## The Stock Book Leabhar Na Stoc



Annual 2013 Review of Fish Stocks with Management Advice for 2014

Léirmheas Bliantúil ar na Stoic Éisc in 2013

Marine Institute<br>Foras na Mara



John Molloy, 1940 to 2013

This volume is dedicated to John Molloy. who was an originator of the Stock Book. His dedication towards researching and advising on the management of Irish fish stocks is a continued inspiration to us all.


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## THE <br> STOCK <br> BOOK

## Report to the Minister for Agriculture, Food and the Marine Annual Review of Fish Stocks in 2013 with Management Advice for 2014



## NoVEMBER 2013

In the 2013 Stock Book, every effort has been made to use the most up to date version of the ICES and STECF advice. However, the final official ICES ACOM and STECF Reports should be consulted for the definitive advice. For more detailed information on specific stocks the relevant ICES Working Group Reports should be consulted. The official EU journal should be consulted for definitive TAC's and Quotas for 2013.

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## ICES Fishing Areas



## ICES Fishing Divisions around the Irish Coast



## About the Stock Book

The Stock Book is produced annually by the Marine Institute's Fisheries Ecosystems Advisory Services (FEAS) and provides up to date scientific information on the state of the fisheries resources exploited by the Irish fleet. It provides the latest scientific advice that informs fishing opportunities for the following year. The Stock Book has been published by the Marine Institute since 1993 and has evolved considerably in that time period. It continues to evolve in a changing fisheries advisory environment.

The majority of the scientific advice presented in the Stock Book is formulated by the International Council for the Exploration of the Seas (ICES). Scientific advice from the Scientific, Technical and Economic Committee for Fisheries (STECF) and the International Commission for the Conservation of Atlantic Tunas (ICATT) is also used. However, in a minority of cases, the Marine Institute may not agree with some aspects of the scientific advice. In such cases an alternative FEAS advice is given with a clear rationale for this advice.

The majority of the ICES scientific advice is released in June each year. This is to facilitate consultation with industry and managers on available fishing opportunities for the coming year. ICES produces the remaining scientific advice in October. The EU's Scientific, Technical and Economic Committee for Fisheries (STECF) also review the state of fish stocks. The Stock Book draws on both the ICES and STECF material and the resultant scientific advice relates to those stocks exploited by the Irish fleet that come under the remit of the Common Fisheries Policy (CFP). The provision of scientific advice on the fisheries resource base is a key input component to the CFP. Scientific advice forms the basis for the management decisions made under the CFP (e.g. annual TAC's and technical measures).

The Stock Book contains impartial scientific advice developed by the Marine Institute working with other international scientists at ICES and STECF. This advice is developed using the latest available research, assessments and advice on the fisheries resource. It is formulated by consensus.

The function of the Stock Book is to inform management decisions on fishing opportunities for 2013 using the latest scientific advice.

The Stock Book is presented to Department of Agriculture, Food and the Marine (DAFM) in November. The information is of vital importance in serving Ireland during the annual TAC negotiations at the various EU Council of Fisheries meetings, but principally at the December Council meeting. It also serves as a valuable reference throughout the year at other fisheries management meetings with the EU. The Stock Book is also of interest to a wider audience, including the fishing industry, marine scientists, managers, environmental NGO's, third level institutes, financial institutions and those with an interest in the status and management of marine fisheries resources in the waters around Ireland.

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

The Stock Book is also available electronically on the Marine Institute's web site at www.marine.ie.

## The Fisheries Resource.

The fishing industry in Europe employs 139,023 full time equivalents and has a fishing fleet of 81,000 vessels with a total gross tonnage of 1.6 million tonnes and annual landings of value of $€ 7.05$ billion. The overall value of the production sector is around $€ 23$ billion which by revenue comparison, puts the industry among the top 250 of the Fortune 500 companies.

The seas around Ireland (ICES Sub Areas VII and VI ) are among the most productive and biologically sensitive areas in EU waters. Most of the fisheries resource within the area come under the remit of the Common

Fisheries Policy (CFP). The 2013 fishing opportunities (i.e. Total Allowable Catches, TAC's species) for the international fleets that operate in the waters around Ireland were I,040,II7 tonnes of fish, with an estimated landed value of $€ \mathrm{I} .16 \mathrm{I}$ billion. This economic value is based on 2012 average prices and represent a conservative estimate. Ireland's share of these fishing opportunities represents $23 \%$ by tonnage and $17 \%$ by value.

These values do not include the valuable inshore fisheries (e.g. lobster, whelk) which are not managed using internationally agreed TACs but do come within the remit of the CFP. These inshore fisheries resource represents a very important resource base for the coastal communities around Ireland.

Irelands share of the TAC (the Irish quota) varies depending on the stock concerned. Ireland has $86 \%$ of the Celtic Sea herring TAC; 69\% of the Boarfish; 37\% of Nephrops in VII; $26 \%$ of Horse Mackerel and $21 \%$ of mackerel. In other stocks it has a much lower share of the TAC; 8\% of Anglerfish in VII; I5\% of Celtic Sea cod and 6\% of Northern Hake (Fig. I.I).

Organisation of the Stock Book
The Stock Book is divided into the following parts;

- Introduction
- About the Stock Book
- The Fisheries Resource
- Rationale for ICES Advice and Commission Proposal on Fishing Opportunities
- Sustainability
- Mixed Demersal Fisheries Issues in Ireland
- Marine Institutes Summary on the Status, Scientific Advice and Proposed 2014 Fishing Opportunities for those stocks of interest to Ireland
- Irish Sea Stocks
- West of Scotland and Rockall Stocks
- Celtic Sea Stocks
- Widely Distributed and Migratory Species
- Deepwater Stocks
- Other Stocks of Interest to Ireland

For each stock, the "FEAS single stock considerations" section (the yellow box) provide the latest scientific advice for the stock (e.g. TAC) for the following year. This advice is generally based on MSY (Maximum Sustainable Yield) or agreed Management Plan considerations. In cases where FEAS does not agree with the ICES advice, the reasons are given and an alternative FEAS advice is proposed. In some cases, this section also provides stock relevant comment on the Communication from the Commission (COM(2013) 319 . Salient information on the future management of the stock may also be presented in the FEAS - single stock considerations section.

The current management section gives information on the past TAC; the match between assessment area and management area and quota allocations by country.

For some stocks, the FEAS advice is supplemented with the details of the ICES advice.
The stocks are grouped by areas (e.g. Irish Sea). For each area, FEAS have produced an ecosystem overview which includes information on the physical, biological, environmental and fishery effects on the benthos and fish communities. The ecosystem overviews also provide ecosystem considerations in terms of formulating ecosystem advice for the particular area.

A summary table of the status of the resource and the advice for each stock is presented at the beginning of the Stock Book (Table I.5).

The Stock Book also contains a series of annexes which include definitions of the technical terms and acronyms used throughout the text.

Fig. I.I \% Share of 2013 EU TAC By Ireland \& Other EU' Members and approximate ${ }^{2}$ value of Irish Quota \& EU TAC

| Species | TAC Area | Irl. Tonnes | Est. Value of Irl Quota | Est. Value of EU TAC |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| MACKEREL | Vb,VI,VII,VIIIabde, IIa, | 57,753 | €52,780,068 | €248,868,627 | 21.2\% |  |  |
| NEPHROPS | VII | 8,506 | € $37,270,996$ | €101,064,604 | 36.9\% |  |  |
| HORSE MACK. | IIa, IVa, VI, VIIa-c, VIIs | 40,803 | $€ 22,434,215$ | €86,865,164 | 25.8\% |  |  |
| MEGRIMS | VII | 2,878 | $€ 8,914,867$ | $€ 53,851,620$ | 16.6\% |  |  |
| BOARFISH | VI, VII and VIII | 56,666 | €7,986,487 | $€ 11,557,053$ | 69.1\% |  |  |
| WHITING | VIIb-k | 6,812 | $€ 7,935,614$ | $€ 28,541,183$ | 27.8\% |  |  |
| ANGLERFISH | VII | 2,209 | $€ 7,856,699$ | $€ 103,655,791$ | 7.6\% |  |  |
| HERRING | VIIghjk | 14,864 | $€ 7,771,836$ | € 8,993,245 | 86.4\% |  |  |
| BLUE WHITING | I, II, III, IV, V, VI, VII, | 13,718 | €5,487,200 | €46,412,800 | 11.8\% |  |  |
| ALBACORE TUNA | North Atlantic | 2,371 | $€ 5,425,164$ | $€ 61,635,897$ | 8.8\% |  |  |
| HADDOCK | VIIb-k,VIII,IX,X | 3,144 | $€ 4,095,903$ | €18,431,564 | 22.2\% |  |  |
| HAKE | Vb,VI,VII,XII,XIV | 1,704 | $€ 3,434,641$ | €62,283,103 | 5.5\% |  |  |
| COD | VIIbc,e-k,VIII,IX, X | 1,479 | $€ 3,093,537$ | $€ 21,334,735$ | 14.5\% |  |  |
| HERRING | $\mathrm{Vb}, \mathrm{VIaN}, \mathrm{VIb}$ | 4,151 | $€ 2,170,405$ | €14,368,277 | 15.1\% |  |  |
| SKATES \& RAYS | VIa, VIb, VIIa-c and VII | 1,165 | $€ 1,985,045$ | $€ 15,205,612$ | 13.1\% |  |  |
| HERRING | I,II (Atlanto-Scandic) | 3,574 | $€ 1,868,713$ | $€ 21,069,812$ | 8.9\% |  |  |
| POLLACK | VII | 1,030 | $€ 1,863,705$ | €24,418,152 | 7.6\% |  |  |
| PLAICE | Vlla | 1,063 | $€ 1,862,693$ | $€ 2,850,989$ | 65.3\% |  |  |
| SOLE | VIIhjk | 181 | $€ 1,771,919$ | $€ 3,935,423$ | 45.0\% |  |  |
| ANGLERFISH | $\mathrm{Vb}, \mathrm{VI}, \mathrm{XII}, \mathrm{XIV}$ | 492 | $€ 1,749,885$ | $€ 17,513,077$ | 10.0\% |  |  |
| SAITHE | VII,VIII,IX,X | 1,491 | $€ 1,733,517$ | $€ 3,692,588$ | 46.9\% |  |  |
| MEGRIMS | $\mathrm{Vb}, \mathrm{VI}, \mathrm{XII}, \mathrm{XIV}$ | 439 | $€ 1,359,842$ | $€ 10,491,541$ | 13.0\% |  |  |
| NEPHROPS | Vb,VI | 226 | €990,271 | $€ 73,131,075$ | 1.4\% |  |  |
| HADDOCK | $\mathrm{Vb}, \mathrm{Va}$ | 690 | € 898,910 | $€ 5,485,957$ | 16.4\% |  |  |
| LING | VI, VII, VIII, IX, X, XII | 591 | $€ 745,633$ | $€ 10,123,450$ | 7.4\% |  |  |
| HERRING | VIaS, VIIbe | 1,364 | €713,185 | $€ 784,295$ | 90.9\% |  |  |
| HERRING | VIIa | 1,300 | €679,722 | $€ 2,610,655$ | 26.0\% |  |  |
| HADDOCK | VIIa | 515 | €670,926 | $€ 1,548,991$ | 43.3\% |  |  |
| COD | I,II | 299 | €625,401 | €41,772,157 | 1.5\% |  |  |
| SOLE | Vlla | 58 | $€ 567,797$ | $€ 1,370,545$ | 41.4\% |  |  |
| HORSE MACK. | IVb, IVc, VIId | 1,029 | €565,763 | $€ 18,913,732$ | 3.0\% |  |  |
| SAITHE | Vb,VI,XII, XIV | 421 | € 489,477 | €10,422,028 | 4.7\% |  |  |
| PLAICE | $\mathrm{Vb}, \mathrm{VI}, \mathrm{XII}, \mathrm{XIV}$ | 261 | $€ 457,350$ | $€ 1,153,012$ | 39.7\% |  |  |
| SOLE | Vb,VI,XII,XIV | 46 | € 450,322 | €558,008 | 80.7\% |  |  |
| COD | VIIa | 188 | € 393,228 | €596,118 | 66.0\% |  |  |
| SOLE | VIIbc | 36 | € 352,426 | €411,164 | 85.7\% |  |  |
| PLAICE | VIIfg | 197 | $€ 345,203$ | €646,598 | 53.4\% |  |  |
| SOLE | VIIfg | 34 | $€ 332,847$ | $€ 10,768,571$ | 3.1\% |  |  |
| PLAICE | VIIbc | 63 | €110,395 | $€ 129,670$ | 85.1\% |  |  |
| PLAICE | VIIhjk | 61 | €106,890 | €247,074 | 43.3\% |  |  |
| HADDOCK | VIb,XII,XIV | 78 | €101,616 | $€ 1,289,740$ | 7.9\% |  |  |
| WHITING | Vb,VI,XII, XIV | 87 | €101,350 | €340,164 | 29.8\% |  |  |
| POLLACK | $\mathrm{Vb}, \mathrm{VI}, \mathrm{XII}, \mathrm{XIV}$ | 56 | €101,328 | €617,013 | 16.4\% |  |  |
| G.LAND HALIBUT | IIa, IV, Vb and VI | 13 | € 81,900 | €7,408,800 | 1.1\% |  |  |
| WHITING | VIIa | 49 | €57,082 | €97,855 | 58.3\% |  |  |
| TUSK | $\mathrm{V}, \mathrm{VI}$ and VII | 53 | €45,569 | €805,633 | 5.7\% |  |  |
| COD | VIb, West Vb,XII,XIV | 16 | $€ 33,466$ | €154,781 | 21.6\% |  |  |
| GR.SILVER SMELT | $\mathrm{V}, \mathrm{VI}$ and VII | 305 | $€ 30,500$ | €431,600 | 7.1\% |  |  |
| BLUE LING | $\mathrm{Vb}, \mathrm{VI}, \mathrm{VII}$ | 7 | €5,983 | $€ 2,170,940$ | 0.3\% |  |  |
| GR. SILVER SMELT | III and IV | 7 | $€ 700$ | $€ 102,800$ | 0.7\% |  |  |
| €200,908,191 $€ 1,161,133,283$ |  |  |  |  | $0 \% \quad 20 \% \quad 40 \% \quad 60 \% \quad 80 \% \quad 100 \%$ |  |  |
|  |  |  |  |  |  |  |  |

${ }^{1}$ Only TAC areas where Ireland has a share of the TAC are included above.
${ }^{2}$ Est. value per tonne based on 2012 average values of Irish Landings in Irish Ports.
$\square \%$ Irl $\quad$ \% Other EU

## Rationale for ICES Advice and the Commission Proposal on Fishing Opportunities

This section deals with updates to the basis for ICES advice given in 2013 and the EC policy on Fishing Opportunities for 2014 and interpretations of these by FEAS with a focus on Data Limited Stocks.

## Background

The basis for ICES advice has changed over the past several years. Since 20 IO ICES has introduced an MSY framework for the advice and has advised clients on transition to MSY compatible harvest rates where possible by 2015. The ICES MSY framework is essentially a harvest control rule (HCR) which is designed to maintain stocks in a state whereby they can produce high long term yield. In 2012 in response to a request from the EC, ICES also addressed the issue of providing a quantitative advice where a precise assessment may not have been possible. Implementing this has required ICES to develop a decision framework based on a categorisation of the information on the stock and fishery and to use expert judgement in estimating the fishing pressure and state of the stock. In addition ICES has had to assume a risk tolerance in situations where information is insufficient to conclude expert judgement on either fishing pressure or state of the stock.

In a parallel process, the EC also reissued its communication on fishing opportunities (COM 2013:319). This communication continues the EC approach from previous years where there was a simplification of the decision tree (see Fig I.2). Essentially there are 4 outcomes in the 2013 communication: either follow the management plan (if such exists), or apply international agreements (where relevant), or apply ICES advice (where ICES gives a quantitative value), or apply the Precautionary Approach (if ICES does not apply a quantitative approach).

## 2013 ICES approach for Data Limited Stocks (DLS)

The categorisation of stock information used by ICES was published in June 2012 (ICES CM 2012/ACOM:68). The general principle followed in the application of methods to the categories is that where the information is less certain that the conservativeness of the advice on yield increases. Following this logic ICES categorised the information base on stocks into 6 categories (Fig. I.3). A short description of the categories is given in Table I.I. The ICES DLS approach remains unchanged in 2013, and in cases where ICES gave an advice for 2013 where the PA buffer was applied, and where there was no new information in 2013 which changed the perception of the state of the stock, then ICES did not give a new advice for 2014, but reiterated its previous advice.

Fig. I. 2 FEAS interpretation of EC policy communication for 2014 fishing opportunities


Fig. I. 3 Overview of categories of ICES assessment types for data rich (category I) and the data limited stocks (DLS) (categories 2-6). The availability of high quality data and proxies for the assessments decreases and the precautionary approach increases from left to right.


Table I.I ICES categories for classifying information value for stock status and pressure

- Category I - data rich stocks (quantitative assessments)

This category includes stocks with full analytical assessments and forecasts; e.g. North Sea cod, and stocks with quantitative assessments based on production models (e.g. anglerfish in Iberian waters).

- Category 2 - stocks with analytical assessments and forecasts that are only treated qualitatively
This category includes stocks with quantitative assessments and forecasts which for a variety of reasons are merely indicative of trends in fishing mortality, recruitment and biomass; e.g. Eastern Channel plaice.
- Category 3 - stocks for which survey-based assessments indicate trends

This category includes stocks for which survey indices (or other indicators of stock size such as reliable fishery-dependant indices [CPUE] and mean length in the catch) are available that provide reliable indications of trends in total mortality, recruitment and biomass; e.g. Irish Sea haddock.

- Category 4 - stocks for which reliable catch data are available for short time-series

This category includes stocks for which a time series of catch can be used to approximate MSY.

- Category 5 - data poor stocks

This category includes stocks for which only landings data are available; e.g. pollack in subareas VI and VII.

- Category $6^{6}$ - negligible landings stocks and stocks caught in minor amounts as bycatch

This category includes stocks where landings are negligible in comparison to discards; e.g. Irish Sea whiting. It also includes stocks that are part of stock complexes and are primarily caught as bycatch species in other targeted fisheries; e.g. North Sea brill in the targeted North Sea plaice and sole fishery. The development of indicators may be most appropriate for such stocks.

