the western stock in Divisions VIIIc and IX.
- The TAC only applies to EU waters. There are unregulated fisheries outside the TAC areas mainly by Norwegian vessels. Catches in these unregulated fisheries accounted for ca. 27,000 t in 2006.
- Since 2005, management advice for the western stock includes a TAC allocation for Division VIIIc as this area has now been included in the western stock definition.
- The agreed TAC for 2007 in Divisions Vb, (EU waters), Sub-areas VI and VII, and Divisions VIIIa, b, d, e, was 137,000 t. The Irish quota for this area was 31,996 t (34,613 t adjusted).

## ADDITIONAL INFORMATION

1. In the absence of reliable fisheries independent data, absolute levels of SSB and  $F$  cannot be determined. However the assessment is indicative of relative trends and shows that SSB may be increasing due to the strong 2001 year class.

2. The total catch of western horse mackerel in 2006 was ca. 155,000 t, which was about 27,000 t less than in 2005.
3. The main catches are taken by the Dutch, German and French freezer trawler fleet, the Irish refrigerated sea water (RSW) vessels and the Danish Industrial Fishery. In Division VIIIc the Spanish fleet take substantial catches.
4. The Irish catch in 2006 was about 29,000 t and was mainly caught west and south of Ireland in Quarter 1 (Divisions VIIb, VIIh, VIIa) and northwest of Ireland in Quarter 3 (Division VIa).
5. Large catches of western horse mackerel were caught in the juvenile areas of the western English channel and South Brittany (Divisions VIIe,f,h; VIIla,b,d).
6. 51% of the total catch in numbers in 2006 consisted of the 2001 year class. The high catch rates of this year class suggest a strong recruitment in 2006.
7. The collection of biological data has improved since 1998 but still remains poor and there is a lack of sampling data for many important horse mackerel fishing countries.
8. Discarding information from all pelagic fleets is not included in the assessment. Discarding from demersal vessels should also be considered. Discarding is considered to be a feature of this fishery.

## ICES ADVICE

### 9.4.3

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Unknown	Unknown	Unknown	Unknown	Uncertainty of absolute level of SSB and F

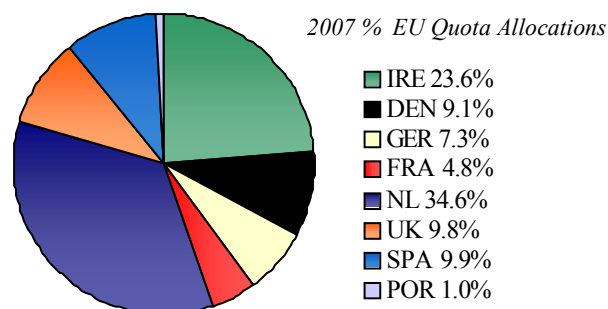
In the absence of defined reference points and a full analytical assessment, the state of the stock is unknown. Relative high catch rates of the 2001 year class in 2002–2006 and an increase in the egg production in 2007 suggest that SSB has increased in recent years. This 2001 year class is stronger than those observed in recent years, but unlikely to be at the same magnitude as the 1982 year class. Fishing mortality is also believed to be relatively low.

#### Management objectives

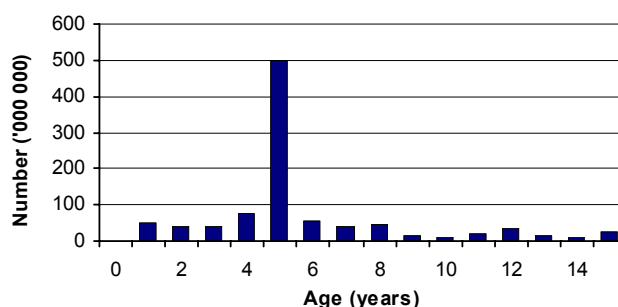
There are currently no explicit agreed management objectives for this stock. A management plan proposed by the Pelagic RAC has been evaluated and accepted by ICES as precautionary in the short term, but not in the long term (See 9.3.2.4 answer to EC request).

#### Reference points

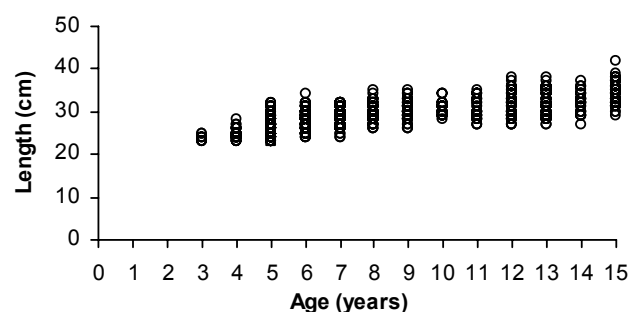
No reference points have been defined for the revised stock unit. In the management plan evaluation the SSB in 1982 has been used as the limit reference point.



**2006 Age Distribution: International Landings, Horse mackerel in western area**



**2006 Size at Age: Irish Sampling, Horse mackerel in western area**



#### Single-stock exploitation boundaries

*Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects*

Exploitation boundaries in the past were based on  $F_{0.1}$ . In view of the absence of a reliable selection profile,  $F_{0.1}$  cannot be estimated at the present time.

*Exploitation boundaries in relation to the precautionary approach*

ICES recommends a TAC of 180 000 t in 2008, 2009, and 2010, indicated by the evaluation of the proposed management plan as being in accordance with the precautionary approach. The TAC applies to all areas where western horse mackerel is caught.

#### Short-term implications

Given the uncertainty of the absolute levels of SSB, F, and R, and in the absence of a full analytical assessment, short-term forecasts cannot be provided.

## Management considerations

The 2001 year class is relatively strong and is contributing to an increase in SSB. This implies increased catch opportunities in the medium term within the proposed management plan.

The advice considers that the TAC applies to all fisheries catching Western horse mackerel. In the past TACs have only been given for parts of the distribution and fishing areas (EU waters). ICES considers that if a TAC is set for this stock under this rule, it should apply to all areas where Western horse mackerel are caught, i.e. Divisions IIa, IIIa (western part), IVa, Vb, VIa, VIIa–c, VIIe–k, and VIIIa–e. If the management area limits have been revised, measures should be taken to prevent misreporting of catch taken in VIIe,h and VIId (the latter then belonging to the North Sea stock management area). This could be done for example by imposing a separate TAC for the areas where juveniles occur for both neighbouring stocks. The management areas do not reflect the stock distribution and this causes distortions in the exploitation rates.

The Pelagic RAC has put forward a management plan for Western horse mackerel. ICES considers that this plan is precautionary in the short term, but not in the long term (see Section 9.3.2.4). This plan makes use of the information available in the egg surveys, and bases three-year TACs on the slope of the three previous egg production estimates.

## Factors affecting the fisheries and the stock

### *The effects of regulations*

The geographical range of this stock increased when the exceptional 1982 year class entered the fishery. This resulted in the development of unregulated fisheries outside the TAC area in the northern North Sea. At present, the TAC for the Western areas only includes Division Vb (EU waters), Subareas VI and VII, and Divisions VIIIa–e. A separate TAC includes EU waters in Division IIa and Subarea IV. Horse mackerel taken in Divisions IIa, IIIa (western part), IVa, Vb, VIa, VIIe–k, and VIIIa–e are allocated by ICES to the Western stock. ICES recommends that the TAC should cover catches from the full distribution of the stock.

### *Changes in fishing technology and fishing patterns*

Western horse mackerel is taken in a variety of fisheries exploiting juvenile fish for the human consumption market (with mid-aged fish mostly for the Japanese market), and older fish either for human consumption purposes (mostly for the African market) or for industrial purposes.

The juvenile fishery in the Western stock distribution area has mainly taken place in Divisions VIIe–h and VIIIa–d. From about 1994 onwards the fishery on juveniles expanded, resulting in a change in exploitation pattern for the stock. This may be due to the lack of older fish (decline of the 1982 year class) and the development of a market for juveniles. The percentage of catch (in weight) in the juvenile areas increased gradually from about 40% in 1997 to about 65% in 2003, dropping again to 40% in 2005 and 2006.

### *The environment*

Research over the last decade has shown strong links between horse mackerel migration into northern areas and water mass transport patterns in the northeastern Atlantic (ICES 2007 Report of WKEFA).

### *Other factors*

The history of this stock reflects the development of a single large year class within the period of 23 years for which data are available. The frequency of the occurrence of such large year classes cannot be evaluated on the basis of the short time-series.

## Scientific basis

### *Data and methods*

The triennial horse mackerel egg survey provides an index of SSB which together with the catches form the basis for the proposed management plan.

Time-series of index of egg production for spawning areas of Western horse mackerel:

1983	513.1
1989	1762.1
1992	1712.1
1995	1264.5
1998	1135.7
2001	820.8
2004	889
2007	1434.0*

\* 2007 value is provisional.

Exploratory assessments using catch and egg survey data were considered indicative of trends, but do not provide a basis for an agreed assessment and short-term forecast. They provide information that was used for the development of the management plan.

### *Uncertainties in assessment and forecast*

The only fishery-independent information for this stock are measures of egg production from surveys held every three years. The relation between egg production and SSB is uncertain. It is therefore not possible to determine the absolute level of recruitment, stock abundance, and fishing mortality. Only relative trends in these quantities have been derived and no catch forecasts are provided. Nevertheless, these relative measures are considered to be sufficient to provide the basis for the proposed management plan.

As in previous years and despite the data sampling regulation for EU countries, some countries with major catches did not carry out biological sampling programmes. This data is required in order to provide a time-series of catch-at-age information that is needed to maintain up-to-date information on stock dynamics, and observation error that is needed for evaluation of the management plan. Discard information is also incomplete for this stock.

### *Comparison with previous assessment and advice*

The perception of historical stock trends is consistent with last year's estimates. For recent years, the trends are slightly different, now showing a slightly increasing spawning biomass.

## Sources of information

Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine, and Anchovy, ICES Headquarters, Copenhagen, 4–13 September 2007 (ICES CM 2007/ACFM:31).

Report of the Workshop on the Integration of Environmental Information into Fisheries Management Strategies and Advice (WKEFA). ICES CM 2007/ACFM:25.

Year	ICES Advice	Predicted catch cor- resp. to advice <sup>2</sup>	Agreed TAC <sup>1</sup>	ACFM Landings <sup>2</sup>	Disc. Slip <sup>2</sup>	ACFM Catch <sup>2</sup>
1987	Not assessed	-	155	157	-	157
1988	No increase in catches	102	169	184	4	188
1989	If sustained catches required; TAC	100	153	267	1	269
1990	TAC	~200	203	363	10	373
1991	Within safe biological limits	-	230	328	5	334
1992	Within safe biological limits	-	250	369	2	371
1993	Within safe biological limits	-	250	424	9	433
1994	Prudent not to increase F	-	300	385	4	389
1995	Reduction in catch	-	300	509	2	511
1996	Reduction in catch	-	300	379	17	397
1997	Reduction in F	173	300	440	3	443
1998	Reduction in F to 0.15	150	320	296	1	304
1999	Effectively limit catches to 200 000 t	<200	265	274	-	274
2000	Effectively limit catches to 200 000 t	<200	240	175	-	175
2001	Effectively limit catches to 224 000 t	<224	233	191	-	191
2002	Effectively limit catches to 98 000 t	<98	150	172	-	172
2003	Effectively limit catches to 113 000 t	<113	137	190 <sup>3</sup>	- <sup>3</sup>	190 <sup>3</sup>
2004	Limit catches to less than 130 000 t	<130	137	157 <sup>3</sup>	1 <sup>3</sup>	158 <sup>3</sup>
2005	Limit catches to less than 150 000 t	<150 <sup>3</sup>	137	182	-	182
2006	Limit catches to less than 150 000 t	<150 <sup>3</sup>	137	155	0	155
2007	Limit catches to less than 150 000 t	<150 <sup>3</sup>	137			
2008–2010	Follow proposed management plan	180 <sup>4</sup>				

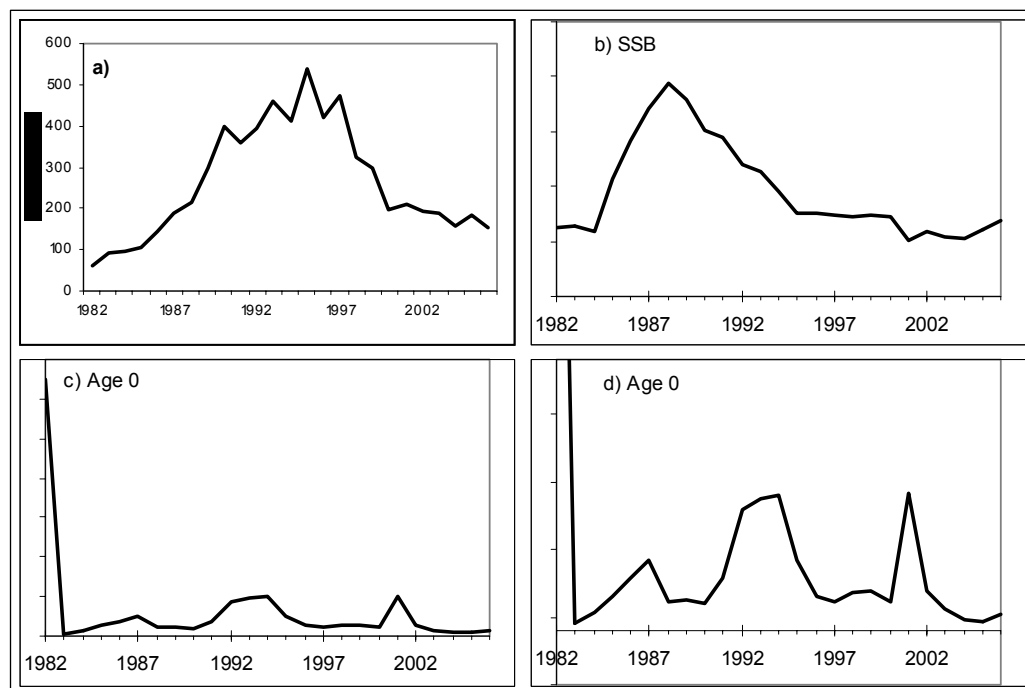
Weights in '000 t.

<sup>1</sup>Division Vb (EU waters only), Subareas VI and VII, Divisions VIIIa,b,d,e.

<sup>2</sup>Divisions IIa, IVa, Vb, VIa, VIIa–c, VIIe–k, VIII a,b,d,e.

<sup>3</sup>Including VIIIc.

<sup>4</sup>The value of 180 is preliminary based on provisional egg survey.



**Figure 9.4.3.1**

Western horse mackerel . SADVF model. Plots of (a) landings, (b) the SSB trajectory, (c) numbers-at-age 0, and (d) the same as (c), but scaled to capture more detail.

**Table 9.4.3.1** Horse mackerel general. Catches (t) in Subarea II. (Data as submitted by Working Group members.)

Country	1980	1981	1982	1983	1984	1985	1986	1987
Denmark	-	-	-	-	-	-	-	39
France	-	-	-	-	1	1	- <sup>2</sup>	- <sup>2</sup>
Germany, Fed.Rep	-	+	-	-	-	-	-	-
Norway	-	-	-	412	22	78	214	3,272
USSR	-	-	-	-	-	-	-	-
Total	-	+	-	412	23	79	214	3,311

	1988	1989	1990	1991	1992	1993	1994	1995
Faroe Islands	-	-	9643	1,115	9,157 <sup>3</sup>	1,068	-	950
Denmark	-	-	-	-	-	-	-	200
France	-2	-	-	-	-	-	55	-
Germany, Fed. Rep.	64	12	+	-	-	-	-	-
Norway	6,285	4,770	9,135	3,200	4,300	2,100	4	11,300
USSR / Russia (1992-)	469	27	1,298	172	-	-	700	1,633
UK (England + Wales)	-	-	17	-	-	-	-	-
Total	6,818	4,809	11,414	4,487	13,457	3,168	759	14,083

	1996	1997	1998	1999	2000	2001	2002	2003
Faroe Islands	1,598	799 <sup>3</sup>	188 <sup>3</sup>	132 <sup>3</sup>	250 <sup>3</sup>	-	-	-
Denmark	-	-	1,755 <sup>3</sup>	-	-	-	-	-
France	-	-	-	-	-	-	-	-
Germany	-	-	-	-	-	-	-	-
Norway	887	1,170	234	2,304	841	44	1,321	22
Russia	881	648	345	121	84 <sup>3</sup>	16	3	2
UK (England + Wales)	-	-	-	-	-	-	-	-
Estonia	-	-	22	-	-	-	-	-
Total	3,366	2,617	2,544	2557	1175	60	1,324	24

	2004	2005	2006 <sup>1</sup>
Faroe Islands	-	-	3
Denmark	-	-	-
France	-	-	-
Germany	-	-	-
Norway	42	176	27
Russia	-	-	-
UK (England + Wales)	-	-	-
Estonia	-	-	-
Total	42	176	30

<sup>1</sup>Preliminary.<sup>2</sup>Included in Subarea IV.<sup>3</sup>Includes catches in Division Vb.

**Table 9.4.3.2**

Horse mackerel general. Catches (t) in North Sea Subarea IV and Skagerrak Division IIIa by country. (Data submitted by Working Group members). Catches partly concern the North Sea horse mackerel.

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Belgium	8	34	7	55	20	13	13	9	10
Denmark	199	3,576	1,612	1,590	23,730	22,495	18,652	7,290	20,323
Faroe Islands	260	-	-	-	-	-	-	-	-
France	292	421	567	366	827	298	231 <sup>2</sup>	189 <sup>2</sup>	784 <sup>2</sup>
Germany, Fed.Rep.	+	139	30	52	+	+	-	3	153
Ireland	1,161	412	-	-	-	-	-	-	-
Netherlands	101	355	559	2,029 <sup>3</sup>	824	160 <sup>3</sup>	600 <sup>3</sup>	850 <sup>4</sup>	1,060 <sup>3</sup>
Norway <sup>2</sup>	119	2,292	7	322	<sup>3</sup>	203	776	11,728 <sup>4</sup>	34,425 <sup>4</sup>
Poland	-	-	-	2	94	-	-	-	-
Sweden	-	-	-	-	-	-	2	-	-
UK (Engl. + Wales)	11	15	6	4	-	71	3	339	373
UK (Scotland)	-	-	-	-	3	998	531	487	5,749
USSR	-	-	-	-	489	-	-	-	-
Total	2,151	7,253	2,788	4,420	25,987	24,238	20,808	20,895	62,877

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	10	13	-	+	74	57	51	28	-
Denmark	23,329	20,605	6,982	7,755	6,120	3,921	2,432	1,433	648
Estonia	-	-	-	293	-	-	17	-	-
Faroe Islands	-	942	340	-	360	275	-	-	296
France	248	220	174	162	302	-	-	-	-
Germany, Fed.Rep.	506	2,469 <sup>5</sup>	5,995	2,801	1,570	1,014	1,600	7	7,603
Ireland	-	687	2,657	2,600	4,086	415	220	1,100	8,152
Netherlands	14,172	1,970	3,852	3,000	2,470	1,329	5,285	6,205	37,778
Norway	84,161	117,903	50,000	96,000	126,800	94,000	84,747	14,639	45,314
Poland	-	-	-	-	-	-	-	-	-
Sweden	-	102	953	800	697	2,087	-	95	232
UK (Engl. + Wales)	10	10	132	4	115	389	478	40	242
UK (N. Ireland)	-	-	350	-	-	-	-	-	-
UK (Scotland)	2,093	458	7,309	996	1,059	7,582	3,650	2,442	10,511
USSR / Russia (1992-)	-	-	-	-	-	-	-	-	-
Unallocated + discards	12,482 <sup>4</sup>	-317 <sup>4</sup>	-750 <sup>4</sup>	-278 <sup>6</sup>	-3,270	1,511	-28	136	-31,615
Total	112,047	145,062	77,904	114,133	140,383	112,580	98,452	26,125	79,161

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006 <sup>1</sup>
Belgium	19	21	19	19	1,004	5	4	6	3
Denmark	2,048	8,006	4,409	2,288	1,393	3,774	8,735	4,258	1,343
Estonia	22	-	-	-	-	-	-	-	-
Faroe Islands	28	908	24	-	699	809	-	35	-
France	379	60	49	48	-	392	174	3,876	2,380
Germany	4,620	4,071	3,115	230	2,671	3,048	4,905	1,811	965
Ireland	-	404	103	375	72	93	379	753	2,077
Lithuania	-	-	-	-	-	-	-	-	2,354
Netherlands	3,811	3,610	3,382	4,685	6,612	17,354	21,418	24,679	20,984
Norway	13,129	44,344	1,246	7,948	35,368	20,493	10,709	24,937	27,200
Russia	-	-	2	-	-	-	-	-	-
Sweden	3,411	1,957	1,141	119	575	1,074	665	239	491
UK (Engl. + Wales)	2	11	15	317	1,191	1,192	2,552	1,778	423
UK (Scotland)	3,041	1,658	3,465	3,161	255	1	1	22	314
Unallocated+discards	737	-325	14613	649	-149	-14,009	-19,103	-21,830	-19,623
xTotal	31,247	64,725	31583	19,839	49,691	34,226	30,435	40,564	38,911

<sup>1</sup> Preliminary.

<sup>2</sup> Includes Division IIa.

<sup>3</sup> Estimated from biological sampling.

<sup>4</sup> Assumed to be misreported.

<sup>5</sup> Includes 13 t from the German Democratic Republic.

<sup>6</sup> Includes a negative unallocated catch of -4000 t.

Table 9.4.3.3

Horse mackerel general. Catches (t) in Subarea VI by country. (Data submitted by Working Group members).

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Denmark	734	341	2,785	7	-	-	-	769	1,655
Faroe Islands	-	-	1,248	-	-	4,014	1,992	4,450 <sup>3</sup>	4,000 <sup>3</sup>
France	45	454	4	10	14	13	12	20	10
Germany, Fed. Rep.	5,550	10,212	2,113	4,146	130	191	354	174	615
Ireland	-	-	-	15,086	13,858	27,102	28,125	29,743	27,872
Netherlands	2,385	100	50	94	17,500	18,450	3,450	5,750	3,340
Norway	-	5	-	-	-	-	83	75	41
Spain	-	-	-	-	-	-	- <sup>2</sup>	- <sup>2</sup>	- <sup>2</sup>
UK (Engl. + Wales)	9	5	+	38	+	996	198	404	475
UK (N. Ireland)	-	-	-	-	-	-	-	-	-
UK (Scotland)	1	17	83	-	214	1,427	138	1,027	7,834
USSR	-	-	-	-	-	-	-	-	-
Unallocated + disc.	-	-	-	-	-	-19,168	-13,897	-7,255	-
Total	8,724	11,134	6,283	19,381	31,716	33,025	20,455	35,157	45,842

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	973	615	-	42	-	294	106	114	780
Faroe Islands	3,059	628	255	-	820	80	-	-	-
France	2	17	4	3	+	-	-	-	52
Germany, Fed. Rep.	1,162	2,474	2,500	6,281	10,023	1,430	1,368	943	229
Ireland	19,493	15,911	24,766	32,-994	44,802	65,564	120,124	87,872	22,474
Netherlands	1,907	660	3,3-69	2,150	590	341	2,326	572	498
Norway	-	-	-	-	-	-	-	-	-
Spain	-2	-2	1	3	-	-	-	-	-
UK (Engl. + Wales)	44	145	1,229	577	144	109	208	612	56
UK (N.Ireland)	-	-	1,970	273	-	-	-	-	767
UK (Scotland)	1,737	267	1,640	86	4,523	1,760	789	2,669	14,452
USSR/Russia (1992-)	-	44	-	-	-	-	-	-	-
Unallocated + disc.	6,493	143	-1,278	-1,940	-6,960 <sup>4</sup>	-51	-41,326	-11,523	837
Total	34,870	20,904	34,456	40,469	53,942	69,527	83,595	81,259	40,145

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006 <sup>1</sup>
Denmark	-	-	-	-	-	-	-	-	-
Faroe Islands	-	-	-	-	-	-	-	-	-
France	221	25,007	-	428	55	209	172	41	411
Germany	414	1,031	209	265	149	1,337	1,413	1,958	1,025
Ireland	21,608	31,736	15,843	20,162	12,341	20,915	15,702	12,395	9,780
Lithuania	-	-	-	-	-	-	-	-	2,822
Netherlands	885	1,139	687	600	450	847	3,701	6,039	1,892
Spain	-	-	-	-	-	-	-	-	-
UK (Engl.+Wales)	10	344	41	91	-	46	5	52	-
UK (N.Ireland)	1,132	-	-	-	-	453	-	210	82
UK (Scotland)	10,447	4,544	1,839	3,111	1,192	-	377	62	43
Unallocated+disc.	98	1,507	2,038	-21	3	-553	559	1,298	-304
Total	34,815	65,308	20,657	24,636	14,190	23,254	21,929	22,055	15,751

<sup>1</sup>Preliminary.<sup>2</sup>Included in Subarea VII.<sup>3</sup>Includes Divisions IIIa, IVa,b, and VIb.<sup>4</sup>Includes a negative unallocated catch of -7000 t.



**Table 9.4.3.4** Horse mackerel general . Catches (t) in Subarea VII by country. (Data submitted by the Working Group members).

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Belgium	-	1	1	-	-	+	+	2	-
Denmark	5,045	3,099	877	993	732	1,477 <sup>2</sup>	30,408 <sup>2</sup>	27,368	33,202
France	1,983	2,800	2,314	1,834	2,387	1,881	3,801	2,197	1,523
Germany, Fed.Rep.	2,289	1,079	12	1,977	228	-	5	374	4,705
Ireland	-	16	-	-	65	100	703	15	481
Netherlands	23,002	25,000	27,500 <sup>2</sup>	34,350	38,700	33,550	40,750	69,400	43,560
Norway	394	-	-	-	-	-	-	-	-
Spain	50	234	104	142	560	275	137	148	150
UK (Engl. + Wales)	12,933	2,520	2,670	1,230	279	1,630	1,824	1,228	3,759
UK (Scotland)	1	-	-	-	1	1	+	2	2,873
USSR	-	-	-	-	-	120	-	-	-
Total	45,697	34,749	33,478	40,526	42,952	39,034	77,628	100,734	90,253

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Faroe Islands	-	28	-	-	-	-	-	-	-
Belgium	-	+	-	-	-	1	-	-	18
Denmark	34,474	30,594	28,888	18,984	16,978	41,605	28,300	43,330	60,412
France	4,576	2,538	1,230	1,198	1,001	-	-	-	27,201
Germany, Fed.Rep.	7,743	8,109	12,919	12,951	15,684	14,828	17,436	15,949	28,549
Ireland	12,645	17,887	19,074	15,568	16,363	15,281	58,011	38,455	43,624
Netherlands	43,582	111,900	104,107	109,197	157,110	92,903	116,126	114,692	81,464
Norway	-	-	-	-	-	-	-	-	-
Spain	14	16	113	106	54	29	25	33	-
UK (Engl. + Wales)	4,488	13,371	6,436	7,870	6,090	12,418	31,641	28,605	17,464
UK (N.Ireland)	-	-	2,026	1,690	587	119	-	-	1,093
UK (Scotland)	+	139	1,992	5,008	3,123	9,015	10,522	11,241	7,931
USSR / Russia (1992-)	-	-	-	-	-	-	-	-	-
Unallocated + discards	28,368	7,614	24,541	15,563	4,0103	14,057	68,644	26,795	58,718
Total	135,890	192,196	201,326	188,135	221,000	200,256	330,705	279,100	326,474

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006 <sup>1</sup>
Faroe Islands	-	-	550	-	-	-	-	3,660	1,201
Belgium	18	-	-	-	1	-	+	+	+
Denmark	25,492	19,223	13,946	20,574	10,094	10,867	11,529	9,939	6,838
France	24,223	-	20,401	11,049	6,466	7,199	8,083	8,469	7,928
Germany	25,414	15,247	9,692	8,320	10,812	13,873	16,352	10,437	7,139
Ireland	51,720	25,843	32,999	30,192	23,366	13,533	8,470	20,406	16,841
Lithuania	-	-	-	-	-	-	-	-	3,569
Netherlands	91,946	56,223	50,120	46,196	37,605	48,222	41,123	31,156	35,467
Spain	-	-	50	7	0	1	27	12	60
UK (Engl. + Wales)	12,832	8,885	2,972	8,901	5,525	4,186	7,178	4,752	2,935
UK (N.Ireland)	-	-	-	-	-	-	-	217	142
UK (Scotland)	5,095	4,994	5,152	1,757	1,461	268	1,146	59	413
Unallocated+discards	12,706	31,239	1,884	11,046	2,576	24,897	18,485	18,368	19,379
Total	249,446	161,654	137,766	138,042	97,906	123,046	112,393	107,475	101,912

<sup>1</sup>Provisional.

<sup>2</sup>Includes Subarea VI.

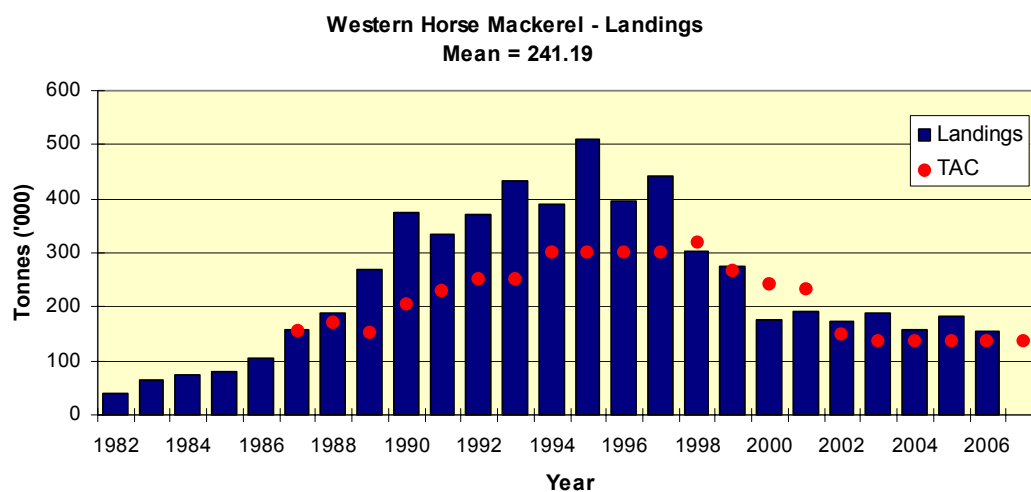
**Table 9.4.3.5**

Horse mackerel general. Catches (t) in Subarea VIII by country. (Data submitted by Working Group members).

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Denmark	-	-	-	-	-	-	446	3,283	2,793
France	3,361	3,711	3,073	2,643	2,489	4,305	3,534	3,983	4,502
Netherlands	-	-	-	-	<sup>2</sup>	<sup>2</sup>	<sup>2</sup>	<sup>2</sup>	-
Spain	34,134	36,362	19,610	25,580	23,119	23,292	40,334	30,098	26,629
UK (Engl.+Wales)	-	+	1	-	1	143	392	339	253
USSR	-	-	-	-	20	-	656	-	-
Total	37,495	40,073	22,684	28,223	25,629	27,740	45,362	37,703	34,177

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	6,729	5,726	1,349	5,778	1,955	-	340	140	729
France	4,719	5,082	6,164	6,220	4,010	28	-	7	8,690
Germany, Fed. Rep.	-	-	80	62	-	-	-	-	-
Netherlands	-	6,000	12,437	9,339	19,000	7,272	-	14,187	2,944
Spain	27,170	25,182	23,733	27,688	27,921	25,409	28,349	29,428	31,081
UK (Engl.+Wales)	68	6	70	88	123	753	20	924	430
USSR/Russia (1992-)	-	-	-	-	-	-	-	-	-
Unallocated+discards	-	1,500	2,563	5,011	700	2,038	-	3,583	-2,944
Total	38,686	43,496	46,396	54,186	53,709	35,500	28,709	48,269	40,930

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006 <sup>1</sup>
Denmark	1,728	4,818	2,584	582	-	-	-	-	1,513
France	1,844	74	7	5,316	13,676	-	2,161	3,540	3,944
Germany	3,268	3,197	3,760	3,645	2,249	4,908	72	4,776	3,325
Ireland	-	-	6,485	1,483	704	504	1,882	1,808	158
Lithuania	-	-	-	-	-	-	-	-	401
Netherlands	6,604	22,479	11,768	36,106	12,538	1,314	1,047	6,607	6,073
Russia	-	-	-	-	-	6,620	-	-	-
Spain	23,599	24,190	24,154	23,531	22,110	24,598	16,245	16,624	13,874
UK (Engl. + Wales)	9	29	112	1,092	157	982	516	838	821
UK (Scotland)	-	-	249	-	-	-	-	-	-
Unallocated+discards	1,884	-8658	5,093	4,365	1,705	2,785	2,202	7,302	4,013
Total	38,936	46,129	54,212	76,120	54,560	41,711	24,125	41,495	34,122

<sup>1</sup>Preliminary.<sup>2</sup>Included in Subarea VII.

# North Sea Horse Mackerel

(Division IIa (eastern part), Divisions IVb,c,VIIId)

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## FSS – SINGLE STOCK CONSIDERATIONS

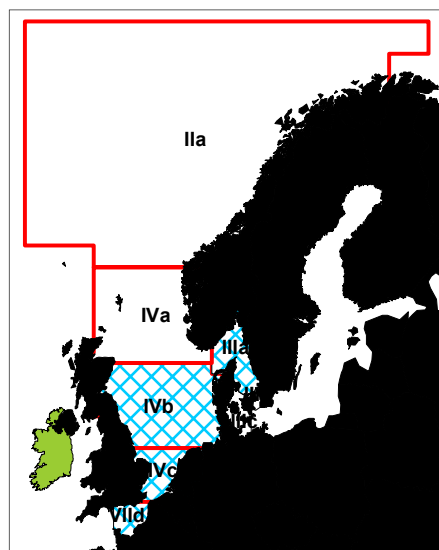
FSS notes that the available information is inadequate to evaluate spawning stock or fishing mortality relative to risk, so the state of the stock is unknown. Catches increased rapidly since the late 1990s and remain at an increased level.

FSS agrees with the ICES and STECF advice for this stock that catches should be limited to 18,000 t (based on the average catches from 1982-1997) in order to constrain the expansion of the fishery until these catches can be shown to be sustainable. This translates to an Irish quota in 2007 of about 690 t.

FSS advises that because recruitment to the North Sea and Western horse mackerel stocks are strongly linked, measures to protect juveniles should be applied to both stocks. FSS notes that a considerable fishery for juvenile horse mackerel has developed in Division VIIId. This fishery is spatially contiguous with the juvenile fishery in Division VIIe (western stock). FSS notes that the TACs set for this stock have not been precautionary or restrictive, while those set for the adjacent western horse mackerel stock have. FSS highlights that unless the TAC for North Sea horse mackerel is restrictive, this could lead to area misreporting, and/or overexploitation of the juveniles from the western horse mackerel stock.

FSS agrees with the ICES advice that the TAC for North Sea horse mackerel should apply to the areas in which North Sea horse mackerel are fished (IIla western part, IVbc and VIIId) and not the current TAC area (EC waters of IIa & IV).

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 46). For North Sea horse mackerel, FSS interprets that the proposal should result in a 15% reduction in the TAC for 2008. However if the EC do not revise the TAC area then FSS interprets that the EC would propose a

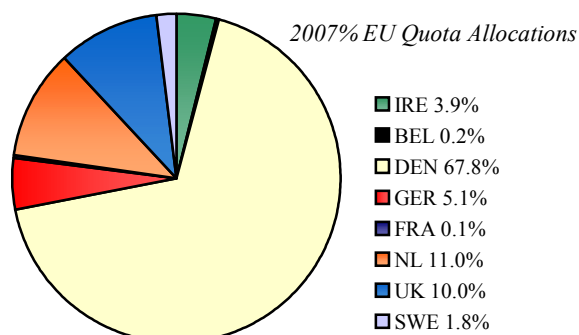


Red Boxes-TAC/Management Areas Blue Shading- Assessment Area

status quo TAC for 2008. Neither of these options are consistent with the ICES, STECF and FSS advised TAC for 2008, which would apply to a new TAC area.

## CURRENT MANAGEMENT

- The stock distribution area is Divisions IIla, IVb,c and VIIId.
- There is no management plan for the fishery.
- The agreed TAC applies to EU waters in Division IIa and Sub-area IV and does not correspond with the distribution and fishery of the stock.
- In the last three years the TAC was 43,000 t. This has been set consistently above the catch and the advised level and is therefore not restrictive.



## ADDITIONAL INFORMATION

1. No assessment of North Sea horse mackerel has been carried out due to poor sampling and lack of signals in relative cohort strength. There is also a lack of reliable fishery-independent abundance indices. Egg surveys have been carried out in the early nineties but historical SSB estimates are considered unreliable due to the likelihood that horse mackerel fecundity is indeterminate. Current North Sea mackerel egg surveys do not cover the Horse Mackerel spawning grounds.
2. The intensity and quality of age sampling has improved with 70% of the catch covered in 2006.
3. Length frequency data from the IBTS bottom trawl surveys in the North Sea were explored for the potential of a length-based assessment, but they do not show a consistent signal to allow the tracking of cohorts through this stock.

4. Catches increased from an average 18,000 t during the period 1982-1997 to over 48,000 t in 2000. In 2006, catches were about 36,000 t, which was 7,000t more than in 2005. While Irish catches were almost zero in recent years, Ireland took over 2,000 t in 2006.
5. Norwegian catches in Division IVa are mostly included in catches for the western stock.
6. Catch at age data show that the proportion of young fish has increased since 2000. This can be partly explained by a change of abundance and partly by a change in the fishery. In previous years catches were mainly taken as by-catch from the small mesh industrial fishery, but recently a large proportion of the catch has been taken in a directed fishery for human consumption, which favours small fish for the north African market.
7. The horse mackerel fishery creates by-catches of juvenile and adult mackerel.

## ICES ADVICE

### 6.4.21

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Unknown	Unknown	Unknown	Unknown	No assessment available due to limited data

The available information is inadequate to evaluate spawning stock or fishing mortality relative to risk, so the state of the stock is unknown. Catches increased rapidly in the late 1990s and have remained high since then.

#### Management objectives

No explicit management objectives have been established for this stock.

#### Reference points

Not available.

#### Single-stock exploitation boundaries

##### *Exploitation boundaries in relation to precautionary considerations*

ICES reiterates the recommendation made since 2002 to limit the catches to below the 1982–1997 average of 18 000 t. It is necessary to constrain the fishery until there is more information about the structure of horse mackerel stocks, and sufficient information to show that higher exploitation rates are sustainable.

#### Short-term implications

No forecast can be made for this stock.

#### Management considerations

ICES advised in 1999 to constrain an expansion of the fishery until there was a scientific basis for advice, because high catch rates can be maintained in pelagic fisheries even when the stock is in decline.

North Sea horse mackerel is hypothesized to migrate to areas where they mix with the western horse mackerel stock. The present agreed TAC is for the North Sea and Division IIa, and these areas do not correspond to the distribution area of the stock. The TAC should apply only to those areas where the North Sea horse mackerel are fished, i.e. Divisions IIIa, IVb,c, and VIId.

The allocation of catches to the different horse mackerel stocks is based on the temporal and spatial distribution of the fishery. It is therefore important that catches be reported by ICES rectangle and by quarter.

The points listed below should be taken into account when considering management options for the North Sea horse mackerel:

The management units are incompatible with the stock units.

Catches have increased during the last decade. The major part of the increased catches is taken in Division VIId in quarters 1 and 4, which is adjacent to the boundary of the western stock. It is also adjacent to an area where juveniles of the western horse mackerel stock are found.

Recent catches are above the advised catch of 18 000 t. The average annual catch in the period 1995–2006 was 31 000 t.

There is a bycatch of mackerel in the horse mackerel fishery.

#### Factors affecting the fisheries and the stock

##### *Changes in fishing technology and fishing patterns*

In earlier years, the majority of the catch was taken as bycatch in the small-mesh industrial fishery. In recent years, most of the catch has come from a directed fishery for human consumption, mainly in Division VIId. This has led to a change in the age composition of the landings towards a higher proportion of younger age groups.

## Scientific basis

### Data and methods

The stock cannot be assessed for management purposes because there are no consistent signals in the catch-at-age data, sampling is insufficient, and fishery-independent indices of abundance are lacking.

Egg surveys for horse mackerel were carried out during the period 1988–1991. The mackerel egg surveys in the North Sea do not cover the spawning area of horse mackerel in the North Sea.

### Comparison with previous assessment and advice

There is no assessment on which to base the status of this stock. The current advice reiterates last year's advice based on average catches observed between 1982 and 1997.

### Source of information

Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine, and Anchovy. ICES Headquarters, Copenhagen 4–13 September 2007 (ICES CM 2007/ACFM:31).

Year	ICES Advice	Predicted catch corresp. To advice	Agreed TAC <sup>1</sup>	ACFM landings <sup>2</sup>
1987	Not assessed	-	30	12
1988	No advice	-	50	24
1989	No advice	-	45	33
1990	No advice	-	40	19
1991	No advice	-	45	12
1992	No advice	-	55	15
1993	No advice	-	60	14
1994	No advice	-	60	6
1995	No advice	-	60	17
1996	No advice	-	60	19
1997	No advice	-	60	20
1998	Develop and implement management plan	-	60	31
1999	Develop and implement management plan	-	60	37
2000	Develop and implement management plan	-	51	48
2001	No increase in catch	-	51	46
2002	No increase in catch from 1982–1997 average	<18	58	23
2003	No increase in catch from 1982–1997 average	<18	50	32
2004	No increase in catch from 1982–1997	<18	42	35
2005	No increase in catch from 1982–1997	<18	43	29
2006	No increase in catch from 1982–1997	<18	43	36
2007	No increase in catch from 1982–1997	<18	43	
2008	No increase in catch from 1982–1997	<18		

Weights in '000 t.

<sup>1</sup>Division IIa and Subarea IV (EU waters only).

<sup>2</sup>Catch of North Sea stock (Divisions IIIaE, IVb,c & VIId).

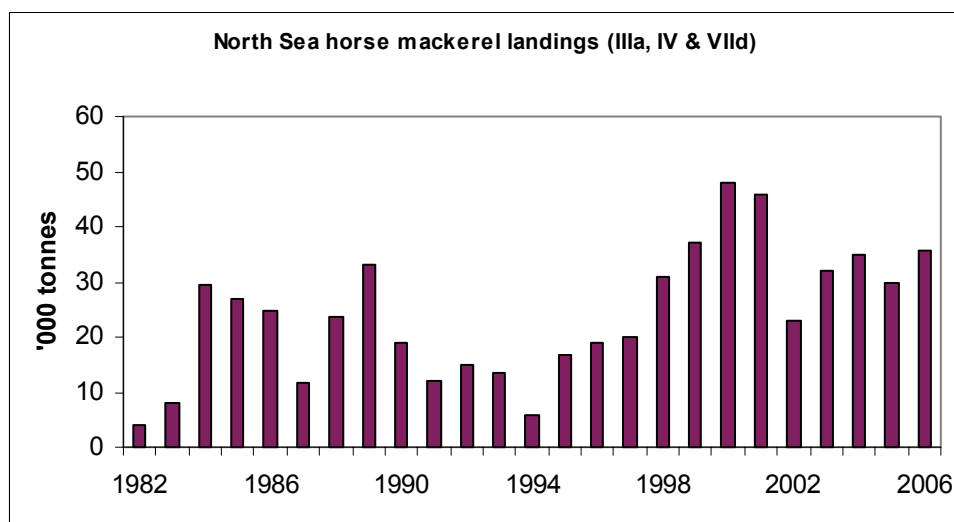


Figure 6.4.21.1

**Table 6.4.21.1** HORSE MACKEREL general. Landings and discards (t) by year and Division, for the North Sea, Western, and Southern horse mackerel stocks.  
(Data submitted by Working Group members.)

Year	IIIa	IVa	IVb,c	Discards	VIII d	North Sea Stock	IIa	IIIa	IVa	VIIa,b	VIIa-c,e-k	VIIIa,b,d,e	VIIIc	Disc	Western Stock	Southern Stock (IXa)	All stocks
1982	2,788 <sup>1</sup>	-	-	-	1,247	4,035	-	-	-	6,283	32,231	3,073	19,610	-	61,197	39,726	104,958
1983	4,420 <sup>1</sup>	-	-	-	3,600	8,020	412	-	-	24,881	36,926	2,643	25,580	-	90,442	48,733	147,195
1984	25,893 <sup>1</sup>	-	-	-	3,585	29,478	23	-	94	31,716	38,782	2,510	23,119	500	96,744	23,178	149,400
1985	-	22,897	-	-	2,715	26,750	79	-	203	33,025	35,296	4,448	23,292	7,500	103,843	20,237	150,830
1986	-	19,496	-	-	4,756	24,648	214	-	776	20,343	72,761	3,071	40,334	8,500	145,999	31,159	201,806
1987	1,138	9,477	-	-	1,721	11,634	3,311	-	11,185	35,197	99,942	7,605	30,098	-	187,338	24,540	223,512
1988	396	18,290	-	-	3,120	23,671	6,818	-	42,174	45,842	81,978	7,548	26,629	3,740	214,729	29,763	268,163
1989	436	25,830	-	-	6,522	33,265	4,809	-	85,304 <sup>2</sup>	34,870	131,218	11,516	27,170	1,150	296,037	29,231	358,533
1990	2,261	17,437	-	-	1,325	18,762	11,414	14,878	112,753 <sup>2</sup>	20,794	182,580	21,120	25,182	9,930	398,645	24,023	441,430
1991	913	11,400	-	-	600	12,000	4,487	2,725	63,869 <sup>2</sup>	34,415	196,926	25,693	23,733	5,440	357,288	21,778	391,066
1992	-	13,955	-	400	688	15,043	13,457	2,374	101,752	40,881	180,937	29,329	24,243	1,820	394,793	26,713	436,548
1993	-	3,895	-	930	8,792	13,617	3,168	850	134,908	53,782	204,318	27,519	25,483	8,600	458,628	31,945	504,190
1994	-	2,496	-	630	2,503	5,689	759	2,492	106,911	69,546	194,188	11,044	24,147	3,935	413,022	28,442	447,153
1995	112	7,948	-	30	8,666	16,756	13,133	128	90,527	83,486	320,102	1,175	27,534	2,046	538,131	25,147	580,034
1996	1,657	7,558	-	212	9,416	18,843	3,366	-	18,356	81,259	252,823	23,978	24,290	16,870	420,942	20,400	460,185
1997	-	14,078	-	10	5,452	19,540	2,617	2,037	65,073 <sup>3</sup>	40,145	318,101	11,677	29,129	2,921	471,700	27,642	518,882
1998	3,693	10,530	-	83	16,194	30,500	2,540 <sup>4</sup>	-	17,011	35,043	232,451	15,662	22,906	830	326,443	41,574	398,523
1999	-	9,335	-	-	27,889	37,224	2,557 <sup>5</sup>	2,095	47,316	40,381	158,715	22,824	24,188	-	298,076	27,733	363,033
2000	-	25,954	-	-	22,471	48,425	1,169 <sup>6</sup>	1,105	4,524	20,657	115,245	32,227	21,984	-	196,911	27,160	272,496
2001	85	69	8,157	-	38,114	46,356	60	72	11,456	24,636	100,676	54,293	20,828	-	212,090	24,911	283,357
2002	-	12,636	-	20	10,723	23,379	1,324	179	36,855	14,190	86,878	32,450	22,110	305	194,292	23,665	241,336
2003	48	623	10,309	-	21,098	32,078	24	1,974	21,272	23,254	101,948	21,732	19,979	-	190,183	19,570	241,831
2004	351	18,348	-	-	16,455	35,154	47	-	11,841	21,929	98,984	8,353	15,772	701	157,627	23,581	216,361
2005	357	13,892	-	62	15,460	29,711	176	-	26,315	22,054	91,431	26,483	14,775	760	181,994	23,111	234,876
2006	1,099	2,661	7,998	78	23,790	35,626	30	-	27,152	15,722	77,970	20,651	13,470	99	155,094	24,557	215,277

<sup>1</sup>Divisions IIIa and IVb,c combined

<sup>2</sup>Norwegian catches in IVb included in Western horse mackerel.

<sup>3</sup>Includes Norwegian catches in IVb (1,426 t).

<sup>4</sup>Includes 1,937 t from Vb.

<sup>5</sup>Includes 132 t from Vb.

<sup>6</sup>Includes 250 t from Vb.

**Table 6.4.21.2** Horse mackerel general. Catches (t) by country in North Sea Subarea IV and Skagerrak Division IIIa. (Data submitted by Working Group members).  
Catches partly concern the North Sea horse mackerel.

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Belgium	8	34	7	55	20	13	13	9	10
Denmark	199	3,576	1,612	1,590	23,730	22,495	18,652	7,290	20,323
Faroe Islands	260	-	-	-	-	-	-	-	-
France	292	421	567	366	827	298	231 <sup>2</sup>	189 <sup>2</sup>	784 <sup>2</sup>
Germany, Fed.Rep.	+	139	30	52	+	+	-	3	153
Ireland	1,161	412	-	-	-	-	-	-	-
Netherlands	101	355	559	2,029 <sup>3</sup>	824	160 <sup>3</sup>	600 <sup>3</sup>	850 <sup>4</sup>	1,060 <sup>3</sup>
Norway <sup>2</sup>	119	2,292	7	322	<sup>3</sup>	203	776	11,728 <sup>4</sup>	34,425 <sup>4</sup>
Poland	-	-	-	2	94	-	-	-	-
Sweden	-	-	-	-	-	-	2	-	-
UK (Engl. + Wales)	11	15	6	4	-	71	3	339	373
UK (Scotland)	-	-	-	-	3	998	531	487	5,749
USSR	-	-	-	-	489	-	-	-	-
Total	2,151	7,253	2,788	4,420	25,987	24,238	20,808	20,895	62,877

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	10	13	-	+	74	57	51	28	-
Denmark	23,329	20,605	6,982	7,755	6,120	3,921	2,432	1,433	648
Estonia	-	-	-	293	-	-	17	-	-
Faroe Islands	-	942	340	-	360	275	-	-	296
France	248	220	174	162	302	-	-	-	-
Germany, Fed.Rep.	506	2,469 <sup>5</sup>	5,995	2,801	1,570	1,014	1,600	7	7,603
Ireland	-	687	2,657	2,600	4,086	415	220	1,100	8,152
Netherlands	14,172	1,970	3,852	3,000	2,470	1,329	5,285	6,205	37,778
Norway	84,161	117,903	50,000	96,000	126,800	94,000	84,747	14,639	45,314
Poland	-	-	-	-	-	-	-	-	-
Sweden	-	102	953	800	697	2,087	-	95	232
UK (Engl. + Wales)	10	10	132	4	115	389	478	40	242
UK (N. Ireland)	-	-	350	-	-	-	-	-	-
UK (Scotland)	2,093	458	7,309	996	1,059	7,582	3,650	2,442	10,511
USSR / Russia (1992 -)	-	-	-	-	-	-	-	-	-
Unallocated + discards	12,482 <sup>4</sup>	-317 <sup>4</sup>	-750 <sup>4</sup>	-278 <sup>6</sup>	-3,270	1,511	-28	136	-31,615
Total	112,047	145,062	77,904	114,133	140,383	112,580	98,452	26,125	79,161

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006 <sup>1</sup>
Belgium	19	21	19	19	1,004	5	4	6	3
Denmark	2,048	8,006	4,409	2,288	1,393	3,774	8,735	4,258	1,343
Estonia	22	-	-	-	-	-	-	-	-
Faroe Islands	28	908	24	-	699	809	-	35	-
France	379	60	49	48	-	392	174	3,876	2,380
Germany	4,620	4,071	3,115	230	2,671	3,048	4,905	1,811	965
Ireland	-	404	103	375	72	93	379	753	2,077
Lithuania	-	-	-	-	-	-	-	-	2,354
Netherlands	3,811	3,610	3,382	4,685	6,612	17,354	21,418	24,679	20,984
Norway	13,129	44,344	1,246	7,948	35,368	20,493	10,709	24,937	27,200
Russia	-	-	2	-	-	-	-	-	-
Sweden	3,411	1,957	1,141	119	575	1,074	665	239	491
UK (Engl. + Wales)	2	11	15	317	1,191	1,192	2,552	1,778	423
UK (Scotland)	3,041	1,658	3,465	3,161	255	1	1	22	314
Unallocated+discards	737	-325	14613	649	-149	-14,009	-19,103	-21,830	-19,623
xTotal	31,247	64,725	31583	19,839	49,691	34,226	30,435	40,564	38,911

<sup>1</sup>Preliminary.

<sup>2</sup>Includes Division IIa.

<sup>3</sup>Estimated from biological sampling.

<sup>4</sup>Assumed to be misreported.

<sup>5</sup>Includes 13 t from the German Democratic Republic.

<sup>6</sup>Includes a negative unallocated catch of -4000 t.



# Blue Whiting Combined Stock

(Sub-areas I-IX, XII and XIV)

For latest information, see: <http://www.ices.dk>



Marine Institute  
Foras na Mara

Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

FSS agrees with ICES advice that this stock has full reproductive capacity but is being harvested with increased risk. Recruitment of the 2005 and 2006 year classes is thought to be poor. It is not known if this is an anomaly or a shift towards a low recruitment regime, as observed in the period before the mid 90s. The assessment for this stock is considered uncertain.

FSS agrees with ICES that fishing within the limits of the management plan (i.e. a reduction of 100,000 t per year until an  $F$  of 0.32 is reached) is not considered to be in accordance with the precautionary approach, under low recruitment scenarios.

FSS further agrees with the ICES advice that current fishing mortality (0.45) is too high and should be reduced. FSS advise fishing mortality =  $F_{pa}$  (0.32) which implies catches of 835,000 t in 2008. FSS is aware that the Coastal States have agreed a TAC for this stock of 1.25 million tonnes for 2008. FSS agrees with ICES that this catch option is not consistent with the precautionary approach. Current  $F$  is above the limits expected to lead to high long-term yield and low risk of depletion of production potential.

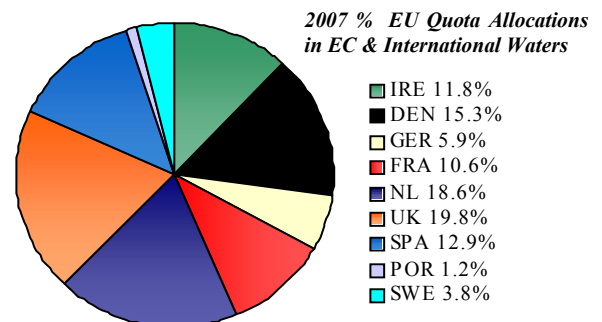
FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 46). For blue whiting, FSS interprets that the proposal would result in a TAC in line with the management plan. However FSS agrees with ICES and STECF that this is not consistent with the precautionary approach.

FSS and ICES encourage managers to develop an alternative management plan to meet their expectations for the exploitation of the stock that would be consistent with the precautionary approach.

The primary means to reduce the catch of juveniles is to reduce overall exploitation. FSS advises that additional measures should be taken to protect juvenile blue whiting.

## CURRENT MANAGEMENT

- In 2005, the coastal states (EU, Norway, Iceland and Faroe Islands) agreed a sharing arrangement for the blue whiting stock. This arrangement provides for catches in 2007 of 1.7 million tonnes, allocated as follows: EU 30.5%, Faroe Islands 26.13%, Norway 25.75% and Iceland 17.63%. Russia will be accommodated by transfers from some of the coastal states and additional catches in the NEAFC regulatory area.
- Ireland has a share of the EU quota. In 2007, the Irish quota was 32,922 t.
- The management targets are to maintain SSB above  $B_{lim}$  (1.5 million t) and fishing mortality at levels no more than  $F_{pa}$  (0.32).
- In October 2007, the Coastal States agreed that the TAC for 2008 will be 1,250,000. The Coastal States further agreed to limit their total catches in 2008 to 1,150,514 tonnes.
- The resultant Irish quota will be around 31,000 t.



## ADDITIONAL INFORMATION

- The assessment for this stock is considered uncertain. There are conflicting signals in the survey and catch at age data and relatively high uncertainty in the acoustic estimate of stock size, particularly in 2007.
- The International blue whiting spawning ground survey was used as a tuning fleet for the first time in 2007.
- The catches in 2006 were over 1.9 million tonnes, a reduction from over 2 million tonnes from 2005. In 2007, assumed landings are 1.8 million tonnes.
- Current SSB is estimated to be about 4.3 million tonnes, which is above the  $B_{pa}$  of 2.25 million tonnes.
- The fishing mortality has increased dramatically since the late 1990s. Fishing mortality is estimated to be = 0.45. ICES considers the current exploitation rate is not sustainable. The maximum fishing mortality, which would be in accordance with precautionary limits, is  $F_{pa}$  (0.32).
- A number of very strong year classes have recruited to the stock in recent years – particularly those of 1997, 1998, 2000 and 2001. These year classes have supported the fishery. Indices from surveys indicate that

the 2005 and 2006 year classes are at low level, similar to those pre 1996. The stock will not sustain the current high catches if the recruitment returns to lower levels.

7. Area misreporting may be a problem in this fishery. Catches taken by some countries within the EU zone are believed to be reported as having been taken outside the zone.
8. Further studies on blue whiting within its distribution range are recommended to facilitate future management including quota allocation.

## ICES ADVICE

### 9.4.4

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Full reproductive capacity	Harvested with increased risk	Overexploited	Above target

Based on the most recent estimates of fishing mortality and SSB, ICES classifies the stock as having full reproductive capacity, but being harvested at increased risk. SSB increased to a historical high in 2003, but has decreased since then. The estimated fishing mortality is well above  $F_{pa}$ . Recruitment in the last decade appears to be at a much higher level than prior to 1996. The 2005 and 2006 year classes are estimated at the pre-1996 level.

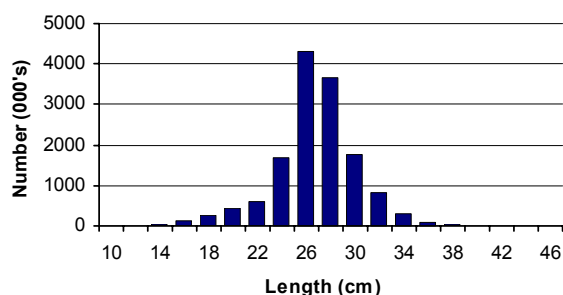
#### Management objectives

The management targets are to maintain the SSB of the blue whiting stock at levels above 1.5 million tonnes ( $B_{lim}$ ) and the fishing mortality rates at levels of no more than 0.32 ( $F_{pa}$ ). To achieve this, TAC are reduced by at least 100 000 t a year until the fishing mortality is reduced to 0.32 ( $F_{pa}$ ). The plan states that if the spawning stock falls below 2.25 million t unspecified actions to obtain a safe and rapid recovery to this level should be taken.

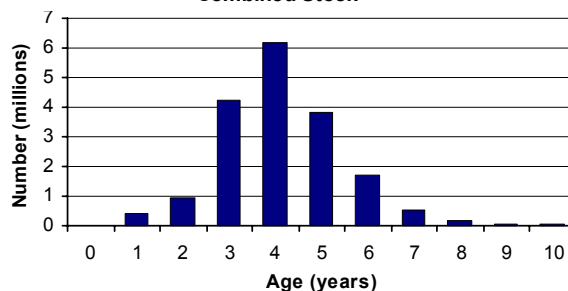
This is a management agreement between the four Coastal States.

ICES has evaluated this management plan in 2006 and found it not to be in accordance with the precautionary approach.

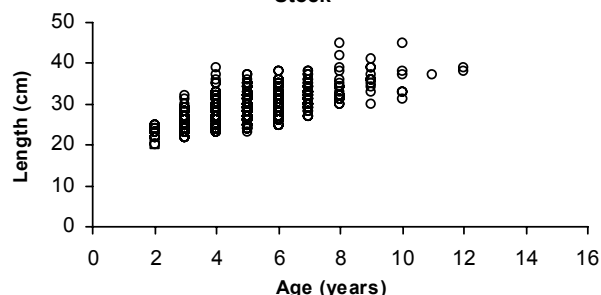
#### 2006 Length Distribution: International Landings, Blue Whiting Combined Stock



#### 2006 Age Distribution: International Landings, Blue Whiting Combined Stock



#### 2006 Size at Age: Irish Sampling, Blue Whiting Combined Stock



#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	1.5 million t	$B_{loss}$
	$B_{pa}$	2.25 million t	$B_{lim} \exp(1.645 \cdot \sigma)$ , with $\sigma = 0.25$ .
	$F_{lim}$	0.51	$F_{loss}$
	$F_{pa}$	0.32	$F_{med}$ (1998).
Targets	$F_y$	$< 0.32$	$= F_{pa}$
	$B_y$	$> 1.5$ million t	$= B_{lim}$ Objectives in the management plan.

(unchanged since 1998, targets added in 2006)

#### Yield and spawning biomass per Recruit F-reference points:

	Fish Mort	Yield/R	SSB/R
Ages 3–7			
Average last 3 years	0.49	0.06	0.15
$F_{0.1}$	0.20	0.05	0.27
$F_{med}$	0.41	0.05	0.17

$F_{max}$  is not well-defined.

ICES has evaluated the biomass limit reference point in 2007. The original reference point was set in 1998, before the era of high productivity became apparent. ICES examined the consequences of these new observations on the reference points and concluded that the reference points did not depend on the productivity regime and should remain unchanged.

### Single-stock exploitation boundaries

#### *Exploitation boundaries in relation to existing management plans*

The maximum catch in 2008 corresponding to the existing management plan is 1.75 million t. However, this would bring SSB below  $B_{pa}$  in 2009, leaving the spawning-stock biomass at 1.75 million t. If clause 6 of the management plan is interpreted as a requirement to keep SSB above  $B_{pa}$  in 2009 this would correspond to a maximum catch of 1.2 million t in 2008.

#### *Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects*

The fishing mortality in 2006 is estimated at 0.45, above the fishing mortalities expected to lead to high long-term yields and low risk of depletion of production potential ( $F_{0.1} = 0.20$ ). This indicates that long-term yield is expected to increase at fishing mortalities well below the historic values. Fishing at such a lower mortality is expected to lead to higher SSB and would therefore lower the risk of the stock being outside precautionary limits.

#### *Exploitation boundaries in relation to precautionary limits*

Fishing at less than  $F_{pa}$  implies catches of less than 835 thousand t in 2008. This would result in the spawning-stock biomass in 2009 remaining above  $B_{pa}$ .

#### *Conclusion on exploitation boundaries*

The management plan is not considered in accordance with the precautionary approach. ICES concludes that the exploitation boundaries for this stock should be based on the precautionary limits.

### Short-term implications

#### *Outlook for 2008*

Basis: Catch(2007) = 1.800; (Catch constraint,  $F_{2007} = 0.55$ ); SSB(2008) = 3.013; R(2008,2009) = GM (1981–2005) = 14.8 billion.

Rationale	Catch (2008) <sup>1</sup>	Basis	F (2008)	SSB (2009)	%SSB change <sup>2</sup>
Zero catch	0	$F=0$	0	3.426	14
Status quo	1.113	$F_{sq} = F_{2006}$	0.45	2.346	-22
Management Plan	1.600	100 000 t reduction from TAC for 2007	0.74	1.885	-37
Management Plan	1.747	100 000 t reduction from TAC for 2007 and Russian and Greenlandic catches of 147 000t	0.84	1.748	-42
Management Plan	1.213	Reduce catches to maintain SSB > $B_{pa}$ within one year	0.51	2.250	-25
Precautionary limits	0.096	$F_{pa} * 0.1$	0.03	3.332	11
	0.234	$F_{pa} * 0.25$	0.08	3.197	6
	0.450	$F_{pa} * 0.50$	0.16	2.986	-1
	0.650	$F_{pa} * 0.75$	0.24	2.792	-7
	0.762	$F_{pa} * 0.90$	0.29	2.683	-11
	0.835	$F_{pa}$	0.32	2.613	-13
	0.905	$F_{pa} * 1.1$	0.35	2.545	-16
	1.006	$F_{pa} * 1.25$	0.40	2.448	-19

<sup>1</sup> Weights in million tonnes.

<sup>2</sup> SSB 2009 relative to SSB 2008.

Shaded scenarios are not considered consistent with the precautionary approach

### Management considerations

The large landings over the last decade were supported by recruitments, which were much higher than in earlier years. Because fishing mortality has remained high and only a few year classes support the fishery and the SSB, the stock is vulnerable to overexploitation. Recruitment of the year classes 2005 and 2006 is weak and might be an order of magnitude lower than recruitment in the preceding 10 years. If catches in 2008 are not considerably reduced from the present level, it is expected that SSB will decline below  $B_{pa}$  in 2009.

In 2006, ICES reviewed the 2005 agreed management plan and considered that it was not precautionary. The simulations showed that, given the high recruitment level observed for the period 1996–2004, the management plan would be robust to uncertainties in both assessment and implementation. However, for low recruitment scenar-

ios, the management plan was not robust to these uncertainties, unless there were unrealistically low levels of noise and bias in both stock assessment estimates and implementation of the TAC.

ICES encourages managers to develop an alternative management plan to meet their objectives for exploitation of the stock that would be consistent with the precautionary approach.

The knowledge of the factors which drive blue whiting recruitment is very limited. It is not known if the poor 2005 and 2006 year classes are an anomaly or if it is a shift towards the low recruitment regime, as observed in the period before the mid-1990s. To illustrate the potential difference for the future, two medium-term forecast scenarios with different recruitment are provided. Figure 9.4.4.3 shows a medium-term forecast for a high recruitment scenario if recruitment was to return to post-1996 levels. In contrast Figure

9.4.4.4 shows a medium-term forecast for the low recruitment scenario if recruitment was to continue at the levels seen in the last two years and return to pre-1996 levels. Given this uncertainty in future recruitment ICES considers that the precautionary approach would be to assume that recruitment in 2008 will follow scenario 2, Figure 9.4.4.4.

## Scientific basis

### Data and methods

Five assessment models were used to explore the data for blue whiting. All models utilized catch-at-age data from commercial catches from 1981 onwards. Several survey time-series were available (1990–2007), but only one of the surveys covers almost the entire distribution area of the spawning stock. Observations from three acoustic surveys are used in the assessment, namely the Norwegian spawning ground survey 1993–2003, the international blue whiting spawning ground survey 2003–2007, and the international ecosystem survey in the Nordic Seas 2000–2007.

The final assessment was done using a Stochastic Multi-Species model (SMS). It has shown the most consistent retrospective pattern and gives results similar to most of the other applied models.

### Uncertainties in assessment and forecast

The assessments should be considered as uncertain. The uncertainty arises from some conflicting information from the catch and survey data in combination with a relatively high uncertainty of the acoustic estimates of the stock size, particularly in 2007. Various models give a consistent perception of trends in SSB and F.

Limited information was available on discarding. However, discarding is considered to be minor and is not included in the assessment.

Indications of low recruitment of year classes 2005 and 2006 are consistent across both survey and catch data.

### Comparison with previous assessment and advice

The new assessment is largely consistent with the assessment that was carried out last year. In previous years the assessments have shown marked upward revisions in SSB each year and downward revisions of fishing mortality (Figure 9.4.4.5).

Last year the advice was to limit landings to 980 thousand tonnes in order to achieve a fishing mortality of less than  $F_{pa} = 0.32$ . This year the advice is on a similar basis and corresponds to predicted landings of 835 thousand tonnes.

## Source of information

Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, 27 August to 1 September (ICES CM 2007/ACFM:29).

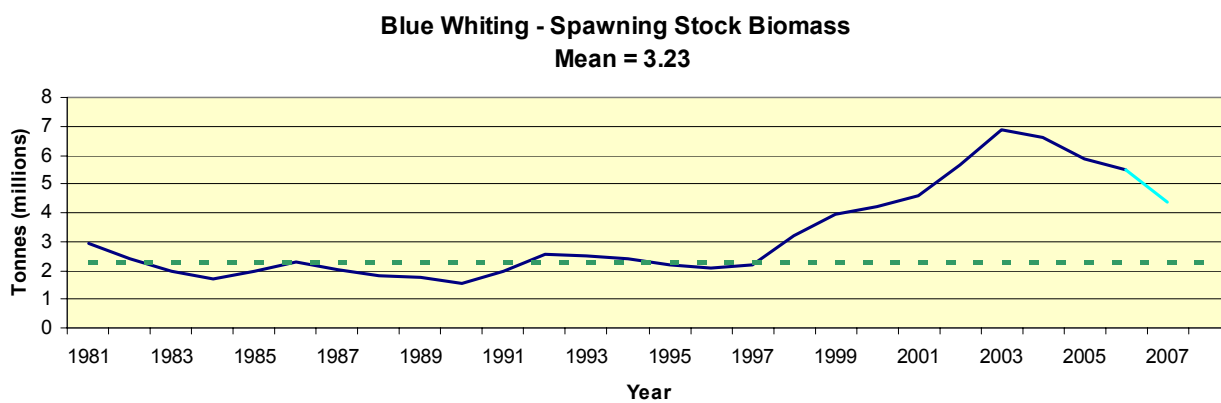
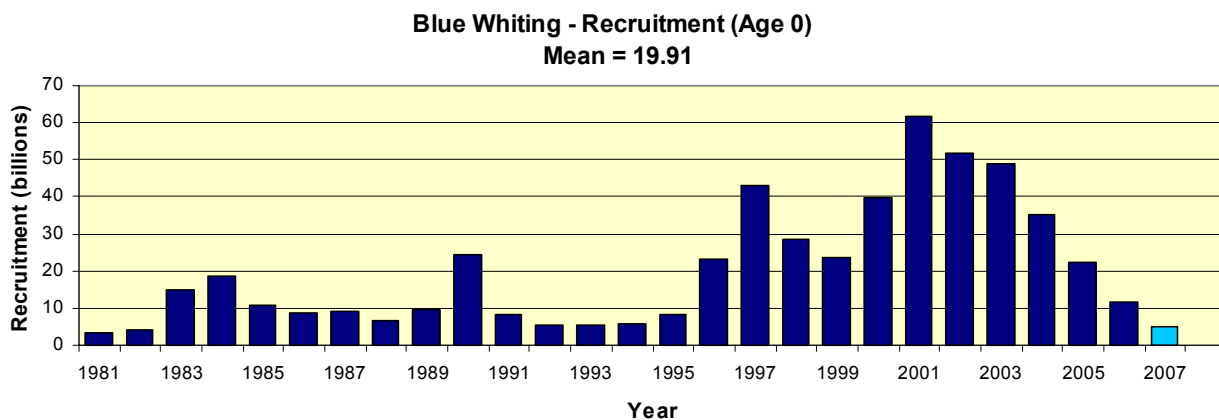
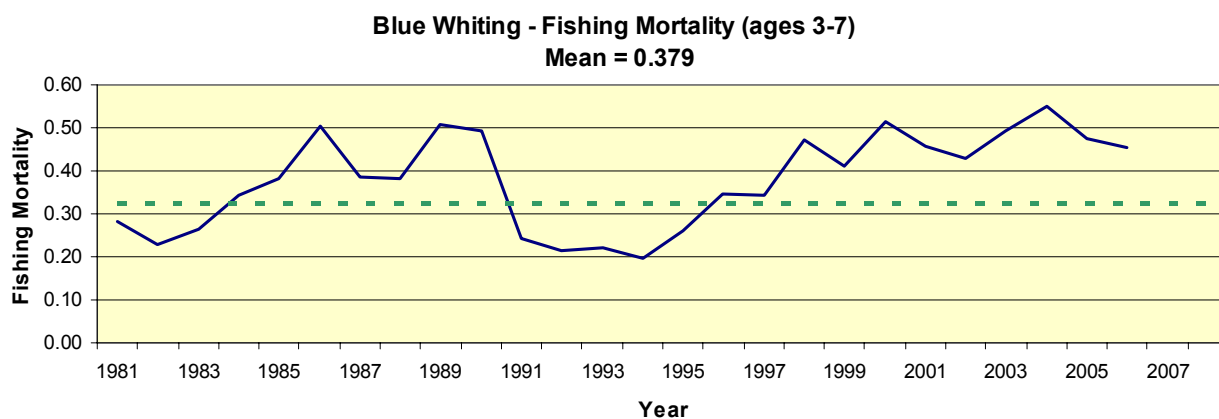
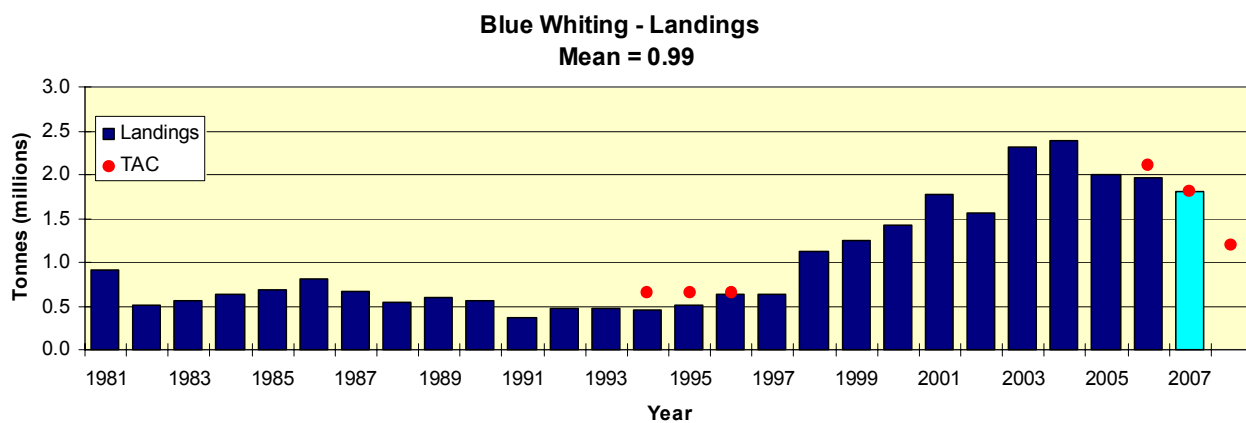
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch
1987	TAC for northern areas; no advice for southern areas	950	-	665
1988	TAC for northern areas; no advice for southern areas	832	-	558
1989	TAC for northern areas; no advice for southern areas	630	-	627
1990	TAC for northern areas; no advice for southern areas	600	-	562
1991	TAC for northern areas; no advice for southern areas	670	-	370
1992	No advice	-	-	475
1993	Catch at <i>status quo</i> F (northern areas); no assessment for southern areas	490	-	481
1994	Precautionary TAC (northern areas); no assessment for southern areas	485	650 <sup>1</sup>	459
1995	Precautionary TAC for combined stock	518	650 <sup>1</sup>	579
1996	Precautionary TAC for combined stock	500	650 <sup>1</sup>	646
1997	Precautionary TAC for combined stock	540		672
1998	Precautionary TAC for combined stock	650		1125
1999	Catches above 650 000 t may not be sustainable in the long run	650		1256
2000	F should not exceed the proposed $F_{pa}$	800		1412
2001	F should not exceed the proposed $F_{pa}$	628		1780
2002	Rebuilding plan	0		1556
2003	F should be less than the proposed $F_{pa}$	600		2321
2004	Achieve 50% probability that F will be less than $F_{pa}$	925		2378
2005	Achieve 50% probability that F will be less than $F_{pa}$	1075		2027
2006	F old management plan	1500	2100 <sup>2</sup>	1966
2007	F should be less than the proposed $F_{pa}$	980	1847 <sup>3</sup>	
2008	F should be less than $F_{pa}$	835		

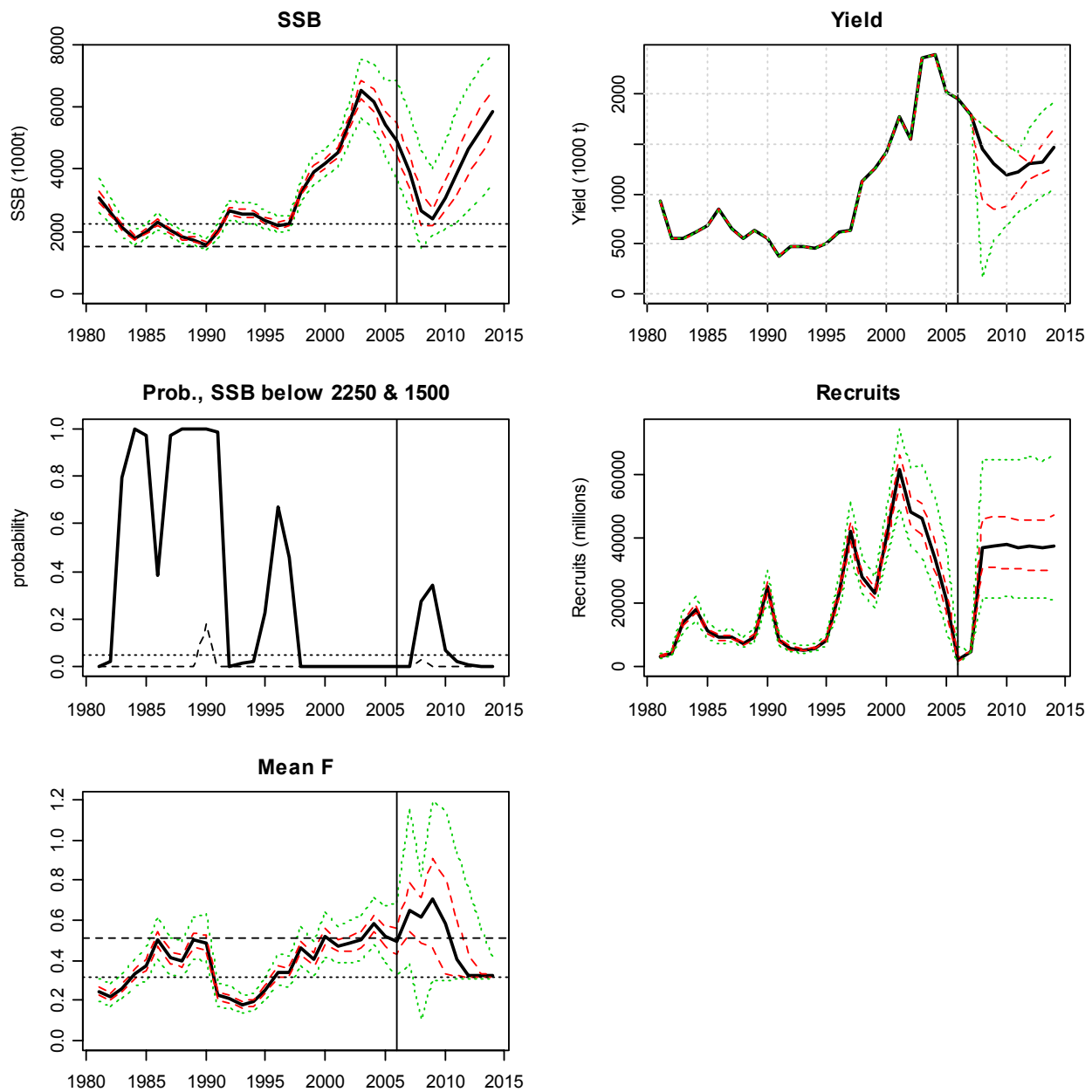
Weights in '000 t.

<sup>1</sup>NEAFC proposal for NEAFC regions 1 and 2.

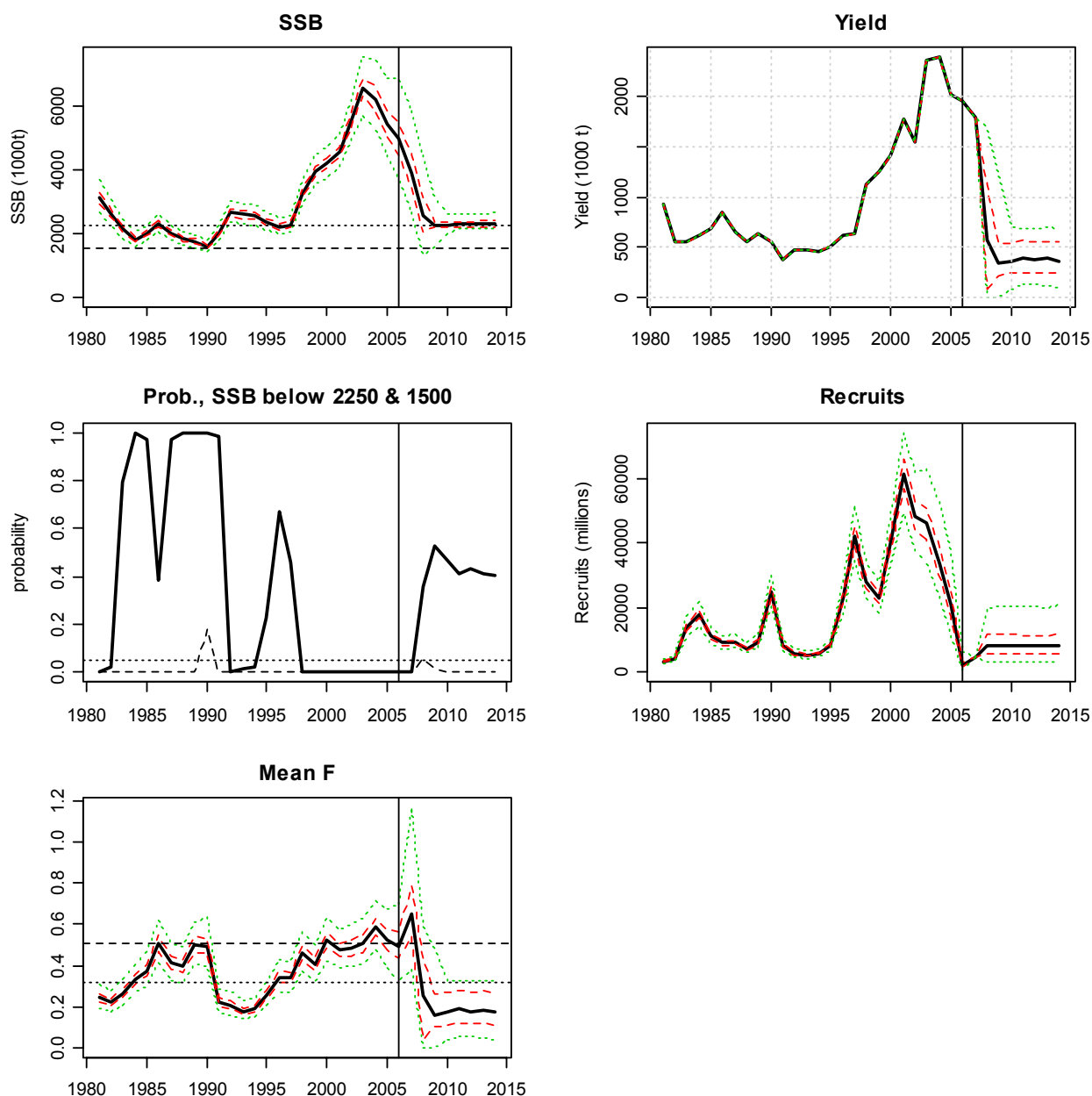
<sup>2</sup>Agreed TAC from four Coastal States of 2 million tonnes, and an additional allocation to Russia in the international zone of 100 000 t.

<sup>3</sup>Agreed TAC from four Coastal States of 1.7 million tonnes, and an additional allocation to Russia and Greenland of 147 000 t.





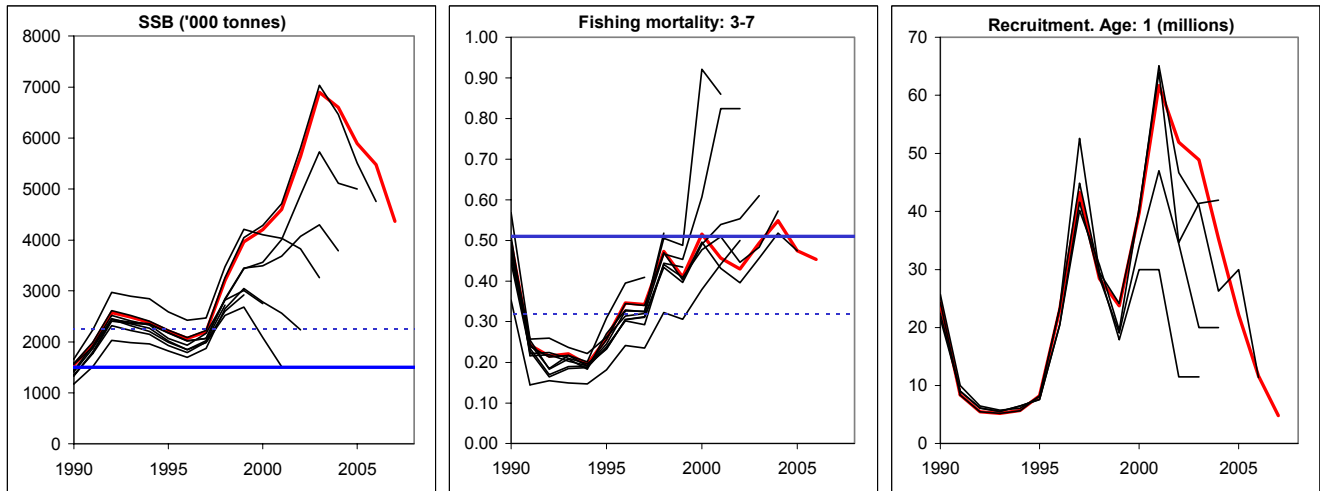
**Figure 9.4.4.3** Blue whiting medium-term prediction with high recruitment scenario; percentiles (2.5, 25, 50, 75, and 97.5) of SSB, mean F, landings and recruitments estimated from simulations and probability of SSB below  $B_{lim}$  and  $B_{pa}$  (horizontal line gives 5% probability). The 2005 and 2006 year classes are fixed at the values used in the short-term forecast. Future recruitments are drawn from a distribution simulating the “high recruitment regime” (1995–2004 year classes). Projections are made using the multi-annual management plan, with an assumption that landings are initially reduced within one year, such that SSB remains above  $B_{pa}$  throughout the simulation.



**Figure 9.4.4.4**

Blue whiting medium-term prediction with low recruitment scenario; percentiles (2.5, 25, 50, 75, and 97.5) of SSB, mean F, landings and recruitments estimated from simulations and probability of SSB below  $B_{lim}$  and  $B_{pa}$  (horizontal line gives 5% probability). The 2005 and 2006 year classes are fixed at the values used in short-term forecast. Future recruitments are drawn from a distribution simulating the “low recruitment regime” (1980–1994 year classes). Projections are made using the multi-annual management plan, with an assumption that landings are initially reduced within one year, such that SSB remains above  $B_{pa}$  throughout the simulation.

Blue whiting combined stock (Sub-areas I-IX, XII & XIV)



**Figure 9.4.4.5** Blue whiting. Historical comparison on assessments for SSB, fishing mortality, and recruitment.



**Table 9.4.4.1** Blue whiting. Landings (tonnes) from directed fisheries (Subareas I and II, Divisions Va, XIVa, and XIVb) by year, as estimated by the Working Group.

Country	1988	1989 <sup>3)</sup>	1990	1991	1992	1993	1994 <sup>2)</sup>	1995 <sup>3)</sup>	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Denmark	-	-	-	-	-	-	-	-	-	-	-	15	7,721	5,723	13,608	38,226	23,437	365	338
Estonia	-	-	-	-	-	-	-	-	377	161	904	-	-	-	-	-	-	-	-
Faroes	-	1,047	-	-	-	-	-	-	345	-	44,594	11,507	17,980	64,496	82,977	115,755	109,380	64,639	70,650
France	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,315
Germany	3	1,341	-	-	-	-	2	3	32	-	78	-	-	3117	1,072	813	488	569	1,772
Iceland	-	4,977	-	-	-	-	-	369	302	10,464	68,681 <sup>4)</sup>	96,295	155,024	245,814	195,483	312,334	279,811	145,640	152,155
Latvia	-	-	-	-	-	-	422	-	-	-	-	-	-	-	-	-	-	-	-
Netherlands	-	-	-	-	-	-	-	72	25	-	63	435	-	5180	906	592	1,365	-	1,279
Norway <sup>5)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	64,581	100,922	215,075	302,166	9,778	10,442
Norway <sup>6)</sup>	-	-	566	100	912	240	-	-	58	1,386	12,132	5,455	-	28,812	-	-	22167	6,793	6,041
Poland	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scotland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	64	-	-
Sweden	-	-	-	-	-	-	-	-	-	-	-	-	-	-	850	57,206	15,794	785	-
USSR/ Russia <sup>1)</sup>	55,816	35,250	1,540	78,603	61,400	43,000	22,250	23,289	22,308	50,559	51,042	65,932	103,941	173,860	145,649	191,507	166,677	177,008	159,370
Total	55,829	42,615	2,106	78,703	62,312	43,240	22,674	23,733	23,447	62,570	177,494	179,639	284,666	591,583	541,467	931,508	921,349	405,577	404,362

<sup>1)</sup> From 1992 only Russia

<sup>2)</sup> Includes Vb for Russia.

<sup>3)</sup> Icelandic mixed fishery in Va.

<sup>4)</sup> include mixed in Va and directed in

<sup>5)</sup> Directed fishery

<sup>6)</sup> By-catches of blue whiting in other fisheries.

Table 9.4.4.2

Blue whiting. Landings (tonnes) from directed fisheries and bycatches caught in other fisheries (Subareas I and II, Divisions Va, XIVa, and XIVb) by year, as estimated by the Working Group.

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998 <sup>1)</sup>	1999	2000	2001	2002	2003	2004	2005	2006
Denmark	797	25	-	-	3,167	-	770	-	269	-	5051	19,625	11,856	18,110	2,141	17,813	44,992	24,731	52,009
Estonia	-	-	-	-	6,156	1,033	4,342	7754	10,605	5,517	5,416	-	-	-	-	-	4)	-	-
Faroese	79,339	70,711	43,405	10,208	12,731	14,984	22,548	26,009	18,258	22,480	26,328	93,234	129,969	188,464	115,127	208,427	206,078	197,134	244,387
France	-	2,190	-	-	-	1,195	-	720	6,442	12,446	7,984	6,662	13,481	13,480	14,688	13,365	-	8,046	14,264
Germany	5,263	4,073	1,699	349	1,307	91	-	6,310	6,844	4,724	17,891	3,170	12,655	15,862	15,378	21,866	13,813	22,089	33,756
Iceland	-	-	-	-	-	-	-	-	-	-	-	64,135	105,833	119,287	91,853	189,159	99,832	119,569	157,353
Ireland	4,646	2,014	-	-	781	-	3	222	1,709	25,785	45,635	35,240	25,200	29,854	17,723	22,484	62,730	73,174	54,910
Japan	-	-	-	-	918	1,742	2,574	-	-	-	-	-	-	-	-	-	-	-	-
Latvia	-	-	-	-	10,742	10,626	2,160	-	-	-	-	-	-	-	-	-	-	-	-
Lithuania	-	-	-	-	-	2,046	-	-	-	-	-	-	-	-	-	-	-	-	2,314
Netherlands <sup>2)</sup>	800	2,078	7,280	17,359	11,034	18,436	21,076	26,703	17,644	23,676	27,884	35,408	46,128	68,415	33,365	45,239	82,520	143,470	101,349
Norway	208,416	258,386	281,036	114,866	148,733	198,916	226,235	261,272	337,434	318,531	519,622	475,004	460,274	399,932	385,495	502,320	486,843	622,981	527,172
UK (Scotland)	5,071	8,020	6,006	3,541	6,849	2,032	4,465	10,583	14,325	33,398	92,383	98,853	42,478	50,147	26,403	27,136	56,326	104,526	72,030
Sweden	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-
USSR/ Russia <sup>3)</sup>	121,705	127,682	124,069	72,623	115,600	96,000	94,531	83,931	64,547	68,097	79,000	112,247	141,257	141,549	144,419	163,812	179,400	150,014	168,664
Total	426,037	475,179	463,495	218,946	318,018	347,101	378,704	423,504	478,077	514,654	827,194	943,578	989,131	1,045,100	846,602	1,211,621	1,232,534	1,465,735	1,428,208

<sup>1)</sup> Including some directed fishery also in Division IVa.

<sup>2)</sup> Revised for the years 1987, 1988, 1989, 1992,

<sup>3)</sup> From 1992 only Russia

<sup>4)</sup> Reported to the EU but not to the ICES WGNPBW. (Landings of 19,467 tonnes)

**Table 9.4.4.3**

Blue whiting. Landings (tonnes) from directed fisheries and bycatches caught in other fisheries (Divisions IIIa and IV) by year, as estimated by the Working Group.

Country	1988	1989	1990	1991	1992	1993 <sup>3)</sup>	1994	1995	1996	1997	1998 <sup>2)</sup>	1999	2000	2001	2002	2003	2004	2005	2006
Denmark <sup>4)</sup>	18,144	3,632	10,972	5,961	4,438	25,003	5,108	4,848	29,137	9,552	40,143	36,492	30,360	21,995					
Denmark <sup>5)</sup>		22,973	16,080	9,577	26,751	16,050	14,578	7,591	22,695	16,718	16,329	8,521	7,749	7,505	35,530	26,896	21,071	16,354	2,316
Faroes <sup>4) 6)</sup>	492	3,325	5,281	355	705	1,522	1,794	-	6,068	6,066	-	-	-	60	7,317	5,712	6,864	1,437	1,969
Faroes <sup>5) 6)</sup>											296	265	42	6,741				3,589	391
Germany <sup>1)</sup>	280	3	-	-	25	9	-	-	-	-			-	81	-	36	19	17	909
Iceland																		307	
Ireland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4		4	9	
Lithuania																			2,321
Netherlands	-	-	20	-	2	46	-	-	-	793			-	-	50	0	0	0	83
Norway <sup>4)</sup>	24,898	42,956	29,336	22,644	31,977	12,333	3,408	78,565	57,458	27,394	28,814	48,338	73,006	21,804	85,062	117,145	107,311	98,938	96,007
Norway <sup>5)</sup>														58,182					
Russia	-	-	-	-	-	-	-	-	-	-	-	-	-	69	-	-		5,204	1,066
Scotland																	35	3	76
Sweden	1,229	3,062	1,503	1,000	2,058	2,867	3,675	13,000	4,000	4,568	9,299	12,993	3,319	2,086	17,689	8,326	3,289	2,175	101
UK	100	7	-	335	18	252	-	-	1	-	-	-	-	-	-	65			
Total	45,143	75,958	63,192	39,872	65,974	58,082	28,563	104,004	119,359	65,091	94,881	106,609	114,476	118,523	145,652	158,180	138,593	128,033	105,239

<sup>1)</sup> Including directed fishery also in Division IVa.

<sup>2)</sup> Including mixed industrial fishery in the Norwegian Sea

<sup>3)</sup> Imprecise estimates for Sweden: reported catch of 34265 t in 1993 is replaced by the mean of 1992 and 1994, i.e. 2,867 t, and used in the assessment.

<sup>4)</sup> Directed fishery

<sup>5)</sup> By-catches of blue whiting in other fisheries.

<sup>6)</sup> For the periode 1987-2000 landings figures also include landings from mixed fisheries in Division Vb.

<sup>7)</sup> Some corrections done in the total amount.

**Table 9.4.4.4**

Blue whiting. Landings (tonnes) from the Southern areas (Subareas VIII and IX and Divisions VIIg-k and VIId,e) by year, as estimated by the Working Group.

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Faroes																			3,616
Germany	-	-	-	-	-	-	-	-	-	-	-	-	-	-	600 <sup>2)</sup>	88 <sup>2)</sup>	973	148	
Ireland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98 <sup>2)</sup>	96 <sup>2)</sup>	12,659	305	
Netherlands	-	-	450	10	-	-	-	-	-	-	10 <sup>1)</sup>	-	-	-	3208 <sup>2)</sup>	2471,8 <sup>2)</sup>	11,426	4,313	
Norway	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39,197		2,789
Portugal	5,979	3,557	2,864	2,813	4,928	1,236	1,350	2,285	3,561	2,439	1,900	2,625	2,032	1,746	1,659	2,651	3,937	5,190	5,323
Russia																	685		
Scotland																	603	10	
Spain	24,847	30,108	29,490	29,180	23,794	31,020	28,118	25,379	21,538	27,683	27,490	23,777	22,622	23,218	17,506	13,825	15,612	17,643	15,173
UK	12	29	13	-	-	-	5	-	-	-	-	-	-	-	-	181			
France	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	784			1,430
Total	30,838	33,695	32,817	32,003	28,722	32,256	29,473	27,664	25,099	30,122	29,400	26,402	24,654	24,964	23,071	20,097	85,093	27,608	28,331

<sup>1)</sup> Directed fisheries in VIIIa

<sup>2)</sup> Landings reported as Directed fisheries and included in the Catch-at-Age calculations of that fisheries

**Table 9.4.4.5** Blue whiting. Total landings by country and area for 2006 in tonnes.

Area	Denmark	Faroe Islands	France	Germany	Iceland	Lithuania	Ireland	Norway	Portugal	Russia	Scotland	Spain	Sweden	Netherlands	Grand Total
Ila	338	64,062	2,315	1,741	125,612			16,483		145,704				1,279	357,534
Ilb				31						13,666					13,697
IIla	982			17				203					23		1,225
IVa	1,204	2,360		680		2,321		95,780		1,066	76		30	83	103,600
IVb	130			212				24					48		414
Va		6,337			5,125										11,462
Vb	4,132	79,151	1,623	545	80,470			2,214		84,522	2,564			3,052	258,273
VIa	26,990	30,191	6,334	18,572	13,976	2,314	9,677	83,526		1,882	57,927			51,787	303,176
VIb	9,021	86,683			59,785		6,984	125,345		58,477	996			2,581	349,872
VIIb	1,645		1,133	3,313			3,099								9,190
VIIc	10,221	40,324	5,174	11,326			35,150	310,533		417	10,543			43,929	467,617
VIIg								2,789							2,789
VIIIabd			21												21
VIIIcIXa									5,323			15,173			20,496
VIIj			1,289												1,289
VIIk		3,616	120												3,736
XII		8,038			3,122			5,554		23,366					40,080
XIVb		251			21,418										21,669
Grand Total	54,663	321,013	18,009	36,437	309,508	4,635	54,910	642,451	5,323	329,100	72,106	15,173	101	102,711	1,966,140

**Table 9.4.4.6** Blue whiting combined stock (Subareas I-IX, XII, and XIV).

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3–7
1981	3308512	2938714	909557	0.283
1982	4139149	2394968	575890	0.228
1983	14997222	1947816	569845	0.263
1984	18577992	1707159	641776	0.343
1985	10686679	1980242	695596	0.383
1986	8611111	2297635	826986	0.504
1987	9000322	2006746	664837	0.385
1988	6783949	1817486	557847	0.381
1989	9462018	1735503	627447	0.507
1990	24242833	1546719	561610	0.492
1991	8394020	1954965	369524	0.242
1992	5485551	2575723	475089	0.215
1993	5218745	2489048	480679	0.221
1994	5681802	2382635	459414	0.195
1995	8227983	2208657	578905	0.259
1996	23058221	2067173	645982	0.346
1997	43276240	2198366	672437	0.342
1998	28408399	3206237	1128969	0.473
1999	23710748	3965308	1256228	0.410
2000	39719997	4202746	1412928	0.516
2001	61664776	4598276	1780170	0.457
2002	51954453	5641212	1556792	0.430
2003	48896185	6897723	2321406	0.494
2004	35328274	6606022	2377569	0.549
2005	22162109	5890104	2026953	0.475
2006	11670000*	5475018	1966140	0.453
2007	4840000	4363000		
Average	19907677	3225748	1003027	0.379

Arith. Mean 20840000.

Geo. Mean 14800000.

\* original value of 2901353 was replaced in the forecast with survey prediction.

## **Annex. Text of agreed Coastal States management plan**

1. A Delegation of the Faroe Islands, a Delegation of the European Community, a Delegation of Iceland, and a Delegation of Norway met in Tórshavn on 26 and 27 October 2006 to consult on the management of the blue whiting stock in the North-East Atlantic in 2007.
2. The Delegations recognised that the basis for management measures in 2007 is the Agreed Record of Conclusions of Fisheries Consultations on the Management of Blue Whiting in the Northeast Atlantic concluded in Oslo on 16 December 2005 (the 2005 Agreed Record), including its Annex I and Annex II.
3. In accordance with Annex II, Paragraph 4 of the 2005 Agreed Record, the Delegations agreed to reduce their total allowable catch of blue whiting in 2007 by 300 000 tonnes.
4. In accordance with Paragraphs 5 and 6 of the 2005 Agreed Record, the Delegations agreed to recommend to their respective authorities the arrangement for the regulation of the fisheries of blue whiting in 2007 as contained in Annex I to this Agreed Record.

### **ANNEX I. ARRANGEMENT FOR THE REGULATION OF THE FISHERIES OF BLUE WHITING IN 2007**

1. In accordance with the multi-annual management arrangement for the fisheries of blue whiting set out in Annex II to the 2005 Agreed Record, the Parties agree to restrict their fisheries of blue whiting in 2007 to a maximum catch limit of 1 700 000 tonnes on the basis of the following quotas:
  - 1.1 European Community 518 500 tonnes
  - 1.2 Faroe Islands 444 125 tonnes
  - 1.3 Iceland 299 710 tonnes
  - 1.4 Norway 437 665 tonnes
2. Each Party may transfer unutilised quantities of up to 10% of the quota allocated to it for 2007 to 2008. Such transfer shall be in addition to the quota allocated to the Party concerned for 2008.
3. In the event of over-fishing of the allocated quotas by any Party in 2007, the quantity shall be deducted from the quota allocated in 2008 for the Party or Parties concerned.
4. The Parties may fish blue whiting within the quotas laid down in Paragraph 1 in their respective zones of fisheries jurisdiction and in international waters.
5. Further arrangements by the Parties, including arrangements for access, quota transfers and other conditions for fishing in the respective zones of fisheries jurisdiction, are regulated by bilateral arrangements.

### **ANNEX II. ARRANGEMENT FOR THE MULTI-ANNUAL MANAGEMENT OF THE BLUE WHITING STOCK**

1. The Parties agree to implement a multi-annual management arrangement for the fisheries on the blue whiting stock which is consistent with the precautionary approach, aiming at constraining harvest within safe biological limits, protecting juveniles, and designed to provide for sustainable fisheries and a greater potential yield, in accordance with advice from ICES.
2. The management targets are to maintain the Spawning Stock Biomass (SSB) of the blue whiting stock at levels above 1.5 million tonnes (Blim) and the fishing mortality rates at levels of no more than 0.32 (Fpa) for appropriate age groups as defined by ICES.
3. For 2006, the Parties agree to limit their fisheries of blue whiting to a total allowable catch of no more than 2 million tonnes.

4. The Parties recognise that a total outtake by the Parties of 2 million tonnes in 2006 will result in a fishing mortality rate above the target level as defined in Paragraph 2. Until the fishing mortality has reached a level of no more than 0.32, the Parties agree to reduce their total allowable catch of blue whiting by at least 100 000 tonnes annually.
5. When the target fishing mortality rate has been reached, the Parties shall limit their allowable catches to levels consistent with a fishing mortality rate of no more than 0.32 for appropriate age groups as defined by ICES.
6. Should the SSB fall below a reference point of 2.25 million tonnes (Bpa), either the fishing mortality rate referred to in Paragraph 5 or the tonnage referred to in Paragraph 4 shall be adapted in the light of scientific estimates of the conditions then prevailing. Such adaptation shall ensure a safe and rapid recovery of the SSB to a level in excess of 2.25 million tonnes.
7. This multi-annual management arrangement shall be reviewed by the Parties on the basis of ICES advice.

In addition to the Coastal States management plan, there is a recommendation by the North East Atlantic Fisheries Commission (NEAFC) at its annual meeting in November 2006 to adopt conservation and management measures for blue whiting in the NEAFC area in 2007. This would result in an expected catch of 147 000 tonnes of blue whiting in addition to the Coastal States Agreement of 1.7 million tonnes for 2007.

1. NEAFC takes notes of the Agreed Record of Conclusion of Fisheries Consultations between the Faroe Islands, the European Community, Iceland and Norway on the Management of Blue Whiting in the North-east Atlantic in 2007 signed in Tórshavn, 27 October 2006.
  2. NEAFC further notes that by way of the said Agreed Record, the aforementioned Parties agreed to restrict their fishery on the blue whiting stock in 2007 according to a total catch limitation of 1.7 million tonnes.
  3. In accordance with Article 5 of the Convention on Future Multilateral Cooperation in North-East Atlantic fisheries, the Contracting Parties recommend the following measure for the blue whiting Stock for 2007.
    - 3.1 In order to ensure consistency and compatibility with the said Agreed Record, the Contracting Parties hereby establish an allowable catch limitation of 268 550 tonnes of blue whiting for 2007 in waters beyond the areas under national fisheries jurisdiction of the Contracting Parties.
    - 3.2 This allowable catch limitation shall be allocated as follows:
      - 3.2.1 European Community 37 400 tonnes (\*)
      - 3.2.2 Norway 31 450 tonnes (\*)
      - 3.2.3 Denmark in respect of:
        - 3.2.3.1. Faroe Islands 31 450 tonnes (\*)
      - 3.2.4 Greenland 10 000 tonnes
      - 3.2.5 Iceland 21 250 tonnes (\*)
      - 3.2.6 Russian Federation 137 000 tonnes
- (\*) Catches taken under these allocations shall be deducted from quotas allocated to Parties to the Agreed Record referred to in Paragraph 2.
4. The national quotas referred to in Annex I of the Agreed Record referred to in Paragraph 2 may be fished in the areas defined in Paragraph 3a.

# Albacore Tuna - North Atlantic



## Fisheries Science Services

The Standing Committee on Research and Statistics (SCRS) of the International Commission for the Conservation of Atlantic Tunas (ICCAT) is responsible for the assessment of the albacore tuna stocks and provides management advice to ICCAT.

## FSS – SINGLE STOCK CONSIDERATIONS

**FSS agrees with the latest ICCAT assessment, conducted in 2007. The assessment indicates that F is well above  $F_{MSY}$  and SSB is below  $B_{MSY}$ .**

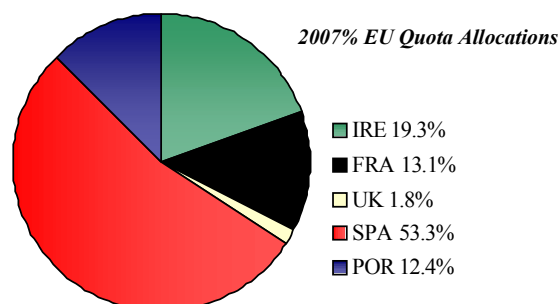
**ICCAT projections based on this assessment indicate that the northern stock will not recover to above  $B_{MSY}$  from the present overfished conditions, in the long term, if catch levels remain over 30,000 t.**

**FSS notes that ICCAT projections show that the stock will not recover if catches remain above 30,000 t per annum. Therefore FSS advises that the TAC for 2008 and subsequent years should be set lower than 30,000 t until the stock can be shown to have recovered.**

Year	TAC	Catch	Irish Quota	Irish catch	ICCAT SCRS Advice	FSS Advice
2000	-	34,500	-	3,274	< 34,000 t	-
2001	34,500	26,592	3,158	2,004	< 34,000 t	-
2002	34,500	22,685	3,158	1,100	< 34,000 t	< 34,000
2003	34,500	25,505	3,158	755	< 34,000 t	< 31,000
2004	34,500	25,605	3,158	175	< 34,000 t	< 31,000
2005	34,500	35,830	3,158	306	< 31,000 t	< 31,000
2006	34,500	36,077	5,679	521	< 31,000 t	< 31,000
2007	34,500	-	8,326	-	< 31,000 t	< 31,000
2008	-	-	-	-	< 30,000 t	< 30,000

## CURRENT MANAGEMENT

- The management area and the assessment area for North Atlantic albacore tuna cover the whole of the Atlantic, north of 5° N, and excluding the Mediterranean Sea.
- In 2001 a TAC was agreed for the first time and set at 34,500 t. This was extended in 2003 to be effective until 2007.
- In 2007 Ireland was allocated a quota of 8,326 t. Under ICCAT rules, up to 50% of national quota can be carried over from year to year.

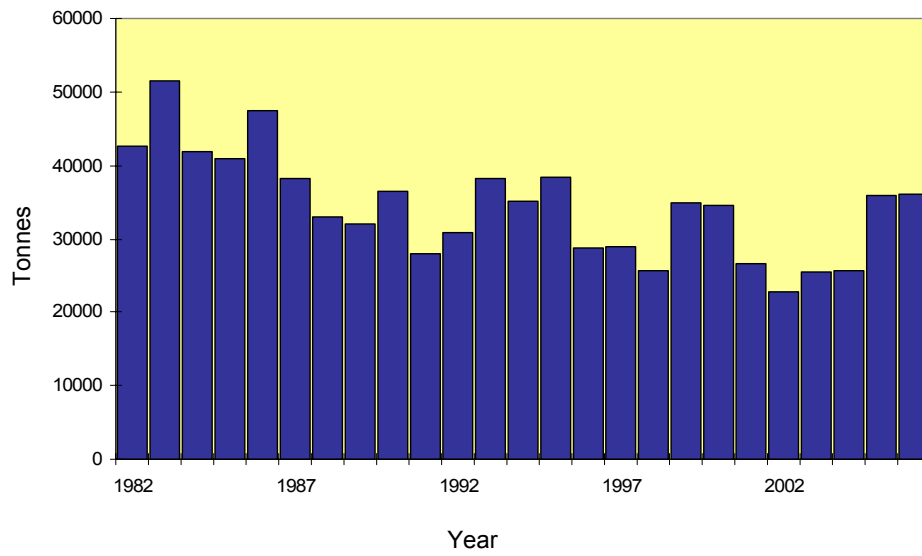


- A 1998 ICCAT regulation does not permit fishing capacity to exceed the average for period 1993 to 1995.
- Since 2002 the EC has introduced a complete ban on the use of drift nets to target albacore. This applies to all EC vessels and also to non-EC vessels fishing in EC waters.

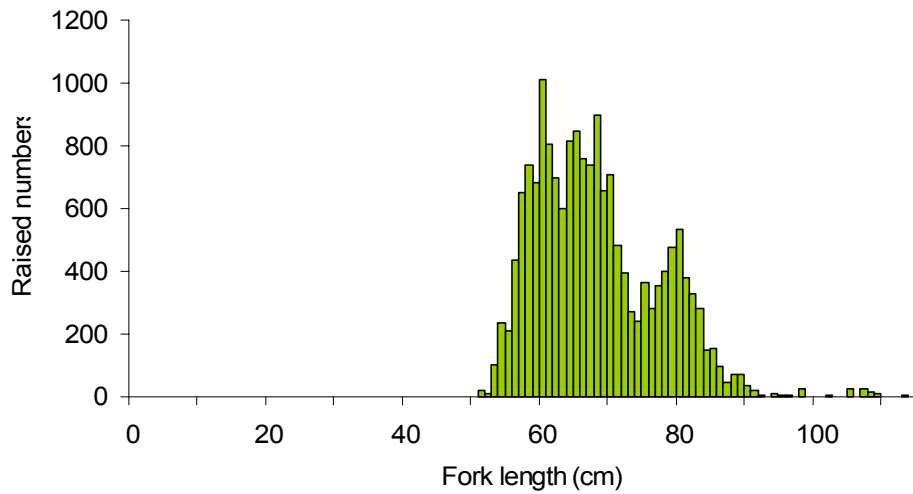
## ADDITIONAL INFORMATION

- A new assessment was conducted in 2007. The assessment was based on catch at length data transformed to catch at age, tuned with several CPUE series. This indicates that SSB has declined and is currently about one quarter of the peak levels. Recent fishing mortality has been well above  $F_{MSY}$ . Estimates of recruitment to the fishery, although variable, have shown generally higher levels in the 1960s and earlier periods with a declining trend thereafter until 2004. However, the most recent recruitment is estimated to be large but uncertain. Current SSB is approximately 20% below the  $MSY$  level, compared to 2000 when it was 50% below).
- Catches have decreased from about 60,000 t in 1964 to 26,000 in 2005. They have increased again to 36,000 t in 2006.
- Surface gears targeting juvenile fish take approximately 90% of the catches.
- Albacore are caught by troll and bait boats targeting juvenile fish; paired mid water trawlers targeting both juvenile and adult fish and longliners targeting adult fish. Adult fish (> 5 years) comprise around 10% of catches.
- CPUE trends in the Bay of Biscay troll fisheries have declined since the mid 1980s. CPUE series in the western Atlantic appear stable.
- The main albacore tuna catching countries in 2006 were Spain (25,000 t), followed by France (5,500 t), Chinese Taipei (2,300 t), and Japan (1,300 t).
- Since the banning of driftnets, Irish landings have declined. In 2000 the Irish landings were 3,464 t and in 2006 landings were 521 t taken by mid-water trawlers and troll boats.

Northern Albacore Reported Landings 1982-2006



Irish Albacore Landings Length Frequency 2006



# Bluefin Tuna

(East Atlantic and Mediterranean)



Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

FSS agrees with the ICCAT-SCRS evaluation that current fishing mortality may be more than 3 times the level that would permit the stock to stabilise at MSY. FSS further agree with ICCAT-SCRS that current fishing is expected to drive spawning biomass to a very low level. Such a low level is considered to give rise to a high risk of fishery and stock collapse. The most recent assessment is considered weak, because total removals are greatly underestimated.

FSS agrees with ICCAT-SCRS that in order to reverse these declines and initiate rebuilding, substantial reductions in F and catch need to be implemented.

FSS agrees with ICCAT-SCRS that the only scenarios that have the potential to address the stock decline and initiate recovery are those that:

- close the Mediterranean to removals during spawning time
- decrease mortality on small fish by fully enforced increases in the minimum size regulation.

ICCAT-SCRS advises that these measures are consistent with catches of about 15,000 t in the short term. However, FSS considers that catches of 15,000 t may not be sufficiently low and may prolong the period required for stock recovery. Therefore FSS advises large reductions in catches each year until the stock shows signs of recovery. These reductions should be implemented as part of a long term management plan for the stock. However, FSS is concerned that these measures would not be effective if effort is displaced to other areas where the stock is taken. FSS is concerned that these measures will not be effective due to continuing unregulated fishing and developing ranching activities in the Mediterranean.

FSS agrees with the ICCAT-SCRS advice that annual catches of about 45,000 t are a long term sustainable yield target. However, given that this is a long lived species, it will take at least 10 years to achieve such yields.

**FSS endorses ICCAT-SCRS recommendation that measures are required to mitigate overcapacity and eliminate illegal fishing.**

## Bluefin Tuna TACs, Catches and Advice 2000-2008

Year	TAC	Official catch	FSS Advice
2003	32,000	31,163	Catches above 26,000 t are not sustainable
2004	32,000	31,376	Catches above 26,000 t are not sustainable
2005	32,000	35,671	Catches above 26,000 t are not sustainable
2006	32,000	26,861	Catches above 26,000 t are not sustainable
2007	32,000	-	Catches < 15,000 t and develop management plan
2008			Catches < 15,000 t

## CURRENT MANAGEMENT

- In 2002, ICCAT set a TAC of 32,000 t for the years 2003 to 2006. The TAC applies to all directed fisheries for blue fin tuna. The EC has a large share of the TAC (18,301 t) but Ireland has no quota. An EC by-catch quota, that is unallocated is available to Ireland.
- The TAC covers the entire east Atlantic Ocean and the Mediterranean Sea.
- In 2006, the Commission adopted a recovery plan for this stock. This plan includes various conservation measures, largely consisting of a TAC together with extended time/area closures and minimum size.

## ADDITIONAL INFORMATION

1. SCRS considers that there are two blue fin tuna stocks, viz, the East Atlantic and Mediterranean stock and the West Atlantic stock, separated by 45°W. The west Atlantic stock is in a state of collapse, though fishing continues. Both stocks mix at feeding time.
2. Official landings in 2006 were about 27,000 t and the TAC was 32,000 t.
3. ICCAT believes that real catches are in excess of the catches reported to the Commission. Current real catches are considered to be about 50,000 t, whilst the TAC is 32,000 t. Thus the TAC is not effective at controlling mortality on the stock.
4. Ranching of blue fin tuna has increased dramatically in the Mediterranean in recent years. In this practice juvenile and spawning fish are taken by purse-seine

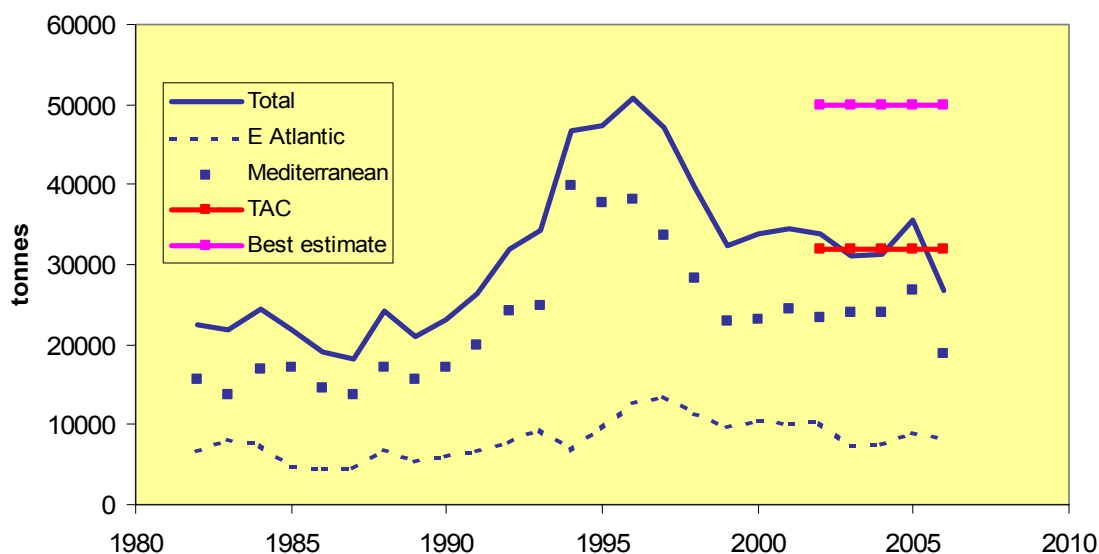


fisheries and then transferred to “ranching pens” where they are retained until they reach marketable condition after which they are slaughtered. Statistics for the numbers of fish killed by this method are not available and are not included in the assessment of the stock.

5. SCRS have noted that management recommendations have been largely ignored and have failed to address the proliferation of tuna pens and purse seine fisheries in the Mediterranean. These tuna pens and client fisheries now operate around the Mediterranean from Spain to Turkey.
6. Fishing pressure on small fish remains intense and further heightens the risk of collapse.
7. Tagging studies indicate that current stock boundaries fail to take into account stock mixing in the Atlantic and that significant catches reported as East Atlantic and Mediterranean fish more properly belong to the West Atlantic stock.

8. Catches from recreational fisheries in the Mediterranean and North East Atlantic have fallen abruptly. The recreational fishery off northwest Ireland failed to catch any tuna from 2005 to 2007.
9. Bluefin tuna caught by Irish vessels are taken as by-catch in directed fisheries for other pelagic species and are accounted for by the EU by-catch quota. The numbers caught in the last two years have fallen abruptly, and in 2006 amounted to only 0.5 t.
10. Historically the main countries catching East Atlantic and Mediterranean bluefin tuna were France, Spain, Italy, Morocco, and Japan. Mis-reporting makes it impossible to rank these countries and more recent entrants to the fishery.
11. Bluefin tuna are mainly caught by purse seiners, longliners, bait boats and by traps by.

Bluefin Tuna in East Atlantic and Mediterranean: Landings Data



# North East Atlantic Pelagic Sharks

No ACFM information has been included for this stock

For latest information, see: <http://www.ices.dk>



## Fisheries Science Services

ACFM did not provide new advice for elasmobranch stocks in 2007. Previous advice is outlined below. For further information, refer to the 2006 Stock Book. In 2006 spurdog and porbeagle were added to CITES Appendix II, that placed restrictions on trade in these species in and out of (although not within) the European Union.

## Basking Shark

### FSS – SINGLE STOCK CONSIDERATIONS

FSS reiterates the ICES advice in 2006, that given the perceived depleted stock status, a zero TAC be set for the whole distribution area of basking shark. Further, FSS agrees with ICES advice that by-catch in mixed fisheries should be reduced to the lowest possible level.

## Porbeagle

### FSS – SINGLE STOCK CONSIDERATIONS

FSS reiterates the ICES advice in 2006 that no directed fishing on porbeagle be permitted on the basis of their life history and vulnerability to fishing. FSS further agrees with ICES and STECF advice that measures should be taken to reduce by-catch to the lowest possible levels.

## Blue Shark

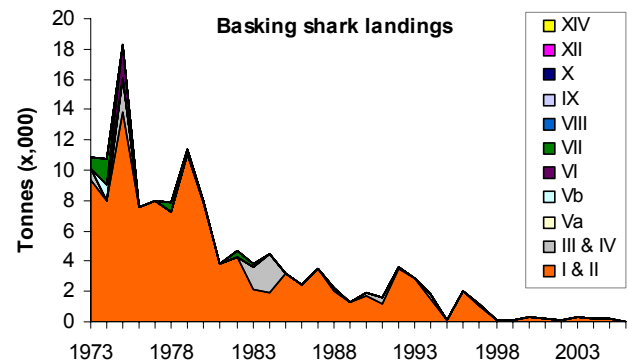
### FSS – SINGLE STOCK CONSIDERATIONS

ICCAT has responsibility for providing advice for this species. According to the most recent assessment, the biomass of the North Atlantic blue shark stock is above the biomass that would support MSY. In many model runs the stock status appeared to be close to the unfished biomass levels, although these results are highly conditional on the initial assumptions used. ICCAT has not provided formal advice this year, but will in 2008. FSS agrees with ICCAT recommendations that precise catch records of blue shark are required for accurate assessments.

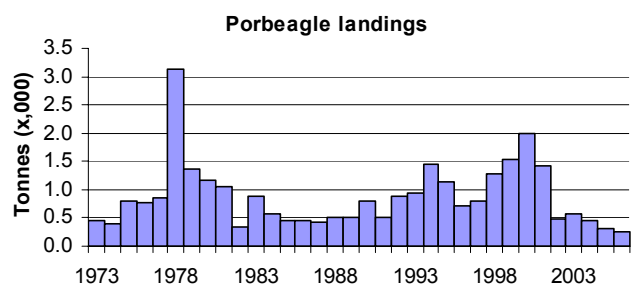
## Spurdog

### FSS – SINGLE STOCK CONSIDERATIONS

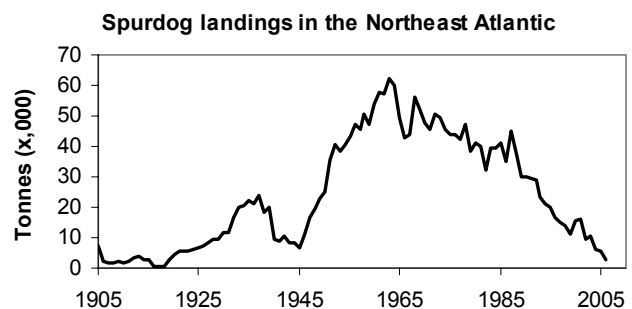
FSS reiterates the ICES advice in 2006 that the stock is depleted and may be in danger of collapse. Target fisheries should not be permitted to continue, and by-catch in mixed fisheries should be reduced to the lowest possible level. A TAC should cover all areas where spurdog are caught in the northeast Atlantic.



Basking Shark: Landings, 1973-2006



Porbeagle: Available landings data for porbeagle in ICES area. It is not clear if data are complete for any year.



Spurdog: Landings of spurdog in the Northeast Atlantic (Sub-areas I-VIII)

# Ecosystem Overview for the Irish Sea

## Summary table of the ICES Ecosystem overview for the Irish Sea

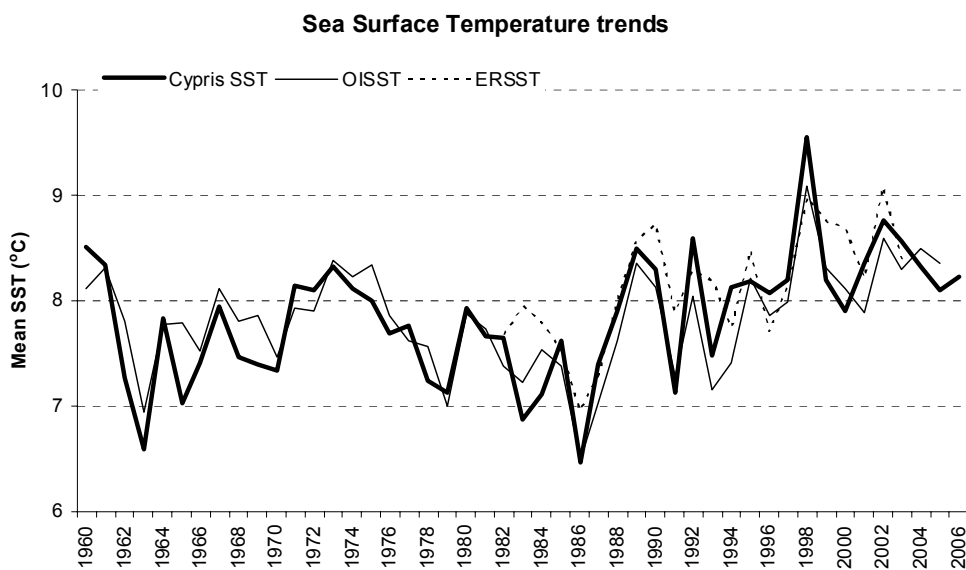
Information condensed from ICES WGRES, 2007 see WG report for further details and reference list.

<b>Physics</b>	
<b>Bathymetry</b>	Shallow sea (less than 100m deep in most places), largely sheltered from the winds and currents of the North Atlantic.
<b>Circulation</b>	An inshore coastal current carries water from the Celtic Sea and St. Georges's Channel northwards through the North Channel, mixing with water from the outer Clyde. A seasonal gyre operates as a local retention mechanism in the western Irish Sea.
<b>Fronts</b>	<b>The Celtic Sea front</b> is situated at the southern entrance to the Irish Sea and the <b>Islay Front</b> is found between Islay and the Malin Shelf.
<b>Temperature Salinity</b>	Time series from the SW coast of the Isle of Man (the Cypris station), western Irish Sea (Gowen, AFBI, Belfast), and two series of combined satellite and ship-recorded indicate a general warming trend in the Irish Sea since 1960, with particularly high temperatures in 1998 (see fig. 1).
<b>Biology</b>	
<b>Benthos, larger invertebrate, biogenic habitats</b>	The main commercial invertebrate species is Norway-lobster ( <i>Nephrops norvegicus</i> ). There are distinct benthic assemblages with plaice and dab on fine substrates in inshore waters and sea urchins and sun-stars on coarser substrates further offshore. Thickback sole ( <i>Microchirus variegatus</i> ) and hermit crabs dominate the transitional zone, while Norway-lobster and Witch ( <i>Glyptocephalus cynoglossus</i> ) dominate on the muddy sediments in the central Irish Sea. Beds of <i>Alcyonium digitatum</i> (Dead man's finger) occur on coarse substrates throughout. Biogenic reefs of horse mussels <i>Modiolus modiolus</i> , maerl and Serpulid worms occur in specific locations.
<b>Fish Community</b>	There are commercial fisheries for cod ( <i>Gadus morhua</i> ), plaice ( <i>Pleuronectes platessa</i> ) and sole ( <i>Solea solea</i> ). The most abundant species in trawl surveys are dab ( <i>Limanda limanda</i> ), plaice, solenette ( <i>Buglossidium luteum</i> ) and common dragonet ( <i>Callionymus lyra</i> ) along with large numbers of poor-cod, whiting and sole. In recent years, abundance of dab, solenette and sculdfish ( <i>Arnoglossus laterna</i> ) and red gurnards <i>Aspitrigla cuculus</i> increased, whereas hake, dragonets and pogge <i>Agonus cataphractus</i> decreased. Lesser spotted dogfish <i>Scyliorhinus canicula</i> is abundant throughout. There are also ray assemblage on sand hills in Southern Irish Sea, and Cardigan Bay.
<b>Birds, Mammals &amp; Elasmobranchs</b>	Basking shark ( <i>Cetorhinus maximus</i> ) occur from April through to October but stock seems severely depleted. Grey seals ( <i>Halichoerus grypus</i> ) are common and 5000-7000 individuals are thought to exist in the Irish and Celtic Seas. Gulls predominate seabird population in particular black-headed, lesser black-backed and herring gulls as well as guillemots.
<b>Environmental signals &amp; implications</b>	There has been a steady warming of sea surface temperatures (SSTs) in the area. Irish Sea cod recruitment exhibited a decline in the 1990s, coincident with an increase in sea surface temperatures. There has been a northward shift in the distribution of some fish such as an increase of Seabass <i>Dicentrarchus labrax</i> and red mullet <i>Mullus surmuletus</i> populations around British coasts
<b>Fishery effects on benthos and fish communities</b>	This area has a number of severely depleted stocks e.g. cod, whiting and sole. Significant proportion of the catch of the demersal fleets is discarded.

## FSS ECOSYSTEM CONSIDERATIONS

FSS advises that the following considerations should be taken into account in developing ecosystem based advice for fisheries in the Irish Sea:

- Fishing has impacted a number of commercial species, with some commercial species such as cod, whiting and sole being overexploited and severely depleted. A cod recovery plan is currently in place.
- Some fisheries including the Nephrops and beam trawl fisheries have high whiting discarding rates. The effect of discarding on the Irish Sea Whiting stock and the ecosystem is not fully understood, however the stock seems to suffer from increased mortality and a decline in biomass.
- A reduction in the abundance of large piscivorous fishes such as cod and whiting, and an increase in species which feed at a lower trophic level, such as Nephrops, has resulted in a marked decline in mean trophic level of the fish community over time.
- There has been an increase in water temperatures in this ecoregion which is likely to affect the distribution area of some fish species, and some changes of distribution have already been noted. Temperature increase is likely to affect stock recruitment of some species. In addition, the combined effects of overexploitation and environmental variability might lead to a higher risk of recruitment failure and decrease in productivity.
- Some localized fisheries are believed to have significant a negative impact on the seabed. These include hydraulic dredging of the seabed for razor clams which results in considerable damage to the associated fauna (see inshore section for further details).



**Fig.1).** Sea surface temperature in the Irish Sea from 1960 to 2006 (ICES 2006).

### References:

ICES. 2007. Report of the Working Group for Regional Ecosystem Description (WGRED), 19 - 23 February 2007, ICES Headquarters, Copenhagen. ICES CM 2007/ ACE:02. 153 pp.

ICES (2006) Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks (WGNDS). ICES ACFM:30

# FSS Advice on Mixed Fisheries in the Irish Sea

## PRECAUTIONARY APPROACH ADVICE

FSS advises that mixed fisheries characteristics be taken into account when managing demersal fisheries in the Irish Sea. Given the critical status of cod, whiting, sole and spurdog these stocks are the overriding concerns in the management advice. The precautionary approach implies that fisheries in the Irish Sea should be managed where the following rules are applied simultaneously:

If fisheries are permitted they should operate:

- without by-catch or discards of cod, sole, spurdog and whiting;
- within the advised precautionary catch limits for all other stocks

FSS recognises that the 'zero catch option' for cod, sole, whiting and spurdog would effectively mean a closure of all the mixed demersal and *Nephrops* fisheries in the Irish Sea. FSS agrees with ICES that a closure of all fisheries catching cod, sole, whiting or spurdog provides the highest probability of recovery for these stocks and is the only advice possible in the context of the precautionary approach.

Therefore FSS advise that the following rules should be followed in the management of mixed fisheries in the Irish Sea:

- Once the TAC is exhausted for a critical stock then all fisheries which catch that stock should be closed.
- Fisheries should only be permitted when they prove that they take zero catch (including discards) of the critical stocks i.e. cod, sole, whiting and spurdog.
- Fisheries should only be permitted when they prove that they take zero catches of non-critical stocks where the TAC is exhausted.
- All other stocks should be exploited within precautionary limits.

## IMPLEMENTATION ISSUES

FSS notes that ICES has previously advised for zero catch of cod, whiting, sole and spurdog in the Irish Sea but that managers, because of social and economic considerations, have never implemented this advice. FSS is aware of the European Commission (EC) proposal for setting of fishing opportunities in 2008 (see page 42). According to this policy statement the Commission "will propose a reduction that is as large as is compatible with any mixed fisheries considerations and with relevant social and economic considerations". Furthermore, "If a recovery plan is in force concerning the stock" (which is the case for Irish Sea cod), "the best possible approximation to the recovery plan rules will be proposed in the light of the existing scientific knowledge". A 25% reduction in effort and catch is the FSS interpretation of the EC policy in relation to Irish Sea cod. However, it is not clear if a commensurate reduction in catch and effort will be applied to other stocks or fisheries in the Irish Sea.

FSS has previously pointed out the poor performance of TACs, as implemented, in reducing fishing mortality. In the past FSS advised that the required reductions in catch and associated fishing mortality can only be achieved if reductions in effort and effective discard mitigation measures are implemented. Fishing effort control was introduced in the Irish Sea in 2003 as part of the cod recovery plan with the main aim of indirectly reducing fishing mortality in cod. While, there has been some reduction in fishing mortality for cod, more drastic reductions in fishing mortality need to be implemented. Thus far there is no clear effect of the decrease in nominal effort on fishing mortality rates of other species. For example no decline in fishing mortality has been observed for sole, whiting or haddock in the Irish Sea.

FSS advises that a well defined 'management plan' needs to be developed and implemented to recover these stocks and to fish them sustainably once they have recovered. FSS advise that such a plan should aim to manage well defined métiers with clearly defined objectives that will ensure a high probability of recovery of all species to agreed levels within a specified time frame.

## Qualitative Description of Fisheries in the Irish Sea

The majority of vessels in the Irish Sea target *Nephrops* with either single- or twin-rig otter trawls. These vessels use either 70-mm diamond mesh with an 80-mm square mesh panel or an 80-mm diamond mesh in their codends, and (by regulation) their landings must consist of at least 35% *Nephrops* by live weight. These vessels have by-catches of whiting (most of which are discarded), and haddock, cod, and plaice. Twin-rig otter trawl were first introduced in the early 1990s. Recent studies show that the use of twin-rigs increases the proportion of roundfish bycatch in *Nephrops* fisheries compared with single-rig otter trawls. *Nephrops* catches are highly seasonal, with the highest *Nephrops* catches seen in the summer months. Catch rates are also dependent on tidal conditions, with higher catches during periods of weak tide.

The roundfish fisheries in the Irish Sea are conducted primarily by vessels from the UK and Ireland. A Northern Irish semi-pelagic trawling for cod and whiting developed in the early 1980s. As the availability of whiting declined the fleet switched to mainly targeting cod and haddock. Irish, Northern Irish, and English and Welsh otter trawlers target plaice, haddock, whiting, and cod, with smaller bycatches of anglerfish, hake, and sole. Some Irish vessels participate in a fishery for rays in the southern Irish Sea. Since 2001, these trawlers have adopted mesh sizes of 100–120 mm and other gear modifications, depending on the requirements of recent EU technical conservation regulations and national legislation.

There is also a beam trawl fishery which takes place mainly in the eastern Irish Sea with vessels from Belgium, Ireland, and the UK. This fishery mainly catches sole with important bycatches of plaice, rays, brill, turbot, anglerfish, and cod. The fishing effort of the Belgian beam trawl fleet varies in response to the catch rates of sole in the Irish Sea relative to catch rates in other areas in which the fleet operates. Fishing effort peaked in the late 1980s following a series of strong year classes of sole, but is presently only about 60% of the peak value.

The other gears used to catch demersal species are gillnets and tanglenets, notably by inshore boats targeting cod, bass, grey mullet, sole, and plaice, and the bottom VHVO trawl targeting hake.

The main pelagic fishery in the Irish Sea is for herring. In recent years, it has been predominantly operated by one pair of trawlers from Northern Ireland. The size of this fleet has declined to a very low level in recent years.

There are also a number of inshore fisheries in the Irish Sea that target stocks not currently assessed by ICES. These include pot fisheries for crab, lobster, and whelk, hydraulic dredge fisheries for razor clams, and dredge fisheries for scallops.

Fishing effort in the semi-pelagic effort increased rapidly between the early 1980s and early 1990s before decreasing somewhat in the mid-1990s. Fishing effort in the England and Wales otter trawl vessels longer than 12 m declined

rapidly after 1989, and from 1999 to 2004 was less than 25% of the effort reported in the 1980s. There has been a declining trend in fishing effort for Northern Irish otter trawlers also since the early 1990s. Fishing effort for Irish otter trawlers has declined in recent years as many vessels switched from targeting roundfish to *Nephrops*.

## Decommissioning Schemes

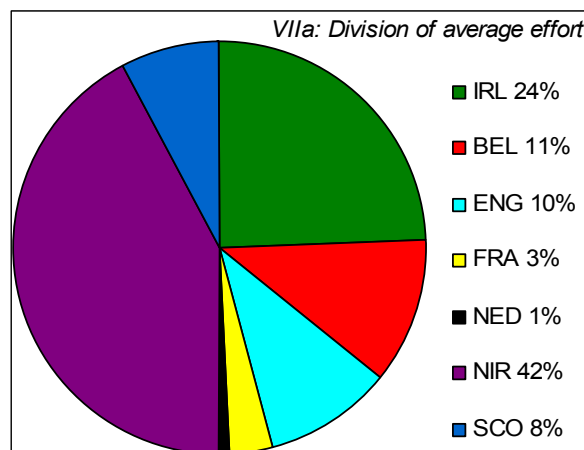
Decommissioning at the end of 2003 permanently removed 19 out of 237 UK demersal vessels that operated in the Irish Sea, representing a loss of 8% of the fleet by number and 9.3% by tonnage. Of these vessels, 13 were vessels that had used demersal trawls with mesh size  $\geq 100$  mm and had more than 5% cod in their reported landings. The previous round of decommissioning in 2001 removed 29 UK(NI) *Nephrops* and whitefish vessels and 4 UK(E&W) vessels registered in Irish Sea ports at the end of 2001. Of these, 13 were vessels that used demersal trawls with mesh size  $\geq 100$  mm and had more than 5% cod in their reported landings.

The Irish fleet has also declined in numbers in recent years although there has been some modernisation particularly since 2000, whereby several large newer vessels joined the fleet. More recently there has also been an Irish decommissioning scheme, whereby around 40 fishing vessels (~6000 GT, 18 000 kW) have been permanently withdrawn from the Irish fishing fleet and removed from the Register of Sea Fishing Vessels in 2005 and 2006. Several of these vessels have a track record of fishing in Area VIIa.

## Recent changes in fishing effort

Effort data and information presented in this section is taken from the STECF Subgroup on review of stocks (SGRST) report on Fishing Effort Management 2007 and the Working Group on the Assessment of Northern Shelf Demersal Stocks 2007.

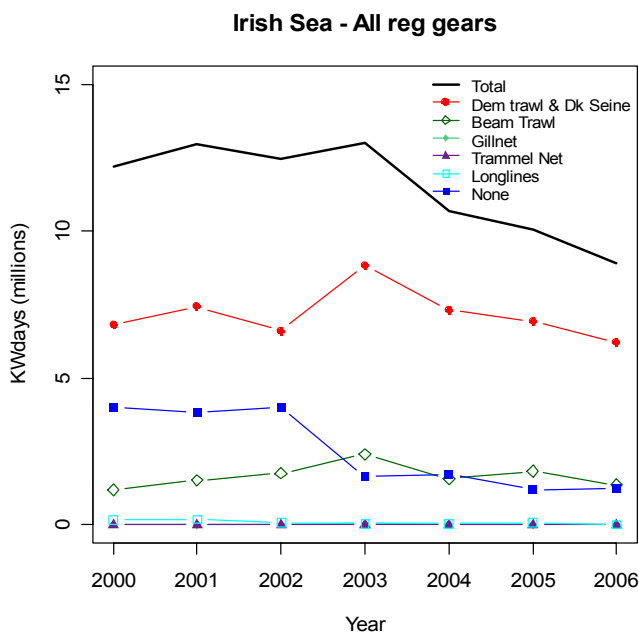
Effort in this area is dominated by Northern Ireland, accounting for 42% of the total effort (Fig. 1). Ireland contributes 24% and Belgium, England and Scotland each contribute about 10%.



**Fig. 1** Percentage effort contribution by country in the Irish Sea (VIIa) based on average total annual effort from 2000-2006.



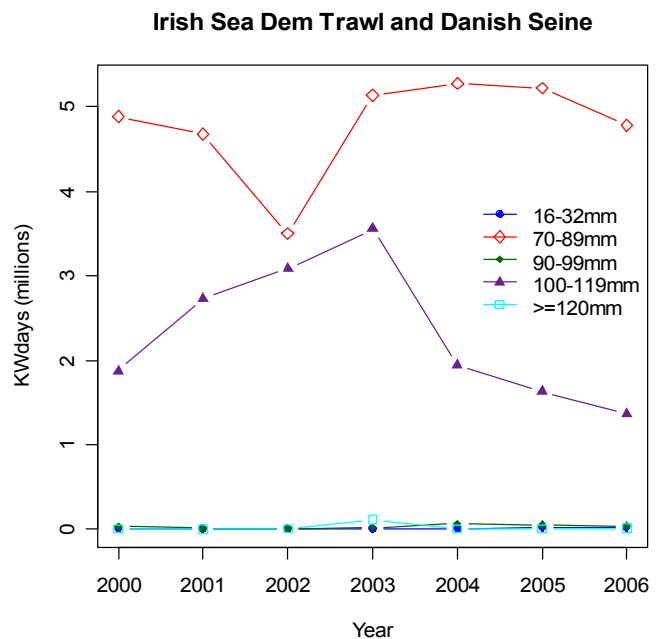
Total effort in the Irish Sea also shows a declining trend since 2000, but at a lesser rate than the West of Scotland, declining by 27% (Fig. 2). Demersal trawls dominate fisheries in this area, contributing over two thirds of the total effort. Beam trawls contribute far less effort (approximately 15%), while effort directed to static gears is negligible. The overall decline in effort from 2003 onwards is primarily related to declining trawl effort, before which trends are masked by allocation of Irish effort into the “none” group. Effort in both the beam trawl and static gear categories has remained relatively stable.



**Fig. 2** Irish Sea trends in nominal effort (kW\*days-at-sea) by gear types, 2000-2006. Category none represents unidentified effort. Irish effort prior to 2003 is within the ‘none’ category.

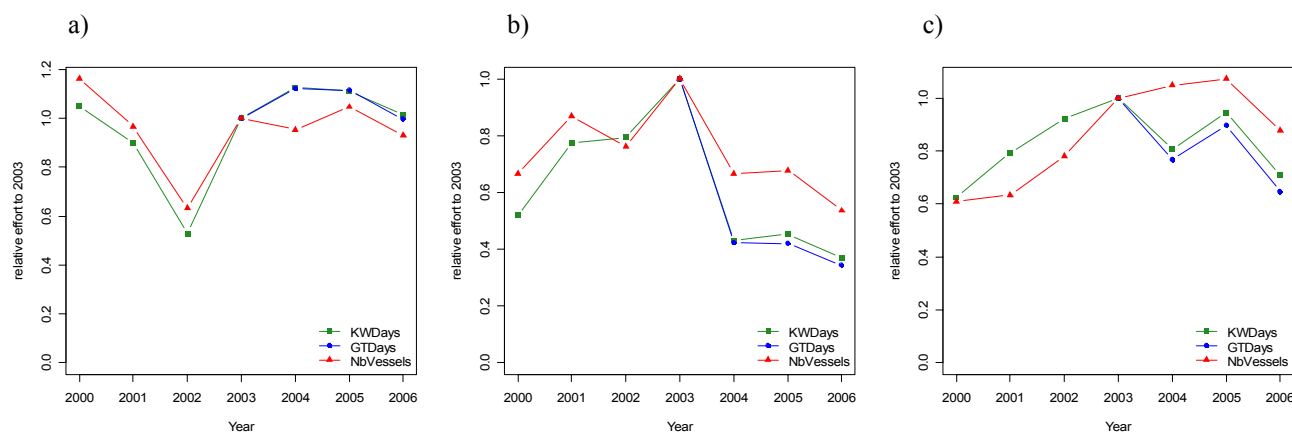
In the Irish Sea demersal trawl and Danish seine group, two mesh size ranges predominate. The small mesh Nephrops fleet, with 70-89mm mesh dominate trawling effort throughout (Fig. 7). No Irish effort in kW days-at-sea is included in Fig. 3 before 2003, as it was not available by mesh size prior to this date. As a result, the relative stability of this group may be misleading, as this is the main category utilised by Ireland in this area. The decline in 2002 effort for this small mesh category can not be explained, although it originates from Northern Ireland, the main effort contributor in the Irish Sea. This reduction in 2002 accentuates the observed increase in 2003, part of which can be explained by the inclusion of mesh specific data from Ireland from that year. It is likely that days-at-sea limitations (204 days per year) have had minimal impact on these fleets, as a decline in effort is only really observed in 2006. There has been a strong reduction in effort by the whitefish fleets with mesh sizes between 100-119mm since 2003, which are now limited to 105 days per year. Effort of 100-119mm trawls in 2006 is just over a third of what it was in the Irish Sea during 2003, indicating that the effort limitations are affecting this fleet. In addition, effort within

the largest mesh group,  $\geq 120$ mm, effectively the cod sector since 2002, appears insignificant.



**Fig. 3** Irish Sea trends in nominal effort (kW\*days-at-sea) for the demersal trawl and Danish Seines groups, 2000-2006. Note that Irish data are only included for 2003-2006.

Effort in terms of gross tonnage days-at-sea (GT\*days at sea) shows very similar evolution of fishing effort to that of effort in kW days-at-sea in all, indicating as in Vla, that vessels have not increased power to increase efficiency. These two effort measures, in addition to the maximum number of vessels were compared by standardising against values for 2003. Comparisons were made for demersal trawl categories 70-89mm and 100-119mm mesh, and beam trawl category 80-89mm mesh. The years prior to 2003 should be discounted from this comparison as Irish data was not included. Trends in vessels to those of effort vary with category. Relative vessel numbers within the 70-89mm mesh are slightly below that of effort but show a similar trend (Fig. 4a) indicating that changes in days-at-sea measures reflect changes in the number of vessels operating within the area. Days-at-sea effort for category 100-119mm mesh has declined at a greater rate than vessels (Fig. 4b), suggesting days-at-sea allocations are limiting. In relation to the beam trawl category however, it was not possible to determine a clear trend (Fig. 4c).



**Fig. 4** Irish Sea trends in relative effort expressed in kW\*days at sea, GT\*days at sea and number of vessels for demersal trawl and Scottish seine **categories a) 4.a.ii.none (70-89mm), and b) 4.a.iv.none (100-119mm), and beam trawl category c) 4.b.i.none 80-89mm.** Effort is relative to 2003 values.

The introduction of days-at-sea has been a strong driver of the observed changes in fishing patterns but, as for V1a, it should be pointed out that there have also been other important measures addressing capacity. Effort decline in the Irish Sea, particularly in the whitefish fleets with >100mm mesh trawls, could be related to decommissioning schemes permanently removing vessels. Decommissioning of UK vessels operating in the Irish Sea began in 1995. In 2001, 29 UK Northern Ireland Nephrops and whitefish vessels, and 4 UK England and Wales vessels registered to Irish Sea ports, were decommissioned. More recently in 2003 19 vessels were removed, of which 13 were vessels operating demersal trawls with mesh sizes greater than 100mm and more than 5% cod in their landings.

Decommissioning of Irish vessels began in 2005, and 26 vessels with a track record of fishing in V1a were permanently removed in August 2006. Within the Irish Sea these vessels accounted for an average of 550,940 kW\*days-at-sea per year, equating to a 19% reduction of total Irish effort. The majority of effort was directed towards demersal otter trawls (50%) and dredges (42%) with the addition of some demersal seines, pelagic trawls, and beam trawls. The impact of this decommissioning in V1a will not be fully apparent until at least 2007. However, reductions occurred in 2005 and 2006 of 11.3% and 4.5%.

**Data summary table adapted from STECF (2007)**

		Special condition	2003	2004	2005	2006	Percentage Change to 2003 (%)
Demersal trawl and Danish siene	16-32mm	none	2,777	4,122	18,961	20,423	635
	70-89mm	IIA81c	848,433	585,886	600,023	497,762	-41
		IIA81d	1,567,464	1,635,243	1,600,788	1,525,423	-3
		none	2,722,867	3,059,958	3,023,644	2,763,072	1
	90-99mm	IIA81d	7,055	6,473	11,629	12,282	74
		none	13,036	60,866	43,901	27,123	108
	100-119mm	IIA81c	286,333	154,489	58,025	50,495	-82
		IIA81d	785,996	670,534	454,092	401,025	-49
		IIA81k	19,139	53,303			-100
		none	2,465,862	1,062,371	1,116,593	915,382	-63
>=120mm	IIA81c	2,026	264	820	6,254	209	
	IIA81d	18,487	2,010			-100	
	none	95,374	6,425	4,670	7,786	-92	
Beam Trawl	80-89mm	none	1,911,815	1,544,235	1,804,906	1,359,237	-29
	100-119mm	none	26,444	5,710	12,573		-100
	>=120mm	none	467,855	17,011	12,670		-100
Gillnet	<110mm	none			895	3,325	
	110-149mm	none	30,551	23,925	3,982	8,020	-74
	150-219mm	none	20,056	11,489	471	18,810	-6
	>=220mm	none	191	1,432	3,239		-100
Trammel	n/a	none				475	
Longline	n/a	none	47,386	52,783	81,118	22,301	-53
Unclassified	none	none	1,640,145	1,727,599	1,206,446	1,263,527	-23
Total			12,979,292	10,686,128	10,059,446	8,902,722	-31



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### **Fisheries interactions in the Irish Sea**

Demersal fisheries in the area are mixed fisheries, with many stocks exploited together in various combinations in different fisheries. In these cases management advice must consider both the state of individual stocks and their simultaneous exploitation in demersal fisheries. Stocks in the poorest condition, particularly the critical stocks, necessarily become the overriding concern for the management of mixed fisheries where these stocks are exploited either as a targeted species or as a bycatch.

Four main fishery units can be described in the Irish Sea: these are *Nephrops* otter trawlers, roundfish otter trawlers, semi-pelagic trawlers, and beam trawlers. As trends in stocks of various species are generally not in synchrony, advice provided on the basis of the status of individual species may result in advised fishing mortalities for a group of co-harvested species that cannot be realized simultaneously within the context of mixed fisheries. Stocks in need of special conservation efforts, such as recovery plans, present particularly difficult challenges. For instance, the reduction of fishing mortality (and effort) required for cod makes it very unlikely that TACs for healthier stocks in the mixed fisheries could be taken. The needs of the stock(s) under recovery plans could be met most directly by setting the TACs for all species in mixed fisheries to correspond to the fishing mortality intended for the species under recovery plans, which would result in large foregone yields in many healthier stocks. The foregone yield could be reduced somewhat if effort could be adjusted on a fleet-by-fleet basis to comply with the total fishing mortality in the proposed recovery plan, while allowing as much harvesting of other species as possible. However, such an approach requires reliable information on the catch-at-age for all species in all fisheries, and is still likely to leave substantial potential harvestable biomass of several species unavailable to any fishery.

Possibly the strongest mixed fishery interaction in the Irish Sea is between the *Nephrops* fishery and the whiting stock. Discard estimates for fleets targeting *Nephrops* are incomplete and considered imprecise, but demonstrate that the selectivity of *Nephrops* trawls for whiting remains relatively poor despite the obligatory use of square mesh panels for vessels targeting *Nephrops* with a 70-mm codend mesh since 1994. ICES points out that in addition to effort restrictions, further technical measures (e.g. increased codend and square mesh panel mesh sizes, separator panels, and fixed grids) should be investigated and this may substantially reduce bycatch and discarding of whiting in this *Nephrops* fishery.

The cod fishery was traditionally carried out by otter trawlers targeting spawning cod in spring and juvenile cod in autumn and winter. Activities of these vessels have decreased, whilst a fishery for cod and haddock using large pelagic trawls increased substantially during the 1990s. Cod are also taken as a bycatch in the *Nephrops*-directed fishery. Although discard estimates for cod in the Irish Sea are not available, discard rates are not thought to be substantial. However, misreporting and underreporting of cod is thought to occur in some VIIa fisheries. Estimates of misreporting for some nations are included in the assessment, but the scientific advice for zero catch of the cod stock requires that the practice be terminated.

The extent to which the stocks are taken in the same fisheries cannot be quantified on the basis of the available data. The existing information suggests that the stocks are caught together to a high (H), medium (M), low (L) extent, or not at all (0), as indicated in Table 1. The information in the table relates to catches so a 'high' linkage can relate to high landings for two species in one fishery, but also to cases where the bycatch of a stock taken in a mixed fishery is discarded.

**Table 1** Technical interactions in the Irish Sea.

Technical Interactions Matrix	Cod in Division VIIa	Haddock VIIa	<i>Nephrops</i> FU 15 & FU 14	Plaice VIIa	Sole VIIa	Whiting VIIa	Rays VIIa	Herring VIIa	Scallops	Whelks	Razor Fish
Cod in Division VIIa		H	M	M	M	M	L	0	0	0	0
Haddock VIIa	White fish trawl, Semi-pelagic trawl, Seine-net		M	M	L	M	L	0	0	0	0
<i>Nephrops</i> FU 15 & FU 14	<i>Nephrops</i> trawl fishery	<i>Nephrops</i> trawl fishery		M	L	H	L	0	0	0	0
Plaice VIIa	Flatfish beam trawl, <i>Nephrops</i> trawl	<i>Nephrops</i> trawl	<i>Nephrops</i> trawl		H	L	M	0	0	0	0
Sole VIIa	Flat fish beam trawl, <i>Nephrops</i> trawl	Flat fish beam trawl	<i>Nephrops</i> trawl	Flatfish beam trawl		L	M	0	0	0	0
Whiting VIIa	Semi-pelagic trawl, <i>Nephrops</i> trawl, White fish trawl	White fish trawl, Semi-pelagic trawl, Seine-net	<i>Nephrops</i> trawl	<i>Nephrops</i> trawl	Beam trawl		L	0	0	0	0
Rays VIIa	Ray otter and beam trawl fishery	Ray otter and beam trawl fishery	<i>Nephrops</i> trawl	Beam trawl	Beam trawl	Ray otter and beam trawl fishery		0	0	0	0
Herring VIIa	None	None	None	None	None	None	None	None	0	0	0
Scallops	None	None	None	None	None	None	None	None		0	0
Whelks	None	None	None	None	None	None	None	None	None		0
Razor Fish	None	None	None	None	None	None	None	None	None	None	

# Irish Sea Cod

## (Division VIIa)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See Irish Sea Overview for Mixed Fishery Advice)

FSS consider that this stock has collapsed. Despite indications of unallocated catches, the assessment can be considered indicative of recent trends although it is not sufficient to provide forecasts for future catch opportunities or spawning stock biomass.

Failure to reduce fishing mortality to zero will result in a prolonged rebuilding phase and a high risk that the stock will not recover. All available data suggest that the stock is expected to decline further in 2008 due to successive weak recruitment since 2002. Given the critical status of the stock FSS advise that only fisheries where industry can prove a zero by-catch of cod should be permitted.

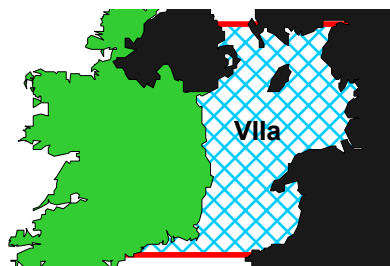
In 2004 the EC implemented a recovery plan for this stock (EC Reg. No 423/2004). FSS notes that this has not affected an increase in SSB or a reduction in fishing mortality. The main reason for this is continued under-reporting of catches. The zero catch advice needs to be accompanied by strong control and enforcement.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). Irish Sea cod will require a reduction in TAC and effort of 25%, given that this stock has collapsed.

FSS considers the establishment of SIP (Science Industry Partnership) projects as a necessary component of a rebuilding plan for this stock.

### CURRENT MANAGEMENT

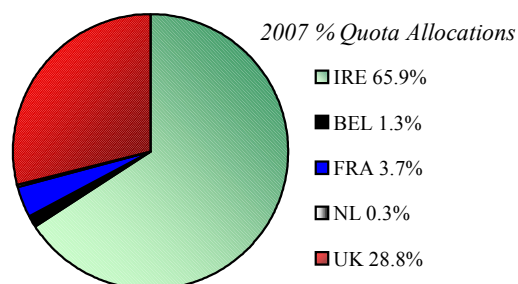
1. The TAC Area covers Division VIIa and corresponds to the assessment area.
2. The 2007 TAC was 1,462 t with an associated Irish quota of 963 t (adjusted to 1,043 t).
3. In 2004 the EC implemented a recovery plan for this stock (EC Reg. No 423/2004).
4. A spawning closure was introduced in 2000 for 10 weeks from mid-February to maximise the reproductive output of the stock (EU Regulations



Red Box-TAC/Management Area Blue Shading- Assessment Area

304/2000 and 2549/2000). Conservation measures have since been revised annually, involving a continued, but smaller spawning ground closure, derogations for certain gears and changes in net design to improve selectivity and protect juvenile fish. FSS has previously examined the impact of the closed areas for Cod in VIIa using simulations. The results indicate that closed areas need to be more stringent to have a measurable effect above the assessment uncertainty.

