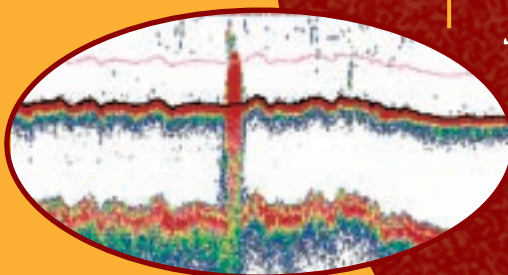


# THE STOCK BOOK



*Annual Review of  
Fish Stocks in 2002  
with Management Advice  
for 2003*



*Marine Institute*  
*Foras na Mara*

...TO ASSESS,  
RESEARCH  
AND ADVISE

*Marine Fisheries Services Division*

*November 2002*



**Marine Fisheries Services Division,  
Galway Technology Park,  
Parkmore, Galway, Ireland**

# THE STOCK BOOK

**Report to the Minister for Communications, Marine and Natural Resources  
Annual Review of Fish Stocks in 2002  
with Management Advice for 2003**

## **The Stock Book Team**

*Paul Connolly, John Joyce,  
Colm Lordan, John Molloy, Rick Officer, Edward Fahy,  
Ciaran Kelly, Maurice Clarke, David Stokes, Sara Jane Moore, Leonie Dransfeld,  
Jennifer Doyle, Ciaran O'Donnell, Grainne Ni Chonchuir, Helen McCormick, Dermot Kennedy,  
Eugene Mullins, Peter White, Graham Johnston, Turloch Smith, Macdara O'Cuaig, Selene Hoey,  
Fiona Woods, Jim Carroll, Deirdre Lynch, Susan Beattie, Nicola Donohoe,  
Denise O'Brien, Lisa Borges, Edgar McGuinness, Ayessha Power,  
Mary McClenaghan, Margaret O'Toole, Niamh Slattery,  
John Boyd, Oonagh Dwane*

***NOVEMBER 2002***

*In the 2002 Stock Book, every effort has been made to use the most up to date version of the ICES advice. However, the final official ICES ACFM 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 2002.*

Marine Institute Headquarters  
Galway Technology Park  
Parkmore  
Galway  
Ireland

Telephone: +353 (0)91 730 400  
Facsimile: +353 (0)91 730 470

E-mail Information: [institute.mail@marine.ie](mailto:institute.mail@marine.ie)  
E-mail Webmaster: [webmaster@marine.ie](mailto:webmaster@marine.ie)  
Website: <http://www.marine.ie>

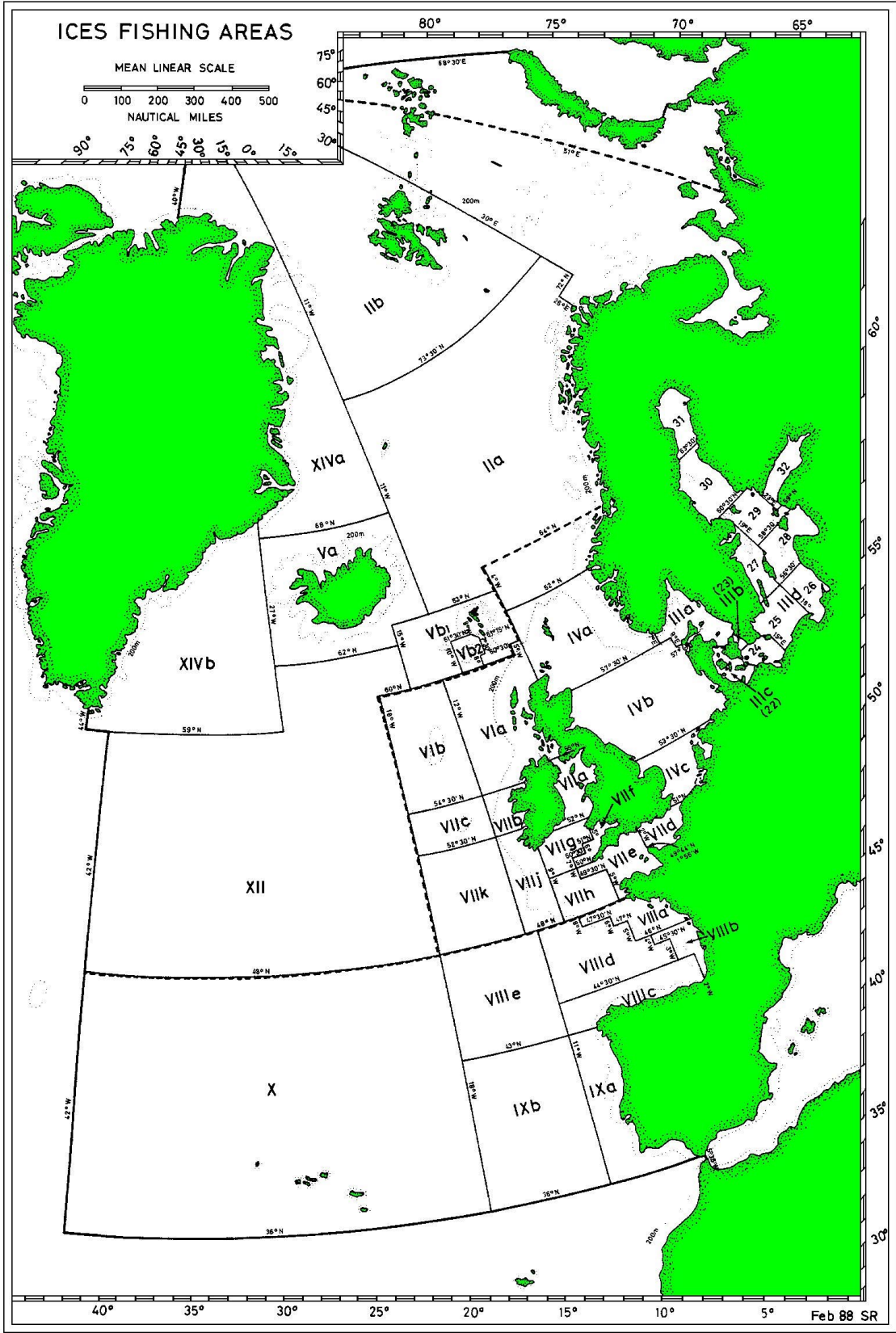
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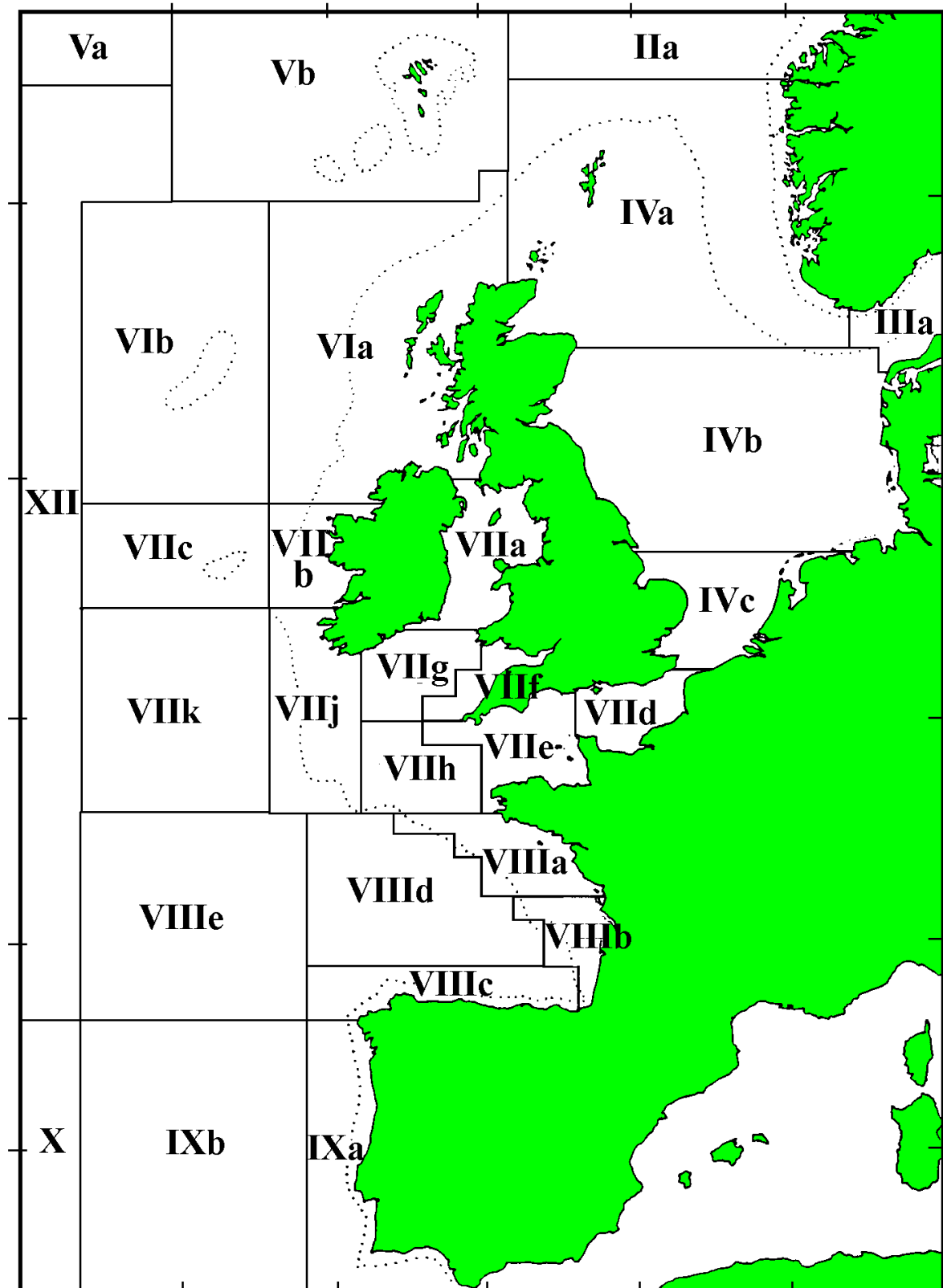


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## ICES Fishing Areas



## *ICES Fishing Divisions around the Irish Coast*



## Purpose of the Stock Book

The **Stock Book** is the principal annual publication of the Marine Institute's Marine Fisheries Services Division (MFSD). Its timely production, and accurate content are essential to MFSD's primary client - the Department of Communications, Marine and Natural Resources (DCMNR) – in serving Ireland during the annual TAC negotiations at the EU Council of Ministers meeting in December and throughout the year at other fisheries management meetings with the EU\*.

The book focuses on the TAC fish stocks of interest to Ireland. The purpose of the book is to provide

- The most up-to-date scientific and management advice from an Irish perspective,
- A summary on the current state of the stocks,
- Salient information on the biology, management and assessment of these fish stocks.

The Stock Book also provides overviews of Ireland's marine fisheries (including non TAC fisheries) and summarises the results of the Marine Institute's monitoring programmes that contribute to the international assessment of fish stocks in the waters around Ireland.

The Stock Book also provides a unique reference source for a much wider audience, including the Irish fishing industry, fisheries scientists, fisheries 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, it should be noted that the Irish landing figures for 2001 remain provisional. ICES, ICCAT and STECF advice available up to the time of printing is incorporated in the Stock Book. However, final ICES, ICCAT and STECF 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.

## Marine Fisheries Services Division

Ireland has an extensive marine territory, encompassing some 900,000 sq km of seabed, which is over 10 times the national land area. Realisation of the importance and economic significance of this resource led to the establishment of the Department of the Marine in 1987 (subsequently the Department of the Marine and Natural

Resources, 1997; Department of Communications, Marine and Natural Resources in 2002) and of the Marine Institute in 1991.

The Marine Institute is the national agency with the general brief to

*“... undertake, to co-ordinate, to promote and to assist in marine research and development and to provide such service related to marine research and development that in the opinion of the Institute will promote economic development and create employment and protect the marine environment”.*

*Marine Institute Act 1991*

The Marine Fisheries Services Division (MFSD) is one of six Service Divisions within the Marine Institute. Its remit is to “assess, research and advise” on marine fisheries in order to ensure the sustainable exploitation of this resource. MFSD is responsible for the monitoring of commercially exploited marine stocks in the waters around the Irish coast. The four units within MFSD (Demersal, Pelagic, Shellfisheries and Inshore) carry out the Irish stock monitoring programmes, participate in the various ICES Working Groups, ACFM and STECF and provide scientific advice to the DCMNR on status and management of these stocks. MFSD also conduct various fisheries research programmes aimed at both improving the knowledge base and the scientific advice for this resource.

MFSD conducts a comprehensive monitoring programme on stocks in the waters around the Irish coast. The basic information required for stock assessment of each stock includes

- the length distribution of the landings,
- a profile of the age structure of the landings,
- discard information
- the number of boats fishing in a particular area,
- the catch and the time spent fishing
- information on the annual landings into each port
- data from various research surveys

The landings are sampled at the ports, various fishermen's Co-operatives, fish processors and auction sites around the coast. The MFSD employs a series of contract port samplers who are continuously sending information to the Marine Institute's Abbotstown Laboratory. These data collection programmes are conducted under the EC Data Collection Regulation (EC Council Regulation 1543/2000). The Marine Institute is the Irish National Programme co-ordinator for this regulation and work closely with DCMNR to ensure the work programmes meet the requirements of the regulation.

MFSD also provides advice to the DCMNR on stocks of local interest and on the inshore fisheries.

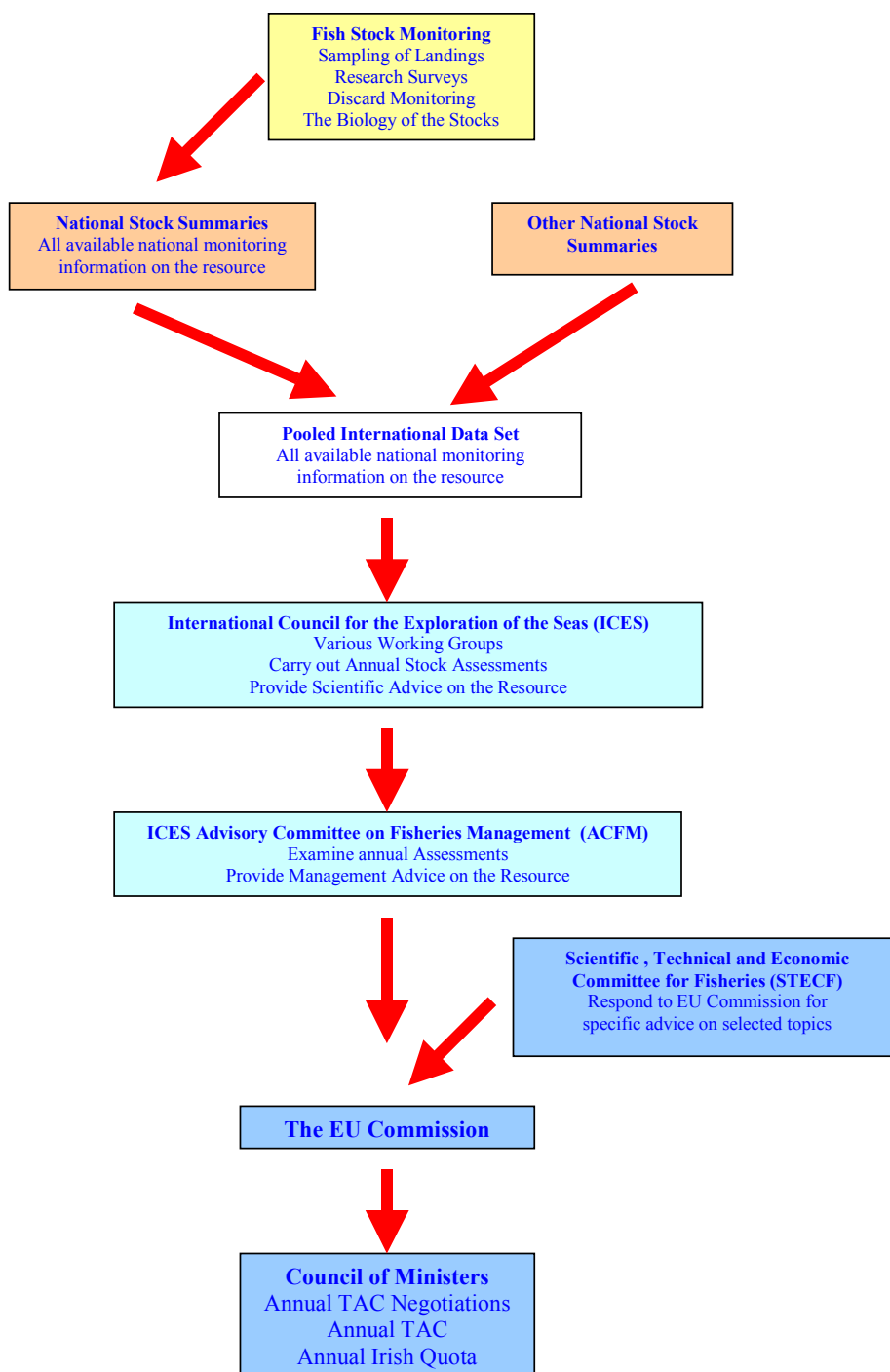
\*An explanation of the acronyms and technical terms used in the Stock Book is found in the appendices.



MFSD conduct surveys on board chartered commercial vessels and on the state research vessel *RV Celtic Voyager*. These surveys include acoustic surveys, egg and larval surveys, young fish surveys, groundfish surveys and tagging studies. The results are used in the annual fish stock assessment process. MFSD also conducts a sea going discard-sampling programme in order to monitor the level of discarding of fish in the various Irish fisheries. Summaries on the status of each stock are presented annually to the appropriate ICES Working Group, for international stock assessment purposes. This information is pooled with other international data to perform annual stock assessments.

The monitoring programme provides the scientific data that are used to assess the status of fish stocks and other commercially exploited living resources. Each year, MFSD carry out assessments at the various working groups of the International Council for the Exploration of the Sea (ICES). These stock assessments provide scientific advice on the status of the stocks and are reviewed by the ICES Advisory Committee on Fisheries Management (ACFM) and the EU Scientific Technical and Economic Committee on Fisheries (STECF). These bodies produce the management advice that forms the basis of the advice to the EU Commission on the annual TAC negotiations.

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



# Organisation of the Stock Book

The Stock Book features a main page for each stock of commercial interest to the Irish fishing industry. This main page includes MFSD commentary and advice, laid out in the following sections;

**MFSD - ADVICE**  
**STATE OF THE STOCK**  
**CURRENT MANAGEMENT**  
**MFSD - ECONOMIC COMMENTS**  
**ADDITIONAL INFORMATION**

**\*\*\*SPECIAL COMMENTS (If Required)**

*Following the main page, the ICES ACFM report for the stock is given.*

**MFSD – ADVICE** appears in a yellow box and is highlighted in red. It provides the main management advice for each stock, mainly in terms of proposed catches for 2003 and any technical measures that need to be considered. The proposed TAC for 2003, with the associated Irish quota is also given. An explanation of the ‘ICES advice on Management’ is provided where this is necessary. MFSD advice then elaborates on any major points that impact on the Irish fisheries. Relevant STECF comments are also included with the MFSD advice.

**STATE OF THE STOCK** details the salient features about the current and historic state of each stock. These include, current and future state of the stock, trends in biomass, recruitment, landings, fishing mortality and precautionary reference points

**CURRENT MANAGEMENT** gives the management and assessment area for the stock and provides the TAC and Irish quota for 2002. 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 herring fish stocks. A pie chart gives the percentage national quota allocation for the TAC.


**MFSD – ECONOMIC COMMENTS** detail the value of the TAC, Irish quota and 2001 Irish landings for each stock. The economic value of the fishery to Ireland is also highlighted.

**ADDITIONAL INFORMATION** provides important additional information on aspects of each stock, mainly from an Irish perspective, including information that does not appear in the ICES advice – derived from the MFSD 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 special comments 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.


For all the key stocks, MFSD 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.

The length frequencies of the Irish catches (including discards when available) are also plotted for each stock together with the age profile of the Irish catches and the size (length) at age.



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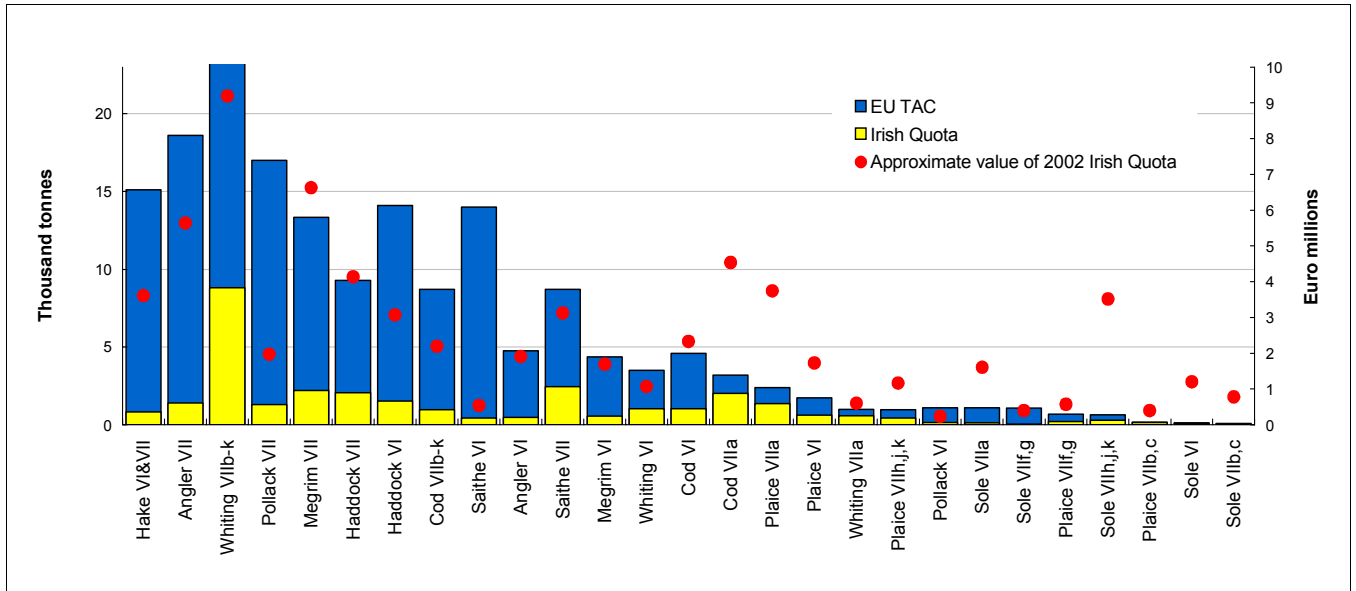
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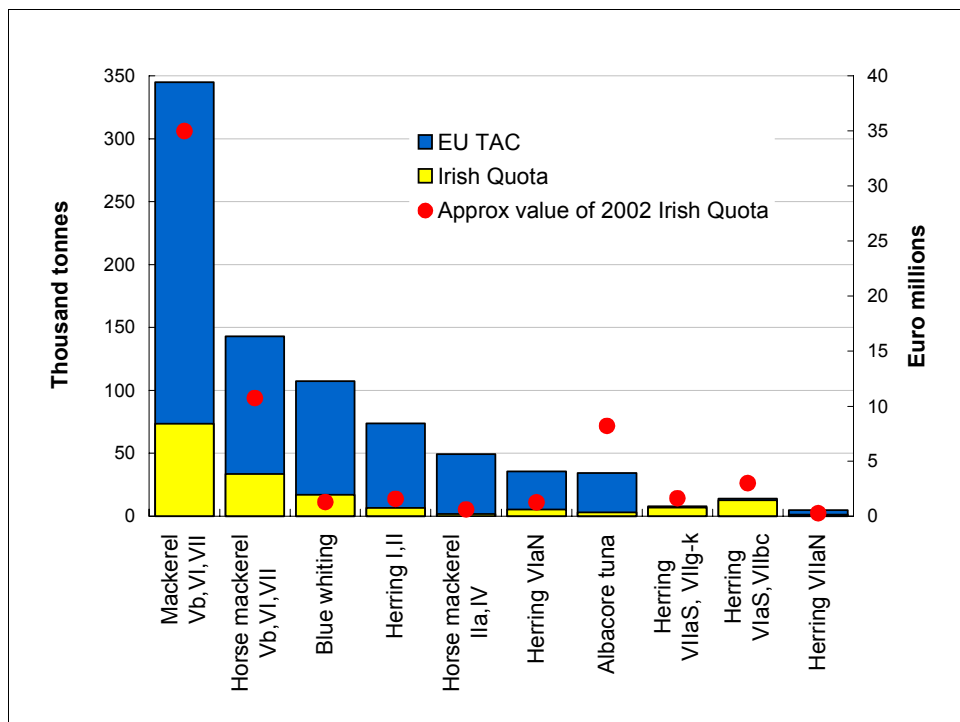
Marine Fisheries Services Division  
Marine Fisheries Service Division, Abbotstown Laboratory, Snugboro Road, Dublin 15.  
telephone: 01 822 8200 facsimile: 01 820 5078 website: www.marine.ie  
Applied Science for Net Profit

# IRELAND'S SHARE OF THE 2002 EU TACS & Approximate Value of the Irish Quota in 2002

## Demersal Fisheries



## Pelagic Fisheries



# MFSD Pelagic Fisheries Overview

The main pelagic fisheries exploited by the Irish fleet are:

- The herring fishery in the Celtic Sea and off the south-west coast (ICES Divs. VIIaS, VIIg and VIIj).
- The herring fishery off the west and north west coast (ICES Divs. VIaS and VIb).
- The mackerel fishery undertaken along the west coasts of Ireland and Scotland and in the North Sea.
- The horse mackerel fishery mainly undertaken off the north-west coast.
- The blue whiting fishery mainly undertaken along the edge of the continental shelf off the west of Ireland.
- The sprat fishery, which takes place along the south, west and north west coasts.
- The tuna fishery that exploits mainly albacore tuna and takes place south and south west of Ireland, in the Bay of Biscay and in international waters

In addition to the above fisheries sporadic landings of pilchards are taken by vessels fishing in the English Channel area and off the north coast of France while Irish freezer trawlers are also engaged in pelagic fisheries off the Mauritanian coast.

## HERRING

### Overview

There are a number of herring stocks around Ireland and the west of Scotland that are exploited by the Irish fleet. These stocks are considered to be biologically separate, for the purposes of assessment and management and each stock has its own management unit (Appendix 2).

The stocks are: -

- The West of Scotland Stock - Div. VIa (North)
- The Stock in the Irish Sea Div. VIIa (North)
- The Stock West and North of Ireland Div. VIa (South) and Div. VIb
- The Stock in the Celtic Sea and South West of Ireland (Div VIIa (South); Div. VII g and Div VII j.

### Irish fisheries

Only the herring stocks in the Celtic Sea and VIIj and in Divisions VIa South and VIb,c have been consistently exploited by Ireland in recent years and these are the most important fisheries for Ireland. Some catches have however, been taken from Division VIa (North) and from Division VIIa (North) and also from the fishery for Norwegian spring spawning herring. Ireland has around 90% of the TACs in both of the main fisheries and has taken its full share of the TACs in recent years. Ireland also has valuable quotas in the fishery to the west of Scotland i.e.

Div. VIa (North) and in the Irish Sea i.e. Div. VIIa (North) – neither of which have been fully utilised in recent years. However for the first time for a number of years some vessels did participate in the Irish Sea fishery in August and September of 2001 and 2002 and a number of landings were made.

The catches taken by Irish vessels in the fishery for Norwegian spring spawning herring have decreased since the Irish fleet first participated in this fishery in 1995. The catches in 2000 and in 2001 were approximately 9,000 t and 4,400 t respectively compared to over 19,000 t in 1996. Difficulties in marketing and in locating herring have discouraged vessels from participating in the fishery and only a small number of vessels participated in 2001 and 2002 when catches were landed into continental ports.



### Management measures

All the fisheries exploited by the Irish fleets are subject to overall TACs, imposed by the EU or by NEAFC. In general the catching potential of the Irish fleet greatly exceeds the total national quota. This has presented severe problems in managing the fisheries – particularly since a large number of very efficient vessels of various sizes have to share a small quota. Consequently all the Irish fisheries are controlled by the imposition of catch quota per vessel that restrict catches on a nightly or on a weekly basis. Quota are dependent on the size and type of vessel. Numbers of vessels are regulated by licences and further restrictions are imposed as to when and where landings can be made. Additional management measures include closed seasons and closed areas. For both herring fisheries important local management committees were established in 2000 and 2001. These committees have a number of functions which include increasing the involvement of the local industry (processors and fishermen) in the assessment and management of the fisheries, ensuring that the level of research required to carry out accurate scientific assessments is adequate and establishing long term targets for stock levels and catches.



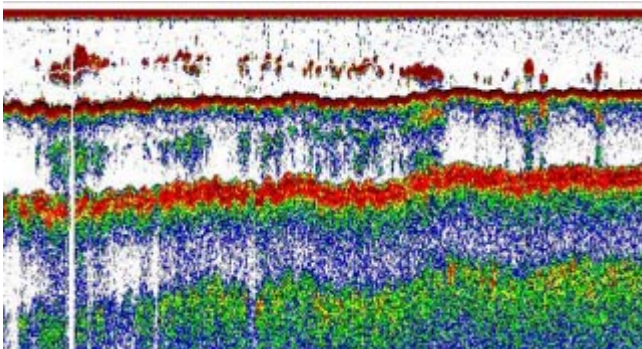
### Herring assessments

It is important to remember that during the 1970s all of the major herring stocks in Western Europe went through a period of decline. This decline was due to a very high exploitation rate and a failure of recruitment. Irish fisheries in the Celtic Sea and in Div. VIa, were closed during the period 1977 to 1982 and the industry suffered severe hardships as a result. The fisheries were eventually re-opened in the early 1980s but many of the traditional markets had in the meantime disappeared. The stocks recovered in the late 1980's but concern has again been expressed about the state of many of the European stocks including the stocks off the west and north west coasts of Ireland. The state of the Celtic Sea herring stock is at present very uncertain. The stock is heavily dependent on continuous good recruitment and appears to be quickly affected by changes in fishing effort and environmental conditions.

The TAC had been stable in recent years but uncertainty in the stock led to a recommendation for a precautionary TAC for the first half of 2002. This TAC was later increased in September 2002 but the figure (13,000 t) is still considerably below the level of recent years (ca 20,000 t). The stock off the north west and west coast continues to remain at a low level despite the reduction in catches in recent years. Recruitment has been very poor in the stock for a number of years and the available advice predicts that the stock will not increase until recruitment improves. The stock in the Irish Sea has been stable at a low level for a number of years even though it is not heavily exploited. No Irish vessels participate in the herring fishery in the North Sea, where the stock has recovered slowly in recent years and is predicted to increase substantially in 2003.

### Market and potential value of the herring catch

The preliminary total landing figure for Ireland in 2001 amounted to over 40,600 t and was valued at over €9.6 million. The corresponding figures for 2000 were 42,000 t valued at €9.95 million. The 2001 figures represent nearly 6% of the total value of the Irish wet fish catch and nearly 16% of its volume.



Prior to 2000 the herring market had been very depressed for a number of years and prices were at a very low level compared with those in the mid 1970s. It had been particularly difficult to sell herring due to a poor demand for "roe" fish on the Japanese market and for frozen whole and filleted herring on the continental market. Catches

taken in the North Sea also have a big influence on the markets for Irish herring, particularly imports of Norwegian herring into Denmark and Germany.



However, the market improved significantly in 2001 when there was a very keen demand for herring. Prices per tonne in the autumn of 2001 were approximately three times higher than in the autumn of 2000. However, this improved market demand was short lived and prices in 2002 have again been very depressed. This appears to have been caused by a ready supply of herring on the European market from the North Sea and the Norwegian fisheries and also because large supplies of poor quality Irish herring landed during the 2001/2002 season remained in cold storage and could not be sold.

Although the value of the Irish herring catch has decreased in 2002 herring fisheries continue to be one of the most important components of the Irish fishing industry. This is because of the number of vessels and processing factories that continue to be heavily dependent on herring and also on the number of jobs that are created in the shore based industries. These fisheries need to be continually assessed and carefully managed in order to prevent any collapse in the stocks and the consequential effect that this would have on the general industry.

## MACKEREL

### Background

ICES have traditionally assessed three mackerel stocks

- North Sea Stock
- Western Stock
- Southern Stock.

However, in recent years it has become increasingly difficult to assess the stocks separately and since 1998 ICES have carried out a combined assessment of all stocks. This combined stock is called the **North East Atlantic mackerel stock**

The North Sea stock was heavily exploited in the 1960s - mainly by the Norwegian purse-seine fleet and at one stage annual catches of over 1 million tonnes were recorded. However the stock collapsed in the late 1960s and the fishery has never subsequently recovered. Catches at the moment are believed to be about 10,000 t-20,000 t.

The western stock, which was not heavily exploited at the

time of the large fisheries on the North Sea stock, dramatically changed its migration pattern and distribution in the 1980's and moved into the Norwegian Sea and North Sea. The shoals over-winter in the Norwegian Sea and in the northern part of the North Sea and in the late 1990's this component remained in these areas until late January or early February. However in recent years the migration from these over-wintering areas appears to have commenced earlier than previously and some shoals are believed to have left the area as early as mid December. This migration brings the shoals to the spawning grounds which are located along the continental shelf from the north coast of Spain to the west coast of Scotland and as far west as the Porcupine Bank. After spawning is completed the shoals migrate northwards towards the summer feeding grounds in the Norwegian Sea and in the northern North Sea and then they return to the over-wintering grounds. The juveniles do not make these extensive migrations and for the first one or two years remain in the southern areas and in inshore waters.

The total catch taken from all fisheries in 2001 was about 678,000 t. This was nearly 8,000 t higher than in 2000. This total catch in 2001 included about 92,000 t, which were taken in the "international" fishery west of Norway. The Southern stock inhabits the area off the north and west coasts of Spain and the coast of Portugal. It is only subjected to a direct fishery in the early part of the year. The catches from this fishery were over 43,000 t in 2001 compared with 36,000 t in 2000.

#### **The Irish mackerel fishery**

The official catch recorded by Ireland for 2001 was about 70,450 t and was valued at over €33 million. The Irish quota in 2001 was 73,597 t.



The Irish fleet began exploiting mackerel in the late seventies when the herring fisheries collapsed. In the early years the shoals were exploited inshore by Killybegs boats during autumn and winter. Gradually the location of the fisheries changed as the stock changed its migration pattern. Since the late 1980s the fleet has concentrated on the over-wintering concentrations in the North Sea and on the

shoals as they migrate to and from the spawning grounds that are situated off the southwest and west of Ireland. Prior to 1989 the Irish fleet was not permitted to fish east of 4°W Long. (i.e. in the North Sea) at any time. Subsequently fishing has been permitted in this area in the fourth quarter but restrictions were imposed on the amount that could be taken. These restrictions affected the fishing pattern of the Irish fleet, particularly as in recent years the annual migrations of shoals from the over-wintering grounds have been delayed. Restrictions were relaxed in 2000 and limited catches have since been permitted east of 4° Long until 15 February. The migrations from the over wintering grounds commenced earlier in recent years than previously and Irish vessels exploited the



shoals west of Scotland in mid December in both years.

Because of the prohibition on fishing in Div IVa in the early years the Irish fleet in 1994 developed a local fishery for mackerel off the north west coast of Donegal during autumn in which substantial quantities of small mackerel were taken. An undesirable aspect of this fishery was that the vast majority of fish in the catches were juvenile immature mackerel between 1 and 3 years old. A similar fishery, which developed off Cornwall in the seventies, led to the introduction of the 'Cornwall box' in which fishing for mackerel is prohibited. The fishery off Cornwall had an adverse effect on the stock and the mortality on juveniles was greatly increased during the time of its existence. However the catches taken in this "local" fishery have decreased considerably since 1996 although survey data and incidental catches from herring boats indicate that large quantities of small mackerel still appear to be present from around the Irish coast, particularly during the autumn.

#### **Management measures**

Apart from the management measures introduced by EU, such as the overall TAC, a limited numbers of days at sea and restrictions on fishing east of 4°W Long there are a number of local management measures imposed on the Irish fleet. These include - seasonal closures, area closures and boat quota. The Irish fishery in 2001 and 2002 has been managed by the North West Pelagic Management Committee and by the South and West Pelagic Committee.



### Mackerel assessments

Assessment of the mackerel stock has been uncertain and there have been major revisions to stock estimates and TACs. The difficulties are created by a number of factors:

- The very large area over which the stock is distributed
- The uncertainty about what actually constitutes a stock
- The international egg surveys, on which the assessments are based, are carried out only every three years
- Uncertainty surrounds the estimates of recruitment
- The changes that have taken place in the mackerel migrations
- The poor quality of the international catch statistics.



tics.

Prior to 1995, three separate mackerel stocks were believed to exist in the North East Atlantic. A large degree of mixing appeared to take place between the three stocks and because of this and the changes in the migrations and distributions of the Western and North Sea stock, it became increasingly difficult to assess the stocks separately. In 1995 the ICES Working Group, which deals with the assessment of mackerel stocks, decided that it was no longer realistic to treat the stocks separately for assessment purposes. It was therefore decided to combine the three different components into one major unit called the **North East Atlantic Mackerel Stock**. This assessment was again carried out at the 2001 meeting of the working group that met in Copenhagen in September. An additional separate assessment of the Western stock was carried out but was only done to study the development of the stock. Predictions were carried out only on the North East Atlantic stock. These predictions were carried out for two different fleets:- the fleet that would normally exploit the combined Western and North Sea components and the fleet that would normally exploit the Southern component. In this way it is possible to examine the likely catches that may be taken from each component.

### Market and potential value of the mackerel catch

The total Irish mackerel catch in 2001 was over 70,000 t valued at €33.48 million. The corresponding catch in 2000 was also about 70,000 and the value was €28.77 million. A large portion of the Irish mackerel catch is landed out-

side Ireland, either in the United Kingdom, (mainly Scotland), and continental ports in France, the Netherlands and Norway. Most of these catches are frozen for export to Russian or Japanese markets. Large mackerel (>600 gm.) can fetch very high prices on the Japanese market. This means that large quantities of small mackerel are often discarded at sea by the freezer trawlers in order to ensure that the major portion of their catch is composed of large mackerel. Catches that are landed at home ports are usually frozen whole or filleted and then frozen for export to a number of countries in Africa, Europe and Asia.

## HORSE MACKEREL

### Overview

ICES recognise three horse mackerel stocks – each of which is assessed separately. The stocks are:

- North Sea stock
- Western stock
- Southern stock

The identities of the different stocks are uncertain and are based on the location of the fisheries, rather than on a sound biological basis.

### The Irish fishery

The Irish fishery for horse mackerel is a comparatively recent one and the fishery has only developed since the early 1980s. Prior to this no landings were recorded by Ireland. The Irish pelagic fleet, (the RSW vessels and one freezer trawler) mainly exploit the western stock but also take small catches from the North Sea stock. The horse mackerel fishery is extremely important to the north west region and Ireland is one of the major horse mackerel catching countries. The main catches are taken during the autumn from off the north west coast but catches are also taken during spring when fish are spawning along the west and south west coasts. The fishery since 1999 has been hampered by a decrease in the stock and also by a lack of demand due to the unsuitability of the fish for the Japanese market. Catches have as a result declined considerably. The sale of the catch for human consumption is largely dependent on Japanese markets and in some years substantial quantities have been reduced to fishmeal.

### Management measures

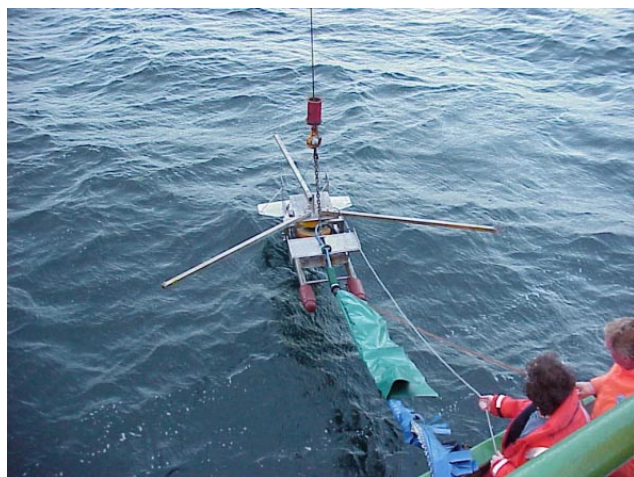
There is no overall management of the horse mackerel stocks. However, the fishery on the Western stock, exploited by EU fleets, is now managed by a TAC. This TAC was divided into national quota for the first time in 1998. The Irish share of the total EU TAC was 23.6%. The TACs prior to 1997 were often grossly exceeded but the EU fishery was closed for the first time in 1998 when the TAC was reached. In addition to the EU imposed man-



agement measures Irish authorities also impose additional measures similar to those in the mackerel fishery. As in the herring and mackerel fisheries the horse mackerel fishery off the north west is managed by the North West Pelagic Management committee that was established in 2000.

### Horse mackerel assessments

The assessments of the horse mackerel stocks are poor because of lack of sampling programmes, lack of survey data and difficulties in interpreting the biological data.



The assessments are heavily reliant on the triannual egg surveys. In 2002 Ireland carried out a special egg survey on this species, funded by the North West Pelagic Management Committee. (See special note on mackerel). Ireland commenced a sampling programme on horse mackerel in 1998 that was part funded by the Donegal Processors. This programme was continued and expanded in 2001 by the Marine Institute and it has enabled Ireland to make a much more substantial contribution to the overall assessment of the stock. The Netherlands, Spain, Portugal, Ireland and Norway are the only countries that carry out comprehensive sampling programmes on horse mackerel.

### Market and potential value of the Horse mackerel catch

The total Irish catch in 2001 was about 55,000 t and was valued at over €17.45 million. The corresponding landing for 2000 was also about 55,000 t and was valued at nearly €15.43 million.

The major portion of the horse mackerel catch is landed at Killybegs and is processed for the Japanese market. The price fluctuates considerably and is very dependent on the success of other horse mackerel fisheries that supply the Japanese market and also on the quality of the fish in Killybegs.

## BLUE WHITING

### Overview

The total catch taken from the blue whiting fishery in the last three years has increased dramatically and in 2000 reached a record level of over 1.4 million t. The main catches are taken by Norway, Russia and a number of northern European countries. Since 1999 very large in-

creases in total catches have been recorded by Russia, Iceland and Faroe Is, all of whom have nearly doubled their previous catches in the last two years.

A large proportion of the total catch is taken from deep waters to the west and north west of Ireland on the spawning concentrations. Other major fisheries take place in the northern European waters between Norway and Iceland.

### The Irish fishery

The Irish fishery for blue whiting has increased significantly in recent years. The catch in 2001 was nearly 30,000 t valued at €2.2 million, compared with 26,000 t, valued at over €1.5 million in 2000. However the volume landed and its value decreased considerably from comparable figures for 1998. The preliminary figure for the 2002 fishery is 17,800 t valued at €1.6 million. The fishery in 2002 was relatively brief due to heavy catches taken by a certain Irish freezer trawler. The fishery is a potentially very valuable source of income to the large vessels fishing out of Killybegs, particularly because of restrictive quota on the pelagic stocks. In 1999 the EU decided to institute an overall TAC on the EU fleets engaged in the fishery and the Irish share of this TAC in the areas in which the Irish fleet operates is 24%. This has caused a severe reduction in the catches since 1999 and has severely limited the expansion of the fishery. Most of the Irish catch has been reduced to fishmeal.

In recent years BIM, together with the North and West Pelagic Management Committee have been investigating the possibility of processing blue whiting for human consumption and in 2001 about 500 t were successfully graded and frozen for this purpose.

### Blue whiting assessment

The assessment of blue whiting assumes that there is only one stock that inhabits a large area extending from the Strait of Gibraltar to the Barents Sea. The assessment is imprecise due to difficulties in interpreting the results of various surveys and a lack of biological data.

## SPRATS

Sprat fisheries have taken place in many areas around the Irish coast without any recognizable pattern. In the 1970's and 1980's sprat fishery largely supported the industrial fishery in the Irish Sea and there have also been important localized fisheries along the south coast and in Galway Bay. In recent years fisheries have developed in Donegal Bay and in the Shannon estuary. The fisheries have assumed considerable importance because they have provided a valuable alternative to the smaller pelagic and white fish vessels that traditionally have been dependent on herring during the autumn and winter. They have also helped to reduce the fishing effort on white fish stocks that are under tight quota.

The total catch in 2001 was only 455 t that was valued at about €84,000. The comparable figure in 2000 was over 6,000 t valued at €1.9 million. Most of this catch was frozen whole for export to continental markets. The markets



are very dependent on sprat catches in the North Sea and in the Baltic Sea.

Sprat is a short lived species and the stocks fluctuate very much because of the variations that take place in recruitment. The fluctuations that occur in the stock sizes make assessment very difficult and no stock assessments are carried out in Ireland. However, various surveys carried out particularly the herring acoustic surveys indicate that considerable sprat stocks are present around the Irish coasts and they are a potentially valuable resource that should be developed further. The abundance of the stocks is unpredictable and it is not possible to provide management advice other than that the stocks should be harvested as they become available.

## PILCHARDS

In 2001 nearly 8,000 t of pilchards (sardines) were recorded by Irish vessels. This catch was valued at €2.7 million and was mainly landed into France. The catch in 2000 was about 2,600 t valued at about €760,000. Most of the Irish catch was taken by vessels fishing in the English Channel. Pilchards were present in the Celtic Sea during the autumn and winter and this stock is a potentially valuable resource if the fish can be landed and marketed in good condition

## ALBACORE TUNA

The Irish fishery for tuna exploits a species called albacore tuna (*Thunnus alalunga*). Albacore tuna is a temperate species widely distributed throughout the Atlantic Ocean and the Mediterranean Sea. On the basis of available biological information three separate stocks are distinguished - Northern and Southern stocks (separated at 5°N.Lat.) and the Mediterranean stock. However, it is acknowledged that the biological basis on which this differentiation is made is very limited. Albacore spawn in the subtropical areas of both hemispheres in the Atlantic and spawning takes place during spring-summer. Maturity is thought to occur in the northern tuna at about 90 cm. Before the onset of sexual maturity juvenile tuna are mainly found in surface waters, where they are targeted by surface gears. Some adult albacore are also taken in surface gears but as a result of their deeper distribution, they are mainly caught using deeper set longlines. Young tuna are also caught by longlines in temperate waters.



The fishery for North Atlantic albacore tuna is carried out mainly by Spain, France and Ireland. The total international catch in 2001 was 25,000 t (preliminary figure) compared with 33,800 t in 2000. The main international catches in 2001 were taken by bait boats (6,000 t), trolling fleets (4,300 t) trawls (5,200 t) and long lines (5,800 t). Prior to 2001 an increasing amount of albacore tuna was taken by drift nets but this method of fishing is now prohibited in EU waters.



The total Irish albacore tuna catch in 2001 was about 2,000 t, which was about 1,500 t lower than that taken in 2000. The total landing in 2001 was valued at €5.2 million. While the fishery remains extremely valuable, especially to the ports on the southwest coast, both the quantity and the value of the catch decreased significantly in 2001. The Irish fishery for albacore tuna developed in the early 1990s and catches reached a peak in 1999 of over 4,800 t. Most of the catches are landed at the ports of Castletownbere and Dingle where the fishery provides a valuable alternative to the demersal and pelagic fisheries. The season for the Irish fishery extends from July through to September.

The main gear used by the Irish fleet prior to 2002 has been drifting gill nets. However this method of fishing was prohibited by the EU from the end of 2001 and this had a very serious effect on the Irish fishery. In an effort to develop alternative methods of catching albacore tuna, other than with drift nets, BIM and the Marine Institute investigated the commercial possibilities of using alternative gears (paired midwinter trawls and trolls) during the 1998 and 1999 seasons. These investigations were funded by the EU and involved Irish and French fishermen. In addition to experiments with gear, investigations were also carried out on the use of satellite imagery to provide information on water temperatures and locations of shoals and also on the use of sophisticated echo sounders to detect tuna shoals. During these investigations observers were placed on as many vessels as possible, to collect biological information on catches and on fishing operations. In 2002 almost the total Irish catch was taken by midwater trawls.

The location of the catches depends very much on the migrations of the tuna shoals which themselves are influenced by water temperatures. Catches are taken over a large area extending from approximately 100 miles west of Kerry to the southern parts of the Bay of Biscay.

The fisheries for tuna species, including albacore tuna, are regulated by the International Commission for the Conservation of Atlantic Tuna (ICCAT). Scientific advice on tuna is formulated by the Standing Committee on Research and Statistics (SCRS) of ICCAT. Prior to 2001 there were no catch restrictions on albacore despite recommendations made by SCRS. However, in 2001 the EU introduced a TAC for albacore of 28,712 t and Ireland was allocated a quota of 3,158 t (11%). These figures were again adopted for 2002

In 1998 an EU regulation was adopted which progressively limited the number of vessels using drift nets and Ireland were required to reduce the number of commercial vessels in 1999 and 2000. Finally this method of catching albacore tuna was prohibited from the beginning of 2002.

Biological sampling of the catches taken in the experimental fisheries and from the commercial catches was continued throughout the 2001 and 2002 seasons. The results of these sampling programmes are submitted to ICCAT for stock assessment.

## BLUEFIN TUNA

Under EU legislation Ireland is not permitted to have a directed fishery for bluefin tuna (*Thunnus thynnus*). However incidental catches of bluefin tuna and swordfish are taken as a by catch in the fisheries for albacore tuna and also in the directed fisheries for other pelagic species and by some recreational sea angling vessels. Most of these catches appear to be taken during autumn off the north west coast.

ICCAT have imposed a TAC for blue fin for the Atlantic and the Mediterranean of 29,500 t of which the EU is permitted to take 18,590 t. Ireland has no quota for bluefin tuna but is permitted to take a by catch of 65 t. The total catch of bluefin recorded by Ireland for 2001 was 8.8 t valued at about €75,000 compared with 44.8 t in 1999 that was valued at €445,000. The TAC set by ICCAT for 2002 on swordfish for the Atlantic, north of 5°N is 10,200 t. The EU quota is 5,073 t.

Some information on the location of blue fin tuna shoals and the possibility of establishing viable angling fisheries was obtained as a result of investigations carried out by BIM in 1997 and 1998. A further study, which was part funded by the Marine Institute, was carried out by a private company, *Gulfstream Sportfishing Ltd*, in 2000. The BIM study was carried out with fishing vessels using longlines while the second study used an angling vessel and employed rods and reels. Both studies indicated that quantities of blue fin tuna are available along the west and northwest coasts during late summer and autumn.

According to ICCAT, the present fisheries for Atlantic bluefin tuna are distributed from the Gulf of Mexico to Newfoundland in the west Atlantic and from roughly the Canary Islands to the south of Iceland in the east Atlantic and also throughout the Mediterranean. Management areas in the Atlantic are separated by a line based on discontinuities in the distribution of the catches and limited biological information. Tagging evidence indicates that movement of bluefin occurs across the current east/west management boundary of the Atlantic. Bluefin tuna can grow to over 3 m and weigh more than 650 kg. The oldest reliable age group is 20 years. Bluefin are characterised by a late age at maturity and have a large number of juvenile age classes and a long life span. This makes the stock well adapted to variations in recruitment success but more vulnerable to fishing pressure than species that grow rapidly. Bluefin are opportunistic feeders with fish, squid and crustacea common in their diet. In the east Atlantic, bluefin tuna generally spawn from late May to July, depending on the spawning area. This spawning area is mainly in those parts of the Mediterranean where the sea surface temperature is around 24°C.



In recent years increasing amounts of juvenile bluefin tuna are caught and then fattened and matured into adults on fish farms throughout the Mediterranean. This has created concerns for the over exploitation of the juvenile component of the stock.

# MFSD Demersal Fisheries Overview

In 2001, the Irish fleet reported total landings of 42,378 tonnes (live weight) of demersal fish species. This represents a small reduction on the 2000 landings of 37,416 t. The most important species by weight were whiting (6,582 t); haddock (5,396 t), anglerfish (3,066 t) and megrim (3,669 t). The total value of demersal fish landed in 2001 was €89.6 million an increase of 34% on the 2000 value of €66.8 million. The most important species in terms of value were anglerfish (€12.2m), megrim (€11.0m), haddock (€10.8m), whiting (€6.9m), cod (€5.9m), hake (€4.8m), and sole (€4.5m).

The demersal fish species can be divided into two main groups. The species where catches are regulated by means of an EC quota, including cod, whiting, haddock, hake, monk, megrim, sole, plaice, saithe and pollock and the non-quota demersal species. These include turbot, ling, witch, lemon sole, pout, John dory and brill. These and other species such as ray/skate and *Nephrops* are exploited in mixed fisheries by the Irish fleet.

The 2001 landings (live weight) of quota demersal species by port are shown in Figure 1. Dunmore East had the highest landings of quota demersal species 4,874 t. The next most important ports were Killybegs (2,457 t), Casteltownbere (2,368 t), Greencastle (2,361 t), Howth (1,463 t) and Dingle (1,461 t). There were also substantial landings (3,149 t) of other quota demersal species from various smaller ports on the south coast.

The quayside value of the 2001 landings of quota demersal species by port is shown in Figure 2. Dunmore East also had the highest landed value of quota demersal species with total landings worth €6.8 million. The next most important ports were Killybegs (€4.4m), Casteltownbere (€4.3m), Howth (€3.8m), and Dingle (€3.8m). The value of the quota demersal species landings from various smaller ports on the south coast was worth €5.6 m in 2001.

The main demersal fisheries can be divided into four general groups as follows;

- The Irish Sea Fishery (Division VIIa),
- The Donegal/Rockall Fishery (Divisions VIa, VIb),
- The Celtic Sea Fishery (Divisions VIIf,g,h), and,
- The West and South West of Ireland Fishery (Divisions VIIj,k, VIIb,c).

## The Irish Sea Fishery (Division VIIa)

Landings of demersal species have continued to decrease in the Irish Sea as stocks have declined. There are three main fleets operating in the Irish Sea. Of these the *Nephrops* fleet is the largest with around 48 vessels in 2001. This fleet has a substantial by-catch of both quota and non-quota demersal species. The otter trawl fleet targets cod, haddock and rays mainly also with a by-catch of other demersal species. This fleet consist of about 6 main

vessels but other vessels may seasonally switch between this and the *Nephrops* fleet. The beam trawl fleet consisting of 6 vessels in 2001 target sole, plaice and rays but have a by catch of cod, haddock and whiting. The otter trawl fishery for *Nephrops* and whitefish mainly takes place in the western Irish Sea and the main ports are Howth, Clogherhead, Kilmore Quay and Dunmore East. The beam trawl fleet operates mainly in the eastern Irish Sea, in Morecambe, Liverpool Bay and south of the Isle of Man. The beam trawl fishery for black sole closes during the second and third quarters and many vessels land directly into the UK. Although the quota for black sole is small it remains a very valuable fishery. In the late 1990's there was a substantial increase in the abundance of haddock in the Irish Sea. This resulted in an additional TAC allocation for haddock which was introduced for Division VIIa in 1998. The main by-catch species from the Irish Sea fishery are monk, saithe, pollock, dogfish, gurnard, and lemon sole. A large amount of whiting are discarded on the nursery grounds of the Western Irish Sea by the *Nephrops* fleet. The Irish Sea demersal fleet is generally made up of older vessels that spend 1-4 days at sea. The Irish Sea beam trawl fleet is made up of newer high-powered large vessels up to 40m, these are mainly second-hand North Sea beamers.

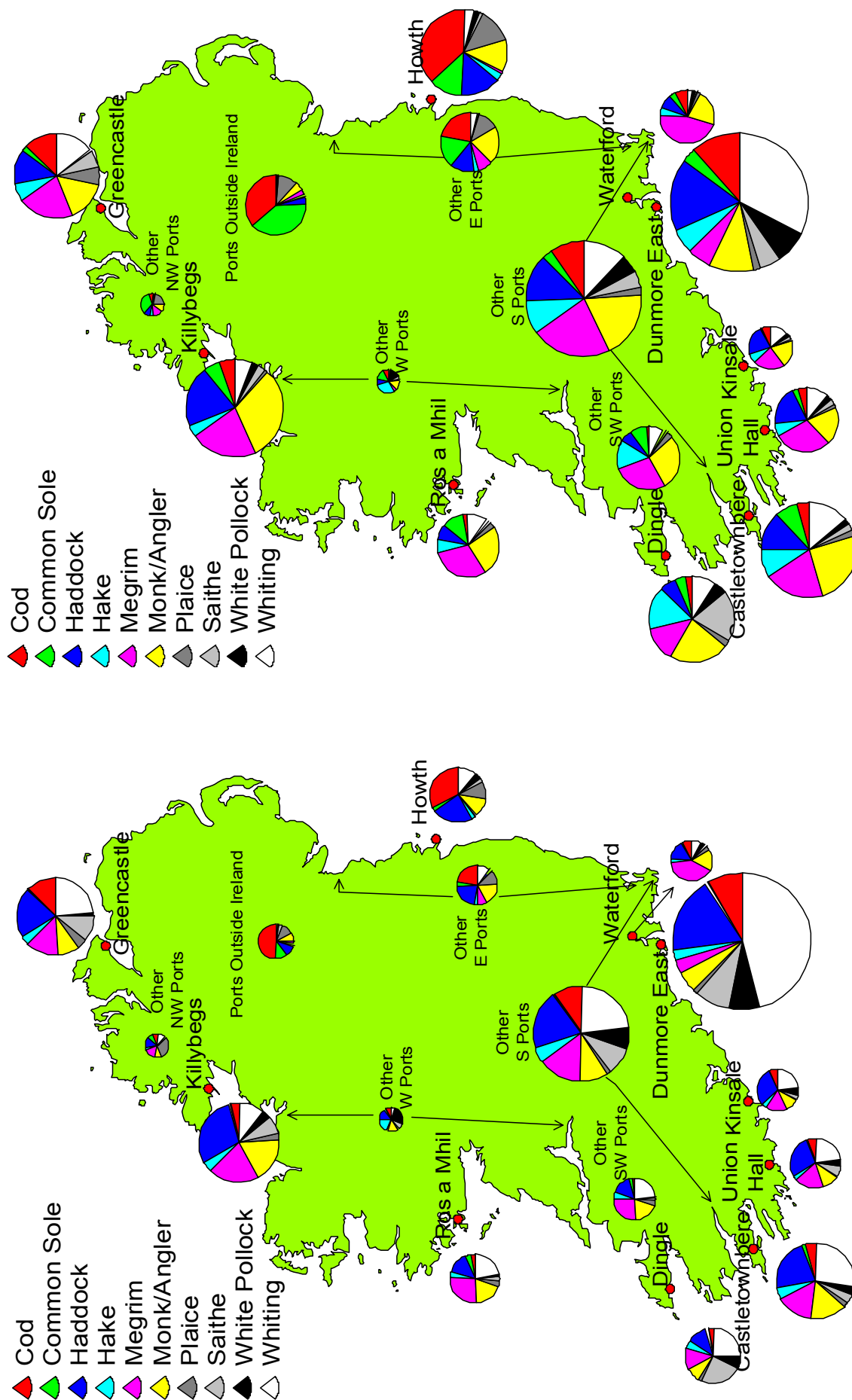
A major feature of the Irish Sea fisheries in since 2000 has been the introduction of the Irish Sea cod recovery plan. A description of the cod recovery plan is given in the key issues in fisheries management section.



## THE SUB AREA VI FISHERY (DIVISIONS VIA, VIB)

The main target species in this fishery are anglerfish, megrim, haddock, whiting and cod, primarily using otter trawl although there is some inshore seining and gill netting. The Irish otter trawl fishery consists of two fleets; one targets roundfish with 90mm rockhopper trawls (otter trawl fleet) and one targets anglerfish megrim, and hake with 80mm light trawls (mixed fishery fleet). The otter trawl fleet fishes to the north of Malin Head and Greencastle and to the west of Aranmore Island. The mixed fishery fleet fishes on Stanton Bank and Donegal Bay. Indi-





**Fig. 1:** Landings (live weight) of quota demersal species by port in 2001.

**Fig. 2:** The quayside value of quota demersal species by port in 2001.



vidual vessels seasonally switch between these two fleets. Since 1999, approximately 15 Irish vessels with significant landings of demersal species from Division VIa have been decommissioned and around ten new vessels have joined the fleet. However, the new vessels appear to be targeting deep-water species and fishing in other areas, and appear to have reduced landings of demersal species compared to the decommissioned boats. The main ports are Killybegs, Greencastle and Burtonport.

The Rockall fishery increased in importance in the late 1990's when up to six Irish vessels were fishing in Division VIb. Some of these vessel were decommissioned and in 2001 to only two vessels fished at Rockall. The fishery at Rockall is dominated by haddock but there are also valuable catches of anglerfish and megrim and sporadic catches of saithe and cod.

Cod stocks are in a serious state of decline in Division VIa. In 2001, following many meetings of fisheries scientists, managers and industry, the European Commission introduced emergency measures for protection of cod to the west of Scotland. A description of the emergency measures and development of cod recovery plans is given in the key issues in fisheries management section.

#### **THE CELTIC SEA FISHERY (DIVISIONS VIIF,G,H)**

The main target species in this fishery are anglerfish, megrim, cod, whiting, plaice and sole. The main gears used are otter trawls, seine nets and gill nets. The fishery mainly takes place in VIIg on the Smalls, Nymph Bank and Labadie Banks. The main ports are Dunmore East, Union Hall, Kinsale, Kilmore Quay and Helvick. The main by-catch species are haddock, hake, anglerfish, saithe and lemon sole. Since the late 1990's haddock landings have become increasingly more important. Recently, there has also been an important spring fishery targeting cod and whiting in VIIg these fisheries have attracted fleets from elsewhere. The Irish fleet that operates in this area is mainly made up of inshore multi-purpose vessels (15-25m) which spend 5-10 days at sea. In recent years several newly built vessels entered the Irish fleet under the Whitefish Renewal Scheme. There has been a rise in the number of Irish vessels switching to seine nets in recent years. These vessels are mainly targeting whiting and haddock and receive higher prices because of the good quality of the fish.



The Northern hake stock is currently at very low levels. In 2001, following many meetings of fisheries scientists, managers and industry, the European Commission introduced emergency measures for protection of northern hake. These measures were introduced ahead of the proposed implementation of a northern hake recovery plan in 2002. A description of the emergency measures and development of the hake recovery plan is given in the key issues in fisheries management section.



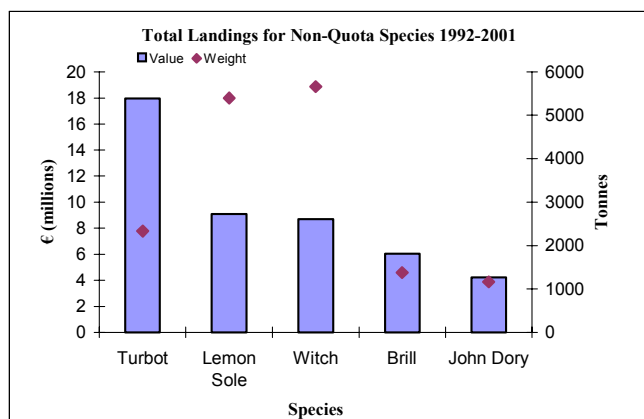
#### **THE WEST AND SOUTH WEST OF IRELAND FISHERY (DIVISIONS VIIJ,K, VIIB,C)**

The main target species are anglerfish, megrim, hake, whiting, haddock, sole, plaice and cod. The main gears used are otter trawls, twin-rig otter trawls, seine nets and gill-nets. The fishery mainly takes place in VIIf, VIIj and on the Porcupine Bank. The main ports are Castletownbere, Dingle, Union Hall and Rossaveal. The main by-catch species are saithe, lemon sole, gurnard and John dory. Haddock landings have increased substantially during the late 1990's following a series of good recruitments in the mid 1990's. The Irish fleet that operates in this area is mainly inshore (15-20m) and offshore (>20m) multi-purpose vessels which spend 5-10 days at sea. The inshore vessels primarily target sole, turbot and plaice in the bays. The offshore vessels target whiting and haddock on the shelf using trawls and seines. The larger offshore vessels primarily target anglerfish and megrim on the continental shelf slope in VIIj, VIIf & VIIc. There has been a rise in the number of vessels, particularly in Castletownbere, switching to seine gear in recent years. In recent years several newly built vessels entered the Irish fleet under the Whitefish Renewal Scheme and several modern second-hand vessels have recently joined the fleet. There has also been an increase in the number of twin-rig trawlers in the area. There were by-catch restrictions (principally anglerfish and cod) imposed on the Irish fleet in 1997 and 1998.

Hake stocks are in a serious state in Sub Area VII. Several meetings have been held in Brussels during 2000 regarding a hake recovery plan for Sub Area VII. Hake is caught in a mixed fishery with anglerfish and megrim and this plan will have a major impact on the fisheries off the south-west of Ireland in 2001 and 2002.

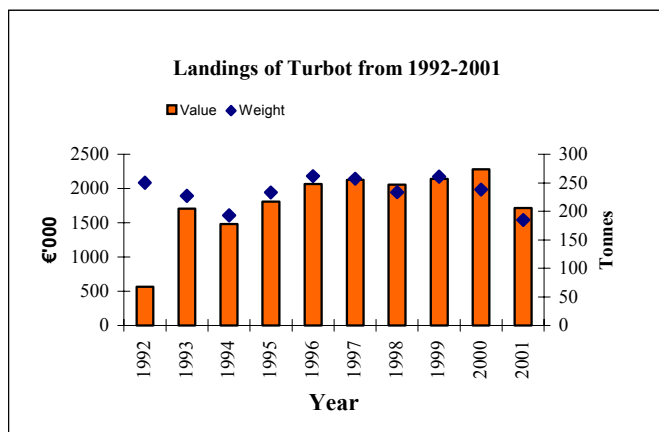
## MFSD Non – Quota Species Overview

The five most important demersal non-quota species to the Irish fishing industry are turbot, lemon sole, witch, brill and john dory. In 2001, these species had a combined value of €4.17million. These species are usually by-caught by otter trawls and beam trawls targeting demersal fisheries and are landed in small quantities. Due to the increasing pressure on quota species, it is important to increase the research of non-quota or non-TAC species. Sampling of these stocks is carried out by the Fisheries Assessment Technicians on their routine discard trips. Sampling is also incorporated into the MFSD annual groundfish surveys.



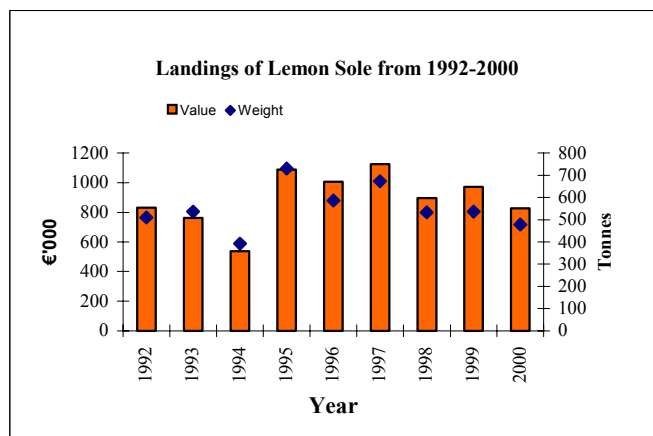
### TURBOT (*PSETTA MAXIMA*)

Turbot was worth €1.7m to the Irish fishing industry in 2001. Occasionally and in the past there has been a target for turbot using tangle nets around Ireland. Beam trawls, otter trawls and seiners are also used. There is a small artisanal longline fishery for turbot in France. The quantity of turbot caught by otter trawls at any time is small, usually one or two per tow. Highest catches are in the summer months when spawning occurs. Turbot commands high market prices and is always in high demand making it a very important non-quota species. Presently turbot are being farmed in Kilkieran Bay, Co. Galway by Turbard Iarthar Chonamara (TIC) Teo. Although some work has been carried out, little is known about the biology of turbot in Irish waters.



### LEMON SOLE (*MICROSTOMUS KITT*)

Lemon sole is caught commercially and as by-catch species in otter trawls. It lives on the seabed in a range of habitats ranging from mud and sand to gravel and even rocky grounds. Although normally living in deeper waters smaller specimens can be caught close inshore. The majority of fish caught are too small to be landed commercially. In 2001 lemon sole landings had a quayside value of € 1.05m. This is an increase of over € 0.2m from 2000. Over the last ten years the price per tonne of lemon sole has varied from €1,300 to €2,400.

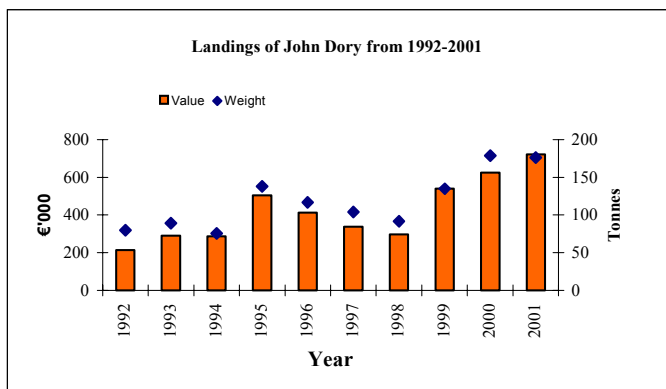


### JOHN DORY (*ZEUS FABER*)

This species is usually caught in small numbers. This may be due to its solitary nature. John Dory rarely forms shoals larger than five individuals. It is an inshore fish which may be found out to 200m, primarily on sandy ground. In 2001, 176 t of john dory were landed with a commercial value of €0.7m.

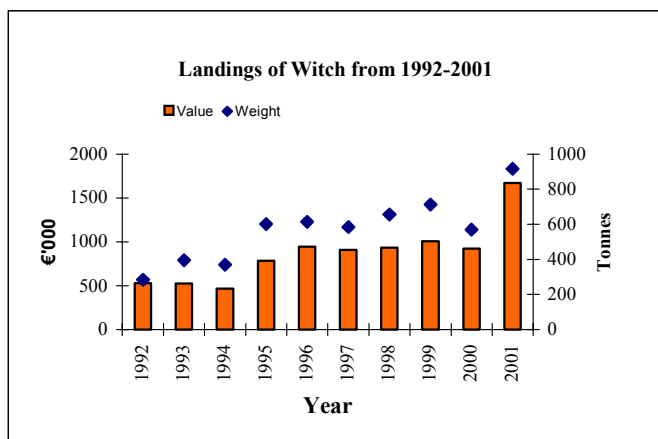
The value of john dory has varied from €2,600-€4,000 per tonne over the last ten years.





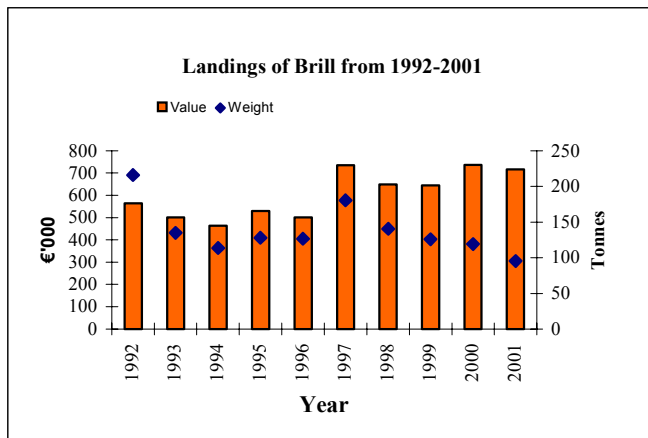
### WITCH (*GLYPTOCEPHALUS CYNOGLOSSUS*)

Witch is found in deep waters. It is most abundant on fine muddy sand or mud in depths of 50m down to 1400m. It is less common closer inshore in shallow waters. This species is targeted by demersal otter trawls. In the Celtic Sea boats may get up to one box of witch per tow. There is a targeted Spanish fishery for witch at Rockall and the Hatton Bank. In 2001, 916 t of witch was landed with a value of €1.6m. From 1992-2001 the price per tonne of witch has varied from €1,300-€1,900.



### BRILL (*SCOPHTALMUS RHOMBUS*)

Irish boats caught 95 t in 2001 with a value of €0.7m. This flat fish is caught principally as by-catch in demersal otter trawls. It is also important for small inshore vessels. In addition, brill can be caught in tangle nets targeting species such as monkfish, rays and turbot. It is a shallow-water fish found close inshore and usually on sandy bottoms. Adult brill are bottom-living fish. The young are found near the shore and in intertidal pools on sandy shores. There has been a gradual increase in the price per tonne of brill in the last ten years, varying from €2,600 in 1992 to €7,500 in 2001.



## MFSD Deepwater Fisheries Overview

Deepwater fisheries are classified as fisheries taking species in depths of 400 m or more. The main fisheries target many different species including ling, tusk, blue ling, forkbeard, mora, black scabbard, orange roughy, roundnose grenadier, greater argentine, siki shark, cocho shark, redfish and Greenland halibut. Some species such as ling and tusk also occur on the continental shelf, but are assessed in the ICES Working Group on the Biology and Assessment of Deep-sea Fisheries Resources. Other species that are fished in deep waters include hake, anglerfish and megrim. But these are assessed in the Northern and Southern Shelf Working Groups. The cold water, or boreal deepwater species Greenland halibut, golden redfish and deepwater redfish are assessed by the North Western Working Group.



Irish fishing activity in deepwater fisheries increased substantially in 2001 and 2002. The new vessels, many built

under the BIM whitefish renewal scheme were involved in fishing in a number of areas. Several vessels targeted orange roughy aggregations in Sub-area VII on the slopes of the Porcupine Bank and a high-catch fishery developed rapidly, with over 2,300 t being landed in 2001. This fishery continued into 2002 also. Elsewhere, vessels targeted the mixed-species slope fishery for roundnose grenadier, black scabbard and sharks. The new Irish longliners targeted sharks, mora and forkbeards on the western slopes. The larger longliners fished for Greenland halibut in Sub-area XII and for wreckfish around the Azores. Irish pelagic vessels targeted greater argentinies in Sub-area VI again in 2001, with reported higher landings than in recent years.

The quayside value of Irish deepwater landings in 2001 was €11.7 m. In 2001 reported landings of deepwater species were 14,200 t, from Irish vessels.

The vulnerability of deepwater species, like orange roughy, to exploitation, means that deepwater fishing is not likely to be a viable alternative fishery in the long term. Indeed the European Commission suggested that deepwater fisheries should not be regarded as alternatives for fleets that have been displaced from more traditional fisheries.

The European Commission has proposed the introduction of new management measures various deep sea resources. These are described in the "Special note on the current status of EU measures for the management of deepwater fisheries". These measures will have an impact on the Irish vessels currently exploiting deep sea fisheries.

Preliminary Irish landings of deepwater species by gear type in 2001.

	Pel. Trawl	Dem. Trawl	Gillnets	Lines	Beam trawl	Seine	Misc.	Grand Total
Greater argentinies	7485	13						7498
Black scabbard	2	783		1				*786
Blue ling		531	24	6				561
Cardinal		216						216
Greater forkbeard		593	61	8	1			663
Roundnose grenadier		452						452
Ling		655	353	14	106	64	1	1193
Orange roughy		2477						2477
Rabbitfish		10		3				13
Siki sharks		99		115				214
Mora		8		17				25
Tusk		90		30				120
Grand Total	7487	5927	438	194	107	64	1	14218

\* Figure revised since WGDEEP.



### LING AND TUSK

Ling is the most consistently landed deepwater species by Irish vessels. However these landings are generally from continental shelf waters where the species also occurs. While deepwater trawling takes some ling, longlining on the shelf edge is the most effective means of catching this species. A fleet of Norwegian longliners target this species west of Donegal and Mayo. The value of Irish ling landings in 2001 was €1.4. Tusk is a by-catch mainly in longline fisheries for ling. The value of landings of tusk was €148,000.

### ROUNDNOSE GRENADIER, BLACK SCABBARD AND BLUE LING

These species are taken together in the mixed-species slope fishery, mainly by French trawlers, but also by new Irish vessels. The main fishing areas are VI and VII. These are valuable species the quayside value of Irish landings of blue ling was €590,000 in 2001, whilst that of black scabbard was €68,000. Though roundnose grenadier is the main target species in the French mixed fishery, Irish landings continue to be low, being valued at €420,000.

### DEEPWATER SHARKS

There is a great diversity of deepwater sharks in Irish deep waters, but only two species are marketed, leafscale gulper shark and Portuguese dogfish. These species are taken mainly on longline, but also as by-catch in trawl fisheries. The quayside value of Irish landings of these species in 2001 was €300,000.

### ORANGE ROUGHY

This species has become the target of an intensive fishery in VII, with Irish trawlers taking the majority of the landings. The quayside value of these landings to Irish vessels in 2001 was €6.7 million.



### GREATER ARGENTINE

This species is a by-catch in demersal fisheries, but is targeted by some RSW vessels in the late spring. In some years there is more activity than others targeting argentine, and in the 1980's Irish vessels dominated the fishery. In 2001 the quayside value of reported Irish landings was €586,000.

### GREATER FORKBEARD AND MORA

These species are often reported together. They are taken in mixed trawl fisheries but also targeted by longliners. The quayside value of forkbeard landings by Irish vessels in 2001 was €970,000.

### GREENLAND HALIBUT AND REDFISH

These boreal deepwater species are targeted by Irish vessels in the Faeroe-Shetland Channel and in international waters of Sub-area XII. Irish landings of Greenland halibut in 2001 were valued at €92,000 whilst landings of redfish were valued at €68,000.

### OTHER SPECIES

The value of Irish rabbitfish landings in 2001 was €13,000. This species increasingly marketable in recent years. The value of wreckfish landings reported to ICES in 2001 was €7,600.

**Preliminary Irish landings of deepwater stocks as reported to the ICES North western WG.**

Year		IIA	IIB	IVA	VB	VIA	VIB	VII	XII	XIV	Grand Total
1996	G. halibut	2		2			31				35
	Redfish	2	1	25			28				56
1997	G. halibut		2	1							3
	Redfish	7		11							21
1998	G. halibut	1		10		10					21
	Redfish	24	3	4							31
1999	G. halibut	2		24		58					84
	Redfish	9		48							58
2000	G. halibut		1	19		6		2			27
	Redfish	6	1	27		46	13				92
2001	G. halibut	1		10		4			49	7	71
	Redfish	5		19	1						24

# MFSD Elasmobranch Fisheries Overview

Skates, rays, sharks and dogfish, whose skeletons are made of cartilage rather than bone, are called elasmobranchs. At present these species are not assessed or subject to catch restrictions, apart from access agreements for Norwegian vessels to EU waters. However this is likely to change in the near future. Some elasmobranchs are becoming relatively more important for the fishing industry, and are valuable fisheries in some areas. However many elasmobranch fisheries have proven unsustainable with rapid declines in landings. Elasmobranchs have life histories. This has prompted the FAO to recommend that individual countries adopt voluntary elasmobranch fishery management plans. Currently, the EU is formulating a response to this FAO request. The value of elasmobranchs in Irish fisheries, excluding deepwater species (see deep-water overview) was €5.4 m in 2001, based on preliminary landings of 4,400 t.

## RAYS AND SKATES

There are several fisheries for rays and skates, often they are taken as by-catch in mixed trawl fisheries. However the most important fishery is in the southern Irish Sea, they are targeted on the “Peaks” ground using rockhopper otter trawls and beam trawls. The main ports where they are landed are Howth, Arklow and Kilmore Quay. The value of rays in 2001 was €3.3, based on Irish landings of 2,100 t. The value of Irish landings of rays has increased in recent years, though landings have declined somewhat since late 1990’s. Rays are landed into the west and north-west ports and sold to the Dublin market or to continental Europe, mainly Belgium. The blonde ray *Raja brachyura*, the thornback ray *Raja clavata*, the spotted ray *Raja montagui*, the cuckoo ray *Raja naevus* are the four main species exploited in the Irish Sea. In addition, the small-eye ray *Raja microcellata* is also a component of the landings in the Celtic Sea. In addition to these species, *Raja batis* the common skate is caught on the west and north coast fisheries and the undulate ray *Raja undulata* is taken in fisheries in the southwest.

## SPURDOG

The landings of spurdogs have declined in recent years, but the value of these landings has increased. This species is a valuable by-catch in demersal trawl fisheries and there is some targeted fishing with gill nets. In 2001 Irish landings were 1,300 t worth €1.5m. Spurdog is a by-catch in demersal otter trawl fisheries but prices for the species vary considerably. This was once considered a serious nuisance species, particularly in the drift-net fishery for salmon on the west and north west coasts. However a gill-net fishery for the species, targeting females, developed and expanded rapidly from 1977 onwards. Between 1977 and 1985 landings increased from 116 t to almost 8,000 t annually. The fishery began in Co. Donegal but effort shifted southward as catches declined. The fishery became

moribund in the early 1990’s as the stocks became depleted. There is some targeting of this species in recent years but landings are very low in comparison to 1980’s levels.

## SPOTTED DOGFISH

Though spotted dogfish are marketed in several European countries including France and Belgium, they are not of commercial importance in Ireland; although they are landed at various ports around the coast, and sold for bait in pot fisheries. Landings of spotted dogfish in Donegal and the west coast are primarily to supply crab and lobster fisheries while in the Irish Sea some of the landings supply the whelk fishery. The value of Irish landings was €242,000 in 2001, based on landings of 632 t.



## LARGE SHARK SPECIES

In recent years, separate landings statistics are collected for these species. Blue shark landings in 2001 were 66t. This is a low value species that is not always retained because its flesh deteriorates rapidly. It is a by-catch or discard in several fisheries. Porbeagle is a higher valued species than blue shark, but less abundant. It is a by-catch in demersal fisheries with landings of 6 tonnes in 2001. Tope is another by-catch shark species with reported landings of 3 t in 2001. There are also unidentified landings of sharks amounting to 273 t. The total value of these large shark species from landings in 2001 was €78,000. Whilst these are not important commercial species, they are very important sport fish species and shark angling is a very important marine tourism resource in Irish coastal areas.

## STATE OF THE STOCKS

The stock structure of Irish elasmobranchs is not clear, and to date no analytical assessments have been carried out in ICES. This situation may change because ICES is expected to provide management advice for elasmobranchs.

branches by 2005. Most rays, skates, sharks and dogfish are widely distributed and there is little information to suggest that populations exist as discrete stocks with little interchange. In fact, it is widely believed that one single stock of spurdogs inhabits the northeast Atlantic, though these fish are known to undertake trans-Atlantic migrations. In the 1980's landings of spurdogs increased markedly as a target fishery using gill-nets developed on the north, and later on the west coasts. Landings peaked at almost 8,000 tonnes in 1985. Assessment of this fishery by MFSD scientists suggested that gill-nets selected for larger females and that this would have a detrimental impact on the breeding segment of the population. This fishery ceased in the early 1990's. The species is now mainly a by-catch in demersal trawl fisheries and landings have declined every year since 1993. Some effort was directed at this species in more recent years however, particularly by gill-netters that usually target hake.

The largest fishery for rays in Ireland is in the Irish Sea (VIIa) where landings peaked at about 2,000 t in 1985, though they were 807 t in 2001. Rays are now the most important component of whitefish landings for Irish Sea otter trawlers. The lack of species-specific commercial CPUE series has hampered the assessment of rays. The relatively stable catch rates in earlier years may have masked the decline, and subsequent "virtual extirpation", of the common skate *Raja batis* from the Irish Sea for example. There is some evidence from English otter trawl surveys that the abundance of larger ray species has declined with the smaller species becoming more abundant in Divisions VIIa and VIIg. In the absence of CPUE indices for each species it is difficult to identify trends in abundance, however. Only France collects commercial CPUE by species for rays. MFSD (formerly FRC) analyses in the early 1990's showed that the smaller species, especially the cuckoo ray survived to greater age than the larger species. There is little information on the stock structure of rays in Irish waters.

**Preliminary Irish landings (live weight tonnes) for skates and rays, by ICES Division, from EU logbook scheme.**

ICES Sub-area	1995	1996	1997	1998	1999	2000	2001
IVa					0		
VIa	467	610	530	414	340	271	222
VIb	63	68	25	16	29	18	10
VIIa	430	438	593	692	827	759	807
VIIb	335	313	369	361	384	340	338
VIIc	15	7	12	1	7	33	36
VIIe	1	3	1	1	0	1	0
VII f	0		0	1	0	0	0
VIIg	76	200	196	206	198	196	265
VIIh	8	16	9	6	6	12	3
VIIj	61	127	262	221	195	207	175
VIIk	3	0	1	9	2	35	11
XII							1
<b>TOTAL</b>	<b>1469</b>	<b>1782</b>	<b>1997</b>	<b>1930</b>	<b>1988</b>	<b>1871</b>	<b>1868</b>

The OSPAR Commission requested ICES to evaluate the scientific basis for designating certain elasmobranchs as endangered. ICES considered that there was sufficient information to categorise the angel shark and common skate as having "severely declined" in the OSPAR area.

### ELASMOBRANCH RESEARCH

Previous work on elasmobranchs focussed on assessment of the biology and assessment of spurdogs, during the directed gill-net fishery. Much research was carried out on ray species in the Irish Sea and Celtic Sea, involving market sampling and investigations of age, growth and reproduction. More recently a Marine Institute-funded project on the biology of Irish Sea rays was completed by the Zoology Department of Trinity College, Dublin under the Marine Research Measure funding scheme.

The MFSD are partners in a new EU funded project enti-

tled "Developing Elasmobranch Stock Assessments" (DELASS) whose four tasks are:

1. Species identification and enhancement of biological sampling programmes.
2. Stock discrimination and separation.
3. Data compilation and exchange
4. Data preparation, stock assessment and identification of species vulnerability.

The involvement of MFSD focuses on enhancing the quality of the data from existing market, on-board and research survey sampling programmes. An evaluation of the identification of elasmobranch species by sampling personnel will be carried out. A major part of the DELASS programme was improving stock identity of pelagic sharks. The MFSD has entered a partnership with the Central Fisheries Board to analyse data on movements of blue sharks tagged in Ireland.

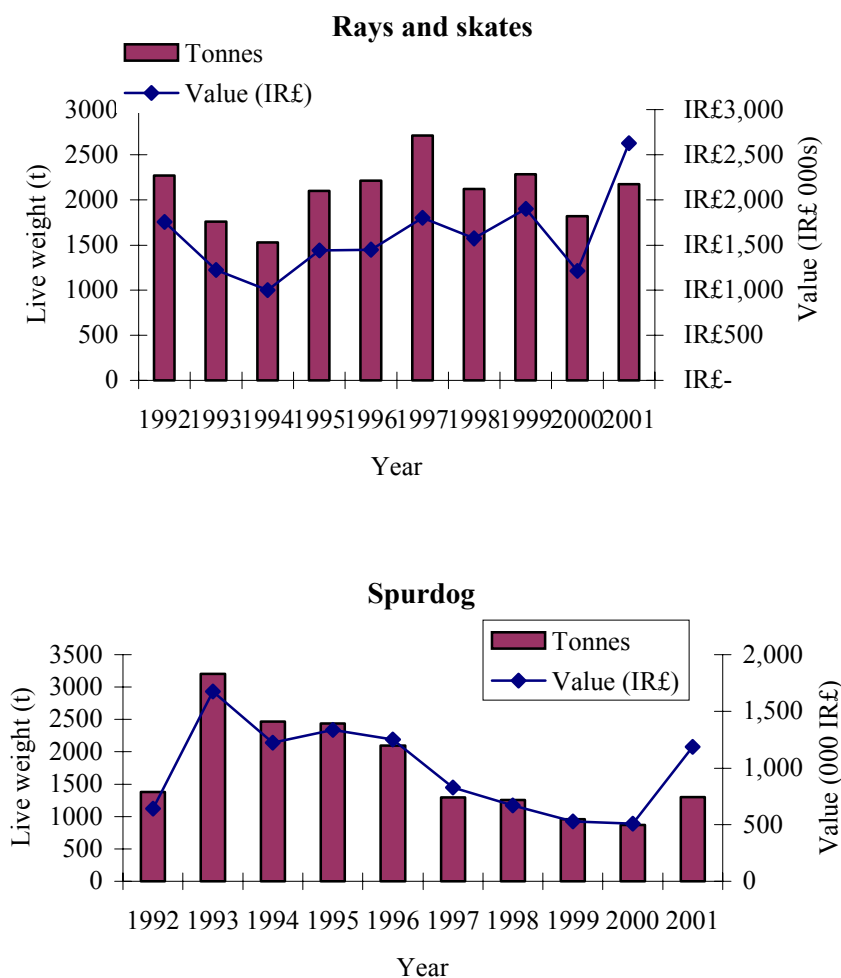
The Central Fisheries Board is Ireland's statutory agency to conserve, develop, protect and promote inland fisheries and sea angling resources. The Central Fisheries Board's Marine Sportfish Tagging Programme was initiated in 1970 in conjunction with selected skippers of angling charter vessels. The Central Fisheries Board programme is the second largest shark tagging programme in the world. Since its inception it has provided a large data set on the movements, migrations and biology sharks and rays, particularly the blue shark, thornback ray, undulate ray, tope, porbeagle and angel shark. The results of these studies have been reported by CFB scientists in several recent scientific publications. The project is now in its 32<sup>nd</sup> year. Under the DELASS project, the data for the thornback ray *Raja clavata* and blue shark *Prionace glauca*, were analysed to investigate stock structure and basic biology of the two species.

Future work on blue shark research will be conducted as part of the Memorandum of Understanding between the Marine Institute and the US National Marine Fisheries Service. The CFB, MFSD and NMFS will work together to improve our knowledge of blue shark movements, stock structure and biology.

## ELASMOBRANCH MANAGEMENT AND CONSERVATION

In response to the call for plans of action on elasmobranch fisheries management, STECF convened a sub-group to evaluate stock status of elasmobranchs taken in European fisheries. The group evaluated available information on stock status and provided a discussion of management measures that could be applied to elasmobranch stocks. More work will be required to evaluate elasmobranch stock status and the newly constituted ICES Working Group on Elasmobranch Fishes will deal with this subject.

Elasmobranchs, being vulnerable to over exploitation, have received increased attention from the international conservation non-governmental community. Elasmobranchs, being top-carnivores are considered to be good indicators of ecosystem health. With the increasing attention being paid to ecosystem impacts of fishing, management of elasmobranch fisheries will increasingly incorporate ecological considerations.





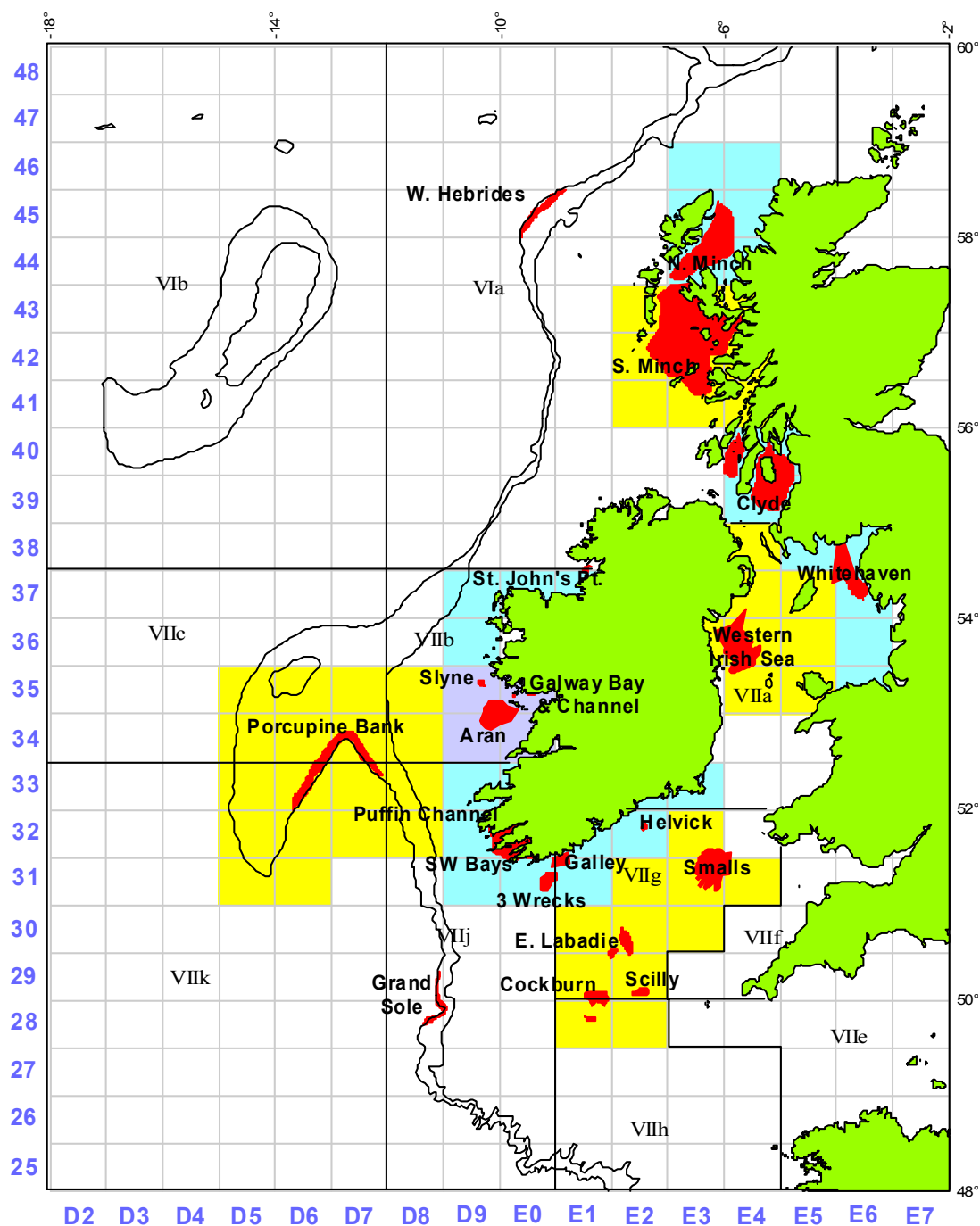
# MFSD Shellfish Fisheries Overview

## NEPHROPS NORVEGICUS (DUBLIN BAY PRAWNS)

### Introduction

*Nephrops* are common on grounds with fine cohesive mud which is stable enough to support their unlined burrows. There are several important prawn fishing around Ireland, as shown in the Figure 1. *Nephrops* around Ireland mainly have either an annual reproductive cycle. After a

short planktonic phase (2-3 weeks) the juvenile *Nephrops* settle on the bottom and do not appear to undertake extensive migrations. *Nephrops* spend most of their life within their burrows, which can be up to 20-30 cm below the surface. Therefore *Nephrops* are only vulnerable to trawl capture when they emerge. Diurnal and seasonal fluctuations in trawl catches (reflecting emergence patterns) are well known and vary between grounds.



**Figure 1.** The main prawn (*Nephrops norvegicus*) fishing grounds around Ireland shown in red



### Prawn fisheries around Ireland

Several important prawn fisheries occur around Ireland. For assessment purposes the ICES Working Group on *Nephrops* Stocks (WGNEPH) divide *Nephrops* from different geographical areas into Functional Units (FUs) and Management Areas (MAs) see Appendix 1. More detail on the stock status and fisheries in the various MAs is given in the stock sections. In 2002 WGNEPH investigated the distribution of international landings by mapping cumulative *Nephrops* landings by ICES Statistical Rectangle between 1996-2000. It was immediately obvious that the *Nephrops* stock in the Western Irish Sea is extremely productive. WGNEPH concluded that it was necessary to revise the boundaries of two FUs 16 and 20-22. Several rectangles were added to FU 16 and one was added to 20-22. These are indicated in Figure 2.

### The Irish prawn fishery

*Nephrops* are primarily caught using otter trawls, however a small percentage of the landings are made by vessels using pots. Most vessels targeting *Nephrops* use twin-rig trawls with heavy ground ropes. In 2001 more than 226 Irish vessels over 10 m declared *Nephrops* landings. Of these 115 landed more than 10 t. These vessels range in size from 10-35 m, with most in the 16-25 m size category. The vessels tend to be multipurpose only targeting *Nephrops* when environmental conditions are suitable and targeting demersal fin-fish at other times. The pot vessels operate in the inshore bays of Cork and Kerry and will typically catch larger *Nephrops* than in trawls. Some fisheries are very seasonal e.g. the Porcupine Bank fishery where as others are year round with seasonal peaks in landings e.g. Western Irish Sea fishery.

Provisional Irish landings of *Nephrops* in 2001 were 7,074 t. This represents a decrease of 8% on the official 2000 landings (7,709 t). Approximately 39% of the 2001 landings were landed as tails. The *Nephrops* fishery is extremely valuable to the Irish fleet. The provisional

estimate of first sale value in 2001 was €23.4 million, making *Nephrops* the second most valuable species after mackerel.

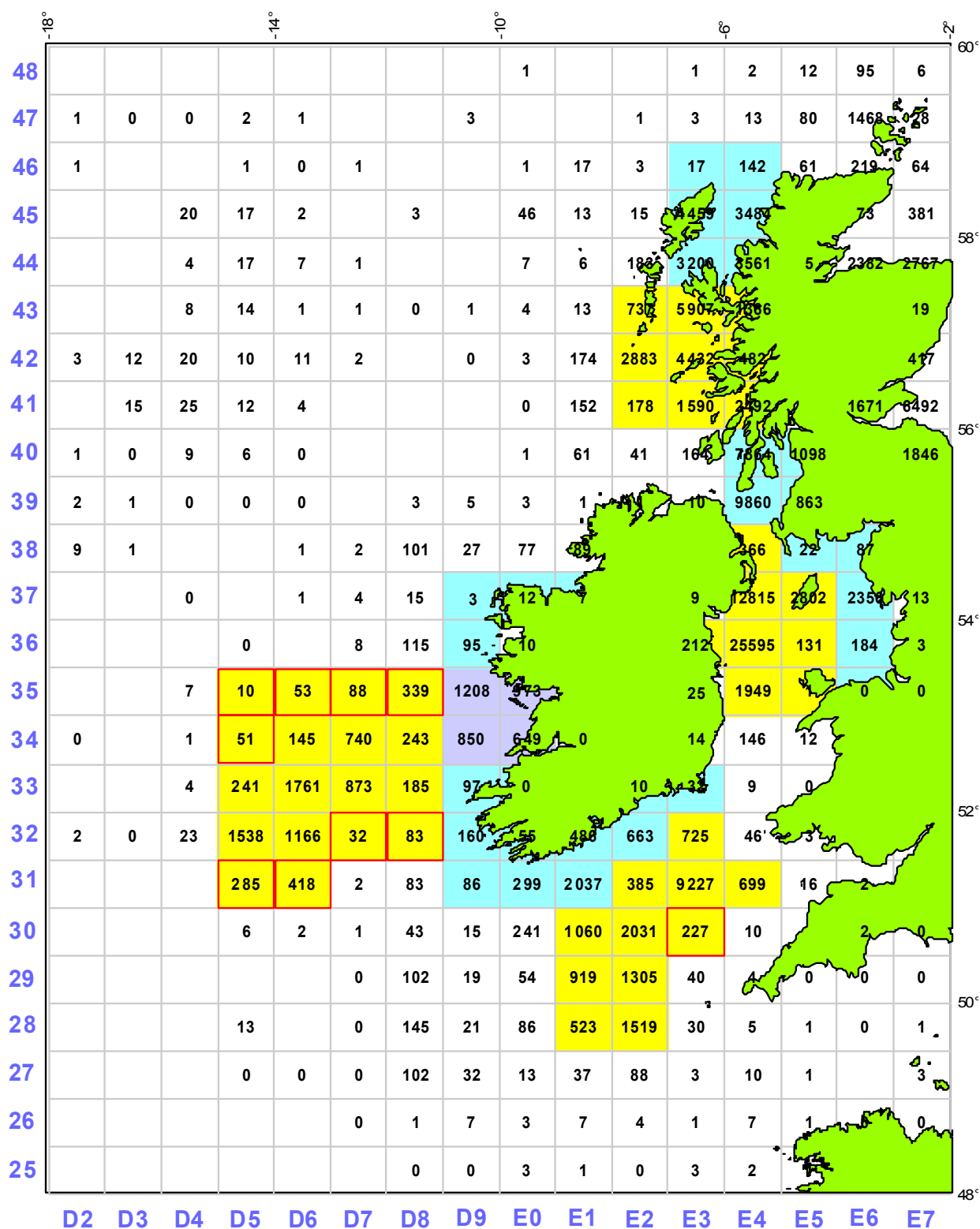
Highest catches by the Irish fleet in 2001 were from the Western Irish Sea (FU 15) where 2,690 t (provisional live weight) of *Nephrops* were caught. Landings by the Irish fleet from the smaller eastern Irish Sea stock were 27 t in 2001. Most of the *Nephrops* caught in the Irish Sea are landed into east coast ports including Howth, Clogherhead, Skerries and Balbriggan with 2001 *Nephrops* landings of 2,169 t, 592 t, 440 t and 169 t respectively. *Nephrops* landings were worth approximately €7.8m in Howth, €1.7m in Clogherhead, €1.0 m in Skerries and €0.4m in Balbriggan. Vessels from these ports also fish in the Celtic Sea.

The Celtic Sea fishery (FUs 20-22) is currently the second most important prawn fishery with provisional Irish landings of 2,123 t in 2001. There are several distinct grounds such as the Smalls, East Labadie, West Labadie, Cockburn bank and other grounds. Most of the *Nephrops* caught are either landed in Dunmore East (2001 landings of 1,218 t worth €2.9m) or in other south and east coast ports.

Important prawn resources are also found closer inshore in the Celtic Sea on the Galley head grounds, Kinsale and in the inshore bays of the south west coast. Provisional Irish landings of *Nephrops* from these grounds were 702 t in 2001. The most important ports include Union Hall with landings of 251 t worth €1.1 m and Kinsale with landings of 249 t worth €0.7m.



On the west coast the grounds at the back of the Aran Islands (FU 17) are very important (2001 landings were 877 t), particularly to the Rossaveal fleet. Total *Nephrops* landings into Rossaveal were 1,069 t (live weight) in 2001 with a value of €4.1m. Further off-shore the Porcupine Bank grounds (FU16) yields valuable catches of very large *Nephrops* during the summer months. However, Irish landings in 2001 (764 t) were low compared to recent years.



**Figure 2.** Available international *Nephrops* landings by ICES Statistical Rectangle between 1996 and 2000 (Spanish landings data are available for 1999 & 1998 only). WGNEPH 2002 added several rectangles to existing FUs, these are indicated with a red border.



## SCALLOPS

The scallop (*Pecten maximus*) is a Northeast Atlantic species and is widespread around Britain and Ireland. *Pecten maximus* is the largest of the 350 pectinid species world wide and one of 12 pectinid species found in Irish waters. Scallops are hermaphrodites and attain sexual maturity at the end of their second summer though gamete release doesn't occur until their third or fourth year. Scallops can be aged externally as rings are laid down annually in spring and early summer. This facilitates data collection for age-based assessment of scallops stocks.



Man has utilised scallops as a food source in Ireland for over five millennia and commercial fisheries in Ireland date back to the 16<sup>th</sup> century. Since the early 1970s Irish scallop fisheries in Ireland have expanded rapidly (Figure 3). This is because of the development of spring-loaded dredges that can be towed in deeper waters either singly or on a beam where several dredges can be deployed simultaneously. Irish landings peaked in 1990 at 1,600 t before declining to only 400 t in 1995. However, landings in the last three years increased substantially and have been close to the highest recorded. Irish landings in 2001 were 1,411 t (worth €3.8m at first sale).

Both inshore and offshore scallop dredging takes place in Ireland. The smaller inshore vessels are 7-10m in length and tow one or two dredges. The larger offshore vessels are between 18-25m and can tow 6 to 14 dredges on each side. Often the inshore fisheries are opportunistic and seasonal and localized patches are often quickly depleted once located. The offshore fishery in the southern Irish Sea and Celtic Sea has declined considerably last year. In 2001 and 2002 BIM have carried out several exploratory surveys and sampling of scallops in Ireland. The Marine Institute and National University of Ireland Cork carried out a provisional assessment of a localized stock in VIIj with BIM in 2002 (see stock Section).

## CEPHALOPODS

Cephalopod resources around Ireland include squid, octopus and cuttlefish. Squid are the most important of these. Five species of squid are caught; the common or white squid (*Loligo forbesi*) is the most important species with

landings in 2001 of 228 t worth €0.5m. This species has a one-year lifecycle in Irish waters. The small squid are not caught in trawls but as they grow larger and come inshore to spawn they form locally abundant aggregations which are by caught in trawls for other demersal species. Limited inshore jigging for *Loligo* takes place in several areas around Ireland. The monthly landing statistics for some areas show distinct seasonal trends in landings. For example, off the Northwest coast (ICES Division VIa) landings peak mostly in October and there is often a second smaller peak in catches during the spring (Figure 4). *Loligo* catches have declined significantly in Division VIa in recent years.

There are sporadic large fisheries for *Loligo forbesi* in a very concentrated area at Rockall. The largest recent outburst was in 1986 when landings were thought to have been in excess of 5,000 t for 3 months.

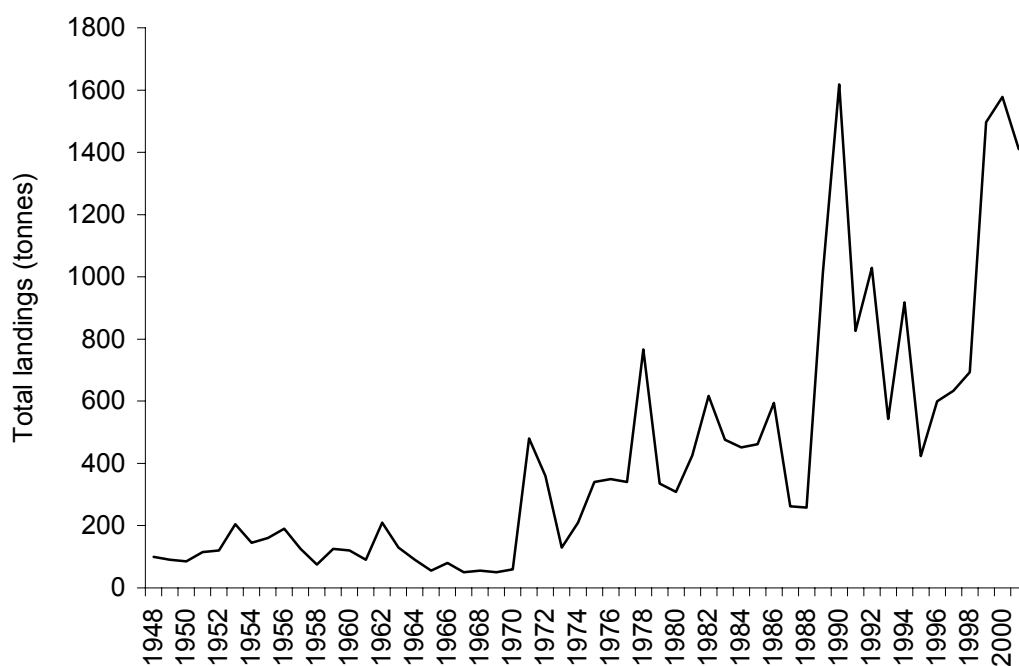
The short finned squid species (*Illex coindetii*, *Todaropsis eblanae*, *Todarodes sagittatus* and *Ommastrephes bartramii*), which occur in deeper water close to the continental slope, are also seasonally abundant. In 2001 Irish landings were 118 t of *Illex* and 8 t of *Ommastrephes* (total value €0.2m). Highest landings of these species are into Dingle, Fenit, Castletownbere and abroad (mainly into Spain).

Octopus and cuttlefish landings in 2000 were negligible with 14 t of the former (exclusively *Eledone cirrhosa*) landed. The very valuable English Channel cuttlefish stock has yielded landings around 10,000 t in the last few years. Cuttlefish from this stock over-winter in deeper waters of the western Channel and southern Celtic Sea where they are occasionally by-caught in small numbers by Irish trawl fisheries.

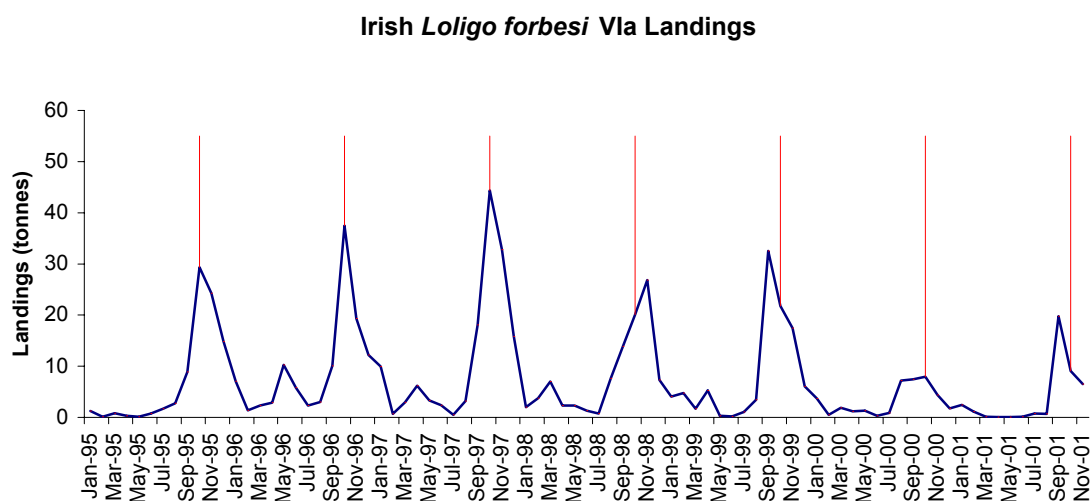


Sampling common squid (*Loligo forbesi*) caught during a survey





**Figure 3:** Total Irish scallop (*Pecten maximus*) landings of since 1948.



**Figure 4:** Monthly Irish landings of white squid (*Loligo forbesi*) from January 1995-December 2001

# MFSD Inshore Stocks Overview

Previous reports in this series have emphasised the importance of the inshore sector as an employer of a large proportion of people engaged in fishing. But precise definition in the inshore sector remains elusive. Vessels of greater length than in the defined user group (boats of <12 m) work in inshore waters and some of the quota species, such as plaice and *Nephrops*, are in large part inshore in distribution but there are no data to distinguish the proportion of their landings originating there. The inshore sector consists of a large number of artisanal vessels which must, however, share inshore grounds with larger boats; they operate a variety of gears for fin and shell fish, many of these species being taken outside the 12 nm limit also.

During the past year, BIM staff attempted to update and make more precise their 1999 review of the sector. Vessels using inshore waters were classified as currachs, punts, open boats, half deckers, decked boats and trawlers; 50% were open vessels <6m and <1.5 grt. Vessels < 12 m accounted for 5,660 t in total.



While salmon fishing was identified as important to the inshore sector, pots/traps featured as one of the principal fishing methods. There was however, a weak relationship between vessel size and the number of pots owned by a skipper, a finding which suggests that limiting boat numbers will do little to cap the number of traps/pots/creels in use, unless separate regulations are introduced for pot numbers – lengthening soak time allows an operator to fish greater numbers of pots. The BIM survey showed that 61% of vessels were unregistered. Several initiatives have been taken within the DoCMNR and its predecessor over the past year to regularise this situation.

It cannot be stated too often that fisheries are a common-age, that active management is required to ensure optimal productivity and that this means restricting effort at a time when fish stocks in both inshore and offshore waters are heavily fished while the demand for fin and shellfish products continues to expand. It is not feasible to manage a fishery whose fleet size and membership is not known and rectifying this is fundamental to any regulatory programme for the inshore. There are precedents for capping fishing effort per vessel – it has been done by restricting drift net length in the salmon fishery, for example – but such moves

will require greater regulatory scrutiny, as would a drive to license fishing vessels and they can only be put into effect after membership of the fleet has been established.

Compulsory log books are also needed to provide details of landings and their origin in order to evaluate the performance and status of inshore stock(lets). Such detail is currently available for only a limited number of fisheries and trends within the majority are based on wide generalisation.

For this review, inshore landings are divided into a number of categories:

- Surface bivalves
- Pot fishery for large, mixed species crustaceans
- Other pot fisheries
- Gathered, rather than fished species
- Selected fin fish species
- Interstitial bivalves

## SURFACE BIVALVES

Surface bivalves (Fig 1) are made up of scallop, queen, oyster (flat and gigas), and mussel. Together their landings were valued at €26 m in 2001. Scallop are also taken in waters outside 12 nm but the majority tonnage within this group is harvested inshore. Further, it is grown in licensed circumstances, such as co-operatives, which confer a grade of ownership. Since the mid-1990s, landings of surface bivalves have greatly increased.

The larger crustacean fishery takes a mixture of brown crab, spider crab, lobster, crawfish and velvet crab, although individual species within this group may be targeted at specific times and places and by the use of particular kinds of trap. In 2001 the combined value of its landings was €26.5 m. The largest component species is brown crab and the inshore fisheries for this recruit from larger offshore stock(s). However, offshore fisheries for brown crab have also developed so that, like scallop, brown crab is no longer an inshore species only. Commercial interest in larger crustaceans is growing, inevitably increasing fishing effort on crawfish and velvet crab, both of which may be over fished as a result (although, in the case of crawfish, the use of tangle nets is identified as a cause of stock decline).

Fisheries for the larger crustaceans are regulated by several TCMs (which are a small percentage of the available array in the case of lobster) but enforcement of these is patchy and inadequate. At the same time, fishermen have contributed to funding enhancement measures for lobster and these have proved encouraging, particularly in Co Wexford, where a pilot lobster management scheme was located. To be effective, TCMs will reduce landings for a period after their introduction and it is important, if they are to be productive, that the industry does not increase effort in that interim in order to maintain the same level of landings while the stock adjusts. That has indeed happened



and, together with poor enforcement of the conservation regulations and the absence of any controls on vessel numbers, has threatened the loss of a management regime which has been painstakingly constructed over the past decade.

### OTHER POT FISHERIES

The category of “other pot fisheries” embraces shrimp, green crab (a species whose exploitation has greatly increased over the past two years) and whelk. Regulations for these species are minimal or non-existent: a close season has been introduced for shrimp and there is a size limit for whelk which is not observed. However, this group of fisheries (which had a first sale value of €6.2 m) in 2001, has been yielding a combined steady tonnage over the past decade.

### GATHERED SPECIES

Finally, in Fig 1, there are two “gathered” rather than fished species. The status of purple sea urchin as an exploitable species is uncertain at the present time. The fishery for periwinkle is also in need of regulation for optimal performance. The value of the gathered species at first sale in 2001 was €2.8 m.

### SELECTED FIN FISH SPECIES

In Fig 2, the landings of three fish species combined are graphed over the past eleven years. John dory, mullet and conger have a special interest to the inshore. Landings of the three combined were increasing until 1998. Their combined value was €0.9 m in 2001. Landings of john dory and conger have been increasing during the 1990s, possibly as a by-catch of increasing trawling effort although a directed long-line fishery targeting conger raised the trend. Bass is another species which is monitored in some detail because of its importance as an angling species but for which commercial data are not available. In view of the many co-existing users of inshore waters, it may be appropriate to consider extending protection to other species whose worth to recreation and tourism considerably outweighs their first sale value for human consumption.

### INTERSTITIAL BIVALVES

Finally, this review considers the growth of landings for interstitial bivalves. The largest component of these in recent years has been razor clam for which a fishery com-

menced in the late 1990s and is now in decline. Razor clam is a bad example of an exploitable species because their beds may require more than a decade to regain their pre-exploited biomass. Worse is the wasteful way in which they were fished: up to 60% of harvestable individuals were damaged beyond acceptance by the market. What was required at the inception of the razor clam fishery was a method of removing limited numbers of the animals from the substratum without damaging them and regulation of the small market for razor clams so that it was not oversupplied, with the consequent reduction in price obtained by the suppliers. Even at this late stage, however, progress remains to be made on the methods of conducting this valuable fishery and stocks of razor clams have been reduced to levels whose exploitation the industry no longer considers worthwhile.

Interstitial bivalves comprise a number of species, some of which (like surf clams) are better candidates for a sustainable fishery than others. What frequently happens is that various species are captured together and the market is geared to cope with only one which bacteriological tests confirm it is safe to sell, this resulting in discarding of often the majority of bivalves captured at any time (Fig 3).

### Source of information:

A survey by hydraulic dredge of interstitial bivalves with commercial potential in Cill Chiaráin Bays and along their connecting shoreline, Co Galway. Fisheries Bulletin, No 2, 2002; 23 pp

Fig 1. Landings of four categories of inshore fisheries, 1990-2001.

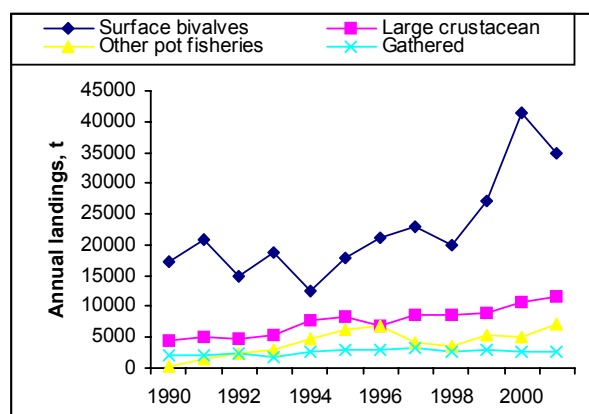
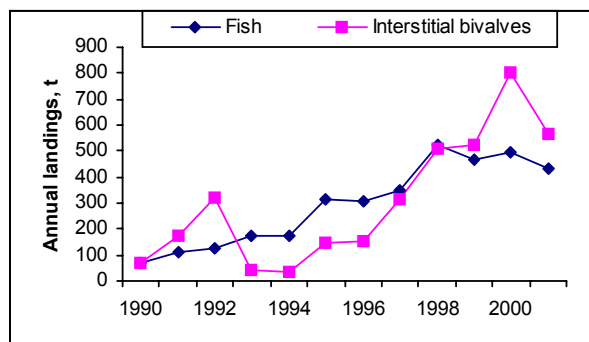
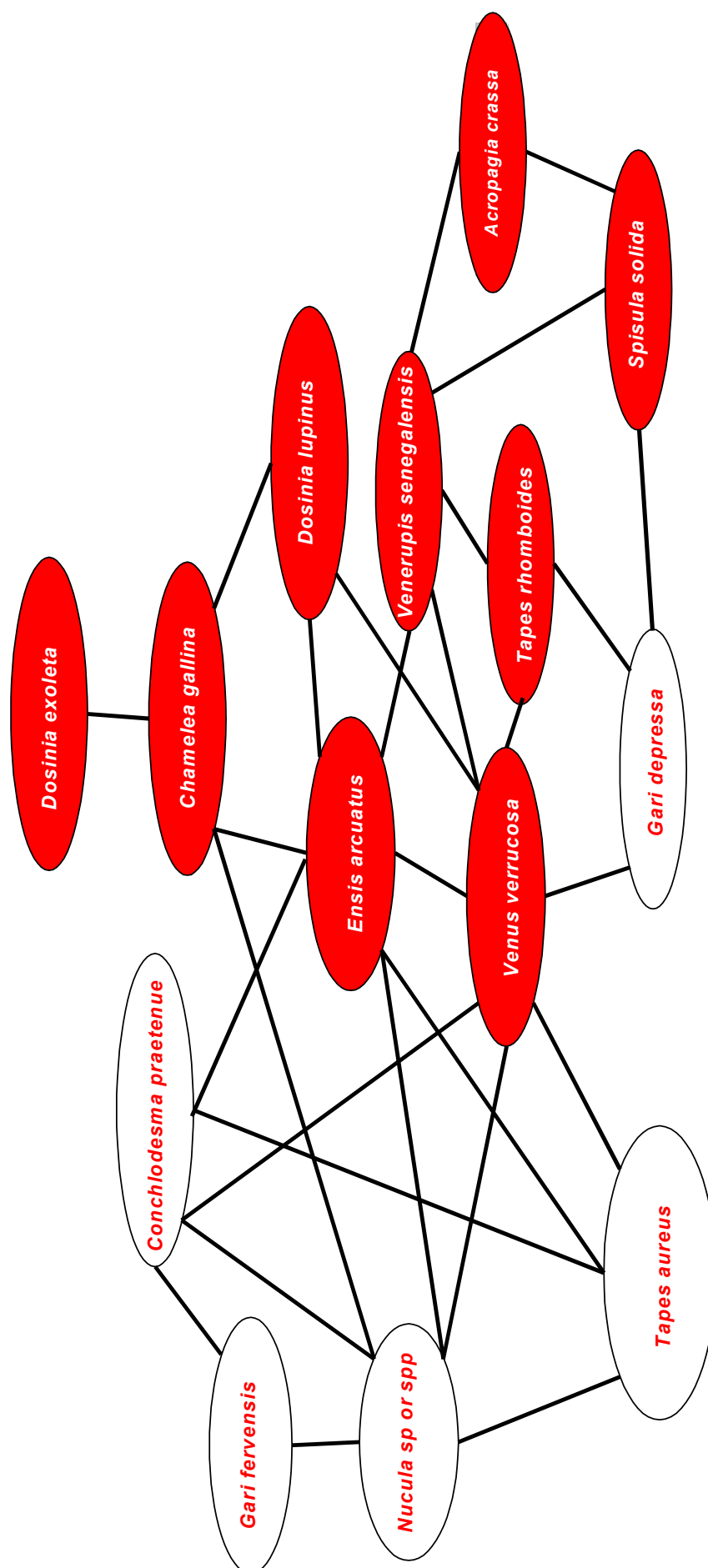


Fig 2. Landings of two categories of inshore fisheries, 1990-2001



<sup>i</sup> A profile of Ireland's inshore fishing fleet and its fishing activity in 2001 By Oliver Tully, BIM July 2001

Fig 3. Bivalve species surveyed in Cill Chiaráin and Beirtreach buí Bays, Co Galway. Red identifies species with commercial potential.





# MFSD Work Overview 2002

## STOCK SAMPLING AND ASSESSMENT 2002

MFSD assesses, researches and advises on the fisheries resources in waters around Ireland. This is achieved through a comprehensive program of fish market, port and sea sampling of landings; discard sampling; analysis of commercial catch and effort data and scientific research surveys.

For the first time in 2002, MFSD's core sampling programme has been carried out under the national programme of the EC Data Collection Regulation 1543/2000 (DCR). In order to ensure the adequate provision of fisheries data for stock assessment by the member states the DCR was set up to "establish a community frame work for the collection and management of data needed to conduct the common fisheries policy". The programme includes the evaluation of fishing capacity and effort, catches and landings and the economic situation of the sector. It is divided into the 1) minimum programme requirements that detail sampling levels that must be achieved by each member state and 2) the extended programme requirements that detail the sampling levels that are desirable but not mandatory. MFSD was responsible for the fulfilment of minimum requirements for biological sampling including age and length composition of catches and discards and the carrying out of scientific fisheries surveys. The funding obtained from the DCR supplements the resources needed for the collection, management, and analysis of fisheries data for the demersal, pelagic, deep water, *Nephrops* and some inshore stocks that are currently monitored and assessed by MFSD.

## DEMERSAL FISHERIES ASSESSMENT

### Demersal Stock Sampling Programme

Under the minimum programme of the DCR, MFSD sampled the demersal fish stocks in waters around Ireland, including anglerfish, cod, haddock, hake, megrim, plaice, sole, whiting and saithe. In many cases sampling levels exceeded the minimum targets, especially when the stocks were of national importance or when they presented long time series that needed to be continued. Species sampled and aged outside the DCR were some plaice, sole and lemon sole stocks.

MFSD contribute data to and participate in the following ICES assessment Working Groups:

- Working Group for the Assessment of Southern Shelf Hake, Monk, Megrim (**WGHMM**)
- Working Group on the Assessment of Southern Shelf Demersal Stocks (**WGSSDS**)
- Working Group on the Assessment of Northern Shelf Demersal Stocks (**WGNSDS**)

These Working Groups produce analytical assessments of

the status of the most important TAC regulated demersal stocks around Ireland. The reports of these Working Groups are available at [www.ices.dk](http://www.ices.dk). In 2002 MFSD acted as international species co-ordinator for Division VIIa whiting, cod and haddock, Division VIIe-k whiting, Divisions VIIb-k haddock, Divisions VIIb,c plaice and sole and Divisions VIIh,j,k plaice and sole. The international data sets for these stocks were collated and checked by MFSD prior to the ICES working groups.

### Demersal Research Surveys

In 2002 MFSD carried out a number of groundfish surveys to obtain abundance and recruitment indices for demersal fish species. Coverage of the different surveys is shown in Figure 1. The annual West Coast groundfish survey has been carried out since 1992. In October 2002 two chartered commercial fishing vessels, the MFV *Marliona* and MFV *Regina Ponti* covered the west coast of Ireland from Stanton Bank southwards to the Fastnet grounds.

The Irish Sea and Celtic Sea groundfish survey programme commenced in October 1997 on the research vessel *Celtic Voyager* and has continued annually in Quarter IV. The survey forms part of the Western IBTS fourth quarter groundfish survey. As an active member of the ICES IBTS Working Group Ireland has been the international survey co-ordinator for western waters since 1998, co-ordinating surveys between UK (England), UK (Scotland), UK (Northern Ireland), Ireland, Spain and France under the ICES IBTS Working Group umbrella. ICES divisions covered by Ireland in this survey are VIa (south), VIIa, b, g and j.

The Irish Sea juvenile plaice survey has been carried out each May since 1975 with the objective of monitoring recruitment in plaice. The data was used in this year's ICES working group as a tuning fleet for the Irish Sea plaice stock.

In collaboration with NOAA, a fish egg and larval survey targeting cod, haddock, whiting, megrim and hake was conducted in March/April this year to study the biophysical interaction of eggs and larvae on spawning grounds in the Celtic Sea (see Figure 1).



## PELAGIC FISHERIES ASSESSMENT

### Pelagic Stock Sampling Programme

Under the DCR, pelagic sampling was carried out on blue whiting, northeast Atlantic mackerel, western horse mackerel, albacore tuna and Celtic Sea, Irish Sea and west of Ireland herring. The investigations carried out in 2001 and 2002 consisted of biological examinations of the catches for length, weight, age, sex, and maturity.

MFSD contribute data to and participate in the following ICES assessment Working Groups:

- Herring Assessment Working Group (HWAG)
- Northern Pelagic and Blue Whiting Working Group (WGNPBW)
- Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy (WGMHSA)

These Working Groups produce analytical assessments of the status of the most important TAC regulated pelagic stocks around Ireland. The reports of these Working Groups are available at [www.ices.dk](http://www.ices.dk). MFSD pelagic sampling data are also used and the ICCAT Working Group on Albacore tuna. In 2002 MFSD acted as the international species co-ordinator for catch and landings data for northeast Atlantic mackerel stock.

### Pelagic Research Surveys

Irish acoustic surveys of herring stocks form an important part of the ICES assessment of the herring fishery in the Celtic Sea. These surveys were continued in 2002 using the F.V *Menhaden* from Castletownbere. Additional surveys were again carried out in the Celtic Sea during the summer and autumn of 2002, under the NDP programme, using a number of commercial herring vessels. The acoustic survey, initiated in 2000 off the Northwest coast was continued in 2001 and 2002, using the F.V *Silver King*. The acoustic survey tracks used in 2002 are shown in Figure 2. MFSD also participated in a Norwegian blue whiting acoustic survey covering the Porcupine and the Rockall Banks.

Data obtained during the 2001 international mackerel and horse mackerel egg survey programme were compiled and analysed in this year's ICES Working Group on Mackerel and Horse Mackerel Egg surveys (WGMEGS). An additional mackerel and horse mackerel egg survey, funded by the Northwest Pelagic Management Committee was carried out in May and June 2002 using the F.V *Atlantean* to study the extent of spawning of these two species in deep water off the west of Ireland and Scotland. Sample positions of the survey are shown in Figure 2.

## DEEPWATER FISHERIES ASSESSMENT

### Deepwater Stock Sampling Programme

This year, in accordance with the DCR, sampling of deepwater species including orange roughy and ling was conducted. In recent years MFSD has carried out detailed sampling of several deepwater species. MFSD contribute

data to and participate in the following ICES Groups:

- Working Group on the Biology and assessment of deep-sea fisheries resources (WGDEEP)
- Study Group on Elasmobranch Fisheries (SGEF)

These Groups investigate the biology of deepwater species and produce analytical assessment of deep-sea fisheries resources. The stock assessment work on deepwater sharks was being conducted as part of the EU-funded DELASS project. The reports of these Groups are available at [www.ices.dk](http://www.ices.dk).

### Deepwater Research Surveys

A plankton survey carried out in May and June by MFSD and the Northwest Pelagic Management Committee in deep water off the west of Ireland and Scotland provided distribution maps of eggs and larvae of deepwater species such as tusk, ling, witch and redfish.



## ELASMOBRANCH FISHERIES ASSESSMENT

### Elasmobranch Stock Sampling Programme

Under the DCR, MFSD carried out biological sampling on elasmobranch catches landed into Ireland. These included rays, spur dogs and migratory sharks. As part of DELASS, MFSD is international co-ordinator for data on blue shark to be used for stock assessment purposes. This includes international landings and discards information, tagging and by-catch data.

### Elasmobranch Research Surveys

The fourth quarter groundfish surveys of the west coast, the Irish Sea and Celtic Sea are used to provide information on the distribution of elasmobranch species and are important in providing CPUE data in the absence of commercial catch data by species.

## NEPHROPS FISHERIES ASSESSMENT

### Nephrops Stock Sampling Programme

Continuous monitoring programmes have been carried out for some years on *Nephrops* stocks in the western Irish Sea (Division VIIa) and more recently on the Aran Grounds and Porcupine Bank. Prior to 2001 the stocks in the Celtic Sea and off the South Coast have not been routinely sampled. Under the DCR minimum programme, MFSD is now required to routinely sample *Nephrops* from the following areas:

- Aran Grounds (FU17)
- Celtic Sea (FU20-22)
- Irish coast (FU19)
- Irish Sea West (FU15)
- Porcupine (FU16)

MFSD contribute data to and participate in the following ICES assessment Working Groups:

- Working Group for the Assessment of *Nephrops* stocks (**WGNEPH**)

This Working Group produces analytical assessments of the status of the important TAC regulated *Nephrops* stocks around Ireland. The reports of the Working Group are available at [www.ices.dk](http://www.ices.dk). In March 2003 this Working Group will meet in Galway to produce up dated assessments for *Nephrops* stocks.

### ***Nephrops* Research Surveys**

In 2002, MFSD successfully completed the first Irish underwater television survey to estimate *Nephrops* stock size from burrow densities. The survey was carried out on the RV *Celtic Voyager* and covered *Nephrops* grounds off Aran, Galway Bay and Slyne Head in June and July. It is planned to repeat the survey over several years to obtain relative abundance indices that can be used in stock assessment.



## **INSHORE FISHERIES ASSESSMENT**

### **Inshore Fisheries Sampling Programme**

For the fulfilment of the DCR, the inshore section of MFSD carried out sampling programmes for brown crabs and razor clams. Other species were sampled due to their importance to the Irish inshore fishery although not required under the DCR. These were bass, spider crabs, whelks, *Spisula solida*, scallops and various other bivalve species. MFSD contribute data to and participate in the following ICES Groups:

- Study Group on Sea Bass (**SGBASS**)
- Study Group on the Biology and Life History of Crab (**SGCRAB**)
- Working Group on Cephalopod Fisheries and Life History (**WGCEPH**)

These Groups investigate the biology and produce analytical assessments of various bass, crab and cephalopod resources. The reports of these Groups are available at [www.ices.dk](http://www.ices.dk). The results of various assessments of in-



shore stocks around Ireland are published in various Marine Institute publication series and are available at: [www.marine.ie/information+services/library+services/marine+institute+publications/index.htm](http://www.marine.ie/information+services/library+services/marine+institute+publications/index.htm)

### **Inshore Research Surveys**

A number of inshore surveys were carried out by MFSD to monitor species abundance and recruitment indices. Bass abundance was examined in Wexford harbour, Ballymacoda and the Blackwater river in collaboration with the central and regional fisheries boards. BIM collaborated with a crab tagging study in Wexford harbour and spider crab surveys in Brandon and Tralee bays. Bivalve surveys were carried out in Gormanstown, Blacksod and Kilkieran Bays, Clifden, ClarinBridge and the Irish Sea. MFSD and BIM also undertook an exploratory fishing survey and sampling programme for scallops in SW Ireland between November 2001 and May 2002.

## **DISCARD SAMPLING PROGRAMME**

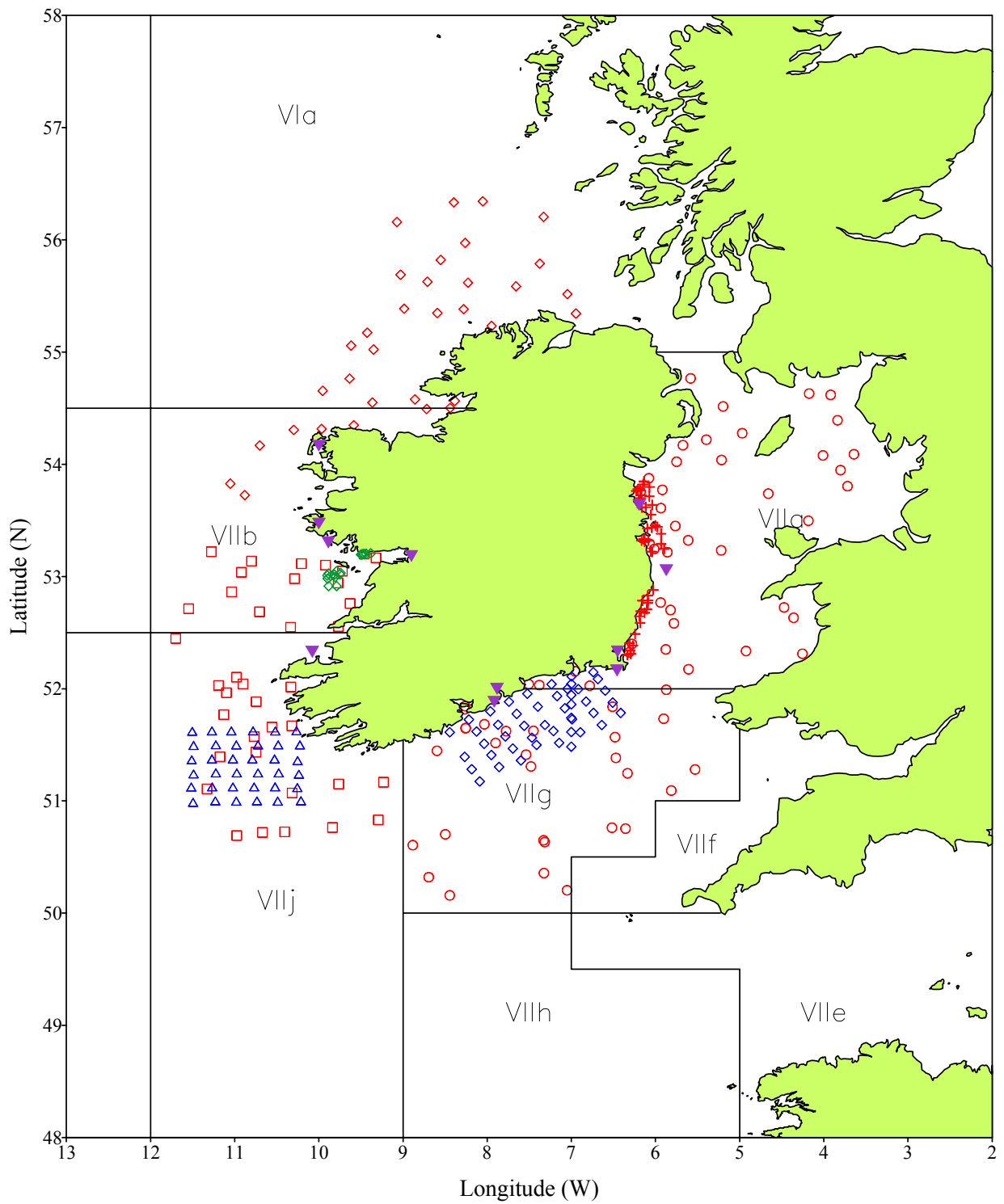
Ireland has carried out a discard monitoring programme since 1993 under various EU Study Contracts. Discard data were collected by Fisheries Assessment Technicians (FAT's) who are based at the major Irish fishing ports (Killybegs, Rossaveal, Castletownbere, Dunmore East and Howth). In 2002 under the DCR minimum programme, MFSD was required to sample and produce an annual discard rate for the following stocks:

- Herring VIa, VIIa,b,c,j
- Haddock VIa, VIb, VIIa, VII
- Whiting VI, VIIa, VIIb-k
- Hake VI, VII
- Plaice VIIa, VIIe-g

Discarding on other species is required by the DCR on a triennial basis. Nevertheless, MFSD produces annual discard estimates for other species including *Nephrops*, sole and anglerfish for the various ICES stock assessment Working Groups. Discard information on other species is also routinely collected on an on-going basis. Irish discard data have been collated and contributed to the following ICES Study Group:

- Study Group on Discards and By-catch Information (**SGDBI**)

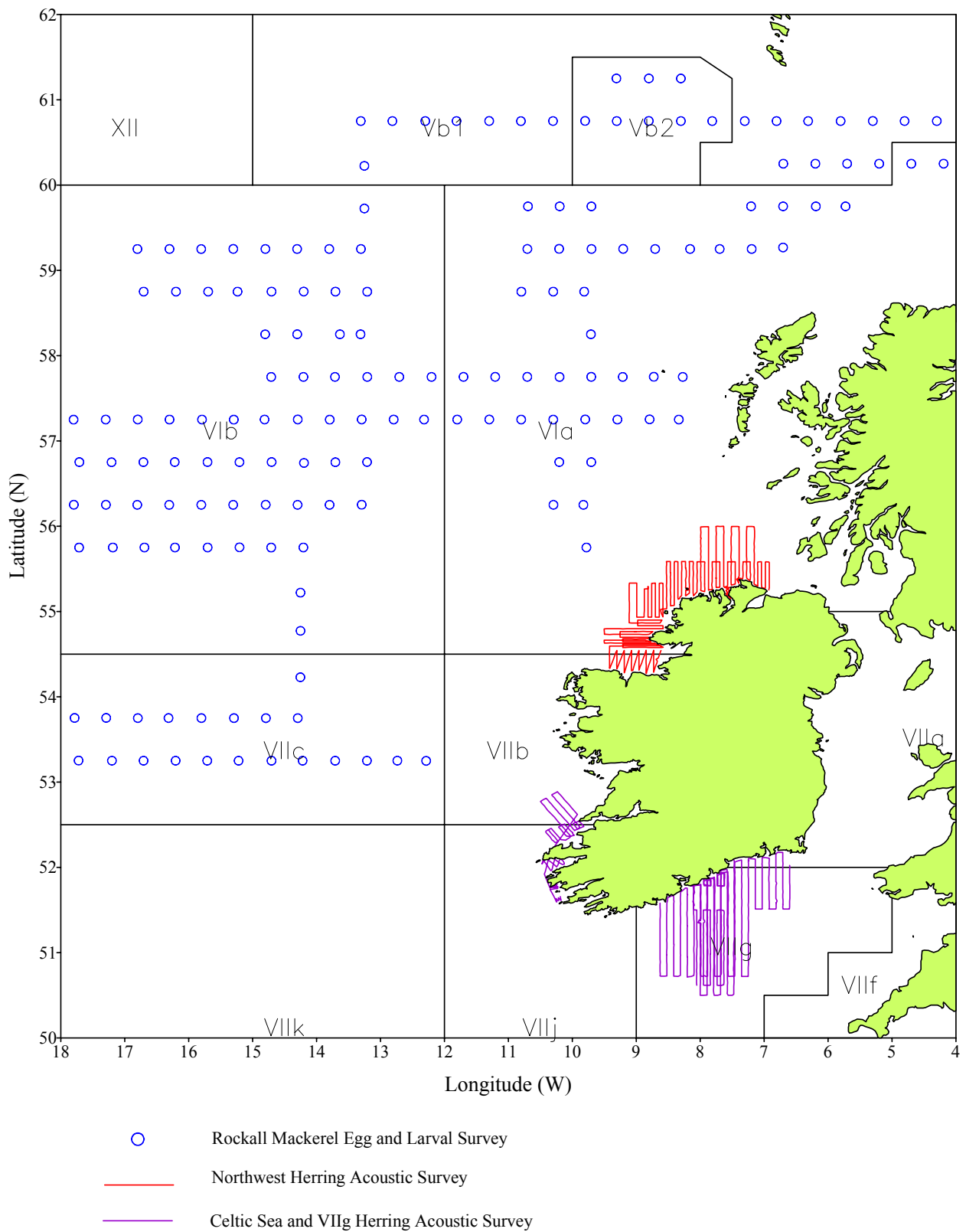
MFSD also participated in this Study Group. The reports of this Group are available at [www.ices.dk](http://www.ices.dk). SGDBI have then made these data available for their inclusion in international stock assessments.



- Irish Sea Celtic Sea Ground Fish Survey
- ◇ West Coast Ground Fish Survey Part A
- West Coast Ground Fish Survey Part B
- ⊕ Irish Sea Young Plaice Survey
- △ MI-NOAA Egg and Larval Multinet Survey
- ◇ MI-NOAA Egg and Larval MOCNESS Survey
- ◇ *Nephrops* Underwater TV Survey
- ▼ Inshore Fisheries Surveys

**Figure 1.** Sample positions of demersal, *Nephrops* and inshore research surveys carried out by MFSD in 2002.





**Figure 2.** Sample positions and survey tracks of mackerel egg and larval and herring acoustic surveys carried out by MFSD in 2002.

# The Form of the ICES Management Advice and the Precautionary Approach

ICES recognises that “changes in fisheries systems are only slowly reversible, difficult to control, not well understood, and subject to change in the environment and human values” (FAO 1996). Therefore ICES agrees **that a precautionary approach** should be applied to fishery management. **Reference points**, stated in terms of **fishing mortality** rates or **biomass** and **management plans** are key concepts in implementing a precautionary approach. They should be regarded as signposts giving information of the status of the stock in relation to predefined limits that should be avoided to ensure that stocks and their exploitation remain within safe biological limits.

The concept of **safe biological limits** was introduced in ICES advice in 1981 and further developed in 1986 (Serchuk and Grainger, 1992). At first, the term was used in relation to management actions, whereas lately it has been used in relation to the state of a stock, and also of its exploitation. In its recent implementation of the concept, ICES has equated being within safe biological limits as being above MBAL and being outside safe biological limits as being below MBAL. This is a needlessly restricted interpretation of a concept which is clearly multi-dimensional involving at least reference points related to fishing mortality and biomass, but possibly also factors such as age-distribution in the stock and in the catch, geographical range, condition factor etc. The concept of safe biological limits is explicitly referred to in the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks and ICES will continue to use it, but in an expanded way, consistent with the precautionary approach.

In order for stocks and fisheries exploiting them to be within safe biological limits, there should be a high probability that:

- 1) The spawning stock biomass is **above** the threshold where recruitment is impaired, and that,
- 2) The fishing mortality is **below** that which will drive the spawning stock to the biomass threshold which must be avoided.

The biomass threshold is defined as  $B_{lim}$  ( $lim$  stands for limit) and the fishing mortality threshold as  $F_{lim}$ . *In order to have a high probability to avoid the thresholds, management action must be taken before the thresholds are approached.* The precision with which the thresholds and current status of the stocks are known, and the risk which is tolerable, are important factors in determining the distance away from the threshold that management action is required. The greater the precision of the assessment, the smaller the distance between limit and precautionary reference points. If the assessment is less reliable, the distance will be greater. **ICES has defined  $B_{pa}$  ( $pa$  stands for precautionary approach) as the biomass below which action should be taken and  $F_{pa}$  as the fishing mortality above which management action should be taken.** The

distance between the limit and the precautionary approach reference points is also related to the degree of risk that fishery management agencies are willing to accept. Therefore, although ICES sees its responsibility to identify limit reference points, it will suggest precautionary reference points. The adoption of precautionary reference points requires discussion with fishery management agencies.

## Formal Definitions

$F_{lim}$  is the limit fishing mortality which should be avoided with high probability because it is associated with unknown population dynamics or stock collapse. There are very few stocks for which  $F_{lim}$  is accurately known. Some stocks in the ICES area have collapsed in the past when fishing mortality exceeded  $F_{lim}$ , but generally speaking, the fishing mortality rate at which the probability of stock collapse becomes unacceptably high remains unknown. Therefore, there are uncertainties in the estimate of  $F_{lim}$ , and there are also uncertainties in estimates of current fishing mortality.

In order to have a high probability that fishing mortality will be below  $F_{lim}$ , a precautionary reference point,  $F_{pa}$  lower than  $F_{lim}$ , is defined. Used as a constraint on fishing,  $F_{pa}$  is designed to ensure that there is a high probability that  $F_{lim}$  will be avoided and that the spawning stock biomass will remain above the threshold below which the probability of good to average recruitment is decreased. In other words,  $F_{pa}$  is a device to ensure that recruitment overfishing does not take place. It is the upper bound on fishing mortality rate to be used by ICES in providing advice.  $F_{pa}$ , given uncertainties, must have a high probability of being below  $F_{lim}$ , and it must have a high probability of being sustainable based on the history of the fishery; i.e., it should be set in the range, and imply a biomass, within those previously perceived to be acceptable. Fishing mortality rates in excess of  $F_{pa}$  will be regarded as “overfishing”.

$B_{lim}$  is the limit spawning stock biomass, below which recruitment is impaired or the dynamics of the stock are unknown. Stocks may become depleted due to reduced recruitment even if fishing mortality is successfully maintained at or below  $F_{pa}$ . Furthermore, efforts to restrain fishing below  $F_{pa}$  may not be successful and biomass may decline as a result. Clearly, therefore, in addition to a constraint on fishing mortality, it is desirable to have a biomass-based constraint to prevent stock decline to values where expected recruitment is low or unknown.

Whereas  $F_{pa}$  defines an “overfishing threshold”, a definition of when the stock is regarded as being in a “depleted state” is also necessary. A threshold in this respect,  $B_{pa}$ , needs to be set to ensure a high probability of avoiding reducing the stock to a point,  $B_{lim}$ , below which recruitment

is impaired or the dynamics of the stock are unknown.  $B_{lim}$  is in general equal to previously defined MBAL values for those stocks where MBAL has been based on considerations of stock-recruitment relationships.  $B_{pa}$  is the biomass below which the stock would be regarded as potentially depleted or overfished. When SSB is below  $B_{pa}$ , fishing mortality may need to be reduced below  $F_{pa}$ .  $B_{pa}$  should be set to ensure a high probability that  $B_{lim}$  is not reached.

### Framework for Advice

Advice from ICES will be constrained by  $F_{pa}$  and  $B_{pa}$ . If fishery management decisions lead to  $F_{pa}$  being exceeded, then this would be regarded as overfishing and management would not be regarded as consistent with a precautionary approach. The development of a management plan to reduce fishing mortality to no greater than  $F_{pa}$  would be advised. If no such plan were developed, ICES would generally advise that management was not consistent with a precautionary approach. Because  $F_{pa}$  would be set such that  $B_{pa}$  were unlikely to be reached, and because  $B_{pa}$  is chosen to provide a high probability of avoiding recruitment failure, if SSB were to fall below  $B_{pa}$ , advice to reduce fishing mortality would be likely. This would depend, however, on whether or not  $F_{pa}$  were also being exceeded and on the prognosis for SSB trends and the probability of recovering to above  $B_{pa}$  in the short term. If SSB were predicted to remain below  $B_{pa}$  in the short to medium term, the development of a recovery plan would be advised. But in general,  $B_{pa}$  is the biomass threshold triggering advice for a reduction in  $F$  to a value below  $F_{pa}$ .

$F_{pa}$  and  $B_{pa}$  are thus the main devices in the ICES framework for providing advice. They are thresholds which constrain advice or which likely trigger advice for the implementation of management/recovery plans. If the development of plans were proposed, fishery management agencies, scientists and perhaps other parties would need to work together on their development. Such plans might involve explicit harvest control rules or sets of decision rules. If the development of plans were recommended, but not taken up, ICES would have to advise that management

was not consistent with a precautionary approach. If plans were developed and not effectively implemented, again the advice would be that management was not consistent with a precautionary approach.

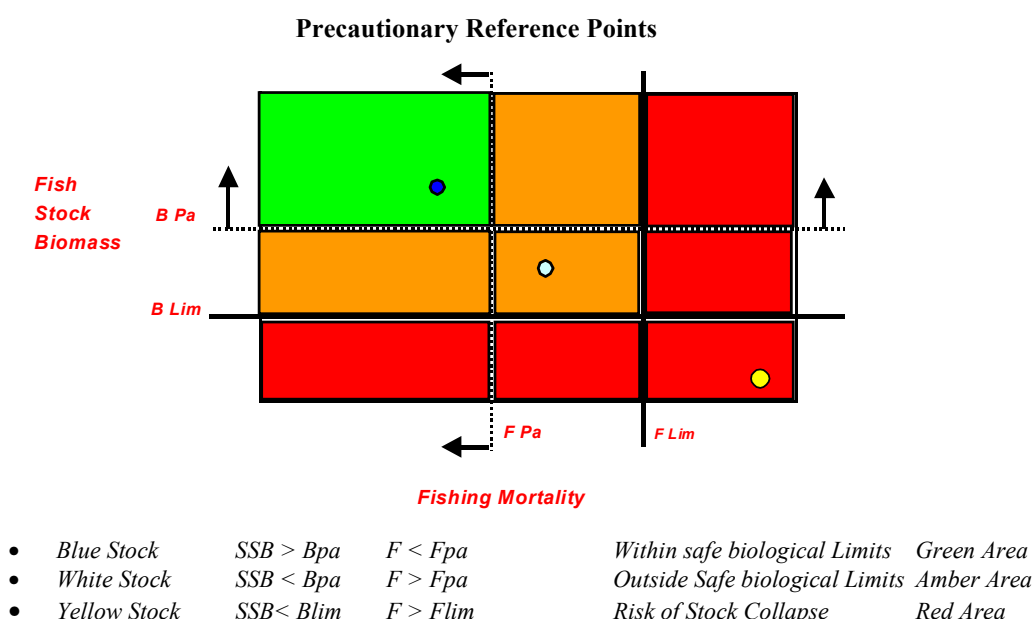
Note that if a stock is regarded as being in a depleted state, or even if overfishing is taking place, the development and effective implementation of a plan which is regarded as sufficient to reduce fishing mortality to no higher than  $F_{pa}$  and to rebuild SSB to above  $B_{pa}$ , within a "reasonable" period, would satisfy the condition that management were consistent with a precautionary approach.

ICES proposed a number of "lim" and "pa" reference points in 1998 as a provisional step to the implementation of a precautionary approach. It was recognised that the estimates of thresholds could change as the concept evolved or with additional knowledge of stock and fishery dynamics. Further discussion of the implementation of the precautionary approach both within ICES (e.g. the 11<sup>th</sup> Dialogue Meeting) and elsewhere (NAFO, FAO, etc.), can be expected to result in further development and clarification of concepts and changes in terminology. It is becoming apparent, for example, that there is a difference in the  $F_{lim}$  concept being used in ICES and NAFO, and ICES will revise its terminology to avoid confusion.

*ICES 1997. Report of the Precautionary Approach to Fisheries Management. Copenhagen, 5–11 February 1997. ICES CM 1997/Assess:7.*

*ICES 1998. Report of the Precautionary Approach to Fisheries Management. Copenhagen, 3–6 February 1998. ICES CM 1998/ACFM:10.*

*Serchuk, F.M. and Grainger, J.R. 1992. Development of the basis and form of ICES Fisheries Management Advice; Historical background (1976–1990) and the new form of ACFM Advice (1991 - ?). ICES C.M. 1992/Assess:20.*



# Some Key Issues in Fisheries Management

## Introduction

Historically, the main objective of fisheries management has been the conservation of fish stocks. The broad objectives of fisheries management may therefore include the aims of maximizing yield (weight or revenue), maintaining a particular level of stock in order to provide a buffer against poor recruitment years or maintain a minimum spawning stock. In modern fisheries management, this limited aim has been extended to address additional economic, social and environmental objectives such as fishers welfare, economic efficiency, the allocation of resources and ecosystem protection. Underpinning all these objectives is the need to ensure that fisheries are exploited on an ecologically sustainable basis.

As fisheries management must often address social, political, legal, economic and biological factors, establishing overall objectives of fisheries management will almost always involve compromise. Once the objectives or policy aims of managing a particular fishery have been defined, the range of management strategies capable of achieving these objectives can be considered. Management objectives may be achieved by placing limitations on catches (output controls) or by restrictions applied to the amount of fishing effort (input controls). Once management objectives have been defined for a fishery, a management plan can be devised that includes a description of:

- the present state of development and exploitation of the fishery
- the policy aims, or objectives of managing the fishery
- the management strategies which would achieve these objectives
- the regulations which may be applied to the fishery under various strategies

A management plan proposed for a fishery must then be framed in terms of an acceptable level of risk of deleterious effects. For a certain stock, it may be estimated that recruitment overfishing will not occur as long as the stock remains above 50,000 tonnes. In this case, a TAC can be set at such a level that there is less than a 10% risk that the stock will be reduced to below 50,000 tonnes in any one year. Repeated runs of a stochastic simulation model can be used in risk assessment (eg. to determine the number of times that the stock will drop below 50,000 tonnes per 1,000 simulations).

There are no explicit management objectives for the majority of EU fish stocks presented in the stock book. However, in recent years, with the advent of recovery plans, management objectives have been established for some stocks, mainly in terms of rebuilding targets (biomass) over time. MFSD stress that management objectives must

be established for all stocks and fisheries in a broader context. These plans should initially focus on maintaining a particular level of stock in order to provide a buffer against poor recruitment years and/or maintain a minimum spawning stock. However longer term objectives should be framed in terms of limiting fishing effort, limiting the efficiency and types of gear, closures (seasonal and area), other technical measures (e.g. minimum mesh size, escape grids, size limits), TAC's and enforcement of regulations.

A key concept in any management plan for a fishery is the notion of sustainability. In 1992, the UN defined sustainable development at Rio (Earth Summit on Sustainable Development) as “*development which does not destroy or undermine the ecological, economic or social basis on which continued development depends*”. In terms of fisheries, the concept of sustainability now requires the rebuilding of many depleted fish stocks. At the Johannesburg earth summit in 2002, one of the outcomes was the recognition of a need to rebuild certain depleted fish stocks by 2015.



## Recovery Plans

There are very serious concerns about the state of a number of key fish stocks in EU waters. Such stocks of interest to Ireland include Irish Sea cod, West of Scotland cod, Irish Sea whiting, Rockall haddock and northern hake. Since 2000, ‘emergency measures’ and ‘recovery plans’ have become a feature in the management of EU fish stocks. ‘Emergency measures’ have been established from the north coast of Spain to Norway as part of the recovery plan process. Ireland is at the geographical center of this recovery plan area and given the mixed fisheries nature of the stocks involved, these plans will have a considerable impact on coastal fishing communities and the fishing fleet.

Recovery plans are ‘special measures’ that are designed to reduce fishing pressure on the stock. They are generally initiated by a substantial reduction in TAC, followed by special ‘emergency measures’. These measures include ‘closed areas’ to protect spawning aggregations (e.g. Irish Sea cod recovery plan) and/or measures to protect juvenile fish in nursery areas (e.g. hake recovery plan). Increased mesh sizes and the use of escape panels in trawl nets are also used to reduce the catch of small fish. The recovery plan should also include effort reductions and increased



control and enforcement measures.

Throughout 2000 and 2001, intensive discussions between the EU Commission, scientists, managers and industry lead to the formulation of the 4 recovery plans in EU waters. Figure 1 shows the areas associated with the hake and cod recovery plans. The measures implemented included restrictions on the fishing activity in certain areas, the use of increased mesh sizes and increased control and enforcement measures. The EU Commission has also introduced a series of derogations for certain fisheries that are carried out in these areas.

The present set of emergency measures have been based on life history characteristics, such as spawning areas/time/duration and data on size and age at maturity. Information on the seasonal and spatial distribution of juveniles and adults has also been used in designing the emergency measures. Surveys carried out by Ireland, UK, France and Spain have been used to map the distribution of juvenile hake from the Bay of Biscay to the West of Scotland. Two important nursery grounds have been identified from these surveys, one in the Bay of Biscay and one off the south and west of Ireland and are the basis of the hake emergency measures. Egg and larval surveys conducted by the UK and Ireland in the Irish Sea identified the spawning areas for cod and formed the basis of the cod box closures.

Considerable discarding of juvenile hake and Irish Sea whiting has been causing scientists and the EU Commis-

sion serious concerns for many years. In recent years, data indicates that discarding of hake has been reduced considerably. However, it is not clear if this is as a result of the very low numbers of juvenile hake currently in the stock, changes in discarding practices or the impacts of improved selectivity. Measures to substantially reduce discarding of whiting in the Irish Sea *Nephrops* fishery will need to form the basis of any Irish Sea whiting recovery plan.

It is recognized that there are some deficiencies in the current suite of emergency measures. To date recovery plans have mainly been based on the life history considerations with no management objectives in place for the stock. Furthermore, scientists have not yet been able to evaluate the effectiveness of the recovery plans. The European Commission now recognises a need to further develop the recovery plan concept.

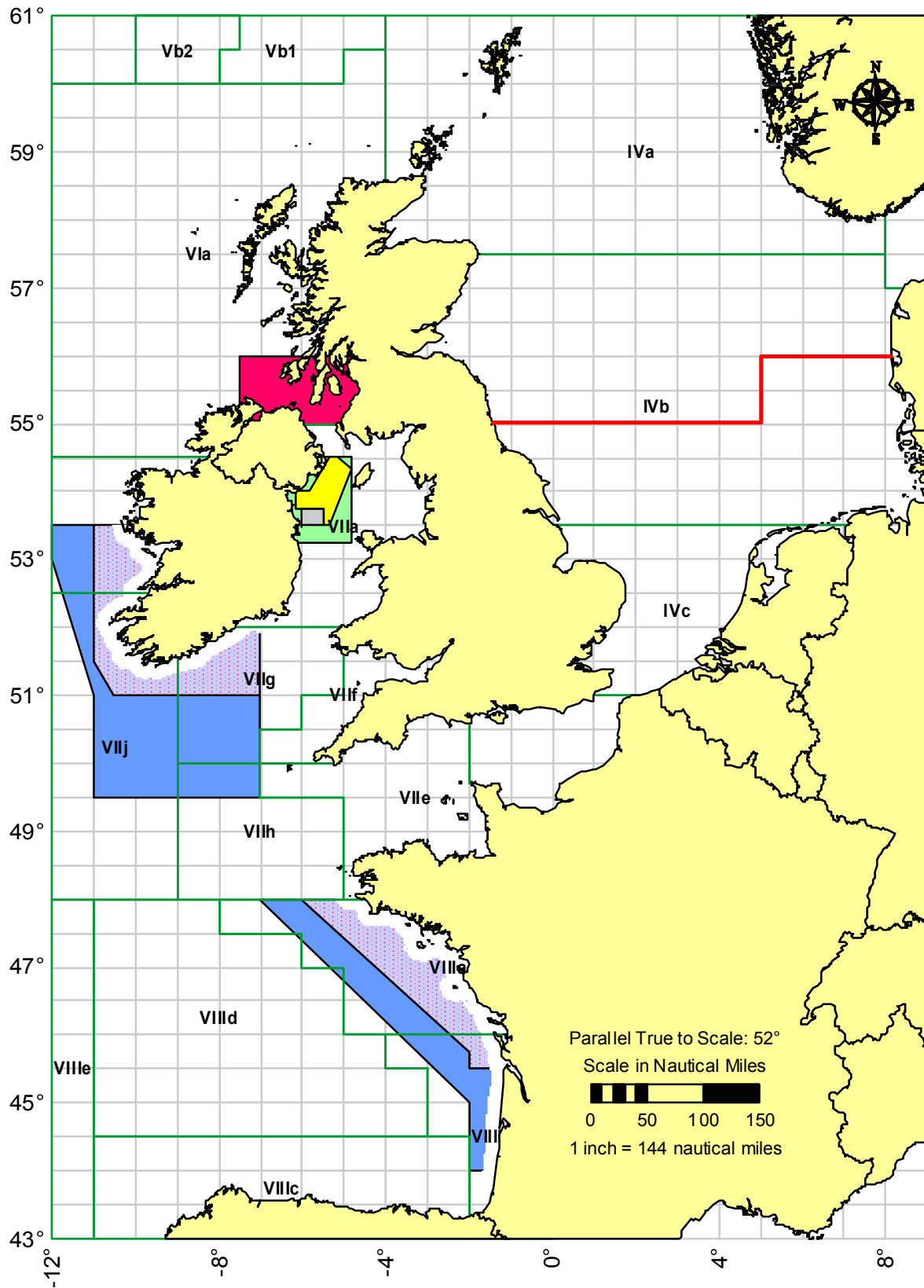
### ***Recovery Plans and the EU Regulations***

The details of the measures implemented for the of recovery of cod and hake stocks can be found in the appropriate Commission Regulations. These regulations are listed below. There are also a variety of Commission Regulations that amend the main regulations. The full text of these regulations may be consulted at:

[http://europa.eu.int/comm/fisheries/doc\\_et\\_publ/factsheets/legal\\_texts/regl\\_en.htm](http://europa.eu.int/comm/fisheries/doc_et_publ/factsheets/legal_texts/regl_en.htm)

- Commission Regulation (EC) No 304/2000, of 9 February 2000, establishing measures for the recovery of the stock of cod in the Irish Sea (ICES division VIIa).
- Commission Regulation (EC) No 259/2001, of 7 February 2001, establishing measures for the recovery of the stock of cod in the North Sea (ICES sub area IV) and associated conditions for the control of activities of fishing vessels.
- Commission Regulation (EC) No 456/2001, of 6 March 2001, establishing measures for the recovery of the stock of cod to the west of Scotland (ICES Division VIa) and associated conditions for the control of activities of fishing vessels.
- Commission Regulation (EC) No 714/2001, of 10 April 2001, amending Regulation (EC) No 259/2001 establishing measures for the recovery of the stock of cod in the North Sea (ICES subarea IV) and associated conditions for the control of activities of fishing vessels.
- Commission Regulation (EC) No 715/2001, of 10 April 2001, amending Regulation (EC) No 456/2001 establishing measures for the recovery of the stock of cod to the west of Scotland (ICES division VIa) and associated conditions for the control of activities of fishing vessels.
- Commission Regulation (EC) No 1162/2001, of 14 June 2001, establishing measures for the recovery of the stock of hake in ICES sub-areas III, IV, V, VI and VII and ICES divisions VIII a, b, d, e and associated conditions for the control of activities of fishing vessels.
- Commission Regulation (EC) No 2056/2001, of 19 October 2001, establishing additional technical measures for the recovery of the stocks of cod in the North Sea and to the west of Scotland.
- Commission Regulation (EC) No 2602/2001, of 27 December 2001, establishing additional technical measures for the recovery of the stock of hake in ICES sub areas III, IV, V, VI and VII and ICES Divisions VIIIa,b,d,e.
- Commission Regulation (EC) No 494/2002, of 19 March 2002, establishing additional technical measures for the recovery of the stock of hake in ICES sub-areas III, IV, V, VI and VII and ICES divisions VIIIa,b,d,e.
- Council Regulation (EC) No 2549/2000, of 17 November 2000, establishing additional technical measures for the recovery of the stock of cod in the Irish Sea (ICES Division VIIa).
- Council Regulation (EC) No 300/2001, of 14 February 2001, establishing measures to be applied in 2001 for the recovery of the stock of cod in the Irish Sea (ICES division VIIa).
- Council Regulation (EC) No 1456/2001, of 16 July 2001, amending Regulation (EC) No 2549/2000 establishing additional technical measures for the recovery of the stock of cod in the Irish Sea (ICES Division VIIa).
- Council Regulation (EC) No 254/2002, of 12 February 2002, establishing measures to be applicable in 2002 for the recovery of the stock of cod in the Irish Sea (ICES division VIIa).

### Figure 1 Recovery Plans During 2002 in EU waters



*Details of restrictions are given on the next page*

## Summary of main restrictions related to ongoing recovery plans shown in Figure 1.

As part of the recovery of the stocks of Cod in the Irish Sea, West of Scotland and North Sea and Northern Hake, several technical measures have been introduced in 2002. These include closed areas and area restrictions details of which are summarised in the text below and shown on the Figure 1. For the definitive text and details of other technical measures in place the Commissions website should be consulted at:

[http://europa.eu.int/comm/fisheries/doc\\_et\\_publ/factsheets/legal\\_texts/legal\\_en.htm](http://europa.eu.int/comm/fisheries/doc_et_publ/factsheets/legal_texts/legal_en.htm)

**COUNCIL REGULATION (EC) No 254/2002 of 12 February 2002**  
establishing measures to be applicable in 2002 for the recovery of the stock of cod in the  
Irish Sea (ICES division VIIa)  
Applicable from 14 February 2002

**Division VIIa**

A prohibition on all fishing gears in green area from 14/2/02 to 30/4/02

Fishing is permitted in the yellow area with prawn net or prawn net with inclined separator panel provided that 35% live wt of aboard is *Nephrops*. The following mesh size are allowed, 70mm-79mm or 80mm-99mm, provided that only one mesh size is aboard and no part of the mesh should be greater than 300mm.

Fishing is permitted in the grey area subject to the same provisions. Only trawls with an inclined separator panel are permitted to fish in this grey box.

**COMMISSION REGULATION (EC) No 494/2002 of 19 March 2002**  
establishing additional technical measures for the recovery of the stock of hake in ICES sub-  
areas III, IV, V, VI and VII and ICES divisions VIII a, b, d, e  
Applicable from 1<sup>st</sup> March 2002

**Sub-area VII & VIII**

In the blue box it is prohibited to conduct any fishing activity using a towed net of mesh size range 55-99mm or a fixed gear of mesh size < 120mm in Sub-area VII and < 100mm in Sub-area VIII (excluding areas within 12 nautical miles of Ireland or France).

Stippled Purple Box- vessels must carry observers for a minimum of 50 voyages and landings must be sampled from a minimum number of 100 occasions.

**COMMISSION REGULATION (EC) No 2056/2001 of October 2001**  
establishing additional technical measures for the recovery of the stocks of cod in the North  
Sea and to the west of Scotland  
Applicable from 1<sup>st</sup> January 2002

**Division VIa**

Conditions laid down for towed demersal gears (not including beam trawls) in Division VIa

A prohibition on towed gears in the subject to Article 2 & 3 of 2549/2000.

Other parts of VIa with mesh sizes 70-79 mm catches shall consist of at least 30% *Nephrops* and < 5% cod.

Other parts of VIa with mesh sizes 100-109 mm catches shall consist of at least 70% round fish and < 5% cod.

**Sub-area IV**

Sub-area IV North of red line with mesh sizes 80-109 catches shall consist of at least 30% *Nephrops*

Sub-area IV with mesh sizes 110-119 50% mixed roundfish and < 25% cod.

## Future Recovery Plans

In November 2000, ICES indicated that a number of cod stocks and the stock of northern hake were at serious risk of collapse. Following this, Norway and the EU enacted various emergency measures covering these stocks in 2001. This was in addition to measures adopted by the EU to aid recovery of Irish Sea cod in the previous year. The EU also made proposals for longer-term recovery plans for these stocks. These proposals include multi-annual recovery plans for northern hake and for cod in the North Sea, to the west of Scotland, in the Kattegat and in the Irish Sea.

The proposed recovery plans aim to increase spawning stock biomass, SSB, to above the adopted biological reference point,  $B_{pa}$ , of each stock. The necessary tools proposed to achieve recovery are TACs set to ensure a high probability that SSB will increase annually by 30% for the cod stocks and 15% for the hake stocks. Within the recovery period there is a proposed maximum annual variation of TACs of no more than 50% from year to year. The tolerance for year-to-year changes in TACs is symmetric, and has higher priority than ensuring the target increase in SSB if the two rules are in conflict. The rule with highest priority is that fishing mortality should not be permitted to exceed  $F_{pa}$  in any year. To achieve the necessary decreases in fishing mortality, fishing effort limitations are also an

integral part of the proposal in addition to measures to temporarily close fishing areas and to increase monitoring and control of fishing vessels.

For North Sea cod, a joint EU-Norway Working Group was established to evaluate the likely effects of the multi-annual plans as proposed in the European Commission proposal. In addition, the EU STECF has reported on the likely development of SSB, fishing mortality and yield for northern hake and the other cod stocks for which recovery plans were advised, and commented on the robustness of the proposed rules. The results of simulation modelling within these groups, incorporating uncertainty in recruitment and bias in the estimation of population numbers, were available to ICES.

The starting point for simulations were the 2000 stock data as provided by ICES Working Groups, from the assessment working group meetings convened during 2001. Two categories of scenarios were conducted: simulations constrained by annual biomass increases and simulations constrained by defined fishing mortality rates. Within those two categories, a number of simulations were run with annual catch deviations ranging from zero to  $\pm 50\%$ . The definition of recovery was considered to be two successive years with a probability greater than 50% that the SSB exceeded  $B_{pa}$ . An overview of scenarios is given in the text table below:

Biomass or F Control	Biomass or F constraint Cod	Biomass or F constraint Hake	Catch constraint	Scenario name
B	+ 30%	+ 15%	$\pm 50\%$	Sc01_base
B	+ 45%	+ 20%	$\pm 50\%$	Sc02
B	+ 15%	+ 10%	$\pm 50\%$	Sc03
F	$0.8 \times F_{pa}$	$0.8 \times F_{pa}$	$\pm 50\%$	Sc04
F	$0.6 \times F_{pa}$	$0.6 \times F_{pa}$	$\pm 50\%$	Sc05
F	$1.0 \times F_{pa}$	$1.0 \times F_{pa}$	$\pm 50\%$	Sc06
B	+ 30%	+ 15%	$\pm 20\%$	Sc07
B	+ 45%	+ 20%	$\pm 20\%$	Sc08
B	+ 15%	+ 10%	$\pm 20\%$	Sc09
F	$0.8 \times F_{pa}$	$0.8 \times F_{pa}$	$\pm 20\%$	Sc10
F	$0.6 \times F_{pa}$	$0.6 \times F_{pa}$	$\pm 20\%$	Sc11
F	$1.0 \times F_{pa}$	$1.0 \times F_{pa}$	$\pm 20\%$	Sc12
B	+ 30%	+ 15%	none	Sc13
B	+ 45%	+ 20%	none	Sc14
B	+ 15%	+ 10%	none	Sc15
F	$0.8 \times F_{pa}$	$0.8 \times F_{pa}$	none	Sc16
F	$0.6 \times F_{pa}$	$0.6 \times F_{pa}$	none	Sc17
F	$1.0 \times F_{pa}$	$1.0 \times F_{pa}$	none	Sc18

The evaluation of the simulations by an STECF sub-group (SGRST) can be summarised as follows:

- The simulations implied a high probability of recovery within 6-9 years for all stocks except for Irish Sea cod. These results were specific to stock specific scenarios. However, it was emphasised that the time frames given in the sub-group report should not be taken as absolute, that the periods were relative and to

be used in comparison of scenarios only, and that the simulations assume that fishing mortality is controlled effectively.

- All scenarios were associated with dramatic decreases in yield and F in the first year of the recovery plan.
- The positive slope of the relationship between yield and recovery time do not allow easy choice of "best" scenario taking into account socio-economic consid-



erations, i.e. the choice requires other objectives.

- At current stock sizes, constraining  $F$  to  $F_{pa}$  is not effective for rebuilding, requiring the longest recovery time.
- During the recovery phase, sustained reduction of  $F < F_{pa}$  is required to ensure a high probability of stock recovery.

The SGRST evaluation was considered by STECF, which concluded that:

- The simulation model platform was not optimal with regard to evaluation of economic impacts, because economic analyses were impeded by the single species modelling approach
- Some consequences for harvesting that result from the harvest rules or rebuilding constraints were considered unattainable (e.g. sharp reduction in fishing mortality and in catches in 2003, and realising very low fishing mortalities by the end of the period), and some biological assumptions (no long term trends in recruitment, no change in mean weight-at-age between years) were considered implausible.

For each stock, STECF had the following comments:

*Northern hake*: Most scenarios have a high probability to achieve recovery within the a 10 year period. STECF noted that the  $B_{pa}$  and  $F_{pa}$  bases for the simulations were poorly determined and the reference points should be revised. The various catch constraints had no effect on recovery time and on annual change in SSB.



*North Sea cod*: Fishing at 80% of  $F_{pa}$  or higher produced no stock recovery within an 8 year period. A biomass target of 15% annual increase in SSB is not sufficient for recovery of this stock.

*Cod in Kattegat*: Scenarios associated with fishing at  $F_{pa}$  did not result in a high probability of recovery; this was attained when fishing at the lower  $F$ s examined. All the biomass controlled scenarios resulted in a high probability of recovery.

*Irish Sea cod*: Only 7 of 18 scenarios indicated more than 90% probability of recovery of this stock within 6-7 years. Recovery within the period could be achieved both by  $F$  and SSB constraints. To achieve recovery within 9 years annual catches would have to be limited to below 4700 t.

*West of Scotland cod*: None of the 18 scenarios indicate recovery within five years. Recovery within 10 years could be achieved both by SSB and  $F$  controlled management. To achieve a recovery of more than 90% probability within a 10-year period, catches would have to be limited to below 5600 t.

An evaluation by ACFM of the current status of all stocks for which emergency measures have been applied, i.e. cod in the Kattegat, cod in the North Sea, Skagerrak and Eastern Channel, cod to the West of Scotland, cod in the Irish Sea and hake in the Northern area, as given in 2002 ACFM report, revealed that none of the stocks currently fulfilled the condition  $SSB > B_{pa}$ . An examination of recent fishing mortality rates compared to those of recent previous years, did not show any sign of decrease in  $F$ -at-age. Should any recovery plan be implemented, then the evaluation of stock status with regard to the details of the plan should be undertaken following implementation.

