



**Marine Fisheries Services Division,
Abbotstown, Dublin 15, Ireland**

THE STOCK BOOK

**Report to the Minister for the Marine and Natural Resources
Annual Review of Fish Stocks in 2000
with Management Advice for 2001**

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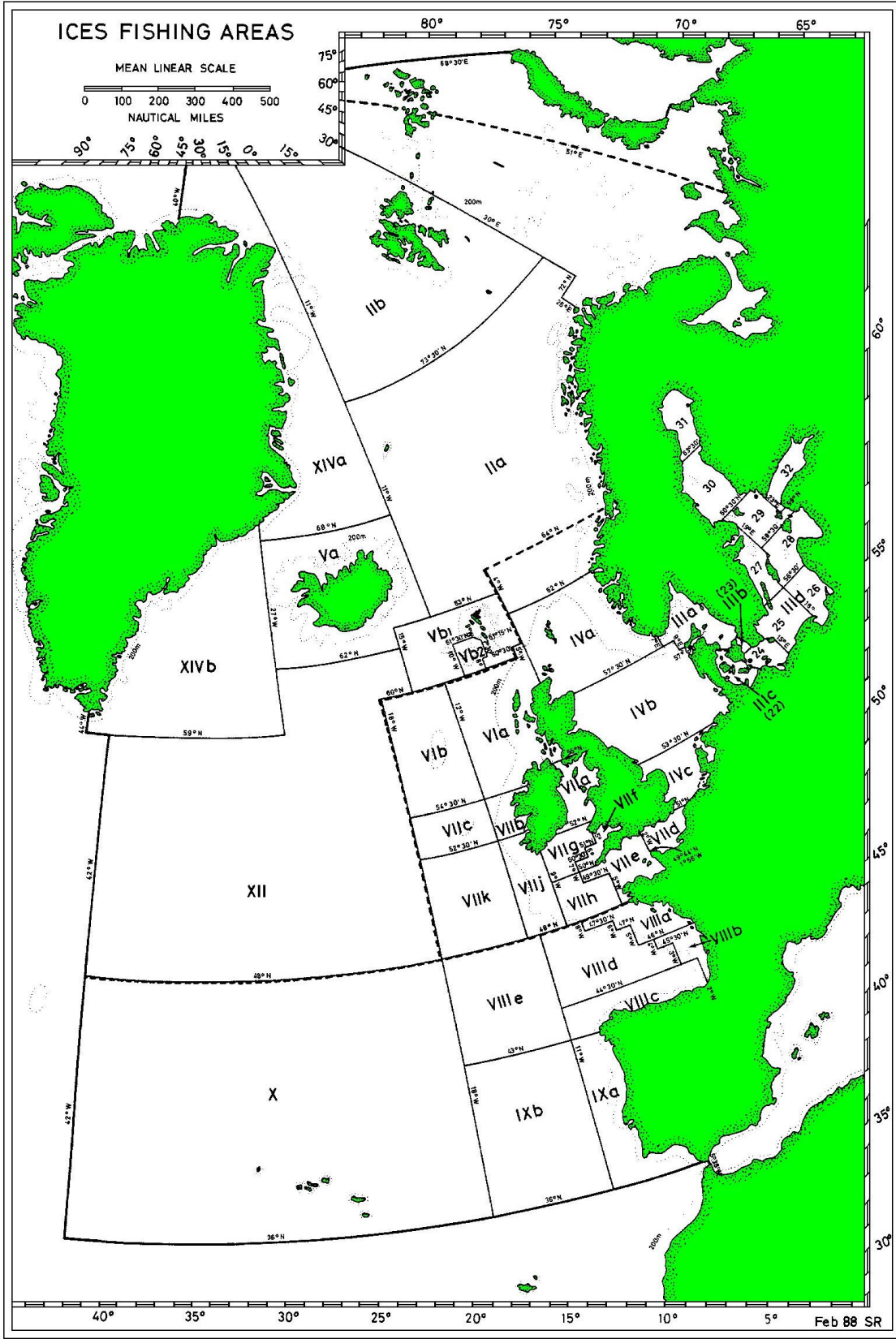
In the 2000 Stock Book, every effort has been made to use the most up to date version of the ICES advice. However, the final official ICES ACFM Reports should be consulted for the definitive advice. For more detailed information on specific stocks the relevant ICES Working Group Reports should be consulted. The official EU journal should be consulted for definitive TAC's and Quotas for 2000.

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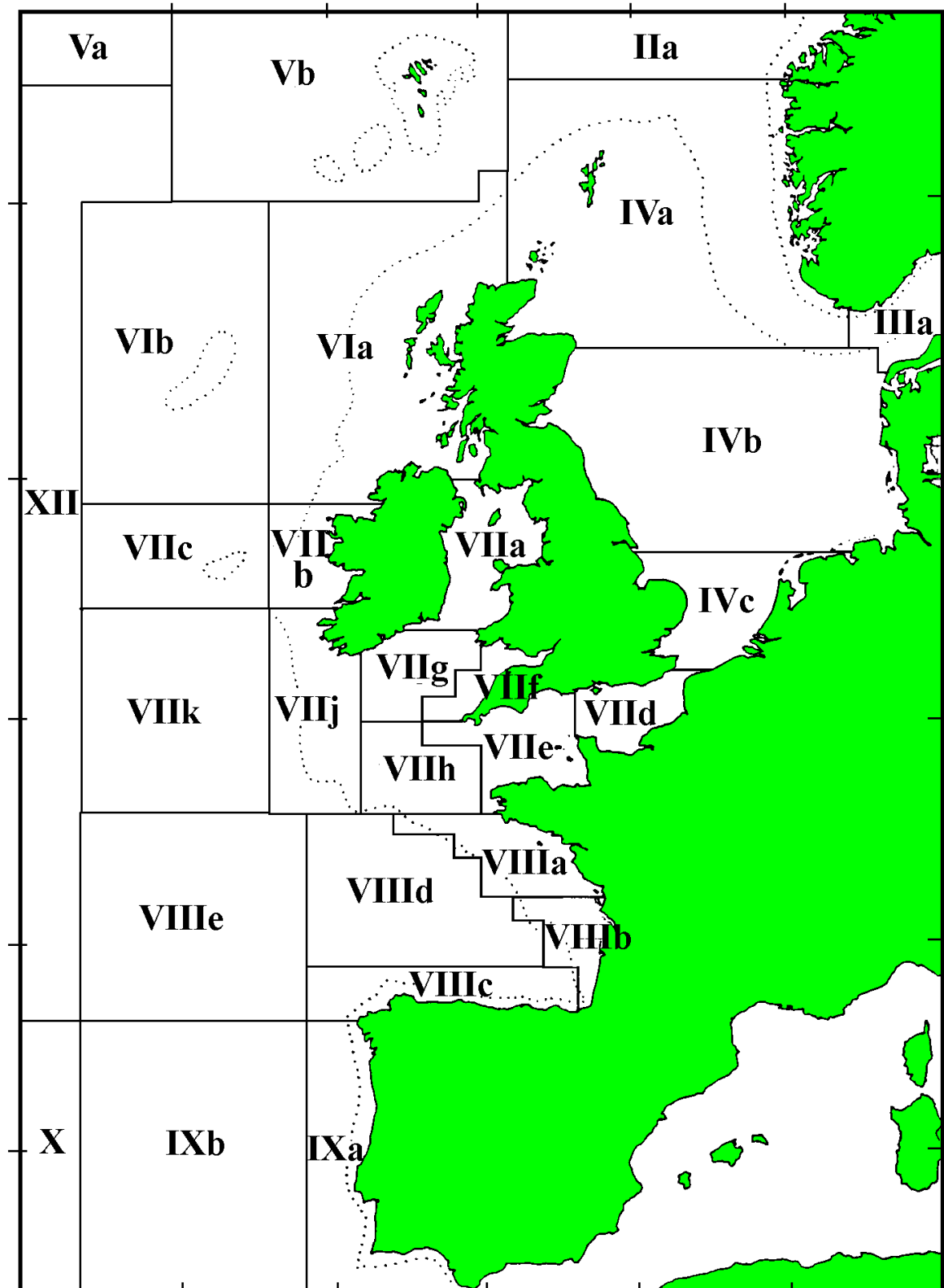
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ICES Fishing Areas



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. Its timely production, and accurate content are essential to MFSD's primary client - the Department of the Marine and Natural Resources (DOMNR)— in serving Ireland during the annual TAC negotiations with the EU *.



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

- The most up-to-date management advice,
- A summary on the current state of the stock,
- Salient information on the biology, management and assessment of these fish.

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 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 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 is accurate, it should be noted that the Irish landing figures for 2000 are provisional. ICES advice available up to the time of printing is incorporated in the Stock Book. However, final ICES ACFM 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.

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

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) 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 role is to monitor, assess, research and advise on marine fisheries in order to ensure the sustainable exploitation of these resources. As such, 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 advice to the DOMNR on status and management of these stocks.

MFSD conducts a comprehensive monitoring programme, on stocks in the waters around the Irish coast. The basic information required for each stock includes the length distribution of the landings, a profile of the age structure of the landings, the number of boats fishing in a particular area, the catch and the time spent fishing (i.e. EU Log-book data) and information on the annual landings into each port.

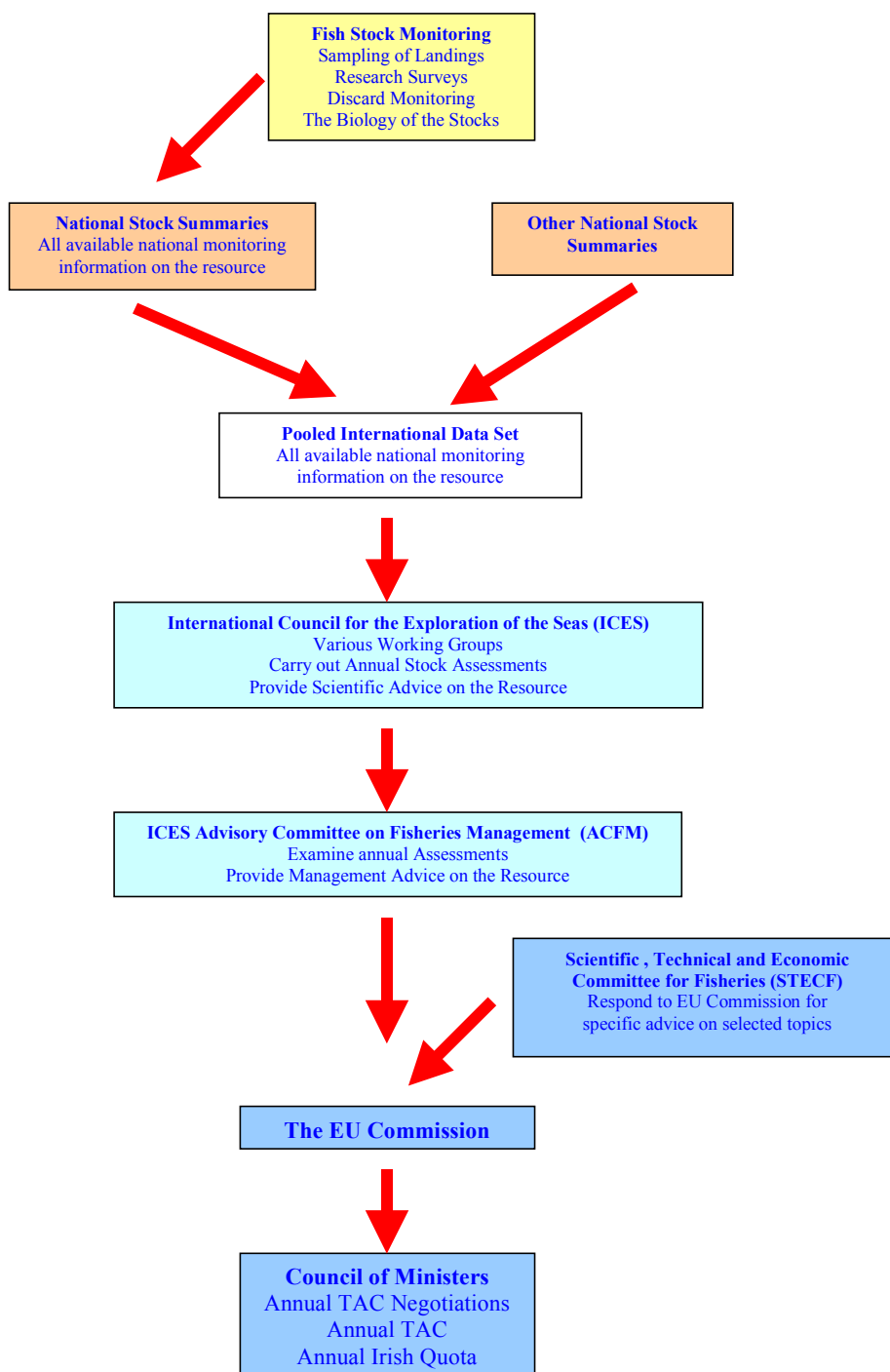
The landings are sampled at the ports, various fishermen's Co-operatives, fish processors and auction sites around the coast, at sea and at the Dublin fish market. The MFSD employs a series of contract port samplers who are continuously sending information to the Marine Institute's Abbotstown Laboratory.

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

MFSD conduct surveys on board chartered commercial vessels and 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 species. Each year, MFSD carry our 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 is organised to feature a **main page** for each of the stocks of fish and shellfish of commercial interest to the Irish fishing industry. Each page includes MFSD commentary and advice, laid out in five sections as follows;

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

Following the main page, the ICES ADVICE for the stock is given.

MFSD – ADVICE is highlighted in red and gives the main management advice for each stock, mainly in terms of proposed catches and any technical measures that need to be considered. The proposed TAC for 2001, 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 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

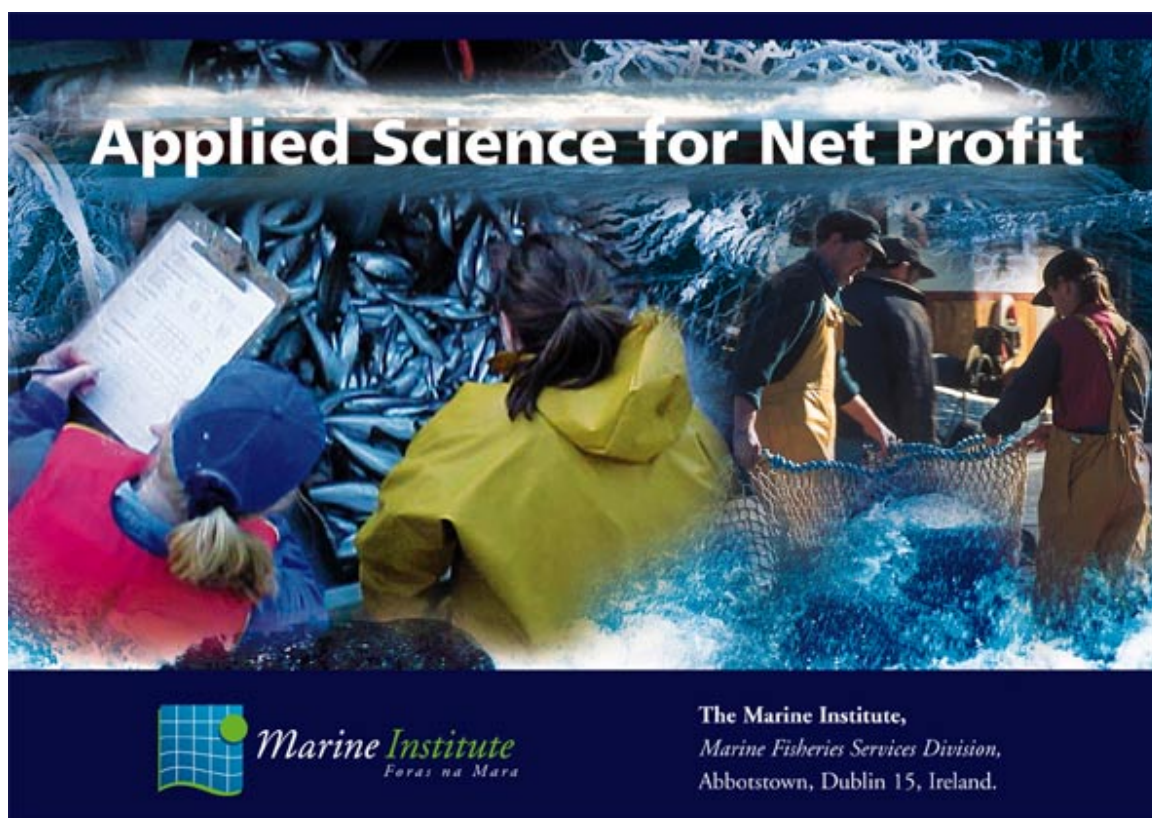
CURRENT MANAGEMENT gives the management and assessment area for the stock and provides the TAC and Irish quota for 2000. Any important points gleaned from ICES advice are highlighted in this section.

MFSD – ECONOMIC COMMENTS detail the value of the TAC, Irish quota and 1999 international 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.

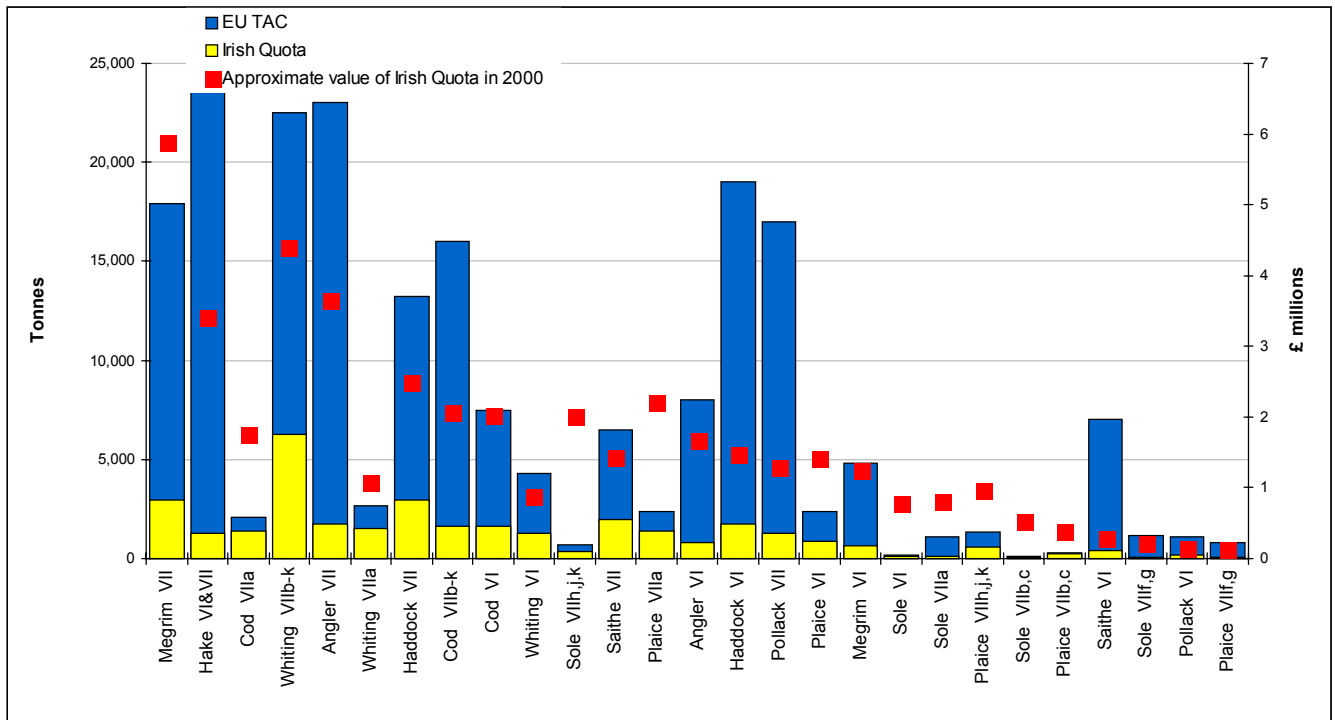
For all the key stocks, MFSD have produced colour plots of the historic trends in biomass, catches, recruitment, and fishing mortality, together with the short term predictions. The precautionary reference points have been shown on these plots in order to track the historic trends in each stock.

The length frequency 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 percentage allocation of the TAC.

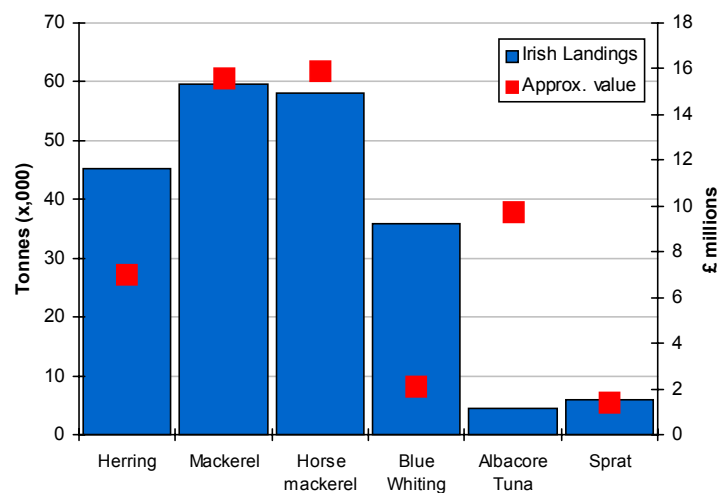


IRELAND'S SHARE OF THE 2000 EU TACS & Approximate Value of the Irish Quota in 2000

Demersal Fisheries



APPROXIMATE VALUE OF IRISH PELAGIC LANDINGS IN 1999



Source: Dept. of the Marine & Natural Resources

Introduction

The main pelagic fisheries exploited by the Irish fleet are: the herring fishery in the Celtic Sea and off the south-west coast (ICES Divisions VIIaS, VIIg and VIIj); the herring fishery off the West and north-west coast (ICES Divisions VIaS and VIIb); 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 tuna fishery which exploits mainly albacore tuna and takes place off the south coast in international waters (see separate overview); the blue whiting fishery mainly undertaken along the edge of the continental shelf off the west of Ireland.

Routine scientific investigations were continued on the herring, mackerel and horse mackerel fisheries during 2000. Investigations, which were initiated in 1998, were continued on the important blue whiting fishery while considerable data were again collected on the albacore fishery.

The investigations carried out in 2000 consisted of biological examinations of the catches for length, weight, age, sex, and maturity, all of which were designed to provide necessary information for stock assessments. 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 2000 using the *R.V. Celtic Voyager*. In addition a new survey was carried out on the herring stock off the west and north-west coast in November 2000, using a commercial vessel (*MFV Sean Pol*).

Herring

Overview

There are a number of herring stocks around Ireland (and the west of Scotland), which 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 - Division VIa (North); The Clyde Stock; The Stock in the Irish Sea Division VIIa (North); The Stock West and North of Ireland Division VIa (South) and Division VIIb; The Stock in the Celtic Sea and South West of Ireland (Division VIIa (South); Division VIIg and Division VIIj).

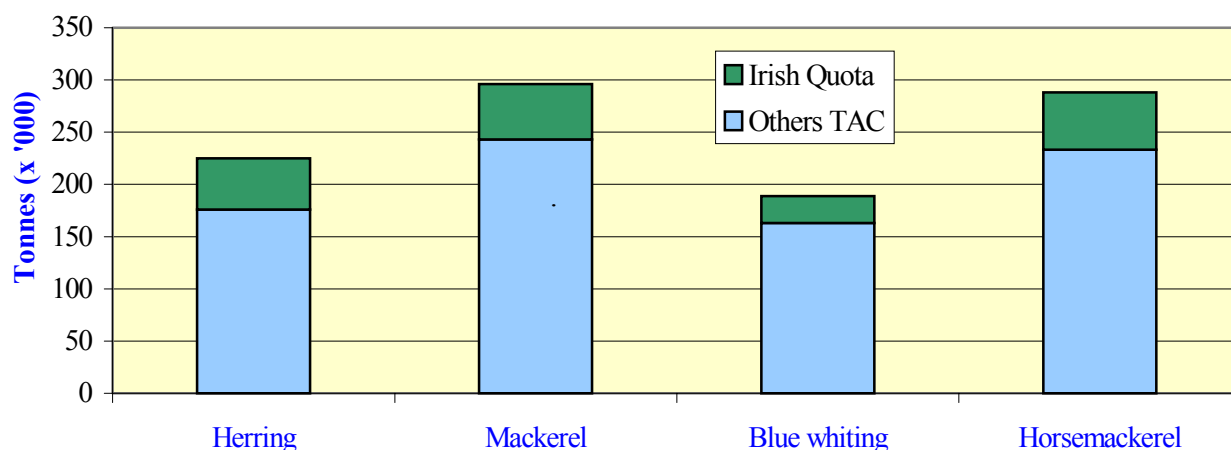
The Irish Fisheries

Only the stocks in the Celtic Sea and VIIj and in Divisions VIa South and VIIb have been consistently exploited by Ireland in recent years. 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 taken its full share of the TACs in recent years. In both of the main fisheries Ireland has 88% of the TACs. Ireland also has valuable quotas in the fishery to the west of Scotland (i.e. Division VIa North) and in the Irish Sea (i.e. Division VIIa North) – neither of which have been fully utilised in recent years.

The catches taken by Irish vessels in the fishery for Norwegian spring spawning herring have decreased substantially since the Irish fleet first participated in 1995.

Ireland's Share of Main Pelagic TACs



The catches in 1998 and in 1999 have been about 3,000 t 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 one vessel participated in 2000 and 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 which restrict catches on a nightly or on a weekly basis. Quotas are dependent on the size and type of vessel. The numbers of vessels are regulated by licenses and further restrictions on when and where landings can be made are also in operation. Additional management measures include closed seasons and closed areas.

Herring assessments

It is important to remember that during the 1970's 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 Division. 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 1980's but many of the traditional markets had in the meantime disappeared. The stocks recovered in the late eighties 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 stock in the Celtic Sea, however, is considered to be in a healthy state but is heavily dependent on good recruitment. The TAC for the Celtic Sea stock has remained very stable in recent years as a result of the stable stock size. However, the TAC on the north-west coast has decreased significantly because of the decrease in the stock in that area and is now less than 50% of what it was for most of the 1990's.

The exact state of the stock is unknown but it appears to have stabilised at a low level and has not increased mainly due to a lack of recruitment. No Irish vessels participate in the herring fishery in the North Sea, where the stock has recovered in recent years.

Market and Potential value of the Herring Catch.

In recent times the herring market has been very depressed and prices have been at a relatively low level compared with those in the mid 1970's. It has been particularly difficult to sell herring due to a very poor demand for "roe" fish on the Japanese market and for fillets for the continental market. The fisheries were very dependent on the Japanese roe market and there is a limited demand for frozen whole or filleted herring. Catches taken in the North Sea also have a big influence on the markets for Irish herring and are partly responsible for the recent depressed state of the market in Ireland.

The difficulties in the herring markets were the motivating factors that lead to the establishment of the Herring Task Force by the Minister during 1998. The results and recommendations of this Task Force were published in early 1999. The preliminary total landing figure for 1999 amounted to over 45,000 t and was valued at over £6.97 million. Both the total quantity landed and the value decreased considerably on the figures for 1998. The corresponding figures for 1998 were 58,000 t valued at £8.4 million. The 1999 figures represent over 6% of the total value of the Irish wet fish catch and nearly 18% of the volume.

Although the herring industry appears to be in a depressed state at present it is important to stress that it still continues to be a major component of the Irish fishing industry. This is because of the number of vessels that continue to be heavily dependent on herring and also on the number of jobs that are created in the shore based industries. Therefore 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; and Southern Stock. However in recent years it has become increasingly difficult to assess the stocks separately and since 1998 ICES now carry out a combined assessment of all components. This combined stock is called the Northeast Atlantic mackerel stock (See below)

The North Sea was heavily exploited in the 1960's - 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 1960's and the fishery has never subsequently recovered. Catches at the moment are believed to be about 10,000 - 20,000t.

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. These changes in migration have now apparently stabilised. The main spawning grounds are located south and west of Ireland while the main over-wintering grounds are in the Norwegian Sea and in the Northern part of the North Sea. The main summer feeding grounds are also located in the Norwegian Sea and in the northern North Sea. Catches in 1999 were about 609,000 t. This included about 50,000 t, which were taken in the "international" fishery west of Norway where catches, mainly taken by Russia, are not subject to a quota.

The Southern stock inhabits the area off the North and West coasts of Spain and the coast of northern Portugal. It is only subjected to a direct fishery in the early part of the year. However the catches from this fishery have increased in recent years and in 1999 were over 44,000 t.

The distribution of the international catches taken during the four quarters of 1999 is shown in Appendix IV a-d. The main Irish catches are taken off the west coast of Scotland in Quarter 1 and in the North Sea and off the north-west coast of Ireland in Quarter 4. Catches are relatively small during Quarters 2 and 3.

The Irish Mackerel Fishery

The official catch recorded by Ireland for 1999 was about 59,600 t and was valued at over £15.5 million. The Irish quota in 1999 was 60,170 t excluding "swaps".

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 1980's 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 ground which are situated off the Southwest and West of Ireland. Prior to 1989 the Irish fleet was not permitted to fish east of 4° (i.e. in the North Sea). Subsequently fishing was permitted in this area but only in the fourth quarter together with restrictions on the amount that could be taken in this area. These restrictions created severe hardships for the Irish fleet, particularly in the years when the annual migrations of shoals from the over-wintering grounds were delayed. These restrictions were relaxed in 2000 and fishing was permitted east of 4° until 15 February. However in 2000 the southern migration of mackerel was earlier than in previous years. Because of the restriction, the Irish fleet in 1994 developed a local fishery off the North-west coast during autumn in which substantial quantities of 'juvenile' mackerel (12,000t in 1994) were taken. The 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 introduc-

tion of the 'Cornwall box' in which fishing for mackerel is prohibited. This fishery had an adverse effect on the stock and the mortality on juveniles was greatly increased during the time of its existence. The Irish local fishery continued in autumn 1995 and substantial catches of young mackerel (approximately 16,000t) were again recorded off the north-west coast. Small catches were also taken off the South coast. However the amounts taken in this "local" fishery have decreased considerably since 1996 although 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 imposed by EU, such as the overall TAC, limited numbers of days at sea and the restrictions on fishing east of 4°, there are a number of local management measures imposed on the Irish fleet. These include - seasonal closures, area closures and boat quota.



Mackerel Assessments

The assessment of the mackerel stock has been extremely difficult 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 stocks are distributed; the uncertainty about what actually constitutes a stock; the fact that the international egg surveys, on which the assessments are based, are only carried out every three years; the uncertainty that surrounds the estimates of recruitment; the changes that have taken place in the mackerel migrations; the uncertainty of the international catch statistics.

Prior to 1995, three separate mackerel stocks were believed to exist in the North East Atlantic; the North Sea stock, the Western Stock and the Southern stock. 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 has become increasingly difficult to assess the stocks separately.

In 1995 the ICES Working Group, which deals with the assessment of the 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

Northeast Atlantic Mackerel Stock.

This assessment was again carried out at the 2000 meeting of the working group that met in Copenhagen in September. An additional separate assessment of the Western stock was carried out to study the development of the stock. Predictions were carried out only on the Northeast 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.

Horsemackerel

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 stock are uncertain and are based more on the location of the fisheries than on a sound biological basis. The seasonal location of the fisheries are shown in Appendix V.

The Irish fishery

The Irish fishery for horse mackerel is a comparatively recent one and the fishery has only developed since the early 1980's. 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 horsemackerel catching countries. The main catches are taken during the autumn off the north-west coast but catches are also taken during Spring while fish are spawning along the west and south-west coasts. The fishery in 1999 and 2000 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. 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.

The total Irish catch in 1999 was about 58,000 t and was valued at over £13.5 million. The corresponding values in 1998 were 74,253 t and £13.5 million.



Management measures

There is no overall management of the stocks but the fishery on the Western stock, exploited by EU fleets is now managed by the EU 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 because the TAC was reached. In addition to the EU imposed management measures, Irish authorities also impose additional measures similar to those in the mackerel fishery.

Horsemackerel 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. Ireland commenced a sampling programme in 1998 that is part-funded by the Donegal Processors. This programme was continued and expanded in 1999 and 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 this stock.

Blue Whiting

Overview

The total catch taken from the blue whiting fishery increased dramatically in the last two years and has exceeded 1.2 million tonnes. The main catches are taken by Norway, Russia and a number of northern European countries. A large proportion of the total catch is taken from deep water 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 1999 was over 35,000t, valued at over £2.08 million. Both the volume landed and the value decreased considerably on the comparative figures for 1998 because of reductions in quota. The preliminary figures for 2000 show further reductions, again because of a decrease in quota (26,080t). The fishery is a potentially very valuable source of income to the large vessels fishing out of Killybegs, particularly because of the restrictive quota on the pelagic stocks. However, 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 operate is 24%. This has caused a severe reduction in the catches recorded in 1999 and 2000 and severely limited the expansion of the fishery. Most of the Irish catch has been reduced to fishmeal but some investigations have been commenced by BIM to investigate the possibilities of landing blue whiting that would be suitable for human consumption.

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 Barent Sea. The assessment is imprecise due to difficulties in interpreting the results of various surveys and a lack of biological data.

Tuna

A New Irish Fishery

Albacore tuna (*Thunnus alalunga*) is a temperate tuna 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°) 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 austral and boreal spring-summer. Maturity is thought to occur in the northern tuna at about 90 cm. Before the onset of sexual maturity, the juvenile tuna are mostly found in surface waters, where they are targeted by the surface gears. Some adult albacore are also taken in surface gears but as a result of the deeper distribution, they are mainly caught using longlines. Young tuna are also caught by longline in temperate waters.

The fishery for North Atlantic albacore tuna is carried out mainly by Spain, France and Ireland. The total international catch in 1999 was 34,500 t compared with 25,400 t in 1998. The main international catches are taken by bait boats (8,800 t), trolling fleets (6,800 t), drift nets (7,900 t) and long lines (6,700 t). An increasing amount has, in recent years, been taken by vessels using drift nets.

Catches

The total Irish catch in 1999 was about 4,500 t which was about 1,100 t higher than that taken in 1998. The total landings in 1999 was valued at £9.7 million. The total value of the catch of albacore tuna and other tuna like species in 1999 amounted to over £10 million which makes this fishery the third most valuable wet fish to be landed. The Irish fishery for albacore tuna developed in the early 1990's. The fishery is mainly exploited by vessels fishing off the south and south west coast and most of the catches are landed at the ports of Castletownbere and Dingle. The fishery is particularly important for the fishing communities off the south and south west coast and provides a valuable alternative to the demersal and pelagic fisheries. The main gear used by the Irish fleet has been drifting gill nets.

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. Small but valuable by-catches of bluefin tuna (*Thunnus thynnus*) and swordfish (*Xiphias gladius*) are also taken with alba-

core. The season for the Irish fishery extends from July through to September.

Scientific advice

The fishery for tuna species including albacore tuna is regulated by the International Commission for the Conservation of Atlantic Tuna (ICCAT). At present albacore tuna is a non quota species and no national quotas are in operation. Scientific advice on tuna is formulated by the Standing Committee on Research and Statistics (SCRS) of ICCAT. In 2000 the SCRS concluded that the spawning stock of Northern tuna is about 30% below the level at which the maximum sustainable yield could be attained but that the current catches could be sustained in the short term.

The Committee was unable to assess whether or not the recommendation made in 1998 to limit the number of vessels taking part in the fishery to the average number in the period 1993-1995 has had the desired effect on the stock. However, the Committee has noted that a limitation on the number of vessels is likely to be ineffective for this stock, and that therefore catch limits may be more appropriate from a practical point of view.

In 1992 the EU introduced a maximum permitted length for drift nets of 2.5 km per vessel. In addition the use of drift nets will not be permitted after the 1st January 2002. In 1998 an EU regulation was adopted which progres-



sively limited the maximum number of vessels using drift nets and Ireland were required to reduce the number of commercial vessels to 18 in 1999 and 2000.

In an effort to develop alternative methods of catching albacore tuna, other than 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 all vessels, where possible, to collect biological information on catches and on fishing operations.

Biological sampling of the catches taken in the experimental fisheries and from the commercial catches was continued throughout the 1999 and 2000 seasons. The results of these sampling programmes are submitted to ICCAT for stock assessment.

MFSD Demersal Fisheries Overview

In 1999, the Irish fleet landed a total of 39,426 tonnes (live weight) of demersal fish species. This represents a reduction on the 1998 landings of 43,656t. In terms of weight, the most important species were whiting (7,643t); haddock (4,898t), monk (4,193t) and megrim (3,161t). The chart below shows the relative importance of the main species in terms of tonnage landed. The total value of demersal fish landed in 1999 was £51.97 million (landed value), compared to £53.3 million in 1998. The most important species in terms of value were monk (£8.8m), megrim (£6.3m), hake (£5.5m), whiting (£5.3m), cod (£4.6m), haddock (£4.1 m), black sole (£2.8m) and plaice (£2.3m).

The demersal fisheries exploited by the Irish fleet are generally mixed fisheries for cod, whiting, haddock, hake, monk, megrim, plaice and sole. These fisheries also yield valuable by-catches of ray/skate (£1.9m), turbot (£1.7m), saithe (£1.4), pollock (£1.1), ling (£0.82), witch (£0.79m), lemon sole (£0.76m), spurdog (£0.53m), brill (£0.50) and forkbeard (£0.29m). The main demersal fisheries can be divided into four general groups as follows;

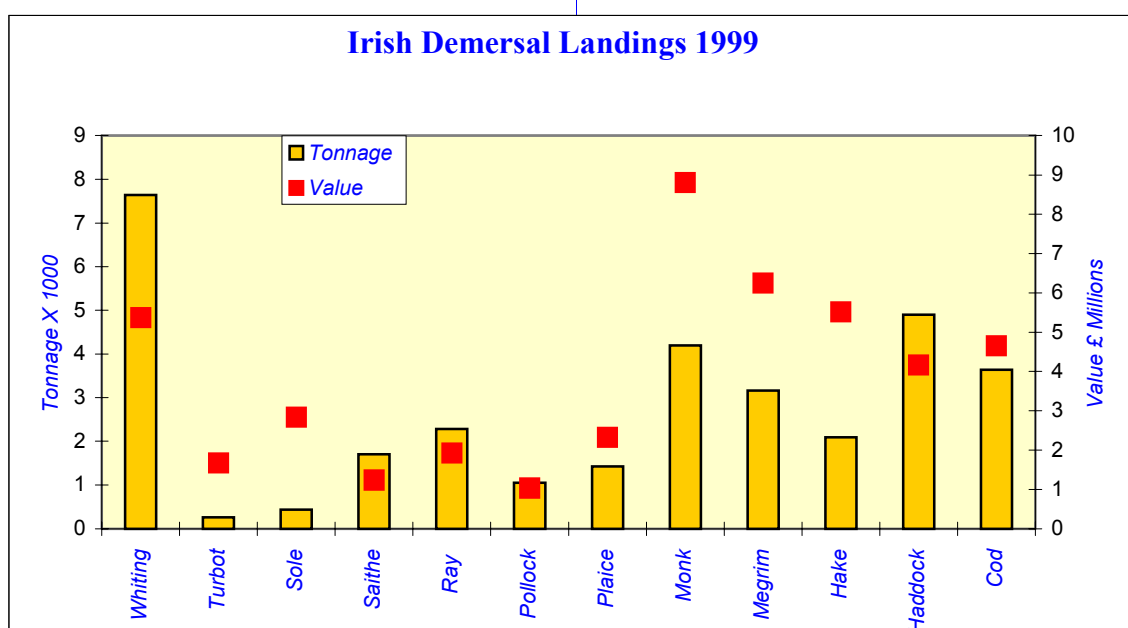
- The Irish Sea Fishery (Division VIIa).
- The Donegal/Rockall Fishery (Divisions VIa, VIb).
- The Celtic Sea Fishery (Divisions VIIf,g,h).
- The West and South West of Ireland Fishery (Divisions VIIj,k, VIIb,c).

The Irish Sea Fishery (Division VIIa).

Landings of demersal species have continued to decrease in the Irish Sea as stocks have declined. The Irish fleet has switched to targeting *Nephrops*, haddock, plaice, sole, and ray species, away from traditional species such as cod, and whiting. The main gears used are otter trawl

(haddock, ray and plaice) and beam trawl (sole and plaice). The otter trawl fishery for whitefish mainly takes place in the western Irish Sea and the main ports are Howth, Clogherhead, Kilmore Quay and Dunmore East. Otter trawl catches are subject to by-catch restrictions. 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. Although the quota for black sole is small it remains a very valuable fishery. In recent years there has been a substantial increase in the abundance of haddock in the Irish Sea, however, indications are that recent year-classes of haddock are relatively poor, and the stock is expected to decrease in abundance over the next few years. The haddock 'outburst' caused major mis-reporting problems for the UK fleet, as their haddock quota from Sub Area VII is small. An additional TAC allocation was introduced for Division VIIa in 1998. The main by-catch species from the Irish Sea fishery are monk, hake, dogfish, gurnard, and lemon sole. Landings of ray species from the southern Irish Sea continue to be of increasing importance to the Irish Sea fleet. In 1999, there was a large amount of whiting discarded on the nursery grounds of the Western Irish Sea by the *Nephrops* fleet. Square mesh were introduced to the fleet in 1995, but no evaluation has been carried out on the effectiveness of this measure. 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 2000, was the introduction of the Irish Sea cod recovery plan (EU Regulation 304/2000). Fisheries scientists, managers and in-



dustry co-operated in the formulation of the recovery plan during the early part of the year and closed areas were introduced for a 10 week period in February 2000, to protect spawning cod. The recovery plan will continue in 2001, with additional measures to protect juvenile cod. The Irish Sea Cod Recovery Plan marks the first steps towards a regional approach to EU fisheries management.

The Sub Area VI Fishery (Divisions VIa, VIb).

The main target species in this fishery are monk, megrim, haddock, whiting and cod, primarily using otter trawl although there is some inshore seining and gill netting. The main ports are Killybegs, Greencastle and Burtonport. The Rockall fishery (Division VIb) has increased in importance over recent years and is now targeted throughout the year. At Rockall, haddock dominate the catches but there are also valuable catches of monkfish and megrim and sporadic catches of saithe and cod. In Division VIa there are four main clean ground fisheries at Stanton, the Stags, Aran and Donegal bay. The target species on those grounds are monk and megrim but plaice, turbot, sole, lemon sole and rays are also by-caught. On the harder grounds of VIa haddock, whiting, cod and squid are targeted. The 1999 Irish groundfish surveys have indicated that a strong year-class of haddock may be entering the fishery in the next few years. The Irish fleet that operates in this area is made up of the approximately 20 large offshore (25m+) multi-purpose and fairly modern whitefish boats that spend up to 10 days at sea. During 2000, several newly-built vessels entered the Irish fleet under the Whitefish Renewal Scheme. There are also approximately 30 smaller multi-purpose vessels that operate on inshore grounds and in bays. There were no by-catch restrictions imposed on the Irish fleet in 1998 or 1999.

Cod stocks are in a serious state in Division VIa. Several meetings have been held in Brussels during 2000 regarding a cod recovery plan for Division VIa. Cod are taken in the mixed fisheries for cod, whiting, and haddock and this plan will have a major impact on the fisheries in Division VIa during 2001.

The Celtic Sea Fishery (Divisions VIIg,h).

The main target species in this fishery are 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, Kilmore Quay and Helvick. The main by-catch species are haddock, hake, megrim, saithe and lemon sole. Haddock landings have increased substantially in recent years. Recently, there has also been an important spring gill net fishery targeting cod in VIIg and the southern part of VIIa which has attracted fleets from elsewhere. The Irish fleet that operates in this area is mainly made up of inshore multi-purpose vessels (15-20m) which spend 5-10 days at sea. During 2000, 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. MFSD commenced a survey programme for the Celtic Sea in 1997.



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 fisheries with monk and megrim and this plan will have a major impact on the fisheries in the Celtic Sea during 2001.

The West and South West of Ireland Fishery (Divisions VIIj,k, VIIb,c).

The main target species are monk, megrim, hake, whiting, haddock, sole and cod. The main gears used are otter trawls, twin-rig otter trawls, seine nets and gill-nets. The fishery mainly takes place in VIIj, VIIb and on the Porcupine Bank. The main ports are Castletownbere, Dingle, Union Hall and Rossaveal. The main by-catch species are plaice, 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. During 2000, several newly built vessels entered the Irish fleet under the Whitefish Renewal Scheme. 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 monk and megrim on the continental shelf slope in VIIj, VIIb & VIIc. There has been a rise in the number of vessels, particularly in Castletownbere, switching to seine gear in recent years. There has also been an increase in the number of twin-rig trawlers in the area. There were by-catch restrictions (principally monk and cod) imposed on the Irish fleet in 1997 and 1998. Several new vessels are expected to join the Irish fleet in 2000 under the white fish renewal scheme and several modern second-hand vessels have recently joined the fleet.

Hake stocks are in a serious state in Sub Area VII. Several meetings have been held in Brussels during 2000 re-

garding a hake recovery plan for Sub Area VII. Hake is caught in a mixed fisheries with monk and megrim and this plan have a major impact on the fisheries off the south-west of Ireland during 2001.

The Irish Demersal Fleet

The Irish demersal fleet consists of approximately 1,300 vessels (> 10m) and can be divided into four segments; the beam trawl fleet (15 vessels); the inshore artisanal (<15m, 873 vessels); the inshore multipurpose (15-20m; 216 vessels) and the offshore multipurpose (>20m and consisting of 132 vessels). During 2000 up to 30 new modern vessels have entered the Irish fleet under the whitefish renewal scheme. The beam trawl fleet mainly targets sole and plaice. The inshore artisanal fleet target mainly mixed high value flatfish, cod, whiting, and haddock using demersal trawls and occasionally seine, trammel and gill-nets. The inshore and offshore multipurpose fleets periodically switch gears, areas of operations and target species. The nature of the fleet has evolved as a result of declining fish stocks, the ageing of the fleet, and market forces. The multipurpose fleet also includes a number of vessels that target whitefish during the summer and herring in the Celtic Sea during the winter and spring. Similarly, the fleet also includes vessels that target tuna during the summer and vessels that seasonally target *Nephrops*, squid and sprat and then switch back to whitefish during the remainder of the year.

The age profile of the fleet shows that most vessels are between 30 and 40 years of age, inefficient and reaching the end of their life span. A large segment of the fleet is in need of renewal and modernisation. In 1998, the Department of the Marine and Natural Resources and BIM introduced the Whitefish Renewal Scheme. This scheme is grant-aiding the introduction of 13 new demersal vessel >25m and several second-hand modern vessels >25m most of which joined the fleet during 2000. In total, approximately 30 new vessels have and 19 modern second-hand vessels have been grant-aided. In addition the scheme funds the upgrading of existing vessels (e.g. shelter-deck; re-engine) and provides grants for safety equipment on existing vessels.

Demersal Stock Monitoring

The work of the demersal section focuses on the stock monitoring and assessment of shelf fisheries in the waters around Ireland. These fisheries include cod, whiting, haddock, hake, monk, megrim, plaice and sole in ICES Divisions VIIa (Irish Sea), VIa (Donegal), VIb (Rockall), VIIb,c (West Coast), VIIj,k (South-west Coast) and VIIg (Celtic Sea). The stock monitoring and assessment programme consists of fish market, port and sea sampling of landings, together with various research vessel surveys and commercial charter surveys. Sampling is supported by EU funding through the FIEFA project (EU Study Contract 97-0059) and SAMFISH projects (EU Study Contract 99-0099).

Discarding is also monitored in a number of fisheries by the Fisheries Assessment Technicians (FAT's) programme. The FAT's are based at the major fishing ports and act as an important source of local intelligence in the ports. The demersal section receives data on a continuous basis (every month) from the main ports of Greencastle, Killybegs, Rossaveal, Castletownbere, Dingle, Dunmore East, Kilmore Quay, Howth and Clogherhead. A team of port samplers are based at these main ports and monitor the length distributions of landed fish at their respective ports. MFSD demersal staffs also visit these ports every quarter in order to secure age and length samples from the landings and assess the activity of the various whitefish fleets. The demersal section also conducts an early morning market-sampling programme at various auction/processing sites in Dublin. In 1999, the demersal section aged *circa.* 20,000 fish and measured 300,000 as part of the demersal fisheries monitoring programme.

The demersal section also conducts a series of surveys in the waters around Ireland. These surveys assess the abundance and distribution of commercial fish stocks and are an important component of the stock assessment process. The West Coast groundfish survey is carried out annually on two chartered commercial fishing vessels and covers the area from the Stanton Bank southwards to the Fastnet grounds. The Irish Sea and Celtic Sea groundfish survey commenced in October 1997 on the new research vessel *Celtic Voyager*. The Irish Sea juvenile plaice survey is carried out each May and monitors recruitment in the plaice stock. MFSD are international survey co-ordinators for the western shelf area and liaise with the UK (Scotland) and France regarding survey coverage and calibration of survey gear. MFSD are involved in an EU funded project with UK (Scotland) and France which focuses on the standardisation of surveys in the Irish Sea and Celtic Sea areas (EU Study Contract 98-0057). In 1999 comparative fishing was carried out with the Scottish research vessel *RV Scotia* and in 2000, similar trials were carried out with the French research vessel *RV Thalassa*. (pictured below)



A cod tagging programme was carried out by the MFSD in the Irish Sea, Celtic Sea and off the west coast of Ireland during 1997, 1998 and 1999. Over 2000 cod were tagged with a return rate of about 12%. In 2000, a special STECF meeting was held in Dublin to review Irish Sea cod tagging data against the background of the Irish Sea cod recovery plan. The results indicate that the movement of cod between the Irish and Celtic Sea areas is very small. Furthermore, no cod that were tagged in the Celtic Sea were recaptured in the Irish Sea. In 1999, cod were tagged with special data storage tags which log data on depth, temperature and position for up to 1 year. Three of these tags have now been recovered and preliminary results suggest that Irish Sea cod are more active throughout the year than their North Sea counterparts.



MFSD stock monitoring data are entered on the various demersal databases and are quality controlled through a strict data management process. The data are extracted and analyses at MFSD and used at the annual ICES Northern Shelf and Southern Shelf Working Groups. MFSD demersal section are currently international species co-ordinators for Divisions VIIa whiting, and Division VIIe-k whiting. The international data sets for these stocks are collated at MFSD and the preliminary assessments are carried out at MFSD before the Working Groups. MFSD demersal section are also co-ordinators for west and south west of Ireland demersal stocks and have carried out the first preliminary assessments for these stocks.

MFSD also conduct a deep water research programme aimed at providing the basic biological information necessary for management of this developing fishery. In 2000, two deep water longline surveys were carried out on the Irish longliner *An Calpall Ban*. A PhD thesis was also completed on the biology of deep water shark. MFSD are members of the ICES Deep Water Study Group.

EU Funded Projects

EU funding played a very important role in developing and expanding the MFSD stock monitoring programmes. The FIEFA project (EU Study Contract 97-0059) commenced in Feb. 98 and finished in Feb. 2000. This project was coordinated by the MI and involved 8 international

fisheries laboratories from Ireland, UK, France, Spain and Portugal. This project set out to increase the quality and quantity of data collected for stock assessment. It also set out to improve data management and increase communication with the industry. This project was replaced by SAMFISH (EU Study Contract 99-09), which is coordinated by Spain and involves the same partners. This project will focus on the same objectives as FIEFA but will target the analysis of sampling levels and the quality of the sampling data.

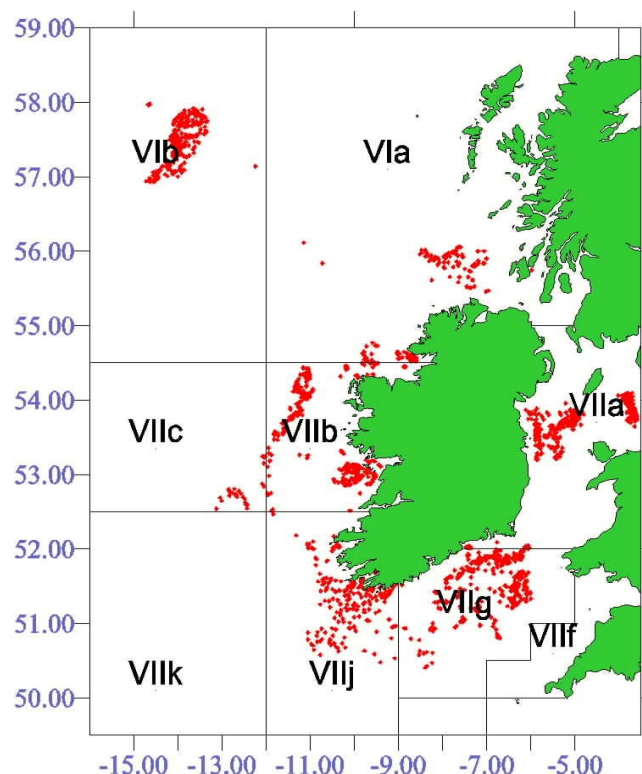


Participation in another EU project has improved survey co-ordination, protocols and data analysis (IPOST EU Study Contract 98-057).

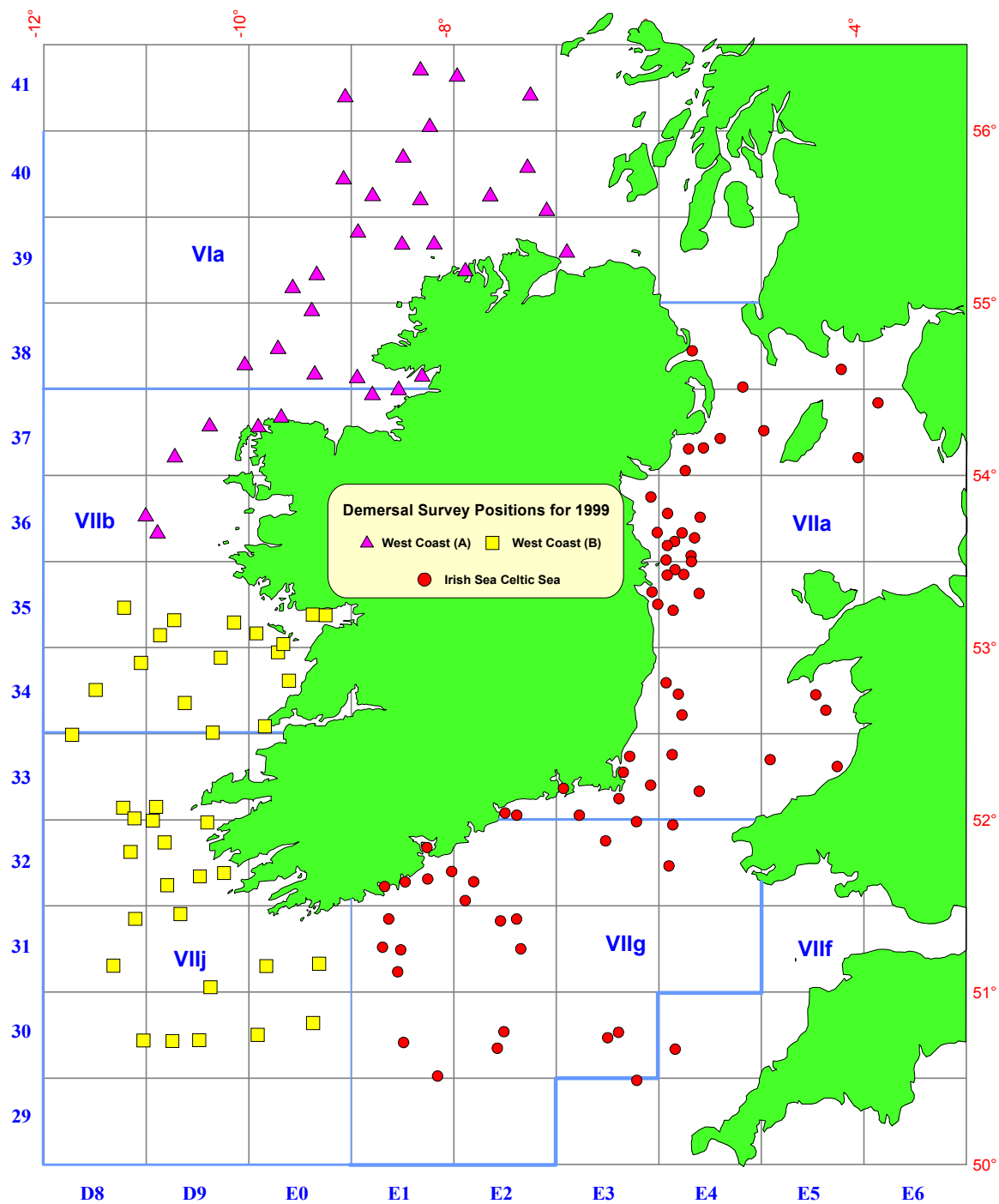
The Egg Production project (EU Study Contract 98-0090) will estimate the biomass of cod and plaice in the Irish Sea using fisheries independent egg production methods.

The Monk/Megrim project (EU Study Contract 98-0096) will increase our understanding of the biology of these species and improve the assessments.

Sampling carried out by the Fisheries Assessment Technicians on commercial Irish Vessels



MFSD Demersal Surveys for 1999

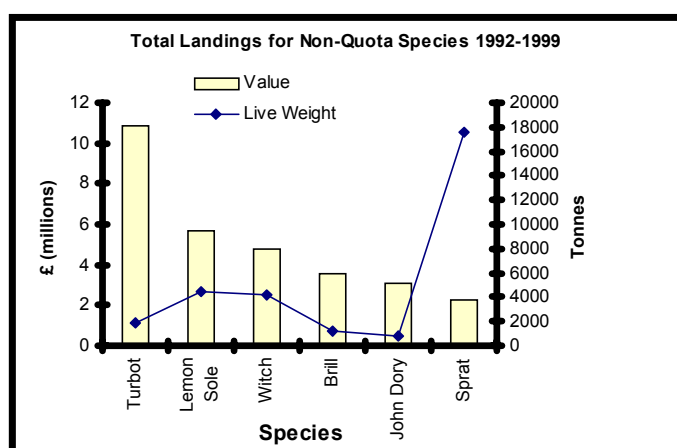


MFSD Non – Quota Species Overview

The most important non-quota species to the Irish fishing industry in terms of value are sprat, brill, turbot, lemon sole, witch and john dory. In 1999 these species had a combined value of £5,554,461 and combined landings of 7,600t. With the exception of sprat, these species are usually by-caught by otter trawls and beam trawls targeting demersal fisheries. They are landed in small quantities. Most fishermen favour prime whitefish above species such as witch and lemon sole.

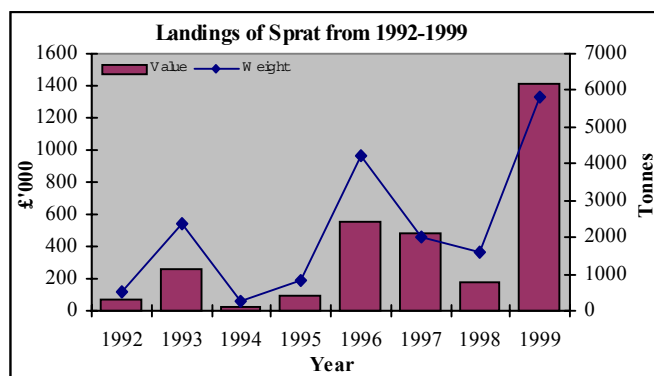
MFSD Research on Non – Quota Species

Due to the increasing pressure on quota species, it is essential to increase the research of non-quota or non-TAC species. Routine sampling of these stocks is carried out by the Fisheries Assessment Technicians on their monthly discard trips. Sampling of is also incorporated into the annual groundfish surveys. In August 2000 the Marine Institute began a dedicated research project assessing the abundance and distribution of non-quota species with emphasis on lemon sole in Irish waters. The age profile and length frequency of lemon sole will also be determined in order to gain insight into population size and current exploitation rates. This work is carried out under the SAM-FISH project which puts great emphasis on improving the information on stocks not currently assessed.



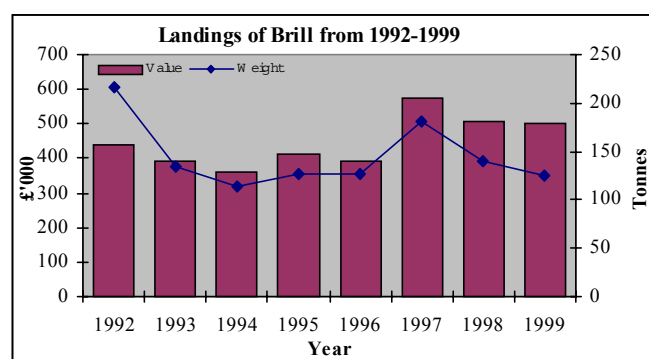
Sprat (*Sprattus sprattus*)

In recent years a large sprat fishery has developed in Killybegs. It is an opportunistic fishery which provides good income for most of the local fishermen. Fishing usually commences mid-September and is exhausted by end of November. Sprat is found in large shoals in shallow water and often close inshore making it easy to catch in large quantities. The main boats that target the sprat fishery are small demersal otter trawls that redirect their efforts from whitefish. In the last year pelagic tank boats in Killybegs have also begun to exploit the sprat fishery. Whilst Killybegs is the main port for this fishery, Cobh and Union Hall have also experienced good landings in recent years. Total landings of sprat for 1999 were 5,825t with a value of £1,410,545 to the Irish economy.



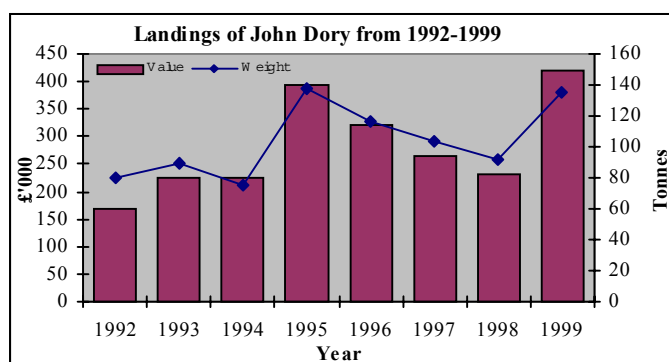
Brill (*Scophthalmus rhombus*)

In 1999, 125t of brill was caught by Irish boats. This had a total value of £503,207. This flat fish is caught principally as by-catch in demersal otter trawls. It is also important for small inshore boats. 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.



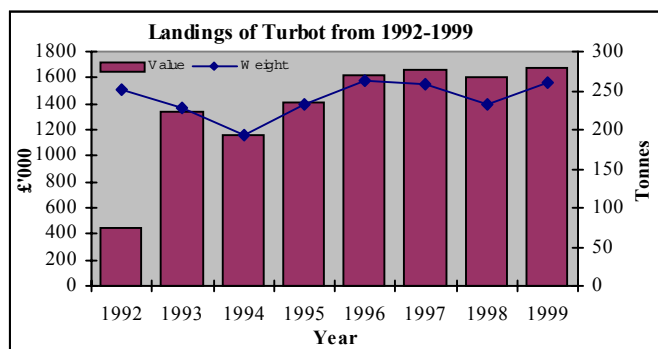
John Dory (*Zeus faber*)

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 1999, 144t of john dory were landed. This had a commercial value of £421,303.



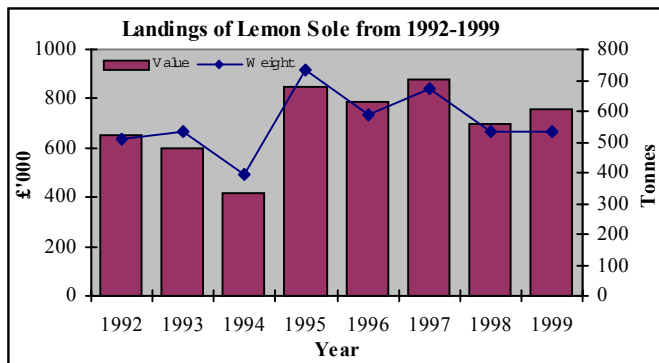
Turbot (Psetta maxima)

A highly valuable species, turbot was worth £1,673,123 to the Irish fishing industry in 1999. This species is mainly caught by tangle nets but also beam trawls, otter trawls and seiners. There is a small artisanal longline fishery for turbot in France. The quantity of turbot caught at any time is small, usually one or two per tow. However, 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



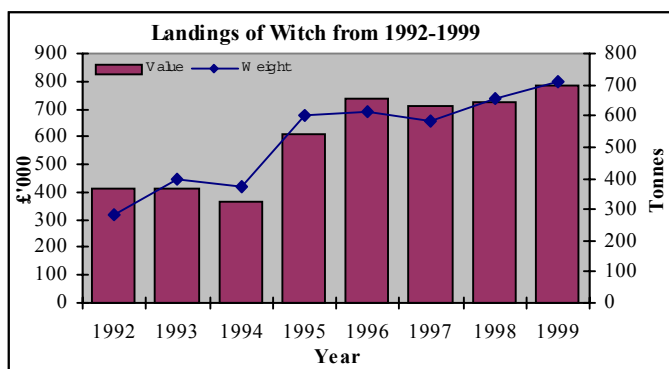
Lemon Sole (Microsromus kitt)

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 undersized and hence too small to be landed commercially. In the Celtic Sea, boats may catch between two and half a box of fish per haul. Lemon sole had a value of £759,673 in 1999.



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 300m. 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 1 box of witch per tow. In 1999, 712t with a value of £786,608 was landed



Five most important ports in 1999 for each Non-quota species.

Sprat

Killybegs	2425.8t
Union Hall	1390t
Cobh	988t
Baltimore	355t
Kinsale	271t
All others	395.9t

Lemon Sole

Greencastle	68.6t
Dunmore East	67.7t
Waterford	66.2t
Killybegs	53.4t
Castletownbere	39.5t
All others	235.7t

Turbot

Union Hall	34.1t
Dingle	25t
Schull	24.5t
Baltimore	22.5t
Dunmore East	14.7t
All others	140.1t

Brill

Killybegs	13.2t
Dingle	10t
Castletownbere	9.9t
Waterford	7.8t
Rossaveal	7.7t
All others	77.1t

Witch

Killybegs	119.5t
Waterford	98.2t
Union Hall	60.1t
Dunmore East	50.2t
Greencastle	49t
All others	335.7t

John Dory

Castletownbere	39.4t
Schull	16.8t
Union Hall	13.2t
Killybegs	11.5t
Dunmore East	9.2t
All others	54.5t

Introduction

Deepwater fisheries target many different species including ling, tusk, blue ling, forkbeard, roundnose grenadier, black scabbard, orange roughy, argentine, Greenland halibut, redfish and sharks. Little data exists upon which to base stock assessment, and while stock structure is not well understood, preliminary assessments have been attempted on several species in recent years. Most species taken in the waters west and north of Ireland are considered together as deepwater resources south of 63° N and are dealt with by the ICES Study Group on the Biology and Assessment of Deep Sea Fisheries Resources. The ICES North Western Working Group deals with several species including the redfish and Greenland halibut taken by Irish vessels in the Faroe-Shetland Channel.



Ling and tusk

Ling is the most consistently landed deepwater species by Irish vessels. However these landings are from continental shelf waters where the species also occurs. While deepwater trawling takes some ling, long-lining on the shelf edge is the most effective means of catching this species. A fleet of Norwegian long-liners target this species west of Cos. Donegal and Mayo. Tusk is a valuable by-catch for these long-liners. The single Irish long-liner has targeted ling and tusk west of Mayo during the summer of 2000. Future expansion of the Irish long-line fleet will mean that ling and tusk landings will increase.

Blue ling, forkbeard and mora

Irish trawlers working the shelf edge catch small quantities of these species. Important long-line species are forkbeard and mora, which are taken mainly by Spanish-owned vessels. Blue ling is taken mainly by trawlers in Sub-area VI by France and more recently by Scotland.

Deepwater sharks

Deepwater sharks are the only species taken in large quantities by both trawl and long-line. Collectively they are marketed as “siki” but this term comprises two species - the Portuguese dogfish *Centroscymnus coelolepis* and the

gulper shark *Centrophorus squamosus*. Spanish owned long-liners target these species, as do French trawlers.

Roundnose grenadier, black scabbard and orange roughy

Roundnose grenadier is taken primarily by French trawlers in Sub-area VI, with much smaller quantities coming from Sub-area VII. Catches are rapidly increasing in international waters of the Hatton Bank area and the Mid-Atlantic Ridge in Sub-area XII. Black scabbard is taken by trawlers in the mixed species trawl fishery along with roundnose grenadiers, blue ling and siki sharks. Again mainly French vessels are involved, though more recently Scottish vessels have been targeting these species. In common with roundnose grenadier and orange roughy, the black scabbard is not taken by demersal long-line. Orange roughy is a by-catch in the trawl fisheries, with only a single French vessel targeting the species in Sub-areas VI and VII. Those species taken in the trawl fishery have been landed in increasing numbers in 1999 and 2000 as larger Irish trawlers have become involved in trawling the eastern and southern slopes of the Rockall Trough. Trawling along the slopes west of Cork and Kerry (the Porcupine Seabight) yield poor returns however.

Argentine

Argentine was landed in large quantities by Irish pelagic vessels in the late 1980's, but these boats ceased to target the species in the early and mid 1990's. More recently Ireland has begun to target argentinines again, with several boats involved in the fishery in 2000. Forkbeard is a by-catch in trawl and long-line fisheries in Sub-areas VI and VII. This species also occurs on the shelf and increased Irish landings reflect increased effort on the shelf edge for such species as megrim, hake and monkfish.

Greenland halibut and redfish

In the Faroe-Shetland Channel Irish trawlers have targeted Greenland halibut and redfish since 1994, though effort increased markedly since 1998. The stock structure of redfish is the subject of much controversy. Two species support the trawl fishery in the Faroe-Shetland Channel, *Sebastes marinus* the golden redfish and *Sebastes mentella* the deepwater redfish. However there are indications that there may be three separate components of *S. mentella* viz. deepsea, oceanic and pelagic races. To complicate matters further, *S. marinus* might be segregated into a “giant” form and the normal-sized form.

Irish vessels fishing in this area operate in Divisions Vb1, IVa and VIa. Redfish are fished in large quantities in Division Va by Iceland, Germany and the Faroes. In addition factory trawlers from these countries, Norway and Russia fish them on the Mid-Atlantic Ridge and east Greenland. The fishery in which Irish vessels participate is regarded as taking a negligible proportion of the overall

catch. Greenland halibut is found in the eastern Atlantic from Scotland to northern Norway, on the Hatton slopes, east Greenland and at Newfoundland. It favours waters colder than 4⁰ C. The fishery in the Faroe-Shetland Channel is prosecuted by Scottish and, more recently, by Irish boats. The landings in this area are small in relation to total landings for this species in the northeast Atlantic.



State of the stocks

Since the 1980's declining resources on the continental shelf have encouraged the development of fisheries in deeper waters. There has been a tendency for fisheries to extend down the continental slopes to target new species. Strong declines in catch per unit effort (CPUE) have been described for ling, blue ling, tusk, orange roughy, roundnose grenadier and black scabbard. CPUE for sharks has also declined, but these data are less conclusive since they are based on combined catches of Portuguese dogfish and gulper shark. Declines in the landings of orange roughy, roundnose grenadier, siki and tusk have been documented. Landings of redfish in Sub-area VI and Division Vb have declined markedly in the past decade, as have those of Greenland halibut in Sub-areas V, XII and XIV.

Since most deepwater species are long-lived, the fish caught in recent years may have been recruited well before the advent of deepwater fishing. Consequently the impact of current exploitation of the spawning stock may be delayed until future years. Deepwater fish are generally very slow-growing and produce small numbers of progeny. They mature late in life and are adapted to a stable environment. They are, therefore, not considered able to withstand high or even moderate fishing rates. However there are examples of non-intensive and traditional fisheries that have been shown to be sustainable. The black scabbard fishery at Madeira, for example, has supported catches for several hundred years.

Assessments for deepwater fish have been hampered by the lack of adequate scientific data. Relatively short CPUE series exist for several fleets of French trawlers. However, only that for the older, larger vessels could be considerable reliable. This is because the level of technology and expertise at catching deepwater fish increased throughout the 1990's. Thus, trends in CPUE may reflect the ability of vessels to catch these species. Furthermore it is known that vessels have extended their geographic and bathymetric ranges, and CPUE declines in one area will have led to movement to hitherto unexploited areas. This implies that CPUE may not be an effective means by which to examine

trends in stock abundance. Most deepwater trawl fisheries are opportunistic, targeting a species for a certain period and continuing to take it as a by-catch. Most, like the French trawl fishery were multi-species in character from the outset, suggesting the TAC regulation is not likely to be an effective management measure. Closed areas are also unlikely to be a useful measure since different life-stages of deepwater fish often live in widely separated areas. Marine Institute studies have shown that commercial cod-ends retain even the smallest roundnose grenadiers. It seems unlikely, therefore, that mesh size would provide a means by which to manage the fishery.

While there is no effective management regime in place for deepwater stocks west or north of Ireland, EU effort restriction legislation (2027/95) does allocate a maximum fishing effort to each Member State. This legislation has provided Ireland with 7.6 % of total towed-gear effort in Sub-area VI and 23 % in Sub-area VII, but no static-gear effort allocation. Norwegian long-liners targeting ling and tusk are given a quota which allows them access to EU waters. However by-catch in this fishery is capped which precludes the targeting of other deepwater species by Norwegian vessels. Greenland halibut in non-EU waters at Greenland and Norway is subject to quotas, which are taken up mainly by Spain, Portugal and Germany. Redfish are also managed by TACs. TACs regulate access of EU vessels to Norwegian, Faeroese, Icelandic and Greenlandic waters. The largest quotas are allocated to Germany. Within EU waters, a TAC for redfish covers Sub-areas V, XII and XIV. The Irish quota for 2000 was 4 tonnes, a fraction of one percentage point of the TAC. However the Sub-area VI is not included in the quota, though some Irish targeting of redfish takes place in that Sub-area. ACFM has advised for reductions in fishing effort for roundnose grenadier, black scabbard, ling, blue ling and tusk. For the other species in Sub-areas VI and VII the advice was for no expansion of fisheries unless accompanied by programmes to evaluate stock status.



MFSD Deepwater Programme

The Marine Institute began a deepwater research survey programme in 1993. To date, ten surveys have been carried out, five each by trawl and long-line. The survey programme was initiated to obtain samples of deepwater fish for biological analysis. The surveys have also provided material for food technology and contaminant studies. They have produced a valuable time series of catch per unit effort (CPUE) and discarding information. All trawl surveys were carried out using the *Mary M*, a demersal

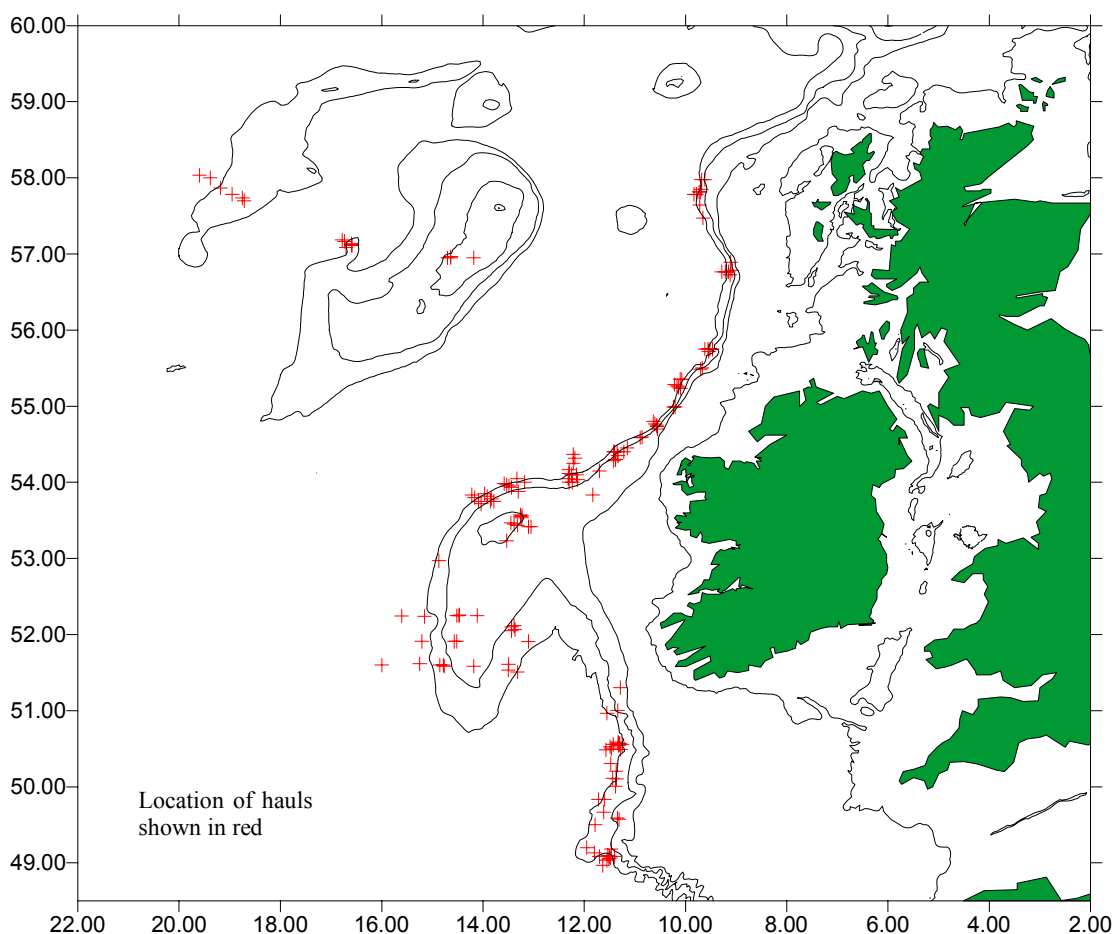
whitefish trawler with commercial trawl gear. The first long-line survey (1995) was carried out using the converted long-liner *Sea Sparkle* from Greencastle and covered the continental slopes of both the Rockall Trough and to a lesser extent, the Porcupine Bank. The second survey (1997) using the Norwegian vessel *Skarheim* covered the Rockall Trough only. The third survey (MFV *Loran*) concentrated on the Porcupine continental slopes and those to the south west of Ireland along the Porcupine Sea Bight, thus achieving coverage of all the continental slopes within the Irish 200 Exclusive Economic Zone. The first long-line survey in 2000 used *An Capall Ban* and covered areas previously not investigated, such as western Rockall and Hatton Banks. The second survey, also on this vessel covered the southern slopes of the Rockall Trough.

Research carried out at the Marine Institute has shown conclusively that the roundnose grenadier is a long-lived species, reaching ages of up to 60 years and only maturing at 7 – 11 years. A biological study of argentinines showed them to be long-lived and produce small numbers of eggs. This was found to be a long-lived slow growing species with low fecundity. Other studies have confirmed that forkbeard and blue mouth rockfish are also long-lived, and that siki and false siki have limited reproductive outputs,

mature at a large size and do not have defined spawning seasons.

Current work includes the development of stock assessment methods for deepwater sharks. Such assessments were hampered by lack of data, but the information collected by the deepwater programme will form the basis of future work in this area. This work is being conducted as part of the EU-funded DELASS project. The MFSD are members of the ICES Study Group on the Biology and Assessment of Deep Sea Fisheries Resources. In addition to work on shelf species the SAMFISH project aims to improve the knowledge of the biology of other non-assessed and non-quota species in deep waters. Argentinines landed into Killybegs in 2000 by the pelagic sector were also sampled and otoliths and length data were collected. In 2000 BIM and Marine Institute personnel acted as observers on the Irish vessels targeting deepwater fish on the continental slopes west and north of Ireland and in the Faroe-Shetland Channel. CPUE and length frequency data were collected and will provide valuable information for future management. These sampling programmes provide important data upon which future management measures may be based.

MFSD Deepwater Longline Survey Programme.



Total international landings of deepwater species in Sub-areas VI and VII as reported to ICES.

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
alfonsino		12	8		3	1	5	3	178	25	81	78
argentine	10,439	25,559	7,294	5,197	5,906	1,577	5,707	7,546	5,863	7,301	5,555	265
blue ling	9,288	9,422	5,964	6,235	6,645	5,526	4,355	4,839	6,915	6,866	7,278	8,169
black scabbard		154	1,060	2,759	3,436	3,529	3,101	3,278	3,689	2,995	1,967	1,631
forkbeard	1,898	1,815	1,921	1,574	1,640	1,462	1,571	2,138	3,590	2,335	3,040	2,176
ling	28,092	20,545	15,766	14,684	12,671	13,763	17,439	20,856	20,838	16,668	19,863	14,811
mora				1	25							
orange roughy		8	17	4,908	4,523	2,097	1,901	1,039	995	1,039	1,071	1,401
rabbitfish							2					
roundnose												
grenadier	32	2,440	5,730	7,793	8,338	10,121	7,860	7,767	7,095	7,070	6,364	5,747
red seabream	252	189	134	123	40	22	10	36	33	36	13	15
sharks	85	40	345	1,438	3,441	4,818	5,473	6,224	5,460	6,224	5,590	3,743
smoothheads								7		7		
tusk	3,002	4,086	3,216	2,719	2,817	2,378	3,233	1,832	2,417	1,832	1,775	1,775

Preliminary Irish landings in live-weight tonnes of deepwater species

	argentine	blue ling	forkbeard	Greenland halibut	grenadiers	redfish	black scabbard	red seabream	tusk	ling	orange roughy	rabbitfish
1992	320		9	5		5		16	13	452		
1993		5	60		144	5	8	7	67	880		0
1994		74	111	5	14	15	3	23	52	1159		2
1995	6	74	110	5	14	15	3	23	52	1542		0
1996	295		154	2	1		0	8	64	1379		
1997	1089	1	228	2	4	48	1	8	45	1305	1	2
1998	405	22	318	21		71			43	1272		2
1999	396	44	379	78	1	183	1	1	44	1139		

Introduction

Skates, rays, sharks and dogfish, whose skeletons are made of cartilage rather than bone, are elasmobranchs. At present these species are not assessed or subject to catch restrictions, apart from liver quotas for Norwegian vessels. However this is likely to change in the near future. Experience from the northwest Atlantic has shown that, as gadoid stocks declined, elasmobranchs increased in relative abundance. In view of declining gadoid stocks in Ireland, elasmobranchs are becoming increasingly important for the fishing industry. However many elasmobranch fisheries have proven unsustainable with rapid declines in landings. This has prompted the FAO to recommend that individual countries adopt voluntary elasmobranch fishery management plans. To date no European country has adopted such a plan. The Irish fleet landed 4,030 t of these fish in 1999, valued at £2,689,559.

Rays and skates

Irish vessels landed 2,283 t of rays and skates in 1999, valued at over £1,900,000. In the Irish Sea, rays are of particular importance to the otter trawl fleet and as other traditional species have declined, rays have become the main demersal fish landed in the recent past. The main ports where they are landed are Howth, Arklow and Kilmore Quay. In view of the declines in demersal species such as cod and hake it is likely that rays and skates will be of increasing importance for trawlers around the coast. Rays are a by-catch for Irish beam trawlers targeting black sole. Some of these rays are landed into English ports. Gill-netters and tangle-netters along the south coast also catch rays in small numbers. Rays are landed into the west and northwest 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* may occur in landings in the southwest.

Spurdog

In 1999 Irish vessels landed 962 t of spurdogs, valued at £529,527. 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. They are landed in greatest numbers at Greencastle, Killybegs, Achill and Ros an Mhíl.

Spotted dogfish

Though spotted dogfish are marketed in several European countries, most notably 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. In 1999 Irish boats landed 682 t of both species of spotted dogfish. The low value of these landings (£182,371) reflects the lack of markets for human consumption.

Large shark species

It is difficult to quantify the tonnage of larger shark species taken every year. This is because several species are grouped together in landings statistics. Blue sharks are caught by gill-net vessels, mainly in Sub-area VIIj, but they are not always landed because their carcasses deteriorate rapidly when stored in ice. It is therefore difficult to accurately quantify the tonnage caught. Other species, such as tope and porbeagle, are landed in small quantities in various places mainly as by-catch in demersal fisheries. Since the demise of the Achill Island fishery Irish fishermen do not target the basking shark anymore, though there is no legal restriction on fishing for this species. Norwegian fishermen targeted this species off the south coast where peak catches occurred in 1984 when 4,442 individuals were caught. This fishery ceased in 1986. Norway is also given quotas for basking shark and porbeagle livers in EU waters. Landings of deepwater siki sharks are not reported to species level. In 1999 landing of deepwater sharks were negligible. During 2000 however, larger Irish trawlers and the single long-liner landed these species, see *Deepwater Fisheries Overview*.



Landings of elasmobranch species by Irish vessels - live weight tonnes.

	Rays and Skates	Spurdogs	Spotted Dogfish	Sharks - Various
1992	2,270			
1993	1,756	3,021	222	17
1994	1,525	2,464	1,158	16
1995	2,098	2,435	1,676	40
1996	2,212	2,095	1,144	23
1997	2,713	1,297	1,085	32
1998	2,120	1,259	1,144	169
1999	2,283	962	682	88

STATE OF THE STOCKS

The stock structure of Irish elasmobranchs is not clear. 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 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. As hake stocks decline gill-net effort may increasingly shift to spurdogs.



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 have declined 813 t in 1999. Despite the de-

cline in landings, 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 in Irish waters. The relatively stable catch rates in earlier years may have masked the decline, and subsequent "virtual extermination", 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 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.

MFSD WORK ON ELASMOBRANCHS

As part of the SAMFISH project, MFSD personnel undertake routine market sampling of all species landed in Ireland, including rays, dogfish and sharks. MFSD involvement in the EU-funded FIEFA project facilitated the development of Irish market and on-board sampling of elasmobranchs to species level. The Fisheries Assessment Technicians in the various ports are engaged in on-board sampling of discards also. It is clear from the discard monitoring work that considerable quantities of elasmobranchs are discarded in Irish fisheries every year. While elasmobranchs are more likely to survive than teleost species there is still cause for concern. Groundfish surveys of the west coast, the Irish Sea and Celtic Sea are conducted each year, in the fourth quarter. In recent years these surveys have provided CPUE data on all elasmobranch species. While the trawl gear used may not reflect the true abundance of fast swimming dogfishes, or the benthic rays they may be of great importance for future stock assessment, in the absence of commercial catch data by species. These surveys also provide important information on the distribution of elasmobranch species.

Irish landings of elasmobranch species by ICES division in 1999.

Division	spurdog	ray and skate	porbeagle	blue shark	spotted dog-fish	various sharks
VIa	91	388	0		30	0
VIb	2	28			0	
VIIa	68	814			57	
VIIb	273	446	1	10	108	1
VIIc	2	7	0	3	0	0
VIIe		0				
VIIg	49	246			88	
VIIh		4				
VIIj	476	349	1	13	398	16
VIIk	0	1	6	40		4

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 and assessment of Irish Sea rays was completed by Trinity College, Dublin under the Marine Research Measure funding scheme.

The MFSD are partners in a new EU funded project entitled “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. In addition the sampling methodologies will be evaluated. The distribution of elasmobranchs from surveys and other sources will be used to



enhance our knowledge of stock structure. A part of DELASS the MFSD will act as international co-ordinators for data on blue shark to be used for stock assessment purposes. This will include international landings information, tagging and by-catch data. The project provides a framework for the development of suitable stock assessment methodologies for the species under study; spotted dogfish, rays, spurdog and blue shark. These assessments will form the basis of future management plans for elasmobranchs. To date the surveys have provided information on the distribution and abundance by species.

MANAGEMENT

The ICES Study Group on Elasmobranch Fisheries deals with elasmobranch species. In the last number of years no stock assessments have been carried out since sufficient expertise was not available to the group. However the DELASS project will provide data that will allow for the first assessment of rays, skates and dogfish. The International Commission for the Conservation of Atlantic Tunas (ICCAT) convened a working group on shark stock assessment because of concerns about the large by-catch of pelagic sharks in tuna fisheries. ICCAT and ICES have agreed to collate existing data on blue shark within both organisations for analysis as part of the DELASS project. MFSD has been appointed co-ordinator for this task.

There are no explicit management plans for any elasmobranch species. To date no TACs or quotas are set for these species in Irish waters, with the exception of Norwegian liver quotas for basking shark and porbeagle. However in the North Sea and Division IIa a TAC for rays has been agreed in recent years and quotas have been allocated to several Member states, mostly to the UK and Belgium. Apart from that TAC no other commercial catch restrictions exist for elasmobranchs in European waters. Recently, the United Nations Food and Agriculture Organisation recommended that individual countries should develop voluntary management plans for elasmobranchs. To date no EU Member State has such a plan, although it

does seem likely that TACs, and possibly, other measures will be set for rays and other elasmobranchs in the near future.

Under an agreement in 1982, Norway was allocated 800 t of basking shark and 500 t of porbeagle livers in EU waters. These quotas were reduced to 400 t of basking shark and 200 t of porbeagle livers in 1985. None of the Norwegian quota for basking shark in EU waters is taken around Ireland at present.

Elasmobranchs have been characterized as being long-lived, slow-growing, mature at large size and produce small numbers of progeny. Concerns have been raised

about the susceptibility of elasmobranchs to over-exploitation. These concerns are based on histories of rapid declines in landings, such as occurred in the west and north coast spurdog fisheries. Indeed, declines of many lucrative fish species, such as cod and hake, in Irish waters have led to increased exploitation of and dependence on several elasmobranch species. A case in point is the Irish Sea ray fishery, which is of great importance to trawlers in the area. Furthermore whitefish vessels in other areas may become increasingly dependent on rays and dogfish species as traditional stocks decline. MFSD aims to collate and analyse available information on elasmobranch species so that future management plans are developed with the best possible biological data.



MFSD Shellfish Fisheries Overview

Prawns

(*Nephrops norvegicus*)

Nephrops are widespread in the waters around Ireland where the seabed sediment is suitable for the animals to make the burrows in which they live. In Irish waters they are most numerous, though with low mean size, where the mud is soft, whereas, where the mud is firmer and sandier, they are less abundant but on average larger. In 1999, 8,492 tonnes were taken in the Irish fishery (22% above the 1998 catch) with a value of £16.3 million (a 26% increase on the 1998 value).

The ICES *Nephrops* Working Group designates areas containing discrete *Nephrops* stocks as 'Functional Units' (FU's) denoted by Arabic numbers. For purposes of giving advice these FU's are grouped together into larger areas that are termed 'Management Units' (MU's) and are denoted by alphabetic letters. These MU's may not correspond to the ICES Divisions and some assessment areas (e.g. L) overlap several divisions. (See figure in Appendix 1).

Highest catches by the Irish fleet in 1999 were from the Western Irish Sea (FU 15) where 4,615 t (live weight) of *Nephrops* were caught. Most of the *Nephrops* caught from this area are landed into east coast ports including Howth, Clogherhead and Skerries with 1999 *Nephrops* landings of 2,752 t, 1,964 t and 1148 t respectively. *Nephrops* landings were worth approximately £5.0m in Howth, £1.2m in Clogherhead and £1.4m in Skerries.



The grounds at the back of the Aran Islands (FU 17) are also a very important ground particularly to the Rossaveal fleet. Landings into Rossaveal were 1,424 t live weight in 1999 and were worth £3.8m. This fishery is also targeted by vessels from Dingle which, like the Rossaveal vessels,

fish the Porcupine Bank in the summer months. Landings in Dingle in 1999 were 204 t worth £0.6m. *Nephrops* are also a very valuable fishery in the south and south west of Ireland and in the Celtic Sea (FU19 and 20-22). The landings in 1999 in Union Hall were 479 t, worth £0.9m, in Dunmore East were 289 t, worth £0.5m and in Kinsale were 159 t, worth £0.4m. There are also substantial landings in Castletownbere, Ballycotton, Baltimore, Killmore Quay, Valentia and Schull.

Nephrops are almost exclusively targeted using demersal trawls. Fishing started in the 1950s and effort increased up to the 1980s since when it has levelled out, with minor fluctuations. In the last six years effort has increased substantially again as vessels switched to the more effective twin-rigs and increased gear efficiency further. Some of the more remote and deepwater grounds, such as the Porcupine Bank have only been exploited by Irish Boats from relatively recent times. There is also evidence that more remote deepwater grounds are still being discovered from time to time. The current reduction in many of the white-fish stocks will lead to further increase in targeting of *Nephrops* stock unless managed effectively.

Nephrops appear to be somewhat resilient to heavy fishing pressure due to their habit of dwelling in burrows. However, due to the great differential in unit value between large and small *Nephrops*, the potential losses in revenue due to 'growth overfishing' (i.e. where too high a proportion of the *Nephrops* are caught before they have undergone their optimal amount of growth) is greater than with most fish species.

Continuous monitoring programmes have been carried out for some years on stocks in the western Irish Sea (Division VIIa) and, more recently on stocks in the Celtic Sea and on the Aran Grounds and Porcupine Bank off the West Coast. Commercial samples of *Nephrops* from the Irish Sea (Management Unit J) are collected at Clogherhead, Skerries and Howth, those from off the west and south-west (Management Unit L) at Rossaveal, Dingle and Skibbereen, and those from the Celtic Sea (Management Unit M) at Dunmore East. Research vessel surveys are carried out annually in February and in June/July in the Irish Sea (J), and surveys are planned for the Aran Grounds and Celtic Sea (M).

Since *Nephrops* contain no annually marked structure (such as otoliths) it is impossible to age them by the methods routinely used for most vertebrate fish species, so their age must be calculated by other means - such as fitting normal curves to polymodal length frequencies.

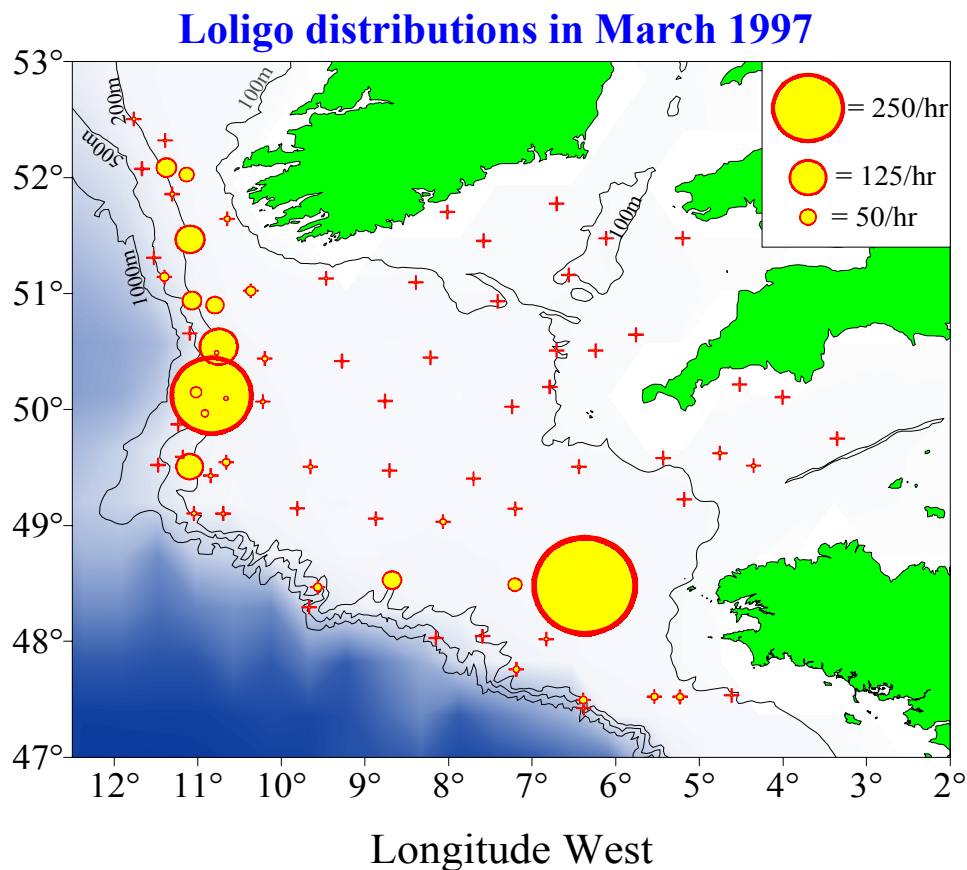
Cephalopods

Five species of commercially exploited squid occur in Irish waters. Of these, the common or white squid (*Loligo forbesi*) is the most important species with landings in 1999 of 282t worth £560,000. Over 1,000t of *Loligo* squid were reported from the ICES areas around Ireland in 1999, 56% of these were from Division VIa. The highest Irish landings of recent years were in 1995 when 1,050 t were landed. 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 seasonally abundant. Up to now these species are not separated in the catch statistics. Reported catches of short-finned squid peaked in 1996 at 481 t. Irish catches in 1999 were estimated to be 323 t. Landings of 454t were reported by all EU countries from the ICES areas around Ireland, 54% of these were from Division VIIg-k. *Illex* squid are the most common in demersal trawls with catches of up to 375kg/hr were recorded in some years by a Marine Institute-funded project to develop a fishery for these species. This species recruits to grounds west of Ireland in November and peak catches occur between February to April. There is thought to be considerable potential to develop this non-quota fishery in the future given that this species is the preferred bait in long line fisheries. However, it is important that the squid are frozen at sea so that they are fresh enough to us for long lining.

Octopus and cuttlefish landings in 1999 were negligible with 10 t of the former (exclusively *Eledone cirrhosa*) landed. The very valuable English Channel cuttlefish stock has yield landings of about 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 by-caught in trawl fisheries. Occasional individuals are caught by Irish vessels.



MFSD Inshore Stocks Overview

Resources under heavy fishing pressure; active participation by DoMNR required to realise new objectives.

A review of landings of six categories of invertebrates is instructive, providing an eloquent account of how inshore stocks are managed.

Crawfish (*Palinurus vulgaris*) is the most valuable species of all, first-sale values have been known to exceed Ir£30

Ir£6.00 per kilo) for which a fishery intensified in the early 1990s. In 1992 there were record landings which may well have been followed by a population collapse. Locally, fishermen regard the palourde as having disappeared from long stretches of coastline.

The exploitation of **sea urchin** (*Paracentrotus lividus*) is something of a mystery. The only way of harvesting this species is by diving and the collection of shellfish by this

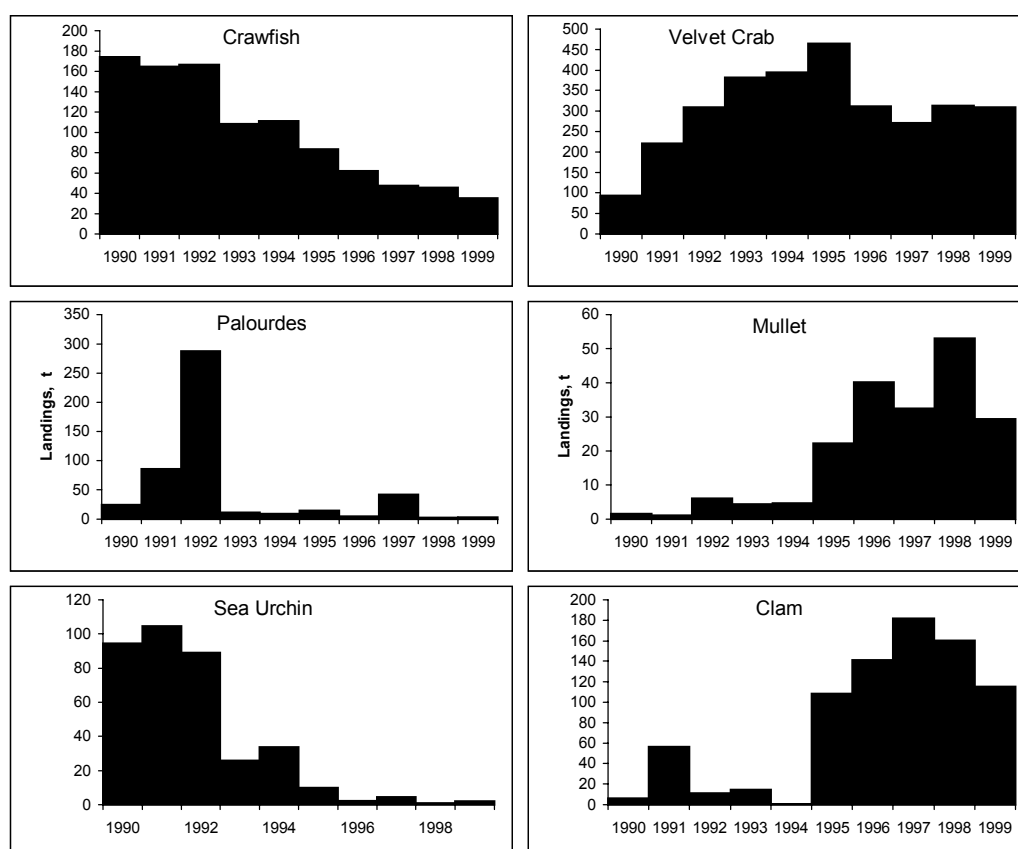


Fig 1 Landings (live weight) of six inshore categories, 1990 to 1999 inclusive (Source: Department of the Marine and Natural Resources).

per kilo. Landings (Fig 1) declined by 70% from 170 tonnes in 1990 to around 40 tonnes in 1999. The cause of this decline is widely regarded as the use of “cray nets” - tangle netting which causes considerable destruction to crustacean and fish stocks. Many, possibly the vast majority, of fishermen would like to see its use prohibited but it is still legal to use cray nets. And, if one fisherman in a community chooses to do so, his neighbours must follow suit or see him capture a disproportionate share of the stock.

The **palourde** (probably a mixture of species) is one of our most valuable bivalve molluscs (first-sale values of almost

method is prohibited by byelaw. The trend in landings of purple sea urchin is regarded as accurately mirroring the declining abundance of this species.

Velvet crab (*Necora puber*) is a target for pot fishermen but it is also frequently taken in association with other crustacean species. The trend in landings of velvets is similar to that of the whelk fishery, a peak in landings in 1995 followed by a slight decline and stabilising of landings. There is no regulation, not even a minimum landing size, in operation for velvet crab in Ireland although other European nations consider it prudent to enforce one.

Landings of **grey mullet** (*Crenimugil labrosus*) suggest a recent interest in the species. Mullet is a long-lived, slow-growing and late-maturing species which, like salmon, is faithful to particular river estuaries. It is a resource which deserves careful husbanding but there are no regulations for its management.

Finally, landings of **clam** - a blanket term embracing a range of species and genera - are also increasing, some of them possibly a by-product of the expanding effort for razor clam. For many belonging in this group there are no conservation regulations and much of what is said elsewhere about the razor clam fishery also applies to these shellfish.

Imposing order on a boom and bust sector

Inshore waters provide the industry with a number of shellfish species which are either not encountered or which cannot be fished in deeper waters. They are also the nursery grounds for whitefish species like hake which are fished in much deeper waters. It would be simplistic to regard these as belonging exclusively to either inshore or offshore grounds.

The inshore waters are heavily exploited using a greater variety of gears than elsewhere: dredges, pots and creels, static nets, both enmeshing and tangling, trawls and hook and line. Regulatory authorities are charged with minimising the interference of one with another.

In the context of the European Union, a portion of the inshore fisheries (depending on how they are defined) are the only ones remaining under national jurisdiction. It follows that national authorities have a special responsibility for their optimal management. Whereas it is commonplace throughout Europe at this time to attribute blame for depleted stocks to any member state other than one's own, it is impossible to do so in the case of say, a shellfish stock exploited in waters which run from less than 7 metres depth into the intertidal.

The BIM report values the inshore stocks at £30 m but that is conservative since it cannot, based on the provisional DoMNR statistics of 1999, include many of the fin-fish species exploited in both shallow waters and further offshore. In broad outline and by conservative definition, landings from the inshore can be considered in the following categories, which include cultured shellfish (Fig 2):

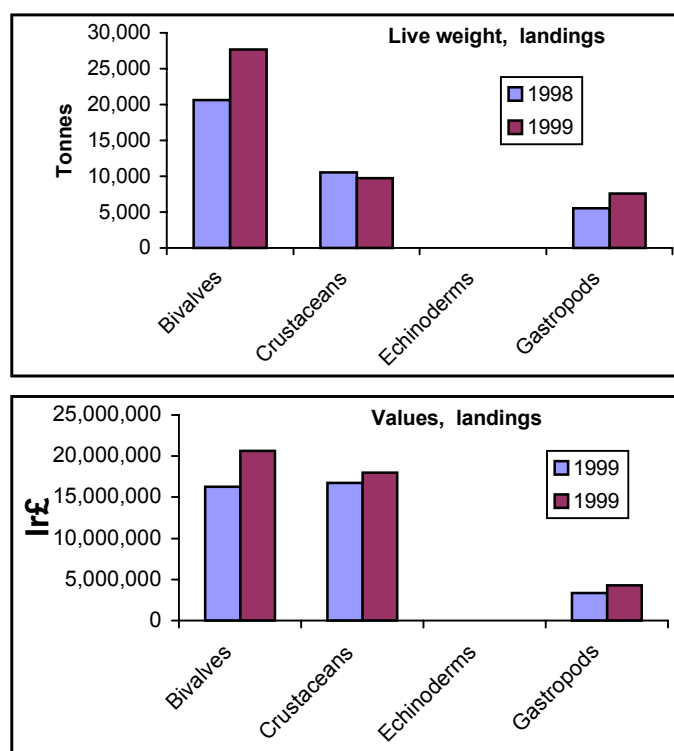


Fig 2 Landings (live weights) and values of landings of various inshore categories in 1998 and 1999 (Source: Department of the Marine and Natural Resources).

In 1998 landings of these were 36,749 t which rose to 45,018 t in 1999, an increase of 22.5%. Their values rose from Ir£36 m in 1998 to Ir£43 m the following year, an increase of 18%.

Less comprehensive assessments

MFSD is involved with assessing and monitoring a number of species belonging in these categories. Inshore species are not regulated by TAC and quota. It follows from this that there is less assessment of any one of them than of shared stocks; a further complication to their assessment is the fact that smaller inshore boats are not required to maintain records of their catches. The ICES system of working groups does not play a part in amalgamating inshore data from various nations and the range of analyses performed is correspondingly more limited. The time series for these fisheries are also shorter, one reason for this being the boom and bust nature of these fisheries (Fig 1). A prospect of success attracts a rapid entry - often in the form of older vessels - which had dropped out of the more modern and competitive pelagic and whitefish fleets - followed by expansion and very soon afterwards depletion of the resource whereupon the effort moves onto some other species. Among those fisheries currently being monitored, none is characterised by prospects of great longevity. Earlier examples of such fisheries include those targeting sea bass and spurdogs.



An advantage to many inshore species is the fact that they are fished using pots or creels. Regulation of these fisheries is by size limit, the animal being given an opportunity to reproduce once before capture. The five invertebrate taxa reviewed by MFSD are all believed to survive discarding. Compliance with the regulations is however poor; yet, if this kind of management cannot be enforced, there is very little hope of success for the altogether more complex management required for shared stocks.

The precautionary principle is a good basis for managing any species and the persistent dis-improvement of measured indicators must be a signal that more stringent enforcement is required.

Some of the species reviewed here (e.g. shrimp and brown crab) cannot be aged and alternative indicators (such as

CPUE) give a measure of stock abundance. In the case of shrimp fisheries, the brief life cycle and small size of the animal make it very difficult for any management regime and a precautionary approach to sustaining yield is considered the only way forward, in this case by establishing a limited open season for the fishery and then monitoring it to ensure yield is maintained. This regime has been recommended for shrimp over several years when the fishery was an autumn-winter one and there was general support for it by fishermen and processors alike but, in the absence of legislation, individual fishermen have extended their activities and shrimp fishing now takes place all the year round on some parts of the coast.

It is the nature of bureaucracies that they move slowly and new fisheries have usually been in progress for some time before there is any reaction to them, by which time unsuitable practices may have been put in place and too many vessels have become involved, creating problems for the introduction of rational management measures. The newest of the inshore fisheries, for razor clams, is a case in point. Experience elsewhere, notably in Portugal, has demonstrated the fragility of fisheries of this kind. The fishing method, hydraulic dredging, is highly destructive (involving up to 40% of discards due to breakages and bruising of the clams in the course of fishing - in fact, more recent information suggests this figure may be as high as 60%) but access to the fishery has not been restricted and the most valuable bed discovered to date, at Gormanstown, Co Meath, was exhausted in little over two years. At times the Spanish market - to which almost all landings were directed - could not absorb them and the first sale price for razor clams fell by 50%; there have been instances of dumping clams which were not sold. Part of the reason for that was the size grades being harvested were not suitable for the market. The clam bed in question is characterised by large animals which are ideal for canning but these were still being sent to Spain at a time then the canneries had ceased to purchase and demand had switched to a live market for smaller individuals.

There is a strong argument to be made for a more imaginative and innovative approach to harvesting species like razor clams. Diving is an obvious alternative which would be more eco-friendly and would permit the recovery of clams in better condition and the selection of sizes more acceptable to the market at any time. Diving is currently prohibited under bye-law and that situation should be reviewed.

If the inshore stocks which are of great value to the industry are to contribute sustainably their finite nature must be recognised in practical measures. Over the medium-long term some means of limiting entry and putting a ceiling on effort in these fisheries will have to be put in place. The practice of fishing out one species and then moving on to another is not consistent with any management regime.

MFSD currently monitors one inshore finfish, sea bass, a species which is not included in Fig 2 (it cannot be sold

but it has a value to angling tourism). Once plentiful in Irish waters stocks ran down as a result of heavy fishing by both hook and line and fixed net. A series of years of relatively low sea temperatures depressed growth, juvenile survival and gonad size resulting in the fish becoming considerably less common than it once was. Sea bass is the only marine species reserved through legislation for anglers. Legislation alone does not confer protection and efforts at enforcement will have to continue into the indefinite future if the species is to recover its former abundance.

Foundation of a new regime

Last year's review of this sector greeted the publication of the BIM review as a foundation on which further constructive development might take place. In the National Development Plan for 2000 the inshore has been recognised as a separate development sector and three pilot inshore development groups have been established to put sustainable management on a new footing: in south Wexford, Dingle, Co Kerry and, most recently, Cleggan, Co Galway. Each has a facilitator appointed by BIM. Collection of facts and statistics is underway in each area.

The objective of these local development groups is to increase the income and standards of living of all involved in the sector through sustainable development of the fisheries in question. First reports identify similar problems everywhere: declining stocks and increasing fishing effort and competition from vessels other than those immediately involved in an area. Additional problems arise from inadequate infrastructure, poor condition of the fleet, scarcity of crew and poor training. Inadequate fish quality and marketing difficulties also provide a challenge but all of these are secondary to the fundamental problems of over-worked resources without which there is no fishery.

Focus on the south Wexford lobster co-operative

Probably the most suitable site for a pilot development programme is South Co Wexford which has an important and well documented lobster fishery and an enthusiastic fishing community. The South Wexford lobster co-operative provides work for 106 direct and 35 indirect employees. In the 1960's its fishing capacity consisted of 5,000 pots which captured 33.0 lobsters per 100 units; by 1995 the effort had risen to 10,000 pots taking 7.6 lobsters per 100 units. The usual progression was anticipated: effort would continue to rise while the valuable resource was fished down.

In the early 1990's fishermen from the area approached BIM with a request to assist with the orderly development of the fishery in a way which allowed for a sustainable yield. At a seminar in Kilmore Quay in 1993 the well tried and tested methods of managing stocks of American lobster were explained and the following year the South Wexford lobster co-op was formed. Its purpose was to stabilise fishing effort, to create a management structure within the fishing community and to enhance the stocks.

The co-op adopted a target of V-notching 7,000 hen lobsters which it has exceeded, by 2,600. V-notching is estimated to have been instrumental in yielding 40 million eggs annually, accounting for some 59% of egg production in the area; 70,000 stage VI hatchery reared lobsters were released into the wild. A system of monitoring by logbook was set up and a method of funding by levy was established. Two percent of prices paid for lobster (later doubled) was to be matched by grants from several sources. The first fruits of these endeavours have become visible in the lobster catches which now include a large number of juveniles from enhanced egg production and a slight improvement in landings.

Developments within the South Wexford co-op are encouraging and a most useful precedent but they are only one element in the foundations of a sustainable fishery: fishing effort has continued to rise within the co-op area and this year an estimated 14,500 pots are being set there. The local fishing community has invested considerable effort and money in their resource but there is no safeguard for this investment and there is no reason why fishermen from other parts of the coast who have not provided a penny towards lobster enhancement anywhere should not move their pots into the area of the South Wexford co-op and harvest its lobsters. In these circumstances it is difficult to see fishermen in Wexford voluntarily restraining their own fishing effort over the longer term and, indeed, there is evidence that many are becoming disenchanted with the work that has so far been done.

What is required in south Wexford is official recognition of the co-operative in the form of supportive legislation which effectively provides a closed licensing system limiting entry to the fishery and capping fishing effort. The co-op has requested some such development. On its being granted the survival of this fishery depends.

In view of the enthusiastic participation of local fishermen in the South Wexford co-op a local pilot system of closed licensing which could have been abandoned at the first sign of legal challenge would appear to have been a sensible way to explore the possibility of introducing a closed licensing system. It is still an option. There is no shortage of suggestions for the ideal management system, there may be several viable alternatives and there are undoubtedly difficulties to be overcome. Any system which is introduced must be non-discriminatory and it must, under current legislation, be for the purposes of conservation and rational exploitation supported by appropriate scientific evidence. However, these criteria and framework provide for something useful to be done. Limiting participation in a fishery by licence is common enough at present. Withholding a system of management will be detrimental to the objectives of this co-op and the longer the current stalemate continues, the more difficult it will be to establish a sustainable lobster fishery there. The south Wexford lobster co-op might yet be the aspirational model for other elements of the inshore fishery; we can only hope it does not prove to have been a wasted effort. If so, it will push back the development of the inshore sector for many years.

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.

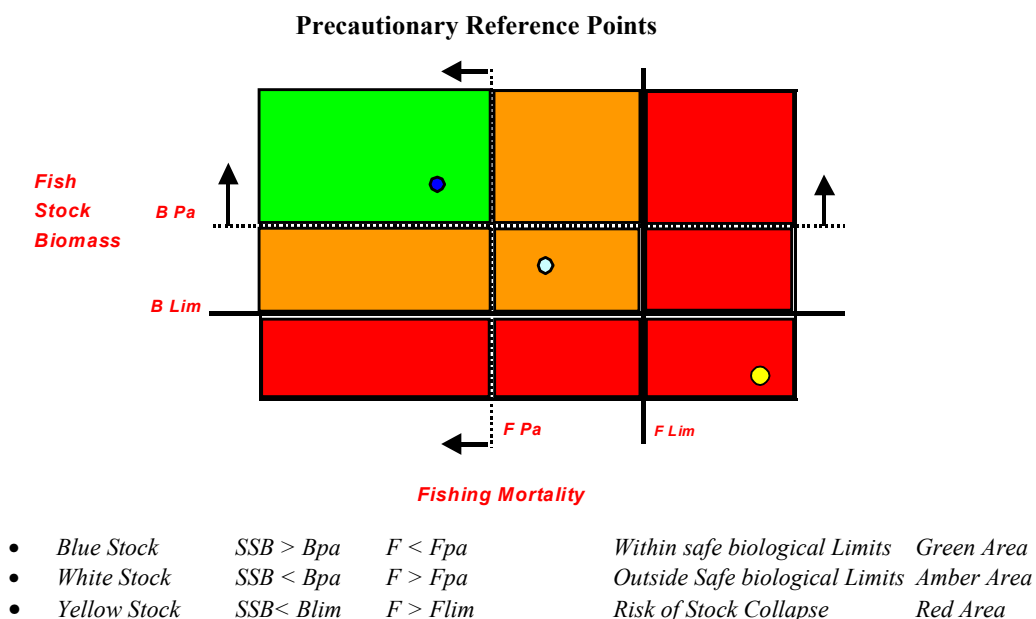
Note that if a stock is regarded as being in a depleted state, or even if overfishing is taking place, the development and effective implementation of a plan which is regarded as sufficient to reduce fishing mortality to no higher than F_{pa} and to rebuild SSB to above B_{pa} , within a "reasonable" 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 11th 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.



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

There is no Irish quota in this fishery, but the catches have a major effect on the markets for Irish herring. MFSD agrees with the ICES advice that the management measures proposed for 2000 should also be applied for 2001 to ensure the continued rebuilding of the spawning stock biomass. These measures consist of adoption of an F_{2-6} of 0.2 and an $F_{0-1} < 0.1$ until the spawning stock biomass is rebuilt above 1.3 million t.

STATE OF THE STOCK

- There is concern for the state of this stock.
- The total landings in 1999 were 372,000 t and very similar to those of 1998. In recent years the landings have been about half those of the preceding five years.
- In 1999 the fishing mortality on juveniles was below 0.1 and on adults was 0.38. While fishing mortality on adults has decreased in recent years, it is still above the proposed F_{pa} which is 0.25. Fishing mortality on juveniles, caused by the industrial fisheries has also decreased and is below the proposed $F_{pa} = 0.12$.
- Recruitment for 1998 is below average. Recruitment for 1999 is well above average.
- In 2000 the SSB was estimated to be around 908,000 t while the proposed $B_{pa} = 1.3$ million tonnes. The SSB collapsed in the sixties and remained very low during the next twenty years. It recovered very slowly but decreased again after 1990 and has since increased. The present size is still considerably below the level recorded in the 1950's and 1960's when it was in excess of 2 million tonnes.
- The prognosis for the stock is that the SSB will increase slightly at current levels of fishing mortality but this increase is very dependent on the strength of the 1998 year class.

CURRENT MANAGEMENT

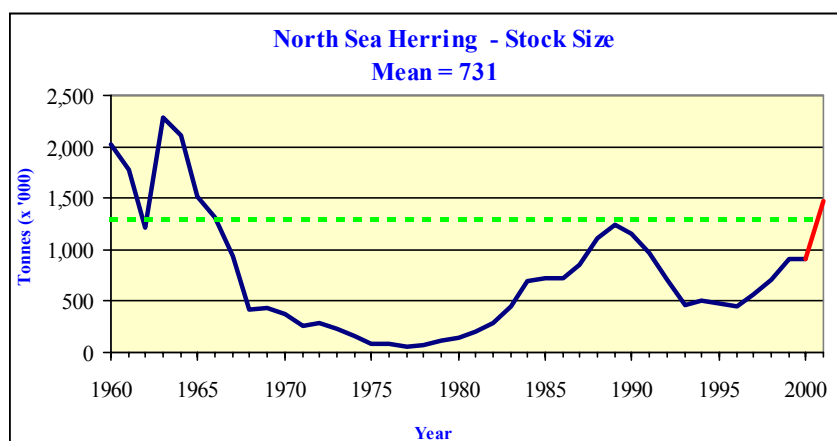
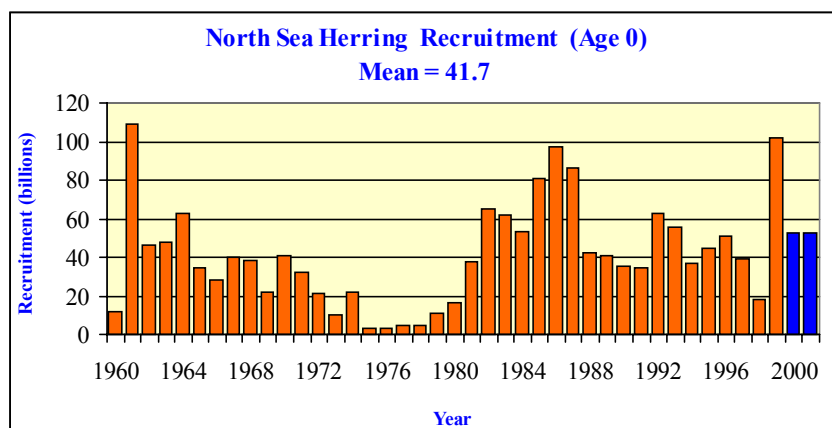
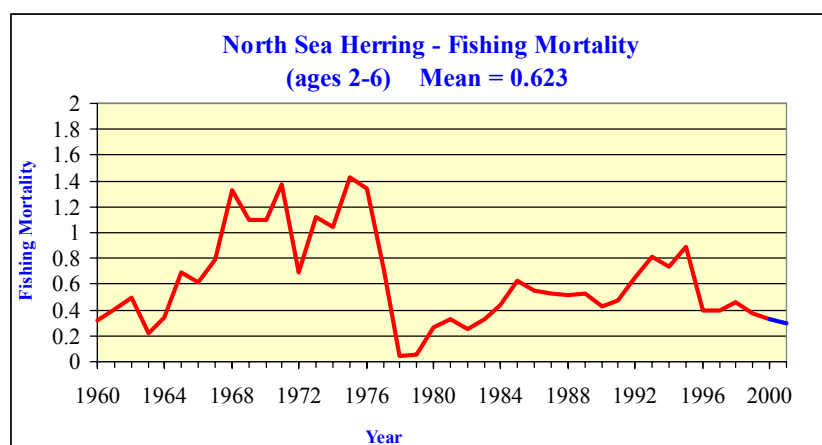
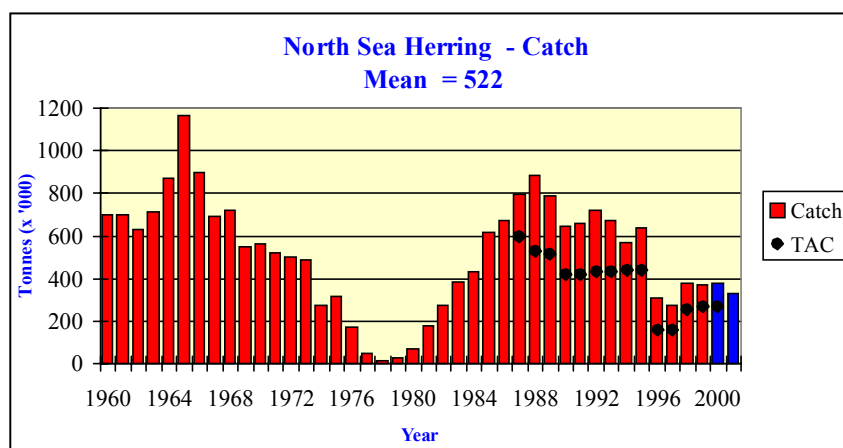
- The TAC is shared between EU and Norway and divided between a number of different fleets operating in the North Sea, the English Channel and Division IIIa. The assessment covers the TAC areas. There is a

separate TAC in operation for Divisions IVc and VIIId (Southern North Sea and 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} (800,000t) 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 directed fishery for 2000 is 265,000 t (including landings from the industrial fisheries and some landings taken under TACs from other ICES areas. The EU share of the TAC is 25,000 t for fisheries for human consumption.

ADDITIONAL INFORMATION

1. The quality of the assessment is considered adequate.
2. The total catch taken from this fishery, including industrial by-catch, in 1999 was about 372,000 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.
5. The international management measures agreed between EU and Norway for this stock appear to be having the desired effect and the spawning stock has slowly increased in recent years.
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. At present, the international herring market continues to be depressed and Irish processors find it difficult to compete with their European counterparts because of herring landed from the fisheries in the North Sea. In theory, a tightly controlled fishery in the North Sea - with small catches for human consumption - should benefit the Irish industry.



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 recommendation that catches in 2001 should not exceed the average of catches between 1991-99. This is about 30,000t. ICES also stress that the TAC should be based on the average of the real landings and not on the reported landings. A TAC in 2001 of 30,000 t will translate to an Irish quota of 4,533 t compared with 6,240 t in 2000.

STATE OF THE STOCK

- The state of this stock is unknown
- There are major uncertainties surrounding the landings from this stock due to misreporting. Landings however, appear to have been relatively stable in recent years (around 30,000 t).
- There is incomplete information about fishing mortality. All the available information suggests that the stock is lightly exploited.
- There is incomplete information about recruitment.
- There is incomplete information about spawning stock size.
- It has not been possible to carry out an assessment on this stock because of major problems relating to catch statistics.
- No reference points have been proposed because of uncertainty about the assessment.
- Short term predictions are not carried out for this stock

CURRENT MANAGEMENT

- The assessment area covers 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 Division VIa North.
- The agreed TACs have always been far 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 2000 was 42,000t. The EU share of the total TAC is 41,340 t while the Irish share of the EU quota is 6,240 t.
- There is no management plan or management objective in this fishery.

MFSD – ECONOMIC COMMENTS

The value of the Irish landings in 1999 reported from this area were £1.1 million. Herring is a very economically important fishery in the North West but the value of this fishery is uncertain due to the misreporting problem.

ADDITIONAL INFORMATION

1. There are major difficulties in the assessment of this stock. These arise mainly from inaccurate catch statistics but there are also conflicting signals arising from the annual estimates obtained from the acoustic surveys carried out by Scotland.
2. The total landing in 1999 was believed to be around 29,700 t while the reported Irish landings were around 7,900 t
3. The TACs for this stock are not restrictive because they have been set on the basis of average official catches that are far higher than actual catches. They are therefore ineffective 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. There are serious misreporting problems in this fishery. Large catches are reported as having been taken from this area but are in fact taken from the adjoining areas Division IVa (North Sea) and Division 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 continuing 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. Ireland obtains samples from this fishery from catches landed into Derry by UK vessels.
10. The Irish sampling programme in 1999 has been supported by the EU Study Contract 98-0059 (FIEFA).

Sampling will continue to be supported by the EU SAMFISH Study Contract 99-009 in 2000.

ICES ADVICE

3.7.8.a

State of stock/fishery

It has not been possible to assess the status of this stock with respect to safe biological limits. Although the state of the stock is uncertain all the indications are that the stock is lightly exploited.

Management objectives:

There are no explicit management objectives for this stock.

Advice on management:

ICES recommends that catches in 2001 should not exceed the average of the 1991–1999 period which is about 30 000 t.

Relevant factors to be considered in management:

In recent years TACs have not been restrictive. There has been substantial misreporting of catches, primarily of North

Sea herring, into this area. ICES maintains its advice that the TAC for this stock should correspond to the level of the actual catches.

Elaboration and special comment:

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

Information on misreporting in the catches has improved, but biological sampling of catches has deteriorated and the assessment remains uncertain. Exploratory assessments are based on uncertain catches, but analyses in recent years have consistently pointed towards the stock being exploited at a sustainable rate. Acoustic surveys, exploratory assessments undertaken using survey only, or commercial and survey data, all indicate that spawning biomass is reasonably stable. Medium term projections based on these assessments also imply that exploitation at the current TAC (25% greater than the current catch) do not pose a threat to the stock.

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 2000 (ICES CM 2000/ACFM:10).

Catch data (Tables 3.7.8.a.1):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Disc. slip.	ACFM Catch ¹
1987	Reduce F to $F_{0.1}$ /status quo F	38-55	49.7		44
1988	TAC	46	49.8		36
1989	TAC	58	58	1.6	34
1990	TAC	61	75	1.3	45
1991	TAC	57	62	1.2	29
1992	TAC	62	62	0.2	29
1993	Catch at status quo F	54-58	62	0.8	32
1994	Catch at status quo F	50-60	62	0.7	24
1995	No specific advice	60 ²	77		30
1996	No advice because of misreporting	-	83.57		26
1997	Catch at status quo F		83.57	0.1	33 ³
1998	Catch at status quo F	59	80.37	0.9	33
1999	Average catches, 1991–1996	28	68		30
2000	Average catches, 1991–1996	28	42		
2001	Average catches, 1991–1999	30			

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

Table 3.7.8.a.1 HERRING in Division VIa (North). Catch in tonnes by country, 1970–1999. These figures do not in all cases correspond to the official statistics and cannot be used for management

Country	1970	1971	1972	1973	1974	1975
Denmark	0	554	150	932	0	374
Faroës	15100	8100	8094	10003	5371	3895
France	1293	2055	680	2441	411	1244
Germany	11768	6444	3376	9914	8887	6182
Iceland	5595	5416	2066	2532	9566	2633
Netherlands	464	8340	22673	27892	17461	12024
Norway	27250	76721	17400	32557	26218	509
UK	103530	99537	107638	120800	107520	85520
Other	930		2679	3199	2726	1620
Unallocated						
Discards						
Total	165930	207167	164756	210270	178160	114001
Area-Misreported						
WG Estimate	165930	207167	164756	210270	178160	114001
Source (WG)	1982	1982	1982	1982	1982	1982

Country	1976	1977	1978	1979	1980	1981
Denmark	249	626	128	0	0	1580
Faroës	4017	3564	0	0	0	0
France	1481	1548	1435	3	2	1243
Germany	4363	0	26	0	256	3029
Iceland	3273	0	0	0	0	0
Netherlands	16573	8705	5874	0	0	5602
Norway	5183	1098	4462	57	0	3850
UK	53371	25539	10231	0	48	31483
Other	5132	261				
Unallocated						4633
Discards						
Total	93642	41341	22156	60	306	51420
Area-Misreported						
WG Estimate	93642	41341	22156	60	306	51420
Source (WG)	1982	1982	1982	1982	1982	1983

Country	1982	1983	1984	1985	1986	1987
Denmark	0	0	96	0	0	0
Faroës	74	834	954	104	400	0
France	2069	1313	0	20	18	136
Germany	8453	6283	5564	5937	2188	1711
Ireland	0	0	0	0	6000	6800
Netherlands	11317	20200	7729	5500	5160	5212
Norway	13018	7336	6669	4690	4799	4300
UK	38471	31616	37554	28065	25294	26810
Other						
Unallocated	18958	-4059	16588	-502	37840	18038
Discards	0	0	0	0	0	0
Total	92360	63523	75154	43814	81699	63007
Area-Misreported			-19142	-4672	-10935	-18647
WG Estimate	92360	63523	56012	39142	70764	44360
Source (WG)	1984	1985	1986	1987	1988	1989

continued

Table 3.7.8.a.1 continued

Country	1988	1989	1990	1991	1992	1993
Denmark	0	0	0	0	0	0
Faroes	0	0	326	482	0	0
France	44	1342	1287	1168	119	818
Germany	1860	4290	7096	6450	5640	4693
Ireland	6740	8000	10000	8000	7985	8236
Netherlands	6131	5860	7693	7979	8000	6132
Norway	456	0	1607	3318	2389	7447
UK	26894	29874	38253	32628	32730	32602
Other						
Unallocated	5229	2123	2397	-10597	-5485	-3753
Discards	0	1550	1300	1180	200	
Total	47354	53039	69959	50608	51578	56175
Area-Misreported	-11763	-19013	-25266	-22079	-22593	-24397
WG Estimate	35591	34026	44693	28529	28985	31778
Source (WG)	1990	1991	1992	1993	1994	1995

Country	1994	1995	1996	1997	1998	1999
Denmark	0	0	0	0	0	0
Faroes	0	0	0	0	0	0
France	274	3672	2297	3093	1903	463
Germany	5087	3733	7836	8873	8253	6752
Ireland	7938	3548	9721	1875	11199	7915
Netherlands	6093	7808	9396	9873	8483	7244
Norway	8183	4840	6223	4962	5317	2695
UK	30676	42661	46639	44273	42302	36446
Other						
Unallocated	-4287	-4541	-17753	-8015	-11748	-8155
Discards	700			62	90	0
Total	54664	61721	64359	64995	65799	53360
Area-Misreported	-30234	-32146	-38254	-29766	-32446	-23623
WG Estimate	24430	29575	26105	35233*	33353	29737
Source (WG)	1996	1997	1997	1998	1999	New Data

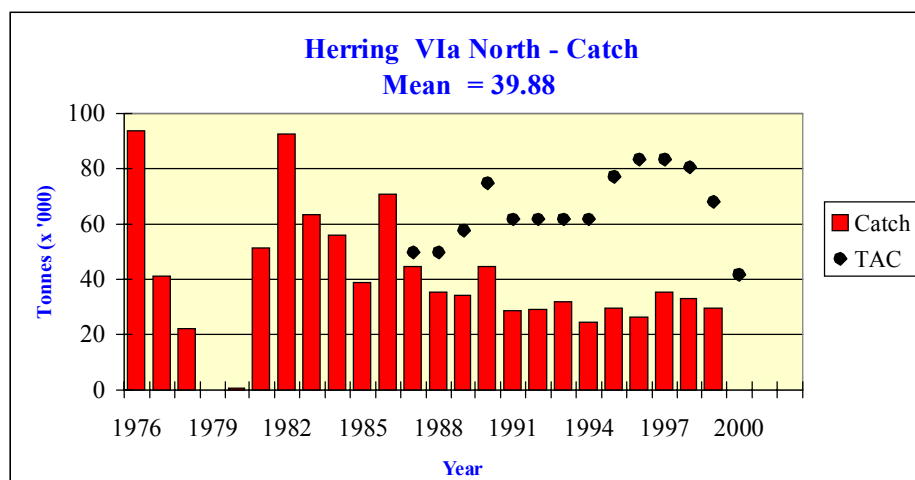
Other: Official catches by countries other than those named.