5. Measures established for the recovery of cod stocks include multi-Annual processes for selection of TAC's, restriction of fishing effort, technical measures, control and enforcement, accompanying structural measures and market measures. These measures are discussed in greater detail in the Section: "Recovery Plans and Effort Limitation".



### ADDITIONAL INFORMATION

1. Due to historic misreporting of catches, the assessment method estimates the total removals from the stock as opposed to relying on official catch statistics. These so called "removal estimates" are presented in the table below but should only be considered as indicative of the scale of removals rather than absolute. Recent estimates have been that around three times the reported landings suggesting either under-reporting of landings or discarding continues to be substantial problem (assuming that natural mortality and emigration rates have been stable) although direct observations suggest that landing records in 2006 are more accurate due to stronger control and enforcement. This assessment approach is far from ideal and results in concerns about the accuracy and absolute levels of

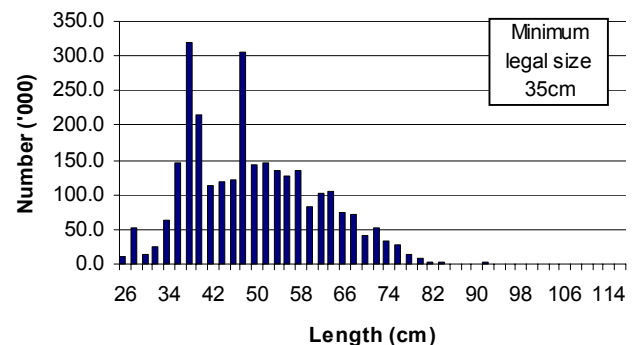
recent SSB and F estimates. Having said that there is little ambiguity about the state of the stock in relation to reference points.

Year	2000	2001	2002	2003	2004	2005	2006
<b>TAC</b>	2,100	2,100	3,200	1,950	2,150	2,150	1,828
<b>International Landings</b>	1,273	2,251	2,704	1,276	1,071	909	838
<b>Removal Estimates</b>	<b>2,474</b>	<b>4,287</b>	<b>6,676</b>	<b>4,797</b>	<b>3,463</b>	<b>2,383</b>	<b>2,405</b>

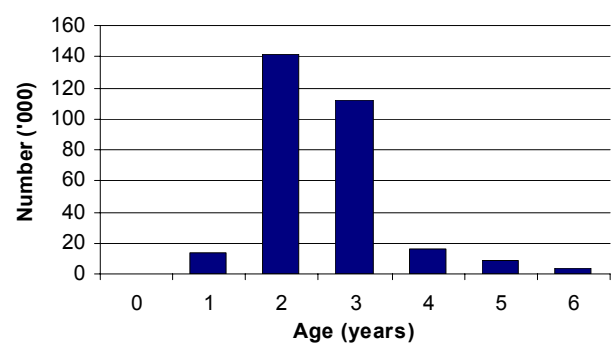
- Results from FSS simulations show that, given the uncertainties in the assessment, any stock rebuilding effects to date from the closed area are difficult to show conclusively. These simulations suggest that in order to be able to measure short-term recovery in cod, more stringent actions in addition to the closed area are required.
- Irish landings in 2006 were 272 t, substantially below the Irish quota of 1,204 t although a substantial quantity was swapped with other member states (UK) for which the national quota is particularly restrictive.
- The landings were mainly made by otter trawlers targeting whitefish, otter trawlers targeting *Nephrops* and beam trawlers.
- The seasonal migration of cod between the Irish Sea and the Celtic Sea was investigated by the FSS cod tagging programme. The results indicated that, while some cod move from the Irish Sea into the Celtic Sea, they constitute a very small proportion of the Celtic Sea cod stock. More recent tagging studies off Greencastle in VIa has resulted in some recaptures in VIIa suggesting minor movement from VIa to VIIa. In addition, a limited tagging study (750 fish) was conducted in the Celtic sea in spring 2006. The majority of recaptures (30) were taken in the Celtic Sea but one fish was recaptured in area VIIa.
- The closure of the spawning grounds during spring from 2000 onwards has mainly affected semi-pelagic trawlers and whitefish otter trawlers. It has caused displacement of effort into surrounding regions and in some cases switching to *Nephrops* trawl gear to take advantage of the derogation for *Nephrops* fishing within the closure.
- Recovery measures have since been complemented by decommissioning and a system of fishing effort limitation which regulates the number of fishing days allowed for various vessel categories deploying gears with specified mesh sizes. Current effort allocations for *Nephrops* trawlers are not restrictive based on comparisons between reported effort and effort allocations.
- Recent experiments in Scotland have shown that cod selection in *Nephrops* trawls can be dramatically improved by inserting a square mesh panel 4m from the cod-line giving a higher selection profile considerably better than a 120mm standard cod-end. This configuration also results in significant reductions in catches of haddock and whiting.
- There is evidence that some of the historical variation in recruitment of Irish Sea cod can be explained by year-to-year changes in sea temperature with a negative

correlation between Spring Sea Surface Temperature and recruitment. However, the large reduction in egg production observed from egg surveys, associated with the decline in both the biomass and age structure of the spawning stock in the 1990s must be considered a primary cause of the reduction in average recruitment compared with earlier years.

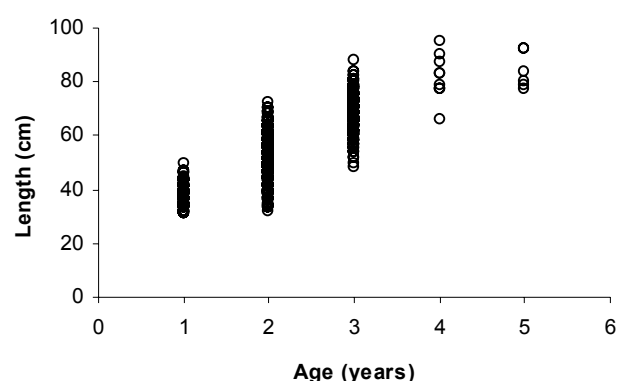
**2006 Length Distribution: Irish Landings (Beam, Otter trawlers & Gill Netters), Cod in VIIa**



**2006 Age Distribution: Reported International Landings, Cod in VIIa**



**2006 Size at Age: Irish Sampling, Cod in VIIa**



## ICES ADVICE

### 5.4.1

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Reduced reproductive capacity	Harvested unsustainably	Overexploited	Not defined

Based on the most recent estimates of SSB, ICES classifies the stock as having reduced reproductive capacity. Although the current estimate of fishing mortality is uncertain, it is estimated to be above  $F_{lim}$ . SSB has been below  $B_{lim}$  since the mid-1990s. Recruitment has been below average for the past sixteen years, and the five most recent year classes are amongst the smallest on record.

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	6 000 t	$B_{lim} = B_{loss}$ , lowest observed level.
	$B_{pa}$	10 000 t	$B_{pa} = MBAL$ , this level affords a high probability of maintaining the SSB above $B_{lim}$ . Below this value the probability of below-average recruitment increases.
	$F_{lim}$	1.00	$F_{lim} = F_{med}$
	$F_{pa}$	0.72	$F_{pa} = F_{med} * 0.72$ . This F is considered to have a high probability of avoiding $F_{lim}$ . Fishing mortalities above $F_{pa}$ have been associated with the observed stock decline.
Targets	$F_y$	Not defined.	

(unchanged since: 1998)

#### Yield and spawning biomass per Recruit (from 2004 Assessment)

	Fish Mort	Yield/R	SSB/R
Ages 2–6			
Average age 2–4 (2002–2004)	1.03	1.677	1.869
$F_{max}$	0.31	2.153	7.999
$F_{0.1}$	0.18	2.009	12.746

#### F-reference points

Candidates for reference points which are consistent with taking high long-term yields and achieving a low risk of depleting the productive potential of the stock may be identified in the range of  $F_{0.1}$ – $F_{max}$ .

#### Single-stock exploitation boundaries

*Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects*

Fishing mortalities between  $F_{0.1}$  and  $F_{max}$  can be considered as candidate target reference points, which are consistent with taking high long-term yields and achieving a low risk of depleting the productive potential. The present fishing mortality is uncertain;

#### Management objectives

The European Commission has enacted a Council Regulation ((EC) No. 423/2004) which establishes measures for the recovery of cod stocks:

*For stocks above  $B_{lim}$ , the harvest control rule (HCR) requires:*

1. setting a TAC that achieves a 30% increase in the SSB from one year to the next,
2. limiting annual changes in TAC to  $\pm 15\%$  (except in the first year of application), and,
3. a rate of fishing mortality that does not exceed  $F_{pa}$ .

*For stocks below  $B_{lim}$  the Regulation specifies that:*

4. conditions 1-3 will apply when they are expected to result in an increase in SSB above  $B_{lim}$  in the year of application,
5. a TAC will be set lower than that calculated under conditions 1-3 when the application of conditions 1-3 is not expected to result in an increase in SSB above  $B_{lim}$  in the year of application.

ICES has previously concluded that a precautionary recovery plan must include an adaptive element, implying that fisheries for cod must remain closed until an initial recovery of the cod SSB has been proven. Such an element of zero catch is not included in the existing plan. ICES therefore considers the recovery plan to be not consistent with the precautionary approach.

however, it is estimated to be well above any candidate reference points.

#### Exploitation boundaries in relation to existing management plans

Given the highly uncertain estimates of fishing mortality resulting from the assessment it has not been possible to conduct a short-term forecast on the basis of the management plan.

#### Exploitation boundaries in relation to precautionary limits

Given the low stock size and recent poor recruitment, it is not possible to identify any non-zero catch which would be compatible with the precautionary approach.

### *Conclusion on exploitation boundaries*

Because the existing recovery plan does not include the elements or measures necessary to rebuild the stock at the current SSB (well below  $B_{lim}$ ), ICES continues to advise on exploitation boundaries in relation to precautionary limits and recommends that the fisheries for cod be closed until an initial recovery of the cod SSB has been proven. Any catches that are taken in 2008 will prolong the recovery to  $B_{pa}$ .

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### **Management considerations**

Various emergency measures have been introduced for cod since 2000, effort control has been in place since 2003, and there have been various decommissioning schemes. These may translate into some reductions in fishing mortality of cod, but the current assessment does not provide sufficiently robust estimates of fishing mortality to allow the possible reductions to be determined. Very few cod survive to age 4 in this stock. This is because:

- There are strong indications that the TAC management control has not been effective in limiting the catch as landings have been underreported, although there is some indication that this is reduced in 2006;
- The effort reductions have not been sufficient although considerable effort reductions have been observed in some fleets (particularly vessels using >100-mm mesh);
- Cod is taken in mixed demersal fisheries (particularly haddock, sole, and *Nephrops*). Unless these fisheries can demonstrate zero bycatches of cod the effort in these fisheries also needs to be reduced substantially;
- Time and area closures have not been sufficient to lead to rebuilding of this stock.

Reducing fishing mortality to close to zero is required if the cod stock is to reach a level where it can regain historic productivity.

A resumption of sampling took place in 2005 at ports inaccessible for port sampling in 2003 and with only limited access in 2004. Sampling was again restricted in 2006. There will continue to be large uncertainties in the stock status and further deterioration in the ability to provide advice unless catches are accurately recorded.

### *Management plan evaluations*

The management plan was evaluated in 2006. This evaluation suggested recovery to levels above  $B_{pa}$  by about 2011, based on a large number of assumptions, most importantly the size of recruiting year classes and also that fishing mortality can be reduced to zero in 2007 to allow the stock to increase above  $B_{lim}$ .

However, there are reports of significant non-reported landings, and as a consequence the current TAC system is not able to regulate fishing mortality. Unless recovery measures are effective in restricting the fishery they cannot be considered precautionary. The management plan was tested with an implementation error of less than 25% (which means no implementation error for  $F = 0$ ), but a larger and more realistic implementation error has not been investigated.

The plan depends primarily on annual estimates of SSB in relation to  $B_{pa}$ , but also on estimates of fishing mortality relative to  $F_{pa}$ . While SSB appears to be estimated well by this assessment, the level of fishing mortality is less well known and aspects of the management plan relating to maximum fishing mortality levels may be difficult to implement.

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### **Factors affecting the fisheries and the stock**

#### *The effects of regulations*

The fishery is managed by TACs that do not restrict landings.

Several regulations have been introduced in the Irish Sea in recent years. These regulations and their impact on the fisheries have been discussed in detail in the overview. To rebuild the SSB, a closure was introduced in 2000 for ten weeks from mid-February (EU Regulations 304/2000 and 2549/2000). This closure was intended to maximize the reproductive output of the stock. The measures were revised in 2001, 2002, and 2003, involving a continued, but smaller spawning-ground closure, coupled with changes in net design to improve selectivity. Various derogations were introduced for gears not targeting cod.

These recovery measures have since been complemented by a system of fishing effort limitation. This is done by adjusting the number of fishing days allowed for various vessel categories deploying gears with various mesh sizes. The introduction of effort regulation has effectively encouraged vessel operators to reduce mesh size and shift to other fisheries, particularly *Nephrops* trawling, in order to gain more days at sea.

It is not possible to evaluate whether the mesh size changes and effort limitations may have benefited cod without information on the level of adherence to catch composition regulations required when using smaller mesh sizes. Trends in nominal effort in this area are presented in Section 17 of the 2006 WG report. STECF (2005) indicates an overall decrease in effort of 19% between 2000 and 2004.

The continued decline in the stock indicates that these measures alone have not proven sufficient to rebuild the stock to precautionary levels. Detailed analysis of the impact of the regulations will not be possible until data of sufficient quality become available.

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### **Scientific basis**

#### *Data and methods*

The assessment model is based on a catch-at-age analysis of reported landings, calibrated with several series of survey indices. In addition, the model estimates missing removals as a bias in landings, assuming that they have the same age composition as reported landings.

Recent discard estimates available for some fleets indicate a variable, but very high discard rate of ages 0 and 1. These estimates are not used in the assessment due to the short time-series available.

#### *Information from the fishing industry*

The UK Fisheries-Science Partnership surveys of the Irish Sea cod spawning grounds in spring 2005–2007, carried out using commercial trawlers, indicated a widespread distribution of cod mostly at low density but with some localized aggregations. The time-series is too short to evaluate stock trends in relation to ICES data. However, the highly truncated age composition of cod in the surveys supports the ICES assessment, indicating continuing high mortality rates.

#### *Uncertainties in assessment and forecast*

The current estimate of fishing mortality is uncertain; therefore it cannot be used for forecasts. The quality of the commercial landings and catch-at-age data for this stock deteriorated in the 1990s following reductions in the TAC without associated control of fishing effort. Limited access to some ports in recent years has also resulted in reduced sampling coverage for estimating length and age compositions.

ICES previously attempted to overcome this problem by incorporating sample-based estimates of landings from three major ports in the WG landings figures from 1991 onwards. The sources of this information became more limited in 2003 and 2004. The large TAC reduction for cod from 2000 onwards, with only the

spring cod closure as a means of restricting effort until days-at-sea restrictions came into force, may have caused more widespread problems with misreporting or over-quota discarding. Hence ICES considers the international landings figures from 2000 onwards to have potentially large inaccuracies that could lead to retrospective bias and other problems with an analytical assessment. The recent implementation of stricter landings enforcement has potentially improved the quality of the landings data in 2006. However, the full effect of these measures cannot be fully assessed yet.

#### *Comparison with previous assessment and advice*

The perception of stock status is similar to last year and the basis for the advice is the same.

#### **Sources of information**

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).  
Report of the STECF for 2005. Evaluation of the Irish Sea Cod recovery plan.

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official landings	ACFM Landings
1987	No increase in F; interaction with <i>Nephrops</i>		10.3		15.0	13.2	12.9
1988	No increase in F; interaction with <i>Nephrops</i>		10.1		15.0	15.8	14.2
1989	No increase in F		13.4		15.0	11.3 <sup>1</sup>	12.8
1990	F at $F_{med}$ ; TAC		15.3		15.3	9.9 <sup>1</sup>	7.4
1991	Stop SSB decline; TAC		6.0		10.0	7.0 <sup>1</sup>	7.1 <sup>2</sup>
1992	20% of F(90) ~ 10 000 t		10.0		10.0	7.4	7.7 <sup>2</sup>
1993	$F_{med}$ ~ 10 200 t		10.2		11.0	5.9	7.6 <sup>2</sup>
1994	60% reduction in F		3.7		6.2	4.5	5.4 <sup>2</sup>
1995	50% reduction in F		3.9		5.8	4.5	4.6 <sup>2</sup>
1996	30% reduction in F		5.4		6.2	5.30	4.96 <sup>2</sup>
1997	30% reduction in F		5.9		6.2	4.44	5.86 <sup>2</sup>
1998	No increase in F		6.2		7.1	4.96	5.31 <sup>2</sup>
1999	Reduce F below $F_{pa}$		4.9		5.5	2.96	4.78 <sup>2</sup>
2000	Lowest possible F		0		2.1	1.42	1.27 <sup>3</sup>
2001	Lowest possible F		0		2.1	2.03	2.25 <sup>3</sup>
2002	Establish recovery plan		-		3.2	2.7	2.69 <sup>3</sup>
2003	Closure of all fisheries for cod		-		1.95	1.5	1.28 <sup>3</sup>
2004		Zero catch		0	2.15	1.1	1.07 <sup>3</sup>
2005		Zero catch		0	2.15	0.967	0.91 <sup>3</sup>
2006		Zero catch		0	1.828	0.935	0.84 <sup>3</sup>
2007		Zero catch		0	1.462		
2008		Zero catch		0			

Weights in '000 t.

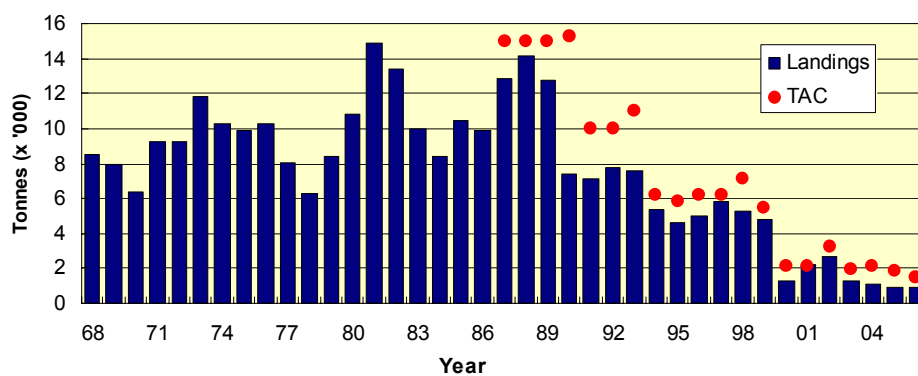
<sup>1</sup>Preliminary.

<sup>2</sup>includes sample based estimates of landings into three ports

<sup>3</sup>based on official data only

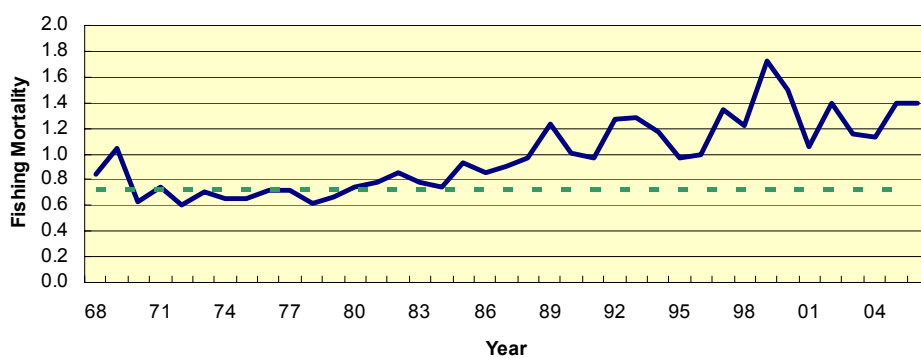
### Cod Vlla - Landings

Mean = 7.6



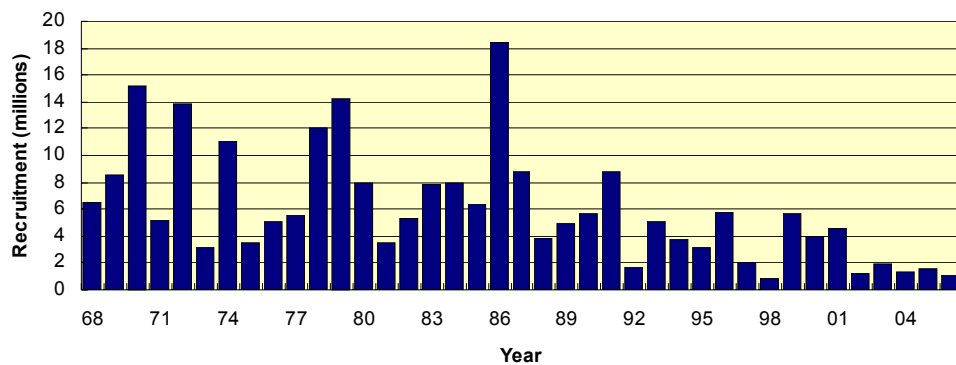
### Cod Vlla - Fishing Mortality

Mean = 0.98



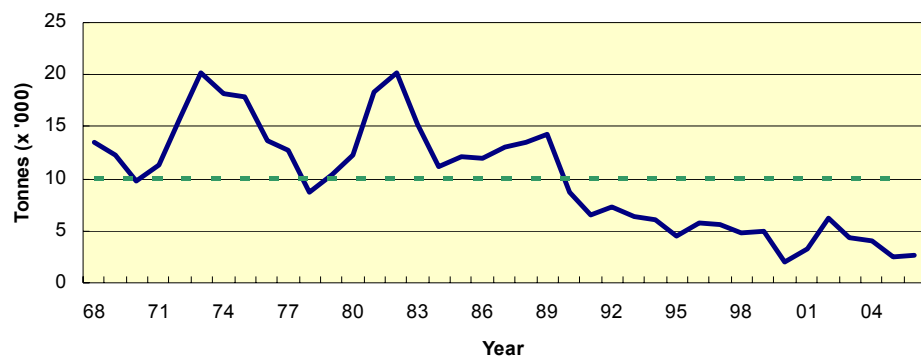
### Cod Vlla - Recruitment (Age 1)

Mean = 6.1



### Cod Vlla - Spawning Stock Biomass

Mean = 10





**Table 5.4.1.1** Nominal landings (t) of COD in Division VIIa as officially reported to ICES, and figures used by ICES.

Country	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	129	187	142	183	316	150	60	283	318	183	104	115	60
France	208	166	148	268	269	n/a	53	74	116	151 <sup>1</sup>	29	35 <sup>1</sup>	13
Ireland	1,506	1,414	2,476	1,492	1,739	966	455	751	1,111	594	380	220	272
Netherlands	-	-	25	29	20	5	1	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	-	-	14	-	-	-
UK (England, Wales & NI)	2,274	2,330	2,359	2,370	2,517	1,665	799	885	1,134	505	646	594 <sup>1</sup>	590
UK (Isle of Man)	26	22	27	19	34	9	11	1	7	7	5	-	-
UK (Scotland)	326	414	126	80	67	80	38	32	29	23	15	3	-
Total	4,469	4,533	5,303	4,441	4,962	2,875	1,417	2,026	2,715	1,477	1,179	967	935
Unallocated	933	54	-339	1,418	356	1,909	-143	226	-20	-192	-107	-57	-97
Total as used by WG	5402 <sup>2</sup>	4587 <sup>2</sup>	4964 <sup>2</sup>	5859 <sup>2</sup>	5318 <sup>2</sup>	4784 <sup>2</sup>	1274 <sup>3</sup>	2252 <sup>3</sup>	2695 <sup>3</sup>	1285 <sup>3</sup>	1072 <sup>3</sup>	910 <sup>3</sup>	838 <sup>3</sup>

<sup>1</sup>Revised.

<sup>2</sup> includes sample-based estimates of landings into three ports.

<sup>3</sup> based on official data only.

n/a = not available.

# Irish Sea Whiting

## (Division VIIa)

For latest information, see: <http://www.ices.dk>



Marine Institute  
Foras na Mara

### Fisheries Science Services

#### FSS – SINGLE STOCK CONSIDERATIONS

(See Irish sea Overview for Mixed Fishery Advice)

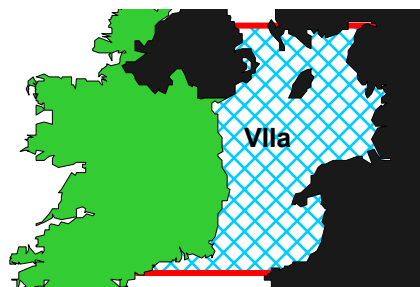
The stock has decreased substantially to very low levels in recent years. High discarding, low landings and poor sampling has lead to uncertain catch data in recent years. Therefore the assessment for this stock is based on survey information only. This indicates further declines in stock and increasing mortality in recent years.

FSS agrees with ICES advice that the catches of whiting in 2008 should be the lowest possible. Furthermore urgent management action is required to rebuild the whiting stock in this area. FSS stresses that the cornerstone of any rebuilding of whiting should be measures that significantly reduce or eliminate the discarding of whiting in the *Nephrops* fishery. This could be achieved by the strengthening of existing technical conservation measures such as a reduction in twine thickness, increasing the mesh size and dimensions of the existing square mesh panel as well as changes in panel position.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS present an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Irish Sea Whiting FSS interpret that the EC fishing opportunity in 2008 will result in a TAC of no more than 315 t and taking the scientific advice of, reducing catches to the lowest possible level, into account.

#### CURRENT MANAGEMENT

- The TAC in 2007 was 371 t with an associated Irish quota of 213 t (adjusted quota = 240 t).
- There are no explicit management objectives or a management plan for this stock.
- The spring closure of the western Irish Sea to whitefish fishing, designed to protect cod, has been continued, but is unlikely to have affected whiting catches, which are mainly by-catch in the derogated *Nephrops* fishery.
- The operation of days-at-sea effort limitations in the Irish Sea since 2004 is not expected to have resulted in a significant reduction in fishing mortality for whiting.
- During 2006/2007, in collaboration with the Irish and UK industry, the NWWVRAC, national Irish and UK

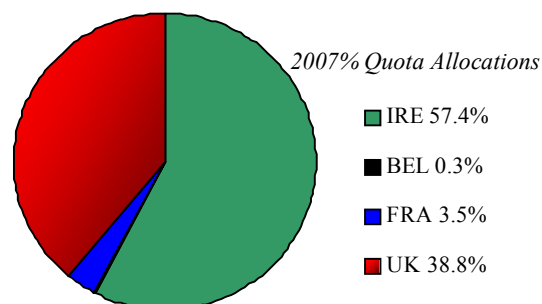


Red Box-TAC/Management Area Blue Shading- Assessment Area

laboratories and administrations, the Irish Sea Enhanced Data Collection Programme was initiated. The consortium secured additional days at sea allocations from the EC for to encourage vessels to participate in the voluntary programme.

#### ADDITIONAL INFORMATION

1. Total landings were estimated to be 85 t in 2006 this is well below the TAC. Of this, the Irish landings were estimated to be 55 t.
2. Estimates of misreporting have not been available for this stock since 2003 making catch-based assessments unreliable.
3. Most of the landings are taken by UK (Northern Ireland), Ireland and UK (England and Wales). UK (Northern Ireland) fleets take most of their landings from the Western Irish Sea, while the UK (England) fleet takes most of its landings from the Eastern Irish Sea. Whiting is taken mainly as by-catch in the mixed otter trawl fisheries for *Nephrops*, cod and other demersal species and in the Northern Ireland semi pelagic fishery for cod.
4. Vessels operating out of Dunmore East, Clogherhead and Howth traditionally take most of the Irish catches. Most of the recent Irish landings were from the Southern Irish Sea and may in fact be fish from the Celtic Sea stock.
5. The denial of access to several major ports in Northern Ireland for biological sampling since 2003 is a major problem. Unless full sampling is resumed at all major ports, there will be larger uncertainties in the stock status and thus more precautionary advice.



6. The effort regulations have provided an incentive for trawlers previously using >100mm mesh to switch to smaller mesh gears, in order to claim more days-at-sea (up to 21 days/month). Ireland has a high quota for this stock (58%) due to the Hague preference agreement.
7. Discarding data shows that individuals in excess of the MLS (27 cm) are discarded. In addition, the discard data indicates that very large numbers of whiting below this size are caught in the *Nephrops* fishery and discarded. Full protection of juvenile whiting will require minimising discards of juvenile whiting in the *Nephrops* fishery.
8. It has proved difficult to evaluate the success of measures, such as the mandatory use of square mesh panels in *Nephrops* trawls since 1994, as there have been very few direct observations of size and age compositions of catches prior to discarding. Experimentally these measures substantially reduce whiting discarding. However, monitoring programmes are needed to evaluate if these experimental benefits have been realised in the commercial fishery.

## ICES ADVICE

### 5.4.5

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Unknown	Unknown	Unknown	Undefined

The state of the stock is uncertain. Long-term information on the historical yield and catch composition all indicate that the present stock size is low. Landings have been decreasing in recent years and are at their lowest level in 2006. The survey results indicate a decline in SSB. There is some indication of increased recruitment. Total mortality has been increasing.

#### Management objectives

No explicit management objectives have been set for this stock.

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	5 000 t	$B_{lim}$ : $B_{loss}$ . The lowest observed SSB as estimated in previous assessment. There is no clear evidence of reduced recruitment at the lowest observed SSBs.
	$B_{pa}$	7 000 t	$B_{pa}$ : $= B_{loss} * 1.4$ : This is considered to be the minimum SSB required to ensure a high probability of maintaining SSB above its lowest observed value, taking into account the uncertainty of assessments.
	$F_{lim}$	0.95	This is the fishing mortality estimated to lead to a potential stock collapse.
	$F_{pa}$	0.65	This F is considered to have a high probability of avoiding $F_{lim}$ and is consistent with a high probability of remaining above $B_{pa}$ in the long run. It implies an equilibrium SSB of 10.6 kt, and a relatively low probability of $SSB < B_{pa}$ ( $= 7$ kt), and is within the range of historic Fs.
Targets	$F_y$	Not defined.	

(unchanged since: 1998)

#### Single-stock exploitation boundaries

##### Exploitation boundaries in relation to precautionary limits

On the basis of the stock status, ICES advises that catches of whiting in 2008 should be the lowest possible.

#### Management considerations

Landings of whiting by all vessels as well as discards of whiting estimated for *Nephrops* fisheries have declined substantially since the 1990s, and whiting is now a relatively minor bycatch in the demersal fisheries. Due to the low value of the catch, a high proportion of whiting are discarded. Reports of significant non-reported landings indicate that the current implementation of the TAC system is not able to restrict fishing.

#### Factors affecting the fisheries and the stock

##### Regulations and their effects

Various technical measures have been introduced in the past to mitigate bycatch of whiting in the *Nephrops* fishery, which operates on

the whiting nursery grounds. It has proven difficult to evaluate the success of measures such as the mandatory use of square mesh panels in *Nephrops* trawls since 1994, as there have been very few direct observations of size and age compositions of catches prior to discarding (much of the discards data are from fisher self-sampling schemes that do not record total catch). Experimentally these measures substantially reduce whiting discarding; however, monitoring programmes are needed to evaluate if these experimental benefits have been realised in the commercial fishery.

Due to the bycatch of cod in fisheries taking whiting, the regulations affecting Division VIIa whiting remain linked to those implemented under the Irish Sea cod recovery plan. The closure of the western Irish Sea to whitefish fishing from mid-February to the end of April, designed to protect cod, has been continued, though it is not clear to what extent these measures will protect whiting.

Similarly the extension of days-at-sea limitations into the Irish Sea in 2006 is not expected to result in a significant reduction in fishing mortality for whiting since the *Nephrops* fleet are still permitted to fish for up to 21 days per month.

The minimum landing size (MLS) for whiting is 27 cm; however, discard data shows that individuals in excess of that size are also discarded.

### The environment

The stock structure of whiting in the Irish Sea has previously been uncertain with differences in the population structure observed between the eastern and western components. However, individual whiting move between the western Irish Sea and other areas within the Irish Sea and this precludes treating different areas within the Irish Sea as containing functionally separate stocks.

### Scientific basis

#### Data and methods

An age-based assessment was carried out based on survey information only and is considered to be indicative of trends only.

#### Information from the fishing industry

Some information was available from the fishing industry. Ireland has established a trial self-sampling scheme (ECONEPH) in cooperation with the *Nephrops* fleet to augment discard sampling in the *Nephrops* fishery. The UK(NI) industry participated in an *ad hoc* workshop on Irish Sea whiting in the spring of 2005 where their information on the fishery was used to inform on the perception of stock structure.

### Uncertainties in assessment and forecast

The major deficiency is poor quality of the input data. An examination of the survey data indicates relatively poor within and between survey tracking of year classes. There are no reliable estimates of catch numbers-at-age since 2003 due to the low landings levels of whiting in recent years and concurrent poor sampling. Discard estimation and raising procedures are problematic and discard estimates may be imprecise.

#### Comparison with previous assessment and advice

The perception of the stock is the same as last year and the basis for the advice, as well as the advice itself are the same.

### Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official Landings	Disc. <sup>2</sup>	ACFM Catch
1987	Reduce F		16.0		18.2	11.7	3.8	14.4
1988	No increase in F; enforce mesh regulations		12.0		18.2	11.5	1.9	11.9
1989	F = F <sub>high</sub> ; enforce mesh regulations		11.0		18.2	11.3	2.0	13.4
1990	No increase in F; TAC		8.3 <sup>1</sup>		15.0	8.2	2.7	10.7
1991	Increase SSB to SSB(89); TAC		6.4 <sup>1</sup>		10.0	7.4	2.7	9.9
1992	80% of F(90)		9.7 <sup>1</sup>		10.0	7.1	4.3	12.8 <sup>3</sup>
1993	70% of F(91) ~ 6 500 t		6.5		8.5	6.0	2.7	9.2 <sup>3</sup>
1994	Within safe biological limits		-		9.9	5.6	1.2	7.9 <sup>3</sup>
1995	No increase in F		8.3 <sup>1</sup>		8.0	5.5	2.2	7.0 <sup>3</sup>
1996	No increase in F		9.8 <sup>1</sup>		9.0	5.6	3.5	8.0 <sup>3</sup>
1997	No advice given		-		7.5	4.5	1.9	4.2 <sup>3</sup>
1998	20% reduction in F		3.8 <sup>4</sup>		5.0	3.4	1.3	3.5 <sup>3</sup>
1999	Reduce F below F <sub>pa</sub>		3.5 <sup>4</sup>		4.41	2.0	1.1	2.8 <sup>3</sup>
2000	Reduce F below F <sub>pa</sub>		<1.6 <sup>4</sup>		2.64	1.1	2.1	2.9 <sup>3</sup>
2001	Lowest possible F		~0		1.39	1.1	1.0	1.7 <sup>3</sup>
2002	Lowest possible F		~0		1.00	0.7	0.7	1.5 <sup>3</sup>
2003	Lowest possible F		~0		0.50	0.5	n/a	n/a
2004		zero catch		0	0.514	0.2	n/a	n/a
2005		zero catch		0	0.514	0.2	n/a	n/a
2006		lowest possible catch		-	0.437	0.08	n/a	n/a
2007		lowest possible catch		-	0.371			
2008		lowest possible catch		-				

Weights in '000 t.

<sup>1</sup>Not including discards from the *Nephrops* fishery.

<sup>2</sup>From the *Nephrops* fishery.

<sup>3</sup>Including estimates of misreporting.

<sup>4</sup>Landings only, no discards included.

n/a = not available.

**Table 5.4.5.1** Nominal catch (t) of whiting in Division VIIa, 1988–2006, as officially reported to ICES and Working Group estimates of discards.

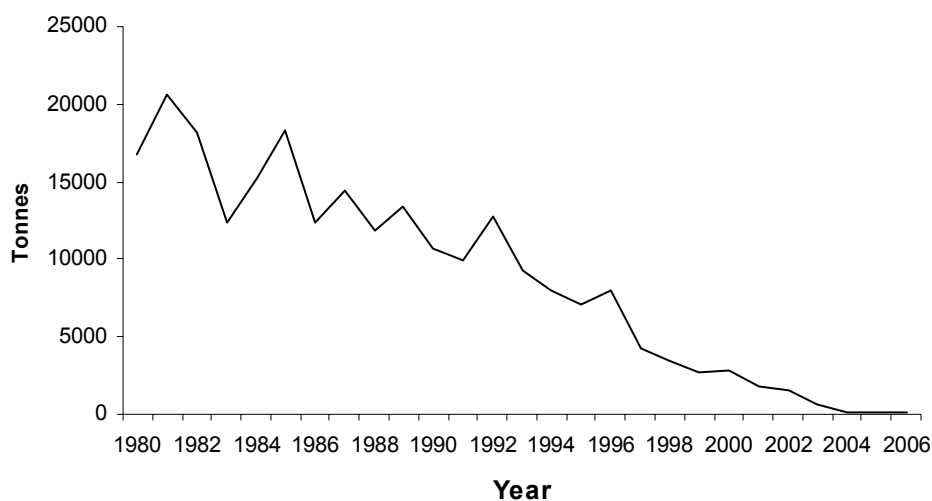
Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	90	92	142	53	78	50	80	92	80	47
France	1,063	533	528	611	509	255	163	169	78	86
Ireland	4,394	3,871	2,000	2,200	2,100	1,440	1,418	1,840	1,773	1,119
Netherlands									17	14
UK(Engl. & Wales) <sup>a</sup>	1,202	6,652	5,202	4,250	4,089	3,859	3,724	3,125	3,557	3,152
Spain										
UK (Isle of Man)	15	26	75	74	44	55	44	41	28	24
UK (N.Ireland)	4,621									
UK (Scotland)	107	154	236	223	274	318	208	198	48	30
UK										
Total human consumption	11,492	11,328	8,183	7,411	7,094	5,977	5,637	5,465	5,581	4,472
Estimated Nephrops fishery discards used by the WG <sup>b</sup>	1,611	2,103	2,444	2,598	4,203	2,707	1,173	2,151	3,631	1,928
Working Group Estimates	11,856	13,408	10,656	9,946	12,791	9,230	7,936	7,044	7,966	4,205

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Belgium	52	46	30	27	22	13	11	10	4.2
France	81	150	59	25	33	29	8	13	3.7
Ireland	1,260	509	353	482	347	265	96	94	55.3
Netherlands	7	6	1						
UK(Engl. & Wales) <sup>a</sup>	1,900	1,229	670	506	284	130	82	47	21.7
Spain						85			
UK (Isle of Man)	33	5	2	1	1	1	1		
UK (N.Ireland)									
UK (Scotland)	22	44	15	25	27	31	6		
UK									
Total human consumption	3,355	1,989	1,130	1,066	714	554	204	164	84.9
Estimated Nephrops fishery discards used by the WG <sup>b</sup>	1,304	1,092	2,118	1,012	740	n/a	n/a	n/a	n/a
Working Group Estimates	3,533	2,762	2,880	1,745	1,487	676	184	158	86

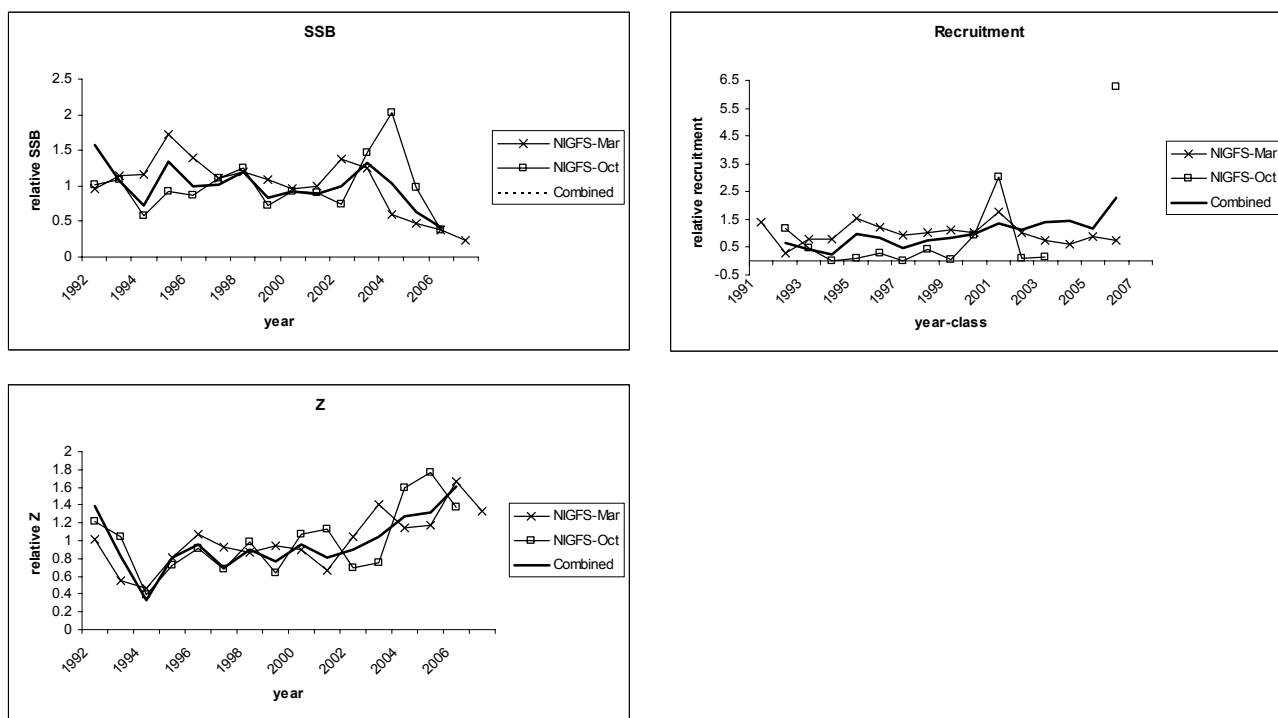
<sup>a</sup> 1989-onwards Northern Ireland included with England and Wales.

<sup>b</sup> Based on UK(N.Ireland) and Ireland data.

\* Preliminary.



**Figure 5.4.5.1** Whiting in Division VIIa. Working group estimates of landings 1980–2006. Note: landings data prior to 2003 has been adjusted for misreporting and includes estimates of discards.



**Figure 5.4.5.2** Mean standardised SSB, total mortality (Z), and recruitment estimates from combined SURBA analysis.

# Irish Sea Haddock

## (Division VIIa)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See Irish sea Overview for Mixed Fishery Advice)

FSS considers the assessment to be indicative only of trends in SSB and recruitment. Surveys have shown that recent year classes are above average and have lead to increased SSB.

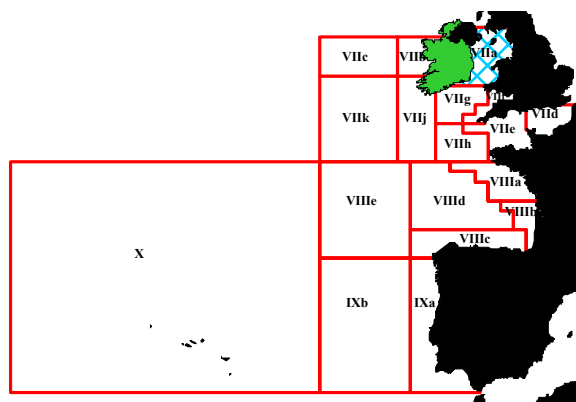
Inadequate information is available to evaluate spawning stock biomass or fishing mortality relative to precautionary reference points. SSB has been increasing and recent recruitment is above average. FSS therefore agrees with the ICES advice that fishing effort should not be allowed to increase to prevent expansion until a reliable assessment is available.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS present an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Irish Sea haddock, FSS interprets that the proposal would be to prevent expansion of the fishery. This may result in the 2007 TAC of 11,520 t being maintained in 2008.

FSS recommends that a long term management plan is developed which recognises that haddock are subject to highly sporadic recruitment which will result in substantial variation in catches and SSB from year to year. FSS therefore recommend that a within-year review of management controls, taking into account real-time information, would allow a more effective means of exploiting the sporadic high recruitment that is characteristic of haddock stocks.

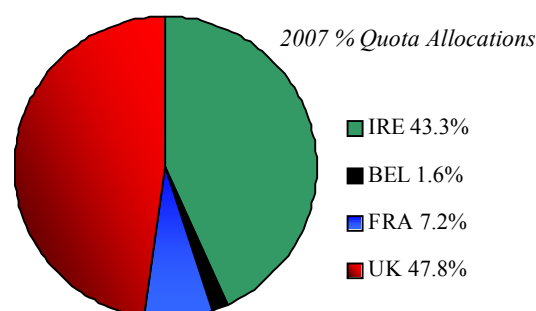
### CURRENT MANAGEMENT

- The TAC Area traditionally covers Sub-areas VII, VIII, IX and X.
- The assessment area covers Division VIIa only.
- The 2007 TAC for haddock of 11,520 t was set for the whole of Divisions VII to X, of which no more than 1,179 t could be taken from Division VIIa.
- There are no explicit management objectives or a management plan for this stock.



Red Boxes-TAC/Management Areas Blue Shading- Assessment Area

- FSS recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching haddock.



### ADDITIONAL INFORMATION

1. Recent estimates of the age composition and levels of landings are considered unreliable because of poor sampling from some major fleets and extensive misreporting. An analytical catch-based assessment could therefore not be performed. There will continue to be uncertainties in the estimated stock status unless full sampling is maintained at all major ports.
2. The assessment is based on survey data only.
3. Recent discard estimates available for some fleets indicate a variable, but very high discard rate of younger fish. These estimates are not used in the assessment due to the incomplete nature of the available time series. Improvements in selection profile that result in reductions in discards will result in an increased future yield.
4. The fishery is dominated by the UK (NI) and Irish fleets. The haddock stock is mainly confined to the western Irish Sea where important mixed species fisheries for *Nephrops*, haddock, whiting and cod take place.

- Irish catches are mainly made by otter trawl vessels operating out of Howth and targeting whitefish or switching between targeting whitefish and *Nephrops*. There is also some by-catch in the *Nephrops* and to a lesser extent in the seine and beam trawl fisheries.
- The Irish landings were estimated to be 183 t in 2006. This is well below the available quota of 550 t.
- FSS believes that there are no known biological reasons why haddock production could not be sustained in the Irish Sea. However the large fluctuations in recruitment characteristic of haddock stocks may mean that landings will fluctuate greatly in response to the strength of incoming year-classes.
- The extent to which the cod and haddock fisheries are linked has not been quantified. This linkage is not one-to-one, but it is evident and likely to be highly variable, particularly in response to variable year-class strength.

## ICES ADVICE

### 5.4.3

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Undefined	Unknown	Undefined	Undefined

The state of the stock is uncertain. The assessment is indicative of trends in SSB and recruitment and is based on survey results. The trend in total mortality remains constant. SSB has shown an increase over the time-series. Recent recruitments appear to be above average and have contributed to the rise in the SSB.

#### Management objectives

There are no explicit management objectives for this stock.

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	Not defined.	There is currently no biological basis for defining appropriate reference points, in view of the rapid expansion of the stock size over a short period and the inability to conduct a full analytical assessment.
	$B_{pa}$	Not defined.	
	$F_{lim}$	Not defined.	
	$F_{pa}$	0,5	ICES proposed that $F_{pa}$ be set at 0.5 by association with other haddock stocks.
Targets	$F_y$	Not defined.	

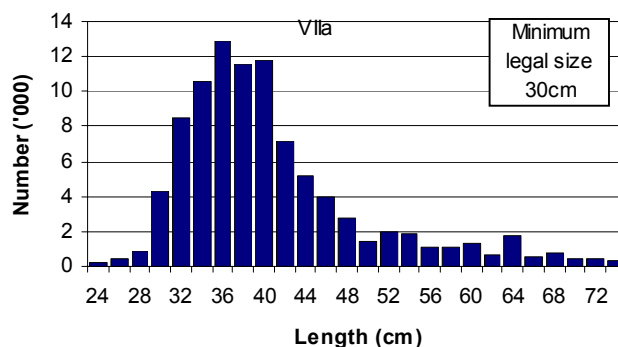
(unchanged since: 1998)

#### Single-stock exploitation boundaries

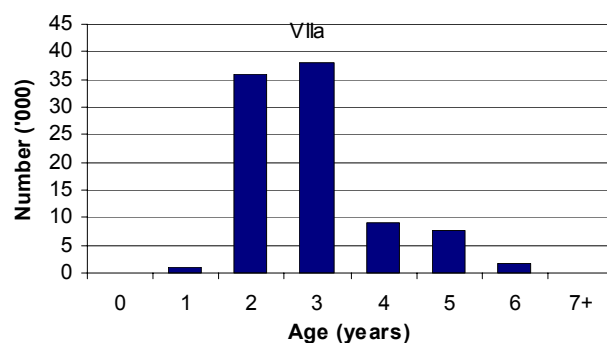
##### Exploitation boundaries in relation to precautionary limits

The available information is inadequate to evaluate spawning stock or fishing mortality relative to precautionary reference points. SSB is increasing and recent recruitments appear to be above average. ICES recommends that fishing effort should not be allowed to increase.

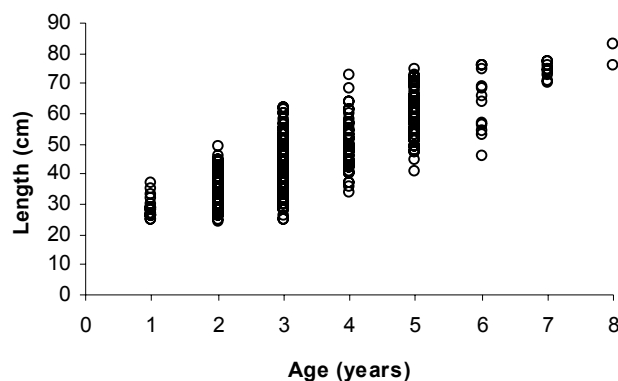
#### 2006 Length Distribution: Irish Landings, Haddock in Vlla



#### 2006 Age Distribution: Irish Landings, Haddock in Vlla



#### 2006 Size at Age: Irish Sampling, Haddock in Vlla



#### Management considerations

There are strong indications that management control is not effective in limiting the catch, and that it has resulted in very uncertain catch data.

The EU Cod Recovery Plan implemented in the Irish Sea from 2004 will affect catches of species caught in related fisheries, including haddock. The current directed fishery for haddock in the Irish Sea is likely to generate bycatches of cod in the same area.



Limited sampling schemes since the 1990s have shown high rates of discarding of haddock less than 3 years old, and variable discarding of 3-year-olds in fisheries using 70- to 80-mm mesh nets. Samples from whitefish vessels since the introduction of 100+ mm mesh and other recent technical measures are too few to form a basis for evaluation of discards in that fleet. However, any measures to reduce discards will result in increased future yield.

## Factors affecting the fisheries and the stock

### Regulations and their effects

Due to the bycatch of cod in the haddock fishery, the regulations affecting Division VIIa haddock remain linked to those implemented under the Irish Sea cod recovery plan. The regulations implemented for cod are detailed in the overview for the Irish Sea. The extent to which fishing mortality may have been reduced in recent years by management measures such as effort limitation and decommissioning of vessels in 2003 could not be reliably evaluated.

## Scientific basis

### Data and methods

An age-based assessment was carried out based on survey information only and is considered to be indicative of trends only.

## Uncertainties in assessment and forecast

Landings data have not been used in the assessment. Landings data for this stock are uncertain because of species misreporting, which has been estimated from quayside observations in one country only. Restrictive quotas for some countries caused extensive misreporting during the 1990s prior to the introduction of a separate TAC allocation for the Irish Sea. Estimates of misreporting prior to 2003 have been included in the estimates of landings.

Furthermore the accuracy of catch-at-age data suffered due to lack of access to port sampling in 2003 at several major ports and only limited access in 2004. A resumption of sampling took place in 2005, but access was again restricted in 2006. There will continue to be uncertainties in the estimated stock status unless full sampling is maintained at all major ports. Therefore landings data have not been used for the assessment.

## Comparison with previous assessment and advice

The perception of the stock from this year's assessment does not differ qualitatively from that obtained last year. The advice last year was to reduce F. Because of the lack of an absolute estimate of F and indications of an increasing stock, the advice this year is to prevent an increase in effort.

## Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official landings	ACFM Landings
1987	Not dealt with					1.287	1.287
1988	Not dealt with					0.747	0.747
1989	Not dealt with					0.560	0.560
1990	Not dealt with					0.582	0.582
1991	Not dealt with					0.616	0.616
1992	Not dealt with					0.656	0.703
1993	Not dealt with					0.730	0.813
1994	Not dealt with					0.681	1.043
1995	Not dealt with				6 <sup>1</sup>	0.841	1.753
1996	No advice				7 <sup>1</sup>	1.453	3.023
1997	Means of setting catch limits req'd				14 <sup>1</sup>	1.925	3.391
1998	Catch limit for VIIa		3.0		20 <sup>1</sup>	3.015	4.902
1999	No increase in F; Catch limit for VIIa		7.0		4.99 <sup>2</sup>	2.370	4.139
2000	Reduce F below F <sub>pa</sub>		<2.8		3.4 <sup>2</sup>	2.447	1.430
2001	Reduce F below F <sub>pa</sub>		<1.71		2.7 <sup>2</sup>	2.238 <sup>3</sup>	2.50
2002	Reduce F below F <sub>pa</sub>		<1.20		1.3 <sup>2</sup>	1.115	1.972
2003	No cod catches		-		0.6 <sup>2</sup>	0.674	n/a
2004	<sup>4)</sup> F<F <sub>pa</sub>	F<F <sub>pa</sub>	4	<1.5	1.5	0.761	n/a
2005	<sup>4)</sup> F<F <sub>pa</sub>	F<F <sub>pa</sub>	4	<1.37	1.37	0.547	n/a
2006	<sup>4)</sup>	Substantial reduction in fishing mortality	4	-	1.275	0.647 <sup>5</sup>	n/a
2007	<sup>4)</sup>	Substantial reduction in fishing mortality	4	-	1.179		
2008	<sup>4)</sup>	No increase in effort	4	-			

Weights in '000 t.

<sup>1</sup> Precautionary TAC for VII, VIII, IX, and X.

<sup>2</sup> VIIa allocation of precautionary TAC.

<sup>3</sup> Incomplete data.

<sup>4</sup> Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

<sup>5</sup> Preliminary.

n/a = not available.

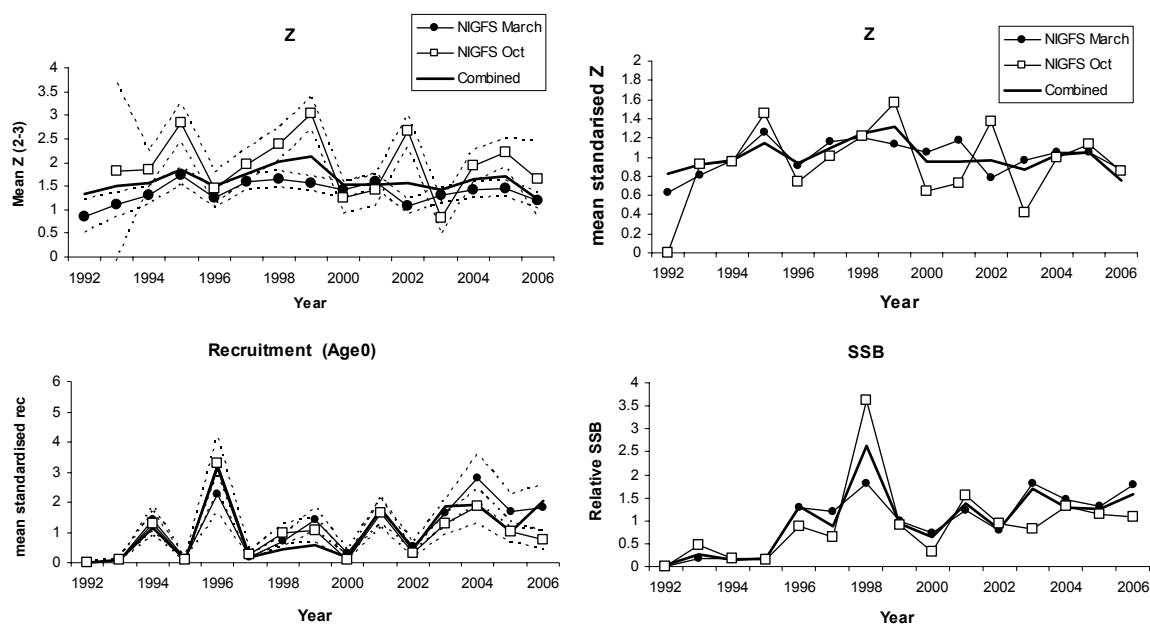


Figure 5.4.3.1

**Table 5.4.3.1** Nominal landings (t) of HADDOCK in Division VIIa, 1984–2006, as officially reported to ICES. (Working Group figures are given in the WG report Table 9.2).

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992
Belgium	3	4	5	10	12	4	4	1	8
France	38	31	39	50	47	n/a	n/a	n/a	73
Ireland	199	341	275	797	363	215	80	254	251
Netherlands	-	-	-	-	-	-	-	-	-
UK (England & Wales) <sup>1</sup>	29	28	22	41	74	252	177	204	244
UK (Isle of Man)	2	5	4	3	3	3	5	14	13
UK (N. Ireland)	38	215	358	230	196	...	...	...	...
UK (Scotland)	78	104	23	156	52	86	316	143	114
Total	387	728	726	1,287	747	560	582	616	703

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	18	22	32	34	55	104	53	22	68
France	41	22	58	105	74	86	n/a	49	184
Ireland	252	246	320	798	1,005	1,699	759	1,238	652
Netherlands	-	-	-	1	14	10	5	2	-
UK (England & Wales) <sup>1</sup>	260	301	294	463	717	1,023	1,479	1,061	1,238
UK (Isle of Man)	19	24	27	38	9	13	7	19	1
UK (N. Ireland)	...	...	...	...	...	...	...	...	...
UK (Scotland)	140	66	110	14	51	80	67	56	86
Total	730	681	841	1,453	1,925	3,015	2,370	2,447	2,229

Country	2002	2003	2004	2005	2006
Belgium	44	20	15	22	23
France	72	146	20	36	18
Ireland	401	229	296	139	183
Netherlands	-	-	-	-	
UK (England & Wales) <sup>1</sup>	551	248	421	344	
UK (Isle of Man)	-	-	-	-	
UK (N. Ireland)	...	...	...	...	...
UK (Scotland)	47	31	9	6	
United Kingdom					423*
Total	1,115	674	761	547	647*

\*Preliminary.

<sup>1</sup>1989–2006 Northern Ireland included with England and Wales.

n/a = not available.

# FUI5 Nephrops in the Western Irish Sea

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

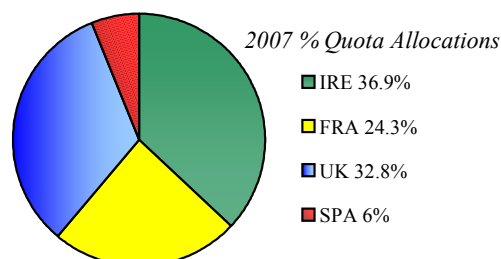
The stock appears to be in good condition and has sustained current levels of effort for many years.

ICES has not given new advice FUI5 *Nephrops* this year. Updated UWTV survey and fishery data does not suggest any change in recent stock perception. Therefore, FSS reiterates last years advice that effort in this fishery should not be allowed to increase compared to 2003–2005 levels. The advice implies maintaining fishing effort in otter trawl fleets using 70-89 mm mesh below recent levels of around 5 million KW days (See page 111). If effort can be effectively controlled, this fishery can be managed without a TAC.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS present an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Irish Sea *Nephrops*, FSS interprets that the proposal would result in the 2007 TAC being maintained in 2008.

## CURRENT MANAGEMENT

- A 'precautionary' TAC area covers Sub-area VII. ICES and FSS recommend that *Nephrops* should be managed at Functional Unit level since the current large TAC area may result in unbalanced exploitation.
- In 2007 the TAC was increased for all of Sub-area VII to 25,153 t, of which Ireland's quota was 9,277 t.
- Division VIIa has two main fisheries in the east (FU 14) and the west (FU 15).
- There are no explicit management objectives or a management plan for this stock. FSS recommend that management objectives be established and that a management plan be developed with stakeholders and implemented for fisheries catching *Nephrops*.
- The following TCMs are in place for *Nephrops* in VIIa after EC 850/98: Minimum Landing Sizes (MLS); total length >70 mm, carapace length >20 mm, tail length >37 mm. Mesh Size Restrictions; Vessels targeting *Nephrops* using towed gears having at least 35% by



weight of this species on board will require 70 mm diamond mesh plus an 80 mm square mesh panel as a minimum or having at least 30% by weight of *Nephrops* on board will require 80 mm diamond mesh.

- A days-at-sea effort limitation has been in place for Irish Sea *Nephrops* vessels since 2004 (See Irish Sea overview).

## ADDITIONAL INFORMATION

1. The Marine Institute in co-operation with Northern Ireland scientists commenced an UWTV survey for the FU 15 stock in 2003. The surveys indicates that the biomass and density has declined by around 40% since 2003 but is still relatively high compared to other *Nephrops* stocks. Other indicators such as size distributions and trawls surveys indicate rather stable trends over a long time. Total landings are thought to be under-reported by around 100% for this stock. Despite this current effort levels appear to be sustainable. If effort can be effectively controlled, this fishery can be managed without a TAC. In the future if the true landings can be established FSS considers that the harvest ratio based on the TV surveys could be adjusted over time to ensure that the stock is exploited at a sustainable rate in the long term. Implicit in this approach is that catch and effort are reported accurately and that the fishery is managed at an appropriate geographic scale (i.e. Functional Unit).
2. Reported Irish landings from FUI5 in 2006 were estimated to be 2,047 t (32% of the total Irish *Nephrops* landings).
3. The LPUEs of Irish *Nephrops* vessels indicates that landable catches fluctuated around 43kg/hr.
4. In 2006, 65 Irish vessels reported *Nephrops* landings. Of these 52 reported significant annual landings in excess of 10 t. This *Nephrops* fleet is by far the largest fleet segment in the Irish Sea. Vessels operating out of Howth, Clogherhead and Skerries take most of the Irish landings.
5. High discarding (~65% of total catch is discarded) is a feature of fisheries catching *Nephrops* in this area. The western Irish Sea *Nephrops* fishery is concentrated on an area that is also a whiting nursery ground. Discarding of juvenile whiting in the *Nephrops* fishery

has contributed significantly to the reduction of the Division VIIa whiting stock.

6. There is also considerable discarding of small *Nephrops* in this fishery. In 2006 Irish vessels discarded an estimated 645 t (24% of catch by weight) of small *Nephrops* or 38% of the total

numbers caught by the Irish fleet. High *Nephrops* discard rates have been sustained in this fishery for many years and the discards component of the catch is well sampled and included in the assessment.

7. There has been no sampling data for these stocks from the commercial fishery in Northern Ireland since 2003 due to non co-operation by the fishing industry with scientists.

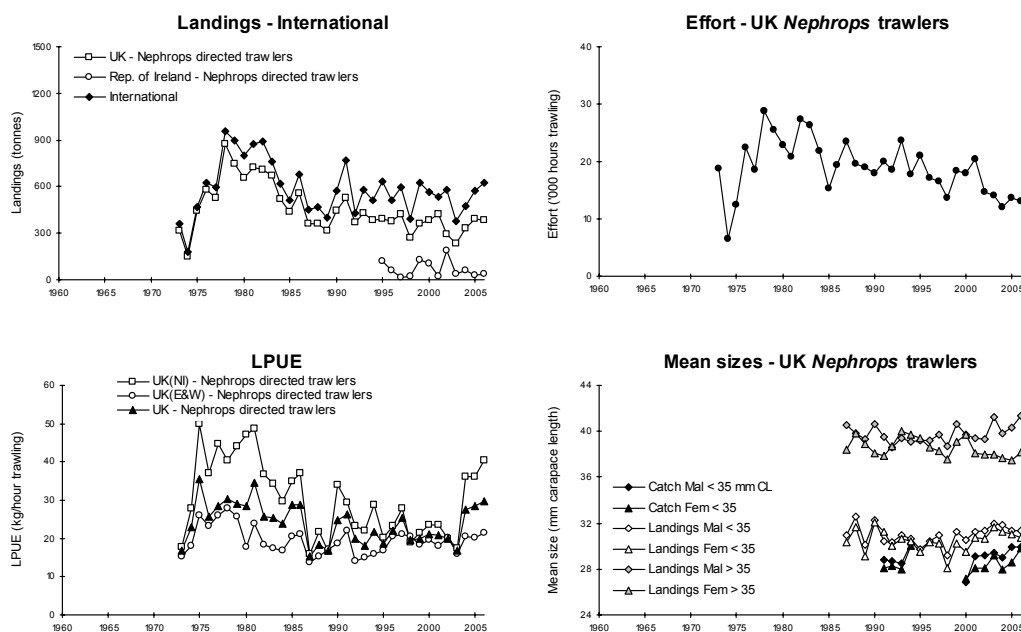


Figure 1. FU 15 Irish Sea West: Long-term trends in landings, effort, CPUEs and/or LPUEs and mean sizes of *Nephrops*.

YEAR	QUARTERS					% DISCARDS BY WEIGHT	% DISCARDS BY NUMBER
	Q1	Q2	Q3	Q4	TOTAL		
2003	307.5	366.4	302.7	43.8	1020.4	27%	42%
2004	168.1	251.2	272.0	75.5	766.7	22%	34%
2005	165.3	83.9	185.0	22.8	457.0	18%	31%
2006	157.7	69.5	345.5	70.5	643.2	24%	38%

Table 1. Percentage Discard Rates of *Nephrops* in FU15 by Weight and Number for Republic of Ireland.

Year	Number of stations	Area Surveyed (M <sup>2</sup> )	Burrow count	Mean Density (No./M <sup>2</sup> )	+/- 95% Confidence Intervals on mean	CV	Raised abundance estimate (million burrows)
2003	166	27,566	42,493	1.66	0.14	4%	9.617
2004	147	23,214	38,484	1.43	0.13	5%	8.291
2005	142	21,415	22,100	1.27	0.12	5%	7.359
2006	144	20,509	22,410	1.20	0.10	4%	6.945
2007*	148	25,155	24,179	1.06	0.09	4%	6.151

\*PRELIMINARY

Table 2. *Nephrops* UWTV survey abundance estimates for grounds in FU 15 from 2003-2007.

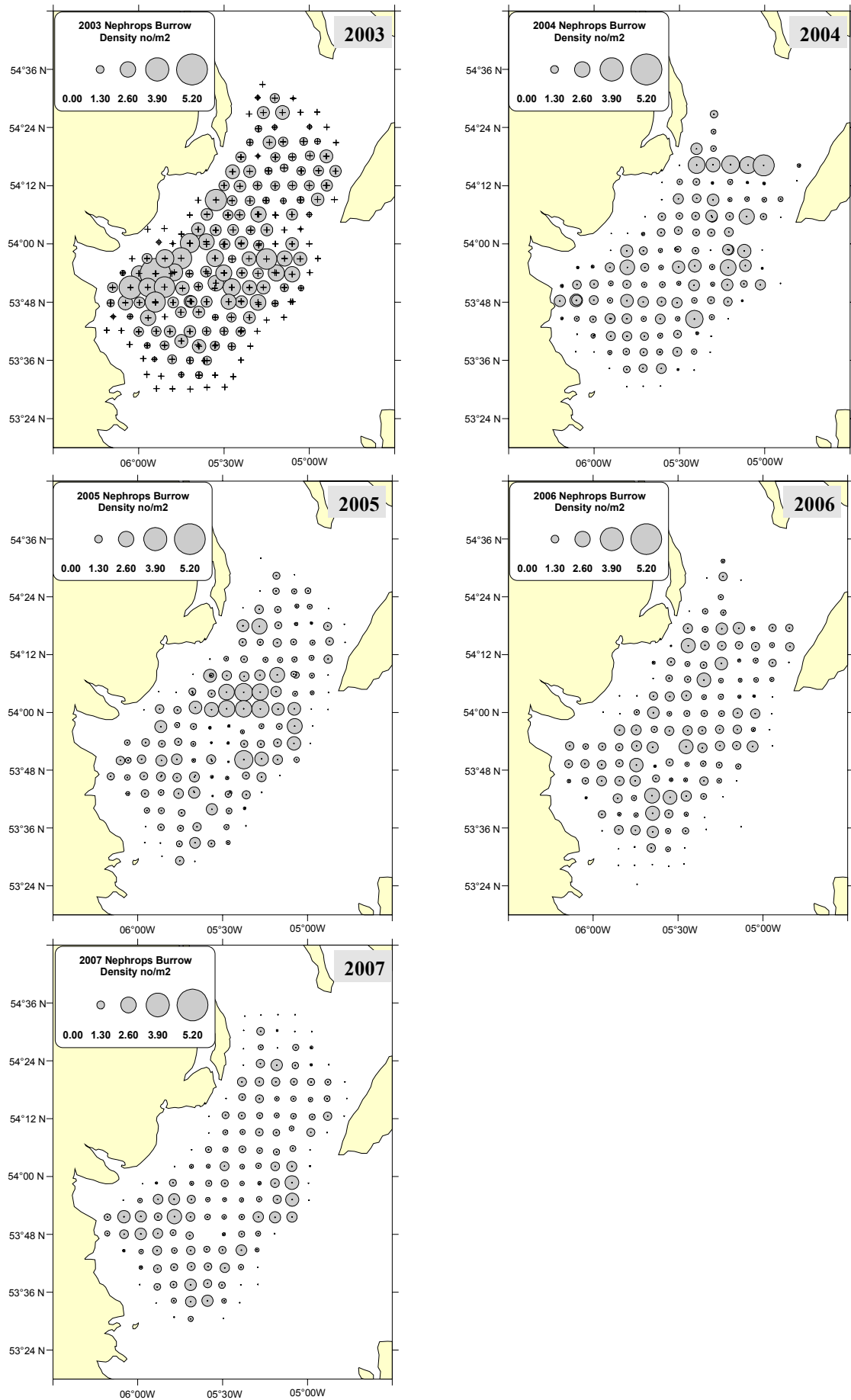


Figure 3. Maps of *Nephrops* UWT survey abundance estimates for grounds in FU 15 from 2003-2007.

# Irish Sea Plaice

## (Division VIIa)

For latest information, see: <http://www.ices.dk>



Marine Institute  
Foras na Mara

Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See Irish Sea Overview for Mixed Fishery Advice)

The assessment shows a consistent increase in SSB and decrease in F in recent years. However the absolute levels are uncertain. FSS consider that the assessment is uncertain, as it does not include discards, which are likely to be substantial.

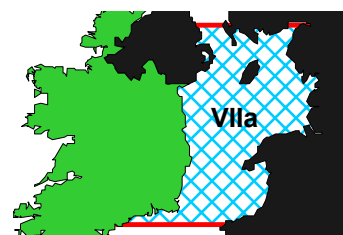
If this stock is to be managed in the short term, given the above indications that the stock is in good condition and increasing, FSS consider that the TAC can be adaptively increased by 15%. This implies a TAC of 2,126 t in 2008 and associated Irish quota of 1,390 t.

However FSS notes that current fishing mortality is around F<sub>0.1</sub> and that little long term yield is gained from increasing fishing mortality above this level. In line with MSY objectives FSS advise that this stock should be managed at F<sub>sq</sub> (0.13), which optimises yield while achieving a low risk of depleting the reproductive potential of the stock. This translates to a TAC in 2008 of 1,740 t and an Irish quota of 1,138 t.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS present an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Irish Sea plaice FSS interpret that the EC fishing opportunity in 2008 will require a 6% decrease in TAC from 2007 levels to 1,740 t

### CURRENT MANAGEMENT

- The TAC for 2007 was 1,849 t with an associated Irish quota of 1,209 t (adjusted quota = 1,244 t). The Hague preference agreement enables Ireland to claim an enhanced share of the TAC.
- There are no explicit management objectives or a management plan for this stock.
- FSS recommend that management objectives be established and that a management plan be developed and implemented for fisheries catching plaice.
- During 2006/2007, in collaboration with the Irish and UK industry, the NWWRAC, national Irish and UK laboratories and administrations, the Irish Sea En-

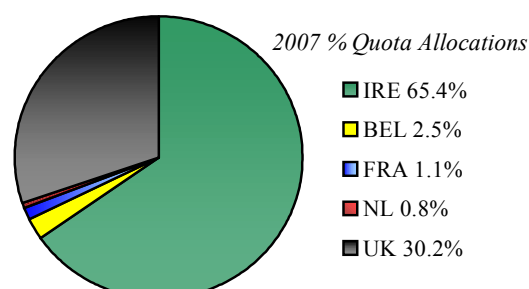


Red Box-TAC/Management Area Blue Shading-Assessment Area

hanced Data Collection Programme was initiated. The consortium secured additional days at sea allocations from the EC for to encourage vessels to participate in the voluntary programme.

### ADDITIONAL INFORMATION

1. Fishing mortality on this stock has been maintained above F<sub>pa</sub> for much of the time-series, but declined through the 1990s. SSB has been above B<sub>pa</sub> throughout the period of assessment.
2. Previous assessments of this stock tended to over-estimate SSB, under estimate fishing mortality and provide poor consistency in estimation of recent recruitment. These tendencies have been reduced in the most recent assessments due to the exclusion of commercial tuning fleet data resulting in increased reliance on the survey data.
3. FSS therefore considers the most recent assessment to be of better quality than previous assessments. However, FSS notes that the surveys indicate a substantial increase in abundance of plaice in recent years that is not apparent from commercial catch data. Estimates of rapidly increasing biomass should be treated with some caution until the discrepancy between the survey and commercial data can be better explained.
4. Discard data suggest that a considerable proportion of the catch may be discarded, although survival rates may be higher than roundfish. Measures to reduce discarding, such as an increase in mesh size, would therefore be beneficial to the stock. As plaice are caught together with sole, any improvements in the exploitation pattern of plaice will result in an increase in the



age of first capture for sole.

5. Total landings were estimated to be 934 t in 2006. Of this, the Irish landings were estimated to be 176 t.
6. Misreporting is not considered a problem in this fishery.
7. UK (England) usually takes over 40% of the total landings. The Irish and Belgian fleets each traditionally take about a quarter of the landings. Effort in the UK and Belgian beam trawl fleets increased in the late 1980s, but declined in the early 1990s.
8. The Irish landings of this stock are taken mainly by otter trawl (targeting mixed species such as cod, whiting and *Nephrops*), but also by beam trawlers targeting sole in quarters 1 and 4. Vessels operating out of Howth, Kilmore Quay and Clogherhead take most of the Irish catch.

## ICES ADVICE

### 5.4.7

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Full reproductive capacity	Harvested sustainably	Underexploited	Not defined

Based on the most recent estimate of SSB and fishing mortality, ICES classifies the stock as having full reproductive capacity and being harvested sustainably. The SSB in 2006 was above  $B_{pa}$ . Fishing mortality has been declining since the late 1980s and has been below  $F_{pa}$  since 1998.

#### Management objectives

There are no explicit management objectives for this stock.

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	Not defined.	There is no biological basis for defining $B_{lim}$ as the stock–recruitment data are uninformative.
	$B_{pa}$	3 100 t	$B_{pa} = B_{loss}$ .
	$F_{lim}$	Not defined.	There is no biological basis for defining $F_{lim}$ as $F_{loss}$ is poorly defined.
	$F_{pa}$	0.45	$F_{pa} = F_{med}$ in a previous assessment, and in long-term considerations. This is considered to provide a high probability that SSB remains above $B_{loss}$ in the long term.
Targets	$F_y$	Not defined.	

(unchanged since: 1998)

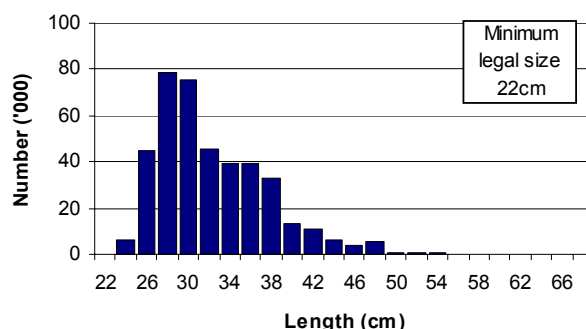
#### Yield and spawning biomass per Recruit

F-reference points:

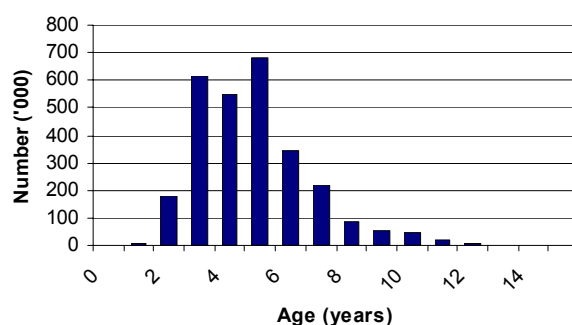
	Fish Mort	Yield/R	SSB/R
	Ages 3–6		
Average last 3 years	0.13	0.19	1.41
$F_{max}$	0.39	0.22	0.58
$F_{0.1}$	0.13	0.20	1.37
$F_{med}$	0.45	0.22	0.52

A candidate for a reference point consistent with high long-term yield and low risk of depleting the productive potential of the stock is around  $F_{0.1}$  (=0.13).

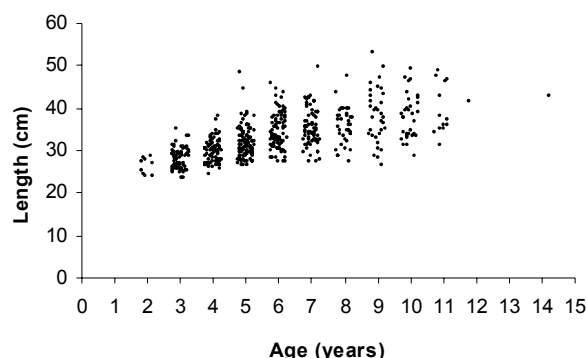
2006 Length Distribution: Irish Beam / Otter trawlers, Plaice in Vlla



2006 Age Composition: International Landings, Plaice in Vlla



2006 Size at Age: Irish Sampling, Plaice in Vlla



### Single-stock exploitation boundaries

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

Fishing mortality is estimated to be below  $F_{0.1}$  (0.13). Fishing at  $F_{0.1}$  is expected to lead to landings of 1700 t in 2008. There would be little gain to the long-term yield by increasing fishing mortalities above current levels.

### Exploitation boundaries in relation to precautionary limits

In order to harvest the stock within precautionary limits, fishing mortality should be kept below  $F_{pa}$  (0.45). This corresponds to catches of less than 5200 t in 2008 and will lead to a reduction in SSB to 10 200 t in 2009.

### Short-term implications

#### Outlook for 2008

Basis:  $F(2007) = F_{sq} = \text{mean } F(03-05) = 0.13$ ;  $R06-08 = \text{GM64-03} = 12.2$  million;  $\text{SSB}(2007) = 11.1$  t;  $\text{SSB}(2008) = 12.4$  t; landings (2007) = 1.55 t.

Rationale	TAC (2008)	Basis	F (2008)	SSB (2009)	% SSB change <sup>1</sup>	% TAC change <sup>2</sup>
Zero catch	0	$F=0$	0	15.1	22%	-100%
High long-term yield	1.74	$F(0.1/\text{long-term yld})$	0.13	13.5	9%	-6%
	0.72	$F_{sq} * 0.4$	0.005	14.4	16%	-61%
	0.90	$F_{sq} * 0.5$	0.006	14.3	15%	-52%
	1.07	$F_{sq} * 0.6$	0.08	14.1	14%	-42%
Status quo	1.24	$F_{sq} * 0.7$	0.09	14.0	13%	-33%
	1.41	$F_{sq} * 0.8$	0.10	13.8	11%	-24%
	1.57	$F_{sq} * 0.9$	0.12	13.6	10%	-15%
	1.74	$F_{sq}$	0.13	13.5	9%	-6%
	1.90	$F_{sq} * 1.1$	0.14	13.3	7%	3%
$F_{pa}$	5.20	$F_{sq} * 3.5$	0.45	10.2	-18%	181%
Weights in '000 t.						
<sup>1</sup> SSB 2009 relative to SSB 2008.						
<sup>2</sup> TAC 2008 relative to TAC 2007.						

### Management considerations

Plaice and sole fisheries in the Irish Sea are less closely linked than in other areas. Plaice are taken in a mixed demersal fishery comprising otter trawl and beam trawl gears. The otter trawl fleet seasonally targets plaice but has declined markedly in the last decade. The beam trawl fleet principally targets sole. The regulations affecting plaice and other demersal stocks in Division VIIa remain linked to those implemented under the Irish Sea cod recovery plan.

### Scientific basis

#### Data and methods

The assessment is based on a catch-at-age analysis, using landings data and data from one age-disaggregated and two biomass surveys. Landings are at the lowest level in the time-series, but information on misreporting is not available. Discard levels are substantial in the fishery, but the time-series is too short to be incorporated into the assessment.

#### Uncertainties in assessment and forecast

Discard sampling studies have indicated discarding up to 80% by number. Discards are not included in the assessment. The assessment may thus be biased, but it is not known to what extent.

There are conflicting signals in the survey and commercial tuning fleet indices. The commercial tuning fleet indices are not used in the assessment as they give inconsistent trends.

The assessment is strongly influenced by survey trends and the retrospective analysis indicates that the assessment overestimates stock size.

#### Comparison with previous assessment and advice

Trends in SSB and fishing mortality are broadly consistent with last year's assessment although F values for the final year have been revised upwards marginally (4%). SSB in 2006 has been revised downwards by 34%. The basis of the advice is the same as last year.

### Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).



Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official landings	ACFM Landings
1987	F high; no long-term gains in increasing F		5.0		5.0	5.6	6.2
1988	No increase in F		4.8		5.0	4.4	5.0
1989	80% of F(87); TAC		5.8		5.8	4.2	4.4
1990	Halt decline in SSB; TAC		5.1		5.1	4.0	3.3
1991	Rebuild SSB to SSB(90); TAC		3.3		4.5	2.8	2.6
1992	70% of F(90)		3.0		3.8	3.2	3.3
1993	F = 0.55 ~ 2800 t		2.8		2.8	2.0	2.0
1994	Long-term gains in decreasing F		<3.7		3.1	2.1	2.1
1995	Long-term gains in decreasing F		2.4 <sup>1</sup>		2.8	2.0	1.9
1996	No long-term gain in increasing F		2.5		2.45	1.9	1.7
1997	No advice		-		2.1	2.0	1.9
1998	No increase in F		2.4		2.4	1.8	1.8
1999	Keep F below $F_{pa}$		2.4		2.4	1.6	1.6
2000	Keep F below $F_{pa}$		<2.3		2.4	1.4	1.4
2001	Keep F below $F_{pa}$		<2.4		2.0	1.5	1.5
2002	Keep F below $F_{pa}$		<2.8		2.4	1.5	1.6
2003	No increase in F		1.9		1.675	1.6	1.6
2004	<sup>2</sup>	$F < F_{pa}$		1.6	1.34	1.1	1.1
2005	<sup>2</sup>	$F < F_{pa}$		2.97	1.608	1.3	1.3
2006	<sup>2</sup>	$F < F_{pa}$		5.9	1.608	0.9	0.9
2007	<sup>2</sup>	$F < F_{pa}$		6.5	1.849		
2008	<sup>2</sup>	$F < F_{pa}$		5.2			

Weights in '000 t.

<sup>1</sup> Catch at *status quo* F.

<sup>2</sup> Single-stock boundary, the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

Plaice in Division VIIa (Irish Sea)

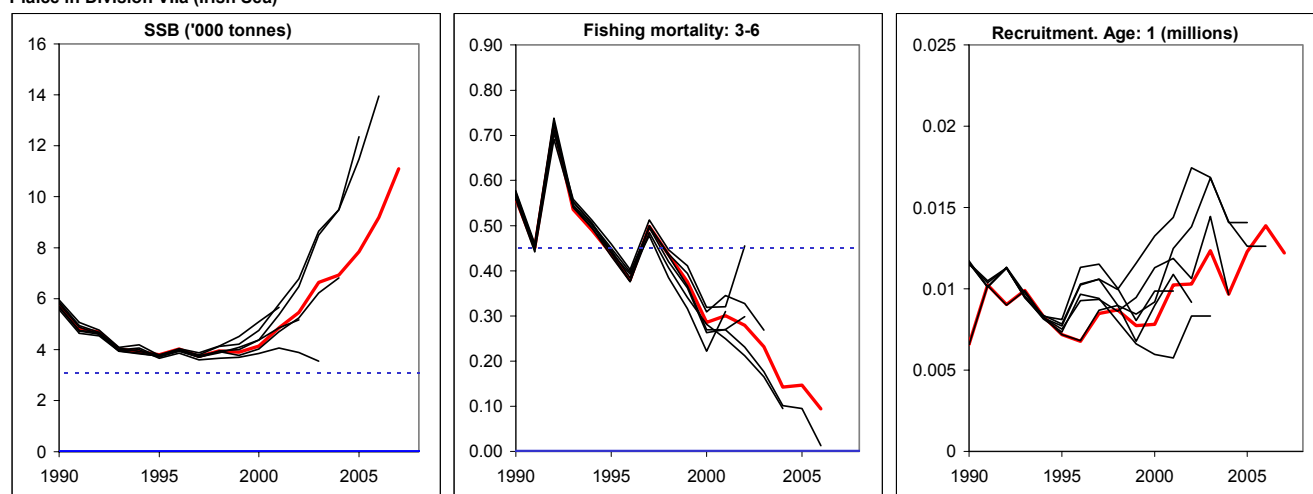
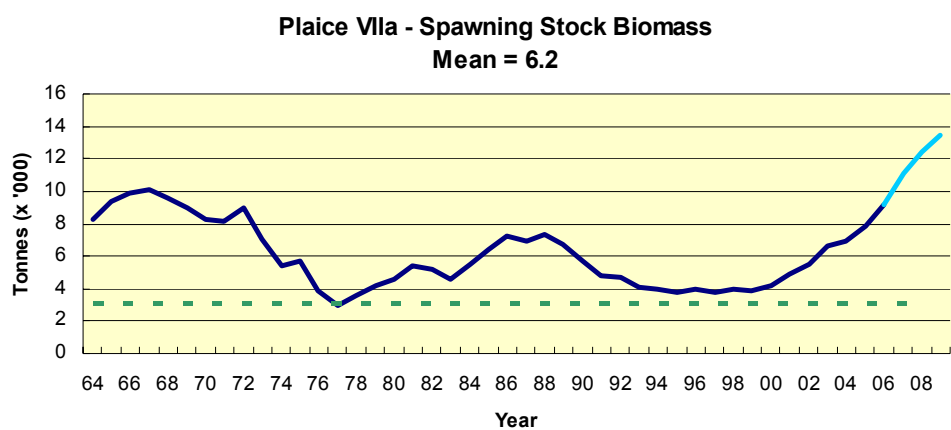
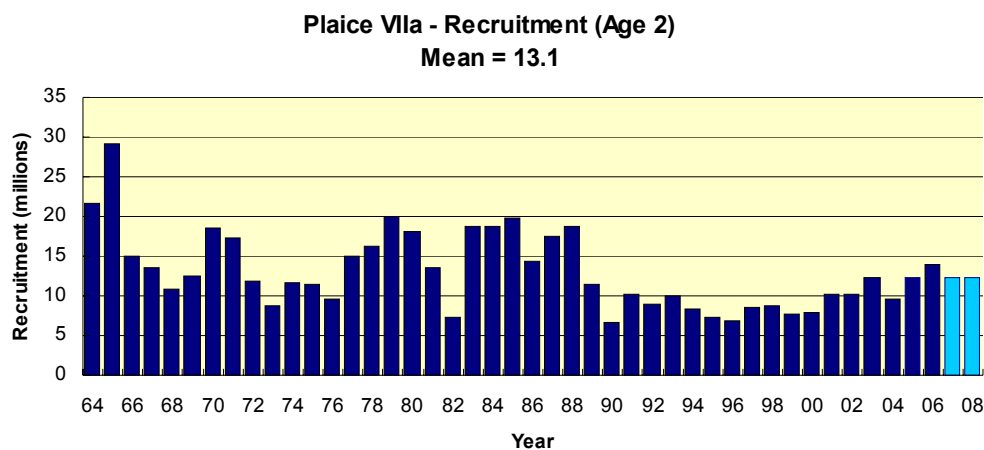
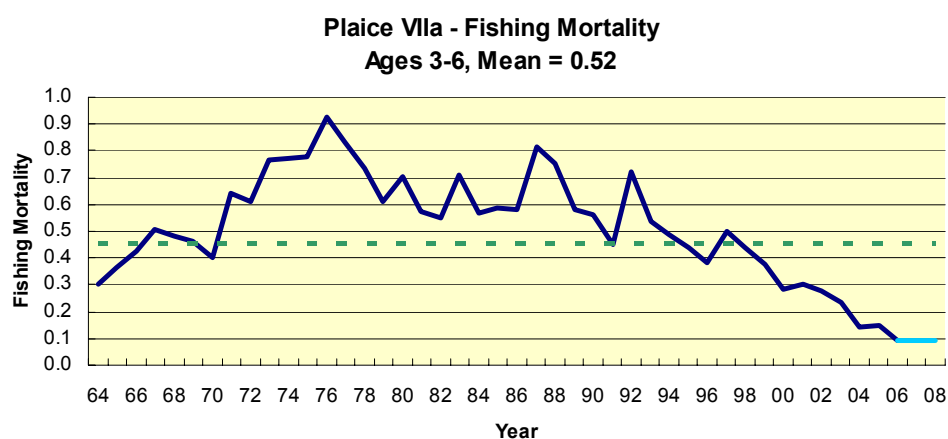
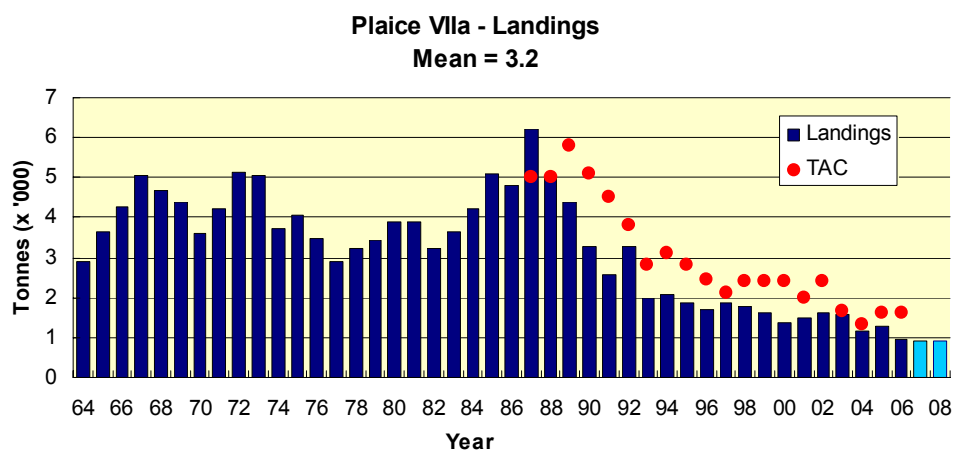


Figure 5.4.7.3

Plaice in Division VIIa (Irish Sea). Comparison of current assessment with previous assessments.



**Table 11.1.2.1** Nominal landings (t) of PLAICE in Division VIIa as officially reported to ICES.

Country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 <sup>1</sup>
Belgium	321	128	332	327	3443	459	327	275	325	482	636	628	431	566	345
France	42	19	13	10	11	8	8	5	14	91	8	7	2	9	2
Ireland	1,355	654	547	557	538	543	730	541	420	378	370	490	328	272	176
Netherlands	-	-	-	-	69	110	27	30	47	-	-	-	-	-	-
UK (Eng.&Wales) <sup>2</sup>	1,381	1,119	1,082	1,050	878	798	679	687	610	607	569	409	369	422	411
UK (Isle of Man)	24	13	14	20	16	11	14	5	6	1	1	1	0	0	0
UK (N. Ireland)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
UK (Scotland)	70	72	63	60	18	25	18	23	21	11	7	9	4	1	0
UK (Total)															
Total	3,193	2,005	2,051	2,024	1,874	1,954	1,803	1,566	1,443	1,488	1,591	1,544	1,134	1,270	934
Discards	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unallocated	74	-9	15	-150	-167	-83	-38	34	-72	-15	31	10	-19	226	-2

Total figures used by  
the Working Group

for stock assessment 3,267 1,996 2,066 1,874 1,707 1,871 1,765 1,600 1,371 1,473 1,623 1,559 1,143 1,281 932

<sup>1</sup>Provisional.

<sup>2</sup>Northern Ireland included with England and Wales.

{UK (Total) excludes Isle of Man data}.

**Table 5.4.7.2** Plaice in Division VIIa (Irish Sea).

Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3–6
1964	21660	8261	2879	0.304
1965	29070	9360	3664	0.365
1966	15070	9885	4268	0.426
1967	13590	10090	5059	0.508
1968	10900	9550	4695	0.481
1969	12500	9009	4394	0.462
1970	18540	8298	3583	0.403
1971	17280	8115	4232	0.640
1972	11820	8949	5119	0.612
1973	8745	7013	5060	0.766
1974	11710	5427	3715	0.770
1975	11510	5669	4063	0.776
1976	9662	3903	3473	0.923
1977	15010	3003	2904	0.835
1978	16170	3541	3231	0.735
1979	20090	4152	3428	0.612
1980	18190	4622	3903	0.701
1981	13550	5409	3906	0.576
1982	7386	5149	3237	0.549
1983	18730	4536	3639	0.708
1984	18770	5509	4241	0.567
1985	19800	6382	5075	0.588
1986	14380	7244	4806	0.580
1987	17590	6880	6220	0.815
1988	18820	7335	5005	0.753
1989	11500	6688	4372	0.580
1990	6605	5747	3275	0.560
1991	10240	4808	2554	0.451
1992	9053	4684	3267	0.720
1993	9916	4028	1996	0.536
1994	8297	3936	2066	0.490
1995	7191	3800	1874	0.438
1996	6779	4025	1707	0.380
1997	8488	3740	1871	0.498
1998	8709	3949	1765	0.436
1999	7752	3910	1600	0.376
2000	7824	4139	1371	0.285
2001	10230	4852	1473	0.301
2002	10300	5456	1623	0.280
2003	12340	6644	1559	0.232
2004	9671	6927	1143	0.143
2005	12280	7843	1281	0.147
2006	13890	9195	932	0.094
2007	12207	11100		
Average	13041	6199	3245	0.521

# Irish Sea Sole

## (Division VIIa)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See Irish Sea Overview for Mixed Fishery Advice)

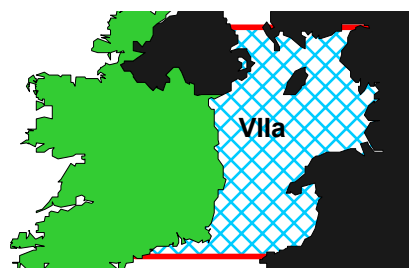
The stock is harvested unsustainably and is of reduced reproductive capacity. SSB is below  $B_{lim}$  and is the lowest in the time series. The stock has suffered from five years of poor recruitment and in order to increase SSB above  $B_{pa}$  fishing mortality must be reduced significantly.

This year an analytical assessment was conducted based on revised catch and weight-at-age. A change in exploitation pattern has been observed in recent assessments, resulting in a rescaling of the estimates of SSB and fishing mortality from 1987 onwards. The absolute estimates of SSB were rescaled downwards and those of F rescaled upwards, both by around 30%. Despite this scaling, trends in SSB and F remain similar. However, the stock is now considered to be below  $B_{lim}$ .

FSS advises that directed fisheries for sole should not be permitted in 2008 and that by-catches of sole be reduced to the lowest level possible in other fisheries. FSS recommends that a recovery plan be implemented that ensures a rapid and safe rebuilding of SSB to levels above  $B_{pa}$ .

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Irish Sea sole, FSS interprets that the proposal would result in a 2008 TAC of 670 t which represents a reduction of 18% from 2007.

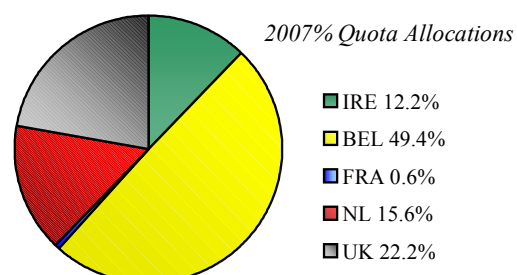
Fishing mortality is estimated to be well above  $F_{0.1}$  (0.20). There will be little gain to the long-term yield by increasing fishing mortalities above  $F_{0.1}$ . A management plan for effort reduction that can be phased in over a number of years and implemented in conjunction with technical conservation measures should be considered.



Red Box-TAC/Management Area Blue Shading- Assessment Area

### CURRENT MANAGEMENT

- The TAC area (Division VIIa) corresponds to the assessment area.
- The TAC in 2007 was 816 t with an Irish quota of 99 t (adapted to 111 t).
- FSS recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching sole.



### ADDITIONAL INFORMATION

1. Given the major revision in SSB,  $B_{pa}$  has been decreased from 3,800 t to 3,100 t and  $B_{lim}$  from 2,800 t to 2,200 t
2. There are indications that area misreporting of sole occurs, and there are also indications that some fleets are not limiting their catches to their quota
3. Estimated Irish landings were about 83 t in 2006.
4. The Irish Sole fishery in VIIa is mainly undertaken by beam trawlers in quarters I and 4. Sole are also a by-catch in demersal otter trawl fisheries.
5. Information on discards is very limited, but indicates that discarding rates are relatively low (<5% by weight).
6. Increasing the age at first capture by increasing the minimum mesh size coupled to an increase in minimum landing size for sole will help alleviate the high discard rates of plaice and would improve the sole exploitation pattern.
7. There are cod by-catches in the sole fishery but the closures of cod spawning-grounds in place since 2000 are unlikely to have had a big impact on the sole fish-

ery. In 2000 the closure covered the Western and Eastern Irish Sea. Since then, the closure has been mainly in the Western part, whereas the main sole fishery takes place in the Eastern part of the Irish Sea.

## ICES ADVICE

### 5.4.12

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to high long-term yield	Fishing mortality in relation to agreed target
Reduced reproductive capacity	Harvested unsustainably	Over exploited	Not defined

Based on the most recent estimates of SSB and fishing mortality, ICES classifies the stock as suffering reduced reproductive capacity and being harvested unsustainably. SSB has declined since 2001 to low levels and reached the lowest level in 2006. Fishing mortality has been close to or above  $F_{lim}$  throughout most of the time-series. Recent recruitment levels have been lower than earlier in the time-series.

#### Management objectives

There are no explicit management objectives for this stock.

#### Reference points

*Yield and spawning biomass per Recruit from 2007 assessment*

	Fish Mort Ages 4–7	Yield/R	SSB/R
Average last 3 years	0.41	0.19	0.55
$F_{max}$	1.79	0.20	0.19
$F_{0.1}$	0.20	0.17	1.01
$F_{med}$	0.26	0.18	0.81

#### F-reference point:

Candidates for reference points which are consistent with taking high long-term yields and achieving a low risk of depleting the productive potential of the stock may be identified at around  $F_{0.1}$ .

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	2200 t	$B_{lim} = B_{loss}$ The lowest observed spawning stock, followed by an increase in SSB.
	$B_{pa}$	3100 t	$B_{pa} \sim B_{lim} * 1.4$ . The minimum SSB required ensuring a high probability of maintaining SSB above its lowest observed value, taking into account the uncertainty of assessments.
	$F_{lim}$	0.40	$F_{lim} = F_{loss}$ . Although poorly defined, there is evidence that fishing mortality in excess of 0.4 has led to a general stock decline and is only sustainable during periods of above-average recruitment.
	$F_{pa}$	0.30	This F is considered to have a high probability of avoiding $F_{lim}$ .
Targets	$F_y$	Not defined.	

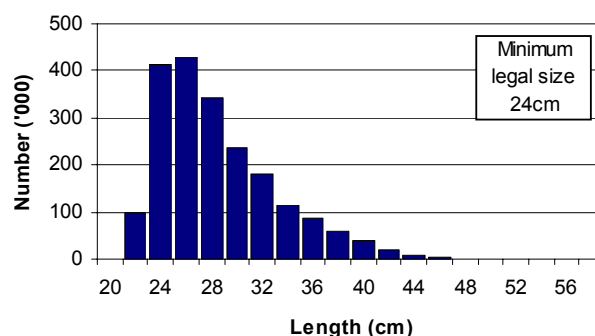
(changed in 2007, SSB estimates rescaled)

#### Single-stock exploitation boundaries

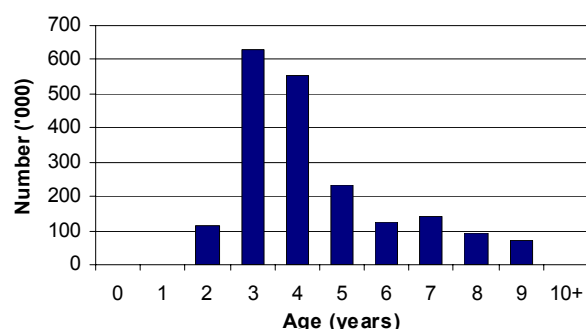
Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

Fishing mortality is estimated to be well above  $F_{0.1}$  (0.2). There will be little gain to the long-term yield by increasing fishing mortalities above  $F_{0.1}$ .

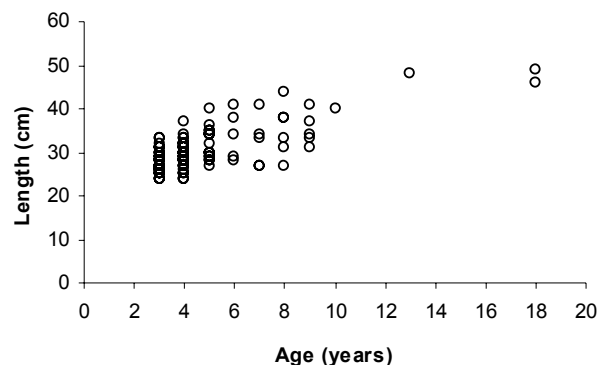
#### 2006 Length Dist.: UK, Ireland & Belgium, Sole in Vlla



#### 2006 Age Composition: International Landings, Sole in Vlla



#### 2006 Size at Age: Irish Sampling, Sole in Vlla



#### Exploitation boundaries in relation to precautionary limits

Given the low SSB and low recruitment since 2000, it is not possible to identify any non-zero catch which will be compatible with the precautionary approach.

## Short-term implications

### Outlook for 2008

Basis:  $F(2007) = F_{sq} = \text{mean } F(04-06) = 0.41$ ;  $R07 = RCT3 = 3.4$  million;  $R08-09 = GM70-04 = 5.8$  million;  $SSB(2007) = 1.79$  kt;  $SSB(2008) = 1.97$  kt; landings (2007) = 0.62 kt.

Rationale	TAC(2008)	Basis	F(2008)	SSB(2009)	%SSB change <sup>1</sup>	% TAC change <sup>2</sup>
Zero catch	0.00	$F=0$	0.00	2.93	49%	-100%
High long-term yield	0.33	$F(\text{long-term yield})$	0.20	2.59	32%	-55%
	0.08	$F_{sq} * 0.1$	0.04	2.86	45%	-90%
Status quo	0.19	$F_{sq} * 0.25$	0.10	2.75	40%	-77%
	0.37	$F_{sq} * 0.5$	0.20	2.59	32%	-55%
	0.52	$F_{pa} = F_{sq} * 0.74$	0.30	2.44	24%	-36%
	0.62	$F_{sq} * 0.9$	0.37	2.36	20%	-25%
	0.67	$F_{sq} * 1$	0.41	2.30	17%	-18%
	0.73	$F_{sq} * 1.1$	0.45	2.25	15%	-11%
	0.81	$F_{sq} * 1.25$	0.51	2.18	11%	-1%

All weights in thousand tonnes.

Shaded scenarios are not considered consistent with the precautionary approach.

<sup>1</sup> SSB 2009 relative to SSB 2008.

<sup>2</sup> TAC 2008 relative to TAC 2007.

## Management considerations

It is not possible for the stock to reach  $B_{pa}$  in one year – a complete closure of the fishery in 2008 would bring SSB above  $B_{lim}$  in 2009. A management plan for effort reduction that can be phased in over a number of years and implemented in conjunction with technical conservation measures should be considered.

Given the successive recent low recruitment, predictions become more dependent on the assumed incoming recruitment. Almost 50% of the predicted SSB in 2009 is based on that assumption.

Sole is caught in a mixed fishery with other flatfish as well as gadoids. Information from observer trips indicates that discarding of sole is relatively low.

## Factors affecting the fisheries and the stock

### The effects of regulations

Technical measures in force are minimum mesh sizes and minimum landing size (24 cm).

The closures of cod spawning-grounds that have been in force since 2000 are unlikely to have had a big impact on the sole fishery. In 2000 the closure covered the Western and Eastern Irish Sea. Since then, closure has been mainly in the western part, whereas the main sole fishery has taken place in the eastern part of the Irish Sea.

## Scientific basis

The assessment is based on landings-at-age data and two survey indices.

## Uncertainties in assessment and forecast

The catch data from 2001 to 2005 were screened and slightly revised. No major anomalies were found, except for the weight-at-age data of 2004. These weights-at-age remain higher compared to other years due to a low male/female sex ratio in that year (on average males weigh less than females). The 2004 weights-at-age were not used to calculate the weights-at-age used in the forecast.

The retrospective analysis indicates poor convergence of the assessment for both SSB and  $F_{bar}(4-7)$  but shows little evidence of substantial retrospective bias.

## Comparison with previous assessment and advice

XSA was used to assess Irish Sea sole, both this year and last year. However, a change in exploitation pattern was observed, resulting in a major revision in the estimates of SSB and fishing mortality from 1987 onwards. The absolute estimates of SSB were rescaled downwards and of  $F$  upwards, both by around 30%. Despite this scaling effect the trends in SSB and  $F$  remain similar. No changes in absolute estimates of recruitment were apparent.

Given the major revision of the SSB and  $F$  estimates, the reference points were recalculated using the same basis as before. This resulted in a change of the biomass reference points, but not of the  $F$  reference points.  $B_{lim}$  was changed from 2800 t to 2200 t and  $B_{pa}$  from 3800 t to 3100 t.

Neither the advice nor the basis has changed compared to last year.

## Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official Landings	ACFM Landings <sup>2</sup>
1987	No increase in F		1.9		2.1	2.0	2.8
1988	80% of F(86); TAC		1.6		1.75	1.9	2.0
1989	80% of F(87); TAC		< 1.48		1.48	1.8	1.8
1990	Interim advice		1.05 <sup>3</sup>		1.5	1.6	1.6
1991	90% of F(89); TAC		1.3		1.5	1.2	1.2
1992	No long-term gains in increased F		1.2 <sup>1</sup>		1.35	1.2	1.3
1993	F = F(91) ~ 920 t		0.92		1.0	1.0	1.0
1994	No long-term gains in increased F		1.51 <sup>1</sup>		1.5	1.4	1.4
1995	20% reduction in F		0.8		1.3	1.3	1.3
1996	20% reduction in F		0.8		1.0	1.0	1.0
1997	20% reduction in F		0.8		1.0	1.0	1.0
1998	20% reduction in F		0.85		0.9	0.9	0.9
1999	Reduce F below $F_{pa}$		0.83		0.9	0.8	0.9
2000	Reduce F below $F_{pa}$		< 1.08		1.08	0.8	0.8
2001	Reduce F below $F_{pa}$		< 0.93		1.1	1.0	1.1
2002	Keep F below $F_{pa}$		< 1.10		1.1	1.0	1.1
2003	Keep F below $F_{pa}$		< 1.01		1.01	1.0	1.0
2004	<sup>4</sup>	Maintain SSB above $B_{pa}$		< 0.79	0.80	0.6	0.7
2005	<sup>4</sup>	$F < F_{pa}$		< 1.00	0.96	0.77	0.8
2006	<sup>4</sup>	Recent catch levels (2002–2004)		< 0.93	0.96	0.57	0.57
2007	Maintain SSB above $B_{pa}$	Zero catch		0	0.82		
2008		Zero catch		0			

Weights in '000 t.

<sup>1)</sup> Catch at *status quo* F.

<sup>2)</sup> Not including misreporting.

<sup>3)</sup> Revised in 1990 to 1.5.

<sup>4)</sup> Single-stock boundary; the exploitation of this stock should be conducted in the context of mixed fisheries.

Sole in Division VIIa (Irish Sea)

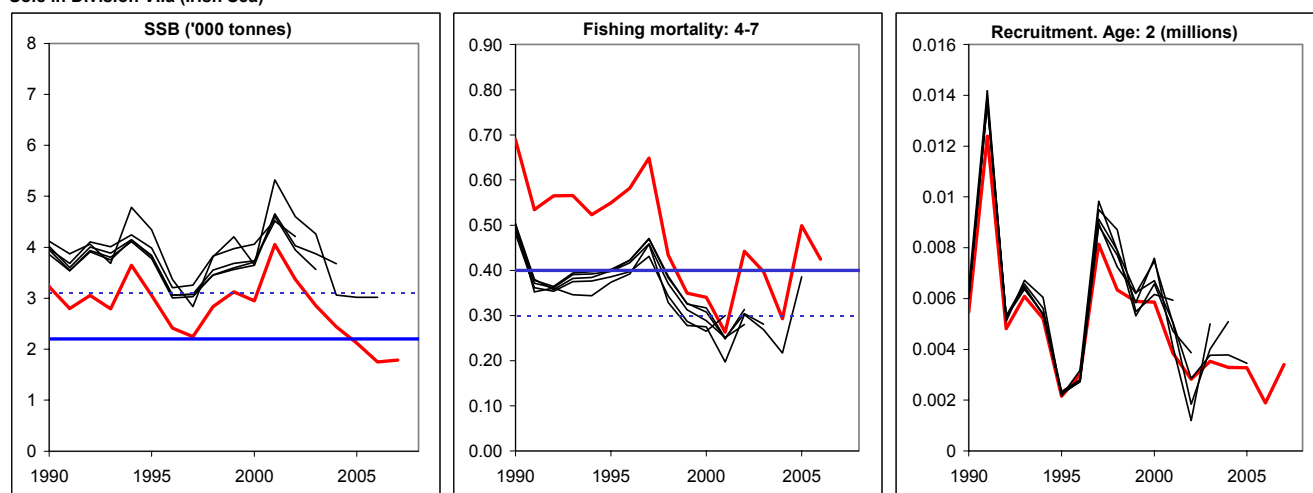
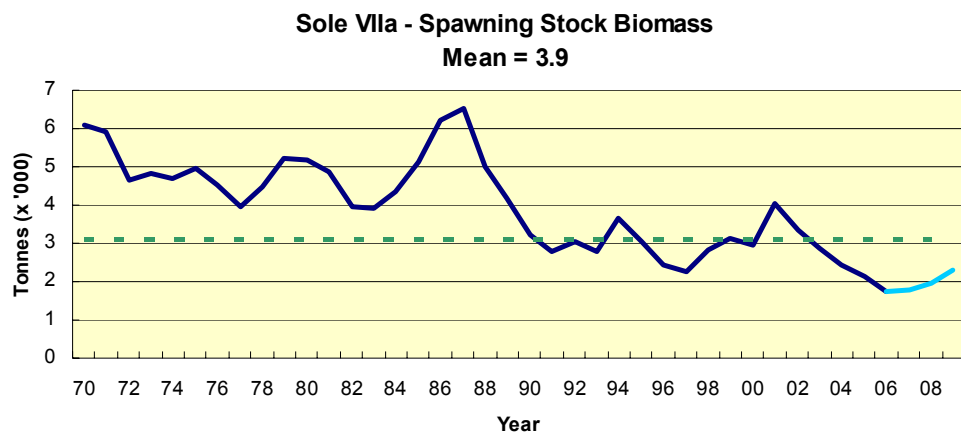
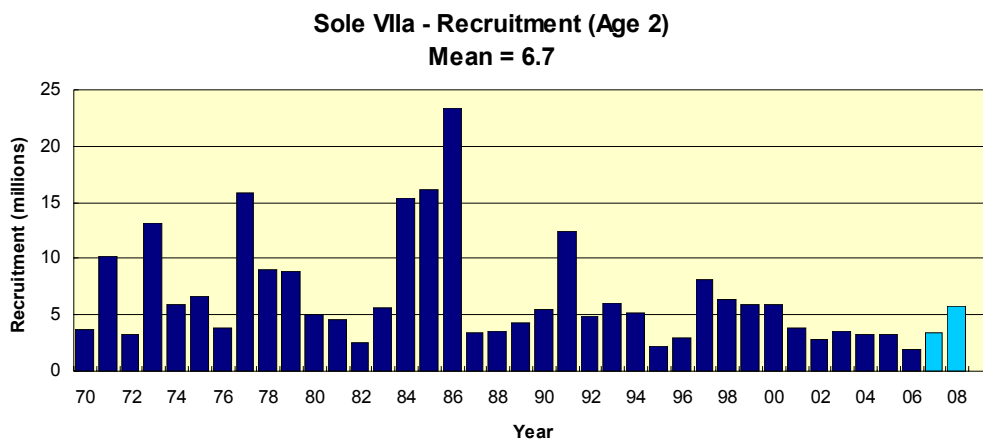
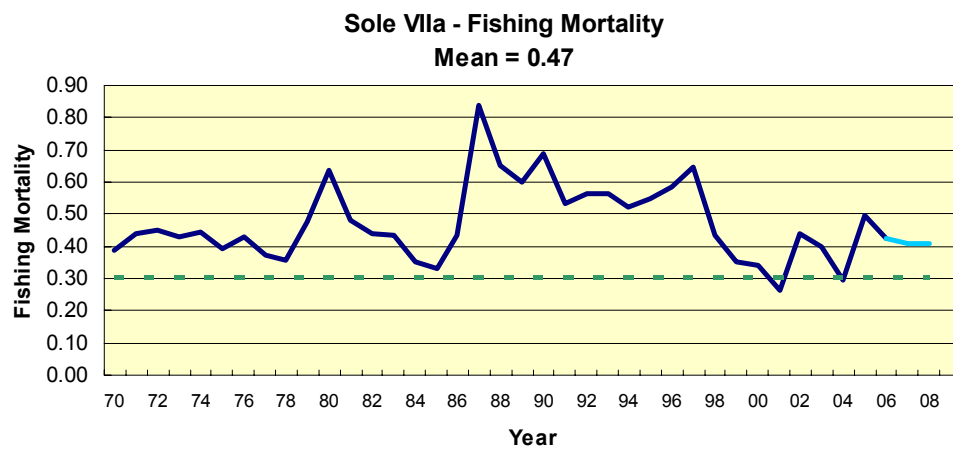
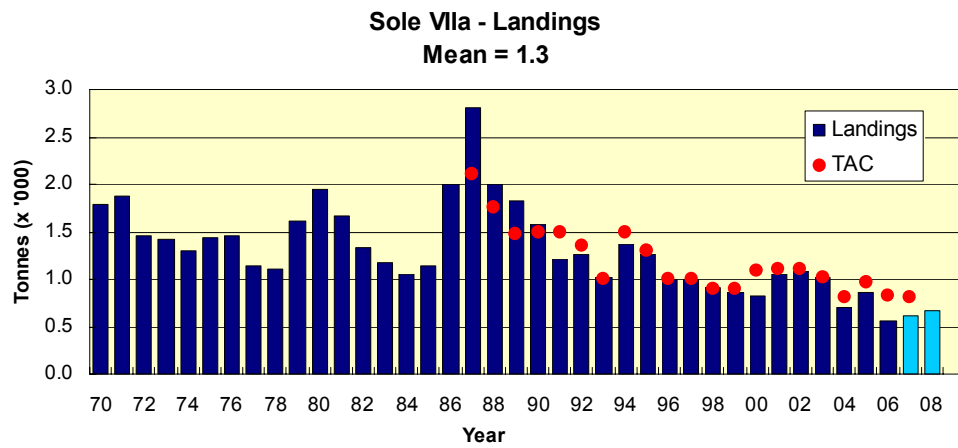


Figure 5.4.12.3 Sole in Division VIIa. Comparison of current assessment with previous assessments.





**Table 12.2.1 - Irish Sea Sole.** Nominal landings (tonnes) as officially reported by ICES, and working group estimates of the landings.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Belgium	930	987	915	1010	786	371	531	495	706	675	533	570	525	469	493	674	817	687	527	662	419
France	17	5	11	5	2	3	11	8	7	5	5	3	3	1	3	4	4	4	1	3	0
Ireland	235	312	366	155	170	198	164	98	226	176	133	130	134	120	135	135	96	103	77	85	83
Netherlands	-	-	-	-	-	-	-	-	-	-	149	123	60	46	60	-	-	-	-	-	-
UK (Engl.& Wales) <sup>1</sup>	637	599	507	613	569	581	477	338	409	424	194	189	161	165	133	195	165	217	106	103	69.4
UK (Isle of Man)	1	3	1	2	10	44	14	4	5	12	4	5	3	1	1	+	+	+	+	+	+
UK (N. Ireland) <sup>1</sup>	50	72	47																		
UK (Scotland)	46	63	38	38	39	26	37	28	14	8	5	7	9	8	8	4	3	3	1	1	n/a
<b>Total</b>	<b>1,916</b>	<b>2,041</b>	<b>1,885</b>	<b>1,823</b>	<b>1,576</b>	<b>1,223</b>	<b>1,234</b>	<b>971</b>	<b>1,367</b>	<b>1,300</b>	<b>1,023</b>	<b>1,027</b>	<b>895</b>	<b>810</b>	<b>833</b>	<b>1,012</b>	<b>1,085</b>	<b>1,014</b>	<b>712</b>	<b>854</b>	<b>572</b>
Unallocated	79	767	114	10	7	-11	25	52	7	-34	-21	-24	16	54	-15	41	2	0	-13	1	-3
Total used by Working Group in Assessment	1,995	2,808	1,999	1,833	1,583	1,212	1,259	1,023	1,374	1,266	1,002	1,003	911	863	818	1,053	1,087	1,014	699	855	569

\* Preliminary

<sup>1</sup> 1989 onwards: N. Ireland included with England & Wales

**Table 5.4.12.2** Sole in Division VIIa (Irish Sea).

Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4–7
1970	3695	6070	1785	0.390
1971	10178	5895	1882	0.440
1972	3186	4652	1450	0.451
1973	13136	4830	1428	0.430
1974	5872	4705	1307	0.444
1975	6682	4960	1441	0.395
1976	3858	4505	1463	0.427
1977	15778	3941	1147	0.370
1978	9046	4488	1106	0.358
1979	8862	5223	1614	0.475
1980	5081	5189	1941	0.636
1981	4512	4883	1667	0.480
1982	2477	3944	1338	0.440
1983	5627	3898	1169	0.434
1984	15422	4343	1058	0.350
1985	16107	5130	1146	0.332
1986	23415	6226	1995	0.432
1987	3403	6541	2808	0.840
1988	3501	4993	1999	0.651
1989	4349	4160	1833	0.601
1990	5490	3226	1583	0.689
1991	12388	2799	1212	0.535
1992	4808	3058	1259	0.565
1993	6092	2792	1023	0.566
1994	5214	3647	1374	0.523
1995	2161	3056	1266	0.549
1996	3007	2419	1002	0.582
1997	8152	2246	1003	0.649
1998	6335	2836	911	0.434
1999	5885	3128	863	0.350
2000	5858	2952	818	0.340
2001	3843	4056	1053	0.263
2002	2826	3368	1090	0.442
2003	3528	2852	1014	0.397
2004	3296	2442	709	0.293
2005	3280	2123	855	0.499
2006	1886	1750	569	0.425
2007	3400	1790		
Average	6622	3924	1329	0.472

# Irish Sea Herring

(Division VIIa North)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

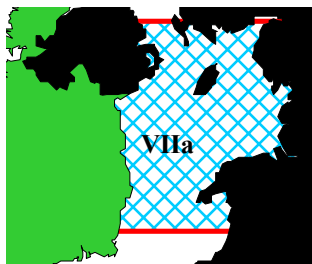
## FSS – SINGLE STOCK CONSIDERATIONS

(See Irish Sea Overview for Mixed Fishery Advice)

ICES classifies the state of this stock as unknown. SSB is unknown but is thought to be stable at a low level. Recent catches of 4,400 t do not appear to be detrimental to the stock. There was no accepted assessment in 2007.

FSS agrees with the ICES and STECF advice that catches in 2008 should not be above 4,400 t. This TAC is based on catches in recent years and translates to an Irish quota of 1,145 t.

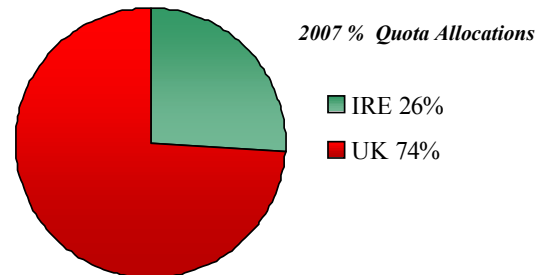
FSS is aware of the EC proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 46). For Irish Sea herring, FSS interprets that the EU fishing opportunities of 2008 will result in a 15% decrease in TAC and will take into account the scientific advice.



Red Box–TAC/Management Area Blue Shading– Assessment Area

## CURRENT MANAGEMENT

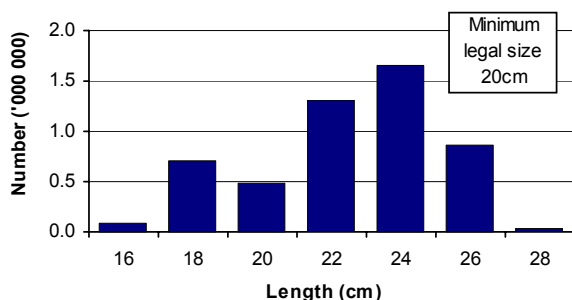
- The TAC for this stock is set by EU and remained at 4,800 t for 2007. The Irish share of the TAC was 1,250 t (26%).
- There is no overall management objective or management plan for this stock.
- There are two closed areas in operation to protect the spawning stock during part of the spawning season and to prevent exploitation of juveniles. These measures were introduced during the period of the industrial fishery in the Irish Sea (1969 – 1979). The areas are off the Louth and Down coast, and the east of the Isle of Man and are closed from September 21<sup>st</sup> to 31<sup>st</sup> December annually (See appendix II).



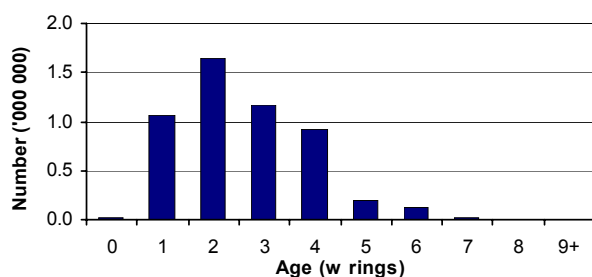
## ADDITIONAL INFORMATION

1. The assessment conducted in 2007 was not accepted by ACFM but it is considered indicative of past trends in the stock. Based on this, the stock is considered to have been stable at a low level near  $B_{pa}$  (9,500 t), for the past ten years.
2. The total catch taken from this fishery in 2006 was estimated to be 4,400 t, which is the same as 2005.
3. In recent years the catches have been below the TAC but the quality of the catch statistics is poor.
4. The fleet fishing for Irish Sea herring is now very small. In 2006 trawlers from Northern Ireland caught 3,820 t with the remaining 580 t being caught by boats from the Republic of Ireland.
5. The stock identity of herring west of the British Isles was reviewed by the EU-funded project WESTHER. The results of this project have shown the herring populations in this area and in Divisions VIaS, VIIb,c, and VIaN form a metapopulation. ICES plans to investigate means to assess and manage this metapopulation. In the meantime, each population will continue to be managed separately.
6. Adult fish are known to migrate from the Irish Sea after spawning while tagging experiments carried out by FSS in 1990 and work carried out by University College, Dublin, have demonstrated that young herring in the Irish Sea recruit to the adult population in the Celtic Sea. Therefore the state of this stock has an effect on the Celtic Sea fishery and all relevant conservation measures should be supported.
7. This stock showed a marked decline in productivity in the late 1970s and has since remained at a low level.

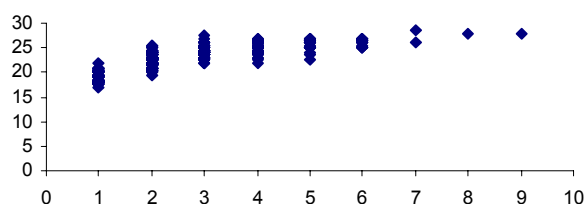
2006 Length Distribution: International Landings, Herring in VIlaN



2006 Age Distribution: International Landings, Herring in VIlaN



2006 Size at Age: Irish sampling, Herring in VIlaN



## ICES ADVICE

### 5.4.15

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
unknown	unknown	unknown	NA

ICES classifies the state of the stock as unknown. Based on the most recent estimates of trends from surveys it seems likely that the stock has been relatively stable at low levels for the past ten years.

#### Management objectives

There are no explicit management objectives for this stock

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	6000 t	Lowest observed SSB.
	$B_{pa}$	9500 t	$B_{pa} = B_{lim} * 1.58$ .
	$F_{lim}$	Not defined.	Not defined.
	$F_{pa}$	Not defined.	Not defined.
Targets	$F_y$	Not defined.	

#### Single-stock exploitation boundaries

##### Exploitation boundaries in relation to precautionary limits

SSB is unknown but thought to be stable at a low level. The recent (2005 and 2006) catches of 4400 t do not appear to have been detrimental to the stock.

#### Management considerations

##### Ecosystem considerations

Irregular cycles are shown in the productivity of herring stocks (weights-at-age and recruitment). There are many hypotheses as to the cause of these changes in productivity, but in most cases it is thought that the environment plays an important role (through transport, prey, and predation). Coincident periods of high and low pro-

duction have been seen in the herring in VlaN and Irish Sea herring. Exploitation and management strategies must account for the likelihood of productivity changing. The Irish Sea herring stock has shown a marked decline in productivity during the late 1970s and has remained at a low level since then.

### Factors affecting the fisheries and the stock

#### Regulations and their effects

Areas closed to herring fishing were established around the east coast of Ireland and the west coast of Britain to protect juveniles when an industrial fishery operated in the 1970s. A closed area exists to the east of the Isle of Man to protect the spawning aggregations. A gillnet fishery has a derogation to fish within the Irish closed box. Boats from the Republic of Ireland are not permitted to fish east of the Isle of Man.

#### Other factors

The stock identity is complex as the juveniles mix with those of the Celtic Sea and the adults migrate from the Irish Sea after spawning. The stock identity has been reviewed by an EU-funded project WESTHER (see special request Section 5.3.3.1).

### Scientific basis

#### Data and methods

The analysis of stock trends is based on acoustic and on larval survey data.

#### Uncertainties in assessment and forecast

Annual estimates of abundance from both surveys are variable but show no indication of decline.

#### Comparison with previous assessment and advice

In recent years the catches have been well below the TAC. The stock seems to be stable with the current catch level so the advice is not to increase catches, which is reflected in a lower catch advice than last year.

### Source of information

Report of the Herring Assessment Working Group for the Area South of 62°N, 13–22 March 2007 (ICES CM 2007/ACFM:11).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Catch
1987	TAC	4.3	4.5	5.8
1988	TAC (Revised advice in 1988)	10.5 (5.6)	10.5	10.2
1989	TAC	5.5	6.0	5.0
1990	Precautionary TAC	5.7	7.0	6.3
1991	TAC	5.6	6.0	4.4
1992	TAC	6.6	7.0	5.3
1993	TAC	4.9–7.4	7.0	4.4
1994	Precautionary TAC	5.3	7.0	4.8
1995	Precautionary TAC	5.1	7.0	5.1
1996	If required, precautionary TAC	5.0	7.0	5.3
1997	No advice given	-	9.0	6.6
1998	<i>Status quo</i> F	6.5	9.0	4.9
1999	F=Proposed $F_{pa}=0.36$	4.9	6.6	4.1
2000	F=90% F(98)=0.31	3.9	5.4	2.0
2001	<i>Status quo</i> F= 0.26	5.1	6.9	5.5
2002	Average catch of 1996–2000	4.8	4.8	2.4
2003	2002 TAC	4.8	4.8	2.4
2004	Advice 2003 catch	4.8	4.8	2.5
2005	<i>Status quo</i> TAC	4.8	4.8	4.4
2006	<i>Status quo</i> TAC	4.8	4.8	4.4
2007	<i>Status quo</i> TAC	4.8	4.8	
2008	<i>Recent catches</i>	4.4		

Weights in '000 t.

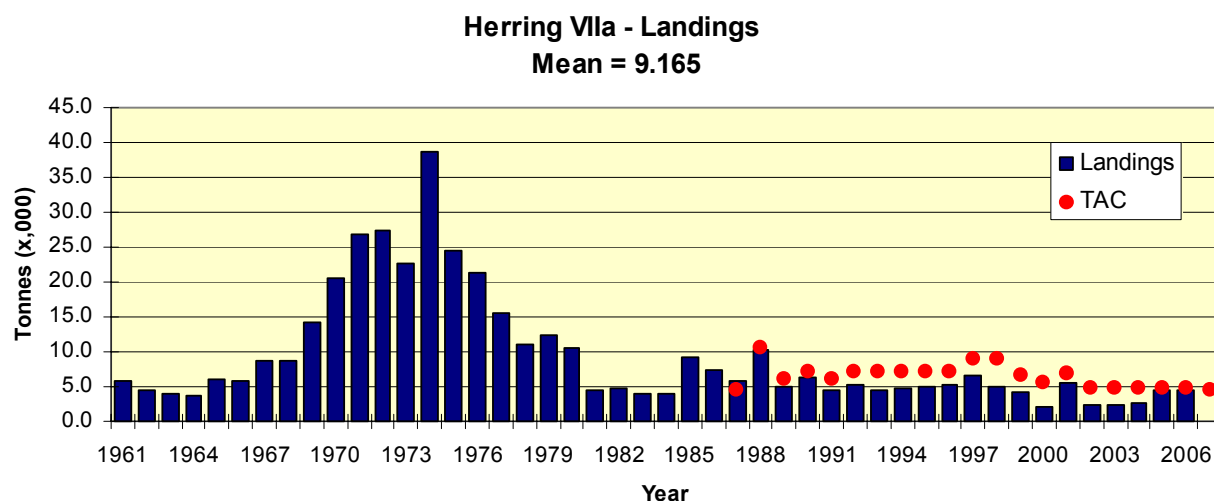


Figure 5.4.15.1 Irish Sea Herring VIIa(N). Landings of Herring from VIIa(N) from 1961 to 2006.

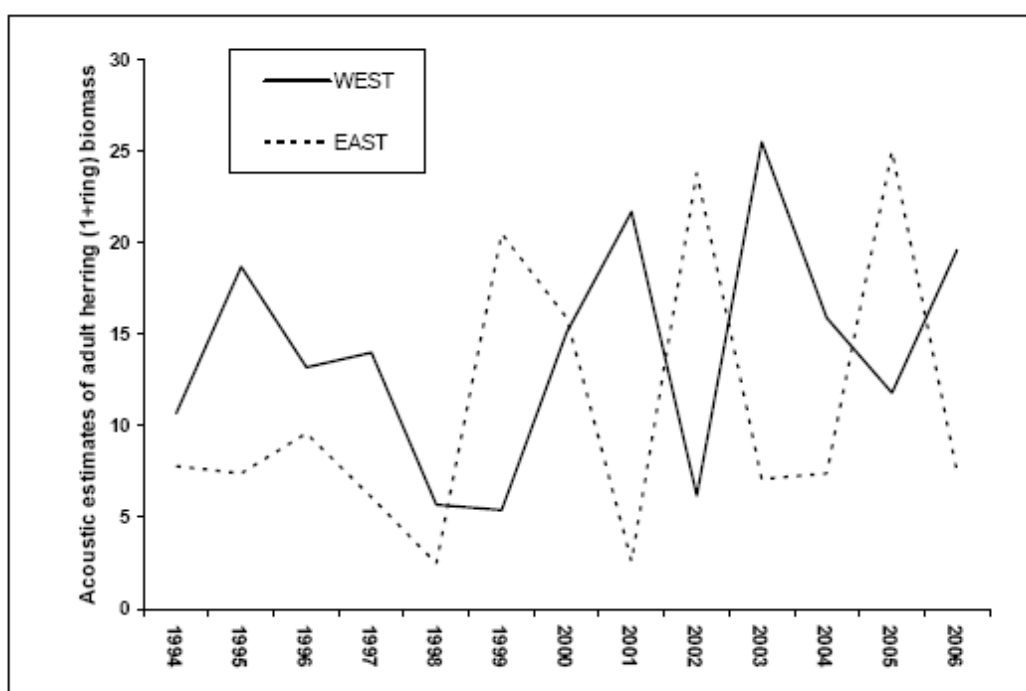


Figure 5.4.15.2 Irish sea herring VIIa (N). Time-series of shifts in adult herring (1+ ring) biomass distribution between the west and the east Isle of Man coasts estimated from acoustic surveys 1994–2006.

# Irish Sea Sprat

(Division VIIa)



Fisheries Science Services

## FSS –SINGLE STOCK CONSIDERATIONS

**Sprat fisheries display large inter-annual variation, both spatially and temporally. In light of decreased quotas for herring, effort may be displaced onto sprat. This should be monitored. In order to prevent an increase in effort, precautionary TACs should be implemented in Sub-area VI and Sub-area VII.**

## CURRENT MANAGEMENT

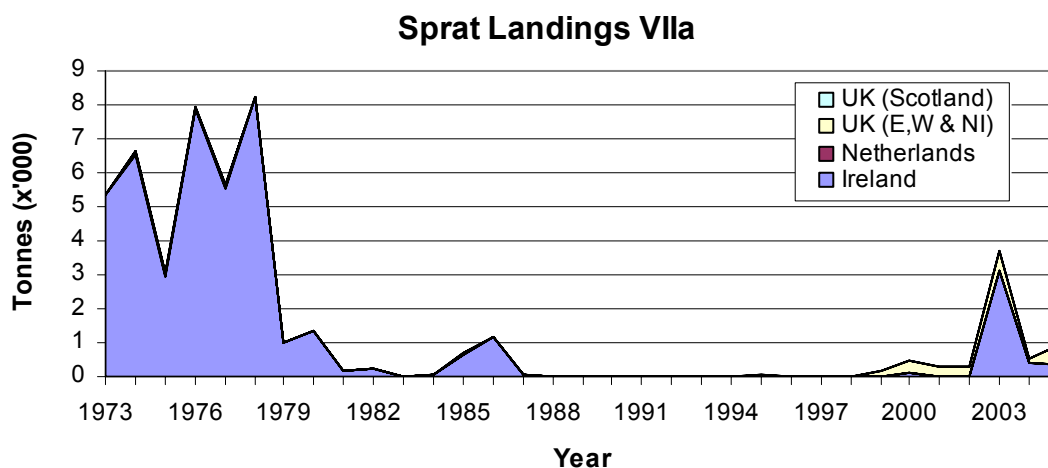
- There are no management regulations for sprat fisheries around Ireland.
- There are no TACs for sprat in Irish waters. A TAC is in place in the English Channel and in the North Sea.

## ADDITIONAL INFORMATION

1. A number of vessels using mid water trawls take part in the fishery. The fishery takes place in shallow in-shore areas in the southern part of Division VIIa.
2. Almost all the sprat catch in this Sub-area are by Irish vessels. Peak landings took place in the 1970s, with almost no declared landings for much of the late 1980s and early 1990s. Sprat landings increased again in the late 1990s. Sprat landings are being curtailed due to the by-catch of other species, mainly mackerel and herring, in this fishery.
3. Sprat, from both targeted fisheries and as part of herring fishery by-catch, have been sampled by FSS since 2000.
4. The degree of species misreporting between herring and sprat needs to be evaluated before advice can be given.

**Table 1.** Landings of sprat from Division VIIa 1995-2006

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Ireland	.	.	.	7	25	123	7	.	3103	408	361	na
Netherlands	.	.	.	.	.	.	.	.	.	.	.	na
UK (E,W & NI)	30	.	2	3	146	371	269	306	592	134	591	na
UK (Scotland)	.	.	.	.	.	.	3	.	.	.	.	na
	30	.	2	10	171	494	279	306	3695	542	952	na



**Figure 1.** Sprat landings in Division VIIa.



# Ecosystem overview for West of Scotland and Rockall

## Summary table of the ICES Ecosystem overview for West of Scotland and Rockall

(Information condensed from ICES WGRED, 2007 see WG report for further details and reference list)

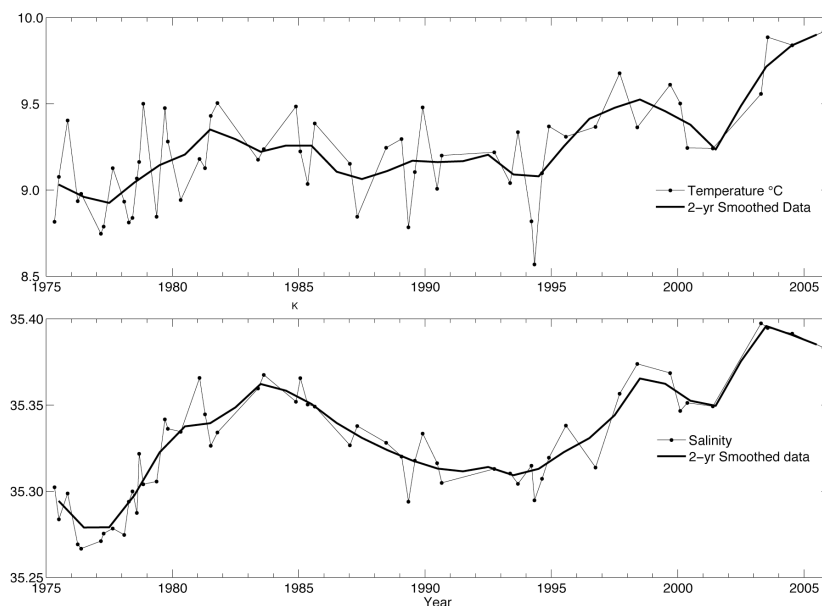
<b>Physics</b>	
<b>Bathymetry</b>	This area is limited to the southwest by the Rockall Trough, where the transition between the Porcupine Bank and the trough is a steep and rocky slope with reefs of deepwater corals; further north, the slope of the Rockall Trough is closer to the coast line; west of the shelf break is the Rockall Plateau with depths of less than 200m. The shelf area consists of mixed sub-strates, with soft sediments (sand and mud) in the west and more rocky, pinnacle areas to the east. The area has several seamounts: the Rosemary Bank, the Anton Dohrn sea mount and the Hebrides, which have soft sediments on top and rocky slopes.
<b>Circulation</b>	The shelf circulation is influenced by the poleward flowing 'slope current', which persists throughout the year north of the Porcupine Bank, but is stronger in the summer. Over the Rockall plateau, domes of cold water are associated with retentive circulation. Thermal stratification and tidal mixing generate a northwards running coastal current.
<b>Fronts</b>	The Islay Front is situated between Islay and the Malin shelf.
<b>Temperature</b>	There has been a steadily warming of surface waters in the Rockall Trough over last decade with highest record in 2005 (Fig.1). Inshore waters off the west of Scotland also continued to warm with more rapid warming taking place since the mid 1990s.
<b>Biology</b>	
<b>Phytoplankton</b>	The productivity is reasonably high on the shelf but drops rapidly west of the shelf break.
<b>Zooplankton</b>	As is true of the adjacent North Sea, the overall abundance of zooplankton in this region has declined in recent years. Continuous Plankton Recorder data in the area show substantial drops in <i>Calanus</i> abundance and these are now below the long term mean. <i>Calanus finmarchicus</i> is known to overwinter in the Faroe-Shetland channel and the abundance of these is known to have been reduced in recent years.
<b>Benthos, larger invertebrate, biogenic habitats</b>	The main commercial invertebrate species is Norway-lobster ( <i>Nephrops norvegicus</i> ), which is targeted on the continental shelf west of Scotland and on the Rockall plateau. Fisheries dredging for scallops and some smaller bivalves exist west of Scotland, as well as Pot fisheries exploiting lobster <i>Homarus gamarus</i> and brown crab <i>Cancer pagurus</i> . Biogenic reefs of horse mussels <i>Modiolus modiolus</i> , maerl and Serpulid worms occur in specific locations.
<b>Fish Community</b>	The shelf edge is a spawning area for mackerel <i>Scorpaenopsis scorpaenoides</i> and blue whiting <i>Micromesistius potassou</i> . Historically, there were important commercial fisheries for cod, haddock and whiting and a number of flatfish species. Hake <i>Merluccius merluccius</i> and angler fish <i>Lophius</i> spp. are also fished across the whole area. The Rockall plateau has important haddock <i>Melanogrammus aeglefinus</i> and angler fish fisheries. On the shelf, the main resident pelagic species is herring <i>Clupea harengus</i> . Scottish groundfish surveys between 1997 and 2000 revealed declines in most commercial fish stocks, including haddock, whiting, norway pout, herring and hake.
<b>Birds, Mammals &amp; Elasmobranchs</b>	Basking shark ( <i>Cetorhinus maximus</i> ) occurs from April through to October but the stock seems severely depleted. The Harbour porpoise <i>Phocoena phocoena</i> is the most numerous cetacean, Minke whale <i>Balaenoptera acutorostrata</i> is found throughout the region. In this area the Grey seals ( <i>Halichoerus grypus</i> ) have their largest population in the Northeast Atlantic with the majority of individuals found in the Hebrides. Common seals ( <i>Phoca vitulina</i> ) are also widespread. There is a high abundance of breeding seabirds, predominantly the common guillemot ( <i>Uria aalge</i> ), razorbill ( <i>Alca torda</i> ) and the Atlantic puffin ( <i>Fratercula arctica</i> ) as well as petrels (including fulmar, <i>Fulmarus glacialis</i> ; storm petrel, <i>Hydrobates pelagicus</i> ; and Manx shearwater, ( <i>Puffinus puffinus</i> ), northern gannets and gulls.

<b>Environmental signals &amp; implications</b>	Surface waters of the Rockall trough have been steadily warming for some years and are currently at an all time high. The general and continuing reduction of copepod abundance and recent changes in zooplankton composition throughout the region are also causes of major concern given the key role that these organisms play in the food web. Increasing temperature and changes in zooplankton communities are likely to have an impact on the life histories of many species.
<b>Fishery effects on benthos and fish communities</b>	The impact of fishing activities on shelf fish communities is unclear, although there are numbers of severely depleted stocks e.g. cod and whiting. Furthermore, the level of discarding in some fisheries can be significant. The effect of fishing on benthic communities is not yet fully understood.

## FSS ECOSYSTEM CONSIDERATIONS

FSS advises that the following considerations should be taken into account in developing ecosystem based advice for fisheries in the West of Scotland and Rockall:

- Fishing has adversely impacted on a number of commercial species, with some commercial species now being severely depleted such as cod and whiting; a recovery plan is currently in place for cod.
- A reduction in the abundance of large piscivorous fishes such as cod, and an increase in smaller pelagic species which feed at a lower trophic level has resulted in a marked decline in the mean trophic level of the fish community over time.
- There has been an increase in water temperatures in this ecoregion which is likely to affect the distribution area of some fish species. In addition, the combined effects of overexploitation and environmental variability might lead to a higher risk of recruitment failure and decrease in productivity.
- This ecoregion harbours extensive populations of grey and common seals which are increasing in abundance. It is not known what effect this increase has on local fish populations, however recent studies of seal diets off western Scotland revealed that grey seals may be an important predator for cod, herring and sandeels in this area.



**Fig. 1)** Rockall Trough temperature and salinity anomalies for the upper ocean (0–800 m) of the northern Rockall Trough. Average across section, seasonal cycle removed from WGRED, 2007.

Ref. ICES. 2007. Report of the Working Group for Regional Ecosystem Description (WGRED), 19 - 23 February 2007, ICES Headquarters, Copenhagen. ICES CM 2007/ ACE:02. 153 pp.

# FSS Advice on Mixed Fisheries in the West of Scotland

## PRECAUTIONARY APPROACH ADVICE

FSS advises that mixed fisheries characteristics be taken into account when managing demersal fisheries in the West of Scotland. Given the critical status of cod, whiting and spurdog these stocks are the overriding concerns in the management advice. The precautionary approach implies that fisheries west of Scotland and at Rockall should be managed where the following rules are applied simultaneously:

If fisheries are permitted they should operate:

- without catch or discards of cod in Sub-area VI.
- without catch or discards of Northeast Atlantic spurdog in Sub-area VI.
- with minimal catch of whiting in Division VIa
- without jeopardizing the recommended reduction in fishing mortality of haddock in Division VIa and herring in Division VIa south
- within the precautionary limits for all other stocks

FSS recognises that the 'zero catch option' for cod, whiting and spurdog would effectively mean a closure of the mixed demersal and *Nephrops* fisheries in the West of Scotland and at Rockall. FSS agrees with ICES that a closure of all fisheries catching cod, whiting or spurdog provides the highest probability of recovery for these stocks and is the only advice possible in the context of the precautionary approach.

Therefore FSS advises that the following rules should be followed in the management of mixed fisheries in the West of Scotland and Rockall:

- Once the TAC is exhausted for a critical stock then all fisheries which catch that stock should be closed.
- Fisheries should only be permitted when they prove that they take zero catch of cod and spurdog and minimal catch of whiting.
- Fisheries should only be permitted when they prove that they take zero catch of non-critical stocks where the TAC is exhausted.
- All other stocks should be exploited within precautionary limits.

## IMPLEMENTATION ISSUES

FSS notes that ICES has previously advised for zero catch of cod, whiting and spurdog but that managers, due to social and economic considerations, have never implemented this advice. FSS is aware of the European Commission (EC) proposal for setting of fishing opportunities in 2008 (see page 42). According to this policy statement the Commission "will propose a reduction that is as large as is compatible with any mixed fisheries considerations and with relevant social and economic considerations". Furthermore, "If a recovery plan is in force concerning the stock" (which is the case for West of Scotland cod), "the best possible approximation to the recovery plan rules will be proposed in the light of the existing scientific knowledge". A 25% reduction in effort and catch is the FSS interpretation of the EC policy in relation to West of Scotland cod. However, it is not clear if a commensurate reduction in catch and effort will be applied to other stocks or fisheries west of Scotland and at Rockall.

FSS has previously pointed out the poor performance of TACs, as implemented, in reducing fishing mortality. In the past FSS advised that the required reductions in catch and associated fishing mortality can only be achieved if reductions in effort and effective discard mitigation measures are implemented. Fishing effort control was introduced in the west of Scotland in 2003 as part of the cod recovery plan with the main aim of indirectly reducing fishing mortality in cod. Despite the significant reductions in nominal effort, there is no clear evidence that effort limitations has reduced fishing mortality rates, particularly on the critical cod or whiting stocks. Fishing mortality is estimated to have reduced significantly for haddock in the period 2000-2002 but has not showed a strong decline since the introduction of days-at-sea.

FSS advises that a well defined 'management plan' needs to be developed and implemented to recover the cod and spurdog stocks in VI and whiting in VIa and to fish them sustainably once they have recovered. FSS advise that such a plan should aim to manage well defined métiers with clearly defined objectives that will ensure a high probability of recovery to agreed levels within a specified time frame.

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## Qualitative Description of Fisheries to the West of Scotland and Rockall

The main fleets operating in Division VIa include the mixed roundfish otter trawl fleet, the *Nephrops* otter trawl fleet, the otter trawl fleet targeting anglerfish, megrim, and hake, and the fleet targeting saithe and/or deep-sea species. To a large extent, the roundfish fishery in Division VIa is an extension of the similar fishery in the North Sea. The demersal fisheries in Division VIa are predominantly conducted by otter trawlers fishing for cod, haddock, anglerfish, and whiting, with bycatches of saithe, megrim, and lemon sole.

The majority of the vessels in the demersal fishery are locally-based Scottish trawlers using light-trawls, but trawlers from Ireland, Northern Ireland, England, France, and Germany also participate in this fishery. The importance of Scottish seiners mainly targeting haddock has been declining in recent years as many of these vessels have been converted to trawlers. Part of the fleet of light trawlers has diversified into a fishery for anglerfish that has been expanding into deeper water off the northern coast of Scotland. Bycatches in this fishery include megrim, ling, and tusk.

About 200 Scottish trawlers also take part in the fisheries for *Nephrops* on inshore grounds. In recent years Irish vessels have also been targeting *Nephrops* in Division VIa, mainly on offshore grounds. These *Nephrops* vessels also land smaller quantities of haddock, cod, whiting, and small saithe, but discard large amounts of whiting and haddock.

The development of a directed fishery for anglerfish has led to considerable changes in the way the Scottish fleet operates. Part of this is a change in the distribution of fishing effort; effort in the roundfish fisheries has shifted away from the traditional inshore areas to more offshore areas and deeper waters. The expansion in area and depth-range of the fishery has been accompanied by the development of specific trawls and vessels to exploit the stock. These vessels mainly use large twin-rig otter trawls with >100-mm mesh. A smaller Irish fleet also targets anglerfish, megrim, and hake on the Stanton bank with 90-mm to 100-mm mesh. This fleet has declined in numbers in recent years although there was a fleet modernisation scheme in the early 2000s whereby several large new vessels joined the fleet. More recently there has also been an Irish decommissioning scheme, involving around 40 fishing vessels (~6000 GT, 18 000 kW) which have been permanently withdrawn from the Irish fishing fleet and removed from the Register of Sea Fishing Vessels in 2005 and 2006. Several of these vessels have a track record of fishing in Division VI.

The fishery for anglerfish has expanded into deeper waters with an associated increase in catches. The expansion of this fishery has been further accelerated by the diversion of fishing effort from other stocks subject to more restrictive quotas in recent years, and by market opportunities. A gillnet fishery has developed on the continental slopes to the West of the British Isles, North of Shetland, at Rockall, and on the Hatton Bank. A preliminary investigation of this fishery suggests high levels of gear loss, widespread dumping of netting, high catch and discarding levels (particularly of monkfish),

and a lack of effective management. These fisheries are occurring in areas believed to have been a refuge for adult anglerfish, increasing the vulnerability of the stock to overexploitation. Immature fish are subjected to exploitation for a number of years prior to first maturity.

The larger Scottish and Irish trawlers fish for haddock at Rockall when opportunities arise for good catches from the Division VIb stock. Vessels from the Russian Federation have fished for haddock and other demersal species at Rockall since 1999 when part of the Bank was designated as being in international waters. Although young saithe are caught by coastal trawlers in Subarea VI, the fishery for saithe essentially takes place on the shelf edge to the west and north-west of Scotland. Traditionally, this fishery has largely been operated by the larger deep-sea French trawlers. However, the number of these vessels has declined in recent years. Since the late 1980s, some of these vessels diverted their activity toward deep-sea species, notably orange roughy, and some medium-sized trawlers also participate in the fishery for deep-sea species during summer in some years.

The pelagic fishery for herring is mainly operated by UK, Dutch, and German vessels in the north, and by Irish vessels in the south. Substantial misreporting of catches from the North Sea and between the northern and southern stocks occurred in the past, but UK licensing regulations are thought to have reduced misreporting since 1997. In recent years TACs for the northern stock have not been restrictive, presumably because of low effort and a weak market. The Clyde herring fishery has declined sharply in recent years as the stock has suffered from a series of low recruitments. Recent TACs have not been taken and the catches have been less than 1000 t since 1991.

There is a directed trawl fishery for mackerel and horse mackerel in the area. The mackerel fishery mainly takes place in the fourth and first quarter of the year, when the mackerel is returning from the feeding area to the spawning area. The horse mackerel is mainly fished in the second half of the year. In addition, there are fisheries for blue whiting in the area.

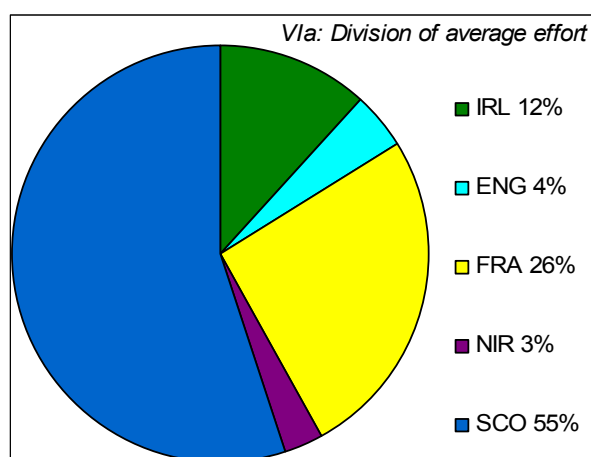
The industrial fisheries in Division VIa are much smaller than in the North Sea. The Scottish sandeel fishery started in the early 1980s, peaking in 1986 and 1988. It is irregular, depending on the availability of the resource and of processing facilities at Shetland, Denmark, and the Faroes. Bycatches in this fishery are very small. The Norway pout fishery is conducted mainly by Danish vessels.

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### Recent fishing effort trends West of Scotland (VIa)

Effort data and information presented in this section is taken from the STECF Subgroup on review of stocks (SGRST) report on Fishing Effort Management 2007 and the Working Group on the Assessment of Northern Shelf Demersal Stocks 2007.

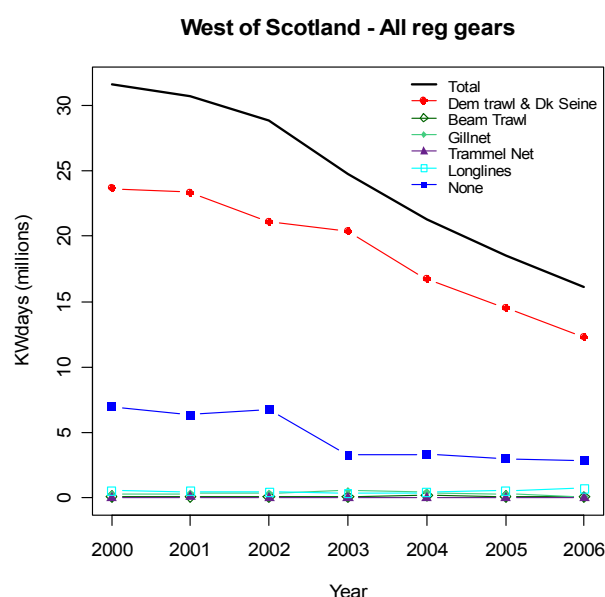
In the West of Scotland, ICES division VIa, effort is dominated by Scotland accounting for 55% of the total effort (Fig. 1). France contributes 26%, Ireland 12% and the remaining countries combined contribute less than 10%.



**Fig. 1** Percentage effort contribution by country in the West of Scotland (Vla) based on average total effort from 2000-2006.

Overall effort in the West of Scotland shows a steady decrease, totalling 44% since 2002 (Fig. 2). Otter trawling is the primary fishery in the West of Scotland, whilst the use of beam trawls and static gears is nominal. This overall decline in effort is primarily caused by reductions in trawl effort.

Irish effort in kW days-at-sea is not yet available by mesh size prior to 2003, therefore in Fig. 2 Irish effort prior to 2003 is within the 'none' category. Given the low level of Irish effort (12%), this does not impact on the impression of overall changes between 2000 and 2003.

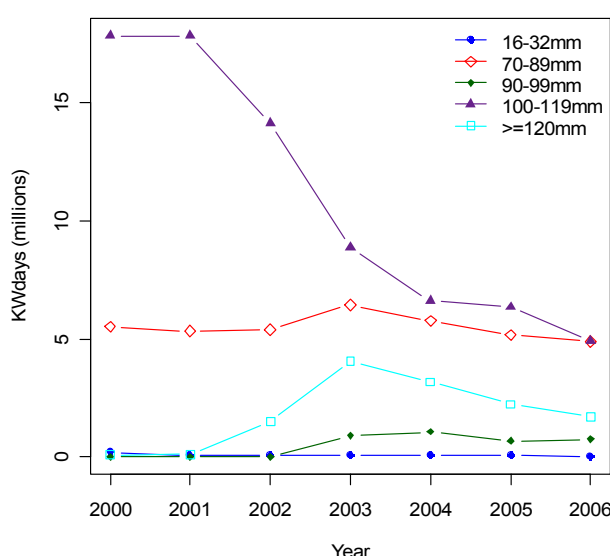


**Fig. 2** West of Scotland trends in nominal effort (kW\*days-at-sea) by gear types, 2000-2006. Category none represents unidentified effort. Irish effort prior to 2003 is within the 'none' category.