ACFM further noted that implementation error due to a lack of reliable information on catches (e.g. discards) and to systematic overestimation of spawning biomass (retrospective error) appeared to be substantial. These sources of uncertainty alone can severely compromise achieving the objectives of recovery plans, including the rapid rebuilding of SSB towards  $B_{lim}$  or  $B_{pa}$ . In conclusion, ACFM did not accept the likely time frames to recovery indicated from the results of the stochastic simulations undertaken to evaluate harvest strategies, and also expressed doubt over the assumption of 100% implementation efficiency implied by the simulations.

At its 15th meeting in November 2002 STECF comprehensively reviewed the evaluation undertaken by ACFM. STECF considered that the evaluation of recovery programmes would be improved by incorporating the most recent available information on stock status and assessment bias (particularly results of retrospective analyses) in every case. STECF considered that the appropriate change in risk arising from lack of knowledge both in respect of discarding and mis-reporting is readily incorporated in the model projections.

In conclusion, STECF considered that predictive models are a useful tool in planning and evaluating recovery strategies and that their application throughout a recovery period is necessary to continually monitor and refine the chosen recovery strategy. STECF echoed comments made by ACFM in respect of the potential for success in any recovery scenario. Success will depend, fundamentally, upon the ability of managers to monitor catches and discards, to adhere to the catch limit and effort reduction schemes, and to achieve reductions in fishing mortality despite assessment uncertainties.

### ***Impact of new technical measures***

Two analyses of mesh changes were presented, one for cod, haddock and whiting in the North Sea, and one for Northern hake.

North Sea demersal fisheries have been subjected to a number of EC and national regulations designed to modify the selectivity of fishing gears. No complete evaluation of their likely impacts has yet been undertaken, but an overview of their potential effects is available based upon a number of simplifying assumptions. This overview considers measures outlined in EC regulations 850/98 and

2056/2001, and UK measures SSI 227/2000, SSI 250/2001 and SI 649/2001. Results are expressed as the percentage deviation from baseline simulations that assume no selectivity changes occur. The results are considered to be indicative under single-species assumptions of the likely impacts assuming full and effective implementa-

tion of the measures subject to the constraint that all fleets catching cod are subject to the full impact of the measures. For 2002, it is assumed that all UK vessels adopt the 110mm mesh size derogation of 2056/2001 and 20% of non-UK fleets adopt it. For 2003, no such derogation is assumed to apply.

The results in terms of estimated percentage change in landings, discards and SSB are summarised in the tables below

#### **Cod:**

Year	Landings for human consumption	Discards	Industrial bycatch	Spawning stock biomass
2002	<-1%	-	-	
2003	<-1%	-	-	<1%
Long Term	7%	-	-	5%

The absence of information on discards in the cod assessment and forecasts mean that the effect of increased selectivity at the youngest ages is not accounted for in the above table.

#### **Haddock:**

Year	Landings for human consumption	Discards	Industrial bycatch	Spawning stock biomass
2002	-11%	-64%	10%	
2003	9%	-70%	29%	28%
Long Term	120%	-77%	113%	160%

#### **Whiting:**

Year	Landings for human consumption	Discards	Industrial bycatch	Spawning stock biomass
2002	-66%	-88%	6%	
2003	-72%	-93%	16%	13%
Long Term	-42%	-91%	26%	57%

The results are based on single species forecasts in which biological interactions, *ie.*, predation, are excluded.

#### **Northern Hake:**

Very simple simulations have been carried out regarding Northern Hake, using modified selection patterns for the predicted period. A partial improvement of the selection pattern is assumed in the intermediate year (no catch at age 0-1), and further improvement is assumed from 2003 onwards (preventing from any catch at age 0-2, *i.e.* less than 30cm). It is recognised that this improvement remains theoretical and has not been documented in the fishery.

The main results are:

- Because hake is a late maturing fish (23 % age 3 are mature, 60% age 4, 90% age 5 and 100% at age 6 and above), any improvement in the selection pattern preventing the capture of younger fish (ages 0-2, ~ less than 30 cm) will only result in SSB increases in the medium term.

- An improvement in the selection pattern alone is unlikely to be effective enough to rebuild SSB. At *status quo* F and with no catch at ages 0-1 in 2002 and no catch at ages 0-2 in 2003 onwards, the SSB is expected to be 18% higher in 2007 than with the current selection pattern.
- An improvement of the selection pattern would increase the probability that a reduction in F will allow a rebuilding in SSB.

#### **Overall**

ICES ACFM notes that the theoretical gains in spawning biomass depicted in these studies may not, in effect, be realised, as mesh size measures are not always as effective as expected in their implementation, often because adjustments in fishing practices may undermine their effect.

## Mixed Fisheries

ACFM bases its advice for TACs for the different species on catch forecasts whose calculation does not take into account the mixed nature of the fisheries. In reality most fishing fleets catch other species than the target species or exploit more than one species. As a consequence, if a fleet exerts a particular fishing effort while exploiting a target species for which its quota has not yet been used up, it will have to discard catches of other species whose quota have been used up.

Such interactions are particularly important if alternatives are to be considered to the latest ICES advice for closure of fisheries catching cod in the North Sea, Irish Sea and waters to the West of Scotland. In considering fisheries interactions, STECF has concluded that, in the North Sea:

- There are no demersal fisheries which do not catch some cod,
- Managing all other demersal species according to the single species advice will not achieve a substantial reduction in F for cod, and,
- An effective reduction on fishing mortality on cod will also require a substantial cut in F of the other demersal species, and for many species a reduced TAC.

There is therefore a critical need to provide catch forecasts corresponding to ACFM advice that quantitatively take into account the mixed nature of fisheries, and are consistent with the precautionary approach. This task was considered by a Subgroup of STECF in October 2002. The STECF Subgroup attempted to calculate Mixed Species Catch Forecasts, as opposed to conventional Single Species Catch Forecasts, that take these interactions into account. Software was developed for this purpose.

The Software calculates the total annual catch of a particular species as the sum of the catches of this species by each fleet, using the conventional catch equation for each fleet. Through this equation the catch of a particular species can be forecasted given a particular desired overall fishing mortality (F) and an estimated stock size. The partial F for each fleet is described as the (historical) *status quo* partial F for that fleet multiplied by an adjustment factor. This factor is fleet specific (the Fleet Factor). Looking at one species only, many different combinations of values of the Fleet Factors will lead to the desired overall F for that species.

The Software, however, implements the constraint that the change in partial fishing mortality of each fleet can be set according to certain Rules, reflecting certain ecosystem or socio-economic considerations. The Subgroup used three different Rules. According to the first Rule reduction in partial F by a particular fleet required to meet the conservation needs of the species (i.e. reduction in overall F) is the same for all fleets. The second Rule states that the reduction in partial F by a particular fleet should be in proportion to the ratio of the catch in weight of that species to the total catch in weight of all commercial species by that

fleet. The third Rule states that the required adjustment in partial F of a fleet should be in proportion to the ratio of the catch in weight by that fleet to the total catch in weight of that species by all fleets. In case an increase in overall F is advised, adjustment in partial F is the same for all fleets (cf. Rule 1). The choice of any of these Rules results in a unique solution of the equation that calculates the Catch Forecast (i.e. the Single Species Catch Forecast).

However, this only applies where management decisions in a mixed fleet fishery are driven by the conservation needs of a single species. Multi-criterion forecasting can only be developed if an appropriate weight is assigned to each of the conservation criteria. Species specific Decision Weights can be implemented, representing the importance of the conservation criteria for each of the species. Choice of the Decision Weights is a policy decision, but could be developed in a standardised way, as for example in proportion to the difference between the latest assessed stock size and the precautionary stock size ( $B_{pa}$ ). Alternatively, the Decision Weight could be chosen to be equal to 1 for the species most at risk and equal to 0 for all other species. Having determined such, Decision Weights can then allow for multi-criterion Catch Forecast calculation (i.e. the Mixed Species Catch Forecast).

Summarising, the Software needs as input the Decision Weights and the required adjustment factor of overall *status quo* F for each species (e.g. as advised by ICES). In addition, one of the three Rules has to be set that determines the relative change in partial fleet F for each species. The Software can then proceed to calculate individual Single Species Catch Forecasts for each species, as well as the species-specific fleet factors by which the partial status quo F of each fleet has to be multiplied. Finally, these species-specific fleet factors are averaged across species to one Fleet Factor per fleet. These averages are weighted according to the chosen Decision Weights. However, in case Rule 1 or Rule 3 (see above) is applied, the Decision Weights are adjusted for each fleet such that they are proportional to the ratio of the catch in weight of that species to the total catch in weight of all species by that fleet. The average Fleet Factors are then used to recalculate individual Catch Forecasts, which are now Mixed Species Catch Forecasts.

In reviewing the work of its Subgroup, STECF noted that limited time and data availability appeared to have constrained the approach taken. STECF highlighted several issues for future development of advice in multi-species fisheries:

- There is an urgent need to include catches of fleets that target *Nephrops* in the analysis.
- Evaluation of mixed fisheries advice through landings may seriously distort the impact of some fisheries.
- Failure to include discards (or bycatch) in the analysis will bias the results if discarding is at high levels.
- Selection patterns and species composition will need to be re-evaluated once mixed fisheries management is implemented.

- Fleet segmentation should be defined at an appropriate level such that each métier:  
Represents an homogeneous group of vessels with similar gears and fishing patterns,  
Has sufficient data to describe the total catch of the métier, and,  
Comprises a distinct group of vessels that can be allocated a quota.

STECF could therefore only consider the Subgroup analyses as a useful first step in providing mixed fisheries options for management and a basis for moving forward with the provision of mixed fishery options and advice for the future.

Despite these limitations STECF published (at the European Commission's request) a specific selected example of mixed fisheries model input and output in the report of

its 15<sup>th</sup> meeting (November 2002). The example was calculated from an incomplete dataset from the North Sea and STECF was not able to validate the suitability of the input data, the numerical veracity of the output or endorse the choice of the example as an appropriate management option. STECF considered that analyses appropriate to the West of Scotland, Irish Sea and Southern Shelf should be conducted before the results of a mixed fisheries management model were applied to these areas.

A newly established ICES Study Group will pursue the development of mixed fishery-based forecasts in early 2003. This Study Group will review approaches to the operational definition of fishery based on individual voyage data within various groups, define fishery-based data requirements for multi-fishery, mixed-species forecasts, and agree on data formats for the compilation of national datasets into international fishery-based datasets.

In October 2002 ACFM provided the following tables to describe the strength of mixed fisheries interactions in the Irish Sea and West of Scotland:

<b>Stock Irish Sea</b>	Recommended 2003 TAC (< '000 t)	Corresponding to F reduction <i>F status quo</i>	Cod	Haddock	Whiting	Plaice	Sole	<i>Nephrops</i>
Cod	0	Lowest possible						
Haddock	2,400	0.6	Strong?					
Whiting	0	Lowest possible	Strong?	Strong?				
Plaice	1,900	1.0	Weak?	Weak?	Weak?			
Sole	1,010	1.05	Weak?	Weak?	Weak?	Strong		
<i>Nephrops</i>	9,550	1.0	Weak?	Strong?	Strong	Weak?	Weak?	

<b>Stock West Scotland</b>	Recommended 2003 TAC (< '000 t)	Corresponding to F reduction <i>F status quo</i>	Cod	Haddock	Whiting	Anglerfish	Megrim	<i>Nephrops</i>
Cod	0	Lowest possible						
Haddock	15,800	0.8	Strong?					
Whiting	1,100	0.2	Strong?	Strong?				
Anglerfish	7,000 (IV+VI)	0.35	Weak?	Weak?	Weak?			
Megrim	4,360 (TAC <sub>2002</sub> )	no assessment	Weak?	Weak?	Weak?	Strong		
<i>Nephrops</i>			Weak?	??	Strong	Weak?	Weak?	



# North Sea Herring

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

No ACFM information has been included for this stock

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



Marine Fisheries Services Division

## MFSD – ADVICE

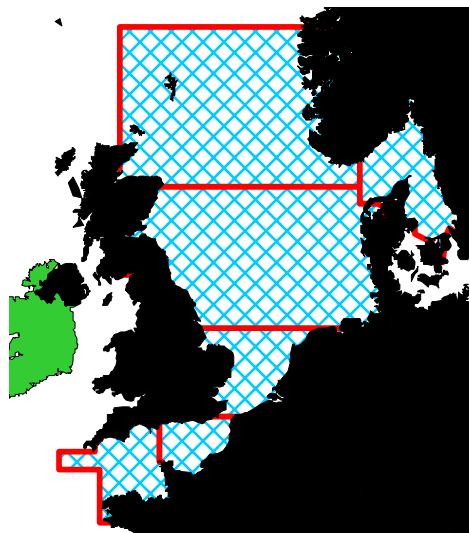
MFSD agrees with the ICES and STECF advice that catches in 2003 should be within the constraints on fishing mortality agreed by EU and Norway, i.e.  $F_{2-6}$  should be less than 0.25 and  $F_{0-1}$  should be less than 0.12. ICES present several options on how this can be achieved. The fisheries on herring in Division IIIa should be managed in accordance with the management advice given on spring-spawning herring. ICES also advise that the analyses of survey data suggest that the catches in 2003 in Divisions IVc and VIIId (Downs herring) should not exceed the TAC for 2002 which is 42,000 t.

## STATE OF THE STOCK

- This stock is now considered to be within safe biological limits.
- The total landings in 2001 were 323,000 t and were very similar to those from 1998 to 2000. In recent years the landings have been about half those of the preceding five years.
- In 2001 the fishing mortality on juveniles has remained below 0.1 for a number of years. Fishing mortality on the adults has been reduced to below 0.24 which is the lowest value for a long time and is below the  $F_{pa}=0.25$ .
- Both the 1998 year class and the 2000 year class appear to be very strong in all surveys.
- The SSB in 2001 was estimated to be around 1.4 million t and is expected to increase further in 2002 to over 1.7 million tonnes. The proposed  $B_{pa}=1.3$  million tonnes. The SSB collapsed in the sixties and remained very low during the next twenty years. The stock size in the 1950s and 1960s was in excess of 2 million tonnes.

## CURRENT MANAGEMENT

- The TAC is shared between EU and Norway and divided between a number of different fleets operating in the North Sea, the English Channel and Division IIIa. The assessment covers the TAC areas. There is a separate allocation by EU of 42,000 t in operation for Divisions IVc and VIIId (Southern North Sea and



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

English Channel).

- There is an international agreement between EU and Norway for this stock that states that efforts will be made to maintain the SSB above  $B_{lim}$  (800,000 t) and that the SSB should be rebuilt to above 1.3 million tonnes. The agreement puts in place a strategy by which the fishery should be managed at various stock sizes. If the SSB falls below 1.3 million tonnes (as it is at present) other management measures will be agreed and implemented, taking into account the scientific advice. This is considered by ICES to be consistent with the precautionary approach.
- Ireland does not take part in this fishery and has no quota.
- The agreed TAC for the fishery for 2002 is 307,673 t (including landings from the industrial fisheries and some landings taken under TACs from other ICES areas). The EU share of the TAC is 189,000 t.

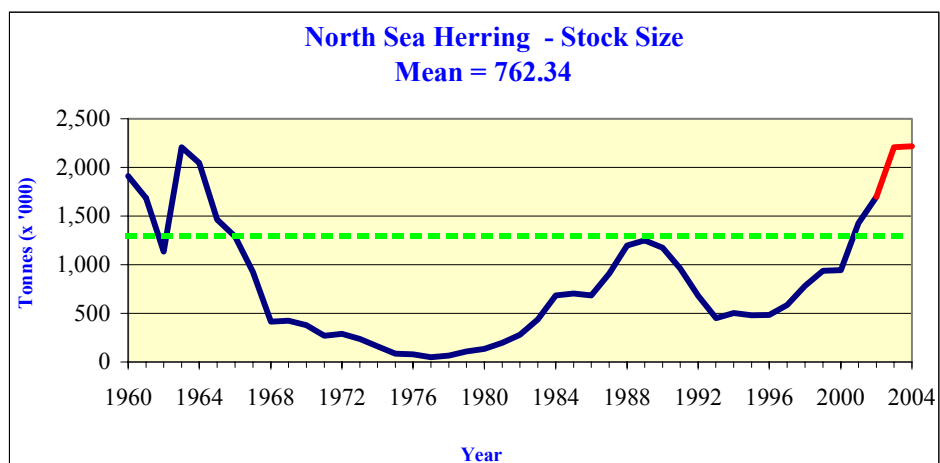
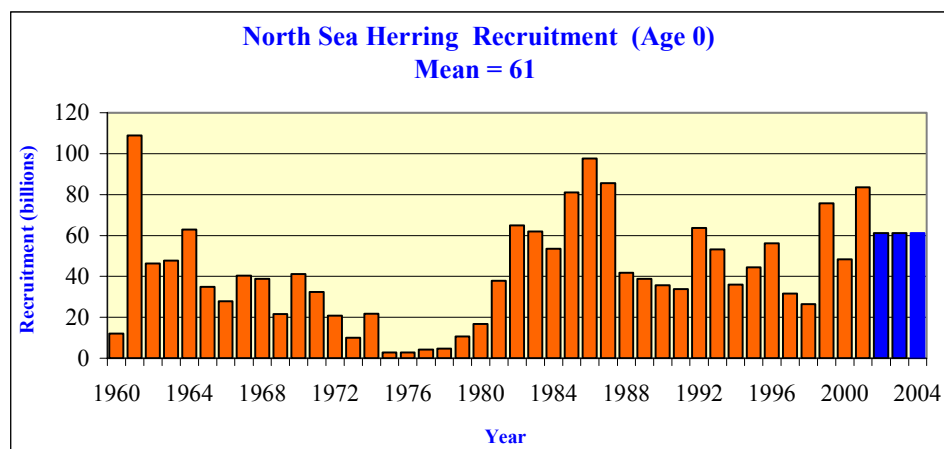
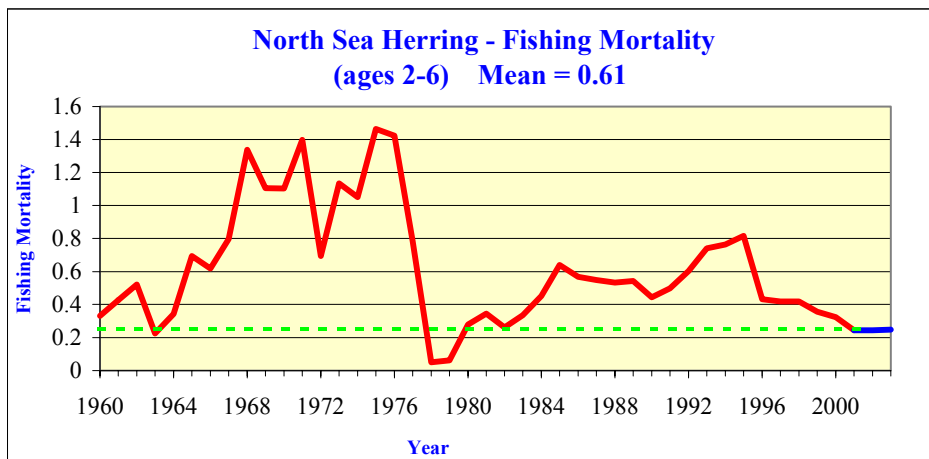
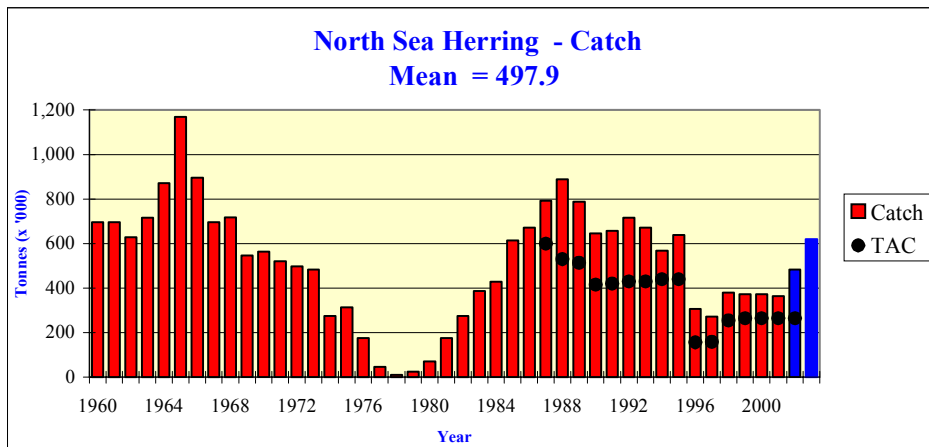
## MFSD – ECONOMIC COMMENTS

- There is no Irish quota in this fishery. However the catches that are taken from this fishery have an important effect on the state of the market for herring landed in Ireland.
- A high stock in the North Sea and a high TAC will have an adverse effect on the market for Irish herring. This is already the situation in 2002.
- The TAC for adult herring for human consumption is likely to increase significantly beyond the current level of 265,000 t.

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## **ADDITIONAL INFORMATION**

1. Recent assessments have been over optimistic and as a result TACs have been too high and delayed the rebuilding of the stock.
2. The total catch taken from this fishery, including the industrial by-catch, in 2001 was about 323,000 t.
3. The catches are mainly taken by Denmark, Norway, Netherlands, and United Kingdom.
4. Misreporting continues to be a major problem in the fishery, resulting in overshooting of the TAC. This is particularly evident for the fishery in Div. IVc and VIId.
5. The international management measures agreed between EU and Norway for this stock continue to operate. Despite the management measures the stock was rebuilding at a slow rate prior to 2000. However the recovery has accelerated in 2001 and 2002 because of good recruitment and reduced catches.
6. The management of the fishery is difficult because it must take into consideration catches taken by the many different international fleets that fish for human consumption and the large industrial fisheries mainly conducted by Denmark.
7. Although Ireland has no quota in this fishery the landings of herring for human consumption by other countries have a major effect on the Irish market. A low TAC for herring in the North Sea would benefit the Irish herring market.. At present Irish processors find it difficult to compete with their European counterparts if large quantities of herring are landed from the fisheries in the North Sea.



# West of Scotland Herring

(Division VIa (North))

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD agrees with the ICES and STECF advice for this fishery that the fishing mortality in 2003 should be maintained *at status quo* ( $F=0.20$ ), corresponding to catches in 2003 of less than 30,000 t. If the TAC in 2003 should be set at 30,000 t the equivalent Irish quota would be 4,457 t compared with a quota of 5,393 t for 2002.

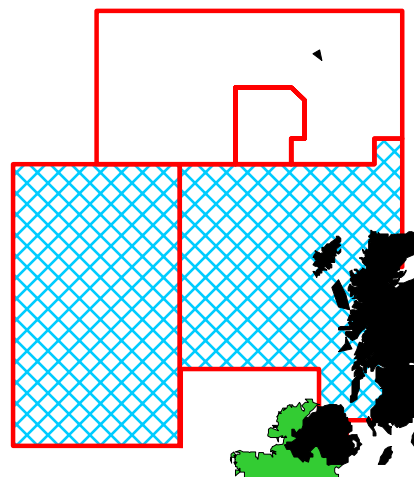
MFSD also advise that it is important that the Irish fleet should avail of the quota in this area. Catches taken in this area which are in fact taken in adjoining area VIa S will have a negative effect on the rebuilding of the stock in VIa S and VIb.

## STATE OF THE STOCK

- There are no concerns for this stock. An assessment was carried out in 2002 using improved data and is considered to reflect the current state of the stock. Reference points have not yet been adopted
- Catches have been stable at around 24,000 t and have been consistently below the agreed TACs for the fishery.
- Fishing mortality is considered to have been low in recent years and the stock is lightly exploited. The current  $F$  is about 0.2.
- Recruitment of the 1998 year class appears to have been very strong.
- The assessment and results from the Scottish acoustic surveys suggest that the stock has increased significantly in recent years because of good recruitment and continuing low fishing mortality. The SSB is around 139,100 t in 2002.
- No reference points have been agreed and predictions indicate that the stock will continue to increase at the present fishing mortality.

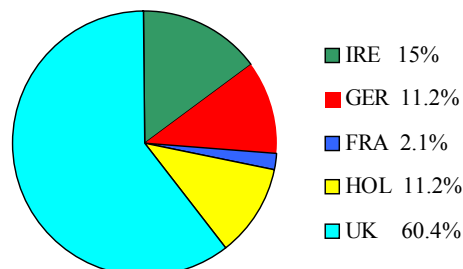
## CURRENT MANAGEMENT

- The assessment is carried out over Division VIa North and VIb while the TAC is set for Divisions Vb, VIa North, and VIb. Very little catches are taken in any area other than Div. VIa North.



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

- The agreed TACs continue to be above the actual catches taken from the stock and have no effect as a conservation measure.
- The overall TAC is set by NEAFC and in 2002 was 36,360 t. The EU share of the total TAC is 35,700 t while the Irish share of the EU quota is 5,393 t.



- There is no management plan or management objective in this fishery.

## MFSD – ECONOMIC COMMENTS

- The Irish catch in 2001 was about 4,300 t which was worth over €1 million.
- Ireland has a very valuable quota in this fishery that has not been fully utilised. The potential value of the 2003 quota is approximately €800,000.
- Although the present prices for herring is very low it is important that Ireland continues to maximize the economic value of this fishery.

## ADDITIONAL INFORMATION

1. The assessment of this stock has improved in recent years and is now a lot less uncertain than previously and can be used as the basis for management advice.



Catch statistics have improved due to increased monitoring and satellite vessel surveillance. The total reported landing in 2001 was nearly 35,000 t but approximately 10,400 t were believed to have been misreported from other areas.

2. The actual landing in 2001 was believed to be around 25,000 t while the reported Irish landing was around 4,300 t
3. The TACs for this stock in recent years have not been restrictive because they have been set on the basis of average official catches that are far higher than actual catches. They are therefore worthless as a conservation measure. ICES have therefore stressed that the TAC for the stock should be based on the actual catches. A TAC, based on the real landings in recent years, would have little adverse effect on the fishery.
4. Catches are reported as having been taken from this area but are in fact taken from the adjoining areas Div. IVa (North Sea) and Div. VIa South (North-west of Ireland).
5. The major landings are taken by the U.K (Scotland) purse seine and midwater trawl fleets. Landings are also reported by Ireland, Netherlands and Germany.
6. In recent years a small number of Scottish and Northern Irish vessels have landed herring from this stock into Derry in August and September. These herring are valuable because they are high quality and have been purchased by processors in Donegal and Dublin.
7. Because of the present depressed state of the herring market catches taken by the Scottish fleets in the July to September period may influence the markets for Irish herring, particularly in the later parts of the year.
8. The state of this stock is important as far as Ireland is concerned because of the possible link between it and the stock in Division VIa South. In both areas there is evidence that the spawning components of the stock may be changing, possibly as a result of environmental changes.
9. MFSD obtains samples from this fishery from catches landed into Derry by Scottish vessels and this data is submitted to the ICES Herring Assessment Working Group. Irish sampling for this stock is supported through the EU funded sampling programme which is required under the Data Collection Regulation 1543/2000 and 1639/2001.

10. The age distribution of the Irish samples from this fishery was dominated by herring in their third years (i.e. the 1998 year class. This year class appears to be the strongest to enter the fishery for a number of years.
11. The length distribution of the Irish samples was dominated by small to medium size fish between 23cm - 26cm fish.

## ICES ADVICE

### 3.7.8.a

#### State of stock/exploitation:

The fishing mortality is at present considered to be low. SSB is believed to have risen recently due to a good year class that entered the fishery in 2001 and an increase in the proportion mature.

#### Management objectives:

There are no explicit management objectives for this stock.

#### Precautionary Approach reference points:

None adopted. Candidate reference points are under investigation.

#### Advice on management:

**ICES recommends that the fishing mortality be maintained at status quo ( $=0.20$ ) corresponding to catches in 2003 of less than 30 000 t.**

#### Relevant factors to be considered in management:

In recent years TACs have not been restrictive, presumably because of low effort and a weak market. There has been substantial misreporting of catches into this area from the North Sea and Division VIa(S).

#### Comparison with previous assessment and advice:

The perception of stock status and management advice has not changed.

#### Catch forecast for 2003:

Basis:  $F(2002) = F_{sq} = F(99-01)$ , scaled = 0.197, Landings(2002) = 28, SSB(2002) = 139 .

Basis	F(2003)	SSB(2003)	Landings(2003)	SSB(2004)
$F = F_{2001}$	0.20	143	30	145
$F = F_{2001} * 1.22$	0.24	140	35	137
$F = F_{2001} * 1.42$	0.28	136	40	130
$F = F_{2001} * 1.62$	0.32	133	45	123

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

### Elaboration and special comment:

There are three main fleets operating: 1) the Scottish in-shore paired midwater trawl fleet, that, together with the Northern Irish fleet, operates in the Minches and around the Isle of Barra in the southern part of the area; 2) the Scottish purse-seine fleet, which operates in the northern part of VIa; 3) the offshore (mainly Dutch and German freezer trawlers) fleet, which operates in the deeper waters near the edge of the continental shelf.

Misreporting of the catches has decreased in recent years. Better information of the catches has been obtained and biological sampling of catches has improved over the last 3-4 years. Satellite surveillance data has improved knowledge of vessel behaviour. The assessment in 2002 is less uncertain than in previous years reflecting the stability of the input data over the last two or three years. Estimates of  $F$  are

reasonably reliable and suggest  $F$  is well below candidate  $F_{pa}$ . Estimates of SSB are more uncertain but suggest the stock is well above any candidate  $B_{pa}$ . Analyses in recent years have consistently pointed towards the stock being exploited at a sustainable rate. Data in the Acoustic surveys and the catch, coupled with a high proportion mature of both 2 and 3 ringers, indicate a considerable increase in spawning biomass due to a large recruitment of 2 ring herring into the population. Yield per recruit analysis with geometric mean recruitment suggests that an  $F$  of 0.28 would provide a yield of 35 000 t in the long term.

### Source of information:

Report of the Herring Assessment Working Group for the Area South of 62°N, March 2002 (ICES CM 2002/ACFM:12).

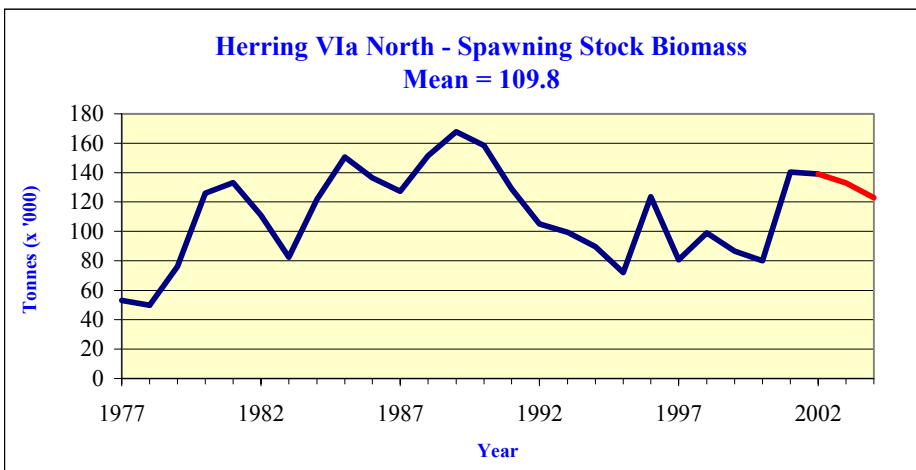
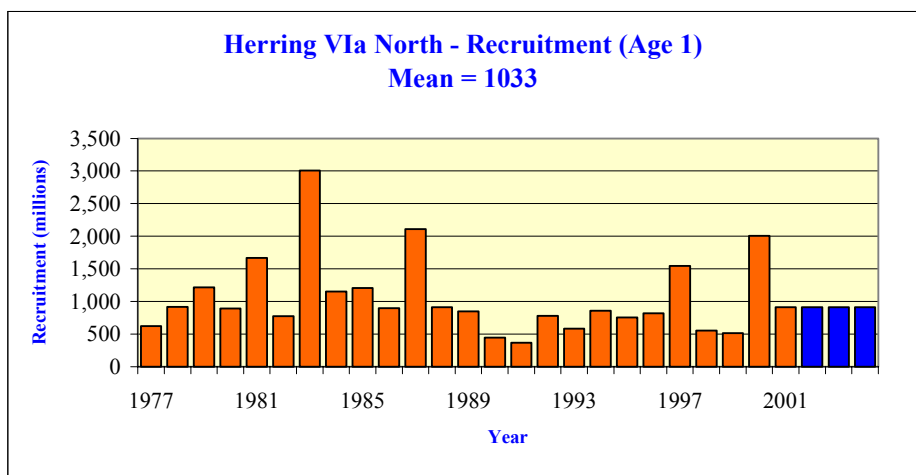
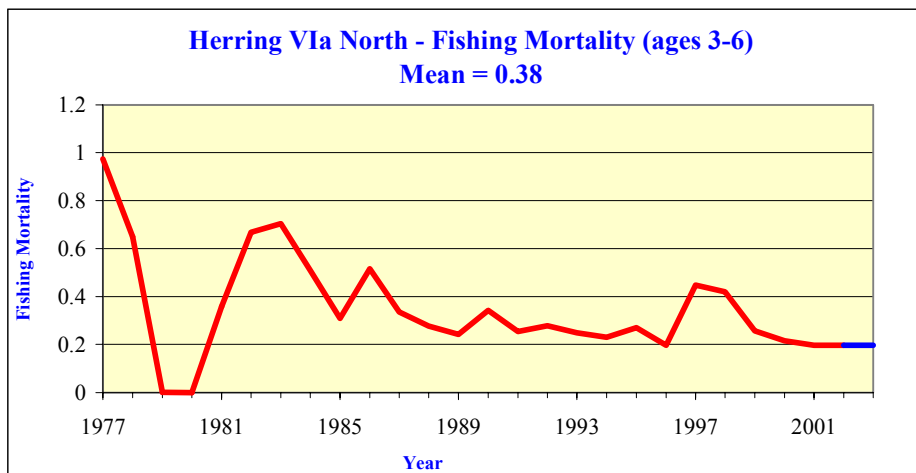
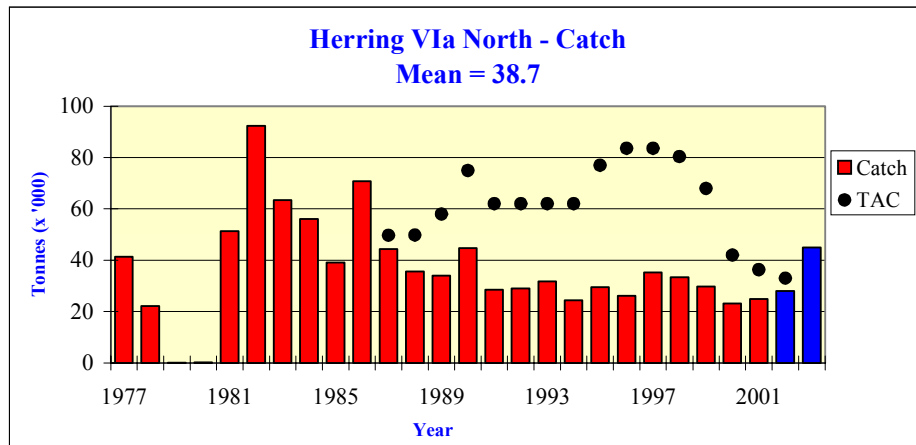
### Yield and spawning biomass per Recruit F-reference points:

	Fish Mort Ages 3-6	Yield/R	SSB/R
Average Current	0.197	0.034	0.165
$F_{max}$	N/A		
$F_{0.1}$	0.167	0.033	0.186
$F_{med}$	N/A		

### Catch data (Tables 3.7.8.a.1-2):

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 <i>status quo F</i>	54-58	62	0.8	32
1994	Catch at <i>status quo F</i>	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 <i>status quo F</i>		83.57	0.1	33 <sup>3</sup>
1998	Catch at <i>status quo F</i>	59	80.37	0.9	33
1999	Average catches, 1991-1996	28	68		30
2000	Average catches, 1991-1996	28	42		23
2001	Average catches, 1991-1999	30	36.36		25
2002	Average catches, 1991-1999	30	33		
2003	$F < 0.28 (<F_{pa})$	<40			

<sup>1</sup> Adjusted for misreporting. <sup>2</sup> Catch at *status quo F*. Weights in '000 t. <sup>3</sup> Revised down from 60 in 1999.



**Table 3.7.8.a.1** Nominal Landings Herring in VIa(N). Catch in tonnes by country, 1981—2001.

These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

	1981	1982	1983	1984	1985	1986	1987
<b>Country</b>							
Denmark	1580			96			
Faroes Islands		74	834	954	104	400	
France	1243	2069	1313		20	18	136
Germany	3029	8453	6283	5564	5937	2188	1711
Ireland						6000	6800
Netherlands	5602	11317	20200	7729	5500	5160	5212
Norway	3850	13018	7336	6669	4690	4799	4300
United Kingdom	31483	38471	31616	37554	28065	25294	26810
Unallocated	4633	18958	-4059	16588	-502	37840	18038
<b>Discards</b>							
Total	51420	92360	63523	75154	43814	81699	63007
Area-Misreported				-19142	-4672	-10935	-18647
<b>WG Estimate</b>	<b>51420</b>	<b>92360</b>	<b>63523</b>	<b>56012</b>	<b>39142</b>	<b>70764</b>	<b>44360</b>
<b>Source (WG)</b>	1983	1984	1985	1986	1987	1988	1989
<b>Country</b>	1988	1989	1990	1991	1992	1993	1994
Denmark							
Faroes Islands			326	482			
France	44	1342	1287	1168	119	818	274
Germany	1860	4290	7096	6450	5640	4693	5087
Ireland	6740	8000	10000	8000	7985	8236	7938
Netherlands	6131	5860	7693	7979	8000	6132	6093
Norway	456		1607	3318	2389	7447	8183
United Kingdom	26894	29874	38253	32628	32730	32602	30676
Unallocated	5229	2123	2397	-10597	-5485	-3753	-4287
<b>Discards</b>		1550	1300	1180	200		700
Total	47354	53039	69959	50608	51578	56175	54664
Area-Misreported	-11763	-19013	-25266	-22079	-22593	-24397	-30234
<b>WG Estimate</b>	<b>35591</b>	<b>34026</b>	<b>44693</b>	<b>28529</b>	<b>28985</b>	<b>31778</b>	<b>24430</b>
<b>Source (WG)</b>	1990	1991	1992	1993	1994	1995	1996
<b>Country</b>	1995	1996	1997	1998	1999	2000	2001
Denmark							
Faroes Islands							
France	3672	2297	3093	1903	463	870	760
Germany	3733	7836	8873	8253	6752	4615	3944
Ireland	3548	9721	1875	11199	7915	4841	4311
Netherlands	7808	9396	9873	8483	7244	4647	4534
Norway	4840	6223	4962	5317	2695		
United Kingdom	42661	46639	44273	42302	36446	22816	21862
Unallocated	-4541	-17753	-8015	-11748	-8155		
<b>Discards</b>			62	90			
Total	61271	64359	64995	65799	61514	37789	35411
Area-Misreported	-32146	-38254	-29766	-32446	-23623	-14626	-10437
<b>WG Estimate</b>	<b>29575</b>	<b>26105</b>	<b>35233*</b>	<b>33353</b>	<b>29736</b>	<b>23163</b>	<b>24974</b>
<b>Source (WG)</b>	1997	1997	1998	1999	2000	2001	2002

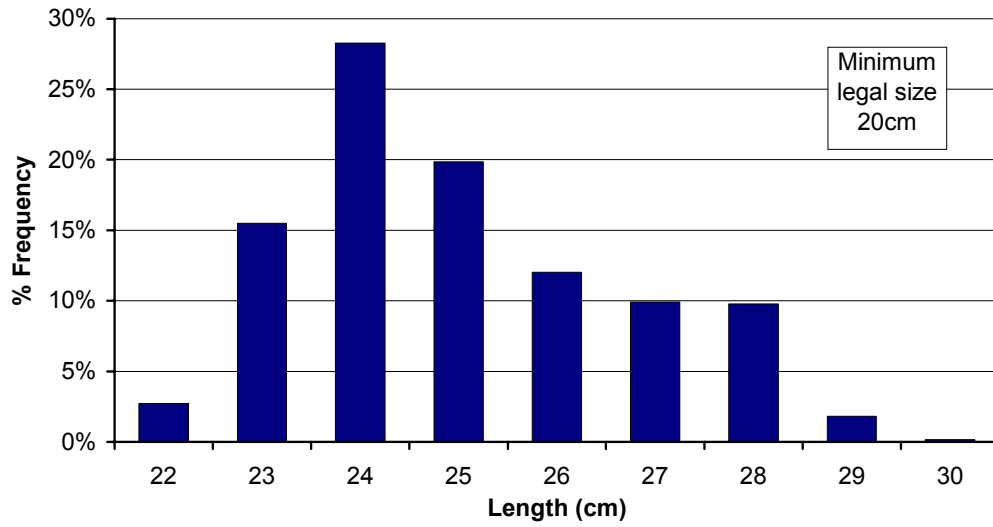
\*WG estimate for 1997 has been revised according to the Bayesian assessment (Working Group Report Section 5.1.3).



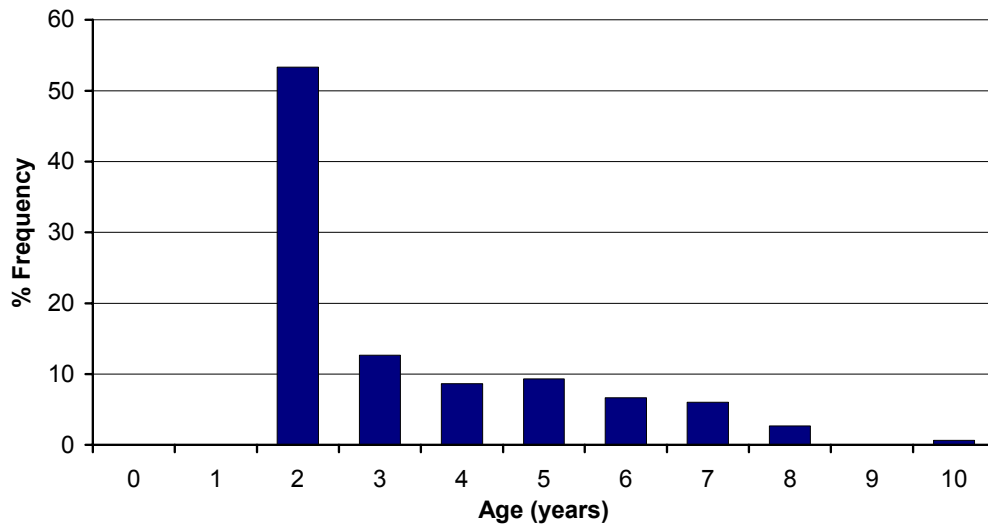
**Table 3.7.8.a.2** Herring in Division VIa (North)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-6
1976	613130	74572	93642	1.0573
1977	625870	53121	41341	0.9738
1978	918160	49875	22156	0.6493
1979	1218170	76139	60	0.0007
1980	891330	126025	306	0.0004
1981	1664130	133253	51420	0.3588
1982	772340	111116	92360	0.6683
1983	3009950	82530	63523	0.7036
1984	1150750	121989	56012	0.5096
1985	1206360	150687	39142	0.3086
1986	896180	136499	70764	0.5163
1987	2107780	127192	44360	0.3361
1988	908810	151468	35591	0.2776
1989	848170	167820	34026	0.2423
1990	444740	158549	44693	0.3423
1991	367420	129053	28529	0.2546
1992	781080	105165	28985	0.2791
1993	583740	99385	31778	0.2482
1994	860420	89704	24430	0.2307
1995	754010	72155	29575	0.2706
1996	817420	123623	26105	0.1977
1997	1546920	80829	35233	0.4478
1998	551720	99078	33353	0.4197
1999	516800	86602	29736	0.2576
2000	2004690	79944	23163	0.2157
2001	76750	140331	24974	0.1972
2002	913633	139181		0.1972
Average	1001869	109848	37232	0.3763

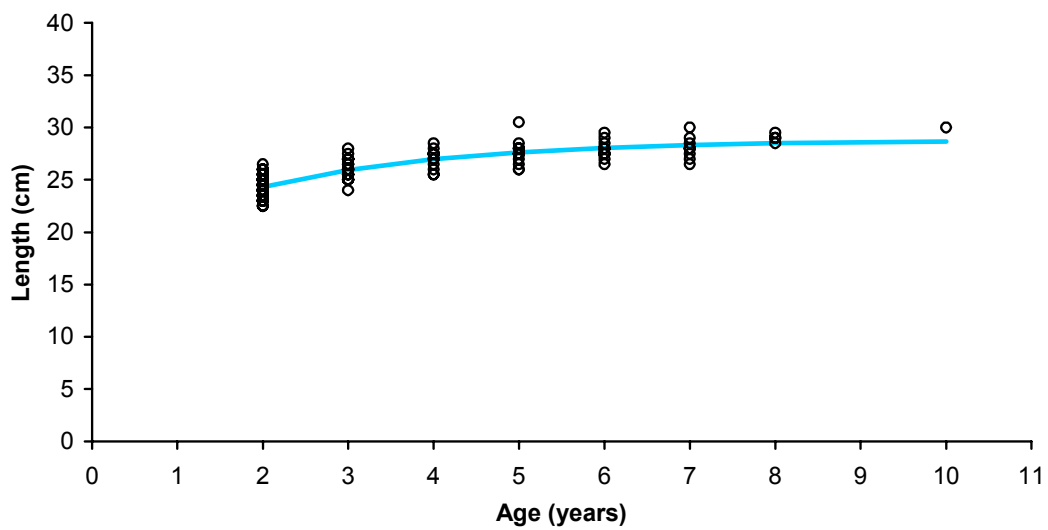
**2001 Length Distribution: Irish Landings, Herring in V1aN**



**2001 Age Distribution: Irish Landings, Herring in V1aN**



**2001 Size at Age: Irish Sampling, Herring in V1aN**



# North West of Ireland Herring

(Divisions VIa South and VIIb,c)

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



Marine Fisheries Services Division

## MFSD – ADVICE

ICES have recommended that the current TAC (14,000 t) should be continued for this stock for 2003. ICES have adopted a very conservative approach for this stock because of the uncertainty of the assessment. The provisional assessment carried out by HAWG and based mainly on MFSD data suggested that the stock may have increased in the past year as a result of the decreased catches. However, because of the uncertainty of the assessment MFSD agree with the ICES and STECF advice as the most appropriate way to manage the stock with regard to the precautionary approach. The Irish quota in 2003 would again be 12,727 t.

MFSD again strongly support the local management committee in their efforts to rebuild this stock and to collect adequate scientific data for accurate stock assessment.

## STATE OF THE STOCK

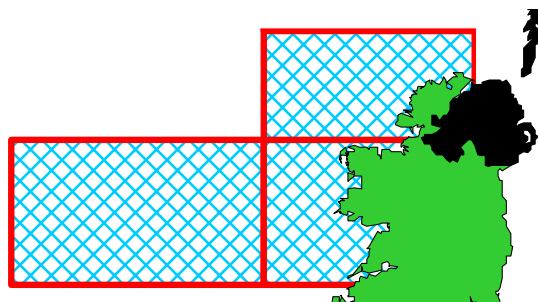
- The state of this stock is uncertain. A provisional assessment, carried out by HAWG in March 2002, was not considered by ICES as sufficiently reliable on which to base management advice.
- The landing in 2001 was 14,000 t. This was slightly lower than in 2000 (15,000 t) and was the lowest recorded from the fishery since 1972.
- The provisional assessment indicated that fishing mortality decreased significantly in 2001 in line with the reduced effort and reduced catch. The value of  $F$  for 2001 is not reliably estimated but may be as low as that in the early part of the time series.  $F_{pa}$  has been set at 0.22.
- There are no methods of estimating recruitment for this stock at present. The 1998 year class appears to be very strong in the adjoining Div. VIa North and this year class also appears to be abundant in the catches from Divs. VIa South and VIIb in 2001. This would suggest that this might be the first strong year class to recruit to the stock for a number of years.
- The SSB declined continually since 1988 when it was estimated to be around 280,000 t. The SSB appeared to remain at a low level in recent years but has now probably started to increase. However the size is not

precisely known but is still probably below the  $B_{pa} = 110,000$  t.

- Because of the uncertainty of the assessment short term predictions were not considered as reliable to use as a basis for the provision of management advice.

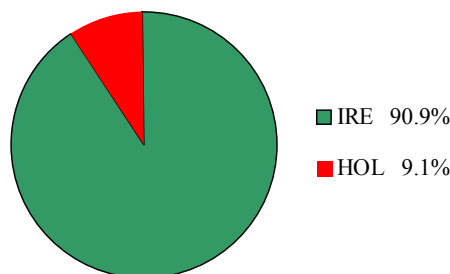
## CURRENT MANAGEMENT

- The assessment area is for Divisions VIa South and VIIb-c, which is the same as the TAC area.



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

- The TAC is set by the EU and for 2002 is 14,000 t. The Irish share in 2002 is 12,727 t (90.9%)
- There are no EU management objectives nor plan for this stock. In 2000 a new Irish Pelagic Management Committee was established for this stock. This committee has a stated aim to rebuild this stock to above the  $B_{pa}$  level of 110,000 t. The time period over which this can be achieved will depend on the annual catches and recruitment. In the longer term it is the policy of the committee to further rebuild the stock to the level at which it can sustain annual catches of around 25,000 t. The committee have also continued the imposition of closed seasons for the fishery. The Irish quota is controlled by a number of catch restrictive measures.



## MFSD – ECONOMIC COMMENTS

- The Irish catch in 2001 was 11,300 t. and the value of the catch was estimated to be about €2.7 million.
- The value of the 2002 quota is €3 million.

- Although the present price for herring has decreased in 2002 this fishery remains extremely important for the pelagic industry along the west and northwest coasts.

## ADDITIONAL INFORMATION

1. The state of this stock is very uncertain and ICES did not accept the assessment carried out by the HAWG in March 2002 as a basis for providing management advice. Recent changes to the management of the fishery are likely to have greatly reduced the impact of misreporting and under-reporting of catches in the area. These changes are adding to the reliability of the catch data and should improve the assessment, which at present is solely based on catch at age data. However a few more years under the current management regime, together with a longer time series of reliable acoustic surveys, will be necessary before it will be possible to produce more accurate estimates of SSB and review the appropriateness of the reference points.
2. The total catch estimated to have been taken from this stock in 2001 was over 14,000 t compared with over 15,000 t in 2000. This catch is the lowest recorded from the fishery since before 1970.
3. Irish landings from this stock have fluctuated very much in recent years and are very dependent on the herring markets and also on the markets in other pelagic fisheries, e.g. mackerel and horse mackerel. The fishery was closed for long periods during 2000 and 2001 and a strict management regime was in place.
4. The main catches (over 85%) are taken by Ireland and are taken by the medium sized refrigerated sea water (RSW) vessels fishing out of Killybegs. Small catches continue to be taken by the Dutch fleet but the fishing effort of this fleet appears to have decreased in recent years.
5. In the past there has been large scale misreporting of catches for this fishery and large catches taken in Div. VIa South were reported as having been taken in adjoining Div. VIa North. This presented considerable difficulties for the accurate assessment of this stock. The problem appears to have diminished in 2000 and 2001 and should diminish further in the future with the advent of the satellite monitoring system.
6. Irish sampling on this stock is supported by the EU funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001.
7. The age distribution of the Irish catches in 2001 was dominated by herring in their third year (the 1998 year class). This year class was also very prevalent in Div. VIa North and may indicate that recruitment in 2001 may be above average. The length distributions were composed mainly of herring between 24 cm and 28 cm. Because of the high abundance of the 1998 year class the overall size of herring in 2001 was smaller than in 2000. Considerable numbers of very large herring appear in the catches from this area during the first quarter of every year.
8. A new series of acoustic surveys was started in 2001

in this area using commercial vessels. The surveys in 2001 and in February 2002 have been carried out by the *M.V Silver King*.

9. The stock in this area appears to have stabilized at a low level for a number of years mainly because of a lack of good recruiting year classes. This is a view consistent with that expressed by fishermen. The decline is particularly evident in Division VIIb where there has almost been a complete absence of herring from the traditional spawning grounds off Galway and the mouth of the R. Shannon.
10. A management plan for the fishery is in operation by the North West Pelagic Management Advisory Committee. The plan aims to involve local fishermen and processors in the assessment and management of the fishery by carrying out. The details of the plan include:
  - Acoustic surveys using commercial vessels in co-operation with the Marine Institute.
  - Installing automatic data loggers on board commercial vessels.
  - Substantial reduction of catches if necessary.
  - Elimination of misreporting misreporting.

## ICES ADVICE

### 3.10.3

#### State of stock/exploitation:

The state of the stock is uncertain. A provisional assessment indicates that SSB decreased from high levels in the late 1980s, to less than 30% of those levels in the mid 1990s, but the current level is unknown. Catches in the last two years have been the lowest observed due to restrictive TACs, and there is a greater proportion of older herring in the 2001 catch.

#### Management objectives:

A local Irish management committee has been established for this stock. One of its aims is to rebuild the stock to above  $B_{pa}$  over a three-year period.

#### Advice on management:

**ICES recommends that the current TACs (14 000 t) should be continued in 2003.**

#### Rebuilding plan:

A management and rebuilding plan for this stock is currently in place. A continuation of this should ensure that catches do not exceed the TAC and that the stock is rebuilt.



### Precautionary Approach reference points (Unchanged since 1999)

ICES considers that:	ICES proposes that:
$B_{lim}$ is 81 000 t	$B_{pa}$ be set at 110 000 t
$F_{lim}$ is 0.33	$F_{pa}$ be set at 0.22

### Technical basis:

$B_{lim}$ : Lowest reliable estimated SSB	$B_{pa}$ : Approximately 1.4 $B_{lim}$
$F_{lim}$ : $F_{loss}$	$F_{pa}$ : = $F_{med}(98)$

### Relevant factors to be considered in management:

Recent changes to the management of the fisheries on this stock are likely to have greatly reduced the impact of mis-reporting and under-reporting of catches in this area. These changes add to the reliability of the catch data and should improve the assessment, which is solely based on catch-at-age data. However a few more years of consistent data under the current management regime will be necessary before it will be possible to produce reliable estimates of SSB and review the appropriateness of the reference points.

The management plan currently in place has led to a closure of this fishery in mid-February 2002, and it will not be re-opened until October 2002.

The high stock levels observed from 1984 to 1992 were the result of two abundant year classes in 1982 and 1986. Apart from these year classes recruitment has been relatively consistent over the time series from 1970 to 2001.

### Catch forecast for 2003:

Given the uncertainty of the assessment no short term forecasts were produced this year.

### Comparison with previous assessment and advice:

The provisional assessment gives a substantial change in perception from last year, suggesting a much greater SSB and lower  $F$ . This inconsistency reflects the instability and imprecision of stock size estimates from the assessments.

### Elaboration and special comments:

In the absence of tuning data the assessment had been carried out by assuming various terminal  $F$  values on the catch at age data. These assessments appear to have poorly estimated  $F$ . Tuning indices are necessary to gain precision in estimates.

Total catches have decreased since 1998 and have been in line with the TAC since 2000. An acoustic survey has been resumed on the stock and commercial vessels have

been equipped with data loggers to obtain information on the distribution of the stocks.

The Irish fishery which constitutes 85% of the catch is operated on a closed season basis and individual boat quota are applied. The Irish fishery was closed in early in February 2002 by the Irish Northwest Pelagic Management Committee (NWPMC), on scientific advice. The Irish NWPMC has stated the following management objectives: *“As regards the herring stock in this area the management policy of the North West Pelagic Management Committee is to rebuild the stock to above the  $B_{pa}$  level of 110,000 t. The time period over which this rebuilding process can be achieved will depend on annual catches and recruitment. In the longer term it is the policy of the committee to further rebuild the stock to the level at which it can sustain annual catches of around 25,000 t. This rebuilding process will be based on scientific advice. In the event of the stock remaining below the required level additional conservation measures will be implemented. It is the policy of the committee to ensure that adequate research is carried out, including sampling and surveys, to enable an accurate assessment of the stock”.*

The fishery exploits a mixture of autumn- and winter/spring-spawning fish, which spawn from October to March. The winter/spring-spawning component is distributed in the northern part of the area. The main decline in the overall stock appears to have taken place on the autumn-spawning component, and this is particularly evident on the traditional spawning grounds in the southern part of the area.

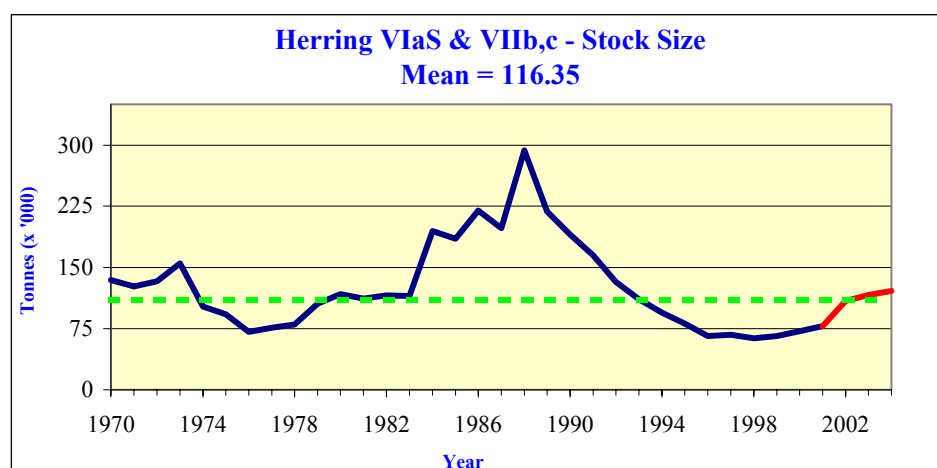
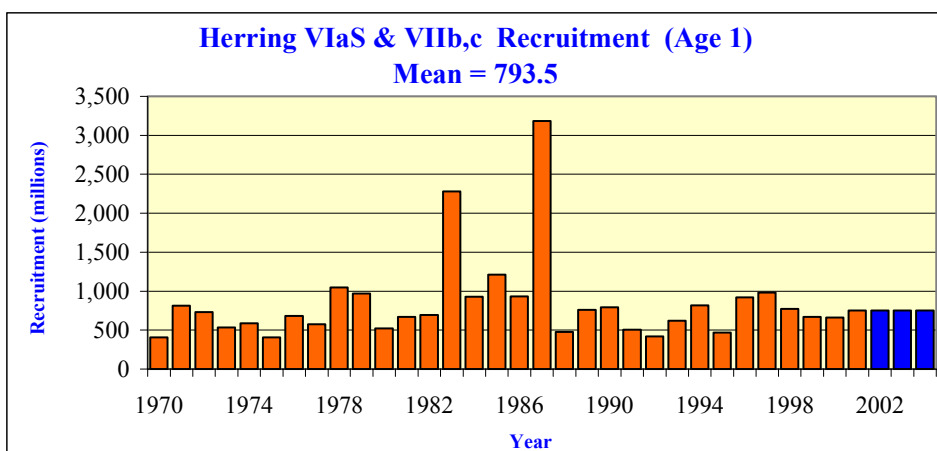
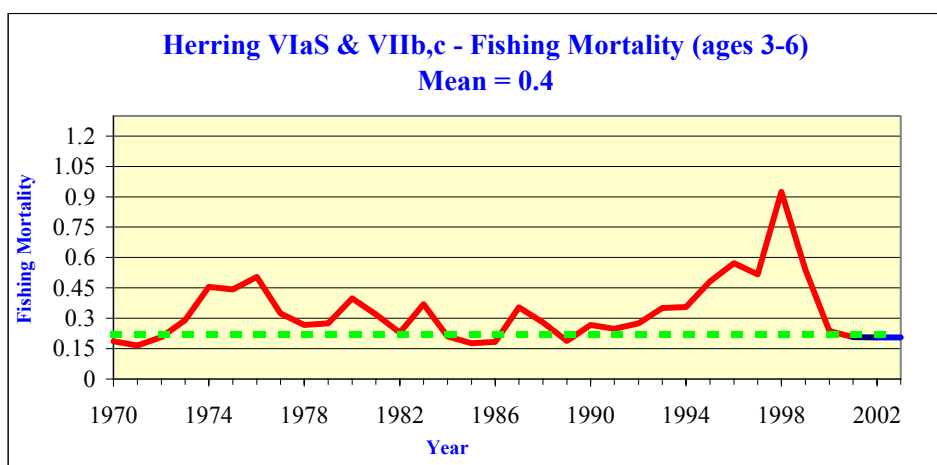
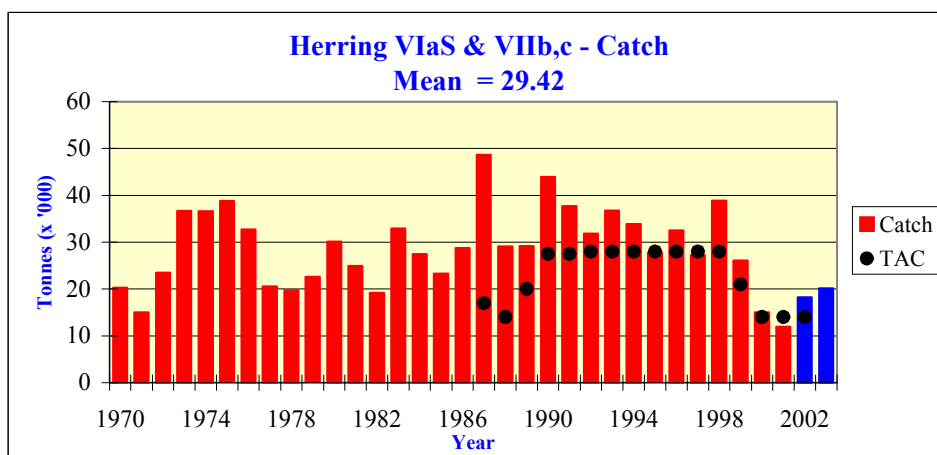
### Source of information:

ACFM Working Document and Report of the Herring Assessment Working Group for the Area South of 62°N, March 2002 (ICES CM 2002/ACFM:12).

**Catch data (Tables 3.10.3.1–2):**

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	-	15
2001	F 40% of F(99) F = 0.2	14	14	13		14
2002	No increase in catches	14				
2003	No increase in catches	14				

<sup>1</sup>Weights in '000 t.



**Table 3.10.3.1** Estimated Herring catches in tonnes in Divisions VIa (South) and VIIb,c, 1988—2001.

These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

Country	1988	1989	1990	1991	1992	1993
France	-	-	+	-	-	-
Germany	-	-	-	-	250	-
Ireland	15,000	18,200	25,000	22,500	26,000	27,600
Netherlands	300	2,900	2,533	600	900	2,500
UK (N.Ireland)	-	-	80	-	-	-
UK (Eng.&Wales)	-	-	-	-	-	-
UK Scotland	-	+	-	+	-	200
Unallocated	13,800	7,100	13,826	11,200	4,600	6,250
Total landings	29,100	28,200	41,439	34,300	31,750	36,550
Discards	-	1,000	2,530	3,400	100	250
Total catch	29,100	29,200	43,969	37,700	31,850	36,800

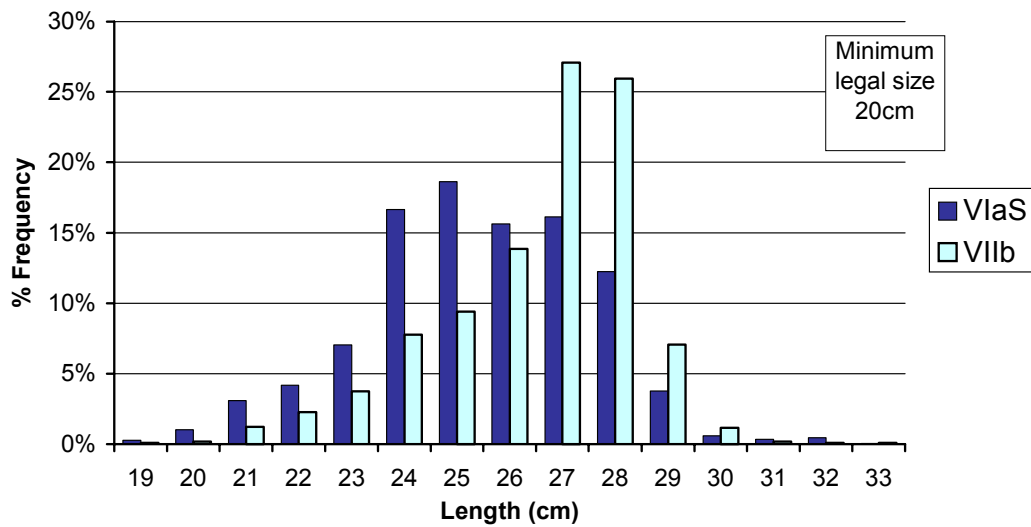
Country	1994	1995	1996	1997	1998	1999
France	-	-	-	-	-	-
Germany	-	11	-	-	-	-
Ireland	24,400	25,450	23,800	24,400	25,200	16,325
Netherlands	2,500	1,207	1,800	3,400	2,500	1,868
UK (N.Ireland)	-	-	-	-	-	-
UK (Eng.&Wales)	50	24	-	-	-	-
UK (Scotland)	-	-	-	-	-	-
Unallocated	6,250	1,100	6,900	-700	11,200	7,916
Total landings	33,200	27,792	32,500	27,100	38,900	26,109
Discards	700	-	-	50	-	-
Total catch	33,900	27,792	32,500	27,150	38,900	26,109

Country	2000	2001 <sup>1</sup>
France		
Germany		
Ireland	10,164	11,278
Netherlands	1,234	2,088
United Kingdom		
Unallocated	3,607	695
Total landings	15,005	14,061
Discards	-	-
Total catch	15,005	14,061

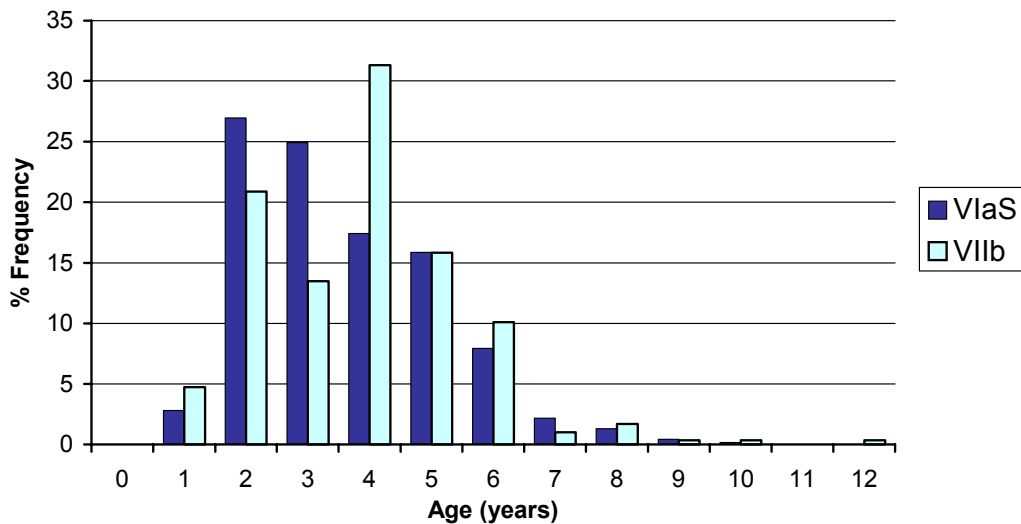
<sup>1</sup>Provisional according to text.



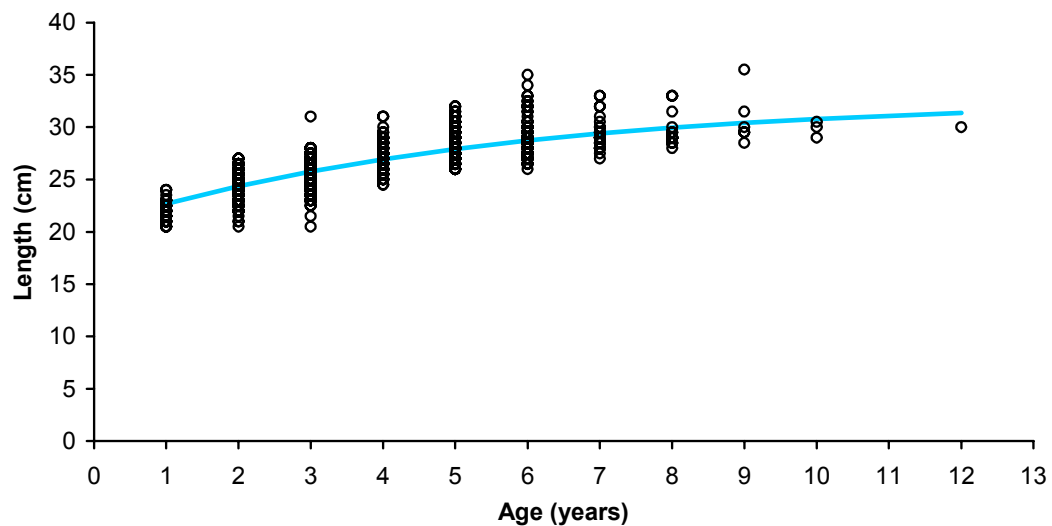
**2001 Length Distribution: Irish Landings, Herring in VlaS VIIb**



**2001 Age Distribution: Irish Landings, Herring in VlaS VIIb**



**2001 Size at Age: Irish Sampling, Herring in VlaS VIIb**



# Irish Sea Herring

(Division VIIa North)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD agrees with the ICES and STECF advice that the catches in 2003 should not be allowed to increase above the advised 2002 TAC (4,800 t). The likely Irish quota in 2003 would be 1,248 t which would be the same as in 2001.

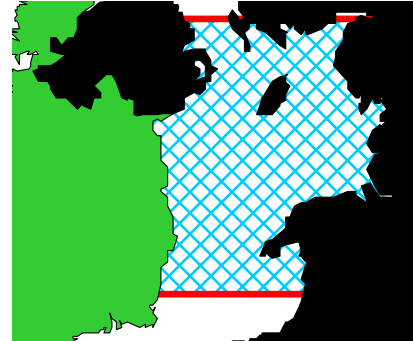
ICES and STECF also consider that areas that were closed for herring fishing along the east coast of Ireland and the west coast of England during the early 1970's in order to protect juveniles should be maintained. MFSD point out that this advice on the protection of juveniles is not necessary in the absence of any industrial fishery.

## STATE OF THE STOCK

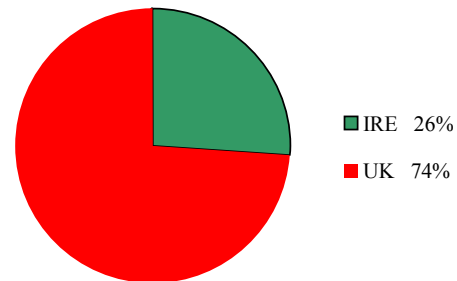
- The state of this stock is uncertain at present and cannot be used to make predictions or to give quantitative catch advice.
- Landings have reduced substantially in recent years and the catch in 2000 was the lowest recorded from the fishery since the early 1970's. The 2001 catch was about 5,500 t but there is considerable doubt about the accuracy of catches due to area misreporting.
- Fishing mortality is believed to have declined very much but it is not possible to estimate the values for recent years. The  $F_{pa}$  has not yet been defined.
- There is no reliable method of estimating recruitment for the stock.
- The SSB cannot be estimated with any certainty. The  $B_{pa}$  is equal to 9,500 t.
- No catch forecasts are possible for the stock.

## CURRENT MANAGEMENT

- The assessment area (Div.VIIa North) is the same as the TAC area.
- The TAC for this fishery is set by EU and was 4,800 t for 2002. The Irish share of the TAC is 1,250 t (26%).
- There is no overall management objective or management plan for this stock. There are a number of closed areas in operation to protect the spawning stock during part of the spawning season and to prevent exploitation of juveniles. The latter measure was introduced during the period of the industrial fishery in the Irish Sea (1969 – 1979) and is no longer necessary.



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



## MFSD – ECONOMIC COMMENTS

- The Irish catch in 2001 was 862 t which was worth about €200,000.
- The potential value of the Irish quota in 2002 would be about €300,000.
- Although Ireland has an important quota in this fishery Irish vessels did not participate in the fishery for a number of years prior to 2001. It is important to avail of this quota, particularly because of the restrictions in other herring fisheries

## ADDITIONAL INFORMATION

1. The assessment carried out in 2002 is too unreliable to be used as the basis for management advice.
2. The total catch taken from this fishery in 2001 was 5,500 t. Two Irish pairs of mid-water trawlers took part in the fishery.
3. There are serious problems with misreporting of catches taken in this fishery and the quality of catch statistics is poor.
4. The main catches in recent years have been taken by a small number of Northern Irish pair trawlers.
5. Prior to 2001 Ireland did not participate in this fishery for a number of years – mainly because of a poor demand for the type of herring that would be landed. The Irish fleet is not permitted to fish on the spawning grounds on the Douglas Bank to the east of the Isle of Man and this has meant that it has not been

- able to exploit the shoals during the spawning season.
6. Samples of the Irish catches were examined during 2001 from landings made at Howth.
  7. Irish sampling for this stock is supported through the EU funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001.
  8. The age distributions of the Irish catches in 2001 were composed mainly of small herring aged between 2 and 4 year old. The length distributions were mainly composed of herring less than 26 cm. while considerable numbers of small herring less than 20 cm were landed.
  9. Tagging experiments carried out by MFSD in 1990 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 well being of the important Celtic Sea fishery and all relevant conservation measures should be supported.

## ICES ADVICE

### 3.9.7

#### State of stock/exploitation:

The state of the stock is uncertain. SSB declined in the late 1980s, and may have been stable in the 1990s but current stock size cannot be estimated with certainty.

#### Management objectives:

There are no explicit management objectives for this stock. However, for any management objective to meet precautionary criteria, spawning stock biomass should be greater than the proposed  $B_{pa}$ .

#### Advice on management:

ICES advises that catch in 2003 should not be allowed to increase above the advised 2002 TAC (4 800 t).

#### Precautionary Approach reference points (established in year 2000):

ICES considers that:	ICES proposes that:
$B_{lim}$ is 6,000t	$B_{pa} = 9,500t$
$F_{lim}$ is not defined	$F_{pa}$ under review, proposed as 0.36 in 1999, not adopted

#### Technical basis:

$B_{lim}$ : lowest observed SSB	$B_{pa}$ : $B_{lim} * 1.58$ ; still under consideration
$F_{lim}$ : not defined	$F_{pa}$ : $F_{med}$

#### Relevant factors to be considered in management:

Areas closed to herring fishing around the east coast of Ireland and west coast of Britain were put in place to protect juveniles when an industrial fishery operated. A closed area exists to the east of the Isle of Man to protect the spawning aggregations.

These closed areas should be maintained. The catch in 1998 to 2001 is uncertain.

#### Comparison with previous assessment and advice:

The update of the assessment gave a similar perception of SSB as last year (2001 assessment) and the 1999 assessment but was different from the 2000 assessment. Until this change in the perception of the stock size is explained it will not be possible to use the assessment for quantitative catch advice.

#### Elaboration and special comment:

Fishing mortality was high during the 1970s due to a transfer of effort from other closed herring fisheries and the operation of an industrial fleet. Since 1981 the size of

the exploiting fleets in this area has declined and the industrial fishery has closed.

Over the years the survey indices have been revised and the new assessments are based on the uncertain catches with additional survey data series providing more information on recruitment and the age structure of the stock. Further exploratory analyses are required before the current assessment can be regarded as stable.

Many aspects of the biology and fisheries data changed rapidly in the mid-1980s, affecting assessment results. These changes require further investigations and depending on the causes of the changes, reference points may be affected. If the changes are a result of stock components being exploited differently by the fishery, any similar changes in the future could cause serious problems for producing reliable assessments.

#### Source of information:

Report of the Herring Assessment Working Group for the Area South of 62°N, March 2002 (ICES CM 2002/ACFM:12).

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

	Fish Mort Ages 2-6	Yield/R	SSB/R
Average Current	0.277	0.033	0.098
$F_{\max}$	N/A		
$F_{0.1}$	0.166	0.029	0.154
$F_{\text{med}}$	N/A		

**Catch data (Tables 3.8.7.1–2):**

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Catch	Discards	ACFM Catch <sup>1</sup>
1987	TAC	4.3	4.5	5.8	4.2	27.3
1988	TAC (Revised advice in 1988)	10.5 (5.6)	10.5	10.2	2.4	19.2
1989	TAC	5.5	6.0	5.0	3.5	22.7
1990	Precautionary TAC	5.7	7.0	6.3	2.5	20.2
1991	TAC	5.6	6.0	4.4	1.9	23.6
1992	TAC	6.6	7.0	5.3	2.1	23.0
1993	TAC	4.9-7.4	7.0	4.4	1.9	21.1
1994	Precautionary TAC	5.3	7.0	4.8	1.7	19.1
1995	Precautionary TAC	5.1	7.0	5.1	0.7	19.0
1996	If required, precautionary TAC	5.0	7.0	5.3	3.0	21.8
1997	No advice given	-	9.0	6.6	0.7	18.8
1998	<i>Status quo</i> F	6.5	9.0	4.9	0.0	20.3
1999	F=Proposed $F_{\text{pa}}=0.36$	4.9	6.6	4.1	0.0	18.1
2000	F=90% F(98)=0.31	3.9	5.4	2	0.0	17.1
2001	<i>Status quo</i> F= 0.26	5.1	6.9	5.5	0.0	17.2
2002	Average catch of 1996-2000	4.8	4.8			
2003	2002 TAC	4.8				

Weights in '000 t.

**Table 3.8.7.1** Irish Sea Herring (Division VIIa). Catch in tonnes by country, 1985—2001.

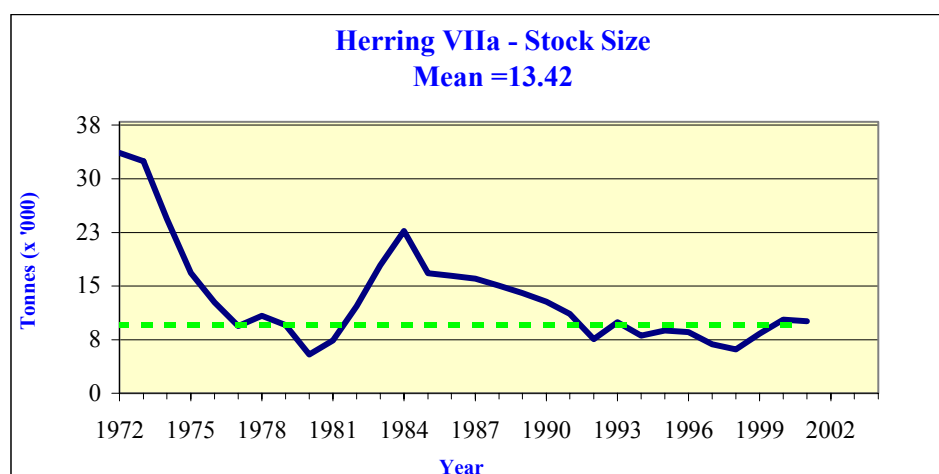
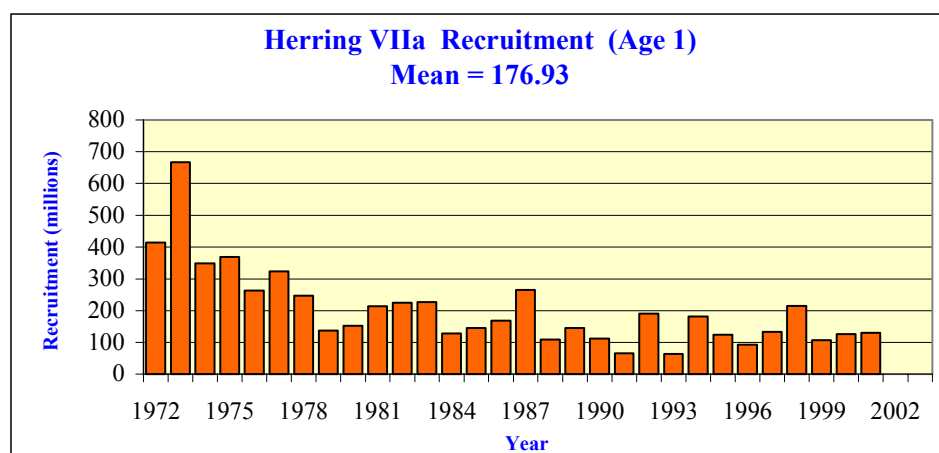
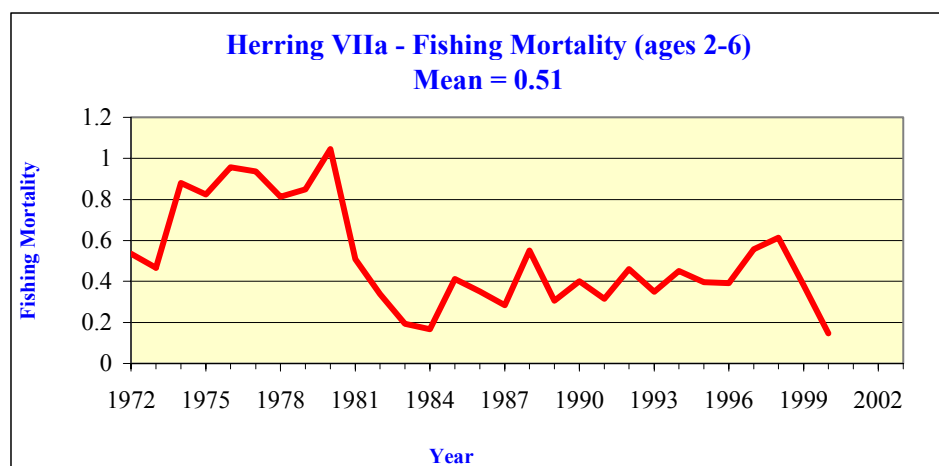
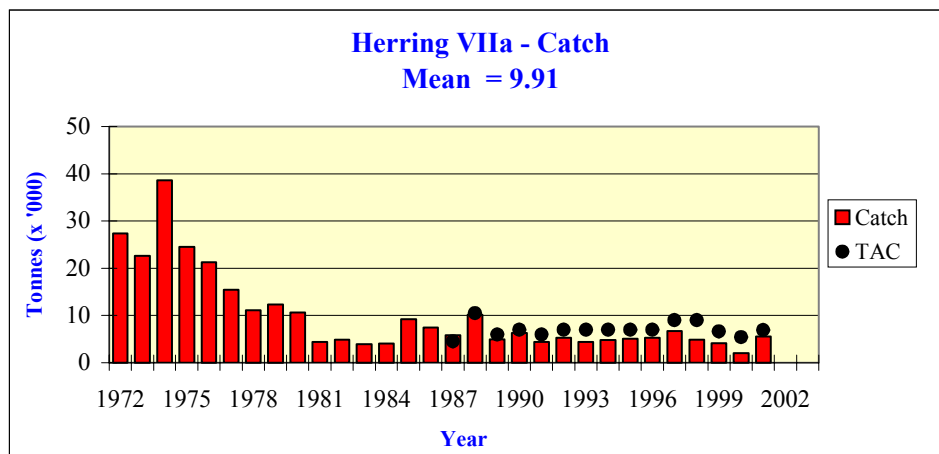
The total catch does not in all cases correspond to the official statistics and cannot be used for management purposes.

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993
Ireland	1,000	1,640	1,200	2,579	1,430	1,699	80	406	0
UK	4,077	4,376	3,290	7,593	3,532	4,613	4,318	4,864	4,408
Unallocated	4,110	1,424	1,333	-	-	-	-	-	-
Total	9,187	7,440	5,823	10,172	4,962	6,312	4,398	5,270	4,408

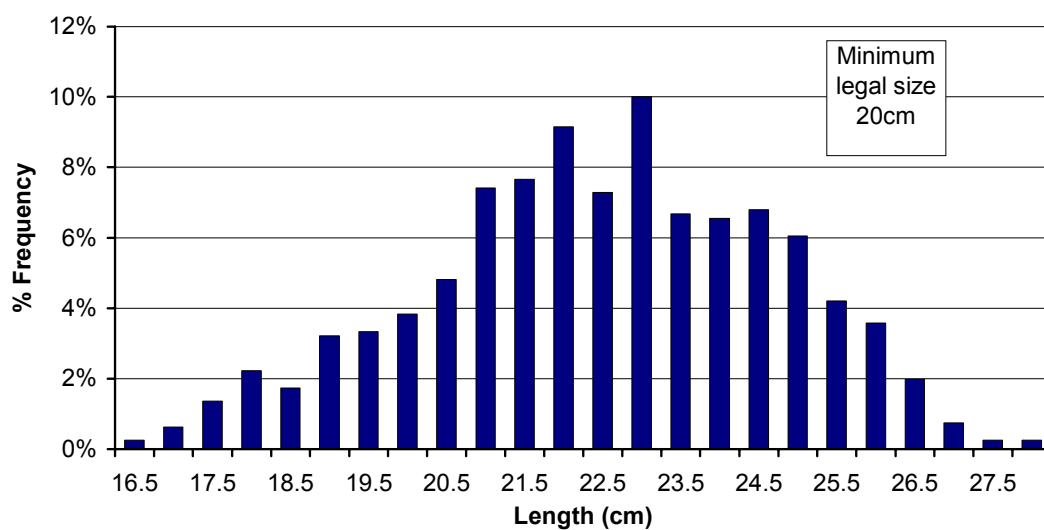
Country	1994	1995	1996	1997	1998	1999	2000	2001
Ireland	0	0	100	0	0	0	0	862
UK	4,828	5,076	5,180	6,651	4,905	4,127	2,002	4,599
Unallocated	-	-	22	-	-	-	-	-
Total	4,828	5,076	5,302	6,651	4,905*	4,127*	2,002*	5,461*

\* Preliminary

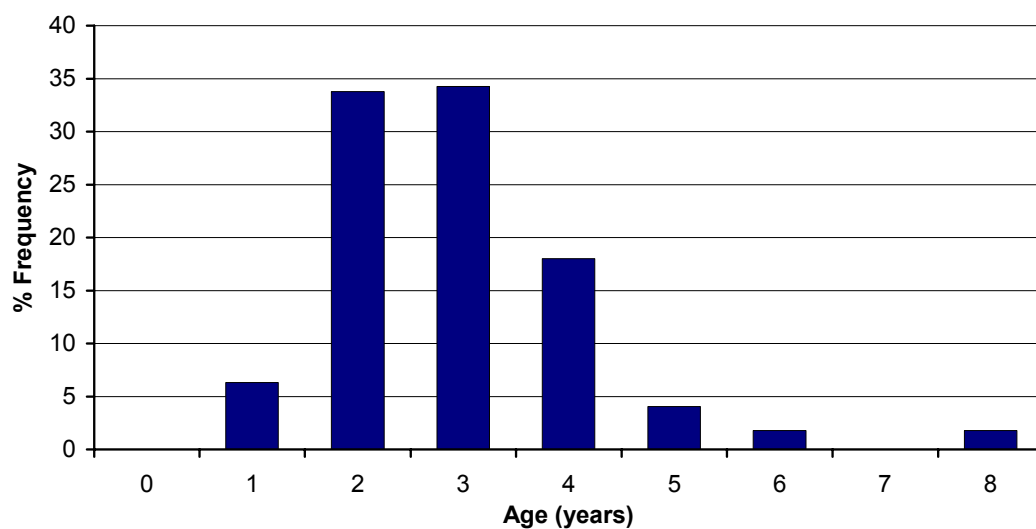




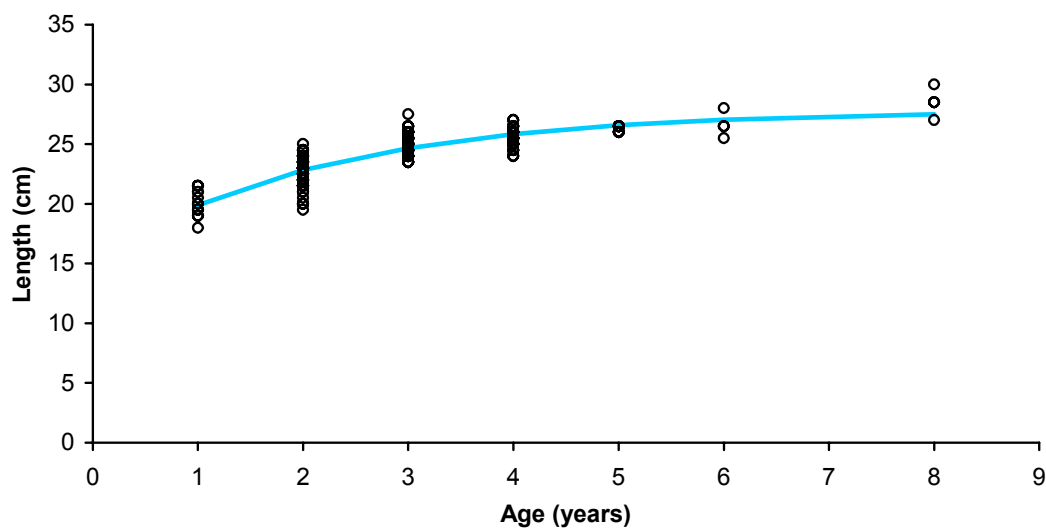
**2001 Length Distribution: Irish Landings, Herring in VllaN**



**2001 Age Distribution: Irish Landings, Herring in VllaN**



**2001 Size at Age: Irish Sampling, Herring in VllaN**



# Celtic Sea Herring

(Divisions VIIaS, VIIg-k)

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



Marine Fisheries Services Division

## SPECIAL NOTE

The 2002 TAC for this fishery was set by EU for the period January to June. This was on the advice from ICES in 2001 and was because of uncertainty in the assessment carried out in 2001 and a perceived change in abundance of the stock since 1999. In March 2002 the Herring Assessment Working Group carried out a new assessment of the stock. There was a high degree of uncertainty in point values of SSB and F from the 2002 assessment.

A subgroup of ACFM met through correspondence before the May 2002 ACFM meeting, and gave updated advice for catches for 2002 to the EU. The assessment was not reviewed by this subgroup. The subgroup advised a catch of 11,000 t for all of 2002 and this was based on a proposed  $F_{pa} = 0.35$ . Marine Institute argued strongly against this advice, pointing out that this very low value of F was observed on only four occasions since 1958 and these were during the early 1960s. Marine Institute scientists suggested that the TAC for 2002 should be based on status quo  $F = 0.45$  and this would have corresponded to a TAC of 13,000 t. Notwithstanding this, it was the opinion of ACFM that advice for a catch based on  $F_{sq}$  was not appropriate given the uncertainty in the current status of the stock and that a more conservative approach need to be taken.

ICES therefore provided advice to the EU that catches in 2002 should be no more than 11,000 t which was based on  $F_{2002} = 0.35$ . Industry representatives made a proposal to EU that the TAC should be around 18,000 t and that measures to protect first time spawning fish should be part of the management plan. The EU set the TAC for 2002 to 11,000 t and but later, following submissions from the Marine Institute (MFSD), this TAC was amended to 13,000 t.

At the full meeting of ACFM in May 2002 at which the advice for 2003 was discussed for this stock, ACFM examined the assessment of the stock that had been carried out in March. It concluded that due to unquantified uncertainty in the assessment, a deterministic short term projection would not be a sufficient basis to provide advice. Without any basis for catch advice ACFM advised a substantial reduction of catches until the age structure of the stock improved.

## MFSD – ADVICE

ICES have recommended that the catch from this fishery for 2003 should be substantially less than recent catches and that catches in subsequent years should remain low until there is evidence of increased abundance of older fish in the population.

ICES has not considered the assessment sufficiently reliable to base catch forecasts on and thus there is no specific catch advice for 2003. If the TAC were based on averages over the past 3 years it would be 17,300 t.

MFSD expresses concerned over the state of this stock due to the lack of older fish and the high proportion of young fish in the catches. MFSD considers that although the assessment is uncertain, it is as accurate as several other assessments on which ICES have given advice. MFSD therefore agree with the STECF advice which suggests that, based on the assessment in 2002, the TAC in 2003 should be 15,000 t. MFSD considers that this 15% reduction in catch rates would reduce F and would maintain SSB above  $B_{pa}$ , provided that strict measures continue to be maintained to protect first time spawning fish (i.e. fish below 23 cm).

MFSD also recommend that the “rotational spawning box” closure system should be maintained. The spawning box C in the eastern part of the Celtic Sea should be closed in January 2003 and the spawning box A in Division VIIj should be closed in November 2003.

In 2000 ICES have pointed out that the proposed extraction of gravel from some of the more important spawning grounds poses a threat to this stock. If spawning is impeded by disruption to the spawning process recruitment may be adversely affected. MFSD therefore would again reiterate the advice given in recent years - that dredging of gravel from known spawning grounds is not consistent with the precautionary principle of fisheries management.

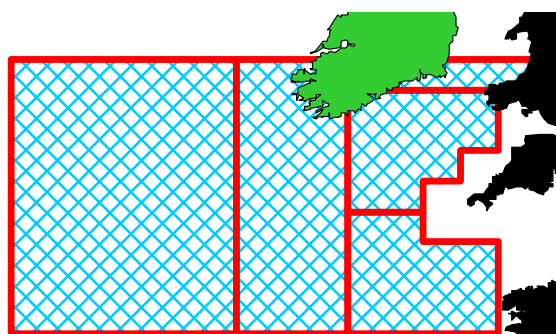
## STATE OF THE STOCK

- The state of this stock at present is uncertain. The assessments in recent years have been very difficult because of conflicting signals from the acoustic surveys and from the sampling data derived from the fishery.
- Landings from the stock have been very stable since the mid 1980s and have been around 18,000 t - 20,000 t each year. Landings in 2001 at 17,200 t were approximately the same as those in 2000 and the lowest recorded from the fishery since the early 1980s.

- Fishing mortality is at present about 0.45. Prior to 2000 fishing mortality appeared to have been decreasing but if the lack of older fish in more recent years is caused by fishing then it may have increased sharply since 2000. The  $F_{pa}$  has not yet been agreed.
- Recruitment has fluctuated very widely over the time series. The number of fish at age present in the catches in recent years suggests that recruitment has been weak in the period 1996-1998 and high in 2000 and 2001.
- The spawning stock has increased since the low levels recorded in the 1970s but the present size of the stock is very uncertain. The  $B_{pa}$  is set at 44,000 t.
- Because of the uncertainty about the present stock size the assessment and the short term predictions carried out in March 2002 were not accepted by ICES as a sound basis for providing management advice.

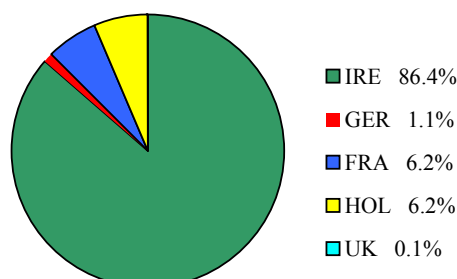
## CURRENT MANAGEMENT

- The TAC area and the assessment area cover all of ICES Divisions VIIg, h, j, and k and the southern part of Div.VIIa.



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

- The TAC is set on an annual basis but the assessments have always been carried out on a seasonal basis (1 April – 31 March). This is because the main fisheries extend over the period October to February.
- The TAC in 2002 is 13,000 t. The Irish quota is 11,235 t
- There is no EU management plan for this fishery. However in early 2001 a new South and West Pelagic Management Committee was set up for this fishery. The Committee has a management plan for the fishery and also a stated objective of rebuilding the stock to a sustainable level in accordance with scientific advice. The committee initiated a number of measures



during the 2001/2002 season aimed at more involvement of fishermen and processors in the assessment and management of the stock. The measures resulted in an early closure of the fishery in February 2002, prior to the taking of the full Irish quota for the period, and the closure of areas in which small herring dominated the catches.

- Acoustic surveys and trial fishing during the closed season were also organised by the committee and carried out in conjunction with Marine Institute and BIM, under the NDP Programme.
- The Irish quota is controlled by a number of measures that include closed seasons, closed areas, and boat and weekly quota. .

## MFSD – ECONOMIC COMMENTS

- The total catch taken by Ireland from the fishery in 2001 was about 17,700 t.
- The value of the Irish catch taken was about €4.18 million which is about the value of the quota.
- Prices increased substantially in 2001 and the fishery remains extremely important for a large number of pelagic vessels operating from Dunmore East, Castletownbere, Dingle, Ros a Mhíl and other ports. During 2002 the prices for herring have decreased dramatically and the immediate market prospects for the fishery are very poor. The fishery also supports a number of processing factories throughout the country. The proportion of the catch that is now consigned to the Japanese “roe” market has declined in recent years.

## ADDITIONAL INFORMATION

1. The uncertainty associated with recent assessments has increased because of conflicting signals between the commercial catch at age data and the acoustic surveys in recent years. This problem is compounded by the lack of any recruitment index which makes short term forecasts very uncertain for this stock. The most recent assessment was not accepted by ICES as a basis for catch forecasts because there was no quantification of the uncertainty.
2. The total landing taken from this fishery in 2001 was 17,700 t. The Irish catch was also 17,700 t
3. The main catches (over 90%) are taken by the Irish midwater trawl fleet that exploit the spawning concentrations during the spawning season. Over 95% of the catch is taken from inshore waters in Divs, VIIj,g and VIIa South.
4. There are some misreporting problems for this fishery. Some small catches that are taken by continental fleets in adjoining areas (Div.VIIe) and in the North Sea have been reported as having been taken in the Celtic Sea.
5. Historically large catches have been taken from this fishery by the Dutch fleet but in recent years only negligible catches have been reported by the Netherlands. These catches appear to be mainly as a by catch in their horse mackerel fishery. Irish fishermen consistently report the presence of a large Dutch fleet



fishing in the area and are reluctant to believe that this fleet is not catching large quantities of herring.

6. The Irish fleet exploiting this stock had decreased in recent years but in 2000/2001 a number of additional vessels rejoined the fishery and the fleet increased to about 38 vessels at peak time compared with about 24 during the previous season. These vessels are mainly “dry hold” boats together with a small number of refrigerated seawater vessels (RSW). Most vessels come from the south and west coast ports and the main landings are made at Dunmore East, Cobh, Castletownbere and Dingle.
7. Irish sampling for this stock is supported through the EU funded sampling programme which is required under the Data Collection Regulation 1543/2000 and 1639/2001.
8. Selected spawning grounds are closed each year in this fishery on a rotational basis. These closures are designed to provide some protection for the spawning shoals and should be maintained.
9. The age distribution of the stock had improved prior to 2000/2001 with an increased abundance of older fish. However, the age distribution in 2001 and 2002 has been dominated by very young herring and nearly 80% of the total catch was composed of 2, 3 and 4 year old herring.
10. The length distributions of the Irish landings during 2001/2002 were dominated by small herrings between 23 cm and 25 cm. The Management Committee organised a comprehensive system whereby catches were measured by processors working with the Marine Institute and fishery officers throughout the season. It was decided that fishing would not be allowed in areas that contained significant numbers (>50%) of herring under 23 cm.
11. Acoustic surveys on the stock were carried out in 2001, using the commercial vessel *R.V Menhaden* and the *R.V Celtic Voyager*. The results from the *F.V Menhaden* gave a higher estimate of biomass than in recent years. These surveys, using the *R.V Menhaden* were continued during 2002. Additional surveys were also carried out by Marine Institute and BIM using commercial vessel and were again funded under the NDP Programme. These programme carried out during August were designed to study the distribution of the adult shoals and to investigate the quality of these herring. From a biological perspective it would be desirable to catch herring from this stock at a time when

the individual fish are in peak condition and at maximum weight. This would reduce the numbers of fish caught per tonne and would therefore reduce fishing mortality.

12. The present state of the stock is not known. This stock collapsed in the mid 1970’s because recruitment declined dramatically over a short period. This period also coincided with a period of high effort in the fishery and increased fishing mortality. The fishery was as a result closed for approximately five years.
13. The fishery on this stock has for a number of years been heavily dependent on the Japanese roe market. This market has declined very much in recent years and this together with a decline in the European demand for herring has meant that there had been a decline in fishing effort on this stock. As has been pointed out by the HAWG on a number of occasions the catching capacity of the fleet far exceeds the TAC and this creates problems in the management of the fishery. Efforts should be made to restrict the number of vessels taking part in the fishery. In 2001 the market demand for herring fillets was strong and this led to high prices. However this situation has been reversed by the start of the 2002/2003 season.
14. Discards in recent seasons have decreased and are not included in the assessment in recent years.

## ICES ADVICE

### 3.9.9

#### State of the stock/exploitation:

The state of the stock is uncertain. Information from the catch and surveys suggests relatively low abundance of older herring for the past two years, and some years of poor recruitment in the mid to late 1990s.

#### Management objectives:

A local Irish management committee has been established for this stock. One of its objectives is the protection of small fish, which is to be enforced by the closure (by Irish statute) of any area in the Celtic Sea and Division VIIj where the landings of herring from the Irish fleet contain more than 50% of individual fish below 23 cm. An Irish management plan is currently in place to protect small first time spawning fish.

#### Precautionary Approach reference points (unchanged since 1999):

ICES considers that:	ICES proposes that:
$B_{lim}$ is 26 000 t	$B_{pa}$ be set at 44 000 t
$F_{lim}$ : not defined	$F_{pa}$ : not defined

#### Technical basis:

$B_{lim}$ : The lowest stock observed	$B_{pa}$ : Low probability of low recruitment
$F_{lim}$ : not defined	$F_{pa}$ : not defined

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**Advice of management:**

**ICES recommends that catches in 2003 should be substantially less than recent catches. Catches in subsequent years should remain low until there is evidence of increased abundance of older fish in the population.**

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**Relevant factors to be considered in management:**

The catches largely consist of incoming year classes about which little is known. Therefore it is difficult to give appropriate management advice for 2002 because of the uncertainty about the current recruitment.

There was a general lack of older fish in the population indicated by relatively low catches of adults in the fishery and the acoustic survey during 2000. In 2001, there were proportionally more 3+ ringers in the catch, but not nearly as many as observed prior to 1998. There were also proportionally more 3-5 ringers in the 2001 acoustic survey.

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**Comparison with previous assessment and advice:**

In 2000 the status of this stock was also considered to be unknown. Due to continued problems with the assessment, precise advice and catch options for 2003 are not possible. The interim advice on 2002 catch from ICES in May 2002 was based on an assessment that was subsequently rejected by ACFM as a basis for advice for 2003. As was stressed in the advice in 2001 and again in the interim advice for 2002, the assessment is highly uncertain, largely caused by the inability to precisely predict recruitment.

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**Elaboration and special comment:**

The point estimate of SSB from a provisional assessment is very imprecise and is greatly influenced by the number of recruits in 2001. The stock is so dependent on recruitment that ICES stresses the importance of obtaining and evaluating all recruitment information that is available from surveys in the area.

Due to the variability of the acoustic survey indices, any analytical assessment will likely result in stock size estimates that have low precision. Such estimates cannot be useful in the context of providing point estimates in short term projections. However, such estimates, together with their uncertainties, can be used in the context of risk assessment if risk levels (e.g., of avoiding  $B_{pa}$  with a high probability) are pre-specified.

Following the 2000-2001 fishery it was decided by the Irish fishing industry (who account for the majority of the catches) to form a Pelagic Management Committee. This committee has stated the following management objective *“to maintain the stock at a level whereby it can sustain annual catches of around 20,000 t. In the event of the stock falling below the level at which these catches can be sustained the Committee will take appropriate rebuilding measures. The Committee will also introduce such measures as are necessary to prevent landings of small first time spawning herring including closed areas, and/or appropriate time closures”*. It is also an objective of the Committee that all landings of herring from the fleet should contain at least 50% of individual fish above 23 cm. Spawning Box closures, as are at present in operation, should be retained and may, if necessary, be expanded both in time and area. This management measure was brought into effect by statute in the last season and resulted in an area closure, and the season was closed before the Irish quota was taken.

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**Source of information:**

Report of the Herring Assessment Working Group for the Area South of 62°N, March 2002 (ICES CM 2002/ACFM:12).

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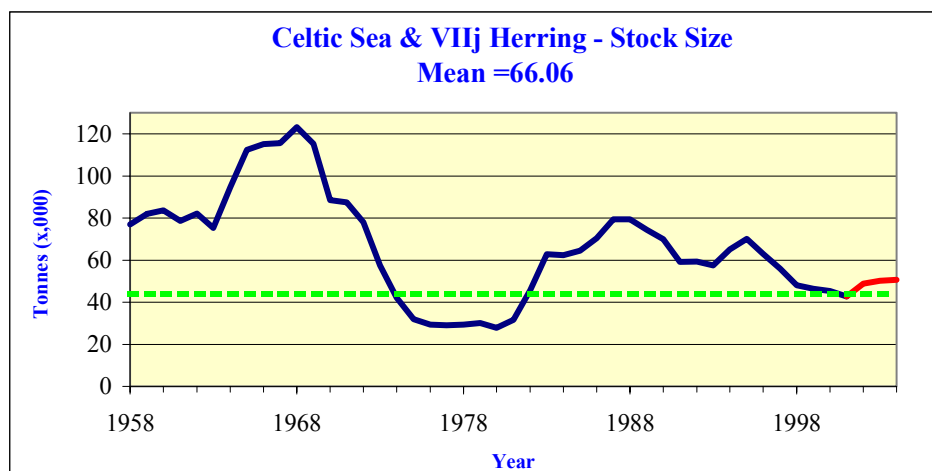
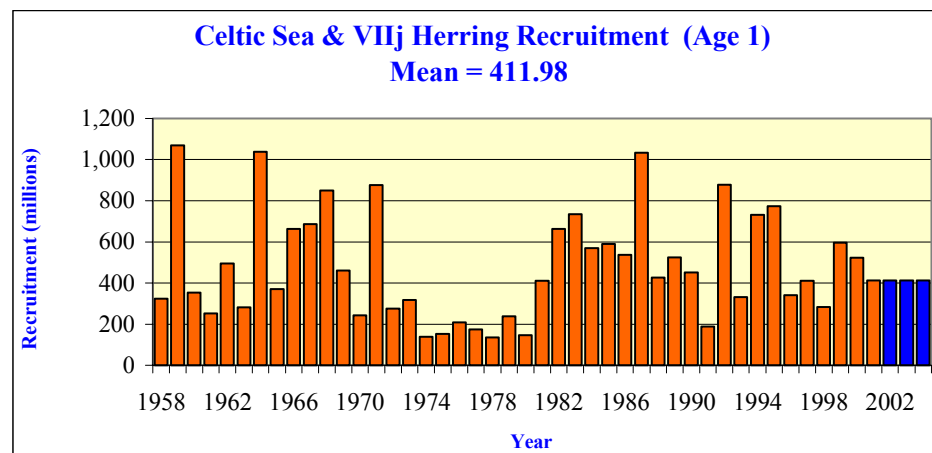
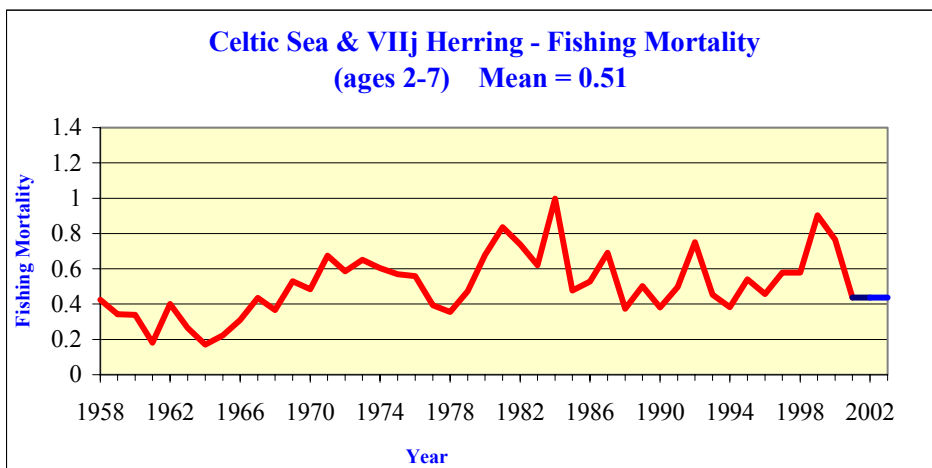
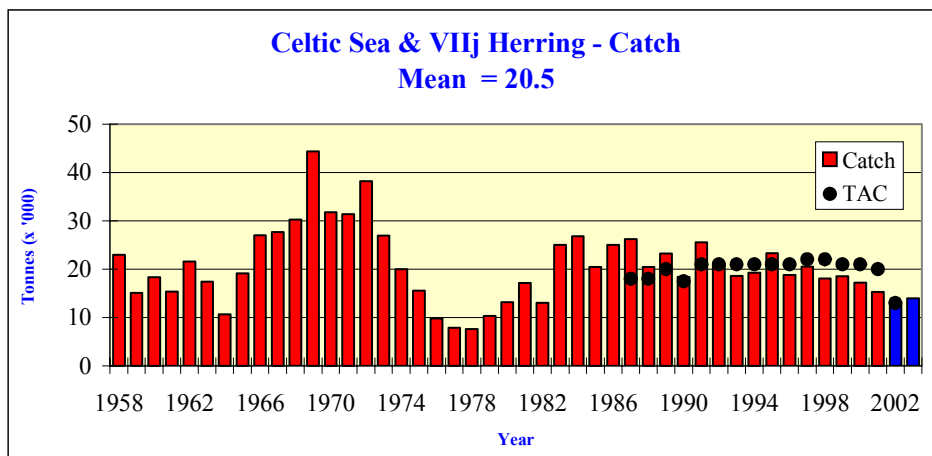
**Yield and spawning biomass per Recruit  
F-reference points:**

	Fish Mort Ages 2-7	Yield/R	SSB/R
Average Current	0.330	0.035	0.125
$F_{max}$	N/A		
$F_{0.1}$	0.128	0.030	0.218
$F_{med}$	N/A		

**Catch data (Tables 3.9.9.1–3):**

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	23.0
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	19.0
1996	TAC	9.8	16.5 – 21 <sup>2</sup>	21	3.0	21.8
1997	If required, precautionary TAC	< 25	22	20.7	0.7	18.8
1998	Catches below 25	< 25	22	20.5	0.0	20.3
1999	F = 0.4	19	21	19.4	0.0	18.1
2000	F < 0.3	20	21	18.8	0.0	17.1
2001	F < 0.34	17.9	20	17.8	0.0	17.2
2002	Precautionary TAC for 1 <sup>st</sup> half of 2002	6.0				
2003	Precautionary TAC	<17				

<sup>1</sup>By calendar year. <sup>2</sup>Revised during 1996 after ACFM May meeting. Weights in '000 t.



**Table 3.9.9.1** Celtic Sea and Division VIIj Herring landings by calendar year (t), 1988—2001. (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
1988	-	-	16,800	-	-	-	2,400	19,200
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	0	20,300
1999	-	200	17,900	1,300	+	-1300	0	18,100
2000	573	228	18,038	44	1	-617	0	18,267
2001 <sup>1</sup>	1,359	219	17,729	-	-	-1578	0	17,729

<sup>1</sup>Preliminary.

**Table 3.9.9.2** Celtic Sea and Division VIIj Herring landings (t) by season (1 April—31 March) 1988/1989—2001/2002. (Data provided by Working Group members.)

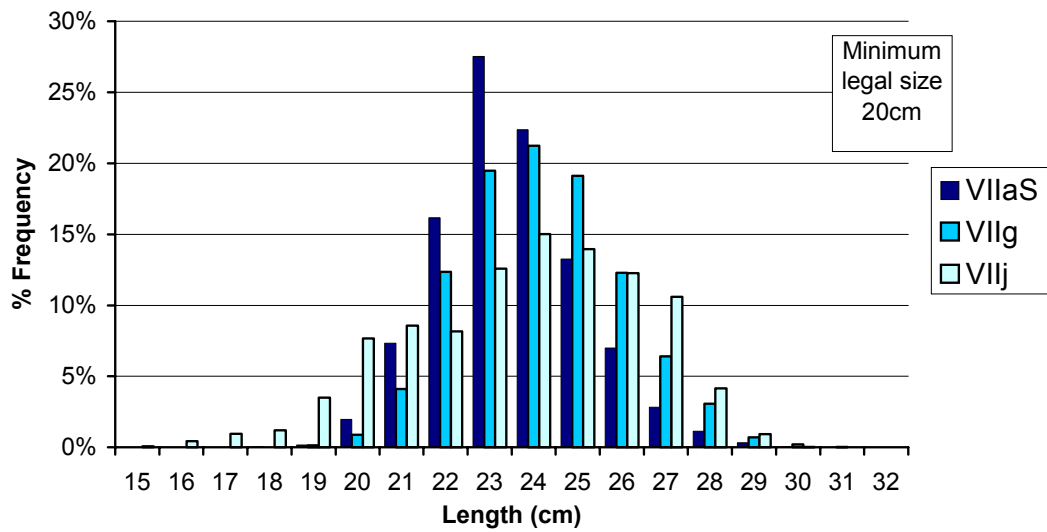
These figures may not in all cases correspond to the official statistics and cannot be used for management purposes.

Year	France	Germany	Ireland	Netherlands	U.K.	Unallocated	Discards	Total
1988/1989	-	-	17,000	-	-	-	3,400	20,400
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	0	20,500
1998/1999	+	-	17,700	1,200	-	-700	0	18,200
1999/2000	-	200	18,300	1,300	+	-1300	0	18,500
2000/2001	573	228	16,962	44	1	-617	0	17,191
2001/2002 <sup>1</sup>	-	-	15,236	-	-	-	0	15,236

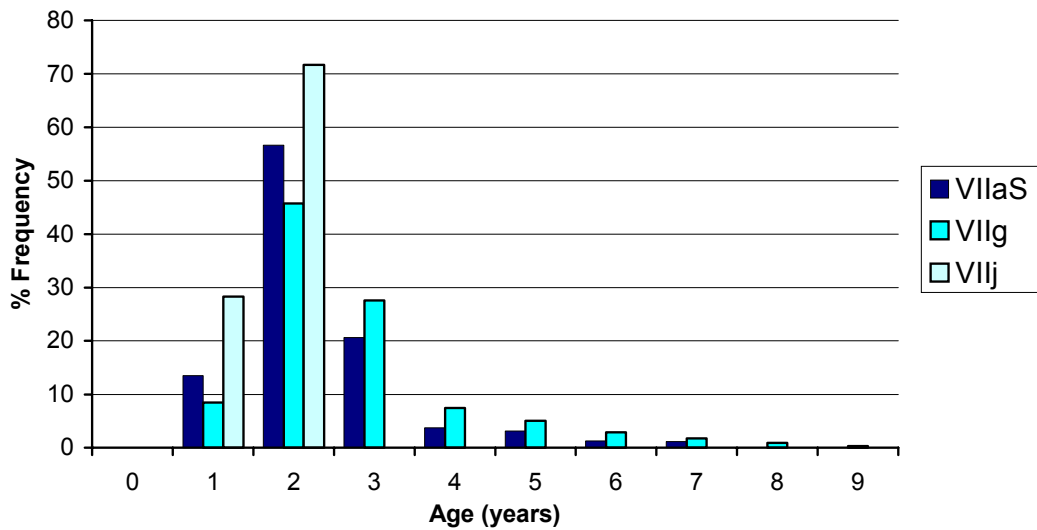
<sup>1</sup> Preliminary.



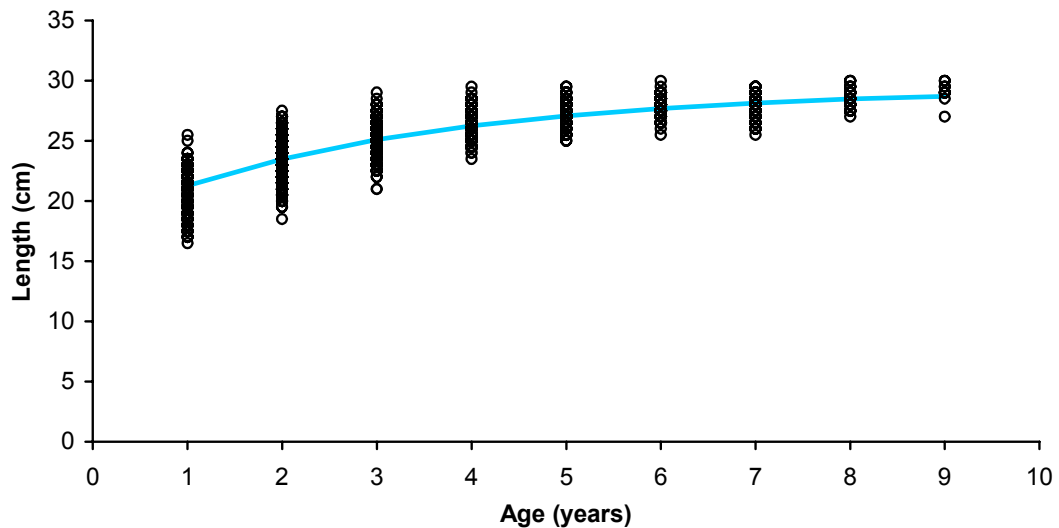
**2001 Length Distribution: Irish Landings, Herring in VIIaS VIIg VIIj**



**2001 Age Distribution: Irish Landings, Herring in VIIaS VIIg VIIj**



**2001 Size at Age: Irish Sampling, Herring in VIIaS VIIg VIIj**



# Norwegian Spring Spawning Herring

## Sub-areas I and II

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



Marine Fisheries Services Division

### MFSD – ADVICE

MFSD agrees with the ICES and STECF advice for this stock. This states that the fishery should be managed according to the agreed long term management plan. The plan states that every effort should be made to maintain the SSB above 2.5 million tonnes and also agrees a specific fishing mortality. Furthermore if the SSB should fall below the  $B_{pa}$  of 5 million tonnes then the fishing mortality rate should be immediately adjusted. This plan was agreed in 1999 by the EU, Faroe Islands, Iceland, Norway and Russia.

Under the terms of the agreement the TAC in 2003 would be 710,000 t. The agreed TAC for 2002 was 850,000 t, which was the same as that for 2001.

The EU share of the likely TAC would be about 61,600 t. This would translate to an Irish quota of about 5,560 t in 2003 compared to 6,670 t in 2002.

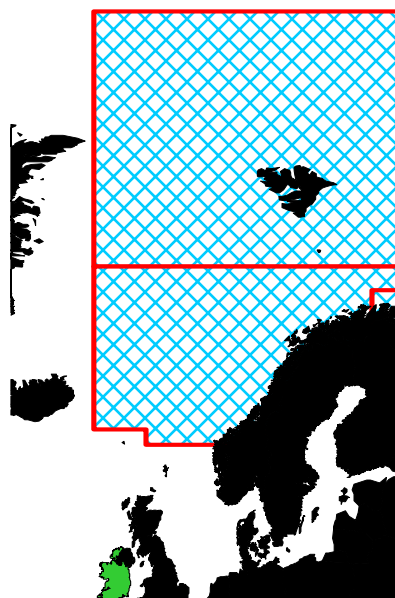
### STATE OF THE STOCK

- This stock is within safe biological limits and there are no concerns about the present state of the stock.
- The fishery was closed for a long time in the 1960s and 1970s and only very small catches were permitted in the 1980s. The estimated catch for 2001 was about 770,000 t which was nearly 500,000 t lower than in 2000. Catches of over 1 million tonnes have been taken from the stock from 1996 – 2000.
- Fishing mortality on this stock had been increasing in recent years but in 2001 it declined and was estimated to be slightly below the  $F_{pa} = 0.15$ . This decline was a result of the very big decrease in the total catch taken in 2001.
- Recruitment of the 1998 and 1999 year classes appear to be strong although the 1999 year class was much lower than predicted.
- In 2001 the SSB was estimated to be 5.2 million tonnes compared with 6 million tonnes in 2000. The SSB increased dramatically during the 1990s because of good recruitment and reached a peak in 1997 of nearly 9 million tonnes.
- The stock is expected to increase in the immediate future at present catch rates. However the predictions are extremely sensitive to the estimate of the 1999

year class which has proved to be lower than expected. Therefore the future stock size and its yield are lower than predicted in 2001.

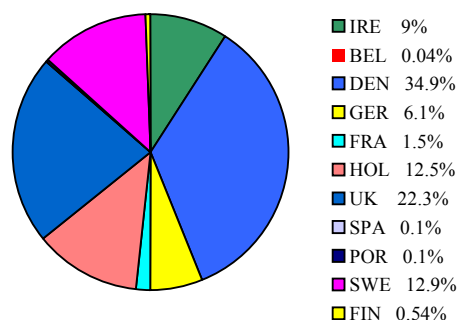
### CURRENT MANAGEMENT

- The TAC area (Sub areas I and II) corresponds with the assessment area.



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

- The TAC set by NEAFC for this fishery for 2002 is 851,500 t. The EU share of this TAC is 73,840 t and the Irish quota is 6,670 t. There are also restrictions on the amounts of the Irish catch that can be taken in different fishing zones.



- A long term management plan has been agreed for this fishery since 1999 between the EU, Faroe Is., Iceland, Norway and Russia. The plan aims at maintaining the SSB above 2.5 million tonnes, and setting TACs consistent with producing a fishing mortality less than 0.125. Provisions are also made should the SSB fall below 5 million tonnes.

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## MFSD – ECONOMIC COMMENTS

- This fishery is relatively new to the Irish fleet. In recent years all the catch has been taken by a small number of vessels, mainly freezer trawlers and has been landed in continental ports.
- The Irish catch in 2001 was 6,070 t valued at €2.25 million. The catch and the quota are extremely valuable and would be of considerable benefit to the industry if landed in Irish ports and processed in Ireland. The preliminary figure for the 2002 Irish fishery, which was completed in the first six months of the year, indicated that landings were significantly reduced to 1,699 t valued at €410,000.
- The value of the Irish quota in 2002 was about €2.5 million.

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## ADDITIONAL INFORMATION

1. The results from the most recent assessment are less optimistic than those carried out in 2001. This is because the 1999 year class was not as strong as predicted.
2. The total landings taken from this fishery in 2001 decreased to 770,000 t compared with 1.2 million tonnes in the previous year.
3. The Irish landing for 2001 was 6,070 t compared with 8,900 t. in 2000 and with 2,400 t in 1999.
4. Misreporting is not thought to be a problem in this fishery.
5. The main catches are taken by Norway, Iceland and Russia. Substantial catches are also taken by Faroe Is. and Denmark.
6. The geographical extent of the fishery has increased since 1995 and a large number of nations now participate in the fishery.
7. In 1996 Ireland participated in this fishery for the first time and landed nearly 20,000 t of herring, much of which went for fishmeal. The remainder was dumped because of poor quality. There has been a big problem in landing these herring in good condition at Killybegs at the time when the Irish fleet was fishing in May. Landings declined in 1997 and 1998 and the total catch in 1998 and 1999 was only about 2,500 t. The landings in 2000 increased substantially to over 8,900 t, most of which was taken by one freezer trawler but decreased again in 2001. This fishery is a valuable potential source of income for the Irish fleet, because of the restrictions on other pelagic fisheries and on blue whiting. However, at present this potential is not being fulfilled.
8. Irish sampling for this stock is supported through the EU funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001.
9. Only two small samples of herring caught by Irish vessels were obtained from this fishery during 2001. Norwegian Spring Spawners are large herring compared with those taken around Ireland and most of the catch was over 10 year old and between 33 cm and 35 cm .

## ICES ADVICE

### 3.1.7.a

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#### State of stock/exploitation

The stock is inside safe biological limits. The stock is harvested at or slightly below  $F_{pa} = 0.15$ . The recruitment of the very strong 1992 year class led to an increase in SSB in 1997 to approximately 9 million t, but SSB has since declined to just over 5 million t in 2001. The incoming year classes 1998 and 1999 are estimated to be strong.

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#### Management objectives:

EU, Faroe Islands, Iceland, Norway and Russia agreed to implement 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 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 adaptation should be at least a linear reduction in the fishing mortality rate from 0.125 at  $B_{pa}$  (5,000,000 tonnes) to 0.05  $B_{lim}$  (2,500,000 tonnes).
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 the objectives of this agreement are consistent with the precautionary approach.

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#### Advice on management:

**ICES advises that this fishery should be managed according to the agreed management plan corresponding to a catch of 710 000 t in 2003.**

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#### Rebuilding plan:

Incorporated to the agreed long-term management strategy in 2001.

**Precautionary Approach reference points (established in 1998):**

ICES considers that:	ICES proposes that:
$B_{lim}$ is 2.5 million t	$B_{pa}$ be set at 5.0 million t.
$F_{lim}$ not considered relevant for this stock	$F_{pa}$ be set at $F = 0.15$

**Technical basis:**

$B_{lim}$ : MBAL	$B_{pa}$ : $B_{pa} = B_{lim} * \exp(0.4 * 1.645)$ (ICES Study Group 1998)
$F_{lim}$ :	$F_{pa}$ : ICES Study Group 1998

**Catch forecast for 2003:**

Basis:  $F_w(2002) = 0.17$  (based on TAC constraint), Landings (2002) = TAC = 850 000 t; SSB(2002) = 5.3 million t, SSB (2003) = 5.8 million t

$F_w(2003)$	Multiplier	Catch (2003)	Landings (2003)	SSB (2004)
0.103		600	600	5,965
0.113		650	650	5,913
0.124		710	710	5,850
0.131		750	750	5,807
0.14		800	800	5,755
0.15		850	850	5,703

Weights in '000 t.

For 2002 landings of 850 000 t were assumed to correspond to the agreed TAC. In recent years the actual catch was close to the TAC, but in 2001 the catch was less than the TAC.

$F_w$  = weighted  $F$ , used in the management plan. Flat selection from age 8 onwards used.

**Medium- and long-term projections:**

The medium term view of the stock is more pessimistic than forecasted last year. The reason for this is that the 1999 year class is now estimated to be much lower than assumed last year.

**Comparison with previous assessment and advice:**

Last year the spawning stock estimate for 2001 was 6.1 million t. This year's estimate of the spawning stock in 2001 is 5.2 million t. The catch forecasted for 2003 is lower than the catch forecasted in 2001 for 2002. This is due to lower estimates of recruitment than was used earlier.

**Relevant factors to be considered in management:**

In spite of the strong 1998 and 1999 year classes, continued fishing under the present management agreement gives a low probability of falling below  $B_{lim}$  in the medium term, but a probability of about 50% of the spawning stock falling below  $B_{pa}$  (5.0 million t).

**Elaboration and special comment:**

The main catches from the fishery in 2001 were taken by Norway (495 000 t), Iceland (78 000 t), Russia (109 000 t)

and Faeroe Islands (34 000 t). Lesser catches were taken by a number of EU fleets (54 000 t). The fisheries in general follow closely the migration of the stock as it moves from the wintering and spawning grounds along the Norwegian coast to the summer feeding grounds in the Jan Mayen and international areas. The Norwegian fishery exploits the stock as it migrates to and remains on the wintering areas and during the spawning period. The Icelandic fishery takes place mainly in May and June and most catches are taken in international waters and the Jan Mayen EEZ. The main Russian catches are taken along the shelf region of the Norwegian EEZ in spring as the stock moves from the spawning grounds and also in August and September in the eastern part of the international area and in the Norwegian zone. The Faroese catches, taken mainly in spring and early summer, are from the Norwegian zone and from the Jan Mayen area. Most of the EU catches are taken in the international area and in the Norwegian zone.

A large increase in fishing effort, new technology and environmental changes contributed to the collapse of this stock around 1970. Recruitment failed when the SSB was reduced below 2.5 million t. In the years following the collapse the aim was to rebuild the spawning stock above this minimum limit. In order to reach this goal, fishing mortality was kept low. However, recruitment remained poor and

SSB increased only slowly until a very strong year class occurred in 1983. As this year class recruited, management between 1985 and 1993 aimed at restricting the fishing mortality to 0.05, although the actual  $F$  was much higher in some years. Year classes after 1983 were on average more than four times stronger than those produced between 1970 and 1982, and SSB continued to increase. Starting in 1989 a succession of above average to very strong year classes were produced, promoting full recovery of the SSB and allowing expansion of fisheries. Up to 1994, the fishery was almost entirely confined to Norwegian coastal waters. Since 1992 the coastal fishery has increased sharply. 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 a total catch exceeding 900 000 t. The fishery expanded further in 1996 and the annual level of the fishery was in the order 1.2-1.5 million t in the period 1996-2000. An international management agreement includes a TAC consistent with a maximum fishing mortality of  $F=0.125$  from 2002. A pre-agreed stock recovery strategy was introduced to the management agreement in 2001.

Juveniles and adults of this stock form an important part of the ecosystem in the Barents Sea and the Norwegian Sea. The herring has an important role as transformer of the plankton production to higher trophic levels (cod, seabirds and marine mammals). It is therefore important to facilitate a high production of the herring.

A report based on the distribution of herring over the summer feeding areas in 2002 by an international ICES co-ordinated survey will be available in September 2002.

#### Data and assessment:

Analytical assessment based on catch, survey data (acoustic surveys of adults and juveniles, larval index) and tagging data

#### Source of information:

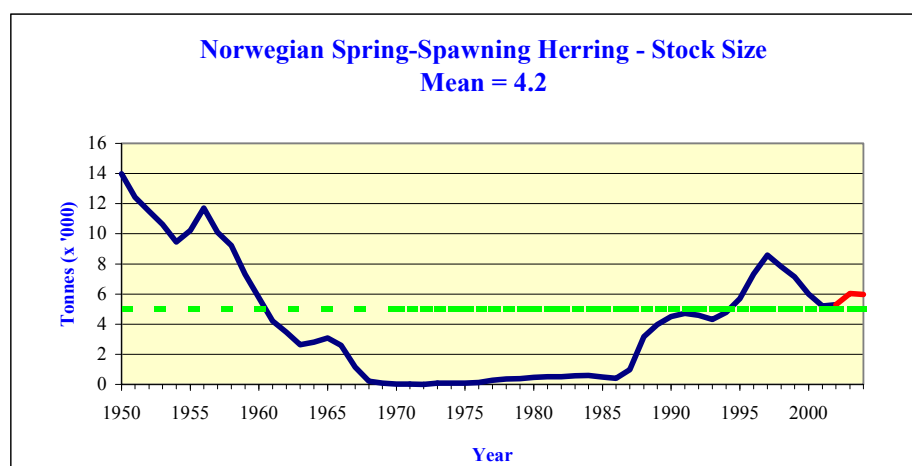
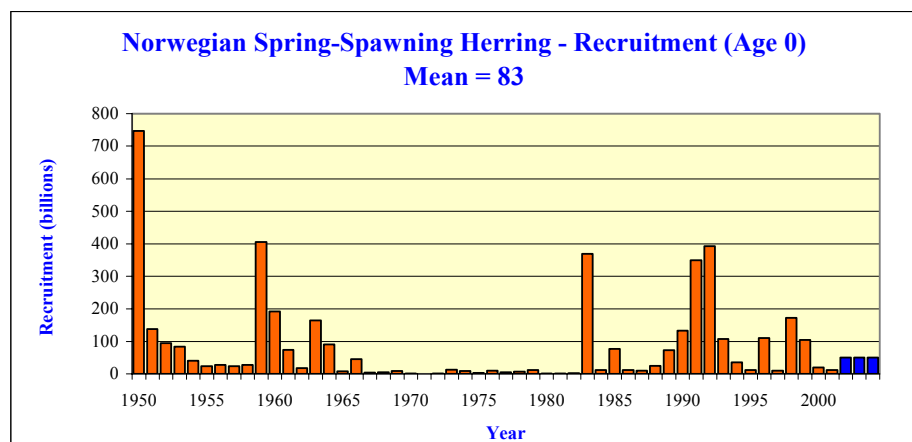
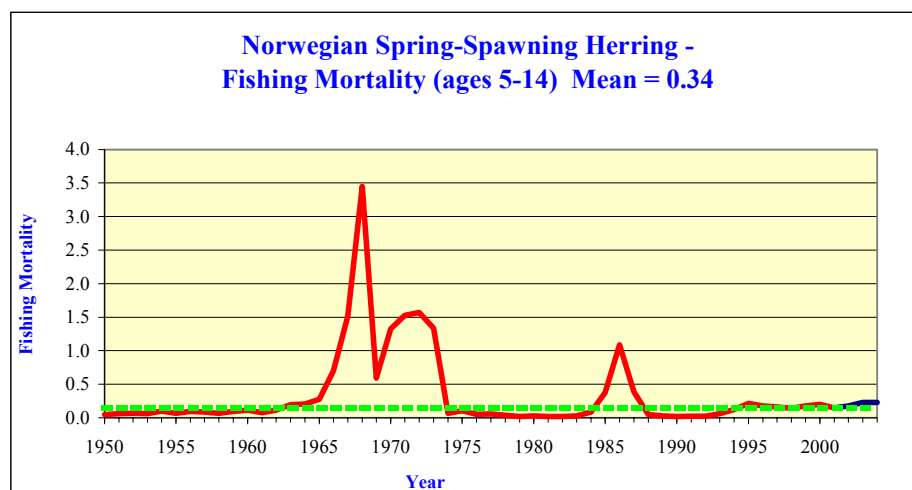
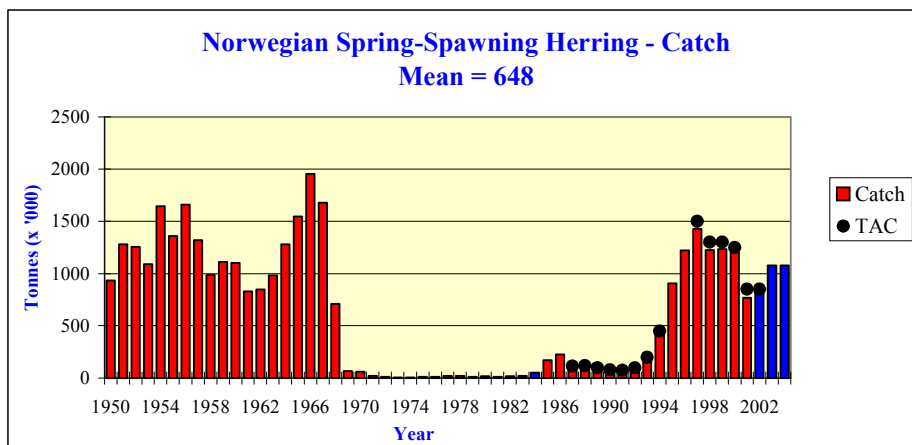
Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, 29 April – 8 May 2002 (ICES CM 2002/ACFM:19).

#### Catch data (Tables 3.1.7.a.1–3).

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	
2003	Do not exceed the harvest control rule	710		

<sup>1</sup>Autonomous TACs totaling 900 000 t; <sup>2</sup>Autonomous TACs totaling 1 425 000 t were set by April 1996. Weights in '000 t.





**Table 3.1.7.a.1** Total catch of Norwegian spring spawning herring (tonnes) since 1972. Data provided by Working Group members.

Year	Norway	USSR/ Russia	Denmark	Faroes	Iceland	Ireland	Nether- lands	Greenland	UK	Germany	France	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 <sup>1</sup>	495,036	109,054	24,038	34,170	77,693	-	6,439	-	12,230	1,588	-	9,818	770,066

<sup>1</sup> Preliminary, as provided by Working Group members.

**Table 3.1.7.a.2** Total catch of Norwegian spring spawning herring (tonnes) since 1972. Data provided by Working Group members.

Year	Norway	USSR/ Russia	Denmark	Faroes	Iceland	Ireland	Nether- lands	Green- land	UK	Germany	France	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	-	15,978	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 <sup>1</sup>													

<sup>1</sup> Preliminary, as provided by Working Group members.

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean Fw Ages 5-14
1950	747374656	13973473	933000	0.0510
1951	138271856	12440190	1278400	0.0662
1952	93898752	11481773	1254800	0.0680
1953	83577056	10613262	1090600	0.0605
1954	39702936	9445040	1644500	0.1046
1955	23753764	10209083	1359800	0.0687
1956	27477146	11716413	1659400	0.0966
1957	23650648	10092566	1319500	0.0893
1958	27810502	9220304	986600	0.0677
1959	405342656	7297327	1111100	0.0966
1960	191338608	5769169	1101800	0.1144
1961	73282680	4192520	830100	0.0767
1962	17712882	3464804	848600	0.1163
1963	164640160	2635437	984500	0.1967
1964	90556040	2795154	1281800	0.2063
1965	7932618	3067483	1547700	0.2775
1966	45349292	2595295	1955000	0.6998
1967	3582245	1145486	1677200	1.5174
1968	4638550	219026	712200	3.4514
1969	9607348	77541	67800	0.5946
1970	620670	30718	62300	1.3252
1971	209800	8231	21100	1.5272
1972	907351	1854	13161	1.5716
1973	12701698	74400	7017	1.3382
1974	8500675	85341	7619	0.0681
1975	2942588	91377	13713	0.1072
1976	10018746	145980	10436	0.0558
1977	5039343	283511	22706	0.0588
1978	6133163	354752	19824	0.0390
1979	12434718	385577	12864	0.0223
1980	1539331	468611	18577	0.0322
1981	1091881	502691	13736	0.0224
1982	2329740	501560	16655	0.0207
1983	369237184	572712	23054	0.0299
1984	11404527	597396	53532	0.0902
1985	77134728	495227	169872	0.3771
1986	11516681	414411	225256	1.0917
1987	9714410	990639	127306	0.3886
1988	24571120	3173305	135301	0.0472
1989	72537216	3964735	103830	0.0298
1990	132600400	4497853	86411	0.0212
1991	349603520	4725509	84683	0.0229
1992	392433184	4583487	104448	0.0268
1993	107313712	4316113	232457	0.0630
1994	34715184	4784792	479228	0.1289
1995	11482169	5684302	905501	0.2126
1996	109362248	7328347	1220283	0.1744
1997	10204600	8583621	1426507	0.1670
1998	172066692	7801115	1223131	0.1444
1999	104319503	7140983	1235433	0.1752
2000	19600858	5987621	1207201	0.2040
2001	12298016	5217729	770054	0.1481
2002		5288000		
Average	83001655	4179884	648031	0.3414

# North East Atlantic Mackerel

(combined Southern, Western and North Sea spawning components)

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



Marine Fisheries Services Division

## MFSD – ADVICE

ICES advice for this stock states that the fishing mortality in 2003 should on average be no more than  $F_{pa}$  (0.17). According to short term predictions made in 2002 this corresponds to landings in 2003 of no more than 542,000 t which would give a corresponding Irish quota of 60,600 t.

The management strategy for this stock is given in the EU Norway agreement, which states that the TAC for this stock can be based on a fishing mortality in the range of 0.15-0.20. The corresponding TAC's range from 482,000 t to 629,000 t.

MFSD considers that  $F_{pa}$  is suitable as a long term harvesting strategy for this stock, but that harvesting levels within the bounds of the EU Norway agreement in the short term are consistent with the precautionary approach.

MFSD reminds managers that the mackerel assessment is only calibrated every three years, and this can cause significant fluctuations in the perception of the recent level of SSB every three years. MFSD suggests that the management regime should be flexible to such fluctuations.

The STECF advice for this stock is in good agreement with that given by ICES.

MFSD agrees with the following ICES advice that:

- The NEA mackerel stock should be considered for a multi annual TAC in order to avoid large changes in TAC advice which can occur following the inclusion of fishery independent data every third year.
- 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 1 February-31 July;
- The 30 cm minimum landing size at present in force in Sub-area IV should be maintained;
- There should be observers placed on board all vessels in fisheries where discarding of mackerel is

perceived to be a problem.

MFSD also point out that discarding of small mackerel may be a problem in the directed fisheries for horse mackerel that have developed in and around the "Cornwall Box". Fishing for mackerel in this box has been prohibited for a number of years and it is important that this management measure should be maintained.

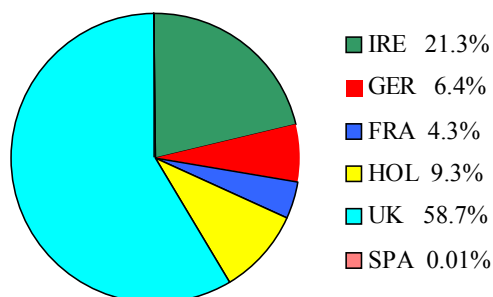
## STATE OF THE STOCK

- There is no concern about the state of this stock at present. This year's assessment indicated that the recent level of the stock is significantly lower than predicted in the previous years. This is primarily caused by the inclusion of the new data point from the 2001 egg survey. This difference may reflect the uncertainty in the assessment which is only calibrated every three years with a new egg survey data point. This is discussed in more detail in the assessment section.
- Catches in 2001 were over 677,000 t, which was about 10,000 t higher than the catch taken in 2000. Catches since 1989 have fluctuated between 585,900 t and 825,000 t. The catch in 2001 was very close to the agreed TAC (670,000 t).
- In 2001 fishing mortality was estimated to be about 0.2 which is above the proposed  $F_{pa}=0.17$ . Fishing mortality on the stock was high in the early 1990's but has decreased since 1994 when it was at the highest value (0.32).
- A number of good year classes have recruited to the stock in past years – particularly those of 1993 and 1996 year class. However the 2000 year class appears to be very weak and may be less than half the average. Recent year classes are poorly estimated and it is important to remember that the stock predictions are heavily dependent on these.
- The current assessment shows that the spawning stock has been increasing since 1994 and in 2001 was estimated to be over 3.4 million tonnes. This is the highest since 1976 and well above the proposed  $B_{pa}=2.3$  million tonnes.
- The prognosis indicates that the current level of fishing mortality is above what is considered sustainable in the long term. Assuming a weak 2000 year class (which should constitute a significant proportion of the stock in 2003), the SSB will decline to 2.86 million tonnes in 2004 under the present fishing effort ( $F=0.20$ ). The re-evaluation of the level of the SSB trajectory by the 2002 assessment suggests that catches will need to be reduced to 542,000 t in 2003 to bring harvesting levels in line with sustainable levels.



## CURRENT MANAGEMENT

- There are 3 agreements that produce the overall TAC for this stock 1)-Coastal states agreement. 2)-NEAFC agreement and 3)-EU-Norway agreement in which Swedish quota in IIIa is agreed. In addition the EU produces an autonomous TAC for VIIIc and IXa from the EU quota. Since 2001 these agreements cover all the areas in which mackerel is fished.
- There is a defined management strategy for the stock between EU, Norway and Faroe Is. In 1999 it was agreed that *“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 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 the 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 adaptations 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”.*
- The total TAC set for 2002 was 683,365 t. The EU TAC was 430,576 t including the southern areas and the Irish share of the EU quota was 73,597 t (17 %) of which only 22,890 t may be fished from 1 October to 15 February in EU waters of ICES Division IVa.



## MFSD – ECONOMIC COMMENTS

- The Irish catch in 2001 was about 70,400 t which was valued at €33.4 million.
- The value of the Irish quota in 2002 is about €35 million.
- In terms of economics this is the most important fishery for many of the pelagic trawlers operating from ports from Donegal to Cork. It is also extremely important to the processing industry in these areas. In recent years a large proportion of the catches are landed in Norwegian and Scottish ports. Large mackerel (> 600 g) command very high prices on the Japanese markets

## ADDITIONAL INFORMATION

1. The historical data set for NEA mackerel was examined and revised in 2002 so that a full set of catch in numbers and tonnes and mean weights at age were available to the assessment for the period 1972 to 2001. Previously only data from 1984 to the most recent year were available.
2. The quality of this assessment has improved in recent years and the time series is now extended to 1972. There is considerable uncertainty on the abundance of the youngest year class and the predictions are heavily dependent on these. When the new SSB index from the egg surveys was applied to the assessment in 2002, the level of the SSB trajectory changed from the previous assessment in 2001. However the trends in the stock development were not significantly different.
3. The total catch in 2001 was over 676,000 t while the Irish catch was about 70,400 t
4. The fishery is dominated by Norway, United Kingdom (Scotland), Ireland and Russia. The main Irish catches are taken by refrigerated sea water (RSW) vessels and freezer trawlers. The Scottish fleet has changed almost completely from purse seines to pair trawling.
5. The problem of misreporting of catches in this fishery – mainly between Divisions IVa and VIa, has re occurred after an absence of 2 years. The reasons for this may be due to separate quota restrictions on Scottish vessels operating in IVa and VIa and the early migration of the stock into VIa. There is very little information on “unallocated catches” (i.e. catches above the quota)
6. There have been reports of discards of small and medium mackerel by freezer trawlers operating in the North Sea and in the Norwegian Sea. Mackerel are discarded to ensure that the major portion of the vessel catch is made up of mackerel that are over 600 g. There have also been reports of substantial discards of mackerel by freezer trawlers operating off the west and south west of Ireland during the horse mackerel fishery. Little is known about mackerel discards from non directed fisheries such as the horse mackerel fishery in Divisions IVb, IVc and VIIe-f. Discards of small mackerel in the directed fisheries for horse mackerel carried around the “Cornwall Box” and in the English Channel may also be a problem. The reported landings may therefore underestimate the catches in certain areas.
7. Irish sampling of this stock is supported through the EC funded sampling programme that is required under the Data Collection Regulation 1543/2000 and 1639/2001.
8. There are very large differences in the length composition and the age compositions of the catches that come from the different fisheries exploited by Irish vessels. Catches from the northern and western areas usually contain larger and older fish than those from south of Ireland and the English Channel. In 2001 the northern and western catches were dominated by 3-7

year old but fish as old as 15 were also present. Most of these fish were between 32 cm and 37 cm. On the other hand mackerel from the southern area were mainly 1-4 year old and between 27 cm to 33 cm.

9. The Irish components of the triennial egg survey were carried out on the *R.V. Celtic Voyager* and the *F.V. Emerald Dawn*. An additional egg survey funded by the fishing industry was carried out in 2002 on the *MFV Atlantean*. This egg survey explored if there was any egg production outside the standard area. The results showed that, although there was no significant egg production to the west of the standard area, in future the egg survey area should cover at least as far north as 60N.Lat.
10. Results from tagging studies carried out by Norway indicate increased mortality on mackerel over the past 3 years.
11. The western component of the combined North East Atlantic mackerel stock is exploited by the Irish fleet.
12. The results of the 2000 Irish West coast ground fish survey were included in the examination of recruitment.

## MFSD SPECIAL COMMENTS

### 1 Egg Survey

The preliminary report on the 2001 egg survey presented to the mackerel working group in last year (in 2001) indicated a 20% reduction in the egg production for NEA mackerel. Further information from the Mackerel Egg Working Group presented to the Mackerel Assessment Working group in September 2002 indicated the following;

- There was no net change in realised fecundity from 1998 to 2001. Therefore the reduction in the egg production is directly translated into a decrease in the SSB.
- Studies on fecundity indicated a latitudinal effect whereby fish were more fecund in the south. However the magnitude of the increase in the fecundity in the southern component between 1998 and 2001 was not reflected in the western area. This raised questions on the appropriateness of using fecundity samples from the southern area which had been taken before the spawning season and were predominantly first time spawning fish. If samples had been taken at peak spawning they would have been from much larger fish.
- As a result of the increase in fecundity the SSB of the southern component was reduced from 800,000 t in 1998 to 371,000 t in 2001.
- An egg survey was carried out in the North Sea in 2002. This survey was limited in temporal and spatial coverage but the results indicate that the North Sea component may have increased from 60,000 t in 1999 to 200,000 t in 2002.
- The increased SSB from the North Sea component in 2002 was not included in any index of the 2001 SSB.

Despite much discussion relating to other problems such as country effects in fecundity samples, problems in egg identification and sample sorting, doubts as to the validity of the fecundity estimate for the southern component, etc. the Working Group decided to use the SSB estimate from the 2001 egg survey and make comment that all these problems contributed to the 0.3 CV.. It was also decided to stress that a management regime that is tolerant to perceived fluctuations in SSB is required to manage this stock under the current situation of fishery independent data availability.

An egg survey carried out by Ireland showed no significant egg production outside the standard survey area. On the basis of this work a recommendation was added to the report that future international egg surveys should adequately cover the survey area to at least 60N Lat.

### 2 Fishery Independent surveys

Given the current assessment problems relating to the availability of only one fishery independent index on a three year cycle there is an increasing effort being placed on finding alternative fishery independent surveys for mackerel, particularly acoustic surveys. There is now a widely used target strength measurement for mackerel and investigations are continuing on using multi frequency echograms to aid in the detection and measurement of mackerel shoals. Scotland and Norway are currently carrying out an annual acoustic survey in December on the Viking Bank (where a large proportion of the stock over winters) and Spain have partitioned mackerel traces from their sardine surveys to provide estimates of mackerel stock size in Divisions VIIIb and VIIIc. Serious consideration should be given to commence Irish mackerel acoustic surveys on a more formal basis and to co operate with Scotland and Norway in this respect. The new research vessel *R.V Celtic Explorer* would seem an ideal platform to carry out these surveys. There would also seem to be some potential for Ireland to adapt the present herring acoustic surveys in the Celtic Sea and VIaS to obtain information on mackerel in this area..

The Russians have been experimenting with an airborne laser based system (Leidar) to detect and estimate mackerel shoals and have worked conjointly with the Norwegians in Div. IIa

### 3 Discards

The major proportion of mackerel discards come from the freezer trawler fleets and vessels fishing horse mackerel in juvenile mackerel areas. There are some simulation studies in progress to examine the effectiveness of the Cornwall box as a means of protecting juvenile mackerel. Some spatial modelling has been carried out by Imperial College London, to examine the effects of different management options for NEA mackerel. These options are based on a theoretical model of the migration of adult mackerel and the distribution of juveniles. One of the options examined is to close other juvenile areas such as northwest Ireland.

Fishery managers in Ireland should therefore be aware that, if the quarter 4 fishery for mackerel off Donegal in which large proportions of juvenile mackerel were taken some years ago is re-established, then a case could be made to close this area.

## 4 Recruitment

One important outcome of the 2002 assessment was the indication of a very weak 2000 year class.

This was based on the low catches of this year class in 2001. This information was also apparent in the recruit survey index in 2000 (recruit surveys are not used in the assessment). The 2000 year class appears to be the third weakest observed in the time series, and about half the strength of the average year class. This observation strongly affects the short term predictions as the 2000 year class comprise what should be the most numerous age group in the catches in 2003

## 5 Assessment

Given that only 1995, 1998 and 2001 were considered as comparable estimates of the size of the SSB of NEA mackerel, only these three index points were used in the preliminary assessments, keeping the same options as last year (with the exception of shortening the period of separable constraint to 7 years). However, treating the egg surveys as a relative index of SSB (as last year) as opposed to absolute, meant that catchability had to be estimated (a parameter which relates the SSB from the survey estimates to that from the catch at age data). With the three points sitting in a cloud (i.e. not in a straight line), this meant that there was very poor definition in the final solution. This was reflected in a relatively flat SSQ (sum of squares surface) and highly skewed statistics on the model fit, as well as a marked change in the catchability estimate from last year. When the assessment was tried for the western component (where there are more egg surveys available) the estimate of catchability was similar to last years assessment (i.e. around 1.0) and the statistics looked much better. This indicates that catchability had not changed for the greater component of the stock between the 1998 and 2001 surveys. It was on this basis that the WG decided to include the 1992 egg survey in the 2002 NEA mackerel assessment and to treat all the index points as absolute (i.e. to assume the catchability as 1.0). This run still changes the SSB trajectory of the past few years (since 1998) indicating a lower stock size, but a trajectory now looks very flat since 1977. Thus the assessment indicates that the stock has not declined over the history of its exploitation but is fluctuating between 2.5 and 3.5mt.

The final assessment was a compromise under difficult circumstances, but is still far from perfect. The statistics of the model fit from the final run are still highly skewed, indicating that the model has been “forced” through a mismatch between the survey and catch information. It can be seen for example that the stock trajectory no longer rises in the period around 1998, which is what the past 3 mackerel

working groups or so have indicated (albeit with some caution). The working group were acutely aware of sending the wrong message from an assessment which is too sensitive to noise, and this is the crux of the issue this year. The working group believed that the neither the very large 1998 SSB estimate nor the much lower 2001 estimate may be reflections of the actual change in SSB in the stock over this period. The treatment of the model in the 2002 assessment is compromise between an effort to dampen this “perceived noise”, and an effort to ensure the statistical appropriateness of the model fit.

The advice gives a TAC which is reduced by 20% on that for the previous year. This must seem a bit strange to anyone who has briefly looked at the assessment and concluded that the stock has remained very stable over the past 25 years or so. It is partly for this reason that MFSD stresses that “*managers should understand that fluctuations in SSB estimates are likely and that any management regime should be robust to such fluctuations on at least a three year cycle.*”

## ICES ADVICE

### 3.12.3.a

#### State of stock/exploitation:

The combined stock is currently harvested outside safe biological limits. The spawning stock biomass in 2002 is estimated to be well above  $B_{pa}$ , but the fishing mortality in 2001 is above  $F_{pa}$ . The North Sea component remains severely depleted.

#### Management objectives:

The agreed record of negotiations between Norway, Faeroe 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.”*

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 optimise long-term yield and at the same time result in a low risk for the stock to decrease below  $B_{pa}$ . If  $F$  on average is kept below 0.17, ICES regards the management plan as meeting precautionary criteria.

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
There is no biological basis for defining $B_{lim}$	$B_{pa}$ be set at 2.3 million t
$F_{lim}$ is 0.26, the fishing mortality estimated to lead to potential stock collapse.	$F_{pa}$ be set at 0.17. This $F$ is considered to provide approximately 95% probability of avoiding $F_{lim}$ , taking into account the uncertainty in the assessments.

#### Technical basis:

	$B_{pa} = B_{loss}$ in Western stock raised by 15%: = 2.3 million t.
$F_{lim} = F_{loss} = 0.26$	$F_{pa} = F_{lim} \times 0.65$ . $F_{0.1} = 0.17$

#### Advice on management:

ICES advises a fishing mortality in 2003 of no more than  $F_{pa}$  (0.17), corresponding to landings in 2003 of less than 542 000 t. ICES advises that any agreed TAC should cover all areas where North-East Atlantic mackerel are fished.

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 1 February–31 July.
- The 30 cm minimum landing size at present in force in Sub-area IV should be maintained.

#### Relevant factors to be considered in management:

Egg surveys were carried out in the western and southern spawning areas during February–July 2001 and in the North Sea spawning area in June 2002. The egg survey SSB estimates in 2001 of both the Western and the Southern area are lower than in 1998. The 2002 egg survey in the North Sea with limited spatial and temporal coverage indicates a higher egg production in the North Sea area than in 1999 due to a relatively strong 1999 year class.

The advised TAC for 2003 is lower than the advice for 2002. Last year ICES indicated that the catch projections for 2002 could be too optimistic. This comment was based on the observation that preliminary information from the egg surveys, carried out in 2001, showed a decline in both the Western and Southern area indicating that the spawning stock could have been overestimated. This preliminary information has subsequently been confirmed. In the present assessment where this new egg survey information was used the estimate of the stock size is lower and the estimate of fishing mortality is higher compared to previous assessments.

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 by-catch. No data on the actual size of mackerel by-catch are available, but the reported landings of mackerel in Divisions IIIa and IVb,c from 1997 onwards might seriously under-estimate catches due to discarded by-catch.

Closure of Division IVa for fishing during the first half of the year was recommended for several years. This was based on the perception that the western mackerel entered the North Sea in July/August, and stayed 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 1<sup>st</sup> February. This was adopted for the 1999/2000 and the 2000/2001 fishing season. Misreporting from IVa to VIa occurred again in 2001. The reasons this misreporting in 2001 are unclear but are not thought to be linked to a change in the timing of the migration to spawning areas.

For mackerel, fishery independent data of the stock size becomes available only once every 3 year from egg-surveys. In the 2 years following the most recent egg-survey, the assessment is an extrapolation based on catch at age and landing data only. Inclusion of a new independent data point may result in quite large revisions of the stock size, fishing mortality and consequently catch predictions and TAC advice. In order to avoid large changes in TAC advice, ICES is investigating whether NE Atlantic mackerel is a suitable candidate to be managed by a multi-annual TAC. The spawning stock has been stable and well above  $B_{pa}$  over a long period. Also many age groups are well represented in the stock and annual fluctuations in recruitment are moderate. ICES has deferred from providing multi-annual advice this year because, it did not complete its work to evaluate the risks associated with specific annual TACs, but intends to consider the provision of multi-annual advice in future.

#### The Mackerel Box

A review of the utility of the mackerel box was undertaken. The review concluded that the loss of potential

yield and the increased risk to the spawning stock of the NEA mackerel resulting from an opening of the box should be avoided. Consequently, the mackerel box should remain closed to targeted mackerel fishing. This is consistent with previous advice.

ICES is aware that juvenile fish are sometimes taken in large quantities in other areas of the NEA mackerel stock distribution and is continually monitoring the situation. ICES will recommend management measures for those areas if appropriate.

#### Catch forecast for 2003:

Basis:  $F(2002) = F(99-01, \text{unscaled}) = F_{sq} = 0.20$  ; Landings (2002) = 649 SSB(2002) = 3080

F (2003)	Basis	SSB (2003)	Landings (2003)	Landings (2003) N	Landings (2003) S	SSB (2004)
0.15	Lower level of agreement by EU, Norway and Faroe	3007	482	452	30	3037
0.17	$F = F_{pa}$	2986	542	508	34	2971
0.18		2975	568	533	35	2941
0.19		2964	597	560	37	2909
0.20	$F_{sq}$ = upper level of agreement by EU, Norway and Faroe	2954	629	590	39	2875

Weights in '000 t.

**N:** Northern area comprising the Western areas, North Sea, Skagerrak and Norwegian Sea (I, IIa, IIIa, IVa, Vb, VI, VII, VIIIa,b,d, e); catches in the international zone in IIa are included.

**S:** Southern area (VIIIc, IXa).

Shaded scenarios considered inconsistent with the precautionary approach.

The catches are allocated to areas according to the proportion of catch-at-age by area in recent years (1998-2000). This forecast is based on the assumption of no change in the spatial distribution of the population and stable fishing mortality levels.

The mid-year prediction for 2002 is based on  $F_{sq}$ .

#### Medium- and long-term projections:

No medium- or long-term projections were carried out.

#### Comparison with previous assessment and advice:

This year's assessment indicates that the recent level of the stock is significantly lower than predicted in the previous years. However, the spawning stock remains well above  $B_{pa}$ , and is the largest in the time-series since 1977. The change in perception of recent SSB level is mainly caused by the inclusion of the 2001 egg survey biomass estimate, which required a change of a number of model parameter settings. However, comparative assessments performed with different models resulted in similar SSB levels. This has also led to higher estimates of fishing mortalities and lower estimates of recruitments in recent years. These differences in the stock perception may reflect the uncertainty in the assessment, which was remarked by ICES in last year's advice.

#### Elaboration and special comment:

No independent information is available on the most recent year classes before they are fully recruited to the fishery. In addition, the assessment model is sensitive to the most recent SSB estimate from the egg surveys leading to changes in the perception the stock. Therefore a management regime, which is capable of incorporating this uncertainty in the advice is required. Specifically the management regime should consider the possibility that poor year classes are not recognised until several years later, and that the recent perception of the stock is subject to variability.

Little is known about discards in the mackerel fishery; however, sampling for discards has improved. ICES continues to recommend that observers should be placed on vessels in order to estimate discards in those fisheries where discard-ing of mackerel is perceived to be a problem.

The assessment data set on commercial landings was extended in 2002, including now the data series from 1972 onwards (previously it started in 1984).

#### 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 area 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 at present 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 where 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**:

North-East Atlantic Mackerel			
Distributed and fished in ICES Sub-areas 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 Sub-Areas VI, VII, VIII a,b,d,e). This component currently comprises 85% of the entire North East Atlantic Stock (historically 61-85% (1972-2002)). 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 Sub-Area IV and Division IIIa). Current knowledge of the state of the spawning components is summarised 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.

**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 egg survey in the North Sea with limited spatial and temporal coverage indicates a higher egg production in the North Sea area than in 1999 due to a relatively strong 1999 year class. However, this component is still considered to be severely depleted and outside safe biological limits.

**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 by-catch 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 are currently at the same level. 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

#### Combined Assessment:

Analytic ICA assessment is based on catch numbers at age for the period 1972 - 2001 and egg survey estimates of SSB from 1992, 1995, 1998 and 2001. Exploratory assessment using different assessment models gave comparable results.

#### Source of information:

Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, 10-19 September 2002 (ICES CM 2003/ACFM:07).

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

	Fish Mort Ages 4-8	Yield/R	SSB/R
Average Current	0.199	0.148	0.723
$F_{max}$	0.656	0.171	0.298
$F_{0.1}$	0.188	0.146	0.749
$F_{med}$	0.204	0.149	0.712

**Catch data for combined area (Tables 3.12.3.a.1-6):**

Year	ICES Advice	Predicted catch corresp. to advice	Total Agreed TAC <sup>4</sup>	Official landings	Disc. <sup>1</sup> slip	ACFM landings <sup>2</sup>
1987	Given by stock component		442	589	11	655
1988	Given by stock component		610	621	36	676
1989	Given by stock component		532	507	7	586
1990	Given by stock component		562	574	16	626
1991	Given by stock component		612	599	31	668
1992	Given by stock component		707	723	25	760
1993	Given by stock component		767	778	18	825
1994	Given by stock component		837	792	5	823
1995	Given by stock component		645	660	8	756
1996	Significant reduction in F	-	452	493	11	564
1997	Significant reduction in F	-	470	434	19	570
1998	F between 0.15 and 0.2	498	549	647	8	667
1999	F of 0.15 consistent with PA	437	562	595	n/a	609
2000	F=0.17: F <sub>pa</sub>	642	612	579	2	667
2001	F=0.17: F <sub>pa</sub>	665	670	620	1	676
2002	F=0.17: F <sub>pa</sub>	694	683			
2003						

<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>4</sup>All areas except some catches in international waters in II. n/a=not available. Weights in '000 t.

**Catch data for western component (Tables 3.12.3.a.4 and 7):**

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC <sup>1</sup>	Disc. slip	ACFM landings <sup>2</sup>
1987	SSB = 1.5 mill. t; TAC	380	405	11	615
1988	F = F <sub>0.1</sub> ; TAC; closed area; landing size	430	573 <sup>1</sup>	36	628
1989	Halt SSB decline; TAC	355	495 <sup>1</sup>	7	567
1990	TAC; F = F <sub>0.1</sub>	480	525 <sup>1</sup>	16	606
1991	TAC; F = F <sub>0.1</sub>	500	575 <sup>1</sup>	31	646
1992	TAC for both 1992 and 1993	670	670 <sup>1</sup>	25	742
1993	TAC for both 1992 and 1993	670	730 <sup>1</sup>	18	805
1994	No long-term gains in increased F	831 <sup>3</sup>	800 <sup>1</sup>	5	798
1995	20% reduction in F	530	608 <sup>1</sup>	8	729
1996	No separate advice	-	422 <sup>1</sup>	11	529
1997	No separate advice	-	416 <sup>1</sup>	19	529
1998	No separate advice	-	514 <sup>1</sup>	8	623
1999	No separate advice	-	520 <sup>1</sup>	0	565
2000	No separate advice	-	573 <sup>1</sup>	2	631
2001	No separate advice	-	630 <sup>1</sup>	1	634
2002	No separate advice	-	642 <sup>1</sup>		
2003					

<sup>1</sup>TAC for mackerel taken in all areas VI, VII, VIIIa,b,d, Vb, IIa, IIIa, IVa. <sup>2</sup>Landings and discards of Western component; includes catches of North Sea component. <sup>3</sup>Catch at Status quo F. Weights in '000 t.

**Catch data for North Sea component (Tables 3.12.3.a.3 and 8):**

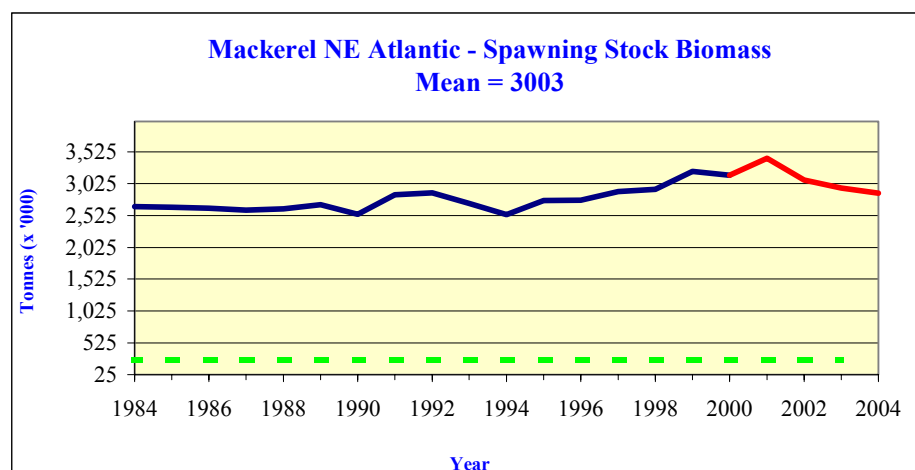
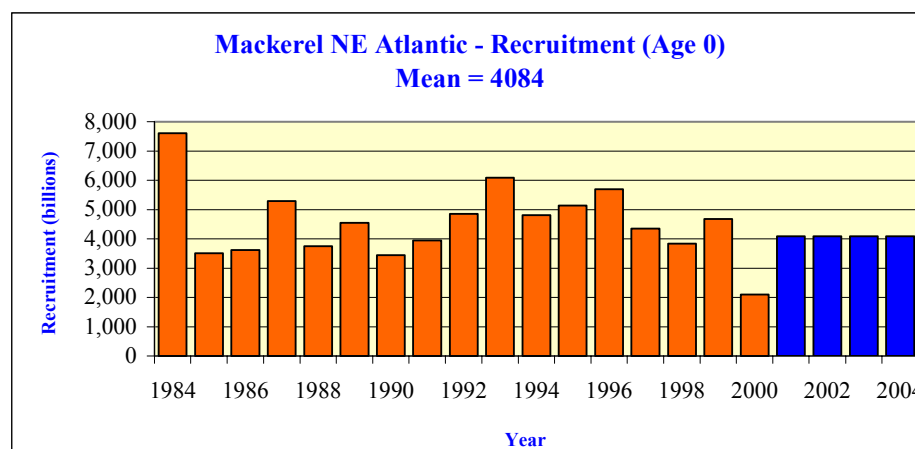
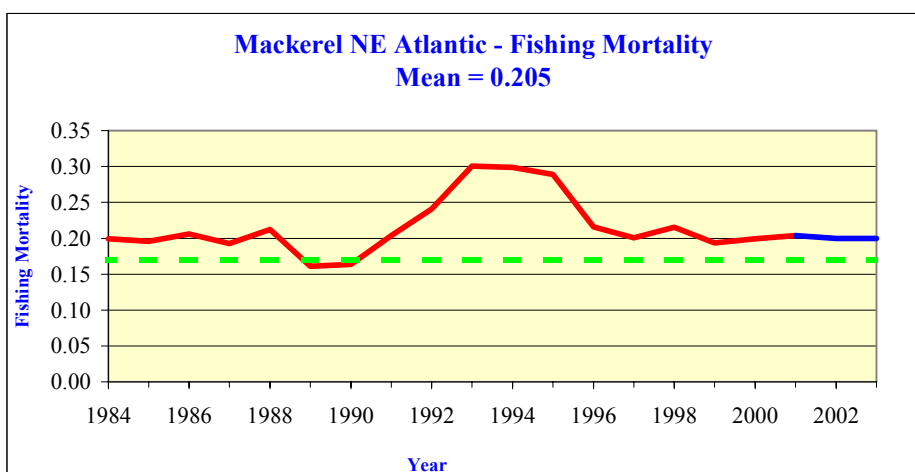
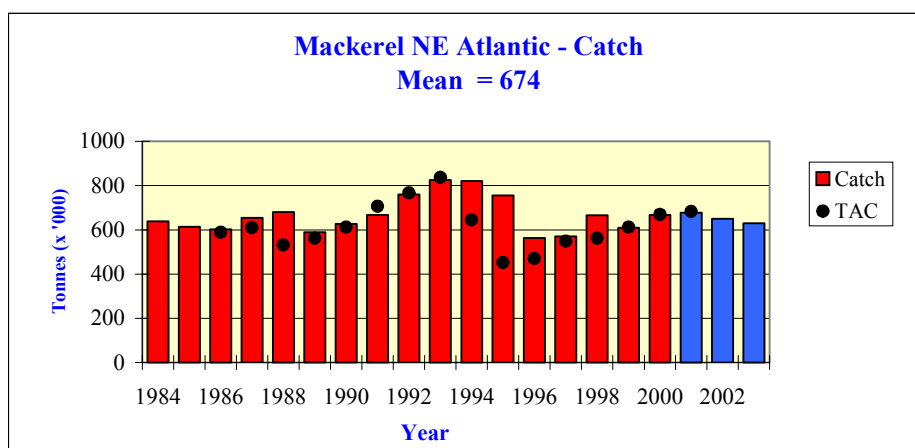
Year	ICES Advice	Predicted catch corresp. to advice <sup>1</sup>	Agreed TAC <sup>2</sup>	ACFM landings <sup>3</sup>
1987	Lowest practical level	LPL	55	3
1988	Closed areas and seasons; min. landing size; by-catch regulations	LPL	55	6
1989	Closed areas and seasons; min. landing size; by-catch regulations	LPL	49.2	7
1990	Closed areas and seasons; min. landing size; by-catch regulations	LPL	45.2	10
1991	Closed areas and seasons; min. landing size; by-catch regulations	LPL	65.5	- <sup>4</sup>
1992	Closed areas and seasons; min. landing size; by-catch 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				

<sup>1</sup>Sub-area IV and Division IIIa. <sup>2</sup>TAC for Sub-area 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. Weights in '000 t.

**Catch data for southern component (Table 3.12.3.a.5):**

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC <sup>1</sup>	ACFM landings
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		41.1	
2003				

<sup>1</sup>Division VIIIc, Sub-Areas IX and X, and CECF Division 34.1.1 (EU waters only). Weights in '000 t.



**Table 3.12.3.a.1** Catches of MACKEREL by area. Discards not estimated prior to 1978. (Data submitted by Working Group members.)

Year	Sub-area VI			Sub-area VII and Divisions VIIa, b,d,e			Sub-area IV and III			Sub-area I, II & Divs. Vb <sup>1</sup>		Divs. VIIIc, IXa		Total	
	Landings	Discards	Catch	Landings	Discards	Catch	Landings	Discards	Catch	Landings		Landings		Landings	Discards
1969	4,800		4,800	47,404		47,404	739,175		739,175	7		42,526		833,912	0
1970	3,900		3,900	72,822		72,822	322,451		322,451	163		70,172		469,508	0
1971	10,200		10,200	89,745		89,745	243,673		243,673	358		32,942		376,918	0
1972	13,000		13,000	130,280		130,280	188,599		188,599	88		29,262		361,229	0
1973	52,200		52,200	144,807		144,807	326,519		326,519	21,600		25,967		571,093	0
1974	64,100		64,100	207,665		207,665	298,391		298,391	6,800		30,630		607,586	0
1975	64,800		64,800	395,995		395,995	263,062		263,062	34,700		25,457		784,014	0
1976	67,800		67,800	420,920		420,920	305,709		305,709	10,500		23,306		828,235	0
1977	74,800		74,800	259,100		259,100	259,531		259,531	1,400		25,416		620,247	0
1978	151,700	15,100	166,800	355,500	35,500	391,000	148,817		148,817	4,200		25,909		686,126	50600
1979	203,300	20,300	223,600	398,000	39,800	437,800	152,323	500	152,823	7,000		21,932		782,555	60600
1980	218,700	6,000	224,700	386,100	15,600	401,700	87,931		87,931	8,300		12,280		713,311	21600
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	45516
1982	340,400	4,100	344,500	257,800	20,800	278,600	35,033	450	35,483	37,600		21,076		691,909	25350
1983	320,500	2,300	322,800	235,000	9,000	244,000	40,889	96	40,985	49,000		14,853		660,242	11396
1984	306,100	1,600	307,700	161,400	10,500	171,900	43,696	202	43,898	98,222		20,208		629,626	12302
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	8191
1986	104,100		104,100	128,499		128,499	236,309	7,431	243,740	101,000		24,789		594,697	7431
1987	183,700		183,700	100,300		100,300	290,829	10,789	301,618	47,000		22,187		644,016	10789
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	35566
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	7090
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	15600
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	30700
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	25000
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	18180
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	5370
1995	145,626	74	145,700	117,883	6,917	124,800	321,474	730	322,204	135,496		27,600		748,079	7721
1996	129,895	255	130,150	73,351	9,773	83,124	211,451	1,387	212,838	103,376		34,123		552,196	11415
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	18864
1998	110,141	71	110,212	105,181	3,206	108,387	264,947	4,735	269,682	134,219		44,164		658,652	8012
1999§	98,666		98,666	93,821		93,821	299,798		299,798	72,848		43,796		608,929	0
2000*	150,927	1	150,928	113,520	1,918	115,438	271,997	165	272,162	92,557		36,074		665,075	2084
2001*	113,234	83	113,317	141,012	1,081	142,093	311,979	24	312,003	67,097		43,198		676,520	1,188
															677,708

\*Preliminary.

<sup>1</sup>For 1976–1985 only Division IIa, Sub-area I, and Division IIb included in 2000 only

§ Discards reported as part of unallocated catches

NB Figures in gray are revised, the revisions are documented in the SGDRAMA annex to this report



**Table 3.12.3.a.2** Catches (t) of MACKEREL in the Norwegian Sea (Division IIa) and off the Faroes (Division Vb). (Data submitted by Working Group members.)