Unallocated: Catches for which the Working Group has specific reports of an under- or over-reporting of catches.

Discards: Estimates of fish discarded or slipped, usually from observer records.

Area-Misreported: Catches reported in the area between 4 and 5 W and reallocated to IVa.

*Working Group estimate for 1997 has been revised according to the 1999 WG estimate.



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

MFSD endorses the ICES advice that catches in 2001 should not exceed the 2000 TAC (13,900 t). This corresponds to a fishing mortality of 0.2 and is expected to result in the stock recovering to above the lowest ever reliable estimated SSB ($B_{lim} = 81,000$ t) in the short term and towards the proposed $B_{pa} = 110,000$ t.

MFSD also stress the importance of implementing a management plan that should ensure that the total catch from the stock be reduced to the advised level and that additional measures such as closed areas, and closed seasons should be considered. Acoustic survey programmes needs to be strengthened to include information gathered by the commercial fleet. If the TAC in 2001 is about 13,900 then the likely Irish quota would be 12,640 t which is the same as that in 2000.

STATE OF THE STOCK

- There are serious concerns for this stock
- The 1999 landing of 26,100 t was considerably lower than that recorded for 1998 (38,900 t) but this was still higher than the agreed TAC of 21,000 t. Landings from this stock have fluctuated very much in recent years and are very dependent on the herring markets, as well as on the markets in other pelagic fisheries, e.g. mackerel and horse mackerel.
- Fishing mortality has shown a sharp increase since the mid 1980s and reached a very high value in 1998. The value in 1999 (0.52) decreased, but is very poorly estimated and above the proposed $F_{pa} = 0.22$
- There has been no substantial recruitment to this stock for a number of years. Over the long term there have been only two outstanding year classes.
- The SSB has declined continually since 1988 when it was estimated to be around 308,000 t. The size in 2000 is not precisely known but may be around 68,800 which is far below the $B_{pa} = 110,000$ t.
- The short term predictions indicate that the stock will remain at the present low level at the current rate of fishing.

CURRENT MANAGEMENT

- The assessment area is for Divisions VIa South and

VIIb-c, which is the same as the TAC area.

- The TAC is totally controlled by the EU and the Irish share is 90.9%
- The 2000 TAC is 13,900 t and the Irish quota is 12,640 t.
- There are no management objectives or plan for this fishery. A recovery plan needs to be quickly introduced and should be aimed at a rapid rebuilding of the stock. The need for this recovery plan was stressed by the North West Pelagic Initiative Group which was established in the summer of 2000. The Irish quota is controlled by a number of catch restrictive measures.

MFSD – ECONOMIC COMMENTS

The value of the Irish landings in 1999 reported from this area were £2.5 million. Herring is a very economically important fishery to the Irish pelagic fleet operating out of Killybegs and Rossaveal.

ADDITIONAL INFORMATION

1. Although the most recent assessment is very uncertain, it is obvious that this stock is in a seriously low state. Acoustic surveys, that were carried out by MFSD in autumn of 1999, gave a very low estimate of the SSB and were not accepted by ICES as a realistic estimate of the stock size. It will not be possible to give accurate advice on the stock biomass until a number of comprehensive and accurate surveys are carried out.
2. The total catch estimated to have been taken from this stock in 1999 was over 26,000 compared with over 38,900 t in 1998.
3. The Irish catch in 1999 was around 16,300 t which was the lowest recorded for a number of years.
4. The main catches (over 85%) are taken by Ireland and are taken by the large refrigerated sea water (RSW) vessels fishing out of Killybegs. Small catches are taken by the Dutch fleet.
5. There is a major misreporting problem for this fishery. Large catches are taken in Division VIa South but are reported as having been taken in adjoining Division VIa North.
6. The stock in this area has been in decline for a number of years due to a combination of poor recruitments and high catches. This decline has been highlighted by MFSD and ICES for a number of years and is consistent with views 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 River Shannon.

7. As the major part of this fishery is within the Irish economic zone and the catches are nearly all taken by Ireland (90.9% of the TAC), an opportunity exists for Ireland to introduce a management plan as suggested by ICES in 1999. This plan should aim at reducing fishing mortality in order to increase the stock above the proposed B_{pa} of 110,000t. The plan should involve the local fishermen in the assessment and management of the fishery and should consider a number of factors such as:
 - Acoustic surveys to be carried out by fishermen in co-operation with the Marine Institute
 - A substantial reduction in catches,
 - The elimination of misreporting,
 - Prohibition of fishing by certain vessels within the in-shore waters.
 - A restriction of fishing in Division VIa South for short periods during the year preferably during the spawning period (October to March).
8. As markets for herring are very poor at present this type of plan could be introduced at present without causing major hardship to the industry. The first steps in the introduction of such a plan was holding of a workshop between herring fishermen and the Marine Institute in July 2000.
9. A program to record the distribution of herring shoals, both spatially and temporally, from commercial vessels, has been initiated in November 2000.
10. The age distribution of the Irish catches in 1999 was dominated by 4 year-old herring (the 1995 year class).
11. The length distribution of the Irish catches was dominated by fish between 25cm and 27 cm.
12. The Irish sampling programme in 1999 has been supported by the EU Study Contract 98-0059 (FIEFA). Sampling will continue to be supported by the EU SAMFISH Study Contract 99-009 in 2000.

ICES ADVICE

3.10.3

State of stock/fishery

The stock is considered to be outside safe biological limits. The SSB is below the proposed B_{pa} and likely to be at its historical low. In recent years fishing mortality has been very high and was substantially in excess of the proposed F_{pa} .

Management objectives:

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

Advice on management:

ICES recommends that the catches in 2001 should not exceed the current TAC (14,000 t). This corresponds to a fishing mortality of 0.2 and is expected to result in the stock recovering to above B_{lim} in the short term and towards the proposed B_{pa} .

Relevant factors to be considered in management:

The SSB forecast is based on the assumption that the TAC for 2000 will be adhered to. If catches are taken in excess of the TAC this catch forecast will be optimistic. There has been considerable misreporting of catches both into the area from the North Sea and out of the area into Division VIaN. The actual catches taken from this stock have greatly exceeded the recommended TAC mainly due to misreporting into Division VIaN.

The high stock levels observed from 1984 to 1992 are the result of two high year classes in 1982 and 1986. No other year classes of this magnitude have been observed over the time series from 1970 to 1999.

Catch forecast for 2001: Basis TAC $F(2000) = 0.24$, Landings(2000) = 14,000, SSB (2000) = 69,000

Basis	F(2001)	SSB(2001)	Landings(2001)	SSB(2002)
0.15F(99)	0.075	90,000	5,500	112,000
0.4F(99)	0.20	84,200	14,000	97,000
F_{pa}	0.22	83,100	15,500	94,400
F(99)	0.51	71,500	31,000	70,600

Elaboration and special comment:

In the absence of tuning data the most recent assessment was carried out by assuming various terminal F values on the catch at age data which are believed to be of good quality. Recent assessments appear to have poorly estimated F .

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 au-

turn spawning component, and this is particularly evident on the traditional spawning grounds in the south 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 2000 (ICES CM 2000/ACFM:10).

Reference points proposed by ICES in 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_{med98}

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			
2001	F 40% of $F(99)$ $F = 0.2$	14				

¹Weights in '000 t.

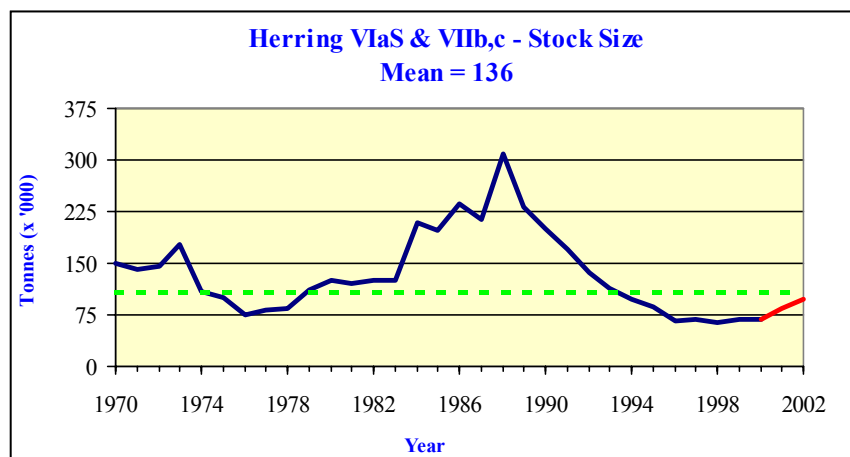
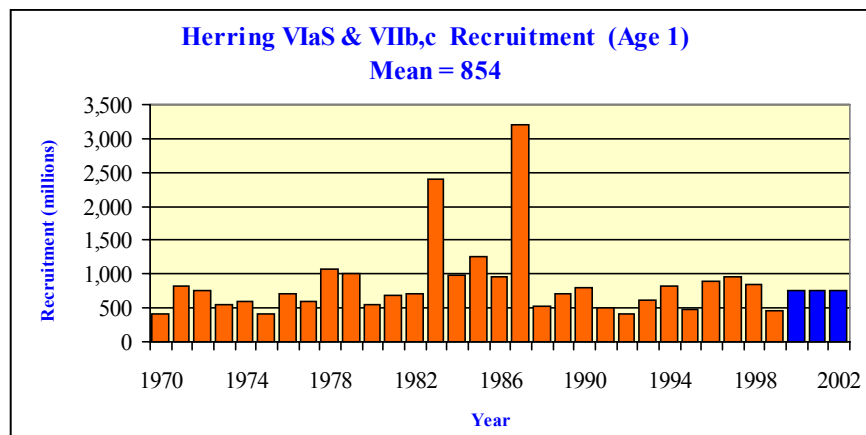
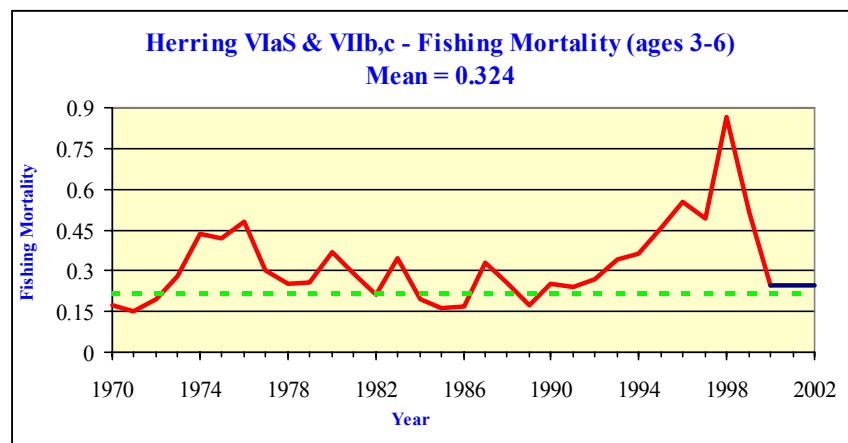
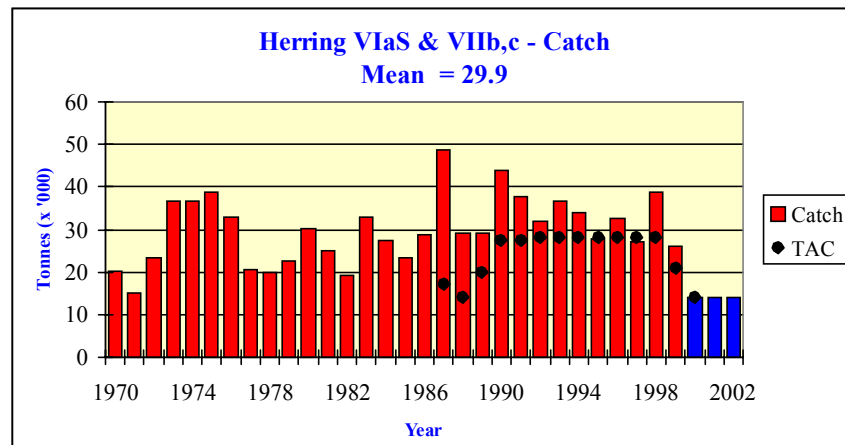


Table 3.10.3.1 Estimated herring catches in tonnes in Divisions VIa (South) and VIIb,c, 1988–1999. These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

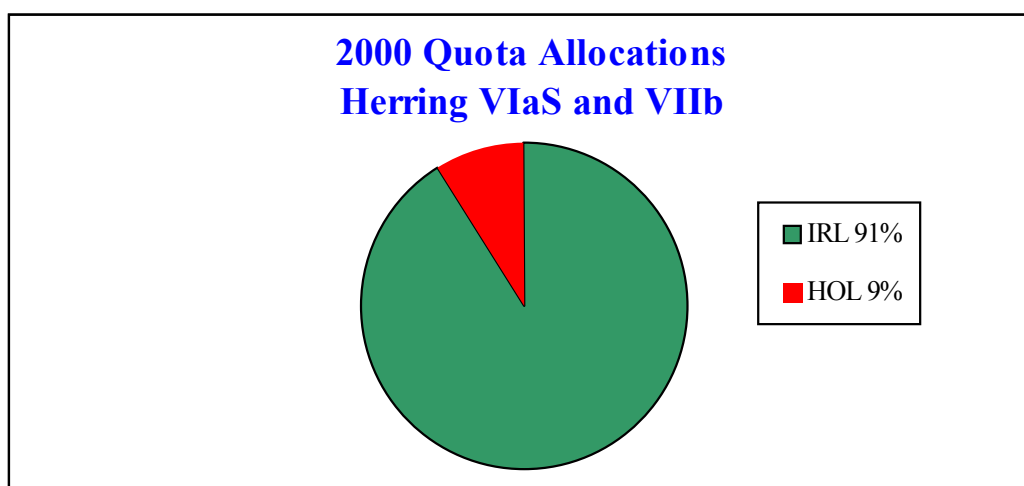
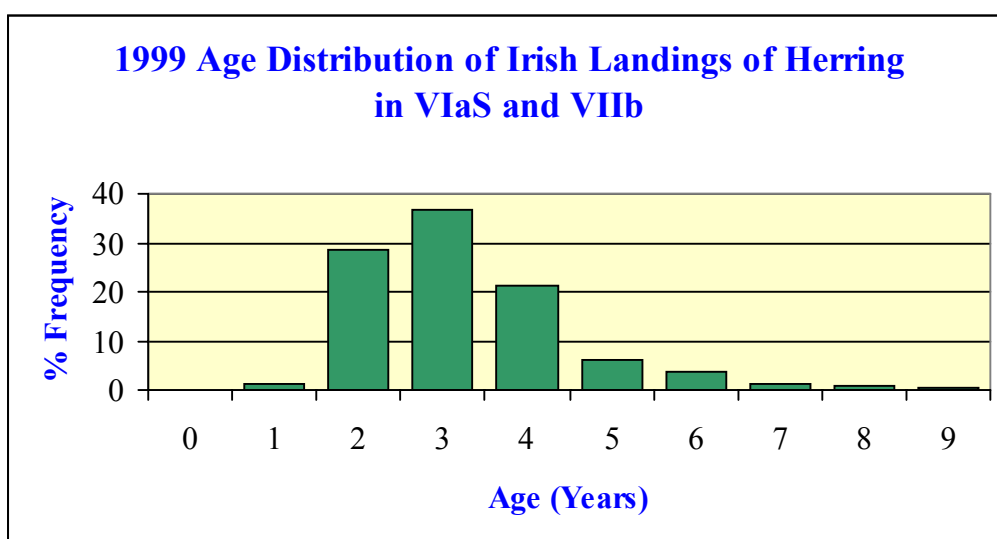
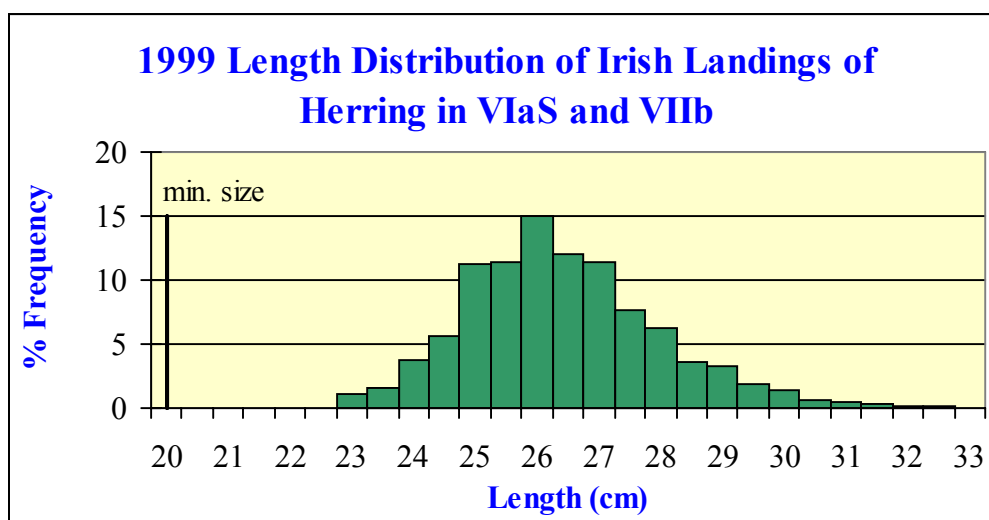
Country	1988	1989	1990	1991	1992	1993
France	-	-	+	-	-	-
Germany, Fed.Rep.	-	-	-	-	250	-
Ireland	15,000	18,200	25,000	22,500	26,000	27,600
Netherlands	300	2,900	2,533	600	900	2,500
UK (N.Ireland)	-	-	80	-	-	-
UK (England & Wales)	-	-	-	-	-	-
UK (Scotland)	-	+	-	+	-	200
Unallocated	13,800	7,100	13,826	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 ¹	1997	1998	1999 ¹
France	-	-	-	-	-	-
Germany, Fed.Rep.	-	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 (England & 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

¹Provisional according to text.

Table 3.10.3.2 Herring in Divisions VIa (South) and VIIb,c (for illustrative purposes only)

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-6
1970	412.36	149.25	20.31	0.171
1971	827.51	140.47	15.04	0.152
1972	743.61	145.73	23.47	0.197
1973	541.78	177.42	36.72	0.279
1974	599.49	109.21	36.59	0.437
1975	416.64	98.91	38.76	0.417
1976	703.64	75.76	32.77	0.478
1977	594.32	81.64	20.57	0.303
1978	1,071.96	85.19	19.72	0.250
1979	1,008.02	111.40	22.61	0.257
1980	542.11	124.92	30.12	0.371
1981	697.38	120.22	24.92	0.292
1982	716.07	123.97	19.21	0.212
1983	2,393.13	124.38	32.99	0.345
1984	974.39	209.39	27.45	0.195
1985	1,260.27	198.49	23.34	0.164
1986	956.58	235.91	28.79	0.169
1987	3,210.25	213.88	48.60	0.328
1988	523.01	308.70	29.10	0.257
1989	710.23	231.51	29.21	0.176
1990	807.65	199.87	43.97	0.250
1991	508.79	171.28	37.70	0.238
1992	420.03	137.45	31.86	0.269
1993	627.55	114.72	36.76	0.341
1994	832.84	97.25	33.91	0.362
1995	471.45	85.76	27.79	0.460
1996	894.13	65.35	32.53	0.555
1997	963.10	69.01	27.23	0.494
1998	846.11	63.06	38.90	0.866
1999	448.72	68.54	26.11	0.517
2000	752.29	68.83	.	0.244
Average	854.05	135.73	29.90	0.324
Unit	Millions	1000 tonnes	1000 tonnes	-



Irish Sea Herring

(Division VIIa)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES advice that, in the absence of a proposed F_{pa} , the fishing mortality in 2001 should not exceed that of 1999 (0.26). This corresponds to catches of no more than 5,100 t in 2001.

ICES also consider that areas that were closed for herring fishing during the early 1970s, along the east coast of Ireland and the west coast of England, should be maintained in order to protect juveniles.

The likely Irish quota in 2001 would be 1,325 t compared with 1,390 t in 2000.

STATE OF THE STOCK

- There are no concerns for this stock, which is now considered to be within safe biological limits.
- Landings have been reduced substantially since the early seventies and have been very stable in recent years at a low level. The 1999 landing of 4,100 t was the lowest since 1983. There is, however, uncertainty in the catch data for 1998 and 1999.
- In 1999 the fishing mortality was estimated to be 0.27 which is likely to be below any proposed F_{pa} . Fishing mortality appears to have declined in recent years.
- Recruitment appears to have been reasonably stable in recent years with no outstanding year-classes as there were in the early 1970s.
- Following a revision of available data a new assessment indicates that in 2000 the SSB is estimated to be 14,000 and is thought to have increased in recent years. The present SSB is now above the proposed $B_{pa}=9,500$ t.
- The prognosis for the stock in the short term is that the SSB will remain at the present level at the current fishing mortality.

CURRENT MANAGEMENT

- The assessment area (Division VIIa North) is the same as the TAC area.
- The TAC for 2000 was 5,350 t and is totally controlled by EU. The Irish share of the TAC is 1,390 t (26%).
- There is no overall management objective or management plan for this stock.
- The Irish fleet has taken very little part in this fishery

since 1990 and no Irish catch has been reported from the fishery since 1996.

- 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.

MFSD – ECONOMIC COMMENTS

There were no Irish landings in 1999 even though Ireland has a quota of 1,390 t. This is not an economically important fishery to the Irish fleet.

ADDITIONAL INFORMATION

1. Although the most recent assessment has been revised the quality of the assessment remains poor.
2. The total catch taken from this fishery in 1999 was 4,100t which was the lowest catch since before 1983. No Irish catch was recorded.
3. There are 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. Ireland has not participated 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).
6. Catches from the fishery that are landed in Ardglass and Kilkeel are purchased by processors in Dublin and Donegal and samples of these herring are obtained by MFSD.
7. 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 conservation measures should be supported.
8. The Irish sampling programme in 1999 has been supported by the EU funded Study Contract 98-0059 (FIEFA). Sampling will continue to be supported by the EU SAMFISH Study Contract 99-009 in 2000.

ICES ADVICE

3.8.7

State of stock/fishery

Following a revision of available data and assessment, ICES perception of the state of the stock has changed since 1999 and the stock is now considered probably to be within safe biological limits. Biomass is above the proposed B_{pa} . Although no F_{pa} has yet been proposed, the current F is likely to be below candidate values (~ 0.3).

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:

In the absence a proposed F_{pa} , ICES advises that fishing mortality should not exceed that in 1999 (0.26). This corresponds to catches of no more than 5 100 t in 2001.

Reference points proposed by ICES in 2000:

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

Technical basis:

B_{lim} : lowest observed SSB	B_{pa} : $B_{lim} \exp(1.645 \sigma)$, $\sigma = 0.25$???
F_{lim} : not defined	F_{pa} :

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. These closed areas should be maintained. There is uncertainty in the catch in 1998 and 1999 the catch forecasts are based on official landings.

the exploiting fleets in this area has declined and the industrial fishery has closed. Due to the revision of the data and assessment in 2000 the F_{pa} proposed in 1999 (F_{med}) may no longer be appropriate ICES is currently considering this matter.

The assessment in 2000 has been revised considerably from 1999. Survey indices have been revised and the new assessments are based on the same 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.

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

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 2000 (ICES CM 2000/ACFM:10).

Catch forecast for 2001: Basis TAC $F(2000)=0.20$, Landings(2000)= 4,000 SSB (2000)= 14,156

Basis	F(2001)	SSB(2001)	Landings(2001)	SSB(2002)
0.6F(99)	0.16	16300	3300	17900
0.8F(99)	0.21	15500	4200	16400
1.0F(99)	0.26	14800	5100	15000
1.2F(99)	0.32	14100	6000	13700
1.4F(99)	0.37	13400	6800	12500

Weights in t.

Shaded scenarios considered inconsistent with the precautionary approach.

Catch data (Tables 3.8.7.1–2):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Catch
1987	TAC	4.3	4.5	5.8
1988	TAC (Revised advice in 1988)	10.5 (5.6)	10.5	10.2
1989	TAC	5.5	6.0	5.0
1990	Precautionary TAC	5.7	7.0	6.3
1991	TAC	5.6	6.0	4.4
1992	TAC	6.6	7.0	5.3
1993	TAC	4.9-7.4	7.0	4.4
1994	Precautionary TAC	5.3	7.0	4.8
1995	Precautionary TAC	5.1	7.0	5.1
1996	If required, precautionary TAC	5.0	7.0	5.3
1997	No advice given	-	9.0	6.6
1998	<i>Status quo</i> F	6.5	9.0	4.9
1999	F=Proposed $F_{pa}=0.36$	4.9	6.6	4.1
2000	F=90% F(98)=0.31	3.9	5.4	
2001	<i>Status quo</i> F= 0.26	5.1		

Weights in '000 t.

Table 3.8.7.1 Irish Sea HERRING (Division VIIa(N)). Catch in tonnes by country, 1985-1999. These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

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

Country	1992	1993	1994	1995	1996	1997	1998
Ireland	406	0	0	0	100	0	0
UK	4,864	4,408	4,828	5,076	5,180	6,651	4,905
Unallocated	-	-	-	-	22	-	
Total	5,270	4,408	4,828	5,076	5,302	6,651	4,905

Country	1999
Ireland	0
UK	4,127
Unallocated	-
Total	4,127*

* provisional

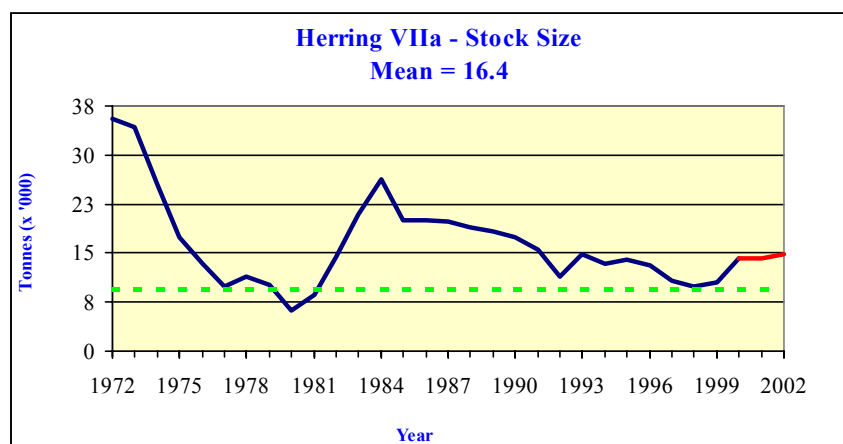
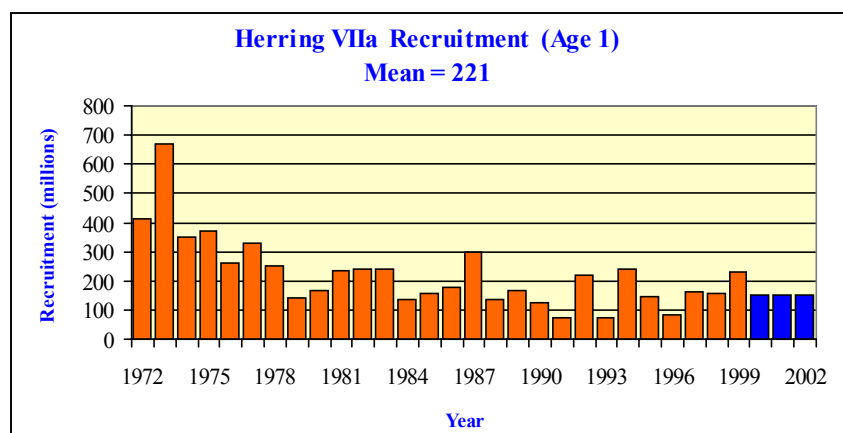
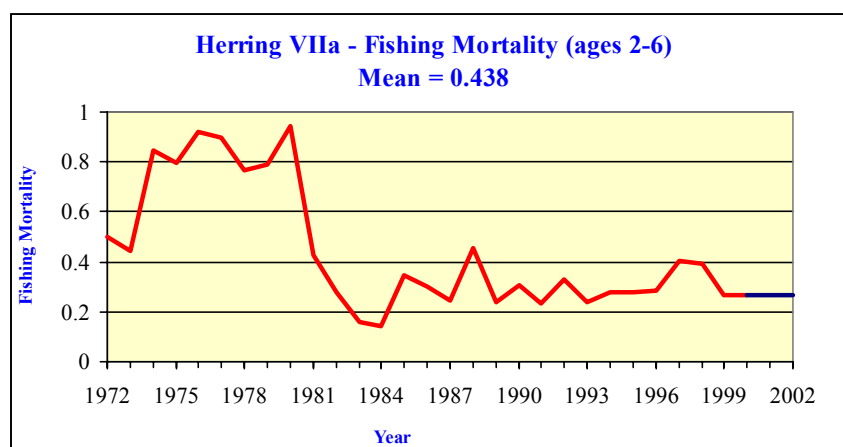
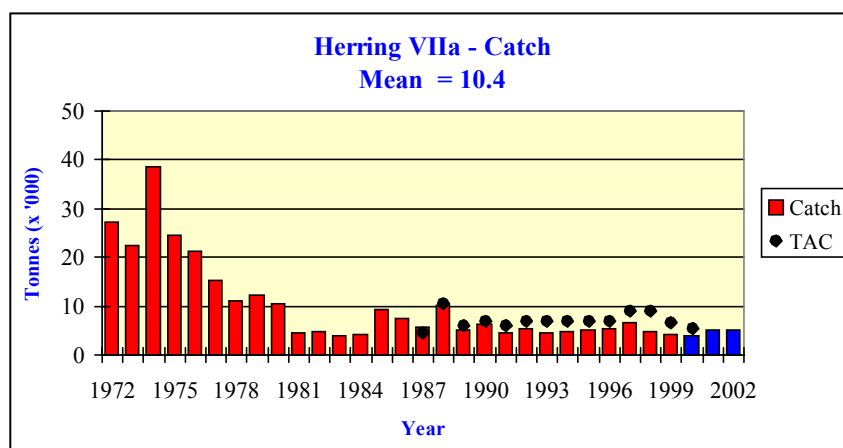


Table 3.8.7.2 Irish Sea herring (Division VIIa)

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-6
1972	415.42	35.55	27.35	0.499
1973	668.38	34.23	22.60	0.445
1974	349.91	25.47	38.64	0.849
1975	370.16	17.54	24.50	0.798
1976	263.89	13.26	21.25	0.921
1977	326.99	9.82	15.41	0.900
1978	250.82	11.33	11.08	0.768
1979	141.48	10.13	12.34	0.790
1980	164.72	6.18	10.61	0.943
1981	237.32	8.64	4.38	0.427
1982	240.68	14.47	4.86	0.276
1983	242.34	20.80	3.93	0.159
1984	137.75	26.26	4.07	0.141
1985	155.28	20.04	9.19	0.349
1986	178.14	20.15	7.44	0.301
1987	298.71	19.72	5.82	0.242
1988	135.82	19.04	10.17	0.455
1989	168.51	18.38	4.95	0.241
1990	128.05	17.40	6.31	0.305
1991	75.78	15.54	4.40	0.235
1992	219.53	11.32	5.27	0.328
1993	74.69	14.96	4.41	0.238
1994	242.20	13.44	4.83	0.280
1995	147.81	14.08	5.08	0.277
1996	82.18	13.22	5.30	0.284
1997	160.25	10.67	6.65	0.406
1998	157.02	9.89	4.91	0.393
1999	229.90	10.66	4.13	0.265
2000	(150.67)	(14.16)		
Average	221.19	16.43	10.35	0.438
Unit	Millions	1000 tonnes	1000 tonnes	-

Celtic Sea Herring

(Divisions VIIaS, VIIg, VIIj)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES advice that states that the SSB is well above the proposed B_{pa} and in the absence of a proposed F_{pa} the fishing mortality should not exceed that of 1999 (0.34). This corresponds to catches of no more than 17,900 t in 2001. This would translate to an Irish quota of 15,462 t compared with 18,140 t in 2000. A continuation of fishing at this rate would maintain the SSB at the current level.

MFSD also stress that there is as yet no method of predicting recruitment to the stock and that the stock could decrease again if recruitment should fail. Because of this and because there is as yet, no management plan for the fishery a conservative approach is advocated. There should be no increase in landings. It should also be noted that ICES predictions show that it is possible to take catches in 2001 of 19,000 t while at the same time maintaining the SSB at the current level. However, that would imply a $F=0.37$ which would be slightly higher than that of 1999, 0.34)

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

STATE OF THE STOCK

- There are no concerns for this stock.
- Landings (calendar year) from the stock have been very stable since the mid 1980s at around 18,000 - 20,000 t. Landings are also reported by season (1st April-31st March)
- Fishing mortality has decreased in recent years and the values recorded in 1998 and 1999 (average = 0.34) have the lowest recorded since the mid 1960s. F_{pa} has not yet been defined. The stock appears to be very sensitive to increased fishing mortality.
- Recruitment has fluctuated very widely over the time series but has been high in recent years, so that a number of strong year classes have boosted the spawning stock. Recruitment since 1997 has been

above average.

- The spawning stock has increased since the low levels recorded in the 1970's. At present it appears to be around 73,000 t which is above the B_{pa} of 44,000 t.
- Short term predictions suggest that the stock will increase slightly to about 75,000 t in 2002 at the current fishing mortality and average recruitment.

CURRENT MANAGEMENT

- The TAC area and the assessment area cover all of ICES Divisions VIIg,h,j,k and the southern part of Division VIIa.
- The TAC in 2000 is 21,000 t. The Irish quota is 18,140 t. The total catch in 1999 was 18,100 t while the Irish catch was about 17,900 t. Ireland has 86.4% of the TAC, which is totally controlled by EU.
- There is no management objective for the fishery.
- There is no overall management objective or management plan for this fishery. The Irish quota is regulated by a number of measures that include closed seasons and closed areas, as well as boat and weekly quotas.

MFSD – ECONOMIC COMMENTS

The value of the Irish landings in 1999 were £3 million. This fishery is economically important to the pelagic fleets operating out of Dunmore East, Castletownbere, Dingle and Cobh. However, it's importance has declined in recent years due to the decline in both the Japanese roe market and European demand for herring.

ADDITIONAL INFORMATION

1. The quality of the most recent assessment has deteriorated because of difficulties with the Irish acoustic surveys in 1999/2000. The most recent assessment appears to show that the stock is lower than that estimated in 1999 although the development of the stock in recent years remains unchanged.
2. The predictions carried out by ICES show that it is possible to take catches in 2001 of 19,000 t while at the same time maintaining the SSB at the current level. The resultant F would however be slightly higher than the F in 1999.
3. The total landing taken from this fishery in 1999 was 18,100 t. The Irish catch was about 17,900 t.
4. 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 Divisions, VII j, g and VIIa South.
5. There are some misreporting problems for this fishery. Some small catches that are taken by continental

fleets in adjoining areas (Division VII e) and in the North Sea have been reported as having been taken in the Celtic Sea.

6. Historically large catches were taken from this fishery by the Dutch fleet but in recent years only negligible catches have been reported and these appear to be mainly as a by-catch in their horsemackerel fishery.
7. The Irish fleet exploiting this stock has decreased in recent years and in 1999/2000 only about 35 vessels participated in the fishery. These vessels are mainly “dry hold” boats together with a small number of refrigerated sea water 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.
8. The age distribution of the stock has improved in recent years with an increased abundance of older fish. Even though the landings were dominated by three year-old herring, there were significant numbers of five year-old herring present.
9. The length distributions also showed an improvement and were dominated by fish of 26 cm and 27 cm. There has been a significant decrease in growth rate in the herring in this stock. This gives the overall impression that herring from the Celtic Sea are smaller than those from other areas and makes them less marketable
10. Acoustic surveys on the stock were resumed in 1998 by MFSD and two surveys were carried out during the 1999/2000 season by the *R.V. Celtic Voyager*. The results of the 1999/2000 gave very low estimates of stock in the area and were not accepted by ICES as realistic estimates. The distributions of shoals in the most recent season were abnormal and spawning appeared to be later than usual.
11. This stock is currently high because of reduced fishing mortalities in recent years and good recruitments. However the 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.
12. The fishery on this stock has been heavily dependent on the Japanese roe market for a number of years. This market has recently declined very much and this, together with a decline in the European demand for whole herring, has meant that there has been a decline in fishing effort on this stock. This means that an opportunity now exists to build up this stock and to improve the size and age compositions of the catches without decreasing the total catches substantially. It would therefore seem advisable to use this period of low demand to increase the stock further by maintaining the TAC similar to those of recent years. A larger stock would also mean that in the event of a possible decrease in recruitment and a subsequent decrease in stock large reductions in TACs might not be necessary.
13. Discards in the last two seasons have decreased and have not been included in the assessment in recent

years.

14. The Irish sampling programme on this stock in 1999/2000 has again been supported by the EU through funding of the Study Contract 97-0059. (FIEFA). This funding has been continued through the SAMFISH Study Contract 99-009.

ICES ADVICE

3.9.9

State of stock/fishery:

The stock is probably within safe biological limits. SSB is at present considered to be high and well above the proposed B_{pa} . No F_{pa} has yet been proposed but the current F is close to likely candidate values (~ 0.35). The stock has remained stable in recent years and has been augmented by two strong year classes (1992/93 and 1993/94). Fishing mortality has decreased in recent years.

Management objectives:

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

Advice on management:

The SSB is currently well above the proposed B_{pa} . In the absence a proposed F_{pa} , ICES advises that fishing mortality should not exceed that in 1999 (0.34). This corresponds to catches of no more than 17,900 t in 2001.

Relevant factors to be considered in management:

The fishery exploits a stock that traditionally was considered to consist of two spawning components (autumn and winter). In recent years the timing of spawning appears to have changed and there is now less distinction between the separate components. Spawning takes place on well-known inshore grounds along the Irish coast from October to February. There are serious potential threats to some of the more important spawning beds from proposed gravel extraction, dumping of dredge spoil and the location of fish farms. These may impair spawning success. Currently management includes a series of rotating closed areas and seasons to protect the spawning stock. These should be maintained

Catch forecast for 2001: Basis: $F(2000) = 0.4$ =catch of 21,000 t (TAC). SSB in 2000 = 73,800 t

Basis	F(2001)	SSB(2001)	Landings(2001)	SSB(2002)
$F=F_{1999} * 0.95$	0.32	73,800	17,200	76,224
$F=F_{1999}$	0.34	73,600	17,900	75,400
$F=F_{1999} * 1.05$	0.37	73,400	19,000	74,000
$F=F_{1999} * 1.1$	0.39	73,000	20,000	72,800
$F=F_{1999} * 1.2$	0.41	72,800	21,000	71,800

Weights in t.

Shaded scenario considered inconsistent with the precautionary approach.

Elaboration and special comment:

The stock experienced a period of low recruitment in the late seventies and recovered in the early eighties. In recent years marketing conditions have been very difficult and future prospects are poor. Improved enforcement has led to a significant reduction in effort. The number of vessels participating in the fishery in 1999/2000 was the lowest for at least 30 years. The catches taken from the fishery have been very stable in recent years and over 95% of the catch is taken by Ireland from the inshore fisheries during the spawning period.

The assessment is carried out for the period 1st April to 31st March. The TAC is set on an annual basis. The present assessment, based on an analysis of catch at age and survey data, is generally consistent with that reported last year. It has not been possible to use the acoustic surveys

in 1999/2000 as indices of SSB because the surveys did not cover the spawning concentrations and the results were therefore not comparable with those from previous surveys.

Discarding which was previously thought to be a problem in the fishery in the past was not thought to be a problem in 1998 or 1999.

The historic data sets used for the assessment are currently under revision and therefore ACFM has not proposed an F_{pa} .

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March 2000 (ICES CM 2000/ACFM:10).

Reference points proposed by ICES in 1999:

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

Technical basis:

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

Catch data (Tables 3.9.9.1–3):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings	Discards	ACFM Catch ¹
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 ²	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			
2001	$F < 0.34$	17.9				

¹By calendar year. ²Revised during 1996 after ACFM May meeting. Weights '000 t.

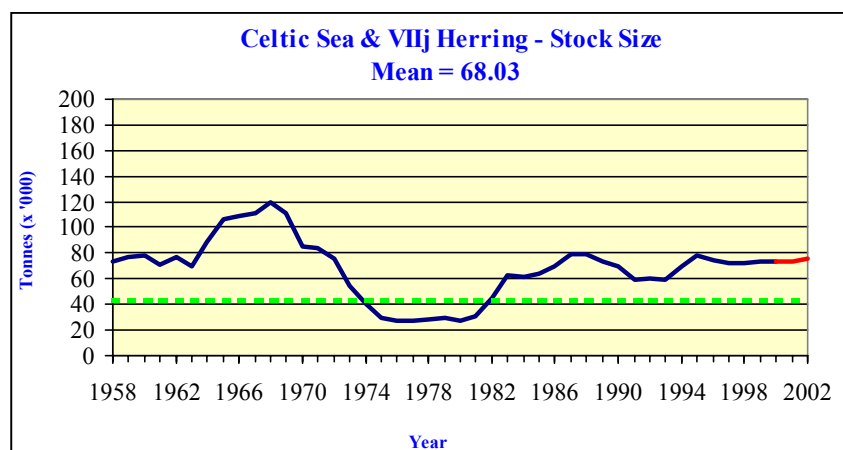
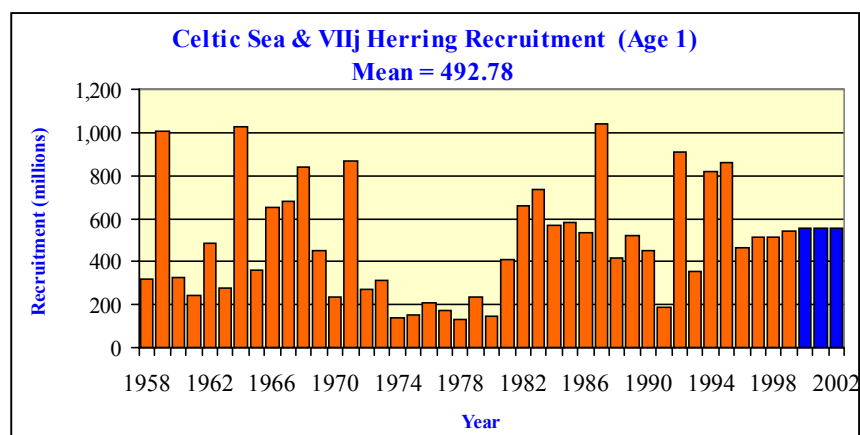
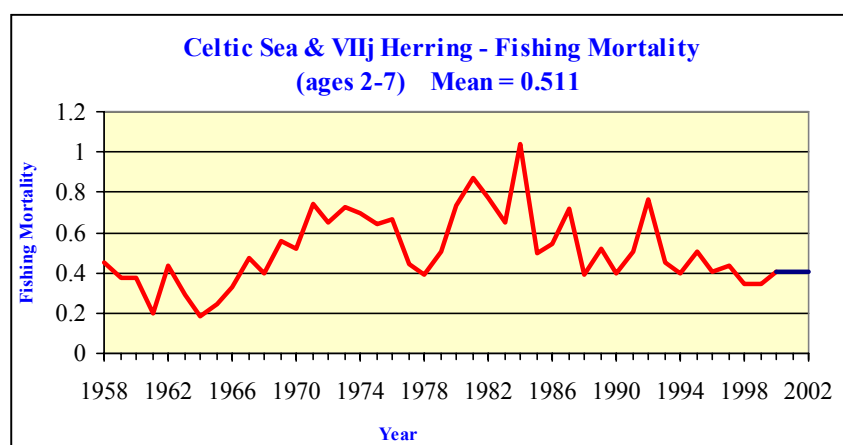
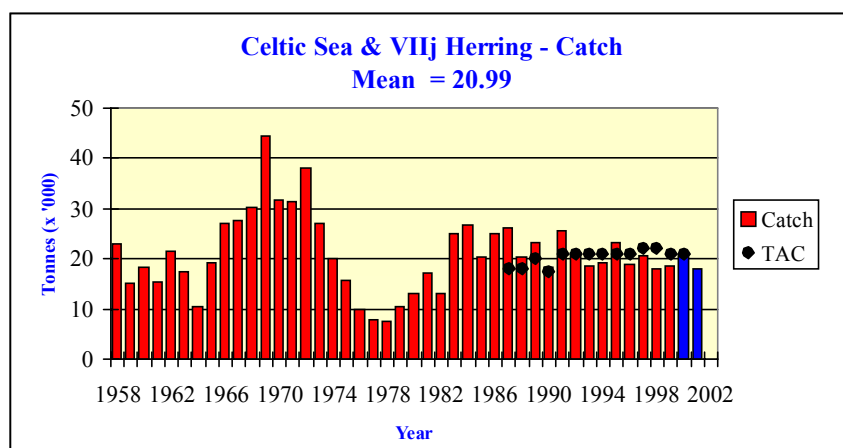


Table 3.9.9.1 Celtic Sea and Division VIIj herring landings by calendar year (t), 1988–1999. (Data provided by Working Group members). These figures may not in all cases correspond to the official statistics and cannot be used for management purposes.

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	-	18,600	1,000	-	-1,800	3,000	21,800
1997	1,300	-	18,000	1,400	-	-2,600	700	18,800
1998	+	-	19,300	1,200	-	-200	0	20,300
1999 ¹		200	17,900	1300	+	-1300	0	18,100

¹ Preliminary.

Table 3.9.9.2 Celtic Sea and Division VIIj herring landings (t) by season (1 April–31 March) 1988/1989–1999/2000. (Data provided by Working Group members. 1998/2000 figures are preliminary). These figures may not in all cases correspond to the official statistics and cannot be used for management purposes.

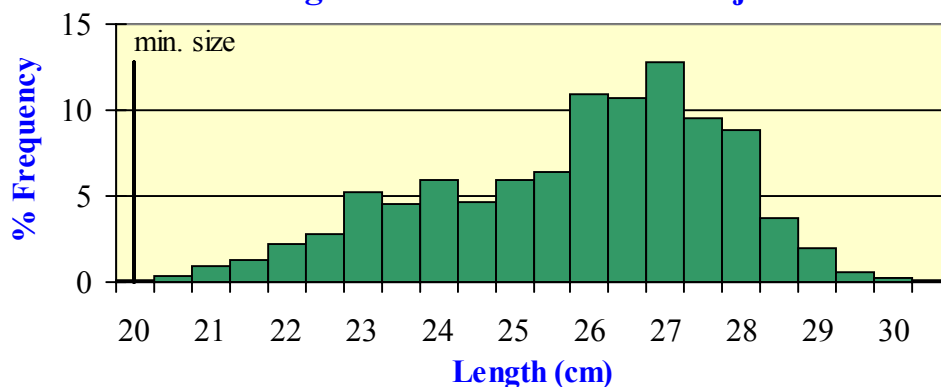
Year	France	Germany	Ireland	Netherlands	U.K.	Unallocated	Discards	Total
1988/1989	-	-	17,000	-	-	-	3,400	20,400
1989/1990	+	-	15,000	1,900	-	2,600	3,600	23,100
1990/1991	+	-	15,000	1,000	200	700	1,700	18,600
1991/1992	500	100	21,400	1,600	-	-100	2,100	25,600
1992/1993	-	-	18,000	1,300	-	-100	2,000	21,200
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	-	-2,100	0	20,500
1998/1999	+	-	17,700	1,200	-	-700	-	18,200
1999/2000 ¹		200	18,300	1300	+	-1300	0	18,500

¹ Preliminary

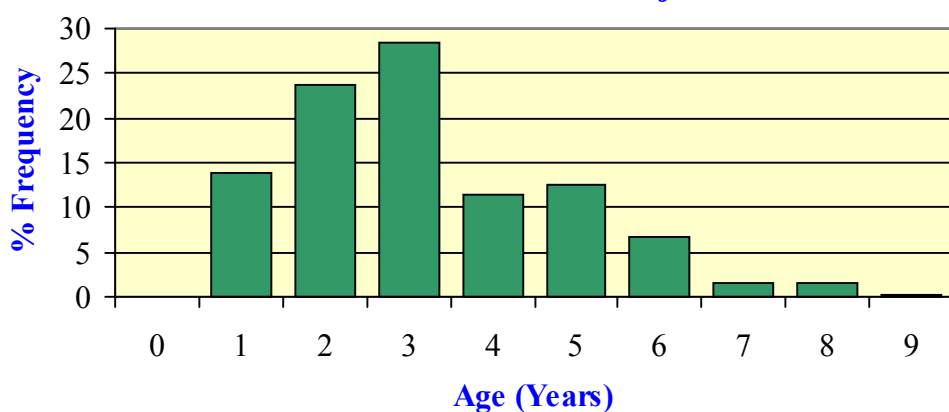
Table 3.9.9.3 Celtic Sea and Division VIIj herring

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-7
1958	320.46	72.90	22.98	0.453
1959	1,007.85	77.17	15.09	0.376
1960	325.42	77.72	18.28	0.375
1961	244.03	71.36	15.37	0.196
1962	486.37	76.67	21.55	0.439
1963	275.70	69.90	17.35	0.293
1964	1,025.66	88.57	10.60	0.182
1965	360.71	106.37	19.13	0.247
1966	649.43	108.51	27.03	0.332
1967	682.71	110.70	27.66	0.474
1968	842.11	119.10	30.24	0.395
1969	450.65	111.70	44.39	0.560
1970	238.77	85.16	31.73	0.521
1971	869.85	84.16	31.40	0.738
1972	270.53	75.17	38.20	0.647
1973	311.77	54.71	26.94	0.729
1974	136.58	39.94	19.94	0.698
1975	152.01	29.80	15.59	0.643
1976	205.74	27.22	9.77	0.664
1977	173.57	27.79	7.83	0.447
1978	134.75	28.24	7.56	0.393
1979	237.36	29.24	10.32	0.505
1980	145.79	27.31	13.13	0.733
1981	409.23	31.23	17.10	0.868
1982	660.32	45.25	13.00	0.772
1983	731.92	62.40	24.98	0.646
1984	566.97	62.03	26.78	1.038
1985	582.79	63.84	20.43	0.495
1986	535.59	69.76	25.02	0.541
1987	1,040.97	78.88	26.20	0.720
1988	416.12	78.81	20.45	0.391
1989	518.90	73.49	23.25	0.521
1990	453.28	69.36	18.40	0.395
1991	188.71	58.69	25.56	0.507
1992	909.27	59.78	21.13	0.766
1993	352.26	59.11	18.62	0.448
1994	818.51	69.59	19.30	0.395
1995	863.27	77.67	23.31	0.507
1996	463.70	74.69	18.82	0.406
1997	515.18	72.25	20.50	0.432
1998	515.47	72.15	18.04	0.343
1999	541.12	73.20	18.49	0.343
2000	558.20	73.75	.	0.405
Average	492.78	68.03	20.99	0.511
Unit	Millions	1000 tonnes	1000 tonnes	-

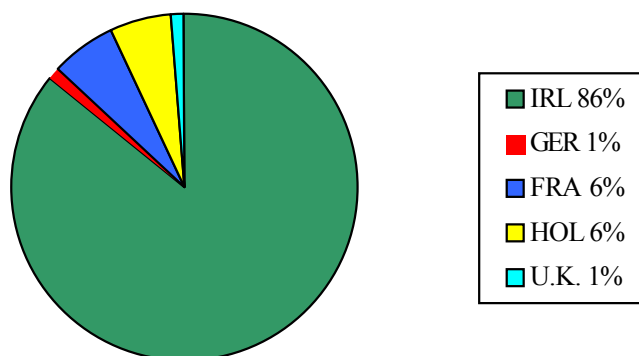
1999 Length Distribution of Irish Landings of Herring in the Celtic Sea and VIIj



1999 Age distribution of Irish Landings of Herring in the Celtic Sea and VIIj



2000 Quota Allocations Herring Celtic Sea and VIIj



Norwegian Spring Spawning Herring

Sub-area I and II

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES advice for this stock, which states that the harvest control rule that links catches with minimum levels of SSB should be applied. These would imply a maximum catch of 753,000 t in 2001. The EU share of the likely quota would be about 65,000 t, which would correspond to an Irish quota of about 5,900 t in 2001 compared to 9,800 t in 2000.

STATE OF THE STOCK

- There are concerns about the state of this stock. The most recent assessment suggests that the stock is lower than that estimated in 1999.
- The fishery was closed for a long time in the 1960s and 1970s and only very small catches were permitted in the 1980s. Landings from 1995-1998 have averaged about 1.3 million tonnes. The estimated catch for 1999 was 1.24 million tonnes. Catches of over 1 million tonnes have been taken from the stock for the last four years.
- In 1999 the fishing mortality was estimated to be 0.16 which was slightly higher than that recorded for 1998. Fishing mortality has been very stable in recent years. The proposed $F_{pa}=0.15$.
- Recruitment of the 1991 and 1992 year-classes were very strong and lead to a rapid increase in stock size. Subsequent year-classes appear to have been much weaker. The 1998 year-class may be above average. However the acoustic surveys that are used to estimate recruitment are difficult to interpret.
- In 2000 the SSB was estimated to be 6.8 million tonnes which is considerably lower than that predicted in 1999. The SSB increased dramatically during the 1990s because of good recruitment and reached a peak in 1997 of over 8.9 million tonnes.
- The stock is expected to decrease in the immediate future and may fall below the B_{pa} of 5 million tonnes in the mid term.

CURRENT MANAGEMENT

- The TAC area (Sub areas I and II) corresponds with the assessment area.
- The TAC set by NEAFC for this fishery for 2000 is 1,250,000 t. The EU share of this TAC is 108,600 t

and the Irish quota is 9,800 t. There are also restrictions on the amounts of the Irish catch that can be taken in different fishing zones.

- A management strategy, (harvest control rule) based on maintaining fishing mortality $F=0.15$, a catch ceiling of 1.5 million tonnes and a minimum SSB of 2.5 million tonnes has been in operation in the fishery for a number of years.

MFSD – ECONOMIC COMMENTS

This fishery is new to the Irish fleet. The value of the Irish landings in 1999 were estimated at £0.6 million. Most of the fish went for fishmeal. The fishery may become important to the pelagic fleet in the north west because of restrictions on other pelagic fisheries. .

ADDITIONAL INFORMATION

1. The most recent assessment has been considerably revised and suggests that the stock is lower than previously estimated. The assessment is hampered by poor sampling data and inadequate surveys.
2. The total landings taken from this fishery in 1999 were 1.23 million tonnes.
3. The Irish landings were about 2,400 t in 1999.
4. Mis-reporting 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 while the remainder was dumped because of poor quality. There has been a big problem in landing fish at Killybegs in good condition at the time when the Irish fleet was fishing (May). Landings declined in 1997 and 1998 and the total catch in 1998 and 1999 was only about 2,500 t. Most of this catch was taken by one vessel and landed into the continent for human consumption.
8. 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.
9. MFSD has carried out a sampling programme on the 1998 and has participated in commercial trips from Killybegs as a result of the joint Marine Institute/ Donegal Processors research project funded under the Marine Research Measure. It was not possible to sample the fishery in 1999 because of the lack of vessels

participating. Ireland, for the first time, submitted biological data on the Irish fishery to the ICES Working Group in 1999 and again in 2000. The intention of this project is to obtain biological information and also to ensure that Ireland is playing an active role in the assessment and management of this stock. It is important that these investigations are maintained when this joint programme is completed in February 2001.

ICES ADVICE

3.1.7

State of stock/fishery

The stock biomass is at present considered to be within safe biological limits and the stock is harvested close to the proposed $F_{pa} = 0.15$. The recruitment of the very strong 1992 year-class led to an increase in the SSB in 1997 to 9 million t, but this has since declined to approximately 6.9 million t in 2000. Continued fishing under the present management agreement and given the recruitment prospects, the spawning stock may fall below B_{pa} (5.0 million t) in the medium term.

Management objectives:

Coastal nations (EU, Norway, Russia, Iceland, Faroe Islands) agreed in 1999 on a long term management plan from 2001. This plan states that a key aim is to keep SSB above 2.5 million tonnes (B_{lim}). Fishing shall be restricted using a TAC consistent with a fishing mortality rate ($=0.125$) which is lower than that recently advised by ICES as F_{pa} (0.15). The plan specifies that management

measures and strategies shall be reviewed and revised on the basis of any new advice provided by ICES. Should SSB fall below 5 million tonnes (B_{pa}), the fishing mortality rate shall be adapted to 'ensure a safe and rapid recovery of SSB to a level in excess of 5 million tonnes. These objectives and plan are considered to be consistent with the precautionary approach.

Advice on management:

ICES advises that this fishery should be managed according to the agreed management plan corresponding to a catch of 753 thousand t in 2001.

Relevant factors to be considered in management:

The present assessment indicates a lower stock size than that estimated in 1999. The results of the Norwegian acoustic surveys, carried out in 1998, and used in the 1999 assessment indicated that the 1991 and 1992 year-classes, which presently dominate the stock, were much more abundant than estimated from the 1997 surveys. The results of the 1999 surveys indicate that these year-classes are not as abundant as estimated by the 1998 surveys and are more in line with the results from the 1997 surveys. This has had the effect of decreasing the estimate of current stock size.

The catch forecast for 2001 is far below that which was forecasted in 1999 for 2000. The reasons for this are the decline in stock abundance from 1999 to 2000 as the 1991 and 1992 year-classes are decreased, the reduced agreed fishing mortality (0.125 vs. 0.15) as well as the reduced estimate of the stock abundance in 1999.

Catch forecast for 2001:

Landings (2000) = 1,250, SSB(2001) = 6,060.

F (2001 onwards)	Basis	Catch (2001)	Landings (2001)	SSB (2002)	Medium term effect of fishing at given level
0.05	$0.32 \cdot F_{99}$	312	312	6,681	Increasing spawning stock
0.08	$0.51 \cdot F_{99}$	492	492	6,499	Increasing spawning stock
0.100	$0.64 \cdot F_{99}$	610	610	6,382	Increasing spawning stock
0.125	Adopted by management	753	753	6,234	Slightly increasing spawning stock
0.150	F_{pa}	894	894	6,098	Slightly increasing spawning stock

Weights in thousand t.

Shaded scenarios are inconsistent with the precautionary approach.

Elaboration and special comment:

The main catches from the fishery are taken by Norway (740 000 t), Iceland (203 000 t), Russia (137 000 t) and Faroe Islands (55 000 t). Smaller catches are taken by a number of EU fleets. Most of the catches are reduced for fishmeal with the exception of the Russian catch, all of which is used to human consumption.

The fisheries in general follow closely the migration of the stock as it moves from the overwintering 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 overwintering areas and during the spawning period. The Icelandic fishery takes place mainly in May and June and most catches are taken in 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 from the international area and the Norwegian Sea.

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 has been to rebuild the spawning stock above this minimum limit. In order to reach this goal, after a period of almost no fishing, the management between 1985 and 1993 aimed at restricting the fishing mortality to 0.05. 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 participat-

ing and a total catch exceeding 900 thousand t. The fishery expanded further in 1996. Recent catches exceed 1.2 million t.

Many countries that have substantial catches from this fishery do not carry out any sampling programmes. In general the overall sampling level is inadequate and this seriously undermines the quality of the assessment.

The results of the assessment suggests that the 1998 year class may be strong. Preliminary indications from Russian surveys carried out in summer of 2000 suggest that this year class may be very strong. However, the strength of the year class has yet to be confirmed.

Multispecies Dimension: The juveniles and adults of this stock form an important part of the ecosystem in the Barents Sea and 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 stock by allowing the stock to be kept above B_{lim} . In the late 1950s the spawning stock was in the order of 5–10 million t.

A report based on the distribution of the herring over the summer feeding areas in 2000 by an international ICES co-ordinated survey will be available in September 2000.

Data and assessment: Analytical assessment based on catch and survey data (acoustic estimates of adults and recruits, tagging estimates, larval index).

Source of information: Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, April/May 2000 (ICES CM 2000/ACFM:16).

Reference points:

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 data (Tables 3.1.7.1–3).

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 ¹	906
1996	Keep SSB above 2.5 million t	-	None ²	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	
2001	Do not exceed the harvest control rule	max 753		

¹Autonomous TACs totalling 900 000 t; ²Autonomous TACs totalling 1 425 000 t were set by April 1996. Weights in '000 t.

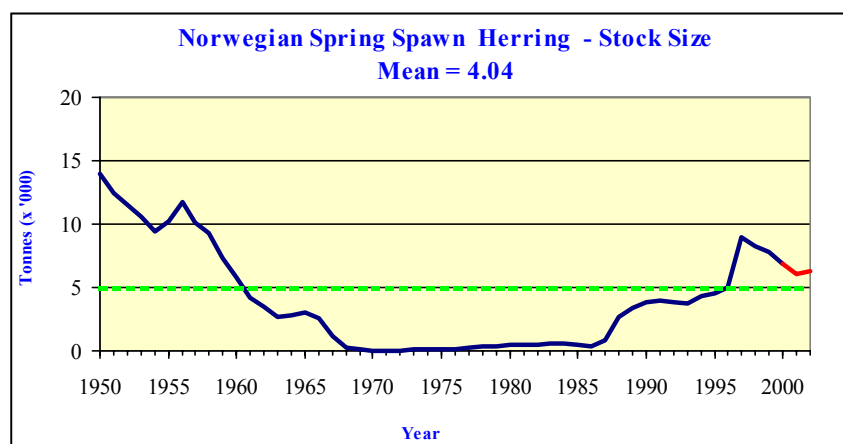
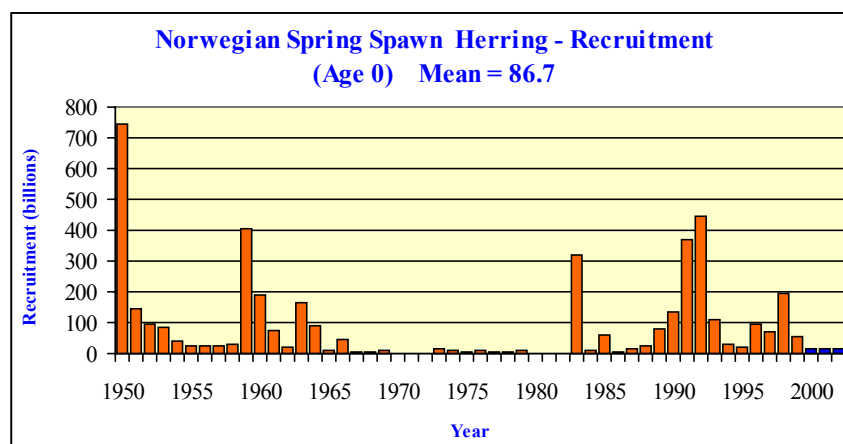
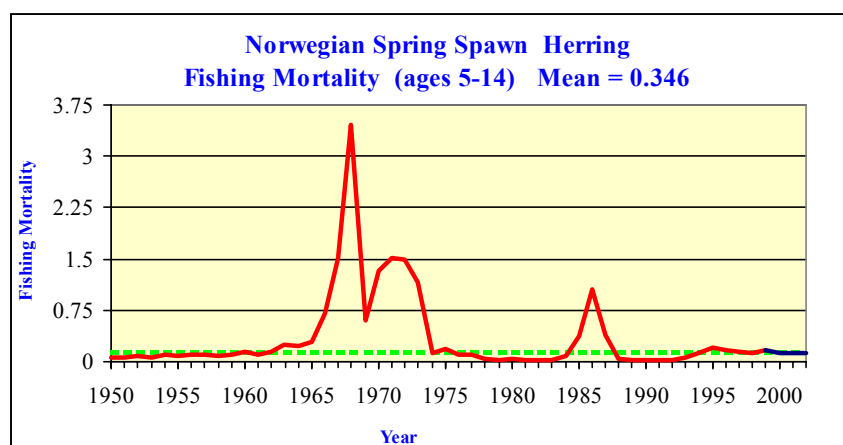
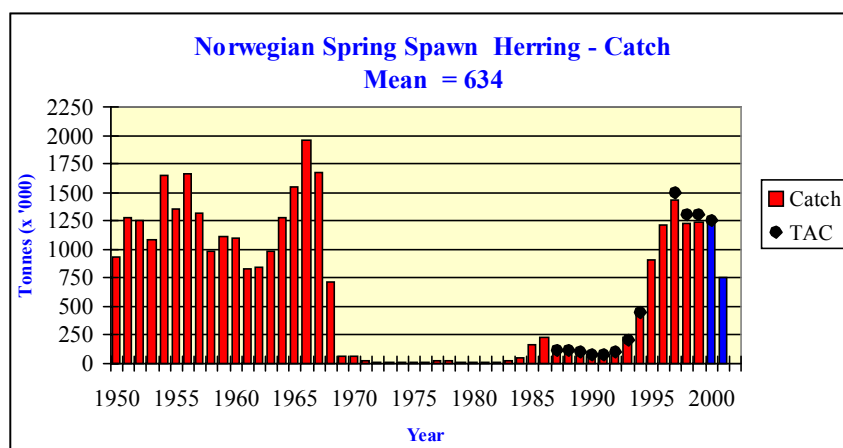


Table 3.1.7.1 Catches of Norwegian spring spawning herring (tonnes) since 1972.

Year	A	B ¹	C	D	Total	Total catch as used by the Working Group
1972	-	9,895	3,266 ²	-	13,161	13,161
1973	139	6,602	276	-	7,017	7,017
1974	906	6,093	620	-	7,619	7,619
1975	53	3,372	288	-	3,713	13,713
1976	-	247	189	-	436	10,436
1977	374	11,834	498	-	12,706	22,706
1978	484	9,151	189	-	9,824	19,824
1979	691	1,866	307	-	2,864	12,864
1980	878	7,634	65	-	8,577	18,577
1981	844	7,814	78	-	8,736	13,736
1982	983	10,447	225	-	11,655	16,655
1983	3,857	13,290	907	-	18,054	23,054
1984	18,730	29,463	339	-	48,532	53,532
1985	29,363	37,187	197	4,300	71,047	169,872
1986	71,122 ³	55,507	156	-	126,785	225,256
1987	62,910	49,798	181	-	112,899	127,306
1988	78,592	46,582	127	-	125,301	135,301
1989	52,003	41,770	57	-	93,830	103,830
1990	48,633	29,770	8	-	78,411	86,411
1991	48,353	31,280	50	-	79,683	84,683
1992	43,688	55,737	23	-	99,448	104,448
1993	117,195	110,212	50	-	227,457	232,457
1994	288,581	190,643	4	-	479,228	479,228
1995	320,731	581,495	0	-	902,226	902,226
1996	462,248	758,035	0	-	1,220,283	1,220,283
1997 ⁵			0	-	1,426,507	1,426,507
1998 ⁶			0	-	1,223,131	1,223,131
1999 ⁶			0	-	1,235,433	1,235,433

A = catches of adult herring in winter
B = mixed herring fishery in remaining part of the year
C = by-catches of 0- and 1-group herring in the sprat fishery
D = USSR-Norway by-catch in the capelin fishery (2-group)

¹ Includes also by-catches of adult herring in other fisheries

² In 1972, there was also a directed herring 0-group fishery

³ Includes 26,000 t of immature herring (1983 year-class) fished by USSR in the Barents Sea

⁴ Preliminary, as provided by Working Group members

⁵ Details of distribution of 1997 and catches by fishery and ICES area given in ICES 1999

⁶ Details of distribution of 1999 catches by fishery and ICES area given in Tables 3.2.3-3.2.5

Table 3.1.7.2 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	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	-	15,978	7,003	605	14,863	1,223,131
1999 ¹	740,640	157,328	37,010	55,527	203,381	2,412	5,871	-	19,207	-	-	14,057	1,235,433

¹ Preliminary, as provided by Working Group members.

Table 3.1.7.3 Norwegian spring-spawning herring

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 5-14
1950	747,374.66	13,984.44	933.00	0.058
1951	143,907.89	12,440.19	1,278.40	0.070
1952	93,898.75	11,481.77	1,254.80	0.073
1953	83,577.06	10,613.26	1,090.60	0.066
1954	39,702.94	9,445.04	1,644.50	0.112
1955	23,753.76	10,222.78	1,359.80	0.078
1956	27,474.77	11,739.81	1,659.40	0.110
1957	23,650.59	10,128.76	1,319.50	0.103
1958	27,810.50	9,280.37	986.60	0.079
1959	405,342.66	7,349.92	1,111.10	0.113
1960	191,338.61	5,817.15	1,101.80	0.136
1961	73,282.68	4,229.87	830.10	0.105
1962	17,712.45	3,464.78	848.60	0.146
1963	164,640.16	2,635.41	984.50	0.253
1964	90,556.04	2,795.13	1,281.80	0.227
1965	7,932.62	3,067.46	1,547.70	0.280
1966	45,349.29	2,595.27	1,955.00	0.700
1967	3,582.25	1,145.47	1,677.20	1.517
1968	4,638.55	219.01	712.20	3.450
1969	9,607.35	77.54	67.80	0.595
1970	620.67	30.72	62.30	1.324
1971	209.80	8.23	21.10	1.520
1972	907.35	1.85	13.16	1.488
1973	12,701.70	74.40	7.02	1.164
1974	8,500.68	85.34	7.62	0.114
1975	2,942.59	91.38	13.71	0.190
1976	10,018.75	145.98	10.44	0.106
1977	5,039.34	283.51	22.71	0.111
1978	6,133.16	354.75	19.82	0.044
1979	12,434.72	385.58	12.86	0.024
1980	1,539.33	468.61	18.58	0.035
1981	1,091.88	502.69	13.74	0.022
1982	2,329.74	501.56	16.66	0.020
1983	318,415.01	572.71	23.05	0.029
1984	11,403.32	597.40	53.53	0.091
1985	60,083.50	495.23	169.87	0.379
1986	6,056.17	396.24	225.26	1.061
1987	16,692.03	866.40	127.31	0.399
1988	25,411.76	2,720.28	135.30	0.045
1989	79,533.19	3,367.50	103.83	0.029
1990	136,750.27	3,781.31	86.41	0.021
1991	370,853.12	3,969.46	84.68	0.023
1992	443,341.73	3,875.23	104.45	0.026
1993	111,323.58	3,748.57	232.46	0.061
1994	32,316.82	4,310.54	479.23	0.121
1995	21,038.20	4,527.73	905.50	0.200
1996	93,725.25	4,975.24	1,220.28	0.163
1997	68,900.06	8,971.55	1,426.51	0.150
1998	195,981.00 ¹	8,309.05	1,223.13	0.129
1999	54,743.00 ¹	7,789.95	1,235.43	0.156
2000	.	6,852.01	.	0.125
Average	86,723.43	4,035.19	634.41	0.346
Unit	Millions	1000 tonnes	1000 tonnes	-

¹ Back calculated from survey estimate

North East Atlantic Mackerel

(combined Southern, Western and North Sea spawning components)

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



Marine Fisheries Services Division

Background

Up to recently ICES assumed the existence of three separate mackerel stocks - the North Sea Stock, the Western Stock and the Southern Stock. These stocks were separated on the basis of different locations of the fisheries and of the spawning grounds. During the 1960s the North Sea stock supported a very important fishery which in some years yielded catches of more than 1 million t. This stock has been over-exploited and is now considered to be depleted. The Western stock has in recent years changed its migrations and location and now spends much of the year in the North Sea where it mixes with the North Sea stock. This stock has increased in recent years. The Southern stock, which is exploited mainly by Spain and Portugal, has also been shown, by tagging experiments, to mix with the Western and North Sea stocks. It has therefore become increasingly difficult to make separate assessments for the individual stocks and ICES has in recent years combined all the data and performed an assessment for all stocks combined. The advice therefore that ICES give applies to the combined stock under the name of **the North East Atlantic Mackerel Stock**. In order to keep track of the development of the spawning biomasses in the different spawning areas the North East Atlantic Mackerel Stock is now divided into three area components termed the **Western Spawning Component**, the **North sea Spawning Component** and the **Southern Spawning Component**.

The North East Atlantic mackerel stock is distributed and fished in ICES Divisions IIa, IIIa, Vb, Sub area VI, VII, VIII and Divisions IXa. A full assessment is carried out on this stock for 1984-2000. The total stock is considered to have increased in recent years.

The Western component spawns in Sub areas VI, VII and Divisions VIII a,b,d and e. A full assessment is carried out on this component but this is only be used to produce a longer time series for recruitment, which is used as the input value for the NE Atlantic mackerel stock. The value for Western mackerel is raised by a ratio defining the proportion of the stock found in the western area.

The North Sea component spawns in Sub area IV and IIIa. No assessment has been carried out on the stock in recent years and the stock remains depleted.

The Southern component spawns in Divisions VIIIc and

IXa. The stock appears to have increased in recent years but no full assessment has been carried out because of lack of data.

MFSD – ADVICE

MFSD agrees with the ICES advice for this stock which states that the fishing mortality in 2001 should be no more than F_{pa} (0.17) This corresponds to landings in 2001 of no more than 665,000 t. ICES advises that the proposed TAC of 665,000 t covers all areas where North- East Atlantic mackerel are fished.

ICES has also advised the following:

- North Sea spawning component still needs the maximum possible protection;
- There should be no fishing 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;
- That observers should be placed on vessels in order to estimate discards in those fisheries where discarding 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.

The advised TAC of 665,000 t for 2001 compares with advised TACs of 642,000t for 2000 and 437,000t for 1999. The Irish share of this TAC depends on the results of the EU/Norwegian agreement but the Irish quota for 2001 should be slightly higher than that for 2000 which was 70,270t.

STATE OF THE STOCK

- There is no concern about the state of this stock at present.
- Catches in 1999 were over 608,900 t which was nearly 58,000 t lower than the catch taken in 1998. Catches since 1989 have fluctuated between 585,900 t and 825,000 t. The catch in 1999 (608,900 t) was considerably higher than that considered to be consistent with the precautionary fishing mortality (0.15) which was 437,000 t or the agreed TAC (562,000 t)
- In 1999 fishing mortality was estimated to be about 0.169 which is just below the proposed $F_{pa}=0.17$.

Fishing mortality has decreased since 1993 when it was at the highest value (0.33)

- A number of good year classes have recruited to the stock in recent years – particularly those of 1993 and 1996. The abundances of the most recent year classes are poorly estimated and it is important to remember that the stock predictions are heavily dependent on these.
- The spawning stock has been increasing since 1984 and in 2000 was estimated to over 3.8 million tonnes. This is the highest in the period 1984-2000 and well above the proposed $B_{pa}=2.3$ million tonnes.
- The prognosis for the stock is that the SSB will remain stable at the current level of fishing mortality at about 3.9 million tonnes up to 2002.

CURRENT MANAGEMENT

- The TAC agreed between EU and Norway does not cover catches by a number of countries in areas outside of the EU and Norwegian economic zones. These catches in 1999 amounted to nearly 55,000 t and were mainly taken by Russia in “international” waters in Divisions IIa and Vb. These catches are not controlled by any TAC.
- The TACs that are set only cover the EU and Norwegian waters in Sub-area IV, VI, VII and VIII and Divisions IIa, IIIa, Vb and IXa. The assessment area covers Sub-areas IV, VI, VII, and Divisions IIIa, and VIIIa, b, d and e.
- 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 TACs set for 2000 appears to be 611,745 t. The EU TAC was 410,685 t including the southern areas and the Irish share of the EU quota was 70,270 t (17.7%) of which only 22,400 t may be fished from 1 October to 31 December in EU waters of ICES Division IVa.

MFSD – ECONOMIC COMMENTS

The value of the Irish landings in 1999 were estimated at £15.6 million. This is a very economically important fishery to the modern pelagic trawlers operating out of the

north west of Ireland and to the processing industry in Donegal.

ADDITIONAL INFORMATION

1. The quality of this assessment has improved in recent years but the time series is still short. The most recent assessment indicates that the stock is larger than that predicted in previous years. There is considerable uncertainty on the abundance of the youngest year class and the predictions are heavily dependent on these.
2. The total international catch in 1999 was estimated to be 609,000 t. The Irish landings were about 59,600 t.
3. A problem of misreporting of catches in this fishery – mainly between Divisions IVa and VIa, is still present though at a lower level than in previous years. There are also problems of unallocated catches (over the quota catches).
4. Little is known about discards in the mackerel fishery and discarding may have increased in the non directed fisheries in the Divisions IVb, IVc and VIIef (horse mackerel fishery). The reported landings may therefore underestimate the catches in certain areas. Discards of small mackerel may be a problem in the directed fisheries for horse mackerel carried out by the Dutch fleet around the “Cornwall Box” and in the English Channel.
5. The fishery is dominated by Norway, United Kingdom (Scotland), Ireland and Russia. The main catches are taken by freezer trawlers and RSW vessels.
6. The fishery is extremely important to the north-west of Ireland, particularly Donegal, where a large number of processing factories are situated
7. The western component of the combined North East Atlantic mackerel stock is exploited by the Irish fleet.
8. The age distributions of the Irish landings in 1999 were dominated by 4, 5 and 6 year old fish. There has been a notable increase in young mackerel in catches in recent years.
9. The length distributions of the Irish catches were dominated by fish between 33cm and 35 cm.
10. The results of the 1999 Irish West coast ground fish survey were used to indicate recruitment.
11. The MFSD investigations have been augmented by a sampling programme part funded by EU and the Donegal Processors and by the EU projects FIEFA (98/0059) and SAMFISH (99-009).

MFSD SPECIAL COMMENTS

1 Assessment and Catch Forecasts.

Prior to 1996 ICES assumed that there were three separate mackerel stocks in the north Atlantic i.e. **North Sea Stock, the Western Stock and the Southern Stock**. The North Sea Stock is considered to be in a very depleted state and catches have been insignificant in recent years. This stock did, however, produce catches up to a million

tonnes in the sixties before it collapsed. The Western stock, which migrates between the Iberian Peninsula, the south and west of Ireland and into the North Sea and Norwegian Sea, now supports all the major fisheries. The Southern stock, which has increased in recent years, supports increasingly important catches off the Iberian Peninsula. Catches in 1998 and 1999 were over 44,000 t.

Since 1996 ICES have combined all the biological data for the different stock and now present only one assessment. This combined stock is called the **North East Atlantic Stock** and forms the basis of the catch forecast table. This amalgamation of stocks has had to be carried out because of the mixing of the North Sea stock with the Western Stock, the dominance of the Western Stock in relation to the North Sea and Southern Stocks, and the difficulties in separating the catches for each component. The predictions of the catches assume that the entire fishery is exploited by two fleets. **The fleet which exploits the Northern fishery.** This fishery is equivalent to the Western and North Sea fisheries and includes catches that are taken in the “international fishery” i.e. the unrestricted fishery, mainly exploited by Russia in Division IIa. **The fleet which exploits the Southern fishery.** This is equivalent to the fishery around the Iberian Peninsula and carried out by Spain and Portugal and in which there has been a TAC based on average catches for a number of years.

Predictions

The assessment carried out by the ICES Working Group was done with two assumptions on the catches in 2000. The first scenario is that produced by ACFM in which the status quo F is assumed. This would generate catches in 2000 of 705,000 t. It should be noted that this catch level is in the region of that taken between 1992 and 1995 when the value of F was in the region of 0.3. The second scenario assumes catches in 2000 of 652,000 t. This is approximately equal to the combined TACs plus about 40,000 t for catches in international waters. The first assumption should be considered as a conservative option as the second assumption shows slightly higher SSBs and likely catch levels in 2001 and 2002.

2 International Catches

The TACs set for the Western and North Sea components of the North East Atlantic Stock only apply to EU waters and to waters controlled by Norway. Considerable catches (nearly 55,000 t in 1999) are taken outside these TAC areas- specifically in ICES Division IIa and around Faroe Is. These catches are mainly taken by Russia and are not subject to any catch controls. Since 1997 ICES have advised that the proposed TAC for the combined stocks should cover all areas in which the North-East mackerel stock is fished. The TAC should therefore be extended to include the areas outside the EEZs. Recognizing that there may not be a mechanism to expand the TACs outside EEZs ICES in 1998 and 1999 have formulated the advice differently to say that catches at a given F are inclusive of those taken in international waters. International catches of be-

tween 50,000 t and 70,000 t should therefore be assumed when considering the catch forecast for a given F in the forecast table.

3 Observers

Large quantities of small mackerel are reported to be discarded by freezer trawlers operating off the west coast of Ireland and in the North Sea. Very little information is available about the quantities involved and the information on discards has, up to 1999, only been supplied by one country - the Netherlands. In 2000, however, the Netherlands stopped supplying explicit information on discards and the overall quantity of discards is maybe underestimated. The lack of information affects the accuracy of the assessments and a continuation of the practice may slow down the rebuilding of the stock. ICES have advised for a number of years that observers should be placed on board these vessels. This recommendation has not yet been put into effect and it may have implications for the Irish fleet.

4 Restrictions on fishing in Division IVa.

In 1998 and 1999 ICES discussed the restriction on fishing mackerel in Division IVa in the North Sea during the first and second quarters. This restriction was designed to protect the North Sea stock. However large quantities of “Western Stock” are also present in Division IVa before beginning the spawning migration the timing of the migrations of the Western component out of the North Sea in the 1990s did not take place until mid February. This resulted in considerable illegal fishing. These illegal catches were reported as being taken in Division VIa. It was suggested that by allowing a fishery during these quarters the misreporting problem might be solved and amount of illegal fishing might be reduced. ICES in 1999 therefore recommended that consideration should be given to allow fishing in Division IVa in January. In 2000 the EU accepted this recommendation and fishing was permitted in Division IVa until the end of January 2000. However it should be noted that in the 1st quarter of 2000 the timing of the migration from the North Sea was much earlier than in previous years, probably starting in December 1999, and this may indicate that the migration pattern is not fixed and can show rapid and substantial changes.

ICES ADVICE

3.12.3.a

State of stock/fishery

The combined stock is believed to be inside safe biological limits but until results of the next egg survey in 2001 are included in the assessment (in 2002) it is difficult to be confident about this. The spawning stock biomass is above B_{pa} , and the fishing mortality is just below F_{pa} .

The SSB of the North Sea component remains severely depleted and outside safe biological limits. The Western component, which at present makes up 71-86% of the stock, is estimated in the most recent assessment to have increased. Surveys indicate that the southern component may have increased.

Management objectives:

The agreed record of negotiations between Norway, Faroese and the 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.”

Advice on management:

ICES advises a fishing mortality in 2001 to no more than F_{pa} (0.17) corresponding to landings in 2001 of less than 665 000 t.. ICES advises that the proposed TAC of 665 000 t covers 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:

Little is known about discards in the mackerel fishery. **ICES recommends that observers should be placed on vessels in order to estimate discards in those fisheries where discarding of mackerel is perceived to be a problem.**

The closure of the mackerel fishery in Divisions IVb,c and IIIa throughout the whole year will 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 for 1997 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 1st February. This was adopted for the 1999/2000 fishing season. There is some indication that this has achieved its objective. However, it should be noted that in the first quarter of 2000, the timing of migration from the North Sea was much earlier than in previous years, probably starting in December 1999, which may indicate that the migration pattern of mackerel is not fixed and can show rapid and substantial changes.

Catch forecast for 2001:

Forecasts below show the anticipated catches in the different areas for various fishing mortalities.

Basis: $F(2000) = F(97-99) = F_{sq} = 0.185$, Landings(2000) = 705,000 t, (SSB in 2000 = 3,933,000 t).

F (2001)	Basis	SSB (2001)	Catch (2001)	Landings (2001) N	Landings (2001) S	Landings (2001) Total	SSB (2002)
0.15	Lower bound of coastal state agreement	3966	592	553	39	592	3986
0.17	F_{pa}	3939	665	622	43	665	3900
0.185	$F_{status\ quo}$	3919	719	672	47	719	3838
0.20	Upper bound of coastal state agreement	3899	773	722	51	773	3776

Weights in '000 t.

N: Northern area comprising the Western areas, North Sea, Skagerrak and Norwegian Sea (IIa, IIIa, IVa, Vb, VI, VII, VIIIa,b,d); 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 (1997-1999).

This forecast is based on the assumption of no change in the spatial distribution of the population and stable fishing mortality levels.

Elaboration and special comment:

This year's assessment indicates that the stock is larger than predicted in the previous years. According to this estimate, the stock is now well above B_{pa} , and the largest in the time series. The present stock estimate is uncertain, however, and the perception of a substantial increase in stock size depends on a limited number of observations. In particular, the abundance of the youngest year classes is poorly substantiated, and the predictions are heavily dependent on these.

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 area of mackerel are widely spread, and only the area in the North Sea is sufficiently discrete to be clearly identified as a separate spawning component. Tagging experiments have demon-

strated 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. Here they mix with the North Sea component in the North Sea. 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 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 termed the **Western Spawning Component**, the **North Sea Spawning Component** and the **Southern Spawning Component**, according to the following spawning areas.

North-East Atlantic Mackerel			
Distributed and fished in ICES 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 comprises approximately 75 - 85% of the entire North East Atlantic Stock. Similarly, the Southern Component is defined as mackerel spawning in the southern area (ICES Divisions VIIIc and IXa). Although the North Sea component has been at an extremely low level since the early 1970s ACFM regards the North Sea component as still existing. This component is spawning 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 showed a large reduction of about 200 000 t, compared with 1995, because of the reduced TACs. The 1999 catch decreased by nearly 60 000 t compared to that of 1998. The SSB of the Western component declined in the 1970s from above 3.0 million t, to 2.2 million tonnes in 1994, but was estimated to have increased to 2.7 million t in 1999. A separate assessment for this stock component is made in order to maintain a longer time series of stock-recruitment data.

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 size of the North Sea com-

ponent was last estimated at 68 000 t by egg surveys in 1999 and that component is considered to be severely depleted and outside safe biological limits. An exceptionally large number of juvenile mackerel (1996 year class) was observed throughout the North Sea and adjacent areas during 1997, but did not appear in the IBTS survey in 1998, and did not produce an increase the spawning population in 1999. These fish are therefore likely to have been of Western origin.

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 have been increasing in recent years and in 1998 and 1999 reached a maximum of 44 000 t. Egg surveys indicate that the size of the southern component has increased and may by now be of the order of 25% of the total stock, while it was considered to have been about 15% in previous years.

Combined Assessment: Analytic assessment based on catch numbers at age for the period 1984 - 1999 and egg survey estimates of SSB from 1992, 1995 and 1998.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, September 2000 (ICES CM 2001/ACFM:06).

Reference points proposed by ICES 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	$F_{pa} = F_{lim} \times 0.65$. $F_{0.1} = 0.17$

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

Year	ICES Advice	Predicted catch corresp. to advice	Total Agreed TAC ⁴	Official landings	Disc. ¹ slip	ACFM landings ²
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	0	609
2000	F=0.17: F _{pa}	642 ⁵	612			
2001	F=0.17: F _{pa}	665 ⁵				

¹Data on discards and slipping from only two fleets, ²Landings and discards from IIa, IIIa, IV, Vb, VI, VII, VIII and IXa., ⁴All areas except some catches in international waters in II. ⁵ Highest tabulated option in precautionary range. 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 ¹	Disc. slip	ACFM landings ²
1987	SSB = 1.5 mill. t; TAC	380	405	11	615
1988	F = F _{0.1} ; TAC; closed area; landing size	430	573 ¹	36	628
1989	Halt SSB decline; TAC	355	495 ¹	7	567
1990	TAC; F = F _{0.1}	480	525 ¹	16	606
1991	TAC; F = F _{0.1}	500	575 ¹	31	646
1992	TAC for both 1992 and 1993	670	670 ¹	25	742
1993	TAC for both 1992 and 1993	670	730 ¹	18	805
1994	No long-term gains in increased F	831 ³	800 ¹	5	798
1995	20% reduction in F	530	608 ¹	8	729
1996	No separate advice	-	422 ¹	11	529
1997	No separate advice	-	416 ¹	19	529
1998	No separate advice	-	514 ¹	8	623
1999	No separate advice	-	520 ¹	0	565
2000	No separate advice	-	573 ¹		
2001	No separate advice				

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

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

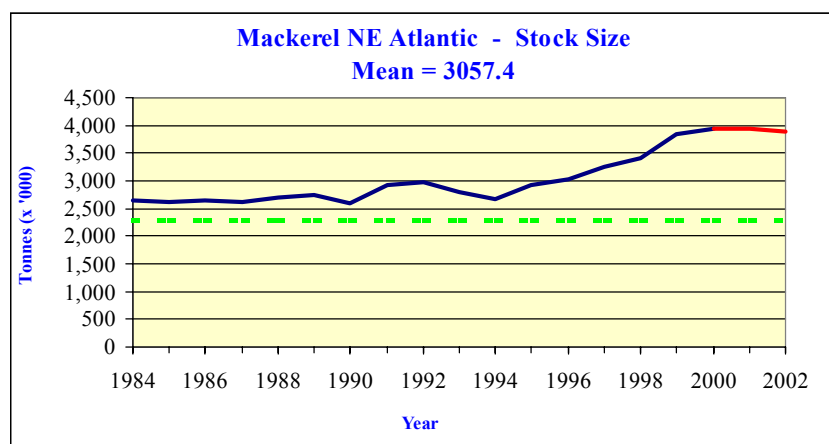
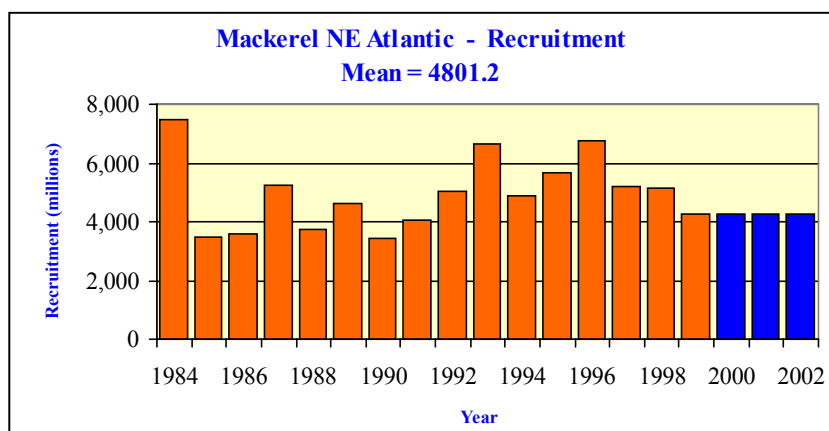
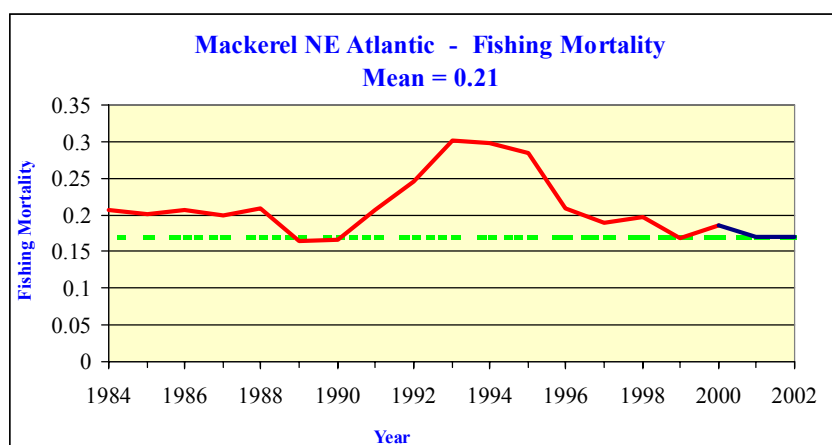
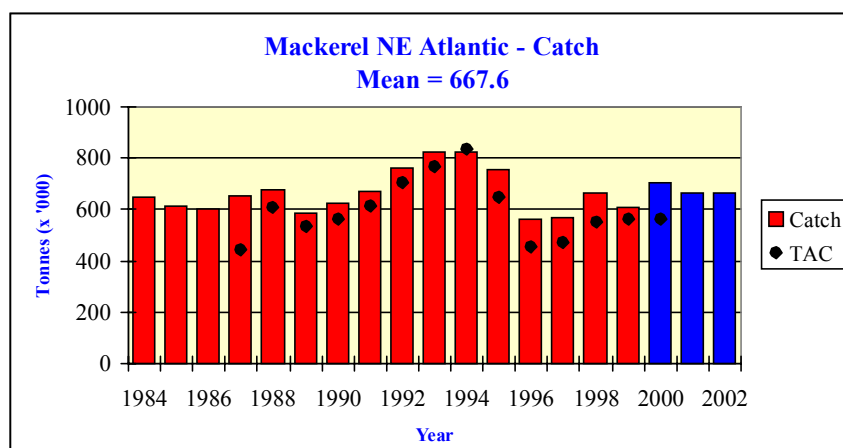
Year	ICES Advice	Predicted catch corresp. to advice ¹	Agreed TAC ²	ACFM landings ³
1987	Lowest practical level	LPL	55	3
1988	Closed areas and seasons; min. landing size; by-catch regulations	LPL	55	6
1989	Closed areas and seasons; min. landing size; by-catch regulations	LPL	49.2	7
1990	Closed areas and 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	- ⁴
1992	Closed areas and seasons; min. landing size; by-catch regulations	LPL	76.3	⁴
1993	Maximum protection; closed areas and seasons; min landing size	LPL	83.1	- ⁴
1994	Maximum protection; closed areas and seasons; min landing size	LPL	95.7	- ⁴
1995	Maximum protection; closed areas and seasons; min landing size	LPL	76.3	- ⁴
1996	Maximum protection; closed areas and seasons; min landing size	LPL	52.8	- ⁴
1997	Maximum protection; closed areas and seasons; min landing size	LPL	52.8	- ⁴
1998	Maximum protection; closed areas and seasons; min landing size	LPL	62.5	- ⁴
1999	Maximum protection; closed areas and seasons; min landing size	LPL	62.5	- ⁴
2000	Maximum protection; closed areas and seasons; min landing size	LPL	69.7	- ⁴
2001	Maximum protection; closed areas and seasons; min landing size			

¹Sub-area IV and Division IIIa. ²TAC for Sub-area IV, Divisions IIIa, IIIb,c,d (EU zone) and Division IIa (EU zone). ³Estimated landings of North Sea component. ⁴No 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 ¹	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	
2001	No separate advice			

¹Division VIIIc, Sub-Areas IX and X, and CECAF Division 34.1.1 (EU waters only). Weights in '000 t.



Western Mackerel Component

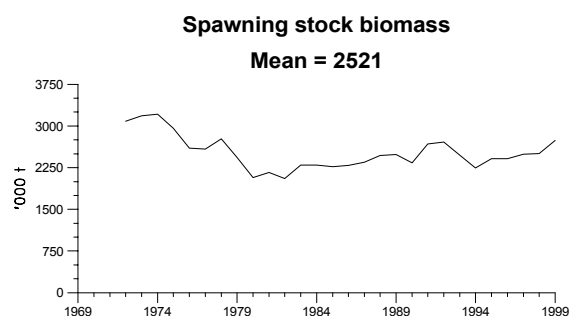
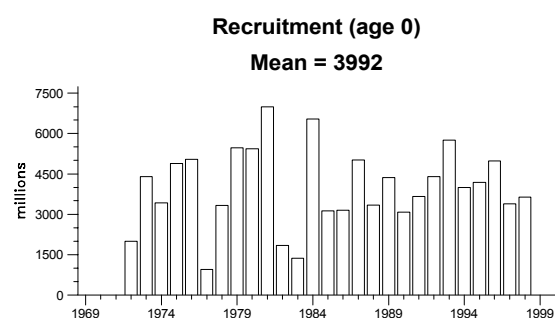
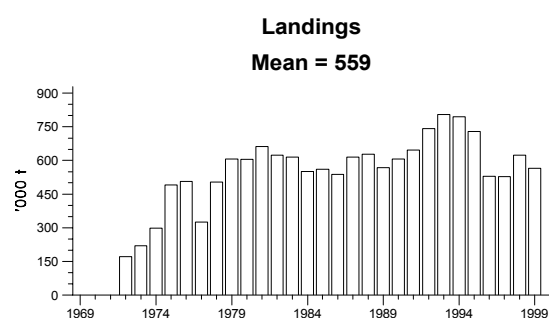


Table 2.1.1 The TACs agreed by the various management authorities and the advice given by ACFM for 1999 and 2000.

Area	Agreed TACs in 1999	Agreed TACs in 2000	Stock components	ACFM advice 1999	ACFM advice 2000	Areas used for allocations	Catch in 1999
IV, IIIa	62,455	69,725	North Sea	Lowest possible level	Lowest possible level	IIa, IIIa, IV, Vb, VI, VII, VIIIa,b, d,e, XII, XIV	565,100
IIa	111,350	124,710	Western	Significant reduction in F	Reduce F below $F_{pa} = 0.17$		
Vb, VI, VII, VIIIa,b,d,e, XII, XIV	310,810	348,110					
Vb, IIa, IVa - Faroese EEZ	35,850	30,000					
VIIIc, IXa	35,000	39,200	Southern	Significant reduction in F	Reduce F below $F_{pa} = 0.17$	VIIIc, Ixa	43,800
Total	555,465	611,745					608,900

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
Denmark	11,787	7,610	1,653	3,133	4,265	6,433
Faroe Islands	137	-	-	-	22	1,247
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
United Kingdom	-	-	2,131	157	1,413	-
USSR	4,293	9,405	11,813	18,604	27,924	12,088
Total	98,222	78,096	101,112	47,186	120,404	90,488

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark	6,800	1,098	251	-	-	4,746	3,198	37	2,090
Estonia	-	-	216	-	3,302	1,925	3,741	4,422	7,356
Faroe Islands	3,100	5,793	3,347	1,167	6,258	9,032	2,965	7,628	2,716
France	-	23	6	6	5	5	0	270	-
Germany	-	-	-	-	-	-	1	-	-
Iceland	-	-	-	-	-	-	92	925	357
Latvia	-	-	100	4,700	1,508	389	233	-	-
Netherlands	-	-	-	-	-	-	561	-	-
Norway	77,200	76,760	91,900	110,500	141,114	93,315	47,992	41,000	54,477
Poland	-	-	-	-	-	-	-	22	-
Russia	-	-	42,440	49,600	28,041	44,537	44,545	50,207	67,201
United Kingdom	400	514	802	-	1,706	194	48	938	199
USSR	28,900	13,631 ²	-	-	-	-	-	-	-
Misreported (IVa)	-	-	-	-	-	-18,647	-	-	-177
					109,625				
Discards	2,300	-	-	-	-	-	-	-	-
Total	118,700	97,819	139,062	165,973	72,309	135,496	103,376	105,449	134,219

Country	1999 ¹
Denmark	106
Estonia	3,595
Faroe Islands	3,011
France	-
Germany	-
Iceland	-
Ireland	100
Latvia	-
Netherlands	661
Norway	53,821
Poland	-
Russia	51,003
United Kingdom	662
Misreported (IVa)	-40,011
Misreported (Vla)	-100
Discards	-
Total	72,848

¹Preliminary.

²Russia.

Table 3.12.3.a.3 Catch (t) of MACKEREL in the North Sea, Skagerrak, and Kattegat (Sub-area IV and Division IIIa). (Data submitted by Working Group members).

Country	1986	1987	1988	1989	1990	1991	1992
Belgium	49	14	20	37	-	125	102
Denmark	23,368	28,217	32,588	26,831	29,000	38,834	41,719
Estonia	-	-	-	-	-	-	400
Faroe Islands	-	-	-	2,685	5,900	5,338	-
France	1,200	2,146	1,806	2,200	1,600	2,362	956
Germany, Fed. Rep.	1,853	474	177	6,312	3,500	4,173	4,610
Iceland	-	-	-	-	-	-	-
Ireland	-	-	-	8,880	12,800	13,000	13,136
Latvia	-	-	-	-	-	-	211
Netherlands	1,949	2,761	2,564	7,343	13,700	4,591	6,547
Norway	50,600	108,250	59,750	81,400	74,500	102,350	115,700
Sweden	1,300	3,162	1,003	6,601	6,400	4,227	5,100
United Kingdom	559	19857	1,002	38,660	30,800	36,917	35,137
USSR (Russia from 1990)	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	-
Misreported (IIa)	-	-	-	-	-	-	-
Misreported (VIa)	148,000	117,000	180,000	92,000	126,000	130,000	127,000
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
Total	243,700	301,618	338,316	281,600	305,100	365,875	367,164

Country	1993	1994	1995	1996	1997	1998	1999 ¹
Belgium	191	351	106	62	114	125	177
Denmark	42,502	47,852	30,891	24,057	21,934	25,326	29,353
Estonia	-	-	-	-	-	-	-
Faroe Islands	11,408	11,027	17,883	13,886	1,367	4,832	4,370
France	1,480	1,570	1,599	1,316	1,532	1,908	2,056
Germany, Fed. Rep.	4,940	1,479	712	542	213	423	473
Iceland	-	-	-	-	-	-	357
Ireland	13,206	9,032	5,607	5,280	280	145	11,293
Latvia	-	-	-	-	-	-	-
Netherlands	7,770	3,637	1,275	1,996	951	1,373	2,819
Norway	112,700	114,428	108,890	88,444	96,300	103,700	106,917
Sweden	5,934	7,099	6,285	5,307	4,714	5,146	5,233
Romania	-	2,903	-	-	-	-	-
Russia	-	-	-	-	3,525	635	345
United Kingdom	41,010	27,479	21,609	18,545	19,204	19,755	31,578
Misreported (IIa)	-	109,625	18,647	-	-	-	40,000
Misreported (VIa)	146,697	134,765	106,987	51,781	73,523	98,432	59,882
Unallocated	-	-	983	236	1,102	3,147	4,946
Discards	2,720	1,150	730	1,387	2,807	4,753	-
Total	390,558	472,397	322,204	212,839	227,566	269,700	299,799

¹ Preliminary.

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

Country	1984	1985	1986	1987	1988	1989	1990	1991
Denmark	200	400	300	100	-	1,000	-	1,573
Estonia	-	-	-	-	-	-	-	-
Faroe Islands	9,200	9,900	1,400	7,100	2,600	1,100	1,000	4,095
France	12,500	7,400	11,200	11,100	8,900	12,700	17,400	10,364
Germany	11,200	11,800	7,700	13,300	15,900	16,200	18,100	17,138
Ireland	84,100	91,400	74,500	89,500	85,800	61,100	61,500	64,827
Netherlands	99,000	37,000	58,900	31,700	26,100	24,000	24,500	29,156
Norway	34,700	24,300	21,000	21,600	17,300	700	-	-
Spain	100	-	-	-	1,500	1,400	400	4,020
United Kingdom	198,300	205,900	156,300	200,700	208,400	149,100	162,700	162,588
USSR	200	-	-	-	-	-	-	-
Unallocated	18,000	75,100	49,299	26,000	4,700	18,900	11,500	-3,802
Misreported (IVa)	-	-	-148,000	-117,000	-180,000	-92,000	-126,000	-130,000
Discards	12,100	4,500	-	-	5,800	4,900	11,300	23,550
Grand Total	479,600	467,700	232,599	284,100	197,000	199,100	182,400	183,509

Country	1992	1993	1994	1995	1996	1997	1998	1999
Denmark	194	-	2,239	1,443	1,271	-	-	552
Estonia	-	-	-	361	-	-	-	-
Faroe Islands	-	2,350	4,283	4,248	-	2,158	3,681	4,239
France	9,109	8,296	9,998	10,178	14,347	19,114	15,927	14,311
Germany	21,952	23,776	25,011	23,703	15,685	15,161	20,989	19,476
Ireland	76,313	81,773	79,996	72,927	49,033	52,849	66,505	48,282
Netherlands	32,365	44,600	40,698	34,514	34,203	22,749	28,790	25,141
Norway	-	600	2,552	-	-	-	-	-
Spain	2,764	3,162	4,126	4,509	2,271	7,842	3,340	4,120
United Kingdom	196,890	215,265	208,656	190,344	127,612	128,836	165,994	127,094
Unallocated	1,472	0	4,632	28,245	10,603	4,577	8,351	9,254
Misreported (IVa)	-127,000	-146,697	-134,765	-106,987	-51,781	-73,523	-98,255	-59,982
Discards	22,020	15,660	4,220	6,991	10,028	16,057	3,277	-
Grand Total	236,079	248,785	251,646	270,476	213,272	195,820	218,599	192,486

Table 3.12.3.a.5 Landings (tonnes) of MACKEREL in Divisions VIIIc and IXa, 1980–1999. Data submitted by Working Group members.

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Spain ¹	11,316	12,834	15,621	10,390	13,852	11,810	16,533	15,982	16,844	13,446
Portugal ²	1,929	3,108	3,018	2,239	2,250	4,178	6,419	5,714	4,388	3,112
Spain ²	2,719	2,111	2,437	2,224	4,206	2,123	1,837	491	3,540	1,763
Poland ²	-	-	-	-	-	-	-	-	-	-
USSR ²	-	-	-	-	-	-	-	-	-	-
Total ²	4,648	5,219	5,455	4,463	6,456	6,301	8,256	6,205	7,928	4,875
TOTAL	15,964	18,053	21,076	14,853	20,308	18,111	24,789	22,187	24,772	18,321

¹Division VIIIc.

²Division IXa.

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Spain ¹	16,086	16,940	12,043	16,675	21,146	23,631	28,386	35,015	36,174	37,631
Portugal ²	3,819	2,789	3,576	2,015	2,158	2,893	3,023	2,080	2,897	2,002
Spain ²	1,406	1,051	2,427	1,027	1,741	1,025	2,714	3,613	5,093	4,164
Poland ²	-	-	-	-	-	-	-	-	-	-
USSR ²	-	-	-	-	-	-	-	-	-	-
Total ²	5,225	3,840	6,003	3,042	3,899	3,918	6,737	5,693	7,990	6,165
TOTAL	21,311	20,780	18,046	19,719	25,045	27,549	34,123	40,708	44,164	43,796

¹Division VIIIc.

²Division IXa.

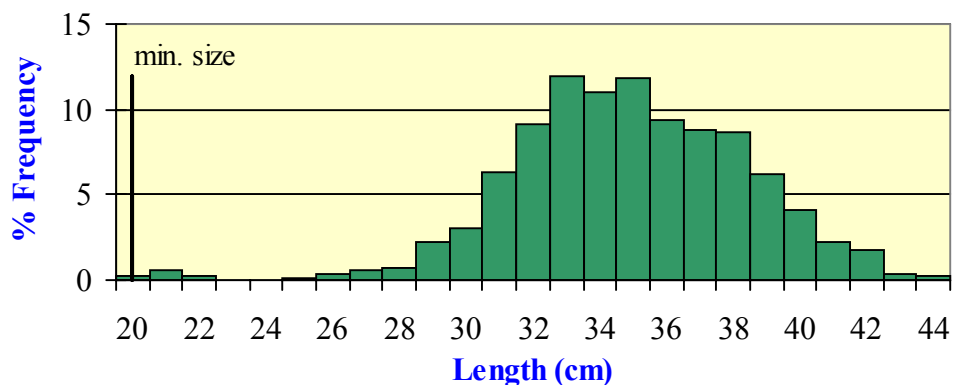
Table 3.12.3.a.6 North-East Atlantic mackerel (combined Southern, Western and North Sea spawning components)

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 4-8
1984	7,495.90	2,644.53	648.08	0.207
1985	3,479.54	2,616.22	614.28	0.201
1986	3,589.75	2,635.57	602.13	0.207
1987	5,254.43	2,617.21	654.81	0.200
1988	3,746.35	2,696.53	676.29	0.209
1989	4,632.70	2,734.95	585.92	0.165
1990	3,421.48	2,593.87	625.61	0.167
1991	4,029.77	2,923.55	667.88	0.207
1992	5,052.48	2,965.39	760.35	0.246
1993	6,670.07	2,802.80	825.04	0.302
1994	4,860.76	2,658.92	823.48	0.298
1995	5,686.91	2,917.65	756.29	0.285
1996	6,765.00	3,014.21	563.59	0.209
1997	5,205.66	3,261.93	569.54	0.190
1998	5,123.64	3,398.94	667.22	0.197
1999	4,252.00	3,830.78	608.93	0.169
2000	4,252.00	3,932.95	.	.
Average	4,912.85	2,955.65	665.59	0.216
Unit	Millions	1000 tonnes	1000 tonnes	-

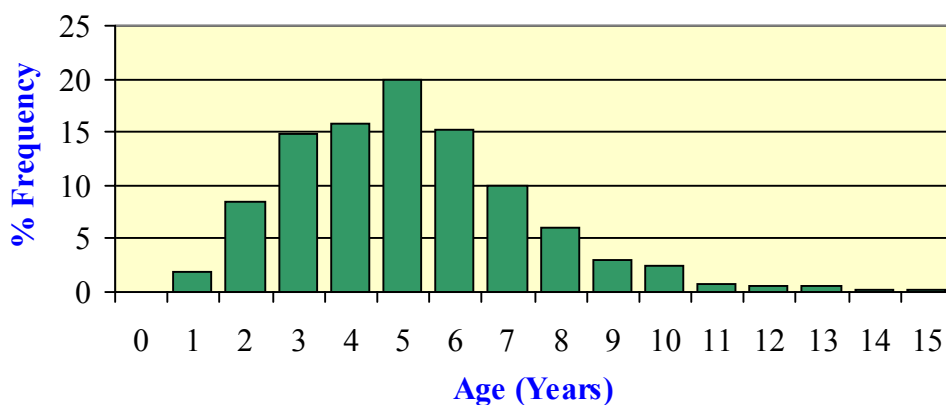
Table 3.12.3.a.7 Mackerel, Western spawning component

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 4-8
1972	2,004.49	3,084.36	170.78	0.015
1973	4,406.32	3,185.22	219.45	0.134
1974	3,424.40	3,210.69	298.05	0.162
1975	4,882.39	2,958.74	491.38	0.262
1976	5,043.04	2,602.98	507.18	0.250
1977	954.06	2,586.19	325.97	0.123
1978	3,322.51	2,767.60	503.91	0.166
1979	5,468.07	2,435.81	605.74	0.233
1980	5,427.11	2,071.98	604.76	0.261
1981	6,993.32	2,160.19	661.76	0.211
1982	1,842.82	2,051.33	623.82	0.212
1983	1,361.49	2,296.93	614.29	0.205
1984	6,534.74	2,294.67	550.93	0.193
1985	3,129.26	2,267.18	561.29	0.200
1986	3,154.66	2,294.14	537.62	0.172
1987	5,018.91	2,347.27	615.38	0.213
1988	3,337.24	2,473.43	628.00	0.233
1989	4,363.99	2,490.18	567.40	0.191
1990	3,078.38	2,337.38	605.94	0.199
1991	3,666.52	2,675.85	646.17	0.219
1992	4,400.79	2,709.76	742.31	0.259
1993	5,762.86	2,473.95	805.04	0.332
1994	4,001.52	2,243.55	795.72	0.326
1995	4,186.54	2,408.82	728.74	0.301
1996	4,982.99	2,413.46	529.46	0.222
1997	3,388.59	2,492.68	528.84	0.204
1998	3,634.02	2,504.02	623.41	0.215
1999	.	2,739.28	565.13	0.198
Average	3,991.52	2,520.63	559.23	0.211
Unit	Millions	1000 tonnes	1000 tonnes	-

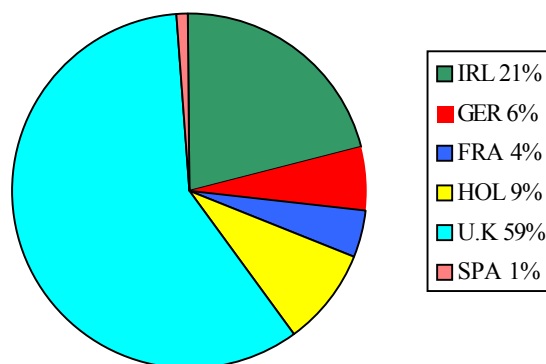
1999 Length Distribution of Irish Landings of Mackerel in NE Atlantic



1999 Age Distribution of Irish Landings of Mackerel in the NE Atlantic



2000 Quota Allocations Mackerel NE Atlantic



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

MFSD – ADVICE

MFSD endorses the advice given by ICES that catches in 2001 should be effectively limited to less than 224,000t corresponding to $F_{0.1}=0.15$. 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), Sub-area VI and Divisions Vb, VIIa–c, VIIe–k, VIIIa,b,d,e. (The present agreed TAC area only covers the EU waters in Divisions Vb, Sub-areas VI, VII, and Divisions VIIIa,b,d,e, Sub area IX and XII.)

MFSD strongly endorses the ICES advice that directed horse mackerel fisheries, in which juvenile are abundant in Divisions VIIe,f, and industrial fisheries in which horse mackerel is taken as a by-catch, should be prohibited

If the EU TAC for 2001 is set at the same level as that for 2000 (233,000 t) then the Irish quota will remain the same (55,010 t).

MFSD also advise that ongoing funding for the sampling programme on this species initiated in 1998 with the processing industry in Donegal as a result of the Marine Institute's Marine Research Measure, which is due to expire in February 2001, should be continued.

STATE OF THE STOCK

- There is no concern about the state of this stock although SSB is estimated to continue to decline at all levels of fishing mortality. Current catches are not considered to be sustainable at recent levels of recruitment.
- Landings increased rapidly from the mid 1980s to 1995 (513,000 t) and have since decreased to 275,000 t in 1999.
- Although the average fishing mortality appears to have remained stable in recent years (0.17–0.25) the fishing mortality on the youngest ages has increased. 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.
- The current SSB is not precisely known but appears to be above $B_{pa}=500,000$ t. SSB has, however continuously declined since 1988 and will continue to decline at present recruitment.
- The prognosis for the stock in the short term is that at

present fishing mortality the SSB will decrease to less than 900,000 t in 2002. This is still well above B_{pa} .

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 fleets and there are considerable amounts of unregulated catches by non EU fleets fishing in international waters.
- The overall TAC for 2000 was 240,000 t. The TAC set by the EU was 233,000.t. The Irish quota was 55,010 t. National quota for this stock were set for the first time in 1998 and if the EU TAC is the same in 2001 as that in 2000 then the Irish quota will remain unchanged..
- There is no management plan or management objective for this fishery.

MFSD – ECONOMIC COMMENTS

The value of the Irish landings in 1999 were estimated at £15.9 million. This is a very economically important species to the Irish RSW pelagic fleet operating out of the north west and to the processing industry in Donegal.

ADDITIONAL INFORMATION

1. The assessment has been considerably revised since last year and a new approach is now being used which appears to indicate a higher and 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.
2. The total landings taken in 1999 was 275,000 t.
3. The Irish catch in 1999 was 58,000 t.
4. 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.
5. The main catches are taken by the Dutch freezer trawler fleet and the Irish refrigerated sea water (RSW) vessels. Considerable Danish catches are taken for industrial purposes - mainly in the Channel area.
6. There is a large Dutch fishery in the Channel area (ICES Divisions VIIe–h) in which large amounts of juvenile horse mackerel continue to be taken. This is a most undesirable development at a time when the overall stock is declining due to a lack of recruitment. ICES has again recommended that this directed fishery and industrial fisheries in which horse mackerel is

taken as a by-catch should be prohibited.

7. The horse mackerel fishery continues to be extremely important to the Irish (RSW) vessels working off the north-west coast and to the processing industry in Donegal. In terms of tonnage alone horse mackerel is the most important species exploited by the Irish fleet. Reports from Irish fishermen suggest that horse mackerel are now less abundant than in the mid nine-ties.
8. The age distribution of the Irish catches were dominated by 6, 7 and 8 year old fish..
9. The length distribution of the Irish catches were dominated by fish between 27 cm and 29 cm
10. The Irish sampling programme since 1998 has been part-funded by the Donegal processors and, as a result of this, a substantial amount of biological data was submitted to the ICES Working Group. This project is due to expire in February 2001 but it is extremely important that this aspect of the Irish sampling programme is continued. The overall Irish sampling programme was also supported by the EU by means of the FIEFA EU funded project 98-0059 and is currently supported by the SAMFISH programme 99-009.

ICES ADVICE

3.12.4

State of stock/fishery

The stock is inside safe biological limits. The current estimate of spawning stock biomass is above B_{pa} . Current catches are not considered to be sustainable at the level of recent recruitment. Average fishing mortality calculated across all ages has remained relatively stable within the range 0.1 - 0.25, but fishing mortality on the youngest ages is increasing. Spawning stock biomass has decreased compared with the mid 1980s and is estimated to continue to decline at all levels of fishing mortality.

Management objectives:

There are no explicit management objectives for this stock. However, for any management objectives to meet precau-

tionary criteria, their aim should be to reduce or maintain F and to increase or maintain spawning stock biomass above B_{pa} .

Advice on management:

ICES advises that catches in 2001 be effectively limited to less than 224 000 t, corresponding to $F_{0.1} = 0.15$. 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, e-k, and VIIIa,b,d,e. ICES also advises that in Divisions VIIe,f directed horse mackerel fisheries in which juveniles are abundant, and industrial fisheries in which horse mackerel is taken as a by-catch, should be prohibited.

Relevant factors to be considered in management:

The extraordinarily strong 1982 year class was 20 times larger than average and 7 times larger than the second largest, the 1993 year class, in the documented history of the fishery 1982-1999. The 1982 year class reached its maximum biomass in 1987 and has decreased since then.

In the absence of outstanding year classes, sustainable yield is unlikely to be higher than about 130 000 t. It is therefore clear that catches will have to be reduced unless another outstanding year class is produced.

Recently fisheries in Divisions VIIe,f have taken large catches of mainly juvenile horse mackerel from the western stock. There has been a clear change in the age-structure of the catches from older to younger fish since 1996. It is not known how abundant the more recent year classes are. Therefore, ICES expresses concern about this high exploitation of juvenile fish at a time when the recruitment is at a low level.

The TAC, which has been in place, applies only to EU waters, and covers only parts of the distribution area of this stock and the fishery. The EU TAC has been 300 000 t during the period 1994-1997, 320 000t in 1998, 265 000 t in 1999 and 240 000 t in 2000.

Catch forecast for 2001:

Basis: $F(2000) = F(97-99) = F_{sq(4-10)} = 0.17$, Landings (2000) = 279,000.

F(2001)	Basis	SSB (2001)	Catch (2001)	Landings (2001)	SSB (2002)
0.07	$0.4 F_{sq}$	1154		110	1057
0.10	$0.6 F_{sq}$	1135		160	1001
0.14	$0.8 F_{sq}$	1116		210	949
0.15	$F_{0.1}$	1110		224	934
0.17	F_{sq}	1100		260	900
0.21	$1.2 F_{sq}$	1080		300	853

Weights in '000 t.

Shaded scenario considered inconsistent with the precautionary approach.

Elaboration and special comment:

A new assessment approach has resulted in a substantial revision of the estimated fishing mortality as well as in the level of SSB in the past, but not in the trends in biomass and SSB. Although the approach is still at an early stage of development, the assessment is considered to be a more realistic representation of the dynamics of the stock, than estimates from previous models.

There have been changes in the distribution of this stock which has resulted in additional fleets outside the TAC area exploiting the stock.

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 maturity ogive is not well estimated and there is uncertainty about natural mortality (0.15).

The assessment carried out uses the results of the international horse mackerel egg surveys. An egg survey on this stock, carried out in 1998 estimated the spawning stock biomass to be 1400 000t.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, September 2000 (ICES CM 2001/ACFM:06).

Reference points proposed by ICES in 1999:

ICES considers that:	ICES proposes that:
B_{lim} is not defined.	B_{pa} be set at 500 000t.
F_{lim} is not defined.	F_{pa} is not defined

Technical basis:

	B_{pa} The egg survey estimate of the SSB that produced the exceptionally strong 1982 year class
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Catch data (Tables 3.12.4.1–8):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	ACFM landings	Disc. slip	ACFM 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	8	304
1999	Effectively limit catches to 200 000t	200	265	275		275
2000	Effectively limit catches to 200 000t	200	240			
2001	Effectively limit catches to 224 000t	224				

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

Western horse mackerel

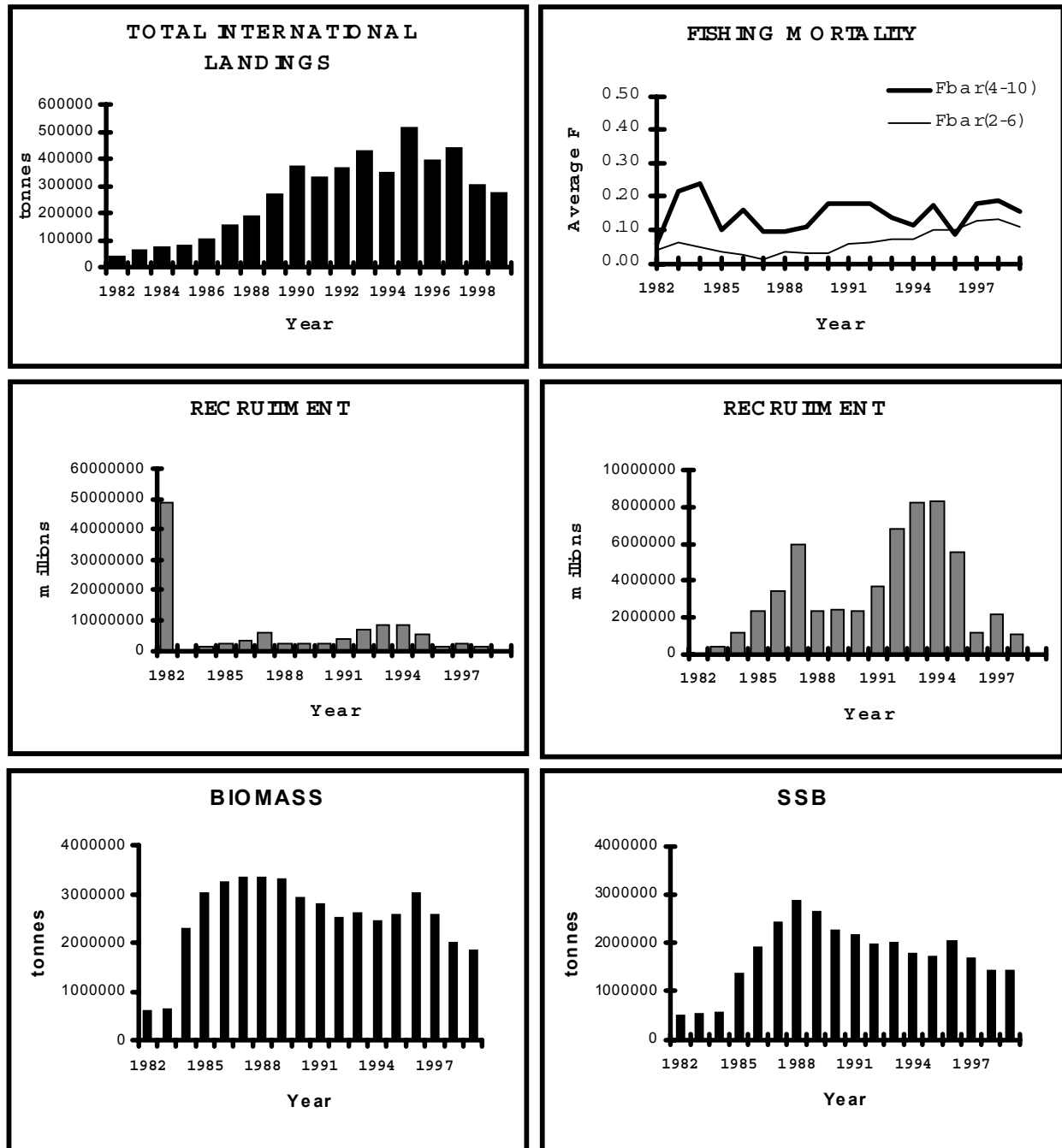


Figure 6.5.5.1 The stock summary plots for the Western Horse mackerel.

- a) Landings
- b) Average fishing mortality (4 - 10)
- c) Recruitment 1982 - 1999
- d) Recruitment 1983 - 1999
- e) Stock biomass
- e) Spawning stock biomass

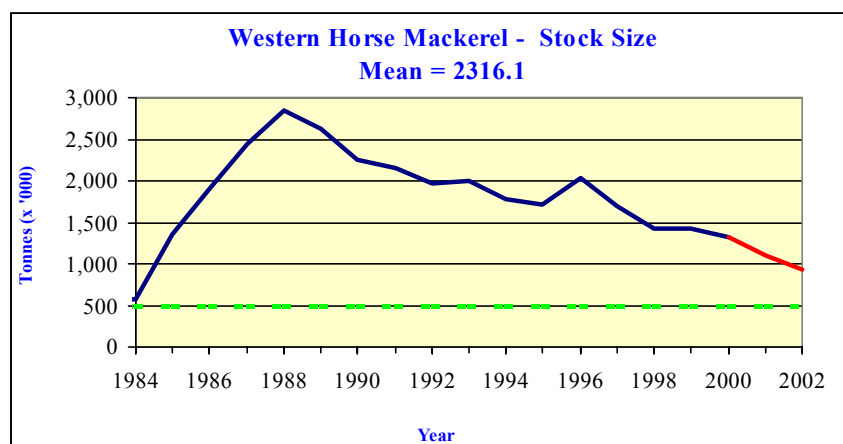
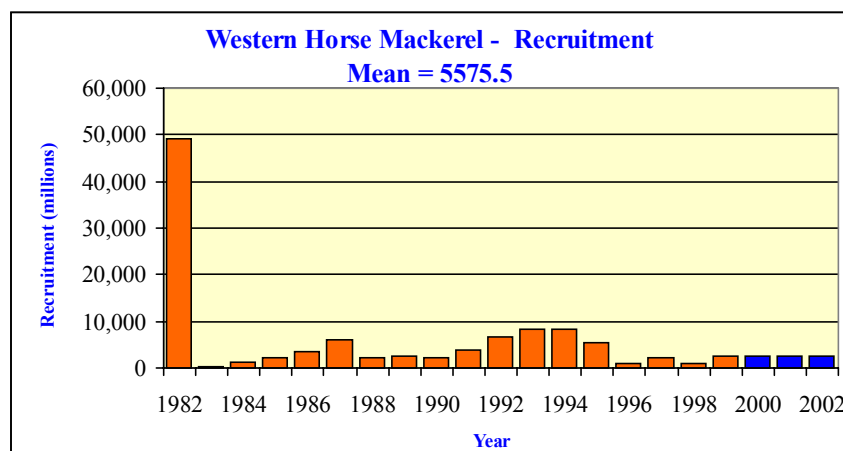
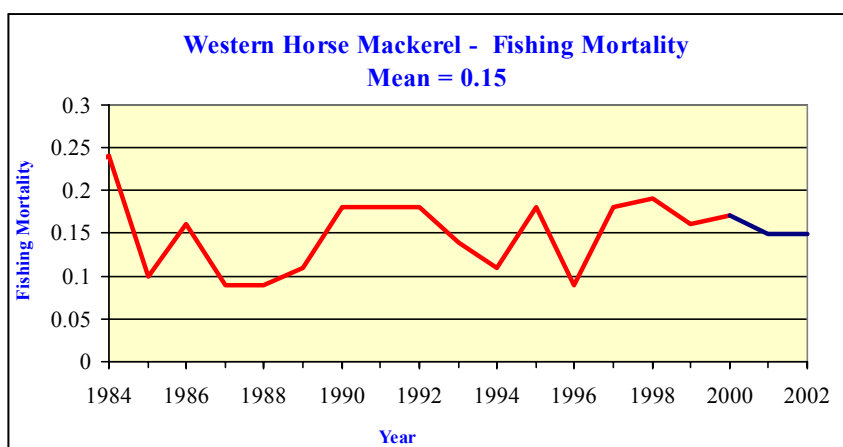
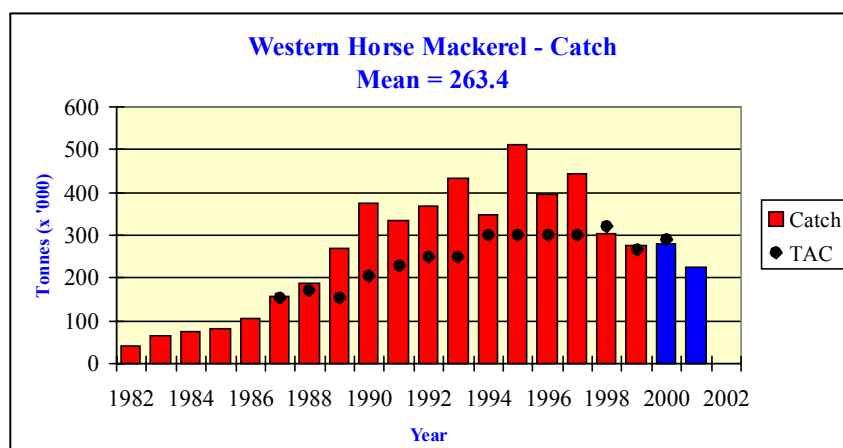


Table 3.12.4.1

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	VIIa,b	VIIa-c,e-k	VIIIa,b,d,e	Discards	Total	VIIIc	IXa		Total
1982	-	27,883	-	1,247	4,035	-	-	6,283	32,231	3,073	-	41,587	19,610	39,726	59,336	104,958
1983	-	44,203	-	3,600	8,020	412	-	24,881	36,926	2,643	-	64,862	25,580	48,733	74,313	147,195
1984	-	258,933	-	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	853,042	34,870	131,218	11,516	1,150	268,867	27,170	29,231	56,401	358,533
1990	148,721	17,437		1,325	18,762	11,414	1,127,532	20,794	182,580	21,120	9,930	373,463	25,182	24,023	49,205	441,430
1991	27,251	11,400		600	12,000	4,487	638,692	34,415	196,926	25,693	5,440	333,555	23,733	21,778	45,511	391,066
1992	23,741	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	8501	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	24,921	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	20,374	155,045	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	25,406	17,011	35,043	232,451	15,662	830	303,543	22,906	41,574	64,480	398,523
1999	20,954	9,335		27,889	37,224	25,577	47,316	40,381	158,715	22,824		273,888	24,188	27,733	51,921	363,033

¹Norwegian and Danish catches are included in the Western horse mackerel.