Historically, the highest effort was deployed by whitefish fleets with otter trawls of 100-119mm mesh. Effort in this group has decreased substantially since 2002 and some effort may have been transferred to larger meshes,

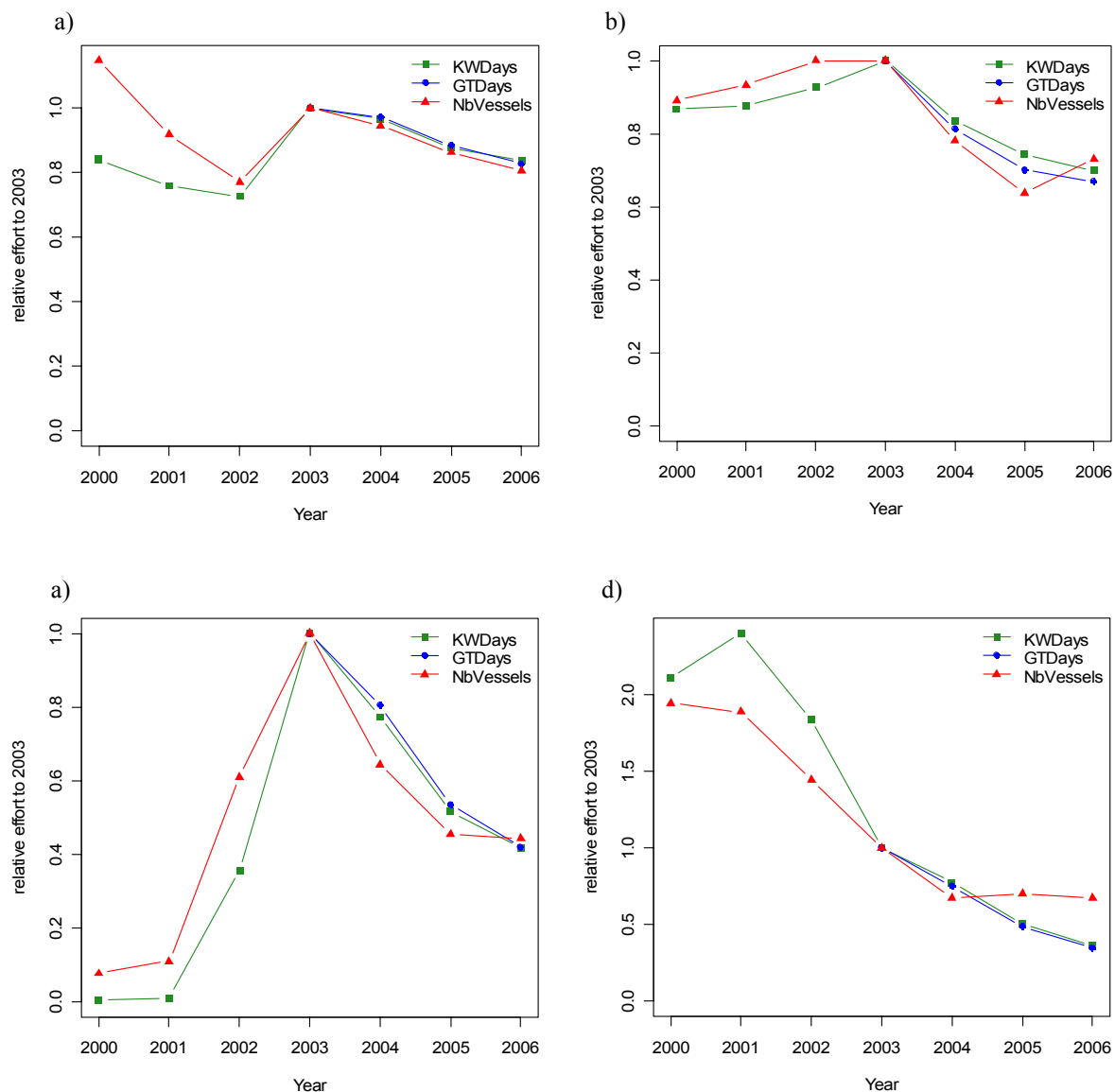
$\geq 120$ mm, for which effort allocation increased until 2003. Effort in both of these larger mesh groups has declined further since 2003 (Fig. 3) which is likely to be the result of restricting vessels to less than 84-85 days-at-sea per year. The 90-99mm mesh group contribution to overall effort in this area is relatively minor and has been stable since 2003. Prior to 2002, their use was not observed suggesting some effort transfer to this group, which has a greater number of days-at-sea available (227 days). Effort of small meshed trawls (70-89mm) mainly targeting *Nephrops*, which also avail of 227 days-at-sea, has shown a reduction of just 9% since 2002, which compared to other fleets is very small, suggesting that effort limitations have not restricted these fleets. Although some transfer of effort from the whitefish fleet to the *Nephrops* fleet is possible, the majority has not been transferred, but has, more likely been redirected to alternative fishing areas or been decommissioned.

**West of Scotland Dem Trawl and Danish Seine**



**Fig. 3** West of Scotland trends in nominal effort (kW\*days-at-sea) for the demersal trawl and Scottish Seines groups, 2000-2006. Note that Irish data are only included for 2003-2006.

Effort in terms of gross tonnage days-at-sea (GT\*days at sea) shows very similar evolution of fishing effort to that of effort in kW days-at-sea in all bar longline gears, indicating that vessels have not increased power to increase efficiency. These two effort measures, in addition to the maximum number of vessels were compared by standardising against values for 2003. Within demersal trawl and Danish seine categories 70-89mm mesh, 70-89mm mesh with less than 5% cod, sole and plaice in catch during 2002 (IIA81d) and  $\geq 120$ mm mesh, the trends over time between the three measures were all consistent (Fig.4a-c), suggesting changes in days-at-sea measures reflect changes in the number of vessels operating within the area. In demersal trawl and Danish seine category 100-119mm mesh the number of vessels has remained effectively constant since 2004 however, the days-at-sea measures fell in unison (Fig. 4d) which would imply the days at sea allocations for this category are limiting.



**Fig. 4** West of Scotland trends in relative effort expressed in kW\*days at sea, GT\*days at sea and number of vessels for demersal trawl and Scottish seine **categories a)** 70-89mm mesh, **b)** 70-89mm mesh with <5% of cod, plaice and sole in catch during 2002 (IIA81d), **c)** >120mm mesh, **and d)** 100-119mm mesh. Effort is relative to 2003 values.

The introduction of days-at-sea has been a strong driver of the observed changes in fishing patterns but it should be pointed out that there have also been other important measures addressing capacity. For example, much of the effort decline, particularly in the whitefish fleets with >100mm mesh trawls, can be related to decommissioning schemes permanently removing vessels. Since 2002, 30.2% of Scottish vessels operating in the cod recovery zone within VIa have been decommissioned. Decommissioning of Irish vessels began in 2005, and 9 vessels with track records of fishing in VIa were permanently removed by the beginning of 2006. Within the West of Scotland these, primarily demersal otter trawl (80%), vessels accounted for an average of 125,797 kW\*days-at-sea per year, equating to a 2% reduction in Irish effort within VIa.

This latest decommissioning may account for some of the 28% decline in Irish effort within the West of Scotland area since 2004. In terms of international effort, it appears to have had little impact, although this is not surprising as Ireland only contributes a small proportion, which has remained relatively stable since 2003.

Specifically for the Irish fleet operating in VI, the introduction of days-at-sea regulation has led to diversion of effort into other areas (mainly VII) and voluntary tie-ups.

**Data summary table adapted from STECF (2007)**

		Special condition	2003	2004	2005	2006	Percentage Change to 2003 (%)
Demersal trawl and Danish seine	16-32mm	none	94,003	94,321	67,742	31,241	-67
	70-89mm	IIA81c	123,680	63,720	29,676	36,123	-71
		IIA81d	3,161,497	2,640,884	2,354,163	2,209,873	-30
	90-99mm	none	3,172,412	3,062,906	2,785,781	2,653,584	-16
		IIA81d	8,832	14,156	21,766	48,978	455
	100-119mm	none	896,317	1,057,247	667,832	707,415	-21
		IIA81c	71,670	42,449	14,101	22,890	-68
		IIA81d	5,047,407	3,663,625	4,447,482	3,525,229	-30
		none	3,747,007	2,909,314	1,889,661	1,369,367	-63
	>=120mm	IIA81c			5,564	749	
		IIA81d	44,397	68,267	147,686	23,165	-48
		none	4,027,622	3,116,030	2,081,772	1,686,071	-58
Beam Trawl	80-89mm	none	13,658	39,884	9,875	9,325	-32
	100-119mm	IIA81c	30,385	35,077			-100
		none					
	>=120mm	IIA81c		1,519			
		none	60,023	151,480	119,958	81,194	35
Gillnet	<110mm	none	51	13,723			-100
	110-149mm	none	32,140	7,957	40,364	36,900	15
	150-219mm	none	55,521	1,026	44,981	1,468	-97
	>=220mm	none	488,537	432,635	218,291	87,952	-82
Trammel net	<110mm	IIA81g					
	n/a	none	636	320			-100
Longline	n/a	none	349,724	454,893	553,932	731,979	109
Unclassified	none	none	3,311,952	3,375,022	2,986,553	2,863,756	-14
Total			24,737,471	21,246,455	18,487,180	16,127,259	-35

### **Fisheries interactions to the West of Scotland and Rockall**

Demersal fisheries in the area are mixed fisheries, with many stocks exploited together in various combinations in different fisheries. The extent to which the stocks are taken in the same fisheries cannot be quantified on the basis of the available data, but is qualitatively presented in Table 1. Roundfish are caught in otter trawl and seine fisheries, with a 120-mm minimum mesh size that comprises mixed demersal fisheries with more specific targeting of individual species in some areas and/or seasons. Cod, haddock, and whiting form the predominant roundfish catch in the mixed fisheries, although there can be important bycatches of other species, notably saithe and anglerfish in the deeper water and of *Nephrops* on the more inshore *Nephrops* grounds. Static-gear fisheries with mesh sizes generally in excess of 140 mm are also used to target cod. Saithe are mainly taken in a directed trawl fishery in deeper water along the shelf in Subarea VI. There is thought to be little bycatch of other demersal species associated with the directed fishery.

Large *Nephrops* fisheries take place in discrete areas that comprise appropriate muddy seabed sediment. Targeted

*Nephrops* fisheries on these grounds are taken predominantly in trawls with mesh sizes less than 100 mm (particularly in the more southerly regions) using single- or multiple-rig trawls. *Nephrops* fishing grounds are mainly in-shore grounds, although there are smaller offshore fisheries at Stanton Bank and west of the Hebrides. The bycatch and discarding of other demersal species in the *Nephrops* fisheries is highly variable.

There are trawl and gillnet fisheries targeting hake and anglerfish and otter trawl fisheries targeting hake, megrim, and anglerfish in Subarea VI. The catch of other demersal species associated in these fisheries is uncertain.

There is an international fishery targeting haddock, grey gurnards, and other species at Rockall using small mesh. Successful application of TACs for this stock would require that there is a simple relationship between recorded landings and effort exerted. This assumption is unlikely to be true for Rockall haddock especially when coupled with ways of evading TACs including misreporting, highgrading, and discarding. In the case of Rockall haddock these may occur to a large extent due to the remote nature of the fishery and the processing of catches at sea by some fleets. Direct effort regulation is therefore suggested as a means of controlling fishing mortality on Rockall haddock.



**Table 1** Stock interactions West of Scotland.

	Anglerfish IV+VI	Megrim	Cod Via	Haddock Via	Whiting Via	Nephrops Via	Saithe IV+Via	Herring Via	NEA Mackerel	Deepwater fish
Anglerfish IV+VI		OTB, GND	OTB	OTB	OTB	NEP OTB	OTB	PTM	PTM	OTB Deep, GND
Megrim	Strong		OTB	OTB	OTB	NEP OTB	OTB	PTM	OTB Deep	OTB Deep
Cod Via	Weak	Weak		OTB, PT	OTB, PT	OTB, NEP OTB	OTB, OTB Deep, PT	PTM	PTM	OTB Deep
Haddock Via	Weak	Weak	Strong		OTB, PT	NEP OTB	OTB, PT	PTM	PTM	OTB Deep
Whiting Via	Weak	Medium	Strong	Strong		NEP OTB	OTB	PTM	PTM	OTB Deep
Nephrops Via	Medium	Medium	Medium	Strong	Strong		OTB	PTM	PTM	OTB Deep
Saithe IIIa+IV+Via	Weak	Weak	Medium	Medium	Weak	Weak		PTM	PTM	OTB Deep
Herring Via	0	0	0	0	0	0	0		PTM	OTB Deep
NEA Mack- erel	0	0	0	0	0	0	Weak	Medium		OTB Deep
Deepwater fish	Strong	Medium	Weak	Weak	0	Weak	Weak	0	0	

**Interaction**

Weak	Weak
Medium	medium
Strong	strong

<b>OTB</b>	OTter Trawls in deepwater	<b>PTM</b>	Pelagic Midwater Trawl
<b>Deep OTB</b>			
<b>Nep</b>	OTter Trawl Nephrops directed	<b>PT</b>	Pair Trawl
<b>GND</b>	Gillnets demersal & deepwater		



# West of Scotland Cod

## (Division VIa)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

FSS considers that this stock has collapsed. The spawning stock biomass is at an all time low, but the total mortality is uncertain and probably high. Recruitment estimates indicate a decline in recruitment in the last decade, correlated with a decline in the spawning stock to the lowest levels observed. Recruitment since the 2002 year class has been amongst the weakest in the time-series although the estimate of the recruiting 2005 year class is slightly higher.

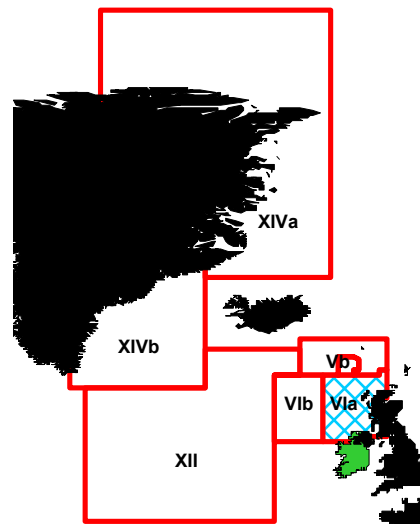
There has been a mismatch between survey and catch data for this stock for many years. The survey data indicates higher stock size than the catch-at-age data. Decoupling survey data from the catch data back in time results in a survey-based assessment which estimates catches to be several times more than those reported. Substantial mis-reporting of cod landings (species and quantity) is known to occur and directly affects the perception of the stock. Because of the poor quality of the input data, no forecast could be presented at the assessment.

FSS considers that the most realistic rebuilding scenario requires reducing fishing mortality to zero for three years to rebuild the stock above  $B_{lim}$  and that further measures will be required to rebuild the stock above  $B_{pa}$  by 2015. Given the critical status of the stock FSS advise that only fisheries where industry can prove a zero by-catch of cod should be permitted.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For West of Scotland cod FSS interprets that the EC fishing opportunity in 2008 will require a reduction in TAC and effort of 25% because of the collapse of this stock. If a TAC is allowed in 2008 FSS encourages the NWWRAC to continue the current Greencastle closure and encourage further time and area closures.

In 2004 the EC implemented a recovery plan for this stock (EC Reg. No 423/2004). FSS notes that

this has not affected an increase in SSB or a reduction in fishing mortality. The main reason for this is continued under-reporting of catches. The zero catch advice needs to be accompanied by strong control and enforcement. FSS notes that even small by-catches are impeding the recovery of this stock.



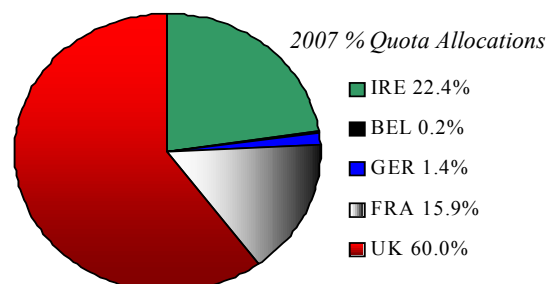
Red Boxes-TAC/Management Areas Blue Shading- Assessment Area

### CURRENT MANAGEMENT

- The TAC Area covers Sub-areas Vb, VI, XII and XIV, with a further restriction on the TAC in Divisions Vb and VIa. The assessment covers Division VIa only. FSS considers that the management area should correspond to the assessment area.
- The 2006 TAC was 490 t for Sub-areas Vb, VI, XII and XIV. The Irish quota was 110 t (adjusted to 120 t).
- A closed area for Cod west of Scotland, known as the “windsock”, has been in place since 2004 (detailed in Annex IV, EC Reg. 2287/2003).

### ADDITIONAL INFORMATION

- I. The reported Irish landings in 2006 of 18 t is the lowest in the time series.



2. There are indications that misreporting has reduced from the beginning of 2006.
3. Demersal trawlers from the UK and France took most of the landings in 2006 (69% and 21% respectively). Effort by UK vessels has declined due to significant decommissioning schemes in the UK.
4. Demersal trawlers from Killybegs and Greencastle have traditionally undertaken the Irish cod fishery. There have been considerable changes in the fleet composition in recent years.
5. The proportion of fish discarded has been high. Regulations to improve the exploitation pattern of cod have been taken in 2002 and 2003 yet discarding rates in the Irish otter trawl fleet are estimated to be high.
6. The Irish fishery on the Cape Grounds off Greencastle, Co. Donegal that traditionally targets juvenile cod was closed during November to February from 2003 to February 2006 inclusive. While the Cape has not been officially closed under a Statutory Instrument (SI) since February 2006, the recent demise of the local fleet through decommissioning and retirement associated with reduced catches has effectively closed the fishing on the Cape. Of the five inshore trawlers that took part in the 2003/04 tagging-programme, only two are presently fishing. The off-shore fleet tend to fish only occasionally on the Cape. As most of the cod catch is taken during the fourth quarter, the closure and subsequent fleet reduction is seen to have reduced the mortality that may otherwise have occurred due to Irish fishing activity
7. The closure was instigated by the local fishing industry to allow an assessment of seasonal closure as a potential management measure. During the closed period, over 13,000 cod were tagged and released by FSS and over 1,300 returns have been recorded. The returns have mainly come from the vicinity of the closed area (i.e. ICES Rectangle 39E3) but recaptures have also been returned from VIa west of Donegal, the Irish Sea VIIa and also in the south in Area VIIj. The bulk of the returns exhibited strong fidelity to the Cape. Growth from the returns was extremely variable but averaged around 17 cm per annum for cod at liberty for extended periods.

## ICES ADVICE

### 5.4.21

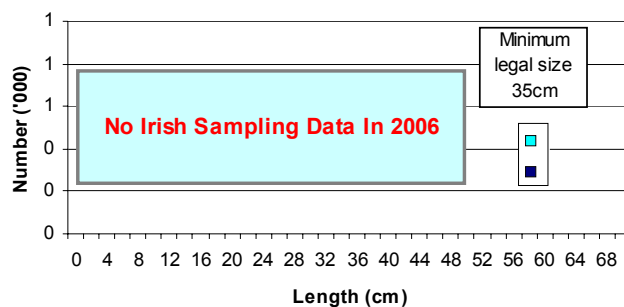
#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Reduced reproductive capacity	Unknown	Unknown	Not defined	Fishing mortality cannot be estimated but is likely to be higher than $F_{pa}$ .

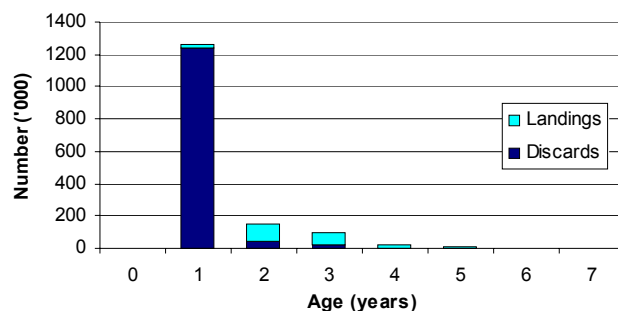
The spawning stock biomass is at an all time low, but the total mortality is uncertain and probably high. Recruitment estimates indicate a decline in recruitment in the last decade, correlated with a decline in the spawning stock to the lowest levels observed. Recruitment since the

8. The full report is available from the Irish Fisheries Bulletin Series No.27 'Evaluation of the benefits to sustainable management of seasonal closure of the Greencastle Codling (*Gadus morhua*) Fishery'.
9. FSS are also concerned that industrial fisheries continue to periodically operate in Division VI with the potential to take large numbers of juvenile cod.

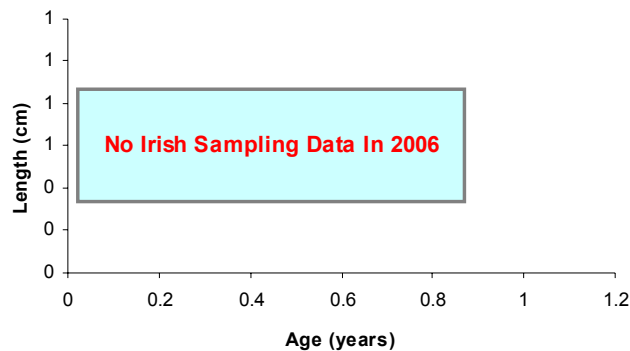
**2006 Length Distribution: Irish otter trawl, Cod in**



**2006 Age Composition: International, Cod in VIa**



**2006 Size at Age: Irish Sampling, Cod in VIa**



2002 year class has been amongst the weakest in the time-series although the estimate of the recruiting 2005 year class is slightly higher.

## Management objectives

The European Commission has enacted a Council Regulation (EC) No. 423/2004) which establishes measures for the recovery of cod stocks:

*For stocks above  $B_{lim}$ , the harvest control rule (HCR) requires:*  
*setting a TAC that achieves a 30% increase in the SSB from one year to the next,*  
*limiting annual changes in TAC to  $\pm 15\%$  (except in the first year of application), and,*  
*a rate of fishing mortality that does not exceed  $F_{pa}$ .*

*For stocks below  $B_{lim}$  the Regulation specifies that:*  
*conditions 1-3 will apply when they are expected to result in an increase in SSB above  $B_{lim}$  in the year of application,*  
*a TAC will be set lower than that calculated under conditions 1-3 when the application of conditions 1-3 is not expected to result in an increase in SSB above  $B_{lim}$  in the year of application.*

ICES has previously concluded that a precautionary recovery plan must include an adaptive element implying that fisheries for cod remain closed until an initial recovery of the cod SSB has been proven. An initial 3-year closure would be required to increase SSB above  $B_{lim}$  with high probability. Such an element of zero catch is not included in the existing plan. ICES therefore considers the recovery plan to be not consistent with the precautionary approach.

## Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	14 000 t	$B_{lim} = B_{loss}$ , the lowest observed spawning stock estimated in previous assessments.
	$B_{pa}$	22 000 t	This is considered to be the minimum SSB required to ensure a high probability of maintaining SSB above $B_{lim}$ , taking into account the uncertainty of assessments. This also corresponds with the lowest range of SSB during the earlier, more productive historical period.
	$F_{lim}$	0.8	Fishing mortalities above this have historically led to stock decline.
	$F_{pa}$	0.6	This F is considered to have a high probability of avoiding $F_{lim}$ .
Targets	$F_y$	Not defined.	

(unchanged since: 1998)

## Single-stock exploitation boundaries

### Exploitation boundaries in relation to existing management plans

The management plan is not explicit about the level of reduction in the catch when the stock is below  $B_{lim}$ . Furthermore, due to the uncertainty in the level of fishing mortality, ICES is not in a position to give quantitative forecasts. Previous simulations show that fishing should be closed for 3 years in order to bring SSB above  $B_{lim}$ .

### Exploitation boundaries in relation to precautionary limits

Given the very low SSB estimates, the high total mortality and low recruitment in this stock, ICES advises zero catch of cod in 2008.

### Conclusion on exploitation boundaries

As the recovery plan for this stock is considered to be consistent with the precautionary approach only when the fishery is closed for an initial period, and as this is congruent with the advice in relation to precautionary limits, ICES advises a zero catch of cod in 2008.

### Short-term implications

No forecast could be presented because of the poor quality of the input data.

## Management considerations

Management of cod fisheries must deal with the combined effects of assessment bias (of which unreliable catch data are a major contributing factor) and the inability of management to control catch. As long as these two interrelated conditions persist and substantial effort is

permitted for fisheries catching cod, rebuilding cannot be achieved. Survey information shows that the total removal of cod in Division VIa may have been underestimated in the past decade relative to earlier periods. In an attempt to remove bias in the assessment a catch-at-age model was used that ignored landings and discard data from 1995 onwards, relying on survey data for this later period. It is, however, considered that mortality estimates arising from an assessment heavily or wholly based on survey data are poorly estimated and therefore noisy and sensitive to survey catchability. In contrast, historical trends in spawning biomass and recruitment appear to be robust measures of stock dynamics.

A study by the sea mammal research unit (SMRU) on seal predation has indicated that seal predation on cod at some or all ages is considered to have become greater than can be accommodated by the standard natural mortality figure of  $M = 0.2$ . It is also possibly subject to a persistent upward trend.

The recent implementation of stricter landings enforcement has potentially improved the quality of the landings data in 2006. However, the full effect of these measures cannot be fully assessed yet.

As cod is taken in mixed demersal fisheries, following the advice will likely result in having to greatly reduce harvesting of other stocks, particularly haddock, whiting, and *Nephrops*. Management needs to take this into account.

Effort data 1998–2005 from UK vessels (one of the main countries fishing in the area) suggests that overall, effort has declined in recent years in Area VIa, and that declines in particular categories have, mostly, not been compensated for by rises in other categories. Larger-

meshed whitefish demersal trawls were the most important gears in Division VIa prior to 2002, but since then there has been a marked decline in KW-days by this category. This is principally explained by the recent, significant decommissioning schemes in the UK. Single-rig *Nephrops* trawls in the 70- to 99-mm mesh category are the other major gears in use and effort by these seems to have been maintained at a fairly stable level throughout the time-series. Numerous other gears generally make small contributions to the overall effort, and the pattern in most of these has been either a downward trend (e.g. seine nets and midwater trawls) or a fluctuation without trend (e.g. fixed nets).

Time and area closures for particular fisheries may be tools to reduce fishing mortality to rebuild this stock. The consequence of displacing effort, caused by the closures, needs to be considered in determining the role of such measures in the recovery plan.

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### Factors affecting the fisheries and the stock

#### *The effects of regulations*

The fishery is managed by a TAC that does not seem to be restricting catches.

Several regulations have been introduced for West of Scotland in recent years. These regulations and their impact on the fisheries have been discussed in detail in the overview. Emergency EU measures were established in the first half of 2001 and led to short-term area closures in the north of the Division and, on a smaller scale, in the Clyde Sea area. These closures were intended to allow as many cod as possible to spawn. The Clyde closure has continued in all subsequent years under national UK legislation. Various derogations were introduced for gears not targeting cod. A new closed area was implemented west of Scotland in 2004 (EC Reg. No. 2287/2003).

The proportion of discarded fish has been high. In 2002 and 2003 regulations were implemented to improve the exploitation pattern of cod. It is not clear whether it is possible to evaluate the potential impacts of these measures on the stock and the fishery.

Increases in cod-end mesh sizes have been introduced into the fishery to improve selectivity. The increase in minimum mesh size from 100 to 120 mm in 2001/2002 (before the introduction of effort regulation 27/2005) partly caused a shift to 80-mm mesh sizes in the mixed fishery trawls, due to the loss of valuable *Nephrops* catch. Catch composition regulations for this mesh size may have resulted in increased discarding and high grading.

The regulation is complemented by a system of fishing effort limitation. This is done by adjustment to the number of fishing days for various vessel categories deploying gears with various mesh sizes. The introduction of effort regulation has effectively further encouraged vessel operators to reduce mesh size and shift to other fisheries, particularly *Nephrops* trawling, in order to gain more days at sea. Without information on the level of adherence to catch composition regulations required when using smaller mesh sizes it is not possible to evaluate whether the mesh size changes and effort limitations may have benefited cod.

However, the continued decline in the stock indicates that these measures alone have not proven sufficient to rebuild the stock to precautionary levels. Detailed analysis of the impact of such regulations is not possible until data of sufficient quality become available.

### *Changes in fishing technology and fishing patterns*

From mid-September 2003 to mid-July 2004 the Irish trawl fishery off Greencastle, Co. Donegal that traditionally targets juvenile cod was closed. The closure was instigated by the local fishing industry to allow an assessment of seasonal closure as a potential management measure. The fishing industry again called for and received a statutory instrument closing the fishery from November 2004 until mid-February 2005 and again November 2005 until mid-February 2006. Most of the cod catch is normally taken in the fourth quarter. During 2000–2002 50% of the Irish catch weight of cod in Division VIa (61% by number) was taken in the fourth quarter. The closure is expected to have reduced the Irish fishing mortality on cod that would otherwise have occurred in 2003, 2004, and 2005.

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### Scientific basis

#### *Data and methods*

A catch-at-age model using catch data up to 1994 tuned by survey data and utilizing survey information alone from 1995 onward was used to evaluate trends in spawning-stock biomass and recruitment. Trends in SSB are similar to results from a model based on survey data alone.

#### *Uncertainties in assessment and forecast*

Catch is considered to be very uncertain, due to incorrect reporting of landings (species and quantity). There are indications that misreporting has reduced from the beginning of 2006.

Some changes have been made to the survey design in the past, but surveys are considered to provide an indicator of long-term stock trends.

#### *Comparison with previous assessment and advice*

The perception of the state of the stock remains unchanged compared to 2003 and subsequent years.

The advice is the same as last year.

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### Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).

Year	ICES advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC <sup>1</sup>	Official landings	ACFM Landings
1987	Reduce F towards $F_{max}$		18.0		22.0	19.2	19.0
1988	No increase in F; TAC		16.0		18.4	19.2	20.4
1989	80% of F(87); TAC		16.0		18.4	15.4	17.2
1990	80% of F(88); TAC		15.0		16.0	11.8	12.2
1991	70% of effort (89)		-		16.0	10.6	10.9 <sup>2</sup>
1992	70% of effort (89)		-		13.5	9.0	9.7 <sup>3</sup>
1993	70% of effort (89)		-		14.0	10.5	11.8 <sup>3</sup>
1994	30% reduction in effort		-		13.0	9.1	10.8 <sup>3</sup>
1995	Significant reduction in effort		-		13.0	9.7	9.6 <sup>3</sup>
1996	Significant reduction in effort		-		13.0	9.6	9.4
1997	Significant reduction in effort		-		14.0	7.0	7.0
1998	20% reduction in F		9.5 <sup>5</sup>		11.0	5.7	5.7
1999	F reduced to below $F_{pa}$		<9.7 <sup>5</sup>		11.8	4.3	4.2
2000	Recovery plan, 60% reduction in F		<4.2		7.48	2.8 <sup>4</sup>	3.0
2001	Lowest possible F, recovery plan		-		3.7	2.5	2.3
2002	Recovery plan or lowest possible F		-		4.6	2.0	2.1
2003	Closure		-		1.81	1.3	n/a
2004		Zero catch	<sup>6</sup>	0	0.85	0.6	n/a
2005		Zero catch	<sup>6</sup>		0.72	0.5	n/a
2006		Zero catch	<sup>6</sup>		0.613	0.5	n/a
2007		Zero catch	<sup>6</sup>	0	0.49		
2008		Zero catch	<sup>6</sup>	0			

Weights in '000 t.

<sup>1</sup>TAC is for the whole of Subareas Vb1, VI, XII, and XIV.

<sup>2</sup>Not including misreporting.

<sup>3</sup>Including ACFM estimates of misreporting.

<sup>4</sup>Incomplete data.

<sup>5</sup>For VIa only.

<sup>6</sup>Single-stock boundaries and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

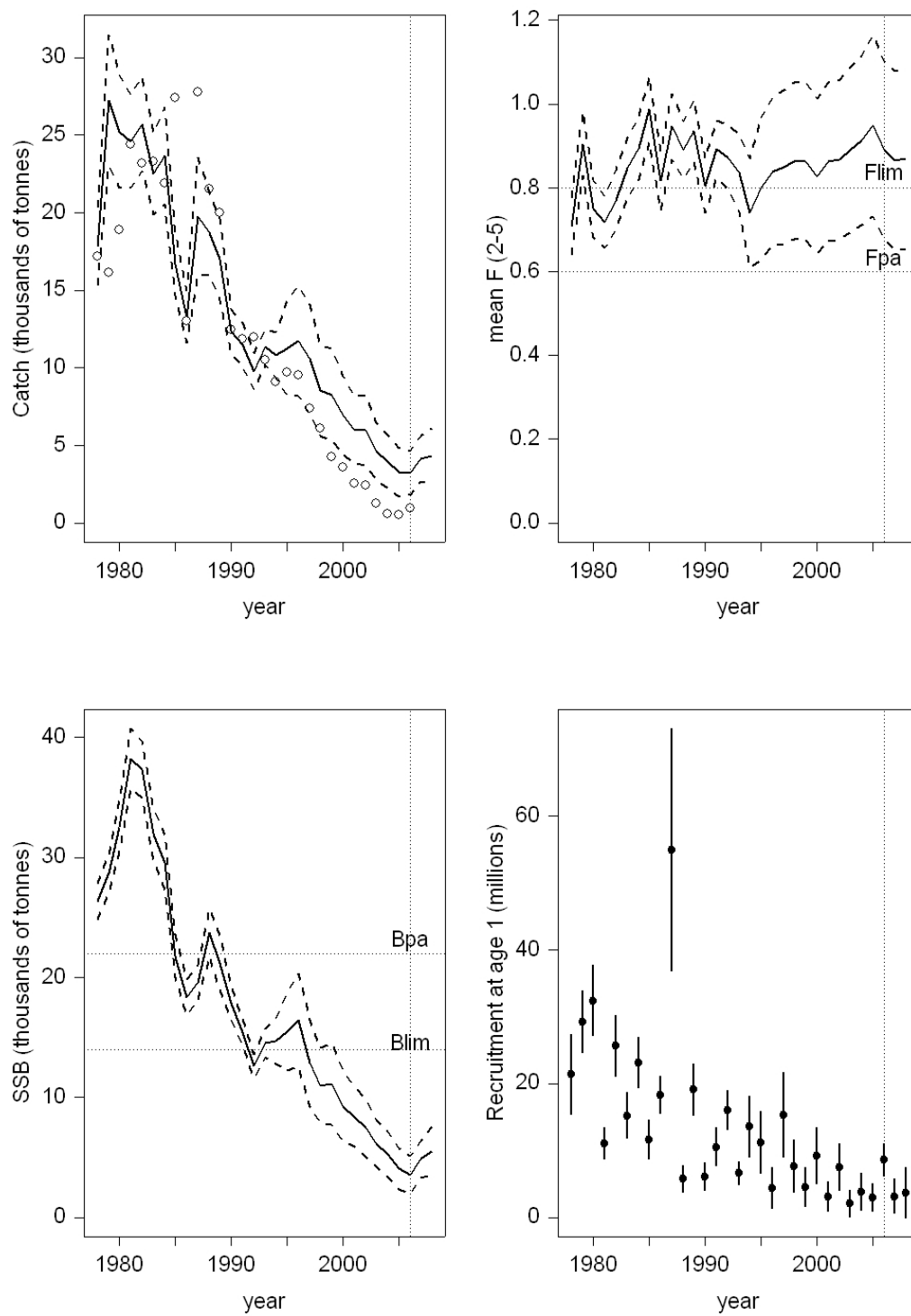


Figure 5.4.21.1 Cod in Division VIa. Summary plot of TSA final run (landings & discard data excluded from 1995 onward). In catch figure, open circles indicate observed catches, and lines indicate estimated removals

**Table 5.4.21.1** Cod in Division VIa. Official catch statistics in 1985–2006, as reported to ICES.

COUNTRY	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Belgium	48	88	33	44	28	-	6	-	22	1	2	+	11	1	+	+	2	+
Denmark	-	-	4	1	3	2	2	3	2	+	4	2	-	-	+	-	-	-
Faroe Islands	-	-	-	11	26	-	-	-	-	-	-	-	-	-	-	-	-	-
France	7,411	5,096	5,044	7,669	3,640	2,220	2,503	1,957	3,047	2,488	2,533	2,253	956	714*	842* <sup>2</sup>	236	391	208
Germany	66	53	12	25	281	586	60	5	94	100	18	63	5	6	8	6	4	+
Ireland	2,564	1,704	2,442	2,551	1,642	1,200	761	761	645	825	1,054	1,286	708	478	223	357	319	210
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-
Norway	204	174	77	186	207	150	40	171	72	51	61	137	36	36	79	114*	40*	88
Spain	28	-	-	-	85	-	-	-	-	-	16	+	6	42	45	14	3	11
UK (E., W., N.I.)	260	160	444	230	278	230	511	577	524	419	450	457	779	474	381	280	138	195
UK (Scotland)	8,032	4,251	11,143	8,465	9,236	7,389	6,751	5,543	6,069	5,247	5,522	5,382	4,489	3,919	2,711	2,057	1,544	1,519
UK																		
Total landings	18,613	11,526	19,199	19,182	15,426	11,777	10,634	9,017	10,475	9,131	9,660	9,580	6,992	5,671	4,289	2,767	2,439	2,231

COUNTRY	2003	2004	2005	2006*
Belgium				
Denmark				
Faroe Islands		2	0	0.8
France	172	91	79	100.7
Germany	+			2
Ireland	120	34	27.9	18
Netherlands	-			
Norway	46	10		30
Spain	3			
UK (E., W., N.I.)	79	46		
UK (Scotland)	879	413		
UK			403	332.1
Total landings	1,299	596	509.9	483.6

\*Preliminary.

# Rockall Cod

## (Division VIb)

For latest information, see: <http://www.ices.dk>



*Marine Institute*  
Foras na Mara

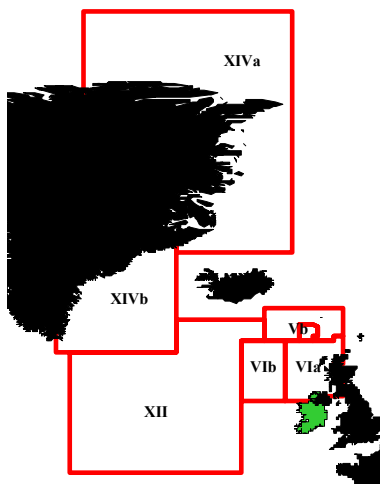
*Fisheries Science Services*

### FSS – SINGLE STOCK CONSIDERATIONS

(See West of Scotland and Rockall Overview for Mixed Fishery Advice)

There is no information of the status of cod in Division VIb. The official landings data show a substantial declining trend in landings from nearly 2,000 t in 1985 to around 50 t in the last two years.

ICES does not give advice for this stock. Given the landings trend and critical condition of the adjacent cod stock in Division VIa, FSS advises a zero catch of cod in 2007 for VIb.



Red Boxes-TAC/Management Areas

### CURRENT MANAGEMENT

- The TAC area covers Sub-areas Vb, VI, XII, and XIV.
- The TAC in 2007 was 490 t, with an associated Irish quota of 110 t (120 t adjusted).
- The official landings reported from Division VIb account for about 10% of the catch in Sub-area VI.
- There are no explicit management objectives or plans for this stock.
- In 2006 the EC allocated all of the TAC to Division VIa

### ADDITIONAL INFORMATION

1. There is no assessment data for this stock. The stock definition is uncertain. Cod in this area may not constitute a separate stock from that in Division VIa.
2. Estimated landings in Division VIb by the Irish fleet were 22.7 t in 2006.
3. Misreporting and under-reporting are considered to be a problem in this fishery.
4. The fishery is dominated by the UK, Ireland and Norway.
5. Cod is a minor by-catch in the limited Irish fishery targeting mainly haddock and megrim.

## ICES ADVICE

5.4.22

### State of the stock

Officially reported catches are shown in the table below. No analytical assessment of this stock has been carried out.

### Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).



**Table 5.4.22.1**

Cod in Division VIb (Rockall). Official catch statistics.

COUNTRY	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Faroe Islands	18	-	1	-	31	5	-	-	-	1	-	-
France	9	17	5	7	2	-	-	-	-	-	-	-
Germany	-	3	-	-	3	-	-	126	2	-	-	-
Ireland	-	-	-	-	-	-	400	236	235	472	280	477
Norway	373	202	95	130	195	148	119	312	199	199	120	92
Portugal	-	-	-	-	-	-	-	-	-	-	-	-
Russia	-	-	-	-	-	-	-	-	-	-	-	-
Spain	241	1200	1219	808	1345	-	64	70	-	-	-	2
UK (E. & W. & N.I.)	161	114	93	69	56	131	8	23	26	103	25	90
UK (Scotland)	221	437	187	284	254	265	758	829	714	322	236	370
Total	1,023	1,973	1,600	1,298	1,886	549	1,349	1,596	1,176	1,097	661	1,031

COUNTRY	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*	
Faroe Islands	-	-	-	-	n/a	n/a	n/a					
France	-	-	-	-	+	+	1			0.08		
Germany	10	22	3	11	1	-	-					
Ireland	436	153	227	148	119	40	18	11	7		22.7	
Norway	91	55*	51*	85*	152*	89	28	25	23	7	7	
Portugal	-	5	-	-	-	-	-					
Russia	-	-	-	-	7	26	-					
Spain	5	1	6	4	3	1		6				
UK (E. & W. & N.I.)	23	20	32	22	4	2	2	3				
UK (Scotland)	210	706	341	389	286	176	67	57				
UK										45	44	28.7
Total	775	962	660	659	572	334	115	102	75	51	58.4	

\* Preliminary.

# West of Scotland Haddock

## (Division VIa)

For latest information, see: <http://www.ices.dk>



Marine Institute  
Foras na Mara

Fisheries Science Services

### FSS - SINGLE STOCK CONSIDERATIONS

(See West of Scotland and Rockall Overview for mixed fishery advice).

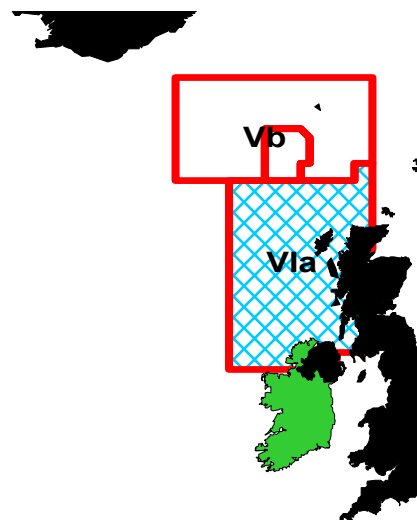
Based on the most recent estimate of SSB and fishing mortality, FSS agrees with the ICES classification of the stock as having full reproductive capacity but notes that it is at risk of being harvested unsustainably due to recent low recruitment which has contributed to the decline in SSB. Fishing mortality has been above  $F_{pa}$  in recent years and SSB is close to  $B_{pa}$ .

The assessment model estimates total catches from the fishery and it is not possible to partition these into landings, discards and other sources of mortality. SSB and recruitment are estimated with a relatively high level of precision, however mortality estimates are less well estimated. Unaccounted removals have been taken into consideration in the assessment.

FSS considers that in order to maximise short-term catches and harvest the stock within precautionary limits fishing mortality should be reduced below  $F_{pa}$  and SSB should be above  $B_{pa}$ . FSS agrees with the ICES recommendations that fishing mortality should be reduced to less than 0.18 to maintain SSB above  $B_{pa}$  in 2009. This corresponds to a total catch (landings plus discards) of 4,200 t in 2008.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For West of Scotland haddock, FSS interprets that the proposal would correspond to landing of 7,200 t in 2008 and an associated Irish quota of 568 t.

FSS recommends that a long term management plan is developed which recognises that haddock are subject to highly sporadic recruitment which will cause substantial variation in catches and SSB from year to year. FSS therefore recommends that a within-year review of management controls, taking into account real-time information, would allow a more effective means of exploiting the sporadic high recruitment that is characteristic of haddock stocks. There will be no gain to the long-term yield by having fishing mortalities above  $F_{0.1}(0.2)$ .



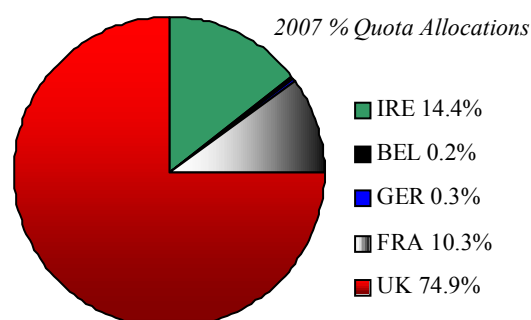
Red Boxes-TAC/Management Areas Blue Shading-Assessment Area

### CURRENT MANAGEMENT

- In 2004 the TAC area was revised to cover Divisions Vb and VIa. The assessment area covers Division VIa only.
- The 2007 TAC allocated to this stock was 7,200 t, with an Irish quota of 1037 t (updated to 1,105 t).
- Since February 2003 a days-at-sea effort control regime was implemented in Division VIa as part of Cod recovery measures.
- There are no explicit management objectives or a management plan for this stock. FSS recommend that management objectives be established and that a management plan be developed and implemented by stakeholders for all fisheries catching haddock.

### ADDITIONAL INFORMATION

1. Irish landings in 2006 were reported to be about 521 t.
2. Otter trawlers from Killybegs and Greencastle have traditionally partaken in the Irish haddock fishery. This is generally a mixed fishery targeting haddock, cod,



whiting, megrim and monkfish. In recent years there has been a decline in effort in Division VIa due to decommissioning and displacement of effort to Sub-area VII (see also the Section “Recovery Plans and Effort Limitation”).

3. The mesh size increase implemented in recent years as part of the cod recovery plan will theoretically improve the selection pattern substantially for haddock in Division VIa.
4. There is evidence to suggest that there is some mixing between haddock populations between VIa and the southern part of Division VIa and there may also be some mixing between haddock from Division VIa and Division IVa.
5. The proportion of haddock discarded has been high. Discarding rates in the Irish otter trawl fleet are estimated to be high (see length and age composition plots). Effective mitigation measures should therefore be introduced.

## ICES ADVICE

### 5.4.23

#### State of the stock

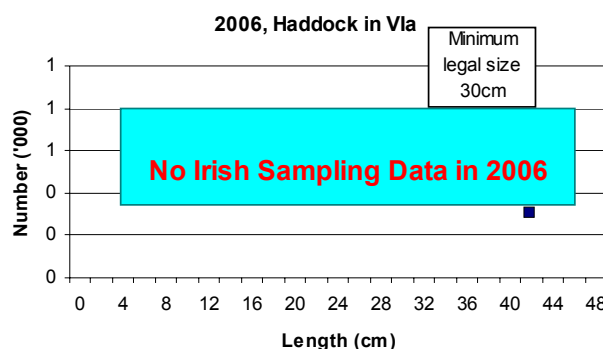
Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Full reproductive capacity	Risk of being harvested unsustainably	Overexploited	Not defined

Based on the most recent estimate of SSB ICES classifies the stock as having full reproductive capacity. The estimate of fishing mortality is above  $F_{pa}$  in most years since 1987.  $F$  has declined in the period 2000–2002 and has remained constant from 2003 onwards. SSB varied around  $B_{pa}$  during the 1990s. The very strong 1999 year class has caused SSB to increase from a level near the historic low in 2000 to a peak in 2002 and has declined since. The 2003 to 2005 year classes are estimated to be weak.

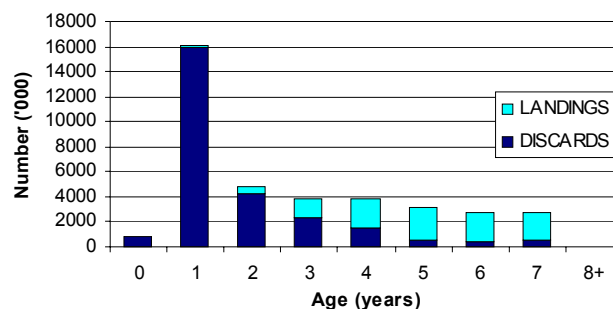
#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	22 000 t	$B_{lim} = B_{loss}$ , the lowest observed spawning stock estimated in previous assessments.
	$B_{pa}$	30 000 t	$B_{pa} = B_{lim} * 1.4$ . This is considered to be the minimum SSB required to have a high probability of maintaining SSB above $B_{lim}$ , taking into account the uncertainty of assessments.
	$F_{lim}$	Not defined.	
	$F_{pa}$	0.5	The $F$ below which there is a high probability of avoiding $SSB < B_{pa}$ in the long term.
Targets	$F_y$	Not defined.	

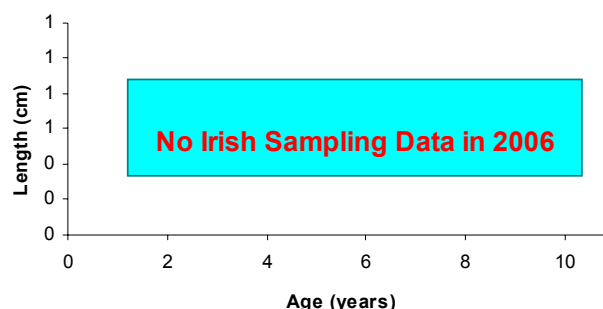
(unchanged since: 1998)



**2006 Age Composition: International catch, Haddock in VIa**



**2006 Size at Age: Irish Sampling, Haddock in VIa**



#### Management objectives

There are no explicit management objectives for this stock.

*Yield and spawning biomass per Recruit*  
*F-reference points:*

	Fish Mort Ages 2–6	Yield/R	SSB/R
Average last 3 years	0.56	0.17	0.34
$F_{\max}$	0.44	0.17	0.43
$F_{0.1}$	0.20	0.15	0.81
$F_{\text{med}}$	0.42	0.17	0.45

### Single-stock exploitation boundaries

*Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects*

Candidates for reference points which are consistent with taking high long-term yields and achieving a low risk of depleting the productive potential of the stock may be identified in the range of  $F_{0.1}$ – $F_{\max}$ . The estimate for  $F_{\max}$  is uncertain, but the current fishing mortality is likely to be higher. There will be no gain to the long-term yield by having fishing mortalities above  $F_{\max}$ . Fishing at such lower mortalities would lead to higher SSB and, therefore, lower risks of fishing outside precautionary limits.

### Exploitation boundaries in relation to precautionary limits

In order to maintain SSB above  $B_{\text{pa}}$  in 2009, ICES recommends a reduction in fishing mortality to less than 0.18. This corresponds to total catches (including discards and unallocated catches) of less than 4 200 t in 2008.

### Short-term implications

#### Outlook for 2008

Basis:  $F(2007) = F_{\text{sq}} = \text{mean } F(\text{age } 2-6) = 0.57$ ;  $R(2007) = 23.4$ ;  $R(2008, \text{Ricker}) = 107.9$  million;  $\text{SSB}(2007) = 23.6$ ;  $\text{SSB}(2008) = 20.5$ ; catch (2007) = 11.9.

Rationale	Total catch (2008)	Basis	F(2008)	SSB(2009)	%SSB change <sup>1</sup>
Zero catch	0	$F=0$	0	34.7	69%
High long-term yield	4.5	$F(\text{long-term yield})$	0.20	29.6	44%
Status quo	2.6	$F_{\text{sq}} * 0.2$	0.11	31.7	55%
	3.9	$F_{\text{sq}} * 0.3$	0.17	30.3	48%
	4.2	$F_{\text{sq}} * 0.33$	0.18	30.0	46%
	5.0	$F_{\text{sq}} * 0.4$	0.23	29.0	41%
	7.2	$F_{\text{sq}} * 0.6$	0.34	26.6	30%
	9.1	$F_{\text{sq}} * 0.8$	0.45	24.4	19%
	9.9	$F_{\text{pa}} = F_{\text{sq}} * 0.88$	0.50	23.6	15%
	10.9	$F_{\text{sq}} * 1$	0.57	22.5	10%
	12.5	$F_{\text{sq}} * 1.2$	0.68	20.7	1%

All weights in '000 tonnes.

Shaded scenarios are not considered consistent with the precautionary approach.

<sup>1</sup> SSB 2009 relative to SSB 2008.

TAC 2008 relative to TAC 2007 cannot be calculated since the forecast estimates total catch and not landings.

### Management considerations

The conflicting signals in the survey and the catch-at-age information indicate that since the mid-1990s there have been unaccounted catches. The recent implementation of stricter landings enforcement has potentially improved the quality of the landings data in 2006; however, the full effect of these measures cannot be fully assessed yet.

There have been several technical conservation measures introduced in the demersal fishery in Division VIa in recent years. These have affected selectivity for haddock because of switching between mesh categories. In addition a number of decommissioning rounds and reallocation of effort from Divisions VIa into other ICES areas have reduced effort. However, the relationship between effort and mortality remains unclear. Management for haddock will be strongly linked to that for cod for which a recovery plan is currently in force.

Special attention needs to be given to considering the sporadic nature

of the haddock recruitment and how to manage periods of low recruitment interspersed with large, occasional pulses. In recent years around 50% of the total catch in weight has been discarded, so restricting landings alone may not achieve the necessary increase in SSB. Mainly 1- to 4-year-old haddock is discarded; however, in 2006, about one fourth of the strong 1999 year class was still discarded.

Recent recruitments have been poor and this has contributed to a decline in SSB.

### Factors affecting the fisheries and the stock

#### Regulations and their effects

In recent years, effort of trawling with larger mesh sizes (120 mm+ traditional gadoid fishery in Division VIa) appears to have been substantially reduced, with fisheries moving into the *Nephrops* fishery in Division IVa (principally, the Fladen Ground). The main reason ap-

pears to be lack of quota and restrictive day allocations related to the cod recovery plan in Division VIa. While there has been a general decline in the haddock fishery in Division VIa, both Irish and Scottish sources suggest that there is an increasing focus in the corresponding Division VIb (Rockall) fishery.

#### *Changes in fishing technology and fishing patterns*

Haddock in Division VIa are caught mainly by Scottish trawlers. Since 1976, Scottish heavy trawl and seine effort has declined, whilst that of light trawlers (shorter than 90 feet) has generally increased.

#### *Other factors*

Haddock in Division VIa are fully exploited from age group 3, and also reach full maturity at that age. Immature fish are subject to comparatively high fishing mortality, and comprise a large fraction of the discarded catch. High fishing mortality on immature haddock increases the susceptibility of the stock to overexploitation.

### **Scientific basis**

#### *Data and methods*

The analytical age-based assessment is based on landings-at-age data, discard-at-age data, and indices from research vessel surveys. Due to uncertainties in landings quantity, catch data 1995–2005 were not used in the assessment. The assessment model therefore estimates total catch from the fishery.

#### *Uncertainties in assessment and forecast*

This year's forecast for haddock in Division VIa is based on an assessment principally driven by survey data since 1995. As is often ob-

served for assessments based primarily on survey information, estimates of SSB and recruitment are estimated with a relatively high level of precision; however, mortality levels are less well estimated and have broad confidence intervals (between 0.3 and 0.8 in 2006).

It is not possible to partition estimates of total catch into landings, discards, and other sources of mortality within the assessment model. Changes in natural mortality are not thought to be the principle source of the estimated unallocated removals from the stock. The unaccounted removals have been taken into account in the assessment.

A number of assumptions have been made about weight-at-age to account for the slow-growing 1999 and 2000 year classes.

#### *Comparison with previous assessment and advice*

The perception of the state of the stock from this year's assessment does not differ from that obtained last year.

The assessment is survey-based from 1995 onwards and estimates total catches (i.e. landings, discards, and unallocated catches) from that year to the present. Consequently, the forecast gives total catches rather than landings. Last year the same assessment procedure was used, but partial Fs for landings and discards were calculated applying 3-year mean landings and discard proportions to the 3-year total mean F. However, this was incorrect, since the applied assessment procedure does not allow partitioning the estimated catches back into landings, discards, and unallocated catches.

### **Source of information**

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).

Year	ICES Advice	Single-Stock Exploitation Boundaries	Predicted catch corresp. to advice	Predicted catch corresp. to Single-Stock Exploitation Boundaries	Agreed TAC <sup>1</sup>	Official Landings	ACFM Landings	Discard Slip.	ACFM Catch
1987	Reduce F towards $F_{\max}$		20.0		32.0	27	27.0	16.2	43.2
1988	No increase in F; TAC		25.0		35.0	21	21.1	10.2	31.3
1989	80% of F(87); TAC		15.0		35.0	24	16.7	3.2	19.9
1990	80% of F(88); TAC		14.0		24.0	13	10.1	5.4	15.5
1991	70% of effort (89)		-		15.2	10	10.6	9.2	19.8
1992	70% of effort (89)		-		12.5	7	11.4 <sup>2</sup>	9.4 <sup>2</sup>	20.8 <sup>2</sup>
1993	70% of effort (89)		-		17.6	13	19.1 <sup>2</sup>	16.9 <sup>2</sup>	36.0 <sup>2</sup>
1994	30% reduction in effort		-		16.0	9	14.2 <sup>2</sup>	11.2 <sup>2</sup>	25.4 <sup>2</sup>
1995	Significant reduction in effort		-		21.0	13	12.4	8.8	21.2
1996	Significant reduction in effort		-		22.9	13	13.4	11.8	25.3
1997	Significant reduction in effort		-		20.0	13	12.9	6.6	19.5
1998	No increase in F		20.8 <sup>3</sup>		25.7	14	14.4	5.7	20.1
1999	F reduced to $F_{pa}$		14.3 <sup>3</sup>		19.0	11	10.4	5.1	15.6
2000	Maintain F below $F_{pa}$		<14.9 <sup>3</sup>		19.0	7	6.9	8.2	15.2
2001	Reduce F below $F_{pa}$		<11.2 <sup>3</sup>		13.9	7	6.7	7.2	14.0
2002	Reduce F below $F_{pa}$		<14.1 <sup>3</sup>		14.1	7	7.1	8.6	15.2
2003	No cod catches		-		8.7	4.9	5.3	4.2	9.6
2004	<sup>4</sup>	$F_{pa}$		12.2	6.5	3.0	3.2	n/a	n/a
2005	<sup>4</sup>	$\frac{3}{4} * F_{pa}$		7.6	7.6	3.2	3.1	n/a	n/a
2006	<sup>4</sup>	$0.7 * F_{pa}$		8.0	7.81	5.7	5.7	n/a	n/a
2007		$0.87 * F_{pa}$		7.2	7.2				
2008		SSB > $B_{pa}$ in 2009		4.2					

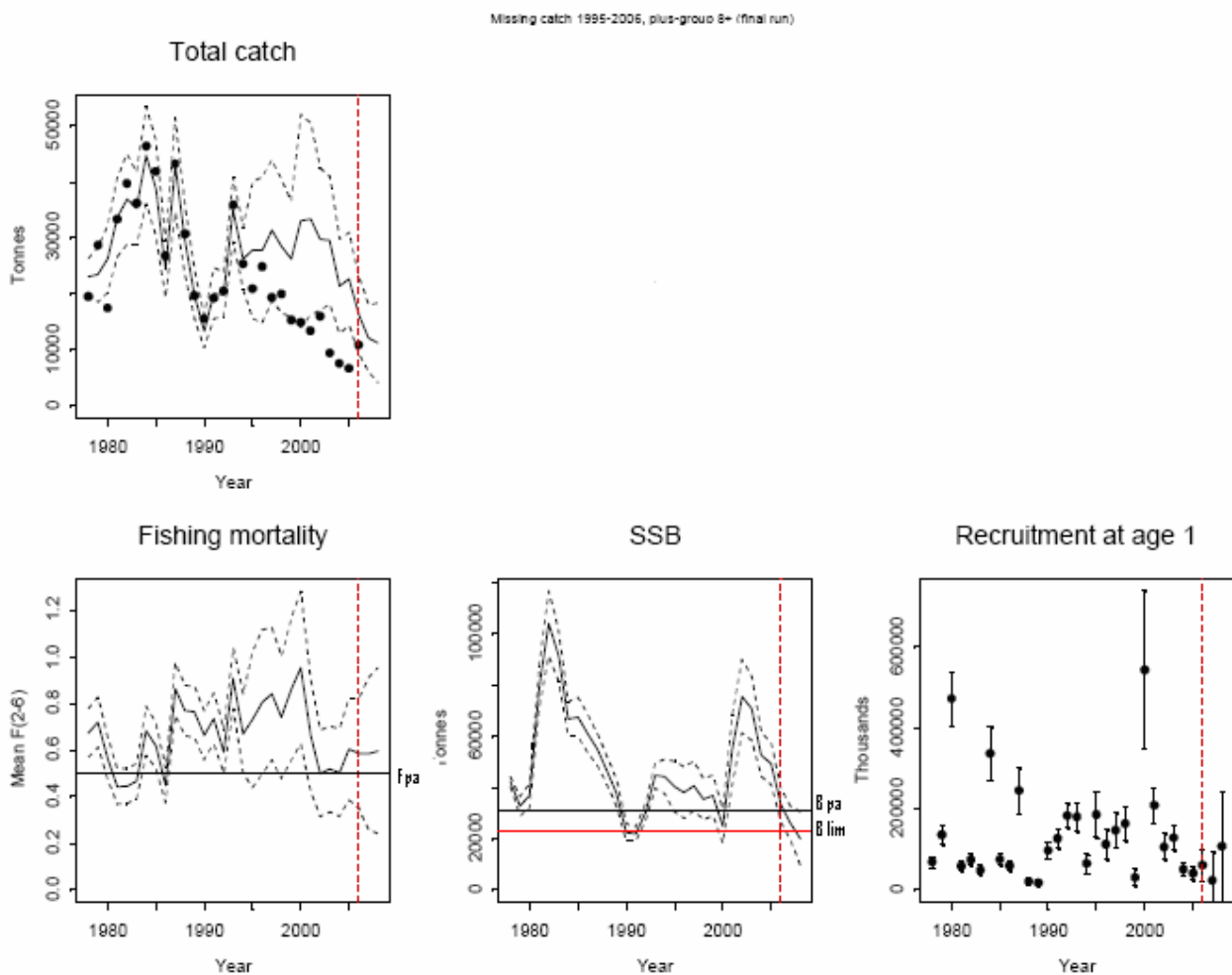
All weights in thousand tonnes.

<sup>1</sup> TAC is set for Divisions VIa and VIb (plus Vb1, XII, and XIV), combined with restrictions on the quantity that can be taken in VIa from 1990.

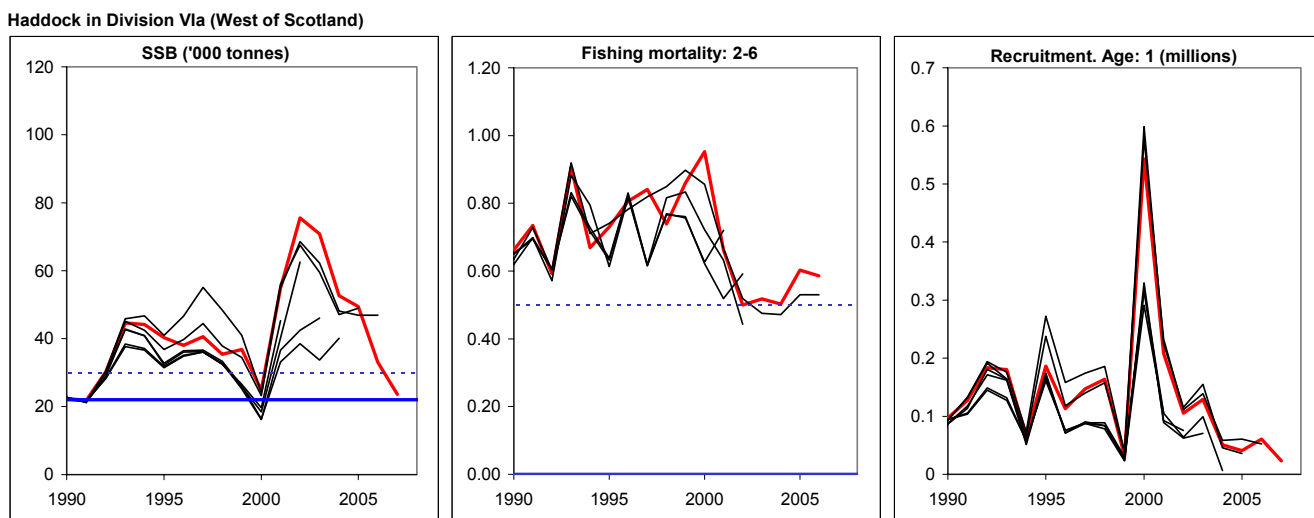
<sup>2</sup> Adjusted for misreporting.

<sup>3</sup> For VIa only.

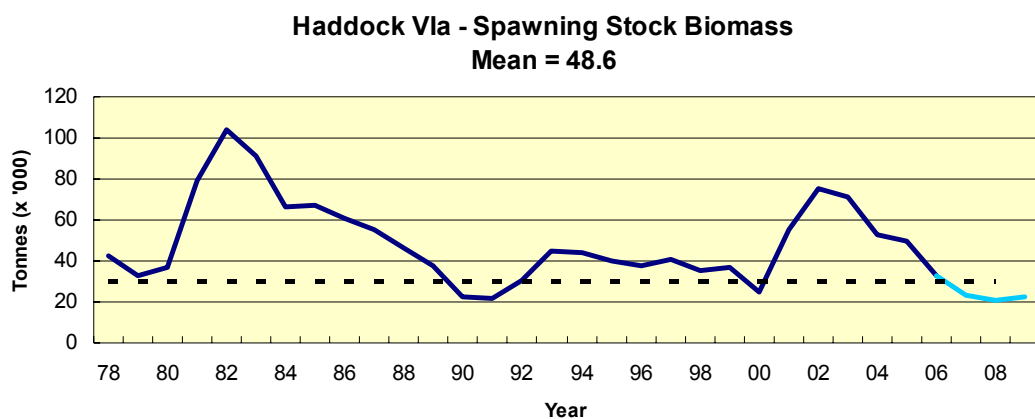
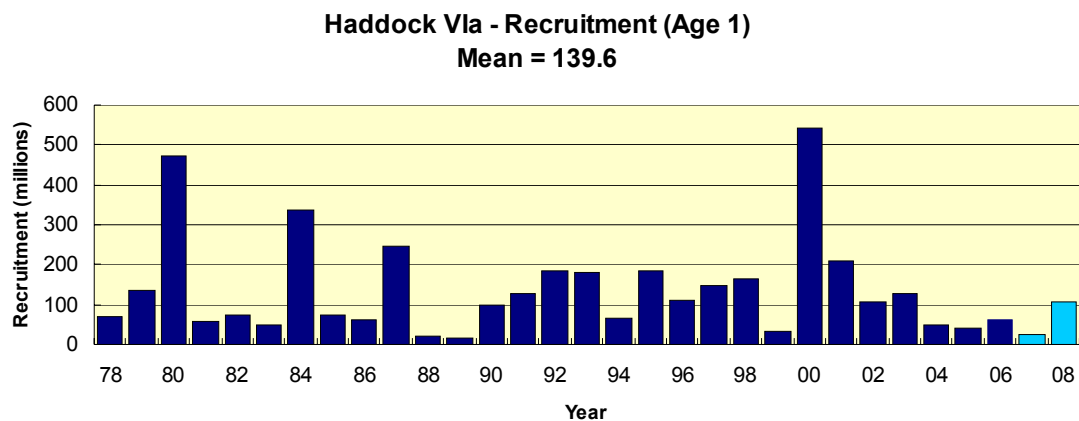
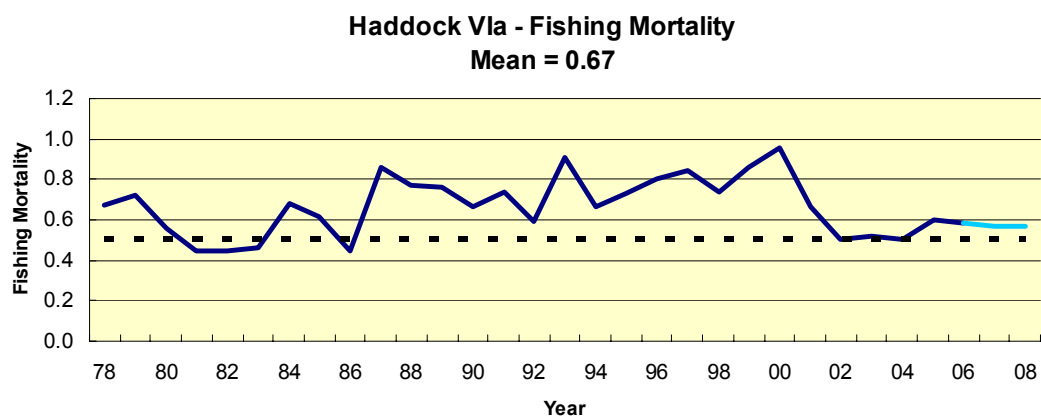
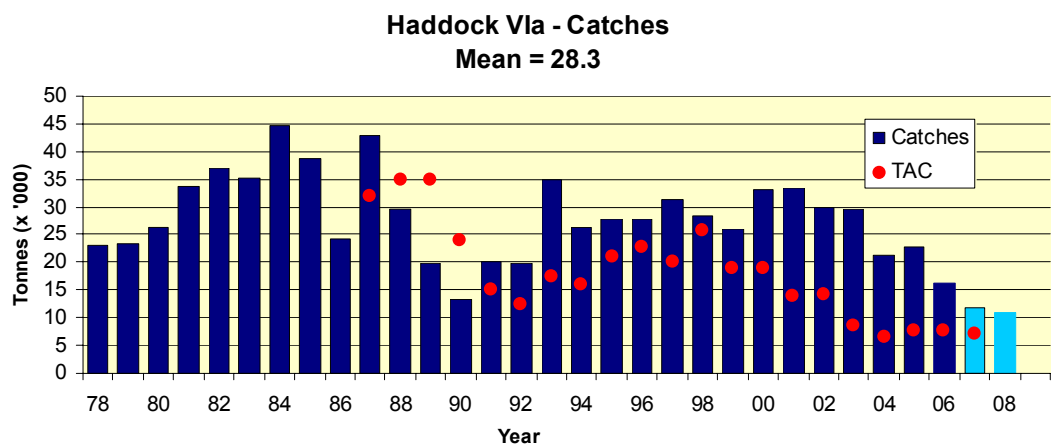
<sup>4</sup> Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.



**Figure 5.4.23.1** Haddock in Division VIa. TSA stock summaries from the final run (missing catch data from 1995 onwards). Estimates are plotted with approximate point-wise 95% confidence bounds. Dots indicate observed values for catch and landings. The vertical line in each plot delineates the last year of the historical assessment (2006); estimates to the right of these lines are the TSA-based forecast.



**Figure 5.4.23.3** Haddock in Division VIa. Comparison of current assessment with previous assessments.



**Table 5.4.23.1** Haddock in Division VIa. Nominal landings (000 t), as officially reported to ICES and estimated by the WG.

COUNTRY	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005 <sup>1</sup>	2006 <sup>1</sup>
Belgium	8	9	-	9	1	7	1	+	1	3	2	2	1	2	+	+		+	
Denmark	+	+	+	+	1	1	-	1	1	-	+	-	-	-	-	+	-		
Faroe Islands	-	13	-	1	-	-	-	-	-	-	-	-	n/a	n/a			4		1
France	3,001	1,335 <sup>1, 2</sup>	863 <sup>1,2</sup>	761 <sup>1,2</sup>	761	1,132	753	671	445	270	394 <sup>1</sup>	788	282	160	151	183	173	233	250
Germany	4	4	15	1	2	9	19	14	2	1	1	2	1	1	+	-		+	7
Ireland	2,731	2,171	773	710	700	911	746	1,406	1,399	1447	1,352	1054	677	744	672	497	194	n/a	521
Norway	54	74	46	12	72	40	7	13	16 <sup>1</sup>	21 <sup>1</sup>	28	18	70	32	30	23	4	21	17
Spain	-	-	-	-	-	-	-	-	-	-	2	4	9	4	4	5			
UK (E & W) <sup>3</sup>	114	-	164	137	132	155	254	322	448	493	458	315	199	201	237				
UK (N. Ire)	35	235							...	...	...	...	...	...	...				
UK (Scot.)	15,151		10,964	8,434	5,263	10,423	7,421	10,367	10,790	10,352	12,125	8,630	5,933	5,886					
UK (total)		19,940													6,225	4,688	3,002	2,972	4,941
Netherlands																	1		
Total reported	21,098	23,781	12,825	10,065	6,932	12,678	9,201	12,794	13,102	12,587	14,360	10,813	7,163	7,030	7,113	4,884	3,007	3,227	5,737
WG estimates	21,136	16,688	10,135	10,557	11,350	19,060	14,243	12,368	13,453	12,874	14,401	10,430	6,952	6,731	7,097	5,334	3,199	3,148	5,723

<sup>1</sup>Preliminary.

<sup>2</sup>Includes Divisions Vb(EC) and VIb.

<sup>3</sup>1989–2002 N. Ireland included with England and Wales.

n/a = Not available.

WG estimates refers to the sum-of-products of landings and weights-at-age provided to the WG, rather than the estimated removals produced in the final assessment.



**Table 5.4.23.2** Haddock in Division VIa (West of Scotland).

Year	Recruitment Age 1 thousands	SSB tonnes	Catches incl disards tonnes	Mean F Ages 2–6
1978	69116	42316	23061	0.6730
1979	136155	32720	23416	0.7190
1980	472072	36708	26245	0.5623
1981	58752	79001	33662	0.4442
1982	74318	103933	36913	0.4450
1983	48463	91336	35252	0.4662
1984	336664	66582	44722	0.6823
1985	75280	67327	38744	0.6176
1986	60103	61032	24341	0.4478
1987	245153	54849	42937	0.8622
1988	20909	46446	29602	0.7689
1989	17434	37828	19824	0.7635
1990	97390	22384	13275	0.6632
1991	127184	21880	20093	0.7344
1992	183623	30175	19845	0.5926
1993	180309	44601	35051	0.9077
1994	65377	44140	26235	0.6689
1995	186246	40319	27791	0.7311
1996	112649	37961	27793	0.8065
1997	146899	40590	31320	0.8407
1998	163571	35403	28511	0.7399
1999	31225	36750	26182	0.8603
2000	543159	24851	32992	0.9528
2001	208626	54871	33347	0.6633
2002	105737	75502	29774	0.5000
2003	128863	70806	29562	0.5178
2004	50797	52620	21362	0.5028
2005	40968	49360	22658	0.6031
2006	60690	33020	16224	0.5864
2007	23400	23600		
Average	135704	48630	28301	0.6663

# Rockall Haddock

## (Division VIb)

For latest information, see: <http://www.ices.dk>



Marine Institute  
Foras na Mara

### Fisheries Science Services

#### FSS – SINGLE STOCK CONSIDERATIONS

(See West of Scotland and Rockall Overview for Mixed Fishery Advice)

Based on the most recent stock estimates ICES considers that the stock is harvested sustainably and is at full reproductive capacity and that fishing mortality has declined in recent years and is now below  $F_{pa}$ . Spawning stock biomass has increased in recent years as a result of good recruitment of the 2001 year class.

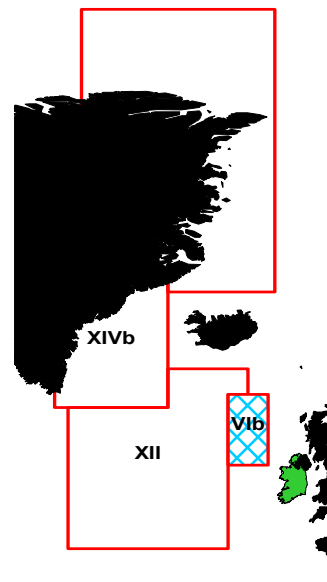
The assessment is based on catch numbers-at-age and one survey index (Scottish Groundfish Survey). Discarding occurs in part of the fishery and has been estimated and used in the assessment. The survey covers only part of the currently known distribution area of haddock. The survey index may thus in part reflect changes in the distributional pattern, and not only in stock dynamics. There is an urgent requirement for well-designed scientific monitoring programmes capable of delivering accurate data on trends in abundance and composition of the fish fauna throughout the area, in a form that can support the development and implementation of a management plan for the Rockall Bank.

FSS agrees with ICES advice that fishing mortality should be less than  $F_{pa}$  corresponding to catches less than 10,640 t in 2008. It should be noted that this advice is based on catch, including discards, and not on landings.

Part of the fishery lies in international waters where catches are unregulated. FSS therefore advises that proper control and enforcement measures, such as those outlined in the EC recovery proposal, should be implemented immediately.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Rockall Haddock, however these rules can not be applied because the majority of the catch is outside EU waters and the absence of a management plan. FSS recommends that the EU and Russia develop a joint management plan for this stock.

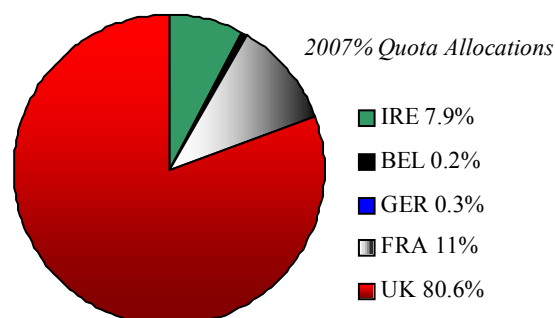
There is no gain in yield by having a target  $F$  above  $F_{0.1}$  (0.18).



Red Boxes-TAC/Management Areas Blue Shading- Assessment

#### CURRENT MANAGEMENT

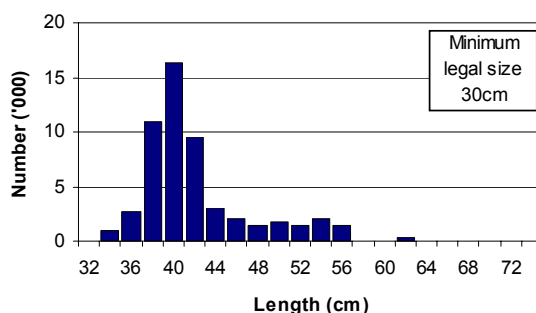
- Since 2004 an autonomous TAC has been set for EU fleets operating in Divisions VIb, XII and XIV.
- The 2007 TAC was 4,615 t. The associated Irish quota was 363 t (updated to 368 t).
- Part of Division VIb falls (since 1999) within international waters fished by non EU vessels (mainly Russian) which are not subject to TAC. This allows for an unregulated fishery in the Rockall area.
- In consultation with the Russian Federation, a recovery plan was proposed by the European Commission in October 2003. The recovery plan is designed to be facilitated by quota and technical regulations. No aspects of the plan have yet been implemented by NEAFC.
- Following the NEAFC agreement in March 2001, NEAFC have maintained an area closure to all fishing (except long-lining) in the SW corner of the Rockall Bank. Data are inadequate to fully evaluate the impact of this measure on the stock status.



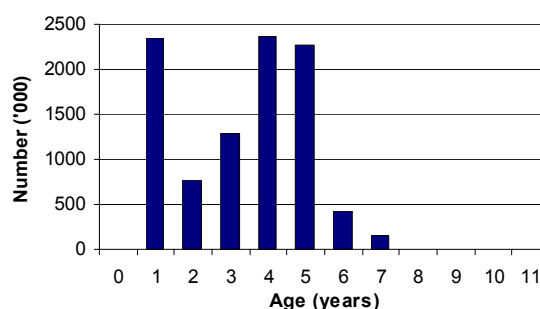
## ADDITIONAL INFORMATION

1. Over the past decade there have been significant changes in the fleets fishing at Rockall (accompanied by changes in the spatial and temporal distribution of their effort). There are also possible misreporting of landings, considerable discarding and high-grading in this fishery. In 1999 a Russian fishery commenced mainly using smaller mesh gears in the international part of the Rockall bank. This fleet now accounts for the majority of the catches.
2. Technical regulations relating to minimum landing sizes and mesh sizes should be harmonised between the EU and international fleets exploiting this stock. In order to improve the exploitation pattern on juvenile haddock, current EU regulations should be adopted in international waters by NEAFC.
3. The fisheries independent data for the stock is poor with limited survey data. In 2005 a trawl acoustic survey was carried out by the Russian Federation and a point estimate of the biomass of Rockall haddock was calculated. Annual surveys should be conducted to provide a fishery independent time series and for providing data on the size distribution of haddock in the area.
4. In general TACs are likely to be effective only if they are strictly enforced. This assumption is unlikely to be true for Rockall haddock, especially when coupled with evasion of TACs as a result of misreporting, high-grading, and discarding. In the case of Rockall haddock such practices may be prevalent due to the remote nature of the fishery and the processing of catches at sea by some fleets.
5. Limited discard data indicate that there is substantial and highly variable discarding of haddock by EU fleets.
6. Ireland took about 41 t in 2006. In the mid 1990s 5–7 otter trawlers from Killybegs and Greencastle carried out the Irish haddock fishery and catches of over 1,000 t were recorded.
7. Very few Irish vessels have participated in the fishery since 2003. This is generally a mixed fishery targeting haddock, megrim and anglerfish.

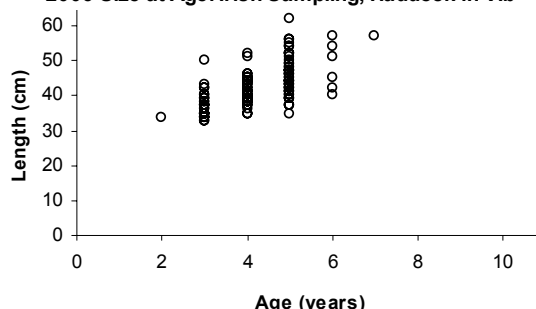
**2006 Length Distribution: Irish Twin Trawlers, Haddock in VIb**



**2006 Q1&2 Age Composition: International Landings, Haddock in VIb**



**2006 Size at Age: Irish Sampling, Haddock in VIb**



## ICES ADVICE

### 5.4.24

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Full reproductive capacity	Harvested sustainably	Underexploited	Not defined

Based on the most recent estimates of SSB and fishing mortality ICES classifies the stock as having full reproductive capacity and it is harvested sustainably. Spawning biomass has increased in recent years as a result of the 2000 and 2001 year classes. SSB has been above  $B_{pa}$  since 2003. Fishing mortality has been above  $F_{pa}$  throughout the time-series but has declined since 2005 to below  $F_{pa}$ .

#### Management objectives

There are no management objectives currently in place for this stock.

## Reference points

	Type	Value	Technical basis
Precautionary approach	B <sub>lim</sub>	6 000 t	B <sub>lim</sub> = B <sub>loss</sub> , the lowest observed spawning stock estimated in previous assessments.
	B <sub>pa</sub>	9 000 t	B <sub>pa</sub> = B <sub>lim</sub> * 1.4. This is considered to be the minimum SSB required to have a high probability of maintaining SSB above B <sub>lim</sub> , taking into account the uncertainty of assessments.
	F <sub>lim</sub>	Not defined.	Not defined due to uninformative stock recruitment data.
	F <sub>pa</sub>	0.4	This F is adopted by analogy with other haddock stocks as the F that provides a small probability that SSB will fall below B <sub>pa</sub> in the long term.
Targets	F <sub>y</sub>	Not defined.	

(unchanged since: 1998)

## Yield and spawning biomass per Recruit

	Fish Mort Ages 2–5	Yield/R	SSB/R
Average last 3 years	0.34	0.14	0.48
F <sub>max</sub>	0.31	0.14	0.52
F <sub>0.1</sub>	0.18	0.13	0.82
F <sub>med</sub>	0.54	0.13	0.30

## F-reference points

A candidate for a target reference point consistent with taking high long-term yields and achieving a low risk of depleting the productive potential of the stock may be around F<sub>0.1</sub> (0.18, based on catches). F<sub>max</sub> is undefined due to a flat-topped Y/R curve.

## Single-stock exploitation boundaries

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

There is no gain in yield by having a target above F<sub>0.1</sub> (0.18).

## Exploitation boundaries in relation to precautionary limits

Fishing mortality should be less than F<sub>pa</sub>, corresponding to catches less than 10 640 t in 2008.

It should be noted that the ICES advice for this stock is based on catch, including discards, and not on landings.

## Short-term implications

### Outlook for 2008

Basis: F(2007) = F<sub>sq</sub> = F(04–06) = 0.34; R = GM 91–04 = 66.4 million; SSB(2007) = 22.2; SSB(2008) = 29.8; catch (2007) = 4.44.

Rationale	Total Catch (2008)	Basis	F(2008)	SSB(2009)	% SSB change <sup>1)</sup>
Zero catch	0.00	F=0	0	40.53	36%
High long-term yield	5.26	F(0.1)	0.18	34.83	17%
Status quo	0.94	F <sub>sq</sub> * 0.2	0.03	39.51	33%
F <sub>pa</sub>	2.73	F <sub>sq</sub> * 0.6	0.09	37.56	26%
	4.44	F <sub>sq</sub>	0.15	35.72	20%
	6.06	F <sub>sq</sub> * 1.4	0.21	33.98	14%
	7.59	F <sub>sq</sub> * 1.8	0.27	32.33	9%
	8.33	F <sub>sq</sub> * 2.2	0.30	31.54	6%
	9.74	F <sub>sq</sub> * 2.6	0.36	30.03	1%
	10.64	F <sub>pa</sub>	0.40	29.06	-2%
	11.75	F <sub>sq</sub> * 3.0	0.45	27.91	-4%
	13.00	F <sub>sq</sub> * 3.4	0.51	26.6	-11%
	14.77	F <sub>sq</sub> * 4.0	0.60	24.8	-17%

Units: '000 tonnes.

Shaded scenarios are not considered consistent with the precautionary approach.

<sup>1)</sup> SSB 2009 relative to SSB 2008.

TAC 2008 relative to TAC 2007 cannot be calculated since the forecast estimates total catch and not landings.

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## Management considerations

The TAC should apply to all areas and countries having fisheries for this stock.

A split between landings and discards in the forecast cannot be provided. This is because some countries land the whole catch while others discard part of the catch. The contribution of the former to the total catch is around 65% in the recent period (2000–2006). For the remaining countries the discard ratio is around 60% over the same period. Since the relative contribution of these two categories in future catches cannot be predicted, ICES cannot split the predicted catches into landings and discards.

Part of Division VIb has since 1999 been in international waters where non-EU vessels are not subject to TAC. This allows for an unregulated fishery in the Rockall area. In addition misreporting and discarding can lead to removals that exceed the TAC. There is a need for an internationally agreed management plan. Such a plan should involve extensive collaboration between stakeholders, scientists, and management authorities in both the design and the monitoring of conservation measures.

Control is difficult because the fishery takes place in remote areas and some fleets process catches at sea. Therefore, effort regulation should be considered as a means of controlling fishing mortality on Rockall haddock.

Haddock is taken in a mixed fishery that currently includes substantial catches of blue whiting and non-assessed species such as grey gurnard.

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## Factors affecting the fisheries and the stock

### *The effects of regulations*

Following the NEAFC agreement in March 2001, an area of the NEAFC zone around Rockall was closed to fishing. Effort in the rectangle containing the closure declined when the closure came into effect. There was also a decline in UK effort across the bank as a whole at this time, but an increase of effort in other areas of Division VIb. Spawning biomass has increased since 2003, but it is difficult to determine to what extent this may be contributed to the efforts made to protect juveniles in the closed area.

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## Scientific basis

### *Data and methods*

The assessment is based on catch numbers-at-age and one survey index (Scottish Groundfish Survey). Discarding occurs in part of the fishery and has been estimated and used in the assessment.

### *Uncertainties in assessment and forecast*

The survey covers only part of the currently known distribution area of haddock. The survey index may thus in part reflect changes in the distributional pattern, and not only in stock dynamics. An annual survey covering the whole of the distributional area may improve assessment of the stock status.

There is an urgent requirement for well-designed scientific monitoring programmes capable of delivering accurate data on trends in abundance and composition of the fish fauna throughout the area, in a form that can support the development and implementation of a management plan for Rockall Bank. The trawl acoustic survey, first run in 2005, should be continued to provide additional information

### *Comparison with previous assessment and advice*

The overall trends are very similar to those obtained last year. However, estimates of fishing mortality have been revised downwards and SSB has been revised upwards, both by around 25% for recent years.

The basis for the advice is similar to last year.

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## Sources of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC <sup>1</sup>	Official Landings	ACFM Landings
1987	Precautionary TAC		10.0			8.0	8.4
1988	Precautionary TAC		10.0			7.6	7.9
1989	<i>Status quo</i> F; TAC		18.0			6.6	6.7
1990	Precautionary TAC		5.5			8.2	3.9
1991	Precautionary TAC		5.5			5.9	5.7
1992	Precautionary TAC		3.8			4.5	5.3
1993	80% of F(91)		3.0			4.1	4.8
1994	If required, precautionary TAC		-			3.7	5.7 <sup>2</sup>
1995	No long-term gain in increasing F		5.1 <sup>3</sup>			5.5	5.6
1996	No long-term gains in increasing F		6.9 <sup>3</sup>			6.8	7.1
1997	No advice given		4.9 <sup>3</sup>			5.2	5.2
1998	No increase in F		4.9			5.1	4.5
1999	Reduce F below $F_{pa}$		3.8			6.0	5.1
2000	Reduce F below $F_{pa}$		< 3.5			5.7 <sup>4</sup>	5.3 <sup>5</sup>
2001	Reduce F below $F_{pa}$		< 2.7			2.3 <sup>4</sup>	2.0 <sup>5</sup>
2002	Reduce F below 0.2		<1.3			3.0	3.3
2003	Lowest possible F		-			6.1	6.2
2004	<sup>6</sup>	Lowest possible catch		-	0.702*	6.3	6.4
2005	<sup>6</sup>	Lowest possible catch			0.702*	5.2	5.2
2006	<sup>6</sup>	Lowest possible catch			0.597*	3.1	2.7
2007	Reduce F below $F_{pa}$		<sup>6</sup>	<7.11	4.615*		
2008	Keep F below $F_{pa}$		<sup>6</sup>	<10.6 <sup>7</sup>			

Weights in '000 t.

<sup>1</sup> TAC is set for Divisions VIa and VIb (plus Vb1, XII, and XIV), combined with restrictions on the quantity that can be taken in VIa from 1990.

<sup>2</sup> Including misreporting.

<sup>3</sup> Landings at *status quo* F.

<sup>4</sup> Incomplete data.

<sup>5</sup> Russian data adjusted to exclude fish below MLS of 30 cm.

<sup>6</sup> Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

<sup>7</sup> This corresponds to catch (= landings + discards).

\*Agreed EU TAC for VIb, XII, and XIV.

Haddock in Division VIb (Rockall)

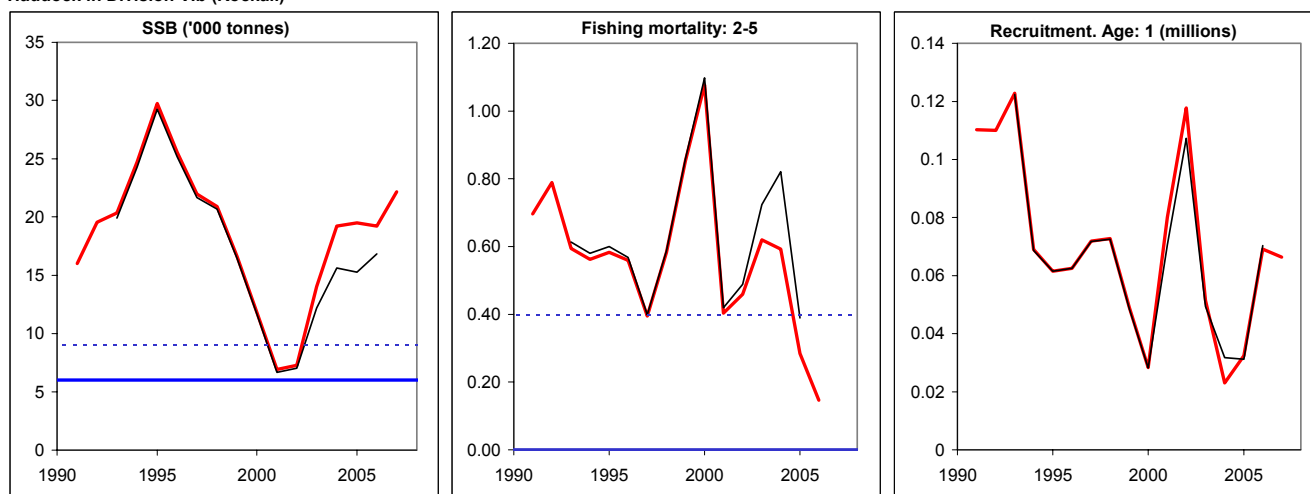
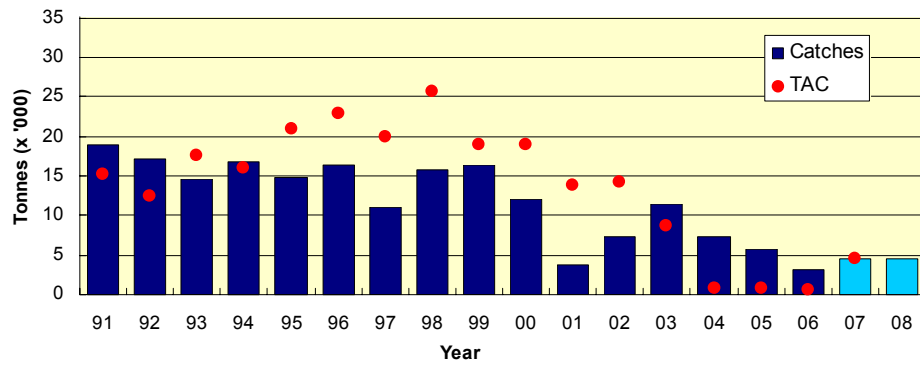


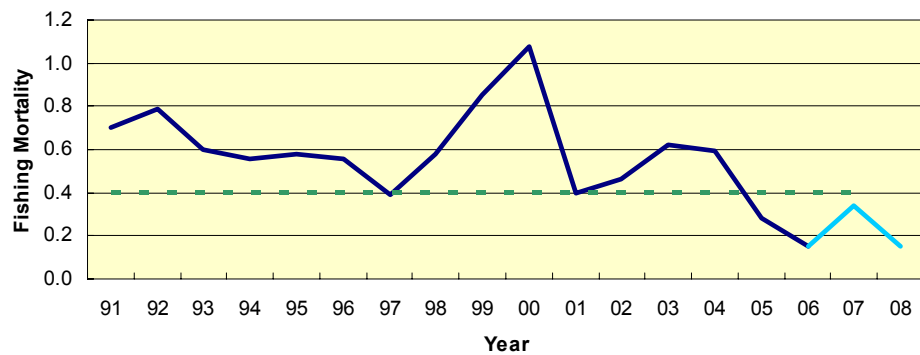
Figure 5.4.24.3

Haddock in Division VIb (Rockall). Comparison of current assessment with previous assessments.

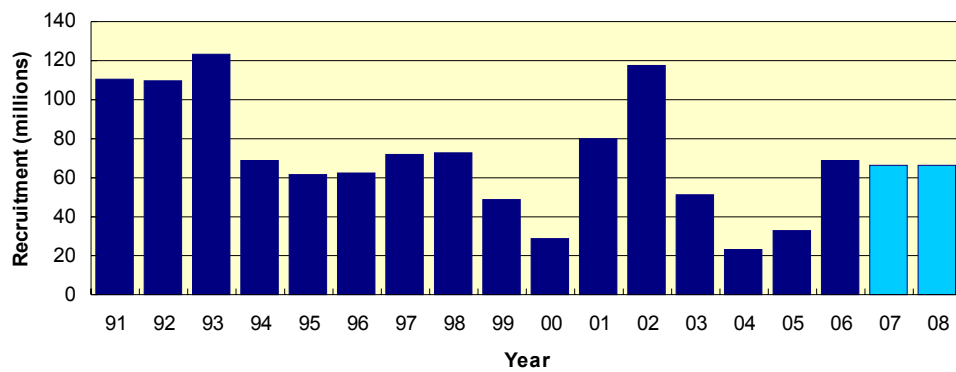
**Haddock Vlb - Catches**  
Mean = 12



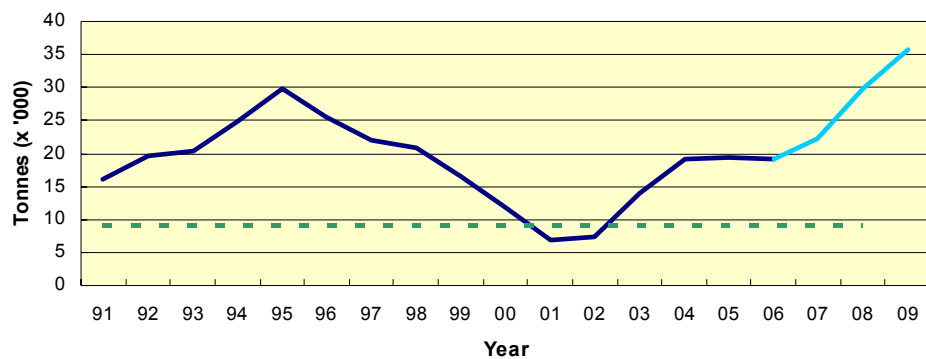
**Haddock Vlb - Fishing Mortality**  
Mean = 0.57



**Haddock Vlb - Recruitment (Age 1)**  
Mean = 70.8



**Haddock Vlb - Spawning Stock Biomass**  
Mean = 18.6



**Table 5.4.24.1** Nominal catch (tonnes) of HADDOCK in Division VIIb, 1989–2005, as officially reported to ICES.

COUNTRY	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 <sup>1</sup>
Faroe Islands	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a	-	-	-	-	2
France	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	-	-	*	-	5	2*	+	1	-	-	-
Germany, Fed. Rep.	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iceland	-	-	-	-	-	-	-	-	+	-	167	-	-	-	-	-	-	-
Ireland	-	620	640	571	692	956	677	747	895	704	1,021	824	357	206	169	19 <sup>5</sup>	105	41
Norway	47	38	69	47	68	75	29	24	24	40	61	152*	70*	49	60	32	33	123
Portugal	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-
Russian Federation	-	-	-	-	-	-	-	-	-	-	458	2,154	630	1,630	4,237	5,844	4,708	2,154
Spain	337	178	187	51	-	-	28	1	22	21	25	47	51	7	19	-	-	-
UK (E, W & NI)	272	238	165	74	308	169	318	293	165	561	288	36	-	-	56	-	-	-
UK (Scotland)	5,986	7,139	4,792	3,777	3,045	2,535	4,439	5,753	4,114	3,768	3,970	2,470	1,205	1,145 <sup>3</sup>	1,606	411 <sup>3</sup>	332 <sup>3</sup>	440 <sup>3</sup>
United Kingdom	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	6,643	8,213	5,853	4,520	4,113	3,735	5,491	6,818	5,220	5,098	5,990	5,688	2,315	3,037	6,148	6,306	5,178	2,760
Unallocated catch	85	-4,329	-198	800	671	1,998	-379	-543	-591	-599	-851	-357	-279	299	94	139	1	290
WG estimate	6,728	3,884	5,655	5,320	4,784	5,733	5,112	6,275	4,629	4,499	5,139	5,331 <sup>4</sup>	2,036 <sup>4</sup>	3,336 <sup>4</sup>	6,242 <sup>4</sup>	6,445	5,179	3,050

<sup>1</sup>Preliminary.

<sup>2</sup>Included in Division VIIa.

<sup>3</sup>Includes UK England, Wales, and N.I. landings.

<sup>4</sup>includes the total Russian catch.

<sup>5</sup> non-official

n/a = not available.



**Table 5.4.24.2** Haddock in Division VIb (Rockall).

Year	Recruitment Age 1 thousands	SSB tonnes	Catches tonnes	Landings tonnes	Discards tonnes	Mean F Ages 2–5
1991	110327	16013	18884	5656	13228	0.70
1992	109990	19545	17192	5321	11871	0.79
1993	122870	20355	14634	4781	9853	0.60
1994	68974	24735	16755	5732	11023	0.56
1995	61571	29734	14756	5587	9168	0.58
1996	62582	25576	16428	7072	9356	0.56
1997	71859	21964	11061	5167	5894	0.39
1998	72818	20902	15848	4986	10862	0.58
1999	49128	16637	16418	5356	11062	0.85
2000	28416	11843	12053	5444	6609	1.08
2001	80138	6913	3658	2123	1535	0.40
2002	117826	7273	7270	3117	4152	0.46
2003	51499	14040	11490	5969	5521	0.62
2004	23055	19223	7321	6437	883	0.59
2005	32445	19478	5693	5191	505	0.28
2006	69128	19214	3142	2756	386	0.15
2007	66400	22167				
Average	70531	18565	12038	5043	6994	0.58

# West of Scotland Whiting

## (Division VIa)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

### FSS - SINGLE STOCK CONSIDERATIONS

(See West of Scotland and Rockall Overview for mixed fishery advice).

The state of this stock is unknown.

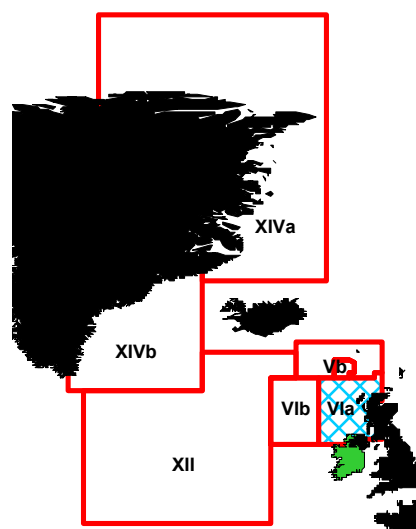
FSS agrees with ICES that this stock is likely to be low, based on historic yield, catch composition and survey data. FSS agrees with ICES advice that the catches of whiting in 2008 should be the lowest possible.

The assessment uses survey-based information to evaluate trends in SSB and recruitment. Fishing mortality is not well estimated by the survey-based assessment and has therefore not been used as a basis for management advice. Concerns over the quality of commercial catch-at-age data have been increasing in recent years, due largely to declining stocks, restrictive TACs, and the greater likelihood of discarding, misreporting and high-grading.

FSS considers that a well defined 'management plan' is necessary to rebuild the whiting stock and to fish it sustainably once it has recovered. FSS considers that such a plan requires clearly defined objectives that will ensure a high probability of recovery to agreed levels within a specified time frame. FSS advises that stock recovery will require substantial and persistent increase in both SSB and recruitment, both of which are at historically low levels.

FSS notes that this fishery suffers from high levels of discarding which are impairing the ability of the stock to recover. Any management plan must ensure that stringent measures capable of effectively reducing the levels of discarding are introduced. This could be achieved through the strengthening of existing technical conservation measures such as a reduction in cod-end twine thickness, increasing the mesh size and dimensions of the existing square mesh panel as well as changes in panel position and promoting the use of species selective trawls.

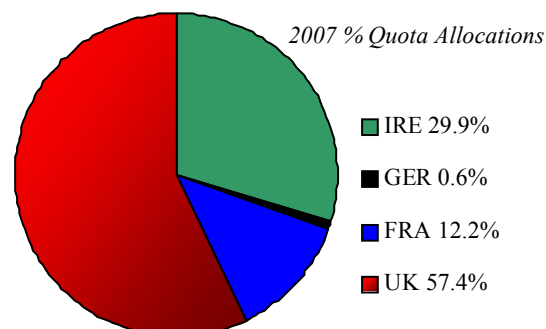
FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For West of Scotland Whiting FSS interpret that the EC fishing opportunity in 2008 will result in a TAC of no more than 867 t and taking the scientific advice of, reducing catches to the lowest possible level, into account.



Red Boxes-TAC/Management Areas Blue Shading- Assessment Area

### CURRENT MANAGEMENT

- The TAC area covers EC waters in Division Vb and Sub-areas VI, XII and XIV.
- The assessment area covers Division VIa only but landings from other areas are negligible.
- The TAC in 2007 was 1,020 t with an associated Irish quota of 305 t (adjusted quota = 350 t).
- There are no explicit management objectives or a management plan for this stock.



- FSS recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching whiting, based on long term considerations.
- Whiting is taken with cod and haddock in mixed demersal fisheries and management advice should be considered in that context.

## ADDITIONAL INFORMATION

- The Irish reported landings of in 2006 were 194 t, which was approximately half the quota of 406 t.
- The fishery is dominated by the Irish and Scottish fleets. Whiting landings from all fleets have declined considerably since the late 1980s.
- Otter trawl vessels fishing out of Killybegs and Greencastle take most of the Irish catch of this stock. Most of these landings are taken from the Donegal Bay, Tory and Aran and Stanton Banks grounds.
- There has been a significant reduction in the number of Irish vessels targeting the mixed gadoid fishery in Division VIa in recent years. Effort by UK vessels has also declined following recent decommissioning schemes in the UK.

## ICES ADVICE

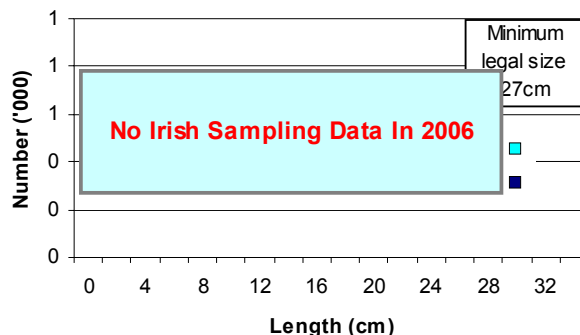
### 5.4.25

#### State of the stock

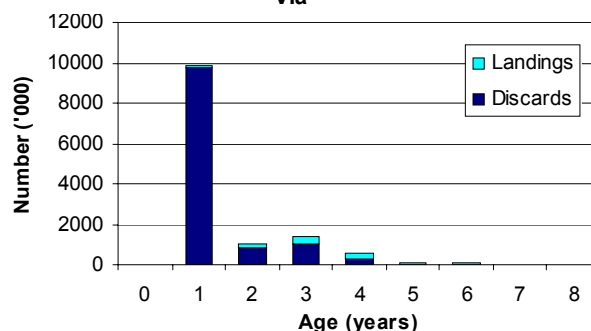
Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Unknown	Unknown	Unknown	Not defined

The state of the stock is unknown, but long-term information on the historical yield and catch composition and the survey-based assessment covering the more recent period all indicate that the present stock size is at a historical low. Total mortality has been higher in the last decade than in the previous one. Recruitment in the most recent years is estimated to be very low.

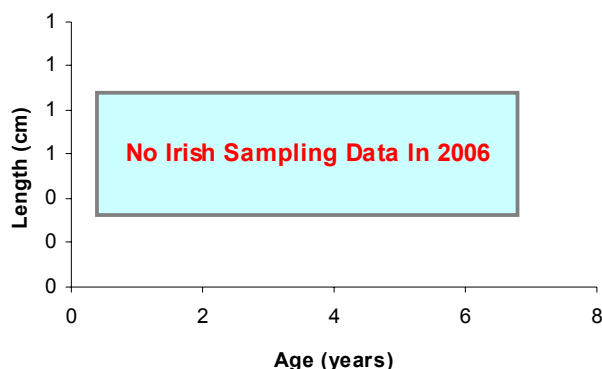
#### 2006 Length Distribution: Whiting in VIa



#### 2006 Age Composition: International Landings, Whiting in VIa



#### 2006 Size at Age: Whiting in VIa



#### Management objectives

There are no explicit management objectives for this stock.

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	16 000 t	$B_{lim} = B_{loss}(1998)$ , the lowest observed spawning stock estimated in previous assessments.
	$B_{pa}$	22 000 t	$B_{pa} = B_{lim} * 1.4$ . This is considered to be the minimum SSB required to have a high probability of maintaining SSB above $B_{lim}$ , taking into account the uncertainty of assessments.
	$F_{lim}$	1.0	$F_{lim}$ is the fishing mortality above which stock decline has been observed.
	$F_{pa}$	0.6	$F_{pa} = 0.6 * F_{lim}$ . This F is considered to have a high probability of avoiding $F_{lim}$ .
Targets	$F_y$	Not defined.	

(unchanged since: 1998)

The advice is based on information from abundance surveys. In the past the reference points have been estimated using a different basis; they can therefore not be compared.

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### Single-stock exploitation boundaries

#### *Exploitation boundaries in relation to precautionary considerations*

Given that SSB is estimated at the lowest observed level and total mortality at the highest level over the time period, catches in 2008 should be reduced to the lowest possible level.

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### Management considerations

There are strong indications that management control is not effective in limiting the catch. Survey information shows that the total removal of whiting in Division VIa may be underestimated in the past decade relative to earlier periods. The effect of the fishery on the stock has therefore been evaluated in relative terms, and advice on absolute levels of future catches is not possible.

The proportion of fish discarded is very high and appears to have increased in recent years. Approximately half of the annual catch weight comprises undersized or low-value whiting which are discarded. Measures to reduce discards and to improve the exploitation pattern would be beneficial to the stock and to the fishery.

The last accepted assessment in 2003 indicated a decrease in SSB by a factor 5 from the 1980s to the 1990s.

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### Factors affecting the fisheries and the stock

#### *Regulations and their effects*

The fishery is regulated by a TAC that does not, however, seem to restrict catches.

The more widespread use of 110-mm mesh nets in 2002 as well as the requirement to fit square mesh panels to certain towed gears since late 2000, may have temporarily improved the selection pattern for whiting. However, the increase in minimum mesh size from 100 to 120 mm in 2001/2002 (before the introduction of effort regulation 27/2005) partly caused a shift to 80-mm mesh sizes in the mixed fishery trawls, due to the loss of valuable *Nephrops* catches. Poorer selectivity at this mesh size may have led to increased discarding and high grading.

With the introduction of effort regulation, vessel operators have effectively been further encouraged to reduce mesh size and shift to other fisheries, particularly *Nephrops* trawling, in order to gain more days-at-sea. There is insufficient information to quantify any effect mesh size changes and effort limitations may have had on the stock of whiting. **However, any management measures leading to a shift of vessels to smaller mesh sizes will result in a worse exploitation pattern and higher discards.**

The continued decline in the stock indicates that these measures alone have not proven sufficient to rebuild the stock to precautionary levels. Detailed analysis of the impact of the regulations will not be possible until data of sufficient quality become available.

#### *Changes in fishing technology and fishing patterns*

Whiting in Division VIa are caught mainly by Scottish trawlers. There has been a reduction in trawl and seine effort, but with a more moderate reduction by *Nephrops* trawlers. At present a higher proportion of the overall effort is by relatively small-meshed trawls. There has been a tendency to shift from the use of heavy groundgear (like rockhopper) to lighter groundgear.

Effort data 1998–2006 from UK vessels (one of the main countries fishing in the area) suggests that overall, effort has declined in recent years in Area VIa, and that declines in particular categories have not been compensated for by rises in other categories. Larger-meshed whitefish demersal trawls were the most important gears in VIa prior to 2002, but since then there has been a marked decline in kW days by this category. This is principally explained by the recent, significant decommissioning schemes in the UK. Single-rig *Nephrops* trawls in the 70- to 99-mm mesh category are the other major gears in use and effort by these seems to have been maintained at a fairly stable level throughout the time-series. Numerous other gears make generally small contributions to the overall effort and the pattern in most of these has been either a downward trend (e.g. seine nets and midwater trawls) or a fluctuation without trend (e.g. fixed nets).

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### Scientific basis

#### *Data and methods*

A survey-based assessment was used to evaluate trends in SSB, total mortality, and recruitment.

#### *Uncertainties in assessment and forecast*

Some changes have been made to the survey design in the past, but surveys are considered to be a reasonable indicator of long-term stock trends. Jumps in survey indices are observed in occasional years. Survey information indicates an increase in unaccounted removal from this stock. Absolute biomass estimates from landings may thus be biased, but it is not known to what extent. Thus, an analytical catch-at-age assessment is not acceptable as a basis for management advice. Advice has therefore been conditioned to the survey-based assessment patterns. The decrease in survey biomass in recent years implies that the unaccounted catch is causing harm to the stock.

#### *Comparison with previous assessment and advice*

The assessment and advice are based on survey information and are consistent with last year's advice.

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### Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).

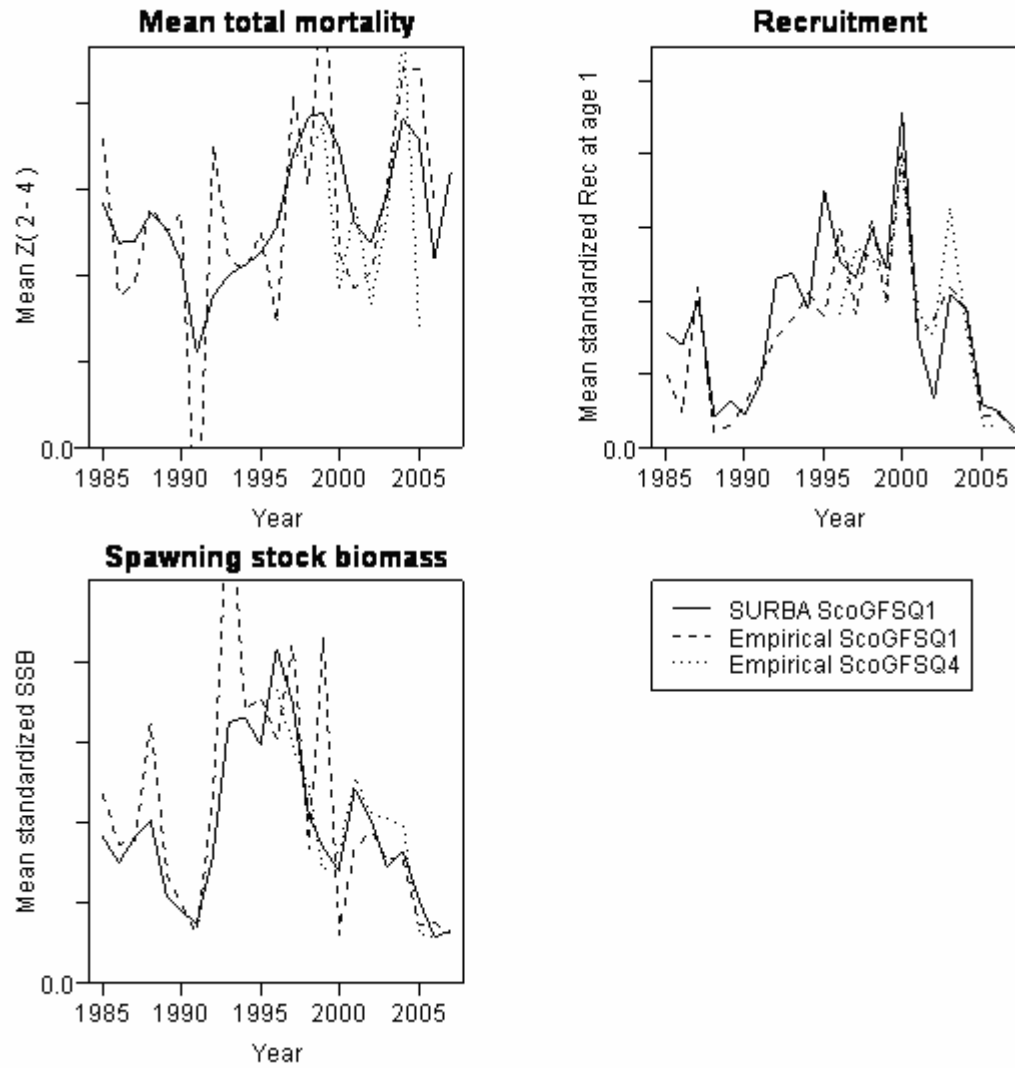
Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Catch corresponding to single-stock boundaries	Agreed TAC <sup>1</sup>	Official Landings	ACFM Landings	Discards slip	ACFM catch
1987	No increase in F		15.0		16.4	12.4	11.5	6.9	18.4
1988	No increase in F; TAC		15.0		16.4	11.9	11.4	11.8	23.1
1989	No increase in F; TAC		13.0		16.4	7.7	7.5	4.1	11.6
1990	No increase in F; TAC		11.0		11.0	6.0	5.6	4.4	10.0
1991	70% of effort (89)		-		9.0	6.9	6.7	5.3	12.0
1992	70% of effort (89)		-		7.5	6.0	6.0	9.4	15.4
1993	70% of effort (89)		-		8.7	6.8	6.9	8.5	15.4
1994	30% reduction in effort		-		6.8	5.8	5.9	8.9	14.8
1995	Significant reduction in effort		-		6.8	6.3	6.1	7.6	13.7
1996	Significant reduction in effort		-		10.0	6.6	7.2	6.9	14.1
1997	Significant reduction in effort		-		13.0	6.2	6.3	4.9	11.2
1998	No increase in F		6.5		9.0	4.7	4.6	5.8	10.5
1999	Reduce F below $F_{pa}$		4.3		6.3	4.7	4.6	3.1	7.7
2000	Reduce F below $F_{pa}$		<4.3		4.3	3.2	3.0	6.7	9.7
2001	Reduce F below $F_{pa}$		<4.2		4.0	2.5	2.4	2.4	4.9
2002	SSB> $B_{pa}$ in short term		<2.0		3.5	1.7	n/a	n/a	n/a
2003	No cod catches		-		2.0	1.3	n/a	n/a	n/a
2004	<sup>2</sup>	SSB> $B_{pa}$ in the short term	<sup>2</sup>	<2.1	1.6	0.8	n/a	n/a	n/a
2005	Exploitation not allowed to increase			<1.6	1.6	0.29	n/a	n/a	n/a
2006	Lowest possible level			-	1.36	0.38	n/a	n/a	n/a
2007	Lowest possible level			-	1.02				
2008	Lowest possible level			-					

Weights in '000 t.

<sup>1</sup>TAC is set for Divisions VIa and VIb combined.

<sup>2</sup>Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

n/a = not available.



**Figure 5.4.25.1** Whiting in Division VIa. Comparison of SURBA final run outputs with empirical estimates from the 2 Scottish surveys. Biomass and recruitment are mean standardized over 1996–2006 (the length of the shortest survey).

**Table 5.4.25.1**

Nominal catch (t) of whiting in Division VIa, 1989–2006, as officially reported to ICES.

COUNTRY	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 <sup>a</sup>
Belgium	1	-	+	-	+	+	+	-	1	1	+	-	-	-	-	+	-	-
Denmark	1	+	3	1	1	+	+	+	+	-	-	-	-	-	+	+	-	-
France	199 <sup>1</sup>	180	352 <sup>1</sup>	105	149	191	362	202	108	82	300	48	52	21	11	6	9	5
Germany	+	+	+	1	1	+	-	+	-	-	+	-	-	-	-	-	-	+
Ireland	1,315	977	1,200	1,377	1,192	1,213	1,448	1,182	977	952	1,121	793	764	577	568	356	172	194
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	1	-	1	2	+	-	2	-	-	-	-	-
UK (E&W) <sup>2</sup>	44	50	218	196	184	233	204	237	453	251	210	104	71	73	35	13	5	...
UK (N.I.)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
UK (Scot.)	6,109	4,819	5,135	4,330	5,224	4,149	4,263	5,021	4,638	3,369	3,046	2,258	1,654	1,064	751	444	103	...
UK (total)																		180
Total landings	7,669	6,026	6,908	6,010	6,751	5,786	6,278	6,642	6,178	4,657	4,677	3,203	2,543	1,735	1,365	819	289	379

\* Preliminary.

<sup>1</sup> Includes Divisions Vb (EC) and VIb.

<sup>2</sup>1989–2001 N. Ireland included with England and Wales.

n/a=Not available.

# Rockall Whiting

## (Division VIb)



*Marine Institute*  
Foras na Mara

Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See West of Scotland and Rockall Overview for Mixed Fishery Advice)

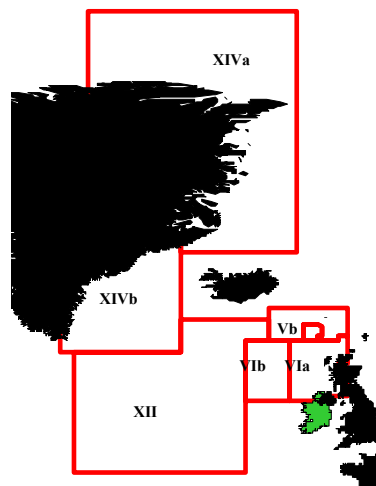
**FSS considers that whiting catches from Division VIb are so insignificant that there is no merit in providing scientific advice for this area.**

### CURRENT MANAGEMENT

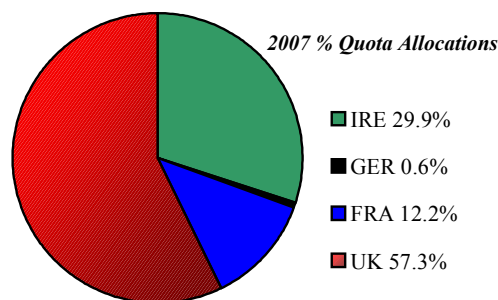
- The TAC area covers Sub-areas Vb, VI, XII and XIV.
- The TAC in 2007 was 1,020 t with an associated Irish quota of 305 t (adjusted quota of 350 t).

### ADDITIONAL INFORMATION

1. Irish vessels reported unusually high landings of 104 t of whiting in Division VIb in 2006. This is well in excess of recent reported catches, which were less than 10 t in the previous 5 years.
2. UK-Scottish landings during the early 1990s are probably linked to area misreporting of other species such as haddock and anglerfish into Division VIb.
3. It is likely that whiting caught at Rockall are part of the same stock as Division VIa whiting.



Red Boxes-TAC/Management Areas



### ICES ADVICE 5.4.26

#### State of the stock

Landings of whiting from Division VIb are negligible. No assessment has been carried out on this stock.

#### Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).

Nominal catch (t) of WHITING in Division VIb (Rockall), 1989–2006, as officially reported to ICES.

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
France	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Ireland	-	-	-	-	32	10	4	23	3	1	-	-	10	-	2	3	3	104
Spain	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
UK (E.& W)	16	6	1	5	10	2	5	26	49	20	+	+	-	-	-	-	...	...
UK (N.Ireland)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
UK (Scotland)	18	482	459	283	86	68	53	36	65	23	44	58	4	7	11	1		
UK (all)																	1	1
Total	34	488	460	288	128	80	62	85	117	44	44	58	14	7	13	4	4	105

\*Preliminary.



# West of Scotland and Rockall Megrim

## (Sub-area VI)

For latest information, see: <http://www.ices.dk>



*Marine Institute*  
Foras na Mara

Fisheries Science Services

### FSS - SINGLE STOCK CONSIDERATIONS

(See West of Scotland and Rockall Overview for mixed fishery advice).

The state of the stock is unknown and there is no ICES assessment. Landings show a declining trend since 1996 although Irish LPUE has been stable since then.

FSS agrees with ICES that landings in 2008 should be no more than the recent landings in Divisions VIa and VIb and unallocated landings from the North Sea (Sub-area IV). The recommended landings are around 1,400 t. This translates into an Irish quota of 182 t. In order to avoid misreporting by area the TAC should include Sub-area IV.

FSS advises that measures should be implemented immediately to ensure that reliable commercial data is collected for this and other stocks in VI. These should include mandatory reporting of gear parameters and catch and effort with fine-scale spatial, temporal and bathymetric data.

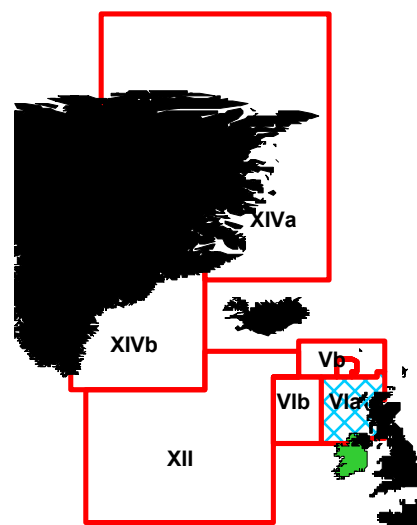
FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For west of Scotland, Rockall and megrim, FSS interprets that the proposal would result in the 2007 TAC being reduced in 2008 towards recent average catches. This implies a TAC 2,448 t in 2008.

### CURRENT MANAGEMENT

- The TAC covers Sub-areas VI, XII, XIV and Division Vb. The 2007 TAC was set at 2,880 t with an Irish quota of 373 t (13%).
- FSS advises that management objectives be established and that a management plan be developed and implemented for the mixed fisheries catching megrim.

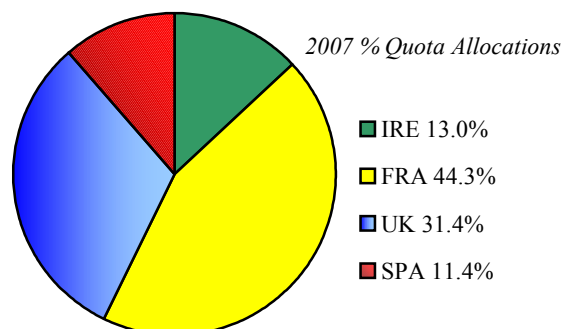
### ADDITIONAL INFORMATION

1. Assessment of this stock is hampered by poor commercial catch and effort data for the main fleets due to misreporting, changes in fishing patterns, discard-



Red Boxes-TAC/Management Areas Blue Shading- Assessment Area

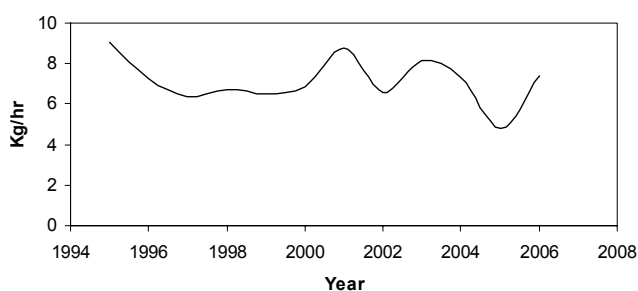
- ing and non-mandatory reporting of effort. The research vessel surveys do not appear to provide a reliable index for this stock due to low and variable catch rates and as the stock distribution extends beyond the current range of the IBTS survey
2. In the past the mis-reporting of anglerfish landings into Sub-area IV has led to an associated mis-reporting of the megrim component of the catch for some fleets. This has led to serious concerns about the accuracy of the landings data and large unallocated catches in the Working Group estimates of landings.
  3. The long-term landings trends suggest that landings have declined substantially since 1996 and the 2006 landings are the lowest in the time series. Estimated 2006 landings are incomplete. Irish landings in 2006 were reported to be 314 t (220 t and 94 t, for Divisions VIa and VIb, respectively).
  4. There have been recent changes to the UK Scottish fleets with decommissioning schemes removing 96 of the 298 demersal trawlers. These trawlers used mesh sizes  $\geq 100$  mm between 2001 and 2004. This will have affected the effort, but due to uncertainty in the effort statistics it is not known to what extent effort



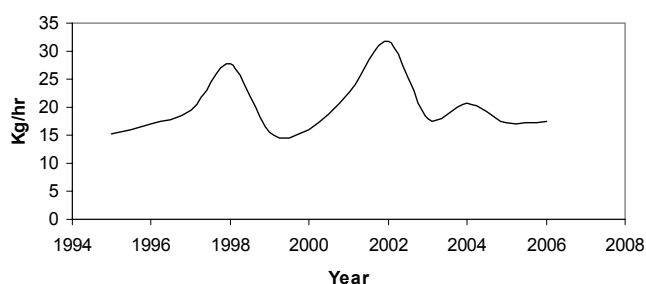
has been reduced. The Irish fleet in Division VIa has also been reduced substantially and now the majority of the reported landings are made by only 12 vessels.

5. Irish landings in Sub-area VI are mainly taken by otter trawlers fishing. Megrim and anglerfish fish landings on a trip-by-trip basis are correlated for Irish otter trawl vessels fishing at Rockall. However, this correlation is not apparent in Division VIa.
6. Two species of megrim are caught. The majority of landings are *Lepidorhombus whiffiagonis*. Landings of *L. boscii* are negligible.
7. Irish discard sampling between 1995-2003 suggest that between 30-50% of the megrim catch by number and between 8-21% by weight are discarded. Male megrim grow to a smaller maximum size than females, and as a consequence the majority of males in the catches are discarded and the bulk of fish landed comprise of females. Improving the selection pattern by increasing the mesh size in this fishery would probably result in higher longer-term yields.
8. FSS points out that megrim are caught in mixed fisheries which may include catches of species outside precautionary limits in Sub-area VI.

Megrim VIa LPUE kg/hr for the Irish OTB fleet



Megrim VIb LPUE kg/hr for the Irish OTB fleet



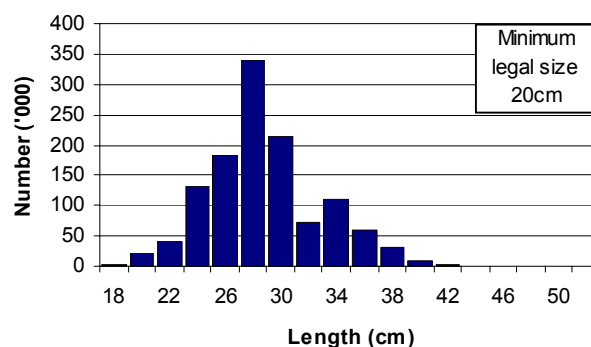
## ICES ADVICE

### 5.4.28

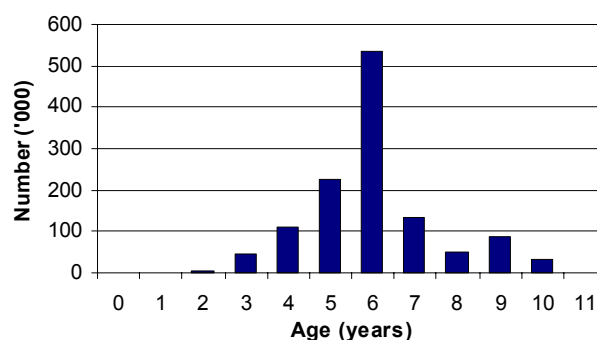
#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to Agreed target
Unknown	Unknown	Unknown	NA

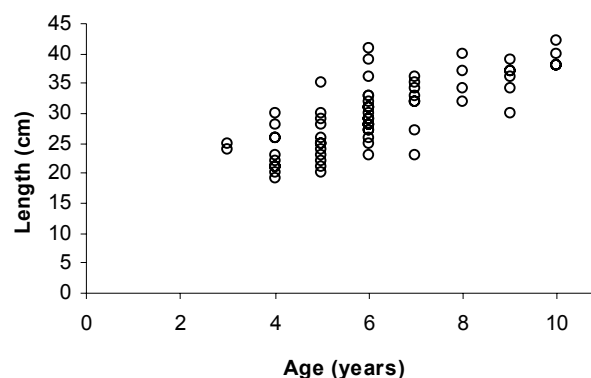
#### 2006 Length Distribution: Irish All Gears, Megrim in VIa



#### 2006 Age Composition: Irish Landings, Megrim in VIa



#### 2006 Size at Age: Irish Sampling, Megrim in VIa



The available information is inadequate to evaluate spawning stock or fishing mortality relative to risk, so the state of the stock is unknown. Landings show a declining trend since 1996.

#### Management objectives

No explicit management objectives have been set for this stock.

#### Reference points

No precautionary reference points have been defined for this stock.

#### Single-stock exploitation boundaries

*Exploitation boundaries in relation to precautionary considerations*

Catches in 2007 should be based on the recent average (2004–2006), about 1 400 t. This includes landings in Division VIa and VIb and unallocated landings in Subarea IV.

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## Management considerations

Decommissioning schemes in Scotland and Ireland are considered to have, at least in part, contributed to the decline of landings in this area. The decline in landings may thus not reflect a reduction of the stock, and the ICES advice continues to be based on recent average landings.

Although the international megrim landings in recent years have been below the TAC, some national quotas are restrictive and this may have led to underreporting of catches.

Area misreporting has been prevalent as megrim catches were misreported from Subarea VI into Subarea IV, due to restrictive quotas for anglerfish (i.e. vessels targeting anglerfish misreported all landings including megrim from Subarea VI into Subarea IV). In order to avoid misreporting by area, the TAC should include Subarea IV.

In the past, management of the megrim stock has been linked to that for anglerfish on the assumption that landings were correlated in the fishery. It was assumed that the anglerfish management would also constrain fishing mortality on megrim. This may no longer be true. Due to recent changes in the fishing pattern, the dynamics of the species are probably not linked.

The minimum landing size (MLS) of megrim was reduced in January 2000 to 20 cm (EC Regulation No. 850/98). The catch is routinely high graded and large numbers of fish continue to be discarded above this MLS.

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## Factors affecting the fisheries and the stock

### *The effects of regulations*

New effort regulations provided an incentive for some vessels previously using >100-mm mesh in otter trawls to switch to smaller-mesh gears to obtain the right to more days-at-sea. This would also require these vessels to be targeting either *Nephrops* or anglerfish, megrim, and whiting with various catch and bycatch composition limits according to EC Regulation No. 850/98. No detailed information was available to quantify how many vessels have switched to using smaller meshes as a result of effort regulation as this information is not reliably recorded in logbook information for some countries.

### *Changes in fishing technology and fishing patterns*

There have been recent changes to the UK Scottish fleets with decommissioning schemes removing 96 of the 298 demersal trawlers (mesh sizes  $\geq 100$  mm) between 2001 and 2004. This will have affected the effort, but due to uncertainty in the effort statistics it is not known to what extent effort has been reduced. The Irish fleet in Division VIa has also been reduced substantially and now the majority of the reported landings are made by only 12 vessels. In the case of the Irish fleet a large number of older vessels have been replaced by fewer modern whitefish vessels as part of a national whitefish renewal scheme. There has also been an Irish decommissioning scheme, whereby around 40 fishing vessels (~6000 GT, 18 000 kW) have been permanently withdrawn from the Irish fishing fleet and removed from the Register of Sea Fishing Vessels in 2005 and 2006.

No information is available on changes in the French and Spanish fleets operating in this area.

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## Scientific basis

### *Data and methods*

The stock was evaluated using information on landing compositions provided by Scotland and catch compositions provided by Ireland.

The quality of the available landings data, specifically the area misreporting and lack of effort and cpue data for the main fleet in the fishery, severely hampers the ability of ICES to carry out an assessment for this stock. For stocks like megrim and anglerfish on the northern shelf, there is a general need for improved spatio-temporal resolution of commercial catch and effort data.

At the moment no survey series adequately covers this stock. Scottish and Irish groundfish surveys catch low numbers of megrim due to unsuitable gear and survey design. In addition, the Irish GFS survey series consists of only two years.

### *Uncertainties in assessment and forecast*

The quality of the landing statistics is unknown, and discard information and cpues from the main fleet are lacking. The surveys only cover a limited range of the known distribution of the stock and are not suitable for a survey-based assessment/forecast approach.

### *Comparison with previous assessment and advice*

This year and last year there was no analytical assessment for this stock and the management advice was based on average landings.

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## Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC <sup>1</sup>	Official Landings <sup>2</sup>	ACFM Landings <sup>3</sup>
1987	Not assessed		-		4.4	3.9	-
1988	Not assessed		-		4.84	4.5	-
1989	Not assessed		-		4.84	2.7	-
1990	Not assessed		-		4.84	2.7	3.7
1991	No advice		-		4.84	3.2	3.7
1992	No advice		-		4.84	3.2	4.8
1993	No long-term gain in increased F		-		4.84	3.0	4.3
1994	No long-term gain in increased F		-		4.84	3.0	4.3
1995	No advice		-		4.84	3.3	4.6
1996	No advice		-		4.84	2.9	5.3
1997	No advice		-		4.84	2.8	4.6
1998	Adequate catch controls		-		4.84	2.7	4.2
1999	Maintain current TAC		4.84		4.84	2.5	3.8
2000	Maintain current TAC		4.84		4.84	2.4	3.6
2001	Maintain current TAC		4.84		4.36	2.4	3.3
2002	Maintain current TAC		4.36		4.36	1.6	2.3
2003	Maintain current TAC		4.36		4.36	1.7	2.3
2004	<sup>4</sup>	Reduce TAC to recent landings		3.60	3.60	1.4	1.8
2005	<sup>4</sup>	Reduce TAC to recent landings		2.3	2.88	0.9	n/a
2006	<sup>4</sup>	Reduce TAC to recent landings		2.3	2.88	0.9	1.1
2007		Reduce TAC to recent landings		2.1	2.88		
2008		Reduce TAC to recent landings		1.4			

Weights in '000 t.

<sup>1</sup> Vb(EC), VI, XII, and XIV.

<sup>2</sup> VIa and VIb.

<sup>3</sup> Landings in VIa and VIb and unallocated landings from IV. Landings in Vb (EC), XII, and XIV are negligible.

<sup>4</sup> Single-stock boundaries and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

n/a = not available.

**Table 5.4.28.1** MEGRIM in Subarea VI: Nominal catch (t) of megrim West of Scotland and Rockall as officially reported to ICES and WG best estimates of landings.

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	-	-
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-
France	398	455	504	517	408	618	462	192	172	0	135	252	79	92	50	48	45
Ireland	317	260	317	329	304	535	460	438	433	438	417	509	280	344	278	156	220
Netherlands	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	-	-
Spain	91	48	25	7	1	24	22	87	111	83	98	92	89	98	45	69	-
UK – Eng+Wales+N.Irl.	25	167	392	298	327	322	156	123	65	42	20	7	14	13	17	10	-
UK – Scotland	1093	1223	887	896	866	952	944	954	841	831	754	770	643	558	469	269	-
UK																	346
Official Total	1924	2154	2125	2047	1907	2451	2044	1795	1622	1394	1424	1630	1105	1105	859	552	611
Unallocated	286	278	424	674	786	1047	2010	1477	1083	1254	823	843	723	537	n/a	n/a	212
As used by WG	2210	2432	2549	2721	2693	3498	4054	3272	2705	2648	2247	2473	1828	1642	1328	561	823
Area misreported landings	339	338	466	735	871	1126	2062	1556	1156	1066	868	829	731	544	421	n/a	212

**Megrim in Division VIb (Rockall)**

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
France	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	-	0.074
Ireland	196	240	139	128	176	117	124	141	218	127	167	176	87	83	43	-	94
Spain	363	587	683	594	574	520	515	628	549	404	427	370	120	93	71	68	-
UK – Eng+Wales+N.Irl.	19	14	53	56	38	27	92	76	116	57	57	42	41	74	42	88	-
UK – England & Wales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	-
UK – Scotland	226	204	198	147	258	152	112	164	208	278	309	236	207	382	372	207	-
UK																	190
Official Total	804	1045	1073	925	1046	816	843	1009	1091	866	964	824	455	632	528	382	284
As used by WG	804	1045	1073	925	1046	816	843	1009	1091	866	964	825	456	632	457	n/a	253

**Total Megrim in Subarea VI (West of Scotland and Rockall)**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Official Total	2728	3199	3198	2972	2953	3267	2887	2804	2713	2260	2388	2454	1560	1737	1387	934	895
As used by WG	3014.1	3476.6	3621.7	3646	3739	4314.4	4896.7	4281	3796.4	3513.8	3211.1	3297.8	2283.7	2274.1	1785	n/a	1076

# West of Scotland Rockall and North Sea Anglerfish

## (Sub-areas IV and VI)

For latest information, see: <http://www.ices.dk>



*Marine Institute*  
Foras na Mara

Fisheries Science Services

### FSS - SINGLE STOCK CONSIDERATIONS

(See West of Scotland and Rockall Overview for mixed fishery advice).

The available information for this stock is inadequate to evaluate spawning stock biomass or fishing mortality relative to precautionary reference points. Reported landings increased up to 1996 and have decreased steadily since then.

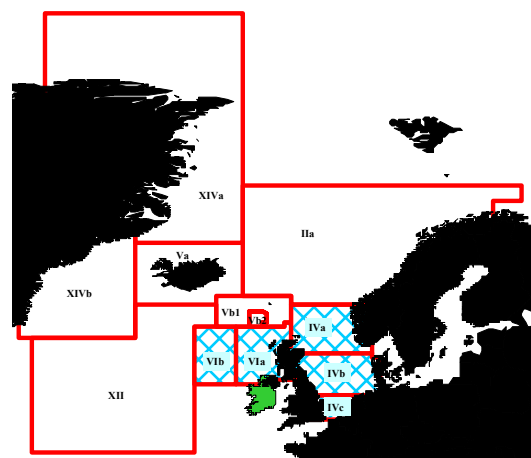
FSS agrees with the ICES advice that effort in this fishery should not be allowed to increase and the fishery must be accompanied by mandatory programmes to collect catch and effort data on both target and by-catch fish.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For west of Scotland, Rockall and North Sea Anglerfish, FSS interprets that the proposal would result in the 2007 TAC being maintained in 2008.

FSS continues to have serious concerns about the inability to assess the state of the stock. A long-term management strategy is more appropriate for a long-lived species like anglerfish. This would involve improving the selection pattern in the fishery by minimising catches of juvenile fish, ensuring that sufficient SSB is conserved to maintain recruitment and by developing a harvest control rule with long-term targets.

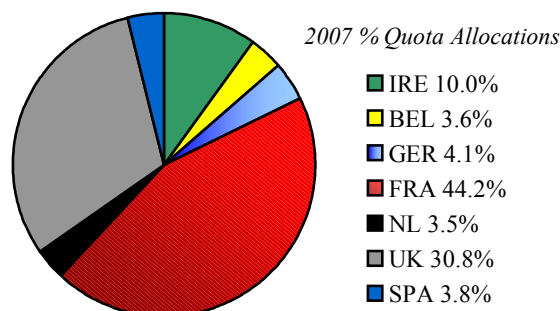
### CURRENT MANAGEMENT

- There are two TACs covering the assessment area in 2007. A TAC of 11,345 t is allocated for Division IIa (EC waters) & North Sea IV(EC waters) and a TAC of 5,155 t is allocated for Sub-areas VI, XII, XIV and Division Vb (EC Waters). Ireland's quota for this stock is 516 t in 2007, (adjusted quota = 568 t). This quota is taken exclusively from Sub-Area VI.
- There is no minimum legal landing size for anglerfish. However, EC Reg. No 2406/96 which deals with common marketing standards fixes a minimum weight of 500g for anglerfish.



Red Boxes-TAC/Management Areas Blue Shading-Assessment Area

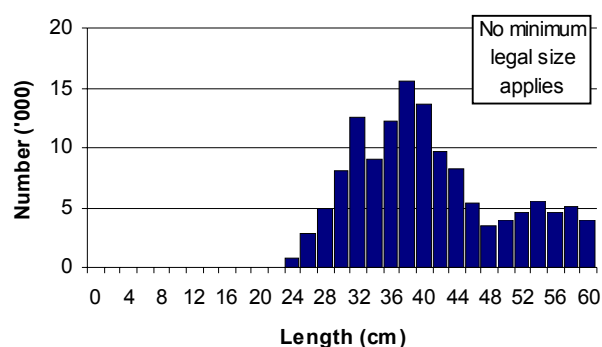
- Since February 2003 an effort control regime has been implemented in Sub-area VI as part of Cod recovery measures. FSS points out that the effort regulations in Division VIa appear to have led to considerable changes in fishing patterns and may have caused vessels to switch to targeting anglerfish and megrim to avail of a higher effort allocations. Detailed quantitative information on this is not yet available.
- In the past the lack of TAC regulation in the adjacent Sub-area IV encouraged mis-reporting of landings into that area and undermined management for Sub-area VI. Estimates which account for this area mis-reporting indicated that the percentage of the catch taken in Division IIa and Sub-area IV, and in Divisions VIa & VIb in the years 1993-2002 averaged 60% and 40%, respectively. In previous years, these proportions have been used to allocate TAC between these areas. However, given the concerns about the veracity of the recent reported landings data, FSS considers that the continued use of this proportionate split is no longer appropriate. Data from the Scottish and Irish Industry-Science partnership anglerfish surveys could be used to derive a more appropriate factor for allocating the TAC between the two areas.
- Since 2006 gillnetting has been banned in water deeper than 200 m in Sub-area VI and vessels can not carry more than 100 km of gillnet aboard.



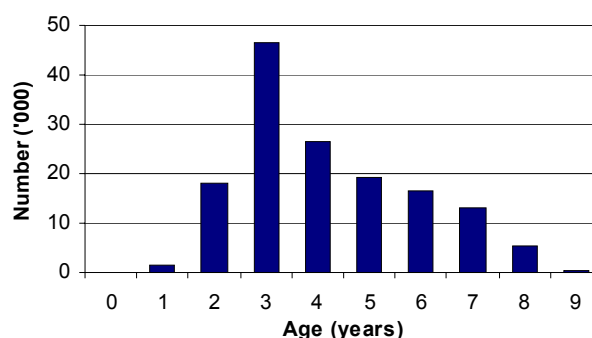
## ADDITIONAL INFORMATION

1. Commercial catch and effort data for the main fleets exploiting this stock are inaccurate due to substantial misreporting (area and volume in most recent years), changes in fishing patterns (rapid expansion of the fishery into deeper water coupled with efficiency increases), discarding (particularly in poorly documented deepwater static gear fisheries) and non-mandatory reporting of effort (for the main Scottish fleets). The fishery independent data from surveys are also inadequate to reliably assess the stock. However, the development of commercial LPUE data from Scottish skippers diaries suggests that the stock is not in decline in recent years.
2. Two species occur in these management areas, *Lophius piscatorius* (white bellied anglerfish) and *Lophius budegassa* (black bellied anglerfish), although catches are almost exclusively of the former.
3. Estimated Irish landings were approximately 445 t in 2006 (392 t in Division VIa and 53 t in Division VIb), an increase of 25% on the 2005 landings. The majority of these landings are from the OTB fleet.
4. The Irish fleet exploiting this fishery is mainly composed of otter trawl vessels from Greencastle and Killybegs.
5. Mesh regulations offer little protection to this species since their shape means that even the small individuals are easily retained in the gear. Industry-initiated programmes to improve current exploitation pattern (where the catch is dominated by small fish) should be used in fisheries catching juvenile anglerfish. Reducing catches of juvenile anglerfish would lead to increases in yield and increase their potential contribution to the future SSB. Irish fishermen report high densities of juvenile anglerfish in a particular area of the Stanton Bank in Division VIa. A closure of this area would reduce the mortality on juvenile fish and result in an increased yield from the stock. This area closure is likely to be supported by the Irish Industry. FSS intend to look at this area in the upcoming Anglerfish Survey
6. The impact on the stock of the deepwater gillnet ban introduced in 2006 is difficult to quantify due to the lack of historical data.
7. FSS points out that anglerfish are caught in mixed fisheries in Sub-area VI and these fisheries may include catches of species that are outside precautionary limits.

2006 Q1 & 2 Length Distribution: Irish Otter Trawlers, Anglerfish in VIa



2006 Q1 & 2 Age Composition: Irish Otter Trawlers, Anglerfish in VIa



8. FSS is currently undertaking a joint industry-science survey for anglerfish in this area in co-operation with the Irish and Scottish fishing industries and the FRS Marine Laboratory in Aberdeen. A dedicated anglerfish survey commenced in 2006 using commercial vessels in Sub-areas VI and VII with the aim of assessing the absolute abundance of the anglerfish stock using the swept area method. The Irish vessels also carried out anglerfish tagging during the survey to investigate migration patterns of the stock. The results of the swept area abundance estimate will lead to a fishery independent assessment of the stock. In 2007 this survey has been further expanded to include the deployment of data storage tags (DST) on anglerfish released during the survey. Results from future recaptures of these DST tags will lead to greater information on the behaviour of anglerfish.



# ICES ADVICE

## 5.4.29

Two species occur in these areas, *Lophius piscatorius* and *L. budegassa*, although catches are almost exclusively of the former.

### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Unknown	Unknown	Unknown	NA	

There are major uncertainties about catch and effort data for anglerfish, as well as limited knowledge about population dynamics and distribution. The available information is inadequate to evaluate spawning stock or fishing mortality relative to risk.

### Management objectives

There are no explicit management objectives for this stock; the European Community and Norway are currently discussing the joint management of this shared stock.

### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	Not defined	There is currently no biological basis for defining $B_{lim}$
	$B_{pa}$	Not defined	
	$F_{lim}$	Not defined	There is currently no biological basis for defining $F_{lim}$
	$F_{pa}$	0.30	$F_{35\%SPR} = 0.30$ . This fishing mortality corresponds to 35% of the unfished SSB/R. It is considered to be an approximation of $F_{MSY}$ .
Targets	$F_y$	Not defined	

(unchanged since 1998)

### Single-stock exploitation boundaries

#### Exploitation boundaries in relation to precautionary considerations

The available information is inadequate to evaluate spawning stock or fishing mortality relative to precautionary reference points. The effort in fisheries that catch anglerfish should not be allowed to increase and the fishery must be accompanied by mandatory programmes to collect catch and effort data on both target and bycatch fish.

### Management considerations

Information from several fisheries indicates that underreporting of total landings has been a problem in recent years due to restrictive individual vessel quotas. In 2005 the TACs of the North Sea Subarea VI were raised to countermand underreporting practices, but it is not known to what extent this has resolved the reporting problems in this fishery. However, the registration of buyers and sellers legislation should make it more difficult to make unreported landings of this (and other) species. This legislation became effective at the start of 2006. There has been an increased enforcement on anglerfish quotas in 2006. This is expected to lead to improved data on total catches of anglerfish.

Estimates accounting for area misreporting indicate that the percentage of the catch taken in Division IIIa and Subarea IV, and in Divisions VIa & VIb in the years 1993–2002 average 60% and 40%, respectively. In previous years, these proportions have been used to allocate TAC between these areas. However, given the concerns about the veracity of the recent reported landings data, such proportionate splitting may no longer be appropriate.

ICES has previously advised a two-stage approach for management of the angler fishery. The first stage was to substantially improve the quality and quantity of data collected on the fishery while maintain-

ing exploitation at its current level. This first stage of data collection was expected to take at least five years, establishing useable time-series of fisheries-dependent and -independent data. The second stage would then be to use these data to examine alternative management approaches and harvest control rules appropriate to this fishery.

Following ICES suggestions in 2005 a number of initiatives were instigated:

- dedicated Scottish and Irish industry/science anglerfish surveys;
- a Scottish tallybook scheme (linked to a longer time series of personal diaries);
- increased observer coverage.

The results obtained from these initiatives are currently unable to provide information on changing stock size or exploitation. The analyses of commercial catches need to take into account the displacement of the fishery to deeper waters. ICES previously emphasized the importance of data collection from the fishery. This is now progressing, and ICES considers that the approach should continue as it is expected to yield useful information in the medium term for the management of this stock.

Recent attempts at actually defining anglerfish fisheries have shown that the vast majority of the catch of anglerfish stems from mixed fisheries, catching sole, saithe, plaice, megrim, *Nephrops*, haddock, and cod, amongst others, with the landings of anglerfish actually being a relatively low percentage of the total. Optional effort restrictions aiming at a recovery of these other species will have a side-effect for the anglerfish too, but a shift from anglerfish-poor areas to anglerfish-rich areas might annihilate this effect. While statistical analysis of Scottish observer data did not provide evidence of such shifts in the recent past, the effect of depth changes in the fishery are, however, not yet fully evaluated.



Ghost fishing and discarding of fish not suitable for consumption due to long soaking times are known to be problems within some offshore gillnetting carried out by “flag-vessels” targeting anglerfish in Subareas VI and VII.

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### Factors affecting the fisheries and the stock

#### *Changes in fishing technology and fishing patterns*

Until the mid-1980s, anglerfish was taken mainly as a bycatch in bottom trawl groundfish fisheries. Restrictive TACs for other species in Division VIa led to increased fishing pressure on anglerfish in that area, where they are now caught in a targeted anglerfish fishery and as a bycatch in other demersal fisheries, including roundfish fisheries in Division VIa, the haddock fishery on Rockall Bank, *Nephrops* fisheries, and fisheries in deeper waters. In the North Sea, anglerfish are caught as a bycatch in demersal fisheries, *Nephrops* and *Pandalus* fisheries in the northern and eastern parts of the North Sea, the Fladen Ground, and the Norwegian Deep. In the Norwegian Deep anglerfish has also been targeted by some demersal trawlers. A Norwegian large-mesh gillnet fishery targeting fish above 60–65 cm has been developed along the Norwegian coast since the early 1990s.

The fishery has expanded into deeper waters, areas believed to have been a refuge for adult anglerfish, and this new fishery therefore increases the vulnerability of the stock to overexploitation. Immature fish are subjected to exploitation for a number of years prior to first maturity.

#### *The environment*

The key features of the species’ life history in relation to its exploitation are the location of the main spawning areas in relation to the exploited areas, and whether or not there is any systematic migration of younger fish back into the deeper waters to spawn. At present, despite the large increase in catches, there is no apparent contraction in distribution; fish are still recruiting to relatively inshore areas such as the Moray Firth and along the Norwegian coast in the northern North Sea. The fact that spawning appears to occur largely in deep water off the edge of the continental shelf may offer the stocks some degree of refuge. It is therefore likely that the current expansion of the fisheries into deeper water will have a negative effect on the stocks.

The distribution of anglerfish in the North Sea, Kattegat, and Skagerrak is associated with the distribution to the West of Scotland (Divisions VIa and VIb). It is likely that catches from these areas come from the same biological stock. Genetic studies have found no evidence of separate stocks and particle-tracking studies have indicated interchange of larvae between areas.

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### Scientific basis

#### *Data and methods*

The information basis for anglerfish is being developed, with improvements to both industry-related data and surveys. There is currently insufficient data to support an assessment of the state of the stock.

#### *Information from the fishing industry*

There is important ongoing science industry collaboration for the collection of tallybooks and joint surveys in Ireland and Scotland.

#### *Comparison with previous assessment and advice*

Analytical assessments have not been made since 2003. This year’s advice is similar to the advice from last year.

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### Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).

#### Subarea IV – North Sea

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official landings	ACFM Landings
1990	Not assessed	-	-	-	-	10.6	9.5
1991	Not assessed	-	-	-	-	11.8	10.6
1992	Not assessed	-	-	-	-	13.3	11.7
1993	Not assessed	-	-	-	-	15.5	13.1
1994	Not assessed	-	-	-	-	18.2	15.4
1995	Not assessed	-	-	-	-	20.9	15.8
1996	Not assessed	-	-	-	-	27.3	16.2
1997	Not assessed	-	-	-	-	25.8	18.2
1998	Not assessed	-	-	-	22.1	19.0	14.0
1999	Not assessed	-	-	-	22.1	14.9	11.7
2000	40% reduction in catches	-	<9.7	-	17.66	14.0	11.6
2001	2/3 of the catches in 1973–1990	-	5.7	-	14.13	14.7	12.7
2002	2/3 of the catches in 1973–1990	-	5.7	-	10.50	12.3	10.3
2003	Reduce F below $F_{pa}$	-	<6.7 <sup>2</sup>	-	7.0	9.4	8.3
2004	<sup>1</sup>	Reduce F below $F_{pa}$		<8.8	7.0	9.8	9.0
2005	<sup>1</sup>	No effort increase		-	10.31	9.1	n.a.
2006	<sup>1</sup>	No effort increase		-	10.31	10.8	n.a.
2007	<sup>1</sup>	No effort increase		-	11.34		
2008	<sup>1</sup>	No effort increase		-			

Weights in '000 t.

<sup>1</sup>Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

<sup>2</sup>Advice for Division IIIa, Subarea IV, and Subarea VIa combined.

#### Division IIIa, Subarea IV, and Subarea VI combined

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC <sup>1</sup>	Official landings	ACFM landings <sup>2</sup>
2003	Reduce F below $F_{pa}$		<6.7		10.2	12.3	n/a
2004	<sup>2</sup>	Reduce F below $F_{pa}$	<sup>2</sup>	<8.8	10.2	10.9	n/a
2005		No effort increase	<sup>2</sup>	-	15.0	13.5	n/a
2006		No effort increase	<sup>2</sup>	-	15.0	14.4	n/a
2007		No effort increase	<sup>2</sup>	-	16.5		
2008		No effort increase	<sup>2</sup>	-			

Weights in '000 t.

<sup>1</sup>Areas IV, IIa (EC) and Vb(EC), VI, XII, and XIV.

<sup>2</sup>Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

n/a = not available.

# Subarea VI – West of Scotland and Rockall

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC <sup>1</sup>	Official landings	ACFM landings <sup>2</sup>
1987	Not assessed		-		7.8	5.2	5.6
1988	Not assessed		-		8.6	7.7	7.7
1989	Not assessed		-		8.6	6.0	7.3
1990	Not assessed		-		8.6	6.4	6.6
1991	No advice		-		8.6	6.0	6.3
1992	No advice		-		8.6	6.6	9.2
1993	No long-term gain in increased F		-		8.6	6.2	10.1
1994	No long-term gain in increased F		-		8.6	6.0	8.8
1995	A precautionary TAC not exceeding recent catch levels		-		8.6	7.2	12.3
1996	A precautionary TAC not exceeding recent catch levels		-		8.6	7.0	18.2
1997	Reduction in fishing effort		-		8.6	6.2	13.7
1998	Reduction in fishing effort		-		8.6	5.4	10.6
1999	Reduce fishing effort, effective implementation of the TAC		-		8.6	5.3	8.4
2000	40% reduction in catches		<7.4		8.0	4.4	7.5
2001	2/3 of the catches in 1973–1990		4.3		6.4	4.0	5.9
2002	2/3 of the catches in 1973–1990		4.3		4.8	3.0	4.8
2003	Reduce F below $F_{pa}$		<6.7 <sup>3</sup>		3.18	3.0	4.1
2004	<sup>4</sup>	Reduce F below $F_{pa}$		<sup>4</sup>	3.18	1.2	3.3
2005		No effort increase		-	4.69	3.9	n.a.
2006		No effort increase		-	4.69	3.2*	n.a.
2007		No effort increase		-	5.15		
2008		No effort increase		-			

Weights in '000 t.