Country	1984	1985	1986	1987	1988	1989	1990
Denmark	11,787	7,610	1,653	3,133	4,265	6,433	6,800
Faroe Islands	137				22	1,247	3,100
France		16				11	
Germany, Fed. Rep.			99		380		
German Dem. Rep.			16	292		2,409	
Norway	82,005	61,065	85,400	25,000	86,400	68,300	77,200
Poland							
United Kingdom			2,131	157	1,413		400
USSR	4,293	9,405	11,813	18,604	27,924	12,088	28,900
Discards							2,300
Total	98,222	78,096	101,112	47,186	120,404	90,488	118,700

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Denmark	1,098	251			4,746	3,198	37	2,090	106	1,375	7
Estonia		216		3,302	1,925	3,741	4,422	7,356	3,595	2,673	219
Faroe Islands	5,793	3,347	1,167	6,258	9,032	2,965	5,777**	2,716	3,011	5,546	3,272
France	23	6	6	5	5	0	270				
Germany						1					
Iceland						92	925	357			
Ireland									100		
Latvia		100	4,700	1,508	389	233					
Lithuania										2,085	
Netherlands						561			661		
Norway	76,760	91,900	110,500	141,114	93,315	47,992	41,000	54,477	53,821	31,778	21,971
Russia		42,440	49,600	28,041	44,537	44,545	50,207	67,201	51,003	49,100*	41,566
United Kingdom	514	802		1,706	194	48	938	199	662		54
USSR <sup>2</sup>	13,631 <sup>2</sup>										
Poland							22				
Sweden											8
Misreported (IVa)				-	-18,647			-177	-40,011		
Misreported (VIa)				109,625					-100		
Discards											
Total	97,819	139,062	165,973	72,309	135,496	103,376	103,598	134,219	72,848	92,557	67,097

<sup>2</sup>Russia.

\*Includes small bycatches in Sub area I & IIb

\*\* Faroese catch revised from previously reported 7,628

**Table 3.12.3.a.3** Catch (t) of MACKEREL in the North Sea, Skagerrak, and Kattegat (Subarea IV and III).  
(Data submitted by Working Group members).

Country	1986	1987	1988	1989	1990	1991	1992	1993
Belgium	49	14	20	37		125	102	191
Denmark	23,368	28,217	32,588	26,831	29,000	38,834	41,719	42,502
Estonia							400	
Faroe Islands				2,685	5,900	5,338		11,408
France	1,200	2,146	1,806	2,200	1,600	2,362	956	1,480
Germany, Fed. Rep.	1,853	474	177	6,312	3,500	4,173	4,610	4,940
Iceland								
Ireland				8,880	12,800	13,000	13,136	13,206
Latvia							211	
Netherlands	1,949	2,761	2,564	7,343	13,700	4,591	6,547	7,770
Norway	50,600	108,250	59,750	81,400	74,500	102,350	115,700	112,700
Sweden	1,300	3,162	1,003	6,601	6,400	4,227	5,100	5,934
United Kingdom	559	19857	1,002	38,660	30,800	36,917	35,137	41,010
USSR (Russia from 1990)								
Romania								
Misreported (IIa)								
Misreported (VIa)	148,000	117,000	180,000	92,000	126,000	130,000	127,000	146,697
Unallocated	7,391	8,948	29,630	6,461	-3,400	16,758	13,566	-
Discards	7,431	10,789	29,776	2,190	4,300	7,200	2,980	2,720
<b>Total</b>	<b>243,700</b>	<b>301,618</b>	<b>338,316</b>	<b>281,600</b>	<b>305,100</b>	<b>365,875</b>	<b>367,164</b>	<b>390,558</b>

Country	1994	1995	1996	1997	1998	1999	2000 <sup>1</sup>	2001
Belgium	351	106	62	114	125	177	146	97
Denmark	47,852	30,891	24,057	21,934	25,326	29,353	27,720	21,680
Estonia				-	-			
Faroe Islands	11,027	17,883	13,886	3,288 <sup>2</sup>	4,832	4,370	10,614	18,571
France	1,570	1,599	1,316	1,532	1,908	2,056	1,588	1,981
Germany, Fed. Rep.	1,479	712	542	213	423	473	78	4,514
Iceland						357		
Ireland	9,032	5,607	5,280	280	145	11,293	9,956	10,284
Latvia				-	-			
Netherlands	3,637	1,275	1,996	951	1,373	2,819	2,262	2,441
Norway	114,428	108,890	88,444	96,300	103,700	106,917	142,320	158,401
Sweden	7,099	6,285	5,307	4,714	5,146	5,233	4,994	5,090
United Kingdom	27,479	21,609	18,545	19,204	19,755	31,578	57,110	50,165
Russia				3,525	635	345	1,672	2
Romania	2,903			-	-			
Misreported (IIa)	109,625	18,647	-	-	-	40,000		
Misreported (VIa)	134,765	106,987	51,781	73,523	98,432	59,882	8,591	39,024
Unallocated	-	983	236	1,102	3,147	4,946	3,197	-272
Discards	1,150	730	1,387	2,807	4,753		1,912	24
<b>Total</b>	<b>472,397</b>	<b>322,204</b>	<b>212,839</b>	<b>229,487</b>	<b>269,700</b>	<b>299,799</b>	<b>272,160</b>	<b>312,004</b>

<sup>1</sup>Includes small catches in IIb & IIId

<sup>2</sup>Faroe catches revised from previously reported 1,367

**Table 3.12.3.a.4** Catch (t) of MACKEREL in the Western area (Sub-areas VI and VII and Divisions VIIa,b,d,e). (Data submitted by Working Group members).

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992
Denmark	200	400	300	100		1,000		1,573	194
Faroe Islands	9,200	9,900	1,400	7,100	2,600	1,100	1,000		
France	12,500	7,400	11,200	11,100	8,900	12,700	17,400	4,095	
Germany	11,200	11,800	7,700	13,300	15,900	16,200	18,100	10,364	9,109
Ireland	84,100	91,400	74,500	89,500	85,800	61,100	61,500	17,138	21,952
Netherlands	99,000	37,000	58,900	31,700	26,100	24,000	24,500	64,827	76,313
Norway	34,700	24,300	21,000	21,600	17,300	700		29,156	32,365
Poland									
Spain	100				1,500	1,400	400	4,020	2,764
United Kingdom	198,300	205,900	156,300	200,700	208,400	149,100	162,700	162,588	196,890
USSR	200								
Unallocated	18000	75100	49299	26000	4700	18900	11,500	-3,802	1,472
Misreported (Iva)			-148,000	-117,000	-180,000	-92,000	-126,000	-130,000	-127,000
Discards	12,100	4,500			5,800	4,900	11,300	23,550	22,020
Grand Total	479,600	467,700	232,599	284,100	197,000	199,100	182,400	183,509	236,079

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001
Denmark		2,239	1,443	1,271	-	-	552	82	835
Estonia			361		-	-			
Faroe Islands	2,350	4,283	4,248	-	2,448 <sup>1</sup>	3,681	4,239	4,863	2,161
France	8,296	9,998	10,178	14,347	19,114	15,927	14,311	17,857	18,975
Germany	23,776	25,011	23,703	15,685	15,161	20,989	19,476	22,901	20,793
Ireland	81,773	79,996	72,927	49,033	52,849	66,505	48,282	61,277	60,168
Netherlands	44,600	40,698	34,514	34,203	22,749	28,790	25,141	30,123	33,654
Norway	600	2,552			-	-			223
Spain	3,162	4,126	4,509	2,271	7,842	3,340	4,120	4,500	4,063
United Kingdom	215,265	208,656	190,344	127,612	128,836	165,994	127,094	126,620	139,589
USSR									
Unallocated	0	4,632	28,245	10,603	4,577	8,351	9,254	0	12,807
Misreported (IVa)	-146,697	-134,765	-106,987	-51,781	-73,523	-98,255	-59,982	-3,775	-39,024
Discards	15,660	4,220	6,991	10,028	16,057	3,277		1,920	1,164
Grand Total	248,785	251,646	270,476	213,272	196,110	218,599	192,486	266,367	255,408

<sup>1</sup>Faroe catches revised from 2,158

**Table 3.12.3.a.5** Landings (tonnes) of mackerel in Divisions VIIIc and IXa, 1977–2001. Data submitted by Working Group members.

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Spain <sup>1</sup>	19,852	18,543	15,013	11,316	12,834	15,621	10,390	13,852	11,810	16,533	15,982	16,844
Portugal <sup>2</sup>	1,743	1,555	1,071	1,929	3,108	3,018	2,239	2,250	4,178	6,419	5,714	4,388
Spain <sup>2</sup>	2,935	6,221	6,280	2,719	2,111	2,437	2,224	4,206	2,123	1,837	491	3,540
Poland <sup>2</sup>	8	-	-	-	-	-	-	-	-	-	-	-
USSR <sup>2</sup>	2,879	189	111	-	-	-	-	-	-	-	-	-
Total <sup>2</sup>	7,565	7,965	7,462	4,648	5,219	5,455	4,463	6,456	6,301	8,256	6,205	7,928
TOTAL	27,417	26,508	22,475	15,964	18,053	21,076	14,853	20,308	18,111	24,789	22,187	24,772

<sup>1</sup>Division VIIIc.

<sup>2</sup>Division IXa.

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Spain <sup>1</sup>	13,446	16,086	16,940	12,043	16,675	21,146	23,631	28,386	35,015	36,174	37,631	30,061	38,205
Portugal <sup>2</sup>	3,112	3,819	2,789	3,576	2,015	2,158	2,893	3,023	2,080	2,897	2,002	2,253	3,119
Spain <sup>2</sup>	1,763	1,406	1,051	2,427	1,027	1,741	1,025	2,714	3,613	5,093	4,164	3,760	1,874
Total <sup>2</sup>	4,875	5,225	3,840	6,003	3,042	3,899	3,918	6,737	5,693	7,990	6,165	6,013	4,993
TOTAL	18,321	21,311	20,780	18,046	19,719	25,045	27,549	34,123	40,708	44,164	43,796	36,074	43,198

<sup>1</sup>Division VIIIc.

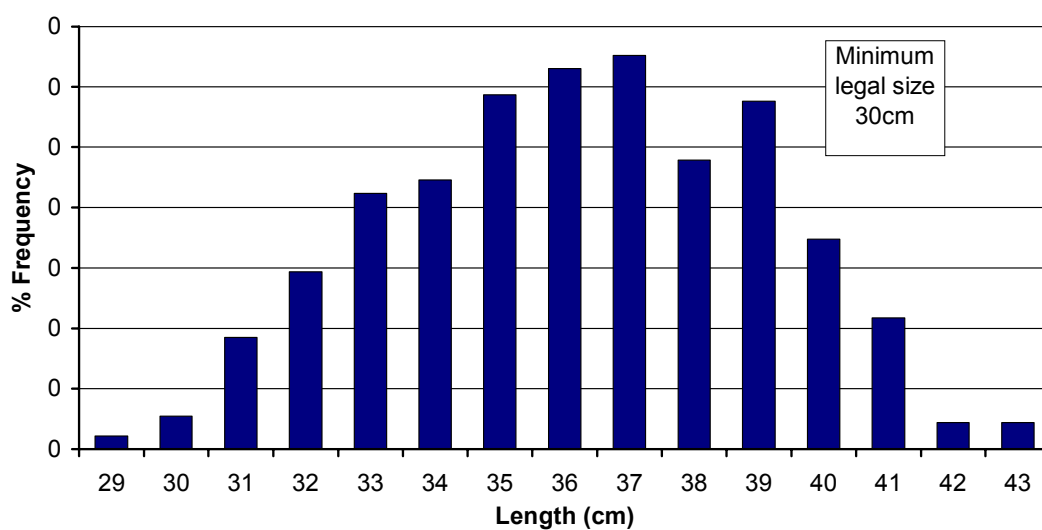
<sup>2</sup>Division IXa.

**Table 3.12.3.a.6** Mackerel (combined Southern, Western & N.Sea spawn.comp.)

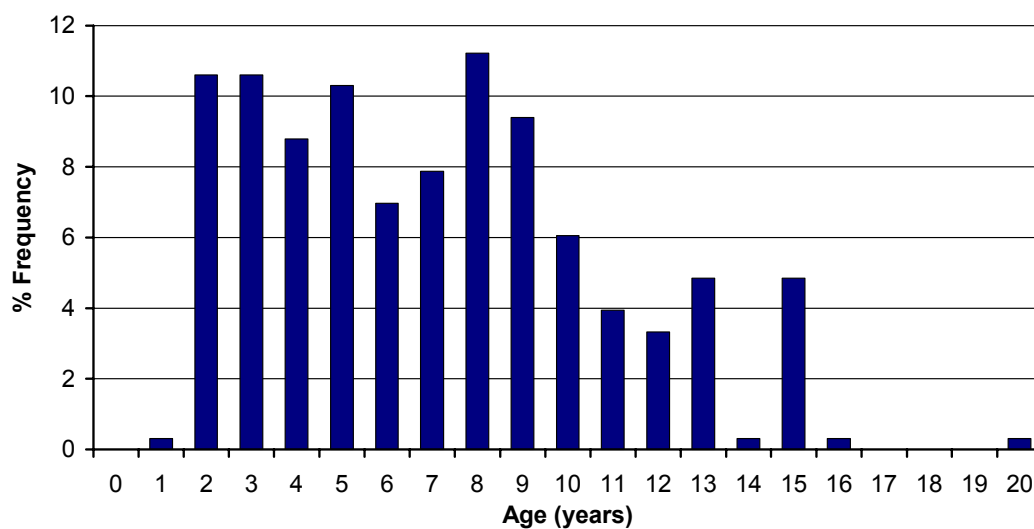
Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4-8
1972	2,248,990	4,148,849	361,204	0.1060
1973	4,976,080	4,255,845	571,011	0.1633
1974	4,216,500	4,118,121	607,632	0.1898
1975	5,102,370	3,875,290	784,070	0.1944
1976	5,125,150	3,554,524	828,239	0.2250
1977	1,060,540	3,388,656	620,276	0.1734
1978	3,341,640	3,352,920	736,832	0.1718
1979	5,429,540	2,899,829	843,227	0.2288
1980	5,778,680	2,444,369	734,951	0.2206
1981	7,538,030	2,508,240	754,438	0.2016
1982	2,180,520	2,407,086	717,267	0.1946
1983	1,694,210	2,671,034	671,588	0.1897
1984	7,607,650	2,664,191	637,606	0.1994
1985	3,515,670	2,654,424	614,371	0.1958
1986	3,620,300	2,637,758	602,200	0.2064
1987	5,297,020	2,607,755	654,991	0.1925
1988	3,751,860	2,627,656	680,492	0.2126
1989	4,552,690	2,694,023	589,509	0.1610
1990	3,446,630	2,542,161	627,511	0.1639
1991	3,940,490	2,851,443	667,886	0.2039
1992	4,858,890	2,881,514	760,351	0.2408
1993	6,084,460	2,717,108	825,036	0.3008
1994	4,805,880	2,537,184	821,395	0.2992
1995	5,139,740	2,757,892	755,776	0.2890
1996	5,697,260	2,768,540	563,612	0.2159
1997	4,353,140	2,902,304	569,613	0.2008
1998	3,839,570	2,937,605	666,682	0.2154
1999	4,679,650	3,215,136	608,930	0.1937
2000	2,105,760	3,156,635	667,159	0.1996
2001	4,084,200	3,423,557	677,708	0.2037
2002	4,084,200	3,080,000		0.1990
Average	4,327,655	3,009,085	674,052	0.2049



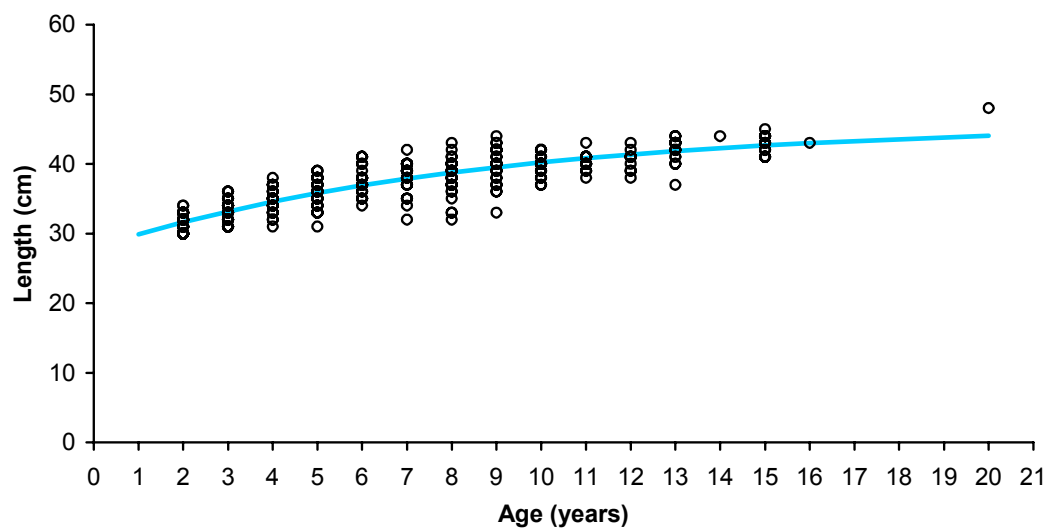
**2001 Length Distribution: Irish Landings, Mackerel in IVa**



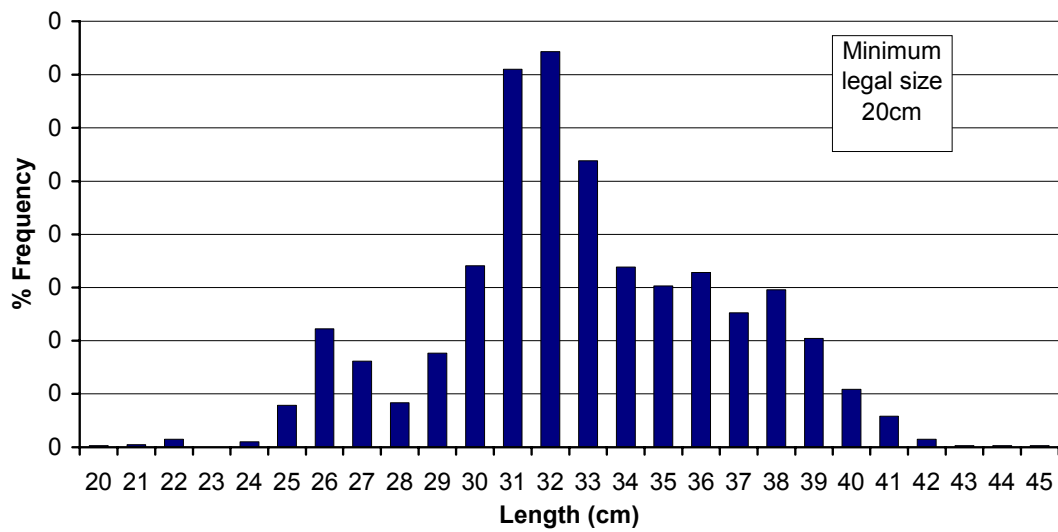
**2001 Age Distribution: Irish Landings, Mackerel in IVa**



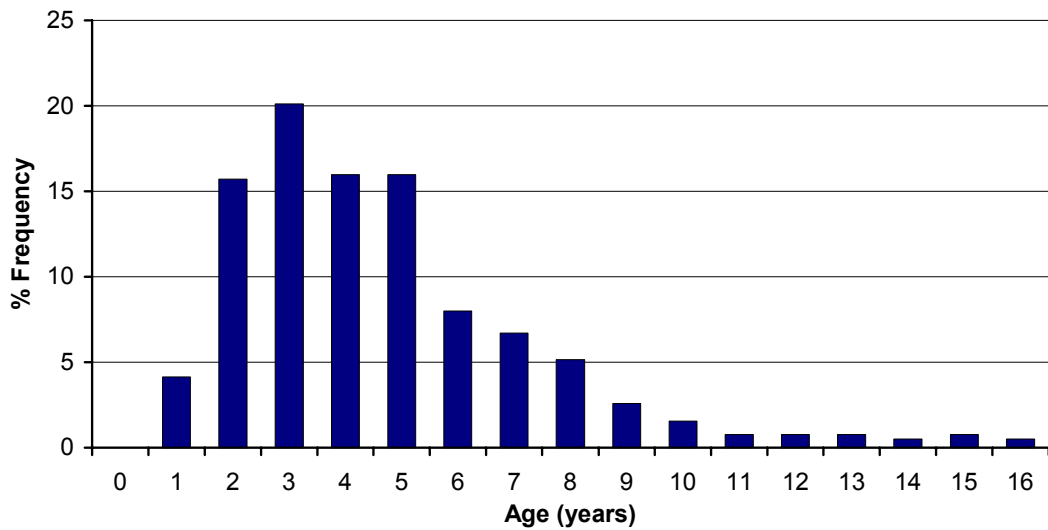
**2001 Size at Age: Irish Sampling, Mackerel in IVa**



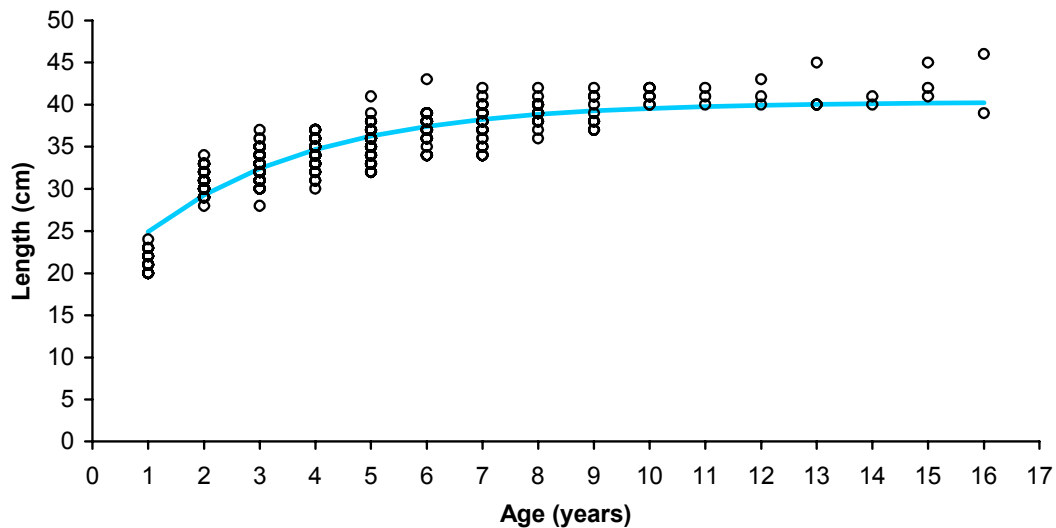
**2001 Length Distribution: Irish Landings, Mackerel in VIa**



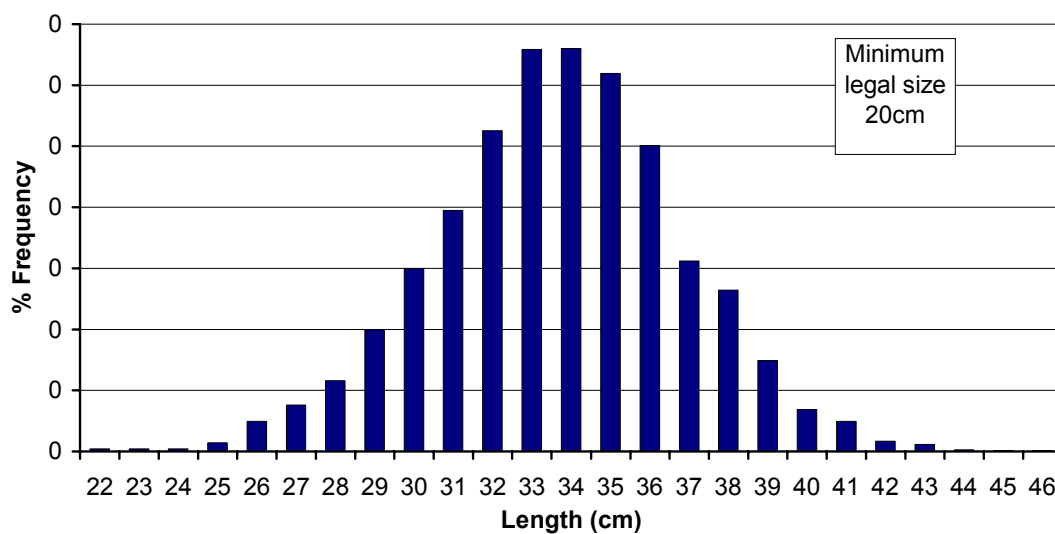
**2001 Age Distribution: Irish Landings, Mackerel in VIa**



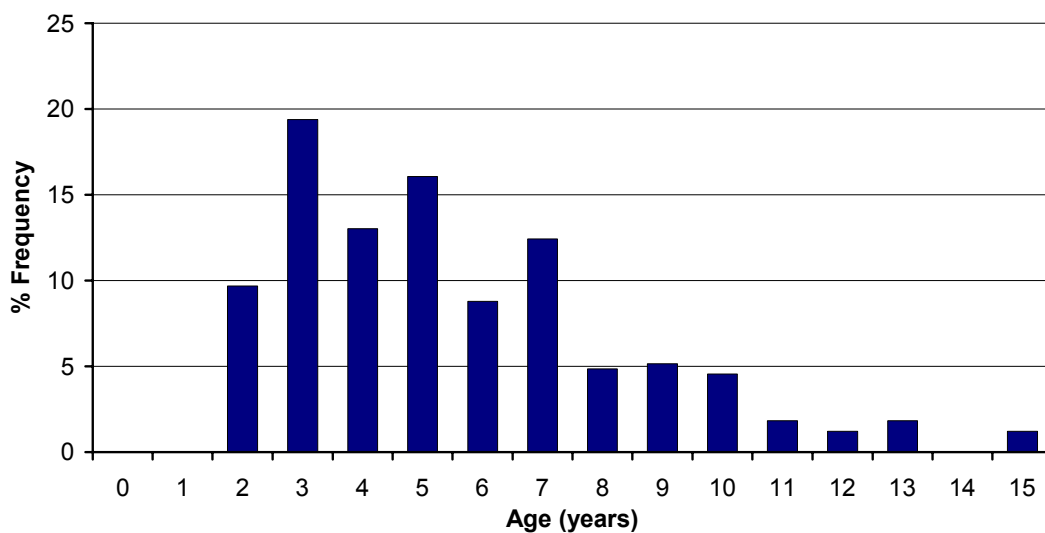
**2001 Size at Age: Irish Sampling, Mackerel in VIa**



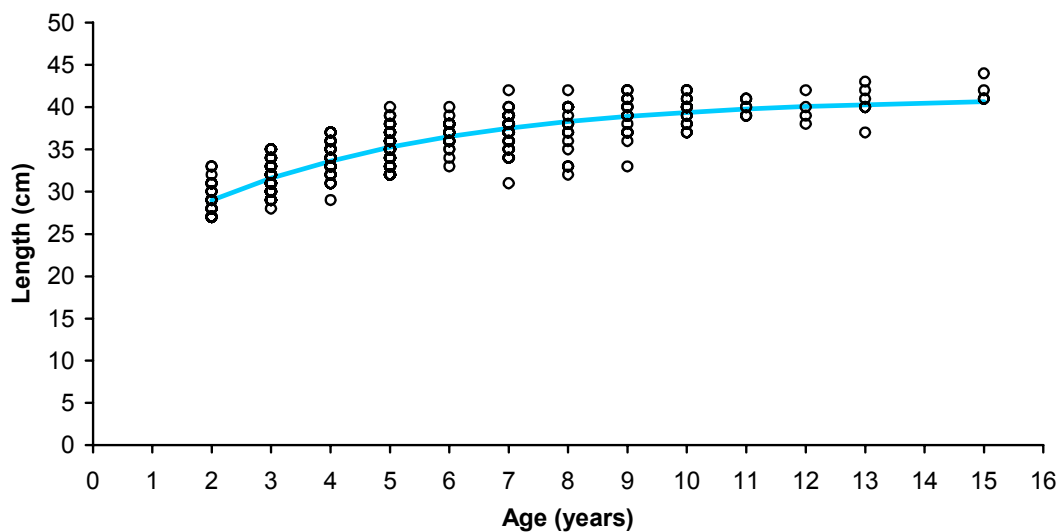
**2001 Length Distribution: Irish Landings, Mackerel in VIIb**



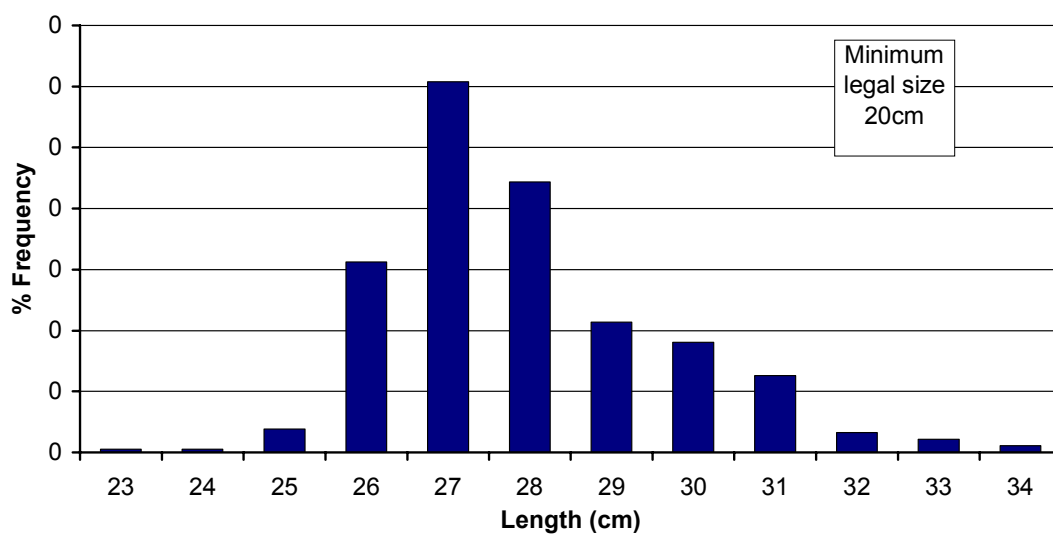
**2001 Age Distribution: Irish Landings, Mackerel in VIIb**



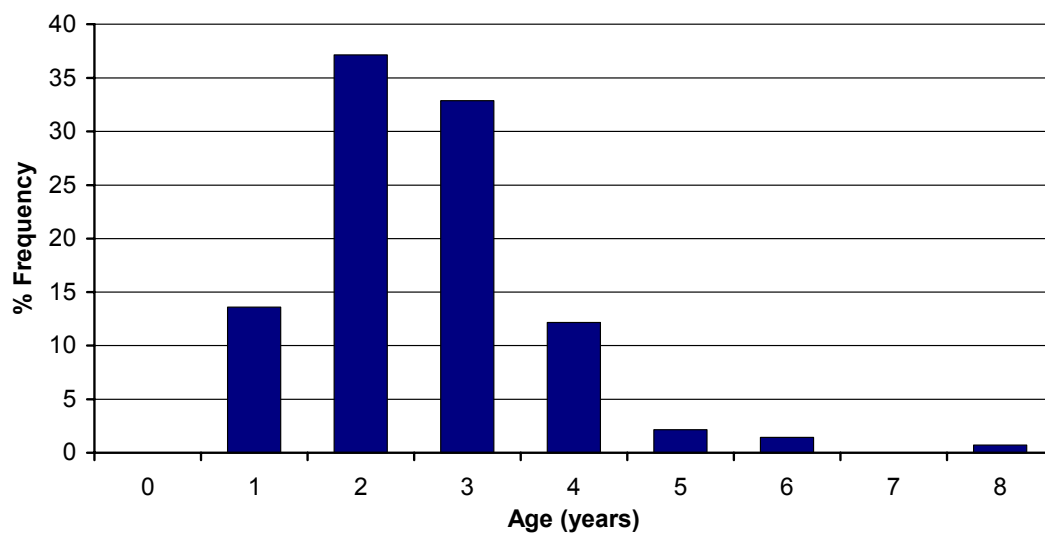
**2001 Size at Age: Irish Sampling, Mackerel in VIIb**



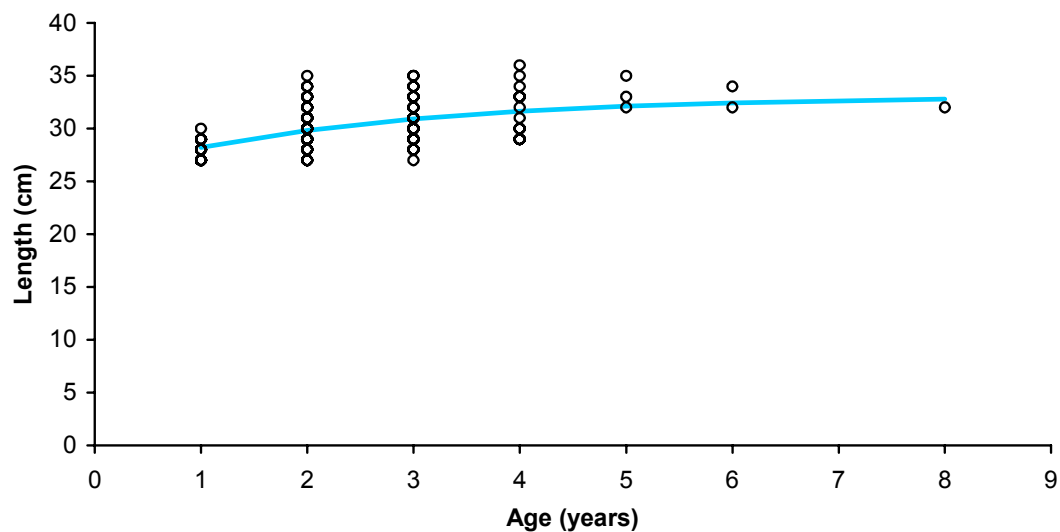
**2001 Length Distribution: Irish Landings, Mackerel in Vlle**



**2001 Age Distribution: Irish Landings, Mackerel in Vlle**



**2001 Size at Age: Irish Sampling, Mackerel in Vlle**



# Western Horse Mackerel

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

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



Marine Fisheries Services Division

## ICES – ADVICE

ICES advises that catches in 2003 should be effectively limited to less than 113,000 t corresponding to  $F_{0.1}=0.15$  as estimated in 2000. ICES also advises that the TAC for this stock should apply to all areas in which Western horse mackerel are fished, i.e. Divisions IIa, IIIa (western part), VI, Vb, VIIa–c, VIIe–k, and VIIIa,b,d,e. ICES also advises that directed horse mackerel fisheries, in areas in which juveniles are abundant and industrial fisheries in which horse mackerel is taken as a by-catch, should be restricted.

## MFSD – ADVICE

MFSD agrees with ICES and STECF catch advice. In addition MFSD advises that the conservation measures introduced to rebuild this stock in 2003 should include measures to protect juveniles in all areas where horse mackerel is fished. This would include a prohibition on fishing horse mackerel in VIIIab throughout the year and in VIIef in the third and fourth quarters. The recommended TAC of 113,000 t would translate into an Irish quota of 25,435 t.

MFSD also agree with the STECF and ICES advice that a management strategy similar to that for North Sea herring, in which both adult and juvenile mortality are independently restricted, should be explored for this stock. To do this ICES should be requested by the Commission to carry out short term predictions for Western horse mackerel for two areas:

- 1) Where adults are distributed (Divisions IIa, IIIa (western part), IVa, VIb, VIa,b, VIIb,c,j,k).
- 2) Where juveniles are distributed (Divisions VIIa, e,f,g,h and VIIIa,b,d,e).

ICES should also be requested to provide medium term predictions for each option to demonstrate the changes in SSB over time.

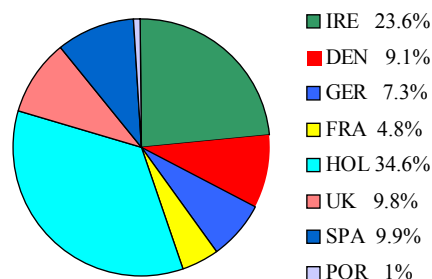
## STATE OF THE STOCK

- The status of the stock now is undefined. Reference points have not yet been agreed for the stock.
- Landings increased rapidly from the mid 1980s to 1995 (513,000 t) and have since decreased to 191,000 t in 2001. This is the second time the landings have not exceeded the TAC.

- The average fishing mortality on adult fish has fluctuated between 0.05–0.26. However the fishing mortality on the youngest ages has increased—particularly in recent years. Current Fishing mortality is above  $F_{0.1} = 0.15$ . No value has yet been proposed for  $F_{pa}$ .
- There has been no recruitment to the stock of comparable strength to the outstanding 1982 year class which recruited to the adult stock in the mid 1980s. Recruitment in the past 5 years has been very poor.
- The current SSB is not precisely known but appears to be around 1 million tonnes. SSB has continuously declined since 1988.
- In the absence of outstanding year classes sustainable yield is unlikely to be higher than about 130,000 t. The prognosis for the stock in the short term is that, if the advised catch is taken in 2003, the SSB will further decline to 524,000 t by 2004.

## CURRENT MANAGEMENT

- The TAC area (Divisions Vb, (EU waters); Sub-areas VI and VII, and Divisions VIIIa,b,d,e.) does not correspond to the assessment area (Divisions IIa, IIIa (western part), Vb, VIa, VIIa–c, e–k and VIIIa,b,d,e).
- The TAC only applies to EU and Faroese fleets. In the past there have been unregulated fisheries outside the TAC areas mainly by Norwegian vessels. Catches in these unregulated fisheries have been low in recent years.
- The total horse mackerel catch in 2001 was 191,000 t. The TAC was 233,000 t. This is the second year in succession in which the TAC has not been taken. The TAC for 2002 is 150,000 t. The Irish quota is 35,713 t.



- There is no management plan or management objective for this fishery. MFSD suggests the current proposal to close areas where juveniles are caught is a suitable measure to protect this stock, provided that the closures relates to the areas where most of the juveniles are being caught.
- The Northwest Pelagic Management Committee manages the Irish fishery.

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## MFSD – ECONOMIC COMMENTS

- The value of the Irish landings and quota in 2001 were estimated at €16.5 million.
- The value of the 2002 quota is about €11 million.
- About 13% of the catch was landed as frozen product and this represented around 20% of the landed value. About half of the total catch of horse mackerel is landed in the north west and the fishery is still extremely important to the Irish refrigerated sea water (RSW) pelagic fleet and the processing industry in Donegal.

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## ADDITIONAL INFORMATION

1. The assessment was again carried out using the new separable Adapt model (SAD) that continues to give a more realistic representation of the state of the stock. Biological data remains very poor and there is a lack of sampling data for many important horse-mackerel fishing countries. The maturity ogive is poorly estimated.
2. The Irish catch in 2001 was about 52,000 t.
3. Area mis-reporting is not considered to be a serious problem in this fishery but doubts persist about the accuracy of the total catch figures recorded by some countries.
4. The main catches are taken by the Dutch and French freezer trawler fleet and the Irish refrigerated sea water (RSW) vessels. Considerable Danish catches are taken for industrial purposes - mainly in the Channel area. Irish vessels also take catches from this area and landings are made into French ports.
5. Reports from Irish fishermen suggest that horse mackerel are now much less abundant than in the mid nineties
6. There are reports of high numbers of juvenile horse mackerel around Ireland in 2002 but these have yet to be confirmed. However horse mackerel is a slow growing species so any beneficial effects of a strong year class would not be apparent until at least 5 years.
7. Irish sampling of this stock is supported through the EC funded sampling programme that is required under the Data Collection Regulation 1543/2000 and 1639/2001.
8. The length distribution of the Irish catches in 2001 were dominated by fish between 26 cm and 29 cm (6 to 8 year old fish).
9. For this stock the reference F is calculated across the ages 4-8. However, since 1995 there has been a change in the selection pattern towards the younger ages. Therefore the reference F should be calculated across all ages that are fully selected.

### MFSD Special Comments

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## 1 Total International Catch

The distribution of the fishery continued to contract in 2001

with almost no catch (60t) in IIa and Vb and significantly reduced catches by the Norwegian fleet in the q 4 in IVa (7,000t). With the exception of 1999 (when the French fleet shifted effort into VIa) catches in VIa since 1997 have remained at a level which is significantly lower than previously. Catches in sub area VII were very similar to 2000, and also show a decline since pre 1997. Sub Area VIII was the only area in which horse mackerel catches have increased. This has been due to an increase in effort from the freezer trawler fleet (France and Netherlands) which have more than trebled their catches in this area since 2000. This is a worrying trend as this catch comprises predominantly juvenile fish.

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## 2 Egg Survey

The assessment for horse mackerel is badly hampered by the absence of a reliable index. SSB estimates will not be given by the Mackerel and Horse Mackerel Egg Working group in 2004 unless the nature of horse mackerel spawning can be clarified. The use of the total egg production estimate is at best a crude approach, and will become inappropriate, if there is any change in the relationship between the number of eggs and the number of spawning fish.

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## 3 Stock Assessment

The assessment was carried out as in previous years using the SAD model. This year this model suffered from much same problems as the mackerel assessment in trying to estimate catchability from 3 data points. This was overcome by assuming a linear decline in the egg production in the years between the egg surveys, thus creating three more data points. This assumption is consistent with the known development of the stock based on the catch at age data.

The assessment results showed the same decreasing trend as last year but the scale of the SSB and F changed slightly giving a current SSB of 761,000 t and an  $F_{4-10} = 0.24$  and  $F_{2-6} = 0.18$ . Reference points were not calculated again and  $F_{pa}$  used by ACFM is based on  $F_{0.1} = 0.15$  as calculated by the 2000 assessment.  $F_{0.1}$  is currently calculated at 0.18. Predictions were given based on  $F_{2002} = F_{status\ quo} = 0.219$  (average  $F_{4-10}$  from 1999-2001) and a catch constraint (TAC) = 150,000 t. Advice for catches in 2003 based on  $F_{pa}$  is then either 113,000 t or 117,000 t.

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## 4 Advice on Juvenile fisheries

A consensus has been reached by the industry on the need to limit the increasing fishing mortality on juvenile horse mackerel. This consensus involves only industry representatives from Scotland, Ireland and the Netherlands. The industry has agreed in principle to area closures, but suggests that these closures should only apply to Sub Area VIII. This would only apply to that component of the western stock which is caught in VIIIabde. The catch data for 2001 show that over 50% of the total catch of 1 year old horse mackerel are taken in the Channel area and



Western Approaches (Divisions VIIe,f,h,j,k). If area closures are intended to protect juvenile fish then these areas should also be included in the closure. Consideration should also be given to protecting juveniles from the North Sea “stock” which are targeted in the neighbouring channel area of VIId in the Quarter 4. There is evidence to suggest that juveniles in this area recruit to both “stocks”.

## ICES ADVICE

### 3.12.4

#### State of stock/exploitation:

The stock status relative to precautionary reference points is undefined. The current fishing mortality is above  $F_{0.1}$ . Spawning stock biomass has decreased compared with the mid-1980s and is estimated to continue to decline at all levels of fishing mortality. Fishing mortality on the youngest ages is increasing.

#### Management objectives:

There are no explicit management objectives for this stock.

#### Precautionary Approach reference points:

No precautionary reference points are proposed for this stock.

#### Advice on management:

ICES advises that catches in 2003 be effectively limited to less than 113 000 t, corresponding to  $F = 0.15$  which in 2000 was estimated to be  $F_{0.1}$ . ICES also recommends that the TAC for this stock should apply to all areas in which Western horse mackerel are fished, i.e. Divisions IIa, IIIa (western part), VI, Vb, IVa, VIIa–c, VIIe–k, and VIIa,b,d,e. ICES also advises that directed horse mackerel fisheries in which juveniles are abundant, and industrial fisheries in which horse mackerel is taken as a by-catch, should be restricted.

#### Relevant factors to be considered in management:

The spawning stock has been dominated by an outstanding 1982 year class and reached a maximum of 2.7 million tonnes in 1988. This year class has been gradually fished out and since then no other outstanding year classes have appeared, the spawning biomass has declined continuously to 0.7 million tonnes in 2002.

In the absence of outstanding year classes, sustainable yield is unlikely to be higher than about 130 000 t, dependent on the exploitation pattern. It is therefore clear that catches will have to be reduced unless another outstanding year class is produced. The assessment indicates that the more recent year classes are well below average since 1996.

Recently fisheries have taken large catches of mainly juvenile horse mackerel from the western stock, and the fishing mortality in the juveniles has increased. ICES expresses concern about this high exploitation of juvenile fish at a time when the recruitment is at a low level, and the spawning stock is declining.

The current fishery targeting juveniles will result in reduced fishing opportunities for adult fish as well as reduced overall TACs. ICES suggests that a management strategy similar to that for North Sea herring, in which both adult and juvenile mortality are independently restricted, be explored for this stock. If the fishing mortality in 2002 is the same as in 2001 the catch in 2002 will decrease below the 191 000 t recorded for 2001. Continued fishing at the level estimated for 2001 is expected to result in a further reduction of catches and the SSB will be below 500 000 tonnes in 2004.

The TAC is set for parts of the western distribution area by EU and was overshot considerably during the period 1988-1999. The two last years the catches were less than the TAC. However, the TAC has only been given for parts of the distribution and fishing areas (EU waters). ICES advises that if a TAC is set for this stock, 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 VIIa,b,d,e.

#### Catch forecast for 2003:

Basis:  $F(2002) = F(2001) = F_{sq(4-10)} = 0.22$  ; Landings (2002) = 181 ; SSB (2002) = 668

F(2003)	Basis	SSB (2003)	Catch (2003)	Landings (2003)	SSB (2004)
0.15	$F_{0.1}$	571	113	113	524
0.18		565	131	131	506
0.22	F(2001)	556	157	157	481

Weights in '000 t.

Shaded scenario considered inconsistent with the precautionary approach.

### Comparison with previous assessment and advice:

The TAC for 2003, corresponding to a fishing mortality of 0.15 is higher than the advice of last year. This is the result of a revised assessment method and the inclusion of new information on the stock size available from egg surveys in 2001, which led to higher estimates of the poor year classes 1996 - 1999. The perception of stock trend is consistent with previous years' estimates.

### Elaboration and special comment:

The distributional 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 Northeast North Sea. Catches outside the TAC area have been low in recent years

The recent history of this stock reflects the development of a single large year class within the period of 17 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.

As in previous years some countries with major catches did not carry out biological sampling programmes. Although this has improved since 1998, the lack of biological data severely hampers the assessment.

The assessment was carried out using S.A.D model, which is a combination of a Separable VPA and an ADAPT

VPA-based model. Recent studies have established that horse mackerel may be an indeterminate spawner and therefore the current estimate of fecundity, used to convert survey egg production estimates to SSB, is considered to be poorly determined. The S.A.D model objective function was modified in order to estimate fecundity during fitting of the model. The assessment results are consistent with previous years' estimates derived from the model and with those of a model fitted using the ISVPA structure. The present assessment uses the results of the international horse mackerel egg surveys. Due to uncertainties about horse mackerel is a determinate or indeterminate spawner only the estimated egg productions have been used in the assessment. The estimated egg production in 2001 was 35% lower than the estimate in 1998.

### Source of information:

Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, 10-19 September 2002 (ICES CM 2003/ACFM:07).

### Yield and spawning biomass per Recruit

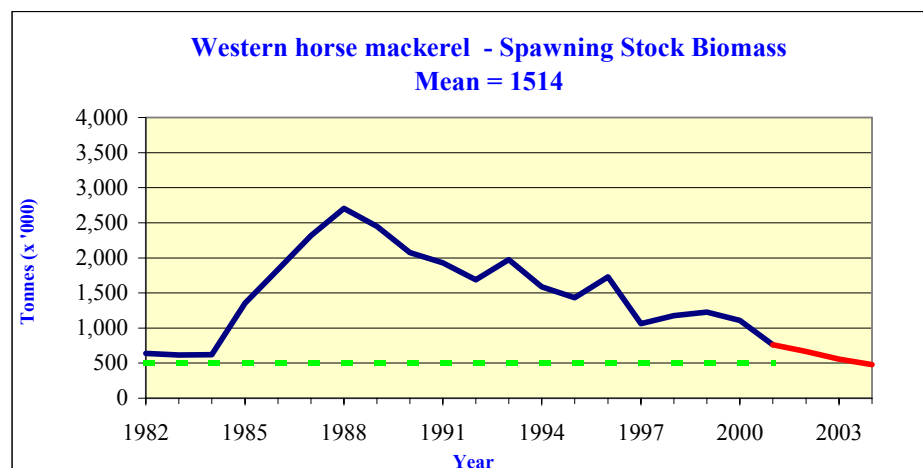
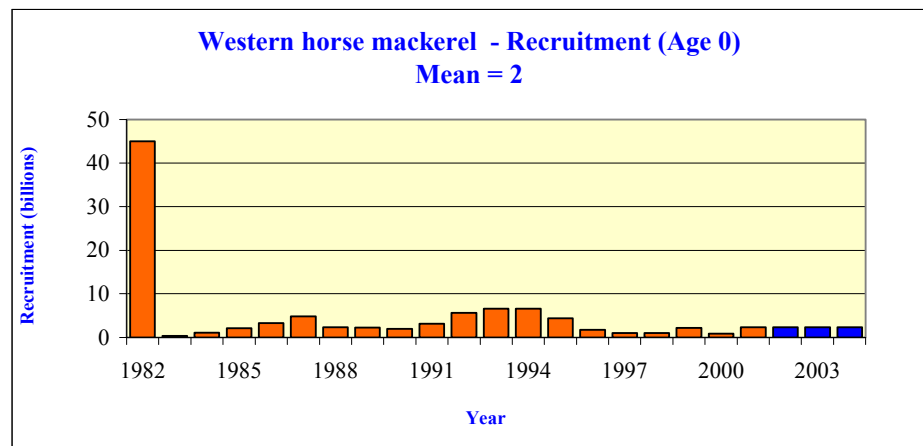
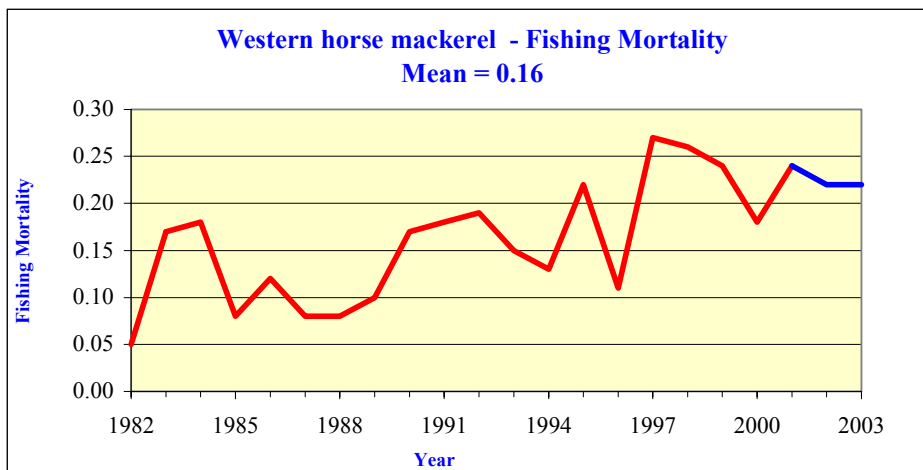
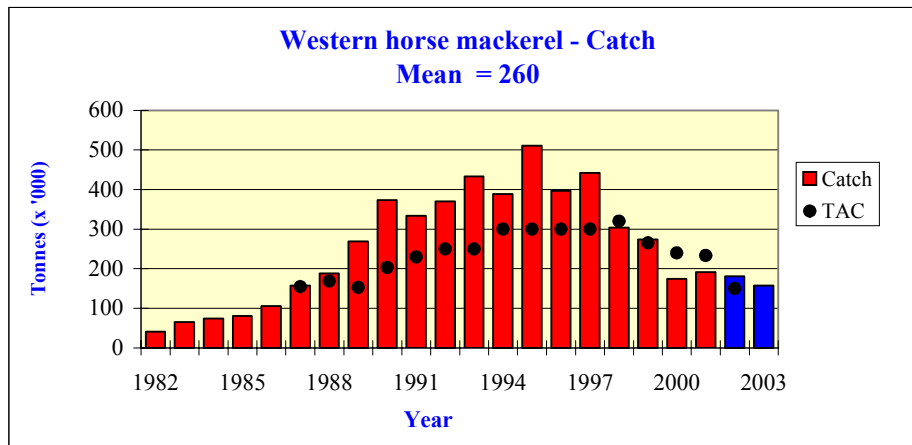
#### F-reference points:

	Fish Mort Ages 4-10	Yield/R	SSB/R
Average Current	0.220	0.053	0.162
Fmax	0.557	0.057	0.047
F0.1	0.179	0.050	0.199
Fmed	N/A		

### Catch data (Tables 3.5.11.1 and 3.12.4.1-6):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC <sup>1</sup>	ACFM landings	Disc. slip	ACF M catch
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 000t	200	265	274	-	274
2000	Effectively limit catches to 200 000t	200	240	175	-	175
2001	Effectively limit catches to <224 000t	<224	233	191	-	191
2002	Effectively limit catches to 98 000t	<98	150			
2003	Effectively limit catches to 113 000t	<113				

<sup>1</sup>Division Vb (EU waters only), Sub-areas VI and VII, Divisions VIIa,b,d,e. Weights in '000 t.



**Table 3.12.4.1** Landings (t) of HORSE MACKEREL in Sub-area 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	-	-	964 <sup>3</sup>	1,115	9,157 <sup>3</sup>	1,068	-	950
Denmark	-	-	-	-	-	-	-	200
France	<sup>2</sup>	-	-	-	-	-	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 <sup>1</sup>
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	2304	841	44
Russia	881	648	345	121	84 <sup>3</sup>	16
UK (England + Wales)	-	-	-			-
Estonia	-	-	22			
Total	3,366	2,617	2,544	2557	1175	60

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

**Table 3.12.4.2** Landings (t) of HORSE MACKEREL in Sub-area IV and Division IIIa by country.  
(Data submitted by Working Group members).

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 <sup>1</sup>
Belgium	19	21	19	19
Denmark	2,048	8,006	4,409	2,288
Estonia	22	-	-	-
Faroe Islands	28	908	24	-
France	379	60	49	48
Germany	4,620	4,071	3,115	230
Ireland	-	404	103	375
Netherlands	3,811	3,610	3,382	4,685
Norway	13,129	44,344	1,246	7,948
Russia	-	-	2	-
Sweden	3,411	1,957	1,141	119
UK (Engl. + Wales)	2	11	15	317
UK (Scotland)	3,041	1,658	3,465	3,161
Unallocated + discards	737	-325	14613	649
Total	31,247	64,725	31583	19,839

<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 -4,000 t.

**Table 3.12.4.3** Landings (t) of HORSE MACKEREL in Sub-area 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	3,369	2,150	590	341	2,326	572	498
Norway	-	-	-	-	-	-	-	-	-
Spain	<sup>2</sup>	<sup>2</sup>	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 <sup>1</sup>
Denmark	-	-	-	-
Faroe Islands	-	-	-	-
France	221	25,007	-	428
Germany	414	1,031	209	265
Ireland	21,608	31,736	15,843	20,162
Netherlands	885	1,139	687	600
Spain	-	-	-	-
UK (Engl. + Wales)	10	344	41	91
UK (N.Ireland)	1,132	-	-	-
UK (Scotland)	10,447	4,544	1,839	3,111
Unallocated +disc.	98	1,507	2,038	-21
Total	34,815	65,308	20,657	24,636

<sup>1</sup>Preliminary.

<sup>3</sup>Includes Divisions IIIa, IVa,b and VIb.

<sup>2</sup>Included in Sub-area VII.

<sup>4</sup>Includes a negative unallocated catch of -7,000 t.



**Table 3.12.4.4** Landings (t) of HORSE MACKEREL in Sub-area 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 <sup>1</sup>
Faroe Islands	-	-	550	-
Belgium	18	-	-	-
Denmark	25,492	19,223	13,946	20,574
France	24,223	-	20,401	11,049
Germany	25,414	15,247	9,692	8,320
Ireland	51,720	25,843	32,999	30,192
Netherlands	91,946	56,223	50,120	46,196
Spain	-	-	50	7
UK (Engl. + Wales)	12,832	8,885	2,972	8,901
UK (N.Ireland)	-	-	-	-
UK (Scotland)	5,095	4,994	5,152	1,757
Unallocated + discards	12,706	31,239	1,884	11,046
Total	249,446	161,654	137,766	138,042

<sup>1</sup>Provisional.

<sup>2</sup>Includes Sub-area VI.

**Table 3.12.4.5** Landings (t) of HORSE MACKEREL in Sub-area 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 <sup>1</sup>
Denmark	1,728	4,818	2,584	582
France	1,844	74	7	5,316
Germany	3,268	3,197	3,760	3,645
Ireland	-	-	6,485	1,483
Netherlands	6,604	22,479	11,768	36,106
Russia	-	-	-	-
Spain	23,599	24,190	24,154	23,531
UK (Engl. + Wales)	9	29	112	1,092
UK (Scotland)	-	-	249	-
Unallocated + discards	1,884	-8658	5,093	4,365
Total	38,936	46,129	54,212	76,120

<sup>1</sup>Preliminary.

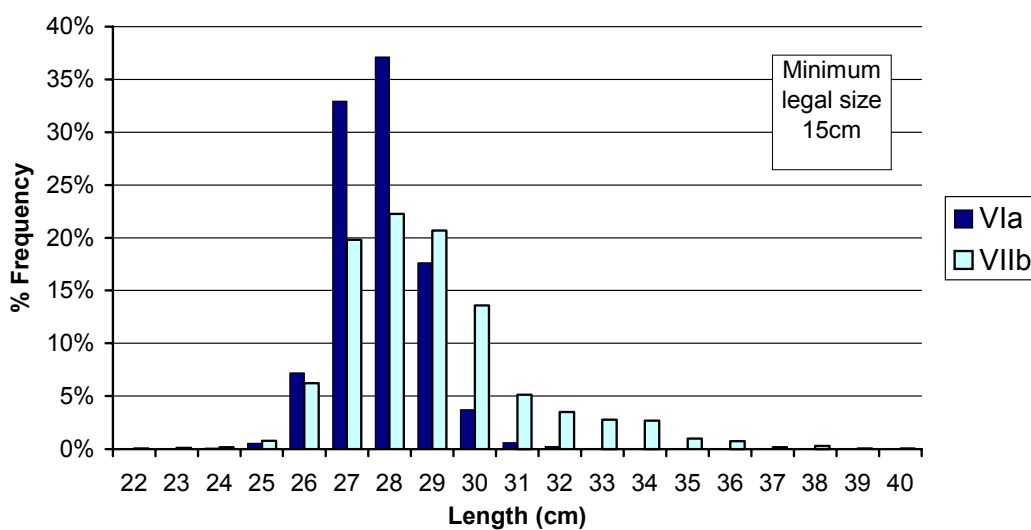
<sup>2</sup>Included in Sub-area VII.

**Table 3.12.4.6** Western horse mackerel (IIa,IVa,Vb,VIa,VIIa-c,e-k,VIIIabde)

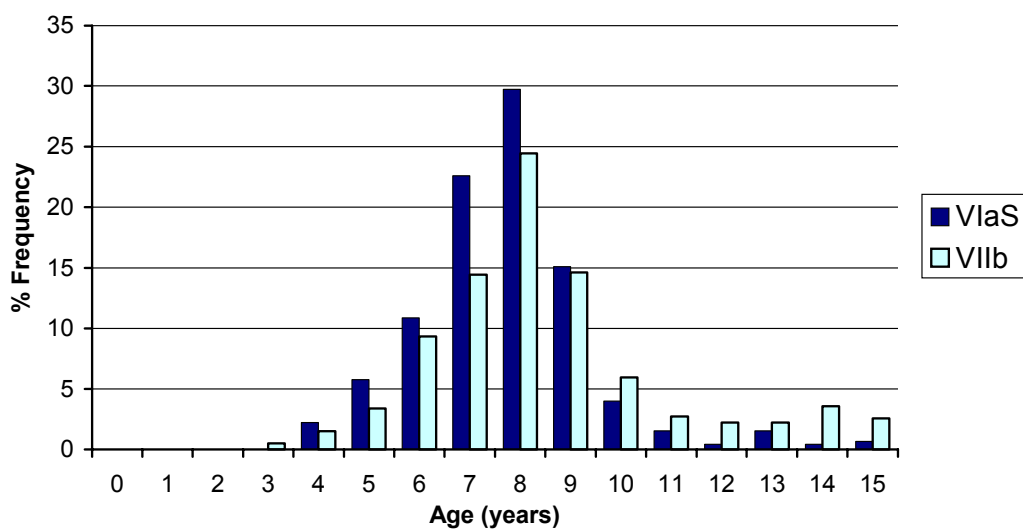
Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4-10
1982	44,985,281	640,531	41,587	0.05
1983	372,425	615,757	64,862	0.17
1984	1,079,073	621,662	73,625	0.18
1985	2,167,673	1,358,069	80,551	0.08
1986	3,302,153	1,833,334	105,665	0.12
1987	4,820,702	2,318,144	157,240	0.08
1988	2,369,846	2,704,530	188,100	0.08
1989	2,255,342	2,449,473	268,867	0.10
1990	1,961,674	2,071,798	373,463	0.17
1991	3,163,768	1,929,564	333,555	0.18
1992	5,628,871	1,687,143	370,550	0.19
1993	6,594,782	1,974,281	433,145	0.15
1994	6,569,173	1,585,283	388,875	0.13
1995	4,421,001	1,428,589	510,597	0.22
1996	1,779,823	1,726,865	396,652	0.11
1997	1,022,526	1,062,891	442,571	0.27
1998	1,010,870	1,176,572	303,543	0.26
1999	2,176,244	1,226,129	273,888	0.24
2000	924,030	1,109,617	174,927	0.18
2001	2,346,726	761,520	191,193	0.24
2002 <sup>1</sup>	2,346,726	667,731		0.22
Average	4,823,748	1,476,921	258,673	0.16

<sup>1</sup>Recruitment in 2001 and 2002 : geometric mean 1983-2000; SSB<sub>2002</sub> : projected; F<sub>2002</sub> = F<sub>status quo</sub> (F<sub>1999-2001</sub>)

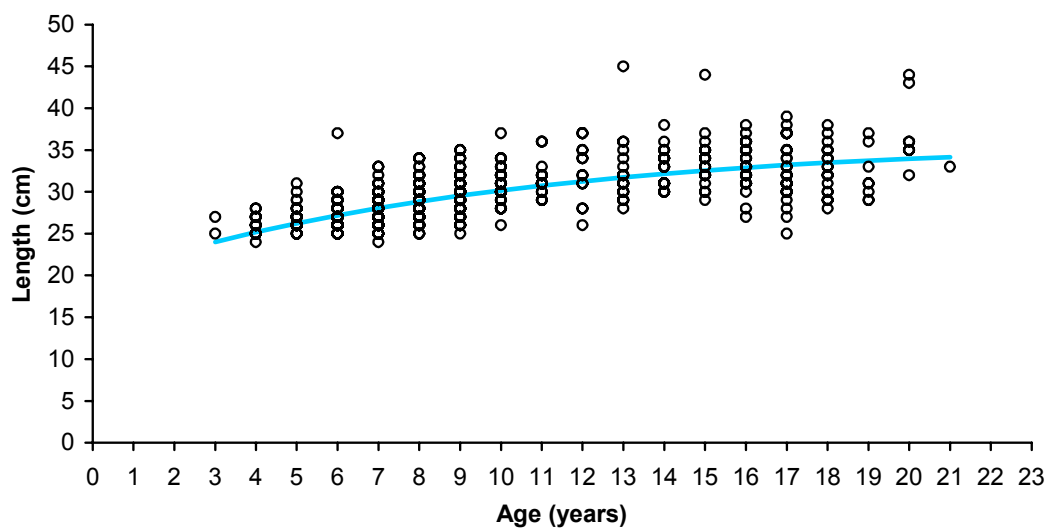
### 2001 Length Distribution: Irish Landings, Horse Mackerel in VIa VIIb



### 2001 Age Distribution: Irish Landings, Horse Mackerel in VIaS VIIb



### 2001 Size at Age: Irish Sampling, Horse Mackerel in VIaS VIIb



# North Sea Horse Mackerel

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

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD 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 avoid an expansion of the fishery until there is further information about the structure of horse mackerel stocks. This translates to an associated Irish quota of about 690 t.

ICES have also expressed concern about the high exploitation of juvenile horse mackerel in Div VIId. MFSD advises that, given the fundamental change in the selectivity of the North Sea fishery in recent years, that a TAC based on the average catches over the period 1982-1997 will result in a much higher than expected juvenile mortality rate. MFSD further advise that recruitment to the North Sea and Western horse mackerel stocks are strongly linked and that measures to protect juveniles should apply to both stocks.

MFSD therefore advise that the restrictions on fishing juvenile horse mackerel (recommended for the Western stock) should include those fisheries in VIId and IVc in the third and fourth quarters which are targeted at juvenile horse mackerel. These are nominally from the North Sea stock.

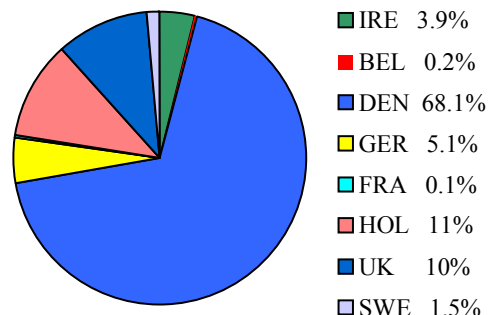
MFSD agree with the advice that Division VIId should be transferred as soon as possible from the Western horse mackerel management area to the North Sea horse mackerel management area.

## STATE OF THE STOCK

- The state of this stock is unknown. There are no reference points because of lack of data.
- Catches have increased in recent years but the 2001 catch of 46,000 t was slightly lower than the 2000 catch of 48,000 t which was the highest recorded from the fishery
- The exploitation rate may be increasing because of the increase in catches and the increasing amounts of juvenile fish that are being caught
- The 1998 year class appears to be abundant in the catches and may be relatively strong
- There is no recent estimate of the size of the SSB. Estimates from egg surveys carried out in the early 1990s suggest that the SSB at that time was around 240,000 t. There is no more recent information on the size of the stock.

## CURRENT MANAGEMENT

- The agreed TAC only applies to EU waters in Division IIa and Sub-area IV and does not correspond with the distribution of the stock. The stock and fishery extends over a greater area and includes the additional areas Divisions IIIa, and VIId.
- The 2002 TAC is 58,000 t. The EU quota is 49,400 t and the Irish quota is 1,950 t. The basis for this TAC is not known.



- There is no management plan for the fishery.

## MFSD – ECONOMIC COMMENTS

- The Irish landings from this stock in 2001 were 375 t worth about €150,000.
- Ireland did not take its full quota from this fishery in 2001 which was worth about €780,000.

## ADDITIONAL INFORMATION

1. No assessment was carried out on this stock in 2002 because of lack of biological and survey data.
2. The total catch taken from this stock in 2001 was estimated to be around 46,000 t. This was slightly lower than the catch taken in 2000 of 48,000 t which was the highest recorded since 1982. Ireland recorded only 375 t of horse mackerel from this fishery in 2001 compared with over 8,100 t for 1997.
3. The TAC in 2001 was 51,000 t. This is higher than the catches taken from the fishery. The high TAC has allowed the fishery to expand in recent years and has no scientific basis.
4. Discarding of horse mackerel in the directed fishery for horse mackerel is not a problem but catches of ju-

venile mackerel are taken and discarded. In addition adult mackerel are discarded from the horse mackerel fisheries in Area IV

5. The stock is exploited in a directed fishery for human consumption and in a fishery for industrial purposes in which juvenile mackerel are taken as a by-catch. In earlier years the majority of the catch was taken as a by-catch 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.
6. There has been a change in the directed fishery in recent years. The catch is now composed of large numbers juvenile fish (1-4 years old). These juvenile fish are targeted for human consumption and exported to the Japanese market. This is an undesirable development and ICES have expressed concern about this high exploitation of juvenile fish.
7. The stock mixes with the Western horse mackerel stock at certain times of the year.

## **ICES ADVICE**

### **3.5.11**

#### **State of stock/exploitation:**

The state of the stock is not known. There is no recent quantitative information on stock size. Catches have been increasing in recent years.

#### **Management objectives:**

No explicit management objectives have been established for this stock.

#### **Precautionary Approach Reference points:**

No precautionary reference points have been proposed for this stock.

#### **Advice on management:**

**ICES recommends that catches in 2003 be no more than the 1982-1997 average of 18 000 t, in order to avoid an expansion of the fishery until there is more information about the structure of horse mackerel stocks, and sufficient information to facilitate an adequate assessment.**

#### **Relevant factors to be considered in management:**

Advice in 1999 was to constrain 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. Despite this advice catches increased by one third, from about 37 000 t in 1999 to 48 000 t in 2000 and 46 kt in 2001. ICES maintains this advice reflecting its concern over the potential impact of the recent expansion of the fishery.

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

In recent years there has been a change in the age composition of the landings with a higher proportions of younger age groups. In 1998 about 55%, in 1999 40% and in 2001 74% of the catch in numbers were fish 1-4 years old. The 1998 year class appears to be abundant in the landings in recent years and may be a relative strong year class.

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#### **Catch forecast for 2003:**

Not available

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#### **Medium- and long-term projections:**

Not available

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#### **Elaboration and special comment:**

The stock cannot be assessed unless adequate data are become available. Egg surveys from 1989 to 1991 indicated a spawning stock biomass of about 240 000 t. The age composition of the relatively small catches until 1997 and the past biomass estimates suggest that the exploitation rate may have been low in the early 1990s. However, the catch increased from a long-term level of 18 000 t to the historic high in 2000 of 48 000 t, and was close to that level in 2001. The exploitation in recent years may therefore have been increasing.

In earlier years the majority of the catch was taken as by-catch 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

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 the fishing nations report their catches by ICES rectangle and by quarter.

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#### **Source of information:**

Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, 10 – 19 September 2002 (ICES CM 2003/ACFM:07).

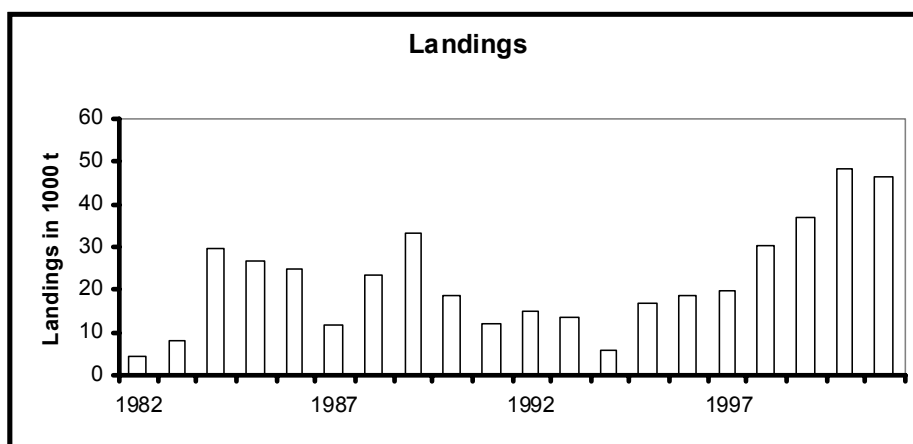


**Catch data (Tables 3.5.11.1-2):**

Year	ICES Advice	Predicted catch cor- resp. 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	
2003	No increase in catch from 1982-1997 average	<18		

<sup>1</sup>Division IIa and Sub-area IV (EU waters only). <sup>2</sup>Catch of North Sea stock (Divisions IIIaE, IVb,c & VIId). (Weights in '000 t.

North Sea horse mackerel (Divisions IIIaE, IVb,c & VIId)



**Table 3.5.11.1 (from wgmhsa table 4.3.1)**

Landings and discards of HORSE MACKEREL (t) by year and division, for the North Sea, Western and Southern horse mackerel.  
(Data submitted by Working Group members.)

Year	North Sea horse mackerel				Western horse mackerel							Southern horse mackerel			Total	
	IIIa	IVb,c	Discards	VIIId	Total	IIa	IVa	VIa,b	VIIa-c,e-k	VIIIa,b,d,e	Discards	Total	VIIIc	IXa		Total
1982	-	2,788 <sup>3</sup>	-	1,247	4,035	-	-	6,283	32,231	3,073	-	41,587	19,610	39,726	59,336	104,958
1983	-	4,420 <sup>3</sup>	-	3,600	8,020	412	-	24,881	36,926	2,643	-	64,862	25,580	48,733	74,313	147,195
1984	-	25,893 <sup>3</sup>	-	3,585	29,478	23	94	31,716	38,782	2,510	500	73,625	23,119	23,178	46,297	149,400
1985	1,138	22,897		2,715	26,750	79	203	33,025	35,296	4,448	7,500	80,551	23,292	20,237	43,529	150,830
1986	396	19,496		4,756	24,648	214	776	20,343	72,761	3,071	8,500	105,665	40,334	31,159	71,493	201,806
1987	436	9,477		1,721	11,634	3,311	11,185	35,197	99,942	7,605	-	157,240	30,098	24,540	54,638	223,512
1988	2,261	18,290		3,120	23,671	6,818	42,174	45,842	81,978	7,548	3,740	188,100	26,629	29,763	56,392	268,163
1989	913	25,830		6,522	33,265	4,809	85,304 <sup>2</sup>	34,870	131,218	11,516	1,150	268,867	27,170	29,231	56,401	358,533
1990	14,872 <sup>1</sup>	17,437		1,325	18,762	11,414	112,753 <sup>2</sup>	20,794	182,580	21,120	9,930	373,463	25,182	24,023	49,205	441,430
1991	2,725 <sup>1</sup>	11,400		600	12,000	4,487	63,869 <sup>2</sup>	34,415	196,926	25,693	5,440	333,555	23,733	21,778	45,511	391,066
1992	2,374 <sup>1</sup>	13,955	400	688	15,043	13,457	101,752	40,881	180,937	29,329	1,820	370,550	24,243	26,713	50,955	436,548
1993	850 <sup>1</sup>	3,895	930	8,792	13,617	3,168	134,908	53,782	204,318	27,519	8,600	433,145	25,483	31,945	57,428	504,190
1994	2,492 <sup>1</sup>	2,496	630	2,503	5,689	759	106,911	69,546	194,188	11,044	3,935	388,875	24,147	28,442	52,589	447,153
1995	240	7,948	30	8,666	16,756	13,133	90,527	83,486	320,102	1,175	2,046	510,597	27,534	25,147	52,681	580,034
1996	1,657	7,558	212	9,416	18,843	3,366	18,356	81,259	252,823	23,978	16,870	396,652	24,290	20,400	44,690	460,185
1997	2,037 <sup>4</sup>	15,504 <sup>5</sup>	10	5,452	19,540	2,617	63,647	40,145	318,101	11,677	2,921	442,571	29,129	27,642	56,771	518,882
1998	3,693	10,530	83	16,194	30,500	2,540 <sup>6</sup>	17,011	35,043	232,451	15,662	830	303,543	22,906	41,574	64,480	398,523
1999	2,095 <sup>4</sup>	9,335		27,889	37,224	2,557 <sup>7</sup>	47,316	40,381	158,715	22,824		273,888	24,188	27,733	51,921	363,033
2000	1,105 <sup>4</sup>	25,954		22,471	48,425	1,169 <sup>8</sup>	4,524	20,657	115,245	32,227		174,927	21,984	27,160	49,144	272,496
2001	157 <sup>9</sup>	8,157		38,114	46,425	60	11,525 <sup>10</sup>	24,636	100,676	54,293		191,193	20,828	24,911	45,739	283,357

<sup>1</sup>Norwegian and Danish catches are included in the Western horse mackerel.

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

<sup>3</sup>Divisions IIIa and IVb,c combined.

<sup>4</sup>Included in Western horse mackerel

<sup>5</sup>Norwegian catches in IVb (1,426 t) included in Western horse mackerel.

<sup>6</sup>Includes 1937 t from Vb

<sup>7</sup>Includes 132 t from Vb

<sup>8</sup>Includes 250 t from Vb

<sup>9</sup>Includes 72 t allocated to western horse mackerel

<sup>10</sup>Includes 69 t allocated to North Sea horse mackerel

**Table 3.5.11.2** Landings (t) of HORSE MACKEREL in Sub-area IV and Division IIIa by country. (Data submitted by Working Group members).

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

Country	1998	1999	2000	2001 <sup>1</sup>
Belgium	19	21	19	19
Denmark	2,048	8,006	4,409	2288
Estonia	22	-	-	-
Faroe Islands	28	908	24	-
France	379	60	49	48
Germany	4,620	4,071	3,115	230
Ireland	-	404	103	375
Netherlands	3,811	3,610	3,382	4685
Norway	13,129	44,344	1,246	7948
Poland	-	-	-	-
Russia	-	-	2	-
Sweden	3,411	1,957	1,141	119
UK (Engl. + Wales)	2	11	15	317
UK (N. Ireland)	-	-	-	-
UK (Scotland)	3,041	1,658	3,465	3161
Unallocated + discards	737	-325	14613	649
Total	31,247	64,725	31583	19,839

<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 -4,000 t.

# Blue Whiting Combined Stock

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

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



Marine Fisheries Services Division

## MFSD – ADVICE

ICES advice states that fishing mortality needs to be substantially reduced on this stock, and that Blue whiting should be harvested at  $F_{pa}$  which is currently estimated at 0.32. This corresponds to a TAC in 2003 of about 600,000 t.

MFSD agrees with the ICES and STECF advice in principle but would highlight that the current reference points are inconsistent for this stock, and therefore the TAC may not be appropriate. MFSD also highlights that the dramatic change in the perception in this stock in the past year is driven by the current perception of above average recruitment.

MFSD points out that 54% of the catches of this stock are taken in unregulated and rapidly expanding non EU fisheries. MFSD considers therefore that the current application of NEAFC TACs set for EU and Norway are not an effective instrument for the management of this stock.

## STATE OF THE STOCK

- There are serious concerns about the state of this stock which is harvested outside safe biological limits based on the current reference points. These reference points will be reviewed by ICES in early 2003. The present assessment gives far higher estimates of stock abundance in the most recent years compared to those obtained from the 1999 – 2001 assessments. Because of this it appears that the rebuilding plan previously recommended by ICES is not necessary at present.
- The landings in 2001 were almost 1.8 million tonnes, -the highest ever recorded. Landings from 1998 to 2001 have been more than double those of the previous four years.
- The fishing mortality has increased dramatically since the late 1990's and in 2001 was nearly double the value for 1999. This was directly due to the increased catches in recent years. Fishing mortality is now estimated to be over 0.82 which is far above the proposed  $F_{pa}=0.32$
- A number of very strong year classes have recruited to the stock in recent years –particularly those of 1996, 1999 and 2000.
- The spawning stock increased substantially in the late

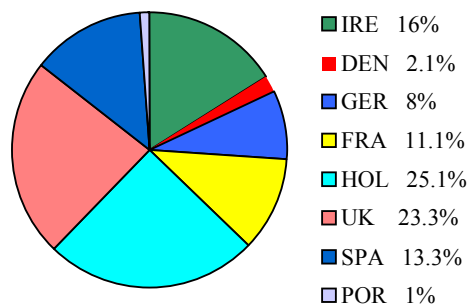
1990s as a result of the strong recruitment. However it has fallen in 2000 and 2001 from a high in 1999 and is predicted to fall rapidly at the current catch rates. Current stock size is estimated to be 2.56 million tonnes which is above the  $B_{pa}$  of 2.25 million tonnes. There is a pronounced absence of older fish in the stock.

- The short-term predictions indicate that the stock will decline rapidly at current fishing mortality and average recruitment levels.

## CURRENT MANAGEMENT

- There is no TAC that is applied to the total fishery for this stock. Autonomous TACs have been set in 2001 and 2002 by the EU and Norway but these only apply to their own fleets. Ireland has a share (16%) of the EU TAC. Under the terms of the EU/Norwegian agreement Norway has again been allowed to fish approximately 190,000 t of blue whiting in EU zone. There are no restrictions on catches that are taken by any of the other countries participating in the fishery. These catches amount to 54% of the total in 2001. Over 23% of the total catch in 2001 was taken in “international” waters which means that over three quarters of the catches of blue whiting are taken in the EU zone.

EU TAC I,II,V,VI,VII,XII,XIV



- The assessment of the stock includes all catches taken over the entire area of the distribution. The assessment therefore includes catches taken in 1) the **Norwegian Sea fishery** (Subareas I+II and Divisions Va, XIVa-b); 2) the **Fishery in the spawning area** (Divisions Vb, VIa, VIb, VIIb-c); 3) the **Industrial mixed fishery** (Divisions IVa-c, Vb, and IIIa) and 4) the **Southern fishery** (Subareas VIII+IX, Divisions VIId, e, g-k).
- The EU, Faroe Islands, Iceland and Norway have agreed in 2001 to implement a long term management plan for the fisheries. This is aimed at maintaining the stock within safe biological limits. The plan which is outlined in the ICES section is aimed at preventing

the stock falling below  $B_{lim}$  (1.5 million tonnes) and to fix catches in 2003 and subsequent years that would generate a fishing mortality less than 0.32. If the stock should fall below  $B_{pa}$  (2.25 million tonnes) then the fishing mortality rate should be adjusted accordingly.

- The TACs that apply to this stock are shown in the table below. The Irish quota is 16% of the EU quota in Sub areas I,II,VI,VII,XII and XIV.

#### BLUE WHITING QUOTAS IN 2002 \*

	Norway	EU	Faroe Islands	Iceland	Russia	Greenland	Total
EU-zone	120 000	180 000	-	-	-	-	300 000
FAR-zone	35 000	-	193 400	-	105 000	-	333 400
NOR-zone	329 396	20 000	6 500	-	41 542	-	397 438
JM-zone	-	-	100	-	-	-	100
ICE-zone	-	-	-	282 000	-	-	282 000
INT-zone	-	-	-	-	≈140 000	-	≈ 140 000
GRL-zone	-	15 000	-	-	-	25 000	40 000
<b>Total</b>	<b>484 396</b>	<b>215 000</b>	<b>200 000</b>	<b>282 000</b>	<b>≈ 286 542</b>	<b>25 000</b>	<b>≈ 1 492 938</b>

\* Quotas set for each party in their respective fishing zones may also be fished in international waters  
May be fished in the Icelandic zone , May be fished in the Faroese zone

#### Breakdown of EU TAC of 180,000 t

Zone	EU	Irish Quota
Ila, IV	27,650	
I,II,V,VI,VII,XII,XIV	107,281	17,165
VIIabde	14,654	
VIIc, IX, X		
Cecaf 34.1.1	30,415	

### MFSD – ECONOMIC COMMENTS

- The value of the Irish catch in 2001 was €2.24 million.
- The value of the Irish quota in 2002 is about €1.6 million.
- A large proportion of the total catch prior to 2001 has been reduced for fishmeal at Killybegs. However considerable efforts have been made by BIM and the North West Pelagic Management Advisory Committee to increase the amount of catch that is suitable for human consumption. The fishery may become much more important in future if these efforts are successful.

### ADDITIONAL INFORMATION

1. The assessment of this stock is considered to be unstable because the age distribution of the stock is changing rapidly due to fishing pressure. Recruitment estimates from the 2001 surveys indicate that the 1999 and 2000 year classes are very abundant. In addition some of the older fish were much more abundant in the catch in 2001 than expected. This has produced a change in the selection pattern in the model

2. The current instability in the assessment caused by the apparent influx of large recruiting yearclasses means that any revision of the SSB reference points will have to await further evaluation. This is because the technical basis for  $B_{lim}$  is  $B_{loss}$  and  $B_{pa}$  is just a scalar of this. As the stock trajectory over the entire period is now unstable  $B_{loss}$  is likely to change from one year to the next. In any event there is a mismatch in the definition of F and SSB reference points where by, even a reduction in fishing mortality to  $F_{pa}$  will cause SSB to drop below  $B_{pa}$  unless a strong year class recruits to the fishery.
3. The definition of  $B_{lim}$  and  $B_{pa}$  will be key indicators to the long term harvesting strategy for this stock. The proposed management plan indicates a linear decline in F when SSB falls below  $B_{pa}$  but the size of the reduction will depend on the time frame of the agreed recovery of SSB to be above  $B_{pa}$ .
4. Even though SSB is predicted to be above  $B_{pa}$  in 2001, short-term predictions show that SSB will fall below  $B_{pa}$  in 2003 unless the fishery is closed for

2003 or unless another strong yearclass recruits to the fishery. Medium term analysis shows that there will be a 95% probability that SSB will rise above  $B_{pa}$  in 5 years if  $F$  is maintained at 0.2. However, the advice is for  $F_{pa} = 0.32$  which would give a TAC of 598,000 t notwithstanding the fact that will cause a decrease in SSB below  $B_{pa}$  2003 and further decreasing SSB in 2004. ACFM considers that although the  $B_{pa}$  reference point will be revised it is important to maintain consistency in the basis for advice

5. The total catch taken from this stock during 2001 was over 1.77 million tonnes. The advised TAC was 628,000 t. There continue to be serious concerns about the large scale unregulated fisheries that are taking place in "international" waters.
6. There was a change in the fishery pattern in 2001 whereby large catches are now taken in Div Va in quarter 3. These catches are mainly taken in Icelandic waters and comprise mainly juvenile fish.
7. The Irish catch in 2001 was 29,900 t compared with 26,100 t in 2000 and 35,900 t in 1999. The Irish catch in recent years has been severely limited because of the small quota and the fishery was closed very early in 2002 because of the rapid up take of the quota. The provisional catch for 2002 is about 17,800 t.
8. 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.
9. The main catches are taken by Norway, Russia, Denmark, Faroe Is and Iceland. Catches by Russia, Iceland and the Faroe Is have doubled over the last three years. The vast bulk of the international catch with the exception of that taken by Russia is reduced for industrial purposes.
10. The Irish fishery for blue whiting has developed since 1997 as a result of the large tank vessels in Killybegs targeting the species. This development arose mainly because of the reduced quota on mackerel and horse mackerel and because of the increased prices for fishmeal in 1998. The fishery has enormous potential for the larger Killybegs vessels but the small percentage of the EU quota that has been allocated to Ireland and the reduction in prices is a major source of disappointment.
11. Although the Irish catch is restricted because of a reduced quota the fishery still remains a valuable resource to the Irish fleet. The spawning grounds are off the west coast of Ireland and the main spawning occurs during the period February to April. It is therefore possible for the Irish fleet to land a better quality fish from easily accessible grounds. Efforts have therefore been made by BIM and the North West Pelagic Management Advisory Committee to develop this fishery so that it will not solely depend on the fishmeal factory at Killybegs. The investigations have concentrated on landing a better quality catch so that it can be processed for human consumption. It is important that these efforts are continued and in 2001 approximately 500 t were graded and frozen for hu-

man consumption.

12. Irish sampling of this stock is supported through the EC funded sampling programme which is required under the Data Collection Regulation 1543/2000 and 1639/2001. Ireland commenced a sampling programme on blue whiting in 1998 as a result of a joint programme between the processing industry at Killybegs and the Marine Institute. Irish scientists have participated in the Norwegian acoustic surveys on the stock each Spring since 1999 and in 2002 submitted considerable data to the Northern Pelagic Assessment Working Group.
13. The age distribution of the Irish catches in 2001 was dominated by 4 year old and 5 year old fish (the 1997 and 1996 year class). The stock is now composed of fish belonging to only a few year classes and without good recruitment will quickly decline.
14. The length distribution of the Irish catches in 2001 was dominated by fish between 25 cm. and 27 cm.
15. Acoustic surveys, carried out by Norway and Russia play a very important role in the assessment of this stock. Ireland does not at present carry out acoustic surveys because of the low economic value of the small Irish quota. However this may change and it may become desirable to carry out surveys using the new research vessel

## ICES ADVICE

### 3.12.5

#### State of stock/exploitation

The stock is harvested outside safe biological limits. The spawning stock biomass for 2001 at the spawning time (April) is inside safe biological limits while the SSB for 2002 is expected to be below  $B_{pa}$ . Fishing mortality has increased rapidly in recent years, and is estimated at 0.82 in 2001. Total landings in 2001 were almost 1.8 million t. The incoming year classes seem to be strong.

#### Management objectives:

EU, Faroe Islands, Iceland, and Norway agreed to implement a long-term management plan for the fisheries of the blue whiting stock, which is consistent with a precautionary approach, aimed at constraining the harvest within safe biological limits and designed to provide for sustainable fisheries and a greater potential yield. The plan shall consist of the following:

1. *Every effort shall be made to prevent the stock from falling below the minimum level of Spawning Stock Biomass (SSB) of 1 500 000 tonnes.*
2. *For 2003 and subsequent years, the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality less than 0.32 for appropriate age groups as defined by ICES, unless future scientific advice requires modification of the fishing mortality rate.*
3. *Should the SSB fall below a reference point of 2 250 000 tonnes ( $B_{pa}$ ) the fishing mortality rate, referred to*



under paragraph 1, shall be adapted in the light of scientific estimates of the conditions then prevailing. Such adaptation shall ensure a safe and rapid recovery of the SSB to a level in excess of 2 250 000 tonnes.

4. In order to enhance the potential yield, the Parties shall implement appropriate measures, which will reduce catches of juvenile blue whiting.
5. The Parties shall, as appropriate, review and revise these management measures and strategies on the basis of any new advice provided by ICES.

ICES has not yet evaluated the management plan with respect to its conformity to the precautionary approach.

#### Advice on management:

ICES recommends that the fishing mortality be less than  $F_{pa}=0.32$ , corresponding to landings of less than 600 000 t in 2003.

#### Rebuilding plan:

Implementation of a rebuilding plan is not necessary since according to the current assessment the state of the stock is better than previously estimated.

#### Precautionary Approach reference points:

ICES considers that:	ICES proposes that:
$B_{lim}$ is 1.5 mill t	$B_{pa}$ be set at 2.25 million t
$F_{lim}$ is 0.51	$F_{pa}$ be set at 0.32

#### Technical basis

$B_{lim} : B_{loss}$	$B_{pa} = B_{lim} \exp(1.645 \cdot \sigma) \sigma = 0.25$
$F_{lim} : F_{loss} (0.51)$	$F_{pa} : F_{med} (1998)$

#### Relevant factors to be considered in management:

The current exploitation rate is not sustainable. The advice implies a reduction in fishing mortality by 60 % to  $F_{pa}$ . However, it is recognised that fishing mortality will have to be reduced further in the following years in order to bring SSB back above  $B_{pa}$ . The reduction of fishing mortality to  $F_{pa}$  is a first necessary step.

The spawning stock biomass reached a peak in 1999 due to the strong year classes 1995, 1996, and 1997. Even though the 1999 and 2000 year classes seem to be very strong, the SSB is expected to decline rapidly at the present level of fishing mortality.

The current exploitation rate and pattern means that few year classes support the fishery. The year classes dominating in the fishery are harvested heavily before they can reproduce or reach full growth potential. The estimate of

year class strength for such young age groups is uncertain. The shift in dominance of younger ages in the stock in recent years is considered to be caused by an overall increase in fishing mortality and increased recruitment.

The proposed biological reference points for this stock may not be appropriate because even at moderate exploitation the probability that the stock drops below  $B_{pa}$  may be substantial. Revision of the biological reference points should be carried out based on a reliable analytical assessment of the stock.

Blue whiting is widely distributed in the eastern North Atlantic. Its distribution extends from the Strait of Gibraltar to the Barents Sea. It consists of several populations with genetic "leakage" between them, but it is treated as one stock since it has so far not been possible to define an unambiguous border between populations.

#### Catch forecast for 2003:

Basis:  $F(2002) = F(2001) = 0.82$ ; Landings(2002) = 1505; SSB in 2002 = 2238.

F(2003) onwards	Basis	Catch (2003)	Landings (2003)	SSB in year 2003	SSB in year 2004
0.00	No fishing	0	0	2238	2756
0.08	$0.1 * F(2001)$	169	169	2202	2559
0.16	$0.2 * F(2001)$	327	327	2167	2378
0.25	$0.3 * F(2001)$	476	476	2132	2214
0.32	$F_{pa} = 0.39 * F(2001)$	598	598	2102	2082
0.33	$0.4 * F(2001)$	615	615	2098	2063
0.41	$0.5 * F(2001)$	747	747	2065	1924
0.82	$F(2001)$	1296	1296	1908	1383

Weights in '000 t, Mean F, ages 3–7.

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### Medium- and long-term projections:

Medium-term projections were made using an  $F$  status quo assumption for the current year. The projections indicate that fishing at the current  $F_{pa}$  has a high probability of reducing the stock to below  $B_{pa}$ . A revised estimate of  $F_{pa}$  that is more consistent with maintaining stock sizes above  $B_{pa}$  will have to be substantially below the current value.

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### Comparison with previous assessment and advice:

The present assessment gives far higher estimates of the stock abundance in the most recent years compared to the assessments made in 1999 to 2001. Recruitment estimates from the 2001 surveys indicated that the 1999 and 2000 year classes were very abundant. The 2002 survey on the spawning grounds suggested that most age classes are more abundant than was indicated by earlier surveys. However, the increase is also seen in all the oldest year classes where a decrease due to mortality would be expected. This suggests that the 2002 survey values may be overestimates.

The 1999 and 2000 year classes were very abundant in the fishery in 2001 (notably in the third quarter). However, the ages 8 and 9 were also more present in the catch than could be expected from the catches of the earlier years. This has caused the selection pattern that is estimated in the model to be changed compared to the assessment from last year. Notably, the selection on the oldest ages has increased and this is carried through in the historical reconstruction of the stock by giving higher fishing mortality to the oldest age and a lower SSB over the historical period. Both the higher abundance of most year classes in the 2002 survey and the high estimates of fishing mortality for the oldest age could be year-specific effects, and not reliable indicators of true changes in stock status relative to recent assessments.

The catch information from 2001 and the surveys from 2001 and spring 2002 indicate that the 1999 and 2000 year classes are very strong, but their actual size is still very uncertain. The survey and catch information that was available for the 2001 assessment (catch data for 2000 and survey information for 2000 and spring 2001) estimated the 1999 year class to be 50 % above average. The estimated strength of the 2000 year class was based on catches of age group 0 only and these were not abnormally high. The surveys do not provide precise estimates of 0 group strength and the strength of the 1 group is estimated in summer after the assessment was done. The summer survey in 2000 found the 0 group abundance to be less than that of the 1999 year class.

The change in perception of recent recruitment has led to a very different outlook for the development of the stock in the near future. Spawning biomass is estimated to be above  $B_{pa}$ , although its exact size is highly uncertain. The trend in fishing mortality is considered to be reflected reliably in the assessment, and there is little doubt that  $F$  is very high and has increased rapidly in the recent years.

Because the stock appears to have improved due to the strong 1999 and 2000 year classes, a rebuilding plan is no longer considered imperative. Nevertheless, a substantial reduction in fishing mortality is still required. Fishing at  $F_{pa}$  ( $=0.32$ ) will result in a declining SSB to a level below  $B_{pa}$  ( $=2.25$  million tonnes) in 2003 unless another strong year class appears.

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### Elaboration and special comment:

Most of the catches are taken in the directed pelagic trawl fishery in the spawning and post-spawning areas (Divisions Vb, VIa,b, and VIIb,c). Catches are also taken in a directed and a mixed fishery in Sub-area IV and Division IIIa and in the pelagic trawl fishery in the northern areas (Sub-area I and II, Divisions Va, XIVa,b). These fisheries in the northern areas have taken 340 000 – 1 390 000 t per year in the last decade, while catches in the southern areas (Sub-area VIII, IX, Divisions VIId,e and g-k) have been stable in the range of 25 000–34 000 t. In Division IXa blue whiting is mainly taken as by-catch in mixed trawl fisheries.

Estimates of spawning biomass by acoustic surveys are well above the level indicated by the assessment. However, it has generally been difficult to reconcile catch data and absolute survey abundance estimates for blue whiting and although the acoustic surveys may be indicative of trends in biomass, the absolute values are not considered representative.

The analytical assessment is based on catch data, acoustic surveys, and commercial CPUE series data.

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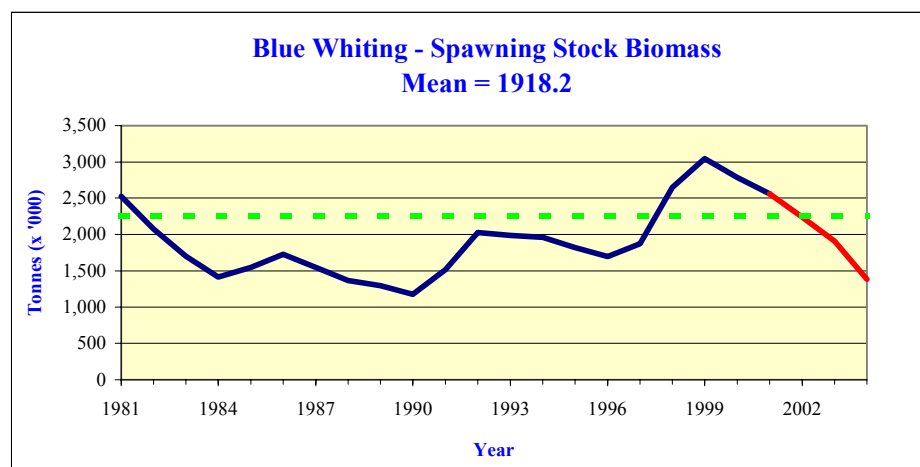
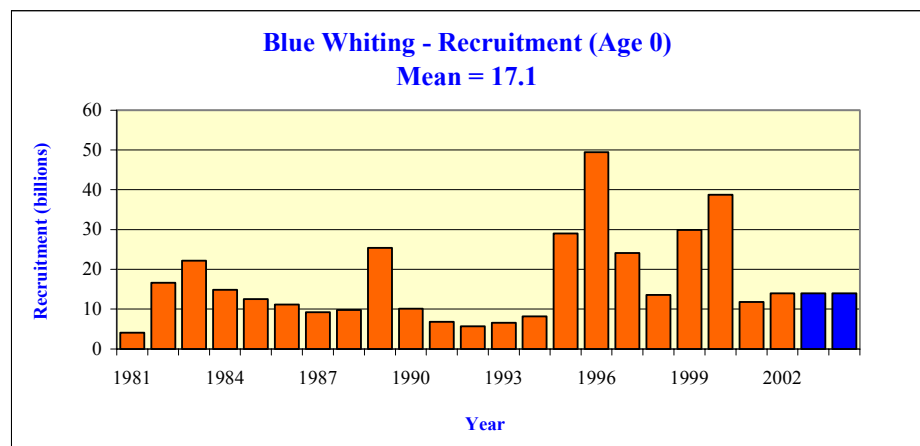
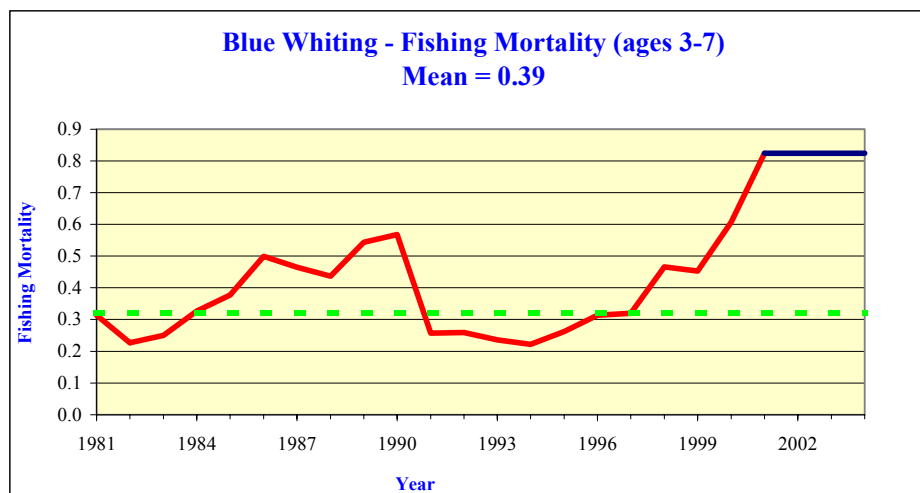
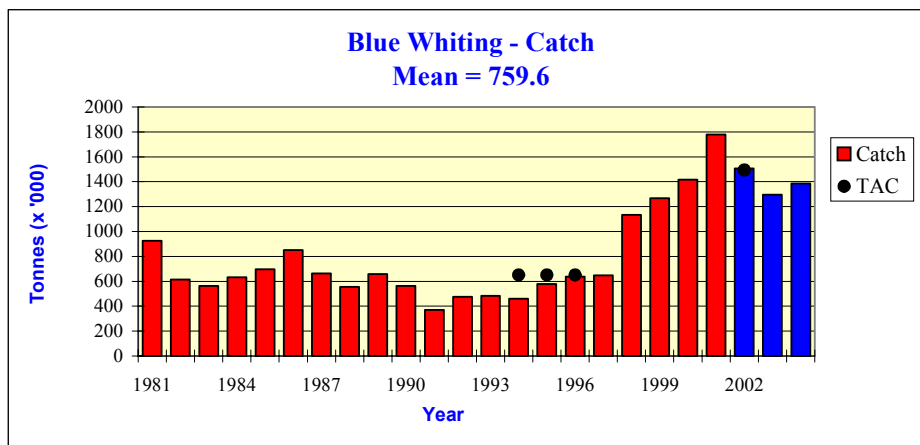
### Source of information:

Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, 29 April – 8 May 2002 (ICES CM 2002/ACFM:19).

**Catch data (Tables 3.12.5.1–7):**

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		
2003	F should be less than the proposed $F_{pa}$	600		

<sup>1</sup>NEAFC proposal for NEAFC regions 1 and 2. Weights in '000 t.



**Table 6.2.1** Landings (tonnes) of BLUE WHITING from the directed fisheries (Sub-areas I and II, Division Va, XIVa and XIVb) 1987–2001, as estimated by the Working Group.

Country	1987	1988	1989 <sup>3)</sup>	1990	1991	1992	1993	1994 <sup>2)</sup>	1995 <sup>3)</sup>	1996	1997	1998	1999	2000	2001
Denmark													15	7,721	5,723
Estonia	-	-	-	-	-	-	-	-	-	377	161	904	-	-	-
Faroes	9,290	-	1,047	-	-	-	-	-	-	345	-	44,594	11,507	17,980	64,496
Germany	1,010	3	1,341	-	-	-	-	2	3	32	-	78	-	-	3117
Greenland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iceland	-	-	4,977	-	-	-	-	-	369	302	10,464	64,863 <sup>4)</sup>	99,092	146,903	245,814
Latvia	-	-	-	-	-	-	-	422	-	-	-	-	-	-	-
Netherlands	-	-	-	-	-	-	-	-	72	25	-	63	435	-	5180
Norway <sup>5)</sup>															64,581
Norway <sup>6)</sup>	-	-	-	566	100	912	240	-	-	58	1,386	12,132	5,455	-	28,812
Poland	56	10	-	-	-	-	-	-	-	-	-	-	-	-	-
USSR/Russia <sup>1)</sup>	112,686	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
Total	123,042	55,829	42,615	2,106	78,703	62,312	43,240	22,674	23,733	23,447	62,570	173,676	182,436	276,545	591,583

<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 Vb.

<sup>5)</sup> Directed fishery

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

**Table 6.2.2** Landings (tonnes) of BLUE WHITING from directed fisheries (Division Vb, VIa,b, VIIb,c, VIIg-k and Sub-area XII) 1987–2001, as estimated by the Working Group.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998 <sup>1)</sup>	1999	2000	2001
Denmark	2,655	797	25	-	-	3,167	-	770	-	269	-	5051	19,625	11,856	18,110
Estonia	-	-	-	-	-	6,156	1,033	4,342	7754	10,605	5,517	5,416	-	-	-
Faroes	70,625	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
France	-	-	2,190	-	-	-	1,195	-	720	6,442	12,446	7,984	6,662	13,481	13,480
Germany	3,850	5,263	4,073	1,699	349	1,307	91	-	6,310	6,844	4,724	17,891	3,170	12,655	15,862
Iceland	-	-	-	-	-	-	-	-	-	-	-	-	61,438	113,280	119,287
Ireland	3,706	4,646	2,014	-	-	781	-	3	222	1,709	25,785	45,635	35,240	25,200	29,854
Japan	-	-	-	-	-	918	1,742	2,574	-	-	-	-	-	-	-
Latvia	-	-	-	-	-	10,742	10,626	2,160	-	-	-	-	-	-	-
Lithauen	-	-	-	-	-	-	2,046	-	-	-	-	-	-	-	-
Netherlands <sup>2)</sup>	5,627	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
Norway	191,012	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
UK (Scotland)	3,315	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
USSR/Russia <sup>3)</sup>	165,497	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
Total	446,287	426,037	475,179	463,495	218,946	318,018	347,101	378,704	423,504	478,077	514,654	827,194	940,881	996,578	1,045,100

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

<sup>2)</sup> Revised for the years 1987, 1988, 1989, 1992, 1995, 1996, 1997

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

**Table 6.2.3** Landings (tonnes) of BLUE WHITING from directed fisheries and by-catches caught in other fisheries in Divisions IIIa, IVa 1987–2001, as estimated by the WG.

Country	1987	1988	1989	1990	1991	1992	1993 <sup>3)</sup>	1994	1995	1996	1997	1998 <sup>2)</sup>	1999	2000	2001
Denmark <sup>4)</sup>	28.541	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
Faroes <sup>4) 6)</sup>	7.051	492	3.325	5.281	355	705	1.522	1.794	-	6.068	6.066	-	-	-	60
Faroes <sup>5) 6)</sup>												296	265	42	6.741
Germany <sup>1)</sup>	115	280	3	-	-	25	9	-	-	-	-			-	81
Netherlands	-	-	-	20	-	2	46	-	-	-	793			-	-
Norway <sup>4)</sup>	24.969	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
Norway <sup>5)</sup>															58.182
Russia															69
Sweden	2.013	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
UK	-	100	7	-	335	18	252	-	-	1	-			-	-
<b>Total</b>	<b>62.689</b>	<b>45.143</b>	<b>75.958</b>	<b>63.192</b>	<b>39.872</b>	<b>65.974</b>	<b>58.082</b>	<b>28.563</b>	<b>104.004</b>	<b>119.359</b>	<b>65.091</b>	<b>94.881</b>	<b>106.609</b>	<b>114.476</b>	<b>118.523</b>

<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.

**Table 6.2.4** Landings (tonnes) of BLUE WHITING from the Southern areas (Sub-areas VIII and IX and Divisions VIIg-k and VIII,e) 1987–2001, as estimated by the Working Group.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Netherlands	-	-	-	450	10	-	-	-	-	-	-	10 <sup>1)</sup>	-	-	-
Norway	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Portugal	9.148	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
Spain	23.644	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
UK	23	12	29	13	-	-	-	5	-	-	-	-	-	-	-
France	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total</b>	<b>32.819</b>	<b>30.838</b>	<b>33.695</b>	<b>32.817</b>	<b>32.003</b>	<b>28.722</b>	<b>32.256</b>	<b>29.473</b>	<b>27.664</b>	<b>25.099</b>	<b>30.122</b>	<b>29.390</b>	<b>26.402</b>	<b>24.654</b>	<b>24.964</b>

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

**Table 6.2.5** Total landings of blue whiting by country and area for 2001 in tonnes. Landing figures provided by Working Group members and these figures may not be official catch statistics and therefore can not be used for management purposes.

Area	Denmark	Faroes	France	Germany	Iceland	Netherlands	Ireland	Norway	Portugal	Russia	Scotland	Spain	Sweden	Grand Total
<b>I</b>											33			33
<b>IIa</b>	5,723	39,694			3,117	74,700	5,180		93,393		148,015			369,821
<b>IIb</b>											25,812			25,812
<b>IIIa</b>	2,954								22				2,040	5,016
<b>IVa</b>	26,546	6,801			81				79,964		69		46	113,507
<b>IXa</b>										1,746				1,746
<b>Va</b>		24,801			171,114									195,915
<b>Vb</b>	13,632	114,591			119,287				63,282		94,776			405,568
<b>Vb VI VII</b>				13,480										13,480
<b>VIa</b>	1,023	28,753			11,619		25,572	18,357	148,789			36,264		270,376
<b>VIb</b>		6,480			650		4,447	567	35,820		37,193	2,963		88,120
<b>VIIb</b>					51		10,595	1,563				6,816		19,025
<b>VIIbc</b>									75,756					75,756
<b>VIIc</b>	3,455	36,816			3,488		25,820	8,438				4,044		82,061
<b>VIIg+XII</b>		1,824							76,285		9,580			87,689
<b>VIIh</b>					2									2
<b>VIIIc+IXa</b>													23,218	23,218
<b>VIIj</b>					52		1,982	929				60		3,023
<b>Grand Total</b>	<b>53,333</b>	<b>259,761</b>	<b>13,480</b>	<b>19,060</b>	<b>365,101</b>	<b>73,595</b>	<b>29,854</b>	<b>573,310</b>	<b>1,746</b>	<b>315,478</b>	<b>50,147</b>	<b>23,218</b>	<b>2,086</b>	<b>1,780,170</b>



**Table 3.12.5.6**

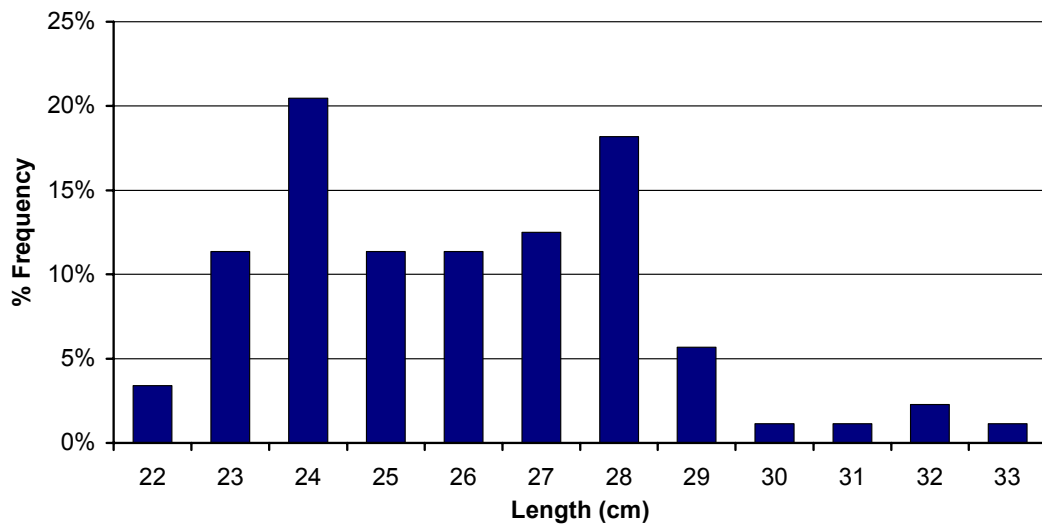
Blue whiting combined stock (Sub-areas I-IX, XII &amp; XIV)

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-7
1981	4055289	2524227	924804	0.3143
1982	16639719	2076892	613859	0.2262
1983	22220166	1701049	562084	0.2497
1984	14847654	1415142	630753	0.3275
1985	12544761	1543316	696998	0.3771
1986	11151699	1728281	849665	0.4990
1987	9213750	1546722	662561	0.4652
1988	9810064	1365409	553690	0.4368
1989	25384230	1293635	657602	0.5439
1990	10114204	1175685	560950	0.5676
1991	6792609	1514241	369806	0.2572
1992	5701122	2026704	475048	0.2593
1993	6554003	1987685	480733	0.2363
1994	8169103	1959444	459082	0.2217
1995	29012229	1819742	577921	0.2617
1996	49460845	1694646	636090	0.3135
1997	24158783	1870973	646242	0.3202
1998	13545724	2648888	1133373	0.4664
1999	29937139	3043905	1265898	0.4531
2000	38754471	2784253	1416451	0.6071
2001	11760000	2561316	1777957	0.8245
2002		2238000		
Average	17134646	1918198	759598	0.3918

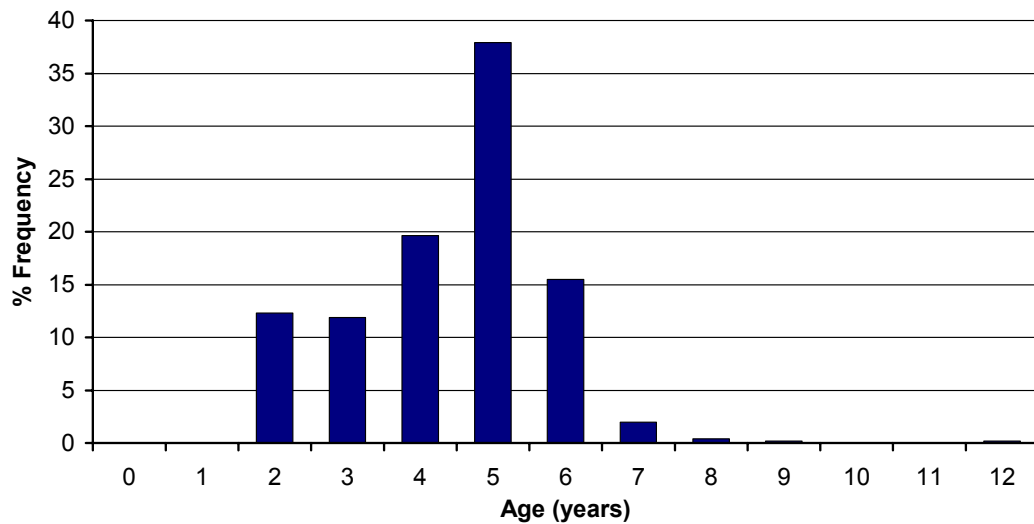
**Table 3.12.5.7** Blue whiting. Results of medium term analysis.

F in 2002 equals F in 2001 (F=0.8245)												
Probabilities (%)					Year when	Year when	Fractiles of catch in 2002			Fractiles of catch in 2003		
F in 2003	B<Blim		B>Bpa		risk B<Blim is	prob. B>Bpa						
and after	2003	2012	2003	2012	below 5%	is above 95%	25%	50%	75%	25%	50%	75%
0.05	4.1	0.0	38.8	100.0	2003	2005	1216	1374	1558	89	102	117
0.10	4.6	0.0	36.9	100.0	2003	2005				174	200	230
0.15	5.5	0.0	35.8	99.8	2004	2006				255	294	336
0.20	5.8	0.0	34.4	97.7	2004	2008				334	384	440
0.25	6.6	0.0	32.2	89.7	2004	>2012				409	470	540
0.30	7.4	0.6	30.7	74.6	2004	>2012				481	554	635
0.32=Fpa	7.4	1.3	30.4	68.2	2004	>2012				509	586	672
0.35	7.8	2.6	29.9	58.1	2004	>2012				551	634	726
0.40	8.7	6.9	28.2	38.8	>2012	>2012				618	711	815

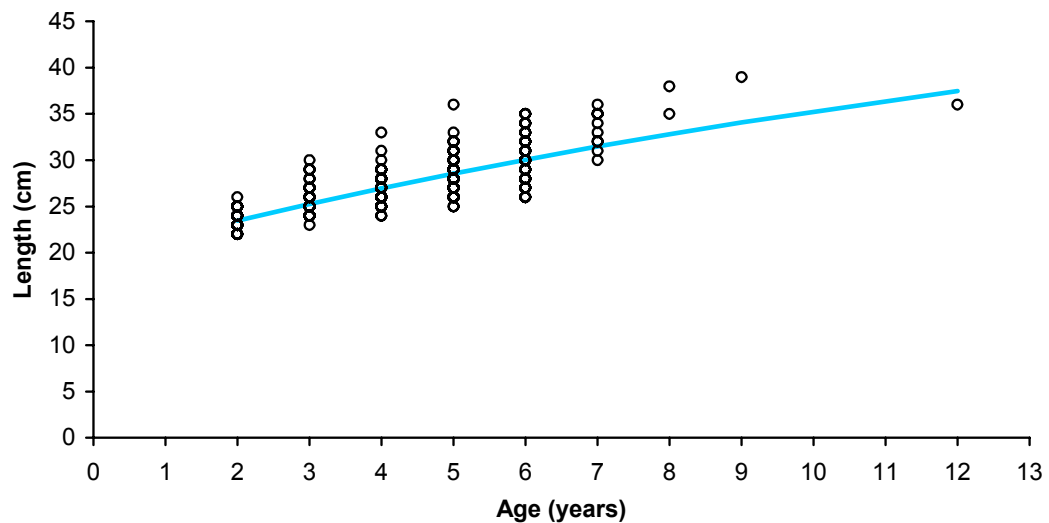
**2001 Length Distribution: Irish Landings, Blue Whiting in VIIb**



**2001 Age Distribution: Irish Landings, Blue Whiting in VIIb**



**2001 Size at Age: Irish Sampling, Blue Whiting in VIIb**



# Albacore Tuna - North Atlantic



## Marine Fisheries Services Division

The Standing Committee of Research and Statistics (SCRS) of the International Commission for the Conservation of Atlantic Tunas (ICCAT) carries out the assessment of the albacore tuna stocks. This body also provides the management advice to ICCAT

### MFSD – ADVICE

MFSD agrees with the advice given by SCRS to ICCAT and with the STECF advice that in order to maintain a stable SSB in the near future then catches should not exceed 34,500 t (the 1999 catch level) for 2003. This would give an Irish quota in 2003 of 3,158 t which would be the same as that for 2002. The SCRS further advised that should the Commission wish the SSB to begin increasing towards the level estimated to support the maximum sustainable yield (MSY) then catches should not exceed 31,000 t.

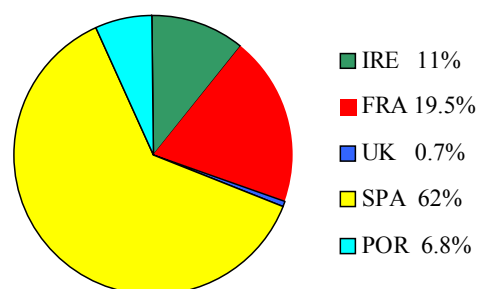
### STATE OF THE STOCK

- Precautionary reference points have not been established for the stock.
- There are concerns for this stock as it is below the level at which it could yield its maximum sustainable catches.
- Landings in the north Atlantic have shown a declining trend since the mid 1960's, largely due to a reduction of fishing effort by the traditional surface and longline fisheries. In contrast effort and catch in the new surface fisheries increased between 1987 and 1999. The total catch in 2001 was about 25,050 t compared with 33,100 t in 2000. This is the lowest catch recorded for the last 25 years. Catches of over 57,000 t were recorded in 1976
- The fishing mortality on juveniles (ages 2-4) has shown an increasing trend while fishing mortality on adults (ages 5) increased to a peak in 1986 but has since declined. Recent rates appear to be high but not as high as during the peak period.
- The abundance of recruits (age 1) and juveniles (ages 2-4) has varied from year to year with perhaps some declining trend from 1975-1985. Recruitment since 1985 appears to have fluctuated, although at lower levels.

- The spawning stock was at the highest level in the late 1970's and subsequently declined until the late 1980's. In recent years the SSB appears to have been about 30% below the level corresponding to that at which the maximum sustainable yield would be achieved.
- The development of this stock is uncertain because of the lack of data on recruitment levels..

### CURRENT MANAGEMENT

- The management area and the assessment area for albacore tuna cover the whole of the Atlantic, north of 5°.
- Prior to 2001 no TAC had been set by ICCAT for albacore tuna. In 2000 SCRS recommended to ICCAT that the catch in 2001 and 2002 should not exceed 34,500 t in order to maintain a stable SSB in the near future. In addition SCRS advised that, if ICCAT wished to rebuild the stock to the MSY level, then annual catches in 2001 and 2002 should not exceed 31,000 t. A TAC of 28,712 t was subsequently imposed by EU for 2001 and Ireland was allocated a quota of 3,158 t (11%). In addition recommendations made by ICCAT in 1998 concerning the limitations on fishing capacity on northern albacore remain in force. In 2002 the EU introduced a complete ban on the use of drift nets in this fishery.



### ECONOMIC COMMENTS

The albacore tuna fishery is extremely valuable to a number of ports on the southwest coast, particularly Castletownbere and Dingle. The total albacore catch in 2001 was valued at over €5.2 million. This made it one of the most important commercial species landed by the Irish fleet. The value of the 2002 quota is nominally about €10 million. The ban on the use of gill nets that came into force at the end of 2001 has had a very serious effect on the tuna fisheries in the south west coast.

## ADDITIONAL INFORMATION

1. No new assessment was carried out in 2002 because of the absence of any new data. Therefore the advice about this stock is based on the most recent assessment that was carried out in 2000. This assessment was considered to be an improvement on those of previous years. However there are still many uncertainties, especially in relation to some of the biological parameters. There was insufficient new data in 2002 to enable a new assessment to be carried out and the next complete assessment of the stock is planned for 2003.
2. The total catch taken from the fishery during 2001 was 25,100 t, compared with 33,800 t in 2000. The Irish catch in 2001 was 2,004 t compared with 3,464 t in 2000. The catch in 1999 of 4,858 t was the highest catch taken by Ireland since it first started exploiting this stock in 1990.
3. There appears to be no area misreporting for this fishery and no reason for under-reporting catches because of the absence of national quota prior to 2001.
4. The main albacore tuna catching countries in 2001 were Spain (9,200 t), France (6,300 t), China (4,399 t) and Ireland (2,000 t). There was a very significant decrease in the Spanish catch of nearly 7,000 t. The total catch is taken by four main types of gears – bait boats, trolling, drift nets and long lines.
5. The Irish fishery for albacore tuna takes place over a large area extending from the south of the Bay of Biscay to the southern end of the Porcupine Bank and the main landings are made at Castletownbere and Dingle. Most of the catches are taken during July to October. The fishery is of recent origin and did not become important until 1992. The main portion of the catch is landed fresh and is exported whole to Spain and France. Because of the ban on the use of drift nets BIM, in 1998, initiated a programme in which the Marine Institute participated, designed to develop alternatives to drift nets. Some success was achieved by vessels using pair mid-water trawls and increased catches were taken by this gear in 2000 and 2001. Preliminary indications from the 2002 fishery suggest that this method of fishing can be economically viable and that the use of “pingers” investigated by BIM would prevent by catches of cetaceans.
6. Irish sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001.
7. Biological information on albacore tuna by Ireland has increased in recent years because of increased sampling at port level and observers on board commercial vessels. According to ICCAT albacore spawning areas in the Atlantic are found in subtropical western areas of both hemispheres and throughout the Mediterranean Sea and spawning takes place during austral and boreal spring-summer. Sexual maturity is considered by SCRS to occur when the fish are about 90 cm. (age 5) in the Atlantic. This conclusion is based on uncertain data but if it were true then it would imply that the vast majority of the Irish catches consist of immature or sub-adult fish. Results from the Marine Institute’s sampling programme as part of the 1999 BIM project would suggest that the larger mature fish are taken in deeper water towards the end of the season. The length distribution of the Irish catches taken in 2001 ranged from 52 cm to 90 cm with most off the fish being between 63 cm and 79 cm.

Estimated landings (MT) of Albacore tuna from 1976-2001 in the North Atlantic

Country	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0
Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada	0	0	0	0	0	0	0	0	0	0	0	0	47
Canada-Jpn	0	0	0	0	0	0	0	0	0	0	1	21	0
Cap-Vert	0	0	0	0	0	0	10	10	0	0	0	0	0
China. Pr	0	0	0	0	0	0	0	0	0	0	0	0	0
Chinese Taipei	14,837	13,723	9,324	6,973	7,090	6,584	10,500	14,254	14,923	14,899	19,646	6,636	2,117
Dominican Republic	0	0	0	0	0	0	0	0	0	0	0	0	0
Cuba	85	83	89	0	31	48	82	38	69	20	31	15	4
Ec-Espana	26,910	25,155	25,404	29,630	25,202	20,819	25,478	29,557	15,685	20,672	24,387	25,206	27,557
Ec-France	6,800	7,733	10,400	9,320	3,955	2,929	2,855	2,391	2,797	1,860	1,200	1,921	2,805
Ec-Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0
Ec-Portugal	610	62	85	149	79	442	321	1,778	775	657	498	433	184
Ec-Uk	0	0	0	0	0	0	0	0	0	0	0	0	0
Grenada	0	0	0	0	0	0	0	0	0	0	0	0	0
Japan	1,345	825	531	1,219	1,036	1,740	781	1,156	576	844	470	494	723
Korea	5,379	5,579	3,048	2,997	797	938	1,326	478	967	390	373	18	16
Mexico	0	0	0	0	2	0	0	33	0	0	0	0	0
Panama	1,227	557	768	425	193	177	494	357	2,551	601	525	44	0
Phillipines	0	0	0	0	0	0	0	0	0	0	0	0	0
St. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0
St. Vincent	0	0	0	0	0	0	0	0	0	0	0	0	0
Trinidad & Tobago	0	0	0	0	0	0	0	268	194	318	0	0	0
Usa	0	2	1	0	21	472	698	347	2,206	97	250	301	288
Ussr	0	0	0	59	0	51	0	0	0	0	0	0	0
Uk-Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0
Venesuela	133	102	397	593	300	331	137	823	580	408	168	26	119
Venesuela-For	0	0	0	0	0	0	0	0	496	59	4	0	18
Total For The Year	57,326	53,821	50,047	51,365	38,706	34,531	42,682	51,490	41,819	40,825	47,553	35,115	33,878

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Barbados	0	0	0	0	0	0	0	1	1	1	0	0	2
Brazil	0	0	0	0	0	0	0	0	0	0	0	4	0
Canada	22	6	5	1	9	32	12	24	31	23	38	122	51
Canada-Jpn	0	0	0	0	0	0	0	0	0	0	0	0	
Cap-Vert	0	0	0	0	0	0	0	0	0	0	0	0	
China. Pr	0	0	0	0	14	8	20	0	0		21	16	51
Chinese Taipei	1,294	3,005	4,318	2,209	6,300	6,409	3,977	3,905	3,330	3,098	5,785	5,299	4,399
Cuba	0	2	0	0	0	0	0	0	0	0	0	0	
Dominican Republic	0	0	0	0	0	0	0	0	323	121	73	95	
Ec-Espana	25,424	25,792	17,233	18,176	18,380	16,998	20,197	16,323	17,294	13,285	15,366	15,965	9,177
Ec-France	4,050	3,300	4,123	6,924	6,293	5,934	5,304	4,694	4,618	3,711	7,189	6,019	6,344
Ec-Ireland	0	40	60	451	1,946	2,534	918	874	1,913	3,750	4,858	3,464	2,004
Ec-Portugal	169	3,185	709	1,638	3,385	974	6,470	1,634	395	91	324	278	1,175
Ec-Uk	0	0	0	59	499	613	196	49	33	117	343	15	0
Grenada	0	0	0	0	0	0	2	1	6	6	6	0	21
Japan	764	737	691	466	485	505	386	466	414	446	446	723	950
Korea	53	34	1	0	8	0	0	2	1	0	0	0	
Mexico	0	0	0	0	0	0	0	0	0	0	0	0	
Panama	0	0	0	0	0	0	0	0	0	0	0	0	
Phillipines	0	0	0	0	0	0	0	0	0	0	4	0	
St. Lucia	0	0	0	1	1	0	1	1	0	0	0	0	3
St. Vincent	0	0	0	0	2	0	0	0	0	0	0	1	
Trinidad & Tobago	0	4	0	247	639	0	0	0	1	1	0	2	11
Usa	242	357	479	438	508	741	545	472	577	829	314	406	322
Ussr	0	0	0	0	0	0	0	0	0	0	0	0	
Uk-Bermuda	0	0	0	0	0	0	0	0	1	0	2	2	
Venesuela	41	95	319	205	246	282	279	315	49	107	91	1,374	329
Venesuela-For	0	0	0	0	0	0	0	0	0	0	0	0	20
Total For The Year	32,059	36,557	27,938	30,815	38,715	35,030	38,307	28,761	28,664	25,465	34,787	33,134	24859

Total Landings 969,390

# Bluefin Tuna

(East Atlantic and Mediterranean)



Marine Fisheries Services Division

## MFSD – ADVICE

**MFSD agrees with the advice given to ICCAT by the SCRS and by STECF that catches in excess of 26,000 t are not sustainable in the long term. SCRS stresses that, because of the uncertainty of the assessment and because recruitment is assumed to continue at average level, this catch level may be too optimistic. There is grave concern about the continuing high catches of small individuals particularly in the Mediterranean and every effort should be made to ensure that the current size limit (6.4 kg) is observed.**

## STATE OF THE STOCK

- There is concern about the state of this stock. The assessment is not precise and biological reference points have not been established.
- The catches in 2001 were estimated to be about 14,500 t compared to historically high catches between 1996 and 1997 in excess of 50,000 t. The 2001 catches are incomplete. The maximum sustainable yield is estimated to be about 25,000 t.
- Fishing mortality, especially on juvenile fish appears to have increased in recent years and has been consistently above the recommended level.
- There is little information about recruitment but there appears to have been a general trend of increasing recruitment in the early 1980s followed by a period without trend.
- The spawning stock appeared to be stable in the 1980's but since 1993 has begun to decline and in 2000 was estimated to be about 86% of the 1970 level.
- Catch predictions show that the current catch level is not sustainable. Predictions indicate that if total fishing mortality or the mortality on juvenile fish could be reduced substantially then the current yield or possibly a higher yield (perhaps in excess of 50,000 t) could be sustained.

## CURRENT MANAGEMENT

- There are a number of management measures in operation. There is now an overall TAC of 29,500 t of which the EU has a quota of 18,590 t. Additional measures include a minimum landing size with a 15% tolerance level; a recommended fishing mortality; re-

strictions on the use of longlines for periods in the Mediterranean for certain sized vessels; restrictions on the use of purse seiners in the Mediterranean and prohibition on the use of spotter planes or helicopters in the Mediterranean.

- The Assessment and management areas are similar and cover the east Atlantic and the Mediterranean Sea. It is recognised that considerable mixing takes place between fish from the east and west Atlantic and this affects the accuracy of the stock assessment.

## MFSD – ECONOMIC COMMENTS

- The Irish of the Irish bluefin catch in 2001 was 8.8 t. This catch was taken in recreational fisheries.
- The value was of the Irish catch €75,000 compared to €172,000 in 2000..
- Although no directed fishery is allowed for bluefin tuna, big game fishing might possibly be very lucrative to the tourism industry on the north west and west coasts. Experimental trials to establish the economic viability of big game fishing for blue fin tuna has been organised by BIM in 2001 and are continuing in 2002. Blue fin tuna, if treated properly and transported quickly to Japanese markets can command extremely high prices.
- Considerable investments have been made by the private sector in recent years - particularly in the Mediterranean in fattening and growing juvenile bluefin tuna. Juvenile fish are captured in the wild and then brought to fattening farms where they are kept and fed until they reach marketable size. This had an adverse effect on the stocks because the capture of these juvenile are in most cases unrecorded.

## ADDITIONAL INFORMATION

1. A new assessment was carried out in 2002 on the state of this stock. However the results were not considered as sufficiently reliable to estimate the size of the stock but were useful in monitoring trends that had taken place.. There is a lack of biological data and catch statistics are imprecise for many countries.
2. The total catch in 2001 was estimated to be around 14,500 t compared to 33,754 t in 2000 and 32,500 t in 1999. The catches in 2000 have been revised upwards while the catches in 2001 are not yet complete There appears to be a serious problem in the actual catches taken from the fishery in recent years.
3. The Irish catch taken as a by catch in directed fisheries for other pelagic species and by anglers was 8.8 t in 2001 compared with 21.6 t in 2000 compared with 44.8 t in 1999.



4. The main catches taken from the East Atlantic and Mediterranean bluefin tuna stock in 2000 were taken by France (7,300 t), Spain (6,200 t), Italy (3,800 t) Japan (3,000 t) Morocco (2,923 t) and Algeria (2,330 t).
5. The main gears used to catch bluefin tuna are purse seines, longlines, traps and bait boats. About 2000 t were caught in sport fisheries in 2000.
6. There is no current Irish biological sampling programme on bluefin tuna. Some information is collected from details of catches taken by anglers and from sales statistics. In 2001 this information was presented in the report on Big Game Fishing in Irish Coastal Waters compiled by *Gulfstream Sports Fishing Ltd* and funded by Marine Institute and Gael-Saoire. This project is also being part funded by the Marine Institute in 2002.

# Sprat

(All areas)



*Marine Fisheries Services Division*

## MFSD – ADVICE

**MFSD advises that sprat stocks around Ireland are not regularly exploited and that there is potential to develop fisheries on this species. Sprat fisheries would provide a valuable alternative to white fish and small pelagic boats and would reduce effort on quota species. MFSD advise that scientific monitoring programmes should accompany any fisheries that develop. It is important to take advantage of this species in years when the sprat shoals appear in coastal waters.**

## STATE OF THE STOCK

- No assessments have been carried out on sprat stocks around Ireland in recent years and the status of the stocks is not known.

## CURRENT MANAGEMENT

- There are no management regulations for sprat fisheries around Ireland.
- TACs are set for a number of fisheries in the North Sea and adjacent areas in which sprat are taken, either in directed fisheries for human consumption or in the industrial fisheries.

## MFSD ECONOMIC COMMENTS

- The value of the catch in 2001 was €186,000.
- The sprat fishery has in some years proved to be an important source of revenue for white fish and small pelagic boats at a time when these sections of the fleet would normally be dependent on other species.
- The fishery has also helped to divert effort from quota fisheries.
- The sprat fisheries did not develop in 2001 to the same extent as in recent years.

## ADDITIONAL INFORMATION

1. The total catch in 2001 was only 455 t. The corresponding catch in 2000 was 6,000 t.
2. A number of vessels using mid water trawls take part in the fishery. The fishery takes place in very shallow inshore areas mainly during autumn.
3. Most of the catch is frozen whole for export to the continental markets.
4. No biological investigations were carried out during 2001 because of the limited fishery.
5. The fisheries need to be carefully monitored for the presence of juvenile herring, which may sometimes constitute significant proportions of the catch. However this has not been the case in the sprat fisheries in Donegal.
6. It may be possible to get information on the size of the sprat stocks from data collected during the herring acoustic surveys and this possibility will be investigated by MFSD.

# Capelin in the East Iceland, Greenland, Jan Mayen area

## (Sub-areas V and XIV and Division IIa west of 5°W)



Marine Fisheries Services Division

### MFSD – ADVICE

MFSD agree with the ICES and STECF advice for this stock which states that in order to ensure a spawning stock biomass of 400,000 t in March 2003, in conformity with the harvest control rule, that the preliminary TAC for the first half of 2002/2003 season should not exceed 690,000 t. This is two thirds of the total TAC of 1,040,000 t predicted for the whole season. ICES advises that the data from the surveys in October-November 2002 and/or the January-February 2003 be used when the final TAC is set for the 2002/2003 season. ICES advise that, while the 2002 summer/autumn season could be opened on 20 June, areas of high juvenile abundance should be closed to commercial fishery in order to prevent harvesting a high proportion of juveniles.

### STATE OF THE STOCK

- There are no concerns for this stock as it is within safe biological limits.
- The landings fluctuate considerably. Over 1.5 million tonnes were recorded in 1996 but landings in 1999 and 2000 years have decreased to 1.0 million tonnes.
- Fishing mortality estimates are not calculated for the stock because of the very short life span.
- The recruitment has been high in recent years
- The SSB in 1999 was estimated to be 650,000 t. The spawning stock is highly variable and is dependent on only two year classes. The SSB reached a peak in 1995 of over 830,000 t. but it has fallen below the minimum safe level of 400,000 t during the period 1989-1991.
- There are no proposed reference points for this short lived species.

### CURRENT MANAGEMENT

- The fishery is managed according to a two part harvest control rule which ensures a minimum SSB of 400,000 t at the end of the fishing season.
- The TAC is set in two parts. The first part of the TAC, which applies for the only first half of the season, is limited to 2/3 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.

### MFSD – ECONOMIC COMMENTS

Ireland has not participated in this fishery although there is a small EU quota available of around 88,000 t. Most of the catch is reduced to fishmeal and the potential value of the quota is low.

### ADDITIONAL INFORMATION

1. The assessment is based on acoustic surveys only.
2. The total catch in 2000 was 1.25 million tonnes. Ireland has not as yet taken part in this fishery but were granted 5 licenses by the Greenland authorities to take part in the fishery in 1999/2000
3. The main catches are taken by Iceland, Norway, Faroe Is, EU and Greenland
4. Most of the catches are reduced to fishmeal and are taken by purse seiners.

# Industrial fisheries West of Scotland (Division VIa)

No ACFM information has been included for these stocks

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



Marine Fisheries Services Division

## Sandeel Division VIa

### MFSD – ADVICE

ICES does not provide advice for this stock. MFSD recommend that the current management regime (see Additional Information) should be maintained corresponding to catches of less than 12,000 t. Furthermore

the impact of the fishery on both the stock and the wider ecosystem must be considered in a management plan for this stock.

### ADDITIONAL INFORMATION

The current management regime for the sandeel fishery uses a multi-annual TAC of 12 000 t per year with the fishery closed from 31 July. Access is limited to vessels with a track record. These arrangements took effect in 1998 for a period of three years and were renewed in 2001.

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 and are estimated to be only 300 t in 2001 (the lowest in the time series).

Sandeel, Division VIa. Trends in effort and landings

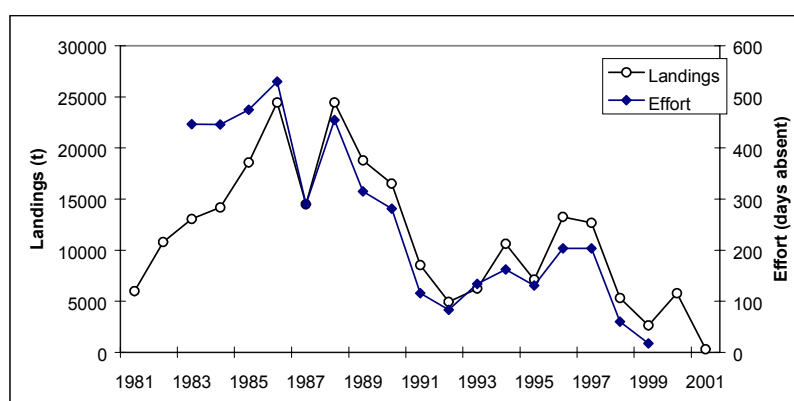


Table 3.7.10.1 Sandeel, Division VIa Landings (tonnes), 1981-2001, as officially reported to ICES.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Denmark	-	-	-	-	-	-	-	-	-	-
UK, Scotland	5972	10786	13051	14166	18586	24469	14479	24465	18785	16515
Total	5972	10786	13051	14166	18586	24469	14479	24465	18785	16515

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Denmark	-	-	80	-	-	-	-	-	-	-
UK, Scotland	8532	4935	6156	10627	7111	13257	12679	5320	2627	-
United Kingdom									5771	
Total	8532	4935	6236	10627	7111	13257	12679	5320	2627	5771

Country	2001*
Denmark	
UK, Scotland	
United Kingdom	295
Total	295

\*Preliminary data for 2001

## Norway pout

### Division VIa

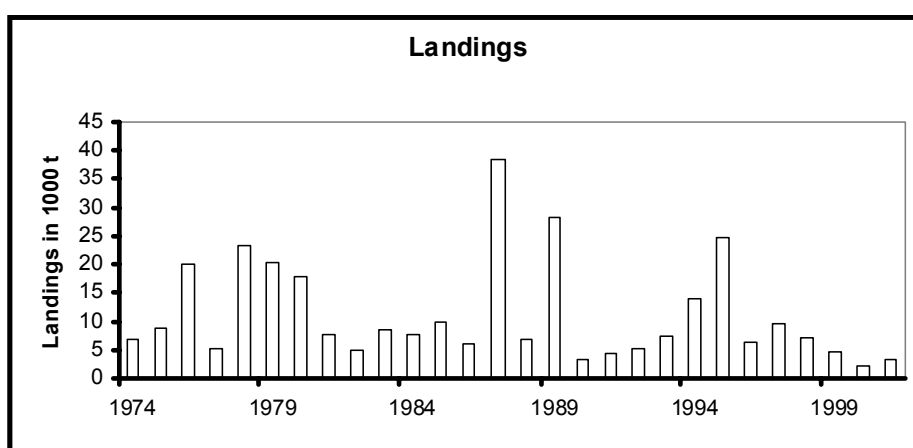
#### MFSD – ADVICE

**MFSD recommend that given the advice for cod and depleted nature of whiting in this area that no industrial fishery for Norway pout should be permitted in Division VIa unless it can be demonstrate that this fishery does not have a significant impact on the cod or whiting stocks. MFSD point out that even an extremely small by-catch (in terms of percentage of catch) of either cod or whiting could be a significant cause of fishing mortality on these stocks.**

#### ADDITIONAL INFORMATION

There are no specific management objectives for the fisheries exploiting this stock. The EC fishery does not appear to be managed by TAC. Although Norway does not currently fish in VIa it is allowed to fish in VIa North of 56°30'N as part of the conditions of its IIa, Skagerrak and Kattegat, North Sea (EC waters) quota allocation. The fishery is a small mesh trawl fishery operated by Danish vessels. Catches are highly variable. The fishery is known to take place on the Stanton Bank which is an important nursery areas for whitefish species in VIa. The only data available are official landings statistics. 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.

Norway pout in Division VIa (West of Scotland)



**Table 3.7.9.1** Norway pout in Division VIa. Officially reported landings (tonnes)

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	5849	28180	3316	4348	5147	7338	14147	24431	6175	9549
Faroese	376	11	-	-	-	-	-	-	-	-
Germany	-	-	-	-	-	-	-	1	-	-
Netherlands	-	-	-	-	10	-	-	7	7	-
UK (E+W)	-	-	-	-	1	-	1	-	-	-
UK (Scotland)	517	5	-	-	-	-	+	-	140	13
Total	6742	28196	3316	4348	5158	7338	14148	24439	6322	9562

Country	1998	1999	2000	2001
Denmark	7186	4624	2005	3214
Faroese	-	-	-	-
Germany	-	-	-	-
Netherlands	-	1	-	-
UK (E+W)	-	-	-	-
UK (Scotland)	-	-	-	-
Total	7186	4625	2005	3214

# Special Note on the advice for Cod stocks in the Irish Sea, West of Scotland and North Sea.



## Marine Fisheries Services Division

Due to the mixed nature of the fisheries in which cod are taken, the 2003 advice for cod stocks in Irish Sea, west of Scotland and the North Sea will have a major impact on the demersal fisheries conducted in these areas. The state of the cod stocks and hence the advice, is similar in all three areas and is given below.

**Advice on management:** *Given the very low stock size, the recent poor recruitments, and continued high fishing mortality despite management efforts to promote stock recovery, ICES recommends a closure of all fisheries for cod as a targeted species or by-catch. In fisheries where cod comprises solely an incidental catch there should be stringent restrictions on the catch and discard rates of cod, with effective monitoring of compliance with those restrictions.*

*These and other measures that may be implemented to promote stock recovery should be kept in place until there is clear evidence of the recovery of the stock to a size associated with a reasonable probability of good recruitment and there is evidence that productivity has improved. The current SSB is so far below historic stock sizes that both the biological dynamics of the stock and the operations of the fisheries are unknown, and therefore historic experience and data are not considered a reliable basis for medium-term forecasts of stock dynamics under various rebuilding scenarios.*

### Reason why ACFM gave this advice for all three stocks.

- 1) The state of all three stocks is similar. The spawning stock biomass (SSB) is severely depleted (Figure 1). In the Irish Sea and North Sea recent estimates of SSB are around 11% of the highest historical SSB. West of Scotland SSB in 2000 was only 7% of the highest historical SSB. Recruitment in all of these stocks appears to be linked to stock size and recent recruitments in all of these stock are estimated to be substantially below average. The stocks are at such a low level now (Below  $B_{lim}$ ) that the biological dynamics of the stocks are unknown i.e. the number of spawning fish is so low that recruitment may continue to be very low and there is a very high risk of continued recruitment failure. This has already happened in the Irish Sea when recruitment was the lowest in the time series in 1998 (only 15% of the average).

**MFSD Comment:** As a general principle the stock is at such a low level that predictions of future stock size and estimates recent stock size estimates will be highly dependent on the recruiting year classes which are poorly estimated in assessments. Therefore the slight increases in stock sizes in most recent years of the assessment remain highly uncertain.

**In the North West Atlantic the cod SSB was severely depleted in the late 1980's and the stock has never rebuilt despite a long and prolonged closure of the fishery.**

- 2) ACFM Advised that SSB cannot be rebuilt above  $B_{pa}$  (a precautionary stock size) in the short term in 2000. This led to the recommendation that recovery/rebuilding plans be introduced and that catch should be zero until recovery plans were introduced. Emergency measures have been introduced and this year the EC asked ACFM to consider its recovery plan proposals for 2003.
- 3) Fishing mortality (F) in this stocks remains very high in all these stock despite the introduction of special emergency measures including closed areas and technical conservation measures TCMs to reduce F. For example in the Irish Sea up to 72% of the total population of mature fish are caught in the fishery each year (Figure 2).
- 4) ACFM were asked to evaluate the impact of the emergency measures on all three stock- However, it was not possible to evaluate the direct impact of the closed areas on SSB since the fishing effort data which were available were too limited. It was also not possible to evaluate if recent recruitment or SSB had increased significantly since the introduction of the closed spawn period because of the short time since their introduction and uncertainties around the point estimates of recent SSB and recruitment estimates.

The impact of the increased mesh sizes introduced were investigated by ACFM both theoretically by simulations and directly by looking at the fishing mortality pattern in the most recent assessments. The results of the simulations of increased mesh size for cod were disappointing. Recent increases in mesh sizes for Cod in the North Sea are not expected to significantly contribute to SSB in the short term (<1% in 2003) and in the long-term will only increase SSB by 5%. The mesh size increases are estimated to have very significant impact on haddock and whiting. Short and long term increases in SSB predicated for both species and landings of haddock for human con-



sumption were predicted to increase by 120%. However the increased mesh result in an overall loss in yield for whiting.

**MFSD COMMENT:** As a general rule the fast growth and large size of cod means that cod will not be significantly impacted by increases in cod end mesh size increases.

The above studies are likely to be over optimistic in terms of SSB increase because fishing practices are adjusted and the theoretical benefits of increasing mesh size are not fully realised.

The direct impact of the emergency measures of the fishing mortality at age estimates from the most recent assessments was also investigated by ACFM. Whilst there appears to be some changes in the fishing pattern in VIa the changes in other areas due to the emergency measures are less apparent. These changes are difficult to interpret and are also not well estimated. Historically assessments have not been very sensitive to changes in selection patterns due to the introduction of new technical conservation measures.

**MFSD COMMENT:** No information was available to ACFM on the direct impact of other technical measures such as separator trawls on the stock status. These measures were estimated to have substantially reduced cod by-catch by the Irish *Nephrops* fleet according to a recent BIM study. Only a few ~ 25% of vessels used these trawls in 2001. In 2002 up to 80% of the Irish *Nephrops* vessels may be using these trawls. The latest assessment only includes data up to 2001- so the impact of this increased usage will not be apparent in the latest assessment.

- 5) ACFM also investigated the likely effects of proposed EC recovery plans for these stocks. ACFM evaluated the special STECF Sub-group report (SGRST). This report evaluated various harvest control rules (HCRs) to rebuild both the cod and hake stocks. ACFM concluded that the stock projections were very sensitive to the starting population numbers and this resulted in a reduced probability of recovery. ACFM noted that an assessment bias of 20% could increase the recovery time for these stock by up to 4 years. The estimate of Irish Sea SSB in 2001 was revised downwards by the most recent assessment by 40% and  $F$  was increased by 12%. This so called retrospective bias in the assessment (Figure 3) indicates that the starting points for the SGRST simulations were considerably higher than the current assessments and the resultant projections were over optimistic. ACFM concluded that uncertainty in the assessment implementation alone can severely compromise achieving the objectives of recovery plans including the rapid rebuilding of SSB towards  $B_{lim}$  or  $B_{pa}$ .

For example if the recovery plan aims at increasing SSB by 30%/year and each year the assessment revises downwards the estimates of SSB by 40% the stock will continue to decline.

**MFSD COMMENT:** There is a high probability that the cod stock in the Irish Sea will not rebuild under the EC rebuilding plan proposals. Even in the over optimistic situation as used in the SGRST simulations the Irish Sea stock will be rebuilt above  $B_{pa}$  in only 7 of the 18 scenarios with 90% probability in 6-7 years. To be consistent with the precautionary approach the only management option is to reduce fishing mortality on cod to zero by implementing a closure of the fishery.

- 6) Global warming is often cited as a reason for the decline of cod stocks around Ireland and in the North Sea. The link between cod recruitment and climate warming has been investigated in several studies for cod stocks in the Irish Sea and the North Sea (Brander, 1998; O'Brien *et al.*, 2000). Data suggests that there is a negative relationship between the increase in temperature and recruitment of Irish Sea and the North Sea cod stocks. Both stocks are at the southern limit of their species distribution and warming of sea temperature causes adverse environmental conditions in which the survival success of the recently spawned is reduced. The link between recruitment levels and sea temperature is however weak, due to the complex and often indirect patterns with which environmental changes influence the biology of the species. A change in temperature affects the timing and area of spawning, which in turn causes different prevalent feeding conditions and altered ocean current transport routes between spawning grounds and nursery areas.

The same studies have however shown that the effect of temperature on cod recruitment is less pronounced when spawning stock biomass is low, as the likelihood of good recruitment is diminished *per se*. It should also be pointed out that the recruitment in the Celtic Sea was above average in 1999 and 2000 despite being the most southerly stock of cod in the Northeast Atlantic. It can therefore be concluded that high fishing pressure resulting in low spawning stock biomass was probably the primary cause of decline in recruitment of North Sea and Irish Sea cod stocks. Changes in the environment, such as global warming, were probably secondary factors.

**MFSD COMMENT:** Any management plan for cod should take into consideration the possible effects of environmental change on the productivity of the stock.

#### MFSD Conclusion

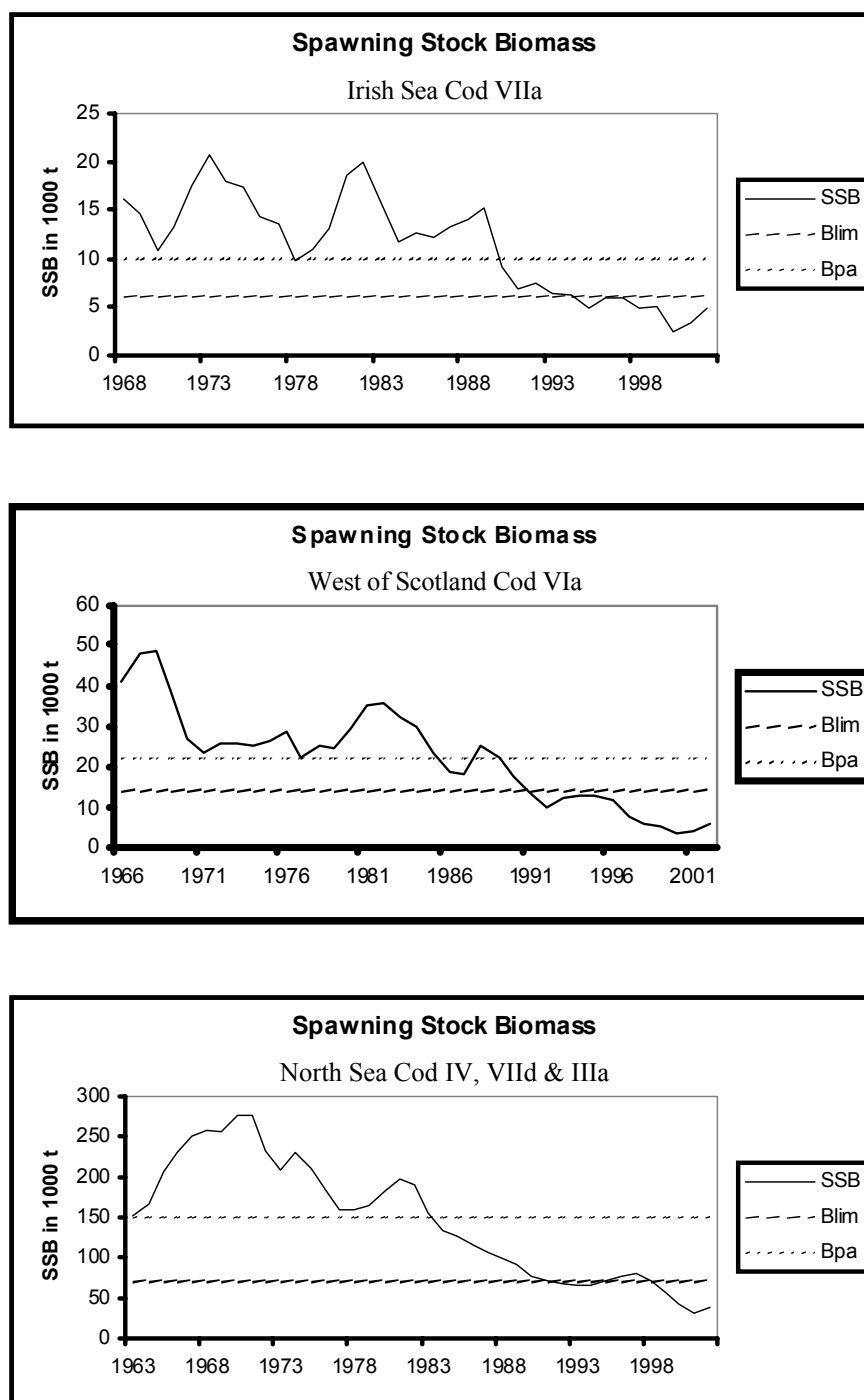
MFSD notes that the ICES advice for Irish Sea, North Sea and West of Scotland fisheries is predicated on the need to rebuild cod stocks. MFSD endorses this ap-

proach as being consistent with the precautionary approach to fisheries management. There is no scientific evidence to suggest that the cod stock in the Irish Sea is in a healthier condition than the North Sea or West of Scotland or that the current emergency measures have had a significant impact on the stock status.

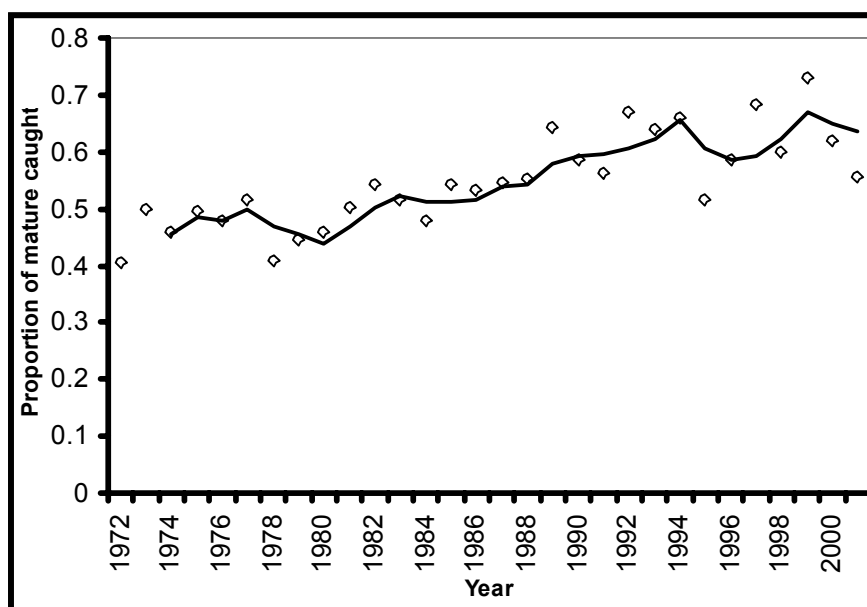
Brander, K. (1998) Effects of environmental variability on growth and recruitment in cod (*Gadus morhua*) using a comparative approach, *Oceanologica Acta*, 23(4), pp. 485-496.

O'Brien, C. M.; Fox, C.J.; Planque, B. and Casey, J. (2000) Climate variability and North Sea cod, *Nature*, 404, p.142.

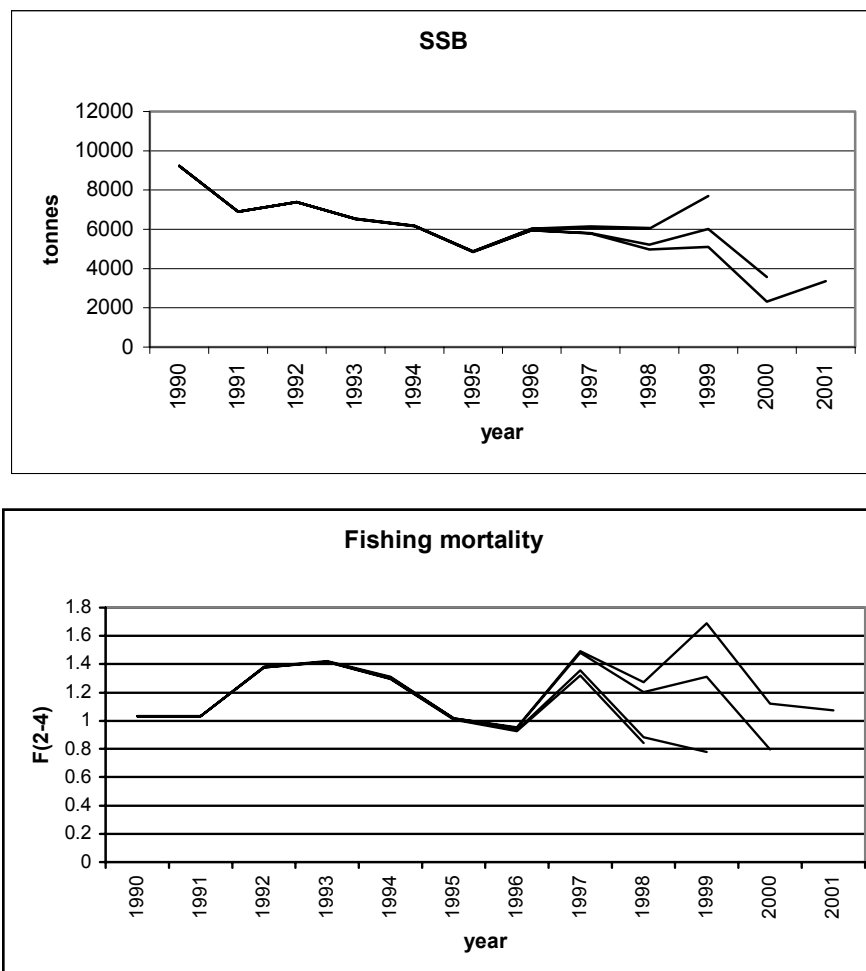
**Figure 1:** Historical development of spawning stock biomass for Cod stock in the Irish Sea, West of Scotland and North Sea.



**Figure 2:** The proportion of the mature cod stock in the Irish Sea (Division VIIa) caught each year by the fishery since 1972. (solid line is a three point moving average smoother)



**Figure 3:** The retrospective bias of over estimating Spawning Stock Biomass and underestimating Fishing Mortality in the Cod VIIa assessment.



# West of Scotland Cod

(Division VIa)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD considers that this stock remains in a critical state where the probability of stock recovery will remain low unless stringent management action is taken immediately. MFSD therefore agrees with the STECF and ICES advice for this stock that closure of all fisheries targeting cod or with a cod by-catch will provide the highest probability of stock recovery.

MFSD advises that there should be stringent and effectively monitored restrictions on the catch and discard rates of cod in all other fisheries. MFSD recognises that there will be difficulties in the implementation and enforcement of this management advice and therefore advises that the definition of cod by-catch and incidental catch fisheries be clarified.

MFSD agrees that technical measures, including industry-initiated programs, should be a tool in rebuilding this stock. Furthermore, MFSD advises that these measures should become a permanent feature of the fishery if cod is to be fished sustainably once it has recovered.

MFSD advises that an ongoing management plan is necessary to recover the cod stock and to fish it sustainably once it has recovered. MFSD 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. MFSD considers that the proper definition and evaluation of all métiers involved in the fishery is crucial to this management plan.

### SPECIAL NOTE:

MFSD considers that it is not yet possible to evaluate existing recovery measures nor to conclude that any perceived change in stock status has resulted from these measures. Whilst recent estimates of  $F$  and  $SSB$  appear to show some improvement, these estimates are likely to be overly optimistic due to retrospective bias in the assessment. MFSD also notes that the  $SSB$  is at such a low level that the biological dynamics of the stock are unknown and there is a high risk of recruitment failure.

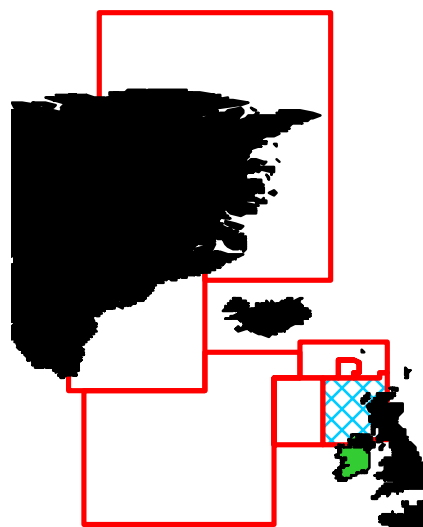
MFSD recognises that large short-term losses will be incurred in many West of Scotland fisheries, but advises that the stringent management is required if the cod stock is to return to its former productivity.

## STATE OF THE STOCK

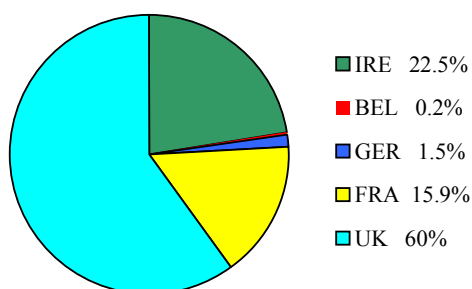
- There are very serious concerns about the state of this stock and the risk of stock collapse.
- The landings have declined since 1988 to an all-time low of 2,300 t in 2001. From 1966-1989 the stock sustained landings averaging about 17,000 t (range: ~11,000 t – ~24,000 t).
- Fishing mortality has been above  $F_{pa}$  in all years since 1976 and above  $F_{lim}$  from 1983 to 2000.
- $SSB$  has been declining since the early 1980s and the estimates for 2000 and 2001 are the lowest recorded, well below  $B_{pa}$  (22,000 t) and 58% below  $B_{lim}$  (14,000 t).
- In the last ten years, only one year class has been above average and the four poorest year classes have been recruited since 1995. The 1998 year class was the weakest ever observed it was less than 15% of the average. At the average rate of exploitation estimated for recent years, the chance of continued poor recruitment is high. At levels of  $SSB$  less than  $B_{lim}$  there is evidence of reduced recruitment.
- Short-term predictions indicate an improvement in  $SSB$  (for *status quo*  $F$  during 2003,  $SSB$  is predicted to increase to 8,300 t). However, medium term analyses suggest that at current rates of exploitation, or at  $F_{pa}$  this improvement in  $SSB$  is unlikely to ever be enough to achieve  $B_{pa}$ .

## CURRENT MANAGEMENT

- The TAC Area covers Sub Areas Vb, VI, XII, and XIV. The assessment covers VIa only. MFSD considers that the management area should correspond to the assessment area.



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



- The TAC allocated to this stock in 2002 was 4,600 t. The Irish quota was 1,035 t.
- Emergency measures were enacted by the EU for 2001 (EC Regulation 456/2001) prior to the agreement and implementation of a five-year cod recovery plan to start in 2002.
- The 2001 emergency measures established three controlled areas from 6 March –30 April. The aim was to minimise the catches of cod and the effect of the measure on pelagic and shellfish fisheries. Certain derogations were allowed for purse seines and pelagic trawls targeting pelagic fish species, dredges, pots and creels and for inner Clyde area *Nephrops* trawls.
- MFSD recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching cod.

### MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was €1.9 m.
- The value of the 2001 Irish landings from Division VIa was €0.8 m.
- This was a very valuable fishery during the 1980s but since then the economic importance has declined.

### ADDITIONAL INFORMATION

1. The assessment is based on landings-at-age and survey CPUE data and is considered to be reasonable.
2. The Irish landings in 2001 of 350 t, about three-quarters of the 2000 landings of 470 t.
3. The quantities of fish mis-reported during 1992–1995 are estimated in the assessment, but the true quantities caught in those years remain uncertain. It is assumed that little or no mis-reporting has occurred since.
4. The fishery is dominated by the UK (Scotland) fleet using towed gears and by the Irish and French bottom trawl fleets. Scottish trawl effort declined to a very low level in 1994 but has since risen to levels of the late 1980's and early 1990's. A considerable increase in effort was observed in the late 1990's as new larger vessels capable of fishing deeper waters have entered the fleet. The French fishery is a saithe directed fishery with a by-catch of cod.
5. 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.
6. Irish Sampling of this stock is supported through the

EC funded sampling programme that is required under Data Collection Regulations 1543/2000 and 1639/2001. MFSD sampling indicates that 1 and 2 year old fish, most of which are immature, comprise 86% of the Irish landings. The lack of older fish in the landings is interpreted as a further indication of the poor state of the stock.

7. MFSD commenced a groundfish survey off Donegal in 1993. The survey has produced very poor catches of cod, confirming the poor state of the stock. MFSD groundfish survey data was used by the 2002 Working Group and was found to perform consistently with other survey data.
8. Although data on discarding are available, the estimates are extremely variable and there is a need to carefully examine the sensitivity on the assessment before these data can be included. Discard data have not been taken into account in the assessment model and the mortality on the youngest age groups is therefore likely to have been underestimated.
9. The minimum landing size of cod is 35mm. Current regulations include a minimum legal mesh size of 100mm. Since mid-2000, UK vessels in this fishery have been required to include a 90mm square mesh panel in order to reduce discarding of the large 1999 year-class of haddock.
10. MFSD are concerned that the controlled areas were not defined for the purposes of regulating fishing effort on the cod stock in this area and that no measure was applied to regulate effort displaced during the period of the control. It is unlikely that the controlled areas in Division VIa will significantly have affected fishing mortality on cod in 2001.
11. MFSD are also concerned that industrial fisheries continue to operate in Division VI with the potential to take large numbers of juvenile cod.

## ICES ADVICE

### 3.7.2.a

#### State of stock/exploitation:

The stock remains outside safe biological limits. Fishing mortality has been above  $F_{pa}$  in all years since 1976 and above  $F_{lim}$  from 1983 to 2000. SSB has been declining since the early 1980s and the estimates for 2000 and 2001 are the lowest recorded, well below  $B_{pa}$  and  $B_{lim}$ . At the average rate of exploitation estimated for recent years, the chance of a stock collapse is high. In the last ten years, only one year class has been above average and the 4 poorest year classes have been recruited since 1995.

#### Management objectives:

Due to the poor state of the cod stock in Division VIa, emergency measures were enacted by the EU for 2001 prior to the agreement and implementation of a five-year cod recovery plan to start in 2002.

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**Advice on management:**

Given the very low stock size, the recent poor recruitments, and continued high fishing mortality despite management efforts to promote stock recovery, ICES recommends a closure of all fisheries for cod as a targeted species or by-catch. In fisheries where cod comprises solely an incidental catch there should be stringent restrictions on the catch and discard rates of cod, with effective monitoring of compliance with those restrictions.

These and other measures that may be implemented to promote stock recovery should be kept in place until there is clear evidence of the recovery of the stock to a size associated with a reasonable probability of good recruitment and there is evidence that productivity has improved. The current SSB is so far below historic stock sizes that both the biological dynamics of the stock and the operations of the fisheries are unknown, and therefore historic experience and data are not considered a reliable basis for medium-term forecasts of stock dynamics under various rebuilding scenarios.

**Precautionary Approach reference points (established in 1998):**

ICES considers that:	ICES proposes that:
$B_{lim}$ is 14 000 t	$B_{pa}$ be set at 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.
$F_{lim}$ is 0.8. Fishing mortalities above this have historically led to stock decline.	$F_{pa}$ be set at 0.60. This F is considered to have a high probability of avoiding $F_{lim}$ .

**Technical basis:**

$B_{lim}$ = smoothed estimate of $B_{loss}$ (as enumerated in 1998)	$B_{pa}$ = previously set at 25 000 t at which good recruitment is probable. Reduced to 22 000 t due to an extended period of stock decline
$F_{lim}$ = F's above 0.8 have led to stock decline in early 1980's	$F_{pa}$ consistent with $B_{pa}$

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**Relevant factors to be considered in management:**

Although large short-term losses will be incurred in many Division VIa fisheries, the advised measures are required if the cod stock is to reach a level where it can regain historic productivity. The advice will likely result in greatly reduced harvesting of other stocks where the fisheries take cod as part of a mixed species fisheries, particularly haddock and whiting. However the current state of the cod stock, and the failure of past measures to bring fishing mortality down to rates that allow rebuilding, mean that more stringent action is required.

Time and area closures for particular fisheries may be a tool in rebuilding this stock, and their effect can be considered in evaluating harvest opportunities for other species.

ICES notes that this advice presents a strong incentive to fisheries to avoid catching cod. If industry-initiated

programs can be demonstrated to bring their catch rates of cod in fisheries for other species down to near zero, then these programs could be considered in management of such fisheries. Industry-initiated programs to pursue such incentives should be encouraged, but must include a high rate of independent observer coverage, or other fully transparent method for ensuring their catches of cod are fully and credibly reported.

The EC regulation No. 456/2001 of the Commission targeted areas where high catch rates of cod are usually experienced during March and April. The controlled areas were not defined for the purposes of regulating fishing effort on the cod stock in this area. No measure was applied to regulate effort displaced during the period of the control. It is unlikely that the controlled areas in Division VIa will significantly have affected fishing mortality on cod in 2001. Observer trips since 1978 have given very variable estimates of discard rates, mainly at age 1 but with significant quantities at age 2 in some years. The estimate of dis-



cards for 1-year-olds in 2000 (1999 year class) was comparatively large.

Even with no directed harvest or by-catch of cod in 2003, SSB is forecast in the short-term to remain below  $B_{pa}$  and  $B_{lim}$ . All possible measures should be considered for implementation in the recovery plan. Fishing effort displaced due

to the cod rebuilding plan in Division VIIa, should not be permitted to target cod in Division VIa, or any other stocks considered to be outside safe biological limits.

Cod is taken with whiting and haddock in a mixed demersal fishery. *Nephrops* trawlers take a by-catch of cod. Management needs to take this into account.

#### Catch forecast for 2003:

Basis:  $F(2002) = F_{sq} = F(01) = 0.61$ ; Landings (2002) = 3.18 ; SSB(2003) = 6.73

F(2003 on-wards)	Basis	Catch (2003)	Landings (2003)	SSB (2004)	Probability (%)SSB < $B_{pa}$ in 2004	Probability (%)SSB < $B_{pa}$ in 2011
0		0	0	13.5	> 50%	<25%
0.12	$0.2 * F_{sq}$	0.9	0.9	12.3	90%	<25%
0.24	$0.4 * F_{sq}$	1.8	1.8	11.1	>90%	<25%
0.37	$0.6 * F_{sq}$	2.5	2.5	10.1	>90%	<25%
0.41	$0.67 * F_{sq}$ 45% SSB increase	2.7	2.7	9.8	>90%	25%
0.49	$0.8 * F_{sq}$	3.2	3.2	9.2	>90%	40%
0.54	$0.89 * F_{sq}$ 30% SSB increase	3.5	3.5	8.8	>90%	50%
0.61	$F_{sq}^1$	3.8	3.8	8.3	>90%	50 - 90%

<sup>1</sup>  $F_{pa} = 0.60$

Weights in '000 t

Shaded scenarios considered inconsistent with a precautionary approach.

#### Medium- and long-term projections:

Although the short-term forecast suggests some improvement in SSB, medium-term analyses indicates that with current rates of exploitation, there remains a high probability that it will remain below  $B_{pa}$ .

#### Comparison with previous assessment and advice:

The estimate of F for 2000 is 8% lower, and SSB in 2001 the same, as given by last year's assessment. Previous assessments of this stock have shown a tendency to underestimate fishing mortality in the last year. It is possible that the sharp decline in the estimate of fishing mortality from 2000 to 2001, given by the present assessment, is a further manifestation of this bias.

#### Elaboration and special comment:

The directed fishery consists mainly of Scottish vessels using towed gears. Since 1976, effort by Scottish heavy trawl and seine effort has decreased, whilst that of light trawlers has generally increased, particularly in more offshore areas. Immature cod in Division VIa are subject to high fishing mortality. The fish are not fully mature until age group 4, increasing the susceptibility of the stock to collapse. Analytical assessment is based on landings-at-age and survey CPUE data. Although data on discarding are available, the estimates are extremely variable and there is a need to

carefully examine the sensitivity on the assessment before these data can be included. Discard data have not been taken into account in the assessment model and the youngest age groups are therefore likely underestimated. The quantities of fish mis-reported during 1992–1995 are estimated in the assessment, but the true quantities caught in those years remain uncertain.