²Norwegian catches in Division IVb included in the Western horse mackerel.

³Divisions IIIa and IVb,c combined.

⁴Included in Western horse mackerel

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

⁶Includes 1937 t from Vb

⁷Includes 132 t from Vb

Table 3.12.4.2 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	- ²	- ²
Germany, Fed.Rep	-	+	-	-	-	-	-	-
Norway	-	-	-	412	22	78	214	3,272
USSR	-	-	-	-	-	-	-	-
Total	-	+	-	412	23	79	214	3,311

Country	1988	1989	1990	1991	1992	1993	1994	1995
Denmark	-	-	-	-	-	-	-	200
Faroe Islands	-	-	964 ³	1,115	9,157 ³	1,068	-	950
France	- ²	-	-	-	-	-	55	-
Germany, Fed. Rep.	64	12	+	-	-	-	-	-
Norway	6,285	4,770	9,135	3,200	4,300	2,100	4	11,300
USSR/Russia (1992 -)	469	27	1,298	172	-	-	700	1,633
UK (England & Wales)	-	-	17	-	-	-	-	-
Total	6,818	4,809	11,414	4,487	13,457	3,168	759	14,083

Country	1996	1997	1998	1999 ¹
Denmark	-	-	1,755 ³	
Estonia	-	-	22	
Faroe Islands	1,598	799 ³	188 ³	132 ³
France	-	-	-	
Germany	-	-	-	
Norway	887	1,170	234	2304
Russia	881	648	345	121
UK (England & Wales)	-	-	-	
Total	3,366	2,617	2,544	2557

¹Preliminary.

²Included in Sub-area IV.

³Includes catches in Division Vb.

Table 3.12.4.3 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	2312	1892	7842
Germany, Fed.Rep.	+	139	30	52	+	+	-	3	153
Ireland	1,161	412	-	-	-	-	-	-	-
Netherlands	101	355	559	20,293	824	1603	6003	8504	10,603
Norway ²	119	2,292	7	322	³	203	776	117,284	344,254
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	24,694	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	124,824	-3174	-7504	-2786	-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 ¹
Belgium	19	21
Denmark	2,048	8,006
Estonia	22	-
Faroe Islands	28	908
France	379	60
Germany	4,620	4,071
Ireland	-	404
Netherlands	3,811	3,610
Norway	13,129	44,344
Poland	-	-
Russia	-	-
Sweden	3,411	1,957
UK (Engl. & Wales)	2	11
UK (N. Ireland)	-	-
UK (Scotland)	3,041	1,658
Unallocated + discards	737	-325
Total	31,247	64,725

¹Preliminary. ² Includes Division IIa. ³ Estimated from biological sampling.

⁴ Assumed to be misreported. ⁵ Includes 13 t from the German Democratic Republic.

⁶ Includes a negative unallocated catch of -4,000 t.

Table 3.12.4.4 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	44,503	40,003
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	-	-	-	-	-	-	-2	-2	-2
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 ¹
Denmark	973	615	-	42	-	294	106	114	780
Faroe Islands	3,059	628	255	-	820	80	-	-	-
France	2	17	4	3	+	-	-	-	52
Germany, Fed. Rep.	1,162	2,474	2,500	6,281	10,023	1,430	1,368	943	229
Ireland	19,493	15,911	24,766	32,-994	44,802	65,564	120,124	87,872	22,474
Netherlands	1,907	660	3,3-69	2,150	590	341	2,326	572	498
Norway	-	-	-	-	-	-	-	-	-
Spain	-2	-2	1	3	-	-	-	-	-
UK (Engl. & Wales)	44	145	1,229	577	144	109	208	612	56
UK (N.Ireland)	-	-	1,970	273	-	-	-	-	767
UK (Scotland)	1,737	267	1,640	86	4,523	1,760	789	2,669	14,452
USSR/Russia (1992 -)	-	44	-	-	-	-	-	-	-
Unallocated + disc.	6,493	143	-1,278	-1,940	-69,604	-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 ¹
Denmark	-	-
Faroe Islands	-	-
France	221	25,007
Germany	414	1,031
Ireland	21,608	31,736
Netherlands	885	1,139
Norway	-	-
Russia	-	-
Spain	-	-
UK (Engl. & Wales)	10	344
UK (N.Ireland)	1,132	-
UK (Scotland)	10,447	4,544
Unallocated +disc.	98	1,507
Total	34,815	65,308

¹Preliminary.

²Included in Sub-area VII.

³Includes Divisions IIIa, IVa,b and VIb.

⁴Includes a negative unallocated catch of -7,000 t.

Table 3.12.4.5 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	14,772	304,082	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	275,002	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
Belgium	-	+	-	-	-	1	-	-	18
Denmark	34,474	30,594	28,888	18,984	16,978	41,605	28,300	43,330	60,412
Faroe Islands	-	28	-	-	-	-	-	-	-
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	40,103	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 ¹
Belgium	18	-
Denmark	25,492	19,223
Faroe Islands	-	-
France	24,223	-
Germany	25,414	15,247
Ireland	51,720	25,843
Netherlands	91,946	56,223
Norway	-	-
Russia	-	-
Spain	-	-
UK (Engl. & Wales)	12,832	8,885
UK (N.Ireland)	-	-
UK (Scotland)	5,095	4,994
Unallocated + discards	12,706	31,239
Total	249,446	161,654

¹Provisional.

²Includes Sub-area VI.

³Includes a negative unallocated catch of -4,000 t.

⁴Includes 5 t from Jersey.

Table 3.12.4.6 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	-	-	-	-	-2	-2	-2	-2	-
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 ¹
Denmark	1,728	4,818
France	1,844	74
Germany	3,268	3,197
Netherlands	6,604	22,479
Russia	-	-
Spain	23,599	24,190
UK (Engl. & Wales)	9	29
Unallocated + discards	1,884	-8658
Total	38,936	46,129

¹Preliminary.

²Included in Sub-area VII.

Table 3.12.4.7 Landings and discards of HORSE MACKEREL (t) by year and division, for the Western horse mackerel. (Data submitted by Working Group members.)

Year	IIa	IVa	VIa,b	VIIa-c,e-k	VIIIa,b,d,e	Discards	Total
1982	-	-	6,283	32,231	3,073	-	41,587
1983	412	-	24,881	36,926	2,643	-	64,862
1984	23	94	31,716	38,782	2,510	500	73,625
1985	79	203	33,025	35,296	4,448	7,500	80,551
1986	214	776	20,343	72,761	3,071	8,500	105,665
1987	3,311	11,185	35,197	99,942	7,605	-	157,240
1988	6,818	42,174	45,842	81,978	7,548	3,740	188,100
1989	4,809	85,304 ¹	34,870	131,218	11,516	1,150	268,867
1990	11,414	112,753 ¹	20,794	182,580	21,120	9,930	373,463
1991	4,487	63,869 ¹	34,415	196,926	25,693	5,440	333,555
1992	13,457	101,752	40,881	180,937	29,329	1,820	370,550
1993	3,168	134,908	53,782	204,318	27,519	8,600	433,145
1994	759	106,911	69,546	194,188	11,044	3,935	388,875
1995	13,133	90,527	83,486	320,102	1,175	2,046	510,597
1996	3,366	18,356	81,259	252,823	23,978	16,870	396,652
1997	2,617	63,647	40,145	318,101	11,677	2,921	442,571
1998	2,540 ²	17,011	35,043	232,451	15,662	830	303,543
1999	2,557 ³	47,316	40,381	158,715	22,824	-	273,888

¹Norwegian catches in Division IVb included in the Western horse mackerel.

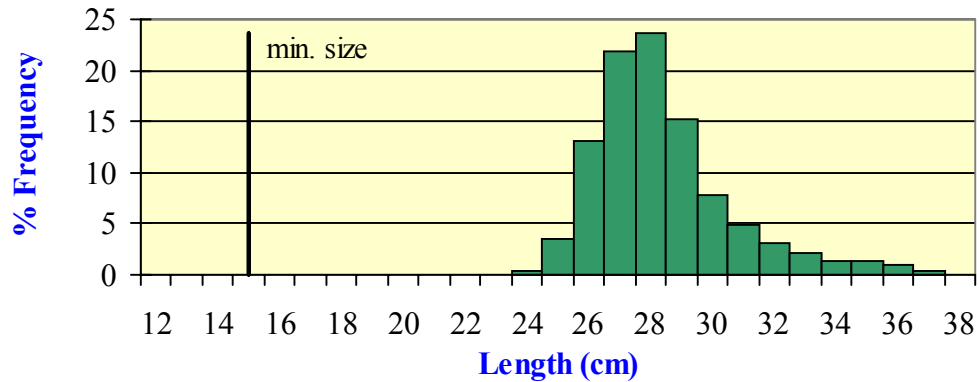
² Includes 1937 t from Vb.

³ Includes 132 t from Vb.

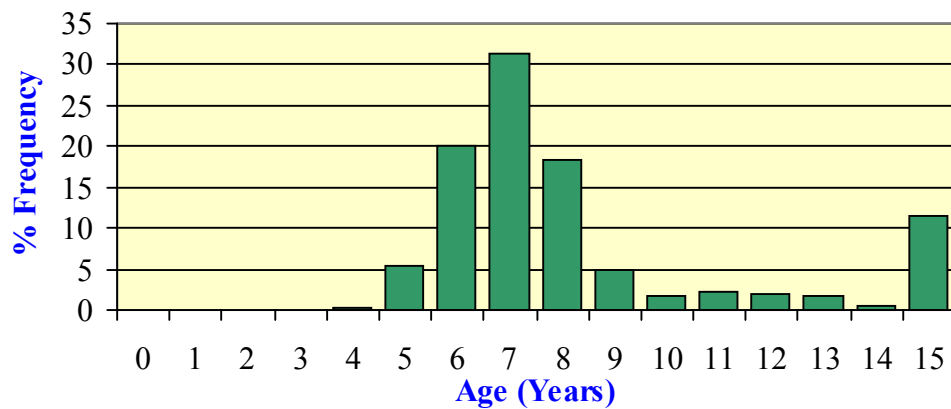
Table 3.12.4.8 The population summary time series age estimated by the SAD assessment model for the Western horse mackerel.

YEAR	RECRUITS Age 0	Biomass (tonnes)	SSB (tonnes)	TOTAL NT. LANDINGS (tonnes)	Fbar (4 - 10)
1982	49098198	624550	503546	41588	0.06
1983	367726	634114	524289	64862	0.22
1984	1136534	2303882	571819	73625	0.24
1985	2364133	3023223	1362169	80521	0.10
1986	3446068	3236134	1902855	105665	0.16
1987	5993413	3346059	2434398	156247	0.09
1988	2345520	3351629	2850352	188100	0.09
1989	2413967	3302982	2627912	268867	0.11
1990	2317687	2931666	2247193	373463	0.18
1991	3699409	2809082	2158276	333600	0.18
1992	6773711	2511542	1957652	368200	0.18
1993	8243981	2603831	1994255	432000	0.14
1994	8292611	2469632	1771589	347842	0.11
1995	5517784	2574986	1703830	512995	0.18
1996	1112136	3018069	2029368	396448	0.09
1997	2126884	2571254	1686534	442571	0.18
1998	1070982	2012525	1417418	303543	0.19
1999		1845116	1424275	275283	0.16

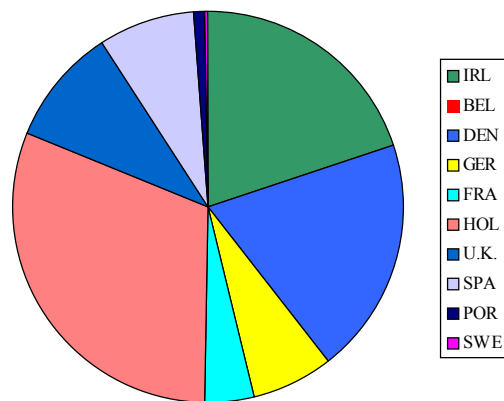
1999 Length Distribution of Irish Landings of Western Horsemackerel



1999 Age Distribution of Irish Landings of Western Horsemackerel



2000 Quota Allocations Western Horsemackerel



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 endorses the ICES advice for this stock that there should be no increase in catch. This translates to a TAC of not more than 51,000 t with an associated Irish quota of 1,950 t. ICES further states that more specific advice cannot be given until there is more complete information about the structure of horse mackerel stocks, to facilitate an adequate assessment. ICES have also expressed concern about the high exploitation of juvenile horse mackerel in Div VIId and MFSD further advises that this industrial fishery should be prohibited.

STATE OF THE STOCK

- The state of this stock is unknown. There is no assessment because of lack of biological and survey data.
- There are no proposed reference points because of lack of data.
- Catches have increased in recent years and the 1999 catch which was mainly taken in Division VIId was the highest recorded (37,000 t)
- The age structure of the catches suggests that the exploitation rate may be low.
- The available biological information indicates that the stock is small (about 224,000 t).
- The stock mixes with the Western horse mackerel stock at certain times throughout the year.

CURRENT MANAGEMENT

- There is no management plan for the fishery.
- The agreed TAC, only applies to 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 2000 TAC was 51,000 t. The EU quota is 49,400 t and the Irish quota is 1,950 t. The basis for this TAC is not known.

MFSD – ECONOMIC COMMENTS

See Western Horsemackerel.

ADDITIONAL INFORMATION

1. No assessment is carried out on this stock because of lack of data.
2. The total catch taken from this stock in 1999 was estimated to be around 37,000 t which was the highest recorded since before 1982. Ireland recorded only 404 t of horse mackerel from this fishery in 1999 compared with over 8,100 t for 1997.
3. The TAC in recent years has been set at 60,000t which is about twice the catches taken from the fishery. The TAC is therefore unrestrictive and ineffective as a conservation measure.
4. Misreporting is not believed to be a problem.
5. Discarding of horse mackerel in the directed fishery is not a problem but catches of juvenile mackerel are taken and discarded.
6. The main catches taken in 1999 were by Norway (44,000 t) and Denmark (8,000 t)
7. The stock is exploited in a directed fishery for human consumption and in a fishery for industrial purposes in which juvenile horse mackerel are taken as a by-catch.
8. There has been a change in the directed fishery in recent years and in 1998 and 1999 over 55% and 40% of the catch in numbers was composed of juvenile fish (1-4 years old). This is an undesirable development and ICES have expressed concern about this high exploitation of juvenile fish.
9. The abundance of horse mackerel and in the North Sea and the Norwegian catches appear to be directly related to the annual influx of water from the Atlantic.

ICES ADVICE 3.5.11

State of stock/fishery

The state of the stock is not known. There is no recent quantitative information on stock size. 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. However the catch increased from a long term level of 18,000 t to the historical high of 37,224 t (mainly in Division VIId) in 1999, and the present level of exploitation is therefore uncertain.

Management objectives:

No explicit management objectives have been established for this stock.

Advice on management:

ICES recommends that there is no increase in catch. More specific advice cannot be given until there is more complete information about the structure of horse mackerel stocks, and sufficient information to facilitate an adequate assessment.

Reference points: There is not sufficient information to estimate appropriate reference points.

Relevant factors to be considered in management:

This stock migrates out of the North Sea to areas where it mixes with the Western horse mackerel. The present agreed TAC area (for the North Sea and IIa) 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.

Over the later years there has been a change in exploitation pattern of this stock. In 1998 about 55% and in 1999 40% of the catch in numbers were fish 1-4 years old respectively, which represents a large increase since 1996 and 1997 (about 28%). Since it is not known how abundant recent year classes are, concern is expressed about this high exploitation of juvenile fish.

Elaboration and special comment:

In earlier years the majority of the catch was taken as by-catch in the small-mesh industrial fishery. Only a small proportion of the catch has been sampled. In order to assess the state of the stock, adequate sampling for determination of catches at age, as well as new egg surveys are needed. 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.

Source of information: Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, September 2000 (ICES CM 2001/ACFM:06).

Catch data (Table 3.5.11.1):

Year	ICES Advice	Predicted catch corresponding to advice	Agreed TAC ¹	ACFM landings ²
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	
2001	No increase in catch	-		

¹Division IIa and Sub-area IV (EU waters only). ²Catch of North Sea stock (See Table 3.5.11.2). Weights in '000 t.

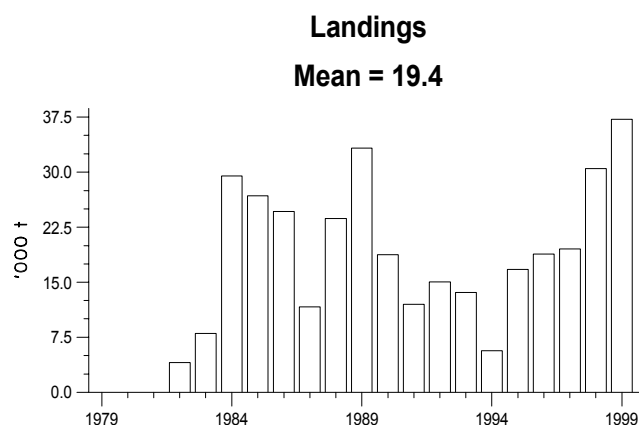


Table 3.5.11.1 Landings and discards of HORSE MACKEREL (t) by year and division, for North Sea horse mackerel. (Data submitted by Working Group members.)

Year	IIIa	IIIa,IVb,c	IVb,c	Discards	VIId	Total
1982	-	2,788 ²	-		1,247	4,035
1983	-	4,420 ²	-		3,600	8,020
1984	-	25,893 ²	-		3,585	29,478
1985	1,138	-	22,897		2,715	26,750
1986	396	-	19,496		4,756	24,648
1987	436	-	9,477		1,721	11,634
1988	2,261	-	18,290		3,120	23,671
1989	913	-	25,830		6,522	33,265
1990	14,872 ¹	-	17,437		1,325	18,762
1991	2,725 ¹	-	11,400		600	12,000
1992	2,374 ¹	-	13,955	400	688	15,043
1993	850 ¹	-	3,895	930	8,792	13,617
1994	2,492 ¹	-	2,496	630	2,503	5,689
1995	240	-	7,948	30	8,666	16,756
1996	1,657	-	7,558	212	9,416	18,843
1997	2,037 ³	-	15,504 ⁴	10	5,452	19,540
1998	3,693	-	10,530	83	16,194	30,500
1999	2,095 ³	-	9,355	-	27,889	37,224

¹Norwegian and Danish catches are included in the Western horse mackerel.

²Divisions IIIa and IVb,c combined.

³Included in Western horse mackerel (Danish and Swedish catches).

⁴Norwegian catches in IVb (1,426 t) included in Western 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	2312	1892	7842
Germany, Fed.Rep.	+	139	30	52	+	+	-	3	153
Ireland	1,161	412	-	-	-	-	-	-	-
Netherlands	101	355	559	20,293	824	1603	6003	8504	10,603
Norway ²	119	2,292	7	322	³	203	776	117,284	344,254
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	24,694	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	124,824	-3174	-7504	-2786	-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 ¹
Belgium	19	21
Denmark	2,048	8,006
Estonia	22	-
Faroe Islands	28	908
France	379	60
Germany	4,620	4,071
Ireland	-	404
Netherlands	3,811	3,610
Norway	13,129	44,344
Poland	-	-
Russia	-	-
Sweden	3,411	1,957
UK (Engl. + Wales)	2	11
UK (N. Ireland)	-	-
UK (Scotland)	3,041	1,658
Unallocated + discards	737	-325
Total	31,247	64,725

¹Preliminary. ² Includes Division IIa. ³ Estimated from biological sampling. ⁴ Assumed to be misreported.

⁵ Includes 13 t from the German Democratic Republic. ⁶ 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

MFSD agrees with the ICES advice that fishing mortality in 2001 should be below 0.28. Fishing at this level will maintain the SSB above the proposed B_{pa} in 2002. The corresponding catch would be 628,000t. The Irish share of the overall TAC is dependent on the results of negotiations between Norway and the EU but will probably be lower than that for 2000 (26,080 t).

STATE OF THE STOCK

- There are concerns about the state of this stock.
- The landings in 1999 were over 1.2 million tonnes, - the highest ever recorded. Landings in 1998 and 1999 have been nearly double those of the previous three years.
- The fishing mortality increased dramatically in 1998 as a result of the large increase in catch from 634,000 t in 1997 to 1,125,000 t in 1998. The high fishing mortality was again maintained during 1999 and was estimated to be 0.43. This is well above the proposed F_{pa} (0.32)
- The recruitment of the 1995, 1996 and 1997 year-classes were exceptionally good, but subsequent year-classes have been average.
- The spawning stock has been high in recent years and in 2000 was estimated to be 2.8 million tonnes. The proposed B_{pa} for the stock is 2.25 million tonnes.
- The short term predictions indicate that the stock will decline at current fishing mortality and recruitment.

CURRENT MANAGEMENT

- There is a TAC for this stock that is set by NEAFC. However this TAC does not cover the combined areas over which the stock is distributed. The EU has a share of this TAC. The agreed TACs in 2000 cover the fisheries carried out in the EEZs belonging to the EU and other contracting states of NEAFC. There are however fisheries taking place in international waters, which are not subjected to restrictions.
- 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 (Sub-areas 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).

- There is as yet no agreed management plan for the fishery. It has been suggested by NEAFC, based on ICES advice, that the fishery should be managed with constant catches of 650,000t. Catches exceeding this are not considered sustainable.
- The overall TACs allocated in 2000 amount to 578,000 t. The TAC allocated to the areas in which the Irish fleet operates is 407,000 t (Sub-areas VI and VII). The EU share of this TAC is 163,000 t while the Irish quota is 26,080t (16%).

MFSD – ECONOMIC COMMENTS

The value of the Irish landings in 1999 were estimated at £2.1 million. The Irish fishery for blue whiting for industrial purposes has only 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.

ADDITIONAL INFORMATION

1. The assessment of this stock is considered to be poor because of a lack of survey data and inadequate biological information.
2. The total catch taken from this stock during 1999 was over 1.26 million tonnes.
3. The Irish catch in 1999 was 35,880 t compared with 44,000 t in 1998. The provisional catch for 2000 is about 26,000 t.
4. Area misreporting may be a problem in this fishery. Catches taken by some countries within the Irish economic zone are believed to be reported as having been taken outside the zone.
5. The main catches are taken by Norway, Russia, Denmark, Faroe Is and Ireland.
6. The Irish fishery for blue whiting for industrial purposes has only 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 is a major source of disappointment.
7. Although the Irish catch may be restricted because of a reduced quota, the fishery still remains a valuable

resource to the Irish fleet. This is because the spawning grounds are off the west coast of Ireland and the main spawning occurs during the period February to April. Up to now this has been an industrial fishery where fish were landed to the fish meal plant in Killybegs. The proximity of Ireland to the fishing grounds is an advantage and in recent years efforts have been made to develop a human consumption fishery in Ireland. To date these efforts have concentrated on improving catch quality and processing and therefore should be continued to achieve a higher value product.

8. The assessment of the stock is very sensitive to the inclusion of certain survey data. If Spanish surveys are excluded, the resultant SSB is considerably higher than that estimated if the surveys are included. A number of countries (Ireland included) have expressed doubts on the assessment because it has been suggested that a Spanish survey that covers only a small part of the distribution of the entire stock should not have a significant influence on the total stock size. In addition Russian scientists have also suggested that assessment models that they use, but which have not been tested or accepted by ICES, suggest that the stock is higher than that currently accepted by ICES. The working Group has therefore been asked to re-examine these problems in detail in 2001.
9. There are also continuing big differences between the estimate of stock size from catch at age analysis and estimates obtained from acoustic surveys. The survey estimates suggest that the stock may be as high as 9 million tonnes which is approximately three times larger than the estimates obtained from VPA. The acoustic surveys are carried out by Norway and Russia but the results have not been used to give management advice.
10. The age distribution of the Irish catches in 1999 was dominated by 3 year old fish (the 1996 year class).
11. The length distribution of the Irish catches in 1999 was dominated by fish between 24cm. and 25 cm.
12. Ireland has 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. The aim of this project is to demonstrate that Ireland is committed to developing the fishery in a responsible manner. It was hoped that this ap-

proach would influence management authorities when quota allocations were being decided. As a result of this sampling programme and participation in the Norwegian acoustic surveys off the west coast Ireland was able to submit a considerable amount of data to the ICES Assessment Working Group, which deals with Blue whiting in 2000. Two Irish scientists, one from BIM and one from the Marine Institute attended the relevant working group in 2000. The MRM programme under which a pelagic scientist was employed in Killybegs is due to be completed in February 2001. It is extremely important that some method is established to enable this programme to be continued.

ICES ADVICE

3.12.5

State of stock/fishery

Although SSB is uncertain, the stock is considered to be harvested outside of safe biological limits. SSB is estimated to be above the proposed B_{pa} and fishing mortality increased from around the proposed F_{pa} in 1997 to well above F_{pa} in 1998 and 1999. Total landings in 1999 were 1 256 000 t and above the ICES recommended catch of 650 000 t. The 1999 landings were primarily comprised of the strong 1995 and 1996 year classes and the 1997 year class.

Management objectives:

At present there are no agreed management objectives for this stock and there is no TAC for the combined area. It has been suggested by NEAFC, based on previous ICES advice, that the fishery should be managed with a constant catch of 650 000 t.

Advice on management:

ICES advises that F in 2001 should be below 0.28 in order to keep SSB above B_{pa} in 2002. This would correspond to a catch of no more than 628 000 t.

Catch forecast for 2001:

Basis: $F(2000) = F(1999) = 0.43$, Landings (2000) = 1.136 million t. SSB in 2000 = 2.756 million t.

F(2001) onwards	Basis	Catch (2001)	Landings(2001)	SSB in year 2001 (million t)	SSB in year 2002 (million t)
0.22	0.5 (F99)	500	500	2.36	2.39
0.28	Gives $B=B_{pa}$ in 2002	628	628	2.33	2.25
0.32	F_{pa}	700	700	2.31	2.17
0.43	F(2000)	915	915	2.25	1.94

Weights in '000 t, Mean F , ages 3–7

Shaded scenarios considered inconsistent with the precautionary approach.

Relevant factors to be considered in management:

The reference points are provisional as there is doubt about the present productivity 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 as it so far has not been possible to define an unambiguous border between populations.

The fishery is composed almost entirely of a few recruiting year classes. These year classes are harvested heavily before they can reproduce or reach full growth potential. The estimate of year class strength at such young age is uncertain.

Catches taken in the current unregulated fishery are well above what a Precautionary Approach would suggest. At present the stock is at a high level due to two exceptional good year classes that will soon grow out of the stock. Current fishing mortality would reduce SSB to below B_{pa} in 2002, and medium term predictions indicate that current F will cause the stock to decrease throughout the next 10 years, resulting in a 40% probability of $SSB < B_{lim}$, by the end of the period. A reduction in F by about 50 % of the 1999 level to around 0.22 would be required to keep SSB above B_{pa} for the projection period (the next 10 years). In the absence therefore of good recruitment, catches in the next few years are likely to decline.

Elaboration and special comment:

The fishery for blue whiting was fully established in 1977. 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) but juveniles are also caught in a mixed industrial 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). Mortalities on one-year olds have increased in 1998 and 1999. These fisheries in the northern area have taken 340 000 – 1 230 000 t per year in the last decade while catches in the southern fisheries (Sub-area VIII, IX, Divisions VIId,e and g-k) have been stable in the range 25 000–34 000 t. Many countries that have substantial catches from this fishery do not carry out any sampling programmes. In general the overall sampling level is inadequate and this seriously undermines the quality of the assessment. The analytical assessment is based on catch data, acoustic surveys and commercial CPUE data.

Source of information: Report of the Northern Pelagic and Blue Whiting Fisheries Working Group, April/May 2000 (ICES CM 2000/ACFM:16).

Reference points proposed by ICES in 1999:

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	
$B_{lim} : B_{loss}$	$B_{pa} = B_{lim} \exp(1.645 \cdot \sigma)$ $\sigma = 0.25$
$F_{lim} : F_{loss} (0.51)$	$F_{pa} : F_{med} (1998)$

Catch data (Tables 3.12.5.1–6):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM catch
1987	TAC for northern areas; no advice for southern areas	950	-	664
1988	TAC for northern areas; no advice for southern areas	832	-	553
1989	TAC for northern areas; no advice for southern areas	630	-	625
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	-	-	474
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 ¹	459
1995	Precautionary TAC for combined stock	518	650 ¹	579
1996	Precautionary TAC for combined stock	500	650 ¹	602
1997	Precautionary TAC for combined stock	540		634
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		
2001	F should not exceed the proposed F_{pa}	628		

¹NEAFC proposal for NEAFC regions 1 and 2. Weights in '000 t.

Table 3.12.5.1 Landings (tonnes) of BLUE WHITING from the main fisheries, 1986–1999, as estimated by the Working Group.

Area	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Norwegian Sea Fishery (Subareas I+II and Divisions Va,XIVa-b)	160,061	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
Fishery in the spawning area (Divisions Vb, VIa, VIb and VIIb-c)	534,263	445,881	421,636	473,165	463,495	218,946	317,237	347,101	378,704	423,282	476,368	488,869	827,194	940,881
Industrial mixed Fishery (Divisions Iva-c, Vb and IIIa)	99,580	62,689	45,143	75,958	63,192	39,872	65,974	58,082	28,563	104,004	119,359	65,091	94,881	106,609
Subtotal northern Fishery	793,904	631,612	522,608	591,738	528,793	337,521	445,523	448,423	429,941	551,019	619,174	616,530	1,095,751	1,229,926
Southern fishery (Subareas VIII+IX, Divisions VIId,e,g-k)	33,082	32,819	30,838	33,695	32,817	32,003	28,722	32,256	29,473	27,664	25,099	30,122	29,400	26,402
Grand total	826,986	664,431	553,446	625,433	561,610	369,524	474,245	480,679	459,414	578,683	644,273	646,652	1,125,151	1,256,328

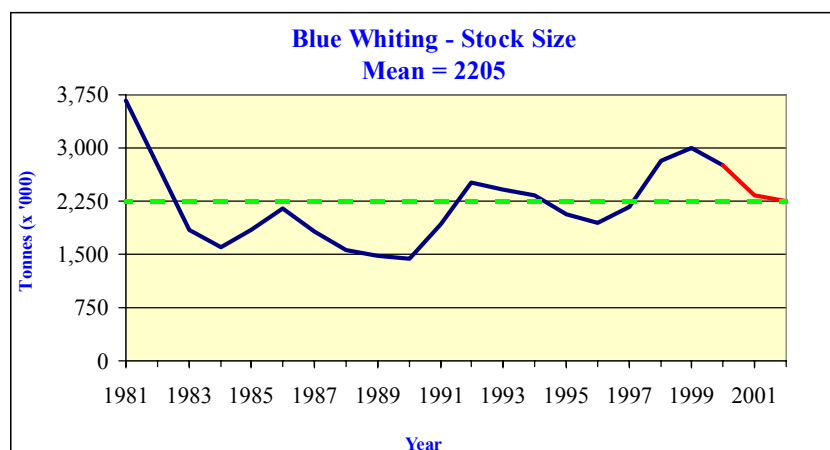
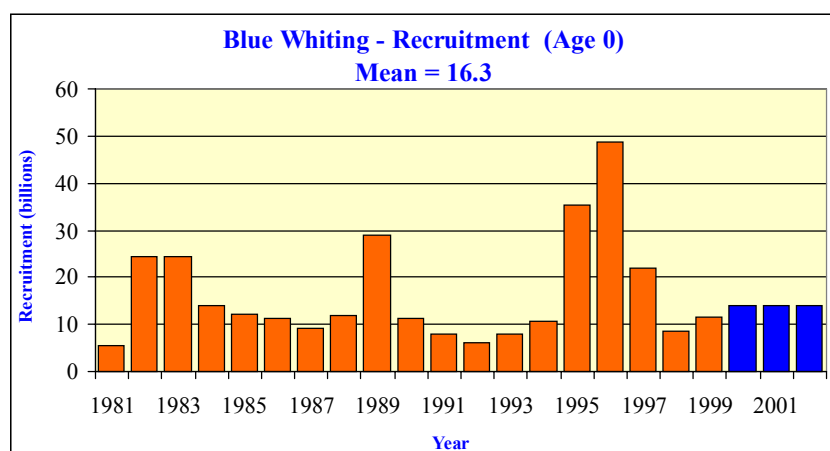
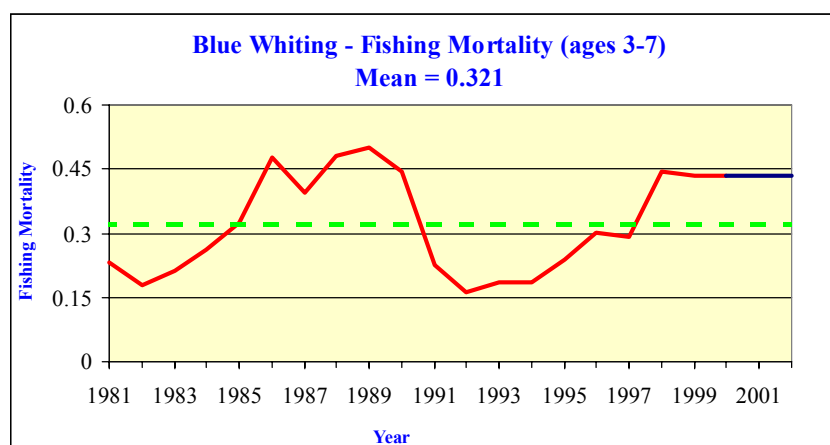
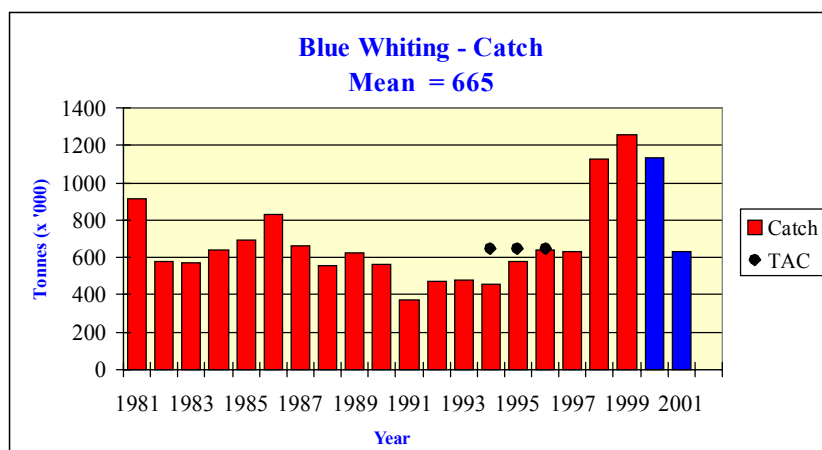


Table 3.12.5.2 Landings (tonnes) of BLUE WHITING from the directed fisheries in the Norwegian Sea (Sub-areas I and II, Division Va, XIVa and XIVb) 1986–1999, as estimated by the Working Group.

Country	1986	1987	1988	1989 ³⁾	1990	1991	1992	1993	1994 ²⁾	1995 ³⁾	1996	1997	1998	1999
Faroese	-	9,290	-	1,047	-	-	-	-	-	-	345	-	44,594	11,507
Germany	3,647	1,010	3	1,341	-	-	-	-	2	3	32	-	78	
Greenland	10	-	-	-	-	-	-	-	-	-	-	-	-	
Iceland	-	-	-	4,977	-	-	-	-	-	369	302	10,464	64,863 ⁴⁾	99,092
Netherlands	-	-	-	-	-	-	-	-	-	72	25	-	63	435
Norway	-	-	-	-	566	100	912	240	-	-	58	1,386	12,132	5,455
Poland	-	56	10	-	-	-	-	-	-	-	-	-	-	
UK (Eng. & Wales)	-	-	-	-	-	-	-	-	-	-	-	-	-	
USSR/Russia ¹⁾	156,404	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
Estonia	-	-	-	-	-	-	-	-	-	-	377	161	904	
Latvia	-	-	-	-	-	-	-	-	422	-	-	-	-	
Denmark	15													
Total	160,061	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

¹⁾ From 1992 only Russia

²⁾ Includes Vb for Russia.

³⁾ Icelandic mixed fishery in Va.

⁴⁾ include mixed in Va and directed in Vb.

Table 3.12.5.3 Landings (tonnes) of BLUE WHITING from directed fisheries in the spawning area (Division Vb, VIa,b, VIIb,c, VIIg-k and Sub-area XII) 1986–1999, as estimated by the Working Group.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998 ¹⁾	1999
Denmark	11,364	2,655	797	25	-	-	3,167	-	770	-	269		5051	19,625
Faroese	80,564	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
France	-	-	-	2,190	-	-	-	1,195	-	720	6,442	12,446	7,984	6,662
Germany	2,750	3,850	5,263	4,073	1,699	349	1,307	91	-	6,310	6,844	4,724	17,891	3,170
Iceland	-	-	-	-	-	-	-	-	-	-	-	-	-	61,438
Ireland	16,440	3,300	245	-	-	-	-	-	3	-	-		45635	35,240
Netherlands	8,888	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
Norway	283,162	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
UK (Scotland)	3,482	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
USSR/Russia ²⁾	127,613	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
Japan	-	-	-	-	-	-	918	1,742	2,574	-	-			
Estonia	-	-	-	-	-	-	6,156	1,033	4,342	7754	10,605	5,517	5,416	
Latvia	-	-	-	-	-	-	10,742	10,626	2,160	-	-			
Lithauen	-	-	-	-	-	-	-	2,046	-	-	-			
Total	534,263	445,881	421,636	473,165	463,495	218,946	317,237	347,101	378,704	423,282	476,368	488,869	827,194	940,881

¹⁾ Including some directed fishery also in Division IVa.

²⁾ From 1992 only Russia

Table 3.12.5.4 Landings (tonnes) of BLUE WHITING from the mixed industrial fisheries and caught as by-catch in ordinary fisheries in Divisions IIIa, IVa 1986–1999, as estimated by the WG.

Country	1986	1987	1988	1989	1990	1991	1992	1993 ³⁾	1994	1995	1996	1997	1998 ²⁾	1999
Denmark	57,315	28,541	18,144	26,605	27,052	15,538	31,189	41,053	19,686	12,439	51,832	26,270	56,472	45,013
Faroes	5,678	7,051	492	3,325	5,281	355	705	1,522	1,794	-	6,068	6,066	296	265
Germany ¹⁾	-	115	280	3	-	-	25	9	-	-	-	-	-	-
Netherlands	1,114	-	-	-	20	-	2	46	-	-	-	793	-	-
Norway	26,941	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
Sweden	8,532	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
UK	-	-	100	7	-	335	18	252	-	-	1	-	-	-
Total	99,580	62,689	45,143	75,958	63,192	39,872	65,974	58,082	28,563	104,004	119,359	65,091	94,881	106,609

¹⁾ Including directed fishery also in Division IVa.

²⁾ Including mixed industrial fishery in the Norwegian Sea

³⁾ 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.

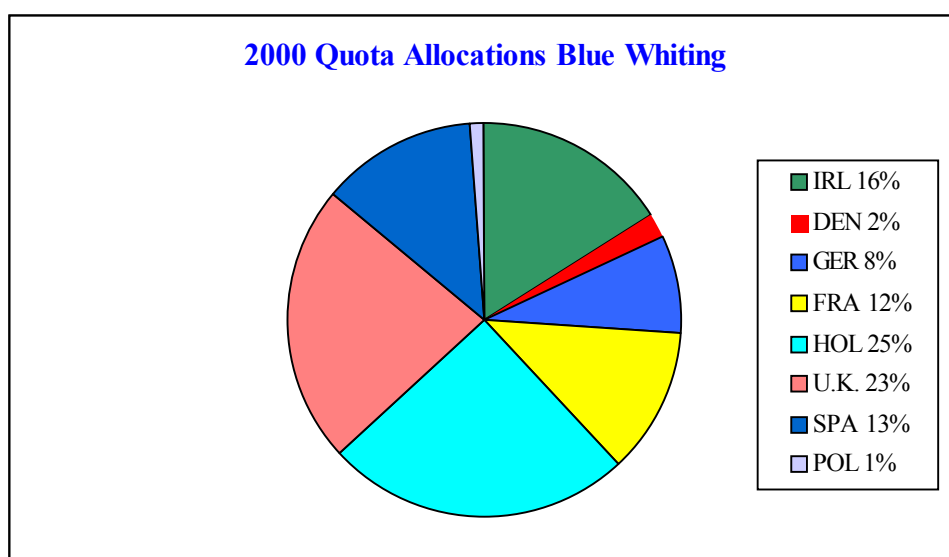
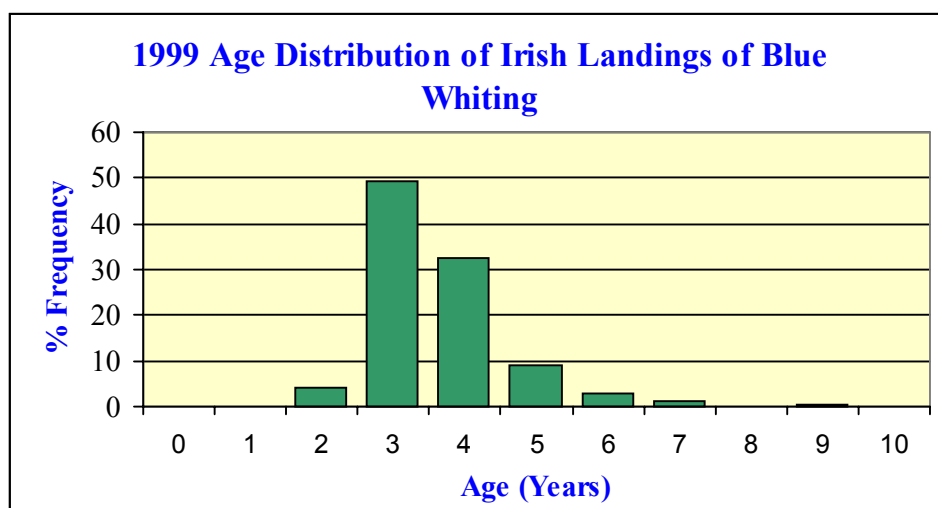
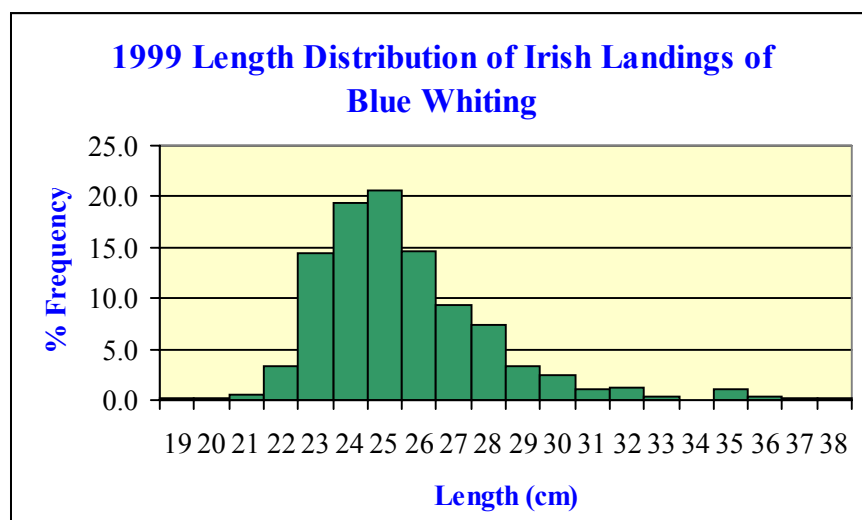
Table 3.12.5.5 Landings (tonnes) of BLUE WHITING from the Southern areas (Sub-areas VIII and IX and Divisions VIIg-k and VIId,e) 1986–1999, as estimated by the Working Group.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Netherlands	-	-	-	-	450	10	-	-	-	-	-	-	10 ¹⁾	-
Norway	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Portugal	8,116	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
Spain	24,965	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
UK	1	23	12	29	13	-	-	-	5	-	-	-	-	-
France	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Total	33,082	32,819	30,838	33,695	32,817	32,003	28,722	32,256	29,473	27,664	25,099	30,122	29,400	26,402

¹⁾ Directed fisheries in VIIIa

Table 3.12.5.6 Blue whiting combined stock (Sub-areas I-IX, XII & XIV)

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-7
1981	5,569.83	3,660.93	909.56	0.231
1982	24,365.71	2,750.31	576.42	0.180
1983	24,262.48	1,846.24	570.07	0.211
1984	13,858.84	1,593.18	641.78	0.262
1985	12,316.18	1,846.78	695.60	0.324
1986	11,157.34	2,153.91	826.99	0.476
1987	9,145.42	1,827.11	664.43	0.394
1988	11,973.46	1,553.35	553.41	0.482
1989	28,801.63	1,487.99	625.43	0.502
1990	11,392.87	1,445.92	561.61	0.445
1991	7,853.39	1,921.30	369.52	0.227
1992	6,193.35	2,518.81	474.25	0.164
1993	8,025.15	2,412.11	480.67	0.185
1994	10,629.47	2,326.89	459.41	0.187
1995	35,210.75	2,067.39	578.69	0.238
1996	48,814.16	1,936.29	637.83	0.302
1997	21,884.44	2,166.50	634.21	0.293
1998	8,550.74	2,817.98	1,125.15	0.444
1999	11,588.27	3,006.96	1,256.33	0.434
2000	14,119.00	2,755.82	.	0.434
Average	16,285.62	2,204.79	665.33	0.321
Unit	Millions	1000 tonnes	1000 tonnes	-



Albacore Tuna



Marine Fisheries Services Division

MFSD – ADVICE

The north Atlantic tuna stock is assessed by the Standing Committee of Research and Statistics (SCRS) of the International Commission for the Conservation of Atlantic Tunas (ICCAT). This body also provides the management advice to the Commission. Precautionary reference points are not estimated for the albacore tuna as the state of the stock is considered to be imprecise.

Nevertheless, MFSD endorse the SCRS recommendation that, if the Commission wishes to maintain a stable SSB in the near future, then the catch should not exceed the current catch level (34,500 t) in the period 2001-2002. Alternatively, if the Commission wishes to increase the SSB towards the level at which it is expected to support the MSY, then catches in 2001 and 2002 should not exceed 31,000 t. The Irish quota is currently under negotiation.

STATE OF THE STOCK

- There are concerns for this stock.
- Landings in the north Atlantic have shown a declining trend since the mid 1960s, largely due to a reduction of fishing effort by the traditional surface and longline fisheries. The total catch in 1999 was about 34,500 t.
- 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. Recruitment appears to be affected by global environmental factors.
- The spawning stock was at the highest level in the late 1970s and subsequently declined until the late 1980s. In recent years the SSB appears to have been below the level corresponding to the maximum sustainable yield.
- There are conflicting views on how the stock will develop in the future because of the difficulty in esti-

imating how recruitment might decline if the stock biomass should fall below the historical low level.

CURRENT MANAGEMENT

- The management area and the assessment area for albacore tuna covers the whole of the Atlantic, north of 5°.
- The TAC is currently being negotiated and the only management regulations recommended by ICCAT pertain to limiting the number of vessels involved in the fishery to the average number involved during the period 1993-1995. In 1992 the EU introduced a maximum permitted length on drift nets of 2.5 km per vessel. However the use of all drift nets will be prohibited after the end of 2001 because of the controversy surrounding the use of this type of gear and the level and nature of by-catch

MFSD – ECONOMIC COMMENTS

The value of the 1999 Irish landings of Albacore Tuna were £9.7 million. This is a new seasonal fishery and the high value of the species make the fishery very economically important to the Irish fleet operating out of the south west of Ireland.

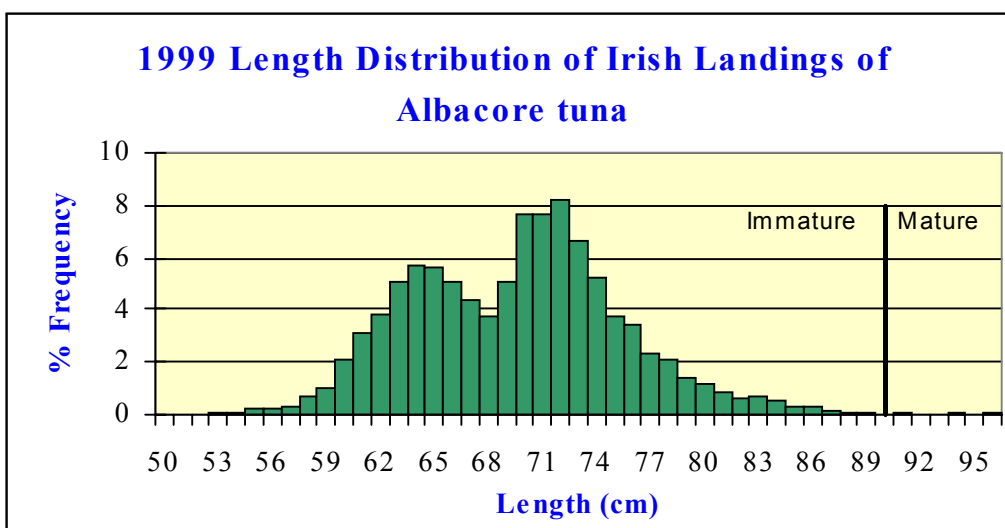
ADDITIONAL INFORMATION

1. The assessment of this stock is considered to have improved in recent years, although there are some uncertainties, especially in relation to some of the elemental biological parameters.
2. The total catch taken from the fishery during 1999 was 34,557 t, compared with 25,380 t in 1998. The Irish catch in 1999 was 4,858 t, compared with 3,098 t in 1998. This 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.
4. The main albacore tuna catching countries in 1999 were Spain (15,000 t), France (7,000 t), China (5,800 t) and Ireland (4,800 t). The total catch is taken by four types of gears – bait boats, trolling, drift nets and long lines.
5. The Irish fishery for albacore tuna is centred along the south-west coast and the main landings are made at Castletownbere and Dingle. 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

proposed ban on the use of drift nets, BIM, in 1998 initiated a programme in which the Marine Institute participated, designed to develop an alternative gear to drift nets. Some success was achieved by vessels using pair mid-water trawls, but this method has not been continued by the main fleet in 2000.

6. 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, sexual matur-

ity is considered to occur when the fish are about 90 cm (age 5). This would imply that the vast majority of the Irish catches are immature 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 1999 are shown below and indicate that most of the catches were between 60cm and 80 cm.



West of Scotland Cod

(Division VIa)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES recommendation that fishing mortality on cod should be reduced to the lowest possible level in 2001. A rebuilding plan should be developed and implemented in order to rebuild SSB above B_{pa} . The rebuilding plan should include provisions to deter directed fishing, reduce by-catches of cod in fisheries for other species to the lowest practical levels, and to deter discarding and mis-reporting of cod in all fisheries.

MFSD recognise that a complete closure is unrealistic given that this is a mixed fishery. The 2001 TAC should be set at 1,994 t (794t for Division VIb and 1,200 t for Division VIa). This translates to an Irish quota of 428 t. This TAC should deter directed fishing and allow a small by-catch of cod in the mixed demersal fishery. The rebuilding plan must include appropriate technical conservation measures to protect cod (e.g. closed areas) which must be introduced as early as possible in 2001. MFSD are concerned about the continued industrial fisheries in VI, which target Norway pout, and have the potential to take large numbers of juvenile cod.

MFSD recommends that a minimum time frame of five years is required to rebuild this stock.

STECF supports the implementation of a rebuilding plan for this stock.

STATE OF THE STOCK

- There are very serious concerns about the state of this stock and the risk of stock collapse.
- The landings in 1999 were at an all-time low of 4,200 t.
- Since 1976 fishing mortality has remained well above the proposed F_{pa} of 0.6. Fishing mortality has exceeded the proposed F_{lim} of 0.8 since 1981.
- Recruitment has been below average since 1992 and the 1995, 1997 and 1998 year-classes are the lowest on record.
- The spawning stock biomass has shown a general decline over the last 20 years. Current SSB levels are less than half of the proposed B_{pa} of 22,000 t and well below the proposed B_{lim} of 14,000 t.
- Short-term predictions indicate that, at current levels of fishing mortality and recruitment, the stock will continue to decline.

CURRENT MANAGEMENT

- The TAC Area covers Sub Areas Vb, VI, XII, and XIV. The assessment covers VIa only.
- The TAC allocated to this stock in 2000 was 7,480 t. The Irish quota was 1,605 t (21%) of which no more than 1,590 t may be fished in Divisions Vb and VIa.
- There are no explicit management objectives or plan for this stock. A rebuilding plan that will reduce F below F_{pa} and increase SSB above B_{pa} is consistent with the precautionary approach.
- Cod are caught in a mixed demersal fishery with haddock, whiting, megrim and monkfish and management needs to take this into account in the rebuilding plan.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £14.1m in Sub-areas VI.
- The value of the 1999 Irish quota was £2.2m.
- The value of the 1999 international landings from Division VIa was £5.0m.
- The value of the 1999 Irish landings from Division VIa was £0.3m.
- This was a very valuable fishery during the 1980s but since then the economic importance has declined.

ADDITIONAL INFORMATION

1. At the ICES Working Group two assessment methods were used for this stock and the results of both were consistent. Time-series analysis was considered to give the most reliable catch forecasts.
2. Total international landings in 1999 were 4,200 t.
3. The Irish landings in 1999 of 223 t were less than half of the 1998 landings.
4. MFSD are concerned that certain vessels in the Irish fleet continue to target juvenile cod (codling) in this area preventing any rebuilding of SSB in this stock and would urge fisheries managers to deter this as a matter of urgency.
5. Mis-reporting of 1992 to 1995 catches was a serious problem in the fishery for those countries with restrictive quotas. Mis-reporting has not been considered to be a serious problem in recent years.
6. 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 1998 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.

7. Demersal trawlers from Killybegs and Greencastle have traditionally undertaken the Irish cod fishery.
8. Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
9. MFSD commenced a groundfish survey off Donegal in 1992. The survey has produced very poor catches of juvenile and adult cod in 1998 and 1999, confirming the poor state of the stock. The Scottish surveys in Division VIa have shown the 1997 and 1998 year-classes to be well below average.
10. Levels of discarding are considered to be at a low level for this stock. MFSD have insufficient data on which to assess the level of discarding from Irish vessels.
11. MFSD sampling indicates that 1 and 2 year old fish, many of which are immature, dominate Irish landings. The lack of older fish in the landings is interpreted as a further indication of the poor state of the stock.
12. Implementation of the cod recovery plan in the Irish Sea may have increased fishing mortality on the VIa stock. The Northern Ireland pelagic fleet that have traditionally targeted cod have started fishing in the North Channel of the Irish Sea since the implementation of the Irish Sea cod recovery plan.

ICES ADVICE

3.7.2.a

State of stock/fishery

This stock is outside safe biological limits. SSB has been declining since the early 1980s and in 2000 is at a record low - well below B_{pa} and below B_{lim} . Fishing mortality in 1999 was above F_{lim} . Continued fishing at current rates is expected to cause the stock to collapse. Although the short term forecast suggests some improvement in SSB, medium term analyses indicate that with current rates of exploita-

tion, this improvement is very unlikely ever to be sufficient to achieve B_{pa} .

Fishing mortality increased progressively over the period 1966 to 1987, rising significantly between 1982 and 1985, and has since remained high. In the last ten years, only one year-class has been of above average and the 3 poorest year classes have recruited since 1995.

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 cod should be reduced to the lowest possible level in 2001. A rebuilding plan should be developed and implemented in order to rebuild SSB above B_{pa} . The rebuilding plan should include provisions to deter directed fishing, reduce by-catches of cod in fisheries for other species to the lowest practical levels, and to deter discarding and mis-reporting of cod in all fisheries.

Relevant factors to be considered in management:

Even with no directed harvest or by-catch of cod in 2001, SSB is forecast in the short term to remain below 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. Scottish *Nephrops* trawlers take a by-catch of cod. A by-catch of cod is taken by French vessels fishing for saithe. Management needs to take this into account.

Catch forecast for 2001:

Basis: $F(2000) = F_{sq} = F(97-99) = 0.94$, Landings (2000) = 3.9, SSB(2001) = 5.4.

F(2001 onwards)	Basis	Catch (2001)	Landings (2001)	SSB (2002)	Probability (%)SSB < B_{pa} in 2004	Probability (%)SSB < B_{pa} in 2009
0	0		0	13.2	< 5	<<5
0.187	$0.2 * F_{sq}$		1.2	11.3	5	<5
0.375	$0.4 * F_{sq}$		2.3	9.8	>50	<5
0.562	$0.6 * F_{sq}$		3.2	8.5	>90	50
0.6	$F_{pa} (0.64 * F_{sq})$		3.4	8.2	>90	>90
0.749	$0.8 * F_{sq}$		4.0	7.4	>90	>90
0.936	$1.0 * F_{sq}$		4.7	6.4	>90	>90

Weights in '000 t.

Shaded scenarios considered inconsistent with a precautionary approach.

Elaboration and special comment:

Using information from the stock-recruit relationship it is possible to construct the expected equilibrium spawning stock biomass for a range of fishing mortality rates. This is shown in the attached diagram (solid line). As F increases the expected equilibrium declines. Also shown on the graph are the observed values of SSB over time (dotted line with years indicated). Where a particular year lies above the solid line, the stock would be expected to decline. Where a point lies below the line, the stock would be expected to increase. Consistent with the analysis, it can be seen that as fishing mortality has increased, the SSB has declined. The diagram shows that the expected equilibrium at the estimated 1999 F is effectively zero, i.e. that the stock will collapse.

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. For reasons that are not clear, recent assessments have over-estimated SSB and under-estimated F . The current assessment was changed compared to previous years to try to take this into account.

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 based on landings-at-age and survey CPUE data. The quantities of fish misreported 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, June 2000 (ICES CM 2001/ACFM:01).

Reference points as proposed by ICES in 1998:

ICES considers that:	ICES proposes that
B_{lim} is 14 000 t, the lowest observed biomass (as enumerated in 1998).	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}	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 long term B_{pa}

Catch data (Tables 3.7.2.a.1-2):

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC ¹	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 ²
1992	70% of effort (89)	-	13.5	9.0	10.4 ³
1993	70% of effort (89)	-	14.0	10.5	13.0 ³
1994	30% reduction in effort	-	13.0	9.1	13.1 ³
1995	Significant reduction in effort	-	13.0	9.6 ⁴	12.2 ³
1996	Significant reduction in effort	-	13.0	9.6 ⁴	9.4
1997	Significant reduction in effort	-	14.0	7.0 ⁴	7.0
1998	20% reduction in F	9.5 ⁵	11.0	5.1 ⁴	5.7
1999	F reduced to below F_{na}	<9.7 ⁵	11.8	4.0 ⁴	4.2
2000	Recovery plan, 60 % reduction in F	<4.2	7.48		
2001	Lowest possible F, recovery plan	0			

¹TAC is for the whole of Sub-area Vb1, VI, XII and XIV. ²Not including misreporting. ³Including ACFM estimates of misreporting. ⁴Incomplete data. ⁵For VIa only. Weights in '000 t.

Table 3.7.2.a.1 COD in Division VIa (West of Scotland).

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Belgium	22	48	88	33	44	28	-	6	-	22	1	2	+	11	1	+
Denmark	-	-	-	4	1	3	2	2	3	2	+	4	2	-	+	+
Faroese Islands	-	-	-	-	11	26	-	-	-	-	-	-	-	-	-	-
France	7,637	7,411	5,096	5,044	7,669	3,640	2,220	2,503	1,957	3,047	2,488	2,533	2,253	956	714*	842
Germany	75	66	53	12	25	281	586	60	5	94	100	18	63	5	6	8
Ireland	2,316	2,564	1,704	2,442	2,551	1,642	1,200	761	761	645	825	1,054	1,286	708	478	
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	
Norway	231	204	174	77	186	207	150	40	171	72	51	61	137*	36*	36*	79
Spain	64	28	-	-	-	85	-	-	-	-	-	16	-	6	-	
UK(E.W.NI)	724	260	160	444	230	278	230	511	577	524	419	450	457	779	474	
UK(Scotland)	9,483	8,032	4,251	11,143	8,465	9,236	7,389	6,751	5,543	6,069	5,247	5,522	5,382	4,489	3,919	
UK																3,087
Total	20,552	18,613	11,526	19,199	19,182	15,426	11,777	10,634	9,017	10,475	9,131	9,660	9,580	6,992	5,629	4,016
Unallocated	720	-6	294	-228	1,231	1,743	399	293	1,189	2,346	3,532	-221	-153	42	85	183
As used by WG	21,272	18,607	11,820	18,971	20,413	17,169	12,176	10,927	10,206	12,821	12,663	9,439	9,427	7,034	5,714	4,199

* Preliminary

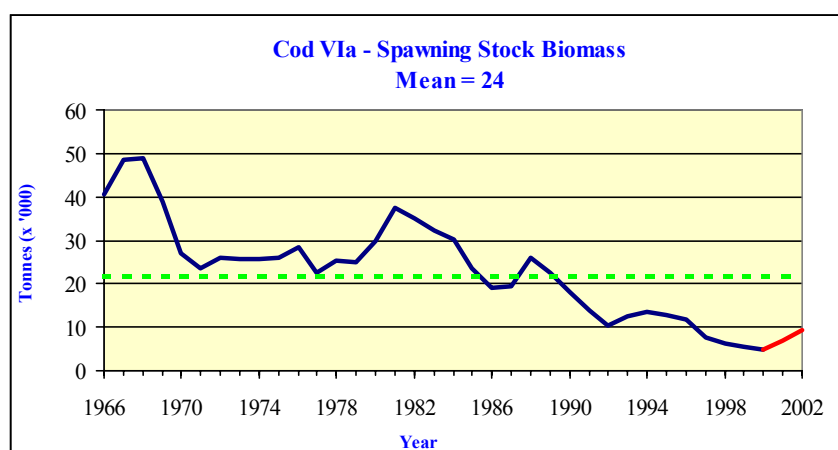
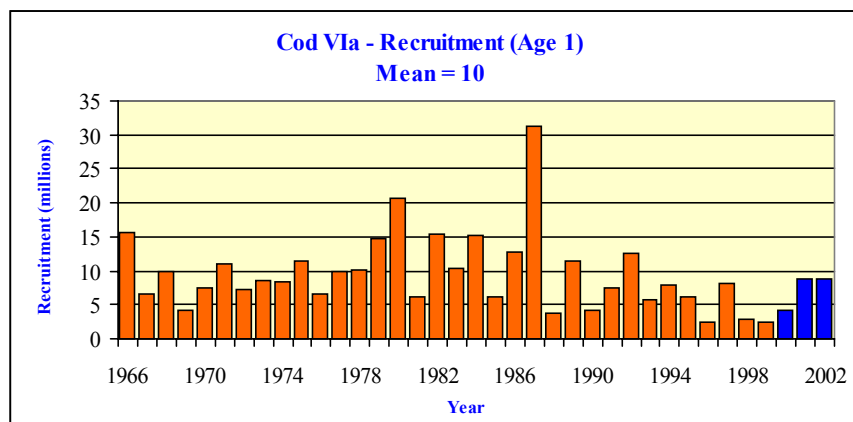
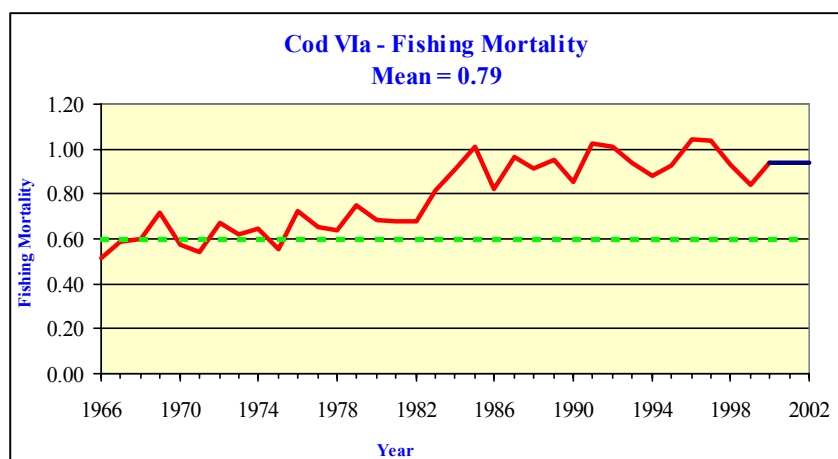
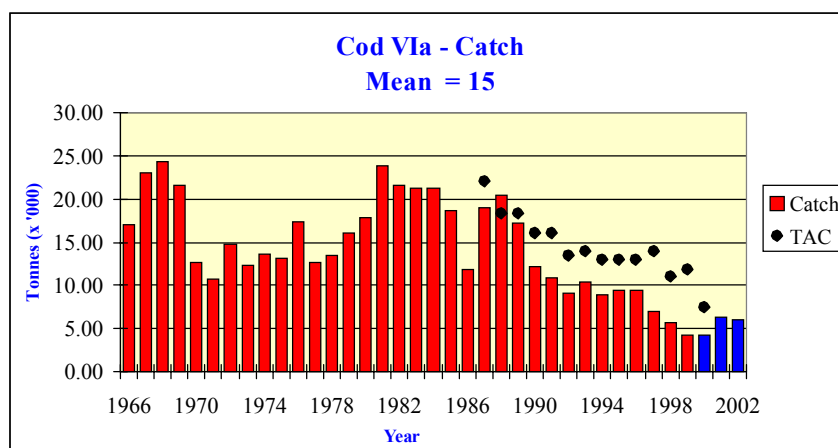
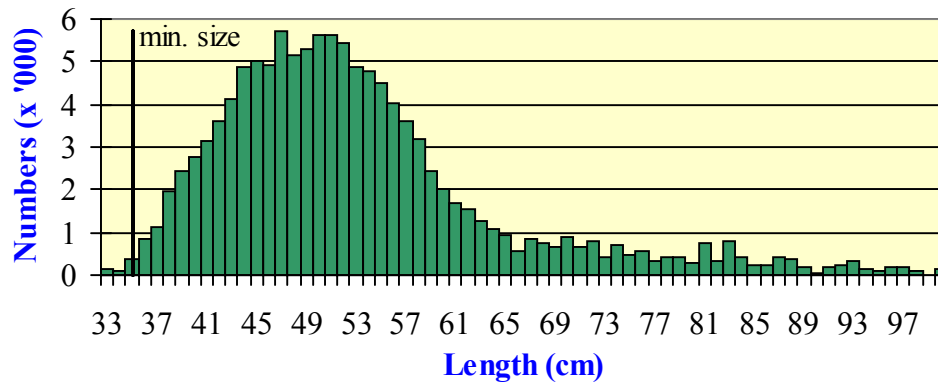


Table 3.7.2.a.2 Cod in Division VIa (West of Scotland).

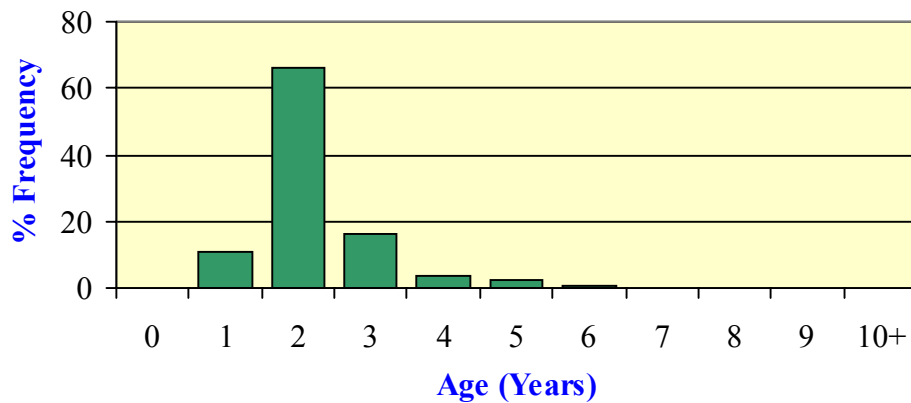
Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-5
1966	15.67	40.66	17.10	0.518
1967	6.68	48.52	22.98	0.587
1968	9.85	49.06	24.34	0.598
1969	4.12	38.97	21.60	0.718
1970	7.59	27.21	12.65	0.576
1971	10.94	23.51	10.66	0.540
1972	7.34	25.86	14.70	0.673
1973	8.67	25.58	12.26	0.618
1974	8.37	25.57	13.64	0.645
1975	11.36	26.03	13.16	0.552
1976	6.64	28.29	17.41	0.722
1977	9.93	22.45	12.62	0.655
1978	10.16	25.34	13.52	0.638
1979	14.70	24.89	16.09	0.752
1980	20.72	29.72	17.88	0.686
1981	6.16	37.46	23.87	0.675
1982	15.35	35.03	21.51	0.677
1983	10.33	32.33	21.31	0.814
1984	15.27	30.19	21.27	0.914
1985	6.17	23.69	18.61	1.013
1986	12.83	18.99	11.82	0.820
1987	31.26	19.54	18.97	0.965
1988	3.74	26.17	20.41	0.911
1989	11.53	22.65	17.17	0.950
1990	4.20	18.06	12.18	0.856
1991	7.49	14.03	10.93	1.026
1992	12.58	10.31	9.09	1.013
1993	5.67	12.63	10.31	0.938
1994	7.82	13.39	8.93	0.879
1995	6.25	12.85	9.44	0.925
1996	2.34	11.88	9.43	1.043
1997	8.21	7.51	7.03	1.034
1998	2.88	6.30	5.71	0.932
1999	2.35	5.48	4.20	0.843
2000	5.40 ¹	4.98	.	.
Average	9.44	23.57	14.79	0.785
Unit	Millions	1000 tonnes	1000 tonnes	-

¹ Short term (1987-1998 year classes) geometric mean.

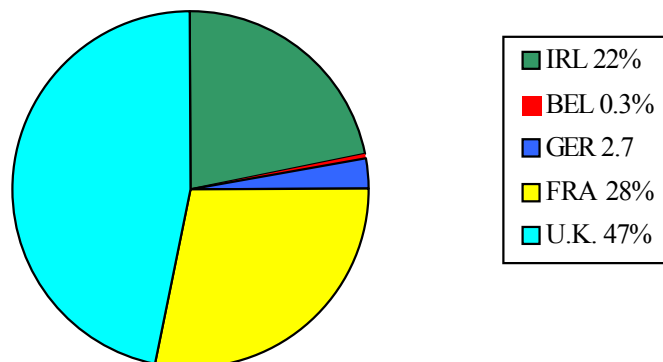
1999 Length Distribution of Irish Landings of Cod in VIa



1999 Age Distribution of Irish Landings of Cod in VI



2000 Quota Allocations Cod VI



Rockall Cod

(Sub-areas VIb)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agree that if a TAC is required for this Division, to be combined with management measures agreed for Division VIa, it should be based on the most reliable catches which over 1996-1998 was 794 t. MFSD emphasise that any TAC set for Sub-area VI should not jeopardise a rebuilding plan for cod in Division VIa. MFSD advise that the TAC in 2001 should be set at 1,994 t (794t for Division VIb and 1,200 t for Division VIa). This translates to an Irish quota of 428 t.

STATE OF THE STOCK

- There is no information on the status of Division VIb cod.
- Recent catches are considered unreliable due to mis-reporting.

CURRENT MANAGEMENT

- The TAC Area covers Sub Areas Vb, VI, XII, and XIV.
- The TAC allocated to this stock in 2000 was 7,480 t. The Irish quota was 1,605 t (21%) of which no more than 1,590 t may be fished in Vb and VIa.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £14.1m in Sub-areas VI.
- The value of the 1999 Irish quota was £2.2m.
- The value of the 1999 international landings from Division VIb was £0.8m.
- The value of the 1999 Irish landings from Division VIa was £0.2m.
- 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. Total international landings in 1999 were 650 t.
3. Landings by the Irish fleet were 148 t in 1999.
4. Mis-reporting and under-reporting are considered to be problems in this fishery, particularly by the large

Scottish twin-rig vessels.

5. The fishery is dominated by the UK (Scotland), with 62% of the 1999 landings, the Irish bottom trawl fleets and the Norwegian long-line fleet. Irish landings were 23% of the total. Norway have reported landings of between 50-100 t in recent years.
6. The fishery is important to the larger Irish vessels that target mainly haddock and megrim. Otter trawlers from Killybegs and Greencastle have traditionally carried out the Rockall cod fishery.
7. Due to low landings MFSD do not sample this stock.
8. Levels of discarding are considered to be low in this stock.
9. Part of Division VIb now lies in international waters and has opened up to non-EU countries. This fishery is currently unregulated and the availability and accuracy of data from non-EU sources may also be questionable.

ICES ADVICE

3.7.2b

Special Comments

There is no information on the status of cod in Division VIb. Official catch data are incomplete. To set a TAC for this Division compatible with management measures for VIa cod, it is proposed to adopt the most recent recorded landings. The average recorded catch over 1996-1998 is 794t (1999 data are incomplete).

Any TAC set for VIb should not jeopardise a rebuilding plan for cod in VIa.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 2000 (ICES CM 2001/ACFM:01).

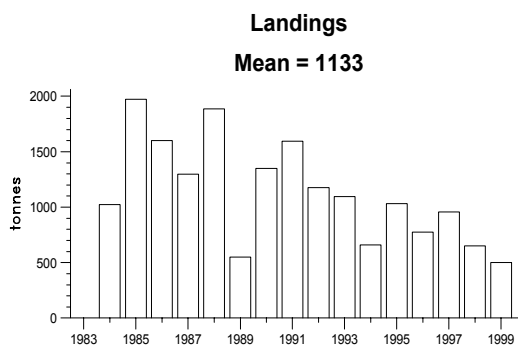
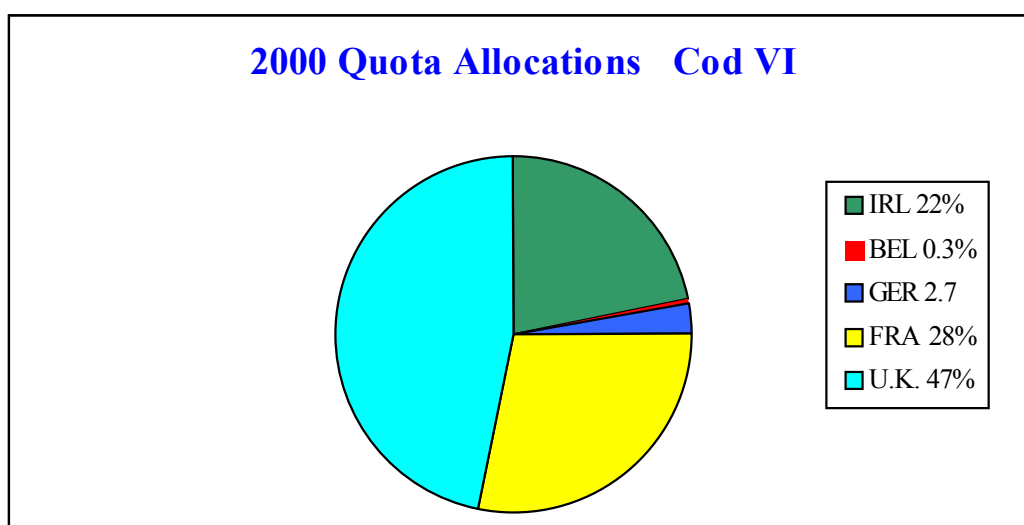
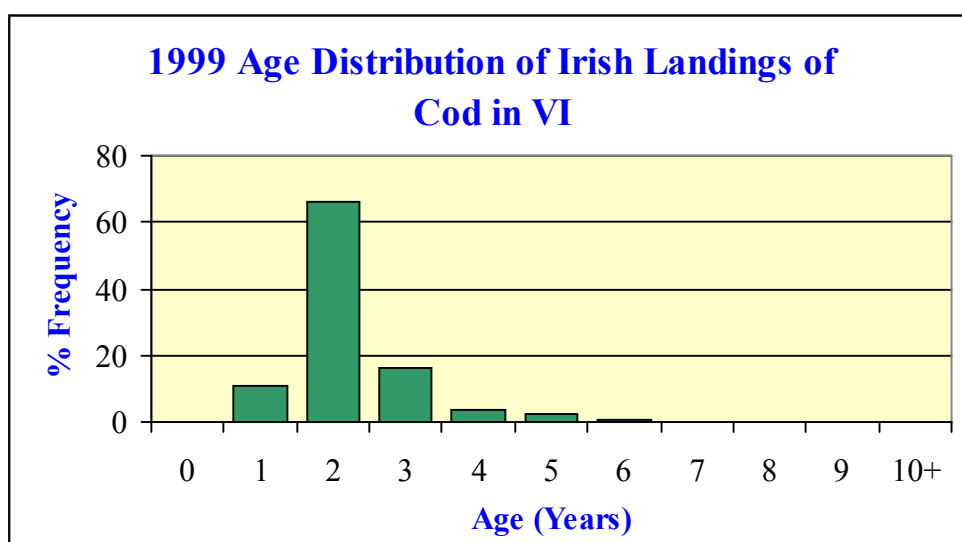


Table 3.7.2.b.1 COD in Division VIb (Rockall).

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Faroes Islands	18	-	1	-	31	5	-	-	-	1	-	-	-	-	-	-
France	9	17	5	7	2	-	-	-	-	-	-	-	-	-	-	-
Germany	-	3	-	-	3	-	-	126	2	-	-	-	10	22	3	11
Ireland	-	-	-	-	-	-	400	236	235	472	280	477	436	153	227	-
Norway	373	202	95	130	195	148	119	312	199	199	120	92	91*	55*	51*	85
Spain	241	1200	1219	808	1345	-	64	70	-	-	-	2	5	1	-	-
UK(E,W,NI)	161	114	93	69	56	131	8	23	26	103	25	90	23	20	32	...
UK(Scotland)	221	437	187	284	254	265	758	829	714	322	236	370	210	706	341	...
UK																406
Total	1,023	1,973	1,600	1,298	1,886	549	1,349	1,596	1,176	1,097	661	1,031	775	957	651	502

* Preliminary.



Irish Sea Cod

(Division VIIa)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES recommendation that fishing mortality on cod should be reduced to the lowest possible level in 2001 in order to give the stock the maximum possibility to recover. MFSD and ICES further recommends that the 2000 rebuilding plan to protect spawning fish should continue, and should be strengthened with additional provisions to protect juveniles, reduce F further, and reduce cod by-catch and discards in all fisheries in Division VIIa. Such measures should be kept in place until SSB is estimated to be above B_{pa} .

MFSD recognise that a complete closure is unrealistic given that it is a mixed fishery. MFSD advise that the 2001 TAC should remain at 2,100 t (Irish quota 1385 t). This TAC should deter directed fishing and to allow a small by-catch of cod in the mixed demersal and *Nephrops* fisheries. The rebuilding plan must include appropriate technical conservation measures (separator panels) to protect juvenile cod. The closed area introduced in 2000 to protect spawning cod from being targeted using semi-pelagic gear should be maintained in 2001. MFSD recommends that a minimum time frame of five years is required to rebuild this stock.

STECF supports the continuation of the Irish Sea cod rebuilding plan.

STATE OF THE STOCK

- There are very serious concerns about the state of this stock and the risk of stock collapse.
- Total international landings in 1999 were 4,800 t. Landings have declined considerably since 1988 when they were estimated to be over 14,000 t.
- Fishing mortality, while fluctuating, has shown a gradual increase since the early 1980's. F remains high ($F=1.07$ in 1999) and is well above the proposed F_{pa} of 0.72 and F_{lim} of 1.0.
- The probability of good recruitment appears to have been reduced at the SSBs observed in the 1990s. Whilst the 1999 year-class was the strongest since 1991 it follows two consecutive poor year-classes (1997 and 1998) and represents only average recruitment. There continues to be a high risk of further and serious decline in SSB.
- SSB has shown a general decline since 1981. SSB has stabilised at a low level. Current SSB (6,676 t) is far

below the proposed B_{pa} of 10,000 t and is now only slightly above the proposed B_{lim} of 6,000 t. More than 60% of the SSB in 2000 comes from the average 1996 year-class, highlighting the perilous state of this stock.

- The short term catch predictions indicate that at an F of 0.5 landings in 2001 and 2002 will in the region of 5,000 t with a high probability of SSB remaining below B_{pa} in the medium term.

CURRENT MANAGEMENT

- The TAC Area covers Division VIIa and corresponds to the assessment area.
- The 2000 TAC was 2,100 t with an associated Irish quota of 1,385 t.
- A recovery plan was introduced in 2000 (EU Regulation 304/2000) and involved a 10 week spawning closure from mid-February to maximise the reproductive output of the stock. The TAC in 2000 was set at 2,100 t to achieve a 40% reduction in F . A second phase of the recovery plan for 2001 will involve continued spawning box closures coupled with technical conservation measures to protect juvenile fish.
- There is some evidence that the recovery plan in 2000 displaced effort towards cod in VIa. In view of the state of cod in VIa management actions that take in VIIa should not encourage a diversion of effort towards other venerable stocks.
- Cod is taken in a mixed demersal fishery in the Irish Sea and management should take this into account.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £7.5m in Division VIIa.
- The value of the 1999 Irish quota was £4.9m.
- The value of the 1999 international landings from Division VIIa was £6.5m.
- The value of the 1999 Irish landings from Division VIIa was £1.3m.
- 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. Successive assessments have revised the recent estimates of fishing mortality upwards. Commercial fleet CPUE data are now considered unreliable and are not included in the assessment.

2. Total international landings were 4,800 t.
3. Ireland reported landings of 954 t (down 55 % on 1998).
4. Whilst mis-reporting is a problem in this fishery for those countries with restrictive quotas, corrections have been included in WG assessments.
5. The fishery is dominated by the UK (NI) pelagic and bottom trawl fleets and by the Irish trawl fleet which mainly operates in the western Irish Sea. The UK (NI) semi pelagic fleet now target large cod throughout the year. The other main fleet is the UK (E&W) fleet that mainly operates in the eastern Irish Sea.
6. 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.
7. Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
8. 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.
9. MFSD are a partner in an EU funded project to estimate the biomass of Irish Sea cod using the egg production method. The surveys will be carried out in 2000 and will provide an independent estimate of stock biomass. A similar project was carried out in 1995 and gave estimates significantly greater than the VPA estimates. ICES considers the VPA estimate the most reliable basis for advice.
10. MFSD data indicates that discarding of cod is negligible in the Irish Sea.
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 during the past 5 years due to the very large 1994 and 1996 year-classes which have become the target of a directed fishery by UK (NI) and the Irish fleet.
13. MFSD are concerned that the NI pelagic fleet that traditionally targets this fishery have shifted effort into area VIa (Northern Channel) and may threaten stocks there.
14. MFSD sampling indicates that 1 and 2-year-old fish, most of which are immature, dominate Irish landings. There is a distinct lack of older fish in the landings. This is interpreted as a danger signal concerning the state of the stock.

ICES ADVICE

3.8.2

State of stock/fishery

This stock is outside of safe biological limits. Fishing mortality in 1999 was above F_{lim} and SSB in 2000 is below B_{lim} . For the last ten years F has remained high and well above F_{pa} and SSB far below B_{pa} . The 1996 year-class comprises 60% of the SSB in 2000, the 1997 and 1998 year-classes are very weak and the 1999 year-class is estimated to be average.

High fishing mortality rates from the mid 1980s resulted in SSB declining sharply until 1995. SSB has stabilised at a low level and has remained far below the proposed B_{pa} . The probability of good recruitment appears to have been reduced at the SSBs observed in the 1990s.

Management objectives:

To rebuild SSB a recovery plan for 2000 introduced a spawning closure for ten weeks from mid-February to maximise the reproductive output of the stock (EU Regulation 304/2000), and the TAC for 2000 was set at 2100t to achieve a 40% reduction in fishing mortality. A second phase of the recovery plan is being discussed for 2001, involving a continued spawning ground closure, coupled with protection of juvenile fish.

Advice on management:

ICES recommends that fishing mortality on cod should be reduced to the lowest possible level in 2001 in order to give the stock the maximum possibility to recover. ICES further recommends that the 2000 rebuilding plan to protect spawning fish should continue, and should be strengthened with additional provisions to protect juveniles, reduce F further, and reduce cod by-catch and discards in all fisheries in Division VIIa. Such measures should be kept in place until SSB is estimated to be above B_{pa} .

Relevant factors to be considered in management:

There continues to be a high risk of serious decline in SSB with unknown consequences for future recruitment. The point estimate of mean F in 1999 (1.07) exceeds F_{lim} (1.0) and the 2000 SSB (4,280t) is below B_{lim} (6,000t). Even if the 2100t TAC for 2000 achieves the implied reduction in mean F in 2000, SSB is still predicted to be less than B_{lim} in 2001. The estimate of the 1999 year class as being of average strength, also could be optimistic based on preliminary information from a survey in fall 2000. Therefore, although details of the assessment and forecast are uncertain they justify a pessimistic view of short term prospects for this stock. There is some evidence that the rebuilding plan in 2000 has

displaced effort towards cod in VIa. In view of the state of the cod stock in VIa any management action taken in Division VIIa should not encourage a diversion of effort towards other vulnerable stocks.

Catch forecast for 2001:

It was not possible to quantify the likely effect on $F(2000)$ of the reduced 2000 TAC, or the changes in fishing effort or fishing pattern resulting from the rebuilding plan. Conse-

quently, there are two catch forecasts, one assuming an effective TAC constrained for 2000, and one assuming no change in fishing mortality in 2000 from recent years.

1) TAC constraint in 2000

Catch forecast for 2001:

Basis: $TAC=2.10$; $F(2000) = 0.53$ ($= 0.44 F(97-99)$), Landings (2000) = 2.10, $SSB(2001) = 5.99$

F (2001) Onwards	Basis	Catch (2001)	Landings (2001)	SSB (2002)	Medium-term effect of fishing at given level
0.00	0.0F(97-99)	0	0	17.46	< 5% probability of $SSB < B_{pa}$
0.24	0.2F(97-99)	1.92	1.92	14.39	< 5% probability of $SSB < B_{pa}$
0.48	0.4F(97-99)	3.50	3.50	11.89	< 5% probability of $SSB < B_{pa}$
0.59	0.5F(97-99)	4.18	4.18	10.82	< 5% probability of $SSB < B_{pa}$
0.72	F_{pa}	4.80	4.80	9.86	< 5% probability of $SSB < B_{pa}$
0.83	0.7F(97-99)	5.36	5.36	8.99	5-10% probability of $SSB < B_{pa}$
0.95	0.8F(97-99)	5.87	5.87	8.20	20-50% probability of $SSB < B_{pa}$
1.19	1.0F(97-99)	6.75	6.75	6.85	>50% probability of $SSB < B_{pa}$

Weights in '000 t.

2) Status quo F in 2000

Catch forecast for 2001:

Basis: $F(2000) = F(97-99) = 1.19$, Landings (2000) = 3.71, $SSB(2001) = 4.20$

F (2001) Onwards	Basis	Catch (2001)	Landings (2001)	SSB (2002)	Medium-term effect of fishing at given level
0.00	0.0F(97-99)		0	14.6	
0.24	0.2F(97-99)		1.5	12.1	
0.48	0.4F(97-99)		2.8	10.0	
0.59	0.5F(97-99)		3.3	9.1	
0.71	0.6F(97-99)		3.8	8.4	
0.83	0.7F(97-99)		4.2	7.7	
0.95	0.8F(97-99)		4.6	7.0	
1.19	1.0F(97-99)		5.0	6.4	

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment:

The cod fishery has traditionally been carried out by otter trawlers targeting spawning cod in spring and juvenile cod in autumn and winter. Activities of these vessels have decreased in recent years whilst a fishery for cod and hake using large pelagic trawls increased substantially during the 1980s. 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 and sole.

Analytical assessment based on landings-at-age and recruitment indices from surveys in Division VIIa. Estimates of misreported landings included from 1991 onwards. Successive assessments have revised the estimates of recent fishing mortality upwards.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 2000 (ICES CM 2001/ACFM:01).

Reference points as proposed by ICES in 1998:

ICES considers that:	ICES proposes that:
B_{lim} is 6 000 t, the lowest observed spawning stock.	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 declines.

Technical basis:

$B_{lim} = B_{loss}$	B_{pa} = Previous MBAL and signs of reduced recruitment
$F_{lim} = F_{med}$	$F_{pa} = F_{med} \times 0.72$

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 ¹	12.8
1990	F at F_{med} ; TAC	15.3	15.3	9.9 ¹	7.4
1991	Stop SSB decline; TAC	6.0	10.0	7.0 ¹	7.1 ²
1992	20% of F(90) ~ 10 000 t	10.0	10.0	7.4	7.7 ²
1993	F_{med} ~ 10 200 t	10.2	11.0	5.9	7.6 ²
1994	60% reduction in F	3.7	6.2	4.4	5.4 ²
1995	50% reduction in F	3.9	5.8	4.5	4.6 ²
1996	30% reduction in F	5.4	6.2	5.30	4.96 ²
1997	30% reduction in F	5.9	6.2	4.44	5.86 ²
1998	No increase in F	6.2	7.1	4.96	5.32 ²
1999	Reduce F below F_{pa}	4.9	5.5	1.98 ³	4.77 ²
2000	Lowest possible F	0	2.1		
2001	Lowest possible F	0			

¹Preliminary. ²Including estimates of mis-reporting. ³Incomplete data. Weights in '000 t.

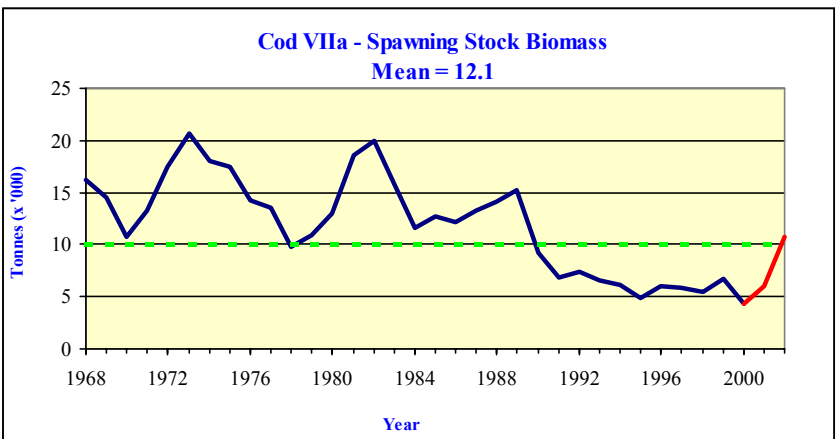
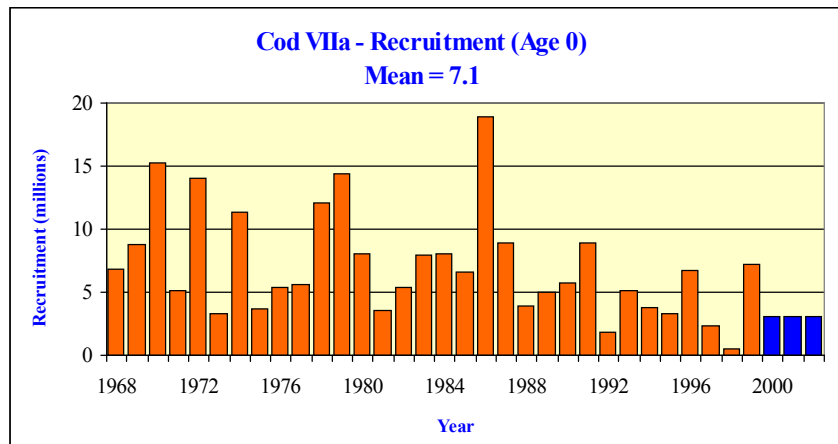
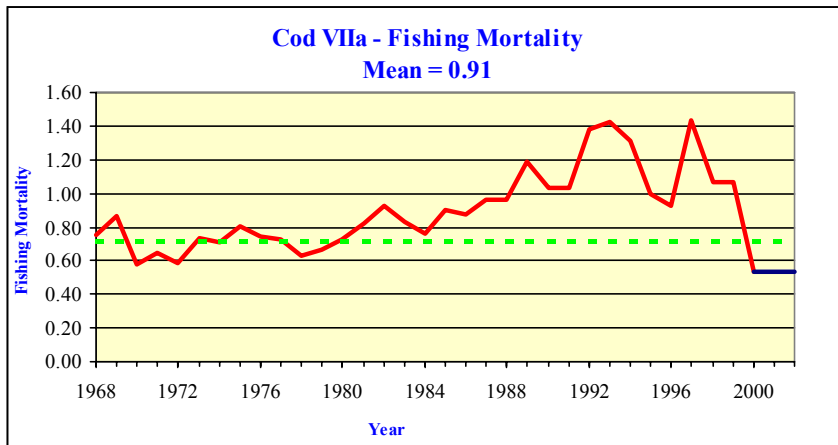
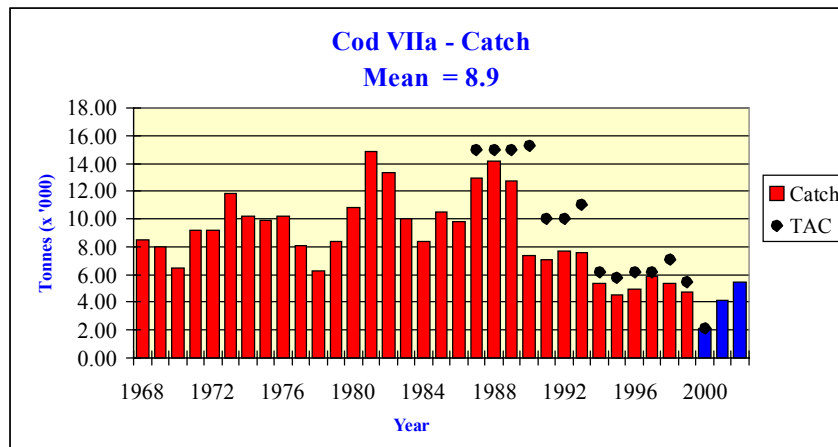


Table 3.8.2.1 Nominal catch (tonnes) of COD in Division VIIa as officially reported to ICES, and Working Group estimates of annual landings.

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999 ¹
Belgium	185	222	344	269	467	310	78	174	169	129	187	142	183	316	150
France	1,782	1,480	1,717	2,406	352 ¹	201 ¹	320 ¹	916	686	208	166	148	268	269 ¹	85
Ireland	4,121	3,991	5,017	5,821	3,656	2,800	2,364	2,260	1,328	1,506	1,414	2,476	1,492	1,739	n/a
Netherlands	104	-	-	-	-	-	-	-	-	-	-	25	29	20	5
UK (Engl. & Wales)	1,200	847	1,922	2,667	6,320	4,752	3,562	3,529	3,244	2,274	2,330	2,359	2,370	2,517	...
³	119	80	44	118	39	48	175	129	57	26	22	27	19	34	
UK (Isle of Man)	2,541	2,992	3,565	4,080	...	...	...	...	...	...	...	...	...	...	...
UK (N. Ireland)	1,038	446	574	472	465	1,767	515	393	453	326	414	126	80	67	...
UK (Scotland)															1,736
UK															
Total	11,090	10,058	13,183	15,833	11,299	9,878	7,014	7,401	5,937	4,469	4,533	5,303	4,441	4,962	1,976
Unallocated	-607	-206	-289	-1,665	1,452	-2,499	81	3343	1,618	933	54	-339	1,418	355	2,792
Total figures used by Working Group for stock assessment	10,483	9,852	12,894	14,168	12,751	7,379	7,095 ²	7,735 ²	7,555 ²	5,402 ²	4,587	4,964	5,859	5,317	4,768

¹Preliminary.

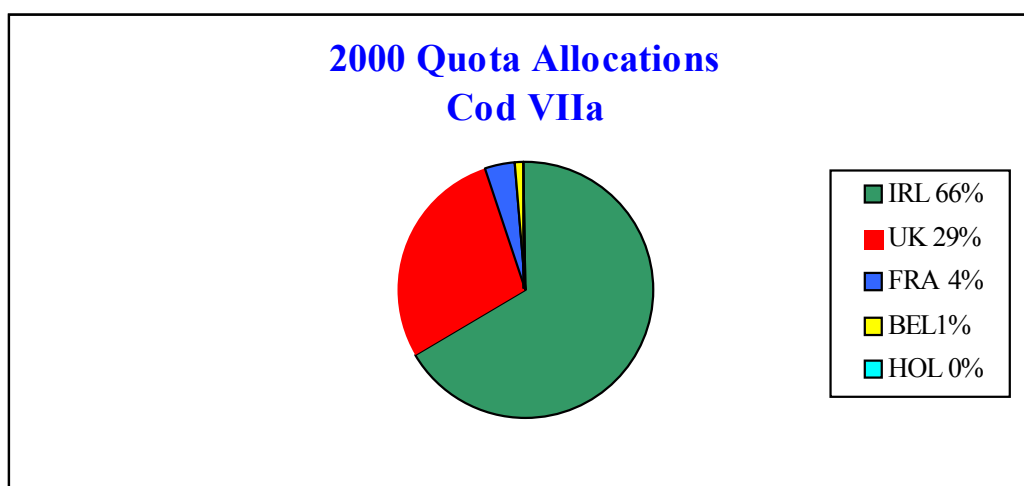
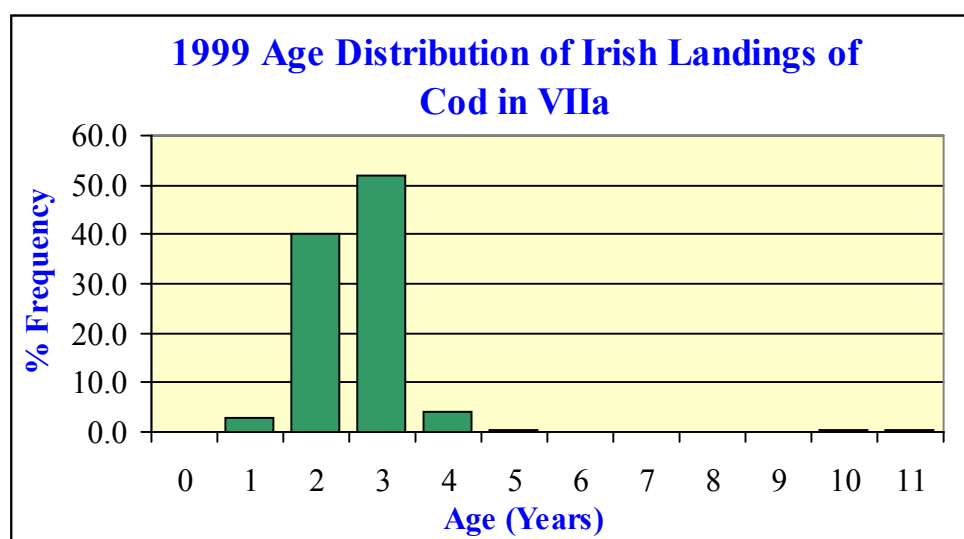
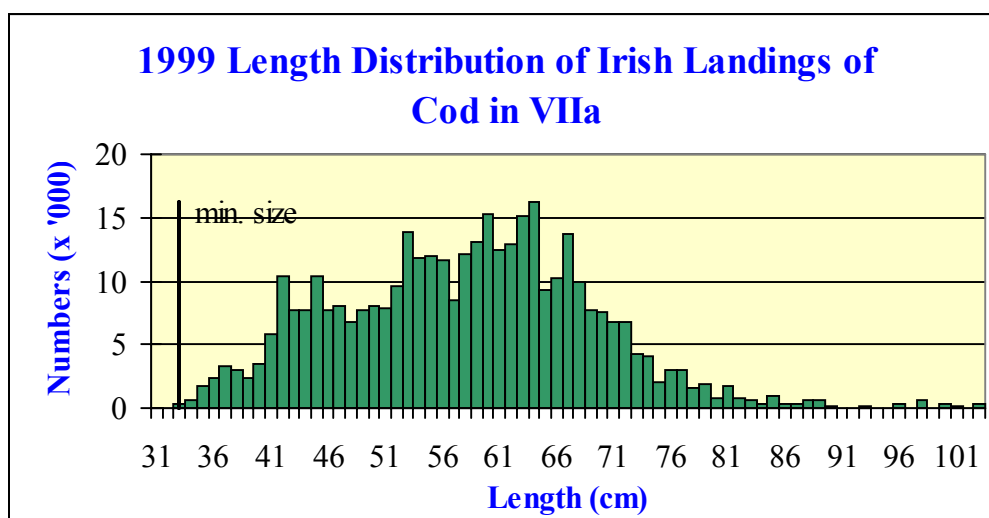
²Revised.

³1989–1999 N. Ireland included with England and Wales.

Table 3.8.2.2 Cod in Division VIIa (Irish Sea).

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-4
1968	6.79	16.23	8.54	0.749
1969	8.80	14.57	7.99	0.869
1970	15.21	10.72	6.43	0.578
1971	5.09	13.31	9.25	0.643
1972	14.04	17.51	9.23	0.586
1973	3.29	20.67	11.82	0.737
1974	11.35	18.00	10.25	0.707
1975	3.62	17.46	9.86	0.804
1976	5.36	14.27	10.25	0.743
1977	5.59	13.55	8.05	0.724
1978	12.09	9.80	6.27	0.630
1979	14.37	10.90	8.37	0.669
1980	8.07	13.06	10.78	0.724
1981	3.58	18.57	14.91	0.819
1982	5.36	20.01	13.38	0.928
1983	7.95	15.74	10.02	0.835
1984	8.07	11.65	8.38	0.759
1985	6.55	12.72	10.48	0.897
1986	18.86	12.14	9.85	0.870
1987	8.90	13.30	12.89	0.958
1988	3.86	14.10	14.17	0.959
1989	4.99	15.21	12.75	1.187
1990	5.74	9.23	7.38	1.032
1991	8.93	6.89	7.10	1.034
1992	1.78	7.38	7.74	1.383
1993	5.18	6.52	7.56	1.423
1994	3.81	6.17	5.40	1.315
1995	3.24	4.88	4.59	1.000
1996	6.67	6.01	4.96	0.925
1997	2.32	5.93	5.86	1.435
1998	0.51	5.51	5.32	1.065
1999	7.15	6.68	4.77	1.069
2000	3.08 ¹	4.28	.	.
Average	6.98	11.91	8.89	0.908
Unit	Millions	1000 tonnes	1000 tonnes	-

¹ Geometric mean for years 1991-1998



Celtic Sea and Western Channel Cod

(Divisions VIIe-k)

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



Marine Fisheries Services Division

MFSD – ADVICE

ICES have given 2 advice options for this stock for 2001. The first corresponds to landings of less than 4,300 t in Divisions VIIe-k, while the second corresponds to landings less than 3,100 t. Option 1 represents a reduction in F of 40% and would give a high probability of rebuilding SSB above B_{pa} in the medium term (10 years). Option 2 requires a 60% reduction in F in order to bring SSB above B_{pa} in the short term.

In order to calculate the TAC additional landings from VIIb,c and VIId have to be included. Because ICES has advised a zero catch in VIId as part of the North Sea cod rebuilding plan, the 2001 TAC for cod will be substantially reduced. If either of the above options are selected the 2001 TAC will be further reduced. MFSD advise that a TAC should be set to give a high probability of rebuilding SSB above B_{pa} in the medium term. This translates to a TAC of 5,300 t with an associated Irish quota of 540 t (see table below).

TAC Area	TAC 2000	Proposed TAC 2001	Basis
VIIe-k		4,300	Assessment
VIId		0	Assessment IV
VIIbc		1,000	Average Catches
Total TAC	16,000	5,300	
Irish quota	1,630	540	

STATE OF THE STOCK

- There are concerns about the state of this stock.
- The landings in 1999 were 9,700 t, which is 10% lower than in 1998. Landings have been steadily decreasing since the recent high of 12,800 t in 1996.
- Fishing mortality (estimated to be 0.98) is too high in this stock and has been above the proposed $F_{pa}=0.60$ since 1989 and is currently above $F_{lim}=0.90$.
- The 1997 and 1998 year classes are below average.
- The spawning stock biomass has been above average in recent years. However, the 2000 is well below the proposed $B_{pa} = 10,000$ t.
- The short-term prediction indicates that spawning stock

biomass will remain below B_{pa} even with a 60% reduction in F .

CURRENT MANAGEMENT

- The TAC area covers Divisions VIIb-k, Sub Areas VIII, IX X and CECAF.
- The assessment area covers Divisions VIIe-k.
- The 2000 TAC was 16,000 t with an associated Irish quota of 1,630 t.
- There are no explicit management objectives or plan for this stock.

Special Note: MFSD strongly advise that, if Division VIId is to be included in the management area, it should be assessed as part of this stock and not part of the North Sea stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £23.0m in Sub-area VII.
- The value of the 1999 Irish quota was £2.4m.
- The value of the 1999 international landings Sub-area VII was £11.7m.
- The value of the 1999 Irish landings was £2.3m.
- Cod has always been 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. There were problems obtaining French landings statistics for 1999, therefore the assessment for this stock may not be as robust as in previous years.
2. The International landings in 1999 were 9,700 t.
3. Irish landings in 1999 were 1,884 t. This is an increase of 10% on the 1998 landings.
4. The levels of misreporting in this stock are currently unknown.
5. France with 68% of the 1999 landings dominates the fishery. Ireland, the UK and Belgium landed 19%, 9% and 3% of the 1999 landings respectively.
6. Most of the French landings are from the Lorient based gadoid fleet and the 1999 landings were estimated by IFREMER.
7. Demersal trawlers from Dunmore East and Castletownbere and other ports in SW Ireland have traditionally targeted Celtic Sea cod. In recent years a targeted gill net fishery involving boats from Dingle has

also become important.

8. Irish sampling for this stock is supported through EU funding of FIEFA (EU Study Contract 97-0059) and SAMFISH (99-009).
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. MFSD discard sampling confirms that discarding is very low for this stock.
11. MFSD sampling indicates that very young fish dominated the Irish landings in 1999 with 92% of the landings being between 1 and 3 years old.
12. Recent 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. Furthermore, no cod, tagged in the Celtic Sea were recaptured in the Irish Sea.
13. Cod throughout its range in the northeast Atlantic has experienced poor recruitment in recent years. This stock is no exception and the last two years of below average recruitment in this stock will result in a serious decline in SSB. There are four proposed rebuilding plans for cod in the Northeast Atlantic. Celtic Sea cod is one of the few cod stock not involved in a rebuilding plan.

ICES ADVICE

3.9.2

State of stock/fishery

The stock is outside safe biological limits. Part of the change in perception of the state of the stock since last year, is due to improvements in the analytical assessments. However, following a period of relative stability, SSB declined 30%, to below B_{pa} in 2000, and the 1997 and 1998 year classes are now estimated to be below average. Fishing mortality has been well above F_{pa} in 1985, and was even above F_{lim} in 1998 and 1999.

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 fishing mortality should be reduced to 0.55 which is below F_{pa} , corresponding to landings of less than 4 300 t in 2001. This represents a reduction in F of 40 % and would give a high probability of rebuilding SSB to above B_{pa} in the medium term (10 years). In order to increase SSB above B_{pa} in the short term, a more substantial decrease in F of at least 60 %, corresponding to catches less than 3 100 t, is required.

Relevant factors to be considered in management:

The assessment area was expanded in 1997 to cover Divisions VIIe-k. The TAC for cod is set for all of Sub-area VII (excluding Division VIIa). In order to protect cod in VII-k, catches in the other parts of sub-area VII which comprise the TAC need to be set appropriately. There is also a need to take into account the state of cod in VIId which is affected by the TAC in area VII. A reduction in F to F_{max} (=0.29) are likely to provide an increase in the long term yield.

Catch forecast for 2001:

Basis: $F(2000) = F(97-99) = 0.91$; Landings(2000) = 6.6; SSB(2001) = 6.3.

F(2001) on-wards	Basis	Catch(2001)	Landings (2001)	SSB (2002)	Medium-term (10 years) Probability(%) of SSB < B_{pa}
0.36	0.4 $F_{(97-99)}$		3.1	10.3	< 5
0.55	0.6 $F_{(97-99)}$		4.3	8.7	< 5
0.68	F_{pa}		5.1	7.7	> 20
0.91	1.0 $F_{(97-99)}$		6.2	6.3	> 50

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment:

It should be noted that 68 % of 1999 international landings in the assessment area were derived from French which official landings were provided only for the TAC area. This is a potential source of error in the assessment. 62% of SSB in 2002 is based on assumed long-term geometric mean recruitment.

Cod in Divisions VIIe-k are taken as a component of 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 1996-99 showed that at the scale of a trip, 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 claim to be able, for each trawl operation, to target cod and whiting separately. In Ireland in recent years, cod has been targetted increasingly 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 south-east 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 inshore-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.

Analytical assessment was based on landings and commercial cpue data for three commercial fleets and one survey. Landing data prior to 1988 are not available for Divisions VIIe,j and k and have been estimated assuming the same relative area distribution of landings as observed in the period 1988-98.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 2000 (ICES CM 2001/ACFM:05).

Reference points proposed by ICES in 1998/1999:

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 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 th percentile of F_{loss}

Catch data (Tables 3.9.2.1–2):

Year	ICES Advice	Predicted catch cor- resp. to advice	Agreed TAC ¹	ACFM Landings
1987	Reduce F	< 6.4 ²		-
1988	No increase in F; TAC	7.0 ²		17.7
1989	No increase in F; TAC	8.6 ²		20.3
1990	No increase in F; TAC	9.2 ²		12.9
1991	TAC; SSB = mean	4.5 ²		9.3
1992	Appropriate to reduce F	-		9.6
1993	20% reduction in F	6.5 ²	19.0	10.2
1994	20% reduction in F	5.6 ²	17.0	10.3
1995	20% reduction in F	4.7 ³	17.0	11.7
1996	20% reduction in F	4.7 ³	20.0	12.8
1997	20% reduction in F	7.4 ⁴	20.0	11.8
1998	10% reduction in F	8.8 ⁴	20.0	10.7
1999	Reduce F below F_{pa}	9.2 ⁴	19.0	9.7
2000	Reduce F below F_{pa}	< 7.6 ⁵	???	
2001	40% reduction in F	< 4.3 ⁵		

¹TAC covers Sub-areas VII (except Division VIIa) and VIII. ²For the VIIf+g stock component. ³For the VIIf-h stock component. ⁴For the VIIe-h stock component. ⁵for VIIe-k stock component. Weights in '000 t.

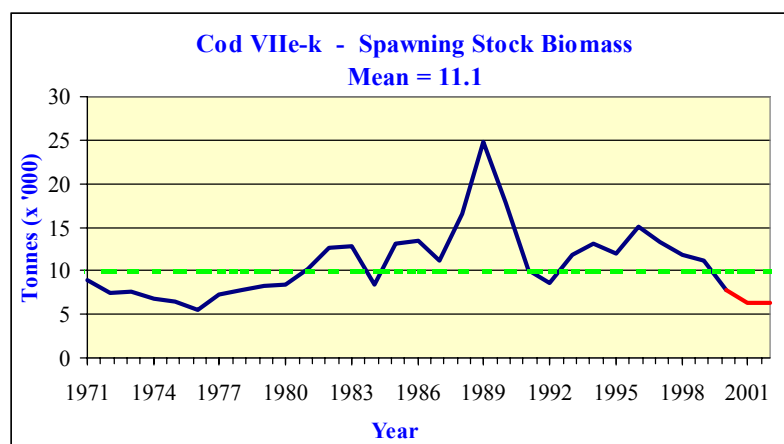
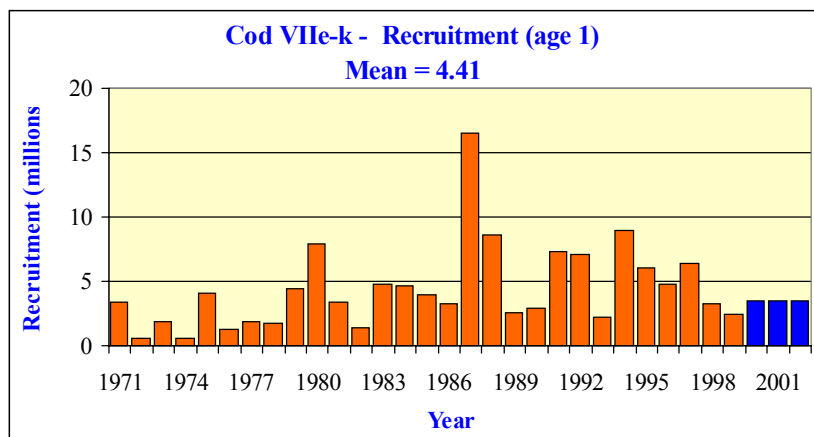
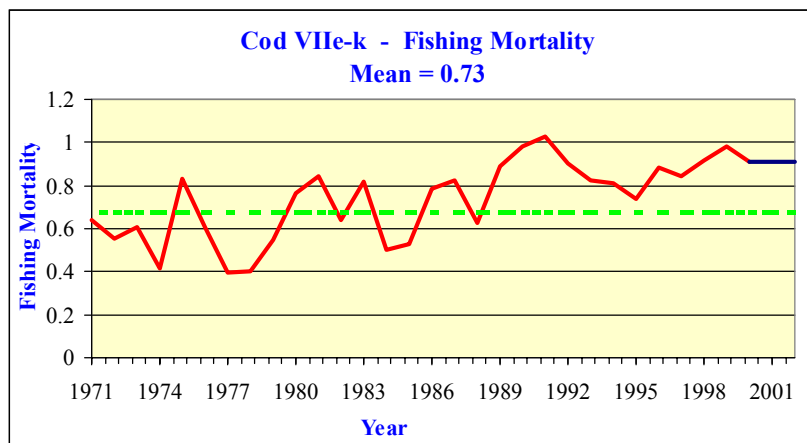
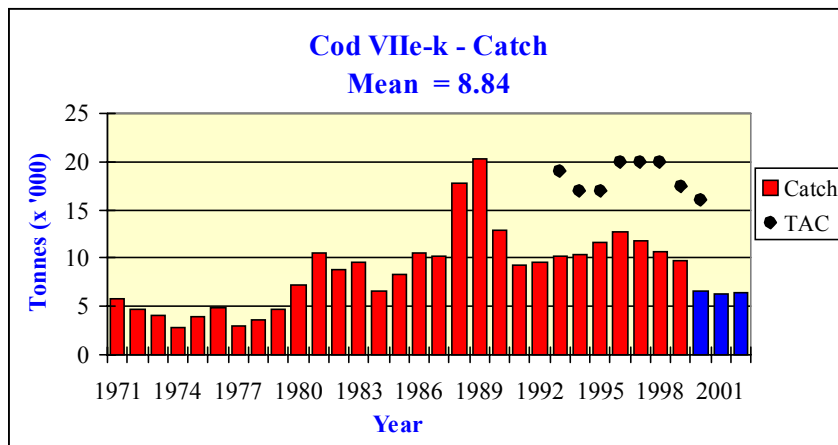


Table 3.9.2.1 Nominal landings of COD in Divisions VIIIf–h, VIIe, VIIe–h, VIIj–k, VIIe–k as used by the Working Group in 2000.

Divisions VIIIf,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	6325	659	515		8018
1999*	326	5594**	1219	444		7584

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	894**		449		1343

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	6488**	1220	893	0	8927

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	87**	664	22	0	773

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	6575**	1884	915	0	9700

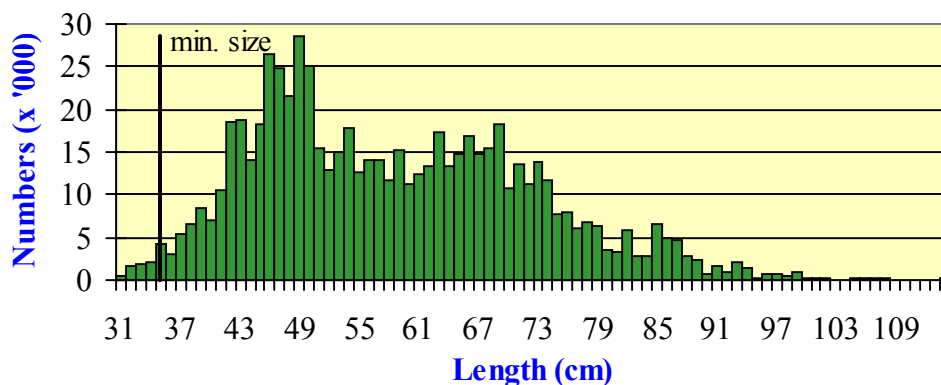
*Provisional.

** estimated landings derived from 1999 official landings in TAC area (see Section 1.4.1)

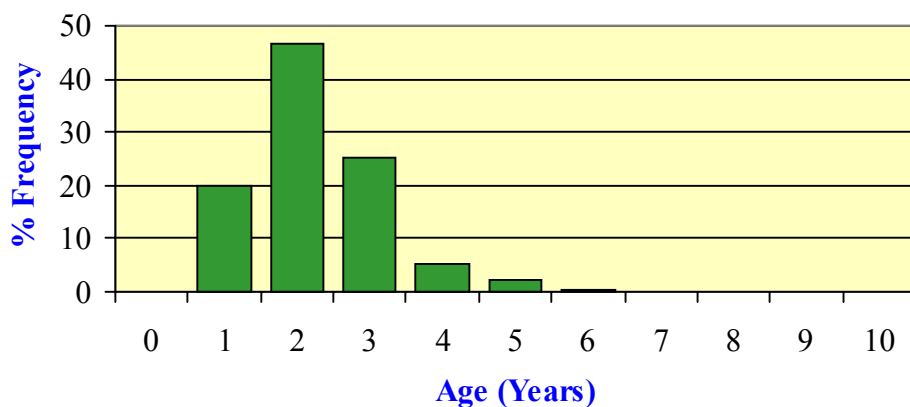
Table 3.9.2.2 Cod in Divisions VIIe-k

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-5
1971	3.34	8.85	5.78	0.638
1972	0.63	7.51	4.74	0.551
1973	1.82	7.61	4.02	0.607
1974	0.54	6.88	2.90	0.415
1975	4.06	6.47	3.99	0.831
1976	1.27	5.44	4.82	0.607
1977	1.83	7.23	3.06	0.397
1978	1.79	7.80	3.65	0.403
1979	4.37	8.32	4.65	0.544
1980	7.85	8.44	7.24	0.763
1981	3.32	10.27	10.60	0.841
1982	1.35	12.71	8.77	0.640
1983	4.73	12.88	9.64	0.817
1984	4.60	8.47	6.63	0.503
1985	3.92	13.13	8.32	0.526
1986	3.29	13.50	10.48	0.784
1987	16.56	11.21	10.23	0.822
1988	8.57	16.60	17.70	0.625
1989	2.57	24.79	20.27	0.889
1990	2.94	17.80	12.91	0.981
1991	7.32	10.02	9.28	1.031
1992	7.07	8.54	9.58	0.902
1993	2.22	11.79	10.21	0.825
1994	9.00	13.09	10.30	0.809
1995	6.09	11.95	11.71	0.742
1996	4.78	15.03	12.75	0.885
1997	6.36	13.30	11.82	0.841
1998	3.29	11.80	10.72	0.914
1999	2.44	11.13	9.70	0.981
2000	3.44	7.76	.	.
Average	4.38	11.01	8.84	0.728
Unit	Millions	1000 tonnes	1000 tonnes	-

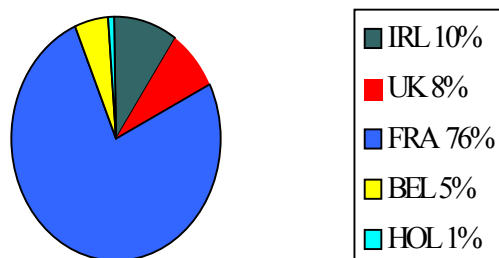
1999 Length Distribution of Irish Landings of Cod in VIIe-k



1999 Age Distribution of Irish Landings of Cod in VIIe-k



2000 Quota Allocations Cod VIIe-k



West of Ireland Cod

(Divisions VIIb,c)



Marine Fisheries Services Division

MFSD – ADVICE

The TAC area covers Divisions VIIb-k, Sub Areas VIII, IX X and CECAF and the advice is based on the assessment for Division VIIe-k (see MFSD advice for this stock). MFSD commenced a sampling programme in 1993 so that data from Divisions VIIb,c may be included with the Divisions VIIe-k assessment. This will bring the assessment more in line with the TAC area (Division VIIId is still assessed with the North Sea stock).

STATE OF THE STOCK

- No Analytical assessment is carried out at present for this stock.
- There are no proposed reference points for this stock.
- Based on last year's estimates of F, cod in division VIIbc is considered over exploited.

ADDITIONAL INFORMATION

1. No analytical assessment is carried out at present for this stock.
2. There were problems obtaining French landings statistics for 1999, no accurate landings were available for VIIb,c in 1999.
3. Irish landings in 1999 were 153 t. This is a decrease of 15% on the 1998 landings.
4. The level of misreporting in this area is unknown.
5. Ireland (with 70% of the 1998 landings) dominates the fishery. The UK and France land the remaining and 30%.
6. Cod are caught in mixed species otter trawl fisheries in VIIb,c by vessels operating from Killybegs, Ros-saveal and Dingle.
7. Cod are an economically valuable by-catch in fisheries targeting anglerfish, megrim and *Nephrops* in this area.
8. Irish sampling for this stock is supported through EU funding of FIEFA (EU Study Contract 97-0059) and SAMFISH (99-009).
9. MFSD have conducted a groundfish survey in this area since 1992, however, cod catches are generally very low in this area.
10. MFSD data on discarding of cod in this area is limited but discards are considered to be negligible.

Nominal international landings (t)
As reported to the Working Group

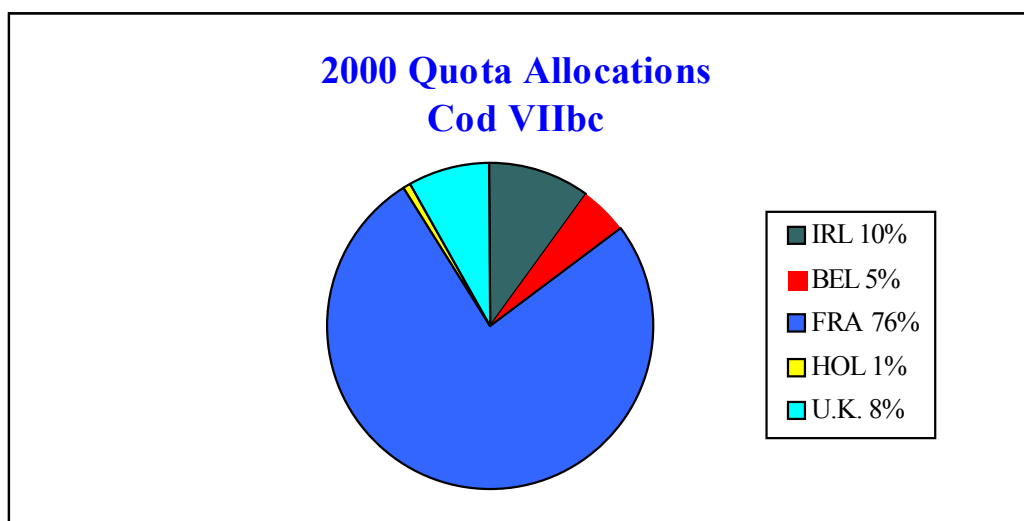
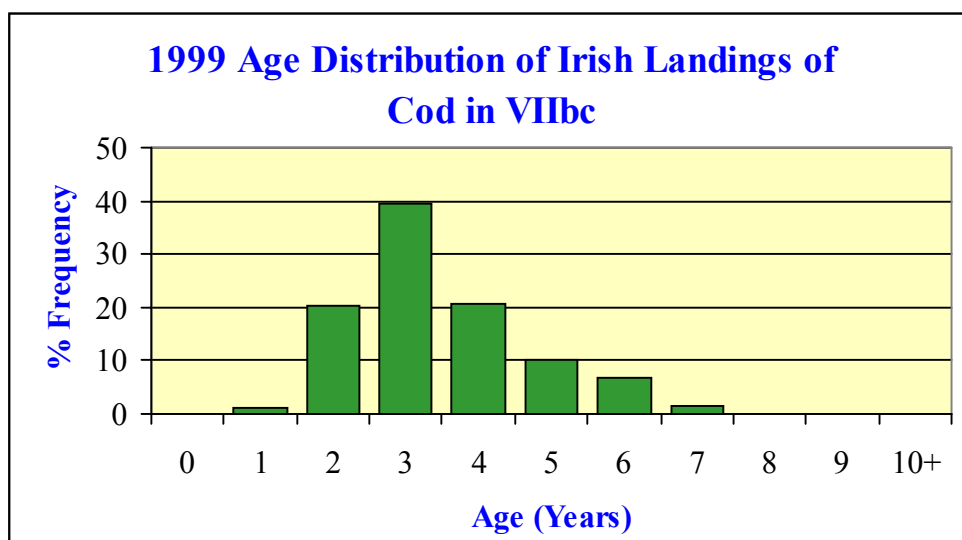
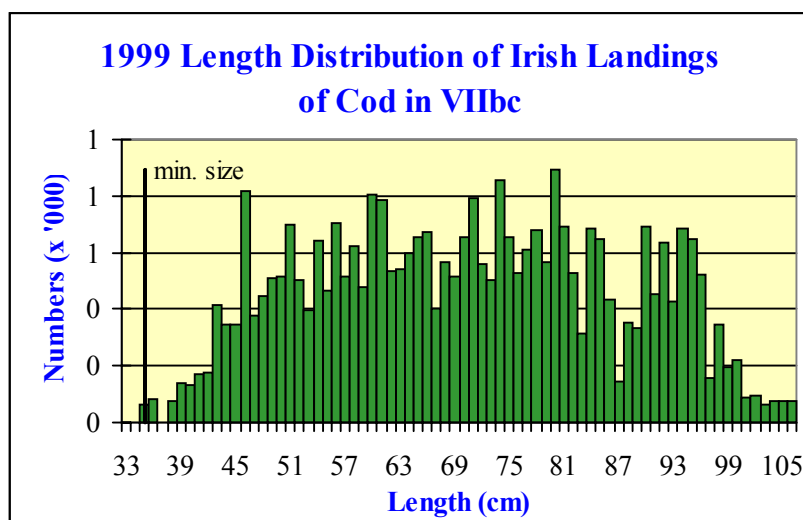
Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
France	591	474	206	112	36	120	156	92	158	82	48*
Germany, Fed. Rep.	-	1	-	-	-	-	-	-	-	-	-
Ireland	388	915	795	612	507	357	462	552	427	232	180*
Norway	2	9	29	11	39	+	7	3	1	6	-
UK (England and Wales) ¹	23	7	12	33	62	17	29	25	35	37	-
UK (Scotland)	5	34	300	177	148	73	93	66	12	7	-
UK											32
Total	1009	1440	1342	945	792	567	747	738	633	364	260

* Preliminary

² Revised

¹ 1989-1998 N. Ireland included with England and Wales.

Norwegian catches, on Russian quotas are included for 1992 and 1993



North Sea Cod

(Sub-areas IV & Division VIIId and Division IIIa)

No ACFM information has been included for this stock

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



Marine Fisheries Services Division

MFSD – ADVICE

Ireland has no quota in the North Sea for Cod, but this stock has been included in the Stock Book because the rebuilding plan impacts on the rebuilding plan for Division VIa. Furthermore, the TAC for Celtic Sea cod is influenced by the advice for VIIId.

MFSD do not provide advice for North Sea cod.

ICES recommend that fishing mortality on cod should be reduced to the lowest possible level in 2001. A rebuilding plan should be developed and implemented in order to rebuild SSB above B_{pa} . The necessary reduction in fishing mortality on cod cannot be achieved by a reduction in TAC alone. The rebuilding plan should include provisions to deter directed fishing, and reduce by-catches of cod in fisheries for other species to the lowest practical levels, as well as deterring discarding and mis-reporting of cod in all fisheries.