[^0]
## Table I. 2 Scenarios where FEAS advice differs from ICES

- Scenario I: Stocks which represent minor components in mixed fisheries

Where species are caught as a minor component in mixed fisheries, average landings may well have reduced in recent years due to effort reductions or changing targeting practices. In such case, exploitation rates are not well controlled by TACs on the by-catch species. In such cases FEAS advises a roll over TAC unless there is evidence that the stock is over exploited or in decline.

- Scenario 2: Stocks where there are discards/quota uptake issue

Where discards and/or quota uptake would result in a reduction in TAC which is in excess of the intended reduction in fishing mortality, FEAS follow the ICES advice but apply the reductions to the TAC and not to recent landings.

- Scenario 3: Stocks where FEAS has a different interpretation of available information from ICES.

Where FEAS expert opinion differs from ICES in relation to the interpretation of available information, FEAS advice may be different but follows the ICES approach. In some cases where exploitation and biomass levels are unknown but FEAS considers the stock indicators to be stable, FEAS advises a reduction in TAC of $5 \%$ per year until there is information that the exploitation rate is sustainable.

- Scenario 4: Stocks where the catches are dominated by high discard rates

Where exploitation rates are mainly associated with high discard rates, further reductions in TAC will not reduce mortality, and will exacerbate discarding. FEAS considers that management measures other the TAC's are more appropriate to achieve reductions in fishing mortality e.g. gear or spatial/temporal measures. In such cases FEAS advises a roll over TAC with the introduction of appropriate technical measures.

Reference points, current stock status in relation to these. ICES has included precautionary reference point wherever these are available. The stock status is summarised in a "traffic light" table utilising four separate symbols to indicate status in relation to different reference points. The key to the symbols is as follows:
( $\quad$ - indicates an undesirable situation based on a quantitative evaluation e.g. $F$ is estimated to be above the relevant reference point or SSB is estimated to be below the relevant reference point
(*) - indicates an undesirable situation based on a qualitative evaluation e.g. based on expert judgement $F$ is considered to be above the relevant reference point or SSB is considered to be below the relevant reference point
$\sigma$ - indicates a desirable situation on a quantitative evaluation e.g. $F$ is estimated to be below the relevant reference point or SSB is estimated to be above the relevant reference point
( - indicates a desirable situation on a qualitative evaluation e.g. based on expert judgement $F$ is considered to be below the relevant reference point or SSB is considered to be above the relevant reference point
? - indicates that the status is unknown e.g. the reference point is undefined or unknown, or $F$ or SSB is unknown relative to a defined reference point

- indicates a qualitative evaluation of direction in recent trends e.g. SSB and F are increasing, decreasing or stable.


## Sustainability

In its simplest sense, sustainable use of renewable resources, whether it be timber or fish, means that the resource can be used indefinitely. There are many definitions of sustainability. Fisheries can be defined as sustainable, when they can be conducted over the long term at an acceptable level of biological and economic productivity, without leading to ecological changes that reduce the options available to future generations. These desired levels of biological and economic productivity are in part management decisions, but it is clear that for many stocks both could be greater than they are today.

Overfishing does not necessarily mean that a fish stock is at risk of extinction or collapse - it simply means that more could be caught with less fishing activity. This means taking each year a proportion of fish in the sea that is the right size to let fish grow and reproduce at their most productive level. Under these conditions the long term catches from fish stocks will be at their maximum sustainable yield (MSY). Fishing too hard means that fish will be caught too soon, too small and using too much fuel. The European Union and Member States have committed themselves to reach the objectives of fishing at MSY by 2015 where possible. For several stocks, high discarding is an issue. Improving selectivity to reduce this will also help in achieving MSY for example for haddock and whiting in the Celtic Sea.

The Commission have outlines the benefits of MSY in COM(201I) 298. The move to MSY should bring significant benefits and will mean a change from fishing intensively on scarce resources to fishing lightly on larger stocks. The same or larger quantities of fish should be caught, but with lower impact on the environment. Impacts of fishing on sea bottoms will be less, by catches of vulnerable organisms, including porpoises, dolphins and other marine mammals will decrease because the overall intensity of fishing will be less. Fuel costs will decrease significantly because it takes less fishing time to catch a tonne of fish from an abundant stock than from a scarce one. This will reduce carbon emissions as well as the fuel expenditure of fishing vessels.

In June 2012, the Commission reported that the status of fish stocks in European waters is improving (EC COM(2012) 278 final). The proportion of overfished stocks in the Atlantic has declined from around $90 \%$ of all stocks between 2005-2009 to $47 \%$ in 20I2. Several stocks in the west of Scotland, Irish Sea and Celtic sea have been over fished in the past and now remain at very low levels (i.e. Cod in Divisions Vla and VIla, Sole in VIla, Whiting in Vla and VIla). Exploitation rates of these depleted stocks appear to remain high in most cases despite significant reductions in fishing effort over the last decade (ECCOM(2012) 278 final).

## Summary of The Resource Base

ICES and FEAS evaluate the state of the resource base in relation to pressure and state indicators. These are Fishing mortality ( $F$ ) the last year of the assessment relative to $\mathrm{F}_{\text {MSY }}$ or the fishing mortality which is expected to deliver maximum sustainable yield given and SSB in the last year if the assessment in relation to a defined Biomass trigger point (below which the stock is at risk of impaired recruitment). In the Table I. 5 on pages 16 and I7, FEAS gives an overview of the scientific status and advice on 59 fish stocks, of which Ireland has a share of the TAC.

Table I. 3 summarises the pressure on the 59 stocks dealt with in the 2013 Stock Book and compares with the same evaluation presented last year. In general the situation has deteriorated slightly with a lower number (20) and percentage (34\%) of stocks assessed to be sustainably fished in 2013 compared with last year. The percentage and number of stocks overfished has increased slightly in 2013 and the number and percentage of stocks with unknown status also increased.

Table 1.4 compares the state of the resource base in terms of SSB in relation to biomass trigger points with the same evaluation presented last year. Over a third or 18 stocks are above biomass trigger points. The number of depleted stocks has declined from 8 to 7 and now $12 \%$ of stocks are assessed to be depleted. The number of stocks with unknown SSB, no assessments or undefined $\mathrm{B}_{\text {triggers }}$ remains relatively high at $58 \%$. There are several different reason why this may be the case:

- Some stocks are very relatively small and sampling is insufficient to support traditional assessment approaches e.g. Plaice and Sole in Vllbc, Vla, Pollock in VI.
- Some have uncertain assessment data for biological or stock identity/mixing reasons (e.g. megrim in VII, anglerfish in VII, Pollock in VII, Sprat, Plaice and Sole in VIlhjk)
- The absolute level of catch is an issues for stocks with high discards (e.g. Whiting in Vla and VIla, Plaice in VIla and Vllfg), where several species are landed together (e.g. rays) or where there are other catches (e.g. angling in the case of Pollock)
- For other stocks the time series of data is too short to properly define $\mathrm{B}_{\text {triger }}$ levels (e.g. Nephrops Stocks).
Over time the number of stocks with unknown status should decline but it is likely that for some stocks problems will remain and the management and advisory framework should take that into account.

Table I. 3 Summary of FEAS evaluation of Fishing Mortality in relation to F MSY for stocks of interest to Ireland.

|  | 2012 |  | 2013 |  |
| :---: | :---: | :---: | :---: | :---: |
| Pressure status F / Fmsy | Number | Percentage | Number | Percentage |
| Fished Below Fmsy | 25 | 42\% | 20 | 34\% |
| Fished Above Fmsy $\boldsymbol{x}$ | 13 | 22\% | 14 | 24\% |
| F Unknown, Undefined Fmsy or na (not available) $?$ | 21 | 36\% | 25 | 42\% |
| Total Number of Stocks | 59 |  | 59 |  |

Table I. 4 Summary of FEAS evaluation of SSB in relation to biomass reference points for stocks of interest to Ireland.

|  | 2012 |  | 2013 |  |
| :---: | :---: | :---: | :---: | :---: |
| Stock status SSB / B trigger | Number | Percentage | Number | Percentage |
| SSB > Btrigger (v) | 20 | 34\% | 18 | 31\% |
| SSB > Blim, <Btrigger o | 1 | 2\% | 0 | 0\% |
| SSB < Btrigger ( $X$ | 8 | 14\% | 7 | 12\% |
| SSB Unknow, Btrigger Undefined or na (not available) | 30 | 51\% | 34 | 58\% |
| Total Number of Stocks | 59 |  | 59 |  |



## Mixed Demersal Fisheries Issues in Ireland

A core objective of the EU Common Fisheries Policy is to "ensure exploitation of living aquatic resources that provides sustainable economic, environmental and social conditions". Under the ongoing reform of the CFP, the goal of attaining fishing mortality rates that are consistent with delivering maximum sustainable yield by 2015 has been set. While achieving this through the regulation of catches (TACs) may be relatively straight-forward in the context of a single species fishery; in multi-gear, multispecies and multi-fleet fisheries using single species, TAC constraints are complex and challenging.

In common with the majority of EU mixed demersal fisheries, Irish fisheries can be characterised as being biologically and technically diverse. Discarding of juvenile and over quota species is problematic for many demersal species. In such fisheries, it is not entirely possible to control which species and how much of each is caught. In fact, economics will drive fishers to make best use of all TACs available to them. Under the current management approach, where single species TACs are largely set without due consideration of these technical interactions, the TACs for some stocks are exceeded in trying to maximise the TACs of other stocks. This is particularly problematic where TACs of species caught together evolve in the opposite direction and are not necessarily reflective of changes in true abundance. Unless tactical and technical adaptations are introduced, it may not be possible to attain single-stock MSY levels and maximise potential yield simultaneously. Additionally, improvements in selection pattern for many of the key species could result in short and medium terms gains, as higher selection patterns are consistent with increases in F $_{\text {MSY }}$ targets and therefore yield (STECF, 20I2). It is therefore important that the effects of changes in exploitation pattern are also considered in the context of setting fishing opportunities. Additional changes to be introduced under the reform of the CFP (COM, 2013) include:

- an obligation to land all catches;
- a move towards a more regionalised approach;
- a greater emphasis on a more results based approach and:
- a move towards multi-annual plans which cover multiple stocks, where and when they are exploited together.

These changes will result in a paradigm shift from current management approaches. This provides a challenge to regional advisory groups and managers to identify and apply instruments that are consistent with the overall policy objectives, whilst maximising the potential yield available and avoiding TAC/quota overshoots. In particular, the obligation to land all catches means that management of TAC species which are currently discarded once the quota is exhausted will become increasingly important. Such 'choke' species could become the limiting factor for many fisheries and unless businesses adapt technically and tactically, failure to adequately deal with choke species will result in premature closure of fisheries. This could lead to the situation where some quotas may be underutilised.

One approach in making TACs more effective in a mixed-fisheries context is to set them at levels that account for the technical interactions. The Fcube model (Ulrich et al, 2012) has been developed to forecast the predicted catches of the key species under differing scenarios (e.g. maximisation of all TACs, or cessation of fishing once the first TAC has been exhausted). It is now used as the basis of mixed-fisheries advice in the North Sea (ICES, 20I2). The Fcube model identifies the likely uptake and associated TAC overshoots and undershoots (Fig. I.4), and provides a sound basis for the identification of which species are problematic. This aids the exploration of how changes in fishing pattern and selectivity could be used to mitigate mixed-species issues.


Fig. I.4. Output from ICES mixed fisheries advice for key Noth Sea stocks based on output from the Fcube model run. The model explores 5 different managaent scenarios i) maximisation of all TACs; ii) cessation of fishing once the first TAC is exhausted; iii) cessation of fishing once the cod TAC is exhaused; iv) status quo fishing effort and $v$ ) effort allocated on the basis of the cod plan. The vertial bars show the predicted catches for a range of species with horizontal lines showing the respective TACs.Vertical bars bars below the zero line show the level of TAC undershoot, while hatched bars show the TAC overshoots.

The setting of TACs consistent with MSY levels and the obligation to land all catches through the development of mixed-fisheries management plans will require 'bottom-up' initiatives. Essentially, these will need to focus on limiting the uptake rate of choke species. Businesses may respond through alternative harvesting strategies by adjusting spatial and temporal activity and/or uptake of species selective gears. There are a wide range of management instruments that could be used. These include technical measures, closed areas and seasons, preferential allocation of fishing opportunities, etc. Adjusting these will result in various changes in exploitation rate and pattern, with a range of biological and economic consequences. However, identifying and quantifying the impact of various management options is a challenge.

The Marine Institute, together with other EU partners, have started to work together with the NWWRAC to begin the development of mixed fisheries plans to aid the decision making process. There are EU-funded projects to deal with these mixed fisheries interactions- GEPETO, which aims to develop the basis of a mixed fisheries plan for the Celtic Seas, and the Decision Support Tool for Celtic Seas Demersal Fisheries, which aims to highlight and identify the biological and economic trade-offs between different management options.

## Mixed fisheries Issues in the West of Scotland

Almost all fishing activity associated with Irish vessels in ICES Division Vla is confined to the southern part of the division and conducted mainly on the Stanton bank and shelf break. While there are a number of single-species fisheries which target shellfish as well as fish species such as pollack, the majority of the activity can be classified as multi-species, with single rig otter trawling being the dominant fishing method. Depending on location, catches are generally mixed. Haddock, saithe, anglerfish and megrim make up the majority of the catch in terms of overall weight, although the relative contribution of each varies with location and season. Both the cod and whiting stocks are severely depleted and the long term management plan for cod (EC Regulation 1342/2008) is the primary policy driver in the area. It is noted that restricting TACs as a means to control fishing mortality in Vla, especially for cod, has failed, as ever-restrictive TACs have simply led to increased and substantial discarding of over-quota cod. It is important to note that the contribution Irish vessels make to the overall cod catch is very low, typically less than $2 \%$ of the total international catch. For this reason, the majority of the Irish trawl fleet operating in VI has been exempted from effort restrictions. With the introduction of the landing obligation, species such as hake, saithe and ling are likely to create 'choke' situations where low quota allocations are likely to limit fishing opportunities. The continued poor state of cod is likely to present challenges and is likely to require further technical and tactical means to decouple cod from other species. This is particularly a problem in the Northern part of Vla.

## Mixed fisheries issues in the Irish Sea

The majority of vessels in the Irish Sea target Nephrops with either single- or twin-rig otter trawls. These vessels use either $70-\mathrm{mm}$ diamond mesh with an $80-\mathrm{mm}$ square mesh panel or an $80-\mathrm{mm}$ diamond mesh in their codends, and (by regulation) their landings must consist of at least $35 \%$ Nephrops by live weight. These vessels have by-catches of whiting (most of which are discarded), and haddock, cod, and plaice. While their landings are dominated by Nephrops (83\%) a large portion of the catch is unwanted by-catch which is discarded. The majority of this comprises of non-commercial species, but juveniles of TAC species (whiting, plaice and cod) are caught and discarded in sufficient volume that will become an important issue with the introduction of the landings obligation. They will potentially become choke species, thereby limiting potential fishing opportunities for the target species.

## Mixed fisheries issues in the Celtic Sea

Mixed fisheries interactions in the Celtic Sea have been well studied and described for the Irish fleet (Gerritsen et al 2012 and Davie 2013). Work is underway to develop mixed fisheries management plans through projects like GEPETO and the NWWRAC Celtic Sea Long Term Management Plan. On the shelf in VIlfghj, there are mixed gadoid fisheries targeting cod, haddock and whiting, mainly with otter trawls main using $>100 \mathrm{~mm}$ cod end mesh (there are also some seine and gill net fisheries). Towards the shelf edge monkfish, megrim and hake become the main target species in trawl fisheries. There are directed Nephrops fisheries at the Smalls, Labadie and Jones's Bank and in a number of smaller mud patches using $70-90 \mathrm{~mm}$ mesh with $I 20$ SMP. Localised flatfish fisheries take place in parts of Vllfg with beam trawls (typically 80 mm mesh)

In considering the mixed fisheries interactions in the Celtic Sea and the ICES advice for 2014, the main conflicts are as follows:

Fishing mortality rates for Cod and whiting are close to or below the FMSY target in recent years, whereas fishing mortality in haddock is $85 \%$ higher than the FMSY target. Fishing cod and whiting at the ICES advice for 2014 implies minimal changes in effort and would result in minimal change in fishing mortality for haddock unless ways to avoid haddock in the mixed fishery can be implemented. Spatially haddock and whiting tend to be very mixed in the catches. For example, on the Galley grounds, haddock account for $27 \%$ and whiting $21 \%$ of the landings (Gerritsen et al, 20I2).

The ICES advice for megrim implies a significant reduction in megrim landings while the catch advice for monkfish in VII is similar to the 2013 levels and hake is currently fished at $\mathrm{F}_{\text {MSY }}$. All three species are strongly associated with shelf edge fisheries. Although some difference in the spatial distribution of all three species does occur, unless ways to avoid megrim specifically, can be introduced, TAC reduction to the levels implied by the ICES advice could result in further discarding.

Sole and Plaice are taken together in VIIfg and the plaice component of the landings is heavily discarded. The advice for sole is for a reduction in F of around $9 \%$ whereas the landings advice for plaice is for an increase in catches. There is a need to address the high discards for plaice in this fishery, and part of the solution could be more flexible quota allocations, to avoid quota-motivated discarding.

Nephrops fisheries in the Celtic Sea range in their mixed fisheries complexity and constituents. The fishery around the Smalls has by-catches of whiting, cod and anglerfish, whereas at the Labadie anglerfish and megrim are landed with Nephrops. The main area where catches of Nephrops should be reduced (FUI9), is particularly mixed, with haddock and most other species important by-catches in most of the patches.

Taking account of the mixed fisheries interactions in TAC setting for 2014 is particularly complex. Failing to do so could result in significant quota motivated discarding, foregone yield in the fishery or other unintended consequences.