#### Source of information:

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

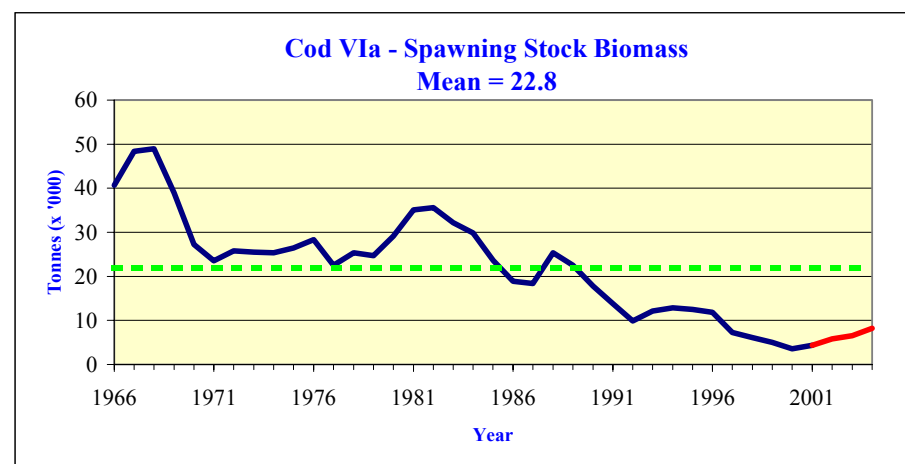
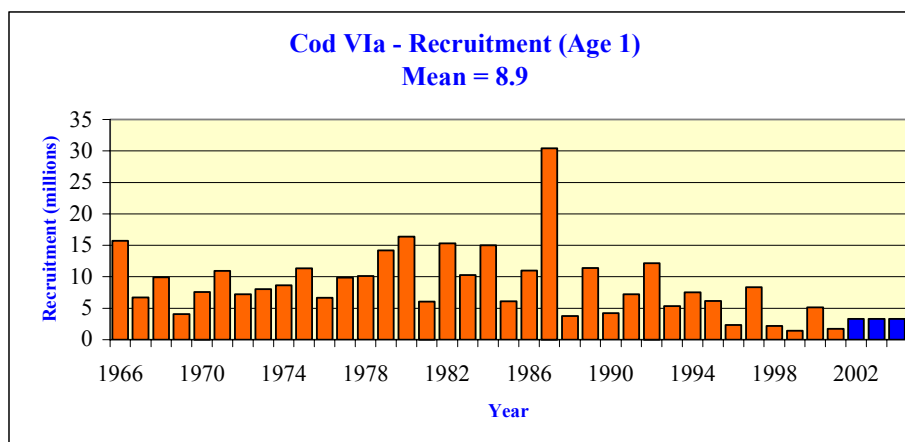
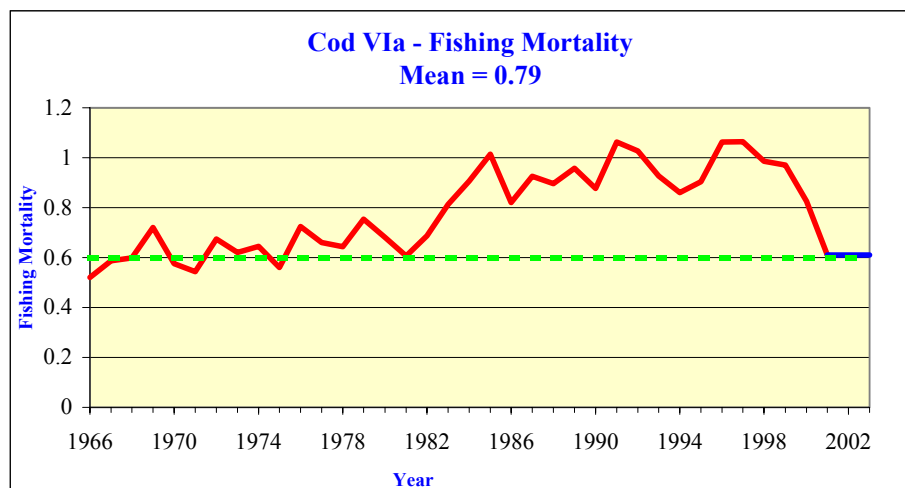
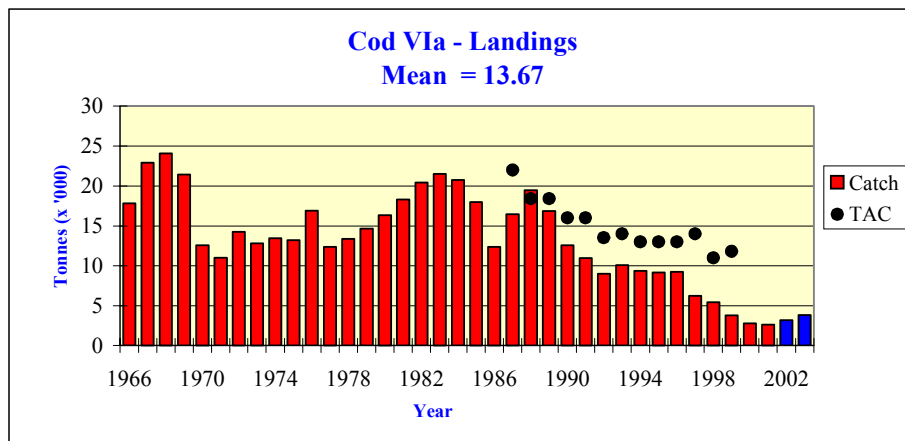
#### Yield and spawning biomass per Recruit F-reference points:

	Fish Mort Ages 2-5	Yield/R	SSB/R
1999-2001 mean	0.787	1.380	2.654
$F_{max}$	0.267	1.631	6.898
$F_{0.1}$	0.163	1.531	10.391
$F_{med}$	0.641	1.354	2.483

**Catch data (Tables 3.7.2.a.1-2):**

Year	ICES advice	Predicted catch corresp. to advice	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	9.3 <sup>3</sup>
1993	70% of effort (89)	-	14.0	10.5	10.8 <sup>3</sup>
1994	30% reduction in effort	-	13.0	9.1	10.1 <sup>3</sup>
1995	Significant reduction in effort	-	13.0	9.6	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>	3.1
2001	Lowest possible F, recovery plan	-	3.7	2.5	2.3
2002	Recovery plan or lowest possible F,	-	4.6		
2003	Closure	-			

<sup>1</sup>TAC is for the whole of Sub-area 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. Weights in '000 t.



**Table 3.7.2.a.1** Nominal landings of COD in Division VIa, 1984–2001, as officially reported to ICES.

	1984	1985	1986	1987	1988	1989	1990	1991	1992
Belgium	22	48	88	33	44	28	-	6	-
Denmark	-	-	-	4	1	3	2	2	3
Faroes Islands	-	-	-	-	11	26	-	-	-
France	7,637	7,411	5,096	5,044	7,669	3,640	2,220	2,503	1,957
Germany	75	66	53	12	25	281	586	60	5
Ireland	2,316	2,564	1,704	2,442	2,551	1,642	1,200	761	761
Netherlands	-	-	-	-	-	-	-	-	-
Norway	231	204	174	77	186	207	150	40	171
Spain	64	28	-	-	-	85	-	-	-
UK (E. & W. & N.I.)	724	260	160	444	230	278	230	511	577
UK (Scotland)	9,483	8,032	4,251	11,143	8,465	9,236	7,389	6,751	5,543
UK									
Total	20,552	18,613	11,526	19,199	19,182	15,426	11,777	10,634	9,017
Unallocated	720	-6	294	-228	1,231	1,743	399	293	240
As used by W.G.	21,272	18,607	11,820	18,971	20,413	17,169	12,176	10,927	9,257 <sup>1</sup>

	1993	1994	1995	1996	1997	1998	1999	2000	2001*
Belgium	22	1	2	+	11	1	+	+	2
Denmark	2	+	4	2	-	+	+	-	-
Faroes Islands	-	-	-	-	-	-	-	n/a	-
France	3,047	2,488	2,533	2,253	956	714*	842*	310*	424
Germany	94	100	18	63	5	6	8	6	4
Ireland	645	825	1,054	1,286	708	478	223	n/a	319
Netherlands	-	-	-	-	2	1	-	-	
Norway	72	51	61	137	36	36	79	114	40
Spain	-	-	16	+	6	42	45	n/a	
UK (E. & W. & N.I.)	524	419	450	457	779	474	381	280	
UK (Scotland)	6,069	5,247	5,522	5,382	4,489	3,919	2,711	2,057	
UK									1679
Total	10,475	9,131	9,660	9,580	6,992	5,671	4,289	2,767	2,468
Unallocated	281	883	-38	-153	42	43	-88	349	-135
As used by W. G.	10,756 <sup>1</sup>	10,014 <sup>1</sup>	9,622 <sup>1</sup>	9,427	7,034	5,714	4,201	3,116	2,333

\* Preliminary.

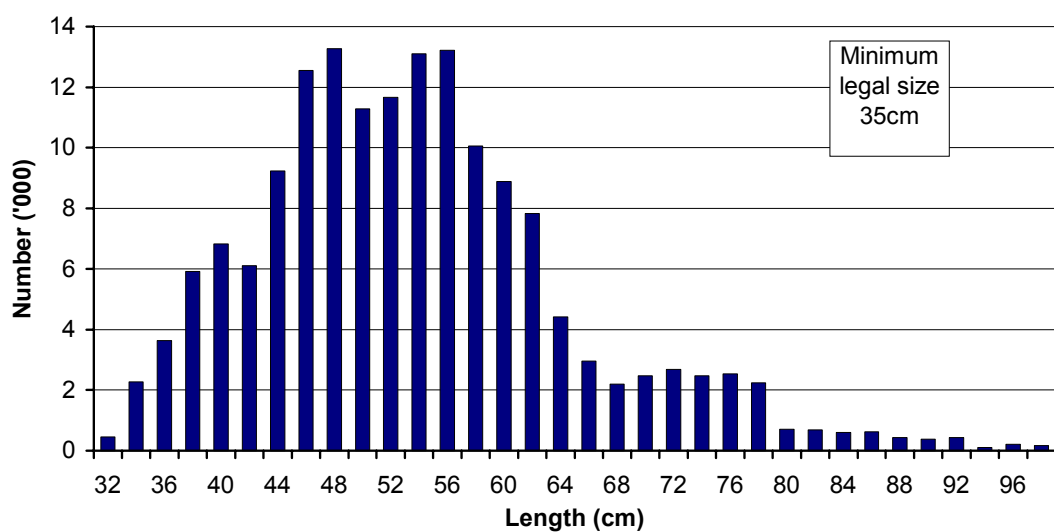
<sup>1</sup> Estimated by TSA (2001 WG meeting).

**Table 3.7.2.a.2** Cod in Division VIa (West of Scotland)

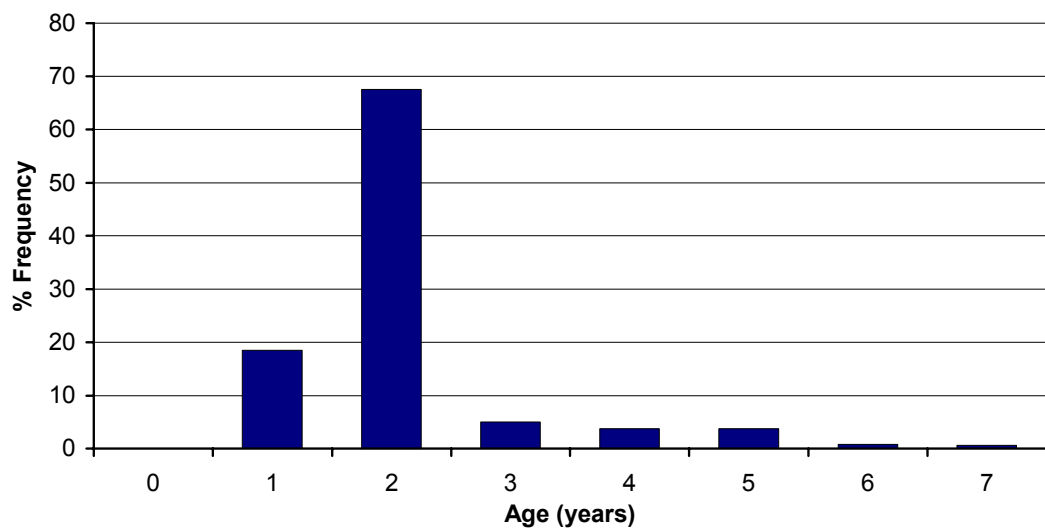
Year	Recruitment	SSB	Landings <sup>1)</sup>	Mean F
	Age 1 thousands	tonnes	tonnes	Ages 2-5
1966	15697	40676	17102	0.521
1967	6702	48353	22978	0.587
1968	9923	48931	24338	0.599
1969	4098	38957	21599	0.720
1970	7559	27216	12652	0.575
1971	10961	23524	10657	0.543
1972	7249	25821	14695	0.675
1973	8001	25568	12262	0.621
1974	8646	25382	13636	0.645
1975	11344	26448	13162	0.561
1976	6657	28366	17406	0.725
1977	9876	22547	12619	0.660
1978	10120	25328	13521	0.643
1979	14183	24694	16089	0.753
1980	16403	29172	17879	0.681
1981	6050	35075	23865	0.607
1982	15319	35615	21511	0.687
1983	10265	32215	21305	0.813
1984	14987	29890	21272	0.906
1985	6121	23596	18607	1.015
1986	10998	18858	11820	0.821
1987	30456	18385	18971	0.926
1988	3757	25327	20413	0.896
1989	11403	22542	17169	0.957
1990	4216	17786	12176	0.877
1991	7191	13777	10927	1.063
1992	12164	9913	9086	1.027
1993	5345	12098	10314	0.927
1994	7553	12866	8928	0.860
1995	6180	12479	9439	0.904
1996	2310	11827	9427	1.063
1997	8353	7313	7034	1.064
1998	2156	6113	5714	0.986
1999	1434	5035	4201	0.971
2000	5129	3596	2977	0.826
2001	1739	4331	2333	0.610
2002	3292	5844		0.610
Average	8752	22310	14113	0.782

<sup>1)</sup> Landings fitted by TSA value may differ slightly from values given in catch tables

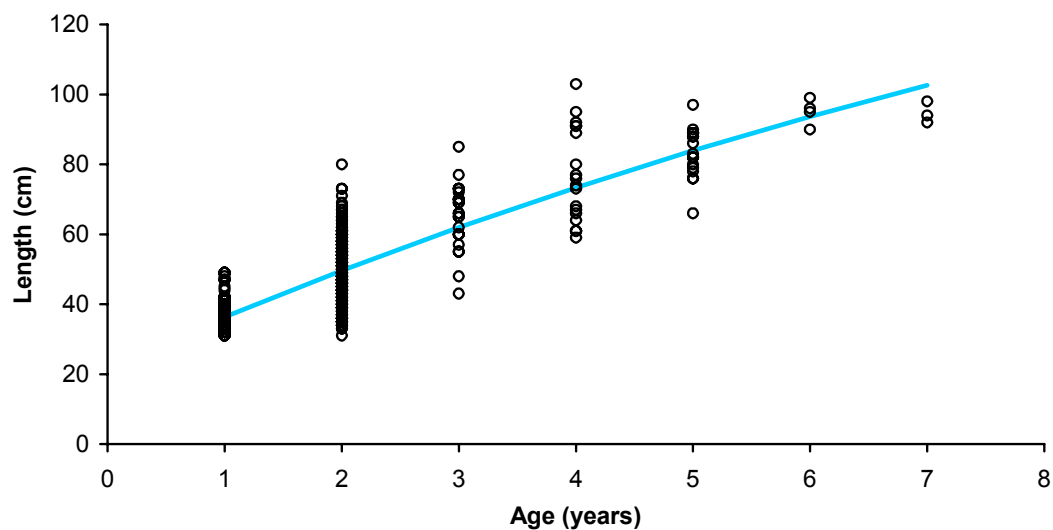
**2001 Length Distribution: Irish Landings, Cod in VIa**



**2001 Age Distribution: Irish Landings, Cod in VIa**



**2001 Size at Age: Irish Sampling, Cod in VIa**





# Rockall Cod

## (Division VIb)

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



### Marine Fisheries Services Division

#### MFSD – ADVICE

MFSD notes that the STECF and ICES advice for Rockall and West of Scotland fisheries is predicated primarily on the need to rebuild haddock and cod stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

TAC is set for Sub-area VI and any catches of cod set for Division VIb should not jeopardise a rebuilding plan for cod in Division VIa or management measures for Division VIb haddock.

MFSD point out that Irish vessels catch cod in mixed fisheries targeting haddock and cod in Sub-area VI. MFSD agrees that a separate TAC, applicable only to Division VIb, and including international waters, is required to improve management of the fishery in Division VIb. MFSD notes that the implementation of its advice is complicated by the international nature of the fishery and therefore suggests that management of this stock should be by international agreement.

TAC Area	TAC 2002	Proposed TAC 2003	Basis
VIa		0	Assessment
VIb		630*	Average landings
Total TAC	4,600	630	
Irish quota	1,035	142	

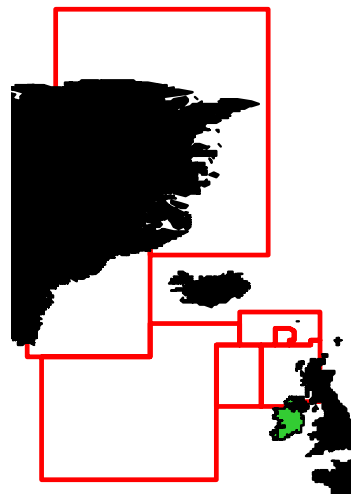
\* Unless ways to harvest cod without incidental catch or discards of haddock can be demonstrated fishing for cod in VIb should not be permitted.

#### STATE OF THE STOCK

- There is no ICES assessment for this stock.
- There is no information on the status of Division VIb cod.
- Landings have been less than 1,000 t since 1996.

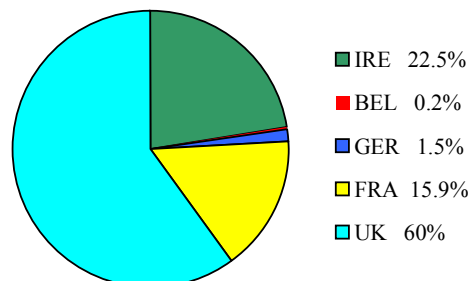
#### CURRENT MANAGEMENT

- The TAC Area covers Sub-areas, VI, XII, and XIV and division VIb.



Red Boxes-TAC/Management Areas

- Due to the rapid decline in cod catches in Division VIa the official landings reported from VIb now accounts for about 25 % of the catch in Sub-area VI.
- The TAC allocated to this stock in 2002 was 4,600 t. The Irish quota was 1,035 t.



- There are no explicit management objectives or plans for this stock.
- MFSD advises that management objectives be established and that a management plan be developed and implemented for the fishery catching cod.

#### MFSD – ECONOMIC COMMENTS

- The value of the 2000 Irish quota was €3.4m (2.7m).
- The value of the 2000 Irish landings from Division VIb was € 0.2m (£0.16m).
- Cod are an economically important by-catch in the Rockall haddock fishery for larger otter trawl vessels from Killybegs and Greencastle.

#### ADDITIONAL INFORMATION

1. There is no assessment for this stock.

2. Landings in VIb by the Irish fleet were reported to be 40 t in 2001.
3. Mis-reporting and under-reporting are considered to be a problem in this fishery.
4. The fishery is dominated by the UK (Scotland), with 50% of the 2001 official landings. Norwegian landings comprise of 27% of the total landings for cod in VIb. Norway has reported longline landings of between 50-150 t in recent years. Irish bottom trawl landings were 20% of the total.
5. The fishery is important to the larger Irish vessels that target mainly haddock and megrim. Otter trawlers from Killybegs have traditionally carried out the Rockall cod fishery.
6. Irish sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001.
7. Levels of discarding are considered to be low in this

## ICES ADVICE

### 3.7.2b

#### Special Comments

There is no information on the status of cod in Division VIb. Official catch data are incomplete.

#### Relevant factors to be considered in management:

Due to the rapid decline in cod catches in Division VIa the official landings reported from this area now accounts for about 25 % of the catch in Sub-area VI. TAC set for Division VIb cod should not jeopardise a rebuilding plan for cod in Division VIa nor management measures for haddock in this area.

#### Source of information:

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2003 (ICES CM 2003/ACFM:04).

**Table 3.7.2.b.1** Catch data COD in Division VIb (Rockall).

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992
Faroes Islands	18	-	1	-	31	5	-	-	-
France	9	17	5	7	2	-	-	-	-
Germany	-	3	-	-	3	-	-	126	2
Ireland	-	-	-	-	-	-	400	236	235
Norway	373	202	95	130	195	148	119	312	199
Portugal	-	-	-	-	-	-	-	-	-
Russia	-	-	-	-	-	-	-	-	-
Spain	241	1200	1219	808	1345	-	64	70	-
UK (E. & W. & N.I.)	161	114	93	69	56	131	8	23	26
UK (Scotland)	221	437	187	284	254	265	758	829	714
Total	1,023	1,973	1,600	1,298	1,886	549	1,349	1,596	1,176

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001
Faroes Islands	1	-	-	-	-	-	-	n/a	n/a
France	-	-	-	-	-	-	-	-	+
Germany	-	-	-	10	22	3	11	1	-
Ireland	472	280	477	436	153	227	148	119	n/a
Norway	199	120	92	91	55*	51*	85*	152*	164*
Portugal	-	-	-	-	5	-	-	-*	-
Russia	-	-	-	-	-	-	-	7*	26
Spain	-	-	2	5	1	6	4	3	
UK (E. & W. & N.I.)	103	25	90	23	20	32	22	4	
UK (Scotland)	322	236	370	210	706	341	389	286	
UK									178*
Total	1,097	661	1,031	775	962	660	659	572	358*

\* Preliminary.

# Irish Sea Cod

(Division VIIa)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD considers that this stock remains in a critical state where the probability of stock recovery will remain low unless stringent management action is taken immediately. MFSD therefore agrees with the STECF and ICES advice for this stock that closure of all fisheries targeting cod or with a cod by-catch will provide the highest probability of stock recovery.

MFSD advises that there should be stringent and effectively monitored restrictions on the catch and discard rates of cod in all other fisheries. MFSD recognises that there will be difficulties in the implementation and enforcement of this management advice and therefore advises that the definition of cod by-catch and incidental catch fisheries be clarified.

MFSD agrees that technical measures, including industry-initiated programs, should be a tool in rebuilding this stock. Furthermore, MFSD advises that these measures should become a permanent feature of the fishery if cod is to be fished sustainably once it has recovered.

MFSD advises that an ongoing management plan is necessary to recover the cod stock and to fish it sustainably once it has recovered. MFSD 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. MFSD considers that the proper definition and evaluation of all métiers involved in the fishery is crucial to this management plan.

### SPECIAL NOTE:

MFSD considers that it is not yet possible to evaluate existing recovery measures nor to conclude that any perceived change in stock status has resulted from these measures. Whilst recent estimates of  $F$  and SSB appear to show some improvement, these estimates are likely to be overly optimistic due to retrospective bias in the assessment. MFSD also notes that the SSB is at such a low level that the biological dynamics of the stock are unknown and there is a high risk of recruitment failure.

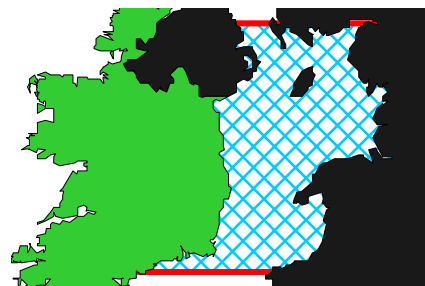
MFSD recognises that large short-term losses will be incurred in many Irish Sea fisheries, but advises that stringent management is required if the cod stock is to return to its former productivity.

## STATE OF THE STOCK

- There are very serious concerns about the state of this stock and its capacity to rebuild.
- The total international landings estimated by the WG were 3,875 t in 2001. This was well in excess of both the agreed TAC of 2,100 t. Total international landings remain well below the landings of up to 14,000 t in the late 1980s.
- Fishing mortality, while fluctuating, has increased progressively over time and has been above  $F_{pa}$  since 1980 and close to or above  $F_{lim}$  since 1987.  $F$  remains high ( $F = 1.08$  in 2001) and is above the  $F_{pa}$  of 0.72 and  $F_{lim}$  of 1.0.
- The probability of good recruitment appears to have been reduced at the low SSBs observed since 1990, and the five weakest year classes on record were produced since 1992. The absence of good recruitment since 1991 and the evidence of reduced recruitment at SSB levels below 10,000 t, means that there remains a high risk of continuous, serious decline in SSB.
- A general decline in SSB since the early 1980s was reversed temporarily only by the strong 1986 year-class. SSB has increased slightly since 2000 due to reduced influence of the weak 1997 and 1998 year classes. SSB in 2002 (4,930 t) is far below the  $B_{pa}$  of 10,000 t and below  $B_{lim}$  of 6,000 t.
- Short-term catch predictions indicate that, at current fishing mortality, landings in 2003 will be about 4,200 t. There continues to be a high probability of SSB remaining below  $B_{lim}$  in the medium term.

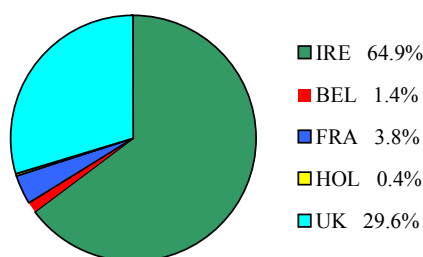
## CURRENT MANAGEMENT

- The TAC Area covers Division VIIa and corresponds to the assessment area.



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

- The 2002 TAC was 3,200 t with an associated Irish quota of 2,017 t.
- To rebuild the SSB of the stock, a spawning closure was introduced in 2000 for ten weeks from mid-February to maximise the reproductive output of the stock (EU Regulations 304/2000 and 2549/2000). The



measures were revised in 2001 and 2002, involving a continued, but smaller spawning ground closure, coupled with changes in net design to improve selectivity and protect juvenile fish.

- There is some evidence that the emergency measures displaced effort towards cod in VIa. In view of the state of cod in VIa, management actions in VIIa should not encourage a displacement of effort towards other vulnerable stocks. Measures to reduce effort are under consideration by the EU under the proposed cod recovery plan.
- MFSD recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching cod.

### MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was about €3.1m.
- The value of the 2001 Irish landings from Division VIIa was about €1.5m.
- This was a very valuable fishery during the 1980s but since then the economic importance has declined due to the poor state of the stock.

### ADDITIONAL INFORMATION

1. This assessment is based on landings at age and recruitment indices from surveys. Commercial fleet CPUE data are now considered unreliable and are not included in the assessment. There is a strong retrospective bias in this assessment; the current assessment revised 2001 SSB downwards by 40% and F upwards by 12%.
2. Irish landings in 2001 were estimated to be 645 t (up 325 t from 320 t in 2000).
3. Whilst mis-reporting is a problem in this fishery for those countries with restrictive quotas, corrections have been included in WG assessments from 1991 onwards.
4. The main fleets targeting cod in the Irish Sea include whitefish and *Nephrops* otter trawlers operating out of ports in UK(NI), UK(E&W) and Ireland, and midwater trawlers operating out of UK(NI). The 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. In recent years the pelagic fishery has also targeted cod during the summer.
5. Otter trawlers from Howth have traditionally carried out the Irish Sea cod fishery. However, in recent

years there has been a marked decline in the number of vessels operating from that port. In 2001 51% of the Irish landings were taken by 48 Irish vessels either targeting *Nephrops* or switching between targeting *Nephrops* and whitefish. In 2001 usage of inclined separator trawls was minimal (around 25%) however in 2002 usage is thought to have increased to around 80%. Otter trawl vessels targeting whitefish accounted for 35% of the landings the remainder were taken by beamers 10% and other gears.

6. Irish Sampling of this stock is supported through the EC funded sampling programme which is required under Data Collection Regulations 1543/2000 and 1639/2001. MFSD sampling indicates that 2-year-old fish, most of which are immature, comprise almost 80% of Irish landings. The distinct lack of older fish in the landings confirms the poor state of the stock.
7. The MFSD commenced a groundfish survey in the Irish Sea on the RV Celtic Voyager in 1997. The survey has consistently produced very poor catches of juvenile and adult cod confirming the poor state of the stock.
8. MFSD data indicates that discarding of cod is negligible in the Irish Sea.
9. There has been a tendency for the fishing mortality estimates for adult cod in the final year of the assessment to be revised upwards, and SSB revised downwards, when new catch and survey data for the following year are added.
10. The closure of the spawning grounds during spring from 2000 onwards has mainly affected pelagic trawlers and whitefish otter trawlers, causing 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.
11. The seasonal migration of cod between the Irish Sea and the Celtic Sea was investigated by the MFSD cod tagging programme. A special STECF meeting was held in Dublin in 2000 to evaluate available tagging data. 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. Furthermore cod tagged in the Celtic Sea were not recovered in the Irish Sea.
12. A notable feature of the Irish Sea mixed gadoid fishery has been the increased targeting of haddock by the traditional cod fleet operating in the western Irish Sea in the last number of years. Haddock abundance has increased substantially in the Irish Sea due to some very large year-classes. These have become the target of a directed fishery by UK (NI) and the Irish fleet.

## ICES ADVICE

### 3.8.2

#### State of stock/exploitation:

The stock remains outside of safe biological limits. Fishing mortality in 2001 was estimated to be above  $F_{lim}$  and SSB in 2002 below  $B_{lim}$ . Fishing mortality has increased

progressively over time and has been above  $F_{pa}$  since 1980 and close to, or above  $F_{lim}$  since 1987. A general decline in SSB since the early 1980s was reversed temporarily only by the strong 1986 yearclass, and, following two weak year classes in 1997 and 1998, SSB reached a historic low in 2000 at less than 50% of  $B_{lim}$ . SSB has increased slightly since 2000 due to reduced influence of the weak 1997 and 1998 year classes. The probability of good recruitment appears to have been reduced at the SSBs observed since 1990, and the five weakest year classes on record were produced since 1992.

### Management objectives:

To rebuild the SSB of the stock, a spawning closure was introduced in 2000 for ten weeks from mid-February to maximize the reproductive output of the stock (EU Regulations 304/2000 and 2549/2000). The measures were revised in 2001 and 2002, involving a continued, but smaller spawning ground closure, coupled with changes in net design to improve selectivity.

### Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$B_{lim}$ is 6 000 t (agreed by ACFM in 1998)	$B_{pa}$ be set at 10 000 t. This is the previously agreed MBAL and affords a high probability of maintaining the SSB above $B_{lim}$ , taking into account the uncertainty of assessments. Below this value the probability of below average recruitment increases.
$F_{lim}$ is 1.0. This is the fishing mortality above which there is a reduced probability that the stock can sustain itself.	$F_{pa}$ be set at 0.72. This $F$ is considered to have a high probability of avoiding $F_{lim}$ . Fishing mortalities above $F_{pa}$ have been associated with observed stock decline.

### Technical basis:

$B_{lim} = B_{loss}$	$B_{pa} =$ Previous MBAL and signs of reduced recruitment
$F_{lim} = F_{med}$	$F_{pa} = F_{med} * 0.72$

### Advice on management:

Given the very low stock size, the recent poor recruitments, and continued high fishing mortality despite management efforts to promote stock recovery, ICES recommends a closure of all fisheries for cod as a targeted species or by-catch. In fisheries where cod comprises solely an incidental catch there should be stringent restrictions on the catch and discard rates of cod, with effective monitoring of compliance with those restrictions.

These and other measures that may be implemented to promote stock recovery should be kept in place until there is clear evidence of the recovery of the stock to a size associated with a reasonable probability of good recruitment and there is evidence that productivity has improved. The current SSB is so far below historic stock sizes that both the biological dynamics of the stock and the operations of the fisheries are unknown, and therefore historic experience and data are not considered a reliable basis for medium-term forecasts of stock dynamics under various rebuilding scenarios.

### Relevant factors to be considered in management:

Although large short-term losses will be incurred in many Irish Sea fisheries, the advised measures are required if the cod stock is to reach a level where it can regain historic productivity. The advice will likely result in greatly reduced harvesting of other stocks where the fisheries take cod as part of a mixed species fisheries, particularly haddock and *Nephrops*. However the current state of the cod stock, and the failure of past measures to bring fishing mortality down to rates that allow rebuilding, mean that more stringent action is required.

Time and area closures for particular fisheries may be a tool in rebuilding this stock, and their effect can be considered in evaluating harvest opportunities for other species.

Diversion of effort from the cod spawning grounds to other vulnerable stocks should also be prevented. It is important that management action being taken to reduce fishing mortality on the adult component of the stock is not compensated for by an increase in fishing mortality on the juveniles.

ICES notes that this advice presents a strong incentive to fisheries to avoid catching cod. If industry-initiated programs can be demonstrated to bring their catch rates of cod in fisheries for other species down to near zero, then these programs could be considered in management of such fisheries. Industry-initiated programs to pursue such incentives should be encouraged, but must include a high rate of independent observer coverage, or other fully transparent method for ensuring their catches of cod are fully and credibly reported.

#### Comparison with previous assessment and advice:

The estimate of mean fishing mortality at ages 2 to 4 given by last year's assessment was influenced by a very high value at age 2 (1998 year-class), and a very low value at age 4 (1996 year-class). The former year class is by far the weakest recorded, making estimates of fishing mortality very unreliable. The current assessment gives a more even distribution of fishing mortality across these age groups, although the estimate for the 1998 year-class remains relatively high. The estimate of fishing mortality in 2000 is 12% higher and SSB in 2001 40% lower in this years assessment compared to last years assessment. The basis for the advice is the same as last year.

#### Catch forecast for 2003:

Basis:  $F(2002) = F(2001) = 1.08$ ; Landings (2002) = 4.4;  $SSB(2003) = 4.6$ .

F (2003) Onwards	Basis	Catch (2003)	Landings (2003)	SSB (2004)
0	$0.0 * F_{sq}$	0	0	10.6
0.22	$0.2 * F_{sq}$	1.2	1.2	8.9
0.43	$0.4 * F_{sq}$	2.2	2.2	7.4
0.57	$0.5 * F_{sq}$ 45% SSB increase	2.7	2.7	6.6
0.65	$0.6 * F_{sq}$	3.0	3.0	6.2
0.72	$F_{pa}$ 30% SSB increase	3.2	3.2	5.9
0.86	$0.8 * F_{sq}$	3.6	3.6	5.3
1.08	$F_{sq}$	4.2	4.2	4.5

Weights in '000 t.

Shaded scenarios are considered inconsistent with the precautionary approach.

#### Elaboration and special comment:

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. In recent years the pelagic fishery has also targeted cod during the summer. Cod are also taken as a by-catch in fisheries for *Nephrops*, plaice, sole and rays. The closure of the spawning grounds during spring from 2000 onwards has mainly affected pelagic trawlers and whitefish otter trawlers, causing 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. Given the precision of the assessment and the tendency to under-estimate F in the final year, it is not yet possible to determine if the emergency measures from 2000 onwards has been successful in reducing fishing mortality and improving SSB.

Analytical assessment is based on landings-at-age and recruitment indices from surveys in Division VIIa. Estimates of mis-reported landings are included from 1991

onwards. There has been a tendency for the fishing mortality estimates for adult cod in the final year of the assessment to be revised upwards, and SSB revised downwards, when new catch and survey data for the following year are added.

#### Source of information:

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

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

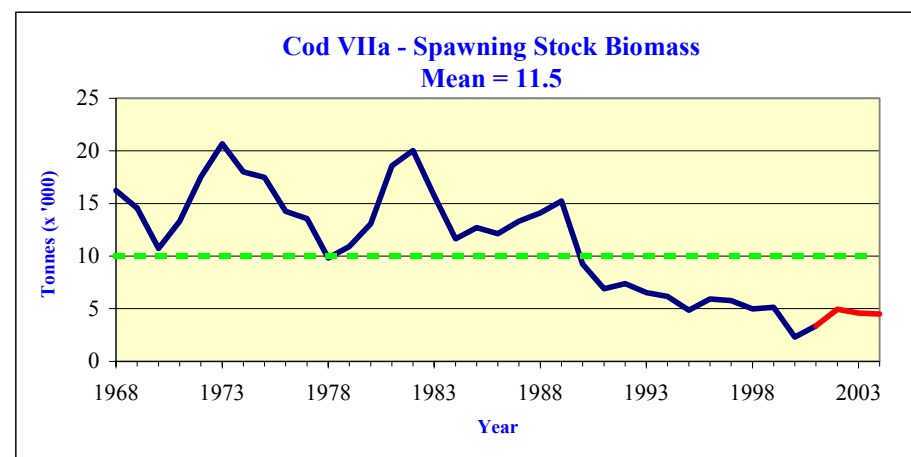
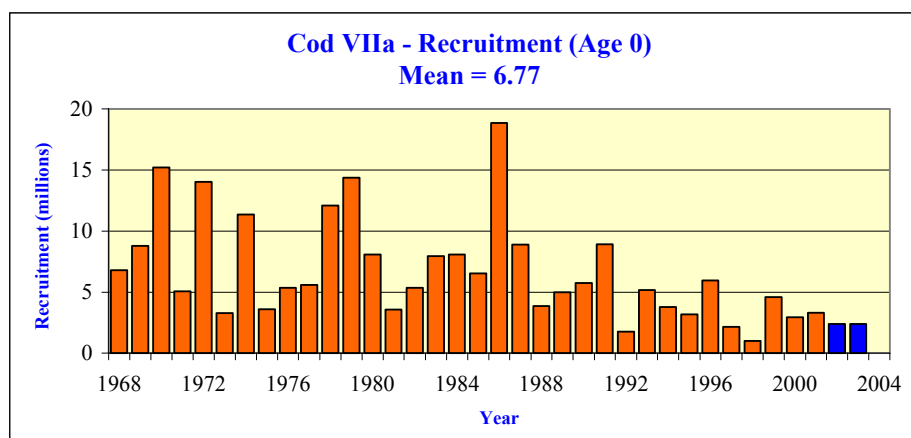
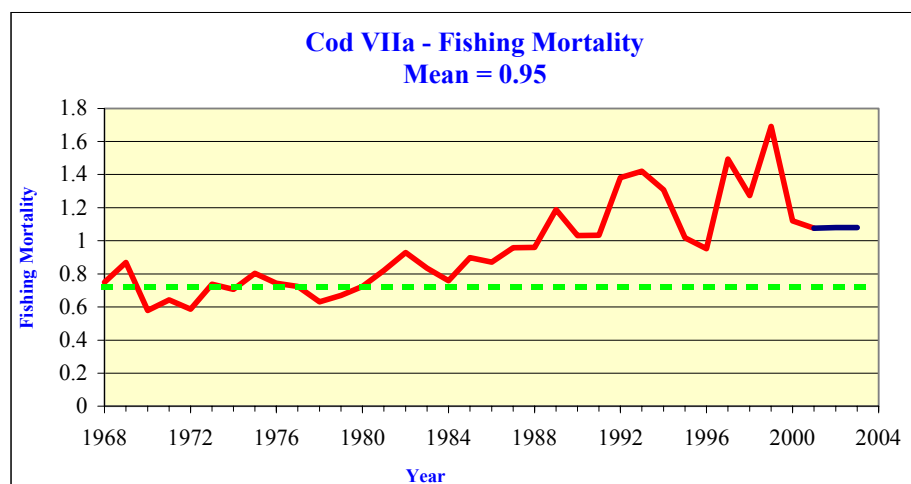
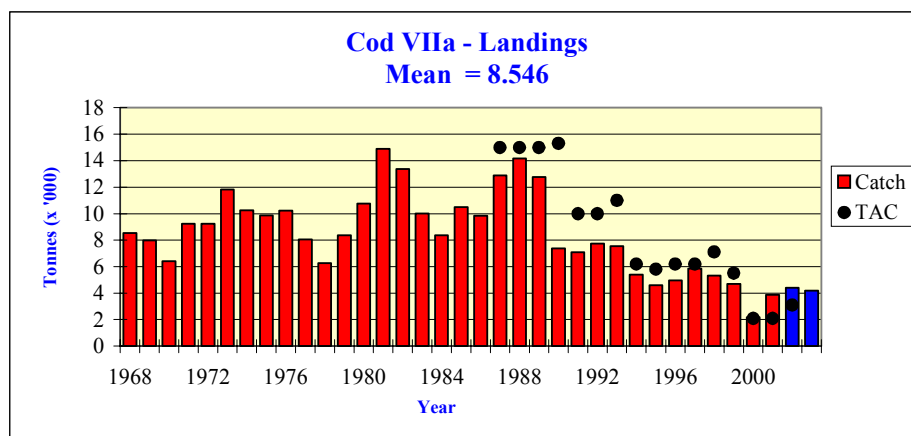
	Fish Mort Ages 2-4	Yield/R	SSB/R
Average Current	1.296	1.291	1.197
$F_{max}$	0.301	1.750	5.976
$F_{0.1}$	0.165	1.618	9.633
$F_{med}$	1.005	1.393	1.623

**Catch data (Tables 3.8.2.1–2):**

Year	ICES Advice	Predicted catch corresp. to advice	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	4.69 <sup>2</sup>
2000	Lowest possible F	0	2.1	1.43 <sup>3</sup>	2.18 <sup>2</sup>
2001	Lowest possible F	0	2.1	1.07 <sup>3</sup>	3.88 <sup>2</sup>
2002	Establish rebuilding plan	-	3.2		
2003	Closure of all fisheries for cod	-			

<sup>1</sup>Preliminary. <sup>2</sup>Including estimates of mis-reporting. <sup>3</sup>Incomplete data. Weights in '000 t.





**Table 3.8.2.1** Nominal catch (t) of COD in Division VIIa as officially reported to ICES, and Working Group estimates of annual landings.

Country	1986	1987	1988	1989	1990	1991	1992	1993
Belgium	222	344	269	467	310	78	174	169
France	1,480	1,717	2,406	352 <sup>1</sup>	201 <sup>1</sup>	320 <sup>1</sup>	916	686
Ireland	3,991	5,017	5,821	3,656	2,800	2,364	2,260	1,328
Netherlands	-	-	-	-	-	-	-	-
UK (England & Wales) <sup>3</sup>	847	1,922	2,667	6,320	4,752	3,562	3,529	3,244
UK (Isle of Man)	80	44	118	39	48	175	129	57
UK (N. Ireland)	2,992	3,565	4,080	...	...	...	...	...
UK (Scotland)	446	574	472	465	1,767	515	393	453
Total	10,058	13,183	15,833	11,299	9,878	7,014	7,401	5,937
Unallocated	-206	-289	-1,665	1,452	-2,499	81	334	1,618
Total figures used by Working Group for stock assessment	9,852	12,894	14,168	12,751	7,379	7,095	7,735	7,555

Country	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	129	187	142	183	316	150	60	283
France	208	166	148	268	269 <sup>1</sup>	85 <sup>1</sup>	66 <sup>1</sup>	74
Ireland	1,506	1,414	2,476	1,492	1,739	966	n/a	714
Netherlands	-	-	25	29	20	5	1	- <sup>1</sup>
UK (England & Wales) <sup>3</sup>	2,274	2,330	2,359	2,370	2,517	1,665	799	n/a
UK (Isle of Man)	26	22	27	19	34	9	n/a	n/a
UK (N. Ireland) <sup>3</sup>	...	...	...	...	...	...	...	...
UK (Scotland)	326	414	126	80	67	80	38	n/a
Total	4,469	4,533	5,303	4,441	4,962	2,960	1,430	1,071
Unallocated	933	54	-339	1,418	348	1,734	749	2,804
Total figures used by Working Group for stock assessment	5,402	4,587	4,964	5,859	5,310 <sup>2</sup>	4,694 <sup>2</sup>	2,179 <sup>2</sup>	3,875

<sup>1</sup>Preliminary.

<sup>2</sup>Revised.

<sup>3</sup>1989–2000 N. Ireland included with England and Wales.

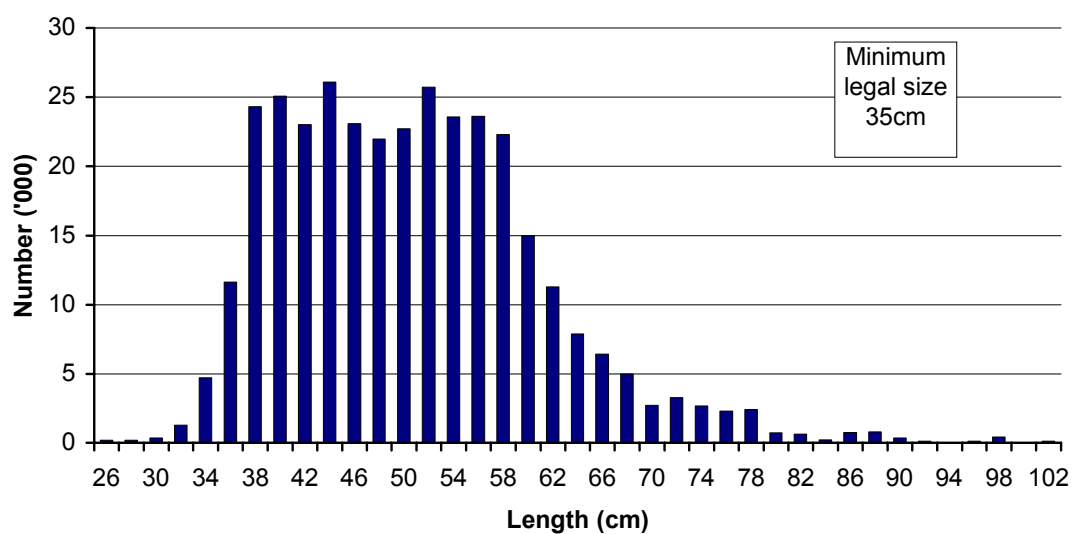
n/a = not available.

**Table 3.8.2.2** Cod in Division VIIa (Irish Sea)

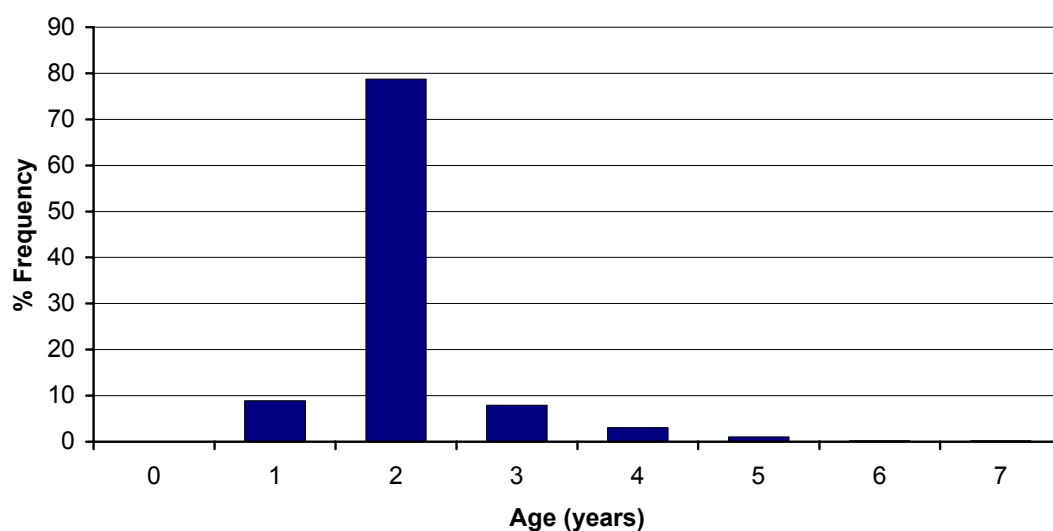
Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-4
1968	6790	16226	8541	0.7487
1969	8803	14570	7991	0.8688
1970	15209	10719	6426	0.5783
1971	5085	13313	9246	0.6432
1972	14035	17507	9234	0.5858
1973	3285	20667	11819	0.7367
1974	11350	17998	10251	0.7067
1975	3615	17464	9863	0.8035
1976	5355	14270	10247	0.7433
1977	5593	13553	8054	0.7237
1978	12093	9801	6271	0.6304
1979	14374	10897	8371	0.6686
1980	8074	13056	10776	0.7238
1981	3578	18573	14907	0.8192
1982	5364	20014	13381	0.9278
1983	7951	15741	10015	0.8345
1984	8071	11652	8383	0.7593
1985	6548	12716	10483	0.8970
1986	18860	12143	9852	0.8704
1987	8901	13303	12894	0.9583
1988	3864	14096	14168	0.9593
1989	4987	15215	12751	1.1871
1990	5738	9226	7379	1.0319
1991	8928	6889	7095	1.0336
1992	1774	7383	7735	1.3815
1993	5169	6524	7555	1.4213
1994	3781	6160	5402	1.3091
1995	3181	4849	4587	1.0178
1996	5945	5945	4964	0.9521
1997	2163	5781	5859	1.4948
1998	994	4973	5310	1.2737
1999	4601	5106	4694	1.6898
2000	2932	2312	2179	1.1207
2001	3295	3364	3875	1.0762
2002	2396 <sup>1</sup>	4932		
Average	6648	11341	8546	0.9501

<sup>1</sup>RCT-3 estimate

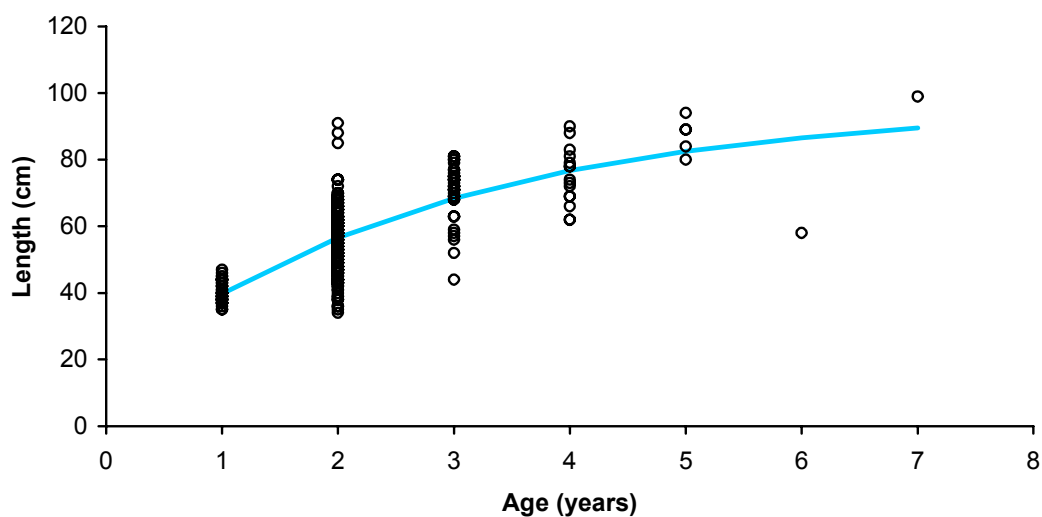
**2001 Length Distribution: Irish Landings, Cod in VIIa**



**2001 Age Distribution: Irish Landings, Cod in VIIa**



**2001 Size at Age: Irish Sampling, Cod in VIIa**



# Celtic Sea and Western Channel Cod

(Divisions VIIe-k)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD agrees with the ICES advice that fishing mortality should be reduced below  $F_{pa}$  corresponding to landings in Divisions VII e-k of less than 3,800 t in 2003. This represents a reduction in  $F$  of at least 60% and would allow SSB to reach  $B_{pa}$  in the short-term.

In order to calculate the TAC for this area additional landings from VIIb,c and VIId have to be included. ICES advice of a zero catch in VIId (as part of the North Sea cod recovery plan). MFSD advise catches of no more than the recent average for Divisions VIIb,c. This translates to a total TAC of 4,013 t with and associated Irish quota of 450 t. MFSD advise that a TAC should be set to give a high probability of rebuilding SSB above  $B_{pa}$  in the medium term.

MFSD strongly advise that to improve the overall management of this stock that the Division VIId should be included as part of the North Sea management area not Sub-area VII management area.

TAC Area	TAC 2002	Proposed TAC 2003	Basis
VIIe-k		3,800	Assessment
VIId		0	Assessment IV
VIIbc		213	Average Catches, 1998-2000 (As reported to the WGSSDS 2002)
Total TAC (VIIb-k,VIII,IX,X)	8,700	4,013	
Irish quota	977	450	

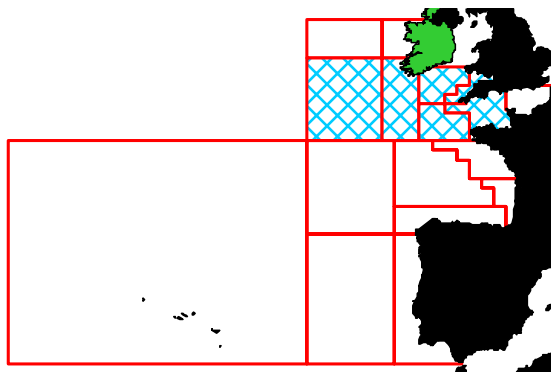
## STATE OF THE STOCK

- There are serious concerns about the state of this stock.
- The landings in 2001 were 8,500 t, an increase of 21% compared to landings in 2000. In general, landings have declined in recent years from a maximum of 12,800 t in 1996.
- Fishing mortality (estimated to be 1.05) is too high in this stock and has been above the  $F_{pa}=0.68$  since 1989 and above  $F_{lim}=0.90$  since 1998.

- Recruitment has been highly variable with the 1997 and 1998 year classes below average and the 1999 year class above average. The 2000 year class is close to the mean. (4.9 million).
- SSB has decreased since 1996 and at 7,700 t is currently below  $B_{pa} = 10,000$  t.
- Short-term predictions suggest that, at current fishing mortality, SSB will decrease to 7,000 t in 2003 and decrease again in 2004 to 5,800 t close to  $B_{lim}$ .

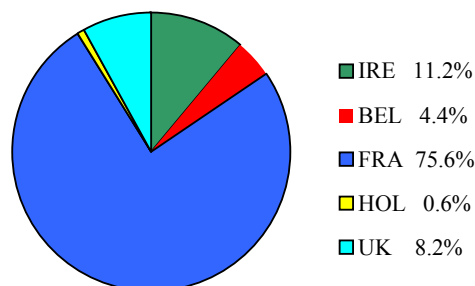
## CURRENT MANAGEMENT

- The TAC area covers Divisions VIIb-k, and Sub Areas VIII, IX and X.
- The assessment area covers Divisions VIIe-k.



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

- The 2002 TAC was 8,700 t with an associated Irish quota of 977 t.



There are no explicit management objectives or plan for this stock.

- MFSD recommend that management objectives be established and that a management plan be developed and implemented for fisheries catching cod.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was about €2.4m.
- The value of the 2001 Irish landings was about €2.4m.

- Cod remains an extremely economically important high value species in Irish mixed demersal fisheries in the Celtic Sea. Landings have in the past been close to the Irish quota, so any TAC reductions will have serious economic effects on the Irish fleet.

## ADDITIONAL INFORMATION

1. The current assessment estimates are very similar to those obtained last year. This year's advice is stronger than the one provided last year because of the further decline in the stock size and high contribution of assumed 2000- 2002-year classes to SSB in 2004.
2. Irish landings in 2001 were 1,091 t in Sub-Area VIIe-k. This is a decrease of 16% from the 2000 landings.
3. The levels of misreporting in this stock are currently unknown.
4. France took about 70% of the total landings in VIIe-k in 2001. Ireland, the UK and Belgium landed about 15%, 10% and 5% of the 2001 landings respectively.
5. Most of the French landings are from the Lorient-based gadoid fleet.
6. Demersal trawlers from Dunmore East and Castletownbere and other ports in south-west Ireland have traditionally targeted Celtic Sea cod during the spring. In recent years a targeted gill net fishery involving boats from Dingle has also become important. The majority of the landings are taken by otter-trawls (56%), followed by Scottish seine (15%), gillnets (13%) and beamers (12%).
7. Irish Sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001. MFSD sampling indicates that very young fish dominated the Irish landings in 2001 with 85% of the landings being between 1 and 2 years old.
8. In 2002 Irish commercial catch and effort data from logbooks were used for the second time to tune the assessment.

9. MFSD commenced a groundfish survey in 1997 on RV *Celtic Voyager* in the Celtic Sea. Catch rates to date have been very low for both juvenile and adult cod confirming the poor state of the stock.
10. Discards in Irish fisheries in recent years have been estimated at less than 1% of landings from Divisions VIIg and VIIj.
11. MFSD tagging work in the Irish Sea suggests that only a small component of cod landings from the Celtic Sea are from fish which spawn in the Celtic Sea. No cod that had been tagged in the Celtic Sea were recaptured in the Irish Sea.
12. Cod throughout its range in the northeast Atlantic has experienced poor recruitment in recent years. Despite the relatively strong 1999 year-class, the recent history of below average recruitment in this stock will result in low levels of SSB. There is evidence of reduced recruitment at SSB levels below 8,000 t.

## ICES ADVICE

### 3.9.2

#### State of stock/fishery

The stock is outside safe biological limits. SSB has decreased since 1996, is currently well below  $B_{pa}$ , and just above  $B_{lim}$ . Recruitment is highly variable. The 1997 and 1998 year classes are well below average, and the 1999 are estimated to be above average and 2000 year classes around average. Fishing mortality shows a generally increasing trend since the early 1980s and has increased well above  $F_{pa}$  since 1989. Fishing mortality has been above  $F_{lim}$  since 1998.

#### Management objectives:

There are no explicit management objectives for this stock.

#### Precautionary Approach Reference Points (established in 1999):

ICES considers that:	ICES proposes that:
$B_{lim}$ is 5 400 t, the lowest observed spawning stock biomass.	$B_{pa}$ be set at 10 000 t. Biomass above this affords a high probability of maintaining SSB above $B_{lim}$ , taking into account the uncertainty in assessments.
$F_{lim}$ is 0.90, the fishing mortality estimated to lead to potential collapse.	$F_{pa}$ be set at 0.68. This F is considered to have a high probability of avoiding $F_{lim}$ and maintaining SSB above $B_{pa}$ in the medium term, taking into account the uncertainty assessments.

#### Technical basis:

$B_{lim} = B_{loss}$	$B_{pa}$ = historical development of the stock
$F_{lim}$ = based on historical response of the stock	$F_{pa}$ = 5 <sup>th</sup> percentile of $F_{loss}$

#### Advice on management:

ICES recommends that fishing mortality should be reduced to less than 0.41 which is below  $F_{pa}$ , correspond-

ing to landings of less than 3 800 t in 2003. This represents a reduction in F of at least 60% and this would allow SSB to reach  $B_{pa}$  in the short-term.

### Relevant factors to be considered in management:

The assessment area was expanded in 1997 to cover Divisions VIIe-k and the ICES advice applies to these areas. However, the cod TAC is set for Sub-areas VII (excluding Division VIIa) and VIII. Within this larger area there is no control over where the catches will be taken. In order to be able to regulate the fishing mortality on the cod stock in Division VIIe-k, a TAC must be set for this area only.

The North Sea cod assessment area includes Division VIId and the North Sea stock will be affected by the cod catches taken in Division VIId. Considering the poor state of the North Sea cod stock, the cod TAC for Sub-areas VII (excl. VIIa) and VIII must be kept at present low levels.

The yield-per-recruit model suggests that a reduction in  $F$  to  $F_{\max}$  ( $=0.28$ ) will increase the long-term yield.

### Catch forecast for 2003:

Basis:  $F(2002) = F(99-01) = 1.01$  ; Landings(2002) = 9.0 ; SSB(2003) = 7.0 .

F(2003) onwards	Basis	Catch(2003)	Landings (2003)	SSB (2004)
0.41	$0.4 F_{sq}$		3.8	10.1
0.51	$0.5 F_{sq}$		4.6	9.2
0.61	$0.6 F_{sq}$		5.2	8.4
0.68	$F_{pa} = 0.67 F_{sq}$		5.7	7.8
0.81	$0.8 F_{sq}$		6.4	6.9
1.01	$F_{sq}$		7.4	5.8

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

### Medium- and long-term projections:

Assuming the current selection pattern, fishing at  $F_{\max}$  would require a 70% reduction in  $F$ .

### Comparison with previous assessment and advice:

The current assessment estimates are very similar to those obtained last year. This year's advice requires a greater reduction in fishing mortality than the one provided last year because of the low stock size, and high contribution of assumed 2001-2002 year classes to SSB in 2004.

### Elaboration and special comment:

Cod in Divisions VIIe-k are taken as a component of catches 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. UK (England and Wales) accounts for about 10% and Ireland for 15%, while Belgian vessels take about 5%. Landings are made throughout the year, but mainly in the winter months during November to April.

Analysis of landings trip by trip for the French gadoid trawlers for the period 1996-1999 showed that on a trip basis, cod and whiting were mixed. Information from the fishery indicates that on a haul basis, these two species are rather well separated. This means that fishermen seem to be able, for each trawl operation, to target cod and whiting separately. In Ireland in recent years, cod has increasingly been the target, using gillnet rather than trawl.

Most 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. Tagging studies have given no evidence of cod movement out of Division VIIe, where there appears to be a simple in-shore-offshore migration between deep-water wrecks and reefs in the summer and inshore spawning areas in the winter. Recent tagging work in the Irish Sea suggest 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.

The analytical assessment was based on landings data and CPUE data for four commercial fleets and two surveys.

### Source of information:

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

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

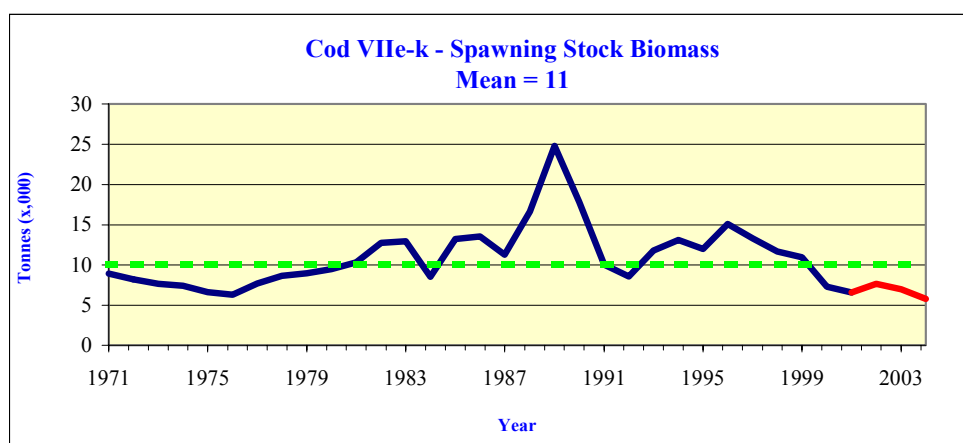
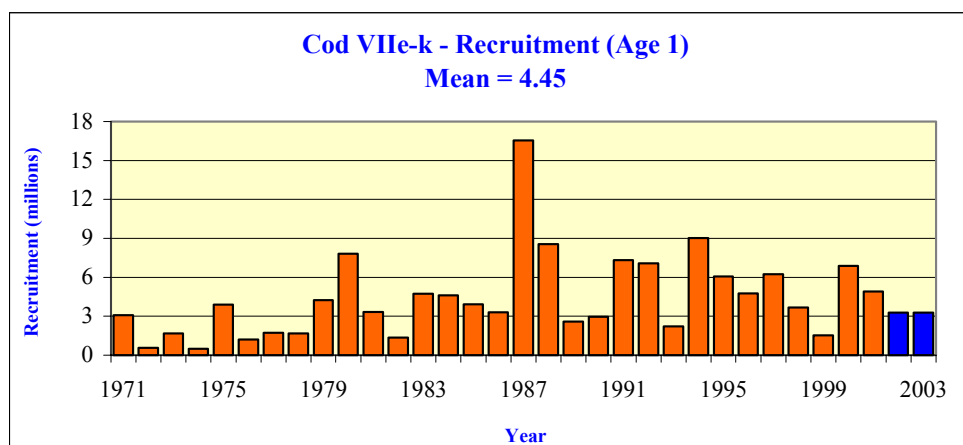
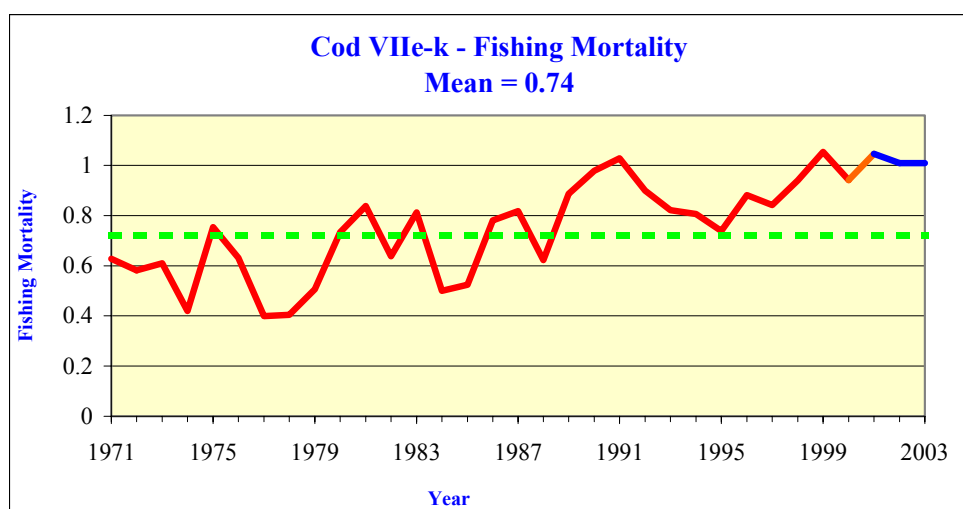
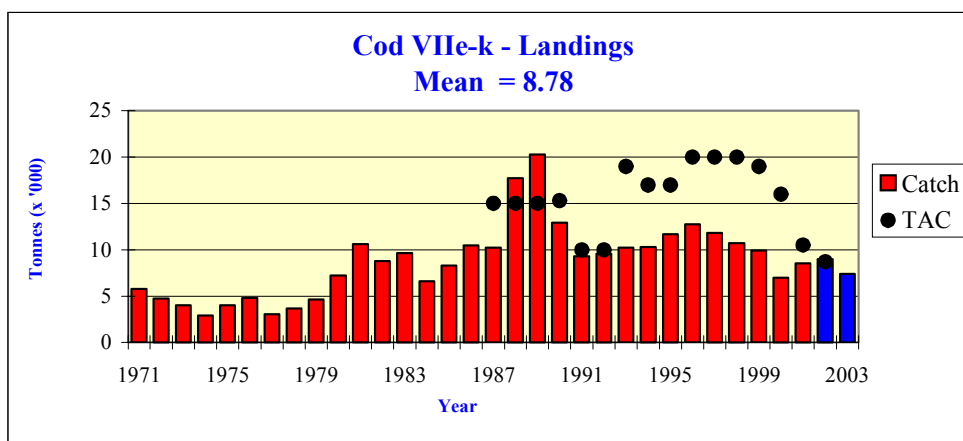
	Fish Mort Ages 2-5	Yield/R	SSB/R
Average Current	1.014	1.774	1.459
$F_{\max}$	0.281	2.519	9.258
$F_{0.1}$	0.170	2.363	14.604
$F_{\text{med}}$	0.696	2.079	2.752



**Catch data (Tables 3.9.2.1-2):**

Year	ICES Advice	Predicted catch cor- resp. to advice	Agreed TAC <sup>1</sup>	ACFM Landings
1987	Reduce F	< 6.4 <sup>2</sup>		-
1988	No increase in F; TAC	7.0 <sup>2</sup>		17.7
1989	No increase in F; TAC	8.6 <sup>2</sup>		20.3
1990	No increase in F; TAC	9.2 <sup>2</sup>		12.9
1991	TAC; SSB = mean	4.5 <sup>2</sup>		9.3
1992	Appropriate to reduce F	-		9.6
1993	20% reduction in F	6.5 <sup>2</sup>	19.0	10.2
1994	20% reduction in F	5.6 <sup>2</sup>	17.0	10.3
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	12.8
1997	20% reduction in F	7.4 <sup>4</sup>	20.0	11.8
1998	10% reduction in F	8.8 <sup>4</sup>	20.0	10.7
1999	Reduce F below $F_{pa}$	9.2 <sup>4</sup>	19.0	9.9
2000	Reduce F below $F_{pa}$	< 7.6 <sup>5</sup>	16.0	7.0
2001	40% reduction in F	< 4.3 <sup>5</sup>	10.5	8.5
2002	45% reduction in F	< 5.3 <sup>5</sup>	8.7	
2003	60% reduction in F	< 3.8 <sup>5</sup>		

<sup>1</sup>TAC covers Subareas VII (except Division VIIa) and VIII. <sup>2</sup>For the VIIf+g stock component. <sup>3</sup>For the VIIf-h stock component. <sup>4</sup>For the VIIe-h stock component. <sup>5</sup>For VIIe-k stock component. Weights in '000 t.



**Table 3.9.2.1** Nominal landings of Cod in Divisions VIIf–h, VIIe, VIIe–h, VIIj–k, VIIe–k as used by the Working Group in 2002.

**Divisions VIIf,g,h**

Year	Belgium	France	Ireland	UK (E + W)	Others	Total
1971						4647
1972						3807
1973	524	2413	64	196	30	3227
1974	197	1954	24	154		2329
1975	377	2657	15	130	30	3209
1976	226	3535	13	97	1	3872
1977	107	2272	17	62		2458
1978	88	2744	30	69		2931
1979	110	3469	72	86		3737
1980	172	5187	246	209	7	5821
1981	285	7806	108	317		8516
1982	174	6391	142	338		7045
1983	262	7013	274	199		7748
1984	240	4569	204	316		5329
1985	456	5632	198	398		6684
1986	374	7473	226	345		8418
1987	216	7187	380	437		8220
1988	542	12065	612	400		13619
1989	891	14298	1003	482		16674
1990	615	8612	177	689		10093
1991	297	5750	246	590		6883
1992	193	6417	340	655		7605
1993	386	7650	331	604		8971
1994	397	6947	966	480		8790
1995	388	7571	820	539		9317
1996	550	8324	949	597		10420
1997	687	7665	397	556		9305
1998	519	6326	659	515		8019
1999	326	5879	1220	444		7869
2000	207	4048	961	407		5623
2001*	345	5489**	818	490		7142

**Division VIIe**

Year	Belgium	France	Ireland	UK	Others	Total
1988	12	1899		839		2750
1989	19	1453		727	2	2201
1990	6	654		610	9	1279
1991	6	341		408		755
1992	2	331		365		698
1993	5	307		274	2	587
1994	1	308		309	2	620
1995	12	554		348		914
1996	2	497		415		914
1997	1	627		441		1069
1998	5	955		456		1416
1999	0	831		431		1262
2000	0	620		318		938
2001*	2	602**		348		952

**Table 3.9.2.1** Continued**Divisions VIIe, f,g,h**

Year	Belgium	France	Ireland	UK	Others	Total
1988	554	13964	612	1239	0	16369
1989	910	15751	1003	1209	2	18875
1990	621	9266	177	1299	9	11372
1991	303	6091	246	998	0	7638
1992	195	6748	340	1020	0	8303
1993	391	7957	331	878	2	9558
1994	398	7255	966	789	2	9410
1995	399	8124	820	888	0	10231
1996	552	8821	949	1012	0	11334
1997	688	8292	397	997	0	10374
1998	525	7280	659	970	0	9434
1999	326	6710	1220	875	0	9131
2000	208	4668	961	725	0	6561
2001*	347	6091**	818	838	0	8094

**Divisions VIIj,k**

Year	Belgium	France	Ireland	UK	Others	Total
1988		407	868	53	2	1330
1989		508	857	14	13	1392
1990		276	1064	47	149	1536
1991		115	1413	96	20	1644
1992		202	872	187	13	1274
1993		143	435	67	4	649
1994		117	650	117	6	890
1995		193	1126	147	8	1474
1996		233	1033	154	0	1420
1997	6	153	1116	169	0	1444
1998	4	102	1059	118	0	1283
1999	0	110	663	22	0	795
2000	0	80	341	20	0	441
2001*	0	179**	273	0	0	452

**Table 3.9.2.1** Continued**Divisions VIIe,f,g,h,j,k**

Year	Belgium	France	Ireland	UK	Others	Total
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	14371	1480	1292	2	17699
1989	910	16259	1860	1223	15	20267
1990	621	9542	1241	1346	158	12908
1991	303	6206	1659	1094	20	9282
1992	195	6950	1212	1207	13	9577
1993	391	8100	766	945	6	10207
1994	398	7372	1616	906	8	10300
1995	399	8317	1946	1035	8	11705
1996	552	9055	1982	1166	0	12754
1997	693	8445	1513	1166	0	11818
1998	528	7383	1718	1089	0	10718
1999	326	6820	1883	897	0	9926
2000	208	4748	1302	745	0	7002
2001*	347	6270**	1091	838	0	8546

\* Provisional.

\*\* Estimated landings derived from official landings in TAC area and computed log-books.

**Table 3.9.2.2** Nominal landings (t) of Cod in Divisions VIIb,c, VIId, and, VIIe-k as used by the Working Group in 2002.

Year	VIIb,c	VIId	VIIe-k
1971			5782
1972			4737
1973			4015
1974			2898
1975			3993
1976			4818
1977			3058
1978			3647
1979			4650
1980		5020	7243
1981		5336	10596
1982		3981	8766
1983		3841	9641
1984		3524	6631
1985		3331	8317
1986		12814	10475
1987		14219	10228
1988		10729	17699
1989		5538	20267
1990		2763	12908
1991		1886	9282
1992		2669	9577
1993		2432	10207
1994		2850	10300
1995	473	3964	11705
1996	519	3503	12754
1997	301	7043	11818
1998	318	8580	10718
1999	172	6858	9926
2000	148	2325	7002
2001*	99	1573	8546

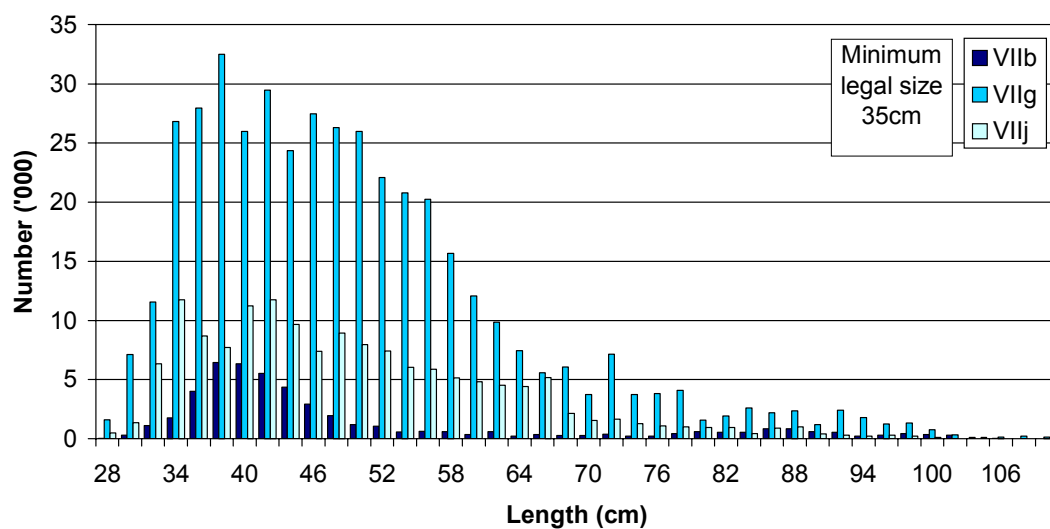
\* Provisional

**Table 3.9.2.3** Cod in Divisions VIIe-k

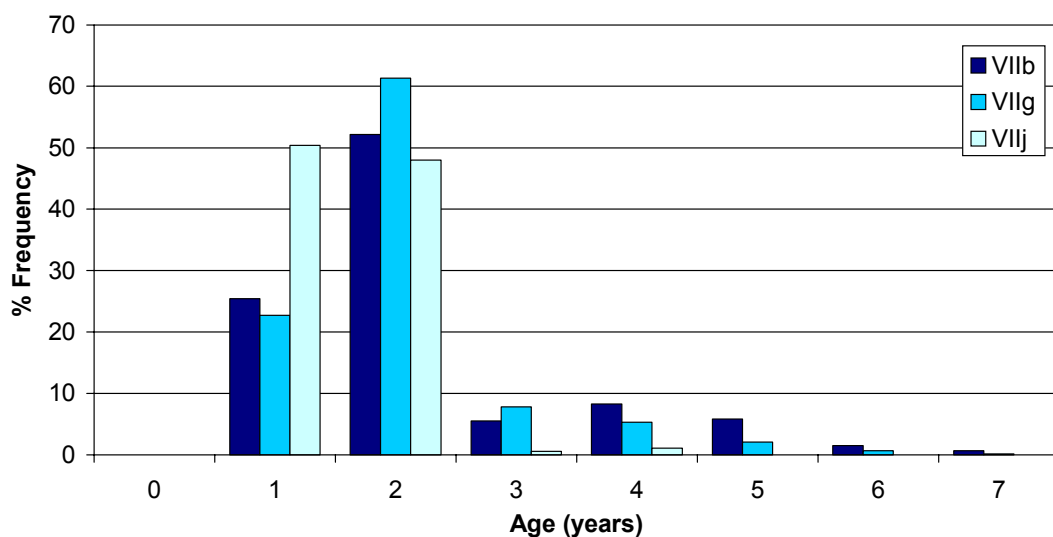
Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-5
1971	3075	8928	5782	0.6284
1972	565	8225	4737	0.5822
1973	1665	7669	4015	0.6096
1974	500	7412	2898	0.4194
1975	3889	6630	3993	0.7549
1976	1202	6304	4818	0.6317
1977	1716	7692	3059	0.3994
1978	1690	8626	3647	0.4050
1979	4221	8951	4650	0.5068
1980	7822	9453	7243	0.7340
1981	3318	10287	10597	0.8387
1982	1350	12745	8766	0.6377
1983	4730	12931	9641	0.8128
1984	4604	8515	6631	0.4999
1985	3919	13204	8317	0.5235
1986	3289	13553	10475	0.7805
1987	16557	11260	10228	0.8182
1988	8574	16644	17699	0.6227
1989	2570	24830	20267	0.8867
1990	2941	17831	12908	0.9789
1991	7325	10041	9282	1.0284
1992	7075	8560	9577	0.8992
1993	2227	11815	10207	0.8222
1994	9015	13115	10300	0.8064
1995	6062	11994	11705	0.7380
1996	4749	15097	12754	0.8809
1997	6244	13305	11818	0.8426
1998	3679	11675	10717	0.9404
1999	1516	10925	9926	1.0541
2000	6891	7277	7002	0.9422
2001	4886	6580	8546	1.0464
2002	3280	7659		1.0142
Average	4411	10929	8781	0.7527



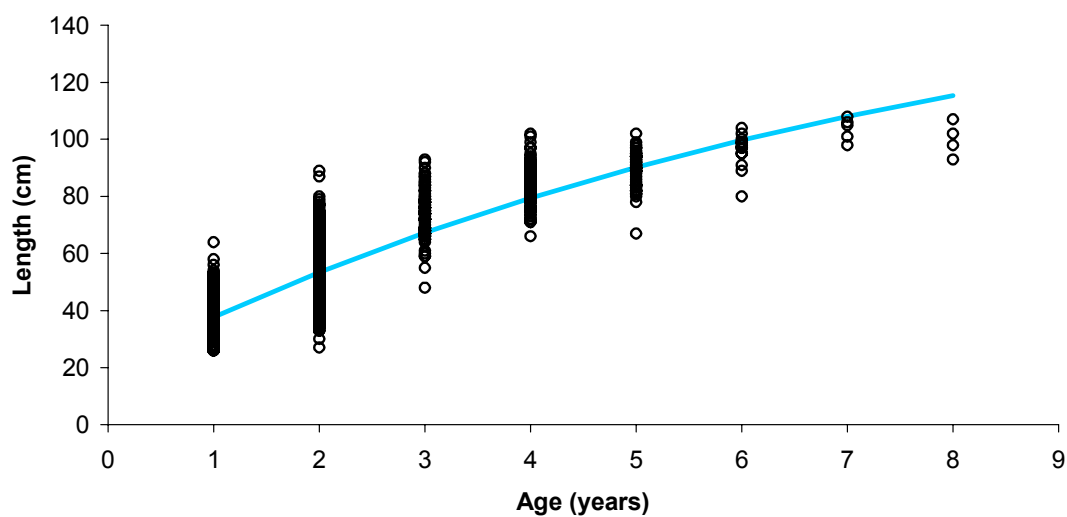
**2001 Length Distribution: Irish Landings, Cod in VIIb VIIg VIIj**



**2001 Age Distribution: Irish Landings, Cod in VIIb VIIg VIIj**



**2001 Size at Age: Irish Sampling, Cod in VIIb VIIg VIIj**



# West of Ireland Cod

(Divisions VIIb,c)



Marine Fisheries Services Division

## MFSD – ADVICE

**Cod in Divisions VIIb,c are included in the management area VIIb-k. There was no ICES advice for this stock. MFSD advise that catches in 2003 be no more than the recent average (1998-2000) of around 213 t as included in advice for Cod VIIe-k.**

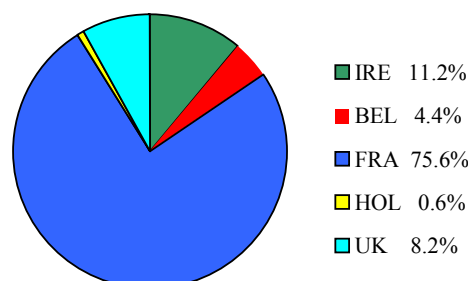
## STATE OF THE STOCK

- No analytical assessment of cod in Divisions VIIb,c is carried out at present.
- There are no reference points for cod in VIIb,c.
- Landings have declined since 1996.

## ADDITIONAL INFORMATION

1. No analytical assessment is carried out at present for this stock.
2. The TAC area covers Divisions VIIb-k, Sub Areas VIII, IX X and CECAF 34.1.1 (Madeira).
3. Irish landings in 2001 were 104 t, a 25% decrease of last years landings of 139 t.
4. The level of misreporting in this area is unknown.
5. Ireland (with 98% of the 2001 landings) dominates the 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. The majority of the landings

- are taken by otter-trawls (79%), followed by gillnets (11%) and Scottish seine (2%).
6. Cod are an economically valuable by-catch in fisheries targeting anglerfish, megrim and *Nephrops* in this area.
  7. Irish Sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001. MFSD sampling indicates that the length distribution of Cod VIIb is dominated by 36-44cm fish, mostly one and two year olds.
  8. MFSD have conducted a groundfish survey in this area since 1992, however, cod catches are generally very low in this area.
  9. MFSD data on discarding of cod in this area is limited but discards are considered to be negligible.
  10. Whilst there is no official ICES advice for this stock the ICES working group stated that due to the dynamics of this stock it is unclear whether it would be more appropriate to include Cod VIIb,c in the Cod VIa assessment rather than the Cod VIIe-k assessment. MFSD agrees with this conclusion.
  11. Until the dynamics of these cod stocks become clear the Working Group resolved to continue the collation of data on VIIb,c cod.

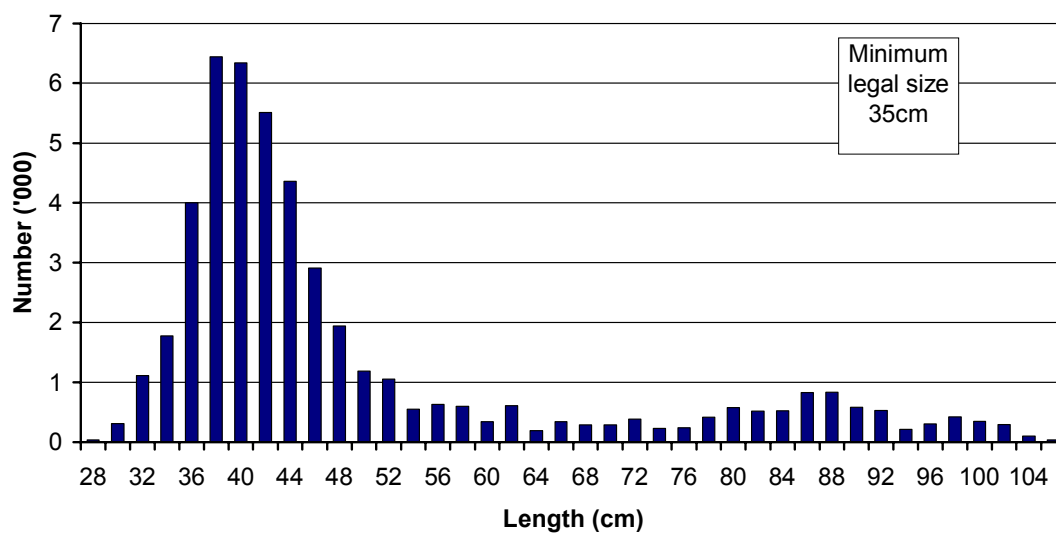


Nominal Landings (t) (as reported to WGSSDS) of Cod in Division VIIb,c for 1995-2001

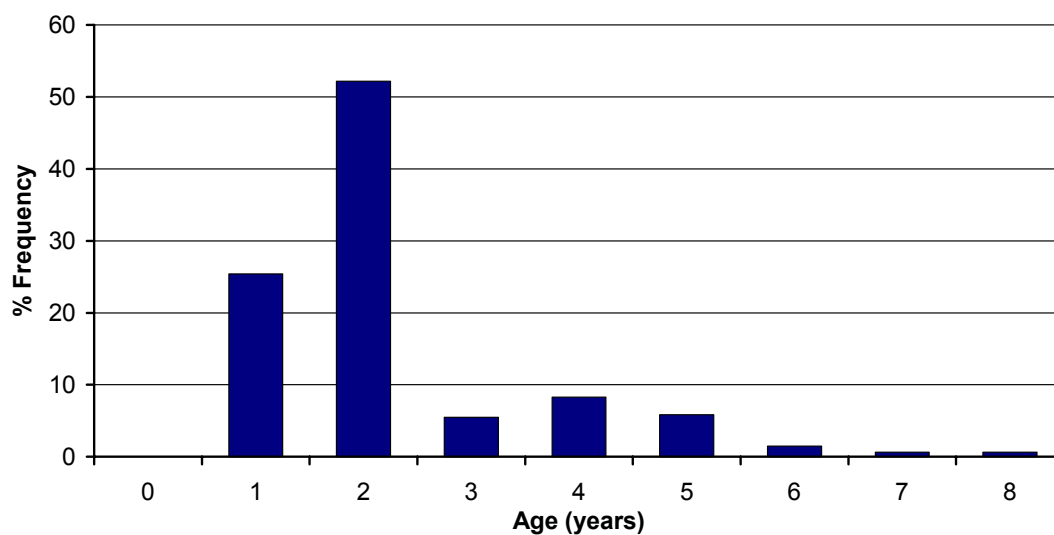
Country	1995	1996	1997	1998	1999	2000	2001
France	91	115	71	44*	... <sup>1</sup> *	... <sup>1</sup> *	... <sup>1</sup> *
Germany	-	-	3	-	-	-	-
Ireland	282	353	177	234	154	141	96
Netherlands	-	-	-	-	-	-	+
Norway	3	1	6	-	11	+	1
Spain	6	3	-	6	2	3	-
UK(E/W/NI)	25	35	37	25	4	4	...
UK(Scotland)	66	12	7	9	1	+	...
United Kingdom							2
Total	473	519	301	318	172	148	

\*Preliminary. <sup>1</sup>See VIIg-k.

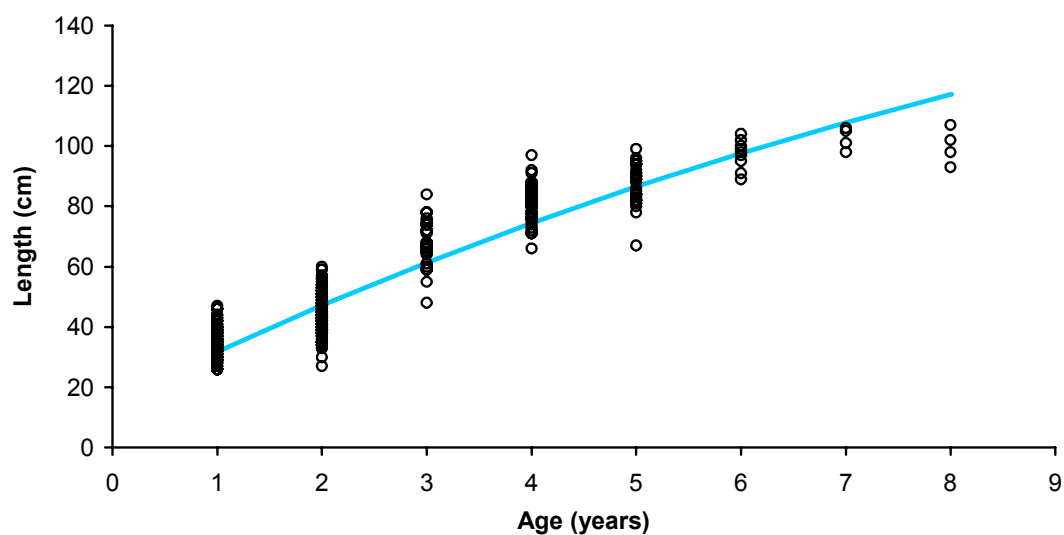
**2001 Length Distribution: Irish Landings, Cod in VIIb**



**2001 Age Distribution: Irish Landings, Cod in VIIb**



**2001 Size at Age: Irish Sampling, Cod in VIIb**



# West of Scotland Haddock

(Division VIa)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the STECF and ICES advice for West of Scotland fisheries is predicated primarily on the need to rebuild cod stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

MFSD therefore agrees with the ICES recommendation that, unless ways to harvest haddock without incidental catch or discards of cod can be demonstrated, fishing for haddock should not be permitted.

MFSD agrees with the ICES advice that fisheries targeting *Nephrops* with a haddock by-catch may continue provided that there is no incidental catch or discards of cod.

MFSD agrees with the ICES advice that programs including industry initiated programs to pursue cod by-catch reduction should be encouraged, but that such programs must ensure that their reported catches of cod are fully and credibly reported.

MFSD agrees with the ICES recommendation that, if any fisheries on haddock are permitted, despite the advice on cod and haddock, then fishing mortality in 2003 should be less than  $F_{pa}$ , corresponding to a reduction in  $F$  of at least 20%. This would correspond to landings of less than 15,800 t in 2003. This translates to an Irish quota of 1,720 t in 2003.

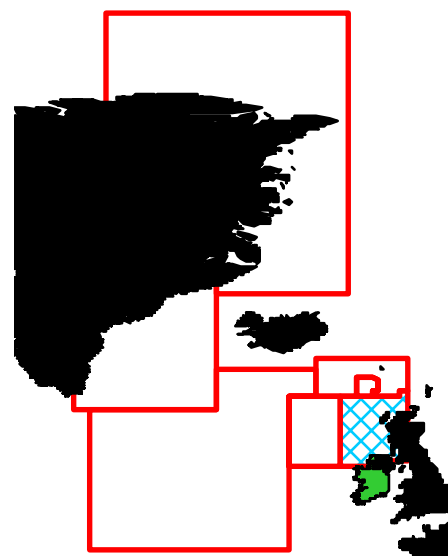
## STATE OF THE STOCK

- There are concerns about the state of this stock.
- International landings in 2001 declined to a new historic low of 13,400 t (Working Group estimate). Landings have been in decline since 1993.
- Fishing mortality is estimated to be 0.63, above the  $F_{pa}$  of 0.50. Fishing mortality has been above  $F_{pa}$  in every year since 1987.
- SSB in 2002 is estimated to be 62,500 t and is well above the  $B_{pa}$  of 30,000 t. SSB varied around  $B_{pa}$  during the 1990s, and reached a historic low at 60% of  $B_{pa}$  in 2000. The very strong 1999 year class has caused SSB to increase rapidly above  $B_{pa}$  in 2001 and 2002.

- Recruitment to this stock has varied greatly in recent years. However, recruitment has shown reduced variability since 1988, resulting in comparatively stable SSB between 1992-2000. The 1999 year class is the 4<sup>th</sup> largest since 1965.
- SSB is predicted to decline to 38,800 t in 2004 at current levels of fishing mortality.

## CURRENT MANAGEMENT

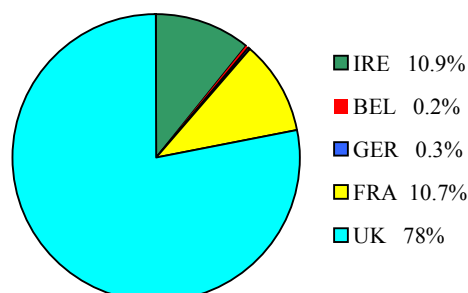
- The TAC Area covers Sub Areas VI, Vb, VI, XII and XIV.
- The assessment area covers Division VIa only.



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

- The 2002 TAC allocated to this stock was 14,100 t. The Irish component of the quota was 1,535 t of which no more than 1,393 t may be fished in Vb and VIa.
- There are no explicit management objectives or a management plan for this stock.

MFSD recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching haddock.



## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was €3.1m.
- The value of the 2001 Irish landings from Division VIa was €2.1m.
- This fishery is extremely important to the white fish fleets operating out of Killybegs and Greencastle.

## ADDITIONAL INFORMATION

- 1 The assessment used landings and discards at age data. It includes research vessel surveys and is considered reasonable.
- 2 Irish landings in 2001 were about 1,000 t, about 70% of the 2000 landings of about 1,500 t.
- 3 Mis-reporting was once a serious problem in the fishery for those countries with restrictive quotas. Corrections have been made for misreporting during 1992-1994. Some misreporting of landings has occurred in recent years, but no quantitative information was provided on possible large-scale misreporting for the period 1995-2001, so no adjustments were made to the landings data.
- 4 Scottish light trawlers dominate the fishery. Effort by Scottish seiners and heavy trawlers has declined since 1976. Ireland, France and England take most of the remaining landings.
- 5 Otter trawlers from Killybegs and Greencastle have traditionally carried out the Irish haddock fishery. This is generally a mixed fishery targeting haddock, cod, whiting, megrim and monkfish.
- 6 Irish Sampling of this stock is supported through the EC funded sampling programme that is required under Data Collection Regulations 1543/2000 and 1639/2001. MFSD sampling indicates that 3, 4 and 5 year-olds comprise almost 60% of Irish landings. Haddock do not reach full maturity until age 3.

- 7 The MFSD commenced a groundfish survey off Donegal in 1993. This survey was used by the Working Group and was found to corroborate Scottish survey data indicating a very strong 1999 year-class. Despite the Irish survey data performing well, these data were not used in the final Working Group assessment due to limitations of the chosen assessment model.
- 8 Haddock in Division VIa are fully exploited by age group 3. 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 over-exploitation.
- 9 The area closures for cod in Division VIa implemented in the emergency measures in 2001 have had no measurable impact on the haddock fishery in Division VIa.

## ICES ADVICE

### 3.7.3.a

#### State of stock/exploitation:

**This stock is harvested outside safe biological limits.** Fishing mortality has been above  $F_{pa}$  in every year since 1987. SSB varied around  $B_{pa}$  during the 1990s, and reached a historic low at 60% of  $B_{pa}$  in 2000. The very strong 1999 year-class, the 4<sup>th</sup> largest since 1965, has caused SSB to increase rapidly above  $B_{pa}$  in 2001 and 2002.

#### Management objectives:

No explicit management objectives are set for this stock.

#### Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$B_{lim} = 22\,000\text{ t}$	$B_{pa}$ be set at 30 000 t
$F_{lim} = \text{not defined}$	$F_{pa}$ be set at 0.50

#### Technical basis:

$B_{lim} = \text{lowest observed SSB}$	$B_{pa} = B_{lim} * 1.4$
$F_{lim} = \text{not defined}$	$F_{pa} = \text{high probability of avoiding } SSB < B_{pa} \text{ in long term}$

#### Advice on management:

Since haddock is mostly taken in demersal fisheries with cod, whiting and in a directed *Nephrops* fishery, the advice for cod determines the advice for haddock. Unless ways to harvest haddock without incidental catch or discards of cod can be demonstrated fishing for haddock should not be permitted.

#### Relevant factors:

On the basis of the status of haddock alone, ICES would recommend that the fishing mortality be less than  $F = 0.50$  ( $=F_{pa}$ ). This would correspond to landings of less than 15 800 t in 2003 and a reduction of fishing mortality of at least 20%. If any fisheries on haddock are permitted, despite the advice on cod and haddock, then total catches should not exceed these values.

The extent to which the cod-haddock-whiting fisheries are linked has not been quantified. This linkage is not one-to-one, but it is evident and probably variable. It is possible for fishing vessels to increase their targeting of individual species within the demersal fish complex, but there will always be a significant by-catch of other roundfish.

ICES notes that this advice presents a strong incentive to fisheries to avoid catching cod. If industry-initiated programs can be demonstrated to bring their catch rates of cod in fisheries for haddock down to near zero, then these programs could be considered in management of these fisheries. Industry-initiated programs to pursue such incentives should be encouraged, but must include a high rate of independent observer coverage, or other fully transparent method for ensuring their reported catches of cod are fully and credibly reported.

Fisheries targeting *Nephrops* may take a by-catch of haddock. In this case ICES notes that haddock may continue to be caught subject to existing EU regulations applying to *Nephrops* fisheries and providing the catch of cod complies with the advice on cod.

Haddock, while a principal target for some fleets, are taken in a mixed roundfish fishery. This means it is impor-

tant to take into account the impact of management of haddock on other stocks, notably cod and whiting. The reverse is, of course, also true. Recent measures to protect Division VIa cod, such as the closed area in 2001, and agreements to increase mesh size, will affect the haddock fishery. Improvements in selectivity related to measures to protect cod should, if effectively implemented, benefit the haddock fishery by reducing discards and increasing landings in the long-term.

A high proportion (up to 50% in weight, 1991–2001) of the total haddock catch is discarded. Square mesh panels were introduced in UK fisheries in 2000 in an attempt to improve selectivity. The minimum mesh size for vessels fishing for cod in the mixed demersal fishery in EC Zones 1 and 2 (West of Scotland and North Sea excluding Skagerrak) was changed to from 100 mm 120 mm from the start of 2002 under EU regulations regarding the cod recovery plan (Commission Regulation EC 2056/2001), with a one-year derogation of 110 mm for vessels targeting other species including haddock. If implemented effectively, these measures should help to improve gear selectivity and reduce discarding of haddock. Measures to control by-catch and discarding of cod should be implemented within any directed haddock fisheries.

#### Catch forecast for 2003:

Basis:  $F(2002) = F_{sq} = F(99-01) = 0.63$ ;  $Catch(2002) = 28.8$ ;  $Landings(2002) = 19.8$ ;  $SSB(2003) = 48.1$

F(2003 onwards) <sup>1</sup>	Basis	Catch (2003)	Discards (2003)	Landings (2003)	SSB (2004)
0.25	$0.4 * F_{sq}$	11.5	2.6	8.9	52.8
0.38	$0.6 * F_{sq}$	16.4	3.8	12.6	47.6
0.50	$F_{pa} (0.8 * F_{sq})$	20.7	4.9	15.8	42.9
0.63	$F_{sq}$	24.6	5.9	18.7	38.8
0.76	$1.2 * F_{sq}$	28.1	6.8	21.3	35.1

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

#### Comparison with previous assessment and advice:

The basis for a single stock fishery advice is the same as last year. The assessment of this stock shows a tendency for the fishing mortality estimates for the final year to be revised upwards when additional catch and survey data for the following year are included. The  $F$  for 2000 was estimated last year to be 0.63, and has been revised to 0.76 by the current assessment. The  $SSB$  estimate for 2001 has been revised downwards by 10%.

#### Elaboration and special comment:

The fishery is dominated by Scottish light trawlers. Effort by Scottish seiners and heavy trawlers has declined since 1976. Haddock in Division VIa are fully exploited by 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 over-exploitation.

Analytical age-based assessment uses landings-at-age data, discard-at-age data, and indices from research vessel surveys. Some misreporting of landings has occurred in recent years.

#### Source of information:

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

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

	Fish Mort Ages 2-6	Yield/R	SSB/R
Average Current	0.634	0.130	0.363
$F_{\max}$	0.246	0.163	0.854
$F_{0.1}$	0.148	0.152	1.218
$F_{\text{med}}$	0.572	0.136	0.403

**Catch data (Tables 3.7.3.a.1-2):**

Year	ICES Advice	Predicted landings corresp. to advice	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 $F_{\text{pa}}$	14.3 <sup>3</sup>	19.0	11	10.4	5.1	15.6
2000	Maintain F below $F_{\text{pa}}$	<14.9 <sup>3</sup>	19.0	7	6.9	8.2	15.2
2001	Reduce F below $F_{\text{pa}}$	<11.2 <sup>3</sup>	13.9	7	6.7	6.7	13.4
2002	Reduce F below $F_{\text{pa}}$	<14.1 <sup>3</sup>	14.1				
2003	No cod catches	-					

<sup>1</sup>TAC is set for Divisions VIa and VIb (plus Vb1, XII & XIV) combined with restrictions on quantity that can be taken in VIa from 1990. <sup>2</sup>Adjusted for misreporting. <sup>3</sup> For VIa only. Weights in '000 t.

**Table 3.7.3.a.1** Haddock, Division VIa. Nominal catch (tonnes) of haddock, 1986–2001, as officially reported to ICES.

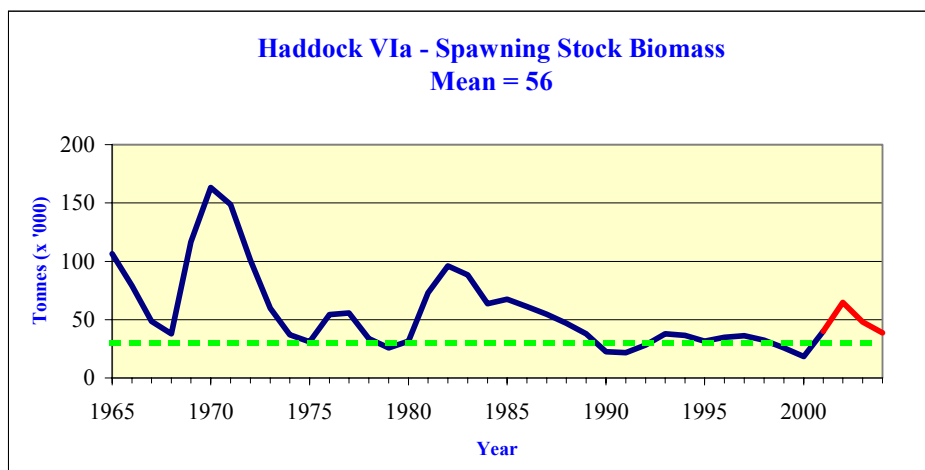
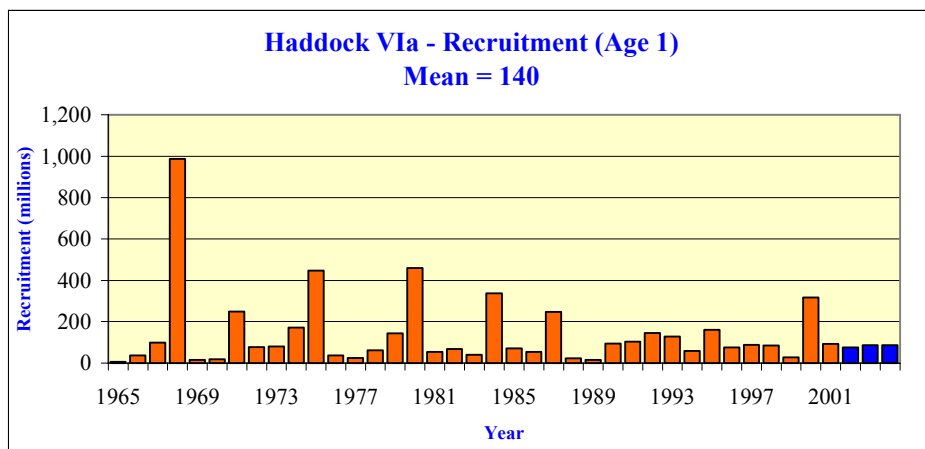
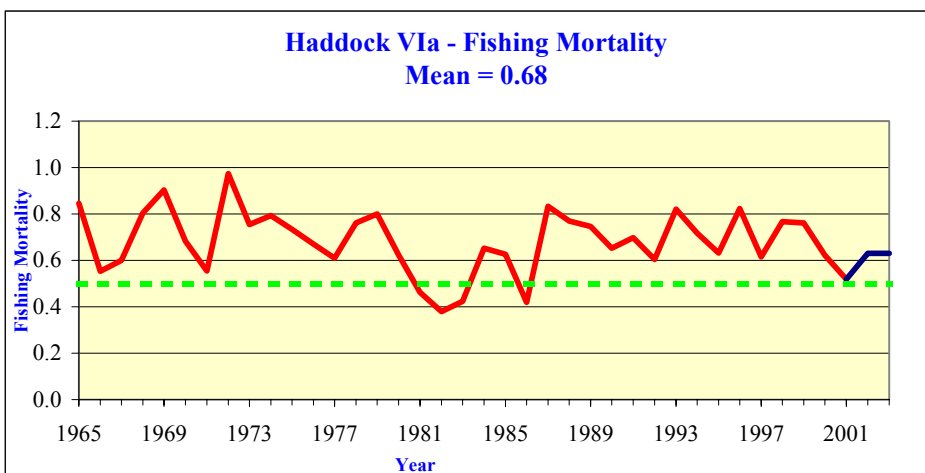
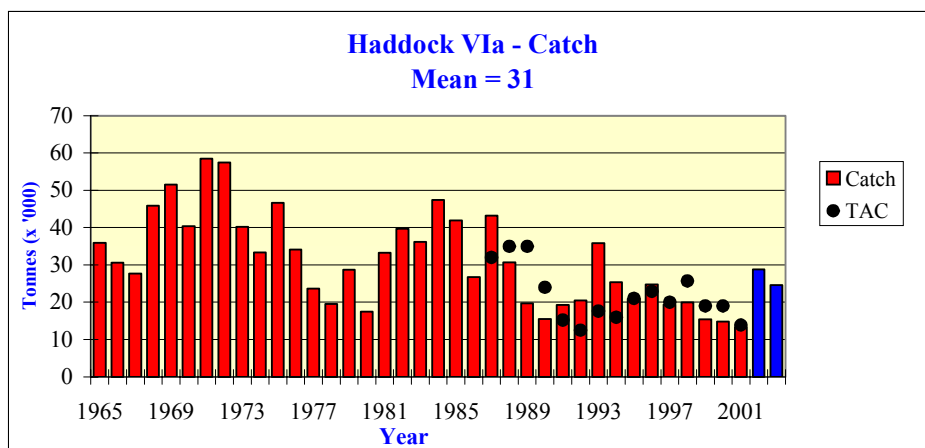
Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	-	29	8	9	-	9	1	7	1	+	1	3	2	2	1	2
Denmark	+	+	+	+	+	+	1	1	-	1	1	-	+	-	-	-
Faroe Islands	1	-	-	13	-	1	-	-	-	-	-	-	-	-	n/a	n/a
France	4,956	5,456	3,001	1,335 <sup>1,2</sup>	863 <sup>1,2</sup>	761 <sup>1,2</sup>	761	1,132	753	671	445	270	394 <sup>1</sup>	788	358	159 <sup>1</sup>
Germany, Fed.Rep.	25	21	4	4	15	1	2	9	19	14	2	1	1	2	1	1
Ireland	2,026	2,628	2,731	2,171	773	710	700	911	746	1,406	1,399	1447	1,352	1054	677	1000
Norway	45	13	54	74	46	12	72	40	7	13	16 <sup>1</sup>	21 <sup>1</sup>	28	18	70 <sup>1</sup>	33 <sup>1</sup>
Spain	-	-	-	-	-	-	-	-	-	-	-	-	2	4	9	n/a
UK (E & W) <sup>3</sup>	222	425	114	235	164	137	132	155	254	322	448	493	458	315	199	199
UK (N. Ireland)	155	1	35								...	...	...	...	...	...
UK (Scotland)	12,955	18,503	15,151	19,940	10,964	8,434	5,263	10,423	7,421	10,367	10,790	10,352	12,125	8,630	5,933	
UK (total)																6,107
Total	20,385	27,076	21,098	23,781	12,825	10,065	6,932	12,678	9,201	12,794	13,102	12,587	14,360	10,813	7,248	7,302
Landings as used by WG	19,574	27,004	21,137	16,693	10,136	10,560	11,353	19,067	14,243	12,372	13,452	12,866	14,401	10,426	6,949	6,724
Discards	7,352	16,218	10,164	3,178	5,406	9,192	9,398	16,904	11,192	8,794	11,838	6,623	5,712	5,131	8,207	6,650
Unallocated landings	-811	-72	39	-7,088	-2,689	495	4,421	6,389	5,042	-423	350	279	41	-387	-299	-578
Total as used by WG	26,926	43,222	31,301	19,871	15,542	19,752	20,752 <sup>1</sup>	35,971	25,435	21,166	25,290	19,489	20,114	15,557	15,156	13,374

<sup>1</sup>Preliminary. <sup>2</sup>Includes Divisions Vb(EC) and VIb.

<sup>3</sup>1989–2001 N. Ireland included with England and Wales.

n/a = Not available.

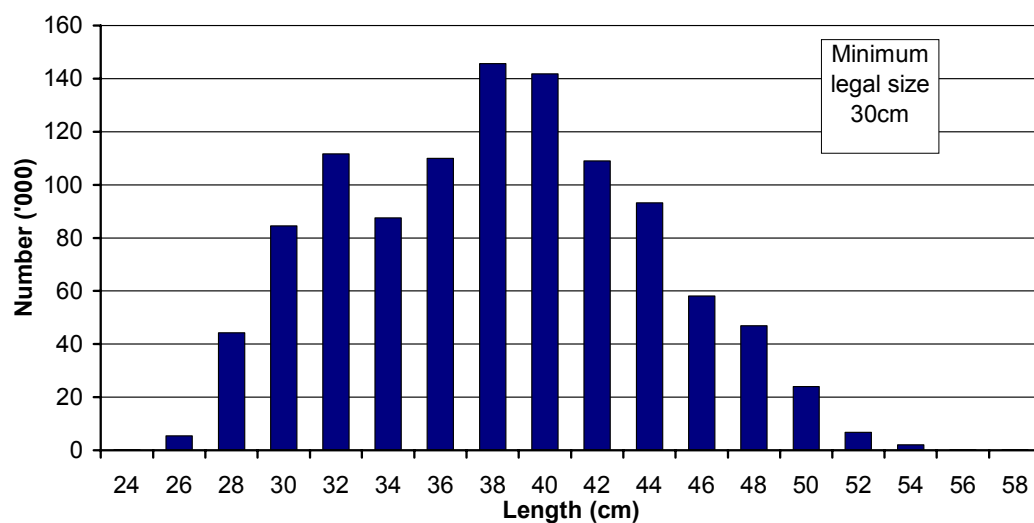




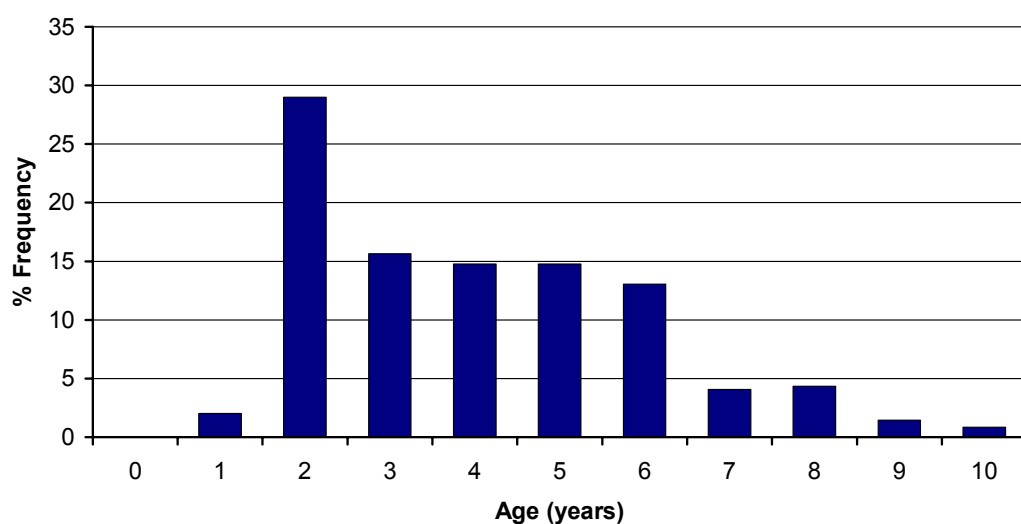
**Table 3.7.3.a.2** Haddock in Division VIa (West of Scotland)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-6
1978	61249	33651	19515	0.7610
1979	143064	25761	28653	0.7999
1980	459273	31516	17461	0.6238
1981	54183	73124	33246	0.4618
1982	68751	96005	39710	0.3796
1983	40381	88314	36188	0.4227
1984	336766	63815	46341	0.6527
1985	71992	67623	41868	0.6270
1986	54864	61132	26745	0.4201
1987	246556	54700	43163	0.8324
1988	22703	47054	30667	0.7702
1989	14893	37932	19662	0.7454
1990	94214	22554	15488	0.6520
1991	103971	21664	19239	0.6982
1992	144886	28174	20548	0.6042
1993	127429	37678	35862	0.8211
1994	58611	36545	25351	0.7176
1995	161066	31452	20945	0.6319
1996	75695	34759	24802	0.8232
1997	87486	36062	19334	0.6156
1998	84049	32492	19933	0.7671
1999	27442	25905	15315	0.7604
2000	316368	18433	14844	0.6215
2001	92522	40196	13381	0.5193
2002	75682	62511		0.5911
Average	120964	44362	26178	0.6528

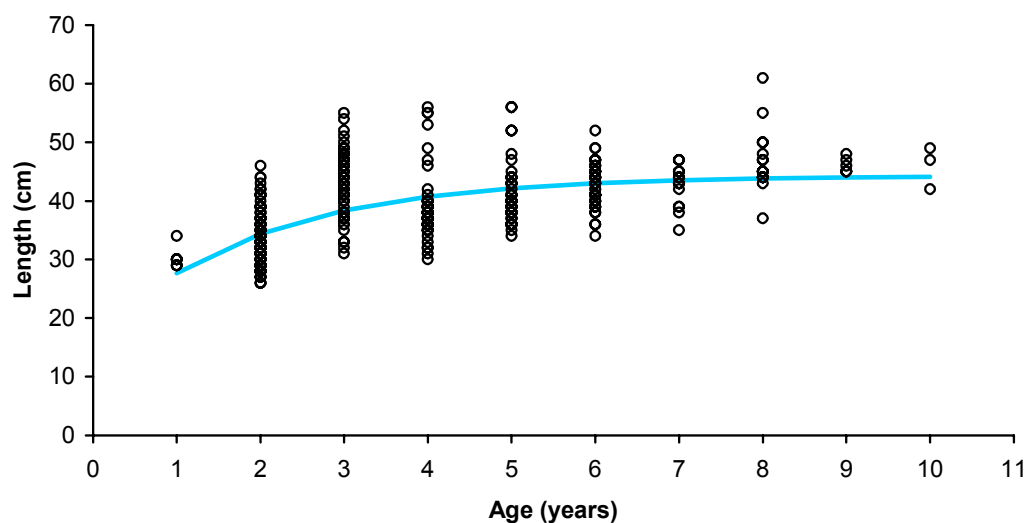
**2001 Length Distribution: Irish Landings, Haddock in Vla**



**2001 Age Distribution: Irish Landings, Haddock in Vla**



**2001 Size at Age: Irish Sampling, Haddock in Vla**



# Rockall Haddock

(Division VIb)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD agrees with the ICES recommendation that fishing mortality in 2003 should be reduced to the lowest possible level, corresponding to zero catches in 2003. Furthermore, MFSD advises that a rebuilding plan should be introduced.

MFSD agrees that a separate TAC, applicable only to Division VIb, and including international waters, is required to improve management of the fishery in Division VIb. MFSD notes that the implementation of its advice is complicated by the international nature of the fishery and therefore suggests that management of this stock should be by international agreement.

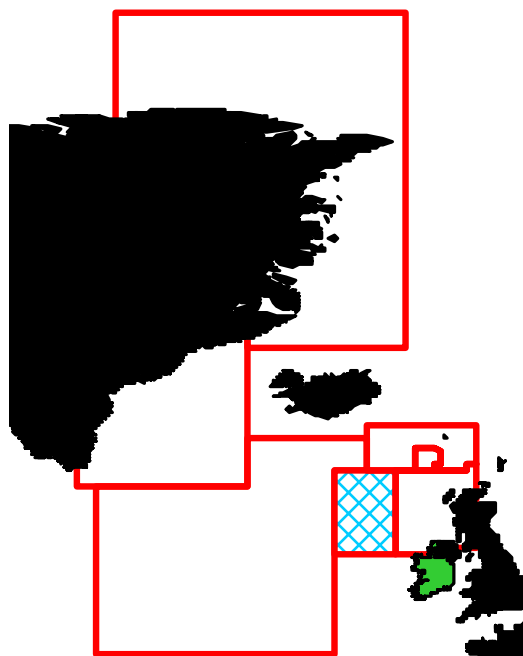
## STATE OF THE STOCK

- There are very serious concerns about the state of this stock.
- Total international landings in 2001 were estimated at 1,920 t. Landings appear to have been relatively stable since 1997 but fell markedly in 2001.
- Fishing mortality in 2001 ( $F = 0.58$ ) was above the  $F_{pa}$  of 0.40. Fishing mortality had declined since the late 1980's before increasing above  $F_{pa}$  in 1999-2001.
- Recruitment has been less than average since 1995. In particular, the 1999 year-class is only about 10% of the long-term average and the lowest on record. Recruitment appears to be more stable than in other haddock stocks.
- Spawning stock biomass has been declining since 1995 to 2,330 t in 2002 which is the lowest in the time series. SSB is now well below the  $B_{pa}$  of 9,000 t and  $B_{lim}$  of 6,000 t. SSB seems to fluctuate in response to variations in recruitment strength.
- Short-term predictions indicate that, at current levels of fishing mortality, SSB will remain well below  $B_{lim}$  at about 2,900 t in 2004.

## CURRENT MANAGEMENT

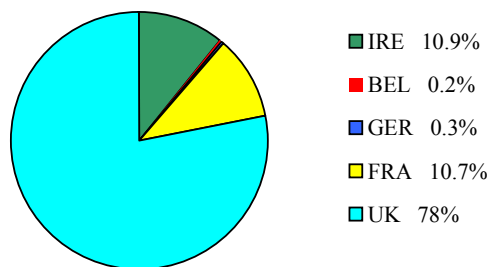
- The TAC Area covers EC waters in Sub Areas Vb, VI, XII, XIV.
- The assessment area covers Division VIb only.
- The 2002 TAC was 14,100 t. The associated Irish quota was 1,535 t, of which no more than 1,393 t

could be fished by Ireland in Vb and VIa.



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

- There are no explicit management objectives or a management plan for this stock.



- In March 2001 a NEAFC agreement prohibited fishing for haddock in international waters to the south-east of Rockall, an area important for juvenile haddock.
- MFSD recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching haddock.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was about €3.1m.
- The value of the 2001 Irish landings from Division VIb was about €0.7m.
- This fishery is important to the larger white fish vessels operating out of Killybegs.

## ADDITIONAL INFORMATION

- 1 MFSD has serious concerns about the accuracy of this assessment: there are inadequacies in the data, there have been significant changes in the fleets fishing at Rockall (accompanied by changes in the spatial and temporal distribution of their effort), possible mis-reporting of landings, considerable discarding and high-grading in this fishery.
- 2 Ireland took about 350 t of the 2001 landings (down 57% on 2000).
- 3 Mis-reporting and under-reporting are considered to be problems in this fishery. Non-EU vessels are now allowed to fish around Rockall and the fishery is currently unregulated.
- 4 The fishery was traditionally dominated by UK Scotland (~ 75% of the landings). Russia has displaced Ireland as the 2<sup>nd</sup> biggest catcher. Reported Russian landings in 2001 were estimated to be 630 t (down from 2,154 t in 2000). There has been a general increase in the amount of Scottish light trawl effort but trawl and seine effort have fallen to a very low level in recent years.
- 5 5 – 7 otter trawlers from Killybegs and Greencastle have traditionally carried out the Irish haddock fishery. In recent years this has declined to only 2 vessels. This is generally a mixed fishery targeting haddock, megrim and monkfish.
- 6 Irish sampling of this stock is supported through the EC funded sampling programme, which is required under Data Collection Regulations 1543/2000 and 1639/2001. MFSD sampling indicates that age groups 2 to 4 dominate Irish landings. Haddock do not reach full maturity until age group 3.
- 7 MFSD do not conduct a groundfish survey at Rockall. The Scottish research vessel survey takes place only every two years, most recently in 2001.
- 8 Although no discard data are available, there is likely to be substantial discarding of younger fish. Limited MFSD discard data indicates that some Irish vessels also carry out high grading.
- 9 Russian catch length compositions include fish below the EU minimum landing size (30cm). However, discard data are not available from the EU fleets.

Russian length-compositions were truncated at 30 cm to produce a “landings-equivalent” age composition for analysis. The unsatisfactory nature of this process is recognised in the assessment but discard data are required from the EU fleets if catches are to be quantified more appropriately.

- 10 Fishing mortality on young fish is likely to be extremely high. Russian vessels operating in international waters catch and retain haddock below the EU minimum landing size of 30 cm and some of the large Russian vessels are reportedly using 40-mm mesh nets.
- 11 It is too early to quantify the effect the NEAFC agreed closed area has had on the haddock stock. It is difficult to predict actual fishing mortality as fleet behaviour will depend on fishing opportunities elsewhere.
- 12 There have been substantial recent changes in targeting practices in the fishery. In recent years the peak in landings by the Irish and Scottish fleet was in the spring (April) and from deeper waters to the west of the Rock. The fishery, which was once almost exclusively a summer fishery, is now a year-round fishery.

## ICES ADVICE

### 3.7.3.b

#### State of stock/exploitation:

The stock remains outside safe biological limits. Spawning stock biomass was below  $B_{lim}$  in 2001 and fishing mortality was above  $F_{pa}$  in 2001. Fishing mortality was above  $F_{pa}$  in most years from 1985 to 1992, then declined to 60% of  $F_{pa}$  in 1998 before increasing above  $F_{pa}$  again in 2000 and 2001. SSB increased from around  $B_{pa}$  in 1990 to more than double  $B_{pa}$  in 1995, but has since declined rapidly to below  $B_{pa}$  in 2000 and 2001. Recruitment has been weak since 1998.

#### Management objectives:

No explicit management objectives are set for this stock.

#### Precautionary Approach reference points (established in 1999):

ICES considers that:	ICES proposes that:
$B_{lim}$ is 6 000 t, the lowest observed spawning stock.	$B_{pa}$ be set at 9 000 t. 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.
$F_{lim}$ is not defined.	$F_{pa}$ be set at 0.4. This F provides a small probability that SSB will fall below $B_{pa}$ in the long term.

#### Technical basis:

$B_{lim} = B_{loss}$ as estimated in a previous assessment	$B_{pa} = B_{loss} * 1.4$
$F_{lim}$ = could not be defined, due to uninformative stock recruitment data	$F_{pa}$ = adopted by analogy with other haddock stocks.

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**Advice on management:**

**ICES recommends that fishing mortality in 2003 should be reduced to the lowest possible level.**

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**Relevant factors to be considered in management:**

The TAC applies to Sub-area VI, with a limit on how much of the catch may be taken in Division VIa, but no such limit for Division VIb. In addition, part of Division VIb now falls within international waters where non EU-vessels are not subject to TAC. This allows for an unregulated fishery in

that area. A separate TAC applicable only to Division VIb, including international waters, would ensure a sustainable fishery in Division VIb.

Following the NEAFC agreement in March 2001, an area of the NEAFC zone around Rockall was closed to fishing. It is too early to quantify the effect this closure has had on the haddock stock. It is difficult to predict actual fishing mortality as fleet behaviour will depend on fishing opportunities elsewhere.

**Catch forecast for 2003:**

Basis  $F(2002) = F(99-01) = 0.55$ ; Landings(2002) = 1.7; SSB(2003) = 2.8.

F(2002)	Basis	Catch (2003)	Landings (2003)	SSB (2004)
0		0	0	4.6
0.11	$0.2 * F_{sq}$	0.4	0.4	4.2
0.22	$0.4 * F_{sq}$	0.8	0.8	3.8
0.33	$0.6 * F_{sq}$	1.1	1.1	3.5
0.40	$F_{pa}$	1.3	1.3	3.3
0.44	$0.8 * F_{sq}$	1.4	1.4	3.2
0.55	$F_{sq}$	1.6	1.6	2.9

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

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**Comparison with previous assessment and advice:**

The recent three assessments of this stock have consistently shown an increase in fishing mortality from 1999 onwards, and a decline in SSB to the lowest observed value in the last year. The estimate of fishing mortality in 2000 is 26% higher, and that of SSB in 2001 34% lower, in this years assessment compared to last years assessment.

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**Elaboration and special comment:**

The Rockall fishery is dominated by Scottish vessels and until recently has taken place largely in the summer if fishing at Rockall is more profitable than in the North Sea or West of Scotland. A few Irish vessels exploit this stock on a more regular basis. Scottish and Irish vessels fish mainly for haddock, whilst Russian trawlers also fish for species such as gurnard.

During 1999 a substantial spring fishery developed for the first time, fishing on concentrations of haddock in a different area of the Rockall bank than previously. A fishery on part of the bank which now falls outside of the EU EEZ also started during 1999 and has led to opportunities for other nations to exploit the fishery, notably Russia. The table on official statistics has included Russian catches from the Rockall area for the last three years. Russian vessels op-

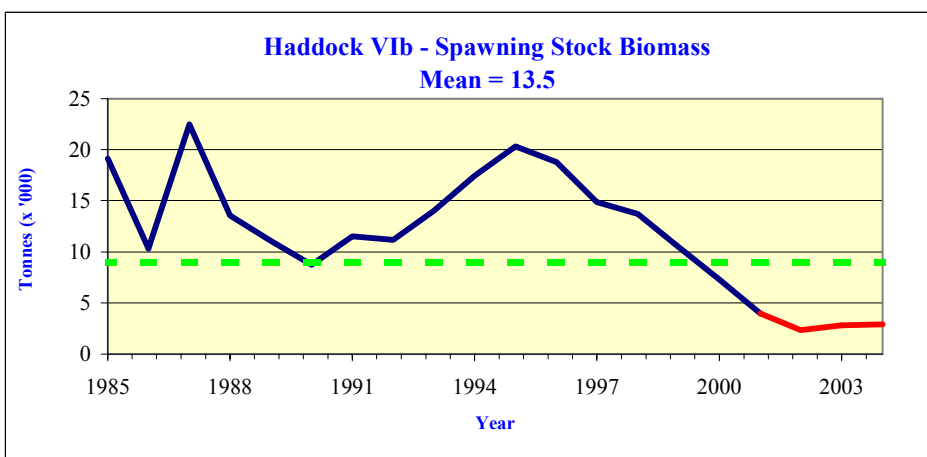
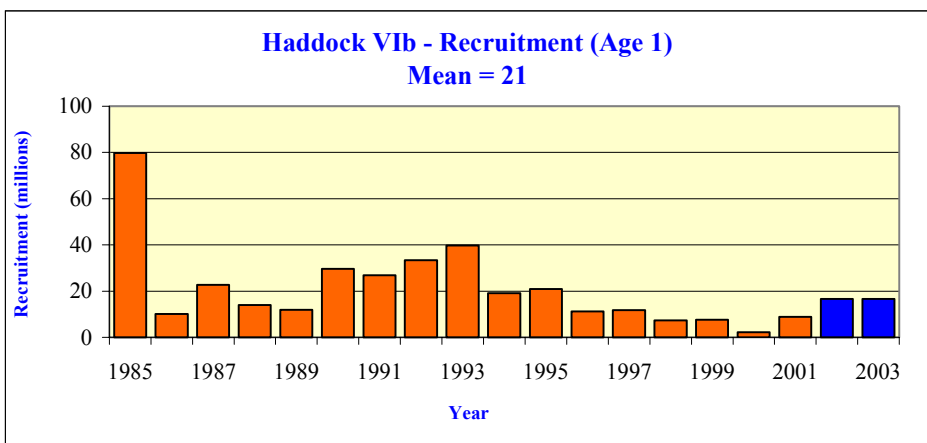
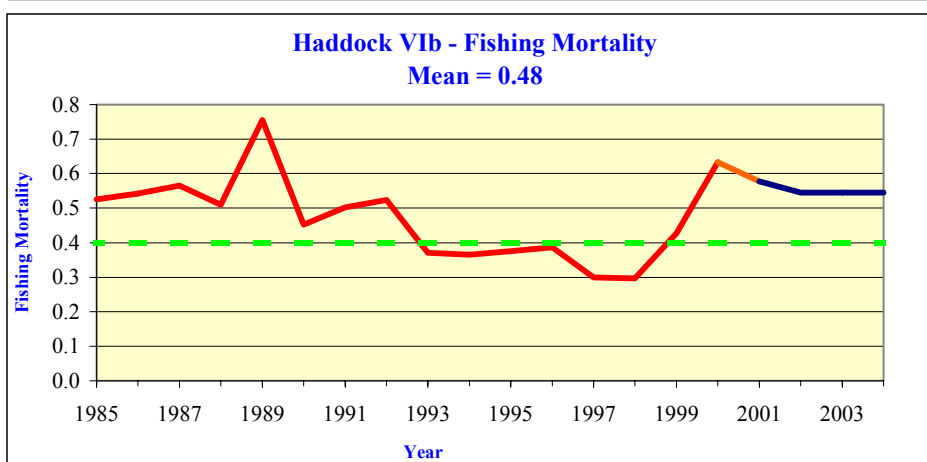
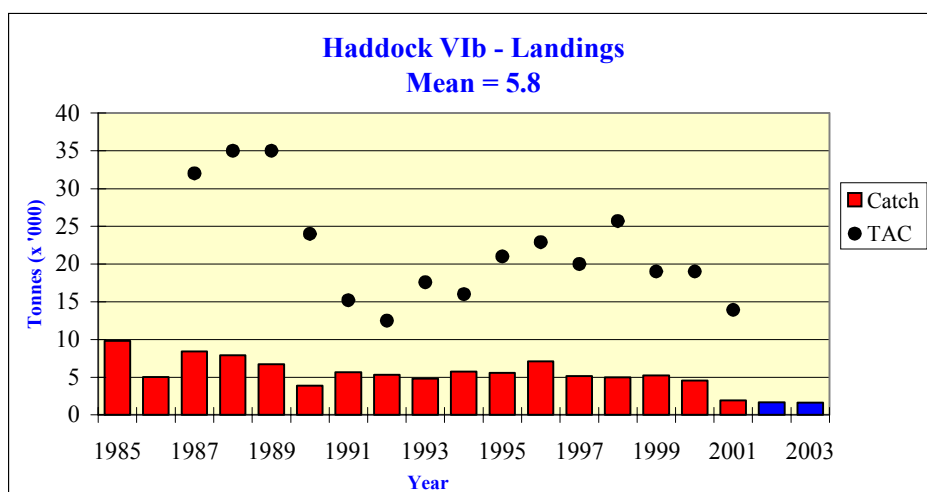
erating in international waters catch and retain haddock below the EU minimum landing size of 30cm. As the assessment contains no data on discards of such fish from EU fleets, the Russian catch data have been adjusted to exclude fish below 30cm.

The analytical, age-based assessment uses landings-at-age data and research vessel survey data. The Scottish research vessel survey takes place every two years, most recently in 2001. Although no discard data are available, there is likely to be substantial discarding of younger fish. The short time series, variable fishing effort and mis-reporting of landings limit the precision of the assessment. Fifty percent of the SSB forecast for 2004 comprises the 2001 year class which is assumed to be at the recent average. The time series is too short to estimate the stock recruitment relationship for medium-term projections and estimation of fishing mortality reference points. Maturity is assumed to be attained at age 3, but information from surveys in 2001 indicates that fish may be maturing at an earlier age.

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**Source of information:**

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).





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

	Fish Mort Ages 2-5	Yield/R	SSB/R
Average Current	0.477	0.234	0.407
$F_{\max}$	N/A		
$F_{0.1}$	0.130	0.179	0.934
$F_{\text{med}}$	0.116	0.173	0.985

**Catch data (Tables 3.7.3.b.1–2):**

Year	ICES Advice	Predicted catch corresp. to advice	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	5.0
1999	Reduce F below $F_{\text{pa}}$	3.8		6.0	5.2 <sup>5</sup>
2000	Reduce F below $F_{\text{pa}}$	< 3.5		5.7 <sup>4</sup>	4.6 <sup>5</sup>
2001	Reduce F below $F_{\text{pa}}$	< 2.7		1.9 <sup>4</sup>	1.9 <sup>5</sup>
2002	Reduce F below 0.2	<1.3			
2003	Lowest possible F	-			

<sup>1</sup>TAC is set for Divisions VIa and VIb (plus Vb1, XII & XIV) combined with restrictions on 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 30cm. Weights in '000 t.

**Table 3.7.3.b.1** Nominal catch (tonnes) of HADDOCK in Division VIb, 1986–2001, as officially reported to ICES.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Faroe Islands	-	5	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a
France	99	5	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	... <sup>2</sup>	2
Germany, Fed. Rep.	-	4	1	-	-	-	-	-	-	-	-	-	-	-	-
Iceland	-	-	-	-	-	-	-	-	-	-	+	-	167	3 <sup>1</sup>	-
Ireland	-	-	-	620	640	571	692	956	677	747	895	704	1,021	824	n/a
Norway	33	20	47	38	69	47	68	75	29	24	24 <sup>1</sup>	40 <sup>1</sup>	61 <sup>1</sup>	152 <sup>1</sup>	70 <sup>1</sup>
Portugal	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-
Russia	-	-	-	-	-	-	-	-	-	-	-	-	458	2,154 <sup>1</sup>	630
Spain	371	245	337	178	187	51	-	-	28	1	22	21	25	50	n/a
UK (E & W) <sup>3</sup>	1,271	753	272	238	165	74	308	169	318	293	165	561	288	36	-
UK (N. Ireland)	-	-	...	...	...	...	...	...	...	...	...	...	...	...	...
UK (Scotland)	6,221	6,542	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 <sup>1</sup>
Total	7,995	7,574	6,643	8,213	5,853	4,520	4,113	3,735	5,491	6,818	5,220	5,098	5,990	5,686	1,907
Unallocated catch	437	355	85	-4,329	-198	800	671	1,998	96	257	-54	-114	-769	-1,127	17
WG estimate	8,432	7,929	6,728	3,884	5,655	5,320	4,784	5,733	5,587	7,075	5,166	4,984	5,221 <sup>4</sup>	4559 <sup>4</sup>	1924

<sup>1</sup>Preliminary.<sup>2</sup>Included in Division VIa.<sup>3</sup>1989–2001 N. Ireland included with England and Wales.<sup>4</sup>includes a reduction in Russian catch data to approximate to “landings-equivalent values (see Section 4.2.3)

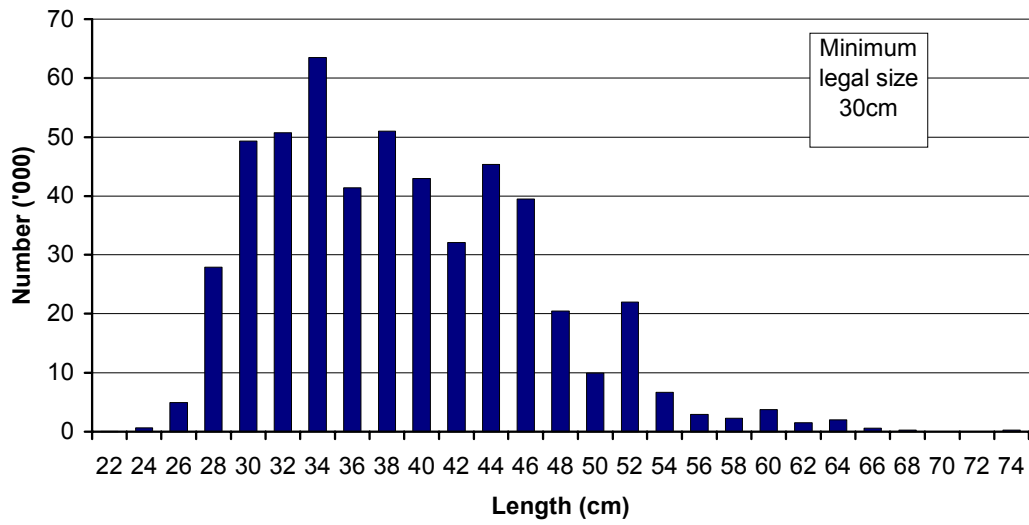
n/a = Not available.

**Table 3.7.3.b.2** Haddock in Division VIb (Rockall)

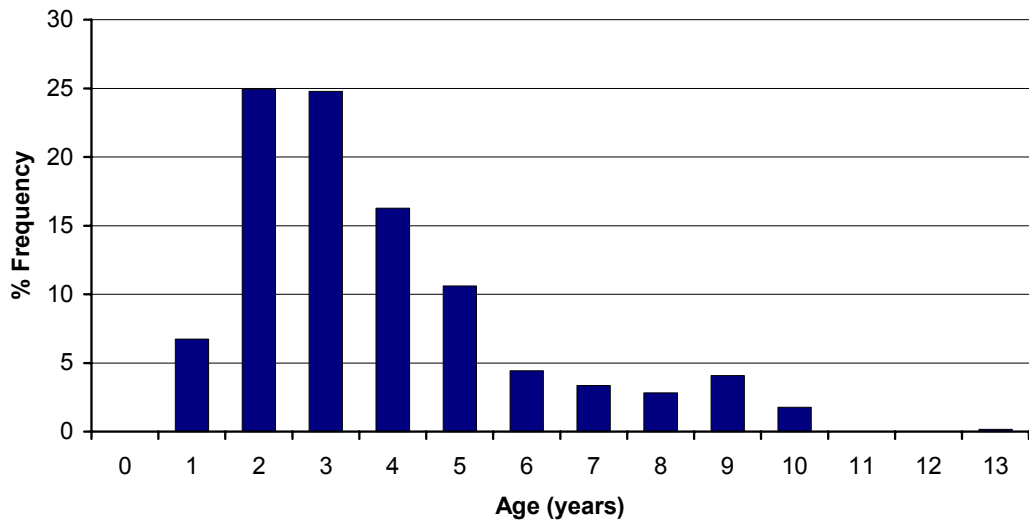
Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-5
1985	79707	19117	9810	0.5259
1986	10190	10328	5014	0.5423
1987	22816	22476	8433	0.5648
1988	14061	13569	7929	0.5103
1989	11937	11093	6728	0.7557
1990	29585	8732	3884	0.4522
1991	26918	11501	5655	0.5021
1992	33408	11163	5320	0.5233
1993	39710	14024	4784	0.3707
1994	19126	17434	5733	0.3651
1995	20936	20322	5587	0.3759
1996	11228	18797	7075	0.3860
1997	11894	14865	5166	0.2993
1998	7447	13709	4984	0.2970
1999	7639	10492	5221	0.4271
2000	2327	7269	4559	0.6325
2001	8911	3960	1924	0.5767
2002	7350 <sup>1</sup>	2328		
Average	20805	12843	5753	0.4807

<sup>1</sup> 1996–2001 GM

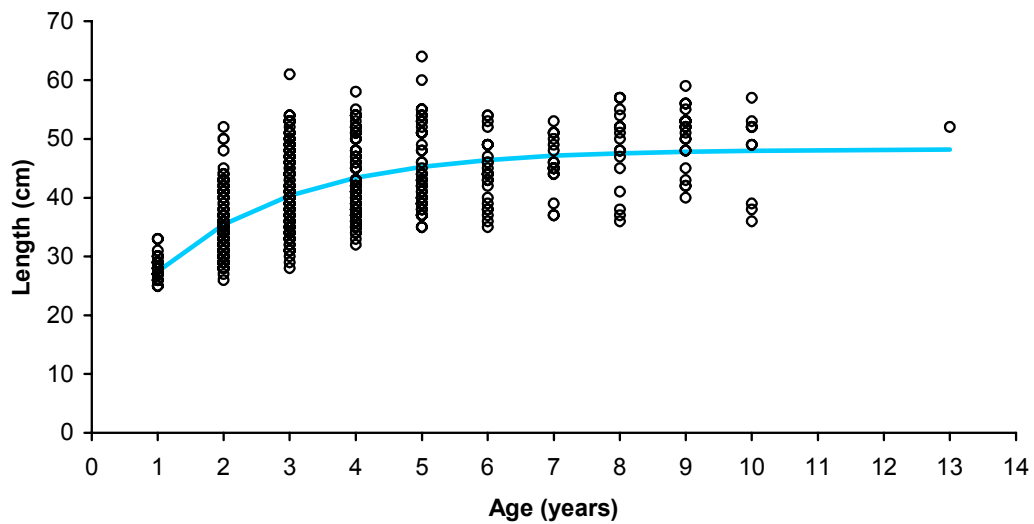
**2001 Length Distribution: Irish Landings, Haddock in VIb**



**2001 Age Distribution: Irish Landings, Haddock in VIb**



**2001 Size at Age: Irish Sampling, Haddock in VIb**



# West of Ireland and Celtic Sea Haddock

(Divisions VIIb-k)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD agrees with the ICES recommendation that a management plan including monitoring of the development of the stock and of the fishery should be developed and implemented. MFSD agrees with the ICES recommendation that there be no increase in landings above the average levels of the last four years (7,200 t in Divisions VIIb-k), until the response of the stock to the fishery is known.

This translates to a TAC in 2003 for Sub Areas VII, VIII, IX and X of not more than 9,200 t (plus no more than 2,000 t proposed in Division VIIa). This corresponds to an Irish quota of not more than 2,044 t in VII, VIII, IX and X (plus not more than 866 t in Division VIIa).

MFSD advise that given haddock are taken in a mixed fishery with cod, management for cod will be determined by management for haddock in Divisions VIIb-k.

TAC Area	TAC 2002	Irish quota 2002	Proposed TAC 2003	Proposed Irish quota 2003
VII,VIII,IX,X	9,300	2,067	9,200	2,044
ad hoc VIIa	1,300	563	2,000 <sup>(a1)</sup>	866 <sup>(a2)</sup>

(a) ICES advises that unless ways to harvest haddock without incidental catch or discards of cod can be demonstrated, fishing for haddock should not be permitted.

1. Of which no more than 2,000 t be fished in VIIa.
2. Of which no more than 866 t be fished in VIIa

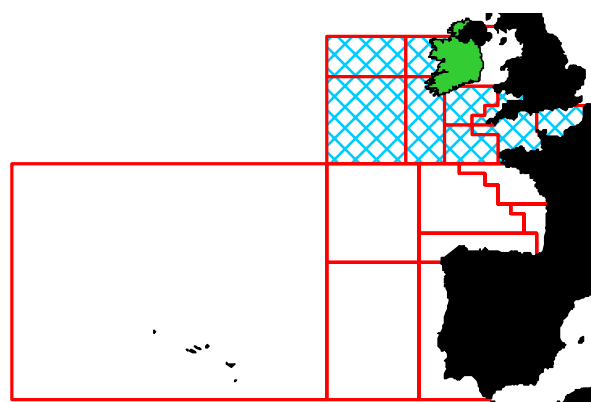
## STATE OF THE STOCK

- The status of this stock is unknown. Whilst MFSD agrees that the assessment does not provide a basis for prediction it does provide an acceptable reflection of the historic development of the stock.
- Landings between 1984-1995 have varied from 2,600 t to 4,900 t, there was a sharp increase in 1996 to 6,600 t and in 1997 to over 10,000 t, followed by a decline in 1998. Total international landings in 2001 were estimated at 8,600 t, an increase of 11% from 2000.
- Fishing mortality has increased from a low in 1995 but has shown an increasing trend since 1997.  $F = 0.48$  in 2001.

- Recruitment in 2000 and 2001 although poorly estimated are probably above average. The 2001 year class is estimated to be 14.9 million.
- SSB in 2001 was estimated at 23.7 million. In general, SSB has increased over the short time series.

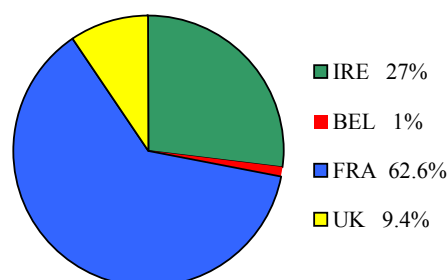
## CURRENT MANAGEMENT

- The TAC area traditionally covers Sub Areas VII, VIII, IX and X. An additional TAC allocation is allowed for Division VIIa.



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

- In 2002, the TAC for Divisions VII, VIII, IX, and X was 9,300 t with an associated Irish quota of 2,067 t (plus 563 t no more of which could be fished in VIIa).



- There are no explicit management objectives or a management plan for this stock.
- MFSD recommend that management objectives be established and that a management plan be developed and implemented for fisheries catching haddock.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota (Sub-area VII) was about €5.3m.
- The value of the 2001 Irish landings from Divisions VIIb-k was about €7.2m.
- Because of the haddock outbursts of the late 1990s this fishery has increased in economic importance in

the mixed demersal fisheries of the west and south coast. It is an important by-catch for otter trawlers and seiners operating out of Dunmore East, Union Hall, Castletownbere, Dingle and Rossaveal.

## ADDITIONAL INFORMATION

1. The current assessment on this stock is based on a short time series of catch at age and tuning fleet data. Inherent imprecision in recruitment estimates, fishing mortality estimates and expected mean weights in the catch make it difficult to predict the future status of the stock with acceptable confidence.
2. Irish landings in 2001 were about 3,500 t.
3. Misreporting is not thought to be a problem in this fishery since the TAC has always been in excess of landings.
4. France takes about 50-60% of the landings, Ireland usually accounts for 25-40% with the remainder taken by Belgium, Norway, the Netherlands, Spain and the UK.
5. The majority of the landings are taken by otter-trawls (50%), followed by seiners (34%) with minor landings taken by beam trawlers (6%) and gillnets (3%). Haddock are caught in a mixed demersal fishery targeting haddock, cod and whiting. Management advice needs to be considered in that context.
6. Irish sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001. MFSD sampling indicates fish in VIIj are dominated by 1-2 year olds whilst fish in VIIg and VIIb are dominated by 2-3 year olds.
7. In 2002, Irish commercial catch and effort data from logbooks were used for the second time to tune the assessment.
8. The MFSD West Coast Groundfish Survey has been conducted in Divisions VIIb & c and VIIj & k since 1993. In 2002, the data from this survey were used for the second time to tune the assessment.
9. Discards were not included in the assessment as data were only available for Irish otter trawlers in VIIb and VIIj. The length composition suggests that discarding of undersize fish may be substantial.
10. MFSD commenced a groundfish survey in the Irish Sea and Celtic Sea on *RV Celtic Voyager* in 1997. The 1998 and 1999 surveys produced good catches of juvenile and adult haddock but the time series is too short to comment on the status of the stock.

## ICES ADVICE

### 3.10.2.a

#### State of stock/exploitation:

The state of the stock is unknown. A preliminary assessment of the state of this stock is considered only indicative of recent stock development. Recruitment seems to be highly variable. This is also reflected in the landings.

#### Management objectives:

None.

#### Precautionary Approach reference points:

Not defined.

#### Advice on management:

**ICES recommends not to increase landings above the average of the last four years of 7,200 t. ICES recommends that a management plan, including monitoring of the development of the stock and of the fishery should be developed and implemented.**

#### Relevant factors to be considered in management:

This stock is presently managed by means of a TAC set for the whole of Subareas VII, VIII, IX and X. The TAC currently includes an additional allocation for Division VIIa. The current TAC is not restrictive on catches from Divisions VIIb-k and creates the opportunity for mis-reporting from other areas.

#### Elaboration and special comment:

Assessment of the state of this stock is difficult due to a short time-series of assessment data. Catches of haddock are recorded along the entire western seaboard of the British Isles, with concentrations off the west coast of Scotland, off the NW coast of Ireland, in the Celtic Sea, and in the western Irish Sea. The extent of mixing between these areas is not presently known. However, recent patterns of recruitment and growth differ between areas.

Some information on discards indicates that they may be substantial.

#### Source of information:

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

**Catch data (Tables 3.10.2.a.1-a.2):**

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC <sup>1</sup>	Official Landings <sup>2</sup>	ACFM landings
1987	Not dealt with			3.0	2.6
1988	Not dealt with			4.0	3.6
1989	Not dealt with			4.2	3.2
1990	Not dealt with			2.9	2.0
1991	Not dealt with			2.6	2.3
1992	Not dealt with			2.9	2.7
1993	Not dealt with			3.4	3.3
1994	Not dealt with			4.1	4.1
1995	Not dealt with		6	4.5	4.5
1996	Not dealt with		7 <sup>3</sup>	6.7	6.8
1997	Not dealt with		14	10.3	10.8
1998	Not dealt with		20	7.4	7.7
1999	Not dealt with		22 <sup>5</sup>	5.9	5.0
2000	No expansion of catches		16.6 <sup>6</sup>	3.7	7.6
2001	No expansion of catches		12 <sup>1</sup>	9.2	8.6
2002	No expansion of catches	8.0	9.3 <sup>1</sup>		
2003	No expansion of catches	7.2			

<sup>1</sup>Applies to Subareas VII, VIII, IX and X.

<sup>2</sup>Possible underestimates due to misreporting.

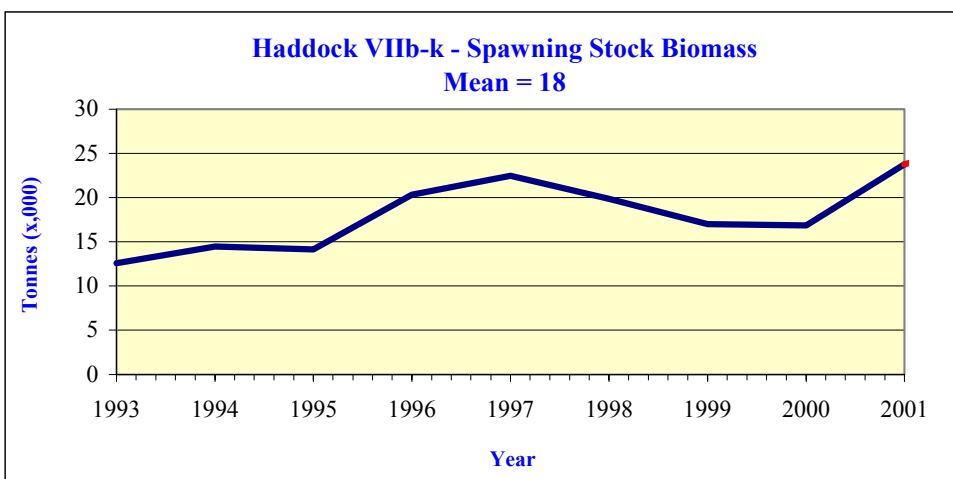
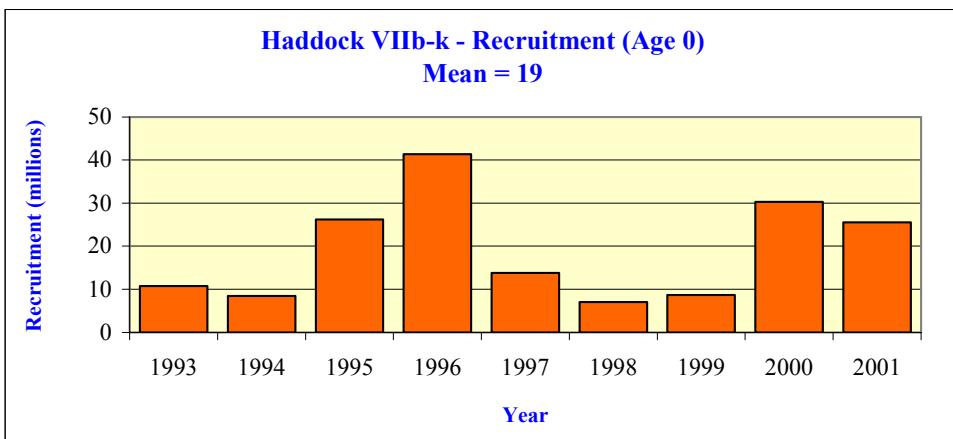
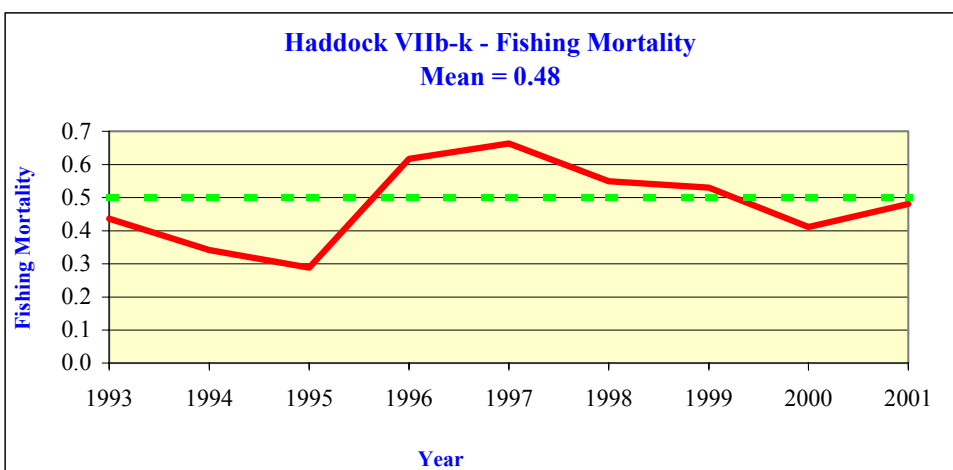
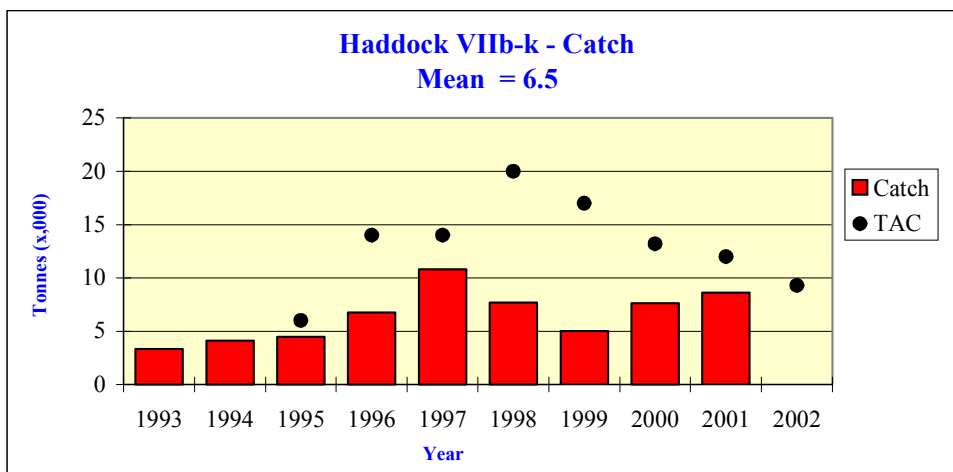
<sup>3</sup>Increased in-year to 14 000 t.

<sup>4</sup>Incomplete official statistics.

<sup>5</sup>Includes separate Division VIIa allocation of 4 990 t.

<sup>6</sup>Includes separate Division VIIa allocation of 3 400 t.

Weights in 000' tonnes.





**Table 3.10.2.a.1** Nominal landings (t) of Haddock in Divisions VIIb,c,e-k, 1984-2000, as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990	1991
Belgium	-	4	6	12	64	117	22	18
France	3,328	2,438	2,279	2,380	3,275	3,412 <sup>a</sup>	2,110 <sup>a</sup>	1,247
Ireland	646	794	317	314	275	323	461	1,020
Norway	17	4	86	-	-	27	31	38
Spain	532	561	-	-	-	-	-	-
UK (Channel Islands)	-	-	-	-	-	-	-	-
UK (England & Wales)	340	168	188	194	405	278	123	137
UK (Scotland)	63	7	57	79	4	17	195	113
Total	4,926	3,976	2,933	2,979	4,023	4,174	2,942	2,573
Unallocated	-2,768	-1,383	-654	-405	-375	-940	-948	-231

Total figures used by

Country	1992	1993	1994	1995	1996	1997	1998	1999
Belgium	21	51	123	189	133	246	142	51
France	1,461	1,839	2,788	2,964	4,527	6,581	3,674*	2,725 <sup>1</sup> *
Ireland	1,073	1,262	908	966	1,468	2,789	2,788	2,034
Norway	26	-	17	64	38	31	49	71*
Netherlands	-	-	-	-	-	-	3	-
Spain	-	-	-	19	48	54	260	88
UK (Channel Islands)	-	-	1	-	-	-	-	-
UK (England & Wales)	220	189	193	228	432	554	410	273
UK (Scotland)	86	67	47	38	7	15	35	5
Total	2,887	3,408	4,077	4,468	6,653	10,270	7,361	5,247
Unallocated	-183	-60	54	2	103	557	307	-197
Total figures used by Working Group	2,704	3,348	4,131	4,470	6,756	10,827	7,668	5,050

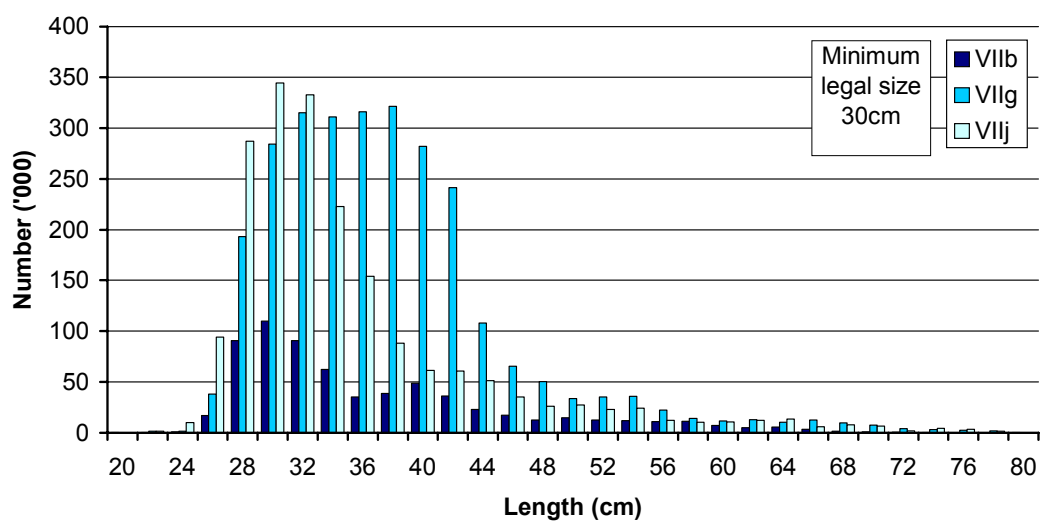
Country	2000	2001*
Belgium	90	165
France	3,357 <sup>1</sup> *	5050
Ireland	n/a	3578
Norway	13*	2
Netherlands	-	
Spain	n/a	
UK (Channel Islands)	-	
UK (England & Wales)	287	
UK (Scotland)	2	
United Kingdom		422
Total	3,749	9,217
Unallocated	4,005	-602
Total figures used by Working Group	7,754	8,615

\* Preliminary.

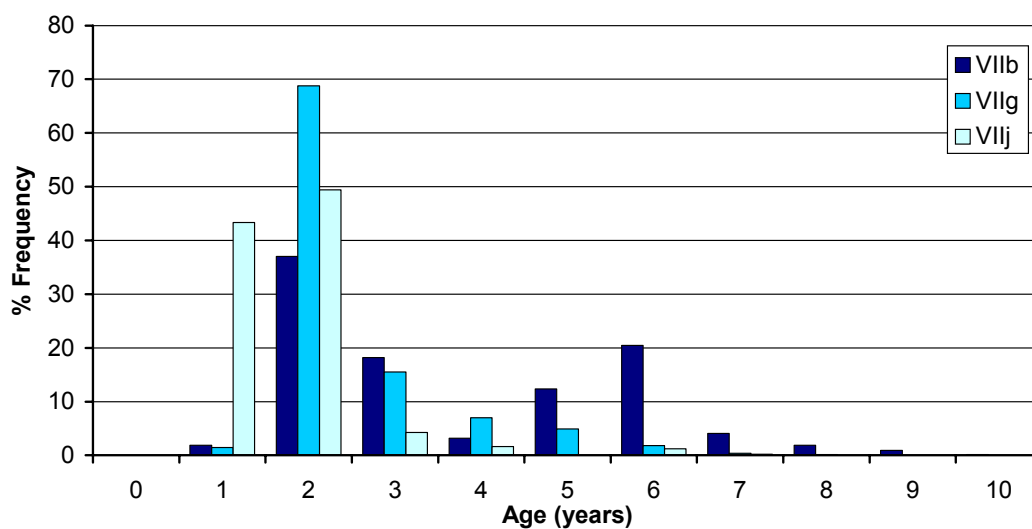
<sup>a</sup> Reported as total landings for Subareas VII & VIII.<sup>1</sup> Includes the whole of area VII.

n/a = not available.

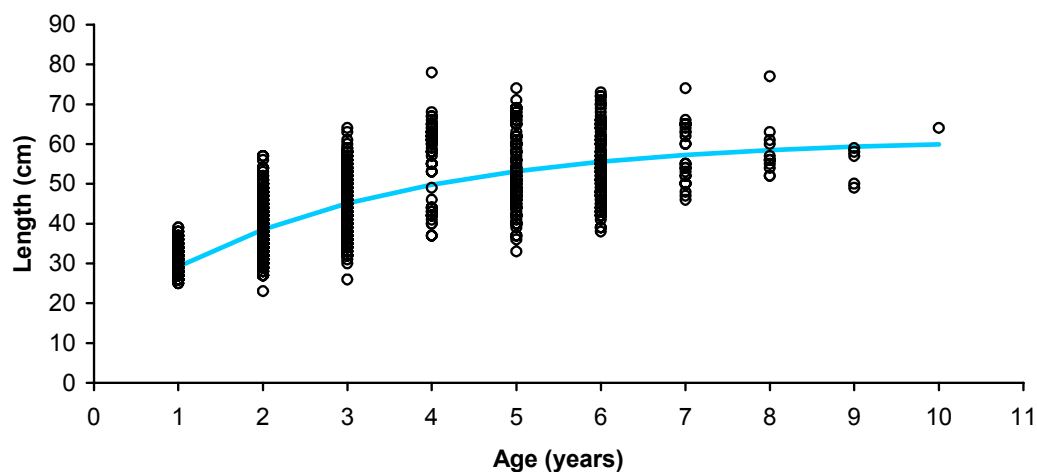
**2001 Length Distribution: Irish Landings, Haddock in VIIb VIIg VIIj**



**2001 Age Distribution: Irish Landings, Haddock in VIIb VIIg VIIj**



**2001 Size at Age: Irish Sampling, Haddock in VIIb VIIg VIIj**



# Irish Sea Haddock

(Division VIIa)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the ICES advice for Irish Sea fisheries is predicated on the need to rebuild cod stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

Haddock is mostly taken in mixed demersal fisheries with cod. MFSD therefore agrees with the ICES recommendation that, unless ways to harvest haddock without incidental catch or discards of cod can be demonstrated, fishing for haddock should not be permitted.

MFSD agrees with the ICES advice that fisheries targeting *Nephrops* with a haddock by-catch may continue provided that there is no incidental catch or discards of cod.

MFSD agrees with the ICES advice that programs including industry initiated programs to pursue cod by-catch reduction in all Irish Sea fisheries should be encouraged, but that such programs must ensure that their reported catches of cod are fully and credibly reported.

MFSD agrees with the ICES recommendation that, if fisheries on haddock are permitted despite the advice for cod and whiting, catches in 2003 should be no higher than 2,000 t (based on the average catch of the last two years). This would translate to an Irish quota of 866 t in 2003.

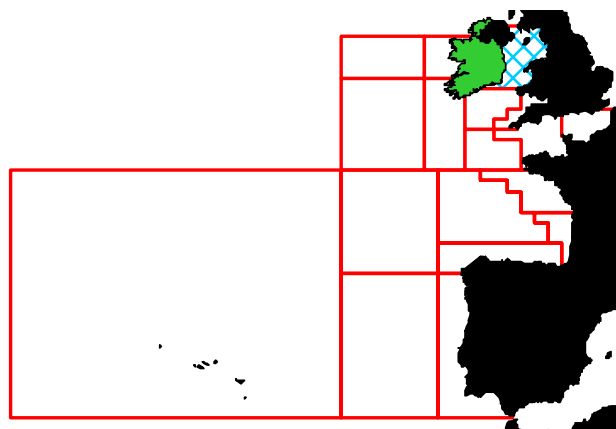
## STATE OF THE STOCK

- The 2002 Working Group assessment was considered very unreliable because of sensitivity towards various model settings.
- International landings in 2001 amounted to 2,500 t (Working Group estimate). This is almost double the 2000 landings of 1,380 t.
- Historical perspectives of SSB, fishing mortality and recruitment are not well known for this stock but fishing mortality appears to be high.
- Occasional pulses of strong recruitment have in the past resulted in opportunistic fisheries lasting only for relatively short periods.
- A relatively long period of productivity in the 1990s indicates that a more sustained population existed.

- $B_{pa}$  is not defined for this stock.  $F_{pa}$  is set at 0.5 by analogy with other haddock stocks.

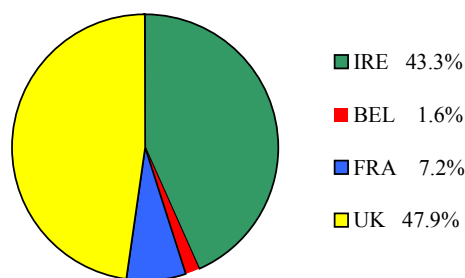
## CURRENT MANAGEMENT

- The TAC Area traditionally covers Sub Areas VII, VIII, IX and X.



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

- The 2002 TAC for haddock of 9,300 t was set for the whole of Divisions VII to X, with an additional allocation of no more than 1,300 t made for landings from Division VIIa.
- This translates to an Irish quota of 2,067 t, plus no more than 563 t fished from VIIa.



- The assessment area covers Division VIIa only.
- There are no explicit management objectives or a management plan for this stock.
- MFSD recommend that management objectives be established and that a management plan be developed and implemented for fisheries catching haddock.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish haddock quota in VIIa was €2.3m.

- The value of the 2001 Irish haddock landings from Division VIIa was €1.1m.
- Compared to the *Nephrops* fishery this fishery is of minor economic importance to the Irish fleet. However with the decline of cod and whiting it will probably be the main catch in the Irish Sea mixed demersal fisheries.

## ADDITIONAL INFORMATION

- 1 The assessment is based on only nine years of catch at age and survey data. There is no biological basis for defining reference points in this stock and ACFM has proposed a precautionary  $F_{pa}$  of 0.5 in view of the rapid expansion of this fishery. The true exploitation pattern of this stock is not known because discards have not been included in the assessment.
- 2 Irish landings in 2001 were 540 t (a 153% increase on the 2000 landings of 360 t).
- 3 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.
- 4 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 seine and beam trawl fisheries.
- 5 Irish Sampling of this stock is supported through the EC funded sampling programme, which is required under Data Collection Regulations 1543/2000 and 1639/2001. MFSD sampling indicates that age groups 2 and 3 dominate Irish landings. Haddock reach full maturity at age group 3.
- 6 MFSD commenced a groundfish survey in the Irish Sea and Celtic Sea on RV *Celtic Voyager* in 1997. This data will be used in future assessments.
- 7 A study of discards from the midwater trawl, single *Nephrops* and twin trawl fleet indicates that almost all fish younger than 2 years old and on the order of 50% of the fish at age 2 are discarded.
- 8 The extent to which the cod-haddock fisheries are linked has not been quantified. This linkage is not one-to-one, but it is evident and probably variable. It

is possible for fishing vessels to increase their targeting of individual species within the demersal fish complex, but there will always be a significant by-catch of other roundfish.

- 9 ICES notes that this advice presents a strong incentive to fisheries to avoid catching cod. If programs can be demonstrated to bring their catch rates of cod in fisheries for haddock down to near zero, then these programs could be considered in management of these fisheries.
- 10 MFSD 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 with the strength of incoming year-classes. MFSD therefore recommends that strong year-classes should be allowed to grow, mature and reproduce. This can only occur if fishing mortality is reduced substantially.
- 11 The present high availability of haddock in Division VIIa has resulted in substantial misreporting and/or discarding due to large by-catches of haddock taken by fleets with restrictive allocations available to them. To alleviate this problem, a separate TAC allocation has been made for Division VIIa since 1999.

## ICES ADVICE 3.8.3

### State of stock/exploitation:

Historical perspectives of SSB, fishing mortality and recruitment are not well known for this stock but fishing mortality appears to be high. Occasional pulses of strong recruitment have in the past resulted in opportunistic fisheries lasting only for relatively short periods. The relatively longer productivity in the 1990s indicate that a more sustained population exist.

### Management objectives:

No explicit management objectives are set for this stock.

### Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$B_{lim}$ not defined	$B_{pa}$ not set
$F_{lim}$ not defined	$F_{pa}$ be set at 0.5

### Technical basis:

$B_{lim}$ = not defined	$B_{pa}$ = not set
$F_{lim}$ = not defined	$F_{pa}$ adopted by analogy with other haddock stocks

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**Advice on management:**

**Since haddock is mostly taken in demersal fisheries with cod and in a *Nephrops* directed fishery, the advice for cod determines the advice for haddock. Unless ways to harvest haddock without incidental catch or discards of cod can be demonstrated fishing for haddock should not be permitted.**

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**Relevant Factor:**

On the basis of the status on the haddock stock alone, ICES would recommend that catches in 2003 be no higher than 2000 t, the average of the last two years.

The extent to which the cod-haddock fisheries are linked has not been quantified. This linkage is not one-to-one, but it is evident and probably variable. It is possible for fishing vessels to increase their targeting of individual species within the demersal fish complex, but there will always be a significant by-catch of other roundfish. Fisheries targeting *Nephrops* may take a by-catch of haddock. In this case ICES notes that haddock may continue to be caught subject to existing EU regulations applying to *Nephrops* fisheries and providing the catch of cod complies with the advice on cod.

ICES notes that this advice presents a strong incentive to fisheries to avoid catching cod. If industry-initiated programs can be demonstrated to bring their catch rates of cod in fisheries for haddock down to near zero, then these programs could be considered in management of these fisheries. Industry-initiated programs to pursue such incentives should be encouraged, but must include a high rate of independent observer coverage, or other fully transparent method for ensuring their reported catches of cod are fully and credibly reported.

The haddock stock is mainly confined to the western Irish Sea where important mixed-species fisheries for *Nephrops* and cod take place. A directed fishery has developed for haddock during the 1990s. Large catches of haddock are taken in the *Nephrops* fishery during periods of high haddock abundance. A directed fishery for mature haddock in spring, using pelagic trawls and whitefish otter trawls, has been curtailed since 2000 by the cod spawning closure. Fishing effort of these vessels has been redirected to surrounding regions, and some vessels switched to using *Nephrops* trawls to take advantage of the derogation for *Nephrops* fishing in the closure.

A TAC is set for haddock for the whole of Sub-areas VII, VIII, IX and X. The present high availability of haddock in Division VIIa has resulted in substantial mis-reporting and/or discarding due to large by-catches of haddock taken by fleets with restrictive allocations available to them. To alleviate this problem, a separate TAC allocation has been made for Division VIIa since 1999.

The haddock stock in the Irish Sea could be sustained if recent year classes indicated by surveys are allowed to re-

alise their potential for growth, and contribute to SSB. This would only occur if fishing mortality is reduced substantially from the high values recorded in the 1990s.

A study of discards from the midwater trawl, single *nephrops* and twin trawl fleet indicates that almost all fish younger than 2 years old and on the order of 50% of the fish at age 2 are discarded.

The current directed fishery for haddock in the Irish Sea is likely to generate by-catches of cod in the same area. Experimental haddock fisheries with observers were permitted inside the cod closure by the European Commission in spring 2000 and 2001, and yielded by-catches of cod of approximately 15 - 20% by weight.

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**Comparison with previous assessment and advice:**

The advice last year was based on an analytical assessment and forecast. This assessment has been considered very unreliable because of sensitivity towards various model settings. The basis of the current advice is on the average catch of last two years.

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**Elaboration and special comment:**

Haddock production in the Irish Sea has been irregular, with one productive period in the late 1950s, two in the early 1970s, and a recent one in the latter half of the 1990s. Production in the 1990s has exceeded that in the earlier periods and also coincided with increased abundance of haddock in the Celtic Sea. Previous productive periods, other than the recent one, are believed to have coincided with strong year classes in Sub-Area VI. Whilst the 1994 year class was relatively strong in Divisions VIa, VIIa and VIIb-k, patterns of recruitment in subsequent years have differed markedly between areas. Growth rates of individual haddock also differ between areas, and haddock grow fastest in the Irish Sea.