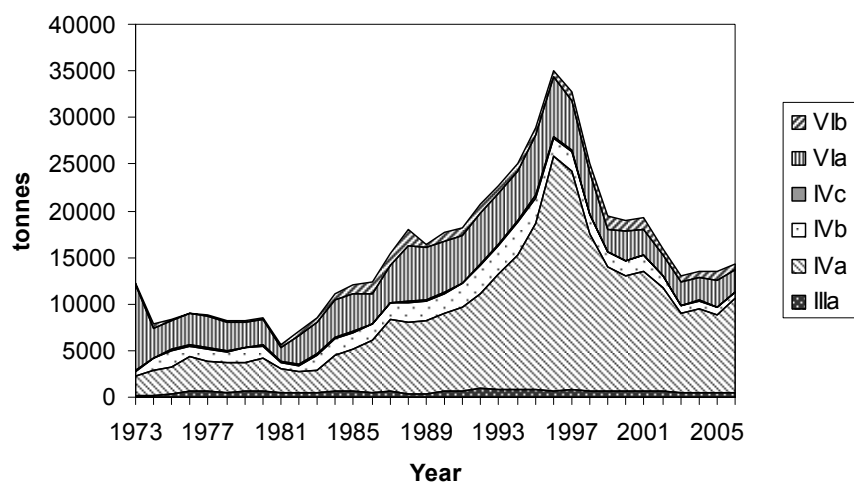
<sup>1</sup>Vb(EC), VI, XII, and XIV.

<sup>2</sup>Division VIa only.

<sup>3</sup>Advice for Division IIIa, Subarea IV, and Subarea VIa combined.

<sup>4</sup>Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

\*Preliminary (Not all countries included).



**Figure 5.4.29.1** Northern Shelf anglerfish. Officially reported landings by ICES area.

**Table 5.4.29.1.** Anglerfish in Subarea VI. Nominal landings (t) as officially reported to ICES.

Anglerfish in Division VIa (West of Scotland)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Belgium	3	2	9	6	5	-	5	2	-	-	+	+	-	+	-	-
Denmark	1	3	4	5	10	4	1	2	1	+	+	.	+	+	-	-
Faroe Is.	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	3
France	1,910	2,308	2,467	2,382	2,648	2,899	2,058	1,634	1,814	1,132	943	739	1,212	1,191	1,392	1,148
Germany	1	2	60	67	77	35	72	137	50	39	11	3	27	39	39	.
Ireland	250	403	428	303	720	717	625	749	617	515	475	304	322	219	356	364
Netherlands	-	-	-	-	-	-	27	1	-	-	-	-	-	-	-	-
Norway	6	14	8	6	4	4	1	3	1	3	2	1	+	+	1	1
Spain	7	11	8	1	37	33	63	86	53	82	70	101	196	110	82	.
UK(E,W&NI)	270	351	223	370	320	201	156	119	60	44	40	32	30	30	20	...
UK(Scot.)	2,613	2,385	2,346	2,133	2533	2,515	2,322	1,773	1,688	1,496	1,119	1,100	705	862	1,127	...
UK (total)																986
Total	5,061	5,479	5,553	5,273	6,354	6,408	5,330	4,506	4,284	3,311	2,660	2,280	2,492	2,453	3,019	2,502
Unallocated	296	2,638	3,816	2,766	5,112	11,148	7,506	5,234	3,799	3,114	2,068	1,882	985	1,938		
As used by WG	5,357	8,117	9,369	8,039	11,466	17,556	12,836	9,740	8,083	6,425	4,728	4,162	3,477	4,391		

\*Preliminary. <sup>1</sup> Includes VIb.

**Table 5.4.29.1 (Cont'd)**  
**Anglerfish in Division VIb (Rockall)**

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Estonia	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Faroe Is.	-	2	-	-	-	15	4	2	2	-	1	-	-	-	-	+
France	-	-	29	-	-	-	1	1	...	48	192	43	191	-	293	91
Germany	-	-	103	73	83	78	177	132	144	119	67	35	64	66	77	-
Ireland	272	417	96	135	133	90	139	130	75	81	134	51	26	13	35	53
Norway	18	10	17	24	14	11	4	6	5	11	5	3	6	5	4	6
Portugal	-	-	-	-	-	-	-	+	429	20	18	8	4	19	63	-
Russia	-	-	-	-	-	-	-	-	-	-	1	-	-	2	4	1
Spain	333	263	178	214	296	196	171	252	291	149	327	128	59	43	-	-
UK(E,W&NI)	99	173	76	50	105	144	247	188	111	272	197	133	133	54	93	...
UK(Scot)	201	224	182	281	199	68	156	189	344	374	367	317	160	294	355	...
UK (total)																523
Total	923	1089	681	777	830	602	899	900	1401	1074	1309	718	643	496	924	674
Unallocated									-9	17	-178	-47	145	121		
As used by WG	923	1,089	681	777	830	602	899	900	1392	1091	1131	671	788	617		

\*Preliminary. <sup>1</sup>Included in VIa.

**Total Anglerfish in Subarea VI (West of Scotland and Rockall)**

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Total official	5,984	6,568	6,234	6,050	7,184	7,010	6,229	5,406	5,685	4,385	3,969	2,998	3,135	2,949	3,943	3,176
Total ICES	6,280	9,206	10,050	8,816	12,296	18,158	13,735	10,640	9,475	7,516	5,859	4,833	4,265	5,008		

\*Preliminary.

**Table 5.4.29.2.** Nominal catch (t) of ANGLERFISH in the North Sea, 1991–2006, as officially reported to ICES.

**Northern North Sea (IVa)**

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Belgium	2	9	3	3	2	8	4	1	5	12	-	8	1	...	-	-
Denmark	1,245	1265	946	1,157	732	1,239	1,155	1,024	1,128	1,087	1,289	1,308	1,523	1,538	1379	1311
Faroes	1	-	10	18	20	-	15	10	6	...	2	+	2	11	22	2
France	124	151	69	28	18	7	7	3*	18 <sup>1</sup> *	8	9	8	8	8	4	5
Germany	71	68	100	84	613	292	601	873	454	182	95	95	65	20	84	84
Netherlands	23	44	78	38	13	25	12	-	15	12	3	8	9	38	13	13
Norway	587	635	1,224	1,318	657	821	672	954	1,219	1,182	1,212	928	769	999	880	1005
Sweden	14	7	7	7	2	1	2	8	8	78	44	56	8	6	5	5
UK(E, W&NI)	129	143	160	169	176	439	2,174	668	781	218	183	98	104	83	34	...
UK (Scotland)	7,039	7,887	9,712	11,683	15,658	22,344	18,783	13,319	9,710	9,559	10,024	8,539	6,033	6,284	6,003	...
UK (total)																7,821
Total	9,235	10,209	12,309	14,505	17,891	25,176	23,425	16,857	13,326	12,338	12,861	11,048	8,522	8,987	8,424	10,149

\* Preliminary. <sup>1</sup>Includes IVb,c.

**Central North Sea (IVb)**

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Belgium	357	538	558	713	579	287	336	371	270	449	579	435	180	259	207	139
Denmark	345	421	347	350	295	225	334	432	368	260	251	255	191	274	237	276
Faroes	-	-	2	-	-	-	-	-	-	-	-	10	-	-	-	-
France	-	1	-	2	-	-	-	-	...	-	-	-	-	+	-	-
Germany	4	2	13	15	10	9	18	19	9	14	9	17	11	11	9	-
Ireland													1	-	-	-
Netherlands	285	356	467	510	335	159	237	223	141	141	123	62	42	25	31	-
Norway	17	4	3	11	15	29	6	13	17	9	15	10	12	22	16	14
Sweden	-	-	-	3	2	1	3	3	4	3	2	9	2	1	4	4
UK(E, W&NI)	669	998	1,285	1,277	919	662	664	603	364	423	475	236	167	120	96	...
UK (Scotland)	845	733	469	564	472	475	574	424	344	318	378	210	241	138	88	...
UK (total)																205
Total	2,522	3,053	3,144	3,445	2,627	1,847	2,172	2,088	1,517	1,617	1,832	1,244	847	850	688	638

\* Preliminary. <sup>1</sup>Includes 2 tonnes reported as Sub-area IV. <sup>2</sup>Included in IVa.

**Table 5.4.29.2. (continued)**  
**Southern North Sea (IVc)**

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Belgium	13	12	34	37	26	28	17	17	11	15	15	16	9	5	4	3
Denmark	2	+	-	+	+	+	+	+	+	+	+	+	+	+	-	+
France	-	-	-	-	-	-	-	10	-	+	-	+	-	-	-	+
Germany	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-
Netherlands	5	10	14	20	15	17	11	15	10	15	6	5	1	-	1	-
Norway	-	-	-	-	+	-	-	-	+	-	+	-	-	-	-	-
UK(E&W&NI)	6	17	18	136	361	256	131	36	3	1	-	-	10	3	-	...
UK (Scotland)	-	-	-	17	-	3	1	+	+	+	-	-	-	7	-	...
Total	26	39	66	210	402	304	160	78	24	31	21	21	20	15	5	3

\* Preliminary. † Included in IVa.

**Total North Sea**

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Total	11,783	13,301	15,519	18,162	20,920	27,327	25,757	19,023	14,867	13,986	14,714	12,313	9,389	9,852	9,117	10,790
WG estimate	10,566	11,728	13,078	15,432	15,794	16,240	18,217	14,027	11,719	11,564	12,677	10,334	8,273	9,027		
Unallocated	-1,217	-1,573	-2,441	-2,730	-5,126	-11,087	-7,540	-4,996	-3,148	-2,422	-2,037	-1,979	-1,116	-825		

\* Preliminary.

**Table 5.4.29.3** Nominal catch (t) of Anglerfish in Division IIIa, 1991–2006, as officially reported to ICES.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Belgium	15	48	34	21	35	-	-	-	-	-	-	-	-	-	-	-
Denmark	493	658	565	459	312	367	550	415	362	377	375	369	215	311	274	227
Germany	-	-	1	-	-	1	1	1	2	1	-	1	-	1	-	-
Netherlands																
Norway	64	170	154	263	440	309	186	177	260	197	200	242	187	130	100	137
Sweden	23	62	89	68	36	25	39	33	36	27	46	55	71	73	79	47
Total	595	938	843	811	823	702	776	626	660	602	621	667	476	519	457	411

\*Preliminary.

# FU11-13 *Nephrops* stocks Northwest of Ireland and West of Scotland

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

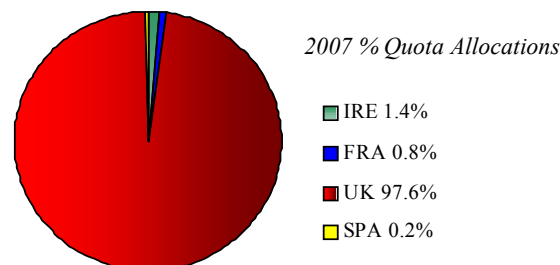
There are three stocks assessed using UWTV survey data in this area; the North Minch FU 11, South Minch FU 12, Clyde FU 13 (Refer to Map Appendix 1). In addition there are important catches including the majority of Irish landings from other areas in Division VIa. All indicators suggest that the stocks are stable or even increasing at current levels of exploitation. However, there is considerable uncertainty about landings, discard and effort data for these stocks. In particular under-reporting of landings is thought to be a problem rendering the previous advice based on average reported landings inappropriate.

ICES has not given new advice for these stocks this year. UWTV survey and fishery data for these stocks does not suggest any change in recent stock perception. Therefore FSS reiterates last years advice that effort in this fishery should not be allowed to increase

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Northwest of Ireland and West of Scotland *Nephrops*, FSS interprets that the proposal would result in the 2007 TAC being maintained in 2008.

## CURRENT MANAGEMENT

- The TAC area covers Sub-area VI and Division Vb. To ensure balanced exploitation *Nephrops* stocks should be managed at an appropriate geographic scale i.e. FU.
- Division VIa contains three main fisheries in the North Minch (FU 11), South Minch (FU 12) and Firth of Clyde (FU 13). The assessment is based on a time series of UWTV surveys in these FUs.
- Irish landings come from the component of this stock which is currently not assessed using UWTV surveys.
- The TAC in 2007 was 19,885 t with an Irish quota of 269 t.



- There are no explicit management objectives or a management plan for these stocks. FSS recommends that management objectives be established and that a management plan be developed with stakeholders and implemented for fisheries catching *Nephrops*.
- The following TCMs are in place for *Nephrops* in Division VIa after EC 850/98: *Minimum Landing Sizes (MLS)*; total length >70 mm, carapace length >20 mm, tail length >37 mm. *Mesh Size Restrictions*; Vessels targeting *Nephrops* using towed gears having at least 35% by weight of this species on board will require 70 mm diamond mesh plus an 80 mm square mesh panel as a minimum or having at least 30% by weight of *Nephrops* on board will require 80 mm diamond mesh.

## ADDITIONAL INFORMATION

1. There is considerable uncertainty about landings, discard, and effort data for these stocks and assessments based on quantitative fishery data are considered unreliable at the present time. TV surveys of the main Functional Units have been carried out for over 10 years now and provide estimates of abundance and variance. The ICES advice is based on a harvest ratio of 15% as estimated using landings data before the stocks increased and under-reporting became more pronounced. The approach of using UWTV surveys is still in development and the current lack of credible landings statistics is hindering the utility of these surveys as an advisory tool. Given that the stocks have been stable or increasing at recent effort levels then keeping effort below recent effort levels seems a reasonable precaution.
2. There is no quantitative information available to scientists but anecdotal information from the industry suggests under-reporting is substantial and true landings are at least 60% higher than landings in this stock.
3. Reported Irish landings in 2006 were 132 t.
4. *Nephrops* are caught by Irish otter trawlers from Greencastle and Killybegs. Up until 1999 Irish landings of *Nephrops* from this area were negligible but since then landings have substantially increased from Donegal Bay and the Stanton Bank.



5. FSS also points out that there may be some potential to expand *Nephrops* fisheries in new areas within Division VIa but mainly outside current assessed FUs. There is also anecdotal evidence that *Nephrops* are occurring in commercial quantities in areas where they were not previously abundant, possibly as a result of reduced predation by cod and other fish species. These areas include fisheries at Stanton

Bank, in Donegal Bay and in deepwater. Fisheries independent methods such as underwater television surveys could be used to evaluate the potential for increased *Nephrops* yields. However, the current Irish quota allocation in this area is low and may restrict the potential for Irish vessels to develop new *Nephrops* fisheries in Division VIa.

Table 1. Total *Nephrops* landings (tonnes) by Functional Unit plus Other rectangles, 1981-2006.

Year	FU 11	FU 12	FU 13	Other Areas	Total
1981	2861	3651	2968	39	9519
1982	2799	3552	2623	27	9001
1983	3196	3412	4077	34	10719
1984	4144	4300	3310	36	11790
1985	4061	4008	4285	104	12458
1986	3382	3484	4341	89	11296
1987	4083	3891	3007	257	11238
1988	4035	4473	3665	529	12702
1989	3205	4745	2812	212	10974
1990	2544	4430	2912	182	10068
1991	2792	4442	3038	255	10527
1992	3560	4237	2805	248	10850
1993	3192	4465	3342	344	11343
1994	3616	4415	2629	441	11101
1995	3656	4680	3989	460	12785
1996	2871	3995	4060	239	11165
1997	3046	4446	3618	243	11353
1998	2441	3729	4843	157	11170
1999	3257	4051	3752	438	11498
2000	3246	3952	3419	421	11038
2001	3259	3992	3182	420	10853
2002	3440	3305	3383	397	10525
2003	3268	3879	3171	433	10751
2004	3135	3868	3025	403	10431
2005	2948	3843	3397	254	10442
2006*	4093	4581	4723	240	13637
*provisional					

Table 2. *Nephrops*, Division VIa and VIb official *Nephrops* landings (tonnes) by country

Division VIa	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
France	8	6	1	0	0	0	0	0	3	4	0	0	0	0	1	9	0	0	0	0	+
Ireland	20	128	11	9	10	1	10	7	6	9	8	5	25	136	130	115	117	145	150	154	132
Spain	5	11	7	2	4	0	0	0	0	3	1	15	18	40	69	30	25	17	8	18	na
UK - Eng+Wales+N.Irl.	0	12	44	25	35	37	56	191	290	346	176	133	202	256	137	139	152	81	10,208	10,258	13,640
UK - Scotland	11,283	11,203	12,649	10,949	10,042	10,458	10,783	11,178	11,047	12,527	10,929	11,104	10,949	11,078	10,667	10,568	10,225	10,450			
TOTAL	11,316	11,360	12,712	10,985	10,091	10,496	10,849	11,376	11,346	12,889	11,114	11,257	11,194	11,510	11,004	10,861	10,519	10,693	10,366	10,430	13,772
Unallocated	-20	-122	-10	-11	-23	31	0	-44	-245	-104	51	-4	-23	-18	35	0	6	58	65	72	-135
WG TOTAL	11296	11238	12702	10974	10068	10527	10849	11332	11101	12785	11165	11253	11171	11492	11039	10861	10525	10751	10,431	10,502	13,637

Division VIb	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
France	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	1	1	0	0	3	+
Germany	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	na	na
Ireland	0	0	0	0	0	0	0	0	0	0	0	1	1	0	8	1	0	1	0	na	na
Spain	8	18	27	14	10	30	2	2	5	2	5	3	6	5	3	14	7	5	2	na	Na
UK - Eng+Wales+N.Irl.	0	11	4	0	1	0	4	6	16	26	65	88	46	2	4	2	3	6			
UK - Scotland	0	0	0	0	0	0	1	9	5	1	5	23	7	5	4	7	7	18	20	14	3
TOTAL	8	29	31	14	11	30	7	17	26	30	81	115	60	12	21	25	18	30	22	17	3
Unallocated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WG TOTAL	8	29	31	14	11	30	7	17	26	30	81	115	60	12	21	25	18	30	22	17	3

# West of Scotland and Rockall Plaice

## (Sub-area VI)



Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See West of Scotland and Rockall Overview for Mixed Fishery Advice)

The status of this stock is unknown. ICES does not carry out an assessment for this stock.

The TAC has not been restrictive but the landings have decreased since 1990. LPUE and landings show a declining stock abundance and FSS therefore advises that the TAC should be adjusted downwards in line with recent landings. Average landings during the period 2004-2006 are around 96 t. If a TAC was set based on this average it would translate to an Irish quota of around 35 t.

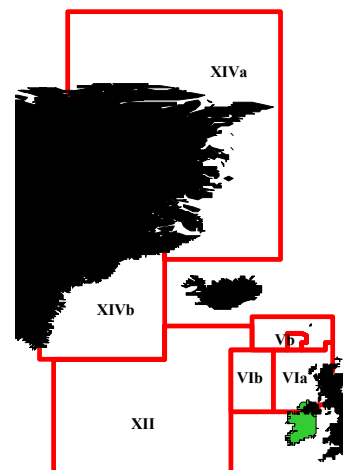
FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For West of Scotland and Rockall Plaice, FSS interprets that the EC fishing opportunities in 2008 should be a 15% reduction of the 2007 TAC which is equivalent to 668 t.

### CURRENT MANAGEMENT

- The TAC area covers Sub-areas VI and XII and XIV and Division Vb.
- The TAC in 2007 was 786 t with an associated Irish quota of 287 t.
- There are no explicit management objectives or plans for this stock.
- FSS advises that management objectives be established and that a management plan be developed and implemented for the fishery catching plaice.

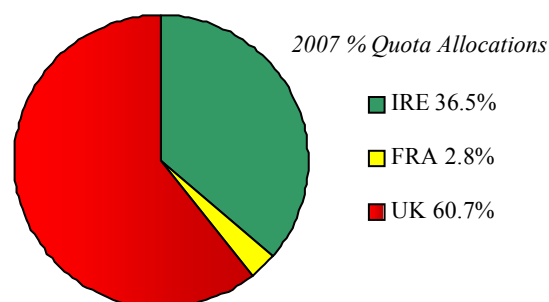
### ADDITIONAL INFORMATION

1. The Irish quota is not restrictive but this fishery once was important to the smaller inshore boats operating in the south of Division VIa.
2. Plaice in Division VIa are caught mainly by demersal otter trawls. The main fisheries are at the Stanton, Stags and Donegal Bay fishing grounds.
3. Irish landings are estimated to be 28 t in 2006, one tenth of the available quota.

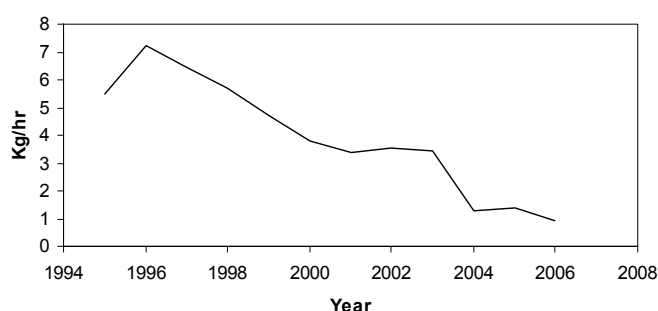


Red Boxes-TAC/Management Areas

4. Discarding practices are not well quantified but FSS sampling has indicated that discarding does occur in this fishery.
5. LPUE estimates for Irish demersal trawlers have been declining since 1996, possibly reflecting a decline in the stock abundance.



Plaice in Division VIa. LPUE kg/hr for the Irish OTB fleet



**Plaice Division VIa landings by country as estimated by FSS. EU TAC and Irish quota also shown.**

(Source of International data: ICES STATLANT 27A database)

Country	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Belgium	2	0	1	0	0	0	0	0	0	0	0	0	0	3	1	1	0
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
France	0	31	44	-	66	67	58	50	44	55	40	57	57	49	44	24	62
Ireland	280	328	463	487	352	338	392	464	425	565	649	660	403	516	649	579	670
Netherlands	15	0	0	0	0	1	0	0	0	0	0	0	204	0	0	0	0
Spain	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
UK - Eng+Wales+N.Irl.	142	158	142	176	127	90	66	62	67	40	45	31	38	26	33	27	11
UK - Scotland	755	969	916	887	731	864	1,049	1,065	947	967	1,070	1,065	1,046	1,149	1,000	1,185	1,097
USSR	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>1,194</b>	<b>1,492</b>	<b>1,566</b>	<b>1,550</b>	<b>1,276</b>	<b>1,360</b>	<b>1,565</b>	<b>1,641</b>	<b>1,483</b>	<b>1,628</b>	<b>1,804</b>	<b>1,813</b>	<b>1,748</b>	<b>1,743</b>	<b>1,727</b>	<b>1,816</b>	<b>1,847</b>
<b>EU TAC<sup>2</sup></b>									1810	1810	1810	1810	1810	1810	1810	2000	2000
<b>Irish Quota</b>									660	660	660	660	660	660	660	730	730

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Belgium	0	0	25	8	30	13	19	19	18	19	9	0	0	0	0	0
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France	23	19	16	4	6	1	2	1	0	1	0	0	0	0	0	0
Ireland <sup>1</sup>	560	357	339	360	401	499	528	418	309	233	187	146	150	62	46	28
Netherlands	0	0	0	0	0	0	19	11	0	0	0	0	0	0	0	0
Spain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UK - Eng+Wales+N.Irl.	37	61	80	135	77	62	67	39	34	18	10	18	6	5	1	0
UK - Scotland	1,433	1,292	1,095	1,181	1,344	1,266	1,052	973	657	387	491	323	243	130	15	0
USSR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>TOTAL</b>	<b>2,053</b>	<b>1,729</b>	<b>1,555</b>	<b>1,688</b>	<b>1,858</b>	<b>1,841</b>	<b>1,687</b>	<b>1,461</b>	<b>1,018</b>	<b>658</b>	<b>697</b>	<b>487</b>	<b>399</b>	<b>197</b>	<b>62</b>	<b>28</b>
<b>EU TAC<sup>2</sup></b>	2000	2400	2400	2400	2400	2400	2400	2400	2400	2400	1920	1728	1534	982	786	786
<b>Irish Quota</b>	730	870	870	870	880	880	880	880	880	880	700	630	559	358	287	287

**Plaice Division VIb landings by country as estimated by FSS.**

(Source of International data: ICES STATLANT 27A database)

Country	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Faeroe Islands	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
France	0	0	0	0	2	0	0	-	0	0	0	0	0	0	0	0	0
Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UK - Eng+Wales+N.Irl.	0	0	1	1	1	0	0	0	0	0	1	0	0	0	1	0	1
UK - Scotland	0	0	0	0	2	0	1	0	0	0	1	3	3	8	7	6	80
Un. Sov. Soc. Rep.	60	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>60</b>	<b>6</b>	<b>1</b>	<b>1</b>	<b>5</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>8</b>	<b>8</b>	<b>6</b>	<b>81</b>

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Faeroe Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ireland <sup>1</sup>	0	0	5	1	2	4	0	0	2	0	1	0	0	0	0	0
Russian Federation	0	0	0	0	0	0	0	0	0	88	0	0	0	0	0	0
Spain	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
UK - Eng+Wales+N.Irl.	0	3	2	5	2	9	15	15	0	1	0	0	0	0	0	0
UK - Scotland	53	27	5	7	12	5	5	7	6	63	7	1	7	0	0	0
Un. Sov. Soc. Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>53</b>	<b>30</b>	<b>12</b>	<b>13</b>	<b>16</b>	<b>18</b>	<b>20</b>	<b>22</b>	<b>8</b>	<b>152</b>	<b>12</b>	<b>1</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>0</b>

<sup>1</sup> Ireland landings since 1995 estimated from DCMNR Logbook databases

<sup>2</sup> TAC area is Vb, VI, XII, XIV

\*Data are preliminary for 2006

# West of Scotland and Rockall Sole

## (Sub-area VI)



Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See West of Scotland and Rockall Overview for Mixed Fishery Advice)

The status of this stock is unknown and there is no ICES assessment. The international landings have shown an increasing trend since the early seventies reaching a peak of around 110 t in the late nineties but since then have rapidly declined to the present value of 14 t. The LPUE has also decreased in recent years.

FSS advises that the TAC should be adjusted downwards in line with recent landings. Average landings during the period 2004-2006 were around 19 t. If the TAC is set in line with this figure it would translate to an Irish quota of around 15 t.

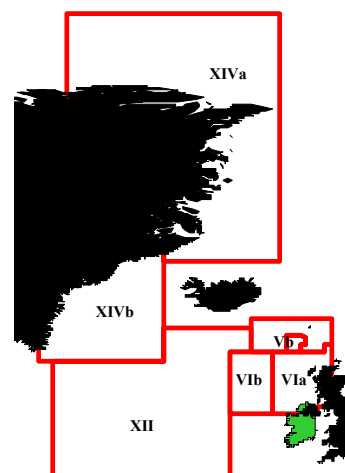
FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Sole West of Scotland and Rockall, FSS interprets that the EC fishing opportunities in 2008 should be a 15% reduction of the 2007 TAC which is equivalent to 58 t.

### CURRENT MANAGEMENT

- The TAC area covers Sub-areas VI, XII, XIV and Division Vb.
- The TAC in 2007 was 68 t with an associated Irish quota of 54 t.
- There are no explicit management objectives or plans for this stock.

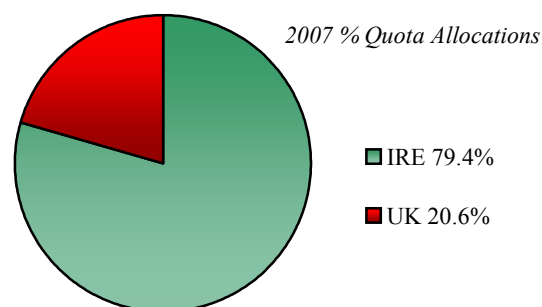
### ADDITIONAL INFORMATION

1. The Irish quota is not restrictive but this fishery is important to the small inshore boats operating in the south of Division VIa.
2. Sole in Division VIa are caught mainly by demersal otter trawls. The main fisheries are at the Stanton, Stags and Donegal Bay fishing grounds.
3. Irish landings in 2006 were 11.8 t.



Red Boxes-TAC/Management Areas

4. FSS data on discarding of sole in this area is limited but discarding is not considered to be a problem.
5. Irish otter trawl LPUE have shown a decreasing trend since the mid-nineties, possibly reflecting a decrease in the abundance of the stock.



Sole Irish OTB fleet in Division VI



# **Sole Division VI nominal landings by country**

(Source of International data: ICES STATLANT database)

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Belgium	.	.	.	.	.	.	.	.	.	.	.	.
Denmark	.	.	.	.	.	.	.	.	.	.	.	.
France	11	3	1	.	3	7	.	1	1	1	.	.
Germany	.	.	.	.	.	.	.	.	.	.	.	.
Ireland	14	16	19	38	30	20	24	23	35	57	54	48
Netherlands	.	.	.	.	.	1	.	.	.	.	.	.
UK - Eng+Wales+N.Irl.	.	.	.	.	.	.	.	.	.	.	.	.
UK - England & Wales	4	4	5	7	2	2	1	1	1	2	1	9
UK - N. Ireland	.	.	.	.	.	.	.	.	.	.	2	.
UK – Scotland	8	.	8	5	8	8	9	10	10	12	8	7
<b>Total</b>	<b>37</b>	<b>23</b>	<b>33</b>	<b>50</b>	<b>43</b>	<b>38</b>	<b>34</b>	<b>35</b>	<b>47</b>	<b>72</b>	<b>65</b>	<b>64</b>

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Belgium	.	.	.	.	.	.	.	.	1	4	11	2
Denmark	.	.	.	.	.	.	.	.	.	.	.	.
France	1	.	.	.	.	.	.	.	1	.	1	.
Germany	.	.	.	.	.	.	.	.	.	.	.	.
Ireland	39	33	42	71	89	80	53	40	40	65	63	74
Netherlands	.	1	.	.	.	.	.	.	.	.	.	.
UK - Eng+Wales+N.Irl.	.	.	.	.	2	1	4	20	22	19	21	21
UK - England & Wales	13	4	2	.	.	.	.	.	.	.	.	.
UK - N. Ireland	.	.	.	1	.	.	.	.	.	.	.	.
UK – Scotland	9	14	17	19	17	11	15	15	13	10	8	8
<b>Total</b>	<b>62</b>	<b>52</b>	<b>61</b>	<b>91</b>	<b>108</b>	<b>92</b>	<b>72</b>	<b>75</b>	<b>77</b>	<b>98</b>	<b>104</b>	<b>105</b>

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	9	8	3	3	1	.	.	.	.	.
Denmark	.	.	.	.	.	.	.	.	.	.
France	.	.	.	1	.	.	.	.	.	.
Germany	.	1	.	.	.	.	.	.	.	.
Ireland	71	79	45	36	27	26	26	22	15	12
Netherlands	7	.	.	.	.	.	.	.	.	.
UK - Eng+Wales+N.Irl.	20	13	12	6	5	4	6	2	.	.
UK - England & Wales	.	.	.	.	.	.	.	.	.	.
UK - N. Ireland	.	.	.	.	.	.	.	.	.	.
UK – Scotland	7	10	5	5	4	2	2	2	1	2
<b>Total</b>	<b>114</b>	<b>111</b>	<b>65</b>	<b>51</b>	<b>37</b>	<b>32</b>	<b>34</b>	<b>26</b>	<b>16</b>	<b>14</b>

# West of Scotland and Rockall Pollack

## (Sub-area VI)



Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

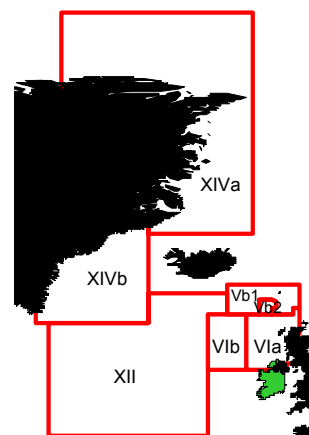
(See West of Scotland and Rockall Overview for Mixed Fishery Advice)

The state of this stock is unknown. There are no accurate international landings data for several recent years.

FSS advises that there is no scientific basis for the current TAC which has been in excess of annual landings since 1989. FSS points out that pollack are mainly distributed and fished in inshore areas and the current TAC area may contain several smaller stocks. Therefore the current TAC management system may not be appropriate and localised stock depletion may still occur. FSS advises that pollack stocks should be assessed and managed on a smaller geographical scale within this area.

In the absence of assessment data, FSS advises that the 2008 TAC should be brought in line with recent average catches of 2002-2006 which is 114 t with an associated Irish quota of 47 t. Programmes should be put in place to estimate sustainable exploitation levels for pollack stocks. However, the advice given for west of Scotland and Rockall stocks, particularly in relation to stocks in need of recovery, should determine the TAC for pollack.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Pollack West of Scotland and Rockall, FSS interprets that the EC fishing opportunities in 2007 should be a 15% reduction of the 2006 TAC which is equivalent to 383 t.



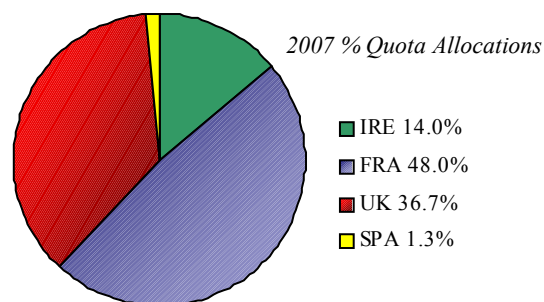
Red Boxes-TAC/Management Areas

### CURRENT MANAGEMENT

- The TAC covers Division Vb and Sub-areas VI, XII and XIV.
- The 2006 TAC was 450 t with an associated Irish quota of 63 t.
- There are no explicit management objectives or plans for this stock.
- FSS advises that management objectives be established and that a management plan be developed and implemented for fisheries catching pollack.

### ADDITIONAL INFORMATION

1. Estimated Irish landings were 25 t in 2006.
2. This fishery is important to the smaller boats mainly operating in inshore waters.
3. There is little scientific information on biology and stock structure of pollack in this area.
4. Levels of discarding of pollack are unknown, but are thought to be low, particularly in the inshore fisheries.
5. FSS does not sample pollack in Sub-area VI.



**Pollack in sub-area VI landings by country as estimated by FSS. EU TAC also shown  
(Source: ICES Statlant database).**

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Belgium	2	6	0	7	0	0	0	0	0	0	0	0
Denmark	0	0	0	0	0	0	0	0	0	0	0	0
France	0	0	0	0	196	196	310	36	342	272	331	212
Germany	0	0	1	0	0	0	0	0	0	0	0	0
Ireland	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	0	3	1	1	1	0	0	0	0	0	0	0
Norway	0	0	4	0	2	4	0	0	0	0	0	0
Portugal	0	0	0	0	0	0	0	0	0	0	0	0
Spain	0	0	0	0	0	0	0	0	55	95	86	222
UK (E, W & NI)	113	97	102	123	169	164	80	51	61	1	32	38
UK - Scotland	390	262	291	396	324	389	270	182	124	102	116	156
Total:	505	368	399	527	692	753	660	269	582	470	565	628
EU TAC:												

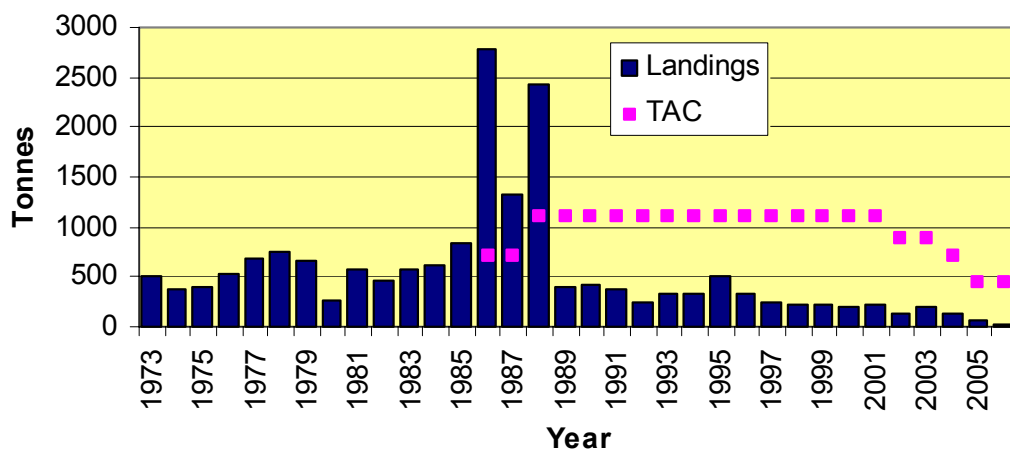
  

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Belgium	0	0	0	0	0	0	0	0	0	0	0	0
Denmark	0	0	0	0	0	0	0	0	0	0	0	0
France	224	145	108	128	111	76	31	21	39	34	64	29
Germany	1	0	0	0	1	0	0	0	0	0	3	0
Ireland	0	223	103	163	103	150	145	23	12	26	83	97
Netherlands	0	0	0	0	0	0	0	0	0	0	0	0
Norway	0	0	0	0	0	1	0	0	0	0	0	1
Portugal	0	0	0	0	0	0	0	0	0	0	0	0
Spain	283	2217	860	1925	0	0	4	0	0	0	0	0
UK (E, W & NI)	17	10	24	13	26	12	45	67	91	154	119	76
UK - Scotland	311	177	235	208	153	180	144	136	182	122	235	134
Total:	836	2772	1330	2437	394	419	369	247	324	336	504	337
EU TAC:		715	710	1100	1100	1100	1100	1100	1100	1100	1100	1100

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	0	0	0	0	0	0	0	0	0	0
Denmark	0	0	0	0	0	0	0	0	0	0
France	14	21	0	11	8	9	3	2	23	3
Germany	1	0	0	2	0	0	0	0	0	0
Ireland	69	60	73	62	108	26	88	68	28	25
Netherlands	0	0	0	0	0	0	0	0	0	0
Norway	2	0	3	0	0	0	1	1	0	0
Portugal	0	0	0	0	0	0	0	0	0	0
Spain	0	0	0	0	0	0	0	0	0	4
UK (E, W & NI)	90	66	39	30	17	32	51	17	3	0
UK - Scotland	72	81	97	86	84	64	60	48	13	0
Total:	248	228	212	191	217	131	203	136	67	32
EU TAC:	1100	1100	1100	1100	1100	880	880	704	450	450

## West of Scotland and Rockall Pollack



# North Sea and West of Scotland Saithe

## (Sub-areas IV & VI and Division IIIa)

For latest information, see: <http://www.ices.dk>



*Marine Institute*  
Foras na Mara

Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See West of Scotland and Rockall Overview for Mixed Fishery Advice)

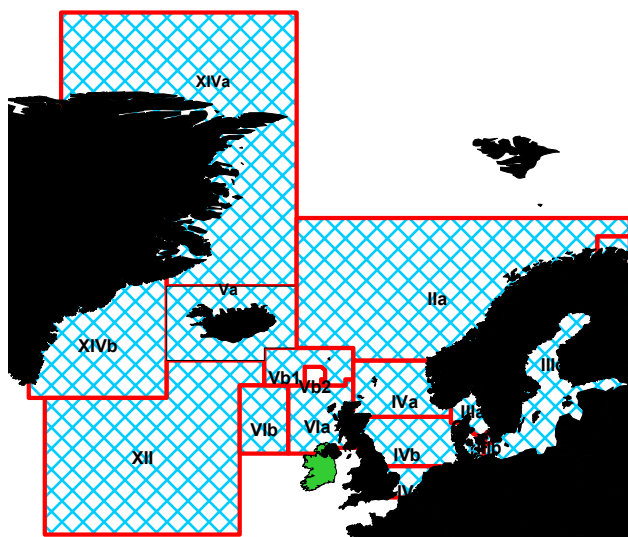
Based on the most recent estimates of SSB and fishing mortality, ICES classifies the stock as being within safe biological limits. FSS considers that this stock is a good example of a stock that has recovered from low levels when fished below  $F_{pa}$ .

In 2004 EU and Norway agreed to implement a long-term plan for the saithe stock that is designed to provide for sustainable fisheries and high yields. FSS agrees with the ICES advice that  $F$  should be less than 0.3 to be in accordance with the management plan. This corresponds to catches of less than 150,000 t in 2008. This translates to a 2008 TAC in Sub-area VI of 13,500 t and an Irish quota 394 t.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For North Sea and West of Scotland Saithe, FSS interprets that the proposal would result in the 2008 TAC being set according to the management plan in 2008.

### CURRENT MANAGEMENT

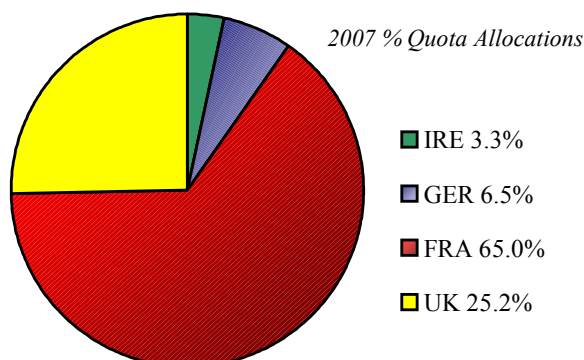
- The assessment area comprises two TAC areas; the first TAC area comprises Divisions IIa, IIIabcd, and Sub-area IV, the second TAC area covers Division Vb as well as Sub-areas VI, XII and XIV.
- The total TAC for Division Vb and Sub-areas VI, XII and XIV in 2007 was 12,787 t, with an allocated Irish quota of 467 t (adjusted quota 514 t).
- There is a long-term management plan for this stock based on the EU- Norway agreement that states that every effort should be made to maintain SSB above 106,000 t ( $B_{lim}$ ) and a TAC consistent with  $F = 0.3$ . Should SSB fall below  $B_{pa}$  this fishing mortality will be adapted in the light of the prevailing conditions (see ACFM advice for detailed description of the management plan).



Red Boxes-TAC/Management Areas Blue Shading- Assessment Area

### ADDITIONAL INFORMATION

- This years assessment is consistent with that of 2006.
- The most serious problem with stock forecasts for saithe is the lack of reliable information about year-class strength before age 3. The recruitment indices seem to improve when age 3 is used as recruits instead of age 1. Since acceptable tuning data for age 1 and 2 fish do not exist, and since the catches of these age groups are very low and variable (due to the inshore distribution of these age groups) the working group decided to use age 3 fish as recruits. A problem with this assessment is the required use of commercial CPUE for tuning (the survey series which are used only contain usable information for age 3-6). To address this problem the Institute of Marine Research (IMR, Norway) has started a new survey along the west coast of Norway to measure the relative abundance of saithe between 2 and 4 years old.





3. Total estimated international landings in Sub-area VI and Sub-area IV and Division IIIa for 2006 were 8,568 t and 117,112 t, respectively. This stock yielded landings of over 250,000 t for most of the 1970s. Landings subsequently declined and have been close to 100,000 t since the late 1980s. Ireland landed an estimated 243 t in 2006 for ICES Sub-area VI. The French, and the UK fleet operating on the shelf edge, and a Scottish fishery operating inshore dominate the fishery in Sub-area VI. In both areas most of the saithe do not enter the main fishery before age 3, because the younger fish are distributed in inshore waters. Irish landings of saithe from Sub-area VI are usually caught in mixed gadoid fisheries by trawlers operating out of Killybegs and Greencastle.
4. There is no long term gain in yield by increasing current fishing mortality. Medium-term analysis indicated that, at the status quo fishing mortality, there is a low probability of the stock falling below  $B_{pa}$  in the medium term.
5. When days at sea limits were introduced in 2003, a concession was made to the saithe fishery in Division VIa, on the basis this fishery took little by-catch of other species. The grounds of this fishery run along the shelf edge. A line was therefore defined, to roughly reflect the easterly limit of this fishery. However, recent analysis by STECF shows, that significant quantities of cod are taken by vessels targeting saithe outside the management line. These vessels are unrestricted in their catch composition and therefore may be hindering the recovery of this severely depleted cod stock.

## ICES ADVICE

### 6.4.12

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Full reproductive capacity	Harvested sustainably	Overexploited	Appropriate

Based on the most recent estimates of SSB and fishing mortality, ICES classifies the stock as having full reproductive capacity and being harvested sustainably. Fishing mortality has declined since 1986, and has been below  $F_{pa}$  since 1997. SSB was below  $B_{pa}$  from 1984 to 1998 (and was below  $B_{lim}$  from 1990–1993), but increased in the late 1990s and is estimated to have been at or above  $B_{pa}$  since 1998.

#### Management objectives

The agreed management plan includes: 1) Maintain the SSB above 106 000 t, and 2) exploitation at  $F = 0.3$  when the stock is above  $B_{pa}$ . The plan is given in detail below (Section 6.4.12 Annex). This management plan will be evaluated by ICES in October 2007.

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	106 000 t	$B_{loss} = 106\ 000\ t$ (estimated in 1998).
	$B_{pa}$	200 000 t	affords a high probability of maintaining SSB above $B_{lim}$ .
	$F_{lim}$	0.6	$F_{loss}$ the fishing mortality estimated to lead to stock falling below $B_{lim}$ in the long term.
	$F_{pa}$	0.4	implies that $B_{eq} > B_{pa}$ and $P(SSB_{MT} < B_{pa}) < 10\%$ .
Targets	$F_y$	0.3	From management plan

Unchanged since 1998.

Yield and spawning biomass per Recruit  $F$ -reference points:

	Fish Mort Ages 3–6	Yield/R	SSB/R
Average last 3 years	0.23	0.85	2.19
$F_{max}$	0.20	0.85	2.52
$F_{0.1}$	0.10	0.78	4.78
$F_{med}$	0.35	0.83	1.40

Candidates for reference points consistent with taking high long-term yields and achieving a low risk of depleting the productive potential of the stock may be identified in the range of  $F_{0.1}$ – $F_{max}$ .

## Single-stock exploitation boundaries

### Exploitation boundaries in relation to existing management plans

At the present SSB level,  $F$  should be below 0.3 to be in accordance with the management plan. This corresponds to landings of 150 000 t in 2008.

### Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential, and considering ecosystem effects

The current fishing mortality (2004-2006 average) is estimated at 0.23, which is above the rate expected to lead to high long-term yields ( $F_{0.1}-F_{\max} = 0.10-0.20$ ). Fishing between  $F_{0.1}$  and  $F_{\max}$  is expected to lead to landings of 57 000 t–107 000 t in 2008.

### Exploitation boundaries in relation to precautionary limits

The exploitation boundaries in relation to precautionary limits imply human consumption landings of about 188 000 t in 2008, where the SSB is expected to remain above  $B_{pa}$  (200 000 t) in 2009.

### ICES conclusion on exploitation boundaries

Although ICES has not evaluated the agreed management plan, the target fishing mortality in the management plan is expected to give high long-term gains in the present situation with a stock that is well above  $B_{pa}$  and ICES therefore recommends to limit landings in 2008 to 150 000 t.

## Short-term implications

The short-term prognosis is made using the  $F_{sq}$  (2004–2006 average) assumption for the intermediate year.  $F_{sq}$  landings for 2007 correspond to 127 000 t, which is below the agreed TACs (123 000 t for the North Sea plus IIIa, and 13 000 t for Division VIa)

### Outlook for 2008

Basis:  $F(2007) = F_{04-06} = 0.23$ ;  $R_{07-09} = GM_{88-04} = 124.5$ ;  $SSB(2008) = 325$ ; landings (2007) = 127.

Rationale	TAC (2008)	TAC IIIa & IV (2008) <sup>3</sup>	TAC VI (2008) <sup>3</sup>	Basis	F 2008	SSB 2009	%SSB change <sup>1)</sup>	% TAC change <sup>2)</sup>
Zero catch	0			$F=0$	0	439	35	
Status quo	122	111	11	$F_{sq}$	0.23	316	-3	-10
High long-term yield	57	51.9	5.1	$F(\text{long-term yield})$	0.1	381	2	-58
Agreed management plan	18	16.4	1.6	$TAC(\text{man. plan}) * 0.1$	0.03	421	30	-87
	44	40	4	$TAC(\text{man. plan}) * 0.25$	0.07	395	22	-68
	83	75.5	7.5	$TAC(\text{man. plan}) * 0.50$	0.15	355	9	-39
	118	107.4	10.6	$TAC(\text{man. plan}) * 0.75$	0.225	320	-2	-13
	138	125.6	12.4	$TAC(\text{man. plan}) * 0.90$	0.27	301	-7	1
	150	136.5	13.5	$TAC(\text{man. plan})$	0.3	288	-11	10
	162	147.4	14.6	$TAC(\text{man. plan}) * 1.1$	0.33	277	-15	19
Precautionary limits	179	162.9	16.1	$TAC(\text{man. plan}) * 1.25$	0.38	260	-20	32
	24	21.8	2.2	$TAC(F_{pa}) * 0.1$	0.04	415	28	-82
	57	51.9	5.1	$TAC(F_{pa}) * 0.25$	0.1	381	2	-58
	107	97.4	9.6	$TAC(F_{pa}) * 0.5 = F_{\max}$	0.2	331	2	-21
	150	136.5	13.5	$TAC(F_{pa}) * 0.75$	0.3	288	-11	10
	173	157.4	15.6	$TAC(F_{pa}) * 0.90$	0.36	266	-18	27
	188	171.1	16.9	$F_{pa} (= F_{sq} * 1.71)$	0.4	251	-23	38
	202	183.8	18.2	$TAC(F_{pa}) * 1.1$	0.44	238	-27	49
	221	201.1	19.9	$TAC(F_{pa}) * 1.25$	0.5	220	-32	63

Weights in '000 t. Shaded scenarios are not considered consistent with the precautionary approach.

<sup>1)</sup> SSB 2009 relative to SSB 2008.

<sup>2)</sup> TAC 2008 relative to TAC 2007.

<sup>3)</sup> Landings split according to the average in 1993–1998, i.e., 91% in IIIa&IV and 9% in VI.

## Management considerations

The ICES advice applies to saithe in the the three areas Division IIIa, and Subareas IV and VI.

Because of its life-history, saithe in the North Sea is partly geographically protected from heavy exploitation as juveniles.

The reported landings have been lower than the TACs during the last five years. Information from fishers indicates that very low prices for saithe combined with high fuel prices are causing this.

## Factors affecting the fisheries and the stock

### Changes in fishing technology and fishing patterns

Variations in EU and Norwegian mesh size regulations in the saithe fishery in 2001–2003 might have contributed to changes in the exploitation pattern (spatial and temporal changes in size-specific fishing mortality between years).

## Scientific basis

### Data and methods

The stock is assessed using an age-based model (XSA), calibrated by two commercial cpue series and two survey indices.

There are no discard estimates for the majority of this fishery, and therefore no discards have been included in the assessment.

### Information from the fishing industry

The reported landings in the last years have been lower than the TACs. Information from fishers indicates that very low prices on saithe, coupled with high fuel prices, are causing these reductions in targeted fisheries.

### Uncertainties in assessment and forecast

The major uncertainty is the lack of information on year-class strength for ages 1–3. IMR in Bergen, Norway began an acoustic survey along the west coast of Norway in 2006 to measure the relative abundance of saithe between 2 and 4 years old (when the saithe is distributed along the coast).

### Comparison with previous assessment and advice

The estimates of SSB in 2007 and F in 2006 were similar to the previous assessment (Figure 6.4.12.3). The basis of the advice is unchanged.

## Source of information

Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 1–8 May 2007(ICES CM 2007/ACFM:18).

## Saithe in IIIa and IV

Year	ICES Advice	Single-Stock Exploitation Boundaries	Predicted landings corresp. to advice	Predicted landings corresp. to single-stock exploitation boundaries	Agreed TAC	Official landings	ACFM landings
1987	Reduce F		<198		173	154	149
1988	60% of F(86); TAC		156		165	113	107
1989	No increase in F; TAC		170		170	92	92
1990	No increase in F; TAC		120		120	85	88
1991	No increase in F; TAC		125		125	93	99
1992	No increase in F; TAC		102		110	92	92
1993	70% of F(91) ~ 93 000 t		93		93	99	105
1994	Reduce F by 30%		72		97	90	102
1995	No increase in F		107		107	97	113
1996	No increase in F		111		111	96	110
1997	No increase in F		113		115	86	103
1998	Reduce F by 20%		97		97	88	100
1999	Reduce F to $F_{pa}$		104		110	108	107
2000	Reduce F by 30 %		75		85	85	87
2001	Reduce F by 20 %		87		87	88	90
2002	$F < F_{pa}$		<135		135	113	117
2003	$F < F_{pa}$		<176		165	105	102
2004		$F < F_{pa}$		<211	190	87	100
2005		F according to man. plan	*	<137	145	111	112
2006		F according to man. plan ( $< F_{pa}$ )	*	<123	123	110	117
2007		F according to man. plan ( $< F_{pa}$ )	*	<124	123		
2008		F according to man. plan ( $< F_{pa}$ )	*	<137			

Weights in '000 t.

\* Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries.

# Saithe in VI

Year	ICES Advice	Single-stock exploitation boundaries	Predicted landings corresp. to advice	Predicted catch corresp to single-stock exploitation boundaries	Agreed TAC	Official landings	ACFM landings
1987	F reduced towards $F_{max}$		19		27.8	32.5	31.4
1988	80% of $F(86)$ ; TAC		35		35	32.8	34.2
1989	$F < 0.3$ ; TAC		20		30	22.4	25.6
1990	80% of $F(88)$ ; TAC		24		29	18.0	19.9
1991	Stop SSB decline; TAC		21		22	17.9	17.0
1992	Avoid further reduction in SSB		<19		17	10.8	11.8
1993	$F = 0.21$		6.3		14	14.5	13.9
1994	Lowest possible F				14	13.0 <sup>2</sup>	12.8
1995	Significant reduction in effort		-		16	10.6 <sup>2</sup>	11.8
1996	No increase in F		10.2 <sup>1</sup>		13	9.4 <sup>2</sup>	9.4
1997	Significant reduction in F				12	8.6 <sup>2</sup>	9.4
1998	60% Reduction in F		4.8		10.9	7.4 <sup>2</sup>	8.4
1999	60% reduction in F		4.8		7.5	6.8	7.3
2000	Reduce F by 30 %		6.0		7	6.4	5.9
2001	Reduce F by 20 %		9.0		9	8.7	8.4
2002	$F < F_{pa}$		<13		14	5.6	5.2
2003	$F < F_{pa}$		<17		17.1	5.0	5.3
2004	$F < F_{pa}$	$F < F_{pa}$	<21	<21	20	1.6	4.4
2005	$F < F_{pa}$	F according to man. plan	<14	<14	15	8.7	5.7
2006	*	F according to man. plan ( $< F_{pa}$ )	*	<12	13	9.4	8.6
2007		F according to man. plan ( $< F_{pa}$ )	*	<12	13		
2008		F according to man. plan	*	<14			

Weights in '000 t.

<sup>1</sup>Status quo catch.

<sup>2</sup>Incomplete data.

\* Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries.

Saithe in Sub-area IV, Division IIIa (Skagerrak) & Sub-area VI

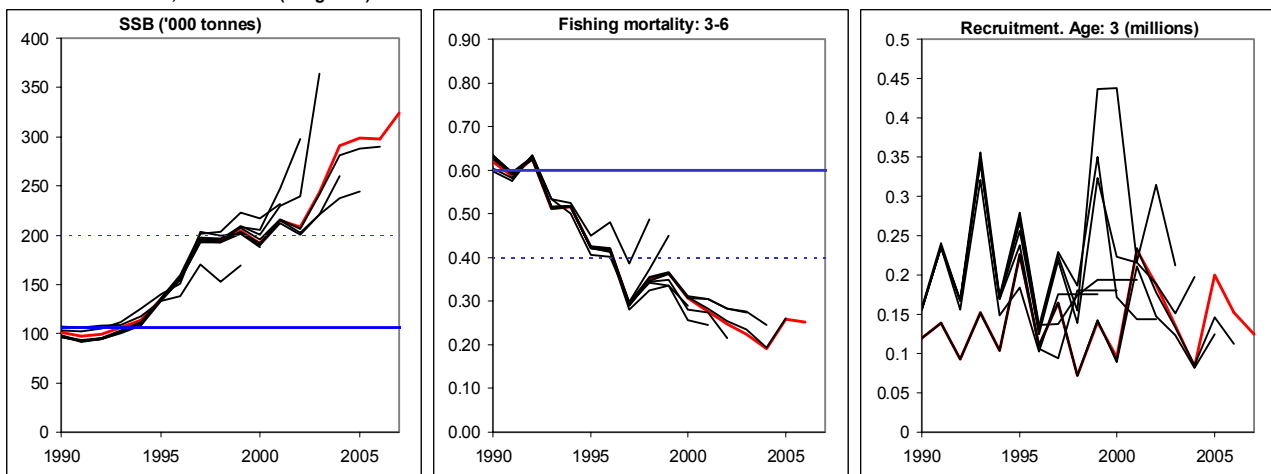
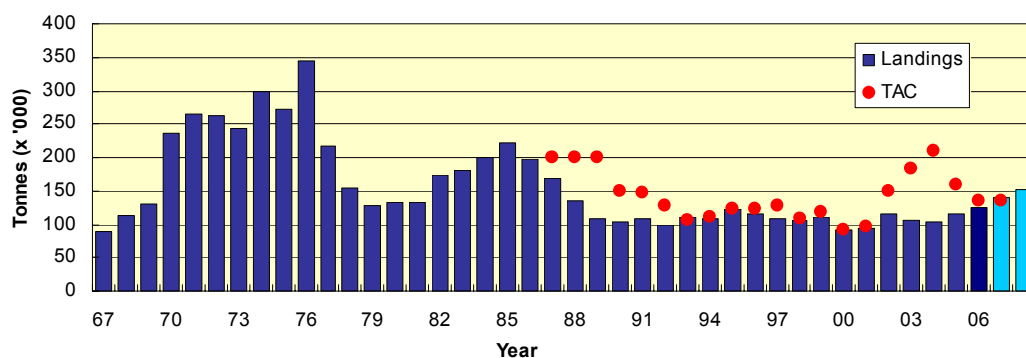


Figure 6.4.12.3

Saithe in Subarea IV, VI, and Division IIIa. Historical performance of the assessments. Note: recruitment age was changed from 1 to 3 in 2004.

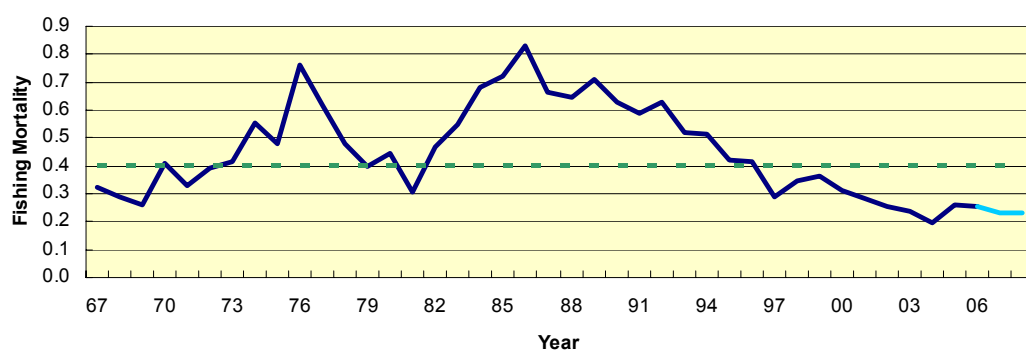
### North Sea and West of Scotland Saithe - Landings

Mean = 155.7



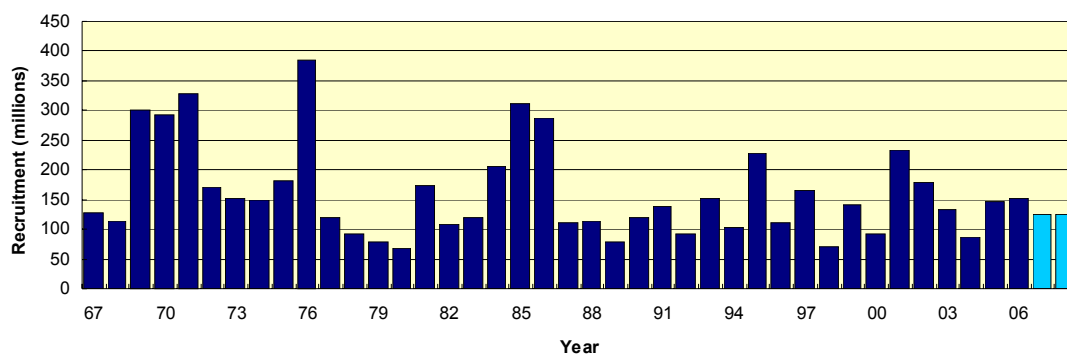
### North Sea and West of Scotland Saithe - Fishing Mortality

Mean = 0.44



### North Sea and West of Scotland Saithe - Recruitment (Age 3)

Mean = 158.3



### North Sea and West of Scotland Saithe - Spawning Stock Biomass

Mean = 239.1

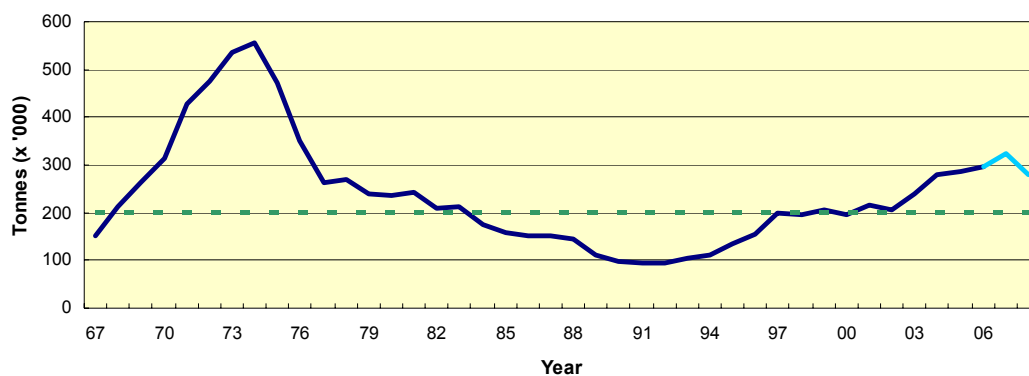


Table 6.4.12.1

Saithe in Subarea IV, Division IIIa (Skagerrak), and Subarea VI.

SAITHE IV and IIIa								
Country	1999	2000	2001	2002	2003	2004*	2005*	2006
Belgium	200	122	24	107	45	22	28	16
Denmark	4494	3529	3575	5668	6954	7991	7498	7471
Faroe Islands	1101	-	289	872	495	558	184	62
France	24305 <sup>1*</sup>	19200	20472	25441	18001	13628	10768	15739
Germany	10481	9273	9479	10999	8956	9589	12401	14390
Greenland	-	601 <sup>2*</sup>	1526 <sup>2*</sup>	62	1616	403	-	-
Ireland	-	1	-	-	-	1	-	0
Netherlands	7	11	20	6	11*	3	40	28
Norway	56150	43665	44397	60013	61735	62783	67365	61268
Poland	862	747	727	752	734*	0	1100	-
Russia	-	67	-	-	-	-	35	2
Sweden	1929	1468	1627	1863	1876	2249	2114	1695
UK (E/W/Nl)	2874	1227	1186	2521	1215	457	1190	9129**
UK (Scotland)	5420	5484	5219	6596	5829	5924	7703	
Total reported	107823	85395	88541	114900	107467	103608	110575	109800
Unallocated	-509	2281	1030	1291	-5809	-3646	968	7312
W.G. Estimate	107314	87676	89571	116191	101658	99962	111543	117112
TAC	110000	85000	87000	135000	165000	190000	145000	123250

\*Preliminary, <sup>1</sup>reported by TAC area, IIa(EC), IIIa-d(EC) and IV, <sup>2</sup>Preliminary data reported in IVa

\*\*Scotland+E/W/Nl combined

SAITHE VI								
Country	1999	2000	2001	2002	2003	2004*	2005*	2006
Faroe Islands	2	-	-	-	2	34	21	76
France	3467 <sup>1*</sup>	3310	5157	3062	3499	3053	3452	5782
Germany	250	305	466	467	54	4	373	532
Ireland	320	410	399	91	170	95	168	243
Norway	126	58	31	12	28	16	20	28
Russia	3	25	1	1	6	6	25	7
Spain	23	3	15	4	6	2	3	-
UK (E/W/Nl)	503	276	273	307	263	37	203	2748**
UK (Scotland)	2084	2463	2246	1567	1189	1563	4433	
Total reported	6778	6850	8588	5513	5215	4810	8699	9416
Unallocated	564	-960	-1770	-327	35	-296	-2960	848
W.G. Estimate	7342	5890	6818	5186	5250	4514	5739	8568
TAC	7500	7000	9000	14000	17119	20000	15044	12787

\*Preliminary, <sup>1</sup>reported by TAC area, IIa(EC), IIIa-d(EC) and IV

\*\*Scotland+E/W/Nl combined

SAITHE IV, IIIa and VI								
	1999	2000	2001	2002	2003	2004	2005	2006
WG estimate	114656	93566	96389	121377	106908	104476	117282	125680

Table 6.4.12.2

Saithe in Subarea IV, Division IIIa (Skagerrak), and Subarea VI.

Year	Recruitment Age 3 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-6
1967	127000	150800	88300	0.322
1968	114000	211700	113800	0.291
1969	301000	264000	130600	0.262
1970	292000	312000	235000	0.408
1971	328000	429600	265400	0.329
1972	171000	474100	261900	0.395
1973	153000	534500	242500	0.416
1974	149000	554900	298400	0.556
1975	181000	472100	271600	0.482
1976	384000	351500	344000	0.760
1977	118000	263100	216400	0.615
1978	92000	268100	155100	0.477
1979	78000	241000	128400	0.396
1980	67000	235100	131900	0.443
1981	173000	241200	132300	0.306
1982	110000	210400	174400	0.469
1983	118000	214100	180000	0.549
1984	205000	176400	200800	0.678
1985	311000	160500	220900	0.717
1986	287000	151300	198600	0.825
1987	112000	152400	167500	0.654
1988	115000	147000	135200	0.636
1989	77000	113500	108900	0.695
1990	120000	100800	103800	0.620
1991	139000	97600	108000	0.587
1992	93000	99800	99700	0.626
1993	152000	105700	111500	0.511
1994	103000	114000	109600	0.516
1995	226000	135300	121800	0.423
1996	110000	157200	115000	0.420
1997	164000	195900	107300	0.294
1998	72000	194700	106100	0.350
1999	140000	204400	110700	0.364
2000	95000	192100	91300	0.308
2001	232000	214800	95000	0.277
2002	188000	207900	115400	0.248
2003	135000	243900	105600	0.223
2004	83000	291000	104200	0.190
2005	200000	299200	124500	0.260
2006	152000	298300	125700	0.252
2007	124000	324000		
Average	161675	237048	156428	0.454

#### Annex 6.4.12 Management plan

In 2004 EU and Norway "agreed to implement a long-term plan for the saithe stock in the Skagerrak, the North Sea and west of Scotland, which is consistent with a precautionary approach and designed to provide for sustainable fisheries and high yields. The plan shall consist of the following elements:

1. Every effort shall be made to maintain a minimum level of Spawning biomass (SSB) greater than 106 000 tonnes ( $B_{lim}$ ).
2. Where the SSB is estimated to be above 200 000 tonnes the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality rate of no more than 0.30 for appropriate age groups.
3. Where the SSB is estimated to be below 200 000 tonnes but above 106 000 tonnes the TAC shall not exceed a level which,

on the basis of a scientific evaluation by ICES, will result in a fishing mortality rate equal to  $0.30 - 0.20 \times (200\ 000 - SSB) / 94\ 000$ .

4. Where the SSB is estimated by the ICES to be below the minimum level of SSB of 106 000 tonnes the TAC shall be set at a level corresponding to a fishing mortality rate of no more than 0.1.
5. Where the rules in paragraphs 2 and 3 would lead to a TAC which deviates by more than 15% from the TAC the preceding year the Parties shall fix a TAC that is no more than 15% greater or 15% less than the TAC of the preceding year.
6. Notwithstanding paragraph 5 the Parties may where considered appropriate reduce the TAC by more than 15% compared to the TAC of the preceding year.
7. A review of this arrangement shall take place no later than 31 December 2007.
8. This arrangement enters into force on 1 January 2005."

# West of Scotland Herring

## (Division VIa (North))

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See West of Scotland and Rockall Overview for mixed fishery advice).

FSS agrees with the ICES advice that this stock is currently fluctuating at a low level and is being exploited slightly above  $F_{msy}$ . FSS notes that fishing according to the proposed management plan would imply catches of 15,000 t in 2008. The assessment is considered to be noisy but unbiased.

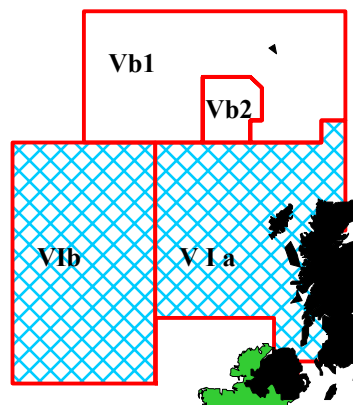
FSS agrees with ICES that if there is an increasing catch on the mixed stock fishery in Division VIaN, this should be considered in the management of the Division VIaS component which is in a depleted state. FSS notes that ICES plans to investigate means to assess and manage the metapopulation formed by this stock and stocks in Divisions VIaS, VIIb,c and VIIaN.

Fishing mortality in the range of the long term management plan is expected to give high long term yield and low risk of stock depletion

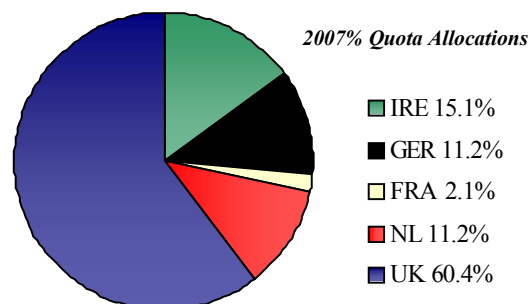
FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 46). For west of Scotland herring, FSS interprets that the proposal would result in a TAC which follows the management plan.

### CURRENT MANAGEMENT

- There are no explicit management objectives for this stock but a proposed management plan is being discussed.
- This management plan, which is subject to an evaluation of a year-on-year TAC constraint has been proposed as follows:
  - ◊  $F = 0.25$  if  $SSB > 75,000$  t Optional year on year TAC constraint.
  - ◊  $F = 0.2$  if  $SSB < 75,000$  t No constraint on TAC.
  - ◊  $F = 0$  if  $SSB$  falls below  $B_{lim}$ .
- This management plan has been tested and found to be in accordance with the precautionary approach.
- The overall TAC in 2007 was 34,000 t. The EU share of the total TAC is 33,340 t while the Irish share of the EU quota was 5,036 t.



Red Boxes-TAC/Management Areas Blue Shading-Assessment



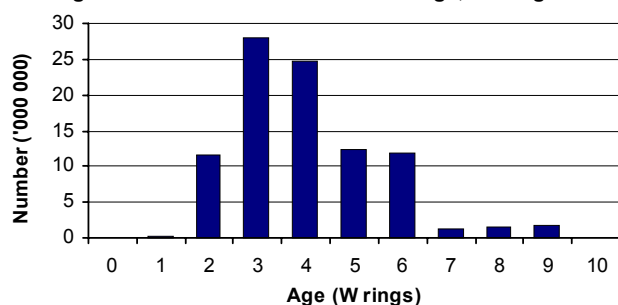
### ADDITIONAL INFORMATION

1. The 1998 year class remains the strongest one to enter the fishery in recent years. The 2001 and 2002 year classes are weak.
2. The 2006 landings were 27,346 t and the TAC has generally not been restrictive. The reported Irish landings in 2006 were around 4,350 t.
3. Historically there was misreporting from Sub-area IV whereby official landings from Division VIaN were higher than the actual catches. The figure for misreporting in 2006 is 6,800 tonnes. This has decreased significantly from 2005 where misreporting was estimated at around 17,000 t.
4. There has been considerable uncertainty in the landings data in the past. Recent revisions of catch data have improved this uncertainty. Enforcement has improved since 2005 and catch figures are now considered to be more accurate.
5. The recent increases in  $F$  are associated with the increased enforcement and reduced area misreporting from Division IVa.
6. The major landings are taken by the U.K (Scotland) midwater trawl fleets. Ireland, Netherlands, Germany, France and the Faroes also report landings.
7. There was no agreed assessment in 2006 but due to the improved acoustic survey an agreed assessment was possible in 2007.



8. The stock identity of herring west of the British Isles was reviewed by the EU-funded project WESTHER. The results have shown that the herring populations in this area and in Divisions VIaS, VIIb,c and VIIa(N) form a metapopulation. A study group will be established to investigate means to assess and manage the metapopulation. The management plan for VIa(N) is being followed in the short term.

**2006 Age Distribution: International Landings, Herring in VIa(N)**



#### Reference points

	Type	Value	Technical basis
Precautionary approach	B <sub>lim</sub>	50 000 t	Lowest reliable estimate of SSB
	B <sub>pa</sub>	Not defined	
	F <sub>lim</sub>	Not defined	
	F <sub>pa</sub>	Not defined	
Targets	F <sub>y</sub>	Not defined	

Unchanged since 2004

#### Yield and spawning biomass per Recruit F-reference points

	Fish Mort Ages 3–6	Yield/R	SSB/R
Average last 3 years	0.20	0.04	0.16
F <sub>max</sub>	N/A		
F <sub>0.1</sub>	0.18	0.03	0.18
F <sub>med</sub>	0.22	0.04	0.15

Management evaluations suggested an F<sub>msy</sub> = 0.25.

#### Single-stock exploitation boundaries

##### Exploitation boundaries in relation to the proposed management plan

Fishing according to the proposed management plan would imply catches up to 15 000 tonnes. The proposal was evaluated and found to be consistent with the precautionary approach.

##### Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

Fishing mortality is in the range of the target mortality of the proposed management plan, and this is expected to give a high long-term yield and a low risk of stock depletion.

## ICES ADVICE

### 5.4.30

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Undefined	Undefined	Overexploited	NA

Based on the most recent estimates of SSB and fishing mortality, ICES considers that the stock is currently fluctuating at a low level and is being exploited slightly above F<sub>msy</sub>. The 2001 and 2002 yearclasses are very weak.

#### Management objectives

There are no explicit management objectives for this stock. However, a proposed management plan is currently being discussed. This management plan was evaluated by ICES in 2005 and found to be consistent with the precautionary approach.

#### Exploitation boundaries in relation to precautionary limits

Precautionary reference points for fishing mortality have not been defined for this stock. Any management measure should have a high probability of avoiding B<sub>lim</sub>.

#### Conclusions on exploitation boundaries

In the absence of exploitation boundaries in relation to precautionary limits ICES recommends to fish according to the proposed management plan.

## Short-term implications

### Outlook for 2008

Basis:  $F(2007) = 0.46$ ;  $SSB(2007) = 66\,510\text{ t}$ ; landings (2007) = 34 000t (TAC constraint).

Rationale	Catches (2008)	Basis	F(2008)	SSB(2009)	% TAC change <sup>1)</sup>
Zero catch	0	$F=0$	$F=0$	96900	-100%
$F_{int}$ <sup>2)</sup>	15003	$F=0.2$	$F=0.2$	75403	-56%
$F_{lt}$ <sup>3)</sup> = $F_{msv}$	18369	$F=0.25$	$F=0.25$	70914	-46%
Proportion F	21594	$F = F_{lt} * 1.2$	$F=0.30$	66730	-36%
Proportion F	24685	$F = F_{lt} * 1.4$	$F=0.35$	62828	-27%
Proportion F	27647	$F = F_{lt} * 1.6$	$F=0.40$	59189	-19%
F 2007	31036	$F=0.46$	$F=0.46$	55149	-9%

Weights in '000 tonnes. Shaded scenarios are not considered consistent with the precautionary approach.

<sup>1)</sup> TAC 2008 relative to TAC 2007.

<sup>2)</sup>  $F_{int}$  is the intermediate F of the suggested management plan.

<sup>3)</sup>  $F_{lt}$  is the long-term F of the suggested management plan.

## Management considerations

There has been considerable uncertainty in the level of landings from this area in the past. Recent revisions to catch data have reduced some of this uncertainty. Enforcement has improved since 2005 and catch figures are more accurate. In 2006 the stock was more heavily exploited than it has been since 1999. This recent increased F is associated with increased enforcement and reduction of area misreporting from Area IVa.

The stock identity of herring west of the British Isles was reviewed by the EU-funded project WESTHER. This identified VIaN as an area where catches comprise a mixture of fish from Areas VIaN, VIaS, and VIIaN. Concerning the management plan for VIaN, ICES has advised that herring components should be managed separately to afford maximum protection. If there is an increasing catch on the mixed fishery in VIaN, this should be considered in the management of the VIaS component which is in a depleted state. It will be a number of years before ICES can provide a fully operational integrated strategy for these units. In this context ICES recommends that the previously endorsed plans for VIaN should be continued (see Section 5.3.3.1). If the proposed management plan were to be implemented in 2008, the current low status of the stock would imply that the 15% TAC reduction limits would not apply.

### Ecosystem considerations

Irregular cycles are shown in the productivity of herring stocks (weights-at-age and recruitment). There are many hypotheses as to the cause of these changes in productivity, but in most cases it is thought that the environment plays an important role (through transport, prey, and predation). Coincident periods of high and low production have been seen in the herring in VIa (N) and Irish Sea herring. Exploitation and management strategies must account for the likelihood of productivity changing. The VIa (N) herring stock has shown a marked decline in productivity during the late 1970s and has remained at a low level since then.

## Factors affecting the fisheries and the stock

### Changes in fishing technology and fishing patterns

Historically, catches have been taken from this area by three fisheries:

- A Scottish domestic pair trawl fleet and the Northern Irish fleet operated in shallower, coastal areas, principally fishing in the Minches and around the Island of Barra in the south; younger herring are found in these areas. This fleet has re-

duced in recent years.

- The Scottish single-boat trawl and purse-seine fleets, with refrigerated seawater tanks, targeting herring mostly in the northern North Sea, but also operating in the northern part of VIa (N). This fleet now operates mostly with trawls, but many vessels can deploy either gear.
- An international freezer-trawler fishery has historically operated in deeper water near the shelf edge where older fish are distributed. These vessels are mainly registered in the Netherlands, Germany, France, and England, but most are Dutch owned.

In recent years the age structure of the catch of these last two fleets has become more similar. A stricter enforcement regime in the UK is responsible for the major decrease in area misreporting in 2006.

## Scientific basis

### Data and methods

The acoustic survey used to tune the assessment has been re-evaluated and found to provide a useful, but noisy signal for tuning the assessment. Misreporting has decreased in 2006 and the quality of the catch data has improved.

### Uncertainties in assessment and forecast

The assessment is considered to be noisy but unbiased. Medium-term evaluations of the management plan have been carried out assuming the same level of noise as seen in the assessment. This year the assessment of the current biomass is more certain than last year.

### Comparison with previous assessment and advice

There was no agreed assessment in 2006, but the data basis has improved and an assessment was agreed upon this year (figure 5.4.30.3). The basis for the advice has changed: last year it was based on *status quo* TAC, this year the advice is based on the proposed management plan.

## Source of information

Report of the Herring Assessment Working Group for the Area South of 62°N, 13–22 March 2007 (ICES CM 2007/ACFM:11).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Disc. slip.	ACFM Catch <sup>1</sup>
1987	Reduce F to $F_{0.1}$ /status quo F	38–55	49.7		44
1988	TAC	46	49.8		36
1989	TAC	58	58	1.6	34
1990	TAC	61	75	1.3	45
1991	TAC	57	62	1.2	29
1992	TAC	62	62	0.2	29
1993	Catch at status quo F	54–58	62	0.8	32
1994	Catch at status quo F	50–60	62	0.7	24
1995	No specific advice	60 <sup>2</sup>	77		30
1996	No advice because of misreporting	-	83.57		26
1997	Catch at status quo F		83.57	0.1	33 <sup>3</sup>
1998	Catch at status quo F	59	80.37	0.9	33
1999	Average catches, 1991–1996	28	68		30
2000	Average catches, 1991–1996	28	42		18 <sup>4</sup>
2001	Average catches, 1991–1999	30	36.36		24 <sup>4</sup>
2002	Average catches, 1991–1999	30	36.36		33 <sup>4</sup>
2003	Catch at status quo F	30	30		28 <sup>4</sup>
2004	F=0.30	41	30	0.1	25 <sup>4</sup>
2005	Catch at status quo F	30	30.1		14 <sup>4</sup>
2006	Catch at status quo F	34	34		27
2007	Status quo TAC advice	34	34		
2008	$F_{int}$ <sup>5</sup> management plan	15			

Weights in '000 t.

<sup>1</sup>) Adjusted for misreporting.

<sup>2</sup>) Catch at status quo F.

<sup>3</sup>) Revised down from 60 in 1999.

<sup>4</sup>) Revised at HAWG 2007.

<sup>5</sup>)  $F_{int}$  is the intermediate F of the suggested management plan.

Herring in Division VIa (North)

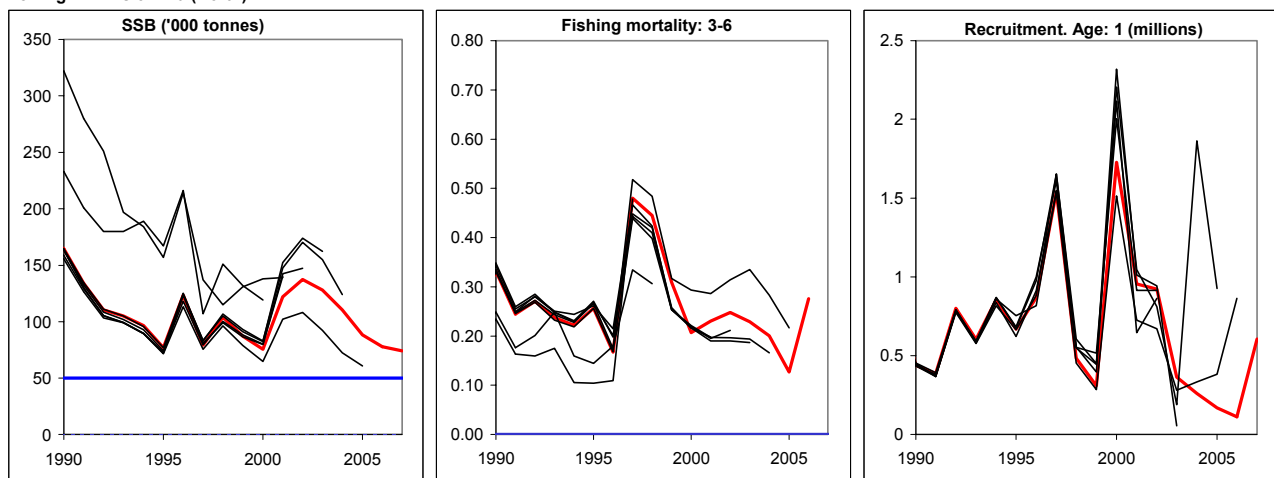


Figure 5.4.30.3

Herring in VIa (N). Historical performance of the assessments. Note: assessments prior to 2001 not comparable with recent assessments.

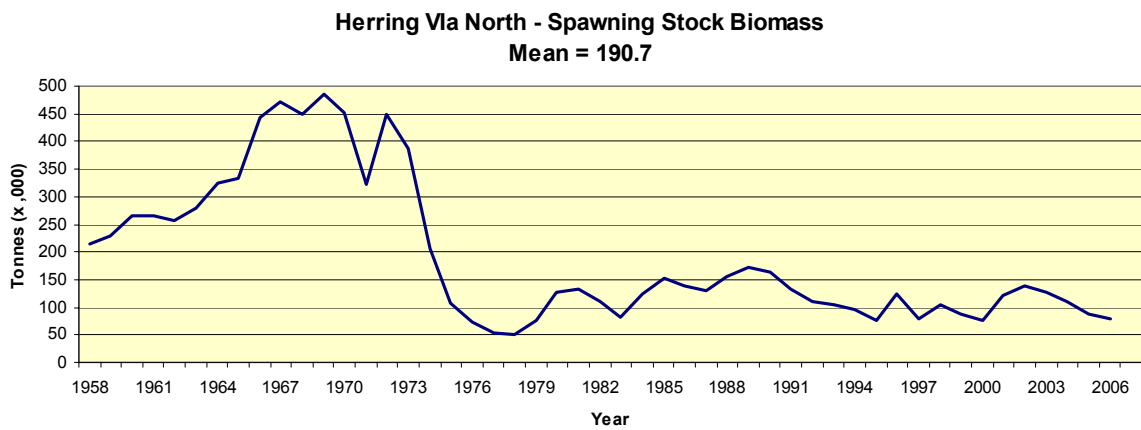
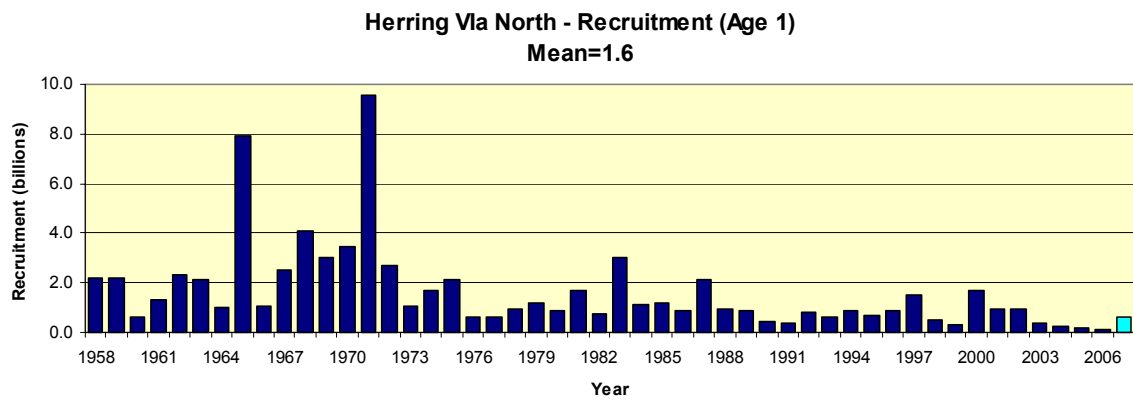
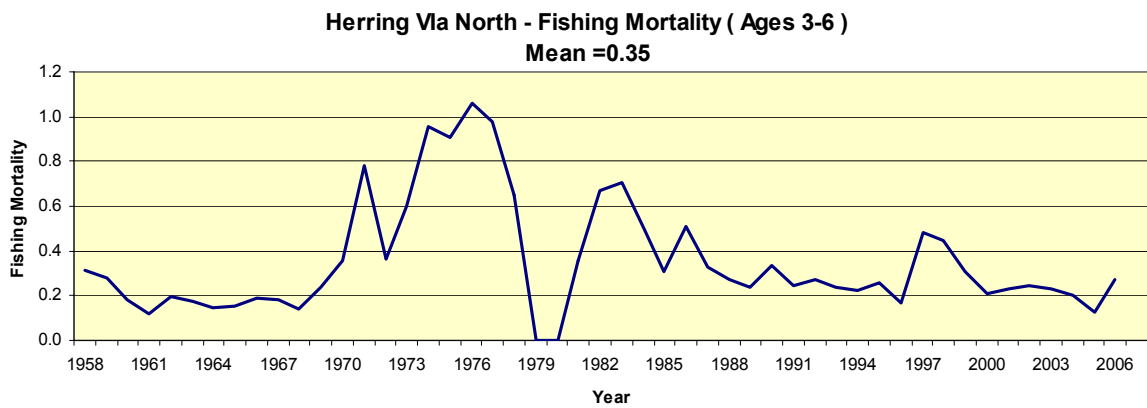
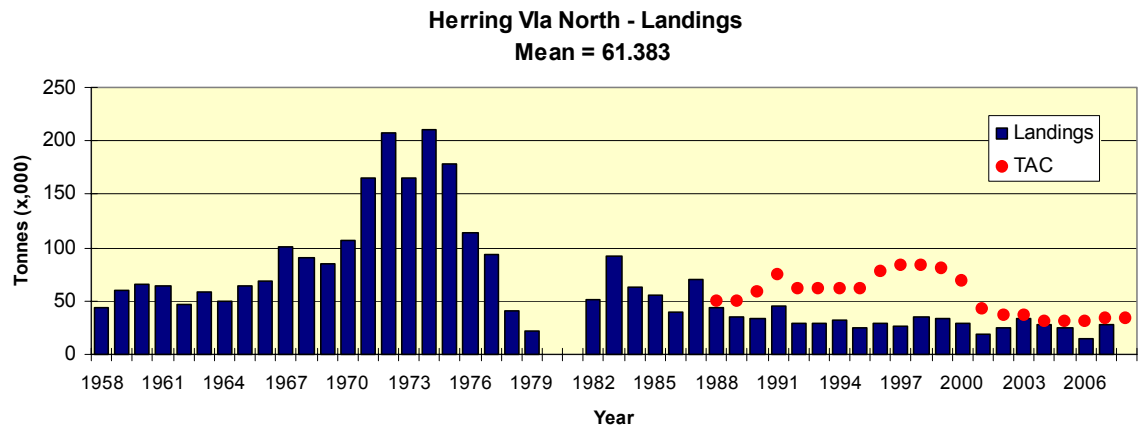


Table 5.4.30.1

Herring in VIa (N). Catch in tonnes by country, 1983–2006. These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

Country	1983	1984	1985	1986	1987	1988	1989	1990
Denmark		96						
Faroese	834	954	104	400				326
France	1313		20	18	136	44	1342	1287
Germany	6283	5564	5937	2188	1711	1860	4290	7096
Ireland				6000	6800	6740	8000	10000
Netherlands	20200	7729	5500	5160	5212	6131	5860	7693
Norway	7336	6669	4690	4799	4300	456		1607
UK	31616	37554	28065	25294	26810	26894	29874	38253
Unallocated	-4059	16588	-502	37840	18038	5229	2123	2397
Discards							1550	1300
Total	63523	75154	43814	81699	63007	47354	53039	69959
Area-Misreported		-19142	-4672	-10935	-18647	-11763	-19013	-25266
WG Estimate	63523	56012	39142	70764	44360	35591	34026	44693
Source (WG)	1985	1986	1987	1988	1989	1990	1991	1992

Country	1991	1992	1993	1994	1995	1996	1997	1998
Denmark								
Faroese	482							
France	1168	119	818	274	3672	2297	3093	1903
Germany	6450	5640	4693	5087	3733	7836	8873	8253
Ireland	8000	7985	8236	7938	3548	9721	1875	11199
Netherlands	7979	8000	6132	6093	7808	9396	9873	8483
Norway	3318	2389	7447	8183	4840	6223	4962	5317
UK	32628	32730	32602	30676	42661	46639	44273	42302
Unallocated	-10597	-5485	-3753	-4287	-4541	-17753	-8015	-11748
Discards	1180	200		700			62	90
Total	50608	51578	56175	54664	61271	64359	64995	65799
Area-Misreported	-22079	-22593	-24397	-30234	-32146	-38254	-29766	-32446
WG Estimate	28529	28985	31778	24430	29575	26105	35233*	33353
Source (WG)	1993	1994	1995	1996	1997	1997	1998	1999

Country	1999	2000	2001	2002	2003	2004	2005	2006
Denmark								
Faroese				800	400	228	1810	570
France	463	870	760	1340	1370	625	613	701
Germany	6752	4615	3944	3810	2935	1046	2691	3152
Ireland	7915	4841	4311	4239	3581	1894	2880	4352
Netherlands	7244	4647	4534	4612	3609	8232	5132	7008
Norway	2695							
UK	36446	22816	21862	20604	16947	17706	17494	18284
Unallocated	-8155			878	-7			
Discards						123	772	163
Total	61514	37789	35411	36283	28835	29854	31392	34230
Area-Misreported	-23623	-19467	-11132	-8735	-3581	-7218	-17263	-6884
WG Estimate	29736	18322 <sup>s</sup>	24556 <sup>s</sup>	32914 <sup>s</sup>	28081 <sup>s</sup>	25021 <sup>s</sup>	14129 <sup>s</sup>	27346
Source (WG)	2000	2001	2002	2003	2004	2005	2006	2007

\*WG estimate for 1997 has been revised according to the Bayesian assessment (see text Section 5.1.3 of 2000 report).

<sup>s</sup>Revised at HAWG 2007.

**Table 5.4.30.2** Herring in Division VIa (North).

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-6
1958	2212700	213788	59669	0.3105
1959	2207110	229855	65221	0.2810
1960	647460	266482	63759	0.1795
1961	1317900	266665	46353	0.1206
1962	2357340	255902	58195	0.1927
1963	2154720	279650	49030	0.1730
1964	993210	325431	64234	0.1454
1965	7931830	331998	68669	0.1519
1966	1073170	443967	100619	0.1850
1967	2509730	473104	90400	0.1843
1968	4107180	448629	84614	0.1400
1969	3000720	484835	107170	0.2366
1970	3441280	451154	165930	0.3534
1971	9575740	322203	207167	0.7801
1972	2676160	449079	164756	0.3621
1973	1075080	388257	210270	0.6026
1974	1674990	205535	178160	0.9531
1975	2116660	108162	114001	0.9061
1976	614530	74599	93642	1.0609
1977	626140	53217	41341	0.9779
1978	915990	50015	22156	0.6483
1979	1219400	76219	60	0.0007
1980	892140	126093	306	0.0004
1981	1667530	133595	51420	0.3585
1982	777670	111549	92360	0.6683
1983	3036180	82975	63523	0.7033
1984	1152680	123173	56012	0.5044
1985	1214240	152361	39142	0.3046
1986	904610	138659	70764	0.5066
1987	2148730	129575	44360	0.3274
1988	927030	155111	35591	0.2729
1989	880110	172862	34026	0.2369
1990	438460	164407	44693	0.3316
1991	384680	133997	28529	0.2442
1992	799660	110473	28985	0.2706
1993	602380	105026	31778	0.2373
1994	855320	96351	24430	0.2216
1995	668080	77034	29575	0.2562
1996	866000	123385	26105	0.1668
1997	1538700	79138	35233	0.4801
1998	482370	103762	33353	0.4445
1999	307380	87029	29736	0.3089
2000	1726800	75351	18322	0.2065
2001	955630	121998	24556	0.2303
2002	921180	137261	32914	0.2476
2003	363590	128104	28081	0.2288
2004	259390	110412	25021	0.2002
2005	168210	88261	14129	0.1264
2006	112240	77787	27346	0.2755
2007	604980*	74047		
Average	1602100	188370	61749	0.3532

\* Geometric mean for the years 1989–2005.

# West of Scotland Sprat

(Division VIa)



*Marine Institute*  
Foras na Mara

Fisheries Science Services

## FSS –SINGLE STOCK CONSIDERATIONS

**Sprat fisheries display large inter-annual variation, both spatially and temporally. In light of decreased quotas for herring, effort may be displaced onto sprat. This should be monitored. In order to prevent an increase in effort, precautionary TACs should be implemented in Sub-area VI and Sub-area VII.**

## CURRENT MANAGEMENT

- There are no management regulations for sprat fisheries around Ireland.
- There are no TACs for sprat in Irish waters. A TAC is in place in the English Channel and in the North Sea.

## ADDITIONAL INFORMATION

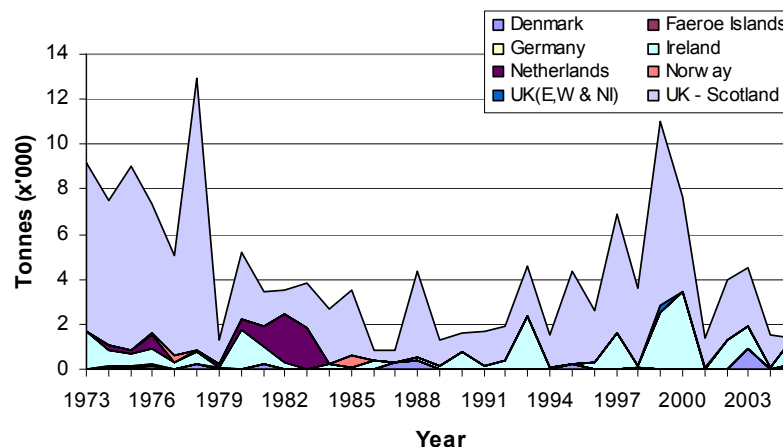
1. A number of vessels using mid water trawls take part in the fishery. The fishery takes place in shallow in-shore areas mainly during autumn.
2. Most of the landings are by Scottish and Irish vessels. Landings fluctuate highly from year to year depending on markets and availability for other pelagic species.
3. Sprat landings are being curtailed due to the by-catch of other species, mainly mackerel and herring, in this fishery.
4. Sprat, from both targeted fisheries and as part of herring fishery by-catch, have been sampled by FSS since 2000.
5. The degree of species misreporting between herring and sprat needs to be evaluated before advice can be given

**Table 1.** Landings of Sprat from VIa 1995-2006.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Denmark	241	.	.	40	.	.	.	.	887	.	.	na
Faeroe Islands	.	.	.	.	.	.	.	.	.	.	252	na
Ireland	.	269	1596	94	2533	3447	4	1333	1060	97	1134	na
UK(E,W & NI)	.	7502	6428	8187	5758	4487	12084	1099	3015	1488	1057	na
UK - Scotland	4124	2350	5313	3467	8161	4238	1294	2657	2593	1416	.	na
	4365	10121	13337	11788	16452	12172	13382	5089	7555	3001	2443	na

Source ICES

**Sprat Landings VIa**



**Figure 1.** Landings of Sprat from Division VIa.

# Ecosystem Overview for the Celtic Sea

## Summary table of the ICES Ecosystem overview for the Celtic Sea

(Information condensed from ICES WGRED, 2007 see WG report for further details and reference list)

<b>Physics</b>	
<b>Bathymetry</b>	Shelf sea south of Ireland, limited to the west by the slope of the Porcupine seabight and the Goban Spur.
<b>Circulation</b>	Along the shelfedge, there is a poleward flowing 'slope current'; on the shelf a weaker current flows north from Brittany across the mouth of the channel. Thermal stratification and tidal mixing generates the Irish coastal current which runs westwards in the Celtic Sea and northwards along the west coast of Ireland. Several rivers discharge freshwater into the ecoregion and influence the circulation patterns, these are notably the River Loire, the Severn and the Irish rivers Lee and Blackwater.
<b>Fronts</b>	The Irish Shelf Front is located to the south and west of Ireland (at c. 11°W), and consists of a tidal mixing front existing all year-round. On shelf, there are the Ushant Front in the English Channel and the Celtic Sea front at the southern entrance to the Irish Sea.
<b>Temperature</b>	Sea surface temperatures measured in coastal stations northwest of Ireland since the 1960s show a trend of sustained positive temperature anomalies from 1990, while CTD measurements made along a section at 53° N since 1999 show warmer conditions in 2003 and 2004, broadly consistent with other regions of the NW European shelf
<b>Biology</b>	
<b>Phytoplankton</b>	Productivity is reasonably high on the shelf with a rapid decrease west of the shelf break. Continuous Plankton Recorder data suggests a steady increase in phytoplankton over at least the last 20 years. Toxic algal blooms occur around Irish coasts esp. along the southwest of Ireland.
<b>Zooplankton</b>	CPR data suggest an overall decline in the abundance of zooplankton in recent years. <i>Calanus</i> abundance is now below the long term mean.
<b>Benthos, larger invertebrate, biogenic habitats</b>	The major commercial invertebrate species is Norway-lobster ( <i>Nephrops norvegicus</i> ). Two epibenthic assemblages predominate in the Celtic Sea: one along the shelf edge and the slope, dominated by the anemone <i>Actinauge Richard</i> and a more widely distributed assemblage on the continental shelf, domination of <i>P. prideaux</i> and other mobile invertebrates (shrimps and echinoderms).
<b>Fish Community</b>	The area is a spawning area for key migratory fish species, notably mackerel <i>Scomber scombrus</i> and horse mackerel <i>Trachurus trachurus</i> . On the continental shelf the main pelagic species are herring <i>Clupea harengus</i> , sardine <i>Sardina pilchardus</i> and sprat <i>Sprattus sprattus</i> . The groundfish community consists of over a hundred species with the most abundant 25 making up 99% of the total biomass. Surveys revealed a downward trend in the biomass and abundance of cod, whiting and hake between 1993 and 2000, in particular in the latter part of the time-series.
<b>Birds, Mammals &amp; Elasmobranches</b>	Basking shark ( <i>Cetorhinus maximus</i> ) is seen throughout area but the stock seems to be severely depleted. The Harbour porpoise <i>Phocoena phocoena</i> is the most numerous cetacean in the region. Bottlenosed dolphin <i>Tursiops truncatus</i> occur in large numbers while the common dolphin <i>Delphinus delphis</i> is also widely distributed in the area. White-beaked dolphin and White-sided dolphin ( <i>Lagenorhynchus albirostris</i> and <i>L. acutus</i> ) occur over much of the shelf area. Grey seals ( <i>Halichoerus grypus</i> ) are common in many parts of the area. Petrels (fulmar and storm-petrel) dominate the seabird populations in the west of Ireland and Celtic Sea region but there are also large breeding colonies of kittiwake, guillemot and gannet.



<b>Environmental signals &amp; implications</b>	Increasing temperature and changes in zooplankton communities are likely to have an impact on the life histories of many species. There has been a northward shift in the distribution of some fish with an increase of Seabass <i>Dicentrarchus labrax</i> and red mullet <i>Mullus surmuletus</i> populations around British coasts. The region also recently experienced an unprecedented increase in the numbers of snake pipefish, <i>Entelurus aequoreus</i> . Abundance of herring <i>Clupea harengus</i> and pilchard <i>Sardina pilchardus</i> occurring off the south-west of England, closely corresponded with fluctuations in water temperature. Sardines were generally more abundant and extended further to the east when the climate was warmer whilst herring were generally more abundant in cooler times.
<b>Fishery effects on benthos and fish communities</b>	The area has a number of severely depleted stocks e.g. cod, whiting and plaice. A significant proportion of the catch of the demersal fleets is discarded. Fishing has impacted due to high levels of exploitation. The size structure of the fish community has changed significantly over time, and a decrease in the relative abundance of larger fish has been accompanied by an increase in smaller fish (4–25g). Temporal analyses of the effects of fishing and climate variation suggest that fishing has had a stronger effect on size-structure than changes in temperature. A marked decline in the mean trophic level of the fish community over time has been documented and this has resulted from a reduction in the abundance of large piscivorous fishes such as cod and hake, and an increase in Nephrops and smaller pelagic species which feed at a lower trophic level. Cetacean bycatch has been noted in some fisheries, particularly in the pelagic trawl fishery for mackerel and horse mackerel in the SW of Ireland.

## FSS ECOSYSTEM CONSIDERATIONS

FSS advises that the following considerations should be taken into account in developing ecosystem based advice for Celtic Sea fisheries:

- Fishing has impacted a number of commercial species, with some commercial species such as Cod, Plaice and Herring now severely depleted.
- A reduction in the abundance of large piscivorous fishes such as cod and hake, and an increase in smaller pelagic species and Nephrops, which feed at a lower trophic level has resulted in a marked decline in mean trophic level of the fish community over time.
- There has been a change in the size structure of the fish community over time with an increase in smaller fish and a reduction in larger fish. Temporal analyses of the effects of fishing and climate variation suggest that fishing has had a stronger effect on size-structure than changes in temperature.
- The inshore areas of the Celtic Sea contain some important spawning grounds for herring. Aggregate extraction and dumping of dredge spoil are likely to have negative effects on Herring recruitment due to perturbation of the spawning beds and an increase in turbidity.
- There has been an increase in water temperatures in this ecoregion which is likely to affect the distribution area of some fish species. Evidence to date suggest that a changing environmental regime can have an impact on recruitment and stocks in the southern end of their geographical species range might be particularly vulnerable. In addition, the combined effects of overexploitation and environmental variability might lead to a higher risk of recruitment failure and decrease in productivity.

Ref: ICES. 2007. Report of the Working Group for Regional Ecosystem Description (WGRED), 19 - 23 February 2007, ICES Headquarters, Copenhagen. ICES CM 2007/ ACE:02. 153 pp.

# FSS Advice on Mixed Fisheries in the Celtic Sea and West of Ireland

## PRECAUTIONARY APPROACH ADVICE

FSS advises that mixed fisheries characteristics be taken into account when managing demersal fisheries in the Celtic Sea Divisions VIIb,c,j-k. Given the critical status of cod and spurdog these stocks are the overriding concerns in the management advice. The precautionary approach implies that fisheries in the Celtic Sea should be managed where the following rules are applied simultaneously:

If fisheries are permitted they should operate:

- With no catch or discard of spurdog and cod in Divisions VIIe-k
- Without jeopardizing the recommended reduction in fishing mortality of plaice in Divisions VIIfg; plaice and sole in Division VIIe; whiting in Divisions VIIe-k; Celtic Sea herring and herring in Divisions VIIbc
- Within the precautionary limits for all other stocks

FSS recognises that the 'zero catch option' for cod and spurdog would effectively mean a closure of all the mixed demersal and *Nephrops* fisheries in the Celtic Sea. FSS agrees with ICES that a closure of all fisheries catching cod or spurdog provides the highest probability of recovery for these stocks and is the only advice possible in the context of the precautionary approach.

FSS advises that the following general rules should be followed in the management of mixed fisheries west and southwest of Ireland and in the Celtic Sea.

- Fisheries should only be permitted when they prove that they take zero catch of the critical stocks i.e. cod and spurdog.
- Once the TAC is exhausted for a particular stock then all fisheries which catch that stock should be closed.
- Fisheries should only be permitted when they demonstrate that they take zero catches of non-critical stocks where the TAC is exhausted.
- All other stocks should be exploited within precautionary limits.

## IMPLEMENTATION ISSUES

FSS notes that ICES has previously advised for zero catch of cod and spurdog in the Celtic Sea but that managers, because of social and economic considerations, have never implemented this advice. Currently cod in the Celtic Sea is not subject to EC recovery plan although closed areas have been introduced with the aim of reducing fishing mortality and STECF have recommended that the introduction of a recovery plan in the area is warranted. FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008. FSS present an interpretation of how this proposal would be implemented for these stocks (see table on page 45). For Celtic Sea fisheries (in the absence of a cod recovery plan) FSS interprets that the EC fishing opportunity in 2008 will be set in line with those for each individual stock. However FSS notes that there are mixed fisheries interactions and that this interpretation is not strictly in accordance with the policy statement on fishing opportunities for 2008.

FSS has previously pointed out the poor performance of TACs, as implemented, in reducing fishing mortality. In the past FSS advised that the required reductions in catch and associated fishing mortality can only be achieved if reductions in effort and effective discard mitigation measures are implemented. Fishing effort control has not yet been extended to the Celtic Sea.

FSS advises that a well defined 'management plan' needs to be developed and implemented to stocks caught in mixed fisheries in the Celtic Sea, west and southwest of Ireland and to fish them sustainably once they have recovered. FSS advise that such a plan should aim to manage well defined métiers with clearly defined objectives that will ensure a high probability of recovery of all species to agreed levels within a specified time frame.

## Qualitative Description of Fisheries in the Celtic Sea and West of Ireland

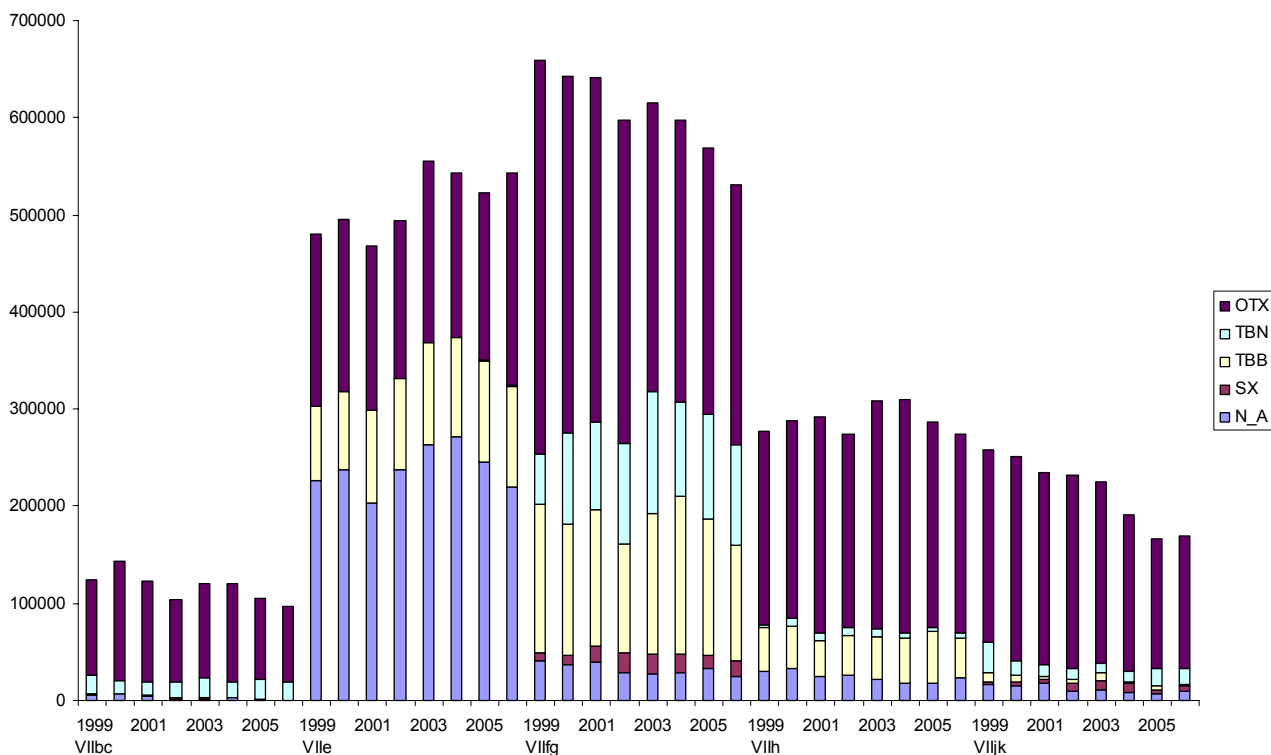
The demersal fisheries on cod, haddock, whiting, sole, and plaice in ICES areas VIIbc,e–k are predominantly carried out by Belgian, French, Irish, and UK fleets. The *Nephrops* fisheries are predominantly carried out by French, Irish, and Spanish fleets. The demersal fisheries on hake, anglerfish, and megrim are predominantly carried out by French, Irish, Spanish, and UK vessels.

The main demersal gear type used in all ICES Divisions VIIbc,e–k is the otter trawl but various different types of trawl and mesh sizes are used depending on target species. There are also significant beam trawl fisheries exploiting flatfish and other benthic species (i.e. plaice, sole, megrim, anglerfish and cuttlefish). Hake are also targeted with long line and gill nets by the Spanish fleet primarily. There some seine net fishing, mainly by Irish vessels, targeting roundfish. Other gears such pots, dredges, creels, longlines and various gill nets are used but their effort is not currently collated internationally by FSS or ICES.

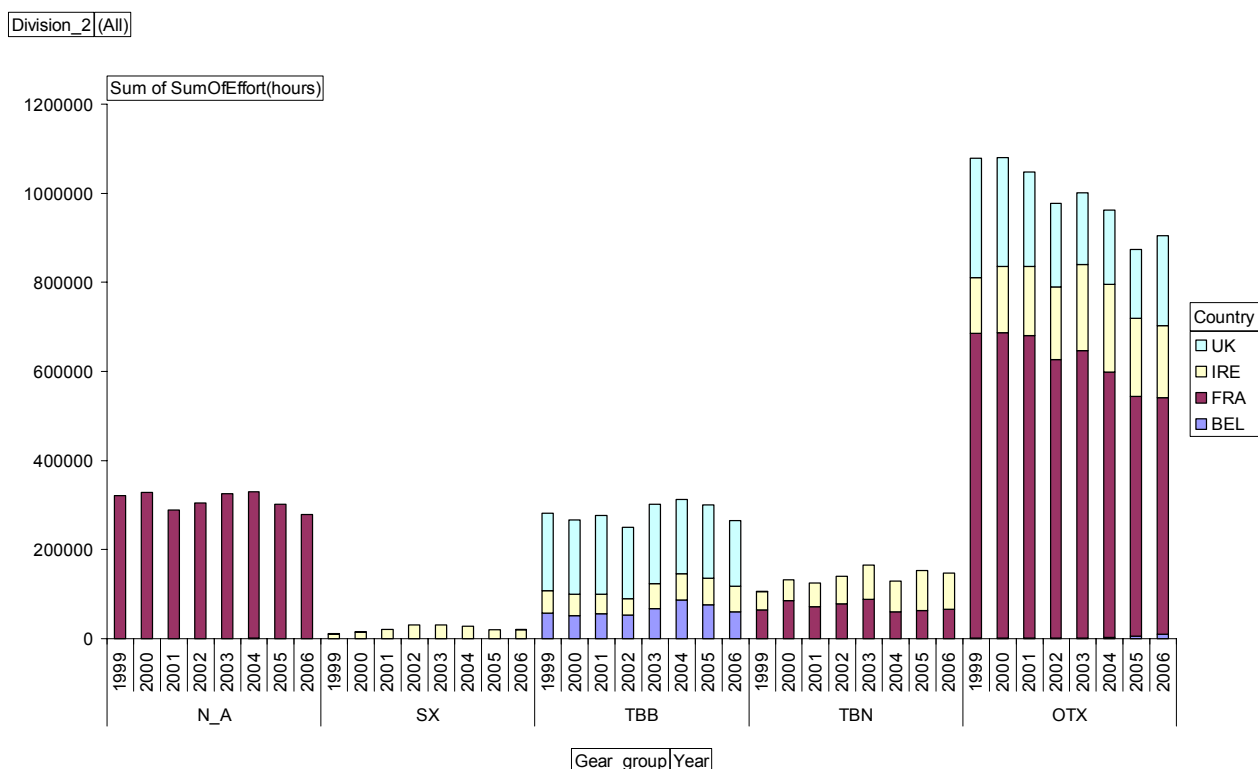
## Recent Trends Celtic Sea and West of Ireland Effort

Effort presented in this section is taken from the WGSSDS 2007. All effort is given in hours fishing and effort for gill net fleets is not available.

The demersal effort is dominated by five main countries, France, Ireland, the United Kingdom and Belgium (Fig. 1). Note Spanish effort data was not available although significant fisheries occur in VIIb,c,j,k. Otter trawling (OTX) is the primary fishery in this area and a significant declining trend is apparent in several areas i.e. VIIf,g VIIj,k and VIIbc in particular (Fig. 1). There are a further two main groupings in the area, beam trawling (TBB) and *Nephrops* trawling (TBN). Effort in those gears is fluctuating with no particular trend. The use of demersal seines (SX) is less significant and also fairly stable in the Celtic Sea.



**Fig. 1.** Total effort (fishing hours) of otter trawlers (OTX), *Nephrops* trawlers (TBN), beam trawlers (TBB), demersal seiners (SX), and not defined gears (N\_A) of Belgium, France, Ireland, and the United Kingdom operating in ICES Divisions VIIbc, VIIe, VIIfg, VIIh, and VIIjk since 1999.



**Fig. 2.** Total effort (fishing hours) in ICES Divisions VIIbc,e-k for otter trawlers (OTX), *Nephrops* trawlers (TBN), demersal seiners (SX), and not identified gear types (N\_A) for Belgium, France, Ireland, and the United Kingdom.

Overall otter trawl effort (OTX) in the area has shown a steady decline since 1999. This decline is primarily driven by declines in French effort. Much of this effort decline appears to be within the otter trawl fleet targeting gadoids and benthic species. Effort from the United Kingdom and Belgium has remained relatively stable, whilst Irish effort has increased.

### Fisheries interactions in the Celtic Sea

Demersal fisheries in the Celtic Sea and west of Ireland are predominately mixed fisheries, with many stocks exploited together in various types of fisheries. Therefore, management advice considers both the state of individual stocks and their simultaneous exploitation in demersal fisheries. The stocks in poorest condition, particularly those outside precautionary limits, necessarily become the overriding concern for the management of fisheries that target or have bycatches of the stock. As trends in stocks of various species generally do not run parallel, advice provided for individual species may have effects on the advised fishing mortalities for a group of co-harvested species.

The main interactions (Table 1) amongst stocks in the Celtic Sea, Southwest of Ireland, and Western Channel, are between:

- anglerfish, megrim, and hake in the otter board trawl fishery in medium to deep water;
- *Nephrops*, cod, and whiting in the *Nephrops* fishery in the Celtic Sea;
- gadoids (cod, haddock, and whiting) within the trawl fishery for roundfish, mainly within Divisions VII f,g;
- sole and plaice in the beam trawl fishery in Divisions VII f,g and VII e;
- haddock, whiting, cod, sole, plaice, hake, megrim, anglerfish, squid, elasmobranchs, and other species within the mixed demersal trawl fisheries.

The directed fisheries for hake (trawl, longlines, and gill-nets) and have few interactions with other stocks.

**Table 1** Stock interactions – Celtic Sea, Southwest of Ireland, and Western Channel.

Stock interaction table																										
Anglerfish budegassa Vilb-k, Villabd	Anglerfish piscatorius Vilb-k, Villabd	Cod Vile-k	Haddock Vilb-k	Hake Northern	Herring Celtic Sea and Division Vilj	Herring Vile(S) and Vilbc	Horse Mackerel Southern	Horse Mackerel Western	Mackerel North East Atlantic	Megrim Vil, Villabd	Nephrops Area L: Vilbcjk	Nephrops Area M: Vilfgh+Vila	Plaice Vilbc	Plaice Vile	Plaice Vilfg	Plaice Vilhjk	Sole Vilbc	Sole Vile	Sole Vilfg	Sole Vilhjk	Sprat Vilde	Whiting Vile-k	Seabass	Skates and rays	Pelagic and migratory sharks	Demersal sharks
	H	L	L	M	0	0	0	0	0	M	M	L	L	L	L	L	L	L	L	L	L			H		
	T	L	L	M	0	0	0	0	0	M	M	M	L	L	L	L	L	L	L	L	L			H		
	T	H	H	L	0	0	0	0	0	L	L	M	0	L	M	L	0	L	L	L	L	H/M		H		
	T	T	T	L	0	0	0	0	0	L	M	M	L	L	L	L	L	L	L	L	L	H	0	H	L	
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	T	N	N	N	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
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	N	N	N	N	N	N	N	N	N	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
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H: the stocks are taken together in most fisheries where they are taken and their fisheries linkage is therefore high; M: the stocks are taken together in some but not all important fisheries and their fisheries linkage is therefore medium; L: the stocks are taken together in some but not all important fisheries and their fisheries linkage is therefore low; NT: Nephrops trawl; N: none

# Northern Hake

(Division IIa, IIIa-d, Vb, VIIIabde and Sub-areas IV, VI, VII, XII & XIV)

For latest information, see: <http://www.ices.dk>



*Marine Institute*  
Foras na Mara

Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

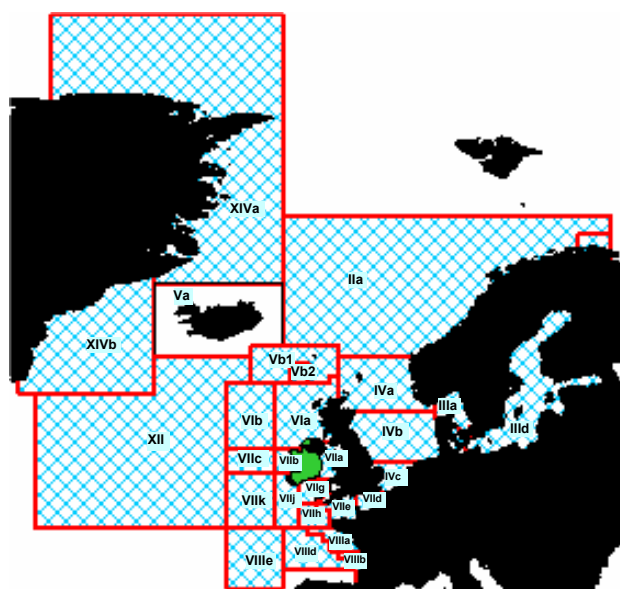
Based on the most recent estimates of SSB and fishing mortality ICES classifies the stock as being at full reproductive capacity and being harvested sustainably. This assessment is relatively consistent from year to year despite serious concerns about the quality of the input data used.

Managers are obliged to follow the agreed recovery plan (EC Reg. No 811/2004) which establishes measures for the recovery of the northern hake. This plan has been evaluated by ICES as is considered consistent with the precautionary approach. Applying a fishing mortality of  $F = 0.25$  as defined in Article 5.2 of the agreed recovery plan is expected to lead to an SSB of 160 500 t in 2009 (above  $B_{pa}$ ), with estimated landings in 2008 of 54,000 t. This would imply an increase in TAC of 3% for 2008 and a Irish quota of 1,670 t.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For northern hake, FSS interprets that the proposal would result in the TAC being set in line with the recovery plan for 2008 as above.

The current fishing mortality, estimated at 0.24, which is that which is expected to lead to high long-term yields and low risk of stock depletion

( $F_{0.1} = 0.10$  and  $F_{max} = 0.17$ ). Fishing Mortality could be reduced to  $F_{max}$  in the short term by reducing the TAC by 27%, implying landings in 2008 of 38,700 t. Given that a management plan should now be developed for this stock one possible scenario is to reduce fishing mortality in a series of smaller steps. FSS and STECF notes that a sequential 5% decrease in  $F$  would lead to  $F_{max}$  before 2015 without significant loss in yields at short term.



Red Boxes-TAC/Management Areas Blue Shading- Assessment Area

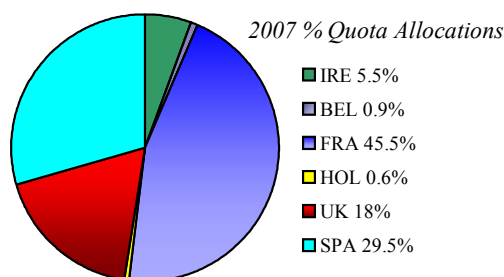
## CURRENT MANAGEMENT

- The Northern hake emergency plan (EC 1162/2001, EC 2602/2001 and EC 494/2002) has been followed up by a recovery plan in 2004 (EC 811/2004). The recovery plan is aimed at achieving a SSB of 140,000 t ( $B_{pa}$ ). This is to be achieved by limiting fishing mortality to  $F = 0.25$  and by allowing a maximum change in TAC

	IIIa; EC waters of IIIb, IIIc and IIId	EC waters of IIa and IV	VI and VII; EC waters of Vb; international waters of XII and XIV	VIIIa, VIIIb, VIId and VIIIe	All Areas Combined	2007 Irish Quota	
2007 TAC	1,588	1,850	29,541	19,701	52,680	1,629	
FSS Advice Options For 2008 disaggregated by TAC area						Corresponding 2008 Irish quota	% Change relative to 2007
$F_{max}$	1,167	1,359	21,702	14,473	38,700	1,197	-27%
$F_{Advised}$ - Recovery Plan	1,628	1,896	30,281	20,195	54,000	1,670	3%

between years of 15%. Targeting  $F$  well below  $F = 0.25$  is expected to increase the long-term yield. Note the rebuilding target has been achieved for 2 years now and article 3 of the recovery plan which states that a management plan be established should be established.

- A number of gear related technical measures affected the hake fishery in 2007. Particularly those laid out for gillnets in Annex III(9) on the use of gillnets in ICES Zones VIa, b, VII b, c, j, k and XII. For 2007 otter-trawlers in Sub-area VIII using a squared mesh panel were allowed to use a 70-mm mesh size in the area defined in Council Regulations No 1162/2001, 2602/2001 and 494/2002, where 100-mm minimum mesh size is required for all otter-trawlers.
- The current assessment area covers Sub-areas III, IV, V, VI, VII and Divisions VIIIabde which corresponds to four TAC areas (see Table).
- The TAC was overshot considerably 2001 between 2001 and 2005 but 2006 landings were below the TAC. The poor performance of TACs, as implemented, in reducing fishing mortality, leads FSS to reiterate that the required reductions in fishing mortality can only be achieved if reductions in effort are included in management, and effective measures to reduce discarding are implemented.
- The 2007 TAC for VI and VII; EC waters of Vb; international waters of XII and was 29,541 t with an associated Irish quota of 1,629 t (Adapted quota = 1,765 t).



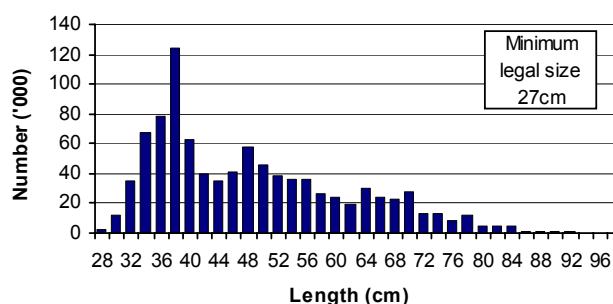
## ADDITIONAL INFORMATION

1. The assessment methodology and results are very similar to last year. Although this assessment appears to be consistent from year to year there are some serious concerns about the accuracy of the age estimation methodology, discard estimates, mis-reporting and the quality of the tuning data used. Discards were not included in this years assessment due to incomplete data. Discarding is known to be substantial in some fisheries.
2. Given the improved perception of the stock the recovery plan currently enforced will need to be superseded with a management plan. This will require explicit modelling of all the sources of uncertainty.

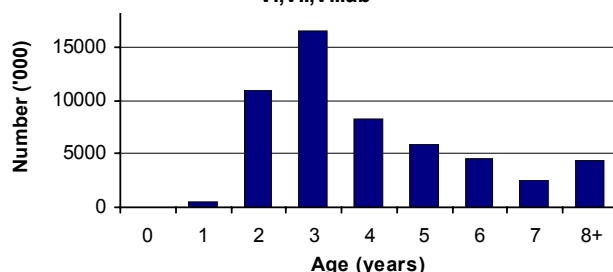
STECF evaluated the biological consequences of various management scenarios in June 2007 and have recommended that the results now need to be considered in a mixed fishery and socio-economic context before long term management plan can be finalised. Management scenarios are sensitive to discard practices and STECF also recommends that in any management plan involving a move towards an  $F_{max}$  target should be include measures which improve the selection pattern.

3. Estimated landings by Irish fleet in 2006 were 1,114 t, an increase of 10% from 2005.
4. Hake are a very important component in the mixed species demersal trawl fisheries in most Irish ports. Ireland has important trawl, seine and gill-net fisheries for hake all along the western shelf and in the Celtic Sea and Stanton Bank area. The most important ports are Castletownbere, Dunmore East and Killybegs. Large volumes of hake are also landed into Irish ports by vessels from other EU countries.
5. FSS recognise that hake is caught in nearly all fisheries in Sub-areas VII and VIII. Hake are therefore caught with other stocks that are outside safe biological limits.
6. Concerns over the accuracy of ageing data and the calculation of catch-at-age data are based on a French pilot study. The results of the study suggest that current ageing procedures may over estimate hake ages. If growth of hake is underestimated, the stock is likely to be smaller and fishing mortality higher.

2006 Length Distribution: Irish Landings, Hake in VII



2006 Age Distribution: International Landings, Hake in VI,VII,VIIIab





## ICES ADVICE

### 9.4.1

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target (<0.25)
Full reproductive capacity	Harvested sustainably	Overexploited	F is around agreed target

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	100 000 t	$B_{lim} = B_{loss}$ the lowest observed biomass in the 2003 assessment.
	$B_{pa}$	140 000 t	$B_{pa} \sim B_{lim} * 1.4$ .
	$F_{lim}$	0.35	$F_{lim} = F_{loss}$ .
	$F_{pa}$	0.25	$F_{pa} \sim F_{lim} * 0.72$ .
Targets	$F_y$	< 0.25	Recovery plan.

(unchanged since: 2003, except the target which was introduced in 2004).

#### Yield and spawning biomass per Recruit

F-reference points:

	Fish Mort Ages 2–6	Yield/R	SSB/R
Average last 3 years	0.244	0.296	0.867
$F_{max}$	0.172	0.304	1.221
$F_{0.1}$	0.099	0.283	1.873
$F_{med}$	0.307	0.283	0.676

Candidates for reference points consistent with taking high long-term yields and having a low risk of depleting the productive potential of the stock may be identified in the range of  $F_{0.1}$ – $F_{max}$ .

The current  $F_{max}$  is just below the assumed M (0.2).

#### Single-stock exploitation boundaries

##### Exploitation boundaries in relation to existing management plans

Applying a fishing mortality of  $F = 0.25$  as defined in Article 5.2 of the agreed recovery plan is expected to lead to an SSB of 160 500 t in 2009, with estimated landings in 2008 of 54 000 t. This would imply an increase in TAC of 3%.

##### Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

The current fishing mortality, estimated at 0.24, is above fishing mortalities expected to lead to high long-term yields and low risk of stock depletion ( $F_{0.1} = 0.10$  and  $F_{max} = 0.17$ ). This indicates that the long-term yield is expected to increase at fishing mortalities well below the historic values. Fishing at such a lower mortality is expected to lead to higher SSB and therefore lower the risk of observing the stock to be outside precautionary limits.

Based on the most recent estimates of SSB and fishing mortality ICES classifies the stock as being at full reproductive capacity and being harvested sustainably. SSB appears to have been close to  $B_{pa}$  over the last 3 years, and  $F$  has been around  $F_{pa}$  since 2001. Recruitment has been relatively stable over the last decade.

#### Management objectives

There are explicit management objectives for this stock in a recovery plan (EC Reg. No. 811/2004). The aim is to increase the SSB to above 140 000 t. A fishing mortality of  $F < 0.25$  has been agreed with a year to year constraint on TAC of 15%, unless the stock is below 100 000 t. In this case a lower TAC will be applied.

##### Exploitation boundaries in relation to precautionary limits

A fishing mortality of  $F_{pa} = 0.25$  is expected to lead to landings of 54 000 t in 2008 and an SSB of 160 500 t in 2009, which is above  $B_{pa}$ .

##### Conclusion on exploitation boundaries

ICES uses the exploitation boundaries in relation to the recovery plan as the basis for the advice for 2008, which coincides with the precautionary limits.



## Short-term implications

### Outlook for 2008

Basis:  $F_{sq}$  = mean  $F(04-06)$  = 0.244;  $R05-08$  = GM 1990–2004 = 186 millions; landings (2007) = 52.2; SSB(2008) = 156.4.

Rationale	Landings (2008)	Basis	F total (2008)	SSB (2009)	%SSB change <sup>1)</sup>	%TAC change <sup>2)</sup>
Zero catch	0.0	$F=0$	0.00	220.2	41%	-100%
High long-term yield	38.7	$F(\text{long term yield})$	0.17	177.3	13%	-27%
<i>Status quo</i>	53.0	$F_{sq}$	0.24	161.6	3%	1%
Agreed recovery plan	6.3	$F(\text{management plan}) * 0.1$	0.03	213.2	36%	-88%
	15.3	$F(\text{management plan}) * 0.25$	0.06	203.2	30%	-71%
	29.3	$F(\text{management plan}) * 0.5$	0.13	187.7	20%	-44%
	42.2	$F(\text{management plan}) * 0.75$	0.19	173.5	11%	-20%
	49.4	$F(\text{management plan}) * 0.9$	0.23	165.6	6%	-6%
	54.0	$F(\text{management plan}) * 1$	0.25	160.5	3%	3%
	58.5	$F(\text{management plan}) * 1.1$	0.28	155.6	-1%	11%
	64.9	$F(\text{management plan}) * 1.25$	0.31	148.6	-5%	23%
Precautionary limits	6.3	$F(\text{prec limits}) * 0.1$	0.03	213.2	36%	-88%
	15.3	$F(\text{prec limits}) * 0.25$	0.06	203.2	30%	-71%
	29.3	$F(\text{prec limits}) * 0.5$	0.13	187.7	20%	-44%
	42.2	$F(\text{prec limits}) * 0.75$	0.19	173.5	11%	-20%
	49.4	$F(\text{prec limits}) * 0.9$	0.23	165.6	6%	-6%
	54.0	$F_{pa} = F_{sq} * 1.02$	0.25	160.5	3%	3%
	58.5	$F(\text{prec limits}) * 1.1$	0.28	155.6	-1%	11%
	64.9	$F(\text{prec limits}) * 1.25$	0.31	148.6	-5%	23%
	74.9	$F(\text{prec limits}) * 1.5$	0.38	137.7	-12%	42%
	84.2	$F(\text{prec limits}) * 1.75$	0.44	127.7	-18%	60%
	93.4	$F(\text{prec limits}) * 2$	0.50	117.8	-25%	77%
	105.0	$F(\text{prec limits}) * 2.25$	0.56	105.0	-33%	99%

All weights in '000 tonnes.

1) SSB 2009 relative to SSB 2008.

2) Predicted landings 2008 relative to TAC 2007 (52.7 thousand tonnes).

Shaded scenarios are not considered consistent with the precautionary approach.

## Management considerations

The northern hake stock has met the SSB target in the recovery plan of 140 000 t for two years (2006 and 2007). Article 3 of the recovery plan indicated a management plan, which should now be implemented. When considering the development of a management plan for northern hake this needs to be developed, taking into account robustness to the present large uncertainty about growth and to the observed recruitment variability (see below, uncertainties in the assessment).

Hake is caught in nearly all fisheries in Subareas VII and VIII and also in some fisheries in Subareas IV and VI.

The increase in SSB appears to be mainly due to a reduction in fishing mortality.

The TAC has been overshoot considerably since 2001, but the overshoot has been reduced from 60% in 2001 to 9% in 2005. Landings in 2006 were below the TAC.

Discards of juvenile hake can be substantial in some areas and fleets, especially in the *Nephrops* fishery in the Bay of Biscay. Surveys suggest that juvenile hake may be much more widespread than hitherto assumed. Improvements in the selection pattern are expected to offer more protection to juvenile hake. Some trawler fleets previously targeting juvenile hake in the Bay of Biscay have diverted their effort to other species and gears in recent years.

## Ecosystem considerations

Hake movements have been studied from the seasonal distribution of catches. From the beginning of the year until March/April adult hake are present in the North of the Bay of Biscay. They appear on the shelf edge in the Celtic Sea in June and July. Between August and December, a large hake fishery is centred to the west and southwest of Ireland, with a decline in catch rates in shallower waters.

Hake belongs to a diverse community of species often caught together including megrim, anglerfish, *Nephrops*, sole, seabass, ling, blue ling, greater forkbeard, tusk, whiting, blue whiting, *Trachurus spp*, conger, pout, cephalopods (octopus, *Loligidae*, *Ommastrephidae*, and cuttlefish), and rays. The relative importance of these species in the hake fishery varies between years depending on gears, sea areas, and biological conditions.

Hake is preyed upon by sharks and other fishes. Cannibalism on juveniles by adults is well known. Adults feed on fish (mainly on blue whiting, other gadoids, sardine, anchovy, and other small pelagic fish), while juvenile hake prey mainly upon planktonic crustaceans (above all euphausiids, copepods, and amphipods).

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## Factors affecting the fisheries and the stock

### *The effects of regulations*

The minimum mesh size for trawls in the Bay of Biscay was increased from 55 mm (“*Nephrops* fishery”)/65 mm (“otter-trawlers”) to 70 mm in 2000.

In June 2001 an Emergency Plan was implemented for the Northern hake stock (Council Regulations Nos. 1162/2001, 2602/2001, and 494/2002). Firstly, a 100-mm minimum mesh size has been implemented for otter-trawlers when hake comprises more than 20% of the total amount of marine organisms retained onboard. This measure did not apply to vessels less than 12 m in length and which return to port within 24 hours of their departure. Secondly, two areas have been defined, one in Subarea VII (SW of Ireland) and the other in Subarea VIII (Bay of Biscay), where a 100-mm minimum mesh size is required for all otter-trawlers, regardless of the amount of hake caught. The fishing mortality of juvenile hake (in the landings) is estimated to have decreased between 1997 and 2001 and has remained low since.

Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a ‘biologically sensitive area’ in Subareas VIIb, VIIj, VIIg, and VIIh. Effort exerted within the ‘biologically sensitive area’ by the vessels of each EU Member State may not exceed their average annual effort (calculated over the period 1998–2002). The hake recovery plan (EC Reg. No. 811/2004) came into operation in 2004 and replaced the emergency plan.

For 2006 and in Subarea VIII, otter-trawlers using a squared mesh panel are allowed to use a 70-mm mesh size in the area defined in Council Regulations Nos. 1162/2001, 2602/2001, and 494/2002, where 100-mm minimum mesh size is required for all otter-trawlers. Furthermore, a ban on gillnets has been implemented in Subareas VIa,b and VIIb,c,j,k for fishing at depths of more than 200 m (EC Reg. No. 51/2006) during the first semester of 2006.

All of these regulations, which were expected to reduce fishing mortality and discarding, may have contributed to the recovery of the stock, although the extent of the effect of the measures cannot be precisely quantified.

### *Changes in fishing technology and fishing patterns*

Since the introduction of the high opening trawls in the mid-1990s, no significant changes in fishing technology have been introduced.

Due to quota restrictions, the Spanish fleet stopped fishing for up to two months in 2001, 2002, and 2003, and one month in 2004, 2005, and 2006. However, this temporary cessation of the fishery is not mirrored in the overall trends in fishing effort.

### *Other factors*

The main part of the fishery (close to 90% of the total landings) was conducted in six Fishery Units, three of them from Subarea VII: FU 1 (Longline in medium to deep water in Subarea VII), FU 3 (Gillnets in Subarea VII), and FU 4 (Non-*Nephrops* trawling in medium to deep water in Subarea VII); two from Subarea VIII: FU 13 (Gillnets in shallow to medium water) and FU 14 (Trawling in medium to deep water in Subarea VIII); and one in Subareas IIIa, IV, V, and VI, representing respectively 22%, 13%, 20%, 8%, 13%, and 15% of the total in 2006.

Spain accounts for the main part of the landings with 58% of the total in 2005. France is now taking 29% of the total, UK 6%, Denmark 3%, Ireland 2%, and other countries (Norway, Belgium, Netherlands, Germany, and Sweden) contribute small amounts.

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## Scientific basis

### *Data and methods*

An age-based assessment (XSA) was performed using four commercial cpue series and four surveys.

Discards were not included in the assessment. Some discard data (partial samples from some years and some fleets) were available, but it was not possible to incorporate these in a consistent way.

### *Information from the fishing industry*

The fishing industry and scientists have met at national level to discuss information that can be used in the assessments. National industries have not provided any additional quantitative information that can be used in the assessment. However, the perception of the stock trends by the industry generally supports the signals given by the data used in this year’s assessment.

### *Uncertainties in assessment and forecast*

Preliminary studies of growth indicate that there may be a problem in estimating the age from otolith reading. The indications are that growth may be severely underestimated and age overestimated for hake.

Following concerns over the accuracy of aging data and the calculation of historic catch-at-age data, an alternative assessment was explored assuming faster growth. The results indicate that the perception of trends in SSB is similar, but the absolute stock levels, variability in recruitment, and exploitation rate are different. If growth of hake is underestimated, the stock is likely to be smaller and fishing mortality higher and reference points would need to be revisited. Further studies, notably extensive tag-recapture studies, are required to draw any firm conclusions on these matters.

Discards are not included in the assessments. Some improvement in discard data availability (number of fleets sampled and area coverage) has been observed. However, sampling does not cover all fleets contributing to hake catches. Discard rates of several fleets are simply not known and for the data available, it is not possible to incorporate them in a consistent way.

There are large uncertainties associated with the most recent recruitments which are only estimated by a single survey. In the absence of reliable 2005 and 2006 recruitment, geometric mean recruitment has been used.

### *Comparison with previous assessment and advice*

The assessment and advice are consistent with last year.

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## Source of information

Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrin, 8–17 May 2007 (ICES CM 2007/ACFM:21).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp to advice	Predicted catch corresp to single-stock exploitation boundaries	Agreed TAC <sup>1</sup>	ACFM landings	Disc. slip.	ACFM Catch***
1987	Precautionary TAC; juvenile protection		-		63.5	63.4	2.0	65.3
1988	Precautionary TAC; juvenile protection		54		66.2	64.8	2.0	66.8
1989	Precautionary TAC; juvenile protection		54		59.7	66.5	2.3	68.8
1990	Precautionary TAC; juvenile protection		59		65.1	59.9	1.5	61.4
1991	Precautionary TAC; juvenile protection		59		67.0	57.6	1.7	59.3
1992	If required, precautionary TAC		61.5		69.0	56.6	1.7	58.3
1993	Enforce juvenile protection legislation		-		71.5	52.1	1.5	53.6
1994	F significantly reduced		<46		60.0	51.3	1.9	53.1
1995	30% reduction in F		31		55.1	57.6	1.2	58.9
1996	30% reduction in F		39		51.1	47.2	1.5	48.8
1997	20% reduction in F		54		60.1	42.6	1.8	44.4
1998	20% reduction in F		45 <sup>2</sup>		59.1	35.0	0.8	35.8
1999	Reduce F below $F_{pa}$		<36 <sup>2</sup>		55.1	39.8	0.8	40.6
2000	50% reduction in F		<20 <sup>2</sup>		42.1	42.0	0.6	42.6
2001	Lowest possible catch, recovery plan		-		22.6	36.7	0.5	37.2
2002	Lowest possible catch / recovery plan		-		27.0	40.0	0.3	40.3
2003	Lowest possible catch / recovery plan		-		30.0	41.8	- **)	-
2004	*)70% reduction in F or recovery plan		*)	<13.8	39.1	47.1	-	-
2005	F=0.19			33	42.6	46.4	-	-
2006	F=0.25			44	43.9	41.8	-	-
2007	Recovery plan limits			50.5	52.7			
2008	Recovery plan limits			54				

Weights in '000 t.

<sup>1</sup>Sum of area TACs corresponding to Northern stock plus Division IIa (EC zone only).

<sup>2</sup>Landings.

\*) Single-stock boundary and the exploitation of this stock should be considered in the context of mixed fisheries.

\*\*) From 2003 onwards, no estimations of discards were available.

\*\*\*) ACFM catch not used in the assessment. Assessment is based on landings only.

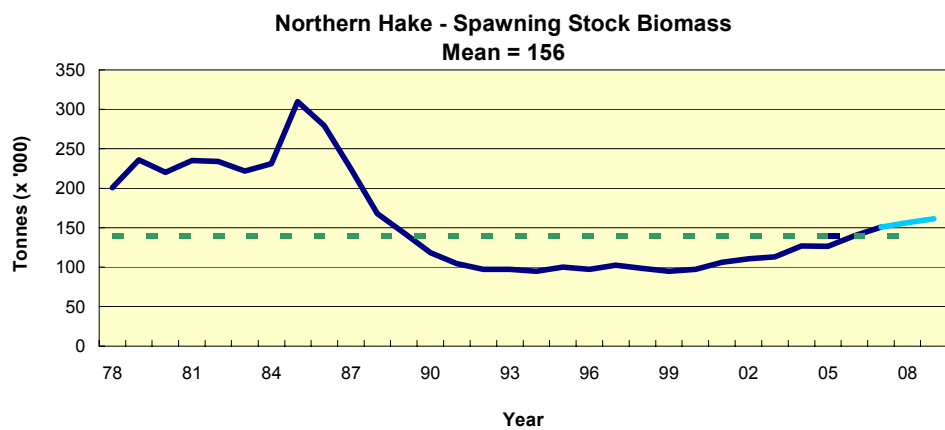
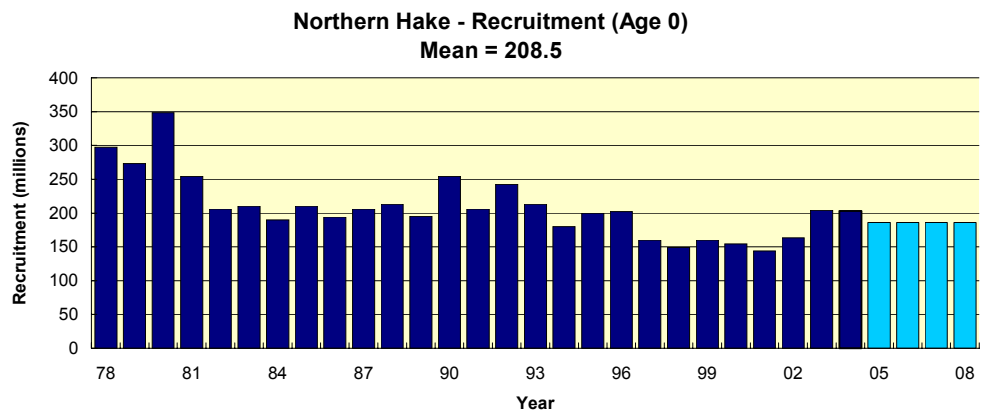
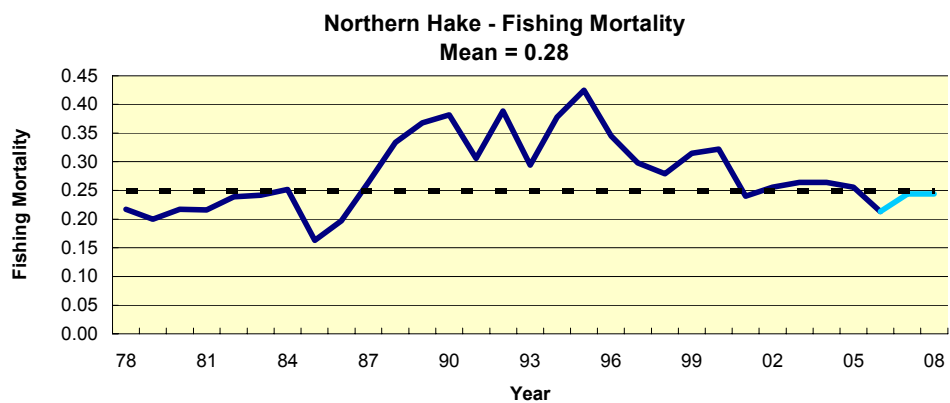
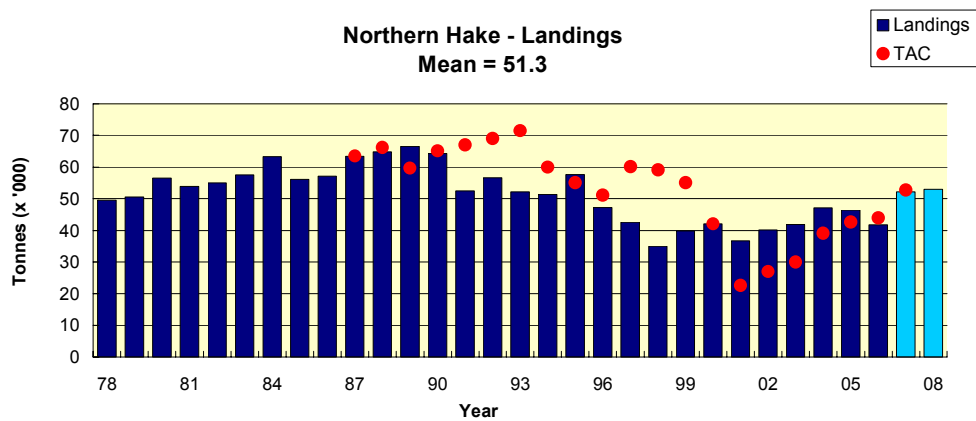


Table 9.4.1.1

Estimates of catches ('000 t) for the Northern hake by area for 1961–2006.

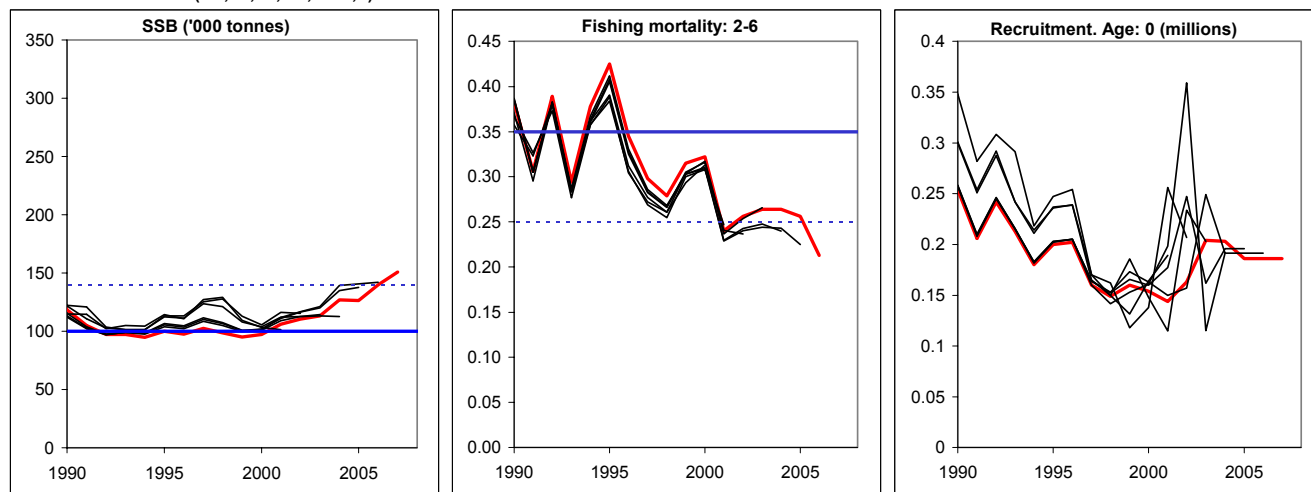
Year	Landings (1)				Discards (2)		Catches (3)
	IVa+VI	VII	VIIIa,b	Unallocated	Total	VIIIa,b	Total
1961	-	-	-	95.6	95.6	-	95.6
1962	-	-	-	86.3	86.3	-	86.3
1963	-	-	-	86.2	86.2	-	86.2
1964	-	-	-	76.8	76.8	-	76.8
1965	-	-	-	64.7	64.7	-	64.7
1966	-	-	-	60.9	60.9	-	60.9
1967	-	-	-	62.1	62.1	-	62.1
1968	-	-	-	62.0	62.0	-	62.0
1969	-	-	-	54.9	54.9	-	54.9
1970	-	-	-	64.9	64.9	-	64.9
1971	8.5	19.4	23.4	0	51.3	-	51.3
1972	9.4	14.9	41.2	0	65.5	-	65.5
1973	9.5	31.2	37.6	0	78.3	-	78.3
1974	9.7	28.9	34.5	0	73.1	-	73.1
1975	11.0	29.2	32.5	0	72.7	-	72.7
1976	12.9	26.7	28.5	0	68.1	-	68.1
1977	8.5	21.0	24.7	0	54.2	-	54.2
1978	8.0	20.3	24.5	-2.2	50.6	2.4	52.9
1979	8.7	17.6	27.2	-2.4	51.1	2.7	53.8
1980	9.7	22.0	28.4	-2.8	57.3	3.2	60.5
1981	8.8	25.6	22.3	-2.8	53.9	2.3	56.3
1982	5.9	25.2	26.2	-2.3	55.0	3.1	58.1
1983	6.2	26.3	27.1	-2.1	57.5	2.6	60.1
1984	9.5	33.0	22.9	-2.1	63.3	1.9	65.1
1985	9.2	27.5	21.0	-1.6	56.1	3.8	59.9
1986	7.3	27.4	23.9	-1.5	57.1	3.0	60.1
1987	7.8	32.9	24.7	-2.0	63.4	2.0	65.3
1988	8.8	30.9	26.6	-1.5	64.8	2.0	66.8
1989	7.4	26.9	32.0	0.2	66.5	2.3	68.8
1990	6.7	23.0	34.4	-4.2	59.9	1.5	61.4
1991	8.3	21.5	31.6	-3.9	57.6	1.7	59.3
1992	8.6	22.5	23.5	2.1	56.6	1.7	58.3
1993	8.5	20.5	19.8	3.3	52.1	1.5	53.6
1994	5.4	21.1	24.7	0	51.3	1.9	53.1
1995	5.3	24.1	28.1	0	57.6	1.2	58.9
1996	4.4	24.7	18.0	0	47.2	1.5	48.8
1997	3.3	18.9	20.3	0	42.6	1.8	44.4
1998	3.2	18.7	13.1	0	35.0	0.8	35.8
1999	4.3	24.0	11.6	0	39.8	0.8	40.6
2000	4.0	26.0	12.0	0	42.0	0.6	42.6
2001	4.4	23.1	9.2	0	36.7	0.5	37.2
2002	2.9	21.1	15.9	0	40.1	0.3	40.4
2003	2.8	23.7	15.3	0	41.9	-	41.9
2004	4.4	27.2	15.5	0	47.1	-	47.1
2005	5.3	26.7	14.4	0	46.4	-	46.4
2006	6.1	24.9	10.8	0	41.8	-	41.8

(1) Spanish data for 1961–1972 not revised, data for Subarea VIII for 1973–1978 include data for Divisions VIIIa,b only. Data for 1979–1981 are revised based on French surveillance data. Includes Divisions IIIa, IVb,c from 1976. There are some unallocated landings moreover for the period 1961–1970.

(2) Discards have been estimated from 1978 and only for Divisions VIII a,b.

(3) From 1978 total catches used for the Working Group.

Hake - Northern stock (IIIa, IV, VI, VII, VIIIa,b)



**Figure 9.4.1.3** Hake – Northern stock (IIIa, IV, VI, VII, and VIIIa,b). Historical performance of the assessments.

**Table 9.4.1.2** Hake – Northern stock (IIIa, IV, VI, VII, and VIIIa,b).

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2–6
1978	297000	200700	49500	0.217
1979	273000	236200	50600	0.200
1980	348000	220100	56500	0.217
1981	254000	234900	53900	0.216
1982	206000	233900	55000	0.239
1983	210000	221800	57500	0.242
1984	190000	231300	63300	0.252
1985	210000	309700	56100	0.163
1986	194000	279300	57100	0.197
1987	206000	224400	63400	0.265
1988	213000	167700	64800	0.334
1989	195000	143600	66500	0.368
1990	254000	118500	64300	0.382
1991	206000	104800	52400	0.306
1992	242000	97400	56600	0.389
1993	213000	97300	52100	0.294
1994	180000	94800	51300	0.378
1995	200000	100100	57600	0.425
1996	202000	97500	47200	0.345
1997	160000	102500	42600	0.298
1998	149000	98600	35000	0.279
1999	160000	95100	39800	0.315
2000	154000	97100	42000	0.322
2001	144000	106100	36700	0.240
2002	163000	110500	40100	0.256
2003	204000	113100	41900	0.264
2004	203000	126900	47100	0.264
*2005	186000	126400	46400	0.256
*2006	186000	139900	41800	0.213
*2007	186000	150900		
Average	206267	156037	51348	0.281

\* replaced by GM 90–04.