## Ecosystem overview for the Irish Sea

## FEAS ECOSYSTEM CONSIDERATIONS

FEAS recommends that the following considerations should be taken into account when developing ecosystem based management objectives for Irish Sea fisheries:

- Fishing has impacted a number of commercial species, with some commercial species such as cod and whiting in the Irish Sea now being considered collapsed. A cod long term management plan is currently in place.
- Demersal fisheries in the Irish Sea are mixed fisheries, catching a large number of commercial and non
 commercial species. Most species are discarded. Mixed fisheries do not only affect the commercial stocks which
- are presented in this Stock Book, but impact on the wider fish community. Discarding rates are also high on many commercial species. Recently introduced technical measures i.e. Swedish grids and separator panels have shown to significantly reduce discarding. Effective implementation of these measures will show if discards can be reduced in the Irish Sea. The obligation to land all catch (i.e. no discarding policy) as introduced by the newly reformed CFP, may offer a reduction in discarding practices if efficiently implemented.
- Demersal trawling impacts on benthic habitats and their communities. The resilience and recoverability of habitats vary depending on substrate type, biota and fishing gear. The overall impact of demersal trawling on the Irish Sea seabed needs to be evaluated in relation to the proportion of different habitats affected.
- In order to implement the ecosystem approach to fisheries (EAFM), fisheries management should incentivise fishing behaviour and approaches that are consistent with the EAFM and introduce management tools which reduce the impact of fishing on the wider ecosystem.

|  | Physical Features |
| :---: | :---: |
| Bathymetry | For the most part the Irish Sea is shallow semi-enclosed shelf sea with a depth range of between 20 m and 100 m . A deeper channel running north to south bisects the region. It connects with the Malin Shelf and Atlantic Ocean through the North Channel and the Celtic Sea via the St George's Channel. It reaches a maximum water depth of 315 m in the Beaufort's Dyke in the north-central region. |
| Substrates | In the north and central regions the tidal streams are weakest and sediments are primarily composed of sublittoral muds, deep sea muds and muddy sands. In the higher energy regions in the south, the sediments are dominated by sublittoral course sediment and there is little or no sedimentation (MESH, 2010). A number of sandbanks, including the Kish Bank and Blackwater Bank, run north to south parallel to the Irish east coast (Roche et al., 2007). |
| Circulation | The Irish Sea receives waters from the weak but persistent flow of the Irish Coastal Current (ICC) which originates from the coast of Brittany (Brown et al., 2003, Fernand et al., 2006) and Atlantic waters through the North Channel. Where these water masses meet at the southwest of the Isle of Man a standing wave and weak currents are generated (Horsburgh et al., 1998). |
| Fronts | A cyclonic, near-surface gyre is found during the spring and summer in the Western Irish Sea (Simpson, 1971, Hill et al., 1997, Simpson and Hunter, 1974). The tidal Celtic Sea Front is also created with the onset of stratification. It is located across the St. George's Channel and forms the entrance to the Irish Sea (Simpson, 1976). A year-round salinity front also exists in the Liverpool Bay area (Simpson et al., 1990). |


| $\begin{gathered} \hline \text { Temperature } \\ \pi \\ \text { salinity } \\ \overrightarrow{(1904-2012)} \end{gathered}$ | Time series from the Cypris Station off the Isle of Man indicates that annual SST has risen by approximately $0.7^{\circ} \mathrm{C}$ between 1904 and 2012 . Seasonal temperatures range from around $7-14^{\circ} \mathrm{C}$. No significant long-term salinity trends have been identified at this location (O'Brien et al., 2012). Low salinities, principally due to freshwater inputs are found in Liverpool Bay (Polton et al., 201 I, Hopkins and Polton, 2012). |
| :---: | :---: |
|  | Biological Features |
| Phytoplankton <br> Diatom abundance $\begin{gathered} \rightarrow \\ \text { Dinoflagellates } \\ \overrightarrow{(1996-2010)} \end{gathered}$ | No significant trends in phytoplankton abundance have been found in time series between 1996 and 2010 (O'Brien et al. 2012), however longer term trends indicate a decline in diatom and dinoflagellate abundance (O'Brien et al. 2012, McGinnity et al.,2012). The spring blooms are generally dominated by diatoms with peak abundances in April/May while the abundance of dinoflagellates peaks in September. Microflagellated algae can also contribute significantly to the spring bloom and peak in abundance between April and September (O'Brien et al. 2012). |
| Zooplankton <br> Overall Abundance $\begin{gathered} \searrow \\ (1958-2010) \end{gathered}$ | Longterm times series starting in 1958 show a decline in overall zooplankton abundance in the Irish Sea (O'Brien et al. 2013). Three of the five most common herbivorous copepod taxa have declined in biomass/abundance (Calanus spp. I-IV, Acartia spp. and Paracalanus spp. and small copepods $<2 \mathrm{~mm}$ ) between 1960-1999 and 2000-2009. C. helgolandicus and Temora longicornis have increased. All four species/groups of common carnivorous zooplankton declined in biomass/abundance over the same time period (Euphausiids, Chaetognaths, Hyperiids and Decapods) (McGinnity et al., 2012). Jellyfish are increasing in abundance in the Irish Sea (Lynam et al., 201I). The common jellyfish Aurelia aurita is the most widespread and abundant species (Doyle et al., 2007, Lynam et al., 201I). |
| Benthos and reefs | Five biotopes (communities associated with geophysical and hydrographical information) have been identified in the Irish Sea (IOSEA, 201I). The Brissopsis assemblage, which includes Nephrops, is associated with sublittoral mud in the western basin below 70 m . The Amphiura community; which includes brittle star, sea urchin and turret shell is found in shallow muds surrounding the Brissopsis community. The Abra community is found in localized western areas in shallow ( $5-30 \mathrm{~m}$ ) nearshore muddy sands with rich organic content. The shallow Venus community, which has two sub-communities of Tellina and Spisula, is widely distributed around the coastline and the deep Venus community, consisting of urchin and bivalves is strongly associated with course and mixed sediments in moderate depths ( $40-100 \mathrm{~m}$ ). The Irish Sea also contains examples of Habitats Directive Annex I reef (The Pieces 'rocky' Reef Complex) and submarine structures made by leaking gases (Croker Carbonate Slabs) (JNCC 201la, 201 Ib). |
| Fish community | The Northern Ireland Groundfish Survey recorded 66 fish species in the QI survey and 63 species in the Q4 survey (ICES, 2012c). The main commercial species identified in both surveys were cod, haddock, whiting and plaice. The Irish Sea harbours important spawning and nursery grounds for demersal species such as cod, whiting, ling, plaice and sole and pelagic species such as herring (Ellis et al., 2012). |
| Mammals | Eleven cetacean species have been identified in the Irish Sea between 2000 and 2009 (Berrow et al., 2010). The harbour porpoise, short-beaked common dolphin and common bottlenose dolphin are the most common sightings. Two species of seal are found in the Irish Sea. The grey seal is larger and more abundant than the harbor seal. The largest grey seal populations are found on St.Patrick's Island, Lambay Island and Rockabill Island and Dalkey Island (Co. Dublin) and Wicklow Head (Co. Wicklow) (Ó Cadhla and Strong, 2007). Harbor seal populations have been identified in Carlingford Lough, Lambay Island and Skerries (Co. Dublin), Clogherhead) and Dundalk Bay (Co. Louth) and Wexford harbour (Cronin et al., 2004). |
| ```Seabirds Draft OSPAR ECO QO \``` | Twenty-six species of seabird have been identified in the Irish Sea region. The most common species found during the breeding season are the Black-legged kittiwake, Northern guillemot and Manx shearwater. Rockabill Island, Ireland's Eye and Lambay Island are considered to be the most important breeding grounds (Mackey et al., 2004, |


| (2004-2012) | Mackey and Giménez, 2004). The OSPAR draft ECOQO for seabirds in OSPAR region <br> III (Celtic Seas) which includes the Irish Sea, shows a downward trend since early 2000 <br> (ICES 20I3b). |
| :--- | :--- |
| Climate change <br> effects on finfish <br> and shellish <br> stocks | The northwards shift of both cold-water and warm-water zooplankton Calanus out of and into <br> the Irish Sea is expected to impact on the distribution of many species (Richardson, 2008). Cod <br> reductions since the 1990s may be due to a combination of small spawning stock biomass and <br> poor environmental condition (Drinkwater, 2005). Plaice recruitment appears to have a <br> negative relationship with sea surface temperature. and effects on herring are not known as <br> there are irregular productivity cycles (ICES, 20I3a). It is thought that adult finfish may be <br> tolerant of changes in pH because CO2 levels are variable as a result of activity, but larvae may <br> be negatively affected (lshimatsu et al., 2008). Changes in precipitation patterns, river discharges <br> and salinity, particularly in coastal areas could also affect inshore species that rely on these areas <br> for spawning or nursery grounds (Reid and Valdés, 20I I). |


|  |
| :---: |
| Fishing effort |
| $(>10 \mathrm{~m}$ vessels) |
| $\searrow$ |

## Human pressures and impacts

The main human activities in the Irish Sea are:

- Fishing
- Transport
- Dredging for shipping
- Offshore energy

Overall fishing mortality $\searrow$

Pressures associated with commercial fisheries are:

- The removal of species
- Seafloor disturbance

Fishing effort in the Irish Sea has decreased and current levels of fishing effort are now 60\% of the 2002 levels (STECF, 2012). Of the almost 20kt landed from the Irish Sea in 2012, $58 \%$ comes from stocks that are fished above $\mathrm{F}_{\text {MSY }}$. Three out of the eight Irish Sea stocks are equal to or above $\mathrm{B}_{\text {trigger }}$ which corresponds to almost $85 \%$ of the landings, while two are below $B_{\text {trigger }}$ namely Irish Sea cod and sole. A high level of discarding is linked to mixed trawl fisheries. Discards of the main commercial demersal stocks by all métiers in the Irish Sea between 2003-2009 ranges from $10 \%$ (cod and monkfish) to $100 \%$ (whiting). Discarding ratios of $100 \%$ is common for non-commercial demersal species (Anon., 201I). Towed bottom fishing gears (trawls, dredges, drags, hydraulic devices) impact on seabed species and habitats. Gear type, intensity of trawling, sediment hardness (Foden et al., 2010) and hydrodynamic conditions (Collie et al., 2000, Kaiser et al., 2006) affect a system's ability to recover.
A full reference list can be found in Appendix VI.

Fig. 1 Pressure \& state indicators


Fig. 2 Unknown status


## Letter code for stocks

A Cod Vlla
B Haddock VIIa
C Whiting VIIa
D Plaice VIla
E Sole VIla
F Nephrops (FUI5) VIla
G $\quad$ Nephrops (FU14) VIIa
H Herring VIlaN

Fig. I Relative fishing pressure ( $F / F_{m s y}$ ) and biomass ( $\mathrm{SSB} / \mathrm{B}_{\text {trigg }}$ ) for Irish Sea stocks, which have SSB and F related against reference points (msy where available, otherwise pa or qualitative). This corresponds to 4 out of 8 stocks and $88 \%$ of the landings. Stocks in the green region are exploited below $\mathrm{F}_{\text {msy }}$ and have an SSB that is above $\mathrm{B}_{\text {trigger }}$.
Fig. 2 Stocks of unknown status in relation to reference points. The size of each bubble corresponds to the landings in 2012. The largest bubble corresponds to 10.5 kt .

Fig. 3 Proportion of Irish Sea stocks fished at or below Fmsy (green), above Fmsy (red) and of unknown status in relation to fishing mortality reference points.

Fig. 4 Proportion of Irish Sea stocks with biomass above $B$ trigger (green), below B trigger (red) and of unknown status in relation to biomass reference points.


Fig. 5 Relative fishing mortality ( F to $\mathrm{F}_{\text {msy }}$ ratios) of Irish Sea stocks, demersal F corresponds to Irish Sea cod and sole, pelagic F corresponds to VllaN Herring and Shellfish F corresponds to Nephrops FUI4 and FUI5.

Fig. 6 Relative biomass (SSB to B $_{\text {msy trigger }}$ ratios) of of Irish Sea stocks, demersal SSB corresponds to Irish Sea cod and sole, pelagic F corresponds to VIlaN Herring and Shellfish F corresponds to Nephrops FUI5.

## Irish Sea Cod

(Division VIla)

## FEAS - SINGLE STOCK CONSIDERATIONS

The ICES advice is that on the basis of the MSY approach there should be no directed fisheries, and bycatch and discards should be minimized in 2014. FEAS agrees with this advice.


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

This stock falls in to ICES category I as it is an age based analytical assessment. SSB has declined tenfold since the 1980s and total mortality remains very high. FEAS agrees with ICES that current landings (i.e. TAC), effort and spatial management of fisheries catching cod in Division VIla are not reducing mortality levels sufficiently.

The EU has adopted a long-term management plan for cod stocks and the fisheries exploiting those stocks (Council Regulation (EC) I342/2008). FEAS agrees with the ICES consideration that the management plan is not in accordance with the precautionary approach.

STECF notes that following the agreed Management Plan would imply a TAC of 215 t in 2014 and an Irish quota of 141 t.

## CURRENT MANAGEMENT

- The TAC Area covers Division Vlla and corresponds to the assessment area.
- The 2013 TAC was 285 t with an associated Irish quota of 188 t .
- In 2008 the EC implemented a long term management plan for cod (EC Reg. No I342/2008).
- A spawning closure was introduced in 2000 for 10 weeks from mid-February to maximise the reproductive output of the stock (EU Regulations 304/2000 and 2549/2000). Conservation
 measures have since been revised annually, involving a continued, but smaller spawning ground closure, derogations for certain gears and changes in net design to improve selectivity and protect juvenile fish. FEAS has previously examined the impact of the closed areas for cod in VIla using simulations. The results indicate that closed areas need to be more stringent to have a measurable effect above the assessment uncertainty.
- Measures established for the recovery of cod stocks include multi-annual processes for selection of TACs, restriction of fishing effort, technical measures, control and enforcement, accompanying structural measures and market measures.
- Eleven Irish Nephrops trawlers are now exempt from effort restrictions due to their use of a sorting grid to maintain cod catches below I.5\% and a further ten vessels have opted to use the grid in 2013..
- All Irish vessels operating in VIla must now use inclined separator panels or a sorting grid as a condition of national license obligations.


## ICES ADVICE

### 5.4.5 Cod in Division VIIa (Irish Sea)

## Advice for 2014

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see ICES, 2012): "ICES advises on the basis of the MSY approach that there should be no directed fisheries, and bycatch and discards should be minimized in 2013 and 2014".

## Quality considerations

The model estimates of total removals continue to vary around two to three times the reported landings, despite more accurate catch reporting. Causes for this discrepancy are unclear. Tagging studies have indicated only limited movement of cod out of Division VIIa, therefore fishing outside of the area is not considered to be a major factor. Discard estimates are evaluated but not yet integrated into the assessment due to the short timeseries. A new assessment method was adopted following the benchmarking of the stock - this has not changed the perception of the stock status, but indicates that mortality rates are declining.

## Scientific basis

| Assessment type | Age-based analytical assessment (SAM). |
| :--- | :--- |
| Stock data category | Category 1. |
| Input data | Commercial landings; nine survey indices (NIGFS-WIBTS-Q1, NIGFS-WIBTS-Q4, |
|  | ScoGFS-WIBTS-Q1, ScoGFS-WIBTS-Q4, NIMIK, 2 UK-FSP (Eastern and Western Irish |
|  | Sea), IS-AEPM, UK(E\&W)-BTS-Q3); maturity-at-age constant in all years; maturity-at- |
|  | age 2 changed in the last years according to Armstrong et al. (2004); fixed natural |
| mortality. |  |

## Sources

Armstrong, M. J., Gerritsen, H. D., Allen, M., McCurdy, W. J., and Peel, J. A. D. 2004. Variability in maturity and growth in a heavily exploited stock: cod (Gadus morhua L.) in the Irish Sea. ICES Journal of Marine Science, 61: 98-112.
ICES. 2012. Cod in Division VIIa (Irish Sea). In Report of the ICES Advisory Committee, 2012, Section 5.4.1. ICES Advice, 2012. Book 5: 27-36.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Table 5.4.5.1 Cod in Division VIIa (Irish Sea). ICES advice, management, and landings.

| Year | ICES Advice / Single-stock exploitation boundaries since 2004 | Predicted catch corresponding to advice | Agreed TAC | Official landings | $\begin{aligned} & \text { ICES } \\ & \text { landings } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1987 | No increase in F; interaction with Nephrops | 10.3 | 15.0 | 13.2 | 12.9 |
| 1988 | No increase in F; interaction with Nephrops | 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 $\mathrm{F}_{\text {med }}$; 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) ~ 10000 t | 10.0 | 10.0 | 7.4 | $7.7{ }^{2}$ |
| 1993 | $\mathrm{F}_{\text {med }} \sim 10200 \mathrm{t}$ | 10.2 | 11.0 | 5.9 | $7.6{ }^{2}$ |
| 1994 | 60\% reduction in F | 3.7 | 6.2 | 4.5 | $5.4{ }^{2}$ |
| 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 | $5.31{ }^{2}$ |
| 1999 | Reduce F below $\mathrm{F}_{\mathrm{pa}}$ | 4.9 | 5.5 | 2.96 | $4.78{ }^{2}$ |
| 2000 | Lowest possible F | 0 | 2.1 | 1.42 | $1.27{ }^{3}$ |
| 2001 | Lowest possible F | 0 | 2.1 | 2.03 | $2.25{ }^{3}$ |
| 2002 | Establish recovery plan | - | 3.2 | 2.7 | $2.69{ }^{3}$ |
| 2003 | Closure of all fisheries for cod | - | 1.95 | 1.5 | $1.28{ }^{3}$ |
| 2004 | Zero catch | 0 | 2.15 | 1.1 | $1.07{ }^{3}$ |
| 2005 | Zero catch | 0 | 2.15 | 0.97 | $0.91{ }^{3}$ |
| 2006 | Zero catch | 0 | 1.828 | 0.95 | $0.84{ }^{3}$ |
| 2007 | Zero catch | 0 | 1.462 | 1.12 | $0.70^{3}$ |
| 2008 | Zero catch | 0 | 1.199 | 1.22 | $0.66{ }^{3}$ |
| 2009 | Zero catch | 0 | 0.899 | 0.75 | $0.47{ }^{3}$ |
| 2010 | Zero catch | 0 | 0.674 | 0.59 | $0.46{ }^{3}$ |
| 2011 | Zero catch | 0 | 0.506 | 0.48 | $0.37{ }^{3}$ |
| 2012 | Zero catch | 0 | 0.380 | 0.33 | $0.20{ }^{3}$ |
| 2013 | No directed fisheries, minimize bycatch and discards | 0 | 0.285 |  |  |
| 2014 | Same advice as for 2013 | 0 |  |  |  |

Weights in thousand tonnes.
${ }^{1}$ Preliminary.
${ }^{2}$ Includes sample-based estimates of landings into three ports.
${ }^{3}$ As reported to the working group.