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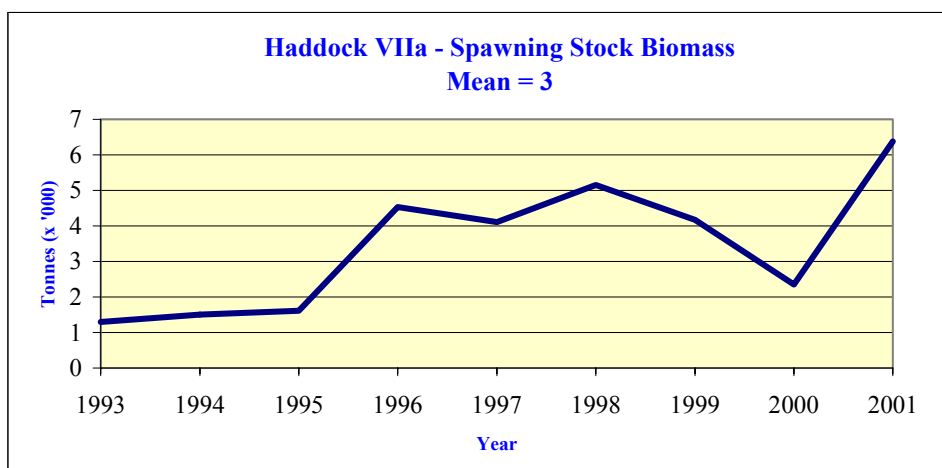
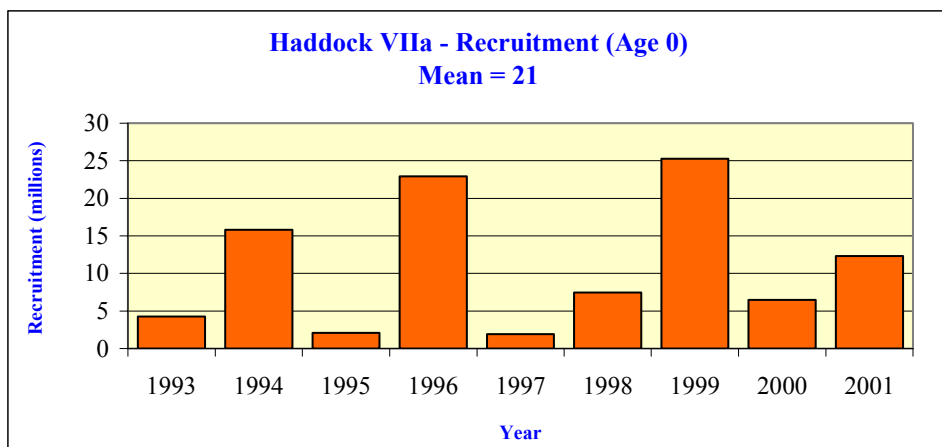
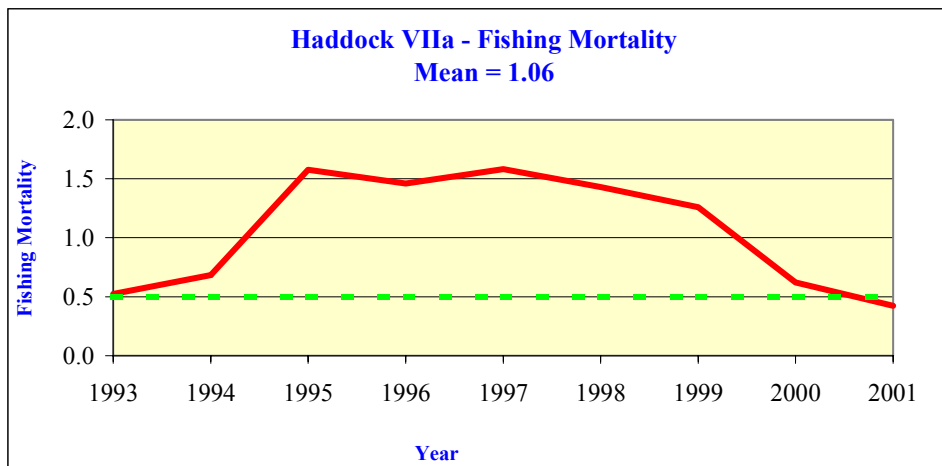
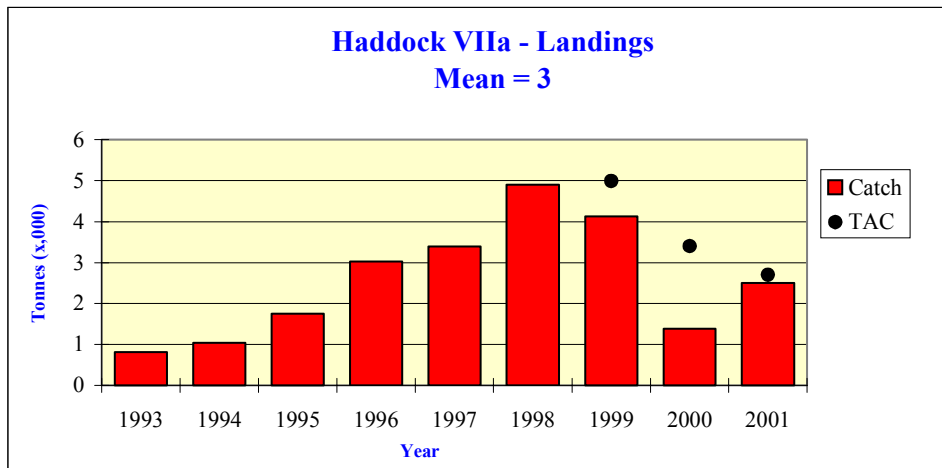
**Source of information:**

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

**Catch data (Tables 3.8.3.1–2):**

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings <sup>2</sup>	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 <sup>6</sup>	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 required		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	4.119
2000	Reduce F below $F_{pa}$	<2.8	3.4 <sup>2</sup>	2.398 <sup>3</sup>	1.380
2001	Reduce F below $F_{pa}$	<1.71	2.7 <sup>2</sup>	2.102 <sup>3</sup>	2.498
2002	Reduce F below $F_{pa}$	<1.20	1.3 <sup>2</sup>		
2003	No cod catches	-			

<sup>1</sup> precautionary TAC for VII, VIII, IX, X. <sup>2</sup> VIIa allocation of precautionary TAC <sup>3</sup>Incomplete data





**Table 3.8.3.1** Nominal landings (t) of HADDOCK in Division VIIa, 1984–2001, as officially reported to ICES.

Country	1984	1985	1986	1987	1988	1989	1990	1991
Belgium	3	4	5	10	12	4	4	1
France	38	31	39	50	47	n/a	n/a	n/a
Ireland	199	341	275	797	363	215	80	254
Netherlands	-	-	-	-	-	-	-	-
UK (England & Wales) <sup>1</sup>	29	28	22	41	74	252	177	204
UK (Isle of Man)	2	5	4	3	3	3	5	14
UK (N. Ireland)	38	215	358	230	196	...	...	...
UK (Scotland)	78	104	23	156	52	86	316	143
Total	387	728	726	1,287	747	560	582	616
Unallocated	0	0	0	0	0	0	0	0
Total figures used by Working Group	387	728	726	1,287	747	560	582	616

Country	1992	1993	1994	1995	1996	1997	1998	1999	2000
Belgium	8	18	22	32	34	55	104	53	22
France	26	41	22	58	105	74	86	n/a	n/a
Ireland	251	252	246	320	798	1,005	1,699	759	1,238
Netherlands	-	-	-	-	1	14	10	5	2
UK (England & Wales) <sup>1</sup>	244	260	301	294	463	717	1,023	1,479	1,061
UK (Isle of Man)	13	19	24	27	38	9	13	7	19
UK (N. Ireland)	...	...	...	...	...	...	...	...	...
UK (Scotland)	114	140	66	110	14	51	80	67	56
United Kingdom									
Total	656	730	681	841	1,453	1,925	3,015	2,370	2,398
Unallocated	47	83	362	912	1,570	1,466	1,887	1,749	-1,018
Total figures used by Working Group	703	813	1,043	1,753	3,023	3,391	4,902	4,119	1,380

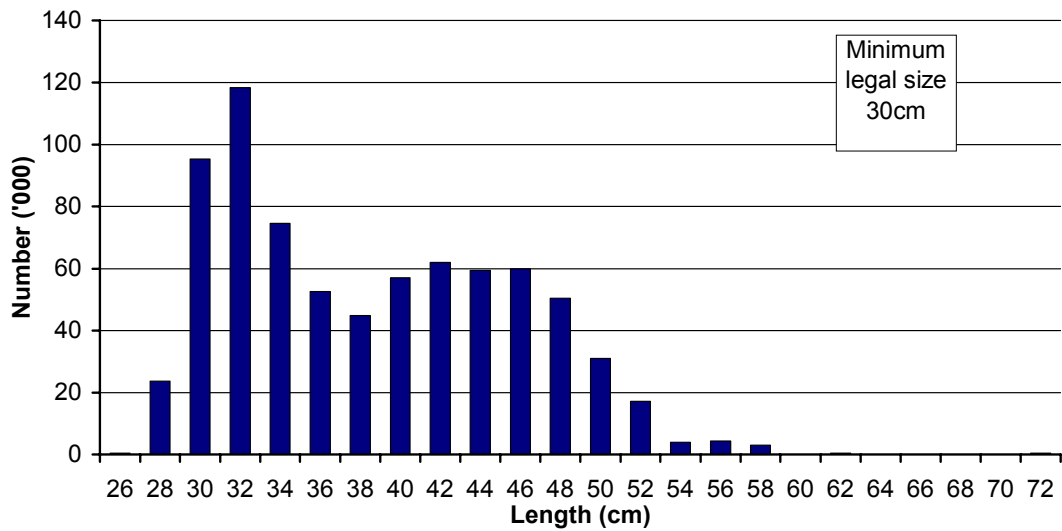
Country	2001
Belgium	68
France	183*
Ireland	528*
Netherlands	
UK (England & Wales) <sup>1</sup>	
UK (Isle of Man)	
UK (N. Ireland)	
UK (Scotland)	
United Kingdom	1,323*
Total	2,102
Unallocated	396
Total figures used by Working Group	2,498

\*Preliminary.

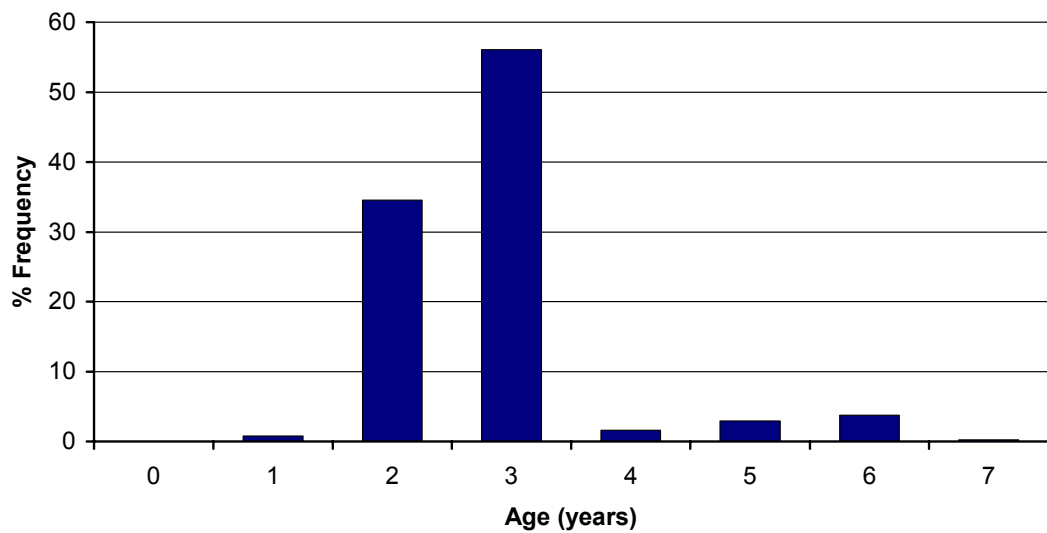
<sup>1</sup>1989–2000 Northern Ireland included with England and Wales.

n/a = not available.

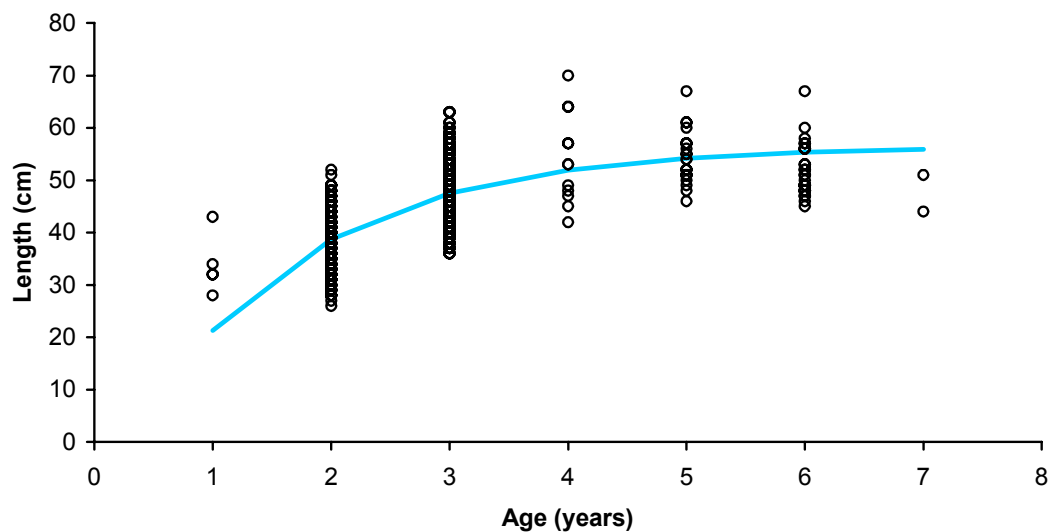
**2001 Length Distribution: Irish Landings, Haddock in VIIa**



**2001 Age Distribution: Irish Landings, Haddock in VIIa**



**2001 Size at Age: Irish Sampling, Haddock in VIIa**



# West of Scotland Whiting

(Division VIa)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the STECF and ICES advice for West of Scotland fisheries is predicated primarily on the need to rebuild cod stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

MFSD therefore agrees with the ICES advice that, unless ways to harvest whiting without incidental catch or discards of cod can be demonstrated, fishing for whiting should not be permitted. MFSD agrees with the ICES advice that programs including industry initiated programs to pursue cod by-catch reduction should be encouraged, but that such programs must ensure that their reported catches of cod are fully and credibly reported.

MFSD advises that current high levels of discarding of whiting mean that restricting landings alone will not achieve the necessary increase in SSB. MFSD stress that the cornerstone of any management plan for fisheries in this area should include measures that significantly reduce the discarding of whiting. Such measures would contribute substantially to the reduction in fishing mortality recommended for whiting.

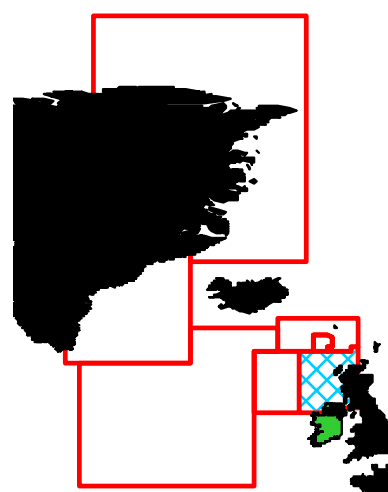
## STATE OF THE STOCK

- There are serious concerns about the state of this stock.
- The 2001 total international catch was estimated to be 4,000 t of which 1,600 t was discarded. Landings have declined markedly since the mid-1980s and are now at an historic low.
- There has been a general decline in recruitment since the mid-1980s, and the 1996, 1998 and 2000 year-classes are the three weakest on record. Strong year-classes have not occurred during the 1990s.
- The estimated Fishing mortality in 2001 of 0.85 is well above  $F_{pa}$  (0.6). Fishing mortality has exceeded  $F_{pa}$  in all years since 1983.
- The estimated Spawning stock biomass in 2002 of 10,200 t is well below the  $B_{pa}$  of 22,000 t and  $B_{lim}$  of 16,000 t. SSB has been in decline since 1981 and has been below  $B_{pa}$  since 1994 and  $B_{lim}$  since 1998.

- Short-term predictions suggest that it is most unlikely that the stock will recover at current levels of fishing mortality. The SSB is expected to increase to 14,200 t by 2004 but still remain well below  $B_{lim}$ .

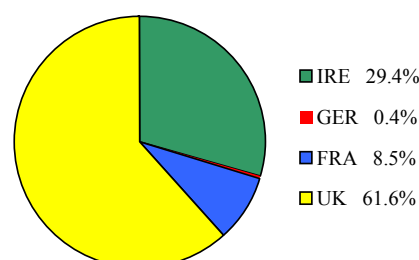
## CURRENT MANAGEMENT

- The TAC area covers EC waters in Divisions Vb and Sub-areas VI, XII and XIV.
- The assessment area covers Division VIa only but landings from other areas are negligible.



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

- The TAC in 2002 was 3,500 t with an associated Irish quota of 1,029 t.
- There are no explicit management objectives or a management plan for this stock.
- Whiting is taken with cod and haddock in mixed demersal fisheries and management advice should be considered in that context. MFSD recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching whiting.



## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was about €1.2m.
- The value of the 2001 Irish landings from Division VIa was about €0.8m.
- Whiting are a low value fish but because of the high quantities landed they are important to the white fish fleets operating out of Killybegs and Greencastle.

## ADDITIONAL INFORMATION

- 1 The assessment uses landings-at-age data, discard-at-age data and indices from research vessel surveys. 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 consequently greater likelihood of discarding, misreporting and high-grading.
- 2 The Irish landings of 739 t in 2001 were similar to the landings in 2000 and are near the lowest ever recorded.
- 3 No corrections were applied for misreporting in the assessment. While some degree of misreporting is still suspected to have occurred, particularly during 1992–1995, it is now considered to have been less of a problem with this stock than had previously been thought.
- 4 The fishery is dominated by the UK-Scotland (70–75% of landings) and Irish (15–20% of landings) fleets. French whiting landings have declined considerably since the late 1980's.
- 5 Otter trawl vessels fishing out of Killybegs and Greencastle take most of the Irish catch of this stock. There has been a significant reduction in the number of Irish vessels targeting the mixed gadoid fishery in VIa in recent years. Most of these landings are taken from the Donegal Bay, Tory and Aran and Stanton Banks grounds.
- 6 Irish sampling of this stock is supported through the EC funded sampling programme, which is required under Data Collection Regulations 1543/2000 and 1639/2001. MFSD sampling indicates that the landings contain few older fish. This confirms the poor state of the stock and suggests the prognosis for this stock is poor.

- 7 MFSD's annual West Coast Groundfish Survey in Division VIa was shown to perform consistently with the Scottish groundfish survey. Unfortunately, the current implementations of the assessment model do not allow for the combination of disaggregated landings and discards with multiple survey indices. To maintain consistency with previous assessments, the Scottish survey was used exclusively in the assessment.
- 8 The proportion of whiting discarded is very high and appears to have increased in recent years. MFSD discard data is limited but discard rates of 50% by weight and 60–70% by number have been reported (ICES SGDBI, 2002). Due to low market demand, there is likely to be considerable discarding of small whiting. This may present a major impediment to stock rebuilding.
- 9 The recovery plan for cod in Division VIa has had no measurable effect on the stock and fishery for whiting in Division VIa.

## ICES ADVICE

### 3.7.4.a

#### State of stock/exploitation:

The stock remains outside safe biological limits. Fishing mortality has exceeded  $F_{pa}$  in all years since 1983, and is estimated to be close to  $F_{lim}$  since 1999. Spawning stock, which has been in decline since 1981, has exceeded  $B_{pa}$  in only one year since 1988 and has been below  $B_{lim}$  since 1998. There has been a general decline in recruitment since the mid-1980s, and the 1996, 1998 and 2000 year-classes are the three weakest on record.

#### Management objectives:

No explicit management objectives are set for this stock.

#### Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$B_{lim}$ is 16 000 t, the lowest observed spawning stock estimated in previous assessments.	$B_{pa}$ be set at 22 000 t. 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.
$F_{lim}$ is 1.0, above which stock decline has been observed.	$F_{pa}$ be set at 0.6. This F is considered to have a high probability of avoiding $F_{lim}$ .

#### Technical basis:

$B_{lim} = B_{lim}(1998) = 16\ 000\ t$	$B_{pa} = B_{lim} * 1.4$
$F_{lim} = \text{see above}$	$F_{pa} = 0.6 * F_{lim}$

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**Advice on management:**

Since whiting is mostly taken in demersal fisheries with cod and haddock, the advice for cod determines the advice for whiting. Unless ways to harvest whiting without incidental catch or discards of cod can be demonstrated fishing for whiting should not be permitted.

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**Relevant Factor:**

On the basis of the status of whiting alone, ICES would recommend that to bring SSB above  $B_{pa}$  in 2004, fishing mortality in 2003 should be below 0.14, corresponding to a human consumption landing of less than 900 t. If any fisheries on whiting are permitted, despite the advice on cod and whiting, then total catches should not exceed these values.

The extent to which the cod-haddock-whiting fisheries are linked has not been quantified. This linkage is not one-to-one, but it is evident and probably variable. It is possible for fishing vessels to increase their targeting of individual species within the demersal fish complex, but there will always be a significant by-catch of other roundfish.

ICES notes that this advice presents a strong incentive to fisheries to avoid catching cod. If industry-initiated programs can be demonstrated to bring their catch rates of cod in fisheries for whiting down to near zero, then these programs could be considered in management of these fisheries. Industry-initiated programs to pursue such incentives should be encouraged, but must include a high rate of independent observer coverage, or other fully transparent method for ensuring their reported catches of cod are fully and credibly reported.

Fisheries targeting *Nephrops* may take a by-catch of whiting. In this case ICES notes that whiting may continue to be caught subject to existing EU regulations applying to *Nephrops* fisheries and providing the catch of cod complies with the advice on cod.

Whiting are taken in a mixed roundfish fishery. This means it is important to take into account the impact of management of whiting on other stocks, notably cod and haddock. The reverse is, of course, also true. Recent measures to protect Division VIa cod, such as the closed area, and agreements to increase mesh size, will affect the whiting fishery. Improvements in selectivity related to measures to protect cod should, if effectively implemented, benefit the whiting fishery by reducing discards and increasing landings in the long-term.

Whiting are taken as a by-catch with cod and haddock in a mixed demersal fishery. The emergency measures introduced for cod in Division VIa have had no measurable effect on the stock and fishery for whiting in Division VIa. A reduced whiting fishery should have a positive impact on the rebuilding of the cod stock in Division VIa.

Over 50% of the SSB in 2004 is expected to be comprised of the 2002 year class for which short-term geometric mean recruitment has been assumed. Retrospective analysis indicates that the over-estimation of the stock may not be fully accounted for in the current assessment and catch forecast.

Fishing effort displaced due to the cod rebuilding plan in Division VIIa, should not be permitted to target whiting in Division VIa, or any other stocks considered to be outside safe biological limits.

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 improve the exploitation pattern would be beneficial to the stock and to the fishery. The more widespread use of 110mm mesh nets in 2002, and the requirement to fit square mesh panels to certain towed gears since late 2000, may improve the selection pattern for whiting.

**Catch forecast for 2003:**

Basis  $F(2002) = F_{sq} = F(2001) = 0.85$  ; Catch(2002) = 6.3 ; Landings(2002) = 3.7 ; SSB(2003) = 12.0 .

F(2002 onwards)	Basis	Catch (2003)	Discards (2003)	Landings (2003)	SSB (2004)
0.09	$0.1 * F_{sq}$	1.0	0.4	0.6	22.7
0.14	$0.16 * F_{sq}$	1.5	0.6	0.9	22.0
0.17	$0.2 * F_{sq}$	1.9	0.8	1.1	21.5
0.26	$0.3 * F_{sq}$	2.7	1.1	1.6	20.4
0.43	$0.5 * F_{sq}$	4.3	1.8	2.4	18.3
0.60	$F_{pa} = 0.71 * F_{sq}$	5.7	2.4	3.2	16.4
0.68 <sup>1</sup>	$0.8 * F_{sq}$	6.2	2.7	3.5	15.7 <sup>1</sup>
0.85	$F_{sq}$	7.3	3.2	4.1	14.2

Weights in '000 t. <sup>1</sup> Option giving 30% increase in SSB

Shaded scenarios considered inconsistent with the precautionary approach.

### Comparison with previous assessment and advice:

The estimate of fishing mortality in 2000 is 2% lower and the estimate of SSB in 2001 30% lower in this years assessment compared to last years assessment. Whilst estimates of fishing mortality have been quite consistent from year to year in this stock, there has been a pronounced tendency for the estimate of SSB for the final year to be revised downwards when an additional year's catch and survey data are included in the assessment. The basis for the single stock fishery advice is the same as last year.

### Elaboration and special comment:

Whiting in Division VIa are caught mainly by Scottish trawlers. Since 1976, Scottish heavy trawl and seine effort has declined, whilst that of light trawlers has generally increased. Approximately 50% of the total catch in weight is discarded, so restricted landings alone will not achieve the necessary increase in SSB. The analytical age-based assessment uses landings-at-age data, discard-at-age data and indices from research vessel surveys.

### Source of information:

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

### Yield and spawning biomass per Recruit

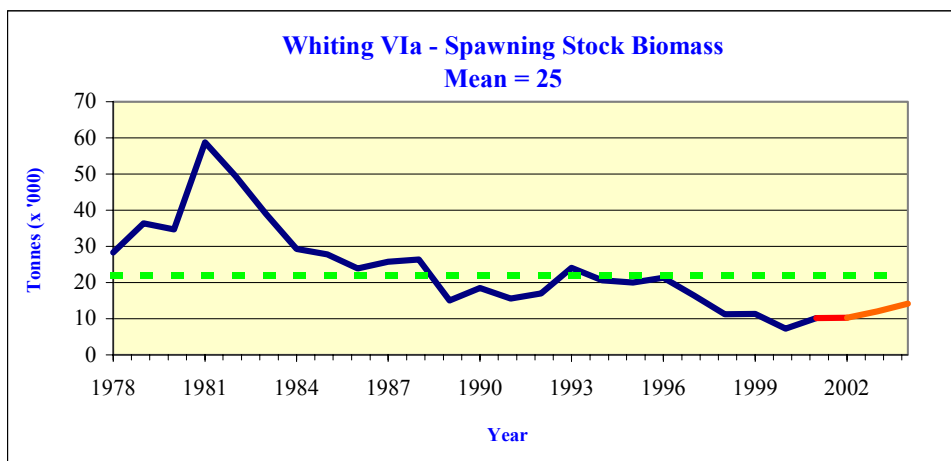
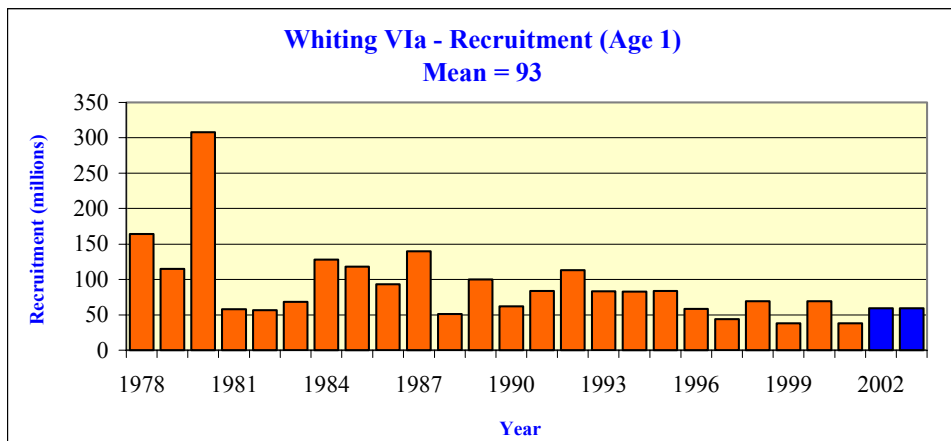
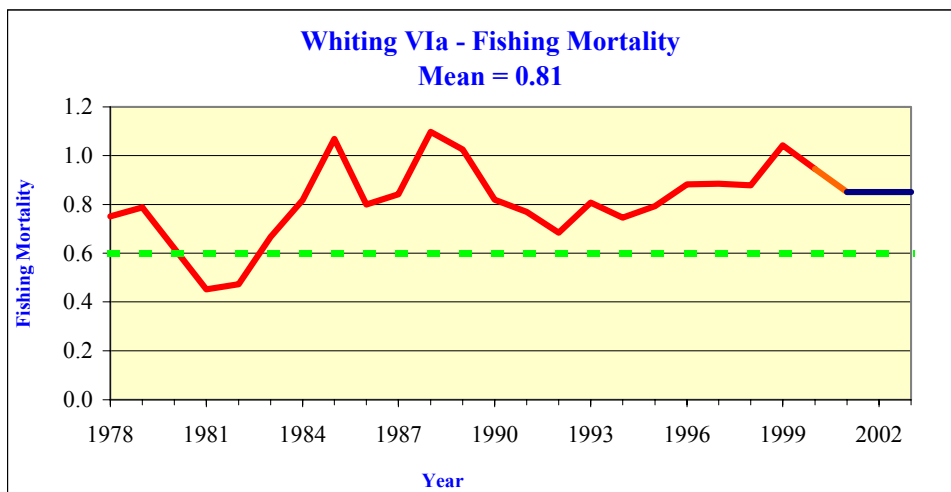
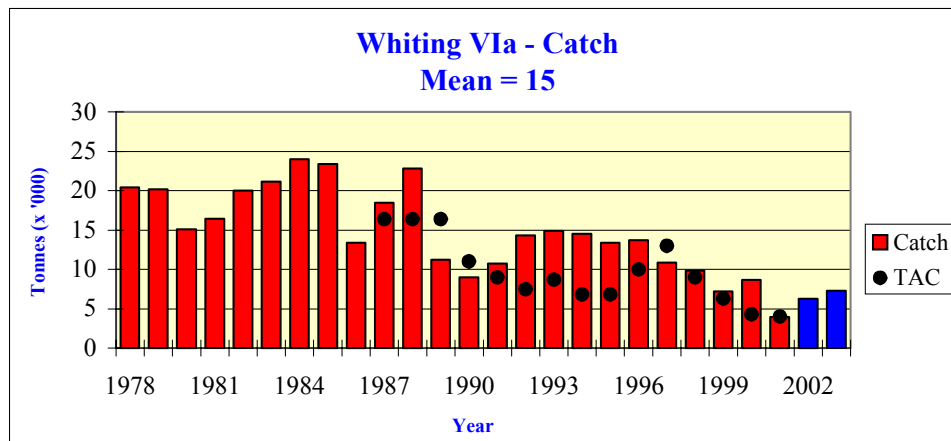
#### F-reference points:

	Fish Mort Ages 1-3	Yield/R	SSB/R
Average Current	0.946	0.063	0.150
$F_{max}$	0.182	0.119	0.614
$F_{0.1}$	0.107	0.111	0.859
$F_{med}$	0.557	0.087	0.248

### Catch data (Tables 3.7.4.a.1-2):

Year	ICES Advice	Predicted land-Agreed ing corresp. TAC <sup>1</sup> to advice	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	11.5	22.9
1989	No increase in F; TAC	13.0	16.4	7.7	7.5	3.7	11.3
1990	No increase in F; TAC	11.0	11.0	6.0	5.6	3.4	9.0
1991	70% of effort (89)	-	9.0	6.9	6.7	4.0	10.7
1992	70% of effort (89)	-	7.5	6.0	6.0	8.4	14.3 <sup>4</sup>
1993	70% of effort (89)	-	8.7	6.8	6.9	8.0	14.9 <sup>4</sup>
1994	30% reduction in effort	-	6.8	5.8	5.9	8.6	14.5 <sup>4</sup>
1995	Significant reduction in effort	-	6.8	6.3	6.1	7.3	13.4 <sup>4</sup>
1996	Significant reduction in effort	-	10.0	6.6	7.2	6.6	13.7
1997	Significant reduction in effort	-	13.0	6.2	6.3	4.6	10.9
1998	No increase in F	6.5	9.0	4.7	4.7	5.2	9.9
1999	Reduce F below <b>F</b> <sub>pa</sub>	4.3	6.3	4.7	4.6	2.6	7.2
2000	Reduce F below <b>F</b> <sub>pa</sub>	<4.3	4.3	3.3	3.0	5.6	8.7
2001	Reduce F below <b>F</b> <sub>pa</sub>	<4.2	4.0	2.4	2.4	1.6	4.0
2002	SSB> <b>B</b> <sub>pa</sub> in short term	<2.0	3.5				
2003	No cod catches	-					

<sup>1</sup>TAC is set for Divisions VIa and VIb combined. <sup>2</sup>Incomplete. <sup>3</sup>Not including misreporting. <sup>4</sup>Including ACFM estimates of misreporting. Weights in '000 t.





**Table 3.7.4.a.1** Nominal catch (t) of WHITING in Division VIa, 1986–2001, as officially reported to ICES.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999 <sup>1</sup>	2000 <sup>1</sup>	2001
Belgium	4	3	1	-	+	-	+	+	+	-	1	1	+	+	-
Denmark	5	-	1	+	3	1	1	+	+	+	+	-	-	-	-
France	1,644	1,249	199 <sup>1,2</sup>	180	352 <sup>1,2</sup>	105	149	191	362	202	108	82 <sup>1</sup>	300 <sup>1</sup>	164 <sup>1</sup>	54 <sup>1</sup>
Germany	+	4	+	+	+	1	1	+	-	-	-	-	+	-	-
Ireland	2,868	2,640	1,315	977	1,200	1,377	1,192	1,213	1,448	1,182	977	952	1,121	793	631 <sup>1</sup>
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	-	1	-	1	2	+	-	n/a
UK (E&W) <sup>3</sup>	62	30	44	50	218	196	184	233	204	237	453	251	210	104	...
UK (N.I.)	13	89	...	...	...	...	...	...	...	...	...	...	...	...	...
UK (Scot.)	7,803	7,864	6,109	4,819	5,135	4,330	5,224	4,149	4,263	5,021	4,638	3,369	3,046	2,258	...
UK (total)															1,724 <sup>1</sup>
Total landings	12,399	11,879	7,669	6,026	6,908	6,010	6,751	5,786	6,278	6,642	6,178	4,657	4,677	3,319	2,409
Unallocated landings	-857	-530	-142	-382	-234	-5	122	177	-199	527	113	38	-49	-301	-5
Discards as used by W.G.	6,875	11,460	3,713	3,356	4,044	8,360	8,017	8,570	7,272	6,568	4,571	5,211	2,567	5,644	1,586
Landings as used by W.G.	11,542	11,349	7,527	5,644	6,674	6,005	6,873	5,963	6,079	7,169	6,291	4,695	4,628	3,018	2,404
Total catches as used by W.G.	18,417	22,809	11,240	9,000	10,718	14,365	14,890	14,533	13,351	13,737	10,862	9,906	7,195	8,662	3,990

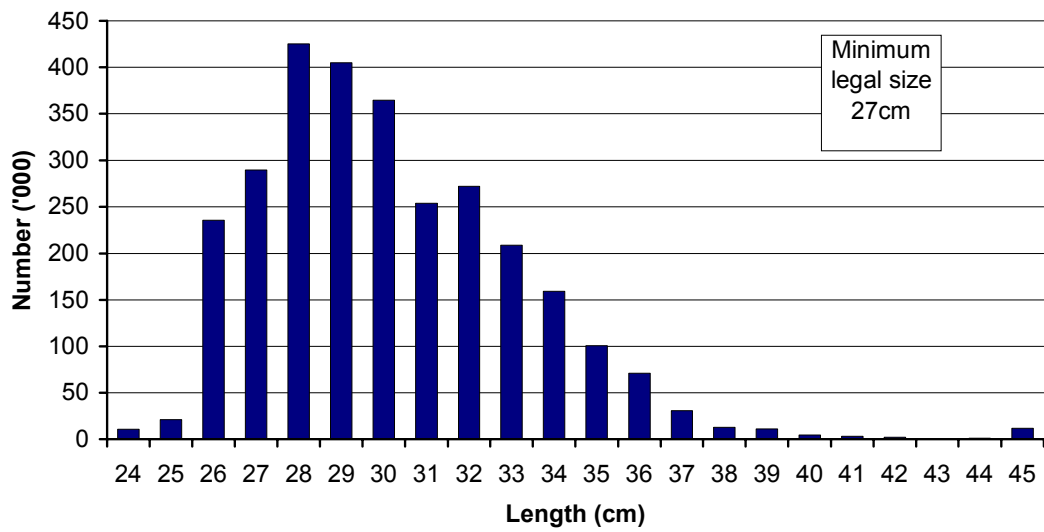
<sup>1</sup>Preliminary.<sup>2</sup>Includes Divisions Vb (EC) and VIb.<sup>3</sup>1989–2001 N. Ireland included with England and Wales.

n/a = Not available.

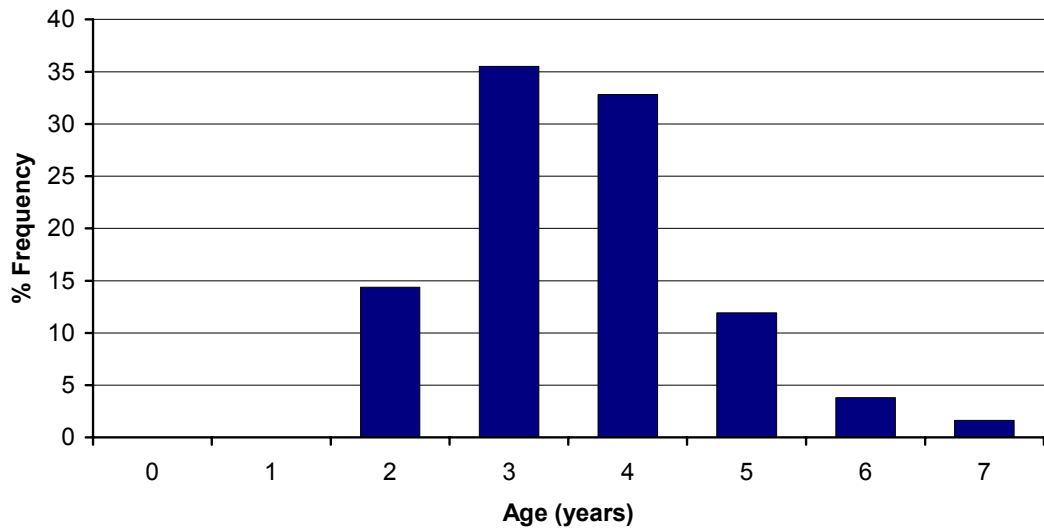
**Table 3.7.4.a.2** Whiting in Division VIa (West of Scotland)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 1-3
1978	163886	28276	20436	0.750
1979	114988	36394	20159	0.788
1980	307610	34669	15101	0.620
1981	58071	58824	16462	0.452
1982	56310	49455	20025	0.473
1983	68546	39015	21150	0.667
1984	128059	29273	24007	0.818
1985	118169	27833	23390	1.069
1986	93328	23924	13373	0.800
1987	139818	25778	18453	0.842
1988	50932	26408	22845	1.097
1989	99722	15058	11248	1.024
1990	61904	18541	8981	0.819
1991	83530	15532	10739	0.769
1992	112919	17025	14332	0.684
1993	83291	24023	14881	0.807
1994	82908	20620	14532	0.745
1995	83634	20023	13372	0.792
1996	58427	21258	13706	0.882
1997	43880	16420	10857	0.885
1998	69198	11178	9864	0.878
1999	38330	11367	7202	1.042
2000	69371	7208	8661	0.945
2001	38475	10107	3984	0.850
2002	59371	10200		0.850
Average	91387	23936	14907	0.814

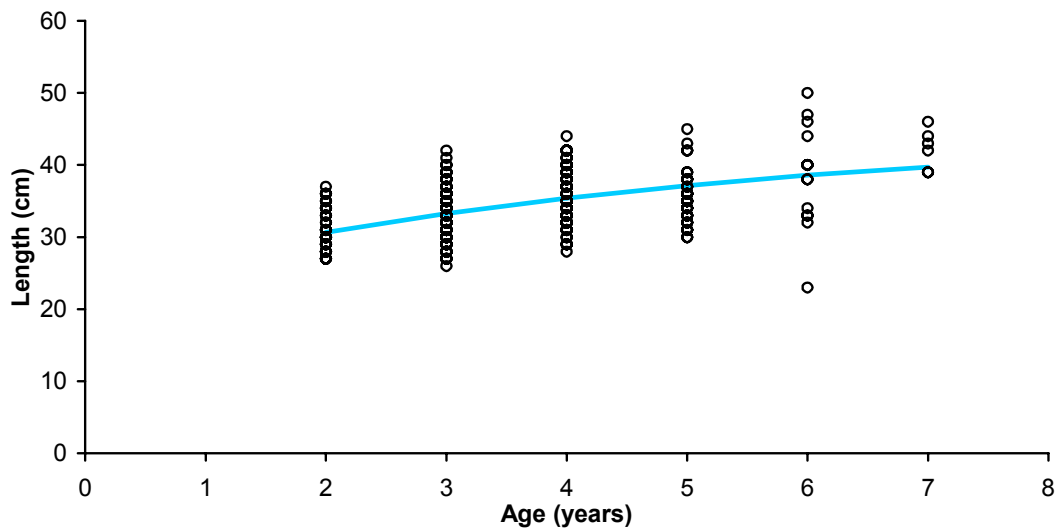
**2001 Length Distribution: Irish Landings, Whiting in Vla**



**2001 Age Distribution: Irish Landings, Whiting in Vla**



**2001 Size at Age: Irish Sampling, Whiting in Vla**



# Rockall Whiting

(Division VIb)

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



Marine Fisheries Services Division

## MFSD – ADVICE

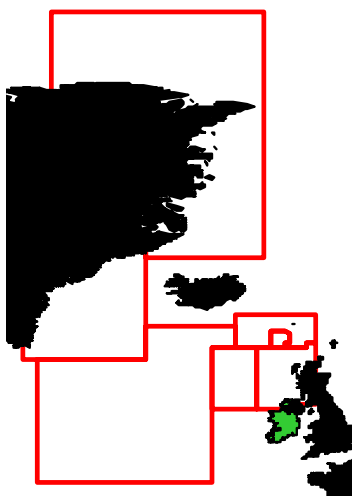
MFSD notes that the STECF and ICES advice for other Rockall and West of Scotland stocks is predicated primarily on the need to rebuild VIb haddock and cod stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

TAC is set for Sub-area VI and any catches of whiting set for Division VIb should not jeopardise a rebuilding plan for cod in Division VIa or management measures for Division VIb haddock.

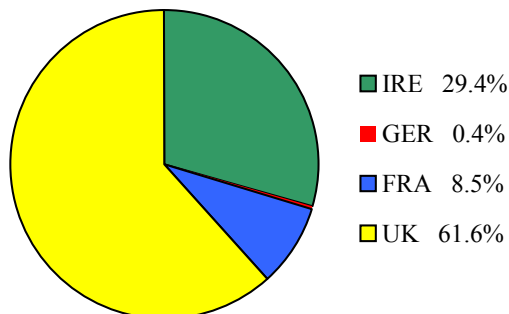
Therefore MFSD advise that unless ways to harvest VIb whiting without incidental catch or discards of haddock or cod can be demonstrated, fishing for saithe should not be permitted.

## STATE OF THE STOCK

- There is no ICES assessment for this stock.
- Catches of whiting from VIb are negligible. Hence only the VIa whiting are assessed.
- There are no reference points proposed for this stock.



Red Boxes-TAC/Management Areas



## CURRENT MANAGEMENT

- The TAC area covers Sub-areas Vb, VI, XII and XIV.
- The TAC in 2002 was 3,500 t with an associated Irish quota of 1,029 t.

## MFSD – ECONOMIC COMMENTS

- This stock is of little or no economic value to Ireland.
- The value of the 2001 Irish landings from Division VIb were valued at €9,000.
- The value of the 2001 Irish quota was €1.7million.

## ADDITIONAL INFORMATION

- 1 Irish vessels reported landings of 9 t of whiting in Division VIb in 2001.
- 2 It is likely that whiting caught at Rockall are migrants from the VIa rather than a discrete VIb stock.
- 3 It is likely that the UK Scottish landings during the early 1990s are probably linked to area misreporting of other species such as haddock and anglerfish into Division VIb.

# Irish Sea Whiting

(Division VIIa)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD agrees with the STECF and ICES advice that fishing mortality on whiting should be reduced to as close to zero as possible in 2003. MFSD therefore endorses the recommendation that a rebuilding plan, including provisions to effectively reduce the directed harvest, discards, and by-catch of whiting in other fisheries, should be developed and implemented in order to rebuild the spawning stock biomass.

MFSD advises that current high levels of discarding mean that restricting landings alone will not achieve the necessary increase in SSB. MFSD stress that the cornerstone of any rebuilding plan should be measures that significantly reduce the discarding of whiting in the *Nephrops* fishery. Such measures would contribute substantially to the reduction in fishing mortality recommended for whiting.

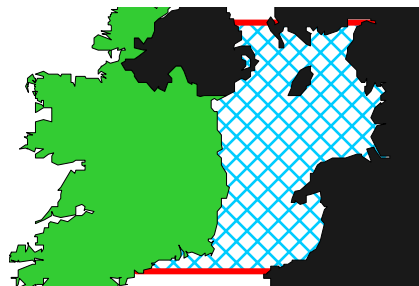
## STATE OF THE STOCK

- There are very serious concerns about the state of this stock. There has been a severe decline in abundance in the western Irish Sea where the bulk of the catch is taken.
- Landings have declined since 1985, and the proportion of the catch discarded has increased. The 2001 catch of about 1,700 t is the lowest on record. The 2001 human consumption landings are estimated to be 733 t, the lowest in the time series and only 16% of the series mean.
- Fishing mortality is very high in the western Irish Sea. Historical estimates of fishing mortality have been above the  $F_{pa}$  of 0.65.  $F$  has remained above  $F_{pa}$  since 1980 (the start of the assessment period).
- Overall, SSB in this stock has been in a continuous state of decline since 1993. SSB fell below the  $B_{pa}$  of 7,000 t and the  $B_{lim}$  of 5,000 t in the mid 1990s and remains near the lowest in the time series.
- There has been a period of below average recruitment since 1992. The relatively strong recruitment in 1999 is only slightly higher than the long-term geometric mean. There is evidence of reduced recruitment at SSB levels below  $B_{pa}$ .
- Short-term predictions were not provided by ICES

because of the uncertainties in the 2002 assessment.

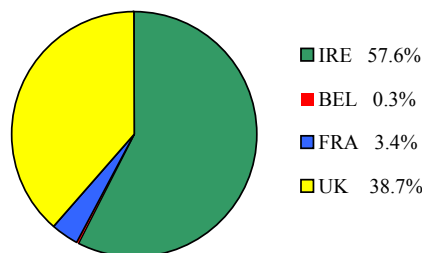
## CURRENT MANAGEMENT

- The TAC area covers Divisions VIIa and corresponds to the assessment area.



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

- The TAC in 2002 was 1,000 t with an associated Irish quota of 576 t.
- There are no explicit management objectives or a management plan for this stock. A recovery plan that will reduce  $F$  below  $F_{pa}$  and increase SSB above  $B_{pa}$  is consistent with the precautionary approach.
- MFSD recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching whiting.



## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was €0.8m.
- The value of the 2001 Irish landings from Division VIIa was €0.4m.
- In the past this fishery yielded landings of up to 20,000 t and was economically very important to all fleets operating in the Irish Sea. However, in recent years the stock has declined and this fishery is of minor economic importance to the Irish fleet.

## ADDITIONAL INFORMATION

- 1 The assessment is based on catch-at-age commercial CPUE and survey indices. There are however,

considerable uncertainties in this assessment due to the high levels of discarding and mis-reporting and strong conflicts between abundance indices from the Eastern and Western Irish Sea.

- 2 The estimated Irish landings of about 410 t in 2001 were about 1.5 times those in 2000 but represent only about half of the Irish quota. Most of these landings were from the Southern Irish Sea and may in fact be fish from the Celtic Sea stock.
- 3 There is evidence of mis-reporting of haddock as whiting by some countries, during the haddock outburst in recent years. The landings data used in the assessment have been adjusted for mis-reporting.
- 4 Most of the landings are taken by UK (Northern Ireland), Ireland and UK (England and Wales). UK (Northern Ireland) fleets are 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 pelagic fishery for cod.
- 5 Vessels operating out of Dunmore East, Clogherhead and Howth take most of the Irish catches.
- 6 Irish Sampling of this stock is supported through the EC funded sampling programme that is required under Data Collection Regulations 1543/2000 and 1639/2001. MFSD sampling indicates that 2 and 3 year-old whiting comprise almost 90% of whiting landings from Divisions VIIa. The absence of older fish in the landings confirms the seriously depleted state of this stock.
- 7 MFSD conducts an annual ground fish survey in VIIa and catches of whiting in recent years confirms the seriously depleted state of the stock. These data were not included in the assessment as the survey does not cover the distribution of the stock.
- 8 Discarding of whiting from the *Nephrops* fishery operating on the main whiting nursery area of the Irish Sea is a major problem in this stock and increases the susceptibility of the stock to overexploitation. Full protection of juvenile whiting

will require minimising discards of juvenile whiting in the *Nephrops* fishery.

- 9 Ireland has a high quota for this stock (58%) due to the Hague preference agreement.
- 10 MFSD notes that the advice for whiting in the Irish Sea does not consider the by-catch of cod in fisheries catching whiting. Nevertheless, MFSD considers the stringent management advice for whiting to be consistent with the management advice for fisheries catching cod.

## ICES ADVICE

### 3.8.4

#### State of stock/exploitation:

The current state of the stock in the Irish Sea as a whole is poorly defined. There has been a severe decline in abundance in the western Irish Sea where the bulk of the catch is taken, and fishing mortality is very high in this region. Historical estimates of fishing mortality have been above  $F_{pa}$ . Catches have declined progressively since the early 1980s, and the proportion discarded has increased. Estimates for 2000 and 2001 indicate that 60 - 70% of the catch was discarded.

#### Management objectives:

No explicit management objectives are set for this stock. However, for any management objectives to meet precautionary criteria, their aim should be to reduce or maintain  $F$  below  $F_{pa}$  and to increase or maintain spawning stock biomass above  $B_{pa}$ .

#### Advice on management:

**ICES recommends that fishing mortality on whiting should be reduced to as close to zero as possible in 2003. A rebuilding plan, including provisions to effectively reduce directed harvest, discards and by-catch in other fisheries should be developed and implemented in order to rebuild SSB.**

#### Precautionary Approach reference points (unchanged since 1999):

ICES considers that:	ICES proposes that:
$B_{lim}$ is 5 000 t, the lowest observed spawning stock biomass as estimated in previous assessment. There is no clear evidence of reduced recruitment at the lowest observed SSB's.	$B_{pa}$ be set at 7 000 t, which 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.
$F_{lim}$ is 0.95. This is the fishing mortality estimated to lead to a potential stock collapse.	$F_{pa}$ be set at 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.

#### Technical basis:

$B_{lim} = B_{loss}$	$B_{pa} = B_{loss} * 1.4$
$F_{lim} = F_{loss}$ as estimated in an earlier assessment	$F_{pa} = 0.65$ , 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 $F$ s.

### Relevant factors to be considered in management:

A *Nephrops* directed fishery operates on the main whiting nursery areas in the Irish Sea. Recent levels of discards in this *Nephrops* directed fishery during the late 1990s have been at around 43% by weight of the estimated catch of whiting in this fishery, rising to over 60% in 2000 and 2001. Discard rates have increased because of the scarcity of fish above minimum landing size and the low value of the catch. This means that the fishing mortality on whiting cannot be effectively controlled by restrictions on landings alone, but would also require measures to reduce discards. Square mesh panels have been mandatory for all UK trawlers (excluding beam trawlers) in the Irish Sea since 1993, and for Irish trawlers since 1994. While the effects of this technical measure have not been formally evaluated, the *Nephrops* fishery still generates substantial quantities of whiting discards, indicating that further measures are necessary. Management measures for the *Nephrops* fishery should also take into account the effect on whiting. Increased use of 100mm in whitefish trawlers since 2001 should also improve selectivity for whiting.

### Medium- and long-term projections:

No medium term projections have been carried out because of the uncertainties in the assessment.

### Comparison with previous assessment and advice:

The advice last year was based on an analytical assessment and forecast. This assessment has been considered very unreliable because of conflicting signals between survey and commercial catch data, and is now considered inadequate for making an analytical forecast.

Catch data (Tables 3.8.4.1-2):

Year	ICES Advice	Predicted catches corresponding to advice	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 regulation	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>5</sup>	5.0	3.4	1.3	3.5 <sup>3</sup>
1999	Reduce F below F <sub>pa</sub>	3.5 <sup>5</sup>	4.41	2.0	1.1	2.8 <sup>3</sup>
2000	Reduce F below F <sub>pa</sub>	<1.6 <sup>5</sup>	2.64	1.2	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			
2003	Lowest possible F	~0				

<sup>1</sup>Not including discards from the *Nephrops* fishery. <sup>2</sup>From *Nephrops* fishery. <sup>3</sup>Including estimates of misreporting.

<sup>5</sup>Landings only, no discards included. <sup>6</sup>Incomplete statistics. Weights in '000 t.

### Elaboration and special comment:

Whiting is taken mainly as a by-catch in mixed species otter trawl fisheries for *Nephrops*, cod and other demersal species, and to a lesser extent in the pelagic fishery for cod and haddock.

Uncertainties in the assessment are related to different trends in survey indices from the Eastern and Western Irish Sea. Survey catch-rates of whiting above the MLS of 27cm have declined continuously in the western region since 1992, reflecting the rapid decline in commercial landings, whilst survey catch-rates in the eastern region are much higher and show little or no trend over time. The commercial fishery has become more concentrated in the western region in recent years as the English and Welsh fleets, which operate mainly in the east, have declined over time. Reconciling the conflicting signals in the assessment will necessitate understanding dispersal of whiting between the two areas. It is not known if the collapse of the population of adult whiting in the western Irish Sea represents a localised depletion of a more broadly distributed stock, or the depletion of a local sub-population.

### Source of information:

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

### Yield and spawning biomass per Recruit

#### F-reference points:

	Fish Mort Ages 1-3	Yield/R	SSB/R
Average Current	0.908	0.067	0.321
F <sub>max</sub>	0.252	0.068	0.280
F <sub>0.1</sub>	0.165	0.064	0.398
F <sub>med</sub>	0.677	0.047	0.085

**Table 10.1.3.1** Nominal catch (t) of WHITING in Division VIIa, 1987–2001, as officially reported to ICES and Working Group estimates of human consumption and discards.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	109	90	92	142	53	78	50	80	92	80	47	52	46	30	27
France	826	1,063	533	528	611	509	255	163	169	78	86	81	150	96	25
Ireland	4,067	4,394	3,871	2,000	2,200	2,100	1,440	1,418	1,840	1,773	1,119	1,260	509	353	467
Netherlands										17	14	7	6	1	
UK (Engl. & Wales) <sup>a</sup>	1,529	1,202	6,652	5,202	4,250	4,089	3,859	3,724	3,125	3,557	3,152	1,900	1,229	670	
UK (Isle of Man)	14	15	26	75	74	44	55	44	41	28	24	33	5	2	
UK (N. Ireland)	4,858	4,621													
UK (Scotland)	281	107	154	236	223	274	318	208	198	48	30	22	44	15	
UK															531
Total human consumption	11,684	11,492	11,328	8,183	7,411	7,094	5,977	5,637	5,465	5,581	4,472	3,355	1,989	1,167	1,050
Estimated <i>Nephrops</i> fishery discards used by the WG <sup>b</sup>	3,899	1,611	2,103	2,444	2,598	4,203	2,707	1,173	2,151	3,631	1,928	1,304	1,092	2,118	1,012
Estimated landings used by the WG	10,519	10,245	11,305	8,212	7,348	8,588	6,523	6,763	4,893	4,335	2,277	2,229	1,670	762	733
Unallocated human consumption	-1,165	-1,247	-23	29	-63	1,494	546	1,126	-572	-1,246	-2,195	-1,126	-319	-405	-317
Total catch figures used by the WG	14,418	11,856	13,408	10,656	9,946	12,791	9,230	7,936	7,044	7,966	4,205	3,533	2,762	2,880	1,745

Revised

Preliminary

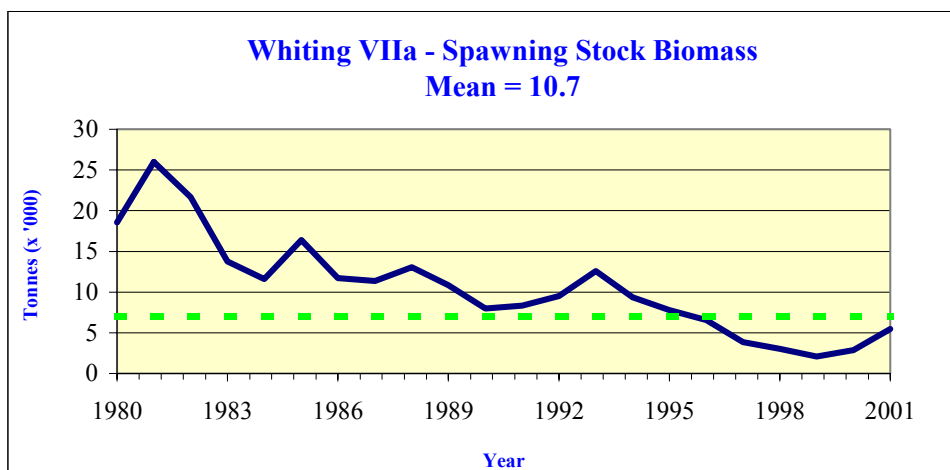
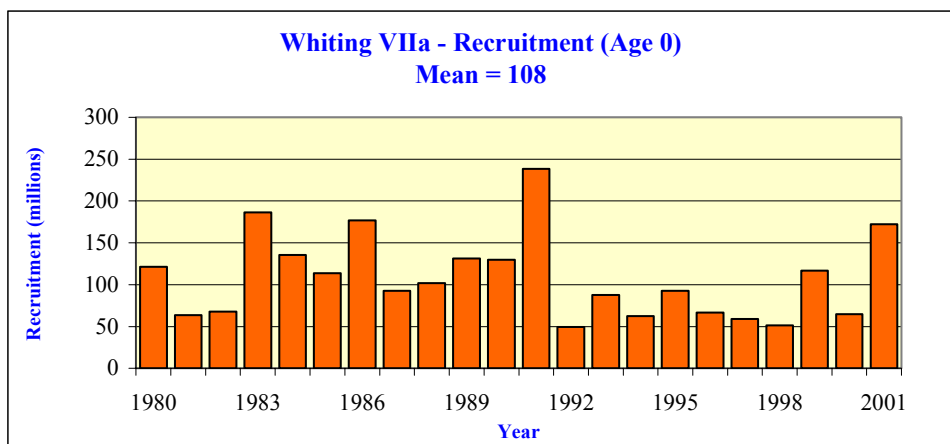
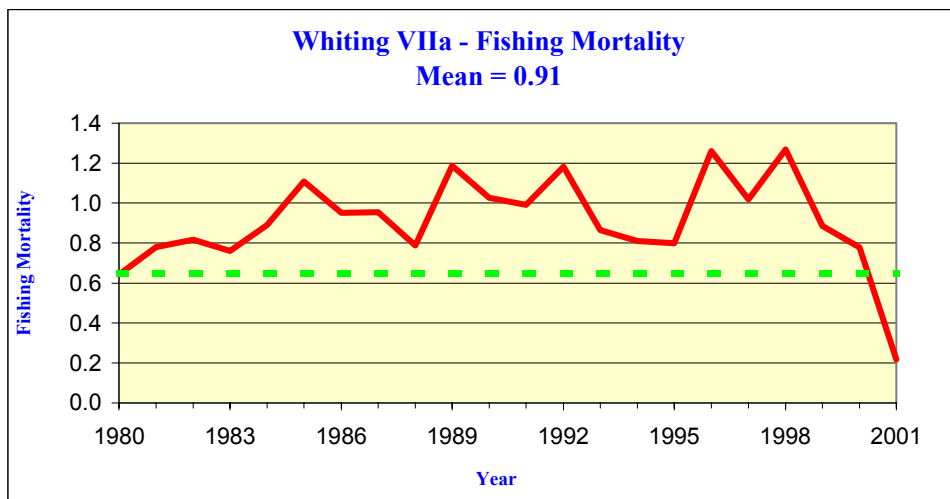
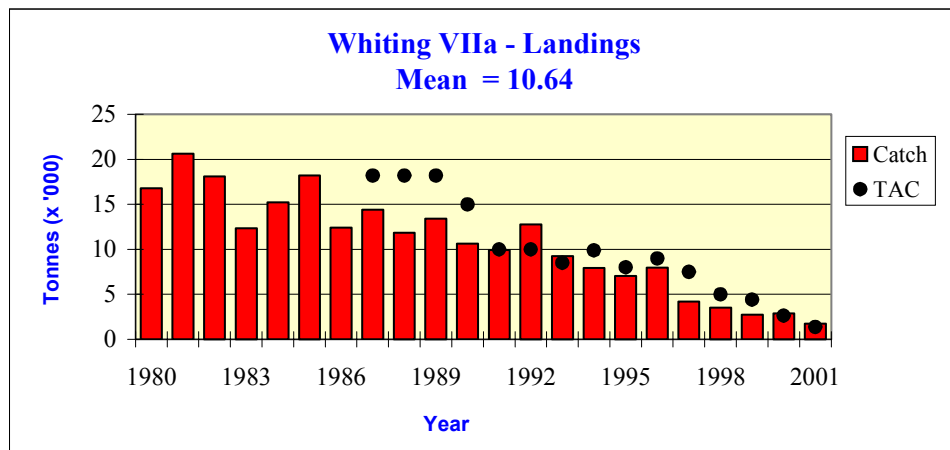
<sup>a</sup> 1989–2000 Northern Ireland included with England and Wales.

<sup>b</sup> Based on UK (N. Ireland) and Ireland data.

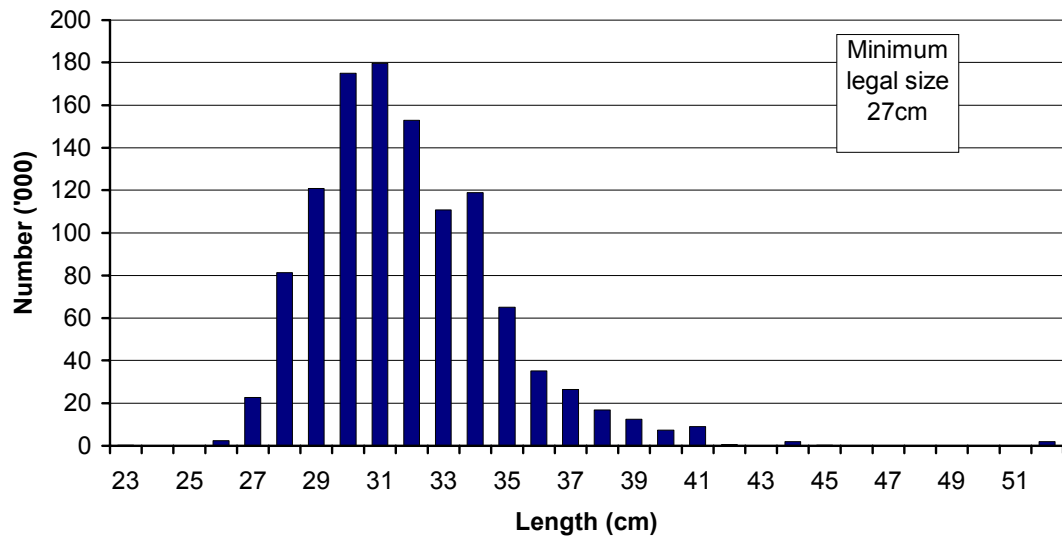
**Table 3.8.4.2** Whiting in Division VIIa (Irish Sea)

Year	Landings tonnes
1980	13461
1981	17646
1982	17304
1983	10525
1984	11802
1985	15582
1986	10300
1987	10519
1988	10245
1989	11305
1990	8212
1991	7348
1992	8588
1993	6523
1994	6763
1995	4893
1996	4335
1997	2277
1998	2229
1999	1670
2000	762
2001	733
Average	8319

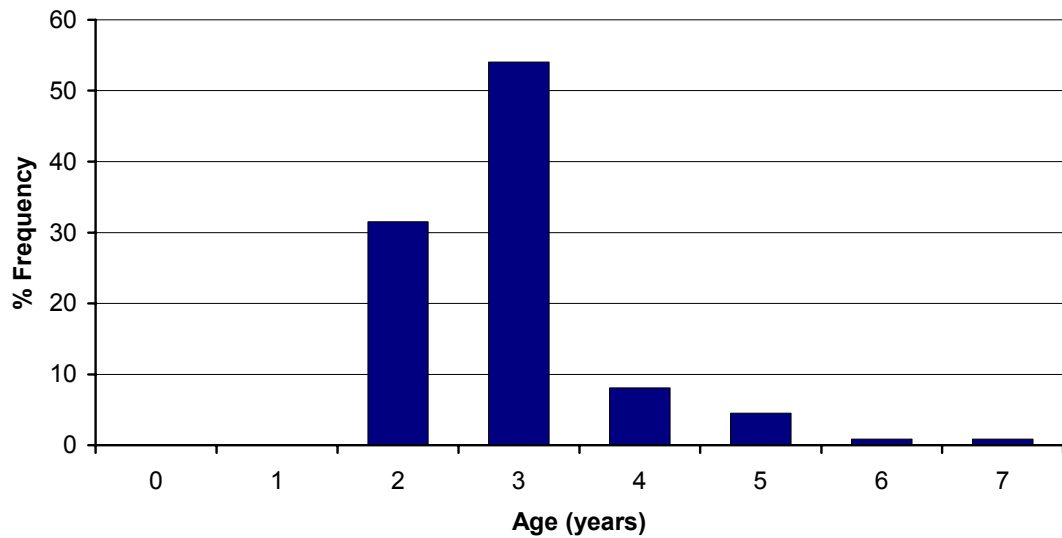




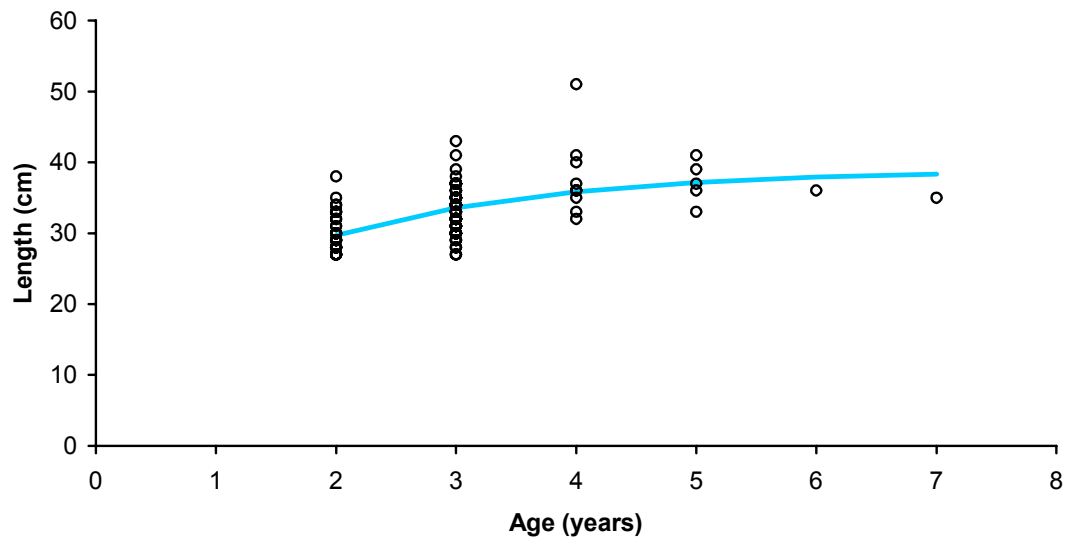
**2001 Length Distribution: Irish Landings, Whiting in VIIa**



**2001 Age Distribution: Irish Landings, Whiting in VIIa**



**2001 Size at Age: Irish Sampling, Whiting in VIIa**



# Celtic Sea and Western Channel Whiting

(Division VIIe-k)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD agrees with the ICES recommendation that fishing mortality should not increase. This advice corresponds to landings for Divisions VIIe-k of not more than 20, 200 t in 2003. This will translate to a TAC of about 20,624 t with an Irish quota of about 5,730 t in 2003.

TAC Area	TAC 2002	Proposed TAC 2003	Basis
VIIe-k		20,200	Assessment
VIIId		0	Assessment Sub-area IV and Division VIIId
VIIb,c, VIII, IX, & X		424	Average Catches, 1998-2000 (As reported to the WGSSDS 2002)
Total TAC	31,700	20,624	
Irish quota	8,814	5,734	

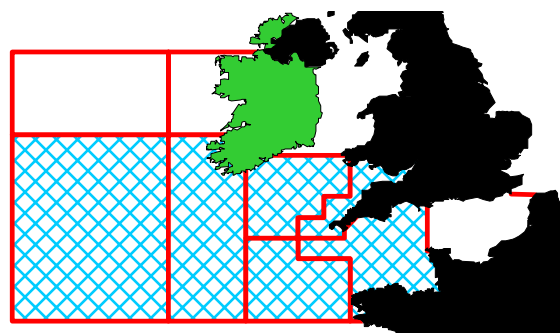
## STATE OF THE STOCK

- There are no concerns about the state of this stock and the stock is within safe biological limits.
- The landings in 2001 were 14,800 t, close to 2000 estimates. Landings had previously been maintained around 20,000 t from 1994 to 1999 but declined to around 15, 000 t since 2000.
- Fishing mortality is estimated to have declined generally until 1997 but has increased slightly in recent years. F is estimated to be 0.53.  $F_{pa}$  has not been defined for this stock.
- This years assessment indicates that during the period 1995-1997 year classes are all below average, that the 1999 recruitment was the highest in the time series but that the 2000 and 2001 year classes are near the lowest in the time series, 41.8 and 32.5 million, respectively.
- SSB is estimated to have decreased from 83,000 t in 1995 to 39,000t in 2000 and to have increased to 63,000t in 2001. SSB remains above the average (39,000t) and above  $B_{pa}$  (21,000 t). The recent increase in SSB results from the lower estimate of F in 2000 and 2001.
- Short-term predictions indicate that, at current fishing mortality, spawning stock biomass will decline in 2003

to 41,000 t and decline further to 35,000 t in 2003. This remains well above  $B_{pa}$ .

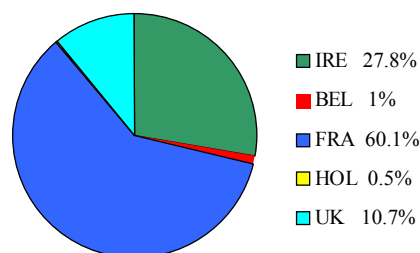
## CURRENT MANAGEMENT

- The TAC area covers Divisions VIIb-k, and the assessment area covers Divisions VIIe-k.



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

- The 2002 TAC was 31,700 t with an associated Irish quota if 8,814 t.



- There are no explicit management objectives or plan for this stock.
- MFSD recommend that management objectives be established and that a management plan be developed and implemented for fisheries catching whiting.

**Special Note:** MFSD strongly advise that Division VIIId should be included as part of the North Sea management area.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was about €6.1m.
- The value of the 2001 Irish landings was about €5.1m.
- Whiting has a low value but the volume landed means that it is the most economically valuable component of the mixed demersal fisheries in the Celtic Sea.

## ADDITIONAL INFORMATION

- Past problems in obtaining French landings statistics

have been alleviated, therefore the assessment for this stock is more robust than in previous years.

2. Irish landings in 2001 were 4,942 t.
3. Misreporting is not considered to be a problem in this fishery.
4. 60% of the 2001 landings were taken by France, mostly by the Lorient-based gadoid fleet. Ireland, the UK and Belgium landed 33%, 6% and 1% of the 2001 landings respectively.
5. Demersal trawlers from Dunmore East and Castletownbere and other ports in south-west Ireland have traditionally targeted Celtic Sea whiting in a mixed trawl fishery. Poor catches elsewhere have attracted vessels from Greencastle, Co. Donegal to this fishery in recent years. The majority of the landings are taken by otter trawls (55%) and Scottish seines (30%).
6. Irish sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001. MFSD sampling indicates that very young fish dominated the Irish landings in 2001 with 68% of the landings being between 2 and 3 years old representing lengths of 28-32cm.
7. In 1997 MFSD commenced a groundfish survey in the Celtic Sea on RV *Celtic Voyager*. This survey is designed to improve recruitment estimates and hence, the accuracy of the assessments and forecasts.

8. Irish commercial catch and effort data from logbooks were used again in 2002 to tune the assessment.
10. In the years where discard sampling levels of the Irish otter trawl fleet were highest discard rates of up to 49 % by number were estimated from the Irish otter trawl fleet. Available data indicate that discarding rates are high in this fishery. This may indicate that estimates of F and catch numbers are too low, particularly at younger ages and this may cause an overestimate of landings in prediction forecasts.

## ICES ADVICE

### 3.9.3

#### State of stock/exploitation:

The stock is within safe biological limits. SSB reached high levels in 1995 and 1996, and has decreased until 1999 though remaining well above  $B_{pa}$ . SSB increased sharply in 2001 as the outstanding 1999 year-class matured. The 2000 and 2001 year-classes are estimated to have been very weak. Fishing mortality was very high during the 1980s, decreased in the early 1990s and is currently estimated to be around 0.6.

#### Management objectives:

There are no explicit management objectives for this stock.

#### Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$B_{lim}$ is 15 000 t, the lowest observed spawning stock biomass.	$B_{pa}$ be set at 21 000 t. Biomass above this affords a high probability of maintaining SSB above $B_{lim}$ , taking into account the uncertainty of the assessment.
$F_{lim}$ is not defined.	$F_{pa}$ not proposed.

#### Technical basis:

$B_{lim} = B_{loss}$	$B_{pa} = B_{lim} * 1.4$
$F_{lim}$ not proposed.	$F_{pa}$ not proposed.

#### Advice on management:

There is no  $F_{pa}$  defined for this stock, but there is no long-term gain in increasing fishing mortality. Therefore, ICES recommends that fishing mortality should not increase, corresponding to landings of at most 20,200 t in 2003.

#### Relevant factors to be considered in management:

The assessment area was expanded in 1997 to cover Divisions VIIe-k. The TAC for whiting is set for all of Subarea VII (excluding Division VIIa). In order to protect whiting in Divisions VIIe-k, the TAC should be allocated to Divisions and catches in the other parts of Subarea VII be accounted against such TACs. The state of whiting in Division VIId should be considered, if setting an overall TAC for Subarea VII.

**Catch forecast for 2003:**

Basis:  $F(2002) = F(99-01) = F_{sq} = 0.63$  ; Landings(2002) = 25.8 ; SSB(2003) = 40.6.

F (2003 onwards)	Basis	Landings (2003)	SSB (2004)
0.38	$0.6 * F_{sq}$	13.8	41.8
0.50	$0.8 * F_{sq}$	17.2	38.4
0.63	$1 * F_{sq}$	20.2	35.5
0.75	$1.2 * F_{sq}$	22.7	33.0
0.88	$1.4 * F_{sq}$	25.0	30.8

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

**Medium- and long-term projections:**

$F_{max}$  is not well estimated due to a flat-topped Y/R curve.

**Comparison with previous assessment and advice:**

The outstanding 1999 year class is now estimated by three surveys and verified by two commercial fleets, although 25% lower than previously estimated. There was an upward revision of F and a downward revision of SSB in the current assessment.

**Elaboration and special comment:**

GM recruitment assumptions account for 42% of the forecast SSB in 2004.

Celtic Sea whiting are taken in mixed species (cod, whiting, hake, *Nephrops*) fisheries. French trawlers account for about 60% of the total landings, Ireland 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 by-catch restrictions and market demand for larger *Nephrops*.

Analysis of landings trip by trip by the French gadoid trawlers for the period 1996-1998 showed that on a trip basis, cod and whiting were mixed. Information from the fishery indicates that on a haul basis, these two species are rather well separated. This means that fishermen seem to be able, for each trawl operation, to target cod and whiting separately.

The main Irish fleets in Divisions VIIIf,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) targeting anglerfish and megrim with whiting as by-catch, offshore in Division VIIg. Division VIIj-k whiting are taken in mixed species fisheries (cod/whiting/anglerfish/megrim and *Nephrops*). The main gears used are otter trawl and seiners, and landings are taken by Ireland (90%) and France (7%).

The main Irish fleet in Divisions VIIj,k are otter trawlers that target mixed gadoids and account for 10% of landings of whiting in Divisions VIIe-k. The main UK fisheries in

Divisions VIIe,f,g,h are inshore between Newlyn and Salcombe and off the north Cornish coast, 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, though landings overall have generally increased during the period since 1982, with peaks in 1989 (16 540 t) and in 1995 (22 680 t). 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.

The main spawning areas of whiting in the Western Channel and Celtic Sea are off Start Point (VIIe), off Trevoze Head (VIIIf), and southeast of Ireland (VIIg). 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 Trevoze Head and southeast of Ireland. There was no evidence of emigration out of the Celtic Sea area. The results of returns of whiting tagged and released in the County Down spawning area show that a greater proportion of Irish Sea whiting move south into the Celtic Sea than north towards the west of Scotland.

Analytical assessment is based on landings, commercial CPUE, and surveys data. Some information on discards indicates that they may be substantial.

**Source of information:**

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

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

	Fish Mort Ages 2-5	Yield/R	SSB/R
Average Current	0.625	0.191	0.484
$F_{max}$	1.363	0.195	0.325
$F_{0.1}$	0.257	0.165	0.790
$F_{med}$	1.559	0.195	0.304

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

**Catch data (Tables 3.9.3.1–2):**

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	14.5
2002	No increase in F	27.7 <sup>4</sup>	31.7	
2003	No increase in F	20.2 <sup>4</sup>		

<sup>1</sup>TAC covers Subarea VII (except Division VIIa). <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-k stock component. Weights in '000 t.

**Table 3.9.3.2** Whiting in Divisions VIIe-k

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-5
1982	62000	19000	11200	1.052
1983	50000	15100	11800	1.391
1984	54000	16100	10000	1.199
1985	71000	17500	10800	1.044
1986	133000	17700	10000	1.071
1987	106000	21300	12700	1.359
1988	33000	30400	15100	1.186
1989	55000	35900	16500	1.036
1990	109000	26400	14100	0.992
1991	166000	20100	13500	1.193
1992	150000	27300	12400	0.766
1993	209000	45600	16300	0.745
1994	112000	62700	20000	0.566
1995	65000	82500	22700	0.495
1996	61000	80500	18300	0.362
1997	61000	67600	20500	0.362
1998	98000	53600	19200	0.447
1999	218000	44700	19900	0.722
2000	42000	39300	14900	0.622
2001	33000	63200	14500	0.531
2002	88000	59300		0.625
Average	94095	40276	15220	0.846

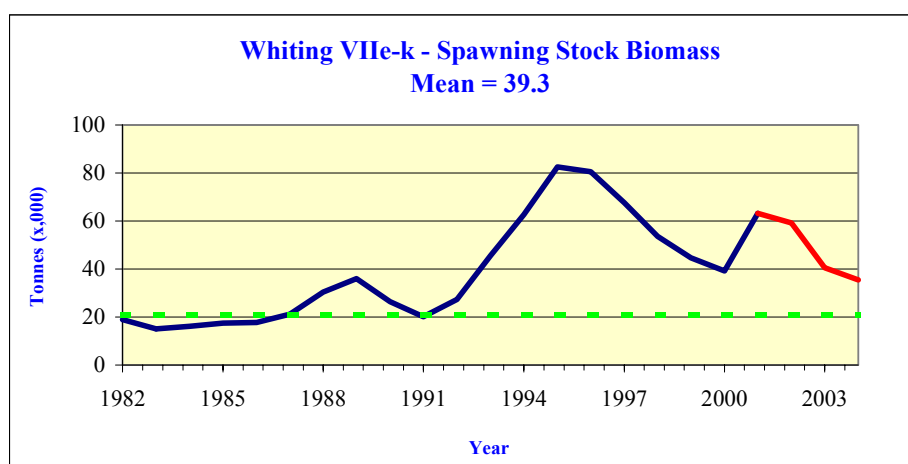
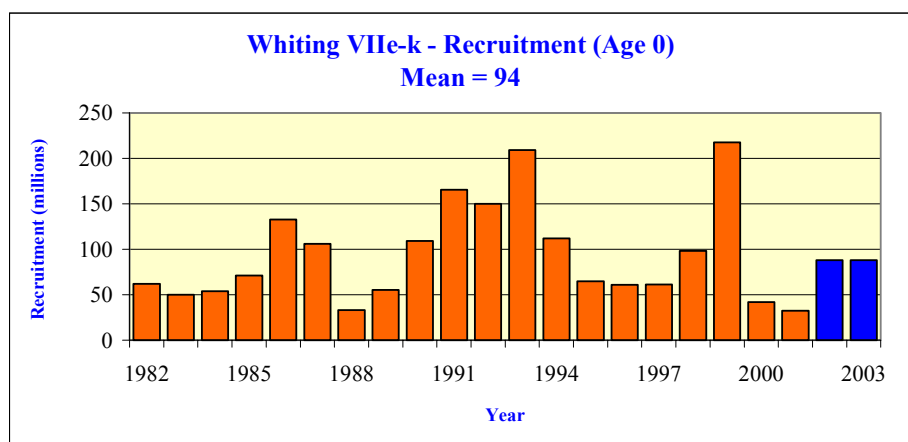
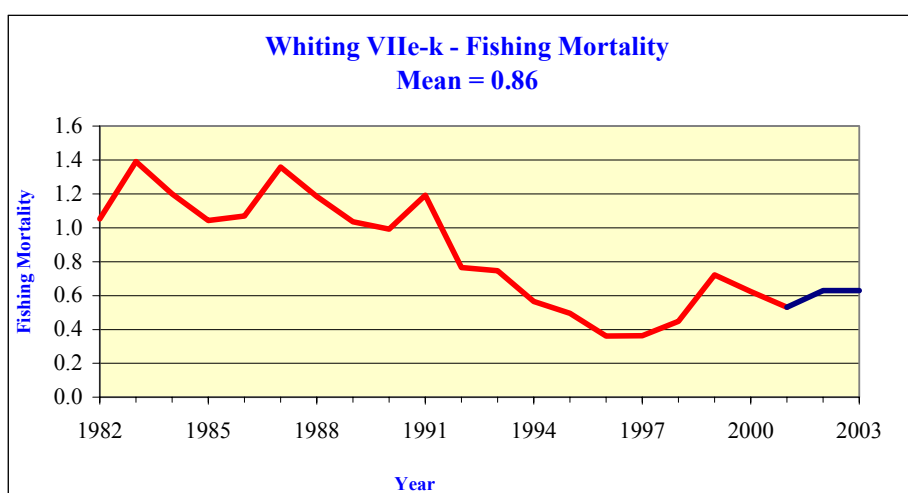
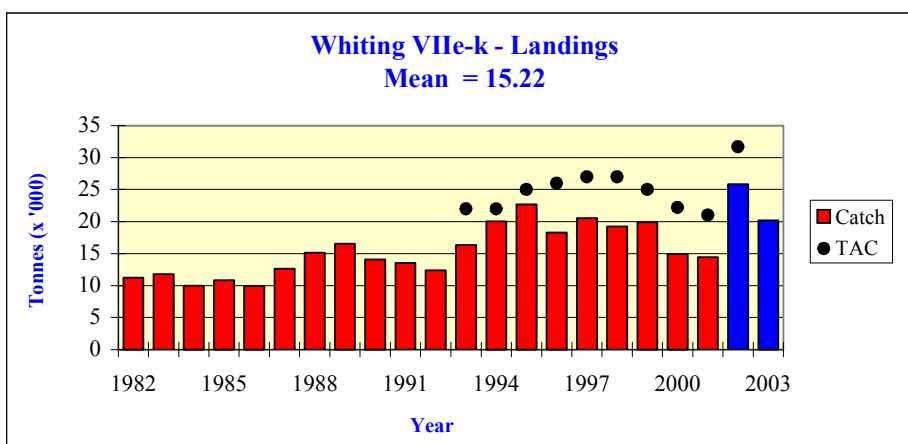




Table 4.2.1

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
Belgium	135	161	167	107	111	159	296	308	292	107	145	228	205	268	449	479	448	194	171
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	12,346	8,954	8,867
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	4,942
Netherlands		398		124										8		1			5
Spain													4	31	24	53	21	10	
UK (E/W/NI)	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	
UK(Scotland)						1	5	74	33	8	17	6	23	34	42	68	3	2	
United Kingdom																			822
Total	11,781	9,985	10,838	9,952	12,652	13,566	16,541	14,106	13,508	12,364	16,320	20,034	21,513	18,120	20,520	19,247	19,971	15,207	14,807
Unallocated	0	0	0	0	0	0	0	0	0	0	0	0	0	1,165	140	-2	-56	-288	-352

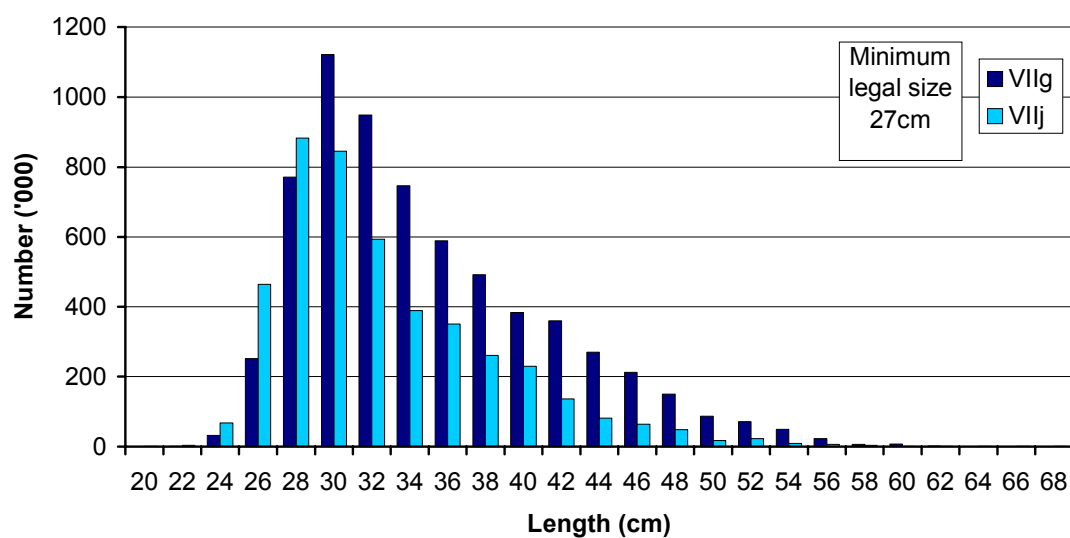
Total as used by

the Working Group 11,781 9,985 10,838 9,952 12,652 15,128 16,541 14,106 13,508 12,364 16,320 20,034 22,678 18,260 20,532 19,245 19,915 14,919 14,455

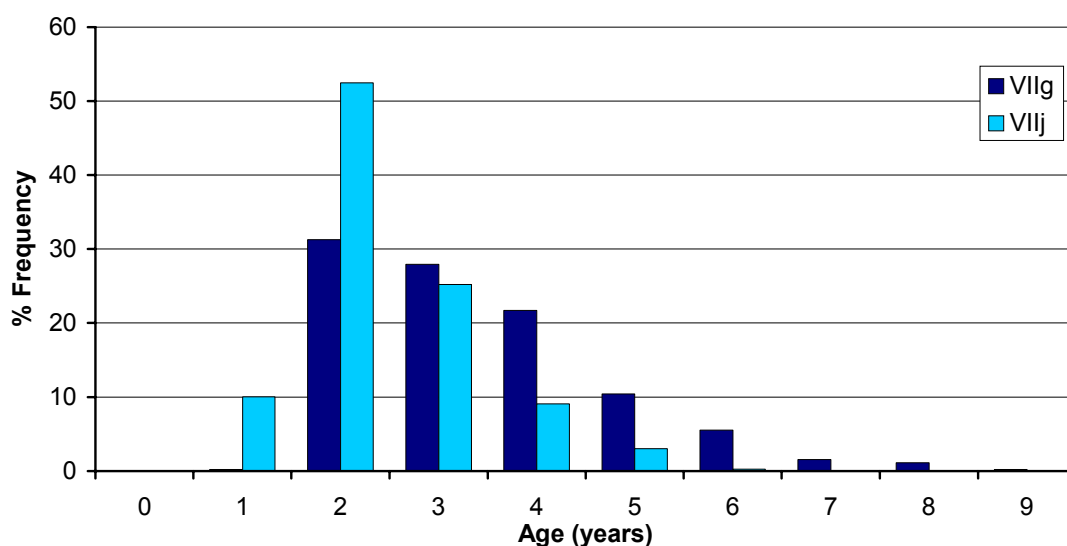
Preliminary

Estimated from logbooks

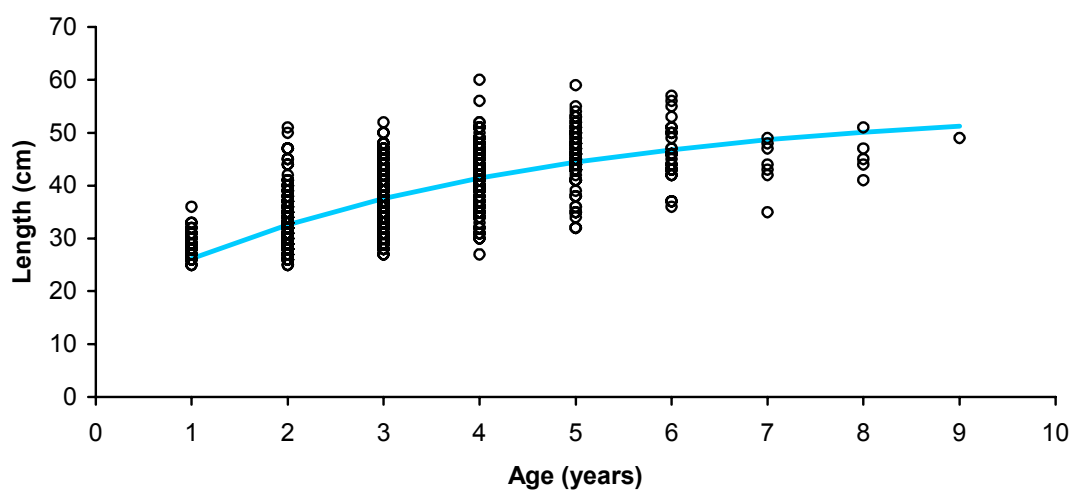
**2001 Length Distribution: Irish Landings, Whiting in VIIg VIIj**



**2001 Age Distribution: Irish Landings, Whiting in VIIg VIIj**



**2001 Size at Age: Irish Sampling, Whiting in VIIg VIIj**



# West of Ireland Whiting

(Divisions VIIb,c)



Marine Fisheries Services Division

## MFSD – ADVICE

Whiting in Divisions VIIb,c are included in the management area VIIb-k. There was no ICES advice for this stock. MFSD advise that catches in 2003 be no more than the recent average (1998-2000) of around 424 t as included in advice for Whiting VIIe-k.

## STATE OF THE STOCK

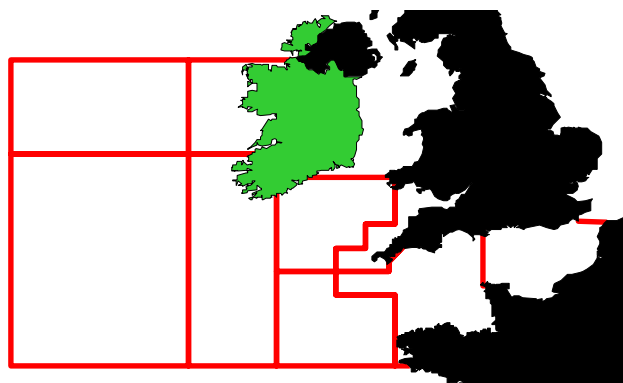
- No analytical assessment is carried out at present for this stock.
- There are no reference points for this stock.
- Total international estimated landings in 2001 were 318 t.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish landings was € 0.3m.

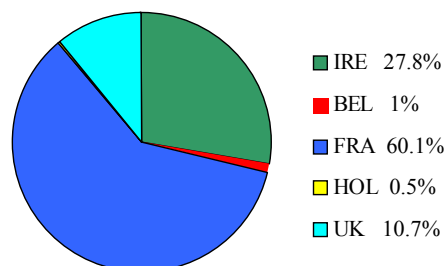
## ADDITIONAL INFORMATION

1. No analytical assessment is carried out at present for this stock.
2. The TAC area covers Divisions VIIb-k.
3. Irish landings in 2001 were 310 t. This is a decrease of 45% on the 2000 landings.
4. Ireland dominates the fishery with 97% of the estimated landings in 2001. The UK, Netherlands and France land the remainder.
5. The majority of the landings are taken by otter trawls

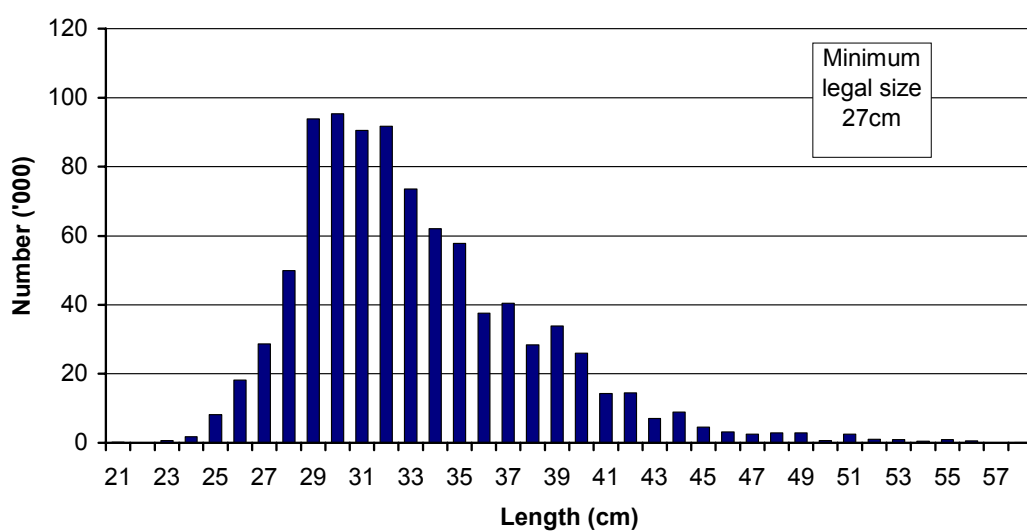


(70%), Scottish seines (15%) and demersal bottom pair trawlers (10%).

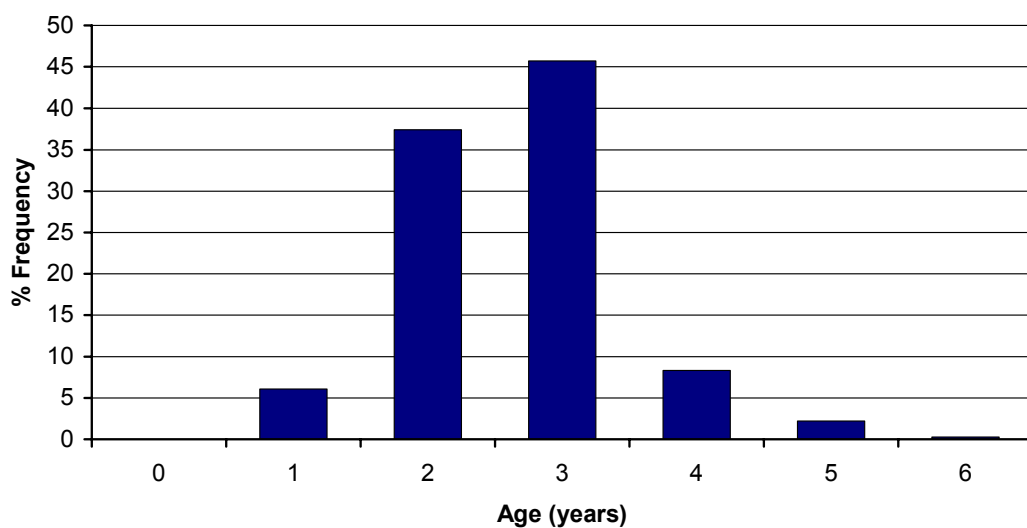
6. Irish sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001. MFSD sampling indicates that the stock is dominated by 2-3 year olds or 29-33cm fish.
7. MFSD have conducted an annual groundfish survey in this area since 1993. These data will be used in any future assessments of this stock which incorporate Division VIIb,c.
8. Discarding practices are not well quantified but MFSD sampling has indicated that discarding does occur in this fishery.
9. Whilst there is no official ICES advice for this stock the ICES working group stated that due to the dynamics of this stock it is unclear whether it would be more appropriate to include whiting VIIb,c in the whiting VIa assessment rather than the whiting VIIe-k assessment. Until the dynamics of these whiting stocks become clear ICES resolved to continue the collation of data on VIIb,c whiting.



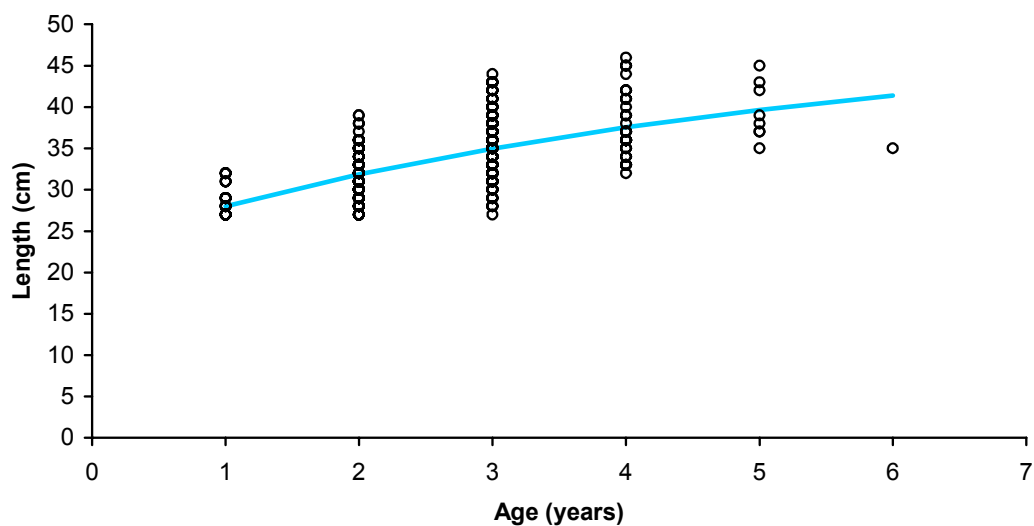
**2001 Length Distribution: Irish Landings, Whiting in VIIb**



**2001 Age Distribution: Irish Landings, Whiting in VIIb**



**2001 Size at Age: Irish Sampling, Whiting in VIIb**



# West of Scotland and Rockall Pollack

(Sub-area VI)



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the STECF and ICES advice for other West of Scotland and Rockall stock is predicated primarily on the need to rebuild cod stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

Therefore MFSD advises that unless ways to harvest pollack without incidental catch or discards of cod can be demonstrated, fishing for pollack should not be permitted.

In the absence of ICES advice for this stock, MFSD advise that, if any fisheries on pollack are permitted, despite the advice on cod, the TAC for 2003 should not exceed 1,100 t. This translates into an Irish quota of 155 t.

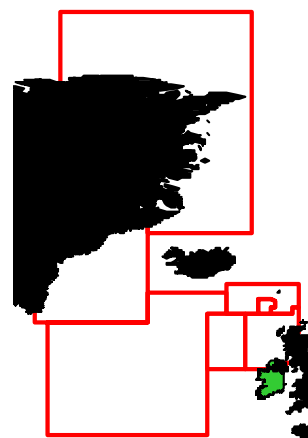
MFSD point out that there is no scientific basis for the proposed TAC and that the current TAC is far in excess of recent annual landings. MFSD advises that a programme be initiated to evaluate stock status so that management objectives and a management plan be formulated for this stock.

## STATE OF THE STOCK

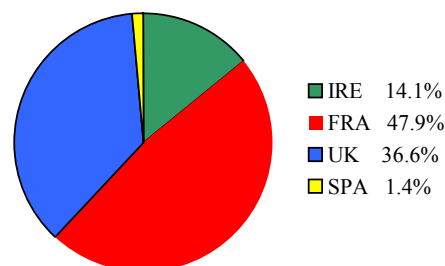
- There is no ICES assessment for this stock.
- International landings in 2001 were estimated to be 109 t.
- There are no precautionary reference points proposed for this stock.

## CURRENT MANAGEMENT

- The TAC covers Vb, VI, XII and XIV.
- The 2002 TAC was 1,100 t with an associated Irish quota of 155 t.
- Currently the TAC is not restrictive, but the Irish quota could become restrictive if the TAC is reduced.
- There are no explicit management objectives or plans for this stock.



Red Boxes-TAC/Management Areas



- MFSD advises that management objectives be established and that a management plan be developed and implemented for fishery catching pollack.

## MFSD ECONOMIC COMMENTS

- The value of the 2001 Irish quota was €228,000.
- The value of the 2001 Irish landings from Division VI was €160,000.
- Pollack catches in the northwest are small but a very valuable component of the catch for some inshore vessels.

## ADDITIONAL INFORMATION

1. Estimated Irish landings were 108 t in 2001.
2. The Irish quota is not restrictive, but 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. MFSD do not sample pollack in Sub-area VI.

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
TAC	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100
International Landings	270	220	340	334	503	334	248	226	384*	190*	109*

\* Preliminary data for France also comprises Sub-areas XII and XIV and Division Vb.

# West of Ireland and Celtic Sea Pollack

(Sub-area VII)



Marine Fisheries Services Division

## MFSD – ADVICE

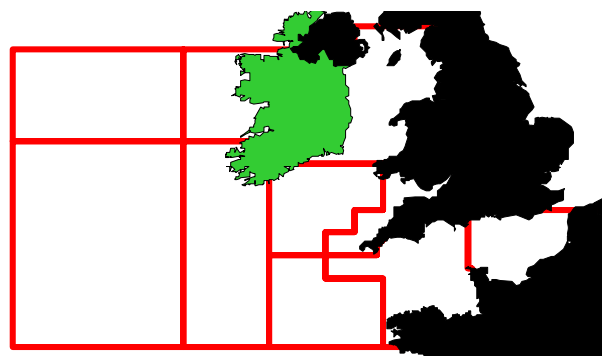
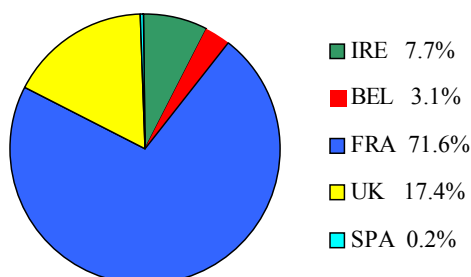
In the absence of ICES advice for this stock, MFSD advise that the TAC in 2003 should not exceed 17,000 t. This translates to an Irish quota of 1,300 t. MFSD point out that there is no scientific basis for the proposed TAC and that the current TAC is far in excess of recent annual landings. MFSD advises that a programme be initiated to evaluate stock status in order that management objectives and a management plan be formulated for this stock.

## STATE OF THE STOCK

- There is no ICES assessment for this stock in Sub-area VII.
- Preliminary international landings in 2001 were estimated to be 4,588 t.
- The status of the stock is unknown.
- There are no precautionary reference points proposed for this stock.

## CURRENT MANAGEMENT

- The TAC area covers Sub-area VII.
- The 2002 TAC was 17,000 t with an associated Irish quota of 1,300 t.



Red Boxes-TAC/Management Areas

- There are no explicit management objectives or plans for this stock.
- MFSD advises that management objectives be established and that a management plan be developed and implemented for the fishery catching pollack.

## MFSD ECONOMIC COMMENTS

- The value of the 2001 Irish quota was €2 million.
- The value of the 2001 Irish landings from Sub-area VII was €1.6 million.
- Pollack are a very valuable component of the catch for some inshore vessels.

## ADDITIONAL INFORMATION

1. Estimated Irish landings were 1,057 t in 2001.
2. The Irish quota is not restrictive but this fishery is particularly important to smaller Irish vessels operating off the southwest and west coasts.
3. Pollack is taken in many localised inshore fisheries.
4. There is little scientific information on the biology and stock structure of pollack in VII.

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
TAC	14,000	14,000	14,000	14,000	14,000	14,000	17,000	17,000	17,000	17,000	17,000
International Landings	5,850	5,310	5,320	6,031	5,683	6,493	6,073	5,709	3,294*	3,786*	4,588*

\* Data are preliminary for 1999 and 2001.

# North Sea and West of Scotland Saithe

(Sub-areas IV & VI and Division IIIa)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the STECF and ICES advice for other West of Scotland stocks is predicated primarily on the need to rebuild cod and haddock stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

MFSD point out that Irish vessels catch saithe in mixed fisheries targeting haddock and cod in Sub-area VI. Therefore MFSD advise that unless ways to harvest saithe without incidental catch or discards of haddock or cod can be demonstrated, fishing for saithe should not be permitted.

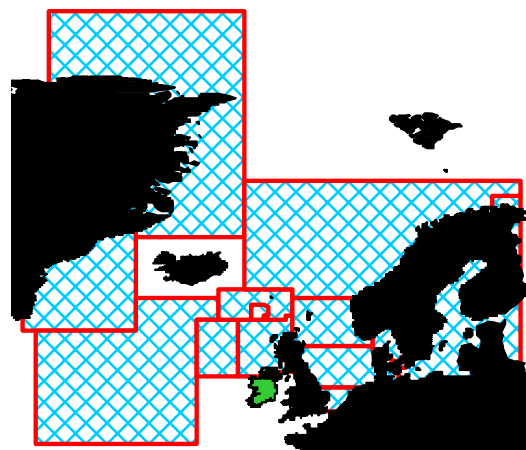
MFSD agrees with the ICES advice that, if any fisheries on saithe are permitted, despite the advice on cod, then fishing mortality in 2003 should be less than  $F_{pa}$  corresponding to landings in 2003 of less than 193 000 t. This corresponds to a TAC in Sub-areas VI, XII and XIV and Division Vb (EU waters) of 17,133 t. This translates to an Irish quota of 520 t.

## STATE OF THE STOCK

- This stock is considered to be within safe biological limits.
- Total estimated international landings in Sub-area VI for 2001 were 8,678 t. Landings began declining in 1985, but have stabilised over the last decade. In recent years, the component of the stock in Sub-area VI has only contributed about 10% of the total landings from Sub-areas III, IV and VI combined.
- The current  $F$  is 0.25 and is below the proposed  $F_{pa}$  of 0.40. Fishing mortality has declined from 1986 to 2001, and is estimated to be below  $F_{pa}$  in 2001.
- Recruitment since 1996 has been below average with the exception of 1999.
- The current SSB is 298,000 t and is above the proposed  $B_{pa}$  of 200,000 t. SSB has remained near or below  $B_{pa}$  since 1984 to 1996, but it has increased in the late 1990s and is estimated to be above  $B_{pa}$  since 1999.
- At current fishing mortality SSB is predicted to increase from 298,000 t in 2002 to 338,000 t in 2004.

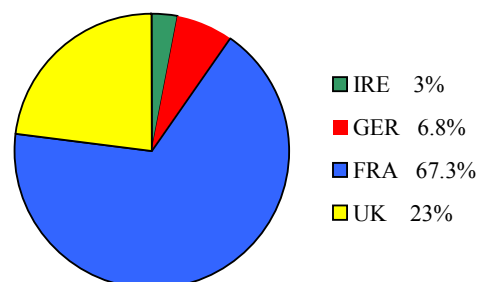
## CURRENT MANAGEMENT

- 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.



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

- The total TAC for Division VIb and Sub-areas VI, XII and XIV in 2001 was 14,000 t, with an allocated Irish quota of 425 t.



- There is a long term management plan for this stock based on the EU- Norway agreement that states that every effort be made to maintain SSB above 106,000 t ( $B_{lim}$ ) and a TAC consistent with  $F = 0.4$ . Should SSB fall below  $B_{pa}$  this fishing mortality will be adapted in the light of the prevailing conditions.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was €0.5 m.
- The value of Irish landings in 2001 from Sub-area VI was €0.5 m.
- Irish landings of saithe are low, but the occasional high catches taken can be profitable.



- This is a valuable species for French trawlers operating in the North Sea and west of Scotland. These vessels alternate between deepwater fishing and targeting saithe on the shelf edge.

## ADDITIONAL INFORMATION

1. The assessment remains sensitive to the addition of a single year's data. However, the general tendency for this assessment to overestimate  $F$  and underestimate SSB appears to be reduced.
2. Ireland took 397 t in 2001.
3. French deep-water fleets operating on the shelf edge and Scottish inshore fleets exploit the saithe fishery in Sub-area VI. Saithe in the North Sea are mainly taken in a directed trawl fishery in deep water near the northern shelf edge and the Norwegian Deep. The main fishery developed in the beginning of the 1970s. The fishery in area VI consists largely of a directed French deepwater fishery operating on the shelf edge and a Scottish fishery operating inshore. The directed fishery started in the early 1970s.
4. Saithe is usually caught in mixed gadoid fisheries in Sub-area VI by trawlers operating out of Killybegs and Greencastle.
5. Irish sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001.
6. MFSD initiated a sampling programme for saithe on the 2002 groundfish survey.
7. There is no long term gain in yield by increasing current fishing mortality. Restricting landings to 132,000 t would maintain status quo fishing mortality and would increase stability of catches in the medium term.

## ICES ADVICE 3.5.5

### State of stock/exploitation:

The stock is within safe biological limits. Fishing mortality has declined from 1986 to 2001, and is estimated below  $F_{pa}$  in 2001. SSB has remained near or below  $B_{pa}$  since 1984, but it has increased in the late 1990s and is estimated to be above  $B_{pa}$  since 1999.

### Management objectives:

In 1999 the EU and Norway have "agreed to implement a long-term management plan for the saithe stock, which is consistent with the precautionary approach and is intended to constrain harvesting within safe biological limits and designed to provide for sustainable fisheries and greater potential yield. The plan shall consist of the following elements:

1. Every effort shall be made to maintain a minimum level of SSB greater than 106 000 t ( $B_{lim}$ ).
2. For 2000 and subsequent years the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality rate of 0.40 for appropriate age groups as defined by ICES.
3. Should the SSB fall below a reference point of 200 000 t ( $B_{pa}$ ), the fishing mortality referred to under paragraph 2 shall be adapted in the light of scientific estimates of the conditions then prevailing. Such adaptation shall ensure a safe and rapid recovery of SSB to a level in excess of 200 000 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 the agreed Precautionary Approach reference points in the management plan are consistent with the precautionary approach, provided they are used as upper bounds on  $F$  and lower bounds on SSB, and not as targets.

### Precautionary Approach reference points (unchanged since 1999):

ICES considers that:	ICES proposes that:
$B_{lim}$ is 106 000 t	$B_{pa}$ be set at 200 000 t
$F_{lim}$ is 0.60	$F_{pa}$ be set at 0.40

### Technical basis:

$B_{lim}=B_{loss}=106\,000\text{ t.}$	$B_{pa}$ Impaired recruitment at SSB less than 200 000 t. This affords a high probability of maintaining SSB above $B_{lim}$ , taking into account the uncertainty of assessments. Below this value the probability of below average recruitment increases.
$F_{lim}=F_{loss}=0.6$ , the fishing mortality estimated to lead to potential stock collapse.	$F_{pa}=5^{th}$ percentile of $F_{loss}$ (0.45) implies that $B_{eq} < B_{pa}$ . $F = 0.4$ implies that $B_{eq} > B_{pa}$ and $P(SSB_{MT} < B_{pa}) < 10\%$ . This $F$ is considered to provide approximately 95% probability of avoiding $F_{lim}$ , taking into account the uncertainty of the assessment.

### Advice on management:

ICES advises that fishing mortality in 2003 should be less than  $F_{pa}$  corresponding to landings in 2003 of less than 193 000 t.

### Relevant factors to be considered in management:

There is no long term gain in yield by increasing current fishing mortality. Restricting landings to 132 000 t would maintain status quo fishing mortality and would increase

stability of catches in the medium term.

The assessment is considered to be uncertain because there are few survey data to confirm the stock trends as calibrated by commercial CPUE. The catch forecast is mainly driven by the assumption of average recruitment,

with about one quarter of the forecast 2003 landings and 2004 SSB originating from this assumption. This means that the forecasts may not track fluctuations in the stock particularly well. Medium-term considerations indicate that continued fishing at  $F_{sq}$  implies low probability of falling below  $B_{pa}$ .

#### Catch forecast for 2003:

Basis:  $F_{2002} = F(TAC) = 0.29$ ; Landings (2002) = 149; SSB(2003) = 325.

F(2003 onwards)	Basis	Total Landings	Landings IIIa & IV <sup>*)</sup> (2003)	Landings VI <sup>*)</sup> (2003)	SSB(2004)
0.15	$0.6 * F_{sq}$	84	76.4	7.6	386
0.20	$0.8 * F_{sq}$	109	99.2	9.8	361
0.25	$1.0 * F_{sq}$	132	120.1	11.9	338
0.30	$1.2 * F_{sq}$	153	139.2	13.8	317
0.34	$1.4 * F_{sq}$	173	157.4	15.6	297
0.40	$1.61 * F_{sq} (=F_{pa})$	193	175.6	17.4	277
0.44	$1.8 * F_{sq}$	211	192.0	19.0	261

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

\*Landings split according to average in 1993-1998.

#### Medium- and long-term projections:

Results of the medium-term analysis indicate that under the *status quo* fishing mortality there is a low probability of falling below  $B_{pa}$  in the medium-term.

#### Comparison with previous assessment and advice:

This assessment gives a new estimate of fishing mortality in 2000 which is 11% lower than the estimate from last year, and estimates of SSB in 2000 and 2001 which are respectively 6% lower and higher compared the estimates from last year. The general tendency of this assessment to overestimate F and underestimate SSB appears to be reduced.

#### Elaboration and special comment:

Saithe in the North Sea are mainly taken in a direct trawl fishery in deep water near the Northern Shelf edge and the Norwegian deeps. Norwegian, French and German trawlers take the majority of the catches. In the first half of the year the fishery is directed towards mature fish, while immature fish dominate in the catches the rest of the year. The main fishery was developed in the beginning of 1970s. In later years, the trawlers have also exploited deep-water fish.

The fishery in Sub-area VI consists largely of a directed French, German and Norwegian deep-water fishery operating on the shelf edge, and a Scottish fishery operating inshore.

The proportional contribution of saithe landings by area over different periods is as follows:

Period	Area IIIa & IV	Area VI
1982-1998	86%	14%
1988-1998	87%	13%
1993-1998	91%	9%

Analytical assessment is based on catch-at-age analysis using CPUE information from commercial fisheries. Lack of recruitment indices for recent and incoming year classes makes catch predictions imprecise.

Before 1999, saithe in Subarea VI and saithe in Subarea IV and Division IIIa were assessed as two separate stocks. The ICES advice applies to the combined areas IIIa, IV, and VI.

#### Source of information:

Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 11 – 20 June 2002 (ICES CM 2003/ACFM: 02).

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

	Fish Mort Ages 2-6	Yield/R	SSB/R
Average Current	0.280	0.632	1.401
$F_{max}$	0.170	0.654	2.409
$F_{0.1}$	0.090	0.604	4.108
$F_{med}$	0.412	0.600	0.857

# **Catch data (Tables 3.5.5.1-2):**

## **Saithe in IV and IIIa**

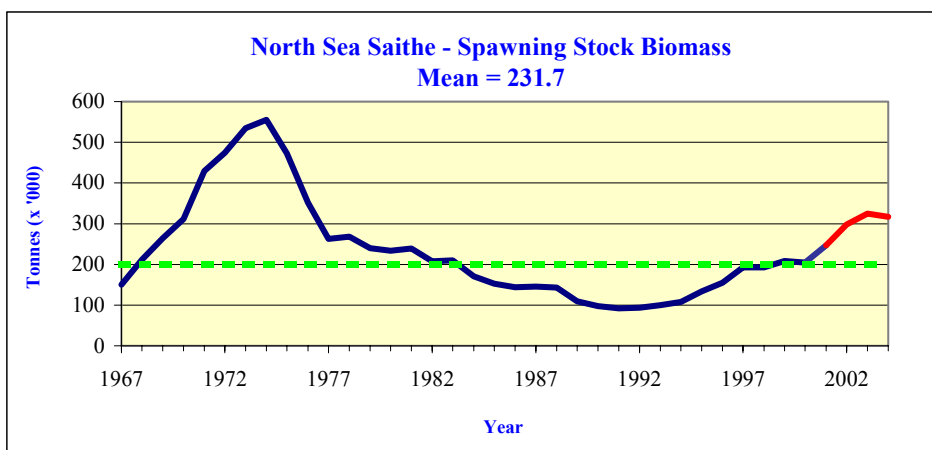
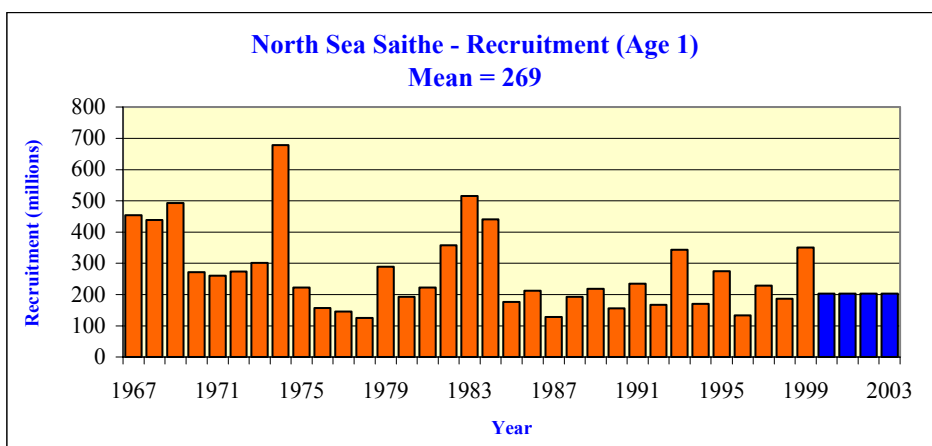
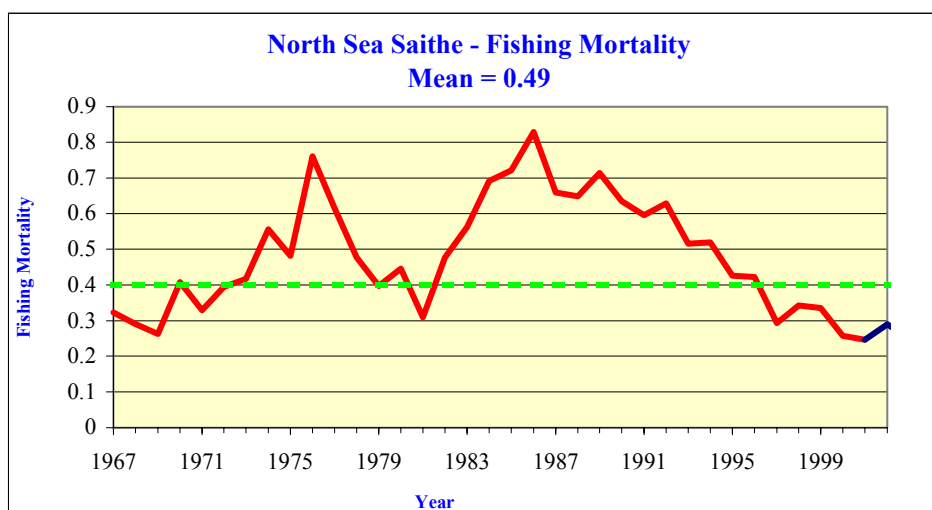
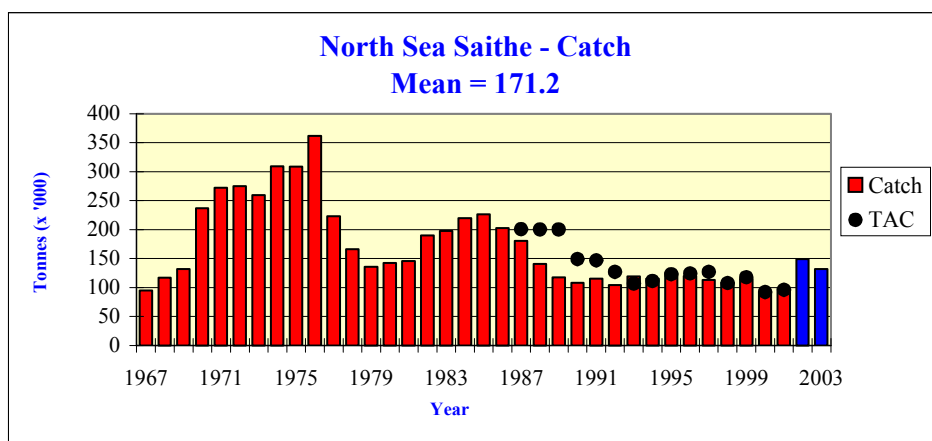
Year	ICES Advice	Predicted land-ings corresp. to advice	Agreed TAC	Official landings	ACFM landings
1987	Reduce F	<198	173	154	149
1988	60% of F(86); TAC	156	165	113	107
1989	No increase in F; TAC	170	170	92	92
1990	No increase in F; TAC	120	120	85	88
1991	No increase in F; TAC	125	125	93	99
1992	No increase 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	86	90
2002	$F < F_{pa}$	<135	135		
2003	$F < F_{pa}$	<176			

Weights in '000 t.

## **Saithe in VI**

Year	ICES Advice	Predicted land-ings corresp. to advice	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		
2003	$F < F_{pa}$	<17			

<sup>1</sup>Status quo catch. <sup>2</sup>Incomplete data. Weights in '000 t.



**Table 3.5.5.1** Nominal catch (in tonnes) of Saithe in Sub-area IV and Division IIIa and Subarea VI, 1992-2001, as officially reported to ICES.

**Sub-area IV and Division IIIa**

Country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	70	113	130	228	157	254	249	200	122	24
Denmark	4,669	4,232	4,305	4,388	4,705	4,513	3,967	4,494	3,529	3,575
Faroe Islands	2,480	2,875	1,780	3,808	617	158	1,298	1,101	-	-
France	9,061	15,258	13,612	11,224	12,336	10,932	11,786 <sup>1</sup>	24,305 <sup>12</sup>	20,399 <sup>12</sup>	21,247 <sup>2</sup>
Germany	13,177	14,814	10,013	12,093	11,567	12,581	10,117	10,481	9,273	9,479
Netherlands	180	79	18	9	17	40	7	7	11	20
Norway	48,205	47,669	47,042	53,793	55,531	46,424	50,254	56,150	42,735 <sup>1</sup>	43,504
Poland	1,238	937	151	592	365	822	813	862	747	727
Sweden	3,302	4,955	5,366	1,891	1,771	1,647	1,857	1,929	1,421	1,510
UK (E. & W.)	2,893	2,429	2,354	2,522	2,864	2,556	2,293	2,874	1,227	-
UK (Scotland)	6,881	5,929	5,566	6,341	5,848	6,329	5,353	5,420	5,484	-
United Kingdom	-	-	-	-	-	-	-	-	-	6,282
U.S.S.R.	-	-	-	-	-	-	-	-	67	-
Total reported	92,156	99,290	90,337	96,889	95,778	86,256	87,994	107,823	85,080	86,368
Unallocated	187	5,840	12,098	16,525	14,458	17,006	12,983	-175	1,945	3,305
W.G. estimate	92,343	105,130	102,435	113,414	110,236	103,322	100,263	107,314	87,449	89,673
TAC	110,000	93,000	97,000	107,000	111,000	115,000	97,000	110,000	85,000	87,000

Preliminary values for France (1989-1995, 1998-2000), Norway (1995, 1997-2000), Sweden (1999).

Includes IIa (EC), IIIa-d (EC) and IV: France (1989-1991, 1994, 1999-2000).

Includes Estonia: USSR (1991).

**Sub-area VI**

Country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	2	2	-	-	-	-	-	-	-	-
Denmark	1	2	-	-	1	-	-	-	-	-
Faroe Islands	1	-	-	-	3	1	-	-	-	-
France	6,534	10,216	8,423	6,145	4,781	4,662	3,635 <sup>1</sup>	3,467 <sup>13</sup>	3,314 <sup>13</sup>	5,176 <sup>1</sup>
Germany	685	222	524	321	1,012	492	506	250	305	466
Ireland	278	317	438	530	419	411	216	320	449	422
Norway	67	59	74	35	34	26	41	126	58 <sup>1</sup>	92
Spain	-	-	-	-	-	13	54	23	3	-
Portugal	-	-	-	-	-	1	-	-	-	-
UK (E. & W. & N.I.)	540	799	744	317	708	294	526	503	276	-
UK (Scotland)	2,708	2,903	2,828	3,279	2,435	2,659	2,402	2,084	2,463	-
United Kingdom	-	-	-	-	-	-	-	-	-	2,522
Russia	-	-	-	-	-	-	-	3	25	-
Total reported	10,816	14,520	13,031	10,627	9,393	8,559	7,380	6,776	6,423	8,678
Unallocated	988	-577	-210	1,143	40	859	1,054	566	-533	-306
W.G. estimate	11,804	13,943	12,821	11,770	9,433	9,418	8,434	7,342	5,890	8,372
TAC	17,000	14,000	14,000	16,000	13,000	12,000	10,900	7,500	7,000	9,000

<sup>1</sup>Preliminary values: France (1998-2000), Norway (1994, 1997-1999).

<sup>2</sup>Includes Division Vb (EC): France (1991).

<sup>3</sup>Reported by TAC area, Vb (EC), VI, XII and XIV: France (1999-2000).

**Sub-areas IV and VI and Division IIIa**

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
W.G. estimate	104,147	119,073	115,256	125,184	119,669	112,740	108,697	114,656	93,600	98,000

**Table 3.5.5.2** Saithe in Subarea IV, Division IIIa (Skagerrak) & Sub-area VI

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-6
1967	454000	150800	94500	0.322
1968	438000	211700	116800	0.291
1969	492000	264000	131900	0.262
1970	271000	312000	236600	0.408
1971	261000	429500	272500	0.329
1972	273000	474000	275100	0.395
1973	301000	534400	259600	0.416
1974	678000	554800	309400	0.557
1975	222000	471900	308900	0.482
1976	157000	351400	361700	0.761
1977	145000	262900	223400	0.616
1978	125000	267600	166200	0.478
1979	289000	240400	136000	0.397
1980	192000	234100	142400	0.446
1981	222000	239200	146100	0.309
1982	358000	207500	189900	0.477
1983	515000	210000	197800	0.563
1984	440000	171300	219600	0.691
1985	176000	153300	226100	0.721
1986	212000	143800	202800	0.829
1987	128000	145500	180800	0.660
1988	192000	143000	140800	0.648
1989	218000	110100	117600	0.714
1990	156000	97400	107900	0.636
1991	235000	91900	115600	0.595
1992	168000	93900	104100	0.629
1993	343000	100300	119100	0.516
1994	171000	108300	115300	0.519
1995	275000	133800	125200	0.426
1996	134000	154700	119700	0.422
1997	229000	192700	112700	0.294
1998	187000	192800	108700	0.343
1999	351000	208500	114700	0.335
2000	203000*	205200	93600	0.258
2001	203000*	247000	98000	0.246
2002	203000*	298000		0.280
Average	267139	233547	171174	0.480

\* GM mean

# West of Ireland and Celtic Sea Saithe

(Sub-area VII)



Marine Fisheries Services Division

## MFSD – ADVICE

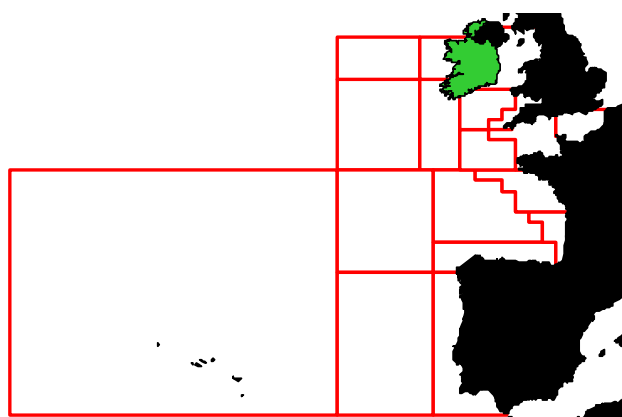
In the absence of ICES advice for this stock, MFSD advise that the TAC for 2003 should not exceed 8,710 t. This translates into an Irish quota of 2,450 t. MFSD point out that there is no scientific basis for the proposed TAC and that the current TAC is far in excess of recent annual landings. MFSD advises that a programme be initiated to evaluate stock status, so that management objectives and a management plan can be formulated for this stock.

## STATE OF THE STOCK

- There is no ICES assessment for this stock.
- International landings increased to around 10,000 t in the late 1980's and early 1990's. Between 1992 and 1996 landings were around 6,000 t to 7,000 t. However, landings have declined somewhat since 1997 and catch data are incomplete for some countries.
- There are no precautionary reference points proposed for this stock.

## CURRENT MANAGEMENT

- The TAC covers VII, VIII, IX, and X.

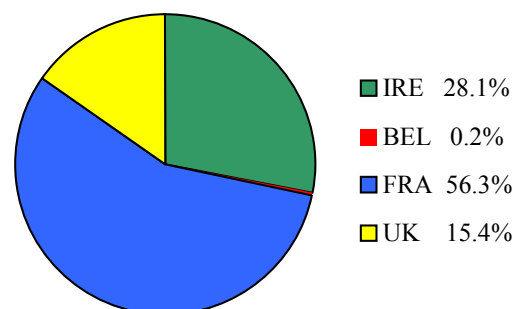


Red Boxes-TAC/Management Areas

- The 2002 TAC was 8,710 t with an associated Irish quota of 2,450 t.
- Currently the TAC is not restrictive.
- There are no explicit management objectives or plans

for this stock.

- MFSD advises that management objectives be established and that a management plan be developed and implemented for fishery catching saithe.



## MFSD ECONOMIC COMMENTS

- The value of the 2001 Irish quota was €3.1 million.
- The value of the 2001 Irish landings from Division VI was €1.8 million.
- Saithe catches are a valuable component of the catch for Irish vessels operating out of Dingle, Dunmore East, Greencastle and Killybegs.

## ADDITIONAL INFORMATION

1. Estimated Irish landings were 1,471 t in 2001, an increase of 30% of the 2000 landings.
2. The Irish fishery takes place mainly in VIIg and VIIj by vessels using gillnets and otter trawls. There are also some catches made with other gears including seine nets.
3. Saithe are a pelagic shoaling species and the stock structure and biology of this species is poorly understood.
4. Irish sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001.
5. MFSD initiated a sampling programme for saithe on the 2002 groundfish survey.



Saithe Division VII official nominal landings by country  
(Source: ICES STATLANT 27A database)

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Belgium	15	8	11	3	9	18	20	16	23	13	6
Denmark	6	.	.	.	.	.	.	.	1	.	.
France	2,317	3,056	2,406	3,415	2,503	6,101	8,256	6,210	6,185	8,278	6,625
Germany,Fed.Rep	6	.	.	2	.	.	.	.	124	30	.
Ireland	1,120	1,093	1,264	942	1,129	1,088	677	1,624	1,400	2,165	1,068
Netherlands	3	66	2	3	.	.	.	.	.	.	.
Norway	.	.	.	2	<0.5	3	38	2	1	12	15
Poland	.	.	.	.	.	.	.	.	.	.	.
Spain	.	128	98	46	99	50	.	.	.	.	.
U.S.S.R	.	.	.	.	.	.	.	.	.	.	.
UK (Ch. Islands)	.	.	.	.	.	.	.	.	.	.	.
UK (Eng. & Wales)	100	120	238	166	954	412	249	372	762	.	.
UK (Eng.Wal.NI)	.	.	.	.	.	.	.	.	.	1,157	1,021
UK (Guernsey)	.	.	5	5	6	13	2	3	4	3	3
UK (Isle of Man)	19	36	34	16	27	9	6	3	4	2	3
UK (N.Ireland)	301	577	872	668	411	665	635	571	491	.	.
UK (Scotland)	56	92	119	138	140	477	488	1,064	143	131	1,040
<b>Total</b>	<b>3,943</b>	<b>5,176</b>	<b>5,049</b>	<b>5,406</b>	<b>5,278</b>	<b>8,836</b>	<b>10,371</b>	<b>9,865</b>	<b>9,138</b>	<b>11,791</b>	<b>9,781</b>

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 <sup>1</sup>
Belgium	4	2	3	6	5	3	6	7	7	4	6
Denmark	.	<0.5	.	1	.	.	.	.	.	.	.
France	7,286	1,911	1,778	3,234	2,119	2,101	1,615	1,537	.	.	661
Germany,Fed.Rep	.	.	.	.	.	.	.	.	.	.	.
Ireland <sup>2</sup>	1,495	1,721	2,010	1,915	2,382	2,062	1,384	1,431	1,352	.	1,471
Netherlands	1	.	.	.	.	3	2	.	.	.	.
Norway	29	38	<0.5	7	14	13	7	.	5	1	67
Poland	.	.	.	.	.	.	.	.	.	.	.
Spain	.	.	.	.	13	27	23	69	34	35	.
U.S.S.R	.	.	.	.	.	.	.	.	.	.	.
UK (Ch. Islands)	.	.	.	.	.	2	.	.	.	.	.
UK (Eng. & Wales)	.	.	.	.	.	.	.	.	.	.	.
UK (Eng.Wal.NI)	1,040	1,217	984	1,059	991	1,340	954	594	413	291	305
UK (Guernsey)	<0.5	1	.	.	8	.	4	<0.5	2	.	.
UK (Isle of Man)	10	8	5	4	11	11	9	7	2	1	<0.5
UK (N.Ireland)	.	.	.	.	.	.	.	.	.	.	.
UK (Scotland)	1,094	705	1,114	979	862	878	557	382	299	162	33
<b>Total</b>	<b>10,959</b>	<b>5,603</b>	<b>5,894</b>	<b>7,205</b>	<b>6,405</b>	<b>6,440</b>	<b>4,561</b>	<b>4,027</b>	<b>2,114</b>	<b>494</b>	

<sup>1</sup> Official landings data were available from ICES for Sub-area VII

<sup>2</sup> Ireland landings from 1995 from DCMNR Logbook databases

# Arctic Stocks (Cod, Haddock and Saithe)

No ACFM information has been included for these stocks

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



## Marine Fisheries Services Division

There are a number of Arctic stocks in which Ireland has an interest. This is because the EU has quota on these stocks and Ireland has a small but valuable share of this quota.

Ireland has taken part in these fisheries in recent years and the main catches have been taken by a small number of Killybegs vessels that started fishing in the 1990s. In 2000 and 2001 other vessels, both trawlers and long liners, have joined the Irish fleet as a result of the white fish fleet renewal programme and these have also exploited the Arctic fisheries. The fisheries are particularly important to Norway and Russia but a number of other countries including Iceland, Faroe Is. United Kingdom, Spain, Poland and Greenland also take very important and substantial 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 are presented in the ICES Report of the Northern Pelagic and Blue Whiting Working Group and in the Report on the Arctic Fisheries Working Group.

## Cod in Sub areas I and II

### North-East Arctic Cod

#### MFSD – ADVICE

**Ireland has a small but valuable quota in this stock. MFSD endorses the ICES and STECF advice that states that in order to harvest the stock within safe biological limits ICES recommends a considerable reduction in fishing mortality to below  $F_{pa}(0.42)$ . This corresponds to catches in 2003 of less than 305,000 t. This would imply a reduction in the Irish quota from 245 t to about 195 t.**

#### STATE OF THE STOCK

- There are serious concerns for this stock and it is outside safe biological limits.
- The landing have fluctuated over the time period 1987 to 2001 between 762,000 t and 414,000 t
- Fishing mortality in 2001 was 0.84 which, although lower than in recent years, is still very high and is not sustainable.
- Recruitment was high in the mid 1990's but surveys

indicate that all recent year classes have been very poor.

- The SSB in 2002 was estimated to be 429,700 t. and has decreased substantially since 1992 when it was estimated to be 867,000 t. It is now below  $B_{pa}$  which is 500,000 t

#### CURRENT MANAGEMENT

- The TAC area corresponds with the assessment area.
- The TAC is already agreed for this stock for 2003 at 435,000 t, including 40,000 t for Norwegian coastal cod. This TAC is agreed as a result of the Russian-Norwegian Fisheries Agreement. However it may be revised downwards as a result of new advice.
- The overall TAC in 2002 was 435,000 t (including 40,000 t for the Norwegian inshore cod). The EU quota was 16,355 t. and the Irish allocation was 245 t. There is also an EU quota of 100 t in Area I and IIb (Svalbard zone) but this is not divided into national quota.
- The management objective is to maintain the SSB above 500,000 t with an appropriate fishing mortality.

#### ADDITIONAL INFORMATION

1. Assessments prior to that of 2001 have overestimated stock size and under estimated fishing mortality but the most recent assessment is considered to be accurate. The stock sizes predicted by the 2002 assessment are higher than those predicted by previous assessments -mainly due to a much higher maturation rate for 6-8 year old cod.
2. The total catch taken from this fishery in 2001 was estimated to be above 426,000 t. The Irish catch was 197 t in the Norwegian zone and about 57 t in the Svalbard zone.
3. The Irish catch was taken as part of the EU quota.
4. The main catches are taken by Norway, Russia, Faroe Is. and United Kingdom.
5. Although misreporting was not considered to be a problem in this fishery there is now increasing evidence to suggest that under-reporting of catches during the 1990s and in recent years may be significant.
6. The main gears used are trawls in off shore waters and gillnets, longlines, handlines and Danish seines in inshore waters.
7. This is an extremely important fishery, especially for Norway and Russia.
8. The fishery was an important source of revenue for a small number of vessels from Killybegs. Although Irish catches are small the fishery may remain important because of the additional white fish vessels that

have joined the Irish fleet in the recent years.

9. Despite a strict management regime in operation for this fishery, which includes many additional management measures, inspections at sea and continuous surveys during the main fishing seasons, the stock has still declined.
10. The state of the cod stock appears to be linked to the capelin stock which has increased in recent years and is expected to remain at a high level in 2001. Capelin are an important source of food for cod and therefore a strong capelin stock is beneficial to the cod stock.
11. Recent estimates have overestimated the SSB and underestimated the fishing mortality for unknown reasons.

## North-East Arctic Haddock

### MFSD – ADVICE

**MFSD endorses the ICES and STECF advice for this fishery which recommends that, the fishing mortality should be reduced to below  $F_{pa}=0.35$  corresponding to catches of less than 101,000 t in 2003.**

### STATE OF THE STOCK

- There is concern for the state of this stock which is being harvested outside safe biological limits.
- Landings have fluctuated very much over the years, as in most haddock stocks, but have decreased from 173,000 t in 1996 to less than 81,000 t in 2001.
- The  $F$  in 2001 was estimated to be 0.46. Fishing mortality has gradually increased in the 1990s as catches increased but has declined in the last two years.. The proposed  $F_{pa}$  is 0.35.
- The exceptionally strong 1990 year has now declined. The 1999 and 2000 year classes are expected to be above average. Exceptionally strong year classes are a feature of this fishery.
- The SSB in 2002 was estimated to 72,000 t which is below the  $B_{pa}$  of 80,000 t. The SSB is expected to increase in the short term and to exceed the  $B_{pa}$ .

### CURRENT MANAGEMENT

- The TAC for this stock applies to Sub-areas I and II, excluding Norwegian coastal haddock. The assessment area covers Sub areas I and Divs. IIa and IIb.
- The EU share of this TAC is combined with that for the North Sea. The agreed TAC for Sub-areas I and II for 2000 was 62,000 t. Ireland is permitted a by catch of haddock in the cod fishery.

### ADDITIONAL INFORMATION

1. The assessment is considered to be more accurate than those of recent years.
2. The total catch taken from this fishery in 2001 t was about 81,000 t. The Irish catch was 43 t.
3. The main catches are taken by Norway and Russia.

Small catches were taken by a number of other countries.

4. The main catches are taken as by-catch in the fisheries for cod. Restrictions of haddock catches therefore depend on the management of North-East Arctic Cod.
5. Misreporting does not appear to be a problem.
6. The fishery, like that for the Arctic cod, is heavily monitored and regulated.

## North-East Arctic Saithe

### MFSD – ADVICE

**MFSD endorses the ICES and STECF advice that fishing mortality for this stock should be reduced to below  $F_{pa}$ . This corresponds to catches in 2003 less than 168,000 t.**

### STATE OF THE STOCK

- There is no immediate concern for the state of this stock which is at present within safe biological limits.
- Landings have been high from 1990 to 2001 between 96,000 t and 168,000 t landings In 2001 were about 134,100 t
- Fishing mortality has declined since 1990 and in 2001 was estimated to be 0.22 which is below the  $F_{pa}$  of 0.26.
- Several above average year classes recruited to the stock in the late eighties but the last four year classes have been below average.
- SSB in 2002 was estimated to be 360,00 t. SSB increased in the nineties and reached a peak in 1998 of over 438,000 t. This was mainly because of the good recruitment. The  $B_{pa}$  is 150,000 t
- The SSB is expected to increase in the short term at the present fishing mortality.

### CURRENT MANAGEMENT

- The 2002 TAC set by Norwegian authorities for Sub-areas I and II is 135,000 t. The EU has also set a TAC for 2002 of 3,240 t.
- Ireland is permitted to take a small by-catch of saithe in the cod fishery.

### ADDITIONAL INFORMATION

1. The quality of the assessment is adequate
2. The total catch taken from this fishery in 2001 was 134,100 t. The Irish catch was minimal.
3. The main catches were taken by Norway. Small catches were taken by a number of other countries.
4. The fishery is dominated by purse seine and trawls.
5. The main catches appear to be taken as by-catch in the cod fishery.

# 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 Fisheries Services Division

## MFSD – ADVICE

MFSD agrees with ICES advice that in light of the general reduction in SSB and poor recruitment since 1997, a recovery plan should be implemented to ensure safe and rapid recovery of SSB to in excess of  $B_{pa}$ . MFSD advises that the chosen recovery plan should:

- ensure increases in SSB that are likely to be detectable on an annual basis despite assessment uncertainty,
- allow for a relatively rapid recovery of the SSB to  $B_{pa}$ ,
- limit fishing mortality at less than precautionary levels (i.e.  $F < F_{pa}$ ), and,
- incorporate a modest degree of change in annual TAC to minimise disruption of the fisheries.

MFSD agrees with ICES that such a recovery plan can only be implemented if there is full compliance by all fisheries harvesting Northern hake. This in turn requires strong support from the industry for the provision of the plan, effective monitoring of the fisheries, and enforcement of the fishery regulations. This will also require effective control of effort in these mixed species fisheries at substantially reduced levels.

MFSD stresses that an improvement in the selection pattern alone is unlikely to be sufficient to reduce exploitation to the level needed to rebuild the hake stock. To reach this goal an additional reduction in mortality

is needed. Reducing fishing mortality by setting the TAC at a low level has been shown to be ineffective due to TAC overshoot and/or misreporting. Therefore MFSD agrees with ICES that in addition to TAC constraints, restrictions in effort of fleets exploiting/targeting hake should be implemented. Closed areas and seasons may contribute to stock recovery, but only if accompanied by major reductions in effort.

MFSD agrees that recovery scenario 8 (as evaluated by ICES) is consistent with the Precautionary Approach. However, MFSD notes that this scenario assumes a *status quo* catch of 41,000 t in 2002; 40% higher than the 2002 TAC of 27,000 t. The scenario also assumes that the modeled 2003 TAC of 21,000 t (20% < agreed TAC for 2002) is not exceeded under the recovery plan. MFSD stresses that the projected evolution of the stock under the recovery plan is entirely dependent on these assumptions. Furthermore, irreconcilable inconsistencies have been noted by STECF between the results of the recovery plan simulations (Page 337 in the ICES report) and the time for recovery given in the ICES advice.

MFSD agrees with STECF that scenario 8 is only one of a variety of options for recovery that is consistent with the precautionary approach. MFSD therefore reproduces below the STECF catch option table detailing the catches and SSB for a range of reductions in fishing mortality and for two values for  $B_{pa}$ : 165,000 t and 143,000 t. The table also indicates the year when  $B_{pa}$  is reached under each scenario. Two values for  $B_{pa}$  were chosen: 165,000 t is the  $B_{pa}$  proposed by ICES and on which the ICES advice is based, 143,000 t is the value suggested by the European Commission in a letter to Member States following a revision of the hake assessment in 2002.

Table produced by STECF showing Yield, SSB and year in which SSB reaches  $B_{pa}$  under various assumptions of F that are consistent with the Precautionary Approach (i.e.  $F < F_{pa} = 0.2$ ).

Relative F	F (from 2003 onwards)	Yield t (2003)	SSB t (2004)	Year when SSB reaches 165,000 t		Year when SSB reaches 143,000 t	
				50%	90%	50%	90%
0.8	0.22 *	33,500	113,700	2008	2011	2006	2007
0.7	0.20	30,200	121,400	2006	2008	2005	2006
<b>0.6</b>	<b>0.17</b>	<b>25,900</b>	<b>121,600</b>	<b>2006</b>	<b>2006</b>	<b>2005</b>	<b>2005</b>
0.4	0.11	18,100	134,500	2005	2005	2004	2004
0.2	0.06	9,200	139,200	2004	2004	2003	2004
0.0	0.0	0	148,900	2004	2004	2003	2003

\* The F of 0.22 in the table is only consistent with the precautionary approach if a  $B_{pa}$  of 143,000 t is considered appropriate for this stock, in which case a  $F_{pa} = 0.24$  would apply. 50% and 90 % indicate the probability of success.

The catch option advised by MFSD (shown in bold type in the previous table) was chosen because it:

- is equivalent to  $F_{max}$  (the fishing mortality at which the maximum yield per recruit is achieved), and,
- suggests a safe and rapid rebuilding of the SSB to a level above  $B_{pa}$  in 2005-2006.

MFSD advise a reduction in  $F$  of around 40% in 2003, corresponding to a total catch of about 25,900 t and translating to an Irish quota of less than 801 t in 2003.

MFSD reiterates ICES advice that if such a recovery plan is not implemented, fishing mortality on hake should be as close to zero as possible.

2002 TAC allocation table Northern Hake with proposed MFSD advice for 2003

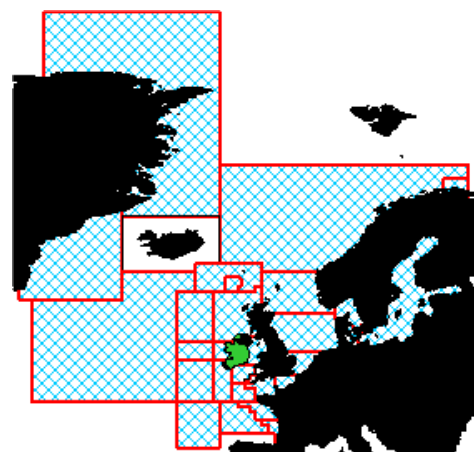
TAC Area	2002 TAC	2002 Irish Quota	MFSD Advice for 2003 TAC	MFSD Advice for 2003 Irish Quota
IIIa-d	813		781	
IIa,IV	946		909	
Vb,VI,VII, XII,XIV	15,118	834	14,524	801
VIIIabde	10,083		9,687	
Total	26,960	834	25,900	801

## STATE OF THE STOCK

- There are very serious concerns about this stock, and the stock is considered to be outside safe biological limits.
- Landings in 2001 were 37,200 t, 54% of peak in landings in 1989. Landings have been steadily decreasing since 1989.
- Fishing mortality is estimated as 0.25 in 2001, well above  $F_{pa} = 0.2$ .  $F$  has been above  $F_{pa}$  throughout the entire time series.
- Recruitments have been variable, though a downward trend is evident throughout the time series. Recruitments in 1997-2000 were the lowest in the series. Recruitment in 2001 is estimated to be about average at 256 million.
- Spawning Stock Biomass in 2002 was 115 400 t, compared with  $B_{pa} = 165,000$  t. SSB been relatively stable at or below  $B_{lim}$  since the early 1990's.
- At status quo  $F$ , SSB is expected to decrease from 115,400 t at the start of 2002 to 109,400 t in 2003 and then to 106,400 t in 2004.

## CURRENT MANAGEMENT

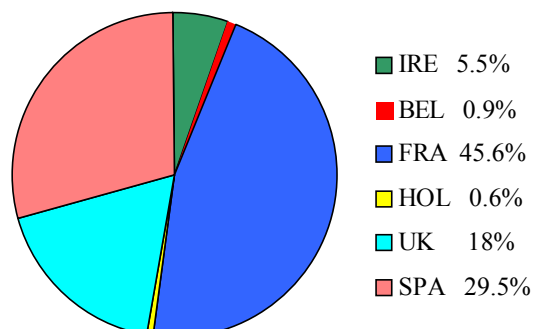
- The current assessment area covers four TAC areas: Divisions IIIa-d; IIa, IV; Vb,VI,VII; VIIIabde.
- The assessment area covers the stock's distribution in Sub-areas III, IV, V, VI, VII and VIIIabde.
- The TAC in 2002 for Vb, VI and VII was 15,118 t,



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

with an Irish quota of 834 t.

- Current management measures for hake are discussed in the section on recovery plans.
- A Management Plan for this stock must incorporate a rebuilding plan.
- Such a plan for the hake stock can be obtained by reducing the fishing mortality, or by a reduction in  $F$  to less than  $F_{pa}$ . Given the state of the stock, and the risk of impaired recruitment, any further delay in the definition/implementation of a recovery plan will be prejudicial to the stock and the fastest possible rebuilding to  $B_{pa}$  is strongly advised.



## MFSD – ECONOMIC COMMENTS

- The value of Irish landings in 2001 was € 3.8 m.
- The economic value of the Irish quota in 2001 was € 3.5 m.
- This is an economically important high-value species that is taken in multi species fisheries with a variety of species. Hake is important to a broad spectrum of the Irish fleet.

## ADDITIONAL INFORMATION

1. In 2001 STECF recommended that ICES revise the biomass reference points ( $B_{pa}$ ) for northern hake in 2002. A revision of  $B_{pa}$  from 165,000 t (dashed green line) to about 145,000 t (solid green line) was suggested. Whilst this was not implemented by ICES in 2002, the European Commission has suggested a value of 143,000 t in a letter to Member States



- following a revision of the hake assessment in 2002.
- Total landings of this stock in Vb, VI and VII were 25,500 t in 2001. Landings in the entire assessment area were 37,200 t in 2001.
  - Landings by Irish fleet in 2001 were 913 t, a decrease of 45% from 2000.
  - Mis-reporting in this fishery is a problem but its extent is unknown.
  - Spain accounts for the main part of the catch with 61% of the total in 2001, France taking 26%, UK 6%, Ireland 2%, Denmark 3% and other countries (Norway, Belgium, Netherlands, Germany, and Sweden) contributing small amounts.
  - 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.
  - The negative image of gill net fisheries and their ability to target spawning aggregations may mean that this fleet could become a focus of recovery plan measures. Any effort regulation of gillnet fisheries would entail restrictions on gear length and soak time.
  - Sampling of this stock is supported by the EC-funded Sampling Programme, which is required under Regulations 1543/2000 and 1639/2001.
  - In 2001, Irish landings of hake ranged between 32 and 80 cm. The minimum size is 27 cm for this species.
  - MFSD have conducted a West Coast Groundfish Survey since 1993 and the results indicate that the Back of the Aran Islands Grounds and the Celtic Sea have important nursery areas for this stock.

- Over the period 1990-1997, discards have fluctuated around 1,600 t. Discards represent most of the catches for the 3 younger age groups (0, 1, 2). Over the last decade catches at age 0 are mainly discarded.
- Hake are targeted using demersal trawls by the international fleet. The Spanish demersal trawl and Spanish flag long-line fleets target larger hake. In recent years several other target fisheries have become important; pelagic trawling in the Bay of Biscay, pair trawling in the Celtic Sea and gill-netting west of Ireland.
- There was a need for a workshop addressing the important issue of ageing older hake, and there is also a need to improve international sampling of older hake.

## ICES ADVICE

### 3.12.2

#### State of stock/exploitation:

The stock is outside safe biological limits. Fishing mortality has been above  $F_{pa}$ , for the entire period of the assessment, which is since 1978, and has even been above  $F_{lim}$  in most years since 1988. Current  $F$  is below  $F_{lim}$ . SSB has generally declined till the early 1990s and has stabilised at low level since. SSB has been below  $B_{pa}$  since 1988, and even below  $B_{lim}$  for most years since 1990. Recruitment estimates for 1997-2000 are the lowest recorded. Recruitment in 2001 is average.

#### Management objectives:

There are no explicit management objectives for this stock.

#### Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$B_{lim}$ is 120 000 t, the lowest observed biomass in the 1998 assessment.	$B_{pa}$ be set at 165 000 t. Biomass above this affords a high probability of maintaining SSB above $B_{lim}$ , taking into account the uncertainty in assessments.
$F_{lim}$ is 0.28, the fishing mortality above which stock dynamics are unknown.	$F_{pa}$ be set at 0.20. This $F$ is considered to have a high probability of avoiding $F_{lim}$ and a 50% probability of maintaining SSB above $B_{pa}$ in the next 10 years, taking into account the uncertainty in assessments.

#### Technical basis:

$B_{lim} = B_{loss}$	$B_{pa} \sim B_{lim} \times 1.4$
$F_{lim} = F_{loss}$	$F_{pa} \sim F_{lim} \times 0.72$ , implies a less than 10% probability that $(SSB_{MT} < B_{pa})$ .

#### Advice on management:

In light of the general reduction in SSB and the generally poor recruitment since 1997, ICES recommends that a recovery plan be implemented to ensure safe and rapid recovery of SSB to in excess of 165 000 t. ICES considers the recovery plan identified as STECF sce-

nario 8 ( $F_{pa}$  limit on annual fishing mortality, 20% annual limit on TAC change, and 20% annual biomass increase, given in the order of priority,) to be consistent with the Precautionary Approach. This recovery plan requires an increase in SSB that is likely to be detectable on an annual basis given current assessment uncer-

tainty, allows for a relative rapid recovery of the SSB to  $B_{pa}$  in about 7 years, and incorporates a modest degree of change in annual TAC to moderate disruption of the fisheries.

Such a recovery plan can only be implemented if there is full compliance by all fisheries harvesting Northern hake. This in turn requires strong support from the fisheries for the provision of the plan, and effective monitoring of the fisheries and enforcement of the fishery regulations. This will also require effective control of effort in these mixed species fisheries at levels reduced substantially from recent levels.

If the above recovery plan is adopted this corresponds to a catch of less than 21,600 t and this implies an effort reduction of around 50% in 2003.

If such a recovery plan is not implemented, ICES recommends that fishing mortality on hake should be as close to zero as possible.

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### Rebuilding plan:

Rebuilding of the hake stock can be obtained by reducing the fishing mortality, or by a reduction in  $F$  combined with an improvement of the selection pattern.

The minimum legal mesh-size was increased from 55/65 mm to 70 mm in the Bay of Biscay since 1 January 2000. An emergency plan for Northern Hake was implemented on 1 September 2001. This plan combines a low TAC for 2001 and 2002, and requires the use of mesh size of 100 mm for trawlers targeting hake in the Bay of Biscay and for trawlers operating in two non-*Nephrops* areas (one in the Bay of Biscay, one in the Celtic Sea). ICES has not been able to quantify the likely impact of these changes in mesh size, but, since hake is a late maturing fish, any improvement in the selection pattern that reduces the catch of younger fish (ages 0-2, ~ less than 30 cm) will have little short term effect on SSB and only increase SSB in the medium term. At *status quo*  $F$  and with no catch of hake of ages 0-1 in 2002 and no catch at ages 0-2 in 2003 onwards, SSB in 2007 is expected to be 18% higher above what is expected if the current selection pattern is maintained. Even this 18 % higher SSB is still below  $B_{pa}$ . But, such an improvement of the selection pattern would increase the probability that a reduction in fishing mortality will allow the rebuilding of SSB.

However, an improvement in the selection pattern alone is unlikely to be sufficient to reduce exploitation to the level needed to rebuild the hake stock. To reach this goal additional reductions in mortality are needed.

An update of the STECF Harvest Control Rule scenario 8 is summarised below. For 2002 it is assumed that fishing mortality will be at *status quo*; for 2003 a TAC constraint is applied, with a TAC 20% lower than that actually set for 2002, i.e.  $0.8 \times 27\,000$  tons = 21 600 t. In 2001 landings were well above the TAC:

- In 2003, the decrease in landings between 2002 and 2003 is around 45%, and SSB is expected to increase by around 15%.
- For 2004 onwards, following the specified HCR would lead to the stock recovery in about 6 years, in more than 80% of the simulations.

ICES reiterates the statement made by STECF, “the values of the outcomes of the harvest control rules should NOT be interpreted as absolute. They are presented as values which are conditional on a number of assumptions made within the forecast model, and are better considered to be relative values to be compared one to another.”

Reducing fishing mortality by setting the TAC at a low level has been shown to be ineffective due to TAC overshoot and/or misreporting. ICES, therefore, recommends that in addition to TAC constraints, restrictions in effort of fleets exploiting/targeting hake should be implemented. Closed areas and seasons may contribute to stock recovery, but only if accompanied by major reductions in effort.

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### Relevant factors to be considered in management:

A fishing mortality of zero in 2003 is not expected to rebuild SSB to  $B_{pa}$  by 2004.

Given the state of the stock, and the risk of impaired recruitment, any further delay in the definition/implementation of a recovery plan will be prejudicial to the stock and the fastest possible rebuilding to  $B_{pa}$  is strongly advised.

The 20% constraint on annual change in TAC means that fishing mortality will not be sufficiently reduced in 2003 to produce a 20% increase in SSB in the short term. Adoption of the rebuilding plan requires a long-term commitment not to increase TAC by more than the 20% constraint once SSB begins to rebuild.

The advised recovery plan is based on a model scenario that includes a number of assumptions. These assumptions are considered reasonable given the current knowledge, but monitoring of the stock, ecosystem and fisheries during the rebuilding period, may document that some of the assumptions are not met. Major deviations from the assumptions, may require changes to the rebuilding plan and/or expectations about the timeframe necessary for recovery.

The advised rebuilding plan is build on forecasts suggesting rebuilding in about 7 years. This is about as fast as recovery is possible without essentially implementing a total closure of the fisheries harvesting Northern hake.

Information from the fishery indicates a decrease in the amount of small hake caught in recent years. This might be explained by an improvement in the selection pattern, changes in fishing strategy, small fish becoming inaccessible to sampling, or simply a consequence of weak year classes in recent years and the enforcement of a minimum landing size.

The Spanish fleets operating in Subareas VI, VII, and VIII stopped fishing for one and a half months during the summer of 2002. Likewise in 2001, an important part of the Spanish (Basque) fleet fishing in Subarea VIII stopped its activity for one month in August.

Hake is caught in nearly all fisheries in Subareas VII and VIII. The LPUE series show different trends indifferent areas and between different fleets. Compared to 2000, LPUE in 2001 shows a 30% decrease for the two most important trawler fleets operating in Subarea VII (A Coruña and Vigo fleets), whilst remaining at a high level for the A Coruña fleet. In Subarea VII long-liners show an increase (+5%) in LPUE (kg/day), and gillnetters in Subarea

VII+VIII (+8%). In Subarea VIII, there is no clear trend in the LPUE. However, even though there are some conflicting signals in LPUE between areas in recent years, the main concern is the overall declining trend in the stock size since the beginning of the assessment period (1978).

### Catch forecast for 2003:

Forecasts with an  $F_{sq}$  for 2002 are presented below. Since the TAC in 2001 was overshoot by more than 60%, and even though an emergency plan has been implemented since September 2001, there is no evidence that forecasts with a TAC constraint would be realistic.

Basis:  $F(2002) = F_{sq} = \text{mean } F_{(99-01)} = 0.28$ ; Landings(2002) = 40.1; Catch(2002) = 41.0; SSB(2003) = 109.4

F(2003) Onwards	Basis	Catch (2003)	Landings (2003)	SSB (2004)
0	0	0	0	148.9
0.06	$0.2F_{sq}$	9.2	9.0	139.2
0.11	$+20\% \text{ SSB} \sim 0.4F_{sq}$	17.9	17.5	130.1
0.14 <sup>1</sup>	$-20\% \text{ TAC} \sim 0.50F_{sq}$	22.1	21.6	125.7
0.17	$0.6F_{sq}$	25.9	25.4	121.6
0.20	$F_{pa}$	29.8	29.2	117.5
0.23	$0.8F_{sq}$	33.5	32.7	113.7
0.28	$F_{sq}$	40.6	39.6	106.4

<sup>1</sup> Acceptable only if there is a long-term commitment to the specified recovery plan. Weights in '000 t. Shaded scenarios are considered inconsistent with the precautionary approach.

### Medium-term projections:

Medium-term projections suggest that fishing at  $F_{pa}$  leads to a 50% probability of the stock exceeding  $B_{pa}$  in 2007, while fishing at the level required to allow a 15% increase in SSB per year leads to the same target in 2005-2006.

### Comparison with previous assessment and advice:

Estimates of fishing mortality and SSB in the current and last year's assessments are similar. This year's assessment did not consider catches of age 0 while these data were included in 2001. However, recruitment estimates remain very similar with the exception of the 1985 yearclass. This year's advice is similar to that of last year.

In this year's assessment, it was decided to remove the age 0 from the international catch-at-age matrix and from the commercial fleet data due to the enforcement of the minimum landing size and partial information on discards in recent years. Abundance indices for age 0 are available from surveys and are used in the assessment.

### Elaboration and special comment:

Since the 1930s, hake has been the main demersal species supporting trawl fleets on the Atlantic coasts of France

and Spain. In 2001, Spain took 60% of the landings, France 25%, UK about 6%, Denmark 3%, and Ireland 2%. Hake are caught throughout the year, the peak landings being made in spring-summer months. The three main gear types used by vessels fishing for hake as a target species are lines (E & W, Spain), fixed-nets and trawls (all countries), mostly bottom trawls, a few pelagic ones (France), and recently also Very High Opening trawls (Spain).

Hake spawn from February through July along the shelf edge, the main areas extending from north of the Bay of Biscay to the south and west of Ireland. 0-groups descend to the seabed (at depths in excess of 200 m), moving to shallower water with a muddy seabed (75–120 m) by September. There are two major nursery areas: in the Bay of Biscay and off southern Ireland. Three-year-old hake begin to move into the shallower regions of the Bay of Biscay and Celtic Sea, but as they approach maturity they disperse to offshore regions.

Hake movements are indicated by the seasonal distribution of catches. From the beginning of the year until March/April 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 the hake fishery is centred to the west and southwest of Ireland, with a decline in catch rates in shallower waters.

Length composition data by fishery unit are available annually for 1978–1989 and quarterly for 1990–2001. Prior to 1992, these were converted to age compositions by numerical methods. For 1992–2001, age readings were used.

Investigations of some structural uncertainties in the assessment model have been carried out. The effects of increasing the current 8+ group to a 10+ group has been tested, even though the ageing of older fish using otoliths appears to be difficult. However, using a 10+ group reduces the sensitivity of SSB perception to model assumptions. In addition, differences in mean F trajectories between the 8+ and 10+ analyses are small, but become more pronounced as older ages are incorporated into the mean F calculation.

ACFM reiterates its May 2002 statement that: ‘Revision of Biological Reference Points for northern hake would

benefit from further investigations into the source of the instability in the assessment. Therefore, no revisions of the biological reference points are currently suggested even though the actual ones are considered to be possibly inappropriate’.

#### Source of information:

Report of the Working Group on the Assessment of Hake, Monk and Megrim, May 2002 (ICES CM 2003/ACFM:01) and STECF Report.

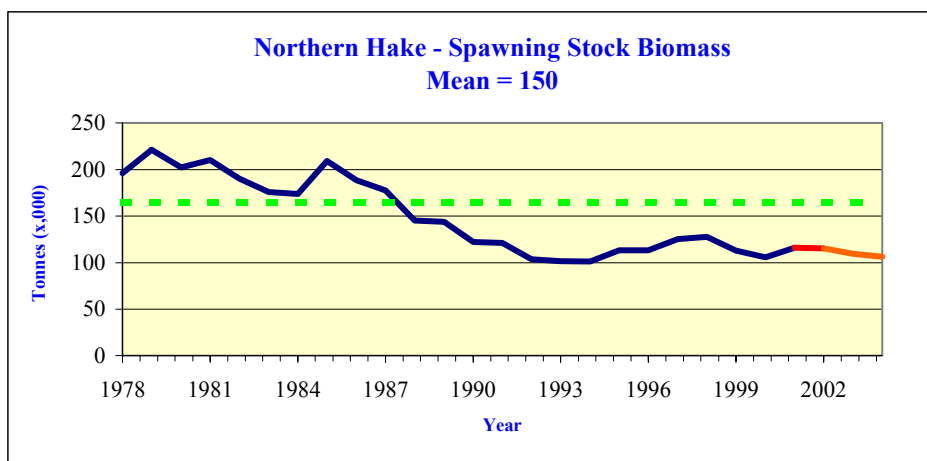
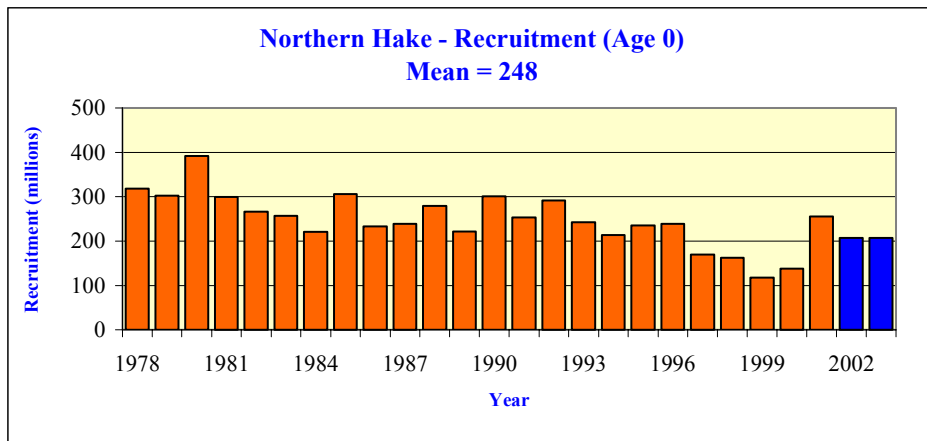
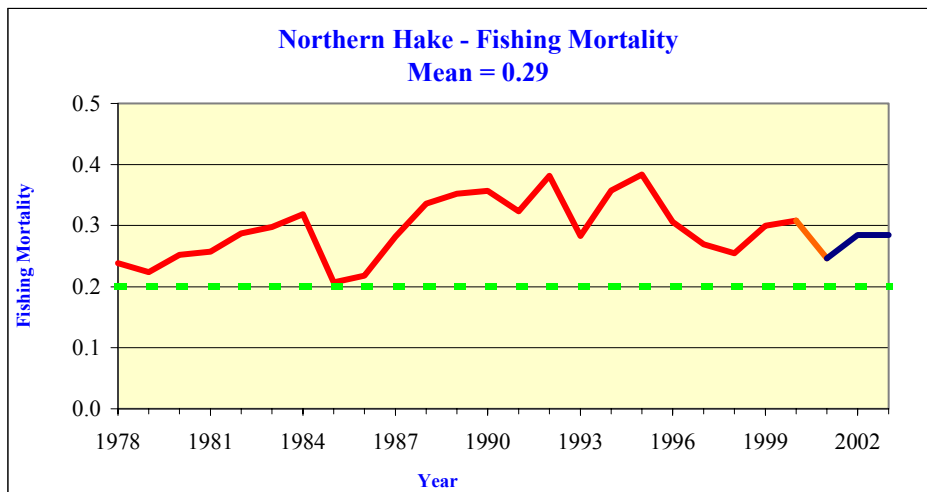
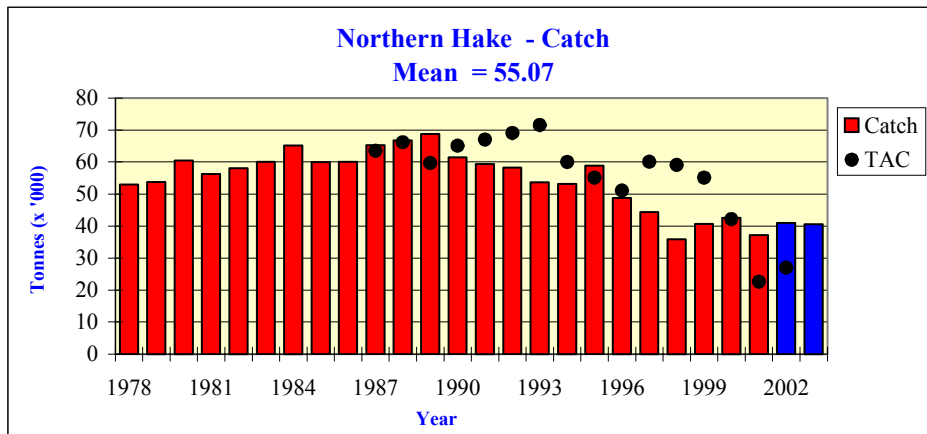
#### Yield and spawning biomass per Recruit F-reference points:

	Fish Mort Ages 2-6	Landings/R	SSB/R
Average Current	0.285	0.240	0.653
$F_{\max}$	0.174	0.256	1.137
$F_{0.1}$	0.107	0.241	1.705
$F_{\text{med}}$	0.280	0.241	0.667

#### Catch data (Tables 3.12.2.1–2):

Year	ICES Advice	Predicted catch corresp to advice	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 $F_{\text{pa}}$	<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, rebuilding plan	-	22.6	36.7	0.5	37.2
2002	Lowest possible catch / rebuilding plan	-	27.0			
2003	Lowest possible catch / rebuilding plan	-				

<sup>1</sup>Sum of area TACs corresponding to Northern stock plus Division IIa (EC zone only). <sup>2</sup>Landings. Weights in ‘000 t.



**Table 3.12.2.1** Estimates of catches ('000 t) for the Northern Hake by area for 1961–2001

Year	Landings <sup>(1)</sup>					Discards <sup>(2)</sup>	Catches <sup>(3)</sup>
	IIIa+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	5.4	24.1	28.1	0	57.6	1.2	58.9
1996	4.4	24.7	18.1	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

<sup>(1)</sup> Spanish data for 1961-1972 not revised, data for Sub-area 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).

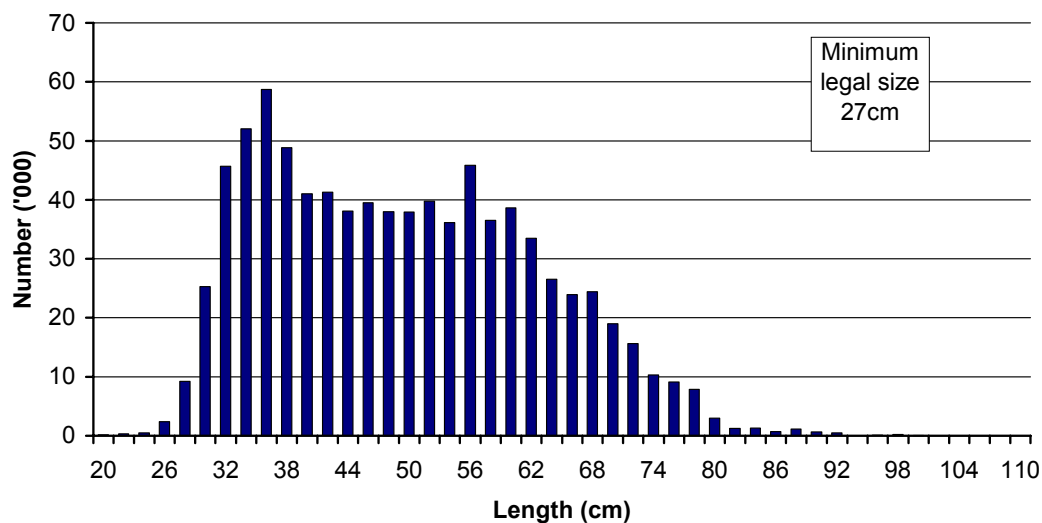
<sup>(2)</sup> Discards have been estimated from 1978 and only for Divisions VIIIa,b.

<sup>(3)</sup> From 1978 total catches used for the Working Group.

**Table 3.12.2.2** Hake - Northern stock (IIIa, IV, VI, VII, VIIIa,b).

Year	Recruitment Age 0 thousands	SSB tonnes	Landings + Discards tonnes	Mean F Ages 2-6
1978	318000	196000	52900	0.238
1979	303000	221100	53800	0.224
1980	392000	202000	60500	0.252
1981	300000	210100	56300	0.257
1982	267000	190400	58100	0.287
1983	257000	175700	60100	0.298
1984	221000	173900	65100	0.319
1985	306000	209000	59900	0.207
1986	233000	188500	60100	0.218
1987	239000	177500	65300	0.282
1988	279000	145200	66800	0.336
1989	221000	143800	68800	0.353
1990	301000	122300	61400	0.357
1991	254000	121100	59300	0.323
1992	292000	103700	58300	0.381
1993	242000	101500	53600	0.283
1994	214000	101300	53100	0.358
1995	236000	113200	58900	0.384
1996	239000	113200	48800	0.306
1997	170000	125300	44400	0.269
1998	162000	127800	35900	0.255
1999	118000	112900	40600	0.300
2000	138000	105600	42600	0.308
2001	256000	116100	37200	0.247
2002	207000*	115400		0.285
Average	246600	148504	55075	0.293

\* GM 99-00

**2001 Length Distribution: Irish Landings, Northern Hake**

# West of Scotland Rockall and North Sea Anglerfish

(Sub-areas IV and VI)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the STECF and ICES advice for other West of Scotland stocks is predicated primarily on the need to rebuild cod stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

MFSD therefore advises that unless ways to harvest anglerfish without incidental catch or discards of cod and VIB haddock can be demonstrated, fishing for anglerfish should not be permitted.

MFSD agrees with the ICES recommendation that, if any fisheries on anglerfish are permitted, despite the advice on cod and VIB haddock, the fishing mortality be reduced to less than  $F_{pa}$ . This implies landings of less than 6,700 t for the assessed component of the stock and 400 t for the non-assessed component in Division VIb (applying a reduction proportional to that used in the other areas).

MFSD advises that the implied TAC in Sub-areas VI, XII, XIV and Division Vb is 2,218 t with an associated Irish quota of 222 t.