**Annex.** The main Articles of the hake recovery plan taken from EC regulation (EC) No. 811/2004:

*“Article 1. Subject matter. This Regulation establishes a recovery plan for the northern hake stock which inhabits the ICES division III a, ICES subarea IV, ICES divisions V b (Community waters), VI a (Community waters), ICES subarea VII and ICES divisions VIII a, b, d, e (the northern hake stock).*

**Article 2. Purpose of the recovery plan.** *The recovery plan referred to in Article 1 shall aim to increase the quantities of mature fish of the northern hake stock concerned to values equal to or greater than 140 000 tonnes.*

**Article 3. Reaching of target levels.** *Where the Commission finds, on the basis of advice from ICES and following agreement on that advice by the Scientific Technical and Economic Committee for Fisheries (STECF), that for two consecutive years the target level for the northern hake stock concerned has been reached, the Council shall decide by qualified majority on a proposal from the Commission to replace the recovery plan by a management plan for the stock in accordance with Article 6 of Regulation (EC) No 2371/2002.*

**Article 4. Setting of TACs.** *A TAC shall be set in accordance with Article 5 where, for the northern hake stock concerned the quantities of mature northern hake have been estimated by the STECF, in the light of the most recent report of ICES, to be equal to or above 100 000 tonnes.*

**Article 5. Procedure of setting TACs.**

*1. Each year, the Council shall decide by qualified majority on a proposal from the Commission on a TAC for the following year for the northern hake stock concerned.*

*2. For 2004, the TAC shall be set at a level corresponding to a fishing mortality of 0,25, 4 % less than status quo fishing mortality. For the subsequent years of the recovery plan, the TAC shall not exceed a level of catches which scientific evaluations carried out by the STECF, in the light of the most recent reports of ICES, indicate will correspond to a fishing mortality rate of 0,25.*

*3. The Council shall not adopt a TAC whose capture is predicted by the STECF, in the light of the most recent report of the ICES, to lead to a decrease in spawning stock biomass in its year of application.*

*4. Where it is expected that the setting of the TAC for a given year in accordance with paragraph 2 will result in a quantity of mature fish at the end of that year in excess of the target level indicated in Article 2, the Commission will carry out a review of the recovery plan and propose any adjustments necessary on the basis of the latest scientific evaluations. Such a review shall in any event be carried out not later than three years following the adoption of this Regulation with the aim of ensuring that the objectives of the recovery plan are achieved.*

*5. Except for the first year of application of this Regulation, the following rules shall apply:*

- (a) where the rules provided for in paragraph 2 or 4 would lead to a TAC for a given year which exceeds the TAC of the preceding year by more than 15 %, the Council shall adopt a TAC which shall not be more than 15 % greater than the TAC of that year or;*
- (b) where the rule provided for in paragraph 2 or 4 would lead to a TAC for a given year which is more than 15 % less than the TAC of the preceding year, the Council shall adopt a TAC which is not more than 15 % less than the TAC of that year.*

**Article 6. Setting of TACs in exceptional circumstances.** *Where the quantities of mature fish of the northern hake stock concerned have been estimated by the STECF, in the light of the most recent report of the ICES, to be less than 100 000 tonnes, the following rules shall apply:*

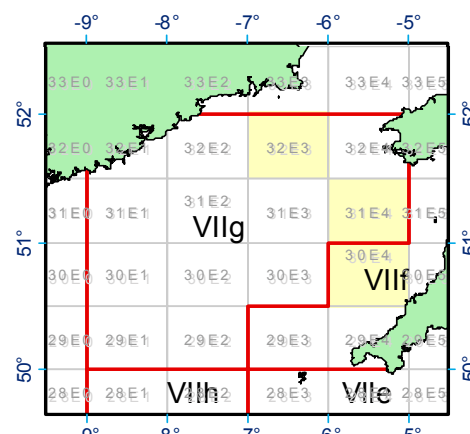
- (a) Article 5 shall apply where its application is expected to result in an increase in the quantities of mature fish of the northern hake stock concerned, at the end of the year of application of the TAC to a quantity equal to or greater than 100 000 tonnes;*
- (b) where the application of Article 5 is not expected to result in an increase in the quantities of mature fish of the northern hake stock concerned, at the end of the year of application of the TAC, to a quantity equal to or greater than 100 000 tonnes, the Council shall decide by a qualified majority, on a proposal from the Commission, on a TAC for the following year that is lower than the TAC resulting from the application of the method described on Article 5.”*

**(Divisions VIIe-k)**

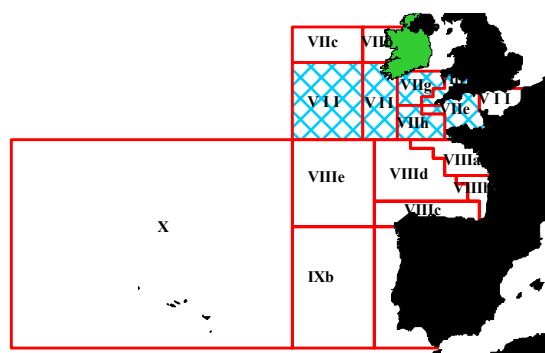


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The direct impact of the Trevose closure on the status of cod cannot be quantitatively disentangled from those of other factors. The displacement of fishing activities away from spawning aggregations is expected to have reduced fishing mortality on mature cod during the spawning season but the



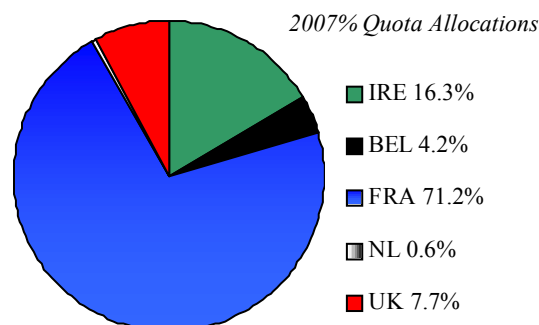
- The TAC area covers Divisions VIIb-k, and Sub-areas VIII, IX and X.
- The assessment area covers Divisions VIIe-k.
- The 2007 TAC was 4,743 t with an associated Irish quota of 775 t (adjusted to 807 t).
- In 2007 an area closure in February - March was implemented for all vessels and gears. The direct impact of this closure on the status of cod is difficult to quantify.
- There are no explicit management objectives or management plan for this stock.
- FSS recommends that management objectives be established and that a management plan be developed



Celtic Sea and Western Channel Cod



and implemented for fisheries catching cod. Any measures aimed at reducing discarding and improving the fishing pattern should be encouraged. These might include spatial and temporal changes in fishing practices or technical measures. These measures would need to be evaluated in the context of other species caught in these mixed fisheries.

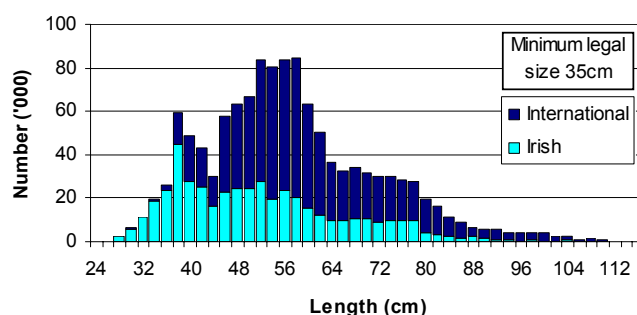


## ADDITIONAL INFORMATION

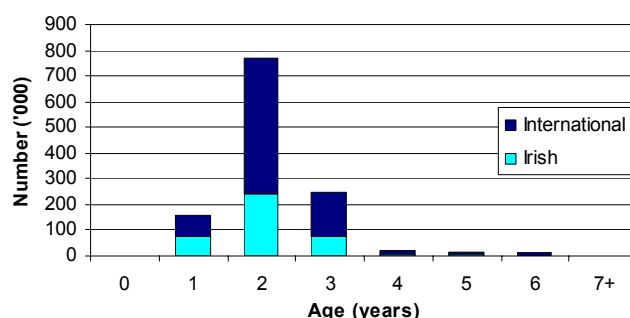
1. There are uncertainties in the catch data due to discarding, high-grading, and unreported landings. Although the change in French high-grading practices (in 2003–2005) has been corrected in the current assessment data there are still some uncertainties in the catch data. Discards are not included in this assessment.
2. There has been an increasing contribution of cod of age 1 in the 2007 French landings (from 5% in 2006 to 19% in 2007, for the gadoids fleet, and 2% to 9% respectively for the *Nephrops* fleet, for the first three quarters). This could indicate that the 2006 year class might be more abundant than the 2005 one.
3. Irish landings in 2006 were estimated at 958 t in Divisions VIIe-k.
4. There are indications of substantial underreporting of landings in some fleets.
5. The landings are dominated by 2 year old fish.
6. France took about 57% of the total reported landings in VIIe-k in 2006. Ireland, the UK and Belgium took about 28%, 11% and 3% of the 2006 landings respectively.
7. Most of the reported French landings are from the Lorient-based gadoid fleet.
8. Demersal trawlers and seiners from Dunmore East and Castletownbere and other ports in south west Ireland have traditionally targeted Celtic Sea cod during the spring. There is a well-established gill net fishery in the south east ports.
9. Information from the Irish fishing industry indicates an increase in numbers of cod in the 2007 spring fishery. This, coupled with the limited quota has led to a reported elevated discarding of cod captured in mixed fisheries in the Celtic Sea.

10. FSS commenced a cod tagging project with the fishing industry in the spring of 2007. 500 cod were tagged and released in the Celtic Sea Cod Box with a further 250 tagged and released in the mouth of Waterford Harbour. A return rate of 4% has been reported to date with the fish being recaptured mainly by the Irish and French fleet operating in the Celtic Sea. One recapture recorded by an angler fishing west of Liverpool is the only recapture to date from the Irish Sea.
11. FSS will also commence a cod recruitment survey in 2008.

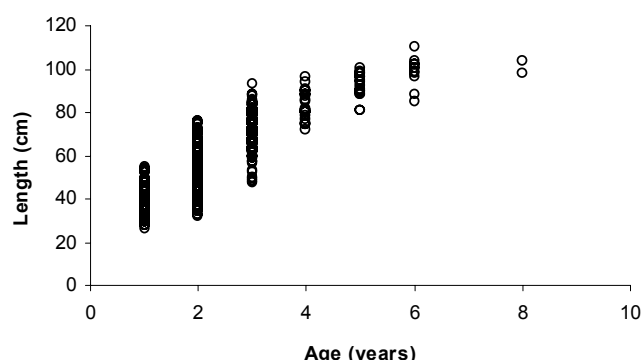
**2006 Length Distribution: International & Irish, Cod in VIIe-k**



**2006 Age Distribution: International & Irish, Cod in VIIe-k**



**2006 Size at Age: Irish Sampling, Cod in VIIe-k**



## ICES ADVICE

### 5.4.2

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Reduced reproductive capacity	Harvested sustainably	Overexploited	Undefined	$F_{sq}$ is higher than $F_{pa}$

Based on the most recent estimates of SSB ICES classifies the stock as remaining well below  $B_{lim}$  since 2004. Fishing mortality has been very high since the mid-1980s, although it has declined in recent years to below  $F_{pa}$  in 2006. Recruitment since 2002 has been well below average.

#### Management objectives

There are no specific management objectives or a management plan for this stock.

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	6 300 t	$B_{lim} = B_{loss} (B76)$ , the lowest observed spawning-stock biomass.
	$B_{pa}$	8 800 t	$B_{pa} = B_{lim} * 1.4$ . Biomass above this value affords a high probability of maintaining SSB above $B_{lim}$ , taking into account the variability in the stock dynamics and the uncertainty in assessments.
	$F_{lim}$	0.90	The fishing mortality estimated to lead to potential collapse.
	$F_{pa}$	0.68	$F_{pa} = 5^{th}$ percentile of $F_{loss}$ . This F is considered to have a high probability of avoiding $F_{lim}$ and maintaining SSB above $B_{pa}$ in the medium term (assuming normal recruitment), taking into account the uncertainty assessments.
Targets	$F_y$	Not defined.	

(unchanged since: 2004)

Yield and spawning biomass per Recruit  
F-reference points:

	Fish Mort Ages 2–5	Yield/R	SSB/R
Average last 3 years	0.75	2.02	2.56
$F_{max}$	0.33	2.34	7.71
$F_{0.1}$	0.20	2.20	12.49
$F_{med}$	0.70	2.06	2.82

#### Single-stock exploitation boundaries

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

Fishing mortalities close to  $F_{max} = 0.33$  can be considered as candidate target reference points, which are consistent with taking high long-term yields and achieving a low risk of depleting the productive potential. The present fishing mortality ( $F_{sq} = 0.75$ ) is above the candidate reference point.

#### Exploitation boundaries in relation to precautionary limits

Given the low stock size and recent poor recruitment, it is not possible to identify any non-zero catch which will be compatible with the precautionary approach. The forecast indicates that a zero catch in 2008 allows SSB to almost achieve  $B_{pa}$  in 2009.

## Short-term implications

### Outlook for 2008

Basis:  $F(2007) = F_{sq} = \text{mean } F(04-06)^3 = 0.75$ ;  $R = \text{GM02-05} = 1.6$  million;  $\text{SSB}(2007) = 5.15$  kt;  $\text{SSB}(2008) = 4.61$  kt; 1 landings (2007) = 3.85 kt.

Rationale	TAC(2008)	Basis	F(2008)	SSB(2009)	%SSB change <sup>1</sup>	% TAC change <sup>2</sup>
Zero catch	0.00	$F=0$	0.00	8.76	90%	-100%
High long-term yield	1.84	$F(\text{long-term yield})$	0.33	6.46	40%	-61%
Status quo	1.69	$F_{sq} * 0.4$	0.30	6.64	44%	-64%
	2.04	$F_{sq} * 0.5$	0.37	6.21	35%	-57%
	2.37	$F_{sq} * 0.6$	0.45	5.80	26%	-50%
	2.68	$F_{sq} * 0.7$	0.52	5.42	18%	-43%
	2.96	$F_{sq} * 0.8$	0.60	5.07	10%	-37%
	3.26	$F_{pa} = F_{sq} * 0.91$	0.68	4.71	2%	-31%
	3.48	$F_{sq} * 1$	0.75	4.44	-4%	-26%
	3.72	$F_{sq} * 1.1$	0.82	4.16	-10%	-21%

All weights in thousand tonnes.

Shaded scenarios are not considered consistent with the precautionary approach.

<sup>1</sup> SSB 2009 relative to SSB 2008.

<sup>2</sup> TAC 2008 relative to TAC 2007.

<sup>3</sup> Assumption for  $F_{2007}$  based on a mean  $F$  2004-2006 to take account of retrospective underestimation of  $F$ .  $F_{sq}$  is therefore higher than  $F_{2006}$ .

## Management considerations

Effort in the main fleet targeting cod has declined considerably since 1999. This has resulted in a decreased fishing mortality on cod. Even though the estimate of fishing mortality in 2006 is below  $F_{pa}$ , the current state of SSB makes it necessary to reduce  $F$  further to reach  $B_{pa}$  in the short term.

There are indications of substantial underreporting of landings in some fleets.

Since the majority of the landings consist of 1-, 2-, and 3-year-old fish, the catch forecast relies heavily on the recruitment assumption. In addition, cod in this area is a fast growing and early maturing fish, and thus also the predicted SSBs are highly dependent on the recruitment assumption.

The current assessment shows that since 2002 recruitment of Celtic Sea cod has been very weak. Consequently ICES used the average of the recent weak year classes as input for the short-term forecast.

There has been an increased contribution of cod of age 1 in the 2007 French landings. This could indicate that the 2006 year class might be more abundant than the 2005 one, but there is presently no firm estimate of the strength of the incoming recruitment.

Any measures aimed at reducing discarding and improving the fishing pattern should be encouraged. These might include spatial and temporal changes in fishing practices or technical measures. These measures would need to be evaluated in the context of other species caught in these mixed fisheries.

The direct impact of the Trevoise closure on the status of cod cannot be quantitatively disentangled from those of other factors. The displacement of fishing activities away from spawning aggregations is expected to have reduced fishing mortality on mature cod during the spawning season but the effects on other parts of the cod stock in the area are unknown (see also Special request on Trevoise closure, Section 5.3.3.1).

The assessment area covers Divisions VIIe-k and the ICES advice applies to these areas only; however, the TAC is set for Divisions VIIb-k, Subareas VIII, IX, X, and CECAF 34.1.1. Within this larger area there is no control over where the catches are taken. Current management measures for Divisions VIIe-k include cod in Divisions

VIIbc and cod in Division VIId. Cod in Division VIId is assessed together with cod in the North Sea. Whatever management measures are implemented, they must be consistent with the assessment area.

Cod in VIIe-k is caught in a range of fisheries including gadoid trawlers, *Nephrops* trawlers, otter trawlers, beam trawlers, and gillnetters. Other commercial species that are caught by these fisheries are haddock, whiting, *Nephrops*, plaice, sole, anglerfish, hake, megrim, and elasmobranchs.

### Ecosystem considerations

Cod in the Celtic Sea are at the southern limit of the range of the species in the Northeast Atlantic. It is known that at the southern limits of their range, recruitment tends to decrease in warmer waters (above 8.5°C) and that cod are not found in waters warmer than 12°C. It is at present unclear to what extent the recent poor recruitments are linked to increased water temperatures. The growth rates in the Celtic Sea are among the fastest observed for cod.

Most of the cod spawning in the Celtic Sea occurs off northern Cornwall in mid- to late March. There is also some spawning off southeast Ireland and a little in the Western Channel.

Previous tagging studies have given no evidence of cod movement out of Division VIIe and into VIIfg, where there appears to be a simple inshore-offshore migration between deepwater wrecks and reefs in the summer and inshore spawning areas in the winter. Past tagging work in the Irish Sea suggested that only a small component of cod landings from the Celtic Sea are fish which spawn in the Irish Sea. Furthermore, no cod tagged in the Celtic Sea were recaptured in the Irish Sea.

## Factors affecting the fisheries and the stock

Cod in Divisions VIIe-k are taken in mixed trawl fisheries. Landings are made mainly by French gadoid trawlers, which prior to 1980 were mainly fishing for hake in the Celtic Sea. Landings of cod by French *Nephrops* trawlers have fluctuated between 10% and 20% of the total French cod landings from this stock in recent years. Since 1988, Irish landings have accounted for on average 14% of the total, but in the last two years accounted for around 29%. UK and Belgium have contributed on average to 9% and 4%, respectively. Landings occur throughout the year, but mainly in the winter months during November to April, with a peak in February-March.

### *The effects of regulations*

Council Regulation (EC) No. 27/2005, Annex III, part A 12 (b) and Council Regulation (EC) No. 51/2006, Annex III, part A 4.2 prohibited fishing in ICES rectangles 30E4, 31E4, and 32E3 during January–March 2005 with some derogations in March, and during February and March 2006. The Council Regulation (EC) No 41/2006 reinstated the closure in February–March 2007. The direct impact of this closure on the status of cod cannot be quantified (see Section on Trevoze closure 5.3.3.1).

Since 1999, French fishing effort has decreased considerably: by 50% for all trawlers and by 65% for the gadoids fleets during the first quarter. This reduction is mostly due to a decrease in the number of vessels involved rather than to a reduction of the mean fishing time per vessel. Although this effort reduction has been initiated before the first year of the closure, the closure has probably been a strong incentive to a further reduction in effort of vessels targeting gadoids.

Technical measures applied to this stock are: a minimum mesh size for beam and otter trawlers in Subarea VII and a minimum landing size (MLS) of 35 cm. For Belgian trawlers that land in Belgium the MLS is 40 cm. Minimum landing sizes do not prevent cod from being caught (and thrown back dead), but might prevent targeting juvenile cod. Recent sampling programmes in countries exploiting this stock indicate that discarding is high and variable. They may account for 40–60% by number of all fish caught. These discards are mainly under the MLS. Qualitative analyses of observations at sea in 2005 have shown that discarding is more prominent in Divisions VIIe and VIIf,g than in VIIh–k, where small fish are less abundant.

Management regulations, particularly effort control regimes in other areas (Division VIIa, Subareas VI & IV), have become increasingly restrictive since 2004 and should not be allowed to result in a displacement of effort into the Celtic Sea.

### *Changes in fishing technology and fishing patterns*

In 2003 and 2004 there has been a substantial behavioural change in the main fisheries with regard to discarding. Discarding occurred in the last quarter of 2002 as the French fishery closed when the cod quota was exhausted.

In 2003–2004 there was substantial high grading of marketable small cod in order to prevent a new early closure of the fishery. This high-grading practice was much reduced in 2005, and discontinued in 2006.

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### **Scientific basis**

#### *Data and methods*

The analytical age-based assessment is based on landings, three surveys, and four commercial cpue series. Discard data are not included in the assessment.

#### *Information from the fishing industry*

Meetings with representatives of the fishing industry were held prior to this year's assessment in France, Republic of Ireland, and the UK. There was no major disagreement about the state of the stock in France but information from some professional organizations indicates that more small cod fish are currently fished in VIIe and cod also occur in areas where they were scarce before (Parsons Bank). All the Irish professional organizations mention that cod were extremely abundant and widespread in the Celtic Sea in spring 2007 and that the spring fishery was the best seen in many years. The Irish industry expressed concern that the reported landings may not reflect the true abundance of cod seen by their members due to discarding, limiting quotas and other factors. The Irish industry questioned the accuracy of recent recruitment

estimates in the 2006 WG assessment. They reported that the 2007 fishery seemed to consist of a broad length range of fish, suggesting not only that the 2005 year class was strong but also that the 2004 and 2003 year classes were also better than estimated in last year's assessment.

The industry has been cooperative in a number of scientific endeavours with regards to this stock. The fisheries science partnership conducted cooperatively between CEFAS and the UK industry has provided information on the relative age compositions, suggesting that the main year-class signals are captured by the assessment.

### *Uncertainties in assessment and forecast*

There are uncertainties in the catch data due to discarding, high-grading, and unreported landings. Although the change in French high-grading practices (in 2003–2005) has been corrected for in the current assessment data there are still some uncertainties in the catch data.

Most of the abundance estimates come from commercial fleets operating on different components of the stock (VIIe, VIIfgh, VIIj). Because of the low cod abundance, the calculated abundance indices for the UK and French surveys are based on very few cod. Nevertheless, both surveys give some indication of year-class strength, especially when a large year class comes through.

The predicted values of landings and SSB are heavily dependent on the recruitment assumption used. In this case a low recruitment has been used in line with recent observations from the stock. This is considered the most likely scenario. However, there has been an increasing contribution of cod of age 1 in the 2007 French landings (from 5% in 2006 to 19% in 2007, for the gadoids fleet, and 2 to 9% respectively for the *Nephrops* fleet, for the first three quarters) could indicate that the 2006 year class might be more abundant than the 2005 one. There is no firm estimate of the strength of the incoming recruitment.

### *Comparison with previous assessment and advice*

The results of this assessment are consistent with those of last year in terms of trends in fishing mortality, SSB, and recruitment. For the most recent years F has been revised upwards by less than 10%, while SSB estimates have remained more or less the same.

The advice and the basis for this advice is the same as last year.

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### **Source of information**

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 26 June–5 July 2007 (ICES CM 2007/ACFM:28).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC <sup>1</sup>	ACFM Landings <sup>6</sup>
1987	Reduce F	< 6.4 <sup>2</sup>		10.2
1988	No increase in F; TAC	7.0 <sup>2</sup>		17.2
1989	No increase in F; TAC	8.6 <sup>2</sup>		19.8
1990	No increase in F; TAC	9.2 <sup>2</sup>		12.7
1991	TAC; SSB = mean	4.5 <sup>2</sup>		9.3
1992	Appropriate to reduce F	-		9.7
1993	20% reduction in F	6.5 <sup>2</sup>	19.0	10.4
1994	20% reduction in F	5.6 <sup>2</sup>	17.0	10.6
1995	20% reduction in F	4.7 <sup>3</sup>	17.0	11.7
1996	20% reduction in F	4.7 <sup>3</sup>	20.0	12.6
1997	20% reduction in F	7.4 <sup>4</sup>	20.0	12.0
1998	10% reduction in F	8.8 <sup>4</sup>	20.0	11.4
1999	Reduce F below $F_{pa}$	9.2 <sup>4</sup>	19.0	8.6
2000	Reduce F below $F_{pa}$	< 7.6 <sup>5</sup>	16.0	6.5
2001	40% reduction in F	< 4.3 <sup>5</sup>	10.5	8.3
2002	45% reduction in F	< 5.3 <sup>5</sup>	8.7	9.4
2003	60% reduction in F	< 3.8 <sup>5</sup>	6.7	6.2
2004	90% reduction in F or management plan	< 0.7	5.7	3.5
2005	17% reduction in F	< 5.2	6.2	3.1
2006	No increase in effort [should have been reduce effort]	Cannot be estimated	5.6	3.3
2007	Zero catch	0	4.7	
2008	Zero catch	0		

Weights in '000 t.

<sup>1</sup>TAC covers Subareas VII (except Division VIIa) and VIII.

<sup>2</sup>For the VII-f+g stock component.

<sup>3</sup>For the VII-f-h stock component.

<sup>4</sup>For the VII-e-h stock component.

<sup>5</sup>For the VII-e-k stock component.

<sup>6</sup>ACFM landings for the period 1988–2002 revised.

Cod in Divisions VII-e-k

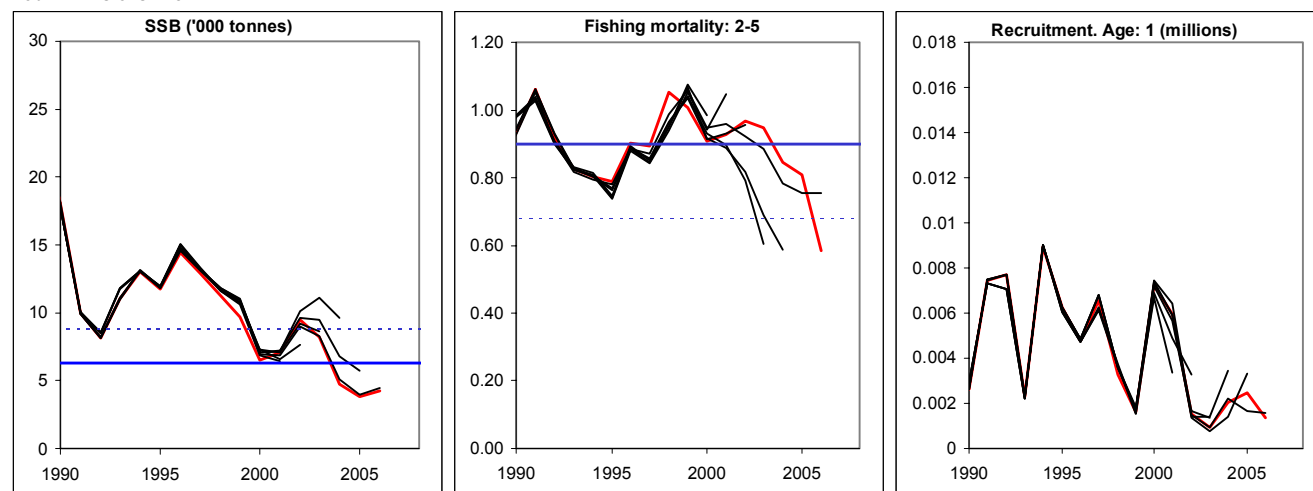
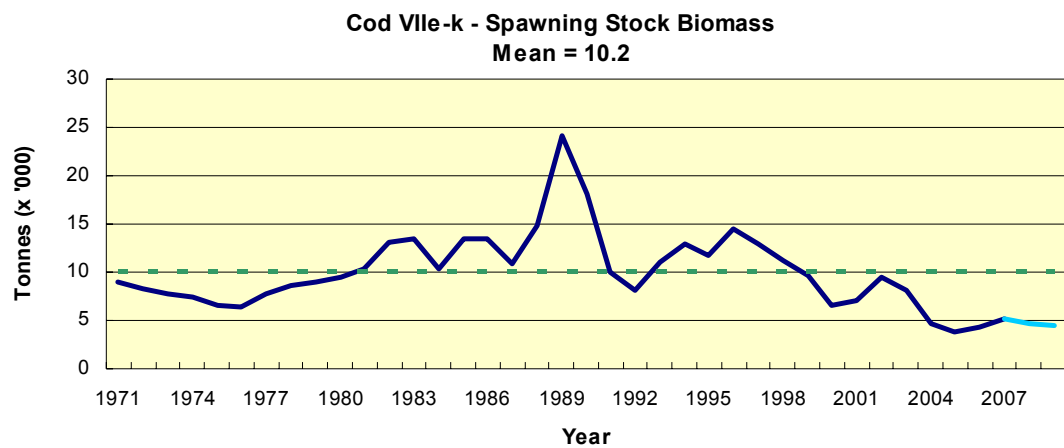
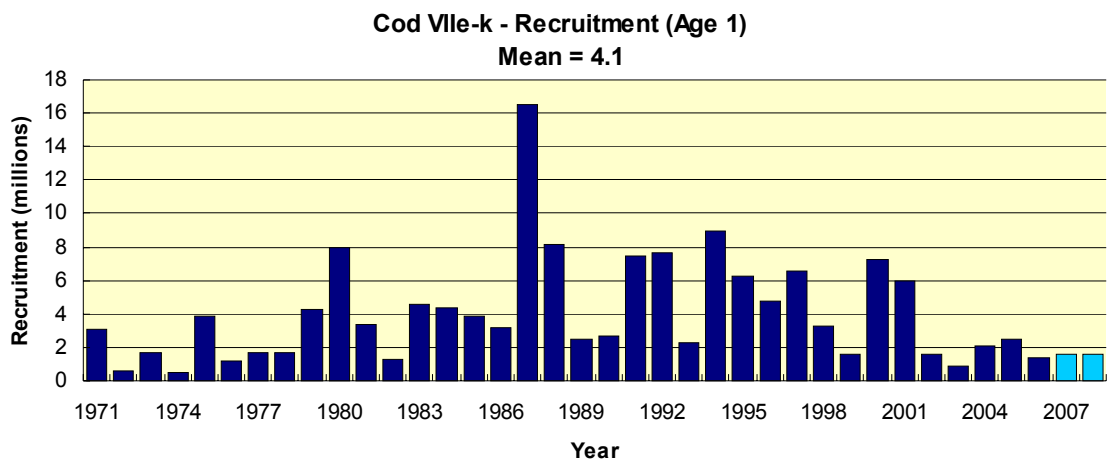
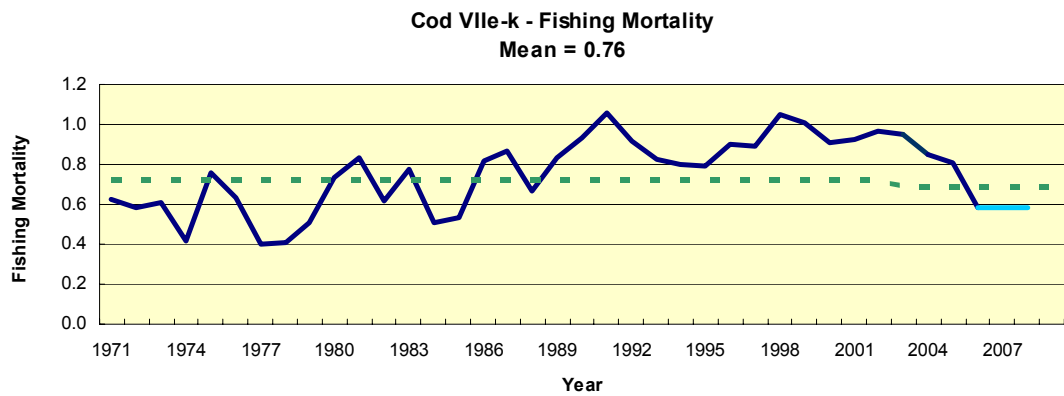
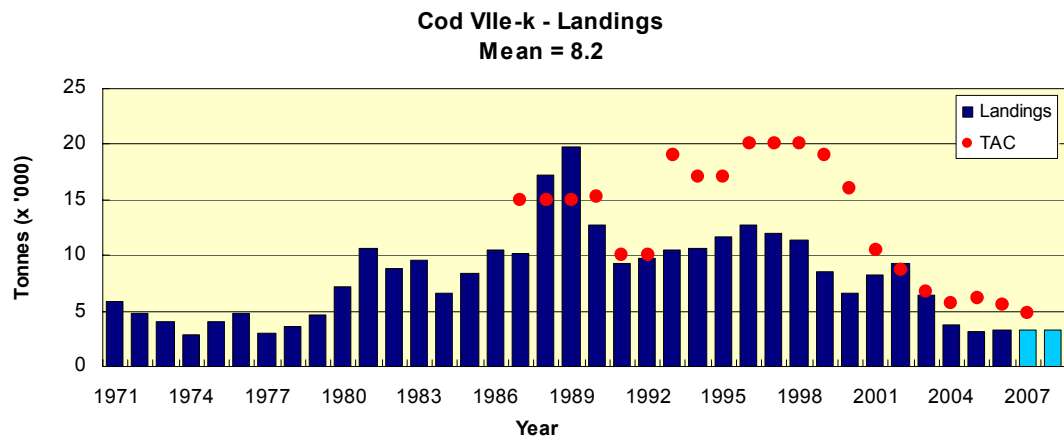


Figure 5.4.2.3 Cod in Divisions VII-e-k. Historical performance of the assessments.



**Table 5.4.2.1      Nominal landings of Cod in Divisions VII e-k  
used by the Working Group**

<b>Year</b>	<b>Belgium</b>	<b>France</b>	<b>Ireland</b>	<b>UK</b>	<b>Others</b>	<b>Total</b>
1971						5782
1972						4737
1973						4015
1974						2898
1975						3993
1976						4818
1977						3058
1978						3647
1979						4650
1980						7243
1981						10596
1982						8766
1983						9641
1984						6631
1985						8317
1986						10475
1987						10228
1988	554	13863	1480	1292	2	17191
1989	910	15801	1860	1223	15	19809
1990	621	9383	1241	1346	158	12749
1991	303	6260	1659	1094	20	9336
1992	195	7120	1212	1207	13	9747
1993	391	8317	766	945	6	10425
1994	398	7692	1616	906	8	10620
1995	400	8321	1946	1034	8	11709
1996	552	8981	1982	1166	0	12680
1997	694	8662	1513	1166	0	12035
1998	528	8096	1718	1089	0	11431
1999	326	5488	1883	897	0	8594
2000	208	4281	1302	744	0	6535
2001	347	6033	1091	838	0	8309
2002	555	7489	694	618	0	9356
2003	136	5222	517	346	0	6221
2004	153	2425	663	282	0	3523
2005	186	1686	870	309	0	3051
2006*	103	1889	958	367	0	3317

\* provisional

Scaled landings 1971-1987 (SSDS WG 1999)

**Table 5.4.2.2** Cod in Divisions VIIe–k

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2–5
1971	3075	8939	5782	0.628
1972	565	8221	4737	0.582
1973	1665	7673	4015	0.610
1974	500	7410	2898	0.419
1975	3889	6622	3993	0.755
1976	1202	6301	4818	0.632
1977	1714	7694	3059	0.399
1978	1690	8625	3647	0.405
1979	4249	8951	4650	0.507
1980	7910	9461	7243	0.734
1981	3357	10357	10597	0.831
1982	1338	13045	8766	0.620
1983	4620	13484	9641	0.775
1984	4327	10403	6631	0.510
1985	3903	13463	8317	0.532
1986	3232	13454	10475	0.815
1987	16555	10809	10228	0.864
1988	8189	14770	17191	0.664
1989	2488	24155	19809	0.833
1990	2645	18023	12749	0.935
1991	7461	10002	9336	1.061
1992	7707	8142	9747	0.916
1993	2282	11018	10425	0.825
1994	8958	13004	10620	0.804
1995	6249	11737	11709	0.790
1996	4784	14410	12681	0.903
1997	6575	12865	12035	0.894
1998	3278	11228	11431	1.054
1999	1612	9688	8594	1.008
2000	7218	6525	6536	0.907
2001	5968	7105	8308	0.928
2002	1552	9466	9356	0.967
2003	913	8187	6420	0.947
2004	2053	4733	3672	0.847
2005	2445	3840	3128	0.809
2006	1371	4237	3317	0.584
2007	1633*	5154		
Average	4098	10224	8238	0.758

\* GM 2002–2005.



# West of Ireland Cod

## (Divisions VIIb,c)



*Marine Institute*  
Foras na Mara

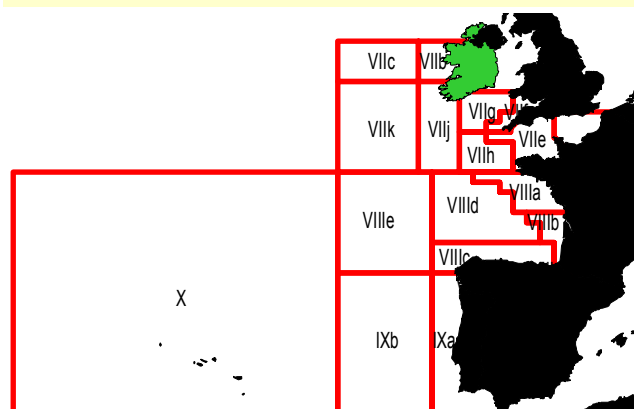
Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

**The state of this stock is unknown.**

**There is no official ICES advice for this stock. FSS advises that catches in 2008 should be no more than the recent average (2004 to 2006) of around 52 t in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.**



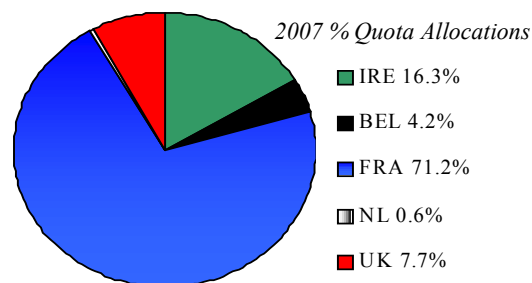
Red Boxes-TAC/Management Areas

### CURRENT MANAGEMENT

- The TAC area covers Divisions VIIb-k, Sub-areas VIII, IX X and CECAF 34.1.1 (Madeira). The TAC in 2007 was set at 4,743 t with an associated Irish quota of 775 t (adjusted to 807 t).
- FSS recommend that management objectives be established and that a management plan be developed and implemented for fisheries catching haddock.

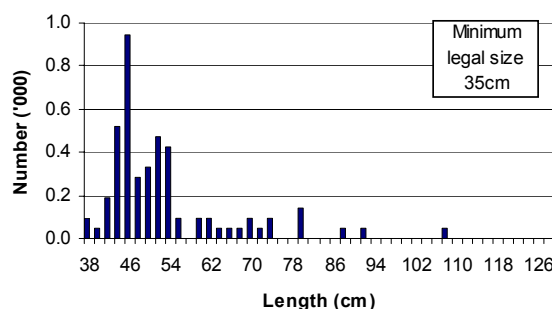
### ADDITIONAL INFORMATION

- Estimated total landings in 2006 were the lowest in the time series (24.3 t).
- Irish landings in 2006 were estimated as 14 t.
- Ireland is the major participant in this fishery. The UK and France land the remainder. Cod are caught in mixed species otter trawl fisheries in VIIb,c by vessels operating from Killybegs, Rossaveal and Dingle.
- Cod are an economically valuable by-catch in fisheries targeting anglerfish, megrim and *Nephrops* in this area.

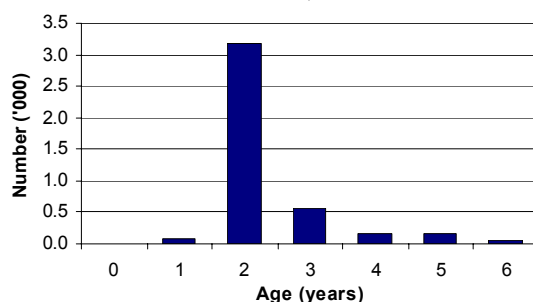


- FSS data on discarding of cod in this area is limited but discards are considered to be negligible.
- The linkages between Cod in Divisions VIIb,c and adjacent areas is unclear. Until the dynamics of these cod stocks are resolved the ICES Assessment Working Group will continue the collation of data on Division VIIb,c cod separately.

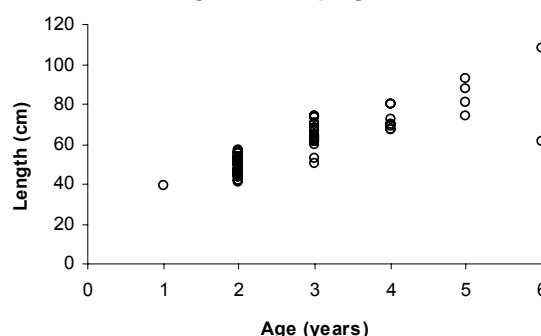
2006 Length Distribution: Irish Landings (Beam, Otter trawlers & Gill Netters), Cod in VIIb, c



2006 Age Distribution: Reported International Landings, Cod in VIIb, c



2006 Size at Age: Irish Sampling, Cod in VIIb, c



Nominal Landings (t) of Cod in Division VIIb,c for 1995-2006

COUNTRY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
France	91	115	71	44	... <sup>1</sup>	46	38	54	33	13	16	8
Germany	-	-	3	-	-	-	-	-				
Ireland	282	353	177	234	154	141	107	59	59	60	32	14.3
Netherlands	-	-	-	-	-	-	+	-	1			
Norway	3	1	6		11	+*	1	5				1
Spain	6	3		6	2	3	1	1				
UK(E/W/Nl)	25	35	37	25	4	4	2	1	8			
UK(Scotland)	66	12	7	9	1	-		1	1	10		
UK												1
TOTAL	473	519	301	318	172	194	150	122	102	83	48	24.3

# West of Ireland and Celtic Sea Haddock

## (Divisions VIIb-k)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

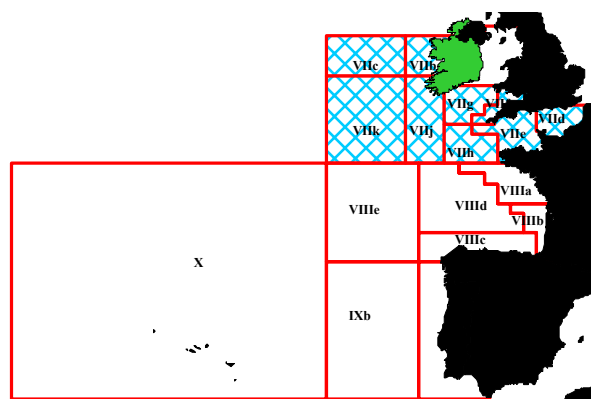
The assessment is considered to be indicative of trends only. The trends indicate that the SSB peaked in 2004 and has been declining since.

Due to high levels of discarding, the fleets have not fully benefited from the good recruitments in 1999–2002. No strong recruitment has been observed since 2002 and estimated recruitment for 2006 is the lowest since 1997. In this context FSS agrees with the ICES advice that the stock should be managed by ensuring that the effort is not allowed to increase, rather than by TAC management. The main focus of management should be to substantially reduce discarding in Celtic Sea fisheries to maximise yield and SSB from future recruitment. Haddock are taken in a mixed demersal trawl fishery with cod, whiting, plaice and management advice needs to be considered in that context.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For West of Ireland and Celtic Sea Haddock, FSS interprets that the proposal would be to prevent expansion of the fishery. This may result in the 2007 TAC of 11,520 t being maintained in 2008.

### CURRENT MANAGEMENT

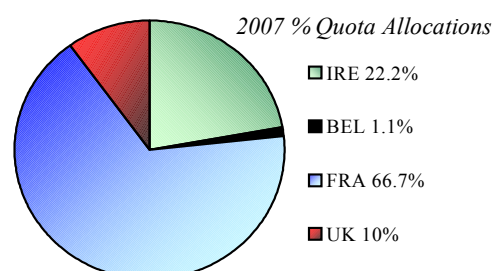
- The TAC area traditionally covers Sub-areas VII, VIII, IX, X and CECAF 34.1.1 with a separate TAC introduced for Division VIIa in 2004.
- In 2007, the TAC for Sub-areas VII, VIII, IX, X and CECAF 34.1.1 was the same as the previous year at 11,520 t with an associated Irish quota of 2,560 t
- There are no explicit management objectives or management plan for this stock.
- FSS recommends that a well defined management plan is necessary for Celtic Sea mixed fisheries.



Red Boxes-TAC/Management Areas Blue Shading- Assessment Area

### ADDITIONAL INFORMATION

1. Discard estimates have been included in the assessment for this stock, but discard data are primarily from Irish Sources, which might not be representative of the international catch. Discard data from France (which takes the majority of the landings) are only available from 2005 onwards. Nevertheless, strong yearclasses can be tracked through the available discard data and followed through in the landings data. It is considered that inclusion of discard data has improved the assessment.
2. In the last 5 years, the numbers of discarded haddock by Irish Otter trawlers indicate that discarding levels are considerable (around 50% of the catch by weight and around 80% of the catch by numbers) but levels are highly variable between fleets and areas. Discarding in 2005 and 2006 by the French and UK fleets also show high levels of discarding of smaller haddock.
3. Irish landings in 2006 were estimated to be 1,838 t.
4. Demersal trawlers from Dunmore East and Castletownbere and other ports in south-west Ireland have traditionally caught Celtic Sea haddock in a mixed trawl fishery. Poor catches and catch restrictions elsewhere have attracted vessels from Greencastle, Co. Donegal to this fishery in recent years.
5. In recent years, France has taken about 55-75% of the landings. Ireland has taken 20-35% with the remainder taken mostly by Belgium, the UK and Spain.



6. Haddock are caught in a mixed demersal fishery targeting haddock, cod and whiting. Management advice needs to be considered in that context.
7. Levels of misreporting are unknown for this fishery. Misreporting was previously not considered to be a problem because the TAC has always been in excess of landings. There is evidence of underreporting for some of the fleets, particularly in recent years, although it remains difficult to quantify.
8. The Irish groundfish survey provides useful data on the distribution, abundance and stock structure for haddock in this area. The west coast is an important nursery area as is the northern part of Division VIIg. There are also indications of migrations of haddock from Division VIIb to the southern part of VIa.

## ICES ADVICE

### 5.4.4

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Undefined	Undefined	Unknown	Undefined

The state of the stock is uncertain. Fishing mortality appears to be relatively stable. Recruitment is highly variable. Several high recruitments in 1999–2002 led to an increase in spawning-stock biomass to the highest level of the series in 2004, and SSB appears to have been declining since.

#### Management objectives

There are no explicit management objectives for this stock.

#### Reference points

No precautionary reference points have been established.

#### Single-stock exploitation boundaries

##### *Exploitation boundaries in relation to precautionary considerations*

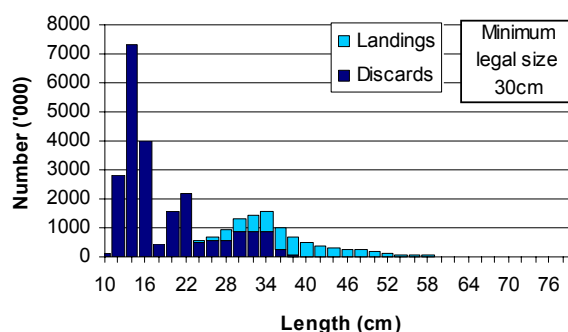
Future catches and SSB will be highly dependent on the strength of incoming year classes and their discard mortality. No strong recruitment has been observed since 2002 and estimated recruitment for 2006 is the lowest since 1997. In this context the stock should be managed by ensuring that fishing effort is not allowed to increase.

#### Management considerations

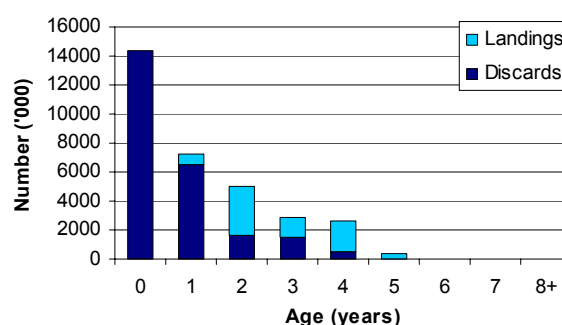
This haddock stock is subject to high discard rates. Therefore TAC management for this species is not very effective.

Due to high levels of discarding, the fleets have not fully benefited from the good recruitments in 1999–2002. Any measure to reduce discarding and to improve the fishing pattern should be encouraged. These might include spatial and temporal changes in fishing practices or technical measures such as increased cod-end mesh size, square-mesh panels, separator trawls, and increased top sheet mesh in towed gears. These measures would need to be evaluated in the context of other species caught in these mixed fisheries.

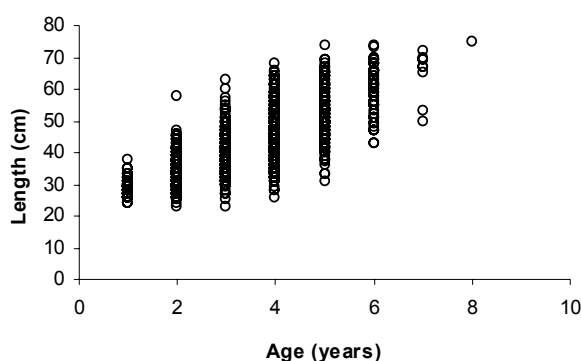
**2006 Length Distribution: International Landings and Discards, Haddock in VIIb-k**



**2006 Age Distribution: International Landings and Discards, Haddock in VIIb-k**



**2006 Size at age: Irish Sampling, Haddock in VIIb-k**



There is some recent information of species misreporting (where haddock was reported as whiting) in some fleets for the years when haddock quotas were restrictive. It is not possible for ICES to evaluate the scale of this problem and the assessment is largely based on landings as reported in logbooks.

Within the large management area there is no control over where the catches are taken. Current management measures for Divisions VIIb–k include haddock in Division VIIa. Whatever management measures are implemented, they must be consistent with the assessment area.

#### *Ecosystem considerations*

Stocks of haddock in Divisions VIa, VIIa, and VIIb–k have shown different growth rates and patterns of recruitment variation during the 1990s. This may reflect latitudinal variations in environmental conditions. Catches of haddock along the Atlantic seaboard of the British Isles are recorded more or less continuously between the west coast of Scotland and the Celtic Sea. Significant genetic differences have been found between samples collected at much smaller spatial scales than the entire west coast of the British Isles (ICES: WGNSSD, 1999). Further investigation is needed to better define the biological stock units.

## Factors affecting the fisheries and the stock

Haddock in Divisions VIIb–k are mainly taken in mixed trawl fisheries. These are mainly otter trawlers, including gadoid trawlers and *Nephrops* trawlers and to a lesser extent beam trawlers.

### Regulations and their effects

Technical measures applied to this stock include a minimum landing size ( $\geq 30$  cm) and the minimum mesh sizes applicable to the mixed demersal fisheries. Given the observed discarding rates in some towed gears there is a mismatch between minimum mesh sizes in these mixed demersal fisheries and the MLS.

The closure of three rectangles in the Celtic Sea was in place during the first quarter of 2005, 2006, and 2007 to protect the cod stock. The impact of this on haddock remains unclear, but the Irish landings data suggest that landings from these rectangles are minor (see Section on Trevose closure 5.3.3.1).

### Changes in fishing technology and fishing patterns

There have been major changes in fleet dynamics over the period of the assessment. Effort in the French gadoid fleet has been declining since 1999. Irish otter trawl effort in VIIg,j has been stable over the last 4 years, but there has been a shift in effort from VIIj to VIIg. During this period there has been a fleet modernization and a decommissioning scheme in Ireland.

### The environment

Recruitment of haddock in this area is highly variable and as yet it has not been possible to link this to specific environmental drivers. Survey data show that the distribution of haddock varies with age; young haddock from Division VIIb move to deeper waters and possibly into Division VIaS as they grow, while migration patterns of haddock in Division VIIg are more variable. The spatial distribution of haddock and their length-at-age data suggest that Divisions VIIb and VIaS might be the same stock, and other biological parameters also do not show obvious spatial patterns.

## Scientific basis

### Data and methods

An age-based analytical assessment was carried out for this stock and is considered to be indicative of trends only. The assessment used landing and discard data, two commercial cpue series, and two surveys.

### Information from the fishing industry

Meetings with representatives of the fishing industry were held prior to the assessment group in Ireland, France, and the UK. No specific issues were raised about the state of this stock or its assessment.

### Uncertainties in assessment and forecast

The discards used in the assessment are derived from a small number of trips within one fleet that is not the largest component of the overall fishery.

There are some concerns about the accuracy of the landings statistics in some fleets.

### Comparison with previous assessment and advice

As last year, there was no agreed assessment.

The advice last year is based on no increase in F. This year a non-increase in fishing effort is advised.

## Sources of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks (ICES CM 1999/ACFM:04).

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 26 June–5 July 2007 (ICES CM 2007/ACFM:28).

Year	ICES Advice	Predicted catch corresp. To advice	Agreed TAC <sup>1</sup>	Official Landings <sup>2</sup>	ACFM landings	Discards	ACFM Catch
1987	Not dealt with			3.0	2.6	na	2.6
1988	Not dealt with			4.0	3.6	na	3.6
1989	Not dealt with			4.2	3.2	na	3.2
1990	Not dealt with			2.9	2.0	na	2.0
1991	Not dealt with			2.9	2.3	na	2.3
1992	Not dealt with			2.9	2.7	na	2.7
1993	Not dealt with			3.4	3.3	1.5	4.8
1994	Not dealt with			4.1	4.1	1.5	5.6
1995	Not dealt with		6	4.5	4.5	1.6	6.1
1996	Not dealt with		7 <sup>3</sup>	6.7	6.8	2.5	9.3
1997	Not dealt with		14	10.3	10.8	2.9	13.8
1998	Not dealt with		20	7.4	7.7	0.6	8.3
1999	Not dealt with		22 <sup>5</sup>	5.2	5.0	0.6	5.6
2000	No expansion of catches		16.6 <sup>5</sup>	6.7	7.6	6.2	12.8
2001	No expansion of catches		12 <sup>5</sup>	9.7	8.7	3.3	12.1
2002	No expansion of catches	8.0	9.3 <sup>5</sup>	7.1	6.8	10.8	17.6
2003	No expansion of catches	7.2	8.185 <sup>5</sup>	8.2	8.4	9.1	17.4
2004	No increase in F	-	9.600 <sup>5</sup>	8.5	8.6	11.7	20.3
2005	No increase in effort	-	11.520 <sup>5</sup>	6.9	6.6	8.2	14.9
2006	No increase in effort	-	11.520 <sup>5</sup>	5.0 <sup>4</sup>	5.4	4.0	9.4
2007	No increase in effort	-	11.520 <sup>5</sup>				
2008	No increase in effort	-	-				

Weights in '000 t.

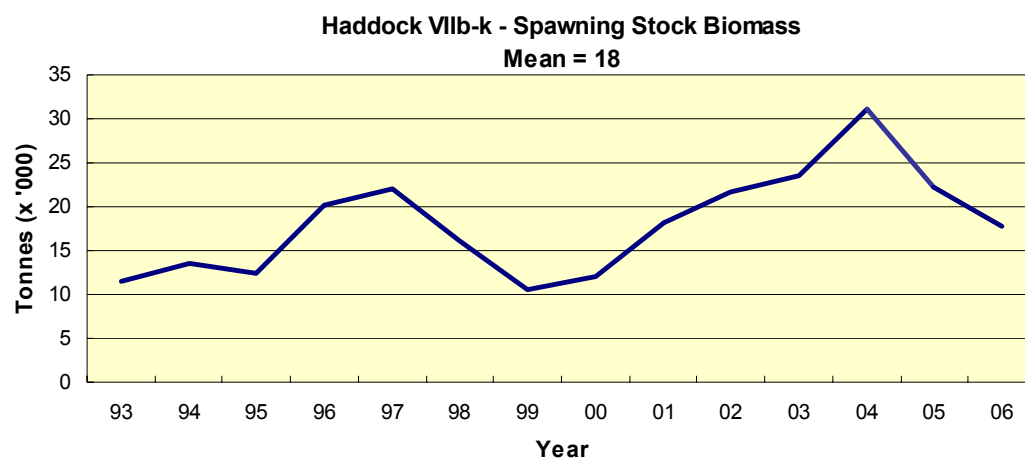
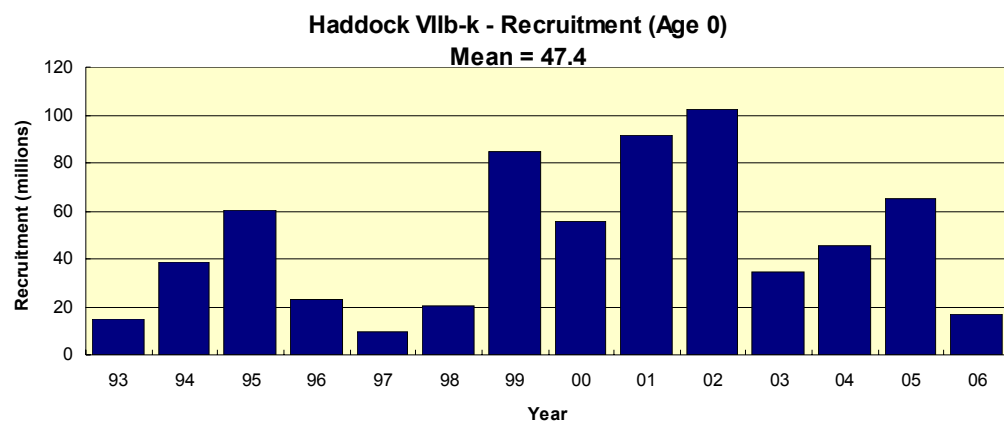
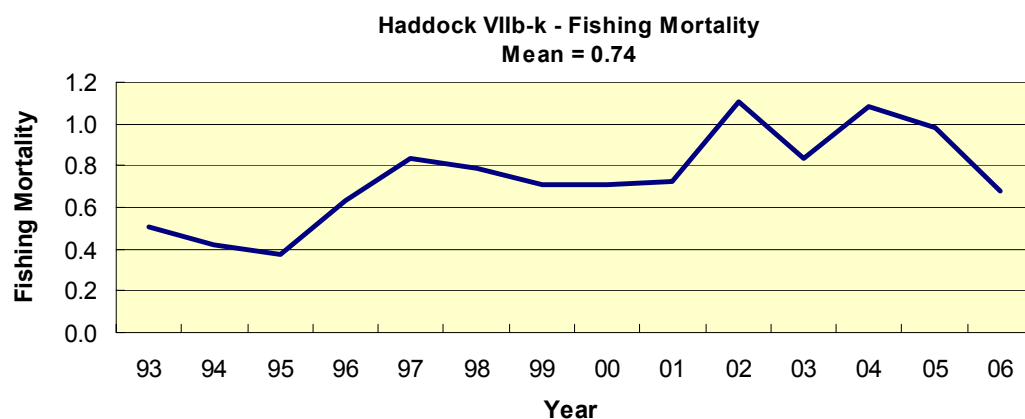
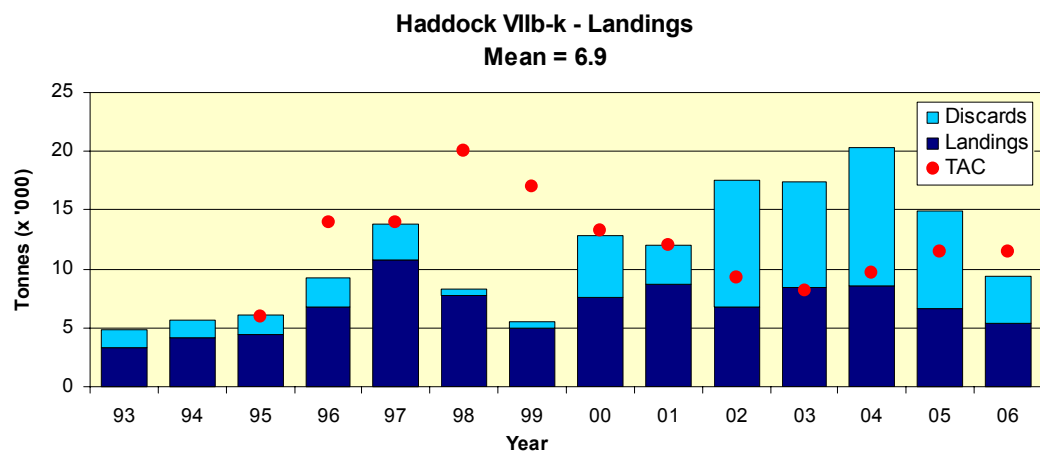
<sup>1</sup>Applies to Subareas VII, VIII, IX, and X.

<sup>2</sup>Possible underestimates due to misreporting.

<sup>3</sup>Increased in-year to 14 000 t.

<sup>4</sup>Incomplete official statistics.

<sup>5</sup>Includes separate Division VIIa allocation.



**Table 5.4.4.1** Nominal landings (t) of haddock in VIIb-k, officially reported to ICES and total landings used by the working group.

Year	Official landings					Un-allocated	Used by WG	
	Belgium	France	Ireland	UK	Others		Landings	Catch
1984	0	3328	646	403	549	4926		
1985	4	2438	794	175	565	3976		
1986	6	2279	317	245	86	2933		
1987	12	2380	314	273	0	2979		
1988	64	3275	275	409	0	4023		
1989	117	3412	323	295	27	4174		
1990	22	2110	461	318	31	2942		
1991	18	1508	1020	250	97	2893		
1992	21	1461	1073	306	26	2887		
1993	51	1839	1262	256	0	3408	3348	1496**
1994	123	2788	908	240	17	4076	4131	1496**
1995	189	2964	966	266	83	4468	4470	1612
1996	133	4527	1468	439	86	6653	6756	2554
1997	246	6581	2789	569	85	10270	10827	2930
1998	142	3674	2788	444	312	7360	7668	632
1999	51	2725	2034	278	159	5247	5027	561
2000	90	3088	3066	289	123	6656	7625	5199
2001	165	4842	3608	422	665	9702	8746	3307
2002	132	4348	2188	315	106	7089	6813	10771
2003	118	5781	1867	393	82	8241	8371	9050
2004	136	6130	1715	313	159	8453	8581	11692
2005	167	4174	2037	292	197	6867	6648	8224
2006*	100	2786	1838	273	24	5021	5378	4021
							357	9399

\* preliminary

\*\* No discard data available, the average effort for 1995-1999 was used to estimate discards

# Celtic Sea and Western Channel Whiting

(Division VIIe-k)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

The assessment is considered to be indicative of trends only. There is a downward trend in the SSB since 1995. Recruitment has been stable since 2000 but F has increased in recent years.

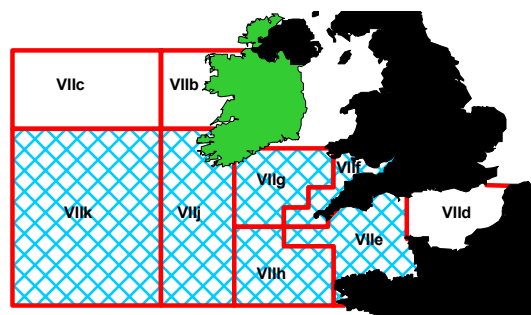
FSS agrees with the ICES advice of a decrease in F. However, FSS considers that implementation of this is difficult as the TAC for this stock also includes whiting in Division VIIId and Divisions VIIb,c. Whiting in VIIId are considered part of the North Sea stock and are assessed as such. Whiting in VIIb,c are not assessed. The advice for the VIIId stock is based on a larger reduction in landings than would be appropriate for the Divisions VIIe-k stock, potentially leading to unbalanced exploitation within the TAC area. For the VIIe-k stock, a reduction in recent landings would be required to reduce F. Furthermore, management advice should focus on a reduction in discarding and improvement of the fishing pattern. Whiting are taken in a mixed demersal trawl fishery with cod, haddock, plaice, and *Nephrops* and management advice needs to be considered in that context.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45) For Celtic Sea and Western Channel Whiting, FSS interprets that the proposal would result in the 2007 TAC being reduced by up to 15% to 16,950 t in 2008.

Although uncertain, it is unlikely that the current fishing mortality is low enough to lead to high long-term yields (F0.1). Fishing at a lower mortality would lead to higher SSB and therefore reduce the risk of bringing the stock outside precautionary limits.

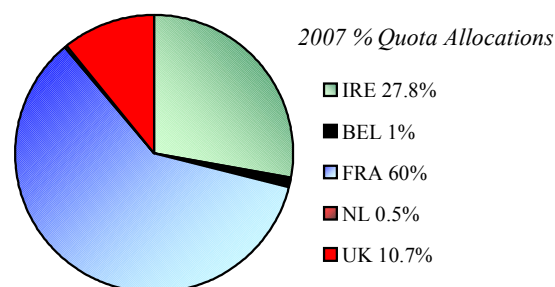
## CURRENT MANAGEMENT

- The TAC area covers Divisions VIIb-k, and the assessment area covers Divisions VIIe-k.
- The 2007 TAC was the same as the previous year at 19,940 t with an associated Irish quota of 5,544 t. (adjusted 6,122 t)



Red Boxes-TAC/Management Areas Blue Shading- Assessment Area

- There are no explicit management objectives or plan for this stock.
- FSS recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching whiting.



## ADDITIONAL INFORMATION

1. Discard levels of whiting are very high and are not included in this assessment. This leads to considerable assessment uncertainty, particularly when strong year classes enter the fishery. Substantial discarding levels may imply that estimates of F and catch numbers are too low, particularly at younger ages.
2. Discard rates for the UK fleets and the French gadoid fleet appear to be quite similar (~45% by number and 33% by weight). The discarding rates of the French *Nephrops* fleet are lower (~18% by number and 5% by weight). Irish discard sampling intensity was substantially reduced in 2006 due to the non-cooperation of the industry with the sampling programme.
3. Irish landings in 2006 were estimated to be about 4,509 t.
4. The level of misreporting of this stock is not known. Under-reporting has previously been considered unlikely because the TAC has been in excess of recent landings. There is some recent evidence of over-reporting, caused by species misreporting, in some fleets. However it was not possible to quantify whether this has occurred over an extended period, or in all fleets.



5. Demersal trawlers from Dunmore East and Castletownbere and other ports in south-west Ireland have traditionally caught Celtic Sea whiting in a mixed trawl fishery. Poor catches and catch restrictions elsewhere have attracted vessels from Greencastle, Co. Donegal to this fishery in recent years.

## ICES ADVICE

### 5.4.6

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Unknown	Undefined	Unknown	NA

The state of the stock is uncertain. The available information is inadequate to evaluate the spawning stock in relation to precautionary approach reference points. The assessment is indicative of trends only. The stock is estimated to have declined in recent years as the strong 1999 year class passed through the fishery. There are indications that recent recruitment is low. Fishing mortality in the most recent decade appears to be lower than in the decade before.

#### Management objectives

There are no specific management objectives for this stock.

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	15 000 t	$B_{lim} = B_{loss}$ , the lowest observed spawning-stock biomass.
	$B_{pa}$	21 000 t	$B_{pa} = B_{lim} * 1.4$ . Biomass above this affords a high probability of maintaining SSB above $B_{lim}$ , taking into account the uncertainty of the assessment.
	$F_{lim}$	Not defined.	
	$F_{pa}$	Not defined.	
Targets	$F_y$	Not defined.	

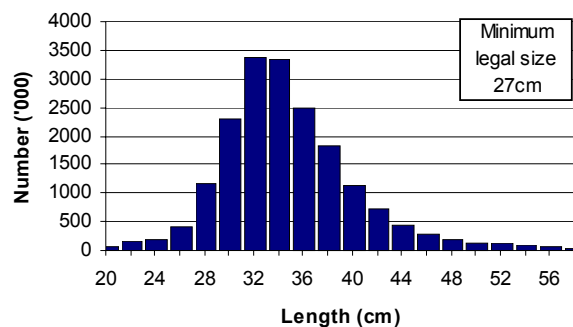
(unchanged since: 1998)

#### Single-stock exploitation boundaries

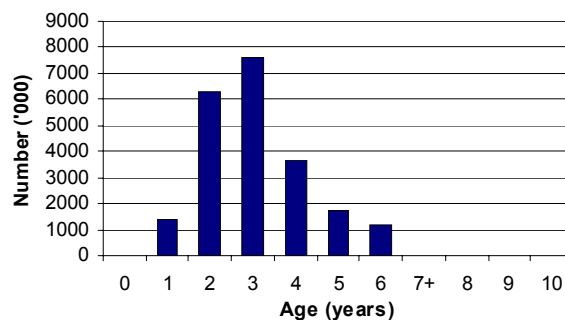
##### Exploitation boundaries in relation to precautionary limits

The current estimates of fishing mortality and SSB are uncertain, but SSB shows a decreasing trend while recruitment is low. In order to reverse this trend, ICES considers that fishing mortality should be reduced. However, ICES cannot quantify the required reduction in fishing mortality.

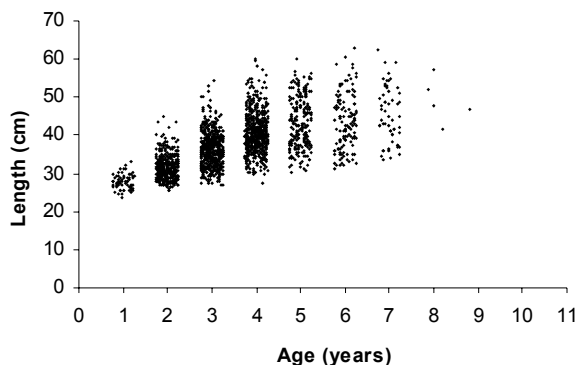
#### 2006 Length Distribution: International Landings, Whiting in VIIe-k



#### 2006 Age Distribution: International Landings, Whiting in VIIe-k



#### 2006 Size at age: Irish Sampling, Whiting in VIIe-k



#### Management considerations

This assessment area (VIIe-k) does not correspond to the TAC area (VIIb-k), whiting in VIIb,c are not assessed and whiting in VIId are included in the WGNSSK assessment of the North Sea stock. Whatever management measures are implemented, they must be consistent with the assessment area.

Whiting are caught in directed gadoid and mixed fisheries throughout the Celtic Sea. Discard rates are high due to the low market value particularly of smaller sizes of the species. High-grading above the MLS is also prevalent in most fisheries. The current assessment does not include discard estimates.

Any measure to reduce discarding and to improve the fishing pattern should be encouraged. These might include spatial and temporal changes in fishing practises or technical measures such as increased cod-end mesh size, square mesh panels, separator trawls, and increased top sheet mesh in towed gears. These measures would need to be evaluated in the context of other species caught in these mixed fisheries.

There is some recent information of species misreporting (haddock reported as whiting) in some fleets in years when haddock quotas were restrictive. It is not possible for ICES to evaluate the scale of this problem and the assessment is largely based on landings as reported in logbooks.

#### *Ecosystem considerations*

The main spawning areas of whiting in the Western Channel and Celtic Sea are off Start Point (VIIe), off Trevose Head (VIIf), and southeast of Ireland (VIIfg).

Returns of adult whiting tagged in the Western Channel indicated more movement into the Celtic Sea than between the Western and Eastern Channel. Whiting released in the Bristol Channel moved south and west towards the two spawning grounds off Trevose Head and southeast of Ireland. There was no evidence of emigration out of the Celtic Sea area. Tagging experiments have indicated movement of whiting from the Irish Sea VIIa into the Celtic Sea.

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#### **Factors affecting the fisheries and the stock**

Celtic Sea whiting are taken in mixed species (cod, whiting, hake, *Nephrops*) fisheries. French trawlers account for about 60% of the total landings, Ireland takes about 30%, and the UK (England and Wales) 7%, while Belgian vessels take less than 1%.

The French *Nephrops* trawlers have for several years adopted a larger mesh, following bycatch restrictions and market demand for larger *Nephrops*.

The main Irish fleets in Divisions VIIf,g,h are inshore and offshore otter trawlers and seiners based in Dunmore East and Kilmore Quay. However, in recent years there has been an increase in the number of Irish beamers (+6 vessels) offshore in Division VIIfg, targeting anglerfish and megrim with whiting as bycatch. Irish landings of whiting from Division VIIfj–k are taken both in a mixed fisheries (cod, whiting, anglerfish, megrim, and *Nephrops*) and in a directed fishery in the first quarter.

The main UK fisheries in Divisions VIIe–h are inshore, the bulk of the landings (> 60%) being made in the winter months between November and March. UK landings in the 1950s were 4–5 times higher than at present. The main gears used in the Western Channel are otter trawls targeting a wide range of species, and beam trawls targeting sole, anglerfish, and plaice.

#### *Regulations and their effects*

The stock is managed by a TAC and technical measures. Technical measures applied to this stock are a minimum landing size ( $\geq 27$  cm) and the area-specific minimum mesh sizes applicable to the mixed demersal fisheries. There is substantial discarding above the minimum landing size due to economic or other factors.

Management regulations, particularly effort control regimes in other areas (VIIa, VI, & IV), became increasingly restrictive in 2004 and 2005 and have resulted in a displacement of Irish effort into the Celtic Sea.

A closure of the three rectangles in the Celtic Sea was in place during the first quarters of 2005, 2006, and 2007 to protect the cod stock. The impact of this on whiting remains unclear. For a more detailed description on the impact of this closure on the fishing behaviour (see Section on Trevose closure 5.3.3.1).

#### *Changes in fishing technology and fishing patterns*

There have been major changes in fleet dynamics over the period of the assessment. Effort in the French gadoid fleet has been declining since 1999. Irish otter trawl effort in VIIfg,j has been stable over the last 4 years but there has been a shift in effort from VIIfj to VIIfg. During this period there has been a fleet modernisation and a decommissioning scheme in Ireland. A further decommissioning scheme is imminent, aimed at removing 40% of the capacity in the whitefish sector nationally.

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#### **Scientific basis**

##### *Data and methods*

The analytical assessment is based on catch-at-age (landings only) data, commercial cpue, and survey data was considered for trends only.

##### *Information from the fishing industry*

Meetings with representatives of the fishing industry were held prior to WGSSDS2007 in Ireland, UK, and France. No specific concerns were raised about the state of this stock.

##### *Uncertainties in assessment and forecast*

Discarding is considered to be significant but is not included in the assessment. Not including discards biases the recruit estimates. There are conflicting signals and considerable noise in the survey data as well as some concerns about the accuracy of the landings statistics in some fleets.

##### *Comparison with previous assessment and advice*

As last year the assessment is only indicative of trends.

The advice last year is based on no increase in F. This year a decrease in F is advised.

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#### **Source of information**

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 26 June–5 July 2007 (ICES CM 2007/ACFM:28).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC <sup>1</sup>	ACFM Landings
1987	<i>Status quo</i> F; TAC	7.1 <sup>2</sup>		12.7
1988	Precautionary TAC	7.0 <sup>2</sup>		13.6
1989	Precautionary TAC	7.9 <sup>2</sup>		16.5
1990	No increase in F; TAC	8.4 <sup>2</sup>		14.1
1991	Precautionary TAC	8.0 <sup>2</sup>		13.5
1992	If required, precautionary TAC	8.0 <sup>2</sup>		12.4
1993	Within safe biological limits	6.6 <sup>2</sup>	22.0	16.3
1994	Within safe biological limits	< 9.4 <sup>2</sup>	22.0	20.0
1995	20% reduction in F	8.2 <sup>3</sup>	25.0	22.7
1996	20% reduction in F	8.6 <sup>3</sup>	26.0	18.3
1997	At least 20% reduction in F	< 7.3 <sup>4</sup>	27.0	20.5
1998	At least 20% reduction in F	< 8.2 <sup>4</sup>	27.0	19.2
1999	No increase in F	12.4 <sup>4</sup>	25.0	19.9
2000	17% reduction in F	< 13.1 <sup>4</sup>	22.2	14.9
2001	No increase in F	13.5 <sup>4</sup>	21.0	12.8
2002	No increase in F	27.7 <sup>4</sup>	31.7	13.3
2003	No increase in F	20.2 <sup>4</sup>	31.7	10.6
2004	No increase in F	14.0	27.0	10.0
2005	No increase in F	10.6	21.6	12.5
2006	No increase in F	10.8	19.9	9.5
2007	No increase in F	-	19.9	
2008	Reduction in F	-		

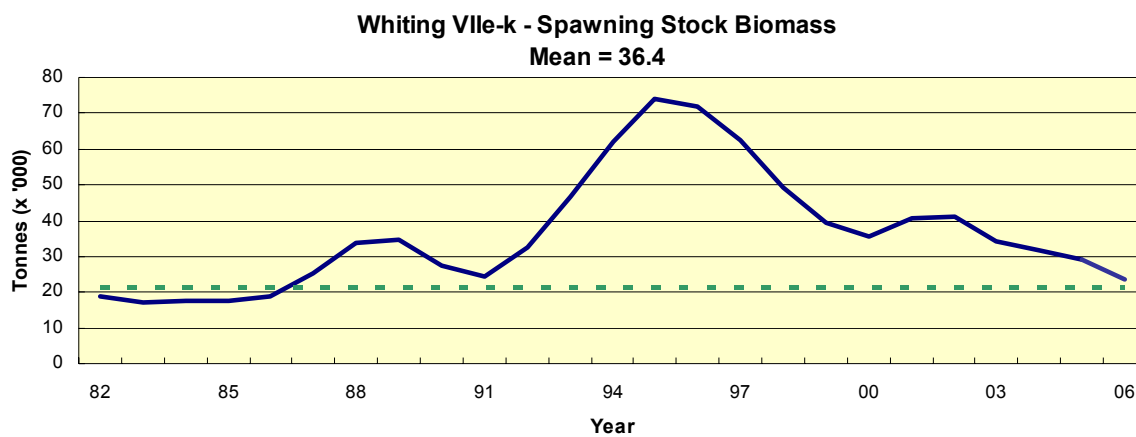
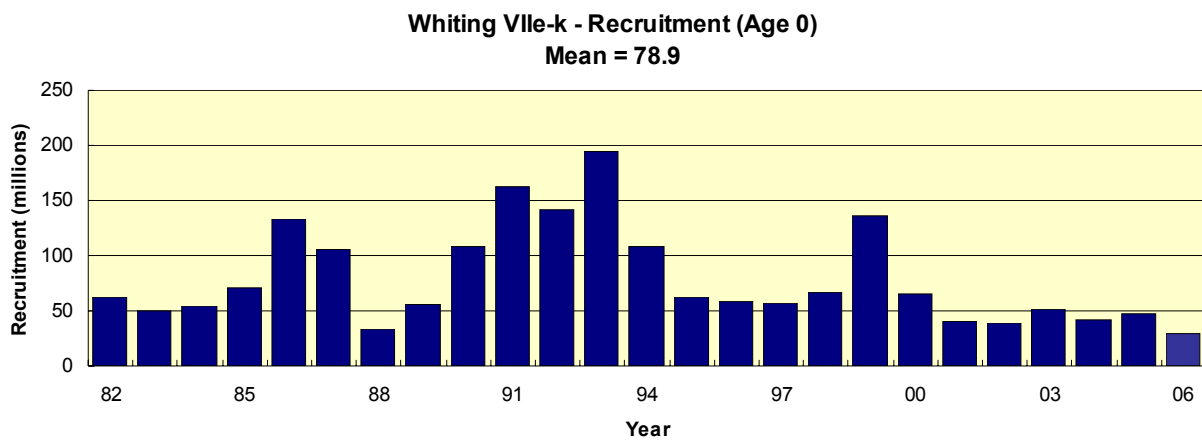
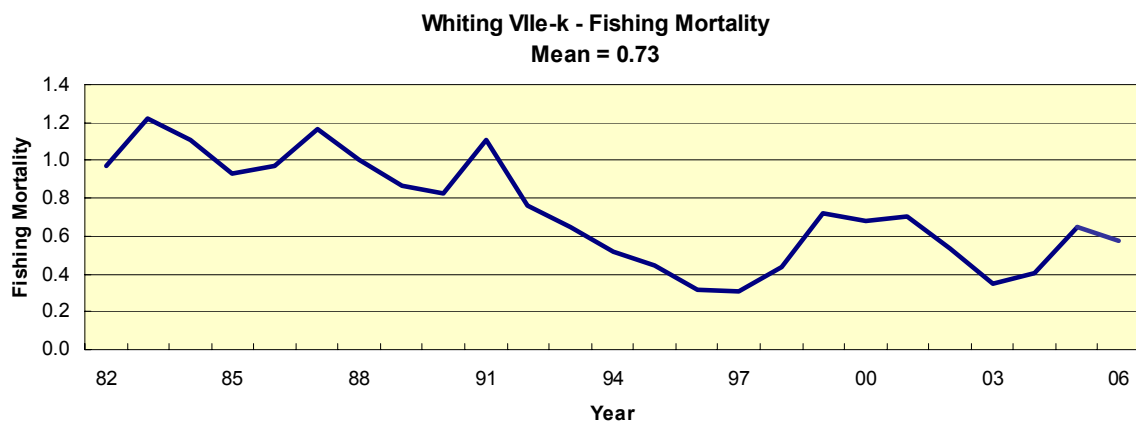
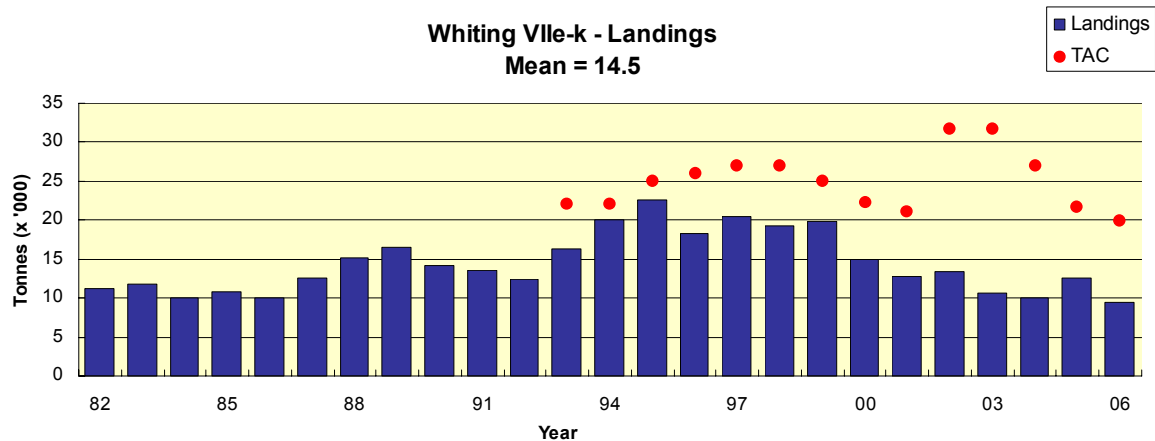
Weights in t.

<sup>1</sup> TAC covers Subarea VII (except Division VIIa).

<sup>2</sup> For the VII<sub>f+g</sub> stock component.

<sup>3</sup> For the VII<sub>f-h</sub> stock component.

<sup>4</sup> For the VII<sub>e-k</sub> stock component.



**Table 5.4.6.1** Whiting in Divisions VIIe-k. Nominal landings (t) as reported to ICES, and total landings as used by the Working Group.

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Belgium	135	161	167	107	111	159	296	308	292	107	145	228	205	268	449	479	448	194	171	149
Denmark																				
France	8,982	7,171	7,820	7,647	10,054	11,410	12,171	10,464	9,956	9,165	10,771	12,634	13,400	9,936	11,370	11,711 <sup>a</sup>	16,418 <sup>b</sup>	9,077 <sup>a</sup>	7,203 <sup>a</sup>	7,435 <sup>a</sup>
Germany										14										
Ireland	1,487	1,301	2,241	1,309	1,452	398	2,817	1,478	1,258	1,691	3,631	5,618	6,077	6,115	6,893	5,226	5,807	4,795	5,008	5,332
Netherlands		398		124										8		1			5	4
Spain													4	31	24	53	21	11	9	12
UK (E/W/N)	1,177	954	610	765	1,035	1,598	1,252	1,782	1,969	1,379	1,756	1,548	1,804	1,728	1,742	1,709	1,346	1,252	946	844
UK (Scotland)						1	5	74	33	8	17	6	23	34	42	68	3	2	11	12
United Kingdom																				
<b>Total</b>	<b>11,781</b>	<b>9,985</b>	<b>10,838</b>	<b>9,952</b>	<b>12,652</b>	<b>13,566</b>	<b>16,541</b>	<b>14,106</b>	<b>13,508</b>	<b>12,364</b>	<b>16,320</b>	<b>20,034</b>	<b>21,513</b>	<b>18,120</b>	<b>20,520</b>	<b>19,247</b>	<b>24,043</b>	<b>15,331</b>	<b>13,353</b>	<b>13,788</b>
<b>Unallocated</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,562</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,165</b>	<b>140</b>	<b>12</b>	<b>-2</b>	<b>-4,126</b>	<b>-466</b>	<b>-569</b>	<b>-509</b>
<b>Total as used by Working Group</b>	<b>11,781</b>	<b>9,985</b>	<b>10,838</b>	<b>9,952</b>	<b>12,652</b>	<b>15,128</b>	<b>16,541</b>	<b>14,106</b>	<b>13,508</b>	<b>12,364</b>	<b>16,320</b>	<b>20,034</b>	<b>22,678</b>	<b>18,260</b>	<b>20,532</b>	<b>19,245</b>	<b>19,917</b>	<b>14,865</b>	<b>12,784</b>	<b>13,279</b>
<b>Revised 2007</b>																				
<sup>a</sup> : Preliminary																				
<sup>b</sup> : Preliminary, Reported as VIIb-k																				

# West of Ireland Whiting

(Divisions VIIb,c)



*Marine Institute*  
Foras na Mara

Fisheries Science Services

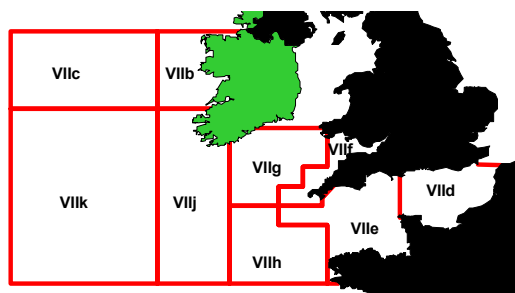
## FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

The state of this stock is unknown.

FSS advises that catches in 2008 should be no more than the recent average (2004 to 2006) of around 191 t in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.

Whiting in Divisions VIIb,c are included in the management area VIIb-k. There was no ICES advice for this stock in 2007.



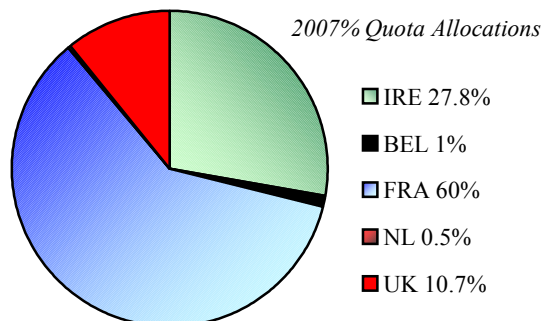
Red Boxes-TAC/Management Areas

## CURRENT MANAGEMENT

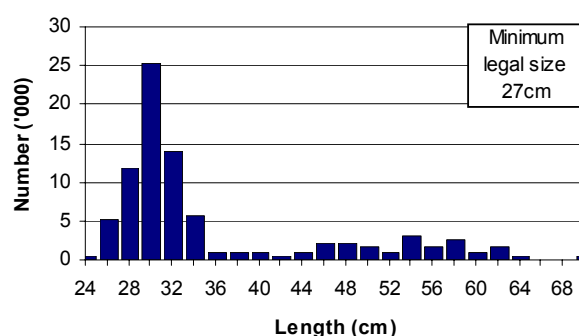
- The TAC area covers Divisions VIIb-k. The TAC in 2007 was set at 19,940 t with an associated Irish quota of 5,544 t (adjusted to 6,122 t).
- FSS recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching whiting.

## ADDITIONAL INFORMATION

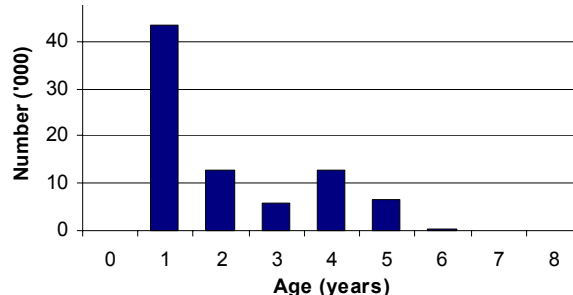
- Irish landings in 2006 were estimated to be 48 t – the lowest in the time series.
- Ireland is the major participant in this fishery.
- Discarding practices are not well quantified but FSS sampling has indicated that discarding does occur in this fishery.
- The linkages between in Divisions Whiting VIIb,c and adjacent areas is unclear. Until the dynamics of these whiting stocks are resolved ICES will continue to collate data on VIIb,c whiting separately.



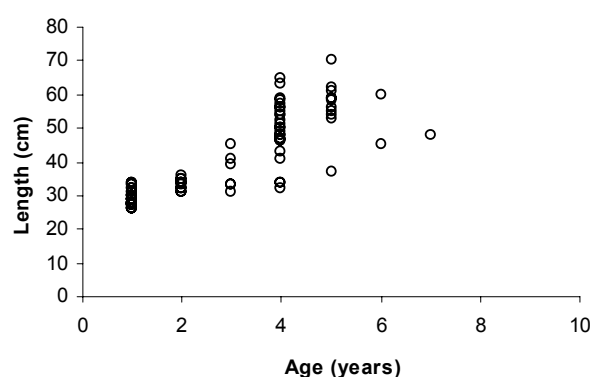
2006 Length Distribution: Irish Landings, Whiting in VIIb, c



2006 Age Distribution: Irish Landings, Whiting in VIIb, c



2006 Size at Age: Irish Sampling, Whiting VIIb,c



Nominal Landings (t) of Whiting in Division VIIb,c for 1995-2006

COUNTRY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
France	57	76	65	37*	... <sup>1*</sup>	107	114	113	92	63	129	54.4
Ireland	1,894	1,233	403	323	206	563	357	386	423	135	65	47.6
Netherlands	-	-	-	-	-	-	2	-	3		2	
Spain	+	+	-	27	1	4	-	6		31	18	
UK(E/W/Ni)	24	96	75	49	10	6	5	4	5	1	11	4.6
UK(Scotland)	71	17	4	27	-	19	1	+	-		10.8	
<b>TOTAL</b>	<b>2,046</b>	<b>1,422</b>	<b>547</b>	<b>463</b>	<b>217</b>	<b>701</b>	<b>479</b>	<b>509</b>	<b>523</b>	<b>230</b>	<b>235.8</b>	<b>106.6</b>

<sup>1</sup>See VIIg-k.

# Celtic Sea and Bay of Biscay Anglerfish

**(Sub-area VIIb-k and Divisions VIIa,b)**

For latest information, see: <http://www.ices.dk>



## *Fisheries Science Services*

## FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

Two species (*L. piscatorius* and *L. budegassa*) are caught together in this area. The state of both stocks is unknown. It has not been possible to quantify SSB, fishing mortality, and recruitment for these stocks. Survey and landings data indicate that biomass of *L. piscatorius* has increased since 2000 and that some recent recruitments may be above average. Landings and survey data for *L. budegassa* indicate that biomass has been fluctuating with a slight decrease in landings in recent years.

Given that there is no immediate concern about the state of both stocks in the short term FSS recommends that the landings in 2008 should be constrained to the recent average landings of 2004–2006. This corresponds to a TAC for both species combined of less than 33,000 t, with a corresponding Irish quota of 1,989 t.

**FSS again points out that the assessment area does not include Division VIIa. Therefore an additional TAC allocation of 454 t (based on average landings 2004-2006) for Division VIIa should be added to the recommended TAC for VIIb-k to attain a TAC for the entire Sub-area VII.**

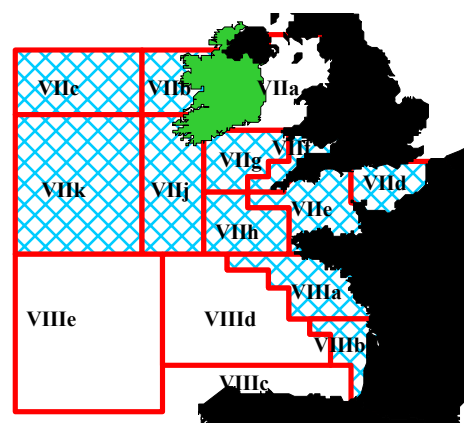
**FSS recognises that anglerfish are an important component of mixed fisheries taking hake, megrim, sole, cod, plaice, and *Nephrops*. As a result, anglerfish are caught with other stocks that are outside precautionary limits.**

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Celtic Sea and

**Bay of Biscay Anglerfish, FSS interprets that the proposal would result in the TAC being set at 26,194 t for Sub-area VII and 7,260 t for Divisions VIIIabde to prevent expansion of the fishery.**

## CURRENT MANAGEMENT

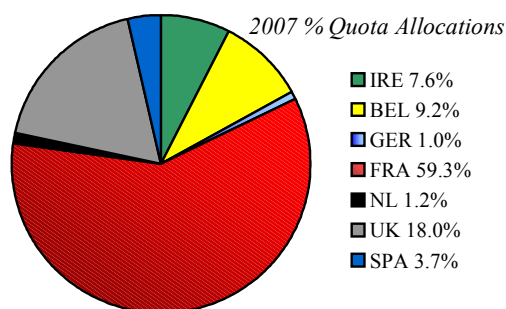
- There are two separate TACs set for anglerfish in this area; one for Sub-area VII and a second for TAC for Divisions VIIIabde. The TAC area does not correspond to the assessment area (Divisions VIIb-k and VIIa,b). An additional allocation needs to be made for VIIa.
- Two species; white bellied (*L. piscatorious*) and black bellied (*L. budegassa*) are caught in this assessment area. These species are not routinely separated by the industry. Therefore a combined TAC is set for both species.
- The 2007 TAC for Sub-area VII was 28, 080 t with an associated Irish quota of 2,128 t (adjusted quota 2,170 t).
- There are no explicit management objectives or plans for this stock.
- There is no minimum legal landing size for anglerfish. However, EC Reg. No 2406/96 dealing with common marketing standards fixes a minimum weight of 500g for anglerfish.
- There is a ban on gillnets in Divisions VIa,b and VIIb,c,j,k fishing in more than 200m depth (EC Reg. No 51/2006).



*Red Box*-TAC/Management Area    *Blue Shading*- Assessment Area

TAC Area	2007 TAC	2007 Irish quota	2008 TAC	2008 Irish quota
VII	28,080	2,170	25,740 + 454 for VIIa	1,989
VIIIabde	7,920		7,260	
<b>Total</b>	<b>36,000</b>		<b>33,454</b>	
<b>Total Advised for VIIb-k &amp; VIIIab</b>	<b>36,000</b>		<b>33,000</b>	





## ADDITIONAL INFORMATION

1. The previous assessments for both species were of poor quality with large year-to-year revisions in stock size estimates. It is difficult to reconcile the stock dynamics observed in the previous assessments, with the perception that the targeted monkfish fishery has expanded rapidly in recent years. The quota for this stock is restrictive for the Irish and most other fleets. Reported landings in recent years have been in excess of the TACs and misreporting has been a serious problem in this stock. The above, coupled with concern about ageing accuracy and recent discarding patterns, has meant that ICES was unable to provide an assessment for its stocks in 2007.
2. Reported landings from the Irish fleet were 2,962 t in 2006, a 20% increase from 2005.
3. Irish landings for this stock are mainly taken in otter trawls and, increasingly by twin-rigs. Anglerfish are the main target species along the western shelf for demersal vessels from Killybegs, Rossaveal, Dingle, Castle-townbere, Union Hall, Dunmore East and many other smaller ports. It is well documented that a significant proportion of the anglerfish are caught in mixed fisheries, especially in association with the *Nephrops* fishery.
4. FSS recommends that technical measures such as fixed grids be introduced into this fishery to reduce catches of juvenile anglerfish and improve the exploitation pattern for these species.
5. Age and growth in anglerfish is uncertain and further investigations and validation work are required.
6. FSS is currently undertaking a joint industry-science survey for anglerfish in this area in co-operation with the Irish and Scottish fishing industries and the FRS Marine Laboratory in Aberdeen. A dedicated anglerfish survey commenced in 2006 using commercial vessels in Sub-area VI and VII with the aim of assessing the abso-

lute abundance of the anglerfish stock using the swept area method. The Irish vessels also carried out anglerfish tagging during the survey to investigate migration patterns of the stock. The results of the swept area abundance estimate will lead to a fishery independent assessment of the stock. In 2007 this survey has been further expanded to include the deployment of data storage tags (DST) on anglerfish released during the survey. Results from future recaptures of these DST tags will lead to greater information on the behaviour of anglerfish.

7. There is a ban on the use of gillnets in Divisions VIa,b and VIIb,c,j,k in waters deeper than 200m (EC Reg. No. 51/2006)

## ICES ADVICE

### 5.4.20

#### State of the stocks

##### *L. piscatorius*

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Unknown	Unknown	Unknown	NA

The state of the stock is unknown. It has not been possible to quantify SSB, fishing mortality, and recruitment for this stock. However, survey data indicate that biomass has been increasing over the 1997–2006 time-series and recruitment in 2001, 2002, and 2004 appear to be above average.

##### *L. budegassa*

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Unknown	Unknown	Unknown	NA

The state of the stock is unknown. It has not been possible to quantify SSB, fishing mortality, and recruitment for this stock. However, survey data indicate that biomass has been rather stable over the time-series and recent recruitment has been above average.

#### Management objectives

There are no explicit management objectives for these stocks.

#### Reference points

##### *L. piscatorius*

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	not defined	
	$B_{pa}$	31 000 t	= $B_{loss}$ . There is no evidence of reduced recruitment at the lowest biomass observed. $B_{pa}$ is equal to the lowest observed SSB in 1993, as estimated in 2000.
	$F_{lim}$	0.33	= $F_{loss}$ , the fishing mortality estimated to lead to potential stock collapse.
	$F_{pa}$	0.24	= $F_{lim} * 0.72$ . This F is considered to have a high probability of avoiding $F_{lim}$ , taking into account the uncertainty in the assessment.
Targets	$F_y$	not defined	

(unchanged since: 1998)

### *L. budegassa*:

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	undefined	
	$B_{pa}$	22 000 t	= $B_{loss}$ . There is no evidence of reduced recruitment at the lowest biomass observed (SSB for 1993 as estimated in 2002).
	$F_{lim}$	undefined	
	$F_{pa}$	0.23	= $F_{med}$ as estimated in 2000. This F is consistent with the proposed $B_{pa}$ .
Targets	$F_y$	not defined	

(unchanged since: 1998)

### Single-stock exploitation boundaries

*Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects*

The current fishing mortality is unknown and cannot be evaluated with respect to long-term yield and low risk to SSB.

*Exploitation boundaries in relation to precautionary limits*

The current stock status is unknown relative to precautionary reference points, but indicators point to the stocks being stable. Therefore ICES recommends that the landings in 2008 should not exceed the average landings of 2004–2006. This corresponds to a TAC for both species combined of lower than 33 000 tonnes.

### Management considerations

Unreported landings are considered to be substantial (in some fisheries). There is no information on the quantities of these. This suggests that the fishery has not been sufficiently controlled and that measures should be taken to improve this situation.

There are indications that discarding has increased in recent years. The increase in discarding may be related to larger year classes recruiting in the fishery. Research vessel surveys indicate an increase in smaller fish on the fishing grounds in recent years. Discarding is also known to be partly dependent on market conditions and TAC restrictions. Reliable estimates of discards are not available.

The absence of estimates of unreported landings and discards handicaps ICES in providing advice on the state of the stock.

The majority of the anglerfish catch consists of young fish. Improvement of the selection pattern is expected to give a higher long-term yield, to increase the size in the catch, and to increase the size of the stock.

*L. piscatorius* and *L. budegassa* are both caught on the same grounds and by the same fleets and are usually not separated in the landings. Management measures for both species must be considered together and in conjunction with other species caught in these fisheries (sole, cod, rays, megrim, *Nephrops*, and hake).

TACs are set for both species combined. There are separate TACs for Subarea VII and Divisions VIIa,b,d,e. The advice applies to a smaller area (Divisions VIIb–k and VIIa,b,d) than the management area. However, the advice covers the majority of the area as recent landings in Division VIIa have been relatively small compared to the total TAC.

### Factors affecting the fisheries and the stock

Anglerfish are an important component of mixed fisheries taking hake, megrim, sole, cod, plaice, and *Nephrops*. A trawl fishery by Spanish and French vessels developed in the Celtic Sea and Bay of Biscay in the 1970s, together with overall annual landings possibly

reached 35–40 000 t by the early 1980s. Landings decreased between 1981 and 1993; since 2000, landings have shown an increasing trend. France and Spain together still report more than 75% of the total landings of both species combined. The remainder is taken by the UK and Ireland (around 10% each) and Belgium (less than 5%).

Otter trawls (the main gear used by French, Spanish, and Irish vessels) currently take about 80% of the total landings of *L. piscatorius*, while around 60% of the UK landings are taken by beam trawlers and gillnetters. Over 95% of the total international landings of *L. budegassa* are taken by otter trawlers. There has been an expansion of the French gillnet fishery in the last decade in the Celtic Sea and in the north of the Bay of Biscay, mainly by vessels landing in Spain and fishing in medium to deep waters. Otter trawling in medium and deep water in Subarea VII appears to have declined, even though the increasing use of twin trawls by French vessels may have increased significantly the overall efficiency of the French fleet.

### Regulations and their effects

There is no minimal landing size for anglerfish but an EU Council Regulation (No. 2406/96), laying down common marketing standards for certain fishery products fixes a minimum weight of 500 g for anglerfish. When the minimum landing size does not fit with the selective properties of the gears, this is expected to lead to discarding of undersized fish.

Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a ‘biologically sensitive area’ in Subareas VIIb, VIIj, VIIg, and VIIh. Effort exerted within the ‘biologically sensitive area’ by the vessels of each EU Member State may not exceed their average annual effort (calculated over the period 1998–2002). These measures have not resulted in a decrease in fishing effort for fleets fishing for anglerfish.

The quota has been restrictive for some fleets and substantial under-reporting of landings is known to have occurred. Information from the Irish fishery indicates that underreporting of total landings has been a problem in recent years due to restrictive individual vessel quotas. In 2005 specific anglerfish licences were introduced in Ireland to improve compliance. There has been an increased enforcement on anglerfish quotas in 2006.

### Changes in fishing technology and fishing patterns

No significant changes in recent years.

### The environment

The spawning of the *Lophius* species is very particular, with eggs extruded in a buoyant, gelatinous ribbon that may measure more than 10 m. This particular spawning pattern results in a highly clumped distribution of eggs and newly emerged larvae. Although this could result in recruitment being sensitive to environmental variations, this has not been demonstrated.

## Scientific basis

### Data and methods

Lacking an analytical assessment the advice is based on survey data and catch information.

### Information from the fishing industry

The fishing industry and scientists have met at the national level to discuss information that can be used in the assessments. Qualitative information has also been provided and has contributed to the assessment process.

### Uncertainties in assessment and forecast

The French EVHOE survey covers a wide area of the distribution of both *Lophius* species and gives reliable estimates of pre-recruits for those species while being noisier for adults, due to the low number of adults caught.

### Comparison with previous assessment and advice

ICES was not able to provide an analytical assessment this year due to the recent deterioration of the quality of the input data.

Advice is now based on recent landings instead of  $F_{pa}$ .

### Source of information

Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim, 8–17 May 2007 (ICES CM 2007/ACFM:21).

Year	ICES Advice	Single-Stock Exploitation Boundaries	Predicted catch corresp. To Single-Stock Exploitation Boundaries	Predicted catch corresp. To advice	Agreed TAC <sup>1,2</sup>	ACFM Landings <sup>2</sup>	Landings of <i>L. Piscat.</i>	Landings of <i>L. Budeg.</i>
1987	Not assessed		-		39.08	29.5	21.9	7.6
1988	Not assessed		-		42.99	28.5	20.1	8.4
1989	Not assessed		-		42.99	30.0	20.5	9.5
1990	Not assessed		-		42.99	29.4	19.8	9.6
1991	No advice		-		42.99	25.1	16.2	8.8
1992	No advice		-		42.99	21.1	12.8	8.3
1993	Concern about <i>L. Pisc.</i> SSB decrease		-		25.1	20.1	13.5	6.7
1994	SSB decreasing, still inside safe biological limits		-		23.9	21.9	16.1	5.8
1995	No increase in F		20.0		23.2	26.8	19.7	7.1
1996	No increase in F		30.3		30.4	30.2	22.1	8.1
1997	No increase in F		34.3		34.3	29.8	21.7	8.1
1998	No increase in F		33.0		34.3	28.2	19.6	8.6
1999	No increase in F		32.9		34.3	24.5	17.2	7.3
2000	At least 20% decrease in F		< 22.3		29.6	22.0 <sup>3</sup>	14.9 <sup>3</sup>	7.1 <sup>3</sup>
2001	Reduce F below $F_{pa}$		< 27.6		27.6	22.2 <sup>3</sup>	16.5 <sup>3</sup>	5.7 <sup>3</sup>
2002	Reduce F below $F_{pa}$		< 19.9		23.7	26.7 <sup>3</sup>	20.1 <sup>3</sup>	6.5 <sup>3</sup>
2003	At least 30% decrease in F		< 16.4		21.0 <sup>4</sup>	31.7	23.6	8.1
2004	At least 10% decrease in F		< 26.7		26.7	34.9	27.3	7.6
2005	Maintain F below $F_{pa}$		< 37.8		31.2	32.1	24.7	7.4
2006	Maintain F below $F_{pa}$		< 33.9		34.0	31.5	25.7	5.8
2007	Maintain F below $F_{pa}$		< 36.0		36.0			
2008	Less than average landings		< 33.0					

Weights in '000 t.

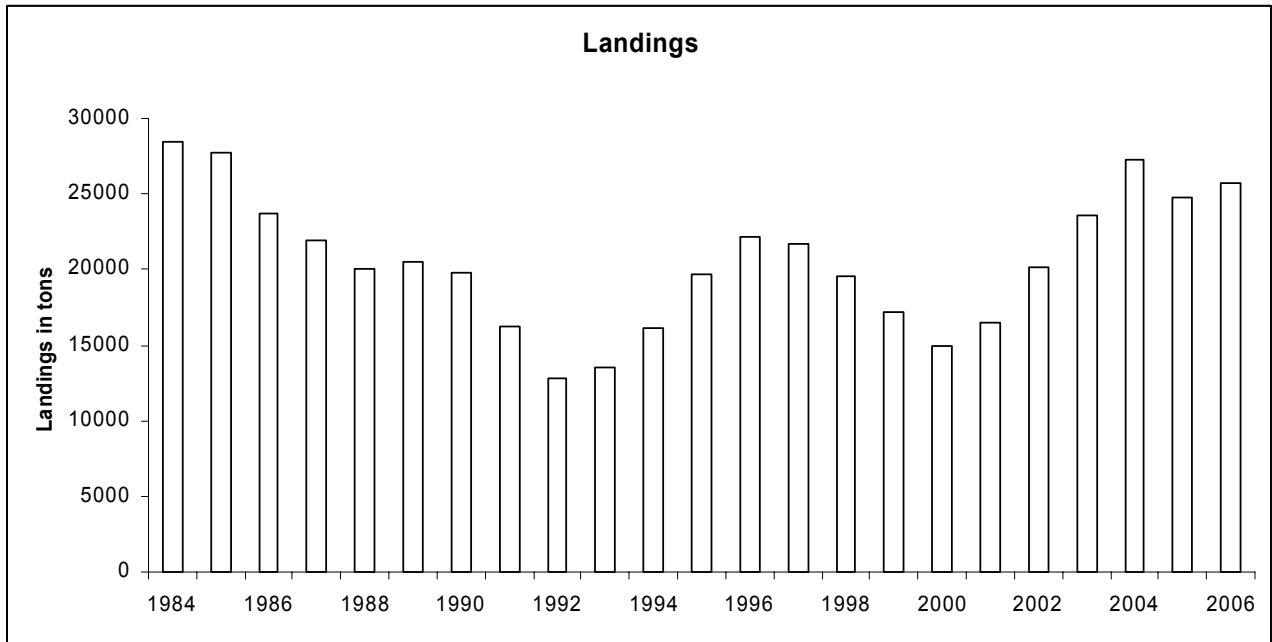
<sup>1</sup> Includes Division VIIa and Divisions VIIId,e.

<sup>2</sup> Applies to both species.

<sup>3</sup> Revised.

<sup>4</sup> TAC was changed during 2003 from 19 400 t to 21 000 t following fast-track advice from ICES.

Anglerfish (*L. piscatorius*) in Divisions VIIb–k and VIIla,b,d,e



Anglerfish (*L. budegassa*) in Divisions VIIb–k and VIIla,b,d,e

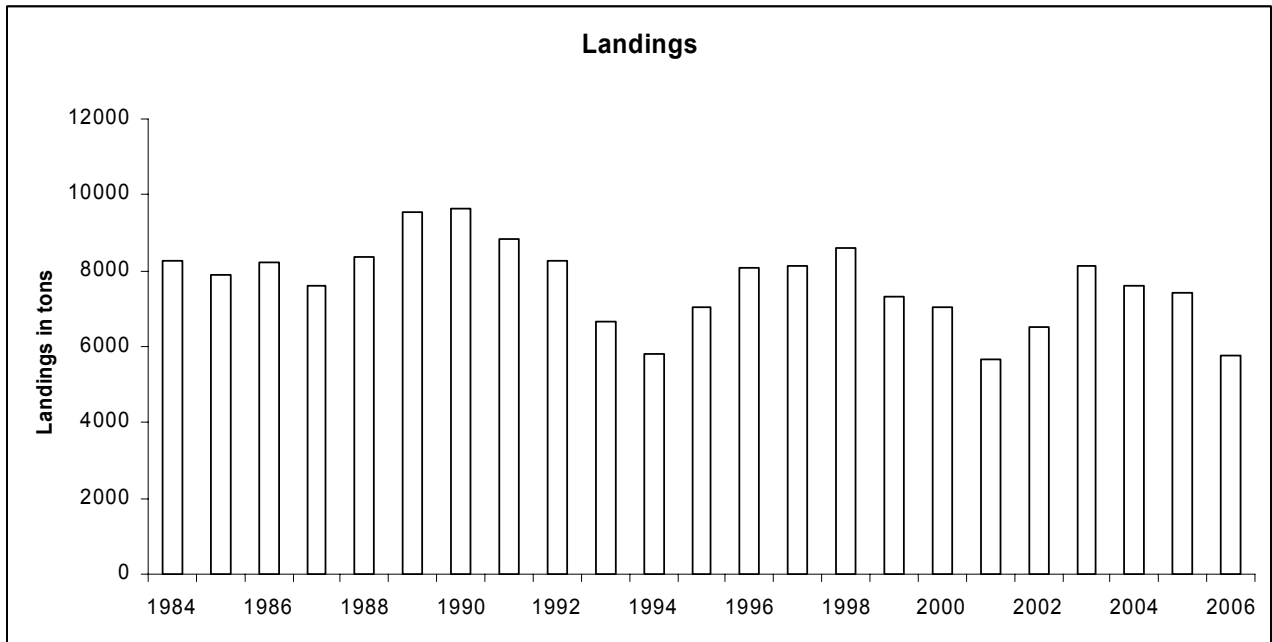
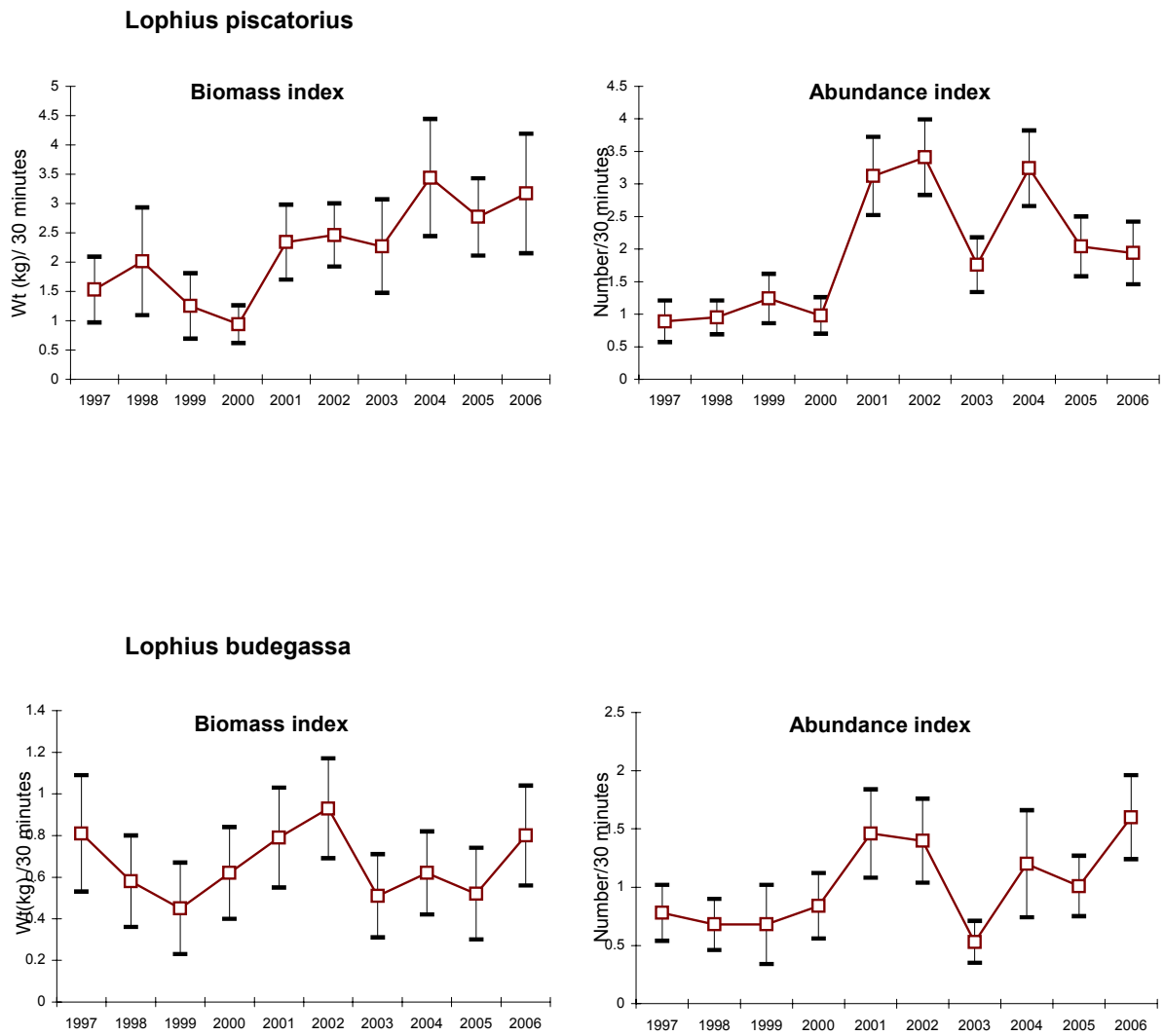
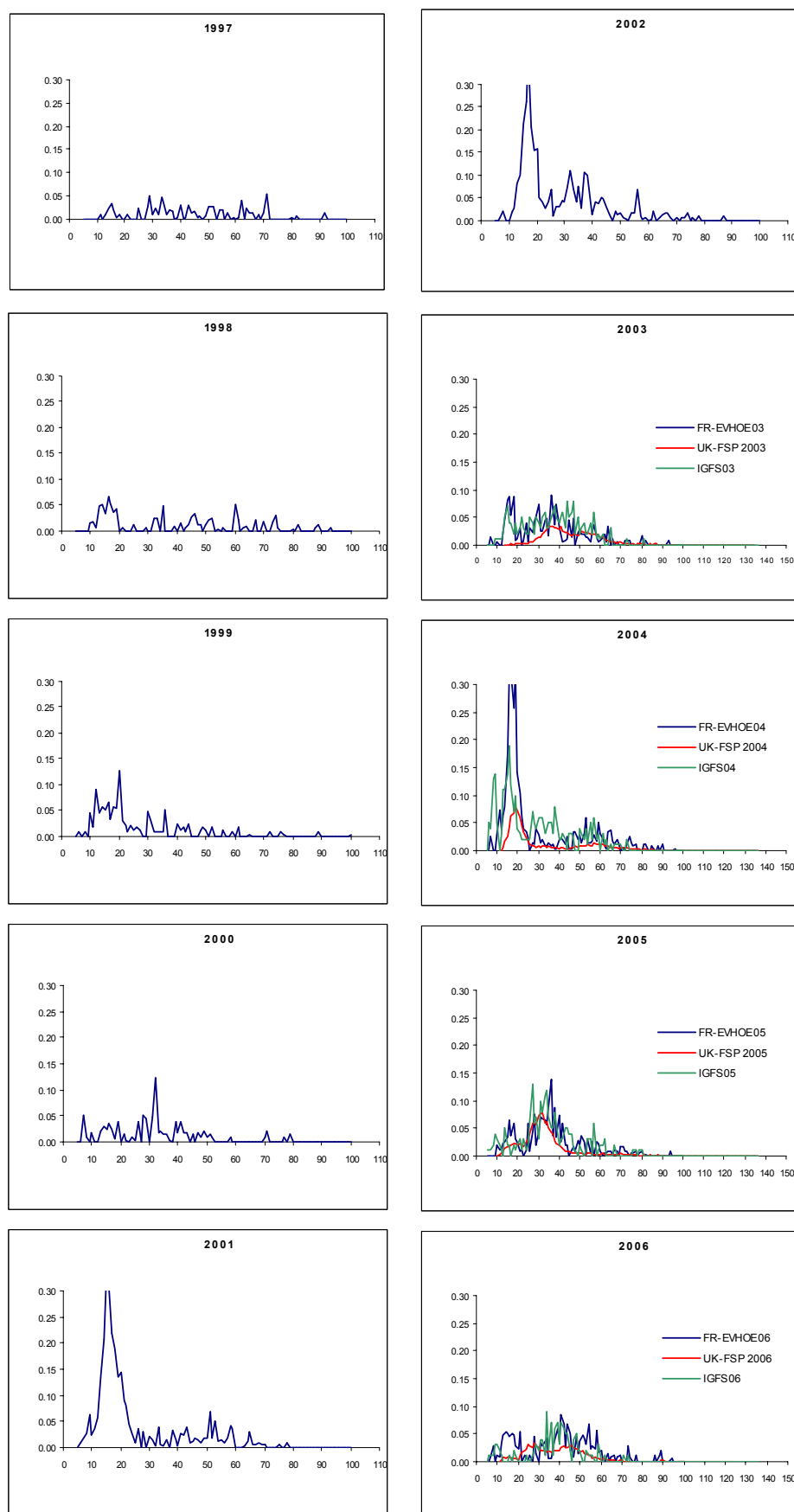


Figure 5.4.20.1

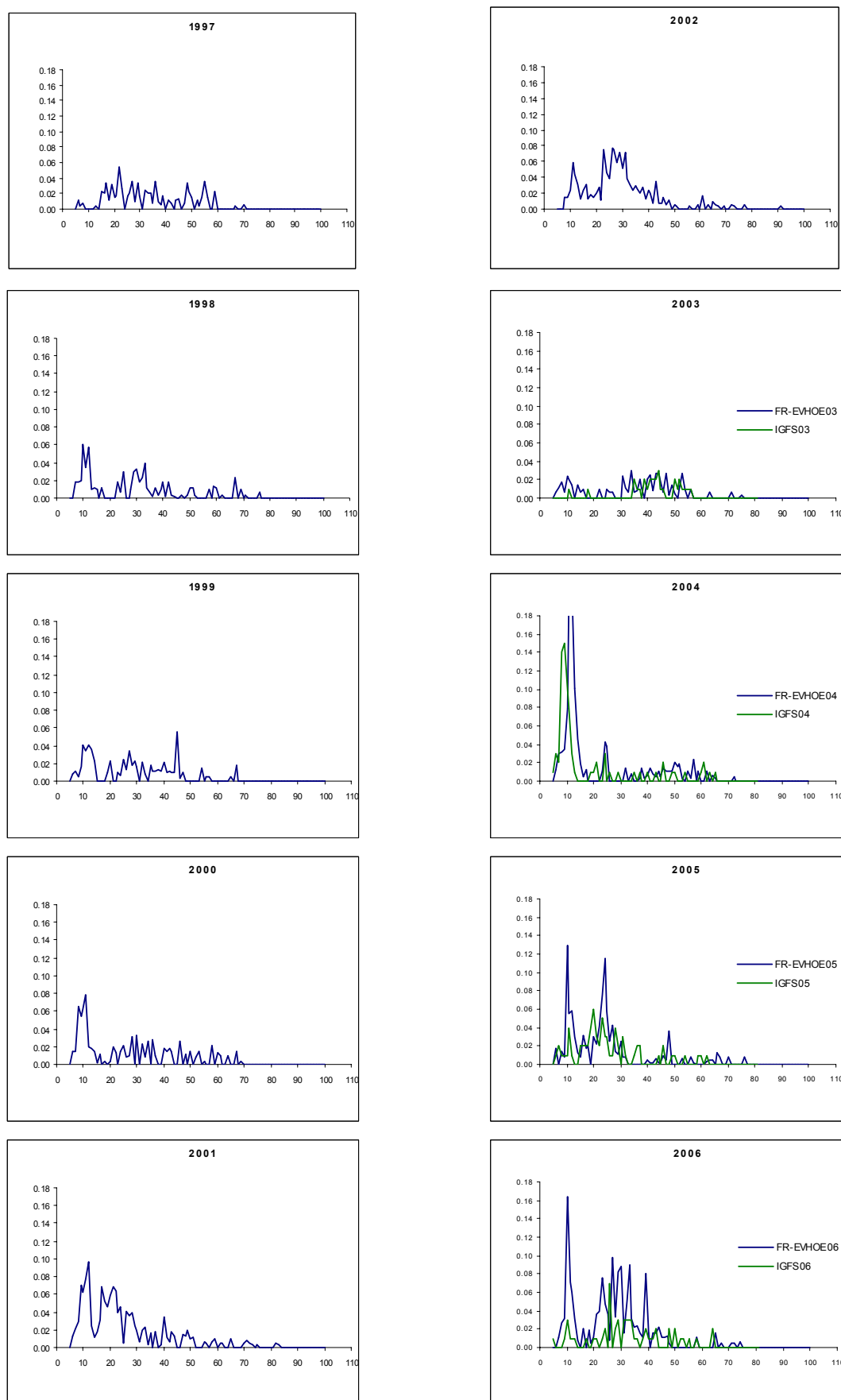


**Figure 5.4.20.2** French EVHOE surveys biomass and total abundance indices from 1997 to 2006. Combined Bay of Biscay and Celtic Sea area. Error bars indicate  $\pm 2$  s.d.



**Figure 5.4.20.3.**

Anglerfish (*L. piscatorius*) in Divisions VIIb–k and VIIa,b,d. Abundance indices at length observed in the FR-EVHOE-S survey from 1997 to 2006 in Subarea VII and Divisions VIIa,b,d. Ground Fish Survey and UK FSP Survey from 2003 to 2006 in the Celtic Sea.



**Figure 5.4.20.4**

Abundance indices at length for *L. budegassa* observed in the FR-EVHOE-S survey from 1997 to 2006 in areas 7 & 8 and in the Irish IGFS from 2004 to 2006 in the Celtic Sea.

**Table 5.4.20.1** Landings in tonnes by Fishery Unit.

***Lophius piscatorius* in Divisions VIIb-k and VIIIa,b,d**  
Landings in tonnes by Fishery Unit

Year	VIIb,c,e-k						VIIIa,b,d				TOTAL VII +VIII
	Gill-Net (Unit 3+13)	Medium/Deep Trawl (Unit 4)	Shallow Trawl (Unit 5)	Beam Trawl (Unit 6)	Shallow/medium Neph.Trawl (Unit 8)	Other	Neph.Trawl (Unit 9)	Shallow Trawl (Unit 10)	Medium/Deep Trawl (Unit 14)	Unallocated	
1986	429	13781	2877	1437	1021		746	720	2657		23666
1987	560	11414	2900	1520	787		1035	542	3152		21909
1988	643	9812	3105	1814	774		927	534	2487		20095
1989	781	8448	5259	2342	754		673	444	1772		20474
1990	1021	8787	3950	1736	880		410	391	2578		19753
1991	1752	7565	2806	1196	752		284	218	1657		16229
1992	1773	6254	1489	1052	887		254	166	942		12818
1993	1742	5776	2125	1281	969		360	278	950		13481
1994	1377	7344	2595	1523	1236		261	198	1586		16120
1995	1915	8461	3195	1805	1242		501	429	1954	228	19730
1996	2244	9796	2637	2189	1149	138	441	379	2229	938	22141
1997	2538	9225	2945	2031	964	39	429	376	2045	1068	21660
1998	3398	8714	2138	1722	812	3	397	149	1699	542	19572
1999	2912	8343	2257	1407	743	19	97	117	1292	0	17186
2000	2299	7340	1853	1457	838	5	100	84	949	0	14925
2001	1806	7978	2243	1982	866	17	136	75	1405	0	16508
2002	2731	9679	2644	1836	922	5	223	88	2002	0	20130
2003	3087	11957	2622	1978	925	81	377	124	2440	0	23591
2004	3982	12773	3055	2454	869	14	461	180	3523	0	27313
2005	4771	11192	2396	2385	571	7	322	152	2925	58	24778
2006**	3623	13341	2257	2418	701	3	433	217	2737	2	25733

\*\* preliminary

***Lophius budegassa* in Divisions VIIb-k and VIIIa,b,d**  
Landings in tonnes by Fishery Unit

Year	VIIb,c,e-k						VIIIa,b,d				TOTAL VII +VIII
	Gill-Net (Unit 3+13)	Medium/Deep Trawl (Unit 4)	Shallow Trawl (Unit 5)	Beam Trawl (Unit 6)	Shallow/medium Neph.Trawl (Unit 8)	Other	Neph.Trawl (Unit 9)	Shallow Trawl (Unit 10)	Medium/Deep Trawl (Unit 14)	Unallocated	
1986	23	5126	348	540	406	0	443	150	1181	0	8217
1987	30	3493	696	462	434	0	483	116	1904	0	7619
1988	34	4072	1095	751	394	0	435	102	1498	0	8382
1989	40	4398	976	1217	515	0	446	112	1829	0	9533
1990	53	4818	631	905	653	0	550	156	1865	0	9632
1991	88	4414	921	384	507	0	475	117	1933	0	8840
1992	90	4808	301	305	594	0	459	191	1518	0	8266
1993	93	3415	429	405	399	0	433	101	1385	0	6659
1994	70	2935	265	209	540	0	232	49	1515	0	5814
1995	110	3963	455	159	617	0	312	62	1286	90	7053
1996	118	4587	477	245	524	28	374	109	1239	392	8092
1997	134	4836	602	132	474	9	313	17	1128	471	8114
1998	179	5565	246	230	288	1	258	72	1454	305	8599
1999	16	4872	115	285	319	0	146	76	1496	0	7325
2000	68	4675	187	261	267	0	136	36	1407	0	7037
2001	36	3761	107	260	301	0	114	28	1080	0	5688
2002	31	4354	151	251	386	0	102	12	1247	0	6534
2003	79	5647	320	346	362	5	155	32	1189	0	8134
2004	107	4720	265	349	394	0	259	8	1489	0	7590
2005	68	4763	160	411	314	0	220	52	1426	14	7428
2006**	8	3658	147	276	218	0	294	1	1171	1	5774

\*\* preliminary



# Celtic Sea and Bay of Biscay Megrim

(Sub-area VII and Divisions VIIa,b,d,e)

For latest information, see: <http://www.ices.dk>



*Marine Institute*  
Foras na Mara

Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

FSS considers that the current stock status is uncertain, data is inadequate to estimate SSB, fishing mortality or recruitment. However, recent survey indices point to the stock being stable.

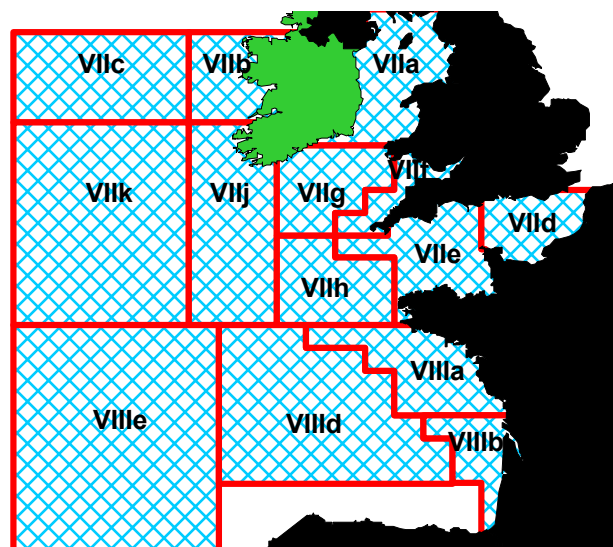
FSS agrees with the ICES and recommends that the landings of *L. whiffiagonis* in 2008 should not exceed the average landings of 2004–2006 (13,000 tonnes). This corresponds to landings of less than 13,560 t for *L. whiffiagonis* and *L. boscii* combined.

TAC area	2007 TAC	2007 Irish Quota	Proposed 2008 TAC	Proposed 2008 Irish Quota
VII	18,300	3,029 (3,364)*	12,136	2,008
VIIIa,b,d,e	2125		1,433	
<b>Total</b>	<b>20,425</b>		<b>13,560</b>	
<b>Total Advised for <i>L. whiffiagonis</i></b>			<b>13,000</b>	
*Adapted quota				

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Celtic Sea and Bay of Biscay Megrim, FSS interprets that the proposal would result in the 2007 TAC being reduced in 2008 towards recent average catches. This implies a TAC of 15,555 t in 2008.

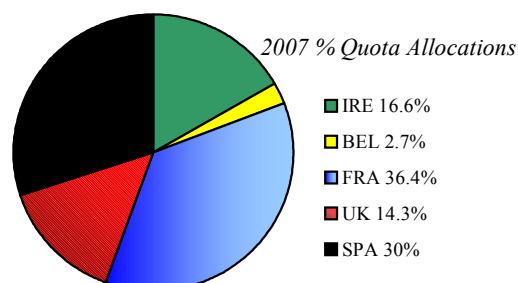
## CURRENT MANAGEMENT

- There are two TAC areas covering the assessment area for this stock; Sub-area VII and Divisions VIIa,b,d,e. The assessment area for this stock is Sub-area VII and Divisions VIIa,b,d,e. As for anglerfish, landings from Division VIIa are not considered in the assessment and advice. However, recent official data suggests landings are minor (<10 t).
- The TAC is also set for two species, *Lepidorhombus whiffiagonis* and *L. boscii*, combined. *L. boscii* accounts for around 5% of the landings.



Red Boxes–TAC/Management Areas Blue Shading– Assessment Area

- FSS advises that a management plan be developed and implemented for fisheries taking megrim.
- The minimum landing size of *Lepidorhombus* spp. is 20 cm. Discarding occurs above this size in some fisheries mainly due to market reasons.



## ADDITIONAL INFORMATION

- The assessment shows large retrospective revisions in stock trends which cannot be fully explained. Analytical assessments in previous years are therefore not considered reliable. The input data for assessment show several deficiencies, including:
  - Limited discard data are available in the time series and filling in of the missing years is problematic because discarding practices in the fisheries are variable over time.
  - There is repeated failure by some countries to provide data.
  - The commercial LPUE data used to calibrate the assessment give conflicting signals.
  - Survey information, particularly on the strength of the incoming year classes is limited.

2. Reported Irish landings of megrim in this area were estimated at 1,750 t in 2006.
3. Megrim are a very valuable by-catch for Irish demersal trawlers from Killybegs, Castletownbere, Waterford and Rossaveal. In recent years megrim have also become important to the Irish beam trawl and twin-rig fleets.
4. The fishery exploits two species of megrim. Irish sampling indicates that catch rates of *L. boscii* are negligible in landings. Irish fishermen do not separate the two species. Due to their smaller average size *L. boscii* are more common in discards particularly in deeper waters.
5. The selection pattern remains poor with the fishery catching a disproportionate amount of small fish. Further technical measures such as increases in mesh size to reduce the catches of small fish should be encouraged for this stock.

## ICES ADVICE

### 5.4.19

#### State of the stock

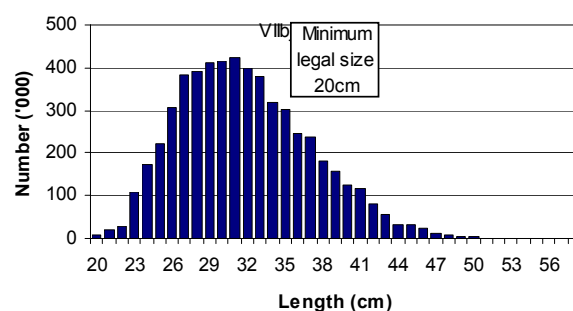
Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Unknown	Unknown	Unknown	Undefined

The state of the stock is unknown. It has not been possible to quantify SSB, fishing mortality, and recruitment for this stock. However, surveys indicate that SSB has been rather stable over the time-series. No information on recruitment is available.

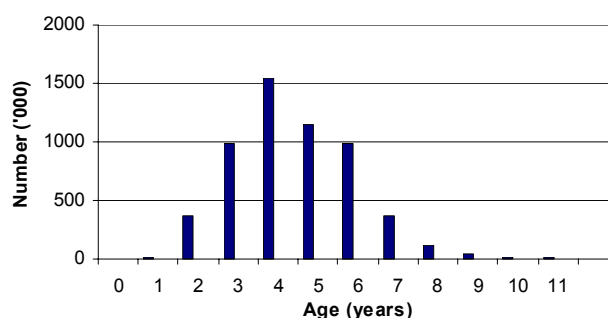
#### Management objectives

There are no specific management objectives for this stock.

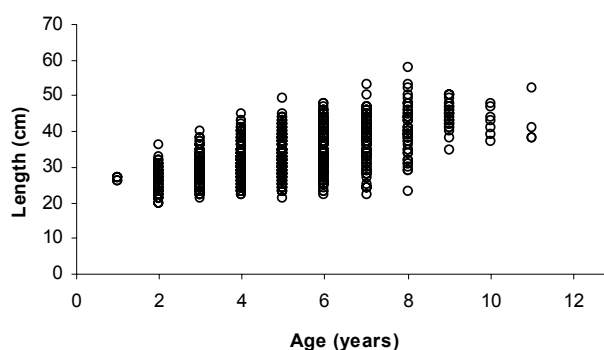
2006 Length Distribution: Irish Landings, Megrim in VIIbjg



2006 Age Distribution: Irish Landings, Megrim in ; Area VIIbjg



2006 Size at Age: Irish Sampling, Megrim in Area VIIbjg



#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	not defined	
	$B_{pa}$	55 000 t	= $B_{loss}$ . There is no evidence of reduced recruitment at the lowest biomass observed and $B_{pa}$ was therefore set equal to the lowest observed SSB.
	$F_{lim}$	0.44	= $F_{loss}$ .
	$F_{pa}$	0.30	= $F_{med}$ ; this implies a less than 45% probability that $(SSB_{MT} < B_{pa})$ .
Targets	$F_y$	not defined.	

(unchanged since:1998)

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## Single-stock exploitation boundaries

### *Exploitation boundaries in relation to precautionary limits*

*The current stock status is unknown, but survey indicators point to the stock being stable. Therefore ICES recommends that the landings of *L. whiffiagonis* in 2008 should not exceed the average landings of 2004–2006. This corresponds to a TAC lower than 13 000 tonnes.*

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## Management considerations

Megrim is caught in a mixed demersal fishery on anglerfish, hake, and *Nephrops*, both as a targeted fishery and as a valuable bycatch.

Landings in 2004–2006 have been well below the agreed TACs. The 2007 TAC was set at 20 425 t, including a 5% contribution of *L. boschii* in the landings.

Discarding of smaller megrim even above the minimum landing size (MLS) of 20 cm is substantial. Improving the selection pattern should benefit the stock and result in a higher long-term yield.

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## Factors affecting the fisheries and the stock

French trawlers operating in the Celtic Sea and targeting demersal species catch megrim as a bycatch. Spanish fleets have a targeted fishery for megrim and also catch megrim in mixed fisheries for hake, anglerfish, *Nephrops*, and other species. Otter trawlers account for the majority of the Spanish landings from Subarea VII. Most UK landings of megrim are made by beam trawlers fishing in ICES Divisions VIIe,f,g,h. Irish megrim landings are taken largely by multi-purpose vessels fishing in Divisions VIIb,c,g for gadoids, plaice, sole, and anglerfish.

### *Regulations and their effects*

The MLS of megrim was reduced from 25 to 20 cm length in 2000, to match the selection pattern of the gear. However, high-grading continues for market reasons.

Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a 'biologically sensitive area' in Subareas VIIb, VIIj, VIIg, and VIIh. Effort exerted within the 'biologically sensitive area' by the vessels of each EU Member State may not exceed their average annual effort (calculated over the period 1998–2002). These measures appear not to have resulted in a decrease in fishing effort for fleets fishing for megrim.

### *Changes in fishing technology and fishing patterns*

No significant changes have been observed in recent years. There has been an Irish decommissioning scheme, whereby around 40 fishing vessels (~6000 GT, 18 000 kW) have been permanently withdrawn from the Irish fishing fleet and removed from the Register of Sea Fishing Vessels in 2005 and 2006.

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## Scientific basis

### *Data and methods*

The advice is based on information from three surveys. Data applicable to an age-structured analytic assessment are being collected, but at present they are considered insufficient to provide a reliable assessment. New surveys have been established recently. The survey information gives indication of recent trends in biomass, but the time-series are still too short to tune an analytic assessment. Some discards data are available, but filling in the missing years is problematic because discarding practices in the fisheries are very variable over time. Commercial cpue data are available, but show conflicting trends.

### *Information from the fishing industry*

Additional qualitative information has been provided by the industry in relation to catches and spatial distribution of the fleets.

### *Uncertainties in assessment and forecast*

There were concerns about the repeated lack of data from some countries.

The EVHOE survey covers a wide area of the distribution of megrim and gives reliable estimates of abundance for adults and juveniles. The species is caught in fair quantities in almost all hauls, giving a good estimate of the length composition of the part of the population selected by the gear.

### *Comparison with previous assessment and advice*

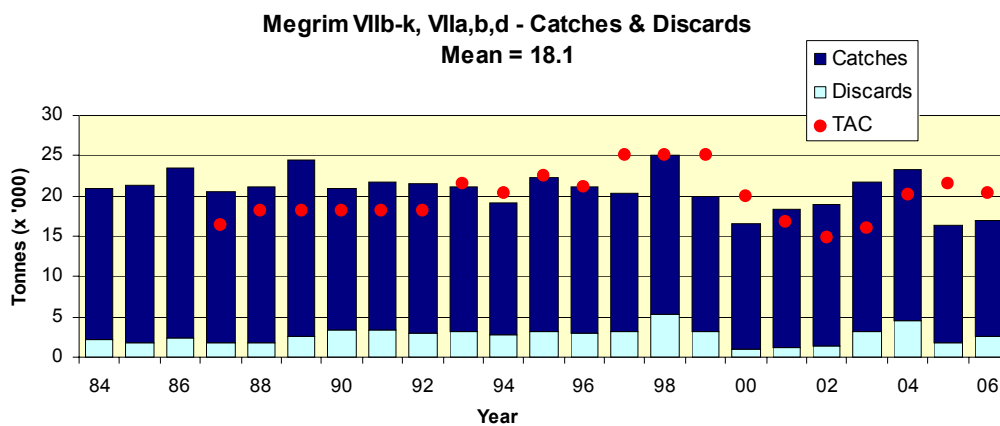
As last year, ICES was not able to provide an analytical assessment, and the basis of the advice remains the same.

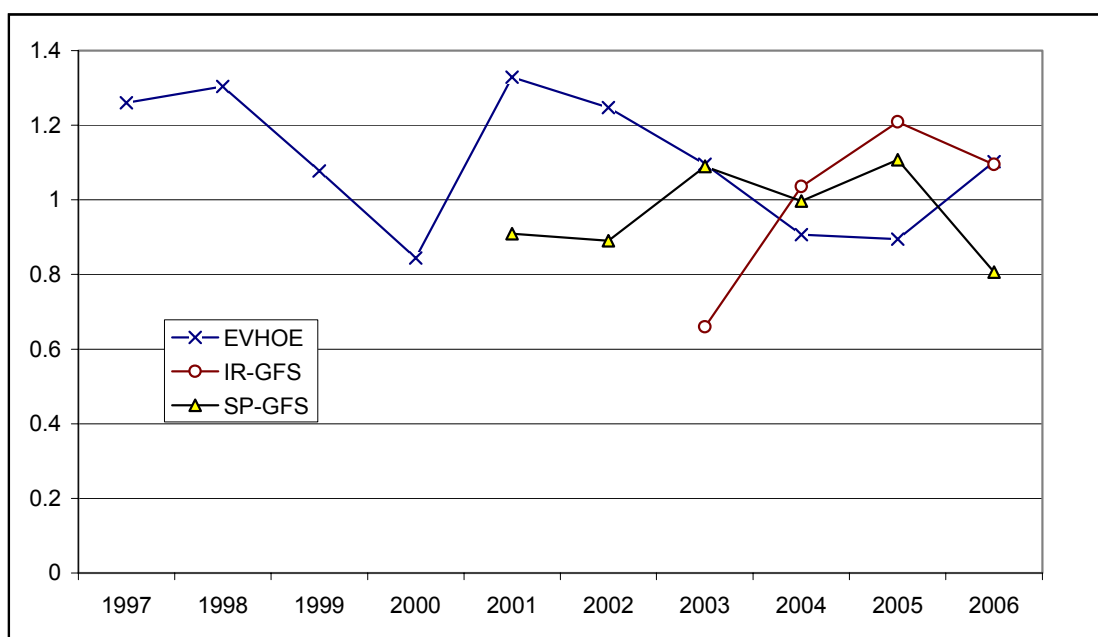
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## Source of information

Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim, 8–17 May 2007 (ICES CM 2007/ACFM:21).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresponding to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC <sup>1</sup>	ACFM Landings	Disc. slip.	ACFM Catch
1987	Not assessed		-		16.46	17.1	1.7	18.8
1988	Not assessed		-		18.1	17.6	1.7	19.3
1989	Not assessed		-		18.1	19.2	2.6	21.8
1990	Not assessed		-		18.1	14.4	3.3	17.7
1991	No advice		-		18.1	15.1	3.3	18.4
1992	No advice		-		18.1	15.6	3.0	18.6
1993	Within safe biological limits		-		21.46	14.9	3.1	18.0
1994	Within safe biological limits		-		20.33	13.7	2.7	16.4
1995	No particular concern		-		22.59	15.9	3.2	19.1
1996	No long-term gain in increased F		16.6		21.20	15.1	3.0	18.1
1997	No advice		14.3		25.0	14.3	3.1	17.3
1998	No increase in F		15.2		25.0	14.3	5.4	19.7
1999	Reduce F below $F_{pa}$		14.6 <sup>1</sup>		25.0	13.7	3.1	16.9
2000	Reduce F below $F_{pa}$		<14.2 <sup>1</sup>		20.0	15.0	2.3	17.3
2001	Reduce F below $F_{pa}$		< 14.1 <sup>1</sup>		16.8	15.8	1.3	17.1
2002	Reduce F below $F_{pa}$		< 13.0 <sup>1</sup>		14.9	15.9	1.5	17.4
2003	Reduce F below $F_{pa}$		< 16.1 <sup>1</sup>		16.0	15.6	3.1	18.8
2004	Reduce F below $F_{pa}$		< 20.2 <sup>1</sup>		20.2	14.3	4.5	18.8
2005	Reduce F below $F_{pa}$		< 22.6 <sup>1</sup>		21.5	12.7	1.8	14.5
2006	Reduce F below $F_{pa}$		<13.6		20.4	12.0	2.5	14.5
2007	Less than average landings 2003–05		< 14.2 <sup>1</sup>		20.4			
2008	Less than average landings 2004–06		< 13.0					





**Figure 5.4.19.1** Megrim (*L. whiffiagonis*) in Divisions VIIb,c,e-k and VIIa,b,d. Scaled biomass indices for FR-EVHOES, SP-PGFS, and IR-GFS.

**Table 5.4.19.1 Megrim (*L. whiffiagonis*) in Divisions VIIb,c,e-k and VIIa,b,d.**  
**Nominal landings and catches (t) provided by the Working Group.**

	Total landings	Total discards	Total catches	Agreed TAC (1)
1984	16659	2169	18828	
1985	17865	1732	19597	
1986	18927	2321	21248	
1987	17114	1705	18819	16460
1988	17577	1725	19302	18100
1989	19233	2582	21815	18100
1990	14371	3284	17655	18100
1991	15094	3282	18376	18100
1992	15600	2988	18588	18100
1993	14929	3108	18037	21460
1994	13685	2700	16385	20330
1995	15862	3206	19068	22590
1996	15109	3026	18135	21200
1997	14230	3066	17296	25000
1998	14345	5371	19716	25000
1999	13715	3135	16850	20000
2000	14485	1033	15517	20000
2001	15806	1275	17081	16800
2002	15988	1466	17454	14900
2003	15414	3147	18561	16000
2004	14300	4511	18811	20200
2005	12712	1831	14542	21500
2006	12011	2468	14479	20425

(1) for both megrim species and VIIa included

# Celtic Sea Plaice

(Division VIIg)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

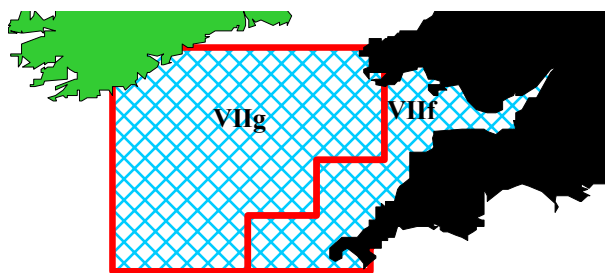
(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

ICES classify this stock at being at risk of suffering reduced reproductive capacity. Although fishing mortality has declined in recent years this stock is considered to be overexploited.

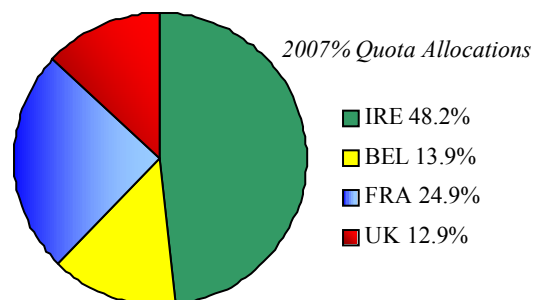
FSS advises that a greater than 60% reduction in  $F$  is required to increase  $SSB$  to  $B_{pa}$  in 2009. This translates to landings of less than 240 t in 2008, and an Irish quota of 116 t. A recovery plan for Celtic Sea plaice alone is unrealistic given the mixed nature of the fishery and high discards. Management initiatives should focus on reducing plaice landings and discards in the mixed fishery.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Celtic Sea Plaice, FSS interprets that the proposal would result in the 2007 TAC being reduced by 15% to 354 t for 2008.

FSS advises managers that this stock should be managed on a long term basis using  $F_{0.1}$  ( $F = 0.14$ ). This would result in higher long term yield and achieve a low risk of depleting the productive potential of the stock. The average fishing mortality for the past three years ( $F = 0.4$ ) is well above  $F_{0.1}$ .



Red Boxes-TAC/Management Areas Blue Shading-Assessment Area



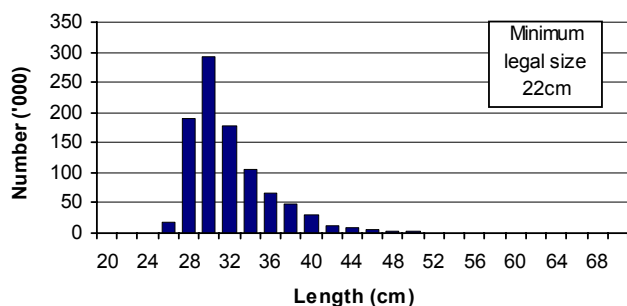
## CURRENT MANAGEMENT

- The 2007 TAC was 417 t with an associated Irish quota of 201 t (adjusted 205 t). The Irish share of the TAC in this area increased from 7% to 48% in the 2007 regulation.
- There are no explicit management objectives or plans for this stock.

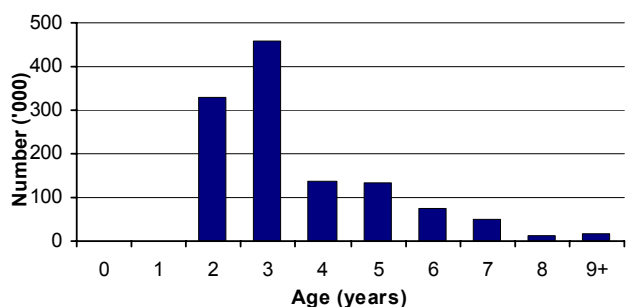
## ADDITIONAL INFORMATION

- There is a slight bias in the assessment which results in a small downward revision of recent SSB estimates. The overall results show good consistency with little or no change in the perception of the stock.
- Irish estimated landings in 2006 were 50 t. Catches are mainly taken by otter trawlers and beamers in Division VIIg.
- Misreporting has been considered a problem for this stock in earlier years. Under-reporting and mis-reporting of catches from ICES Division VIIg to VIIj may have taken place in the most recent years, but no information is available on the scale of the problem.
- Routine discard monitoring began in 2002 following the introduction of the EU data collection regulations. Discards data for 2002-2005 are available for the UK(E&W) fleets; for 2003-2005 from the Belgium fleets; and for 1996-2005 from Irish fleets (although sampling levels prior to 2003 were not high). Estimates of discarding are not included in this assessment. Discard rates are high (30 to 70% in number) for this stock and their non-inclusion may represent a major deficiency in the assessment.
- An area closure for Cod in February - March was implemented in 2005-2007 for some vessels and gears for ICES rectangles 30E4, 31E4, 32E3 this may have impacted on the major fisheries catching plaice.

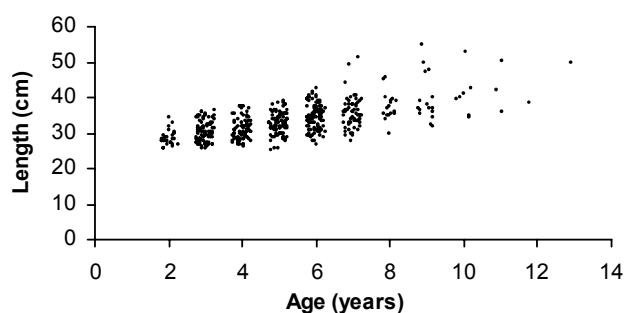
### 2006 Length Distribution: International Landings, Plaice in VIlf,g



### 2006 Age Distribution: International Landings, Plaice in VIlf,g



### 2006 Size at Age: Irish Sampling, Plaice in VIlf,g



## ICES ADVICE

### 5.4.8

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Reduced reproductive capacity	Undefined	Overexploited	No agreed target

Based on the most recent estimates of SSB, ICES classifies the stock as having reduced reproductive capacity. No F reference points have been defined. SSB peaked in 1988–1990, following a series of good year classes, then declined rapidly and has since 2000 remained around  $B_{lim}$ . Fishing mortality has fluctuated around an average level (0.60) for the entire time-series but has declined since 2003. Recruitment was relatively high in most years in the 1980s, but has been lower since then. Some very weak classes have occurred since the late 1990s.

#### Management objectives

There are no specific management objectives for this stock.

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	1 100 t	$B_{lim}=B_{loss}$ , the lowest observed spawning stock biomass.
	$B_{pa}$	1 800 t	$B_{pa}=B_{lim} \times 1.64$ . Biomass above this affords a high probability of maintaining SSB above $B_{lim}$ , taking into account the uncertainty of assessments.
	$F_{lim}$	Not defined.	
	$F_{pa}$	Not defined.	
Targets	$F_y$	Not defined.	

#### Yield and spawning biomass per Recruit F-reference points:

	Fish Mort Ages 3–6	Yield/R	SSB/R
Average last 3 years	0.41	0.23	0.57
$F_{max}$	0.28	0.24	0.85
$F_{0.1}$	0.14	0.22	1.64
$F_{med}$	0.48	0.23	0.48

## Single-stock exploitation boundaries

*Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects*

Target reference points have not been agreed for this stock. A candidate for a target reference point which is consistent with taking high long-term yields and achieving a low risk of depleting the productive potential of the stock may be identified in the range of  $F_{0.1}$  (0.14) and  $F_{max}$  (0.28). Having a target above this level provides no gain in yield. Current  $F$  is estimated to be 0.29.

## Exploitation boundaries in relation to precautionary considerations

A 60% reduction in  $F$  is needed to increase SSB to around  $B_{pa}$  in 2009. This corresponds to landings of less than 240 t in 2008.

## Short-term implications

### Outlook for 2008

Basis:  $F(2007) = F_{sq} = \text{mean } F(04-06) = 0.41$ ;  $R = \text{GM}89-05 = 3$  million;  $\text{SSB}(2007) = 1.33$  kt;  $\text{SSB}(2008) = 1.41$  kt; landings (2007) = 0.59 kt

Rationale	TAC(2008)	Basis	F(2008)	SSB(2009)	%SSB change <sup>1</sup>	% TAC change <sup>2</sup>
Zero catch	0.00	$F=0$	0.00	2.04	44%	-100%
Status quo	0.59	$F_{sq}$	0.41	1.47	4%	42%
High long-term yield	0.43	$F(\text{long-term yield})$	0.28	1.63	15%	2%
Status quo	0.07	$F_{sq} * 0.1$	0.04	1.97	39%	-83%
	0.24	$F_{sq} * 0.37$	0.15	1.80	28%	-43%
	0.32	$F_{sq} * 0.5$	0.21	1.73	22%	-22%
	0.47	$F_{sq} * 0.75$	0.31	1.59	13%	12%
	0.54	$F_{sq} * 0.9$	0.37	1.52	8%	30%
	0.59	$F_{sq} * 1$	0.41	1.47	4%	42%
	0.64	$F_{sq} * 1.1$	0.45	1.43	1%	54%
	0.71	$F_{sq} * 1.25$	0.52	1.36	-3%	70%

All weights in '000 tonnes.

Shaded scenarios are not considered consistent with the precautionary approach.

<sup>1</sup> SSB 2009 relative to SSB 2008.

<sup>2</sup> TAC 2008 relative to TAC 2007.

## Management considerations

If the advised large reduction in  $F$  is not achievable in the short term, ICES urges a Recovery plan to be developed. This plan should include a sustained reduction of fishing mortality to rebuild the stock above  $B_{pa}$  in the medium term. Catch and effort reductions are required to promote such a reduction in fishing mortality.

Since 2000 the estimated landings have been below the TACs. Nevertheless, according to the catch forecast the predicted landings in 2007 at *status quo* fishing mortality are much higher than the agreed TAC for 2007.

Discard rates are believed to be high for this stock in some seasons/fleets. The high level of discarding indicated in this mixed fishery would suggest a mis-match between the mesh size employed and the size of the fish landed. Increases in the mesh size of the gear should result in fewer discards and, ultimately, in increased yield from the fishery. The use of larger-mesh gear should be encouraged in this fishery in instances where mixed fishery issues allow for it.

### Ecosystem considerations

There is some evidence from tagging that plaice from the southern and western coasts of Wales move southwards to join the adult population off the north Cornish coast during spawning.

## Factors affecting the fisheries and the stock

In the 1970s, the plaice fishery in Divisions VIIIf,g was mainly carried out by Belgian beam trawlers and Belgian and UK otter trawlers. Effort in the UK and Belgian beam trawl fleets increased in the late 1980s, but has since declined. Recently, many otter trawlers have been replaced by beam trawlers targeting sole. Landings gradually increased until 1989, then declined rapidly in 1991. The main fishery occurs in the spawning area off the north Cornish coast, at depths greater than 40 m, about 20 to 25 miles offshore. Although plaice are taken throughout the year, the larger landings occur during February–March after the peak of spawning, and again in September.

### Regulations and their effects

Plaice in the Bristol Channel and Celtic Sea (ICES Divisions VIIIf and VIIg) are managed by TAC and technical measures. Technical measures in force for this stock are minimum mesh sizes, minimum landing size, and restricted areas for certain classes of vessels. Technical regulations regarding allowable mesh sizes for specific target species, and associated minimum landing sizes, came into force on 1 January 2000. The minimum landing size for plaice in Divisions VIIIf,g is 27 cm.

Since 2005, ICES rectangles 30E4, 31E4, and 32E3 have been closed during the first quarter (Council Regulations 27/2005, 51/2006, and 41/2007) with the intention of reducing fishing mortality on cod.



There is evidence that this closure has redistributed effort to other areas. Many vessels (particularly beam trawlers from the UK and Belgium) fished close to the borders of the closed rectangles during the closure, and fished intensively inside the rectangles when they were re-opened. Information from the UK shows that plaice can be caught in areas outside of the closed area with the same catch rates. Therefore the closed area probably had little impact on the fishing mortality on plaice.

## Scientific basis

### Data and methods

The analytical age-based assessment (XSA) is based on landings, one survey index, and two commercial cpue series.

### Information from the fishing industry

The UK industry believes this stock does not appear to be doing very well. Effort on the whole should have been decreasing with the closure forcing boats to switch to monk and *Nephrops*. Discarding is mainly a MLS problem and not a high grading issue.

From the UK Fisheries Science Partnership conducted in 2003–2006 it was confirmed that discards of plaice in the Celtic Sea were substantial. Catch rates of plaice during 2005 were highest off the north coast of Cornwall, with the average size of the fish caught tending to increase from north to south.

### Uncertainties in assessment and forecast

Discards are substantial and can range from 30 to 70% discarded plaice in number (mainly below the minimum landing size). Due to the short time-series discards are not included in the assessment.

There is a retrospective bias of overestimation of SSB and underestimation of fishing mortality. Recent forecasts for this stock have been overly optimistic, probably due to this bias problem. The GM assumptions of average recruitment in the most recent years contribute little to forecasted landings.

### Comparison with previous assessment and advice

The perception of the state of the stock is similar to last year.

The advice for an F reduction to rebuild SSB above  $B_{pa}$  is consistent with last year's advice.