STATE OF THE STOCK

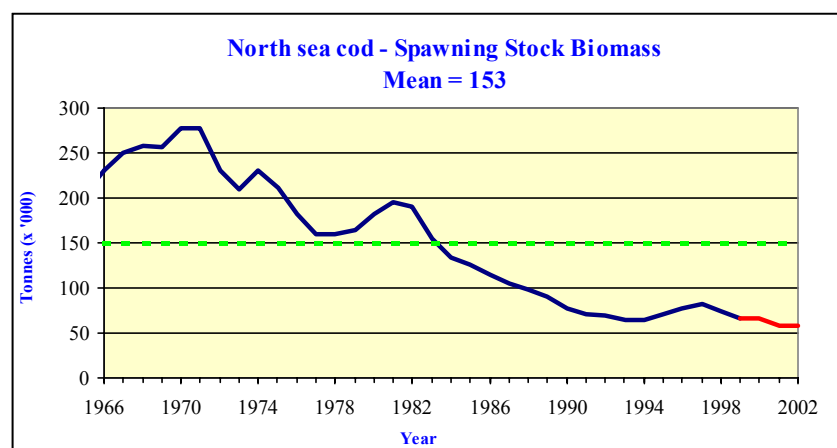
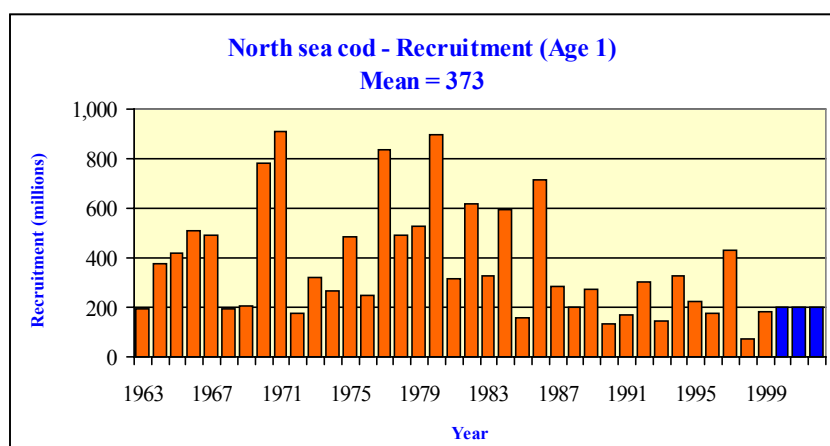
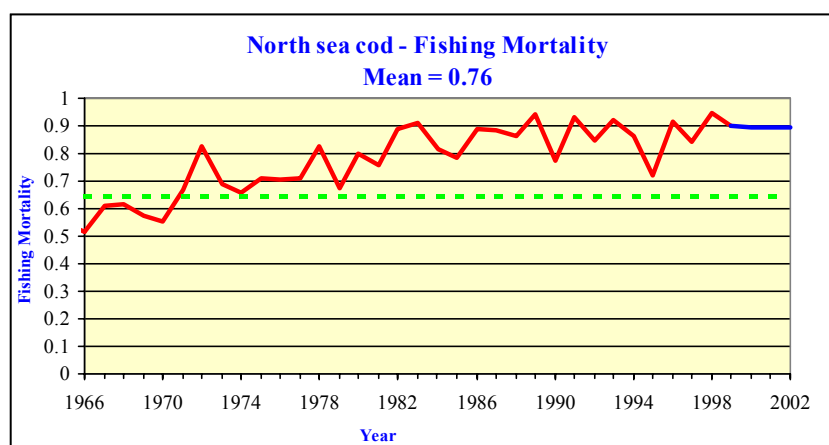
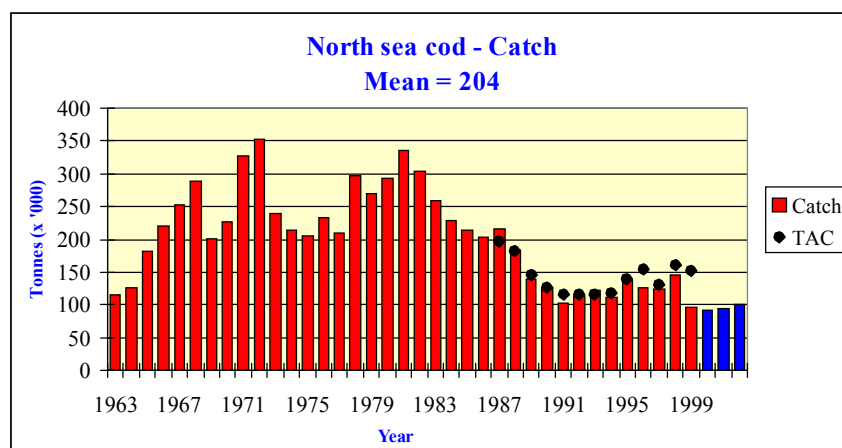
- There are serious concerns for this stock.
- The proposed precautionary reference points for this stock are $B_{pa} = 150,000t$ and $F_{pa} = 0.65$
- Current SSB is 66,700t, which is well below B_{pa}
- Current F is 0.90 which is above F_{pa}
- Fishing mortality has remained at about the historic high and above F_{pa} since the early 1980s and F in 1999 is estimated to be above F_{lim} .
- Except for the 1996 year-class, recruitment has been below average since 1987. The 1997 year-class was the poorest on record and the 1998 and 1999 year-classes are also estimated to be relatively poor. Preliminary indications suggest that the 2000 year-class is not large.
- The spawning stock is estimated to have been below B_{pa} since 1984, is presently below B_{lim} and is in a region where the chance of stock collapse is high.
- Short term predictions suggest that the predicted status quo landings are 93,000 t for 2000 and 96,000 t for 2001. This means a spawning biomass of 67,000 t at the start of 200 and 59,000 t in 2001. Landings in 2001 and SSB in 2002 will be dominated by the recruiting classes 1998 and 1999, while the importance of the previously strong 1996 year-class is predicted to decrease substantially.

CURRENT MANAGEMENT

- The agreed TACs for cod in Division IIIa (Skagerrak) and Sub-area IV TACs were 11,600 t and 81,000 t in 2000.
- The 2000 TAC was set at a level roughly corresponding to the upper limit implied by the advice from ICES in 1999.
- There is no TAC for cod set for Division VIIId alone. Landings from Division VIIId count against the overall TAC agreed for ICES Divisions VIIe-k
- There is a long term management plan for this cod stock based on the EU- Norway agreement (See ICES advice).

ADDITIONAL INFORMATION

1. In 1999, the EU minimum mesh size for towed gears in Sub-area IV and Division IIIa was 100mm, and 80mm in Division VIIId. Trawlers targeting *Nephrops* were permitted to use a 70mm cod end mesh but had to incorporate an 80mm square mesh panel in the trawl. *Nephrops* trawlers were also subject to white-fish by-catch limits.
2. In Sub-area IV< vessels targeting sole, which take a by-catch of cod were permitted to use a minimum cod end mesh size of 80mm, south of 55° N.
3. Trawlers in Division IVc were permitted to use a 90mm minimum cod end mesh in fisheries directed to whiting. The minimum size for towed gears in Norwegian waters is 100mm.
4. The minimum landing size for cod in all areas is 35cm for EU Member States, although the minimum landing size in Norwegian waters is 40cm.
5. New technical regulations for EU waters came into force on 1 January 2000. The regulation describes the minimum target species composition for different mesh size ranges. Cod in the whole of the NEAFC region 2 can now only be targeted by towed gears with a minimum cod end mesh size of 100mm. Cod will continue to form a by-catch in the fisheries using 80mm cod end meshes targeting sole, south of area 56°N, and in the fisheries targeting *Nephrops*. The minimum mesh size for fixed gears targeting cod remains unchanged at 120mm.
6. Landings for the combined areas for 1999 is 97,000 t. This comprises of 11,000t from Division IIIa, 78,300 t for IV and 6,900 t for Division VIIId.
7. The fishery is not important to Ireland.
8. There is no Irish sampling of this stock.



Haddock West of Scotland

(Division VIa)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES recommendation that fishing mortality on Division VIa haddock in 2000 should be reduced below the proposed F_{pa} corresponding to landings in 2001 of less than 11,200 t. This implies a high probability of SSB remaining above B_{pa} in the medium term. This translates to a TAC of 13,900 t (11,200 t for VIa and 2,700 t for VIb) with an associated Irish quota of 1,266 t in 2001.

STATE OF THE STOCK

- There are concerns about the state of this stock.
- Total international landings in 1999 were estimated to be at an all-time low of 15,600 t. Landings show a cyclical pattern in response to large incoming year-classes. Landings have been below average since 1994.
- Fishing mortality in 1999 ($F=0.62$) was above the proposed F_{pa} of 0.50. Fishing mortality has fluctuated widely with no long-term trend, but has been above F_{pa} in most years.
- The strong pulses in recruitment typical of haddock have weakened in recent years. The 1995 to 1998 year classes are well below average, the 1999 year class is above average and the biggest since 1992.
- Current SSB (31,700 t) is well above the proposed B_{pa} of 22,000 t. SSB fluctuates in response to large variations in year-class strength and reached the lowest observed value of 21,900 in 1991 following recruitment of two very weak year-classes. The SSB subsequently increased and has fluctuated between 30,000t and 45,000 t since 1993.
- SSB is predicted at 45,000 t in 2002 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.
- The 2000 TAC was 19,000 t with an associated Irish quota of 1,730 t of which no more than 1,590 t may be fished in Vb and VIa.
- There are no explicit management objectives or a management plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £13.1m in Sub-areas VI.
- The value of the 1999 Irish quota was £1.2m.
- The value of the 1999 international landings from Division VIa was £10.7m.
- The value of the 1999 Irish landings from Division VIa was £0.7m.
- 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 Total international landings in 1999 were estimated to be at an all-time low of 15,600 t.
- 3 Ireland took about 1,053 t in 1999 (down more than 25% on 1998).
- 4 Mis-reporting in 1992 to 1995 was a serious problem in the fishery for those countries with restrictive quotas. It has not been considered a serious problem in recent years.
- 5 Landings in 1999 were dominated by the UK (Scotland) with 86% of the International landings. France, Belgium and Norway take the remaining landings. Whilst the fishery is dominated by the UK (Scotland) light trawlers (~80% of landings), Scottish trawl effort has declined since 1976. French landings have also declined considerably since the late 1980s.
- 6 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. Management advice needs to be considered in that context.
- 7 Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
- 8 There is evidence from the Irish and Scottish ground fish surveys that the 1999 year-class is very strong. A very strong year-class is also expected in the North Sea and Celtic Sea.
- 9 The MFSD commenced a groundfish survey off Donegal in 1992. This survey produced very high catches of 0-group haddock in 1999 and corroborates Scottish results that indicate a very strong 1999 year-class. This year-class has not been fully included in this assessment since recruitment is at age 1. Management initiatives to reduce discarding of the 1999 year-class would be very beneficial and allow this stock to remain within safe biological limits and may even rebuild this stock.

- 10 Discarding is a problem in this stock and any measures to reduce discards would be beneficial. MFSD sampling suggests that about 12% of the total weight of fish caught (34% by number) was discarded in 1999. Almost all of the discarded catch sampled was undersized – only 4% of the discarded catch was of a landable size. High fishing mortality on immature haddock increases the susceptibility of the stock to overexploitation. Improved precision in estimates of levels of discarding would be beneficial.
- 11 MFSD sampling indicates that age groups 2, 3 and 4 dominate Irish landings. Haddock reach full maturity at age group 3.

ICES ADVICE

3.7.3.a

State of stock/fishery

This stock is considered to be harvested outside safe biological limits. SSB in 2000 is close to but above B_{pa} , and the fishing mortality in 1999 was above F_{pa} .

Spawning stock biomass has varied widely in response to large variations in year class strength and has fluctuated around 40 000 t since 1993. Fishing mortality has also been variable with no long-term trend but has been above F_{pa} in most years. The 1999 year-class is above average strength, but all other recent year classes have been close to average.

Management objectives:

No explicit management objectives are set for this stock. However, for any management objectives to meet precautionary criteria, F should be less than F_{pa} and the spawning stock biomass should be greater than B_{pa} .

Advice on management:

ICES recommends that fishing mortality on Division VIa haddock in 2000 should be reduced below the proposed F_{pa} corresponding to landings in 2001 of less than 11,200 t. This implies a high probability of SSB remaining above B_{pa} in the medium term.

Relevant factors to be considered in management:

Haddock are taken with cod and whiting in a mixed demersal fishery and a rebuilding plan for cod in VIa will have an impact on the haddock fishery in VIa. Also a continued haddock fishery will impact any cod rebuilding plan. The different trends in fishing mortality in these species over time suggest that some limited targeting can occur. If a directed haddock fishery occurs in 2001, its management plan should include measures to control by-catch and discarding of cod.

A high proportion (up to 47% in weight, 1990–1999) of the total haddock catch is discarded, and any measures to reduce discards would be beneficial to the stock and the fishery. National technical measures introduced to help protect the 1999 year class of haddock in the North Sea may also be beneficial in VIa.

Catch forecast for 2001:

Basis: $F(2000) = F_{SQ} = F(97-99) = 0.61$; $Catch(2000) = 20.8$, $Landings(2000) = 12.1$, $SSB(2001) = 39.8$

F(2001 on-wards)	Basis	Catch (2001)	Discards (2001)	Landings (2001)	SSB (2002)	Medium term (10 year) Probability (%) of $SSB < B_{pa}$
0	$F = 0$	0	0	0	70.2	< 5
0.12	0.2 $F(97-99)$	5.3	2.0	3.3	64.0	< 5
0.24	0.4 $F(97-99)$	10.2	4.0	6.2	58.4	< 5
0.37	0.6 $F(97-99)$	14.6	5.8	8.8	53.3	< 5
0.50	F_{PA}	18.6	7.4	11.2	48.7	5
0.61	$F(97-99)$	22.2	8.9	13.3	44.5	<10
0.73	1.2 $F(97-99)$	25.6	10.4	15.2	40.7	<20

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

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 using landings-at-age data, discard-at-age data, and indices from research vessel surveys. Some misreporting of landings has occurred in recent years, but this is not considered to have significantly affected results of current assessment.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 2000 (ICES CM 2001/ACFM:01).

Reference points:

ICES considers that:	ICES proposes that:
B_{lim} is 22 000 t, the lowest observed spawning stock estimated in previous assessments.	B_{pa} be set at 30 000 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 0.5. This F is considered to have a high probability of avoiding SSB below B_{pa} in the long term.

Technical basis:

$B_{lim} = B_{loss}$	$B_{pa} = B_{lim} * 1.4$
F_{lim} = not defined, but F_{loss} estimated to be in the range of 1.2-1.3	F_{pa} = see above

Catch data (Tables 3.7.3.a.1-2):

Year	ICES Advice	Predicted landings corresp. to advice	Agreed TAC ¹	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 ²	9.4 ²	20.8 ²
1993	70% of effort (89)	-	17.6	13	19.1 ²	16.9 ²	36.0 ²
1994	30% reduction in effort	-	16.0	10	14.2 ²	11.2 ²	25.4 ²
1995	Significant reduction in effort	-	21.0	13	12.4	8.8	21.1
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 ³	25.7	14	14.4	5.7	20.1
1999	F reduced to F_{pa}	14.3 ³	19.0	10	10.4	5.1	15.6
2000	Maintain F below F_{pa}	<14.9 ³	19.0				
2001	Reduce F below F_{pa}	<11.2 ³					

¹TAC is set for Divisions VIa and VIb (plus Vb1, XII & XIV) combined with restrictions on quantity that can be taken in VIa from 1990. ²Adjusted for misreporting. ³For VIa only. Weights in '000 t.

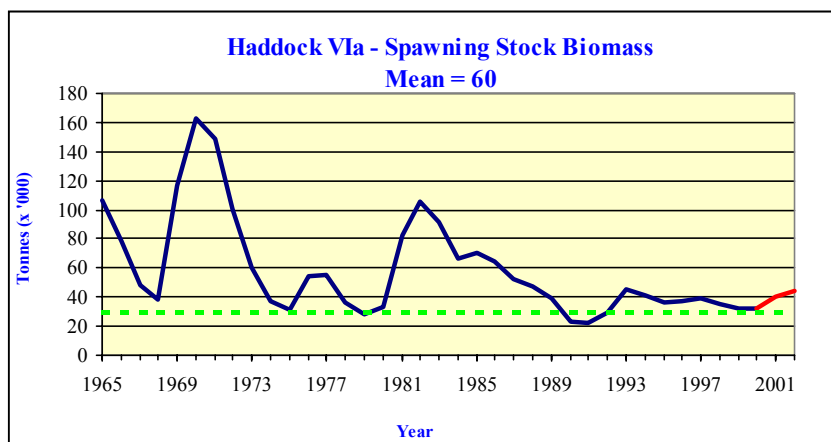
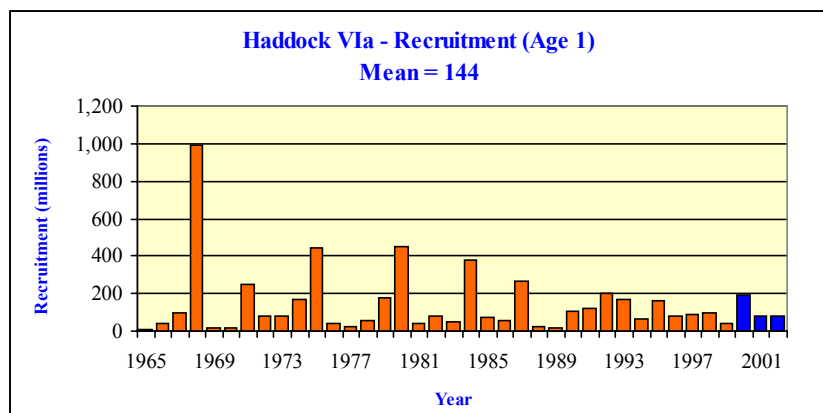
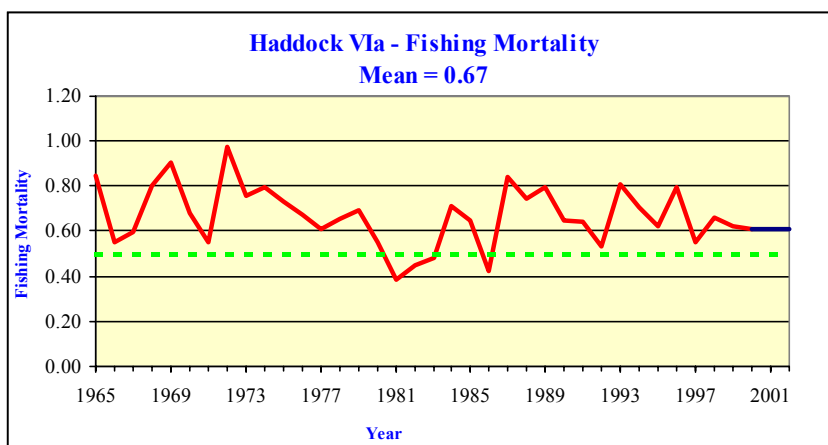
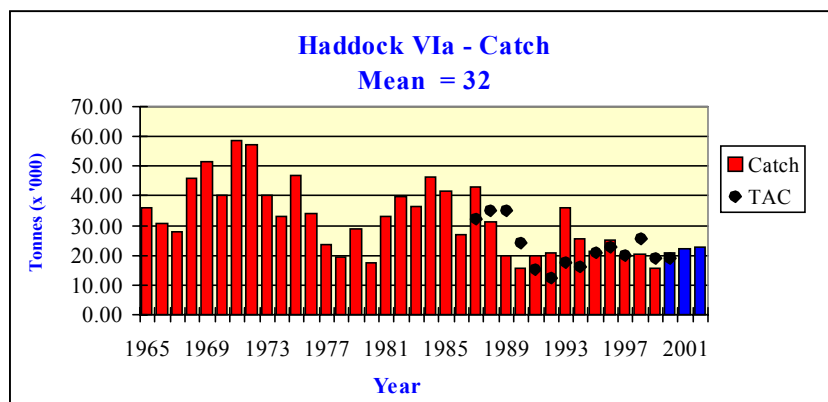


Table 3.7.3.a.1 Nominal catch (tonnes) of HADDOCK in Division VIa, 1985–1999, as officially reported to ICES.

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999 ¹
Belgium	7	-	29	8	9	-	9	1	7	1	+	1	3	2	2
Denmark	+	+	+	+	+	+	+	1	1	-	1	1	-	+	-
Faroe Islands	-	1	-	-	13	-	1	-	-	-	-	-	-	-	-
France	5,930	4,956	5,456	3,001	1,335 ^{1,2}	863 ^{1,2}	761 ^{1,2}	761	1,132	753	671	445	270	394 ¹	788
Germany, Fed.Rep.	38	25	21	4	4	15	1	2	9	19	14	2	1	1	2
Ireland	3,512	2,026	2,628	2,731	2,171	773	710	700	911	746	1,406	1,399	1447	1,352	n/a
Norway	76	45	13	54	74	46	12	72	40	7	13	16 ¹	21 ¹	28	18
Spain	166	-	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a
UK (E & W) ³	348	222	425	114	235	164	137	132	155	254	322	448	493	458	...
UK (N. Ireland)	-	155	1	35	...	...	...	...	...	...	...	...	...	...	...
UK (Scotland)	15,036	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	...
UK (total)															8,945
Total	25,113	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	9,755
Landings as used by	24,385	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	10,424
Discards	17,451	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
Unallocated landings	-728	-811	-72	39	-7,088	-2,689	495	4,421	6,389	5,042	-423	350	279	41	669
Total as used by WG	41,836	26,926	43,222	31,301	19,871	15,542	19,752	20,752 ¹	35,971	25,435	21,166	25,290	19,489	20,114	15,555

¹Preliminary.²Includes Divisions Vb(EC) and VIb.³1989–1999 N. Ireland included with England and Wales.

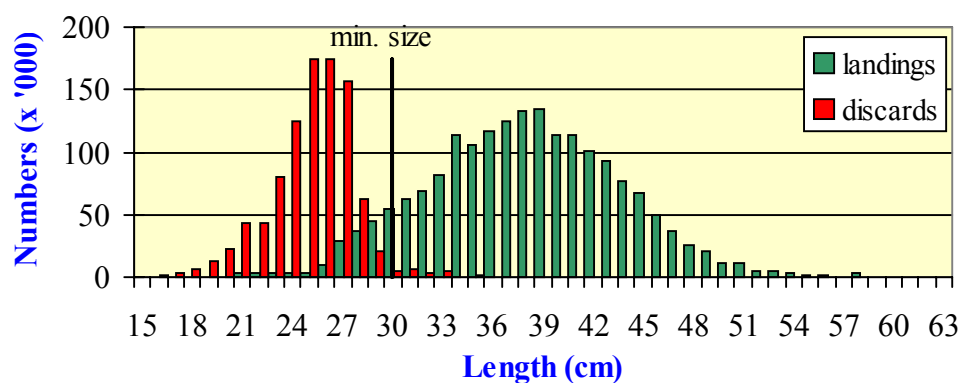
n/a = Not available.

Table 3.7.3.a.2 Haddock in Division VIa (West of Scotland)

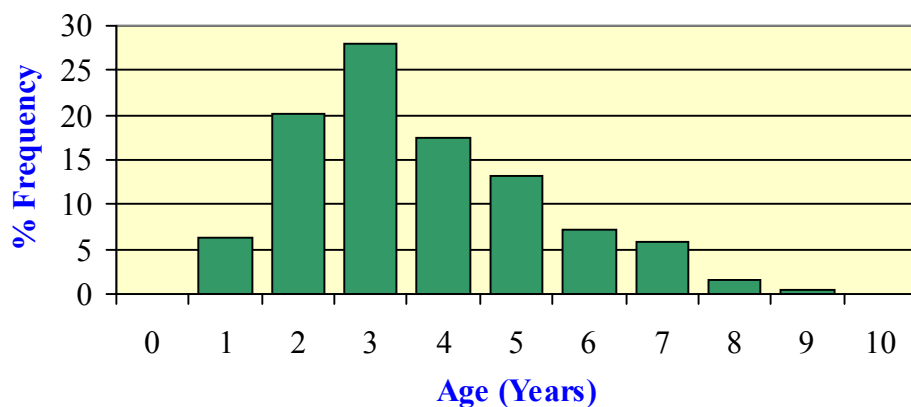
Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-6
1965	5.15	106.65	35.89	0.845
1966	36.93	78.88	30.59	0.554
1967	99.36	48.59	27.69	0.600
1968	986.64	37.73	45.80	0.805
1969	16.01	116.43	51.49	0.903
1970	17.91	163.12	40.33	0.682
1971	248.46	148.54	58.48	0.555
1972	77.10	101.00	57.46	0.973
1973	80.26	59.84	40.20	0.755
1974	171.42	37.04	33.34	0.793
1975	446.74	30.83	46.63	0.734
1976	37.08	54.36	34.07	0.671
1977	23.45	55.60	23.66	0.610
1978	60.34	35.80	19.51	0.655
1979	180.38	27.69	28.85	0.693
1980	449.27	32.79	17.48	0.551
1981	39.34	82.02	33.31	0.384
1982	81.33	105.68	39.68	0.446
1983	45.52	91.04	36.29	0.480
1984	376.87	66.47	46.36	0.712
1985	72.37	70.87	41.84	0.651
1986	54.47	63.99	26.93	0.426
1987	267.51	52.36	43.22	0.838
1988	22.81	47.59	31.30	0.746
1989	17.91	38.75	19.87	0.796
1990	105.95	23.42	15.54	0.649
1991	120.72	21.91	19.75	0.643
1992	203.18	29.14	20.75	0.532
1993	165.28	45.03	35.97	0.811
1994	64.75	41.09	25.44	0.708
1995	160.52	36.41	21.17	0.623
1996	78.54	36.79	25.29	0.798
1997	92.30	38.98	19.49	0.552
1998	93.58	35.37	20.11	0.660
1999	43.63 ¹	31.74	15.56	0.623
2000	193.09 ¹	31.70	.	.
Average	145.45	59.03	32.27	0.670
Unit	Millions	1000 tonnes	1000 tonnes	-

¹ RCT3 Estimate

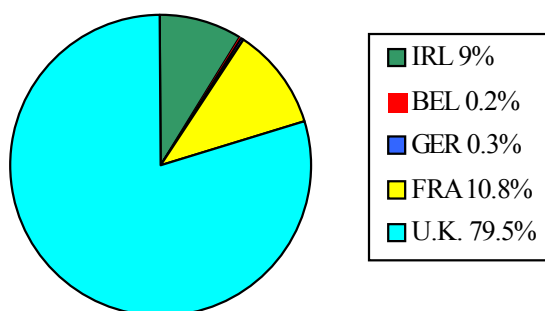
1999 Length Distribution of Irish Landings and Discards of Haddock in VIa



1999 Age Distribution of Irish Landings of Haddock in VIa



2000 Quota Allocations Haddock VI



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 2001 should be reduced below the proposed F_{pa} , corresponding to landings in 2001 of less than 2,700 t. This translates to a TAC of 13,900 t (11,200 t for VIa and 2,700 t for VIb) with an associated Irish quota of 1,266 t in 2001.

MFSD has serious concerns about the accuracy of this assessment since there has been large increases in effort at Rockall, possible mis-reporting of landings, considerable discarding and hi-grading in this fishery. Furthermore, part of the Division falls within international waters, leading to the possibility of an unrestricted fishery commencing in the area. MFSD advise that the fishery in international waters should be monitored.

STATE OF THE STOCK

- There are serious concerns about the state of this stock.
- Total international landings in 1999 were estimated at 5,400 t. Landings appear to have been relatively stable since 1997.
- Fishing mortality in 1999 ($F = 0.52$) was above the proposed F_{pa} of 0.40. Fishing mortality has declined since the late 1980's but has increased in 1999.
- Recruitment in the last four years has been less than average. Recruitment appears to be more stable than in other haddock stocks.
- SSB has been declining since 1996 to 7,000 t in 2000 and is now only below the proposed B_{pa} of 9,000 t. SSB seems to fluctuate in response to variations in recruitment strength.
- In the short term SSB will remain below B_{pa} at current levels of fishing mortality.

CURRENT MANAGEMENT

- The TAC Area covers Sub Area Vb, VI, XII, XIV.
- The assessment area covers Division VIb only.
- The 1999 TAC was 19,000 t with an associated Irish quota of 1,730 t of which no more than 1,590 t may be fished in Vb and VIa.
- There are no explicit management objectives or a management plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £16.1m in Sub-areas VI.
- The value of the 1999 Irish quota was £1.5m.
- The value of the 1999 international landings from Division VIb was £4.6m.
- The value of the 1999 Irish landings from Division VIb was £0.9m.
- This fishery is extremely important to the larger white fish vessels operating out of Killybegs and Greencastle. In the past this was largely a summer fishery but now these vessels target haddock all year round. It should be noted that the value of the fish taken at Rockall is higher than for VIa haddock.

ADDITIONAL INFORMATION

- 1 There are problems associated with the quality of catch and landings statistics which impact on the accuracy of the assessment.
- 2 Total international landings in 1999 were estimated at 5,400 t.
- 3 Ireland took about 1,020 t of the 1999 landings (up 316 t on 1998).
- 4 Mis-reporting and under-reporting are considered to be problems in this fishery, particularly by the large Scottish twin-rig vessels. In addition Rockall has opened up to non-EU countries and the fishery is currently unregulated. The availability and accuracy of data from non-EU sources may also be questionable.
- 5 The fishery is dominated by the UK (Scotland) trawlers (~75% of landings). 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.
- 6 Otter trawlers from Killybegs, and Greencastle have traditionally carried out the Irish haddock fishery. This is generally a mixed fishery targeting haddock, megrim and monkfish. Irish vessels are now exploiting this stock on a more regular basis and take about 19% of landings.
- 7 Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
- 8 Scottish surveys in Division VIb indicate that the 1997 year-class is below average. The Scottish survey that underpins this assessment is now biannual and there will be no survey data in 2000. It is therefore questionable as to whether a full assessment will be carried out in 2001.
- 9 MFSD do not conduct a groundfish survey at Rockall.

- 10 Although no discard data are available, there is likely to be substantial discarding of younger fish. There are reports that up to 80% of the haddock caught by some Scottish vessels is discarded. MFSD discard data indicates that high grading is also carried out by some Irish vessels.
- 11 There have been substantial recent changes in targeting practices in the fishery. In 1999 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.
- 12 MFSD sampling indicates that age groups 2 to 6 dominate Irish landings. Haddock do not reach full maturity until age group 3.

ICES ADVICE

3.7.3.b

State of stock/fishery

The stock is considered to be outside safe biological limits. Fishing mortality in 1999 was above the proposed F_{pa} and SSB is below the proposed B_{pa} in 2000.

Catch forecast for 2001

Basis $F(2000) = F_{SQ} = F(99) = 0.52$; Landings(2000) = 3.8; SSB(2001) = 6.3.

F(2001 onwards)	Basis	Catch (2001)	Landings (2001)	SSB (2002)	Medium term effect of fishing at given level
0.21	0.4 F(99)	1.6	1.6	10.0	N/A
0.31	0.6 F(99)	2.2	2.2	9.3	N/A
0.4	F_{PA}	2.7	2.7	8.8	N/A
0.42	0.8 F(99)	2.8	2.8	8.7	N/A
0.52	F(99)	3.3	3.3	8.2	N/A
0.63	1.2 F(99)	3.8	3.8	7.7	N/A

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

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. It is largely a haddock fishery, with relatively little catch of other species.

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. An unregulated fishery on part of the bank which now falls outside of the EU EEZ also started during 1999. Both of the developments continued into 2000, and are likely to continue into 2001.

63% of SSB in 2002 are based on assumed long term geo-

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 in 2001 should be reduced below the proposed F_{pa} , corresponding to landings in 2001 of less than 2,700 t.

Relevant factors to be considered in management:

The TAC covers Division VI, with a limit on how much of the catch may be taken in VIa but no such limit for VIb. In addition, part of VIb now falls within international waters where non EU vessels are not subject to TAC. This allow for an unregulated fishery in that area. A separate TAC applicable only to Division VIb, including international waters, would ensure sustainable fishery in VIb.

It is difficult to predict actual fishing mortality as fleet behaviour will depend on fishing opportunities elsewhere.

metric mean recruitment.

Analytical, age-based assessment using landings at age data, research vessel survey data and commercial CPUE data. Although no discard data are available, there is likely to be substantial discarding of younger fish. The short time series, variable fishing effort and misreporting of landings limits the precision of the assessment. The time series is too short to estimate the stock recruitment relationship for medium-term projections and estimation of fishing mortality reference points. Full maturity is assumed to be attained in age group 3.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 2000 (ICES CM 2001/ACFM:01).

Reference points as proposed by ICES 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	$B_{pa} = B_{loss} \times 1.4$
F_{lim} = could not be defined, due to uninformative stock recruitment data	F_{pa} = adopted by analogy with other haddock stocks.

Catch data (Tables 3.7.3.b.1–2.):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	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 ⁴	5.3
1993	80% of F(91)	3.0		4.1 ⁴	4.8
1994	If required, precautionary TAC	-		3.7 ⁴	5.7 ²
1995	No long-term gain in increasing F	5.1 ³		5.5 ⁴	5.6
1996	No long-term gains in increasing F	6.9 ³		6.8 ⁴	7.1
1997	No advice given	4.9 ³		5.2 ⁴	5.2
1998	No increase in F	4.9		5.1 ⁴	5.0
1999	Reduce F below F_{pa}	3.8		4.8 ⁴	5.4
2000	Reduce F below F_{pa}	< 3.5			
2001	Reduce F below F_{pa}	< 2.7			

¹TAC is set for Divisions VIa and VIb (plus Vb1, XII & XIV) combined with restrictions on quantity that can be taken in VIa from 1990. ²Including misreporting. ³Landings at *status quo* F. ⁴Incomplete data. Weights in '000 t.

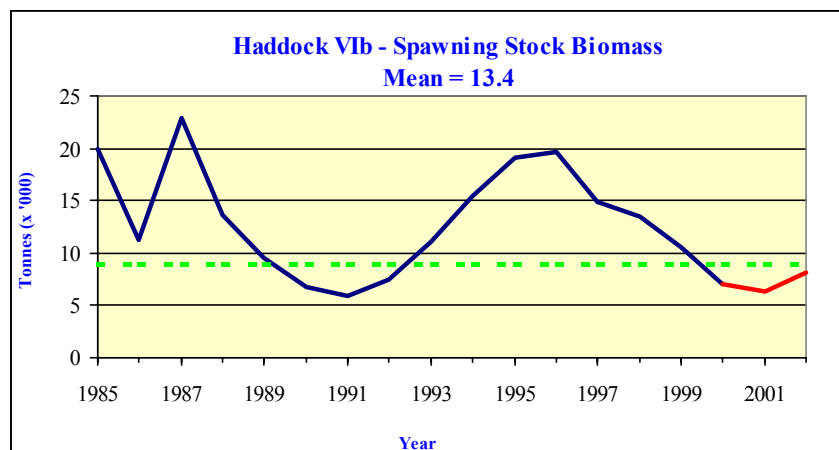
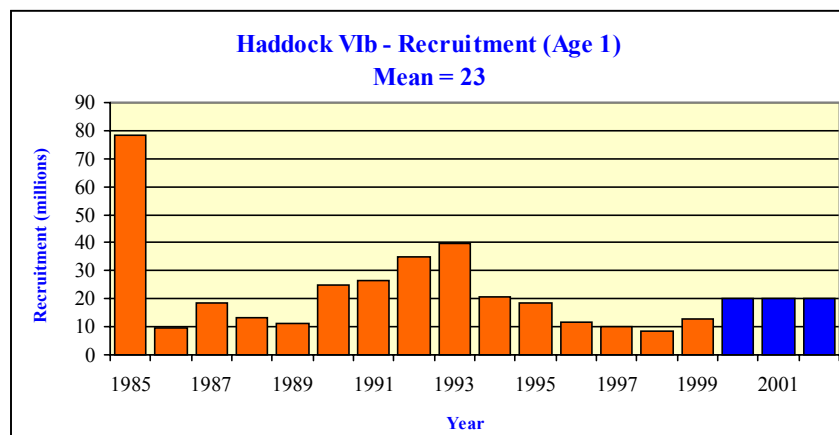
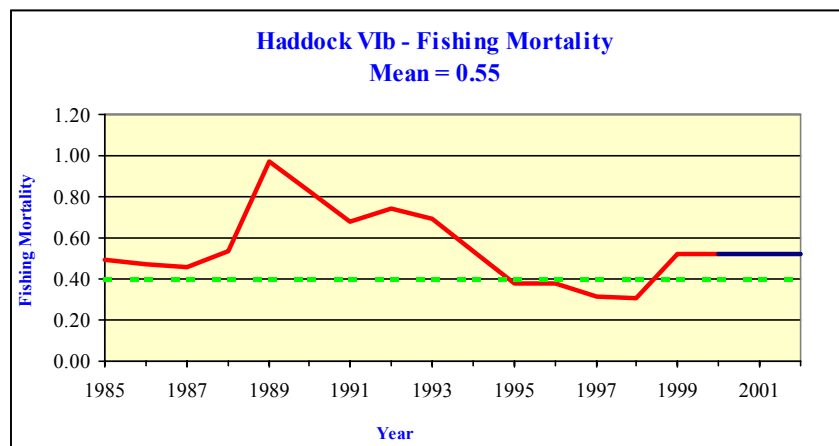
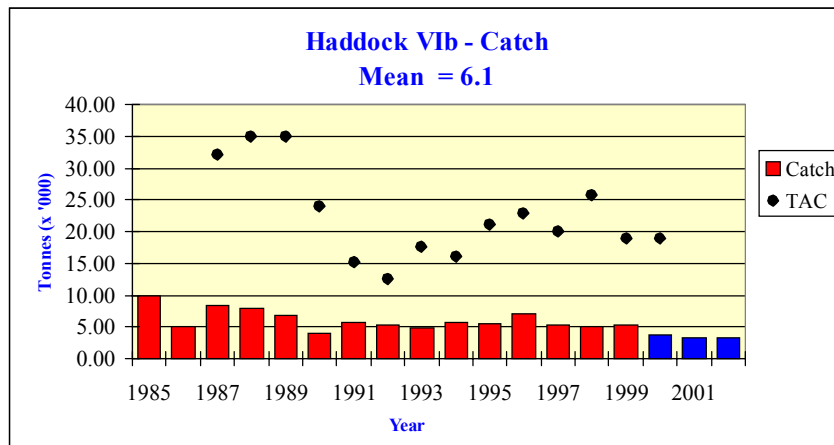


Table 3.7.3.b.1 Nominal catch (tonnes) of HADDOCK in Division VIb, 1985–1999, as officially reported to ICES.

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999 ¹
Faroe Islands	1	-	-	5	-	-	-	-	-	-	-	-	-	-	-
France	116	103	99	5	... ²	... ²	... ²	... ²	... ²	... ²	... ²	... ²	... ²	... ²	... ²
Germany, Fed. Rep.	4	-	-	4	1	-	-	-	-	-	-	-	-	-	-
Iceland	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Ireland	-	-	-	-	-	620	640	571	692	956	677	747	895	704	n/a
Norway	31	83	33	20	47	38	69	47	68	75	29	24 ¹	24 ¹	40 ¹	61
Portugal	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-
Russia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	458
Spain	892	756	371	245	337	178	187	51	-	-	28	1	22	n/a	n/a
UK (E & W) ³	1,876	703	1,271	753	272	238	165	74	308	169	318	293	165	561	288
UK (N. Ireland)	-	157	-	-	...	...	...	...	...	...	...	...	...	...	...
UK (Scotland)	6,397	2,961	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
Total	9,317	4,763	7,995	7,574	6,643	8,213	5,853	4,520	4,113	3,735	5,491	6,818	5,220	5,077	4,777
Unallocated catch	493	251	437	355	85	-	-198	800	671	1,998	96	257	-54	-93	581
WG estimate	9,810	5,014	8,432	7,929	6,728	3,884	5,655	5,320	4,784	5,733	5,587	7,075	5,166	4,984	5,358

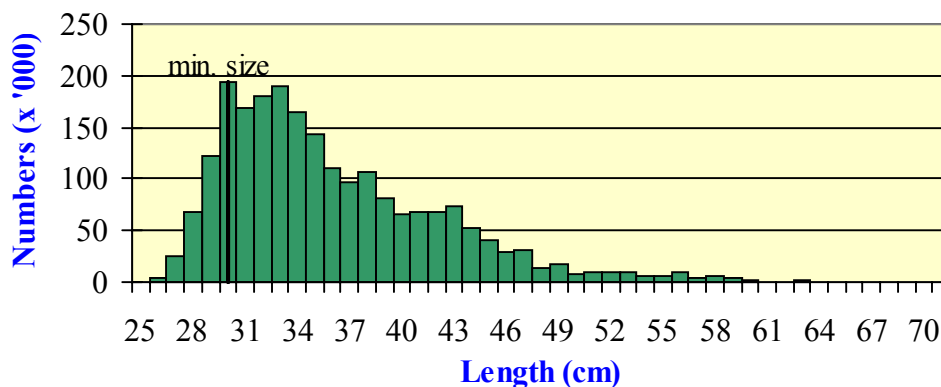
¹Preliminary.²Included in Division VIa.³1989–1999 N. Ireland included with England and Wales.

n/a = Not available.

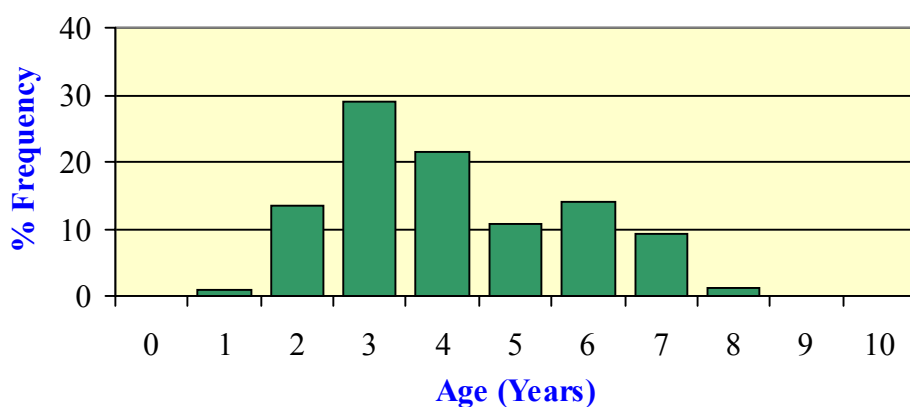
Table 3.7.3.b.2 Haddock in Division VIb (Rockall)

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 2–5
1985	78.38	19.92	9.81	0.492
1986	9.28	11.30	5.01	0.473
1987	18.59	22.91	8.43	0.460
1988	13.40	13.62	7.93	0.534
1989	11.05	9.57	6.73	0.970
1990	24.82	6.67	3.88	0.828
1991	26.51	5.97	5.66	0.682
1992	35.13	7.38	5.32	0.743
1993	39.49	11.05	4.78	0.693
1994	20.61	15.45	5.73	0.534
1995	18.30	19.04	5.59	0.378
1996	11.86	19.59	7.08	0.376
1997	10.08	14.96	5.17	0.313
1998	8.68	13.45	4.98	0.306
1999	12.97	10.52	5.36	0.523
2000	20.01	7.02	.	.
Average	22.45	13.02	6.10	0.554
Unit	Millions	1000 tonnes	1000 tonnes	-

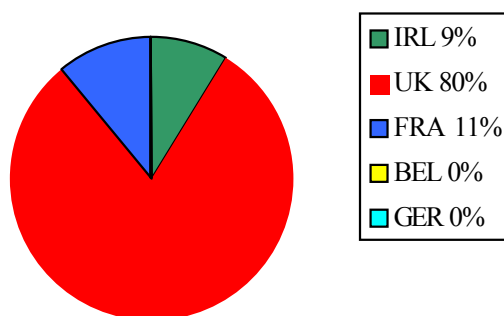
1999 Length Distribution of Irish Landings of Haddock in VIb



1999 Age Distribution of Irish Landings of Haddock in VIb



2000 Quota Allocations Haddock VIb



West of Ireland and in the 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 and ICES recommend that there be no increase in catch until the response of the stock to the fishery is known.

This translates to a TAC in 2001 for Sub Areas VII, VIII, IX and X of not more than 13,200 t with an associated Irish quota of not more than 2,930 t.

STATE OF THE STOCK

- The status of this stock is unknown.
- No new assessment of this stock was undertaken in 2000 and the previous assessment had been undertaken with limited data. The results were not considered to be a valid basis for scientific advice.
- Landings have increased markedly during the 1990s following a series of very strong year-classes, particularly the 1995 year-class. Total international landings in 1999 were estimated at 5,200 t.
- The TAC for this stock is not restrictive and international landings in 1998 were about one-third of the TAC. If a TAC were to be set in line with recent landings (*circa.* 8,000 t), there would be severe implications for the Irish quota.

CURRENT MANAGEMENT

- The TAC Area traditionally covers Sub Areas VII, VIII, IX and X. In 2000, an additional TAC allocation of 3,400 t was allowed for Division VIIa. This additional TAC was allocated according to the mean cod and whiting relative stability keys for VIIa.
- The assessment area covers Division VIIa only. There is no assessment for Divisions VIIb-k.
- In 2000, the TAC for Divisions VII, VIII, IX, and X was 13,200 t with an associated Irish quota of 2,930 t (excluding Division VIIa).
- There are no explicit management objectives or a management plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £17.5m in Sub-area VII.

- The value of the 1999 Irish quota was £3.9m.
- The value of the 1999 international landings from Divisions VIIb-k was £4.5m.
- The value of the 1999 Irish landings from Divisions VIIb-k was £1.8m.
- 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 There is no current assessment on this stock and the state is unknown.
- 2 Total international landings in 1999 were estimated at 5,200 t.
- 3 Irish landings in 1999 were about 2,033 t (down 25% on 1998).
- 4 There is no information on levels of mis-reporting for this stock.
- 5 The French and Irish bottom trawl fleets dominate the fishery taking 95% of the catch. This fishery remains very important to Ireland with Irish catches at about 40% of total landings.
- 6 Otter trawlers from Dunmore East, Union Hall, Castletownbere, Dingle and Rossaveal have traditionally carried out the Irish haddock fishery. Haddock are caught in a mixed demersal fishery targeting haddock, cod and whiting. Management advice needs to be considered in that context.
- 7 Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
- 8 The MFSD West Coast Groundfish Survey has been conducted in Divisions VIIb & c and VIIj & k since 1993. Indications from the 1999 West Coast survey and anecdotal information about discarding in trawl fisheries suggest a strong incoming year-class in this stock. Management efforts should be directed at protecting this incoming year-class from recruitment over-fishing.
- 9 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.
- 10 MFSD discard sampling suggests that about 14% of the total weight of fish caught (7% by number) was discarded. Most of the discarded catch sampled was undersized – only 4% of the discarded catch was of a landable size. High fishing mortality on immature haddock increases the susceptibility of the stock to

overexploitation . Improved precision in estimates of levels of discarding would be beneficial.

- 11 MFSD sampling indicates that age groups 2, 3 and 4 dominate Irish landings. Haddock reach full maturity at age group 3.

ICES ADVICE

3.10.2.a

State of stock/fishery

There is no current assessment on this stock and the state is unknown.

Advice on management:

ICES recommends that a management plan including monitoring of the development of the stock and of the fishery should be developed and implemented. ICES recommends that there be no increase in catch until the response of the stock to the fishery is known.

Relevant factors to be considered in management:

This stock is presently managed by means of a TAC set for the whole of areas VII, VIII, IX and X. The TAC currently includes an additional allocation for area VIIa. The current TAC is not restrictive on catches from this area and creates the opportunity for misreporting from other areas.

Elaboration and special comment:

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.

An assessment was attempted in 1999 but the results were not considered to be a valid basis for scientific advice.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 2000 (ICES CM 2001/ACFM:01).

Catch data (Tables 3.10.2.a.1-2):

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official Landings ²	ACFM landings
1987	Not dealt with			3.0	1.3
1988	Not dealt with			4.0	0.7
1989	Not dealt with			4.2	0.6
1990	Not dealt with			2.9	0.6
1991	Not dealt with			2.6	0.6
1992	Not dealt with			2.9	0.7
1993	Not dealt with			3.4	3.2
1994	Not dealt with			4.1	3.7
1995	Not dealt with		6	4.5	4.1
1996	Not dealt with		7 ³	6.6	6.2
1997	Not dealt with		14	10.3	9.7
1998	Not dealt with		20	7.1	6.8
1999	Not dealt with		22 ⁵	3.1	5.2
2000	No expansion of catches		16.6 ⁶		
2001	No expansion of catches				

¹Applies to Sub-areas VII, VIII, IX and X. ²Possible underestimates due to misreporting. ³Increased in-year to 14000 t.

⁴Incomplete official statistics. ⁵Includes separate Division VIIa allocation of 4,990 t. ⁶Includes separate Division VIIa allocation of 3,400 t Weights in 000' tonnes.

Table 3.10.2.a.1 Nominal landings of HADDOCK in Divisions VIIb,c,e-k, 1984-1999, 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 ^a	2,110 ^a	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

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 ¹
Ireland	1,073	1,262	908	966	1,468	2,789	2,788	n/a
Norway	26	-	17	64	38 [*]	31 [*]	49	71
Netherlands	-	-	-	-	-	-	3	-
Spain	-	-	-	19	48	54	n/a	n/a
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	7,101	3,125
Unallocated		-180	-375	-364	-477	-527	-293	2,033
Total figures used by Working Group	-	3,228	3,702	4,104	6,176	9,743	6,808	5,158

^{*} Preliminary .

^a Reported as total landings for Sub-areas VII & VIII.

¹ Includes the whole of area VII.

n/a = not available

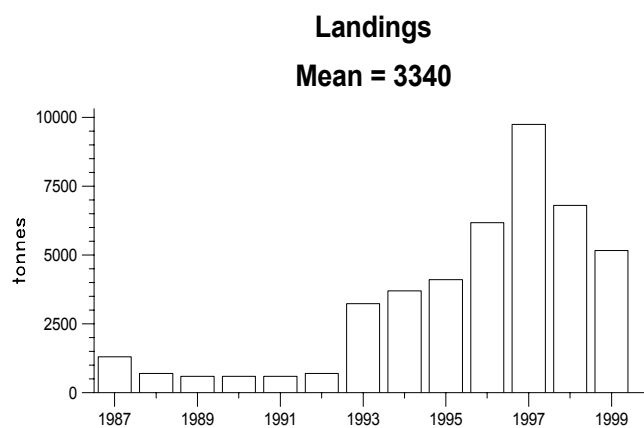
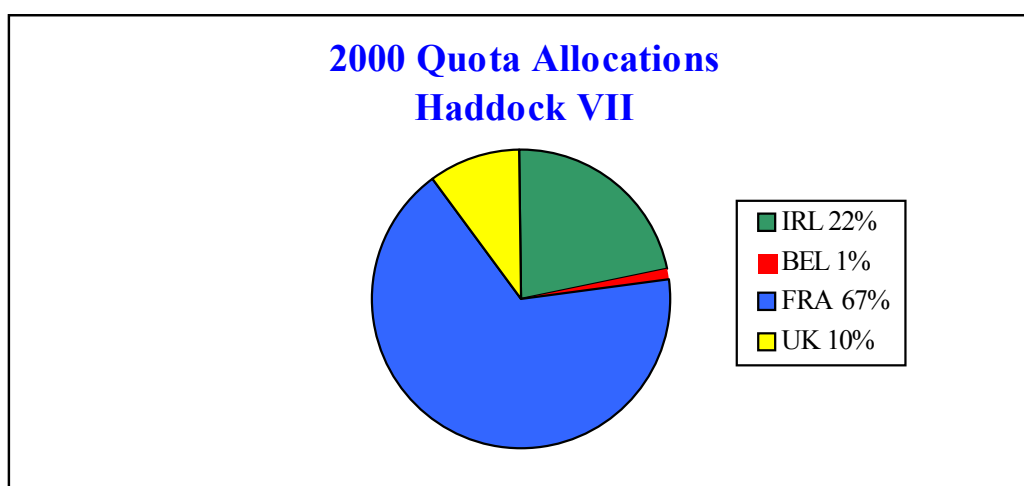
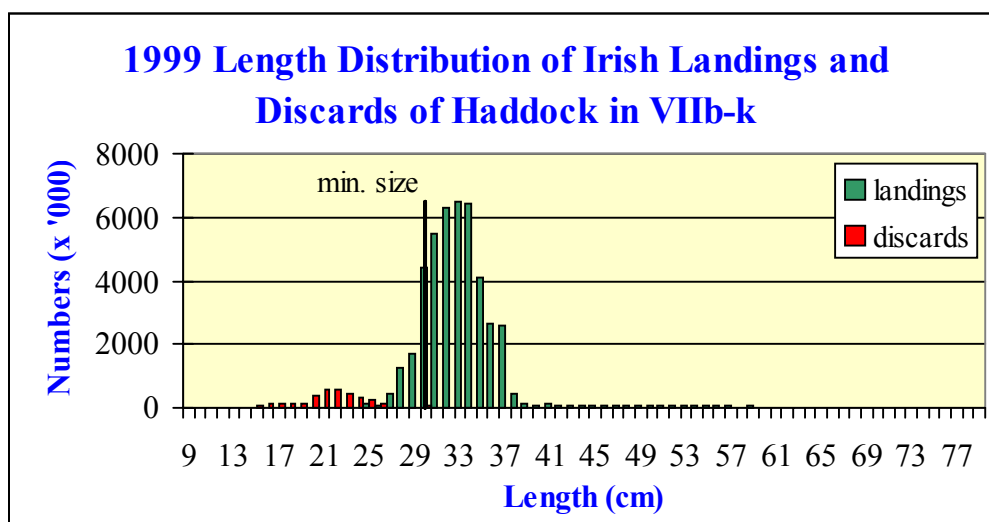


Table 3.10.2.a.2 Haddock in Divisions VIIb-k.

Year	Landings
1987	1,300
1988	700
1989	600
1990	600
1991	600
1992	700
1993	3,228
1994	3,702
1995	4,104
1996	6,176
1997	9,743
1998	6,808
1999	5,158
<hr/>	
Average	3,340
<hr/>	
Unit	tonnes



Irish Sea Haddock

(Division VIIa)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES recommendation that fishing mortality in 2001 should be reduced to below F_{pa} , corresponding to a catch in 2001 of less than 1,710 t. If the separate TAC allocation for Division VIIa continues, based on the relative stability key for cod/whiting, this translates to an Irish quota of 740 t in 2001.

STECF supports the separate allocation of TAC for haddock in Sub-area VIIa.

STATE OF THE STOCK

- There are concerns about the state of this stock.
- Landings have increased five-fold since 1993 following recruitment of the very large 1994 and 1996 year-classes. The estimated total international landings in 1999 of 4,100 t were the second highest since 1993.
- The fishing mortality of 1.15 estimated in 1999 is well above the proposed F_{pa} of 0.50. Fishing mortality has remained very high throughout the assessment period.
- Occasional pulses of strong recruitment have resulted in opportunistic fisheries lasting only for comparatively short periods. A population outburst occurred in the 1990s, with strong year-classes in 1994 and 1996 causing a large increase in SSB and catches. Recent recruitment has been near average.
- B_{pa} is not defined for this stock. SSB has increased seven-fold since 1993 but began to decline in 1999. SSB is predicted to decline in 2000 before stabilising in 2001 and 2002 at the current level of fishing mortality.

CURRENT MANAGEMENT

- The TAC Area traditionally covers Sub Areas VII, VIII, IX and X. However, in 1999 and 2000, a separate TAC allocation was made for Division VIIa, allowing additional catches to be taken from this Division. This additional TAC was allocated according to the mean cod and whiting relative stability keys for VIIa.
- The 2000 additional TAC allocation for Division VIIa was 3,400 t with an associated Irish quota of 1,472 t.
- The assessment area covers Division VIIa only.

- There are no explicit management objectives or a management plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £2.2m in Division VIIa.
- The value of the 1999 Irish quota was £1.0m.
- The value of the 1999 international landings from Division VIIa was £1.8m.
- The value of the 1999 Irish landings from Division VIIa was £0.7m.
- 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 six 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.
- 2 The estimated total international landings in 1999 of 4,100 t.
- 3 Irish landings in 1999 Ireland were low at 759 t.
- 4 The present high availability of haddock in VIIa may have resulted in substantial mis-reporting and/or discarding due to large by-catches of haddock taken by fleets with restrictive allocations available to them. MFSD data indicate that up to 53% by weight of haddock caught are discarded on some vessels.
- 5 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.
- 6 Otter trawlers operating from Howth have traditionally taken Irish catches and normally account for 18-45% of landings.
- 7 Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
- 8 MFSD commenced a groundfish survey in the Irish Sea and Celtic Sea on RV *Celtic Voyager* in 1997. The 1998 and 1999 surveys produced very good catches of juvenile and adult haddock confirming the current high stock size.
- 9 MFSD believes that there are no known biological reasons why haddock production could not be sustained in the Irish Sea. However the large fluctua-

tions in recruitment characteristic of haddock stocks may mean that landings will fluctuate greatly with the strength of incoming year-classes. MFSD therefore supports ICES recommendations that recent strong year-classes should be allowed to grow, mature and reproduce. This can only occur if fishing mortality is reduced substantially.

- 10 MFSD sampling indicates that age groups 2, 3 and 4 dominate Irish landings. Haddock reach full maturity at age group 3.

ICES ADVICE

3.8.3

State of stock/fishery

This stock is harvested outside of safe biological limits. Fishing mortality in 1999 was well above F_{pa} . Occasional pulses of strong recruitment have resulted in opportunistic fisheries lasting only for comparatively short periods. A more sustained population outburst has occurred in the 1990s, with strong year classes in 1994 and 1996 causing a large increase in spawning biomass and catches.

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} .

Advice on management:

ICES recommends that fishing mortality in 2001 should be reduced to below F_{pa} , corresponding to a catch in 2001 of less than 1,710 t.

Relevant factors to be considered in management:

A TAC is set for haddock for the whole of areas VII, VIII, IX and X. The present high availability of haddock in 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.

The haddock stock in the Irish Sea could be sustained if recent strong year-classes are allowed to realise their potential for growth, and contribute to SSB. This would only occur if fishing mortality is reduced substantially.

The haddock stock is mainly confined to the western Irish Sea where important mixed-species fisheries for *Nephrops*, whiting 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.

The current directed fishery for haddock in the Irish Sea is likely to generate by-catches of cod in the same area. The management plan for haddock should include provisions to keep this by-catch to the lowest practical level.

Catch forecast for 2001:

Basis: $F(2000) = F_{sq} = F(97-99) = 1.21$, $Catch(2000) = 2.89$, $Landings(2000) = 2.89$, $SSB(2001) = 3.96$.

F(2001 on-wards)	Basis	Catch (2001)	Landings (2001)	SSB (2002)	Medium term effect of fishing at given level
0.24	0.2 F(97-99)		0.89	6.73	N/A
0.48	0.4 F(97-99)		1.62	5.85	N/A
0.5	F_{pa}		1.71	5.79	N/A
0.72	0.6 F(97-99)		2.22	5.12	N/A
0.97	0.8 F(97-99)		2.72	4.51	N/A
1.21	1.0 F(97-99)		3.14	4.00	N/A
1.45	1.2 F(97-99)		3.49	3.57	N/A

Weights in '000 t.

No medium-term analyses possible with this stock.

Shaded scenarios considered inconsistent with the precautionary approach.

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 coincides 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.

Analytical age-based assessment using landings at age and indices from research surveys. The time series of data is short and recent F is likely to be poorly estimated.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 2000 (ICES CM 2001/ACFM:01).

Reference points as proposed by ICES in 1998:

ICES considers that:	ICES proposes that
There is currently insufficient stock data for defining appropriate reference points, in view of the rapid expansion of the stock size over a short period.	F_{pa} be set at 0.5 by analogy with other haddock stocks.

Catch data (Tables 3.8.3.1–2):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings ²	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 ⁶	0.703
1993	Not dealt with			0.730	0.813
1994	Not dealt with			0.681	1.043
1995	Not dealt with		6 ¹	0.841	1.753
1996	No advice		7 ¹	1.453	3.023
1997	Means of setting catch limits required		14 ¹	1.925	3.391 ⁶
1998	Catch limit for VIIa	3.0	20 ¹	3.015	4.902
1999	No increase in F ; Catch limit for VIIa	7.0	4.99	1.596 ⁴	4.109
2000	Reduce F below F_{pa}	<2.8	3.4		
2001	Reduce F below F_{pa}	<1.7			

Weights in 1000 tonnes. ¹Applies to Sub-areas VII, VIII, IX and X. ²Possible underestimates due to misreporting. ³Increased in-year to 14000 t. ⁴Incomplete official statistics.

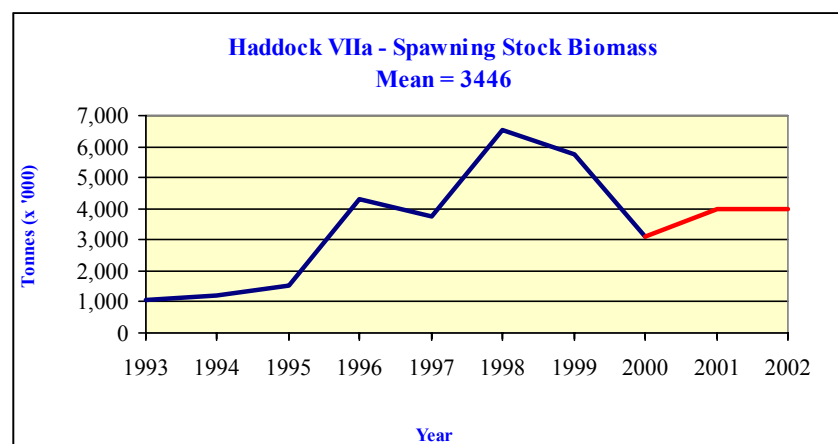
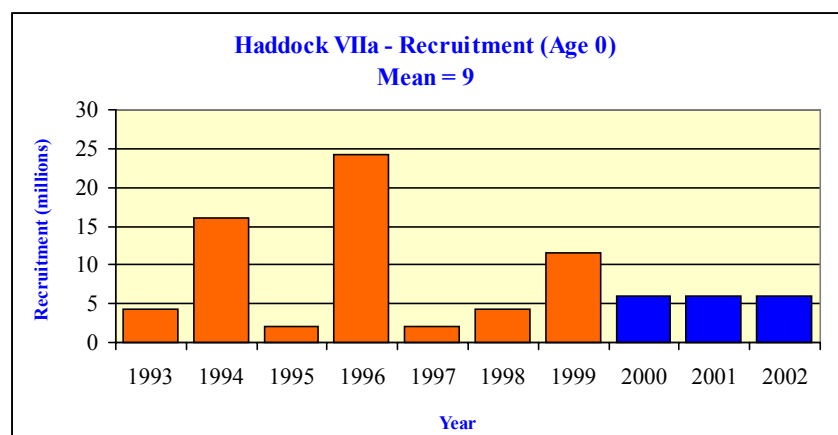
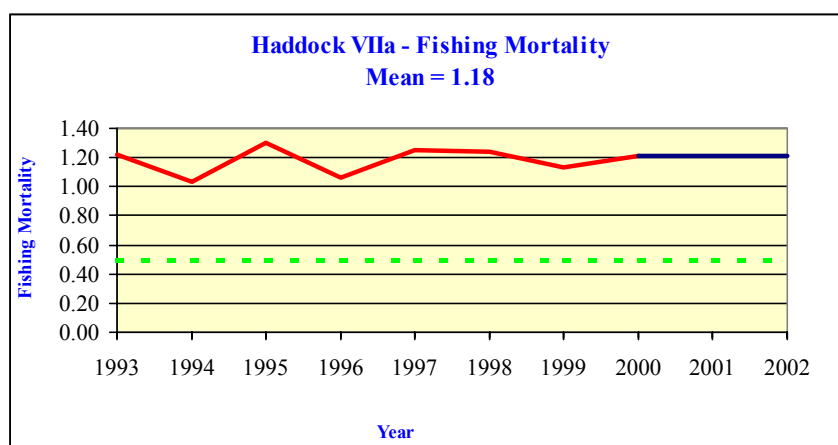
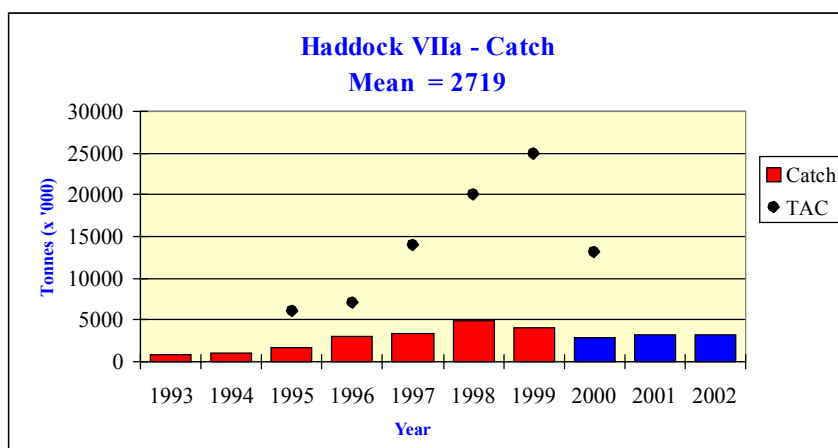


Table 3.8.3.1 Nominal landings of HADDOCK in Division VIIa, 1984–1999, as officially reported to ICES.

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) ¹	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*
Belgium	8	18	22	32	34	55	104	53
France	26	41	22	58	105	74	86	n/a
Ireland	251	252	246	320	798	1,005	1,699	n/a
Netherlands	-	-	-	-	1	14	10	5
UK (England & Wales) ¹	244	260	301	294	463	717	1,023	...
UK (Isle of Man)	13	19	24	27	38	9	13	
UK (N. Ireland)	...	...	...	...	...	...	...	...
UK (Scotland)	114	140	66	110	14	51	80	...
United Kingdom								1,538
Total	656	730	681	841	1,453	1,925	3,015	1,596
Unallocated	47	83	362	912	1,570	1,466	1,887	2,513
Total figures used by Working Group	703	813	1,043	1,753	3,023	3,391	4,902	4,109

*Preliminary.

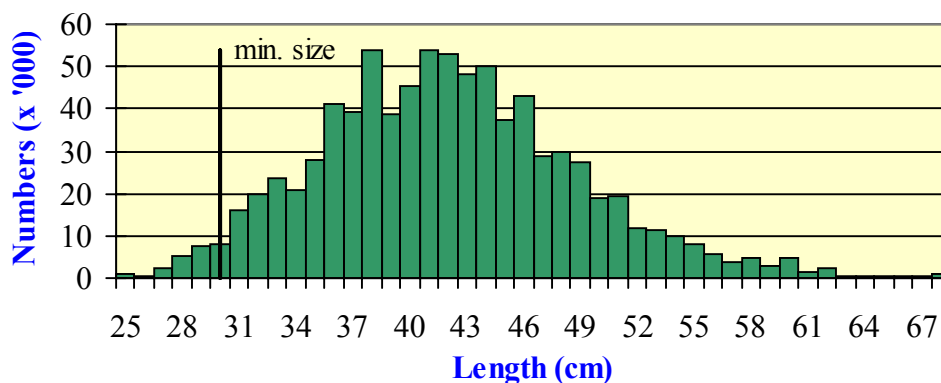
¹1989–1999 Northern Ireland included with England and Wales.

n/a = not available.

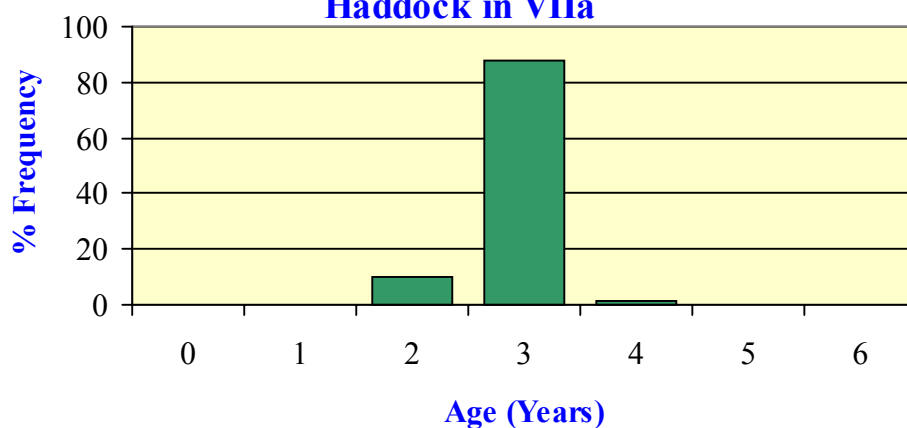
Table 3.8.3.2 Haddock in Division VIIa (Irish Sea)

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-4
1993	4.35	1.06	0.81	1.219
1994	15.96	1.18	1.04	1.029
1995	2.05	1.52	1.75	1.300
1996	24.15	4.31	3.02	1.067
1997	2.05	3.73	3.39	1.247
1998	4.27	6.56	4.90	1.244
1999	11.49	5.76	4.11	1.130
2000	5.88	3.12	.	.
Average	8.78	3.40	2.72	1.177
Unit	Millions	1000 tonnes	1000 tonnes	-

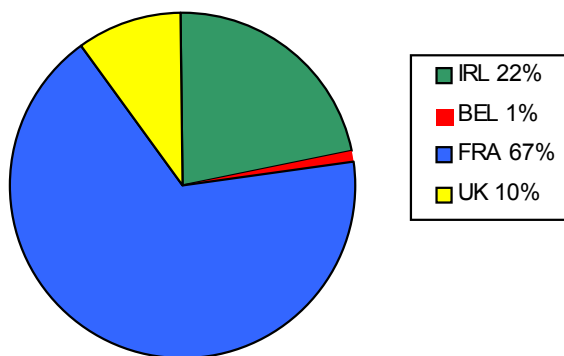
1999 Length Distribution of Irish Landings of Haddock in VIIa



1999 Age Distribution of Irish Landings of Haddock in VIIa



2000 Quota Allocations Haddock VII



West of Scotland Whiting

(Division VIa)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES recommendation that fishing mortality should be reduced below the proposed F_{pa} , corresponding to landings in 2001 of less than 4,200 t. This is expected to increase SSB above B_{pa} in the short term. This translates to an Irish quota of less than 1,221 t.

MFSD further advises that measures to reduce discarding should be implemented. MFSD agrees with the ICES advice that this stock is outside safe biological limits.

MFSD also advise that whiting are taken as a by-catch with whiting and haddock in a mixed demersal fishery and that a rebuilding plan for cod in VIa will have a positive effect on the stock.

STATE OF THE STOCK

- There are serious concerns about the state of this stock.
- Catches have declined continuously since the mid-1980s.
- The estimated fishing mortality in 1999 of 0.98 exceeds the proposed F_{pa} of 0.60 and is very close to the proposed F_{lim} of 1.0. Fishing mortality was also more variable prior to the mid-1980s, but since then it has been less variable at around the average, showing an increasing trend since 1994.
- There were large fluctuations in recruitment prior to the mid-1980s, but since then it has been lower and less variable. Strong year-classes have not occurred during the 1990s.
- The estimated SSB in 2000 of 14,100 t is well below the proposed B_{pa} of 22,000 t and smaller than the proposed B_{lim} of 16,000 t. SSB declined during the 1980s and since then has been lower but more stable between years. SSB has been below B_{pa} since 1994. Whilst SSB has increased from the historic 1998 low it is unlikely at the current levels of fishing mortality that this increase in SSB will allow the stock to recover.
- The stock will increase but will remain below B_{pa} in the short term at current levels of fishing mortality.

CURRENT MANAGEMENT

- The TAC area covers Divisions VIb and Sub-areas

VI, XII and XIV.

- The assessment area covers Division VIa only but landings from other areas are negligible.
- The TAC in 2000 was 4,300 t with an associated Irish quota of 1,250 t.
- There are no explicit management objectives or a management plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £3.7m in Sub-areas VI.
- The value of the 1999 Irish quota was £1.1m.
- The value of the 1999 international landings from Division VIa was £2.7m.
- The value of the 1999 Irish landings from Division VIa was £0.7m.
- 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 and discards-at-age data, as well as indices from research vessel surveys and is considered adequate.
- 2 Total international catch was estimated to be 7,200 t of which 4,600 t were landed.
- 3 Ireland landed 1,121 t (up 18% on 1998). The 1999 catch was marginally lower than that in 1998 and was the lowest recorded.
- 4 In the past, mis-reporting was considered a problem in this fishery. This year the landings data used in the assessment have not been adjusted for mis-reporting. While some degree of mis-reporting is still suspected to have occurred, particularly in the years 1992-1995, it is considered to have been less of a problem than previously thought.
- 5 The fishery is dominated by the UK-Scotland (70-75% of 1998 landings) and Irish (15-20% of 1998 landings) fleets. French whiting landings have declined considerably since the late 1980's.
- 6 Vessels fishing out of Killybegs and Greencastle take most of the Irish catch of this stock. Most of these landings are taken from the Donegal Bay, Tory and Aran and Stanton Banks grounds. Whiting is taken with cod and haddock in mixed demersal fisheries and management advice should be considered in that context.
- 7 Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
- 8 MFSD conducts annual ground fish surveys in Divi-

sion VIa (the West Coast Groundfish Survey). The survey has yielded very low catches of older whiting in the last six years and confirms the poor state of this stock.

- 9 MFSD discard estimates, whilst preliminary, suggest that about 25% of the weight of the total catch is discarded. Due to low market demand there is considerable discarding of small whiting MFSD sampling suggest that ~44% of the total number caught are discarded. This presents a major impediment to stock recovery. Almost 90% of the discarded fish sampled by MFSD were above the minimum legal length.
- 10 MFSD sampling indicates that fish in age groups 2 and 3 dominate Irish landings of whiting from Divisions VIa. The lack of older fish in the landings confirms the poor state of the stock and suggests the prognosis for this stock is poor.

ICES ADVICE

3.7.4.a

State of stock/fishery

The stock outside of safe biological limits. Fishing mortality is estimated to exceed the proposed F_{pa} . Spawning stock is below the proposed B_{pa} . There has been no trend in recruitment during the 1990s, but a gradual increase in F has reduced SSB, which has been below B_{lim} since 1998.

Management objectives:

No explicit management objectives are set for this stock. However, for any management objectives to meet precautionary criteria, F should be less than F_{pa} and the spawning stock biomass should be greater than B_{pa} .

Advice on management:

ICES recommends that fishing mortality should be reduced below the proposed F_{pa} , corresponding to landings in 2001 of less than 4 200 t. This is expected to increase SSB above B_{pa} in the short term.

Relevant factors to be considered in management:

Whiting are taken as a by-catch with cod and haddock in a mixed demersal fishery and a rebuilding plan for cod in VIa will have a positive effect on the stock and fishery for whiting in VIa. Also a continued whiting fishery will impact any cod rebuilding plan. The different trends in fishing mortality in these species over time suggest that the stocks can to some extent be harvested independently.

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. Measures to improve the exploitation pattern would be beneficial to the stock and to the fishery. National technical measures introduced to help protect the 1999 year class of haddock may also be beneficial to the whiting.

A high proportion (85% at *status quo* F) of the forecast SSB in 2002 comes from year classes for which long term geometric mean recruitment has been assumed. This has considerable influence on the predicted achievement of the precautionary reference.

Catch forecast for 2001

F(2001 onwards)	Basis	Catch (2001)	Discards (2001)	Landings (2001)	SSB (2002)
0.182	$0.2 \cdot F_{SQ}$	3.0	1.5	1.5	29.9
0.363	$0.4 \cdot F_{SQ}$	5.6	2.8	2.8	26.4
0.545	$0.6 \cdot F_{SQ}$	7.9	4.0	3.9	23.5
0.6	$F_{PA} (0.66 \cdot F_{SQ})$	8.5	4.3	4.2	22.7
0.726	$0.8 \cdot F_{SQ}$	9.8	5.0	4.8	20.9
0.908	$1.0 \cdot F_{SQ}$	11.5	5.9	5.6	18.6

Weights in '000 t.

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, and there are indications of changes in discarding practice towards discarding larger whiting, so controls on landings alone will not achieve the necessary increase in SSB.

Analytical age-based assessment, using 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, June 2000 (ICES CM 2001/ACFM:01).

Reference points

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:	
$B_{lim} = B_{lim}(1998) = 16\ 000\ t$	$B_{pa} = B_{lim} \times 1.4$
$F_{lim} = \text{see above}$	$F_{pa} = 0.6 \times F_{lim}$

Catch data (Tables 3.7.4.a.1-2):

Year	ICES Advice	Predicted landing corresp. to advice	Agreed TAC ¹	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 ⁴
1993	70% of effort (89)	-	8.7	6.8	6.9	8.0	14.9 ⁴
1994	30% reduction in effort	-	6.8	5.8	5.9	8.6	14.5 ⁴
1995	Significant reduction in effort	-	6.8	6.3	6.1	7.3	13.4 ⁴
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	4.6	4.7	5.2	9.9
1999	Reduce F below F_{pa}	4.3	6.3	3.6 ²	4.6	3.1	7.7
2000	Reduce F below F_{pa}	<4.3	4.3				
2001	Reduce F below F_{pa}	<4.2					

¹TAC is set for Divisions VIa and VIb combined. ²Incomplete. ³Not including misreporting. ⁴Including ACFM estimates of misreporting. Weights in '000 t.

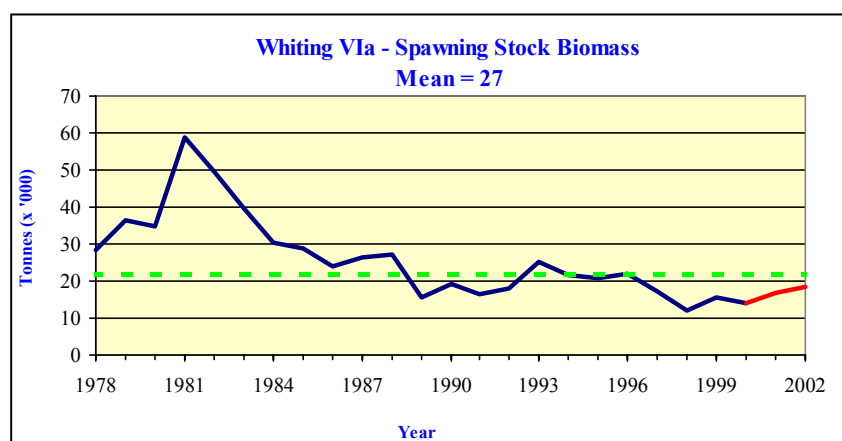
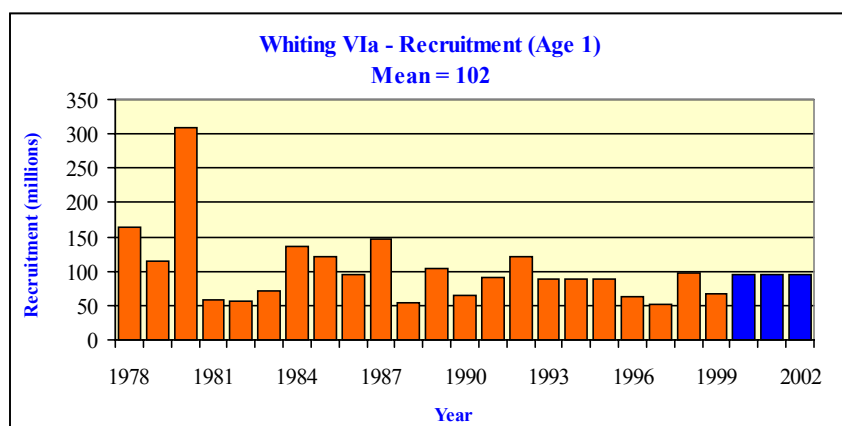
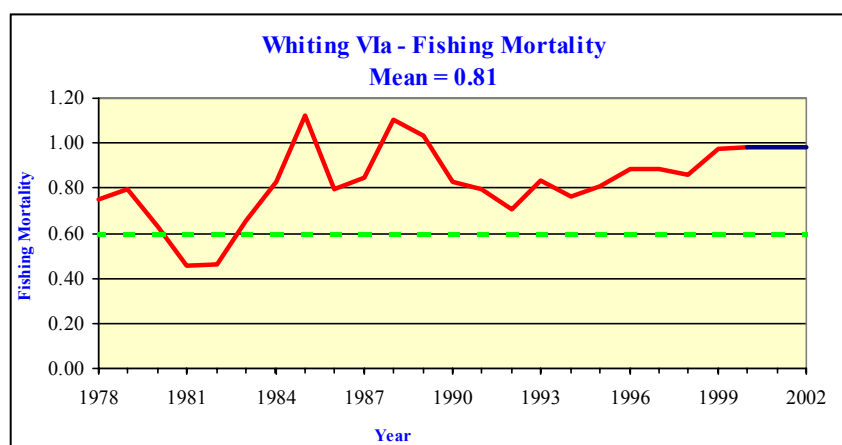
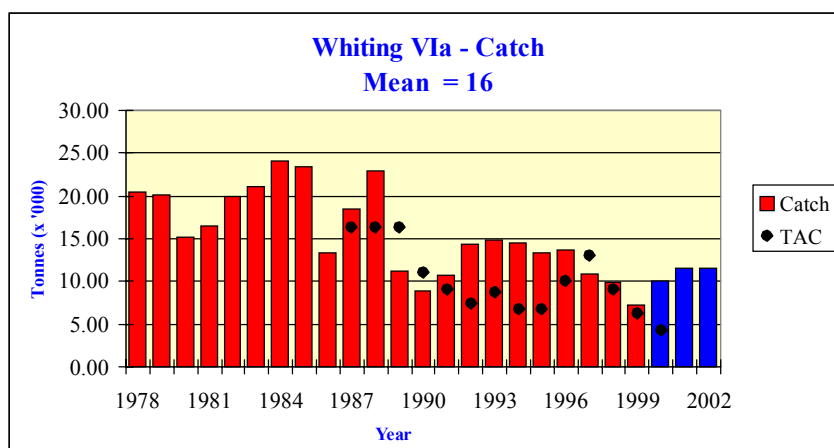


Table 3.7.4.a.1 Nominal catch (tonnes) of WHITING in Division VIa, 1985–1999, as officially reported to ICES. Discards

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999 ¹
Belgium	3	-	4	3	1	-	+	-	+	+	+	-	1	1	+
Denmark	-	-	5	-	1	+	3	1	1	+	+	+	+	-	
France	1,502	829	1,644	1,249	199 ^{1,2}	180	352 ^{1,2}	105	149	191	362	202	108	82	300
Germany	9	1	+	4	+	+	+	1	1	+	-	-	-	-	
Ireland	1,917	1,683	2,868	2,640	1,315	977	1,200	1,377	1,192	1,213	1,448	1,182	977	952	
Netherlands	14	-	-	-	-	-	-	-	-	-	-	-	-	-	
Spain	61	-	-	-	-	-	-	-	-	-	1	-	1	n/a	
UK (E & W) ³	63	26	62	30	44	50	218	196	184	233	204	237	453	...	
UK (N.Ireland)	17	5	13	89	...	...	...	...	...	...	...	...	...	...
UK (Scotland)	9,051	5,848	7,803	7,864	6,109	4,819	5,135	4,330	5,224	4,149	4,263	5,021	4,638	...	
UK (All)														3,620	3,256
Total	12,637	8,392	12,399	11,879	7,669	6,026	6,908	6,010	6,751	5,786	6,278	6,642	6,178	4,655	3,556
Unallocated land-ings	1169	98	-857	-530	-142	-382	-234	-5	122	177	-199	527	114	-40	1072
Discards	10,379	4,895	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
Landings as used by W.G.	13,086	8,490	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

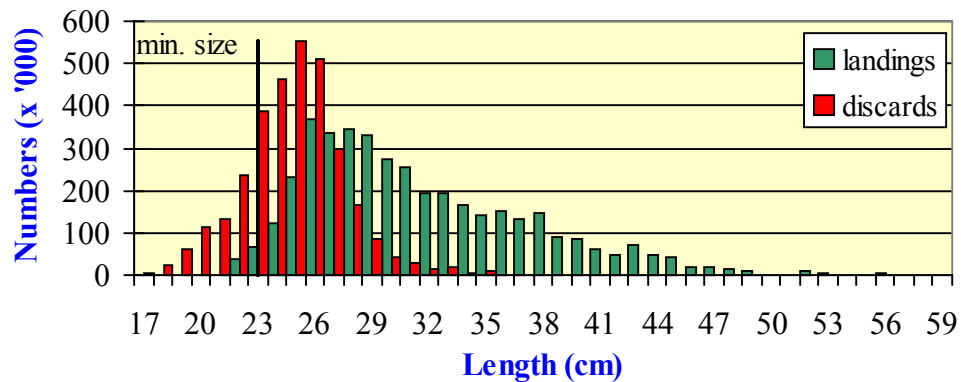
¹Preliminary. ²Includes Divisions Vb (EC) and VIb. ³1989–1999 N. Ireland included with England and Wales. n/a = Not available.

Table 3.7.4.a.2 Whiting in Division VIa (West of Scotland).

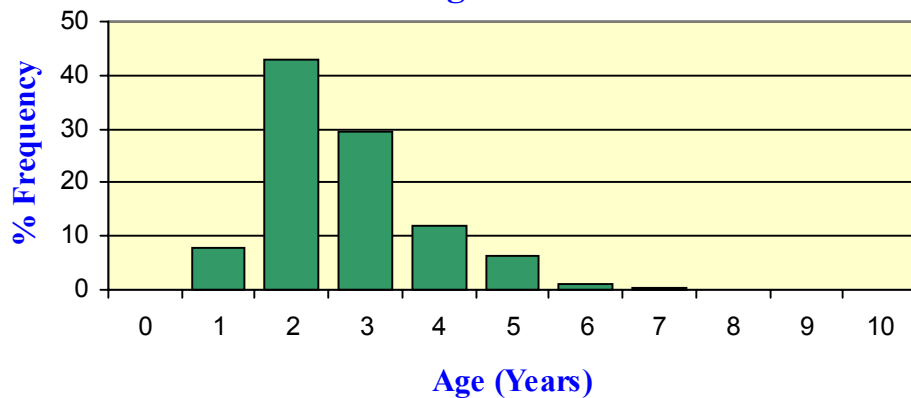
Year	Recruitment Age 1	Spawning Stock Biomass	Catch	Fishing Mortality Age 2-4
1978	164.14	28.20	20.44	0.750
1979	115.27	36.51	20.16	0.798
1980	308.39	34.75	15.10	0.626
1981	58.65	58.99	16.46	0.454
1982	56.81	49.55	20.03	0.465
1983	70.54	39.43	21.15	0.657
1984	135.44	30.32	24.01	0.831
1985	121.64	28.75	23.39	1.122
1986	96.11	24.13	13.37	0.798
1987	146.62	26.23	18.45	0.844
1988	53.79	27.27	22.85	1.105
1989	103.09	15.53	11.25	1.031
1990	65.67	19.09	8.98	0.825
1991	90.83	16.32	10.74	0.796
1992	121.79	17.92	14.33	0.707
1993	88.82	25.38	14.88	0.835
1994	88.71	21.41	14.53	0.764
1995	88.85	20.79	13.37	0.810
1996	62.98	22.03	13.71	0.886
1997	51.28	17.19	10.86	0.885
1998	96.15	12.02	9.86	0.862
1999	65.97	15.67	7.20	0.977
2000	94.00 ¹	14.11	.	.
Average	101.98	26.16	15.69	0.810
Unit	Millions	1000 tonnes	1000 tonnes	-

¹ Geometric mean (78-97)

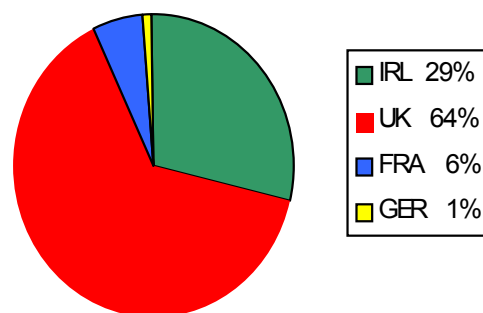
1999 Length Distribution of Irish Landings and Discards of Whiting in VIa



1999 Age Distribution of Irish Landings of Whiting in VIa



2000 Quota Allocations Whiting VI



Rockall Whiting

(Division VIb)

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



Marine Fisheries Services Division

MFSD – ADVICE

ICES did not provide advice for this stock. MFSD agrees with the ICES recommendations for whiting in VIa that fishing mortality should be reduced below the proposed F_{pa} , corresponding to landings in 2001 of less than 4 200 t. This is expected to increase SSB above B_{pa} in the short term.

STATE OF THE STOCK

- There is no ICES advice for this stock.
- There is no assessment for this stock. Catches of whiting from VIb are negligible. Hence only the VIa whiting are assessed.
- The status of this stock is unknown.
- There are no proposed reference points proposed for this stock.

CURRENT MANAGEMENT

- The TAC area covers Sub-areas Vb, VI, XII and XIV.
- The TAC in 2000 was 4,300 t with an associated Irish quota of 1,250 t.

MFSD – ECONOMIC COMMENTS

This stock is of little or no economic value to Ireland.

ADDITIONAL INFORMATION

- 1 Irish vessels reported very small landings of whiting in Division VIb, 1999 landings were 0.1 t.
- 2 It is likely that whiting caught at Rockall are migrants from the VIa rather than an autonomous VIb stock.
- 3 It is likely that the UK Scottish landings during the early 1990s are due to misreporting of other species such as Haddock and Anglerfish into Division VIb.
- 4 No official 1999 Irish landings were reported to the ICES 2000 Working Group.

ICES ADVICE 3.7.4.b

Special Comments

Landings of whiting from Division VIb are negligible. No assessment has been carried out on this stock.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 2000 (ICES CM 2001/ACFM:01).

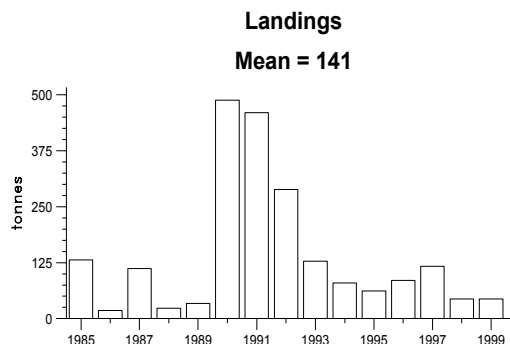


Table 3.7.4.b.1 Nominal catch (tonnes) of WHITING in Division VIb, 1985–1999, as officially reported to ICES.

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999 ¹
France	2	-	-	-	... ²	... ²	... ²	... ²	... ²	... ²	... ²	... ²	... ²	... ²	...
Ireland	-	-	-	-	-	-	-	-	32	10	4	23	3	1	
Spain	123	-	-	-	-	-	-	-	-	n/a	n/a	n/a	n/a	n/a	
UK (E.& W) ³	+	5	4	-	16	6	1	5	10	2	5	26	49	...	
UK (N.Ireland)	-	-	-	-	...	...	...	...	...	...	...	...	...	...
UK (Scotland)	6	13	108	23	18	482	459	283	86	68	53	36	65	...	
UK (all)														43	44
Total	131	18	112	23	34	488	460	288	128	80	62	85	117	44	44

¹Preliminary. ²Included in Division VIa. ³1989–1999 N. Ireland included with England and Wales. n/a = not available.

Irish Sea Whiting

(Division VIIa)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES recommendation that fishing mortality on whiting should be reduced to the lowest possible level in 2001. A rebuilding plan including provisions to effectively reduce both directed harvest and by-catch in other fisheries should be developed and implemented in order to rebuild SSB above B_{pa} .

MFSD recognise that a complete closure is unrealistic given that this is a mixed fishery. The TAC should remain at 2,640 t to allow a small by-catch of whiting in the *Nephrops* and haddock fisheries. MFSD stress that the rebuilding plan must include 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. MFSD recommends that a minimum time frame of five years is required to rebuild this stock.

STECF notes that a major problem of discarding exists in the Irish Sea *Nephrops* fishery and advises that measures are taken immediately to prevent by catch of juvenile whiting in this fishery.

STATE OF THE STOCK

- There are very serious concerns about the state of this stock and the risk of collapse.
- Catches have declined continuously since the 1980's. The 1999 landings of 2,400 t was 21% lower than in 1998 and was an all-time low for this stock.
- F in 1999 is 0.78 and is above the proposed F_{pa} of 0.65. F has been above F_{pa} since 1980 (the start of the assessment period). Whilst it has declined in recent years it remains high.
- Recruitment has fluctuated over the assessment period with occasional high values. Recruitment has been below average since 1992 although the 1999 year-class appears to be above average.
- SSB in 2000 is estimated to be 2,500 t and is well below the proposed B_{pa} of 7,000 t and the proposed B_{lim} of 5,000 t.
- SSB is predicted to remain well below B_{pa} in the short term at the current level of fishing mortality.

CURRENT MANAGEMENT

- The TAC area covers Divisions VIIa and corresponds to the assessment area.

- The TAC in 2000 was 2,640 t with an associated Irish quota of 1,525 t.
- There are no explicit management objectives or a management plan for this stock. A rebuilding plan that will reduce F below F_{pa} and increase SSB above B_{pa} is consistent with the precautionary approach.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £2.9m in Division VIIa.
- The value of the 1999 Irish quota was £1.8m.
- The value of the 1999 international landings from Division VIIa was £1.0m.
- The value of the 1999 Irish landings from Division VIIa was £0.3m.
- 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 since the stock declined, 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.
- 2 The 1999 landings of 2,400 t was 21% lower than in 1998 and was an all-time low for this stock.
- 3 In 1999 Ireland reported landings of 509 t (only 33% of its quota).
- 4 There is evidence of mis-reporting of haddock catches as whiting catches by some countries, particularly during the haddock outburst in recent years. The landings data used in the assessment have been adjusted for mis-reporting.
- 5 The fishery is dominated by Ireland (26% of 1999 landings) and UK (Northern Ireland-64% of 1999 landings) fleets. Most landings by the Irish and UK (Northern Ireland) fleets are taken from the Western Irish Sea, while the UK (England) fleet takes most of its landings from the Eastern Irish Sea.
- 6 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.
- 7 Vessels operating out of Clogherhead and Howth take most of the Irish catches.
- 8 Ireland has a high quota for this stock (58%) due to the Hague preference agreement. The reported catch has fallen from 14,428 t (1987) to 2,425 t (1999), the TAC being reduced accordingly.

- 9 Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
- 10 MFSD conducts an annual ground fish survey in VIIa and VIIg. Catches of whiting from the survey (1997 and 1998 data only) are low and confirm the poor state of the stock.
- 11 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. Measures to reduce the level of discarding are required. MFSD sampling suggests that about 91% of the total weight of fish caught (96% by number) was discarded. Whilst much of the discarded catch sampled was undersized, about 60% of the discarded catch was of a landable size. Unfortunately the whiting by-catch from the *Nephrops* fishery are generally caught in a poor condition due to physical damage in the trawl inflicted by *Nephrops* hard parts.
- 12 There is some evidence that the 1999 year-class was strong and measures should be put in place to protect this year-class immediately if SSB is to be rebuilt.
- 13 High fishing mortality on juvenile whiting increases the susceptibility of the stock to overexploitation. Protection of the strong 1999 recruitment may contribute to rebuilding of this stock. However, protection of juvenile whiting will require minimising discards of juvenile whiting and may require closing the western Irish Sea *Nephrops* fishery.
- 14 MFSD sampling indicates that fish in age groups 2 and 3 dominate Irish landings of whiting from Divisions VIIa. The distinct lack of older fish in the landings confirms the poor state of the stock and its future.

ICES ADVICE

3.8.4

State of stock/fishery

This stock is outside safe biological limits. The current assessment indicates that fishing mortality has been above the proposed F_{pa} since 1980. SSB has declined since 1980 to a

very low level, and has been below B_{lim} since 1997. Catches have declined continuously since the early 1980s.

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 the lowest possible level in 2001. A rebuilding plan including provisions to effectively reduce both directed harvest and by-catch in other fisheries should be developed and implemented in order to rebuild SSB above B_{pa} .

Relevant factors to be considered in management:

Approximately 45% of the total estimated catch of whiting is discarded in the *Nephrops* directed fishery which operates on the main whiting nursery areas in the Irish Sea. Hence 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.

Over 90% of the SSB in 2002 are comprised of the 1999 and 2000 year classes which are poorly determined.

Catch forecast for 2001:

Basis: $F(2000) = F_{sq} = F(97-99) = 1.07$, $Catch(2000) = 4\ 665$, $Landings(2000) = 1\ 803$, $SSB(2001) = 4\ 462$.

F(2001) (landings)	F(2001) (discards)	F(2001) (Total)	Basis ¹	Catch (2001)	Landings (2001)	SSB (2002)	Medium-term-(10 year) effect of fishing at given level
0.00	0.00	0.00	0.0F ²	0	0	12075	< 5% probability SSB < B_{pa}
0.00	0.51	0.51	0.0F (97-99)	2797	0	6764	< 5% probability SSB < B_{pa}
0.11	0.51	0.62	0.2F (97-99)	3494	745	6211	5% probability SSB < B_{pa}
0.14	0.51	0.65	F_{pa}	3653	915	6086	20% probability SSB < B_{pa}
0.22	0.51	0.73	0.4F (97-99)	4097	1393	5743	50% probability SSB < B_{pa}
0.39	0.51	0.90	0.7F (97-99)	4861	2219	5166	95% probability SSB < B_{pa}
0.56	0.51	1.07	1.0F (97-99)	5497	2909	4703	> 95% probability SSB < B_{pa}
0.67	0.51	1.18	1.2F (97-99)	5864	3309	4443	> 95% probability SSB < B_{pa}

Weights in tonnes ¹F multipliers applied to human consumption fishery only. ² Multiplier applied to human consumption fishery and discards. Shaded scenarios considered inconsistent with the precautionary approach.

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 in the pelagic fishery for cod.

Analytical assessment based on catch-at-age, commercial CPUE and indices from surveys in Division VIIa. Estimates of discards in the *Nephrops* fisheries are included in the as-

essment, and estimates of misreported landings have been included since 1991. Discarding by whitefish fleets is presently being studied, but there are insufficient data for inclusion in the assessment.

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 2000 (ICES CM 2001/ACFM:01).

Reference points as proposed by ICES in 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:

$B_{lim} = B_{loss}$	$B_{pa} = B_{loss} \times 1.4$
$F_{lim} = F_{loss}$ as estimated in the current 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 Fs.

Catch data (Tables 3.8.4.1–2):

Year	ICES Advice	Predicted catches corresponding to advice	Agreed TAC	Official Landings	Disc. ²	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_{high} ; enforce mesh regulation	11.0	18.2	11.3	2.0	13.4
1990	No increase in F; TAC	8.3 ¹	15.0	8.2	2.7	10.7
1991	Increase SSB to SSB(89); TAC	6.4 ¹	10.0	7.4	2.7	9.9
1992	80% of F(90)	9.7 ¹	10.0	7.1	4.3	12.8 ³
1993	70% of F(91) ~ 6 500 t	6.5	8.5	6.0	2.7	9.2 ³
1994	Within safe biological limits	-	9.9	5.6	1.2	7.9 ³
1995	No increase in F	8.3 ¹	8.0	5.5	2.2	7.0 ³
1996	No increase in F	9.8 ¹	9.0	5.6	3.5	8.0 ³
1997	No advice given	-	7.5	4.5	1.9	4.2
1998	20% reduction in F	3.8 ⁵	5.0	2.1	1.3	3.5
1999	Reduce F below F_{pa}	3.5 ⁵	4.41		1.1	2.4
2000	Reduce F below F_{pa}	<1.6 ⁵	2.66			
2001	Lowest possible F	0				

¹Not including discards from the *Nephrops* fishery. ²From *Nephrops* fishery. ³Including estimates of misreporting.

⁵Landings only, no discards included. Weights in '000 t

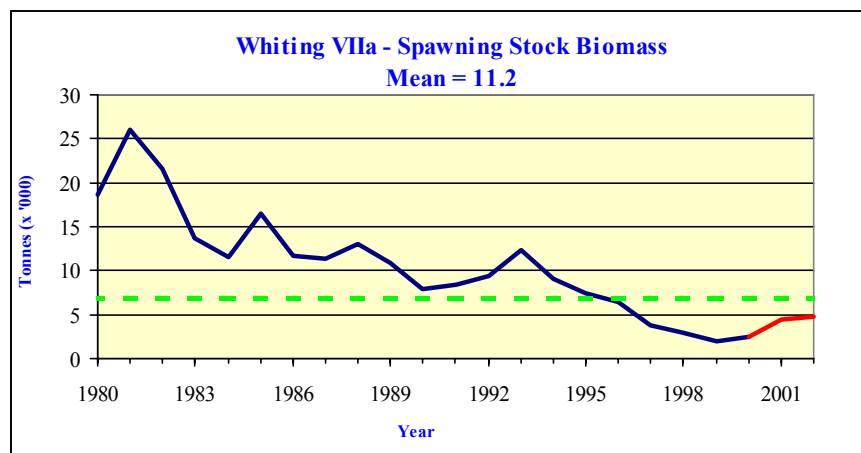
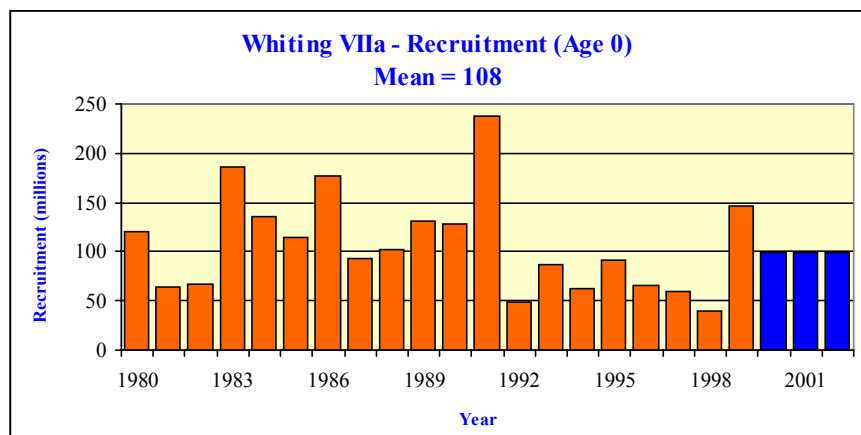
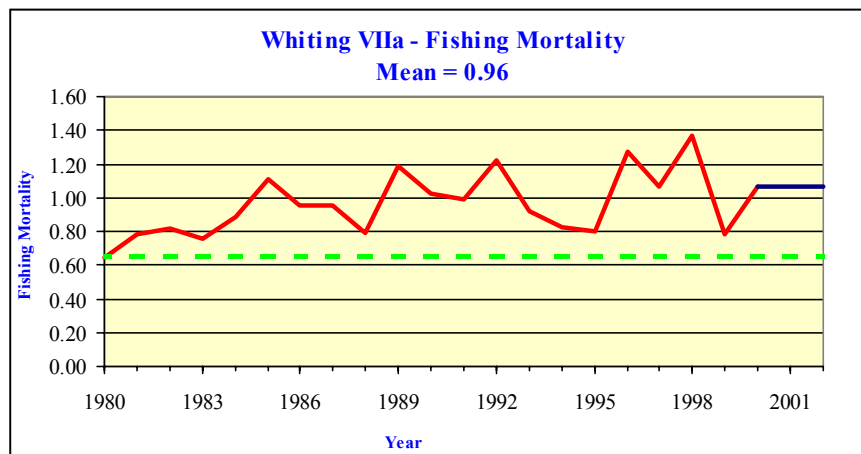
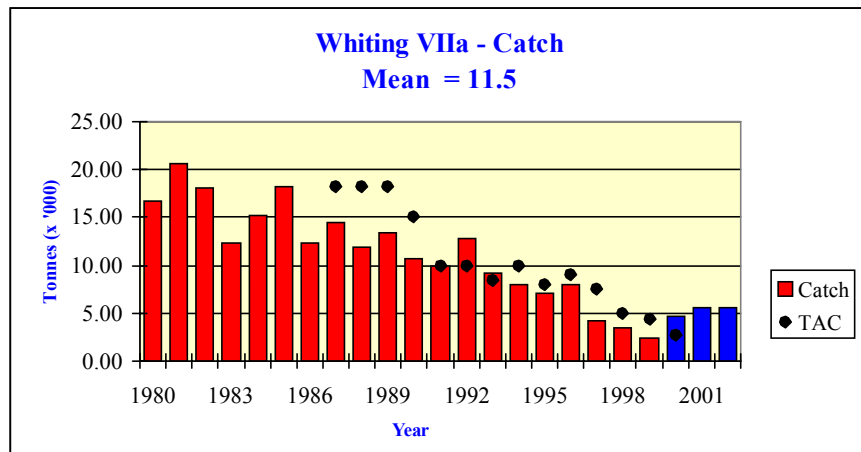


Table 3.8.4.1 Nominal catch (tonnes) of WHITING in Division VIIa, 1986–1999, as officially reported to ICES and Working Group estimates of human consumption and discards.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999 ¹
Belgium	70	109	90	92	142	53	78	50	80	92	80	47	52	46
France	770	826	1,063	533	528	611	509	255	163	169	78	86	81	150
Ireland	3,101	4,067	4,394	3,871	2,000	2,200	2,100	1,440	1,418	1,840	1,773	1,119	1,260	n/a
Netherlands	-	-	-	-	-	-	-	-	-	-	17	14	7	5
UK (Engl.& Wales) ³	1,004	1,529	1,202	6,652	5,202	4,250	4,089	3,859	3,724	3,125	3,557	3,152	1,400	...
UK (Isle of Man)	25	14	15	26	75	74	44	55	44	41	28	24	33	...
UK (N. Ireland)	4,940	4,858	4,621	...	...	...	...	...	...	...	...	...	...	...
UK (Scotland)	129	281	107	154	236	223	274	318	208	198	48	30	22	...
UK	...	...	...	...	...	...	...	...	...	...	...	...	1,916	1,271
Total human consumption	10,039	11,684	11,492	11,328	8,183	7,411	7,094	5,977	5,637	5,465	5,581	4,472	2,089	1,472
Unallocated human consumption	16	-1,020	-1,537	65	-211	-129	1,447	551	1,119	-574	-1,109	-2,193	-1,124	-139
Estimated discards from Nephrops fishery ²	2,360	3,754	1,901	2,015	2,684	2,664	4,250	2,702	1,180	2,153	3,494	1,926	1,307	1,092
Total figures used by the Working Group for stock assessment	12,415	14,418	11,856	13,408	10,656	9,946	12,791	9,230	7,936	7,044	7,966	4,205	3,533	2,425

¹Preliminary.

²Based on UK (N. Ireland) and Ireland data.

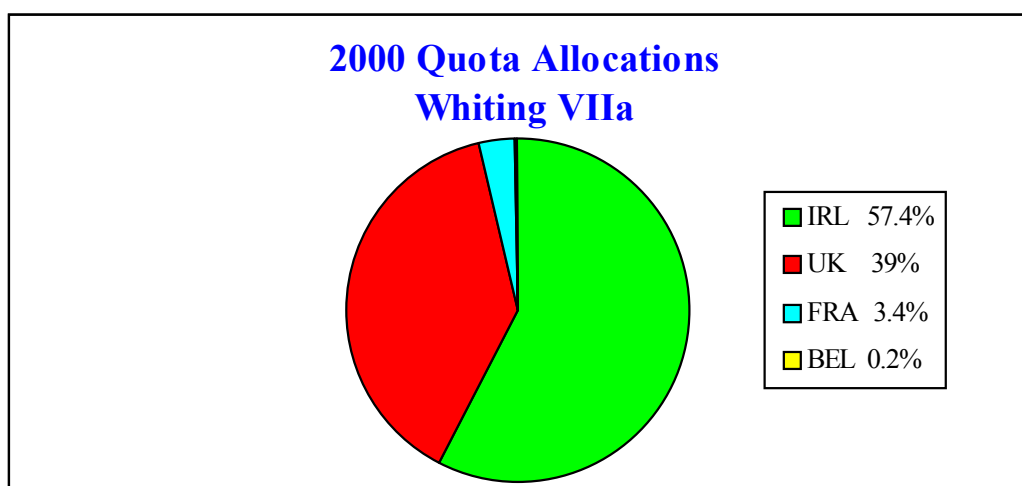
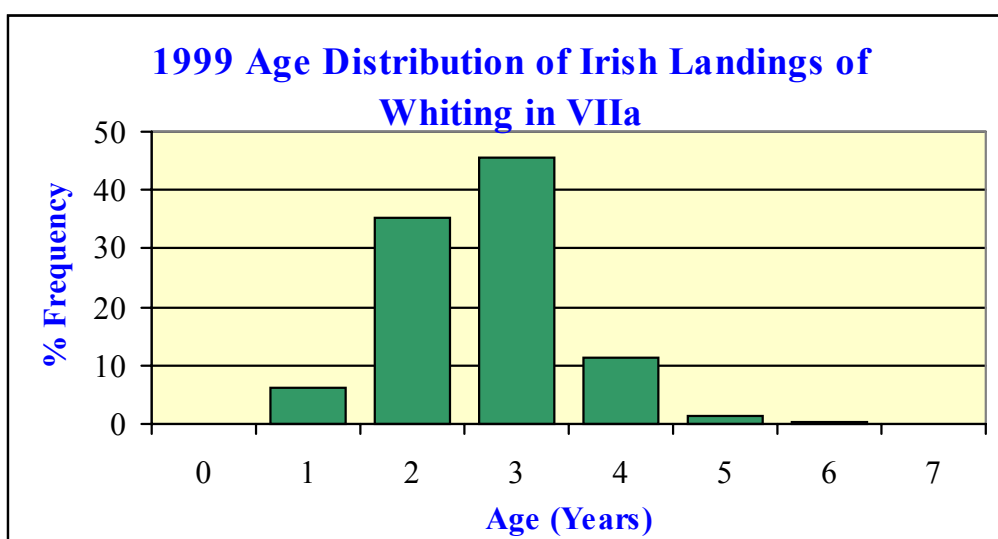
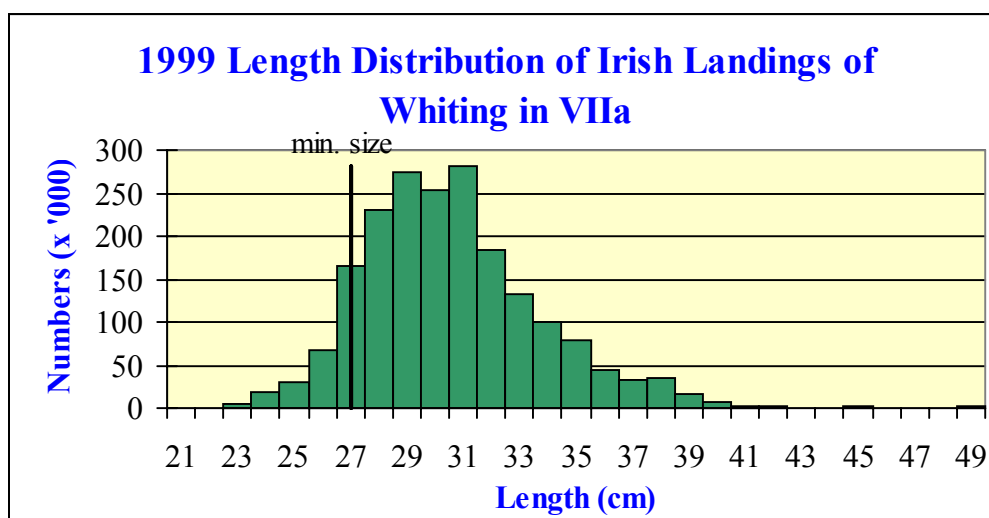
³1989–1999 Northern Ireland included with England and Wales.

n/a = Not Available

Table 3.8.4.2 Whiting in Division VIIa (Irish Sea).

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 1-3
1980	121.11	18.56	16.79	0.642
1981	63.57	26.00	20.61	0.781
1982	67.63	21.66	18.11	0.818
1983	186.53	13.76	12.35	0.761
1984	135.50	11.58	15.24	0.890
1985	113.65	16.43	18.24	1.108
1986	176.72	11.77	12.42	0.952
1987	92.94	11.35	14.42	0.955
1988	101.82	13.03	11.86	0.789
1989	130.79	10.83	13.41	1.187
1990	128.59	7.97	10.66	1.022
1991	237.46	8.34	9.95	0.993
1992	49.44	9.37	12.79	1.224
1993	87.53	12.34	9.23	0.921
1994	62.36	8.98	7.94	0.828
1995	91.87	7.48	7.04	0.804
1996	65.71	6.36	7.97	1.272
1997	59.02	3.74	4.21	1.063
1998	40.37	2.89	3.53	1.371
1999	146.07	1.92	2.43	0.780
2000	99.77 ¹	2.49	.	.
Average	107.54	10.80	11.46	0.958
Unit	Millions	1000 tonnes	1000 tonnes	-

¹Geometric mean



Celtic Sea and Western Channel Whiting

(Division VIIe-k)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agree with the ICES recommendation that current fishing mortality is too high and should be reduced to 0.55 the average of 1997-1999. This advice corresponds to landings for Division VIIe-k of 13,500 t. This will translate to a TAC of 19,674 t with an Irish quota of 5,473 t in 2001.

TAC Area	TAC 2000	Proposed TAC 2001	Basis
VIIe-k		13,500	Assessment
VIIId		2,420	Assessment IV
VIIb,c, VIII, IX, & X		3,754	Recent Catches
Total TAC	22,500	19,674	
Irish quota	6,260	5,473	

STATE OF THE STOCK

- There are no concerns about the state of this stock.
- The landings in 1999 were 19,400 t, which is similar to the landings in 1998. Landings have been around 20,000 t since 1994 the recent high was 22,700 t in 1995.
- Fishing mortality is estimated to be 0.78 in 1999 and is above the proposed $F_{pa} = 0.72$.
- There was a period of above average recruitment in the early 1990s for this stock. Recruitment is estimated to have been below average since 1995 except for the 1998 year-class which was average.
- The spawning stock biomass has been above average in recent years reaching a peak in 1995 at almost 80,000 t. However, SSB has been decreasing in recent years but remains above the proposed $B_{pa} = 21,000$ t.
- The short-term prediction is for spawning stock biomass decline to 32,400 t at current fishing mortality and recruitment.

CURRENT MANAGEMENT

- The TAC area covers Divisions VIIb-k, and the assessment area covers Divisions VIIe-k.
- The 2000 TAC was 22,500 t with an associated Irish

quota of 6,260 t.

- There are no explicit management objectives or plan for this stock.

Special Note: MFSD strongly advise that if Division VIIId is to be included in the management area it should be assessed as part of this stock and not part of the North Sea stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £15.7m in Sub-area VII.
- The value of the 1999 Irish quota was £4.4m.
- The value of the 1999 international landings Sub-area VII was £12.2m.
- The value of the 1999 Irish landings was £3.7m.
- While whiting has a low value the volume landed mean that it is an economically valuable component of the mixed demersal fisheries in the Celtic Sea.

ADDITIONAL INFORMATION

1. There were problems obtaining French landings statistics for 1999, therefore the assessment for this stock may not be as robust as in previous years.
2. International landings in 1999 were 19,400 t.
3. Irish landings in 1999 were 5,807 t. This is an increase of 12% on the 1998 landings.
4. Misreporting is not considered a problem in this fishery.
5. France with 60% of the 1999 landings dominates the fishery. Ireland, the UK and Belgium landed 26%, 7% and 2% of the 1999 landings respectively.
6. Most of the French landings are from the Lorient based gadoid fleet and the 1999 landings were estimated by IFREMER.
7. Demersal trawlers from Dunmore East and Castle-townbere and other ports in SW Ireland have traditionally targeted Celtic Sea whiting in a mixed trawl fishery. Last year poor catches elsewhere attracted vessels from Greencastle Co. Donegal to this fishery.
8. Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
9. The MFSD commenced a groundfish survey in 1997 on RV *Celtic Voyager* in the Celtic Sea. This survey will help to improve recruitment estimates in this stock greatly helping the accuracy of the assessments and forecasts.
10. Discarding of Whiting is known to be a serious problem with all fleet but the French *Nephrops* may be discarding as much whiting as they land. Discarding

of whiting is also a problem in the Irish fleet. MFSD sampling suggests that about 16.7% of the total weight of fish caught (38% by number) was discarded. Almost all (95%) of the discarded catch was of a landable size.

11. There are strong indications that the 1999 year-class is very strong, however, since it is not well estimated the Working Group did not accept the estimate. If this year-class is strong than it will have a significant impact on discards this year and landings in 2001 and the assessment may be overly pessimistic.
12. The MFSD sampling indicates that very young fish dominated the Irish landings in 1999 with 62% of the landings being between 2 and 3 years old.

ICES ADVICE

3.9.3

State of stock/fishery

The stock is considered to be inside safe biological limits. SSB reached a record high in 1995 and has decreased since then, but is currently well above B_{pa} . Fishing mortality displayed a declining trend until 1997 but has subsequently increased and is estimated to have been above F_{pa} in 1999. Recruitment has been below average since 1984.

Catch forecast for 2001:

Basis: $F(2000) = F(97-99) = 0.55$, Landings(2000) = 13.3, SSB(2001) = 35.8.

F (2001 onwards)	Basis	Catch (2001)	Landings (2001)	SSB (2002)	Medium-term situation (10 years) Probability (%) $SSB < B_{pa}$
0.33	0.6 F_{97-99}		8.9	40.6	<5
0.44	0.8 F_{97-99}		11.3	38.2	<5
0.55	1.0 F_{97-99}		13.5	36.1	<5
0.66	1.2 F_{97-99}		15.5	34.1	<5
0.72	F_{pa}		16.5	33.1	<5
0.77	1.4 F_{97-99}		17.3	32.4	<5

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment:

It should be noted that 61% 1999 of the international landings for this stock were derived from the French official landings were provided only for the TAC area. This is particularly important in relation to the estimate of current fishing mortality.

65% of SSB in 2002 is based on assumed long-term geometric mean recruitment.

Celtic Sea whiting are taken in mixed species (cod, whiting, hake, *Nephrops*) fisheries. French trawlers report 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 restric-

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 maintain spawning stock biomass above B_{pa} .

Advice on management:

In order to reverse the decline in SSB, ICES recommends that fishing mortality should be the average of 1997-1999 of 0.55 corresponding to landings in 2001 of 13 500 t.

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 Sub-area VII (excluding Divisions VIIa). In order to protect whiting in VII-k, catches in the other parts of sub-area VII which comprise the TAC need to be set appropriately. There is also a need to take into account the state of whiting in VIId which is affected by the TAC in area VII.

tions and market demand for larger *Nephrops*.

Analysis of landings trip by trip for the French gadoid trawlers for the period 1996-98 showed that at the scale of a trip, 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 claim to be able, for each trawl operation, to target cod and whiting separately.

The main Irish fleets in VII f,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 VII g. Division VII j-k whiting are taken in a 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 VII_{jk} are otter trawlers which target mixed gadoids and account to 10% of Divisions VII_{e-k} landings of whiting. The main UK fisheries in VII_{e,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, angler-fish and plaice.

The main spawning areas of whiting in the Western Channel and Celtic Sea are off Start Point (VII_e), off Trevose

Head (VII_f) and south-east of Ireland (VII_g). Returns of adult whiting tagged in the Western Channel indicated more movement into the Celtic Sea than between the Western and Eastern Channel. Whiting released in the Bristol Channel moved south and west towards the two spawning grounds off Trevose Head and south-east 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 based on landings, commercial CPUE and Surveys data. No data are available on discarding of whiting, which is thought to be considerable.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 2000 (ICES CM 2001/ACFM:05).

Reference points: F_{lim} and F_{pa} have not previously been proposed for this stock.

ICES considers that:	ICES proposes that:
B_{lim} is 15 000t, the lowest observed spawning stock biomass	B_{pa} be set at 21 000t. 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:

$B_{lim} : B_{loss}$	$B_{pa} = B_{lim} \times 1.4$
F_{lim} not proposed.	F_{pa} not proposed.

Catch data (Tables 3.9.3.1–3):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	ACFM Landings
1987	Status quo F; TAC	7.1 ²		12.7
1988	Precautionary TAC	7.0 ²		13.6
1989	Precautionary TAC	7.9 ²		16.5
1990	No increase in F; TAC	8.4 ²		14.1
1991	Precautionary TAC	8.0 ²		13.5
1992	If required, precautionary TAC	8.0 ²		12.4
1993	Within safe biological limits	6.6 ²	22.0	16.3
1994	Within safe biological limits	< 9.4 ²	22.0	20.0
1995	20% reduction in F	8.2 ³	25.0	22.7
1996	20% reduction in F	8.6 ³	26.0	18.3
1997	At least 20% reduction in F	< 7.3 ⁴	27.0	20.5
1998	At least 20% reduction in F	< 8.2 ⁴	27.0	19.3
1999	No increase in F	12.4 ⁴	25.0	19.4
2000	17% reduction in F	< 13.1 ⁴	22.2	
2001	No increase in F	13.5 ⁴		

¹ TAC covers Sub-area VII (except Division VII_a). ² For the VII_{f+g} stock component, ³ For the VII_{f-h} stock component,

⁴ For the VII_{e-k} stock component. Weights in '000 t.

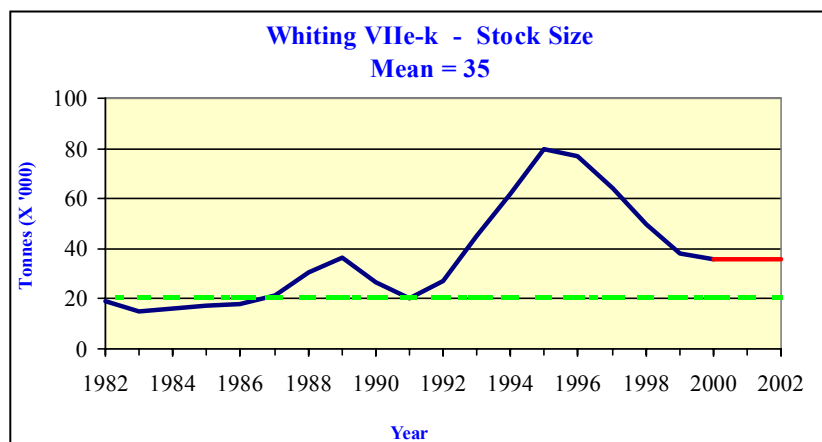
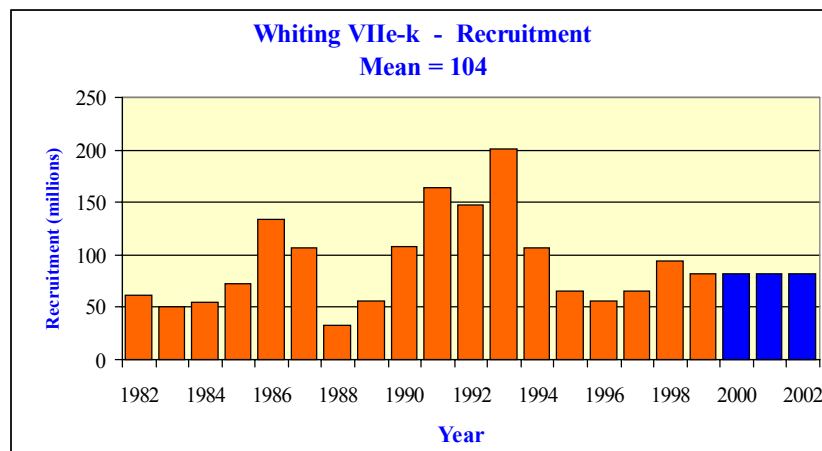
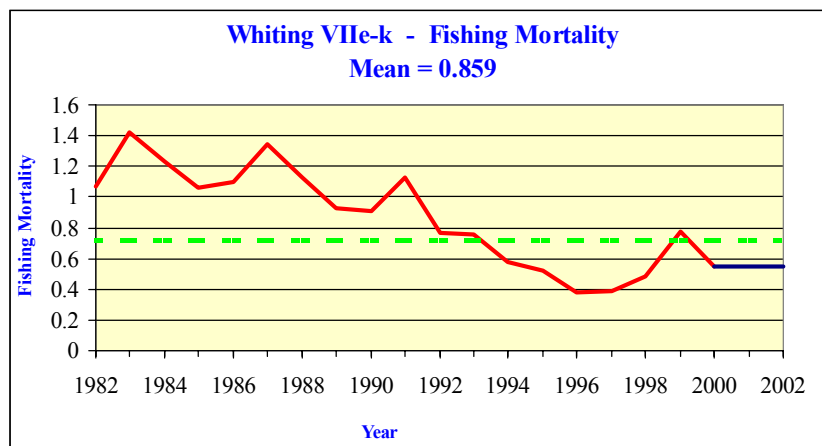
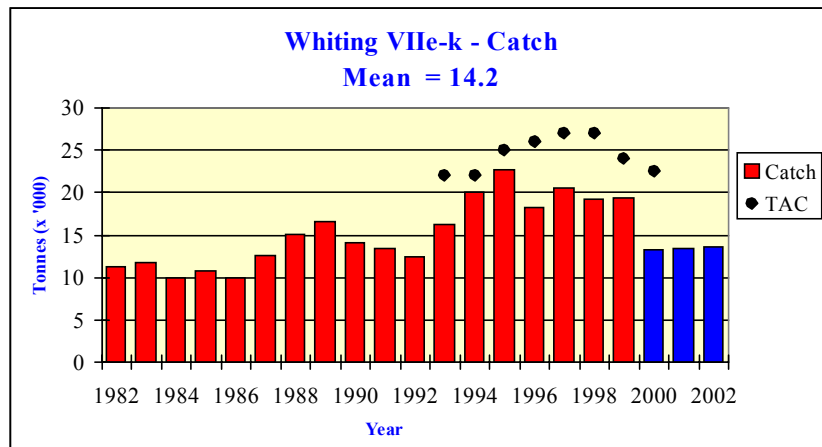


Table 3.9.3.1 WHITING in Divisions VIIe-k. Nominal Landings (tonnes) used by the Working Group.

	1983 ²	1984 ²	1985 ²	1986 ²	1987 ²	1988 ²	1989	1990
Denmark								
France	8,982	7,171	7,820	7,647	10,054	11,410	12,171	10,464
Germany								
Ireland	1,487	1,301	2,241	1,309	1,452	398	2,817	1,478
Belgium	135	161	167	107	111	159	296	308
Netherlands	0	398	0	124	0	0	0	0
UK (E&W)	1,177	954	610	765	1,035	1,598	1,252	1,782
UK(Scotland)						1	5	74
Total	11,781	9,985	10,838	9,952	12,652	13,566	16,541	14,106

	1991	1992	1993	1994	1995	1996 ¹	1997 ^{1,2}	1998 ¹	1999 ¹
Denmark			0	0	0	0	0	0	0
France	9,956	9,165	10,771	12,634	13,095	9,992	11,707	11,964	11,790
Germany		14	0	0	0	0	0	0	0
Ireland	1,258	1,691	3,631	5,618	7,609	6,392	6,695	5,189	5,807
Belgium	292	107	145	228	204	267	447	449	431
Netherlands	0	0	0	0	0	0	0	0	0
UK (E&W)	1,969	1,379	1,756	1,548	1,748	1,609	1,683	1,643	1,330
UK(Scotland)	33	8	17	6	22	0	0	0	1
Total	13,508	12,364	16,320	20,034	22,678	18,260	20,532	19,245	19,359

¹Preliminary.²Revised. Data from 1983 to 1987 revised. Data for 1997 revised.**Table 3.9.3.2** WHITING in Sub-areas VIII, IX and X. Nominal landings (tonnes) as officially reported to ICES.

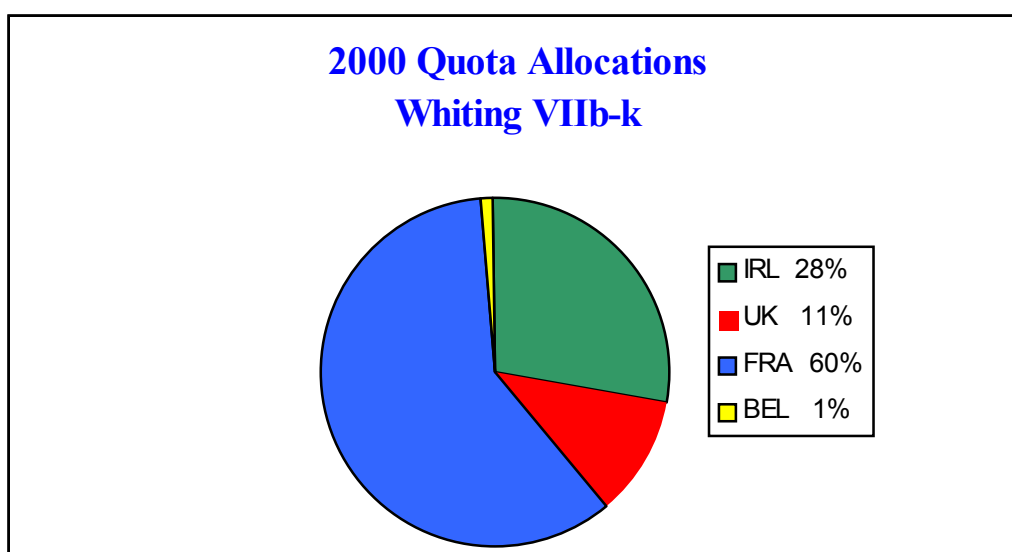
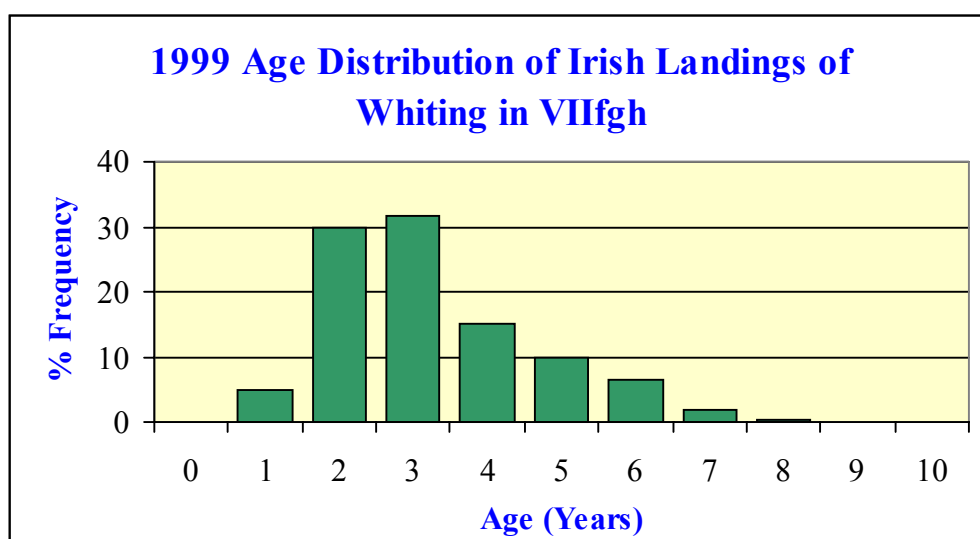
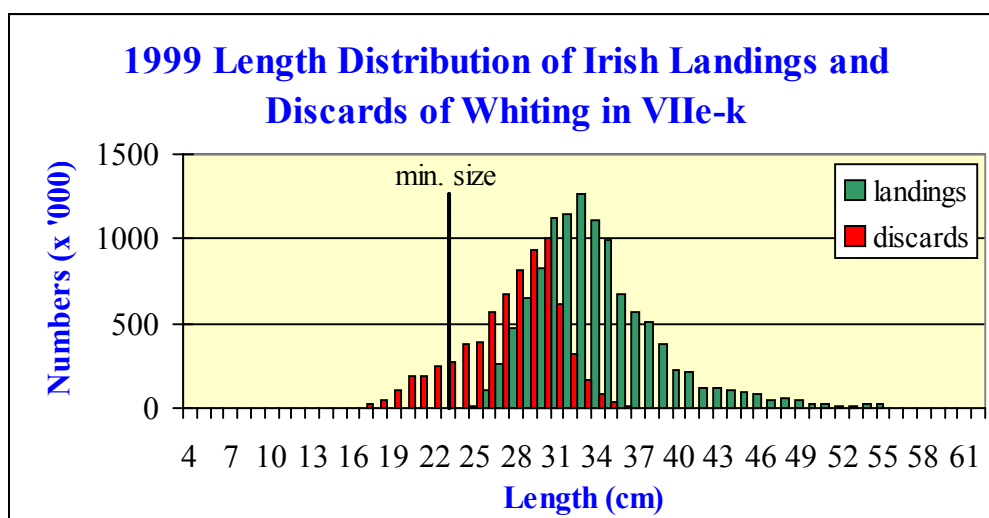
Year	France*	Others	Total
1989	2,284	428	2,712
1990	2,167	299	2,466
1991	2,577	159	2,736
1992	2,389	216	2,605
1993	2,999	323	3,322
1994	3,497	444	3,941
1995	2,645	175	2,820
1996	1,544	204	1,748
1997	1,895	190	2,085
1998	1,750	226	1,976

*Preliminary.