TAC Area	TAC 2002	Proposed TAC 2003	Basis
IIIa and Sub-Area IV	10,500	4,882	$F < F_{pa}$
Sub-areas VI, XII, XIV and Division Vb	4,770	2,218	$F < F_{pa}$
Total TAC	15,270	7100	
Irish quota	477	222	

## STATE OF THE STOCK

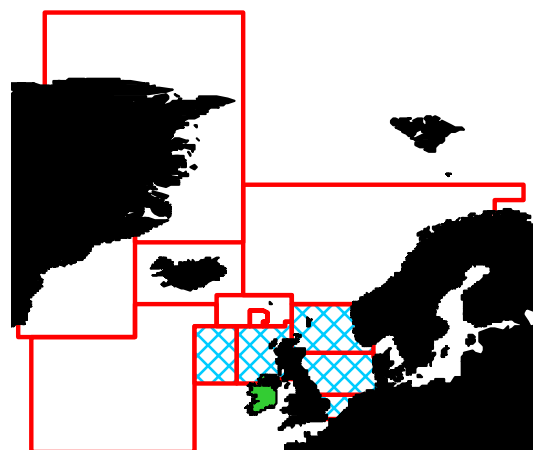
- There are concerns about the state of this stock even though the historical perspective of SSB, fishing mortality, and recruitment is not well estimated.
- International landings in 2001 amounted to 15,800 t. This is a combined working group estimate for Sub-areas IV and VI. This is a decrease on the 2000 landings of 18,900 t. During the 1970's landings were fairly stable at around 9,000 t but from 1991 they increased steadily with the spatial expansion of the fishery to a peak of 34,400 t in 1996. Landings have declined steadily since 1996.
- An assessment for the combined area indicates that

the recent  $F$ 's have been well above the  $F_{pa}$  of 0.3. It is likely that fishing mortality has increased since the 1980s as the fishery has expanded into deeper water, although  $F$  has declined since 1997. All analyses indicate that  $F$  is well above what may be considered sustainable.

- Recruitment is not well estimated.
- Lack of biological information prevents the estimation of SSB with certainty but SSB appears to have declined recently to a relatively low level. There is no proposed  $B_{pa}$ .

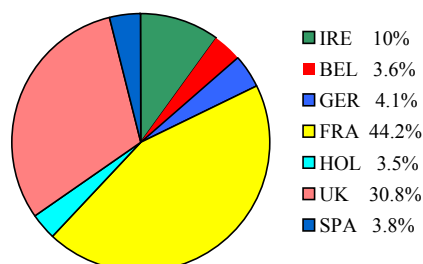
## CURRENT MANAGEMENT

- Due to previous problems with mis-reporting catches from Sub-Area IV into VI the assessment area has been extended and combines anglerfish from Sub-areas IV, Divisions VIa and IIIa. The assessment does not cover Division VIb.



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

- There are two TACs covering the assessment area in 2002: 10,500 t for Division IIIa and Sub-Area IV and 4,770 t for Sub-areas VI, XII, XIV and Division Vb. Ireland takes its quota (477 t in 2002) exclusively from Sub-Area VI.



- There are no management objectives or a management plan for this stock.

- MFSD recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching anglerfish.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was €2.6m.
- The value of the 2001 Irish landings from Sub-area VI was €2.0m.
- This is a very valuable stock to demersal trawlers primarily from Killybegs and Greencastle.

## ADDITIONAL INFORMATION

1. Previous assessments have been highly uncertain. This year, for the first time, an assessment was accepted for anglerfish in Division IIIa, Subarea IV, and in Division VIa.
2. Irish landings were about 510 t in 2001 and decrease of about 10% on the 2000 landings.
3. 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. However, due to a long history of mis-reporting, the correct allocation of catches to Sub-areas IV and VI is not possible.
4. A recently expanded and modernised UK Scottish fleet primarily exploits this fishery. The fleet has managed to maintain landings by moving into deeper waters and by increasing efficiency using twin-rig trawls. This has made a realistic assessment for this stock very difficult.
5. The Irish fleet exploiting this fishery is mainly composed of otter trawl vessels from Greencastle and Killybegs.
6. Irish Sampling of this stock is supported through the EC funded sampling programme that is required under Data Collection Regulations 1543/2000 and 1639/2001. In recent years the size of landed fish in Ireland has continued to decrease. This may lead to over exploitation of juveniles on nursery grounds.
7. The assessment uses a recruitment index calculated from data collected on a Scottish survey.
8. There are no working group discard estimates for this species. MFSD have insufficient data on which to assess the level of anglerfish discarding by Irish vessels.
9. Mesh regulation offer little protection to this species since their shape means that even the small individuals are easily retained in the gear. The length at 50% selection used in the assessment seems to be unrealistically high for a species which, due to its shape would be expected to be fully selected at much lower lengths. Anglerfish are the subject of significant fishing mortality before attaining full maturity. The use of such an incorrect selection pattern would tend to under-estimate the mortality on smaller anglerfish. MFSD suggest that fisheries targeting juvenile anglerfish < 40cm must be deterred by fisheries managers if this stock is to recover.
10. The assessment is mainly based on data concerning *L. piscatorius*. The Irish fishery catches more black-

bellied monkfish *L. budegassa* than other fisheries on the northern shelf. Ratios of black-bellied to white-bellied anglerfish are not well estimated over time but black bellied anglerfish could constitute up to 30% of Irish landings. It may be beneficial to the Irish fisheries managers to take this into account when considering future management options for this stock.

11. The current low level of landings is a very worrying trend given that there is no perceived change in the exploitation pattern. In fact effective fishing effort may have increased. The sharp reduction in landings since 1996 and the scarcity of mature females in the catches may indicate that the stock is heavily over-exploited.
12. The expansion of the trawl fishery into deepwater coupled with a UK-Spanish deepwater tangle net fishery has probably lead to depletion of the spawning component. The fishery has expanded into areas which are believed to have been refugia for adult anglerfish, increasing the vulnerability of the stock to over-exploitation.
13. MFSD participated in an EU-funded research project to increase biological knowledge of the anglerfish and megrim stock in Sub-area VI. Findings suggest that large mature females are uncommon in deeper water and indicate a very low SSB in this stock. Less than 1% of the monkfish examined in commercial and research catches were mature. These findings cannot be reconciled with the SSB estimates from this assessment. Therefore the SSB estimated in this length-based assessment might be unrealistic. Other findings of this project indicated that the no differences in stock structure could be detected from west of Ireland to the north sea and MFSD point out that the current assessment area may not be appropriate.
14. MFSD point out that the ICES assessment only covers the period 1992-2001 during which the stock was not harvested sustainably. Fishing mortality in this assessment is calculated relative to the first year of the assessment period.

## ICES ADVICE

### 3.7.7

Two species occur, *Lophius piscatorius* and *L. budegassa*, although catches are almost exclusively of the former.

This year for the first time an assessment for the anglerfish in Division IIIa, Sub-area IV and in Division VIa was accepted. The advice therefore has a different structure than what previously has been presented.

### State of stock/exploitation:

The stock is harvested outside of safe biological limits. An assessment for the combined area indicates that the recent  $F$ 's have been well above  $F_{pa}$ . Even though the historical perspective of SSB, fishing mortality and recruitment is not well estimated, it is likely that fishing mortality has increased since the 1980s as the fishery has expanded into deeper water with an associated increase in catches, although these have

declined since 1997. The fishery has expanded into areas believed to have been refugia for adult anglerfish, increasing the vulnerability of the stock to over-exploitation. Immature fish are subjected to exploitation for a number of years prior to first maturity.

### Management objectives:

No explicit management objectives are set for this stock. However, for any management objectives to meet precau-

tionary criteria, their aim should be to reduce or maintain  $F$  below  $F_{pa}$ .

### Advice on management:

ICES recommends that the in fishing mortality be reduced to less than  $F_{pa}$ . This implies landings of less than 6 700 t for the combined Division IIIa, Sub-area IV and Division VIa. The corresponding catch in Division VIb will be about 400 t applying a cut proportional to that used in the other areas.

### Precautionary Approach reference points (unchanged since 1998):

ICES considers that:	ICES proposes that:
There is currently no biological basis for defining $B_{lim}$ or $F_{lim}$	$F_{35\%SPR} = 0.30$ be chosen as $F_{pa}$ . This fishing mortality corresponds to 35% of the unfished SSB/R. It is considered to be an approximation of $F_{MSY}$ .

### Relevant factors to be considered in management:

Catches for the combined area are believed to be adequately estimated. However, due to a long history of mis-reporting, the correct allocation of catches to Sub-areas IV and VI is not possible. Estimates which take into account mis-reporting indicate that the percentage of the catch taken in Sub-area VI in the years 1992-2001 (the period used in the assessment) has ranged between 36%-44%, with a mean of 42%. These values may be used as a basis to allocate the 2003 TAC between the management units.

Estimates which take into account mis-reporting indicate that the percentage of the catch taken in Division IIIa, Subarea IV and Division VIa in the years 1992-2001 (the period used in the assessment) is 3%, 58% and 39% respectively. These values may be used as a basis to allocate the 2003 TAC between the these areas.

The lack of TAC regulation in the adjacent Sub-area IV before 1998 encouraged mis-reporting of landings into that area and undermined management for Sub-area VI. The agreed TACs in 1998 and 1999 for Sub-area IV were based on recent landings reported from that area. Because those landings included misreporting in the preceding years these TACs are unlikely to have prevented further mis-reporting or to have improved conservation in either area.

Anglerfish are subject to significant fishing mortality before attaining full maturity, and this means the stock is particularly vulnerable to depletion of the spawning component. Their body shape means that at a young age they are easily retained by the minimum mesh size currently in force. They are known to be discarded, although no routine discard sampling is undertaken. There is also a by-catch of small anglerfish associated with scallop dredging.

In past assessments the existence of a large unexploited reservoir of mature females was assumed to exist in deep waters. In recent years, surveys and fisheries have explored deep water areas widely, without locating any such aggregations of mature anglerfish.

### Comparison with previous assessment and advice:

Following trials in 2000 and 2001, the length-based assessment has now been evaluated as providing sufficient information on the state of the stock for making an analytical forecast. Previous advice was based on 2/3 of the landings in the period 1973-1999.

### Elaboration and special comment:

The distribution of anglerfish in the North Sea, Kattegat and Skagerrak is closely associated with the distribution to the West of Scotland (Division VIa). It is likely that catches from these areas come from the same biological stock. The link with the anglerfish in Rockall is less certain and therefore a separate advice is given for Division VIb.

Until the mid-1980s, anglerfish was taken mainly as a by-catch in bottom trawl groundfish fisheries. Restrictive TACs for other species in Division VIa have led to increased fishing pressure on anglerfish in that area, where they are now caught in a targeted anglerfish fishery. Species such as cod, haddock and saithe form a significant by-catch in the anglerfish fishery.

The North Sea catch at length distribution is derived solely from Scottish market sampling. Information for catch composition is unavailable from other countries. The assessment does not contain data from Rockall, and the forecast refers to landings in Division IIIa, Subarea IV and Division VIa.

### Source of information:

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

**Catch forecast for 2003:**

Basis:  $F(2002) = F_{sq} = F(01 \text{ unscaled}) = 0.91$  ; Landings (2002) = 16.5 ;  $SSB(2003) = 9.6$

F(2003 on-wards)	Basis	Catch (2003)	Landings (2003)	SSB (2004)	Probability (%)SSB < $B_{pa}$ in 2004
0	0	0	0	17	
0.18	$0.2 * F_{sq}$	4.1	4.1	15	
0.30	$F_{pa}$	6.7	6.7	14	
0.37	$0.4 * F_{sq}$	7.9	7.9	13	
0.55	$0.6 * F_{sq}$	11.3	11.3	12	
0.73	$0.8 * F_{sq}$	14.3	14.3	11	
0.92	$F_{sq}^1$	17.1	17.1	10	

Weights in '000 t

Shaded scenarios considered inconsistent with a precautionary approach.

**Catch data (Tables 3.7.7.1 and 3):**
**Sub-area IV - North Sea**

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ACFM Landings
1989	Not assessed	-	-	10.1	9.3
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	14.6	10.1
2002	2/3 of the catches in 1973-1990	5.7	10.50		
2003	Reduce F below $F_{pa}$	<6.7 <sup>1)</sup>			

Weights in '000 t.

<sup>1)</sup> Advice for Division IIIa, Subarea IV, and Subarea VIa combined.



**Catch data (Tables 3.7.7.2 and 3):**

**Sub-area VI - West of Scotland and Rockall**

Year	ICES Advice	Predicted catch corresp. to advice	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	4.9	7.3
2001	2/3 of the catches in 1973-1990	4.3	6.4	3.5	5.7
2002	2/3 of the catches in 1973-1990	4.3	4.8		
2003	Reduce F below F <sub>pa</sub>	<6.7 <sup>4)</sup>			

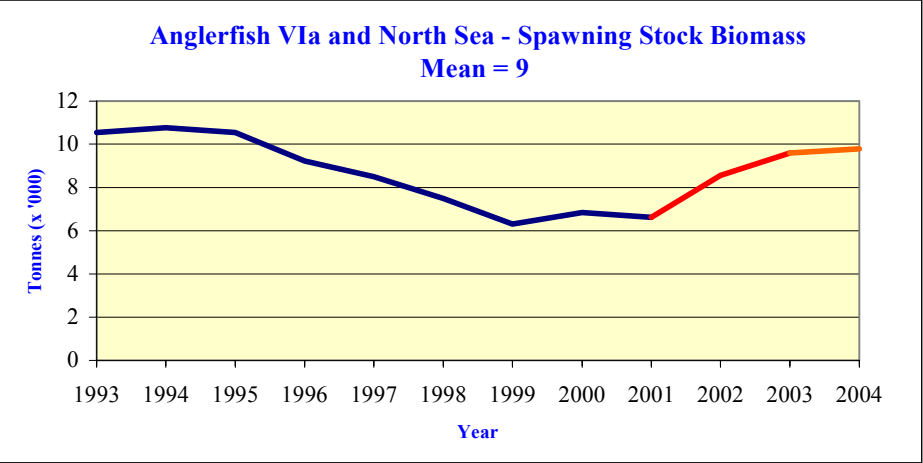
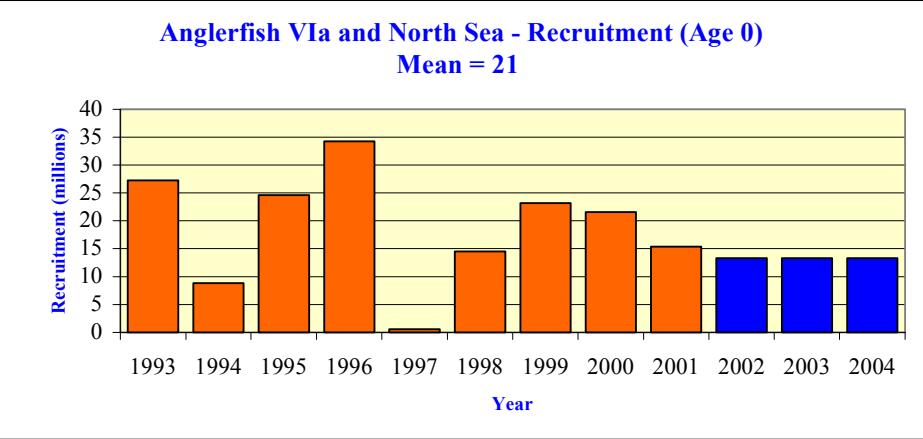
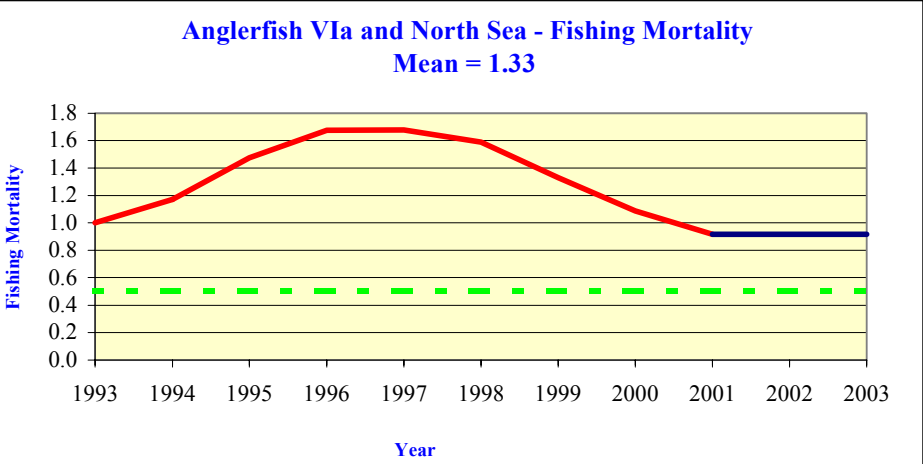
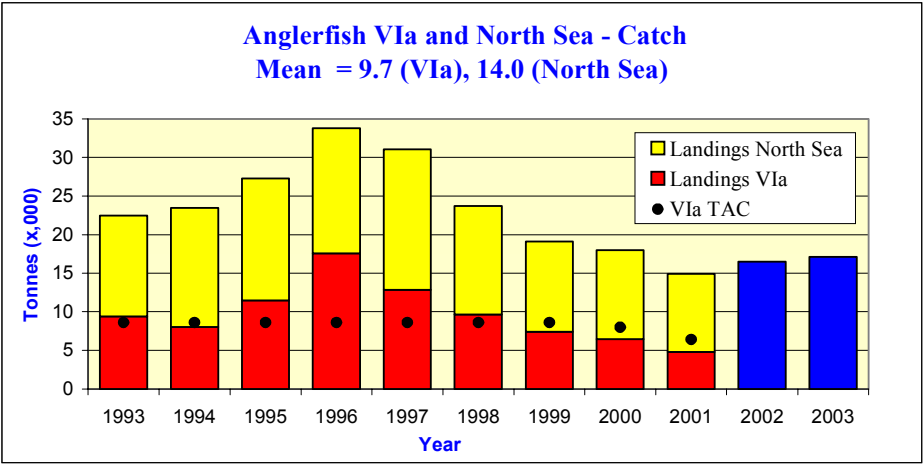
<sup>1</sup>Vb(EC), VI, XII and XIV. <sup>2</sup>Division VIa only. <sup>3</sup>Incomplete data. Weights in '000t.

<sup>4)</sup> Advice for Division IIIa, Subarea IV, and Subarea VIa combined.

**Catch data (Tables 3.7.7.1-3):**

**Division IIIa, Subarea IV, and Subarea**

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC <sup>1</sup>	Official landings	ACFM landings <sup>2</sup>
2003	Reduce F below F <sub>pa</sub>	<6.7			



**Table 3.7.7.1** Nominal catch (t) of ANGLERFISH in the North Sea, 1989–2001, as officially reported to ICES.**Northern North Sea (IVa)**

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	1	8	2	9	3	3	2	8	4	1	5	12	-
Denmark	835	984	1,245	1265	946	1,157	732	1,239	1,155	1,024	1,128	1,087	1,289
Faroes	1	7	1	-	10	18	20	-	15	10	6	n/a	-
France	-	-	124	151	69	28	18	7	7	3*	18 <sup>1*</sup>	19 <sup>1*</sup>	19*
Germany	187	70	71	68	100	84	613	292	601	873	454	182	95
Netherlands	70	18	23	44	78	38	13	25	12	-	15	12	-*
Norway	309	421	587	635	1,224	1,318	657	821	672	954	1,219	1,182*	1,209*
Sweden	9	5	14	7	7	7	2	1	2	8	8	78	44
UK(E, W&NI)	99	91	129	143	160	169	176	439	2,174	668	781	218	...
UK (Scotland)	6,366	6,788	7,039	7,887	9,712	11,683	15,658	22,344	18,783	13,319	9,710	9,559	...
UK (total)													10,194*
Total	7,877	8,392	9,235	10,209	12,309	14,505	17,891	25,176	23,425	16,860	13,344	12,349	12,850

\* Preliminary. <sup>1</sup>Includes IVb,c.**Central North Sea (IVb)**

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	209	216	357	538	558	713	579	287	336	371	270	449	579
Denmark	211	278	345	421	347	352 <sup>1</sup>	295	225	334	432	368	260	251
Faroes	-	-	-	-	2	-	-	-	-	-	-	n/a	-
France	-	-	-	1	-	2	-	-	-	-*	... <sup>2*</sup>	... <sup>2*</sup>	-*
Germany	2	1	4	2	13	15	10	9	18	19	9	14	9
Netherlands	574	267	285	356	467	510	335	159	237	223	141	141	-*
Norway	2	27	17	4	3	11	15	29	6	13	17	9*	15*
Sweden	-	-	-	-	-	3	2	1	3	3	4	3	2
UK(E, W&NI)	628	754	669	998	1,285	1,277	919	662	664	603	364	423	...
UK (Scotland)	495	634	845	733	469	564	472	475	574	424	344	318	...
UK (total)													848*
Total	2,121	2,177	2,522	3,053	3,144	3,447	2,627	1,847	2,172	2,088	1,517	1,617	1,704

\* Preliminary. <sup>1</sup>Includes 2 tonnes reported as Sub-area IV. <sup>2</sup>Included in IVa.**Southern North Sea (IVc)**

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	54	21	13	12	34	37	26	28	17	17	11	15	15
Denmark	-	-	2	-	-	-	-	-	-	+	+	+	+
France	-	-	-	-	-	-	-	-	-	10	... <sup>1*</sup>	... <sup>1*</sup>	-*
Germany	-	-	-	-	-	-	-	-	-	-	-	+	-
Netherlands	2	7	5	10	14	20	15	17	11	15	10	15	-*
Norway	-	-	-	-	-	-	-	-	-	-	+	-*	+
UK(E&W&NI)	30	6	6	17	18	136	361	256	131	36	3	1	...
UK (Scotland)	-	-	-	-	-	17	-	3	1	+	+	+	...*
Total	86	34	26	39	66	210	402	304	160	78	24	31	15

\* Preliminary. <sup>1</sup>Included in IVa.**Total North Sea**

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total	10,084	10,603	11,783	13,301	15,519	18,162	20,920	27,327	25,757	19,026	14,885	13,997	14,569
WG estimate	9,342	9,491	10,566	11,728	13,078	15,432	15,794	16,240	18,217	14,027	11,719	11,564	10,102
Unallocated	-742	-1,112	-1,217	-1,573	-2,441	-2,730	-5,126	-11,087	-7,540	-4,999	-3,166	-2,433	-4,467

Preliminary.

**Table 3.7.7.2** Anglerfish in Subarea VI. Nominal landings (t) as officially reported to ICES.

## Anglerfish in Division VIa (West of Scotland)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	2	8	-	3	2	9	6	5	+	5	2	+	+	+
Denmark	-	34	-	1	3	4	5	10	4	1	2	1	+	+
France	2,329	1,901	2,182	1,910	2,308	2,467	2,382	2,648	2,899	2,058	1,634*	1,814 <sup>1</sup> *	1,843 <sup>1</sup> *	951*
Germany	9	10		1	2	60	67	77	35	72	137	50	39	11
Ireland	324	556	398	250	403	428	303	720	717	625	749	617	515	500*
Netherlands	-	-	-	-	-	-	-	-	-	27	1	-	-	-*
Norway	8	27	8	6	14	8	6	4	4	1*	3*	1*	3*	2*
Spain	269	15	35	7	11	8	1	37	33	63	86	53	79	
UK	433	153	71	270	351	223	370	320	201	156	119	60	44	...
(E&W&NI)														
UK(Scotland)	2,629	3,024	2,921	2,613	2,385	2,346	2,133	2,533	2,515	2,322	1,773	1,688	1,496	...
UK (total)														1,158*
Total	6,003	5,728	5,615	5,061	5,479	5,553	5,273	6,354	6,408	5,330	4,506	4,284	4,019	2,622
Unallocated			184	296	2,638	3,816	2,766	5,112	11,148	7,506	5,234	3,799	2,406	2,186
As used by WG			5,799	5,357	8,117	9,369	8,039	11,466	17,556	12,836	9,654	7,413	6,425	4,808

\*Preliminary. <sup>1</sup>Includes VIb.

## Anglerfish in Division VIb (Rockall)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Faroe Islands	6	1	-	-	2	-	-	-	15	4	2	2		
France	4	-	-	-	-	29	-	-	-	1	1	... <sup>1</sup> *	... <sup>1</sup> *	195*
Germany	-	-	-	-	-	103	73	83	78	177	132	144	119	67
Ireland	-	-	400	272	417	96	135	133	90	139	130	75	81	-*
Norway	7	13	16	18	10	17	24	14	11	4	6	5	11*	5*
Portugal	-	-	-	-	-	-	-	-	-	-	+	-	20	19
Russia	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Spain	1340	81	138	333	263	178	214	296	196	171	252	291	14	
UK(E&W&NI)	123	17	19	99	173	76	50	105	144	247	188	111	272	...
UK(Scotland)	250	201	249	201	224	182	281	199	68	156	189	344	374	...
UK (total)														565*
Total	1,730	313	822	923	1,089	681	777	830	602	899	900	972	891	852

\*Preliminary. <sup>1</sup>Included in VIa.

## Total Anglerfish in Sub-area VI (West of Scotland and Rockall)

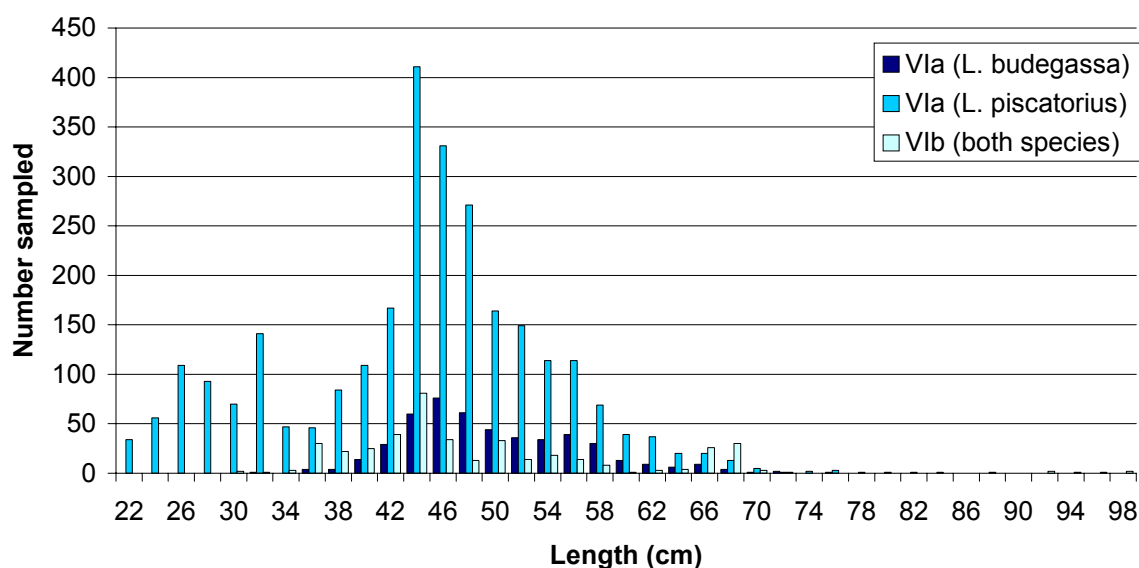
Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total official	7,733	6,041	6,437	5,984	6,568	6,234	6,050	7,184	7,010	6,229	5,406	5,256	4,910	3,474
Total ICES	7,733	6,041	6,621	6,280	9,206	10,050	8,816	12,296	18,158	13,735	10,554	8,385	7,316	5,660

\*Preliminary.

**Anglerfish in Sub-areas IV (North Sea) and VI (West of Scotland and Rockall).**

Year	Sub-area IV	Sub-area VI	Total
1973	2,894	9,348	12,242
1974	4,231	3,652	7,883
1975	5,106	3,198	8,304
1976	5,272	3,455	8,727
1977	4,854	3,954	8,808
1978	4,627	3,627	8,254
1979	4,871	3,195	8,066
1980	5,263	2,834	8,097
1981	3,562	1,718	5,280
1982	3,169	3,608	6,777
1983	4,405	3,850	8,255
1984	6,096	4,642	10,738
1985	6,801	5,056	11,857
1986	7,608	4,416	12,024
1987	9,236	5,249	14,485
1988	8,744	7,733	16,477
1989	9,342	6,041	15,383
1990	9,491	6,621	16,112
1991	10,566	6,280	16,846
1992	11,728	9,206	20,934
1993	13,078	10,050	23,128
1994	15,432	8,816	24,248
1995	15,794	12,296	28,090
1996	16,240	18,158	34,398
1997	18,217	13,735	31,952
1998	14,027	10,554	24,581
1999	11,719	8,385	20,104
2000	11,564	7,316	18,785
2001	10,102	5,660	15,762

**2001 Length Distribution: Irish Sampling, Anglerfish in VIa & VIb**



# Celtic Sea and Bay of Biscay Anglerfish

(Sub-area VIIb-k and Divisions VIIa,b)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD agrees with ICES advice that  $F$  should be reduced by 30% for both species in order to rebuild SSB of *L. piscatorius* above  $B_{pa}$  in the short term. This corresponds to landings of less than 16,400 t in 2003 for both species combined (11,400 t *L. piscatorius*, and 5,000 t *L. budegassa*).

MFSD advise that an additional allocation based of average landings (1998-2000) of 535 t for Division VIIa should be added to the TAC for Sub-area VII. The breakdown of the TACs by area are given below. This would translates to a 2003 Irish quota in VII of 1,003 t in 2003.

MFSD points out that in order to be consistent with the Precautionary Approach, management of mixed fisheries taking anglerfish will be determined by measures to assist the recovery of the Northern hake stock.

TAC Area	2002 TAC	2002 Irish quota	2003 Proposed TAC*	2003 Irish quota*
VII	18,600	1,410	13,248	1,003
VIIlabde	5,160		3,687	
Total	23,760		16,935	
Average 1998-2000 VII landings			535	

## STATE OF THE STOCK

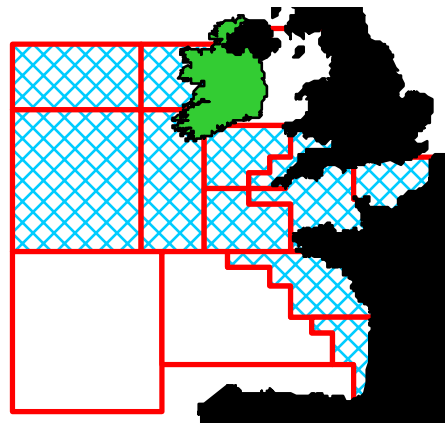
- The stock of *Lophius piscatorius* is outside safe biological limits, and the stock of *Lophius budegassa* is inside safe biological limits.
- Landings of *L. piscatorius* were 15 000 t in 2001 in Sub-area VII, a 9% increase on the revised 2000 landings figure. Landings of *L. budegassa* were 4,500 t in Sub-area VII, 19% lower than the revised 2000 landings. Combined landings peaked in 1981 close to 40,000 t. Landings of *L. piscatorius* have increased in 2001, relative to 2000. *L. budegassa* landings have been below the average in the most recent year.
- Fishing mortality for *L. piscatorius* has been close to the  $F_{pa} = 0.24$  in recent years. Fishing mortality for *L. budegassa* is now below  $F_{pa} = 0.23$ .
- Recruitment of *L. piscatorius* has declined from peaks in 1990 and 1991 year classes, with recruitment in re-

cent years around the mean. Recruitment of *L. budegassa* declined during the 1990's but the 1998 year class was the highest in the series, subsequent recruitments have been around average.

- Spawning Stock Biomass is declining for *L. piscatorius* and was 28,000 t in 2001, below  $B_{pa} = 31,000$  t. The SSB of *L. budegassa* has declined since 1995, but was 23,000 t in 2001, above  $B_{pa} = 22,000$  t.
- SSB of *L. piscatorius* is expected to remain below  $B_{pa}$  in the short term at status quo fishing mortality. SSB of *L. budegassa* is expected to remain slightly above  $B_{pa}$  up to an including 2004, assuming status quo fishing mortality.

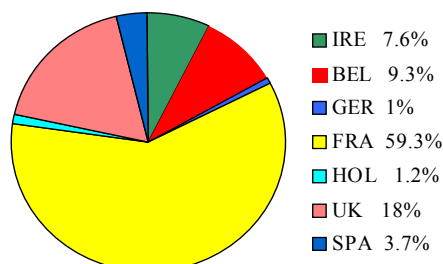
## CURRENT MANAGEMENT

- There are two separate TACs for this stock Sub-area VII and a TAC for Divisions VIIabde. These TAC areas do not correspond to the assessment area (Divisions VIIb-k and VIIa,b).
- Two species (*L. piscatorius* and *L. budegassa*) are caught in the management and assessment area. These species are not routinely separated by the industry therefore a combined TAC is set for both species.



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

- The 2002 TAC for Sub Area VII was 18,600 t with an associated Irish quota of 1,410 t.
- There are no explicit management objectives or plans for this stock.



- MFSD advises that management objectives be established and that a management plan be developed and implemented for fisheries taking anglerfish.

## MFSD – ECONOMIC COMMENTS

- The value of the Irish landings of these species in 2001 was € 9.1 m.
- The value of the Irish quota was €5.6 m.
- This is an economically important high-value species taken with hake and megrim. Some of the new larger Irish whitefish vessels are heavily reliant on these species.

## ADDITIONAL INFORMATION

1. F and SSB for *L. piscatorius* were similar to last year's assessments, though recent recruitment seems to be have been overestimated in last years' assessment. The increasing number of young individuals in some tuning fleets may be due to problems with ageing.
2. The results of this years' assessment of *L. budegassa* scaled upwards the level of SSB, due to the correction of an error in the maturity ogive. The trend in SSB was not affected by this correction.
3. Total landings of both species in Divisions VII b-k were 19 000 t in 2001. Landings of *L. piscatorius* in 2001 were 15 000 t, a 9% increase from 2000 and those of *L. budegassa* were 4 500 t in 2001, a 19% decrease.
4. Estimated landings from the Irish fleet were 2,312 t in 2001, a 24% decrease from 2000.
5. The quota for this stock is restrictive for the Irish and most other fleets. Therefore misreporting continues to be a serious problem in this stock. MFSD continues to be concerned that inaccurate landings data may cause the assessment to be over optimistic.
6. The European fleet on the western seaboard of Ireland has heavily targeted anglerfish for over 15 years. France and Spain take 70% of the landings. The remainder is taken by the UK and Ireland (around 10% each) and Belgium (less than 5%). A fishery, mainly by UK and French flag vessels using tangle-nets, exploit this stock in deepwater and on rough ground. Simultaneously, the trawl fleets heavily targeted anglerfish on the shelf and down the slope. These fleets have improved their efficiency by increasing spread of their trawls, switching to twin-rigs and pioneering new grounds not previously fished.
7. Irish landings for this stock are mainly taken in otter trawls and, increasingly by twin-rigs because of the recent Whitefish Renewal Scheme. Anglerfish are the main target species along the western shelf for demersal vessels from Killybegs, Rossaveal, Dingle, Castletownbere, Union Hall, Dunmore East and many other smaller ports.
8. Sampling of these stocks is supported by the EC-funded Sampling Programme which is required by Di-

rectives 1543/2000 and 1639/2001.

9. *L. piscatorius* sampled by MFSD in Sub-area VII ranged in length between 22 cm and 104 cm, but were dominated by fish in the range 32 to 50 cm. MFSD started ageing anglerfish for the first time in 2002.
10. MFSD have conducted a west coast groundfish survey since 1993 and the results indicate that the continental shelf west and south of Ireland is an important nursery area for this stock. MFSD recommends that management measures should be established to discourage targeting of juvenile anglerfish, particularly to protect the strong 1999-year class of *L. piscatorius* and the 1997 and 1998 year classes of *L. budegassa*.
11. There is no systematic sampling of discards for anglerfish, but programmes were conducted in 1992 and 1997 on the French fleets, in 1994 on the Spanish fleets and from 1996 to 1998 in Ireland. The Irish results indicate very low level of discarding.
12. There is no minimum legal landing size for anglerfish and, since it is likely that the discards are limited and include only very small fish, they are not included in the assessment.

## ICES ADVICE 3.9.12

### State of stocks/exploitation:

The stock of *Lophius piscatorius* is outside safe biological limits, and the stock of *Lophius budegassa* is inside safe biological limits. The SSB of both stocks decreased from 1986 until 1993, then increased up to 1995-1996 and are presently decreasing. For both stocks, fishing mortality in most years has been above  $F_{pa}$ , and even above  $F_{lim}$  for *L. piscatorius*. In 2001 fishing mortality is estimated to be below  $F_{pa}$  for *L. budegassa*, while for *L. piscatorius* F 2001 is above  $F_{lim}$ . Recent recruitments of *L. piscatorius* (1998 and 1999 year classes) and of *L. budegassa* (1997 and 1998 year classes) are above average, and there is evidence of strong year classes (respectively 2000 and 1999) recruiting to the fishery.

### Management objectives:

There are no explicit management objectives for this stock. However, for any management objectives to meet precautionary criteria, their aim should be to reduce or maintain F below  $F_{pa}$ , and to increase or maintain spawning stock biomass above  $B_{pa}$ .

### Advice on management:

ICES recommends that F should be reduced by 30% for both species in order to rebuild SSB of *L. piscatorius* above  $B_{pa}$  in the short term. This corresponds to landings of less than 16 400 t in 2003 for both species combined (11 400 t *L. piscatorius*, and 5 000 t *L. budegassa*).

International landings of anglerfish in VIIa, from STATLANT database and from EU logbooks (Ireland only).

1995	1996	1997	1998	1999	2000
969	796	774	652	534	420

**Precautionary Approach reference points:  
L. piscatorius (changed in 2000)**

ICES considers that:	ICES proposes that:
$B_{lim}$ is not defined	$B_{pa}$ be set at 31 000 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.
$F_{lim}$ is 0.33, the fishing mortality estimated to lead to potential stock collapse.	$F_{pa}$ be set at 0.24. This F is considered to have a high probability of avoiding $F_{lim}$ , taking into account the uncertainty in assessments.

**Technical basis:**

$B_{lim}$ : Not defined	$B_{pa} : B_{loss}$
$F_{lim} \cdot F_{loss}$	$F_{pa} : F_{lim} \times 0.72$

**L. budegassa: ( $B_{pa}$  changed in 2002 due to a correction of the maturity ogive values):**

ICES considers that:	ICES proposes that:
$B_{lim}$ is not defined.	$B_{pa}$ be set at 22 000 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.
$F_{lim}$ is not defined.	$F_{pa}$ be set at $F_{med} = 0.23$ . This F is consistent with the proposed $B_{pa}$ .

**Technical basis:**

$B_{lim}$ = Not defined	$B_{pa} = B_{loss}$
$F_{lim}$ = Not defined	$F_{pa}$ = see above.

**Relevant factors to be considered in management:**

The fishery may become heavily dependant on the strong year classes entering in the fishery. The increase in small individuals in the catches causes some concern as the potential contribution to the future landings and SSB of the recent strong year classes could be impaired by growth over-fishing. There is no minimal landing size for anglerfish but in order to protect juveniles of these year-classes, the use of selective devices, such as rigid grids, should be promoted.

*L. piscatorius* and *L. budegassa* are both caught on the same grounds by the same fleets, and are usually not separated by species in landings; therefore, management measures for both species must be considered together and in conjunction with other species caught in these fisheries (sole, cod, rays, megrim, and hake). The management area for this stock also includes Division VIIa, where catches in recent years have been between 500 and 1 300 t.

**Catch forecast for 2003:**

Basis: *L. piscatorius*:  $F_{2002} = F(99-01) = 0.30$  ; Landings(2002) = 15.6; SSB(2003) = 26.4

Basis: *L. budegassa*:  $F_{2002} = F(99-01) = 0.27$  ; Landings(2002) = 6.8 ; SSB(2003) = 22.6

<i>L. piscatorius</i>				<i>L. budegassa</i>			
F(2003)	Basis	Landings(2003)	SSB(2004)	F(2003)	Basis	Landings(2003)	SSB(2004)
0.18	$0.6F_{sq}$	9.9	32.0	0.16	$0.6F_{sq}$	4.4	25.1
0.21	$0.7F_{sq}$	11.4	30.7	0.19	$0.7F_{sq}$	5.0	24.5
0.24	$F_{pa}=0.8F_{sq}$	12.7	29.4	0.21	$0.8F_{sq}$	5.7	23.9
0.27	$0.87F_{sq}$	13.7	28.6	0.23	$F_{pa}=0.87F_{sq}$	6.1	23.5
0.27	$0.9F_{sq}$	14.1	28.3	0.24	$0.9F_{sq}$	6.3	23.3
0.30	$1.0F_{sq}$	15.4	27.1	0.27	$1.0F_{sq}$	6.9	22.8
0.33	$1.1F_{sq}$	16.6	26.1	0.29	$1.1F_{sq}$	7.5	22.2
0.36	$1.2F_{sq}$	17.8	25.0	0.32	$1.2F_{sq}$	8.1	21.7

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.



### Medium- and long-term projections:

Assuming the current selection pattern,  $F_{\max}$  is 0.29 and 0.59  $F_{\text{pa}}$  for *L. piscatorius* and *L. budegassa* respectively.

Medium-term projections suggest that a 20% reduction in  $F$  (i.e.  $F_{\text{pa}}$  for *L. piscatorius*) leads to a more than 95% probability of both stocks exceeding  $B_{\text{pa}}$  in 2005.

### Comparison with previous assessment and advice:

The title for this assessment has changed to better reflect the areas covered. However, the actual assessment area is unchanged compared to previous years. For *L. piscatorius* the present estimates of  $F$  and SSB are very similar to those obtained from last year's assessment. For *L. budegassa* correction of an error in the figures of the maturity ogive did not alter the historic trend in SSB but has scaled it upwards. Fishing mortality for this stock has been revised upwards since 1996. Changes in strategy and fishing grounds of the fishery have caused changes in the selection pattern of some fleets towards smaller fish. Recent recruitment for both stocks have been strongly revised. However these revisions do not strongly affect the estimate of SSB in the short term.

The present advice is stronger than last year because the stocks have remained low and fishing mortality has increased on small fish.

### Elaboration and special comment:

Anglerfish landings from the west of the British Isles and down to the northern Bay of Biscay comprise two species - *L. piscatorius* and *L. budegassa*. *L. piscatorius* has a wide distribution in waters from the south-western Barents Sea to the Atlantic coast of Spain, whereas *L. budegassa* has a more southerly distribution, ranging from the British Isles in the north to Senegal in the south. Large specimens of both species are found in deep waters. Juvenile anglerfish have been caught both in deep water and along the shoreline, and discrete nursery areas have not been identified.

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, and overall annual landings may have attained 35–40 000 t by the early 1980s. Even though fishing effort increased until 1990, landings decreased between 1986 and 1993, but returned to the original level 10 years ago, when France and Spain together reported 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 UK landings are by beam trawlers and gill netters. Over 95% of total international landings of *L. budegassa* are taken by otter trawlers. There has been an expansion of the French gill net fishery in the late 80's in the Celtic Sea and in the

north of the Bay of Biscay, mainly by vessels based in Spain and fishing in medium to deep waters. Otter-trawling in medium and deep water in ICES Sub-area 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. Fishing activity by UK gill netters and beam trawlers has remained relatively stable over the period 1986–1995. Belgium landings of anglerfish are exclusively by beam trawlers.

The analytical age-based assessment is based on landings, survey and commercial CPUE data. The catch-at-age matrix covers ages to 13+ for *L. piscatorius* and to 14+ for *L. budegassa*. Short-term predictions of landings and SSB are not sensitive to recent assumed recruitment.

### Source of information:

Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim, May 2002 (ICES CM 2003/ACFM:01).

#### Anglerfish (*L. piscatorius*)

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

	Fish Mort Ages 3-8	Yield/R	SSB/R
Average Current	0.302	0.952	1.794
$F_{\max}$	0.088	1.313	8.165
$F_{0.1}$	0.052	1.226	12.237
$F_{\text{med}}$	0.272	0.998	2.128

#### Anglerfish (*L. budegassa*)

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

	Fish Mort Ages 6-10	Yield/R	SSB/R
Average Current	0.267	0.464	1.529
$F_{\max}$	0.159	0.497	2.915
$F_{0.1}$	0.100	0.469	4.494
$F_{\text{med}}$	0.232	0.479	1.853

**Catch data (Tables 3.9.12.1-5):**

Year	ICES Advice	Predicted catch cor- resp. to advice	Agreed TAC <sup>1</sup>	ACFM Landings	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 <sup>3</sup>	17.2 <sup>3</sup>	7.3 <sup>3</sup>
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	16.6	5.6
2002	Reduce F below $F_{pa}$	< 19.9	23.76			
2003	At least 30% decrease in F	< 16.4				

<sup>1</sup>Includes Division VIIa and Divisions VIII d,e; applies to both species. <sup>3</sup>Revised. Weights in '000 t.

**Table 3.9.12.1** Landings (t) of both species of Anglerfish in Divisions VIIb-k and VIIa,b,d. Working Group estimates.

Year	VIIb-k	VIIa,b,d	Total
1977 <sup>1</sup>			19895
1978 <sup>1</sup>			23445
1979 <sup>1</sup>			29738
1980 <sup>1</sup>			38880
1981 <sup>1</sup>			39450
1982 <sup>1</sup>			35285
1983 <sup>1</sup>			38280
1984 <sup>1</sup>	28847	7909	36756
1985 <sup>1</sup>	28491	7161	35652
1986	25987	5897	31883
1987	22295	7233	29528
1988	22494	5983	28477
1989	24731	5276	30007
1990	23434	5950	29384
1991	20385	4684	25069
1992	17554	3530	21084
1993	16633	3507	20140
1994	18093	3841	21934
1995	21922	4862	26784
1996	24132	6102	30233
1997	23928	5846	29774
1998	23295	4876	28171
1999 <sup>1</sup>	21288	3224	24512
2000 <sup>1</sup>	19250	2711	21961
2001*	19476	2728	22205

\*Preliminary.

<sup>1</sup> Revised.

**Table 3.9.12.2** Landings (t) of *L. piscatorius* in Divisions VIIb-k and VIIIa,b,d.  
Working Group estimates.

Year	VIIb-k	VIIIa,b,d	Total
1984 <sup>1</sup>	23056	5416	28472
1985 <sup>1</sup>	23193	4568	27761
1986	19544	4122	23666
1987	17180	4729	21909
1988	16147	3948	20095
1989	17584	2889	20474
1990	16374	3379	19753
1991	14071	2158	16229
1992	11456	1362	12818
1993	11894	1587	13481
1994	14075	2045	16120
1995	16618	3113	19730
1996	18153	3988	22141
1997	17743	3917	21660
1998	16786	2787	19572
1999 <sup>1</sup>	15690	1506	17186
2000 <sup>1</sup>	13765	1133	14898
2001*	15026	1544	16571

\*Preliminary.

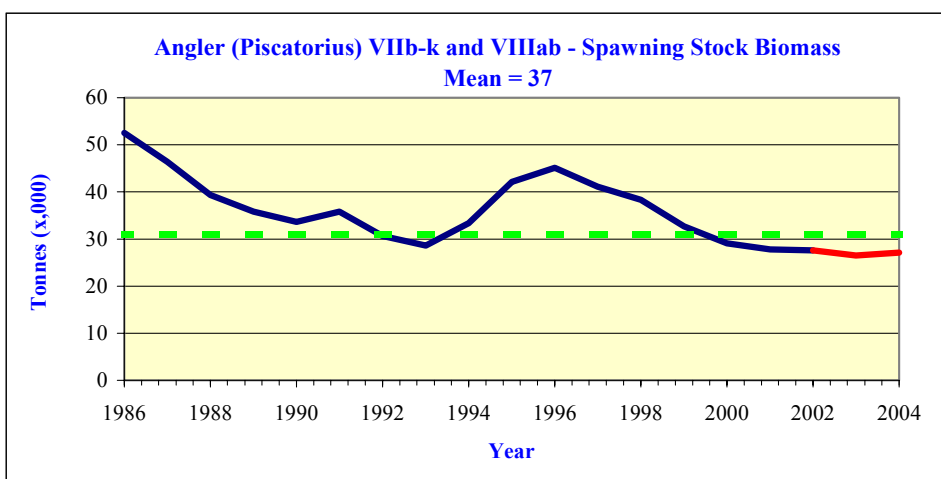
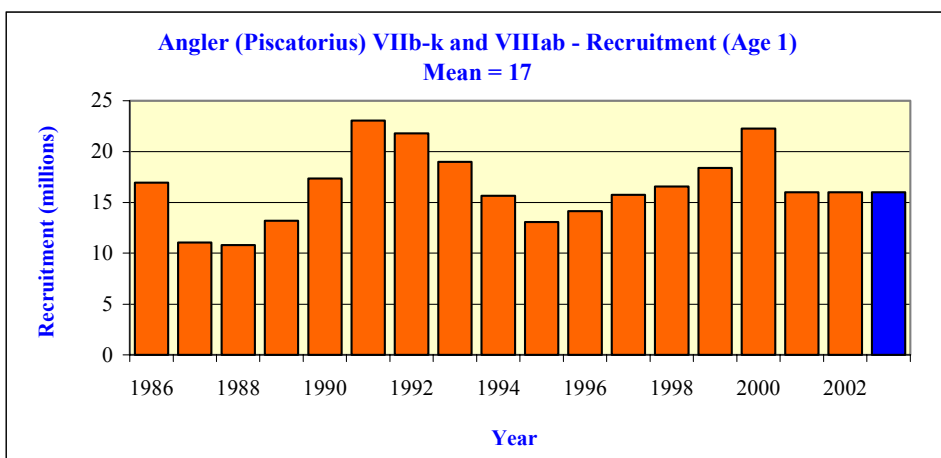
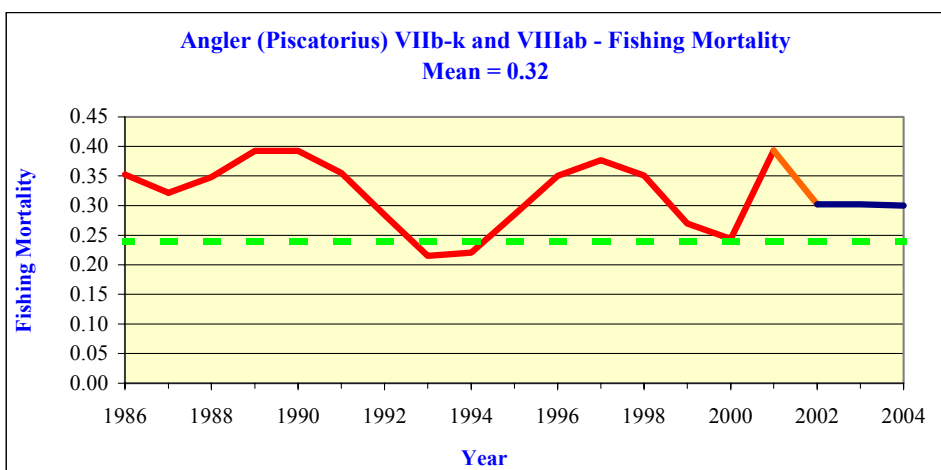
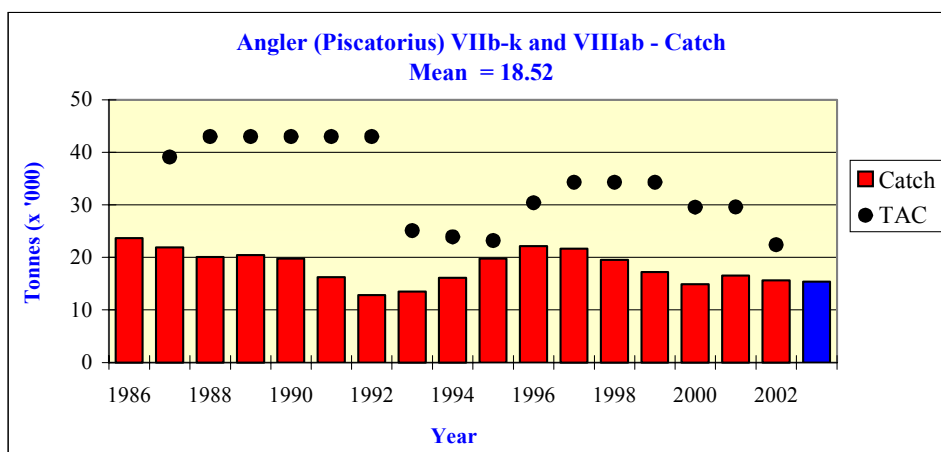
<sup>1</sup> Revised

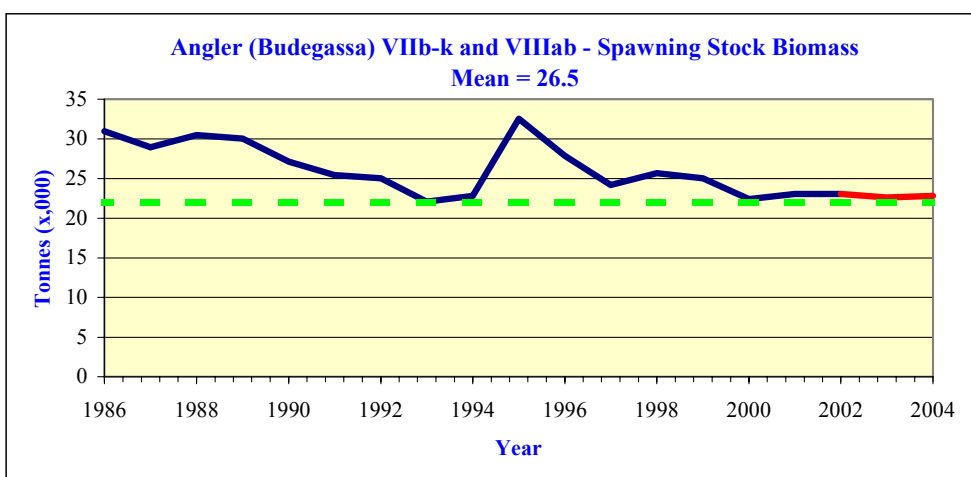
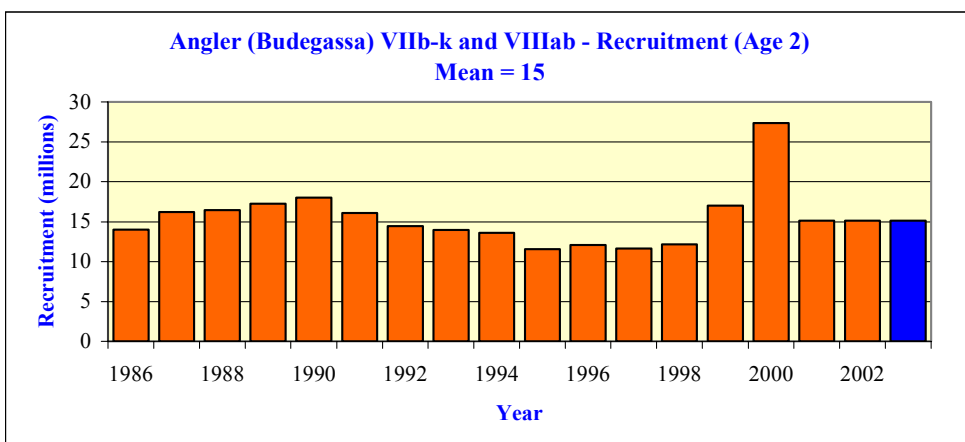
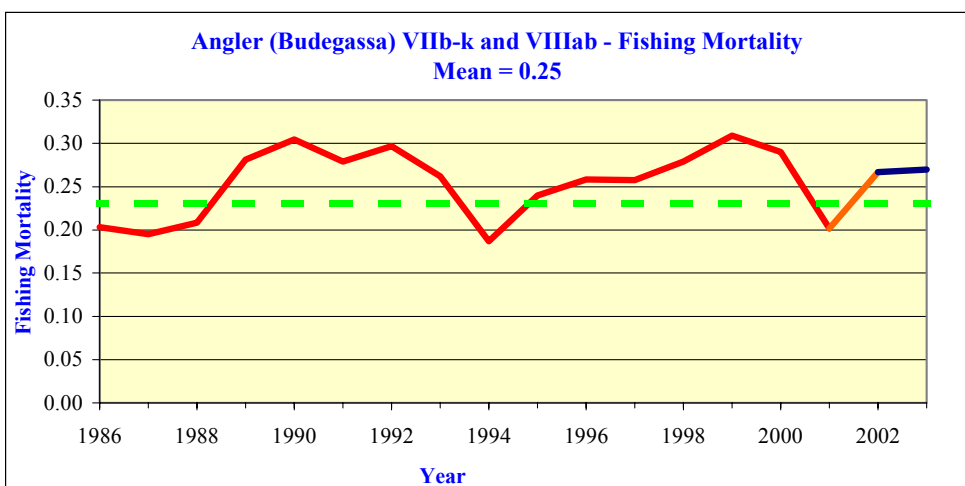
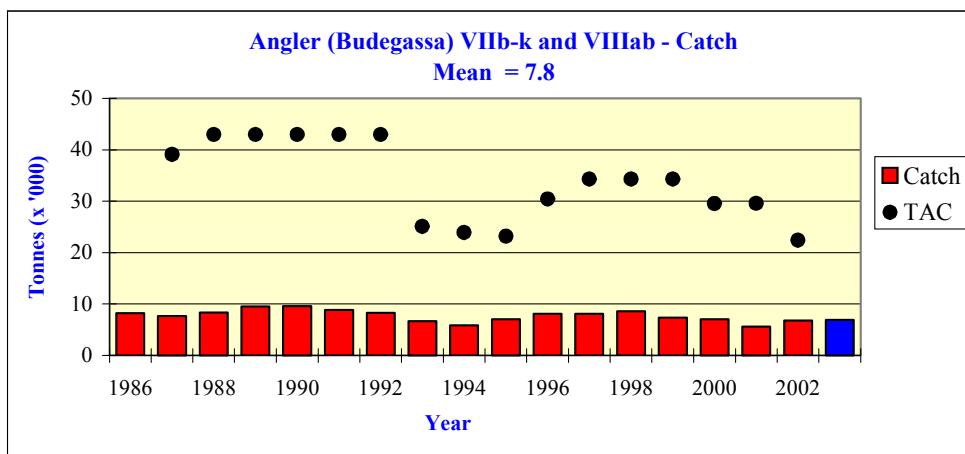
**Table 3.9.12.3** Landings (t) of *L. budegassa* in Divisions VIIb-k and VIIIa,b,d.  
Working group estimates.

Year	VIIb-k	VIIIa,b,d	Total
1984 <sup>1</sup>	5791	2493	8284
1985 <sup>1</sup>	5298	2593	7891
1986	6443	1775	8217
1987	5115	2504	7619
1988	6347	2035	8382
1989	7146	2387	9533
1990	7061	2571	9632
1991	6314	2526	8840
1992	6098	2168	8266
1993	4739	1919	6659
1994	4018	1796	5814
1995	5304	1749	7053
1996	5978	2114	8092
1997	6185	1929	8114
1998	6510	2089	8599
1999 <sup>1</sup>	5607	1718	7325
2000 <sup>1</sup>	5485	1578	7064
2001*	4450	1184	5634

\*Preliminary.

<sup>1</sup> Revised.





**Table 3.9.12.4** Anglerfish (*Piscatorius*) in Divisions VIIb-k and VIIa,b,d.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-8
1986	17,000	52,500	23,700	0.352
1987	11,000	46,400	21,900	0.322
1988	11,000	39,300	20,100	0.348
1989	13,000	35,900	20,500	0.392
1990	17,000	33,600	19,800	0.392
1991	23,000	35,800	16,200	0.355
1992	22,000	30,600	12,800	0.285
1993	19,000	28,600	13,500	0.215
1994	16,000	33,300	16,100	0.220
1995	13,000	42,100	19,700	0.285
1996	14,000	45,100	22,100	0.350
1997	16,000	41,100	21,700	0.377
1998	17,000	38,300	19,600	0.351
1999	18,000	32,700	17,200	0.270
2000	22,000	29,100	14,900	0.244
2001	16,000*	27,800	16,600	0.393
2002	16,000*	27,600		0.302
Average	16,529	36,459	18,525	0.321

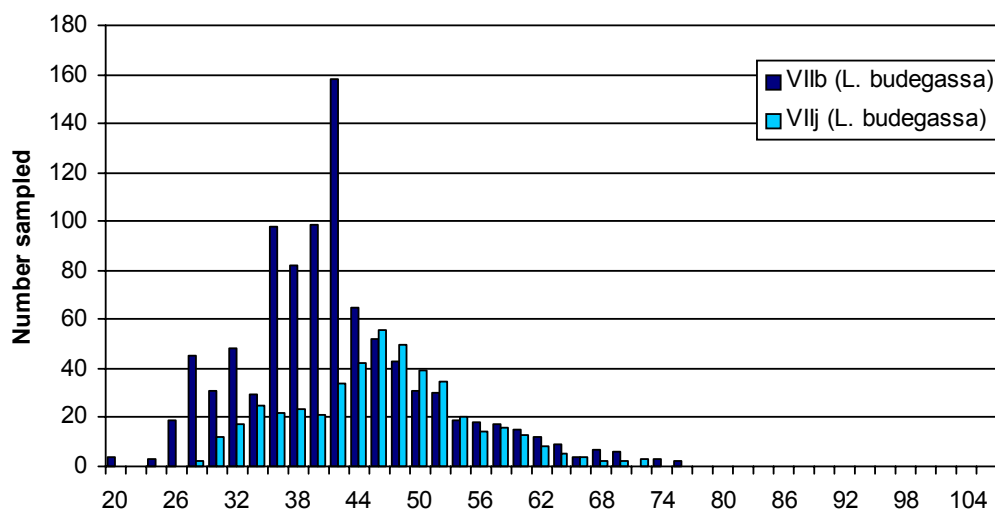
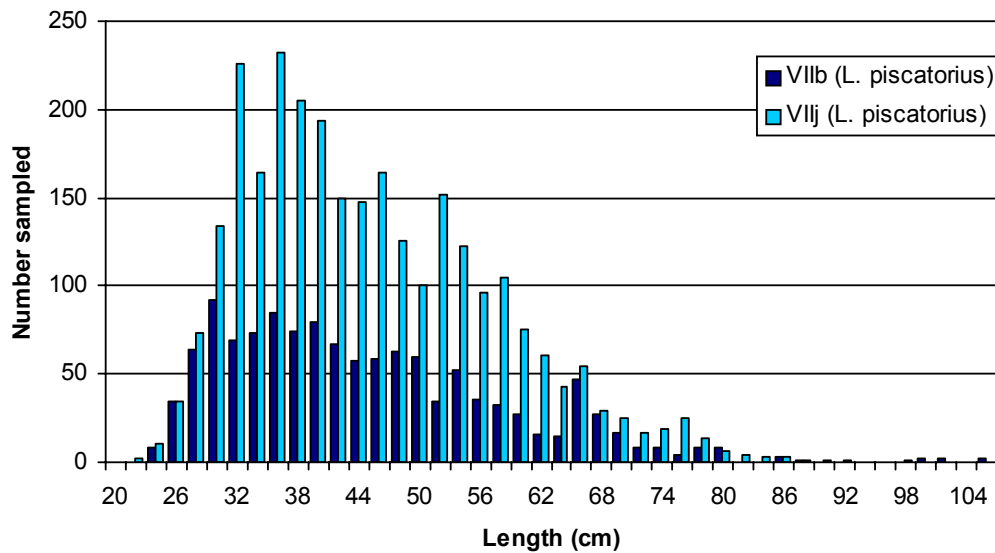
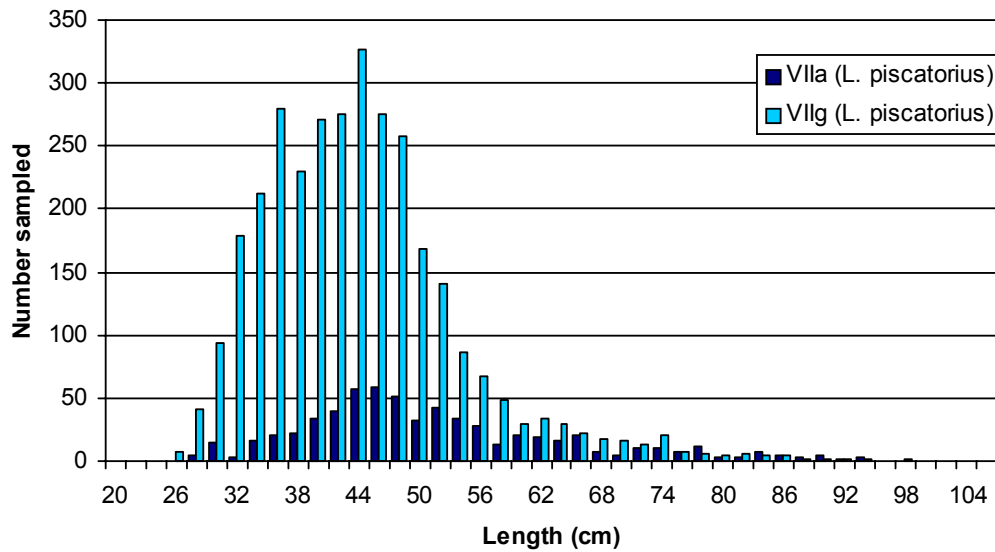
\* GM87-00

Anglerfish (*Budegassa*) in Divisions VIIb-k and VIIa,b,d

Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 6-10
1986	14,024	30,969	8,217	0.203
1987	16,228	28,923	7,619	0.195
1988	16,462	30,497	8,382	0.208
1989	17,255	30,051	9,533	0.281
1990	18,006	27,114	9,632	0.305
1991	16,068	25,440	8,840	0.279
1992	14,460	25,021	8,266	0.297
1993	13,995	22,072	6,659	0.262
1994	13,631	22,791	5,814	0.187
1995	11,561	32,527	7,053	0.240
1996	12,095	27,868	8,092	0.258
1997	11,656	24,182	8,114	0.258
1998	12,183	25,673	8,599	0.279
1999	17,031	25,051	7,325	0.309
2000	27,379	22,405	7,065	0.290
2001	15,166*	23,066	5,634	0.202
2002	15,166*	23,092		0.267
Average	15,433	26,279	7,803	0.254

\* GM87-00

### 2001 Length Distribution: Irish Sampling, *L. piscatorius* in VIIa & VIIg



# West of Scotland and Rockall Megrim

(Sub-area VI)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the STECF and ICES advice for other West of Scotland stocks is predicated primarily on the need to rebuild cod stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

MFSD therefore advises that unless way to harvest megrim without incidental catch or discards of cod and VIb haddock can be demonstrated, fishing for anglerfish should not be permitted.

MFSD agrees with the ICES recommendation that, if any fisheries on megrim are permitted, despite the advice on cod and VIb haddock, catches in 2003 should be no more than the recent TAC of 4,360 t. This translates into an Irish quota of 565 t.

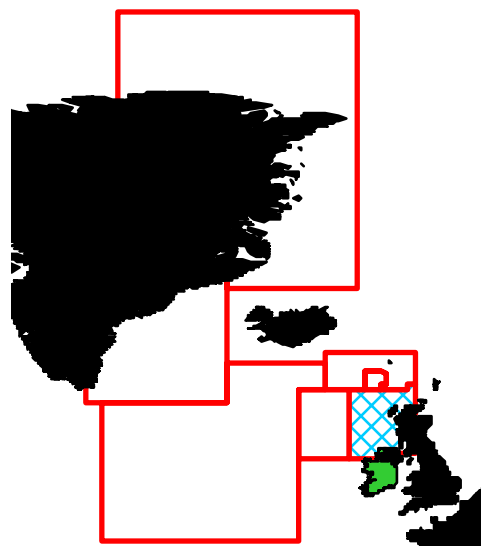
Last year the MFSD advice was linked to that of Anglerfish. Recent investigations have indicated that landings of these two species are not correlated for Irish demersal trawlers in VIa. Similarly, as the Scottish fishery has expanded into deeper waters, the megrim and anglerfish may no longer be as strongly linked for that fleet.

## STATE OF THE STOCK

- The state of this stock in relation to biological reference points is not known.
- The estimated 2001 Sub-area VI landings were 2,630 t (Note: VIb landings are incomplete). The landings from VIa have shown a marked increase from 1991 to 1996 (4,400 t) but have subsequently fallen to the recent low of 2,350 t in 2001.
- There are indications that fishing mortality has declined in recent years from a high in 1995.
- There is evidence that recruitment was above average in 1992 and 1993. Recruitment in recent years is poorly estimated.
- Spawning stock biomass may have declined in this stock since the early 1990s.
- The preliminary assessment carried out this year is not a sufficient basis to predict future stock development.

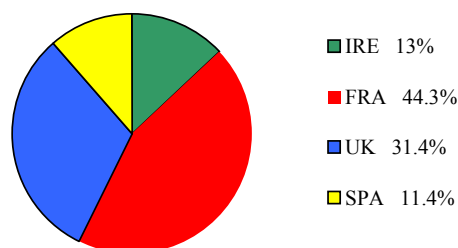
## CURRENT MANAGEMENT

- The assessment area is currently Division VIa while the TAC is based on a larger area (Sub-areas VI, XII, XIV and Division Vb).



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

- The 2002 TAC was set at 4,360 t with an Irish quota of 565 t (13%).



- Where megrim are caught in mixed fisheries. This stock will probably benefit from management measures adopted to protect juveniles of other species in Division VIa, particularly the recent increases mesh sizes.
- There are no explicit management objectives or a management plan for this stock.
- MFSD advise that management objectives be established and that a management plan be developed and implemented for the mixed fisheries catching megrim.

## MFSD – ECONOMIC COMMENTS

- The value of the 2000 Irish quota was €1.7m.



- The value of the 2000 Irish landings from Sub-area VI was €1.9m.
- This is an economically important by-catch species in the mixed demersal fisheries off Donegal and at Rockall.

## ADDITIONAL INFORMATION

- 1 A preliminary assessment was carried out for VIa megrim in 2002. This assessment is hampered by the lack of catch and effort data from both the main fleet exploiting megrim and research surveys.
- 2 Irish landings in 2001 were 621 t (445 t and 176 t, for VIa and VIb, respectively).
- 3 Irish landings in Sub-area VI are mainly taken by otter trawlers fishing at the Stanton, Rockall and in Donegal Bay. 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.
- 4 Mis-reporting of anglerfish landings in the past, into Sub-area IV has led to an associated mis-reporting of the megrim component of the catch for some fleets. No information is available on mis-reporting by the Irish fleet.
- 4 Scottish and Irish vessels dominate the fishery. French landings declined in the early 1990s and remain low. Spain reports the highest landings of megrim from VIb.
- 5 Irish sampling for this stock is supported through the EC funded sampling programme, which is required under Data Collection Regulation 1543/2000 and 1639/2001.
- 6 Irish landings are dominated by 4-6 year old megrim in VIa and 6-9 year old megrim in VIb. Differences in age structure and growth rates of the population suggest that megrim from these two Divisions should be assessed as different stocks.
- 7 MFSD have carried out a groundfish survey in the southern part of VIa however this survey is targeted at gadoids and does not provide a reliable index for this stock.
- 8 Two species of megrim are caught. The majority of landings are *Lepidorhombus whiffiagonis*. Landings of *L. boscii* are negligible.
- 9 Irish discard sampling between 1995-2000 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.
- 10 An EU funded research project (with the Marine Laboratory Aberdeen & Scottish Association for Marine Science) to investigate the biology and distribution of monkfish and megrim in Sub-area VI was concluded in 2001.

## ICES ADVICE

### 3.7.6

#### State of stock/exploitation:

The absence of a time-series of abundance indices and discards estimates means that the historical perspective of SSB, fishing mortality and recruitment is not well estimated for this stock. It is likely that fishing mortality increased in the 1990s as the fishery for anglerfish, (in which megrim is taken as a by-catch) expanded into progressively deeper water. Landings of both species peaked in 1996 and have subsequently declined. There are weak indications that fishing mortality on megrim may have declined in recent years, as has also been estimated for anglerfish.

#### Management objectives:

No explicit management objectives are set for this stock.

#### Reference points:

There is not sufficient information to estimate appropriate reference points.

#### Advice on management:

**ICES advises that catches in 2002 be no more than the recent TAC.**

#### Relevant factors to be considered in management:

Megrim are caught as part of a targeted anglerfish fishery, which expanded rapidly in the 1990s. Vessels targeting anglerfish in waters deeper than 450 m are likely to have reduced by-catches of megrim, particularly when using 100 mm and larger meshes. Maintenance of the existing megrim TAC should help to prevent expansion of the fishery for anglerfish that is considered to be outside safe biological limits. Megrim are also caught in mixed species fisheries in VIa, and discarding is a problem particularly from trawls with 80 mm meshes. The megrim in Sub-area VI consists of two species, *Lepidorhombus whiffiagonis* and *L. boscii*. The large majority of the landings are *L. whiffiagonis*. Although total landings are less than the TAC, some national quotas are restrictive and this has led to mis-reporting. Previously, the adjacent fishery in the North Sea was not subject to a TAC for megrim, and catch controls on anglerfish in Sub-area VI have led to mis-reporting of landings, including the megrim component, into the North Sea.

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 females.

The landings from Division VIa showed a marked increase from 1991 to 1996 (4 400 t), but have subsequently fallen to the recent low of 2 300 t in 2001.

### Elaboration and special comment:

Until recently, megrim was taken mainly as a by-catch in bottom trawl groundfish fisheries. The expansion of the fishery for anglerfish has led to increased fishing pressure on megrim in the area, where they are now caught as a by-catch in the targeted anglerfish fishery. Previous analyses have indicated that megrim are more robust to exploitation than anglerfish, hence management of the fishery should primarily reflect concerns for the anglerfish stock.

Length frequency and age composition data are only available for 1992–2001. Incomplete data were available for 1990 and 1991. Preliminary assessments have previously indicated that F may be rather low, but this impression may be due to the expansion of the area fished.

### Source of information:

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

### Catch data (Tables 3.7.6.1-2)

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC <sup>1</sup>	Official landings	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	2.9
1991	No advice	-	4.84	3.2	2.7
1992	No advice	-	4.84	3.2	3.7
1993	No long-term gain in increased F	-	4.84	3.0	3.4
1994	No long-term gain in increased F	-	4.84	3.0	3.3
1995	No advice	-	4.84	3.3	3.8
1996	No advice	-	4.84	2.9	4.4
1997	No advice	-	4.84	2.8	3.6
1998	Adequate catch controls	-	4.84	2.7	3.1
1999	Maintain current TAC	4.84	4.84	2.5	2.9
2000	Maintain current TAC	4.84	4.84	2.0	2.7
2001	Maintain current TAC	4.84	4.36	1.8 <sup>2</sup>	2.3
2002	Maintain current TAC	4.36			
2003	Maintain current TAC	4.36			

<sup>1</sup>Vb(EC), VI, XII and XIV. <sup>2</sup>Incomplete data. <sup>3</sup>Landings in VIa. Landings in Vb (EC), XII, and XIV negligible. Weights in '000 t.

**Table 3.7.6.1** Nominal catch (t) of MEGRIM in Subarea VI (West of Scotland and Rockall), as officially reported to ICES and WG best estimates of landings for Division VIa.

### Megrim in Division VIa (West of Scotland)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*	2000*	2001*
Belgium	1	1	1	-	1	-	-	1	-	-	-	-	-	+	-
Denmark	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
France	997	1,295	457	398	455	504	517	408	618	462	192	172	203	167	244
Germany	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Ireland	403	685	474	317	260	317	329	304	535	460	438	433	438	417	507 <sup>†</sup>
Spain	102	121	43	91	48	25	7	1	24	22	87	111	83	85	n/a
UK(E&W&NI)	380	354	122	25	167	392	298	327	322	156	123	65	42	20	-
UK(Scotland)	991	1,068	1,169	1,093	1,223	887	896	866	952	944	954	841	831	754	-
UK															776
Total	2,874	3,526	2,267	1,924	2,154	2,125	2,047	1,907	2,451	2,044	1,794	1,622	1,597	1,443	1,527
Unallocated				1,000	518	1,595	1,356	1,373	1,375	2,381	1,795	1,522	1,338	1,247	821
As used by WG				2,924	2,672	3,720	3,403	3,280	3,826	4,425	3,589	3,144	2,935	2,690	2,348

\* Preliminary. <sup>†</sup> Includes 6b landings

**Megrim in Division VIb (Rockall)**

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*	2000*	2001*
France	2	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Ireland	-	-	-	196	240	139	128	176	117	124	141	218	127	167	-
Spain	583	751	205	363	587	683	594	574	520	515	628	549	404	22	-
UK(E&W&NI)	261	77	18	19	14	53	56	38	27	92	76	116	57	57	-
UK(Scotland)	174	185	178	226	204	198	147	258	152	112	164	208	278	309	-
UK															278
Total	1,020	1,014	401	804	1,045	1,073	925	1,046	816	843	1,009	1,091	866	555	279

**Total Megrim in Sub-area VI (West of Scotland and Rockall)**

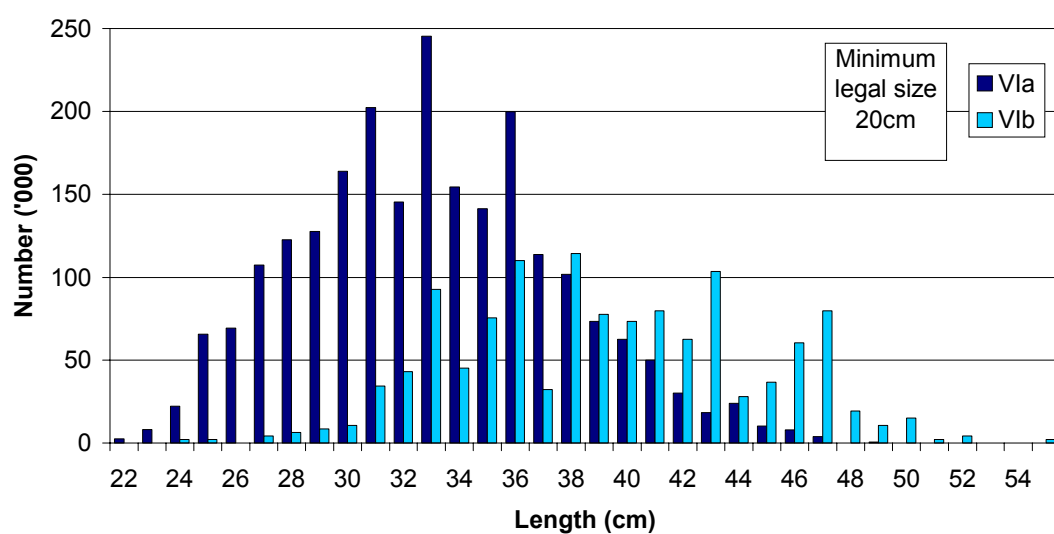
Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*	2000*	2001*
Total	3,894	4,540	2,668	2,728	3,199	3,198	2,972	2,953	3,267	2,887	2,803	2,713	2,463	1,998	1,806
As used by WG				3,728	3,717	4,793	4,328	4,326	4,642	5,268	4,598	4,235	3,801	3,245	2,627

\* Preliminary. † Includes 6b landings

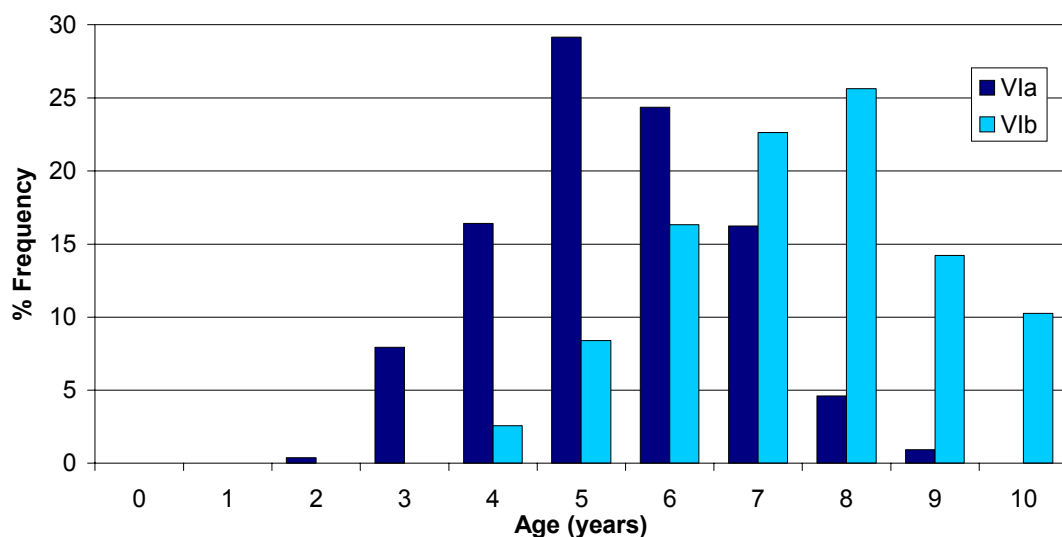
**Table 3.7.6.2** Megrim in Sub-area VI (West of Scotland and Rockall)

Year	Landings
	tonnes
1983	3469
1984	3384
1985	3753
1986	2780
1987	3894
1988	4540
1989	2668
1990	3728
1991	3717
1992	4793
1993	4328
1994	4326
1995	4642
1996	5268
1997	4598
1998	4235
1999	3801
2000	3245
2001	2627
Average	3884

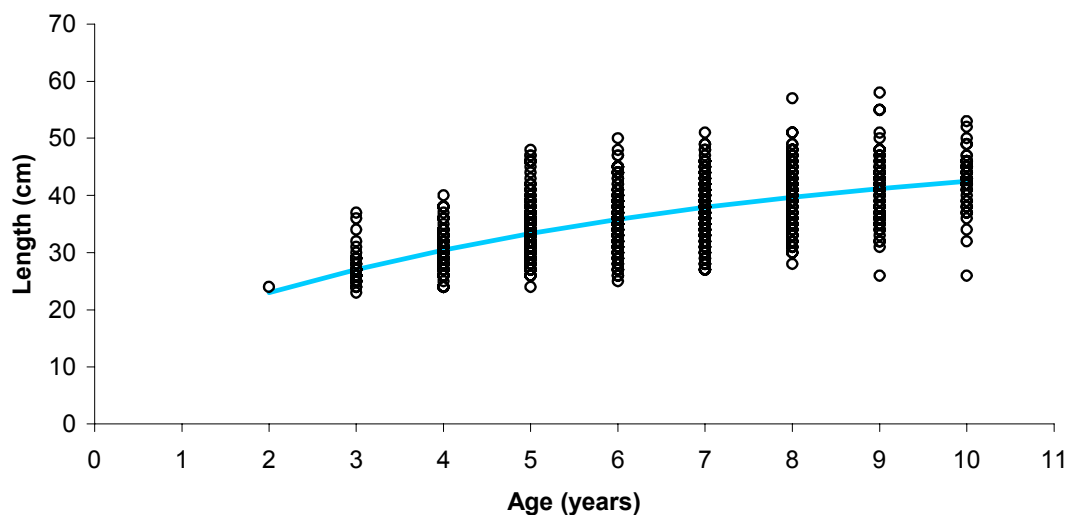
**2001 Length Distribution: Irish Landings, Megrim in V1a V1b**



**2001 Age Distribution: Irish Landings, Megrim in V1a V1b**



**2001 Size at Age: Irish Sampling, Megrim in V1a V1b**



# Celtic Sea and Bay of Biscay Megrim

(Sub-area VII and Divisions VIIIa,b,d,e)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD agrees with the ICES recommendation that fishing mortality on *L. whiffagonis* should be reduced to below  $F_{pa}$ , corresponding to landings of less than 15,300 t in 2003. Including a 5% contribution of *L. boscii* in the landings, the equivalent TAC for the two species combined would be 16,100 t. This would translate to an Irish quota of 2,373 t in 2003.

MFSD points out that in order to be consistent with the Precautionary Approach, management of mixed fisheries taking megrim will be determined by measures to assist the recovery of hake.

TAC area	2002 TAC	2002 Irish Quota	Proposed 2003 TAC	Proposed 2003 Irish Quota
VII	13,350	2,210	14,425	2,388
VIIIa,b,d,e	1,550		1,675	
Total	14,900		16,100	

## STATE OF THE STOCK

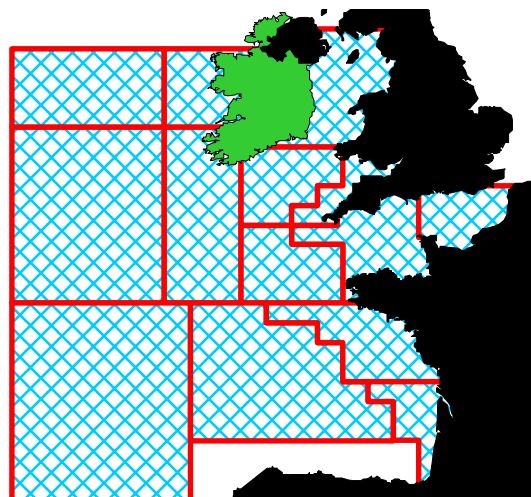
- There are concerns about the stock of *Lepidorhombus whiffiagonis* that is harvested outside safe biological limits.
- The landings in 2001 were 17,100 t, which is 1% lower than in 2000. Landings have been relatively stable, fluctuating around 17,000 t since 1990.
- The fishing mortality in 2001 was 0.39, compared with the proposed  $F_{pa} = 0.3$ . Fishing mortality has been above  $F_{pa}$  since 1999.
- Recruitment (age 1) has been relatively stable with peaks for the 1997 and the 1999 year classes.
- The Spawning Stock Biomass in 2002 was 68,500 t, compared with the proposed  $B_{pa} = 55,000$  t. The SSB decreased from about 80,000 t in the mid-1980s to about 60,000 t in 1989.
- In the short term SSB is predicted to be relatively stable in 2003 and 2004.

## CURRENT MANAGEMENT

- There are two TAC areas covering the assessment

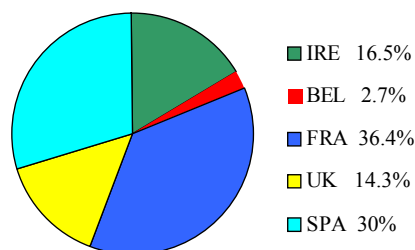
area for this stock; Sub Area VII and Divisions VIIIa, b,d,e).

- The assessment area for this stock; Sub-area VII and Divisions VIIIa,b,d,e).



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

- The 2002 TAC was 13,350 t with an Irish quota of 2,210 t. The TAC for VIIIa,b,d,e was 1,550 t in 2002.



- There are no explicit management objectives or plan for this stock.
- MFSD advises that management objectives be established and that a management plan be developed and implemented for fisheries taking megrim.

## MFSD – ECONOMIC COMMENTS

- The economic value of the Irish quota was €7.4 m in 2001.
- The economic value of Irish landings was €8.3 m in 2001.
- Megrim is an extremely important species for the Irish industry, caught in mixed fisheries with hake and anglerfish, but also with *Nephrops*, cod and whiting. The value per tonne of these landings has increased in the last year.

## ADDITIONAL INFORMATION

1. Historical trends in F and SSB are similar to those in the previous assessment. There is a slight downward revision in F and upward revision in SSB in the very recent years (by less than 5% for SSB and less than 10% for F). The present advice is similar to last year's advice. The 2001 catches and landings are very closed to last year's prediction.
2. Revised data from France for year 2000 and 2001 has been used this year by the Working Group.
3. Irish landings of megrim in this area were 2,767 t in 2001.
4. In the past misreporting has not been a problem in this fishery as the TAC was not restrictive.
5. Spain and France dominate the fishery with about 70% of the landings between them. In 2001 Ireland landed an estimated 16 % of the total international landings
6. 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.
7. Irish sampling for this stock is supported through the EC-funded Sampling Programme, which is required under Data Collection Directives 1543/2000 and 1639/2001.
8. MFSD sampling has shown that age 4 is the dominant year class in VIIg, age 5 in VIIb and age 3 in VIIj.
9. In 2002 revised Irish commercial catch and effort data from logbooks were used to tune the assessment for the second time.
10. MFSD also carried out an egg and larval survey in March 2000 and 2001. The preliminary results from this survey indicate that the continental shelf edge southwest of Ireland is an important spawning area for megrim.
11. The fishery consists of two species. Irish sampling in-

dicates that catch rates of *L. boscii* are negligible in landings. Irish fishermen don't separate the two species. Due to their smaller average size *L. boscii* are more common in discards particularly in deeper waters.

12. The selection pattern is poor, the fishery takes a disproportionate amount of small fish. Technical measures such as increases in mesh size to reduce the catches of small fish should be investigated for this stock.
13. In the last three years, a decreasing trend in the discards has been observed. The estimation of discards in 2001 is the lowest in the series. The discards decrease in 2000 and 2001 this can be partly explained by the reduction in the minimum legal size and the use of larger mesh sizes due to the Northern Hake Emergency Plan. There are only limited discard information for the French fleet in this area.
14. A reliable discarding programme would be required to improve the estimates of recruiting year classes for both of these stocks.

## ICES ADVICE 3.9.11

### State of stock/exploitation:

The stock of *Lepidorhombus whiffiagonis* is harvested outside safe biological limits. SSB was high from 1984 to 1988, then declined until 1990 but has remained above  $B_{pa}$ . The fishing mortality has declined from the 1991 peak until 1997 and has increased since then to above  $F_{pa}$ . Recruitment at age 1 has been relatively stable with peaks for the 1997 and the 1999 year classes.

### Management objectives:

There are no explicit management objectives for this stock.

International landings of megrim in VIIa, from STATLANT database and from EU logbooks (Ireland only).

1995	1996	1997	1998	1999	2000
132	64	34	35	40	26

### Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$B_{lim}$ is not defined	$B_{pa}$ be set at 55 000 t. There is no evidence of reduced recruitment at the lowest biomass observed and $B_{pa}$ was therefore set equal to the lowest observed SSB.
$F_{lim}$ is 0.44, the fishing mortality above which stock dynamics are unknown	$F_{pa}$ be set at 0.30, the estimated $F_{med}$ . This F is consistent with the proposed $B_{pa}$ and it approximates $F_{MSY}$ .

### Technical basis:

$B_{lim} =$	$B_{pa} = B_{loss}$
$F_{lim} = F_{loss}$	$F_{pa} = F_{med}$ ; implies a less than 5% probability that $(SSB_{MT} < B_{pa})$

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**Advice on management:**

ICES recommends that fishing mortality should be reduced to below  $F_{pa}$ , corresponding to landings of less than 15 300 t in 2003. Including a 5% contribution of *L. boschii* in the landings, the equivalent TAC for the two species combined would be 16 100 t.

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**Relevant factors to be considered in management:**

For most fleets, megrim is taken in mixed fisheries for hake, anglerfish, *Nephrops*, cod and whiting. The selection pattern is poor, i.e. that the fishery takes a disproportionate amount of small fish. Technical measures such as increases in mesh size to reduce the catches of small fish should be investigated for this stock.

**Catch forecast for 2003:**

Basis:  $F(2002) = F(99-01) = 0.35$ ; Landings(2002) = 16.3 t; Catch(2002) = 19.4 t; SSB(2003) = 70.6.

F(2003)	Basis	Catch(2003)	Landings (2003)	SSB(2004)
0.17	0.5 $F_{sq}$	11.1	9.5	79.0
0.21	0.6 $F_{sq}$	13.1	11.2	76.7
0.24	0.7 $F_{sq}$	15.0	12.8	74.4
0.28	0.8 $F_{sq}$	16.9	14.4	72.2
0.30	$F_{pa}$	18.0	15.3	70.9
0.31	0.9 $F_{sq}$	18.7	15.9	70.1
0.35	1 $F_{sq}$	20.4	17.3	68.0
0.38	1.1 $F_{sq}$	22.0	18.7	66.1
0.42	1.2 $F_{sq}$	23.6	20.1	64.2

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

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**Medium- and long-term projections:**

Medium-term projections suggest that fishing at status quo leads to a more than 95% probability of SSB exceeding  $B_{pa}$  in 2007, at  $F_{pa}$  there is a 5% probability of SSB falling below  $B_{pa}$  in 2009.

There would be no loss in long-term (yield-per-recruit) if the current fishing mortality rate was reduced to  $F_{max}$ . Such a reduction in fishing mortality would increase the expected spawning stock biomass per recruit to the order of 50%.

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**Comparison with previous assessment and advice:**

The title for this assessment has changed to better reflect the areas covered. However, the actual assessment area is unchanged compared to previous years. Historical trends in  $F$  and SSB are similar to those in the previous assessment, with a slight downward revision in  $F$  and upward revision in SSB in the very recent years (by less than 5% for SSB and less than 10% for  $F$ ). The present advice is similar to last year's advice.

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**Elaboration and special comment:**

Megrim in the Celtic sea, west of Ireland and in the Bay of Biscay are caught predominantly by Spanish and French vessels, which together have reported more than 60% of the total landings, and by Irish and UK demersal trawlers. Most UK landings of megrim are made by beam trawlers fishing in Divisions VIIe,f,g,h. Otter trawlers account for the majority of Spanish landings from Sub-area VII prosecuting a

mixed fishery for anglerfish, hake and megrim on the shelf edge around the 200 m contour to the south and west of Ireland. Irish megrim landings are largely made by multi-purpose vessels fishing in Divisions VIIb,c,g for gadoids as well as plaice, sole and anglerfish. Megrim landings have remained fairly stable over the period 1986–2001. Discards are estimated to be less than 10% by weight of the total catches in recent years and comprise fish over a large range of sizes.

Megrim are widely distributed over the whole of Sub-areas VII and VIII and are most abundant in the deeper waters of the continental shelf. Spawning takes place between January and April along the edge of the continental shelf to the southwest and west of the British Isles, and research vessel trawling surveys indicate that 0-group megrim do not move far from the spawning grounds on the shelf edge during their first year.

An age-based analytical assessment using catch-per-unit effort from three commercial fleets and three surveys was performed. Discard estimates were used but were considered incomplete as only Spain provided data. Estimates of recruitment are considered to be very dependant on discards information.

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**Source of information:**

Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim, May 2002 (ICES CM 2003/ACFM:01).

# Yield and spawning biomass per Recruit

F-reference points:

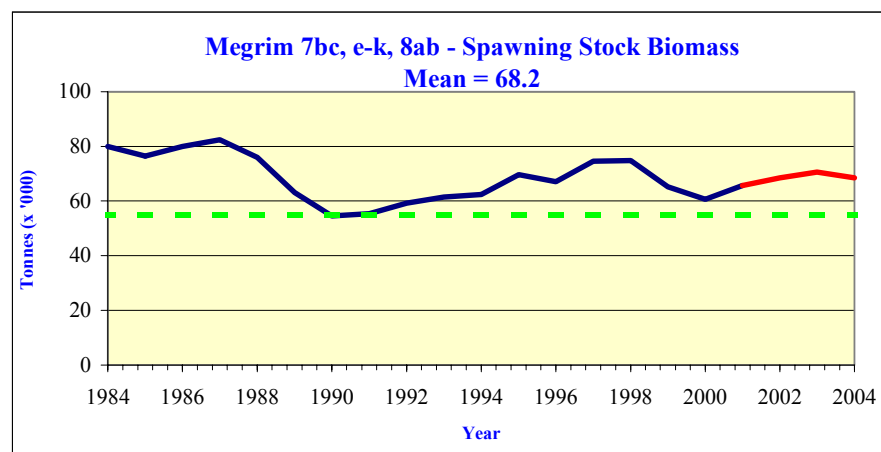
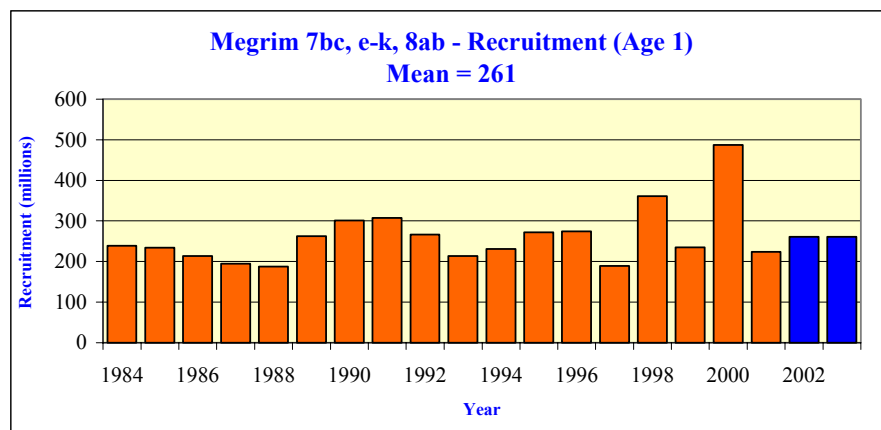
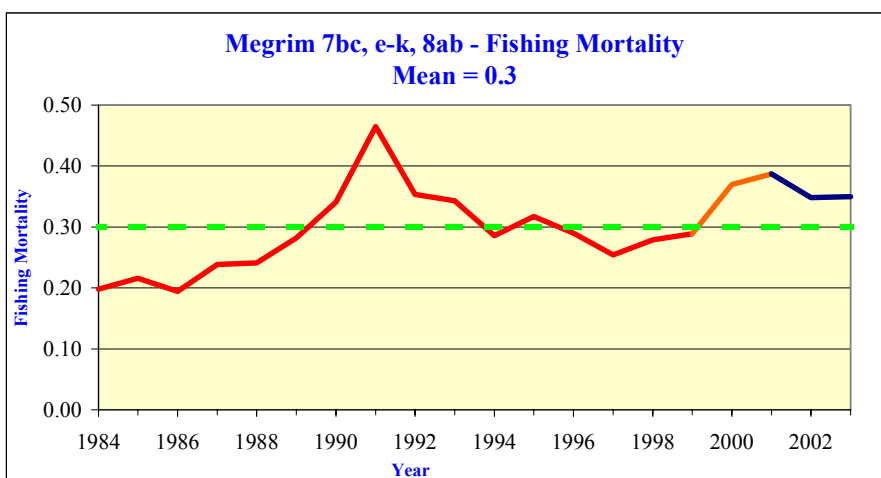
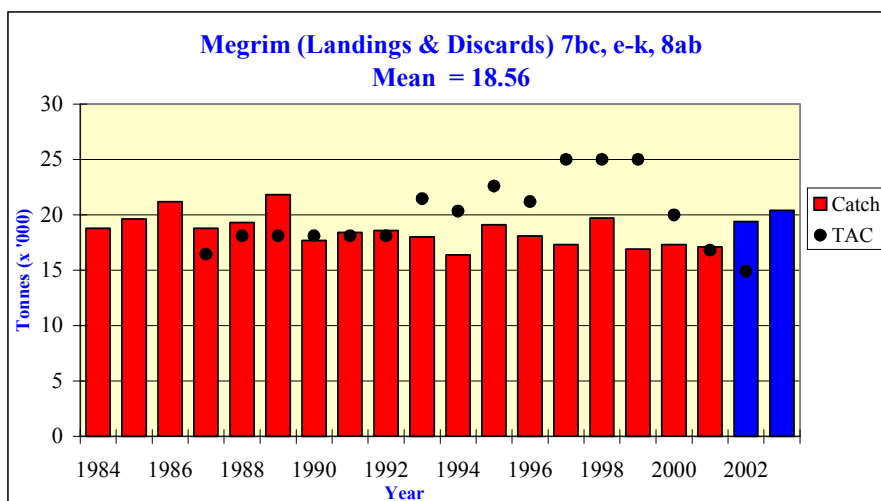
	Fish Mort Ages 3-6	Landings/R	SSB/R
Average Current	0.349	0.066	0.227
$F_{max}$	0.229	0.068	0.337
$F_{0.1}$	0.134	0.064	0.522
$F_{med}$	0.290	0.067	0.271

# Catch data (Tables 3.9.11.1-2):

Year	ICES Advice	Predicted catch corresp. to ad- vice	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 <sup>2</sup>	21.20	15.1	3.0	18.1
1997	No advice	14.3 <sup>2</sup>	25.0	14.3	3.1	17.3
1998	No increase in F	15.2 <sup>2</sup>	25.0	14.3	5.4	19.7
1999	Reduce F below $F_{pa}$	14.6 <sup>2,1</sup>	25.0	13.7	3.1	16.9
2000	Reduce F below $F_{pa}$	<14.2 <sup>2,1</sup>	20.0	15.0	2.3	17.3
2001	Reduce F below $F_{pa}$	< 14.1 <sup>2,1</sup>	16.8	15.8	1.3	17.1
2002	Reduce F below $F_{pa}$	< 13.0 <sup>2,1</sup>	14.9			
2003	Reduce F below $F_{pa}$	< 16.1 <sup>2,1</sup>				

<sup>1</sup>Includes *L. boschii*. <sup>2</sup>Landings assuming current discarding practise. Weights in '000 t.





**Table 3.9.11.1** Megrim (*L. whiffiagonis*) in Divisions VIIb-c, e-k and VIIa,b,d. Nominal landings and catches (t) provided by the Working Group.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Total landings	17865	18927	17114	17577	19233	14371	15094	15600	14929	13685
Total discards	1732	2321	1705	1725	2582	3284	3282	2988	3108	2700
Total catches	19597	21248	18819	19302	21815	17655	18376	18588	18037	16385
Agreed TAC <sup>1</sup>			16460	18100	18100	18100	18100	18100	21460	20330

	1995	1996	1997	1998	1999	2000	2001
Total landings	15862	15109	14254	14345	13714	15031	15778
Total discards	3206	3026	3066	5371	3135	2265	1275
Total catches	19068	18135	17320	19716	16850	17297	17053
Agreed TAC <sup>1</sup>	22590	21200	25000	25000	25000	20000	16800

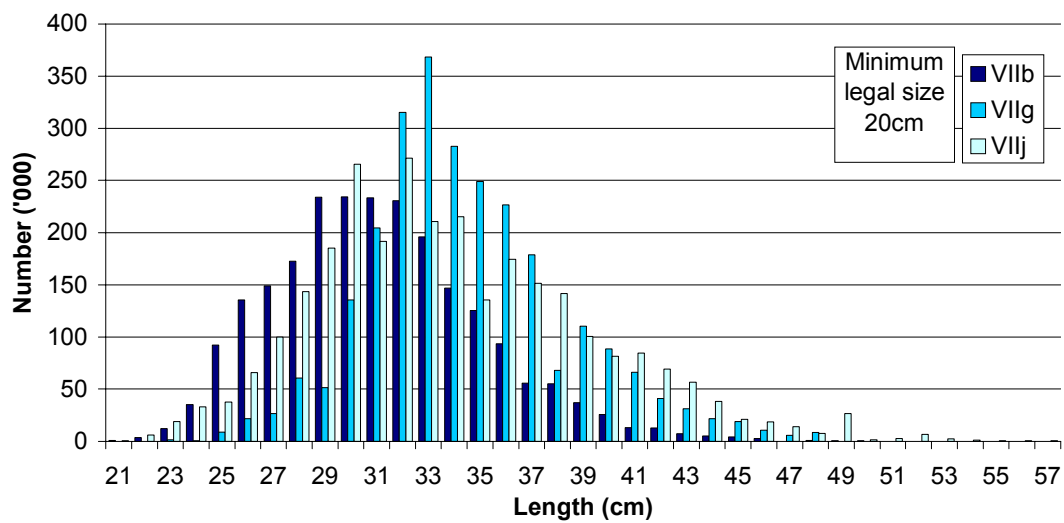
<sup>1</sup> For both Megrim species and VIIa included.

Megrim (*Whiffiagonis*) in Sub-area VII & Divisions VIIa,b,d,e

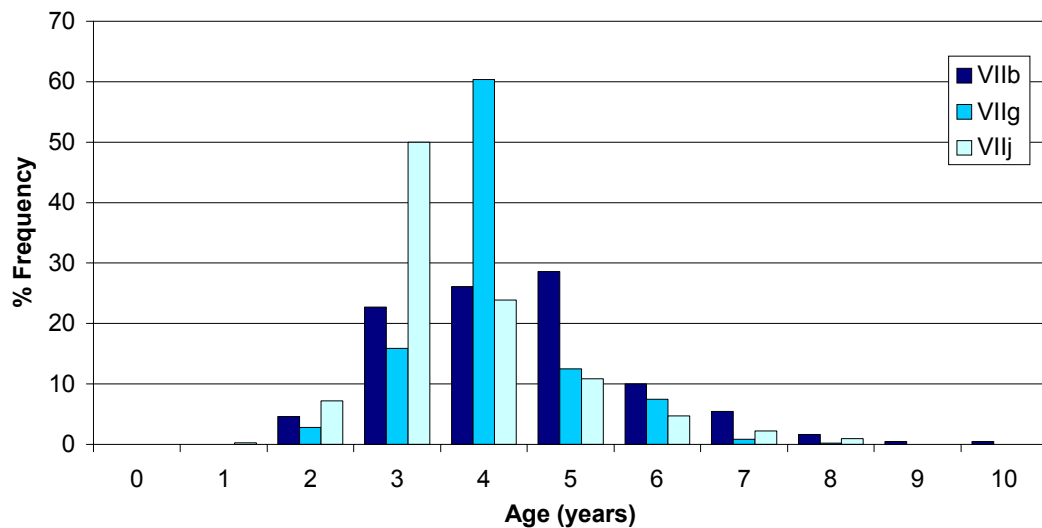
Year	Recruitment Age 1 thousands	SSB tonnes	Landings + Discards tonnes	Mean F Ages 3-6
1984	239,000	79,900	18,800	0.198
1985	234,000	76,400	19,600	0.216
1986	214,000	79,900	21,200	0.194
1987	195,000	82,400	18,800	0.238
1988	187,000	75,900	19,300	0.241
1989	262,000	63,100	21,800	0.282
1990	301,000	54,500	17,700	0.341
1991	307,000	55,300	18,400	0.465
1992	266,000	59,200	18,600	0.353
1993	214,000	61,400	18,000	0.343
1994	231,000	62,400	16,400	0.286
1995	272,000	69,600	19,100	0.317
1996	274,000	67,100	18,100	0.290
1997	189,000	74,500	17,300	0.254
1998	361,000	74,800	19,700	0.279
1999	235,000	65,100	16,900	0.289
2000	487,000	60,600	17,300	0.370
2001	224,000	65,700	17,100	0.387
2002	261000*	68,500		0.348
Average	260,684	68,226	18,561	0.300

\* GM 87-00

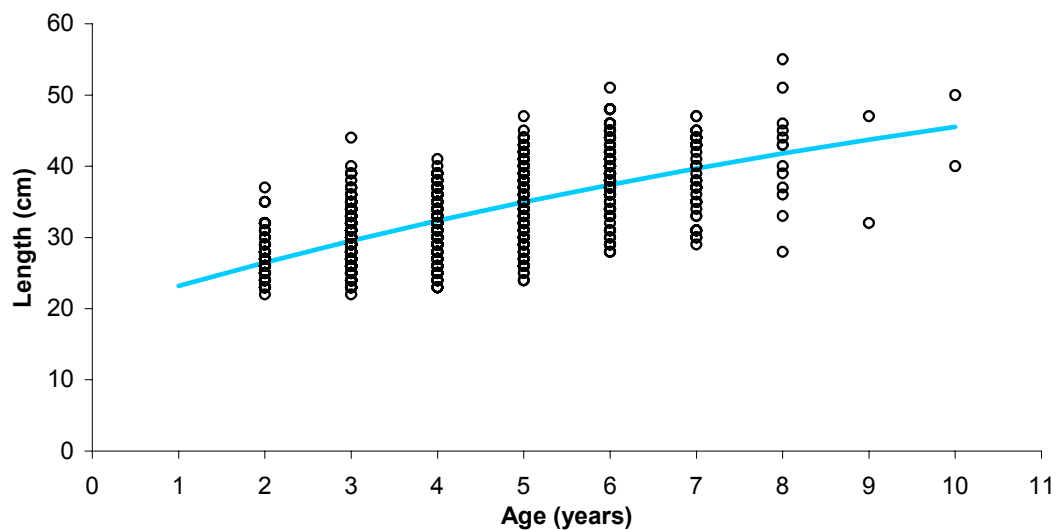
**2001 Length Distribution: Irish Landings, Megrim in VIIb VIIg VIIj**



**2001 Age Distribution: Irish Landings, Megrim in VIIb VIIg VIIj**



**2001 Size at Age: Irish Sampling, Megrim in VIIb VIIg VIIj**



# West of Scotland and Rockall Plaice

(Sub-area VI)



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the STECF and ICES advice for other West of Scotland and Rockall stocks is predicated primarily on the need to rebuild cod and haddock stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

MFSD point out that Irish vessels catch plaice in mixed fisheries which may include catches of cod and VIB haddock. Therefore MFSD advise that unless ways to harvest plaice without incidental catch or discards of cod and haddock can be demonstrated, fishing for plaice should not be permitted.

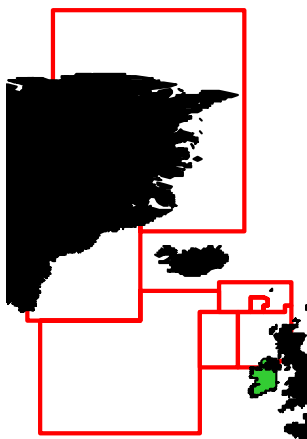
In the absence of ICES advice for this stock, MFSD advise that, if any fisheries on plaice are permitted, despite the advice on cod and haddock, the TAC in 2003 should not exceed 1,728 t. This translates to an Irish quota of 630 t.

## STATE OF THE STOCK

- There is no ICES assessment for this stock.
- Preliminary international landings in 2001 were estimated to be 703 t.
- There are no reference points proposed for this stock.

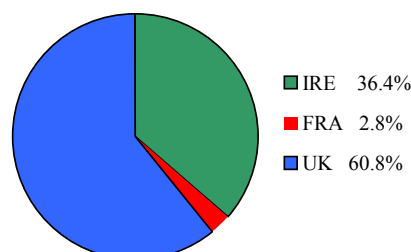
## CURRENT MANAGEMENT

- The TAC area covers Sub-areas, VI and XII and XIV and Division Vb.



Red Boxes-TAC/Management Areas

- The TAC in 2002 was 1,728 t with an associated Irish quota of 630 t.



- There are no explicit management objectives or plans for this stock.
- MFSD advises that management objectives be established and that a management plan be developed and implemented for the fishery catching plaice.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was € 1.9 million.
- The value of the 2001 Irish landings from Division VIa was € 0.5 million.
- This stock is economically important to small inshore trawlers operating out of Killybegs, Greencastle and the smaller ports in Donegal.

## ADDITIONAL INFORMATION

1. In 2001 Irish vessels reported an estimated plaice landings of 187 t from VIa, a reduction of about 20% of the 2000 landings.
2. The Irish quota is not restrictive but this fishery is important to the smaller inshore boats operating in the south of Division VIa.
3. The TAC for this stock was reduced by 10% in 2002.
4. Plaice in VIa are caught mainly by demersal otter trawls. The main fisheries are at the Stanton, Stags and Donegal Bay fishing grounds.
5. Irish sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001. The MFSD sampling indicates that the Irish landings were mainly comprised of 4 and 5 year old fish.
6. MFSD have conducted an annual groundfish survey in this area since 1993. These data will be used in any future assessments of this stock.
7. Discarding practices are not well quantified but MFSD sampling has indicated that discarding does occur in this fishery.
8. LPUE estimates for Irish demersal trawlers has been declining since 1996 possibly reflecting a decline in the stock abundance.

### Plaice Division VIa official nominal landings by country

(Source: ICES STATLANT 27A database)

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Belgium	.	.	.	.	.	.	.	3	1	1	.
Denmark	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	7
France	58	50	44	55	40	57	57	49	44	24	62
Germany	.	.	.	.	.	.	.	.	.	.	.
Germany,Fed.Rep.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	.
Ireland	392	464	425	565	649	660	403	516	649	579	670
Netherlands	.	.	.	.	.	.	204	.	.	.	.
Norway	.	.	.	.	.	.	.	.	.	.	.
Spain	.	.	.	1	.	.	.	.	.	.	.
U.S.S.R	.	.	.	.	.	.	.	.	.	.	.
UK (Eng.& Wales)	65	58	65	38	41	31	34	19	9	.	.
UK (Eng.Wal.NI)	.	.	.	.	.	.	.	.	.	27	11
UK (N.Ireland)	1	4	2	2	4	.	4	7	24	.	.
UK (Scotland)	1,049	1,065	947	967	1,070	1,065	1,046	1,149	1,000	1,185	1,097
<b>Total</b>	<b>1565</b>	<b>1641</b>	<b>1483</b>	<b>1628</b>	<b>1804</b>	<b>1813</b>	<b>1748</b>	<b>1743</b>	<b>1727</b>	<b>1816</b>	<b>1847</b>

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 <sup>1</sup>
Belgium	-	.	25	8	30	13	19	19	18	19	8
Denmark	<0.5	<0.5	-	<0.5	<0.5	<0.5	.	<0.5	.	.	<0.5
France	23	19	16	4	6	1	2	1	.	.	1
Germany	.	<0.5	.	.	.	.	.	.	.	.	.
Germany,Fed.Rep.	.	.	.	.	.	.	.	.	.	.	.
Ireland <sup>2</sup>	560	357	339	360	340	562	549	440	337	230	187
Netherlands	.	.	.	.	.	.	19	11	.	.	.
Norway	.	<0.5	.	.	.	.	.	.	.	.	.
Spain	.	.	.	.	.	.	.	.	.	.	.
U.S.S.R	.	.	.	.	.	.	.	.	.	.	.
UK (Eng.& Wales)	.	.	.	.	.	.	.	.	.	.	.
UK (Eng.Wal.NI)	37	61	80	135	77	62	67	39	34	18	9
UK (N.Ireland)	.	.	.	.	.	.	.	.	.	.	.
UK (Scotland)	1,433	1,292	1,095	1,181	1,344	1,266	1,052	973	657	387	498
<b>Total</b>	<b>2053</b>	<b>1729</b>	<b>1555</b>	<b>1688</b>	<b>1797</b>	<b>1904</b>	<b>1708</b>	<b>1483</b>	<b>1046</b>	<b>654</b>	<b>703</b>

<sup>1</sup> Official landings data were available from ICES for Sub-area VI

<sup>2</sup> Ireland landings from 1995 from DCMNR Logbook databases

### Plaice Division VIb official nominal landings by country

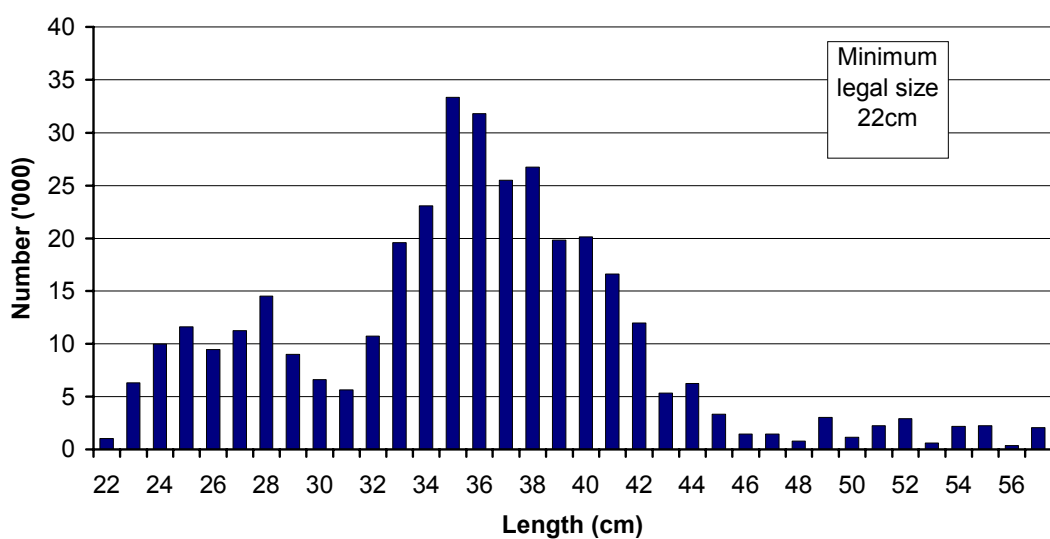
(Source: ICES STATLANT 27A database)

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 <sup>1</sup>
Faroe Islands	.	.	.	.	.	.	.	.	.	.	.
France	.	.	.	.	.	.	.	.	.	.	.
Ireland <sup>2</sup>	.	.	5	1	2	4	<0.5	1	10	<0.5	<0.5
Russian Fed.	.	.	.	.	.	.	.	.	.	88	.
U.S.S.R	.	.	.	.	.	.	.	.	.	.	.
UK (Eng.& Wales)	.	.	.	.	.	.	.	.	.	.	.
UK (Eng.Wal.NI)	<0.5	3	2	5	2	9	15	15	<0.5	1	.
UK (Scotland)	53	27	5	7	12	5	5	7	6	63	.
<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>23</b>	<b>16</b>	<b>152</b>	<b>&lt;0.5</b>

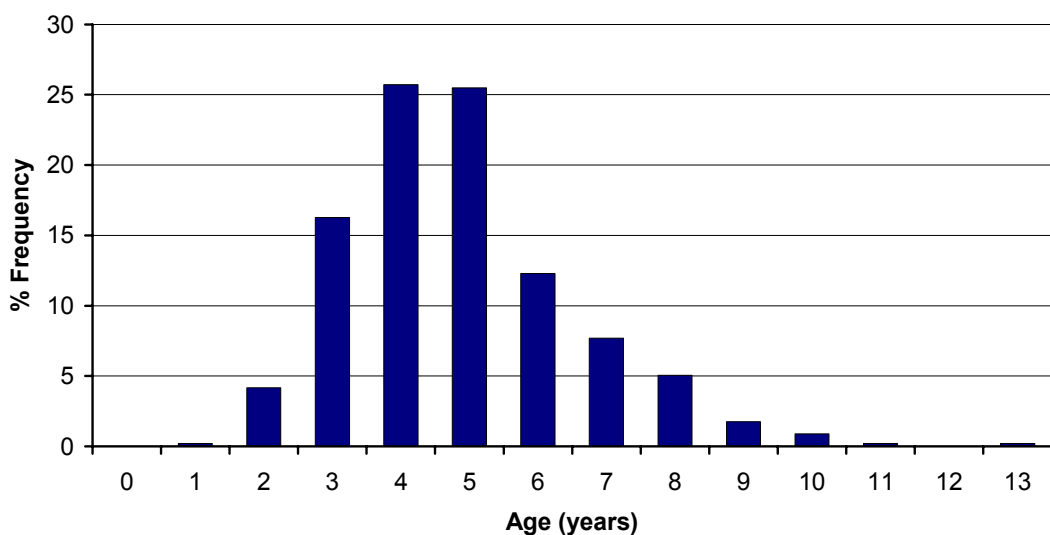
<sup>1</sup> No official landings data were available from ICES for Division VIb

<sup>2</sup> Ireland landings from 1995 from DCMNR Logbook databases

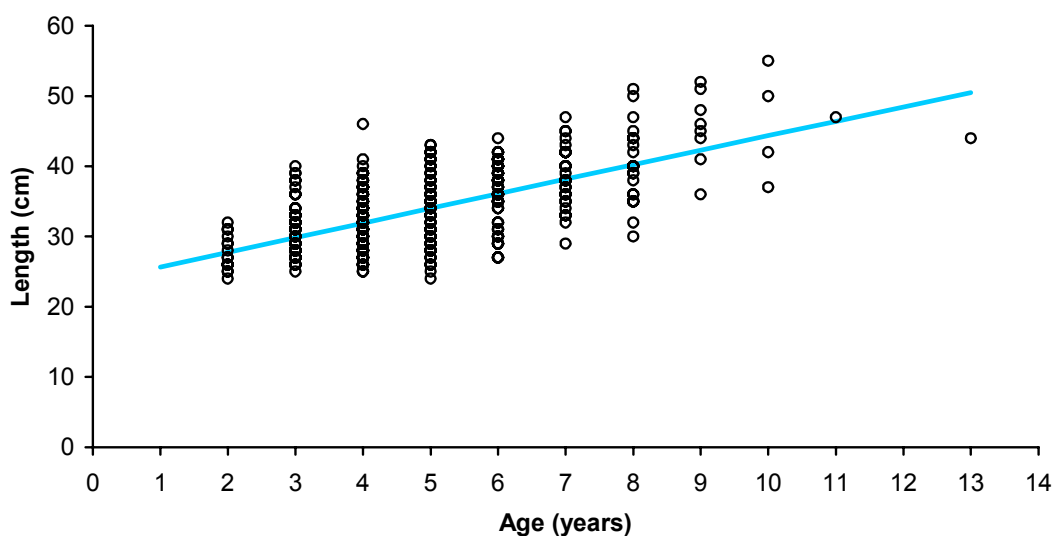
**2001 Length Distribution: Irish Landings, Plaice in VIa**



**2001 Age Distribution: Irish Landings, Plaice in VIa**



**2001 Size at Age: Irish Sampling, Plaice in VIa**



# Irish Sea Plaice

(Division VIIa)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the STECF and ICES advice for other Irish Sea stocks is predicated primarily on the need to rebuild cod stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

MFSD therefore advise that management of this stock will have to consider the management of cod and whiting which are taken in the same mixed fisheries. Unless way to harvest plaice without incidental catch or discards of cod and whiting can be demonstrated fishing for plaice should not be permitted.

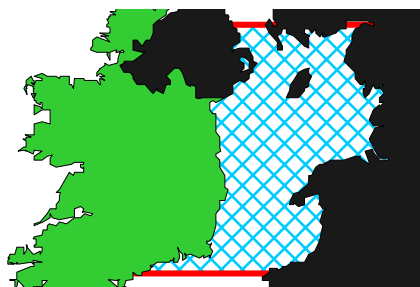
MFSD agrees with the ICES recommendation that if any fisheries on plaice are permitted, despite the advice on cod and whiting, fishing mortality on plaice in 2003 should not be allowed to increase above the current level, corresponding to landings of less than 1,900 t in 2003. This translates to an Irish quota of about 1,080 t in 2003.

## STATE OF THE STOCK

- There are no concerns about the state of this stock.
- Landings remained low at 1,473 t in 2001, marginally higher than the 2000 all time low of 1,371 t for this stock.
- Fishing mortality has also declined to historical lows. The fishing mortality estimated in 2001 of 0.27 is well below the  $F_{pa}$  of 0.45.
- Recruitment between 1964 and 1987 was variable and included some high values. Since 1987, recruitment has been less than average.
- The SSB estimated in 2001 of 4,860 t is above the  $B_{pa}$  of 3,100 t. SSB was relatively high in the mid-1980s following a series of good year-classes, but has declined since 1989. SSB has been increasing since 1997 and has remained above  $B_{pa}$  for the entire time series.
- Short-term predictions suggest that SSB will increase to around 6 000 t by 2004 at current levels of fishing mortality.

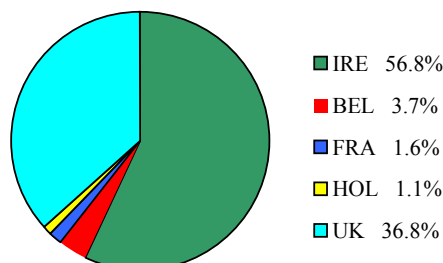
## CURRENT MANAGEMENT

- The TAC area (Division VIIa) corresponds to the assessment area.



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

- The TAC for 2002 was 2,400 t with an associated Irish quota of 1,364 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.
- MFSD recommend that management objectives be established and that a management plan be developed and implemented for fisheries catching plaice.



## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was about €3.5m.
- The value of the 2001 Irish landings from Division VIIa was about €1.0m.
- This fishery is an economically important by-catch species in the mixed demersal trawler from operating from Howth and the beam trawl fleet many of which land into the UK.

## ADDITIONAL INFORMATION

- 1 The assessment for this stock tends to over-estimate SSB and under estimate fishing mortality possibly because discard estimates are not included in the assessment.
- 2 Irish landings in 2001 were about 360 t (close to the 2000 landings of about 350 t). The 2001 Irish land-

- ings were only 28% of the quota mainly because quota uptake by the Irish fleet was very low.
- 3 Misreporting is not considered a problem in this fishery.
  - 4 UK (England) 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. Beam trawl fleets target sole and, as catch rates for sole in the Irish Sea have been low in recent years, they have moved to sole fishing grounds in other areas.
  - 5 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, Killmore Quay, Waterford and Clogherhead take most of the Irish catch.
  - 6 Irish Sampling of this stock is supported through the EC funded sampling programme, which is required under Data Collection Regulations 1543/2000 and 1639/2001. MFSD sampling indicates that age groups 4 to 6 dominate Irish landings of plaice from Divisions VIIa.

- 7 The non-inclusion of discard information may represent a major deficiency in the assessment since preliminary investigations suggest that a considerable proportion of the catch may be discarded (approximately 90% at ages 1 and 2, 45% at age 3 and 10% at age 4). Measures to reduce discarding would therefore be beneficial to the stock.

## ICES ADVICE

### 3.8.5

#### State of stock/exploitation:

The stock remains within safe biological limits. The SSB in 2002 was above  $B_{pa}$  and fishing mortality in 2001 was below  $F_{pa}$ . Fishing mortality on this stock was above  $F_{pa}$  in most years between 1967 and 1997, but declined through the 1990s and is now at about 60% of  $F_{pa}$ . SSB has been above  $B_{pa}$  throughout the period of assessment.

#### Management objectives:

No explicit management objectives are set for this stock.

#### Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
There is no biological basis for defining $B_{lim}$ or $F_{lim}$	$B_{pa}$ be set at 3 100 t. There is evidence of high recruitment at the lowest biomass observed and $B_{pa}$ can therefore be set equal to the lowest observed SSB
	$F_{pa}$ be set at 0.45. This is considered to provide a high probability that SSB remains above $B_{pa}$ in the long term.

#### Technical basis:

$B_{lim}$ and $F_{lim}$ : stock-recruitment data uninformative; $F_{loss}$ poorly defined	$B_{pa} = B_{loss}$
	$F_{pa} = F_{med}$ in a previous assessment, and long term considerations

#### Catch forecast for 2003:

Basis:  $F(2002) = F_{sq} = F(99-01) = 0.30$ ; Landings(2002) = 1.7; SSB(2003) = 5.5.

F(2003) onwards	Basis	Catch (2003)	Landings (2003)	SSB (2004)
0.30	$1.0 * F_{sq}$	1.9	1.9	5.7
0.36	$1.2 * F_{sq}$	2.2	2.2	5.4
0.45	$F_{pa} (= 1.5 * F_{sq})$	2.6	2.6	5.0

Weights in '000 t.

#### Advice on management:

ICES recommends that fishing mortality on plaice in 2003 should not be allowed to increase above the current level, corresponding to landings of less than 1,900 t.

This is consistent with the advice for sole, which is taken in the same fisheries. In addition there is no long-term gain in yield per recruit at higher fishing mortality.



### Medium- and long-term projections:

At current  $F$ , and assuming that the pattern of reduced recruitment observed since the late 1980s continues into the future, SSB is expected to increase to around 6 000 t by 2004 and to 7 000 t by 2011. The probability of SSB falling below  $B_{pa}$  remains very small for fishing mortality rates at  $F_{pa}$  and below. Current  $F$  is close to the value giving maximum yield per recruit.

### Comparison with previous assessment and advice:

The estimate of fishing mortality in 2000 is 18% higher and SSB in 2001 14% lower in this year's assessment compared to last year's assessment. The basis for the advice is the same as last year.

### Elaboration and special comment:

Plaice are taken mainly in long-established UK and Irish otter trawl fisheries for demersal fish. They are also taken as a by-catch in the beam trawl fishery for sole. The main fishery is concentrated in the North-east Irish Sea. Effort in the UK and Belgian beam trawl fleets increased in the late 1980s, but declined in the early 1990s.

The analytical assessment is based on a tuned catch-at-age analysis with CPUE data from three commercial fleets and three surveys, and does not include estimates of discarded fish.

Reported landings in recent years are likely to be more accurate than in the past.

### Multiannual TAC Arrangements and Recovery Plans:

Section 3.5.17 reviewed a study on schemes for Multiannual advice on TACs for four plaice and two sole stocks. These studies indicated possible target fishing mortalities for specific TAC schemes. ICES considers that target values must be defined by management taking scientific studies into account. ICES has not received feed-back with specification of target reference points and therefore continues to provide advice based on the precautionary reference points consistent with previous practice.

The analytical assessment is based on a tuned catch-at-age analysis with CPUE data from three commercial fleets and three surveys, and does not include estimates of discarded fish.

Reported landings in recent years are likely to be more accurate than in the past.

### Source of information:

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

### Yield and spawning biomass per Recruit

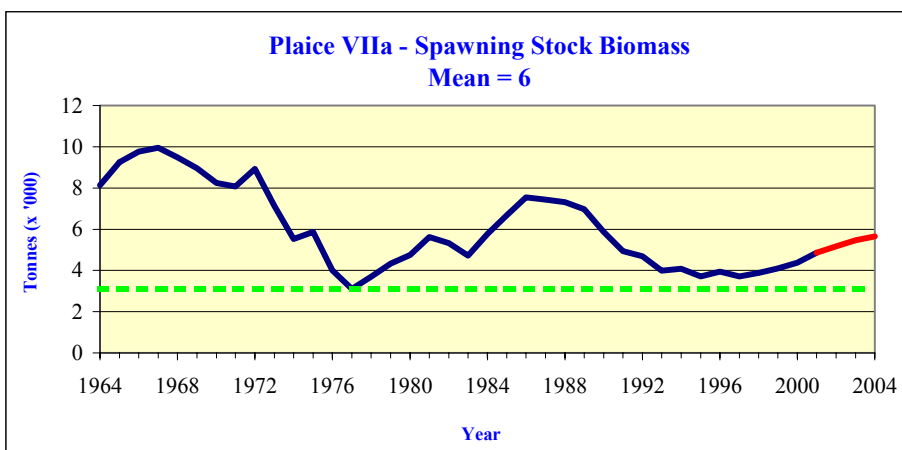
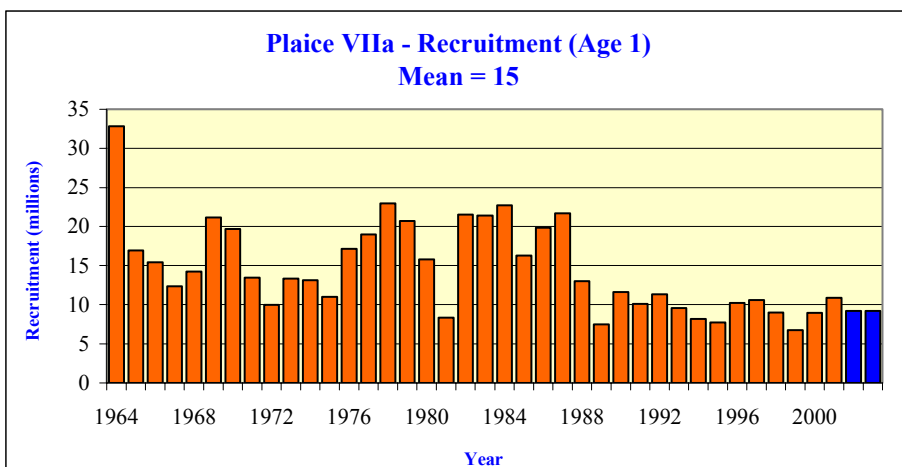
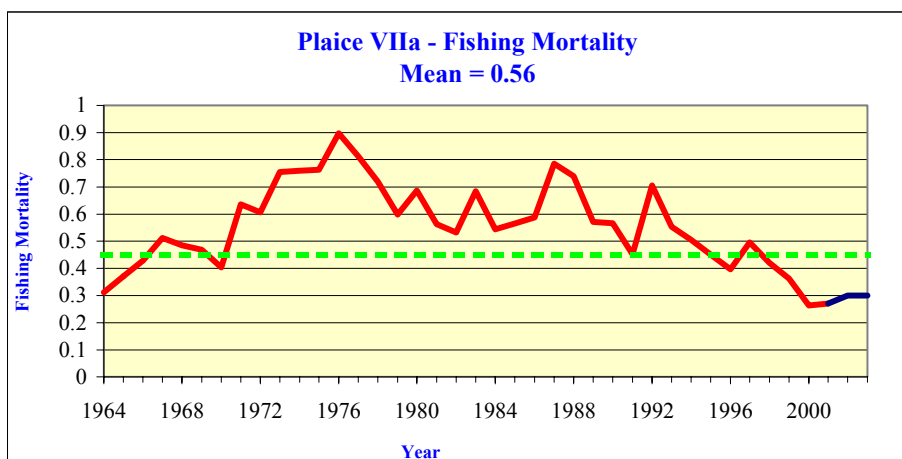
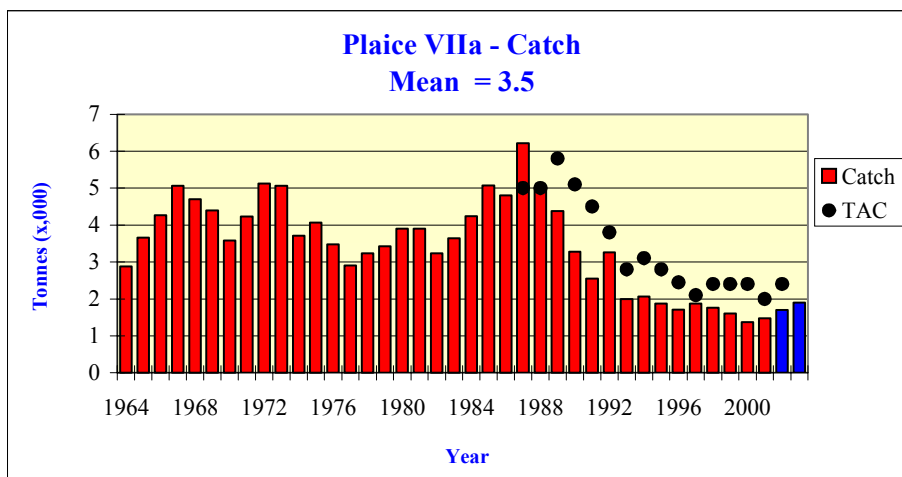
#### F-reference points:

	Fish Mort Ages 3-6	Yield/R	SSB/R
Average Current	0.559	0.211	0.630
$F_{max}$	0.317	0.211	0.599
$F_{0.1}$	0.124	0.187	1.283
$F_{med}$	0.426	0.209	0.456

### Catch data (Tables 3.8.5.1-2):

Year	ICES Advice	Predicted catch corresp. to advice	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	$F = 0.55 \sim 2\,800$ 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	1.5	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		
2003	No increase in F	1.9			

Weights in '000 t. <sup>1</sup>Catch at *status quo* F. <sup>2</sup>Incomplete statistics.



**Table 3.8.5.1** Nominal landings (t) of PLAICE in Division VIIa as officially reported to ICES.

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 <sup>1</sup>
Belgium	243	265	301	138	321	128	332	327	344 <sup>3</sup>	459	327	275	325	482
France	58	11	105	20	42	19	13	10	11	8	8	5	22	9 <sup>1</sup>
Ireland	2,009	1,406	1,350	900	1,355	654	547	557	538	543	730	541	420	367 <sup>1</sup>
Netherlands	-	-	-	-	-	-	-	-	69	110	27	30	47	- <sup>1</sup>
UK (Eng.&Wales) <sup>2</sup>	1,630	2,409	1,959	1,584	1,381	1,119	1,082	1,050	878	798	679	687	610	618 <sup>1</sup>
UK (Isle of Man)	12	18	27	51	24	13	14	20	16	11	14	5	6	
UK (N. Ireland)	286	...	...	...	...	...	...	...	...	...	...	...	...	...
UK (Scotland)	127	76	219	104	70	72	63	60	18	25	18	23	21	...
UK (Total)														
Total	4,365	4,185	3,961	2,797	3,193	2,005	2,051	2,024	1,874	1,954	1,803	1,566	1,451	1,476
Discards	220	-	-	-	-	-	-	-	-	-	-	-	-	-
Unallocated	420	187	-686	-243	74	-9	15	-150	-167	-83	-38	34	-80	-3
Total figures used by the Working Group for stock as- sessment	5,005	4,372	3,275	2,554	3,267	1,996	2,066	1,874	1,707	1,871	1,765	1,600	1,371	1,473

<sup>1</sup>Provisional.<sup>2</sup>1989–1999 Northern Ireland included with England and Wales.<sup>3</sup>Final Statlant 27a data.

{UK (Total) excludes Isle of Man data}.

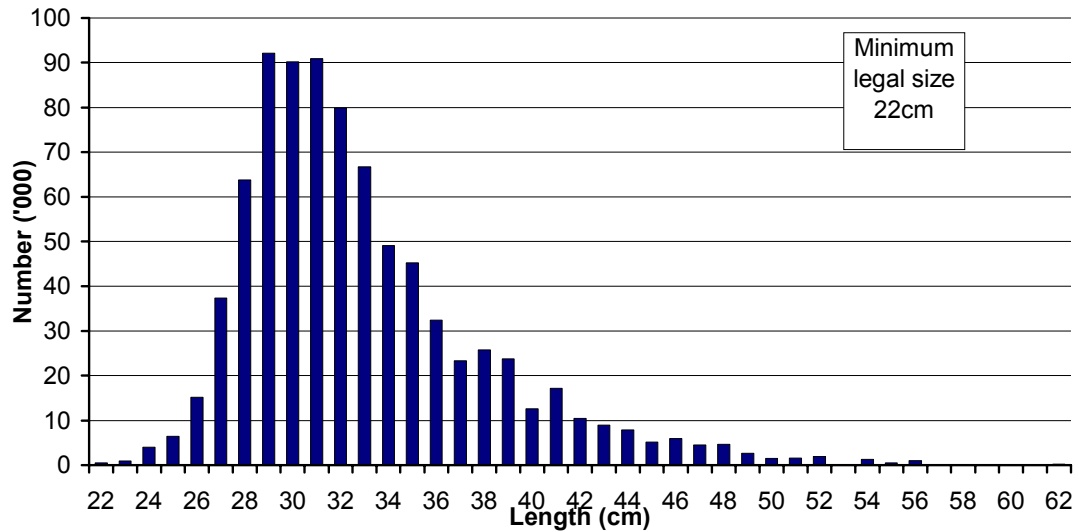
n/a = not available.

**Table 3.8.5.2** Plaice in Division VIIa (Irish Sea)

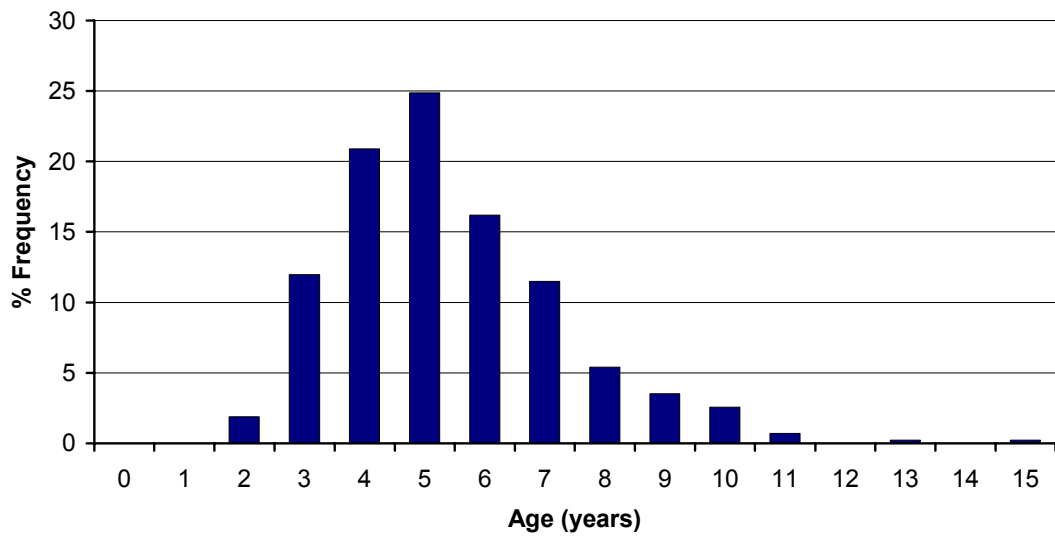
Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-6
1964	32801	8128	2879	0.3117
1965	16941	9246	3664	0.3709
1966	15435	9757	4268	0.4288
1967	12377	9950	5059	0.5122
1968	14252	9492	4695	0.4857
1969	21154	8962	4394	0.4677
1970	19664	8255	3583	0.4041
1971	13481	8064	4232	0.6362
1972	9987	8920	5119	0.6066
1973	13337	7129	5060	0.7552
1974	13141	5529	3715	0.7602
1975	11007	5862	4063	0.7639
1976	17123	4007	3473	0.8975
1977	19023	3095	2904	0.8123
1978	22957	3691	3231	0.7195
1979	20707	4332	3428	0.5976
1980	15794	4756	3903	0.6866
1981	8323	5618	3906	0.5619
1982	21516	5324	3237	0.5316
1983	21406	4721	3639	0.6838
1984	22715	5779	4241	0.5441
1985	16280	6685	5075	0.5653
1986	19852	7542	4806	0.5879
1987	21716	7443	6220	0.7857
1988	13011	7309	5005	0.7396
1989	7487	6969	4372	0.5701
1990	11628	5866	3275	0.5666
1991	10123	4938	2554	0.4511
1992	11331	4680	3267	0.7048
1993	9579	3993	1996	0.5529
1994	8208	4071	2066	0.5042
1995	7722	3711	1874	0.4504
1996	10229	3944	1707	0.3967
1997	10599	3719	1871	0.4956
1998	8993	3878	1765	0.4202
1999	6787	4089	1600	0.3623
2000	8979	4375	1371	0.2626
2001	10896	4863	1473	0.2703
2002	9184 <sup>1</sup>	5172		
Average	14506	5997	3500	0.5519

<sup>1</sup> Short-term GM (1989-2000)

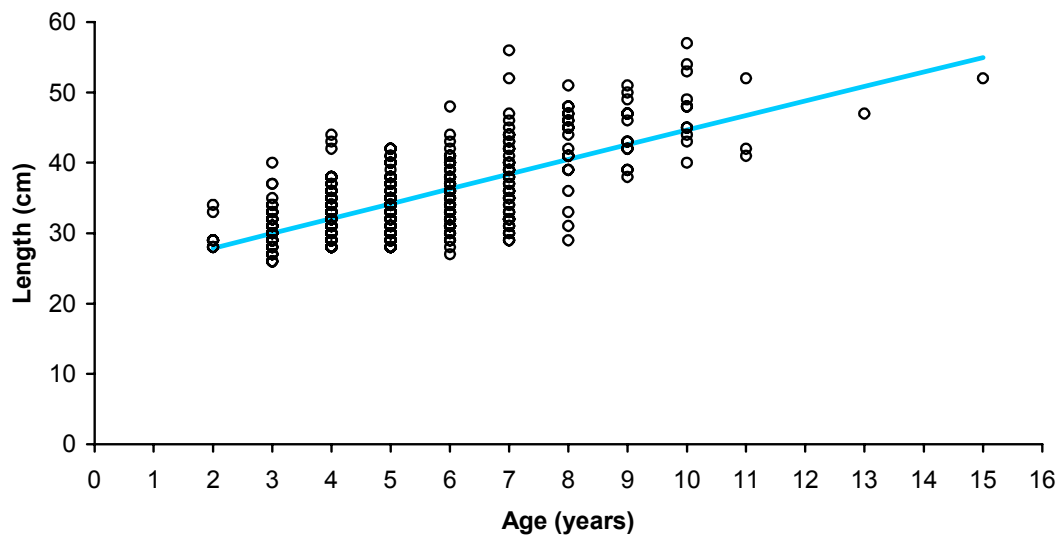
**2001 Length Distribution: Irish Landings, Plaice in Vlla**



**2001 Age Distribution: Irish Landings, Plaice in Vlla**



**2001 Size at Age: Irish Sampling, Plaice in Vlla**



# West of Ireland Plaice

(Divisions VIIb,c)

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



Marine Fisheries Services Division

## MFSD – ADVICE

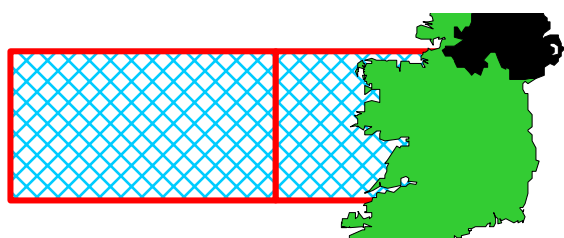
MFSD agrees with the ICES recommendation that catches in 2003 be no more than the recent average (1998-2000) of around 160 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment. This translates to a TAC of 160 t and an Irish quota of 128 t in 2003.

## STATE OF THE STOCK

- Due to the short time series of data and tuning fleets, the assessment is treated as preliminary.
- It is not appropriate to produce trends in biomass, fishing mortality and recruitment due to the short time series of data available.
- The estimated total international landings for 2001 were 87 t.

## CURRENT MANAGEMENT

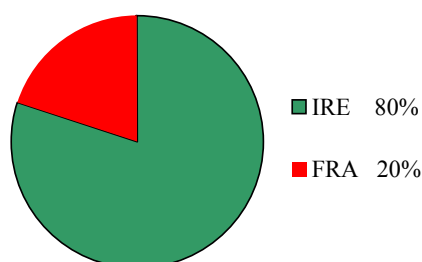
- The TAC area covers VIIb,c as does the assessment area.



Red Boxes-TAC/Management Areas

Blue Shading- Assessment Area

- The 2002 TAC was 180 t with an associated Irish quota of 144 t.



- There are no explicit management objectives or plan for this stock. Ireland has an opportunity as the main participant in fisheries in this area to develop and implement a management strategy for these fisheries.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was € 0.5 m.
- The value of the 2001 Irish landings was € 0.17m.
- Plaice are a very economically important component of otter trawl fisheries in this area.

## ADDITIONAL INFORMATION

1. A tentative assessment was carried out on this stock. No short term or medium predictions were carried out due to the short time series of data available.
2. Irish estimated landings in 2001 were 63 t. This is a 21% decrease from landings in 2000.
3. Misreporting is not considered to be a problem in this fishery.
4. On average, Ireland had 95% of total international landings between 1993-2001.
5. The majority of the landings are taken by otter trawls (92%) and Scottish seines (5%).
6. Irish Sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001. MFSD sampling indicates that the stock is dominated by 3-4 year olds.
7. MFSD have conducted an annual groundfish survey in this area since 1993 and this survey data was used in the assessment.
8. Irish commercial catch and effort data from logbooks were used to tune the assessment.
9. The level of discards is not well quantified but MFSD sampling has indicated that discarding does occur in this fishery.

## ICES ADVICE 3.9.14

### State of stock/exploitation:

The state of the stock is not known in relation to biological reference points. Catches have declined since 1995 to a historic low in 2001.

### Management objectives:

No explicit management objectives have been established for this stock.

**Precautionary Approach Reference points:**

No precautionary reference points have been proposed for this stock.

**Advice on management:**

**ICES recommends that catches in 2003 be no more than the recent average (1998-2000) of around 160 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.**

**Relevant factors to be considered in management:**

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.

**Comparison with previous assessment and advice:**

The assessment for this stock is preliminary. ICES gave no advice for this stock in 2001.

**Elaboration and special comment:**

ICES carried out a preliminary assessment on the status of this stock. This assessment used catch-at-age data from 1993-2001 and commercial and survey tuning data from Ireland. The time series of the data and tuning fleets were too short to make conclusions about the current stock status. Catch forecast for 2003 and medium- and long-term projections are not available.

Ireland is the major participant in this fishery with around 90% of the international landings between 1993-2001. Plaice are normally caught in mixed species otter trawl fisheries in Division VIIb. These vessels target mainly other demersal fish species and *Nephrops*.

**Source of information:**

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 9 – 18 July 2002 (ICES CM 2003/ACFM:03).

**Catch data (Tables 3.10.4.1):**

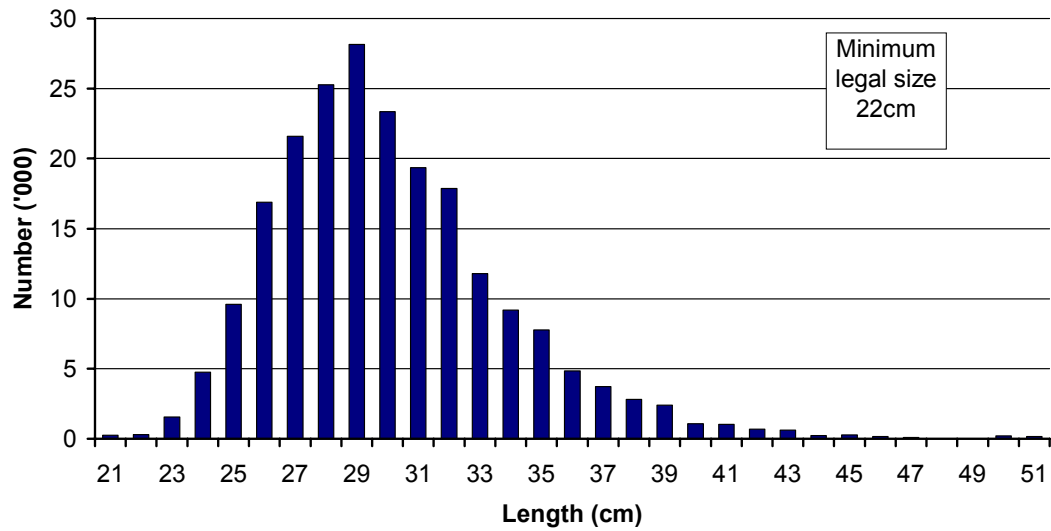
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM landings
1993	-	-	-	197
1994	-	-	-	215
1995	-	-	-	315
1996	-	-	-	240
1997	-	-	-	213
1998	-	-	-	183
1999	-	-	-	172
2000	-	-	-	116
2001	-	-	240	87
2002	No advice	-	240	
2003	Reduce TAC to recent landings	200		

**Table 3.10.4.1** Nominal Landings (t) (as reported to WGSSDS) of Plaice in Division VIIb,

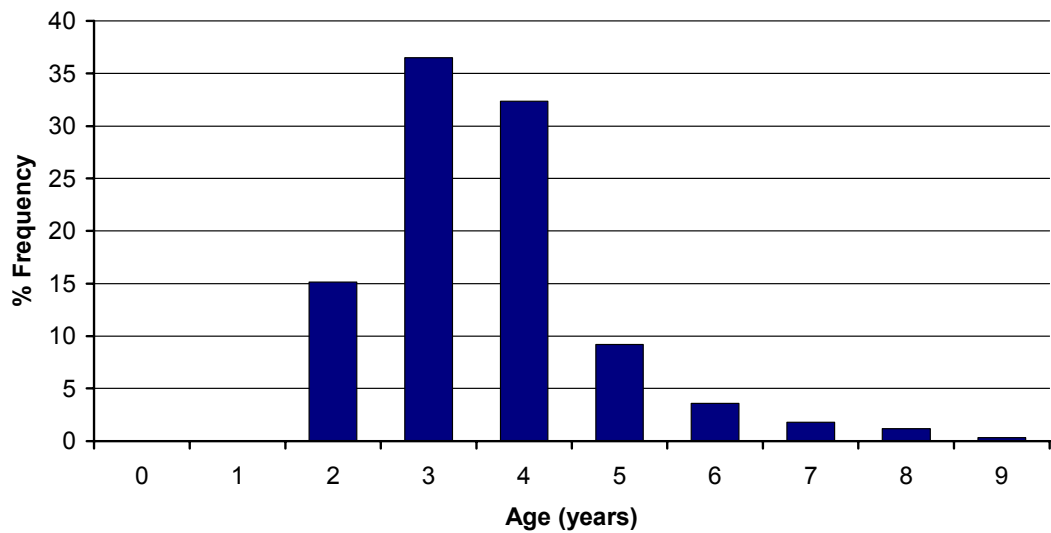
Country	1993	1994	1995	1996	1997	1998	1999	2000	2001*
France	2	1	5	1	3		8*	22*	22*
Ireland	191	200	239	248	206	160	157	3	63
UK (England & Wales)	1	2	1	2		1			
UK (Scotland)	2	3	1				2		
Total	196	206	246	251	209	161	167	25	85
Unallocated	1	9	69	-11	4	22	5	91	2
Total figures used by Working Group	197	215	315	240	213	183	172	116	87

\* Preliminary .

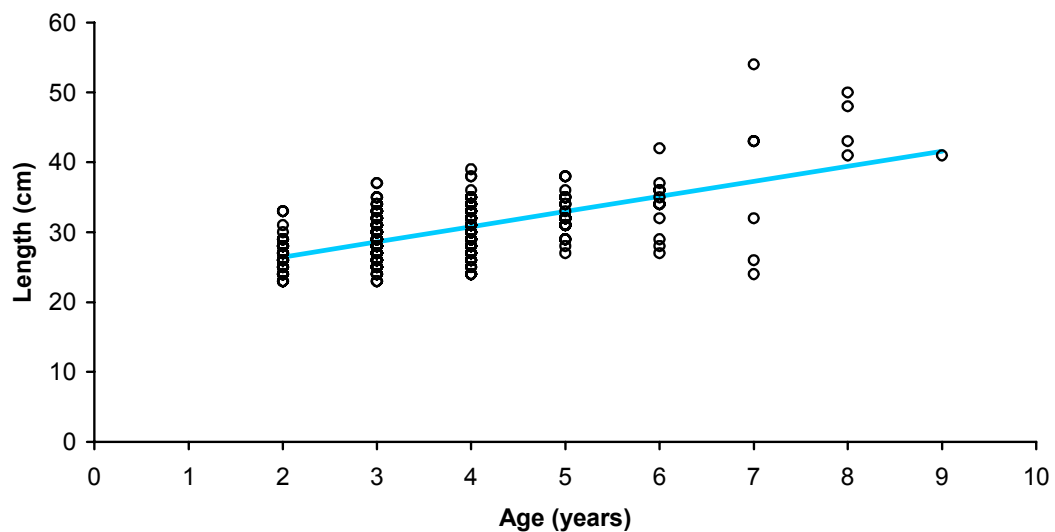
**2001 Length Distribution: Irish Landings, Plaice in VIIb**



**2001 Age Distribution: Irish Landings, Plaice in VIIb**



**2001 Size at Age: Irish Sampling, Plaice in VIIb**





# Celtic Sea Plaice

(Divisions VIIIfg)

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



Marine Fisheries Services Division

## MFSD – ADVICE

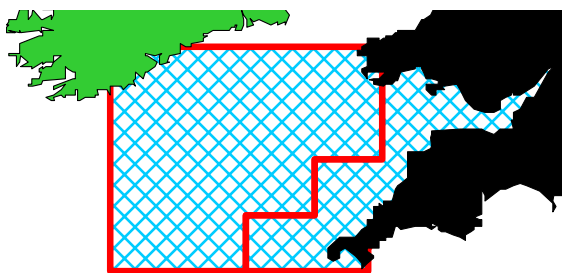
MFSD agrees with the ICES recommendation for a reduction in fishing mortality of 40%, corresponding to landings of 660 t in 2003. This is consistent with the reduction in F recommended for sole, which is the target species for the flatfish fisheries in this area. This is expected to result in an increase in SSB to  $B_{pa}$  in the short term. This advice translates into an Irish quota of 203 t in 2003.

## STATE OF THE STOCK

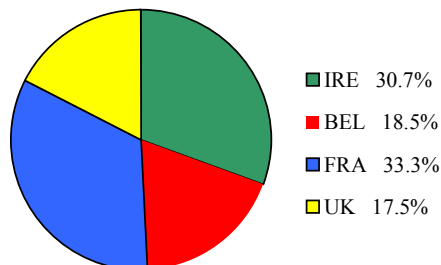
- There are serious concerns about the state of this stock.
- The estimated landings in 2001 were 715 t, similar to landings in 2000.
- In F has declined sharply in 2000 and 2001 and is estimated to be 0.40 (35% below the average of the time series).  $F_{pa}$  has not been defined for this stock.
- Recruitment is estimated to be 3.5 million. All recruitment's since 1989 have been below the long-term average.
- SSB rose to a high level throughout the 1980's, following a series of above-average recruitment. SSB subsequently declined to around  $B_{pa}$  (1,800 t) between 1993-1997. SSB but has declined further since 1997 and was estimated to be 1,500 t in 2001.
- Assuming current fishing mortality ( $F_{sq}=0.55$ ). SSB is predicted to remain around 1,600 t during 2002-2004.

## CURRENT MANAGEMENT

- The TAC area covers Divisions VIIIfg as does the assessment area.



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



- The 2002 TAC was 680 t with an associated Irish quota of 209 t.
- There are no explicit management objectives or plans for this stock. MFSD advises that management objectives be established and that a management plan be developed and implemented for fisheries catching plaice.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was € 0.14 m.
- The value of the 2001 Irish landings was € 0.13 m.
- Plaice are an economically important component of the mixed demersal fisheries in the Celtic Sea.

## ADDITIONAL INFORMATION

1. A lack of age composition data from Belgium and France may have a considerable impact on the estimates of the true age structure of the international landings. This may have an impact on the quality of the current assessment.
2. Irish estimated landings in 2001 were 46 t. This is a decrease of 34% on the 2000 landings.
3. Under reporting and misreporting of catches by ICES Division may have taken place in the most recent years, but no information is available on the magnitude of the problem.
4. Belgium and France with 39% and 36% of the 2001 landings dominate the fishery. The UK and Ireland landed the remainder, 19% and 6%, respectively.
5. The majority of the Irish landings are taken by otter trawls (59%), Scottish seine (26%) and beam trawls (12%). In the 1970s, the Divisions VIIIfg plaice fishery 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 of these otter trawlers have been replaced by beam trawlers, which target sole.
6. Irish Sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001. MFSD sampling indicates that approxi-

mately 45% of Irish landings in 2001 were 3 to 4 year old fish.

7. MFSD commenced a groundfish survey in 1997 on RV *Celtic Voyager* in the Celtic Sea. Therefore the time series is too short to provide a useful abundance index for this stock.
8. The results of tagging experiments suggest that plaice from the south and west coasts of Wales move southwards to join the adult population off the north Cornish coast during spawning. MFSD have recently initiated a plaice tagging programme in the Celtic Sea.
9. Discarding practices are not well quantified but MFSD sampling has indicated that discarding does occur in this fishery.
10. The early closure of the Celtic Sea fishery this year to the Belgian fleet is expected to impact on landings of plaice from this area in 2002.

## ICES ADVICE

### 3.9.4

#### State of stock/exploitation:

The stock is outside safe biological limits. SSB decreased from 1988 to 2000 and has been below  $B_{pa}$  since 1998. Fishing mortality has fluctuated around the average. Most recent year classes have been below average.

#### Management objectives:

There are no explicit management objectives for this stock.

#### Precautionary Approach reference points (established in 1998, modified in 2001):

ICES considers that:	ICES proposes that:
$B_{lim}$ is 1 100 t, the lowest observed spawning stock biomass $B_{loss}$ .	$B_{pa}$ be set at 1 800 t. Biomass above this affords a high probability of maintaining SSB above $B_{lim}$ , taking into account the uncertainty assessments.
$F_{lim}$ not defined.	$F_{pa}$ not defined

#### Technical basis:

$B_{lim}=B_{loss}$	$B_{pa}=B_{lim} * 1.64$
$F_{lim}=Not\ defined$	$F_{pa}$ not defined

#### Advice on management:

ICES recommends a reduction in F of at least 40% relative to  $F_{sq}$ , corresponding to landings of less than 660 t in 2003. This is consistent with the reduction in F recommended for sole, which is the target species for the flat-fish fishery in this area. This is expected to result in an increase in SSB above  $B_{pa}$  in the short-term.

#### Relevant factors to be considered in management:

At status quo F, SSB is likely to remain below  $B_{pa}$ .

Plaice is taken mainly in a directed beam-trawl fishery for sole, and to a lesser extent in otter trawl fisheries. Management should take account of the mix of Celtic Sea sole and plaice.

#### Catch forecast for 2003:

Basis: TAC constraint;  $F_{sq} = F(99-01) = 0.55$ ; Landings (2002) = 0.68 ; SSB(2003) = 1.78

F(2003) Onwards	Basis	Landings (2003)	SSB(2004)
0.27	$0.5 * F_{sq}$	0.57	2.12
0.33	$0.6 * F_{sq}$	0.66	2.03
0.38	$0.7 * F_{sq}$	0.76	1.94
0.44	$0.8 * F_{sq}$	0.84	1.86
0.55	$F_{sq}$	1.01	1.71
0.66	$1.2 * F_{sq}$	1.16	1.57

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

In order to achieve a 30% increase in SSB from 2003 to 2004 a 70% reduction in F would be required.

---

**Medium- and long-term projections:**

Assuming the current selection pattern,  $F_{\max}$  is estimated to be  $0.44 F_{\text{sq}}$ . Results of the medium-term analysis indicate a low probability of SSB falling below  $B_{\text{pa}}$  in the medium term when fishing mortality is reduced by 40% in 2003 onwards.

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**Comparison with previous assessment and advice:**

Results of this assessment are close to the previous one. As previously, advice has been based on Sole.

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**Elaboration and special comment:**

The fisheries that catch plaice in the Celtic Sea mainly involve vessels from France, Belgium, England and Wales, and to a lesser extent Ireland.

In the 1970s, the Divisions VIII,g plaice fishery 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, which target 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 March after the peak of spawning, and again in September.

There is some evidence from tagging that plaice from the south and west coasts of Wales move southwards to join the adult population off the north Cornish coast during spawning.

Analytical age-based assessment using landings, survey, and commercial CPUE data.

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**Source of information:**

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

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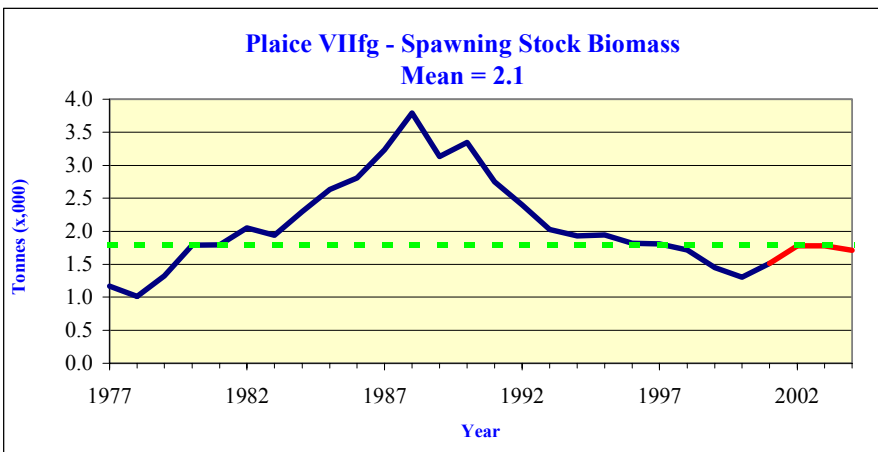
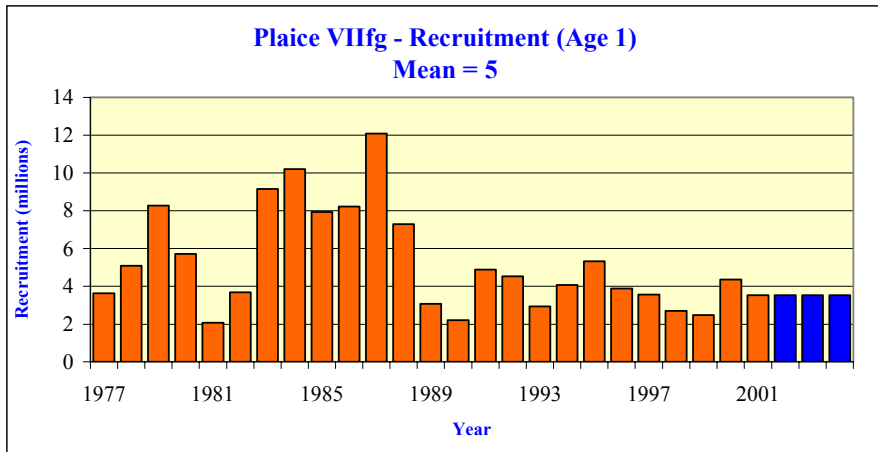
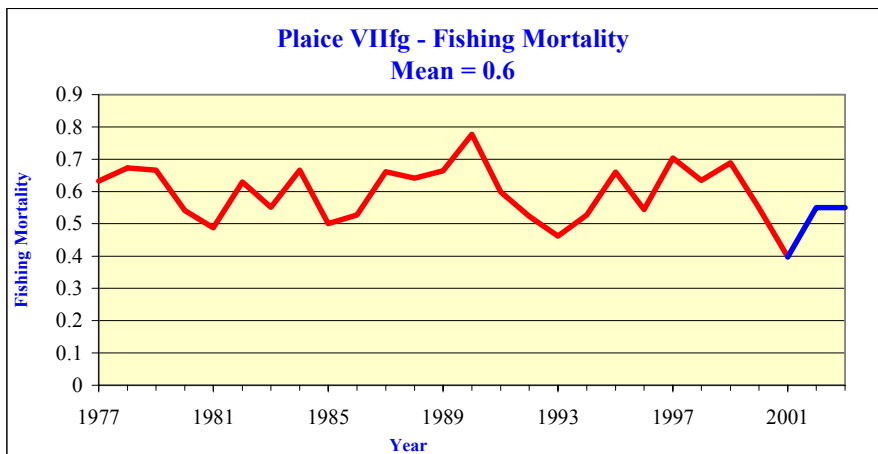
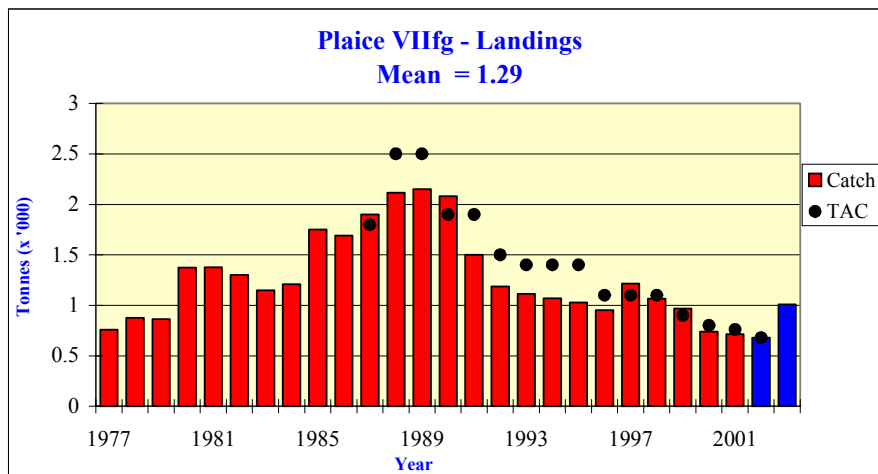
**Yield and spawning biomass per Recruit  
F-reference points:**

	Fish Mort Ages 3-6	Yield/R	SSB/R
Average Current	0.545	0.249	0.439
$F_{\max}$	0.240	0.264	0.972
$F_{0.1}$	0.105	0.237	1.871
$F_{\text{med}}$	0.514	0.251	0.466

**Catch data (Tables 3.9.4.1-2):**

Year	ICES Advice	Predicted catch cor- resp. to advice	Agreed TAC	Official landings	ACFM Landings
1987	TAC not to be restrictive on other species	-	1.8	1.90	1.90
1988	TAC not to be restrictive on other species	-	2.5	2.12	2.12
1989	TAC not to be restrictive on other species	-	2.5	2.15	2.15
1990	F likely to be $F(88)$	~1.9	1.9	2.08	2.08
1991	F likely to be $F(89)$	~1.7	1.9	1.50	1.50
1992	No long-term gains in increasing F	-	1.5	1.19	1.19
1993	No long-term gains in increasing F	-	1.4	1.11	1.11
1994	No long-term gains in increasing F	-	1.4	1.07	1.07
1995	No increase in F	1.29	1.4	1.03	1.03
1996	20% reduction in F	0.93	1.1	0.95	0.95
1997	20% reduction in F	1.10	1.1	1.22	1.22
1998	20% reduction in F	1.00	1.1	1.07	1.07
1999	35% reduction in F	0.67	0.9	0.97	0.97
2000	30% reduction in F	0.70	0.80	0.74	0.74
2001	40% reduction in F	0.60	0.76	0.72	0.72
2002	At least 35% reduction in F	0.68	0.68		
2003	At least 40% reduction in F	<0.66			

Weights in '000 t.



**Table 3.9.4.1** Celtic Sea Plaice. Nominal landings (t) in Divisions VIIIf+g, as used by Working Group.

Year	Belgium	France	Ireland	UK (Engl. & Wales)	Others	Total re- ported	Unallo- cated	Total as used by WG
1977	214	365	28	150	0	757	0	757
1978	196	527	0	152	0	875	0	875
1979	171	467	49	176	0	863	0	863
1980	372	706	61	227	7	1,373	0	1,373
1981	365	697	64	251	0	1,377	0	1,377
1982	341	568	198	196	0	1,303	0	1,303
1983	314	532	48	279	0	1,173	-27	1,146
1984	283	558	72	366	0	1,279	-69	1,210
1985	357	493	91	466	0	1,407	345	1,752
1986	544	598	59	324	21	1,546	145	1,691
1987	576	708	122	495	0	1,901	0	1,901
1988	635	687	164	630	0	2,116	0	2,116
1989	835	649	195	472	0	2,151	0	2,151
1990	777	642	167	496	0	2,082	0	2,082
1991	479	533	94	395	0	1,501	0	1,501
1992	326	455	106	301	0	1,188	0	1,188
1993	396	342	87	290	0	1,114	0	1,114
1994	357	281	182	250	0	1,070	0	1,070
1995	337	254	153	284	0	1,028	0	1,028
1996	359	239	116	238	0	952	0	952
1997	494	321	143	259	0	1,217	0	1,217
1998	458	298	135	176	0	1,067	0	1,067
1999	415	262	122	169	0	968	0	968
2000	233	302	70	134	0	739	0	739
2001	277	256	46	136	0	715	0	715

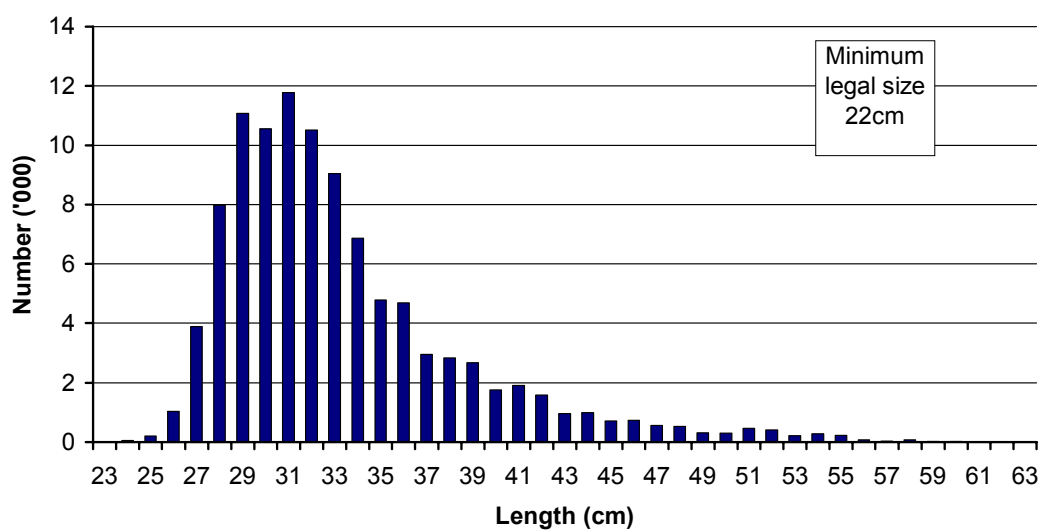
N.B.: ICES receives statistics from some countries only for Divisions VIIg-k combined and not for each Division separately. The figures up to 1982 and 1987 onwards are provided by members of the Working Group; from 1983–1986, they are figures submitted to the EC by member states.