### Source of information

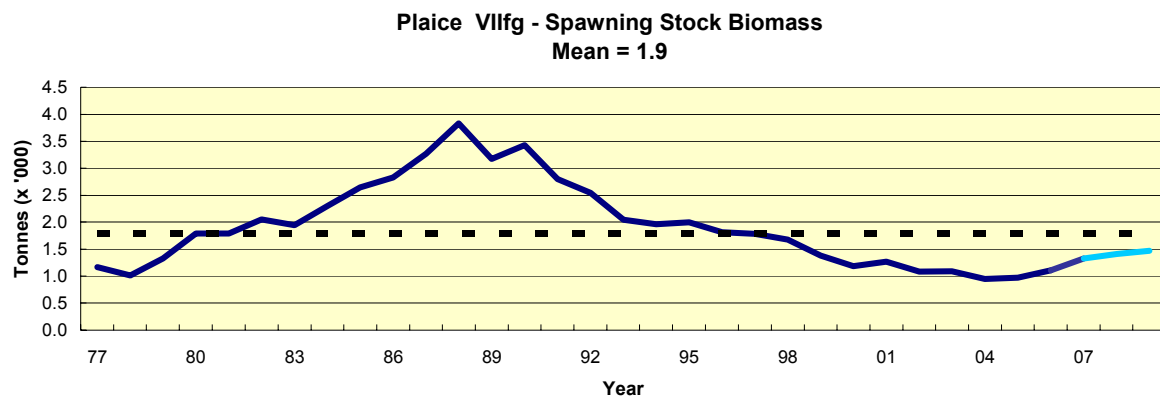
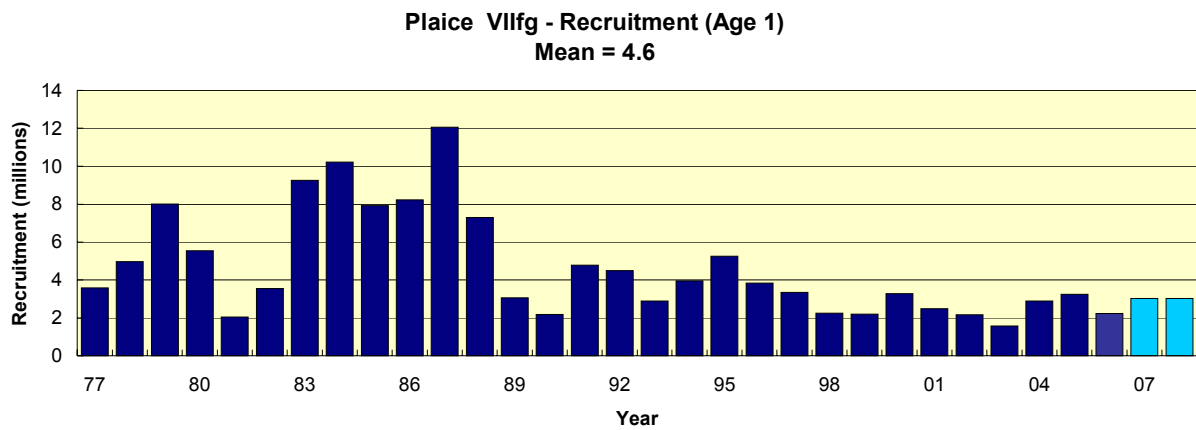
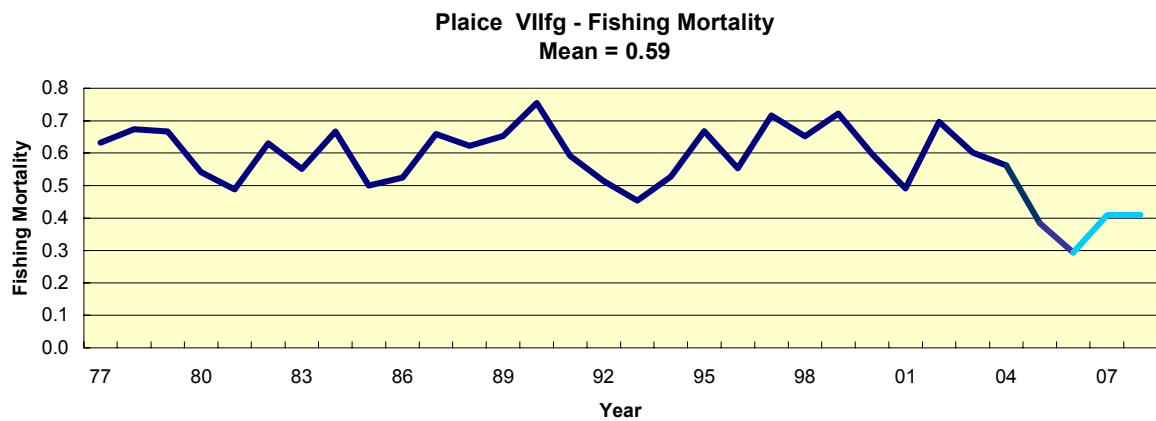
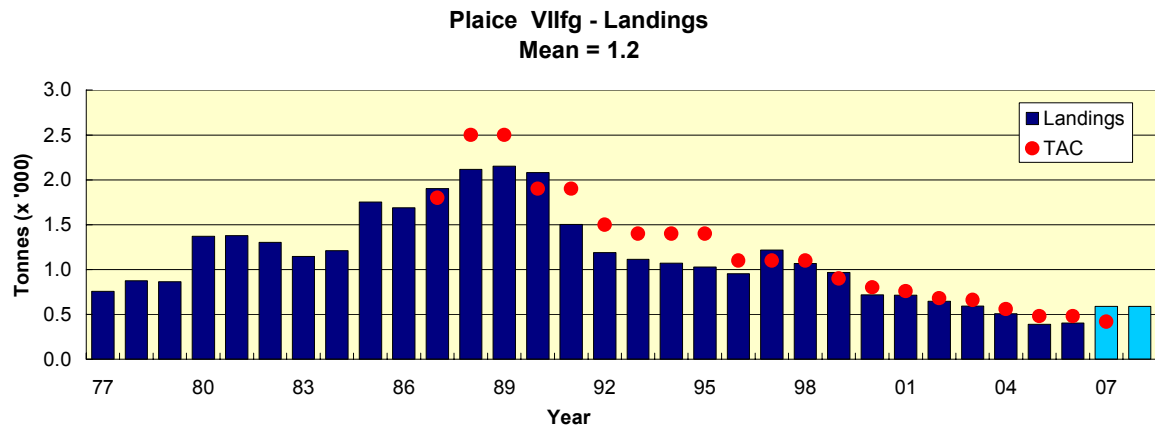
Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 26 June–5 July 2007 (ICES CM 2007/ACFM:28).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official landings	ACFM Landings
1987	TAC not to be restrictive on other species		-		1.8	1.91	1.90
1988	TAC not to be restrictive on other species		-		2.5	2.19	2.12
1989	TAC not to be restrictive on other species		-		2.5	2.58	2.15
1990	F likely to be F(88)		~1.9		1.9	2.22	2.08
1991	F likely to be F(89)		~1.7		1.9	1.83	1.50
1992	No long-term gains in increasing F		-		1.5	1.36	1.19
1993	No long-term gains in increasing F		-		1.4	1.30	1.11
1994	No long-term gains in increasing F		-		1.4	0.98	1.07
1995	No increase in F		1.29		1.4	0.96	1.03
1996	20% reduction in F		0.93		1.1	0.98	0.95
1997	20% reduction in F		1.10		1.1	1.26	1.22
1998	20% reduction in F		1.00		1.1	1.15	1.07
1999	35% reduction in F		0.67		0.9	0.66	0.97
2000	30% reduction in F		0.70		0.80	0.72	0.72
2001	40% reduction in F		0.60		0.76	0.68	0.71
2002	At least 35% reduction in F		0.68		0.68	0.62	0.65
2003	At least 40% reduction in F		<0.66		0.66	0.56	0.59
2004	<sup>1</sup>	F < 0.10 or Recovery plan	<sup>1</sup>	<0.21	0.56	0.49	0.51
2005	<sup>1</sup>	70% Reduction in F or Recovery plan	<sup>1</sup>	<0.25	0.48	0.40	0.39
2006	<sup>1</sup>	50% reduction in F or Recovery plan	<sup>1</sup>	<0.40	0.48	0.38	0.40
2007	<sup>1</sup>	50% reduction in F or Recovery plan	<sup>1</sup>	<0.38	0.42		
2008	<sup>1</sup>	60% reduction in F	<sup>1</sup>	<0.24			

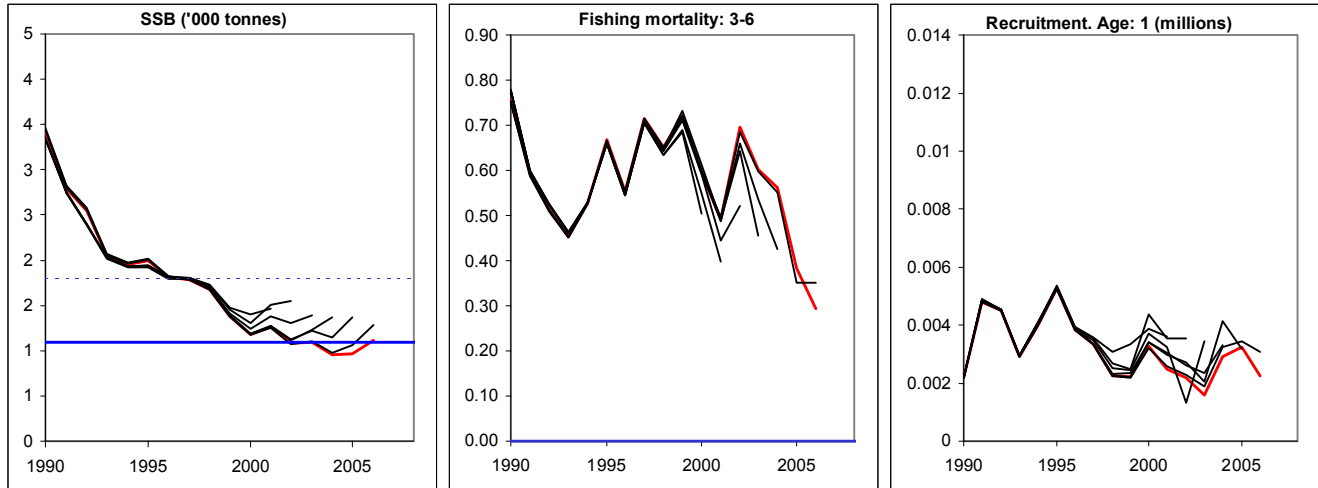
Weights in '000 t.

<sup>1</sup> Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

(Official landings figures have been corrected following the discovery of errors in the time-series).



Celtic Sea plaice (Divisions VII f and g)



**Figure 5.4.8.3** Celtic Sea plaice (Divisions VII f and g). Comparison of current assessment with previous assessments.

Table 5.4.8.1

Plaice in divisions V,II,f&g  
Nominal landings (t) as reported to ICES, and total landings as used by the working group

National landings as estimated by the working group 1977 - 1985; as reported to ICES and total landings as used by the working group 1986 onwards

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Belgium</b>	214	196	171	372	365	341	314	283	357	665	581	617	843	794	836
<b>UK (Engl. &amp; Wales)</b>	150	152	176	227	251	196	279	366	466	529	496	629	471	497	392
<b>France</b>	365	527	467	706	697	568	532	558	493	878	708	721	1089	767	444
<b>Ireland</b>	28	0	49	61	64	198	48	72	91	302	127	226	180	160	155
<b>N. Ireland</b>												1			
<b>Netherlands</b>										9					
<b>Scotland</b>	0	0	0	7	0	0	0	0	0	1				1	
<b>Total</b>	757	875	863	1373	1377	1303	1173	1279	1407	2384	1912	2194	2583	2219	1827
<b>Unallocated</b>	0	0	0	0	0	0	-27	-69	345	-693	-11	-78	-432	-137	-326
<b>Total as used by WG</b>	757	875	863	1373	1377	1303	1146	1210	1752	1691	1901	2116	2151	2082	1501
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
<b>Belgium</b>	371	542	350	346	410	594	540	371	224	241	248	221	212	168	173
<b>UK (Engl. &amp; Wales)</b>	302	290	251	284	239	258	176	170	134	136	105	127	87	55	87
<b>France</b>	504	373	298	254	246	329	298		287	262	186	165	145	132	67
<b>Ireland</b>	180	89	82	70	83	78	135	115	76	45	79	51	45	44	48
<b>N. Ireland</b>															
<b>Netherlands</b>															
<b>Scotland</b>	5	9	1	2											
<b>Total reported</b>	1362	1303	982	956	978	1259	1149	656	721	684	618	564	489	399	375
<b>Unallocated</b>	-174	-189	88	72	-26	-42	-82	312	-3	30	28	30	21	-10	28
<b>Total as used by WG</b>	1188	1114	1070	1028	952	1217	1067	968	718	714	646	594	510	389	403

**Table 5.4.8.2** Celtic Sea plaice (Divisions VIIIf and g).

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3–6
1977	3582	1170	757	0.632
1978	4965	1010	875	0.673
1979	8005	1323	863	0.666
1980	5550	1789	1373	0.541
1981	2050	1793	1377	0.488
1982	3549	2055	1303	0.630
1983	9262	1941	1146	0.551
1984	10227	2303	1210	0.667
1985	7920	2645	1752	0.500
1986	8228	2830	1691	0.525
1987	12071	3269	1901	0.659
1988	7309	3831	2116	0.622
1989	3065	3173	2151	0.653
1990	2187	3427	2082	0.755
1991	4786	2797	1501	0.592
1992	4504	2544	1188	0.514
1993	2900	2046	1114	0.454
1994	3961	1958	1070	0.528
1995	5253	1998	1028	0.668
1996	3839	1814	952	0.553
1997	3351	1783	1217	0.716
1998	2246	1675	1067	0.652
1999	2210	1378	968	0.722
2000	3285	1182	718	0.597
2001	2485	1266	714	0.491
2002	2169	1083	646	0.696
2003	1572	1092	594	0.602
2004	2907	951	510	0.562
2005	3241	971	389	0.383
2006	2242	1110	403	0.294
2007	3022*	1328		
Average	4631	1940	1156	0.586

\* GM 1989–2005.

# Southwest of Ireland Plaice

(Divisions VIIh-k)

For latest information, see: <http://www.ices.dk>



*Marine Institute*  
Foras na Mara

Fisheries Science Services

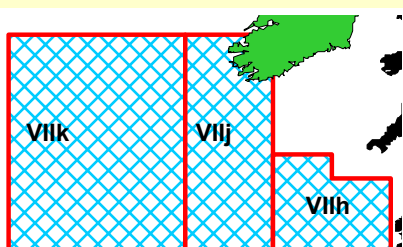
## FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

The state of this stock is unknown. Landings show a declining trend since the beginning of the time-series. Other indicators such as LPUE and surveys also indicate a generally declining trend.

FSS agrees with ICES advice that catches in 2008 should be no more than the recent average (2004 to 2006) of around 177 t in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment. This translates to an Irish quota of 78 t.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Southwest of Ireland Plaice, FSS interprets that the EC fishing opportunities in 2008 should be a 15% reduction of the 2007 TAC which is equivalent to 286 t.



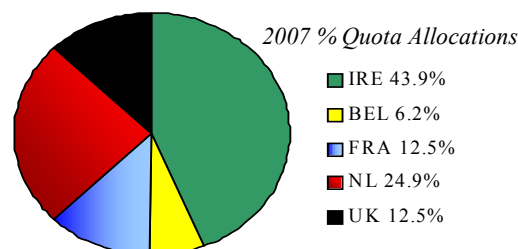
Red Boxes-TAC/Management Areas Blue Shading-Assessment Area

## CURRENT MANAGEMENT

- The 2007 TAC was 337 t with an associated Irish quota of 148 t. Recent landings have been well below this precautionary TAC.
- Given the mixed nature of fisheries catching plaice it is unrealistic to develop a management plan for this stock. Ireland as the main participant has an opportunity to develop and implement a management strategy for mixed fisheries in this area.

## ADDITIONAL INFORMATION

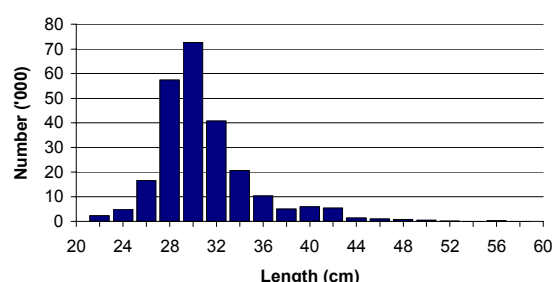
- Irish estimated landings declined further in 2006 to 66 t, the lowest in the time series.
- Area misreporting may be a problem in this fishery (see



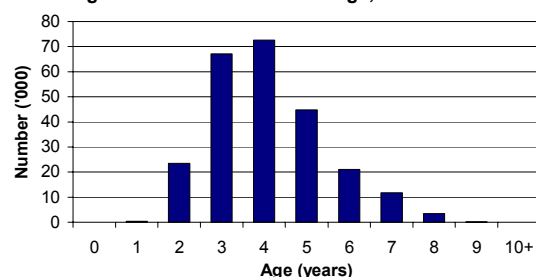
Celtic Sea Plaice).

- Ireland has accounted for on average about 90% of the landings in this fishery since 1996. Belgium, the UK and France take most of the remaining catch.
- Plaice are mainly caught in mixed species otter trawl fisheries in inshore parts of VIIj by vessels from Dingle, Castletownbere, Union Hall, Baltimore and Schull. Otter trawls accounted for around 90% of the landings in 2006.
- FSS sampling indicates that the Irish landings were mainly comprised of 3-5 year old fish in 2006.
- The level of discards is not well quantified but FSS sampling has indicated that discarding does occur in this fishery.

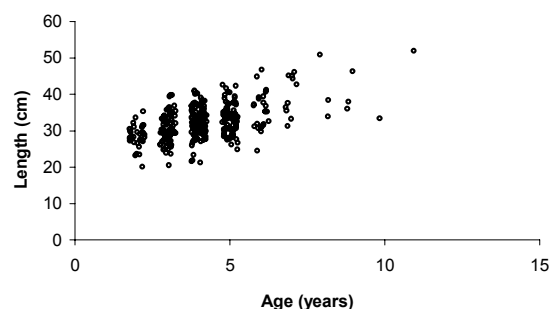
2006 Length Distribution: Irish Landings, Plaice in VIIh-k



2006 Age Distribution: Irish Landings, Plaice in VIIh-k



2006 Size at Age: Irish Sampling, Plaice in VIIh-k



## ICES ADVICE

### 5.4.10

#### State of the stock

Spawning bio-mass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Unknown	Unknown	Unknown	NA

The available information is inadequate to evaluate the state of the stock. Landings have decreased continuously since the beginning of the time-series.

#### Management objectives

There are no explicit management objectives for this stock.

#### Reference points

No precautionary reference points have been established.

#### Single-stock exploitation boundaries

##### *Exploitation boundaries in relation to precautionary considerations*

Catches in 2008 should be no more than the recent average (2004–2006) of around 177 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.

#### Management considerations

Landings are substantially below the TAC and have been declining. The 2006 landings are the lowest observed in the time-series. The advice based on recent average landings may not be precautionary enough if this stock is in decline.

Plaice are taken as part of a mixed demersal fishery by otter trawlers. Management options proposed for plaice should also take into consideration other demersal fish species taken in the fishery.

Discard sampling is low, but the available information suggests that discarding of this plaice stock can be quite variable from year to year.

#### Factors affecting the fisheries and the stock

##### *Regulations and their effects*

Plaice is managed through a precautionary TAC and technical conservation measures. The agreed TAC for plaice in 2007 was set at 337 t. Vessel quota restrictions were imposed on Irish vessels for hake, cod, and anglerfish.

##### *Changes in fishing technology and fishing patterns*

Ireland, France, Belgium, and UK are the participants in this fishery. Plaice are predominantly caught in mixed species otter trawl fisheries in Division VIIj. Irish vessels increasingly target hake, anglerfish, and megrim and not the more traditional inshore species (plaice, sole, whiting, and cod). Otter trawlers accounted for the majority, with beam trawlers and seiners taking smaller catches of plaice.

#### Scientific basis

##### *Data and methods*

No analytical assessment was agreed for this stock.

##### *Comparison with previous assessment and advice*

The basis for the advice is similar as last year.

#### Source of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 26 June–5 July 2007 (ICES CM 2007/ACFM:28).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	ACFM landings
1993	-		-		-	655
1994	-		-		-	577
1995	-		-		-	542
1996	-		-		-	453
1997	-		-		-	645
1998	-		-		-	444
1999	-		-		-	406
2000	-		-		-	299
2001	-		-		1215	261
2002	-		-		1080	313
2003	Reduce TAC to recent average (1998–2000) <sup>1</sup>		450		582	217
2004		Reduce TAC to recent average (2000–2002)	<sup>1</sup>	320	466	221
2005		Reduce TAC to recent average (2001–2003)		271	466	164
2006		Reduce TAC to recent average (2002–2004)		245	396	147
2007		Reduce TAC to recent average (2003–2005)		196	337	
2008		Reduce TAC to recent average (2004–2006)		177		

Weights in t.

<sup>1</sup> Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

**Table 5.4.10.1** Plaice in Divisions VII h-k (Southwest Ireland).  
Nominal landings (t), 1987-2006, as officially reported to ICES.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium*	<b>250</b>	<b>245</b>	<b>403</b>	<b>301</b>	<b>252</b>	<b>246</b>	<b>344</b>	<b>197</b>	<b>235</b>	<b>304</b>	<b>442</b>
Denmark	0.5	0.5	0.5	-	-	-	-	-	-	-	-
France	85	135	229	77	173	90	64	48	60	48	69
Ireland	300	369	454	338	478	477	383	271	321	305	344
Netherlands	-	-	-	-	-	-	-	-	-	52	-
Spain	-	-	-	-	-	-	-	-	-	-	-
UK - Eng+Wales	.	.	73	88	287	264	218	258	282	154	138
UK - England & Wales	246	433	.	.	.	.	.	.	.	.	.
UK - Scotland	-	1	-	1	0.5	6	7	1	4	1	0.5
Un. Sov. Soc. Re	-	-	-	-	-	.	.	.	.	.	.
Total	881.5	1183.5	1159.5	805	1190.5	1083	1016	775	902	864	993.5
Unallocated	882	1184	1160	805	1191	1083	361	198	360	411	349
Total figures used by Working Group							655	577	542	453	645
Country	1998	1999	2000	2001	2002	2003	2004	2005	2006		
Belgium	<b>335</b>	45	4	27	69	20	67	32	22		
Denmark	-	-	-	-	-	-	-	-	-		
France	49	.	54	50	45	33	34	22	25.3		
Ireland	286	299	200	160	155	127	91	90	65.8		
Netherlands	13	1	2	-	-	-	-	.	.		
Spain	-	0.5	5	3	2	6	6	.	.		
UK - Eng+Wales	106	82	75	73	59	56	36	28	18.5		
UK - England & Wales	.	.	.	.	.	.	.	.	.		
UK - Scotland	0.5	0.5	1	-	-	-	-	.	.		
Un. Sov. Soc. Re	.	.	.	.	.	.	.	.	.		
Total	789.5	428	341	313	330	242	234	172	132		
Unallocated	346	22	42	52	17	25	13	8	-15		
Total figures used by Working Group	444	406	299	261	313	217	221	164	147		

\* Belgian Landings highlighted include VIlg



# West of Ireland Plaice

## (Divisions VIIb,c)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

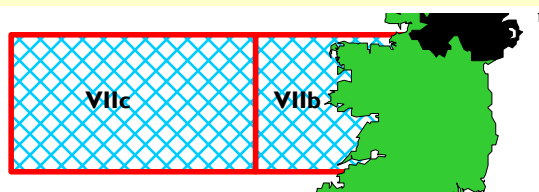
### FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

The state of this stock is unknown. Landings show a declining trend in recent years.

FSS agrees with ICES advice that catches in 2008 should be no more than the recent average (2004 to 2006) of around 40 t in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment. This translates to an Irish quota of 32 t.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For West of Ireland Plaice, FSS interprets that the proposal would result in the 2007 TAC being reduced by 15% to 104 t in 2008.



Red Boxes-TAC/Management Areas

Blue Shading- Assessment Area

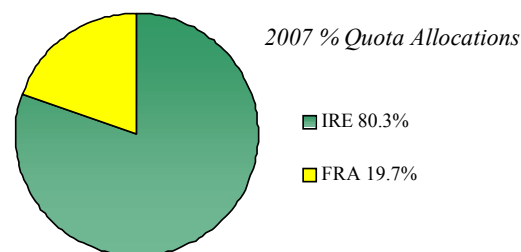
### CURRENT MANAGEMENT

- The 2007 TAC was 122 t with an associated Irish quota of 98 t.
- Given the mixed nature of fisheries catching plaice it is unrealistic to develop a management plan for this stock. Ireland as the main participant has an opportunity to develop and implement a management strategy for mixed fisheries in this area.

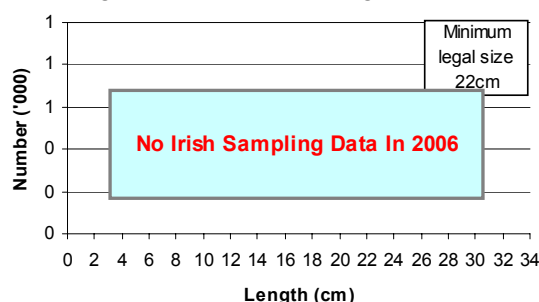
### ADDITIONAL INFORMATION

- No assessment has been carried out for this stock for several years but landings show a declining trend. Sampling in 2006 was extremely limited (see page 30). Therefore length and age distributions are not available.
- Irish estimated landings in 2006 were 20 t. This is a 20% decrease from the 2005 landings.

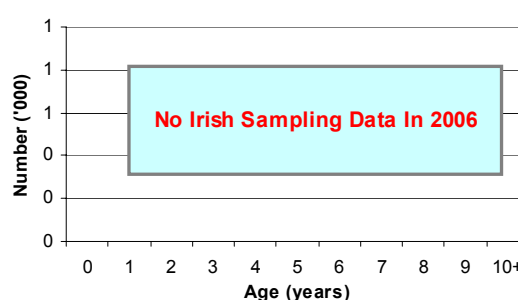
- Misreporting is not considered to be a problem in this fishery.
- On average, Ireland accounts for around 70% of total international landings in recent years.
- Over 95% of the Irish landings are taken by otter trawls in a mixed fishery.
- The level of discards is not well quantified but FSS sampling has indicated that discarding does occur in this fishery.



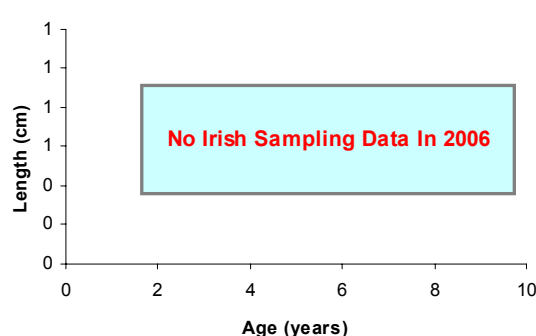
2006 Length Distribution: Irish Landings, Plaice in VIIb,c



2006 Age Distribution: Irish Landings, Plaice in VIIb,c



2006 Size at Age: Irish Sampling, Plaice in VIIb,c



## ICES ADVICE

### 5.4.11

#### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield
Unknown	Unknown	Unknown

The state of the stock is unknown, but landings show a declining trend in recent years. No assessment was performed, due to the short series of data and lack of reliable tuning indices.

#### Management objectives

There are no explicit management objectives for this stock.

#### Reference points

No precautionary reference points have been established.

#### Single-stock exploitation boundaries

*Exploitation boundaries in relation to precautionary considerations*  
Catches in 2008 should be no more than the recent average (2004–2006) of around 40 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.

#### Management considerations

Landings have been declining and 2006 landings are the lowest observed in the time-series, at around 30% of the TAC level. The

advice based on recent average landings may not be precautionary enough if this stock is in decline. Plaice are taken as part of a mixed demersal fishery by otter trawlers. Management options proposed for plaice should also take into consideration other demersal fish species and *Nephrops* taken in the VIIb,c fishery.

#### *Factors affecting the fisheries and the stock*

Ireland is the major participant in this fishery with around 90% of the international landings taken in 1993–2003. Plaice are normally caught in mixed species otter trawl fisheries in Division VIIb. These vessels mainly target other demersal fish species and *Nephrops*.

#### *The effects of regulations*

Plaice is managed by a precautionary TAC and technical measures.

Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a 'biologically sensitive area' in areas of VIIb, VIIj, VIIg, and VIIh. Effort exerted within the 'biologically sensitive area' by the vessels of each EU Member State may not exceed their average annual effort (calculated over the period 1998–2002).

#### Scientific basis

##### *Data and methods*

Data update and screening methods only. No analytical assessment was performed.

#### Source of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 26 June–5 July 2007 (ICES CM 2007/ACFM:28).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresponding to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	ACFM landings
1993	-		-		-	197
1994	-		-		-	215
1995	-		-		-	315
1996	-		-		-	240
1997	-		-		-	213
1998	-		-		-	183
1999	-		-		-	172
2000	-		-		-	108
2001	-		-		240	87
2002	No advice		-		180	71
2003	Reduce TAC to recent landings		160		160	72
2004	<sup>1</sup>	Reduce TAC to recent av. landings (2000–2002)	<sup>1</sup>	90	160	55
2005		Reduce TAC to recent av. landings (2001–2003)		77	160	38
2006		Reduce TAC to recent av. landings (2002–2004)		65	144	31
2007		Reduce TAC to recent av. landings (2003–2005)		55	122	
2008		Reduce TAC to recent av. landings (2004–2006)		40		

Weights in t.

<sup>1</sup> Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

**Table 5.4.11.1** Plaice in Divisions VII b, c (Southwest Ireland).

Nominal landings	(t)	1973-2006	as	officially reported to	ICES.								
		1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Country													
Denmark	-	-	-	-	-	-	-	2	-	-	-	-	-
France	60	45	10	9	4	16	6	12	9	8.00	37	2	2
Ireland	124	106	153	133	135	122	117	142	135	122	108	110	110
Spain	-	-	-	-	-	-	-	65	58	22	7	-	-
UK - Eng+Wales+N.Irl.	-	-	-	-	-	-	-	-	-	-	-	-	-
UK - England & Wales	1	1	-	-	-	-	-	-	4	4	-	3	3
UK - Scotland	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	185	152	163	142	139	138	125	219	206	156	152	118	118

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Denmark	-	-	-	-	-	-	-	-	-	-	-
France	10	11	13	9	1	11	9	3	2	1	5
Ireland	150	114	153	157	159	130	179	180	191	200	239
Spain	-	-	-	-	-	-	-	-	-	-	-
UK - Eng+Wales+N.Irl.	-	-	-	-	1	2	-	6	1	2	1
UK - England & Wales	7	5	1	2	-	-	-	-	-	-	-
UK - Scotland	-	-	-	-	13	90	3	3	2	3	1
Total	167	130	167	168	174	233	191	192	196	206	246

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Denmark	-	-	-	-	-	-	-	-	-	-	-
France	1	3	-	-	31	8	17	8	16	14	10
Ireland	248	206	160	157	99	70	51	56	39	25	19.6
Spain	-	-	-	-	-	-	-	2	1	-	-
UK - Eng+Wales+N.Irl.	2	-	1	-	-	-	2	-	-	-	-
UK - England & Wales	-	-	-	-	-	-	-	-	-	-	-
UK - Scotland	-	-	-	2	-	-	-	-	-	-	-
UK	-	-	-	-	-	-	-	-	-	-	0.3
Total	251	209	161	159	130	78	70	66	56	39	29.5
Unallocated	-11	4	22	13	-22	9	1	6	-1	-1	1
Total as used by the Working Group	240	213	183	172	108	87	71	72	55	38	30.5

# Celtic Sea Sole

## (Divisions VIIg)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

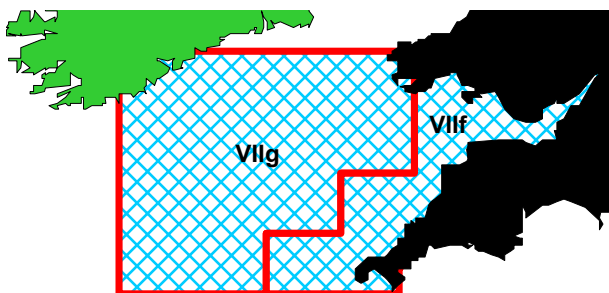
(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

ICES classifies this stock as having full reproductive capacity and is harvested sustainably. The assessment is consistent with last year.

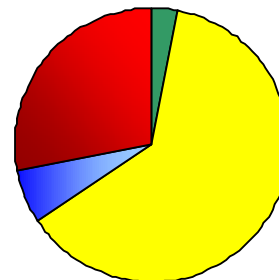
FSS endorses the ICES short term advice that  $F$  should be maintained below  $F_{pa}$ . This translates to a 2008 TAC of 1,000 t with an associated Irish quota of 31 t.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Celtic Sea sole, FSS interprets that the proposal would result in the 2008 TAC being set on the basis of  $F_{sq}$  which results in a 3% increase on the 2007 TAC to 920 t.

FSS advises managers that this stock should be managed on a long term basis in the range of  $F_{max}$  or  $F_{0.1}$ . This would result in higher long term yield and achieve a low risk of depleting the reproductive potential of the stock. Average fishing mortality for the past three years ( $F = 0.38$ ) is far in excess of  $F_{max}$  ( $F = 0.23$ ) or  $F_{0.1}$  ( $F = 0.11$ ). Therefore a management plan should be put in place to adapt fishing mortality towards an agreed long-term fishing mortality target.



Red Boxes-TAC/Management Areas Blue Shading- Assessment Area



2007 % Quota Allocations

IRE 3.1%  
BEL 62.5%  
FRA 6.3%  
UK 28.1%

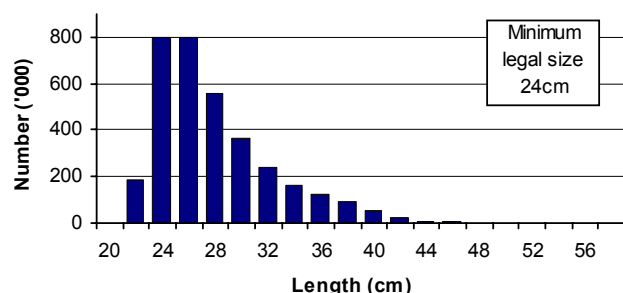
### CURRENT MANAGEMENT

- The 2007 TAC was 893 t with an associated Irish quota of 28 t (adjusted 32 t).
- There are no explicit management objectives or plans for this stock.

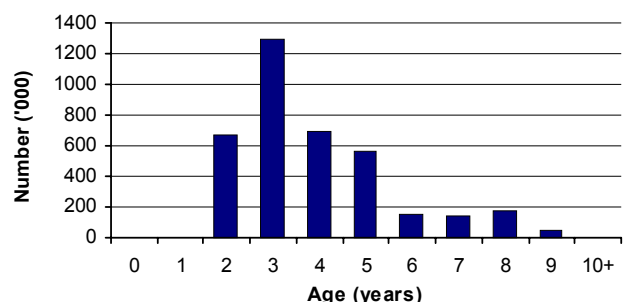
### ADDITIONAL INFORMATION

- The trends and estimates of fishing mortality, SSB and recruitment were consistent with those from last year's assessment. Recruitment since the strong 1998 year class has been around average.
- Irish estimated landings in 2006 were 38 t. This is a slight increase on the 2005 landings (34 t).
- Misreporting from ICES Division VIIg to VIIj is considered to be a problem for this stock and the level of misreporting has probably substantially increased, as a result of the exceptionally strong 1998 year class in association with more restrictive quotas. It is known that misreporting occurs to surrounding areas and this has been taken into account where possible.
- Recent discard estimates are available for the UK beam trawler, the Irish otter trawler and the Belgian beam trawler fleets. Discarding of sole is considered to be negligible.
- As well as technical measures including minimum mesh sizes and minimum landing size there are also restricted areas for vessels and gears.
- In response to an industry request to examine the possibility of combining the VIIg and VIIh-k sole quotas FSS points out that there is no evidence that sole in these areas constitute part of the same stock. Recent tagging experiments suggest that there is only limited movement of sole between the Bristol Channel VIIf and adjacent areas. It is generally thought that once it has settled sole do not move very far other than some short inshore/offshore migrations with some along-shore drift. ICES currently considers that fisheries for sole in VIIg and VIIh-k are separate fisheries. Landings data for the Belgian fleets are, however, corrected for area misreporting from Divisions VIIh-k to VIIg.

## 2006 Length Distribution: International Landings, Sole in Vllf,g



## 2006 Age Distribution: International Landings, Sole in Vllf,g



## Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	not defined.	
	$B_{pa}$	2 200 t	There is no evidence of reduced recruitment at the lowest biomass observed and $B_{pa}$ can therefore be set equal to the lowest observed SSB.
	$F_{lim}$	0.52	$F_{lim} = F_{loss}$ .
	$F_{pa}$	0.37	This $F$ is considered to have a high probability of avoiding $F_{lim}$ and maintaining SSB above $B_{pa}$ in 10 years, taking into account the uncertainty of assessments. $F_{pa} = F_{lim} \times 0.72$ ; implies a less than 5% probability that $(SSB_{MT} < B_{pa})$ .
Targets	$F_y$	not defined.	

## Yield and spawning biomass per Recruit

### F-reference points:

	Fish Mort	Yield/R	SSB/R
	Ages 4–8		
Average last 3 years	0.38	0.18	0.47
$F_{max}$	0.23	0.19	0.84
$F_{0.1}$	0.11	0.17	1.67
$F_{med}$	0.28	0.19	0.69

## Single-stock exploitation boundaries

### Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

Target reference points have not been agreed for this stock. A candidate for a target reference point which is consistent with taking high long-term yields and achieving a low risk of depleting the productive potential of the stock may be identified in the range of  $F_{0.1}$  (0.11) and  $F_{max}$  (0.23). There is no gain in yield having a target above this level. The risk to the stock at this level of fishing mortalities appears to be very low in the medium term.

# ICES ADVICE

## 5.4.13

### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Full reproductive capacity	Harvested sustainably	Overexploited	No agreed target

Based on the most recent estimates of SSB and fishing mortality, ICES classifies the stock as having full reproductive capacity and being harvested sustainably. SSB in 2007 is estimated to be above  $B_{pa}$ . Fishing mortality in 2006 is estimated to be below  $F_{pa}$ . The exceptional year class of 1998 has increased SSB to above the long-term average, but as the contribution of this year class on SSB diminishes, SSB declines again.

### Management objectives

There are no specific management objectives for this stock.

### Exploitation boundaries in relation to precautionary limits

$F$  should be kept below  $F_{pa}$ , corresponding to landings of less than 1000 tonnes in 2008. This is expected to keep the stock above  $B_{pa}$ .

## Outlook for 2008

Basis:  $F(2007) = F_{sq}$  = mean  $F(04-06)$  scaled to 2006  $F = 0.33$ ;  $R(2007)$  = mean  $R(71-04) = 4.9$  million;  $SSB(2007) = 2.87$  kt;  $SSB(2008) = 2.81$  kt; landings (2007) = 0.94 kt.

Rationale	TAC(2008)	Basis	F(2008)	SSB(2009)	%SSB change <sup>1</sup>	% TAC change <sup>2</sup>
Zero catch	0.00	$F=0$	0.00	3.68	31%	-100%
High long-term yield	0.67	$F(\text{long-term yield})$	0.23	2.96	6%	-25%
Status quo	0.50	$F_{sq} * 0.5$	0.17	3.15	12%	-44%
	0.59	$F_{sq} * 0.6$	0.20	3.05	9%	-34%
	0.76	$F_{sq} * 0.8$	0.26	2.87	2%	-15%
	0.84	$F_{sq} * 0.9$	0.30	2.78	-1%	-6%
	0.92	$F_{sq} * 1$	0.33	2.70	-4%	3%
	0.99	$F_{sq} * 1.1$	0.36	2.62	-7%	11%
	1.00	$F_{pa} = F_{sq} * 1.12$	0.37	2.60	-7%	12%
	1.07	$F_{sq} * 1.2$	0.40	2.54	-10%	19%

All weights in '000 tonnes.

Shaded scenarios are not considered consistent with the precautionary approach.

<sup>1</sup> SSB 2009 relative to SSB 2008.

<sup>2</sup> TAC 2008 relative to TAC 2007.

## Management considerations

Sole is mainly taken in a beam trawl fishery as part of a mixed demersal fishery with plaice and cod.

In recent years, fishing mortality has been high but has declined over the last 4 years to below  $F_{pa}$  in 2006. At current levels of fishing mortality, there is a high probability that SSB will remain within the observed range of stock dynamics in the short and medium term.

## Factors affecting the fisheries and the stock

The fisheries for sole in the Celtic Sea and Bristol Channel involve vessels from Belgium, taking two thirds, the UK one quarter, and France and Ireland taking minimal amounts of the total landings. The sole fishery is concentrated on the north Cornish coast off Trevose Head and around Lands End.

Sole are taken mainly in a beam trawl fishery that started in the early 1960s and, to a lesser extent, in the longer established otter trawl fisheries. In the 1970s, the fishery was mainly carried out by Belgian beam trawlers and Belgian and UK otter trawlers. The use of beam trawls (to target sole and plaice) increased during the mid-1970s, and the Belgian otter trawlers have now been almost entirely replaced by beam trawlers. Effort in the Belgium beam trawl fleet increased in the late 1980s as vessels normally operating in the North Sea were attracted to the west by improved fishing opportunities. Beam trawling by UK vessels increased substantially from 1986, reaching a peak in 1990 and decreasing thereafter. In the Celtic Sea, the beam and otter trawl fleets also take other demersal species such as plaice, cod, rays, brill, turbot, and anglerfish.

## Ecosystem considerations

The main spawning areas for sole in the Celtic Sea are in waters 40 to 75 m deep, off Trevose Head, and spawning usually takes place between February and April. Juvenile sole are found in relatively high abundance in depths up to 40 m, and adult sole (fish aged 3 plus) are generally found in deeper water. Spawning and nursery grounds are well defined.

The results of recent tagging experiments suggest that there is only limited movement of sole between the Bristol Channel and adjacent areas.

## Regulations and their effects

In 2004, effort limitations (due to e.g. recovery plans for cod in the Irish Sea and the Eastern Channel) on most fishing grounds where the Belgian fleet normally operates resulted in a concentration of the Belgian effort into the Celtic Sea, where no such effort restrictions were in place.

Since 2005, ICES rectangles 30E4, 31E4, and 32E3 have been closed during the first quarter (Council Regulations 27/2005, 51/2006, and 41/2007) with the intention of reducing fishing mortality on cod.

There is evidence that this closure has redistributed effort to other areas. Monthly sightings and VMS data of beam trawlers and otter trawlers (vessels of all nationalities) in 2004 to 2006 show that, during the first months of the year, beam trawl effort is particularly concentrated in rectangle 30E4 except when the closure is in force. The VMS data also show that the otter trawl effort redirected out of the closed rectangles during the months of the closure is dispersed across adjacent rectangles and is not concentrated around the very edges of the closed area.

Many vessels (particularly beam trawlers from the UK and Belgium) fished close to the borders of the closed rectangles during the closure, and fished intensively inside the rectangles when they were re-opened. In 2007 it was noted that catch rates of sole were initially high on re-opening but fell off rapidly.

Nine Belgian beam trawlers were decommissioned between August 2005 and November 2006. Over the period 2000–04, these vessels accounted for an average 17.6% of the total kW-days in the Celtic Sea.

## Changes in fishing technology and fishing patterns

There have been no major shifts between fisheries. Beam trawlers still account for more than 93% of the Belgian fleet; however, due to high fuel prices; several vessels of this fleet segment have tested

different methods in order to reduce their fuel costs. These include (a) reducing the weight of the beam trawl by decreasing the length of the beam or (b) reducing the weight of the shoes.

A few large beam trawlers in the Belgium fleet (~1200 kW) are currently using two technical modifications for the beam trawl, including T90-codends in combination with a benthos release panel in the belly of the beam trawl. Indications are that the remaining fleet is considering a voluntary uptake of these modifications.

## Scientific basis

### Data and methods

The analytical age-based assessment is based on landings, two commercial cpue series, and one survey index.

### Information from the fishing industry

In 2006 the UK industry indicated that fishing was poor in Subarea VII<sub>fg</sub> at spawning time with a greatly reduced number of vessels prosecuted the fishery. Fishing in 2007 showed good numbers and a wide size range of sole, and the number of beam trawlers prosecuting the fishery were more similar to historical levels, despite the cod closure.

At a pre-WG industry meeting, the Irish industry questioned the stock definitions as used by the WG for sole and plaice in VII<sub>fg</sub> and VII<sub>h-k</sub>. The WG did not have any new information on stock discrimination for this area to suggest that the stock data for VII<sub>fg</sub> and

VII<sub>h-k</sub> should be merged in the assessment. Previous tagging studies in VII<sub>f</sub> have shown little evidence of movement in and out of that area, and there is no information from tagging on movement of sole between VII<sub>f</sub> and VII<sub>j</sub>. It is generally thought that once it has settled sole moves little around other than for short inshore/offshore migrations with some along-shore drift.

### Uncertainties in assessment and forecast

The catch numbers appear to be reasonably reliable though there is some variability in survey tuning data.

The influence of the assumed recruitment to the short-term forecast is small.

### Comparison with previous assessment and advice

Results are very close to those of the previous assessment. Since fishing mortality in 2006 is estimated to be below  $F_{pa}$ , ICES now classifies the stock as being "harvested sustainably".

The basis for the advice is similar to last year. Since fishing mortality in 2006 is estimated to be below  $F_{pa}$ , the advice is now to keep  $F$  below this level.

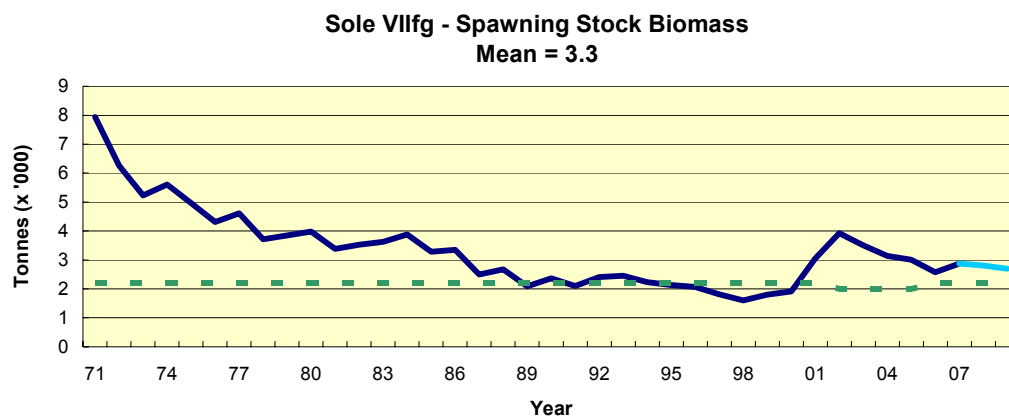
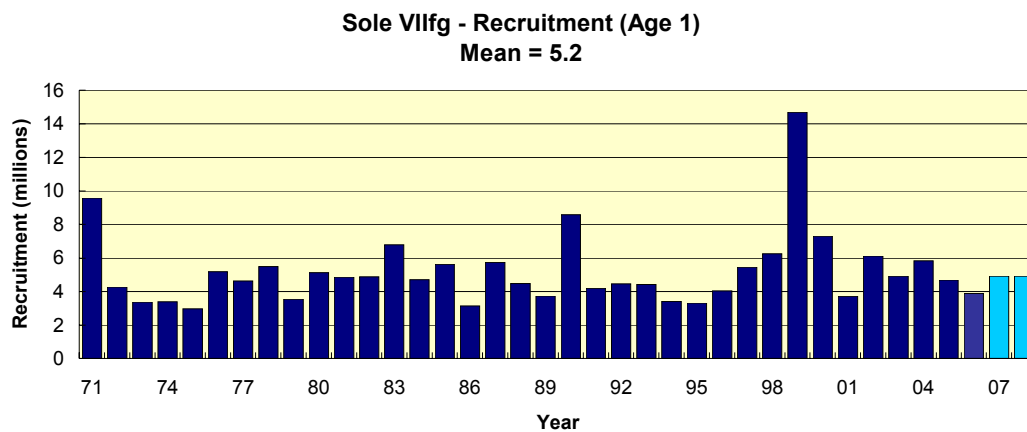
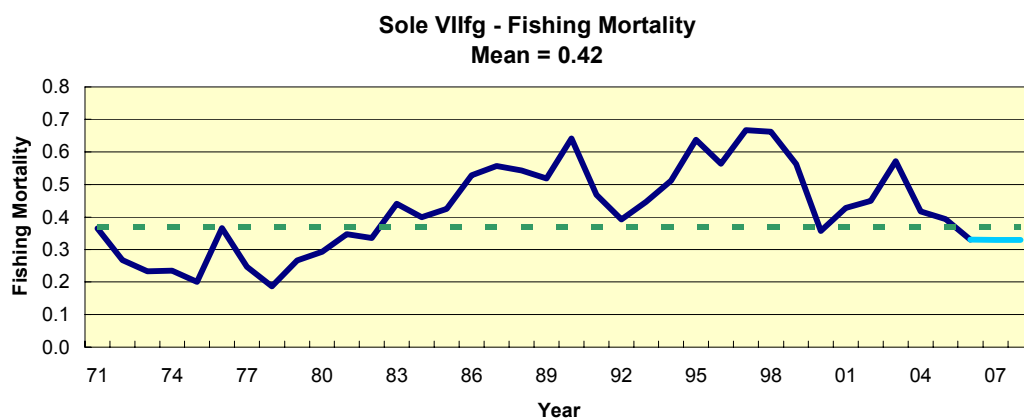
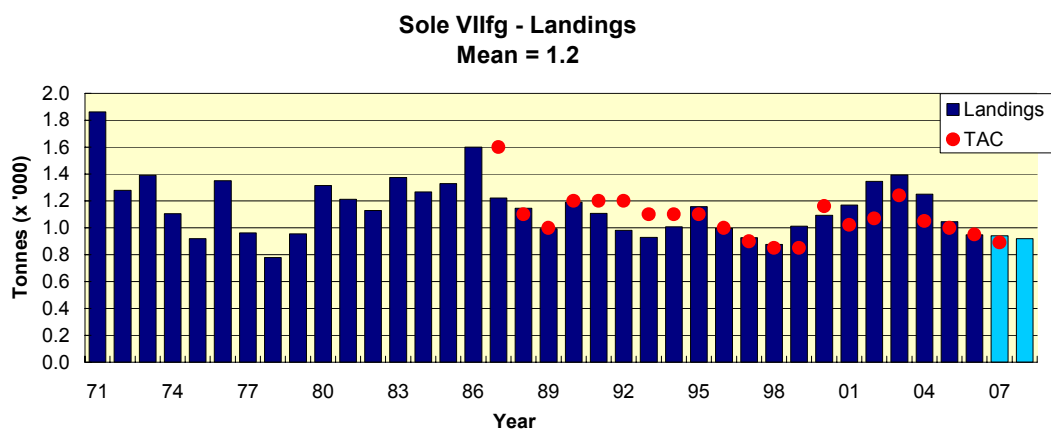
## Source of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 26 June–5 July 2007 (ICES CM 2007/ACFM:28).

Year	ICES advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	ACFM Landings
1987	Status quo $F$ ; TAC		1.6		1.6	1.22
1988	$F = F(\text{pre-86})$ ; TAC		0.9		1.1	1.15
1989	$F$ at $F(81-85)$ ; TAC		1.0		1.0	0.99
1990	No increase in $F$		1.2		1.2	1.19
1991	No increase in $F$		1.1		1.2	1.11
1992	No long-term gains in increasing $F$		1.1		1.2	0.98
1993	No long-term gains in increasing $F$		-		1.1	0.93
1994	No long-term gains in increasing $F$		-		1.1	1.01
1995	No increase in $F$		1.0		1.1	1.16
1996	20% reduction in $F$		0.8		1.0	1.00
1997	20% reduction in $F$		0.8		0.9	0.93
1998	20% reduction in $F$		0.7		0.85	0.88
1999	Reduce $F$ below $F_{pa}$		0.81		0.96	1.01
2000	Reduce $F$ below $F_{pa}$		<1.16		1.16	1.09
2001	Reduce $F$ below $F_{pa}$		<0.81		1.02	1.17
2002	Reduce $F$ below $F_{pa}$		<1.00		1.07	1.35
2003	Reduce $F$ below $F_{pa}$		<1.24		1.24	1.39
2004	<sup>1</sup>	Reduce $F$ below $F_{pa}$	<sup>1</sup>	<1.00	1.05	1.25
2005	<sup>1</sup>	Reduce $F$ below $F_{pa}$	<sup>1</sup>	<0.84	1.00	1.04
2006	<sup>1</sup>	Reduce $F$ below $F_{pa}$	<sup>1</sup>	<0.88	0.95	0.95
2007	<sup>1</sup>	Reduce $F$ below $F_{pa}$	<sup>1</sup>	<0.84	0.89	
2008	<sup>1</sup>	Keep $F$ below $F_{pa}$	<sup>1</sup>	<1.00		

Weights in '000 t.

<sup>1</sup> Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.





Sole in Divisions VII f and g (Celtic Sea)

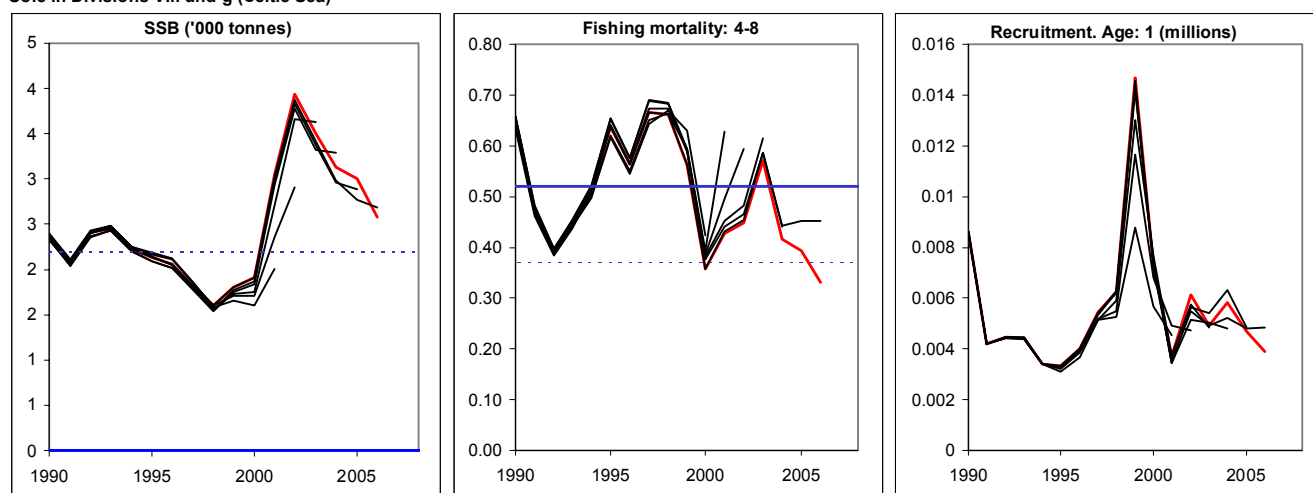


Figure 5.4.13.2 Sole in Divisions VII f and g (Celtic Sea). Comparison of current assessment with previous assessments.

Table 5.4.13.1 Celtic Sea sole. Divisions VII f and VII g. Official Nominal landings (t), 1986–2006 and data used by the Working Group.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Belgium	1039*	701*	705*	684*	716*	982*	543*	575*	619*	763*	695*
Denmark	2	-	-	-	-	-	-	-	-	-	-
France	146	117	110	87	130	80	141	108	90	88	102
Ireland	188*	9	72	18	40	32	45	51	37	20	19
UK(E. & W, NI.)	611*	437	317	203	353	402	325	285	264	294	265
UK(Scotland	-	-	-	-	0	0	6	11	8	-	0
Netherlands	3	-	-	-	-	-	-	-	-	-	-
Total	1,989	1,264	1,204	992	1,239	1,496	1,060	1,030	1,018	1,165	1,081
Unallocated	-389	-42	-58	-	50	-389	-79	-102	-9	-8	-86
Total used in assessment	1,600	1,222	1,146	992	1,189	1,107	981	928	1,009	1,157	995

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 <sup>1</sup>
Belgium	660*	675*	604	694	720	703	715	735	648	578
Denmark	-	-	-	-	-	-	-	-	-	-
France	99	98	61	74	77	65	124	79	104	48
Ireland	28	42	51	29	35	32	26	33	34	36
UK(E. & W, NI.)	251	198	231	243	288	318	342	283	217	232
UK(Scotland	0	-	0	-	-	+	+	-	-	-
Netherlands	-	-	-	-	-	-	-	-	-	-
Total	1038	1013	886	1,040	1,120	1,118	1,207	1,130	1,003	894
Unallocated	-111	-138	65	51	48	227	185	119	41	52
Total used in assessment	927	875	1,012	1,091	1,168	1,345	1,392	1,249	1,044	946

<sup>1</sup>Preliminary.

\* including VII g-k.

**Table 5.4.13.2** Sole in Divisions VIIf and g (Celtic Sea).

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4–8
1971	9566	7942	1861	0.365
1972	4257	6258	1278	0.268
1973	3373	5234	1391	0.233
1974	3389	5605	1105	0.235
1975	2964	4965	919	0.200
1976	5184	4307	1350	0.366
1977	4625	4610	961	0.247
1978	5483	3714	780	0.187
1979	3529	3842	954	0.267
1980	5124	3980	1314	0.293
1981	4854	3390	1212	0.347
1982	4879	3524	1128	0.335
1983	6778	3626	1373	0.441
1984	4693	3878	1266	0.399
1985	5636	3283	1328	0.425
1986	3146	3343	1600	0.528
1987	5726	2498	1222	0.556
1988	4483	2681	1146	0.543
1989	3724	2087	992	0.519
1990	8587	2372	1189	0.641
1991	4195	2097	1107	0.468
1992	4452	2413	981	0.393
1993	4423	2454	928	0.446
1994	3404	2230	1009	0.511
1995	3316	2136	1157	0.637
1996	4030	2065	995	0.564
1997	5437	1816	927	0.667
1998	6255	1602	875	0.662
1999	14698	1804	1012	0.562
2000	7296	1914	1091	0.357
2001	3714	3048	1168	0.428
2002	6118	3931	1345	0.449
2003	4919	3507	1392	0.571
2004	5832	3133	1249	0.417
2005	4685	3009	1044	0.394
2006	3888	2576	946	0.331
2007	4913*	2871		
Average	5185	3358	1155	0.424

\* GM 1971–2004.

# Southwest of Ireland Sole

## (Divisions VIIh-k)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

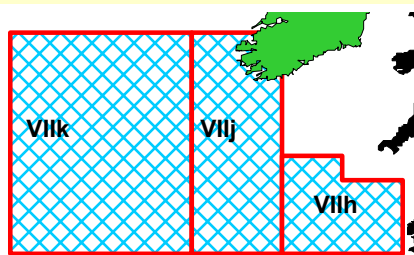
### FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

The state of this stock is unknown. Landings and LPUE show a generally declining trend in recent years.

FSS agrees with ICES advice that catches in 2007 should be no more than the recent average (2004 to 2006) of around 300 t in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment. This translates to an Irish quota of 135 t.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Southwest of Ireland Sole, FSS interprets that the EC fishing opportunities in 2008 should be a 15% reduction of the 2007 TAC which is equivalent to 553 t.



Red Boxes-TAC/Management Area Blue Shading-Assessment Area

### CURRENT MANAGEMENT

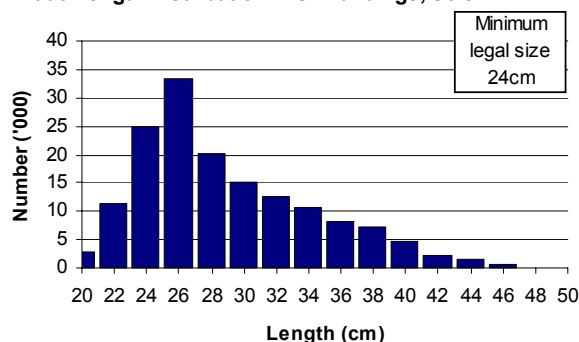
- The 2007 TAC was 650 t with an associated Irish quota of 293 t.
- There are no explicit management objectives or plan for this stock. Ireland, one of the main participants in this fishery, has an opportunity to develop and propose a management strategy for fisheries catching sole.

### ADDITIONAL INFORMATION

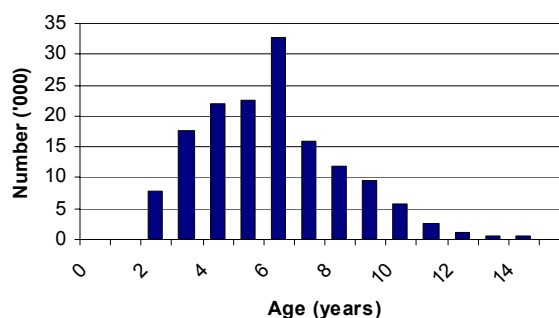
- Irish estimated landings in 2006 were 63 t, a large decrease on the 95 t landed in 2005.

- Area misreporting may be a problem in this fishery (see Celtic Sea Sole).
- In 2006, UK had the greatest landings (34%) followed by Ireland, France and the Belgium.
- The majority of the Irish landings in this fishery are taken by otter trawls (73%) and beam trawls (25%). This fishery has been in decline for several years. In the past sole was a very important target fishery for the inshore vessels operating from Dingle, Castletownbere, Baltimore and Union Hall.
- FSS sampling indicates that the Irish landings in 2006 had a broad range of ages represented (up to age 22).
- FSS data on discarding of sole in this area is limited but discarding is not considered to be a problem.

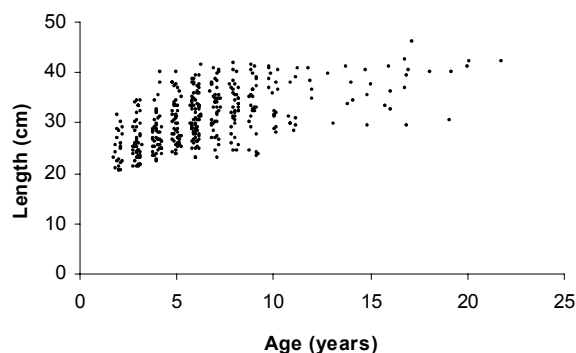
2006 Length Distribution: Irish Landings, Sole in VIIh-k

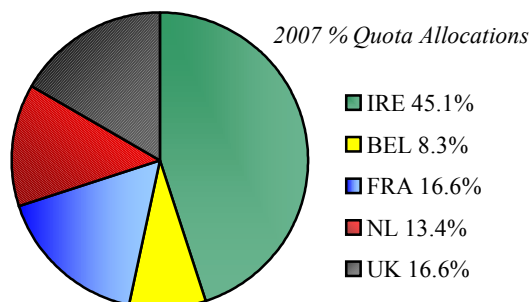


2006 Age Distribution: Irish Landings, Sole in VIIh-k



2006 Size at Age: Irish Sampling, Sole in VIIh-k





## ICES ADVICE

### 5.4.37

#### State of the stock

Spawning bio-mass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Unknown	Unknown	Unknown	NA

The state of the stock is unknown. No assessment was performed, due to the short series of data and lack of reliable tuning indices.

#### Management objectives

There are no explicit management objectives for this stock.

#### Reference points

No precautionary reference points have been established.

#### Single-stock exploitation boundaries

##### *Exploitation boundaries in relation to precautionary considerations*

Catches in 2008 should be no more than the recent average (2004–2006) of around 300 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.

#### Short-term implications

No forecast.

#### Management considerations

Sole are taken as part of a mixed demersal fishery by otter trawlers. Management options proposed for sole should also take into consideration other demersal fish species taken in the fishery.

Area misreporting from VII f,g into VII h,j,k is known to be a problem in some fleets, but landings data have not been corrected for this. The extent of other misreporting is not known.

#### Factors affecting the fisheries and the stock

Sole are predominantly caught in mixed-species otter trawl fisheries in Division VIIj. These vessels target mainly hake, anglerfish, and megrim. Sole are also caught in flatfish-directed beam trawler fisheries. Seiners generally take a lesser catch of sole. Ireland and Belgium are the major participants in this fishery.

#### *The effects of regulations*

Sole is managed through TAC and technical conservation measures. Boat quota restrictions were imposed on Irish vessels for hake, cod, and anglerfish, and these are likely to have impacted the sole landings.

Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a 'biologically sensitive area' in Divisions VIIb, VIIj, VIIg, and VIIh. Effort exerted within the 'biologically sensitive area' by the vessels of each EU Member State may not exceed their average annual effort (calculated over the period 1998–2002).

#### *Changes in fishing technology and fishing patterns*

Ireland, UK, and France are the major participants in this fishery. Sole were predominantly caught by Irish otter trawl vessels in Division VIIj, within a mixed-species fishery. Irish otter trawl vessels operate from the ports of Castletownbere, Dingle, Union Hall, Baltimore, and Schull. Increasingly these Irish vessels target mainly hake, anglerfish, and megrim and not the more traditional inshore species (plaice, sole, whiting, and cod). The Irish beam trawlers and seiners generally take a lesser catch of sole. Other international fleets operating in this area are the UK, French otter trawl, and Belgian beam trawl fleets.

#### Scientific basis

##### *Data and methods*

Data update and screening methods only. No analytical assessment was performed.

#### Source of information

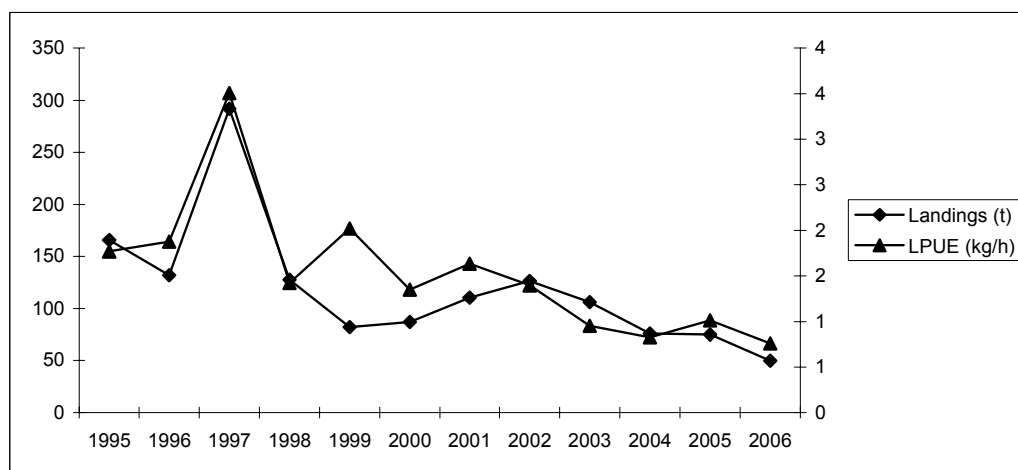
Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 26 June–5 July 2007 (ICES CM 2007/ACFM:28).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	ACFM landings
1993	No advice		-		-	495
1994	No advice		-		-	398
1995	No advice		-		-	403
1996	No advice		-		-	443
1997	No advice		-		-	564
1998	No advice		-		-	423
1999	No advice		-		-	381
2000	No advice		-		-	329
2001	No advice		-		650	325
2002	No advice		-		650	430
2003	Reduce TAC to recent landings		330		390	245
2004	<sup>1</sup>	Reduce TAC to recent average (2000–2002)	<sup>1</sup>	360	390	290
2005		Reduce TAC to recent average (2001–2003)		335	650	326
2006		Reduce TAC to recent average (2002–2004)		380	650	272
2007		Reduce TAC to recent average (2003–2005)		287		
2008		TAC < recent average (2004–2006)		300		

Weights in t.

<sup>1</sup> Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

**Figure 4.6.1** Landings, Effort and LPUE for Sole VIIh-k



**Table 5.4.37.1 Sole in Divisions VII h-k (Southwest Ireland).**

**Nominal landings (t), 1973-2006, as officially reported to ICES.**

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Belgium	406	369	210	638	519	290	384	522	576	471	411	474
Denmark	-	-	-	-	-	-	-	-	-	-	-	-
France	390	143	207	19	103	23	29	27	107	104	176	120
Ireland	108	116	97	152	126	73	109	162	195	172	176	156
Netherlands	4	15	2	33	140	60	-	-	-	-	51	194
Spain	190	153	152	131	26	1	8	2	-	-	38	-
UK - Eng+Wales+	.	.	.	.	.	.	.	.	.	.	.	.
UK - England & W	6	5	24	11	12	11	18	42	83	108	129	151
UK - Scotland	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total</b>	<b>1104</b>	<b>801</b>	<b>692</b>	<b>984</b>	<b>926</b>	<b>458</b>	<b>548</b>	<b>755</b>	<b>961</b>	<b>855</b>	<b>981</b>	<b>1095</b>

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	318	442	271	254	252	353	358	312	317	338	433
Denmark	-	-	-	-	-	-	-	-	-	-	-
France	25	38	44	53	84	66	55	43	44	42	47
Ireland	201	188	168	182	206	266	306	255	237	184	243
Netherlands	280	3	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	-	-	-	-
UK - Eng+Wales+	.	.	.	.	177	144	234	215	209	172	192
UK - England & W	200	261	193	166	.	.	.	.	.	.	.
UK - Scotland	-	-	-	-	-	-	-	2	5	2	-
<b>Total</b>	<b>1024</b>	<b>932</b>	<b>676</b>	<b>655</b>	<b>719</b>	<b>829</b>	<b>953</b>	<b>827</b>	<b>812</b>	<b>738</b>	<b>915</b>

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	375	368	346	101	8	13	154	170	157	90	36.2
Denmark	-	-	-	-	-	-	-	-	-	-	-
France	50	58	74	.	79	103	108	138	108	99	62.2
Ireland	183	203	221	207	111	125	130	105	111	98	67.3
Netherlands	70	-	7	1	10	-	-	-	-	.	1
Spain	-	-	-	-	-	-	1	-	-	2	-
UK - Eng+Wales+	148	113	111	97	95	111	124	78	79	112	-
UK - England & W	.	.	.	.	.	.	.	.	.	.	-
UK - Scotland	-	-	-	-	-	-	-	-	-	.	-
UK	-	-	-	-	-	-	-	-	-	-	86.3
<b>Total</b>	<b>826</b>	<b>742</b>	<b>759</b>	<b>406</b>	<b>303</b>	<b>352</b>	<b>517</b>	<b>491</b>	<b>455</b>	<b>401</b>	<b>253</b>
Unallocated	383	178	336	25	-26	27	87	246	165	75	-19
Total figures used by Working Group	443	564	423	381	329	325	430	245	290	326	272

# West of Ireland Sole

## (Divisions VIIb,c)

For latest information, see: <http://www.ices.dk>



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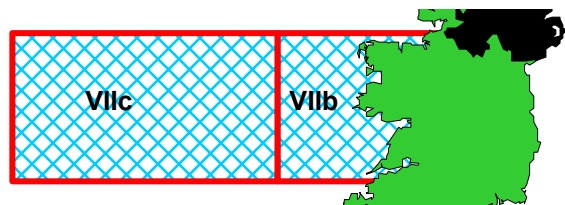
Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

The state of this stock is unknown.

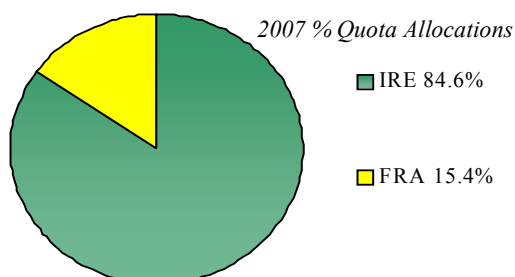
FSS agrees with ICES advice that the precautionary TAC should remain in place. Catches in 2008 should be no more than the recent average (2004 to 2006) of around 50 t in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment. This translates to an Irish quota of 42 t. FSS is aware of the EC proposal for setting of fishing opportunities in 2008 (see page 42). For west of Ireland sole, FSS interprets that the proposal would result in a TAC of 55 t in 2008.



Red Boxes-TAC/Management Areas Blue Shading-Assessment Area

### CURRENT MANAGEMENT

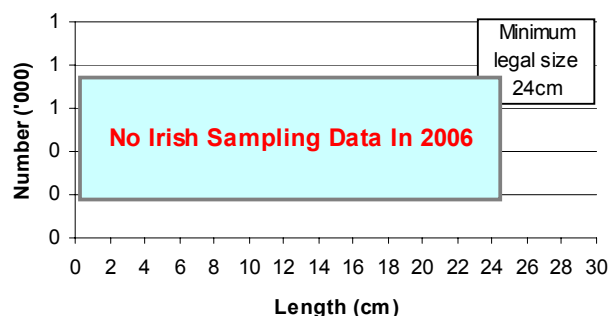
- The 2007 TAC was 65t with an associated Irish quota of 55 t.
- There are no explicit management objectives or plan for this stock.
- FSS recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching sole.



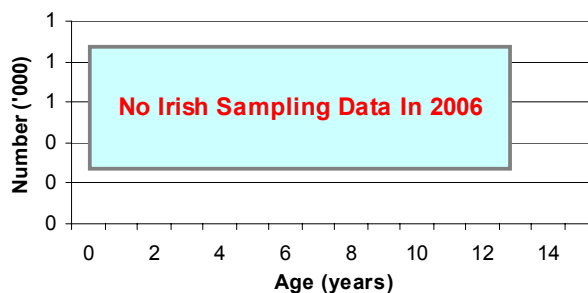
### ADDITIONAL INFORMATION

- Irish estimated landings in 2006 were 31 t.
- Misreporting is not perceived to be a problem in this fishery.
- Ireland took 75% of total international landings in recent years.
- Sole are caught in mixed species otter trawl fisheries, mainly in inshore areas of Division VIIb.
- FSS data on discarding of sole in this area is limited but discarding is not considered to be a problem.

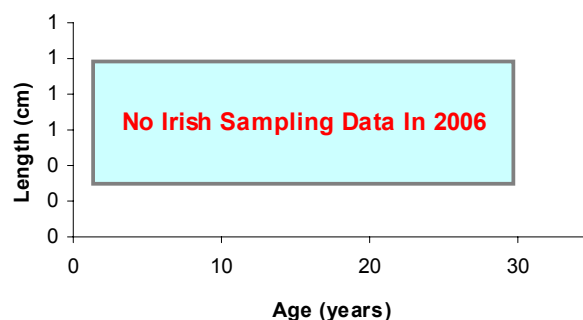
2006 Length Distribution: Irish Landings, Sole in VIIb,c



2006 Age Distribution: Irish Landings, Sole in VIIb,c



2006 Size at Age: Irish Sampling, Sole in VIIb,c



## ICES ADVICE

### 5.4.38

#### State of the stock

Spawning bio-mass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target
Unknown	Unknown	Unknown	NA

The state of the stock is unknown. No assessment was performed, due to the short series of data and lack of reliable tuning indices.

#### Management objectives

There are no explicit management objectives for this stock.

#### Reference points

No precautionary reference points have been established.

#### Single-stock exploitation boundaries

##### *Exploitation boundaries in relation to precautionary considerations*

Catches in 2008 should be no more than the recent average (2004–2006) of around 50 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.

#### Short-term implications

No forecast.

#### Management considerations

The recent average catches (2002–2004) were 64 t. Sole are taken as part of a mixed demersal fishery by otter trawlers. Management

options proposed for sole should also take into consideration other demersal fish species and *Nephrops* taken in the VIIb,c fishery.

#### Factors affecting the fisheries and the stock

Ireland is the major participant in this fishery, taking about 75% of the international landings in recent years. Sole are normally caught in a mixed species otter trawl fisheries in Division VIIb. These vessels mainly target other demersal fish species and *Nephrops*.

##### *The effects of regulations*

Sole is managed by a precautionary TAC and technical measures. The agreed TAC for 2004 and 2005 was 65 t, which is a decrease from the previous TAC of 80 t for 2001–2003.

Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a 'biologically sensitive area' in Divisions VIIb, VIIj, VIIg, and VIIh. Effort exerted within the 'biologically sensitive area' by the vessels of each EU Member State may not exceed their average annual effort (calculated over the period 1998–2002).

##### *Changes in fishing technology and fishing patterns*

Sole are opportunistically exploited in otter trawl fisheries in this area and there is no known change in fishing technology and fishing patterns in this area.

#### Scientific basis

##### *Data and methods*

Data update and screening methods only. No analytical assessment was performed.

#### Source of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 26 June–5 July 2007 (ICES CM 2007/ACFM:28).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	ACFM landings
1993	-		-		-	60
1994	-		-		-	70
1995	-		-		-	59
1996	-		-		-	57
1997	-		-		-	55
1998	-		-		-	66
1999	-		-		-	72
2000	-		-		-	57
2001	-		-		80	60
2002	No advice		-		80	61
2003	Reduce TAC to recent landings		65		80	64
2004	<sup>1</sup>	Reduce TAC to recent landings (1998–2002)	<sup>1</sup>	65	65	69
2005		Reduce TAC to recent landings (1999–2003)		62	65	44
2006		No increase in catches		64	65	43
2007		No increase in catches		64	65	
2008		No increase in catches		50		

Weights in t.

<sup>1</sup> Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.



Table 5.4.38.1

## Sole in Divisions VII b, c (Southwest Ireland).

Nominal landings (t), 1973-2006, as officially reported to ICES.

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
France	-	25	7	6	3	3	6	9	6	5	9	3
Ireland	12	12	19	44	14	16	13	24	47	55	40	17
Spain	19	16	30	25	1	-	11	1	-	-	-	-
UK - Eng+Wales+N.Irl.	.	.	.	.	.	.	.	.	.	.	.	.
UK - England & Wales	-	-	-	-	-	-	-	-	-	1	-	-
Total	31	53	56	75	18	19	30	34	53	61	49	20

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
France	6	8	2	2	-	-	5	2	1	1	2
Ireland	44	29	39	34	38	41	46	43	59	60	59
Spain	-	-	-	-	-	-	-	-	-	-	-
UK - Eng+Wales+N.Irl.	.	.	.	.	-	-	-	-	-	-	-
UK - England & Wales	-	-	-	1	.	.	.	.	.	.	.
Total	50	37	41	37	38	41	51	45	60	61	61
Unallocated									0	9	-2
Total as estimated by the Working Group									60	70	59

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
France	2	3	-	.	13	11	14	24	24	13	11
Ireland	52	51	49	68	65	53	50	50	49	38	31.2
Spain	-	-	-	-	-	-	-	-	-	.	.
UK - Eng+Wales+N.Irl.	-	1	-	-	-	-	-	-	-	.	.
UK - England & Wales	.	.	.	.	.	.	.	.	.	.	.
Total	54	55	49	68	78	64	64	74	73	51	
Unallocated	3	0	17	4	-10	-4	-3	-10	-4	-7	
Total as estimated by the Working Group	57	55	66	72	68	60	61	64	69	44	43

# FU 16 Nephrops on the Porcupine Bank

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

No quantitative assessment of this stock is available. Porcupine Bank stock (FU 16) appears to have declined up to 2000 but since then landings and LPUEs have increased somewhat but have decreased again in 2006. Recent recruitment may be weak and exploitation rates may also be increasing.

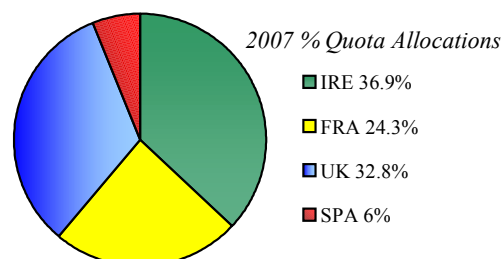
ICES has not given new advice for FU16 *Nephrops* this year. There are indications from landings, effort and LPUE data during the last three years that there is increased targeting of *Nephrops* in this area. FSS considers that this increase in targeting this stock is undesirable and advises that effort and catches should be reduced until the perception of stock trends are reliable and an expansion of the fishery is shown to be sustainable.

Furthermore, FSS advises that all *Nephrops* fisheries are managed at an appropriate geographical scale i.e. Function Unit.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For FU16 *Nephrops*, FSS interprets that the proposal would result in the 2007 TAC being maintained in 2008.

## CURRENT MANAGEMENT

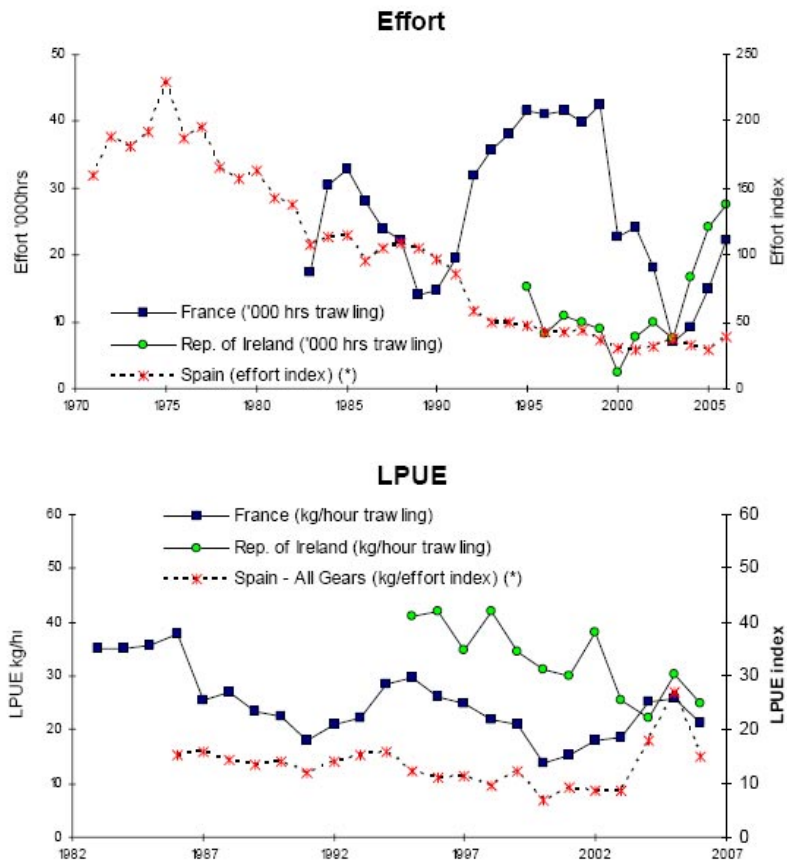
- A 'precautionary' TAC area covers Sub-area VII, whereas the assessment area is Division VIIb. ICES and FSS recommend that *Nephrops* should be managed at Functional Unit level since the current large TAC area may result in unbalanced exploitation.
- In 2007 the TAC was increased for all of Sub-area VII to 25,153 t, of which Ireland's quota was 9,277 t.
- There are no explicit management objectives or a management plan for this stock. FSS recommend that management objectives be established and that a management plan be developed with stakeholders and implemented for fisheries catching *Nephrops*.



- The following TCMs are in place for *Nephrops* in Sub-area VII (excluding Division VIIa) after EC 850/98: Minimum Landing Sizes (MLS); total length >85 mm, carapace length >25 mm, tail length >46 mm. Mesh Size Restrictions; Vessels targeting *Nephrops* using towed gears having at least 35% by weight of this species on board will require 70 mm diamond mesh plus an 80 mm square mesh panel as a minimum or having at least 30% by weight of *Nephrops* on board will require 80 mm diamond mesh.

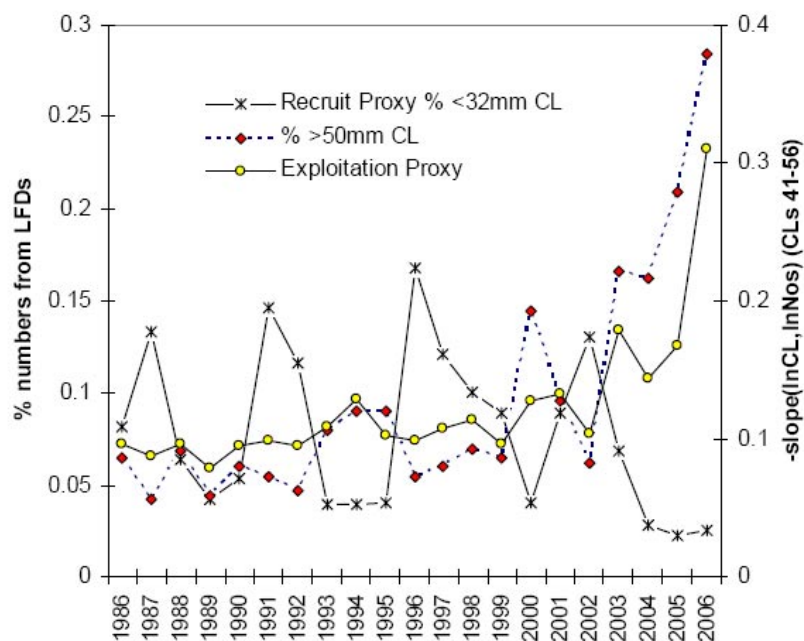
## ADDITIONAL INFORMATION

1. Assessments for this stocks is hampered by poor quality sampling data or by a short time series of sampling data. Multiple lines of evidence (Landings, LPUE trends and mean size) all suggest that the FU 16 stock declined substantially up to 2000. The are indications of increased abundance in 2005 sparking renewed interest in the fishery. All the size distribution information shows an increase in the mean size of *Nephrops* in this area. This may be due to combined effects of weak recruitment in recent years and the growth of a good year class that first entered the commercial fishery in 2002.
2. *Nephrops* landings and discards from FU 16 have not been sampled in Ireland for the majority of 2006 and 2007 and therefore no sampling data will be available for assessment and advice in 2008.
3. Irish effort has increased rapidly from 2000 to the highest observed in 2006.
4. Irish LPUE has fluctuated with a declining trend to the lowest observed in 2006 (~20kg/hr).
5. *Nephrops* in FU16 are exploited by Irish, Spanish, French and UK vessels. The different fleets operate in different parts of the area and have significantly different mean sizes in the landings.
6. In 2006 34 Irish vessels reported landings from the Porcupine Bank. Of these only 23 reported landings over 10 t.
7. The Irish fishery consists of otter trawl vessels and increasingly in recent years twin-rig vessels. Vessels from Rossaveal, Dingle, Union Hall, Dunmore East, Clogherhead mainly exploit the fishery.



(\*) The Spanish effort index is based on a combination of hours at sea and average engine power. Irish and French effort and LPUE is unstandardised.

**Figure 1. *Nephrops* FU 16 (Porcupine) Effort and LPUE trends for fleets**



**Figure 2. *Nephrops* FU 16 (Porcupine). Trends in various proxies from Male length frequency data**

**Table 1. *Nephrops* FU 16 (Porcupine) Landings by country**

Year	France	Rep. of Ireland	Spain	UK	Total
1965	514				514
1966	0				0
1967	441				441
1968	441				441
1969	609				609
1970	256				256
1971	500		1444		1944
1972	0		1738		1738
1973	811		2135		2946
1974	900		1894		2794
1975	0		2150		2150
1976	6		1321		1327
1977	0		1545		1545
1978	2		1742		1744
1979	14		2255		2269
1980	21		2904		2925
1981	66		3315		3381
1982	358		3931		4289
1983	615		2811		3426
1984	1067		2504		3571
1985	1181		2738		3919
1986	1060		1462	69	2591
1987	609		1677	213	2499
1988	600		1555	220	2375
1989	324	350	1417	24	2115
1990	336	169	1349	41	1895
1991	348	170	1021	101	1640
1992	665	311	822	217	2015
1993	799	206	752	100	1857
1994	1088	512	809	103	2512
1995	1234	971	579	152	2936
1996	1069	508	471	182	2230
1997	1028	653	473	255	2409
1998	879	598	405	273	2155
1999	889	609	448	185	2132
2000	313	227	213	120	872
2001	366	369	270	158	1163
2002	324	543	276	139	1282
2003	130	296	333	108	867
2004	232	494	588	126	1441
2005	380	741	799	208	2129
2006	446	732	571	192	1941

**Table 2. *Nephrops* FU 16 (Porcupine) Landings, effort and LPUE by fleet**

Year	Spanish fleet			French Nep fleet <sup>1</sup>			Irish Nep Fleet <sup>2</sup>		
	Landings	Effort	T/day * BHP/100	Landings	Effort	LPUE (>10%)	Landings	Effort	LPUE
	Tonnes	day * BHP/100		Tonnes	('000's Hrs)	(kg/hr)	Tonnes	('000's Hrs)	(kg/hr)
1971	1444	159	9						
1972	1738	188	9						
1973	2135	181	12						
1974	1894	192	10						
1975	2150	229	9						
1976	1321	187	7						
1977	1545	196	8						
1978	1742	166	11						
1979	2255	157	14						
1980	2904	163	18						
1981	3315	143	23						
1982	3931	138	29						
1983	2811	108	26	615	18	35			
1984	2504	114	22	1067	30	35			
1985	2738	115	24	1181	33	36			
1986	1462	95	15	1060	28	38			
1987	1677	105	16	609	24	26			
1988	1555	109	14	600	22	27			
1989	1417	105	14	324	14	23			
1990	1349	96	14	336	15	23			
1991	1021	85	12	348	19	18			
1992	822	59	14	665	32	21			
1993	752	49	15	799	36	22	206		
1994	809	50	16	1088	38	28	512		
1995	579	48	12	1234	42	30	971	15	41
1996	471	43	11	1069	41	26	508	8	42
1997	473	42	11	1028	41	25	653	11	35
1998	405	43	10	879	40	22	598	10	42
1999	448	37	12	889	43	21	609	9	35
2000	213	30	7	313	23	16	227	2	31
2001	270	29	9	366	24	17	369	8	30
2002	276	31	9	324	18	22	543	10	38
2003	333	38	9	130	7	19	296	7	26
2004	588	32	18	232	9	25	494	16	21
2005	799	30	27	380	15	26	628	24	30
2006	571	39	15	446	22	21	683	28	25

<sup>1</sup> = Vessels where <10% of landed value was Nephrops <sup>2</sup> = Vessels where 20% of the landed weight was Nephrops

# FU17 Nephrops on the Aran Grounds

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

No quantitative assessment of this stock is available but there are no indications from landings and LPUE data that the stock has declined.

ICES has not given new advice for FU17 *Nephrops* this year. The Irish UWTV survey data for FU17 in 2007 shows a slight increase in burrow density (~30%) from the lowest observed in 2006.

FSS reiterates last years advice that *Nephrops* fisheries in FU 17 should be constrained to recent levels of effort at an appropriate geographical scale. This implies effort around 15kHrs for the Irish fleet. If effort can be effectively controlled, this fishery can be managed without a TAC.

Furthermore, FSS advises that all *Nephrops* fisheries are managed at an appropriate geographical scale i.e. Function Unit. Given that Ireland is the main exploiter of the FU 17 national management plans should be developed to ensure sustainable exploitation.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For FU 17 *Nephrops*, FSS interprets that the proposal would result in the 2007 TAC being maintained in 2008.

## CURRENT MANAGEMENT

- See section for FU 16.

## ADDITIONAL INFORMATION

- Assessments for this stock are hampered by a short time series of sampling data and uncertain catch data. Current management does not constrain landings from this fishery as the TAC is set for a much larger area and reported landings statistics are not thought to be reliable. The advice is based on average effort.
- Nephrops* landings and discards from FU 17 have not been sampled for the majority of 2006 and 2007 and therefore no sampling data will be available for assessment and advice in 2008.
- The mean size for the FU17 stock has remained

relatively stable up to 2005.

- The Irish fishery consists of otter trawl vessels and increasingly in recent years twin-rig vessels. The LPUE fluctuated around ~40kg/hr from 1995-2005. But LPUE increased in 2006 (~50kg/hr) primarily driven by “new” vessels entering the fishery.
- In recent years there has been progress in understanding the fisheries biology of *Nephrops* in FU 17. For the first time fishery independent data are becoming available as *Nephrops* directed underwater TV surveys have been successfully carried out annually in FU 17 since 2002. The abundance estimates for the Aran Grounds has fluctuated in the surveys around 1 billion burrows with a mean density of around 1/m<sup>2</sup>. The densities in Galway Bay are higher and on the Slyne Head ground are somewhat lower. The preliminary 2007 UWTV estimate shows an increase (~30%) in the Aran Ground burrow density from the lowest observed in 2006.
- Nephrops* in FU's 17 are almost exclusively exploited by Irish vessels. Landings in 2006 were 635 t. Discarding is also substantial ~20% by weight and 30% by number.
- The fishery has traditionally been dominated by vessels from Rossaveal although in 2006 vessels from other areas also participated in the fishery.

Table 1. Reported *Nephrops* landings FU 17 by country.

Year	FU 17			
	France	Rep. of Ireland	UK	Total
1974	477			477
1975	822			822
1976	131			131
1977	272			272
1978	481			481
1979	452			452
1980	442			442
1981	414			414
1982	210			210
1983	131			131
1984	324			324
1985	207			207
1986	147			147
1987	62			62
1988	14	814		828
1989	27	317		344
1990	30	489		519
1991	11	399		410
1992	11	361		372
1993	11	361	0	372
1994	18	707	4	729
1995	91	774	1	866
1996	2	519	4	525
1997	2	839	0	841
1998	9	1401	0	1410
1999	0	1140	0	1140
2000	1	879	0	880
2001	1	912	0	913
2002	2	1152	0	1154
2003	0	925	0	925
2004	0	525	0	525
2005	0	772	0	772
2006	0	635	0	635

Table 2. *Nephrops* directed fleet effort and LPUE for FU 17 from 1995-2005.

Year	Irish <i>Nephrops</i> Directed Fleet		
	Effort (Hrs)	Landings (tonnes)	LPUE (kg/hr)
1995	15306	530	35
1996	9109	311	34
1997	15763	478	30
1998	21909	926	42
1999	19546	743	38
2000	17131	547	32
2001	18700	600	32
2002	18565	861	46
2003	19922	732	37
2004	12899	381	30
2005	14900	729	46
2006	10762	558	52

Table 3. *Nephrops* UWTV survey abundance estimates for grounds in FU 17 from 2002-2007.

Ground	Year	Number of stations	Area Surveyed (M <sup>2</sup> )	Burrow count	Mean Density (No./M <sup>2</sup> )	95%CI	CV	Raised abundance estimate (million burrows)
Aran Grounds	2002	49	9,450	7,599	0.81	0.12	8%	787
	2003	42	11,398	11,652	1.09	0.13	6%	1,000
	2004	64	13,040	18,742	1.38	0.16	6%	1,406
	2005	70	12,373	13,321	1.06	0.12	6%	1,053
	2006	67	10,527	6,928	0.61	0.08	6%	644
	2007*	71	11,992	10,272	0.82	0.10	6%	838
Galway Bay	2002	7	1,299	2,017	1.58	0.34	9%	n/a
	2003	3	591	941	1.60	0.73	11%	n/a
	2004	9	2,312		0.73	0.32	19%	n/a
	2005	4	661	1,625	1.67	0.32	6%	n/a
	2006	3	540	1,107	0.98	0.67	16%	n/a
	2007*	5	890	992	1.14	0.29	9%	n/a
Slyne Grounds	2002	5	1,216	1,027	0.85	0.23	10%	4.4
	2003							
	2004	3	827	531	0.68	0.66	23%	3.4
	2005	3	531	294	0.55	0.13	6%	2.9
	2006	3	526	210	0.41	0.49	28%	2.1
	2007*	4	838	547	0.63	0.49	24%	3.4

\*PRELIMINARY

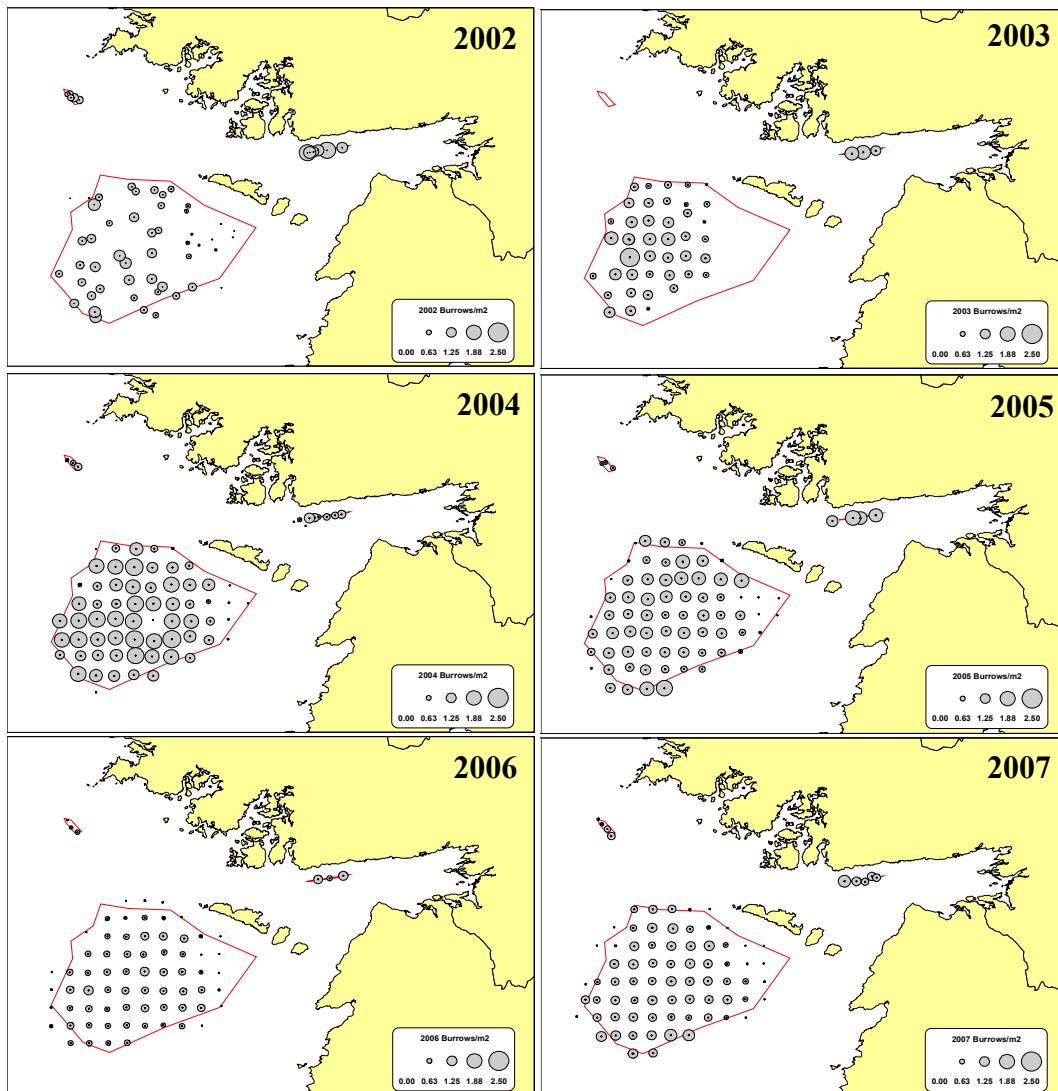


Figure 1. Maps of *Nephrops* UWTV survey abundance estimates for grounds in FU 17 from 2002-2007.

# FU 19 Nephrops Stocks on the SW and SE Coast of Ireland



*Marine Institute*  
Foras na Mara

Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

The state of the stock is unknown. Landings and LPUEs for FU 19 have fluctuated considerably in recent times.

ICES has not given new advice for FU 19 Nephrops this year. FSS reiterates last years advice that effort in this fishery should not be allowed to increase compared to recent years. This implies effort of around 25kHrs for the Irish Nephrops fleet.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For West and in-shore South of Ireland Nephrops, FSS interprets that the proposal would result in the 2007 TAC being maintained in 2008.

## CURRENT MANAGEMENT

- For current management See FU 16.

## ADDITIONAL INFORMATION

- Assessments for this stocks is hampered by poor quality sampling data or by a short time series of sampling data and are considered highly uncertain. The advice is based on average effort.
- The status of the FU 19 stock is unknown since the many discrete populations present sampling problems and in fact may represent multiple stocks that should be sampled and assessed independently. The recent expansion of Irish effort for these stocks is undesirable given the uncertainty that this is sustainable. FSS considers that fisheries independent data is needed for these stocks to more accurately assess their status. Part of this area was covered by the Celtic Sea UWTV survey in 2006.
- Nephrops in FU 19 are exploited by Irish, French and UK vessels.
- In 2006, 27 Irish vessels reported landings in excess of 10 from this FU.

- The Irish fishery consists of otter trawl vessels and increasingly in recent years twin-rig vessels. Vessels from Rossaveal, Dingle, Union Hall, Dunmore East, Clogherhead and Kinsale mainly exploit the fishery.
- Furthermore, FSS advises that all Nephrops fisheries are managed at an appropriate geographical scale i.e. Function Unit. Given that Ireland is the main exploiter of the FU 19 stocks national management plans should be developed to ensure sustainable exploitation.

Table 1. Reported Nephrops landings FU 17 by country.

Year	FU 19			
	France	Rep. of Ireland	UK	Total
1989	245	652	2	899
1990	181	569	4	754
1991	212	860	5	1077
1992	233	640	15	888
1993	229	672	4	905
1994	216	153	21	390
1995	175	507	12	695
1996	145	736	7	888
1997	93	656	7	756
1998	92	733	2	827
1999	70	499	3	572
2000	134	541	11	686
2001	105	702	2	809
2002	162	1130	0	1292
2003	151	1075	0	1226
2004	68	997	1	1066
2005	4	637	0	641
2006	0	662	0	662

Table 2. Effort, Landings and LPUE for the Irish Nephrops fleet.

Year	Irish Fleet		
	Nephrops trawlers (>30% landings weight)		
	Effort hrs	Landings Tonnes	LPUE Kg/hr
1995	9126	206	22.5
1996	9295	220	23.7
1997	9604	248	25.8
1998	15775	386	24.5
1999	13345	206	15.4
2000	9329	178	19.1
2001	9701	309	31.8
2002	25565	764	29.9
2003	28887	621	21.5
2004	26554	529	19.9
2005	23848	455	19.1
2006	24010	456	19.0



# FU 20 -22 Nephrops Stocks in the Celtic Sea

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

The state of the stock is unknown but there are no indications from landings and LPUE data that the stock has declined. Landings have been relatively stable at around 4,600 t in recent years and there are no specific concerns about recent stock development.

ICES has not given new advice for FU 20-22 this year. Irish UWTV survey and fishery data for FU20-22 does not suggest any change in recent stock perception. Therefore FSS reiterates last years advice that effort in this fishery should not be allowed to increase. Given that landings are considered accurate in this area this implies landings around 4,600 t.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Celtic Sea Nephrops, FSS interprets that the proposal would result in the 2007 TAC being maintained in 2008.

## CURRENT MANAGEMENT

- See management advice for FU 16

## ADDITIONAL INFORMATION

1. This area consists of several different discrete populations. Adequate geo-referenced catch, effort data and sampling data are not yet available on which to base an analytical assessment. Indicators such as size structure and catch rates on surveys and from the fishery are relatively stable. The Marine Institute commenced an UWTV survey for the FU 20-22 stock in 2006 and this was continued in 2007. This survey series may become the main basis for the assessment and advice on this stock in future years once an adequate survey time series exists and the performance of the survey as a stock indicator can be fully evaluated.
2. Irish landings from FU 20-22 in 2006 were estimated

to be 1,858 t (30% of the total Irish Nephrops landings).

3. In LPUE of Irish Nephrops vessels show a declining trend over time but has been around ~40kg/hr in recent years. French LPUE is more stable or increasing slightly.
4. The importance of these Nephrops grounds to the Irish fleet has increased in recent years and effort is around 60% higher than in the early 2000s. Most of the Irish landings from this fishery were from the grounds south of the Smalls. Effort has decreased in 2006 by ~12%.
5. In 2006, 111 Irish vessels reported Nephrops landings from Division VIIg. Of these 63 reported significant annual landings in excess of 10 t. The Irish fishery consists of otter trawl vessels and, increasingly in recent years, twin-rig vessels. Vessels from Dunmore East, Howth and Clogherhead mainly exploit the fishery.
6. FSS considers that the current application of a TAC to the whole of Sub-area VII may lead to unbalanced exploitation of Nephrops stocks and may also hinder management of Nephrops fisheries in a mixed fisheries context. FSS considers that individual Nephrops stocks should be managed and effort should be controlled on a more appropriate geographical scale i.e. Functional Unit.

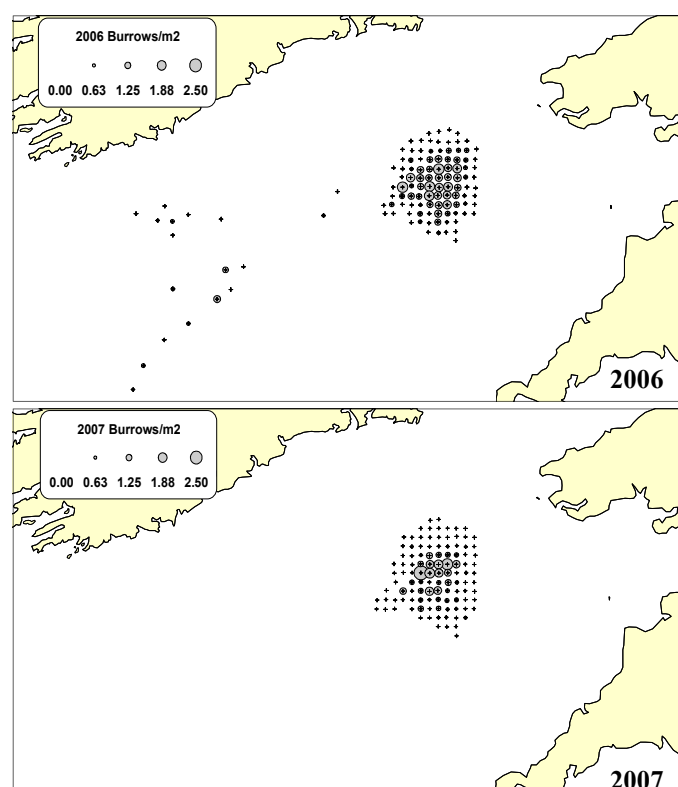


Figure 1. Maps of Nephrops UWTV survey abundance estimates for grounds in FU 20-22 from 2006-2007.



Table 1. *Nephrops* UWTV survey abundance estimates for grounds in FU 20-22 from 2006-2007.

Ground	Year	Number of stations	Area Surveyed (M <sup>2</sup> )	Burrow count	Mean Density (No./M <sup>2</sup> )	95%CI	CV	Raised abundance estimate (million burrows)
Smalls	2006	100	15,312	10,389	0.63	0.11	9%	2,603
Labadie Bank	2006	9	1,322	760	0.42	0.28	29%	n/a
Nymphe Bank	2006	2	195	89	0.27	3.47	100%	n/a
Seven Heads	2006	7	995	293	0.23	0.23	41%	n/a
Smalls	2007*	107	16,378	8,445	0.43	0.09	11%	1,978

\*PRELIMINARY

Table 2. *Nephrops* in VIlg. Nominal landings (t) for FU 20-22 as used by Working Group.

Year	France	Rep. of Ireland	UK	Other Countries <sup>1</sup>	Total reported	Unallocated	Total
1983	3667						
1984	3653						
1985	3599						
1986	2638						
1987	3080	329					
1988	2926	239					
1989	3221	784					
1990	3762	528					
1991	2651	644					
1992	3415	750					
1993	3815	770	63	0	4648	-274	4374
1994	3658	1415	68	2	5143	-274	4869
1995	3803	1575	125	2	5505	-282	5223
1996	3363	1377	86	2	4828	-217	4611
1997	2589	1552	95	4	4240	-213	4027
1998	2241	1619	64	1	3925	-90	3835
1999	2745	824	41	0	3610	-78	3532
2000	2782	1793	47	1	4623	-44	4579
2001	2532	2123	21	1	4677	-33	4644
2002	3134	1496	15	8	4653	-50	4603
2003	3511	1385	19	N/A	4915	0	4915
2004	2511	1626	36	N/A	4173	0	4173
2005	2490	2389	53	N/A	4932	0	4932
2006	2398	1858	N/A	N/A	4256	0	4256

<sup>1</sup>Other countries includes Belgium

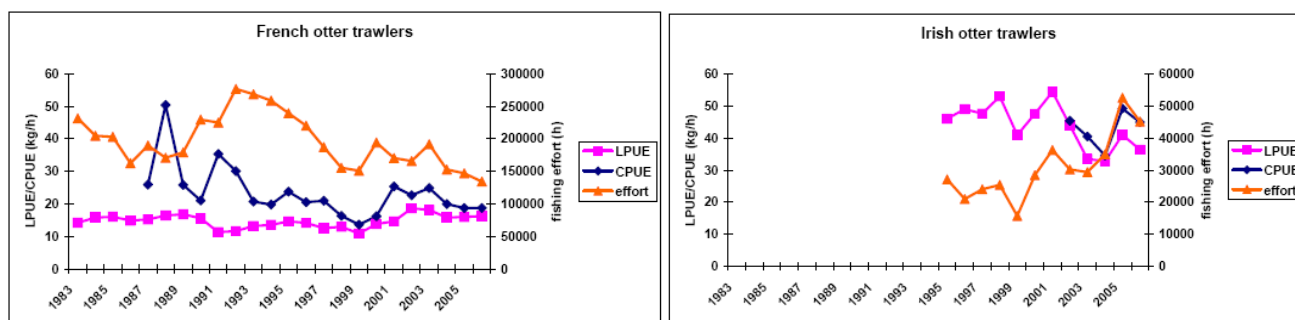


Figure 2. *Nephrops* fleets in FU 20-22 LPUE, CPUE and effort trends.

# West of Ireland and Celtic Sea Pollack

## (Sub-area VII)



*Marine Institute*  
Foras na Mara

*Fisheries Science Services*

### FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

The state of this stock is unknown and there is no ICES assessment.

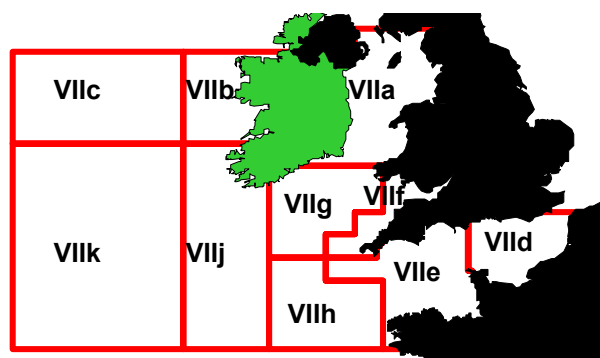
FSS advises that there is no scientific basis for the current TAC, which is far in excess of recent annual landings. However there has been a good uptake of the Irish quota. For this reason FSS advises that the 2008 TAC should be scaled in line with the recent proportion (2002-2006) of Irish uptake of the quota. This corresponds to a 2008 TAC of 13,217 t. FSS advise that pollack stocks should be assessed and managed on a smaller geographical scale within this Sub-area.

FSS notes that pollack are mainly distributed and fished in inshore areas and the current TAC area may contain several smaller stocks. In this situation the current TAC management system may not be appropriate and localised stock depletion may still occur.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2007 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Pollack West of Ireland, FSS interprets that the EC fishing opportunities in 2007 should be a 15% reduction of the 2006 TAC which is equivalent to 13,005 t.

### CURRENT MANAGEMENT

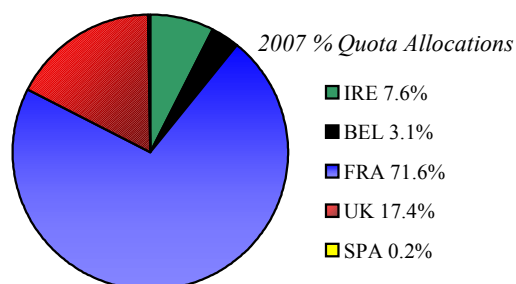
- The TAC area covers Sub-area VII.
- The 2006 TAC was 15,300 t with an associated Irish quota of 1,168 t.
- There are no explicit management objectives or plans for this stock.
- FSS advises that management objectives be established and that a management plan be developed and implemented for fisheries catching pollack.
- FSS points out that the French quota uptake is 40% of the TAC. Increased quota uptake by the French may therefore alter the stock status.



*Red Boxes-TAC/Management Areas*

### ADDITIONAL INFORMATION

1. Estimated Irish landings were 809 t in 2006.
2. Total international landings in 2006 were estimated at 3,178 t.
3. The Irish quota is not restrictive but this fishery is particularly important to smaller Irish vessels operating off the southwest and west coasts.
4. Levels of discarding of pollack are unknown, but are thought to be low, particularly in the inshore fisheries.
5. Pollack is taken in many localised inshore fisheries.
6. There is little scientific information on the biology and stock structure of pollack in Sub-area VII.



**Pollack in Sub-area VII landings as estimated by FSS. EU TAC also shown.**  
(Source of International data: ICES STATLANT 27A database)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Belgium	89	299	295	339	157	186	151	237	244	154	167	207
Channel Islands	0	0	30	55	87	51	20	16	25	13	16	13
Denmark	0	0	0	0	1	21	18	7	0	0	0	0
France	0	0	0	0	3569	5496	5119	5242	5814	4253	6214	3927
Germany	0	0	0	0	0	14	76	0	0	0	0	0
Ireland	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	3	13	17	4	1	8	1	1	3	0	0	0
Norway	0	0	0	0	0	0	0	0	0	0	0	0
Spain	0	0	0	0	0	0	0	1	23	32	26	486
UK (E,W &NI)	127	218	258	363	374	459	667	737	683	959	993	1051
UK - (Scotland)	0	5	2	3	4	5	9	16	72	50	36	36
<b>Total:</b>	<b>219</b>	<b>535</b>	<b>602</b>	<b>764</b>	<b>4193</b>	<b>6240</b>	<b>6061</b>	<b>6257</b>	<b>6864</b>	<b>5461</b>	<b>7452</b>	<b>5720</b>
<b>EU TAC:</b>												

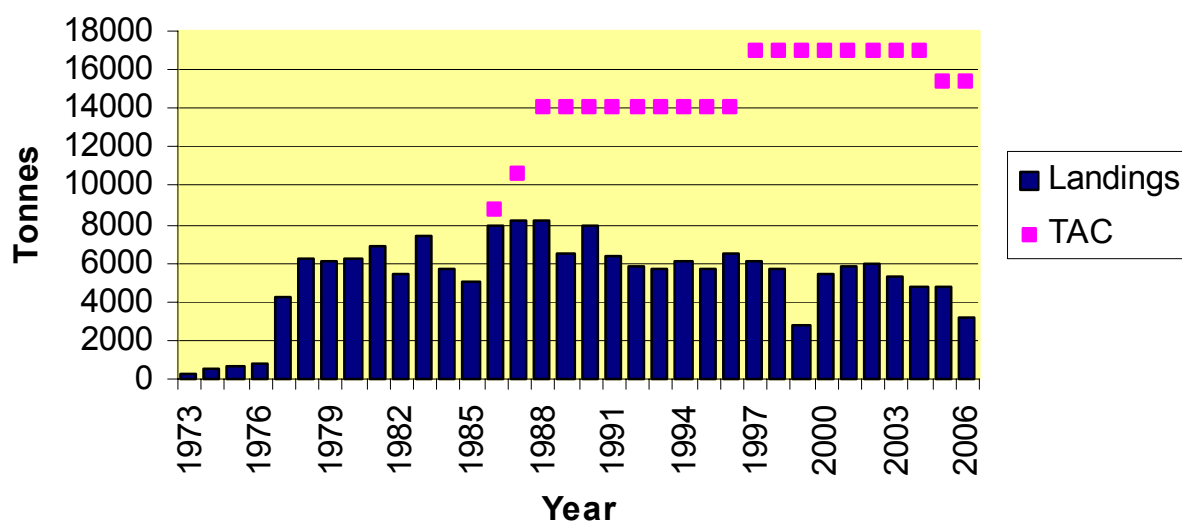
  

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Belgium	269	241	149	191	145	133	76	62	55	94	88	94
Channel Islands	12	10	14	7	19	25	7	24	17	10	24	27
Denmark	0	0	0	0	0	0	0	0	0	0	2	0
France	3741	4574	5213	5211	3893	4831	3211	2849	2325	2621	2315	2684
Germany	0	0	0	0	0	0	0	0	0	0	0	0
Ireland	0	1335	848	1066	994	1066	1045	1014	1137	921	1107	1190
Netherlands	0	0	0	0	0	0	0	0	0	0	0	6
Norway	0	0	0	0	0	0	0	0	0	0	0	0
Spain	20	17	19	22	18	26	22	19	7	8	4	5
UK (E,W &NI)	963	1757	1964	1713	1458	1873	1925	1851	2065	2370	2081	2406
UK - (Scotland)	47	28	32	20	10	16	30	14	53	11	63	86
<b>Total:</b>	<b>5052</b>	<b>7962</b>	<b>8239</b>	<b>8230</b>	<b>6537</b>	<b>7970</b>	<b>6316</b>	<b>5833</b>	<b>5659</b>	<b>6035</b>	<b>5684</b>	<b>6498</b>
<b>EU TAC:</b>		<b>8,670</b>	<b>10,610</b>	<b>14,000</b>	<b>14,000</b>	<b>14,000</b>	<b>14,000</b>	<b>14,000</b>	<b>14,000</b>	<b>14,000</b>	<b>14,000</b>	<b>14,000</b>

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	99	92	86	71	100	117	113	104	98	79
Channel Islands	35	52	75	97	57	40	41	55	63	48
Denmark	0	0	0	0	0	0	0	0	0	0
France	2443	2375	0	2422	2515	2481	2284	1914	2198	2213
Germany	0	0	0	0	0	0	0	0	0	0
Ireland	984	886	976	1069	1274	1308	1151	1049	728	809
Netherlands	4	1	0	0	0	0	0	1	1	1
Norway	0	0	3	0	0	0	0	0	0	0
Spain	7	11	19	5	9	17	12	13	16	28
UK (E,W &NI)	2440	2217	1619	1707	1921	1951	1730	1634	1620	0
UK - (Scotland)	65	78	9	6	9	8	17	16	1	0
<b>Total:</b>	<b>6077</b>	<b>5712</b>	<b>2787</b>	<b>5377</b>	<b>5885</b>	<b>5922</b>	<b>5348</b>	<b>4786</b>	<b>4725</b>	<b>3178</b>
<b>EU TAC:</b>	<b>17,000</b>	<b>17,000</b>	<b>17,000</b>	<b>17,000</b>	<b>17,000</b>	<b>17,000</b>	<b>17,000</b>	<b>17,000</b>	<b>15,300</b>	<b>15,300</b>

## West of Ireland and Celtic Sea Pollack - Landings



# West of Ireland and Celtic Sea Saithe

## (Sub-area VII)



Fisheries Science Services

### FSS – SINGLE STOCK CONSIDERATIONS

(See Celtic Sea, West and Southwest of Ireland Overview for Mixed Fisheries Advice)

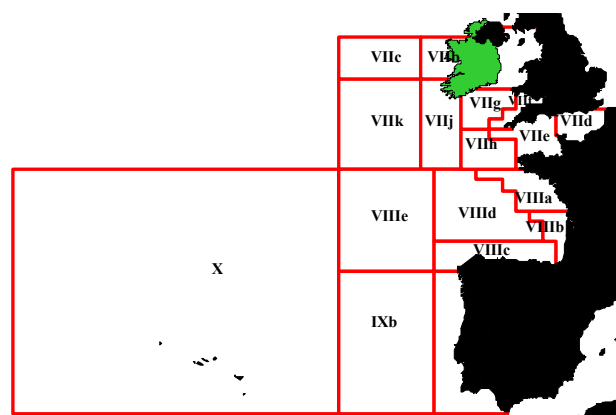
The status of this stock is unknown and there is no ICES assessment. International landings data are incomplete in recent years but appear to show a strongly declining trend since 1990.

FSS notes that there is no scientific basis for the proposed TAC and that the current TAC is far in excess of recent annual landings. Irish and international landings have declined in recent years. In the absence of ICES advice for this stock, FSS considers that the landings in 2008 should be in line with recent landings and should not exceed 1,100 t (average 2004-6). This translates into an Irish quota of 309 t in 2007.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 45). For Celtic Sea and West of Ireland Saithe, FSS interprets that the EC fishing opportunities in 2008 will be a 15% decrease in TAC which is equivalent to 3,222 t.

### CURRENT MANAGEMENT

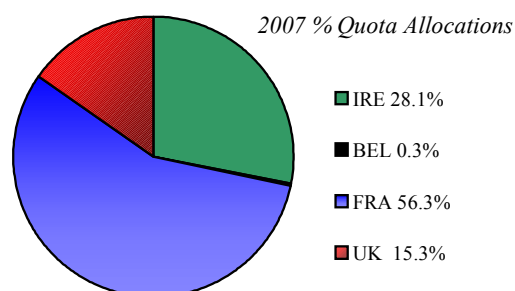
- The TAC covers Sub-areas VII, VIII, IX and X.
- The 2007 TAC was 3,790 t with an associated Irish quota of 1,066 t.
- Currently the TAC is not restrictive.
- Given the mixed nature of fisheries catching saithe, it is unrealistic to develop a management plan for this stock. Ireland, as the main participant in this fisheries, has an opportunity to develop and implement a management strategy for mixed fisheries in this area.



Red Boxes-TAC/Management Areas

### ADDITIONAL INFORMATION

1. International reported landings have shown a decreasing trend since the start of the nineties from around 10,000-12,000 t to a historical low of 690 t in 2006. However, catch data are incomplete for some countries.
2. Estimated Irish landings were 86 t in 2006. Irish landings have shown a marked decrease in recent years.
3. There are no precautionary reference points proposed for this stock.
4. The Irish fishery takes place mainly in Division VIIg and Division VIIj by vessels using gillnets and otter trawls. There are also some catches made with other gears including seine nets.
5. Saithe are a shoaling species and the stock structure and biology of this stock are poorly understood.



Saithe Division VII official nominal landings by country  
(Source: ICES STATLANT database)

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Belgium	21	53	34	30	10	9	9	19	12	13	6	10
Channel Is (total)	.	.	.	.	.	.	.	.	.	.	.	.
Denmark	.	.	1	5	1	19	7	6	.	.	.	.
France	5916	4339	3780	2923	2591	2105	1699	2317	4563	4061	4760	3697
Germany, Fed. Rep. of	.	.	4	.	15	16	3	46	.	.	11	5
Germany, New Länder	5	.	.	.	.	.	.	.	.	.	.	.
Guernsey	.	.	.	.	.	.	.	.	.	5	5	6
Ireland	893	785	1045	1362	1083	1451	1632	2220	2197	2367	2383	2374
Isle of Man	.	.	.	.	.	.	41	19	36	34	16	27
Netherlands	74	75	106	106	52	44	35	84	100	22	7	.
Norway	.	.	.	.	.	.	.	.	.	.	3	.
Poland	101	1	78	43	1	.	.	.	.	.	.	.
Spain	444	490	603	.	632	.	.	.	266	179	70	118
UK - Eng+Wales+N.Irl.	.	.	.	.	.	.	.	.	.	.	.	.
UK - England & Wales	308	299	204	157	144	89	61	109	184	419	230	968
UK - N. Ireland	608	432	319	292	423	343	276	301	577	872	668	411
UK - Scotland	7	8	61	6	10	106	34	56	94	119	138	140
Un. Sov. Soc. Rep.	54	49	68	61	.	.	.	.	.	.	.	.
<b>Total</b>	<b>8431</b>	<b>6531</b>	<b>6303</b>	<b>4985</b>	<b>4962</b>	<b>4182</b>	<b>3797</b>	<b>5177</b>	<b>8029</b>	<b>8091</b>	<b>8297</b>	<b>7756</b>

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Belgium	31	25	20	23	15	9	5	2	4	9	8	5
Channel Islands (ns)	.	.	.	.	.	.	.	.	.	.	.	2
Denmark	.	.	.	.	.	.	.	.	.	1	.	.
France	6101	8256	6210	6185	8278	6625	7286	1911	1778	3234	2119	2101
Germany, Fed. Rep. of	.	.	.	124	30	.	.	.	.	.	.	.
Guernsey	.	.	.	.	.	.	.	.	.	.	.	.
Ireland	13	2	3	4	3	3	.	1	.	.	8	.
Isle of Man	2177	1739	1624	1400	2165	1068	1495	1721	2010	1915	2382	2062
Netherlands	9	6	3	4	2	3	10	8	5	4	11	11
Poland	.	.	.	.	.	.	1	.	.	.	.	3
Spain	3	40	2	1	16	24	29	38	.	7	14	13
UK - Eng+Wales+N.Irl.	.	.	.	.	.	.	.	.	.	.	.	.
UK - England & Wales	118	.	.	.	.	.	.	.	.	.	13	27
UK - N. Ireland	.	.	.	.	1157	1021	1040	1217	984	1059	991	1340
UK - Scotland	709	646	372	762	.	.	.	.	.	.	.	.
Un. Sov. Soc. Rep.	665	635	571	491	.	.	.	.	.	.	.	.
<b>Total</b>	<b>10303</b>	<b>11837</b>	<b>9869</b>	<b>9136</b>	<b>11797</b>	<b>9793</b>	<b>10959</b>	<b>5603</b>	<b>5894</b>	<b>7208</b>	<b>6407</b>	<b>6442</b>

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	9	8	7	4	7	13	3	1	1	.
Channel Islands (ns)	.	.	.	.	.	.	.	.	.	.
Denmark	.	.	.	.	.	.	.	.	.	.
France	1615	1537	.	2621	647	507	351	618	387	267
Germany, Fed. Rep. of	.	.	.	.	.	.	.	.	.	.
Guernsey	.	.	.	.	.	.	.	.	.	.
Ireland	4	.	2	.	.	.	.	.	.	.
Isle of Man	1384	1431	1352	1325	1644	1263	754	629	394	393
Netherlands	9	7	2	1	.	4	4	3	.	.
Poland	2	.	.	.	.	.	.	.	.	.
Spain	7	.	5	1	67	3	.	3	.	9
UK - Eng+Wales+N.Irl.	.	.	.	.	.	.	.	.	.	.
UK - England & Wales	23	68	33	35	18	13	8	3	21	21
UK - N. Ireland	954	594	413	291	306	286	338	304	208	.
UK - Scotland	.	.	.	.	.	.	.	.	.	.
Un. Sov. Soc. Rep.	.	.	.	.	.	.	.	.	.	.
<b>Total</b>	<b>4564</b>	<b>4027</b>	<b>2113</b>	<b>4439</b>	<b>2722</b>	<b>2095</b>	<b>1482</b>	<b>1597</b>	<b>1013</b>	<b>690</b>

\* Irish landings in 2006 from DCMNR Logbooks database

# Celtic Sea Herring

(Divisions VIIaS, VIIg-k)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

## FSS –SINGLE STOCK CONSIDERATIONS

FSS agrees with ICES that the stock size continues to be uncertain and SSB is probably below  $B_{pa}$  and possibly below  $B_{lim}$ . The current stock size is likely to be as low as when the stock collapsed in the 1970s. The assessment is considered uncertain but it is indicative of stock trends.

FSS further agrees with ICES that targeted fishing should not proceed unless accompanied by a rebuilding plan. FSS considers that the current proposed plan, as agreed by the Pelagic RAC is not consistent with the precautionary approach. FSS notes the ICES comment that catches in the order of 10,000 t are unlikely to guarantee recovery of the stock and that catches of around 5,000 t are associated with a high likelihood of recovery.

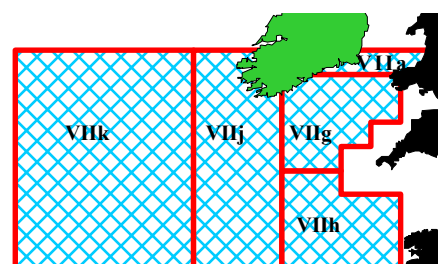
FSS notes that much of the argumentation required for the plan is based on socio economic considerations. FSS does not carry out socio economic evaluations and recommends that a full evaluation be carried out by the relevant experts.

FSS notes that increases in yield will not be achieved with a fishing mortality higher than  $F_{0.1}$  (~0.2). Simulations suggest that long term yield is not greater than 15,000 t.

FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see page 42). FSS presents an interpretation of how this proposal would be implemented for this stock (see table on page 46). For Celtic Sea herring, FSS interprets that the proposal would result in a "TAC reduction that is as large as is compatible with mixed fishery and relevant socio economic considerations".

FSS restates that actions that perturb herring spawning beds or increase turbidity after spawning are likely to have a negative affect on recruitment to the stock. Such activities include aggregate extraction and dumping of dredge spoil.

FSS considers the establishment of SIP (Science Industry Partnership) projects as a necessary component of a rebuilding plan for this stock.



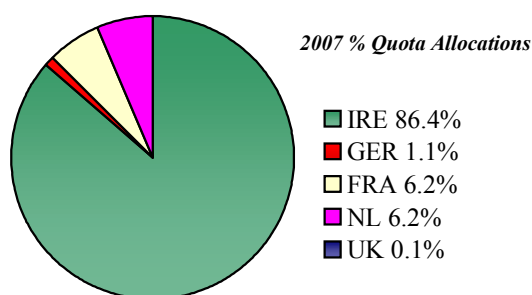
Red Boxes-TAC/Management Areas Blue Shading- Assessment Area

## CURRENT MANAGEMENT

- The TAC is set on an annual basis but the assessments are carried out on a seasonal basis (1 April – 31 March).
- The TAC in 2007 was 9,393 t, with an Irish quota of 8,117 t. This is a 15% reduction from 2006.
- There is no internationally agreed management plan for this fishery. However in 2001 the Celtic Sea Herring Management Advisory Committee was set up to;
  - Build the stock to a level whereby it can sustain annual catches of around 20,000 t.
  - Take appropriate rebuilding measures in the event of the stock falling below the level at which these catches can be sustained.
  - Introduce measures to prevent landings of small and juvenile herring, including closed areas and/or appropriate time closures.
  - Ensure that all landings of herring should contain at least 50% of individual fish above 23 cm.
  - Maintain, and if necessary expand the spawning box closures in time and area.
  - Ensure that adequate scientific resources are available to assess the state of the stock.
  - Participate in the collection of data and to play an active part in the stock assessment procedure.
- This committee has extensive consultations with FSS on an on-going basis. The status of the stock was discussed in a number of meetings before and after the meeting of the 2007 Working Group.
- Selected spawning grounds are closed each year in this fishery on a rotational basis. These closures, (see map at end of section), are designed to provide some protection for the spawning shoals and should be maintained. In 2007/2008 Box B, containing the spawning boxes off Cork Harbour, was closed. In 2008/2009 Box C will be closed.

## ADDITIONAL INFORMATION

- The current estimate of SSB is very uncertain but is probably below  $B_{pa}$ , and possibly below  $B_{lim}$ . At current SSB levels there is a risk of reduced recruitment.

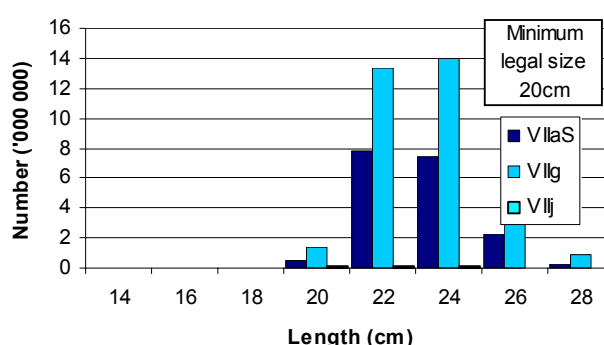


2. Current fishing mortality is uncertain and is probably high and well above the long term sustainable level of  $F_{0.1} = 0.2$ .
3. In 2007 a proposed plan was developed for this stock by the management committee and adopted by the Pelagic RAC. The following are the elements of this plan:
  - ◇ TAC for 2007 reduced by 15%, relative to 2006. This equates to a TAC in 2007 of 9 393 t. In the subsequent years, 2008, 2009 and 2010 the TAC will be fixed at 9 393t.
  - ◇ Spawning Box C (Sub-Division VIIaS) will be closed for 2007, 2008, 2009 and 2010. A sentinel fishery will be permitted in this box, up to a maximum quota of 646 t, for vessels < 50 ft only. This will facilitate intensive sampling of catches. This is necessary to help measure the strength of recruitment.
  - ◇ A new recruit survey will be conducted by the Marine Institute. This survey will improve the predictive power of the assessment and help to improve quantification of strength of incoming year classes.
  - ◇ The TAC provision in Point 1 above will be adjusted in the event of improvements in stock status as shown by ICES.
  - ◇ A reduction in TAC is possible if ICES advises that this is required.
4. In 2006, the total landings for the quota year were 8,530 t. The landings for the assessment year were 6,944 t, a considerable reduction on previous years.
5. Recruitment of the 2001/2002 year class was estimated as the weakest on record. There is little information in the assessment on the strength of recruitment, because 2 year old fish are poorly represented in the catch.
6. This fishery is becoming increasingly reliant on 3, 4 and 5 year old fish, with very few older fish represented in the catch.
7. The number of Irish vessels participating in this fishery in recent years has been low and markets have remained poor. There are four processing factories in the South and West of Ireland that depend on this fishery.
8. No information is available on fishing by foreign fleets but effort is believed to be very low.
9. There is no information on discarding in this fishery, and information is required to show if discarding is a problem.
10. Several studies have confirmed that juveniles from the Celtic Sea are present in the western Irish Sea

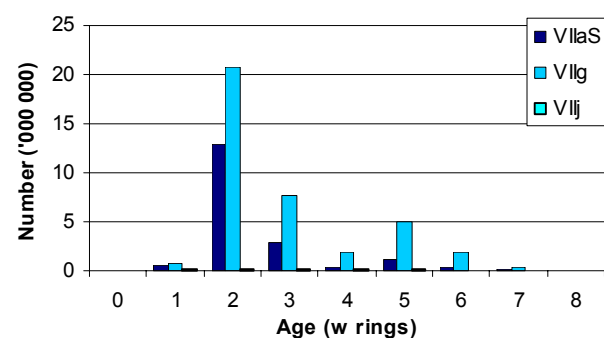
and return to the Celtic Sea at 1 and 2 ringers. The effect of this mixing on recruitment to the Celtic Sea fishery and stock is currently unquantified and further work is required on this area.

11. The stock identity is complex and was subject to the EU multi-disciplinary stock discrimination project WESTHER. The results of this project found that the Celtic Sea herring stock should continue to be managed as a separate stock.
12. Productivity was examined at the working group and it was found that this stock had variable productivity, without any distinct trends, throughout the time series. This variable productivity could not be linked to environmental trends.

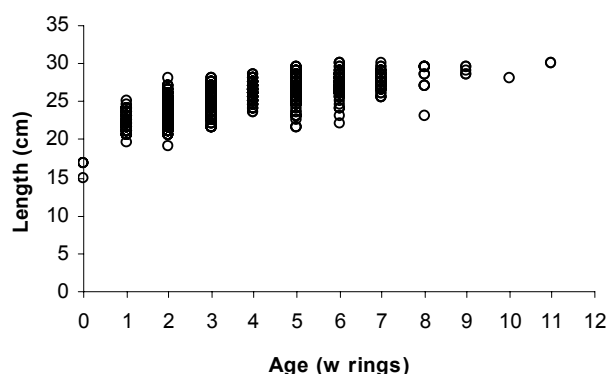
**2006 Length Distribution: International Landings, Herring in VIIaS VIIg VIIj**



**2006 Age Distribution: International Landings, Herring in VIIaS VIIg VIIj**



**2006 Size at Age: Irish Sampling, Herring in VIIaS VIIg VIIj**





## ICES ADVICE

### 5.4.16

#### State of stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Uncertain, but likely at risk of reduced reproductive capacity	unknown	unknown	NA	

The stock size continues to be uncertain, with several exploratory assessments all suggesting that the SSB is probably below  $B_{pa}$  and possibly below  $B_{lim}$ . The current stock size is likely as low as when it collapsed in the 1970s. The trend in recent years has been to reduce SSB and increase  $F$ . The stock is currently composed mainly of younger fish.

#### Management objectives

There is no EU management plan for this stock. A local management group the “Celtic Sea Management Advisory Committee” is in the process of developing a rebuilding plan for this stock, to be submitted to the Pelagic RAC.

#### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	26 000 t	The lowest stock observed
	$B_{pa}$	44 000 t	Low probability of low recruitment
	$F_{lim}$	Not defined	
	$F_{pa}$	Not defined	
Targets	$F_y$	Not defined	

#### Single-stock exploitation boundaries

##### *Exploitation boundaries in relation to precautionary limits*

The current level of SSB is uncertain, but may be below  $B_{pa}$  and possibly even below  $B_{lim}$ . At current levels of SSB there is a risk of reduced recruitment. Currently  $F$  is uncertain but high and needs to be reduced.

Under these circumstances ICES recommends that targeted fishing should not proceed without a rebuilding plan. ICES advises that this should encompass a full consultation with the stakeholders. The plan should be scientifically evaluated, and ICES is prepared to be involved in the process.

#### Management considerations

Fishing mortality of this stock has been high for many years, well above a long term sustainable level of  $F_{0.1} = 0.18$ . From 1982 the stock was maintained with good recruitment up to the mid-1990s. SSB has declined steadily since 1990. In recent years, the fishery has relied on younger fish at 3, 4, and 5 years of age.

Though the state of the stock is uncertain, SSB is considered to be at a low level, likely as low as the size when the stock previously collapsed. Given the age structure of the population and the current uncertainty, ICES considers that there is a high risk for reduced stock productivity.

Celtic Sea and Division VIIj herring are assessed on a seasonal basis, 1 April to 31 March, while the TACs are set by the calendar year. There is a rotating closure of spawning areas off the south coast of Ireland.

Although current  $F$  is uncertain given the current state of the stock,

there is a need to reduce catches further. Other measures may help with recovery but the key issue is the reduction of fishing mortality. Given the current difficulties in estimating the stock any measures that are taken will need to be maintained for several years before any change in the state of the stock can be expected to be detected.

Preliminary simulations indicate that catches in the order of 10 000 t (roughly corresponding to the perceived current level of  $F = 0.6$ ) are unlikely to guarantee recovery of the stock. These simulations also indicate that an  $F$  of around 0.4 is associated with uncertainty in recovery, while an  $F$  of 0.2 ( $\sim F_{0.1}$ ) is associated with a high likelihood of recovery. Under most circumstances a catch of around 5000 t appears to be appropriate to ensure that  $F=0.2$ .

#### Factors affecting the fisheries and the stock

The stock is exploited by two types of vessels, larger boats with RSW storage and smaller dry hold vessels. The smaller vessels are confined to the spawning grounds (VIIaS and VIIg) during the winter period. The RSW vessels target the stock inshore in winter and offshore during the summer feeding phase (VIIg). There has been little fishing in VIIj in recent seasons, and there is evidence that stock abundance in this area is currently low.

The collapse of the market for herring roe means that there is no longer the same incentive to discard (slip) catches.

The number of vessels participating in the fishery has decreased in recent years. However, efficiency has increased, especially in the RSW vessels.

Given the current state of the stock relaxation of management measures to protect the stock, such as the area closures, would not be advised.



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### The environment

Exploratory analysis of the environmental signals in the Celtic Sea suggested that water temperatures in the region have been variable but without any trend. This suggests that equilibrium analysis can be part of the basis for developing management strategies.

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### Scientific basis

#### *Data and methods*

Exploratory analyses use catch and survey data. The current management regime has resulted in catch data which are thought reasonably reliable. The acoustic surveys are imprecise.

#### *Assessment period and TAC*

Celtic Sea and Division VIIj herring are assessed on a seasonal basis, 1 April to 31 March, while TACs are set by the calendar year.

#### *Uncertainties in assessment and forecast*

The exploratory assessments give a clear picture of past stock trends – the decrease in SSB to a low level and the increasing F since the mid-1990s are both well demonstrated (Figure 5.4.16.1). Recent history is uncertain because of the imprecise survey used to tune the assessment. The current small number of year classes in the stock exacerbates the uncertainty caused by the imprecise survey.

No final assessment is produced in 2007.

#### *Comparison with previous assessment and advice*

The perception of the stock status this year is similar to last year.

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### Source of information

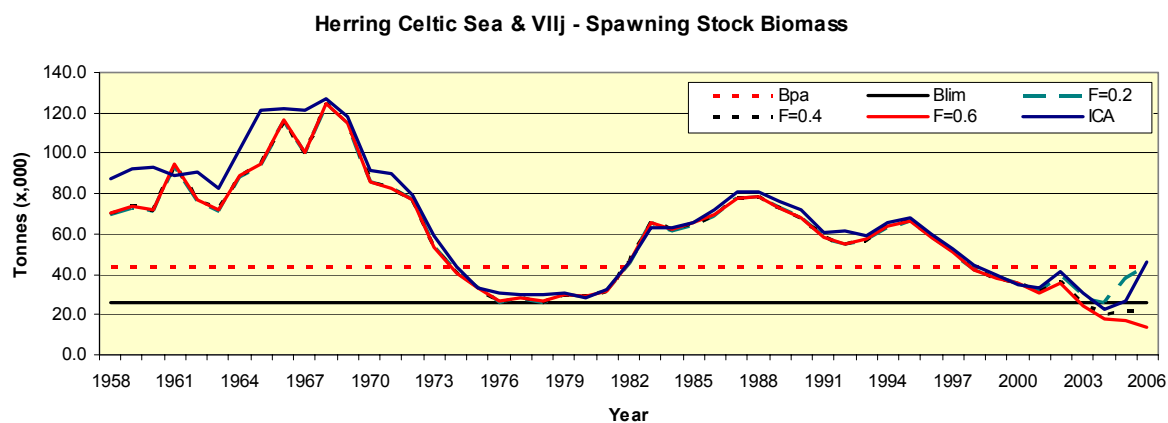
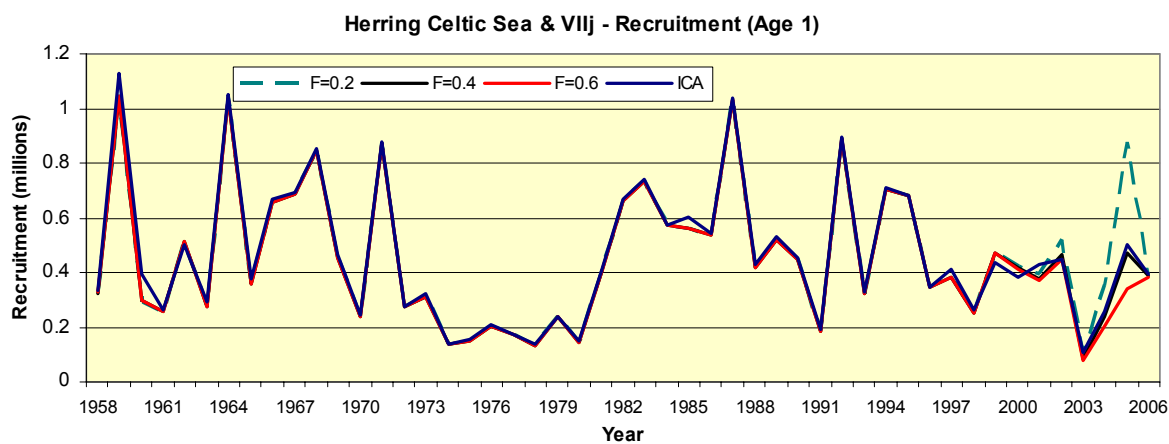
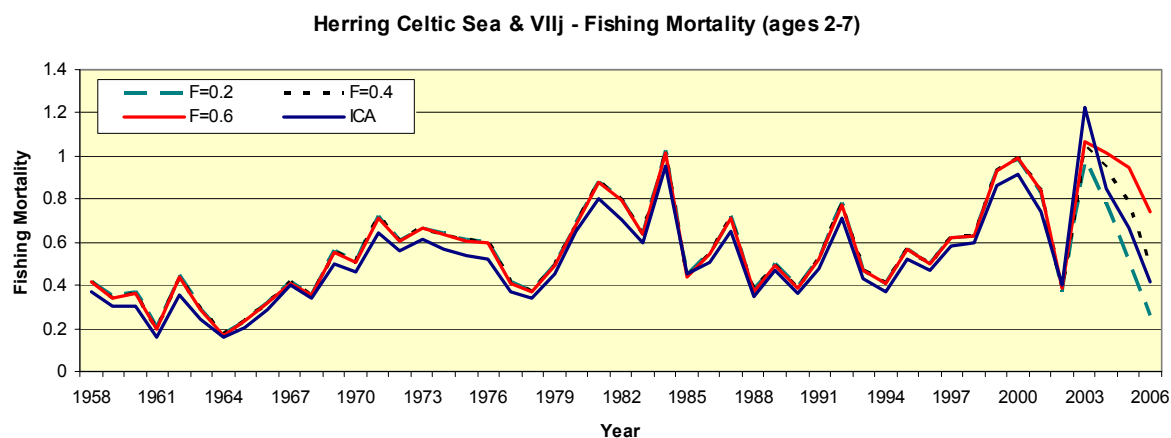
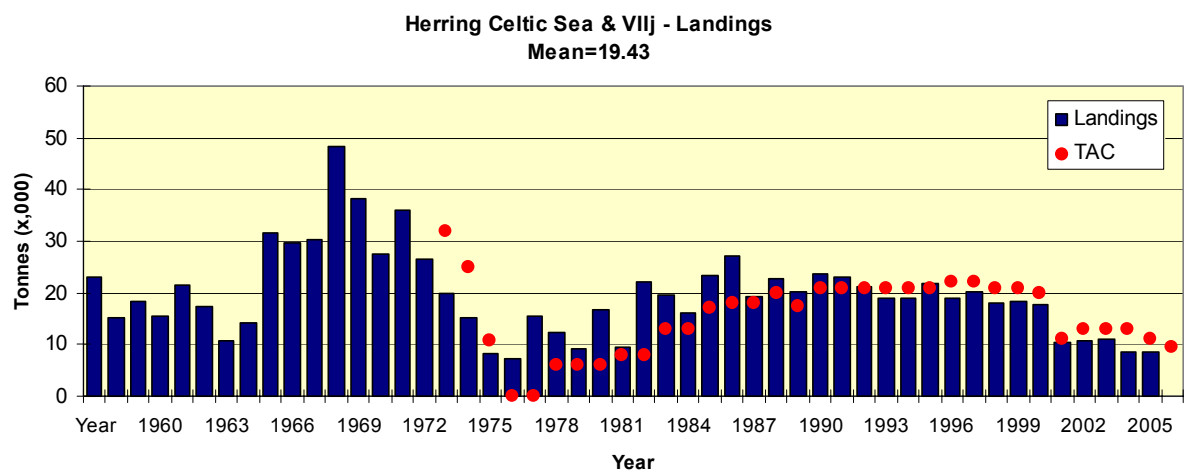
Report of the Herring Assessment Working Group for the Area South of 62°N, 13–22 March 2007 (ICES CM 2007/ACFM:11).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings	Discards	ACFM Catch <sup>1</sup>
1987	Precautionary TAC	18	18	18	4.2	27.3
1988	TAC	13	18	17	2.4	19.2
1989	TAC	20	20	18	3.5	22.7
1990	TAC	15	17.5	17	2.5	20.2
1991	TAC (TAC excluding discards)	15 (12.5)	21	21	1.9	23.6
1992	TAC	27	21	19	2.1	23
1993	Precautionary TAC (including discards)	20–24	21	20	1.9	21.1
1994	Precautionary TAC (including discards)	20–24	21	19	1.7	19.1
1995	No specific advice	-	21	18	0.7	19
1996	TAC	9.8	16.5–21 <sup>2</sup>	21	3	21.8
1997	If required, precautionary TAC	< 25	22	20.7	0.7	18.8
1998	Catches below 25	< 25	22	20.5	0	20.3
1999	F = 0.4	19	21	19.4	0	18.1
2000	F < 0.3	20	21	18.8	0	18.3
2001	F < 0.34	17.9	20	19	0	17.7
2002	F < 0.35	11	11	11.5	0	10.5
2003	Substantially less than recent catches	-	13	12	0	11
2004	60% of average catch 1997–2000	11	13	12	-	11
2005	60% of average catch 1997–2000	11	13	10	-	8
2006	Further reduction 60% avg catch 2002–2004	6.7	11	9	-	8.5
2007	No fishing without rebuilding plan	--	9.3		-	
2008	No targeted fishing without rebuilding plan	--				

Weights in '000 t.

<sup>1</sup>) By calendar year.

<sup>2</sup>) Revised in 1996 after the ACFM May meeting



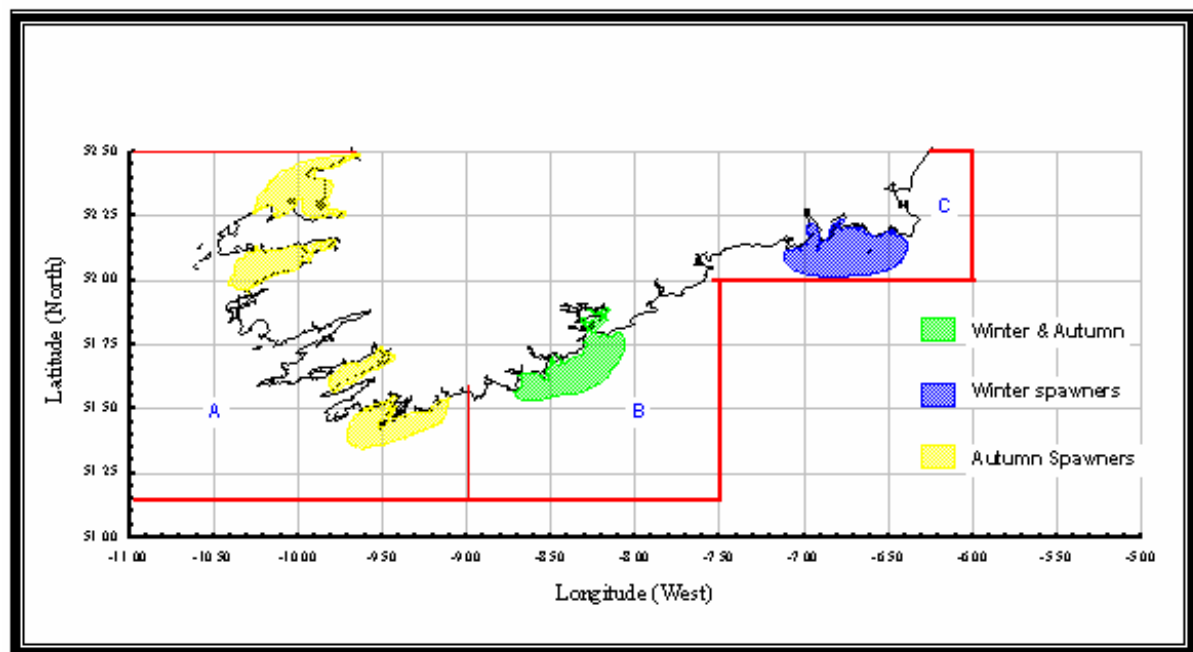
**Table 5.4.16.1** Celtic Sea and Division VIIh, j, and k herring landings in tonnes by quota year, 1988–2004. (Data provided by Working Group members.) These figures may not in all cases correspond to the official statistics and cannot be used for management purposes.

Year	France	Germany	Ireland	Netherlands	U.K.	Unallocated	Discards	Total
1989	+	-	16,000	1,900	-	1,300	3,500	22,700
1990	+	-	15,800	1,000	200	700	2,500	20,200
1991	+	100	19,400	1,600	-	600	1,900	23,600
1992	500	-	18,000	100	+	2,300	2,100	23,000
1993	-	--	19,000	1,300	+	-1,100	1,900	21,100
1994	+	200	17,400	1,300	+	-1,500	1,700	19,100
1995	200	200	18,000	100	+	-200	700	19,000
1996	1,000	0	18,600	1,000	-	-1,800	3,000	21,800
1997	1,300	0	18,000	1,400	-	-2,600	700	18,800
1998	+	-	19,300	1,200	-	-200	-	20,300
1999		200	17,900	1300	+	-1300	-	18,100
2000	573	228	18,038	44	1	-617	-	18,267
2001	1,359	219	17,729	-	-	-1578	-	17,729
2002	734	-	10,550	257	-	-991	-	10,550
2003	800	-	10,875	692	14	-1,506	-	10,875
2004	801	41	11,024	-	-	-801	-	11,065
2005	821	150	8452	799	-	-1770	-	8,452
2006	-	-	8,530	518	5	-523	-	8,530

**Table 5.4.16.2** Celtic Sea & Division VIIj herring landings in tonnes by assessment year (1 April–31 March) 1988/1989–2004/2005. (Data provided by Working Group members.) These figures may not in all cases correspond to the official statistics and cannot be used for management purposes.

Year	France	Germany	Ireland	Netherlands	U.K.	Unallocated	Discards	Total
1989/1990	+	-	15,000	1,900	-	2,600	3,600	23,100
1990/1991	+	-	15,000	1,000	200	700	1,700	18,600
1991/1992	500	100	21,400	1,600	-	-100	2,100	25,600
1992/1993	-	-	18,000	1,300	-	-100	2,000	21,200
1993/1994	-	-	16,600	1,300	+	-1,100	1,800	18,600
1994/1995	+	200	17,400	1,300	+	-1,500	1,900	19,300
1995/1996	200	200	20,000	100	+	-200	3,000	23,300
1996/1997	1,000	-	17,900	1,000	-	-1,800	750	18,800
1997/1998	1,300	-	19,900	1,400	-	-2100	-	20,500
1998/1999	+	-	17,700	1,200	-	-700	-	18,200
1999/2000		200	18,300	1300	+	-1300	-	18,500
2000/2001	573	228	16,962	44	1	-617	-	17,191
2001/2002	-	-	15,236	-	-	-	-	15,236
2002/2003	734	-	7,465	257	-	-991	-	7,465
2003/2004	800	-	11,536	610	14	-1,424	-	11,536
2004/2005	801	41	12,702	-	-	-801	-	12,743
2005/2006	821	150	9,494	799	-	-1770	-	9,494
2006/2007	-	-	6,944	518	5	-523	-	6,944

## Herring Spawning boxes off the South coast.



# North West of Ireland Herring

(Divisions VIa South and VIIb,c)

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

## FSS – SINGLE STOCK CONSIDERATIONS

FSS agrees with ICES that SSB may be stable at a low level. The current level of SSB is uncertain but is likely to be below  $B_{pa}$ .  $F$  is likely to be above  $F_{pa}$  and also likely to be above  $F_{lim}$ . The assessment is still considered exploratory and only indicative of stock trends.

FSS agrees with the ICES advice that a rebuilding plan should be put in place to reduce catches and that no fishing should be allowed unless a rebuilding plan is in place. FSS notes that no rebuilding plan has been proposed. FSS advise that a rebuilding plan should be developed and evaluated by ICES.

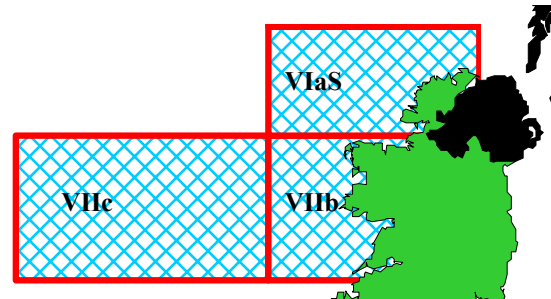
FSS is aware of the European Commission proposal for setting of fishing opportunities in 2008 (see above, and page 42). FSS present an interpretation of how this proposal would be implemented for this stock (see above, and table on page 46). For Northwest of Ireland herring, FSS interprets that the proposal would result in a "TAC reduction that is as large as is compatible with mixed fishery and relevant socio economic considerations".

FSS restates that actions which disturb herring spawning beds or increase turbidity after spawning are likely to have a negative effect on recruitment to the stock. Such activities include aggregate extraction and the dumping of dredge spoil.

FSS considers the establishment of SIP (Science Industry Partnership) projects as a necessary component of a rebuilding plan for this stock.

## CURRENT MANAGEMENT

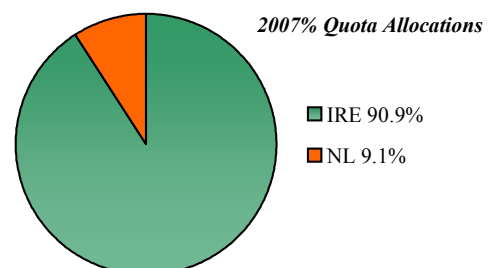
- The TAC, set by the EU for 2007 is 13,860 t, of which the Irish quota is 12,600 t.
- In 2000 the Irish Northwest Pelagic Advisory Committee was established to manage the Irish fishery for this stock but this committee is no longer active. The committee had a stated aim to rebuild this stock to above the  $B_{pa}$  level of 110,000 t. The time



Red Boxes-TAC/Management Areas Blue Shading- Assessment Area

period over which this could be achieved depended on the annual catches and recruitment. In the longer term it was the policy of the committee to further rebuild the stock to the level at which it could sustain annual catches of around 25,000 t. The committee had also continued the imposition of closed seasons for the fishery.

- Changes to the management of this stock in recent years have influenced the way the fishery is prosecuted in space and time. Large RSV vessels do not now have access to the areas inside the 12 mile limit.