Table 3.9.3.3 Whiting in Divisions VIIe-k

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-5
1982	62.03	18.94	11.23	1.074
1983	50.12	15.05	11.78	1.420
1984	54.04	16.06	9.99	1.232
1985	71.75	17.42	10.84	1.063
1986	133.58	17.66	9.95	1.096
1987	106.23	21.32	12.65	1.348
1988	33.12	30.69	15.13	1.127
1989	55.34	36.29	16.54	0.930
1990	108.51	26.81	14.11	0.905
1991	163.77	20.35	13.51	1.124
1992	147.54	27.44	12.36	0.768
1993	200.99	45.15	16.32	0.760
1994	106.88	61.59	20.03	0.579
1995	65.03	79.96	22.68	0.523
1996	56.62	76.89	18.26	0.383
1997	66.03	64.39	20.53	0.386
1998	94.90	49.70	19.25	0.482
1999	82.14 ¹	38.40	19.36	0.780
2000	82.14	35.84	.	.
Average	91.62	36.84	15.25	0.888
Unit	Millions	1000 tonnes	1000 tonnes	-

¹ GM over the period.



West of Ireland Whiting

(Divisions VIIb,c)



Marine Fisheries Services Division

MFSD – ADVICE

The TAC area covers Divisions VIIb-k, Sub Areas VIII, IX X and CECAF and the advice is based on the assessment for Division VIIe-k (see MFSD advice for this stock). MFSD commenced a sampling programme in 1993 so that data from Divisions VIIb,c may be included with the Divisions VIIe-k assessment. This will bring the assessment more in line with the TAC area (Division VIIId is still assessed with the North Sea stock).

STATE OF THE STOCK

- No analytical assessment is carried out at present for this stock.
- There are no proposed reference points for this stock.
- Based on last year's estimates of F, whiting in division VIIb,c is considered over exploited.

ADDITIONAL INFORMATION

1. No Analytical assessment is carried out at present for this stock.
2. There were problems obtaining French landings statistics for 1999, no accurate landings were available for VIIb,c in 1999.
3. Irish landings in 1999 were 202 t. This is a decrease of 43% on the 1998 landings.
4. Ireland with 73% of the 1998 landings dominates the fishery. The UK and France land the remaining and 27%.
5. Whiting are caught in mixed species otter trawl fisheries in VIIb,c.
6. Irish sampling for this stock is supported through EU funding of FIEFA (EU Study Contract 97-0059) and SAMFISH (99-009).
7. MFSD have conducted a groundfish survey in this area since 1992. These data will be used in any future assessments of this stock which incorporate Division VIIb,c.
8. MFSD whiting discard data in these Divisions is not sufficient to evaluate fully the extend of discarding in this area.

Nominal international landings (t) As reported to the Working Group

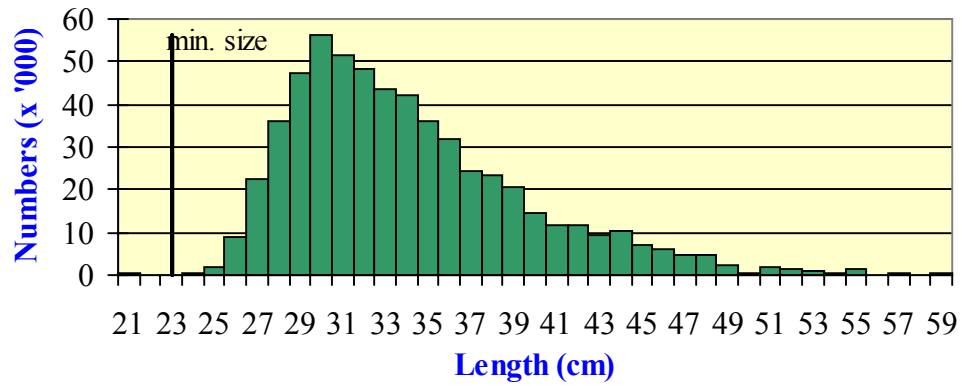
Country	1988	1989	1990	1991	1992	1993	1994	1995*	1996	1997	1998
France	113	56	63	40	27	31	27	58	146	77 ²	53*
Ireland	922	1199	770	540	730	826	1151	2084	1268	474	354*
UK (England and Wales) ¹	12	2	2	14	14	23	18	24	96	75	-
UK (Scotland)	+	32	36	80	155	147	117	71	117	4	-
UK											76
Total	1047	1289	871	674	926	1027	1313	2237	1627	629	483

* Preliminary

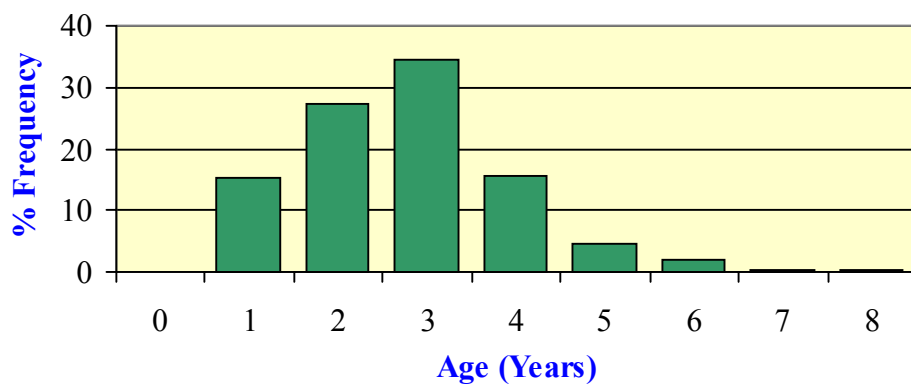
¹ 1989-1997 N. Ireland included with England and Wales.

² Revised

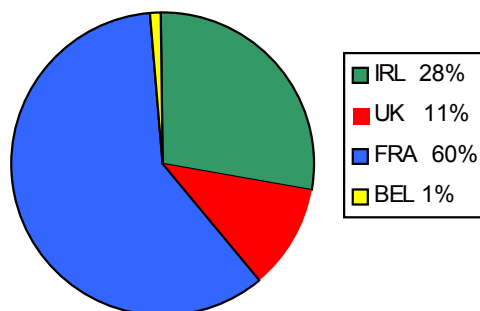
1999 Length Distribution of Irish Landings of Whiting in VIIbc



1999 Age Distribution of Irish Landings of Whiting in VIIbc



2000 Quota Allocations Whiting VIIb-k



West of Scotland and Rockall Pollack

(Sub-area VI)



Marine Fisheries Services Division

MFSD – ADVICE

MFSD advises that the TAC for 2001 should not exceed 1,100 t. This translates into an Irish quota of 150 t.

STATE OF THE STOCK

- There is no ICES advice for the stock in Sub Area VI.
- The status of this stock is unknown.
- There are no precautionary reference points proposed for this stock.

CURRENT MANAGEMENT

- The TAC covers Vb, VI, XII and XIV.
- The 2000 TAC was 1,100 t with an associated Irish quota of 150 t.
- There are no management plan or objectives for this stock.

MFSD ECONOMIC COMMENTS

- The value of the 1999 TAC was £1.1m in Sub-areas VI.
- The value of the 1999 Irish quota was £0.1m.
- The value of the 1999 international landings from Division VI was £0.2m.
- The value of the 1999 Irish landings from Division VI was £0.1m.
- Pollack catches in the northwest are small and the stock is currently of limited economic value.

ADDITIONAL INFORMATION

1. There is no assessment for this stock.
2. International landings in 1999 were estimated to be 202 t.
3. Estimated Irish Landings were 73 t in 1999.
4. The Irish quota is not restrictive, but this fishery is important to the smaller boats operating in the south of Division VIa.
5. MFSD suggest that there is some potential to develop pollack fisheries in inshore area using automated jigging machines.

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999
TAC	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	139

West of Ireland and Celtic Sea Pollack

(Sub-area VII)



Marine Fisheries Services Division

MFSD – ADVICE

MFSD advise that the TAC in 2001 should not exceed 17,000 t. This translates to an Irish quota of 1,300 t.

STATE OF THE STOCK

- There is no ICES advice for this stock in Sub Area VII.
- The status of the stock is unknown.
- There are no precautionary reference points proposed for this stock.

CURRENT MANAGEMENT

- The TAC area covers VII.
- The 2000 TAC was 17,000 t with an associated Irish quota of 1,300 t.
- There is no management plan or objectives for this stock.

MFSD ECONOMIC COMMENTS

- The value of the 1999 TAC was £16.8m in Sub-areas VII.
- The value of the 1999 Irish quota was £1.2m.
- The value of the 1999 international landings from Division VII was £2.7m.
- The value of the 1999 Irish landings from Division VII was £1.1m.
- Pollack are a very valuable component of the catch in many inshore vessels.

ADDITIONAL INFORMATION

1. There is no assessment for this stock.
2. International landings in 1999 were estimated to be 2,802 t.
3. Estimated Irish landings were 1114 t in 1999.
4. The Irish quota is not restrictive but this fishery is particularly important to smaller Irish vessels operating off the south west and west coast.
5. MFSD suggest that there is some potential to develop pollack fisheries in inshore area using automated jigging machines.

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999
TAC	14,000	14,000	14,000	14,000	14,000	14,000	17,000	17,000	17,000
International Landings	5,850	5,310	5,320	6,031	5,683	6,493	6,073	5,709	1,788

North Sea Saithe

(Sub-areas IV & VI and Division IIIa)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD endorses the ICES advice to allow SSB to rebuild to above B_{pa} in the medium term through a reduction in F of 20%, corresponding to landings of less than 96,000 t in 2001. This translates to a TAC for Sub-area VI of 9,000 t, with an associated Irish quota of 508 t.

STATE OF THE STOCK

- There are serious concerns about the state of this stock.
- Landings began declining in 1985, but have stabilised over the last decade. In recent years, the part of the stock in area VI has only been able to support less than 10% of the total landings from Areas IIIa, IV and VI combined.
- The current F is 0.45 and is above the proposed F_{pa} of 0.40. Fishing mortality has declined from 1986 to 1997, but has increased recently and is higher than the F_{pa} .
- Recruitment since 1996 has been below average.
- The current SSB is 181,000 t and is below the proposed B_{pa} of 200,000 t. SSB has remained near or below the B_{pa} , since 1984.
- SSB will decline even further in the short term unless there is a reduction in F of at least 40%.

CURRENT MANAGEMENT

- Two TAC areas cover this assessment area, the first TAC area is IIa, IIIa,d, and Sub-area IV, the second TAC area covers Division Vb as well as Sub-areas VI, XII and XIV.
- The total TAC for Sub-areas VI, XII and XIV in 2000 was 7,000 t, with an allocated Irish quota of 395 t.
- There is a long term management plan for this stock based on the EU- Norway agreement (See ICES advice).

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £9.6m in Sub-area VI.
- The value of the 1999 Irish quota was £0.5m.
- The value of the 1999 international landings from

Sub-area VI was £9.3m.

- The value of the 1999 Irish landings from Sub-area VI was £0.4m.
- Saithe is a low value species and annual landings are low. However, the high volumes occasionally caught during some trips by Irish vessels can be profitable.

ADDITIONAL INFORMATION

1. Previously, there were two separate assessments carried out by ICES, one for Sub-area VI (West of Scotland & Rockall) and a second for Sub-area IV (North Sea) and Division IIIa (Skagerrak). In 1999, these assessments were combined and this assessment now relates to two separate management areas; (1) Division IIa, Division IIIa-d, Sub-area IV and (2) Division Vb, Sub-area VI, Sub area XII, Sub-area XIV.
2. Total International landings in Sub-area VI for 1999 were 6,946 t
3. Ireland took approximately 322 t in 1999.
4. 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.
5. The saithe is usually caught in mixed gadoid fisheries in Sub-area VI by trawlers operating out of Killybegs and Greencastle.
6. There is no dedicated Irish sampling of this stock.
7. MFSD commenced a groundfish survey off Donegal in 1992. The small catches of saithe do not allow any evaluation of the state of this stock.
8. The minimum mesh size for towed gears is 100mm in IV and VI and 90mm in Skagerrak. Minimum landing size is 35cm in EU waters. In Norwegian waters minimum landing size is 32cm in IV and 30cm in the Skagerrak.

ICES ADVICE 3.5.5

State of stock/fishery

The stock is outside safe biological limits. Fishing mortality has declined from 1986 to 1997, but has increased recently and is higher than the F_{pa} . SSB has remained near or below

the B_{pa} , since 1984. SSB is estimated to have increased in the late 1990s but has decreased 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 tonnes (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 tonnes (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 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 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.

Advice on management:

To allow SSB to rebuild to above B_{pa} in the medium term ICES recommends that F be reduced by 20% ($F=0.36$), corresponding to landings of less than 96 000 t in 2001.

Relevant factors to be considered in management:

A reduction of F to F_{pa} will not rebuild the SSB to above B_{pa} in the short term. In order to achieve the B_{pa} in 2002, as suggested by article 3 of the EU-Norway agreement, a reduction of F of more than 50% would be required. Medium term projections indicate that the stock can be expected to rebuild above B_{pa} in the medium term under the advised F. The gradual but consistent increase in SSB through the 1990s, under F's somewhat above the F advised for 2001, support these projections, and suggest that maintaining the advised F will produce a safe recovery.

About half of the landings forecasted for 2001 and one third of the SSB 2002 originate from assumed recruitment. (average over recent 10 years).

Before 1999, saithe in Sub-area VI and saithe in Sub-area IV and Division IIIa were assessed as two separate stocks. The ICES advice applies to the full area.

In recent years the part of the stock in area VI has only been able to support less than 10% of the total landings from Areas IIIa, IV and VI combined. The table below illustrates the decline in proportion of landings from area.

% landings by area over different periods		
Period	Area IIIa & IV	Area VI
1982-1998	86	14
1988-1998	87	13
1993-1998	91	9

Catch forecast for 2001:

F(2001 onwards)	Basis	Total Landings	Landings IIIa & IV* -2001	Landings VI* -2001	SSB(2002)	Medium-term effect (10 years)Probability (%) of SSB < B_{pa} 2004 2009	
0.18	0.4F(97-99)	52	47	5	202	<5	<5
0.22	0.5F(97-99)	64	58	6	192	<5	<5
0.27	0.6F(97-99)	75	68	7	182	<5	<5
0.32	0.7F(97-99)	86	78	8	173	<5	<5
0.36	0.8F(97-99)	96	87	9	164	~20	5
0.4	F_{pa} 0.9F(97-99)	106	97	9	156	~50	20
0.45	1.0F(97-99)	115	105	10	149	>50	>50

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

*Landings split according to average in 1993-1998

Elaboration and special comment:

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 deep water fishery operating on the shelf edge and a Scottish fishery operating inshore. The directed fishery started in the early 1970s.

The assessment is analytical based on catch-at-age analysis using information from commercial fisheries and surveys.

Lack of recruitment indices for recent and incoming year classes makes catch predictions potentially imprecise. This can lead to higher than expected catches in some years, which presents problems for quota management.

Source of information: Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, October 2000 (ICES CM 2001/ACFM:07).

Reference points proposed by ICES in 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:

$B_{lim}=B_{loss}=106\ 000\ t.$	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 % 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.

Catch data (Tables 3.5.5.1-3):

Saithe in IV and IIIa

Year	ICES Advice	Predicted landings 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	103
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	86	100
1999	Reduce F to F_{pa}	104	110	106	107
2000	Reduce F by 30 %	75	85		
2001	Reduce F by 20 %	87			

Weights in '000 t.

Saithe in VI

Year	ICES Advice	Predicted landings 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 ²	12.8
1995	Significant reduction in effort	-	16	10.6 ²	11.8
1996	No increase in F	10.2 ¹	13	9.4 ²	9.4
1997	Significant reduction in F		12	8.5 ²	9.4
1998	60% Reduction in F	4.8	10.9	7.1 ²	7.6
1999	60% reduction in F	4.8	7.5	3	7
2000	Reduce F by 30 %	6.0	7		
2001	Reduce F by 20 %	9.0			

¹Status quo catch. ²Incomplete data. Weights in '000 t.

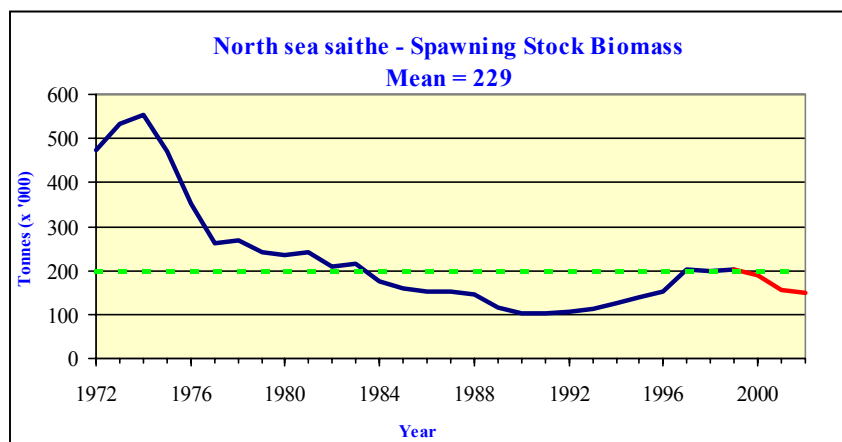
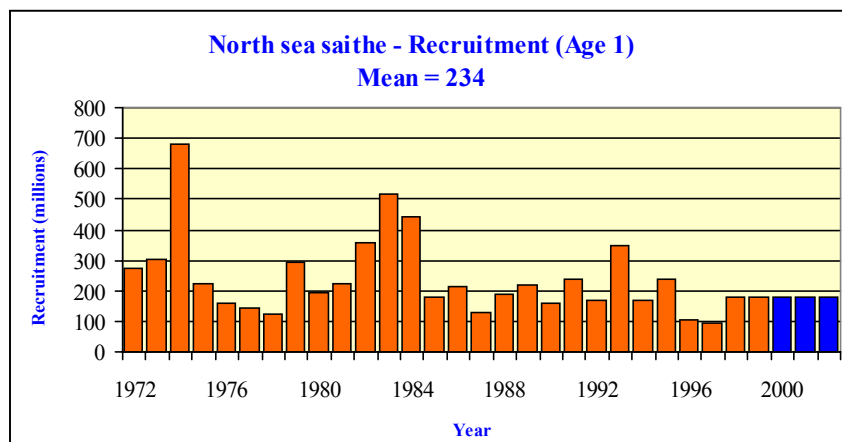
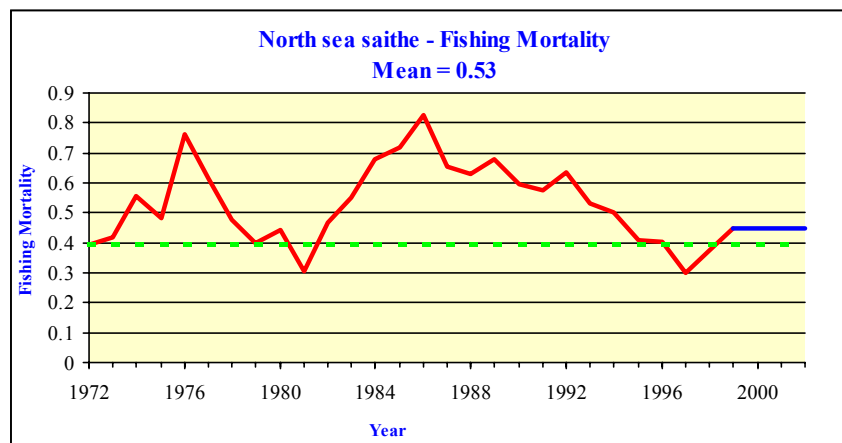
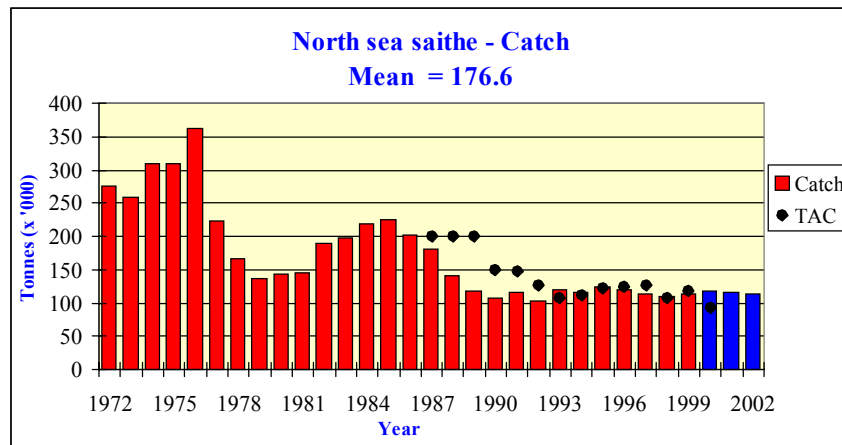


Table 3.5.5.1 Nominal catch (in tonnes) of SAITHE in Sub-area IV and Division IIIa, 1987-1999, as officially reported to ICES.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Belgium	4	60	13	23	29	70	113	130	228	157	254	249	200
Denmark	7,928	6,868	6,550	5,800	6,314	4,669	4,232	4,305 ¹	4,388	4,705	4,513	3,967	4,494
Faroe Islands	691	276	739	1,650	671	2,480	2,875	1,780 ¹	3,808	617	158	1,298	-
France	38,356	28,913	30,761 ^{1,2}	29,892 ^{1,2}	14,795 ^{1,2}	9,061 ¹	15,258 ¹	18,220 ^{1,2}	11,224 ¹	12,336	10,937	11,786 ¹	24,305 ^{1,4}
Germany	22,400	18,528	14,339	15,006	19,574	13,177	14,814	10,013	12,093	11,567	12,581	10,117	10,481
Netherlands	334	345	257	206	199	180	79	18	9	17	40	7	7
Norway	66,400	40,021	24,737	19,122	36,240	48,205	47,669	47,042	53,293 ¹	55,382	46,484 ¹	49,540 ¹	55,816 ¹
Poland	832	1,016	809	1,244	1,336	1,238	937 ¹	151	592	365	822	813	862
Sweden	1,732	2,064	797	838	1,514	3,302	4,955	5,366	1,891	1,771	1,592	1,841	1,869 ¹
UK (E&W)	3,233	3,790	4,012	3,397	4,070	2,893	2,429	2,354	2,522	2,864	2,556	2,293	2,874
UK (Scot.)	11,911	10,850	9,190	7,703	8,602	6,881	5,929	5,566	6,341	5,848	6,329	5,353	5,420
USSR	-	-	-	-	116 ³	-	-	-	-	-	-	-	-
Total reported to ICES	153,821	112,731	92,204	84,881	93,460	92,156	99,290	90,337	96,889	95,629	86,316	85,966	106,328
Unreported landings	-4,414	-6,132	-172	3,199	5,093	343	5,316	12,256	16,525	14,607	17,006	14,120	985
Landings as used by WG	149,407	106,599	92,032	88,080	98,553	92,499	104,606	102,593	113,414	110,326	103,322	100,086	107,313
TAC	173,000	165,000	170,000	120,000	125,000	110,000	93,000	97,000	107,000	111,000	115,000	97,000	110,000

¹Preliminary.

²Includes IIa(EC), IIIa-d(EC).

³Includes Estonia.

⁴Includes Iia(EC).

Table 3.5.5.2 Nominal catch (tonnes) of SAITHE in Sub-area VI, 1987–1999, as officially reported to ICES.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Belgium	12	14	15	-	6	2	2	+	-	- ⁴	-	-	-
Denmark	7	+	2	-	+	1	2	+	+	1	-	-	-
Faroe Islands	-	8	-	-	24	1	-	-	-	3	n/a	-	-
France	24,581	24,656	17,106 ²	12,961 ²	12,423 ²	6,534	10,216	8,423	6,145	4,781	4,662	3,635	-
Germany	1,486	1,584	1,116	275	590	685	222	524	321	1,012	492	506	250
Ireland	704	544	593	520	260	278	317	438	530	419	411	-	-
Norway	38	50	72	64	31	67	59	74 ¹	35	34	26 ¹	41	126 ¹
Spain	533	857	65	70	49	-	-	n/a	n/a	n/a	n/a	-	-
Portugal	-	-	-	-	-	-	-	-	-	-	1	+	-
UK (E.&W) ³	1,708	1,193	462	855	593	540	799	744	317	...	...	n/a	503
UK (N. Ireland)	26	13	...	...	...	...	...	...	...	708	294	n/a	-
UK (Scotland)	3,442	3,925	2,971	3,258	3,885	2,708	2,903	2,828	3,279	2,435	2,659	n/a	2,084
UK (Total)	-	-	-	-	-	-	-	-	-	3,143	2,961	3,170	-
Total	32,537	32,844	22,402	18,003	17,861	10,816	14,520	13,035	10,627	9,393	8,545	7,089	2,963
Unallocated	-1,168	1,334	3,175	1,862	-866	988	-577	-214	1,143	40	873	500	3,983
Total figures used by WG	31,369	34,178	25,577	19,865	16,995	11,804	13,943	12,821	11,770	9,433	9,418	7,589	6,946

¹Preliminary.

²Includes Division Vb (EC).

³1989–1995 N. Ireland included with England and Wales.

⁴Final Statlant 27a data.

n/a = not available.

Table 3.5.5.3 Saithe in Sub-area IV, Division IIIa and Sub-area VI

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-6
1972	273.44	474.09	275.10	0.395
1973	301.50	534.48	259.60	0.416
1974	678.48	554.90	309.44	0.556
1975	222.47	472.06	308.93	0.482
1976	157.28	351.53	361.68	0.760
1977	145.96	263.12	223.40	0.615
1978	125.48	268.08	166.20	0.477
1979	291.21	241.03	135.97	0.396
1980	193.17	235.12	142.40	0.443
1981	222.18	241.14	146.09	0.306
1982	357.70	210.34	189.86	0.469
1983	515.45	214.07	197.77	0.549
1984	442.36	176.32	219.64	0.679
1985	179.49	160.35	226.13	0.717
1986	215.81	151.15	202.76	0.825
1987	129.16	152.16	180.78	0.654
1988	190.35	147.17	140.78	0.629
1989	219.06	114.71	117.61	0.678
1990	159.21	103.47	107.95	0.597
1991	239.70	102.40	115.58	0.575
1992	166.98	105.28	104.15	0.634
1993	345.92	112.27	119.07	0.533
1994	169.89	126.30	115.26	0.500
1995	237.54	140.47	125.18	0.407
1996	106.26	150.90	119.67	0.402
1997	93.77	203.68	112.74	0.298
1998	180.62 ¹	199.99	108.70	0.372
1999	180.62 ¹	202.02	114.26	0.450
2000	180.62 ¹	188.38 ²	.	.
Average	238.68	227.48	176.67	0.529
Unit	Millions	1000 tonnes	1000 tonnes	-

¹ GM (1988-1997).² SSB estimated using the average weight-at-age in the stock over the years 1997-1999.

Arctic Stocks

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 a quota on some of these stocks and Ireland has taken part in these fisheries. The main catches have been taken by a small number of Killybegs vessels in the 1990s. The main stocks in these fisheries are cod, haddock and saithe. Summaries of the state of each stock and ICES advice for each stock is 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.

North-East Arctic Cod

MFSD – ADVICE

Ireland has a small but valuable quota for this stock. MFSD endorses the ICES advice for this stock, which states that a rebuilding plan and a considerable reduction in fishing mortality are required. In order to have a high probability of rebuilding the spawning stock to above 500,000t by 2003, ICES recommends a reduction in fishing mortality for at least two years to below 0.32 (about 67% reduction compared to 1999), corresponding to catches in 2001 of less than 263,000t. The rebuilding plan should also include measures to ensure that all catches are reported fully and that the exploitation pattern is improved.

This translates to an Irish quota of 163 t in 2001.

STATE OF THE STOCK

- There are serious concerns for this stock.
- The landings have fluctuated over the time period 1987 to 1998 between 435,000t and 762,000t
- Fishing mortality in 1999 was 0.96 and has risen substantially since 1990. The recent values are among the highest ever recorded. The proposed F_{pa} is 0.42
- Recruitment was high in the mid-nineties but surveys indicate that the 1998 and 1999 year classes are below average.
- The SSB in 2000 was estimated to be 249,000 t. and has decreased substantially since 1992 when it was estimated to be 896,000 t. It is now below B_{pa} = 500,000 t.

CURRENT MANAGEMENT

- The TAC area corresponds with the assessment area.
- The 1999 TAC is more than 160% of the estimated SSB for that year.
- As well as the overall TAC there is an additional TAC of 40,000t allocated to Norway each year for coastal cod.
- The overall TAC in 2000 was 390,000t. The EU quota was 16,608 t and the Irish allocation was 342 t. including 100 t in Area I and IIb (Svalbard zone)
- This fishery is managed mainly by Norway and Russia and the management objective is to maintain the SSB above 500,000t with an appropriate fishing mortality.

ADDITIONAL INFORMATION

- The recent assessments are considered to have over-estimated stock size and under estimated fishing mortality.
- The total catch taken from this fishery in 1999 was estimated to be above 485,000 t. The Irish catch was 552 t.
- The Irish catch was taken as part of the EU quota.
- The main catches are taken by Norway, Russia, Faeroe Is and United Kingdom.
- Misreporting does not appear to be a problem
- The main gears used are trawls in off shore waters and gillnet, longlines, handlines and Danish seines in inshore waters.
- This is an extremely important fishery, especially for Norway and Russia.
- The fishery was an important source of revenue to the Killybegs vessels that participated in it. It may remain important because of the additional white fish vessels that have joined the Irish fleet in the recent years.
- 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.
- The well being of the cod stock appears to be linked to the capelin stock which at the moment appears to be increasing.
- Recent estimates have overestimated the SSB and underestimated the fishing mortality for unknown reasons.

North-East Arctic Haddock

MFSD – ADVICE

Ireland has a small quota on this stock.

MFSD endorses the ICES advice for this fishery which states that in order to harvest the stock within safe biological limits, the fishing mortality should be reduced to below $F_{pa}=0.35$, corresponding to catches less than 66,000 in 2001.

STATE OF THE STOCK

- There is concern for the state of this stock.
- Landings have fluctuated very much over the years, as in most haddock stocks, but have decreased from 173,000t in 1996 to less than 82,000 t in 1999.
- The F in 1999 was estimated to be 0.55. Fishing mortality has increased rapidly in the 1990s as catches increased. The proposed F_{pa} is 0.35.
- The exceptionally strong 1990 year-class is now declining.
- The SSB in 2000 was estimated to 89,200t. The SSB increased rapidly as a result of the recruitment of the very strong 1999 year-class but is now expected to decrease and will remain below the proposed B_{pa} in the short term.

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 63,000 t with an Irish allocation of 7 t.

ADDITIONAL INFORMATION

1. The quality of the assessment is incomplete because of inadequate survey coverage within the Russian economic zone.
2. The total catch taken from this fishery in 1999 was 81,700 t. The Irish catch was 31 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

Ireland has a small quota on this stock.

MFSD endorses the ICES advice for this stock that recommends fishing mortality should be reduced to below F_{pa} . This corresponds to catches in 2001 less than 115,000 t.

STATE OF THE STOCK

- There is concern for the state of this stock.
- Landings have been high from 1994 to 1999 between 200,000t and 252,000t
- Fishing mortality has declined since 1990 and in 1999 was estimated to be 0.37 which is above the $F_{pa} = 0.26$.
- Several above average year-classes recruited to the stock in the late eighties but the last four recruiting year-classes have been below average.
- SSB in 2000 was estimated to be 198,000 t. SSB increased in the nineties because of good recruitment but is expected to decrease. However the assessment is uncertain.

CURRENT MANAGEMENT

- The TAC is only set for Norway. There is an EU TAC for saithe but it is set for this area combined with the North Sea area.
- The 2000 TAC set by Norwegian authorities for Sub-areas I and II is 125,000 t and there is no EU quota. Ireland has a small by-catch allocation of 11 t.

ADDITIONAL INFORMATION

1. The quality of the assessment is adequate
2. The total catch taken from this fishery in 1999 was 150,000t. The Irish catch was 32 t.
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.

**Capelin in the Iceland
East-Greenland-Jan Mayen area**
(Sub-areas V and XIV and
Division IIa west of 5°W)

MFSD – ADVICE

MFSD agrees with the ICES advice for this stock which states that, in order to ensure a spawning stock biomass of 400,000 t in March 2001 in conformity with the harvest control rule, that the preliminary TAC for the first half of 2000/2001 season should not exceed 650,000 t. This is two thirds of the total TAC of 975,000 t predicted for the whole season and is designed to reduce the risk of overexploitation. ICES advises that the data from the surveys in November 2000 and/or the January-February 2001 be used when the final TAC is set for the 2000/2001 season. ICES advises that, while the 2000 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. The authorities responsible for the management of the stock should make provisions for a quick and efficient process to close such areas to the fishery.

STATE OF THE STOCK

- There are no concerns for this stock.
- The landings fluctuate considerably. Over 1.5 million tonnes were recorded in 1996 but landings in 1998 and 1999 years have decreased to 1.1 million tonnes and 933,000 t respectively.
- Fishing mortality estimates are not calculated for the stock.
- 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 400,000t.
- The preliminary TAC for 2000 was 650,000t.

ADDITIONAL INFORMATION

1. The assessment is based on acoustic surveys only.
2. The total catch in 1999 was 933,000 t. Ireland has not, as yet, taken part in this fishery.
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.
5. Ireland were granted 5 licenses by the Greenland authorities to take part in the fishery in 1999/2000 as part of the EU quota of 48,945 t in east Greenland waters (Area XIV) but did not participate in the 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 the ICES recommendation that the lowest possible catch be taken in 2001, in light of the continued decrease in SSB and very poor recruitments since 1997. MFSD and ICES further recommends that a rebuilding plan be implemented for this stock, including provisions to maintain F as low as possible until a substantial increase of the SSB has been documented. This is not likely to be achieved without improved compliance with the regulatory measures. The rebuilding plan should include provisions to deter directed fishing, reduce by-catches of hake in fisheries for other species to the lowest practical levels, and to deter discarding and mis-reporting of hake in all fisheries.

MFSD recognise that a complete closure is unrealistic, given that hake is taken in a mixed fishery with anglerfish, megrim and *Nephrops*. MFSD recommend a by-catch TAC of about 13,600 t to deter direct fishing and allow a by-catch of hake in fisheries for other species. MFSD strongly advise that technical conservation measures must be introduced to protect juvenile hake. Furthermore, enforcement of minimum landing size is essential to prevent further deterioration of the stock. These measures are seen as an absolute priority in any rebuilding plan. MFSD recommends that a minimum time frame of ten years is required to rebuild this stock.

STECF supports the proposal for a rebuilding plan. The objectives of this plan will be difficult to achieve without significant reductions in hake by-catches and discarding, in the mixed demersal and *Nephrops* fisheries. Furthermore, reductions in the targeting of juveniles and improved compliance with regulatory measures is necessary.

STATE OF THE STOCK

- There are very serious concerns about the state of this stock and the risk of stock collapse.
- The landings in 1999 were 39,300 t, which is 11% higher than in 1998. Despite this, landings have been steadily decreasing since 1989 and are currently at 57% of the 1989 landings.
- Fishing mortality (estimated to be 0.38) is too high in this stock and has been above the proposed $F_{pa}=0.20$ throughout the time series.
- Recruitment, though variable, shows a downward trend since the beginning of the time series and the 1997, 1998 and 1999 year classes are the lowest on

record.

- The spawning stock biomass has also declined since the beginning of the time series and has been below the proposed $B_{pa} = 165,000$ t since 1990. SSB in 2000 is estimated at 87,700 t the lowest in the time series.
- The short-term predictions indicate that SSB in 2002 will reach a new historic low at current levels of fishing mortality.
- A zero catch in 2001 will result in an SSB in 2002 which is still well below B_{pa} .

CURRENT MANAGEMENT

- The assessment area currently covers four TAC areas (See TAC allocation table).
- Ireland has quota in the TAC area Vb, VI, VII, XII and XIV only. The 2000 TAC for this area was 23,600 t with an associated Irish quota of 1,300 t.
- A proposed TAC of 13,600 t in 2001 for all four areas (See TAC allocation table) will result in a substantial reduction in the Irish quota to 420 t.
- There are no explicit management objectives or plan for this stock. A rebuilding plan that will reduce F below F_{pa} and increase SSB above B_{pa} is consistent with the precautionary approach.

TAC allocation table Northern Hake with proposed MFSD advice for 2001

	TAC Area	2000 TAC	2000 Irish Quota	Proposed MFSD Advice for 2001 TAC	Proposed MFSD Advice for 2001 Quota
1	IIIa-d	1,270		410	0
2	IIa,IV	1,480		478	0
3	Vb,VI,VII, XII,XIV	23,600	1,300	7,626	420
4	VIIIabde	15,740		5,086	0
	Total	42,090	1,300	13,600	0

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £81.6m in Sub-areas VI,VII,XII,XIV and Division Vb.
- The value of the 1999 Irish quota was £4.5m.
- The value of the 1999 international landings Sub-areas VI,VII,XII,XIV and Division Vb was £69.1m.
- The value of the 1999 Irish landings was £5.6m.
- This is an extremely economically important high value species which is taken with anglerfish and me-

grim. Any dramatic reduction in the TAC will have a severe impact on profit margins of Irish vessels.

ADDITIONAL INFORMATION

1. There were problems obtaining French landings statistics for 1999, therefore the assessment for this stock may not be as robust as in previous years.
2. The total international landings in 1999 were 38,500 t.
3. Irish landings in 1999 were 2,138 t. This is an increase of 8% on the 1998 landings.
4. The level of mis-reporting in this fishery is unknown.
5. Spain with 58% of the 1999 landings dominates the fishery. France, the UK and Ireland landed 21%, 11% and 6% of the 1999 landings respectively.
6. Hake are a very important component in the mixed species demersal trawl fisheries in most Irish ports. In recent years a targeted gill net fishery involving boats from the southwest has also become important.
7. A large proportion (approximately 60%) of the International landing of hake are from the waters to the northwest, west and southwest of Ireland. There considerable landings of hake into Ireland by Spanish vessels (3,620 t in 1999) and Spanish flag vessels.
8. Irish sampling for this stock is supported through EU funding of FIEFA (EU Study Contract 97-0059) and SAMFISH (99-009).
9. MFSD have conducted a West Coast Groundfish Survey since 1992 and the results indicated that the back of the Aran Islands and Celtic Sea area are an important nursery area for this stock.
10. MFSD also carried out an egg and larval survey in March 2000. The preliminary results from this survey indicate that the continental shelf edge southwest of Ireland may be an important spawning area for hake and megrim.
11. Discarding of juvenile hake is a major problem, mainly in all demersal and *Nephrops* trawl fisheries. Gill net fisheries, which take a large component of the Irish catch (about 40%) have no discards of juvenile hake. MFSD discarding sampling suggests that 6.7% of the weight of hake caught is discarded (44% by number). Approximately 20% of these discards are of landable size, this is mainly because hake are trawl damaged easily and the market does not accept damaged fish. Appropriate technical conservation trials should be carried out to reduce this discarding.
12. Hake are targeted using demersal trawls by the international fleet. Larger hake are target by the Spanish fleet and Spanish flag vessels using long-lines. In recent years several other target fisheries have become important these include; pelagic trawling in the Bay of Biscay, pair trawling in the Celtic Sea and gill netting west of Ireland.
13. MFSD sampling indicates fish between 33-59cm dominated the Irish landings in 1999. Hake are not routinely aged in Ireland but the international age frequency suggests that 62% of the landings being between 2 - 4 years old.

ICES ADVICE

3.12.2

State of stock/fishery

The stock is outside safe biological limits. Fishing mortality has been above F_{pa} , for the period of the assessment, since 1978. SSB has continuously declined and since 1989 has been below B_{pa} . Recruitment estimates for 1997 and 1998 are the lowest recorded, and indications are that the 1999 year class is also small.

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:

In the light of the continued decrease in SSB and very poor recruitment since 1997, ICES recommends that the lowest possible catch be taken in 2001. ICES further recommends that a rebuilding plan be implemented for this stock including provisions to maintain F low until a substantial increase of the SSB has been documented. This is not likely to be achieved without improved compliance with the regulatory measures. The rebuilding plan should include provisions to deter directed fishing, reduce by-catches of hake in fisheries for other species to the lowest practical levels, and to deter discarding and mis-reporting of hake in all fisheries.

Relevant factors to be considered in management:

SSB cannot be rebuilt above B_{pa} in the short term, even with an F of 0 in 2001. An effective reduction in F of at least 50 % in 2001 is required even to halt the decline in SSB. At *status quo* fishing mortality, SSB is expected to continue to decrease in 2001 and 2002. Compliance with technical measures regarding mesh sizes of trawls and minimum landing size is known to be poor, and firm management measures and improved enforcement are needed to prevent a further deterioration of the stock.

Catch forecast for 2001:

Basis: $F(2000) = F(97-99) = 0.32$, Landings(2000) = 27.1, Catch(2000) = 28.1, SSB(2001) = 83.4 .

F(2001)	Basis	Catch (2001)	Landings (2001)	SSB (2002)	Probability (%) of SSB being below B_{pa} in 2004	Probability (%) of SSB being below B_{pa} in 2009
0	0	0	0	103.3	<5%	<5%
0.06	0.2F(97-99)	5.9	5.7	97.2	>50%	<5%
0.13	0.4F(97-99)	11.6	11.0	91.5	>95%	<5%
0.16	0.5F(97-99)	14.3	13.6	88.7	>95%	<5%
0.20	F_{pa}	16.9	16.1	86.1	>95%	>50%
0.25	0.8F(97-99)	21.9	20.9	81.0	>95%	>95%
0.32	1.0F(97-99)	26.7	25.4	76.2	>95%	>95%

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment:

Since the 1930s, hake has been the main species supporting trawl fleets on the Atlantic coasts of France and Spain, and is present in the catches of nearly all fisheries in Sub-areas VII and VIII. In 1999, Spain took 60% of the landings, France 20%, UK about 8% and Ireland 5%. Hake are caught throughout the year, the peak landings being made in the 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 otter trawls (all countries). By-catches of mainly juvenile hake are taken in the *Nephrops* fisheries in the Northern Bay of Biscay. These fisheries have a high proportion (80%) of small hake (less than 30 cm) in their catches, but account for less than 20% in the total international catch of small hakes.

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 years 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 south-west of Ireland, with a decline in catch rates in shallower waters.

Length composition data by fishery unit available annually for 1978–1989 and quarterly for 1990–1999. Prior to 1992, these were converted to age compositions by numerical methods. For 1992–1999, age readings were used. Data include discards estimates.

For 1999, only total official figures for landings were available for France, with no effort data for the commercial fleets.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 2000 (ICES CM 2001/ACFM:05).

Reference points as proposed by ICES 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 is 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 $(SSB_{MT} < B_{pa})$.

Catch data (Tables 3.12.2.1–2):

Year	ICES Advice	Predicted catch corresp to advice	Agreed TAC ¹	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	42.5	1.8	44.2
1998	20% reduction in F	45 ²	59.1	34.7	0.8	35.5
1999	Reduce F below F_{pa}	<36 ²	55.1	38.5	0.8	39.3
2000	50% reduction in F	<20 ²	44.2			
2001	Lowest possible catch, rebuilding plan					

¹Sum of area TACs corresponding to Northern stock plus Division IIa (EC zone only). ²Landings. Weights in '000 t.

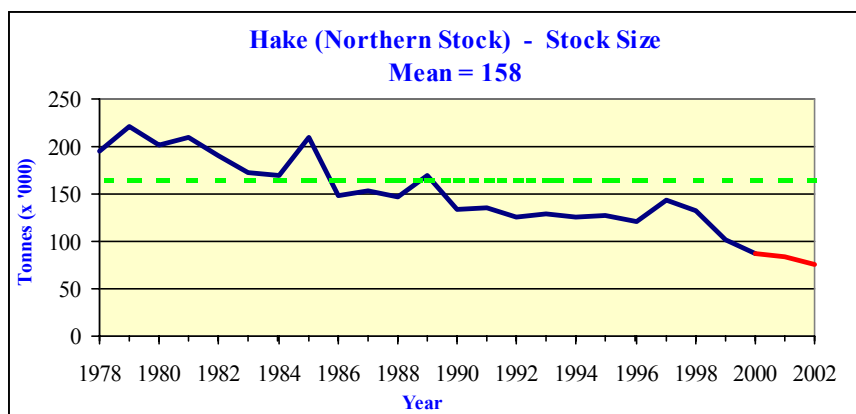
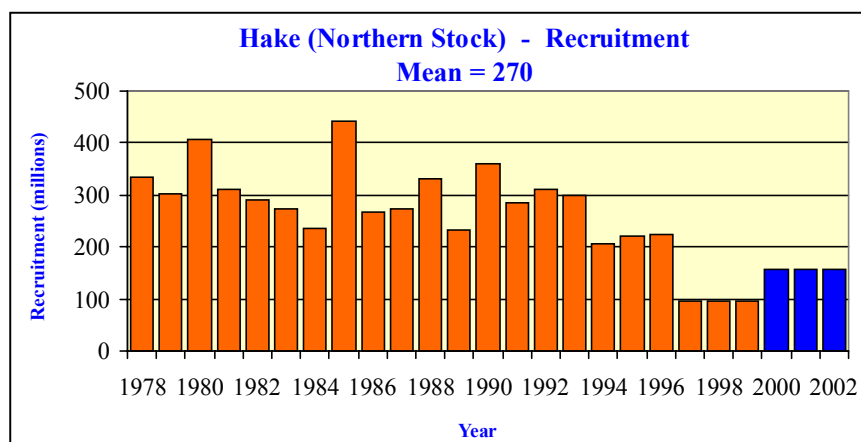
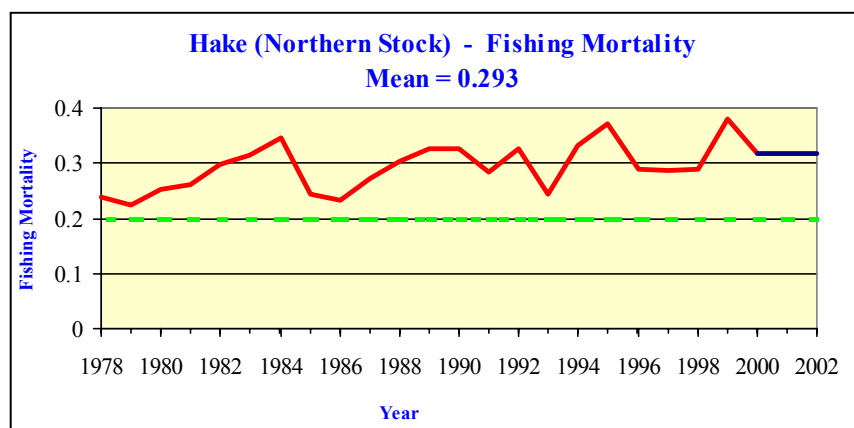
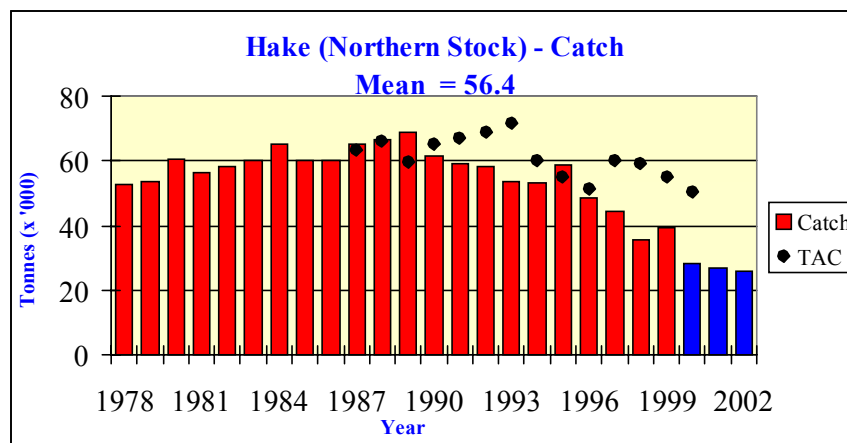


Table 3.12.2.1 Estimates of catches ('000 t) for the NORTHERN HAKE by area for 1961–1999.

Year	Landings ⁽¹⁾					Discards ⁽²⁾	Catches ⁽³⁾
	IVa+VI	VII	VIIIa,b	Unallocated	Total	VIIIa,b	Total
1961	-	-	-	95.6	95.6	-	95.6
1962	-	-	-	86.3	86.3	-	86.3
1963	-	-	-	86.2	86.2	-	86.2
1964	-	-	-	76.8	76.8	-	76.8
1965	-	-	-	64.7	64.7	-	64.7
1966	-	-	-	60.9	60.9	-	60.9
1967	-	-	-	62.1	62.1	-	62.1
1968	-	-	-	62	62	-	62
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	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	24.7	0	54.2	-	54.2
1978	8	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	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	3.1	58.1
1983	6.2	26.3	27.1	-2.1	57.5	2.6	60.1
1984	9.5	33	22.9	-2.1	63.3	1.9	65.1
1985	9.2	27.5	21	-1.6	56.1	3.8	59.9
1986	7.3	27.4	23.9	-1.5	57.1	3	60.1
1987	7.8	32.9	24.7	-2	63.4	2	65.3
1988	8.8	30.9	26.6	-1.5	64.8	2	66.8
1989	7.4	26.9	32	0.2	66.5	2.3	68.8
1990	6.7	23	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	3.2	18.9	20.3	0	42.5	1.8	44.2
1998	3.2	18.6	12.9	0	34.7	0.8	35.5
1999 ⁽⁴⁾	3.6	22.7	12.3	0	38.5	0.8	39.3

⁽¹⁾ 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).

⁽²⁾ Discards have been estimated from 1978 and only for Divisions VIIIa,b, and for French bottom beam trawlers.

⁽³⁾ From 1978 total catches used for the Working Group.

⁽⁴⁾ For France only total official figures were available.

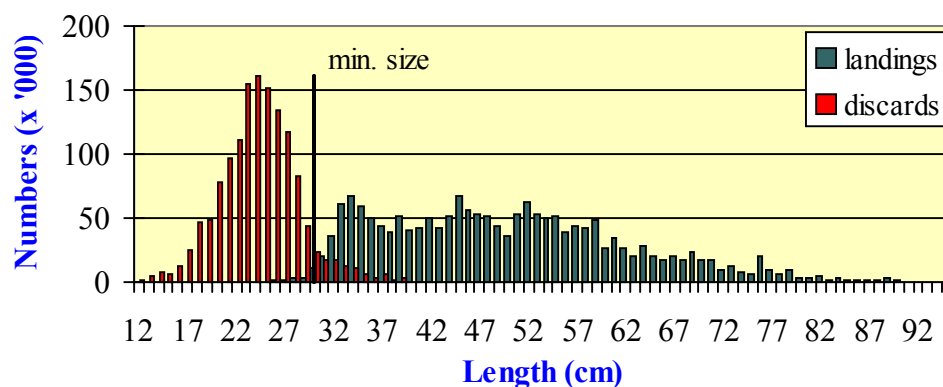
Table 3.12.2.2 Hake - Northern Stock (IIIa, IV, VI, VII, VIIIa,b)

Year	Recruitment Age 0	Spawning Stock Biomass	Landings	Fishing Mortality Age 2-6
1978	333.27	195.95	52.91	0.238
1979	302.11	220.92	53.80	0.224
1980	407.52	201.87	60.46	0.251
1981	310.37	210.38	56.26	0.262
1982	291.66	190.18	58.06	0.298
1983	274.67	173.15	60.13	0.314
1984	236.69	170.14	65.15	0.345
1985	442.60	209.87	59.94	0.245
1986	268.64	147.84	60.05	0.232
1987	273.32	153.70	65.32	0.271
1988	332.14	146.92	66.82	0.304
1989	233.29	169.19	68.78	0.326
1990	360.21	134.47	61.41	0.326
1991	285.68	134.78	59.29	0.282
1992	310.70	125.46	58.29	0.327
1993	300.04	129.34	53.64	0.243
1994	206.13	125.30	53.14	0.332
1995	220.07	126.96	58.86	0.372
1996	222.57	121.39	48.76	0.290
1997	96.35	143.73	44.24	0.286
1998	95.19	131.81	35.55	0.288
1999	96.00	102.40	39.31	0.380
2000	156.00	87.74	.	.
Average	263.27	154.50	56.37	0.292
Unit	Millions	1000 tonnes	1000 tonnes	-

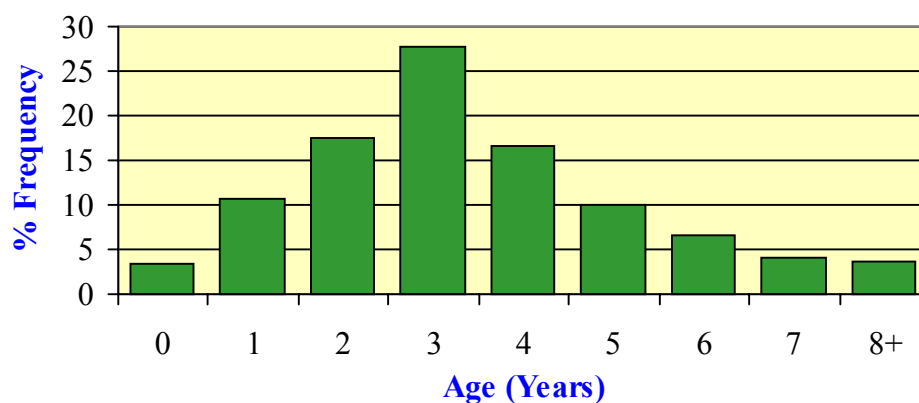
Recruitment in 1999 = average of R in 1997 and 1998

Recruitment in 2000 = GM over 1994-1998 (low SSB)

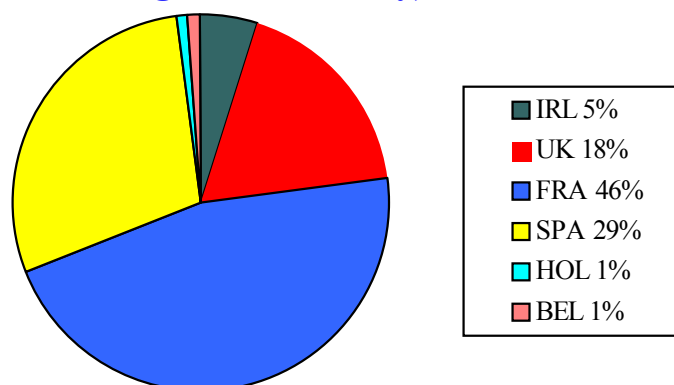
1999 Length Distribution of Irish Landings and Discards of Hake Northern



1999 Age Distribution of International Landings of Hake Northern



2000 Quota Allocations Hake Northern (TAC including area VII only)



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 agrees with ICES that the catch in the combined area should be reduced substantially to landings no greater than 10,000 t in 2001. This may not be achievable in a single year but a significant reduction in 2001 is necessary as a first step. The assessment is too imprecise to give exact guidance on what the reduction in fishing should be. The highest annual catches that may have been sustainable were around 15,000 t and occurred in the period 73-90 before the recent expansion in the fisheries. Since then the stock has since been depleted and now ICES recommends catches no higher than 2/3 of the sustainable catches identified in the period 1973-1990 (10,000 t). This translates to an Irish quota of 430t in 2001.

STATE OF THE STOCK

- There are serious concerns about the state of this stock.
- Landings increased significantly in the early 1990s peaking at 24,500 t in 1997. In 1999 estimated landings were 16,000 t.
- Fishing mortality (F) appears to be decreasing from the high of 1996. However, to meet precautionary criteria, F still needs to be reduced by 50% to bring it below F_{pa} .
- Recruitment is estimated to have been relatively stable except in the most recent years.
- Catch-at-age analysis suggests that SSB was stable in recent years. However, length-based analyses suggested a decline in SSB. Lack of biological information prevents the estimation of SSB with any degree of certainty. 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 VI and IV.
- There were two TACs covering the assessment area in 2000: 17,660 t for Division IIa and Sub-Area IV and 8,000 t for Sub-areas VI, XII, XIV and Division Vb. Ireland takes its quota exclusively from Sub-Area VI, which amounted to 800 t in 2000 (10% of

the total).

- There are no management objectives or a management plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £16.3m in Sub-areas VI.
- The value of the 1999 Irish quota was £1.6m.
- The value of the 1999 international landings from Sub-areas VI was £7.9m.
- The value of the 1999 Irish landings from Sub-areas VI was £1.3m.
- This is a very valuable stock to demersal trawlers primarily from Killybegs and Greencastle.

ADDITIONAL INFORMATION

1. The assessment is highly uncertain. The rapid expansion of this fishery primarily by the Scottish fleet has made a realistic assessment of this stock very difficult. Background biological data on this stock is poor and further scientific information is urgently needed.
2. Total international landings from Sub-area VI were 4,218 t.
3. Irish landings were 692 t in 1999 and decrease of 21% on the 1998 landings. 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.
4. Mis-reporting of landings is considered to be a problem in this fishery.
5. 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.
6. The Irish fleet exploiting this fishery is mainly composed of otter trawl vessels from Greencastle and Killybegs.
7. Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
8. The poor catches of anglerfish on the Irish west coast ground fish survey confirm the poor state of this stock.
9. Levels of discarding are considered to be low in this fishery. MFSD have insufficient data on which to assess the level of anglerfish discarding by Irish vessels.
10. The current decline in landings suggests a decline in biomass given that there is no perceived change in exploitation pattern. In fact, effort and efficiency have probably increased.

11. 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.
12. Mesh regulation offer little protection to this species since their shape means that even the small individuals are easily retained in the gear. However, MFSD would advise that fisheries targeting juvenile anglerfish < 40cm must be deterred by fisheries managers if this stock is to recover.
13. Anglerfish are the subject of significant fishing mortality before attaining full maturity. The expansion of the trawl fishery into deepwater coupled with a UK-Spanish deepwater tangle net fishery has lead to depletion of the spawning component.
14. An EU-funded research project is ongoing in MFSD to increase biological knowledge of the anglerfish and megrim stock in Sub-area VI (in conjunction with the Marine Laboratory Aberdeen and Scottish Association for Marine Science). Part of this project is to identify refuges of large mature female monkfish in deeper water. Preliminary 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 inaccurate.

ICES ADVICE

3.7.7

State of stock/fishery

The stock is harvested outside of safe biological limits. Although highly uncertain, 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 shown a sharp drop over 1997–1999. 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. 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 catch in the combined area should be reduced substantially. The highest catch that may have been sustainable were around 15 000t and occurred in the period 73-90 before the recent expansion in the fisheries. The stock has since been depleted and the sustainable catch at present is likely to be lower. The assessment is too imprecise to give exact guidance on what the reduction in fishing should be. ICES recommends catches no higher than 2/3 of the sustainable catches identified in the period 1973-1990. That corresponds to landings no greater than 10 000 t in 2001.

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-area IV and VI is not possible. Estimates which take into account mis-reporting indicate the percentage of the catch taken in Sub-area VI in the years 1992-1999 (the period used in the assessment) has ranged between 36%-53% with a mean of 43%. These values may be used as a basis to allocate the 2001 TAC between the management units.

The advised reduction in catches may not be achievable in a single year, but a significant reduction in 2001 is necessary as a first step. Formerly, 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. The agreed TAC in 1998 and 1999 for Sub-area IV was based on recent landings reported from that area. Because those landings included mis-reporting 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 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. Unless and until additional spawners are located, fisheries management should be based on sustainable use of the known population.

Two species occur, *Lophius piscatorius* and *L. budegassa*,

although catches are almost exclusively of the former.

Elaboration and special comment:

The fishery for anglerfish in the North Sea is closely associated with the fishery to the West of Scotland, and catch trends from the two areas are similar with a steady increase from around 1984 due to the development of a directed Scottish fishery, and a sharp decline from 1997 to 1999. It is likely that catches from two areas come from the same biological stock.

A number of different assessment approaches were attempted, using data from the two areas both separately and combined. These assessments are preliminary in nature, and do not provide precise reconstructions of the stock history. However, when used as the basis for yield-per-recruit analyses, all approaches lead to the conclusion that a substantial reduction in fishing mortality is required. The sharp reduction in landings since 1996, and the scarcity of mature females in the catches may also be indications that the

stock is heavily over-exploited and is a serious cause of concern.

Recent biological studies suggest that female anglerfish may not mature until 90 cm, instead of the 70 cm assumed in assessments. This would indicate that assessments over-estimate the size of SBB and that the female portion of the stock suffers even higher fishing mortality before maturation.

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. Other protected species (cod, haddock, saithe) are also caught in the targeted anglerfish fishery, and, on the basis of yield and SSB per recruit, diversion of effort from the mixed demersal fishery to the anglerfish fishery does not alleviate fishing pressure on cod in Division VIa.

Reference points:

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} .

Catch data (Tables 3.7.7.1 and 3): Sub-area IV - North Sea

Year	ICES Advice	Predicted corresp. to advice	catchAgreed 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		
2001	2/3 of the catches in 1973-90	5.7			

Weights in '000 t.

Catch data (Tables 3.7.7.2 and 3) Sub-area VI - West of Scotland and Rockall

Year	ICES Advice	Predicted corresp. to advice	catchAgreed TAC ¹	Official landings	ACFM landings ²
1987	Not assessed	-	7.8	5.2	-
1988	Not assessed	-	8.6	7.7	-
1989	Not assessed	-	8.6	6.0	-
1990	Not assessed	-	8.6	6.4	5.8
1991	No advice	-	8.6	6.0	5.4
1992	No advice	-	8.6	6.6	8.1
1993	No long-term gain in increased F	-	8.6	6.2	9.4
1994	No long-term gain in increased F	-	8.6	6.0	8.0
1995	A precautionary TAC not exceeding recent-catch levels	-	8.6	7.2	11.5
1996	A precautionary TAC not exceeding recent-catch levels	-	8.6	7.0	17.6
1997	Reduction in fishing effort	-	8.6	6.2	12.8
1998	Reduction in fishing effort	-	8.6	5.1	9.7
1999	Reduce fishing effort, effective implementation of the TAC	-	8.6	4.2 ³	7.4
2000	40% reduction in catches	<7.4	8.0		
2001	2/3 of the catches in 1973-90	4.3			

¹Vb(EC), VI, XII and XIV. ²Division VIa only. ³Incomplete data. Weights in '000 t.

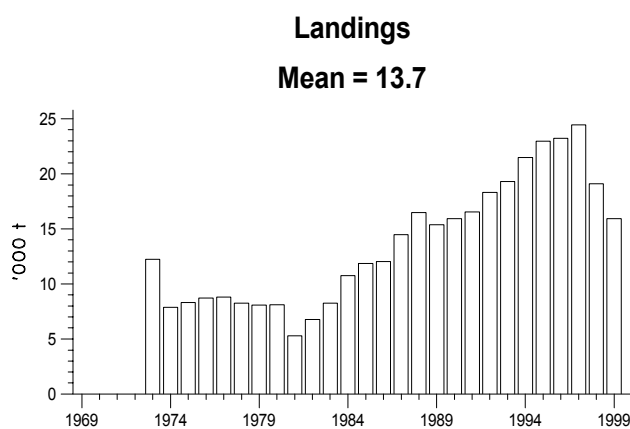


Table 3.7.7.1 Nominal catch (tonnes) of ANGLERFISH in the North Sea, 1989–1999, as officially reported to ICES.**Northern North Sea (IVa)**

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Belgium	1	8	2	9	3	3	2	8	4	1	5
Denmark	835	984	1,245	1265	946	1,157	732	1,239	1,155	1,024	1,127
Faroes	1	7	1	-	10	18	20	-	15	10	-
France	-	-	124	151	69	28	18	7	7	3	18
Germany	187	70	71	68	100	84	613	292	601	873	439
Netherlands	70	18	23	44	78	38	13	25	12	-	15
Norway	309	421	587	635	1,224	1,318	657	822	672	941	1,218
Sweden	9	5	14	7	7	7	2	1	2	8	6
UK (E+W+NI)	99	91	129	143	160	169	176	439	2,174	668	...
UK (Scot)	6,366	6,788	7,039	7,887	9,712	11,683	15,658	22,344	18,783	13,319	...
UK (Total)	...	...	...	...	...	...	...	...	...	...	10,491
Total	7,877	8,392	9,235	10,209	12,309	14,505	17,891	25,177	23,425	16,847	13,319

* Preliminary.

Central North Sea (IVb)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Belgium	209	216	357	538	558	713	579	287	336	371	270
Denmark	211	278	345	421	347	352	295	225	334	432	368
Faroes	-	-	-	-	2	-	-	-	-	-	-
France	-	-	-	1	-	2	-	-	-	-	-
Germany	2	1	4	2	13	15	10	9	18	19	9
Netherlands	574	267	285	356	467	510	335	159	237	223	139
Norway	2	27	17	4	3	11	15	29	7	13	19
Sweden	-	-	-	-	-	3	2	1	3	3	3
UK (E+W+NI)	628	754	669	998	1,285	1,277	919	662	664	603	...
UK (Scot)	495	634	845	733	469	564	472	475	574	424	...
UK (Total)	...	...	...	...	...	...	...	...	...	...	708
Total	2,121	2,177	2,522	3,053	3,144	3,447	2,627	1,847	2,173	2,088	1,516

* Preliminary.

Southern North Sea (IVc)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Belgium	54	21	13	12	34	37	26	28	17	17	11
Denmark	-	-	2	-	-	-	-	-	-	+	-
France	-	-	-	-	-	-	-	-	-	10	-
Netherlands	2	7	5	10	14	20	15	17	11	15	10
UK (E+W+NI)	30	6	6	17	18	136	361	256	131	36	...
UK (Scot)	-	-	-	-	-	17	-	3	1	+	...
UK (Total)	...	...	...	...	...	...	...	...	...	...	3
Total	86	34	26	39	66	210	402	304	160	78	24

* Preliminary.

Total North Sea

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Total	10,084	10,603	11,783	13,301	15,519	18,162	20,920	27,328	25,758	19,013	14,859
WG estimate	9,342	9,491	10,566	11,728	13,078	15,432	15,794	16,240	18,217	14,027	11,719
Unallocated	-742	-1,112	-1,217	-1,573	-2,441	-2,730	-5,126	-11,088	-7,541	-4,986	3,067

* Preliminary.

Table 3.7.7.2 ANGLERFISH in Sub-area VI. Nominal landings (t) as officially reported to ICES.**Anglerfish in Division VIa (West of Scotland)**

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Belgium	-	4	2	15	2	8	-	3	2	9	6	5	-	5	2	+
Denmark	-	-	-	4	-	34	-	1	3	4	5	10	4	1	2	1
France	1,723	2,036	1,505	1,601	2,329	1,901	2,182	1,910	2,308	2,467	2,382	2,648	2,899	2,058	1,634	1,814
Germany	4	24	3	4	9	10		1	2	60	67	77	35	72	137	50
Ireland	172	119	295	187	324	556	398	250	403	428	303	720	717	625	749	
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	27	1	-
Norway	6	5	6	3	8	27	8	6	14	8	6	4	4	1	3	1
Spain	355	281	142	130	269	15	35	7	11	8	1	37	33	63	n/a	
UK(E.W.NI)	58	52	38	243	433	153	71	270	351	223	370	320	201	156	...	...
UK(Scotland)	1,617	1,522	1,099	1,768	2,629	3,024	2,921	2,613	2,385	2,346	2,133	2,533	2,515	2,322	...	...
UK															1,892	1,748
Total	3,935	4,043	3,090	3,955	6,003	5,728	5,615	5,061	5,479	5,553	5,273	6,354	6,408	5,330	4,420	3,614
Unallocated							184	296	2,638	3,816	2,766	5,112	11,148	7,506	5,234	3,799
As used by							5,799	5,357	8,117	9,369	8,039	11,466	17,556	12,836	9,654	7,413

Anglerfish in Division VIb (Rockall)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Faroe Islands	5	4	-	-	6	1	-	-	2	-	-	-	15	4	2	
France	35	13	19	4	4	-	-	-	-	29	-	-	-	1	1	
Germany	-	-	-	-	-	-	-	-	-	103	73	83	78	177	132	144
Ireland	-	-	-	-	-	-	400	272	417	96	135	133	90	139	130	
Norway	14	7	9	11	7	13	16	18	10	17	24	14	11	4	6	5
Spain	598	642	990	730	1340	81	138	333	263	178	214	296	196	171	n/a	
UK(E.W.NI)	20	85	112	253	123	17	19	99	173	76	50	105	144	247	...	...
UK(Scotland)	35	262	196	296	250	201	249	201	224	182	281	199	68	156	...	...
UK															377	455
Total	707	1,013	1,326	1,294	1,730	313	822	923	1,089	681	777	830	602	899	648	604

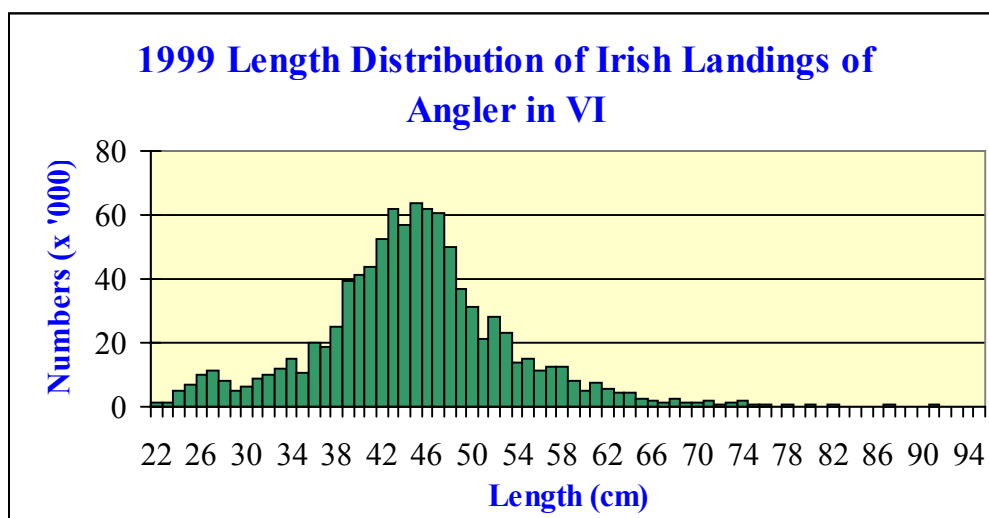
Total Anglerfish in Sub-area VI (West of Scotland and Rockall)

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Total	4,642	5,056	4,416	5,249	7,733	6,041	6,437	5,984	6,568	6,234	6,050	7,184	7,010	6,229	5,068	4,218

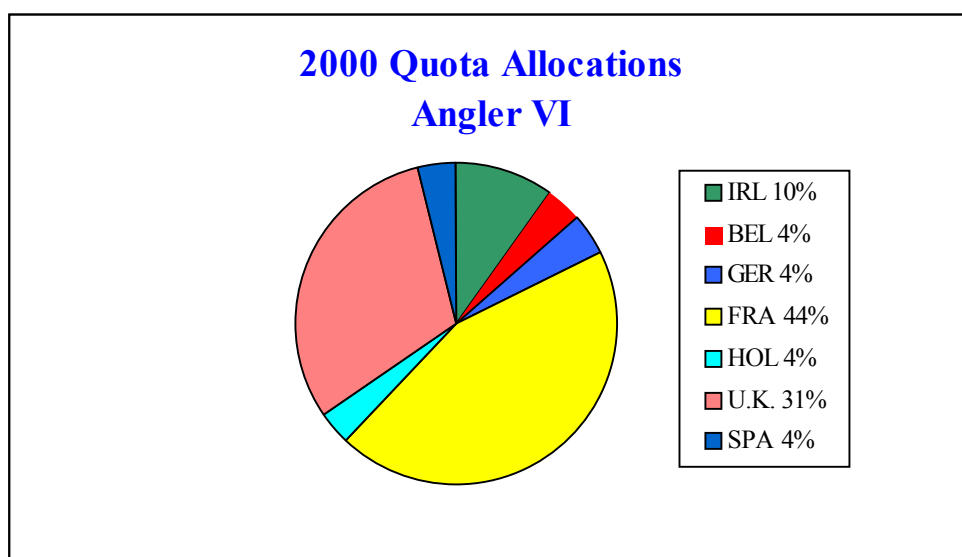
*Preliminary

Table 3.7.7.3 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	6,437	15,928
1991	10,566	5,984	16,550
1992	11,728	6,568	18,296
1993	13,078	6,234	19,312
1994	15,432	6,050	21,482
1995	15,794	7,184	22,978
1996	16,240	7,010	23,250
1997	18,217	6,229	24,446
1998	14,027	5,068	19,095
1999	11,719	4,218	15,937



AT PRESENT MFSD DO NOT AGE ANGLERFISH



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

ICES have given 2 advice options for this stock in 2001. The first corresponds to a TAC of 27,600 t and the second to a TAC of 20,200t. MFSD agrees with the ICES recommendation that F should be kept below F_{pa} and SSB should be kept above B_{pa} . This would correspond to landings less than 27,600 t for both species combined (18,300 t *L. piscatorius* and 9,300 t *L. budegassa*).

MFSD cannot reconcile the advice in option 2 with the precautionary approach, as the projected decrease in SSB in the short term will still leave the stock well above B_{pa} .

TAC Area	2000 TAC	Irish quota	ICES ADVICE	
			Option 1	Option 2
VII	23,000	1,740	21,468 (Irl quota 1,624)	15,712 (Irl quota 1,189)
VIIIabde	6,570		6,132	4,488
	29570		27600	20200

STATE OF THE STOCK

- There are no concerns about the state of this stock.
- The landings of *L. piscatorius* in 1999 were 14,600 t, which is 25% lower than in 1998. The landings of *L. budegassa* in 1999 were 10,000 t, which is 17% higher than in 1998. Combined landings peaked in 1981 close to 40,000 t, landings of *L. piscatorius* have been decreasing since the recent high of 22,000 t in 1996. Conversely, *L. budegassa* landings have been increasing in recent years since the low of 1994.
- Fishing mortality for *L. piscatorius* has been close to the proposed $F_{pa}=0.24$ in recent years. Similarly, fishing mortality for *L. budegassa* has been close to $F_{pa}=0.23$.
- Recruitment in *L. piscatorius* was extremely low in the 1997 year-class, above average in the early 1990s, but has declined since. The 1995 year-class is very low in *L. budegassa*.
- The SSB for *L. piscatorius* has remained well above $B_{pa} = 31,000$ t since 1995. Similarly, the SSB in *L. budegassa* has remained well above $B_{pa} = 16,000$ t since 1995.
- The *L. piscatorius* SSB is forecast to decline in the short term at the current level of fishing mortality but

will remain well above B_{pa} . SSB in *L. budegassa* is predicted to increase even further at the current fishing mortality and recruitment.

CURRENT MANAGEMENT

- Two species are caught in the management and assessment area (*L. piscatorius* and *L. budegassa*) these are not routinely separated by the industry therefore a combined TAC is set for both species.
- There are two TAC areas covered by this assessment area; Sub Area VII and Divisions VIIa,b,d,e. The assessment area covers Divisions VIIb-k and VIIa,b.
- The 2000 TAC for Sub Area VII was 23,000 t with an associated Irish quota of 1,740 t.
- There are no explicit management objectives or plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £55.6m in Sub-area VII.
- The value of the 1999 Irish quota was £4.2m.
- The value of the 1999 international landings Sub-area VII was £51.2m.
- The value of the 1999 Irish landings was £7.5m.
- This is an extremely economically important high-value species which is taken with hake and megrim. Any dramatic reduction in the TAC will have a severe impact on profit margins of Irish vessels.

ADDITIONAL INFORMATION

- There were problems obtaining French landings statistics for 1999. Given this uncertainty the working group considered it prudent not to carry out a new assessment of this stock this year. However the assessment carried out last year was revised and used to provide advice this year.
- The landings of *L. piscatorius* were 14,600 t and *L. budegassa* were 10,000 t in 1999.
- Irish landings in 1999 were 3,605 t. This is an increase of 15% on the 1998 landings.
- The TAC for this stock is very restrictive for the Irish fleet and most other fleets and misreporting continues to be a very serious problem in this stock. MFSD are seriously concerned that degradation of landings data by misreporting may be causing this assessment to be over optimistic.
- The European fleet on the western seaboard of Ireland has heavily targeted anglerfish for over 15 years now. France dominate the fishery, with over 50% of the 1999 landings, the UK catch about 20%, Ireland 15%

and Spain close to 10%. A fishery, mainly by UK Spanish and French flag vessels using tangle-nets, fished 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 increased efficiency substantially by increasing spread of their trawls, switching increasingly to twin-rigs and pioneering new grounds never previously fished.

6. Irish landings for this stock are mainly taken in otter trawls and, increasingly with the recent Whitefish Renewal Scheme, twin-rigs. Anglerfish are the main target species along the western shelf for demersal vessels from Killybegs, Rossaveal, Dingle, Castle-townbere, Union Hall, Dunmore East and many other smaller ports.
7. Irish sampling for this stock is supported through EU funding of FIEFA (EU Study Contract 97-0059) and SAMFISH (99-009).
8. MFSD have conducted a west coast ground fish survey since 1992 and the results indicated that the continental shelf west and south of Ireland may be an important nursery area for this stock.
9. Discarding is known to be very low in this stock and MFSD discard sampling suggests that only 0.8% of the total weight caught (1.9% by number) was discarded in 1999.

Special Note:

MFSD have serious concerns about the basis of the advice. The advice given is consistent with both the precautionary approach and the current assessment. However, anecdotal information from the Irish fleet indicates that despite substantial increases in efficiency and targeting of anglerfish CPUE have not increased. In addition The biology of anglerfish is not well understood and could also have a serious impact on the accuracy and applicability of the assessment.

ICES ADVICE

3.9.12

State of stock/fishery

These stocks are inside safe biological limits. SSB of both stocks decreased continuously from 1986 until 1993 and are presently well above B_{pa} . For both stocks, fishing mortality has in most years been above F_{pa} , but is presently (1998) estimated to be close to F_{pa} . Improvements to the assessment have produced new estimates for F and SSB over the entire historic trajectory of the two species. Although trends are very similar, the new estimates lead to new values of reference points, forecast catches, and consequently the advice.

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:

This corresponds to landings of less than 27 600t in 2001 for both species combined (18 300t *L. piscatorius*, and 9 300t *L. budegassa*). For *L. piscatorius*, in order to prevent a decrease in SSB in the short term, a reduction of F of at least 30% would be required. This would correspond to landings of less than 20 200t in 2001 for both species combined (13 400t *L. piscatorius*, and 6 800t *L. budegassa*).

Reference points revised in 2000: Revision based on extension of age range used in the assessment.

***L. piscatorius*:**

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	$B_{pa} : B_{loss}$
$F_{lim} : F_{loss}$	$F_{pa} : F_{lim} \times 0.72$

L. budegassa:

ICES considers that:	ICES proposes that:
B_{lim} is not defined.	B_{pa} be set at 16 600 t. There is no evidence of reduced recruitment at the lowest biomass observed and B_{pa} can therefore 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:

In absence of reliable catch at age data from the French fishery in 1999 due to deficiencies in the statistical data base, only an updated 1999 assessment was presented. Catch predictions were carried out one more year ahead from the 1999 data assuming *status quo* F in 1999 and 2000. Without a fully updated assessment, the uncertainty will increase about the present stock size and the projected catches and SSB. The SSB is expected to decrease for *L. piscatorius* in the short term because the strong year classes

1990-1992 will pass through the fishery and the following year classes are about average.

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 800 and 1 400 t.

Catch forecast for 2001:

Basis: *L. piscatorius*: $F_{99} = F(96-98) = 0.24$, Catch(1999) = F_{sq} predicted = 20.5, SSB(2000) = 52.6.

$F_{2000} = F(96-98) = 0.24$, Catch(2000) = F_{sq} predicted = 19.4; SSB(2001) = 50.1.

Basis: *L. budegassa*: $F_{99} = F(96-98) = 0.23$, Catch(1999) = F_{sq} predicted = 9.2; SSB(2000) = 24.7.

$F_{2000} = F(96-98) = 0.23$, Catch(2000) = F_{sq} predicted = 9.3; SSB(2001) = 25.2.

<i>L. piscatorius</i>				<i>L. budegassa</i>			
F(2001)	Basis	Landings (2001)	SSB(2002)	F(2001)	Basis	Landings (2001)	SSB(2002)
0.12	$0.5F_{sq}$	9.9	56.3	0.12	$0.5F_{sq}$	5	29
0.15	$0.6F_{sq}$	11.7	54.5	0.14	$0.6F_{sq}$	5.9	28.2
0.17	$0.7F_{sq}$	13.4	52.7	0.16	$0.7F_{sq}$	6.8	27.4
0.19	$0.8F_{sq}$	15.1	51	0.19	$0.8F_{sq}$	7.6	26.6
0.22	$0.9F_{sq}$	16.7	49.4	0.21	$0.9F_{sq}$	8.5	25.9
0.24	$F_{sq} = F_{pa}$	18.3	47.8	0.23	$F_{sq} = F_{pa}$	9.3	25.2
0.27	$1.1F_{sq}$	19.8	46.3	0.26	$1.1F_{sq}$	10.1	24.5

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment:

The catch at age matrix was extended to include ages to 13+ for *L. piscatorius* and to 14+ for *L. budegassa*. Consequently, the age range used to calculate reference F for each stock has been modified.

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 water 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.

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 have returned to the level 10 years ago, when France and Spain have 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 last decade 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. In Sub-Area VI, which is not covered by this assessment, French landings of anglerfish have fluctuated around 2 000 t over the last two decades. 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. In the Bay of Biscay, the spawning season extends from April to July for both species and spawning mainly occurs close to the edge of the continental shelf. Eggs are released in long gelatinous ribbons and have been recorded in March on the shelf edge in the Celtic Sea and off the west coast of Britain between May and July. Juvenile anglerfish have been caught both in deep water and along the shoreline and discrete nursery areas have not been identified.

No recruitment indices are available for these stocks, and there was a downward revision of the estimates of abundance of *L. piscatorius* recruits in 1993–1995, and for *L. budegassa* recruits in 1995 and 1996, mostly due to poor sampling of small fish.

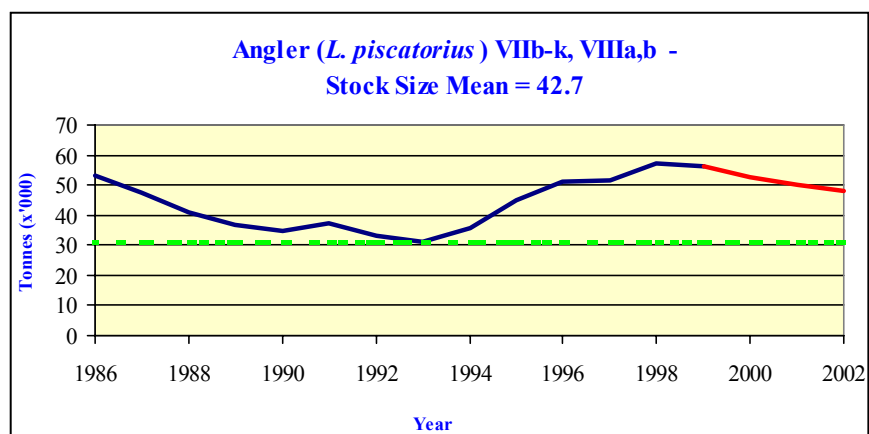
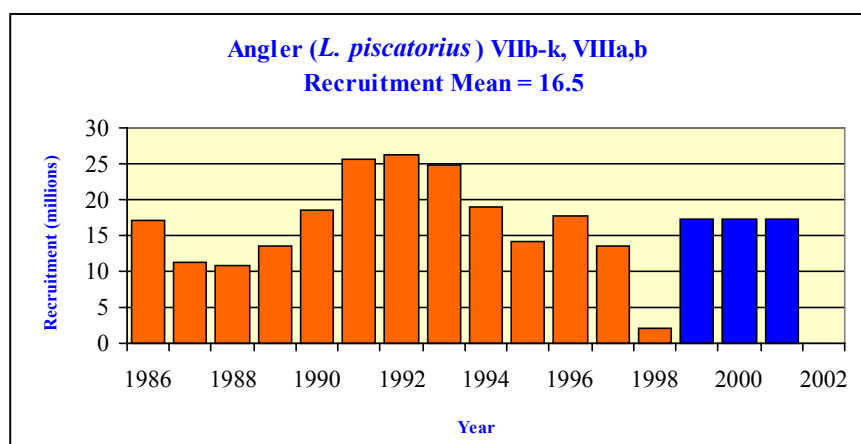
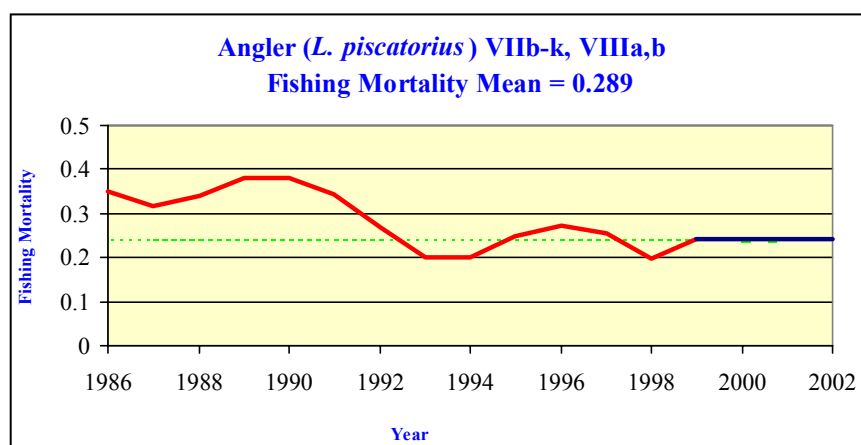
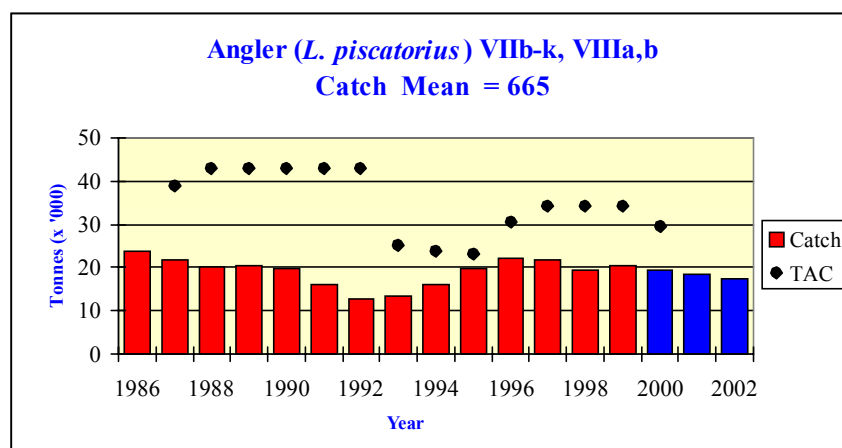
Short-term predictions of landings and SSB are not sensitive to recent assumed recruitment.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 2000 (ICES CM 2001/ACFM:05).

Catch data (Tables 3.9.12.1–5):

Year	ICES Advice	Predicted catch cor- resp. to advice	Agreed TAC ¹	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	29.3	19.7	9.6
1991	No advice	-	42.99	25.0	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 ²	20.1	13.5	6.7
1994	SSB decreasing, still inside safe biological limits	-	23.9 ²	21.9	16.1	5.8
1995	No increase in F	20.0	23.2 ²	26.8	19.7	7.1
1996	No increase in F	30.3	30.4 ²	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	24.6 ⁴	14.6 ⁵	10.0 ⁵
2000	At least 20% decrease in F	< 22.3	29.6			
2001	Reduce F below F _{pa}	< 27.6				

¹Includes Division VIIa; applies to both species. ²Includes Divisions VIIId,e. ³Revised. ⁴French catches from official data per TAC area. ⁵Split by species considered unreliable. Weights in '000 t.



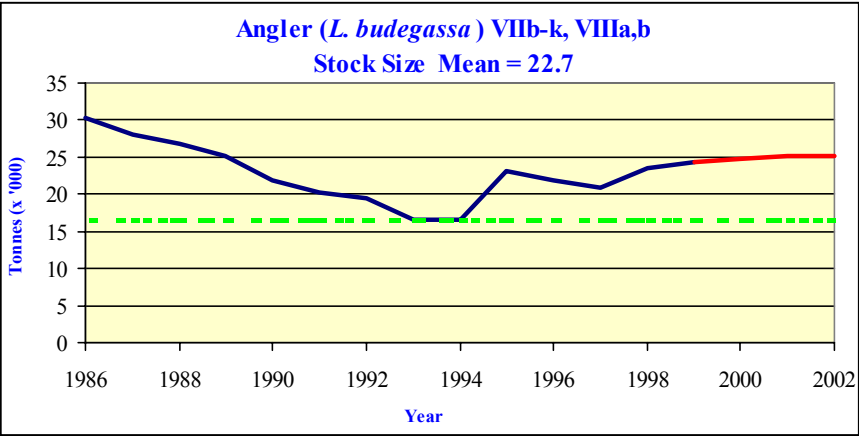
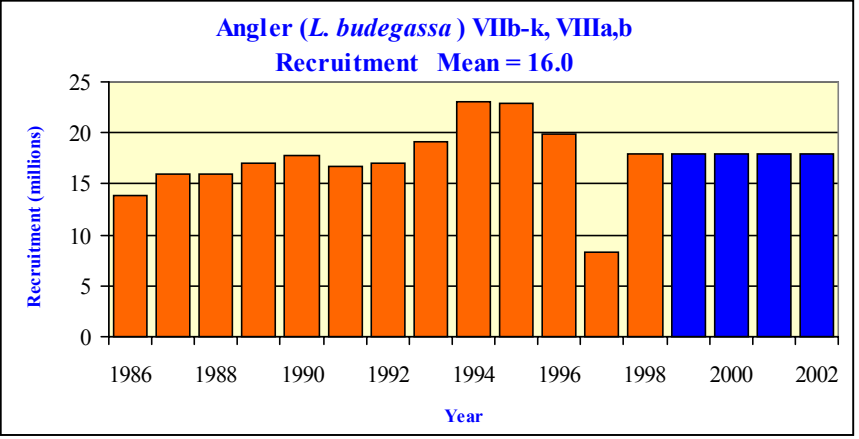
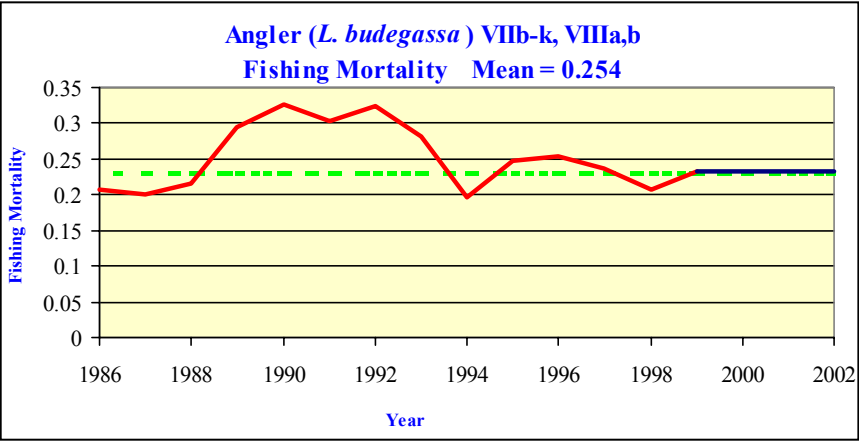
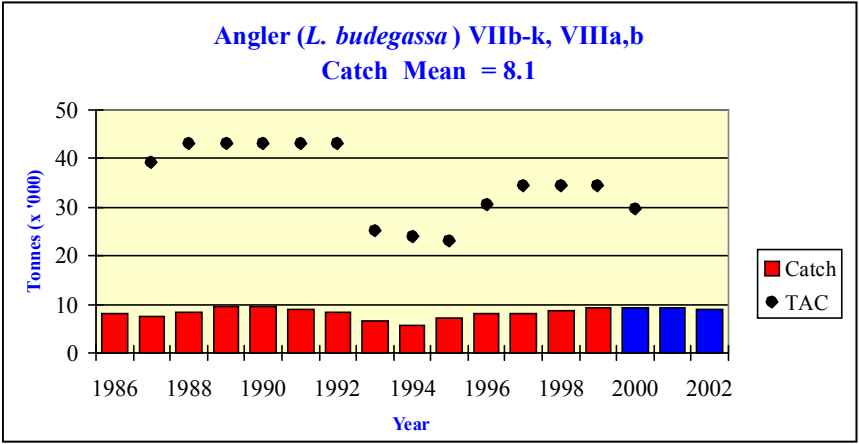


Table 3.9.12.1 Landings (tonnes) of both ANGLERFISH in Divisions VIIb-k and VIIa,b,d. Working Group estimates.

Year	VIIb-k	VIIa,b,d	Total
1977			19895
1978			23445
1979			29738
1980			38880
1981			39450
1982			35285
1983			38280
1984	28847	7909	36756
1985	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*	12394	122228	24622

*Preliminary.

Table 3.9.12.2 Landings (tonnes) of *L. piscatorius* in Divisions VIIb-k and VIIa,b,d. Working Group estimates

Year	VIIb-k	VIIIa,b,d	Total
1984*	23056	5416	28472
1985*	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*	7521	7061	14582

*Preliminary.

Table 3.9.12.3 Landings (tonnes) of *L. budegassa* in Divisions VIIb-k and VIIa,b,d. Working group estimates

Year	VIIb-k	VIIIa,b,d	Total
1984*	5791	2493	8284
1985*	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*	4873	5168	10041

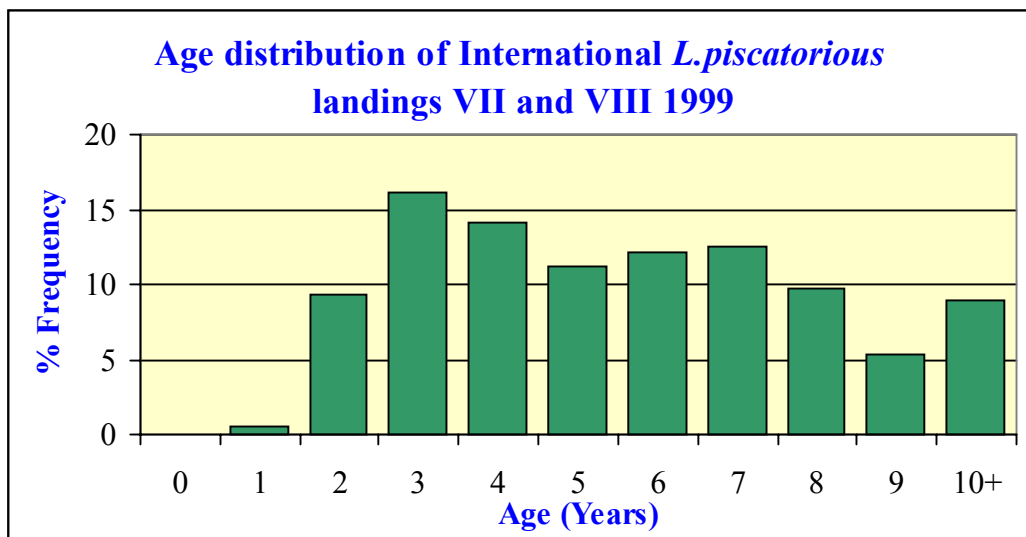
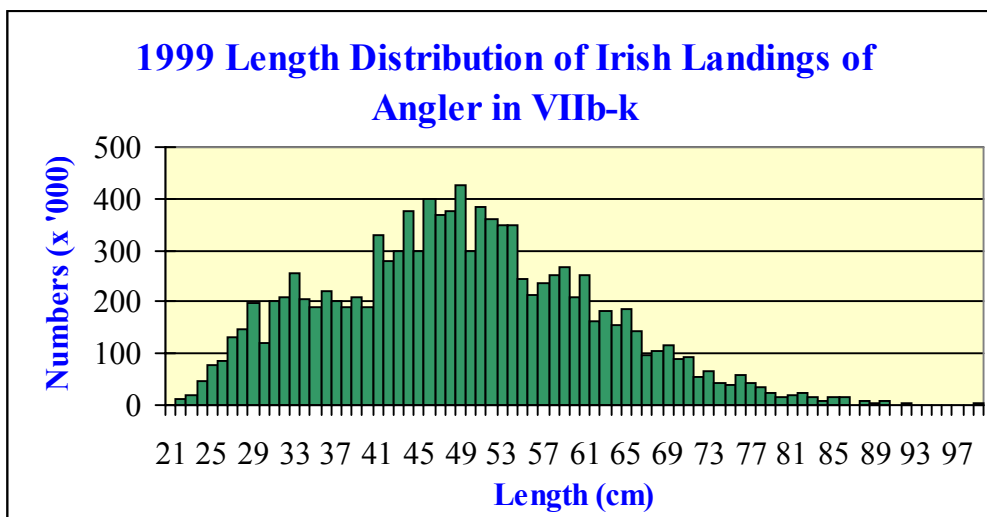
*Preliminary.

Table 3.9.12.4 Anglerfish (*Piscatorius*) in Divisions VIIb-k and VIIa,b

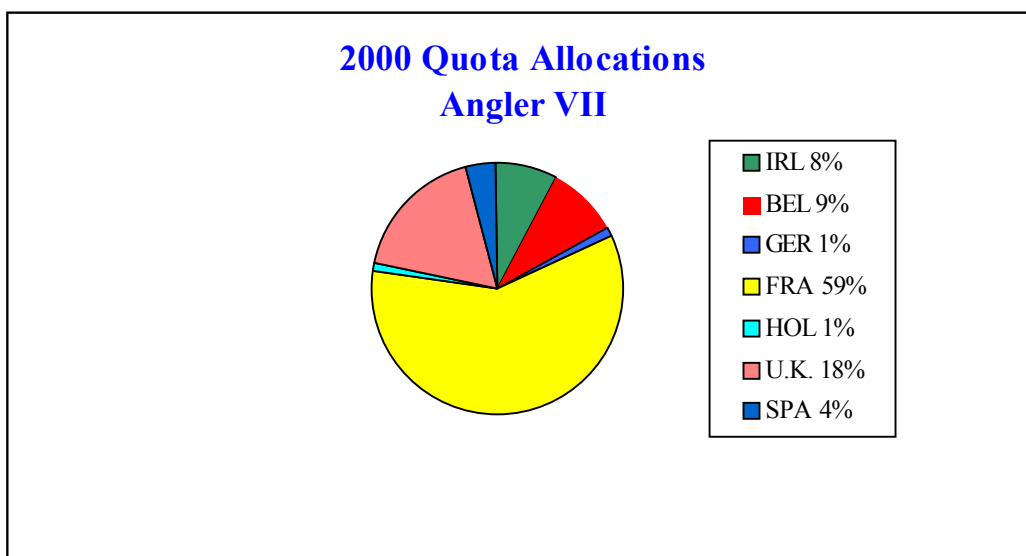
Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-8
1986	17.16	53.14	23.67	0.349
1987	11.25	47.29	21.91	0.318
1988	10.74	40.69	20.10	0.339
1989	13.50	36.94	20.47	0.380
1990	18.46	34.98	19.75	0.381
1991	25.67	37.11	16.23	0.345
1992	26.29	33.25	12.82	0.270
1993	24.70	30.96	13.48	0.200
1994	18.99	35.66	16.12	0.199
1995	14.13	45.00	19.73	0.247
1996	17.71	51.11	22.14	0.271
1997	13.63	51.47	21.66	0.256
1998	2.16	57.47	19.57	0.199
1999	17.28	56.06	20.49	0.242
2000	17.28	52.56	.	.
Average	16.60	44.25	19.15	0.285
Unit	Millions	1000 tonnes	1000 tonnes	-

Table 3.9.12.5 Anglerfish (*Budegassa*) in Divisions VIIb-k and VIIa,b

Year	Recruitment Age 2	Spawning Stock Biomass	Landings	Fishing Mortality Age 6-10
1986	13.83	30.22	8.22	0.207
1987	15.98	28.10	7.62	0.201
1988	16.02	26.89	8.38	0.216
1989	16.95	25.24	9.53	0.294
1990	17.75	21.91	9.63	0.326
1991	16.78	20.35	8.84	0.304
1992	17.01	19.35	8.27	0.325
1993	19.10	16.62	6.66	0.282
1994	23.04	16.64	5.81	0.196
1995	22.90	23.11	7.05	0.248
1996	19.88	21.97	8.09	0.255
1997	8.27	20.80	8.11	0.237
1998	17.91	23.60	8.60	0.206
1999	17.91	24.26	9.24	0.233
2000	17.91	24.74	.	.
Average	17.42	22.92	8.15	0.252
Unit	Millions	1000 tonnes	1000 tonnes	-



AT PRESENT MFSD DO NOT AGE ANGLERFISH



West of Scotland and Rockall Megrim

(Sub-area VI)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD endorses ICES advice that the current TAC is maintained at 4,840 t with an associated Irish quota of 630 t.

STATE OF THE STOCK

- There is no concern about this stock.
- No assessment was carried out on this stock this year.
- There are not sufficient data to propose reference points.
- Fishing effort has increased in recent years because of an expansion of the anglerfish fishery into deeper waters.

CURRENT MANAGEMENT

- The assessment area is for Sub Area VI while the TAC is based on a larger area (Sub Areas VI, XII, XIV and Division Vb).
- The 2000 TAC was 4,840 t of which the Irish allocation was 630 t (13%).
- There are no explicit management objectives or a management plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £9.1m in Sub-area VI.
- The value of the 1999 Irish quota was £1.2m.
- The value of the 1999 international landings from Sub-areas VI was £5.9m.
- The value of the 1999 Irish landings from Sub-area VI was £1.1m.
- This is an economically important by-catch species in the mixed demersal fisheries off Donegal and at Rockall.

ADDITIONAL INFORMATION

- 1 No assessment was carried out for this stock.
- 2 The estimated 1999 catch of 3,200 t has declined from a high of over 5,000 t in 1996.
- 3 Irish landings in 1999 were 565 t (down 14% on 1998).
- 4 Mis-reporting of anglerfish landings in the past,

primarily by Scottish vessels into Sub-area VI has led to an associated mis-reporting of the megrim component of the catch. The proportion of megrim landed by Irish vessels from the anglerfish fishery is higher than that of the UK or French fleets. This may be due to under reporting of anglerfish landings by Irish vessels.

- 5 The fishery is dominated by Scottish and Irish vessels (~25% and ~10-15% of landings, respectively).
- 6 Irish landings in Sub-area VI are mainly taken by otter trawlers fishing at the Stanton, Rockall banks and Donegal Bay.
- 7 Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
- 8 MFSD have carried out a groundfish survey in the southern part of VIa since 1992 and catches indicate that the stock has been stable over this period.
- 9 MFSD discard sampling suggests that about 13% of the total weight of fish caught was discarded. Most of the discarded catch sampled was undersized. About 33% of the discarded catch sampled was of a landable size.
- 10 Megrim are a valuable by-catch of the larger vessels fishing Rockall haddock. This stock is also a valuable by-catch from the anglerfish fishery. Catch controls to protect anglerfish stocks in area VI will consequently also effect by-catch landings of megrim.
- 11 Two species of megrim are caught. The majority of landings are *Lepidorhombus whiffiagonis*. Landings of *L. boscii* are negligible.
- 12 MFSD are partners in 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 area VIa.

ICES ADVICE 3.7.6

State of stock/fishery

When last assessed (1999) the stock was within safe biological limits. The historical perspective of SSB, fishing mortality and recruitment is not well estimated, although it is likely that fishing mortality has increased since the 1980s as the fishery for anglerfish, (in which megrim is taken as a by-catch) has expanded into progressively deeper water.

Management objectives:

No explicit management objectives are set for this stock.

Advice on management:

ICES advises that the current TAC be maintained.

Reference points

There is not sufficient information to estimate appropriate reference points.

Relevant factors to be considered in management:

Megrim are caught as part of a targeted anglerfish fishery which has expanded rapidly in recent years. 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.

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 misreporting. 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 misreporting of landings, including the megrim component, into the North Sea.

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 that area, where they are now caught as a by-catch in the targeted anglerfish fishery

Length frequency and age composition data are only available for 1992–1999. 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, June 1999 (ICES CM 2000/ACFM:01).

Catch data (Tables 3.7.6.1-2)

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings	ACFM landings ³
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 <i>F</i>	-	4.84	3.0	3.4
1994	No long-term gain in increased <i>F</i>	-	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	2.0	3.1
1999	Maintain current TAC	4.84	4.84	1.4 ²	2.8
2000	Maintain current TAC	4.84	4.84		
2001	Maintain current TAC	4.84			

¹Vb(EC), VI, XII and XIV. ²Incomplete data. ³Landings in VIa. Landings in Vb (EC), XII, and XIV negligible. Weights in '000 t.

Table 3.7.6.1 Nominal catch (tonnes) of MEGRIM in Sub-area VI (West of Scotland and Rockall), as officially reported to ICES.

Megrim in Division VIa (West of Scotland)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Belgium	-	-	-	1	1	1	-	1	-	-	1	-	-	-	-	
Denmark	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	
France	1,398	1,411	777	997	1,295	457	398	455	504	517	408	618	462	192	172	203
Germany	1	-	-	-	2	-	-	-	-	-	-	-	-	-	-	
Ireland	134	151	243	403	685	474	317	260	317	329	304	535	460	438	433	n/a
Spain	310	422	137	102	121	43	91	48	25	7	1	24	22	87	n/a	n/a
UK(E.W.NI)	14	84	55	380	354	122	25	167	392	298	327	322	156	123	65	42
UK(Scotland)	862	919	660	991	1,068	1,169	1,093	1,223	887	896	866	952	944	954	841	831
Total	2,719	2,987	1,872	2,874	3,526	2,267	1,924	2,154	2,125	2,047	1,907	2,451	2,044	1,794	1,511	1,076
Unallocated							1,000	518	1,595	1,356	1,373	1,375	2,381	1,795	1,633	1,745
As used by WG							2,924	2,672	3,720	3,403	3,280	3,826	4,425	3,589	3,144	2,821

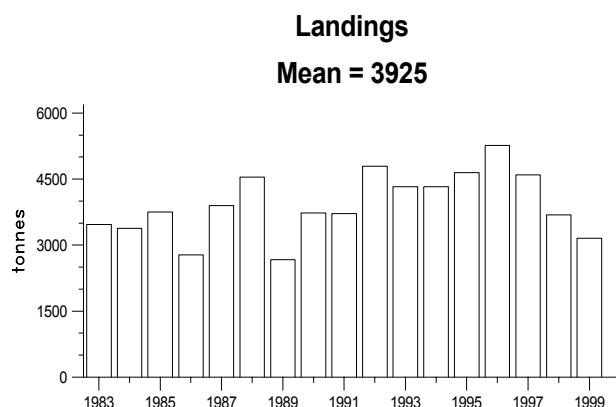
Megrim in Division VIb (Rockall)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
France	9	6	11	2	1	-	-	-	-	-	-	-	-	-	-	
Ireland	-	-	-	-	-	-	196	240	139	128	176	117	124	141	218	n/a
Spain	640	646	730	583	751	205	363	587	683	594	574	520	515	628	n/a	n/a
UK(E.W.NI)	6	32	88	261	77	18	19	14	53	56	38	27	92	76	116	57
UK(Scotland)	10	82	79	174	185	178	226	204	198	147	258	152	112	164	208	278
Total	665	766	908	1,020	1,014	401	804	1,045	1,073	925	1,046	816	843	1,009	542	335

Total Megrim in Sub-area VI (West of Scotland and Rockall)

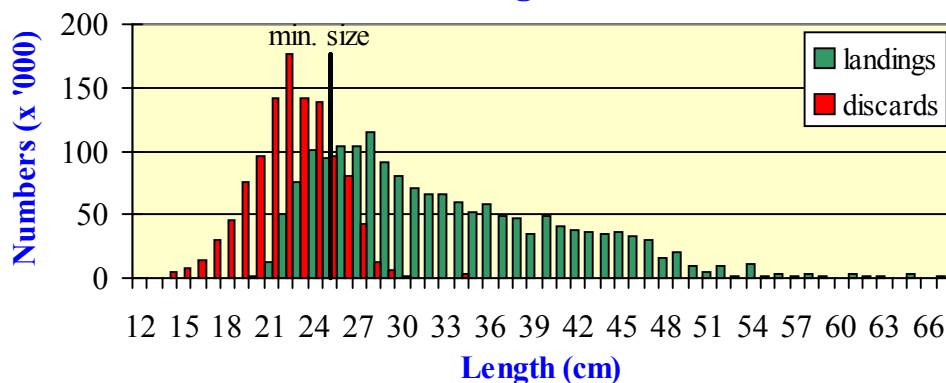
Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Total	3,384	3,753	2,780	3,894	4,540	2,668	2,728	3,199	3,198	2,972	2,953	3,267	2,887	2,803	2,053	1,411
As used by WG							3,728	3,717	4,793	4,328	4,326	4,642	5,268	4,598	3,686	3,156

Table 3.7.6.2 Megrim in Sub-area VI (West of Scotland and Rockall).

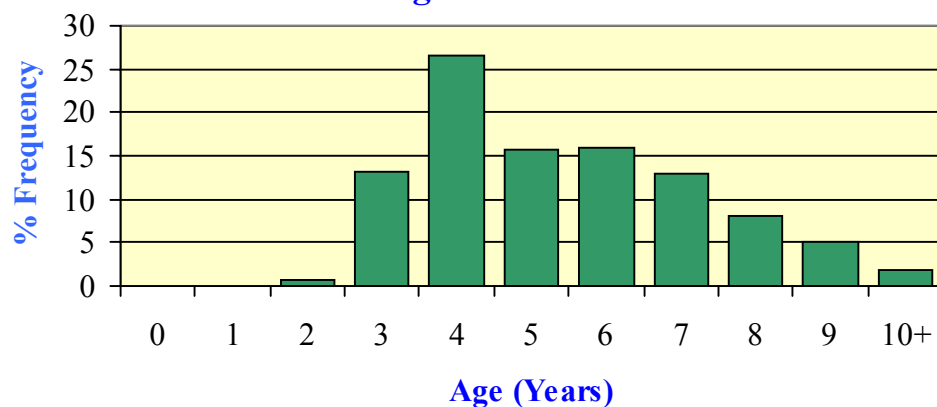


Year	Landings
1983	3,469
1984	3,384
1985	3,753
1986	2,780
1987	3,894
1988	4,540
1989	2,668
1990	3,728
1991	3,717
1992	4,793
1993	4,328
1994	4,326
1995	4,642
1996	5,268
1997	4,598
1998	3,686
1999	3,156
Average	3,925
Unit	tonnes

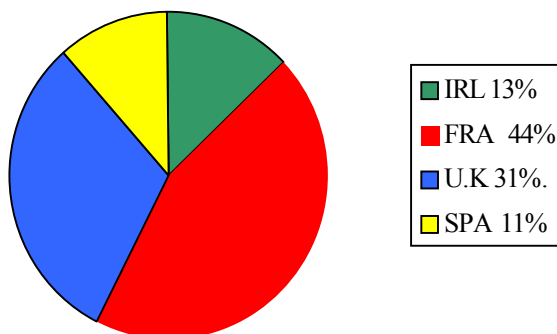
1999 Length Distribution of Irish Landings and Discards of Megrim in VI



1999 Age Distribution of Irish Landings of Megrim in VI



2000 Quota Allocations Megrim VI



Celtic Sea and Bay of Biscay Megrim

(Sub-area VII and Divisions VIIa,b,d,e)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES recommendation that fishing mortality should be reduced to below F_{pa} corresponding to landings less than 13,400 t in 2001. Taking into account a 5% contribution of *L. boschii* in the landings, the equivalent TAC for the two species combined would be 14,100 t. This translates to an Irish quota of 2,094 t in 2001.

MFSD stress that the hake rebuilding plan will impact on the 2001 TAC for this stock.

TAC area	2000 TAC	2000 Irish Quota	Proposed 2001 TAC	Proposed 2000 Irish Quota
VII	17,920	2,970	12,634	2,094
VIIIa,b,d,e	2,080		1,466	
	20,000		14,100	

STATE OF THE STOCK

- While ICES have concerns about the state of this stock, MFSD would point out that the stock has been exploited close to F_{pa} since 1994 and at, or above, B_{pa} since 1990.
- The landings in 1999 were 13,700 t, which is 5% lower than in 1998. Landings have been relatively stable, fluctuating around 14,000 t since 1990.
- The 1999 estimate of F (0.32) is close to the proposed $F_{pa}=0.30$. Fishing mortality has been close to F_{pa} since 1992.
- Recruitment is estimated to be very stable in this stock.
- The spawning stock biomass decreased suddenly from about 80,000 t in the mid-1980s to about 60,000 t in 1989. Since then SSB has remained fairly stable at about 60,000 t which is above the proposed $B_{pa} = 55,000$ t.
- The short-term prediction is for spawning stock biomass to remain stable at the current fishing mortality and recruitment.

CURRENT MANAGEMENT

- There are two TAC areas covering the assessment area for this stock; Sub Area VII and Divisions VIIa,

b,d,e).

- There continues to be an unrealistically high TAC for this stock.
- The TAC for Sub Area VII in 2000 was 17,920 t and in Divisions VIIa,b,d,e was 2,080 t. The Irish quota for Sub-area VII TAC was 2,970 t in 2000.
- There are no explicit management objectives or plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £44.7m in Sub-area VII.
- The value of the 1999 Irish quota was £8.2m.
- The value of the 1999 international landings Sub-area VII was £27.4m.
- The value of the 1999 Irish landings was £5.9m.
- In recent years megrim has become an extremely economically important high value species which is taken with hake and anglerfish. Irish landings in 1999 were similar to the 2000 Irish quota so any further reductions in TAC will have a serious impact on the profitability of Irish vessels.

ADDITIONAL INFORMATION

- There were problems obtaining French landings statistics for 1999. In addition a new estimate of discards was presented to the working group. Given the uncertainties, the working group considered it prudent not to carry out a new assessment of this stock this year. The 1999 assessment of the status of this stock was used and the short-term prediction was carried forward for an additional year.
- International landings were 13,700 t in 1999.
- Irish landings in 1999 were 2,957 t. This is similar to the 1998 landings.
- Misreporting has not been a problem in this fishery due to the unrealistically high TACs.
- Spain and France dominate the fishery with about 70% of the landings between them. In 1999 Ireland landed 22% of the total international landings.
- Most of the international landings are taken in mixed species demersal trawl fisheries, particularly those targeting anglerfish, hake and *Nephrops*.
- Megrim are a very valuable by-catch for Irish demersal trawlers from Dunmore East, Castletownbere, Dingle, Union Hall and other ports in SW Ireland. In recent years megrim have also become important to the Irish beam trawl and twin-rig fleets.
- Irish sampling for this stock is supported through EU funding of FIEFA (EU Study Contract 97-0059) and SAMFISH (99-009).

9. MFSD have conducted a West Coast Groundfish Survey since 1992 and the results indicated that catches of megrim are relatively stable in this stock.
10. MFSD also carried out an egg and larval survey in March 2000. The preliminary results from this survey indicate that the continental shelf edge southwest of Ireland may be an important spawning area for megrim and hake.
11. There is a problem with discarding of small megrim, which are retained in 80mm mesh cod-ends. MFSD sampling suggests that about 11.6% of the total weight of fish caught (34% by number) was discarded in 1999. About 22.4% of these fish were of landable size (Min. size 1999 25cm). The minimum landing size (MLS) was reduced for megrim in January 2000 to 20cm in an attempt to reduce discarding. However, small megrim are less valuable on the market and discarding continues to be a problem in this fishery.
12. MFSD sampling indicates that 76% of the landings being between 3 and 6 years old, however, older fish are still common in landing with 2% of the catch over 10 years.
13. The fishery consists of two species however, Irish sampling indicates that catch rates of *L. boscii* are negligible in landings. Irish fishermen don't separate the two species. Due to their smaller average size however, *L. boscii* are more common in discards particularly in deeper waters.

ICES ADVICE

3.9.11

State of stock/fishery

The stock is harvested slightly outside safe biological limits. SSB was high from 1984 to 1988, then declined until 1990 and has been stable above B_{pa} since then. The fishing mortality has declined from the 1991 peak and is above but close to F_{pa} . Recruitment has been relatively stable.

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 fishing mortality should be reduced to below F_{pa} corresponding to landings less than **13 400 t in 2001**. Taking into a 5% contribution of *L. boscii* in the landings, the equivalent TAC for the two species combined would be **14 100 t**.

Relevant factors to be considered in management:

Circa 10% of the catch is composed of younger fish (1-2 years old), almost all of them being discarded. Until 1999, the minimum legal size of *Lepidorhombus spp.* in this area was 25 cm length. From 1st January 2000 the minimum legal size for these species is reduced to 20 cm. This allows landings of fish that are predicted to be discarded in the catch forecast table. The possible effects on future discard practice cannot be predicted.

Catch forecast for 2001:

Basis: $F(1999) = F(96-98) = 0.32$; Landings(1999) = 14.3; Catch(1999) = 18.1; SSB(2000) = 62.0

Basis: $F(2000) = F(96-98) = 0.32$; Landings(2000) = 14.3; Catch(2000) = 18.1; SSB(2001) = 62.0.

F(2001)	Basis	Catch(2001)	Landings (2001)	SSB(2002)	Medium-term situation (10 years) Probability (%) of SSB < B_{pa}
0.19	0.6 F_{96-98}	11.6	9.2	70.0	-
0.26	0.8 F_{96-98}	14.9	11.8	66.1	-
0.30	F_{pa}	17.1	13.4	63.7	-
0.32	1.0 F_{96-98}	18.0	14.2	62.4	-
0.39	1.2 F_{96-98}	21.0	16.5	59.0	-

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment:

Reliable catch at age data from the French fishery in 1999 were not available due to deficiencies in the statistical data base. Furthermore, there was insufficient information on discards. There were no French discard data for 1999 and the data available on Spanish discards indicated in 1999 a large change in the discard pattern. The three years forecast assumes F at status quo in 1999 and 2000.

Megrim to the west of Britain 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. For most fleets, megrim is taken in mixed fisheries for hake, anglerfish, *Nephrops*, cod and whiting. Most UK landings of megrim are made by beam trawlers fishing in ICES Divisions VIIe,f,g,h. Otter trawlers account for the majority of Spanish landings from Sub-area VII, the remainder being taken by gill netters 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 me-

grim 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 1986–1999. Discards are estimated to be about 15% (27% in 1998) of the total catches by weight 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 south-west 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.

Age-based analytical assessment using catch-per-unit effort from two commercial fleets and one survey with two components. Discard estimates used.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 2000 (ICES CM 2001/ACFM:05).

Reference points as set in 1998: *L. whiffiagonis*

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 is 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 ($SSB_{MT} < B_{pa}$)

Catch data (Tables 3.9.11.1–2):

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	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 ²	21.20	15.1	3.0	18.1
1997	No advice	14.3 ²	25.0	14.2	3.1	17.3
1998	No increase in F	15.2 ²	25.0	14.3	5.4	19.7
1999	Reduce F below F_{Da}	14.6 ^{2,1}	25.0	13.7	3.1	16.9
2000	Reduce F below F_{Da}	<14.2 ^{2,1}	20.0			
2001	Reduce F below F_{Da}	< 14.1 ^{2,1}				

¹Includes *L. boschii*. ² Landings assuming current discarding practise. Weights '000 t.

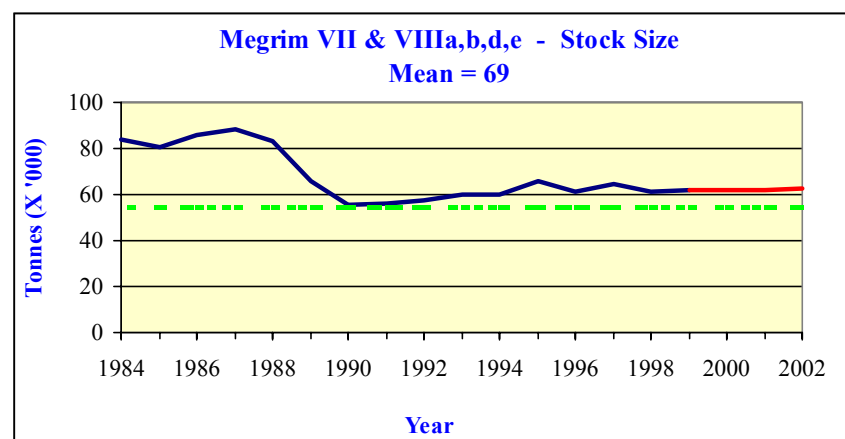
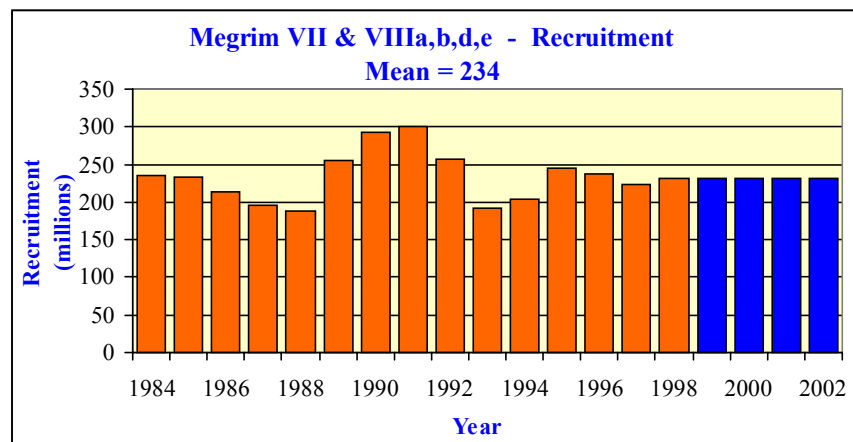
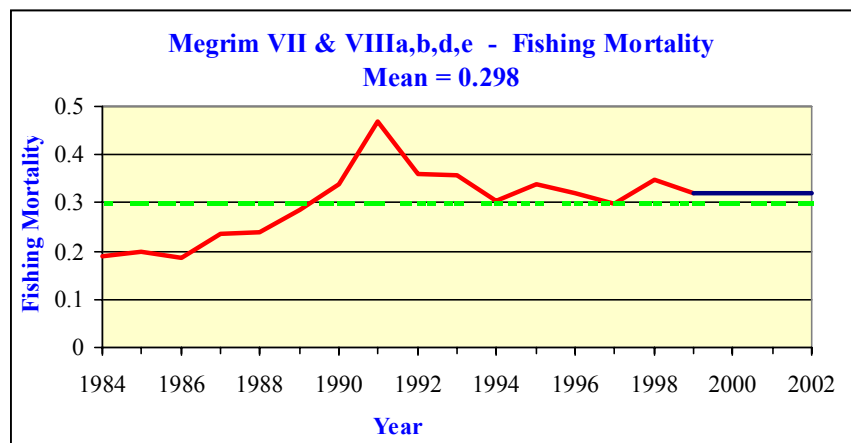
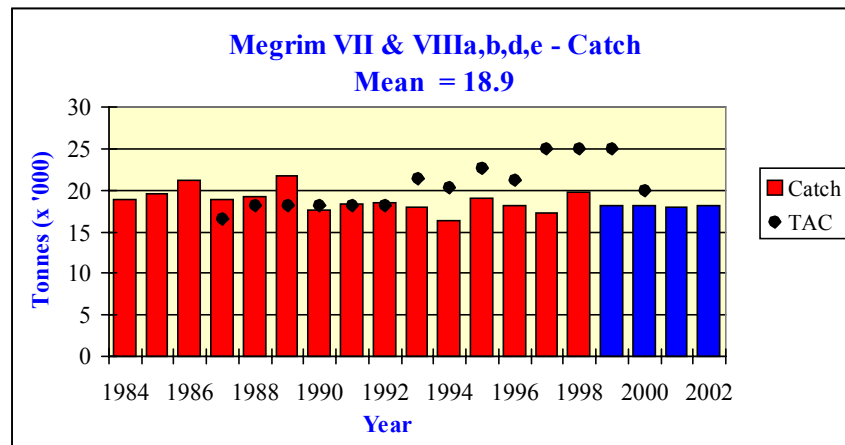


Table 3.9.11.1 MEGRIM (*L. whiffiagonis*) in Divisions VIIb-c, e-k and VIIa,b,d. Nominal landings and catches (t) provided by the Working Group.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Total landings*	1786	18927	17114	17577	19233	14371	15094	15600	14929	13685	15862	15109	14254	14345	13714
	5														
Total discards*	1732	2321	1705	1725	2582	3284	3282	2988	3108	2700	3206	3026	3066	5371	3135
Total catches	1959	21248	18819	19302	21815	17655	18376	18588	18037	16385	19068	18135	17320	19716	16850
	7														
Agreed TAC ¹		16460	18100	18100	18100	18100	18100	18100	21460	20330	22590	21200	25000	25000	25000

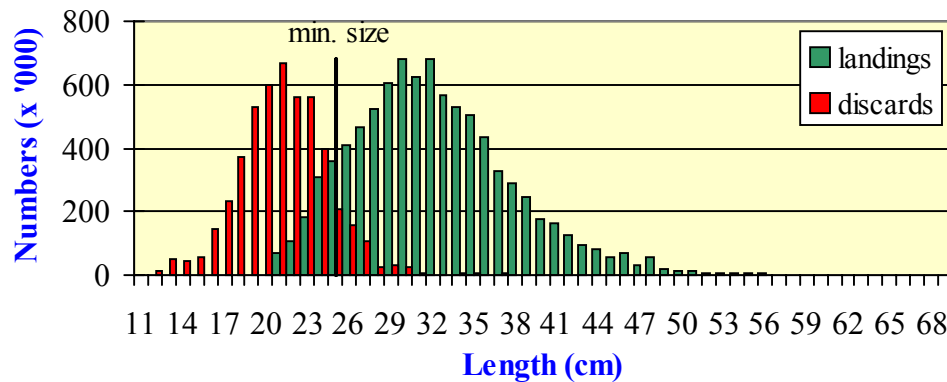
¹Includes VIIa.

*Preliminary.

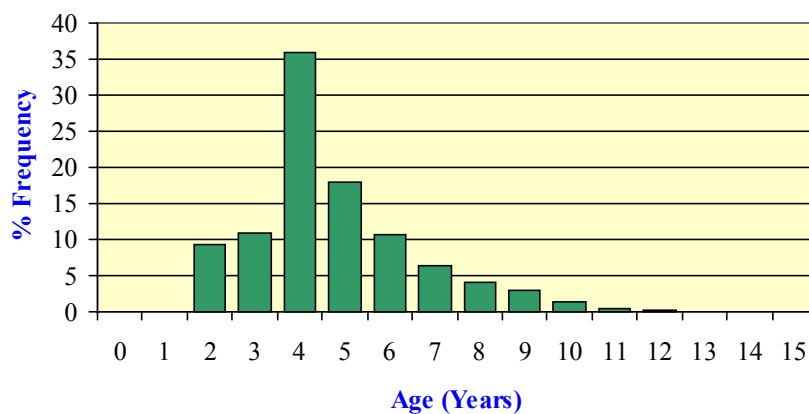
Table 3.9.11.2 Megrim (*Whiffiagonis*) in Sub-area VIII and Divisions VIIa,b,d,e

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-6
1984	235.67	83.96	18.83	0.188
1985	234.11	80.88	19.60	0.199
1986	213.76	85.52	21.25	0.187
1987	195.18	88.07	18.82	0.235
1988	187.21	83.28	19.30	0.240
1989	255.78	65.74	21.82	0.286
1990	293.22	55.37	17.66	0.340
1991	300.20	56.04	18.38	0.468
1992	257.66	57.49	18.59	0.361
1993	192.33	60.13	18.04	0.356
1994	203.66	60.21	16.39	0.305
1995	245.77	65.62	19.07	0.340
1996	237.81	61.40	18.14	0.319
1997	224.02	64.65	17.32	0.298
1998	232.26	61.51	19.72	0.347
1999	232.26	62.03	18.13	0.320
2000	232.26	62.03	.	0.320
Average	233.72	67.88	18.81	0.301
Unit	Millions	1000 tonnes	1000 tonnes	-

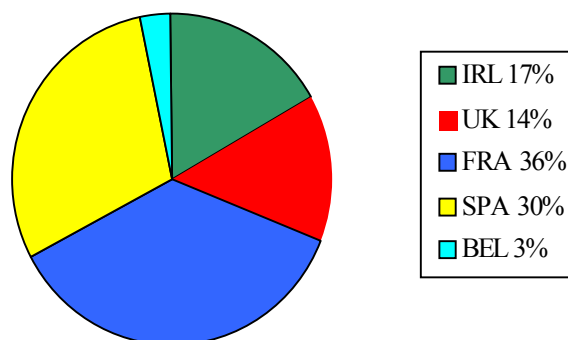
1999 Length Distribution of Irish Landings and Discards of Megrim in VIIb,c,e-k and VIIa,b



1999 Age Distribution of Irish Landings of Megrim in VIIb-k



2000 Quota Allocations Megrim VIIb-k



USING VII & VIIabde MEG QUOTAS

West of Scotland and Rockall Plaice

(Sub-area VI)



Marine Fisheries Services Division

MFSD – ADVICE

**ICES did not provide advice for this stock.
MFSD advise that the TAC in 2001 should remain at 2,400 t. This translates to an Irish quota of 880 t.**

STATE OF THE STOCK

- There is no ICES advice for this stock.
- The status of this stock is unknown.
- There are no proposed reference points for this stock.

CURRENT MANAGEMENT

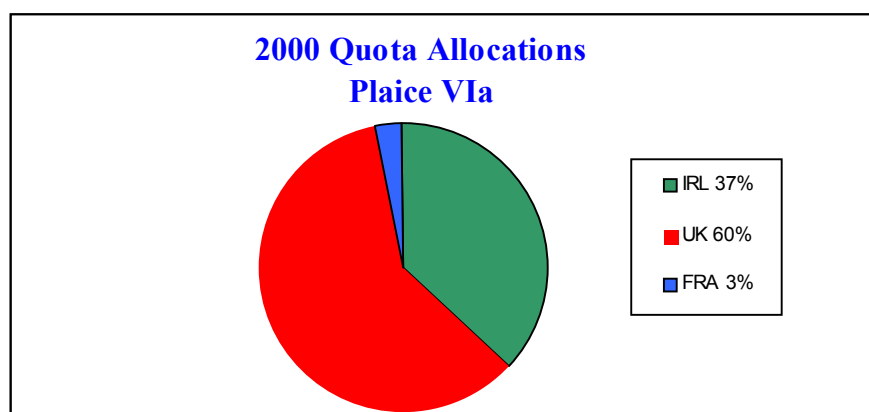
- The TAC area covers Sub-areas Vb, VI and XII and XIV.
- The TAC in 2000 was 2,400 t with an associated Irish quota of 880 t.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £3.2m in Sub-areas VI.
- The value of the 1999 Irish quota was £1.2m.
- The value of the 1999 Irish landings from Division VIa was £0.4m.
- This stock is economically important primarily to small inshore trawlers operating out of Killybegs, Greencastle and the smaller ports in Donegal.