**Table 3.9.4.2** Celtic Sea plaice (Divisions VIIIf and g)

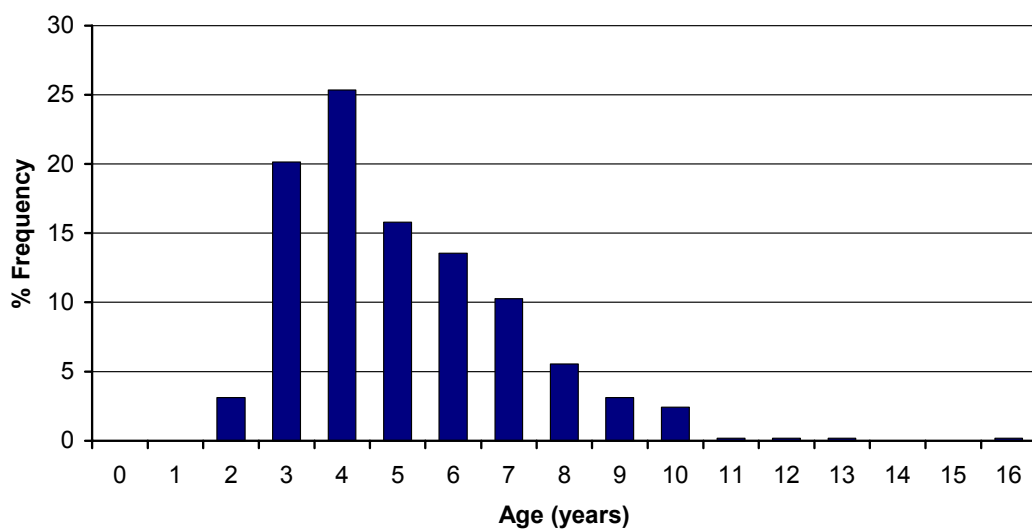
Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-6
1977	3633	1170	757	0.632
1978	5091	1010	875	0.673
1979	8264	1323	863	0.666
1980	5709	1789	1373	0.541
1981	2080	1793	1377	0.488
1982	3679	2055	1303	0.630
1983	9161	1942	1146	0.551
1984	10212	2298	1210	0.666
1985	7947	2635	1752	0.500
1986	8229	2809	1691	0.527
1987	12086	3238	1901	0.661
1988	7291	3792	2116	0.641
1989	3063	3134	2151	0.664
1990	2197	3347	2082	0.777
1991	4884	2751	1501	0.598
1992	4533	2400	1188	0.524
1993	2942	2025	1114	0.462
1994	4074	1927	1070	0.527
1995	5324	1942	1028	0.660
1996	3898	1815	952	0.544
1997	3555	1808	1217	0.704
1998	2692	1717	1067	0.634
1999	2473	1450	968	0.689
2000	4365	1305	739	0.549
2001	3537*	1513	715	0.398
2002	3537*	1553		0.546
Average	5171	2098	1286	0.594

\* GM<sub>89-00</sub>

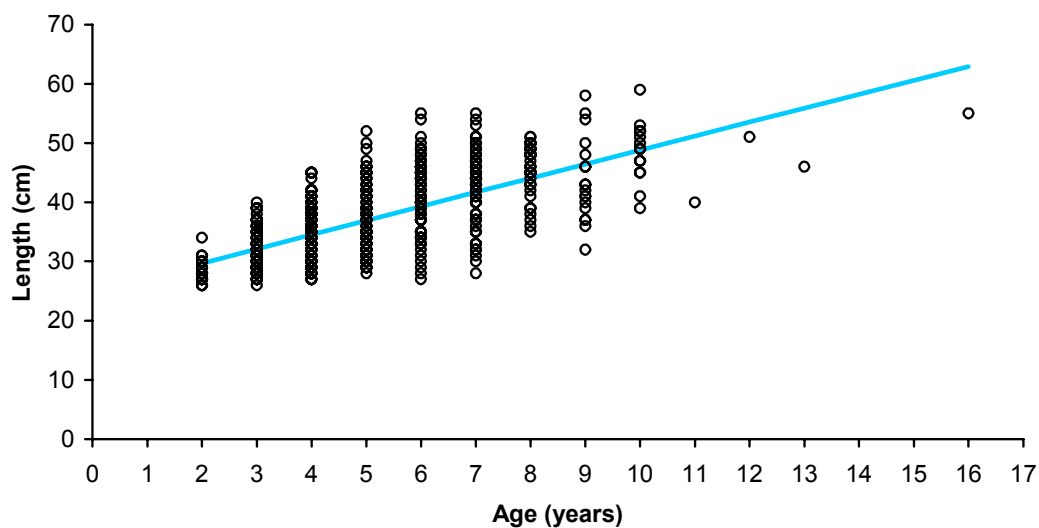
**2001 Length Distribution: Irish Landings, Plaice in VIIg**



**2001 Age Distribution: Irish Landings, Plaice in VIIg**



**2001 Size at Age: Irish Sampling, Plaice in VIIg**



# Southwest of Ireland Plaice

(Divisions VIIh-k)

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



Marine Fisheries Services Division

## MFSD – ADVICE

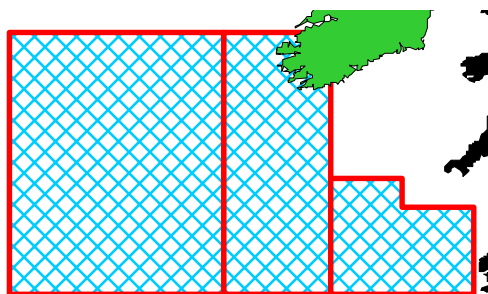
MFSD agrees with the ICES recommendation that catches in 2003 be no more than the recent average (1998-2000) of around 450 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment. This translates to an Irish quota of 197 t.

## STATE OF THE STOCK

- Due to the short time series of data and tuning fleets, the assessment is treated as preliminary.
- It is not appropriate to produce trends in biomass, fishing mortality and recruitment due to the short time series of data available.
- The estimated total international landings of plaice in Divisions VIIh-k in 2001 was 276 t.

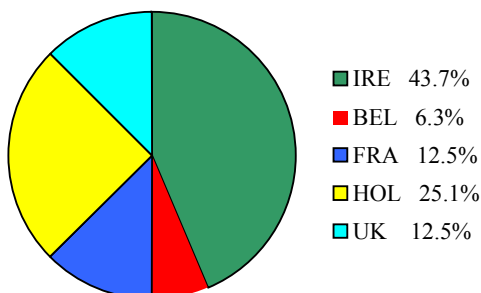
## CURRENT MANAGEMENT

- The TAC area covers Divisions VIIh-k as does the assessment area.



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

- The 2002 TAC was 970 t with an associated Irish quota of 424 t.



- There are no explicit management objectives or plan for this stock. Ireland has an opportunity as the main participant in this fishery to propose a management strategy for this stock.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was €1.5m.
- The value of the 2001 Irish landings was €0.4m.
- Plaice is an important species particularly to smaller inshore trawlers in the southwest of Ireland.

## ADDITIONAL INFORMATION

1. A tentative assessment was carried out on this stock. No short term or medium predictions were carried out due to the short time series of data available.
2. Irish estimated landings in 2001 were 152 t. This is 16% lower than the 2000 landings.
3. Mis-reporting is not perceived to be a problem in this fishery.
4. Ireland, with 55% of the 2001 landings, dominates the fishery. France and the UK take most of the remaining catch.
5. 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 95% of the landings in 2001.
6. Irish Sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001. MFSD sampling suggests that the stock is dominated by 3-4 year olds.
7. MFSD have conducted an annual groundfish survey in this area since 1993 and this survey data was used in the assessment.
8. Irish commercial catch and effort data from logbooks were used to tune the assessment.
9. The level of discards is not well quantified but MFSD sampling has indicated that discarding does occur in this fishery.

## ICES ADVICE 3.9.16

### State of stock/exploitation:

The state of the stock in relation to biological reference points is not known. Catches have been declining and the 2001 landings are the lowest in the time series.



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**Management objectives:**

No explicit management objectives have been established for this stock.

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**Precautionary Approach Reference points:**

No precautionary reference points have been proposed for this stock.

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**Advice on management:**

**ICES recommends that catches in 2003 be no more than the recent average (1998-2000) of around 450 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.**

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**Relevant factors to be considered in management:**

Recent landings have been about 30% of the TAC. 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.

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**Catch forecast for 2003 and Medium- and long-term projections:** Not available

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**Comparison with previous assessment and advice:**

The assessment for this stock is preliminary. ICES gave no advice for this stock in 2001.

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**Elaboration and special comment:**

ICES carried out a preliminary assessment on the status of this stock. This assessment used catch-at-age data from 1993-2001 and commercial and survey tuning data from Ireland. The time series of the data and tuning fleets were too short to make conclusions about the current stock status.

Plaice are predominantly caught within mixed species otter trawl fisheries in Division VIIj. These vessels target mainly hake, anglerfish and megrim. Beam trawlers and seiners generally take a lesser catch of Plaice. Ireland is the major participant in this fishery with around 60% of the international landings between 1993-2001.

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**Source of information:**

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 9 – 18 July 2002 (ICES CM 2003/ACFM:03).

Nominal Landings (t) (as reported to WGSSDS) of Plaice in Division VIIh-k for 1993-2001

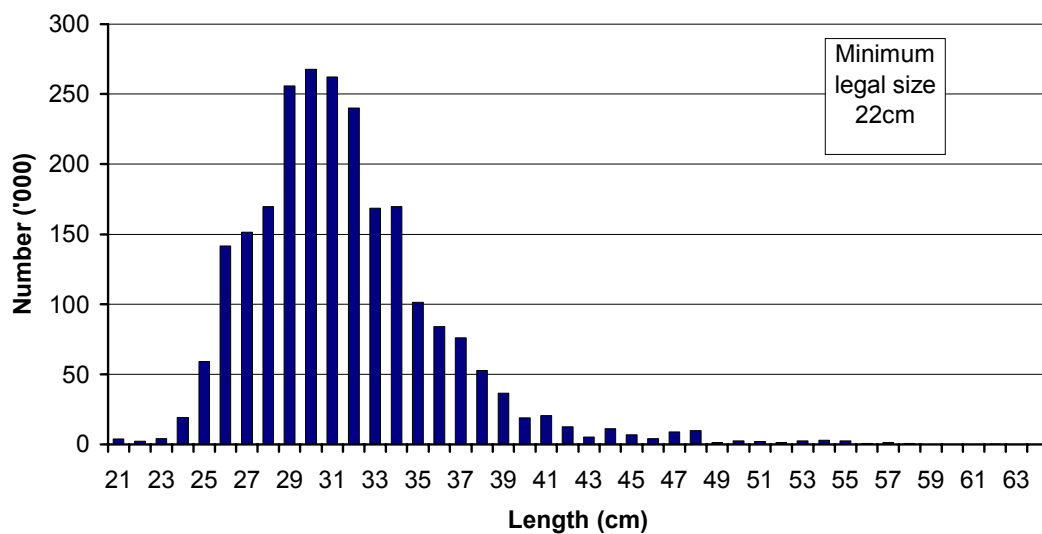
Country	1993	1994	1995	1996	1997	1998	1999	2000	2001*
Belgium					-	-	45	4	
France	64	48	60	48	69	49	74	112	57
Ireland	383	271	321	305	344	286	287	180	152
Netherlands				52		13	1		
Spain							+		
UK (England & Wales)	218	258	282	154	138	106	95	72	67
UK (Scotland)	7	1	4	1					
Total	672	578	667	560	551	454	500	367	276
Unallocated	-20		-126	-129	88	-15	38		
Total figures used by Working Group	652	578	541	431	639	439	538	367	276

\* Preliminary

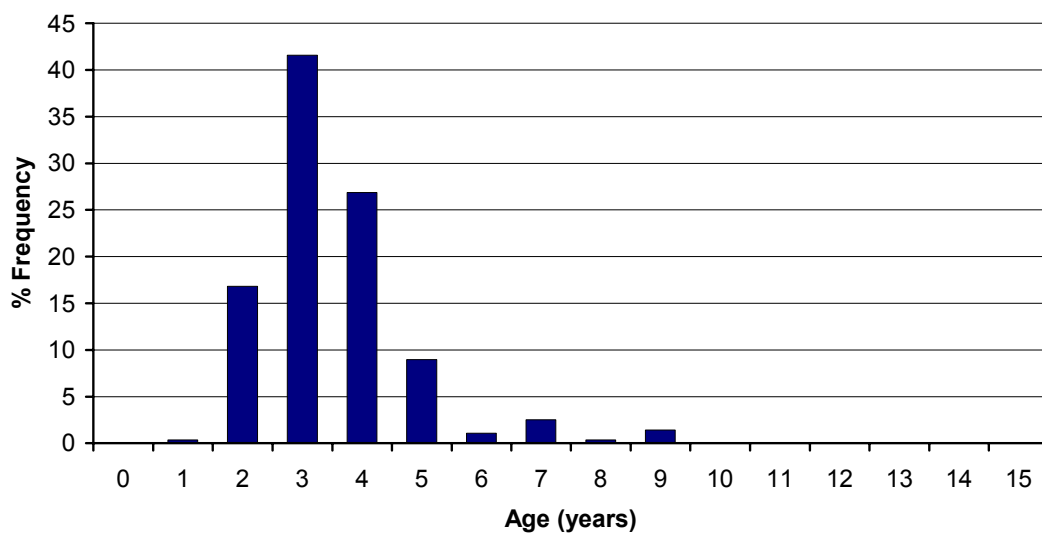
**Catch data (Tables 3.9.14.1):**

Year	ICES Advice	Predicted catch cor-resp. to advice	Agreed TAC <sup>1</sup>	ACFM landings <sup>2</sup>
1993	-	-	-	652
1994	-	-	-	578
1995	-	-	-	541
1996	-	-	-	431
1997	-	-	-	639
1998	-	-	-	439
1999	-	-	-	538
2000	-	-	-	367
2001	-	-	1215	276
2002	-	-	1080	
2003	Reduce TAC to recent average (1998-2000)	450		

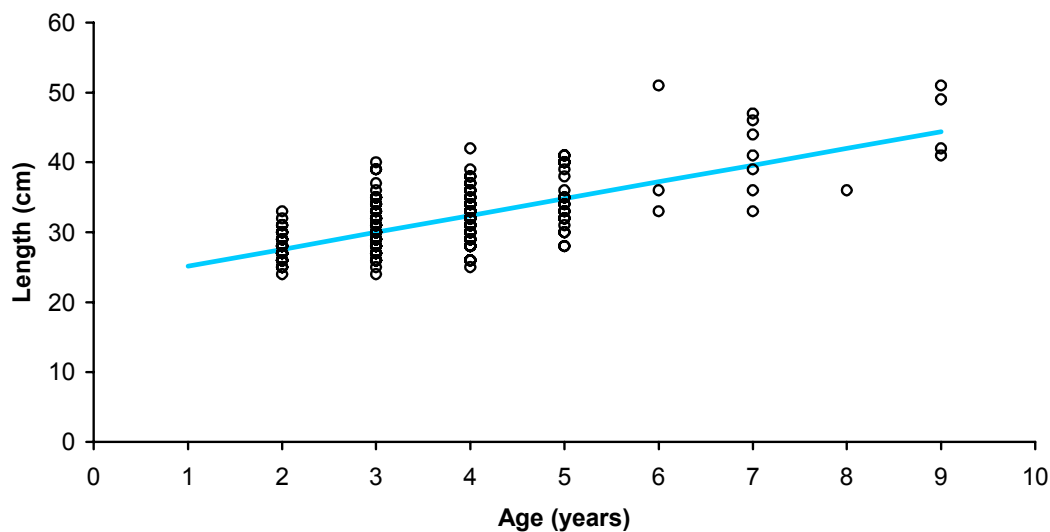
**2001 Length Distribution: Irish Landings, Plaice in VIIj**



**2001 Age Distribution: Irish Landings, Plaice in VIIj**



**2001 Size at Age: Irish Sampling, Plaice in VIIj**



# West of Scotland and Rockall Sole

(Sub-area VI)



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the STECF and ICES advice for other West of Scotland and Rockall stocks is predicated primarily on the need to rebuild cod stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

MFSD point out that Irish vessels catch sole in mixed fisheries which may include catches of cod and haddock. Therefore MFSD advise that unless ways to harvest plaice without incidental catch or discards of cod can be demonstrated, fishing for sole should not be permitted.

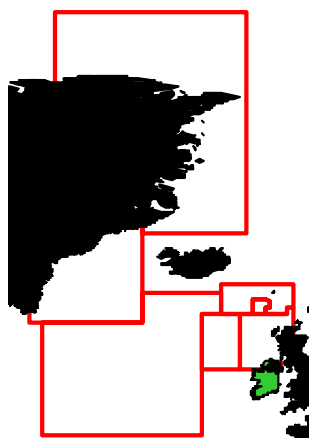
In the absence of ICES advice for this stock, MFSD advise that, if any fisheries on sole are permitted, despite the advice on cod and haddock, the TAC in 2003 should not exceed 125 t. This translates to an Irish quota of 100 t.

## STATE OF THE STOCK

- There is no ICES assessment for this stock.
- Preliminary international 2001 landings were estimated to be 37 t in Division VIa and <0.5 t in VIb.
- There are no reference points proposed for this stock.

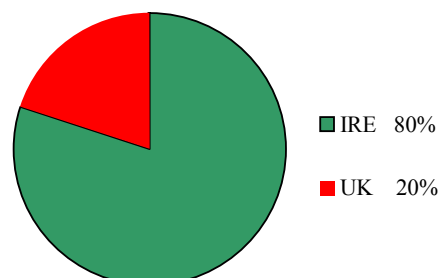
## CURRENT MANAGEMENT

- The TAC area covers Sub-areas VI and XII and XIV and Division Vb.



Red Boxes-TAC/Management Areas

- The TAC in 2002 was 125 t with an associated Irish quota of 100 t.



- There are no explicit management objectives or plans for this stock.
- MFSD advises that management objectives be established and that a management plan be developed and implemented for the fishery catching sole.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was €1.3 million.
- The value of the 2001 Irish landings was €0.3 million.
- This stock is economically important to small inshore trawlers operating out of Killybegs, Greencastle and the smaller ports in Donegal.

## ADDITIONAL INFORMATION

1. In 2001, the Irish catch for sole in VIa was 27 t, a reduction of 13% of the 2000 landings.
2. The Irish quota is not restrictive but this fishery is important to the small inshore boats operating in the south of Division VIa.
3. The TAC for this stock was reduced by 11% in 2002.
4. Sole in VIa are caught mainly by demersal otter trawls. The main fisheries are at the Stanton, Stags and Donegal Bay fishing grounds.
5. Irish sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001.
6. MFSD have conducted an annual groundfish survey in this area since 1993. These data will be used in any future assessments of this stock.
7. MFSD data on discarding of sole in this area is limited but it is not considered to be a problem.
8. Irish otter trawl LPUE have been declining since 1998 possibly reflecting a decrease in the abundance of the stock.

**Sole Division VIa official nominal landings by country**  
(Source: ICES STATLANT 27A database)

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Belgium	.	.	.	.	.	.	.	.	.	.	.
Denmark	.	.	.	.	.	.	.	.	.	.	.
France	1	1	1	.	.	1	.	.	.	.	.
Germany	.	.	.	.	.	.	.	.	.	.	.
Ireland	23	35	57	54	48	39	33	42	71	89	80
Netherlands	.	.	.	.	.	.	1	.	.	.	.
UK (Eng.& Wales)	1	1	2	1	9	13	4	2	.	.	.
UK (Eng.Wal.NI)	.	.	.	.	.	.	.	.	.	2	1
UK (N.Ireland)	.	.	.	2	<0.5	.	<0.5	<0.5	1	.	.
UK (Scotland)	10	10	12	8	7	9	14	17	18	17	11
<b>Total</b>	<b>35</b>	<b>47</b>	<b>72</b>	<b>65</b>	<b>64</b>	<b>62</b>	<b>52</b>	<b>61</b>	<b>90</b>	<b>108</b>	<b>92</b>

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 <sup>1</sup>
Belgium	.	.	1	4	11	2	9	8	3	3	1
Denmark	.	<0.5	.	.	.	.	.	.	.	.	.
France	.	.	1	.	1	.	.	.	.	.	<0.5
Germany	.	.	.	.	.	.	-	.	.	.	.
Ireland <sup>2</sup>	53	40	40	65	62	80	71	81	51	36	27
Netherlands	.	.	.	.	.	.	7	-	.	.	.
UK (Eng.& Wales)	.	.	.	.	.	.	.	.	.	.	.
UK (Eng.Wal.NI)	4	20	22	19	21	20	19	13	12	6	5
UK (N.Ireland)	.	.	.	.	.	.	.	.	.	.	.
UK (Scotland)	15	15	13	10	8	8	7	9	4	3	4
<b>Total</b>	<b>72</b>	<b>75</b>	<b>77</b>	<b>98</b>	<b>103</b>	<b>110</b>	<b>113</b>	<b>111</b>	<b>70</b>	<b>48</b>	<b>37</b>

<sup>1</sup> Official landings data were available from ICES for Sub-area VI

<sup>2</sup> Ireland landings from 1995 from DCMNR Logbook databases

**Sole Division VIb official nominal landings by country**  
(Source: ICES STATLANT 27A database)

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 <sup>1</sup>
France	.	.	.	.	.	.	.	.	.	.	.
Germany	.	.	.	.	.	.	.	1	.	.	.
Ireland <sup>2</sup>	.	.	.	.	.	.	<0.5	.	1	<0.5	<0.5
UK (Eng.& Wales)	.	.	.	.	.	.	.	.	.	.	.
UK (Eng.Wal.NI)	.	.	.	<0.5	<0.5	1	1	.	.	.	.
UK (Scotland)	<0.5	<0.5	.	<0.5	.	<0.5	.	1	1	2	.
<b>Total</b>	<b>&lt;0.5</b>	<b>&lt;0.5</b>	<b>0</b>	<b>&lt;0.5</b>	<b>&lt;0.5</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>&lt;0.5</b>

<sup>1</sup> No official landings data were available from ICES for Division VIb

<sup>2</sup> Ireland landings from 1995 from DCMNR Logbook databases

# Irish Sea Sole

(Division VIIa)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the STECF and ICES advice for other Irish Sea stocks is predicated primarily on the need to rebuild cod stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

MFSD therefore advise that management of this stock will have to consider the management of cod and whiting which are taken in the same mixed fisheries. Unless way to harvest sole without incidental catch or discards of cod and whiting can be demonstrated fishing for sole should not be permitted.

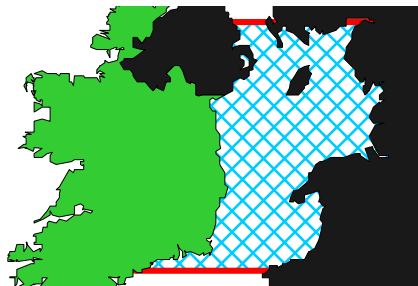
MFSD agrees with the ICES recommendation that if any fisheries on sole are permitted, despite the advice on cod and whiting, fishing mortality in 2003 should be below the  $F_{pa}$ , corresponding to landings of less than 1,010 t in 2003. This translates to an Irish quota of 123 t in 2003.

## STATE OF THE STOCK

- There are no concerns about the state of this stock.
- Whilst landings increased in 2001 to about 1,050 t, they remain close to the year 2000 historic low of 820 t.
- The estimated fishing mortality in 2001 of 0.25 is below the  $F_{pa}$  of 0.3.  $F$  had remained above  $F_{pa}$  for the entire time series, except for 2000 and 2001.
- Recruitment in this stock has occurred in pulses. The 1993 and 1994 year class were the lowest on record while the 1995 and 1996 year-class were above average. Recent year-classes have been below average.
- The estimated SSB in 2002 of 4,210 t is greater than the  $B_{pa}$  of 3,800 t. SSB had fluctuated around  $B_{pa}$  since 1990 but rebuilding of the SSB from the historic lows of 1996 and 1997 continued until 2001.
- Short-term predictions indicate that SSB will remain stable at about 4,230 t in 2004.

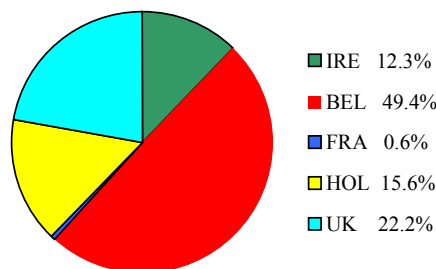
## CURRENT MANAGEMENT

- The TAC area (Division VIIa) corresponds to the assessment area.



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

- The TAC in 2002 was 1,100 t with an Irish quota of 134 t.
- There are no explicit management objectives or a management plan for this stock.
- MFSD recommend that management objectives be established and that a management plan be developed and implemented for fisheries catching sole.



## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was about €1.6m.
- The value of the 2001 Irish landings from Division VIIa was about €1.7m.
- This fishery is an extremely important, high economic value fishery. Particularly to the beam trawl fleet which target sole in the eastern Irish Sea and often land in the UK. Sole are also a valuable by-catch for other trawl vessels operating out of Howth and other east coast ports.

## ADDITIONAL INFORMATION

- 1 Irish landings were about 138 t in 2001.
- 2 Although misreporting of sole catches by area is suspected, and fleets constrained by quotas are likely to have been declaring landings only in line with expected quota uptake, there is no information on whether this constitutes a serious problem for the assessment of this stock.
- 3 Beam trawlers from Belgium traditionally take up to two-thirds of the landings. The UK (England and Wales) and Ireland each take about 15% of the land-

- ings.
- 4 The Irish Sole fishery in VIIa is mainly undertaken by beam trawlers in quarter 1 and 4. Sole are also a by-catch in demersal otter trawl fisheries. Management options for sole therefore need to consider the interactions with other species in the fishery.
  - 5 Irish Sampling of this stock is supported through the EC funded sampling programme, which is required under Data Collection Regulations 1543/2000 and 1639/2001. MFSD sampling indicates that fish in age groups 3, 4 and 5 dominate the landings.
  - 6 Limited observations on discarding of sole indicate that rates of discarding are relatively low.
  - 7 Because of the cod closure in 2000 Belgian beam trawl effort was displaced from the first quarter to April, May and October. The UK beam trawl effort in 2000 decreased in April but increased in May. The total UK Beam effort decreased by 40% in 2000 compared to 1999. Since the closed area was restricted to the west of the Irish Sea in 2001, it is unlikely that it has influenced effort distribution in 2001.

## ICES ADVICE

### 3.8.6

#### State of stock/exploitation:

The stock is within safe biological limits. The SSB in 2002 was above  $B_{pa}$  and fishing mortality in 2001 was below  $F_{pa}$ . Fishing mortality varied around  $F_{lim}$  from 1970 to 1999, but has declined to 80% of  $F_{pa}$  in 2001. SSB has recently increased from the historic low in 1997.

#### Management objectives:

No explicit management objectives are set for this stock.

#### Advice on management:

**ICES recommends that fishing mortality in 2003 remains below the proposed  $F_{pa}$ , corresponding to landings of less than 1 010 t in 2003.**

#### Relevant factors to be considered in management:

Limited observations on discarding of sole indicate that rates of discarding are relatively low.

#### Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$B_{lim}$ is 2 800 t. The lowest observed spawning stock in an earlier assessment.	$B_{pa}$ be set at be set at 3 800 t, which 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.
$F_{lim}$ is 0.4. 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.	$F_{pa}$ be set at 0.30. This $F$ is considered to have a high probability of avoiding $F_{lim}$ .

#### Technical basis:

$B_{lim} = B_{loss}$	$B_{pa} \sim B_{lim} * 1.4$
$F_{lim} = F_{loss}$ poorly defined; based on historical considerations	$F_{pa} = \text{see above}$

#### Catch forecast for 2003:

Basis:  $F(2002) = F(99-01)$ ;  $F_{sq} = 0.28$  ; Landings(2002) = 1.05 ; SSB(2003) = 4.11.

F(2003) onwards	Basis	Landings (2003)	SSB (2004)
0.26	$0.9 * F_{sq}$	0.88	4.31
0.28	$1 * F_{sq}$	0.97	4.23
0.30	$F_{pa} = 1.05 * F_{sq}$	1.01	4.18
0.31	$1.1 * F_{sq}$	1.05	4.14
0.34	$1.2 * F_{sq}$	1.13	4.06

Weights in '000 t. Shaded scenarios considered inconsistent with the precautionary approach.

**Comparison with previous assessment and advice:**

The estimate of fishing mortality in 2000 is 12% higher, and SSB in 2001 the same, in this year's assessment compared to last year's assessment. The basis for a single stock fishery advice is the same as last year.

**Elaboration and special comment:**

Sole are taken mainly in a beam trawl fishery and are also taken as a by-catch in otter trawl fisheries. In recent years, catch rates of sole have been low in the Irish Sea, and part of the beam trawl fleet has moved to sole fishing grounds in other areas. The analytical assessment is based on a tuned catch at age analysis with CPUE data from two commercial beam trawl fleets and two surveys.

**Source of information:**

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, August 2002 (ICES CM 2003/ACFM:04).

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

	Fish Mort Ages 4-7	Yield/R	SSB/R
Average Current	0.399	0.186	0.795
$F_{max}$	0.523	0.192	0.463
$F_{0.1}$	0.177	0.169	1.169
$F_{med}$	0.300	0.187	0.758

**Catch data (Tables 3.8.6.1–2):**

Year	ICES Advice	Predicted catch. corresp. to advice	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		
2003	Keep F below $F_{pa}$	< 1.01			

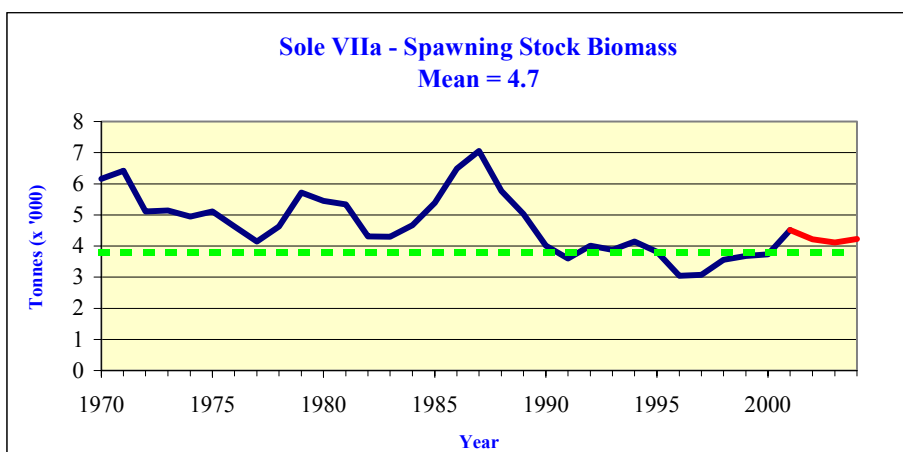
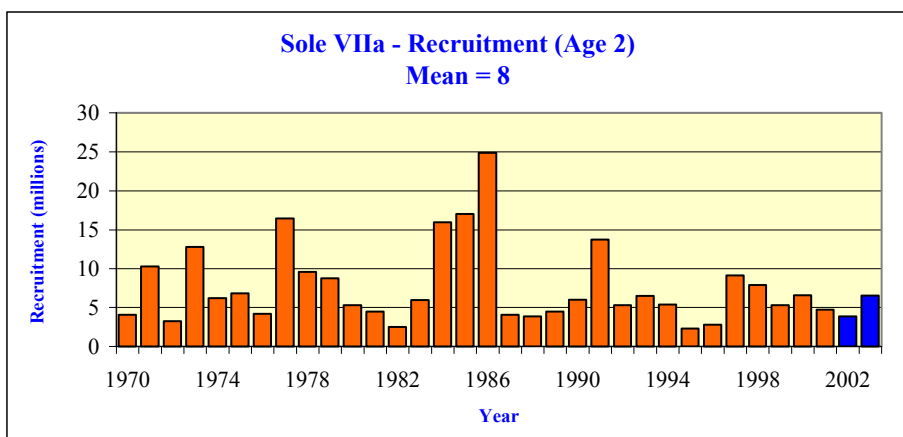
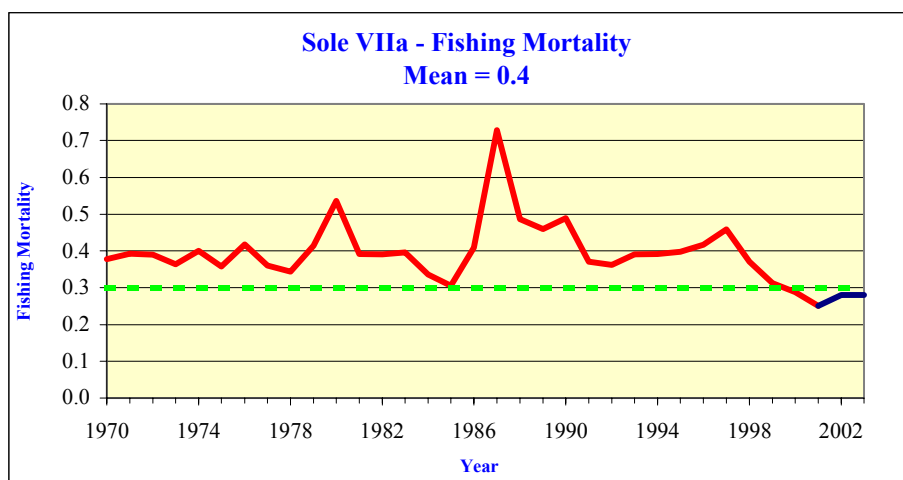
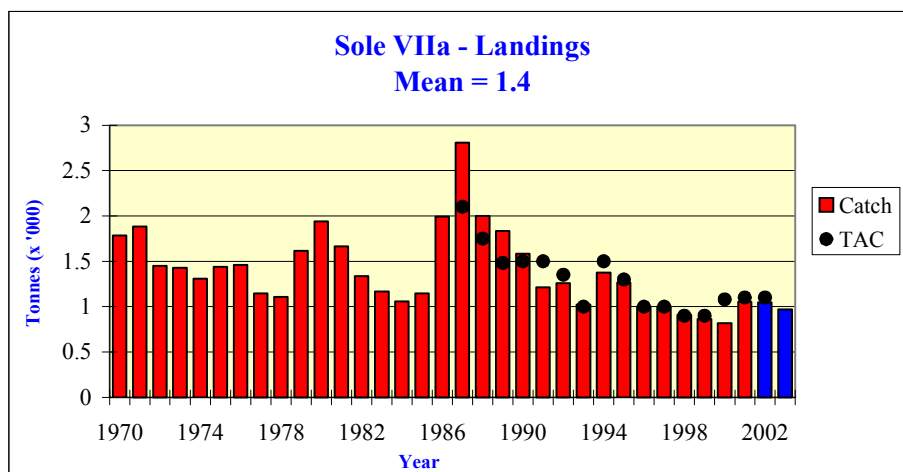
<sup>1</sup>Catch at *Status quo* F. <sup>2</sup>Not including misreporting. <sup>3</sup>Revised in 1990 to 1.5. <sup>4</sup>Incomplete statistics. Weights in '000 t.

**Table 3.8.6.1** Irish Sea Sole. Divisions VIIa. Nominal landings (t), as officially reported to ICES

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	930	987	915	1010	786	371	531	495	706	675	533	570	525	469	493	674
France	17	5	11	5	2	3	11	8	7	5	5	3	5 *	1 *	2 *	4 *
Ireland	235	312	366	155	170	198	164	98	226	176	133	130	134	120	134	125 *
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	...
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	...
United Kingdom																198 *
<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>897</b>	<b>810</b>	<b>831</b>	<b>1,001</b>
Unallocated	79	767	114	10	7	-9	25	52	2	-34	-21	-24	14	50	-13	52
<b>Total used by Working Group in Assessment</b>	<b>1,995</b>	<b>2,808</b>	<b>1,999</b>	<b>1,833</b>	<b>1,583</b>	<b>1,214</b>	<b>1,259</b>	<b>1,023</b>	<b>1,369</b>	<b>1,266</b>	<b>1,002</b>	<b>1,003</b>	<b>911</b>	<b>859</b>	<b>818</b>	<b>1053</b>

\* Preliminary

<sup>1</sup> 1989 onwards: N. Ireland included with England & Wales



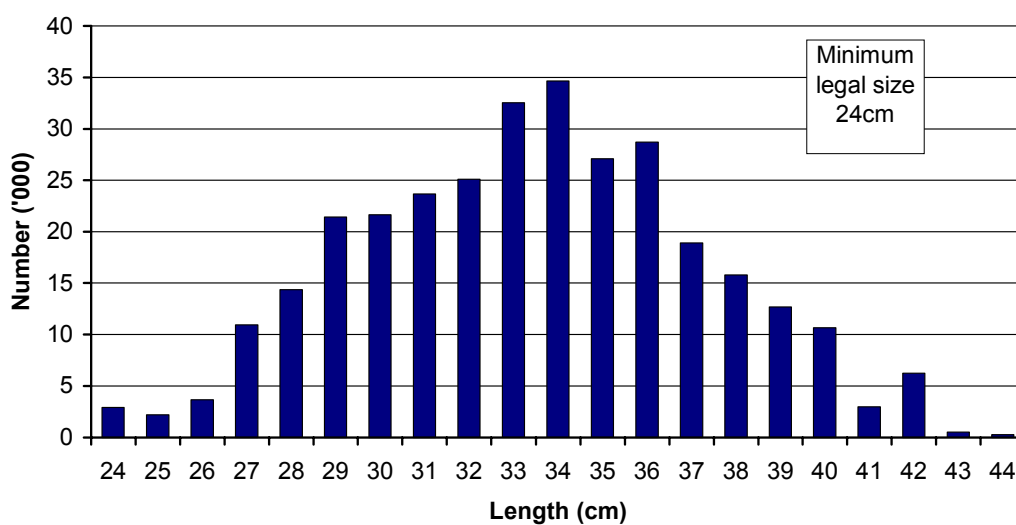


**Table 3.8.6.2** Sole in Division VIIa (Irish Sea)

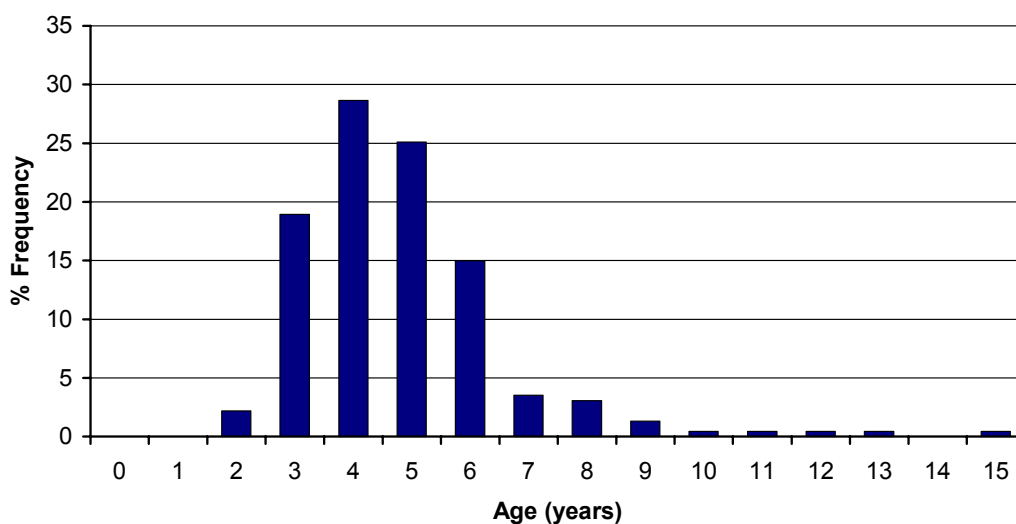
Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4-7
1970	4047	6159	1785	0.3782
1971	10297	6419	1882	0.3926
1972	3221	5106	1450	0.3902
1973	12785	5141	1428	0.3636
1974	6199	4942	1307	0.4006
1975	6804	5119	1441	0.3581
1976	4185	4626	1463	0.4171
1977	16453	4140	1147	0.3602
1978	9591	4627	1106	0.3438
1979	8762	5722	1614	0.4142
1980	5324	5450	1941	0.5359
1981	4506	5341	1667	0.3917
1982	2516	4305	1338	0.3909
1983	5940	4302	1169	0.3962
1984	15964	4674	1058	0.3354
1985	17025	5387	1146	0.3056
1986	24896	6492	1995	0.4093
1987	4082	7056	2808	0.7286
1988	3860	5769	1999	0.4864
1989	4494	5032	1833	0.4594
1990	6031	4017	1583	0.4892
1991	13744	3603	1212	0.3710
1992	5283	4007	1259	0.3618
1993	6482	3884	1023	0.3909
1994	5377	4146	1374	0.3921
1995	2288	3820	1266	0.3978
1996	2797	3052	1002	0.4165
1997	9117	3080	1003	0.4586
1998	7903	3554	911	0.3709
1999	5313	3683	863	0.3127
2000	6577	3736	818	0.2883
2001	4731	4513	1053	0.2507
2002	3869 <sup>1</sup>	4210		
Average	7590	4700	1405	0.3951

<sup>1</sup> RCT-3 estimate

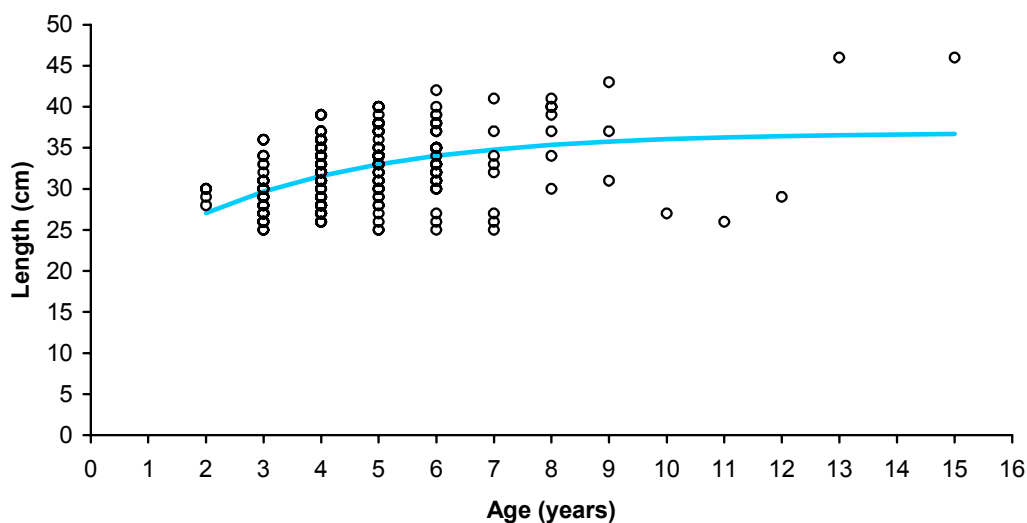
**2001 Length Distribution: Irish Landings, Sole in Vlla**



**2001 Age Distribution: Irish Landings, Sole in Vlla**



**2001 Size at Age: Irish Sampling, Sole in Vlla**



# West of Ireland Sole

(Divisions VIIb,c)

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



Marine Fisheries Services Division

## MFSD – ADVICE

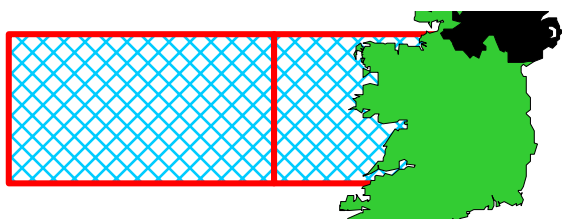
MFSD agrees with the ICES recommendation that catches in 2003 be no more than the recent average (1993-2000) of around 65 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment. This translates to a TAC of 65 t and an Irish quota of 53 t in 2003.

## STATE OF THE STOCK

- Due to the short time series of data and tuning fleets, the assessment is treated as preliminary.
- It is not appropriate to produce trends in biomass, fishing mortality and recruitment due to the short time series of data available.
- The estimated total international landings for 2001 were 60 t.

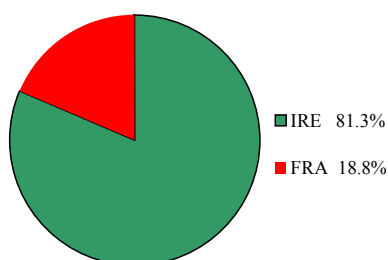
## CURRENT MANAGEMENT

- The TAC area covers Divisions VIIb,c as does the assessment area.



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

- The 2002 TAC was 80 t with an associated Irish quota of 65 t.



- There are no explicit management objectives or plan for this stock. Ireland has an opportunity as the main

participant in fisheries in this area to develop a management strategy for these fisheries.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was € 0.8 m.
- The value of the 2001 Irish landings was € 0.6 m.
- The high value of sole make them a very valuable species in this area particularly for smaller inshore trawlers.

## ADDITIONAL INFORMATION

1. A tentative assessment was carried out on this stock. No short term or medium predictions were carried out due to the short time series of data available.
2. Irish estimated landings in 2001 were 51 t.
3. Misreporting is not perceived to be a problem in this fishery.
4. On average, Ireland had 95% of total international landings between 1993-2001.
5. Sole are caught in mixed species otter trawl fisheries (accounting for 92% of the landings in 2001) mainly in inshore areas of VIIb.
6. Irish Sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001. MFSD sampling indicates that the Irish landings were mainly comprised of 4 to 6 year old fish (55% of the landings). Older age groups are also well represented in the landings.
7. MFSD has conducted an annual groundfish survey in this area since 1993 and this survey data was used in the assessment.
8. Irish commercial catch and effort data from logbooks were used to tune the assessment.
9. MFSD data on discarding of sole in this area is limited but discarding is not considered to be a problem.

## ICES ADVICE

3.9.15

### State of stock/exploitation:

The state of the stock is not known in relation to biological reference points. Catches have been relatively stable in recent years.

### Management objectives:

No explicit management objectives have been established for this stock.

**Precautionary Approach Reference points:**

No precautionary reference points have been proposed for this stock.

**Advice on management:**

**ICES recommends that catches in 2003 be no more than the recent average (1993-2000) of around 65 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.**

**Relevant factors to be considered in management:**

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.

Catch forecast for 2003 and medium- and long-term projections not available

**Comparison with previous assessment and advice:**

The assessment for this stock is preliminary. ICES gave no advice for this stock in 2001.

**Elaboration and special comment:**

ICES carried out a preliminary assessment on the status of this stock. This assessment used catch-at-age data from 1993-2001 and commercial and survey tuning data from Ireland. The time series of the data and tuning fleets were too short to make conclusions about the current stock status.

Ireland is the major participant in this fishery with 96% of the international landings between 1993-2001. Sole are normally caught in mixed species otter trawl fisheries in Division VIIb. These vessels target mainly other demersal fish species and *Nephrops*.

**Source of information:**

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 9 – 18 July 2002 (ICES CM 2003/ACFM:03).

**Tables 3.10.5.1** Nominal Landings (t) (as reported to WGSSDS) of Sole in Division VIIb,c for 1993-2001

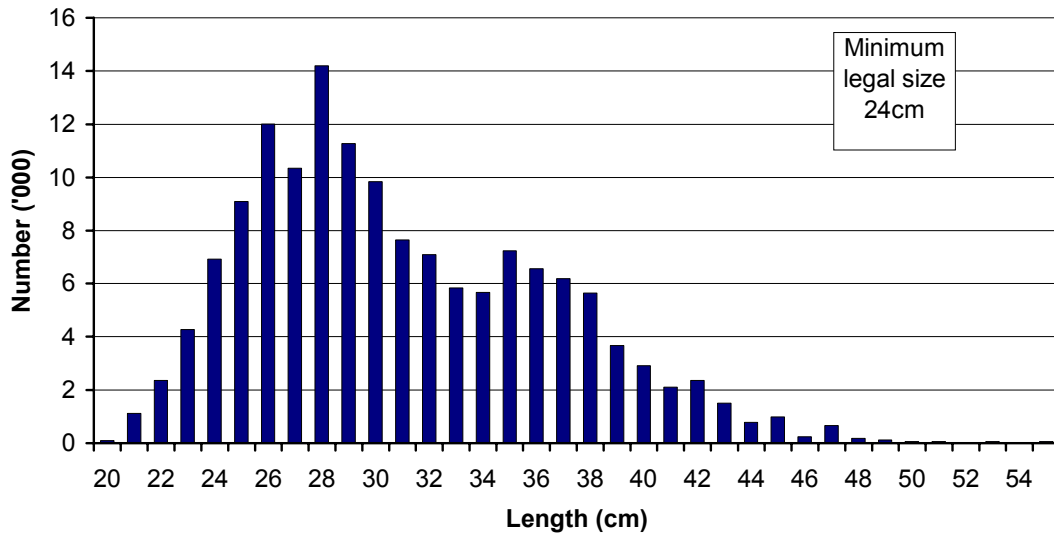
Country	1993	1994	1995	1996	1997	1998	1999	2000	2001*
France	1	1	2	2	3		2*	2*	9*
Ireland	59	60	59	52	51	49	68	73	36
UK (England & Wales)	+	+	+	+	1	+		+	
UK (Scotland)									
Total	60	61	61	54	55	49	70	75	45
Unallocated		9	-2	3		17	2	-7	15
Total figures used by Working Group	60	70	59	57	55	66	72	68	60

\* Preliminary .

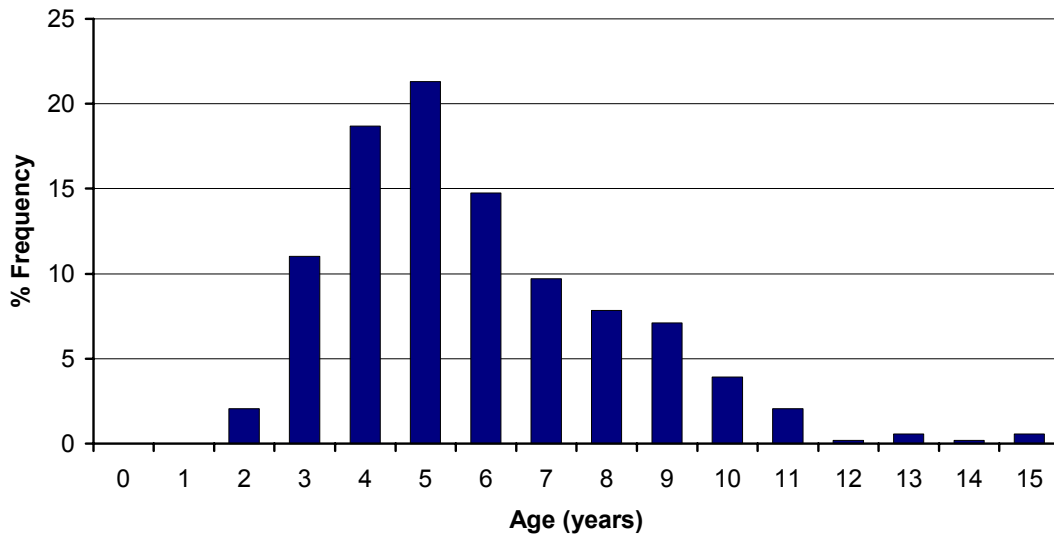
**Catch data (Tables 3.10.5.1):**

Year	ICES Advice	Predicted catch corresponding to advice	Agreed TAC <sup>1</sup>	ACFM landings <sup>2</sup>
1993	-	-	-	60
1994	-	-	-	70
1995	-	-	-	59
1996	-	-	-	57
1997	-	-	-	55
1998	-	-	-	66
1999	-	-	-	72
2000	-	-	-	68
2001	-	-	80	60
2002	No advice	-	80	
2003	Reduce TAC to recent landings	65		

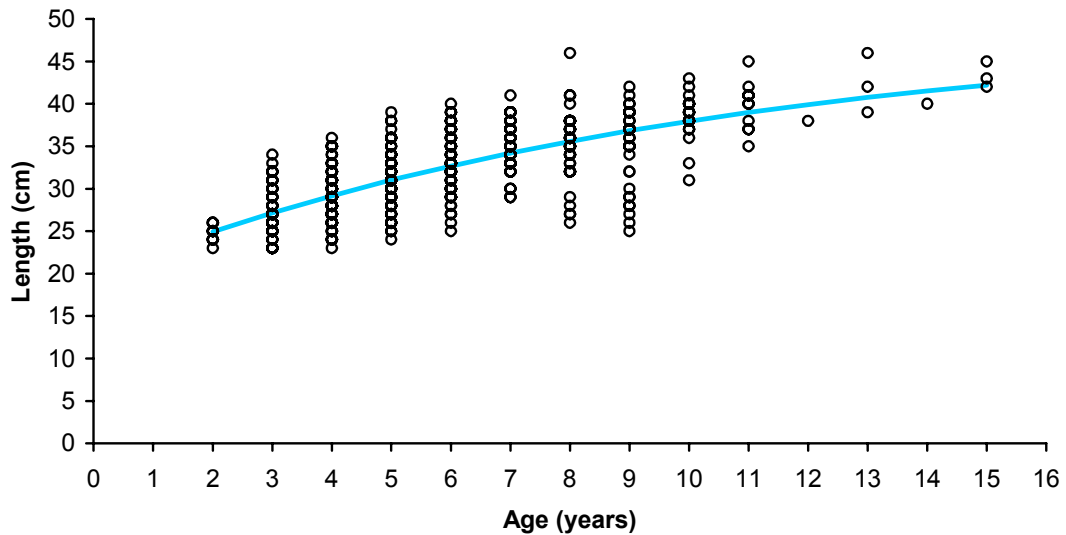
**2001 Length Distribution: Irish Landings, Sole in VIIb**



**2001 Age Distribution: Irish Landings, Sole in VIIb**



**2001 Size at Age: Irish Sampling, Sole in VIIb**



# Celtic Sea Sole

(Divisions VIIfg)

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



Marine Fisheries Services Division

## MFSD – ADVICE

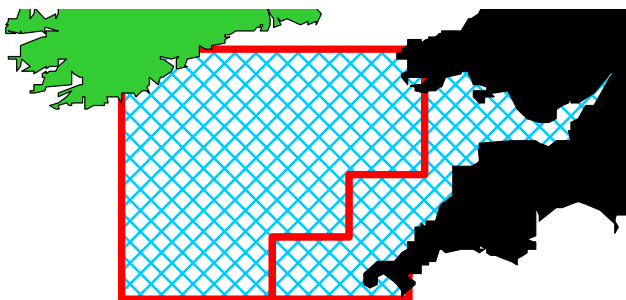
MFSD agrees with ICES recommendations that the fishing mortality should be reduced below  $F_{pa}$ , corresponding to landings of less than 1,240 t in 2003. This corresponds to a reduction of 40% from status quo  $F$  and will maintain SSB above  $B_{pa}$  in the short term. This advice translates to an Irish quota of 38 t in 2003.

## STATE OF THE STOCK

- There are concerns about the state of this stock which is harvested outside safe biological limits.
- The 2001 landings were 1,168 t, which is 7% higher than in 2000. Landings peaked in 1986 at about 1,600 t but have been stable and close to 1,000 t since 1989.
- Fishing mortality ( $F=0.63$ ) is too high for this stock and has been above the  $F_{pa}=0.37$  since 1983.
- Recruitment has fluctuated during the time series and the 1998 year-class is the biggest on record.
- SSB is estimated to have declined continuously from the highest value of 5,900 t in 1971 to the lowest in the time-series in 1998. SSB for 2001 is estimated to be 2,360 t, just above  $B_{pa}=2,200$  t.
- The assessment indicates a large 1998 year class, and SSB is expected to increase in the short-term. However, outstanding year classes have only been produced at long intervals and the stock increase is therefore likely to be temporary.

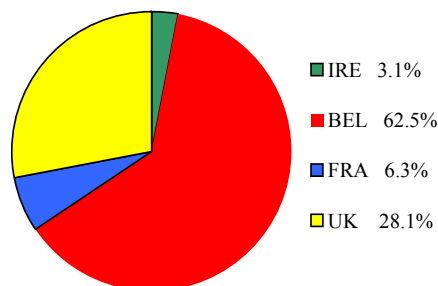
## CURRENT MANAGEMENT

- The TAC area covers Divisions VIIfg as does the assessment area



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

- The 2002 TAC was 1,070 t with an associated Irish quota of 33 t.



- There are no explicit management objectives or plans for this stock. MFSD advises that management objectives be established and that a management plan be developed and implemented for fisheries catching sole.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was € 0.36 m.
- The value of the 2001 Irish landings was € 0.6 m.
- The high market value of sole makes it an economically important component of the mixed demersal otter trawl fisheries in the Celtic Sea.

## ADDITIONAL INFORMATION

1. The assessment is based on data from two commercial fleets (the Belgium and UK beam trawl) and a beam trawl survey. The results of this year assessment are similar to last year assessment.
2. Irish estimated landings in 2001 were 50 t. This is a decrease of 40% on the 2000 landings.
3. The levels of misreporting in this stock are unknown, however, TACs have been restrictive and overshoot by some countries in recent years.
4. Belgium with 64% of the 2001 landings dominates the fishery. The UK, France and Ireland landed 25%, 7% and 3% of the 2001 landings respectively.
5. The majority of the Irish landings are taken by otter trawls (56%), Scottish seine (23%) and beam trawls (19%). The Irish quota allocation is very restrictive for sole in this area.
6. Irish Sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001.
7. MFSD commenced a groundfish survey in 1997 on RV *Celtic Voyager* in the Celtic Sea. This survey does not provide a useable abundance index for this

stock since the otter trawl used is not efficient at catching sole.

8. The results of tagging experiments suggest that there is only limited movement of sole between VIIf and elsewhere. There is an important spawning ground in VIIf for sole.
9. In previous years, discard data were available from the Irish otter trawl fleet, indicating that discarding of sole is negligible.
10. MFSD would point out that the strong 1998 year class offers managers an opportunity to rebuild this stock in the medium term. Outstanding year classes have only been produced at long intervals in this stock. Currently fishing mortality remains very high. The 1998 year class is expected to account for 36% to the 2002 landings. This year class will not be fully mature until 2003. Because of the high exploitation rate before 2003 the impact of this year class on the 2003 SSB estimate will be reduced. Furthermore the potential for this year class to contribute to the SSB in the medium term has also been reduced.

## ICES ADVICE

### 3.9.5

#### State of stock/exploitation:

The stock is harvested outside safe biological limits. Fishing mortality has increased since the late 1970s, exceeding  $F_{pa}$  since the early 1980s, and is at present above  $F_{lim}$ . SSB has declined steadily since the early 1970s. SSB fell below  $B_{pa}$  in 1995 and has remained low until 2001, when the outstanding 1998 year class began to contribute and SSB increased above  $B_{pa}$ . SSB is forecast to increase further in 2002-2003. Recruitment has fluctuated with some peaks: the 1970 and 1989 year classes were strong, and the 1998 year class the strongest in the series.

#### Management objectives:

There are no explicit management objectives for this stock.

#### Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$B_{lim}$ is not defined	$B_{pa}$ be set at 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.
$F_{lim}$ is 0.52, the fishing mortality estimated to lead to potential stock collapse.	$F_{pa}$ be set at 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.

#### Technical basis:

$B_{lim}$ : Not defined	$B_{pa} : B_{loss}$
$F_{lim} : F_{loss}$	$F_{pa} : F_{lim} \times 0.72$ ; implies a less than 5% probability that ( $SSB_{MT} < B_{pa}$ )

#### Advice on management:

ICES recommends that the fishing mortality should be reduced to below  $F_{pa}$ , corresponding to landings of less than 1 240 t in 2003. This corresponds to a reduction of 40% from *status quo*  $F$ , and will maintain SSB above  $B_{pa}$  in the short-term.

#### Relevant factors to be considered in management:

The assessment indicates a large 1998 year class, and SSB is expected to increase in the short-term. However, outstanding year classes have only been produced at long intervals and the stock increase is therefore likely to be temporary.

Sole is taken mainly in a directed beam-trawl fishery with plaice as a by-catch, and to a lesser extent in otter trawl fisheries. Management should take account of the mix of Celtic Sea sole and plaice.

**Catch forecast for 2003:**

Basis:  $F(2002)=TAC$  constraint,  $F_{sq} = F(99-01, scaled)=0.63$ ; Landings(2002) = 1.07 ; SSB(2003) = 3.37

F(2003)	Basis	Landings (2003)	SSB (2004)
0.25	$0.4 * F_{sq}$	0.89	3.77
0.31	$0.5 * F_{sq}$	1.08	3.56
0.37	$F_{pa} = 0.59 * F_{sq}$	1.24	3.37
0.44	$0.7 * F_{sq}$	1.43	3.16
0.50	$0.8 * F_{sq}$	1.59	2.99
0.57	$0.9 * F_{sq}$	1.74	2.82
0.63	$1.0 * F_{sq}$	1.88	2.66

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

**Medium- and long-term projections:**

Results of the medium-term analysis indicate a low probability of SSB falling below  $B_{pa}$  after 5-10 years when fishing mortality is reduced below  $F_{pa}$  from 2003 onwards. Assuming the current selection pattern,  $F_{max}$  is  $0.39 * F_{sq}$ .

**Comparison with previous assessment and advice:**

Results are very close to those of the previous assessment. The 1998 year class was re-estimated as around 30% higher.

**Elaboration and special comment:**

The fisheries for sole in the Celtic Sea and Bristol Channel involve vessels from Belgium, taking 2/3, the UK 1/4, 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.

The catch prediction for 2002 assumed that the TAC would be taken and hence the fishing mortality would be below  $F_{sq}$ . This is based on information that the Belgian fleet has stopped fishing for sole in June 2002 when it reached its TAC limit.

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 decreased thereafter. In the Celtic Sea, the beam and otter trawl fleets also take plaice, rays, brill, turbot and anglerfish.

The main spawning areas for sole in the Celtic Sea are in waters 40–75 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.

Age-based analytical assessment using catch-per-unit effort data from two commercial fleets and one survey.

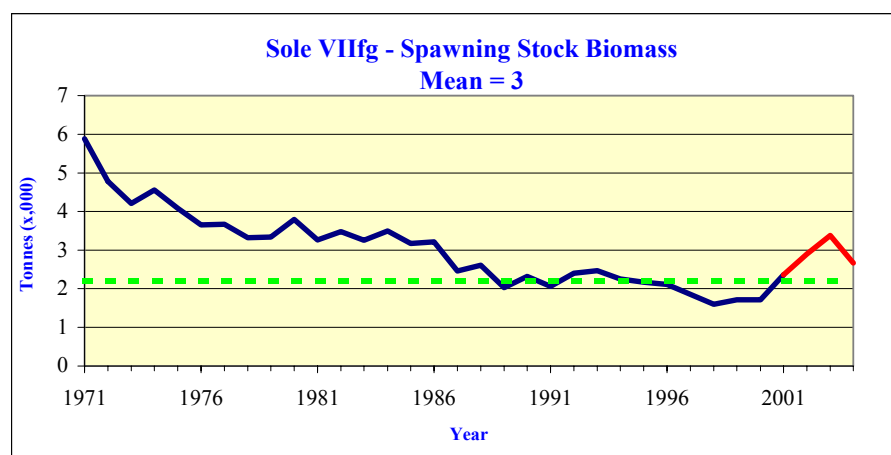
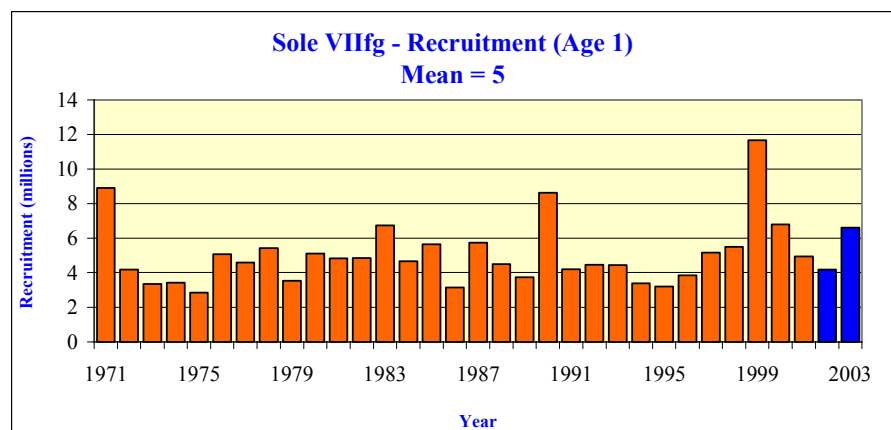
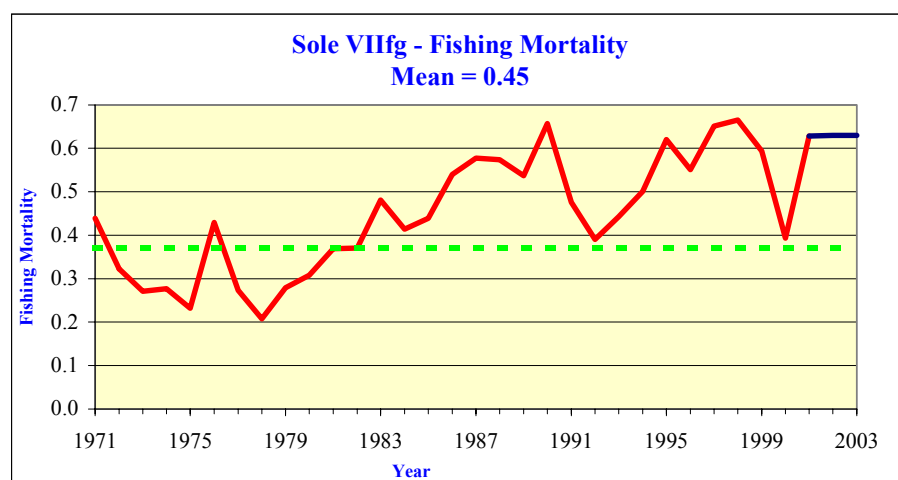
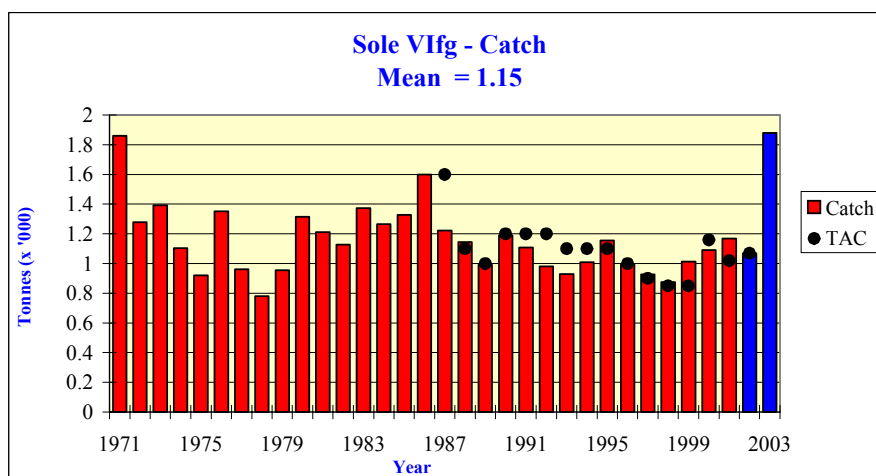
**Source of information:**

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2002 (ICES CM 2003/ACFM:03).

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

	Fish Mort Ages 4-8	Yield/R	SSB/R
Average Current	0.538	0.210	0.384
$F_{max}$	0.248	0.226	0.959
$F_{0.1}$	0.117	0.205	1.885
$F_{med}$	0.345	0.222	0.664





**Catch data (Tables 3.9.5.1-2):**

Year	ICES advice	Predicted catch cor- resp. to advice	Agreed TAC	ACFM Landings
1987	<i>Status quo</i> F; TAC	1.6	1.6	1.22
1988	F = F(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	
2003	Reduce F below $F_{pa}$	<1.24		

Weights in '000 t.

**Table 3.9.5.1** Celtic Sea SOLE. Divisions VIIIf and VIIg. Nominal landings (t), 1986–2001. Data used by the Working Group.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 <sup>1</sup>
Belgium	1,092	704	725	660	689	839	516	512	612	728	610	562	568	669	694	748
France	92	72	89	97	100	80	136	103	86	89	97	79	72	98	117	78
Ireland	12	9	15	32	41	n/a	4	28	47	45	23	36	37	50	74	36
UK(E. & W.)	404	437	317	203	359	395	325	285	264	294	265	251	198	231	243	288
Others	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-
Total	1,600	1,222	1,146	992	1,189	1,324	981	928	1,009	1,156	995	928	875	1,047	1,128	1149
Unallocated	-	-	-	-	-	-217	-	-	-	1	-	-1	-	-36	-37	19
Total used in assessment	1,600	1,222	1,146	992	1,189	1,107	981	928	1,009	1,157	995	927	875	1,012	1,091	1168

<sup>1</sup>Preliminary.

**Table 3.9.5.2** Sole in Divisions VIIIf and g (Celtic Sea)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4-8
1971	8900	5883	1861	0.438
1972	4176	4775	1278	0.322
1973	3335	4203	1391	0.271
1974	3423	4555	1105	0.277
1975	2844	4087	919	0.232
1976	5072	3650	1350	0.429
1977	4578	3668	961	0.273
1978	5419	3316	780	0.208
1979	3524	3337	954	0.279
1980	5096	3791	1314	0.308
1981	4827	3265	1212	0.369
1982	4853	3474	1128	0.370
1983	6752	3251	1373	0.481
1984	4675	3500	1266	0.414
1985	5636	3166	1328	0.439
1986	3141	3209	1600	0.539
1987	5738	2460	1222	0.577
1988	4502	2600	1146	0.574
1989	3743	2024	992	0.537
1990	8625	2320	1189	0.657
1991	4201	2059	1107	0.475
1992	4463	2397	981	0.390
1993	4434	2472	928	0.442
1994	3396	2246	1009	0.501
1995	3195	2171	1157	0.620
1996	3851	2110	995	0.550
1997	5164	1850	927	0.651
1998	5491	1599	875	0.665
1999	11663	1712	1012	0.594
2000	6802	1711	1091	0.393
2001	4928	2360	1168	0.628
2002	4716	2904		0.628
Average	5036	3004	1149	0.454

# Southwest of Ireland Sole

(Divisions VIIh-k)

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



## Marine Fisheries Services Division

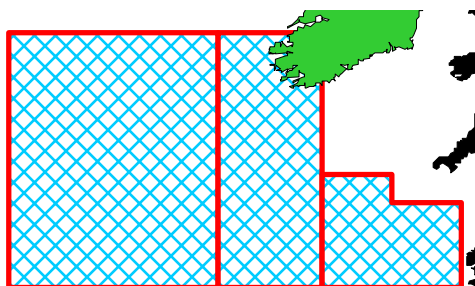
**MFSD agrees with the ICES recommendation that catches in 2003 be no more than the recent average (1999-2001) of around 330 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment. This translates to an Irish quota of 149 t.**

## STATE OF THE STOCK

- Due to the short time series of data and tuning fleets, the assessment is treated as preliminary.
- It is not appropriate to produce trends in biomass, fishing mortality and recruitment due to the short time series of data available.
- The estimated total international landings of sole in divisions VII h-k in 2001 was 325 t.

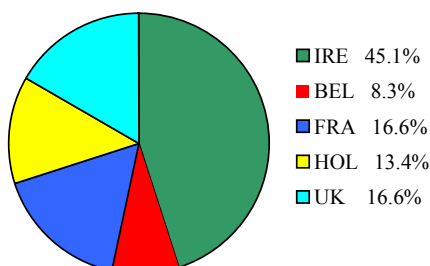
## CURRENT MANAGEMENT

- The TAC area covers Divisions VIIh-k as does the assessment area.



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

- The 2002 TAC was 650 t with an associated Irish quota of 293 t.
- There are no explicit management objectives or plan for this stock. Ireland has an opportunity as the main participant in fisheries in this area to develop and propose a management strategy for these fisheries.



## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was € 3.5 m.
- The value of the 2001 Irish landings was € 1.3 m.
- The high market value of sole makes it a very important fishery particularly to smaller inshore trawlers in the southwest of Ireland.

## ADDITIONAL INFORMATION

1. A tentative assessment was carried out on this stock. No short term or medium predictions were carried out due to the short time series of data available.
2. Irish estimated landings in 2001 were 110 t. This is similar to landings in 2000 (107 t).
3. Mis-reporting is not considered as a problem in this stock.
4. In 2001, France, UK and Ireland each landed roughly a third of total international landings.
5. The majority of the Irish landings for this fishery are taken by otter trawls (87%) and beam trawls (11%). This is a very important target fishery for the inshore Irish otter trawl fleet, particularly in Dingle, Castletownbere, Baltimore and Union Hall.
6. Irish sampling for this stock is supported through the EC funded sampling programme which is required under Data Collection Regulation 1543/2000 and 1639/2001. MFSD sampling indicates that the Irish landings in 2001 were dominated by 3 year olds or 24-28cm fish.
7. MFSD have conducted an annual groundfish survey in this area since 1993 and this survey data was used in the assessment.
8. Irish commercial catch and effort data from logbooks were used to tune the assessment.
9. MFSD data on discarding of sole in this area is limited but discarding is not considered to be a problem.

## ICES ADVICE 3.9.17

### State of stock/exploitation:

The state of the stock is not known in relation to biological reference points. Catches in the last three years are the lowest in the short time series.

### Management objectives:

No explicit management objectives have been established for this stock.

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**Precautionary Approach Reference points:**

No precautionary reference points have been proposed for this stock.

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**Advice on management:**

**ICES recommends that catches in 2003 be no more than the recent average (1999-2001) of around 330 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.**

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**Relevant factors to be considered in management:**

Recent landings have been about 50% of the TAC. 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.

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**Catch forecast for 2003:**

Not available

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**Medium- and long-term projections:**

not available.

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**Comparison with previous assessment and advice:**

The assessment is preliminary. ICES gave no advice for this stock in 2001.

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**Elaboration and special comment:**

ICES carried out a preliminary assessment on the status of this stock. This assessment used catch-at-age data from 1993-2001 and commercial and survey tuning data from Ireland. The time series of the data and tuning fleets were too short to make conclusions about the current stock status.

Sole are predominantly caught within mixed species otter trawl fisheries in Division VIIj. These vessels target mainly hake, anglerfish and megrim. Beam trawlers and seiners generally take a lesser catch of sole. Ireland is the major participant in this fishery with around 50% of the international landings between 1993-2001.

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**Source of information:**

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 9 – 18 July 2002 (ICES CM 2003/ACFM:03).

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**Catch data (Tables 3.9.15.1):**

Year	ICES Advice	Predicted catch corresp. to advice	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	-	-	327
2000	No advice	-	-	327
2001	No advice	-	650	325
2002	No advice	-	650	
2003	Reduce TAC to recent landings	330		

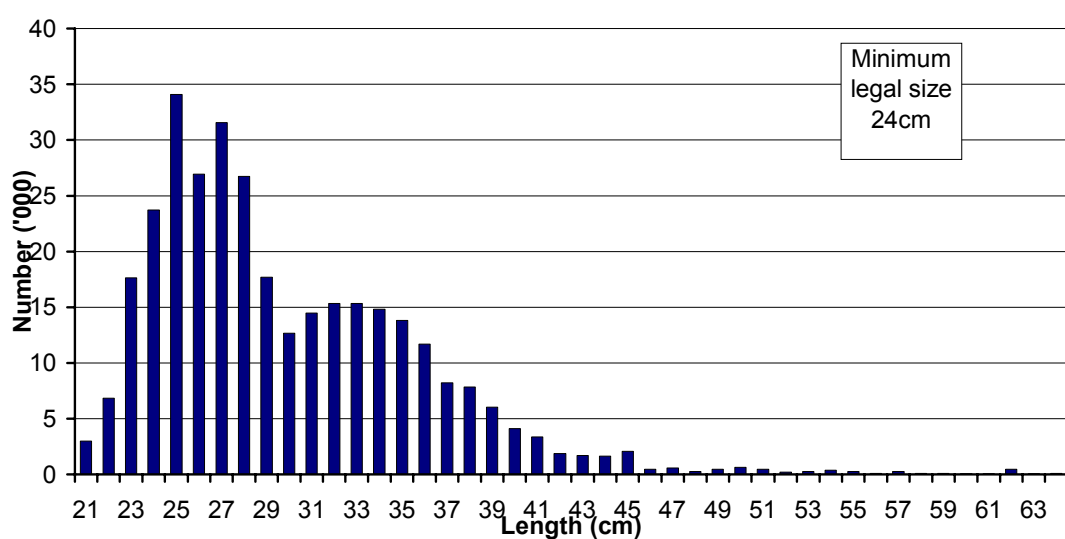
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**Nominal Landings (t) (as reported to WGSSDS) of Sole in Division VIIh-k for 1995-2001**

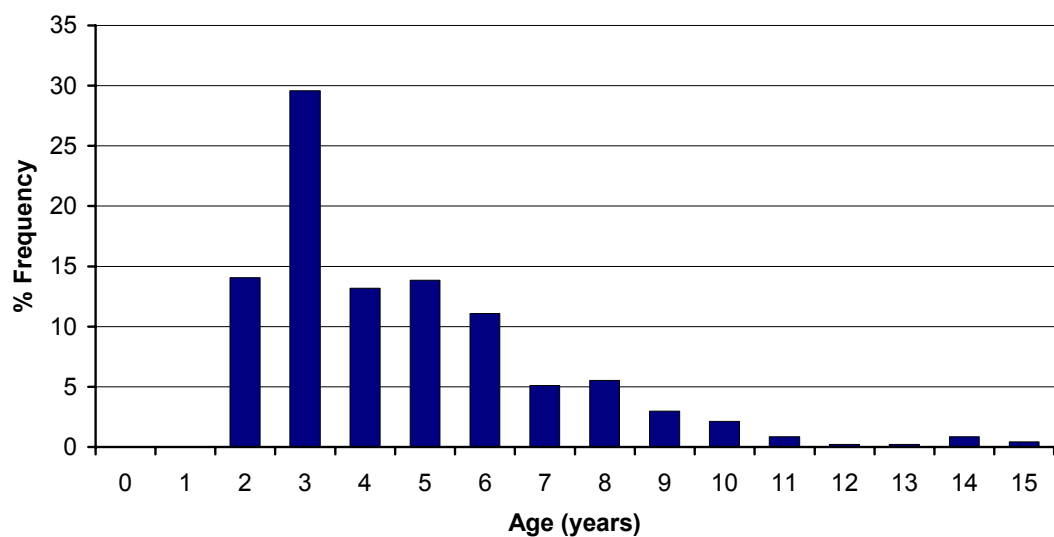
Country	1993	1994	1995	1996	1997	1998	1999	2000	2001*
Belgium					-	-	101		6
France	44	42	47	50	58	74	N/A	125	98
Ireland	237	184	243	183	203	221	207	107	110
Netherlands				70		7	1		10
UK (England & Wales)	209	172	192	148	113	111	97	95	111
UK (Scotland)	5	2							
Total	495	400	482	451	374	413	406		
Unallocated		-2	-79	-8	190	10	-22		
Total figures used by Working Group	495	398	403	443	564	423	384	327	325

\* Preliminary .

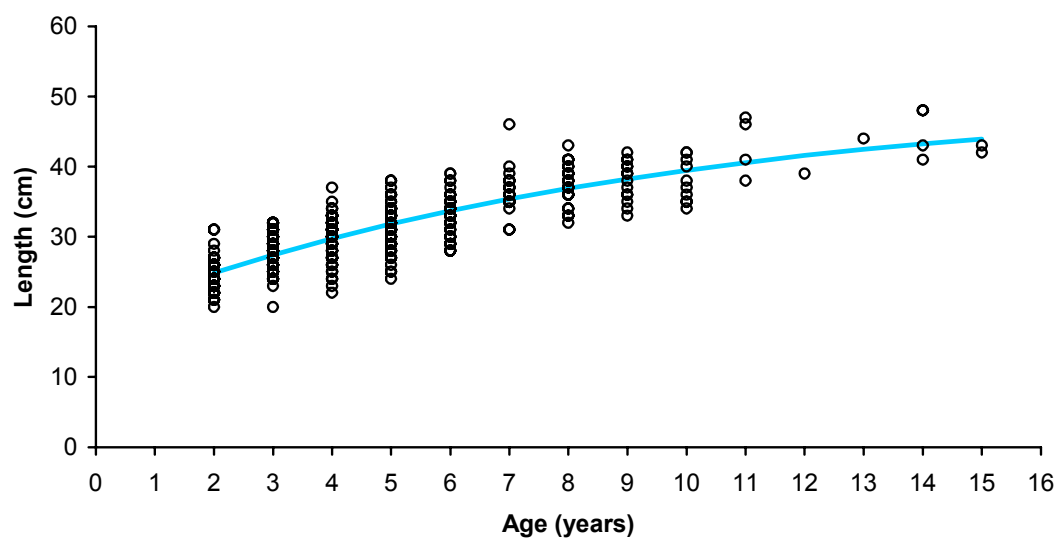
**2001 Length Distribution: Irish Landings, Sole in VIIj**



**2001 Age Distribution: Irish Landings, Sole in VIIj**



**2001 Size at Age: Irish Sampling, Sole in VIIj**



# Special Note on Current Status of EU measures for the Management of Deepwater Fisheries



## Marine Fisheries Services Division

**MFSD are very concerned that insufficient management measures are in place for deep sea fish stocks. These species are long lived, slow to mature and very vulnerable to overfishing. Recent rapid expansion of deep sea fisheries in the absence of effective management measures is not consistent with the precautionary approach.**

Scientific advice from ICES and endorsed by STECF indicates that the most appropriate conservation measures for deep sea species would be based on effort limitations and reductions. The EU is expected to develop a system for the management of effort directed on deep sea species in line with scientific advice as soon as possible. However, restricting catches by means of quota management of deep sea fisheries is considered by the European Commission to be a first step before further conservation measures are introduced. MFSD endorses the STECF comment that TACs would have deficiencies as a management tool in deepwater and that that management measures based on effort/fleet regulation would be an appropriate long term approach for management of deep sea fisheries.

In December 2000, the Council of the European Union adopted a declaration whereby the Commission was invited to propose catch limitations for deep sea fish stocks in 2001 at the latest and to propose the allocation of these catch limitations among member states. Council Regulation

COM (2001) 764 fixes for 2002 the fishing opportunities for some deep sea stocks for the Community, both in International waters and in Community waters. Due to the urgent requirement for conservation of these species, the EU proposed to implement unilateral measures and then seek agreement within NEAFC (North East Atlantic Fisheries Commission).

In June 2002, a compromise proposal was put forward for a *Council Regulation fixing for 2002 the fishing opportunities for deep sea fish stocks* and a *Council Regulation establishing specific access requirements and associated conditions applicable to deep sea stocks*.

The TAC's associated with certain deep water fish species, given in *Council Regulation fixing for 2003 the fishing opportunities for deep sea fish stocks* are given in the table below.

Further measures, due to be implemented in January 2003 and outlined in the *Council Regulation establishing specific access requirements and associated conditions applicable to deep sea stocks* are listed below. These measures will apply to a broad range of deep sea species.

- Deep Sea Fishing permit
- Effort Restrictions
- Reporting of Fishing Gear characteristics and fishing operations
- Vessel Monitoring System
- Designated Landing Ports
- Observers
- Information on fishing activity by observers

The measures in these proposals are currently under negotiation by EU Member States. These proposals are due for consideration at upcoming EU Council of Fisheries Ministers meetings in November and/or in December 2002.

European Commissions proposed TACs, management areas and Irish quota for certain Deep Sea fish species in 2003

Species	Species	Management Area	TAC	Irish Quota
Black Scabbard	<i>Aphanopus carbo</i>	V, VI, VII, XII	3,110	93
Argentine	<i>Argentina silus</i>	III, IV	1,566	10
Argentine	<i>Argentina silus</i>	V, VI, VII	6,247	441
Tusk	<i>Brosme brosme</i>	V, VI, VII	710	40
Roundnose Grenadier	<i>Coryphaenoides rupestris</i>	Vb, VI, VII	5,106	346
Orange Roughy	<i>Hoplostethus atlanticus</i>	VI	88	10
Orange Roughy	<i>Hoplostethus atlanticus</i>	VII	1,349	300
Blue Ling	<i>Molva dypterygia</i>	II, IV, V	138	10
Blue Ling	<i>Molva dypterygia</i>	VI, VII	3,678	10
Ling	<i>Molva molva</i>	VI, VII, VIII, IX,	14,966	1,102
Red seabream	<i>Pagellus bogaraveo</i>	VI, VII, VIII	350	10

\* Consult EC Council Regulation COM (2001) 764 Final (December 2001) for details

# Deepwater Stocks in the Northwestern Area

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



Marine Fisheries Services Division

## Greenland Halibut

Sub-areas V and XIV

### MFSD – ADVICE

**MFSD agrees with the ICES advice that the ratio  $F/F_{MSY}$  for Greenland halibut in V and XIV in 2002 should be reduced to below 0.67, corresponding to catches in 2002 for the total stock of less than 21 000 t.**

### STATE OF THE STOCK

- There are concerns about this stock, which is harvested outside safe biological limits. Recent  $F_s$  are estimated to be above the proposed  $F_{pa}$  and close to  $F_{MSY}$ . Even though the recent historical development of SSB and fishing mortality are not well estimated, it is likely that fishing mortality has decreased and biomass increased in recent years.
- Estimated international catch in these areas decreased from 61,000 t in 1989 to 28,000 t in 2001.
- Advice this year was based on a production model. According to the results of this model an appropriate  $F_{pa}$  would be 0.25, which is 2/3 of the estimated  $F_{MSY}$ . Fishing at or below  $F_{pa}$  will allow the stock to recover to  $B_{MSY}$  in the short term.

### ADDITIONAL INFORMATION

- Irish vessels have targeted this species in the Faeroe-Shetland Channel in recent years. This area is outside the area assessed, but it is very likely to be part of the same stock, that is wide-ranging in the northern North Atlantic. Hence, MFSD suggests that the advice for V and XIV gives an indication of the state of the stock in Division IVa and VIa also.
- In 2001 preliminary Irish landings were 71 t, mainly from Sub-area XII. These landings came from Irish longliners fishing on the Hatton Bank and the Mid Atlantic Ridge.
- Greenland halibut is faster growing and has higher fecundity than many of the deepwater species south of 63° N. Therefore it is considered that it could recover more rapidly than other deepwater species.
- Assessment and management areas should be ex-

tended to cover the distribution of this stock outside Arctic waters.

## Redfish Species (*Sebastes* spp.)

There are two main commercial species of redfish, a third, the small redfish is now targeted somewhat in Icelandic waters. Of the two main species, golden redfish occurs in shallower waters down to about 500 m. This species has a genetically distinct component, or “giant form” that occurs in pelagic waters on the Reykjanes Ridge. The other species, deepwater redfish, has a complex stock structure and there is much controversy about stock segregation. However it appears to consist of three components, one is a demersal form associated with continental shelf and slope waters, in V, VI, XII and XIV. There are also “oceanic” and “pelagic deep-sea components” that occur pelagically. The main fisheries for these are in V and XIV. The fisheries for redfish in VI, where Irish effort mainly occurs, are a negligible part of overall North Atlantic fisheries, but take three species, and at least one stock component of deepwater redfish.

## Golden redfish

Sub-areas V, VI, XII and XIV

### MFSD – ADVICE

**MFSD agree with ICES advice that that effort should be reduced by 25%, corresponding to catches not exceeding a total of 31 000 t in ICES Divisions Va and Vb. As the fishable stock of *S. marinus* in Sub-area XIV is depleted, there should be no direct fishery for *S. marinus* in that Sub-area. In order to rebuild the stock further in the near future fishing effort should not be allowed to expand on the incoming 1990 year class.**

### STATE OF THE STOCK

- There are concerns about this stock that is outside safe biological limits.
- The stock in Division Va has fluctuated between  $U_{pa}$  and  $U_{lim}$  since 1990 and is currently slightly below  $U_{pa}$ .
- $U_{lim}$  = 20% of highest observed survey index.  $U_{pa}$  be set at 60% of highest observed survey index.  $U$  is an index of total exploitable biomass.
- In Sub-area XIV the German groundfish survey has shown an almost continuous decrease in biomass in-



dices by more than 90% since 1986, and *indices* at East-Greenland have been very depleted in the last decade.

- In Division Vb catches have declined since 1985 to a low level. The strong 1990 year class has started to recruit to the fishery and should sustain the stock in the short to medium term. The surveys do not indicate further strong year classes.

## ADDITIONAL INFORMATION

- International landings decreased from 130,000 t in 1982 to 42,000 t in 1994 and decreased to 37,000 t in 2001. Most of these now come from Va, since the XIV fishery has become severely depleted.
- Most Irish landings from this stock come from IV and VI, but this area is part of the assessment area. Landings in these areas are a negligible component of total landings.
- MFSD provided Irish landings data for 1995-2001 to the North western Working Group in 2002.
- The TAC for redfish (combined species) was 95,000 t in V, XII and XIV. The Irish quota in this area in 2001 was 3 t.

## Deepwater redfish

Sub-areas V, VI, XII and XIV

### MFSD – ADVICE

**MFSD agrees with the ICES advice that effort should be kept low and no higher than the recent average. Accordingly, the catch for the total stock should be less than 30 000 t. As the stock of *S. mentella* in Sub-area XIV is depleted there should be no direct fishery for *S. mentella* in that Sub-area.**

## STATE OF THE STOCK

- The stock is considered to be within safe biological limits.
- All CPUE indices show a substantial reduction from a high in the late 1980s, but from the mid-1990s the CPUE index from the Icelandic demersal fishery has remained relatively stable, slightly above  $U_{pa}$ .
- Since 1994 total catches have declined by over 50%, although the decline is not completely the consequence of declining stock status. The catch in 2001 (22,500 t) was the lowest since 1979 (21,000 t).
- The reference point  $U$  (an index of total exploitable biomass) is used in the Icelandic commercial bottom trawl fishery and is defined as  $U_{max}$ .  $U_{pa} = U_{max} / 2$ .  $U_{lim} = U_{max} / 5$ .
- A strong cohort from 1989 was observed in the survey in 1995 to 1998. That cohort has emigrated from the survey area and has started to contribute to the fisheries.

## ADDITIONAL INFORMATION

- Most of the international landings of this stock come from Va. The landings in VI, where Irish fishing mainly takes place are negligible.
- MFSD provided Irish landings data for 1995-2001 to the North western Working Group in 2002.
- The TAC for redfish (combined species) was 95,000 t in V, XII and XIV. The Irish quota in this area in 2001 was 3 t.

# Deepwater Stocks South of 63°N

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



Marine Fisheries Services Division

## Formulation of Management Advice for Deepwater Fisheries

There has been great debate in the scientific community on the formulation of management advice for deepwater fisheries. Voluminous advice was produced by ICES in response to requests from NEAFC and the European Commission. MFSD provided an interpretation and summary of this advice in the *Stockbook* for 2000 and 2001. Management advice in 2001 applied to all species south of 63°N. It included a species specific classification of stock status, based on two categories:

1. Developing new fisheries: Fisheries on such species be permitted only when they expand very slowly, and are accompanied by programmes to collect data, which allow evaluation of stock status.
2. Fully or overexploited fisheries: Immediate reduction in effort/catch until these fisheries can be shown to be sustainable.

In 2002 the ICES Working Group on Deep-sea Fisheries Resources (WGDEEP) met to continue to assess the status of these stocks. However, due to problems with data availability (see below) no new assessments were possible. In addition WGDEEP referred to the ICES Study Group on Elasmobranch Fishes to further refine assessment methodologies of deepwater sharks. Again owing to the lack of data, no assessment that could improve knowledge of stock status was possible. Based on the work of these two groups, ICES has provided updated management advice for each of the deepwater species. In addition, MFSD provides advice for these species below.

In 2001 a Sub-group of STECF produced a report on deepwater fisheries, with special emphasis on management options, management areas and sensitive habitats likely to be impacted on by these fisheries. A summary of this work is presented in the *2001 Stockbook*.

## Current management measures

After an intensive round of consultations within the Council of the European Union and the European Commission, a proposal on management of deepwater fisheries emerged

in June 2001. This entailed, in the first instance, TAC's for black scabbardfish, blue ling, greater silver smelt, ling, orange roughy, red seabream roundnose grenadier and tusk. Once the regulation has been adopted, the second phase will encompass measures to limit fishing effort on and access to a larger number of stocks. Deepwater sharks were not included in the first round of TAC's but there is a commitment to introduce TAC's for these species later.

The European Union subsequently announced its intention to seek an agreement on the regulation of deepwater fisheries in the NEAFC regulatory area. The proposals brought forward for discussion at the NEAFC AGM in November 2002 include VMS, designated ports, restrictions on fleet capacity, data collection and work towards fixing catching opportunities. TAC regulation is not part of these EU proposals.

## Ling

### MFSD – ADVICE

**MFSD agrees with ICES that overall fishing effort on ling be reduced by 30% in all areas.**

### STATE OF THE STOCK

- The state of the stock is highly uncertain due to the lack of updated information. In previous years it was considered to be outside safe biological limits in all parts of its range (Category 2). There is no evidence to suggest that the situation has changed.
- International landings in VI and VII were 28,000 t in 1998, declining to 12,500 t in 1992, increasing to 21,000 t in 1995, but decreased to 11,000 t in 2001, the lowest in the series. Landings declined in Va, but have remained stable around 4,000 t in Vb for most of the 1990's.
- The only new information is the updated series from the Icelandic groundfish survey in Division Va that suggests a decline in this area.

### ADDITIONAL INFORMATION

- Assessments were carried out in 1998 and 2000, but no new assessment was possible in 2002, owing to lack of data.
- The updated CPUE series for the Icelandic longline fishery in Va shows no trend in the period 1994-2001. The series from the groundfish survey, for the years 1985 to 2001, shows however a rather clear declining trend, and indices for 2000 and 2001 are the lowest in

the series. The commercial effort statistics may not fully account for changes in efficiency. Considered together, these series may be interpreted as showing a declining abundance of ling being compensated for by enhanced efficiency in the commercial fishery.

- Available data suggest that also the ling stock in Va is declining, but no statement can be made of the state of the stock in relation to reference points at this stage.
- Total landings in 2001 were 33,000 t. Preliminary Irish landings were 1,267 t, comprising 88 t from VI and 1,173 t in VII. There were small landings from Sub-area XII.
- ICES considers ling to be less vulnerable than many deepwater species, based on life history data, and suggested that sustainable exploitation rates could be comparable to northeast Arctic cod.
- Norwegian long-liners and French trawlers take the main catches in Sub-area VI. There are small catches in Division VIIa and Ireland takes most of the catch. In Divisions VIIb,c,g,j and k UK (English and Welsh) trawlers take most of the ling as a by-catch.
- Norway has a quota of ling in EU waters, allowing the targeting of this species in VI and VII by Norwegian longliners. Management of fisheries taking ling should take into consideration the catching opportunities afforded to other coastal jurisdictions for ling.
- Since this species straddles international waters, management measures for fisheries taking ling should be adopted within NEAFC.
- There are insufficient data on age, growth and reproduction for ling. Sampling of this stock is supported by the EC-funded Sampling Programme, which is required under Regulations 1543/2000 and 1639/2001.

## Tusk

### MFSD – ADVICE

**MFSD agrees with ICES that overall fishing effort on tusk be reduced by 30% in all areas.**

### STATE OF THE STOCK

- The state of the stock is highly uncertain due to the lack of relevant CPUE data for the major fisheries in the most recent years. In previous years the stock was considered to be fully or over-exploited in all areas (Category 2), except the Hatton Bank, in VIb and XII (Category 1). It is unlikely that the exploitation rate has decreased in recent years. The stock probably remains outside safe biological limits.
- Landings fluctuate between 2,000 t and 4,000 t throughout the 1990's in VI and VII. Landings in these areas in 2001 were 2,500 t. Landings in Vb have declined from 6,200 t in 1991 to 4,000 t in 2001.
- In Division Va, the survey index from the Icelandic groundfish survey suggests a pronounced declining abundance.

## ADDITIONAL INFORMATION

- No new CPUE data were available from the important fishing areas except Va, hence no analyses could be conducted.
- The CPUE for the Icelandic longliners in Division Va in 2001 was the lowest on record, and seems to have declined since 1997. The abundance index derived from the groundfish survey in Va has shown an almost uninterrupted declining trend since 1985, and in 2000 and 2001 it was about 35% of the level observed at the beginning of the series. Both CPUE series thus suggest significantly declining abundance.
- There is some evidence of increased abundance of small fish in recent years in Va.
- Landings in the ICES area were 26,500 t, having declined from 42,000 t in 1989. Preliminary Irish landings were 120 t in 2001, mainly from Sub-area VI, with small by-catches from vessels targeting Arctic stocks in the Norwegian zone.
- ICES considers tusk to be more vulnerable to overexploitation than ling, based on a life history approach. However ICES considered that since tusk is mainly a by-catch in ling fisheries, the 30% reduction could be achieved by having the same reduction in effort for ling.
- The most important fisheries are in II, Va and Vb. Tusk is taken as a by-catch of ling by Norwegian vessels in VI. There are new Russian and Norwegian fisheries for the species on the Hatton Bank.
- Norway has a quota of tusk in EU waters (currently there are TAC restrictions on tusk catches for EU vessels), allowing a by-catch of this species in VI and VII by Norwegian longliners. Management of fisheries taking tusk should take into consideration the catching opportunities afforded to other coastal jurisdictions for this species.
- Since this species straddles international waters management measures for fisheries taking tusk should be adopted within NEAFC.

## Blue ling

### MFSD – ADVICE

**MFSD agrees with ICES that there should be no directed fisheries for blue ling. MFSD reiterates ICES recommendation that technical measures such as closed areas be implemented to protect spawning aggregations. In addition MFSD points out that in order to be consistent with the Precautionary Approach, management measures for mixed fisheries taking blue ling should be determined by measures to assist the recovery of this species.**

### STATE OF THE STOCK

- There are serious concerns about the state of stocks of blue ling, that are outside safe biological limits in all areas (Category 2).

- Landings in VI and VII were 11,200 t in 2001, having risen from 4,300 t in 1994. they declined from 9,200 t in 1988. In Va and Vb, landings have declined in recent years.
- The exploitable biomass at the end of 2001 is considered to be below 20% of the maximum observed biomass.

## ADDITIONAL INFORMATION

- An assessment, using production and depletion models was attempted in 2002, but the results were not reliable.
- CPUE values for 2001 from French trawlers in VI and VII were the lowest in the series. The survey index from the Icelandic groundfish survey has decreased by 50% since 1986.
- Landings in the ICES area declined from 25,400 t in 1998 to 9,500 t in 1994, but increased again to 16,900 t in 2001. Preliminary Irish landings were 561 t in 2001, mainly from Division VIIk, and Ireland now dominates the fishery for blue ling in this area.
- The stock structure of blue ling is poorly understood. The species has several discrete spawning areas in V, XIV and possibly VI. Area VII is considered to be the southern extremity of the species. Another species, Spanish ling that is very similar inhabits waters from VII southwards. This species does not form spawning aggregations, and is not a target species for any fishery.
- The main fisheries are the French trawl fisheries in Vb2, VI and VII. In Vb and VII these target spawning fish in the spring. Elsewhere there is an Icelandic fishery in Va and a Faeroes fishery in Vb1.
- Norway has a quota of blue ling in EU waters (currently there are TAC restrictions on blue ling catches for EU vessels), allowing a by-catch of this species in VI and VII by Norwegian longliners. Management of fisheries taking blue ling should take into consideration the catching opportunities afforded to other coastal jurisdictions for this species.
- Since this species straddles international waters management measures for fisheries taking tusk should be adopted within NEAFC.
- More detailed information on the location of spawning areas of blue ling should be collected quickly, to identify where closed areas should be located.

## Orange roughy

### MFSD – ADVICE

**MFSD agrees with ICES advice that orange roughy stocks cannot sustain high rates of exploitation. Newly-discovered aggregations are often overexploited before enough information is available to provide timely advice on management. MFSD further agrees with ICES that exploitation of orange roughy should be strictly limited and the stocks/populations closely monitored. Reiterat-**

**ing ICES' recommendation, MFSD point out that the data obtained from such monitoring should be incorporated into appropriate management measures. These recommendations should also apply to areas where there is currently no exploitation on orange roughy. There should be no directed fishery in Sub-area VI.**

## STATE OF THE STOCK

- There are serious concerns about the state of the stock of orange roughy in VI which is severely depleted and outside safe biological limits. In VII there appears to be sequential depletion of previously unexploited aggregations. Elsewhere the situation is uncertain.
- Landings in VI decreased from 3,500 t in 1993 to 116 t in 1995 and have remained below 200 t for the rest of the 1990's, with landings in 2001 being 280 t. In VII rose to 3,000 t in 1992, declined to 800 t in 1995, and increased again to 3,400 t in 2001.
- Landings in VII have increased in recent years and CPUE have remained stable. This probably reflects sequential depletion of aggregations.

## ADDITIONAL INFORMATION

- No new assessments were carried out in 2002, as data were not available at a sufficiently fine spatial scale. Conventional assessments of orange roughy are unlikely to be possible due to the biology of the species, the particular nature of the fishery and the difficulty in collecting data over a sufficient time period to permit a meaningful assessment of the stock.
- Abundance indices from French trawlers for VI reached the lowest value in the series in 2001. There has been no sign of recovery of this stock since the end of targeted fishing in the 1990's. The CPUE index in VII from French trawlers has been relatively stable since 1997.
- CPUE is likely to remain stable for this species despite reductions in abundance. This is because of the tendency of the species to re-aggregate after fishing, the targeting of these aggregations by the fishery and the movement of the fishery from aggregation to aggregation.
- Landings in the ICES area were 3,964 tonnes in 2001, having declined from 5,000 t in 1992. Preliminary Irish landings in 2001 were 2,477 t, mainly from Sub-area VII.
- There are four main fisheries in the north Atlantic. The main fishery up to 2000 was conducted by French trawlers in VI and VII. In 2001, an Irish fishery has rapidly developed in Sub-area VII, taking the most of the landings. The other fisheries include a Faeroese fleet, which mainly operates in Division Vb and international waters (Hatton Bank and mid-Atlantic ridge) and a small Icelandic coastal fleet conducted in Division Va. There have been landings by New Zealand (450 t) from XII in 2001.
- Orange roughy are particularly vulnerable to over exploitation being very long lived (estimated to reach 180 years) and to form dense aggregations that are



targeted by fisheries.

- Since this species straddles international waters management measures for fisheries taking orange roughy should be adopted within NEAFC.
- Sampling of this species is supported by the EC-funded Sampling Programme, which is required under Regulations 1543/2000 and 1639/2001.
- OSPAR requested ICES to evaluate if orange roughy is a threatened species. ICES advised that the threats to orange roughy are due to the effects of fishing.

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## Roundnose grenadier

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### MFSD – ADVICE

**MFSD agrees with ICES advice for regulation of the fishery for roundnose grenadier in all areas in order to control fishing effort. For Sub-areas VI and VII and Divisions Vb and IIIa significant reductions on effort are necessary. In all other areas, the expansion of fisheries should not be allowed until reliable assessments indicate that increased harvests are sustainable.**

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### STATE OF THE STOCK

- There are concerns about the state of stocks of roundnose grenadier. In previous years the stocks in Vb, VI and VII were considered to be fully or over exploited (Category 2).
- Landings in VI rose to 8,000 t in 1993, declined to 5,000 t in 1998 and rose to 8,800 t in 2001. In VII landings rose to 1,900 t in 1994, declined to 889 t in 2000 but increased to 1,330 t in 2001.
- The state of the stock in Vb, VI and VII seems unclear because of a recent increase in CPUE from French trawlers. There is some question over the comparability of recent CPUE data for this fleet due to changes in the calculation methods used.

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### ADDITIONAL INFORMATION

- An assessment was attempted in 2002 for Vb, VI and VII, but the results were unreliable.
- ACFM considers a 50% reduction in effort to be appropriate to allow rebuilding to commence.
- There is no evidence supporting the upward trend in French trawler CPUE. It is not considered to be evidence that the stock is increasing in size.
- Trends in the size composition of the landings towards smaller fish suggest that the stock is severely impacted by the fishery and current level of catches are likely to be unsustainable.
- Landings in the ICES area have increased to 19,000 t in 1991, declined to 10,000 t in 1995 and increased again to 24,600 t in 2001. Preliminary Irish landings were 453 t in 2001, mainly from VII.
- In Vb, VI and VII the main fishery is by French trawlers, targeting it in the mixed species deepwater fishery. Spain has developed a large scale fishery on

the Hatton Bank in VIb and XII.

- The level of fishing of this species in international waters in VIb and XII is not fully known.
- Due to its biological parameters, the species can only sustain a low fishing mortality and recovery of depleted stock(s) is expected to be slow. Therefore, the lack of assessment should not delay the implementation of a management regime for roundnose grenadier.
- Since this species straddles international waters management measures for fisheries taking roundnose grenadier should be adopted within NEAFC.

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## Black scabbard

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### MFSD – ADVICE

**MFSD agrees with ICES' recommendation for a significant reduction in the fishing effort in the northern areas. The contradicting trends of the CPUE series make it difficult to advise on the need for effort reduction in the southern area. MFSD points out that since there is no evidence that a separate stock exists in the southern areas, no expansion of the effort should be allowed and fisheries should not be allowed to expand until reliable assessments indicate that increased harvests are sustainable.**

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### STATE OF THE STOCK

- There are concerns about the state of this stock. In previous years it was considered fully or over-exploited (Category 2) in all areas except X.
- Landings in VI and VII rose to 4,600 t in 2001, the highest in the series. Landings in VIII and IX peaked at 4,500 t in 1993, and were 2,700 t in 2001.
- The state of the stock in V, VI, VII and XII is very unclear. CPUE shows a consistent decline to a historically low level in 1999, a slight increase in 2000, and then a very considerable increase in 2001. In VIII and IX CPUE from longliners suggests that abundance in the southern area has remained relatively stable during the past decade.

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### ADDITIONAL INFORMATION

- Assessments were attempted in 2001 for the northern and southern areas separately. The sharp upward trend in CPUE in the northern area and the lack of resolution in the CPUE data from the southern area rendered the outputs unreliable.
- There is no evidence supporting the upward trend in French trawler CPUE. It is not considered to be evidence that the stock is increasing in size.
- Landings in the ICES area increased to 9,000 t in 1993, declined to 5,000 t in 1999 and increased to 8,000 t in 2001. Preliminary Irish landings in 2001 were 786 t, mainly from VII.
- There are two separate fisheries; west of Ireland and

the UK black scabbard is taken in the mixed trawl fishery with roundnose grenadier, orange roughy, blue ling and sharks. In the south it is taken in targeted artisanal long fisheries off Portugal.

- There is considerable debate about the biology of this species, it is considered to be short lived and fast growing by some scientists, but there is evidence from MFSD studies that it is longer lived and slower growing.
- It does not seem likely that the dynamics of the species could explain the sharp increase in CPUE in the northern area in 2001.
- The advice of this year is based on fleets whose CPUE trends are contradictory, and whether this is caused by separate stocks remains unknown.
- Since this species straddles international waters management measures for fisheries taking black scabbard should be adopted within NEAFC.

## Greater forkbeard

### MFSD – ADVICE

**MFSD agrees with the ICES advice that greater forkbeard stocks can probably only sustain very low rates of exploitation, and that fisheries on such species, also as by-catch, should be permitted only when they are accompanied by programs to collect data. MFSD point out that the ICES advice for roundnose grenadier also seems relevant for greater forkbeard, that expansion of fisheries should not be allowed until reliable assessments indicate that increased harvests are sustainable.**

### STATE OF THE STOCKS

- The state of forkbeard stocks is unknown. In previous years it was classified as a new or developing fishery by ICES (Category 1). However, this species has been fished since the 1980s.
- Landings in VI and VII rose gradually throughout the 1990's, peaking at 4,600 t in 2000 and were 4,100 t in 2001.

### ADDITIONAL INFORMATION

- No assessments have ever been carried out for greater forkbeard stocks.
- Landings in the ICES area increased from 2,000 t in 1988 to 4,100 t in 1996, decreased to 2,700 t in 1997 and increased again to 5,000 t in 2000. Preliminary Irish landings for 2001 were 663 t, mainly from VII.
- There are no data from gillnet fisheries for this species, though they are known to exist.
- The species is taken as a by-catch in trawl and longline fisheries mainly in VI, VII and VIII.
- Since this species is taken in mixed fisheries, a single species approach to management seems inappropriate.
- There is a problem of misidentification and mis-

reporting of greater forkbeard. Mora, another deepwater species, is often reported as greater forkbeard.

## Portuguese dogfish and Leafscale gulper shark

### MFSD ADVICE

**MFSD agrees with the ICES advice that these sharks can sustain only very low exploitation rates. They are taken in mixed fisheries, which makes it difficult to manage them in a single-species context. Due to the declining trends in CPUE, despite the mixed nature of the catches, ICES recommends that the overall exploitation be reduced. ICES further advises that species-specific landings data be collected for all deepwater sharks to allow better understanding and quantification of the status of exploited shark species.**

**MFSD recommends that efforts to report and collect landings statistics for each species continue.**

### STATE OF THE STOCKS

- The status of these stocks is unknown.
- Landings in VI and VII of both species increased from 1,200 t in 1991 to 4,800 t in 2001. In IX the landings have fluctuated around 1,000 t since the early 1990's. However not all countries report deepwater shark landings, but report them as "various sharks".
- The situation in V, VI and VII is unclear. There has been an increase in the commercial CPUE index from French trawlers in VI.

### ADDITIONAL INFORMATION

- A preliminary assessment was carried out in 2002, but the input data were very poor and no conclusions can be drawn.
- The current advice is based on commercial CPUE data and fishery independent surveys. However, these data may indicate trends but do not provide absolute estimates of abundance.
- It is not possible to identify the exact reduction in effort required, but ICES considers that it is more likely to be large (50%) rather than small (10%).
- The increase in French trawler CPUE for VI in 2000 and 2001 was not supported by combined Irish and Norwegian longline survey abundance data. CPUE indices from the French fleet may not be a reliable estimator of abundance or reflect trends in populations caught with different gears and in different areas.
- Landings of both species in the ICES area have increased from 615 t in 1990 to 7,000 t in 2001. However, estimated landings of "various sharks", (including an unknown component of deepwater

sharks, but excluding as far as possible non-deepwater species) increased from 40 t in 1990 to 4,800 t in 1998, but declined to 2,000 in 2001. Preliminary Irish landings of both deepwater shark species in 2001 were 213 t.

- The main fishery is in VI and VII as part of the mixed species trawl fishery. France is the main participant. In VII and VIII Spanish and Spanish-owned flag gillnetters and longliners target these species in some years. There are directed artisanal longline fisheries off Portugal.
- No landings data are available for Spanish and Spanish-owned vessels, except for the Spanish trawl fishery on the Hatton Bank.
- There are no data from gillnet fisheries for these species, though gillnet fisheries are known to exist.
- MFSD are involved in an EC-funded project (DELASS, 99-055) to develop stock assessments for these species. Much progress has been made on methodologies, but there are still insufficient data with which to conduct assessments.
- Since this species straddles international waters management measures for fisheries taking Portuguese dogfish and leafscale gulper shark should be adopted within NEAFC.

## Greater argentine

### MFSD ADVICE

**MFSD agrees with the ICES advice that greater argentine stocks can probably only sustain very low rates of exploitation, and that fisheries on such species, also as by-catch, should be permitted only when they are accompanied by programs to collect data. MFSD point out that the ICES advice for roundnose grenadier also seems relevant for greater argentine, that expansion of fisheries should not be allowed until reliable assessments indicate that increased harvests are sustainable.**

### STATE OF THE STOCK

- The state of stocks of greater argentine is unknown.
- Landings in VI and VII were highest in 1989 at 25,500 t, but declined to less than 2,000 t in 1993, but increased to over 22,000 t in 2001. Landings in Vb fluctuated between 8,000 t and 12,000 t since the mid 1990's.
- There have been no assessments of greater argentine, but the decline in fish of ages more than 20 years suggests high levels of exploitation.

### ADDITIONAL INFORMATION

- The lack of data have prevented any assessments of argentine being carried out.
- Landings in the ICES area declined from 38,000 t in 1989 to 15,000 t in 1993, but increased to over 45,000 t in 2001, the highest in the series.

- Misreporting is a problem in fisheries for this species. There is a tendency to misreport other pelagic species as greater argentine. This may explain in part, the increase in landings in recent years.
- The main participants in this fishery in VI and VII are Dutch freezer trawlers. Irish refrigerated seawater vessels targeted the species heavily in the late 1980's and in recent years there has been some targeting of the species by Irish vessels.

## Other species

Limited data, mainly landings, exist for other deepwater species caught by Irish deepwater fisheries.

- Preliminary Irish landings of cardinal were 216 t in 2001, mainly as a by-catch of orange roughy fishing in VII. Reported landings in the ICES area were 358 t in 2001, mainly from VII.
- Preliminary Irish landings of rabbitfish in 2001 were 13 t. Reported landings for the ICES area have increased markedly from low levels in the early 1990's to over 800 t in 2001, as the species becomes commercially marketable. Most of these landings come from VI and VII.
- Wreckfish were taken by Irish vessels in 2001 and 2002, some of these catches may have come from outside the ICES area.
- Preliminary Irish landings of mora were 25 t in 2001, but this species may also be reported as forkbeards. Reported data for this species are underestimates of the actual values, but there have been increases in most recent years, mainly in VI and VII.
- Small landings of roughhead grenadier were reported in 2001, from Irish vessels targeting Greenland halibut.

## LING VIa

Year	Belgium	Denmark	Faroes	France <sup>(1)</sup>	Germany	Ireland	Norway	Spain <sup>(2)</sup>	E&W	IOM	N.I.	Scot.	Total
1988	4	+	-	5,381	6	196	3,392	3575	1,075	-	53	874	14,556
1989	6	1	6	3,417	11	138	3,858		307	+	6	881	8,631
1990	-	+	8	2,568	1	41	3,263		111	-	2	736	6,730
1991	3	+	3	1,777	2	57	2,029		260	-	10	654	4,795
1992	-	1	-	1,297	2	38	2,305		259	+	6	680	4,588
1993	+	+	-	1,513	92	171	1937		442	-	13	1,133	5,301
1994	1	1		1713	134	133	2034	1027	551	-	10	1,126	6,730
1995	-	2	0	1970	130	108	3,156	927	560	n/a		1994	8,847
1996			0	1762	370	106	2809	1064	269			2197	8,577
1997			0	1,631	135	113	2229	37	151			2,450	6,746
1998				1,531	9	72	2,910	292	154			2,394	7,362
1999				941	4	73	2,997	468	152			2,264	6,899
2000*		+		717	3	75	2,956	359	143			2,287	6,253
2001*				720	3	70	1,869	129	106			2,179	5,076

<sup>(1)</sup> Reported by Division

## LING VIb

Year	Faroes	France <sup>(2)</sup>	Germany	Ireland	Norway	Spain <sup>(3)</sup>	E & W	N.I.	Scotland	Russia	Total
1988	196		-	-	1,253		93	-	223		<b>1,765</b>
1989	17		-	-	3,616		26	-	84		<b>3,743</b>
1990	3		-	26	1,315		10	+	151		<b>1,505</b>
1991	-		-	31	2,489		29	2	111		<b>2,662</b>
1992	35		+	23	1,713		28	2	90		<b>1,891</b>
1993	4		+	60	1179		43	4	232		<b>1,522</b>
1994	104		-	44	2116		52	4	220		<b>2,540</b>
1995	66		+	57	1,308		84		123		<b>1,638</b>
1996	0			124	70	679	150		101		<b>1,124</b>
1997	0			46	29	504	103		132		<b>814</b>
1998		1		10	44	944	71		324		<b>1,394</b>
1999		26		25	41	498	86		499		<b>1,175</b>
2000*	+	18		31	19	1,172	157		475	7	<b>1,879</b>
2001*		16		3	18	328	116		307		<b>788</b>

\*Preliminary. <sup>(1)</sup> Includes XII. <sup>(2)</sup> Until 1966 included in VIa. <sup>(3)</sup> Included in Ling VIa.

## LING VII

Year	France	Total
1988	5,057	<b>5,057</b>
1989	5,261	<b>5,261</b>
1990	4,575	<b>4,575</b>
1991	3,977	<b>3,977</b>
1992	2,552	<b>2,552</b>
1993	2,294	<b>2,294</b>
1994	2,185	<b>2,185</b>
1995	<sup>(1)</sup>	
1996	<sup>(1)</sup>	
1997	<sup>(1)</sup>	
1998	<sup>(1)</sup>	
1999	<sup>(1)</sup>	
2000	<sup>(1)</sup>	
2001	<sup>(1)</sup>	

<sup>(1)</sup> Reported by Division



Table 7.1. continued

**LING VIIa**

Year	Belgium	France	Ireland	E & W	IOM	N.I.	Scotland	Total
1988	14	<sup>(1)</sup>	100	49	-	38	10	<b>211</b>
1989	10	<sup>(1)</sup>	138	112	1	43	7	<b>311</b>
1990	11	<sup>(1)</sup>	8	63	1	59	27	<b>169</b>
1991	4	<sup>(1)</sup>	10	31	2	60	18	<b>125</b>
1992	4	<sup>(1)</sup>	7	43	1	40	10	<b>105</b>
1993	10	<sup>(1)</sup>	51	81	2	60	15	<b>219</b>
1994	8	<sup>(1)</sup>	136	46	2	76	16	<b>284</b>
1995	12	9	143	106	1	<sup>(2)</sup>	34	<b>305</b>
1996	11	6	147	29	-	<sup>(2)</sup>	17	<b>210</b>
1997	8	6	179	59	2	<sup>(2)</sup>	10	<b>264</b>
1998	7	7	89	69	1	<sup>(2)</sup>	25	<b>198</b>
1999	7	3	32	29		<sup>(2)</sup>	13	<b>84</b>
2000*	3	2	18	25			25	<b>73</b>
2001*		3	33	20			31	<b>87</b>

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

**LING VIIb,c**

Year	France <sup>(1)</sup>	Germany	Ireland	Norway	Spain <sup>(3)</sup>	E & W	N.I.	Scotland	Total
1988	<sup>(1)</sup>	-	50	57		750	-	8	<b>865</b>
1989	<sup>(1)</sup>	+	43	368		161	-	5	<b>577</b>
1990	<sup>(1)</sup>	-	51	463		133	-	31	<b>678</b>
1991	<sup>(1)</sup>	-	62	326		294	8	59	<b>749</b>
1992	<sup>(1)</sup>	-	44	610		485	4	143	<b>1,286</b>
1993	<sup>(1)</sup>	97	224	145		550	9	409	<b>1,434</b>
1994	<sup>(1)</sup>	98	225	306		530	2	434	<b>1,595</b>
1995	78	161	465	295		630	<sup>(2)</sup>	315	<b>1,944</b>
1996	57	234	283	168		1117	<sup>(2)</sup>	342	<b>2,201</b>
1997	65	252	184	418		635	<sup>(2)</sup>	226	<b>1,780</b>
1998	32	1	190	89		393		329	<b>1,034</b>
1999	50	4	377	288		488		159	<b>1,366</b>
2000*	116	21	401	170		327		140	<b>1,175</b>
2001*	71	5	423	515		94		122	<b>1,230</b>

\*Preliminary. <sup>(1)</sup> See Ling VII. <sup>(2)</sup> Included with UK (EW). <sup>(3)</sup> Included with VIIg-k.

**LING VIIId,e**

Year	Belgium	Denmark	France <sup>(1)</sup>	Ireland	E & W	Scotland	Ch. Islands	Total
1988	36		<sup>(1)</sup>	-	743	-		<b>779</b>
1989	52	-	<sup>(1)</sup>	-	644	4		<b>700</b>
1990	31	-	<sup>(1)</sup>	22	743	3		<b>799</b>
1991	7	-	<sup>(1)</sup>	25	647	1		<b>680</b>
1992	10	+	<sup>(1)</sup>	16	493	+		<b>519</b>
1993	15	-	<sup>(1)</sup>	-	421	+		<b>436</b>
1994	14	+	<sup>(1)</sup>	-	437	0		<b>451</b>
1995	10	-	885	2	492	0		<b>1,389</b>
1996	15		960		499	3		<b>1,477</b>
1997	12		1,049	1	372	1	37	<b>1,472</b>
1998	10		953		510	1	26	<b>1,500</b>
1999	7		538	-	507	1		<b>1,053</b>
2000*	5		446	1	372	+	13	<b>837</b>
2001*			384	-	399	-		<b>783</b>

\*Preliminary. <sup>(1)</sup> See Ling VII.

**TUSK VIa**

Year	Denmark	Faroes	France <sup>(1)</sup>	Germany	Ireland	Norway	E & W	N.I.	Scot.	Spain	Total
1988	-	-	766	1	-	1,310	30	-	13		<b>2,120</b>
1989	+	6	694	3	2	1,583	3	-	6		<b>2,297</b>
1990	-	9	723	+	-	1,506	7	+	11		<b>2,256</b>
1991	-	5	514	+	-	998	9	+	17		<b>1,543</b>
1992	-	-	532	+	-	1,124	5	-	21		<b>1,682</b>
1993	-	-	400	4	3	783	2	+	31		<b>1,223</b>
1994	+		345	6	1	865	5	-	40		<b>1,262</b>
1995		0	332	+	33	990	1		79		<b>1,435</b>
1996		0	368	1	5	890	1		126		<b>1,391</b>
1997		0	359	+	3	750	1		137	11	<b>1,261</b>
1998			395	+		715	-		163	8	<b>1,281</b>
1999			383	+	3	113	1		182	47	<b>729</b>
2000*				+	20	1,327	8		231	75	<b>1,661</b>
2001*				+	31	1,201	8		279	33	<b>1,552</b>

<sup>(1)</sup> Not allocated by divisions before 1993.

\*Preliminary

**TUSK VIb**

Year	Faroes	France	Germany	Ireland	Iceland	Norway	E & W	N.I.	Scot.	Russia	Total
1988	217		-	-		601	8	-	34		<b>860</b>
1989	41	1	-	-		1,537	2	-	12		<b>1,593</b>
1990	6	3	-	-		738	2	+	19		<b>768</b>
1991	-	7	+	5		1,068	3	-	25		<b>1,108</b>
1992	63	2	+	5		763	3	1	30		<b>867</b>
1993	12	3	+	32		899	3	+	54		<b>1,003</b>
1994	70	1	+	30		1,673	6	-	66		<b>1,846</b>
1995	79	1	+	33		1,415	1		35		<b>1,564</b>
1996	0	1		30		836	3		69		<b>939</b>
1997	1	1		23		359	2		90		<b>476</b>
1998		1		24	18	630	9		233		<b>915</b>
1999				26	-	591	5		331		<b>953</b>
2000*		2		22		1933	14		372	1	<b>2,344</b>
2001*				29		476	10		157	5	<b>677</b>

**TUSK VIIa**

Year	France	E & W	Scotland	Total
1988	n.a.	-	+	+
1989	2	-	+	<b>2</b>
1990	4	+	+	<b>4</b>
1991	1	-	1	<b>2</b>
1992	1	+	2	<b>3</b>
1993	-	+	+	+
1994	-	-	+	+
1995	-	-	1	<b>1</b>
1996	-	-		
1997	-	-	1	<b>1</b>
1998	-	-	1	<b>1</b>
1999	-	-	+	+
2000*		-	+	+
2001*		-	+	+

**Table 9.1. continued**

**TUSK VIIb,c**

Year	France	Ireland	Norway	E & W	N.I.	Scotland	Total
1988	n.a.	-	12	5	-	+	<b>17</b>
1989	17	-	91	-	-	-	<b>108</b>
1990	11	3	138	1	-	2	<b>155</b>
1991	11	7	30	2	1	1	<b>52</b>
1992	6	8	167	33	1	3	<b>218</b>
1993	6	15	70	17	+	12	<b>120</b>
1994	5	9	63	9	-	8	<b>94</b>
1995	3	20	18	6		1	<b>48</b>
1996	4	11	38	4		1	<b>58</b>
1997	4	8	61	1		1	<b>75</b>
1998	3		28	-		2	<b>33</b>
1999	-	16	130	-		1	<b>146</b>
2000*		58	88	12		3	<b>161</b>
2001*		54	177	4		25	<b>260</b>

**TUSK VIIg-k**

Year	France	Germany	Ireland	Norway	E & W	Scotland	Spain	Total
1988	n.a.		-	-	5	-		<b>5</b>
1989	3		-	82	1	-		<b>86</b>
1990	6		-	27	0	+		<b>33</b>
1991	4		-	-	8	2		<b>14</b>
1992	9		-	-	38	-		<b>47</b>
1993	5		17	-	7	3		<b>32</b>
1994	4		12	-	12	3		<b>31</b>
1995	3		8	-	18	8		<b>37</b>
1996	3		20	-	3	3		<b>29</b>
1997	4	4	11	-		+	0	<b>19</b>
1998	2	3	4	-		1	0	<b>10</b>
1999	8	1	-	-		1	6	<b>16</b>
2000*			5	-	-	+	3	<b>8</b>
2001*			-	9	-	+	2	<b>11</b>

\*Preliminary

**Table 7.1. continued**

**LING VII f**

Year	Belgium	France (1)	Ireland	E & W	Scotland	Total
1988	77	(1)	-	367	-	<b>444</b>
1989	42	(1)	-	265	3	<b>310</b>
1990	23	(1)	3	207	-	<b>233</b>
1991	34	(1)	5	259	4	<b>302</b>
1992	9	(1)	1	127	-	<b>137</b>
1993	8	(1)	-	215	+	<b>223</b>
1994	21	(1)	-	379	-	<b>400</b>
1995	36	110	-	456	0	<b>602</b>
1996	40	121	-	238	0	<b>399</b>
1997	30	204	-	313		<b>547</b>
1998	29	204	-	328		<b>561</b>
1999	16	108	-	188		<b>312</b>
2000*	15	90	1	111		<b>217</b>
2001*		110	-	92		<b>202</b>

\*Preliminary. <sup>(1)</sup> See Ling VII.

**LING VII g-k**

Year	Belgium	Denmark	France	Germany	Ireland	Norway	Spain <sup>(2)</sup>	E&W	IOM	N.I.	Scot.	Total
1988	35	1	(1)	-	286	-	2,652	1,439	-	-	2	<b>4,415</b>
1989	23	-	(1)	-	301	163		518	-	+	7	<b>1,012</b>
1990	20	+	(1)	-	356	260		434	+	-	7	<b>1,077</b>
1991	10	+	(1)	-	454	-		830	-	-	100	<b>1,394</b>
1992	10	-	(1)	-	323	-		1,130	-	+	130	<b>1,593</b>
1993	9	+	(1)	35	374			1,551	-	1	364	<b>2,334</b>
1994	19	-	(1)	10	620		184	2,143	-	1	277	<b>3,254</b>
1995	33	-	1597	40	766	-	195	3046		<sup>(3)</sup>	454	<b>6,131</b>
1996	45	-	1626	169	771		583	3209			447	<b>6,850</b>
1997	37	-	1,574	156	674		33	2112			459	<b>5,045</b>
1998	18	-	1,362	88	877		1669	3,465			335	<b>7,814</b>
1999	-	-	1,229	49	554		455	1,619			292	<b>4,198</b>
2000*	17		1006	12	624	-	518	921			303	<b>3,401</b>
2001*			963	4	727	24	490	591			285	<b>3,084</b>

**ORANGE ROUGHY (*Hoplostethus atlanticus*) VI**

Year	Faroes	France	E & W	Scotland	Ireland	Spain	TOTAL
1988							<b>0</b>
1989		5					<b>5</b>
1990		15					<b>15</b>
1991		3502					<b>3502</b>
1992		1422					<b>1422</b>
1993		429					<b>429</b>
1994		179					<b>179</b>
1995	40	74		2			<b>116</b>
1996	0	116		0			<b>116</b>
1997	29	116	1				<b>146</b>
1998		100				2	<b>102</b>
1999		175			0	1	<b>176</b>
2000		136			2		<b>138</b>
2001*		159		11	110		<b>280</b>

\*Provisional

**ORANGE ROUGHY (*Hoplostethus atlanticus*)**

Year	France	Spain	UK (E+W)	Ireland	Scotland	TOTAL
1988						<b>0</b>
1989	3					<b>3</b>
1990	2					<b>2</b>
1991	1406					<b>1406</b>
1992	3101					<b>3101</b>
1993	1668					<b>1668</b>
1994	1722					<b>1722</b>
1995	831					<b>831</b>
1996	879					<b>879</b>
1997	893					<b>893</b>
1998	963	6				<b>969</b>
1999	1157	4				<b>1161</b>
2000	1019		729	1		<b>1749</b>
2001*	1022			2367	22	<b>3411</b>

\*Provisional

**Landings of *Centrophorus squamosus* and *Centroscymnus coelolepis* as reported to ICES, by Sub-area or Division.**

	IVa	Va	Vb	VIa	VIb	VI	VII	VI/VII	VIII	IXa	X	XII	Total
1990			140							475			<b>615</b>
1991	3		75			944	265			1075		1	<b>2363</b>
1992	133		123			1953	878		15	1114		2	<b>4218</b>
1993	51		91			2454	857		9	946		6	<b>4414</b>
1994	86		149			2198	1363		8	1155		8	<b>4967</b>
1995	10		262			1784	991		0	1354		139	<b>4540</b>
1996	6		348			2374	754		1	1189		147	<b>4819</b>
1997			261			2222	571		1	1311		32	<b>4398</b>
1998		5	433			2081	673		13	1220	4	56	<b>4485</b>
1999	20		461	1651	472		440		20	972	8	50	<b>4094</b>
2000	0		340	2570	470		621		21	1049		809	<b>5880</b>
2001	0		331	2986	801		1032		5	1130		725	<b>7010</b>
	<b>309</b>	<b>5</b>	<b>3014</b>	<b>7207</b>	<b>1743</b>	<b>16010</b>	<b>8445</b>		<b>93</b>	<b>12990</b>	<b>12</b>	<b>1975</b>	<b>51803</b>

**Landings of sharks not elsewhere identified, containing an unknown component of deepwater sharks, as reported to ICES.**

	IVa	Va	Vb	Via	VIb	VII	VI+VII	VIII + IX	XII	Total
1990		3	0				43	0		<b>46</b>
1991	0	133	3				254	2850		<b>3240</b>
1992	0	51	41				639	3740		<b>4471</b>
1993	0	86	387				1392	0		<b>1865</b>
1994	0	10	43				1864	4		<b>1921</b>
1995	0	6	0				2099	39		<b>2144</b>
1996	0		32				2176	25		<b>2233</b>
1997	0		47				3240	1079		<b>4366</b>
1998	0	20	0				3023	1811		<b>4854</b>
1999	53	0	9	136	112	244	1791	476		<b>2821</b>
2000	10	0	69	145	420	164	8	228	38	<b>1082</b>
2001	10		212	68	210	315	0	321		<b>1136</b>
	<b>73</b>	<b>306</b>	<b>843</b>	<b>349</b>	<b>742</b>	<b>723</b>	<b>16486</b>	<b>10573</b>	<b>38</b>	<b>30133</b>

# Northwest of Ireland and West of Scotland *Nephrops*

(WG -MA C = Division VIa)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the STECF and ICES advice for other West of Scotland stocks is predicated primarily on the need to rebuild cod stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

Therefore MFSD advise that unless ways to harvest *Nephrops* without incidental catch or discards of cod can be demonstrated, fishing for *Nephrops* should not be permitted.

Should *Nephrops* fisheries in VIa be permitted, despite the advice for cod, then MFSD recommends there is no basis to revise the advice given for 1993-2002. Therefore ICES advises a status quo of TAC of 11,300 t for 2003. This translates to an Irish quota of 153 t.

## STATE OF THE STOCK

- There are no concerns about the status of *Nephrops* stocks in this area.
- Landings have fluctuated around 11,000 t since 1987.
- Reference points for stocks in this area have not been defined.

## CURRENT MANAGEMENT

- The TAC area covers Sub-area VI and Division Vb this incorporates WG-MAs B C and D.
- WG-MA C contains three main fisheries in the North Minch (FU 11), South Minch (FU 12) and Firth of Clyde (FU 13) and analytical assessments are carried out for all three of these.
- Irish landings come from the component of this stock which is currently not assessed.
- The TAC in 2002 was 11,340 t with an Irish quota of 153 t.
- There are no explicit management objectives or a management plan for this stock.
- MFSD recommend that management objectives be established and that a management plan be developed and implemented for fisheries catching *Nephrops*.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota was €0.34m.
- The value of the 2001 Irish landings from Sub-area VI was €0.32m.
- *Nephrops* are a small but valuable by-catch for trawl vessels operating at Stanton Bank and in Donegal Bay.

## ADDITIONAL INFORMATION

1. ICES carried out assessments for three stocks (FU 11, 12 & 13) in this Management Area in 2001.
2. The estimated international landings were 10,200 t in 2000.
3. Irish landings in 2001 were 98 t.
4. There is no information on misreporting in this stock.
5. The UK (Scotland) with 98% of the 2000 landings dominates this fishery. The fishery is mainly located in Scottish inshore waters and is fished by otter trawlers and creel vessels with 90.5% and 9.5% of the landings respectively.
6. Catch composition data suggest that the creel fisheries catch a higher proportion of berried females than the trawl fisheries and this could result in higher losses of SSB than in other FUs.
7. *Nephrops* are caught by otter trawlers from Greencastle and Killybegs. Up until 1999 Irish landings of *Nephrops* from this area were negligible. Irish landings were 8 t in 1996, and zero in 1997 and 1998. However, in the last three years Irish vessels have substantially increased landings of *Nephrops* from Donegal Bay and the Stanton Bank.
8. MFSD do not currently sample *Nephrops* in Division VIa.
9. MFSD advise that there may be potential to expand this deepwater fishery for *Nephrops* in Division VIa.
10. 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.
11. The WGNeph investigated landings of *Nephrops* from grounds outside current FUs at the meeting in 2002 and concluded that a revision of the FUs in this MA was not required.

There are three Functional Units in this Management Area: a) North Minch (FU 11), b) South Minch (FU 12) and c) Clyde (FU 13).

## 2001 ICES ADVICE

### 3.14.2.h

#### State of stock/exploitation:

All stocks in this Management Area appear to be exploited at sustainable levels. a) North Minch: Annual LPUEs have fluctuated without trend, despite a twofold increase in effort over the past 25 years. VPA estimates of stock biomass and recruitment fluctuating, but there is no evidence of long-term trends. Relatively stable biomass levels are also evident from the results of the TV camera surveys.  $F_{bar}$  of both males and females fluctuating, without long-term trend. Y/R analysis based on outputs of VPA shows that current  $F$  is close to  $F_{max}$  for males, and below  $F_{max}$  for females. b) South Minch: Annual LPUEs fluctuating without trend. Male stock biomass has been stable till 1994, but has slightly declined since then. Female stock biomass has generally increased till the mid-1990s, then stabilised. Recruitment shows little variation, but currently is slightly below the long-term average, particularly in males. TV camera surveys suggest that abundance is fluctuating but stable.  $F_{bar}$  of both males and females fluctuating without trend. Y/R analysis based on outputs of VPA indicates that current  $F$  is at  $F_{max}$  for males, and below  $F_{max}$  for females. c) Clyde: LPUEs were at a low level in the early 1990s, but markedly increased since then. Overall, annual LPUEs have been fluctuating along a slightly upward long-term trend. Age-based assessment suggests stable stock biomass for males, and increasing biomass for females. Recruitment in the last eight years has been above the long-term average. TV camera surveys suggest continued increase in abundance from 1995 to 1998, lower abundance levels in 1999, and higher levels again in 2000.  $F_{bar}$  shows a feeble upward trend for males, except for the last three years, and is fairly stable for females. Y/R analysis shows that current  $F$  is well above  $F_{max}$  for males, and below  $F_{max}$  for females.

#### Management objectives:

There are no management objectives set for this fishery.

#### Advice on management:

There is no basis to revise the advice given previously, and therefore ICES reiterates its advice of a Management Area TAC of 11 300 t for both 2002 and 2003.

#### Relevant factors to be considered in management:

Catch composition data indicate that the creel fisheries in these FUs are taking higher proportions of berried females than the trawl fisheries. This could result in higher losses to the female spawning stock than in other FUs, where berried females are less accessible to exploitation. In 1999, attention was drawn to the shift in effort between the FUs in this Management Area and the change in balance in the landings which this entailed. Since then, the landings from the Clyde have declined, returning the balance to that observed during the early 1990s.

#### Comparison with previous assessment and advice:

The results of the analytical assessments confirm the conclusions that could be drawn from the 1997 and 1999 assessments.

#### Elaboration and special comments:

Only UK vessels are involved in these fisheries. In FUs 11 and 12, *Nephrops* directed trawlers and creelers account for 75- 85 % and 10-15 % of the landings respectively. In FU 13, over 95 % of the landings are taken by *Nephrops* directed trawlers. The use of 70 mm mesh size multi-rig gear has been eliminated following the UK national ban. Landings and effort in all three FUs have increased since the 1960s. In the North Minch and South Minch, landings have declined in recent years, corresponding to a decrease in *Nephrops* directed effort. Landings from the Clyde were very high in the mid-1980s, lower in the early 1990s, and higher again in the late 1990s. LPUEs and mean size data, and landings/area and effort/area indices are available for all FUs. Length-frequency data are available since 1981.

#### Source of information:

Report of the Working Group on *Nephrops* Stocks, April 2001 (ICES CM 2001/ACFM:16).



**Catch data (Tables 3.14.2.h.1-3.14.2.h.2):**

Year	ICES advice	Recommended TAC	Agreed TAC	ACFM landings
1987				11.2
1988				12.7
1989				11.0
1990				10.0
1991				10.5
1992		-11.4	12.0	10.8
1993		-11.3	12.0	11.3
1994		11.3	12.6	11.1
1995		11.3	12.6	12.8
1996		11.3	12.6	11.2
1997		11.3	12.6	11.2
1998		11.3	12.6	11.2
1999		11.3	12.6	11.5
2000		11.3	12.6	10.2
2001		11.3	11.34	
2002		11.3		
2003		11.3		

(Weights in '000 t)

**Table 3.14.2.h.1** *Nephrops* landings (tonnes) by Functional Unit plus Other rectangles in Management Area C (VIa).

Year	FU 11	FU 12	FU 13	Other	Total
1991	2792	4442	3018	250	<b>10502</b>
1992	3560	4236	2788	244	<b>10828</b>
1993	3192	4455	3342	344	<b>11332</b>
1994	3616	4415	2629	438	<b>11098</b>
1995	3656	4680	3989	460	<b>12785</b>
1996	2871	3995	4060	239	<b>11165</b>
1997	3046	4345	3618	219	<b>11228</b>
1998	2441	3730	4843	143	<b>11157</b>
1999	3257	4051	3753	437	<b>11497</b>
2000*	2890	3693	3259	384	<b>10227</b>
* provisional na = not available					

**Table 3.14.2.h.2** *Nephrops* landings (tonnes) by country in Management Area C (VIa).

Year	Rep. of Ireland	Spain	UK	Total
1991	33	0	10469	<b>10502</b>
1992	10	0	10818	<b>10828</b>
1993	7	0	11325	<b>11332</b>
1994	3	0	11095	<b>11098</b>
1995	13	1	12770	<b>12785</b>
1996	8	1	11156	<b>11165</b>
1997	8	4	11216	<b>11228</b>
1998	23	11	11122	<b>11157</b>
1999	141	31	11325	<b>11497</b>
2000*	109	53	10065	<b>10227</b>
* provisional na = not available				

# Irish Sea *Nephrops*

(WG - MA J = Division VIIa excluding Rectangles 33E2-E5 and 34E3-E5)

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD notes that the STECF and ICES advice for other Irish Sea stocks is predicated primarily on the need to rebuild cod and whiting stocks. MFSD endorses this approach as being consistent with the precautionary approach to fisheries management.

MFSD therefore advise that unless ways to harvest *Nephrops* without incidental catch or discards of cod and a significant reduction in the discarding of juvenile whiting can be demonstrated, fishing for *Nephrops* should not be permitted.

MFSD advise that programs such as the use of separator trawls to reduce cod by-catch in the *Nephrops* fishery should be encouraged, but that such programs must ensure that their reported catches of cod are fully and credibly reported.

Should fishing for *Nephrops* be permitted, despite the cod and whiting advice, MFSD advise that there is no basis to revise the advice given previously and endorses the 2001 ICES advice that landings from WG-MA J be set at the level of the 1995-1999 landings. This translates to a 2003 TAC of 17,790 t and associated Irish quota of 6,561 t for Sub-area VII (see Table)

Management Area	Functional Units	Landings advice	Basis
WG-MA J	14, 15	9,550	Average landings 1995-1999
WG-MA L	16, 17, 18, 19	4,440	Average landings 1995-1999
WG-MA M	20-22	3,800	Average landings 1995-1999
Sub-Area VII	14 to 22	17,790	

## STATE OF THE STOCK

- There are no concerns about the status of *Nephrops* in this area. However these *Nephrops* stocks in this area are fully exploited.
- International landings in 2000 were 8,900 t. This was close to average for the last ten years.
- Fishing mortality in FU 15 was relatively stable between 1994 and 1999 but has increased in 1999 and 2000; F on females is higher than on most other stocks.

- Recruitment is currently relatively stable.
- Biomass has increased since 1994.
- Reference points for stocks in this area have not been defined.

## CURRENT MANAGEMENT

- The TAC area covers Sub-area VII. ICES have suggested a separate TAC for Division VIIa since the current large TAC area may result in unbalanced exploitation.
- WG-MA J contains two fisheries in the east (FU 14) and the west (FU 15). Analytical assessments are carried out for both of these stocks.
- The 2002 agreed TAC for all of Sub-area VII was 17,790 t, of which Ireland's quota was 6,561 t.
- There are no explicit management objectives or a management plan for this stock.
- Effective measures to reduce fishing mortality on juvenile whiting in the western Irish Sea need to be considered in the management of this stock.
- MFSD recommend that management objectives be established and that a management plan be developed and implemented for fisheries catching *Nephrops*.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota in Sub-area VII was €23 m.
- The value of the 2001 Irish landings from Division VIIa was €8.3m.
- This is the most economic important fishery in the

Irish Sea and supports the vast majority of the Irish Sea vessels.

## ADDITIONAL INFORMATION

- ICES carries out assessments for these stocks on a bi-annual basis no new assessment was carried out in 2002. In 2001 the FU 15 assessment was considered more robust with the inclusion of an Irish commercial tuning fleet in the assessment for the first time.

2. The provisional international landings were 8900 t in 2000, this represents a significant decrease from 1999 (11,400 t).
3. Irish landings in 2001 were estimated to be 2,715 t, approximately 58% were landed as tails.
4. There is no information on misreporting in this stock.
5. Landings in 2000 were 60.5% by UK (mainly Northern Ireland) and 39.5% by Ireland.
6. The Irish fishery consists mainly of twin-rig otter trawl vessels, 48 Irish vessels reported *Nephrops* landings from the Irish Sea in 2001.
7. Vessels operating out of Howth, Clogherhead and Skerries take most of the Irish landings. Irish activity is concentrated on FU 15 the Western Irish Sea.
8. Irish sampling of this stock is supported through the EC funded sampling programme that is required under Data Collection Regulations 1543/2000 and 1639/2001.
9. 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 VIIa whiting stock.
10. There is also considerable discarding of small *Nephrops* in this fishery. In 1999 Irish vessels discarded an estimated 1,276 t of small *Nephrops* or 45% of the total numbers caught by the Irish fleet.
11. MFSD sampling suggest discarding of hake by Irish vessels in the Irish sea is negligible.

## 2001 ICES ADVICE

### 3.14.2.j

There are two Functional Units in this Management Area:  
a) Irish Sea East (FU 14) and b) Irish Sea West (FU 15).

#### State of the stock/exploitation:

The stocks in this Management Area appear to be exploited at sustainable levels.

a) Irish Sea East: Annual LPUEs fluctuating, but generally lower in the 1990s than in the late 1970s and early 1980s. Landings fairly stable since the mid-1980s. Length-based Y/R analysis suggests that current  $F$  is at or above  $F_{\max}$  for males (depending on procedure used to estimate length composition of the discards), and at or below  $F_{\max}$  for females. No age-based assessment carried out.

b) Irish Sea West: CPUEs and LPUEs have recovered from the low values in the early 1990s. Age-based assessment indicates an increase in male biomass, and relative stability in female biomass and in both male and female recruitment.  $F_{\text{bar}}$  of males is currently stable and lower than 10 years ago.  $F_{\text{bar}}$  of females fluctuating without obvious trend, but higher than in most other *Nephrops* stocks. Y/R analysis based on outputs of VPA shows that current  $F$  is slightly above  $F_{\max}$  for males, and at  $F_{\max}$  for females.

#### Management objectives:

There are no management objectives set for this fishery.

#### Advice on management:

**There is no basis to revise the advice given previously, and therefore ICES recommends that the landings from this Management Area in 2002 and 2003 be kept at a level corresponding to the average for 1995-1999, i.e. at 9550 t.**

ICES also notes that this Management Area is within a much larger TAC area (Sub-area VII), and that a single TAC set for the whole Sub-area will not result in balanced exploitation. In an attempt to resolve this problem, ICES suggests a separate *Nephrops* TAC for Division VIIa, as is done for several finfish stocks (such as cod, whiting, plaice and sole).

#### Relevant factors to be considered in management:

Although exploited throughout the year, increased effort generally occurs during the summer months, when females are available for capture after hatching their eggs. This results in higher annual fishing mortality rates on females than in most other northern FUs. The high  $F$  values on both sexes in the Irish Sea West suggest that the situation should be very carefully monitored.

#### Comparison with previous assessment and advice:

The results of this year's assessments broadly confirm the conclusions that could be drawn from the 1997 and 1999 assessments. The proposed Management Area TAC of 9550 t represents a net increase of 150 t over the current advice, which is entirely due to an update of the reference period used to calculate the 5 years' average of the landings (viz. 1995-1999 as opposed to 1987-1991. This formed the basis for the advice given previously). Elaboration and special comments:

Most of the landings from this Management Area are taken by the UK and Ireland. Irish Sea East landings and effort increased to a peak in the late 1970s and early 1980s, and have now stabilised at about 60 % of that level. In the Irish Sea West, both landings and effort have been reasonably stable over the past 12 years.

LPUE and mean size data are available for both units, CPUE data for the Irish Sea West only. Length composition data are collected on a regular basis for both FUs. The lack of discard samples from the Irish Sea East in the most recent years prevented the use of an age-based assessment for this stock.

#### Source of information:

Report of the Working Group on *Nephrops* Stocks, April 2001 (ICES CM 2001/ACFM:16)

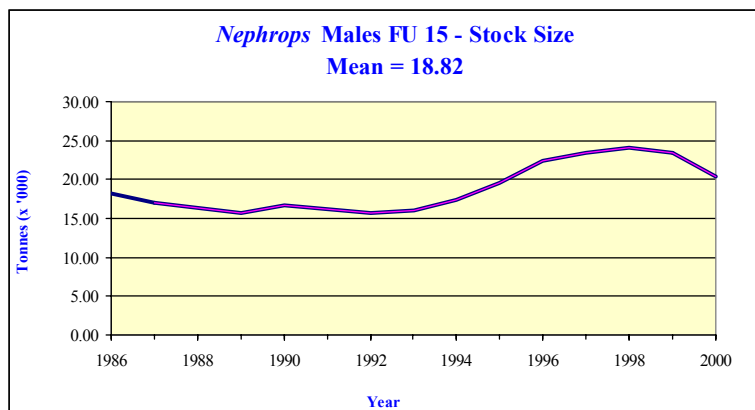
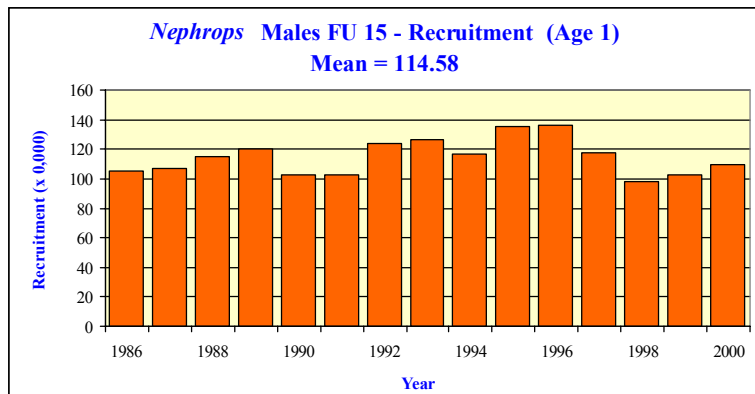
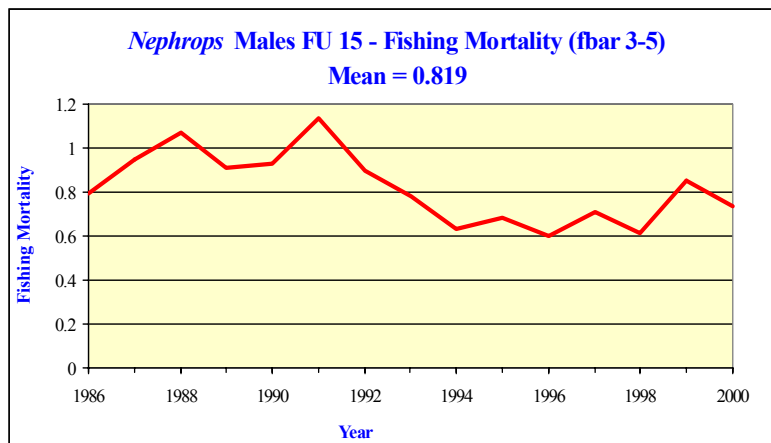
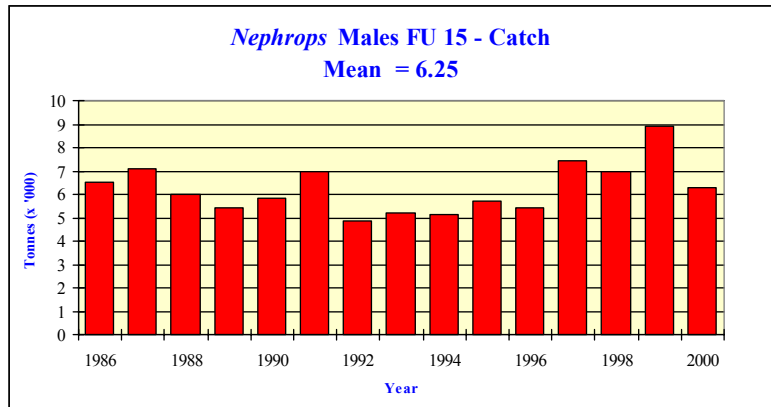
**Catch data (Tables 3.14.2.j.1-3.14.2.j.2):**

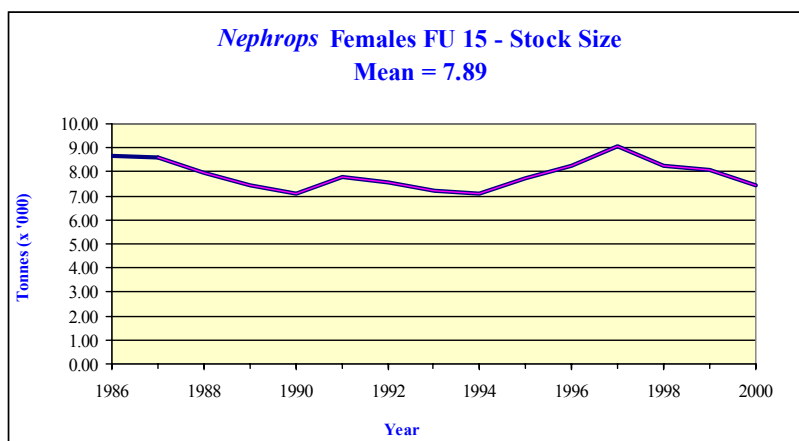
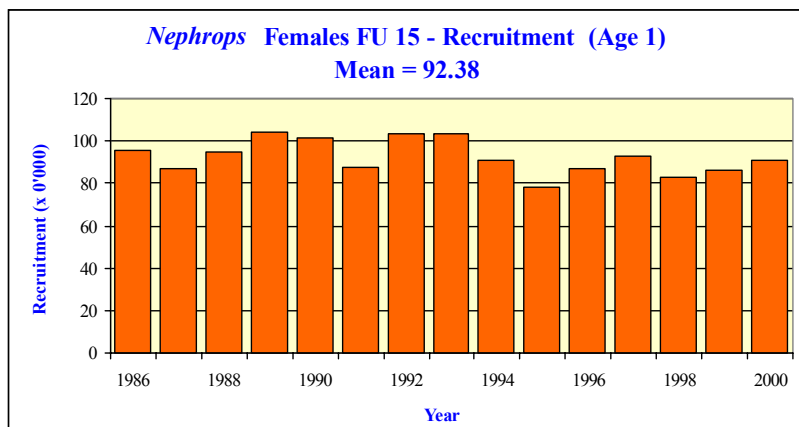
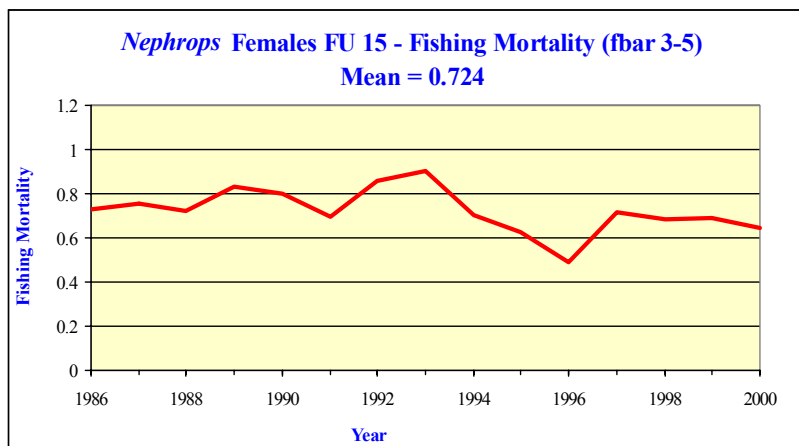
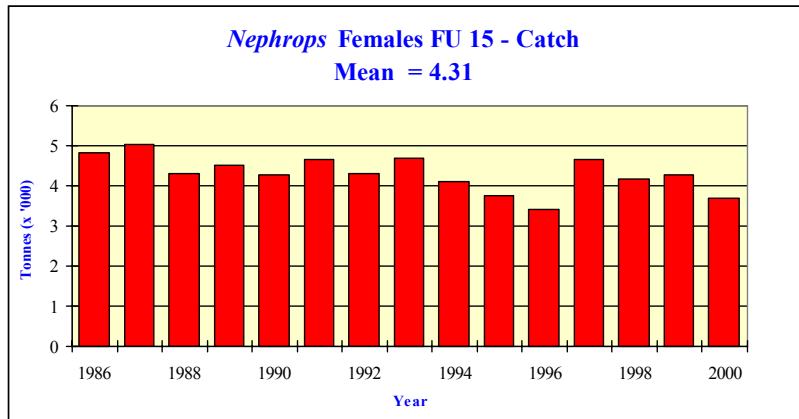
Year	ICES advice	Recommended TAC	Agreed TAC <sup>1</sup>	ACFM Landings
1987				9.9
1988				9.1
1989				8.5
1990				8.9
1991				10.3
1992		8.9	20.0	8.0
1993		9.4	20.0	8.7
1994		9.4	20.0	8.1
1995		9.4	20.0	8.4
1996		9.4	23.0	7.8
1997		9.4	23.0	10.6
1998		9.4	23.0	9.5
1999		9.4	23.0	11.4
2000		9.4	21.0	8.9
2001		9.4	18.9	
2002		9.55		
2003		9.55		

(Weights in '000 t) <sup>1</sup> Sub-area VII

**Table 3.14.2.j.1** *Nephrops* landings (tonnes) by Functional Unit plus Other rectangles in Management Area J (VIIa, North of 53° N).

Year	FU 14	FU 15	Other	Total
1991	772	9566	0	<b>10339</b>
1992	432	7547	0	<b>7979</b>
1993	586	8110	1	<b>8697</b>
1994	515	7623	0	<b>8139</b>
1995	638	7790	14	<b>8442</b>
1996	512	7235	23	<b>7770</b>
1997	599	9914	107	<b>10619</b>
1998	389	9131	15	<b>9534</b>
1999	625	10729	58	<b>11412</b>
2000 *	566	8273	61	<b>8900</b>
* provisional na = not available				





# West of Ireland and inshore south of Ireland *Nephrops*

(WG - MA L = Divisions VIIb,c,j,k, VIIg (Rectangles 31E1, 32E1, 32E2) and VIIa (Rectangles 33E2 and 33E3))

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD believe that there is no basis to revise the advice given previously and endorses the ICES advice that landings from WG-MA L be set at the level of the 1995-1999 landings. This translates to a TAC of 17,790 t for Sub-area VII for 2003 (see Table) with an associated Irish quota of 6,561 t.

- There are no explicit management objectives or a management plan for this stock.
- Hake are by-caught in *Nephrops* fisheries in this area and this needs to be considered in the context of the proposed rebuilding plan for Hake.
- MFSD recommend that management objectives be established and that a management plan be developed and implemented for fisheries catching *Nephrops*.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota in Sub-area VII was €23m.
- The value of the 2001 Irish landings from MA L was €9.5m.

Management Area	Functional Units	Landings advice	Basis
WG-MA J	14, 15	9,550	Average landings 1995-1999
WG-MA L	16, 17, 18, 19	4,440	Average landings 1995-1999
WG-MA M	20-22	3,800	Average landings 1995-1999
Sub-Area VII	14 to 22	17,790	

## STATE OF THE STOCK

- The status of *Nephrops* stocks in this area are unknown.
- There was a sharp decline in the provisional 2000 landings to 2,265 t. Mainly caused by a decline in landings from FU 16.
- The current fishing mortality, recruitment and SSB are not known for these stocks.
- Reference points for stocks in this area have not been defined.

## CURRENT MANAGEMENT

- The TAC area comprises all of ICES Sub-area VII, whereas the WG-MA L is Division VIIb,c,j,k and inshore rectangles south of Ireland (31E1, 32E1, 32E2, 33E2, 33E3).
- The WG-MA L contains two main fisheries on the Porcupine Bank (FU 16) and in outer Galway Bay, off the Aran Islands (FU 17). The WG-MA L also includes very small inshore fisheries to the north (FU 18) and numerous small-scattered inshore fisheries off the south-west and south coasts (FU 19).
- The 2002 agreed TAC for all of Sub-area VII was 17,790 t, of which Ireland's share was 6,561 t.

- *Nephrops* are a very important fishery in this area particularly to vessels operating out of Rossaveal, Dingle, Union Hall and other south and east coast ports.

## ADDITIONAL INFORMATION

1. ICES carried out a new assessment for FU 17 in 2001. No analytical assessments were performed for the other stocks in WG-MA L due to a lack of available data. No new assessments were carried out in 2002. The quality of the assessment in FU 17 is poor due to the short time series of data available and the absence of information on discarding.
2. The provisional 2000 international landings were 2,665 t, with 764 t in FU16, 877 t in FU17, 9 t in FU18, 632 t in FU19 and 382 t in non-FU rectangles.
3. The provisional Irish landings in 2001 were 2,090 t and increase on the 2000 landings of 1,784 t, but well below the highest historical landings of 3,039 t in 1998.
4. There is no information on misreporting in this stock.
5. Landings are dominated by Ireland with 67% of the 2000 landings. France, Spain and the UK caught 16%, 12% and 5% of the 2000 landings respectively.
6. The Irish fishery consists of otter trawl vessel and in-



creasingly in recent years twin-rig vessels. Vessels from Rossaveal, Dingle, Union Hall, Dunmore East and Kinsale mainly exploit the fishery.

7. Irish sampling of this stock is supported through the EC funded sampling programme that is required under Data Collection Regulations 1543/2000 and 1639/2001. Historical biological data for these stocks is limited.
8. The first *Nephrops* directed underwater television survey was successfully carried out in FU 17 during 2002. This and future surveys will provide the first fisheries independent index of stock size and will be used to calibrate future stock assessments.
9. Discarding of small *Nephrops* occurs in fisheries in this MA. Recent discard estimates for FU 17 indicate that discards can be up to 40% by number and 20% by weight.
10. There are significant whitefish by-catches (hake, anglerfish, megrim, whiting and sole) taken in the *Nephrops* fishery in VII.
11. Ireland dominates the landings in these fisheries some of which are within the 12-mile zone. There is an opportunity for Ireland to develop long-term management plans for these stocks.
12. Traditionally, landings from the Porcupine Grounds (FU 16) were limited by weather. However because of improvements in the fleet this has become less of a limitation in recent years. MFSD considers that there maybe some potential for development of new deep-water *Nephrops* fisheries in this area.
13. ICES investigated the distribution of deepwater *Nephrops* stocks in Sub-areas VI and VII in 2002 and recommended expanding some of the FU 16 in this Management Area.

## 2001 ICES ADVICE

### 3.14.2k

There are four Functional Units in this Management Area:

- a) Porcupine Bank (FU 16), b) Aran Grounds (FU 17), c) Ireland NW coast (FU 18) and d) Ireland SW and SE coast (FU 19).

#### State of stock/exploitation:

All stocks in this Management Area are considered to be exploited at sustainable levels.

- a) Porcupine Bank: Annual LPUEs of the Spanish *Nephrops* fleet steeply declined in the mid- and late 1980s, but relatively stable since then. LPUEs of the French and Irish fleets have been fluctuating, but show little evidence of a decrease. Mean sizes in landings generally stable. No length- or age-based assessments carried out.
- b) Aran Grounds: There are only LPUE and limited ef-

fort data on this stock. Landings and effort varied considerably over the past 6 years, following the same pattern, with low values in 1996 and peak values in 1998. No age-based assessment carried out.

- c+d) Ireland coastal stocks: There are only LPUE and limited effort data on these stocks. Landings are strongly fluctuating (with a marked dip in 1994) along an overall downward trend. LPUE data show a dip in 1999 and 2000, but the data series is too short to draw definite conclusions. Data are insufficient to allow for length- or age-based assessments.

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#### Management objectives:

There are no management objectives set for this fishery.

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#### Advice on management:

**ICES recommends that the landings be kept at a level corresponding to the average for 1995-1999, i.e an overall Management Area TAC of 4440 t for both 2002 and 2003.**

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#### Relevant factors to be considered in management:

It should be noted that this Management Area includes four FUs and that a TAC set for the entire area will not necessarily result in a balance of exploitation between the units. At present, this Management Area is within a much larger TAC area (Sub-area VII), where the problem referred to is even greater.

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#### Comparison with previous assessment and advice:

The proposed Management Area TAC represents a net increase of 440 t over the current advice, which is entirely due to an update of the reference period used to calculate the 5 years' average of the landings (viz. 1995-1999 as opposed to 1987-1991, which formed the basis for the advice given previously).

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#### Elaboration and special comments:

Landings from the Porcupine Bank are mainly by France, Ireland, Spain and the UK. Landings from the other FUs are mostly by Ireland. Spanish landings from FU 16 continued to decrease over the past 5 years, while French and Irish landings remained relatively stable. Total landings from the Porcupine Bank peaked in the early 1980s, but have decreased since. Landings from FU 17 have generally increased, while those from FU 19 decreased. Total international landings from the Management Area as a whole have increased between the mid-1980s and the late 1990s, exceeding the recommended TAC in almost all years since 1994.

CPUE, LPUE and mean size data are available for most FUs, but the extent of the data series is often limited.

Landings from 'Other rectangles' (i.e. rectangles that are not part of a FU) from this Management Area are some-

times considerable, and may even exceed those taken from the FUs. It does not seem logical that analytical assessments are being performed on FUs, which yield scarcely 100 t of *Nephrops* landings per year (or even less), while areas that yield several hundreds of tonnes remain unassessed. Therefore, ICES suggests that the available data on the distribution of these deep-water stocks be critically reviewed, and – if deemed necessary – that a revision of the FUs within this Management Area be considered.

#### Source of information:

Report of the Working Group on *Nephrops* Stocks, April 2001 (ICES CM 2001/ACFM:16).

#### Catch data (Tables 3.14.2.k.1-3.14.2.k.2):

Year	ICES advice	Recommended TAC	Agreed TAC <sup>1</sup>	ACFM landings
1987				4.5
1988				3.9
1989				4.0
1990				3.1
1991				3.4
1992		3.8	20.0	3.7
1993		~4.0	20.0	3.6
1994		~4.0	20.0	4.3
1995		~4.0	20.0	4.9
1996		4.0	23.0	4.1
1997		4.0	23.0	4.0
1998		4.0	23.0	5.0
1999		4.0	23.0	4.2
2000		4.0	21.0	2.7
2001		4.0	18.9	
2002		4.44		
2003		4.44		

(Weights in '000 t) <sup>1)</sup> Sub-area VII

**Table 3.14.2.k.1** *Nephrops* landings (tonnes) by Functional Unit plus other rectangles in Management Area L (VIIb,c,j,k).

Year	FU 16	FU 17	FU 18	FU 19	Other	Total
1991	1613	519	0	1077	196	<b>3405</b>
1992	1969	412	1	888	454	<b>3724</b>
1993	1826	372	10	905	487	<b>3599</b>
1994	2482	729	126	389	599	<b>4326</b>
1995	2668	866	24	699	610	<b>4867</b>
1996	2129	527	45	806	651	<b>4158</b>
1997	2026	735	10	690	551	<b>4013</b>
1998	1806	1392	75	740	938	<b>4951</b>
1999	1865	1117	16	505	650	<b>4152</b>
2000 *	764	877	9	632	382	<b>2665</b>
* provisional na = not available						

**Table 3.14.2.k.2** *Nephrops* landings (tonnes) by country in Management Area L (VIIb,c,j,k).

Year	France	Rep. of Ireland	Spain	UK	Total
1991	590	1519	1152	144	<b>3405</b>
1992	909	1351	1139	325	<b>3724</b>
1993	1039	1310	1075	175	<b>3599</b>
1994	1322	1716	1069	219	<b>4326</b>
1995	1500	2325	767	275	<b>4867</b>
1996	1216	1751	875	316	<b>4158</b>
1997	1123	2001	554	335	<b>4013</b>
1998	980	3039	571	361	<b>4951</b>
1999	904	2516	536	196	<b>4152</b>
2000 *	425	1784	320	136	<b>2665</b>
* provisional na = not available					

# Southern Irish Sea and Celtic Sea *Nephrops*

(WG-MA M = Division VIIa South of 53°N and Divisions VIIg,h,f  
excluding inshore rectangles south of Ireland (31E1, 32E1, 32E2, 33E2, 33E3))

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



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD believe that there is no basis to revise the advice given previously and endorses the 2001 ICES advice that landings from WG-MA M be set at the level of the 1995-1999 landings. This translates to a 2003 TAC of 17,790 t for Sub-area VII (see Table) with an associated Irish quota of 6,561 t.

Management Area	Functional Units	Landings advice	Basis
WG-MA J	14, 15	9,550	Average landings 1995-1999
WG-MA L	16, 17, 18, 19	4,440	Average landings 1995-1999
WG-MA M	20-22	3,800	Average landings 1995-1999
Sub-Area VII	14 to 22	17,790	

## STATE OF THE STOCK

- There are no concerns about the status of *Nephrops* in this area.
- Landings increased to 5,700 t in 1995 but declined steadily to 2,800 t in 1999 before increasing again in 2000 to the provisional value of 4,285 t.
- Fishing mortality for FU 20-22 declined between 1996 and 1999 before increasing in 2000.
- Indications are that recruitment has declined in this stock but biomass has remained stable in recent years.
- Reference points for stocks in this area have not been defined.

## CURRENT MANAGEMENT

- The TAC covers Sub-area VII, whereas the Management Area M is Division VIIa South of 53°N and Division VIIg,f,h and excluding inshore rectangles south of Ireland (31E1, 32E1, 32E2, 33E2, 33E3).
- The Management Area M contains several main fisheries south and east of the Smalls and east of the Labadie bank (FU 20-22). The MA also includes numerous small-scattered fisheries where the substrate is suitable. Within MA M an analytical assessment is carried out on FUs 20-22 combined.
- The 2002 agreed TAC for all of Sub-area VII was

17,790 t, of which Ireland's share was 6,561 t.

- There are no explicit management objectives or a management plan for this stock.
- Management of the *Nephrops* fishery needs to take into account the hake rebuilding plan.
- MFSD recommend that management objectives be established and that a management plan be developed and implemented for the fishery catching *Nephrops*.

## MFSD – ECONOMIC COMMENTS

- The value of the 2001 Irish quota in Sub-area VII was €23 m.

- The value of the 2000 Irish landings from Management Area M was €6.4 m.
- *Nephrops* are a very important fishery in this area particularly to vessels operating out of Dunmore East, Howth and Clogherhead.

## ADDITIONAL INFORMATION

1. ICES carried out an analytical assessment for this stock in 2001. No new assessment was carried out in 2002.
2. The provisional international landings were 4,290 t in 2000.
3. The importance of these *Nephrops* grounds to the Irish fleet has increased in recent years. Irish landings in 2001 were 2,120 t an increase of 17% on the 2000 landings. Most of the Irish landings from this fishery were from the grounds south of the Smalls.
4. There is no information on misreporting in this stock.
5. France with approximately 57% of the 2000 landings dominate fishery, Irish landings account for 42% of the total.
6. The serious delay in processing the French fisheries statistics prevented inclusion of the effort data for 1999 in the assessment.
7. The Irish fishery consists of otter trawl vessel and in-

creasingly in recent years twin-rig vessels. Vessels from Dunmore East, Howth and Clogherhead mainly exploit the fishery.

8. Irish Sampling of this stock is supported through the EC funded sampling programme that is required under Data Collection Regulations 1543/2000 and 1639/2001.
9. There are no surveys directed at *Nephrops* in this area.
10. Ireland started collecting discard information for this stock for the first time in 2002.
11. There are significant whitefish by-catches (whiting, anglerfish, megrim, hake, cod and sole) taken in the *Nephrops* fishery in MA M.
12. The minimum commercial landings size in France of 35mm CL results in considerable discarding of *Nephrops* by the French fleet in this fishery.
13. More frequent sampling of the *Nephrops* discards in this fishery by Ireland and France would improve the quality of the length-frequency data.
14. The WGNPEH investigated landings of *Nephrops* from grounds outside current FUs at the meeting in 2002 and concluded that ICES rectangle 30E4 should be added to the FU 20-22.

## 2001 ICES ADVICE

### 3.14.2.1

There are three Functional Units in this Management Area: FUs 20, 21 and 22, together called Celtic Sea.

#### State of stock/exploitation:

The stock in this Management Area appears to be exploited at sustainable levels. a) Celtic Sea (FUs 20, 21 and 22 combined): Annual LPUEs of French *Nephrops* trawlers fell in 1989- 91, slightly increased till 1995, then decreased again. Mean sizes in catches and landings show an overall increasing trend. Age-based assessment (on males only) shows relative stability in stock biomass, and temporary decline in recruitment in 1997-1998. Estimates of recruitment should be considered cautiously, owing to the lack of a regular discard sampling programme.  $F_{bar}$  for males is fluctuating, with the values for the most recent years at the lower end of the range. Y/R analysis (males only) based on outputs of VPA suggests that current  $F$  is close to  $F_{maX}$ .

#### Management objectives:

There are no management objectives set for this fishery.

#### Advice on management:

**There is no basis to revise the advice given previously, and therefore ICES recommends a TAC for Management Area M of 3800 t for both 2002 and 2003.**

#### Relevant factors to be considered in management:

It is expected that the mesh size increase that was implemented in the beginning of 2000, will have a long-term beneficial effect on the exploitation pattern of this stock. Comparison of the length-frequencies of the landings for 1998, 1999 and 2000, shows a net decrease in the proportion of smaller *Nephrops* in the 2000 landings.

#### Comparison with previous assessment and advice:

Results of this year's assessment (using an improved method for the calculation of the discard removals) give a less pessimistic appreciation of the state of exploitation, with much more stable values for (male) stock biomass, and a less dramatic decline in recruitment. Females were not assessed, for reasons of their overall scarcity in the landings. This makes the estimates of their removals too dependent on the estimates of the discards, for which regular sampling data are not available.

#### Elaboration and special comments:

Landings from this stock are reported by France, Ireland and the UK. Until 1993, the French landings represented at least 80 % of the total, since then their share has dropped to 55-65 %. There has been a considerable increase in Irish landings, from 650-750 t in early 1990s to over 1500 t in the late 1990s. International landings reached a peak in 1995, and have generally decreased since, except in 2000, when they increased again to approx. 4250 t. LPUE, mean size data and length compositions of the French landings are available for this stock. Discard data available for some years only. A serious delay in the processing of the French fishery statistics prevented inclusion of the effort data for the years 1999 in the XSA tuning. For 2000, an estimate of overall effort was derived from logbook data. However, this estimate was not corrected for target species of the effort. Establishment of an Irish sampling programme, and more frequent discard samplings of the French fleet would greatly improve the quality of the length-frequency data, the more so since (a) the minimum landing sizes applied by the two fleets are different (25 mm CL in Ireland vs. 35 mm CL in France), and (b) discarding by the French fleet is substantial (owing to the large commercial minimum landing size).

#### Source of information:

Report of the Working Group on *Nephrops* Stocks, April 2001 (ICES CM 2001/ACFM:16).