## ADDITIONAL INFORMATION

- The state of the stock is considered to be uncertain and is likely to be below  $B_{lim}$  of 81,000 t. In 2007 trial assessments were carried out which used the acoustic surveys as a tuning fleet.
- Trends were identified which indicate that the SSB is at a historic low level or declining slightly.
- Fishing mortality has increased concomitantly with increased catches and the increased TAC in 2006. The current  $F$  is uncertain but likely to be above  $F_{pa}$  (0.22) and possibly  $F_{lim}$  (0.33).
- Recruitment is thought to be stable at a low level. There is no evidence that any large year classes have recruited to the fishery in recent years. There are no fishery independent indices of recruitment.
- Official Irish landings of 14,840 t were recorded in

2006. This is an increase on 2005 landings which were 13,350 t.

6. In 2007 catch data was reallocated from Division VIaN to VIaS to account for area misreporting. This elementary revision was implemented for the years 2000-2005, consistent with the procedure conducted up to 1999.
7. The number of Irish vessels participating in this fishery in recent years has been low but the fleet is still powerful. The markets for herring from this fishery have been poor.
8. The stock structure of Northwest of Ireland herring is different to the Celtic Sea herring stock, in that there is no recruitment failure in the Northwest, the age-profile is broader and the stock is not dependant on incoming year classes.
9. The stock identity of herring west of the British Isles was reviewed by the EU-funded project WESTHER. The results of this project show that the herring populations in this area and Divisions VIaN and VIIaN form a metapopulation. ICES plans to investigate means to assess and manage this metapopulation. In the meantime, each population will continue to be managed separately.
10. An Industry/Science partnership is being discussed at present to investigate this stock.

## ICES ADVICE

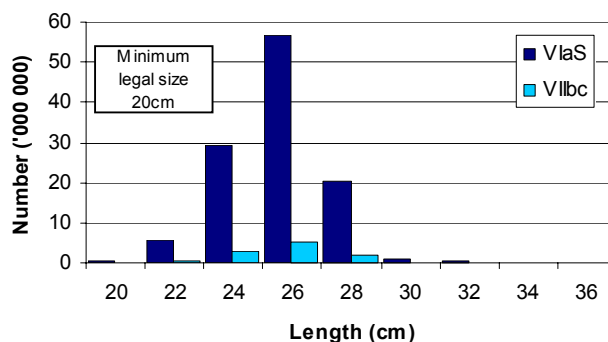
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#### State of stock/exploitation

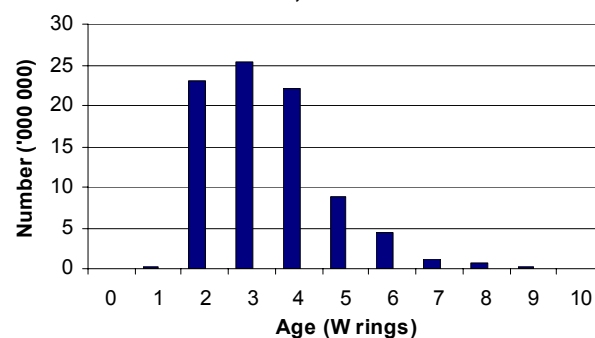
Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Uncertain	Uncertain	Unknown	NA	No accepted assessment, but SSB is probably at a historically low level. F is likely to be high.

Preliminary assessments suggest that SSB may be stable at a low level. The current level of SSB is uncertain but likely to be below  $B_{lim}$ . There is no evidence that large year classes have recruited to the stock in recent years. F appears to have increased concomitantly with increases in the catch. F is likely to be above  $F_{pa}$  and also likely above  $F_{lim}$ .

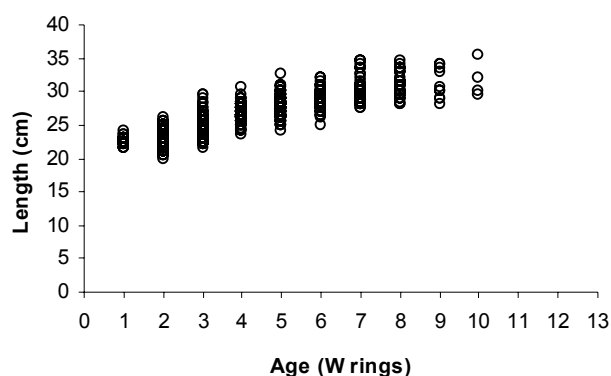
#### 2006 Length Distribution: International Landings, Herring in VIaS VIIbc



#### 2006 Age Distribution: International Landings, Herring in VIaS, VIIbc



#### 2006 Size at Age: Irish Sampling, Herring in VIaS, VIIbc



#### Management objectives

There is no explicit management plan for this stock. The local Irish management committee developed the objective to rebuild the stock to above  $B_{pa}$  and to maintain catches of 25 000 t per year. The implementation of the closed season from March to October has been successful in ensuring that the fishery mainly concentrates on the spawning component in this area.

## Precautionary approach reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	81 000 t	Lowest reliable estimate of SSB
	$B_{pa}$	110 000 t	Approximately 1.4 $B_{lim}$
	$F_{lim}$	0.33	Lowest observed F
	$F_{pa}$	0.22	$F_{med}$ (1998)
Targets	$F_y$	Not defined	

(unchanged since 1998)

### Single-stock exploitation boundaries

#### *Exploitation boundaries in relation to precautionary limits*

ICES recommends a rebuilding plan be put in place that will reduce catches. If no rebuilding plan is established, there should be no fishing. The rebuilding plan should be evaluated with respect to the precautionary approach.

### Short term implications

No final assessment was produced and no short-term predictions were conducted.

### Management considerations

The current catch regime has been in place since 2000 but does not appear to have reduced F below  $F_{lim}$ .

SSB may be stable at an historical low level, or even declining slightly. The peak in SSB in the 1980s may have been an isolated event. This stock should be exploited with caution. Though little information on recruitment is available, it is unlikely that it is above average. Certainly every effort should be taken to maintain catches below the current level. The catch target of the local management plan is not likely to be achievable at current stock productivity.

### Factors affecting the fisheries and the stock

#### *Regulations and their effects*

Changes to the management of this stock have influenced the way the fishery is prosecuted in space and time. The RSW vessels do not have access to the spawning grounds within a 12-mile limit. Fish on the spawning grounds are targeted largely by dry hold vessels only.

#### *Changes in fishing technology and fishing patterns*

The pattern of this fishery has changed over time. In the early part of the 20th century the main spawning components were the winter spawners off the north coast, and this was where the main fishery took place. In the 1970s and 1980s the west of Ireland autumn-spawning components were dominant and the fishery was mainly distributed along the coasts of VIIbc and VIaS. More recently the northern grounds are more important again with most of the catches from VIIb concentrated in the northwest, near to the boundary of VIa South.

### *Information from the fishing Industry*

Reports from the industry indicate large concentrations of herring in the northern part of VIa South.

### *Other factors*

The fishery exploits a mixture of autumn- and winter/spring-spawning fish. The winter/spring-spawning component is distributed in the northern part of the area. The autumn spawners in the west are not targeted much, though it is unclear if this is evidence of low abundance.

### Scientific basis

#### *Data and methods*

The acoustic survey time-series was used in exploratory assessments and these showed similar trends in stock development over a range of assumptions.

Catch data were revised by reallocation between VIaN and VIaS. This elementary revision was implemented for the years 2000–2005, being consistent with the procedure conducted up to 1999.

#### *Uncertainties in assessment and forecast*

The acoustic survey series used to tune the exploratory assessment is very short and this contributes to the uncertainty of the assessment. This spawning survey is only conducted in January, whilst the spawning period lasts from October to February. There are inconsistencies in the cohort strength in both the survey and the fishery and there are differences in the age structure in each. The perception of stock trends is consistent, even though the most recent estimates of SSB and F are uncertain.

#### *Comparison with previous assessment and advice*

The perception of the state of the stock is the same as last year. However, F may have increased, which would be consistent with an increase of 15% in catch. Giving the continued lack of recovery the advice for catch reduction remains the same.

### Source of information

Report of the Herring Assessment Working Group for the Area South of 62°N, 13–22 March 2007 (ICES CM 2007/ACFM:11).

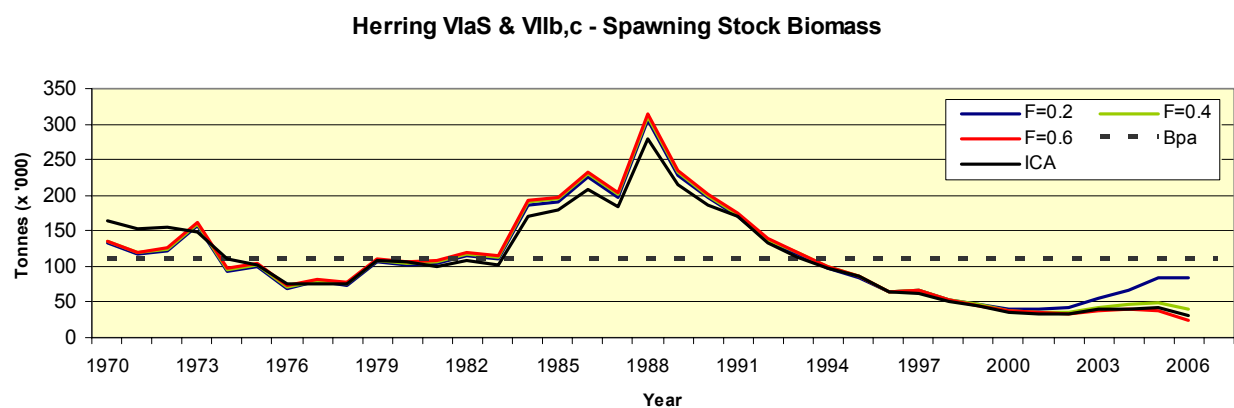
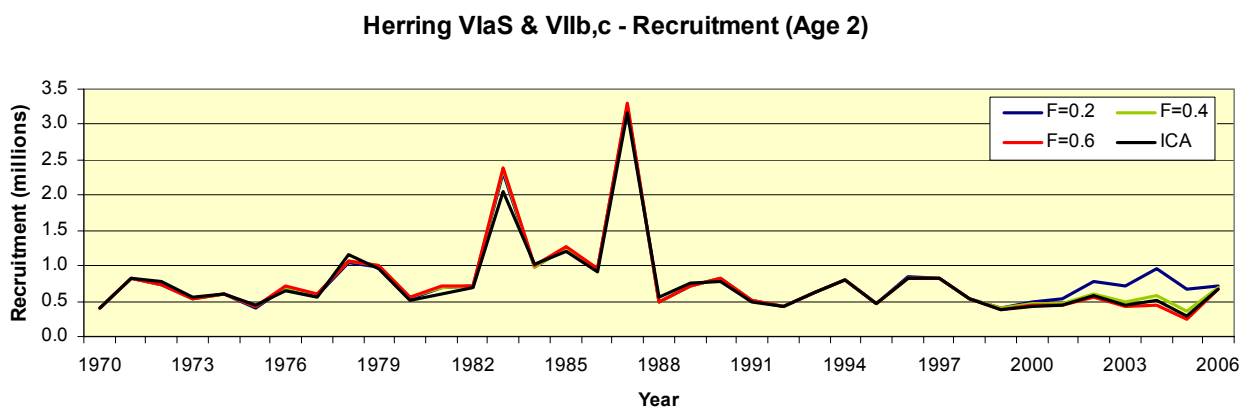
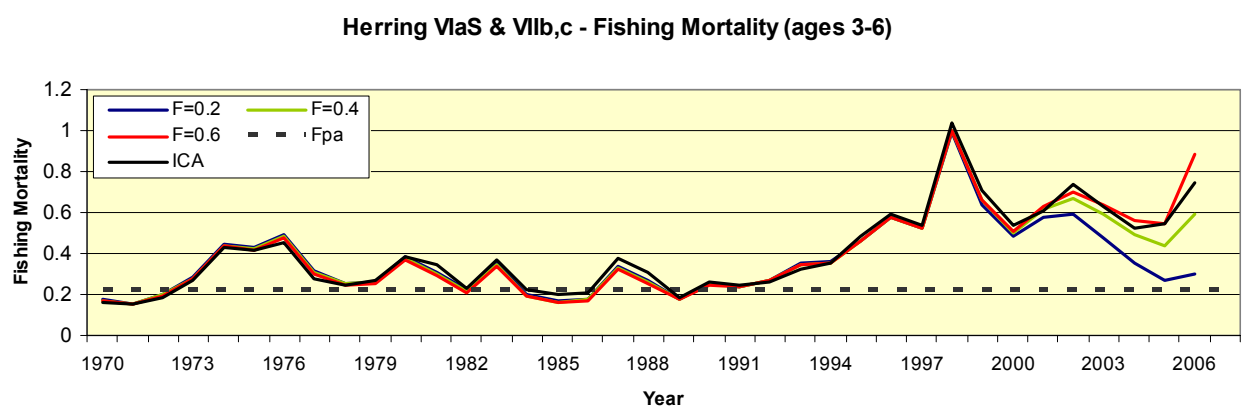
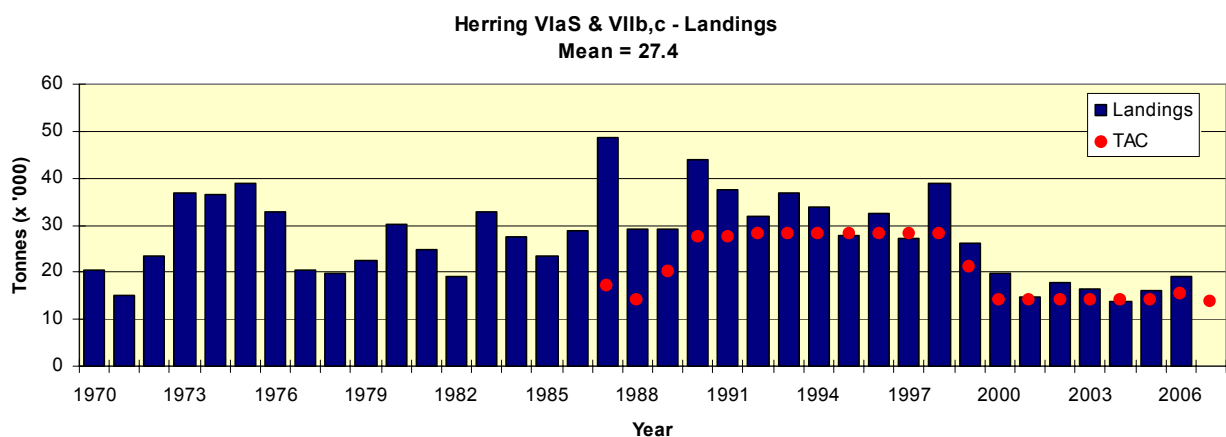
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings	Disc. slip.	ACFM Catch
1987	TAC	18	17	17	-	49
1988	TAC depending on whether 1987 TAC is taken	11–18	14	15	-	29
1989	TAC	15	20	21	1.0	29
1990	TAC depending on whether 1989 TAC is taken	25–27	27.5	28	2.5	44
1991	TAC	< 26	27.5	23	3.4	38
1992	TAC (including discards)	29	28	27	0.1	32
1993	Precautionary TAC (including discards)	29	28	30	0.3	37
1994	Precautionary TAC	28	28	27	0.7	34
1995	Precautionary TAC (including discards)	36	28	27	-	28
1996	If required, precautionary TAC	34	28	25	-	33
1997	Catches below 25	< 25	28	28	0.1	27
1998	Catches below 25	< 25	28	28	-	39
1999	F 70% of F(97)	19	21	18	-	26
2000	F 40% of F(98) = Proposed $F_{pa}$	14	14	10	-	19
2001	F 40% of F(99) F = 0.2	14	14	13	-	14
2002	No increase in catches	14	14	14	-	17
2003	No increase in catches	14	14	14	-	16
2004	No increase in catches	14	14	11	-	13
2005	No increase in catches	14	14	13	-	16
2006	No increase in catches	14	15.4	15.2	-	19
2007	Rebuilding plan with reduced catches		13.8			
2008	Rebuilding plan with reduced catches					

Weights in '000 tonnes.

**Table 5.4.17.1** Herring in Divisions VIaS and VIIbc. Landings in tonnes by quota year, 1988–2006. (Data provided by Working Group members.) These figures may not in all cases correspond to the official statistics and cannot be used for management purposes.

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006
France	-	-	-	-	515	-	-	-	-
Germany, Fed.Rep.	-	-	-	-	-	-	-	-	-
Ireland	25200	16325	10164	11278	13072	12921	10950	13351	14840
Netherlands	2500	1868	1234	2088	366	-	64	-	353
UK (N.Ireland)	-	-	-	-	-	-	-	-	-
UK (England + Wales)	-	-	-	-	-	-	-	-	-
UK Scotland	-	-	-	-	-	-	-	-	6
Total landings	27700	18193	11398	13366	13953	12921	11014	13351	15199
Area misreported/Unallocated	11200	7916	8448	1390	3873	3581	2813	2880	3994
Discards	-	-	-	-	-	-	-	-	-
WG catch	38900	26109	19846	14756	17826	16502	13827	16231	19193





# Bristol and English Channels Herring

(Divisions VIIe,f)



*Marine Institute*  
Foras na Mara

*Fisheries Science Services*

## FSS –SINGLE STOCK CONSIDERATIONS

**There is no Irish quota for this stock and it is not known if there is a link between herring in this area and the Celtic Sea herring stock.**

## CURRENT MANAGEMENT

- The TAC for this stock is set at 1,000 t. This is divided equally between the UK and France.
- In the absence of an assessment the TAC for this stock has remained unchanged in recent years.
- Preliminary landings in 2006 have been around 760 t. This is similar to the 2005 landings. Landings have fluctuated over the last ten years, from a low of 176 t to a high of 1,040 t.

## ADDITIONAL INFORMATION

1. There is currently very little available information on this fishery
2. The majority of French landings in 2006 were reported in November by one pelagic vessel. It is not clear if this was taken as by catch in the Q4 Horse Mackerel fishery or was a result of area misreporting.

Herring Divisions VIIef landings by country 1994-2006

Country		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006*
Denmark	VIIe	9												
France	VIIe	12	503	22	551	26		335	526	500	497	496	516	515
France	VIIef							150	1					
UK	VIIe	430	445	471	481	376	164	159	193	163	315	199	66	190
UK	VIIef	2	3	3	8	14	12	81		5	21	47	198	76
<b>Total</b>		<b>453</b>	<b>951</b>	<b>496</b>	<b>1040</b>	<b>416</b>	<b>176</b>	<b>725</b>	<b>720</b>	<b>668</b>	<b>833</b>	<b>742</b>	<b>780</b>	<b>767</b>

\*Preliminary Landings

# West of Ireland and Celtic Sea Sprat

(Division VIIb-k)



Fisheries Science Services

## FSS –SINGLE STOCK CONSIDERATIONS

**Sprat fisheries display large inter-annual variation, both spatially and temporally. In light of decreased quotas for herring, effort may be displaced into sprat. This should be monitored. In order to prevent an increase in effort, precautionary TACs should be implemented in Sub-area VI and Sub-area VII.**

## CURRENT MANAGEMENT

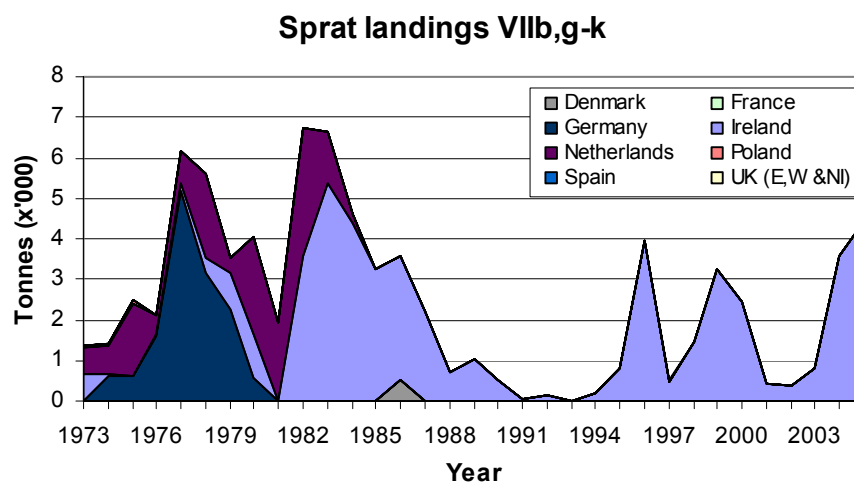
- There are no management regulations for sprat fisheries around Ireland.
- There are no TACs for sprat in Irish waters. A TAC is in place in the English Channel and in the North Sea.

## ADDITIONAL INFORMATION

1. A number of vessels using mid water trawls take part in the fishery. The fishery takes place in shallow inshore areas mainly during autumn.
2. A summer fishery developed along the south coast in 2004 and 2005. Most of the catch is frozen whole for export to the continental markets.
3. Fishing effort is generally concentrated along the south and mid-west coasts. Traditionally dry hold vessels took the bulk, if not all of the landings. However, due to quota restrictions and a continuation of poor market prices for Celtic Sea herring some of the RSW vessels now target sprat along the south coast.
4. Sprat landings are being curtailed due to the by-catch of other species, mainly mackerel and herring, in this fishery.
5. Sprat, from both targeted fisheries and as part of herring fishery by-catch, have been sampled by FSS since 2000.
6. The degree of species misreporting between herring and sprat needs to be evaluated before advice can be given.
7. The total catch from this fishery in recent years has been taken exclusively by Irish vessels

**Table I.** Landings of Sprat from Divisions VIIb,g-k, 1995-2006

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Ireland	799	3945	489	1477	3268	2462	444	396	785	3591	4433	na
UK (E,W &NI)	.	.	6	.	.	.	.	.	.	.	.	na
	799	3945	495	1477	3268	2462	444	396	785	3591	4433	na



**Figure I.** Landings of Sprat from Divisions VIIb,g-k.

# Ecosystem Overview for Deepwater

This description covers the benthic deepwater ecosystem and its associated species; for a description of the oceanic water column habitat, please refer to the section of widely distributed and migratory species.

## Summary table of the ICES Ecosystem for the Deep Sea

(Information condensed from ICES WGRED, 2007 see WG report for further details and reference list)

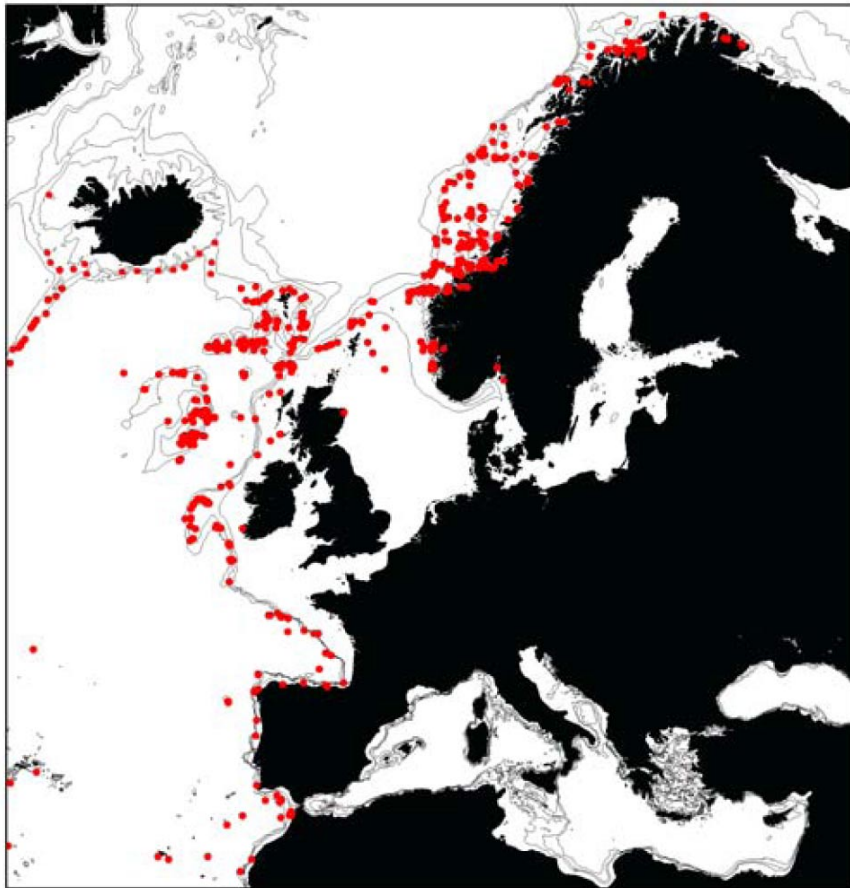
Physics	
<b>Bathymetry</b>	Most of the surface is abyssal plain with an average depth >ca 4 000 m. the continental slope is rocky hard substrate from Ireland southwards and covered with sediment west of the British Isles. Two offshore banks, Rockall and Hatton Banks are separated from the continental shelf by the Rockall Trough. North of this advisory region is marked by the Wyville Thomson and Iceland-Faroe Ridges and the south by the Azores. . To the west is the mid-Atlantic Ridge (MAR), stretching from Iceland to the Azores. Isolated seamounts occur over the whole basin.
<b>Circulation</b>	The general circulation in the epipelagic zone (0-200m) is a warm current flow from the south-west North Atlantic towards the European coast with several side branches. Cold currents flow south from the Labrador Sea and Irminger Sea and also as a strong deep water flow between Shetland and the Faroes.
<b>Temperature Salinity</b>	Below about 700m there is little seasonal variation in temperature, average temperatures are 7°C to 8°C at 1000m depth and less than 4°C below 2000m.
Biology	
<b>Phytoplankton</b>	Photosynthetic primary production at the surface is limited in many areas by nutrient availability, except near seamounts and other topographical features that cause upwelling. The depth of primary production is limited to the euphotic zone which reaches a maximum depth of 200m and only a small proportion (1%-3%) may arrive in deeper waters as 'planktonic snow'. This and descents of carcasses down the slopes bring organic matter to the deep environments.
<b>Benthos, larger invertebrate, biogenic habitats</b>	There is little commercial exploitation of large invertebrates in this region, some by-catch of cephalopods and crabs <i>Chaceon affinis</i> occurs in deep-water fisheries. Biogenic habitats occur along the slope, such as those formed by the scleractinian <i>Lophelia pertusa</i> a colonial coral, forming large bioherms or reefs along the slope, on the offshore banks, on the mid-Atlantic Ridge and on seamounts. Dense and diverse fauna associated with such reefs include fixed (e.g. anthipatarians, gorgonians) and mobile invertebrates (e.g. echinoderms, crustaceans) and has species richness up to three times higher than on the surrounding sedimentary seabed.
<b>Fish Community</b>	The midwater pelagic or <i>mesopelagic</i> zone (200-1000 m) has a high diversity and abundance of small fish species notably Myctophidae, Gonostomatidae and Stomiidae, most of which migrate diurnally and thus bring nutrients into deeper water layers. Fish communities above the abyssal plane in the <i>bathypelagic</i> zone (1000-3000m) include Bathylagidae, Platytroctidae and Searsidae. The species composition of demersal deep water fish community depends on depth. Dominant commercial species at 200-2000m include species such as ling, tusk, round-nose grenadier, orange roughy deepwater sharks, chimaeriforms and other species such as redfish, monkfish and Greenland halibut. All deepwater shark species and most larger deep-water demersal fish are assumed to be highly vulnerable to overexploitation, having a low reproductive capacity. Most fisheries are occurring on the continental slopes, the seamounts and the MAR.
<b>Elasmobranches</b>	Amongst sharks, <i>Centroscymnus coelolepis</i> and <i>Centrophorus squamosus</i> , the two main commercial species (1 to 1.5 m long) are seriously depleted. The status of a number of smaller or less common species ( <i>Centroscymnus crepidater</i> , <i>Deania calcea</i> , <i>Dalatias licha</i> , <i>Scymnodon ringens</i> , <i>Etmopterus</i> spp. <i>Galeus</i> spp. <i>Apristurus</i> spp.) is less clear.

<b>Environmental signals &amp; implications</b>	The deep sea environment is considered to be less variable than surface systems. Moreover, due to the long life span of exploited species, variations in annual recruitment have a relatively minor effect on the standing biomass so short-term variability in the environment is unlikely to have great effects on stocks. Abundance of some deepwater invertebrate species has been linked to the North Atlantic Oscillation but overall it is not known how climate change might change the deep seas in the longer term.
<b>Fishery effects on benthos and fish communities</b>	Modern fishing fleets have caused significant reduction in demersal deepwater fish biomass in just a few years; resulting in the collapse of several fisheries. In addition to catching target species, deepwater fisheries by-catch unwanted species that are either too small or currently unmarketable and discarding rates are often high (in the order of 50%).. Deepwater trawling can damage deep sea benthic communities, impacting particularly on structurally complex habitats such as <i>Lophelia</i> reefs. Deep-water set nets can also have a negative impact, both on the fish community due to ghost fishing and targeting vulnerable species such as sharks. Long-line fishing can also have negative effects to the ecosystem through breaking off branches of coral, overturning large sponges and also might have some by-catch of sea-birds. The degree of perturbation and damage caused by deepwater fisheries depends on their spatial extend and frequency of their activities.

## FSS ECOSYSTEM CONSIDERATIONS

FSS advises that following ecosystem considerations should be taken into account in developing ecosystem based fisheries advice for deepwater fisheries:

- Due to their low reproductive output and high longevity, many deepwater fish species are very vulnerable to overfishing. Populations of fish that aggregate on oceanic bathymetric features such as seamounts are particularly sensitive to overfishing, due to high catchability. Most commercial deepwater species are now severely depleted. This depletion has lead to changes in demersal deep sea fish communities due to the loss of their larger predators.
- Many demersal slope species are not commercial because they do not reach sufficient size or have low marketability resulting in the bulk of the catch being discarded. As the deepwater fish community is very species rich, this is likely to affect a large number of species.
- Deepwater species are dependant on nutrient input from the upper ocean layers via planktonic snow, mesopelagic species and fall of carcasses. This should be taking into account when considering fisheries for mesopelagic species
- The human exploitation of the deepwater ecosystem has been a relative recent event if compared to the long history of human activities on the shelf. Thus, the pristine nature of many of its habitats should be taken into account when considering any exploitation of deepwater resources.
- Biogenic habitat such as those formed by the cold water coral *Lophelia pertusa* occur along the slope, on the offshore banks (Rockall and Hatton), on the mid-Atlantic Ridge and on seamounts supporting rich and diverse faunal assemblages. Deepwater trawling as well as set nets and longlining are known to have negative impacts on these habitats and closed area have already been set up for their protection (see further details in this chapter). However, many areas in the deepsea ecoregion remain to be surveyed for *Lophelia pertusa*. In addition the impact of fishing on other biogenic habitats such as deepwater sponge beds should be considered and further evaluated.
- The deep sea is a very stable system that is less exposed to environmental variability than the shallow shelf seas. As a consequence, benthic faunal assemblages in general might be less resilient to perturbation caused by fishing than their shelf sea counterparts.



**Fig. 1** Distribution of deepwater *Lophelia* reefs in the North East Atlantic and wider (WGRED, 2007 reproduced from Freiwald, 1998).

**References:**

- Freiwald, A. and Wilson, B.J., 1998. Taphonomy of modern deep, cold-temperate water corals reefs. *Historical Biology*, 13: 37-52.
- ICES. 2007. Report of the Working Group for Regional Ecosystem Description (WGRED), 19- 23 February 2007, ICES Headquarters, Copenhagen. ICES CM 2007/ ACE:02. 153 pp.

# Deepwater Stocks South of 63°N

For latest information, see: <http://www.ices.dk>



## Fisheries Science Services

Management advice on deepwater species is biennial and was last given in 2006 (ICES WGDEEP& ICES WEGEF). For details regarding the advice the reader is asked to refer to the 2006 Stock Book. This year's chapter on deepwater fisheries includes following sections:

1. Commission's review of the future management of deepwater species
2. Updated EC and Irish TACs for 2007 and 2008 for all deepwater fisheries
3. Updated international and Irish catches for deepwater species in 2006
4. Update on deepwater closed areas
5. FSS Advice on the western Irish Natura 2000 Sites

### 1. Commission's review of the future management of deepwater species

The European commission has recently published a review on the management of deepwater fisheries in the community waters, NEAFC and CECAF (Com-2007-30-final): The review focuses on the nature of deepwater fisheries, their current management and legislation and reasons for the failure of a sustainable deepwater fishery.

In the report the commission recognised and adopted the scientific view that deepwater species are highly vulnerable to overfishing and that most species are overexploited. They give a number of reasons why the management of deepwater fisheries has failed and resulted in the overexploitation and in many cases depletion of deepwater species:

- **Restrictive quotas:** After it was recognised in 2003, that most deepwater species were harvested at unsustainable levels, the Commission proposed measures to restrict the fishery. These measures included using catches rather than TACs as a baseline (as these were lower than the TACs) and restricting them by a further 30%. The measures were however not adopted by the council.
- **TACs:** The effective management of the fishery through TACs was questioned as there is a lack of knowledge on the catch composition and discarding practices of the different deepwater fisheries. The extent of their geographical distribution is

also not well understood resulting in management areas that do not correspond to the stock distribution. In addition only a limited number of deepwater species is subjected to TACs thus encouraging species misreporting.

- **Effort control:** Deepwater permits were only issued to vessels that were able to demonstrate catches of deepwater species from 1998-2000 of >10 tons in any of these years. This was implemented in order to avoid the expansion of a deepwater fleet. However many of the species were caught as a bycatch in the shelf fishery allowing vessels to obtain permits without focusing on deepwater fisheries.
- **Lack of adherence to regulations:** there has been limited compliance of member states to EC regulations on observer programmes, designation of deepwater ports, listing vessels with deepsea licenses and regular reporting of deepwater effort. The lack of compliance and the limited usefulness of supplied data was partially explained by the fact that there were no clearly defined sampling strategies in terms of scientific observer programmes and no guidelines by the commission with regard inspection and surveillance.
- **Difficulty in effective monitoring and control:** The adherence to regulations such as prohibition of fishing in protected areas depends on effective vessels monitoring systems. However, it was noted that no member country has implemented warning systems that alert fisheries monitoring centres when vessels are not complying with the regulations. In addition the fact that the licensing for deepwater fishing was too broad enabled vessels to fish in areas where there are deep sea quotas but where they may target species that the vessels has no right to fish.

### Future improvement and direction:

In the report the Commission has recognised that the current measures in place do not afford the protection of deepwater fish stocks. They point out that there is a need for improved knowledge on the different deepwater fisheries, their target and by-catch species, so that licensing can be restricted to certain types of fisheries. Monitoring should also be more rigorous and reporting procedures for VMS should be set up. Scientific monitoring of the fishery should be improved through the establishment of clear guidelines and agreed reporting formats between the member states. The data should be made more available to the working groups and there should also be more of an emphasis on the ecosystem effects of deep sea fisheries.



## 2. Updated EC and Irish TACs for 2007 and 2008 for all deepwater fisheries

Table 1. Comparative table of set TACs for 2007 and 2008

Species:	ICES Zones	EC TACs for 2007	Irish TAC For 2007	EC TACs for 2008	Irish TAC For 2008	Change between 2008 TACs and 2007 TACs (%)
Deep Sea Sharks <sub>2</sub>	V, VI, VII, VIII, IX	2472	<b>164</b>	1646	<b>109</b>	-33%
Deep Sea Sharks <sub>2</sub>	X	20	-	20	-	No change
Deep Sea Sharks <sub>2</sub> and <i>Deania histricosa</i> and <i>Deania profundorum</i>	XII	99	<b>4</b>	49	<b>2</b>	-51%
Black scabbardfish <i>Aphanopus carbo</i>	I,III,IV	15	-	15	-	No change
Black scabbardfish <i>Aphanopus carbo</i>	V, VI, VII, XII <sub>3</sub>	3042	<b>87</b>	3042	<b>87</b>	No change
Black scabbardfish <i>Aphanopus carbo</i>	VIII, IX, X	4000	-	4000	-	No change
Black scabbardfish <i>Aphanopus carbo</i>	CECAF 34.1.2.	4285	-	4285	-	No change
Alfonsinos <i>Beryx spp</i>	I, II, III, IV, V, VI, VII, VIII, IX, X, XII, XIV	328	<b>10</b>	328	<b>10</b>	No change
Roundnose grenadier <i>Coryphaenoides rupestris</i>	I, II, IV, Va*	20	-	20	-	No change
Roundnose grenadier <i>Coryphaenoides rupestris</i>	III*	1060	-	1000	-	-6%
Roundnose grenadier <i>Coryphaenoides rupestris</i>	Vb, VI, VII <sub>3</sub>	4600	<b>299</b>	4600	<b>299</b>	No change
Roundnose grenadier <i>Coryphaenoides rupestris</i>	VIII, IX, X, XII, XIV	6114	<b>9</b>	6114	<b>9</b>	No change
Orange roughy <i>Hoplostethus atlanticus</i>	VI	51	<b>6</b>	34	<b>4</b>	-33%
Orange roughy <i>Hoplostethus atlanticus</i>	VII <sub>3</sub>	193	<b>43</b>	130	<b>29</b>	-33%



Table 1. Comparative table of set TACs for 2007 and 2008 cont.

Species:	ICES Zones	EC TACs for 2007	Irish TAC For 2007	EC TACs for 2008	Irish TAC For 2008	Change between 2008 TACs and 2007 TACs (%)
Orange roughy <i>Hoplostethus atlanticus</i>	I, II, III, IV, V, VIII, IX, X, XI, XII, XIV	44	<b>6</b>	30	<b>4</b>	-32%
Blue ling <i>Molva dypterygia</i>	II, IV, V <sub>3</sub>	95	<b>7</b>	78	<b>6</b>	-18%
Blue ling <i>Molva dypterygia</i>	III	20		15		-25%
Blue ling <i>Molva dypterygia</i>	VI, VII <sub>3</sub>	2510	<b>7</b>	2009	<b>6</b>	-20%
Red seabream <i>Pagellus bogaraveo</i>	VI, VII, VIII <sub>3</sub>	298	<b>9</b>	298	<b>9</b>	No change
Red seabream <i>Pagellus bogaraveo</i>	IX	1080		1080		No change
Red seabream <i>Pagellus bogaraveo</i>	X <sub>4</sub>	1136		1136		No change
Forkbeards <i>Phycis blennoides</i> .	II,III,VI	36		36		No change
Forkbeards <i>Phycis blennoides</i> .	V, VI, VII	2028	<b>260</b>	2028	<b>260</b>	No change
Forkbeards <i>Phycis blennoides</i>		267		267		No change
Forkbeards <i>Phycis blennoides</i>	X, XII	63		63		No change

community waters <sup>1</sup> Based on official catch data and estimations from ACFM (International Council for the Exploration of the Sea (ICES)),<sup>2</sup> Where reference is made to “deep sea sharks”, this shall refer to sharks in the following list of species: Portuguese dogfish (*Centroscymnus coelolepis*), Leafscale gulper shark (*Centrophorus squamosus*), Birdbeak dogfish (*Deania calceus*), Kitefin shark (*Dalatias licha*), Greater lantern-shark (*Etmopterus princeps*), Velvet belly (*Etmopterus spinax*), Black dogfish (*Centroscyllium fabricii*), Gulper shark (*Centrophorus granulosus*), Blackmouth dogfish (*Galeus melastomus*), Mouse catshark (*Galeus murinus*), Iceland catshark (*Apristurus* spp.). <sup>3</sup> This quota is only intended for by-catches; no directed fisheries are allowed, <sup>4</sup> Up to 10% of the 2008 quota may be taken in December 2007

### 3. Updated international and Irish catches for deepwater species in 2006

Table 2. International and Irish catches for deepwater species for 2005 and 2006.

Species:	ICES Zones	2005		2006	
		Int. Landings	Irish landings	Int. Landings	Irish landings
Deep Sea Sharks	V,VI,VII,VIII,IX	3592	381	2672	113
Deep Sea Sharks	X	1	0	0	0
Deep Sea Sharks	XII	134	0	0	0
Black scabbardfish <i>Aphanopus carbo</i>	I,III,IV	2		13	
Black scabbardfish <i>Aphanopus carbo</i>	V, VI, VII,	3165	79	2507	71
Black scabbardfish <i>Aphanopus carbo</i>	VIII, IX, X	379		65	
Alfonsinos <i>Beryx spp</i>	I, II, III, IV, V, VI, VII, VIII, IX, X, XII, XIV	418		351	
Roundnose grenadier <i>Coryphaenoides rupestris</i>	I, II, IV, Va	109		78	
Roundnose grenadier <i>Coryphaenoides rupestris</i>	Vb	1836		1795	
Roundnose grenadier <i>Coryphaenoides rupestris</i>	VI	3669	17	1974	4
Roundnose grenadier <i>Coryphaenoides rupestris</i>	VII	201	55	464	216
Roundnose grenadier <i>Coryphaenoides rupestris</i>	XIb	4820		86	
Roundnose grenadier <i>Coryphaenoides rupestris</i>	VIII, IX, X, XII, XIV	17		859	
Orange roughy <i>Hoplostethus atlanticus</i>	VI	47	6	33	1
Orange roughy <i>Hoplostethus atlanticus</i>	VII	255	90	488	37
Orange roughy <i>Hoplostethus atlanticus</i>	I, II, III, IV, V, VIII, IX, X, XI, XII, XIV	361		149	
Blue ling <i>Molva dypterygia</i>	Vb	2454		2834	
Blue ling <i>Molva dypterygia</i>	Va,XIV	1390		1582	
Blue ling <i>Molva dypterygia</i>	VI, VII	3075	12	2581	6
Red seabream <i>Pagellus bogaraveo</i>	X	1113		958	
Forkbeards <i>Phycis blennoides.</i>	II,III,IV	133		188	
Forkbeards <i>Phycis blennoides.</i>	V, VI, VII	2295	237	2133	82
Forkbeards <i>Phycis blennoides</i>	X, XII	25		15	
Ling <i>Molva molva</i>	III	210		188	
Ling <i>Molva molva</i>	IV	6598		9857	
Ling <i>Molva molva</i>	VI	4214	106	4040	169
Ling <i>Molva molva</i>	VII	3800	782	4038	1310
Ling <i>Molva molva</i>	VIII	498		411	
Ling <i>Molva molva</i>	XII	1		1	

#### 4. Update on closed areas in the offshore waters around Ireland

There are a number of different implemented and proposed Marine protected areas in the deep waters off Ireland and the UK. This section reviews the protected areas, gives its legislative background and summarises the management measures in each of the areas. For a geographical overview of the different MPAs, see fig. 1

##### I. Cold water corals on the Darwin Mound, West of Scotland

The European Commission regulated the fishing activities around the Darwin mound.

The technical conservation regulation (850/98) was amended in 2004 to protect cold water corals in the area around the Darwin Mound. The measure prohibits bottom trawling and fishing with static gear including bottom set gill-nets and longlines. The UK have proposed the Darwin Mound as a SAC as part of the Natura 2000 network under the habitat directive.

##### II. Cold water coral SACs off Ireland

In October 2007, the European Commission has adopted the proposal to protect cold water corals off the Atlantic coast of Ireland (Com 2007-570 final). The four sites comprise a total area of 2,500km<sup>2</sup> and include the Belgica mound province, the Hovland mound province, the south west Porcupine Bank and the North-west Porcupine Bank. The Irish government has proposed to have these sites designated as SACs in the Natura 2000 network under the EU habitat directive. In order to guarantee protection to the sites from the impacts of fishing before Natura 2000 is operational, provisional measures are to be implemented under the CFP amendment of regulation. This regulation entails the prohibition to conduct bottom trawling and fishing with static gear including bottom set gill-nets and longlines.

##### III. Orange Roughy boxes off the west and north coast of Ireland

In December 2006, the COUNCIL REGULATION (EC) No 2015/2006 fixed the TACs for deep-sea fish stocks. Within this regulation, protection boxes were implemented for Orange Roughy off the Porcupine Bank and the Northwest of Ireland. The regulation entails that vessels holding a deep-sea fishing permit shall be monitored when entering, transiting and exiting the areas and they can't retain any quantity of orange roughy at the end of that fishing trip unless all gears carried on board are lashed and stowed during the transit of the area and the average speed during transit is not less than 8 knots.

##### IV. NEAFC closures of vulnerable deepwater habitats

In 2004, NEAFC recommended measures to protect vulnerable deepwater habitats on the Hectate and Faraday Seamounts, the Reykjanes Ridges, Altair Seamounts and the Antialtair Seamounts. In these areas bottom trawling and fishing with static gear including bottom gill net and longlines are prohibited. This meas-

ures are in force for the period from 1 January 2005 – 31 December 2007.

##### V. NEAFC closures of cold coral habitats off the Rockall and Hatton

In 2004, NEAFC requested ICES to provide information on the distribution of coldwater corals in the NEAFC Regulatory Area, inter alia on the Hatton Bank and on the western slopes of the Rockall Bank, and to indicate appropriate boundaries of any closure of areas where coldwater corals are affected by fishing activities; ICES identified one such area on the Hatton bank, and a number of areas on the Rockall Bank, some of which were heavily fished and others less heavily fished or not fished. In the light of this information, the Contracting Parties, in accordance with Article 5 of the Convention, have agreed that bottom trawling and fishing with static gear shall be prohibited in areas of the Hatton Bank, the Rockall Bank, the Logachev Mounds and the West Rockall Mounds. This measure is in force for the period 1 January 2007 – 31 December 2009.

#### 5. FSS Advice on Western Irish Natura 2000 Sites

In response to a proposal for four Natura 2000 Sites off the west coast of Ireland, DG Fisheries and Maritime Affairs asked ICES to evaluate the fisheries undertaken at these sites and to assess the impact of fisheries management measures, including site closure on those fisheries.

##### NW Porcupine Bank

The main fishing activity in this area relates to longliners fishing for hake. FSS agree with ICES advice that longliners should have restricted access to the site until the implications of exploitation of hake to the habitat is better understood.

##### SW Porcupine Bank

The main fishing activity in this area relates to pelagic trawlers targeting blue whiting. FSS consider that the pelagic trawl fishery will not adversely affect the conservation objectives of the site and advise that access to these vessels should not be restricted.

##### Belgica Mounds

There are active bottom trawl and longline fisheries in the area targeting hake and deepwater species. FSS agree with ICES that the sites should be fully closed to demersal fishing activity.

##### Hovland Mound

There is a deep water bottom trawl fishery in the area and FSS agree with ICES and advise a full closure of the site.

In conclusion, FSS advises that demersal trawling as well as fishing with long lines and set nets should be prohibited in all four proposed Natura 2000 sites. In contrast, FSS considers that pelagic trawling does not adversely affect the conservation objectives for the site and should not be prohibited.

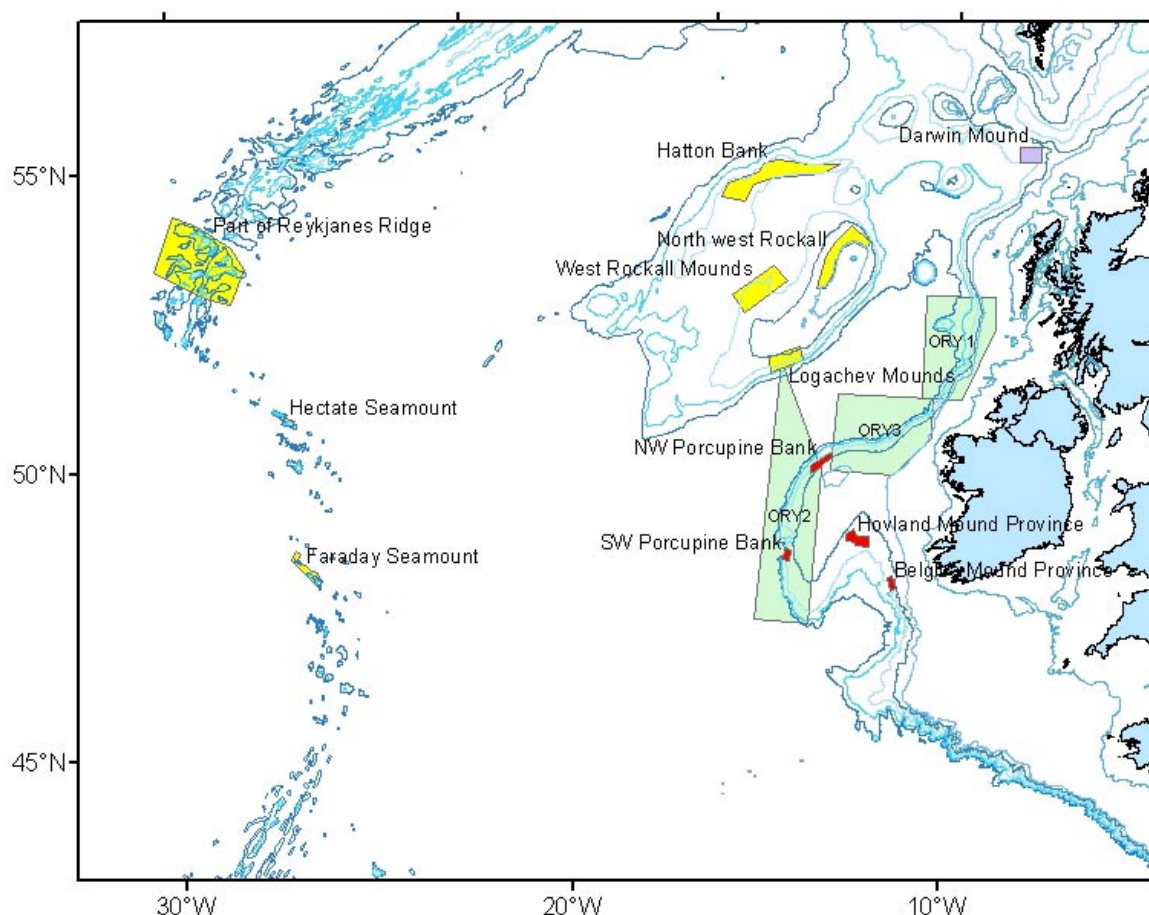
### Future Advice for Nature 2000 Sites

Most EU Member states are in the process of identifying and proposing habitats for protection as offshore Natura 2000 sites and are developing suitable management frameworks for these sites. While it is the responsibility of each Member State to interpret the Habitats Directive in the most appropriate way, it will improve the consultation process if a consistent approach is adopted. FSS support the ICES 10 recommendations regarding the assessment of proposals for fisheries management at Natura 2000 sites (ICES 2007);

1. Are specific conservation objectives for all habitats and species at the sites clearly justified ?
2. How well are the presence and distribution of the conservation features at the site known. Based on reliable evidence and scientific records/observation ?
3. Is the basis for the spatial extent of the site boundary clearly explained and justified in terms of conservation objectives ?
4. Are the threats to habitats and species from different types of fishing gears understood and documented and have they been explained to all stakeholders including relevant RAC's.

5. Is the fine scale and broad scale distribution of fleets (by nation, gear and species described for the site and the region and is there associated information on target and by catch species.
6. Is there any information on seasonal trends in fisheries ?
7. Are there any cumulative or in combination effects to be considered ?
8. Which fisheries management measures, if any are necessary and sufficient to maintain the habitat features in favourable condition and are they proportionate and enforceable ?
9. Are any proposed buffer zones proportionate to ensure full site protection and/or effective monitoring ?
10. What measures would be necessary to monitor and assess the maintenance and/or recovery of the interest features within the site ?

Ref. ICES. 2007. Report of the Workshop on Fisheries Management in Marine Protected Areas (WKFMPA), 10–12 April 2007, ICES Headquarters. ICES CM 2007/MHC:06. 72 pp.



**Fig. 1** proposed and implemented deep sea marine protected areas around Ireland. Purple box shows EC closed area for fishing on the Darwin Mound, yellow shows NEAF closed areas, red show proposed Irish deepwater coral SACs and green shows Orange roughy boxes. For further explanation on regulation and management strategies see text.

# Northeast Atlantic Redfish Fisheries (*Sebastes* spp.)

For latest information, see: <http://www.ices.dk>



## Fisheries Science Services

Redfish fisheries take place on two *Sebastes* species in different areas and various depths, outlined below (see Figure 1). The redfish TAC for Sub-areas V, XII and XIV, NAFO Sub-area II, and divisions If and 3k is 59,515 t, with an Irish quota of one tonne. However some Irish pelagic vessels have shown an interest in developing a fishery for pelagic redfish. Future development of redfish fisheries by Irish vessels would be dependant on quota transfer. In previous years some Irish trawlers fished for redfish and Greenland halibut in the Faeroe/Shetland area.

A third species, *S. viviparus* has only been of minor commercial value in Icelandic waters and is exploited in two small areas south of Iceland at depths of 150-250 m.

Vessels fishing for pelagic *Sebastes mentella* in Sub-Area 2 and Division If and IIIk must use nets with a minimum mesh size of 100 mm.

### Fisheries by Sub-areas and Divisions:

Va: Traditionally the fishery was carried out by demersal and pelagic trawls. Demersal *S. marinus* and *S. mentella* predominate in catches, but in recent years pelagic fisheries for *S. mentella* have become more important. Iceland is the main country exploiting redfish in this area. Peak nominal landings and that for 2006 are as follows:

Source	Peak catch (t) * (year(s))	Catch (t) for 2006
<i>S. mentella</i> (demersal)	57,000 (1994)	17,412
<i>S. mentella</i> (pelagic)	40,000-47,000 (1998-2003)	16,380
<i>S. marinus</i>	97,000 (1982)	41,400

In 2006, about 14, 000 t (17% of the total landings) were caught in the NAFO Regulatory Area.

Vb: Demersal stocks are most important, *S. marinus* and *S. mentella* are taken by demersal trawlers. The Faeroe Islands take about 90% of the catch, German and French fleets take most of the remainder. Landings of *S. marinus* have declined from 9,000 t in 1985 to just 656 t in 2006.

VI: UK, French and Irish demersal trawlers take redfish stocks as a by-catch, which is a negligible proportion of the total catches in the whole area. No landings of *S. marinus* were reported from sub-area VI in 2006.

XII: Mainly pelagic *S. mentella* stocks are exploited by at least 13 fleets from Russia, Germany, Iceland, Faeroe

Islands and Norway. Since 2000 there has been an extension of effort into the NAFO zone. Pelagic landings of *S. mentella* have declined from 132,000 t in 1995 to 6,795 t in 2006.

XIV: Both species and all stocks are exploited. German freezer trawlers take most of the demersal catches. A pelagic fishery began in 1982 in the deeper waters of the area and since 1990 the main fleets have been from Russia, Iceland, Norway and Germany. There is now more effort in international waters in this area. For *S. marinus*, landings have declined from 31,000 t in 1982 to less than 200 tonnes in recent years. For pelagic *S. mentella*, landings have declined from 133,000 t in 1996 to 45,943 t in 2006. Landings by the main countries, Germany and Russia, have declined by about 40% in this period, probably due to declining CPUE and profitability. With the opening of the cod fishery off East Greenland in 2007, it is expected that by-catches of *S. marinus* will increase in Sub-area XIV.

Ila: A fishery in pelagic waters in the international zone in Division Ila developed in 2006, taking *S. mentella*. This fishery is managed by NEAFC. A TAC of 15,500 t, including by-catch, was applied in this area from 1 September to 15 November 2007. One Irish trawler searched for redfish in this area in 2006. The TAC for 2008 will be agreed in November.

In 2006 there was a special request from NEAFC on *Sebastes mentella* regarding its stock structure. However, as no consensus about the stock structure could be reached, ICES concluded to "maintain the current advisory units until more information becomes available: a demersal unit on the continental shelf in ICES Divisions Va, Vb, and XIV and a pelagic unit in the Irminger Sea and adjacent areas (V, VI, XII, and XIV)." This latter unit also includes pelagic redfish in the NAFO Convention Area. However, additional information on stock structure has become available recently and ICES will evaluate this information in 2008.

From the German survey on the Greenland shelf there are indications of an increase in biomass from 2003 and onwards. These fish will reach fishable size in the coming years. However, it is not clear whether these fish will recruit to the pelagic stock or to the demersal stock.

ICES again had difficulties in obtaining catch estimates from the various fleets and there are indications that unreported catches are substantial.

Discarding of redfish is thought to be negligible due to the seasonal closure of nursery areas. Discarding of redfish by other fisheries is thought to be negligible, particularly due to the use of sorting grids in the shrimp fisheries.

## ***Sebastes marinus* on the continental shelf** **Sub-areas V, VI, XII and XIV**

### **FSS – SINGLE STOCK CONSIDERATIONS**

The stock is inside safe biological limits ( $U_{pa}$ ). However a large proportion of the catches in Division Va in recent years are caught from only two year-classes. The fishable stock situation remains poor for Sub-area XIV and Division Vb. ACFM did not provide advice for this stock in 2007. FSS advise that catches be set at the previously advised level of 35,000 t. FSS agrees with ICES advice in 2005 and 2006 that there be no directed fishery for *S. marinus* in Sub-area XIV as the fishable stock of *S. marinus* in Sub-area XIV is depleted and the adult stock is non-migrating.

## **Pelagic fishery for *Sebastes mentella*** **Sub-areas V, VI, XII and XIV and the NAFO area**

### **FSS – SINGLE STOCK CONSIDERATIONS**

The state of the stock is unknown. FSS agrees with ICES advice that a management plan be developed and implemented which takes into account the uncertainties in science and the properties of the fisheries.

ACFM advice in 2006 was that the TAC in 2007 be set at zero. Key considerations in this advice were the decline in reported landings and cpue in the two preceding years. A further decline in 2006

was not observed. Therefore, FSS agrees with ICES that catches of *S. mentella* in 2008 be set at 20,000 t as a starting point for the adaptive part of the management plan. The basis of the 20,000 t is that this is a significant reduction in catches compared with the recent past.

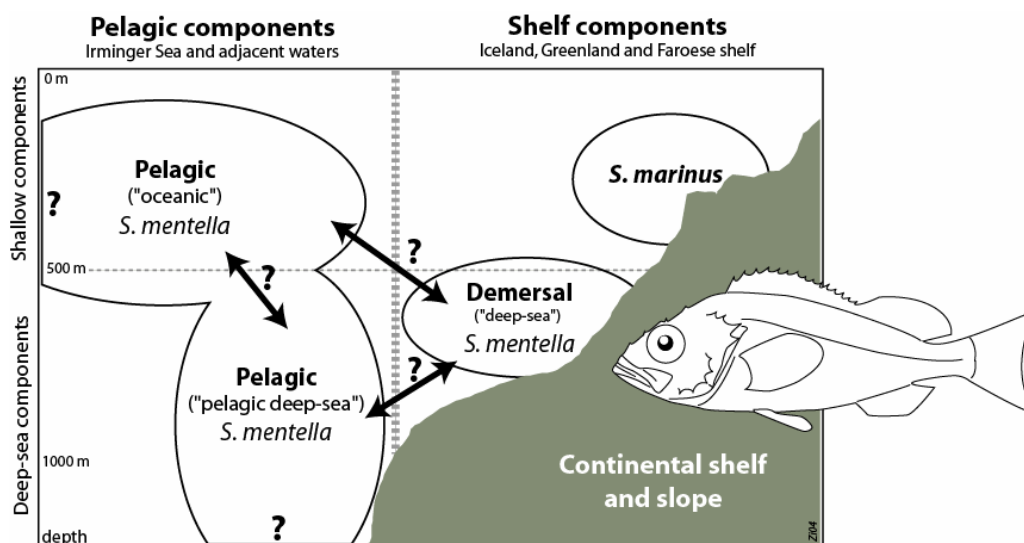
No reference limits have been established for this stock.

Nursery areas for the stock are found at the continental slope off East Greenland. The juvenile redfish in these areas should therefore be protected, and measures already in place to reduce the by-catches in the shrimp fishery need to be continued.

## **Deep-sea *Sebastes mentella* on the continental shelf** **Sub-areas V, VI, XII and XIV**

### **FSS – SINGLE STOCK CONSIDERATIONS**

The state of the stock is unknown. FSS agrees with the ICES advice that catches in 2008 should not exceed 22,000 t, which corresponds to the lowest observed catch since 1980, taken in 2001 and 2004. This catch level coincides with a time when survey abundance estimates derived from the major fishing grounds did not decrease. FSS agrees that there should be no directed fishing for demersal *S. mentella* in Sub-area XIV until there are clear signs of improvement in the adult stock size in that area. This is the same advice as for the last two years. No reference limits have been established for this stock.



**Figure I.** Possible relationship between redfish occurrences in the Irminger Sea and adjacent waters.



# Industrial Fisheries

No ACFM information has been included for this stock

For latest information, see: <http://www.ices.dk>



Fisheries Science Services

## Sandeel Division VIa

### FSS – SINGLE STOCK CONSIDERATIONS

ICES does not provide advice for this stock. FSS recommends that a precautionary TAC should be set at the level of recent landings. FSS advises that the impact of the sandeel fisheries on the ecosystem should be considered as part of an overall management plan.

### CURRENT MANAGEMENT

- A TAC for sandeel in Division VIa has not been established.

### ADDITIONAL INFORMATION

- The state of the stock is unknown. When last assessed in 1996 this stock was inside safe biological limits.
- Landings and effort in this fishery have declined in recent years. Preliminary data for 2006 indicate that no catches were reported. There are no landings recorded by the Irish fleet and the UK is the only country exploiting this fishery in recent years.
- A TAC of 12,000 t took effect in 1998 for a period of three years and was renewed in 2001 until 2005.
- By-catch from this fishery is believed to be very small.
- There is a management plan for sandeel. This however refers only to the North Sea fishery.
- Fishing grounds are close inshore and often adjacent to large colonies of seabirds for which the sandeel population is an important food supply, especially during the breeding season.

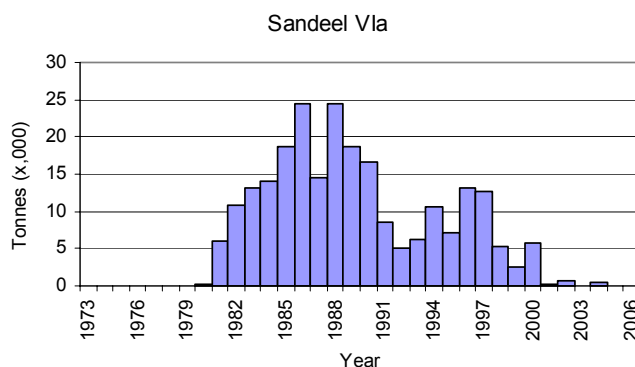


Fig 1. International Sandeel Landings in VIa

Table I Sandeel, Division VIa Landings (tonnes), 1981-2006, as officially reported to ICES

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Denmark	-	-	-	-	-	-	-	-	-	-	-	-	80
UK - Scotland	5972	10873	13051	14166	18586	24469	14479	24465	18785	16515	8532	4985	6156
Total	5972	10873	13051	14166	18586	24469	14479	24465	18785	16515	8532	4985	6236

Country	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Denmark	-	-	-	-	-	-	-	-	-	-	-	-	-
UK - Scotland	10627	7111	13257	12679	5320	2627	5771	295	706	-	566	-	-
Total	10627	7111	13257	12679	5320	2627	5771	295	706	0	566	0	0

\* Preliminary data.

## Norway pout

### Division VIa

#### FSS – SINGLE STOCK CONSIDERATIONS

Norway pout in Division VIa is managed as part of the North Sea TAC and the proportion of this TAC that may be removed from VIa is not regulated. FSS points out that even an extremely small by-catch (in terms of percentage of catch) of herring, cod or whiting could be a significant cause of fishing mortality on these stocks, especially in the Stanton Bank area. FSS advises that by-catch in this fishery should be quantified and made available to ICES. Given that there is a recovery plan for cod in the area, it is important to show zero by-catch in this fishery. FSS advises that the impact of the Norway pout fisheries on the ecosystem should be considered as part of an overall management plan. Ireland does not prosecute this fishery.

#### ADDITIONAL INFORMATION

- There are no specific management objectives for the fisheries exploiting this stock. The EU quotas are set at zero. Norway has a quota of 1,000 tonnes for the EC waters of North Sea and VIa North. Although Norway does not currently fish in VIa, it is allowed to fish in VIa North as part of the conditions of its IIa, Skagerrak and Kattegat, North Sea (EC waters) quota allocation.

- Since 2005 the Danish quota has been set at zero in EC waters. Denmark was previously the main exploiter of this stock.
- The Danish fishery for Norway pout has used small mesh trawls. Catches are highly variable depending on the availability of the resource and of processing facilities at Shetland, Denmark, and the Faeroe Islands.
- The fishery is known to take place on the Stanton Bank, which is an important nursery area for whitefish species in Division VIa, especially cod and whiting.
- There is no other information available on which to base scientific advice. By-catches in this fishery should be quantified and made available to ICES.

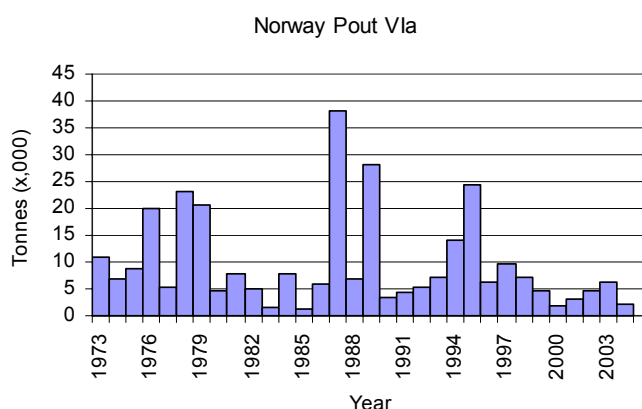


Fig 2. Norway pout in Division VIa (West of Scotland)

Table 2 Norway pout in Division VIa. Officially reported landings (tonnes)

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	28180	3316	4348	5147	7338	14147	24431	6175	9549
Faeroe Islands	11	.	.	.	.	.	.	.	.
Germany	.	.	.	.	.	.	1	.	.
Netherlands	.	.	.	10	.	.	7	7	.
UK (E&W)	.	.	.	1	.	1	.	.	.
UK (Scotland)	5	.	.	.	.	.	.	140	13
<b>Total</b>	<b>28196</b>	<b>3316</b>	<b>4348</b>	<b>5158</b>	<b>7338</b>	<b>14148</b>	<b>24439</b>	<b>6322</b>	<b>9562</b>
	1998	1999	2000	2001	2002	2003	2004	2005	2006
Denmark	7186	4624	2005	3214	4815	6395	2281	.	na
Faeroe Islands	.	.	.	.	4	.	.	.	na
Germany	.	.	.	.	.	2	.	.	na
Netherlands	.	1	.	.	.	.	.	.	na
UK (Scotland)	.	.	.	.	.	.	4	.	na
<b>Total</b>	<b>7186</b>	<b>4625</b>	<b>2005</b>	<b>3214</b>	<b>4819</b>	<b>6397</b>	<b>2285</b>	<b>0</b>	<b>0</b>



## Lanternfish and Other Mesopelagic Species

### Sub-areas VI and VII

#### FSS – SINGLE STOCK CONSIDERATIONS

ICES does not provide advice for these species. Given the experience of the directed fisheries for orange roughy and other deepwater species, FSS recommends that fisheries should not be allowed to develop until sufficient information is available to assess the resource, the impact of the fishery on the resource, and their role in the ecosystem.

#### CURRENT MANAGEMENT

- There are no management regulations for mesopelagic species around Ireland.
- There are no TACs for mesopelagic species in Irish waters.

#### ADDITIONAL INFORMATION

- Within the ICES area, only Russia has any declared landings of mesopelagic species.
- Russia began to report catches in 2000, peaking at 10,000 tonnes in 2002, declining to low levels in 2004.
- It is not clear what has caused the decline in Russian landings.
- Fisheries for these species may develop if quotas for other pelagic species continue to decline.
- Industry/Science partnerships should be initiated to assess this resource.

## Boarfish

### Sub-areas VI and VII

#### FSS – SINGLE STOCK CONSIDERATIONS

ICES does not provide advice for this stock. Given the experience of the directed fisheries for orange roughy and other deepwater species, FSS recommends that fisheries should not be allowed to develop until sufficient information is available to assess the resource, the impact of the fishery on the resource, and their role in the ecosystem. FSS recommends that catches be maintained at a very low level until further information on the stock be obtained.

#### CURRENT MANAGEMENT

- There are no management regulations for boarfish around Ireland.
- There are no TACs for boarfish in Irish waters.

#### ADDITIONAL INFORMATION

- Within these areas, only Ireland has any declared landings of boarfish.
- In the past, boarfish were normally taken as a by-catch by the pelagic fleet and were used for the production of fishmeal. However in recent years target fisheries have developed as quotas for other pelagic species have declined.
- An unknown quantity of boarfish are discarded, particularly by the herring and mackerel fleets, each year. In the past they have been considered a nuisance species.

Table 3. Lanternfish in the ICES area. Only Russia has any declared landings of these species.

	1998	1999	2000	2001	2002	2003	2004	2005	2006
Division IIa	.	.	.	.	842	46	.	2	na
Division Vb	.	.	998	1412	9026	460	9	.	na
Division VIb	.	.	.	1803	11	.	.	.	na
Division XIVb	.	.	.	.	293	180	166	187	na
Sub-area XII	.	.	.	.	.	.	.	1	na
Total:	0	0	998	3215	10172	686	175	189	na

Table 4. Boarfish landings in the Divisions VI and VII. Only Ireland has declared any landings of this species. Landings from ICES and logbook data.

	2000	2001	2002	2003	2004	2005	2006
Division VIa	.	5	37	66	292	10	21
Division VIIg	.	51	34	216	224	183	13
Division VIIb	.	.	.	.	.	.	375
Division VIIj	.	64	20	179	122	12	2360
Division VIII	.	.	.	.	38	.	1
Total:	0	120	91	461	676	205	2770

# Arctic Stocks (Cod, Haddock and Saithe)

No ACFM information has been included for these stocks

For latest information, see: <http://www.ices.dk>



## Fisheries Science Services

There are a number of Arctic stocks in which Ireland has an interest. EU quota allocations for this area include a portion of the annual TAC for the Irish fleet.

Ireland has taken part in these fisheries in recent years and the main catches have been taken by a small number of trawlers that started fishing in the 1990s. In 2000 and 2001 new Irish vessels (under the white fish fleet renewal programme), including long liners, have been involved in this increasingly important fishery. These fisheries are important to Norway and Russia but a number of other countries including Iceland, Faroe Is. United Kingdom, Spain, Poland and Greenland also take catches.

The main stocks that are exploited by the Irish fleet are Cod, Haddock, and Saithe. Summaries of the state of each stock and of the ICES advice for each stock are presented below. The full analyses of these stock carried out by ICES and are available on the ICES web site <http://www.ices.dk/advice/icesadvice.asp>

## Cod in Sub-areas I and II

### North-East Arctic Cod

#### FSS –SINGLE STOCK CONSIDERATIONS

Based on the most recent estimates of SSB and fishing mortality, ICES classifies the stock as having full reproductive capacity and at risk of being harvested unsustainably. The SSB has been above  $B_{pa}$  since 2002. Fishing mortality was reduced significantly over the years 1999–2003 but has since then increased to a level below  $F_{lim}$  in 2004–2006. Surveys indicate that recent year classes are below average.

This stock is subject to a management plan which has been evaluated by ICES and is in accordance with the precautionary approach. The management plan implies a TAC of 409,000 t in 2008. However, in recent years the management plan was not fully enforced resulting in considerable under-reporting of catches generating an  $F$  that is just below  $F_{lim}$ .

## CURRENT MANAGEMENT

- Management strategies for cod and haddock should take into account the following:
  - Conditions for high long-term yield from the stocks
  - Achievement of year-to-year stability in TACs
  - Full utilization of all available information on stock development
- On this basis, the Parties determined the following decision rules for setting the annual fishing quota (TAC) for Northeast Arctic cod (NEA cod):
  - Estimate the average TAC level for the coming 3 years based on  $F_{pa}$ . TAC for the next year will be set to this level as a starting value for the 3-year period.
  - The year after, the TAC calculation for the next 3 years is repeated based on the updated information about the stock development. However the TAC should not be changed by more than  $\pm 10\%$  compared with the previous year's TAC.
  - If the spawning stock falls below  $B_{pa}$ , the procedure for establishing TAC should be based on a fishing mortality that is linearly reduced from  $F_{pa}$  at  $B_{pa}$  to  $F = 0$  at SSB equal to zero. At SSB-levels below  $B_{pa}$  in any of the operational years (current year, a year before and 3 years of prediction) there should be no limitations on the year-to-year variations in TAC.
  - The Parties agreed on similar decision rules for haddock, based on  $F_{pa}$  and  $B_{pa}$  for haddock, and with a fluctuation in TAC from year to year of no more than  $\pm 25\%$  (due to larger stock fluctuations)."

## ADDITIONAL INFORMATION

1. Surveys indicate that recent year classes are at or below average.
2. The total catch taken from this fishery in 2006 was estimated to be about 596,197 t. The Irish catch was 413 t in the Norwegian zone, a significant increase on 2005 levels (82 t). There were no reported Irish catches in the Svalbard zone.
3. The main catches are taken by Norway and Russia.
4. Concerns of misreporting in 2002–06 remain. Estimates for 2006 equate to around 25% of the official reported landings. The assessment of this stock includes the estimate of non-reported catches.
5. The main gears used are trawls in off shore waters and gillnets, longlines, handlines and Danish seines in inshore waters.
6. The fishery is an important source of revenue for a small number of Irish vessels.
7. The management regime in operation for this fishery includes inspections at sea and continuous surveys during the main fishing seasons.

## North-East Arctic Haddock

### FSS –SINGLE STOCK CONSIDERATIONS

FSS notes that the state of the stock is uncertain, but trends indicate that the stock is high with above average recruitment in recent years. The catch data was revised in 2006 which has resulted in a significantly different perception of the stock from recent years.

Although a management plan exists, due to uncertainty in the assessment and implementation error due to high levels of misreporting, ICES can not provide advice in relation to the management plan.

The recent increases in SSB have been associated with catches of less than 130,000 t FSS agrees with ICES that catches should be maintained below this level.

### CURRENT MANAGEMENT

- See North-East Arctic cod.

### ADDITIONAL INFORMATION

1. The agreed TAC for 2007 is 150,000 t.
2. The dynamics of this stock have been driven by sporadic strong year classes that have led to wide fluctuations in SSB. Year classes from 1997 onwards are estimated to be above or at the long-term average.
3. The total catch taken from this fishery in 2006 was about 167,000 t, (including unreported landings). Irish catches were reported to be 91 t in 2006.
4. The main catches are taken by Norway and Russia. Small catches are taken by a number of other countries.
5. The main catches are taken by directed fisheries and also as by-catch in the fisheries for cod. Restrictions of haddock catches therefore depend on the management of North-East Arctic Cod.
6. The harvest control rule proposed by the joint Norwegian – Russian Fisheries agreement has been evaluated by ICES and is not considered not to be consistent with the precautionary approach due to high levels of misreporting.

## North-East Arctic Saithe

### FSS –SINGLE STOCK CONSIDERATIONS

Based on the most recent estimates of SSB and fishing mortality, ICES classifies the stock as having full reproductive capacity and to be harvested sustainably. Fishing mortality is stable and has since 1996 been below  $F_{pa}$ . The SSB has since 1994 been well above  $B_{pa}$ . After a long period of low stock size, the stock recovered during the 1990s with the recruitment of several above-average year classes.

FSS agrees with the ICES advice that fishing mortality for this stock should be maintained below  $F_{pa}$ . This corresponds to catches in 2008 less than 247,000 t.

### CURRENT MANAGEMENT

- The 2007 TAC set by Norwegian authorities for Sub-areas I and II is 222,525 t. The EU has a quota for 2007 of 3,950 t.
- In addition to TAC regulations there are minimum mesh sizes, minimum landing size (increased in 1999) and closed area regulations in operation.
- Ireland is permitted to take a by-catch of saithe in the cod fishery, 7 t in 2006.
- ICES has evaluated the Harvest Control Rule (HCR) and concluded that it is consistent with the precautionary approach under the conditions that the assessment uncertainty and error are not greater than those calculated from historical data.

### ADDITIONAL INFORMATION

1. The SSB of this stock has been well above  $B_{pa}$  since 1994, showing good recovery after a long period of low stock size.
2. Fishing mortality is stable and has been below  $F_{pa}$  since 1996.
3. The total catch taken from this fishery in 2006 was 212,480 t.
4. The main catches were taken by Norway. Small catches were taken by a number of other countries.
5. The main fishery is prosecuted by trawls, purse seine and gillnets respectively.
6. The main catches are taken as by-catch in the cod fishery, in addition to a traditional targeted gill net fishery for spawning saithe.

# Snow Crab in West Greenland

(NAFO Zone I)



*Marine Institute*  
Foras na Mara

## Fisheries Science Services

The fisheries agreement between the European Community and the Government of Denmark and the local government of Greenland expired on 31/12/06. A new Fisheries Partnership Agreement was concluded in June 2007 and covers the period 1/1/07 to 31/12/12 with a financial contribution of €15,847,244. The fisheries agreement allows vessels from Germany, Denmark, UK, Spain, Portugal and Ireland, which have allocated quota, to fish in Greenland waters for cod, redfish, Greenland halibut, shrimp, Atlantic halibut, capelin and snow crab.

In 2007, Ireland's share of the 500 tonnes EU snow crab TAC was 62 t. This is Ireland's first quota in the NAFO area. No Irish vessels have yet participated in the fishery.

## FSS ADVICE

**Stock Assessments were conducted in 2007 and scientific advice was provided by the Greenland Institute of Natural Resources (GINR) for 2007. The GINR recommended catches for 2007 are the same as what was recommended in 2006. FSS has no further information from GINR in relation to 2008.**

**Given the state of the stock and the lack of data from some areas, FSS considers that 2008 catches should not be increased and area closures should remain. FSS would point out that this advice will not rebuild the stock, but only halt the decline.**

**FSS agrees with GINR that a seasonal fishery from April to July be established in all management areas to reduce discards and mortality on soft shelled crabs and ensure the greatest potential for recruitment to the stock. A seasonal fishery will also promote the most optimal and sustainable utilization of the crab resource.**

**If required, the scientific advice will be reviewed when more up to date information becomes available from GINR in March 2008.**

## OVERVIEW

Snow crab (*Chionoecetes opilio*), also referred to as Queen crab, are found throughout the North Pacific and in the North West Atlantic from Greenland to the Gulf of Maine. They prefer deep, cold water conditions and are found on sandy seafloors at depths between 350 and 1,500 meters. Snow crab are fecund, but relatively late to mature. It takes 5 or 6 years for juveniles to grow to harvestable size. Their maximum lifespan is about 12-13 years. While harvest is limited to large males, mortality from capture stress leads to the death of up to 25% of all crabs released. Major predators of snow crab include groundfish, seals and other snow crab. Natural variability in recruitment, as well as increasing exploitation have lead to a wide fluctuation in Alaska's and Canada's landings. Snow crab has become very important to the fishing economy of eastern Canada as cod and other groundfish have declined. The fishery for snow crab is currently the third largest in Greenland waters (economically). The fishery takes place in areas 62-70°N.

## CURRENT MANAGEMENT

There are no management objectives for the snow crab resource in West Greenland, however from 2004, the main objective of recommendations from GINR has been to stop the decreasing biomass of the crab resource in the different management areas.

Greenland, a protectorate of the kingdom of Denmark, maintains a relatively small snow crab fishery on the west coast of the landmass. Snow crab are patchily distributed and commercially exploited along the coast and within the fjords of west Greenland. They are managed by quotas and assessed within the inshore and offshore of 6 Management units (Upernavik; Uummannaq-Disko Bay; Sisimuit; Maniitsoq-Kangaamiut; Nuuk-paamiut and Narsaq-Qaqortoq).

Snow crab are fished using large metal framed traps, baited with chopped herring. Most of Greenland's crab fishing fleet is small, local vessels and the fishery was established by the Danes in the late 1960's. Greenland's snow crab fishery is managed by Denmark who develop management plans, issue commercial fishing licences, inspect commercial landings and administer the Danish Fishing fleet. Management measures in place include permit requirements, quotas, gear limitations, area closures, sex and size restrictions.

## STATE OF THE STOCK

Despite a recent halt in the decline of the crab resource in many areas, there are few indications that the exploitable biomass will improve in the short term. The advice from GINR is not expected to improve the stock, but only stop the continued decline. If a rebuilding of the stock to achieve higher exploitable biomass and better catches is the objective, then the recommended catch in 2008 should be further reduced to allow the stock to grow.

CPUE has declined and despite a recent halt to the decline in the majority of fisheries, the snow crab biomass was considered to be at low levels and recruitment indices from biological surveys indicate poor recruitment is expected in the near future.

There are further concerns about the state of the resource. In all areas surveyed, the commercial stock is made up of a large proportion of soft and new shell crabs. This suggests that the fishing pressure is high and a large percentage of mature hard shell crabs are being removed. The fishery at present is highly dependent on new recruits, which make it strongly dependent on the previous years recruitment and vulnerable to fluctuations in recruitment from year to year. Furthermore there is a large mortality of soft shelled crabs as a result of discarding.

## Source of Information

Carl, J. and Burmeister A. (2007)  
Assessment of Snow Crab in West Greenland.  
Greenland Institute of Natural Resources

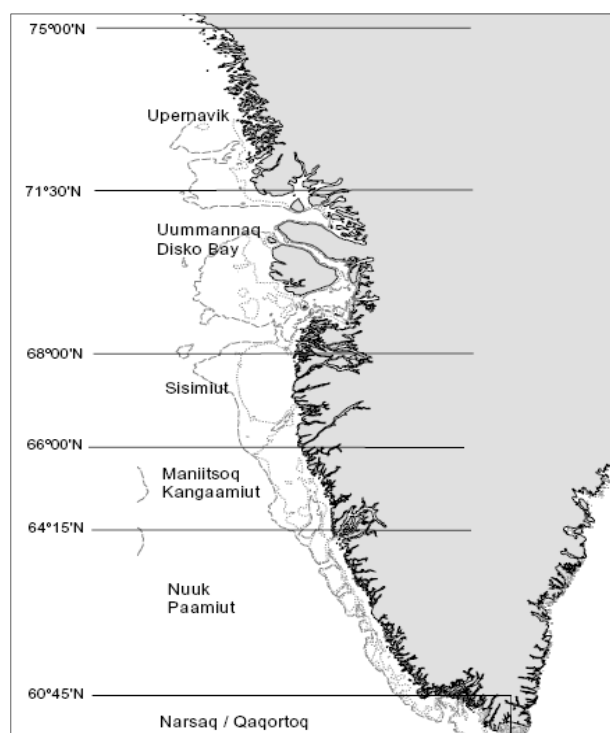


Fig. 1. Map of West Greenland outlining the 6 management and assessment areas for the snow crab fishery.

2007 summary of catch recommendations for the snow crab fishery in 2007 from GINR. Total catches for 2005 are also given. FSS recommends that based on available information, catches in 2008 should remain the same as for 2007.

Management Area	Recommended Catch Inshore 2007	Recommended Catch Inshore 2007	Catch (Tonnes) Inshore 2005	Catch (Tonnes) Offshore 2005
Disko Bay	1,800	130	1,364	135
Sisimiut	350	Closure Continue	790	335
Maniitsoq	No advice	Closure Continue	59	14
Nuuk-Paamiut	700	1,600	256	2,039
<b>Total Recommended Catch</b>	<b>2,850</b>	<b>1,730</b>	<b>2,469</b>	<b>2,523</b>



# Capelin in the Iceland, East Greenland, Jan Mayen area

## (Sub-areas V and XIV and Division IIa west of 5°W)



Fisheries Science Services

### FSS –SINGLE STOCK CONSIDERATIONS

The state of the stock is unknown. In 2007 the fishery was closed until November. FSS agrees with the ICES advice that the TAC from November 2007 until March 2008 should be set at 207,000 t.

This preliminary TAC is based on the relatively low number of juvenile capelin observed during the November 2006 acoustic survey. The TAC may be revised when new information on the abundance of the whole stock becomes available.

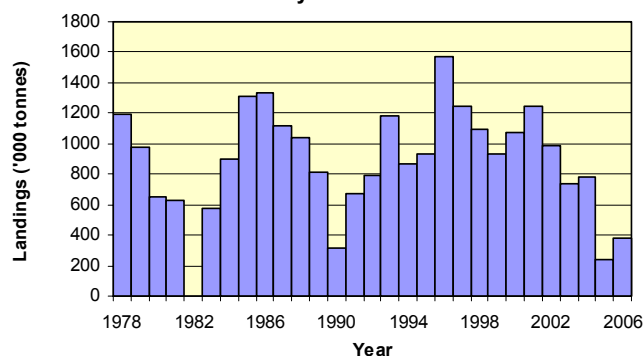
### CURRENT MANAGEMENT

- The total international catch in the 2006/2007 season was 377,000 t. This was against an initial advised catch of zero, due to the absence of information from acoustic surveys.
- The fishery is managed according to a two-part harvest control rule which aims for a predicted SSB of at least 400,000 t at the end of the fishing season. This is currently estimated at 410,000 t. ICES has not evaluated the management plan with respect to its conformity to the precautionary approach.
- The TAC is set in two parts. The first part of the TAC, which applies for only the first half of the season (August-November), is limited to 66% of the total advised TAC for the entire season. The TAC for the remainder of the season is reviewed to ensure that the SSB at the end of the season will be above 400,000 t.
- Immediate, temporary area closures in the fishery are introduced when high abundance of juveniles are measured in the catch (i.e. if more than 20% of the catch is composed of fish less than 13 cm). These closures are enforced using on board observers.

### ADDITIONAL INFORMATION

1. Ireland has not participated in this fishery to date. However, this may change in the future. The EU has a quota of 7.7% of the TAC of capelin in this area and Ireland is entitled to a share of this.
2. Peak landings of over two million tonnes were caught in 1979 and 1985. Landings have since declined to less than 400,000 t per year.
3. The assessment is completely based on acoustic surveys. Results from the autumn 2004/winter 2005 survey program did not encounter any immature fish for the second year running. The annual spring acoustic survey was not possible in early 2006. An estimate for the 2005 year class was available from an acoustic survey in November 2006. It is estimated low, but sufficient to allow a fishery in 2007/08.
4. The fishery is based on maturing capelin (2-3 age in the autumn), which spawn at ages 3-4 in March of the following year. The SSB is highly variable as it is based on only two age-groups.
5. The main catches are taken by purse seiners from Iceland, Greenland and Norway and are used for reduction to fishmeal. Iceland, Greenland and Norway are currently responsible for the management of this stock.
6. The capelin fishery is a highly targeted fishery. Discards are allowed when catches are beyond the carrying capacity of the vessel. Discarding from the purse-seine fishery are practically zero and thought to be low in pelagic trawls.
7. ICES have highlighted this stock as a research priority in terms of ecosystem impacts of industrial fishing practices.

Capelin in the Iceland, East Greenland, Jan Mayen area



# Sardines

(Sub-area VII and Divisions VIIIa, b, d & e)



Fisheries Science Services

## FSS –SINGLE STOCK CONSIDERATIONS

The southwest and Celtic Sea sardine fishery may increase in importance in the coming years due to the management restrictions placed on the herring fishery in this area. To date no quota restrictions apply to Sub-areas VII or VIII (with the exception of Division VIIIc). However insufficient information exists upon which to base management advice.

## CURRENT MANAGEMENT

- Currently no management or regulations exist for sardine fisheries outside of ICES Divisions VIIIc or IXa (where a TAC of 92,000 t applies).
- There are no TACs for sardines in ICES Sub-areas VI, VII or Divisions VIIIabde.

## ADDITIONAL INFORMATION

1. The total reported catch of sardines in Sub-areas VI, VII and VIII was 32,000 t in 2006. Peak landings of 41,000 t were made in 2003. The majority of catches are by French vessels, while the Dutch fleet operate a large fishery for sardines in Biscay area (Divisions VIIIa-b).
2. The main fishery takes place in the north part of the Bay of Biscay.

3. Irish catches of sardines are primarily taken in the Celtic Sea, Divisions VIIg and VIIj. A directed fishery takes place in the English Channel and the western approaches (Divisions VIIe and VIIh). Catches have been reported for large RSW vessels from Killybegs in recent years. Incidental catches of sardines are sometimes taken during the Celtic Sea herring fishery in the early Autumn.
4. Occurrence of this species appears sporadic, with strong inter-annual variation.
5. Little evidence exists to support possible directed fisheries for sardines in inshore traditional herring grounds areas along the south coast by the dry hold fleet.
6. The importance of this fishery may increase as further restrictions are imposed on the Celtic Sea herring fishery.
7. Ireland reported between 2,000 t and 4,500 t in Sub-area VII from 1999-2004. There were no Irish catches reported prior to this. Landings reached a peak in 2002, and have fluctuated since then.
8. At present it is not possible to quantify the misreporting of sardines with other small pelagics, including herring and mackerel.
9. Levels of discarding of sardines are unknown, but are considered to be low.
10. A French acoustic survey is routinely carried out each year in spring in the Bay of Biscay and information on sardine distribution and abundance is available, with a time series starting in 2000.

**Table I.** Sardine Catches in ICES area VI, VII and VIIIa,b,d & e.

<b>Area VI</b>	<b>1985</b>	<b>1986</b>	<b>1987</b>	<b>1988</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>
Denmark	-	-	-	-	-	-	-	1	-	-	-
Ireland	-	-	-	-	-	-	-	-	-	-	-
Netherlands	-	-	-	-	-	-	-	-	-	-	8
Spain	-	-	-	-	-	-	-	-	-	-	-
UK - England & Wales	-	-	2	-	-	4	-	-	-	-	-
	0	0	2	0	0	4	0	1	0	0	8
<b>Area VII</b>											
Denmark	3111	3602	1573	3234	4667	6113	4462	17843	13395	20804	9603
France	2089	2570	965	2586	1219	1128	1963	1777	1135	1285	1282
Germany	-	-	-	-	-	107	8	4	-	2	33
Ireland	-	-	-	-	-	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-	-	-	-	-	-
Netherlands	-	-	-	-	11	6	-	41	109	20	107
Norway	-	-	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	-	-	-	-
UK - England & Wales	1936	1374	1991	1777	1660	2078	2952	4493	4917	2081	6853
UK - Scotland	-	-	-	-	-	-	-	-	-	-	280
	7136	7546	4529	7597	7557	9432	9385	24158	19556	24192	18158
<b>Area VIIIabde</b>											
Denmark	-	-	-	-	-	-	-	-	308	-	-
France	8162	10230	7665	7808	8811	8543	12482	8847	8805	8604	9877
Germany	-	-	-	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-	-	-	-	-	-
Netherlands	-	-	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	35	43	45	-	-
UK - Eng+Wales+N.Irl.	-	-	-	-	-	-	-	-	-	-	-
	8162	10230	7665	7808	8811	8543	12517	8890	9158	8604	9877
<b>Total:</b>	<b>15298</b>	<b>17776</b>	<b>12196</b>	<b>15405</b>	<b>16368</b>	<b>17979</b>	<b>21902</b>	<b>33049</b>	<b>28714</b>	<b>32796</b>	<b>28043</b>

<b>Area VI</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
Denmark	-	-	-	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	246	1231	-	-	-	2
Netherlands	-	-	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	-	2	-	-
UK - England & Wales	-	-	-	-	-	-	-	-	-	-	-
	0	0	0	0	0	246	1231	0	2	0	2
<b>Area VII</b>											
Denmark	1396	1124	14316	3490	1682	-	-	-	742	-	-
France	1563	3346	1974	-	1667	9625	8642	12572	8882	15425	17724
Germany	-	13	97	133	270	329	130	13	60	140	246
Ireland	-	-	-	3195	2430	2209	4479	2058	1043	426	1208
Lithuania	-	-	-	-	-	-	-	-	-	-	18
Netherlands	48	414	1644	5097	6541	426	1815	6543	2032	2135	2289
Norway	-	-	-	-	-	-	-	-	-	-	-
Spain	-	-	-	8	-	-	10	-	-	-	2
UK - England & Wales	6968	5144	4727	3568	3028	8900	6636	4358	2681	3630	-
UK - Scotland	336	2136	2146	1247	1325	1475	1222	-	-	-	-
	10311	12177	24904	16738	16943	22964	22934	25544	15440	21756	21487
<b>Area VIIIabde</b>											
Denmark	-	-	-	124	-	-	-	-	-	-	12
France	8604	10706	9778	-	10444	10123	12316	10693	10067	11787	9810
Germany	-	-	68	11	38	135	4	-	-	54	78
Ireland	-	-	-	-	162	20	114	1915	1412	974	79
Lithuania	-	-	-	-	-	-	-	-	-	-	5
Netherlands	24	-	26	9	32	321	18	67	6	-	2
Spain	-	-	873	2384	1989	-	2887	2413	1853	72	839
UK - England & Wales	-	-	-	-	-	-	276	68	-	-	-
	8628	10706	10745	2528	12665	10599	15615	15156	13338	12887	10825
<b>Total:</b>	<b>18939</b>	<b>22883</b>	<b>35649</b>	<b>19266</b>	<b>29608</b>	<b>33809</b>	<b>39780</b>	<b>40700</b>	<b>28780</b>	<b>34643</b>	<b>32314</b>



# Developing Scientific Advice for New MOU Species



## Fisheries Science Services

The MOU (Memorandum of Understanding) between ICES and the European Commission forms the basis for the provision of scientific advice on the TAC stocks that are managed under the Common Fisheries Policy. However, in the latest MOU, the EU Commission have added a list of new species for which scientific advice may be sought. These new species include sea bass, lemon sole, dab, flounder, turbot, brill, spurdog, skates and rays, gurnard, red mullet, lesser spotted dogfish and porbeagle. ICES has never provided scientific advice for these stocks (apart from Sea Bass), and they generally receive little attention in the ICES areas.

The Working Group on the Assessment of New MOU species (WGNEW) and the Working Group on Elasmobranch Fisheries (WGEF) have collated information on these species. In 2005, WGNEW made a first overview of the available information of all 11 species and provided information on general biology, stock identification, fisheries, survey data, biological sampling and parameters, stock trends and management. In addition, an inventory was prepared of data requirements.

In 2006, the information was further updated but limited progress was made due to the poor attention paid to

these species, compared to the more important commercial species. WGNEW consider that much of the information remains “hidden in cupboards” and in different datasets containing market sampling and survey data sets.

WGNEW recommended that an integrated EU project should be funded to access and collate all the disparate data sets on these species. A detailed small scale project proposal is due to be considered for EU funding shortly.

Collated data on the new species draw heavily from the North Sea and from other ICES areas. In this section of the Stock Book, the focus is on landings of new species from the waters around Ireland (Sea Bass, Porbeagle and Spurdog are dealt with in separate parts of the Stock Book). The new species are presented as total landings from ICES Sub Area VI and VII, by country. These tables indicate that the landings by Ireland are small. However, some of the species are of major economic importance (e.g. brill, turbot skates and rays). These landings records should be treated with caution as some of the species are discarded or simply not recorded. The new species may be important from an overall ecosystem perspective.

**FSS recognises that these species have economic importance to Ireland. FSS advise that Ireland should collate information on these new species, particularly from survey data, and input to WGNEW and WGEF. FSS agree with WGNEW, that John Dory should be included in the new Species list.**

### Rays and Skates

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	VI	1	2	2	4	2	4	2	8	9	4	4
	VII	657	824	845	1002	891	1142	1578	1695	1573	1594	1421
France	VI	526	384	333	0	328	283	217	185	155	196	174
	VII	8405	9224	8101	6551	7672	7679	7145	7434	5718	5997	5101
Germany	VI	49	26	36	67	76	8	1	6	22	22	6
	VII	4	9	17	10	21	7	0	3	18	17	0
<b>Ireland</b>	<b>VI</b>	<b>749</b>	<b>619</b>	<b>503</b>	<b>416</b>	<b>294</b>	<b>248</b>	<b>312</b>	<b>382</b>	<b>370</b>	<b>195</b>	<b>200</b>
	<b>VII</b>	<b>1545</b>	<b>1883</b>	<b>1879</b>	<b>1974</b>	<b>1615</b>	<b>1671</b>	<b>2116</b>	<b>2362</b>	<b>2195</b>	<b>1592</b>	<b>1440</b>
Netherlands	VII	0	0	13	4	13	7	11	0	0	0	13
Norway	VI	124	121	148	88	169	100	69	63	48	49	86
	VII	0	0	0	0	0	11	0	0	0	0	15
Portugal	VI	0	25	26	24	29	17	31	18	0	0	0
Spain	VI	375	468	552	356	349	158	45	73	15	14	0
	VII	1661	2618	3168	5067	4279	2350	3592	1312	22	25	20
UK - (E,W&N.I.)	VI	276	174	291	214	264	185	206	206	114	46	38
	VII	3241	3267	3422	3081	3168	3267	3071	3290	2474	3322	1966
UK (Scotland)	VI	138	171	153	156	290	177	147	213	202	89	116
	VII	113	118	119	156	275	244	192	293	257	91	144
<b>Total</b>		<b>17863</b>	<b>19933</b>	<b>19607</b>	<b>19170</b>	<b>19735</b>	<b>17560</b>	<b>18736</b>	<b>17543</b>	<b>13192</b>	<b>13254</b>	<b>10744</b>

### Lemon Sole

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	VI	0	0	1	0	0	0	0	0	0	0	0
	VII	278	326	379	303	278	276	379	377	547	464	267
France	VI	13	8	6	0	8	5	8	8	8	8	6
	VII	781	845	773	0	686	698	669	603	640	578	550
<b>Ireland</b>	<b>VI</b>	<b>196</b>	<b>243</b>	<b>194</b>	<b>135</b>	<b>97</b>	<b>67</b>	<b>65</b>	<b>63</b>	<b>54</b>	<b>49</b>	<b>31</b>
	<b>VII</b>	<b>194</b>	<b>198</b>	<b>176</b>	<b>259</b>	<b>290</b>	<b>312</b>	<b>323</b>	<b>352</b>	<b>344</b>	<b>293</b>	<b>266</b>
Isle of Man	VII	4	0	4	3	3	1	0	0	0	0	0
Spain	VI	0	0	33	72	72	66	22	20	0	0	2
	VII	0	0	2	1	49	42	101	76	0	2	0
UK - Eng+Wales+N.Irl.	VI	3	2	12	2	1	0	1	6	3	2	0
	VII	360	384	340	280	251	276	253	261	223	226	0
UK – Scotland	VI	298	190	168	192	155	149	89	76	50	12	0
	VII	2	2	1	2	3	13	3	7	9	0	0
<b>Total</b>		<b>2129</b>	<b>2198</b>	<b>2089</b>	<b>1249</b>	<b>1893</b>	<b>1905</b>	<b>1913</b>	<b>1849</b>	<b>1878</b>	<b>1634</b>	<b>1122</b>

### European Flounder

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	VII	5	8	4	7	1	3	11	12	16	19	14
France	VI	0	0	0	0	1	0	0	0	0	0	0
	VII	0	0	0	0	2	4	5	0	0	0	0
<b>Ireland</b>	<b>VI</b>	<b>3</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>
	<b>VII</b>	<b>5</b>	<b>11</b>	<b>8</b>	<b>11</b>	<b>11</b>	<b>15</b>	<b>17</b>	<b>39</b>	<b>39</b>	<b>4</b>	<b>4</b>
Netherlands	VII	0	0	4	1	0	0	0	0	0	0	0
Spain	VI	0	0	1	0	2	0	0	0	0	0	0
Spain	VII	0	0	1	0	1	1	0	8	0	5	2
UK - Eng+Wales+N.Irl.	VI	0	0	0	0	1	0	0	0	0	0	0
	VII	73	77	55	37	59	48	34	56	16	29	0
UK – Scotland	VI	4	14	4	0	0	0	0	0	0	0	0
	VII	0	1	3	1	0	0	0	0	0	0	0
<b>Total</b>		<b>90</b>	<b>111</b>	<b>84</b>	<b>57</b>	<b>78</b>	<b>73</b>	<b>67</b>	<b>116</b>	<b>71</b>	<b>57</b>	<b>20</b>

### Turbot

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	VI	3	2	2	6	7	3	2	9	6	2	2
	VII	162	161	122	125	145	166	191	243	194	197	214
France	VI	0	0	0	0	0	0	0	0	0	0	0
	VII	324	253	209	0	381	363	353	373	396	403	360
Germany	VI	0	0	1	1	0	0	0	0	8	6	2
	VII	0	0	0	4	9	0	3	2	8	3	0
<b>Ireland</b>	<b>VI</b>	<b>30</b>	<b>35</b>	<b>39</b>	<b>30</b>	<b>16</b>	<b>15</b>	<b>10</b>	<b>19</b>	<b>20</b>	<b>11</b>	<b>9</b>
	<b>VII</b>	<b>90</b>	<b>123</b>	<b>113</b>	<b>109</b>	<b>144</b>	<b>116</b>	<b>119</b>	<b>163</b>	<b>175</b>	<b>123</b>	<b>119</b>
Isle of Man	VII	1	1	0	0	0	0	0	4	0	0	0
Netherlands	VI	0	4	0	0	0	0	0	0	0	0	0
	VII	4	8	4	4	7	12	1	2	2	2	3
Spain	VI	5	6	3	0	0	0	0	0	0	0	0
	VII	6	8	5	7	2	0	2	6	0	6	1
UK - Eng+Wales+N.Irl.	VI	3	5	2	2	2	1	2	2	5	1	0
	VII	301	299	225	195	183	185	330	275	192	152	0
UK – Scotland	VI	100	76	77	42	23	22	17	18	13	7	0
	VII	0	1	1	8	10	8	6	10	29	7	0
<b>Total</b>		<b>1029</b>	<b>982</b>	<b>803</b>	<b>533</b>	<b>929</b>	<b>891</b>	<b>1036</b>	<b>1126</b>	<b>1048</b>	<b>920</b>	<b>710</b>

**Brill**

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	VI	0	1	0	0	0	0	0	1	1	0	0
	VII	104	109	106	105	85	95	96	111	109	129	101
France	VI	1	0	0	0	0	0	0	0	0	0	0
	VII	58	60	56	0	89	87	81	77	85	86	91
<b>Ireland</b>	<b>VI</b>	<b>15</b>	<b>30</b>	<b>35</b>	<b>26</b>	<b>13</b>	<b>12</b>	<b>10</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>10</b>
	<b>VII</b>	<b>55</b>	<b>90</b>	<b>67</b>	<b>57</b>	<b>87</b>	<b>76</b>	<b>73</b>	<b>87</b>	<b>83</b>	<b>75</b>	<b>64</b>
Netherlands	VI	0	1	0	0	0	0	0	0	0	0	0
	VII	5	7	2	1	3	0	0	0	0	0	0
UK - Eng+Wales+N.Irl.	VI	3	4	2	1	1	0	0	0	6	1	0
	VII	224	235	160	122	93	122	126	125	87	69	0
UK – Scotland	VI	6	4	5	3	2	3	2	23	1	0	0
	VII	1	1	1	1	1	0	1	1	2	0	0
<b>Total</b>		<b>472</b>	<b>542</b>	<b>434</b>	<b>316</b>	<b>374</b>	<b>395</b>	<b>389</b>	<b>437</b>	<b>386</b>	<b>372</b>	<b>266</b>

**Red Mullet**

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	VII	0	0	0	0	0	0	0	1	10	9	13
France	VI	0	0	0	0	0	0	0	0	0	4	0
	VII	58	77	85	0	76	90	81	87	137	147	126
<b>Ireland</b>	<b>VII</b>	<b>1</b>	<b>0</b>	<b>13</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>11</b>	<b>13</b>
Isle of Man	VII	0	0	0	0	0	4	0	0	0	0	0
Netherlands	VII	0	0	0	0	0	0	0	0	0	9	0
Spain	VI	0	0	0	0	0	0	0	0	0	0	0
	VII	0	0	0	13	0	0	0	0	1	0	0
UK - Eng+Wales+N.Irl.	VI	3	0	0	0	0	0	0	6	0	0	0
	VII	36	22	15	9	19	22	25	23	17	26	0
<b>Total</b>		<b>98</b>	<b>99</b>	<b>113</b>	<b>22</b>	<b>95</b>	<b>116</b>	<b>106</b>	<b>119</b>	<b>168</b>	<b>206</b>	<b>152</b>

**Grey Gurnard**

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	VI	0	0	0	0	0	0	0	0	0	0	0
	VII	6	8	12	0	0	0	6	3	5	9	4
France	VI	3	3	1	0	2	2	3	0	0	1	0
	VII	39	32	22	0	60	63	39	28	30	25	16
<b>Ireland</b>	<b>VI</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	<b>VII</b>	<b>0</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Netherlands	VII	0	0	0	0	7	0	0	0	0	1	0
Russian Federation	VI	0	0	0	0	26081	3155	60	263	1401	2456	138
UK - England & Wales	VI	0	0	0	0	0	0	0	0	0	0	0
UK – Scotland	VI	2	2	0	0	0	13	11	0	0	0	0
<b>Total</b>		<b>50</b>	<b>45</b>	<b>53</b>	<b>0</b>	<b>26150</b>	<b>3233</b>	<b>119</b>	<b>294</b>	<b>1436</b>	<b>2492</b>	<b>158</b>

### Common Dab

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	VI	0	5	3	2	1	0	0	0	0	0	0
	VII	69	125	105	90	79	120	83	87	89	80	72
Denmark	VI	0	0	0	0	0	0	0	0	0	0	0
France	VI	0	1	0	0	0	0	0	0	0	7	3
	VII	5	10	3	0	28	4	6	4	19	25	20
Germany, Fed. Rep.	VI	0	0	0	0	0	0	0	0	0	0	0
<b>Ireland</b>	<b>VI</b>	<b>16</b>	<b>44</b>	<b>35</b>	<b>5</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>0</b>	<b>0</b>
	<b>VII</b>	<b>28</b>	<b>44</b>	<b>44</b>	<b>27</b>	<b>25</b>	<b>29</b>	<b>24</b>	<b>30</b>	<b>48</b>	<b>6</b>	<b>5</b>
Netherlands	VI	0	0	1	0	0	0	0	0	0	0	0
	VII	0	0	8	8	8	0	0	0	0	0	1
Spain	VI	0	0	0	8	5	5	6	0	0	2	0
	VII	0	0	0	16	12	12	13	0	0	26	1
UK - Eng+Wales+N.Irl.	VI	5	9	95	43	4	7	7	15	8	1	0
	VII	89	79	66	52	47	27	16	22	21	22	0
UK – Scotland	VI	47	29	26	24	13	16	10	17	18	6	0
<b>Total</b>		<b>259</b>	<b>346</b>	<b>388</b>	<b>275</b>	<b>227</b>	<b>221</b>	<b>165</b>	<b>177</b>	<b>206</b>	<b>175</b>	<b>102</b>

### Lesser Spotted Dogfish (Sub-areas VI and VII) Note: These are known to be underestimated.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium									377	392	389
France	18	6	51	46	26	63	28	na	na	3756	na
<b>Ireland</b>	<b>465</b>	<b>796</b>	<b>886</b>	<b>470</b>	<b>407</b>	<b>518</b>	<b>506</b>	<b>285</b>	<b>124</b>	<b>85</b>	<b>152</b>
Spain	51	73	22	67	77	46	50	20	21	41	na
UK E&W)	.	.	.	.	11	.	.	88		325	126
UK Scotland)	.	.	.	.	.	.	37	8	33	55	42
<b>Total</b>	<b>534</b>	<b>875</b>	<b>959</b>	<b>583</b>	<b>521</b>	<b>627</b>	<b>621</b>	<b>401</b>	<b>555</b>	<b>4654</b>	<b>709</b>

# Inshore Fisheries Overview

A large proportion of Ireland's fishing fleet (>80%) operate within 12 miles of the coast and mainly rely on local stocks of crab, lobster, shrimp, scallops, whelk and cockles (Table 1). In 2005 (last complete figures) inshore landings with an estimated value of €29.2 million were harvested by the Irish fleet. The inshore fleet is concentrated on the west and south coasts and supports over 3,000 fishermen.

The fleet is mainly composed of vessels under 12m in length which fish within 12 miles of the coast. There are over 1,000 inshore vessels on the Irish fishing boat register with an additional 700 currently in the process of registration under the 'Scheme for the Licensing of Traditional Pot Fishing Boats in the Irish Inshore Fleet'. The size of the inshore fleet is still not precisely known. It fishes mostly static gears and specific enquiries (Fahy et al, 2002, Meredith and Fahy, 2005) indicate quantity of gear in the water had escalated in recent years. A large proportion of the vessels working in the inshore sector are not properly licensed and registered and only when all vessels are legally entitled to fish can the sector be effectively regulated. To date there is still no inshore log-book system in place and information on specific fisheries must be sought through dealer's transactions which they are not obliged to reveal.

The publication of Bord Iascaigh Mhara's *Irish inshore fisheries sector: review and recommendations* (Anon. 1999) highlighted the social, economic and biological importance of the inshore sector. The BIM report was fol-

lowed by an initiative to develop "the inshore", which culminated in a new administrative framework aimed at effective management and sustainable development of the sector (Anon. 2005). The framework will provide integrated management by joining up the relevant functions of the DAFF (Department of Agriculture, Fisheries and Food), the state agencies and the industry under one umbrella, in order to agree and to produce management plans.

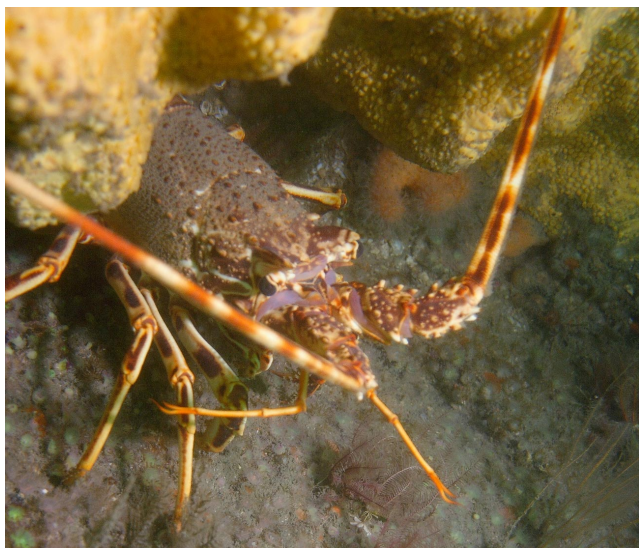


The framework is ambitious and will provide a focal point for discussions on the rational exploitation of inshore fisheries based on the management of biological stock units. The Cawley Report (Anon. 2006a) recommended that fleet management policies and related licensing should be updated with a view to establishing efficient and transparent policies and procedures. The Group

Table 1. The value of strictly inshore species, wild rather than cultured, landings in 2005.

Order of inshore stocks	Value, €k	Inshore value, €k	Notes
Bass	?	?	Angling species 50%
Conger	360	180	
Whelk	2,508	2,508	
Periwinkle	1,318	1,318	
Cockle	238	238	
Surf clam	40	40	50%
Scallop	2,016	1,008	
Palourde	?	?	
Razor clam	1,349	1,349	
Purple sea urchin	?	?	
Green crab	6	6	75%
Spider crab	141	141	
Velvet crab	455	455	
Brown crab	8,050	6,037	
Lobster	12,795	12,795	
Crawfish	708	708	
Shrimp	2,400	2,400	
Totals	32,384	29,184	

recommended the immediate re-establishment of the Licensing Policy Review Group who would investigate the establishment of a new inshore fleet segment (to include specific coastal areas designated with exclusive or priority access for inshore vessels). Sea Change (Anon. 2006 b) states that Ireland will continue to develop and strengthen the co-management framework for inshore stocks and that this will be underpinned by credible scientific advice and the introduction of measures to maintain and where necessary rebuild stocks.



This review of inshore stocks concentrates on 15 shellfish and two finfish species which constitute only a proportion of the biomass harvested within 12 miles of the coast (the offshore limit of “inshore” waters). Sprat, for example, are harvested mostly within coastal waters (landwards within 1 n mile outside the baselines) but they are reviewed as pelagic fisheries. Statistical coverage by DAFF of the species which are regularly reported is reasonably good and the status of inshore stocks between 2001 (the inception of the new management regime) and 2006 can be evaluated (Table 1). The species listed are the mainstay of small boats fishing in coastal waters and three of them (Palourde, Periwinkle and Purple Sea Urchin) contribute landings to coastal communities that do not require involvement of vessels for their harvest. Currently landings of periwinkles are attributed in DAFF reports to vessels under 10m. The term “gathering on foot” – a translation of the Spanish “*mariscadores a pie*” (shellfishers on foot) is proposed instead.

The species listed as contributors to the inshore sector do not include finfish captured by gill and tangle net which are believed to be on the increase and which should receive greater attention in the future. Furthermore, trawl fisheries are not considered here either because their operation is described under demersal and *Nephrops* fisheries.

## Inshore fisheries post-2001

Table 2 lists target inshore species and describes the progress of the fisheries in three columns. The first is a simple statement of whether the landings are higher or lower in 2006 compared to 2001. The second column, in some cases a value judgment, in others based on good data, states whether fishing effort has increased in the interim and the third column is an opinion of the current status of the fishery over its longer history.

Species which provided increased landings in 2006 compared to 2001 begin with razor clams. Since the inception of this fishery in 1997 the capture technology has become more efficient and a greater LPUE is the likely outcome. Landings are now made to fill specific orders, so there is less of the inevitable dumping which accompanied the scramble for market share in the early years of the fishery. However, hydraulic dredging is highly destructive of benthic communities and it should not be allowed to continue into the future; instead, diving under supervision for these species has been recommended in successive stock books. Increasing landings is not an indication of a healthy fishery. Recently published research suggests that the Irish Sea razor clam beds will take decades to recover from what is a very brief period of exploitation (Fahy and Carroll, 2007).

Bass, our most valuable sport angling species, had higher landings in 2006 than in 2001 (i.e. the angling LPUE index was slightly higher). Much effort by regional fisheries boards has gone into the protection of this species, which is still illegally captured for sale. The strength of the bass stock is however only a fraction of its biomass in the 1960s and 1970s. The warming of the seas has extended the range of this species elsewhere in western Europe and there is no reason to suppose that its former strength will be regained in Ireland. Bass should be managed in the future only as an anglers’ species – it is not capable of sustaining a commercial fishery - and DAFF is to be congratulated on renewing the bass conservation regulations in 2007 on an open-ended rather than an annual basis.

Conger eel is a species which is shared by hook and line and trawl fishers (recreational and commercial). In recent years a directed long line fishery has developed and landings have increased since 1990. FAO statistics suggest that the combined landings of various countries (from what is probably the same stock), are decreasing. Ireland commenced targeting conger when the species was considered close to being fully exploited.

Higher landings of shrimp were recorded in 2006 than in 2001. However landings in 2006 were considerably less than in 1999, when they peaked having increased steadily since 1992. A review of this fishery suggested that growth-over-fishing might be taking place as a result of intensive exploitation (Fahy et al, 2006). Increasing effort very often accompanies stock decline and the introduction of effort restrictions to bring about rational conservation should be considered. A close season, together with a reduction in fishing effort are two obvious and necessary adjustments to fishery practice.



**Table 2. The status of various inshore fisheries for species harvested largely or exclusively within 12 miles**

Method	Target	Change in Fishing Between 2001 and 2006			Stock Status	Some Key Considerations
		Landings	Effort			
Dredge, hydraulic	Razor clam	higher	probably higher		declining	Develop management plan which includes closed areas, following periods and logbook scheme.
Dredge, suction, mainly	Cockle	higher	higher		fully exploited/over exploited	Develop Management Plans which embrace impacts on SAC's and SPA's. Concerns about transplantment.
Dredge, lined	Scallop	lower	decreased		fully exploited/over exploited?	Reduce fishing effort and develop management plans.
Dredge, various	Surf clam	lower	higher		fully exploited/over exploited	Strictly enforce size limits.
Gathering on foot	Periwinkle	lower	unknown		unknown	Develop local management plans
Gathering on foot	Palourde	lower	unknown		unknown	Establish size limits and closed seasons.
Gathering on foot	Purple sea urchin	lower	unknown		unknown	No longer reported in national statistics Need data sets to evaluate local stocks.
Hook and line	Bass	higher	unknown		depleted	No longer reported in national statistics. Introduce special harvesters permits In line with stock status.
Hook and line	Conger Eel	higher	unknown		declining	Should be managed as an angling species not a commercial trawl fishery. Illegal landings considered a problem
Pot	Whelk	lower	lower		fully exploited	Need for collection of localised data sets. Careful consideration as to whether this should be a angling or a commercial longline fishery.
Pot	Green crab	lower	lower		under exploited	Strict enforcement of Regulations Large number of undersized whelk are caught.
Pot	Spider crab	lower	increasing		stable	Collect local data sets to evaluate stocks.
Pot	Velvet crab	lower	increasing		stable	Strict enforcement on size limits. Ban tangle nets. Use of small individuals as bait should be discouraged
Pot	Brown crab	lower	increasing		fully exploited	Signs of local depletion in stocks but not fished everywhere. Consider size limits and closed season.
Pot	Lobster	lower	probably increasing		fully exploited	Current exploitation not sustainable. No further expansion of effort.
Pot	Shrimp	higher	increasing		fully/over exploited	Local management schemes should continue (V-notch). Landings now characterised by successively good and bad year classes growth overfishing suspected.
Tangle net, pot	Crawfish	lower	increasing		over exploited	Closed season should be expanded from Jan to Sept. Stocks overfished and in need of urgent rebuilding.

Reduction in fishing effort by static gear is recommended by FSS for the pot fisheries for large crustaceans generally. In some well documented instances, the race to remain solvent has involved the replacement of smaller inshore vessels by larger inshore vessels. The larger boats can operate further offshore where they target crab and fish larger quantities of gear on a longer soak time. As a result the inshore migration of female brown crab has been curtailed in some areas and the traditional inshore fishery is being progressively extinguished.

Inshore fisheries would be greatly transformed by the introduction of management measures. One species whose status has positively responded is lobster for which V-notching is widely practised. However, any management scheme, once agreed, must be enforced. Crawfish, is another species which rapidly responds positively to the removal of tangle netting. This method of capture is legal on many parts of the coast despite recommendations that it should be banned. Furthermore, despite the sanctuary areas in which the use of tangle nets is prohibited, the capture of crawfish by these nets continues unhindered.

Of the various species listed in Table 2, only one is regarded as under-exploited. The capture of green crab on shellfish beds is rewarded by bounty and the animal has various markets as industrial ingredients and as bait for whelk.



Two of the gathering fisheries, for palourde and purple sea urchin, have not recently been reported in statistical returns, probably because too few are being captured although the confused conservation status of purple sea urchin might have a bearing on what is reported. Once this stage in a fishery has been reached, it is unlikely they will be recorded in the future and we may be witnessing the commercial demise of species which provided income to local coastal communities in the not-too-distant past.

The Irish fishing fleet numbers 2,500 vessels which were grouped in size categories by Fahy et al (2007). According to BIM, vessels <12 m account for two thirds of the total fleet. In spite of declining CPUE, participants continue to recruit to the pot fishery for larger crustaceans.

These include people who have decommissioned vessels >18 m but who wish to remain involved in fishing. The data are not available to provide a comprehensive account of the consequences of intensifying competition for a declining resource but indications suggest that the inshore fleet is far from fully occupied.

For a year from March 2006, the activities of typical inshore vessels in three index ports in west, south west and southern Ireland were monitored (Fahy et al, 2007). Boats ranged in size from 5 – 13 m. The exercise recorded when boats went to sea (when they were presumed to be working) and observed what gears they were using. The gears varied through shellfish dredges, nets, hook and line, pots and otter trawl. Their activity patterns (numbers of days at sea, presumed working) ranged from 14 to 42% of days on which observations were carried out; and those were all working days, Monday to Friday. Only 3% of boats showed evidence of using two gears. There was little, if any, evidence of a seasonal succession in gear usage, which used to be considered characteristic of inshore fishing.

Available data suggests that participants in inshore fisheries no longer practise a variety of fishing methods which switch from one species to another as different fisheries come into season. Instead, an individual fisher is privileged to have a single local stock which supports his/her vessel and provides him/her with a living for part of the year. Demand for marine product has increased and the resources display every sign of being over-exploited. Meanwhile, effort increases in a relentless race to survive which can end only in greater hardship for a growing number of inshore fishers.

### **Inshore Institutional Framework**

In 2005 an institutional framework was devised to promote consensual policy making within the inshore sector (Anon., 1999; 2005). This framework concentrates on 15 species and over 25 stocks. It is comprised of a number of advisory committees who will work at local, regional and national level to produce fishery management plans (See Fig 1). Four National Species Advisory Groups (SAG's) will develop national management plans for crab (3 species), lobster (2 species), shrimp (1 species) and molluscs (8 species). Management Plans produced by the SAG's will be presented to the Inshore Fisheries Review Group (IFRG), who will review the plans prior to their consideration by the Minister. Connecting local fishermen and their representative organisations to the framework will be achieved mainly through the Local Advisory Committees (LAC's) comprising local fishermen who will be encouraged to produce local plans and present them to the SAG's. Ultimately the framework will provide integrated management by 'joining up' the relevant functions of the DCMNR, State agencies and the industry.



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### Special procedural note.

*The change over from DCMNR to DAFF has complicated the nomenclature of inshore bye-laws and regulations. It is understood that provision is available for the regulations which are referred to in the Inshore Stocks section of the Stock Book but they may not be exactly as cited.*

*The inshore section of the Stock Book contains references to a number of technical conservation measures originally authorised by section 223 of the Fisheries (Consolidation) Act, 1959. Section 9 of the Fisheries (Amendment) Act of 1978 allowed insertion of additional measures into the 1959 Act. Further conservation provisions which were to be introduced were set out in Section 4 of the Fisheries (Amendment) Act of 1983. Together, these Acts authorised the formulation of various Statutory Instruments.*

*Following judgment in the case of Browne –v- AG and others (supreme court record number 139/02) on 16 July 2003, existing technical conservation measures were reissued under Section 15 of the Sea-Fisheries and Maritime Jurisdiction Act, 2006*

*It is understood that the text and provisions of such regulations will be the same as their predecessors; dates will be altered where such Instruments are issued on an annual basis. Not all of the reissued regulations were traced at the time of going to press and in these cases the original S.I. numbers and dates are used.*

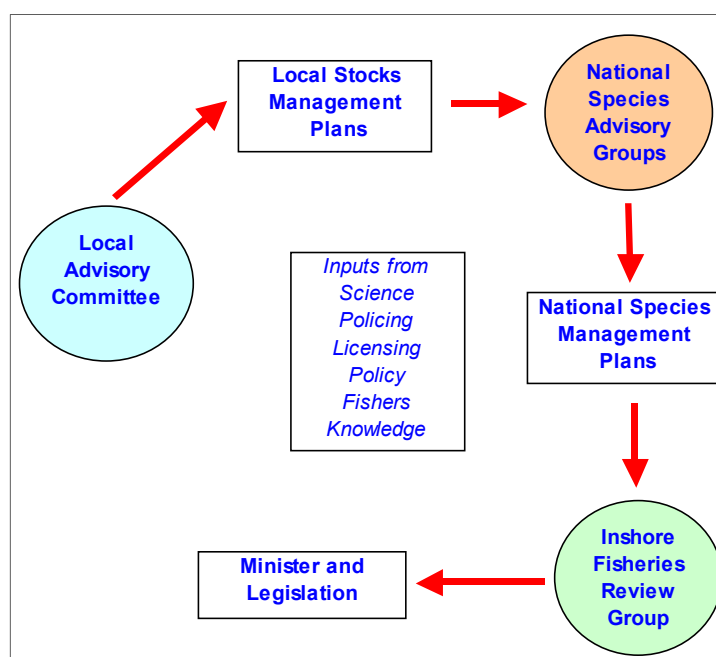


Fig. 1 – The Inshore Institutional Framework (Anon., 2005)

# Bass on all Coasts

## (Sub-areas VI and VII)

*Dicentrarchus labrax*



*Marine Institute*  
*Foras na Mara*

*Fisheries Science Services*



### FSS – ADVICE

**FSS recommends that bass should continue to be managed as an anglers' rather than a commercial species. Regulations that are currently in place should remain and should be enforced. FSS also advises that efforts should be made to obtain wider protection through the European Union for the species which is seen to be vulnerable in Irish waters. All agencies involved with fisheries management and angling should continue to co-operate in the management of this species.**



### STATE OF THE STOCK

- The bass stock remains greatly depleted since the 1960s and 1970s. Irish bass landings are dominated by occasional large recruitments. Fish of 1989 and 1990 are now becoming rare in the anglers' landings and the 1995 year class, which is robust among UK fish, is not strongly represented in Irish waters. However, the 2002 year class which was the strongest in the series of 0-group surveys since 1996 is due to recruit to the fishery in 2009 and the 2007 survey of 0-group fish was encouraging.

- Enforcement of the conservation regulations is taking place but the illegal fishery for bass continues although it is not possible to quantify it.
- There are indications in the time series of rod-caught bass of a slight improvement in the abundance of the species in Irish waters.
- There are no statistics on the clandestine trade in this species other than the records of prosecutions and seized illegally-caught bass from which the Marine Institute and Central Fisheries Board staffs occasionally obtain scales and length measurements.



### CURRENT MANAGEMENT

Bass in Irish waters are protected by a number of measures whose effect has been to extinguish the commercial fishery for the species. The Bass (Conservation of Stocks) Order, 1990, regulates the activities of Irish fishermen within ICES sub-areas VI and VII: commercial fishing for bass is prohibited, the taking of bass using nets is prohibited, and Irish fishing boats must not have bass on board or engage in transhipment of bass. This order also sets the legal size of capture of bass at 40 cm.

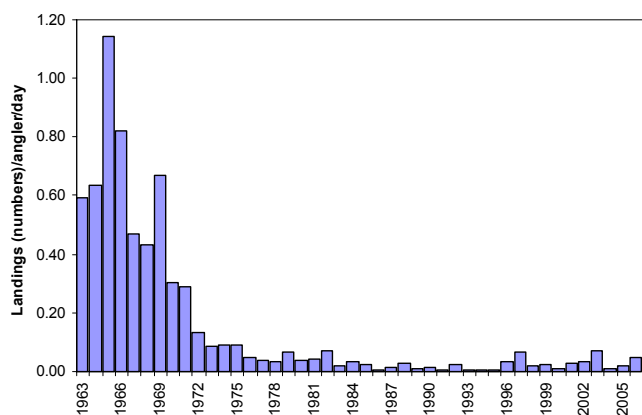
Two further measures, hitherto reissued annually, were in 2007 renewed on an open-ended basis. The Bass (Restrictions on Sale) Regulations 2007 (S.I. No. 367 of 2007) prohibits the sale or offer for sale of bass (other than bass which have been imported into the State). The Bass Fishing Conservation bye-law No. 826 of 2007 (S.I. No. 368 of 2007) imposes a bag limit of two bass in any one period of 24 hours and it provides a ban on angling for bass during the spawning season (15 May – 15 June).

The combination of regulations have the effect of confining the exploitation of bass to anglers. Bass is the only marine fish species which is managed in this way in Ireland. The regulations are enforced by the Regional Fisher-

ies boards in association with the Central Fisheries board and prosecutions are made. Some enforcement is also undertaken by DCMNR's fisheries officers, which now operate as the Sea Fisheries Protection Agency (SFPA).

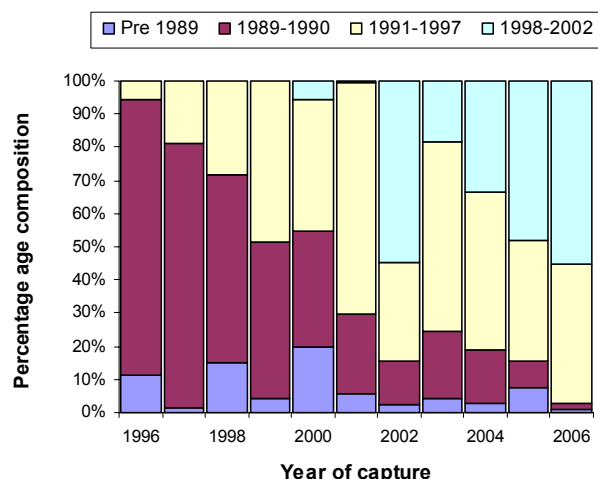
## ADDITIONAL INFORMATION

1. Ireland's bass are genetically part of a European panmixia. The origin of our broodstock is not established beyond doubt and it is possible that some, at least, are distributed as eggs and larvae to our coastal waters from spawning concentrations of the adults from the south coast of England/north west France. Once here, bass establish strong affinities with summer feeding areas to which they return in successive years. In Ireland therefore, the distribution of bass has a southern emphasis. However, global warming has encouraged its northward extension and the removal of top predators like cod has provided a niche in the North Sea into which bass have been able to expand. The capture of bass by fishermen in Northern Ireland is becoming more frequent.
2. Bass is reserved for anglers in Ireland and in support of this policy commercial fishing for the species by Irish fishermen is not permitted. The only available indicators of bass abundance are the records which anglers maintain. One such log, from the Cork Angling Club, which has been in existence since 1963 demonstrates the decline in the species in recent years although periodic slight improvements in numbers landed per angler/day are discernible (Fig 1).



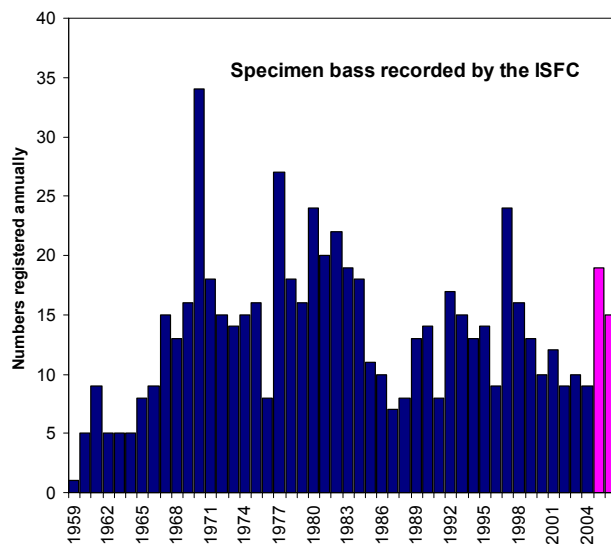
**Fig 1.** Catch of bass per angler-day as recorded by the Cork sea angling club, 1963-2006. Performance improved in the period 1996-2006 over the preceding decade.

3. Age composition of bass landings is dominated by occasional strong year classes (Fig 2). The 1989 year class was regarded in the UK as of similar strength to the 1959 one which dominated the catches of the later 1960s and 1970s; while the 1989 and 1990 year classes were well represented in Ireland, they were relatively short lived. A strong 1995 year class in Britain is not much in evidence in Ireland. The 1989 and 1990 year classes continue to exponentially decline in abundance and no exploited year class since has proved as strong as either of them. The principal objective of age analysis of angler-caught fish is to monitor the year class composition of the stock. Oc-



**Fig 2.** Age class composition of "adult" bass, mainly-angler caught, in the period 1996-2006 inclusive. The decline of the 1989 and 1990 year classes is alluded to in the text.

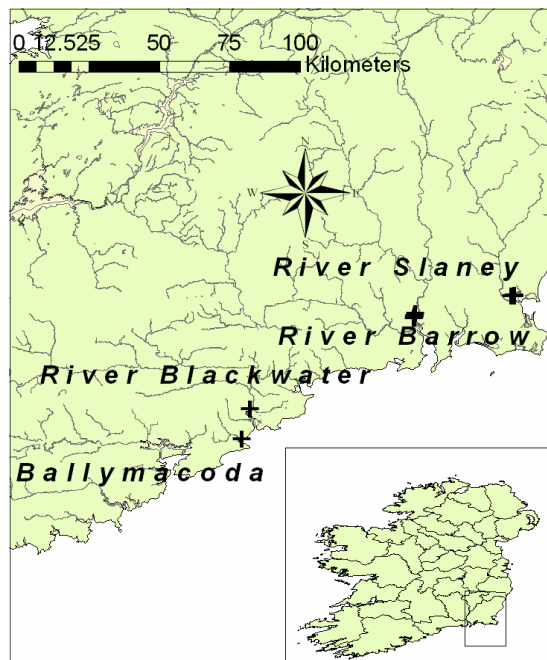
asionally specimen bass scales are interpreted (Specimens are fish which have reached a certain weight threshold, and are accepted by the Irish Specimen Fish Committee as having been caught by "fair angling". It is likely that 1989 and 1990 bass are currently contributing significantly to specimen fish numbers (Fig 3). (Adult bass age composition is determined from samples of angler-caught fish; the samples include some illegally-captured bass seized by the enforcement authorities. Some adults captured by the Celtic Explorer in the course of survey work in 2006 are included in Fig 2).



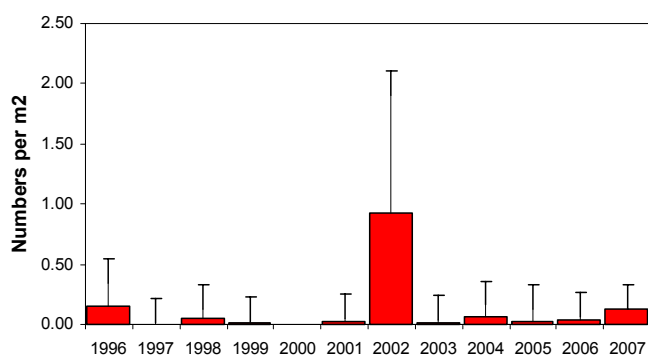
**Fig 3.** Numbers of specimen bass recorded annually between 1959 and 2006 inclusive. Indications suggest that the 1989 and 1990 year classes contribute a large proportion of those recorded in 2005 and 2006.

4. Strong pre-recruit year classes frequently carry through into the exploited year classes. Annual surveys of 0-group densities have been undertaken annually by the Marine Institute in association with the Central and Regional Fisheries Boards in south east Ireland (Fig 4) between 1996 and 2007. The only

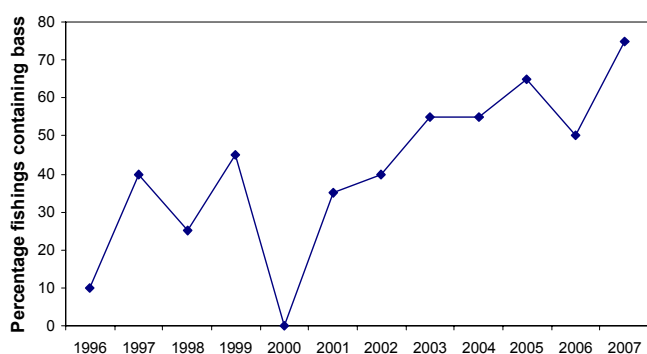
indication of a strong year class since these surveys commenced was in 2002 (Fig 5). In 2007, reasonable densities of 0 group bass were reported and the juveniles in 2007 were more widespread than during any survey conducted to date but the fish were very small which could leave them vulnerable to colder winter weather (Fig 6).



**Fig 4.** Locations at which juvenile bass were surveyed in 2007.

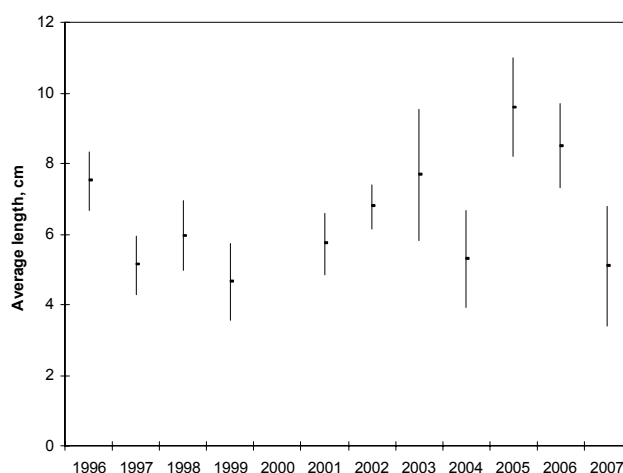


**Fig 5.** Mean density (numbers per m<sup>2</sup>) [ $\pm 1$  standard deviation] of 0-group bass in annual surveys, 1996-2007 inclusive.



**Fig 6.** The proportion of sites surveyed which yielded 0-group bass annually, 1996-2007 inclusive.

5. Age at full recruitment of bass to the angling fishery is approximately 7+
6. When they occur, strong year classes tend to extend across the species's geographical range although there have been some differences between Ireland and the UK [a detail which supports the view that bass in Irish waters should be regarded as a separate stock for management purposes].
7. The southern distribution of bass in Ireland reflects its preference for warmer waters; temperature has a strong influence on bass behaviour and development. 0-group bass are sampled in the last week in August; their longer mean lengths in recent years resulted from higher summer temperatures (Fig 7). Growth success in its first summer improves the prospects of the year class recruiting to the fishery.



**Fig 7.** Mean length [ $\pm 1$  standard deviation] of 0-group bass at the end of August, beginning of September, 1996-2007 inclusive.

8. Ireland's bass stock is not considered by WGNEW because it does not have a commercial fishery and because the recreational fishery is poorly documented. However, some of the recommendations made by WGNEW in 2007 concerning bass in EU waters are relevant to the Irish case because they emphasise the nature of the bass fishery generally. Input controls (protection of juvenile fish and limitations on entry by fishers) are considered superior to outputs, such as TACs, because bass are frequently a by-catch of fishing operations. Even in better documented recreational fisheries, the quantity landed is uncertain and the precautionary principle of limiting effort is strongly advised. Finally, the WG advises improved monitoring of 0-group and pre-recruitment abundance and a greater knowledge of environmental effects on bass distribution and ecology.

**Sources of information:** Report of the Working Group on Assessment of New MoU Species (WGNEW). ICES Advisory Committee on Fishery management ICES CM 2007 ACFM:01 Ref, LRC.



# Conger eel on all Coasts

## (Sub-areas VI and VII)

*Conger conger*



Fisheries Science Services

### FSS – ADVICE

**FSS encourages the collection of localised data sets on the biology and ecology of this species.**

In recent years an inshore longline fishery targeting conger eel has become established. Consideration should be given to whether this is preferable to its harvest as a recreational angling target species. The wider question of the need for conservation measures for this species is also worthy of consideration, particularly in the context of the poor status of freshwater eel, *Anguilla anguilla*.

### STATE OF THE STOCK

Unknown.

### CURRENT MANAGEMENT

None.

### ADDITIONAL INFORMATION

1. Conger eel is captured by the trawl fishery and in pots baited for larger crustaceans and it is an important component species of the recreational angling fishery. Since the mid-1990s there have been attempts to establish an inshore long line fishery for the species. In 2006, landings of 340 t, valued at €0.282 m were registered by Ireland (Fig 1).
2. Congers captured offshore are smaller in size and large individuals, of value to anglers, have returned from spawning, probably in the vicinity of the Azores.
3. Landings of conger by western European nations from the Atlantic reached a peak in 1996 but from 1999 they have declined; however they again rose from 2003 (See Stock book from 2006).
4. Landings to Ireland rose until 1998 when the long line fishery commenced. However, landings in 2006 appear to be continuing the more stable trend since 1998.
5. Conger landings to Ireland have a pronounced southern bias (Fig 2).
6. Landings come mainly from the trawl fishery and they are made mainly in winter rather than summer (Fig 3).

**Source of information:** O'Sullivan, S (2002) Biology of the conger eel in Irish waters. Unpublished Ph.D. thesis. National University of Ireland, Cork.

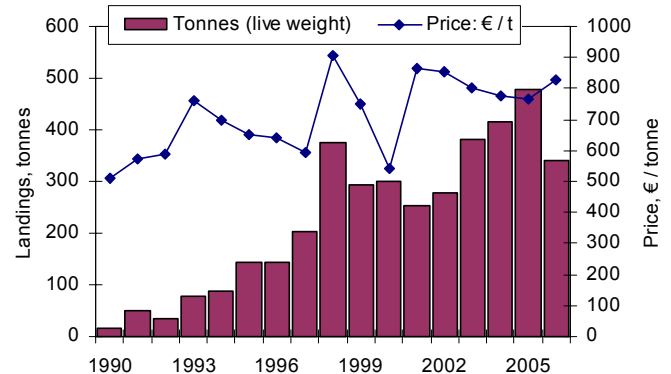


Fig 1. Landings and first sale value of conger in Ireland, 1990-2006 (Source: DAFF).

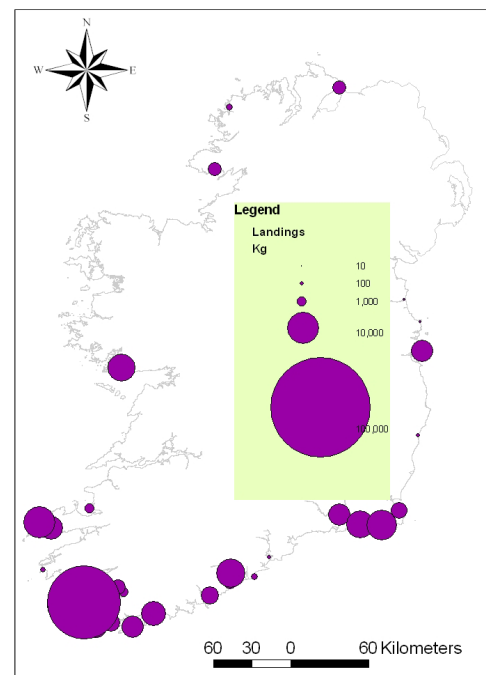


Fig 2. Landings of conger to Irish ports in 2006.

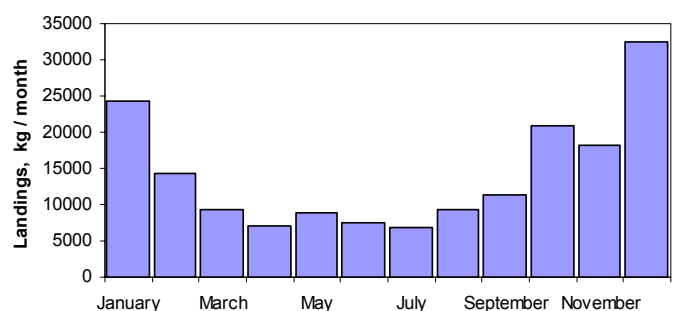


Fig 3. Monthly distribution of conger landings to Ireland in 2006.

# Whelk Fishery on all Coasts

## (Sub-areas VI and VII)

*Buccinum undatum*



Fisheries Science Services

### FSS – ADVICE

FSS are concerned about the large landing of undersized whelk in the fishery. FSS advises that national and EU conservation regulations for this species should be strictly enforced, particularly the provision that undersized whelk are segregated and immediately returned to the water.

FSS advises that entry to this fishery should be confined to smaller vessels and that the number of boats in the fleet should be capped as should the permissible amount of gear per vessel.

### General introduction to the distribution and output of Irish whelk fisheries

The largest Irish whelk fishery is situated in the south west Irish Sea. Some small patches of the animal occur in the Celtic Sea and in the Cape fishery, Co Donegal (Fig 1). Celtic Sea and Cape whelk co-exist with large crustacean, *Cancer pagurus*, stocks and their shells are more heavily armoured than whelk in the Irish Sea. There are indications that more heavily armoured animals mature at a larger size and later age than thinly shelled whelk. Output from thick shelled whelk fisheries can be erratic; once fished down, the population recovers slowly. The S W Irish Sea fishery largely occupies spawning and nursery grounds. The stock is however resilient and up to 40% of the biomass is removed from parts of it in some years.

Total landings of whelk in 2006 were 3,560 tonnes with a first sale value of €2.9 m, a considerable reduction from the highest ever landings in 2003 (Fig 2).

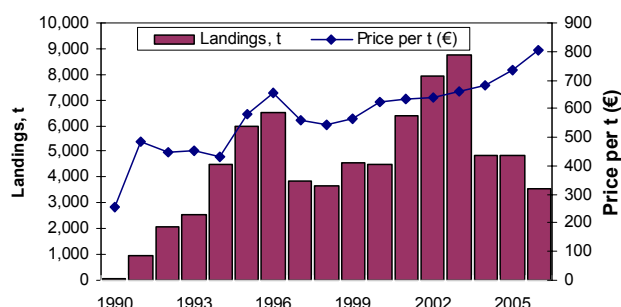


Fig 2. Landings of whelk and first sale price per tonne, 1995-2006 inclusive.



Fig 1. Distribution of significant whelk fisheries in Republic of Ireland waters.

Whelk fisheries are considered in three groups whose individual outputs are shown on Fig 3. The most valuable is the south west Irish Sea fishery whose performance is examined in the context of the co-existing seed mussel fishery. There are insufficient data to examine whelk landed from the Celtic Sea but new data are provided for the Cape fishery in Co Donegal.

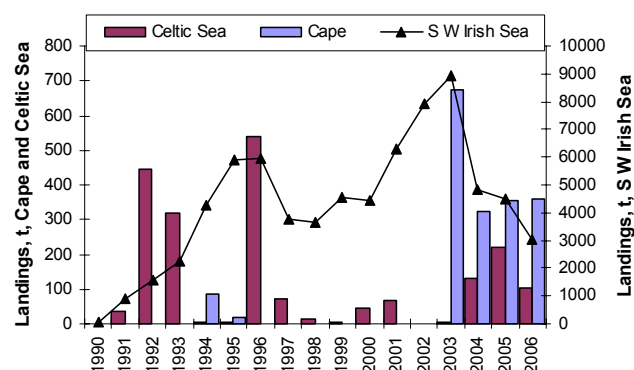


Fig 3. Productivity of three groups of whelk patches: the south west Irish Sea, the Celtic Sea and the Cape fisheries.

## Whelk in South West Irish Sea

Division VIIa

### STATE OF THE STOCK

There are concerns about the state of the stock and the high exploitation levels. The highest landings in 15 years were recorded in 2003 but catches halved in the following two years and the trend continued downwards in 2006. Landings in 2006 were the lowest recorded to date and they were below the 12 year average for the

third successive year (Fig 4). Exceptional recruitments took place between 2001 and 2003 but the recruitment index in 2006 was similar to that recorded in the previous year. Biomass in 2006 was at the lowest level to date. Total mortality ( $Z$ ), much of it fisheries generated, has tended downwards since 2002 but it remains above the 12 year average.

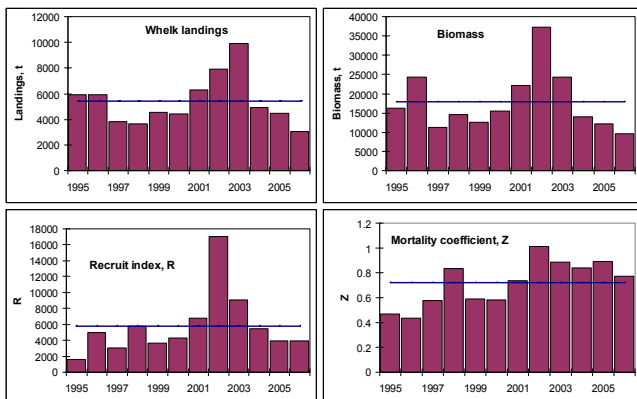


Fig 4. Performance indicators for the south west Irish Sea fishery, 1995-2006.

## CURRENT MANAGEMENT

For details of the assessment procedure in this fishery and the definition of sectors in the south west Irish Sea, refer to previous Stock Books.

The Whelk (Conservation of Stocks) Order, 2001 (S.I. 294 of 2001) makes it an offence to have on board, tranship or offer for sale whelk that are less than 25 mm in width across the broadest part of the shell, this corresponding to an approximate length of 50 mm; the order further directs that sub-sized animals should be carefully handled and returned immediately to the water. Annex XII of EU regulation 850/98 imposes a size limit of 45 mm length, which has approximately the same effect. Neither regulation is enforced.

Size regulations are an appropriate conservation measure in this fishery which targets animals below the size limit. In some ports these account for almost 50% of the landings by number.



A whelk fishing boat from the south west Irish Sea fishery

## ADDITIONAL INFORMATION

1. Fishing effort in the south west Irish Sea broadly reflects the biomass of the target species and it fluctuates between approximately 4,000 and 14,000 boat days annually.
2. A study recently completed for EU on small scale fisheries (inshore fisheries) in Europe examined the structure of the south west Irish Sea whelk fleet. The fleet is described as "relict" consisting largely of vessels constructed by BIM in the 1950s which were, and are still registered as, using mobile gears, activities from which they have retired. The fleet operates as two components: one fishes persistently irrespective of the status of the stock. When biomass is low these vessels account for almost 70% of landings. The remainder of the fleet becomes active only when biomass increases in which case the persistent fishers take only 30% of landings.
3. The fishery is a relatively inexpensive one to become involved in and boats have entered and left it in response to the state of the market and, particularly at the southern periphery of the fishery, the local depletion of stock. A record recruitment between 2001 and 2003 attracted more effort into the fishery. A mis-match of effort and landings in 2003 precipitated a fall in LPUE which was followed by a withdrawal of fishing effort. As yet there have been no signs of another sizeable recruitment.
4. Whelk are exported, mainly to the Far East and sustaining this trade is problematical. Continuity of supply is essential to the survival of the market.
5. For assessment purposes the Irish Sea fishery is divided into four sectors; landings from Dublin and Wexford, at the northern and southern ends respectively, are characterised by larger whelk and, usually, few juveniles. The centre Arklow and Courtown sectors, in contrast, yield large volumes of small whelk. These centre sectors may be the spawning grounds for some whelk which on-grow in the Dublin and Wexford sectors. A large proportion of the S.W. Irish Sea fishery is made up of spawning and nursery ground.
6. The four sectors have performed differently in the course of the expansion of this fishery: landings to the Dublin one declined and rose again; the yield from Wexford declined irreversibly, despite the fact that virtually no juvenile whelk are landed there, while landings from the Arklow sector have greatly increased and now dominate the fishery.
7. Sampling the S W Irish Sea fishery was unsatisfactory in 2007. A British purchaser exported some 700 tonnes of whelk (up to September) which were not sampled. Occasional inspections by the newly formed Sea Fisheries Protection Agency (SFPA) resulted in a temporary cessation in the landing of undersized whelk but they were not followed by prosecution of malefactors and harvesting of sub-legal sized whelk has continued. At this time it is not possible to give an estimate of undersized whelk for 2007 but preliminary indications suggest it was high (Table 1). The percentage of undersized whelk har-

vested from this hitherto unregulated fishery is used as an indicator of recruitment. Thus, when sampling closely followed SFPA inspections, the quantities of undersized whelk may have been uncharacteristically low.

8. Mortality coefficients (Z) from all four sectors of the fishery in 2007 remained high (Table 2).
9. Preliminary indicators in 2007 suggest that the age at full recruitment continued to rise in 2007, following the substantial recruitment of 2001-2004 inclusive (Fig 5).
10. An argument frequently rehearsed with fishers participating in this fishery is that although the number of undersized whelk harvested has increased, particularly during the prelude to a major recruitment, their weight adds little to the value of landings: it averaged 15% over the period 1995 – 2006 (Fig 6).

Table 1. Percentage undersized whelk (<50 mm in length), by number, landed into each fishery sector in the south west Irish Sea annually from 1995. Data for 2007 are provisional and incomplete.

Year	Dublin	Arklow	Courtown	Wexford	Weighted average
1995	2.3	13.8	23.8	6.0	9.7
1996	4.6	27.5	47.6	12.0	20.3
1997	13.9	35.3	34.4	9.8	26.9
1998	23.2	43.1	21.1	7.6	39.6
1999	12.3	33.8	48.9	8.8	29.4
2000	9.7	40.0	48.9	8.8	27.3
2001	24.4	36.1	16.3	5.7	30.7
2002	47.0	47.4	37.8	1.7	45.6
2003	23.1	43.1	21.1	7.6	37.2
2004	54.5	39.2	30.6	14.5	38.8
2005	42.9	30.5	17.2	39.2	32.3
2006	42.9	43.9	33.9	21.8	41.0
2007	10.9	35.1	47.7	24.4	
Average	24.0	36.1	33.0	12.9	31.6
S.D.	17.4	8.8	12.5	10.1	9.9
Coef var	0.73	0.24	0.38	0.78	0.31

Interpolated

Table 2. Mortality coefficient Z calculated for each sector of the south west Irish Sea fishery since 1995 inclusive. Values for 2007 are provisional and incomplete.

Year	Dublin	Arklow	Courtown	Wexford	Weighted average
1995	0.33	0.52	0.65	0.44	0.47
1996	0.26	0.48	0.64	0.40	0.43
1997	0.35	0.68	0.74	0.41	0.58
1998	0.43	0.88	0.84	0.42	0.83
1999	0.24	0.68	0.88	0.62	0.59
2000	0.46	0.68	0.86	0.21	0.58
2001	0.62	0.77	0.83	0.60	0.74
2002	0.82	1.03	1.33	0.82	1.01
2003	0.90	0.88	1.00	0.77	0.88
2004	0.93	0.86	0.63	0.62	0.84
2005	0.77	0.80	1.74	0.91	0.89
2006	0.96	0.72	0.75	0.83	0.77
2007	0.93	0.99	1.31	0.75	

Interpolated

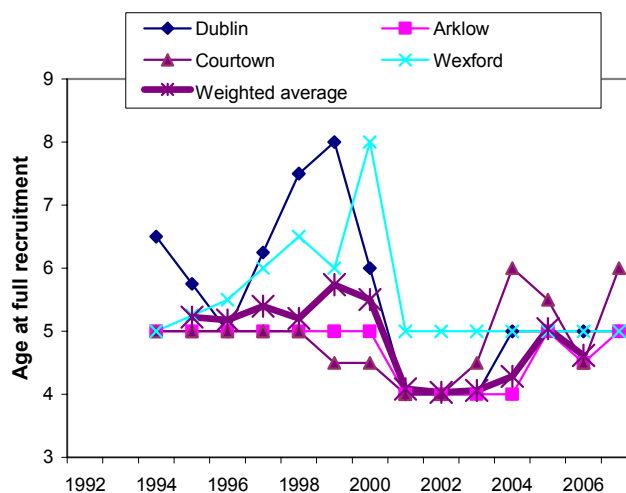


Fig 5. Age at full recruitment of whelk in four sectors of the Irish Sea fishery from 1995 to 2007 inclusive. The weighted trend extends only to 2006.

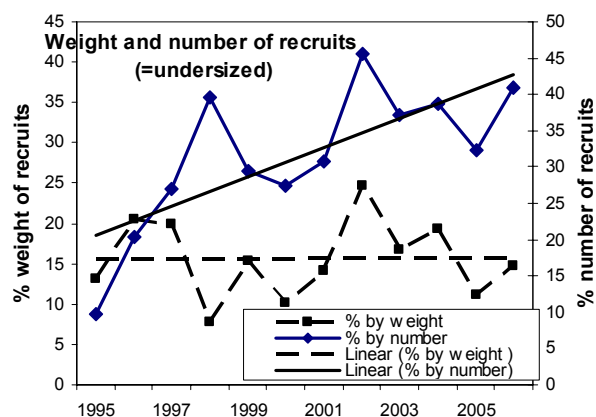


Fig 6. The percentage by number and by weight of sub-legal size whelk landed from the south west Irish Sea fishery.

## The whelk and seed mussel fisheries in the south west Irish Sea

The interaction of these fisheries was examined in 2007. Fishers believe seed mussel removals take place to the detriment of whelk stocks. The following is a summary of findings:

1. Small samples of seed mussel collected from the dredge fishery off Wicklow Head in 2007 were aged: 0-group, 3.0%, 1-group, 84.8% and 2-group, 12.1%.
2. Approximate quantities of seed-mussel removals (provided by Terence O'Callaghan and Herbie Denis, BIM) correlate closely with whelk biomass in the south west Irish Sea (Fig 7). Seed removals and whelk biomass both trend in the same direction and the correlation between them is not consequential; neither the biomass of whelk nor the yield of seed mussel appears to influence the productivity of the other.
3. Length frequencies of whelk removed indicate the dredge fishery take smaller individuals than the pot fish-



ery (Fig 8). Age frequencies of dredged whelk were 2-group, 16.4%, 3-group, 30.2%, 4-group 29.7%, 5-group, 14.9%, 6-group, 4.2%, 7-group, 1.4% and 8-group, 0.3%. Thus, these animals were also substantially younger than harvested by the pot fishery.

4. There are conflicts in gear use, whelk pots are removed by dredging operations.
5. The areas in which the two fisheries operate coincide in places; the whelk fishery occupies approximately 1,800 km<sup>2</sup>, the seed mussel fishery over a decade, approximately 32 km<sup>2</sup> (Fig 9).

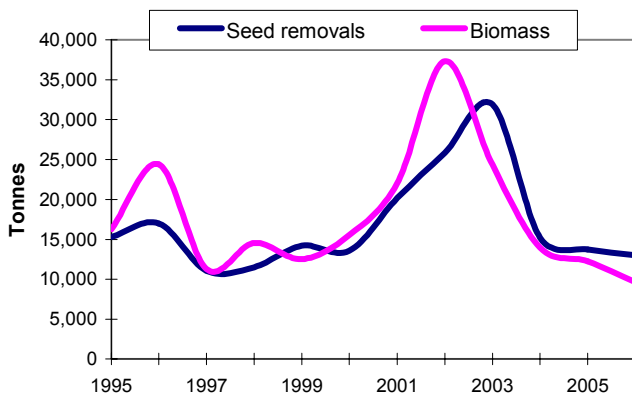


Fig 7. Seed mussel removals and total whelk biomass in the south west Irish Sea fishery, 1995-2006.