ADDITIONAL INFORMATION

- 1 There is no assessment for this stock.
- 2 The international landings for this stock are not known.
- 3 In 1999 Irish vessels reported plaice landings of 309 t from VIa and 2 from VIb
- 4 The Irish quota is not restrictive but this fishery is important to the smaller inshore boats operating in the south of Division VIa.
- 5 The TAC for this stock has remained unchanged since 1991.
- 6 Anecdotal evidence suggests that in areas such as the Stags the stock is in decline.
- 7 Plaice in VIa are caught mainly by demersal otter trawls. The main fisheries are at the Stanton, Stags and Donegal Bay fishing grounds.
- 8 MFSD carry out limited sampling on this stock and propose to carry out preliminary assessments in the near future.
- 9 Irish sampling for this stock is supported through EU funding of FIEFA (EU Study Contract 97-0059) and SAMFISH (99-009).



Irish Sea Plaice

(Division VIIa)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES recommendation that fishing mortality on plaice in 2001 should be maintained below the proposed F_{pa} , corresponding to landings of less than 2 400 t in 2001. This translates to an Irish quota of 1,365 t.

MFSD advise that management of this stock will have to consider the cod rebuilding plan and the advice for sole.

STATE OF THE STOCK

- There are no concerns about the state of this stock.
- Landings in 1999 were 1,600 t, this is 11% lower than in 1998 and an all time low for this stock.
- The fishing mortality estimated in 1999 of 0.32 is below the proposed F_{pa} of 0.45. The decline in fishing mortality seen in recent years has kept F below F_{pa} since 1995.
- Recruitment between 1964 and 1988 was variable and included some high values. Since 1988, recruitment has been less than average.
- The SSB estimated in 2000 of 4,900 t is above the proposed B_{pa} of 3,100 t. SSB was relatively high in the mid-1980s following a series of good year-classes, but has subsequently declined due to the lower recruitment since 1989. SSB has been above B_{pa} for the entire time series.
- At current levels of fishing mortality SSS is predicted to increase to 5,300 t in 2002.

CURRENT MANAGEMENT

- The TAC area (Division VIIa) corresponds to the assessment area.
- The TAC for 1999 was 2,400 t with an associated Irish quota of 1,365 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 – ECONOMIC COMMENTS

- The value of the 1999 TAC was £4.6m in Division VIIa.

- The value of the 1999 Irish quota was £2.6m.
- The value of the 1999 international landings from Division VIIa was £3.0m.
- The value of the 1999 Irish landings from Division VIIa was £1.0m.
- This fishery is an economically important by-catch species in the mixed demersal trawler and the beam trawl fleet out of Howth.

ADDITIONAL INFORMATION

- 1 The assessment is considered adequate and is calibrated with data from two commercial fleets and two surveys.
- 2 International landings in 1999 were 1,600 t.
- 3 Ireland took 540 t of this catch (down 26% on 1998).
- 4 Misreporting is not considered a problem in this fishery.
- 5 UK (England) and Ireland each take about 40% of the total 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. It is important to note that even if catch rates of sole in Division VIIa increase, there is limited scope for re-expansion in this fishery given the low recruitment seen in VIIa plaice recently.
- 6 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.
- 7 Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
- 8 The 1999 landings were 34% below the TAC mainly because quota uptake by the Irish fleet is very low. Ireland's high quota for this stock (57%) is due to the Hague preference agreement.
- 9 MFSD conducts an annual ground fish survey in VIIa (the *RV Celtic Voyager* Irish Sea and Celtic Sea survey). Catches of plaice from the Irish Sea and Celtic Sea survey (1997 and 1998 data only) are low and cannot be considered to be indicative of abundance.
- 10 Measures to reduce discarding would be beneficial to the stock. MFSD sampling suggests that about 43% of the total weight of fish caught was discarded. Most of the discarded catch sampled was undersized. About 29% of the discarded catch sampled was of a landable size.

- 11 MFSD was a main partner in an EU funded egg production project 1995-1997. An assessment based on the results of this project gave estimates of stock size significantly greater than the VPA estimates. A review meeting held in 1998, could not resolve these differences. ICES considers the VPA estimate the most reliable basis for advice. A second egg production project commenced in 2000 and will provide fishery independent estimates of plaice stock size.
- 12 MFSD sampling indicates that age groups 3 to 8 dominate Irish landings of plaice from Divisions VIIa.

ICES ADVICE

3.8.5

State of stock/fishery

The stock is considered to be within safe biological limits. SSB in 2000 is above B_{pa} and fishing mortality in 1999 was below F_{pa} . Consistent with an overall decline in fishing effort on flatfish in the Irish Sea, the exploitation rate on this stock has declined in recent years.

Recruitment has been below average since the mid 1980s, but this period of reduced recruitment started at a time of relatively high SSB, and there is no indication that it has resulted from reduced spawning biomass.

Catch forecast for 2001:

Basis: $F(2000) = F_{sq} = F(99) = 0.32$, Landings(2000) = 1.75, SSB(2001) = 5.16, ($F_{pa} = 0.45$).

F(2001) onwards	Basis	Catch (2001)	Landings (2001)	SSB (2002)	Medium term (10 year) Probability (%) of SSB < B_{pa}
0.32	1.0F(99)		1.82	5.33	< 5% probability of SSB < B_{pa}
0.38	1.2F(99)		2.12	5.06	< 5% probability of SSB < B_{pa}
0.45	F_{pa}		2.40	4.80	< 5% probability of SSB < B_{pa}

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

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 plaice in 2001 should be maintained below the proposed F_{pa} , corresponding to landings of less than 2 400 t in 2001.

Relevant factors to be considered in management:

The VIIa cod stock recovery plan may have a positive impact on the plaice stock and fishery.

Significant discarding of under-sized plaice occurs in some fisheries, and measures to reduce discards will benefit the stock.

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.

Assessment calibrated with data from two commercial fleets and two surveys. Estimates of discards are only available for a few years and are not included in the assessment.

Source of information: Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, June 2000 (ICES CM 2001/ACFM:01).

Reference points as proposed by ICES 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 F 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 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	2.0	2.1
1995	Long-term gains in decreasing F	2.4 ¹	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	1.0 ²	1.6
2000	Keep F below F_{pa}	<2.3	2.4		
2001	Keep F below F_{pa}	<2.4			

Weights in '000 t. ¹Catch at *status quo* F. ²Incomplete statistics

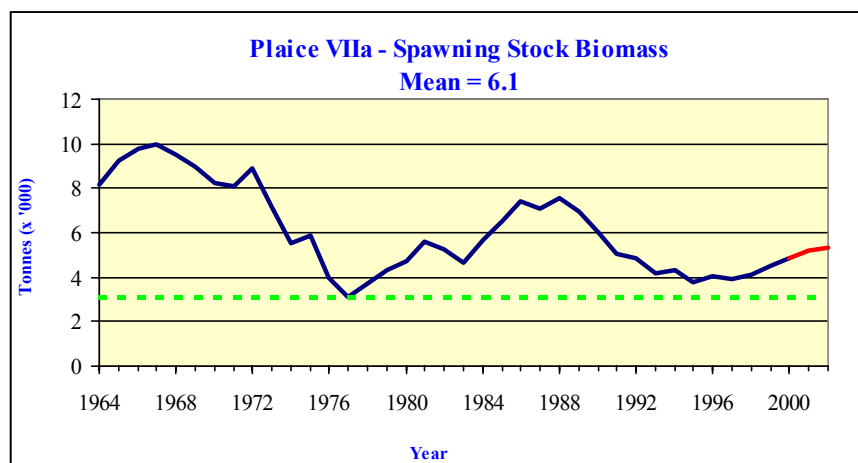
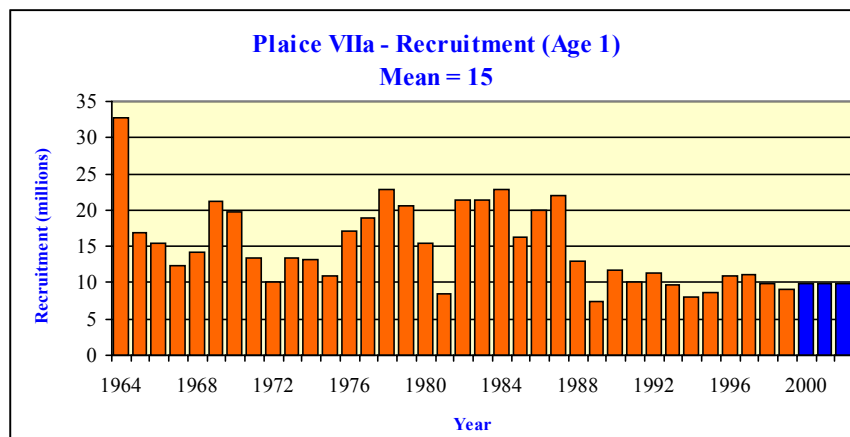
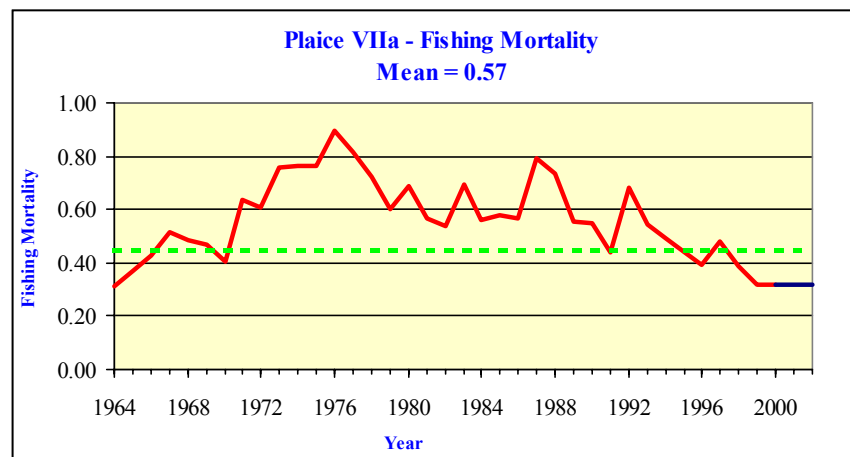
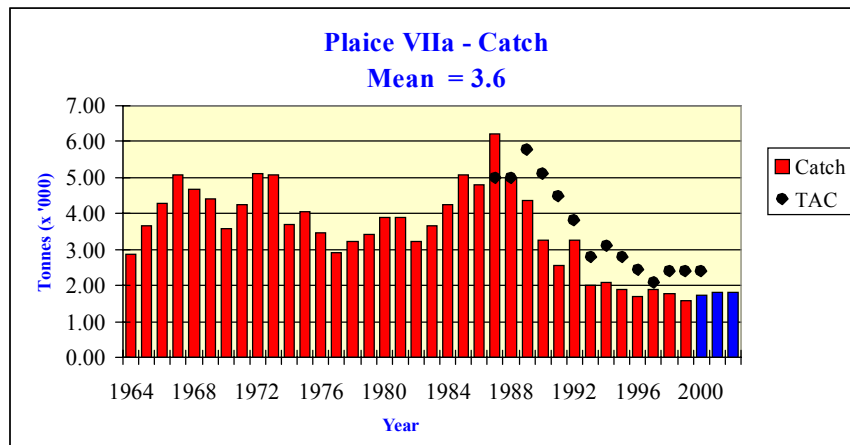


Table 3.8.5.1 Nominal landings (t) of PLAICE in Division VIIa as officially reported to ICES.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999 ¹
Belgium	384	403	243	265	301	138	321	128	332	327	344 ³	459	327	275
France	165	87	58	11	105	20	42	19	13	10	11	8	8 ¹	5
Ireland	1,858	2,132	2,009	1,406	1,350	900	1,355	654	547	557	538	543	730	n/a
Netherlands	-	-	-	-	-	-	-	-	-	-	69	110	27	30
UK (Eng.&Wales) ²	1,774	2,366	1,630	2,409	1,959	1,584	1,381	1,119	1,082	1,050	878	798	679	...
UK (Isle of Man)	12	9	12	18	27	51	24	13	14	20	16	11	14	
UK (N. Ireland)	272	332	286	...	...	...	...	...	...	...	...	...	...	...
UK (Scotland)	119	243	127	76	219	104	70	72	63	60	18	25	18	...
UK (Total)														709
Total	4,584	5,572	4,365	4,185	3,961	2,797	3,193	2,005	2,051	2,024	1,874	1,954	1,803	1,019
Discards ⁴	250	270	220	-	-	-	-	-	-	-	-	-	-	-
Unallocated	-28	378	420	187	-686	-243	74	-9	15	-150	-167	-83	-38	556
Total figures used by the Working Group for stock assessment	4,806	6,220	5,005	4,372	3,275	2,554	3,267	1,996	2,066	1,874	1,707	1,871	1,765	1,575

¹Provisional

²1989–1999 N.Ireland included with England and Wales

³Final Statlant 27a data

{UK (Total) excludes Isle of Man data}

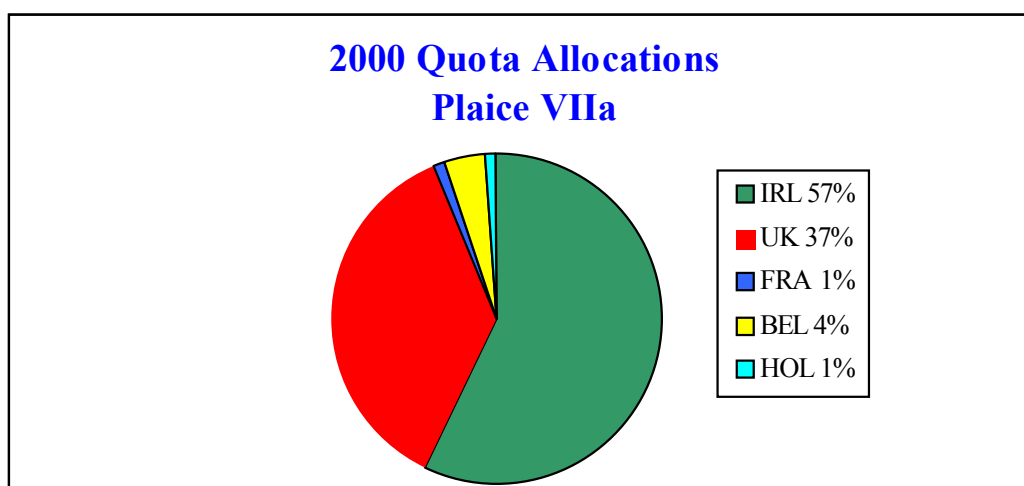
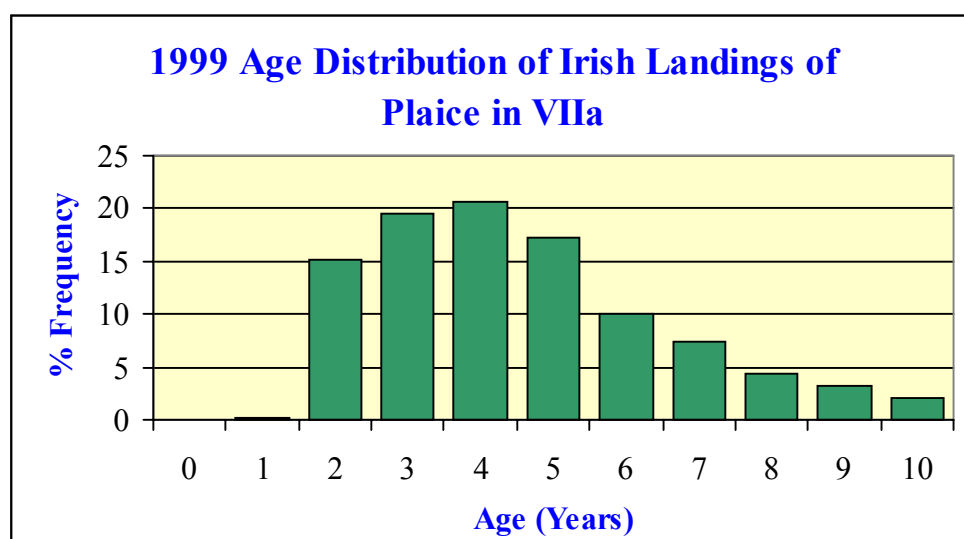
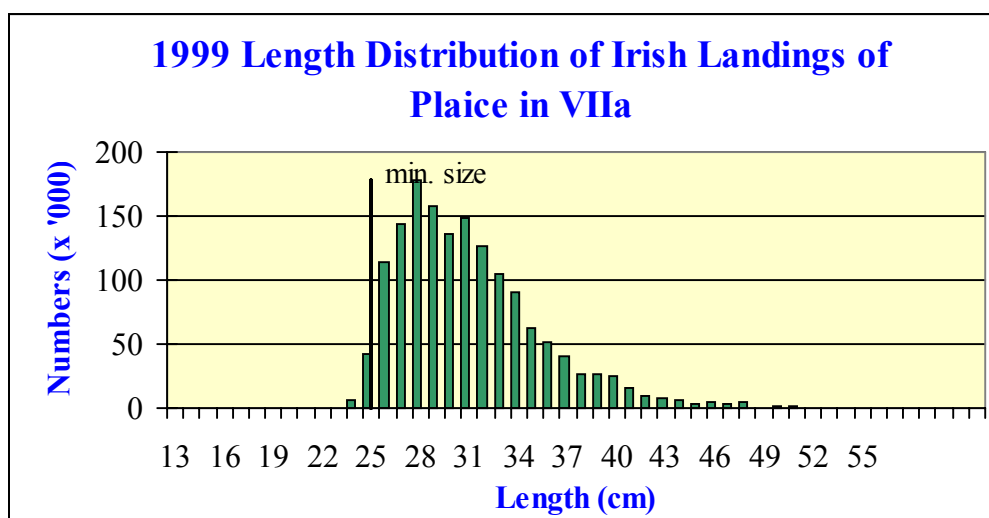
⁴ A ‘-’ indicates no information on discards

n/a = not available

Table 3.8.5.2 Plaice in Division VIIa (Irish Sea)

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-6
1964	32.80	8.13	2.88	0.312
1965	16.94	9.25	3.66	0.371
1966	15.44	9.76	4.27	0.429
1967	12.38	9.95	5.06	0.512
1968	14.25	9.49	4.70	0.486
1969	21.15	8.96	4.39	0.468
1970	19.66	8.26	3.58	0.404
1971	13.48	8.06	4.23	0.636
1972	9.99	8.92	5.12	0.607
1973	13.34	7.13	5.06	0.755
1974	13.14	5.53	3.72	0.760
1975	11.00	5.86	4.06	0.764
1976	17.11	4.01	3.47	0.898
1977	19.01	3.09	2.90	0.813
1978	22.93	3.69	3.23	0.720
1979	20.68	4.33	3.43	0.599
1980	15.42	4.75	3.90	0.689
1981	8.43	5.59	3.91	0.565
1982	21.39	5.27	3.24	0.538
1983	21.40	4.65	3.64	0.697
1984	22.80	5.66	4.24	0.560
1985	16.33	6.56	5.08	0.580
1986	20.00	7.41	4.81	0.568
1987	21.96	7.08	6.22	0.794
1988	13.04	7.58	5.01	0.733
1989	7.51	6.96	4.37	0.556
1990	11.75	5.98	3.28	0.548
1991	10.13	5.09	2.55	0.437
1992	11.36	4.84	3.27	0.683
1993	9.74	4.15	2.00	0.542
1994	8.10	4.28	2.07	0.492
1995	8.67	3.78	1.87	0.438
1996	10.85	4.06	1.71	0.393
1997	11.02	3.91	1.87	0.477
1998	9.97	4.12	1.77	0.389
1999	9.12	4.49	1.58	0.316
2000	9.80 ¹	4.88	.	.
Average	14.92	6.09	3.61	0.570
Unit	Millions	1000 tonnes	1000 tonnes	-

¹ Geometric mean of 1989-1997



West of Ireland Plaice

(Divisions VIIb,c)



Marine Fisheries Services Division

MFSD – ADVICE

The MFSD assessment of this stock last year indicated that this stock was fully exploited and advises that there should be no increase in F. This corresponds to landings of 300 t in 2001 with associated Irish quota of 240 t.

STATE OF THE STOCK

- The state of this stock is unknown.
- There are no proposed reference points for this stock..
- Landings in 1998 were 175 t, the 1999 landings data are incomplete.
- Based on last year's estimates of F, plaice in division VIIbc is likely to be over-exploited.

CURRENT MANAGEMENT

- The TAC area covers VIIb,c as does the fishery which is currently not assessed.
- The 2000 TAC was 300 t with an associated Irish quota of 240 t.
- There are no explicit management objectives or plan for this stock. Ireland has a unique opportunity as the main participant in this fishery to develop a management strategy for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £1.4m in Divisions-VIIb,c.
- The value of the 1999 Irish quota was £1.1m.
- The value of the 1999 Irish landings was £0.7m.
- Plaice are a very economically important component of otter trawl fisheries in parts of this area.

ADDITIONAL INFORMATION

1. No analytical assessment is carried out at present for this stock.
2. There were problems obtaining French landings statistics for 1999, no accurate landings were available for VIIb,c in 1999.
3. Irish landings in 1999 were 157 t. These are similar to the 1998 landings.
4. Misreporting is not perceived to be a problem in this fishery.
5. Ireland, with 97% of the 1998, landings dominates the fishery. France land the remaining 3%.
6. Plaice are caught in mixed species otter trawl fisheries mainly in inshore areas of VIIb.
7. Irish sampling for this stock is supported through EU funding of FIEFA (EU Study Contract 97-0059) and SAMFISH (99-009).
8. MFSD have conducted a groundfish survey in this area since 1992 and this survey indicates that plaice are not abundant in this area.
9. Discarding practices are not well quantified but MFSD sampling has indicated that discarding does occur in this fishery.
10. The MFSD sampling indicates that the Irish landings were mainly comprised of 3 and 4 year old fish (60% of the landings).

**Nominal international landings (t)
As reported to the Working Group**

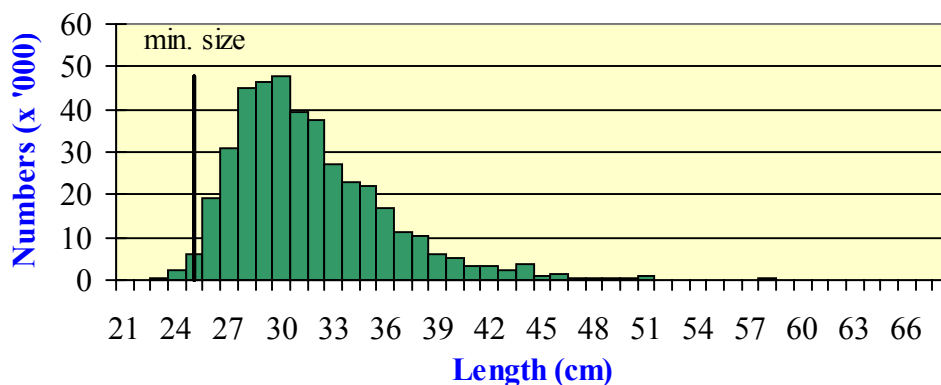
Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
France	9	1	11	9	3	5	2	7	19	6	4*
Ireland	157	159	130	179	180	191	209	316	250	210	169
UK (England and Wales) ¹	2	1	2	-	6	1	2	1	2 ²	+	-
UK (Scotland)	+	13	90	3	3	2	3	1	-	+	-
UK											2
Total	168	174	233	191	192	199	216	325	271	216	175

* Preliminary

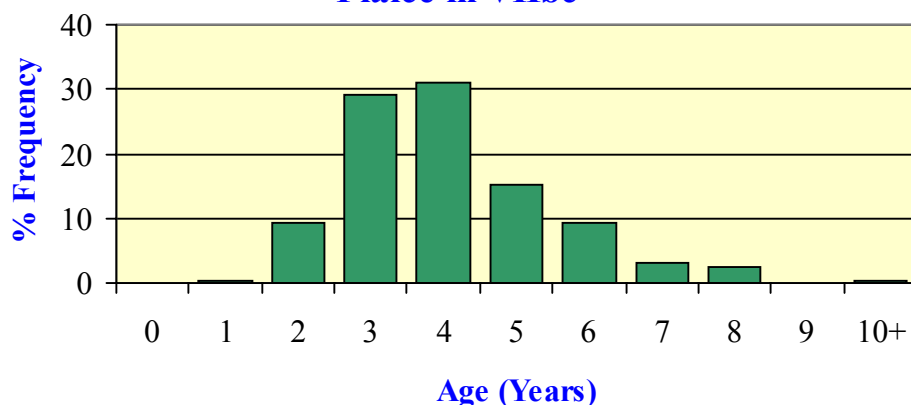
¹ 1989-1997 N. Ireland included with England and Wales.

² Revised

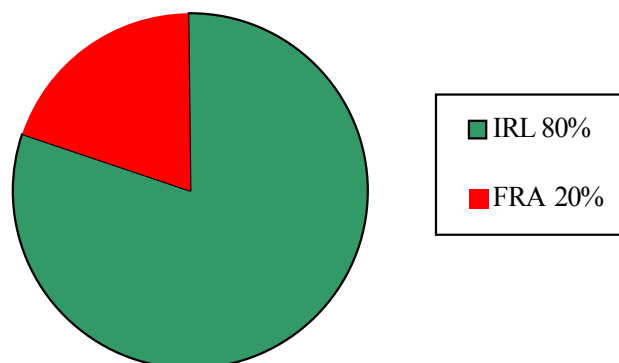
1999 Length Distribution of Irish Landings of Plaice in VIIbc



1999 Age Distribution of Irish Landings of Plaice in VIIbc



2000 Quota Allocations Plaice VIIbc



Celtic Sea Plaice

(Division 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 (F) of 40%, corresponding to landings of 600 t in 2001. This is consistent with the reduction in F recommended for sole, which is the target species for the flatfish fishery in this area. This will result in a F in 2001 below F_{pa} and an increase in SSB in the medium term (10 years). F would have to be reduced by at least 60% to enable SSB to reach the proposed B_{pa} in the short term. This advice translates into an Irish quota of 60 t.

STATE OF THE STOCK

- There are serious concerns about the state of this stock.
- The landings in 1999 were 960 t, which is 10% lower than in 1998. Landings peaked in the late 1980s at about 2,000 t but have been close to 1,000 t since 1992.
- Fishing mortality has fluctuated around the proposed $F_{pa}=0.60$ during the time series. It is currently estimated to have been above the proposed F_{pa} since 1997.
- There was a period of prolonged good recruitment between 1983-1988 in this stock. Recruitment is estimated to have been close to, or below, average since then.
- The spawning stock biomass in this stock peaked in 1987 but has been declining steadily since. The 1999 estimate is the lowest in the recent time series and below the proposed $B_{pa} = 1,800$ t.
- The short-term prediction is for spawning stock biomass to continue to decline at the current fishing mortality and recruitment.

CURRENT MANAGEMENT

- The TAC area covers Divisions VIIIfg - as does the assessment area.
- The 2000 TAC was 800 t with an associated Irish quota of 80 t.
- There are no explicit management objectives or plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £1.3m in Divisions-VIIIfg.
- The value of the 1999 Irish quota was £0.1m.
- The value of the 1999 international landings Divisions VIIIfg was £1.4m.
- The value of the 1999 Irish landings was £0.2m.
- Plaice are an economically important component of the mixed demersal fisheries in the Celtic Sea.

ADDITIONAL INFORMATION

1. There were problems obtaining French landings statistics for 1999, therefore the assessment for this stock may not be as robust as in previous years. In addition sampling levels for the Belgium beamer fleet have in the past been poor and add some uncertainty to this assessment.
2. The international landings in 1999 were 960 t.
3. Irish landings in 1999 were 122 t. This is a decrease of 10% on the 1998 landings.
4. The levels of misreporting in this stock are unknown, however, recent TAC have been restrictive and over-shot by some countries in recent years.
5. Belgium with 45% of the 1999 landings dominates the fishery. France, the UK and Ireland landed 26%, 18% and 13% of the 1999 landings respectively.
6. Celtic Sea plaice are a valuable by catch to Irish demersal trawlers and also to the Irish beam trawl fleet.
7. Irish sampling for this stock is supported through EU funding of FIEFA (EU Study Contract 97-0059) and SAMFISH (99-009).
8. 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.
9. Preliminary MFSD discard sampling suggests that discarding may be a problem in this fishery.
10. MFSD sampling indicates that approximately 26% of Irish landings in 1999 were three year fish, however older age groups are also well represented in the samples.

ICES ADVICE 3.9.4

State of stock/fishery

The stock is outside safe biological limits. SSB declined

sharply from 1980 – 93 when it fell below B_{pa} . Since then SSB has continued to decline at slower rate. Fishing mortality is estimated to be above F_{pa} . Recruitment since 1989, except for the average 1994 year class, has been well below average.

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 a reduction in F of 40%, corresponding to landings of 600 t in 2001. This is consistent with the reduction in F recommended for sole which is the target species for the flatfish fishery in this area. This will result in a fishing mortality in 2001 below F_{pa} and an increase in SSB in the medium term. F would have to be reduced by at least 60% to enable SSB to reach B_{pa} in the short term.

Relevant factors to be considered in management:

At current fishing mortality it is unlikely that SSB will increase.

Catch forecast for 2001:

Basis: $F(2000) = F_{sq}(97-99) = 0.69$, Landings (2000) = 0.93, SSB(2001) = 1.37.

F(2001)	Basis	Landings (2001)	SSB(2002)	Medium-term situation (10 years) Probability (%) of SSB < B_{pa}
0.28	$0.4 \times F_{sq}$	0.42	1.80	<5%
0.42	$0.6 \times F_{sq}$	0.60	1.63	<5%
0.49	$0.7 \times F_{sq}$	0.68	1.56	<5%
0.56	$0.8 \times F_{sq}$	0.76	1.49	10%
0.60	F_{pa}	0.80	1.45	10-20%
0.69	$1.0 \times F_{sq}$	0.90	1.36	20-50%
0.83	$1.2 \times F_{sq}$	1.02	1.25	>50%

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment:

The fisheries taking plaice in the Celtic Sea mainly involve vessels from France and Belgium: Landings are split among France 39% of the total landings, Belgium 30%, England and Wales 24%, and Ireland the remaining 7%.

In the 1970s, the VIIIf,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. There is insufficient biological sampling of this stock, in part within national landings and also because of landings through foreign ports.

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 2000 (ICES CM 2001/ACFM:05).

Reference points as set in 1998:

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} be set at 0.60. This F is considered to have a high probability of maintaining SSB above B_{pa} in 10 years taking into account the uncertainty assessments.

Technical basis:

$B_{lim}: B_{loss}$	$B_{pa}: B_{lim} \times 1.64$
F_{lim} : Not defined	$F_{pa}: \sim F_{med}$; implies a less than 5% probability that $(SSB_{MT} < B_{pa})$

Catch data (Tables 3.9.4.1–2):

Year	ICES Advice	Predicted catch corresponding to advice	Agreed TAC	Official landings	ACFM Landings
1987	TAC not to be restrictive on other species	-	1.8	1.9	1.9
1988	TAC not to be restrictive on other species	-	2.5	2.1	2.1
1989	TAC not to be restrictive on other species	-	2.5	2.2	2.2
1990	F likely to be F(88)	~1.9	1.9	2.1	2.1
1991	F likely to be F(89)	~1.7	1.9	1.5	1.5
1992	No long-term gains in increasing F	-	1.5	1.2	1.2
1993	No long-term gains in increasing F	-	1.4	1.1	1.1
1994	No long-term gains in increasing F	-	1.4	1.1	1.1
1995	No increase in F	1.29	1.4	1.0	1.0
1996	20% reduction in F	0.93	1.1	0.9	1.0
1997	20% reduction in F	1.10	1.1	1.2	1.2
1998	20% reduction in F	1.00	1.1	1.1	1.1
1999	35% reduction in F	0.67	0.9	na	1.0
2000	30% reduction in F	0.70	0.8		
2001	40% reduction in F	0.60			

Weights in '000 t.

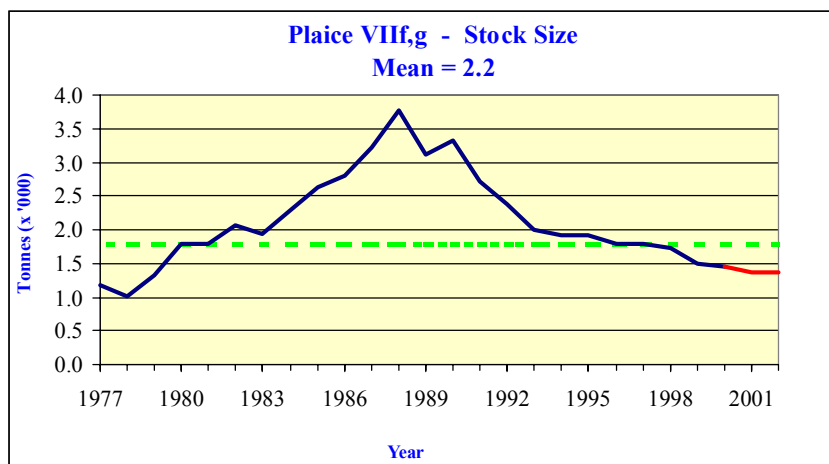
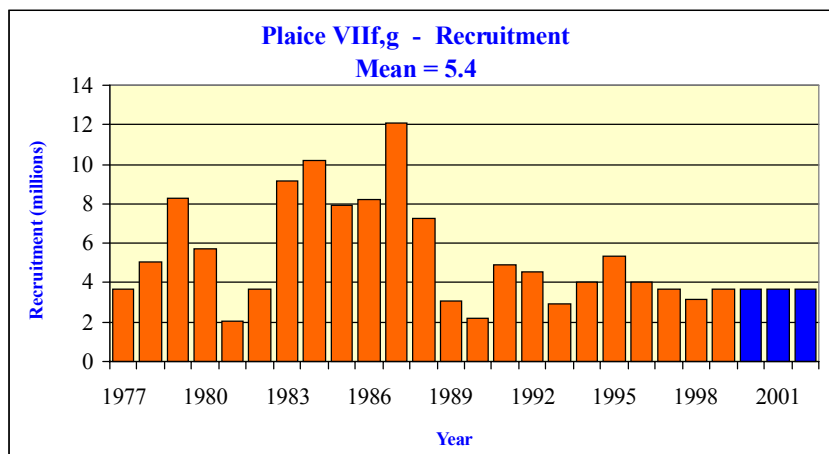
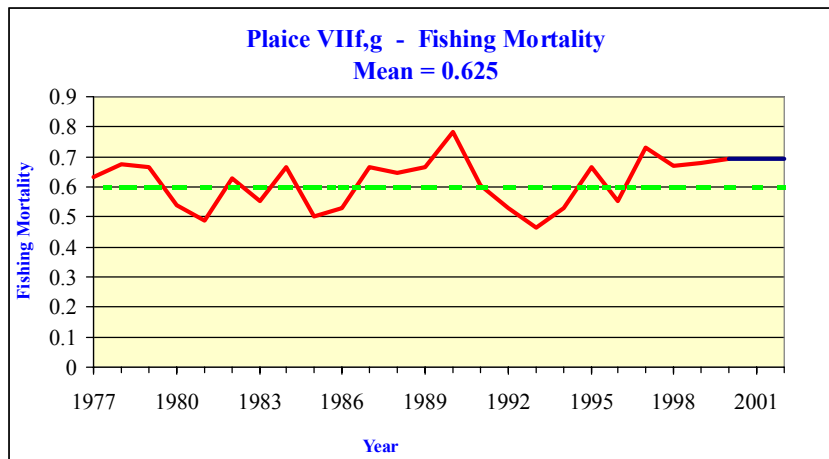
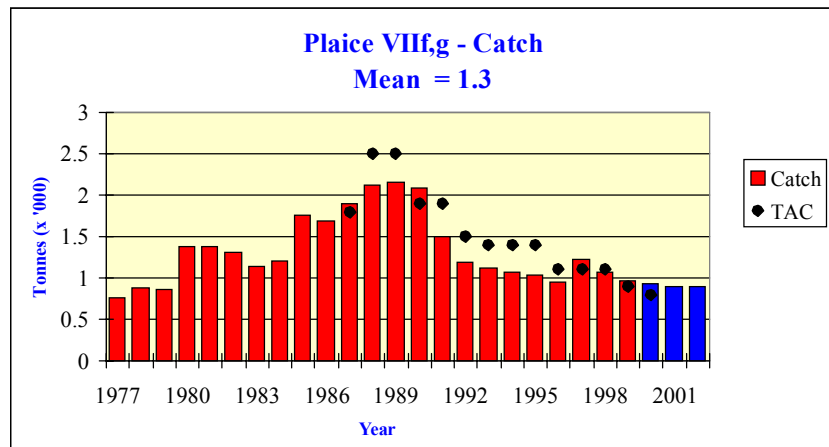


Table 3.9.4.1 Celtic Sea PLAICE. Nominal landings (tonnes) in Divisions VII f+g, as used by Working Group.

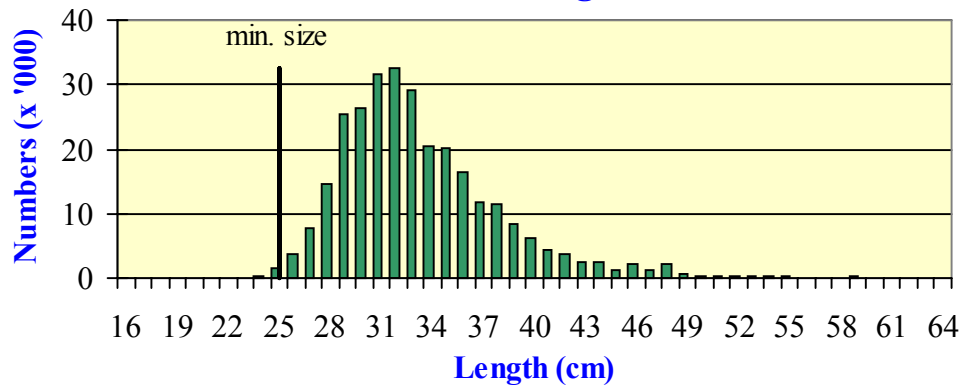
Year	Belgium	France	Ireland	UK (Engl. & Wales)	Others	Total re-reported	Unallocated	Total as used by WG
1977	214	365	28	150	0	757	0	757
1978	196	527	0	152	0	875	0	875
1979	171	467	49	176	0	863	0	863
1980	372	706	61	227	7	1,373	0	1,373
1981	365	697	64	251	0	1,377	0	1,377
1982	341	568	198	196	0	1,303	0	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	253	122	169	0	959	0	959

N.B.: ICES receives statistics from some countries only for Divisions VII g-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.

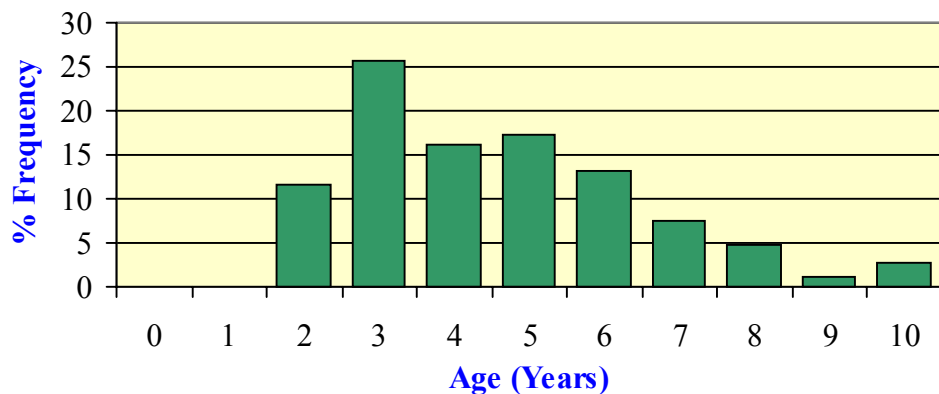
Table 3.9.4.2 Celtic Sea plaice (Divisions VII f and g)

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 3-6
1977	3.63	1.17	0.76	0.632
1978	5.09	1.01	0.88	0.673
1979	8.26	1.32	0.86	0.666
1980	5.71	1.79	1.37	0.541
1981	2.08	1.79	1.38	0.488
1982	3.68	2.06	1.30	0.630
1983	9.14	1.94	1.15	0.551
1984	10.19	2.30	1.21	0.667
1985	7.95	2.63	1.75	0.501
1986	8.21	2.80	1.69	0.528
1987	12.07	3.23	1.90	0.663
1988	7.28	3.78	2.12	0.648
1989	3.05	3.12	2.15	0.668
1990	2.20	3.32	2.08	0.781
1991	4.88	2.72	1.50	0.604
1992	4.53	2.38	1.19	0.528
1993	2.90	2.00	1.11	0.465
1994	4.00	1.91	1.07	0.530
1995	5.38	1.92	1.03	0.664
1996	4.04	1.79	0.95	0.554
1997	3.69	1.79	1.22	0.730
1998	3.14	1.72	1.07	0.672
1999	3.68	1.49	0.96	0.680
2000	3.66	1.45	.	.
Average	5.35	2.14	1.33	0.611
Unit	Millions	1000 tonnes	1000 tonnes	-

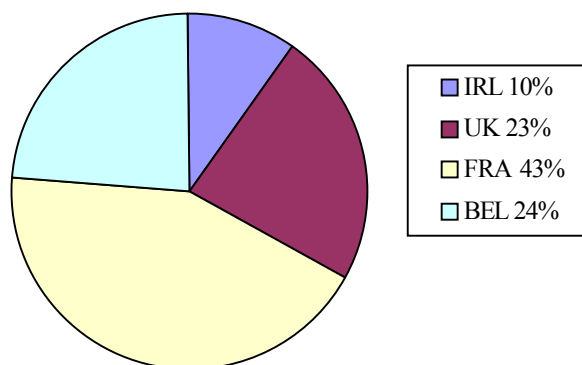
1999 Length Distribution of Irish Landings of Plaice in VII f,g



2000 Age Distribution of Irish Landings of Plaice in VII g



2000 Quota Allocations Plaice VII f,g



Southwest of Ireland Plaice

(Divisions VIIh,j,k)



Marine Fisheries Services Division

MFSD – ADVICE

MFSD assessments last year indicated that this stock was over-exploited. Given that landings are far below the TAC for this stock, MFSD recommends that the TAC should be increased. This translates to a 2001 TAC of 1,350 t with an associated Irish quota if 590 t

STATE OF THE STOCK

- The state of this stock is not known.
- Total international landings in 1998 were 525 t, the 1999 are incomplete.
- There are no proposed reference points for this stock.
- Based on last year's estimates of F, plaice in division VIIh,j,k are considered to be over-exploited.

CURRENT MANAGEMENT

- The TAC area covers VIIh,j,k as does the fishery, which is currently not assessed.
- The 2000 TAC was 1,350 t with an associated Irish quota if 590 t.
- There are no explicit management objectives or plan for this stock. Ireland has a unique opportunity as the main participant in this fishery to develop a management strategy for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £2.2m in Divisions-VIIh,j,k.

- The value of the 1999 Irish quota was £1.1m.
- The value of the 1999 Irish landings was £0.7m.
- Plaice are a very economically important species particularly to smaller inshore trawlers in the southwest of Ireland.

ADDITIONAL INFORMATION

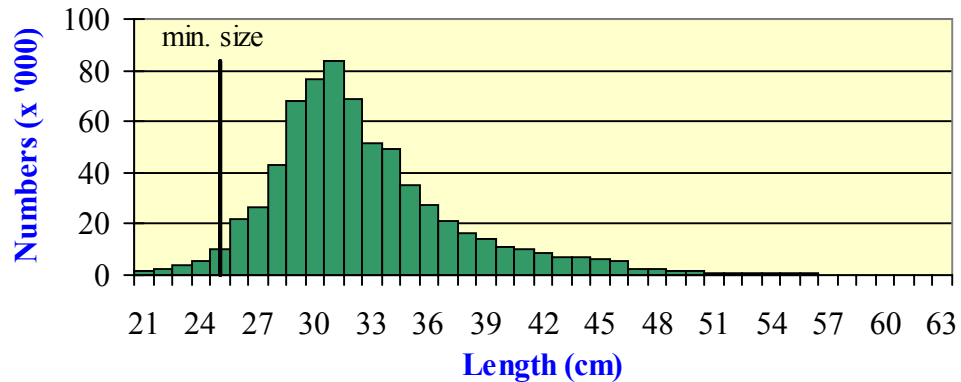
1. No analytical assessment is carried out at present for this stock.
2. There were problems obtaining French landings statistics for 1999. No accurate landings were available for VIIh,j,k in 1999.
3. Irish landings in 1999 were 296 t. This is 6% higher than the 1998 landings.
4. Mis-reporting is not perceived to be a problem in this fishery.
5. Ireland (with 53% of the 1998 landings) dominates the fishery. The UK, Belgium and France land 20%, 14% and 10% respectively.
6. 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.
7. Irish sampling for this stock is supported through EU funding of FIEFA (EU Study Contract 97-0059) and SAMFISH (99-009).
8. MFSD have conducted a groundfish survey in this area since 1992 and this survey provides information on the distribution and of abundance for this stock.
9. Discarding practices are not well quantified but MFSD sampling has indicated that discarding does occur in this fishery.
10. The MFSD sampling indicates that the Irish landings were mainly comprised of 2 to 4 year old fish (82% of the landings).

Nominal international landings (t) As reported to the Working Group

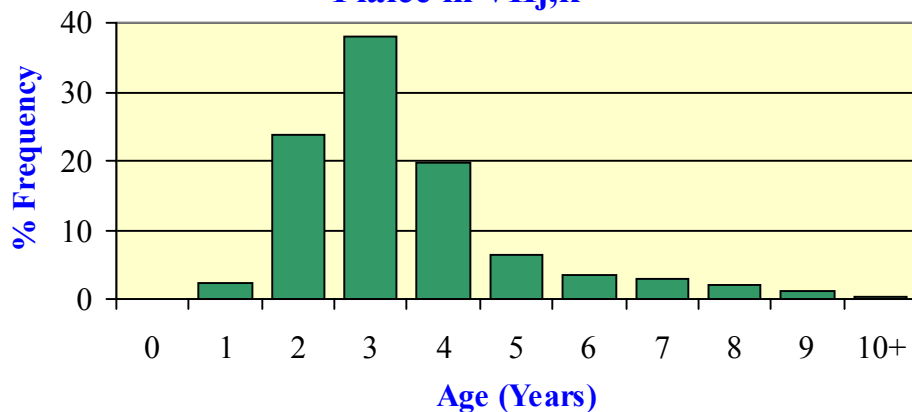
Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Belgium	-	-	-	-	-	-	-	-	-	49	74
Denmark	+	+	-	+	-	+	-	+	-	-	-
France	96	112	113	88	90	67	47	61	70	75	53*
Ireland	369	454	338	478	477	383	271	321	281	330	278*
Netherlands	-	-	-	-	-	-	-	-	52	-	13
UK (E/W/NI)	433	73	88	287	264	218	258	282	154	138	-
UK (Scotland)	1	-	1	+	6	7	1	4	1	+	-
UK											107
Total	899	639	540	853	837	675	577	668	558	592	525

* Preliminary

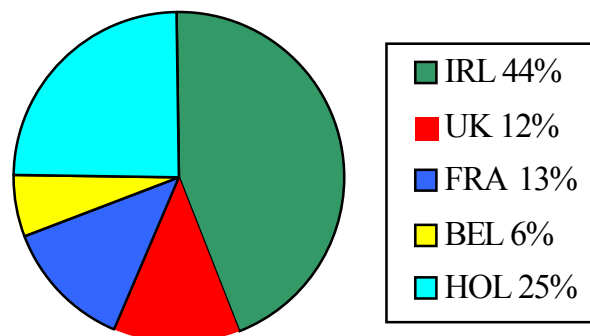
1999 Length Distribution of Irish Landings of Plaice in VIIj,k



1999 Age Distribution of Irish Landings of Plaice in VIIj,k



2000 Quota Allocations Plaice VIIh-k



West of Scotland and Rockall Sole

(Sub-area VI)



Marine Fisheries Services Division

MFSD – ADVICE

**ICES did not provide advice for this stock.
MFSD advise that the TAC in 2001 should not exceed
155 t. This translates to an Irish quota of 125 t.**

STATE OF THE STOCK

- There is no ICES advice for this stock.
- The status of this stock is unknown.
- There are no proposed reference points proposed for this stock.

CURRENT MANAGEMENT

- The TAC area covers Sub-areas Vb, VI and XII and XIV, no analytical assessment has been carried out in this area.
- The TAC in 2000 was 155 t with an associated Irish quota of 125 t.
- There are no explicit management objectives or a management plan for this stock.

MFSD – ECONOMIC COMMENTS

The value of the 1999 TAC was £1.1m in Sub-area VI.

The value of the 1999 Irish quota was £0.9m.

The value of the 1999 Irish landings from Division VIa was £0.3m.

This stock is economically important primarily to small inshore trawlers operating out of Killybegs, Greencastle and the smaller ports in Donegal.

ADDITIONAL INFORMATION

- 1 There is no assessment for this stock.
- 2 No international landings are available for this stock.
- 3 In Ireland sole is landed as common sole and slip sole. In 1999, the total landed weight for sole in VIa was 45 t.
- 4 The Irish quota is not restrictive but this fishery is important to the small inshore boats operating in the south of Division VIa.
- 5 The TAC for this stock has remained unchanged since 1991.
- 6 MFSD carry out limited sampling on this stock and propose to carry out preliminary assessments in the near future.
- 7 Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).

Irish Sea Sole

(Division VIIa)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES recommendation that fishing mortality in 2001 should be reduced below the proposed F_{pa} corresponding to landings of less than 930 t in 2001. This translates to an Irish quota of 112 t in 2001.

STATE OF THE STOCK

- There are concerns about the state of this stock.
- Landings have declined from 1,400 t in 1994 to an historic low in 1999 of 860 t.
- The estimated fishing mortality in 1999 of 0.35 is above the proposed F_{pa} of 0.3. F has remained above the proposed F_{pa} for the entire time series.
- Recruitment in this stock has been in pulses. The 1993 and 1994 year class were the lowest on record while the 1995 and 1996 year-classes were above average. The 1995 and 1996 year-classes offer an opportunity to rebuild the stock only if fishing mortality is reduced.
- The estimated SSB in 2000 of 3,800 t corresponds to the proposed B_{pa} of 3,800 t. SSB has fluctuated around B_{pa} since 1990. SSB is recovering from the historic lows of 1996 and 1997 and is forecast to continue at B_{pa} in the short term.

CURRENT MANAGEMENT

- The TAC area (Division VIIa) corresponds to the assessment area.
- The TAC in 2000 was 1,080 t with an Irish quota of 130 t.
- There are no explicit management objectives or a management plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £5.9m in Division VIIa.
- The value of the 1999 Irish quota was £0.7m.
- The value of the 1999 international landings from Division VIIa was £5.7m.
- The value of the 1999 Irish landings from Division VIIa was £0.7m.

- This fishery is an extremely economically important high value fishery. It is targeted by the beam trawl fleet

ADDITIONAL INFORMATION

- 1 The assessment is considered reliable and was calibrated with data from two commercial beam trawl fleets and two surveys.
- 2 International landings in 1999 were 860 t.
- 3 Ireland reported landings of 113 t of the 1999.
- 4 There is no information on mis-reporting, though it may be a problem in this fishery as fleets constrained by quotas are likely to have been declaring landings only in line with expected quota uptake.
- 5 The fishery is dominated by beam trawlers from Belgium (50-60% of landings), the UK (England and Wales) and Ireland (14% of landings). CPUE and effort on the part of Belgian and UK (E&W) beam trawl fleets have declined since 1990 as boats moved away to other grounds. The Belgian beam trawl effort has remained stable since 1992.
- 6 The Irish Sole fishery in VIIa is mainly undertaken by beam trawl and is closed in quarter 2 and 3. 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.
- 7 Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
- 8 MFSD groundfish surveys use otter trawl for demersal species. It has been recognised that this gear is not effective at targeting sole and has produced variable catch rates that are not considered indicative of stock trends.
- 9 Preliminary analysis of MFSD discard monitoring in VIIa suggests that about 5% of the total catch is discarded in this fishery. None of the discarded fish sampled were above the minimum size landable.
- 10 MFSD were partners in an EU funded project to estimate the biomass of Irish Sea sole using the egg production method. The surveys gave biomass estimates significantly higher than estimates from the VPA. ICES considers the VPA estimate the more reliable basis for advice.
- 11 MFSD sampling indicates that fish in age groups 3, 4 and 5 dominate the fishery.

ICES ADVICE

3.8.6

State of stock/fishery

This stock is harvested outside safe biological limits. Fishing mortality in 1999 remained above the proposed F_{pa} . SSB in 2000 is at the proposed B_{pa} . SSB has increased from a historic low in 1997 and is currently at B_{PA} .

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 in 2001 should be reduced below the proposed F_{pa} corresponding to landings of less than 930 t in 2001.

Relevant factors to be considered in management:

The rebuilding plan for cod in Division VIIa may have a positive impact on the sole stock and fishery.

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.

Assessment was tuned with 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, June 2000 (ICES CM 2001/ACFM:01).

Catch forecast for 2001:

Basis: $F(2000) = TAC$, $F = 0.34$, Landings(2000) = 1.08, SSB(2001) = 3.77 ($F_{pa} = 0.3$).

F(2001) onwards	Basis	Landings (2001)	SSB (2002)	Medium term (10 year) Probability (%) of SSB < B_{pa}
0.26	0.6 F(97-99)	0.81	4.12	< 5% probability of SSB < B_{pa}
0.30	F_{pa}	0.93	4.00	< 5% probability of SSB < B_{pa}
0.34	0.8 F(97-99)	1.05	3.89	10% probability of SSB < B_{pa}
0.43	1.0 F(97-99)	1.26	3.67	20-50% probability of SSB < B_{pa}
0.51	1.2 F(97-99)	1.46	3.47	>50% probability of SSB < B_{pa}

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Reference points as proposed by ICES in 1999:

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 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 have 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 data (Tables 3.8.6.1–2):

Year	ICES Advice	Predicted catch. corresp. to advice	Agreed TAC	Official landings	ACFM landings ²
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 ³	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 ¹	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 ¹	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	0.90	0.91
1999	Reduce F below F_{pa}	0.83	0.9	0.69	0.86
2000	Reduce F below F_{pa}	< 1.08	1.08		
2001	Reduce F below F_{pa}	< 0.93			

¹Catch at *Status quo* F. ² Not including misreporting. ³Revised in 1990 to 1.5. Weights in '000 t.

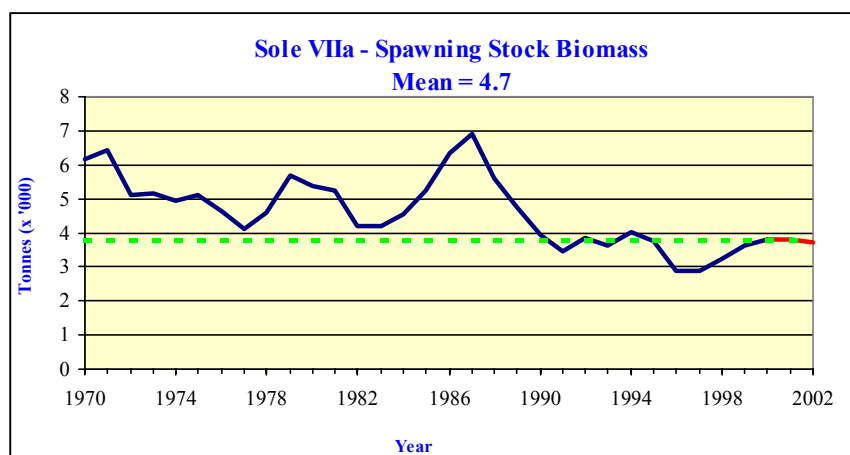
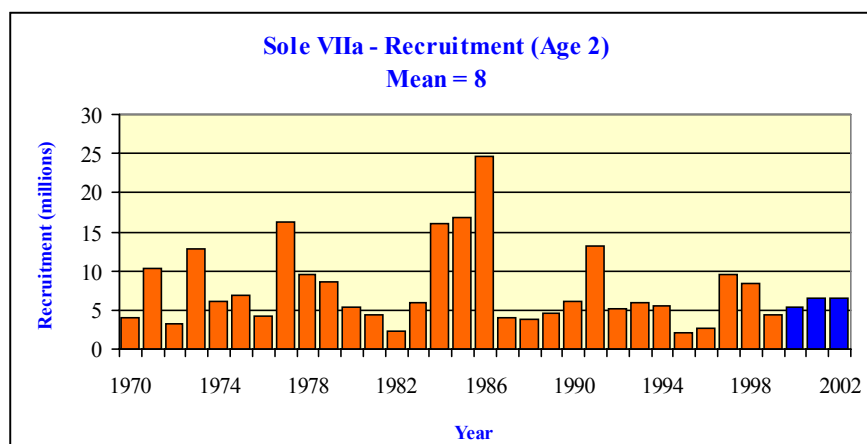
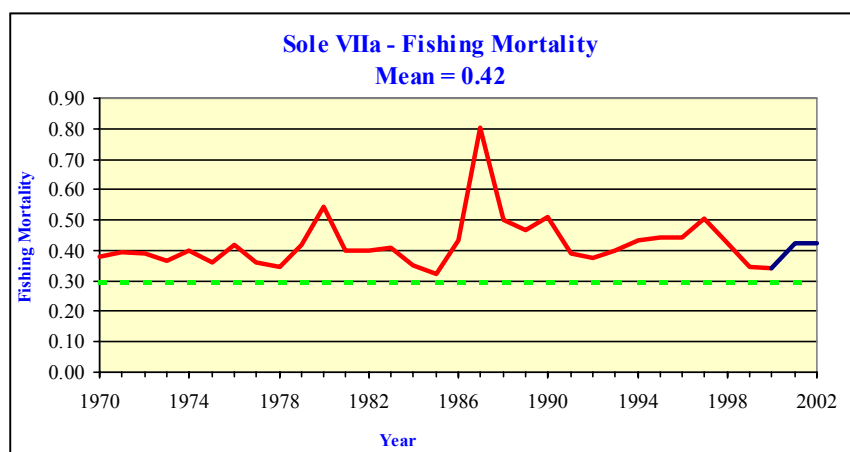
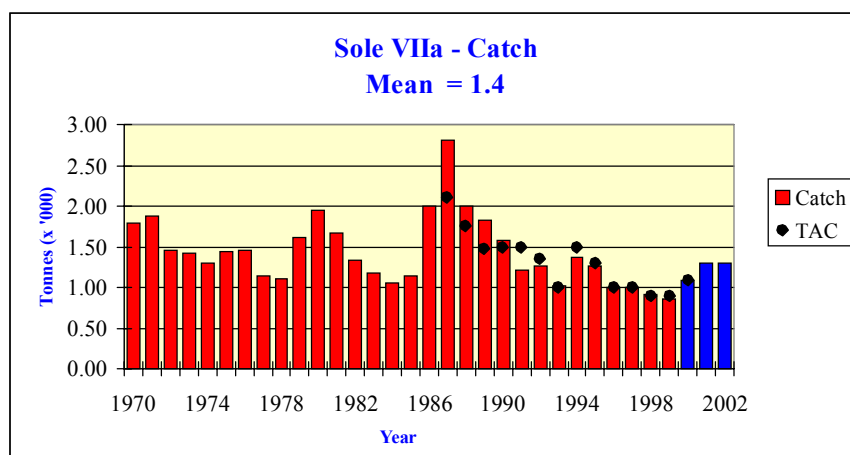


Table 3.8.6.1 Irish Sea SOLE. Divisions VIIa. Nominal landings (tonnes), as officially reported to ICES.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999*
Belgium	930	987	915	1,010	786	371	531	495	706	675	533	570	524	469
France	17	5	11	5	2	3	11	8	7	5	5	3	5*	1
Ireland	235	312	366	155	170	198	164	98	226	176	133	130	134	n/a
Netherlands	-	-	-	-	-	-	-	-	-	-	149	123	60	46
UK (Engl.& Wales) ¹	637	599	507	613	569	581	477	338	409	424	194	189	161	165
UK (Isle of Man)	1	3	1	2	10	44	14	4	5	12	4	5	3	
UK (N. Ireland) ¹	50	72	47	...	...	...	...	...	...	...	...	...	...	...
UK (Scotland) ¹	46	63	38	38	39	26	37	28	14	8	5	7	9	8
Total	1,916	2,041	1,885	1,823	1,576	1,223	1,234	971	1,367	1,300	1,023	1,027	896	689
Unallocated	79	767	114	10	7	-9	25	52	2	-34	-23	-24	14	171
Total used by Working Group in Assessment	1,995	2,808	1,999	1,833	1,583	1,214	1,259	1,023	1,369	1,266	1,002	1,003	911	859

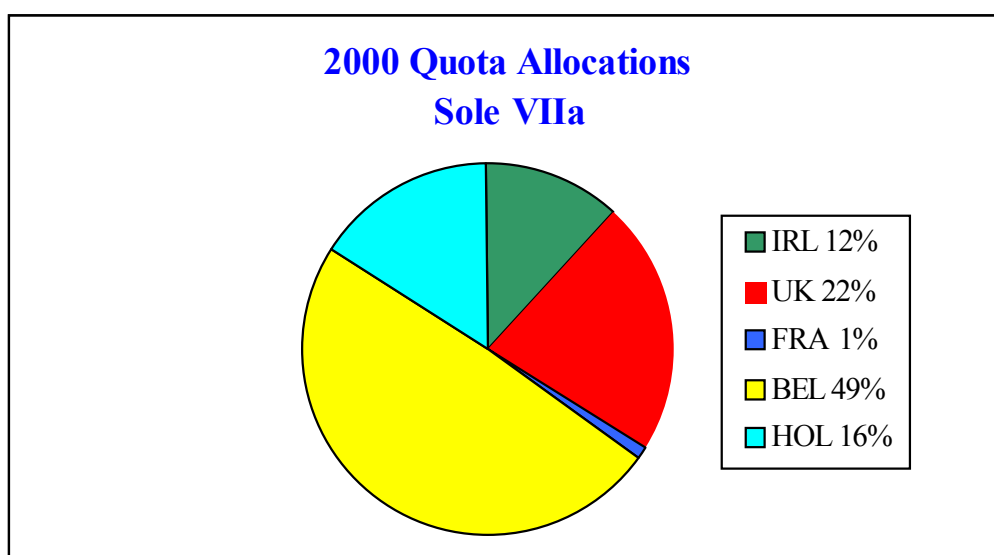
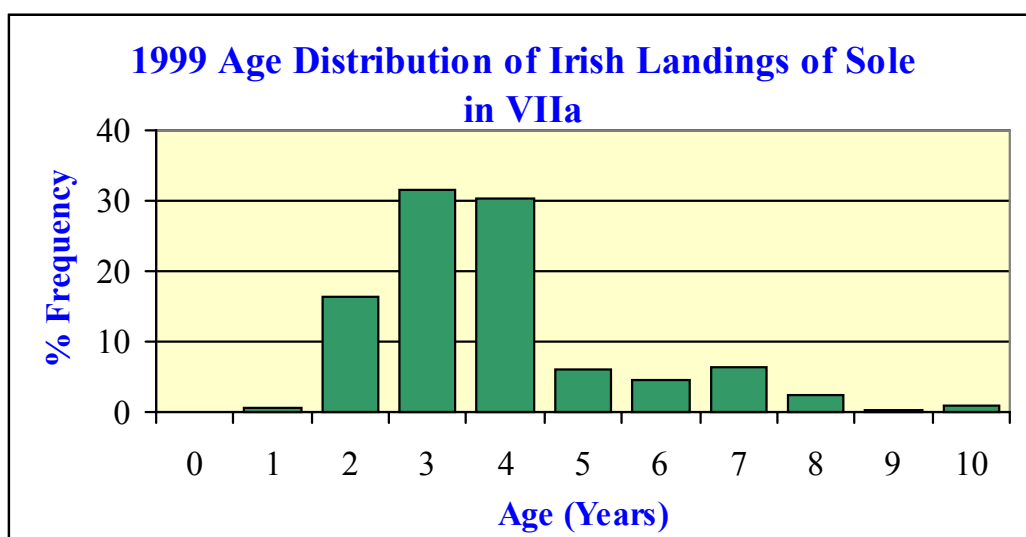
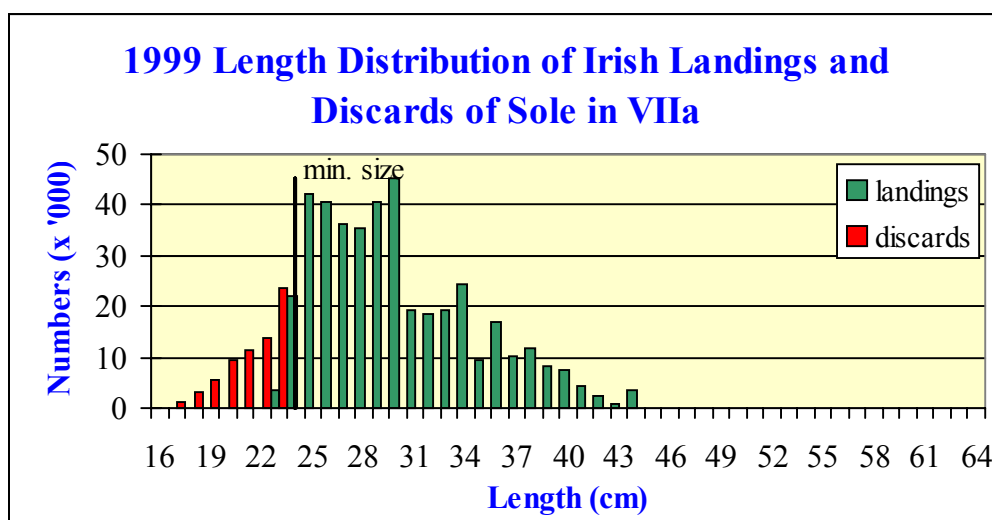
* Preliminary.

¹ 1989–1999 N.Ireland included with England & Wales.

n/a Not available.

Table 3.8.6.2 Sole in Division VIIa (Irish Sea)

Year	Recruitment Age 2	Spawning Stock Biomass	Landings	Fishing Mortality Age 4–7
1970	4.05	6.16	1.79	0.378
1971	10.29	6.42	1.88	0.393
1972	3.22	5.10	1.45	0.390
1973	12.77	5.14	1.43	0.364
1974	6.19	4.94	1.31	0.401
1975	6.79	5.11	1.44	0.359
1976	4.17	4.62	1.46	0.418
1977	16.33	4.13	1.15	0.362
1978	9.47	4.60	1.11	0.346
1979	8.68	5.68	1.61	0.417
1980	5.30	5.39	1.94	0.543
1981	4.43	5.26	1.67	0.401
1982	2.36	4.21	1.34	0.401
1983	5.89	4.18	1.17	0.408
1984	16.06	4.54	1.06	0.349
1985	16.74	5.24	1.15	0.321
1986	24.66	6.36	2.00	0.432
1987	4.00	6.93	2.81	0.806
1988	3.91	5.58	2.00	0.500
1989	4.68	4.76	1.83	0.469
1990	6.17	3.91	1.58	0.511
1991	13.23	3.46	1.21	0.391
1992	5.17	3.85	1.26	0.373
1993	5.91	3.61	1.02	0.398
1994	5.49	4.03	1.37	0.433
1995	2.15	3.75	1.27	0.445
1996	2.63	2.90	1.00	0.444
1997	9.62	2.87	1.00	0.504
1998	8.39	3.22	0.91	0.425
1999	4.40	3.61	0.86	0.346
2000	5.28	3.79	.	.
Average	7.69	4.62	1.44	0.424
Unit	Millions	1000 tonnes	1000 tonnes	-



West of Ireland Sole

(Divisions VIIb,c)



Marine Fisheries Services Division

MFSD – ADVICE

The assessment carried out last year indicated that this stock was probably under-exploited. The TAC is not fully taken up. MFSD have advised that there should be no increase in the catches of the fully exploited Plaice from VIIb,c. Since plaice and sole are taken in a mixed fishery the TAC for sole should remain at 100 t which translates to an Irish quota of 85 t.

STATE OF THE STOCK

- The state of this stock is unknown.
- Total international landings were 56 t in 1998, the 1999 landings are incomplete.
- There are no proposed reference points for this stock.
- Based on last year's estimates of F, plaice in division VIIbc is likely to be underexploited.

CURRENT MANAGEMENT

- The TAC area covers VIIb,c as does the fishery which is currently not assessed.
- The 2000 TAC was 100 t with an associated Irish quota of 85 t.
- There are no explicit management objectives or plan for this stock. Ireland has a unique opportunity as the main participant in this fishery to develop a management strategy for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £1.8m in Divisions VIIb,c.
- The value of the 1999 Irish quota was £1.5m.
- The value of the 1999 Irish landings was £1.2m.
- The high value of sole make them a very economically valuable species in this area particularly for smaller inshore trawlers.

ADDITIONAL INFORMATION

1. No analytical assessment is carried out at present for this stock.
2. There were problems obtaining French landings statistics for 1999, no accurate landings were available for VIIb,c in 1999.
3. Irish landings in 1999 were 68 t. This is an increase of 26% on the 1998 landings.
4. Misreporting is not perceived to be a problem in this fishery.
5. Ireland with 96% of the 1998 landings dominates the fishery. France land the remaining and 4%.
6. Sole are caught in mixed species otter trawl fisheries mainly in inshore areas of VIIb.
7. Irish sampling for this stock is supported through EU funding of FIEFA (97-0059) and SAMFISH (EU Study Contract 99-009).
8. MFSD have conducted a groundfish survey in this area since 1992, however, sole catches are low and variable and do not give a good abundance index for this stock.
9. MFSD data on discarding of sole in this area is limited but it is not considered to be a problem.
10. The MFSD sampling indicates that the Irish landings were mainly comprised of 3 and 4 year old fish (48% of the landings) older age groups are also well represented in the landings.

Nominal International Landings of sole in VII bc as reported to Working Group

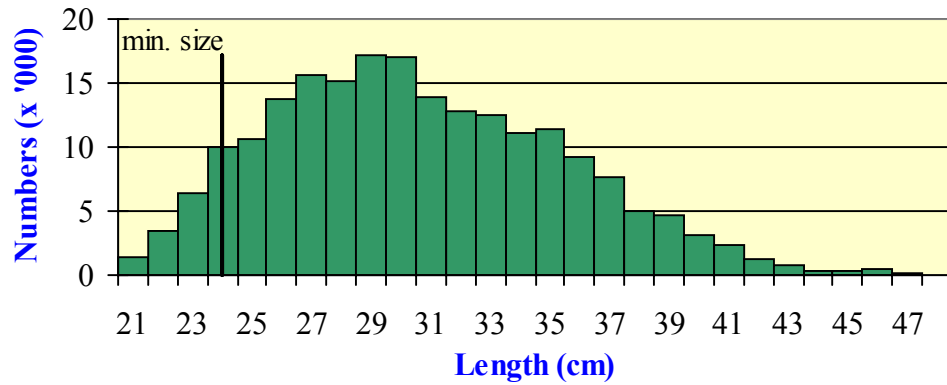
Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
France	2	+	-	5	2	2	1	2	4	3	2*
Ireland	34	38	41	46	43	59	70	63	64	50	54*
UK (England and Wales) ¹	1	+	+	+	+	-	-	-	+	1	+
Total	37	38	41	51	45	61	71	65	68	54	56

* Preliminary

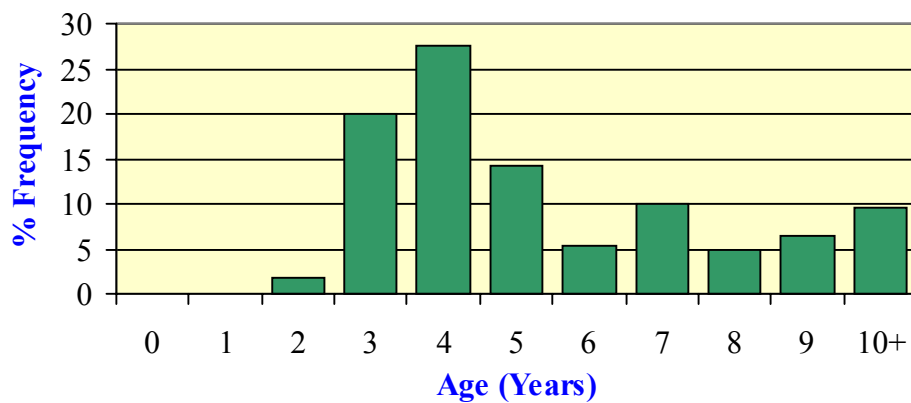
¹ 1989-1997 N. Ireland included with England and

² Revised Wales.

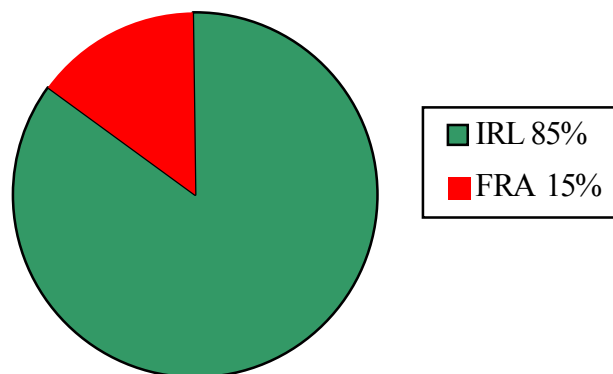
1999 Length Distribution of Irish Landings of Sole in VIIbc



1999 Age Distribution of Irish Landings of Sole in VIIbc



2000 Quota Allocations Sole VIIbc



Celtic Sea Sole

(Division VIIIfg)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with ICES recommendations that the fishing mortality (F) should be reduced below F_{pa} , corresponding to landings of less than 810 t in 2001. This corresponds to a reduction of 40% from status quo F, and will promote an increase in SSB above B_{pa} in the short term. This advice translates to an Irish quota of 24 t in 2001.

STATE OF THE STOCK

- There are serious concerns about the state of this stock.
- The landings in 1999 were 1,010 t, which is 16% lower than in 1998. Landings peaked in 1986 at about 1,600 t but have been close to 1,000 t since 1989.
- Fishing mortality is much too high on this stock and has been above the proposed $F_{pa}=0.37$ since 1983. Fishing mortality has been very high since 1994.
- Recruitment has fluctuated during the time series and the 1998 year-class is the biggest on record.
- The spawning stock biomass in this stock has been declining steadily since the beginning of the time series. The 1999 estimate is the lowest in the series and below the proposed $B_{pa} = 2,200$ t.
- The short-term prediction is for spawning stock biomass to continue to increase slightly at current levels fishing mortality and recruitment.

CURRENT MANAGEMENT

- The TAC area covers Divisions VIIIfg as does the assessment area
- The 2000 TAC was 1,160 t with an associated Irish quota of 35 t.
- There are no explicit management objectives or plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £6.0m in Divisions VIIIfg.
- The value of the 1999 Irish quota was £0.2m.
- The value of the 1999 international landings Divi-

sions VIIIfg was £6.3m.

- The value of the 1999 Irish landings was £0.3m.
- The high market value of sole make it economically important component of the mixed demersal fisheries in the Celtic Sea.

ADDITIONAL INFORMATION

1. There were problems obtaining French landings statistics for 1999, therefore the assessment for this stock may not be as robust as in previous years.
2. The international landings in 1999 were 1,010 t.
3. Irish landings in 1999 were 50 t. This is a decrease of 35% on the 1998 landings.
4. The levels of misreporting in this stock are unknown, however, TACs have been restrictive and overshot by some countries in recent years.
5. Belgium with 66% of the 1999 landings dominates the fishery. The UK, France and Ireland landed 22%, 6% and 5% of the 1999 landings respectively.
6. Celtic Sea Sole are a valuable species for Irish demersal trawlers from the south coast and also to the Irish beam trawl fleet, however, the Irish quota allocation is very restrictive.
7. Irish sampling for this stock is supported through EU funding of FIEFA (EU Study Contract 97-0059) and SAMFISH (99-009).
8. MFSD commenced a groundfish survey in 1997 on RV *Celtic Voyager* in the Celtic Sea. This survey does not provide an abundance index for this stock since the otter trawl used is not efficient at catching sole.
9. The results of tagging experiments suggest that there is only limited movement of sole between VIIIf and elsewhere. There is an important spawning ground in VIIIf for sole.
10. MFSD sampling indicates that approximately 46% of Irish landings in 1999 were three year old fish.
11. The 1998 year-class will contribute 48% of the landings during 2001 and 2002. This year-class will not be fully mature until 2003 and the high exploitation before 2003 will reduce the potential for this year-class to contribute to the SSB.

ICES ADVICE

3.9.5

State of stock/fishery:

The stock is outside safe biological limits. Fishing mortality has increased since the late 1970s and has exceeded F_{pa} .

since the early 1980s. It has even exceeded F_{lim} since 1995. SSB has declined steadily since the early 1970's. SSB fell below B_{pa} in 1995, and reached a second low in 1998. Year classes in the 1990's have been generally around the long term average, but the 1998 year class is strong.

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 the fishing mortality should be reduced below F_{pa} , corresponding to landings of less

than 810 t in 2001. This corresponds to a reduction of 40% from *status quo* F , and will promote an increase in SSB above B_{pa} in the short term.

Relevant factors to be considered in management:

Survey data indicate 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. The 1998 year class contributes 48% to the landings in the short term prediction. This year class will not be fully mature until 2003, and the high exploitation before 2003 will reduce the potential for this year class to contribute to the SSB.

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 2001:

Basis: $F(2000) = F(97-99) = 0.62$; Landings(2000) = 0.97 ; SSB(2001) = 1.89.

F(2001)	Basis	Landings (2001)	SSB (2002)	Medium-term situation (10 years) Probability (%) of SSB being below B_{pa}
0.25	0.4 F_{97-99}	0.57	2.78	< 5
0.31	0.5 F_{97-99}	0.69	2.64	< 5
0.37	$F_{pa} = 0.6 F_{97-99}$	0.81	2.51	< 5
0.43	0.7 F_{97-99}	0.92	2.39	< 5
0.49	0.8 F_{97-99}	1.02	2.27	20-50
0.62	1.0 F_{97-99}	1.21	2.05	~ 50

Weights in '000 t.

Shaded scenarios considered inconsistent with the precautionary approach.

Elaboration and special comment:

The fisheries for sole in the Celtic Sea and Bristol Channel involve vessels from Belgium, taking 65%, the UK 23%, France 8% and Ireland 4% of the total landings. The sole fishery is concentrated on the north Cornish coast off Trevose Head and around Lands End.

Sole are taken mainly in a beam-trawl fishery that started in the early 1960s and, to a lesser extent, in the longer established otter-trawl fisheries. In the 1970s, the fishery was mainly carried out by Belgian beam trawlers and Belgian and UK otter trawlers. The use of beam-trawls (to target sole and plaice) increased during the mid 1970s, and the Belgian otter trawlers have now been almost entirely replaced by beam trawlers. Effort in the Belgium beam-trawl fleet increased in the late 1980s as vessels normally operating in the North Sea were attracted to the west by improved fishing opportunities. Beam-trawling by UK vessels increased substantially from 1986, reaching a peak in 1990 and 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 adjoining areas.

Age-based analytical assessment using catch-per-unit effort data from two commercial fleets and one survey.

Projections were made setting the 1998 year class at the same level as the two largest ones in the time series (9 million at age 1).

Source of information: Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, September 2000 (ICES CM 2001/ACFM:05).

Reference points as set 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 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 ($SSB_{MT} < B_{pa}$)

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	1.2
1988	F = F(pre-86); TAC	0.9	1.1	1.1
1989	F at F(81–85); TAC	1.0	1.0	1.0
1990	No increase in F	1.2	1.2	1.2
1991	No increase in F	1.1	1.2	1.1
1992	No long-term gains in increasing F	1.1	1.2	1.0
1993	No long-term gains in increasing F	-	1.1	0.9
1994	No long-term gains in increasing F	-	1.1	1.0
1995	No increase in F	1.0	1.1	1.2
1996	20% reduction in F	0.8	1.0	1.0
1997	20% reduction in F	0.8	0.9	0.9
1998	20% reduction in F	0.7	0.85	0.88
1999	Reduce F below F_{pa}	0.81	0.96	1.0
2000	Reduce F below F_{pa}	<1.16	1.16	
2001	Reduce F below F_{pa}	<0.81		

Weights in '000 t.

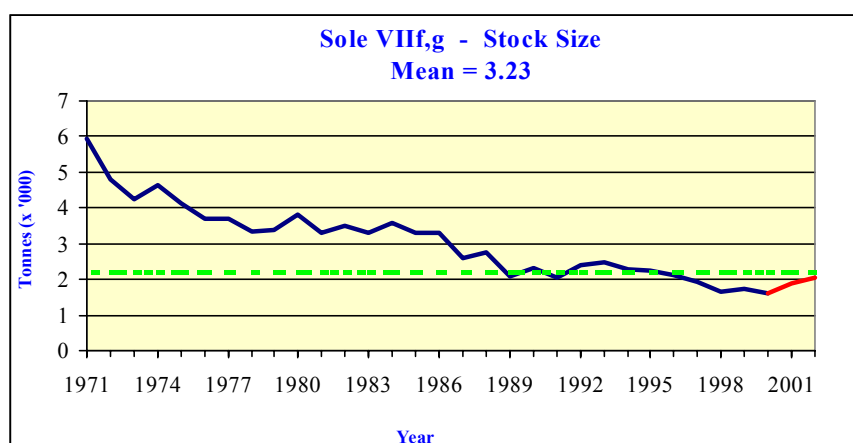
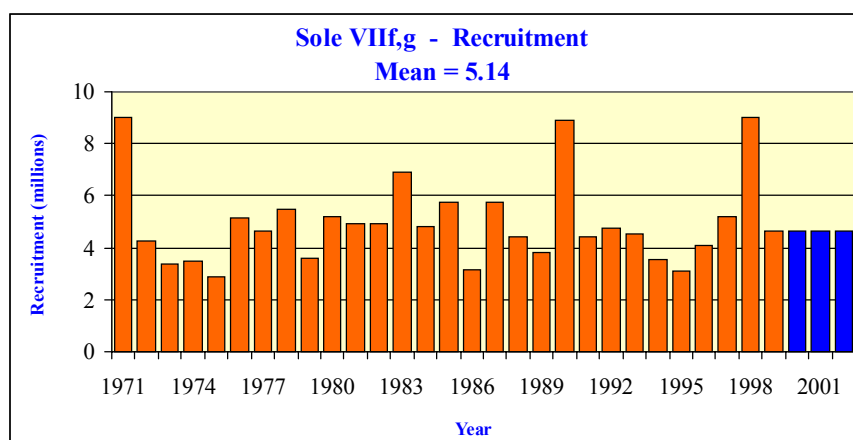
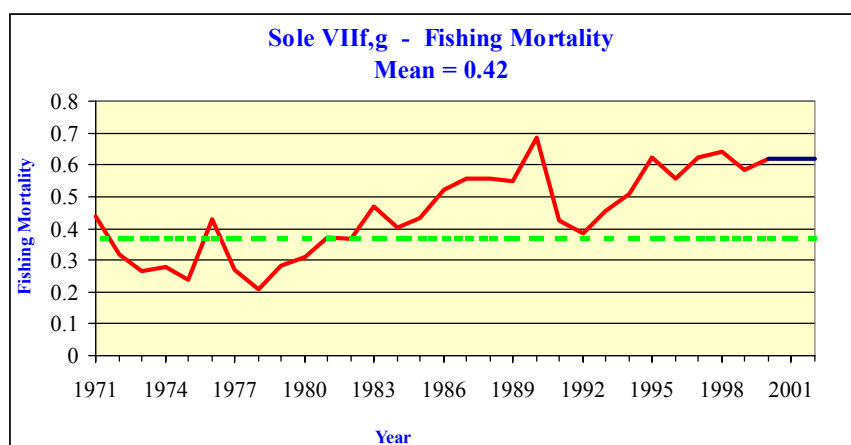
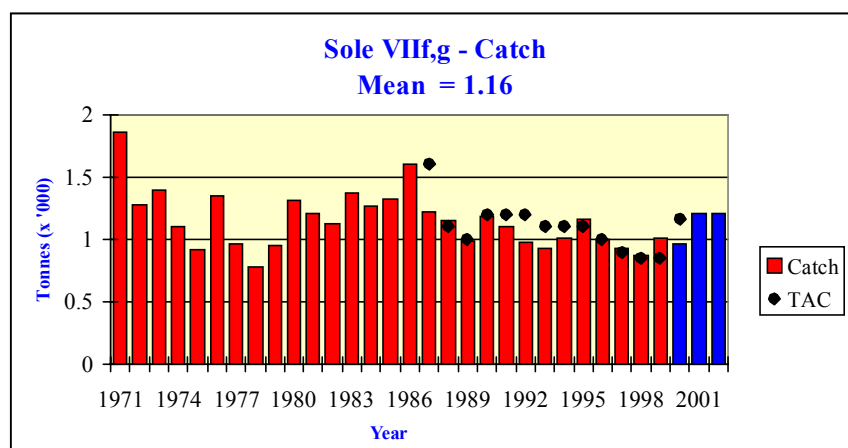


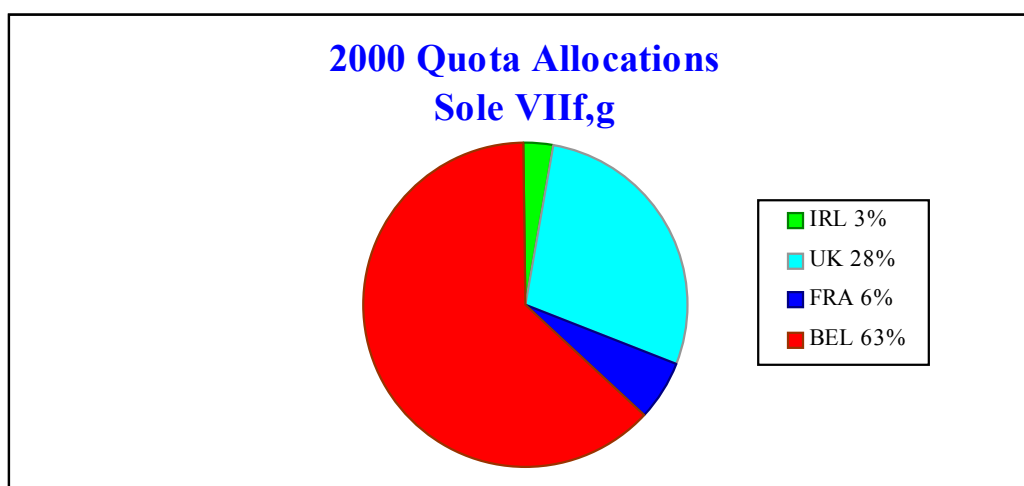
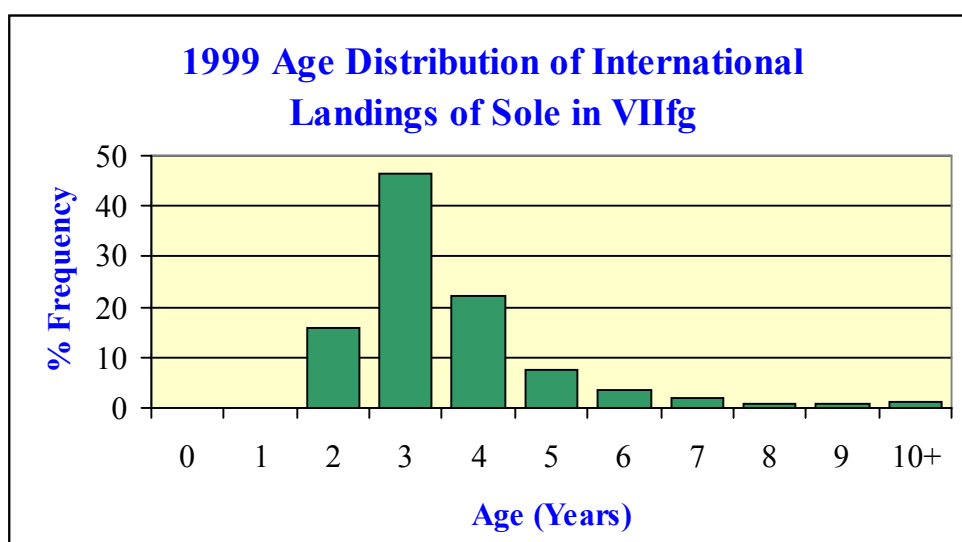
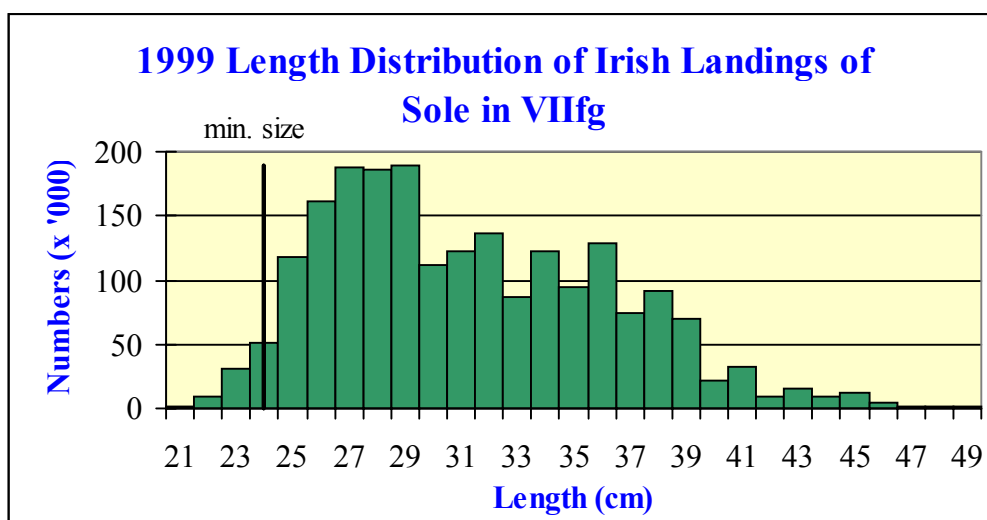
Table 3.9.5.1 Celtic Sea SOLE. Divisions VIIIf and VIIg. Nominal landings (tonnes), 1986–1999. Data used by the Working Group.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999 ¹
Belgium	1,092	704	725	660	689	839	516	512	612	728	610	562	568	669
France	92	72	89	97	100	80	136	103	86	89	97	79	72	61
Ireland	12	9	15	32	41	N/A	4	28	47	45	23	36	37	50
UK(Engl.& Wales)	404	437	317	203	359	395	325	285	264	294	265	251	198	231
Others	-	-	-	-	-	10	-	-	-	-	-	-	-	-
Total	1,600	1,222	1,146	992	1,189	1,324	981	928	1,009	1,157	995	928	875	1011
Unallocated	-	-	-	-	-	-217	-	-	-	-	-	-1	-	1
Total used in assessment	1,600	1,222	1,146	992	1,189	1,107	981	928	1,009	1,157	995	927	875	1012

Table 3.9.5.2 Celtic Sea sole (Divisions VIIIf and g)

Year	Recruitment Age 1	Spawning Stock Biomass	Landings	Fishing Mortality Age 4-8
1971	8.98	5.92	1.86	0.437
1972	4.23	4.81	1.28	0.317
1973	3.38	4.25	1.39	0.267
1974	3.46	4.63	1.11	0.278
1975	2.87	4.14	0.92	0.238
1976	5.14	3.68	1.35	0.429
1977	4.65	3.71	0.96	0.270
1978	5.47	3.36	0.78	0.206
1979	3.59	3.39	0.95	0.284
1980	5.20	3.83	1.31	0.309
1981	4.91	3.30	1.21	0.371
1982	4.94	3.51	1.13	0.366
1983	6.90	3.31	1.37	0.468
1984	4.80	3.60	1.27	0.402
1985	5.77	3.29	1.33	0.433
1986	3.18	3.31	1.60	0.520
1987	5.76	2.59	1.22	0.558
1988	4.42	2.77	1.15	0.559
1989	3.82	2.09	0.99	0.549
1990	8.89	2.31	1.19	0.685
1991	4.43	2.04	1.11	0.426
1992	4.74	2.39	0.98	0.385
1993	4.50	2.50	0.93	0.455
1994	3.56	2.28	1.01	0.507
1995	3.09	2.24	1.16	0.624
1996	4.06	2.14	1.00	0.557
1997	5.17	1.91	0.93	0.625
1998	4.97	1.64	0.88	0.639
1999	9.00 ¹	1.72	1.01	0.583
2000	4.62	1.61	.	.
Average	4.95	3.07	1.15	0.440
Unit	Millions	1000 tonnes	1000 tonnes	-

¹ The level of the two highest R of the series.



Southwest of Ireland Sole

(Divisions VIIh,j,k)



Marine Fisheries Services Division

MFSD – ADVICE

MFSD advise that there should be no increase in the exploitation of sole in VIIh-k. The 2001 TAC for VIIh,j,k sole should remain at 720 t with an associated Irish quota if 325 t.

STATE OF THE STOCK

- The state of this stock is not known.
- Total international landings in 1998 were 463 t, the 1999 figures are incomplete.
- There are no proposed reference points for this stock..
- Based on last year's estimates of F, plaice in divisions VIIh,j,k are considered to be under-exploited.

CURRENT MANAGEMENT

- The TAC area covers VIIh,j,k as does the fishery, which is currently not assessed.
- The 2000 TAC was 720 t with an associated Irish quota if 325 t.
- There are no explicit management objectives or plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £4.0m in Divisions VIIh,j,k.
- The value of the 1999 Irish quota was £1.8m.
- The value of the 1999 Irish landings was £1.1m.
- The high market value of sole make it a very economically important fishery particularly to smaller in-shore trawlers in the southwest of Ireland.

ADDITIONAL INFORMATION

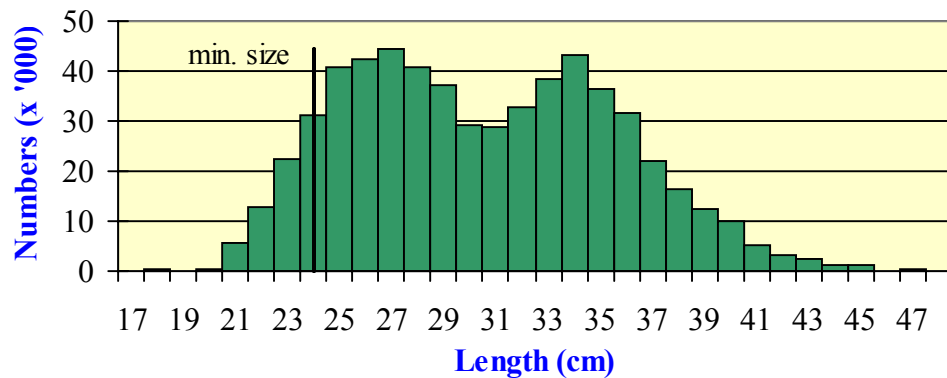
1. No analytical assessment is carried out at present for this stock.
2. There were problems obtaining French landings statistics for 1999, no accurate landings were available for VIIh,j,k in 1999.
3. Irish landings in 1999 were 199 t. This is 5% lower than the 1998 landings.
4. Mis-reporting is not perceived as a problem in this stock.
5. Ireland (with 45% of the 1998 landings) dominates the fishery. The UK, Belgium and France land 24%, 20% and 11% respectively.
6. Sole are mainly caught in mixed species otter trawl fisheries in inshore parts of VIIj. This is a very important target fishery for the inshore Irish otter trawl fleet, particularly in Dingle, Castletownbere, Baltimore and Union Hall.
7. Irish sampling for this stock is supported through EU funding of FIEFA (EU Study Contract 97-0059) and SAMFISH (99-009).
8. MFSD have conducted a groundfish survey in this area since 1992, however, sole catches are low and variable and do not give a good abundance index for this stock.
9. MFSD data on discarding of sole in this area is limited but it is not considered to be a problem.
10. MFSD sampling indicates that the Irish landings were mainly comprised of 3 to 5 year old fish (64% of the landings).

Nominal International Landings of sole in VII h,j,k as reported to Working Group

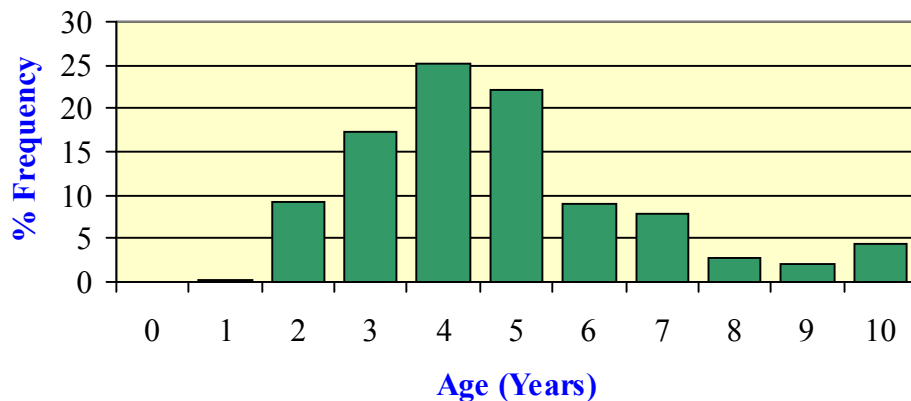
Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Belgium	-	-	-	-	-	-	-	-	-	51	91
France	37	51	71	47	44	44	42	44	52	58	51*
Ireland	82	206	266	306	255	237	184	218	211	119	210*
UK (E/W/NI)	166	177	144	234	215	209	172	192	148	113	-
UK (Scotland)	-	-	+	-	2	5	2	-	+	-	-
UK											111
Total	285	434	481	587	516	495	400	454	411	341	463

* Preliminary

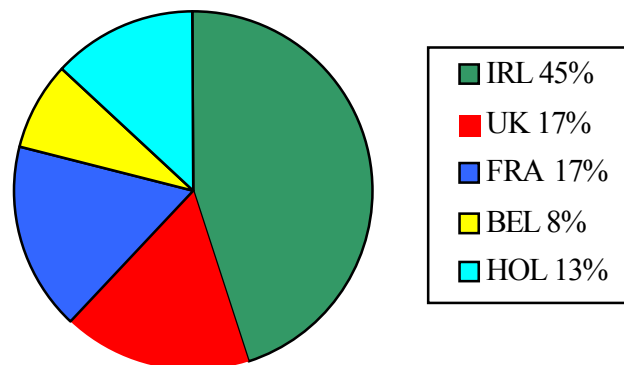
1999 Length Distribution of Irish Landings of Sole in VIIj,k



1999 Age Distribution of Irish Landings of Sole in VIIj,k



2000 Quota Allocations Sole VIIh-k



Deepwater Stocks

No ACFM information had been included for these stocks

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



Marine Fisheries Services Division

Formulation of Management Advice for Deepwater Fisheries

Throughout 2000, there has been considerable discussion within ICES concerning the formulation of management advice for deepwater fish. The salient points of these discussions sourced from various documents are summarised below. MFSD advice and comments are given for each of the proposed management measures.

Experience shows that deep-sea stocks can be depleted very quickly and that recovery will be slow. These populations generally have a high proportion of old fish, their fecundities are low, and regeneration and growth are so slow that stock numbers do not increase in the depleted areas in the short or medium term. Fisheries on deep-water species often develop and expand before sufficient information is available on which to base management advice. Fisheries for deep-water species are developing inside and outside national jurisdictions and the exploitation rates are unknown.

Against this background, in April 2000, the EU requested advice from ICES on deep sea fisheries management. In particular, ICES was requested to indicate the probable utility of application of TACs, geographical and/or temporal closures, other technical measures including appropriate mesh size, hook size and gear structure and effort limitation. In 2000 NEAFC also requested that ICES provide advice on management of deepwater fisheries. NEAFC specifically asked what further information is needed to provide a basis for comprehensive management measures and what measures could be introduced in the interim period when long-term measures are being formulated. The advice provided by ICES to the EU and NEAFC is summarised below. This advice is based on the report of the relevant ICES study group and the report of an *ad hoc* committee of ACFM that reviewed available information on deepwater fisheries. In addition, ICES and MFSD advice on the species for which stock assessment was attempted in 2000 is presented below.

SUMMARY OF ICES AND MFSD MANAGEMENT ADVICE

ICES advise that a combination of management measures are required and that no one measure will be successful.

MFSD agrees with this advice.

Closed areas were considered as a viable measure in the long term, though much research is required to determine the size these areas should be. Thus closed areas are not an effective short term measure. An expansion of closed areas are Marine Protected Areas (MPAs), mainly to protect the benthos. A legal basis exists for defining MPAs within 200 mile EEZs but not in international waters. However, it is not clear what size such MPAs should be in order to be an effective management measure, since the structure of deep water stocks are poorly understood.

MFSD does not consider MPAs to be an effective management measure until stock discrimination is more clearly defined.

Some consideration was given to gear limitations. A general ban on trawling in certain areas and a zonation scheme to prevent the expansion of trawling has been suggested. ICES also suggested that long-lines are not a viable alternative to trawls since many commercial species do not take bait and discards of deepwater sharks would be very high.

MFSD note that the impact of trawling on the deepwater environment is unknown and suggests that a ban on trawling in certain designated areas (e.g. nursery grounds) would be beneficial to stock status. MFSD suggests that a strictly regulated long-line fishery should achieve a balance between trawling and long-lining in the exploitation of deepwater fish.

ICES advised that TACs in the range of 1 – 2 % of virgin biomass be considered. However TACs are unlikely to be effective on their own and ICES have suggested that they should be employed in combination with other measures. ICES have suggested the setting of TACs at specified levels for a period of time and reviewing those levels based on ongoing analyses of stock structure. This approach has been used in Australia and New Zealand for management of orange roughy stocks.

MFSD advises that TACs are unlikely to be effective on their own and that further research into the means by which any deepwater TACs are formulated is required.

A licensing system should be implemented by the EU, in combination with TACs, seasonal/area closures and possible gear limitations (maximum number of hooks/ trawl

bans). Such a scheme should aim to allow for a restricted access to the resource for vessels primarily engaged in exploiting other resources.

MFSD would point out that the EU Directive (2027/95) places a restriction on effort, allocating a maximum fishing effort to each Member State. This legislation has provided Ireland with 7.6 % of total towed-gear effort in Sub-area VI and 23 % in Sub-area VII. However no static-gear effort is allocated to Ireland. MFSD advise that regulation of fishing effort should form the basis of any licensing scheme.

It was specifically stated that no measures would be effective without enforcement, including satellite tracking of vessels.

MFSD agrees that effective enforcement is essential for the success of any management plan.

In order to improve the knowledge base for future management a unified data collection system will be required. Where possible, observers should accompany deepwater fishing trips. Appropriate log-book data should be recorded at a higher spatial and temporal resolution than at present. There is particular concern about fisheries in international waters where available landings data may not reflect the true scale of recent activity. New management areas should be defined for data collection and management of deepwater fisheries, and the EU and NEAFC should be encouraged to adopt these in international negotiations.

MFSD advises that continued exploitation of deepwater fish should be accompanied by data collection schemes to improve the knowledge base for future management.

Deep water ecosystems including fish stocks are highly vulnerable to exploitation. According to OSPAR terminology such habitats are defined as “sensitive” or “very sensitive”, and therefore require a high degree of protection. ICES has therefore recommended that the Commission funds research into the impact of trawling on the deep sea floor. In view of the high level of discarding and low chance of survival of escapees from trawls, ICES considers it important that managers should be aware of the likely effects of fishing practices on the deep-water ecosystems.

MFSD is aware that ecological considerations will be incorporated into management advice in the future. Investigation of the ecosystem effects of fishing is a new and developing area of research in all marine fisheries.

Surveys of deepwater areas should be co-ordinated at an international level. This implies increased funding and more co-ordination at an international level. There is urgent need for continuing dialogue between managers, scientists and fishermen to ensure the success of management procedures. These discussions could take the form of open hearings or workshops.

MFSD endorses this advice and points out that the ICES International Bottom Trawl Survey may be a good model for the co-ordination of deep water surveys.

Blue Ling

MFSD – ADVICE

For MFSD advice on the management of deepwater species - see section on Formulation of Management Advice for Deepwater Fisheries.

ICES advises that there be no directed fisheries on this stock and measures be implemented to reduce or minimise catches of this stock in mixed fisheries.

STATE OF THE STOCK

- There are concerns about the state of this stock.
- Landings in Sub-areas VI and VII have increased since 1994 to 8,169 t in 1999. In Sub-areas I and II and Divisions Va and Vb landings have shown a downward trend since the 1980s.
- Exploitable biomass at the end of 1998 was considered be less than 20% of maximum observed biomass.

ADDITIONAL INFORMATION

- Assessment was attempted using commercial CPUE from French trawlers but results were unreliable.
- Total landings in all ICES areas were 16,528 t in 1999. Total landings in Sub-area VI were 7,821 t in 1999.
- Landings by Irish vessels in 1999 were 43 t, mainly from Sub-area VI.
- French trawlers take most of the catch in Sub-area VI, but catches from UK (Scottish) trawlers have increased in recent years. Norwegian long-liners also take blue ling as a by-catch in ling fisheries in Sub-area VI. Landings in Sub-area VII are negligible.
- Irish landings of blue ling are a by-catch for larger trawlers working on the edge of the continental shelf.
- Little is known about the life-history of blue ling and age determination has not been achieved.

Ling

MFSD – ADVICE

For MFSD advice on the management of deepwater species - see section on Formulation of Management Advice for Deepwater Fisheries.

ICES advise that overall fishing effort on ling be reduced by 30 %.

STATE OF THE STOCK

- The state of the stock is highly uncertain.
- Landings in 1998 were 8,756 t in Sub-area VI and

decreased from 16,321 t in 1988. In Sub-area VII landings have remained stable at around 10,000 t throughout the 1990's. Landings in Divisions IVa and Va have remained stable but in Vb have declined.

- Estimates of total mortality from Division Vb were similar to previous years (0.7 – 0.8).

ADDITIONAL INFORMATION

1. Assessments were conducted for Division Vb only because of lack of data in other areas. However this assessment was unreliable because of inconsistencies in the CPUE series. Total mortality was calculated for Divisions IIa, IVa and Vb.
2. Total landings in 1998 were over 54,000 t in all ICES areas. The Irish catch in 1999 was 1,138 t, from Sub-areas VI and VII.
3. 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.
4. Norway has a quota for ling in EU waters that is used by the Norwegian long-liners targeting the species in Sub-area VI and VII.
5. There is insufficient data on age, growth or reproduction of this species throughout Europe.

Tusk

MFSD – ADVICE

For MFSD advice on the management of deepwater species - see section on Formulation of Management Advice for Deepwater Fisheries.

ICES advise that overall fishing effort on tusk be reduced by 30 %.

STATE OF THE STOCK

- There is concern about the state of the stock.
- Landings in 1998 were 28,949 t in the ICES area, having decreased from over 40,000 t in 1991. Landings in Sub-area VI have decreased from 2,121 t in 1991 to 1,281 t in 1998. Landings in Sub-area VII have decreased from 68 t to 44 t, but are a negligible component of overall landings.
- Total mortality in 1998 was estimated as about 0.3 in Division Va.

ADDITIONAL INFORMATION

1. Assessment was based on CPUE series. However the CPUE series was too short and results are unreliable. However CPUE indices in Division Vb showed a steady decline. Exploitable biomass appears to be less than 20 % of initial size in Vb.

2. Total landings in 1998 were 28,949 t and have declined from over 42,000 t in 1989. Landings in Sub-area VI in 1998 were 2,196 t. Irish landings in 1999 were 45 t.
3. Tusk is mainly taken as by-catch in the Norwegian long-line fishery for ling. French and UK (Scottish) trawlers take ling as a by-catch.
4. Irish trawlers and long-liners catch tusk in Sub-areas VI and VII.

Orange Roughy

MFSD ADVICE

For MFSD advice on the management of deepwater species - see section on Formulation of Management Advice for Deepwater Fisheries.

ICES advise that fisheries for orange roughy only expand very slowly and are accompanied by programmes to collect data which allow evaluation of stock status. Orange roughy stocks can only sustain very low levels of exploitation.

STATE OF THE STOCK

- There are concerns about the state of orange roughy stocks.
- Landings in Sub-area VI have decreased markedly from over 3,000 t in 1990 to about 100 t annually in the late 1990's. Landings in Sub-area VII have fluctuated around 1,000 t annually since 1995.
- In Sub-area VI total biomass in 1998 was estimated as around 1,600 t, below proposed U_{pa} . In Sub-area VII the situation is less clear.

ADDITIONAL INFORMATION

1. The assessment was based on a French commercial CPUE series for Sub-areas VI and VII. However CPUE may not be an effective index of stock abundance since orange roughy is a shoaling species forms dense aggregations on seamounts and other topographical features.
2. Landings in 1998 in the ICES area were 1,923 t. France took almost all the catch in Sub-areas VI and VII (1,063 t).
3. Irish landings were negligible throughout the 1990's. However in 1999 and 2000 larger Irish trawlers landed some quantities of this species in 2000, preliminary landings of 65 tonnes were reported to ICES for 1999.
4. Age estimation data suggest that orange roughy can attain ages of 125 years and only mature at ages in excess of 20 years. They form dense aggregations on isolated seamounts. In Australia and New Zealand such aggregations have been depleted quite quickly. Thus orange roughy cannot sustain heavy fishing pressure.

5. There is insufficient information on the biology of this species.

Roundnose grenadier

MFSD ADVICE

For MFSD advice on the management of deepwater species - see section on Formulation of Management Advice for Deepwater Fisheries.

ICES advise that effort be reduced by 50 % on roundnose grenadier.

STATE OF THE STOCK

- There are concerns about the state of this stock.
- Landings in Sub-area VI have declined from 8,205 t in 1993 to 4,496 t in 1999. In Sub-area VII landings have fluctuated around 1,000 t in recent years.
- Biomass is estimated to be about 40,000 t - about twice the maximum sustainable yield.

ADDITIONAL INFORMATION

1. The assessment is based on CPUE from French trawlers and is the only such CPUE series available. It is not possible however, to ascertain to what extent these trawlers target roundnose grenadier, rather than other species.
2. Total landings in the ICES area in 1998 were 25,150 t. Ireland landed 1.5 t of all species of grenadiers in 1999. Some of these landings were of another species of grenadier from the Faroe-Shetland Channel.
3. Ireland does not collect separate landings statistics for roundnose grenadier and roughhead grenadier.
4. Mis-reporting or failure to report landings of roundnose grenadiers is a problem, particularly in international waters in Sub-area XII and Division VIb.
5. In Sub-areas VI and VII and Division Vb French trawlers take most of the catch. In international waters Spain, Portugal and some former Soviet-bloc countries target roundnose grenadier, in recently developed fisheries.
6. Roundnose grenadier is a by-catch for larger Irish trawlers fishing on the continental slopes.
7. Discarding is a serious problem in trawl fisheries, with 30 % of landed weight estimated to be discarded each year.
8. Irish research has shown that roundnose grenadier is long-lived (up to 60 years) and only mature between ages 7 and 11 years. They were also found to have low fecundities.

Black scabbard

MFSD – ADVICE

For MFSD advice on the management of deepwater species - see section on Formulation of Management Advice for Deepwater Fisheries.

ICES advise that a reduction of fishing effort of 50 % is required to bring the catch down to around maximum sustainable yield.

STATE OF THE STOCK

- There are concerns about the state of the stock.
- Landings in Sub-areas VI and VII have declined from 3,529 t in 1993 to 1,967 t in 1998. Preliminary Irish landings in 1999 were 30 t. In 2000 Irish trawlers landed considerable quantities of black scabbard.

ADDITIONAL INFORMATION

1. The assessment for Sub-areas V, VI, VII and XII was based on international catch data for these areas and French trawl CPUE for Sub-areas VI and VII.
2. Total landings in 1998 were 5,563 t in the ICES area. In Sub-areas VI and VII total landings were 1,967 t and French trawlers took most of the catch (1,815 t) in 1998.
3. Little is known about stock structure, migration, age or reproduction of this species.

Forkbeard

MFSD – ADVICE

For MFSD advice on the management of deepwater species - see section on Formulation of Management Advice for Deepwater Fisheries.

ICES advise that forkbeard stocks can only sustain very low levels of exploitation, therefore fisheries on such species should only be permitted when they expand very slowly and are accompanied by programmes to collect data for the evaluation of stock status.

STATE OF THE STOCKS

- The state of forkbeard stocks is unknown.
- Landings in Sub-area VI and VII increased from 1,898 t in 1988 to 3,040 t in 1998. Landings in Sub-areas VIII and IX have increased from 81 t in 1988 to 665 t in 1998. Landings in other areas are negligible.

ADDITIONAL INFORMATION

1. No assessment was carried out on forkbeard owing to a lack of suitable data.
2. Total international landings were 3,765 t in 1998.
3. Ireland caught 530 t of forkbeard in 1998 as by-catch in trawl fisheries in Sub-areas VI and VII. In 1999 Irish vessels landed 379 t and in 2000 several Irish trawlers and long-liners caught considerable quantities of this species.
4. There is a mis-reporting problem in forkbeard fisheries as landings of another deepwater species, mora, are reported as being forkbeard.

Argentina

MFSD – ADVICE

For MFSD advice on the management of deepwater species - see section on Formulation of Management Advice for Deepwater Fisheries.

ICES advise that argentine stocks can only sustain very low levels of exploitation and that fisheries for this species be permitted only when they expand very slowly and are accompanied by programmes to collect data for the evaluation of stock status.

STATE OF THE STOCK

1. The state of argentine stocks is unknown.
2. Landings in Sub-areas VI and VII were 5,555 t in 1998, having decreased from 10,438 t in 1988. Landings in Division Vb increased from 287 t in 1988 to 17,570 t in 1998.

ADDITIONAL INFORMATION

1. No assessment was carried out on argentine owing to a lack of data. CPUE is not a viable indicator of stock abundance of this species since it is a semi-pelagic shoaling species.
2. Total landings in Sub-area VI and VII were 5,555 t in 1998 of which Ireland caught 405 t. However several Irish RSW trawlers targeted argentinines in 2000.
3. Mis-reporting may be a problem in fisheries for argentine.
4. Most of the catch is taken by Dutch vessels in Sub-areas VI and VII. Irish vessels took most of the catch in the late 1980's but ceased to target this species for most of the 1990's.
5. MFSD research has shown that the argentine is a long-lived species, with a slow growth rate and low fecundity. As such, it is unable to sustain heavy fishing pressures.

Other species

Limited landings data exist for mora, rabbitfish, siki shark and faux siki shark and insufficient information was available for assessment. However these species are of interest to the Irish industry, and are particularly important in long-line catches.

MFSD ADVICE

For MFSD advice on the management of deepwater species - see section on Formulation of Management Advice for Deepwater Fisheries.

ADDITIONAL INFORMATION

- Official landings of mora in Sub-areas VI and VII are only available for Norway, which landed 8 tonnes in 1999. Whilst mora is an important by-catch for Spanish, UK and Irish long-liners, it is not reported separately and landings are aggregated with other species, mainly forkbeard.
- Rabbitfish are of increased commercial importance and markets exist in France. Irish vessels have landed this species in 2000. Little landings data exists for this species.
- Landings data of deepwater squalid sharks are collected by only by one country, France. Other countries, including Ireland, aggregate deepwater shark species with other species of sharks. French trawlers take most of the catch, though UK (English and Welsh) and Spanish registered long-liners also land deepwater sharks.
- French landings of siki and faux siki combined peaked in 1994 at 3,609 t and declined to 1,938 t in 1999. UK (Scottish) landings have increased in recent years.
- The lack of species-specific CPUE or landings data for the two exploited deepwater squalids prevented meaningful stock assessments from being carried out.
- The by-catch of other deepwater species in Norwegian long-line fisheries for ling and tusk is capped by EU effort restriction order (2027/95). Thus these vessels are precluded from targeting deepwater species such as mora, forkbeard, sharks or rabbitfish. It is not clear how this regulation is enforced.

STECF Advice (preliminary)

STECF Agrees that additional management measures are required for deepwater resources. However STECF stresses that adoption of advice to introduce TAC's in this fishery will be problematic. STECF advise that in this stock there is a history of misreporting of catch and species and suggest that alternative methods of quota allocation should be considered. STECF stress that effective enforcement is essential and would like to see a data collection system in place for these fisheries.

Table 3.12.6.a.1**Blue ling IVa**

Year	Denmark	Faroes	France ⁽¹⁾ (IV)	FRGermany	Norway	UK (EW)	UK (Sco))	Ireland	Total
1988	1	13	221	6	116	2	2		361
1989	1	-	239	4	196	12	+		452
1990	+	-	312	8	162	4	+		486
1991	1	31	369	7	178	2	32		620
1992	1	-	237	9	263	8	36		554
1993	2	101	74	2	186	1	44		410
1994	+		136	3	241	14	19		413
1995	+	2	73	+	201	8	193		477
1996	+	0	45	4	67	4	52		172
1997	+	0	35	+	61	0	172		268
1998	+	1	26		55	2	191		275
1999*	2		18	+	96	144		2	262

*Preliminary. ⁽¹⁾ Included in VI.

N.B. 1999 values for UK (EW) are preliminary **UK** values.

Table 3.12.6.a.1 continued**Blue ling VIa**

Year	Faroes	France	FRGermany	Ireland	Norway	Spain (inc VIb)	UK (EW)	UK (Scot)	Total
1988	14	6,616	2	-	29		2	1	6,664
1989	6	7,383	2	-	143		-	+	7,534
1990	-	4,487	44	-	54		-	1	4,586
1991	8	3,226	18	-	63		1	35	3,351
1992	4	5,483	4	-	129		-	24	5,644
1993	-	4,311	48	3	27		13	42	4,444
1994	-	2,999	24	73	90	433	1	91	3,711
1995	0	2,835	+	11	96	392	34	738	4,106
1996	0	4,115	4		50	681	9	1407	6,266
1997	0	3,427	+	1	29	190	789	1,021	5,457
1998	0	4,160			21	142	11	1,416	5,750
1999*	0	3,953 ⁽¹⁾	+	16	25	116	1,106		5,216

*Preliminary. ⁽¹⁾ Includes VIb

N.B. 1999 values for UK (EW) are preliminary total **UK** values

Blue ling VIb

Year	Faroes	France	FRGer- many	Norway	UK(EW)	UK (Scot)	Iceland	Ireland	Total
1988	2,000	499	37	42	9	14			2,601
1989	1,292	61	22	217	-	16			1,608
1990	360	703	-	127	-	2			1,192
1991	111	2,482	6	102	5	15			2,721
1992	231	348	2	50	2	14			647
1993	51	373	109	50	66	57			706
1994	5	89	104	33	3	25			259
1995	1	305	189	12	11	38			556
1996	0	87	92	7	37	74			297
1997	138	331		6	65	562	1		1,102
1998	76	469		13	190	287	122		1,035
1999		(2)	(2)	9	2,579			17	2,605

*Preliminary. ⁽¹⁾ Includes XII. ⁽²⁾ Included in VIa.

N.B. 1999 values for UK (EW) are preliminary total **UK** values

Table 3.12.6.b.1

LING VIa

Year	BEL	DEN	FAR	FRA ⁽¹⁾	GER	IRE	NOR	SPA ⁽²⁾	E&W	IOM	N.I.	SCO	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*				1,751	4	148	2,997	322	152			2,156	7,530

*Preliminary. ⁽¹⁾ Includes VIb until 1996 ⁽²⁾ Includes minor landings from VIb

Table 3.12.6.b.1 continued

LING VIIg-k

Year	BEL	DEN	FRA	GER	IRE	NOR	SPA ⁽²⁾	E&W	IOM	N.I.	SCO	Total
1988	35	1	⁽¹⁾	-	286	-	2,652	1,439	-	-	2	4,415
1989	23	-	⁽¹⁾	-	301	163		518	-	+	7	1,012
1990	20	+	⁽¹⁾	-	356	260		434	+	-	7	1,077
1991	10	+	⁽¹⁾	-	454	-		830	-	-	100	1,394
1992	10	-	⁽¹⁾	-	323	-		1,130	-	+	130	1,593
1993	9	+	⁽¹⁾	35	374			1,551	-	1	364	2,334
1994	19	-	⁽¹⁾	10	620		184	2,143	-	1	277	3,254
1995	33	-	1597	40	766	-	195	3046		⁽³⁾	454	6,131
1996	45	-	1626	169	771		583	3209			447	6,850
1997	37	-	1,574	156	674		33	2112			459	5,045
1998	18	-	1,362	88	877		1669	3,465			335	7,814
1999*	-	-	1,353	49	418		144	1,619			1	3,584

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

LING VIII

Year	Bel-gium	France	Germany	Spain	UK (EW)	Total
1988		1,018			10	1,028
1989		1,214			7	1,221
1990		1,371			1	1,372
1991		1,127			12	1,139
1992		801			1	802
1993		508			2	510
1994		n/a		77	8	85
1995		693		106	46	845
1996		825	23	170	23	1,041
1997	1	705	+	290	38	1,034
1998	5	1,220	-	543	29	1,797
1999*	22	582	-	63	8	675

Table 3.12.6.b.1 continued

LING VIb

Year	Faroes	France ⁽²⁾	Germany	Ireland	Norway	Spain ⁽³⁾	UK (EW)	UK(NI)	UK (Scot)	Total
1988	196		-	-	1,253		93	-	223	1,765
1989	17		-	-	3,616		26	-	84	3,743
1990	3		-	26	1,315		10	+	151	1,505
1991	-		-	31	2,489		29	2	111	2,662
1992	35		+	23	1,713		28	2	90	1,891
1993	4		+	60	1,179		43	4	232	1,522
1994	104		-	44	2,116		52	4	220	2,540
1995	66		+	57	1,308		84		123	1,638
1996	0		124	70	679		150		101	1,124
1997	0		46	29	504		103		132	814
1998		1	10	44	944		71		324	1,394
1999*		16	25	39	498		86		483	1,147

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

LING VII

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

*Preliminary. ⁽¹⁾ Reported by Division

LING VIIa

Year	Bel-gium	France	Ireland	UK (EW)	UK (IOM)	UK (NI)	UK (SCO)	Total
1988	14	⁽¹⁾	100	49	-	38	10	211
1989	10	⁽¹⁾	138	112	1	43	7	311
1990	11	⁽¹⁾	8	63	1	59	27	169
1991	4	⁽¹⁾	10	31	2	60	18	125
1992	4	⁽¹⁾	7	43	1	40	10	105
1993	10	⁽¹⁾	51	81	2	60	15	219
1994	8	⁽¹⁾	136	46	2	76	16	284
1995	12	9	143	106	1	⁽²⁾	34	305
1996	11	6	147	29	-	⁽²⁾	17	210
1997	8	6	179	59	2	⁽²⁾	10	264
1998	7	7	89	69	1	⁽²⁾	25	198
1999*	7	8	31	29		⁽²⁾	13	88

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

Table 3.12.6.b.1 continued

LING VIIb,c

Year	France (1)	Germany	Ireland	Norway	Spain ⁽³⁾	UK (EW)	UK (NI)	UK (Scot)	Total
1988	(1)	-	50	57		750	-	8	865
1989	(1)	+	43	368		161	-	5	577
1990	(1)	-	51	463		133	-	31	678
1991	(1)	-	62	326		294	8	59	749
1992	(1)	-	44	610		485	4	143	1,286
1993	(1)	97	224	145		550	9	409	1,434
1994	(1)	98	225	306		530	2	434	1,595
1995	78	161	465	295		630	⁽²⁾	315	1,944
1996	57	234	283	168		1117	⁽²⁾	342	2,201
1997	65	252	184	418		635	⁽²⁾	226	1,780
1998	32	1	190	89		393		329	1,034
1999*	71	4	291	288		488		7	1,149

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

LING VIIId,e

Year	Belgium	Denmark	France (1)	Ireland	UK (EW)	UK (Scot)	UK (Ch. Isl)	Total
1988	36	+	(1)	-	743	-		779
1989	52	-	(1)	-	644	4		700
1990	31	-	(1)	22	743	3		799
1991	7	-	(1)	25	647	1		680
1992	10	+	(1)	16	493	+		519
1993	15	-	(1)	-	421	+		436
1994	14	+	(1)	-	437	0		451
1995	10	-	885	2	492	0		1,389
1996	15		960		499	3		1,477
1997	12		1,049	1	372	1	37	1,472
1998	10		953		510	1	26	1,500
1999*	7		503		507	1		1,018

*Preliminary. ⁽¹⁾ See Ling VII.

LING VIIIf

Year	Belgium	France (1)	Ireland	UK (EW)	UK (Scot)	Total
1988	77	(1)	-	367	-	444
1989	42	(1)	-	265	3	310
1990	23	(1)	3	207	-	233
1991	34	(1)	5	259	4	302
1992	9	(1)	1	127	-	137
1993	8	(1)	-	215	+	223
1994	21	(1)	-	379	-	400
1995	36	110	-	456	0	602
1996	40	121	-	238	0	399
1997	30	204	-	313		547
1998	29	204	-	328		561
1999*	16	190	-	188		394

*Preliminary. ⁽¹⁾ See Ling VII.

Table 3.12.6.c.1

TUSK VIa

Year	DEN	FAR	FRA ⁽¹⁾	GER	IRE	NOR	E&W	N.I.	SCO	SPA
1988	-	-	766	1	-	1,310	30	-	13	
1989	+	6	694	3	2	1,583	3	-	6	
1990	-	9	723	+	-	1,506	7	+	11	
1991	-	5	514	+	-	998	9	+	17	
1992	-	-	532	+	-	1,124	5	-	21	
1993	-	-	400	4	3	783	2	+	31	
1994	+		345	6	1	865	5	-	40	
1995		0	332	+	33	990	1		79	
1996		0	368	1	5	890	1		126	
1997		0	359	+	3	750	1		137	11
1998			395	+		715	-		163	8
1999*			383	+	4	113	1		161	39

⁽¹⁾ Not allocated by divisions before 1993.

TUSK VIb

Year	Faroes	France	Germany	Ireland	Iceland	Norway	E&W	N.I.	SCO	Total
1988	217		-	-		601	8	-	34	860
1989	41	1	-	-		1,537	2	-	12	1,593
1990	6	3	-	-		738	2	+	19	768
1991	-	7	+	5		1,068	3	-	25	1,108
1992	63	2	+	5		763	3	1	30	867
1993	12	3	+	32		899	3	+	54	1,003
1994	70	1	+	30		1,673	6	-	66	1,846
1995	79	1	+	33		1,415	1		35	1,564
1996	0	1		30		836	3		69	939
1997	1	1		23		359	2		90	476
1998		1		24	18	630	9		233	915
1999*				26	-	591	5		296	918

TUSK VIIa

Year	France	UK (EW)	UK (Scot)	Total
1988	n.a.	-	+	+
1989	2	-	+	2
1990	4	+	+	4
1991	1	-	1	2
1992	1	+	2	3
1993	-	+	+	+
1994	-	-	+	+
1995	-	-	1	1
1996	-	-		
1997	-	-	1	1
1998	-	-	1	1
1999*	-	-	+	+

TUSK VIIb,c

Year	France	Ireland	Norway	UK (EW)	UK (NI)	UK (Scot)	Total
1988	n.a.	-	12	5	-	+	17
1989	17	-	91	-	-	-	108
1990	11	3	138	1	-	2	155
1991	11	7	30	2	1	1	52
1992	6	8	167	33	1	3	218
1993	6	15	70	17	+	12	120
1994	5	9	63	9	-	8	94
1995	3	20	18	6		1	48
1996	4	11	38	4		1	58
1997	4	8	61	1		1	75
1998	3		28	-		2	33
1999*	-	15	130	-		1	146

Table 3.12.6.c.1 continued

TUSK VIIg-k

Year	France	Germany	Ireland	Norway	UK (EW)	UK (Scot)	Total
1988	n.a.		-	-	5	-	5
1989	3		-	82	1	-	86
1990	6		-	27	0	+	33
1991	4		-	-	8	2	14
1992	9		-	-	38	-	47
1993	5		17	-	7	3	32
1994	4		12	-	12	3	31
1995	3		8	-	18	8	37
1996	3		20	-	3	3	29
1997	4	4	11	-		+	19
1998	2	3	4	-		1	10
1999*	8	1	-	-		1	10

Table 3.12.6.g.1

ORANGE ROUGHY (*Hoplostethus atlanticus*) VI

Year	Faroes	France	UK (EW)	UK (Scot)	Ireland	Spain	TOTAL
1988							0
1989		5					5
1990		15					15
1991		3502					3502
1992		1422					1422
1993		429					429
1994		179					179
1995	40	74		2			116
1996	0	116		0			116
1997	29	116	1				146
1998		100				2	102
1999*		130			65	1	196

*Provisional

ORANGE ROUGHY (*Hoplostethus atlanticus*) VII

Year	France	Spain	TOTAL
1988			0
1989	3		3
1990	2		2
1991	1406		1406
1992	3101		3101
1993	1668		1668
1994	1722		1722
1995	831		831
1996	879		879
1997	893		893
1998	963	6	969
1999*	1201	4	1205

*Provisional

Table 3.12.6.d.1

ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*) VI

Year	Faroes	France	FRGer-many	Ireland	Norway	Spain	UK (EW)	UK (Scot)	TOTAL
1988	27		4				1		32
1989	2	2211	3					2	2218
1990	29	5484	2						5515
1991		7297	7						7304
1992	99	6422	142		5		2	112	6782
1993	263	7940	1					1	8205
1994		5898	15	14				11	5938
1995	0	6329	2	59				82	6472
1996	0	5888						156	6044
1997	15	5795		4	-			218	6032
1998	13	5170			21	3			5207
1999*		4445	-	50	-	1			4496

ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*) VII

Year	France	Ireland	Spain	TOTAL
1988				0
1989	222			222
1990	215			215
1991	489			489
1992	1556			1556
1993	1916			1916
1994	1922			1922
1995	1295			1295
1996	1051			1051
1997	1033		5	1038
1998	1146		11	1157
1999*	1247		4	1251

Table 3.12.6.e.1

BLACK SCABBARD FISH (*Aphanopus carbo*) VI and VII

Year	Faroes	France	Germany	Ireland	Spain	UK (Scot)	UK (EWNI)	TOTAL
1988								0
1989	46	108						154
1990		1060						1060
1991		2759						2759
1992	3	3433						3436
1993	62	3411	48	8				3529
1994		3050	46	3		2		3101
1995		3257	3			18		3278
1996		3650	2			36	1	3689
1997	3	2754		0	1	235	2	2995
1998		1815		0	3	148	1	1967
1999		1600		30	0	*	1	1631

* No landings

Table 3.12.6.i.1 Greater forkbeard (*Phycis blennoides*): Study Group estimates of landings (tonnes)

GREATER FORKBEARD (*Phycis blennoides*) VI and VII

Year	France	Ireland	Norway	Spain	UK (EWNI)	UK (Scot) ⁽¹⁾	Germany	TOTAL
1988	252	0	0	1584	62	0		1898
1989	342	14	0	1446	13	0		1815
1990	454	0	88	1372	6	1		1921
1991	476	1	126	953	13	5		1574
1992	646	4	244	745	0	1		1640
1993	0	0	53	824	0	4		881
1994		111		1002	0	6		1119
1995	430	163		722	808	15		2138
1996	519	154		1428	1434	55		3590
1997	512	131	5	46	1460	181		2335
1998	357	530	162	530	1364	97		3040
1999*	499	374	198	177	927		1	2176

⁽¹⁾ Includes Moridae

Table 3.12.6.f.1 Argentines. Study Group estimates of landings (tonnes).