Figure 6.2.32. Cod in ICES Division VIIa: Comparison between the results of the assessment carried out at WGCSE 2012 and that performed at WGCSE 2013.

## Irish Sea Whiting <br> (Division VIla)

## FEAS - SINGLE STOCK CONSIDERATIONS

The ICES advice is that "on the basis of precautionary considerations catches should be reduced to the lowest possible levels and that effective technical measures should be implemented to reduce discards". FEAS agrees with this advice.

This stock falls into ICES category 2.1 .3 since the analytical assessment is indicative of trends only. The underlying data do not support the provision of estimates of $\mathrm{F}_{\text {Msy }}$. However, it is likely that


Red Box-TAC/Management Area Blue Shading-Assessment Area current $F$ is above $F_{\text {MSY. }}$. Therefore, catches (mainly discards) of whiting in 2014 should be the lowest possible.
Urgent management action is required to rebuild the whiting stock in this area. FEAS stresses that the cornerstone of any rebuilding of whiting stocks should be measures that significantly reduce or eliminate the discarding of whiting in the Nephrops fishery. These might include spatial and temporal changes in fishing practises or technical measures such as increased codend mesh size, square mesh panels, separator trawls, Swedish grids and increased top sheet mesh in towed gears.

## CURRENT MANAGEMENT

- The TAC area covers Division VIla and this corresponds with the assessment area.
- The TAC for Division VIla in 2013 was 84 t with an associated Irish quota of 49 t .
- There are no explicit management objectives or a management plan for this stock.
- The spring closure of the western Irish Sea to whitefish fishing, designed to protect cod, has been continued, but is unlikely to have affected whiting catches, which are mainly by-catch in the derogated
 Nephrops fishery.
- The operation of days-at-sea effort limitations in the Irish Sea since 2004 is not expected to have resulted in a significant reduction in fishing mortality for whiting.
- Swedish grids in particular have been shown to significantly reduce (-72\%) catches of whiting in the Nephrops fishery since their introduction by 4 Irish vessels in late 2009 and 2010.
- Uptake of Swedish has increased further in 2013 to 21 vessels.


## ICES ADVICE 5.4.43 Whiting in Division VIIa (Irish Sea)

## Advice for 2014

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see ICES, 2012): "ICES advises on the basis of precautionary considerations that catches should be reduced to the lowest possible levels and that effective technical measures should be implemented to reduce discards".

## Quality considerations

Since 2003 the low landing levels have resulted in poor sampling coverage of the stock and no reliable estimates of catch numbers-at-age. After a period of incomplete discard information between 2003 and 2006 discard estimates are available for the main fleets but are imprecise; however, the quality of discard information has improved subsequently. Discard estimates since 2007 show that more than 1000 t of whiting were discarded annually with $\sim 50 \mathrm{t}$ of landings. The majority of the discards were below minimum landing size. Survey data are consistent with a high total mortality and low stock size.

## Scientific basis

| Assessment type | Analytical survey-based assessment considered to be indicative of trends only. |
| :---: | :---: |
| Stock data category | Category 2.1.3. |
| Input data | Survey indices (NIGFS-WIBTS-Q1 and NIGFS-WIBTS-Q4); fixed maturity ogive from surveys; constant natural mortality assumed. |
| Discards and bycatch | Discards were not included in the assessment but are available for monitoring (OTB $<100 \mathrm{~mm}$ ). |
| Indicators | NIMIK, UK (E\&W)-BTS-3Q, and UK FSP survey. |
| Other information | Commercial landings. |
| Working group report | WGCSE (ICES, 2013). |

## Sources

ICES. 2012. Whiting in Division VIIa (Irish Sea). In Report of the ICES Advisory Committee 2012, Section 5.4.5. ICES Advice, 2012, Book 5: 63-68.

ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Table 5.4.43.1 Whiting in Division VIIa (Irish Sea). ICES advice, management, and landings, discards, and catches.

| Year ICES Advice | Predicted catch corresp. to advice | Agreed <br> TAC | Official landings | ICES landings | Disc. ${ }^{2}$ | $\begin{aligned} & \text { ICES } \\ & \text { catch } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1987 Reduce F | 16.0 | 18.2 | 11.7 | - | - | - |
| 1988 No increase in F enforce mesh requlations | 12.0 | 18.2 | 11.5 | 10.24 | 1.90 | 12.14 |
| $1989 \mathrm{~F}=\mathrm{F}_{\text {high }}$; enforce mesh regulations | 11.0 | 18.2 | 11.3 | 11.30 | 2.00 | 13.30 |
| 1990 No increase in F; TAC | $8.3{ }^{1}$ | 15.0 | 8.2 | 8.21 | 2.70 | 10.91 |
| 1991 Increase SSB to $\operatorname{SSB}(89)$ | $6.4{ }^{1}$ | 10.0 | 7.4 | 7.35 | 2.70 | 10.05 |
| 1992 80\% of F(90) | $9.7{ }^{1}$ | 10.0 | 7.1 | 8.59 | 4.30 | 12.89 |
| 1993 70\% of F(91) ~ 6500 t | 6.5 | 8.5 | 6.0 | 6.52 | 2.70 | 9.22 |
| 1994 Within safe biological limits | - | 9.9 | 5.6 | 6.76 | 1.20 | 7.96 |
| 1995 No increase in F | $8.3{ }^{1}$ | 8.0 | 5.5 | 4.89 | 2.20 | 7.09 |
| 1996 No increase in F | $9.8{ }^{1}$ | 9.0 | 5.6 | 4.33 | 3.50 | 7.83 |
| 1997 No advice given | - | 7.5 | 4.5 | 2.28 | 1.90 | 4.18 |
| 1998 20\% reduction in F | $3.8{ }^{4}$ | 5.0 | 3.4 | 2.23 | 1.30 | 3.53 |
| 1999 Reduce F below $\mathrm{F}_{\mathrm{pa}}$ | $3.5{ }^{4}$ | 4.41 | 2.0 | 1.67 | 1.10 | 2.77 |
| 2000 Reduce F below $\mathrm{F}_{\mathrm{pa}}$ | <1.6 ${ }^{4}$ | 2.64 | 1.1 | 0.76 | 2.10 | 2.86 |
| 2001 Lowest possible F | $\sim 0$ | 1.39 | 1.1 | 0.73 | 1.00 | 1.73 |
| 2002 Lowest possible F | $\sim 0$ | 1.00 | 0.7 | 0.75 | 0.70 | 1.45 |
| 2003 Lowest possible F | $\sim 0$ | 0.50 | 0.5 | 0.68 | n.a. | - |
| 2004 zero catch | 0 | 0.514 | 0.2 | 0.18 | n.a. | - |
| 2005 zero catch | 0 | 0.514 | 0.2 | 0.16 | n.a. | - |
| 2006 lowest possible catch | 0 | 0.437 | 0.08 | 0.09 | n.a. | - |
| 2007 lowest possible catch | 0 | 0.371 | 0.2 | 0.20 | n.a. | - |
| 2008 lowest possible catch | 0 | 0.278 | 0.08 | 0.08 | 1.60 | 1.68 |
| 2009 Same advice as last year | 0 | 0.290 | 0.1 | 0.10 | 1.90 | 2.00 |
| 2010 Same advice as last year | 0 | 0.157 | 0.12 | 0.12 | 1.00 | 1.12 |
| 2011 See scenarios | - | 0.118 | 0.11 | 0.07 | 1.20 | 1.27 |
| 2012 Lowest possible catch and improve selectivity | 0 | 0.089 | 0.07 | $0.05^{5}$ | 1.40 | 1.45 |
| 2013 Lowest possible catch and improve selectivity | 0 | 0.084 |  |  |  |  |
| 2014 Same advice as for 2013 | 0 |  |  |  |  |  |

Weights in thousand tonnes.
${ }^{1}$ Not including discards from the Nephrops fishery.
${ }^{2}$ From the Nephrops fishery from 1987 to 2002.
${ }^{3}$ Including estimates of misreporting.
${ }^{4}$ Landings only, no discards included.
${ }^{5}$ Since 2012 landings from statistical rectangles 33E2, 33E2, and 33E3 reallocated to Divisions VIIe-k whiting landings. n.a. $=$ not available.

## Irish Sea Haddock

## (Division VIla)

## FEAS - SINGLE STOCK CONSIDERATIONS

The ICES advice is based on the approach for data-limited stocks and states that catches in 2014 should be no more than I,I20 t implying landings of no more than 572 t . Further technical measures should be introduced to reduce discards. FEAS agrees with this advice but considers that management of this stock by TAC alone is inappropriate because landings, not catches, are controlled. Discard estimates are very variable, but considered to be large in some years.


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

This stock falls in to ICES category 3.2.0 since the survey based assessment is indicative of trends only. Effort has declined in the main fisheries catching haddock but the relative total mortality as estimated from surveys shows little change over the time series. SSB shows an increasing trend since 2010. No MSY reference points are defined for this stock.

There are no specific management objectives for the stock. FEAS advises that measures to reduce discarding should be introduced. These might include spatial and temporal changes in fishing practises or technical measures such as increased cod-end mesh size, square mesh panels, separator trawls, Swedish grids and increased top sheet mesh in towed gears.

## CURRENT MANAGEMENT

- The TAC Area previously covered Sub-areas VII, VIII, IX and X but since 2009 a separate TAC is allocated for Division Vlla.
- The 2013 TAC for haddock in Division Vlla was 1189 t with an Irish quota of 515 t .
- There are no explicit management objectives or a management plan for this stock.
- Effort reductions as part of the Cod Long Term Management Plan (EC Reg.l342/2008) will also reduce catch and discarding of haddock in this area.
- FEAS recommends that management objectives be established and
 that a management plan be developed and implemented for fisheries catching haddock.


## ICES ADVICE 5.4.10 Haddock in Division VIIa (Irish Sea)

## Advice for 2014

Based on ICES approach to data-limited stocks, ICES advises that catches should be no more than 1120 tonnes in 2014. If discard rates do not change from the average of the last three years, this implies landings of no more than 572 tonnes. Further technical measures should be introduced to reduce discards.

## Stock status

| F (Fishing Mortality) |  |  |
| :---: | :---: | :---: |
|  |  | 2010-2012 |
| MSY ( $\mathrm{F}_{\text {MSY }}$ ) |  | Unknown |
| Precautionary $\operatorname{approach}\left(\mathrm{F}_{\mathrm{pa}}, \mathrm{F}_{\mathrm{lim}}\right)$ |  | Unknown |



Figure 5.4.10.1 Haddock in Division VIIa (Irish Sea). Summary of trends in ICES estimates of landings (in tonnes; 2003 sampling was inadequate to derive catch age compositions), recruitment, total mortality, and spawning-stock biomass relative to the mean of the time-series. The horizontal lines in the SSB plot indicate the average of the respective time-series.

The assessment is indicative of trends only. Trends in SSB from the assessment indicate that the average of the biomass indicator in the last two years (2012-2013) is $17 \%$ higher than the average of the three previous years (2009-2011). SSB trends are fluctuating due to the dependence of incoming year classes.

## Management plans

No specific management objectives are known to ICES.

## Biology

Recruitment is highly variable and the biomass increases rapidly after good recruitment. Density-dependent growth is also evident by year class, which will have an effect on the overall yield of abundant year classes.

## The fisheries

Haddock in Division VIIa are taken in Nephrops and mixed demersal trawl fisheries, using mid-water trawls and otter trawls, and in seine net fisheries. The haddock TAC has not been fully caught in recent years, mainly due to the restricted TAC for cod. Landings are made throughout the year, but are generally more abundant during the third quarter. Since 2012 it has been mandatory for all Irish and UK(Northern Ireland) vessels to use specified species-selective gears. These gears are primarily aimed at reducing cod bycatch, but will also reduce haddock catch, although this cannot be quantified. Discard estimates are very variable, being large in some years.

## Catch distribution Total catch (2012) was 1061 t ( $32 \%$ landings and $68 \%$ discards).

## Quality considerations

This assessment is based on survey trends only, for lack of a time-series with reliable discard data. This may be due to poor discard and landing samplings in some years. Sampling levels, however, have improved considerably in the last four years. Landings have been revised since 1993 and exclude landings from the southern rectangles in the Irish Sea as they not are believed to be part of this stock.

Due to the uncertainty in the mortality estimates for the stock, the advice is based only on the SSB estimated from the assessment used as indicator of stock size. The methods applied to derive quantitative advice for datalimited stocks are expected to evolve as they are further developed and validated. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished.

## Scientific basis

| Assessment type | Surba analysis based on survey information, considered indicative of trends only. |
| :--- | :--- |
| Stock data category | Category 3.2.0. |
| Input data | One survey index (NIGFS-WIBTS-Q1); annual maturity and growth data from the |
| Discards and bycatch | NIGFS-WIBTS-Q1 survey. <br> Discards were not included in the assessment but are available for monitoring for the <br> otter and beam trawl fleets. |
| Indicators | NIGFS-WIBTS-Q4, NIMIK, UK-FSP (Eastern and Western Irish Sea), IS-AEPM <br> surveys. |
| Other information | Benchmarked in 2013 (WKROUND; ICES, 2013a). |
| Working group report | WGCSE (ICES, 2013b). |

5.4.10

## ECOREGION Celtic Sea and West of Scotland STOCK Haddock in Division VIIa (Irish Sea)

## Reference points

|  | Type | Value | Technical basis |
| :--- | :--- | :--- | :--- |
| MSY | MSY $\mathrm{B}_{\text {trigger }}$ | Not <br> defined. |  |
|  | $\mathrm{F}_{\mathrm{MSY}}$ | Not <br> defined. |  |
|  | $\mathrm{B}_{\text {lim }}$ | Not <br> defined. |  |
|  | $\mathrm{B}_{\mathrm{pa}}$ | Not <br> defined. |  |
|  | $\mathrm{F}_{\text {lim }}$ | Not <br> defined. |  |
|  | $\mathrm{F}_{\mathrm{pa}}$ | 0.5 | ICES proposed that $\mathrm{F}_{\mathrm{pa}}$ be set at 0.5 by association with other <br> haddock stocks. |

(Unchanged since: 1998)

## Outlook for 2014

The assessment is indicative of trends only. The main reason no full analytical assessment can be presented is uncertainties in the mortality estimates for the stock and absolute levels of catch. Therefore, fishing possibilities cannot be projected.

## ICES approach to data-limited stocks

For data-limited stocks for which a biomass index is available, ICES uses a harvest control rule based on indexadjusted status quo catch. The advice is based on a comparison of the two most recent index values with the three preceding values, combined with recent catch or landings data. Knowledge about the exploitation status also influences the advised catch.

For this stock the biomass is estimated to have increased by $17 \%$ between the periods 2009-2011 (average of the three years) and 2012-2013 (average of the two years). This implies a $17 \%$ increase in catches compared to the average catches of the last three years, corresponding to catches in 2014 of no more than 1120 tonnes. If discard rates do not change from the average of the last three years, this implies landings of no more than 572 tonnes.

Considering that the effort in the main fisheries has decreased, no additional precautionary reduction is needed (Figure 5.4.10.2).

## Precautionary considerations

Management measures should be introduced in the Irish Sea to reduce discarding of small haddock in order to maximize their contribution to future yield and SSB.

## Additional considerations

## Management considerations

TAC uptake has been less than $71 \%$ since 2008 mainly due to a restrictive TAC for cod. The haddock TAC is thus not restrictive for any country. Discarding at younger ages is a serious problem for this stock. The discard rates for Nephrops fleets (TR2 70-99 mm mesh size) in 2011 were $99-100 \%$ for one-year-olds, $63-94 \%$ for two-year-olds, and 3-21\% for three-year-olds by number.

An increase in mesh size to reduce discarding will be beneficial to this stock and could increase future yield. Reduced selectivity on younger ages would reduce discarding and promote stock increase when strong year classes occur. Some fleets are using 80 mm mesh to target Nephrops, 90 mm mesh in mixed fisheries, and 100+ mm to target gadoids and other species. Recent gear trials have shown that square mesh panels can significantly reduce discards of undersized haddock (BIM, 2009).

ICES notes that there have been a number of industry and national initiatives to reduce discarding associated with Nephrops fisheries. The Northern Irish fleet has voluntarily introduced novel square mesh panel designs (Briggs, 2010). STECF evaluated this measure and concluded that based on the experimental trials, the proposed gear should lead to a large reduction in the discarding of haddock and whiting $<20 \mathrm{~cm}$ (STECF, 2012). The Irish Nephrops fleet have expanded the use of sorting grids and separator trawls as the use of more speciesselective gear is now mandatory. Such initiatives should lead to significant reductions in discards if effectively implemented in the fisheries. It is important that the effectiveness of these devices and their impact on discards and landings are monitored and evaluated.

The Annual Egg Production Method (AEPM) survey estimates of haddock SSB confirm the trend in SSB from the assessment (Fig. 5.4.10.3). The absolute estimates in 2006 and 2008 ( 8.8 kt and 9.4 kt with CV of $32 \%$ and $24 \%$, respectively) are very large compared to the estimated landings of 650 and 870 t , respectively. Even when discard estimates at age $2+$ are taken into account the total catch estimates are $\sim 1000-1200 \mathrm{t}$ during this period. This would imply a much lower mortality than given by the age profile in the survey used in the assessment. There is, however, no evidence from any fishery data of an age composition that would reflect low mortality. The AEPM estimate for 2010 is, in contrast to the 2006 and 2008 estimates, substantially lower at 870 t (CV of $26 \%$ ), corresponding to landings of 940 t and catch estimates of $\sim 1100 \mathrm{t}$.

Current TAC management measures are not responsive enough considering the dynamic nature of changes in stock abundance. The increase in abundance from 2005 to 2008 created increased catch opportunities. During this period the TAC remained relatively constant and resulted in increased discarding of older fish (particularly in 2007). The TAC for 2009 was increased based on the increasing trend of stock abundance, in spite of evidence of weaker recruitment and possible decreasing abundance.