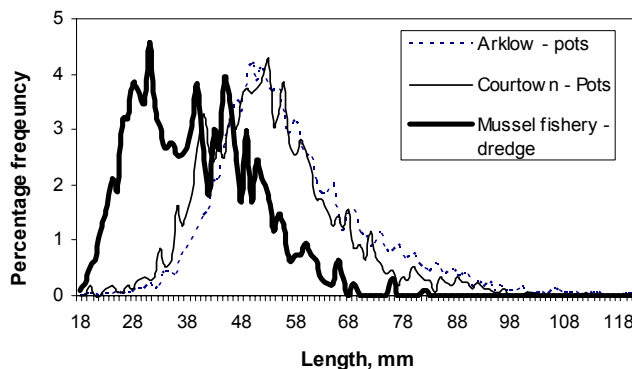


Fig 8. Length frequency distributions of whelk from the pot fisheries landing into Arklow and Courtown, compared with similar data from the seed mussel dredge fishery.



Seed mussel dredgers at work off Wicklow Head, June 2007

6. While the seed mussel fishery can effectively remove mussel reefs which are valuable sources of biodiversity and provide an important basis for the food chain of fin fish and are probably also significant nursery areas for juvenile whelk, the influence of dredged areas on the south west Irish Sea whelk stock must be limited to whelk patches coinciding with mussel reefs because whelk do not have a planktonic stage and are sedentary.
7. It is suggested that productivity of both is controlled by a common factor, possibly an environmental regulator.

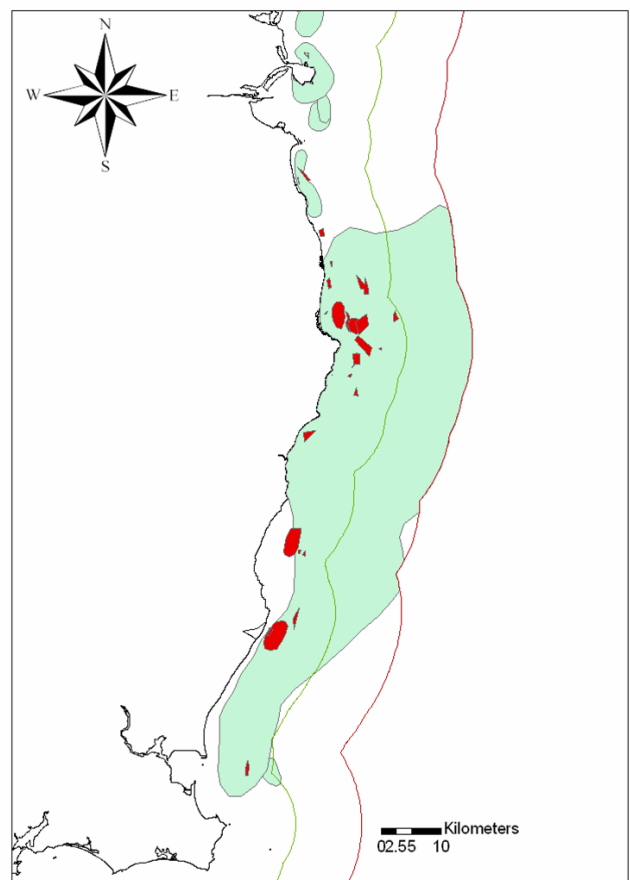


Fig 9. The distribution of seed mussel patches (red) and the extent of the whelk fishery (green) in the south west Irish Sea fishery.

# Northern (Cape) Whelk fishery

Division VIa

## FSS – ADVICE

**FSS advises that the size limits imposed on whelk fisheries by national and European measures should be strictly enforced. Buyers should ensure that the product conforms to these requirements. Fishermen should be discouraged from exploiting nursery areas which may be identified from catches containing a high proportion of individuals of sub-legal size. In view of their importance as a food item for brown crab, consideration should be given to the possible ecosystem interactions and consequences for the crab fishery of depleting local whelk populations.**

## STATE OF THE STOCK

The status of this stock is unknown but in view of its close similarity with whelk in the Wexford and Dublin sectors of the south west Irish Sea fishery and with patches of whelk in the vicinity of Kilmore Quay (the latter being better known as a fishery for large crustacean species), the Northern fishery is assumed to be a vulnerable one, susceptible to rapid depletion and requiring a long period of recovery after being fished down.

## CURRENT MANAGEMENT

The Whelk (Conservation of Stocks) Order, 2001 (S.I. 294 of 2001) makes it an offence to have on board, tranship or offer for sale whelk that are less than 25 mm in width across the broadest part of the shell, this corresponding to an approximate length of 50 mm; the order further directs that sub-sized animals should be carefully handled and returned immediately to the water. Annex XII of EU regulation 850/98 imposes a size limit of 45 mm length, which has approximately the same effect.

## ADDITIONAL INFORMATION

1. Landings of whelk have been irregularly made from Division VIa into Greencastle, Malin, Buncrana and Burtonport from the Cape grounds (Figs 1 and 3) since 1991. In 2003 exploratory fishing of whelk was undertaken on the Cape grounds; commercial interest in this fishery has been intensified by the depletion of stock in the south west Irish Sea fishery in 2004.
2. The Northern fishery consists of whelk which are thick shelled, as opposed to the thin shelled animals which are harvested in the southwest Irish Sea. Thick shelled whelk typically occur in crustacean fisheries and the largest Irish brown crab stock occurs in Division VIa.
3. The exploited animals have few juveniles and under-sized among them (approximately 6.1 and 6.7% by number were beneath the size limit in landings examined in 2003 and 2004 respectively) although sam-

ples examined in 2007 contained >12% juveniles (Fig 10). Otherwise the length frequency of landings examined in 2007 was very similar to that of whelk in the Donegal fishery in 2005. Few under-sized whelk indicate either the industry is complying with conservation regulations (smaller whelk being sieved out and discarded) or that the rate of recruitment is relatively slow.

4. The exploited Northern Stock is fully recruited at 5 years and had a mortality coefficient (Z) value of 0.3162 in 2007 which had increased from 0.25 in 2004.
5. The quantity of landings in 2006 was similar to that in the previous year.

### Sources of information:

Small scale fisheries in Europe, contract No FISH/2005/10

Fahy, Edward, Suzanne Grogan, Jennifer Byrne and Jim Carroll (in press) Some thick shelled whelk *Buccinum undatum* characteristics and fisheries in Ireland. Fisheries Bulletin.

Fahy, Edward, Jim Carroll, Margaret O'Toole, Claire Barry and Lee Hother\_Parkes (2005) Fishery-associated changes in the whelk *Buccinum undatum* stock in the southwest Irish Sea, 1995 -2003. Irish Fisheries Investigations No 15: 26 pp

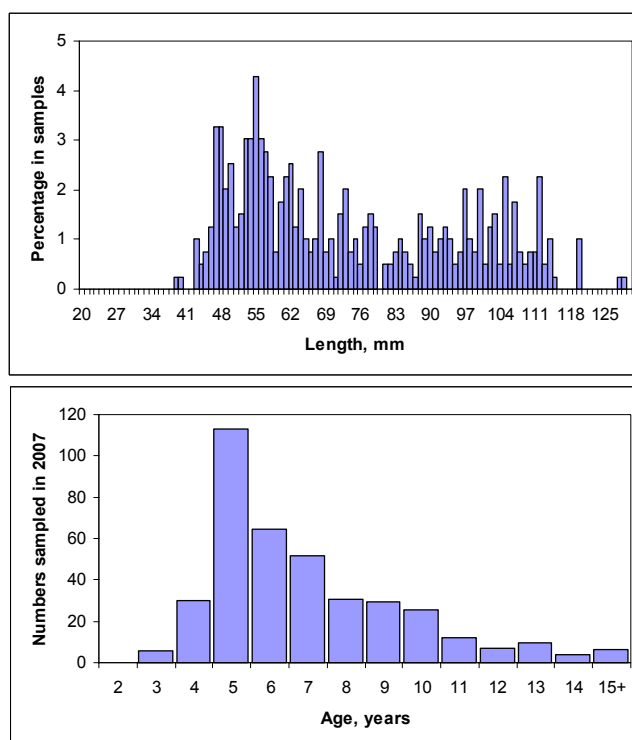


Fig 10. Percentage length frequency of whelk landed into Co Donegal from the Cape fishery in 2007 (above); and (below) the age frequency of these animals using an ALK devised in 2004.

# Periwinkle on all Coasts

## (Sub-areas VI and VII)

*Littorina littorea*



Fisheries Science Services



Periwinkle gathering coastline, Sligo.

### FSS – ADVICE

**FSS advises that a size limit should be established and enforced in a way which ensures undersized animals are not removed from the sea shore. Consideration should be given to establishing a close season in the months of June and July or from May to August when high temperatures cause mortalities. Consideration might also be given to a close season between January and April when spawning is taking place.**

### STATE OF THE STOCK

- Periwinkle populations should be regarded as stock-lets rather than belonging to a single stock unit. There is no assessment of any of these hence the state of the resource is unknown.
- A frequent complaint about the quality of landings in recent years suggests that too many juveniles are gathered. Landings have been declining; they are currently one third of their level less than a decade ago. That said, there is considerable variability in the production of different areas of coastline which might indicate local over-exploitation.
- An added complication to evaluating this species is the ageing population of gatherers which harvest these gastropods so that decreased local harvests might simply indicate a lack of interest.

### CURRENT MANAGEMENT

This is an open access fishery. The only regulation which applies to it is the EU directive on shellfish hygiene (91/492 E.E.C.).

### ADDITIONAL INFORMATION

1. The periwinkle fishery had landings of 1,232 tonnes in 2006, an improvement on 1,066 t in 2005, with an estimated first sale value of €1.663 m. Landings in 2005 had been the lowest since 1973 (Fig 1).
2. Periwinkles are gathered on virtually all Irish coasts to supply an export trade to the United Kingdom, Belgium, the Netherlands, France and Spain.
3. Annual landings of periwinkle fell from 2,400 tonnes in the 1970s to 1,600 t in the following decade. They increased again in the 1990s but have tended downward since mid-decade. There are too many unknown factors to state whether this trend is a cyclical phenomenon.
4. Wholesalers report a decline in the quality of landings, indicating too many small animals are gathered.
5. The price for periwinkle has increased more than for any other shellfish over the past decade.
6. The contribution of different areas of coastline has varied from time to time. The western seaboard (counties Sligo, Mayo, Galway and Clare) remains the most important producer of this gastropod.
7. A number of unquantifiable factors may contribute to the crude performance indicators of this fishery but changes are known to be taking place in littoral ecology at present and this important species should be regularly monitored.

**Source of information:** Cummins, V., Coughlan, S., McClean, O., Connolly, N., Mercer, J., and Burnell, G. (2002) An assessment of the potential for the sustainable development of the edible periwinkle, *Littorina littorea*, industry in Ireland. Marine Institute, Marine Resource Series, No 22, 79 pp.

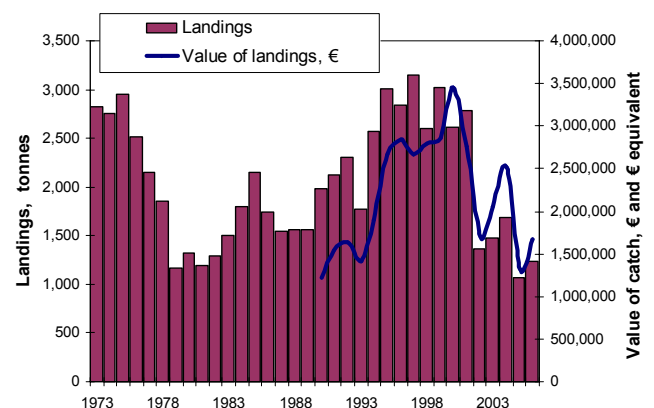


Fig 1. Landings of periwinkle (1973-2006) and their total first sale value (1990-2006). Source, DAFF.

# Common Cockle in the Irish Sea

## (Division VIIa)

*Cerastoderma edule*



Fisheries Science Services

### FSS – ADVICE

FSS advises that the cockle fishery urgently requires a management initiative which recognizes the inherent restrictions on exploitation imposed by European conservation legislation in Special Areas of Conservation and Special Protection Areas. A number of regulations have been introduced to this fishery since 2006 and while these are welcome they must be enforced. They do not address the conservation requirements of the enclosed coastal waters which support cockle stocks; many cockle strands in Britain and Ireland are officially recognized as significant food sources for migratory wading birds. There is a need to cap fishing effort which has been rapidly expanding in the most important fisheries, Dundalk Bay and Waterford Harbour, although enforcement of the new regulations would have the effect of reducing effort. Certain harvesting methods are potentially damaging probably resulting in loss of juvenile cockles by serially discarding the same animals. There is a need to evaluate and further regulate harvesting practices.

A number of initiatives in cockle management have been used elsewhere, notably in the UK and the Netherlands, and their implementation should be considered in order to secure conservation objectives, consistent with SAC and SPA requirements. They include periodic closures and rotation of fishing areas and regulation by TAC. The new regulations have the potential to attain some of those goals.

The polyvalent system of licensing vessels together with the existence of special (bivalve) licences means that capping effort is problematical. Conserving and managing stocks which are being exploited by a variety of fishing methods requires constant monitoring, evaluation and adjustment of fishing effort to ensure the conflicting objectives of wading bird conservation, harvesting and the minimisation of by-catch mortality are reconciled.

FSS have concerns that transplantation of small cockles may be taking place from nursery areas and places where the growth rate is low, for on-

growing, to fisheries outside the jurisdiction. If such activities take place they should be subject to the same survey, harvest and movement regulations as currently apply to the seed mussel fishery (cf: DCMNR policy document 2004).

FSS strongly recommends that the measures which have been introduced should be enforced and monitored.



Cockle dredgers in Dundalk Bay

### STATE OF THE STOCK

In recent years the status of cockle stocks has altered rapidly. In Dundalk Bay, the principal fishery, the stock was so depleted that the fishers concerned voluntarily closed it in 2006. Most of the landings in 2006 originated in Waterford Harbour. Following a period of closure in 2007, Waterford Harbour was reopened under a new regulatory regime. A management regime was also introduced in Dundalk Bay in 2007. Thus, while annual landings of cockles to Ireland appear not to vary much from in recent years, their origin is substantially different from one year to another (Fig 1).

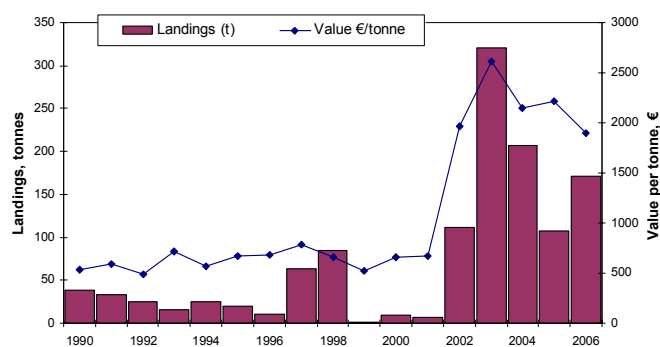


Fig 1. Annual landings to Ireland and first sale price per tonne of cockles (Source DAFF and BIM).



## CURRENT MANAGEMENT

- EC Directive 79/223 which specifies that water quality in areas from which bivalve shellfish are harvested should be of a certain standard applies generally to waters from which all bivalve species are dredged.
- A number of measures have been introduced since the previous stock book was published concerning the management of cockle fisheries.
- The Cockle (Fisheries management and conservation) regulations, 2007 [S.I. No 269 of 2007], published on 15 June 2007, closed the cockle fishery in Dundalk Bay until 15 July 2007 while a management regime was devised.
- The Cockle (Fisheries management and conservation) (Dundalk Bay) regulations 2007 [S.I. No 532 of 2007] introduced a suite of conservation regulations for Dundalk Bay. The distribution of fishing areas in Dundalk Bay is shown in Fig 2. The thrust of S.I. No 532 is to divide the area into four control “boxes” in which harvesting would be regulated (Fig 3). Fishing can take place only at certain times of day, daily landings per vessel must be less than a certain weight, there is a size limit on cockles which can be removed (sub-sized must be returned to the water where they have been captured) and there are restrictions on the type of gear to be used. Finally, there is a requirement to report landings; such a regulation already exists in the format of a gatherers’ docket but, hitherto, that has not been enforced.



Fig 2. The distribution of cockle fishing (indicated by open circles) in Dundalk Bay (from Fahy et al, 2005)

- The Cockle (Fisheries management and conservation) (Waterford Estuary) regulations 2007 [S.I. No 531 of 2007] introduced on 27 July 2007, a suite of conservation regulations for Waterford Harbour. The consequences of these should be similar to those of the regulations for Dundalk Bay and two harvesting areas are identified in the S.I. (Fig 4).

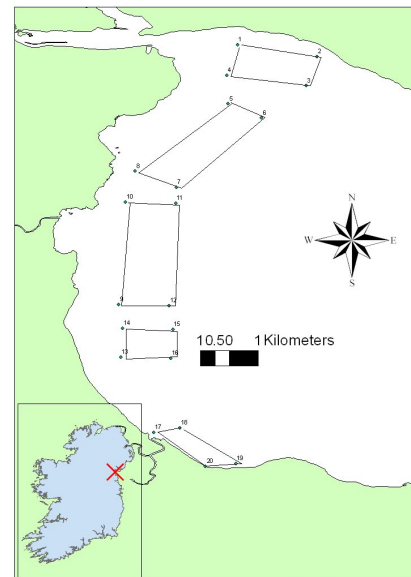


Fig 3. Regulatory divisions of Dundalk Bay as set out in S.I. No. 532.

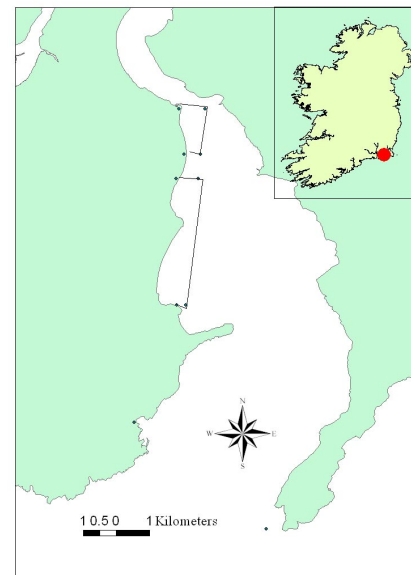


Fig 4. The distribution of cockle fisheries (rectangular “boxes”) in Waterford Harbour in S.I. No. 531.

- The Cockle (Fisheries management and conservation) (Tramore Bay) regulations 2007 [S.I. No 533 of 2007] placed a ban on the harvesting of cockles, other than by picking and hand raking for private consumption, within Tramore Bay. This is wholly desirable and in the general interests of conservation because the Back Strand in Tramore is a significant habitat for wading birds. The cockle stock is of limited distribution, slow growth and high density. Observations on it were provided in the Stock Book in 2006. Its small size would ensure its rapid depletion were commercial harvesting methods applied there.

## ADDITIONAL INFORMATION

1. Landings and values per tonne of cockles to Ireland are given in Fig 1. Cockles are widespread in Ireland

at low density but in recent years the majority have been harvested in Dundalk Bay (in 2005 98% of all landings came from this fishery) and the recent development of an organized fishery there has both increased the tonnage put onto the market, ensured a more consistent supply of product and raised the price; Dundalk Bay cockles are of high quality. The collapse in the Dundalk Bay fishery in 2006 dispersed some of the fishing effort to Waterford Harbour where FSS have assessed one of the cockle patches. Similar data from Tramore Co Waterford where a small stock is harvested by picking and raking are also presented for comparison (Stock book, 2006).

2. Fishing for cockles is carried on mainly by suction dredging (box dredging and hand raking are also practised) close inshore where some of the grounds are briefly accessible only at the highest spring tides. Landings in 2004 showed a decline on those in the previous year. At the time a problem was anticipated with serial discarding which, it was stated, would damage juvenile and undersized discards and was likely to have long term consequences for the stocks.
3. The latest interest in commercial fishing in Dundalk Bay is traced to 2001 when 3 vessels dredged almost 9 tonnes; the following year an estimated 2-3 boats and a small artisanal rake fishery accounted for almost 169 tonnes. In 2003 the number of dredgers rose to between 8 and 10 and landings of 177 tonnes were recorded from these. The concentration of fishing effort (some of it coming from the purchase of new vessels and the conversion of existing ones for cockle dredging) required that these boats relocate elsewhere once the Dundalk fishery collapsed. Much of the effort displaced to the south east of the country.
4. The southern patches of cockles are characterised by being small and having very high densities (up to 600 – 800 per m<sup>2</sup>) which contrast with the low densities reported from Dundalk Bay. Their growth rates are consequently low and the quality of the product is poor by comparison with Dundalk Bay.
5. Preliminary estimates suggest that approximately 171 tonnes of cockles were removed from Waterford Harbour in 2006 (Source: John Hickey, BIM).

6. The transport of small cockles has been reported from Dundalk Bay and Waterford Harbour for on-growing outside the State. It is not been possible to verify these.
7. Over the past year efforts have been made to ensure that only licensed vessels work in this fishery but the fact that a polyvalent licence is sufficient for a dredger, allied with the existence of large numbers of “special” bivalve dredging licences is unlikely to dampen effort.
8. Initiatives are under consideration to set aside small areas of Dundalk Bay for mariculture which, in a public fishery, are unlikely to be as effective as restricting fishing to certain parts of the Bay.
9. Two European Community Directives which are relevant to development in the Bay have been enacted. Council Directive 79/409, EEC, the Birds Directive, designated Dundalk Bay an SPA (Special Protection Area), because of its international importance as an over-wintering area for migratory birds. The Directive seeks to protect the environmental qualities of the Bay and to prevent disturbance of feeding birds. Council Directive 92/43, EEC, the Habitats Directive, also applies to the Bay which has been designated a cSAC (candidate Special Area of Conservation). Exactly how these directives (92/43 weakens some of the provisions in 79/409) will affect the cockle fishery has yet to be discovered. However, the implementation of a conservation regime in this Bay is likely to reduce the permissible harvest: one estimate has given the biomass of cockles required to support winter migrant birds in a particular year as 1,500 tonnes.

#### **Source of information.**

Edward Fahy, Jim Carroll and Sean Murran (2005) The Dundalk cockle *Cerastoderma edule* fishery in 2003 – 2004. Irish Fisheries Investigations No 14: 16 pp.

# Surf Clams on North, South and West Coasts

## (Sub-areas VI and VII)

*Spisula mainly solida*



Fisheries Science Services



### FSS – ADVICE

**FSS advises that the minimum size limit for this species should be enforced. There is little incentive for not doing so because smaller animals obtain very low prices. However, such is the state of dredge fisheries at present that even sub-sized animals find a market. Species like surf clams form small beds that would ideally be managed locally by fishermen who exploit them when an optimal size has been reached. Administrative arrangements might be usefully directed at fostering the circumstances in which co-operative enterprises of this kind flourish. Successful management however requires that agreed arrangements are enforced.**

**Surf clams are easily aged so that occasional surveys should serve to predict when harvesting is appropriate. A simple box dredge is the ideal way to exploit these animals although repeated dredging of a bed will cause mortalities among non-target age and size groups. FSS advises that appropriate dredge bar spacing is introduced and that dredges are not overloaded to the point where the sorting mechanism does not operate.**

**The limited circumstances in which surf clams proliferate are vulnerable to environmental change, particularly to harbour and channel dredging operations when spoil clogs the interstices of the coarse sand in which the clams live and this should be noted where EIAs are being compiled.**

### STATE OF THE STOCK

*Spisula* fisheries exist as isolated stocklets. With the exception of one, all of those examined to date had previously been exploited and the growth curves of the animals displayed characteristics of fished, some of them heavily fished, populations. This resource is a relatively limited one on which excess capacity from other dredge fisheries is being directed.

### CURRENT MANAGEMENT

- The only management measure is an EU regulation (Annex XII of 850/98) specifying a minimum size limit of 25 mm in length. Some attempts have been made to manage these fisheries locally by fishermen staying away from beds while they recover from heavy exploitation or beds which have had a large recruitment which is still below harvest threshold size.
- Harvesting of *Spisula* is permitted only in waters whose quality is specified in Council Directive on the quality required in shellfish waters 79/923 EEC.

### ADDITIONAL INFORMATION

1. Small *Spisula* landings were recorded by DAFF in 2006; local enquiries from Waterford Harbour suggest that approximately 45 tonnes were landed (source: John Hickey, BIM); The first sale price suggested by DAFF is reported here (Fig 1). The value of the fishery in 2006 was approximately €107,100.

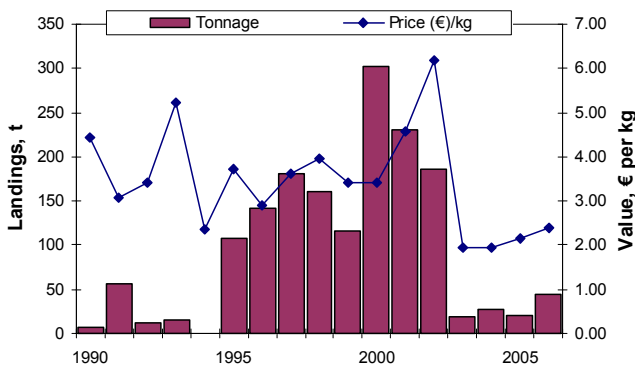


Fig 1. Landings and first sale value (€ per kg) of surf clams in Ireland, 1990-2006.

2. When last assessed, in 2005, the clam bed in Waterford Harbour consisted mainly of 4 and 5-year old animals which are assumed to provide most if not all of the landings in 2006. There was no indication in

2005 of any subsequent large year class (See Stock Book, 2005).

3. Fisheries for surf clams developed as an offshoot of the razor clam fishery in the late 1990s. They are however largely exploited using box dredges.
4. Beds of these interstitial clams so far discovered are small in extent, c 1-2 km<sup>2</sup> or smaller. They usually occur in special circumstances of strong current and in medium or large particle size composed of shell or *Lithothamnium* sand (known as *Spisula* sand) which can be vulnerable to clogging by siltation.
5. To date *Spisula solida* is the only species encountered in the commercial landings.
6. The clams have a life expectancy of up to 10 years; they reach legal size at about age 3 – 4. Most rapid growth is made in the early years and relatively little weight is added in later ones. Surf clams require fewer years in which to reach asymptotic size than, say, razor clams, so that planning a phased harvesting regime is more realistic for *Spisula*.

7. *Spisula* is easily aged using external shell sculpture and this makes verification of predictions about year class strength straightforward.
8. A disadvantage in this species (and possibly other interstitial species also) is irregular spatfalls which undermine continuity of supply. Factors which influence spatfall are unknown but the small size of the beds in which the species usually occurs is likely to be important.
9. Fisheries for surf clams should ideally be managed on a co-operative basis.
10. Clam dredges should be equipped with a bar spacing of a minimum 11 mm to accommodate the size limit.

**Source of information:** E Fahy, J Carroll, M O'Toole and J Hickey (2003) A preliminary account of fisheries for the surf clam *Spisula solida* (L) (Mactracea) in Ireland. Fisheries Bulletin No 21; 27 pp.



# King scallop and Queen scallop on all Coasts

## (Sub-area VI and VII)

*Pecten maximus* and *Aequipecten opercularis*



### Fisheries Science Services

King scallop is a typically inshore species, harvested in sheltered bays although there are also substantial fisheries for them outside 12 nm in south east Ireland (Fig 1).

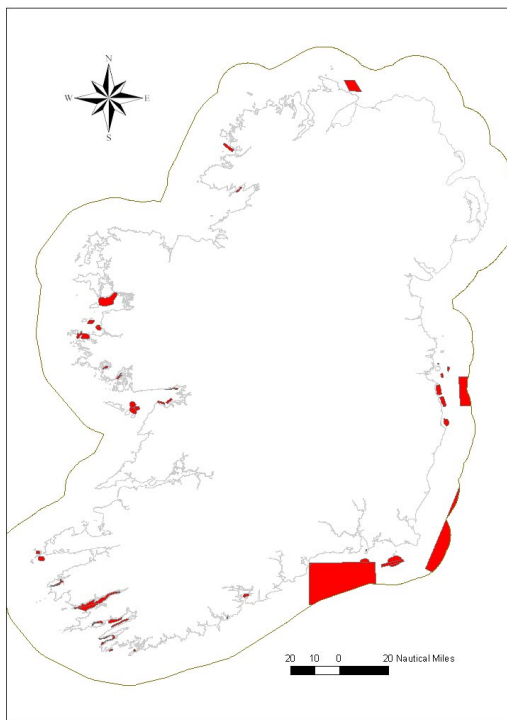


Fig 1. King scallop fisheries within 12 nautical miles around the coast of the Republic of Ireland.

King scallops are landed into more than 42 ports around the coast. Off the west and south coasts they occur as discrete stocks whose locations and extent are well known. However, access to some offshore beds is considered to be still improving. The largest concentrations of the species occur off the south east coast in the Celtic and Irish Seas (Fig 2).

The south east fishery is fundamentally different from the smaller inshore stocks. The offshore south east beds are exploited by vessels of 17-36 m towing up to 36 dredges. This fishery expanded out from south Wexford inshore waters in the 1970s, moving south and eastwards into the southern Irish Sea. Following further expansion in the 1990s the fleet was harvesting from the English Channel and the west of France, south of 48°N. (Details of

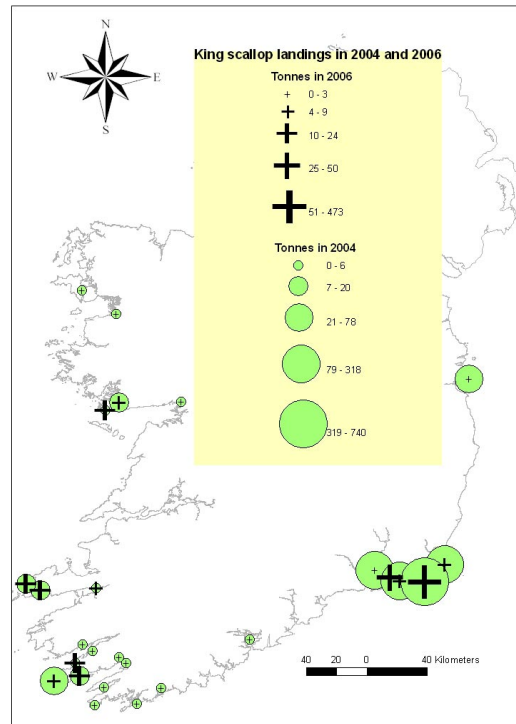


Fig 2. Landings of king scallops to ports in Ireland in 2004 (in which the highest landings since 1990 were recorded) and 2006.

these fishing grounds are provided in the Stock Book for 2003). Vessels of <600 kW tended to work inshore and vessels >600 kW offshore in the Irish Sea and the larger vessels also worked close to the coast of Britain and France. As a result of economic constraints, the size of the fishery has declined since 2003: viable fisheries were located further from the Irish coast but the duration of fishing trips to and from them reduced the quality of the product and became progressively more expensive to pursue with the rise in fuel prices.



King scallop dredgers in Kilmore Quay.

King scallop landings 1995-2006 inclusive are summarised by port in Table I. The year 2004 recorded the heaviest landings of the species and in 2006 landings were substantially lower. The price per tonne has declined since 2000 (Fig 3) but it increased again in 2006 possibly because the landings came from closer inshore and the animals were in better condition on arrival for processing.

King scallop are captured mainly by tined scallop dredge which is destructive of other marine invertebrates and habitat. Some are taken by beam trawl (Tully et al,

2002), fewer by otter trawl while gill nets and mid-water trawls have been known to make some landings.

The fishery for queen scallop takes the species as a by-catch in otter trawls rather than dredges. Landings have been increasing recently and in 2006 reached a maximum of 276 tonnes since 1990 valued at €193,000. (Fig 4) Landings are made mainly from the Malin Head and southern Irish Sea fisheries. First sale price per tonne has been declining since 1999.

Table I. Landings of king scallop (t) by Irish vessels, 1995 - 2006. Source, DAFF

Port	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Totals
Achill				1						1	0		1
Arklow	2			2	13	12			1				29
Ballycrovane												24	24
Baltimore	-				0				4	1		1	7
Bantry	2							3	5	6		2	18
Carna							5		25	3	15	20	68
Castlegregory							0						0
Castletownbere							3	1	25	20		14	62
Crosshaven				1									1
Cleggan			1										1
Cobh	1	1	2	1	1	1	1	2	2	2	9	1	23
Duncannon	1			-	60	117	74		4	78	149	50	531
Dingle				14	69		64	12	15	9	9	13	206
Downings							38	53					91
Dunmore East	148	89	169	33	292	198	72	44	71	158	73	9	1,356
Dunmanus								3	5	2		1	10
Fenit													-
Galway					0						0	1	1
Garrish/Travara							1			60		5	66
Glengarriff								1	1	3		2	6
Goleen/Crookhaven										2		1	3
Greencastle					1	5	23	36	14				78
Helvick					-	-							-
Howth	8		0	53	137	78	62	75	102	62	0	0	578
Kenmare							0	1	34		6	5	46
Killybegs						1							1
Kilmacalogue												2	2
Kilmore Quay	0	249	337	452	746	870	369	608	815	740	590	473	6,247
Rosslare	2	-	2	4	6	82	356	100	102	318	38	7	1,017
Rosaveal		0	6	12	38	-	35			9	2	6	108
Sneem							3	6		6			15
Schull									4				4
Tully/Renvyle							0						0
Unionhall												1	1
Valentia							14		18	11	16	13	71
Waterford	11	4	12	9	91	31	20	76	53	152	42	3	503
Westport							6					1	7
Wicklow				3			1						4
France									5				5
UK		-	0	11	38	13	262	119	482	633	322		1,879
Netherlands										76			76
Spain									0				0
Belgium									2	81	37		120
Totals	174	342	529	594	1,490	1,408	1,410	1,139	1,788	2,431	1,307	654	13,267

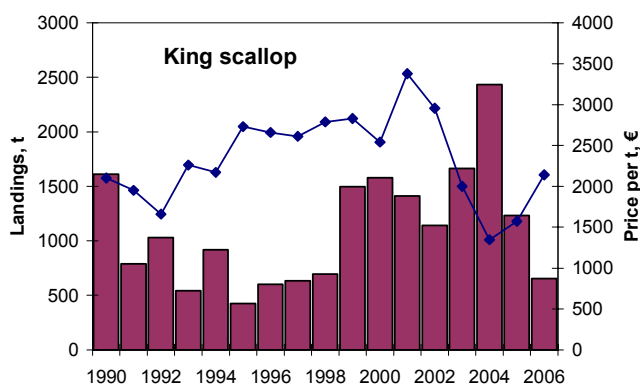


Fig 3. Landings and first sale value of king scallops to the Republic of Ireland

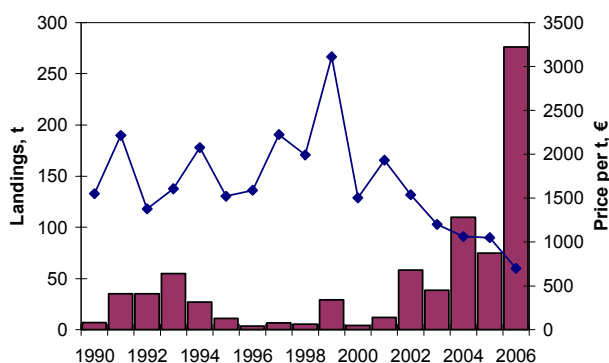


Fig 4. Landings and first sale value of queen scallops to the Republic of Ireland

## CURRENT MANAGEMENT

### KING SCALLOP

#### Effort regulations

Area VII, vessels > 15 m are limited to 525,012 kilowatt days at sea annually (EU regulation 2004/1415).

The effort by all vessels >10 m must not exceed 109,395 kilowatt days in the Biologically Sensitive Area defined in EU Regulation 1954/2003.

#### Effort and technical conservation measures

National legislation SI 464/2005 allows the number of Irish registered vessels >10 m to be restricted. Additional measures which may be applied include quantity of gear, total landings or days at sea.

#### Size limits

Minimum landing size of 100 mm shell width everywhere except in area VIIa where 110 mm shell width applies (EU regulation 1998/850).

#### Limited entry for vessels >10 m (Fisheries Amendment Act 2003 (No 21)).

As from 1<sup>st</sup> January 2006 it has been DCMNR policy to require a vessel > 10 m to have a track record of 50 days annually fishing scallop in the 2.5 years prior to June 2005

to be permitted entry to the fishery. Scallop fishing is defined as fishing with dredges to take landings which are made up of at least 80% scallops by weight.

#### Harvest regulations

EU regulation 2002/226 requires scallops to be tested for ASP.

## QUEEN SCALLOP

The maximum length of the shell of queen scallop must be a minimum of 40 mm to conform with EU regulation (Annex XII of 850/98).

## South east scallop fisheries

Divisions VIIa, g

### *Pecten maximus*

#### FSS ADVICE

**FSS advises that the management priority in this fishery must be the reduction of fishing effort (through reducing the number of dredges per vessel, reducing the number of boats and/or reducing the number of days at sea). Reducing the catch in the short term as through the operation of regional, individual or fleet sector quota should also be considered.**

**Higher growth rates of scallop in smaller inshore grounds suggests that these might be suitable places into which translocation of juveniles for on-growing might be attempted. Different minimum landing sizes for different stock(lets) and area closures might be conducive to higher yield per recruit.**

#### STATE OF THE STOCK

The south east fishery depends on scallops of 3-5 years old. The age structure of the stock was stable between 2001 and 2005 suggesting stable recruitment over the period. Fishing effort increased from 2000 to 2004 inside 12 nautical miles but decreased outside it. Decommissioning of large vessels in Kilmore Quay and Duncannon in 2007 is likely to benefit the stock.

#### ADDITIONAL INFORMATION

1. Survey work on the south east scallop stocks has been undertaken by BIM between 2001 and 2005.
2. Scallop growth is positively related to current strength and temperature, both of which vary spatially in the region and that, as a result, fishing mortality rates also vary spatially.
3. Higher fishing mortality rates can occur in slow growing areas and this is contrary to the effort limitation regime currently in place in the region east and west of 7° W.

- The age structure of commercial size scallops in the landings is truncated and the fishery relies mainly on animals of 3-5 y.o. . The age structure of the stock was stable between 2001 and 2005.
- Inshore effort increased from 2000 – 2004 but decreased outside 12 nm.
- The Wexford scallop fleet based mainly at Kilmore Quay but with some boats at Duncannon, consisted of some 22 vessels ranging from 17.5 to 36 m OAL. Each fished between 16 and 36 dredges. The majority had bi-valve licences, the remainder polyvalent ones. The vessels blockaded the ferry port on Rosslare in June 2007 in protest against EU fishing restrictions which affected their activities. The following month a decommissioning scheme was announced to remove 25 whitefish boats from the fleet.

#### Sources of information:

Oliver Tully, Antonio Hervas and John Hickey (2002) Fishing activity and stock assessment of scallops off the south east coast of Ireland 1995-2002.

Antonio Hervas, Oliver Tully, Eimear O'Keeffe and John Hickey (2006) The king scallop (*Pecten maximus*) fishery: analysis of the resource in 2004-2005.

Outside Division VIIa, scallop landings are irregular and in only one have they reached 119 tonnes between 1995 and 2006 inclusive (Fig 5). There is no information on Division VIIb.

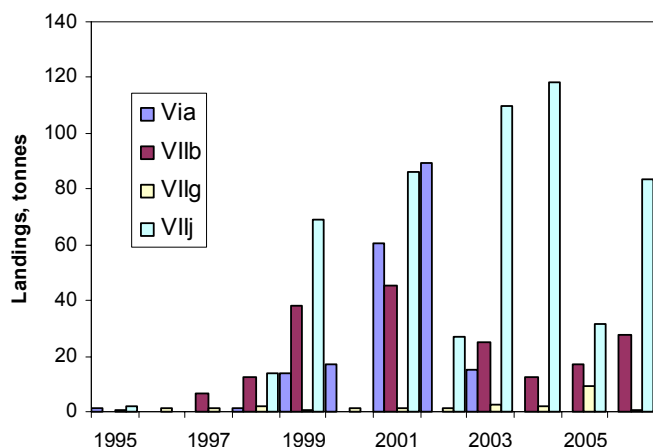


Fig 5 Annual landings sourced mainly in ICES Divisions other than VIIa.

## South west scallop fisheries

Divisions VIIj.

*Pecten maximus*

### FSS ADVICE

**FSS advises that management objectives be established for local fisheries in this area. Effort should be constrained until it can be established that the fishery can sustain its expansion. Small closed areas may be the most appropriate management tool.**

### STATE OF THE STOCK

Preliminary assessments in 2002 suggested a local was fully exploited. Other than that the state of these stocks is unknown. There are no data on recruitment in these fisheries and landings data are only recently available.

### ADDITIONAL INFORMATION

- Escallop fisheries in VIIj landed 119 t in 2004.
- Preliminary estimates of fishing mortality in 2002 indicated that  $F$  was between 0.63 and 0.68;  $F_{max}$  was 0.55 and  $F_{0.1}$  was 0.30.
- There were uncertainties in the construction of a catch curve concerning the catchability of older scallops which might have led to current fishing mortality being over-estimated.
- Yield per recruit analysis suggested that reducing fishing mortality by c 50% to  $F_{0.1}$  (a precautionary level) resulted in a 6% reduction in yield and a 50% increase in spawning stock.

## Scallop off the North Coast

Division VIa

*Pecten maximus*

### FSS ADVICE

**Further information should be sought on the biology and ecology of this stock**

### STATE OF THE STOCK

Unknown. In five of the twelve years for which data are presented in Table 1, no landings were recorded from this Division. However, in 2002, 89 tonnes were landed.

### ADDITIONAL INFORMATION

- Survey data from BIM in 2002 indicated commercially exploitable stocks north east of Malin Head in 40 –85 m of water, centred off the north and extending

eastwards on the Antrim coast. The Malin Head stock is possibly a component of a larger metapopulation whose sources of recruitment are not known.

2. In 2002 more than 60% of scallops caught were 4 – 5 years old.

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## Queen scallop in the Irish Sea and off the North coast.

Divisions VIa and VIIa

*Aequipecten opercularis*

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### FSS ADVICE

**FSS recommends the collection of further data on the biology and distribution of this species.**

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### STATE OF THE STOCK

Unknown

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### ADDITIONAL INFORMATION

1. The majority of queen scallops landed in 2002 were harvested from a new directed fishery off Malin Head (96 t were landed into Greencastle in 2004) and from the southern Irish Sea (although less than 1 t was landed into Howth and Waterford combined in 2004). In 2005, 53 t were landed into Greencastle.
2. Landings of queen scallops have been increasing since 2000 and reached a total of 276 tonnes in 2006. The first sale price has been declining since 1999 (Fig 3). In 2006 190 tonnes were landed at Downings and Greencastle.
3. Surveys conducted by BIM in 2001 recorded queen scallop in discrete patches separated by few or no scallops over a wide area in the Irish Sea.
4. Average size of queen scallop sampled was 60 mm shell height. This corresponds approximately to 63 mm shell length.
5. Recruitment was complete at 3 y.o. and animals of this age made up 45% of the catch in 2001.



# Palourde on West Coasts

(Divisions VIa, VIIb, j)

*Tapes decussates*



Marine Institute  
*Foras na Mara*

Fisheries Science Services



Palourde

## FSS– ADVICE

**FSS advises that further data should be sought on the biology and ecology of this species. A greater effort should also be made to locate and record exploitation of palourde.**

## STATE OF THE STOCK

Unknown. Occasionally strong spatfalls may have accounted for irregularities in yield of this species in the past.

## CURRENT MANAGEMENT

There is a minimum size limit of 40 mm length (annex XII of EU regulation 850/98).

## ADDITIONAL INFORMATION

1. Landings of palourde fluctuate considerably from one year to the next (Fig 1); the species is a valuable one. Between 1990 and 2001, first sale prices ranged between €3.9 and €5.6 per kg. From 2002 no landings were registered in official statistics and it is possible that small landings were. Industry sources report approximately 1.3 tonne landed in 2003 valued at €6,500. So far, only 0.5 t was traced to 2005; none was traced the following year. It is supposed that much of the exploitation of this species is for personal consumption which is not recorded in national statistics. Landings and first sale prices from 2002 are based on occasional information from industry sources.

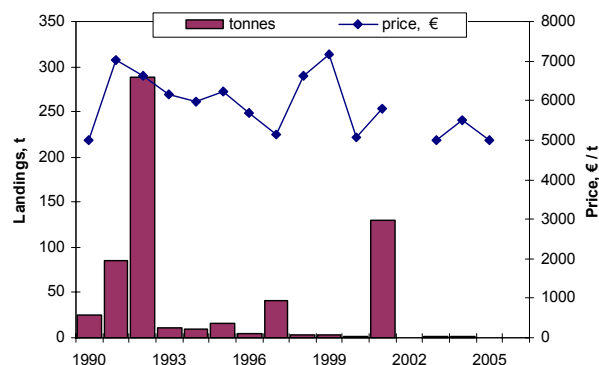


Fig 1. Extant information on the landings and first sale values of palourde in Ireland, 1990 – 2006.

Source: Department responsible for fisheries in earlier years, industry sources in later.

2. Palourde are interstitial bivalves which are dug out of the sand.
3. Growth data were obtained from commercial samples in 2003. The calculated growth curve at the time puts  $L_{inf}$  at 47.1 mm, not far above the minimum size limit of 40 mm length.
4. The apparently declining status of palourde prompted an investigation by FSS in association with Taighde Mara Teo and others which has identified a number of locations in Cos Cork, Kerry, Galway and Donegal from which palourde used to be harvested (Fig 2). Whenever it is convenient to do so, surviving patches of the species have been sampled to establish its density, growth rate and age structure and to ascertain the nature of the substratum supporting the population.
5. Patches of palourde have invariably been very small (Stock Book for 2006) and isolated. They are long lived and their growth rates have not been found to differ dramatically from one patch to another.
6. Age classes represented in the commercial landings ranged between 2 and 16. Before age 6 they were probably not representatively sampled. Our surveys have so far obtained fewer than 10 0-group animals.
7. At least one population which was examined in 2006 was in an area otherwise seriously affected by the *Karenia* outbreak in that year<sup>1</sup>; the densities of palourde within it and their age structure suggested they had not been adversely affected. Palourde had been considered a candidate mariculture species in the 1960s partly because of its ability to survive stressful environmental conditions in which other shellfish species could not live.

8. Palourde locate high on the shore, compared with other interstitial bivalves. They occupy relatively coarse coarse aggregate (Fig 3).
9. In a number of locations previously known to support palourde beds the populations have been killed off by, in one instance, road widening and in others by harbour developments.

#### Sources of Information:

<sup>1</sup> Silke, J., O'Brien, F. and Cronin, M. (2005) *Karenia miki-motoi*: an exceptional dinoflagellate bloom in Western Irish waters, Summer 2005. Marine Institute. Marine Environment and Health Series No 21, pp 48.

Partridge, J.K. (1977) Studies on *Tapes decussatus* (L.) in Ireland. PhD thesis. NUI Galway.

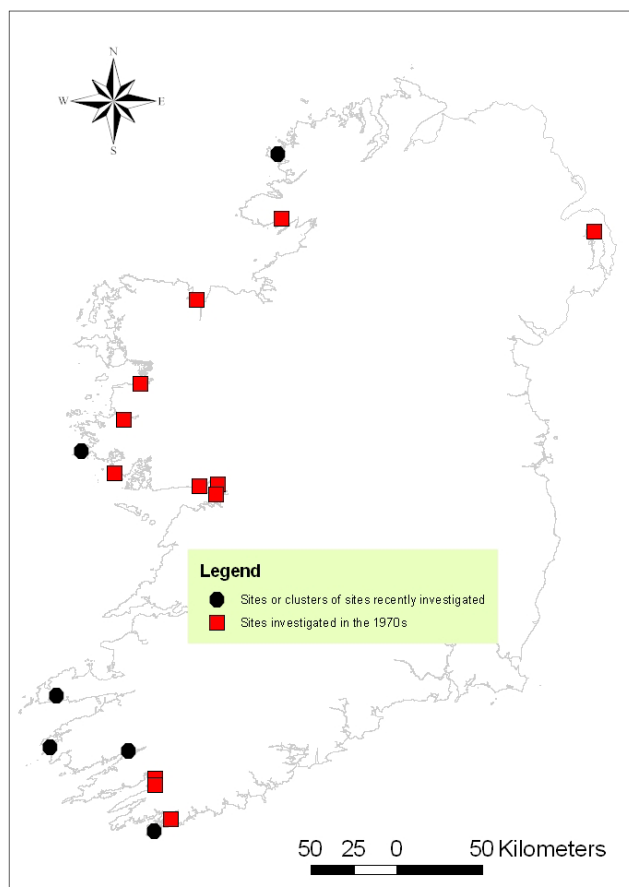


Fig 2. Sites at which the occurrence of palourde was examined in the 1970s and in recent years.

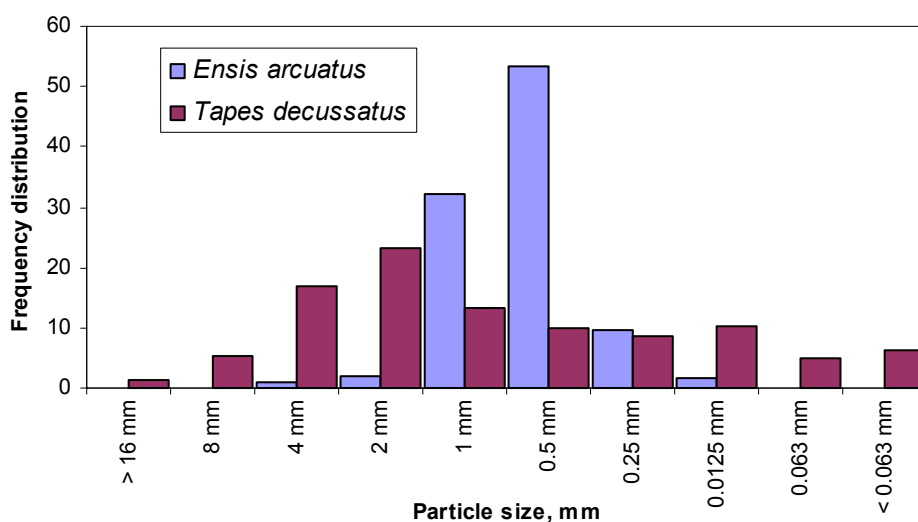


Fig 3. Particle analysis of sediment containing palourde and, for comparison, the razor clam, *Ensis arcuatus* which favours coarse (*Spisula*) sand.

# Razor Clams

(Mainly Division VIIa)

*Ensis siliqua*



Marine Institute  
*Foras na Mara*

Fisheries Science Services



Dead razor shells on a beach adjoining a hydraulic dredging operation.

Razor clams in Ireland are typical k-strategy species: long lived, slow growing, late maturing and well adjusted to their environment. Investigations in the north west Irish Sea suggest that exceptionally large spatfalls are occasional rather than the norm although small recruitments occur probably every year. Such populations can display stability over a long period but exploitation can rapidly destabilise them and frequently results in population decline. Methods of harvesting have improved in recent years, but they need to be reviewed and controlled to limit incidental damage to associated fauna as well as to target species. Many razor clams are discarded as a result of damage caused by hydraulic dredging. The market for razor clams is small and there is a case for restricting landings at times when demand is low in order to raise prices and to prevent dumping of unsold product. Razor clams could be a high value product but maximising their value requires a more sophisticated approach to both harvesting and marketing.

## FSS– ADVICE

**FSS advises that special and urgent consideration should be given to devising a management plan for razor clams. Controls in these fisheries should include closed areas and fallowing periods. To monitor progress in this and other bivalve fisheries, a combined logbook/gatherer's document should be introduced and its use should be enforced.**

**FSS considers that the prohibition on diving for razor clams should be reviewed. Divers would be more selective in what they take back to the surface and they would cause less disturbance to the substratum. Divers would also take a more marketable and less stressed animal from soft substrata where dredging can cause considerable damage to the shellfish. Harvesting by divers would improve the prospect of depuration.**

## STATE OF THE STOCK

Currently, there are virtually no landings to the west coast, the smaller beds there having been depleted. The east coast beds of *E. siliqua* in class A waters had been fished down to point where harvesting became uneconomic. Improving capture technology enabled some of the beds to be revisited. In the early years of this fishery (1997–1999) it was feasible to trace all landings from the Gormanstown bed which was the only one open to exploitation; since then, other areas have been opened to harvesting some of them in waters of poorer quality from which shellfish must be cooked before export.

The Gormanstown bed has been monitored for seven years in the course of which it was dredged continuously. The nature of the interstitial community has changed considerably in the meantime and other species have achieved numerical and biomass dominance over *Ensis siliqua* which had been almost a monoculture when exploitation of the bed commenced (See Stock Book, 2006). The age structure of the razor clam stock at Gormanstown is considerably younger now than when exploitation began (Table 1).

## CURRENT MANAGEMENT

Razor clams are subject to size limit by EU regulation (Annex XII of 950/98). The minimum size is 10 cm. Harvesting of razor clams is permitted only in waters whose quality is specified in Council Directive on the quality required in shellfish waters 79/923 EEC. Licensed polyvalent vessels or those having a special bivalve licence are permitted to dredge razor clams. Unlicensed vessels also do so. The principal beds for *E. siliqua* on the east coast are enclosed within the limits shown on Fig 1. There is no attempt to regulate exploitation.



Table 1. Analysis of the percentage age composition of *E. siliqua* at Gormanstown. There was no sampling in 2003. Age groups  $\geq 10\%$  are shaded. The 2+ group in 2000, arising from a spatfall in 1998, is marked with a border. Table from Fahy and Carroll, 2007

Age group	1998	1999	2000	2001	2002	2004	2005
1	1	6	3	1	1	3	0
2	5	6	15	3	1	9	0
3	4	8	8	3	5	3	2
4	4	7	3	4	9	4	6
5	6	8	5	8	15	6	13
6	7	6	5	8	16	11	18
7	4	3	3	4	6	6	8
8	7	5	5	7	10	9	13
9	8	7	6	9	11	12	15
10	6	4	5	6	2	5	2
11	9	7	8	10	7	9	9
12	10	8	10	10	5	8	4
13	9	7	7	9	5	6	6
14	11	9	11	11	4	6	3
15	8	6	7	8	3	3	1
<b>Total %</b>	99	100	100	99	100	100	100
<b>Numbers</b>	663	1,481	210	989	382	441	331

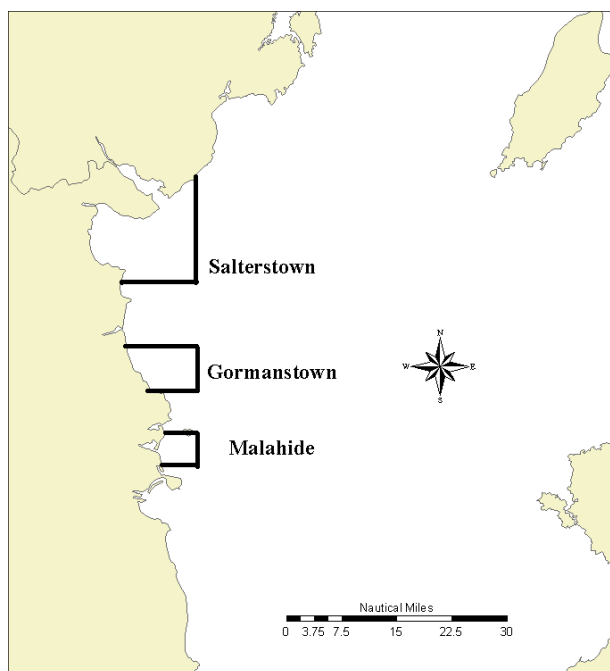


Fig 1. Regulatory "boxes" for razor clam exploitation in the north west Irish Sea.

## ADDITIONAL INFORMATION

1. Landings of razor clams in Ireland in 2006 amounted to 545 tonnes with a first sale value of €1.8 m. (Fig 2). The fishery for razor clams commenced in the late 1990s, rose to a peak in 2000 and declined, subsequently increasing again; landings in 2006 were the highest reported to date.

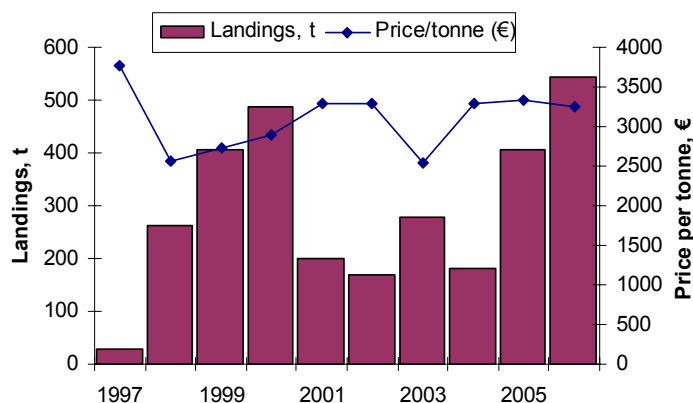


Fig 2. Landings and first sale value of razor clams, 1997-2006 inclusive.

2. Landings of razor clams from Ireland display characteristics associated with k-strategy species: they can be substantial for a period until the virgin biomass is depleted and thereafter insignificant (See Stock Book, 2006). For three years, 1999 – 2001, Ireland produced more than half of all razor clams in the north east Atlantic from the Gormanstown bed in Co Meath.
3. Three potentially exploitable species of razor clams occur in Irish waters; each has specific sediment preferences so they do not occupy the same areas. There is evidence that prolonged dredging which puts smaller particles of the substratum into suspension may result in loss of fines and this may have consequences for settlement of spat. Two species, *Ensis siliqua* and *E. arcuatus*, have contributed to the landings in Ireland, *E. arcuatus* coming from the Atlantic coast.
4. Locally, *Ensis* spp. are frequently the most abundant bivalves. Harvesting them has been carried out by hydraulic dredging and although techniques have improved since the first blade-fluidised-bed dredges were used in the late 1990s, the method still causes considerable incidental damage and disturbance to razor clams and associated fauna. Rejection and discard rates as a result of breakage and bruising have declined from the estimated 60% which used to accompany the early dredgers but the consequences of fishing by these methods are still very high although not recently precisely quantified.
5. The harvestable proportion of a razor clam bed can be as high as 90% of the invertebrate biomass.
6. Both commercial species of razor clams are long lived, longevity extending to 16 – 18 years. Growth becomes asymptotic after 10 years. The spawning period appears to be extensive although investigations have revealed there is only one spatfall per year in the case of *E. arcuatus*. Investigations on *E. siliqua* suggest that heavy spatfalls may be very rare.
7. FSS staff have made occasional observations on both west and east coast razor clam beds but most investigative effort has been concentrated on the Gormanstown bed which was the original focus of effort for fluidised-bed hydraulic dredging in 1997.
8. As in the case of most razor clam beds, razor clams at Gormanstown made up most of the biomass of the bed and their population has altered as a result of exploitation. The most significant indication of a large spat-fall

suggests it occurred in 1998 (15% of razor clams in 2000 were reckoned to have spat then). In recent years the size range of clams caught has narrowed and larger animals are becoming less abundant. The suggestion is that at Gormanstown, older age groups which were removed by dredging are not being replaced.

9. At Gormanstown the target species of the fishery, *E. siliqua*, is also being displaced by another suspension feeding bivalve, *Lutraria lutraria*. *Lutraria* is also considered vulnerable to hydraulic dredging but the shell is more robust than that of *Ensis*, hence it survives better in the midst of hydraulic dredging. *Lutraria* appears to have had a successful spatfall in 1998 which is the likely source of the majority of these clams currently in the Gormanstown bed. It is a large species and the ratio of *Lutraria* to *Ensis* biomass at Gormanstown has altered. Another, smaller bivalve, *Pharus legumen* appears to have had a successful spatfall in the same year as *Lutraria* and that is regarded as the origin of the majority of the current population of this species. Thus, opening the hard substratum of the Gormanstown bed appears to have provided opportunities for competing species to expand their populations. They have done so to the detriment of the target commercial species. A summary of these events was provided in the Stock Book, 2006.
10. A recent analysis of the market for razor clams has important implications for the management of beds in Ireland. The more valuable species for the live market is *E. arcuatus*, which is almost exclusively har-

vested on the west coast. *E. arcuatus*, harvested on the east coast of Ireland, is more suitable for canning. The report demonstrates that suppliers of razor clams to the Spanish market, the main consumer of razor clams from Ireland, are outside the EU. The Spanish trade is very seasonal: demand for fresh material is from April to August while the remainder of the year is occupied by demand for razors for canning. The average price/kg for *Ensis* for the fresh market in Madrid is approximately twice as great as that for razors which will be processed by canning. The retail price for some razor clam products in Spain exceeds €100 per kg. The current level of exports to Spain, based on market research in 2003 and 2004, suggests that c45 tonnes were exported during the period April to August to supply the fresh market and c308 tonnes in the period September – March for canning.

#### Sources of information:

DCMNR (2005) Molluscan shellfish production areas, sample points and co-ordinates for biotoxin and phytoplankton samples. Mimeo.

Fahy, E and J Carroll (2007) Consequences of hydraulic dredging for a razor clam *Ensis siliqua* (L) bed in the north-west Irish Sea. Biology and Environment: Proceedings of the Royal Irish Academy 107B (3): 115-128.

BIM (Market Development Division) European market for razor clams (*Ensis ensis* and *E. siliqua*). Appendix 2.5.1. of Sustainable harvesting of *Ensis* (Razor shellfish) – SHARE. (Ref: Interreg IIIB – Project 90).

# Purple Sea Urchin on West Coast

(Divisions VIa, VIIb, j)

*Paracentrotus lividus*



Marine Institute  
Foras na Mara

Fisheries Science Services

## FSS – ADVICE

Harvesting of this species should only be by special permit, which relate to a specific location and stock. The permit should be issued after considering the status of the stock and should specify the amount to be harvested. The operation should be supervised. This species should continue to be listed among the landings recorded by DAFF and SFPA if fishing or gathering of the species is to continue. Landings should include animals harvested for consumption or as broodstock for culture. The precise status of this species should be clarified.

## STATE OF THE STOCK

- The species is widely regarded as locally extinct in tidal locations and some pools which held this species in the recent past do not do so any longer. The extent and status of sub-tidal populations is not known.
- Recorded landings of *Paracentrotus lividus* declined from 375 tonnes in 1976 to 0 in recent years. The department responsible for fisheries did not list the species among the landings since 2001 (Fig 1); this may be due to under-recording because some, probably no more than 3 tonnes nationwide, are believed to have been harvested annually in 2002 and 2003; the trend in landings represents its depleted status.

## CURRENT MANAGEMENT

- Some protection is available to this species under S.I. No 94 of 1997 but its conservation status is otherwise unclear and it should be put on a formal protected footing.

## ADDITIONAL INFORMATION

1. This species is universally regarded as vulnerable to over-exploitation and slow to regenerate its numbers from depleted stocks. Attempts are being made to rear it artificially for human consumption.
2. Section 32 of the Wildlife (Amendment) Act, 2000, allows the Minister to make regulations excluding any species of fish or aquatic invertebrate from the provi-

sions of the Act. The Wildlife (Fish and Aquatic Invertebrate Animals) (Exclusion) Regulations, 2001 (S.I. No 372 of 2001) Part 2 lists Aquatic Invertebrate Animals which are not protected and which may be commercially exploited. *Paracentrotus lividus* is not among them. This would suggest it is a protected species. On the other hand, the species is not on the fifth schedule of the Wildlife Act (1976) which would confer a protected status. Thus it appears to occupy a no-man's land in which it is neither exploitable nor protected.

3. Within an SAC (Special Area of Conservation) the species is protected under the European Communities Act, 1972, Council Directive 92/43/EEC of 21 May 1972 (the Habitats Directive) which is transposed into national legislation by S.I. No 94 of 1997 making its commercial harvesting notifiable to a statutory authority (presumably DAFF) which gives consent to the activity; alternatively the activity should be notified to the Minister for Arts, Heritage, Gaeltacht and the Islands. However, this requirement also applies to periwinkles which are included in the Part 2 schedule of S.I. No 372 of 2001.

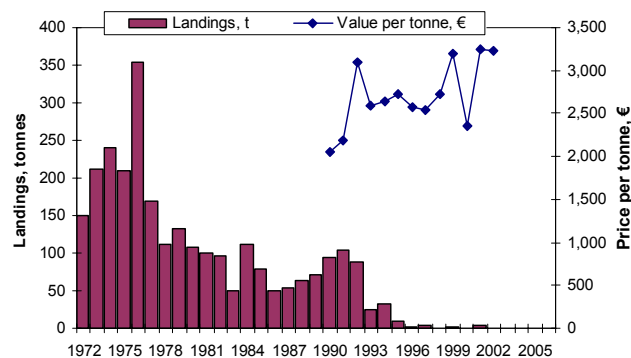


Fig 1. Reported landings (1972-2006) and first sale price (from 1990) of purple sea urchin

# Green Crab on all Coasts

## (Sub-areas VI and VII)

*Carcinus maenas*



*Fisheries Science Services*

### FSS – ADVICE

**FSS provides no advice for this species other than encouraging the collection of localised data sets on its biology and ecology and time series of population data on this species.**

### STATE OF THE STOCK

Unknown. There is likely to be a number of stocklets rather than a single stock.

### CURRENT MANAGEMENT

None to enhance its status. The removal of green crab from shellfish beds is rewarded by bounty. There are several potential market outlets for landings.

### ADDITIONAL INFORMATION

1. Green crab is a successful scavenger and predator which has a pest status in mariculture.
2. Landings of green crab in 2006, were 46 t valued at €51,000 (Fig 1). Landings and prices for this species have fluctuated considerably over the past fifteen years and this is likely to be the prognosis for its fishery.
3. Accumulated landings for the period 2003-2005 in-

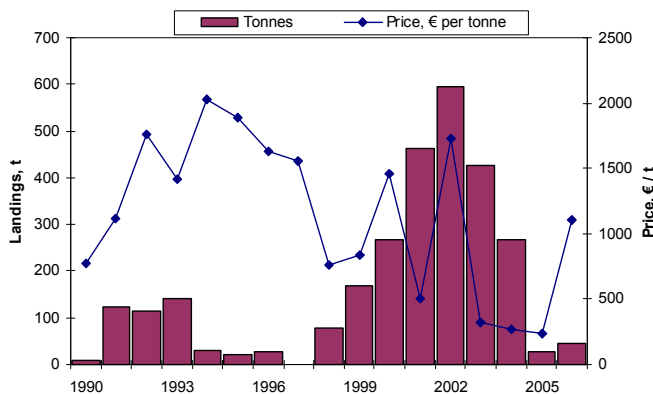


Fig 1. Landings and first sale value of green crab in Ireland in 2006 (Source: DAFF)

clusive were provided in the Stock book for 2006 which demonstrated the association of the species with estuarine conditions in which shellfish, notably mussels, are harvested. In 2006 all reported landings came from the south west (Fig 2).

4. Green crab is a successful scavenger and predator, which has extended its range in other continents where it has a pest status in mariculture.
5. The fishery for green crab expanded after 1998, reached a peak in 2002 and declined afterwards. Green crab can be used as bait in whelk fisheries. It is a source of ingredients for food processing. Anglers use newly moulted green crab as bait, particularly for sea bass which is an important predator of the species.
6. The main market for green crab is currently in France where its capacity in 2002 was estimated at 1,000 t.
7. The removal of green crab from shell fish layings contributes to better survival of juvenile bivalves. BIM offers a bounty for the removal of this species in such circumstances.

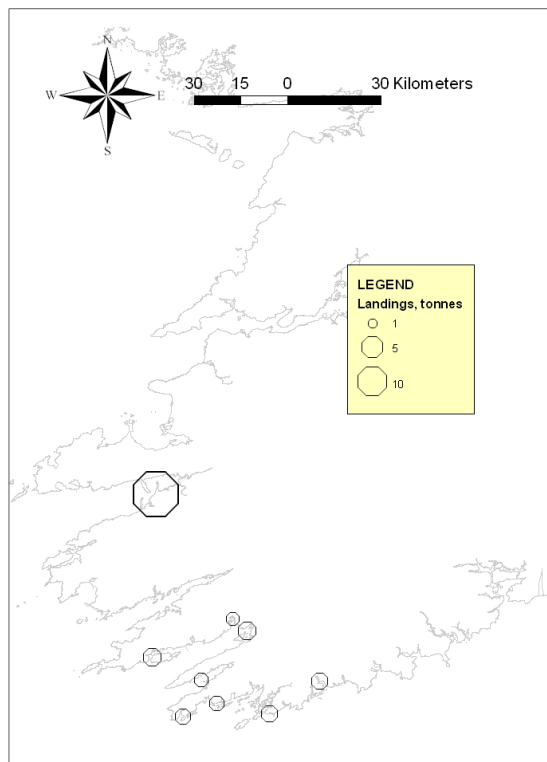


Fig 2. Location of landings of green crab in 2006 (Source: DAFF)

# Spider Crab on Mainly West and South Coasts

## (Sub-area VII)

*Maja brachydactyla*



Marine Institute  
Foras na Mara

Fisheries Science Services



Recently moulted male spider crabs

### FSS- ADVICE

FSS advises that the national size limits for this species (120mm carapace length) be enforced. There should also be a ban on the use of tangle nets to which the species is susceptible. A recent development has been the landing of male claws by vessels using tangle nets. In fisheries like Magharees, Co Kerry, the only one which has targeted spider crab in Ireland over a period of more than 20 years, there should be a cap on gear in use. Because much spider crab is unsuitable to supply a quality market, there has been a tendency to use immatures and small adults as whelk bait and this is not desirable. Strict enforcement of EU and national TCMs would eliminate the practice.

### STATE OF THE STOCK

Spider crab appear to be increasing in abundance and the range of the species may be extending northwards.

A problem for the interpretation of spider crab landings data is the fact that the species has been poorly recorded. In some years the landings of spider crab landed into one fishery, Magharees in Co Kerry, have exceeded the total tonnage recorded nationally by the Government department responsible for Fisheries.

Despite increasing fishing effort and rising landings, the fishery for human consumption is not believed to be endangering spider crab stocks. The market demands a high quality product which is available in limited quantities but adult crab are generally plentiful, in a wide range of sizes. The majority are discarded live, egg bearing females which do not reach acceptable market size are numerous and a large proportion of both sexes is not commercially worth landing; immatures tend not to enter pots and traps. Provided exploitation of

smaller animals for bait or as a by-catch in tangle nets does not inflict damage on the reproductive segment of a population, no immediate problem is foreseen other than the fact that there are inherent dangers for any fishery which depends on a single year class and this has increasingly become the situation in Magharees, Co Kerry. The significance of a decreasing trend in LPUE in Magharees is unknown.

Exploitation of this species may substantially increase with a rise in price; such a rise did take place locally in 2005.

### CURRENT MANAGEMENT

- Annex XII of EU regulation 850/98 imposes a size limit of 120 mm carapace length on this species. The Spider crab (Conservation of stocks) Regulations, 2006 [S.I. No. 236 of 2006], a continuation of a similar regulation in 2001, substituted a national size limit of 125 mm carapace length on female spider crab and 130 mm carapace length on males. Although there are good biological reasons for the national regulation, it was introduced at the behest of the industry in Magharees to ensure a product of reasonable quality for export. Outside Magharees compliance with the regulations is, at best, poor. Within the Magharees fishery compliance with the regulation depends on the state of the market: when demand is high - it is not observed.
- Local efforts have been made in Magharees to cap pot numbers in order to stabilise fishing effort. They have not been successful and without support from DAFF they are unlikely to succeed.

### ADDITIONAL INFORMATION

- In 2006 153 t of spider crab worth an estimated €156,000 were landed (source DAFF) (Fig 1). Landings of the species are fairly stable, with occasionally higher yields (1999, 2001, 2003).

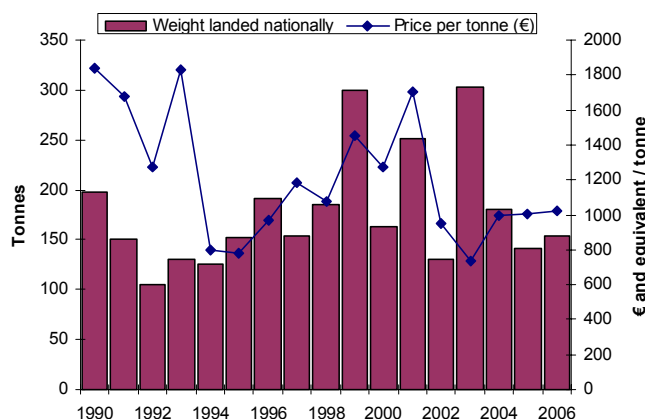


Fig 1. Landings to Ireland and first sale price of spider crab, 1990-2006.



- Although they occur on all Irish coasts, spider crab are considered to be at the northern limit of their range in Ireland and Scotland. The main fishery for them in the eastern Atlantic is in the vicinity of Galicia (north west Spain) and the Channel Islands. In Ireland, recorded landings have a southern and western emphasis (Fig 2).

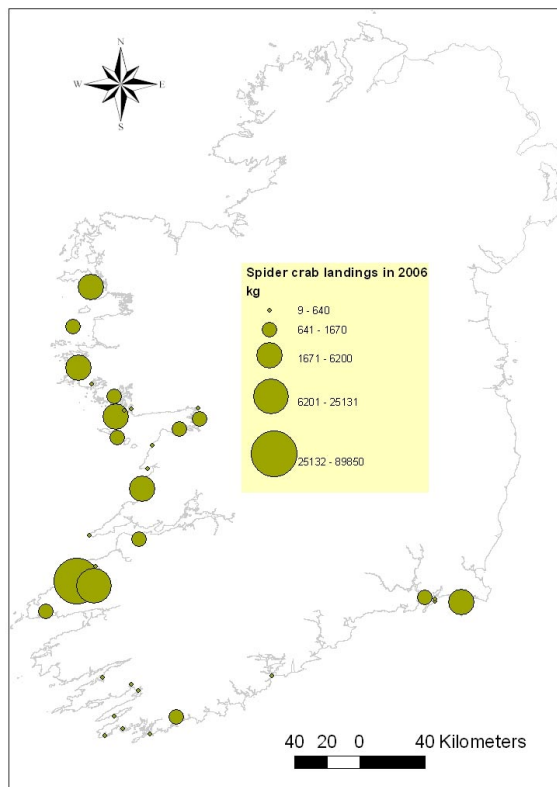


Fig 2. Recorded landings of spider crab by port in 2006 (Source: DAFF).

- The commercial problem with spider crab is their low value (compared with, say, lobster) and the absence of a home market for them. Most of those landed in Ireland are consumed in France and Spain. It can be difficult to collect sufficient animals of high quality to economically justify their transport to the Continent. Hence, the occurrence of landings may have more to do with the availability of vivier truck outlets than the actual distribution of the species. Some processing of the species in Ireland has commenced in the recent past by live export is believed to be the principal outlet for the species.
- The heaviest local concentration of spider crab in Ireland is in Tralee and Brandon Bays which together constitute the Magharees fishery. Magharees has, since 1981, provided the majority of spider crab landed and, in some years since 1990, landings from this fishery have exceeded the recorded landings for the entire country (Fig 3).
- The Magharees fishery is confined to Tralee and Brandon Bays which are shallow (Fig 4). The results of tagging work currently underway in this fishery suggest that spider crabs may be confined to these

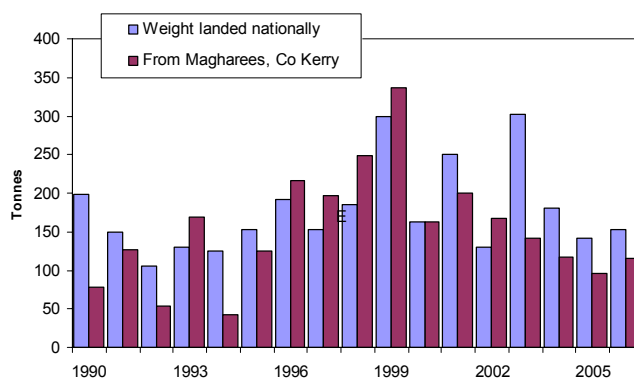


Fig 3. Recorded landings of spider crab from Magharees and nationally, 1990 - 2006 (Source: industry and Government Department responsible for Fisheries).

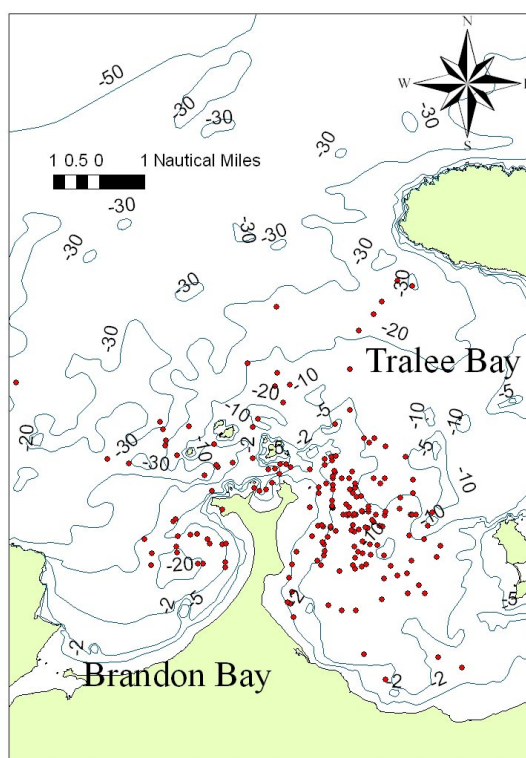


Fig 4. Tag recoveries of spider crab from the Magharees fishery to date, bathymetry added.

- bays throughout the year; so far no tag has been returned from outside the area. Fig 5 updates the locations of reported tag recoveries recorded in the course of commercial fishing; almost all were inside the 30 m and the vast majority inside 20 m isobath. Outside 50 m, brown crab becomes the dominant species.
- Landings from the Magharees were, in the first years of the fishery, until 1989, relatively high after which they declined, with the exception of a later temporary rise in yield (from 1996 to 1999). Periodic increases in yield of this kind might occur cyclically in spider crab populations but the reasons for them are unknown. The estimated effort in Magharees ranged from 3,750 pots set at the beginning of the fishery in

1981 and reaching a peak in 1997 at 10,000 pots. In 2006 the estimated effort was 7,920 pots. A crude LPUE index, expressed as the yield in kg per pot is shown in Fig 5.

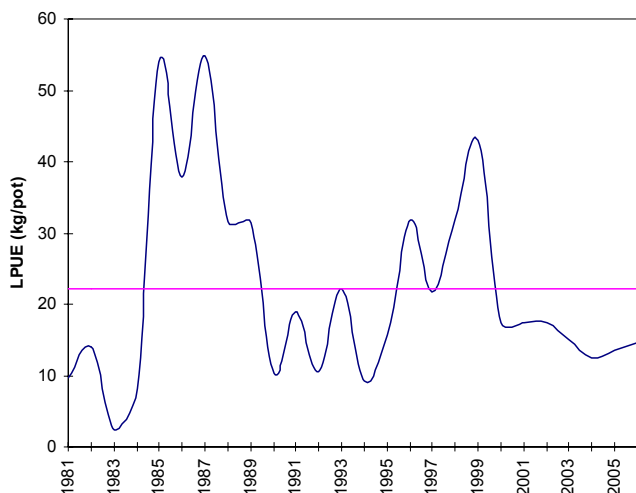


Fig 5. LPUE index for the Magharees fishery, 1981-2006 expressed as the yield (kg) per pot used in the fishery.

6. The pattern of yield which has developed is explained by the fact that virgin fisheries consist of several year classes of spider crab in their terminal (adult) moult. Unlike brown crab, spider crab do not grow further once they have reached that stage. However, a spider crab in its terminal moult may survive for up to 10 years hence, unexploited populations contain a higher proportion of adults. Once exploitation begins, spider crabs in their terminal moult are depleted until, in a heavily fished stock, a single year class supplies all the adults in a fishery.
7. Adult male spider crab have a large range in size, from 100 to 170 mm carapace length. The reason for this variation is not known although it has been suggested that in certain favourable conditions, an extra moult may be introduced to the life cycle. This is surmised from the higher incidence of larger spider crabs in the stocks in France in certain years but the phenomenon remains to be proved.
8. Since the Magharees fishery for spider crabs commenced in the 1980s, the behaviour of the fishermen there has changed and a progressively higher proportion of the catch is made in the spring months. Earlier Stock Books contain details of this.
9. While the status of the spider crab fishery is considered satisfactory at present there are inherent dangers in relying on a single year class to maintain a fishery and that is substantially the case in Magharees. Investigative work on the bionomics of the Magharees spider crab population is nearing conclusion (See Stock Book, 2006). Current emphasis is on applying a chronology to nail erosion in adult crab (Fig 6). One finding is that to date no male crab >145 mm carapace length has had an erosion index of >2.0 (Fig 7). The implication of this is that these animals are selectively removed from the population. Exami-

nation of length frequencies samples, suggests this happens very rapidly (Fig 8). The implication is that every individual spider crab in these two small bays is captured at least once a year.

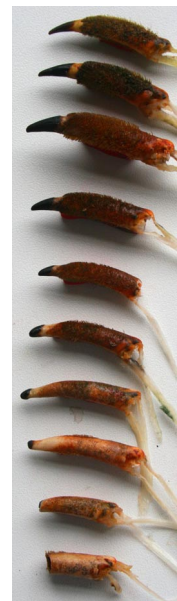


Fig 6. Erosion in male spider crab claws: top, earlier to bottom, later.

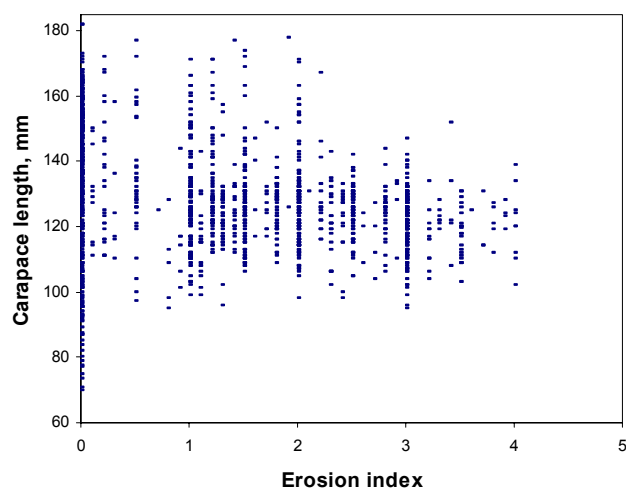


Fig 7. Erosion stages identified in male crabs of different carapace length

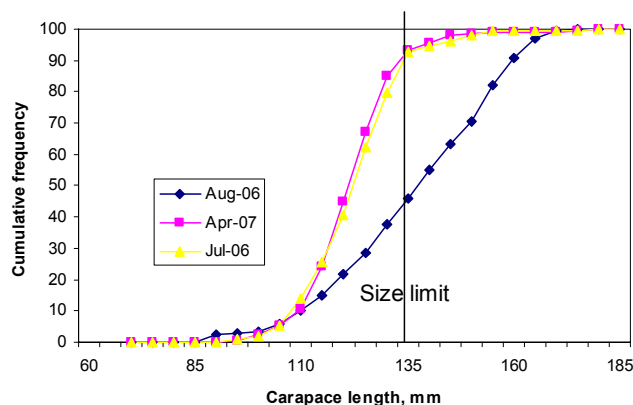


Fig 8. Cumulative length frequencies of male spider crab, spring/summer and autumn.

# Velvet Crab on all Coasts

## (Sub-areas VI and VII)

*Necora puber*



Marine Institute  
Foras na Mara

Fisheries Science Services



Male (above) and female velvet crab

### FSS – ADVICE

**FSS advises that effort in the mixed crustacean pot fishery, which takes this species as a by-catch, should be capped with a view to stabilising exploitation. Conservation measures that include a size limit and closed season should also be evaluated.**

### STATE OF THE STOCK

The state of the stock is unknown but there are indications of over-fishing in areas where the species is heavily exploited (see under additional information, below).

### CURRENT MANAGEMENT

None

### ADDITIONAL INFORMATION

1. Relatively small in volume, velvet crab is a significant contributor to the yield of the mixed crustacean fishery. The species is known to be vulnerable to over-fishing and should be monitored. Conservation measures implemented in the UK include a size limit of 65 mm carapace width, a closed season during the summer months. It was also a convention among fishers in Britain to return ovigerous females to the water. The possibility of introducing these measures on a precautionary basis should be considered for this fishery.
2. Velvet crab is usually taken as a by-catch in the course of potting for larger crustacean species but

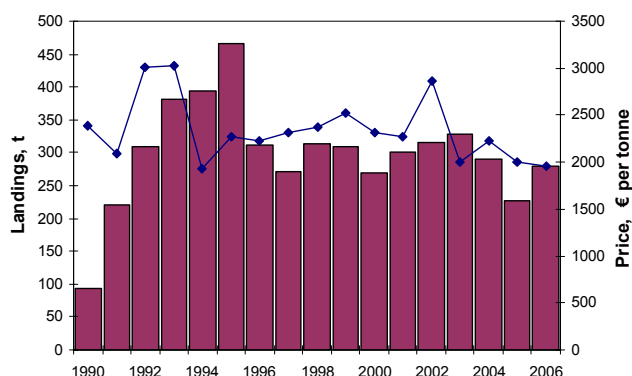


Fig 1. Annual landings (histogram) and price per tonne (line) of velvet crab 1990 – 2006

there are directed fisheries targeting it. Although its landings are small it is a valuable species in the Irish Sea where brown crab landings provide approximately 1% of the total national yield of that species.

3. In 2006, 280 tonnes of velvets were landed, nationwide, with a value of €560,000. Landings have tended downwards by c 9 tonnes per year since 1995 when 465 tonnes were recorded (Fig 1). This apparent decline has taken place at a time when pot fishing effort greatly increased resulting in larger landings of brown crab, with which velvet crab is associated, despite declining brown crab LPUE.
4. The fishery for velvet crab commenced in Ireland (as it did in the Orkney and Shetland Islands) in the late 1980s following over-exploitation of the species in Spain and infection by the dinoflagellate species *Haematodinium* in parts of France. The species is not consumed in Ireland and landings are exported to France and Spain.
5. *Necora puber* is the largest of seven portunid species occurring in these islands; it frequents rocky shorelines, unlike the others, and probably occurs all around the Irish coast. However, it is landed in a relatively small number of places. Of some 130 landing places monitored by DAFF, between 1996 and 2006, velvets have been landed at 71 in total (Fig 2); 27 – 46 per year. Their number has fluctuated without significant trend. Handling the species is problematical; its survival is poorer than that of brown crab in captivity. Processing takes place but probably on a limited scale (source: Market Development Division of BIM). The availability of a marketing outlet is likely to limit landings of the species.
6. Despite difficulties in handling velvet crab, the majority of exports are live, by vivier truck. The records of one operator who purchased more than 7,000 consignments of velvets between 1990 and



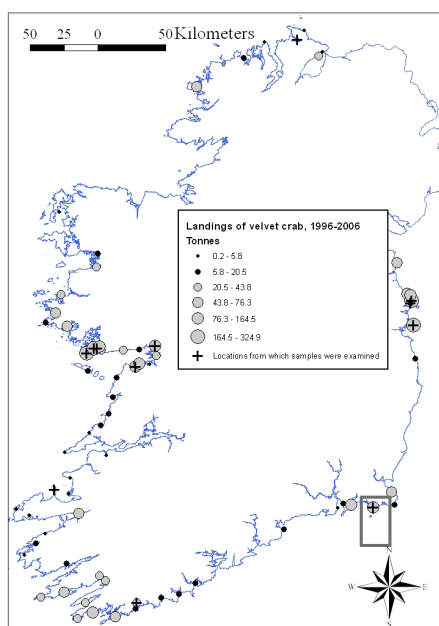


Fig 2. Locations at which landings of velvet crab were recorded between 1996 and 2006 inclusive, the symbol size indicating the weight landed. Crosses indicate ports whose landings were sampled, either at sea or following purchase from commercial buyers. The box on the south east coast shows where the associations of velvet crab with other large crustacean species were examined (it is further elucidated in Fig 4).

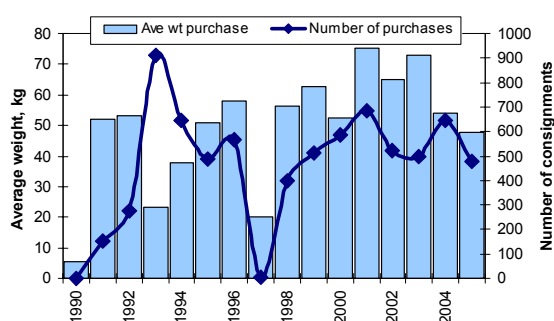


Fig 3. Number and average weight of velvet crab consignments by a vivier operator, 1991-1995 inclusive.

2005 inclusive are summarised in Fig 3. Consignments purchased would have been accumulated prior to sale but there is no clear trend in either their number or their average weight.

7. Investigative work on velvet crab (Fig 4) confirms their positive significant association with brown crab and their negative association with spider crab (Pearson rank correlation).
8. In order to examine the consequences of harvesting on velvet crab, the ages of males and females were estimated. The species may have a life expectancy of up to 10 years. Larger individuals were absent from areas in which heavy landings have been recorded over a number of years (Figs 2 and 5).
9. Examination of market records also suggest there has been a decline in the quality of velvet crab landed, with implications for the age structure of the stocks. Velvet crab purchased by the vivier buyer in the early 1990s were considerably heavier than the bulked samples examined in the course of the latest investigation

(Table 1). Recent investigations are based on material sourced from commercial boats at sea or purchased from buyers of velvet crab.

10. Examination of the fecundity of velvet crab in Ireland suggests it is of the same order as in the Orkney Islands, considerably lower than in Spain.

**Source of information:** Edward Fahy, Jim Carroll, Aisling Smith and Sinead Murphy (in prep. Working title) Ireland's velvet crab fishery.

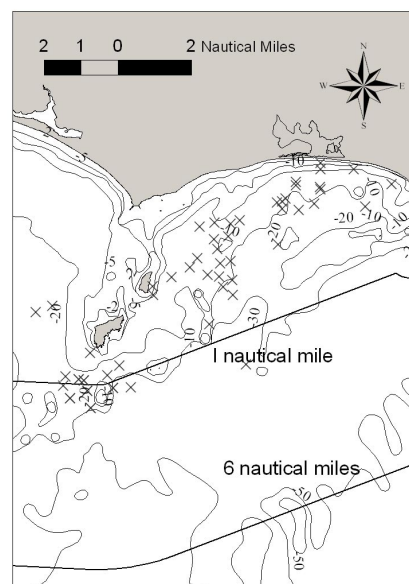


Fig 4. Locations (x) at which potting for larger crustaceans was undertaken in 2004 and 2005. The association between velvet crab and other species was examined by Pearson rank correlation. The inshore nature of the fishery is emphasised by the position of the 1 nautical mile line (outside the base line).

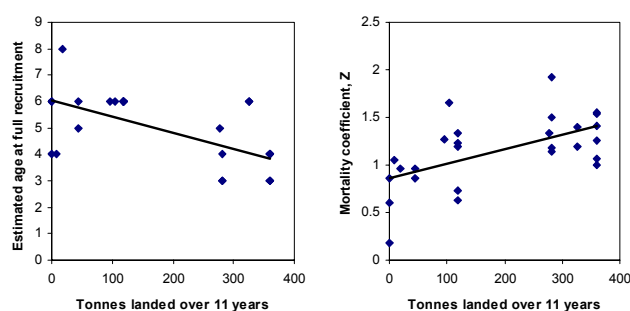


Fig 5. The estimated age at full recruitment and mortality coefficient, Z, for male spider crab sampled between 2004 and 2007, correlated against cumulative landings at various points (Fig 1) between 1996 and 2006 inclusive.

Table 1 . Percentage weight composition of 3 size grades in commercial velvet samples.

	2004-2007	1991-1995
Small	68.2	75.0
Medium	30.9	10.2
Large	0.9	14.7

# Brown Crab on all Coasts

## (Sub-areas VI and VII)

*Cancer pagurus*



Fisheries Science Services



Male brown crab

The decline of white fish fisheries has been accompanied by an expansion of fisheries for a number of invertebrate species of which brown crab is pre-eminent. Reviews of brown crab fisheries in various EU nations and in Norway presented to WGCRAb in May 2007 confirm that landings of the species have been increasing over a wide area in the North east Atlantic. Greater effort has been put into pursuing landings further offshore, so that a percentage of the increase is probably due to fishing taking place over a wider area.

This is one of the most important inshore species. In 2004, landings of 13,690 t live weight of edible crab had a first sale value of €14.5 m (Figure. 1); comparable data for 2006 indicate a considerable fall in landings and an improvement in price: 8,967 tonnes were recorded landed into Ireland with a first sale value of €9.9 m. After 14 years of increase (by 600 tonnes annually) landings have apparently stabilized and may have begun to fall. Brown crab remains one of the mainstay species of inshore fisheries but progressively larger proportions of the landings have been made by offshore super-crabber vessels in recent years; meanwhile, the number of inshore vessels continues to decline and they are replaced by large (<15 m) boats with a longer range from shore. Brown crab migrations are being intercepted further out to sea and fewer females are being captured in traditional coastal waters.. Insofar as inshore fisheries have a socio-economic value to local coastal communities, the further expansion of the offshore fleet which is less labour intensive, should be borne in mind where the allocation of this resource between the two sectors is considered.

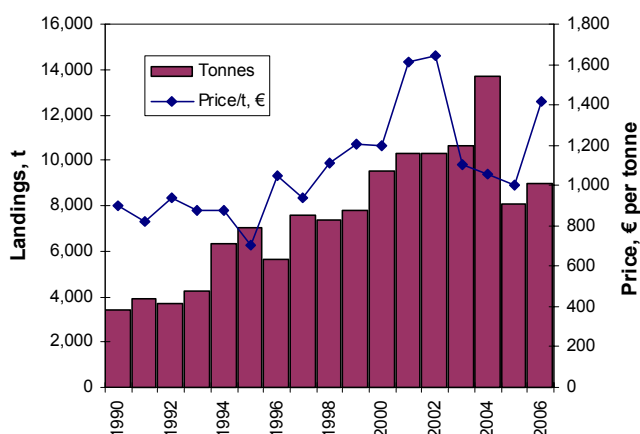


Fig 1. Landings and first sale values of brown crab, 1990-2006 inclusive.

The structure of Irish brown crab stocks is not known but a major divide is proposed between crab in VIa, which make up the largest fishery and which, in 2004, contributed 63% of the national landings, and crab from south east Ireland which contributed 6.3%. Both have distinctive migration patterns, females in VIa migrate out to the shelf edge. Tagged crab in the northern stock have been recovered from as far south as Co Galway. In the south east, females migrate south into area VIIg and possibly into area VIIf, their migration patterns being guided by the circulation patterns around the Nympe Bank in the Celtic Sea. Some tagged females have been returned from the Scilly Isles, off Cornwall and by the Roscoff super-crabber fleet from approximately 60 nm south of the Irish coast.

The most distinctive differences between the northern and south eastern stocks is the LPUE which in the south east in 2002 was approximately half the value recorded in the Donegal fisheries.



Soft-eye pots used for the capture of brown crab and other large crustaceans.

Processed hen crab, harvested in the autumn months, is an important component of Irish crab exports accounting for 40% of volume and 75% total value. Exports of live and fresh crab have shown a decline in value in recent years. The argument has been made that landings are currently too high and that limiting fishing effort would benefit both markets and stocks. There are signs of over-fishing and inshore local depletion suggesting that available fishing effort might usefully be cut back.

The harvesting of poor quality crab (recently moulted) for use as whelk bait has been reported in the past. It remains a problem in both the northern and south east fisheries. The use of brown crab as bait might be an agency for the spread of the dinoflagellate *Haematodinium* which has become more prevalent in crab in recent years, possibly as a result of increasing sea temperatures.

A technique proposed to indicate changes in crab abundance is to monitor the landings as specific points in successive years: statistics collectors tend, over the short term, to seek information from the same sources. In Figure 2, a comparison is made between landings in 2004 when, exceptionally, 13,690 tonnes were landed and the following year which registered a decline in landings to 8,058 tonnes. The altered situation is manifested by a reduction in landings in the majority of ports. What occurred between 2003 and 2006, on the other hand, may be more representative of stable or slightly declining, rather than dramatically falling landings: Ports showing increases and falls are fairly evenly represented. The more recently intensified effort in the west registers as increased landings. The majority of the south coast however registered a fall in yield.

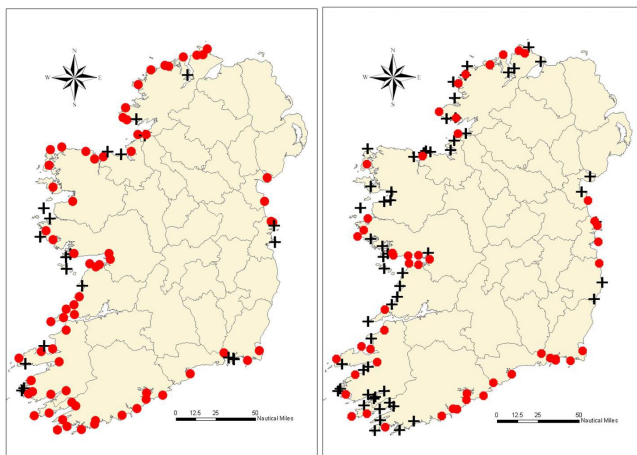


Fig 2. Brown crab landings reported by port as increase (+) and decrease (•) between successive years: left, 2004 and 2005 and right, 2003 and 2006.

## Northern Brown crab stock

Sub-area VI, Division VIIb

1. Brown crab off northwest Ireland and west of Scotland constitute one stock. Close inshore the stock is fished by smaller boats (< 12 m), offshore,

by larger purpose-built tank boats referred to as super crabbers. These vessels stay at sea for up to 6 days in a single trip and bring crab back to shore alive. The smaller inshore boats land their catches daily.

2. Boats >15 m are constrained by kW-days effort limitations which have encouraged the development of fast-worker boats of up to 14 m and these fish sometimes more than 20 nm offshore. The two fleets frequently fish side by side. A 14 m vessel is capable of handling half as much gear as a super crabber. The super crabber fleet is more mobile than the inshore one and is capable of remaining in close proximity to heavy densities of migrating crab.
3. Fishers who operate close to shore complain that the abundance of crab in the summer months has declined because the animals are intercepted in deeper water before reaching the inshore. The number of vessels participating in this fishery declined more than 50% between 1997 and 2005. Conversely, the potential fishing effort increased from 41,000 to 55,000 pots. This was accompanied by an increase in soak time.
4. As previously described in greater detail, the LPUE has been in decline since 1990 and the significance of this reduction is contested. Some observers argue that the decline merely describes a division of the landings among a larger number of pots, others that it is indicative of a real reduction in the stock. In all parts of the fishery which, offshore, extends to the shelf edge, a similar trend in LPUE is down.
5. The size composition of the landings remained similar in the period 1997 – 2001 (possibly since 1985).

## FSS ADVICE

**FSS considers that the rate of expansion of the landings from this fishery is not sustainable. FSS advises that the number of vessels participating in the fishery should be capped and there should be no further expansion of fishing effort (number of pots per vessel).**

## STATE OF THE STOCK

The state of this stock is unknown but the available indicators give cause for concern. An account of the decline of offshore LPUE was provided in previous stock books. The Malin Head inshore fleet accounts for approximately 30% of MSY of the Co Donegal share of brown crab landings and approximately 20% of the effort required to achieve MSY. The  $F_{0.1}$  level has been exceeded by the Malin Head fleet according to the calculations.

ICES data indicates that LPUE has declined from 2.82 kg/pot lift in 1991 to 1.26 kg/pot lift in 2006 in the offshore fishery. Such data as are available from the more poorly documented inshore component are comparable with results obtained from the offshore index fleet. Studies on the inshore component estimate a loss of between 37 and 57 % LPUE over 15 years. The counter-argument is pre-



sented that declining LPUE correlates with increasing total numbers of pots hauled annually in this fishery, suggesting that current levels of fishing effort are sustainable. However, the fishery is open access and there is currently no mechanism to cap effort which a precautionary approach would recommend. While the number of vessels participating has declined in recent years, their replacements have been larger and fishing practices have greatly increased fishing effort (through longer soak times).

Longer LPUE data series in the offshore fishery have gone through three discernible phases: between 1991 and 1994 it declined as older crab in the virgin stock were fished down, between 1994 and 2002 LPUE was stable but in 2001 and 2002 it showed a decline which is regarded as ominous. The 2007 WGCRAb report reported a further reduction in mean annual LPUE from 2.82 to 1.26 kg per pot lift in the offshore fishery between 1991 and 2006. In spite of being well documented, the available indices do not provide a conclusive account of brown crab abundance in the northern fishery. The offshore fleet is mobile, moving gear to the highest densities of crab hence the prevailing high LPUE data for this fleet may not represent the true abundance of the animals; the area in which fishing takes place is known to have expanded considerably since the super-crabber sector came into existence in the early 1990s. Inshore LPUE data are collected at a time when the animals migrate into shallow water where they are concentrated so that these data might not be a good indicator of true abundance either.

## CURRENT MANAGEMENT

Landings of brown crab in this fishery are subject to the EU size limit of 130 mm across the maximum width of the carapace (Annex XII of regulations 850/98); at the most northern limit of the fishery the appropriate size limit is 140 mm. The prohibition of landing claws which exceed 5% of crab whole weight landed also applies.

The “western waters” regulation (1954/2003/EC) anticipated that the Commission would revise and update effort ceilings for edible crab and spider crab; effort would be allocated on the basis of kiloWatt-days. The limits for the northern crab stock, applying to vessels greater than 15 m in length, were published in document 1415/2004/EC. This mechanism is not considered completely satisfactory because:

1. It covers only large vessels. Smaller inshore boats whose range now overlaps that of the super-crabber fleet, are capable of handling large quantities of gear (currently up to 700 pots per day by vessels of 12 m).
2. Effort may be more accurately expressed in terms of pots lifted per vessel rather than the time spent fishing. Pot fleet number may be considerably enlarged by extending soak time. Currently a soak time of 2 days is established allowing a double set of gear to be operated by the same vessel. In theory the potential exists to fish three sets of pots simultaneously.

## ADDITIONAL INFORMATION

1. Landings of brown crab from the northern fishery in 2003 were 8,625 t valued at €9.14 m (€1,220 per tonne) (Source: DCMNR).
2. The extent of the Northern crab stock has been investigated by tagging experiments. In 2001 the range of crab tagged at Malin Head extended northwards to latitude 56°, westwards to the continental slope and south to Co Galway. The prevailing direction of crab movement is westwards against the current, which moves eastwards in Co Donegal; the larvae are presumably washed back against the adults' trajectory.
3. The more labour intensive inshore sector has been equally dividing the landings with the offshore boats until recently but this equal sharing is unlikely to persist indefinitely even if the offshore fleet ceases to expand further because of the declining success of the smaller inshore vessels.
4. Because crabs cannot be aged, this fishery has been monitored using LPUE data and the offshore sector is well documented. However, LPUE data must be interpreted with caution in a crab fishery whose inshore sector is likely to be occupied by an aggregation or concentration of animals during the summer months. Data for the offshore sector may provide a good indication of stock abundance, provided they are collected in the same way and in the same place each year. Instead, it was demonstrated using GPS that between 1991 and 1996 effort in the northern fishery intensified and the area over which fishing took place expanded (Stock book, 2003).
5. LPUE in the offshore sector of the Northern fishery, declined from 2.82 kg per pot lift in 1991 to approximately 2 kg per pot lift in 1994; thereafter it stabilized until 2000 when it declined from 1.8 to 1.37 and then increased to 1.4 kg per pot hauled in 2004; lowest recorded LPUE to date was in 2006 (1.26 kg/pot lift).
6. In the course of a mark-recapture experiment carried out in 2001, an estimated 25% of the crab stock was removed by fishing in a five week period, indicating a heavy exploitation rate.

## South East Brown crab

Divisions VIIa, g

This stock is exploited mainly by smaller (<12 m) boats although super-crabbers from the Northern fishery have been known to occasionally fish it. The limits of the stock are not known and it may well extend into division VIIe and be exploited by UK and French vessels. The Roscoff super-crabber fleet ranges extensively over its likely distribution.

## FSS ADVICE

**FSS advises that existing TCMs, should be strictly enforced. The official statistics for the fishery**

have, in the past, been shown to be inaccurate by a factor of 2-3 and the method by which they are estimated needs to be reviewed. This stock requires a management plan. It is exploited along with a number of other crustacean species. FSS advises that a logbook system should be introduced and its use enforced; data should be abstracted and accurate catch trends ascertained on a regular basis. FSS advises that further technical measures to discourage the harvesting of poor quality (recently moulted) crab for use as whelk bait should be considered. FSS advise a cap on gear. This has been under review for several years by virtue of its relevance to the management of the associated lobster fishery.

## STATE OF THE STOCK

Assessment of crab stocks is complicated by the fact that they cannot be aged. One approach is to monitor LPUE with a view to stabilising it. Such indicators as are available, suggest that LPUE in this fishery has declined but the data could be explained as more fishermen sharing the resource. It is very likely that brown crab in this area hyper-aggregate in inshore waters during summer and autumn months and the exploitation of heavily concentrated numbers of animals can give a misleading account of their abundance

## CURRENT MANAGEMENT

Two EU TCMs apply to this stock (see Annex XII of regulation 850/98): One fixes the maximum width of the carapace at 130 mm, the second prohibits the landing of crab claws which exceed 5% of the weight of whole crab. Carapace width cannot be deduced from claw size hence the restriction on claw landings serves to clarify compliance with the size limit. In the event neither regulation is enforced; there is little direct evidence for the size limit not being complied with but there is circumstantial evidence that it is not.

## ADDITIONAL INFORMATION

1. This fishery extends from longitude  $-6.3^{\circ}$  to  $-7.0^{\circ}$ . It is conducted within 8 nm of the coast and it has an offshore component. Few animals tagged in 2002 and 2003 were retaken as far west as Helvic Head so they may have returned to deeper water at that longitude. Larger females ( $>18$  cm width) have since been returned after two years without having moulted in the interim, two from the Scilly Isles, suggesting that the southward range and size of this stock are both large. The most recent return of a female tagged in this fishery indicates she had not moulted in five years.
2. The fishery is conducted throughout the year, effort increasing to a maximum in the late autumn. Female crab are in their best condition and they are therefore at their most valuable at that time.
3. This fishery is highly productive, yielding  $>900$  t to an inshore area with an estimated maximum extent of  $<500$  km<sup>2</sup> and a coastline of approximately 55 km

in 2002. In 2004 landings of 826 t with a value of €0.66 m (€794 per t.) were made. A large proportion of crab landed in this fishery are of poor quality, used as bait to trap whelk.

4. In spring the landings consist largely of males which are fairly sedentary and they are joined by progressively greater numbers of females as the year advances. The females migrate into coastal waters in order to moult and mate; they move back to deeper waters in winter.
5. Current levels of LPUE are, in part at least, a consequence of increasing fishing effort. In the period 1972 – 1980 inshore fishing effort directed on larger crustaceans in this fishery by pots and traps doubled; the following decade it further increased by 128%. Thirty years after 1968 the number of pots per km of fishery had increased by 241 %. In 1998 the number of pots and traps fished per km of coastline stood at 191; the latest census, prepared for 2002 provided an estimate of in excess of 292 pots per km. In a period of 14 years, fishing effort was therefore more than 347% greater than in 1988, the number of pots having risen from approximately 50 per km of coastline in the early 1970s. Increasing pot numbers is a conservative estimate of fishing power, unquantifiable technological innovation like the addition of GPS and pot haulers also having contributed much in the interim.
6. At its maximum in October 2002, the fishery had  $>14,000$  pots operated by up to 69 vessels.
7. Estimates of female maturation in 2004 and 2005 support the current size limit of 130 mm

## Other stock divisions

BIM have proposed two further stock divisions: from North Mayo (the southern extent of the Northern stock) to Shannon and from Shannon to Cork. Nothing is known of the migratory behaviour of crab in these areas. In common with other stocks their landings have increased in recent years.

In the case of Cos Galway and Clare, landings rose from 150 t in 1990 to 650 in 2003. Landings to Cos Cork and Kerry were approximately 500 t annually between 1990 and 1996 when they began to rise, reaching 3,500 t in 2004.

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# Lobster on all Coasts

## (Sub-areas VI and VII)

*Homarus gammarus*



Fisheries Science Services



Lobster

### FSS- ADVICE

FSS advises that there is a need for restrictions on entry to lobster fisheries and a cap on the amount of gear in use.

This species is managed by a number of TCMs. TCMs are effective only where fishing effort is stabilised. The current range of conservation measures (Minimum LS of 87 mm (Carapace Length) and protection of V-notched females) should continue and enforcement of the regulations should be intensified. FSS advises that consideration should be given to the introduction of a Maximum Landing Size of 120 – 125 mm carapace length, to protect previously V-notched females whose tail fins have repaired.

### STATE OF THE STOCK

The State of the lobster stock is unknown and performance indicators vary locally. Egg per recruit production is low, calculated at 7% of virgin egg production. Catch rates have been stable or increasing over the past decade despite strong increases in fishing effort, this suggesting that recruitment has been strong. Stocks may be vulnerable to a further reduction in egg production and recruitment in a less favourable recruitment environment.

### CURRENT MANAGEMENT

In Europe and North America a management strategy for lobster is directed towards increasing natural egg production by the use of TCMs and by limiting fishing effort. The minimum landing size is currently 87 mm carapace length (CL) (EU regulation 850/1998) and it is illegal to land lobsters which have V-notched or damaged tail fins (S.I. No 234 of 2006 – Lobster (Conservation of stocks) regulations 2006).

### ADDITIONAL INFORMATION

1. Lobster fisheries are conducted on all coasts (Fig 1) between April and October approximately (Fig 2). The fishery is open access.

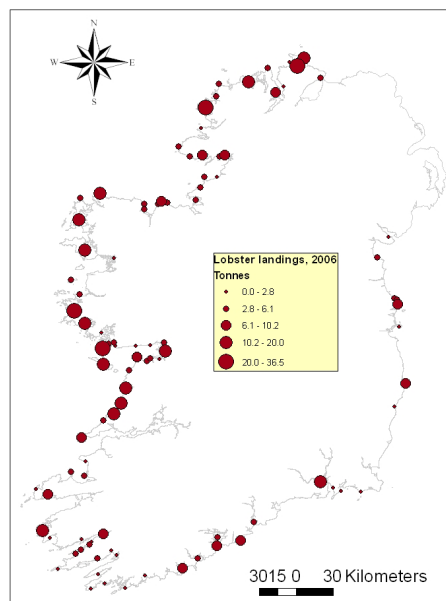


Fig 1. Landings of lobster to Ireland in 2006 (Source: DAFF).

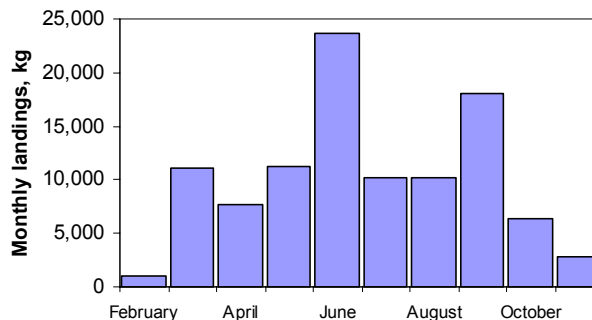


Fig 2. Landings of lobster from February to November, 2006 inclusive (Source: DAFF and Browne et al (2001). The months of January and December contain, in addition to lobsters landed in those months, unallocated landings from other months of the year.

2. Lobster fisheries are related to inshore fisheries for brown crab and much that has been written about brown crab is relevant to lobster. By-catch rates of lobster in brown crab fisheries are typically 20-25% of targeted lobster. Observations on the escalation of pot numbers fishing brown crab are relevant to lobster. Although lobster catch rates have been strong over the past 10 years, they are 3 times lower than in the 1960s.
3. Lobster landings to Ireland totalled 853 t (their highest level since 1930) valued at €12.8 m in 2004 but they were strong in 2006 when 640 tonnes with a first sale value of €8.2m were landed (Fig 3 - Source: DAFF). The price of lobster had reached a peak of €18,000 / t in 2002 but fell to just under €15,000 / t in 2004; a further reduction to €12,846 per tonne in 2006 was recorded.
4. Lobster management is funded by government through BIM and administered locally by co-operatives. The objective of size limits and V-notching programmes is to enhance natural egg production. Since the practice was introduced in 1990, >100,000 female lobsters had been V-notched and released. A voluntary logbook scheme to record target and incidental catch rates of legal, undersized and V-notched lobsters was introduced in 1995 by BIM in Co Wexford and this was extended to all coasts in 2002. On some parts of the south coast 10-15% of legal sized female lobsters are V-notched while in Co Clare more than 25% are. V-notches persist for up to three moults after which they grow out; during this time the lobster may increase in size by up to 30 mm carapace length.
5. Catch rates in 2002 varied by region and were strongest in the southwest (25 lobsters per 100 pots hauled) and weakest in the south east (5-10 lobsters per 100 pots hauled). LPUE time series have been collected in Co Clare and on the south coast. The former increased while the latter declined between 2002 and 2004.
6. Estimation of fishing mortality (F) have been made from length cohort analyses but depend on the growth rates and natural mortality (M) rates assumed. F was estimated at 0.4 - 0.6 in the period 2002 - 2004. It was assumed to be lower than in the 1990s.
7. Lobsters are fully recruited to the fishery at 95 mm CL which is one moult above the Minimum LS of 87 mm. 95 mm CL is the length at which 50% reach maturity.
8. 11% of landings in 2005 were below the MLS.
9. Current egg production per recruit relative to the situation which would apply if there were no fishery, is reckoned to be <10% in all areas. The safe limit is calculated to be 10%. However, this does not include egg production by V-notched lobsters.
10. A spawning potential of 10% could, it has been calculated, be achieved by a 10% reduction in effort and a simultaneous increase in MLS to 95 mm.
11. The introduction of the Maximum LS of 120-130 mm would be effective in achieving 10% spawning potential in most areas.
12. Effort management in combination with additional TCMs may be the most efficient and economically acceptable means of restoring egg production to above the 10% reference point.

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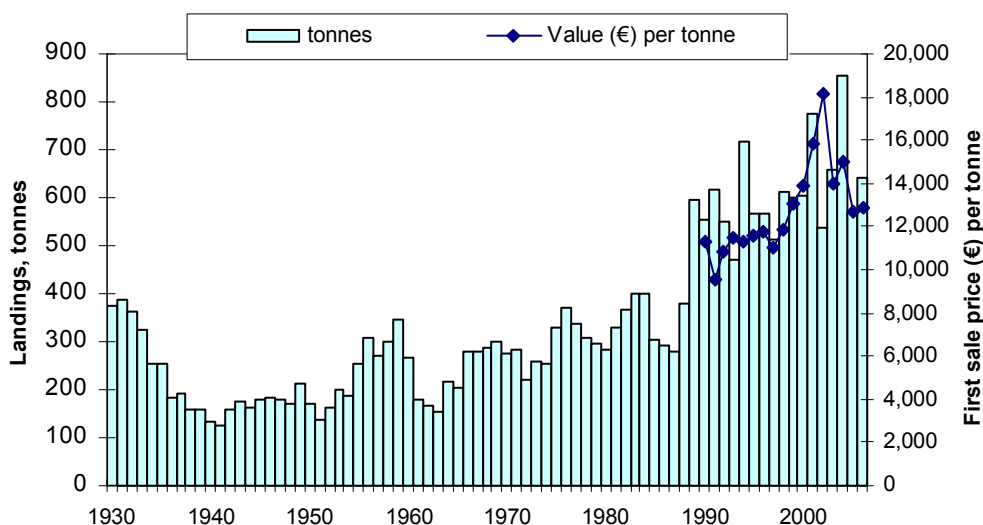


Fig 3. Landings (1930-2006) and first sale values of lobster (1990-2006) (Source DAFF).



# Crawfish on Mainly Western Coasts

(Sub-areas VI and VII)

*Palinurus elephas*



Marine Institute  
Foras na Mara

Fisheries Science Services



Crawfish, *Palinurus elephas*.

## FSS – ADVICE

FSS considers that crawfish stocks are overfished and in need of urgent remedial measures. FSS advises that an outright ban on the use of “cray nets” would be more effective and greatly preferable to the current restrictions on what those nets are permitted to catch. Further opportunities to reduce fishing pressures on this species should be sought in an effort to rebuild the population.

Two closed areas have been established in which crawfish tangle netting is prohibited but the prohibition is not enforced and the animals have been captured in large numbers by this method in the closed area in Co Kerry.

## STATE OF THE STOCK

The only information currently available is landings data which suggest that crawfish are in decline with current landings at a historic low for the series 1971 to 2006 (Fig 1).

## CURRENT MANAGEMENT

E.U. TCMs (Annex XII of regulation 850/98) specify a minimum size limit of 110 mm carapace length. The Crawfish (Conservation of Stocks) regulation, 2006 [S.I. No 232 of 2006] adopts this in Irish law. The Crawfish (Fisheries Management and Conservation) Order, 2002 [S.I. no 179 of 2002] bans the taking of crawfish by net in two areas off

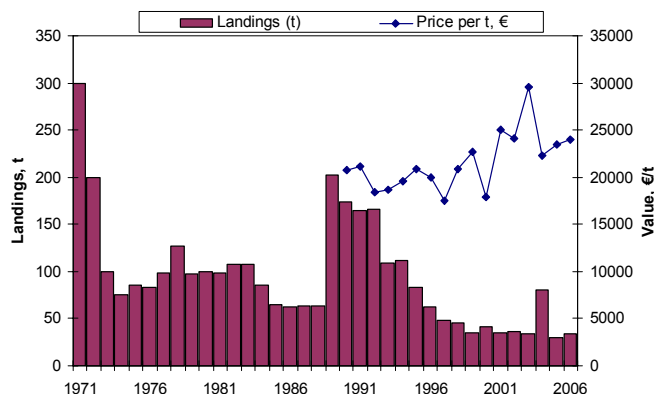


Fig 1 Crawfish landings and first sale prices 1971-2006 (Source: DAFF).

the Galway and Kerry coasts (Fig 2). Use of these nets is however allowed for flat fish species. Their use is poorly monitored and substantial numbers of crawfish are probably captured in this gear.

## ADDITIONAL INFORMATION

1. In 2006, 34 t of crawfish landings were valued at €0.81 m. This is slightly above landings in the previous year which were the lowest recorded since 1971. Its first sale price of just under €24,000 per tonne in 2007 makes it our most valuable crustacean species. First sale prices of €50,000 per tonne have been realised for crawfish in recent years.
2. Crawfish have been in decline at least since 1992 (Fig 1) although landings stabilised over the past five years and increased in 2004; the landings in 2006 have not reversed the downward trend.
3. Crawfish is a western species whose stronghold is in Co Kerry (Fig 2)
4. Crawfish is known to be vulnerable to a number of fishing methods, including towed gears (trawls and scallop dredges). Scallop dredges may kill the animals without retaining them. Tangle nets (“cray nets”) which were introduced to target this species and which are also used to capture fin fish, are credited with playing a large role in their decline.
5. Cray nets also cause incidental damage to fin-fish and other crustaceans (particularly spider crab) in the Co Kerry conservation area.. The capture of crawfish is seasonal, coinciding with the immigration of other large crustaceans to inshore waters (Fig 3).

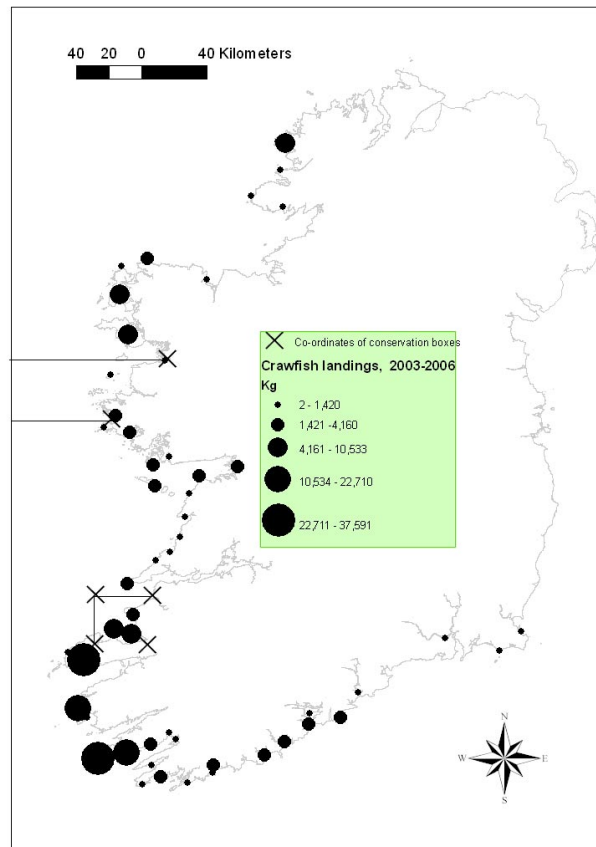


Fig 2 Landings of crawfish to Ireland between 2003 and 2006 inclusive Co-ordinates of the conservation boxes whose particulars are contained in S.I. No 179 of 2002 are marked. The northern conservation box extends to longitude 16° W.

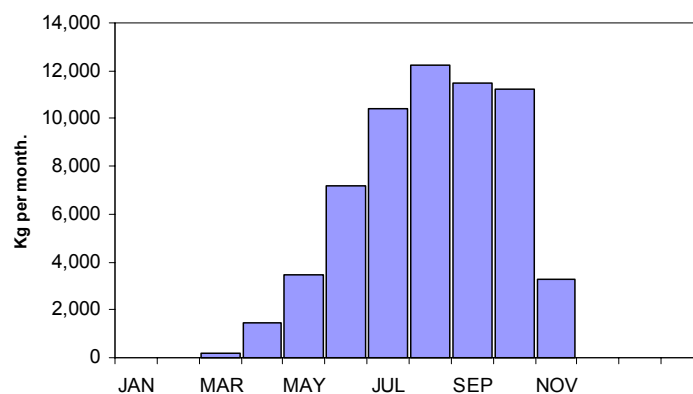


Fig 3. Seasonal landings of crawfish, February to November inclusive. Landings in December and January are omitted.

# Shrimp on South and West Coasts

(Divisions VIa, VIIa (south coast), b, g and j)

*Palaemon mainly serratus*



Fisheries Science Services

## FSS – ADVICE

**FSS advises that this fishery should be closed from the end of January to the beginning of September. Shrimp are intensively fished and effort (number of pots) should be capped.**

**The latest of a series of shrimp conservation measures titled Shrimp (Fisheries Management and Conservation), Regulations 2006 [S.I. No 235 of 2006] expresses the objective of closing the shrimp fishery from 1 May to 1 August. FSS considers that this closed period is too short.**

**FSS advises that this fishery requires greater monitoring and collection of data towards providing a greater understanding of the mechanisms underlying shrimp production and an explanation for fluctuating catches in recent years.**

## STATE OF THE STOCK

Shrimp probably occur as a number of local stocks rather than as a single stock unit. The animals are small, hence they are eaten by a wide range of predators. This and their short lives (about 2 years), makes stock size prediction problematical. Recruitment may occur cyclically and the species may be susceptible to growth overfishing. Irregular yield in recent years may be an indication that growth overfishing is taking place.



Chinese hat ended creel, end on.

## CURRENT MANAGEMENT

The only management measure is a brief close season (S.I. No. 235 of 2006, referred to above) at the only time in the year when shrimp are not berried and when there is relatively little commercial interest in fishing, hence it is unlikely to have any beneficial value.

## ADDITIONAL INFORMATION

1. Shrimp landings to Ireland in 2006 were reported to be 322 tonnes with a first sale value of €4.5 m (Source: DAFF with information on price from industry). There would appear to have been a considerable rise in first sale price over the past two years (Fig 1).

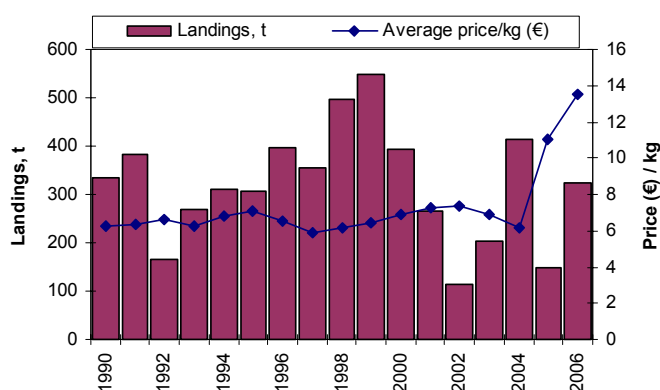


Fig 1 Landings (annual values and average for the period 1990-2006) and first sale values of shrimp, Source DAFF and industry.

2. This fishery commenced in the mid-1970s in Baltimore, south west Ireland whence it has extended north to Connemara and east to Co Waterford; more recently, though to a more limited extent, into Co Donegal (Fig 2). The fishery has gone through three recognisable phases: from 1975 until 1989 landings were stable but low. In 1990 they began to expand, a trend which continued until 1999 after which yield declined and, most recently, appears to have become irregular. The years 2002 and 2003 were poor as was 2005 whereas good landings were recorded in 2004 and 2006.
3. Plastic Chinese-hat-ended creels baited with fish offal are used to target shrimp. As is general in the inshore sector, fishing effort has risen with elapsed time. The fishing season has also extended and in some parts of Ireland fishing has been reported taking place all the year round.

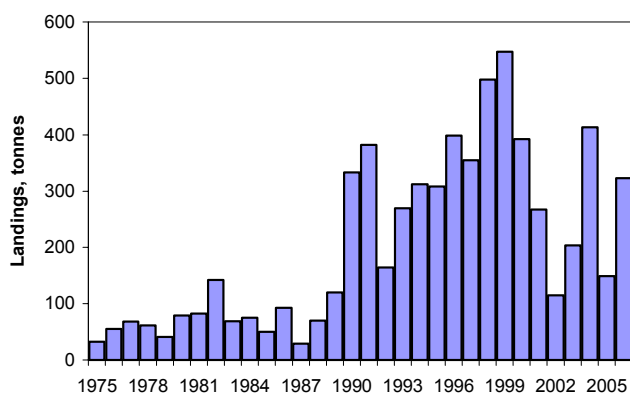


Fig 2. Annual landings of shrimp for the period 1975-2006 inclusive (source: DAFF).

4. Shrimp are taken in some numbers on all Irish coasts and recently potting for them has been reported from Co Dublin. However, the species is concentrated on the south west. Between 1995 and 2003 Co Galway produced 20% of the national catch, Kerry 23%, Cork 45% and Waterford 6%.
5. Landings are compared by port in 2004 (a year of high yield – Fig 1) and 2005 when landings were low (Fig 3). Where landing places are dispersed and landings are medium weight range, they are fairly similar in both years. However, in west Cork and Kerry where landings places are closely clustered and the landings were heavy in 2004, they appear to have largely disappeared the following year. This phenomenon may be consistent with growth overfishing.

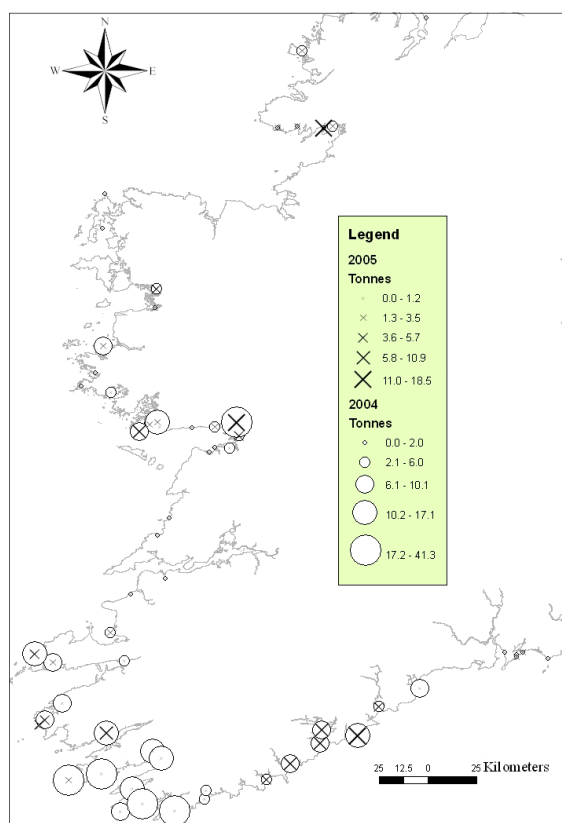


Fig 3. Landings of shrimp by port in 2004 and 2005 (Source: DAFF).

6. The number of boat-days required to make the landings is estimated to have averaged 9,400 annually between 1990 and 2004 (ranging from 3,300 in 2002 to 13,600 in 1994) (See Stock book, 2006).
7. Three performance indicators are used to monitor changes within the stock(s).
  - Total landings data collected by DAFF,
  - Average daily landing weights (from processors' records),
  - The average weight of shrimp landed in November and December (from records of factory graded shrimp. This analysis has been undertaken up to 2004.
8. The average weight of shrimp captured per day in late autumn indicates the strength of the 0 group in the population. A larger 0-group presence (lower average individual weight) is associated with heavier catches (larger daily landings). In recent years the December average weight has tended to indicate relatively fewer 0-group animals were present, suggesting recruitment failure. Recruitments in shrimp may be cyclical.
9. Shrimp are ovigerous (in berry) for much of the year: the 1+group carries eggs over the late autumn to spring when 0-group shrimp become mature. Berried females are the most valuable products of this fishery being twice as heavy as males of comparable age and the principal fishery in Autumn targets them. Shrimp are not berried in the summer months hence a close season at this time (when there is least interest in pursuing a commercial fishery anyway) is likely to be ineffective in conserving the species. Of greater benefit would be a cessation of fishing in Spring to allow of 0-group animals to spawn.

**Source of information:** Edward Fahy, Niamh Forrest, Margaret O'Toole, Ruth Mortimer and Jim Carroll (2006) Indicators of performance in the fishery for shrimp *Palaemon serratus* (Pennant) in Irish coastal waters. Journal of Shellfish Research, 25 (3): 1021-1026.







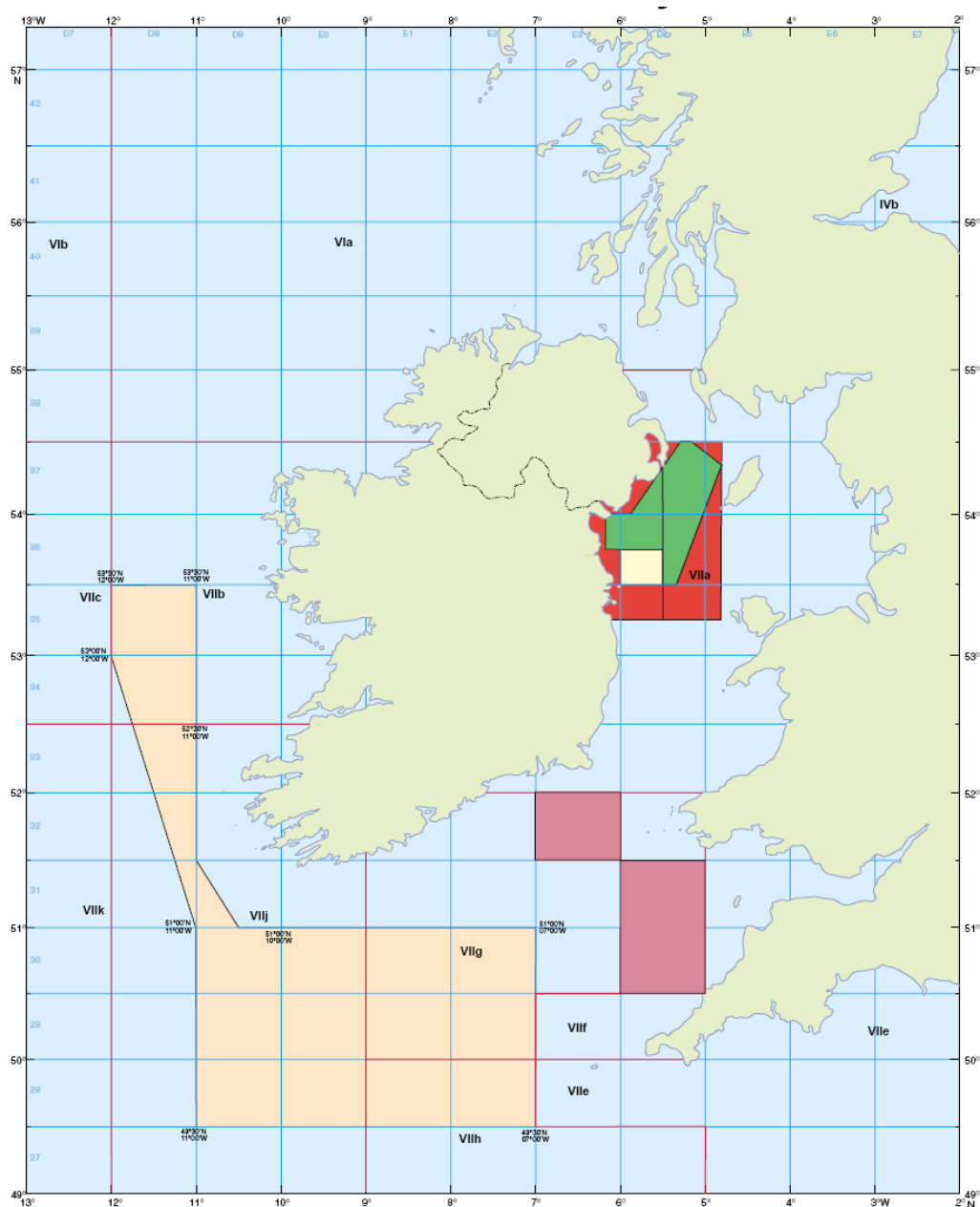
## Restrictions on Mackerel & Herring



(Map courtesy of B.I.M.)



## Cod and Hake Recovery Boxes in 2007



### IRISH SEA COD BOX

■ Closed to all fishing with any demersal trawl, seine or similar towed net, any gill net, trammel net or similar static net or any fishing gear incorporating hooks from the 14th of February to 30th April 2007.

■ Fishing is permitted with a prawn net in the areas of the closed boxes coloured green provided:  
A minimum of 35% live weight of prawns is on board.  
Only one mesh size range is carried on board, 70-79mm or 80-99mm.  
No other type of gear is carried on board.  
No mesh in any part of the net is greater than 300mm.

■ Fishing is permitted with a prawn net in this area provided that in addition to the above:  
It complies with the provisions made for the green zone.  
It includes an inclined separator panel.  
If the total weight of cod retained on board is greater than 18% of the total catch, the vessel must stop fishing in this area for at least 24 hours.

### CELTIC SEA CONSERVATION AREA - (COD BOX)

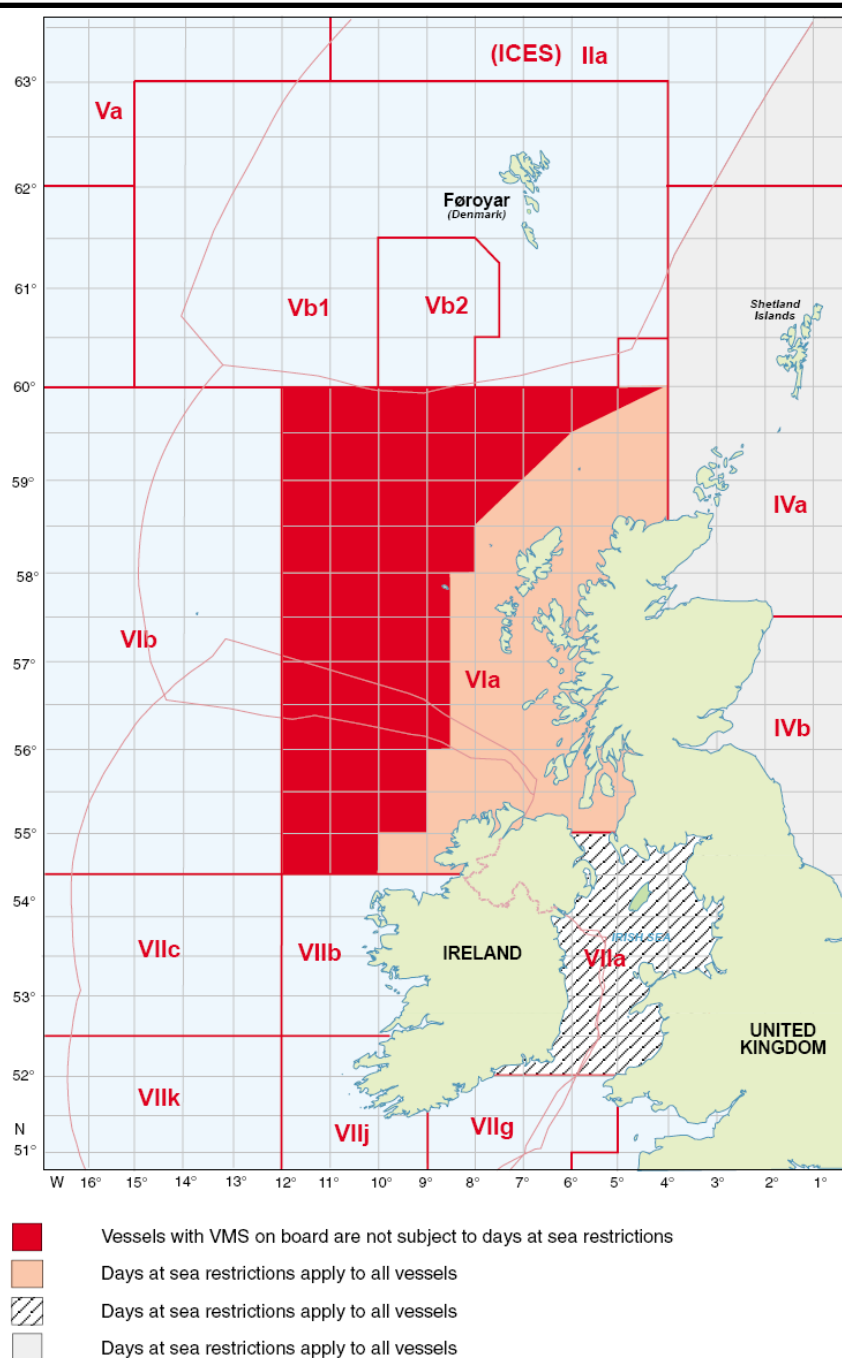
■ From 1st February 2007 to 31 March 2007 it is prohibited to conduct any fishing activity within these areas except with pots and creels provided no fish other than shellfish are retained on board or Pelagic trawls with a codend mesh size of 55mm provided no fish other than herring, mackerel, pilchard/sardines, sardinellas, horse mackerel, sprat, blue whiting and argentines are retained on board.

### HAKE BOX

■ Fishing is prohibited with all towed nets or mesh size range between 55mm and 99mm or fixed gear of mesh less than 120mm.

(Map courtesy of B.I.M.)

## Days at Sea Regulations Areas VIa and VIIa in 2007



### GEAR TYPE

Demersal trawls, seines or similar towed gears except beam trawls of a mesh size  $\geq 100\text{mm}$

Demersal trawls, seines or similar towed gears except beam trawls of a mesh size  $\geq 120\text{mm}$

Demersal trawls, seines or similar towed gears except beam trawls of a mesh size  $\geq 70 - < 90\text{mm}$

Demersal trawls, seines or similar towed gears except beam trawls of a mesh size  $\geq 90 - < 100\text{mm}$

Demersal trawls, seines or similar towed gears except beam trawls of a mesh size  $16-31\text{mm}$

Beam trawls of mesh size  $\geq 80\text{mm}$

Gill, Tangle and Trammel nets

Demersal longlines

Note: Certain Derogations apply. See Table 1 of Annex IIA of EU Reg. 41/2006

### DAYS AT SEA (01.02.07 - 31.01.08)

84 days (105 days area VIIa)

85 days (114 days area VIIa)

227 days (204 days area VIIa)

227 days

228 days

143 days (132 days area VIIa with mesh size  $\geq 80 - < 90\text{mm}$ )

140 days

173 days

(Map courtesy of B.I.M.)



# DEFINITION OF FISHERIES TECHNICAL TERMS AND ACRONYMS



## Fisheries Science Services

**Abundance Index** Information obtained from samples or observations and used as a measure of the weight or number of fish which make up a stock.

**ACFM** Advisory Council on Fisheries Management – This ICES group is responsible for compiling and analysing all available fish stock information to compile advice on stock levels and strategies for management.

**Acoustic surveys** Acoustic surveys use sound waves emitted from a "transducer" to estimate the density of plankton and fish shoals. The survey vessel tows the transducer under water, which is linked to an echo sounder in the vessel which records the shoals of fish as "marks" on a screen or paper trace. The density of these marks is used to calculate total biomass of a stock.

**Adaptive Management Approach** Adaptive management is a modification of actions based on a response to a monitored process i.e. real-time assessment and management.

**Age** The number of years of life completed, here indicated by an Arabic numeral, followed by a plus sign if there is any possibility of ambiguity (age 5, age 5+) (see <http://www.efan.no>)

**Annual (or seasonal) Total Mortality Rate** The number of fish which die during a year (or season), divided by the initial number. Also called actual mortality rate, coefficient of mortality.

**Benthic** Anything living on, or in, the sea floor.

**BIM** An Bord Iascaigh Mhara, The Irish Sea Fisheries Board, charged with responsibility for development of the fishing and aquaculture industries in Ireland. (see <http://www.bim.ie>)

**Biomass** Measure of the quantity, usually by weight in metric tons (2,205 pounds = 1 metric ton), of a stock at a given time.

**Biological reference points** Various reference points can be defined for fished stocks. These can be used as a management target or a management trigger (i.e. point where more stringent management action is required) Examples include fishing mortality reference points  $F_{0.1}$ ,  $F_{max}$ ,  $F_{med}$ ,  $F_{pa}$  and biomass reference points  $B_{pa}$  and  $B_{lim}$ .

**$B_{lim}$**  The  $B_{lim}$  is the limit of the spawning stock biomass, below which recruitment is impaired or the dynamics of the stock are unknown.

**$B_{pa}$**   $B_{pa}$  is the Spawning Stock Biomass (SSB) level above which the stock should be maintained to ensure a low risk to recruitment impairment. In stocks where there has been no evidence of reduced recruitment below a certain SSB size,  $B_{pa}$  has been calculated by multiplying  $B_{loss}$  (the lowest observed SSB) by uncertainty factor ( $e^{-1.645}$ ) to take into account assessment uncertainty.

**By-catch** Refers to discarded catch (see Discards) plus incidental catch not purposely targeted by the fishermen.

**CECAF** Fisheries Committee for the Eastern Central Atlantic – a committee of FAO (see below) and web page [http://www.fao.org/fi/body/rfb/cecaf/cecaf\\_home.htm](http://www.fao.org/fi/body/rfb/cecaf/cecaf_home.htm)

**CFP / Common Fisheries Policy** The instrument of fisheries management within the European community (see [http://europa.eu.int/comm/fisheries/policy\\_en.htm](http://europa.eu.int/comm/fisheries/policy_en.htm))

**CFB / Central Fisheries Board** is responsible for National inland fisheries development plans, administration of funding programmes, fresh water and sea angling promotion and management of fish rearing operations. (see <http://www.cfb.ie/index.htm>)

**Collapse** FSS consider a stock to have collapsed when the spawning stock biomass has been below  $B_{lim}$  for three consecutive years.

**CPUE / Catch Per Unit of Effort** The catch of fish, in numbers or in weight, taken by a defined unit of fishing effort. Also called catch per effort, fishing success, or availability.

**DCR / Data Collection Regulation** EU Council Regulations 1543/2000 and 1639/2001 established a community framework for the collection and management of the data needed to conduct the Common Fisheries Policy. Each member state must collect data on the biology of the fish stocks, on the fleets and their activities and on economic and social issues. (see: [http://europa.eu.int/comm/fisheries/policy\\_en.htm](http://europa.eu.int/comm/fisheries/policy_en.htm))

**DELASS** Developing Elasmobranch Stock Assessments – An EU-funded project aimed at species identification, stock identification and discrimination, as well as data preparation and exchange on elasmobranch species such as sharks and rays.

**Demersal** Fish, such as cod, whiting, haddock, sole, plaice, skates and rays, that normally swim in mid-water at or close to the sea floor.

**Discard** Discards are defined as that part of the catch returned to the sea as a result of economic, legal or other considerations.

**Discard rate** The percentage (or proportion) of the total catch which is discarded.

**Ecosystems** are composed of living animals, plants and non living structures that exist together and 'interact' with each other. Ecosystems can be very small (the area around a boulder), they can be medium sized (the area around a coral reef) or they can be very large (the Irish Sea or even the eastern Atlantic).

**Effective fishing effort** Fishing effort or intensity standardised in some way e.g. hours fished in an area.

**Elasmobranchs** Fish, such as skates, rays, sharks and dogfish, whose skeletons are cartilaginous rather than bony (as in the teleost species such as cod, whiting, plaice and herring).

**Emergency Measures** Measures adopted by the EU prior to the introduction of cod and hake as part of the recovery plan. **Exploitation pattern** The distribution of fishing mortality over the age composition of the fish population determined by the type of fishing gear, area and seasonal distribution of fishing, and the growth and migration of the fish. The pattern can be changed by modifications to fishing gear, for example, increasing mesh or hook size, or by changing the ratio of harvest by gears exploiting the fish (e.g., gill net, trawl, hook and line, etc.).

**Exploitation rate** The proportion of a population at the beginning of a given time period that is caught during that time period (usually expressed on a yearly basis). For example, if 720,000 fish were caught during the year from a population of 1 million fish alive at the beginning of the year, the annual exploitation rate would be 0.72.

**FAO** Fisheries and Agriculture Organization – Based in Rome, this organization is part of the United Nations (see <http://www.fao.org/fi/default.asp>).

**FAT** Fisheries Assessment Technician – regionally-based sea-going staff employed by FSS.

**Fishing Effort** The total fishing gear in use for a specified period of time. When two or more kinds of gear are used, they must be adjusted to some standard type

**Fishing Mortality** Deaths in a fish stock caused by fishing.

**$F_{lim}$**  is the limit fishing mortality.  $F_{lim}$  should be avoided with high probability because it is associated with unknown stock dynamics or stock collapse.

**$F_{max}$**  The fishing mortality for a given exploitation pattern rate of growth and natural mortality, that results in the maximum level of yield-per-recruit.

**$F_{msy}$**  The fishing mortality rate, which, if applied constantly, would result in Maximum Sustainable Yield (MSY). The largest annual catch that may be taken from a stock continuously without affecting the catch of future years; a constant long-term MSY is not a reality in most fisheries, where stock sizes vary with

the strength of year classes moving through the fishery. For practical purposes, the European Commission is likely to use the proxy of  $F_{0.1}$ , which approximates to  $F_{msy}$ .

**$F_{0.1}$**  The fishing mortality at which the increase in yield-per-recruit in weight for an increase in a unit-of-effort is only 10 percent of the yield-per-recruit produced by the first unit of effort on the unexploited stock (i.e., the slope of the yield-per-recruit curve for the  $F_{0.1}$  is only one-tenth the slope of the curve at its origin).

**$F_{pa}$**  is a precautionary reference point designed to ensure that there is a high probability that  $F_{lim}$  will be avoided and that spawning stock biomass will remain above the threshold ( $B_{pa}$ )

**$F_{sq}$**  is some estimate of recent fishing mortality. A three year average is used for most stocks since in most assessments the most recent  $F$  estimate is the most uncertain.

**Gadoids** An important family of food fish, including cod, haddock, rocklings, hake, whiting, blue whiting and ling. Usually characterised by the presence of a barbel on the chin.

**Gill nets** Static nets suspended in the water column to trap fish by the gills.

**Groundfish** Species of demersal fish dwelling on, or close to the sea floor, as targeted in the annual FSS groundfish surveys around the Irish coast.

**Growth overfishing** Occurs when fishing mortality exceeds  $F_{max}$

**FSS / Fisheries Science Services** – One of seven service areas of the Marine Institute, FSS's mission is to Assess, Research and Advise on the marine fisheries resource in Irish waters – (see: <http://www.marine.ie/>)

**Fleet** A physical group of vessels sharing similar characteristics in terms of technical features and/or major activity (e.g. the Irish beam trawler fleet < 300 hp, regardless of which species or species groups they are targeting).

**Fishery** Group of vessel voyages targeting the same (assemblage of) species and/or stocks, using similar gear, during the same period of the year and within the same area (e.g. the Irish flatfish-directed beam trawl fishery in the Irish Sea).

**Harvest Control Rule** A predefined rule governing the exploitation of fish stock such that management targets are achieved. These vary from the simple to the extremely complex.

**ICES** International Council for the Exploration of the Seas –Ireland shares the Total Allowable Catches TACs for many stocks we exploit with our European Union partners. Because of this international dimension many stocks need to be assessed in an international fora such as ICES. (see: <http://www.ices.dk/>)

**ICCAT** International Commission for the Conservation of Atlantic Tuna – (see: <http://www.iccat.es/>)

**IFREMER** France's national marine research agency – (see: <http://www.ifremer.fr/anglais/>)

**Inshore fisheries** There are various definitions of in-shore fisheries including those fisheries that are conducted within 12 miles of the shore, including demersal, pelagic, shellfish and sea angling fisheries.

**ISWPAC** Irish South and West Pelagic Advisory Committee

**MCS** Marine Conservation Society

**Management Plan** is a agreed plan to manage a stock. With defined objectives, implementation measures, review processes and stakeholder agreement and involvement.

**Maximum Sustainable Yield** The largest average catch or yield that can continuously be taken from a stock under existing environmental conditions. (For species with fluctuating recruitment, the maximum might be obtained by taking fewer fish in some years than in others.) Also called maximum equilibrium catch, maximum sustained yield, sustainable catch.

**Marine Institute** The Marine Institute is Ireland's national agency with the following general functions : "to undertake, to co-ordinate, to promote and to assist in marine research and development and to provide such services related to marine research and development, that in the opinion of the Institute will promote economic development and create employment and protect the environment." Marine Institute Act, 1991 – (see: <http://www.marine.ie/>)

**Metapopulation** consists of a group of spatially separated [populations](#) of the same [species](#) which interact at some level.

**Métier** Homogeneous Subdivision of a fishery by vessel type (e.g. the Irish flatfish-directed beam trawl fishery by vessels < 300 hp in the Irish Sea).

**MPA / Marine Protected Area** A conservation area in the sea usually designated for the protection and maintenance of biological diversity and natural and cultural resources.

**Natural Mortality** Deaths in a fish stock caused by predation, illness, pollution, old age, etc., but not fishing.

**NEAFC / North Eastern Atlantic Fisheries Commission** – A commission that manages fisheries off Scandinavia and north-eastern Europe - (see <http://www.neafc.org/>)

**Nominal catch** The sum of the catches that are landed (expressed as live weight or equivalents). Nominal catches do not include unreported discards.

**NOAA / National Oceanic and Atmospheric Administration** FSS co-operate with NOAA, our US counterparts, on a number of strategic projects. (see <http://www.noaa.gov>)

**OSPAR** The Oslo and Paris Commissions, which have the objective of protecting the Northeast Atlantic against pollution. Member countries range from Finland to Portugal and Iceland.

**Pelagic** Fish that spend most of their life swimming in the water column, as opposed to resting on the bottom, are known as pelagic species.

**Precautionary Approach** The precautionary approach should be widely applied to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment. The absence of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures.

**Quota** A portion of a total allowable catch (TAC) allocated to an operating unit, such as a Vessel class or size, or a country.

**Rate Of Exploitation** The fraction, by number, of the fish in a population at a given time, which is caught and killed by man during the year immediately following. The term may also be applied to separate parts of the stock distinguished by size, sex, etc. Also called fishing coefficient.

**Rebuilding Plan** (See Recovery Plan)

**Recovered** FSS consider a stock to have recovered when the spawning stock biomass has been above  $B_{pa}$  for three consecutive years

**Recovery Plan** This is a multi-annual plan to recover seriously depleted stock. The plans general involve agreed Harvest control Rules, Technical Measures, effort controls and various control and enforcement measures.

**Recruitment** The amount of fish added to the exploitable stock each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to the fishing gear in one year would be the recruitment to the fishable population that year. This term is also used in referring to the number of fish from a year class reaching a certain age. For example, all fish reaching their second year would be age 2 recruits.

**Recruitment overfishing** The rate of fishing above which the recruitment to the exploitable stock becomes significantly reduced. This is characterised by a greatly reduced spawning stock, a decreasing proportion of older fish in the catch, and generally very low recruitment year after year.

**Relative Abundance** An estimate of actual or absolute abundance; usually stated as some kind of index; for example, the average catch per tow on a survey.

**SACs** Special Areas of Conservation, sites designated under the European Community Habitats Directive, to protect internationally important natural habitats and species.

**Sample** A proportion or a segment of a fish stock which is removed for study, and is assumed to be representative of the whole. The greater the effort, in terms of both numbers and magnitude of the samples, the greater the confidence that the information obtained is a true reflection of the status of a stock (level of abundance in terms of numbers or weight, age composition, etc.).

**Shellfish Fisheries** Those fisheries where the target species are either crustaceans (e.g. *Nephrops*, lobsters, crabs and crayfish) or molluscs (Cephalopods, scallops, oysters etc.).

**STECF** The Scientific Technical and Economic Committee on Fisheries. Established by the European Commission and comprises fisheries scientists and economists from the member states. The role of STECF is to advise the European Commission on scientific, technical and economic issues related to the management of fisheries resources that are exploited worldwide by members of the European Union.

**Stock** A "stock" is a population of a species living in a defined geographical area with similar biological parameters (e.g. growth, size at maturity, fecundity etc.) and a shared mortality rate. A thorough understanding of the fisheries biology of any species is needed to define these biological parameters.

**Stockettes** Is a small localised population of a species living in a defined geographical area that mixes with other populations at a meta-population level perhaps during breeding phase of the life-cycle but may have different biological parameters and mortality rates.

**SSB / Spawning Stock Biomass** The total weight of all sexually mature fish in the population. The size of SSB for a stock depends on abundance of year classes, the exploitation pattern, the rate of growth, fishing and natural mortality rates, the onset of sexual maturity and environmental conditions.

**Spawning stock biomass-per-recruit (SSB/R)** The expected lifetime contribution to the spawning stock biomass for a recruit of a specific age (e.g., per age 2 individual). For a given exploitation pattern, rate of growth, and natural mortality, an expected equilibrium value of SSB/R can be calculated for each level of  $F$ . A useful reference point is the level of SSB/R that would be realised if there were no fishing. This is a maximum value for SSB/R, and can be compared to levels of SSB/R generated under different rates of fishing. For example, the maximum SSB/R for Georges Bank haddock is approximately 9 kg for a recruit at age 1.

**Sustainable yield** The number or weight of fish in a stock that can be taken by fishing without reducing the stock biomass from year to year, assuming that environmental conditions remain the same.

**TAC / Total Allowable Catch** is the total regulated catch from a stock in a given time period, usually a year.

**Tangle nets** Static nets lain on the bottom of the sea, aimed at trapping fish and shellfish by entanglement in their meshes.

**Teleost** Type of fish – such as cod, mackerel, plaice and sole – have skeletons made of bone, as opposed to elasmobranchs – such as sharks and rays – whose skeleton is composed of cartilage.

**TCM / Technical Conservation Measures** These measures take the form of closed areas, increased mesh sizes and gear modifications (such as separator panels) and are aimed at protecting specific stocks, or age-classes within that stock, from overfishing (See also Recovery Plans).

**U** An index of exploitable biomass. Notation used for deepwater stocks by ACFM in May 1998.

**$U_{lim}$**  For deepwater stocks has been calculated as  $0.2 * U_{max}$  (may be a smoothed abundance index).

**$U_{pa}$**  For deepwater stocks has been calculated as  $0.5 * U_{max}$ . For redfish  $U_{pa} = 0.6 * U_{max}$ .

**Unaccounted mortality** Any mortality that is not accounted for properly in a stock assessment model. Potential causes of unaccounted mortality include illegal or misreported landings; escapement or avoidance mortality that occurs when fish are injured by fishing gear but are not captured; and ghost fishing mortality, caused by lost gear (e.g., traps and gillnets) that continues to catch fish.

**Unaccounted removals** Any removal that are not accounted for properly in a stock assessment model. Potential causes include unaccounted mortality, migrations changes in natural mortality due to starvation, competition, predation, disease or mass mortality events.

**Whitefish** Term used to describe demersal species such as cod, plaice, ray etc., as opposed to pelagic or salmonid species.

**WWF** World Wide Fund for Nature - The Conservation Organization (known as World Wildlife Fund in certain countries)

**Year class (or cohort)** Fish in a stock born in the same year. For example, the 1987 year class of cod includes all cod born in 1987, which would be age 1 in 1988. Occasionally, a stock produces a very small or very large year class which can be pivotal in determining stock abundance in later years.

**Yield-per-recruit** The expected lifetime yield-per-fish of a specific age (e.g., per age 2 individual). For a given exploitation pattern, rate of growth, and natural mortality, an expected equilibrium value of  $Y/R$  can be calculated for each level of  $F$ .