**Catch data (Tables 3.14.2.1.1-3.14.2.1.2):**

Year	ICES Advice	Recommended TAC	Agreed TAC <sup>1</sup>	ACFM Landings
1987				3.4
1988				3.1
1989				3.9
1990				4.4
1991				3.3
1992		-3.8	20.0	4.3
1993		3.8	20.0	4.7
1994		3.8	20.0	5.2
1995		3.8	20.0	5.6
1996		3.8	23.0	4.8
1997		3.8	23.0	4.3
1998		3.8	23.0	3.9
1999		3.8	23.0	2.9
2000		3.8	21.0	4.3
2001		3.8	18.9	
2002		3.8		
2003		3.8		

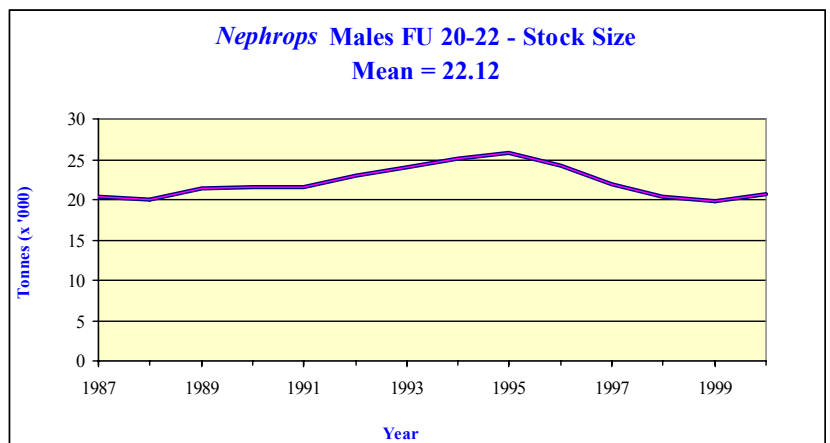
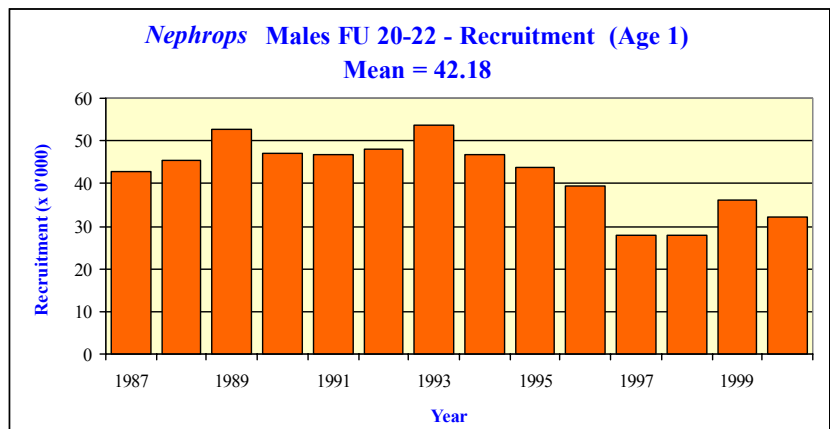
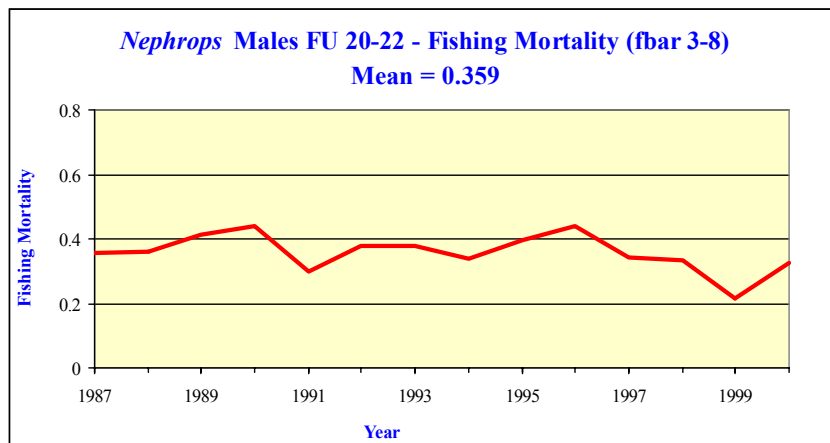
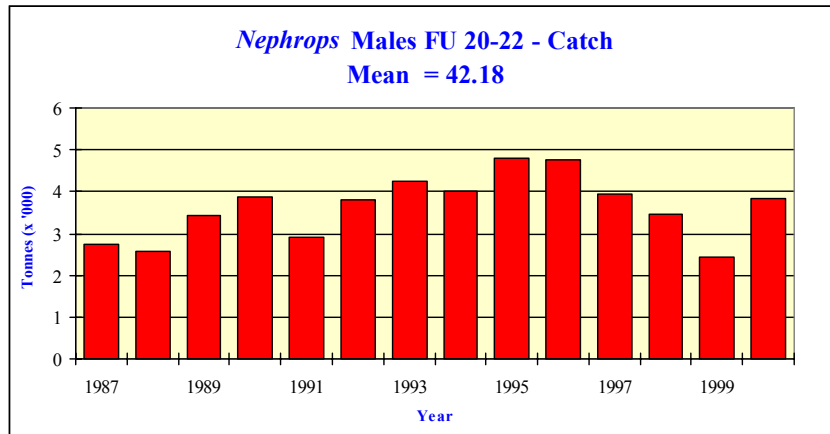
(Weight in '000 t) <sup>1)</sup> Sub-area VII

**Table 3.14.2.1.1** *Nephrops* landings (tonnes) by Functional Unit plus Other rectangles in Management Area M (VII f,g,h, excluding rectangles 31 E1 and 32 E1-E2 + VII a, South of 53° N).

Year	FUs 20-22	Other	Total
1991	3100	178	<b>3278</b>
1992	4013	236	<b>4249</b>
1993	4403	275	<b>4679</b>
1994	4900	285	<b>5185</b>
1995	5260	334	<b>5594</b>
1996	4536	265	<b>4801</b>
1997	4037	259	<b>4295</b>
1998	3737	148	<b>3885</b>
1999	2502	352	<b>2854</b>
2000 *	4238	52	<b>4290</b>
* provisional na = not available			

**Table 3.14.2.1.2** *Nephrops* landings (tonnes) by country in Management Area M (VII f,g,h, excluding rectangles 31 E1 and 32 E1-E2 + VII a, South of 53° N).

Year	Belgium	France	Ireland	UK	Total
1991	3	2617	644	15	<b>3278</b>
1992	0	3413	750	86	<b>4249</b>
1993	0	3846	770	63	<b>4679</b>
1994	2	3692	1426	65	<b>5185</b>
1995	2	3891	1576	125	<b>5594</b>
1996	2	3328	1388	82	<b>4801</b>
1997	4	2614	1590	87	<b>4295</b>
1998	1	2158	1668	58	<b>3885</b>
1999	0	1926	890	38	<b>2854</b>
2000 *	1	2441	1805	44	<b>4290</b>
* provisional na = not available					





# Brown crab (Northern fisheries)

(Division VIa)

*Cancer pagurus*



Marine Fisheries Services Division

## MFSD – ADVICE

**The population dynamics of this fishery are not fully understood and efforts to achieve a better understanding of the stock should be continued. Consideration should be given to capping effort in this fishery and possibly to regulating catches by TAC and quota. Improvements in grading practices would reduce wastage.**

## STATE OF THE STOCK

- The state of this stock is unknown.
- During the 1990s there was a decline in both Cpue and Lpue which accompanied an increasing fishing effort in the offshore sector. However, earlier data suggest the decline in Cpue began in the 1980s, before offshore vessels commenced operations.

## CURRENT MANAGEMENT

- Both sectors are open access. The only constraints are an EU imposed size limit of 130 mm carapace width and a ban on the landing of claws weighing more than 5% of the total weight of whole crab on board a vessel.

## ADDITIONAL INFORMATION

1. In 2000 landings of brown crab into Co Donegal accounted for 40% of national landings for the species. The Malin Head inshore fleet landed some 9% of the national total brown crab in 2000; its activities are regarded as an indicator of inshore fishing activity in the northern brown crab fishery.
2. The Northern brown crab fishery consists of inshore and offshore sectors. The inshore fishery has been in existence since the 1960s, the offshore one is more recent, having commenced in 1990.
3. Brown crab actively migrate in the waters between northern Ireland and Scotland. Movements tend to be predominantly in a westerly direction. Inshore and offshore sectors fish the same stock and cpue trends in each are similar. Cpue levels in the offshore fishery in 2000 were approximately 2 kg per pot hauled (Fig 1).
4. In the period 1978-1988 inclusive, 56% of landings

by the inshore fishery took place in the third and fourth quarters respectively; in the period 1989-1999 inclusive 54% of landings took place in the third quarter and 46% in the fourth.

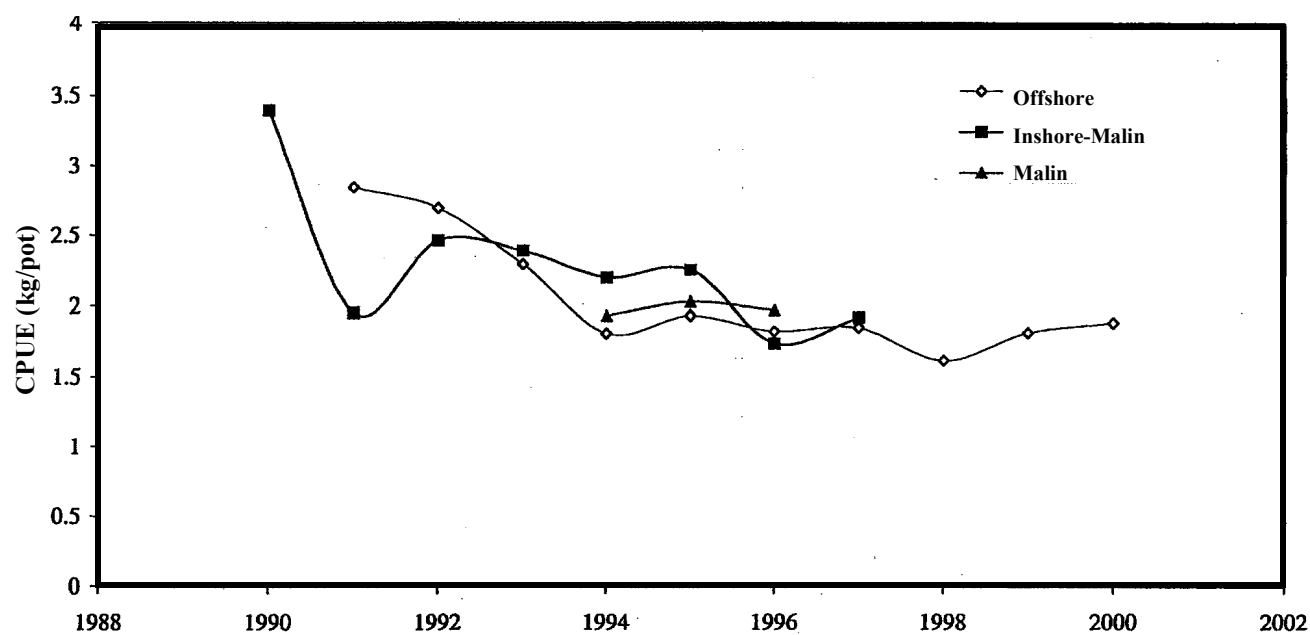
5. A tagging experiment in 2001 concluded that 1-2% of the crab population was exploited per fishing day; during the five weeks of the experiment, which took place at the most intense fishing period of the year approximately 25% of the population is estimated to have been removed.
6. Recruitment to the population is believed to be largely by migration.
7. Discarding levels were high in both inshore and offshore sectors of the fishery in 2000 (47 and 39%). Additional wastage from a local processor was estimated at 14% as a result of poor meat quality.

### Sources of information

Report of the Study Group on the biology and life history of crabs 2000 ICES CM 2001/G:04 Ref: E

Population assessment of the Malin Head edible crab (*Cancer pagurus* L.) stock. By M. Robinson, A.O'Leary and O. Boyle. Mimeo. BIM. 2002

Fig 1. Cpue from three elements of the Co Donegal crab fisheries (source: Robinson et al, 2002).



# Brown crab (South east of Ireland)

(Division VIIa,g)

*Cancer pagurus*



Marine Fisheries Services Division

## MFSD – ADVICE

**Enforcing current conservation regulations on size limit and on permitted claw landings should be a priority. Measures should be taken to discourage the use of brown crab as bait for whelk (particularly the use of undersized and soft crab) and the targeting of crab for that purpose. Over the medium term the fishery should be stabilised and effort capped. Information is required on the interactions between this inshore fishery and its offshore component, as well as data on the basic biology of the species.**

**Continuous monitoring to bring cpue and lpue series up to date and maintain them is a minimal management requirement**

## STATE OF THE STOCK

- The south east brown crab fishery is the inshore component of a larger stock; the offshore component is under-exploited at present, evidence for this being increasing lpue in recent years.
- Recruitment to the inshore sector is probably by migration.

## CURRENT MANAGEMENT

- Brown crab is potted in a mixed crustacean fishery which is open access. Crab are caught for human consumption but they are also used as whelk bait. There is an argument for using waste or moribund crab from processing for this purpose. However, there has been a tendency to target undersized individuals close inshore and to gather poor quality (soft) crab for this market.
- There is a need to enforce the existing EU size limit and to consider extending protection to soft crab. The ban on landing large quantities of crab claws, currently in existence, needs to be enforced. There may be a local problem posed by inshore scallop dredging in conserving the local brown crab stock.

## ADDITIONAL INFORMATION

1. The fishery in south east Ireland is poorly documented and official statistics are believed to under-record land-

ings by a factor of 2-3 times. Between 500 and 800 tonnes of the species are the estimated landings to 55 km of coastline annually. Brown crab is targeted for human consumption and sold to three principal buyers in the region; possibly three additional Irish buyers have purchased crab on occasion from this fishery as do a number of *vivier* operators.

2. Fishing effort (as indicated by the number of crab pots in use) has been increasing in this fishery since the 1970s. It doubled between 1972 and 1988 and in the following decade rose by 128%. In the 30 years after 1968, the number of pots per km of coastline increased by 241%.
3. Cpue declined over the 1990s. Comparison of biological indicators gives conflicting signals about the status of the stock. Lpue is lower than in the Donegal inshore fishery referred to in this stockbook, ranging between 0.8 kg per pot haul in the second quarter and 1.1 kg in the third and fourth quarters of 2002, approximately 50% of the level recorded in the Northern crab fisheries.
4. Unlike the northern inshore fishery, landings in the second quarter of the south east fishery account for 14% of total annual landings. Crab are in very poor condition in the second quarter of the year and most of those which are captured then, are harvested for claws and as whelk bait. When the south eastern inshore fishery commences in spring, the ratio of male to female crab is highest. As the year proceeds, and vessels move further offshore, females become progressively more numerous in the landings (Fig 1).
5. In 2001 the total national landings of brown crab were estimated at 10,312 t (including raised crab claw weights) [valued at €13.1 million], the largest landings of this species to date. The south east inshore crab fishery has been reckoned to contribute some 7-8% of the total brown crab landings during the mid-1990s. While the total landings for 2001 are high, they should be evaluated in the context of an increasing fishing effort which cannot be indefinitely sustainable.

### Sources of information

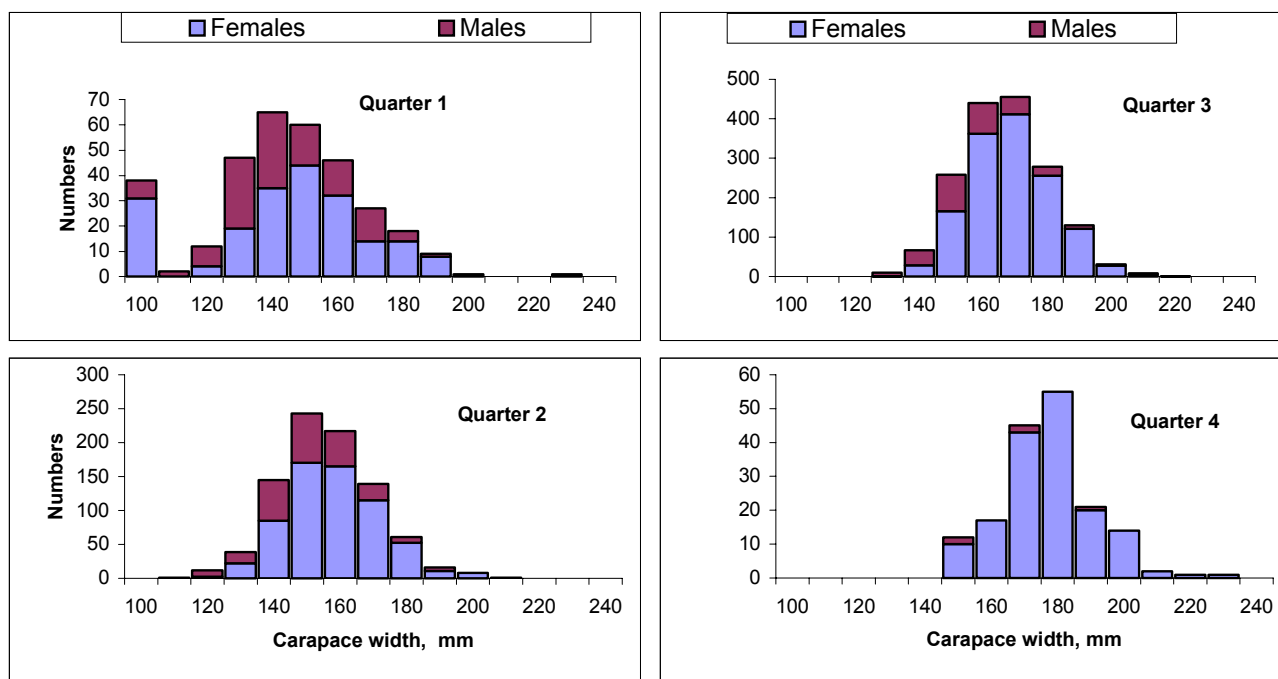
The inshore port fishery for brown crab (*Cancer pagurus*), landing into south east Ireland: estimate of yield and assessment of status By Edward Fahy, Jim Carroll and David Stokes (2002) Irish Fisheries Investigations 10, 26 pp

Conflict between two inshore fisheries: for whelk (*Buccinum undatum*) and brown crab (*Cancer pagurus*). By Edward Fahy 2001 Hydrobiologia 465: 73-83.

Anon (2001) Report of the Study Group on the Biology and Life History of Crabs ICES CM 2001/G:04 Ref: E

Data obtained by MI and BIM staff in the course of a tagging experiment on brown crab in the south east fishery in 2002.

Fig 1 The composition by width (mm) and sex of crabs captured by commercial fishermen and marked for population assessment purposes.



# Lobster (All coasts)

(Sub-areas VI and VII)

*Homarus gammarus*



Marine Fisheries Services Division

## MFSD – ADVICE

The two technical conservation measures current in Ireland: minimum carapace length (raised from 85 to 87mm on 1 January 2002) and prohibited capture of V-notched individuals, should be more strictly enforced. There is a need to regularise the licensing and registration of inshore vessels (this fleet sector being the principal captor of lobster) and to cap fishing effort.

## STATE OF THE STOCK

- Fully or over exploited. Cpue has been falling for the past 30 years.

## CURRENT MANAGEMENT

- Lobster fisheries have open access. There is local administration by a number of co-operatives, a size limit is in existence and V-notching is widely practised.
- There is some release of juveniles which have been hatchery reared.
- Enforcement of regulations is poor and erratic. Funds from State sources and from the industry have been put into V-notching, part of this representing an investment by fishermen. However, many inshore vessels which target lobster are unlicensed.
- A management regime for all inshore species requires limitations on entry to the fishery and regulation through the licensing regime has been promised by government; as yet it has not materialized.

## ADDITIONAL INFORMATION

- Landings of lobster over the past decade have been higher than at any time since 1930 (Fig 1). Price has been increasing at the same time and the first sale value of lobster is currently approximately €16 per kg (Fig 2). Total landings of lobster in 2001 were 777 t valued at €12,286,380.
- The thrust of conservation regulations which specify a permitted landing size of 87mm carapace length and of the V-notching scheme is towards increasing egg production and, hence, juvenile recruitment.

Some early juvenile release is practised in Ireland although its efficacy is unknown. Additional/alternative conservation regulations are practised in other lobster fisheries in Europe and North America, including protection for berried females, maximum size limit, licensing of boats, trap limits, gear regulation, fishing season, reserves and escape gaps and the use of biodegradable trap materials to allow liberation of captured animals when gear is lost.

- The use of size limits in inshore trap fisheries whose target species survive discarding successfully, enables sub-sized animals grow-on after release. A minimum size is usually selected so that an individual will spawn once before capture. In the case of lobster, only 15% have reached first maturation on capture, so that the minimum dimension (although it has been increasing) does not satisfy the spawn-once-before-capture rule. To satisfy that, the minimum size at capture should be 96 mm carapace length. In Ireland the most common size group in the landings (and, it is presumed, the stock(s)) is the 86-92 mm one.
- An egg per recruit model (Fig 3) indicates that an increase in minimum size would substantially increase average egg production per lobster. In the unfished stock an adult lobster could be expected to produce 85,000 eggs. At present the average lobster produces 6,000 eggs, 7% of its potential. Increasing the minimum size has the effects of raising egg production but also of reducing lpue. The tendency in such circumstances is to increase fishing effort, thus negating the improvement, and this is what has taken place in recent years.

It is estimated that the introduction of a new conservation measure will require 2-4 years before its consequences are apparent in improved landings and fishing effort should be stable in the interim.

### Sources of information:

Towards a management policy for Irish lobster fisheries By Oliver Tully, Mark Norman, Vincent Roantree and Ronan Browne. Paper presented at a seminar Management of Irish lobster fisheries in the Galway Bay Hotel, Salthill, November 2000. Mimeo.

Conservation options for Ireland's lobster fishery By Oliver Tully. The Irish Skipper. January 2002.

An historical overview of the Republic of Ireland's lobster (*Homarus gammarus*) fishery, with reference to European and North American (*Homarus americanus*) lobster landings. By R.W. Browne, J.P. Mercer and M.J. Duncan. Hydrobiologia 465 (2001): 45-48

Fig 1. Annual landings of lobster to Ireland, 1930 – 2001 inclusive. Source, Browne et al, 2001.

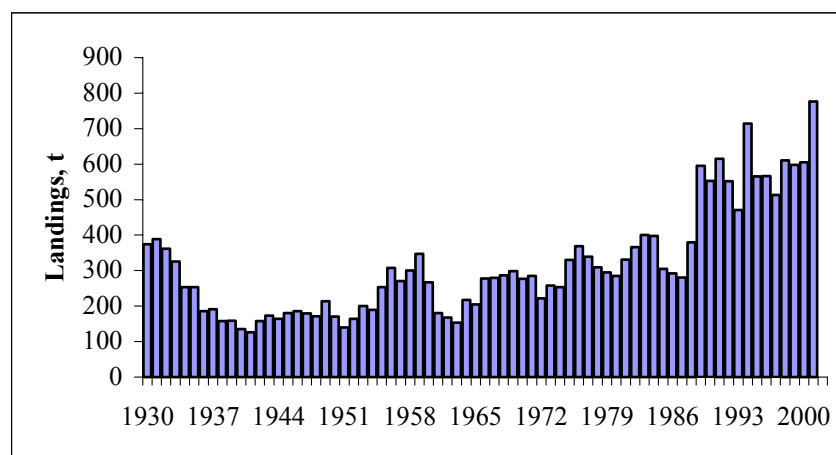


Fig 2 First sale price (Euro / kg) of lobster, 1990-2001. Source: DoCMNR.

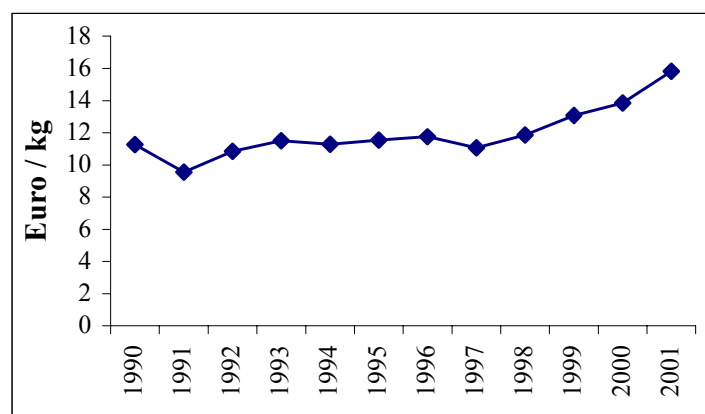
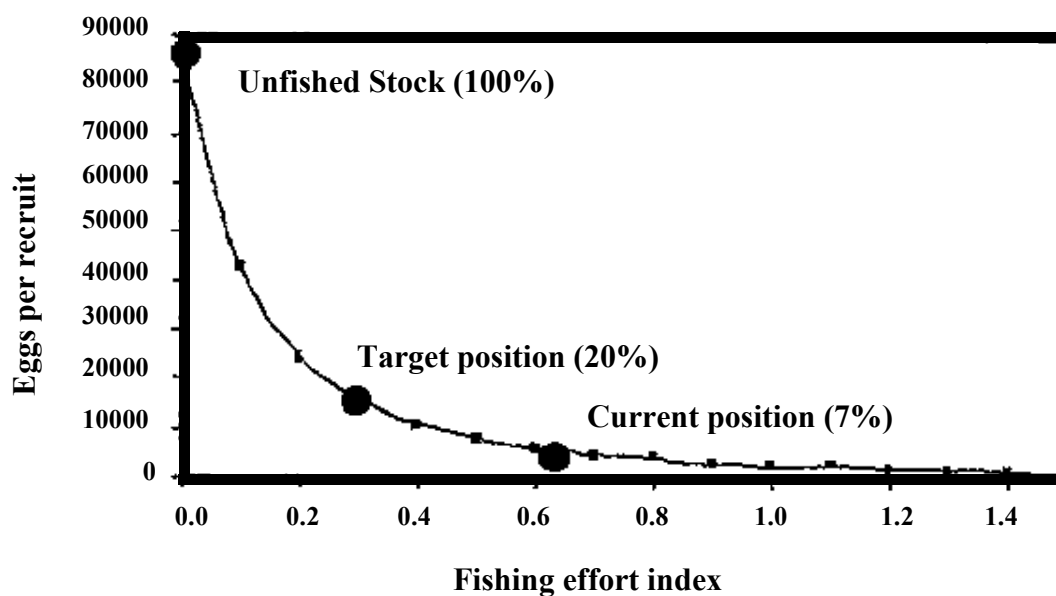


Fig 3. Egg per recruit model of the Irish lobster fishery. Source: Oliver Tully, 2002.



# Spider crab (All coasts)

(Sub-areas VI and VII)

*Maja squinado*



*Marine Fisheries Services Division*

## MFSD – ADVICE

**Enforcement of size limits is a basic requirement in the management of this species. It should also apply to fisheries in which spider crab is a by-catch, such as the south east crustacean pot fishery where immature spider crab are harvested as whelk bait, in defiance of the conservation regulations. The only directed fishery for this species is in Tralee and Brandon Bays (the Magharees fishery) and fishing effort there should be capped. The use of tangle nets should be prohibited as a method of catching this species.**

## STATE OF THE STOCK(S)

- The directed fishery for spider crab in the Magharees fishery commenced in the early 1980s and effort has continued to rise at a steady rate. Currently there are 20 half-deckers engaged in the fishery setting an average of 500 pots per boat. Despite this the LPUE has risen since 1994 although it declined in the last two years. The quality of the catch has however disimproved; large male spider crabs are particularly valuable and their incidence has declined.
- A single year class probably provides almost all landings in the Co Kerry fishery but, other than this, the state of the stock there is unknown. Until 2000 an increase in fishing effort was accompanied by a rise in landings (Fig 1) but indicators of the performance of this fishery must be interpreted with caution because market demand strongly influences fishing activity. Trends in the lpue index (Fig 2) suggest a more robust status in the late 1980s which might have been a consequence of several year classes contributing to the landings.
- The state of the stocks in other fisheries, such as the south east one, is not known but a similar decline in the quality of landings is believed to have occurred.

## CURRENT MANAGEMENT

S.I. No 321 of 2001: Spider crab (Conservation of stocks) Order, 2001 makes it an offence to take male spider crab of less than 130 mm length and female spider crab of less than 125 mm. These regulations are more stringent than specified by the European Union whose size limit is 120

mm. Within the directed Magharees fishery the size limits are observed; elsewhere they are not observed or enforced.

## ADDITIONAL INFORMATION

1. Spider crabs grow to maturity in two years; once adult they may live for a further 6 – 7 years and these large crabs make up a large proportion of the catch in a virgin fishery. Fishing tends to remove the older animals until eventually one year-class makes up most, if not all, of the catch. This phenomenon has been reported elsewhere, notably in the Normandy/ Brittany fishery for the species and it would appear to have happened in Tralee and Brandon Bays, as established by comparison with an earlier assessment carried out by BIM.
2. The spider crab landings from the Magharees fishery were valued at €426,530 so that it is a significant contributor to local employment. Spider crab are targeted by some 20 half deckers which also capture other large crustacean species. The fishery has been in existence since the early 1980s and fishing effort has continued to increase at a steady rate; at present an estimated 10,000 pots fish spider crab in these two bays (Fig 1).
3. Lpue has remained stable over the past decade although there are signs of it tending downward (Fig 2). The quality and relative value of the catch have declined. Periodic assessments have been undertaken by staff from BIM and the Marine Institute and the decline in the quality of male spider crab since fishing commenced in the 1980s has been noted. Further investigations have revealed that male spider crab tend to predominate in the landings during the early months of the year, females later (Fig 3). Males also tend to be larger during the early months than later in the year. Research has demonstrated that male crabs behave territorially in crustacean pots, discouraging the entry of other spider crabs and this may explain the heavier catches of males during the spring months, a greater incidence of females following removal of large males from the population.
4. Spider crab plays an important role in the management of another inshore fishery: the oyster beds in Tralee Bay. Spider crabs prey on starfish, a major predator of oysters. Hence, spider crabs are regarded as playing an important role in the ecology of other fisheries occurring in their vicinity.
5. The south east brown crab fishery also takes some spider crab but the landings to it probably do not exceed 20 tonnes annually. The heaviest landings from this also tend to occur in the earlier months of the



year although fishing effort on brown crab (of which spider crab is a by-catch) increases from August to October.

6. The inshore fishery in Tralee and Brandon Bays is unusual because it has survived increasing fishing effort over a period of 20 years and the stocks show no signs of immediate collapse. Much of that is undoubtedly due to the fact that the market demands a high quality (large) product which is sufficient to allow a proportion of the catch to mature before the critical size dimension is reached. Spider crabs develop rapidly, reaching maturity within two years and they spawn once a year at this latitude.
7. Potential threats to this fishery are several: they include the use of sub-size spider crab as bait. This has happened in the south east fishery. Cray nets (tangle netting set for crawfish) have proved destructive in the past and there are no regulations preventing their use at the present time.

8. Tralee and Brandon Bays are fortunate to have a fishing community which values its stock of spider crab but this species (and inshore fisheries for other species) would benefit from enforcement of conservation regulations on all parts of the coast. Effort in the Tralee and Brandon Bay fisheries should however be capped.

#### Sources of information:

The Magharees spider crab *Maja squinado* fishery in 2000 by Edward Fahy. Irish Fisheries Investigations No 9, 2001. 21 pp plus Appendix.

The inshore pot fishery for brown crab (*Cancer pagurus*), landing into south east Ireland: estimate of yield and assessment of status By Edward Fahy, Jim Carroll and David Stokes. Irish Fisheries Investigations No 11, 2002: 26 pp.

Fig 1 Annual landings (tonnes) and an effort index based on the number of pots fished, in the Tralee and Brandon Bays inshore spider crab fishery, 1981-2001.

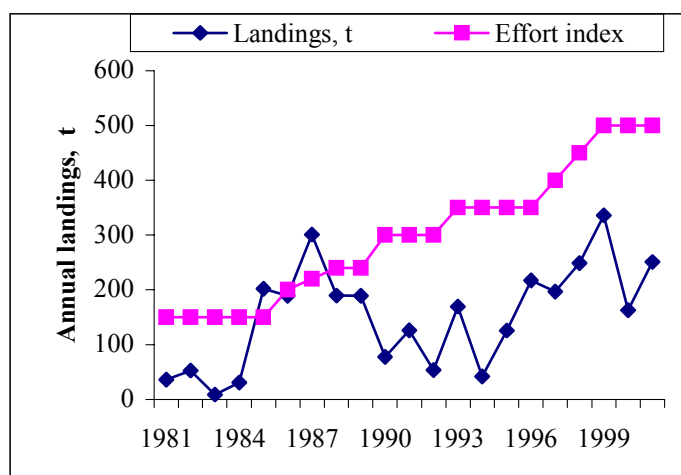




Fig 2 Lpue index for spider crab in the Tralee and Brandon Bays fishery, 1981-2001, a three year moving average is superimposed.

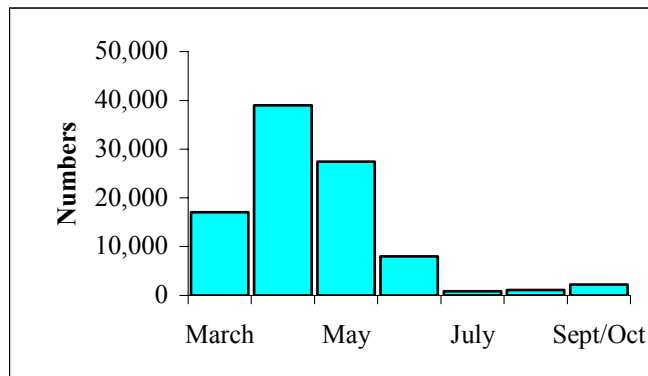
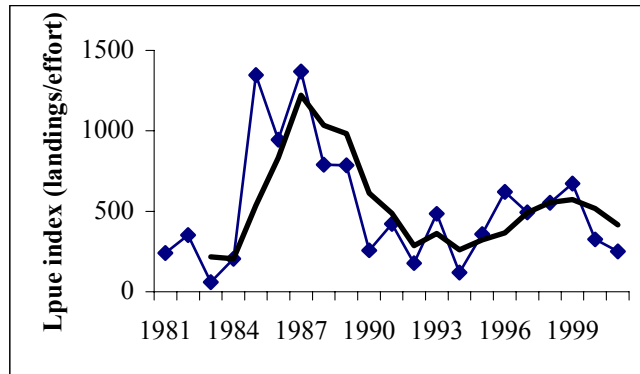
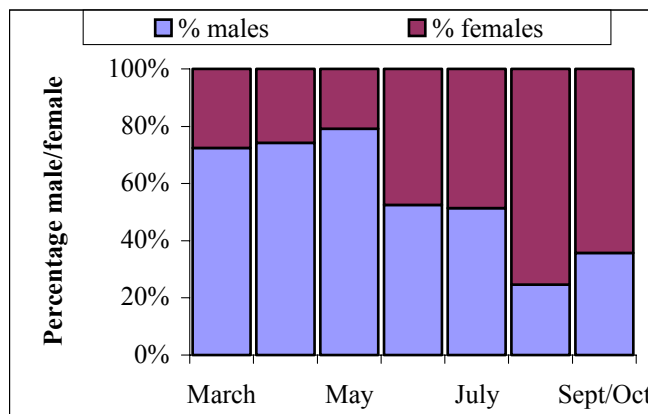


Fig 3 (Above) Spider crabs are graded by sex; occasional records on tally sheets for the period 1998 – 2001 inclusive noted the numbers of spider crabs loaded onto trucks for export from Magharees. These numbers (not an exhaustive or necessarily representative total for the period) are set out in the top histogram.  
(Below) The proportions of males and females in the exports.



# Velvet crab (All coasts)

(Sub-areas VI and VII)

*Necora puber*



Marine Fisheries Services Division

## MFSD – ADVICE

This is a valuable species whose stocks should be monitored with the objective of securing optimal management over the longer term.

## STATE OF THE STOCK(S)

Unknown.

## CURRENT MANAGEMENT

Velvet crab are taken as a by-catch in the pot fishery for larger crustacean species. There are no regulations concerning its capture.

## ADDITIONAL INFORMATION

- The species is a valuable one, obtaining €2.0 – €2.5 per kg at first sale. Landings have been stable over the past six years (Fig 1). In 2001 300 t were valued at €682,314 were landed.
- Velvet crab is taken very close to shore and this may explain its greater landings during the earlier months of the year before the effort for brown crab moves further offshore (Fig 2).

### Sources of information

The inshore pot fishery for brown crab (*Cancer pagurus*) landing into south east Ireland: estimate of yield and assessment of status by Edward Fahy, Jim Carroll and David Stokes. Irish Fisheries Investigations No 11 (2002) 26 pp.

Fig 1.

a, Landings of velvet crab, 1990 – 2001 inclusive;  
b, first sale price per kg (source: DoCMNR).

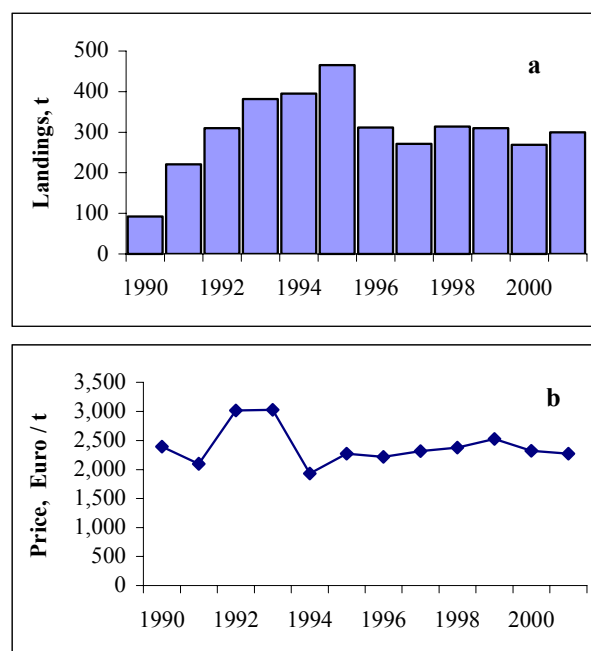
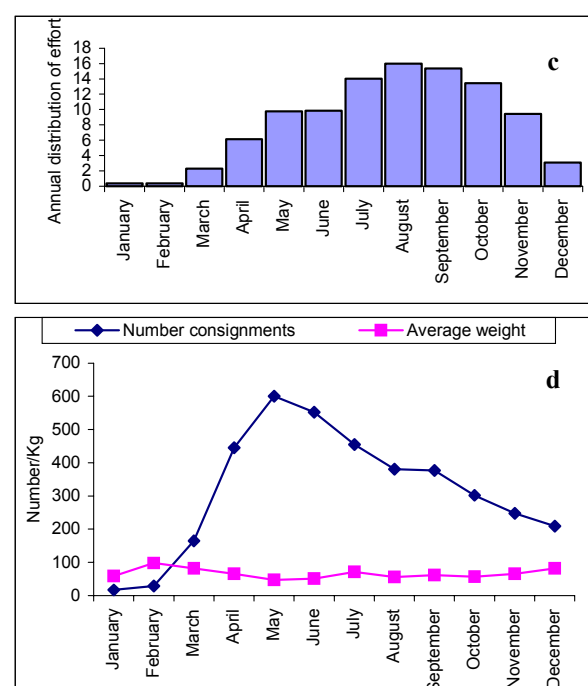


Fig 2. Details of annual distribution of effort (c) and number and weight (kg) of consignments of velvet crab (d): from data obtained from the South east brown crab fishery.



# Crawfish (All coasts)

## (Sub-areas VI and VII)

*Palinurus elephas*



Marine Institute  
Foras na Mara

Marine Fisheries Services Division

### MFSD – ADVICE

Existing conservation measures for this species should be enforced and additional opportunities to reduce fishing effort should be sought.

### STATE OF THE STOCK

The state of the stock is unknown but the decline in landings over the past decade (Fig 1) is taken as an indicator of the state of the biomass of the species.

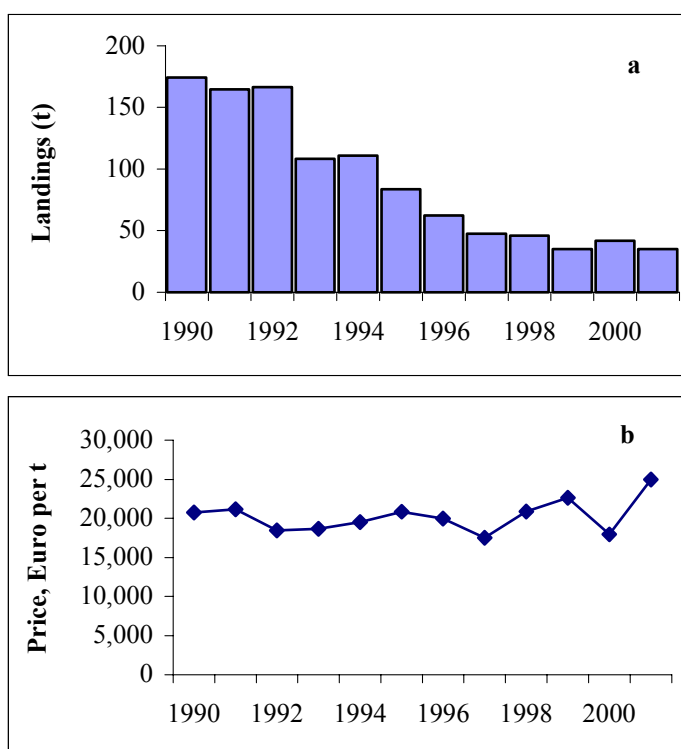
### CURRENT MANAGEMENT

- European Union regulations impose a size limit of 110 mm carapace length on this species.
- S.I. No 322 of 2001 [Crawfish, conservation of stocks order, 2001] imposes this size limit in divisions VI and VII.
- S.I. No 179 of 2002 [Crawfish, Fisheries Management and Conservation Order, 2002] imposes a ban on the capture of crawfish by fishing nets in two specified areas off the Co Galway and Co Kerry coasts.

### ADDITIONAL INFORMATION

- Crawfish is the most valuable of the larger crustacean species targeted by pots. In addition, it is vulnerable to capture by tangle net and susceptible to damage by towed gears.
- Crawfish are unique among the larger crustaceans (brown crab, spider crab and lobster) because its landings are perceived to be declining rapidly, necessitating urgent remedial measures.
- The ban on capture of crawfish by fishing nets which was introduced in 2002 is regarded as inadequate; a ban on the use of nets suitable for the capture of crawfish would be more appropriate.

Fig 1 a, Landings of crawfish to Ireland, 1990 – 2001;  
b, average price per kg in the same period.  
Source: DoCMNR



# Shrimp fishery (South and west coasts )

(mainly in Divisions VIIg, j and b)

*Palaemon* mainly *serratus*



Marine Fisheries Services Division

## MFSD – ADVICE

The recently signed Shrimp (Fisheries Management and Conservation) Order, 2002 [S.I. No 180 of 2002] which introduced a close season for the period 7 May to 17 August 2002, should be renewed in future years for the period of approximately 1 February to 17 August. The requirements of the Order, which are to prevent fishing for shrimp or landing them during the spring and summer months, should be enforced. The fishery should be monitored with a view to modifying fishing effort.

## STATE OF THE STOCK

Unknown.

## CURRENT MANAGEMENT

- Because of their brief life-cycle and small size shrimp are regarded as unpredictable and unmanageable.
- A precautionary approach to sustaining yield is recommended and is believed to have widespread support within the industry. The introduction of a close period for part of 2001 is the first step to a management regime.

## ADDITIONAL INFORMATION

1. This fishery commenced in the mid-1970s in south west Ireland whence it has extended north to Connemara and east to Co Waterford. It is carried on using plastic Chinese hat-ended creels. As is general in the inshore sector, fishing effort has risen with time. The fishing season has also extended and in some parts of Ireland fishing now takes place all the year round.
2. From the beginning of the 1990s shrimp fishing reached a new intensity and landings have been consistently higher since; the greatest landings to date were made in 1999.
3. Yield continued to rise in the 1990s but landings in 2000 declined from the previous year's high for the time series and landings in 2001 marked a further reduction (Fig 1).
4. Because the population dynamics of *Palaemon* are

poorly understood and fishing pressures are increasing, there is concern for the survival of this fishery. In such circumstances a precautionary approach is strongly advised, stabilising the fishery and then monitoring it with a view to modifying fishing effort.

5. The first sale value of this fishery in 2001 was €1.9 million. Over the past decade the first sale price of shrimp appears to have remained stable (Fig 2) although size grades command a wide variation in price and their proportions in the fishery are known to vary from one year to another.

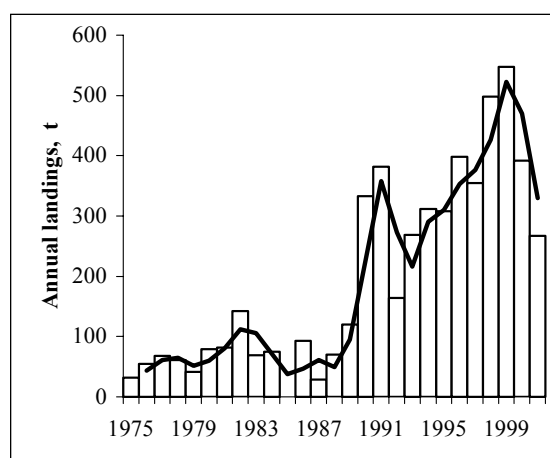
### Sources of information

The commercial exploitation of shrimp *Palaemon serratus* (Pennant) in Ireland By Edward Fahy and Paul Gleeson (1996) Irish Fisheries Investigations New series No 1 28 pp

Catch analysis of shrimp *Palaemon serratus* (Pennant) taken by different mesh sizes By Edward Fahy, Niamh Forrest and Laura Oakey (1998) Fisheries Bulletin No 16 11pp

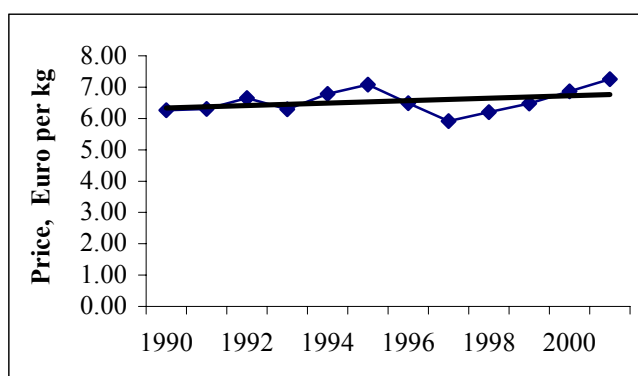
Estimates of the contribution of *Palaemon elegans* Rathke to commercial shrimp landings in Ireland and observations on its biology By Edward Fahy, Niamh Forrest and Paul Gleeson (1998). Irish Naturalist's Journal 26 (3/4): 93-98.

Fig 1. Annual landings of shrimp (tonnes); a two year moving average is superimposed on the data.



Source: DoCMNR

Fig 2. Price of shrimp at first sale over the past decade.



Source, DoCMNR

# Whelk fishery (Division VIIa)

## *Buccinum undatum*



### Marine Fisheries Services Division

#### MFSD – ADVICE

**MFSD advises that the conservation regulations (National regulation S.I. No 278 of 1994 and its successor regulations) should be enforced in a way which ensures that undersized animals are immediately, on capture, returned to the water in the areas in which they are fished. An approximately similar but differently defined size limit is imposed by the European Union.**

#### STATE OF THE STOCK

- Because the size limit is not enforced in this fishery, landings of whelk consist of the unsorted catches.
- Over the past three years approximately, these have contained a larger than hitherto but now declining proportion of juveniles so that the age at full recruitment has moved back from 5 to 4 years old.
- A pulse of recruitment is currently moving through the populations: in 2000 the proportion of undersized animals was estimated at 37%, the following year it had reduced to 29% and the latest assessment which covers the period September 2001 to August 2002 recorded undersized at 20% of the landings (Table 1). While 20% is far too high it is the lowest recorded percentage of undersized whelk since 1996 when landings of a similar order (5,943 t as opposed to 6,297 t in 2001) were recorded (Fig 1). On this occasion however, the Arklow/Wicklow sector of the fishery is contributing a higher proportion of the landings than in 1996 (Fig 2).

#### CURRENT MANAGEMENT

- The fishery is subject to national regulations which impose a minimum size of 25 mm maximum shell width which corresponds approximately with 50 mm length (from the tip of the spire to the end of the siphonal canal).
- European Community regulations impose a minimum length of 45 mm.
- The regulations are ignored.
- Occasionally compliance has involved bringing catches ashore for sorting and releasing undersized individuals close to shore which defeats the purpose of the exercise.

#### ADDITIONAL INFORMATION

1. Whelk do not have a drifting planktonic stage and the juveniles emerge from the egg cases as tiny adults. Whelk tend to form local stocklets which display genetic differences over short distances – perhaps as little as a nautical mile. For assessment purposes this fishery is divided into four sectors, those at the northern and southern end of the fishery are characterised by older, larger whelk occurring at lower density. The centre sectors are nursery and spawning areas occupied by high densities of smaller individuals which have, at times, been shown to display the Lee phenomenon (stunting due to over-crowding).
2. Total landings of whelk in 2001 were 6.3 kt with a first sale value in excess of €4 million.
3. Whelk landings rose rapidly in the early 1990s as a consequence of a decline in stocks of similar gastropods in the Pacific Ocean.
4. The fishery is a relatively inexpensive one to become involved in and boats have entered and left the fishery in response to the state of the market and, particularly at the southern periphery of the fishery due to the exhaustion of stocks. As some boats left the fishery landings increased to those which remained. At its peak in 1996 the fishery involved some 80 vessels which number halved in the interim. In the last two years boats have again been rejoining.
5. The trade in whelk has been disrupted on a number of occasions for commercial reasons which are as likely as the depletion of stocks to have discouraged participation in the fishery. The unstable commercial environment has contributed positively to the conservation of stocks.
6. Increased values for the coefficients of mortality ( $Z$ ) (Table 2) during last year, particularly in the central sectors of this fishery [which are similar to values recorded in 1996, the previous year of peak landings] are likely to have been influenced by the pulse of recruits entering the fishery.

**Source of information:** A second assessment of the whelk *Buccinum undatum* fishery in the southwest Irish Sea with particular reference to its history of management by size limit. By Edward Fahy, Eric Masterson, David Swords and Niamh Forrest. Irish Fisheries Investigations No 6 (2000): 67 pp.

**Table 1. Percentage undersized whelk (<50mm long), by number, landed in each fishery sector annually.**

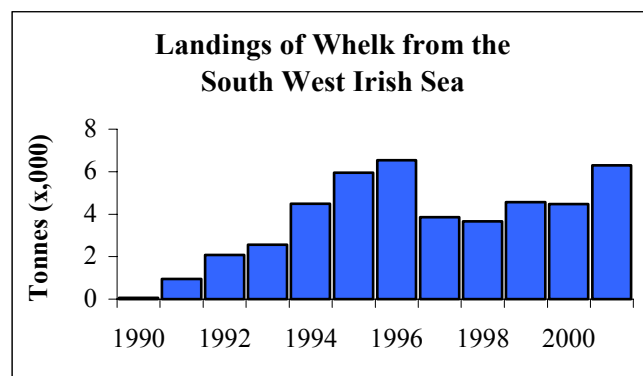
<b>Year</b>	<b>Dublin</b>	<b>Arklow</b>	<b>Courtown</b>	<b>Wexford</b>	<b>Overall average</b>
<b>1994</b>	27.5	32.6	51.1	7.9	<b>31.4</b>
<b>1995</b>					
<b>1996</b>	4.6	27.5	47.6	12.0	<b>24.3</b>
<b>1997</b>	61.8	26.8	19.4	4.5	<b>32.7</b>
<b>1998</b>					
<b>1999</b>	12.3	33.8	48.9	1.6	<b>33.1</b>
<b>2000</b>	9.7	40.0	48.9	8.8	<b>37.1</b>
<b>2001</b>	22.7	33.7	16.1	6.7	<b>28.9</b>
<b>2002</b>	20.1	22.6	11.8	0.6	<b>20.3</b>
<b>Averages</b>	<b>22.7</b>	<b>31.0</b>	<b>34.8</b>	<b>6.0</b>	<b>29.7</b>

*Italicised figures are based on assessments from September to August of the following year, undertaken for the stock book.*

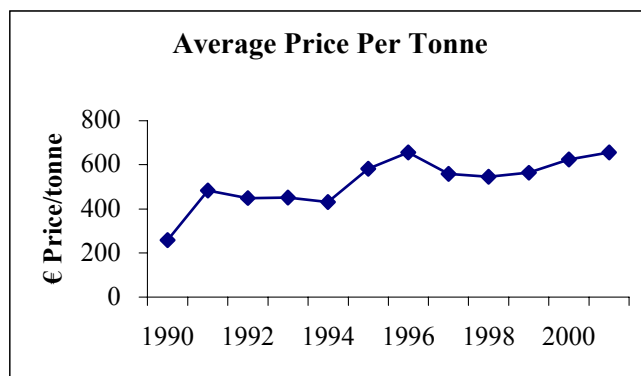
**Table 2. Coefficients of mortality (Z) calculated from the catch curves for each year in which an assessment was undertaken.**

<b>Year</b>	<b>Dublin</b>	<b>Arklow</b>	<b>Courtown</b>	<b>Wexford</b>	<b>Averages</b>
<b>1994</b>	0.40	0.56	0.66	0.48	<b>0.53</b>
<b>1995</b>					
<b>1996</b>	0.26	0.48	0.64	0.40	<b>0.45</b>
<b>1997</b>	0.81	0.90	0.94	0.51	<b>0.79</b>
<b>1998</b>					
<b>1999</b>	0.24	0.68	0.88	0.62	<b>0.61</b>
<b>2000</b>	0.41	0.68	0.86	0.21	<b>0.54</b>
<b>2001</b>	0.57	0.79	0.86	0.50	<b>0.68</b>
<b>2002</b>	0.77	0.90	0.91	0.52	<b>0.77</b>
<b>Averages</b>	<b>0.49</b>	<b>0.71</b>	<b>0.82</b>	<b>0.46</b>	<b>0.62</b>

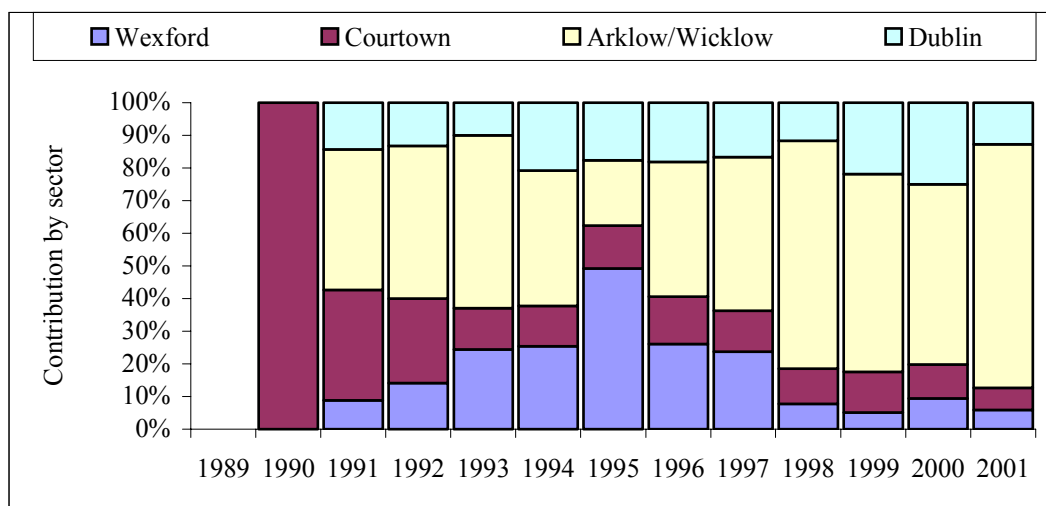
*Italicised figures were obtained in an assessment for the period September -August, undertaken for the stock book.*



**Fig 1. (Above) Landings of whelk from the south west Irish Sea, 1990 to 2001**  
**(Below) Average price per tonne**  
*(Source: DoCMNR)*



**Fig 2. Contribution by sector to whelk landings from the south west Irish Sea, 1989 – 2001**  
*(Source: DoCMNR).*





# Scallop in south west of Ireland

## Division VIIj



Marine Fisheries Services Division

### MFSD – ADVICE

**MFSD advise that management objectives should be established and a management plan should be developed for the localised scallop fisheries in this area. In the absence of a management plan in this area the fishery should be exploited with caution and the fleet should not be allowed to expand further until this fishery can be shown to be sustainable.**

**MFSD point out that regional co-management of scallop fisheries is both appropriate and desirable to ensure sustainability. In that context and given the sedentary nature of scallops small-scale closed areas maybe the most risk adverse management tool. MFSD further advise that the current minimum landing size of 100 mm for scallops is appropriate in this area.**

### STATE OF THE STOCK

- The state of the stock is unknown. Preliminary assessments indicate the stock is fully exploited.
- Landings data are only available for the most recent years and landings are increasing.
- Preliminary estimates of fishing mortality indicate that  $F$  is between 0.63 and 0.68 both of which are close to  $F_{\max}$  (0.55) and above  $F_{0.1}$  (0.30) for this stock.
- Recruitment is known to be variable in scallops there are no data on recruitment specific to this area.
- The size of the spawning stock biomass is unknown although it is likely to be very localised. However the relationship between stock size and recruitment for these localised patches is unknown.
- There is insufficient information to predict future stock development.

### CURRENT MANAGEMENT

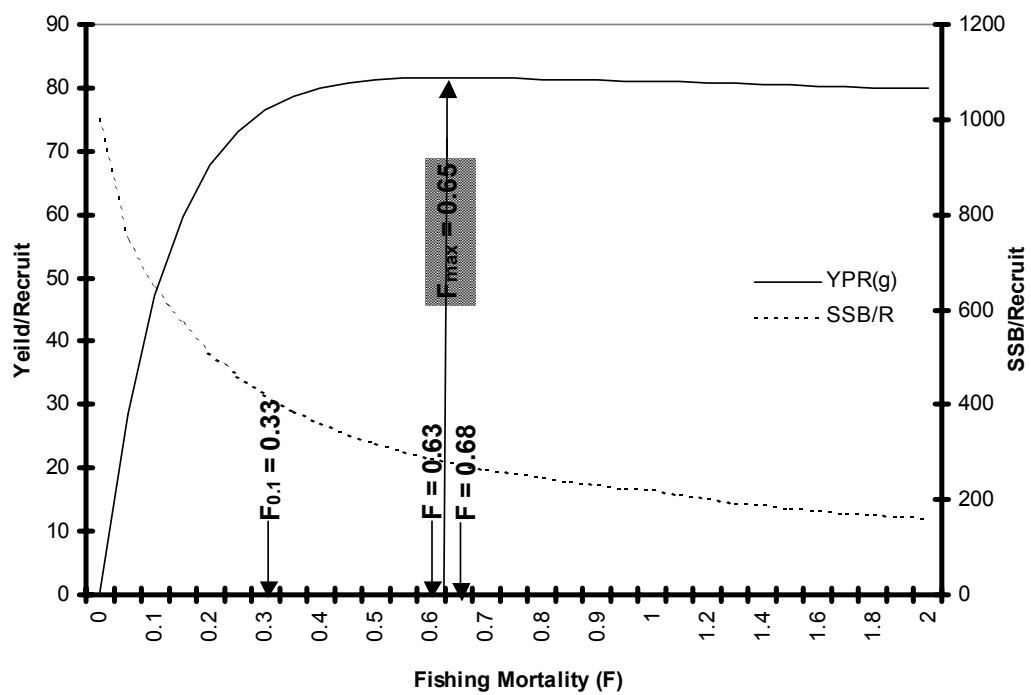
- There is currently no TAC for this stock.
- The assessment area consisted of several small localised scallop fisheries or stocklets in ICES Division VIIj.
- There are no management objectives for this stock.
- MFSD advise that management objectives should be established and a management plan should be developed for the localised for the scallop stocklets in this area.

### MFSD – ECONOMIC COMMENTS

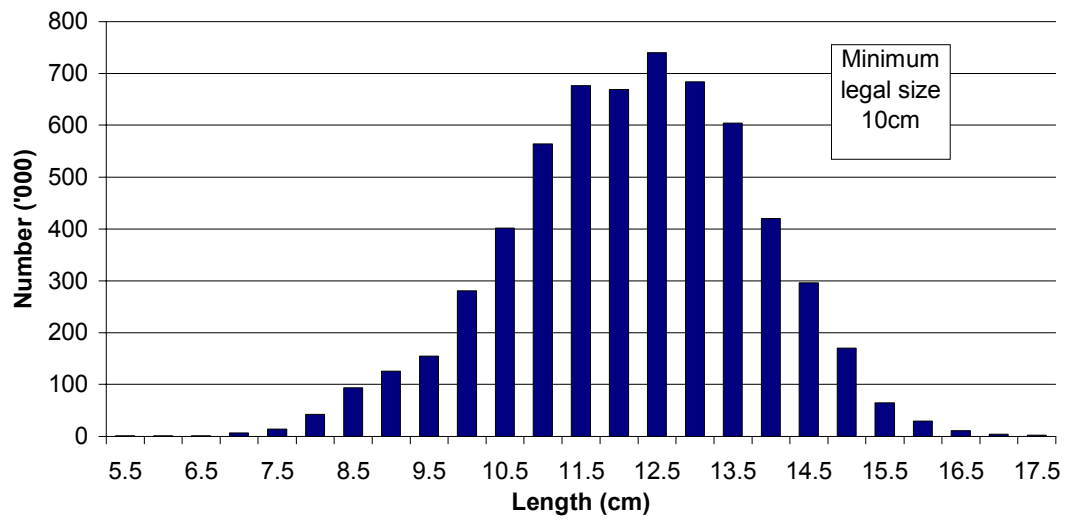
- Scallops are an extremely valuable species. Irish landings in 2001 were worth €3.8 m.

### ADDITIONAL INFORMATION

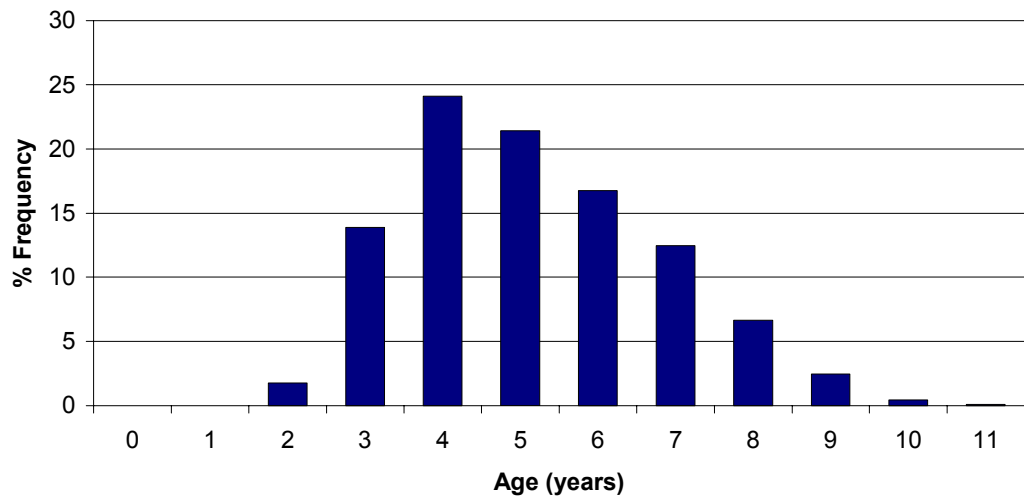
1. A preliminary catch curve assessment was carried out for this stock in 2002. There are several uncertainties due to the underlying assumptions made of most concern is possible bias due to reduced catchability of older scallops. This could mean that current fishing mortality is overestimated.
2. Total landings from VIIj in 2001 were 42 t. This is less than the recent maximum of 71 t in 1999.
3. There are serious concerns about the quality and geographic scale of landings and effort data for this stock. Any management program for this stock should involve the collection of fishery data on a geographical scale finer than ICES Statistical Rectangle.
4. Only Irish vessels exploit this scallop stocks in VIIj. These fisheries take place mainly inside our 12 mile zone. Three vessels are currently exploiting the stocklets investigated here.
5. Scallops are landed in several ports in VIIj in including Dingle, Baltimore, Castletownbere and Valentia.
6. There is an important and valuable ranched scallop fishery around Valentia Island this is currently managed by a local co-operative. BIM are currently evaluating the stock and hydrodynamics around Valentia.
7. Scallops were sampled in this area between November 2001 and May 2002 during BIM funded exploratory fishing surveys. Scallops in this area are not routinely sampled by MFSD. Sampling indicated that scallops up to 11 years were found in the catches most were between 3-7 years. The modal length of catches was 125 mm.
8. Discarding is not a problem in this fishery although there may be some incidental mortality of individuals by the dredges during operations.
9. A Thompson and Bell yield per recruit analysis and spawning biomass per-recruit was carried out using an estimated selection pattern.  $F_{\max}$  is poorly defined and the yield per recruit curve is flat topped suggesting there is little gain or loss in yield by increasing effort. Recruitment is variable in scallops and the fishery is in a developmental phase so the results should be treated cautiously. The results suggest that reducing fishing mortality by around 50% to  $F_{0.1}$  (a precautionary level of fishing mortality) results in only a 6% reduction in yield but a 50% increase in spawning stock.



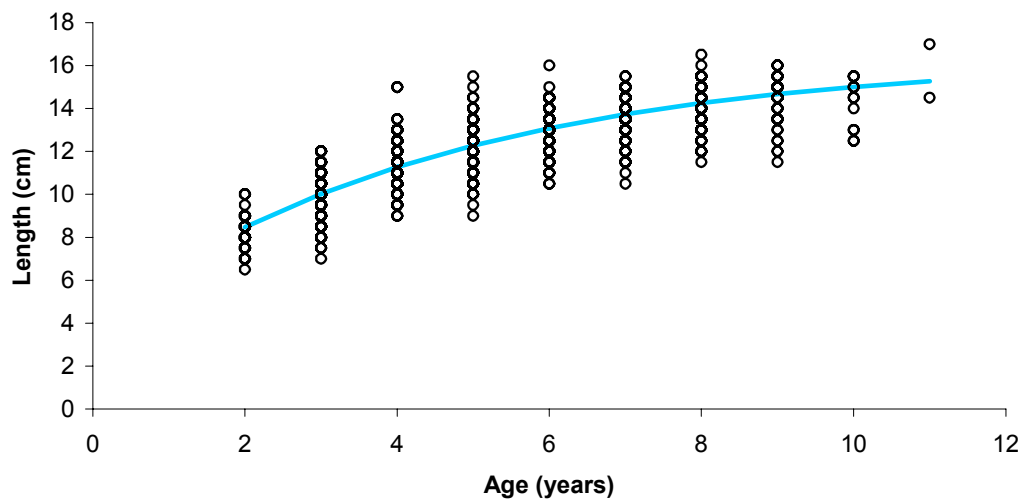
**2001 Length Distribution: Irish Catches, Scallop in VIIj**



**2001 Age Distribution: Irish Catches, Scallop in VIIj**



**2001 Size at Age: Irish Sampling, Scallop in VIIj**



# Razor clams (All coasts)

(Sub-areas VI and VII)

*Ensis spp*



Marine Fisheries Services Division

## MFSD – ADVICE

MFSD advise that management objectives should be established and a management plan should be developed and implemented in this fishery. MFSD also advises that the potential for this fishery is small; the commercial species are long lived and slow maturing and that a spat fall every year cannot be depended on. Fishing effort needs to be reduced as a matter of urgency and a range of conservation and management measures should be introduced to slow down the rate of removal of razor clam beds. Active consideration should be given to the introduction of sustainable fishing methods.

- Controls in this fishery should include closed areas and fallowing periods.
- In order to monitor the progress of the fishery a new combined logbook/gatherer's document form should be introduced and its use should be enforced.
- Methods of harvesting have evolved since the fishery began in 1997 but they should be reviewed in the interest of minimising incidental damage to juveniles and associated infauna and surface organisms.
- Alternative possibilities of harvesting by divers under a controlled regime should be considered.
- The value of razor clams fluctuates inversely with the quantities harvested and the market for them is small. Consideration should be given to restricting fishing in the interests of raising prices and to matching the supply of razor clams with demand.

## STATE OF THE STOCK

- The tonnage of razor clams landed, as recorded in the national statistics is regarded as indicative of the state of the fishery (Fig 1). Following a brief expansion in 1997, the landings are now in decline.
- Two species of razor clams contribute commercial landings in Ireland: *Ensis siliqua* on the east coast and *E. arcuatus* on the western seaboard. *E. siliqua* forms extensive beds in very fine sediments in the Irish Sea; in the Atlantic it is less abundant. *E. arcuatus* burrows into coarse sediments (*maërl*) and it forms smaller patches in the lee of rocks, reefs and

islands which protect it from the Atlantic swell.

- Both species 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 spat fall per year in the case of *E. arcuatus*. Spat falls appear to take place frequently, according to age analysis of populations on the east and west coasts. However investigations on the razor clam bed at Gormanstown, on the east coast, currently in progress, record only one spat fall in five years (Fig 2) while similar observations on *E. arcuatus* in Co Galway, reveal a spat fall in 2000, a better one a year later and a poor spat fall a year after that (Fig 3).
- Work undertaken on the recovery of the Gormanstown bed on the East coast in 1998 and 1999 suggests that the removal of *E. siliqua* was followed by the immigration of other infauna and surface fauna to the bed rather than by regeneration of the razor clam stock. Densities of *E. arcuatus* in Connemara are still reduced following a widespread mortality event in 2001 (Fig 4).

## CURRENT MANAGEMENT

This fishery is currently regulated only by EU size limit of 10 cm length and by the requirement that the waters from which razor clams are harvested conform to certain quality standards. Harvesting of razor clams by divers is prohibited.

## ECONOMIC COMMENTS

The market for razor clams is largely in Spain and demand for them is small. Consideration should be given to restricting supply in order to maintain good prices (there is an inverse relationship between the two) and, thereby, prolonging the life of the resource.

## ADDITIONAL INFORMATION

- Locally, *Ensis* spp. are frequently the most abundant bivalves. Harvesting them has been carried out by dredging and, although techniques have improved since the first blade or harrow dredges were used in the late 1990s, the technique 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 not completely quantified.
- Fishing for razor clams by dredging could more aptly

be described as mining. The harvestable proportion of the bed can be as high as 90% of the razor clam biomass and there is at present no consideration of imposing a fallowing period after harvesting and before fishing is again resumed.

- The rapid clearance of razor clam beds by dredging has had a number of consequences for the market which is largely confined to Spain. Large quantities of the animals have occasionally over-supplied the limited outlets and the price for razor clams has fallen as a result. Within Spain itself there are two market sectors. Canneries prefer *Ensis siliqua* but lose interest in about March when the animal commences spawning and loses condition. The fresh (live) market prefers smaller razor clams and *E. arcuatus* would be more suited to it.
- Diving for razor clams is currently prohibited by law but there are strong reasons for revising that prohibition, under stringent controls. 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, lessening the prospect of depuration, and resulting in its rejection by buyers.

## Sources of information

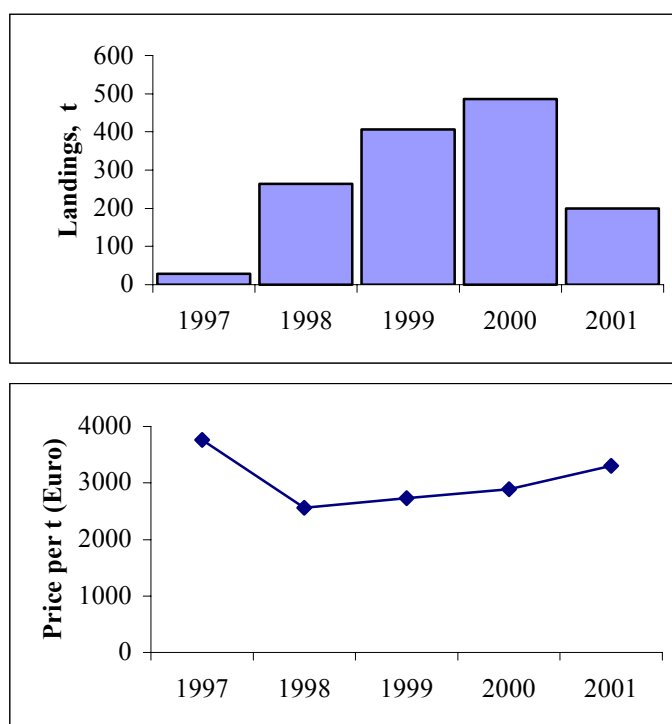
Edward Fahy and Joanne Gaffney (2001) Growth statistics of an exploited razor clam (*Ensis siliqua*) bed at Gormans-town, Co Meath, Ireland. In Coastal Shellfish – a Sustainable Resource (ed G. Burnell) Hydrobiologia. 465: 139 - 151

Edward Fahy, Mark Norman, Ronan Browne, Vincent Roantree, Nick Pfeiffer, David Stokes, Jim Carroll and Orla Hanniffy (2001) Distribution, population structure, growth and reproduction of the razor clam *Ensis arcuatus* (Jeffreys) (Solenaceae) in coastal waters of western Ireland Irish Fisheries Investigations 9: 24 pp

Edward Fahy, Maria Lyons Alcantara, Mark Norman, Ronan Browne, Vincent Roantree and Nick Pfeiffer (2002) Mortalities of *Ensis arcuatus* (Jeffreys)(Solenaceae) in Western Ireland Journal of Shellfish Research 21 (1): 29-32.

Edward Fahy, Jim Carroll, Ronan Browne, Aoife Ni Rathaille, Paul Casburn, Seamus Breathnach, Mark Norman and David Stokes (2002) A survey by hydraulic dredge of interstitial bivalves with commercial potential in Cill Chiaráin and Beirtreach buí Bays and along their connecting shoreline, Co Galway. Fisheries Bulletin 20: 23 pp.

Fig 1 Landings and average price per tonne of razor clams (mainly *E. siliqua*), 1997 – 2002.



Source: DoCMNR

Fig 2 Length frequency distributions of *Ensis siliqua* from the Gormanstown bed in four years. The samples in 1999 show the presence of 0-group animals.

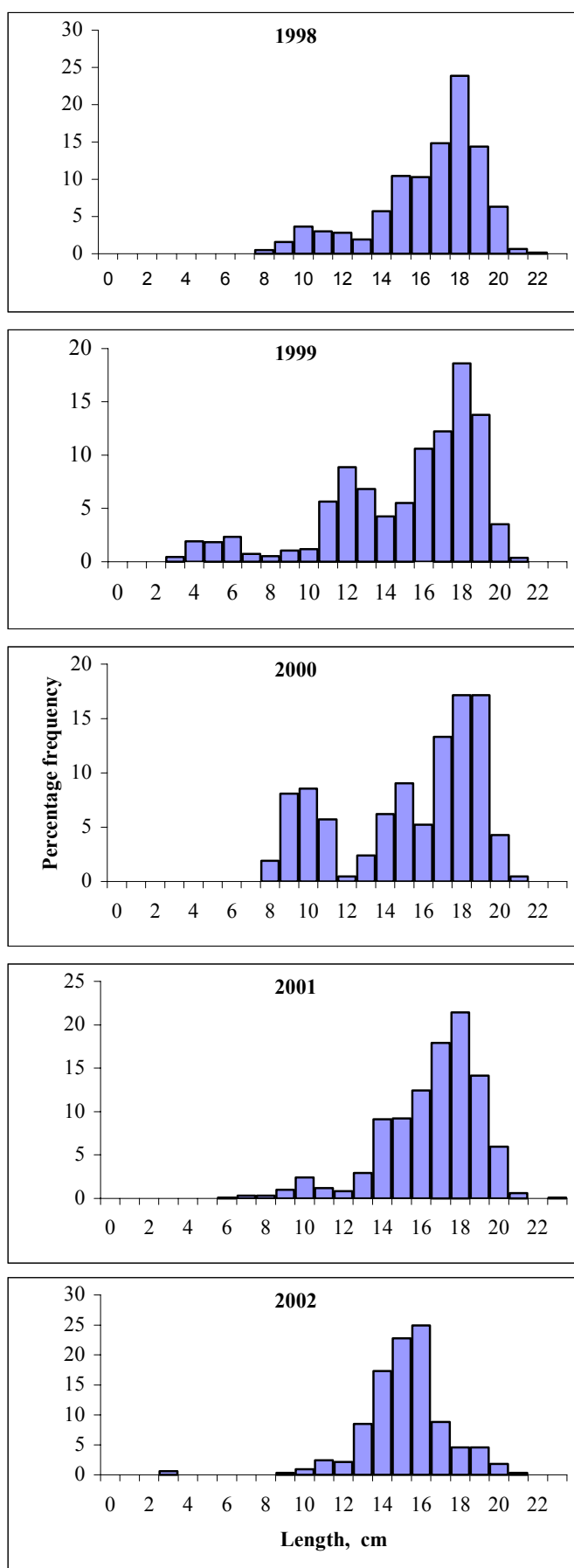


Fig 3. Length frequencies of *Ensis arcuatus* sampled in Connemara in three successive August months. The samples from 2001 indicate a strong presence of 0 group animals.

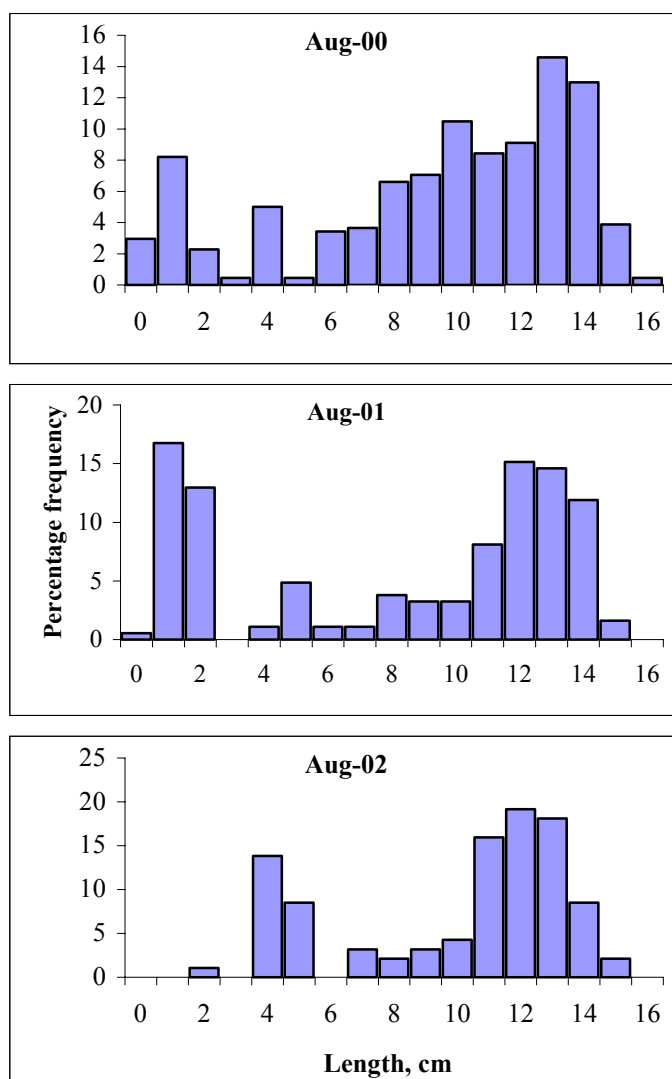
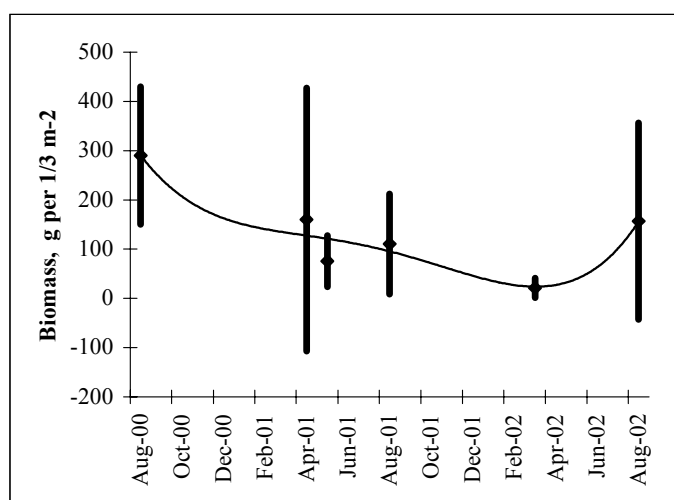


Fig 4. The biomass of *Ensis arcuatus* per  $1/3 \text{ m}^{-2}$  in a small bed in Connemara. Following an unexplained widespread mortality event in 2001, the biomass was reduced by 74% from the August before. Monitoring in 2002 confirmed there has been no recovery yet.



# Surf clams (South and west coasts)

(Divisions VIIg,j and b)

*Spisula solidus*



Marine Fisheries Services Division

## MFSD – ADVICE

**MFSD recommend that each fishery for this species should be locally regulated to ensure optimal exploitation and to prevent overworking of the bed which would result in juvenile mortalities. Because these fisheries are individually isolated and small in area, a management rotation to allow for fallowing is an attainable objective. Limited entry to fisheries of this kind will be necessary in some places.**

## STATE OF THE STOCK

There are various isolated stocks at different stages of exploitation.

## CURRENT MANAGEMENT

- A European Union size limit of 25 mm length applies to this species.
- Fisheries are small and local and they are not regulated.

## ADDITIONAL INFORMATION

1. Landings in excess of 500 t per year (approximate value €300,000) of surf clams have been made in recent years although they do not appear in the official statistics.
2. MI, in association with BIM, is currently evaluating patches of *Spisula* in Cos Waterford, Cork and Galway.
3. *Spisula* is fished using both box and hydraulic dredges.
4. The species can be abundant in coarse shell sand or disintegrating maërl. Most information has so far been collected from a patch in the Waterford estuary which has yielded several hundred tonnes of shellfish but is currently over-fished.
  - The distribution of the patch in 2001 is shown in Fig 1; the concentration of solid dots marks the heavy biomass. The optimum catches recorded by a fisherman in 2000 are shown as the open squares on Fig 1. The rapid alteration in the distribution of *Spisula* is believed to be due to a combination of heavy exploitation and the

displacement of clay upstream which is diluting the sand in which the animal lives.

- A survey of the Waterford fishery undertaken in 2001 showed a strong representation of *Spisula* aged 1+ (Fig 2). A yield per recruit curve (Fig 3) indicated fishing effort greater than  $F_{max}$  in 2001.
- Growth curves for length and weight of *Spisula* in Waterford estuary are shown in Fig 4. At 25 mm length (the size limit), the animals within this patch would be approximately 3+. Animals of this age, numbering more than 200 per kg, are of little commercial value. Highest prices are obtained for *Spisula* averaging 7 years and older.
- Unlike the other recently developed bivalve fishery, for razor clams, *Spisula* could be managed on a rotational basis.



Fig 1. The location of a *Spisula* bed close to Hook Head, Waterford estuary. The concentration of solid dots mark heaviest biomass in 2001 while the open squares indicate the distribution of good fishing the year before.

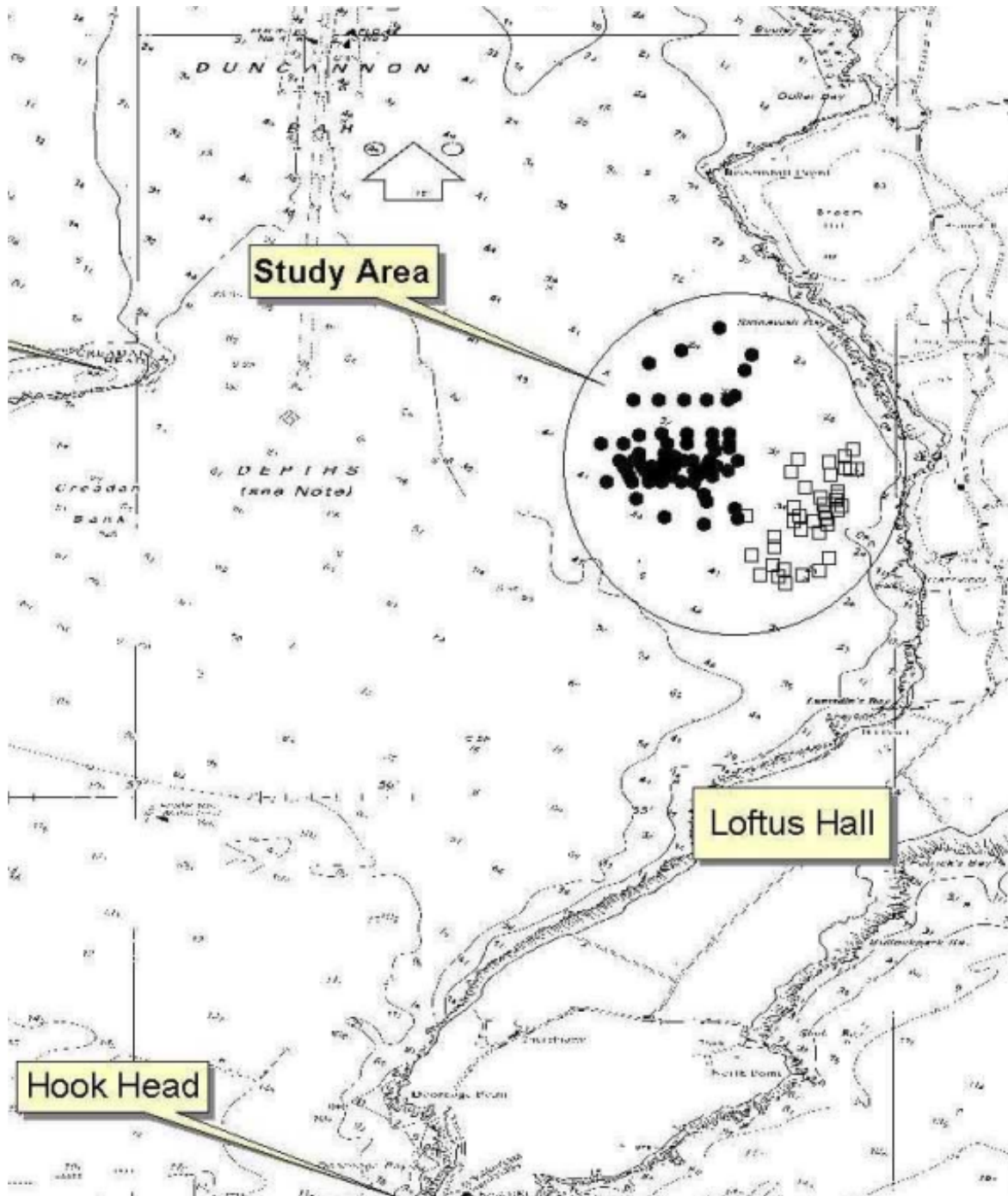


Fig 2. Representation of age groups in the Waterford *Spisula* bed, sampled by grab, in 2001.

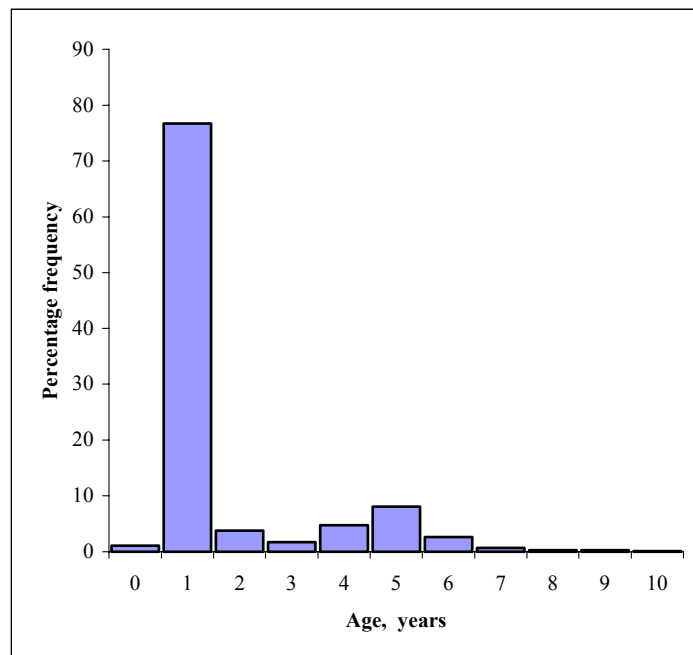


Fig 3. Yield per recruit curve for *Spisula* in the Waterford bed in 2001.

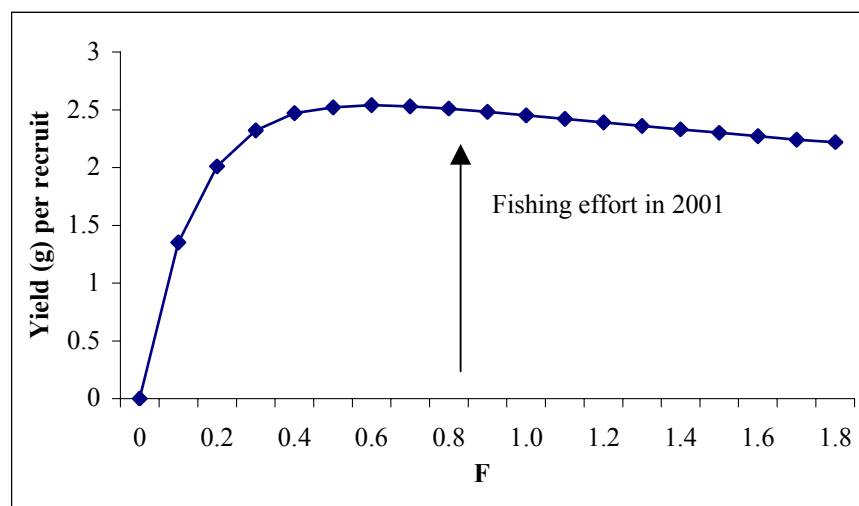
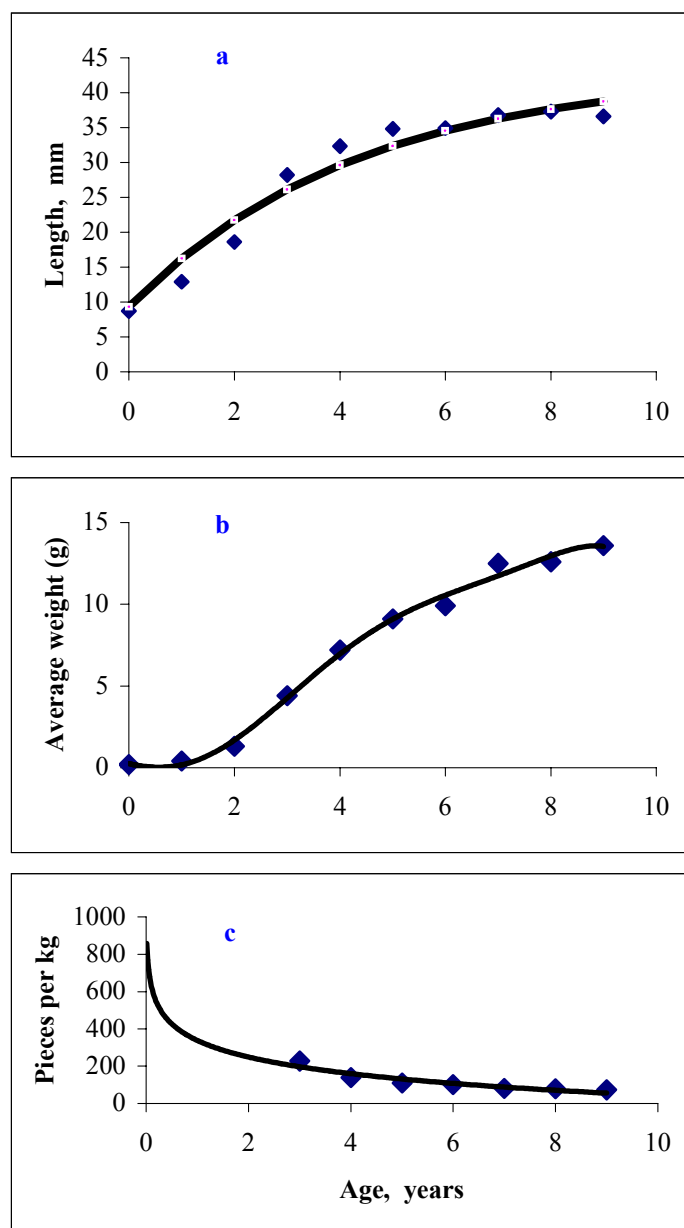


Fig 4. Aspects of the growth and value of *Spisula* from the Waterford bed in 2001: a, Length at age; b, Weight at age; c, Number of *Spisula* per kg,



# Bass (All coasts)

## (Sub-areas VI and VII)

*Dicentrarchus labrax*



Marine Fisheries Services Division

### MFSD – ADVICE

**MSFD recommend that all existing bye-laws and regulations protecting bass should be continued indefinitely. These include a size limit, bag limit, prohibition of the commercial capture of bass and prohibition on the sale of bass from Irish waters and a close season to coincide with spawning. MFSD also recommends active enforcement of the regulations.**

### STATE OF THE STOCK

- Major recruitments occurred in 1989 and 1990 and these fish still make up a substantial proportion of the rod catch (Fig 1)
- Over the long term, the stock(s) is still at a low level, as indicated by an index to the performance of the rod fishery (Fig 2).
- The 1989 and 1990 year classes are in decline but fish from the mid-1990s are now entering the landings (Figs 1 and 3). It is as yet unclear from scale analyses of anglers' catches and of seized consignments of illegally captured fish in 2000 and 2001 whether these fish come from the 1996 year class only or whether they were spawned between 1995 and 1997 inclusive.
- In addition to analysing the year class composition of anglers' landings, MFSD, in association with the Central and Regional fisheries boards, undertakes a survey of juvenile bass annually. This year, 2002, was the seventh successive survey year and it provided evidence of the heaviest densities of 0-group bass to date (Fig 4). The lengths achieved by this year class in August were also among the largest obtained in the series to date (Fig 5). The size of 0-group fish can be critical in the event of a very cold winter which only the larger individuals survive.

### CURRENT MANAGEMENT

- Bass is managed as an angling species and it is the only marine fish to be so managed. The behaviour of bass makes them vulnerable to inshore netting and it is appropriate that this fishery, which is regarded as being in a depleted state, should not be opened to commercial exploitation.
- Regulations for the conservation of bass include a size limit of 40 cm, a close season during spawning, prohibition of commercial fishing and of the sale of bass from Irish waters and a bag limit of two fish per angler per day.

### ADDITIONAL INFORMATION

1. Bass are slow growing and later maturing. The species, which is a warm water one, is close to its northern limits in the water around Ireland. Bass reach the size limit of 40cm at which they enter the angling fishery at approximately 5+ to 6.
2. The past year has seen two important developments in our understanding of Irish bass. Declan Tobin who has been associated with these surveys, completed his Ph. D. on bass genetics in Galway. He concludes that bass in the north east Atlantic is a panmixia, essentially one stock with at least occasional exchange of fish between Britain and Ireland.
3. At first sight - though not necessarily - contrary to this finding, the first ICES study group on bass which convened in Brest, France, earlier this year, concluded that there was little intermixture of British and Irish bass. Bass tagged in either country have not been recaptured in the other's fishery. Available evidence suggests that bass stay close to shore. Most of the commercial catches from the waters surrounding Ireland can be attributed to the U.K. (Divisions VIIa,f and g) while less than one tonne annually was reported by France and the Basque country combined as originating from Divisions VIIa,b and VIIb,c,j and k.
4. Stock divisions for bass tentatively proposed by the study group are as set out in Fig 6; they have distinctive recent histories.
  - The North Sea- Channel stock appears to be expanding as a result of large recruitments, notably in 1989 and possibly because bass, being a top predator, is occupying the niche once held by declining cod populations. In Ireland, on the other hand, bass has not expanded to the same extent and the larger recruitment of 1989 appears to have been relatively less effective in increasing the stock. These fish are now declining in the landings.
  - Although bass in Ireland and Britain appear to have similar occasionally good brood years, there are differences between them and in Ireland the 1990 year class appears to have been as strong as its predecessor, a pattern which was observed only locally in the U.K.
4. The accumulating evidence would suggest that bass is an inshore species whose biology requires national rather than international protection and management. Whereas the North Sea-Channel Stock is expanding and is capable of supporting a commercial pair-trawl fishery, Irish bass are closer to the limits of their geographical range and, possibly for this reason, are less able to withstand commercial exploitation.

#### Sources of information

Report of the Study Group on Sea Bass. Brest, France, 11-15 March 2002.

Fig 1. Year class composition of scales from bass landed in Ireland by anglers and seized from illegal net catches. The black columns indicate the 1989/90 year classes while the hatched column identifies bass of the 1996 year class.

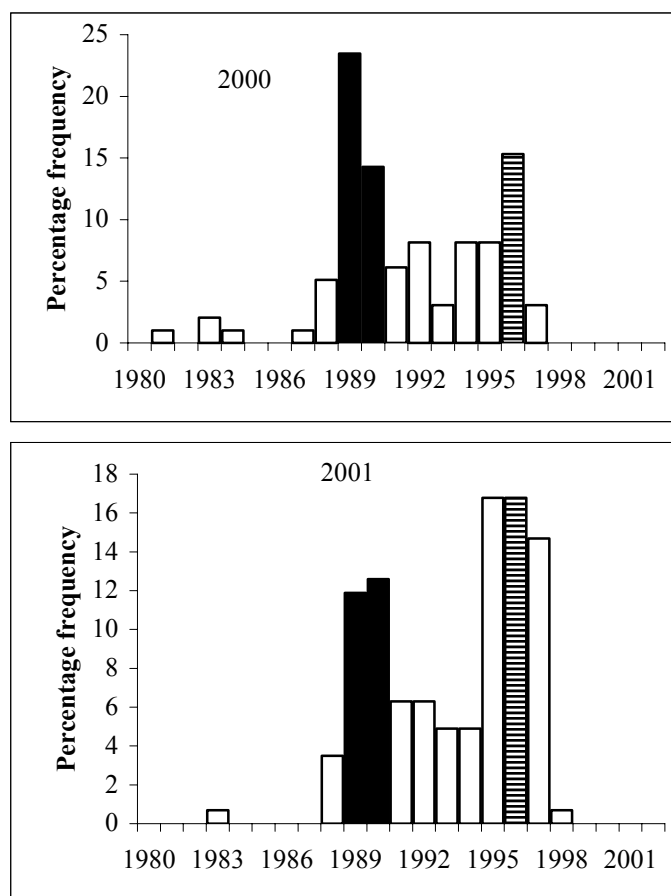


Fig 2. A record of bass caught per angler day from the Cork Angling Club, 1963 to 2001 inclusive.

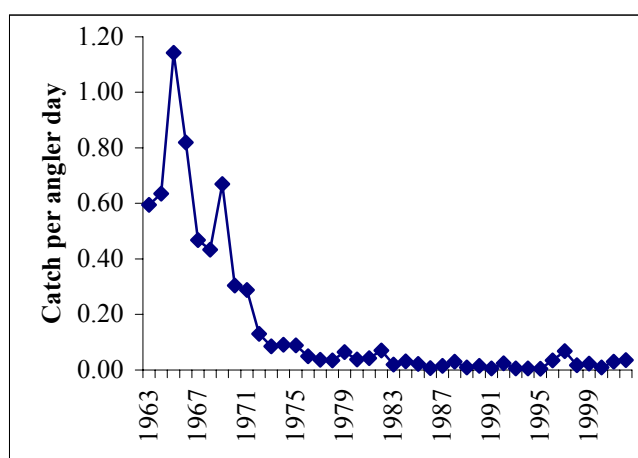


Fig 3. Bass catch per angler day from the Cork Angling Club, 1990 – 2001 inclusive (from Fig 2) showing the contribution of fish from the 1989/90 and 1995-97 year classes.

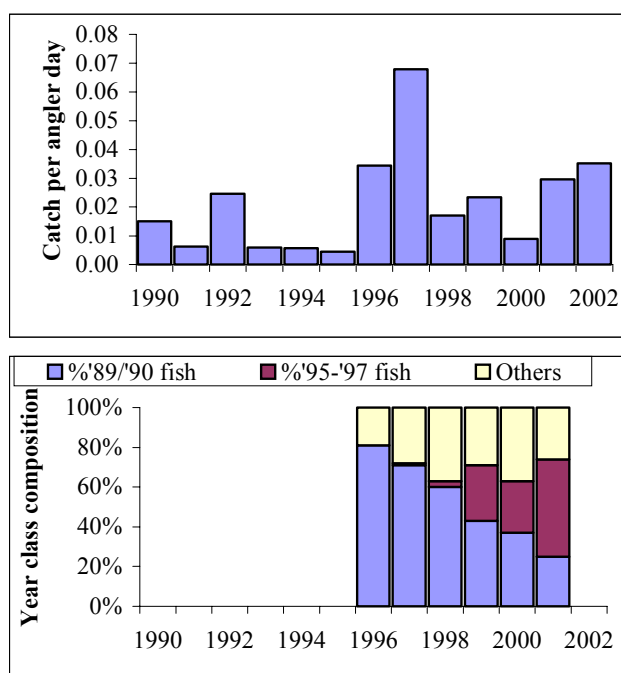


Fig 4. Densities of 0-group bass in August, 1996 – 2002; mean values  $\pm$  1 s.d.

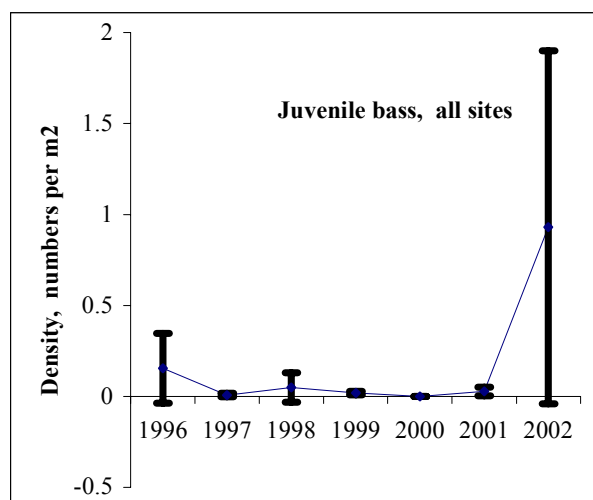
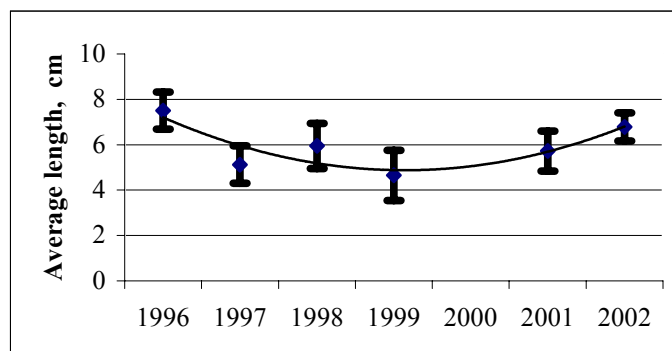
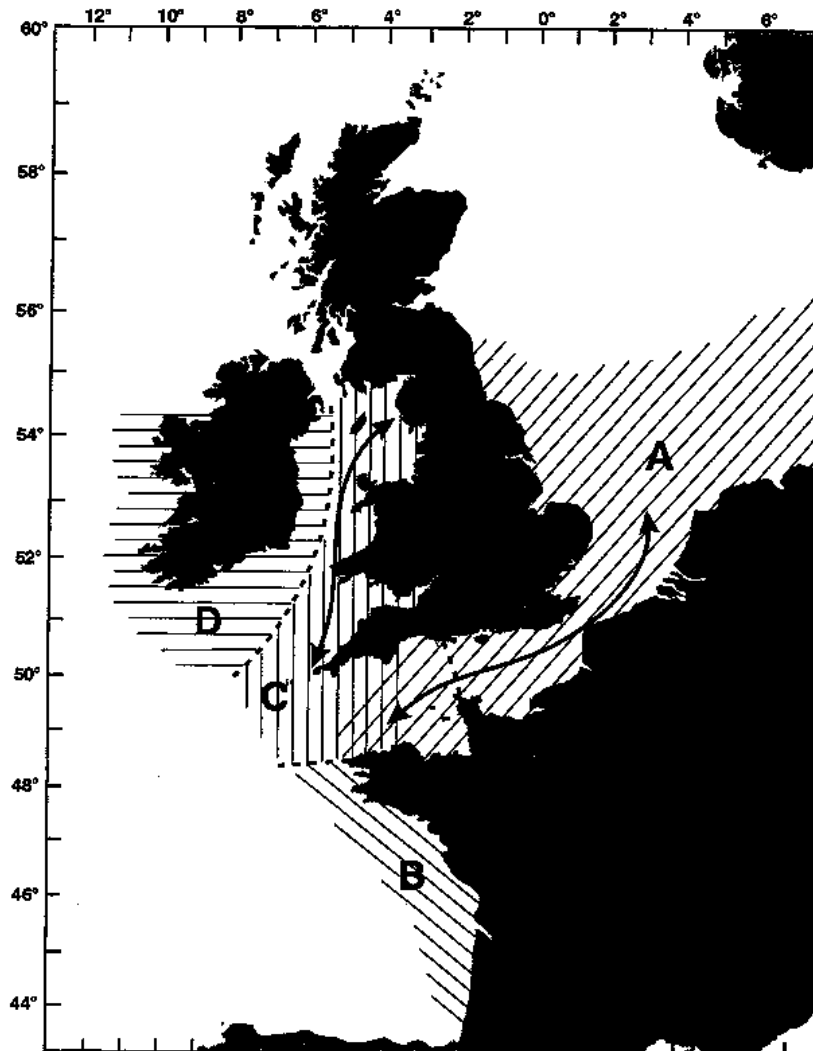


Fig 5. Mean length ( $\pm$  1 s.d.) of 0-group bass at St Mary's Point in August, 1996 – 2002; trend line fitted.



**Fig 6. Tentative stock divisions of bass in the north east Atlantic:**

- A: North Sea – Channel;
- B: Biscay;
- C: UK, west coast;
- D: Ireland;



# Conger eel (All coasts)

(Sub-areas VI and VII)

*Conger conger*

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*Marine Institute*  
*Foras na Mara*

*Marine Fisheries Services Division*

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## **MFSD – ADVICE**

**Consideration should be given to whether developing a directed commercial fishery for this species (as opposed to a recreational fishery) is the best way to exploit conger eel.**

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## **STATE OF THE STOCK**

The state of the stock is unknown.

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## **CURRENT MANAGEMENT**

There are no management measures for this stock.

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## **ADDITIONAL INFORMATION**

- Conger eel is captured in the trawl fishery and in pots baited for large crustacean species. Conger is an important target of the recreational angling fishery. A long-line fishery directed on conger in inshore waters, commenced in the mid 1990s.
- Conger eel is taken at relatively smaller size in trawls fishing offshore. Larger individuals, some of the oldest possibly having returned from spawning, occur close inshore (Fig 1).
- Landings by a combination of N.E. Atlantic countries (U.K., Spain, France, Belgium and Portugal) in the period 1988 to 1999, peaked in 1996 and tended downwards after that (Fig 2).
- Landings to Ireland rose more steeply from the mid-1990s, coinciding with the commencement of a long-line fishery targeting the species. Since 1998 landings to Ireland have been declining (Fig 3).
- First sale price for conger has fluctuated at between 50 and 90 cent per kg. Recorded landings of conger eel in 2001 amounted to 252 t valued at €171,861.

### **Source of information**

*Biology of the conger eel in Irish waters* by Sandra O'Sullivan March 2002 Unpublished PhD. National University of Ireland, Cork.



Fig 1. Length frequency distributions of conger eel from inshore and offshore waters (O'Sullivan, 2002).

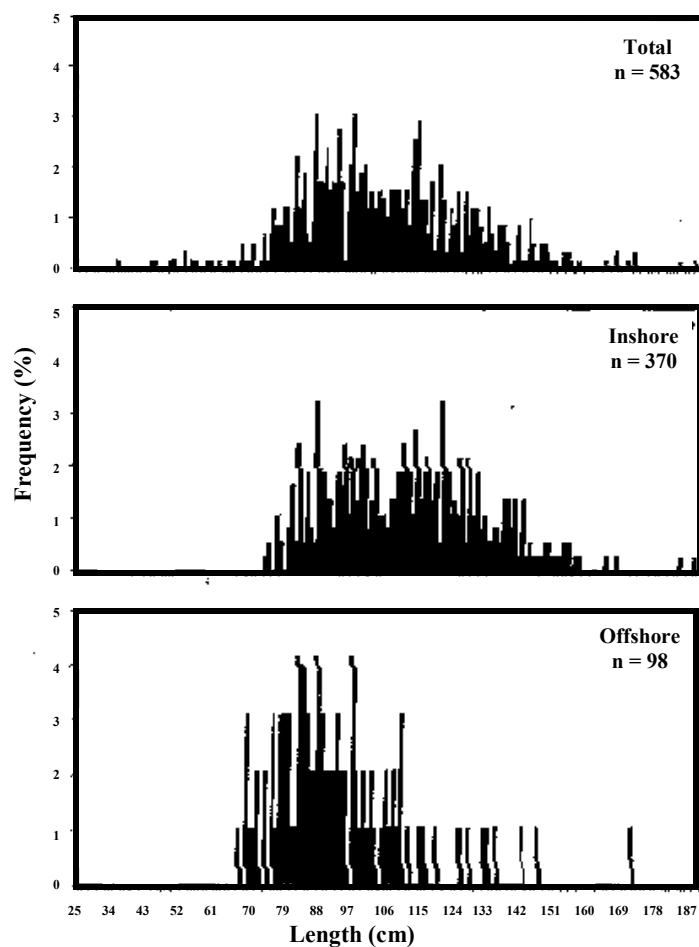


Fig 2. Landings (t) by North East Atlantic countries (France, Spain, U.K., Brussels and Portugal), 1988 – 1999 (Source, FAO).

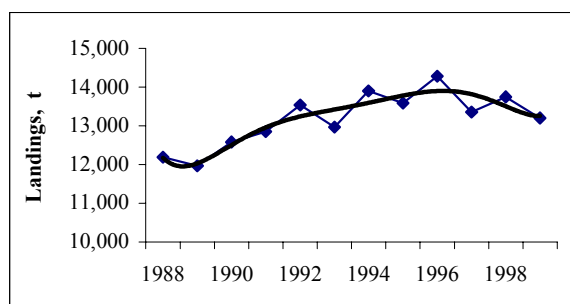
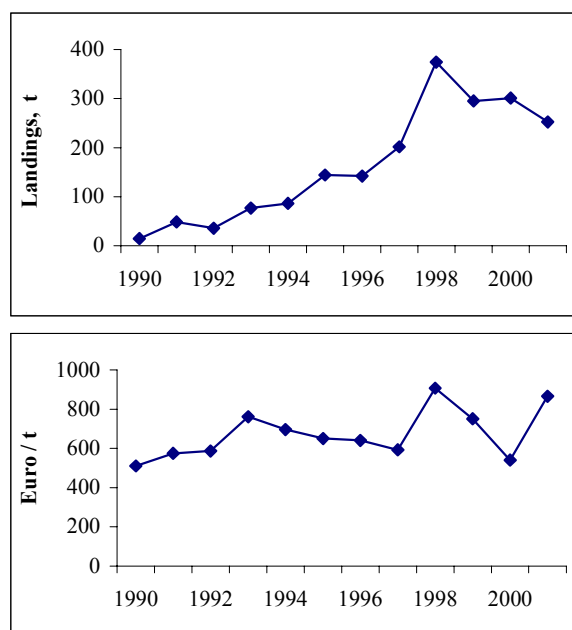


Fig 3. Weight (t) and value (Euro per tonne) of conger eel landed into Ireland, 1990 – 2001 (Source: Department of Communications, Marine and Natural Resources).



# Periwinkle (All coasts)

(Sub-areas VI and VII)

*Littorina littorea*



Marine Institute  
Foras na Mara

Marine Fisheries Services Division

## MFSD – ADVICE

A size limit should be established and enforced in a way which ensures undersized animals are released before sale. Consideration should be given to establishing a close season at those times 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

- Annual landings of periwinkle fell from 2,400 tonnes in the 1970s to 1,600 in the following decade. They increased again in the 1990s but have tended slightly downward since mid-decade.
- Wholesalers report a decline in the quality of landings, indicating too many small animals are being gathered.

## CURRENT MANAGEMENT

This is an open access fishery. The only regulation which applies to it is the EU directive on shellfish hygiene (91/492).

## ADDITIONAL INFORMATION

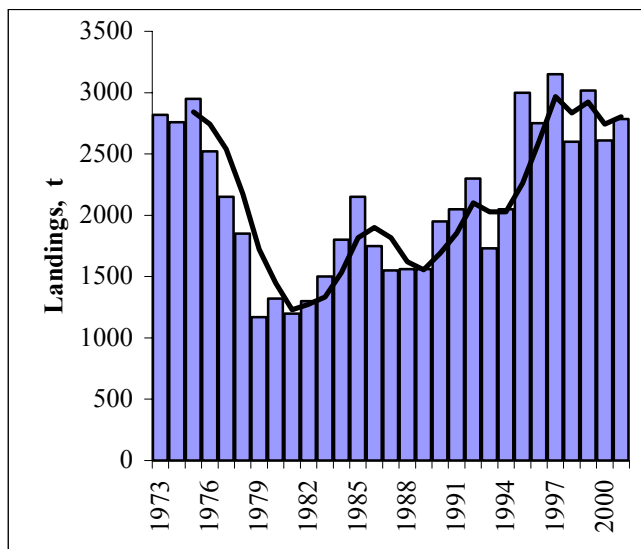
- The periwinkle fishery had an estimated first sale value of €2.76 million in 2001.
- Periwinkles are gathered on virtually all Irish coasts to supply an export trade to the United Kingdom, Belgium, the Netherlands, France and Spain. A recent survey attributed the source of periwinkle exports to the following areas in Ireland:

Area 1: Donegal, Leitrim, part Sligo.	3 %
Area 2: part Sligo, Mayo, Galway, Clare.	68
Area 3: Limerick, Kerry, Cork.	19
Area 4: Waterford, Wexford.	3
Area 5: Louth, Dublin.	7

### Sources of information

As assessment of the potential for the sustainable development of the edible periwinkle, *Littorina littorea*, industry in Ireland. By Valerie Cummins, Susan Coughlan, Orla McClean, Niamh Connolly, John Mercer and Gavin Burnell. Marine Institute, 2000.

Fig 1 Landings (tonnes) of *Paracentrotus lividus* from 1972 to 2001, three year moving average superimposed. Source: DoCMNR.



# Purple sea urchin (All coasts)

(Divisions VIa, VIIb,j)

*Paracentrotus lividus*



Marine Fisheries Services Division

## MFSD – ADVICE

Harvesting of this species should only be by special permit, referring to a specific and detailed location, issued after considering the status of the stocklet and specifying the amount to be harvested.

## STATE OF THE STOCK

- Landings of *Paracentrotus lividus* declined from 375 tonnes in 1976 to 0.7 tonnes in 2000 (Fig 1). In 2001 2.9 t [valued at €7,415] were landed.
- The species is widely regarded as depleted and possibly locally extinct; tidal pools which held this species in the recent past do not support it now.
- The extent and status of sub-tidal populations is not known.

## CURRENT MANAGEMENT

The ban on diving for shellfish has provided some protection to this species which is, however, vulnerable to collection from tidal pools.

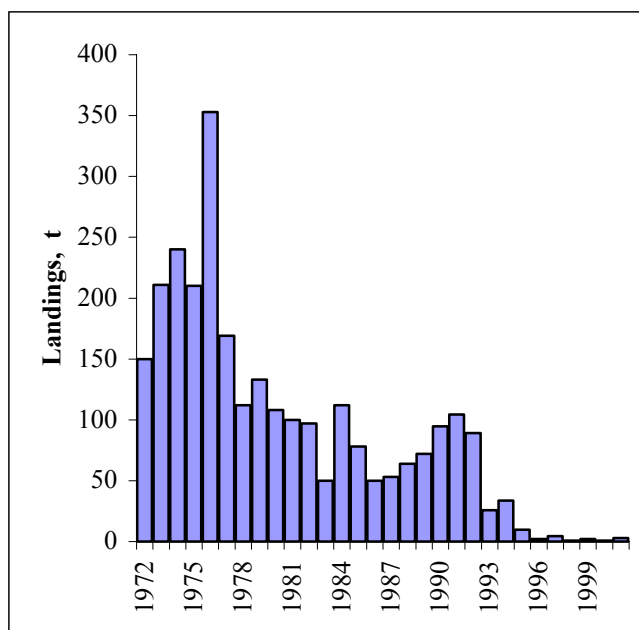
## ADDITIONAL INFORMATION

- This species is universally regarded as vulnerable to over-exploitation and slow to regenerate its numbers from depleted stocks. Attempts are being made in Ireland and elsewhere to rear it artificially for human consumption.
- In Ireland it has been omitted from S.I. No 372 of 2001 – Wildlife (Fish and Aquatic Invertebrate Animals) (Exclusion) Regulations, 2001 which has the effect of declaring certain species to be outside the provision of the Wildlife (Amendment) Act, 2000. Excluded species are those which are being or are capable of being commercially exploited. Thus *Paracentrotus lividus* is no longer regarded as a commercial species. However, a more pro-active approach to its conservation would be appropriate.

### Sources of information

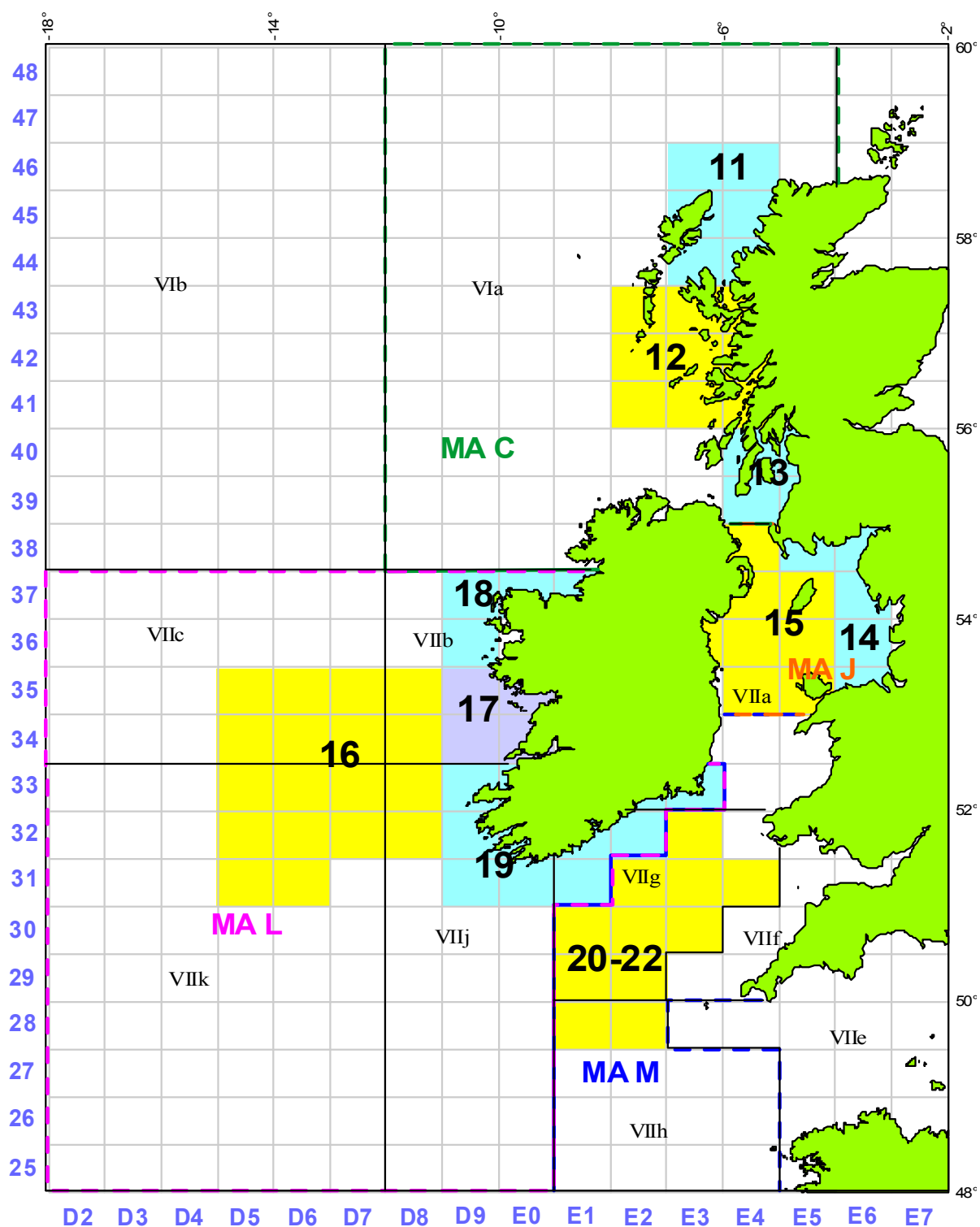
Landings statistics from DoCMNR.

Fig 1 Landings (tonnes) of *Paracentrotus lividus* from 1972 to 2001.



# Appendix I

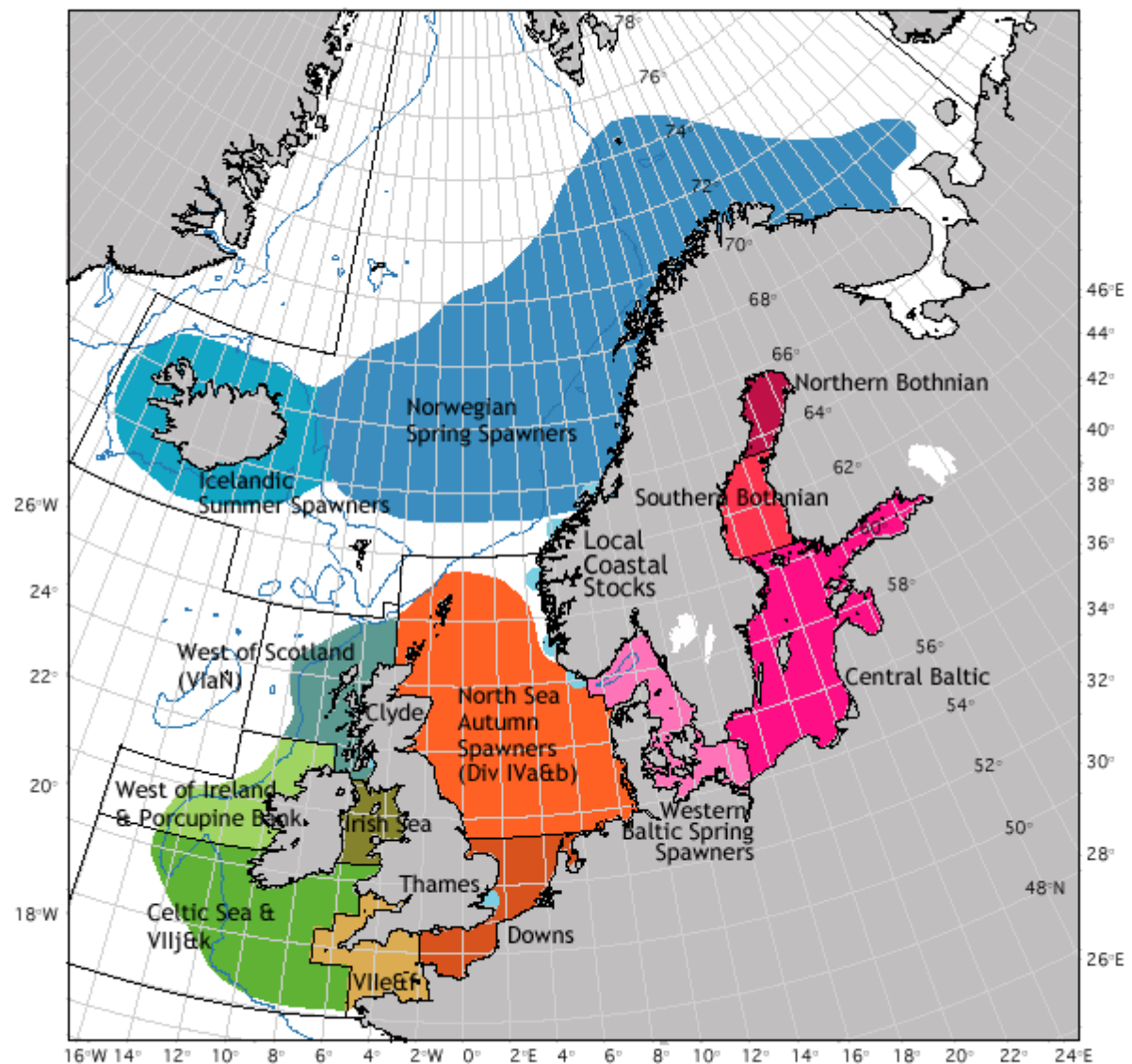
## *Nephrops* Functional Units (FUs) and Management Areas (MAs) around Ireland



# Appendix II

## North East Atlantic Herring Assessment and Management Units

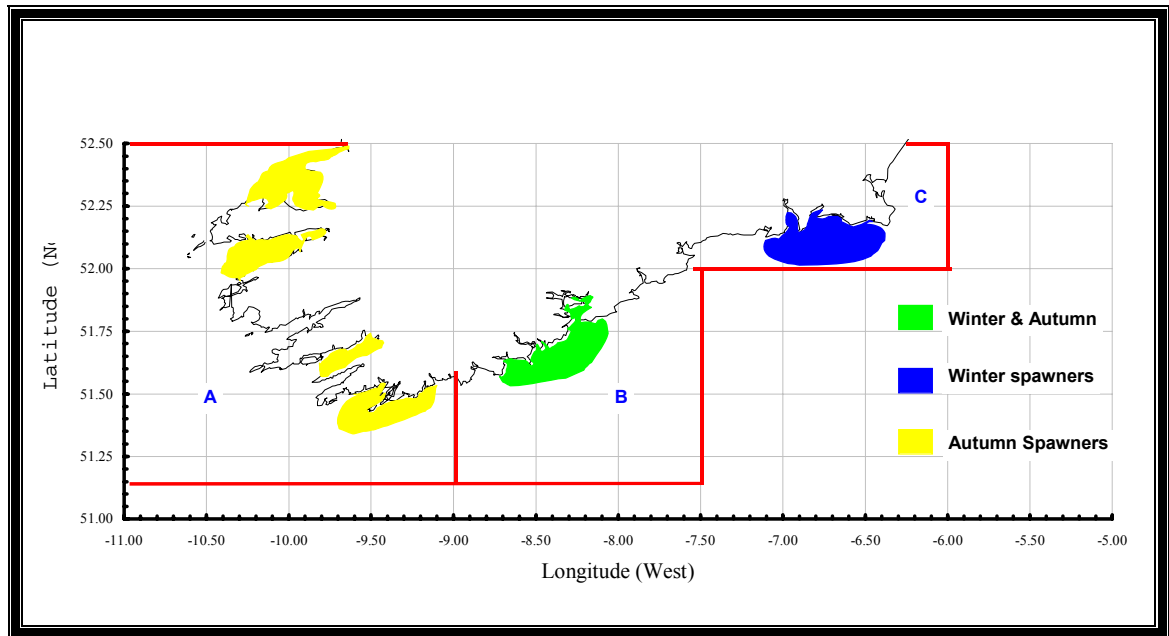
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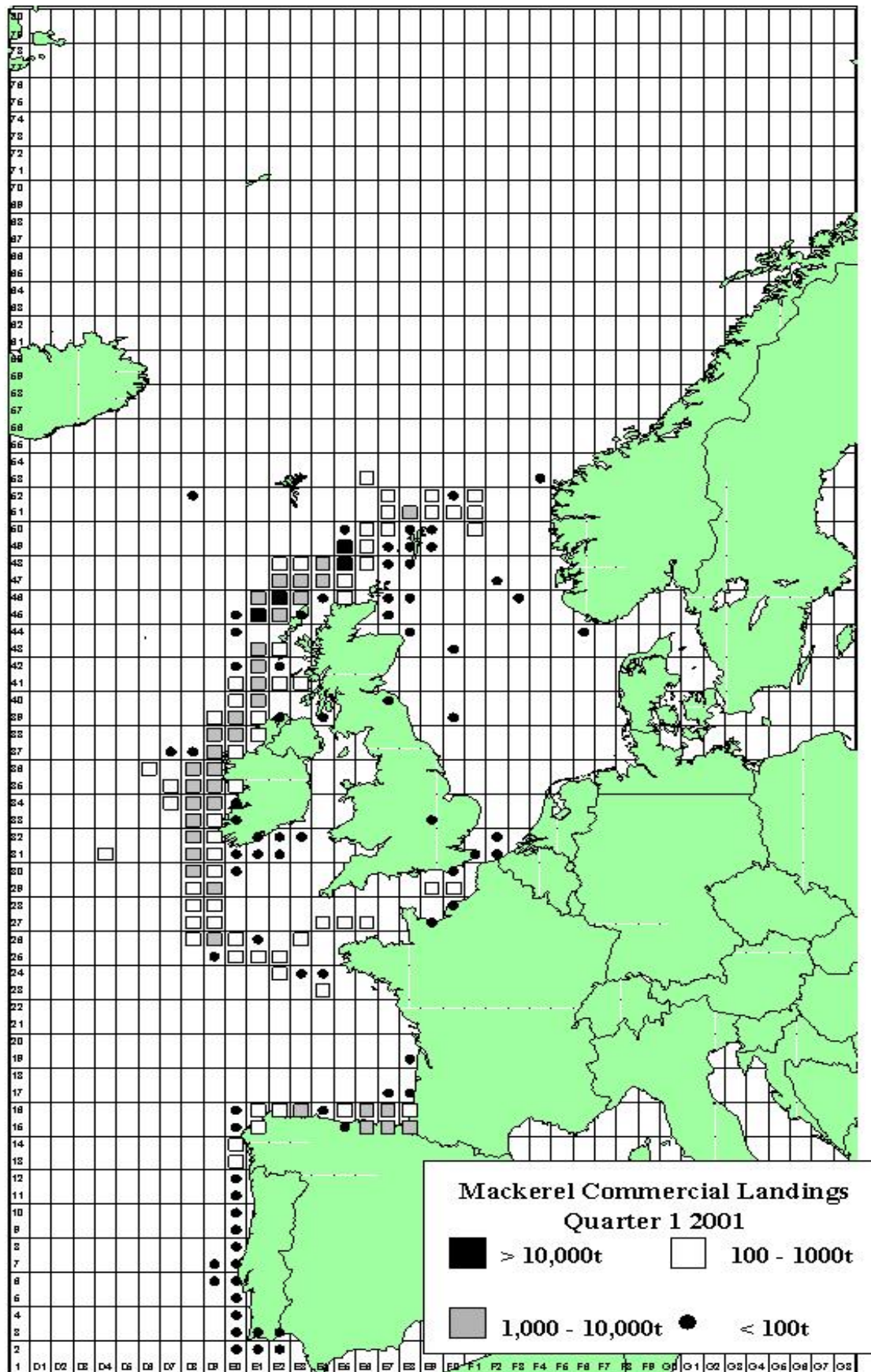
# Appendix III

## Herring Spawning boxes off the South coast.

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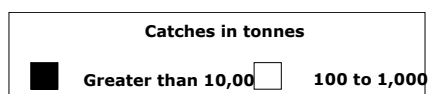
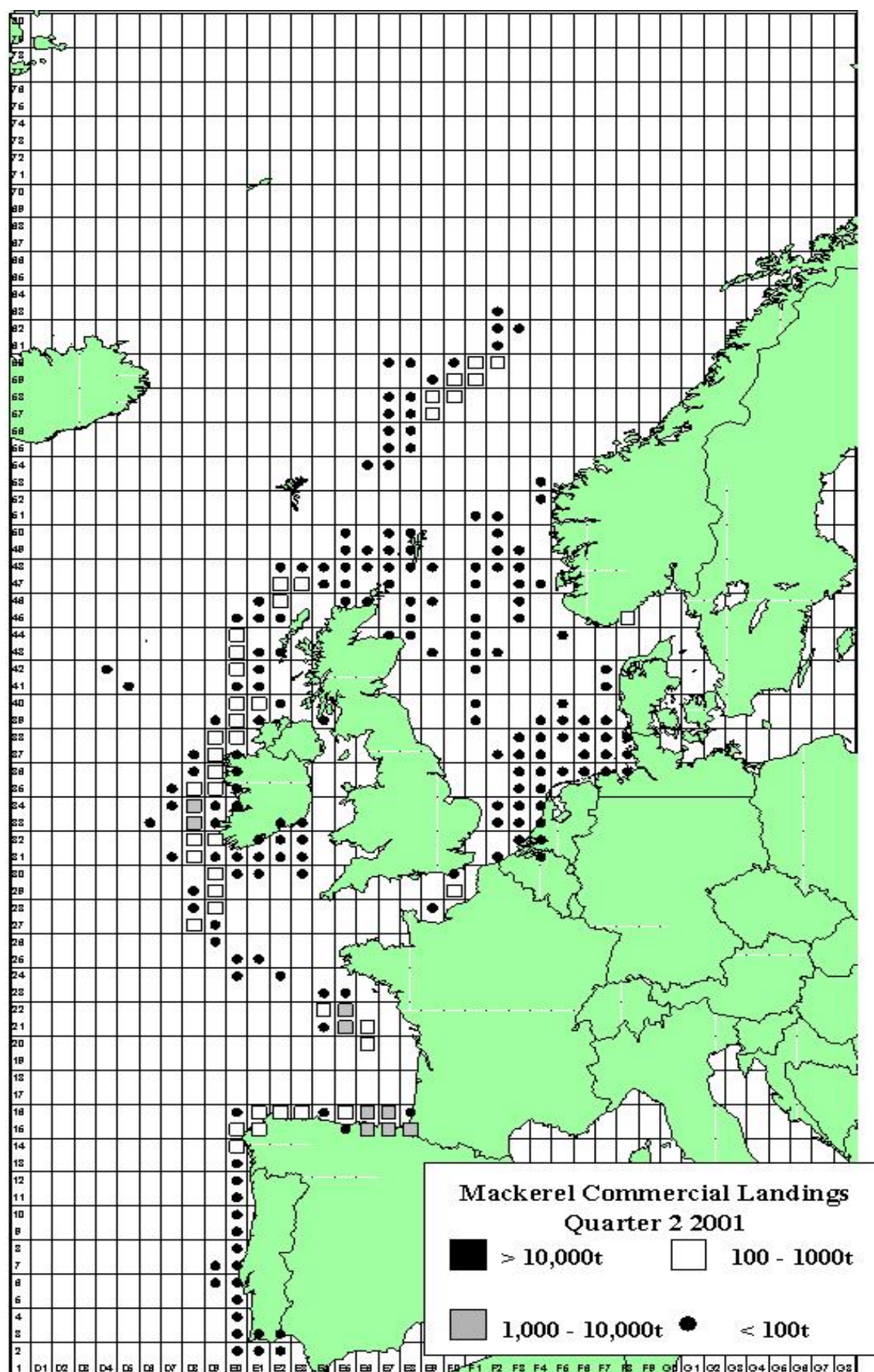


## Appendix IV



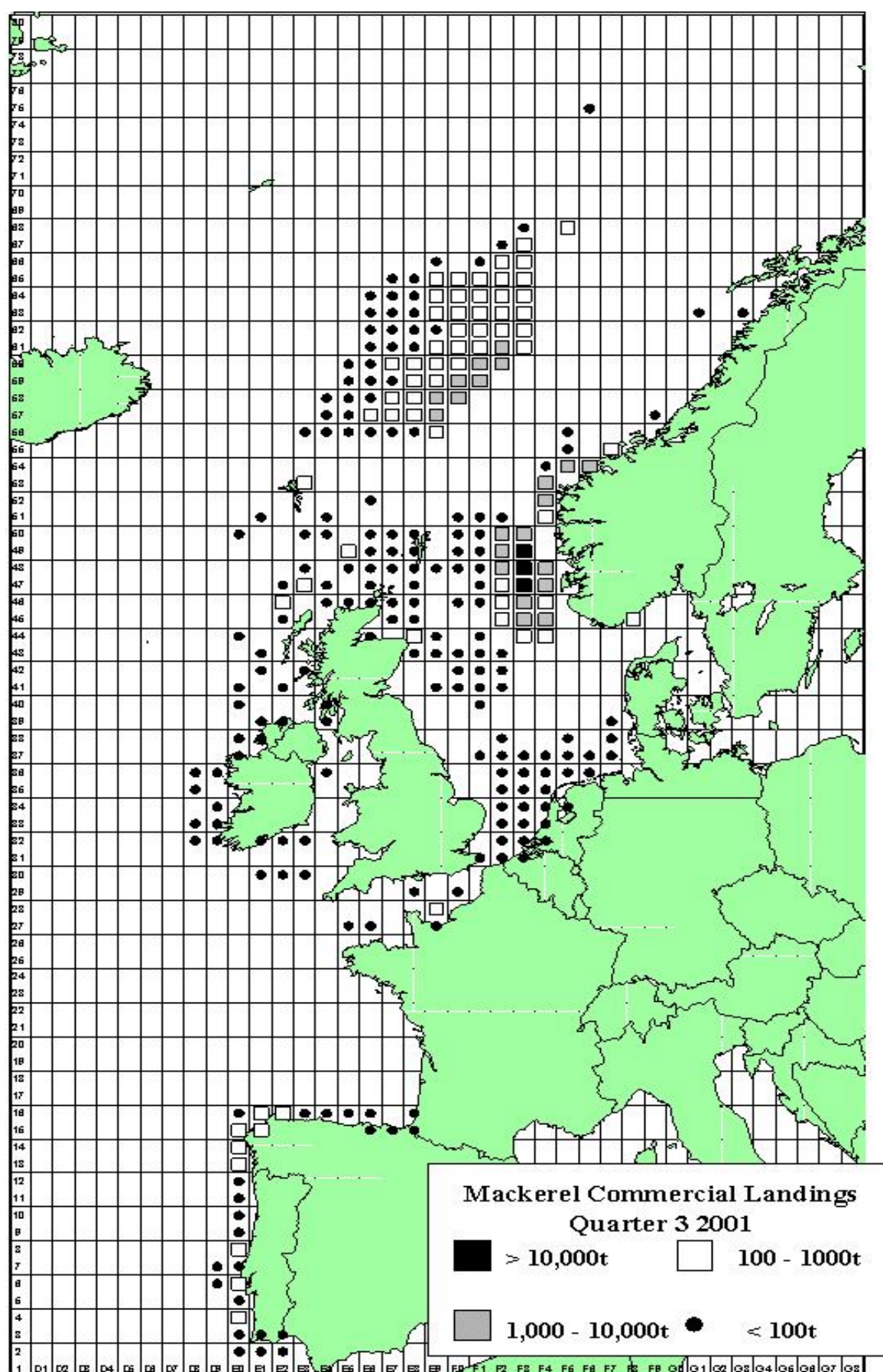


## Appendix IV

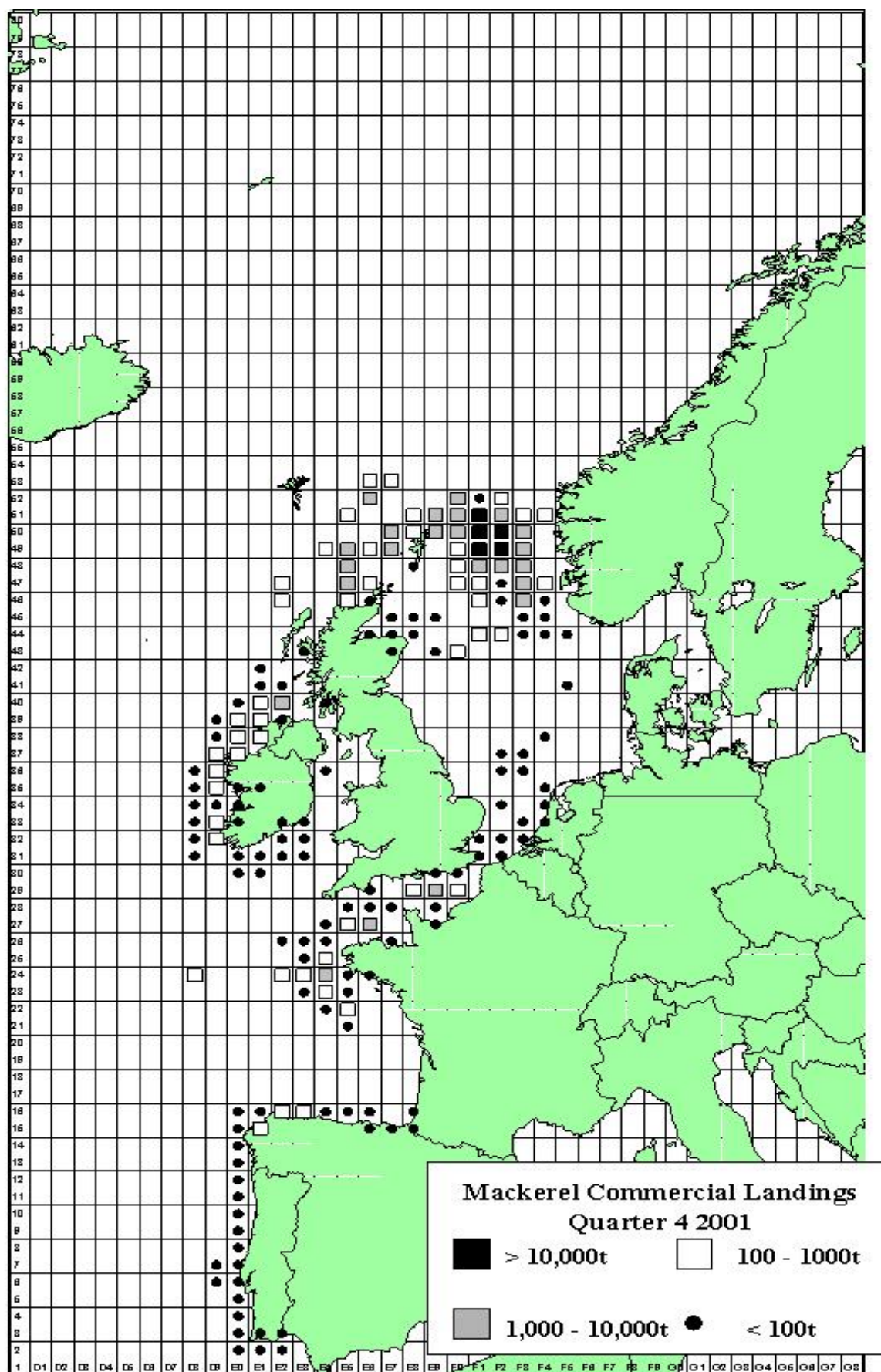




## Appendix IV

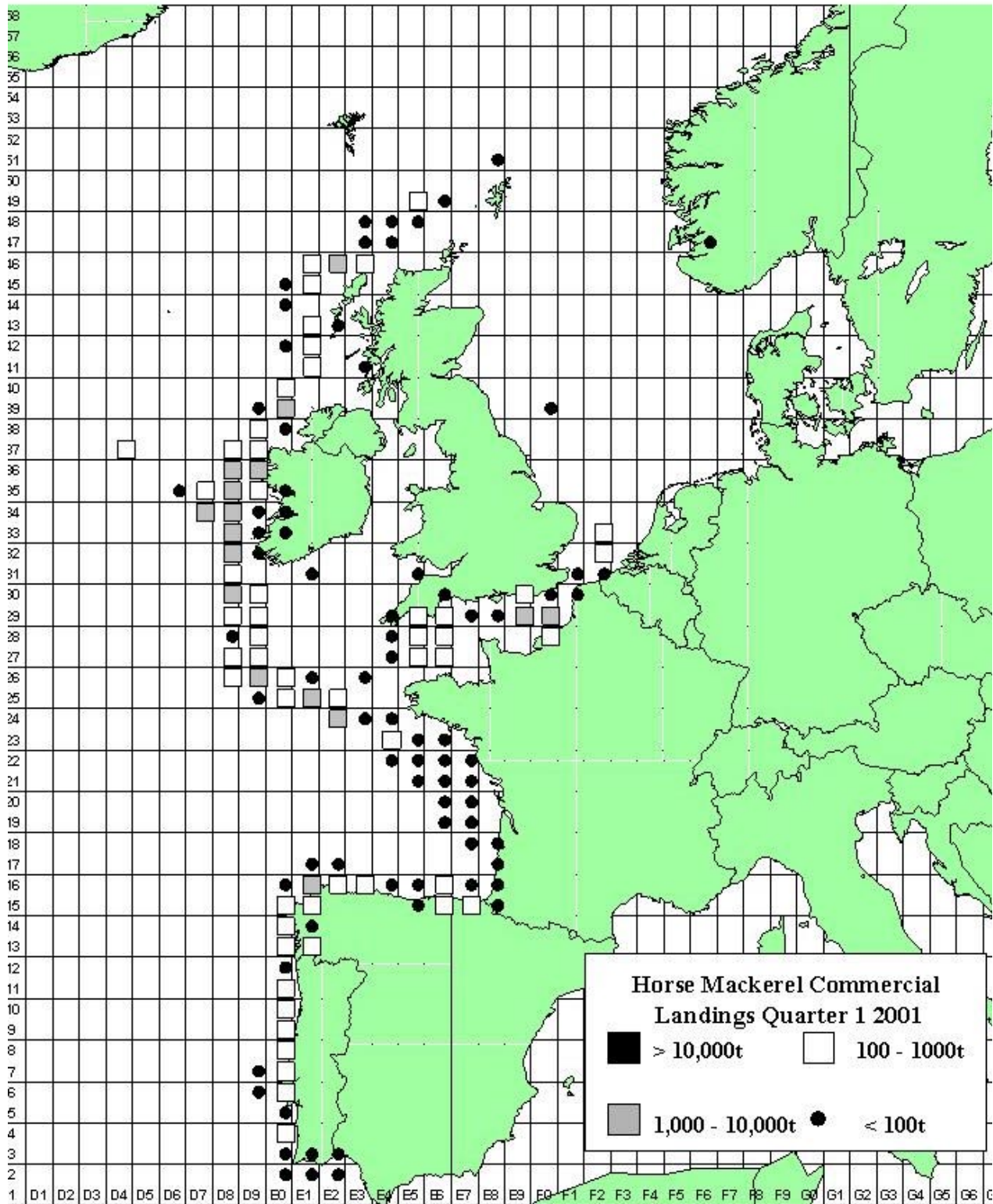


## Appendix IV

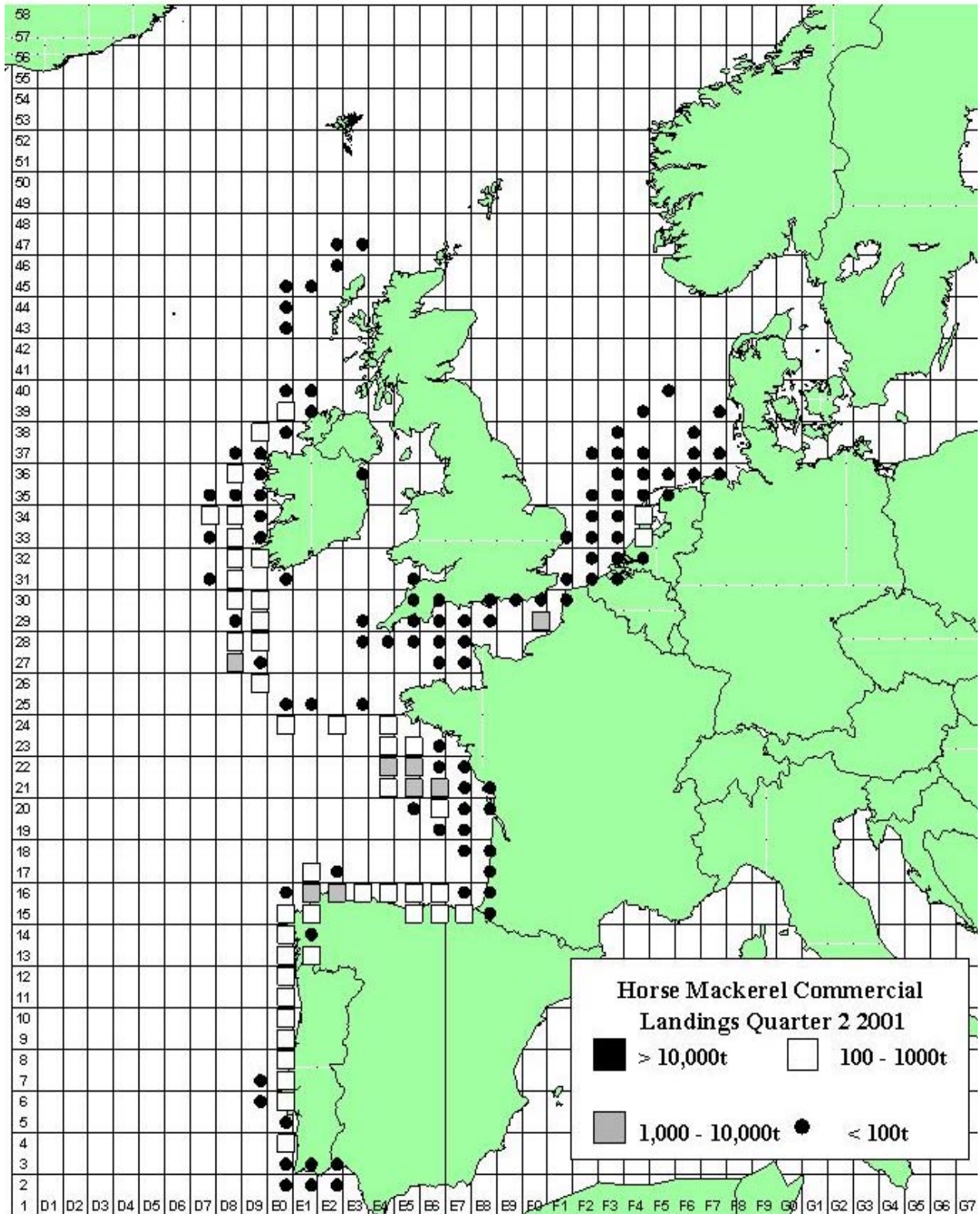




## Appendix V

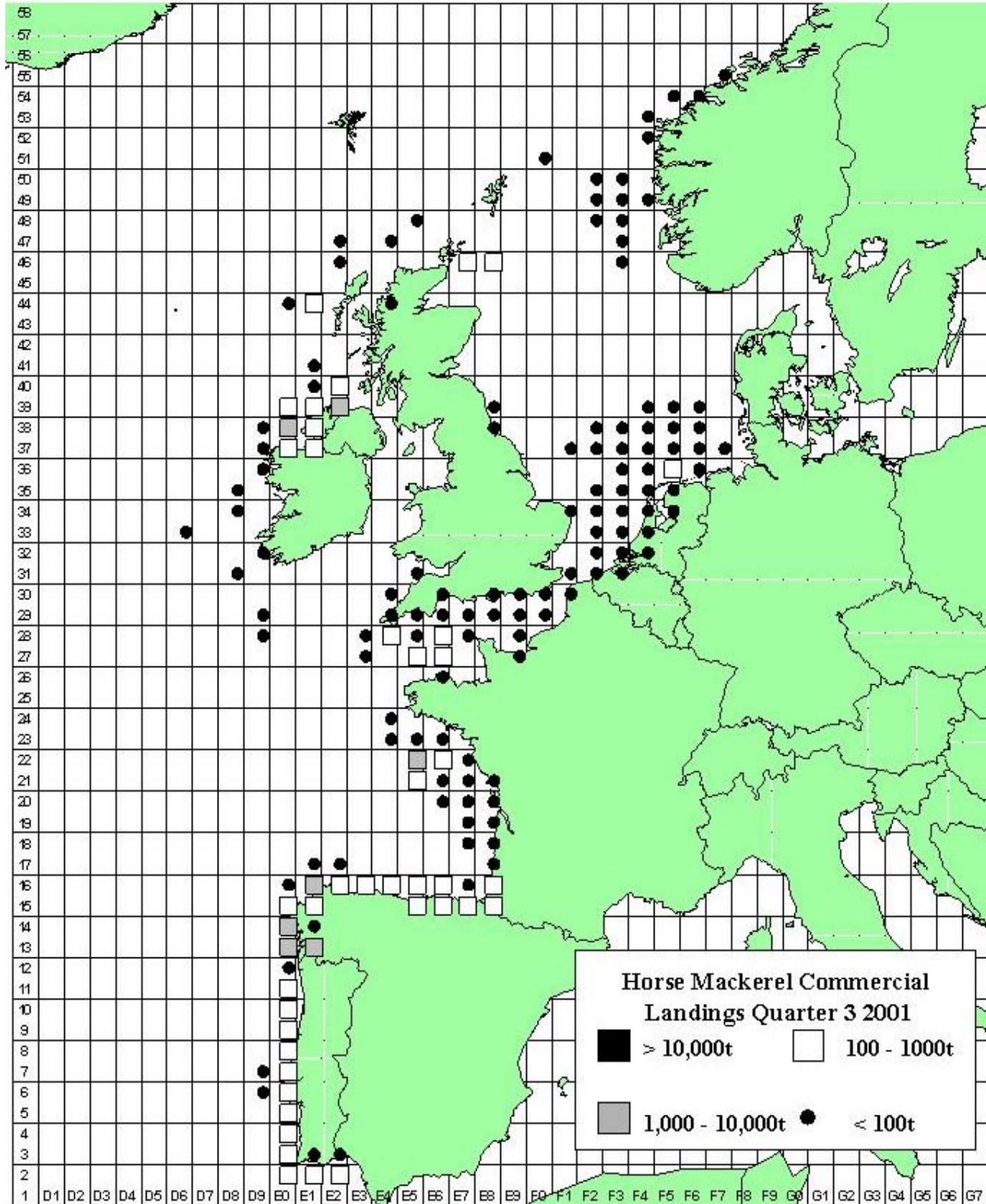


## Appendix V

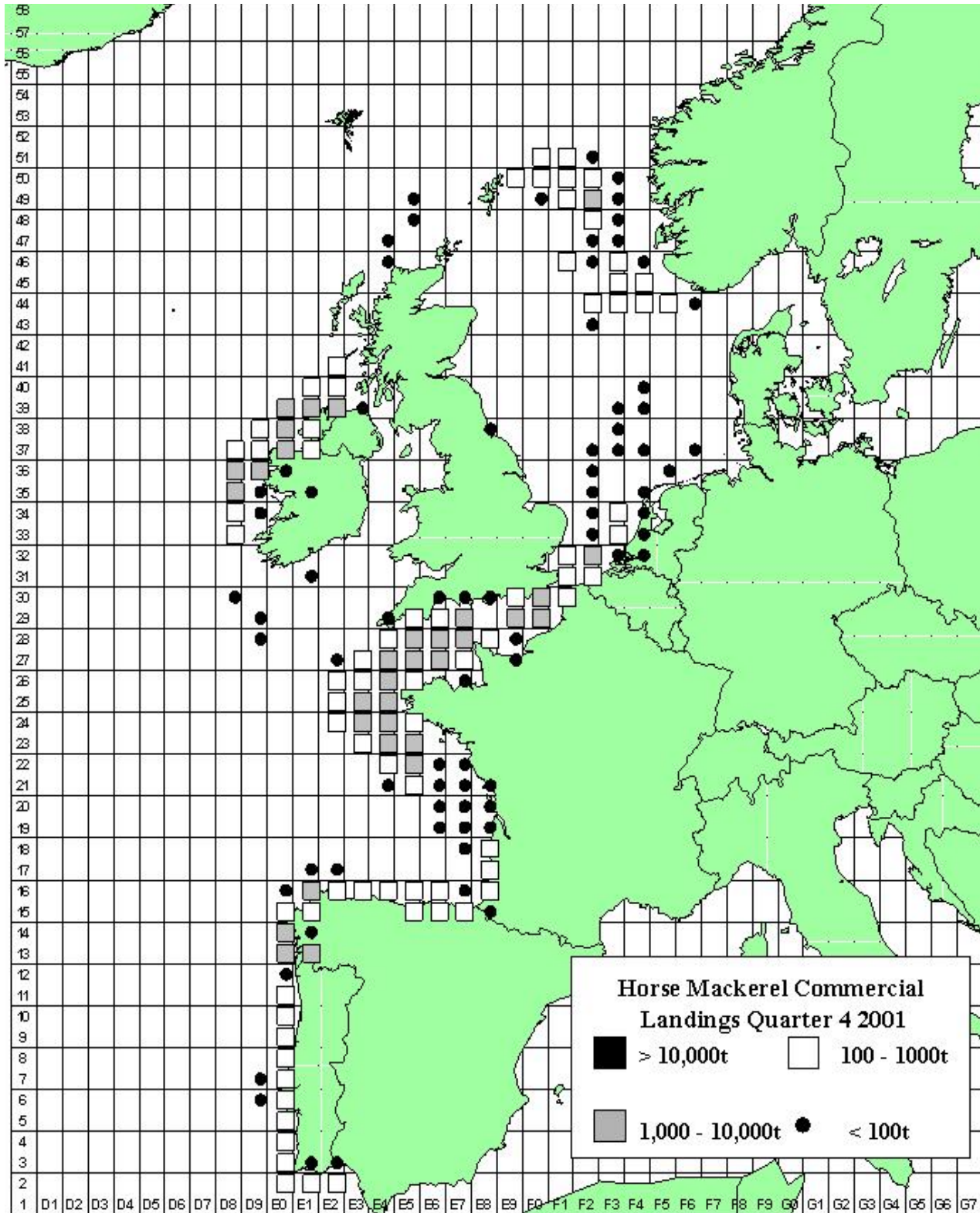




## Appendix V

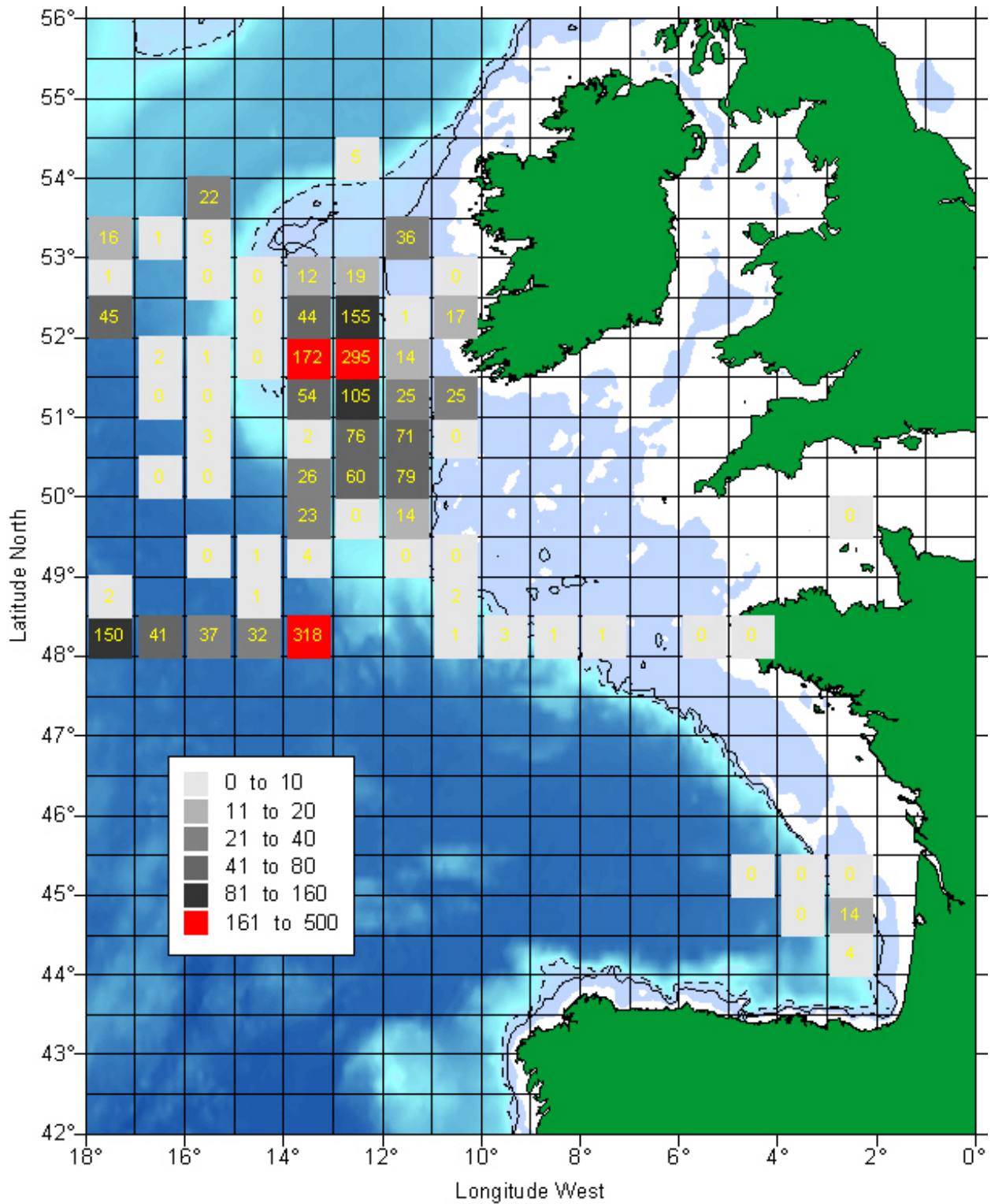


## Appendix V



## Appendix VI

Albacore Tuna Landings by Irish Vessels in 2001. (Total Landings 2,000 t)





## Appendix VII

### EU Member States shares of the 2002 TAC's

COD	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	GRE
I,II <sup>(1)</sup>	16,355	245			1,976	1,813		7,666	2,205	2,205			245
Vb,VI,XII,XIV	4,600	1,035	7		68	730		2,760					
VIIa	3,110	2,017	43			117	11	922					
VIIb-k,VIII,IX,X <sup>(2)</sup>	8,700	977	383			6,573	55	712					

<sup>(1)</sup> Norwegian & Greenland waters.

<sup>(2)</sup> May not be fished in the waters under the sovereignty or jurisdiction of Spain or Portugal

HADDOCK	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	14,100	1,535 <sup>(1)</sup>	31		37	1,505		10,992					
VII,VIII,IX,X <sup>(2)</sup>	9,300	2,067 <sup>(3)</sup>	103			6,200		930					
ad hoc VIIa	1,300	563	21			94		622					

<sup>(1)</sup> of which, no more than 1,393t may be fished in Vb,VIIa.

<sup>(2)</sup> May not be fished in the waters under the sovereignty or jurisdiction of Spain or Portugal.

<sup>(3)</sup> of which, no more than 563t may be fished in VIIa.

HAKE	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,VII,XII,XIV	15118 <sup>(1)</sup>	834	139			6,882	90	2,717	4,456				

<sup>(1)</sup> Within an overall TAC of 26,980 tonnes for the northern stock of hake

HERRING	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
I,II (Atlanto-Scandic)	73,840	6,670	30	25,750	4,510	1,110	9,210	16,460	80	80	9,540	400	
Vb,VIIaN,VIIb	35,700	5,393			3,991	755	3,991	21,571					
VIIaS,VIIbc	14,000	12,727					1,273						
VIIa N	4,800	1,250						3,550					
VIIghjk VIIaS	13,000	11,235			144	802	802	17					

MACKEREL	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,VII,VIIIabde,XII,XIV	345,012	73597 <sup>(1)</sup>			22,079	14,721	32,198	202,397	20				

<sup>(1)</sup> of which, 22,400t may be found from 1 January to 15 February & 1 October to 31 December 2002 in EC waters of ICES Division IVa.

PLAICE	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	1,728	630				48		1,050					
VIIa	2,400	1,364	88			38	27	883					
VIIbc	180	144				36							
VIIIfg	680	209	126			227		119					
VIIhjk	970	424	61			121	243	121					

SOLE	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	125	100						25					
VIIa	1,100	134	543			7	172	244					
VIIbc	80	65				15							
VIIIfg	1,070	33	669			67		301					
VIIhjk	650	293	54			108	87	108					

WHITING	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	3,500	1,029			15	299		2,157					
VIIa	1,000	576	3			34		387					
VIIb-k	31,700	8,814	309			19,020	155	3,402					



## Appendix VII

### EU Member States shares of the 2002 TAC's

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<b>SAITHE</b>	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	14,000	425			948	9,417		3,211					
VII,VIII,IX,X	8,710	2,450	20			4,900		1,340					

<b>HORSE MACK.</b>	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Ila,IV	49,400	1,950	80	33,630	2,530	50	5,450	4,960			750		
Vb,VI,VII,VIIIabde,XII,XIV	143,000	33,763		12,975	10,371	6,853	49,479	14,026	14,163	1,371			

<b>MONKFISH</b>	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	4,770	477	171		196	2,110	165	1,468	183				
VII	18,600	1,410	1,719		192	11,030	223	3,345	683				

<b>MEGRIMS</b>	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	4,360	565				1,932		1,367	495				
VII	13,350	2,210	361			4,861		1,914	4,005				

<b>NEPHROPS</b>	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI	11,340	153				92		11,072	23				
VII	17,790	6,561				4,326		5,836	1,067				

<b>POLLACK</b>	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	1,100	155				527		403	15				
VII	17,000	1,298	529			12,177		2,964	32				

<b>BL.WHITING</b>	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb, VI, VII, XII, XIV	107,281	17,165		2,218	8,582	11,944	26,963	25,032	14,304	1,073			

<b>ALBACORE TUNA</b>	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Atlantic, north of 5°N	28,712	3,158				5,599		201	17,801	1,953			

<b>Redfish</b>	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
V, XII, XIV	13,883	3			9,367	875	4	23	1,645	1,966			

Catches in this area shall be counted against the quota for redfish in V,XII,XIV.

# DEFINITION OF FISHERIES TECHNICAL TERMS AND ACRONYMS



## Marine Fisheries Services Division

**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.

**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 bottom of the sea.

**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 that recruitment is not impaired. 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.

**Catchability** The fraction of a fish stock which is caught by a defined unit of the fishing effort. When the unit is small enough that it catches only a small part of the stock (0.01 or less) it can be used as an instantaneous rate in computing population change. Also called catchability coefficient, force of fishing mortality.

**Catch Curve** A simple assessment method where the slope of a line fitted through the log of numbers of fish taken at successive ages or sizes is used to estimate total mortality ( $Z$ ).

**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>)

**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.

**Critical Size** The average size of the fish in a year-class at the time when the instantaneous rate of natural mortality equals the instantaneous rate of growth in weight for the year-class as a whole. Also called optimum size.

**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.

**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. See the section on "Some Key Issues in Fisheries Management" for details of these measures.

**Equilibrium Catch** The catch (in numbers) taken from a fish stock when it is in equilibrium with fishing of a given intensity, and (apart from the effects of environmental variation) its abundance is not changing from one year to the next.

**Equilibrium Yield** The yield in weight taken from a fish stock when it is in equilibrium with fishing of a given intensity, and (apart from effects of environmental variation) its biomass is not changing from one year to the next. Also called sustainable yield, equivalent sustainable yield.

**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 MFSD.

**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<sub>lim</sub>** 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<sub>max</sub>** The rate of fishing mortality for a given exploitation pattern rate of growth and natural mortality, that results in the maximum level of yield-per-recruit.

**F<sub>0.1</sub>** The fishing mortality rate 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<sub>pa</sub>** 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 ( $B_{pa}$ ) below which the probability of good to average recruitment is decreased.

**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 MFSD groundfish surveys around the Irish coast.

**Growth overfishing** Occurs when fishing mortality exceeds  $F_{max}$

**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/>)

**Incidental Catch** The retained catch of non-targeted species.

**IFREMER** France's national marine research agency – (see: <http://www.ifremer.fr/anglais/>)

**Inshore fisheries** There are various definitions of inshore fisheries including those fisheries that are conducted within 12 miles of the shore, including demersal, pelagic, shellfish and sea angling fisheries.

**Length Frequency** An arrangement of recorded lengths which indicates the number of times each length or length interval occurs. For example, 10 measurements of lengths are taken in the following order 10, 12, 12, 14, 12, 15, 15, 12, and 10. A typical length frequency would be

Length	Occurrence
10	2
11	0
12	4
13	0
14	1
15	2
16	0
17	0
18	0
or	
Interval	Occurrence
10-12	6
13-15	3
16-18	0

**Long-term potential catch** The largest annual harvest in weight that could be removed from a fish stock year after year, under existing environmental conditions. This can be estimated in various ways, from maximum values from production models to average observed catches over a suitable period of years.

**Maintainable Yield** "The largest catch that can be maintained from the population, at whatever level of stock size, over an indefinite period. It will be identical to the sustainable yield for populations below the level giving the MSY, and equal to the MSY for populations at or above this level".

**Management Plan** A plan agreed to promote the sustainable use of marine resources, usually characterised by clearly defined objectives, and agreed management actions and constraints that will ensure a high probability of maintenance or recovery of resources to agreed sustainable levels.

**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/>)

**MFSD / Marine Fisheries Services Division** – One of six divisions of the Marine Institute, MFSD's mission is to assess, research and advise on the marine fisheries resource in Irish waters – (see: <http://www.marine.ie/>)

**Mortality rates** Mortality rates are critical for determining the abundance of fish populations and the effects of harvesting strategies on yield and spawning potential from a stock. Fish abundance is a balance between the factors that act to increase the stock births and factors that decrease population numbers (deaths). When births exceed deaths, the stock increases, and vice-versa. The stock is brought into stability when the number of recruits entering the fishery balances the number of deaths. Fishery managers can control deaths caused by fishing by manipulating the fishing effort on fish of sizes vulnerable to the gear. Fishing mortality can be changed through indirect methods, such as regulating mesh size to make fish of certain ages less vulnerable to the gear. Direct control measures, such as catch quotas or effort limits, determine the rate of fishing mortality on the vulnerable

sizes. The total number of births is determined by the abundance of breeders in the population the spawning stock which can also be manipulated by managers.

Mortality occurs at all life stages of the population. Depending on the species, mortalities suffered from the egg to larval stages are usually very high, less so from the larval to juvenile stage. In young fish, death can occur from several causes - starvation, predation, or disease. If fish survive their first year, these natural causes of death usually decline dramatically, and in many cases, fishing becomes the dominant source of mortality. Pollution may also add to the death rate of the population. Generally, young fish are more vulnerable to pollution mortalities than are older fish.

Knowing the sources and levels of mortalities affecting fish populations is a critical ingredient of forecasting both landings and spawning stock sizes, and in evaluating the changes in populations that may be induced by regulations such as minimum mesh sizes, minimum fish lengths, quotas, effort limits, and area closures. The rate at which the stock is harvested is usually estimated by calculating the abundance of a cohort or year class over successive years to determine how rapidly it is declining. The total mortality of the population is the sum of deaths due to both natural and fishing-related causes.

The fishing mortality rate (F) on each age group of a stock is determined by two factors

- (1) the proportion of that age group that is big enough to be captured by the gear (usually termed the partial recruitment of each age), and
- (2) the overall amount of fishing effort on the stock. At intermediate stock abundance levels the relationship between effort and F is direct. A doubling of effort translates into a doubling of the fishing mortality rate. At very low or very high stock sizes (when the stock is either hard to locate or unavoidable), the relation between effort and F may change.

**MPA / Marine Protection 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, senility, 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/](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** MFSD co-operate with NOAA, our US counterparts, on a number of strategic projects. ([see http://www.noaa.gov](http://www.noaa.gov))

**Optimum Yield (OY)** The yield from a fishery which provides the greatest overall benefit to the nation with particular reference to food production and recreational opportunities; it is based on MSY as modified by economic, social or ecological factors.

**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.

**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)

**Recovery Plan** The terms Recovery Plan and Rebuilding Plan

are used interchangeably to describe a series of measures undertaken where a stock shows signs of high fishing mortality, low recruitment, declining landings and very low spawning stock biomass to the extent that the stock cannot replace itself (a condition known as “Recruitment Failure”). Recovery Plans aim to protect spawning aggregations and/or juveniles through Technical Conservation Measures (TCM’s). These measures take the form of closed areas, increased mesh sizes and gear modifications (such as separator panels). A substantial reduction in annual TAC’s is normally the starting point for a recovery plan, followed by the appropriate TCM. Effort reductions will be the third element in future recovery plans. Ireland is the center of three recovery plans – for Irish Sea Cod, West of Scotland Cod and Northern Hake. See the section on “Some Key Issues in Fisheries Management” for further details.

**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.

**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 was 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.

**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 com-

pared 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** Fish species – 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<sub>lim</sub>** For deepwater stocks has been calculated as  $0.2 * U_{max}$  (may be a smoothed abundance index).

**U<sub>pa</sub>** For deepwater stocks has been calculated as  $0.5 * U_{max}$ . For redfish  $U_{pa}=0.5$  or  $0.6 * U_{max}$ .

**Virtual population analysis (or cohort analysis)** An analysis of the catches from a given year class over its life in the fishery. If 10 fish from the 1968 year class were caught each year for 10 successive years from 1970 to 1979 (age 2 to age 11), then 100 fish would have been caught from the 1968 year class during its life in the fishery. Since 10 fish were caught during 1979, then 10 fish must have been alive at the beginning of that year. At the beginning of 1978, there must have been at least 20 fish alive because 10 were caught in 1978 and 10 more were caught in 1979. By working backward year by year, one can be virtually certain that at least 100 fish were alive at the beginning of 1970. A virtual population analysis goes a step further and calculates the number of fish that must have been alive if some fish also died from causes other than fishing. For example, if in addition to the 10 fish caught per year in the fishery, the instantaneous natural mortality rate was also known then a virtual population analysis calculates the number that must have been alive each year to produce a catch of 10 fish each year plus those that died from natural causes. If one knows the fishing mortality rate during the last year for which catch data are available (in this case, 1979), then the exact abundance of the year class can be determined in each and every year. Even when an approximate fishing mortality rate is used in the last year (1979), a precise estimate of the abundance can usually be determined for the stock in years prior to the most recent one or two (e.g., 1970-1977 in the example) (1976 or 1975). Accuracy depends on the rate of population decline and the correctness of the starting value of the fishing mortality rate (in the most recent year). This technique is used extensively in fishery assessments since the conditions for its use are so common; many fisheries are heavily exploited, the annual catches for a year class can generally be easily determined, and the natural mortality rate is known within a fairly small range and is low compared with the fishing mortality rate.

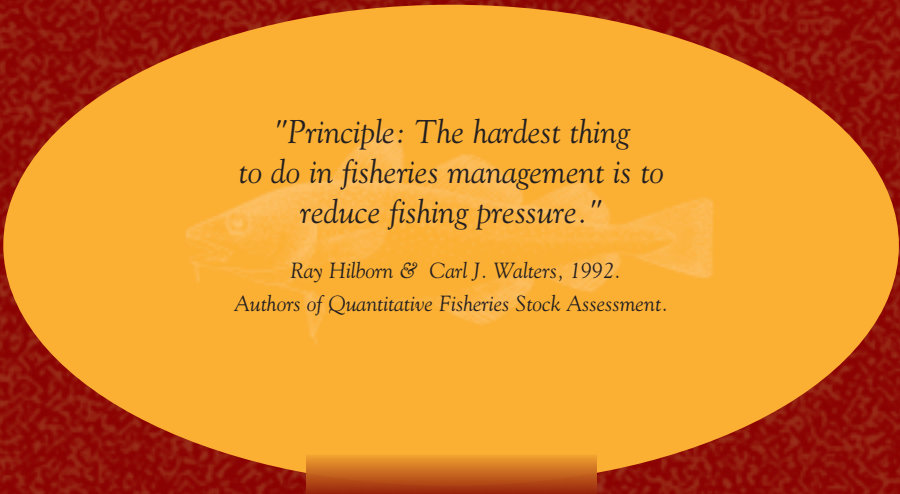
**Whitefish** Term used to describe demersal species such as cod, plaice, ray etc., as opposed to pelagic or salmonid species.

**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.





*"Principle: The hardest thing  
to do in fisheries management is to  
reduce fishing pressure."*

Ray Hilborn & Carl J. Walters, 1992.  
Authors of *Quantitative Fisheries Stock Assessment*.