Landings data have not been used in the assessment. Landings data for this stock are uncertain because of species misreporting, which has been estimated from quayside observations in one country only. Restrictive quotas for some countries caused extensive misreporting during the 1990s prior to the introduction of a separate TAC allocation for the Irish Sea. Estimates of misreporting have been included in the estimates of landings, except for 2003. The recent implementation of the UK "Buyers and Sellers" legislation has improved the quality of the landings data and there is little evidence of misreporting since 2006.

International effort trends for the main gears in the Irish Sea, as collated and presented by the STECF effort group, show very strong effort reductions in the directed whitefish fleet (TR1, larger meshed trawls), which traditionally was the main fishery targeting haddock. A recent decline is also detected in the Nephrops fishery (TR2), which is the fleet now catching haddock as a bycatch.

## Regulations and their effects

EU has adopted a long-term plan for cod stocks and the fisheries exploiting those stocks (Council Regulation (EC) $1342 / 2008$ ). The long-term management plan for cod implemented in the Irish Sea from 2008 will affect catches of species caught in related fisheries, including haddock.

## Changes in fishing technology and fishing patterns

The introduction of effort regulation has effectively encouraged vessel operators to reduce mesh size and shift to other fisheries, particularly to Nephrops trawling, in order to gain more days at sea. This has implications for catch compositions and the selectivity of the fishery. The use of species-selective gears to mitigate effort restrictions and thus avoid effort limits has increased steadily since 2009. A conditional national licence was introduced by Ireland in March 2012, making the use of grids or separator panels mandatory for all TR2 boats fishing in the Irish Sea. Around $55 \%$ of the Irish vessels use separator trawls, while $45 \%$ have opted to use Swedish grids to reduce bycatch. Grids have been shown to reduce catches of $<25 \mathrm{~cm}$ haddock to negligible levels. Since October 2012, all TR2 vessels in the UK(Northern Ireland) fleet are required to use a highly selective fishing gear to reduce overall discarding of fish. The targeted whitefish fishery that developed during the 1990s using semi-pelagic trawls has declined to less than four vessels prosecuting a seasonal fishery that is conditional of available cod quota.

## Uncertainties in the assessment

An assessment was carried out based solely on survey information and is considered to be indicative of trends only. Both total mortality, recruitment, and SSB estimates are relative as survey catchabilities-at-age are not known.

## Information from the fishing industry

The UK Fishery-Science Partnership Irish Sea roundfish survey 2004-2012, which was carried out using commercial trawlers, indicated similar year-class signals to research vessel surveys. This survey supports the conclusions of the assessment.

## Comparison with previous assessment and advice

The perception of the stock has not changed since last year's assessment. The basis for advice this year is the same as last year and based on ICES approach to data-limited stocks.

## Sources

BIM. 2009. Summary report of Gear Trials to Support Ireland's Submission under Articles $11 \& 13$ of Reg. 1342/2008. Nephrops Fisheries VIIa \& VIIb-k. Project 09.SM.T1.01. Bord Iascaigh Mhara (BIM), May 2009.

Briggs, R. P. 2010. A novel escape panel for trawl nets used in the Irish Sea Nephrops fishery. Short Communication. Fisheries Research, 105: 118-134.
ICES. 2013a. Report of the Benchmark Workshop on Roundfish Stocks, 4-8 February, Aberdeen, UK. ICES CM 2013/ACOM: 47.
ICES. 2013b. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.
STECF. 2012. 39th Plenary Meeting Report of the Scientific, Technical and Economic Committee for Fisheries (PLEN-12-01). Luxembourg: Publications Office of the European Union. 2012.


Figure 5.4.10.2 Haddock in Division VIIa (Irish Sea). Effort trends for regulated gears in the Irish Sea, showing decrease in TR1 effort.


Figure 5.4.10.3 Haddock in Division VIIa (Irish Sea). Trends in SSB 2013 from the surba analysis projected to 2014 compared with the Irish Sea annual egg production method survey estimates of SSB $(+2 \times$ standard error).

Table 5.4.10.1 Haddock in Division VIIa (Irish Sea). ICES advice, management, and landings.

| Year ICES Advice | Predicted catch corresp. to advice | Agreed TAC ${ }^{1}$ | Official landings | ICES landings | $\begin{gathered} \text { ICES } \\ \text { discards } \end{gathered}$ | ICES catches |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1987 Not dealt with |  |  | 1.3 | 1.3 |  |  |
| 1988 Not dealt with |  |  | 0.7 | 0.7 |  |  |
| 1989 Not dealt with |  |  | 0.6 | 0.6 |  |  |
| 1990 Not dealt with |  |  | 0.6 | 0.6 |  |  |
| 1991 Not dealt with |  |  | 0.6 | 0.6 |  |  |
| 1992 Not dealt with |  |  | 0.7 | 0.7 |  |  |
| 1993 Not dealt with |  |  | 0.7 | 0.8 |  |  |
| 1994 Not dealt with |  |  | 0.7 | 1.0 |  |  |
| 1995 Not dealt with |  | $6^{1}$ | 0.8 | 1.7 |  |  |
| 1996 No advice |  | $7^{1}$ | 1.5 | 3.0 |  |  |
| 1997 Means of setting catch limits req'd |  | $14^{1}$ | 1.9 | 3.5 |  |  |
| 1998 Catch limit for Division VIIa | 3.0 | $20^{1}$ | 3.0 | 4.9 |  |  |
| 1999 No increase in F; catch limit for VIIa | 7.0 | $4.99{ }^{2}$ | 2.4 | 4.1 |  |  |
| 2000 Reduce F below $\mathrm{F}_{\mathrm{pa}}$ | $<2.8$ | $3.4{ }^{2}$ | 2.4 | 1.4 |  |  |
| 2001 Reduce F below $\mathrm{F}_{\mathrm{pa}}$ | $<1.71$ | $2.7^{2}$ | 2.2 | 2.2 |  |  |
| 2002 Reduce F below $\mathrm{F}_{\mathrm{pa}}$ | $<1.20$ | $1.3{ }^{2}$ | 1.1 | 1.8 |  |  |
| 2003 No cod catches | - | $0.6{ }^{2}$ | 0.7 | n/a |  |  |
| $2004 \mathrm{~F}<\mathrm{F}_{\mathrm{pa}}$ | $<1.5$ | $1.5^{2}$ | 0.8 | 1.2 |  |  |
| $2005 \mathrm{~F}<\mathrm{F}_{\mathrm{pa}}$ | $<1.37$ | 1.37 | 0.5 | 0.7 |  |  |
| 2006 Substantial reduction in fishing mortality | - | 1.275 | 0.7 | 0.6 |  |  |
| 2007 Substantial reduction in fishing mortality | - | 1.179 | 1.1 | 0.9 |  |  |
| 2008 No increase in effort | - | 1.238 | 0.9 | 0.8 |  |  |
| 2009 No increase in effort | - | 1.424 | 0.8 | 0.6 |  |  |
| 2010 No increase in effort | - | 1.424 | 0.9 | 0.7 | 0.4 | 1.1 |
| 2011 See scenarios | - | 1.317 | 0.8 | 0.4 | 0.3 | 0.7 |
| 2012 Reduce catch and improved selectivity | - | 1.215 | $0.8{ }^{3}$ | $0.3{ }^{3}$ | $0.7^{3}$ | $1.0^{3}$ |
| 2013 Decrease catch by $18 \%$ | $<0.71$ | 1.215 |  |  |  |  |
| 2014 Increase catch by 17\% | 1.120 |  |  |  |  |  |

Weights in thousand tonnes.
${ }^{1}$ Precautionary TAC for Subareas VII, VIII, IX, and X up to 1998 and the Division VIIa allocation of precautionary TAC from 1999.
${ }^{2}$ Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.
${ }^{3}$ Preliminary.

Table 5.4.10.2 Haddock in Division VIIa. Nominal landings ( $t$ ) by country, as officially reported to ICES. The total ICES landings used in the assessment are also shown.

| Country | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Belgium | 3 | 4 | 5 | 10 | 12 | 4 | 4 | 1 | 8 | 18 |
| France | 38 | 31 | 39 | 50 | 47 | $\mathrm{n} / \mathrm{a}$ | $\mathrm{n} / \mathrm{a}$ | $\mathrm{n} / \mathrm{a}$ | 73 | 41 |
| Ireland | 199 | 341 | 275 | 797 | 363 | 215 | 80 | 254 | 251 | 252 |
| Netherlands | - | - | - | - | - | - | - | - | - | - |
| UK (England \& Wales) ${ }^{1}$ | 29 | 28 | 22 | 41 | 74 | 252 | 177 | 204 | 244 | 260 |
| UK (Isle of Man) | 2 | 5 | 4 | 3 | 3 | 3 | 5 | 14 | 13 | 19 |
| UK (N. Ireland) | 38 | 215 | 358 | 230 | 196 | $\ldots$ | $\ldots$ | $\ldots$ | $\ldots$ | $\ldots$ |
| UK (Scotland) | 78 | 104 | 23 | 156 | 52 | 86 | 316 | 143 | 114 | 140 |
| Total | 387 | 728 | 726 | 1287 | 747 | 560 | 582 | 616 | 703 | 730 |
| ICES landings | 387 | 728 | 726 | 1287 | 747 | 560 | 582 | 616 | 656 | 813 |
|  |  |  |  |  |  |  |  |  |  |  |
| Country | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
| Belgium | 22 | 32 | 34 | 55 | 104 | 53 | 22 | 68 | 44 | 20 |
| France | 22 | 58 | 105 | 74 | 86 | $n / \mathrm{a}$ | 49 | 184 | 72 | 146 |
| Ireland | 246 | 320 | 798 | 1005 | 1699 | 759 | 1238 | 652 | 401 | 229 |
| Netherlands | - | - | 1 | 14 | 10 | 5 | 2 | - | - | - |
| UK (England \& Wales) ${ }^{1}$ | 301 | 294 | 463 | 717 | 1023 | 1479 | 1061 | 1238 | 551 | 248 |
| UK (Isle of Man) | 24 | 27 | 38 | 9 | 13 | 7 | 19 | 1 | - | - |
| UK (N. Ireland) | $\ldots$ | $\ldots$ | $\ldots$ | $\ldots$ | $\ldots$ | $\ldots$ | $\ldots$ | $\ldots$ | $\ldots$ | $\ldots$ |
| UK (Scotland) | 66 | 110 | 14 | 51 | 80 | 67 | 56 | 86 | 47 | 31 |
| Total | 681 | 841 | 1453 | 1925 | 3015 | 2370 | 2447 | 2229 | 1115 | 674 |
| ICES landings |  |  |  |  |  |  |  |  |  |  |

*Preliminary.
${ }^{1}$ Since 1989 Northern Ireland included with England and Wales.
$\mathrm{n} / \mathrm{a}=$ not available.

Table 5.4.10.3 Haddock in Division VIIa. Stock assessment results in relative to the mean of the time-series (s.e.: standard error).

| Year | Relative recruitment <br> estimates |  | Relative SSB |  | Relative TSB |  | Relative mean Z 2-3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| s.e. | estimates | s.e. | estimates | s.e. | estimates | s.e. |  |  |
| 1992 | 0.047 | 0.002 | 0.009 | 0.003 | 0.034 | 0.007 | 0.197 | 0.055 |
| 1993 | 0.007 | 0.000 | 0.149 | 0.000 | 0.123 | 0.023 | 0.729 | 0.203 |
| 1994 | 0.074 | 0.004 | 0.193 | 0.004 | 0.157 | 0.034 | 1.026 | 0.285 |
| 1995 | 0.944 | 0.050 | 0.108 | 0.052 | 0.567 | 0.085 | 1.081 | 0.300 |
| 1996 | 0.100 | 0.005 | 1.001 | 0.005 | 0.864 | 0.182 | 0.701 | 0.195 |
| 1997 | 2.330 | 0.125 | 1.437 | 0.122 | 1.896 | 0.320 | 1.243 | 0.345 |
| 1998 | 0.173 | 0.009 | 1.560 | 0.009 | 1.292 | 0.283 | 1.111 | 0.309 |
| 1999 | 0.696 | 0.040 | 1.022 | 0.039 | 0.887 | 0.182 | 1.232 | 0.342 |
| 2000 | 1.287 | 0.062 | 0.581 | 0.070 | 0.802 | 0.191 | 1.101 | 0.306 |
| 2001 | 0.271 | 0.015 | 1.050 | 0.015 | 0.873 | 0.178 | 1.221 | 0.339 |
| 2002 | 1.720 | 0.091 | 0.762 | 0.088 | 1.073 | 0.282 | 0.731 | 0.203 |
| 2003 | 0.519 | 0.027 | 1.674 | 0.027 | 1.457 | 0.277 | 0.933 | 0.259 |
| 2004 | 1.651 | 0.093 | 1.563 | 0.099 | 1.428 | 0.426 | 1.155 | 0.321 |
| 2005 | 2.331 | 0.120 | 1.170 | 0.121 | 1.298 | 0.438 | 1.097 | 0.305 |
| 2006 | 1.582 | 0.084 | 1.529 | 0.079 | 1.426 | 0.379 | 0.787 | 0.219 |
| 2007 | 2.606 | 0.138 | 1.665 | 0.136 | 1.692 | 0.397 | 1.097 | 0.305 |
| 2008 | 0.717 | 0.039 | 1.896 | 0.039 | 1.539 | 0.286 | 1.185 | 0.329 |
| 2009 | 0.562 | 0.031 | 1.217 | 0.031 | 0.943 | 0.192 | 1.165 | 0.324 |
| 2010 | 1.354 | 0.071 | 0.605 | 0.079 | 0.744 | 0.175 | 0.922 | 0.256 |
| 2011 | 1.197 | 0.074 | 0.781 | 0.076 | 0.902 | 0.169 | 1.074 | 0.298 |
| 2012 | 1.163 | 0.082 | 0.911 | 0.075 | 1.011 | 0.350 | 1.160 | 0.322 |
| 2013 | 0.668 | 0.067 | 1.117 | 0.090 | 0.991 | 0.190 | 1.052 | 0.292 |

# Overview of Nephrops Stocks around Ireland 

## (Sub-area VII)

## FEAS -MULTIPLE STOCKS CONSIDERATIONS

ICES, STECF and FEAS advise that all Nephrops fisheries in VII are managed at an appropriate geographical scale i.e. Functional Unit (FU). FEAS reiterates that the lack of management controls at an appropriate geographic scale could lead to unbalanced exploitation and possible over exploitation of some stocks. However, FEAS recognise that implementing FU management presents serious operational issues and may require a fundamental redesign of the quota management system in Ireland and elsewhere. Both ICES and STECF give advice for individual FUs not for the whole TAC area.


Red Boxes - TAC/Management Area Shading - Functional Unit

This year ICES have based assessments on Underwater Television Surveys (UWTV) for FUs 14, 15, 16, 17, 19, and 22. Most stocks do not have defined biomass reference points due to the short time series of UWTV observations. Three Nephrops stocks in VII are fished below the Fmsy proxy FU 14, 16 and 22. Three stocks are fished above the FMSY in 2012: FUl5, FUI7 and FU19. For FU20-2I the ICES advice given last year based on the ICES Nephrops data limited approach has not been updated. Last year's qualitative evaluation showed that mortality was declining and recent landings are well below sustainable levels.

The information base for assessments has also improved significantly since 2011 with new UWTV surveys in FU19, FU16 and FU20-2I in 2012 and 2013. The fishing industry has collaborated with scientists to address data deficiencies by developing a trawl survey and providing grade information for landings for FUI6. The only catches not currently assessed with UWTV surveys are from FUI8 and other rectangles. These represent $1.9 \%$ of the landings from VII in 2012. Based on the ICES approach to data-limited stocks, ICES advises that landings from FU 18 and 'other rectangles' should be no more than 235 tonnes. FEAS agrees with the ICES advice.

The quantitative catch advice given by ICES for 2014 is summarised below. A comparison with the advice last year is also shown. The total advice for 2014 of $17,564 \mathrm{t}$ would represent an $8 \%$ decrease on that implied by ICES last year. Reducing the TAC to the levels of the cumulative ICES advice of I7,564 t would be unnecessarily restrictive for countries with full quota uptake, such as Ireland and the UK (Figure 1). This could lead to under exploitation of some FUs. The TAC has always been set above the cumulative ICES advice for this area (Figure 2). FEAS advise that the large differences in recent quota uptakes between countries must be taken into account when setting an overall TAC for VII.

|  |  |  | ICES Advice ('000 t) |  | FEAS Advice ('000 t) |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Ground | $\underset{\sim M S Y}{F}$ | $\begin{gathered} \hline \text { SSB ~ } \\ \text { Btrig } \\ \hline \end{gathered}$ | 2013 | 2014 | 2014 |
| Irish Sea East (FUI4) | $v$ | ? | <0.88 | < 0.951 | $<0.951$ |
| Irish Sea West (FUI5) | (x) | $v$ | <9.3 | < 8.244 | < 8.244 |
| Porcupine Bank (FUI6) | $\checkmark$ | $\Rightarrow$ | <1.8 | $<1.848$ | $<1.848$ |
| Aran Grounds (FUI7) | ( | (4) | <0.59 | <0.591 | < 0.591 |
| Ireland SW and SE Coast (FUI9) | * | (4) | <0.82 | $<0.521$ | $<0.521$ |
| Celtic Sea - Labadie etc. FU 20-21 | (4) | $?$ | <2.5 | $<2.500$ | $<2.500$ |
| Celtic Sea - Smalls FU 22 | - | $\rightarrow$ | <3.1 | <2.674 | < 2.674 |
| FU 18 \& Other rectangles | $3$ | $?$ | <0.2 | < 0.235 | $<0.235$ |
| Agreed TAC ('000 t) |  |  | 23.065 |  |  |

## CURRENT MANAGEMENT

- The TAC area covers Sub-area VII. ICES and FEAS recommend that Nephrops should be managed at Functional Unit level since the current large TAC area may result in unbalanced exploitation.
- Quota uptake by member states has change over time (Figure I). Ireland and the UK have fully used their quota in most recent years. Uptake by France and Spain is well below the quota.
- In 2013 the TAC was $23,065 \mathrm{t}$, of which Ireland's quota was $8,506 \mathrm{t}$ (EC 57/201I). The 'of which clause' limits catches
 from FUl6 in 2013 to less than $1,800 \mathrm{t}$ with an associated Irish quota of 653 t .
- There are no explicit management objectives or a management plan for Nephrops stocks in VII. FEAS recommends that management objectives be established and that a management plans be developed with stakeholders and implemented for fisheries catching Nephrops.
- The following TCMs are in place for Nephrops in Division VIla after EC 850/98: Minimum Landing Sizes (MLS); total length $>70 \mathrm{~mm}$, carapace length $>20 \mathrm{~mm}$, tail length $>37 \mathrm{~mm}$; Mesh Size Restrictions; Vessels targeting Nephrops using towed gears having at least $35 \%$ by weight of this species on board will require 70 mm diamond mesh plus an 80 mm square mesh panel as a minimum or having at least $30 \%$ by weight of Nephrops on board will require 80 mm diamond mesh.
- The following TCMs are in place for Nephrops in Sub-area VII (excluding Division VIla) after EC 850/98: Minimum Landing Sizes (MLS); total length $>85 \mathrm{~mm}$, carapace length $>25 \mathrm{~mm}$, tail length $>46 \mathrm{~mm}$. Mesh Size Restrictions; Towed gears targeting Nephrops having at least $35 \%$ by weight of this species on board will require 70 mm diamond mesh plus an 80 mm square mesh panel as a minimum or having at least $30 \%$ by weight of Nephrops on board will require 80 mm diamond mesh.