ARGENTINES (*Argentina silus*) VI and VII

Year	Faroes	France	Germany	Ireland	Nether-lands	Norway	UK (EW)	UK (Scot)	UK (NI)	Russia	TOTAL
1988				5454		4984					10438
1989	188			6103	3715	12184	198	3171			25559
1990	689			37 585	5871			112			7294
1991		7		453	4723			10	4		5197
1992		1		320	5118			467			5906
1993					1168			409			1577
1994				43 150	4137			1377			5707
1995	1597			357 6	5440			146			7546
1996				1394 295	3953			221			5863
1997				1496 1089	4696			20			7301
1998				463 405	4687						5555
1999*		14		24 227						5	270

Request to ICES for advice on fishery management in 2000 regarding deep-sea stocks

1. What further information is needed to provide a basis for comprehensive management measures for appropriate stock units (which might include conventional catch, effort and gear restrictions) to conserve deep water species?
2. What interim management measures could be introduced based on existing biological information?

Regarding NEAFC-request 1

ICES is concerned that the landings statistics as available may not reflect the true scale of the recent fishing activity in waters outside the national EEZs. ICES recommends that the member states should be encouraged to collect area-specific catch, landings, effort and biological data from exploratory and commercial fishing activities in international waters and report it to ICES. Any documented information that member states may have on fishing activity from non-member states in these waters should also be reported to ICES.

ICES is also aware that most of the current assessments are derived from relatively short CPUE series and is concerned that some of these series are not being updated. ICES recommends that member states maintain and refine long-term data series on catch and effort and where possible collate historical information.

Almost all deep-water species have fragile skins and suffer considerable damage in a trawl and there is likely to be a very high mortality of escapees of both juveniles of commercial species and non-commercial of small adult size. For similar reasons selectivity grids would probably be ineffective. Skin damage and the effects of severe pressure change results in a total mortality of discarded fish. Thus mesh size regulations are not considered to be effective technical measure.

As a consequence of the high mortality of escapees and discards ICES considers that it is important that managers should be aware of the likely effects on the deep-water ecosystems.

For almost every deep-water species the assessments have been based on arbitrary stock units such as ICES Sub-areas. There is a urgent need for research on stock discrimination in deep-water species.

Regarding NEAFC-request 2.

The deep-water fishery has been increasing in the magnitude in recent years and in most areas it is a new fishery. In general, the deep-water species are very long lived and slow growing, have a high age/size at first maturity and have a low fecundity. Ecologically they are adapted to a stable environment. For this reason the species and stocks are *a priori* not able to cope with high or even moderate exploitation rates. In traditional and non-intensive fisheries a few have been shown to be sustainable.

The few existing data, mostly relatively short CPUE time-series, underpin this vulnerability. This implies that fish removed by the fishery are not replaced by recruits in a time scale that could compensate for the loss. However, in some of the most recently developed fisheries the new recruits will

have been produced before the current exploitation of the spawning stock started thus delaying the magnitude of the decline in CPUE.

As a result, a possible interim measure for management could be a consequent reduction of the exploitation by means of a stringent reduction of fishing effort. Some fisheries are fairly opportunistic and target a species for a certain period and continue catching it afterwards as a bycatch. Many of the fisheries are mixed fisheries from the very beginning. For this reason a TAC regulation is not very likely to be effective.

Although in some areas, notably on steep slopes or around oceanic islands, longlining can be selective. However in the areas of the trawl fisheries most of the commercial teleosts do not take bait and discards of deep-water sharks would be high. Thus longlining is not a viable alternative to trawling.

Imposing closed areas is not likely to be effective since a patchwork of highly sensitive areas, such as certain sea mounts being geographically widely scattered, are unlikely to be controlled adequately. The different life cycle stages of deep-water species span a wide range of depths but protection of juveniles, for example, by depth limitations could not be enforced.

An immediate step towards effectively controlling the fishery could be the strict regulation of the numbers of boats, trawl-hours or numbers of hooks per day etc. Because, there is virtually no overlap with conventional shelf species there would be no conflict with any existing management measures. However, this can hardly be seen as an interim measure but rather as a medium term-measure.

One possible interim measure could be working towards an effort reduction and at the same time supporting the continuations or resumption of the collection of CPUE data, since the present assessments of the state of the stocks and reference points were almost entirely derived from CPUE analyses. Only in a few cases can it be anticipated that analytical assessments may become possible in the medium term. With the end of financing some deep sea projects the CPUE series have also come to a halt. It has caused concern at ICES that CPUE series for several species, notably ling and tusk, in many fishing areas, could not be updated. It should also be stressed again that these CPUE series provide the only existing relevant information. A very important interim measure would be to initiate a continuation of the CPUE series.

ICES stresses that sustainable management of fisheries on deep water species is not easy. Although the types of measure discussed above can be movements in the right direction the likelihood that they will ensure conservation of the resources is low, unless they are carefully designed and effectively implemented to address specific fisheries, species, and locales. ICES is attaching high priority to assembling scientific knowledge on management of these types of fisheries and conservation of these types of species. It plans to provide a more complete and specific framework for selecting and applying management measures for Deep Sea Fisheries in the near future.

3.12.6.1 Answer to EC request for advice on Deep Sea Fisheries Management

EC has requested ICES

to provide advice on possible management measures to be applied to deep waters species as indicated in the Memorandum of Understanding. In particular, ICES is requested to indicate the probable utility of application of

- TACs
- Geographical and/or temporal closures
- Other technical measures including appropriate mesh size, hook size and gear structure
- Effort limitation

In addition, ICES is requested to comment on environmental impacts created as a result of fishing for deep-water species and to advise on possibilities for reducing or eliminating such effects.

Background

The deep-sea fish stocks live in an ecosystem of low energy turnover and in which major catastrophic events do not or only rarely occur. The reproductive strategy of the species is adapted to this: the fish grow slowly, reproduce at relatively old ages and the number of offspring is small and sometimes highly regular. Orange roughy and *Sebastes* spp., for instance, undergo extended periods (in the order of a decade or more) of very low recruitment to the adult population. Moreover, the very nature of the deep-water stocks suggests that impact of fishing on population sizes and dynamics may not be evident before many years after the onset of the fishing activity. Therefore, exploitation rate should be very low. There are only few scientific data available and the attitude should be not to exploit until far more biological data have been collected. This is consistent with the Precautionary Approach because impacts of fisheries will be difficult to reverse. However, since the fishery in the North Atlantic has already developed, it is too late to adopt such precautionary standpoint for many species and stocks. Most of the deep-sea stocks are presently overexploited. There have been many warnings that the development of deep-sea fisheries is not sustainable and recommendations to immediately reduce the fishery on deep-sea stocks have been numerous.

If a very long-lived species like orange roughy is indicative for other k-strategists of the deep sea (fish with few eggs per spawning season and a long mature lifespan), **the sustainable yield may be only 1-2% per year of the pre-exploitation biomass** for these species. Furthermore, given their biological

characteristics, the rate of rebuilding could be slow, rarely more than about 2.5 % of virgin biomass per year. Growth rate could be less unfavourable to exploitation for some other species (e.g. roundnose grenadier, black scabbard, argentine, sea bream), but in any case, the exploitation rate must be low. Far more research is needed to determine the scope, if any, of deep-sea fisheries to expand further. To this end, the productivity of the dominant species in the North Atlantic will have to be evaluated.

In the light of the wide area covered by the fleets, scientific surveys (egg surveys, hydroacoustic surveys) will probably not in the near future provide a firm scientific basis to manage these fisheries. The immediate threat is that stocks may be fished down before the status of the stocks can be assessed. Compared to the economic damage of fishing down the resources, a zero TAC for a few years might be a tolerable measure to prevent damage to the most sensitive habitats.

Specific reply to the request of the EU

A list with 13 points is presented below. These points might be helpful to consider for management of deep sea fish resources. The background to the answer is elaborated in the ANNEX.

Points 3-8 present proposals for management actions to alter how deep-sea fisheries are prosecuted, with the intent of providing improved conservation of deep-sea species and habitats, and sustainability of the fisheries. Like all such management actions, effectiveness of new measures depends on how well the particular measure is tailored to the characteristics of the species and fishery affected. Managers will require significant support from science both in identifying the species and fisheries when selecting and designing specific measures for those fisheries.

Points 6-8 include administrative recommendations to ensure orderly and informative monitoring and enforcement of deep-sea fisheries.

Points 9-12 include recommendations for increased scientific research activity, which in the light of the lack of data and understanding of the stock dynamics are important. In light of the very limited knowledge of the biology of Northeast Atlantic deep-sea species and habitats, all parties need to have realistic expectations with regard to the precision and specificity of scientific advice that ICES will be able to provide in the near term, in response to specific questions from managers.

Point 13 stresses the need for a continued dialogue among science advisors, managers and the industry. Such a dialogue is obviously essential to success of all other initiatives.

A more detailed analysis of the situation and explanation of the suitability of the possible interim and long term measures for the management of the deep-sea stocks is given in the ANNEX.

1. Deep-sea ecosystems, including deep-sea fish stocks are highly vulnerable to the exploitation and immediate measures for their rebuilding and measures to prevent further stock decline must be implemented. According to the OSPAR definition, the deep-sea habitats may be regarded as sensitive or even as very sensitive and therefore deserve a high degree of protection.
2. No management measure, if implemented alone, seems to guarantee that the objectives of a sustainable exploitation of the fish stocks could be achieved; therefore, a combination of different actions is needed.
3. *Closed Areas to Fishing* may be considered a viable measure only for the long term, though research will have to show how effective they can be for stock management and which size they must have. Imposing closed areas for the deep-sea will not solve the present situation in the short term. Far more research will have to be done before it can be properly assessed how they could function for the deep-sea.
4. *Gear limitation*: In the light of the environmental sensitivity of the deep-sea floor, a general trawl ban for the deep-sea seems sensible and possible for some fisheries and/or areas. As a short term step for the implementation of such measures, zonation systems to prevent expansion of trawl fisheries into new areas should be instituted as quickly as possible. Gear limitation to long-lines should be considered.
5. *Drastic reductions of catches* seem unavoidable. TACs on the basis of 1-2% of B_0 /year, or a higher percentage should be considered. A higher percentage should be used only if the species in question is demonstrated to be a less stringent k-strategist as the orange roughy. ICES could examine the possibility to rank the most important deep-sea species of the North Atlantic and their life strategy in relation to the orange roughy. If this is achievable, a species- or stock-specific maximum exploitation rate could be defined on this basis, taking into account all available biological information. The primary objective could be to set TACs to maintain the SSB of each stock **above 30% of the virgin biomass (B_0)**. If below this level, TACs are to be reduced so that SSB reaches 30% B_0 **in a period of 10 years**. The fishery is to be closed if SSB fell **below 20% B_0** . These figures are

adopted from the presently used Australian and New Zealand system and may not necessarily be optimal for the North Atlantic. Here they are considered minimum-values and should preferably be set higher, while the recovery period of 10 years seems sensible and should be adopted.

6. A *general licensing system* should be implemented by the European Commission (yearly notification system). The licensing system should be combined with TACs, seasonal and area closures and possibly with gear limitation (max. number of hooks, trawl ban etc.). Gear technological specifications (hook sizes etc.) have to be explored separately.
7. None of the proposed measures can be of success if there is not a *strict and effective enforcement*. This includes satellite tracking and the use of such recordings in court cases. Specific log-books should be mandatory.
8. A *comprehensive data collection system* should be established. Observers should be placed on board of deep-sea vessels where possible be mandatory. Otherwise appropriate log-book keeping cannot be provided.
9. The Commission should support projects to *improve the collection of information on fisheries, biological parameters and stock definitions and for research on the biology of deep-sea species*. A list of deep-sea species for which this may be applied for is given in the *Study Group on the Biology and Assessment of Deep Sea Fisheries Resources, ICES CM 1998/ACFM:12*.
10. The Commission should strongly support projects for *investigating the impact of trawl gear on the deep sea floor*.
11. The *international survey activities* should be increased drastically. This will not be possible without increased funding of research institutes. It is suggested to strongly centralise the research activities.
12. For data collection and management purposes *specific deep sea areas should be defined* where possible. The Commission and NEAFC should be encouraged to adopt such proposals.
13. Dialogue among managers, industry and scientists should be maintained. Workshops or open hearings such as initiated by the EC should be repeated, with clear orientation towards developing specific and far-reaching solutions.

ANNEX

Effort limitation by TACs

New Zealand and Australia have had experience with a TAC system for management of deep sea resources. During the eighties the management of the orange roughy fishery off New Zealand, based on TACs and ITQs failed to prevent overexploitation mainly because the initial TACs were set considerably higher than would be sustainable in the long term (Clark 1995). In recent years, after TACs have been reduced, trawl surveys and commercial data suggest the stocks might have stabilised (Clark *et al.*, 2000). As a whole, the Quota Management System (based on TAC and ITQ system) which has been introduced in New Zealand for management of fisheries including deep-sea fisheries was considered by Shallard (1997) to be of benefit to the fishery, the fishing community and the economy. Despite the beneficial effects, in the medium term the TAC system has not prevented a serious overexploitation of the stocks. The TACs in New Zealand are based on two reference points, the maximum constant yield (MCY), which is a constant catch strategy; and current annual yield, which applies to a target fishing mortality rate each year (Annala 1995, as cited in Clark 1996). **Adaptive management strategies** may provide a guide to determining effective long term management. This involves fixing experimental TACs at specified levels for a period of time during which the stock is monitored regularly. After adequate monitoring, stock properties such as SSB and mortality rate are compared with *a priori* criteria defined for the conservation of the stock. The results are then used to adapt the catch levels and management measures as appropriate (Hopper 1995). Experts in adaptive management stress that such experiments are most informative when the experimental TACs probe the response of the stock; that is, there are periods when TACs are quite high and quite low, relative to expected sustainable catches, so the monitoring provides clear information about responses of the stock to the harvest rate. They also stress that experimental TACs must be kept unchanged long enough that potential impacts of the harvest on the stock will have occurred.

An attempt to adopt adaptive management strategies was made by the Australian Fisheries Management Authority (AFMA) which formulated management objectives to develop the fishery based on the principles of *ecologically sustainable development*. The primary objective was to set TACs **to maintain the SSB of each stock above 30% of B_0** . If below this level, **TACs were to be reduced so that SSB reached 30% B_0 by the year 2004 (i.e. in a period of 10 years). The fishery was to be closed if SSB fell below 20% B_0** (Koslow *et al.* 1997). However, according to Symes (1998), at least in some case, the resulting TACs could be too low to secure the viability of fisheries. In general he concludes that TACs are not very likely to prove appropriate,

unless set at non-viable levels **or are used in combination with other accompanying measures.**

The management measures described above seem to be in principle appropriate and feasible (if set at appropriately low levels) because these cases were essentially single species fisheries on deep sea resources. Regulating the deep sea fishery by TACs *as the primary tool* is likely to be difficult for a mixed fishery typical for some deep sea fisheries in Europe. First, due to the mixed fishery, *i.e.* diversified nature of most of the deep sea fleets in Europe, TACs could be set at levels which would not be viable for a fleet depending solely on deep sea species. This difficulty could be addressed if TACs for the deep sea species could be set at low levels, allowing fisheries limited, finely tuned and well documented access to the resource, while other measures directed these fleets to fishing opportunities on other resources for most of the time. The second difficulty is that quotas for different deep-sea species could be taken up at different rates, providing an incentive for fleets to discard, high-grade, or misreport, to allow continued harvesting of under-subscribed stocks as quotas on other species are being reached. This difficulty requires effective observation and monitoring of catches, but also provides a positive incentive for fleets to develop selective fishing practices.

For many countries the national statistical databases do not make specific provision for recording all deep sea species which are usually classified as “others” or are included in some general classification such as “other sharks” etc. Classification of landings into species therefore involves sampling the landings of mixed species as done in some countries. In some cases species are landed unsorted and/or skinned prior to landing and/or discarded except for their livers. However, for important species (*e.g.* orange roughy, argentine, ling and blue ling, black scabbardfish) landings can be estimated at least inside national EEZs. On the other hand, there is concern over deep sea water catches in international waters, and the available landing statistics may not reflect the true scale of the recent activity in these waters.

There are difficulties in aging individuals of these species. Together with the problems of obtaining landing statistics these problems imply that even if biological sampling could be improved there is little chance that analyses of the state of the stocks analogous to that available for such species as cod, plaice etc. will be forthcoming in the foreseeable future. Consequently, management based on **age-based assessments** appears impossible for most deep water species. Non-aged based methods, such as depletion models, are more promising, but can only be applied when accurate data on fisheries (catches, effort...) and stock structure are available. Such data are needed urgently for deep-sea fisheries.

Even if reliable quantitative assessments were available, a TAC system is only one of the tools available for the management of fisheries. Implementation of TACs for deep-sea stocks, *not accompanied with other measures*, probably would not prevent deep sea ecosystems suffering adverse impacts.

Possible management measure: effort limitation by licensing scheme

The European Commission considered a licensing system as a mean of controlling exploitation of the deep sea species as early as in 1993. At its simplest level, the scheme might consist of authorising specified Community vessels or skippers to land one or more of the relevant species. Community vessels or skippers not specifically authorised to land these species would be explicitly forbidden to do so. The success of such a scheme depends on the degree to which the “new” species overlap geographically with more conventional ones. The perception is that the overlap is not very great and that, in general, capture of the “new” species does not imply capture of conventional species and *vice versa*. Therefore, it appears futile for a vessel/skipper to catch the relevant species when not authorised to land them and such vessels/skippers will confine their fishing activities to conventional species.

A licensing system of this type should also prohibit transshipment of designated species. Otherwise vessels/skippers not authorised to land the species in question may catch them and tranship them to vessels/skippers who possess the appropriate authorisation. A licensing system should also include an obligation to allow qualified observers (*inter alia* trained in species identification) on-board.

Implementation of a licensing system would not prevent the fishing capacity and efficiency of individual vessels to increase, and therefore supplementary actions are necessary to prevent overexploitation in the longer term.

Norway has already moved towards implementing a licensing system. Vessels larger than 28m need an annual permit from the Directorate of Fisheries to access the fishery, whereas gear type (number of hooks etc.) is not regulated as part of the access privileges. These permits are the only national regulation of effort currently enforced in Norway, but they are not the major factor limiting the fleet size. The number of vessels that may access certain EEZs is regulated according to negotiated agreements (Bergstad 2000). For fishing on greater silver smelt in the area between 62° and 67°N a special area based licence is needed. These regulations have been used instead of applying TACs.

Other strategies have been applied for the Patagonian toothfish (*Dissostichus*) fishery in the South Atlantic. TACs are set together with other accompanying measures, such as seasonal restrictions (for the

protection of sea birds), area restrictions and a notification system on a yearly basis. This implies that each year notifications have to be submitted to CCAMLR by the nations intending to fish in the next season. The granted notifications are coupled with the mentioned area/time restrictions and with obligations for specific technical measures and the inclusion of an observer on board. As soon as the TAC is been reached, this specific management area is closed for the remainder of the season. Aged-based analytical assessments can be made for this species because it is possible to read the age of a Patagonian toothfish up to an age of 10. However, since this species grows considerably older, the assessment is driven primarily not by the age structure of the catches but by an abundance index of the 4-year old juveniles. This index is obtained by a trawl survey in shallower waters before the fish leave the nursery grounds and migrate to greater depths where it enters the fishery.

It is obvious that managing deep water fisheries is a complex task. Deep water fisheries are to a large extent opportunistic and concentrate on a changing variety of species. The adaptive strategies as outlined use TACs in various combinations with a licensing system, geographical and temporal restrictions and gear limitations. However, such measures can only be soundly based if more fundamental biological information and fishery data are collected to allow stock discrimination and species and area specific allocation of catches.

Stock discrimination

There are several reasons why exploitation rates must remain low as long as knowledge about stock structures is sparse. Because of their life-history, sedentary deep-water species may be highly vulnerable to local depletions if quotas are set for larger geographic areas but fisheries operate in restricted patches of the area, with the patches moving over time. The reverse risk is also possible, that fisheries being managed on the basis of depletion estimators could fail to show negative impacts of over-fishing, if the fishery is operating in a preferred habitat which is continually replenished by immigration from adjacent areas which do become depleted. Little but at least some effort has been invested into the question of horizontal species distribution, although considerable effort has been invested to describe species distribution and habitat affinity as well as community structures in the vertical dimension, mostly in the context of habitat confinement at the continental slopes (Ehrich 1983, Rätz 1984, Merrett & Haedrich 1997, Haedrich & Merrett 1988, 1990, Haedrich *et al.* 1998). Though perhaps vertically stratified, some deep sea species seem to have a worldwide distribution (*e.g.* orange roughy, black scabbardfish). However, it is very likely that they have a number of spawning grounds and form several stocks. Data on stock structure are also lacking for species with distribution areas restricted to the Atlantic Ocean. The case of the depletion of roundnose grenadier in the

North West Atlantic in the 1960s (Symes 1998) is consistent with this and points at only limited or very slow horizontal migrations for this species. The same seems to be the case of the blue ling west of the British Isles (Ehrich & Reintsch 1985).

By contrast, the widely accepted concept of the apparent homogeneity of the deep sea environment, and generally cosmopolitan distribution of deep sea organisms (Bruuns 1957) has not really been substantiated. In Howes's (1991) study it is apparent that cosmopolitan or circum-oceanic distributions are commonly found only among deep-living species, and from Koslow (1993) a trend toward a more widespread distribution with greater depth is evident. In spite of the species distribution, it is still generally accepted that there are widespread faunal communities in the deep sea whose distribution is broadly consistent with large-scale oceanographic circulation (Koslow, 1993). However, studies on faunal distribution in the deep sea focus on the distribution at a **species** level from a zoogeographical point of view (e.g. Ekman 1967, Howes, 1991, Koslow *et al.* 1994, Merrett & Haedrich 1997), are less concerned with community structure or stocks in the sense of fishery sciences, or are centred on relatively limited areas on the continental slope (e.g. Bergstad *et al.* 1998).

It is clear from the investigations by Koslow (1993) that at least for the North Atlantic, the distribution of deep-sea fish is not "random" in the sense that it is without pattern or that the assemblages at a particular site and depth is a random mix of species from the total regional pool.

Management of the "stock" has hitherto focussed on the ICES boundaries. Huge sub-areas, such as sub-area XII have no Divisions. This, for example prevents catches of a species from the Mid-Atlantic Ridge being distinguished from the same species caught at Hatton Bank area. In the absence of any other evidence on stock identity it would seem logical to set statistical area boundaries along major faunal barriers such as the Wyville Thompson Ridge and the Faeroe-Iceland Ridge. In the longer term the north Atlantic region should be re-defined according to the known deep sea stocks, similar to the round fish areas in the North Sea. Some effort has been directed already towards redefining these areas (Coggan, R.A., 1997). This work should be expanded and assessment of stocks and management of the fisheries should be conducted according to these areas.

In summary, it is clear that almost nothing is known about deep-sea fish stock structure, and only little about the distribution of species. As a general concept, it seems to be true that the deeper the fish lives, the wider the distribution is on a *species* level. However, it is very likely that such widely distributed species form a number of stocks with specific spawning grounds (e.g. orange roughy). It is also clear that lack of knowledge of stock structure presents a real threat to conservation

and sustainable management of these species. It is urgent to invest in the research of the stock structure of deep sea species and to redefine the ICES divisions for the purpose of deep-sea fisheries management.

Data collection

The state of the biological information stands in sharp contrast to the exploitation rate and the vulnerability of deep-sea stocks. This applies to data collection of landings, discards, effort and biological data on a species level. This is still the case even though marked effort especially from the EU (as outlined in Gordon 1998) has been invested recently to collect cpue (e.g. Lorange & Dupouy 1998b), landings and discard data (e.g. Connolly & Kelly 1996, Blasdale & Newton 1998, Dupouy *et al.* 1998) from the deep sea fishery. These data are one key to improved management of deep sea species and fisheries. This situation is not new. In previous reports ICES stated that ***a comprehensive data collection system should be urgently initiated and that research on the stocks should be increased to provide the data necessary for assessment.*** A minimum prerequisite to improve this situation is the mandatory keeping of logbooks which contain sufficiently disaggregated information (logbooks are mandatory already for Norwegian deep sea fisher (Bergstad 2000)).

Assessment methods

New Zealand and Australia have invested relatively great effort in the assessment of stock size accompanying the development of the orange roughy fishery. These fisheries are apparently the only ones where substantial effort into stock assessment of deep sea fish has so far been invested.

As described by Clark (1996) the information sources have been four-fold: stratified random trawl surveys, acoustic surveys, egg production surveys and analysis of the CPUE data of the fishery. Generally all these approaches have their advantages and limitations. Since the knowledge of orange roughy (and even more for other species) reaction to trawl gear in stratified random trawl surveys is poor, swept area estimates of biomass were used as measures of relative rather than absolute abundance (Francis 1992, Clark 1995). However, orange roughy schools are apparently very much disturbed by approaching trawl gear from above and extensive schools are densely compressed, allowing extremely high CPUE values. With regard to hydroacoustics, the target strength of the deep sea fish is generally relatively low because the swim bladder is usually filled with wax esters (Do & Coombs 1989). For orange roughy the target strength changes over time and with tilt of the fish, *i.e.* with its position in the currents around the sea mounts which are usually relatively strong. Generally, it is around -50dB (McClatchie *et al.*, unpublished, in Clark 1996). The egg production methods, on the other hand, have been shown to be very suitable for orange roughy. The fish is a determinate spawner, the eggs float to the surface and are easily

distinguishable. For a target species like orange roughy this approach seems suitable. For others the feasibility of egg production methods must be explored. CPUE data have their well known limitations due to change in technical approaches and development of skills of the skippers, both of which are especially strong in deep sea fisheries. Furthermore, CPUE methods are problematic due to the sporadic nature of some of these fisheries.

In summary, around Australian/New Zealand, different surveys have been established, most of them parallel or in close conjunction. Trawl surveys were found to be less suitable, whereas egg surveys and hydroacoustic surveys render best results. Moreover cpue series and biomass reduction models are used. None of this is essentially different to what is done in the North Atlantic region. However, the manpower and ship-time invested in stock assessment and fundamental investigation on the biology is of a totally different and greater magnitude. The situation in the North Atlantic is more complex than that seen in New Zealand and Australia. There is a variety of deep sea species not one single dominant species and the species form less dense spawning concentrations than those observed in the Indo-Pacific region. The manpower and ship-time needs are higher in the North Atlantic than in the Indo-Pacific region.

Effort limitation by closing areas - Closed Areas to Fishing, Marine Protected Areas, (MPAs)

Closed areas for fishing have been established a number of times all over the world, specifically *e.g.* for the protection of juvenile haddock in America (Frank *et al.* 2000) or more generally a number of fish species and benthos (Tuya *et al.* 2000). Also in EU waters closed areas have been imposed, for instance for plaice to exclude vessels of certain sizes from specific areas. It is not disputed that such measures have a positive effect on the stocks. The effectiveness with regard to the management of the stocks in the short and medium term, however, is often difficult to prove (*e.g.* plaice box, Pastoors *et al.* 2000). At present a number of research projects try to quantify such measures worldwide (*e.g.* Russ & Alcala 1996). Research to quantify the effects of such measures with respect to stock structure, age composition, effects on growth etc., are not yet conclusive enough to give more specific advice. For this reason it can at present only be stated that closed areas for fishing will definitely have some positive effect. The specific effect depends on the duration of the measure, the location and the size of the area, the species biology and in particular their migratory behaviour and reproductive strategy. All this has to be investigated specifically, and no general conclusions can presently be drawn.

Marine Protected Areas (MPAs) are an extension of the closed area concept including primarily benthos in the protection. They are mostly not designed specifically for the protection of fish. MPAs have been subject to scientific discussions at least since the early 1990s.

They were initially intended primarily for scientific purposes (*e.g.* Lindeboom 1994). More recently, MPAs are frequently brought forward as means of nature conservation of the sea, including now fish as a target for conservation (*e.g.*, WWF, see www.ngo.grida.no/wwfneap). WWF (1998) proposed relatively specifically designated areas (Western Irish Sea Front, Rockall Bank, Dogger Bank, Rockall Trough/Channel) with the double purpose to protect both the benthos and the fish communities. However, the purpose of already imposed MPAs (Norway's *Lophelia* area, Tasmanian seamounts) are not primarily to protect fish stocks but to protect precious benthos, first of all cold water corals. The use of MPAs is linked to the OSPAR concept of the sensitive nature of the habitat (see below). Also, MPAs or fisheries exclusion zones are evaluated with respect of their potential effects in determining the structure on the benthos, *i.e.* changes of predator density on the benthos community etc. (Hall 1994, Hall *et al.* 1990), and not with regard to effects on the fish stocks.

MPAs could in principle be established both inside national EEZs and outside. To date however, MPAs have (if at all established) all been in territorial waters, *i.e.* inside the 12 or 200 nm zone, and thus fall within the national jurisdictions. For some European countries the national EEZs cover areas beyond the continental shelf and therefore extend also into parts of the deep sea. Here MPAs for the deep sea could in principle be established on the basis of national or EU jurisdiction. Around the North Atlantic these countries are Norway, the Faeroese, Iceland, Greenland/Denmark, Ireland, UK-Scotland, UK-England, Spain, Portugal and France. **For international waters outside the EEZ's there seems at present to be no legal basis at all to impose MPAs.**

OSPAR (1997) defined selection criteria for **sensitive habitats**: A "**sensitive habitat**" is one that if adversely affected by human activity, will only recover in 5-25 years, a "**very sensitive habitat**" is one that if adversely affected by human activity, will only recover over a long period (>25 years), or not at all. Such considerations are potentially relevant for defining closed areas and MPAs in the deep sea area.

With respect to the implementation of MPAs for the deep sea stocks the question must be solved, which international organisation would have the sufficient authority to establish them.

OSPAR (1998) clarified that with regard to Article 4 ANNEX V of the Convention, it has no mandate for programs or measures concerning a question relating to the management of fisheries. However, where the Commission considers that action is desirable in relation to such question, it shall draw that question to the attention of the authority or international body competent for that question.

It may be questionable if a legal basis could be established as a result of international negotiations by NEAFC, or by the *International Seabed Authority* of the UN which has been established in 1994, with its headquarter in Jamaica. So far however, this authority is primarily concerned with pollution and economic aspects of sea bed mining, and is developing a code for mining polymetallic nodules; guidelines are under discussion to regulate environmental assessment obligations for the mining contractors. According to Thiel & Koslow (1999) these will include the establishment of stable reference zones in the various mining claims to study natural community changes in undisturbed areas, as well as the recovery of the fauna after mining ceases. This authority is, however, by definition not responsible for aspects of conservation, precautionary exploitation or the closing of areas.

The *International Maritime Organization* (IMO) on the other hand is responsible for regulating or preventing the disposal of wastes on the seabed. The conventions of the IMO however have not been ratified by many countries and are not concerned with the conservation of fish stocks and only indirectly with the deep sea fauna (such as hydrothermal vents etc.). However, the IMO is the only acknowledged international organisation which could exclude vessels from operating in a specific area because it has the authority to design shipping routes and to regulate the traffic on sea. Regulations for excluding sea traffic from *specific and small areas* can also possibly be based on ecological grounds. The basis for this is the Resolution A.572(14) "General Provisions on Ships' Routing", (Assembly 14th Session, Resolutions IMO, London 1992). Even though this could be seen as a backdoor into MPAs in international waters, MPAs for the deep sea are neither specific in character (unless specific sea mounts are to be protected), nor are they small. Moreover, there is obviously no justification for preventing ship traffic in an entire area, only to keep fishing vessels out.

This problem has been recognised also by the *International Union of the Conservation of Nature* (IUCN), working on the legal aspects of MPAs since 1999. It also has established generally recognized criteria for the selection of MPAs, such as the extent to which the site is in a natural state and its biogeographic, ecological, economic, social and/or scientific importance.

Apart from the question on which organisation have sufficient authority and international mandate to establish MPAs, the question remains how useful MPAs are for the management of deep sea fish stocks.

When establishing MPAs, according to Symes (1998), consideration has to be made regarding cost-benefit of implementing:

either one large continuous area, with probable disadvantage of concentrating the discriminatory

socio-economic disbenefits, but with obvious advantage of relatively low enforcement costs using satellite global positioning systems, vessel monitoring systems (VMS);

or several smaller areas distributed throughout the target zone which would have the benefit of dispersing the socio-economic disbenefits and reducing the discriminatory effect, without significantly increasing the enforcement costs;

or a mosaic of randomly selected small areas (100 km²) which would minimize the socio-economic effects and the risk of discrimination but with the disadvantage of much higher enforcement costs. The mosaic approach would have the additional advantage of increasing the opportunity for comparative scientific research to determine the efficacy of closure systems in arresting the degradation of marine ecosystems.

However, apart from cost-benefit considerations, the size and distribution of the reserves should be based on understanding of the biogeography, reproductive strategies and ecology of the benthic fauna and its associated deepwater fishes (Koslow *et al.* 2000). However, ICES (1994) has evaluated MPAs and came to the conclusion that *the closure of an area may merely result in a shift of fishing effort to other areas, the losses will partly be compensated, particularly because many commercial important fish species perform considerable annual migrations and dispersal is generally high.* Although this was not addressed to deep sea fish, it is still a very valid conclusion.

To date there are only two MPAs for the deep sea environment. This has been established in 1995 under Australian jurisdiction within the 200 nm EEZ south of Tasmania. Concerns about the impacts of trawling on benthic seamount fauna led to the world's first deepwater marine reserve over an area of 370 km² on the continental slope. The reserve encloses 14 seamounts in the vicinity of an orange roughy fishing ground (Koslow *et al.* 2000). The other MPA for the deep-sea environment was established recently off Norway to protect *Lophelia* reefs from the impact of trawl gear.

In summary, there is apparently no legal basis for any regulation of the fishery by means of MPAs in international waters in connection with other industrial deep sea activities, nor is it clear which institution would have authority to establish MPAs in international waters. Nevertheless, according to Thiel and Koslow (1999) not only vulnerable fish stocks but also precious habitats such as hydrothermal vents, deep water corals or other characteristic habitats must be protected so that all physical, chemical and biological processes will remain undisturbed. This concerns biologists, marine chemists, physicists, oceanographers as well as fishery biologists.

However, from the perspective of the fisheries management of deep sea fish stocks MPAs are in the short and medium term no viable tool to conserve the stocks for mainly two reasons: It is at present not clear how big such MPAs must be to have an effect on the stocks, nor is it clear where exactly such protected areas should be. As first step into that direction it could be considered to temporarily close relatively confined areas of known spawning grounds, such as parts of the Hatton Bank during the spawning season of blue ling. This could then be a part of a licensing system if only limited effort shall be allowed to be exerted on the species. Gradually such limitations could develop into MPAs. However, another inherent problem of MPAs with respect to fisheries management is that effort prohibited from an MPA is likely to increase the fishing pressure elsewhere. For this reason MPAs can only work in combination with other effort regulating measures.

Gear limitation and environmental impacts created as a result of fishing for deep-water species

The impact of trawl gear on the deep sea bed has barely been investigated. Research has so far focussed on the effect of trawl gear on seamounts and at particular sites on the continental slopes. Some research has been done on the deep sea bed with regard to deep sea mining (harvesting of manganese nodules). However, there is no systematic investigation on the impact of trawl gear on the deep sea floor.

It has recently been shown that seamounts have a high degree of invertebrate endemism (Richer de Forges *et al.* 2000), they are ecologically only little understood and have a high proportion of newly discovered species. Richer de Forges (1998) found only 5% mean overlap in species between ridge systems at the same latitude and separated by only approximately 1000 kilometres in the Coral and the Tasman Sea. A study on seamounts around Tasmania found some 300 species of fish and invertebrate fauna, of which 24-43% were new to science and 16-33% restricted to the seamount environment (Koslow & Gowlett-Holmes 1998).

Bottom trawling is considered to be particularly destructive on seamounts, the deep sea floor and on the slope of the continental shelf (*e.g.* Rogers 1999), due to

their general sensitivity. Even though trawling is not the most typical gear in deep sea fisheries it is frequently used (*e.g.* Spanish deep sea fishery (Muñoz *et al.* 2000)). Trawl fisheries have been shown to have potentially severe impacts on the benthic fauna of seamounts, where some fish species aggregate. Photographic transects from investigations in Tasmania indicate that 95% of the bottom was bare rock on a heavily fished seamount, compared with 10% on the most comparable unfished seamount (Koslow & Gowlett-Holmes 1998, Koslow *et al.* 2000). According to Parker & Tunnicliffe (1994) and Mullineaux & Mills (1997) the risk of severe depletion, and even extinction, of elements of the benthic seamount fauna is increased by their high specific habitat requirements, localised distributions and high levels of local endemism. In the North Atlantic, deep sea resources are mostly exploited on the continental slope, and endemism could be less important compare to seamounts; however, particular ecosystems like deep sea corals are removed by the bottom trawl nets. Koslow *et al.* (2000) suggest that in some fisheries, changes in fishing practice, such as switching from trawling to long-lining, should be considered. Such change could be difficult to implement for some fisheries where fish are not available to long lining (orange roughy, roundnose grenadier...).

However, also the long line fishery mainly on ling, tusk (and cod) by Norwegian, Faeroese and Icelandic vessels is expanding. Though regulated in Norway by a licensing system, the exerted effort per ship is unlimited. Even though the collected CPUE data series have not been continued since the end of the EU-Nordic project, the effort seems to increase: the average Norwegian longliner hauls 25'000 to 40'000 hooks per day, but the most advanced longliners reach even 60-65'000 hooks per day (Fishing News International, Sept. 2000).

An interim measure for the protection of the deep sea ecosystems could be a general ban of bottom trawling trawl and zonation to allow "traditional" trawling. This would apply to areas such as Subareas VIII and IX where there some effort control already is exerted on the deep sea crustacean trawling, or in Subareas and Divisions VI, Vb and VII, VIII, IX and X and some COPACE areas where effort control was imposed on 1 January 1996 (Council Regulation (EC) No. 2027/95). However, a closer inspection of the control mechanisms must show how effective these effort control measures are in practice. Furthermore, total ban of trawling in some areas of high ecological interest (coral reefs...) must be considered.

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Greenland halibut

(Sub-areas V and XIV)

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 ICES that the TAC for the total stock in 2001 should be less than 20,000 t. It appears from the response of the stock to recent catches that this level of catch is sustainable. Ireland does not have a quota for this species at present, and the TAC does not cover the area currently worked by Irish vessels.

STATE OF THE STOCK

- The state of the stock cannot be reliably determined.
- The landings in 1999 were just over 20,000 t, having declined from over 61,000 t in 1989. Landings in 1998 and 1999 have been the lowest since 1976.
- Current fishing mortality (0.27) is estimated to be below or close to proposed F_{pa} and has shown an overall downward trend since 1989. The proposed $F_{pa} = 0.36$.
- Recruitment has declined since 1985. The 1986 and subsequent year classes have been below average.
- Spawning stock biomass has declined from 122,000 t in 1988 to a low of 68,000 t in 1998. Proposed $B_{pa} = 80,000$ t.

CURRENT MANAGEMENT

- There is no consistent management plan throughout the area. The fishery in Division Vb is subject to an effort limitation. The fishery in Divisions Va and XIVb are catch limited. The agreed TAC for Division Va is close to the recommended TAC for the entire area.
- The assessment comprises Sub-areas V and XIV. It does not include catches in Divisions IVa or VIa.
- The TAC in 2000 for Division Va only was 10,000 t. There is no TAC for EU waters, including the area where Irish vessels operate.
- There are no explicit management objectives for the stock. However for any management objective to meet precautionary criteria F should be less than the proposed F_{pa} and SSB should be greater than the proposed B_{pa} .
- There are currently no management objectives for this stock.

- There is currently no management plan for the fishery.

ADDITIONAL INFORMATION

1. The assessment is considered imprecise because fishing mortality has been overestimated and SSB underestimated in recent years. There were strong trends in catchability in the tuning fleet data. These factors may be partly due to the change and expansion of the fishery in the last decade. There is considerable uncertainty about the estimates of SSB but there is no doubt that it is low.
2. Total landings were over 20,000 t in 1999. In 1999 the Irish catch was 78 tonnes, having increased from 5 tonnes in 1994.
3. The main catches are taken by Iceland, Germany and Norway. A new long-line fishery has developed in 2000 in international waters of Hatton Bank (Sub-area XII) prosecuted by Norwegian vessels.
4. Irish otter trawlers target this species along with redfish in the Faroe-Shetland Channel, straddling Divisions Vb1, VIa and IVa. The single Irish long-liner targeted this species in Sub-area XII in 2000.
5. MFSD and BIM personnel have collected catch, effort and length-frequency information on-board Irish trawlers in this fishery since 1996.
6. The only survey for this species is confined to Icelandic EEZ waters. This survey indicates an upward trend in fishable biomass, conflicting with the current assessment..
7. The lack of survey data for this species, outside Icelandic waters is a cause for concern. Further information on age, growth, maturity and mortality of this species is required for stock assessment purposes.
8. Stock structure in this species is poorly understood.
9. At present the Irish fishery is outside the assessment and management areas. Thus the Irish fishery is outside the assessment and management areas.
10. No Irish landings, CPUE or length-frequency data from observer programmes is supplied to ICES. MFSD will present all available Irish data to the ICES Working Group in 2001.

Redfish *Sebastes mentella* and *Sebastes marinus*

Sub-areas V and VI, XII and XIV

No ACFM information has been included for these stocks

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



Marine Institute
Foras na Mara

Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with ICES advice that fishing effort on *S. mentella* should be further reduced by 25 % in all areas. This is consistent with ICES advice that fishing effort on *S. marinus* should not exceed 1999 levels in order to protect incoming year classes. This would result in a TAC of 90,000 t with an associated Irish quota of 3 t in 2001. MFSD advises that the assessment and management areas should be extended to cover all areas in which this stock is distributed.

STATE OF THE STOCK

OF *SEBASTES MARINUS*

- There are concerns about the state of the stock of *S. marinus* which is outside safe biological limits.
- Landings in 1999 were estimated to be about 42,000 t. Landings have decreased by over 50 % since 1988. Landings in Sub-area XIV have decreased by 90 %. Landings in Sub-area VI have increased since 1992 to 773 t in 1999.
- Exploitable biomass in Division Va reached lowest recorded levels in 1995. There has been a slow increase in recent years due to improved recruitment. In Division Va current stock size is close to proposed U_{pa} , which is defined as $0.6 * U_{max}$. In Division Vb the biomass index has fluctuated in recent years.
- Recruitment in Va has been poor since the 1990/1991 year class.

STATE OF THE STOCK

OF *SEBASTES MENTELLA*

- There are concerns about the state of this stock which is outside safe biological limits.
- Estimated landings have decreased since 1994 having doubled in the early 1990s. Latest estimates for 1998 were over 38,000 t. Landings in Division Va have decreased from about 56,000 t in 1994 to about 32,000 t in 1998. Landings in Division Vb decreased by 75 % since 1992. In Sub-area VI landings have fluctuated at a low level and are a negligible component of overall landings.

CURRENT MANAGEMENT OF *SEBASTES MARINUS* AND *SEBASTES MENTELLA*

- The TAC for redfish covers Sub-areas V, XII and XIV. However management is complicated since the fishery is based mainly on two species. It is further complicated by the possibility that there are several stock components within each species. Most Irish landings of these species are outside the TAC area, in Sub-areas IV and VI.
- The assessment area does not correspond with the management area.
- The TAC in 2000 was 120,000 t. The EU share was 20,780 t and the Irish quota was 4 t.
- There are no explicit management objectives for either species.
- There is as yet no management plan for this fishery.

ADDITIONAL INFORMATION

1. Assessments were based on commercial and survey CPUE from Iceland for Division Va, Faeroese survey CPUE in Vb and German survey CPUE for Sub-area XIV. An analytical assessment was conducted in 2000 for *S. marinus* using an age-production model. No analytical assessment was carried out for *S. mentella*.
2. Total landings in 1999 were 42,040 t for *S. marinus* in Sub-areas V, VI, XII and XIV. Latest estimated landings for *S. mentella* were 38,419 t for 1998 for Sub-areas V, VI, XII and XIV. Irish landings were 34 t in Sub-area VI. However Ireland landed 39 t from Sub-area IV, outside the TAC area.
3. The main catches in Sub-area VI are taken by France and UK (Scotland). In Sub-area Va Iceland takes most of the catch, in Sub-area Vb the Faeroe Islands take most of the catch while in Sub-area XIV Russia, Germany and Iceland are the main participants.
4. The Irish fishery for redfish has developed since the mid 1990s. In 1999 and 2000 several larger Irish trawlers fished for redfish and Greenland halibut in the Faeroe-Shetland Channel straddling Divisions IVa, Vb and VIa. No Irish landings were taken from within the TAC area in 1999.
5. MFSD and BIM personnel have collected catch, effort and length-frequency information on-board Irish trawlers in this fishery since 1996.
6. ICES did not have access to length data for Sub-area VI.

7. Surveys are carried out in Sub-area Va by Iceland, in Sub-area Vb by the Faeroe Islands and in Sub-area XIV by Germany. No survey information for Sub-area VI was available to ICES.
8. By-catch of juvenile *S. marinus* in a shrimp fishery in Sub-area XIV is considered to be a serious problem. ICES recommend that appropriate measures be adopted to minimise this practice.
9. Management of redfish stocks is complicated. The fishery is based mainly on *S. marinus* and *S. mentella*, with small catches of a third species *S. viviparus* in Faeroese waters. The TAC covers all species combined. Management is further complicated by the possibility of separate stock units within the TAC area. Official statistics sent to ICES do not report catch by species / stock. ICES splits the landings data by species based on biological and survey information supplied by individual countries. Since no length frequency or survey data are available for Sub-area VI at present MFSD will present all available Irish data to the ICES Working Group in 2001.

Table 3.2.6.c.1 Deep-sea *S. mentella* on the continental shelf. Landings (in tonnes) by area used by the Working Group.

Year	Va	Vb	VI	XII	XIV	Total
1978	3,902	7,767	18	0	5,403	17,090
1979	7,694	7,869	819	0	5,131	21,513
1980	10,197	5,119	1,109	0	10,406	26,831
1981	19,689	4,607	1,008	0	19,391	44,695
1982	18,492	7,631	626	0	12,140	38,889
1983	37,115	5,990	396	0	15,207	58,708
1984	24,493	7,704	609	0	9,126	41,932
1985	24,768	10,560	247	0	9,376	44,951
1986	18,898	15,176	242	0	12,138	46,454
1987	19,293	11,395	478	0	6,407	37,573
1988	14,290	10,488	590	0	6,065	31,433
1989	40,269	10,928	424	0	2,284	53,905
1990	28,429	9,330	348	0	6,097	44,204
1991	47,651	12,897	273	0	7,057	67,879
1992	43,414	12,533	134	0	7,022	63,103
1993	51,221	7,801	346	0	14,828	74,196
1994	56,720	6,899	642	0	19,305	83,566
1995	48,708	5,670	540	0	819	55,737
1996	34,741	5,337	1,048	0	730	41,856
1997	37,876	4,558	418	0	199	43,051
1998	32,710	4,089	298	3	1,319	38,419
1999 ¹	28,590	5,294	243	0	865	34,992

1) Provisional data.

Northwest of Ireland and West of Scotland *Nephrops*

(Management Unit C = Division VIa)

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



Marine Fisheries Services Division

MFSD – ADVICE

MFSD agrees with the ICES advice that there is no basis to revise the advice given for 1993-1999. ICES advises a status quo of TAC of 11,300 t for 2001. This translates to an Irish quota of 152 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 1989.
- 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 Management Units D and C.
- Management Unit 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.
- The TAC in 2000 was 12,600 t with an Irish quota of 170 t.
- There are no explicit management objectives or a management plan for this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £22.0m in Sub-areas VI.
- The value of the 1999 Irish quota was £0.3m.
- The value of the 1999 Irish landings from Division VIa was £0.2m.
- This could potentially become an economic important fishery to Ireland in the future if new grounds open up and if the Irish quota can be increased.

ADDITIONAL INFORMATION

1. ICES carries out assessments for these stocks on a bi-annual basis and no new assessment were carried out in 2000.
2. No international landings were available for 1999.

3. Irish landings in 1999 increased to 136 t, of which approximately 26% was landed as tails.
4. There is no information on mis-reporting in this stock.
5. The UK (Scotland) - with almost 100% of the 1998 landings - dominates this fishery, which is primarily located in their inshore waters.
6. *Nephrops* are primarily by-catch in 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 two years Irish vessel have substantially increased landings of *Nephrops* from Donegal Bay, the Stanton Bank area and have also began targeting *Nephrops* in the South Minch (FU 12).
7. MFSD do not sample *Nephrops* in Division VIa.
8. In 2000 there have also been landings of large *Nephrops* from vessels engaged in BIM-supported exploratory fishing west of the Hebrides.
9. MFSD advise that there is some potential to expand this deepwater fishery for *Nephrops* in Division VIa.
10. The recent increases in landings of *Nephrops* by Irish vessels are partly because scarcity of demersal fish species has meant increased targeting by the fleet. There is also anecdotal evidence however, 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. If this trend in expanding fisheries outside current assessment areas continues then the quota will soon become restrictive for Irish vessels. Future assessment and management should take these new fisheries into consideration.

ICES ADVICE

3.7.11.a

State of stock/fishery:

Stock biomass and recruitment are relatively stable in the North and South Minch FUs, but appear to be increasing in the Firth of Clyde.

- a) North Minch: LPUE has fluctuated without obvious trend, although current levels are at the lower end of the range. Improved age-based assessment suggests stable F_s , but declining stock size for males. TV camera survey suggests increase in abundance, likely

to appear in fishery in next few years.

- b) South Minch: LPUE fluctuating without trend and at average level in 1997 and 1998. TV camera surveys suggest abundance fluctuating but stable between 1995 and 1998.
- c) Firth of Clyde: LPUE was at a low level in early 1990s, but has shown marked increases since 1992. Now at highest level in time series. Age-based assessment suggests increasing biomass and recruitment for both males and females, but increasing trend in F for males. TV camera surveys suggest continued increase in abundance from 1995 to 1998.

Management objectives:

There are no management objectives set for this fishery.

Advice on management:

There is no basis to revise the advice given for 1993-99 and therefore ICES advises a *status quo* TAC of 11300 t for each of the years 2000 and 2001.

Relevant factors to be considered in management:

Catch composition data indicate that creel fishery in the area is taking higher proportions of berried females than trawl fishery. This could result in higher losses to the female spawning stock than in other FU where berried females are less accessible to exploitation.

Elaboration and special comments:

Only UK vessels are involved in these fisheries. *Nephrops* directed trawlers and creelers account for 80 % and 10 % of the landings respectively. 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, landings have declined in recent years. Landings from the South Minch are relatively stable since 1988, while those from the Clyde have increased since the early 1990s. Attention to suitable allocation between the FUs of quotas within the overall TAC is required.

LPUE, mean size, landings/area and effort/area data available for all FUs. Y/R analysis repeated, as well as age-based assessments for North Minch and Clyde. The VPAs were not considered reliable for females. LCA assessments of creel fisheries in North and South Minch.

Source of information: Report of the Working Group on *Nephrops* Stocks, April 1999 (ICES CM 1999/ACFM:13).

Catch data (Tables 3.7.11.a.1-2):

Year	ICES advice	Recommended TAC	Agreed TAC	ACFM landings
1987			16.0	11.2
1988			16.0	12.5
1989			16.0	11.0
1990			16.0	10.1
1991		11.7	13.5	10.5
1992		~11.4	12.0	10.8
1993		~11.3	12.0	11.4
1994		11.3	12.6	11.1
1995		11.3	12.6	12.8
1996	<i>Status quo</i> TAC	11.3	12.6	11.2
1997	<i>Status quo</i> TAC	11.3	12.6	11.2
1998		11.3	12.6	11.1
1999		11.3	12.6	
2000		11.3		
2001		11.3		

(Weights in '000 t)

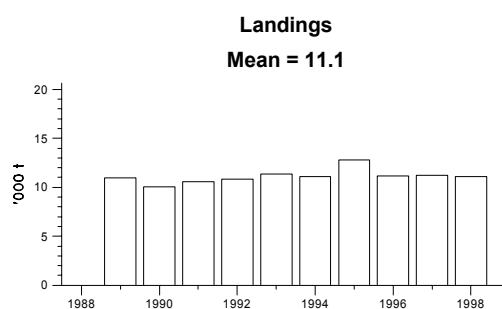


Table 3.7.11.a.1 *Nephrops* landings (tonnes) by Functional Unit plus other rectangles in Management Area C (VIa).

Year	FU 11	FU 12	FU 13	Other	Total
1989	3205	4745	2796	235	10981
1990	2543	4430	2878	217	10068
1991	2789	4442	3015	298	10544
1992	3548	4237	2727	283	10795
1993	3192	4454	3315	376	11337
1994	3616	4415	2629	441	11101
1995	3656	4678	3989	460	12783
1996	2871	3995	4061	228	11155
1997	3046	4345	3619	212	11222
1998 *	2428	3710	4840	120	11098
* provisional na = not available					

Table 3.7.11.a.2 *Nephrops* landings (tonnes) by country in Management Area C (VIa).

Year	Rep. of Ireland	Spain	UK	Total
1989	na	7	10974	10981
1990	na	1	10067	10068
1991	33	19	10492	10544
1992	10	18	10767	10795
1993	7	0	11330	11337
1994	3	0	11098	11101
1995	13	0	12770	12783
1996	8	0	11147	11155
1997	0	4	11218	11222
1998 *	0	11	11087	11098
* provisional na = not available				

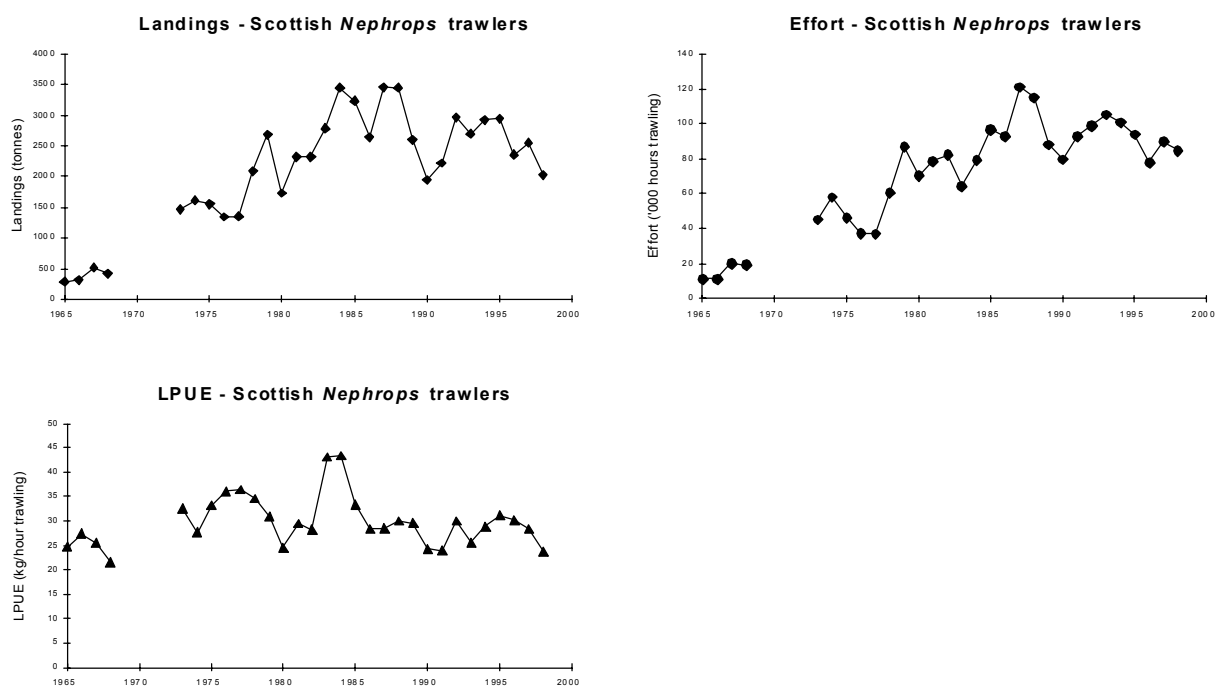


Figure 3.7.11.a.1 - North Minch (FU 11): Long term trends in landings, effort and LPUEs of *Nephrops* in catches and landings.

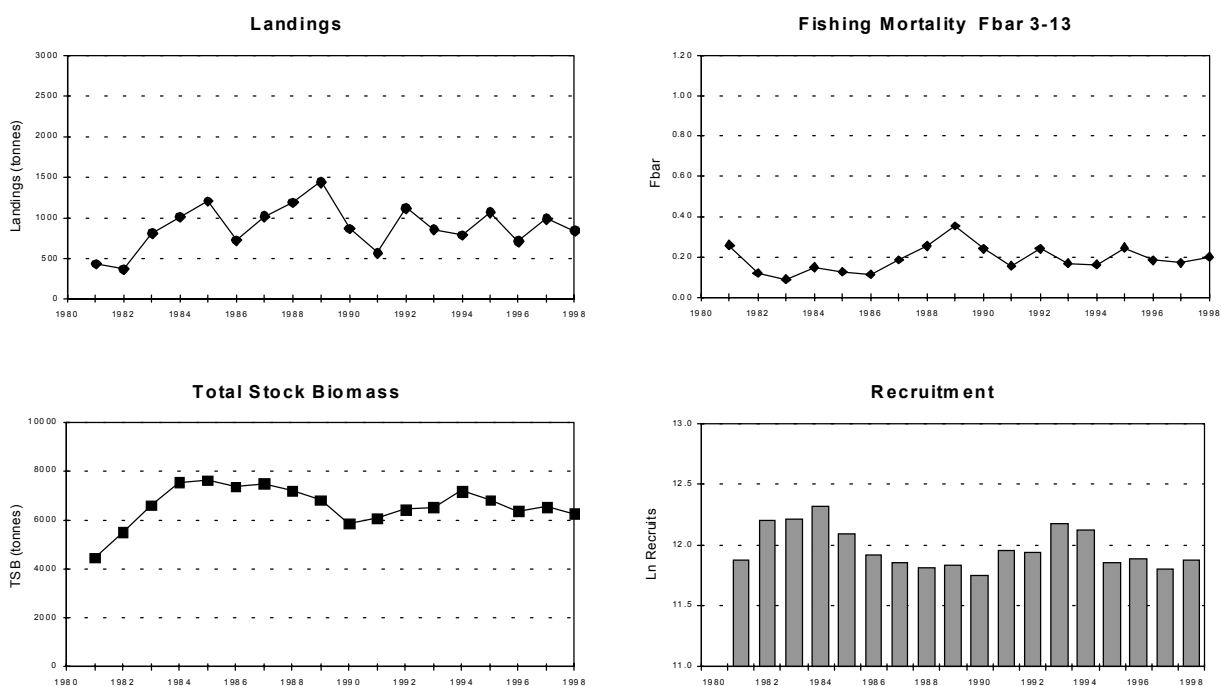


Figure 3.7.11.a.2 - North Minch (FU 11): Output VPA females: Trends in Landings, \bar{F} , TSB and Recruitment.

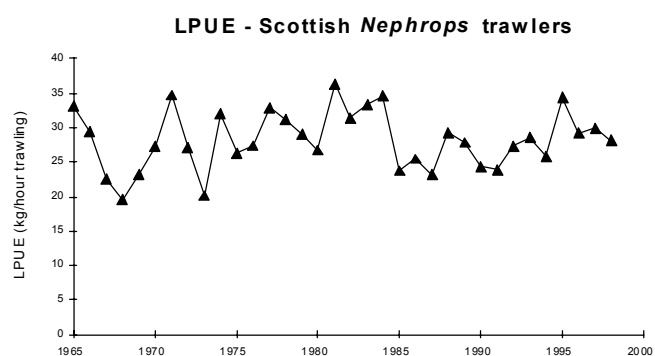
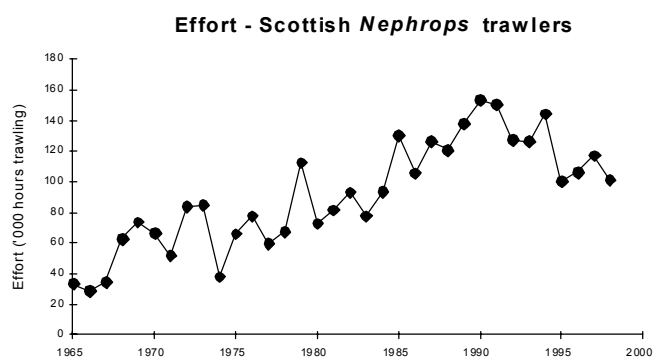
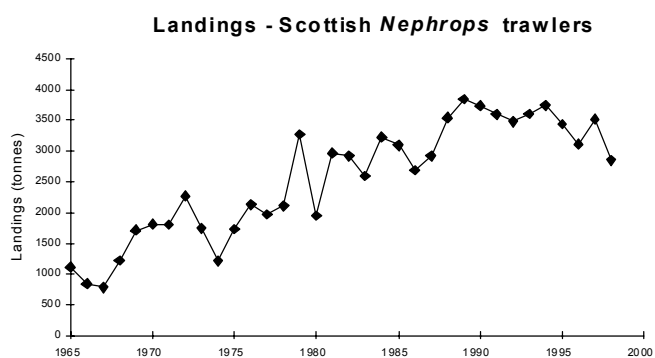


Figure 3.7.11.a.3 - South Minch (FU 12): Long term trends in landings, effort and LPUEs of *Nephrops* in catches and landings.

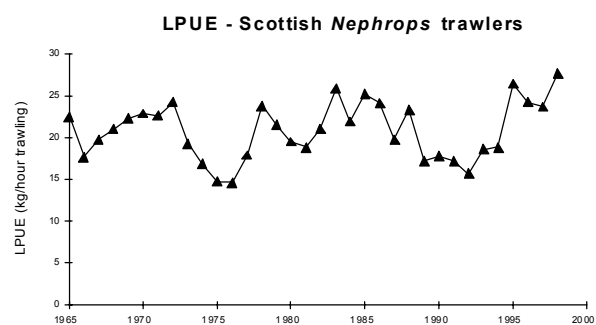
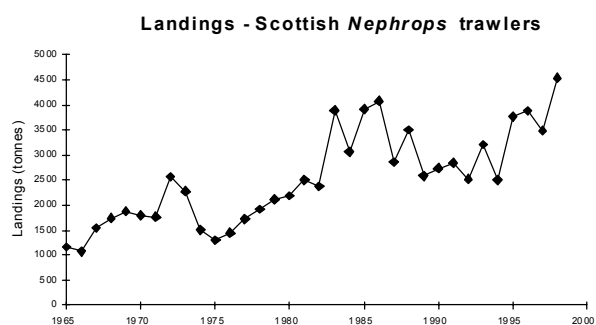


Figure 3.7.11.a.4 - Firth of Clyde (FU 13): Long term trends in landings, effort and LPUEs of *Nephrops* in catches and landings.

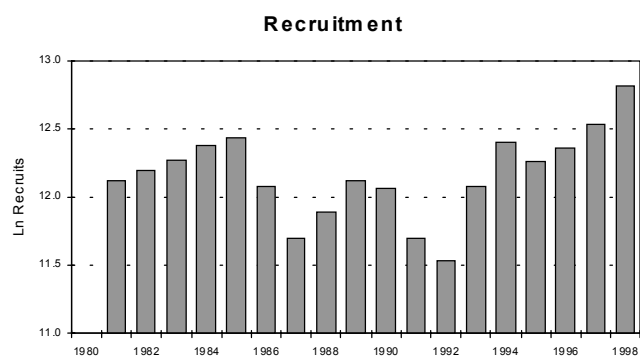
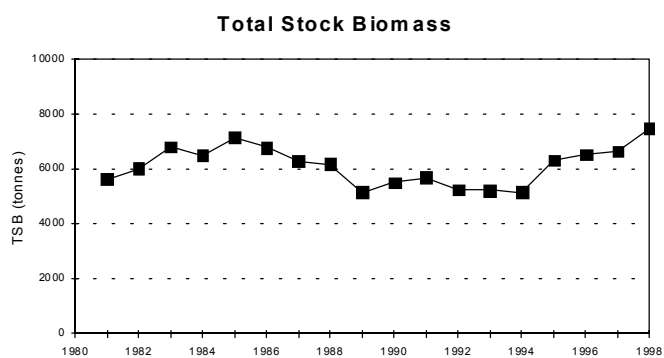
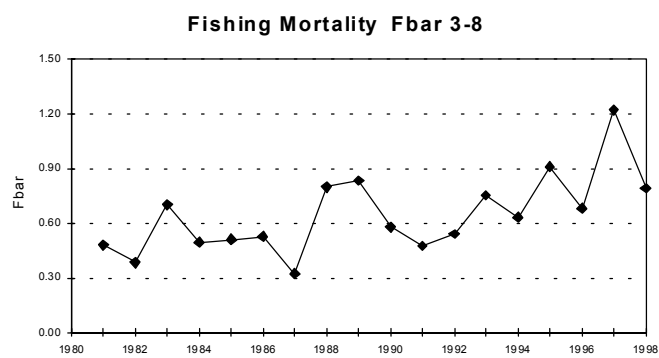
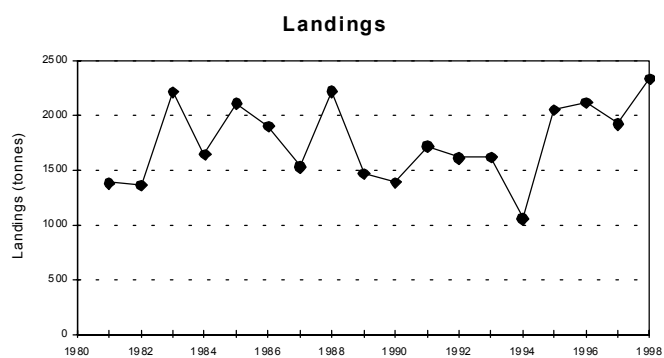


Figure 3.7.11.a.5 - Clyde (FU 13): Output VPA males: Trends in Landings, Fbar, TSB and Recruitment.

Irish Sea *Nephrops*

(Management Unit 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 agrees with the ICES advice that there is no basis to revise the advice given for 1993-1999. ICES advises a status quo of TAC of 9,400 t for Management Unit J in 2001. This translated to a quota of 17,200 t for Sub-area VII (MU J = 9,400 t, MU L = 4,000 t, MU M = 3,800 t) with an associated Irish quota of 6,348 t.

STATE OF THE STOCK

- There are no concerns about the status of *Nephrops* in this area.
- International landings in 1998 were 9,422 t, (364t in FU 14, and 9,058 t in FU 15), which was about 5% above average for the last ten years, and the fourth highest in that period.
- F (fishing mortality) has declined generally since 1991; F on females is higher than on most other stocks.
- Recruitment is currently relatively stable.
- Biomass has been relatively stable since at least 1989.
- Reference points for stocks in this area have not been defined.

CURRENT MANAGEMENT

- The TAC area covers Sub-area VII
- Management Unit J contains two fisheries in the east (FU 14) and the west (FU 15) analytical assessments are carried out for both of these.
- The 2000 agreed TAC for all of Sub-area VII was 21,000 t, of which Ireland's share was 7,750 t.
- There are no explicit management objectives or a management plan for this stock.
- Measures to reduce fishing mortality on juvenile whiting need to be considered in the management of this stock.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £44.2m in Sub-areas VII.
- The value of the 1999 Irish quota was £16.3m.
- The value of the 1999 Irish landings from Sub-area

VII was £16.1m.

- This is the most economic important fishery in the Irish Sea and supports the vast majority of the Irish Sea.

ADDITIONAL INFORMATION

1. ICES carries out assessments for this stock on a biannual basis and no new assessment was carried out in 2000.
2. No international landings were available in 1999.
3. Irish landings in 1999 were estimated to be 4,615 t, approximately 62% was landed as tails.
4. There is no information on mis-reporting in this stock.
5. Landings in 1998 were 68% by UK (mainly Northern Ireland) and 32% by Ireland.
6. The Irish fishery consists of otter trawl vessel and increasingly in recent years twin-rig vessels.
7. Most of the Irish Sea landings are made by vessels operating out of Howth and Clogherhead. Irish activity is overwhelmingly concentrated on FU 15 the Western Irish Sea.
8. MFSD carry out a monitoring programme on *Nephrops* stocks in the western Irish Sea.
9. The western Irish Sea *Nephrops* fishery is concentrated on an area that is also a whiting nursery ground. Discarding of juvenile whiting the *Nephrops* fishery has contributed significantly to the reduction of the VIIa whiting stock.
10. Higher returns in the medium and long term would be possible with some reduction in fishing mortality.

ICES ADVICE 3.8.8

State of stock/fishery

Both stocks are considered to be fully exploited.

- a) Irish Sea East: Evidence of a fall in effort and generally increasing trend in CPUE in the most recent years.
- b) Irish Sea West: CPUE and LPUE have increased in recent years. Age-based assessments indicate relative stability in terms of stock biomass and recruitment. F on females is higher than in most other *Nephrops* stocks.

Management objectives:

There are no management objectives set for this fishery.

Advice on management:

There is no basis to revise the advice given for 1993-99 and therefore ICES advises that the TAC should not exceed 9400 t for each of the years 2000 and 2001.

Relevant factors to be considered in management:

Although exploited throughout the year, increased effort generally occurs during the summer months (especially in Irish Sea East), when females are available for capture after hatching their eggs. This results in higher annual fishing mortality rates on females than in other more northern FUs. The high F values on both sexes in Irish Sea West suggest that the situation should be very carefully monitored.

It should be noted 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 necessarily result in balanced exploitation in this and other parts of the Sub-area.

Elaboration and special comments:

Most of the landings from this Management Area J are taken by the UK and the Republic of Ireland. Irish Sea East landings and effort increased to a peak in 1978, and have now stabilised at half that level. The low landings in 1998 are consistent with the reduction in effort in the summer months. In 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 available for Irish Sea West. Length-based assessment repeated for both units and age-based assessment for Irish Sea West.

Source of information: Report of the Working Group on *Nephrops* Stocks, April 1999 (ICES CM 1999/ACFM:13).

Catch data (Tables 3.8.8.1-2):

Year	ICES advice	Recommended TAC	Agreed TAC ¹	ACFM landings
1987				9.9
1988				9.1
1989				8.5
1990				8.9
1991		8.76		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	9.3
1996		9.4	23.0	7.8
1997		9.4	23.0	10.5
1998		9.4	23.0	9.4
1999		9.4	23.0	
2000		9.4		
2001		9.4		

(Weights in '000 t) ¹) Sub-area VII

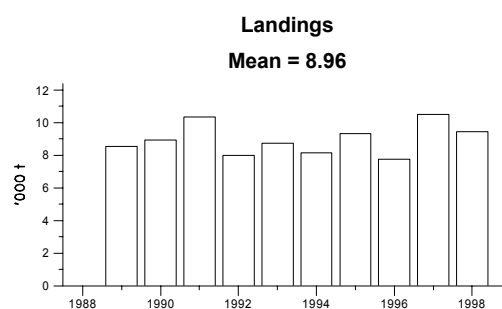


Table 3.8.8.1 *Nephrops* landings (tonnes) by Functional Unit plus other rectangles in Management Area J (VIIa, North of 53° N).

Year	FU 14	FU 15	Total
1989	438	8084	8522
1990	644	8278	8922
1991	859	9468	10327
1992	495	7502	7997
1993	618	8111	8729
1994	514	7628	8142
1995	504	8817	9321
1996	452	7304	7756
1997	586	9923	10509
1998 *	364	9058	9422
* provisional na = not available			

Table 3.8.8.2 *Nephrops* landings (tonnes) by country in Management Area J (VIIa, North of 53° N).

Year	Belgium	France	Rep. of Ireland	Isle of Man	UK	Total
1989	0	19	2484	8	6011	8522
1990	0	8	2724	25	6165	8922
1991	1	12	3390	62	6864	10327
1992	1	6	2381	14	5596	7997
1993	0	8	2750	32	5939	8729
1994	0	17	1797	16	6312	8142
1995	2	7	3269	23	6020	9321
1996	1	2	1614	10	6127	7756
1997	1	0	3320	7	7180	10509
1998 *	1	0	3008	25	6388	9422
* provisional na = not available						

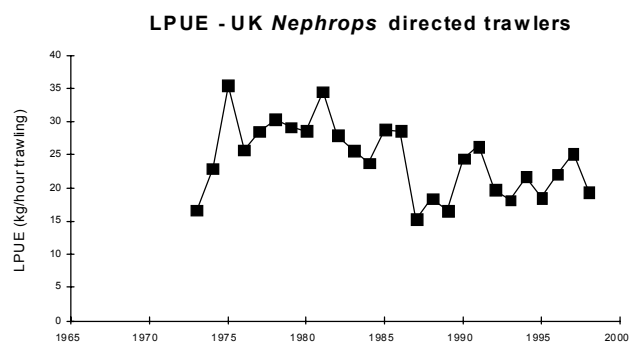
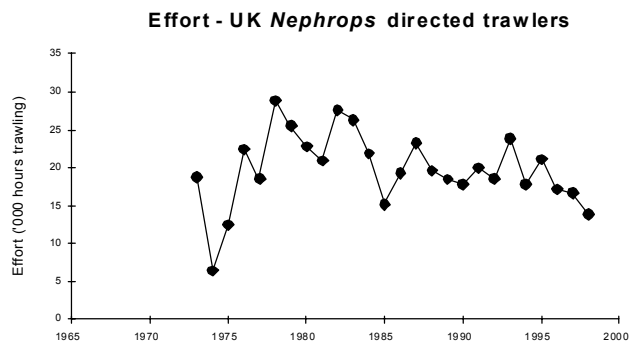
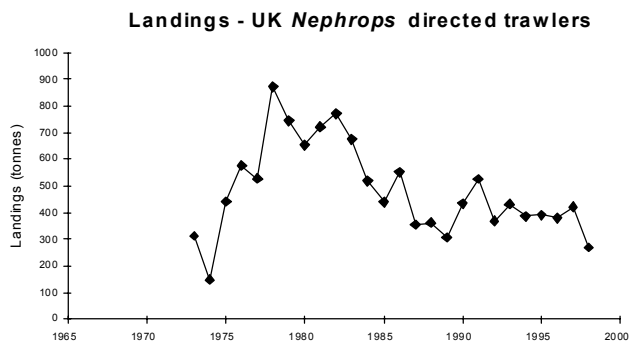


Figure 3.8.8.1 - Irish Sea East (FU 14): Long term trends in landings, effort and LPUEs of *Nephrops* in catches and landings.

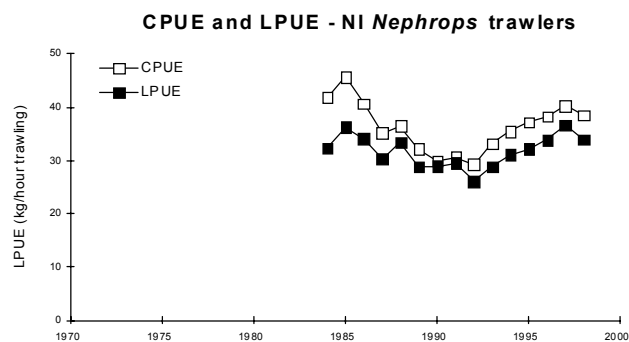
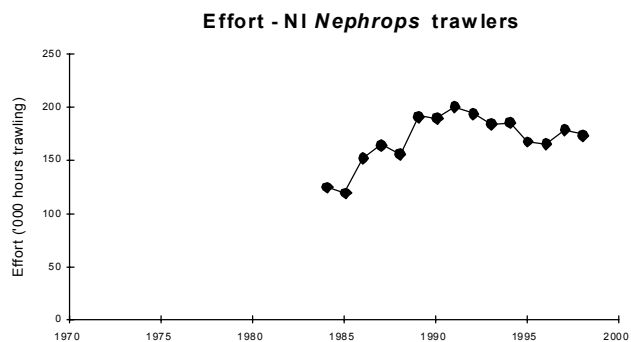
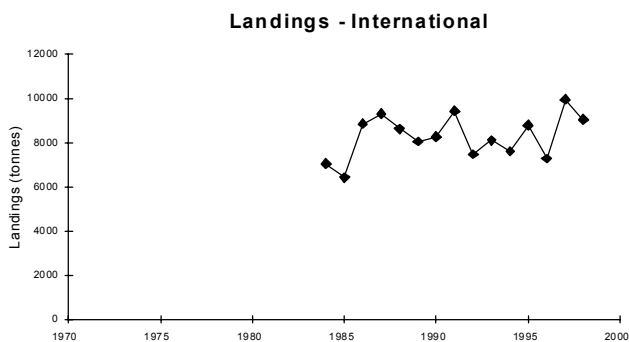


Figure 3.8.8.2 - Irish Sea West (FU 15): Long term trends in landings, effort, CPUEs and LPUEs of *Nephrops* in catches and landings.

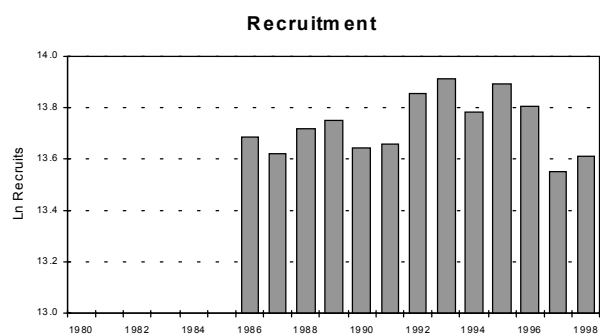
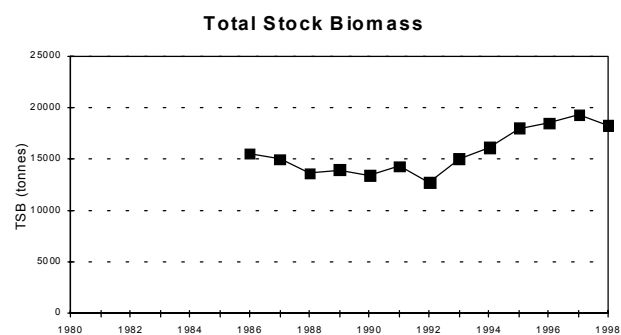
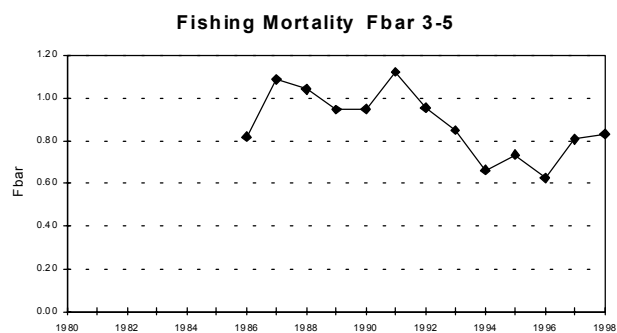
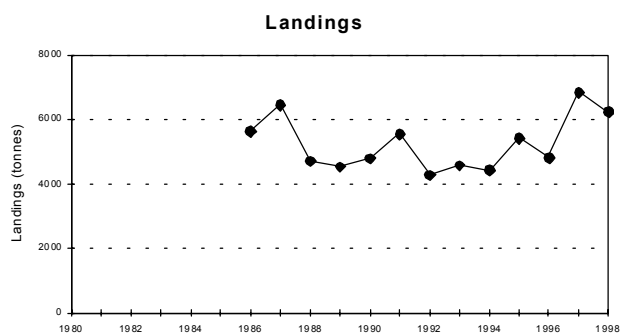


Figure 3.8.8.3 - Irish Sea West (FU 15): Output VPA males: Trends in Landings, Fbar, TSB and Recruitment.

West of Ireland and inshore south of Ireland *Nephrops*

(Management Unit 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 agrees with the ICES advice that there is no basis to revise the advice given for 1993-1999. ICES advises a status quo of TAC of 4,000 t for Management Unit L in 2001. This translated to a quota of 17,200 t for Sub-area VII (MU J = 9,400 t, MU L = 4,000 t, MU M = 3,800 t) with an associated Irish quota of 6,348 t.

STATE OF THE STOCK

- There are no concerns about the status of *Nephrops* in this area.
- The 1998 landings were the second highest in the last ten years.
- 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 Management Unit L is Division VIIb,c,j,k and inshore rectangles south of Ireland (31E1, 32E1, 32E2, 33E2, 33E3).
- The Management Unit L contains two main fisheries on the Porcupine Bank (FU 16) and in outer Galway Bay, off the Aran Islands (FU 17). The MU 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). Within MU L analytical assessments are carried out on FU 16 and FU 17 only.
- The 2000 TAC for all of Sub-area VII was 21,000 t, of which Ireland's share was 7,750 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 by-catch.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £44.2m in Sub-areas VII.
- The value of the 1999 Irish quota was £16.3m.
- The value of the 1999 Irish landings from Sub-area VII was £16.1m.
- *Nephrops* are a very economically important fishery in this area particularly to vessels operating out of Rossaveal, Dingle and Union Hall.

ADDITIONAL INFORMATION

1. ICES carries out assessments for this stock on a biannual basis and no new assessment was carried out in 2000.
2. No international landings were available in 1999 but international landings in 1998 were 4 556t, with 1,780t in FU16, 1 427t in FU17, 58t in FU18, 703t in FU19 and 588t in non-FU rectangles.
3. Irish landings in 1999 were 2,751 t which was similar to the 1998 landings, approximately 26% was landed as tails.
4. There is no information on misreporting in this stock.
5. Landings are dominated by Ireland with 62% of the 1998 landings. France, Spain and the UK caught 18%, 12% and 8% of the 1998 landings respectively.
6. The Irish fishery consists of otter trawl vessel and increasingly in recent years twin-rig vessels. The Aran grounds (FU 17) accounted for 43% of the Irish landings in 1999, the South and Southwest coast (FU 19) was the next most important area with 19% of the 1999 landings. The Porcupine Bank accounted for over 10% of the 1999 landings, other important areas included the shelf edge in VIIj. Vessels from Rossaveal, Dingle, Union Hall, Dunmore East and Kinsale mainly exploit the fishery.
7. MFSD carry out a monitoring programme on *Nephrops* stocks in FU 16 the Porcupine Bank and FU 17 back of the Aran Islands.
8. There are no surveys directed at *Nephrops* in this area.
9. There are significant whitefish by-catches (hake, anglerfish, megrim, whiting and sole) taken in the *Nephrops* fishery in VII.
10. Stocks in FU 16 and FU 17 are close to fully exploited, and any increase in fishing mortality (F) could lead to reduced catches in the medium and long term. FUs 18 and 19 have not been assessed.
11. Higher returns in the medium and long term would be

possible with some reduction in fishing mortality.

12. An increase in mesh size for vessels targeting *Nephrops* on the Aran grounds to 90mm should be investigated as a management measure.
13. Traditionally, landings from the Porcupine Grounds (FU 16) were limited by weather. With the advent of the Whitefish Renewal Scheme however, these grounds have become accessible to new vessels. MFSD considers that there is some potential for development of deepwater *Nephrops* fisheries in this area.

ICES ADVICE

3.10.4

State of stock/fishery:

- a Porcupine Bank: LPUE of Spanish fleet slowly increased until 1994-95, but has since fallen. LPUE of French fleet at much higher levels than in early 1990s, but showing signs of a decrease.
- b Aran Grounds: Insufficient data to allow assessment.
- c Ireland coastal stocks: Insufficient data to allow assessment.

Management objectives:

There are no management objectives set for this fishery.

Advice on management:

There is no basis to revise the advice given for 1993–99 and therefore ICES advises that a TAC of 4000 t be set for each of the years 2000 and 2001.

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 balanced exploitation between the units. At present, this Management Area is within a much larger TAC area where the problem referred to will be even greater.

Elaboration and special comments:

Fleets from France, Ireland, Spain and UK are involved in the *Nephrops* fishery on Porcupine Bank. Landings from the other FUs mostly by Republic of Ireland. Spanish landings from FU 16 continue to decrease, while French, Irish and UK landings increase. Total landings from Porcupine peaked in the early 1980s, but have decreased since. International landings from the Management Area as a whole have increased since 1993, exceeding the recommended TAC in 1994, 1995, 1996 and 1998.

CPUE, LPUE and mean size data available for Porcupine Bank, and limited mean size data for the Aran Grounds. Length-based Y/R assessments were carried out for the Porcupine Bank and the Aran Grounds.

Source of information: Report of the Working Group on *Nephrops* Stocks, April 1999 (ICES CM 1999/ACFM:13).

Catch data (Tables 3.10.4.1–2):

Year	ICES advice	Recommended TAC	Agreed TAC ¹	ACFM landings
1987				4.5
1988				3.9
1989				4.0
1990				3.1
1991		5.09		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	5.0
1996	Status quo TAC	4.0	23.0	4.1
1997	Status quo TAC	4.0	23.0	3.7
1998		4.0	23.0	4.6
1999		4.0	23.0	
2000		4.0		
2001		4.0		

(Weights in '000 t) ¹⁾ Sub-area VII

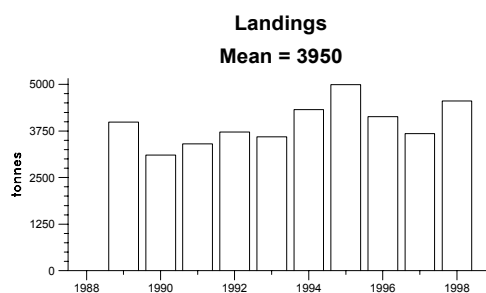


Table 3.10.4.1 *Nephrops* landings (tonnes) by Functional Unit plus other rectangles in Management Area L (VIIb,c,j,k).

Year	FU 16	FU 17	FU 18	FU 19	Other	Total
1989	2108	828	11	898	143	3988
1990	1883	345	5	754	114	3101
1991	1613	519	0	1077	196	3405
1992	1968	412	1	888	454	3723
1993	1826	372	10	904	486	3598
1994	2482	729	126	390	599	4326
1995	2933	933	25	405	694	4990
1996	2504	506	51	470	606	4137
1997	2040	813	16	261	550	3680
1998 *	1780	1427	58	703	588	4556
* provisional na = not available						

Table 3.10.4.2 *Nephrops* landings (tonnes) by country in Management Area L (VIIb,c,j,k).

Year	France	Rep. of Ireland	Spain	UK	Total
1989	583	1827	1505	73	3988
1990	544	1060	1436	59	3101
1991	590	1519	1152	144	3405
1992	909	1351	1139	325	3723
1993	1039	1310	1075	175	3598
1994	1322	1716	1069	218	4326
1995	1500	2446	767	275	4990
1996	1216	1729	875	317	4137
1997	1123	1667	554	334	3680
1998 *	819	2810	570	357	4556
* provisional na = not available					

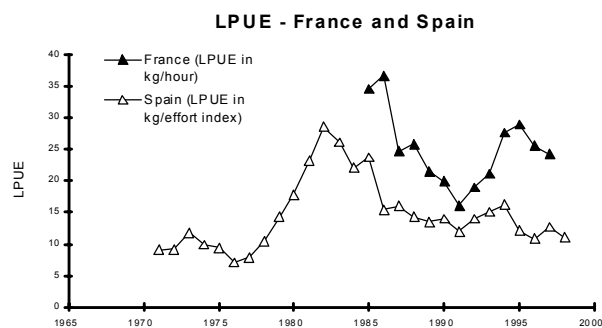
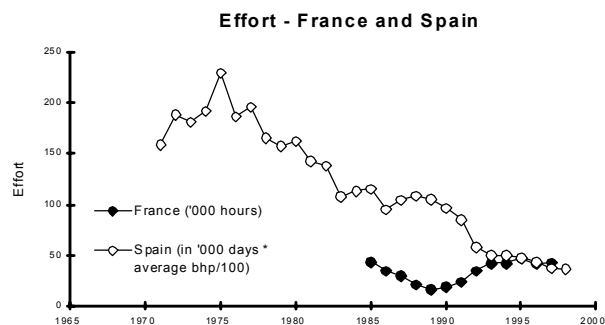
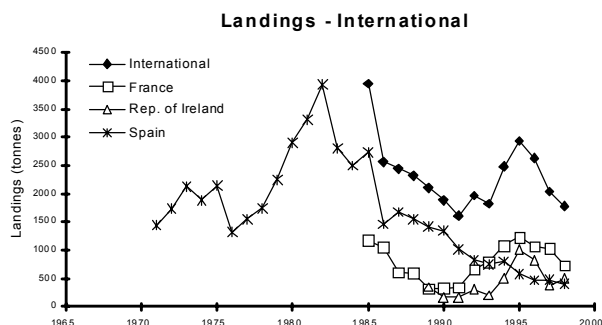


Figure 3.10.4.1 - Porcupine Bank (FU 16): Long term trends in landings, effort and LPUEs of *Nephrops* in catches.

Southern Irish Sea and Celtic Sea *Nephrops*

(Management Unit 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 agrees with the advice of ICES that the TAC for Management Unit M for 2001 should not exceed 3,800 t since there are mixed biological signals from this stock. This translates to a quota of 17,200 t for Sub-area VII (MU J = 9,400 t, MU L = 4,000 t, MU M = 3,800 t) with an associated Irish quota of 6,348 t.

STATE OF THE STOCK

- There are no concerns about the status of *Nephrops* in this area.
- Landings increased to over 6,000 t in 1995 but declined to 3,500 t in 1998.
- No reliable estimates of fishing mortality are available for this stock.
- Indications are that recruitment and biomass have 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 Unit 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 Unit M contains several main fisheries south and east of the Smalls and east of the Labadie bank (FU 20-22). The MU also includes numerous small-scattered fisheries where the substrate is suitable. Within MU M an analytical assessment is carried out on FUs 20-22 combined.
- The 2000 TAC for all of Sub-area VII was 21,000 t, of which Ireland's share was 7,750 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 by-catch.

MFSD – ECONOMIC COMMENTS

- The value of the 1999 TAC was £44.2m in Sub-areas VII.
- The value of the 1999 Irish quota was £16.3m.
- The value of the 1999 Irish landings from Sub-area VII was £16.1m.
- *Nephrops* are a very economically important fishery in this area particularly to vessels operating out of Dunmore East, Howth and Clogherhead.

ADDITIONAL INFORMATION

1. ICES carries out assessments for this stock on a biannual basis and no new assessment was carried out in 2000.
2. No international landings were available in 1999 but international landings in 1998 were 3,400 t.
3. Irish landings in 1999 were 989 t a decrease of 42% on the 1998 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. Ireland and France with approximately 50% of the 1998 landings dominate fishery.
6. The Irish fishery consists of otter trawl vessel and increasingly in recent years twin-rig vessels. Vessels from Dunmore East, Howth and Clogherhead mainly exploit the fishery.
7. MFSD currently do not carry out a monitoring programme on *Nephrops* stocks in this area.
8. There are no surveys directed at *Nephrops* in this area.
9. There are significant whitefish by-catches (hake, anglerfish, megrim, whiting and sole) taken in the *Nephrops* fishery in VII.
10. Higher returns in the medium and long term would be possible with some reduction in fishing mortality.

ICES ADVICE

3.9.13.a

State of stock/fishery:

LPUE fell in 1989–91, slightly increased till 1995, then decreased again to 1997. VPA suggests that biomass and recruitment have been stable since 1996.

Management objectives:

There are no management objectives set for this fishery.

Advice on management:

There are mixed biological signals on this stock, and therefore ICES advises that the landings should not exceed the previously advised TAC of 3800 t in each of the years 2000 and 2001.

Relevant factors to be considered in management:

So far, the TAC for this area has not been enforced, and this has allowed the landings to increase over 6000 t.

Attention is drawn to the fact that, as in the Irish Sea, fishing mortality on females is similar to that on males. Therefore, this stock could be more vulnerable to spawning stock depletion.

Elaboration and special comments:

Landings 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 roughly 65%. Considerable increase in Irish landings, from 650–750 t in early 1990s to 1100–2000 t since. International landings decreasing since 1995.

LPUE, mean size data and length compositions of catches available. A serious delay in the processing of fishery statistics in France prevented to include the year 1998 in the assessments, as data for this year were partial only at the time of the WG meeting. Length- and age-based assessments performed on both sexes, but quality of VPA questionable due to lack of appropriate discard data for most years in the time series.

Source of information: Report of the Working Group on *Nephrops* Stocks, April 1999 (ICES CM 1999/ACFM:13).

Catch data (Tables 3.9.13.a.1–2):

Year	ICES advice	Recommended TAC	Agreed TAC ¹	ACFM landings
1987				3.4
1988				3.1
1989				3.8
1990				4.4
1991		3.83		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	6.0
1996		3.8	23.0	4.5
1997		3.8	23.0	3.9
1998		3.8	23.0	3.5 ²
1999		3.8	23.0	
2000		3.8		
2001		3.8		

(Weight in '000 t) ¹⁾ Sub-area VII ²⁾ Highly provisional

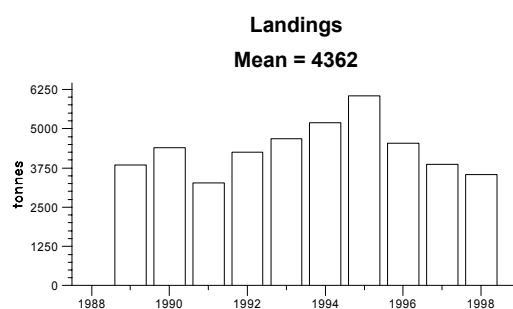


Table 3.9.13.a.1 *Nephrops* landings (tonnes) by Functional Unit plus other rectangles in Management Area M (VIIIf,g,h, excluding rectangles 31 E1 and 32 E1-E2 + VIIa, South of 53° N).

Year	FUs 20-22	Other	Total
1989	3636	210	3846
1990	4123	263	4386
1991	3100	178	3278
1992	4016	236	4252
1993	4403	275	4678
1994	4901	287	5188
1995	5743	305	6048
1996	4250	281	4531
1997	3614	248	3862
1998 *	3439	108	3547
* provisional na = not available			

Table 3.9.13.a.2 *Nephrops* landings (tonnes) by country in Management Area M (VIIIf,g,h, excluding rectangles 31 E1 and 32 E1-E2 + VIIa, South of 53° N).

Year	Belgium	France	Rep. of Ireland	UK	Total
1989	0	3044	784	18	3846
1990	0	3841	528	17	4386
1991	3	2617	644	14	3278
1992	0	3413	750	89	4252
1993	0	3846	770	62	4678
1994	2	3692	1426	68	5188
1995	2	3891	2031	124	6048
1996	2	3328	1115	86	4531
1997	4	2614	1149	95	3862
1998 *	1	1769	1714	63	3547
* provisional na = not available					

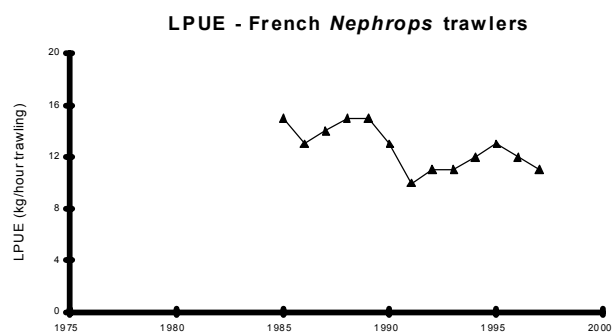
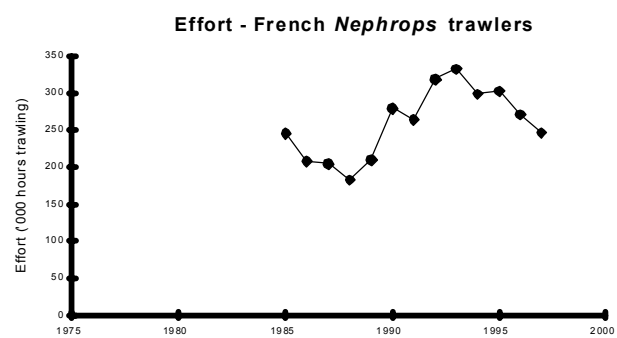
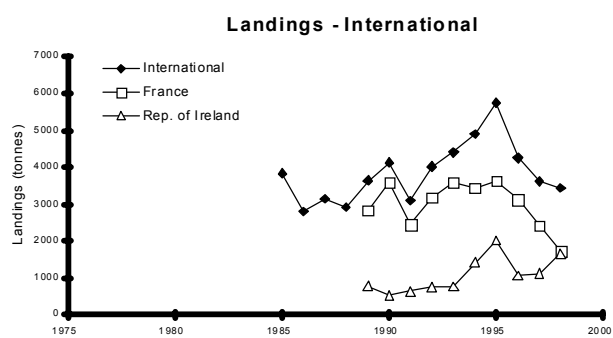


Figure 3.9.13.a.1 - Celtic Sea (FUs 20-22): Long term trends in landings, effort and LPUEs of *Nephrops* in catches and landings.

Spider crab fishery

(Divisions VIIj)

Maja squinado



Marine Fisheries Services Division

MFSD – ADVICE

In the absence of national regulations, the local co-operative might consider capping the fishing effort and introducing regulations to encourage a better quality of catch.

Scientific advice exists to the effect that the size limit should be raised to a carapace length of 130 mm.

STATE OF THE STOCK

This fishery for spider crab, in Tralee and Brandon Bays, 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 been rising since 1994. The quality of the catch has however declined.

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 one year-class makes up most, if not all, of the catch. This phenomenon has been reported, 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.

CURRENT MANAGEMENT

- This fishery is pursued in Tralee and Brandon Bays by pots targeting large crustaceans (lobster and crawfish) in addition to spider crab.
- 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.
- The fishery is regulated by size limit, the critical dimension being a carapace length of 120 mm.
- CPUE has been maintained but the quality and relative value of the catch have declined.
- 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.

ADDITIONAL INFORMATION

This inshore stock is unusual because it has survived increasing fishing effort over a period of 20 years and the stocks appear to be in good condition. Much of that is undoubtedly due to the fact that the market demands a high quality (large) product and the size limit is sufficiently large to allow a proportion of the catch to mature before the critical size dimension is reached. Spider crabs also develop rapidly, reaching maturity within two years and they spawn once a year at this latitude.

Potential threats to this fishery are several: they include the use of sub-size spider crab as bait. This has happened in the spider crab fishery in the south east of the country. 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.

Tralee and Brandon Bays are fortunate to have a fishing community which values its spider crab stock but this and other inshore fisheries would benefit from a national regulatory regime.

Sources of information:

Edward Fahy (in preparation) The Magharees spider crab *Maja squinado* fishery in 2000.

Fig 1 An index of fishing effort (based on pot numbers) and total landings from the spider crab fishery of Tralee and Brandon Bays, 1981 – 1999.

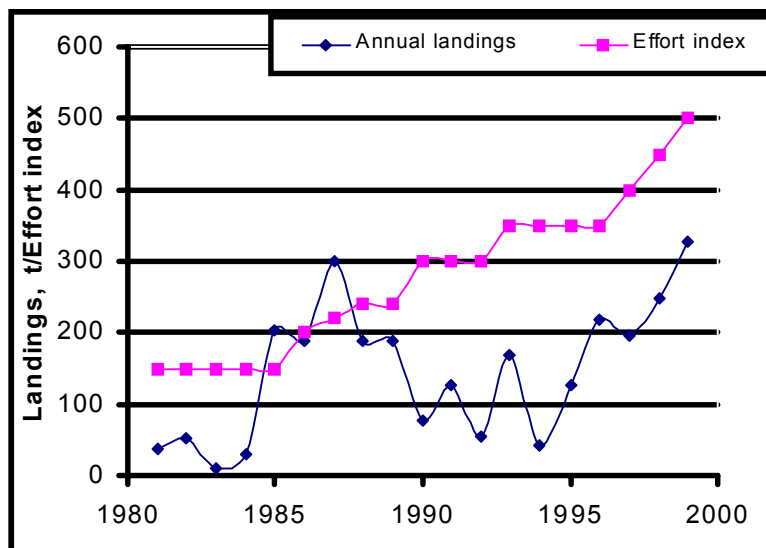


Fig 2. Three indices of CPUE in the spider crab fishery of Tralee and Brandon Bays.

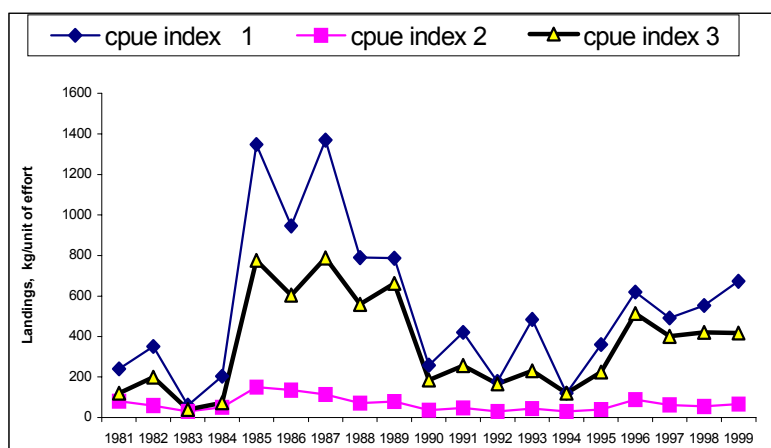
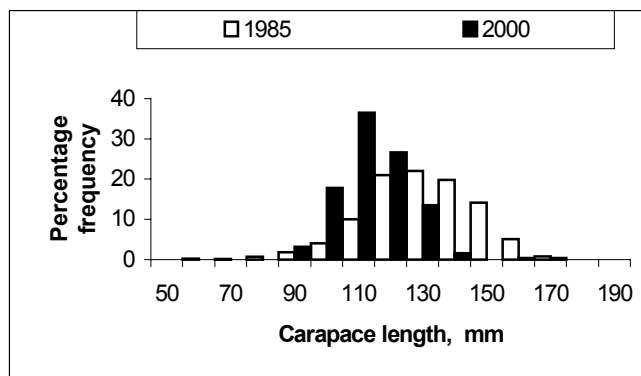


Fig 3. Length frequency distributions of male spider crabs from the fishery in Tralee and Brandon Bays in 1985 and 2000.



Brown crab in south east Ireland

(Divisions VIIa and g)

Cancer pagurus



Marine Fisheries Services Division

MFSD – ADVICE

Enforcing current conservation regulations is a priority. Continued assessment and monitoring to bring CPUE series up to date in addition to investigating interactions with other fisheries is a medium term requirement.

STATE OF THE STOCK

Some 30 vessels - half-deckers of 10-15 m - target brown crab along the south coast of Wexford. The geographical limits of this fishery are not known. Small inshore boats fish creels within 10 nautical miles of the coast but foreign boats are believed to pot crabs further offshore.

Effort is known to have increased in this fishery over the past ten years by more than 100% along the Wexford coast. LPUE data up to 1996 have been extracted from various sources and these indicate that crab abundance fell initially but stabilised after 1990.

Brown crab is harvested for the claw fishery and as whole cooked crab. It also supplies bait for the whelk fishery in the south west Irish Sea. At its peak, this is estimated to have consumed 470 tonnes of brown crab in 1996. Not all crab used for bait purposes is discarded from the fishery for human consumption. Brown crab have been targeted for bait purposes and both soft crab and undersized crab have also been used in whelk pots. Dredging for scallops may present a conflict with the brown crab fishery. Scallop fishing effort has intensified and is becoming an all-the-year-round activity in the course of which large numbers of berried crab are reportedly killed during the winter months.

Crabs cannot be aged so assessments of fisheries of this kind are fraught with difficulties.

CURRENT MANAGEMENT

- A number of factors are a source of concern in this fishery
- The Co Wexford fishery for brown crab has expanded its fishing effort by 100% over the past ten years. LPUE declined in 1991 and stabilised until 1996.
- Crab are caught for human consumption and to pro-

vide bait for the whelk fishery in the Irish Sea.

- Fishing pressure is expected to intensify further and a precautionary approach to sustaining yield is required. This should embrace enforcement of the current minimum size regulations.
- Over the medium term consideration should be given to protecting soft crab and possibly raising the minimum size limit. Stabilising effort over the medium to long term may be necessary, either by limiting further entry to the fishery or by restricting the numbers of pots fished by a single vessel.
- Investigations should be undertaken on the interactions between this fishery and dredging for scallops.

ADDITIONAL INFORMATION

In 1998 landings of brown crab nationally totalled 7,773 t (live weight) valued at Ir£6.7 m. This represents a doubling of landings, irrespective of the inconsistent reporting of the crab claw fishery. Landings to the Co Wexford brown crab fishery have in past years (an analysis was carried out in 1995 and 1996) been officially estimated at 1-3% of the national total more than 50% of it coming from Co Donegal, but a more detailed appraisal based on the books of local shellfish buyers rates the contribution of the Wexford fishery higher, at around 470 t annually (some 7-8%).

Sources of information: Fahy, E (1998) The interaction of two inshore fisheries: for crab *Cancer pagurus* and whelk *Buccinum undatum*. ICES Study Group on crab. Brest

Fahy, E (1999) Conflict between two inshore fisheries: for whelk (*Buccinum undatum*) and brown crab (*Cancer pagurus*), in the southwest Irish Sea. Third International Conference on Shellfish Restoration, Cork.

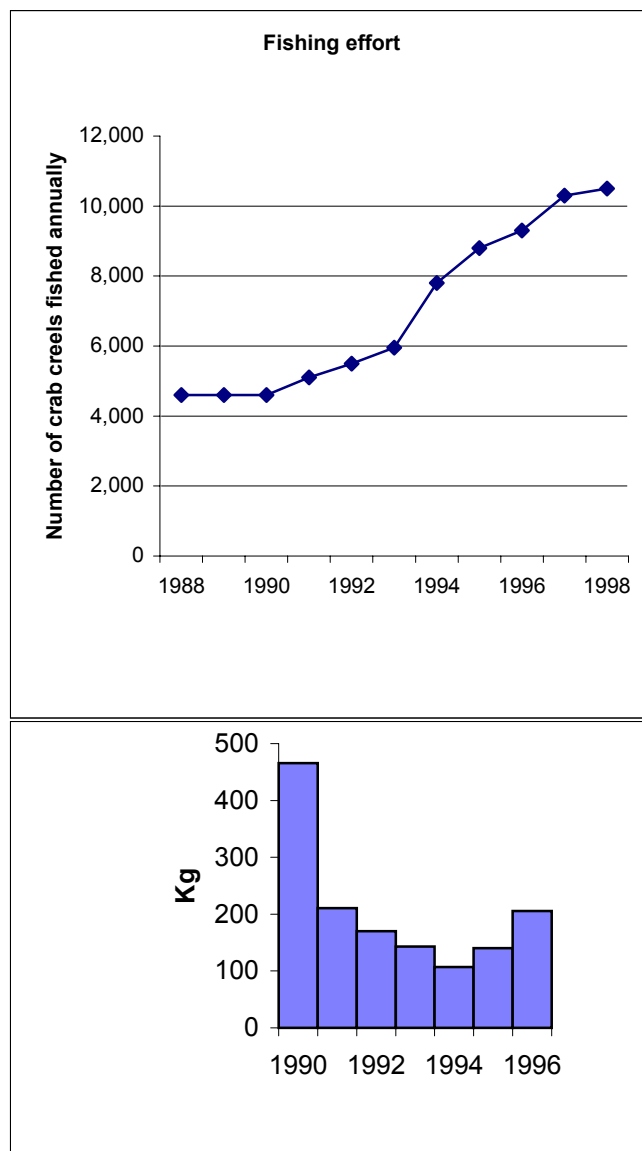


Fig 1 Effort and catch in the Wexford brown crab fishery: above, total effort over a ten year period from 1988 and below, landings expressed as consignment delivered to processor per boat -day from 1990 to 1996.

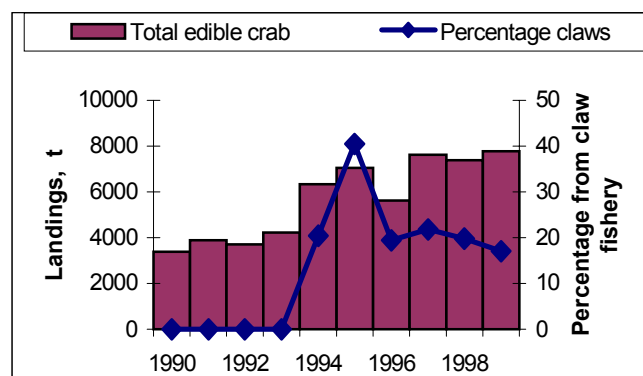


Fig 2 National landings (t) of brown crab, 1990 to 1999 inclusive and the percentage contribution of crab claws to the total..

Razor clams in the Irish Sea and West Coast

(Divisions VIIa and VIIb)

Ensis spp



Marine Fisheries Services Division

MFSD – ADVICE

Entry to this fishery should be restricted and the fishery should be carefully monitored with a view to regulating it. Useful data and compliance with the requirements to document the source of landings would be secured by devising a common logbook and gatherers' registration docket.

Reducing fishing effort by regulations like close seasons should be used as an interim measure pending a more comprehensive regulatory system.

Because the fishery is a new one novel methods of harvesting (such as diving) should be actively considered. Razor clams can have a high value but the market for them is small, suggesting that harvesting should be carried out only when opportunities for sale are known to exist.

STATE OF THE STOCK

Razor clam fisheries are very fragile; the animals are long-lived (up to 18 years old) and the frequency of successful spatfalls is unknown. Harvesting by hydraulic dredge results in heavy breakages (as much as 60% of clams encountered by the dredge may be killed, discarded or later rejected). Recovery of clam beds is likely to be long term. The market for razor clams is small.

The present scenario is one of progressive removal of clam patches with the eventual consequential inability to satisfy market demand.

There are strong arguments to be made for tighter regulation of this fishery, for both conservation and market reasons.

CURRENT MANAGEMENT

- Commercial exploitation of razor clams urgently requires a precautionary approach. This fishery is in need of close monitoring and regulatory measures.
- Razor clam species are relatively long lived and their reproduction may be sporadic. Clam beds can be irreparably damaged by hydraulic dredging.

ADDITIONAL INFORMATION

Provisional figures for 1999 reported landings of 407 tonnes of razor clams, valued at Ir£0.87 million, a doubling of landings from the previous year.

During the past year fishing effort moved off the Gormanstown bed, in the Irish Sea, whose stocks were fished down, the boats locating on another clam bed further north. MFSD continues to monitor the fishery at Gormanstown in an effort to ascertain the longer term effects of hydraulic dredging on the ecosystem there.

MFSD also commenced investigations on the western razor clam beds (or patches) which are much smaller than the Gormanstown bed on the east coast. The dominant species in the Atlantic is *Ensis arcuatus* although other species also occur there. The biology of *arcuatus* appears to be variable, its growth rate (Fig 1), density and probably its longevity (Fig 2), being regulated by local conditions to an extent which was not observed in populations of *Ensis siliqua* on the east coast.

In association with Taighde Mara Teo., MFSD undertook a survey of a clam bed within the waters controlled by Kilkieran Bay Co-op in Connemara, the objective being to quantify the resource with a view to controlled harvesting (Fig 3).

Source of information:

Fahy, E (1999) Biology and exploitation of a razor clam bed at Gormanstown, Co Meath, Ireland. Paper delivered to the Third International Conference on Shellfish Restoration, Cork.

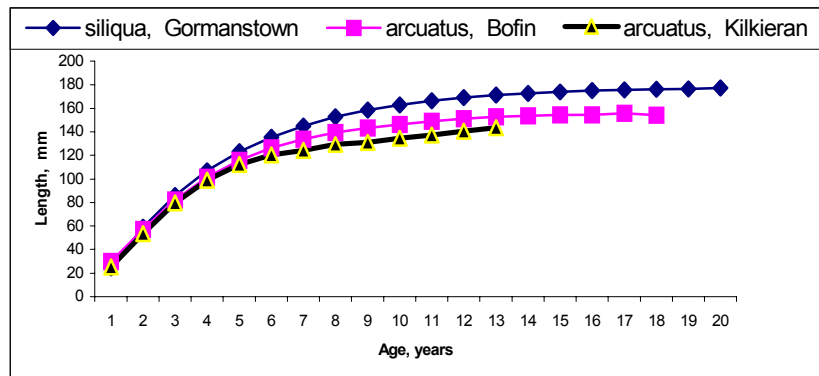


Fig 1. Calculated growth curve for *Ensis siliqua* (east coast) compared with averaged lengths at age of *E. arcuatus* at Bofin Island and in Kilkieran Bay (west coast).

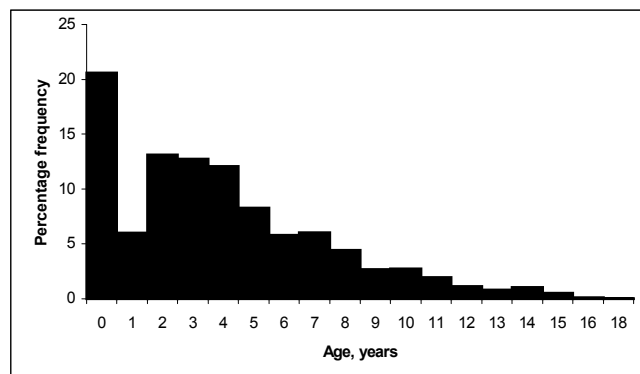


Fig 2. Age frequencies of *E. arcuatus* in Kilkieran Bay.

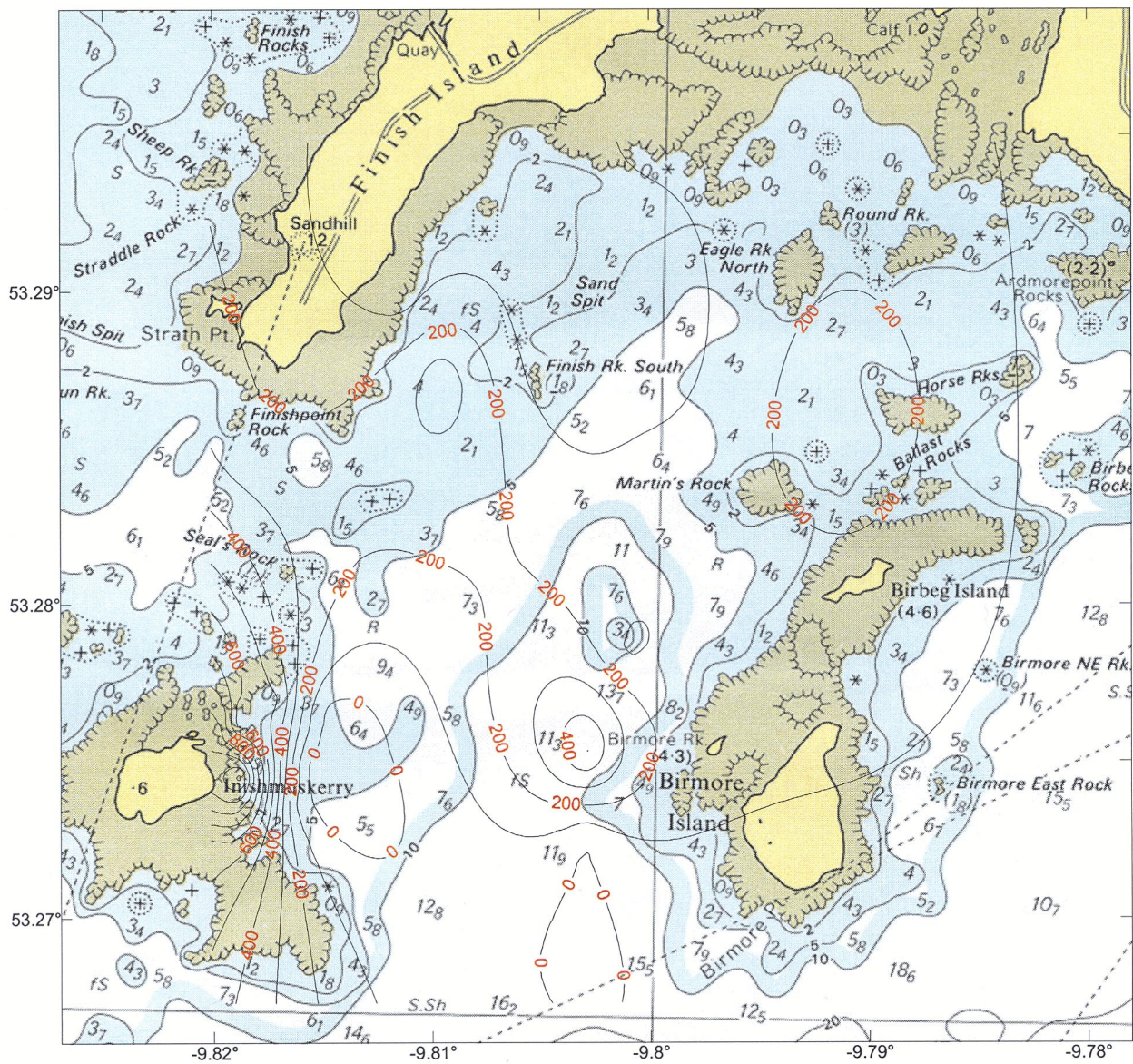


Fig 3. Isolines of razor clam biomass from a dive survey of part of Kilkieran Bay in 2000.

Sea bass on all coasts

(Sub-areas VI and VII)



Marine Fisheries Services Division

MFSD – ADVICE

Bye laws protecting sea bass should remain in place as should active enforcement of the measures.

The possibility of involving the European Union in conservation measures for this species should be pursued.

The genetic status of local populations should be elucidated.

Monitoring of this fishery should continue.

STATE OF THE STOCK

Sea bass are at the northern limit of their geographical range in the waters around these islands where sea temperatures have a major influence as regulators of the life cycle. During the 1980s sea temperatures were relatively low and bass year-classes were correspondingly poor. At the end of the decade temperatures improved and bass stocks responded. Scale samples submitted by anglers confirm the importance of the 1989 year-class and the 1990 one is also providing a large proportion of the anglers' catch. In Britain the 1989 year-class has been regarded by some authorities as on a par with the 1959 one, here its consequences are less marked, possibly because the illegal fishery has made heavy inroads into it.

Nearly half of the fish sampled by anglers and seized illegally caught specimens so far in 2000 come from two year-classes (Fig 1), 1989 and 1990. These fish have made above average growth (Fig 2) and they currently weigh up to 3 kg (Table 1) providing excellent sport on rod and line but, paradoxically, giving an over-optimistic impression of the strength of the stocks.

Relative year-class strengths would appear to reflect water temperatures: the 1989 and 1990 year-classes originated in warm conditions. Subsequent recruitment, when water temperatures were low, was poor. It may be too early to recognise a strong brood year in the mid 1990s although the 1995 year-class made a good recruitment in the United Kingdom. The juvenile survey conducted in August 2000 with the Central and Regional fisheries Boards, yielded the poorest indication of 0-group strength since the series commenced in 1996.

CURRENT MANAGEMENT

- Despite a policy of protecting sea bass over a period of 20 years, the stocks are still depleted.
- 1989 and 1990 produced good year-classes of the fish and these make up the bulk of the angling and illegal commercial landings at present.
- Bass is the only marine species reserved for anglers

ADDITIONAL INFORMATION

Because the fishery for bass is reserved for anglers, commercial statistics on it are not available. Samples of scales and life-data from fish captured by anglers and from fish seized by the authorities after illegal capture, provide an indication of the year-class strength of the stocks. It must however be interpreted with caution; anglers are selective in what they regard as worthy of being reported and some of their observations are not accurately measured. A survey of juvenile bass is undertaken annually with the Central and Regional fisheries Boards.

There is controversy about the definition of bass stocks harvested in waters close to the Irish coast and genetic information on this would be helpful to management. Intensification of a pair-trawl fishery for sea bass in the English Channel by Scottish and French boats has resulted in large landings and gives a renewed urgency to the clarification of any relationship between Irish and British stocks of the fish. CEFAS, with IFREMER, have initiated a tagging programme to ascertain the origin of bass harvested in this fishery; MFSD and the Central Fisheries Board are assisting with this work. Both are also working with a student in National University, Galway, who is examining the inter-relationships among local populations by DNA analysis.

Sources of information:

Observations on the status of bass *Dicentrarchus labrax* stocks in Ireland in the late 1990s. Edward Fahy, Niamh Forrest, Una Shaw and Peter Green. Irish Fisheries Investigations No 5 2000: 27 pp.

MFSD: Unpublished information

<http://www.cefass.co.uk/Basstagging.htm>

Table 1 Average weights (g) of 1989 and 1990 year classes as reported by anglers.

Year of capture	1996	1997	1998	1999	2000
1989 year class	1,423	1,730	1,570	1,911	2,608
1990 year class	1,420	1,356	1,343	1,475	1,952

Numbers of scale samples accompanied by weight data

1989 year class	32	61	27	15	10
1990 year class	8	24	34	12	5

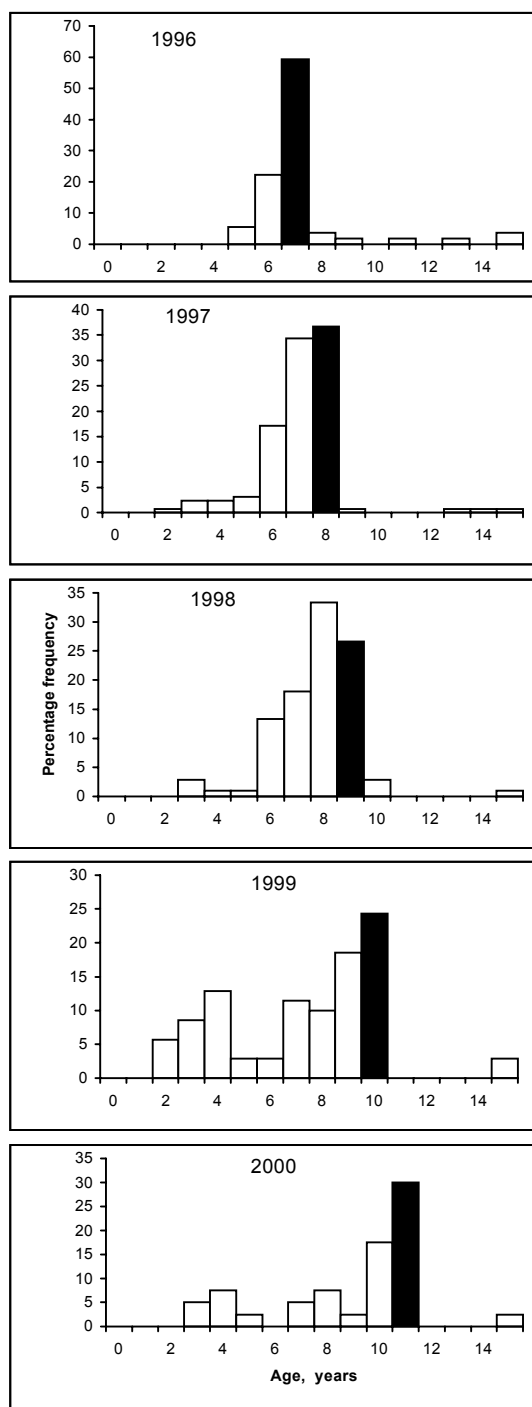


Fig 1 Relative year class strength of the angler-caught and illegally captured sea bass, from scale samples. The 1989 year class is shown in black.

Fig 2 Average back-calculated lengths at age for sea bass of the 1989 and 1990 year classes. *Also shown is an average of various sea bass growth patterns in Irish waters for comparison (In Fahy et al, 2000).



Shrimp fishery on south and west coasts

(Divisions VIIg, j and b)

Palaemon mainly serratus



Marine Fisheries Services Division

MFSD – ADVICE

For several years various interests in this fishery have urged a finite open season from approximately August to January. This should be put in place without further delay and monitoring of the fishery should continue.

STATE OF THE STOCK

Unknown.

CURRENT MANAGEMENT

- Because of their brief life-cycle and small size shrimp are regarded as unpredictable and unmanageable.
- Yield has continued to rise in the 1990s and landings in 1999 were the heaviest to date
- A precautionary approach to sustaining yield is recommended.

ADDITIONAL INFORMATION

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 chi-

nese hat-ended creels. As is general in the inshore sector, fishing effort has risen with time. The fishing season has also increased and in some parts of Ireland fishing now takes place all the year round.

From the beginning of the 1990s shrimp fishing reached a new intensity and landings have been consistently higher since; the greatest landings to date having been made in 1999.

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.

Sources of information: Fahy, E and P Gleeson (1996) The commercial exploitation of shrimp *Palaemon serratus* (Pennant) in Ireland Ir Fish Invest New series No 1
Fahy, E, N Forrest and L Oakey (1998) Catch analysis of shrimp *Palaemon serratus* (Pennant) taken by different mesh sizes Fisheries Bulletin No 16.
Fahy, E, N Forrest and P Gleeson (1998) Estimates of the contribution of *Palaemon elegans* Rathke to commercial shrimp landings in Ireland and observations on its biology. Ir Nat J 26 (3/4): 93-98.

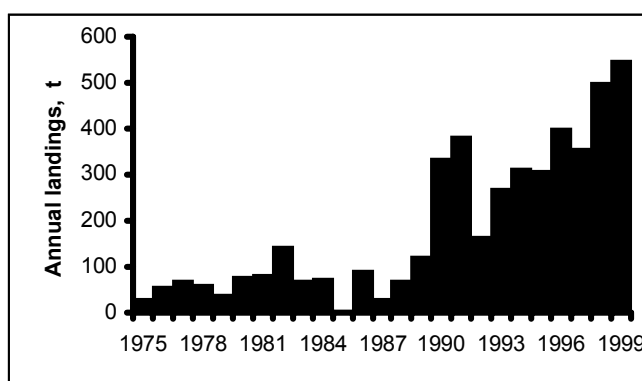


Fig 1. Annual landings of shrimp (tonnes); source, Department of the Marine and Natural Resources.

Whelk fishery in Division VIIa

Buccinum undatum



Marine Fisheries Services Division

MFSD – ADVICE

This fishery is in need of immediate and persistent management by enforcement of the size limit.

STATE OF THE STOCK

At its peak, the whelk fishery occupied approximately 80 vessels of from 10 to 20 m, but this number had halved by 1998. Whelk-producing ground extends from Howth in the north to Carne at the southern end of the Irish Sea. There is little fishing on the south coast. The relative contribution of the southern ports, Wexford and Roslare, has declined recently while landings at Wicklow and Arklow have increased; these two ports currently produce more than 60% of all whelk landed from the fishery, that proportion is maintained in the provisional landings figures for 1999.

A recent review of the fishery, based on all data collected since 1994 (available as Irish Fisheries Investigations, New series, No 6 (in press)) contains sufficient detail to consider the stock(lets) as four geographical divisions which reflect the generalisations previously made about the size range of landings to the principal ports: animals from the north - landed into Howth, and from the south - landed into Wexford and neighbouring ports, tend to be larger than those potted in the vicinity of Courtown, Arklow and Wicklow. The central sectors of the fishery (on the Codling and Rusk Banks), fished out of those last three ports, produce most of the undersized animals. A survey of CPUE in 1999 is contained in the latest assessment which shows that the largest biomass of whelk is located on these sand and gravel banks (see accompanying computer-generated maps).

Individually, rather than having their landings considered as a single entity, each sector has a different performance record. The central sectors, providing landings to Arklow, Wicklow and Courtown, are major nursery areas and their stocks also display the greatest resilience (from an analysis of CPUE), in addition, paradoxically, to yielding large quantities of undersized whelk. The Wexford sector, despite a low incidence of undersized animals in its landings, appears to display the greatest loss of landings as the history of the fishery progressed.

Usually, the vital statistics of this fishery would be presented in the calendar year following the one under review. In this case provisional details of percentage undersized whelk landed (until August) in 2000 to each of the four fishery sectors (calculated on the assumption that landings remain as they were in 1999), are given in the accompanying table. They are 4% worse than in 1999 and the highest to date, reinforcing the management advice that the size limits must be more rigidly enforced.

Z-values, calculated from the catch curves of each sector in 2000 (from samples to August of the year), are much the same as in 1994 in the Dublin Sector, the first year of assessment of this fishery; they are high in the Arklow and Courtown sectors and much lower in Wexford.

CURRENT MANAGEMENT

- This fishery is regulated by bye-law under the Whelk (Conservation of Stocks) Order, 1994; S.I. No 278 of 1994 which sets a minimum size of 25 mm at the maximum width of the shell, corresponding with 50 mm in length.
- A substantial proportion of the landings is below this minimum size limit.
- A review of the fishery completed in 2000 re-emphasises the need for enforcement of conservation measures.

ADDITIONAL INFORMATION

Whelk landings rose rapidly in the early 1990s as a consequence of the decline in stocks of similar gastropods in the Pacific. The main markets for Irish whelk are in the Far East, particularly in Korea. The fishery is a relatively inexpensive one to enter and many traditional fishermen and newcomers to the industry responded to the opportunities. Demand for product has suffered reverses in the form of fluctuating prices and market difficulties which discouraged some fishing effort; overall this declined by 50% since 1996, the year in which peak landings were made.

Sources of information: Edward Fahy, Eric Masterson, David Swords and Niamh Forrest (in press) A second assessment of the whelk fishery in the south west Irish Sea with particular reference to its history of management by size limit. Irish Fisheries Investigations No 6.

Fig 1. Landings of whelk from the south west Irish Sea, 1990 – 1999 and, below, the percentage distribution of landings among the four sectors of the fishery.

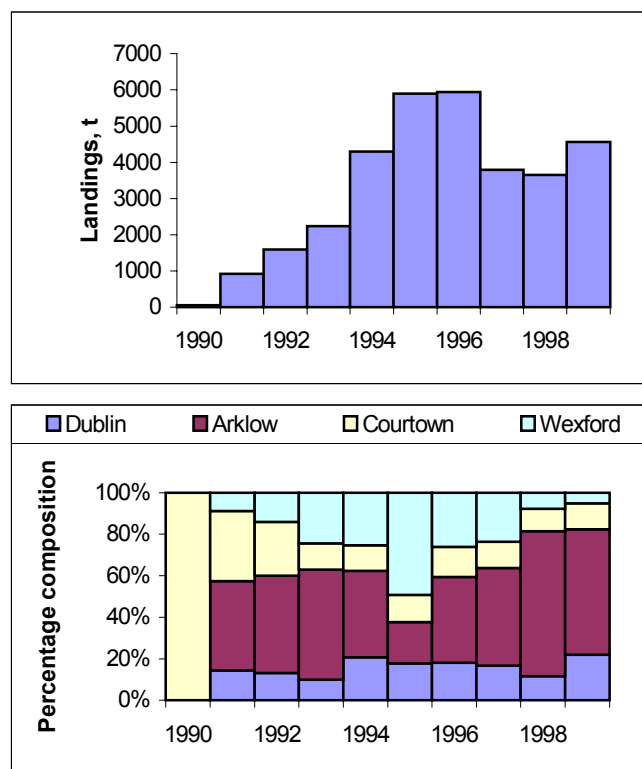


Table 1. Percentage undersized whelk (<50mm long), by number, landed in each fishery sector annually.