Figure I. The time series of landings and quotas by country for VII Nephrops (no Spanish landings were available for 201I)


Figure 2. The time series of TAC, ICES advice and landings for VII Nephrops

## ICES ADVICE 5.4.21 Nephrops in Subarea VII

## Introduction

Nephrops are limited to a muddy habitat and the distribution of suitable sediment defines the species distribution. The stocks are assessed as seven separate functional units (FUs) as shown in Figure 5.4.21.1. There are also some smaller catches from areas outside these functional units as well as all of FU 18 which are not formally assessed. The advice for Nephrops stocks is given by functional unit in Sections 5.4.21.1-7.

| Section | FU no. | Name | ICES <br> Divisions | Statistical rectangles |
| :--- | :--- | :--- | :--- | :--- |
| 5.4 .21 .1 | 14 | Irish Sea East | VIIa | $35-38$ E6; 38 E5 |
| 5.4 .21 .2 | 15 | Irish Sea West | VIIa | 36 E3; 35-37 E4-E5; 38 E4 |
| 5.4 .21 .3 | 16 | Porcupine Bank | VIIb,c,j,k | $31-35$ D5-D6; 32-35 D7-D8 |
| 5.4 .21 .4 | 17 | Aran Grounds | VIIb | $34-35$ D9-E0 |
| 5.4 .21 .5 | 19 | Ireland SW and SE coasts | VIIa,g,j | $31-33$ D9-E0; 31 E1; 32 E1-E2; 33 E2-E3 |
| 5.4 .21 .6 | $20-21$ | Celtic Sea - Labadie | VIIg,h | $28-30$ E1; 28-31 E2; 30 E3 |
| 5.4 .21 .7 | 22 | Celtic Sea - the Smalls | VIIg,f | $31-32$ E3; 31-32 E4 |



Figure 5.4.21.1 Nephrops functional units in Subarea VII (around Ireland).

## Summary of the advice for 2014

A summary of the advice for all areas can be found in Table 5.4.21.1.
To protect the Nephrops stocks in this management area, management should be implemented at the functional unit level.

There is no information available on the trends in the stock or exploitation status for FU 18 and the rectangles outside the FUs ('other rectangles') for which ICES provides advice. Based on the ICES approach to datalimited stocks, ICES advises that landings from FU 18 and 'other rectangles' should be no more than 235 tonnes. No information on discards is available for the area corresponding to FU 18 and 'other rectangles'.

Table 5.4.21.1 Nephrops in Subarea VII. ICES advice, management, and landings by functional unit, plus other rectangles.

| Year | Predicted landings corresponding to ICES advice |  |  |  |  |  |  | Agreed <br> TAC | ICES landings |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Irish Irish <br> Sea Sea <br> East West <br> (FU (FU <br> $14)$ $15)$ | Porcupine Bank (FU 16) | Aran Grounds (FU 17) | Ireland SW and SE coasts (FU 19) | Celtic Sea Labadie (FUs 20-21) | Celtic <br> Sea the Smalls FU 22 | FU 18 and other rectangles 1) |  |  |
| Division | VIIa |  | VIIb,c,j,k |  | VIIg,h | VIIg,f |  | VII | VII |
| 1992 | 8.9 |  | 3.8 |  |  |  |  | 20.0 | 15.8 |
| 1993 | 9.4 |  | $\sim 4.0$ |  |  |  |  | 20.0 | 16.6 |
| 1994 | 9.4 |  | $\sim 4.0$ |  |  |  |  | 20.0 | 17.2 |
| 1995 | 9.4 |  | $\sim 4.0$ |  |  |  |  | 20.0 | 18.5 |
| 1996 | 9.4 |  | 4.0 |  |  |  |  | 23.0 | 16.6 |
| 1997 | 9.4 |  | 4.0 |  |  |  |  | 23.0 | 18.9 |
| 1998 | 9.4 |  | 4.0 |  |  |  |  | 23.0 | 18.3 |
| 1999 | 9.4 |  | 4.0 |  |  |  |  | 23.0 | 18.7 |
| 2000 | 9.4 |  | 4.0 |  |  |  |  | 21.0 | 16.4 |
| 2001 | 9.4 |  | 4.0 |  |  |  |  | 18.9 | 16.1 |
| 2002 | 9.55 |  | 4.44 |  |  |  |  | 17.79 | 16.1 |
| 2003 | 9.55 |  | 4.44 |  |  |  |  | 17.79 | 15.7 |
| 2004 | 9.55 |  | 3.3 |  |  |  |  | 17.45 | 15.3 |
| 2005 | 9.55 |  | 3.3 |  |  |  |  | 19.544 | 16.0 |
| 2006 | 9.55 |  | 3.3 |  |  |  |  | 21.498 | 16.2 |


| Year | Predicted landings corresponding to ICES advice |  |  |  |  |  |  |  | Agreed TAC | ICES landings |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Irish <br> Sea <br> East <br> (FU <br> 14) | Irish <br> Sea <br> West <br> (FU <br> 15) | Porcupine Bank (FU 16) | Aran Grounds (FU 17) | Ireland SW and SE coasts (FU 19) | Celtic Sea Labadie (FUs 20-21) | Celtic <br> Sea the Smalls FU 22 | FU 18 and other rectangles |  |  |
| Division | VIIa |  | VIIb,c,j,k |  |  | VIIg,h | VIIg,f |  | VII | VII |
| 2007 | - ${ }^{2}$ | - ${ }^{2)}$ | - ${ }^{3}$ | ${ }^{-3}$ | - ${ }^{3}$ | ${ }^{2}{ }^{2}$ |  |  | 25.153 | 19.0 |
| 2008 | -2) | -2) | - ${ }^{\text {) }}$ | - ${ }^{\text {) }}$ | - ${ }^{3}$ | $<5.3$ |  |  | 25.153 | 20.5 |
| 2009 | $<1.0$ | $<8.5$ | $<1.0$ | $<0.9$ | $<0.8$ | $<5.3$ |  | $<0.2$ | 24.650 | 17.9 |
| 2010 | $<1.0$ | $<5.5$ | 0 | $<0.5$ | $<0.8$ | $<5.3$ |  | $<0.2$ | 22.432 | 17.2 |
| 2011 | $<0.68$ | $<9.5$ | 0 | $<0.9$ | - ${ }^{4}$ | -4) |  | $<0.2$ | 21.759 | 16.2 |
| 2012 | $<0.96$ | $<9.8$ | -5) | < 1.1 | -6) | - ${ }^{6}$ | $<2.3$ | 5) | 21.759 | 18.4 |
| 2013 | $<0.88$ | $<9.3$ | $<1.8$ | $<0.59$ | $<0.82$ | $<2.5$ | $<3.1$ | $<0.2$ | 23.065 |  |
| 2014 | $<0.951$ | <8.244 | $<1.848$ | $<0.591$ | $<0.521$ | $<2.5$ | $<2.674$ | $<0.235$ |  |  |

Weights in thousand tonnes.
${ }^{1)}$ Prior to 2009, landings corresponding to advice for other rectangles and FU 18 were included with adjacent FUs.
${ }^{2)}$ No increase in effort.
${ }^{3)}$ Constrain effort to recent levels.
${ }^{4}$ ) ICES provided advice based on MSY and precautionary scenarios.
${ }^{5)}$ No increase in catches.
${ }^{6}$ ) Reduce catches.

## Biology

Nephrops is limited to a muddy habitat, requiring sediment with a silt and clay content of between 10 and $100 \%$ to excavate its burrows. This means that the distribution of suitable sediment defines the species distribution. Adult Nephrops only undertake very small-scale movements (a few 100 m ), but larval transfer may occur between separate mud patches in some areas. This makes some stocks, particularly those with lower average density, vulnerable to localized depletion. Catch rates and composition vary daily and seasonally between different areas and sexes due to different emergence patterns and underlying population densities. After the onset of maturity the male Nephrops grows faster and attains a larger size than the female. Density limits growth, and Nephrops have a smaller average size on grounds with high Nephrops density ( $>0.7 \mathrm{~m}^{-2}$ ) than on grounds with low density. Whilst females are carrying their eggs their emergence rate from burrows is much reduced. Males are limited in their geographical range for finding mates, hence low densities of males can have a significant impact upon stock spawning potential.

## Environmental influence on the stock

Temperature and hydrographic factors, particularly during the larval phase, are critical to recruitment success in Nephrops. Some stocks in Division VII, such as the FU 15 stock, have well known and understood larval retention mechanisms (i.e. Western Irish Sea Gyre). Other stocks, such as the Porcupine Bank stock, have less well understood larval retention mechanisms. This results in very different population structure, productivity, and vulnerability to fishing. Increasing water temperature leading to shorter larval development times is thought to improve recruitment in areas such as the Irish Sea. Increased storminess related to the North Atlantic Oscillation (NAO) has also been linked to reduced recruitment and low catch rates several years later on the Porcupine Bank.

## Effects of the fisheries on the ecosystem

Trawling for Nephrops results in bycatch and discards of other commercial species, including cod, haddock, whiting, hake, monkfish, and megrim. Given that 80 mm is the predominant mesh size used in Nephrops fisheries the resulting discard rates of small Nephrops and fish can be high.

The high mud content and soft nature of Nephrops grounds means that trawling readily marks the seabed, trawl marks remaining visible for some time. Despite the high intensity of fishing (some areas are impacted $>7$ times
year ${ }^{-1}$ ) burrowing fauna can be seen re-emerging from freshly trawled grounds, implying that there is some resilience to trawling.

The survival rate of discarded trawl-caught Nephrops is highly variable and depends on many factors, including tow duration, catch composition, air temperature, and post-capture handling. There are no recent estimates for the fisheries in Subarea VII but estimates from studies conducted in other areas range from 20-40 \% in Scottish waters (Wileman et al., 1999) to $45-65 \%$ in the Bay of Biscay (Méhault et al., 2011). Across most of Subarea VII discard survival is expected to be relatively low due to lengthy tow durations, volume of catches, prolonged sorting on deck, and relatively high density of Nephrops on the seabed. Taking this into account, a discard survival value of $10 \%$ is used in most cases. In FU 22 a discard survival of $25 \%$ is used based on a study by Morizur et al. (1982). In FU 14 discarding is known to occur over non-Nephrops habitat and in these cases $0 \%$ survival is assumed.

## MSY approach for stocks with underwater TV surveys

Most functional units are monitored by underwater TV (UWTV) surveys, in which burrows are counted by means of video analysis. For these FUs, MSY reference points for fishing mortality have been evaluated. No precautionary reference points have been defined for Nephrops.

Under the ICES MSY approach, exploitation rates likely to generate high long-term yield (and low probability of stock overfishing) have been explored and proposed for each functional unit. Owing to the way Nephrops are assessed, it is not possible to estimate $\mathrm{F}_{\text {MSY }}$ directly and hence proxies for $\mathrm{F}_{\text {MSY }}$ are determined. Three candidates for $\mathrm{F}_{\text {MSY }}$ proxies are $\mathrm{F}_{0.1}, \mathrm{~F}_{35 \% \mathrm{SpR}}$, and $\mathrm{F}_{\text {max }}$. There may be strong differences in relative exploitation rates between the sexes for many stocks. To account for this, values for each of the candidates have been determined for males and females separately, and for the two sexes combined. The appropriate $\mathrm{F}_{\text {MSY }}$ candidate has been selected for each functional unit independently according to the perception of stock resilience, factors affecting recruitment, population density, knowledge of biological parameters, and the nature of the fishery (relative exploitation of the sexes and historical harvest rate versus stock status).

A decision-making framework based on the table below was used in the selection of preliminary stock-specific $\mathrm{F}_{\text {MSY }}$ proxies. These may be modified following further data exploration and analysis. The combined sex $\mathrm{F}_{\text {MSY }}$ proxy should be considered appropriate provided that the resulting percentage of virgin spawner-per-recruit for males or females does not fall below $20 \%$. In such a case a more conservative sex-specific $\mathrm{F}_{\text {MSY }}$ proxy should be chosen over the combined proxy.

|  |  | Burrow density (average burrow $\mathrm{m}^{-2}$ ) |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  | Medium $0.3-0.8$ | $\begin{aligned} & \text { High } \\ & >0.8 \end{aligned}$ |
| Observed harvest rate or landings compared to stock status (historical performance) | $\begin{aligned} & >\mathrm{F}_{\max } \\ & \mathrm{F}_{\max }-\mathrm{F}_{0.1} \\ & <\mathrm{F}_{0.1} \\ & \text { Unknown } \\ & \hline \end{aligned}$ | $\begin{aligned} & \mathrm{F}_{35 \% \mathrm{SpR}} \\ & \mathrm{~F}_{0.1} \\ & \mathrm{~F}_{0.1} \\ & \mathrm{~F}_{0.1} \\ & \hline \end{aligned}$ | $\begin{aligned} & \mathrm{F}_{\max } \\ & \mathrm{F}_{35 \% \mathrm{SpR}} \\ & \mathrm{~F}_{0.1} \\ & \mathrm{~F}_{35 \% \mathrm{SpR}} \\ & \hline \end{aligned}$ | $\begin{aligned} & \mathrm{F}_{\max } \\ & \mathrm{F}_{\max } \\ & \mathrm{F}_{35 \% \mathrm{SpR}} \\ & \mathrm{~F}_{35 \% \mathrm{SpR}} \\ & \hline \end{aligned}$ |
| Stock size estimates | Variable <br> Stable | $\begin{aligned} & \mathrm{F}_{0.1} \\ & \mathrm{~F}_{0.1} \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline \mathrm{F}_{0.1} \\ & \mathrm{~F}_{35 \% \mathrm{SpR}} \\ & \hline \end{aligned}$ | $\begin{aligned} & \mathrm{F}_{35 \% \mathrm{SpR}} \\ & \mathrm{~F}_{\max } \end{aligned}$ |
| Knowledge of biological parameters | Poor <br> Good | $\begin{aligned} & \mathrm{F}_{0.1} \\ & \mathrm{~F}_{35 \% \mathrm{SpR}} \end{aligned}$ | $\mathrm{F}_{0.1}$ $\mathrm{F}_{35 \% \mathrm{SpR}}$ | $\begin{aligned} & \mathrm{F}_{35 \% \mathrm{SpR}} \\ & \mathrm{~F}_{\max } \\ & \hline \end{aligned}$ |
| Historical fishery | Stable spatially and temporally <br> Sporadic <br> Developing | $\mathrm{F}_{35 \% \mathrm{SpR}}$ <br> $\mathrm{F}_{0.1}$ <br> $\mathrm{F}_{0.1}$ | $\mathrm{F}_{35 \% \mathrm{SpR}}$ $\mathrm{F}_{0.1}$ <br> $\mathrm{F}_{35 \% \mathrm{~S} \text { pR }}$ | $\mathrm{F}_{\text {max }}$ <br> $\mathrm{F}_{35 \% \mathrm{SpR}}$ <br> $\mathrm{F}_{35 \% \mathrm{~S} \text { pR }}$ |

Preliminary MSY $\mathrm{B}_{\text {trigger }}$ reference points were proposed at the lowest abundance observed in the UWTV burrow abundance, unless the stock has shown signs of stress at higher abundance (in which case a higher value is used). However, the time-series of surveys in Subarea VII are too short for that. For FU 15, where a longer series of survey trawl cpue was available; this was used to estimate a preliminary MSY $\mathrm{B}_{\text {trigger }}$.

## Additional considerations

The overriding management consideration for these stocks is that management should be at the functional unit rather than the ICES subarea/division level. Management at the functional unit level should provide the controls to ensure that catch opportunities and effort are compatible and in line with the scale of the resources in each of the stocks defined by the functional units.

Current management of Nephrops in Subarea VII (both in terms of TACs and effort) does not provide adequate safeguards ensuring that local effort is sufficiently limited to avoid depletion of resources in separate functional units. The current situation allows for catches to be taken anywhere in the TAC area and this could imply inappropriate harvest rates in some FUs. The "of which" clause applied on the Porcupine Bank since 2011, without other management measures, has increased the risk of highgrading and area misreporting in that area.

Landings from the northwest coast of Ireland (FU 18) have previously been treated as a separate functional unit although landings have been negligible in recent years and there is no major Nephrops fishery in that area. There are also Nephrops catches in other rectangles outside functional units in Subarea VII. There is no information available on the trends in the stock or exploitation status for FU 18 and the rectangles outside the FUs ('other rectangles') for which ICES provides advice.

Landings in Subarea VII in recent years have been well below the TAC due to low uptake by France and Spain, whereas the UK and Irish landings are close to the quota.

## Regulations and their effects

Landings by some fleets prior to 2007 are thought to have been underreported. The implementation of the 'Buyers and Sellers' legislation in the UK in 2006 and 'sales notes' in Ireland in 2007, coupled with the increased TAC in 2007, is thought to have improved the reliability of reported landings data. The transition has been accompanied by a large change in reported landings and a significant recent increase in landings per unit effort (lpue) for some countries that cannot completely be attributed to changes in the stock.

## Data and methods

The assessments and advice for Nephrops stocks in FUs 14 and 15 (Irish Sea), 16 (Porcupine Bank), 17 (Aran Grounds), 19 (southeast and southwest coast of Ireland), and 22 (the Smalls) are primarily based on abundance estimates from underwater TV (UWTV) surveys together with fishery landings data and estimates of quantities of discards (from which dead discards are calculated). Additional indicators of changes in stocks are derived from trends in length compositions and sex ratio in the catches, fishery lpue, and (for FUs 15 and 16) trawl survey catch rates.

The advice for FUs 20-21 (Celtic Sea) is the same as last year's advice and is based on a range of indicators of stock trends, including fishery lpue, trawl survey catch rates, size compositions, and sex ratio. This advice applies ICES approach to data-limited stocks (stock category 4.1.4).

The advice for FU 18 and 'other rectangles' also follows ICES approach to data-limited stocks, and is based on a $20 \%$ reduction (precautionary buffer) compared to the average landings of the last three years (2010-2012), according to category 6.2 (ICES, 2012). No information on discards is available for FU 18 and 'other rectangles'. Landings from 'other rectangles' are estimated because no Spanish landings have been reported to ICES in 2011 and 2012 for this area. Prior to 2011 the Spanish landings represented around one third of the total landings from 'other rectangles'.

For FUs $14,15,16,17,19$, and 22, the following procedure is adopted for providing assessment and advice based on UWTV survey estimates:

- Total population numbers are estimated from the UWTV surveys, including adjustments for a range of biases associated with the method. At the benchmark meetings (ICES, 2009, 2013a) it was proposed that the UWTV surveys provide abundance estimates for Nephrops of 17 mm carapace length and over.
- Historical harvest ratios are calculated as the ratio of total dead catch numbers (landings and dead discards) to population numbers from the UWTV survey in each year.
- Recent fishery length compositions (landings and dead discards) are analysed using a length-based assessment model to estimate population numbers and fishing mortality-at-length for Nephrops of 17 mm carapace length and over. This method assumes that the length compositions are representative of
a population at equilibrium. The analysis is done separately for males and females using stock-specific growth and maturity parameters.
- Yield-per-recruit and spawning biomass-per-recruit curves are derived for male and female Nephrops, based on fishery selectivity parameters from the length-based assessment model. The harvest ratios associated with potential $\mathrm{F}_{\text {MSY }}$ proxies (e.g. $\mathrm{F}_{0.1}, \mathrm{~F}_{\text {max }}, \mathrm{F}_{35 \% \text { SPR }}$ ) for males, females, and for both sexes combined are computed. These are conditional on a fishery selectivity pattern that includes fishing mortality due to landings and dead discards of Nephrops in the years covered by the assessment model.

Catch options tables for 2014 are derived for $\mathrm{F}_{\text {MSY }}$ proxy and other options by applying the appropriate harvest ratios to the population numbers estimate from the most recent UWTV survey. This assumes that population numbers remain stable in the interim year. Landings are derived from the resultant total catch numbers after multiplying by the recent average value for proportion retained and mean weight in the landings.

## Uncertainties in assessment and forecast

Preparing for the benchmark of UWTV assessments (ICES, 2009) ICES expert groups have worked to reduce uncertainty and increase precision in the interpretation of survey data. Despite these improvements, there remains a requirement for expert knowledge in the production of correction factors applied to UWTV abundance estimates.

In the provision of catch options based on the survey estimates additional uncertainties related to mean weight in the landings, discard rates, and discard survival also arise. The variability in mean weight and discarding is a key uncertainty in the derivation of catch options. The procedure outlined in the benchmarks (ICES, 2009, 2013a) is to use a multi-annual average to dampen variability. Improved quality of fishery data and knowledge of growth rates are needed for development of analytical assessment models and improvement of MSY reference points. The calculations of harvest ratio and reference points $\mathrm{F}_{0.1}$ and $\mathrm{F}_{\max }$ are all based on yield-perrecruit analyses. In addition, important assumptions are made on growth, natural mortality, and discard rates in the derivation of reference points.

## Sources

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Figure 5.4.21.2
Nephrops in Subarea VII. Top: Total landings (in tonnes). Bottom: percentage of the total landings by functional unit (FU) and from rectangles outside the FUs. Landings from FUs 20-21 and FU 22 are combined prior to 1999.

Table 5.4.21.2 Nephrops in Subarea VII. ICES estimates of landings (tonnes) from all individual functional units within TAC Subarea VII.

| Year |  |  |  |  |  |  |  |  |  |  | Total landings in ICES Subarea VII |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1978 | 961 | 7296 | 1744 | 481 |  |  |  |  |  | 249 | 10731 |
| 1979 | 900 | 8948 | 2269 | 452 |  |  |  |  |  | 237 | 12806 |
| 1980 | 730 | 4578 | 2925 | 442 |  |  |  |  |  | 205 | 8880 |
| 1981 | 829 | 7249 | 3381 | 414 |  |  |  |  |  | 382 | 12255 |
| 1982 | 869 | 9315 | 4289 | 210 |  |  |  |  |  | 234 | 14917 |
| 1983 | 763 | 9448 | 3426 | 131 |  |  | 3667 |  |  | 174 | 17609 |
| 1984 | 602 | 7760 | 3571 | 324 |  |  | 3653 |  |  | 187 | 16097 |
| 1985 | 498 | 6901 | 3919 | 207 |  |  | 3599 |  |  | 194 | 15318 |
| 1986 | 671 | 9978 | 2591 | 147 |  |  | 2638 |  |  | 113 | 16138 |
| 1987 | 449 | 9753 | 2499 | 62 |  |  | 3409 |  |  | 107 | 16279 |
| 1988 | 462 | 8586 | 2375 | 828 |  |  | 3165 |  |  | 140 | 15556 |
| 1989 | 401 | 8128 | 2115 | 344 |  | 899 | 4005 |  |  | 134 | 16026 |
| 1990 | 563 | 8300 | 1895 | 519 |  | 754 | 4290 |  |  | 102 | 16423 |
| 1991 | 747 | 9554 | 1640 | 410 |  | 1077 | 3295 |  |  | 169 | 16891 |
| 1992 | 427 | 7541 | 2015 | 372 |  | 888 | 4165 |  |  | 409 | 15816 |
| 1993 | 515 | 8102 | 1857 | 372 | 10 | 905 | 4358 |  |  | 455 | 16573 |
| 1994 | 447 | 7606 | 2512 | 729 | 126 | 390 | 4843 |  |  | 570 | 17223 |
| 1995 | 584 | 7796 | 2936 | 866 | 26 | 695 | 5198 |  |  | 397 | 18498 |
| 1996 | 475 | 7247 | 2230 | 528 | 46 | 888 | 4602 |  |  | 623 | 16639 |
| 1997 | 566 | 9971 | 2409 | 841 | 15 | 756 | 3991 |  |  | 340 | 18888 |
| 1998 | 388 | 9128 | 2155 | 1410 | 78 | 827 | 3819 |  |  | 514 | 18320 |
| 1999 | 624 | 10786 | 2290 | 1140 | 16 | 579 |  | 1152 | 1788 | 322 | 18697 |
| 2000 | 567 | 8370 | 910 | 880 | 9 | 696 |  | 1778 | 2907 | 243 | 16361 |
| 2001 | 532 | 7441 | 1222 | 913 | 2 | 815 |  | 1833 | 2935 | 368 | 16062 |
| 2002 | 577 | 6793 | 1327 | 1154 | 14 | 1318 |  | 2674 | 1990 | 243 | 16090 |
| 2003 | 376 | 7065 | 908 | 933 | 16 | 1239 |  | 2953 | 2050 | 186 | 15726 |
| 2004 | 472 | 7270 | 1526 | 525 | 22 | 1074 |  | 2443 | 1827 | 161 | 15320 |
| 2005 | 570 | 6554 | 2315 | 778 | 15 | 711 |  | 2469 | 2425 | 180 | 16017 |
| 2006 | 628 | 7561 | 2120 | 637 | 14 | 741 |  | 2523 | 1752 | 270 | 16246 |
| 2007 | 959 | 8491 | 2186 | 913 | 3 | 957 |  | 2419 | 2881 | 206 | 19015 |
| 2008 | 681 | 10508 | 1000 | 1057 | 1 | 866 |  | 2980 | 3114 | 322 | 20529 |
| 2009 | 708 | 9198 | 825 | 625 | 10 | 833 |  | 3145 | 2245 | 316 | 17905 |
| 2010 | 583 | 8963 | 917 | 1000 | 7 | 722 |  | 1793 | 2708 | 359 | 17052 |
| 2011 | 561 | 10162 | 1205 | 600 | 13 | 608 |  | 1237 | 1617 | 149 | 16152 |
| 2012 | 530 | 10527 | 1260 | 1135 | 28 | 770 |  | 1189 | 2633 | 325 | 18397 |
| Average | 606 | 8368 | 2136 | 639 | 24 | 834 | 3919 | 2185 | 2348 | 274 | 16213 |

[^1]Table 5.4.21.3 Nephrops in Subarea VII. Landings by country for FU 18 .

| Year | Ireland | UK | Total |
| ---: | ---: | ---: | ---: |
| 1993 | 9 | 1 | 10 |
| 1994 | 124 | 2 | 126 |
| 1995 | 24 | 2 | 26 |
| 1996 | 46 | 1 | 46 |
| 1997 | 13 | 2 | 15 |
| 1998 | 77 | 1 | 78 |
| 1999 | 15 | 0 | 16 |
| 2000 | 9 | 0 | 9 |
| 2001 | 2 | 0 | 2 |
| 2002 | 14 | 0 | 14 |
| 2003 | 16 | 0 | 16 |
| 2004 | 22 | 0 | 22 |
| 2005 | 15 | 0 | 15 |
| 2006 | 14 | 0 | 14 |
| 2007 | 3 | 0 | 3 |
| 2008 | 1 | 0 | 1 |
| 2009 | 10 | 0 | 10 |
| 2010 | 7 |  | 7 |
| 2011 | 13 | 0 | 13 |
| 2012 | 28 |  | 28 |

Table 5.4.21.4 Nephrops in Subarea VII. Landings by country for other rectangle outside functional units but within ICES Subarea VII.

| Year | France | Ireland | Spain | UK | UK E\&W | UK NI | UK SCO | Belgium | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1976 |  |  |  | 0 |  |  |  |  | 0 |
| 1977 |  |  |  | 1 |  |  |  |  | 1 |
| 1978 |  |  | 249 | 0 |  |  |  |  | 249 |
| 1979 |  |  | 237 | 0 |  |  |  |  | 237 |
| 1980 |  |  | 205 | 0 |  |  |  |  | 205 |
| 1981 |  |  | 382 | 0 |  |  |  |  | 382 |
| 1982 |  |  | 228 | 6 |  |  |  |  | 234 |
| 1983 |  |  | 168 | 6 |  |  |  |  | 174 |
| 1984 |  |  | 186 | 1 |  |  |  |  | 187 |
| 1985 |  |  | 151 | 43 |  |  |  |  | 194 |
| 1986 |  |  | 80 | 33 |  |  |  |  | 113 |
| 1987 |  |  | 58 | 49 |  |  |  |  | 107 |
| 1988 |  |  | 62 | 78 |  |  |  |  | 140 |
| 1989 |  |  | 88 | 46 |  |  |  |  | 134 |
| 1990 |  |  | 87 | 15 |  |  |  |  | 102 |
| 1991 |  |  | 131 | 38 |  |  |  |  | 169 |
| 1992 |  |  | 317 | 92 |  |  |  |  | 409 |
| 1993 |  | 62 | 323 | 70 |  |  |  |  | 455 |
| 1994 |  | 220 | 260 | 90 |  |  |  |  | 570 |
| 1995 |  | 100 | 188 | 109 |  |  |  |  | 397 |
| 1996 |  | 96 | 404 | 123 |  |  |  |  | 623 |
| 1997 |  | 112 | 81 | 147 |  |  |  |  | 340 |
| 1998 |  | 145 | 166 | 203 |  |  |  |  | 514 |
| 1999 | 51 | 136 | 88 | 47 |  |  |  |  | 322 |
| 2000 | 41 | 65 | 107 | 31 |  |  |  |  | 243 |
| 2001 | 26 | 104 | 217 | 21 |  |  |  |  | 368 |
| 2002 | 17 | 119 | 87 | 19 |  |  |  |  | 243 |
| 2003 | 0 | 152 | 34 |  |  |  |  |  | 186 |
| 2004 | 0 | 88 | 61 | 12 |  |  |  |  | 161 |
| 2005 | 0 | 125 | 50 | 5 |  |  |  |  | 180 |
| 2006 | 0 | 140 | 26 | 9 | 16 | 78 |  |  | 270 |
| 2007 | 0 | 89 | 23 | 3 | 33 | 57 |  |  | 206 |
| 2008 | 0 | 76 | 24 | 4 | 49 | 170 |  |  | 322 |
| 2009 | 0 | 29 | 209 |  | 29 | 49 |  |  | 316 |
| 2010 | 0 | 120 | 155 |  | 22 | 53 | 9 |  | 359 |
| 2011 |  | 92 | 39* |  |  |  | 17 |  | 149 |
| 2012 | 1 | 194 | 92** |  | 7 | 30 |  | 1 | 325 |

*Estimates based on the average percentage in 2010 and 2012.
** From STECF database.

## FUI4 Nephrops in the Eastern Irish Sea

## FEAS - SINGLE STOCK CONSIDERATIONS

ICES advises on the basis of the MSY approach that landings from FU 14 in 2014 should be no more than 95 I t. If total discard rates do not change from the average of 2006-2008, this implies total catches of no more than I,I3I t. FEAS agrees with the ICES advice.

This stock falls in to ICES category I for data-rich stocks for which a quantitative assessment is available.


Red Boxes - TAC/Management Area Blue Shading - Functional Unit

The current TAC area and the stock assessment areas do not match for Nephrops in VII (see the overview for Nephrops stocks in Sub-area VII on page 42). FEAS agrees with the ICES and STECF advice that all Nephrops fisheries should be managed at an appropriate geographical scale i.e. Functional Unit.

## CURRENT MANAGEMENT

- For current management see the overview for Nephrops stocks in Sub-area VII on page 42.
- Effort control limitations also apply to the main Nephrops catching fleet (TR2) in the Irish Sea under the cod long term plan (EC I342/2008).


## ICES ADVICE 5.4.21.1 Nephrops in Irish Sea East (FU14)

## Advice for 2014

ICES advises on the basis of the MSY approach that landings from FU 14 in 2014 should be no more than 951 tonnes. If total discard rates do not change from the average of 2006-2008, this implies total catches of no more than 1131 tonnes. For this FU, no discards are expected to survive the discarding process.

In order to ensure the stock in this FU is exploited sustainably, management should be implemented at the functional unit level.

## Stock status

| F (Fishing Mortality) |  |  |
| :---: | :---: | :---: |
|  | 20102011 | 2012 |
| MSY ( $\mathrm{F}_{\text {MSY }}$ ) | ( $\downarrow$ | ( Below target |
| Precautionary $\operatorname{approach}\left(\mathrm{F}_{\mathrm{pa}}, \mathrm{F}_{\text {lim }}\right)$ | ? ? | ? Undefined |

SSB (Spawning-Stock Biomass)
2011-2013
MSY ( $\mathrm{B}_{\text {trigger }}$ )
Undefined
Precautionary
approach ( $\mathrm{B}_{\mathrm{p}}, \mathrm{B}_{\text {lim }}$ )
Qualitative evaluations

|  | 2011-2013 |
| :--- | :--- |
| $?$ | Undefined |
| $?$ | Undefined |
| $\rightarrow$ | Stable |





Figure 5.4.21.1.1 Nephrops, Irish Sea East (FU 14). Long-term trends in landings (in tonnes); UWTV survey abundance with $95 \%$ confidence limits (in millions); and harvest rate (green dashed line is the $\mathrm{F}_{\text {MSY }}$ proxy).

The abundance of Nephrops in FU 14 is stable with the exception of 2012, where there has been an increase. There is not a long enough time-series to determine a candidate for MSY $\mathrm{B}_{\text {trigger }}$. The current harvest rate (removals/UWTV abundance) is below the $\mathrm{F}_{\text {MSY }}$ proxy.

## Management plans

No specific management objectives are known to ICES.

## Biology

The Eastern Irish Sea stock is of a relatively low mean density ( $\sim 0.3$ to 0.4 burrows $\mathrm{m}^{-2}$ ) and is limited to two discrete areas of muddy sediment. The main part of the stock sits between the Isle of Man and the Cumbrian coast of England, with a smaller patch in Wigtown Bay off the southern coast of Scotland.

## The fisheries

The fleet of vessels targeting Nephrops in 2012, with mesh sizes of $70-99 \mathrm{~mm}$ and where the weight of Nephrops landed is more than $25 \%$ of the total landing, consisted of around 25 English vessels almost entirely single-otter trawling and around 48 generally larger Northern Irish vessels, over $56 \%$ of which fish multi-rig trawls. The multiriggers take around one third of the landings. 80 mm codends are commonly used for both types of trawl. The fishery takes place mainly in spring and early summer, when male Nephrops predominate.

Catch distribution Total landings (2012): 530 t ( $32 \%$ twin-rig otter trawls, $68 \%$ single-otter trawl). Discards are estimated at $28 \%$ by number.

## Effects of the fisheries on the ecosystem

The Nephrops trawl fishery takes bycatch of other species, especially plaice, but also whiting and cod.

## Quality considerations

No reliable length composition has been available since 2010 due to reduced sampling by the United Kingdom, and no up-to-date estimates of discard rates exist. The calculation of catch options has been based on sampling information from 2006 to 2008. Improved sampling is required to provide up-to-date estimates for discard rates and mean weight for landings.

Additional resources have been made available for Nephrops catch sampling in the Eastern Irish Sea and a sampling programme has been reinstated in 2013.