Year	Dublin	Arklow	Courtown	Wexford	Total
1994	27.5	32.6	51.1	7.9	31.4
1995					
1996	4.6	27.5	47.6	12	24.3
1997	61.8	26.8	19.4	4.5	32.7
1998					
1999	12.3	33.8	48.9	1.6	33.1
2000	9.7	40	48.9	8.8	37.1
Averages	23.2	32.1	43.2	7	

Figures for 2000 are preliminary

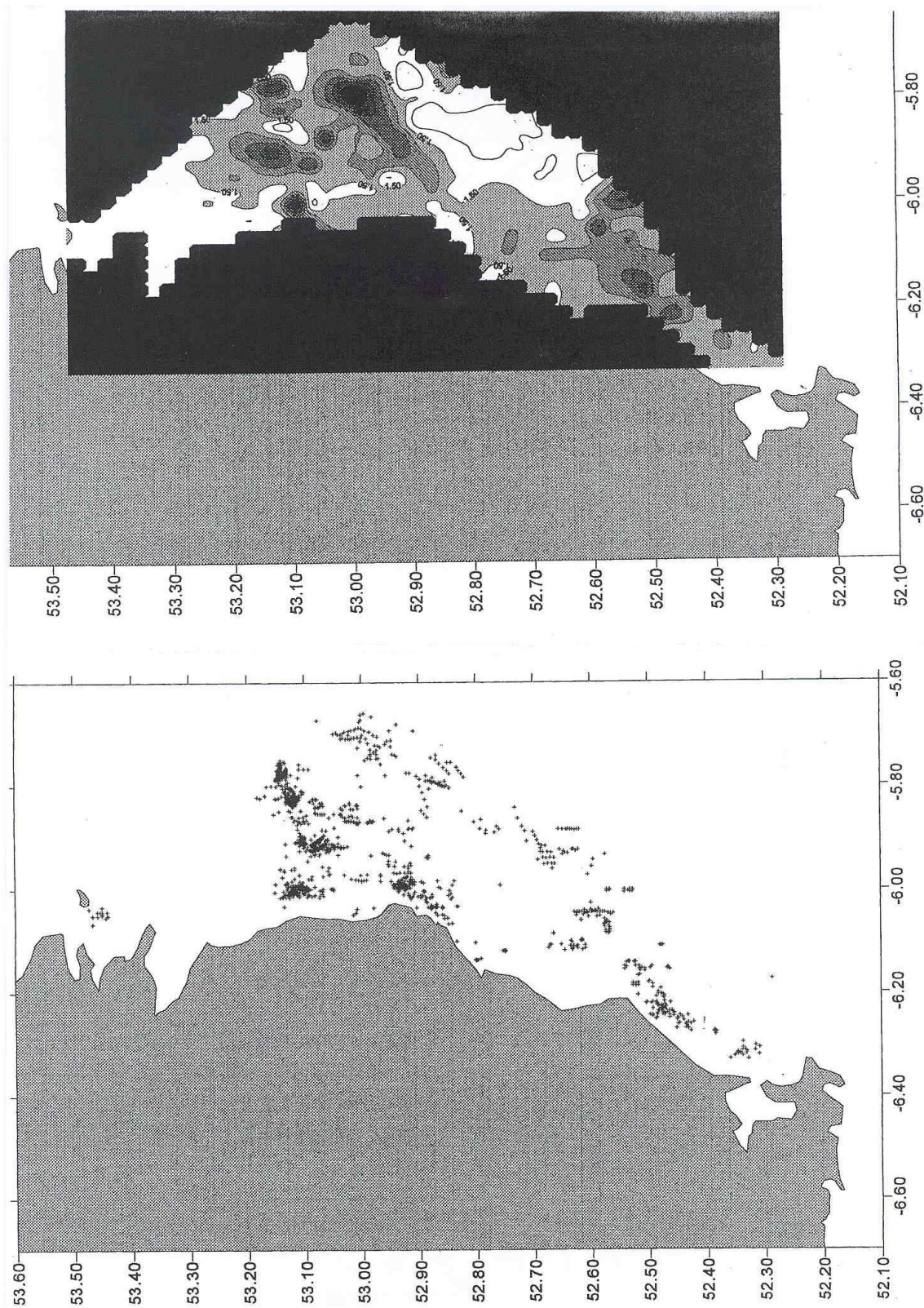
Table 2: Calculated values of Z for each sector of the south west Irish Sea whelk fishery in each year of assessment.

Coefficients of mortality (Z) calculated from the catch curves for each year in which an assessment was undertaken.

	Sectors				
Year	Dublin	Arklow	Courtown	Wexford	Averages
1994	0.4	0.56	0.66	0.48	0.53
1995					
1996	0.26	0.48	0.64	0.4	0.45
1997	0.81	0.9	0.94	0.51	0.79
1998					
1999	0.24	0.68	0.88	0.62	0.61
2000	0.41	0.68	0.86	0.21	0.54
Averages	0.42	0.66	0.8	0.44	

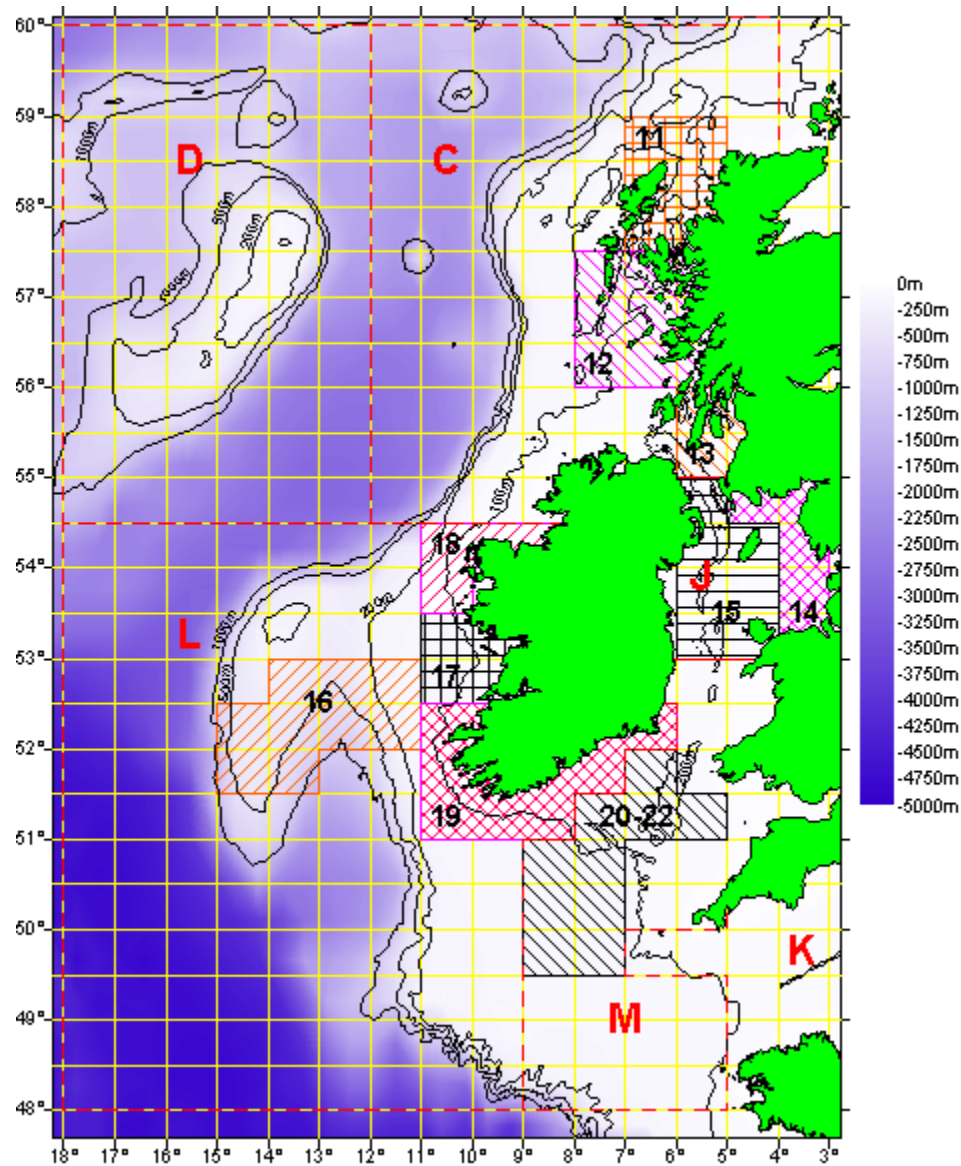
Figures for 2000 are preliminary.

Figs 2 Computer generated maps of (left) sources of information from fishermen about the CPUE of whelk in the south west Irish Sea fishery and (right) contours indicating relative abundance of whelk, generated from the data.



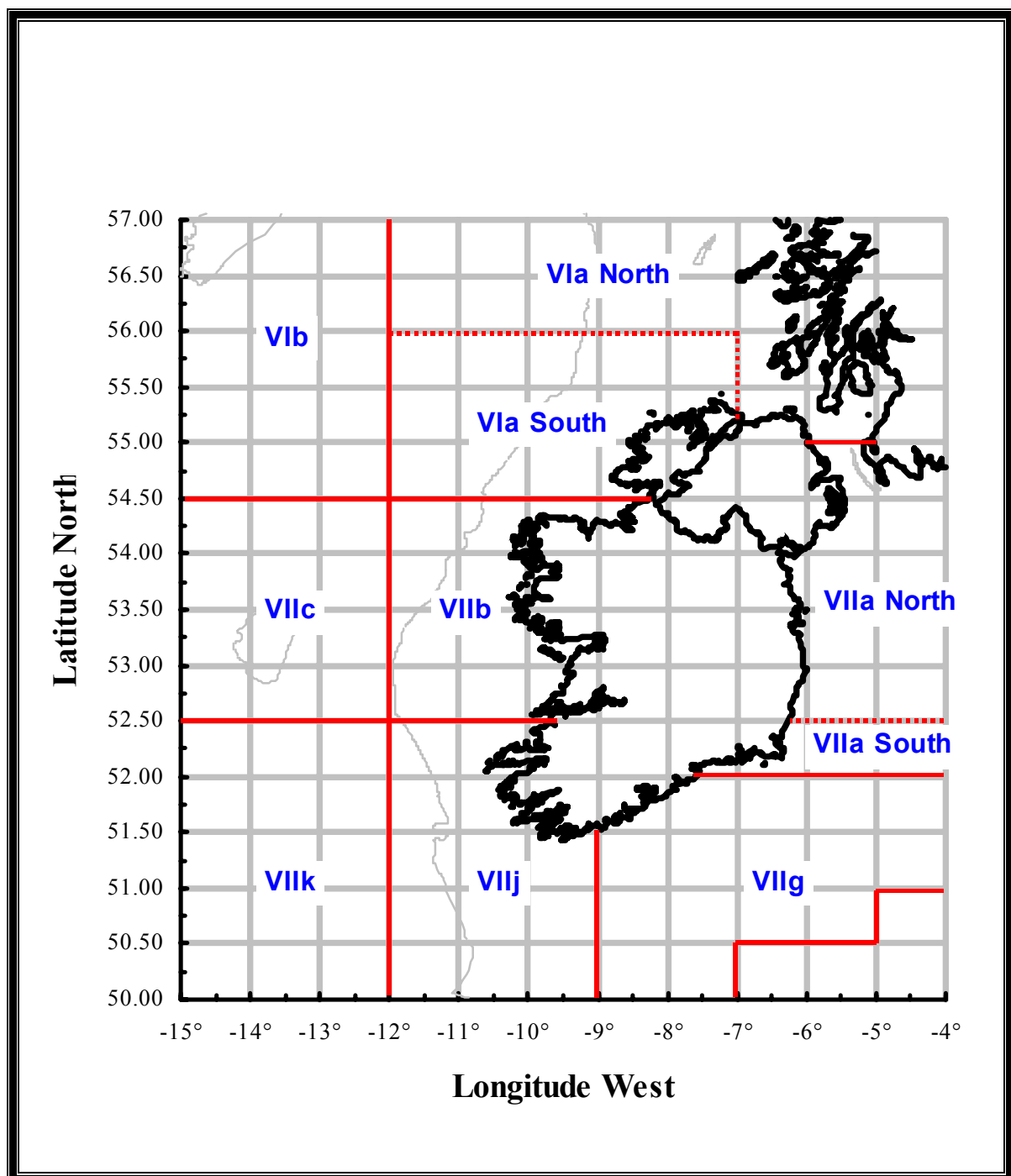
Appendix I

Nephrops Functional Units (FUs) and Management Units (MUs)



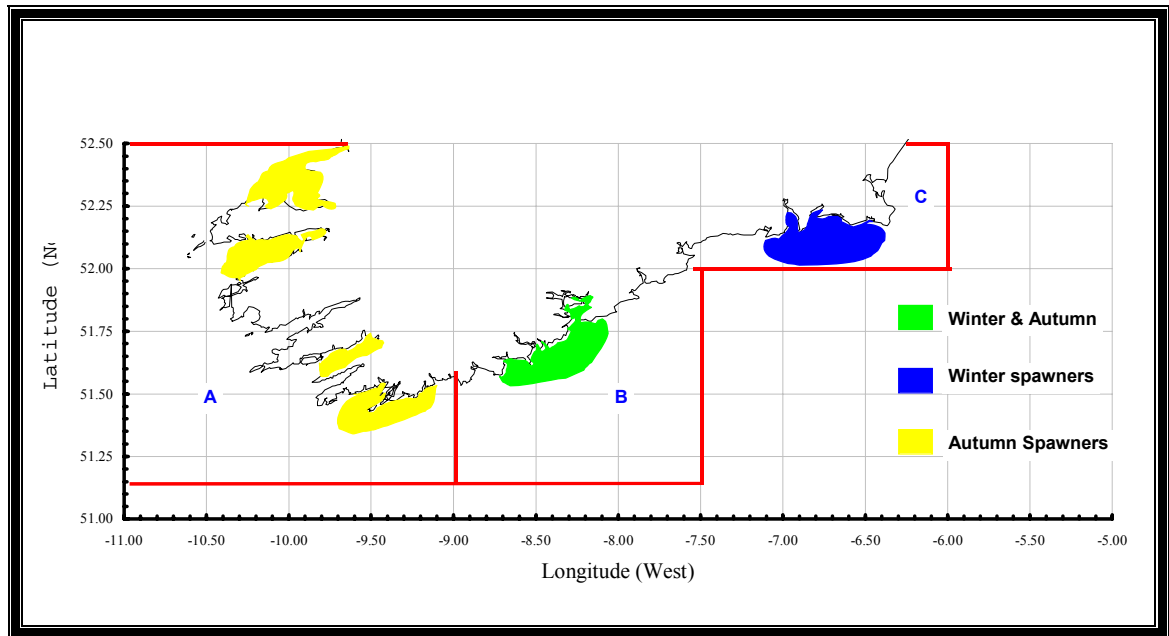
Appendix II

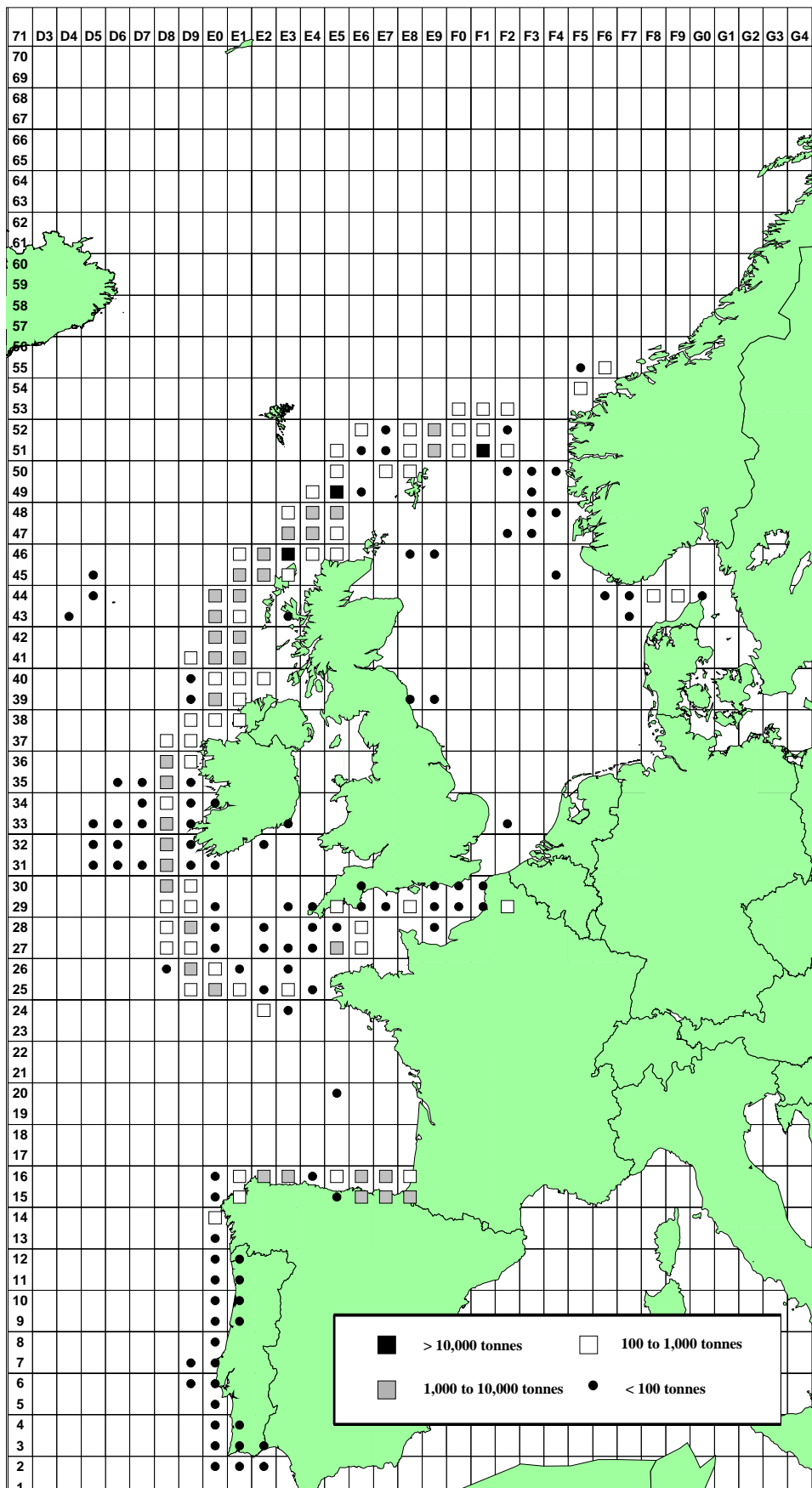
Herring Management Units around the Irish Coast



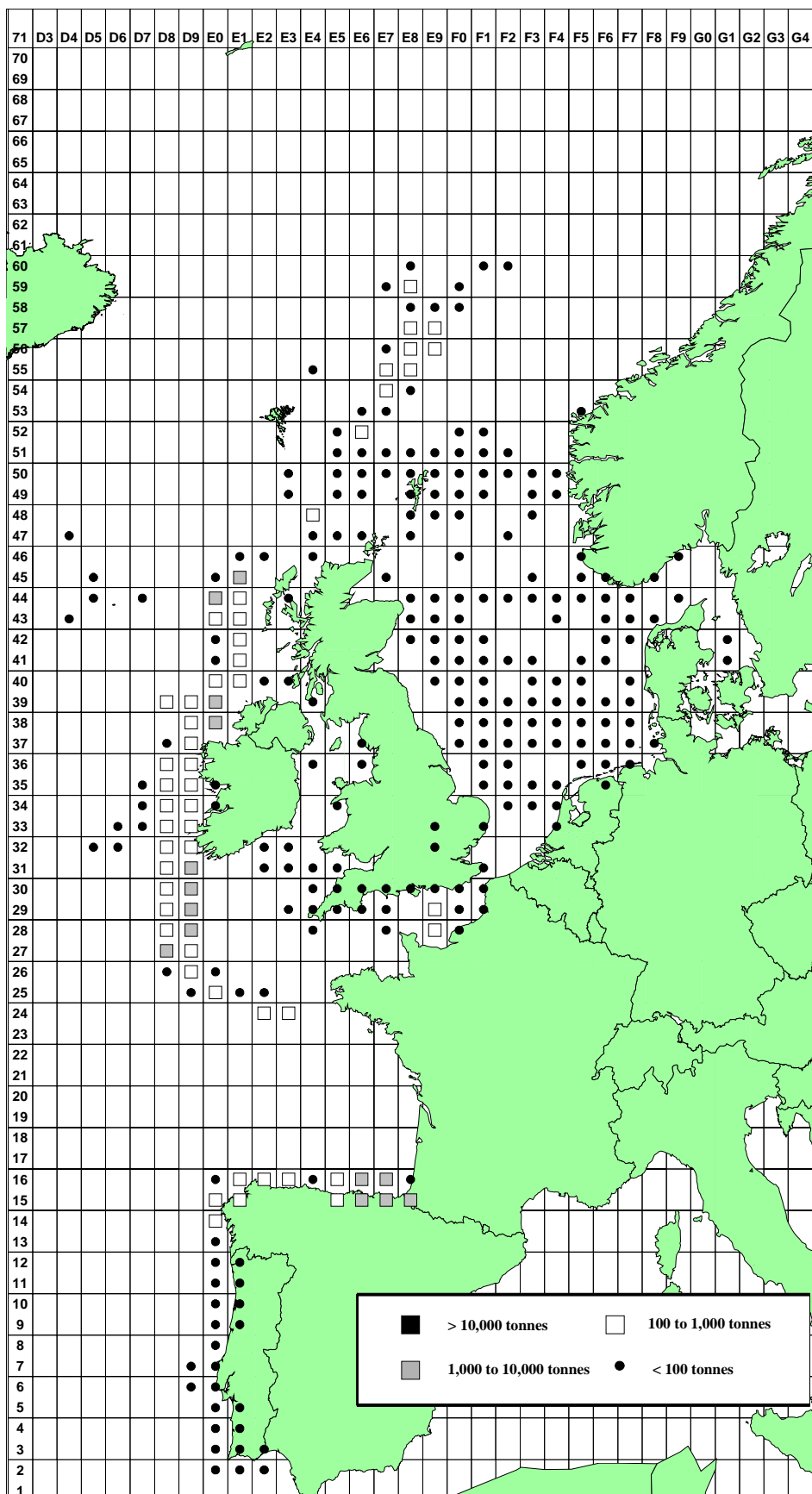
Appendix III

Herring Spawning boxes off the South coast.

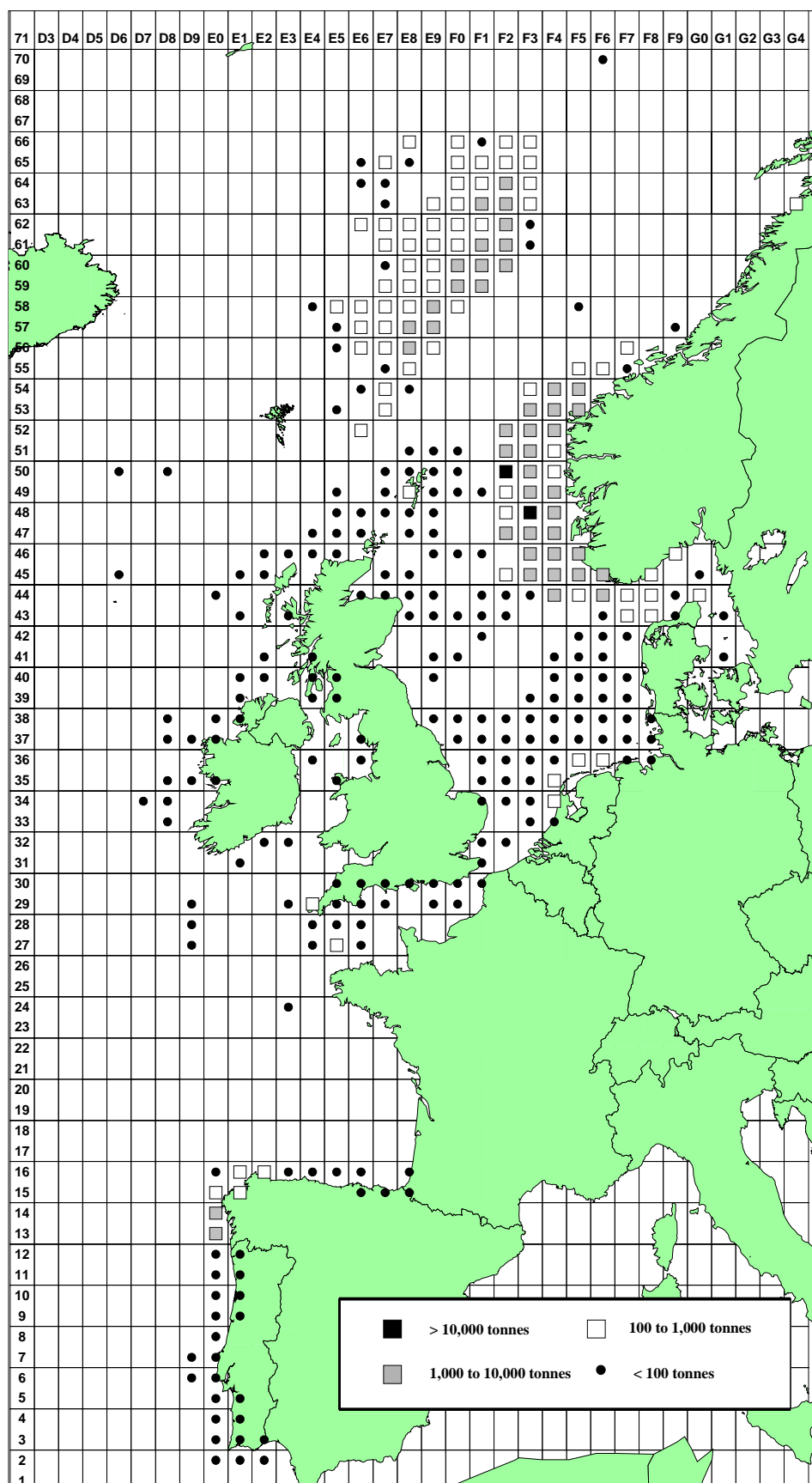




Appendix IV Mackerel commercial catches in Quarter 1 1999

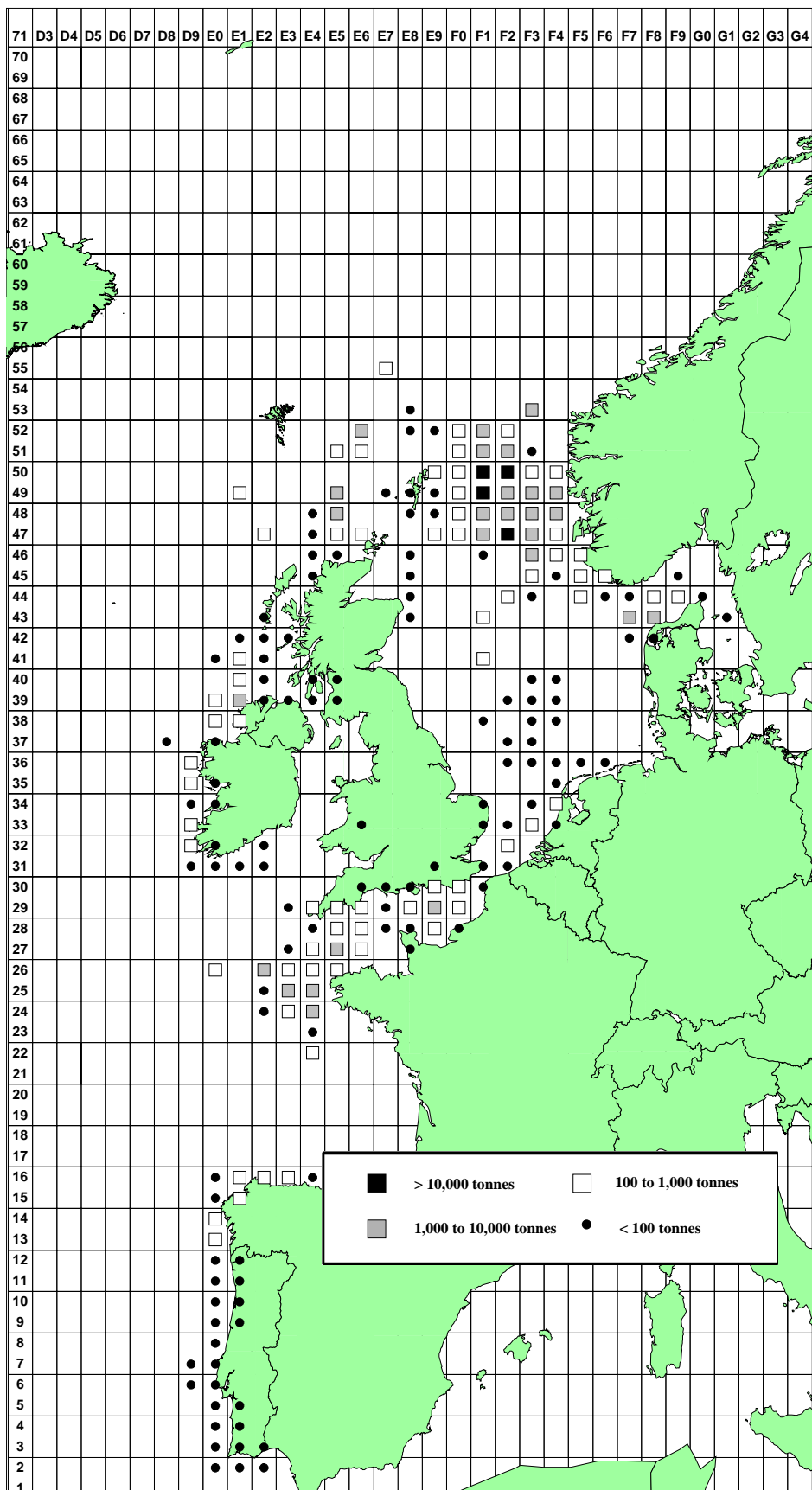


Appendix IV Mackerel commercial catches in Quarter 2 1999

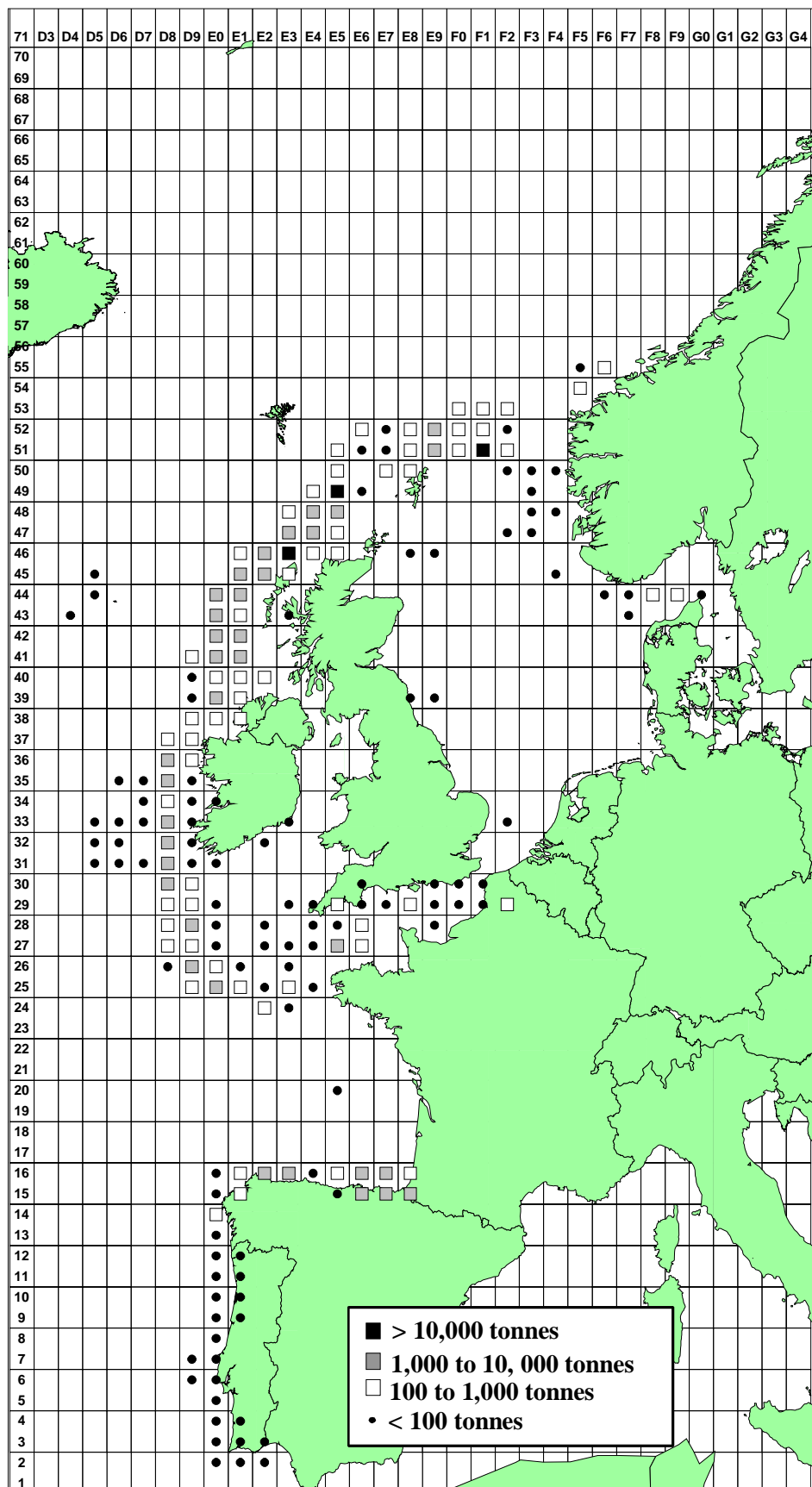


Appendix IV

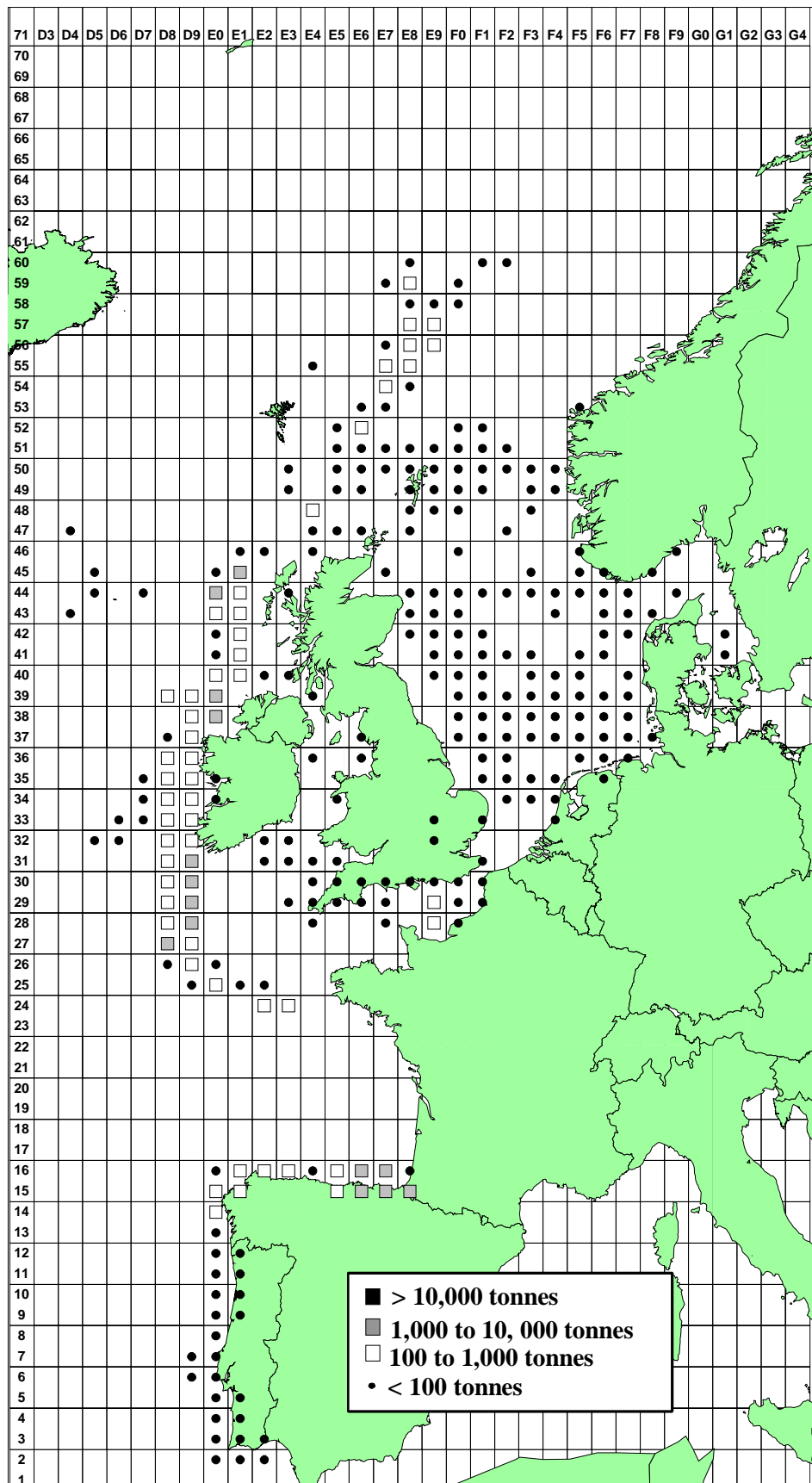
Mackerel commercial catches in Quarter 3 1999

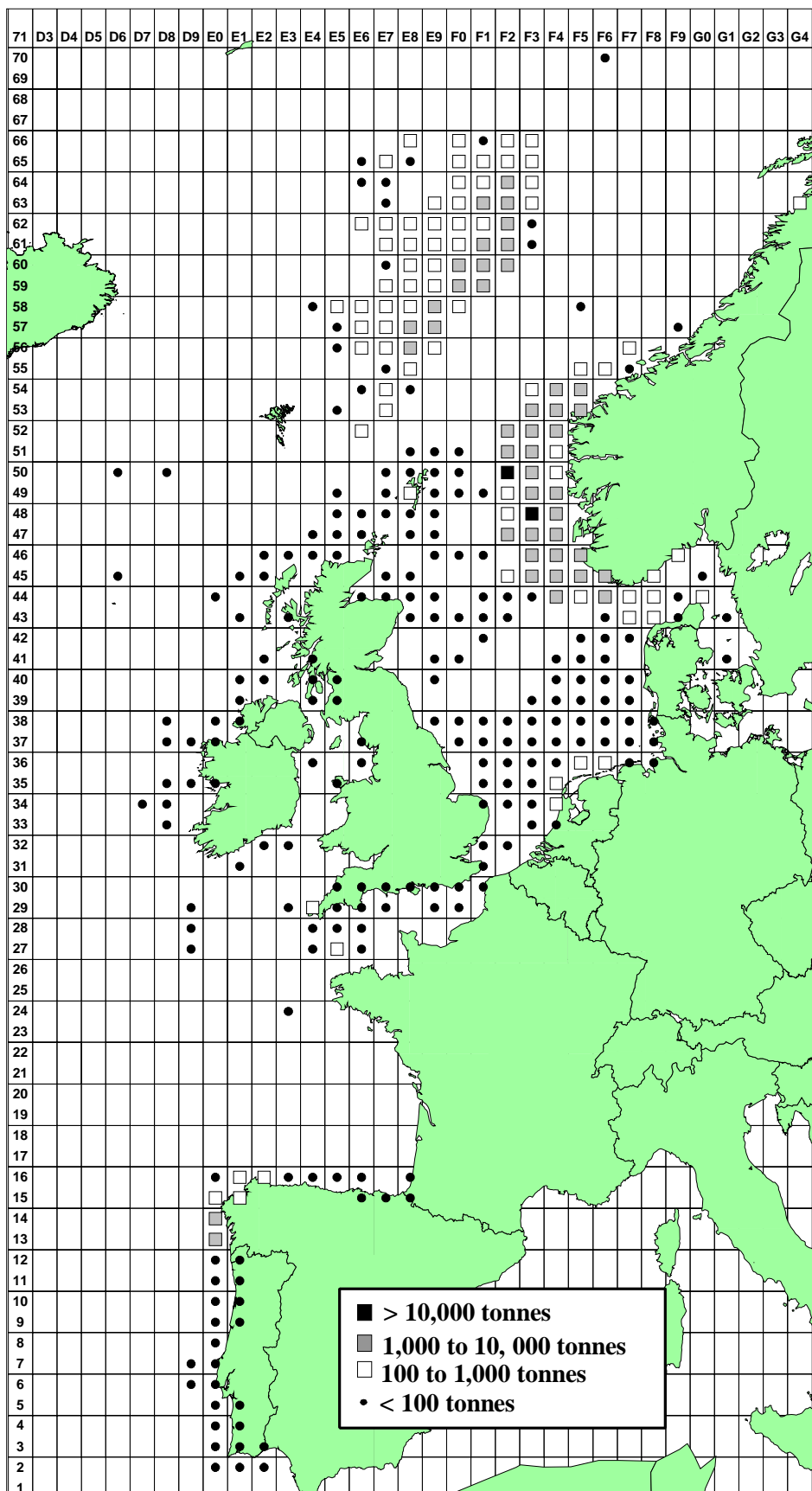


Appendix IV Mackerel commercial catches in Quarter 4 1999

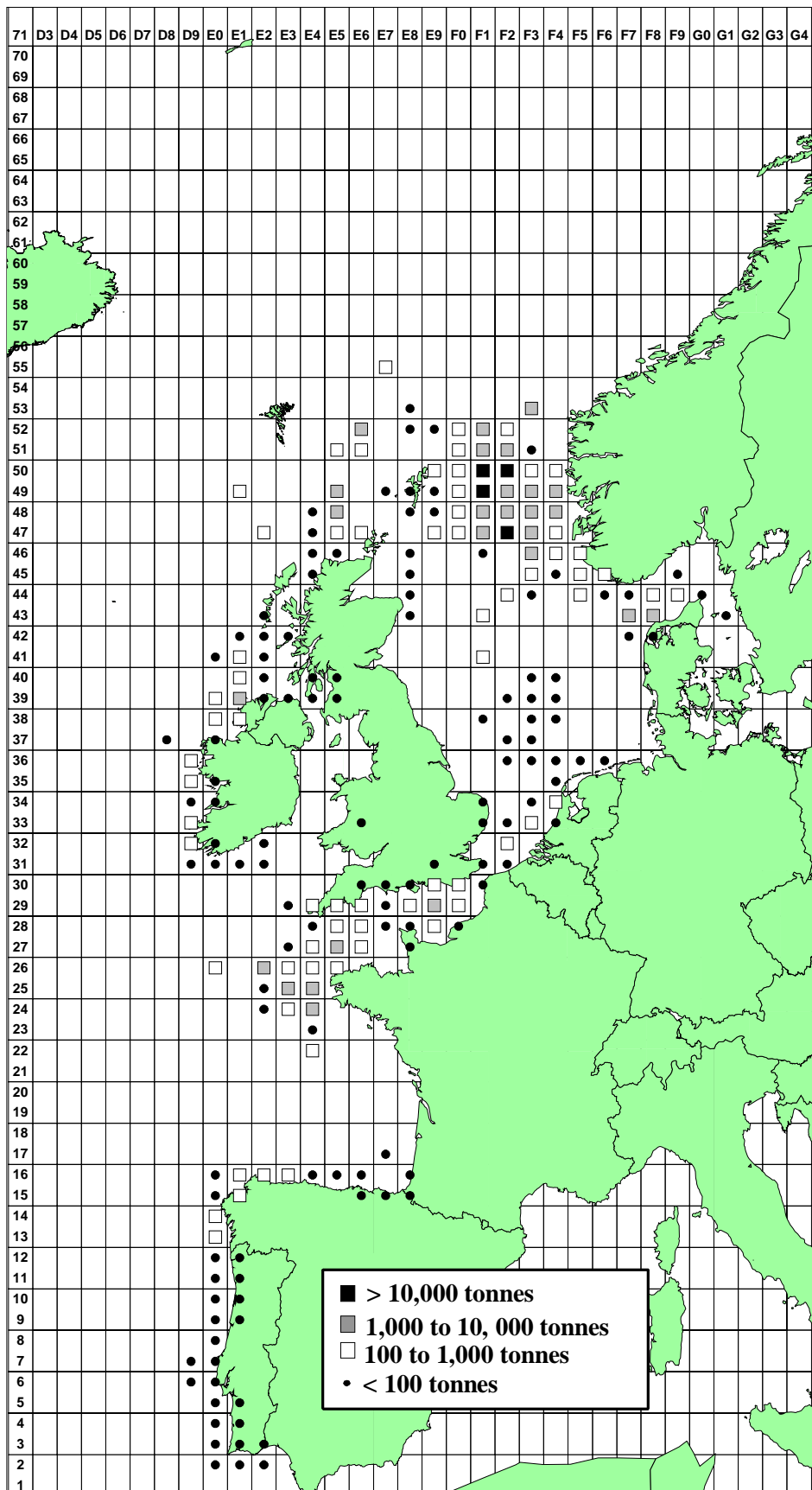


Appendix V Horse Mackerel commercial catches in quarter 1 - 1999





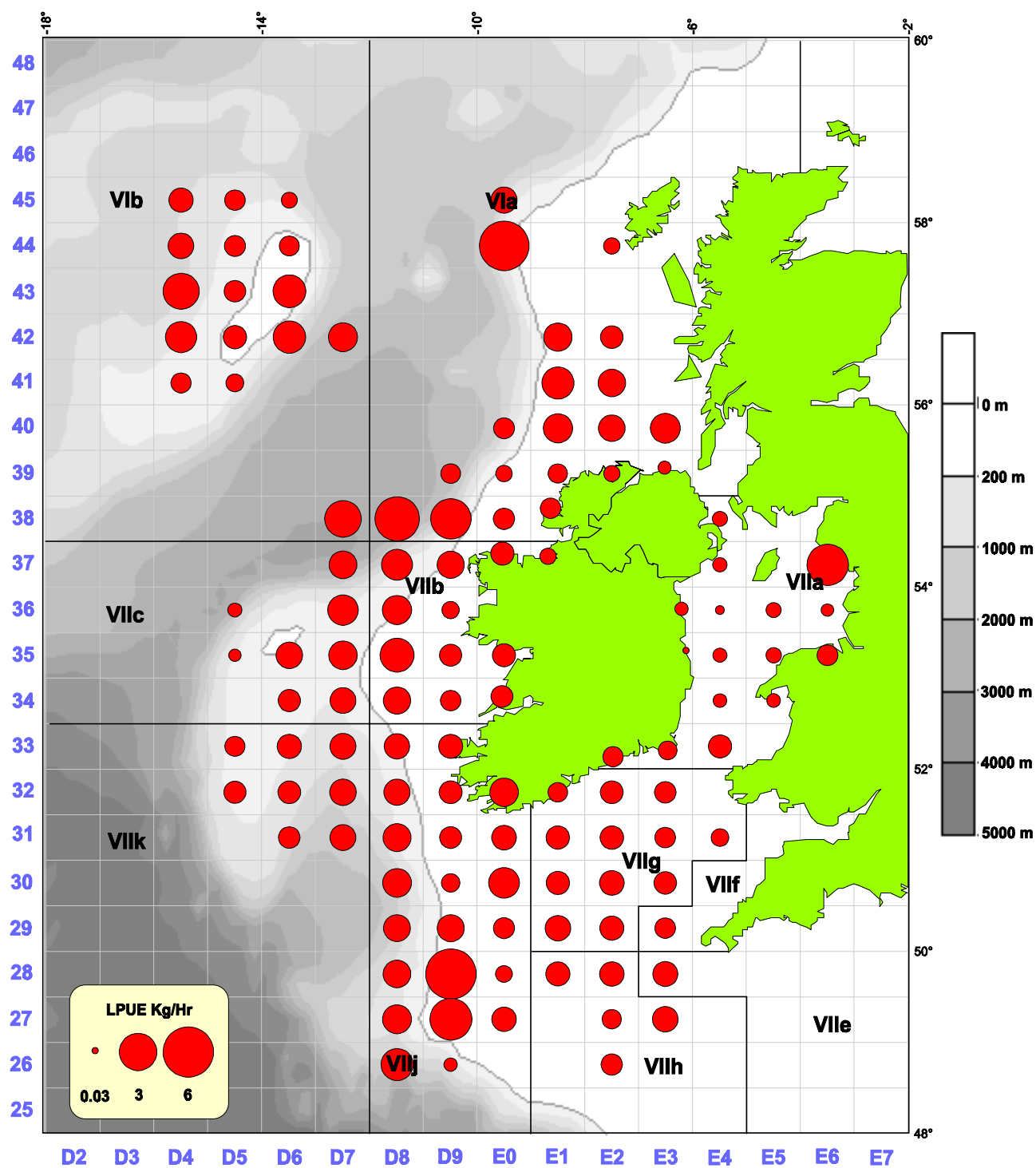
Appendix V Horse Mackerel commercial catches in quarter 3 - 1999



Appendix V Horse Mackerel commercial catches in quarter 4 - 1999

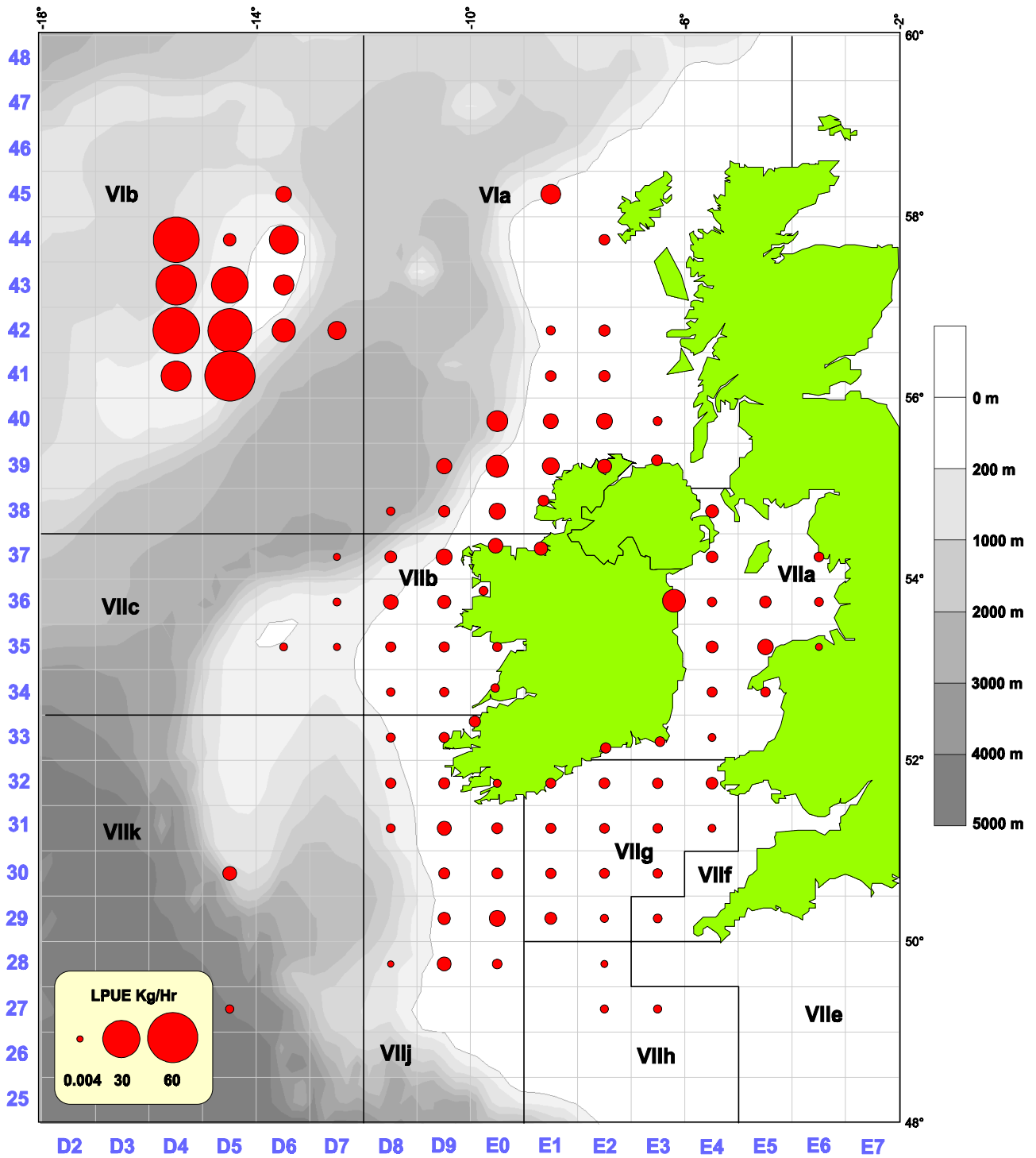
Appendix VI

Cod Annual LPUE for Irish Fleets in 1999



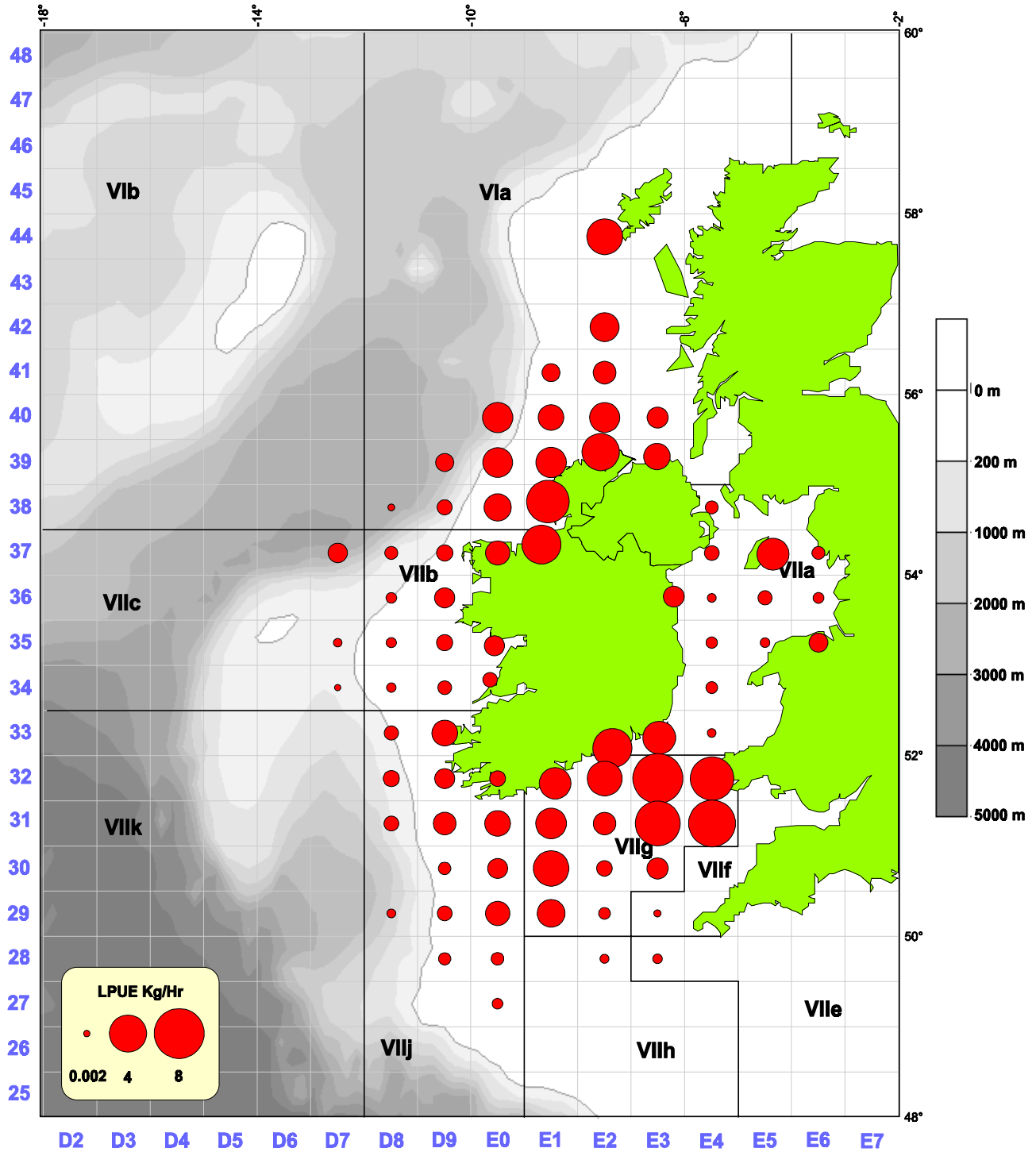
Appendix VI

Haddock Annual LPUE for Irish Fleets in 1999



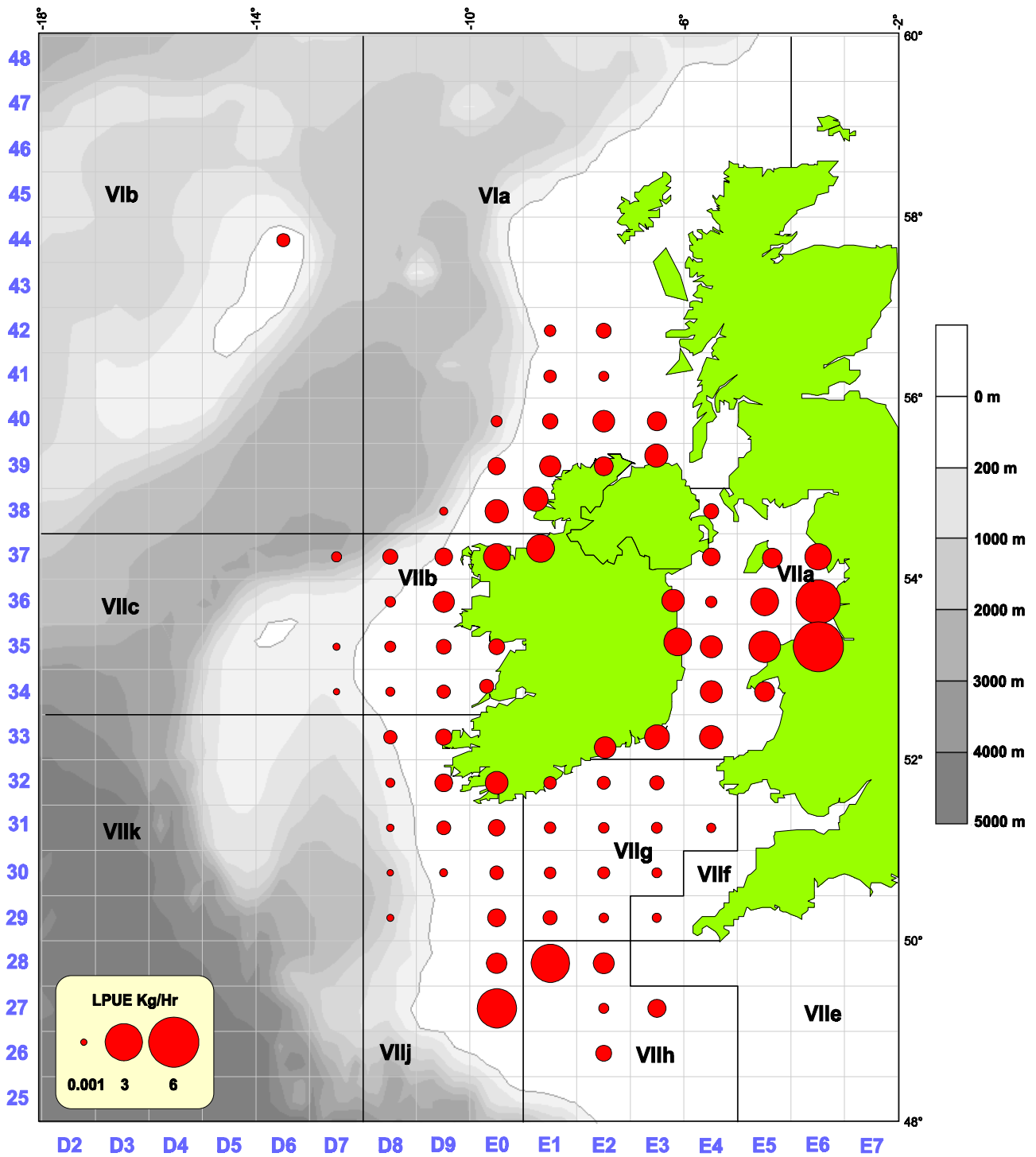
Appendix VI

Whiting Annual LPUE for Irish Fleets in 1999



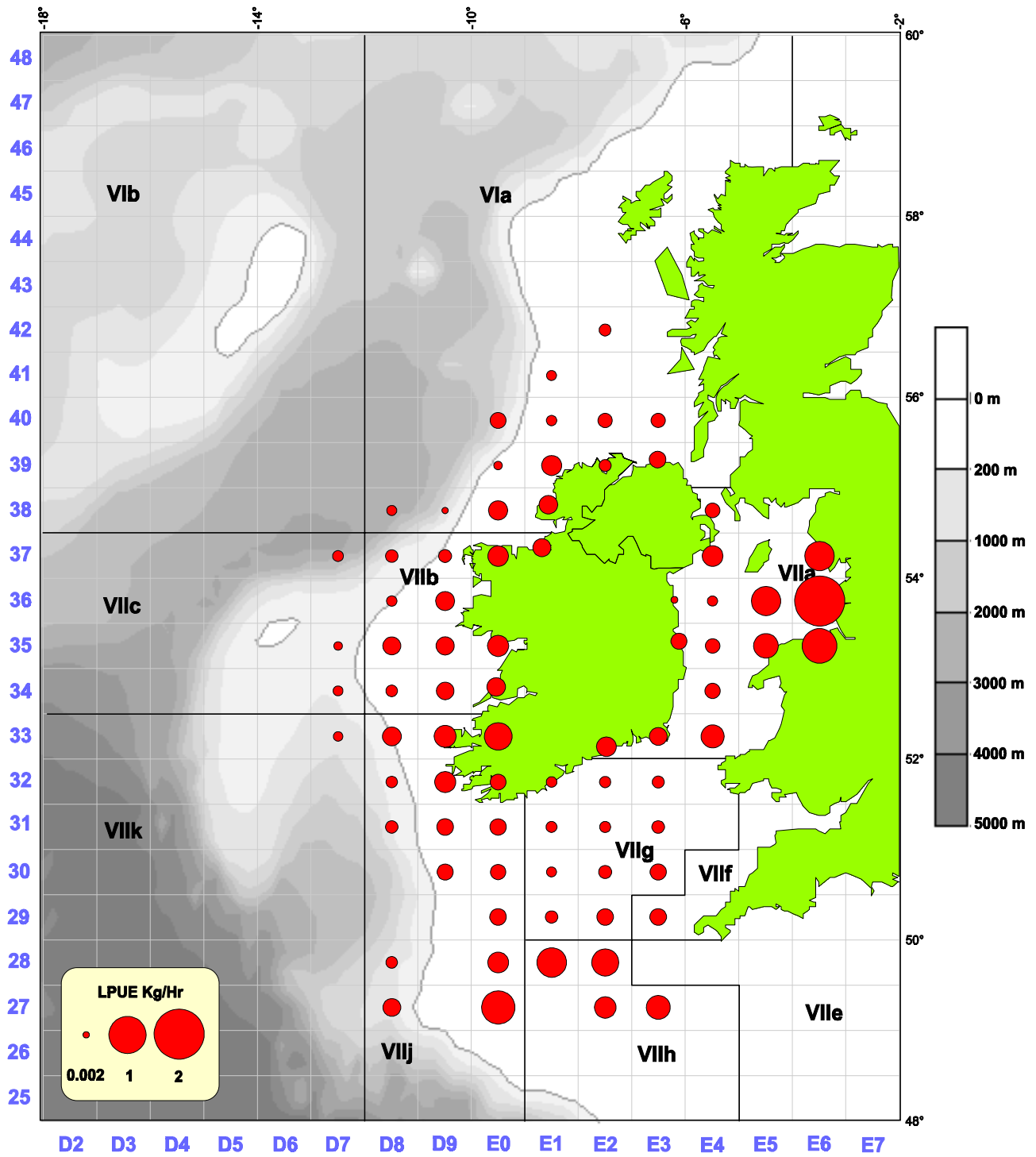
Appendix VI

Plaice Annual LPUE for Irish Fleets in 1999



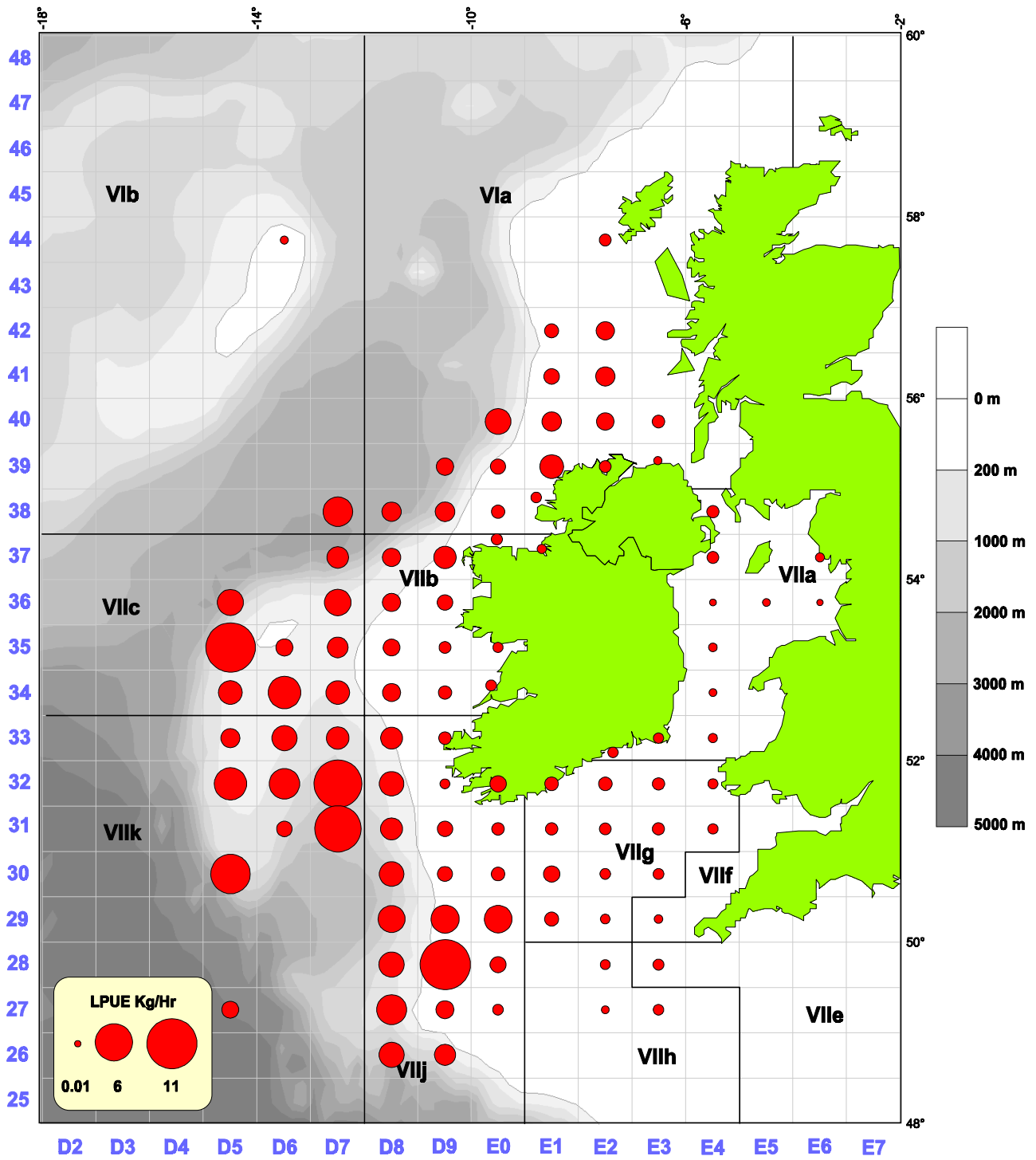
Appendix VI

Sole Annual LPUE for Irish Fleets in 1999



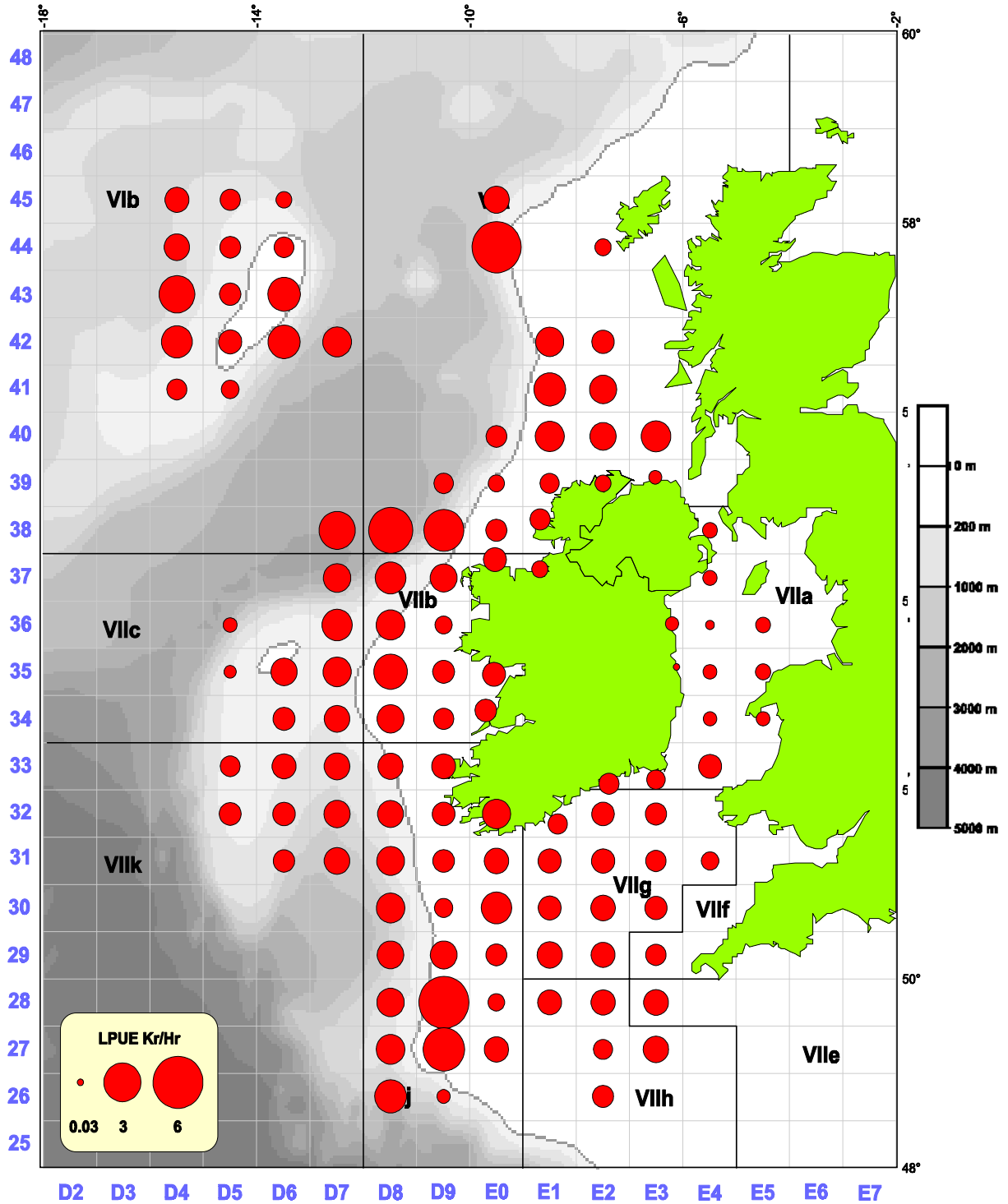
Appendix VI

Hake Annual LPUE for Irish Fleets in 1999



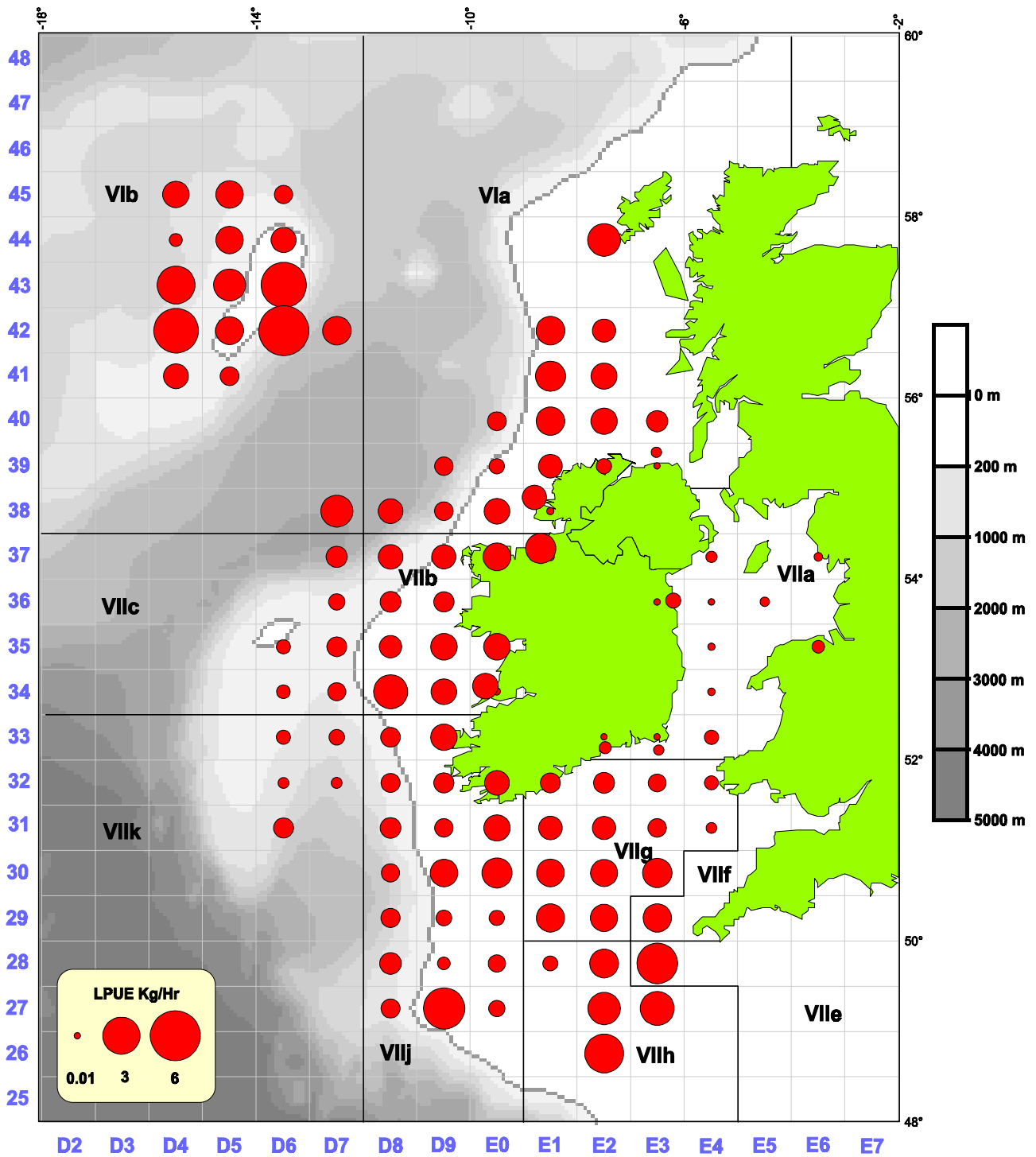
Appendix VI

Anglerfish Annual LPUE for Irish Fleets in 1999



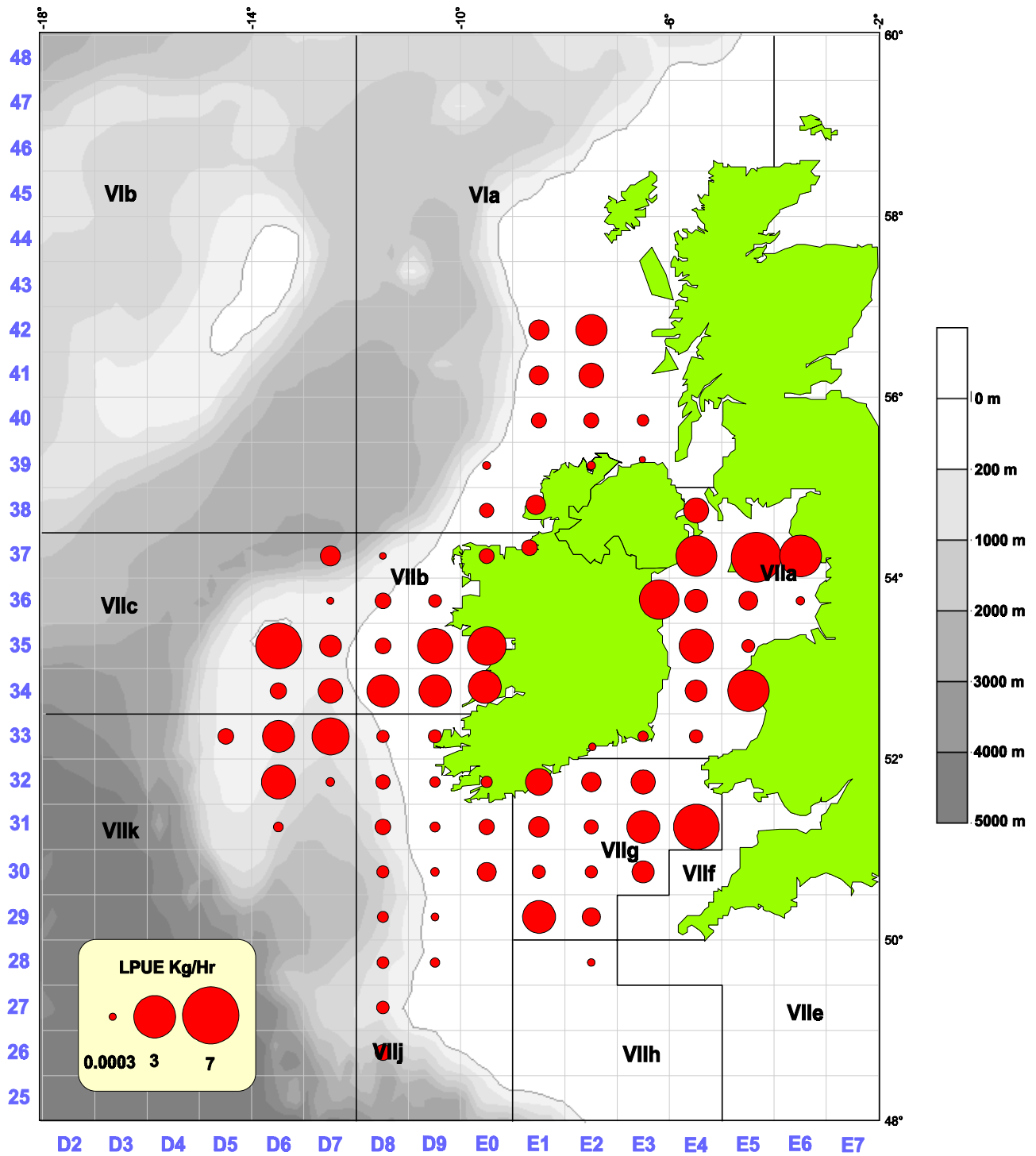
Appendix VI

Megrim Annual LPUE for Irish Fleets in 1999



Appendix VI

Nephrops Annual LPUE for Irish Fleets in 1999



Appendix VII

EU Member States shares of the 2000 TAC's

EU Member States' shares of 2000 TAC's
Summary and analysis of ICES areas

SUMMARY tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	not alloc.	Total tonnes
COD	4,862	3,400	57,680	27,277	20,540	8,625	49,042	8,840	3,585	26,533	1,573	342	212,299
SAITHE	2,355	100	3,520	11,930	29,611	140	11,664			1360			60,680
HADDOCK	6,132	574	4,505	1,881	13,710	250	71,998			1290			100,340
HAKE	1,300	250	2,020	100	22,330	200	4,510	17,240	2,540	100			50,590
HERRING	48,210	7,568	133,819	108,230	27,561	69,586	96,953	120	120	167,576	96,628		756,371
MACKEREL	70,270	530	31,205	21,630	15,920	32,410	194,780	32,330	6,680	4,930			410,685
PLAICE	3,155	7,290	32,750	5,810	5,775	38,280	31,390	120	120	950			125,640
WHITING	9,035	615	2,965	455	20,585	1,095	25,675	2,800	2,640	335			66,200
SPRAT		2,590	280,060	26,994	3,370	3,370	14,650			100,913	18,573		450,520
SOLE	700	4,355	1,640	1,510	8,350	17,290	2,835	770	1,245	30			38,725
MONKFISH	2,540	3040	1380	1240	22,870	1030	20,970	7,810	1,130	20			62,030
MEGRIMS	3,600	490	10	10	9,870	40	6,970	11,700	150				32,840
NEPHROPS	7,920	900	4,575	25	9,435	465	34,085	2,695	1,125	1,315			62,540
POLLACK	1,450	530			14,950		3,360	1,640	20				21,950
BL.WHITING	26,080		65,920	37,620	29,409	41,115	57,341	75,730	14,130	155		3,000	350,500
HORSE MACK.	56,960	80	54,770	19,430	11,690	86,070	27,810	59,660	33,180	750			350,400

SUMMARY %	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	not alloc.	Total%
COD	2.29	1.60	27.17	12.85	9.68	4.06	23.10	4.16	1.69	12.50	0.74	0.16	100.00
SAITHE	3.88	0.16	5.80	19.66	48.80	0.23	19.22			2.24			100.00
HADDOCK	6.11	0.57	4.49	1.87	13.66	0.25	71.75			1.29			100.00
HAKE	2.57	0.49	3.99	0.20	44.14	0.40	8.91	34.08	5.02	0.20			100.00
HERRING	6.37	1.00	17.69	14.31	3.64	9.20	12.82	0.02	0.02	22.16	12.78		100.00
MACKEREL	17.11	0.13	7.60	5.27	3.88	7.89	47.43	7.87	1.63	1.20			100.00
PLAICE	2.51	5.80	26.07	4.62	4.60	30.47	24.98	0.10	0.10	0.76			100.00
WHITING	13.65	0.93	4.48	0.69	31.10	1.65	38.78	4.23	3.99	0.51			100.00
SPRAT		0.57	62.16	5.99	0.75	0.75	3.25			22.40	4.12		100.00
SOLE	1.81	11.25	4.23	3.90	21.56	44.65	7.32	1.99	3.21	0.08			100.00
MONKFISH	4.09	4.90	2.22	2.00	36.87	1.66	33.81	12.59	1.82	0.03			100.00
MEGRIMS	10.96	1.49	0.03	0.03	30.05	0.12	21.22	35.63	0.46				100.00
NEPHROPS	12.66	1.44	7.32	0.04	15.09	0.74	54.50	4.31	1.80	2.10			100.00
POLLACK	6.61	2.41			68.11		15.31	7.47	0.09				100.00
BL.WHITING	7.44		18.81	10.73	8.39	11.73	16.36	21.61	4.03	0.04		0.86	100.00
HORSE MACK.	16.26	0.02	15.63	5.55	3.34	24.56	7.94	17.03	9.47	0.21			100.00

Appendix VII

EU Member States shares of the 2000 TAC's

COD	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
I,II *	16,150	1.50%			12.08%	11.08%		46.85%	13.49%	13.49%			1.50%
Vb,VI,XII,XIV	7,480	**21.46%	0.27%		2.67%	28.41%		47.19%					
VIIa	2,100	65.95%	1.43%			3.57%	0.24%	28.81%					
VIIb-k,VIII,IX,X	16,000	10.19%	4.44%			76.44%	0.63%	8.31%					
* Norwegian & Greenland waters.													
** of which, no more than 1,590t may be fished in Vb, VIa.													

HADDOCK	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	19,000	*9.11%	0.21%		0.26%	10.89%		79.53%					
VII,VIII,IX,X	13,200	22.20%	1.14%			66.67%		10.00%					
ad hoc VIIa	3,400	43.29%	1.59%			7.21%		47.91%					
* of which, no more than 1,590t may be fished in Vb, VIa.													

HAKE	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,VII,XII,XIV	23,600	5.51%	0.93%			45.51%	0.59%	17.97%	29.49%				

HERRING	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
I,II (Atlanto-Scandic)	108,600	9.02%	0.04%	34.88%	6.10%	1.50%	12.48%	22.29%	0.11%	0.11%	12.92%	0.54%	
Vb,VIaN,VIb	41,340	15.09%			11.18%	2.10%	11.18%	60.45%					
VIaS,VIbC	13,900	90.94%					9.06%						
VIIa	5,350	25.98%						74.02%					
VIIghjk	21,000	86.38%			1.10%	6.19%	6.19%	0.14%					

MACKEREL	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
b,VI,VII,VIIIabde,XII,XI	329,410	*21.33%			6.40%	4.27%	9.33%	58.66%	0.01%				
* of which, 22,400t may be found from 1 January to 15 February & 1 October to 31 December 2000 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	2,400	36.67%				2.92%		60.42%					
VIIa	2,400	56.88%	3.54%			1.46%	1.25%	36.88%					
VIIbC	300	80.00%				20.00%							
VIIfg	800	10.00%	24.38%			42.50%		23.13%					
VIIhjk	1,350	43.70%	5.93%			12.59%	25.19%	12.59%					

SOLE	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	155	80.65%						19.35%					
VIIa	1,080	12.04%	49.54%			0.46%	15.74%	22.22%					
VIIbC	100	85.00%				15.00%							
VIIfg	1,160	3.02%	62.50%			6.47%		28.02%					
VIIhjk	720	45.14%	8.33%			16.67%	13.19%	16.67%					

WHITING	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	4,300	29.07%			0.35%	6.05%		64.53%					
VIIa	2,640	57.77%	0.19%			3.41%		38.64%					
VIIb-k	22,500	27.82%	0.98%			60.00%	0.49%	10.71%					

Appendix VII

EU Member States shares of the 2000 TAC's

SAITHE	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	7,000	5.64%			4.57%	45.79%		44.00%					
VII,VIII,IX,X	6,500	30.15%	0.31%			54.62%		14.92%					

HORSE MACK.	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
IIa,IV	49,400	3.95%	0.16%	68.08%	5.12%	0.10%	11.03%	10.04%			1.52%		
VI,VII,VIIIabde,XII,X	233,000	23.61%		9.07%	7.25%	4.79%	34.60%	9.81%	9.91%	0.96%			

MONKFISH	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	8,000	10.00%	3.63%		4.13%	44.13%	3.50%	30.75%	3.88%				
VII	23,000	7.57%	9.26%		1.04%	59.26%	1.22%	18.00%	3.65%				

MEGRIMS	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	4,840	13.02%				44.21%		31.40%	11.36%				
VII	17,920	16.57%	2.68%			36.38%		14.34%	30.02%				

NEPHROPS	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI	12,600	1.35%				0.79%		97.66%	0.20%				
VII	21,000	36.90%				24.31%		32.79%	6.00%				

POLLACK	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb,VI,XII,XIV	1,100	13.64%				48.18%		36.36%	1.82%				
VII	17,000	7.65%	3.12%			71.65%		17.41%	0.18%				

BL.WHITING	Total tonnes	IRE	BEL	DEN	GER	FRA	HOL	UK	SPA	POR	SWE	FIN	Not alloc.
Vb, VI, VII, XII, XIV	163,000	16.00%		2.07%	8.00%	11.13%	25.13%	23.33%	13.33%	1.00%			

Stocks in the West of Ireland (Divisions VIIb,c,h–k)

Fleet and Fisheries

The fishery in Divisions VIIb,c is mainly a trawl fishery although some gill netting is carried out. The fishery in Divisions VIIh–k is also a trawl fishery but gill netting is increasing in importance in the area. These are mixed fisheries for cod, whiting, hake, sole and plaice; and cod and whiting are taken as by-catch in the *Nephrops* fishery. In recent years, there has been an increase in the number of seiners operating in the Irish fleet in Division VIIg,j targeting whiting.

Landing figures for these ICES Divisions are difficult to interpret as several countries differ in the manner in which they report their landings data for the various ICES Divisions.

Other species taken in the area are herring, mackerel and blue whiting (See Sections 3.10.3, 3.9.9, 3.12.3 and 3.12.5).

Management Measures

There are single cod and whiting TACs covering the whole of Divisions VIIb–k so that assessment areas do not correspond to management areas. In 1997, the assessment areas for Celtic Sea cod and whiting were extended to include Divisions VIIj,k. The assessment areas now covers Divisions VIIe–k.

State of the Stocks

In 1999 further exploratory assessments, using swept areas, surplus production and VPA, were used to estimate biomass. Exploitation levels were also studied using catch curves, yield per recruit and VPA.

These groups of fish may be only components of larger stock complexes. The fishing mortality rates were compared with those in adjacent areas but it is still not clear if these stocks should be assessed with the stocks in the Celtic Sea or with the stocks off the West of Scotland.

Stock monitoring programmes and annual groundfish and young fish surveys are in place and will eventually permit more elaborate assessments. There is a directed fishery for hake mainly in Divisions VIIh–k and an overview of hake is provided in Section 3.12.2.

Anglerfish and megrim are important species in this area but are assessed for Sub-areas VII and VIII. An overview is provided in Sections 3.9.11 and 3.9.12.

Nephrops fisheries take place in Functional units 16–19 (see Section 3.10.4 in the 1999 ACFM report). Catch per unit of effort has been stable and has fluctuated without trend over recent years. There is a TAC for all of Sub-area VII. There is an overview of *Nephrops* stocks in Section 2.5 in the 1999 ACFM report.

Stocks in Sub-area VI

Fisheries

To a large extent, the roundfish fishery in Division VIa is an extension of the similar fishery in the North Sea. The demersal fisheries in Division VIa are predominantly conducted by otter-trawlers fishing for cod, haddock, anglerfish and whiting, with by-catches of saithe, megrim and lemon sole. These trawlers use mesh sizes of 80–100 mm depending on area and may at times discard considerable amounts of young haddock and whiting. The majority of these vessels are locally-based Scottish trawlers using 'light-trawls', but trawlers from Ireland, Northern Ireland, England, France and Germany also participate in this fishery. The importance of Scottish seiners essentially targeted at haddock has been declining in recent years as many of these vessels have been converted to trawlers. A part of the fleet of light trawlers has diversified into a fishery for anglerfish which has been expanding into deeper water off the northern coast of Scotland. By-catches in this fishery include megrim and cod.

The larger Scottish trawlers and Irish trawlers fish for haddock at Rockall when opportunities arise for good catches from the Division VIb stock. Although young saithe are caught by coastal trawlers, the fishery for saithe essentially takes place on the shelf edge to the west and north-west of Scotland. Traditionally, this fishery has largely been operated by the larger deep-sea French trawlers. However, the number of these vessels has declined in recent years. Since the late 1980s, some of these vessels diverted their activity toward deep-sea species, notably orange roughy, and some medium-sized trawlers also participate in the fishery for deep-sea species during summer in some years.

Some 200 Scottish trawlers also take part in fisheries for *Nephrops* on inshore grounds. Some use 70 mm mesh with 80 mm square mesh panel, but others use 100 mm mesh to avoid the by-catch limitations associated with the smaller mesh size. These boats also land small quantities of haddock, cod, whiting and small saithe, but discard large amounts of whiting and haddock.

The pelagic fishery for herring is mainly operated by UK vessels in the north, and by Irish vessels in a roe fishery in the south. Substantial misreporting of catches from the North Sea and between the northern and southern stocks occurred in the past, but UK licensing regulations are thought to have reduced misreporting since 1997. The Clyde herring fishery has declined sharply in recent years

as the stock has suffered from a series of low recruitments. Recent TACs have not been taken and the catches have been less than 1 000 t since 1991.

There is a directed trawl fishery for mackerel and horse mackerel in the area. The mackerel fishery mainly takes place in the fourth and first quarter of the year, when the mackerel is returning from the feeding area to the spawning area. The horse mackerel is mainly fished in the second half of the year. In addition, there are fisheries for blue whiting in the area.

The industrial fisheries in Division VIa are much smaller than in the North Sea. The Scottish sandeel fishery started in the early 1980s, peaking in 1986 and 1988. It is irregular, depending on the availability of the resource and of processing facilities at Shetland, Denmark and Faroe. By-catches in this fishery are very small. The Norway pout fishery is conducted mainly by Danish vessels.

State of stocks

Last year, ICES introduced a new definition of safe biological limits, with reference to precautionary biomass and fishing mortality reference points.

The assessments of demersal and herring stocks in Sub-area VI continued to be hampered by the poor quality of catch data due to misreporting, although this has become less of a problem for roundfish species in recent years. Quantities misreported during 1992–1995 were estimated for Division VIa cod, and estimates of area misreporting since 1987 were made for anglerfish and megrim. The distribution of reported catch data were also examined to estimate the likely extent of misreporting of herring between the North Sea and Division VIa North.

It is likely that the stocks of haddock, saithe, anglerfish and megrim in Division VIa are closely related to those of the same species in the North Sea. The saithe stock is now assessed as part of the North Sea stock, and the pattern of haddock recruitment in the two areas is very similar.

Apart from haddock, all roundfish stocks in Sub-area VI are considered to be outside safe biological limits and ICES advice points to the need of reducing fishing mortality in the relevant fisheries.

The stock of cod in 1999 remains close to its lowest recorded spawning stock level. It is considered to be outside

safe biological limits and subject to a rate of fishing mortality that is not sustainable in the longer term.

The haddock spawning stock in Division VIa remained in 1999 at about double the low values recorded in 1991, and was thus above B_{pa} . Fishing mortality on this stock has decreased in recent years, and is now below F_{pa} . The spawning biomass in Division VIb in 1999 was slightly below the proposed B_{pa} for this stock, and fishing mortality was in excess of F_{pa} .

This year's assessment of the whiting stock in Division VIa indicates that this stock is outside safe biological limits, with spawning biomass in 1999 below B_{pa} , and fishing mortality above F_{pa} .

Concerns that catch-rates of megrim and anglerfish are being sustained by continual expansion into new areas mean that assessments of these species are not considered sufficiently reliable to be used as the basis of advice. However, there are indications that fishing mortality on anglerfish may not be sustainable in the long term. The fish are exploited at an early age due to their size and shape, and are subject to considerable fishing mortality prior to first maturity. Adult anglerfish which previously found a refuge in deep water are now being exploited in a directed fishery. The expansion of this fishery has been further accelerated by diversion of fishing effort from other stocks subject to more restrictive quotas in recent years and by market opportunities. Fishing mortality on megrim appears to be sustainable. However, this may not remain the case if the fishery expands further into deeper water.

The assessment of the stock of herring in Division VIa North has been impossible due to low precision in the data on catches, acoustic surveys and larvae surveys. The state of the stock is uncertain and it has not been possible to assess the status of this stock with respect to safe biological limits. The catches from this stock have been stable since

1991., after correction of landings for misreporting, indicates that, following a period of light exploitation, catches and fishing mortality have increased abruptly in 1997. The spawning stock increased progressively during the 1980s and stabilized in the 1990s, but is likely to decline under current rate of exploitation. The state of the herring stock in Division VIa South is more also uncertain, and the fishery appears to be dependent on occasional strong year classes. There are indications that this stock may have declined considerably in recent years, and that levels of fishing mortality may be comparatively high. There is evidence that the Clyde herring stock remains very low.

When last assessed (in 1996) the level of exploitation on sandeel was moderate and the SSB of this stock appears to be high. The stock is, however, subject to large variations depending on recruitment. Precautionary management has been put in place on a three-year basis, including a TAC and fishery closures after 31 July each year, in order to reduce the interaction with breeding seabirds.

The fisheries for mackerel and horse mackerel exploit the southern and western components of mackerel and the western horse mackerel stock. These stocks seasonally. These widely distributed stocks are presented in Section 3.12.4. The mackerel stock is considered to be harvested outside safe biological limits: the spawning biomass is close to above B_{pa} , but fishing mortality exceeds the proposed F_{pa} . Following the outstanding 1982 year class, which still contributes a large part of the catches, recruitment of horse mackerel has been weak. SSB is bound to decline as this year class is fished out at the current high exploitation rate.

The *Nephrops* stocks are now assessed every two years. The overall catches of *Nephrops* from Division VIa North have remained stable since the mid 1980s, and catch-rates of the different stocks have fluctuated without trend.

Stocks in the Irish Sea (Division VIIa)

Fisheries

The roundfish fisheries in the Irish Sea are conducted primarily by vessels from the bordering countries (UK and Ireland). The majority of vessels are otter-trawlers fishing for cod, whiting and plaice, with by-catches of haddock, anglerfish, hake and sole. The mesh size is 80 mm and 80 mm square mesh panels have been mandatory for UK otter-trawlers since 1993, and for Irish trawlers since 1994. The number of Irish vessels operating in this region has declined in recent years. Fishing effort in the England and Wales fleet of vessels longer than 12.2 m declined rapidly after 1989, and over 1992–1995 was about 40% of the effort reported in the 1980s, although it has increased again in recent years. Since the early 1980s there has been a development of semi-pelagic trawling for cod and whiting, predominantly by vessels from Northern Ireland. Some of these vessels switch between pelagic trawling and twin-trawl fishing for *Nephrops* depending on fishing opportunities and market demands.

Although some of the otter-trawlers also take part in the fishery for sole, there has been a growing number of beam-trawlers, particularly from southern England and from Belgium, exploiting this stock. The most important by-catches of this fleet are plaice, rays, brill, turbot and anglerfish. The fishing effort of the Belgium beam-trawl fleet varies according to the catch-rates of sole in the Irish Sea compared with other areas in which the fleet operates. Fishing effort peaked in the late 1980s following a series of strong year classes of sole, but is presently only about 60% of the peak value.

A fleet of vessels, primarily from Ireland and Northern Ireland, takes part in a targeted *Nephrops* fishery using 70 mm nets and 75 mm square-mesh panels. The larger vessels, including some which normally target roundfish, may use twin trawls with 80 mm mesh. Decommissioning has reduced the size of the Northern Ireland fleet in recent years. All boats take a considerable by-catch of whiting, much of which is discarded. Discards comprise mainly juveniles because the distribution of *Nephrops* coincides with the main nursery grounds for whiting. In this fishery as well as in the roundfish fishery in the western Irish Sea, the by-catch of haddock has increased substantially in recent years because of strong year classes in the 1990s.

The other gears employed to catch demersal species are gill-nets, notably by inshore boats targeting cod, bass, grey mullet, sole and plaice.

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

State of the Stocks

Last year, ICES introduced a new definition of safe biological limits, with reference to precautionary biomass and fishing mortality reference points.

The stock of cod is considered to be outside safe biological limits and at risk of collapse: The spawning biomass is below the proposed B_{pa} and is forecast to drop well below B_{lim} in the short-term. Fishing mortality exceeds F_{lim} . Fishing mortality on cod increased progressively throughout the 1980s. During the early 1990s, the spawning stock declined rapidly and is presently dominated by only a few age classes. As a consequence, it is sensitive to variations in recruitment and in 1995 reached a historical low following entry of the very weak 1992 year class. The forecast decline in the spawning stock is due to two successive very weak year classes.

The stock of whiting is also considered to be outside safe biological limits, both in terms of biomass and of fishing mortality. The Irish Sea whiting fishery has been characterised by high levels of fishing mortality throughout the 1980s and 1990s. At such high fishing mortalities, the spawning stock contains few age classes and is vulnerable to poor recruitment, and the stock has been in more or less continuous decline since the early 1980s.

A notable phenomenon in the Irish Sea, and also in the Celtic Sea, during the 1990s has been a substantial growth in the stock of haddock, particularly following the recruitment of above-average 1991 and 1993 year classes and a very strong 1994 year class. The 1996 year class is confirmed to be still stronger and will result in increased catches in the short term. The fish are confined mainly to the western Irish Sea where established roundfish and *Nephrops* fisheries take place. Due to the present TAC arrangements, some national quotas have proved limiting, causing substantial misreporting.

The stock of plaice is considered to be within safe biological limits. The landings declined in the 1990s, and in 1998 were close to the lowest recorded. This resulted from a combination of declining fishing effort and a succession of below-average year classes recruited since 1987. The

spawning stock has been below average throughout the decade. If fishing mortality remains below F_{pa} as at present, the stock is expected to increase and will have a low probability of falling outside safe biological limits in the medium-term.

The sole stock is considered to be outside safe biological limits. It has benefited several times since 1970 from very strong year classes, and as a consequence has sustained fishing mortalities that are considered high for a sole stock. The frequency of such year classes has decreased since the mid-1980s, leading to a decline in spawning stock to a historical low in 1996. However, recent recruitment has been above average so an increase in SSB in the short-term is likely.

The stocks of *Nephrops* in the Irish Sea are considered to be fully exploited. There is some concern that fishing mortality may rise from the current high level if the use of twin trawls expands. Account should also be taken of the impact of this fishery on the stocks of protected species. There has been no assessment in recent years of the effects on *Nephrops* of predation by cod, but the low abundance of the latter has probably reduced its impact.

The stock of Irish Sea herring is presently subject to low fishing mortality exerted by a small fleet of trawlers from Northern Ireland. The stock has recovered from the collapse which followed high fishing mortalities in the 1970s. However its present state is uncertain because the series of survey estimates remains too short to establish the recent trends in biomass.

Stocks in the Celtic Sea, Western Channel and northern parts of the Bay of Biscay

Fleets and fisheries

Most of the demersal fisheries in this area have a mixed catch. Although it is possible to associate specific target species with particular fleets, various quantities of cod, whiting, hake, anglerfish, megrim, sole, plaice and *Nephrops* are taken together, depending on gear type.

In the Celtic Sea and Western Channel, fisheries for demersal species, mainly cod, whiting, sole and plaice, are conducted by Belgium, France, Ireland and the UK. The principal gears used are otter trawls and beam trawls. The targeting of sole and plaice using beam trawls became prevalent during the mid-1970s, leading to an increase in the landings of these two species. The gradual replacement of otter trawls by beam trawls has occurred in the Belgian and UK fleets. In the Bay of Biscay there has been a substantial replacement of inshore trawling by gill-net fisheries targeting sole.

A trawl fishery for anglerfish by Spanish and French vessels developed in the Celtic Sea and Bay of Biscay in the 1970s and expanded until 1990. The fishery's catch includes a large component of juvenile fish, for which there is no minimum landing size. In addition, a gill net fishery has developed in the Celtic Sea in the last decade.

Nephrops are an important component of the fisheries in this area. These fisheries developed in the 1970s and 1980s and effort increased continuously until recent years. Landings increased initially as effort increased but these have tended to stabilise or decline at continuing high effort levels. The mesh size used when fishing for *Nephrops* can lead to a significant by-catch of juvenile fish, notably hake.

There are separate trawl fisheries targeting herring in the Celtic Sea and mackerel and horse mackerel in the whole area. The herring fishery is principally a "roe" fishery and discard rates have at times reached very high levels. There is also a small directed fishery for sprat in the Channel.

Management measures

The assessment units used for many of the demersal stocks in this area are small and catches deriving from them are generally in the region of 10 thousand t or less. However, the TACs set for the stocks often cover many assessment units. In addition, for a number of units, there are insufficient data for adequate assessments. This means

that TACs, which cover a number of heavily exploited stocks comprise a summation across units of analytical forecasts and average catches which may offer no effective management control of the exploitation rate. Since a number of stocks affected by this problem are regarded as being close to or outside safe biological limits, there is a need to reconsider the areas on which TACs are set if management is to improve.

A notable feature of the demersal fisheries in this area is their mixed nature. The effectiveness of single species TACs is likely to be diminished unless this is taken into account. Use of measures to reduce fishing mortality directly, such as effort reductions in fleets, is likely to avoid a number of the disadvantages of catch controls in regulating the exploitation rate.

The fisheries in the Celtic Sea are very similar to the fisheries in the Bay of Biscay and some of the same fleets operate in both areas. However, the technical measures in the two areas differ. Despite the revision by the European Commission Technical Conservation Regulation of existing technical measures in 1st January 2000, the minimum mesh sizes in the Celtic Sea are still often different from those in the Bay of Biscay. These differences make enforcement more difficult.

State of the stocks

The majority of fish stocks which are assessed in this area are considered to be harvested outside safe biological limits. They are characterised by low spawning stock biomass and recent high fishing mortality rates. Of particular concern are Celtic Sea (VII f,g) and Western Channel (VII e) sole and plaice. These stocks exhibit high *F*, low *SSB* and low recruitments in most recent years.

The Northern hake stock is discussed fully in Section 3.12.2. It is important to note that this species is taken by most of the demersal fleets in this area. This hake stock is outside safe biological limits, and a rebuilding plan is needed in order to rebuild the *SSB*.

There are no major concerns about the *Nephrops* stocks in this area though most stock units are fully exploited or over-exploited in terms of yield per recruit. Management of these fisheries, however, needs to be sensitive to by-catches of stocks requiring protection such as Celtic Sea cod and Northern hake.

The Celtic Sea herring *SSB* has been stable in the last fif-

teen years. The recruitment has been above average in three of the last four years.

The mackerel caught in the area belong to the Southern and Western spawning components. The Western horse mackerel is declining rapidly due to one extremely strong year class being fished down and will, at present F, continue to decline.

For many of the stocks in this area there are insufficient data for an assessment. It is, therefore, not possible to evaluate their status but it is likely that several of these stocks are fully exploited.

Widely Distributed and Migratory Stocks

A number of stocks assessed by ICES are not confined to the individual areas considered in other sections of this report. They include species some of whose stock units are distributed over much wider areas such as hake and a number of deep-water species, and migratory species such as mackerel, horse mackerel and blue whiting.

The fisheries for many of these species are summarised in the area overviews, and in this section of the report the detailed assessments are given for those stocks which are distributed over more than one area, namely Northern hake, mackerel, Western horse mackerel and blue whiting.

The Northern Hake is fished throughout Sub-areas IV, VI, VII and VIII. The stock, which in 1998 was estimated to be about 134,000 t, has been at a low level for a number of years and is considered to be outside safe biological limits. The landings, which are mainly taken by Spain and France, have decreased in recent years and the 1998 landings of 35,500 t were the lowest recorded for over twenty years. Recruitment has been very poor in 1997 and 1998 and the stock is not expected to increase unless there is a substantial reduction in fishing mortality.

The North East Atlantic mackerel stock which is considered to consist of three spawning components (North Sea, Western and Southern) is fished over a very wide area extending throughout Sub-areas II, IV, VI, VII and VIII. Considerable mixing of the components occurs at various times throughout the year. The fishery is conducted by a number of countries but Norway, United Kingdom, Russia, Ireland and the Netherlands take the main catches. The total catch in 1998 was estimated to be over 667,000 t. The spawning stock has increased in recent years and in 1998 was estimated to be over 3.7 million t. This increase

has been because of a number of good recruitments and this increase is expected to be maintained in the future if a reduction in fishing mortality can be achieved. Although the spawning stock is high it is still considered to be outside safe biological limits because fishing mortality is too high.

The Western horse mackerel stock is like the mackerel fished over wide areas extending throughout Sub-areas IV, VI, VII and VIII. The fishery is also exploited by a number of countries but the Netherlands and Ireland take the main catches. The catch in 1998 was estimated to be about 304,000 t, which was the lowest since 1990. The state of the stock is not known but it is thought to have declined considerably over the last ten years and is considered to be outside safe biological limits. This is because no other comparative year class has replaced the exceptional 1982 year class, which has maintained the fishery for a number of years. The stock is not expected to increase at present levels of recruitment and fishing mortality rates.

The Northern Blue Whiting stock is fished mainly throughout Sub-areas II, V, VI and VII by a number of countries, mainly by Norway, Russia, Iceland, Denmark, Faroe Islands, United Kingdom and Ireland. The 1998 catches were over 1.1 million t and were the highest recorded from the fishery. Most of these catches were landed for industrial purposes. The spawning stock, that in 1998 was estimated to be over 2.9 million t, has been boosted by the very good year classes in 1995 and 1996. However, it is expected that the stock will rapidly decline in the near future if recruitment returns to normal and will not be able to maintain the present high catches.

DEFINITION OF FISHERIES TECHNICAL TERMS AND ACRONYMS.



Marine Fisheries Services Division

Absolute Recruitment The number of fish which grow into the catchable size range in a unit of time (usually a year).

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.

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, or coefficient of mortality.

Availability The fraction of a fish population which lives in regions where it is susceptible to fishing during a given fishing season. This fraction receives recruits from, or becomes mingled with, the non-available part of the stock at other seasons, or in other years. (Any more or less completely isolated segment of the population is best treated as a separate stock.)

Assessment level Categories of the level of complexity of, and data available for assessment. Index of abundance (INDEX), yield-per-recruit analysis (YIELD), analysis of the age structure of the catch (AGE STRUCTURE), analysis including the relationship between recruitment and spawning stock SIZE (SPAWNING STOCK), and assessment that allows prediction of future (one or two years ahead) stock sizes and catches (PREDICTIVE).

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 pounds or metric tons (2,205 pounds = 1 metric ton), of a stock at a given time.

Biological reference points Fishing mortality rates that may provide acceptable protection against growth overfishing and/or recruitment overfishing for a particular stock. They are usually calculated from equilibrium yield-per-recruit curves, spawning stock biomass-per-recruit curves and stock recruitment data. Examples are $F_{0.1}$, F_{max} and F_{med} .

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} The B_{pa} is the SSB below which there is evidence of reduced recruitment. In stocks where there has been no evidence of reduced recruitment, B_{pa} has been calculated using the following equation $B_{pa} = B_{loss} \cdot e^{1.645 \square}$. For the purpose of this estimation, \square was generally taken to be 0.2.

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 graph of the logarithm of number of fish taken at successive ages or sizes.

CFP Common Fisheries Policy –The instrument of fisheries man-

agement within the European community (see http://europa.eu.int/comm/fisheries/policy_en.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, availability.

Cod End The bulbous bag on the end of a fish net in which the catch collects.

Conditional Fishing Mortality Rate The fraction of an initial stock which would be caught during the year (or season) if no other causes of mortality operated. Also called fishing mortality rate.

Conditional Natural Mortality Rate The fraction of an initial stock that would die from causes other than fishing during a year (or season), if there were no fishing mortality. Also called annual natural mortality rate, seasonal natural mortality rate.

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.

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, plaice, skates and rays, that normally swim in mid-water at or near the sea floor.

Discard Discards are defined as that part of the catch returned to the sea as a result of economic, legal or aesthetic considerations.

Discard rate The percentage (or proportion) of the catch discarded.

Effectiveness of Fishing A general term referring to the percentage removal of fish from a stock, but not as specifically defined as either rate of exploitation or instantaneous rate of fishing.

Elasmobranchs Fish, such as skates, rays, sharks and dogfish, whose skeletons are made of cartilage rather than bone, as in the teleost species such as cod, whiting, plaice and herring.

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 under the FIEFA and SAMFISH programmes to monitor discards.

FIEFA Framework for Improved European Fisheries Assessment – an EU-funded study contract (97-0059), led by Ireland, to improve fisheries assessment and communication between scientists and fishermen generally. This project has been superseded by the

SAMFISH project.

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

Effective fishing effort Fishing effort or intensity standardized in some way e.g. hours fished in an area.

Fishing Mortality Deaths in a fish stock caused by fishing.

Fishing Power The catch which a particular gear or vessel takes from a given density of fish during a certain time interval. For example, larger vessels (horsepower) have a greater ability to catch more fish, thus the greater their fishing power. Also, improvements in a vessel or gear, such as fish finders, Loran, etc., can increase fishing power.

F_{lim} is the limit fishing mortality. F_{lim} should be avoided with high probability because it is associated with unknown stock dynamics or stock collapse.

F_{max} The 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. This is the point that defines growth overfishing.

F_{0.1} 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} rate is only one-tenth the slope of the curve at its origin).

F_{pa} is a precautionary reference point designed to ensure that there is a high probability that F_{lim} will be avoided and that spawning stock biomass will remain above the threshold below which the probability of good to average recruitment is decreased.

Gadoids An important family of food fish, including cod, 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 The rate of fishing, as indicated by an equilibrium yield-per-recruit curve, greater than which the losses in weight from total mortality exceed the gain in weight due to growth. This point is defined as F_{max}.

ICES International Council for the Exploration of the Seas – (see: <http://www.ices.dk/>)

ICCAT International Commission for the Conservation of Atlantic Tuna – (see: <http://www.iccat.es/>)

IFREMER France's national marine research agency – (see: <http://www.ifremer.fr/anglais/>)

Inshore fisheries Those fisheries that are conducted within 12 miles of the shore, including demersal, pelagic, shellfish and sea angling fisheries.

Instantaneous Rate Of Fishing Mortality When fishing and natural mortality act concurrently, F is equal to the instantaneous total mortality rate, multiplied by the ratio of fishing deaths to all deaths. Also called rate of fishing, instantaneous rate of fishing, force of fishing mortality.

Instantaneous Rate Of Growth The natural logarithm of the ratio of final weight to initial weight of a fish in a unit of time, usually a year. When applied collectively to all fish of a given age in a stock, the possibility of selective mortality must be considered.

Instantaneous Rate Of Mortality The natural logarithm (with sign changed) of the survival rate. The ratio of number of deaths per unit of time to population abundance during that time, if all deceased fish were to be immediately replaced so that population does not change. Also called coefficient of decrease.

Instantaneous Rate Of Natural Mortality When natural and fishing mortality operate concurrently it is equal to the instantaneous total mortality rate, multiplied by the ratio of natural deaths to all deaths. Also called force of natural mortality.

Instantaneous Rate Of Recruitment Number of fish that grow to catchable size per short interval of time, divided by the number of catchable fish already present at that time. Usually given on a

yearly basis that is, the figure just described is divided by the fraction of a year represented by the "short interval" in question. This concept is used principally when the size of the vulnerable stock is not changing or is changing only slowly, since among fishes recruitment is not usually associated with stock size in the direct way in which mortality and growth are.

Instantaneous Rate Of Surplus Production Equal to rate of growth plus rate of recruitment less rate of natural mortality - all in terms of weight and on an instantaneous basis. In a "balanced" or equilibrium fishery, this increment replaces what is removed by fishing, and rate of surplus production is numerically equal to rate of fishing. Also called instantaneous rate of natural increase.

Length Frequency An arrangement of recorded lengths which indicates the number of times each length or length interval occurs. For example, 9 measurements of lengths are taken in the following order 10, 12, 12, 14, 12, 15, 15, 12, and 10.

A 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.

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 monitor, 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 man-

agers can control deaths caused by fishing by manipulating the sizes of fish 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 deep sea.

Natural Mortality Deaths in a fish stock caused by predation, 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/))

Net Increase (or decrease) New body substance elaborated in a stock, less the loss from all forms of mortality.

Nominal catch The sum of the catches that are landed (expressed as live weight or equivalents). Nominal catches do not include unreported discards.

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.

Precision and Accuracy Precision is the closeness to each other of repeated measurements of the same quantity or object, while accuracy is closeness of a measured or computed value to its true value. As an illustration, suppose regulations state that fishermen can only land 5,000 kg. of cod per trip. A fisherman makes 10 trips with the intent to not exceed the 5,000 kg limit. Before landing each trip, he estimates that his total catch for each was approximately 5,000 kg. However, after landing each trip, weight's in at a dealer showed that every catch was just about 5,500 kg. The fisherman's estimates of his catch were, therefore, precise but not accurate. Two fictional series of research vessel tows were made in a single stratum. The first series resulted in catches of 61, 55, 60, 64, 63 and 59 pounds. The second resulted in 10, 20, 45, 60, 110 and 115 pounds. Both resulted in mean catches per tow of 65 lbs. The first series of tows is a very precise estimate of abundance while the estimate of the second series is very imprecise. The range of values about the average in the first series (55-64) is much narrower than that of the second (19-115); therefore, confi-

dence in the first average as an estimate of relative abundance is much greater than confidence in the second average. Nothing can be stated about the accuracy of either of the series of tows in providing estimates of true abundance. The degree of accuracy is affected by fish behaviour, gear performance, and a possible mismatch between the timing and area of surveys in relation to fish movements and distribution.

Parameter A "constant" or numerical description of some property of a population (which may be real or imaginary).

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.

Production 1. The total elaboration of new body substance in a stock in a unit of time, irrespective of whether or not it survives to the end of that time. Also called net production, total production. 2. Yield.

Quota A portion of a total allowable catch (TAC) allocated to an operating unit, such as a vessel class or size, or to 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.

Rate Of Removal An inexactly defined term that can mean either rate of exploitation or rate of fishing (depending on the context).

Rate Of Utilisation Similar to rate of exploitation, except that only the fish landed are considered. The distinction between catch and landings is important when considerable quantities of fish are discarded at sea.

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 Curve, Reproduction Curve A graph of the progeny of a spawning at the time they reach a specified age (for example, the age at which half of the brood has become vulnerable to fishing), plotted against the abundance of the stock that produced them.

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, as bottom trawl survey stratified mean catch per tow.

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.)

SAMFISH An EU Study Contract (99-009) to improve sampling practices in western European waters and continue to improve communication between scientists and the industry.

Shellfish Fisheries Those fisheries where the target species are either crustaceans (e.g. *Nephrops*, lobsters, crabs and crayfish) or molluscs (Cephalopods, scallops, oysters etc.).

Standardisation The procedure of maintaining methods and equipment as constant as possible. Without standardisation one cannot determine whether measurements of yearly differences in relative abundance are caused by actual fluctuations in stock abundance or by differences in the measurement procedure used. The lack of standardisation is one reason why surveys using different commercial fishing vessels in different years do not produce comparable information. For example, if two vessels of different horsepower are used in separate years, the results can't be compared, unless vessel mensuration experiments are performed. This would

involve a comparison of the two vessels' catches to determine the influence of their fishing power on the size of the catch, and a determination of a correction factor.

STECF Scientific Technical and Economic Committee on Fisheries is a committee of fisheries scientists, economists, managers and European Union official that formulate management strategies for fisheries resources within EU waters.

Stock Part of a fish population usually with a particular migration pattern, specific spawning grounds, and subject to a distinct fishery. A fish stock may be treated as a total or a spawning stock. Total stock refers to both juveniles and adults, either in numbers or by weight, while spawning stock refers to the numbers or weight of individuals which are old enough to reproduce.

Stratified Mean (Average) Catch Per Tow For separate species of fish, each average catch per tow (determined from a series of tows) in each geographic stratum of a region is multiplied by that area (square nautical miles) of the stratum in which the tows were made. All of the individual products are added together and the total is divided by the sum of the entire area of the region. The final result is the stratified mean catch per tow; this is used as an index of relative abundance. For example, a scientist wishes to calculate the stratified mean catch per tow of cod in a region (perhaps Irish Sea) that measures 100 square nautical miles. The region has been divided into 5 strata on the basis of depth. In each strata, 5 tows are made and the average catch of cod is calculated.

SSB / Spawning stock biomass The total weight of all sexually mature fish in the population. This quantity depends on year-class abundance, the exploitation pattern, the rate of growth, fishing and natural mortality rates, the onset of sexual maturity and environmental conditions.

Spawning stock biomass-per-recruit (SSB/R) The expected lifetime contribution to the spawning stock biomass for a recruit of a specific age (e.g., per age 2 individual). For a given exploitation pattern, rate of growth, and natural mortality, an expected equilibrium value of SSB/R can be calculated for each level of F. A useful reference point is the level of SSB/R that would be realised if there were no fishing. This is a maximum value for SSB/R, and can be compared to levels of SSB/R generated under different rates of fishing. For example, the maximum SSB/R for Georges Bank haddock is approximately 9 kg for a recruit at age 1.

Status of exploitation An appraisal of exploitation is given for each stock discussed in the Species Synopsis section using the terms unknown, protected, not exploited, under-exploited, moderately exploited, fully exploited, and over-exploited. These terms describe the effect of current fishing effort on each stock, and is based on current data and the knowledge of the stocks over time.

Success (of fishing) Catch per unit of effort.

Surplus Production Production of new weight by a fishable stock, plus recruits added to it, less what is removed by natural mortality. This is usually estimated as the catch in a given year plus the increase in stock size (or less the decrease). Also called natural increase, sustainable yield, equilibrium catch.

Survival Rate Number of fish alive after a specified time interval, divided by the initial number. Usually on a yearly basis.

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.

U An index of exploitable biomass. Notation used for deepwater stocks by ACFM in May 1998.

U_{lim} For deepwater stocks has been calculated as $0.2 * U_{max}$ (may be a smoothed abundance index).

U_{pa} For deepwater stocks has been calculated as $0.5 * U_{max}$. For red-fish $U_{pa}=0.5$ or $0.6 * U_{max}$.

Usable Stock The number or weight of all fish in a stock that lie within the range of sizes customarily considered usable (or designed so by law). Also called standing crop.

ated so by law). Also called standing crop.

Utilised Stock, Utilised Population The part, by number, of the fish alive at a given time, which will be caught in future.

Vessel class Commercial fishing vessels are classified according to their gross registered tons (grt) of displacement. Vessels displacing less than 5 tons are not routinely monitored, and are referred to as undertonnage. Larger vessels are classified as follows

Vessel Class	G R T
2	5 - 50
3	51 - 150
4	151 - 500

Virtual Population Utilised stock.

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.

Stock	Biological					2000					2001					1st Rnd TAC	Biological Summary	TAC Summary
	Exploitation	Stock Size	Stock Trend	Biological Limits	Comment	Agreed TAC	EU TAC Allocation	Irish Quota	Irish %	Adj.	Adjusted Irish Quota	ICES Recomm.	% of 00	FRC Recomm.	% of '00	Irish Quota		
Herring North Sea (IVa,b,c,d & IIIa)	Over	Low	Increasing	Concern	Stock rebuilding, possible good recruitment	345,000	257,831					379,000	110%	379,000	110%			
Herring VIa North	Uncertain	Low	Increasing	Concern	TAC is too high, misreporting problem	42,000	41,340	6,240	15%		6,240	30,000	71%	30,000	71%	4,533		
Herring VIa South & VIIb,c	Over	Low	Decreasing	Concern	Multiannual recovery plan needed	13,900	13,900	12,640	91%		12,640	13,900	100%	13,900	100%	12,640		
Herring VIIa North	Over	Low	Decreasing	Concern	No Irish fishery, low recruitment	5,350	5,350	1,390	26%		1,390	5,100	95%	5,100	95%	1,325		
Herring Celtic Sea & VIIj	Fully	High	Stable	No concern	Current F is low due to depressed markets	21,000	21,000	18,140	86%		18,140	17,900	85%	17,900	85%	15,462		
Norwegian Spring Spawning	Over	Low	Decreasing	Concern	SSB overestimated in 1999 assessment	1,250,000	108,600	9,800	9%	-700	9,100	753,000	60%	753,000	60%	67,950		
Arctic Cod	Over	Low	Decreasing	Serious Concern	This stock needs a rebuilding plan	390,000	16,608	242	1.5%	-18	224	263,000	67%	263,000	67%	3,832		
Cod Vb, VI, XII, XIV						7,480	7,480	1,605	21%	-20	1,585	0	0%	1,994	27%	428		
Cod VIa	Over	Lowest	Lowest	Serious Concern	This stock needs a rebuilding plan							0		1,200				
Cod VIIb	Unknown	Unknown	Unknown	Unknown	TAC based on average catch 1996-1998							794		794				
Cod VIIa	Over	Lowest	Decreasing	Serious Concern	This stock needs a rebuilding plan	2,100	2,100	1,385	66%	-440	945	2,100	100%	2,100	100%	1,385		
Cod VIIb-k, VIII, IX, X						16,000	16,000	1,630	10%		1,630	5,300	33%	5,300	33%	540		
Cod VIIb,c	Unknown	Unknown	Unknown	Unknown	Should be included in VIIe-k assessment									1,000				
Cod VIIe-k	Over	High	Decreasing	Concern	SSB decreasing F too high							4,300		4,300				
Angler (Monk) Vb, VI, XII, XIV	Over	Low	Decreasing	Concern	Lack of TAC for IV caused misreporting	25,660	25,660	800	3%		800	10,000	39%	10,000	39%	430		
Angler (Monk) VI	Over	Low	Decreasing	Concern	New assessment grouping VI and IV	8,000	8,000	800	10%		800	4,300	54%	4,300	54%	430		
Angler (Monk) IV	Over	Low	Decreasing	Concern	New assessment grouping VI and IV	17,660	17,660					5,700	32%	5,700	32%			
Angler VII,VIIIabde	Fully	Average	Increasing	No concern	Rebuilding plan for hake will have major impact	23,000	23,000	1,740	8%	1,347	3,087	21,468	93%	21,468	93%	1,624		
Megrim Vb, VI,XII,XIV	Unknown	Unknown	Unknown	Unknown	Expanding fishery, no assessment data	4,840	4,840	630	13%	-20	610	4,840	100%	4,840	100%	630		
Megrim VII,VIIIabde	Over	Low	Stable	Concern	Rebuilding plan for hake will have major impact	20,000	20,000	2,970	15%	371	3,341	14,100	71%	14,100	71%	2,094		
Haddock Vb, VI,XII,XIV						19,000	19,000	1,730	9%	108	1,838	13,900	73%	13,900	73%	1,266		
Haddock VIa	Fully	Low	Stable	Concern	Maintain F below Fpa							11,200		11,200				
Haddock VIIb	Over	Average	Decreasing	Concern	Rockall in international zone - Unregulated fishery							2,700		2,700				
Haddock VII,VIII,IX,X	Unknown	Unknown	Unknown	Unknown	A full analytical assessment is needed for this stock	13,200	13,200	2,930	22%		2,930	13,200	100%	13,200	100%	2,930		
Haddock VIIa	Over	High	Decreasing	Concern	Rebuilding plan for cod and whiting will have major impact	3,400	3,400	1,472	43%	-120	1,352	1,710	50%	1,710	50%	740		
Whiting Vb, VI, XII, XIV	Over	Low	Decreasing	Serious Concern	Rebuilding plan for cod will have major impact	4,300	4,300	1,250	29%	-330	920	4,200	98%	4,200	98%	1,221		
Whiting VIIa	Over	Lowest	Decreasing	Serious Concern	This stock needs a rebuilding plan	2,640	2,640	1,525	58%	-345	1,180	0	0%	2,640	100%	1,525		
Whiting VIIb-k						22,500	22,500	6,260	28%	-800	5,460	19,674	87%	19,674	87%	5,473		
Whiting VIIb,c	Unknown	Unknown	Unknown	Unknown	Separate TAC needed									3,754				
Whiting VIIe-k	Fully	High	Decreasing	No concern	F reduction based on advice for Cod in VII									13,500				
Hake (Northern-Vb, VI, VII, XII, XIV)	Over	Lowest	Decreasing	Serious Concern	This stock needs a rebuilding plan	23,600	23,600	1,300	6%	587	1,887	0	0%	13,600	58%	420		
Blue Whiting Vb,VI,VII	Over	Average	Decreasing	Concern	Assessment uncertain, SSB possibly higher	407,000	163,000	26,080	16%		26,080	628,000	154%					
Nephrops Vb,VI	Fully	Unknown	Unknown	Unknown	Increasing Irish catch, No new assessment in 2000 for all VI	12,600	12,600	170	1%		170	11,300	90%	11,300	90%	152		
Nephrops VII					Separate TACs needed	21,000	21,000	7,750	37%	-40	7,710	17,200	82%	17,200	82%	6,348		
Nephrops VIIa exc. 33E2-E5	Fully	Average	Stable	No concern	No new assessment in 2000 for all VII							9,400		9,400				
Nephrops VIIbjk	Unknown	Unknown	Unknown	Unknown	No new assessment in 2000 for all VII							4,000		4,000				
Nephrops VIIgh,a(33E2-E5)	Fully	Unknown	Unknown	No concern	No new assessment in 2000 for all VII							3,800		3,800				
Plaice Vb, VI, XII, XIV	Unknown	Unknown	Unknown	Unknown	No assessment on this stock	2,400	2,400	880	37%	-100	780	2,400	100%	2,400	100%	880		
Plaice VIIa	Fully	Average	Stable	No Concern	Maintain F below Fpa, recruitment is low	2,400	2,400	1,365	57%	-479	886	2,400	100%	2,400	100%	1,365		
Plaice VIIb,c	Unknown	Unknown	Unknown	Unknown	No increase in exploitation	300	300	240	80%		240			300	100%	240		
Plaice VIIf,g	Over	Low	Decreasing	Concern	40% reduction in F needed to recover stock	800	800	80	10%		80	600	75%	600	75%	60		
Plaice VIIh,j,k	Over	Unknown	Decreasing	Unknown	No increase in exploitation	1,350	1,350	590	44%	-60	530			1,350	100%	590		
Saithe VI	Over	Low	Decreasing	Serious Concern	Combined assessment with North Sea	7,000	7,000	395	6%	-10	385	9,000	129%	9,000	129%	508		
Saithe VII,VIII,IX,X	Unknown	Unknown	Unknown	Unknown	No information on this stock	6,500	6,500	1,960	30%	-110	1,850			6,500	100%	1,960		
Mackerel NE Atlantic	Fully	High	Increasing	No concern	Maintain F at EU Norway agreed level	612,000	410,685	70,270	17%	-900	69,370	665,000	109%	665,000	109%	76,355		
Mackerel North Sea	Over	Low	Stable	Concern	No fishing possible	24,725	24,725	0	0%		0							
Sole Vb,VI,XII,XIV	Unknown	Unknown	Unknown	Unknown	No assessment on this stock	155	155	125	81%	-30	95			155	100%	125		
Sole VIIa	Over	Average	Increasing	Concern	Good recruitment but F too high	1,080	1,080	130	12%	10	140	930	86%	930	86%	112		
Sole VIIb,c	Under	Unknown	Unknown	Unknown	No increase in exploitation, consider plaice	100	100	85	85%		85			100	100%	85		
Sole VIIf,g	Over	Low	Stable	Serious Concern	Possibly good recruitment but F too high	1,160	1,160	35	3%	2	37	810	70%	810	70%	24		
Sole VIIhjk	Under	Unknown	Stable	Unknown	No increase in exploitation, consider plaice	720	720	325	45%	-80	245			720	100%	325		
North Sea Horsemackerel	Unknown	Unknown	Unknown	Unknown	Prohibit fishing for juvenile horse mackerel	51,000	49,400	1,950	4%		1,950	51,000	100%	51,000	100%	1,950		
Western Horsemackerel	Fully	Average	Decreasing	No Concern	Prohibit fishing for juvenile horse mackerel	240,000	233,000	55,010	24%		55,010	240,000	100%	240,000	100%	55,010		

Explanation of the biological summary column: Red indicates there is concern or serious concern about the stock. Yellow indicates the biological limits of the stock are unknown and green indicates there is no concern about the stock.

Explanation of the TAC summary column: Red indicates there is reduction in the TAC, yellow indicates there is no change in the TAC and green indicates the TAC has been increased.