Scientific basis

| Assessment type | UWTV and trends. |
| :--- | :--- |
| Stock data category | 1 |
| Input data | One survey index (UWTV-FUs 14-15); commercial catches (international landings and |
|  | length frequencies from the Nephrops catch sampling programme and the CEFAS |
|  | Observer programme); maturity data from commercial catch sampling; fixed natural |
| mortality. |  |
| Discards and bycatch | Discards from English trawls were included in the assessment. |
| Indicators | Size structure of catches, sex ratio, and lpue. |
| Other information | None. |
| Working group report | WGCSE (ICES, 2013). |

## ECOREGION Celtic Sea and West of Scotland <br> STOCK Nephrops in Irish Sea East (FU 14)

## Reference points

|  | Type | Value | Technical basis |
| :--- | :--- | :--- | :--- |
| MSY | MSY B trigger | Not <br> approach | F $_{\text {MSY }}$ | | Harvest |
| :--- |
| ratio 9.8\%. |$\quad$| No available reference. UWTV time-series too short. |
| :--- |
| length-based yield-per-recruit analysis. |

(unchanged since 2011)

Harvest ratio reference points (2010):

|  | Male | Female | Combined |
| :--- | :--- | :--- | :--- |
| $\mathrm{F}_{\max }$ | $15.8 \%$ | $17.4 \%$ | $16.4 \%$ |
| $\mathrm{~F}_{0.1}$ | $9.6 \%$ | $10.2 \%$ | $\mathbf{9 . 8 \%}$ |
| $\mathrm{~F}_{35 \% \mathrm{SpR}}$ | $12.5 \%$ | $13.5 \%$ | $13.0 \%$ |

Compared to other Nephrops stocks in the ICES area the absolute population density of this stock appears relatively low ( $<0.39 \mathrm{~m}^{-2}$ ) in a highly seasonal male dominant fishery. The area covered by this fishery is relatively small and the confidence intervals for the abundance estimate are large for a geostatistical survey. The annual variability of lpue for the smaller individuals in the catch suggest that recruitment to this fishery is quite variable. However, the fishery appears to have been sustainable with harvest rates below $\mathrm{F}_{0.1}$. In this instance, therefore, the use of $\mathrm{F}_{0.1}$ as a proxy for $\mathrm{F}_{\mathrm{MSY}}$ (for the combined sexes) is considered appropriate as it will deliver high long-term yield with a low probability of recruitment overfishing.

## Outlook for 2014

Basis: $\mathrm{F}_{2013}=\mathrm{F}_{2012}=3.9 \%$; adjusted survey index $(2013)=465.7$ millions; mean weight in landings (2006$2008)=28.9 \mathrm{~g}$; mean weight in discards $(2006-2008)=14.1 \mathrm{~g}$; dead discards in number ( $27.9 \%$ ) based on 2006-2008 sampling; survival rate $=0 \%$.

| Basis | Total <br> catches* | Landings | Dead <br> discards** | Surviving <br> discards** | Harvest <br> rate (\%) |
| :--- | :---: | :---: | :---: | :---: | :---: |
|  | L+DD+SD | L | DD | SD | for <br> $\mathrm{L}+\mathrm{DD}$ |
| $\mathrm{F}_{\text {MSY }}$ proxy | 1131 | 951 | 180 | 0 | 9.8 |
| $\mathrm{~F}_{2013}$ | 450 | 378 | 71 | 0 | 3.9 |
| $\mathrm{~F}_{35 \% \text { SpR Combined }}$ | 1500 | 1261 | 238 | 0 | 13 |
| $\mathrm{~F}_{\text {max Combined }}$ | 1892 | 1591 | 300 | 0 | 16.4 |

Weights in tonnes.

* Total catches are the landings plus dead and surviving discards.
** Total discard rate is assumed to be $27.9 \%$ of the catches (in number, average of the three years 20062008); discard survival is assumed to be $0 \%$.


## MSY approach

No MSY $\mathrm{B}_{\text {trigger }}$ has been identified for this FU. Following the ICES MSY approach implies that the harvest ratio for FU 14 should be less than $9.8 \%$, resulting in landings of no more than 951 t in 2014 . If discard rates do not change from the average of 2006-2008 (assuming $0 \%$ discard survival), this implies total catches of no more than 1131 t in 2014.

## Additional considerations

The advice takes into account the 2013 UWTV survey results.
The Nephrops trawl fishery takes bycatches of other species, especially plaice, but also whiting and cod. Selectivity of this fishery needs to be improved to reduce bycatches of cod, whiting, and undersized plaice.

Although up-to-date discard rate estimates are not available due to insufficient sampling, information from 2006-2008 (on which catch options for FU 14 are based), indicate that the proportion of discarded Nephrops is substantial. On average during 2006-2008, around $28 \%$ (in numbers) or $16 \%$ (in weight) of the Nephrops caught are estimated to have been discarded.

The fishery peaks in spring/summer. Some UK vessels temporarily relocate, targeting the Farn Deeps Nephrops fishery on the east coast of England in the winter months.

## Regulations and their effects

The cod long-term plan was introduced in 2009 (EC 1342/2008). Annual effort baselines in Nephrops trawl fisheries (Effort group TR2 OTB 70-99 mm) in Division VIIa have been reduced by $25 \%$ annually since 2009. There are provisions in the cod long-term plan to be exempt from these effort restrictions, or to have them reduced, making the impact of this regulation on overall effort difficult to assess.

## Changes in fishing technology and fishing patterns

The UK Nephrops-directed effort in FU 14 has declined since 2007 and is estimated in 2012 to be at its lowest value since 1974.

## Uncertainties in assessment and forecast

Some general uncertainties are discussed in the introduction of Section 5.4.21.
The main uncertainty for this stock is the insufficient sampling since 2010.
The short time-series of reliable commercial data and UWTV surveys means that biological reference points for this stock are imprecise.

Uncertainties in the survey, mean weight in the landings, and discard rates are not taken into account in the advice.

## Comparison with previous assessment and advice

The advice for 2014 was delayed until autumn to take account of the most up-to-date survey information.
The basis for the assessment and advice is the same as last year, i.e. based on the MSY approach.

## Source

ICES. 2013. Report of the Working Group for Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Length frequencies for catch (dotted) and landed(solid): Nephrops in FU 14


Figure 5.4.21.1.2 Nephrops in Irish Sea East (FU 14). Annual length composition of catch (dotted) and landed (solid) of males (right) and females (left) from 1996 (bottom) to 2009 (top). Mean sizes of catch and landings (using same line types) is shown in relation to minimum landing size (MLS). The figure shows a vertical display of MLS levels ( 20 mm CL and 35 mm CL). Sampling levels since 2010 were insufficient to provide robust data; this figure was therefore not updated.

Table 5.4.21.1.1 Nephrops in Irish Sea East (FU14). ICES advice, management, landings, and discards.

| Year | ICES advice | Predicted landings corresp. to advice (FU 14) | Recommended landings (FUs $14+15$ ) | ICES landings (FU 14) | Total discards (FU 14) |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1989 |  |  |  | 0.40 |  |
| 1990 |  |  |  | 0.56 |  |
| 1991 |  |  |  | 0.75 |  |
| 1992 |  |  | 8.9 | 0.43 |  |
| 1993 |  |  | 9.4 | 0.52 |  |
| 1994 |  |  | 9.4 | 0.45 |  |
| 1995 |  |  | 9.4 | 0.58 |  |
| 1996 |  |  | 9.4 | 0.48 |  |
| 1997 |  |  | 9.4 | 0.57 |  |
| 1998 |  |  | 9.4 | 0.39 |  |
| 1999 |  |  | 9.4 | 0.62 |  |
| 2000 |  |  | 9.4 | 0.57 |  |
| 2001 |  |  | 9.4 | 0.53 |  |
| 2002 | Set TAC in line with 1995-99 landings |  | 9.55 | 0.58 |  |
| 2003 | Set TAC in line with 1995-99 landings |  | 9.55 | 0.38 | 0.15 |
| 2004 | Set TAC in line with 1995-99 landings |  | 9.55 | 0.47 | 0.15 |
| 2005 | Set TAC in line with 1995-99 landings |  | 9.55 | 0.57 | 0.13 |
| 2006 | No increase in effort |  | 9.55 | 0.63 | 0.11 |
| 2007 | No increase in effort |  | - | 0.96 | 0.18 |
| 2008 | As for 2007 |  | - | 0.68 | 0.14 |
| 2009 | No increase in effort and landings (2007) | $<1.0$ | - | 0.70 | 0.03 |
| 2010 | No new advice, same as for 2009 | < 1.0 | - | 0.58 |  |
| 2011 | Transition towards the ICES MSY | $<0.68$ | * | 0.56 |  |
| 2012 | MSY approach | $<0.96$ | * | 0.53 |  |
| 2013 | MSY approach | $<0.88$ | * |  |  |
| 2014 | MSY approach | $<0.951$ | * |  |  |

Weights in thousand tonnes.

* It is not recommended to manage the two stocks as a single unit.

Table 5.4.21.1.2 Nephrops in Irish Sea East (FU 14). Landings (tonnes) by country.

| Year | Rep. of Ireland | UK | Other countries | Total |
| :---: | :---: | :---: | :---: | :---: |
| 2000 | 114 | 451 | 2 | 567 |
| 2001 | 26 | 506 | 0 | 532 |
| 2002 | 203 | 373 | 1 | 577 |
| 2003 | 69 | 306 | 1 | 376 |
| 2004 | 62 | 409 | 1 | 472 |
| 2005 | 34 | 536 | 0 | 570 |
| 2006 | 34 | 594 | 0 | 628 |
| 2007 | 86 | 873 | 0 | 959 |
| 2008 | 29 | 652 | 0 | 681 |
| 2009 | 16 | 692 | 0 | 708 |
| 2010 | 45 | 538 | 0 | 583 |
| 2011 | 31 | 530 | 0 | 561 |
| 2012 | 52.6 | 478 | 0.123 | 530 |

Table 5.4.21.1.3 Nephrops in Irish Sea East (FU 14). Results from the UWTV-FU 14 survey of Nephrops grounds in 2008-2013.

| Year | No <br> valid <br> stations | Mean <br> station <br> density <br> $\left(\right.$ no. $\left./ \mathbf{m}^{2}\right)$ | Mean <br> krigged <br> density <br> $\left(\mathbf{n o .} / \mathbf{m}^{2}\right)$ | Abundance <br> (millions) <br> including <br> Wigtown Bay | 95\% <br> CI | Landings | Removals <br> (millions) | Harvest <br> rate |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 2007 |  |  |  | Unreliable data |  |  |  |  |
| 2008 | 32 | 0.34 | 0.38 | 407.6 | 63.0 | 676 | 32.4 | $7.96 \%$ |
| 2009 | 32 | 0.28 | 0.33 | 350.0 | 76.0 | 707 | 33.9 | $9.69 \%$ |
| 2010 | 26 | 0.33 | 0.4 | 422.0 | 103.0 | 582 | 27.9 | $6.62 \%$ |
| 2011 | 26 | 0.36 | 0.41 | 431.0 | 109.0 | 561 | 26.9 | $6.25 \%$ |
| 2012 | 26 | 0.48 | 0.62 | 652.7 | 114.1 | 530 | 25.4 | $3.90 \%$ |
| 2013 | 31 | 0.39 | 0.44 | 465.7 | 92.9 |  |  |  |

Table 5.4.21.1.4 Nephrops in Irish Sea East (FU 14). UWTV abundance, confidence intervals, harvest ratio, landings in number, and mean weight in landings. No reliable length composition or discard rate estimates are available since 2010 .
$\left.\left.\begin{array}{llllllllll}\hline & \begin{array}{l}\text { Landings } \\ \text { in } \\ \text { number } \\ \text { (millions) }\end{array} & \begin{array}{l}\text { Discards } \\ \text { in } \\ \text { number } \\ \text { (millions) }\end{array} & \begin{array}{l}\text { Removals } \\ \text { in } \\ \text { number } \\ \text { (millions) }\end{array} & \begin{array}{l}\text { Proportion } \\ \text { removals } \\ \text { retained }\end{array} & \begin{array}{l}\text { Adjusted } \\ \text { survey } \\ \text { (millions) }\end{array} & \begin{array}{l}\text { Harvest } \\ \text { ratio } \\ \text { (\%) }\end{array} & \begin{array}{l}\text { Landings } \\ \text { (t) }\end{array} & \begin{array}{l}\text { Mean } \\ \text { weight } \\ \text { (t) }\end{array} \\ \hline 2003 & 9.6 & 8.7 & 18.4 & 0.52 & & & 376.7 & 151 & 0.48 \\ \text { in } \\ \text { landings } \\ \text { (grams) }\end{array}\right] \begin{array}{l}\text { Dead } \\ \text { discard } \\ \text { rate }\end{array}\right)$

## FUI5 Nephrops in the Western Irish Sea

## FEAS - SINGLE STOCK CONSIDERATIONS

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than $8,244 \mathrm{t}$. If total discard rates do not change from the average of the last three years (2010-20I2), this implies total catches of no more than 9,914 t. FEAS agrees with the ICES advice.

This stock falls in to ICES category I for data-rich stocks for which a quantitative assessment is available.


The current TAC area and the stock assessment areas do not match for Nephrops in VII (see the overview for Nephrops stocks in Sub-area VII on page 42). FEAS agrees with the ICES and STECF advice that all Nephrops fisheries should managed at an appropriate geographical scale i.e. Functional Unit.

## CURRENT MANAGEMENT

- For current management see the overview for Nephrops stocks in Sub-area VII on page 42.
- Effort control limitations also apply to the main Nephrops catching fleet (TR2) in the Irish Sea under the cod long term plan (EC I342/2008).


## ICES ADVICE 5.4.21.2 Nephrops in Irish Sea West (FU 15)

## Advice for 2014

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 8244 tonnes. If total discard rates do not change from the average of the last three years (2010-2012), this implies total catches of no more than 9914 tonnes. Note that this figure includes discards expected to survive the discarding process assumed to be $10 \%$ of the total number discarded for this stock.

In order to ensure the stock in this functional unit is exploited sustainably, management should be implemented at the functional unit level.

## Stock status

| F (Fishing Mortality) |  |  |  |
| :---: | :---: | :---: | :---: |
|  | 20102011 |  | 2012 |
| MSY ( $\mathrm{F}_{\text {MSY }}$ ) | ( $x$ | ( | Above target |
| Precautionary $\operatorname{approach}\left(\mathrm{F}_{\mathrm{pa}}, \mathrm{F}_{\text {lim }}\right)$ | ? ? | ? | Undefined |


| SSB (Spawning-Stock Biomass) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | 2011 | 2012 |  | 2013 |
| MSY ( $\mathrm{B}_{\text {trigger }}$ ) | ( | ( | ( | Above trigger |
| Precautionary approach ( $\mathrm{B}_{\mathrm{pa}}, \mathrm{B}_{\text {lim }}$ ) | ? | (?) | ? | Undefined |



Figure 5.4.21.2.1 Nephrops in Irish Sea West (FU 15). Long-term trends in landings (tonnes); recent UWTV abundance (in millions; SSB proxy); and harvest rates (prior to 2007 the harvest rate is considered to be a minimum estimate due to possible underreporting of landings). The horizontal lines represent MSY $\mathrm{B}_{\text {trigger }}$ (upper panel) and $\mathrm{F}_{\text {MSY }}$ (lower panel).

Since 2003 stock abundance has been above MSY $\mathrm{B}_{\text {trigger }}$. Recent harvest rates (removals/UWTV abundance) have fluctuated around the $\mathrm{F}_{\text {MSY }}$ proxy and are now above it.

## Management plans

No specific management objectives are known to ICES.

## Biology

Nephrops in the Western Irish Sea occur at very high density (average 0.9 burrow $\mathrm{m}^{-2}$ ) and have a smaller average size and size-at-maturity than most other stocks. The observed high density implies intense competition for space and food on the seabed. This is thought to make the stock resilient to high fishing pressure.

## Environmental influence on the stock

The environment in the Western Irish Sea is very suitable for Nephrops, with a large mud patch and a gyre that retains the larvae over the mud patch, thus ensuring good recruitment. Nephrops is a major food species for cod in the Irish Sea.

## The fisheries

The gears used are a mixture of single- and twin-rig otter trawls. The use of specified species-selective gears has been mandatory for all Irish vessels since March 2012 and similar conditions were introduced in October 2012 for the UK (Northern Ireland) vessels. Some Irish vessels started using multi (quad) rig trawls in 2012. Provisional data suggest a $\sim 30 \%$ increase in Nephrops catch rates and a reduction in fish bycatch of $\sim 30 \%$ due to the lower headline height.

Catch distribution Total catch $(2012)=12.4 \mathrm{kt}$, where 10.5 kt are landings $(100 \%$ otter trawls $)$ and 1.9 kt discards.

## Effects of the fisheries on the ecosystem

The Nephrops trawl fisheries take bycatches of other species, especially juvenile whiting, haddock, plaice, and cod.

## Quality considerations

Harvest ratios since 2006 are considered reliable due to more accurate landings data reported under new legislation. The quality of input data and level of sampling are good for this stock.

## Scientific basis

Assessment type
Stock data category
Input data

Discards and bycatch
Indicators

## Other information

 Working group reportUWTV and trends, catch options based on UWTV and Fs from per-recruit analysis. 1 One survey index (UWTV (FUs 14-15); commercial catches (international landings, length frequencies from catch sampling); fixed maturity ogive based on survey sampling, fixed natural mortality. Discard survival rate.
Discards included in the assessment from the Irish directed Nephrops fleet and the UK(NI) directed Nephrops fleet.
One trawl survey index (NI-NEP-Trawl-Summer). Size structure of catches, sex ratio, and lpue.
The latest benchmark (based on the UWTV survey) was performed in 2009 (ICES, 2009). WGCSE (ICES, 2013).

### 5.4.21.2

## ECOREGION Celtic Sea and West of Scotland STOCK Nephrops in Irish Sea West (FU 15)

## Reference points

|  | Type | Value | Technical basis |
| :--- | :--- | :--- | :--- |
| MSY | MSY B $_{\text {trigger }}$ | 3 billion individuals. | Minimum abundance observed based on a scaled trawl <br> approach |
|  | $\mathrm{F}_{\text {MSY }}$ | HR $17.1 \%$. | Equivalent to $\mathrm{F}_{\text {max }}$ for combined sexes in 2010. |
| Precautionary <br> approach | Not defined. |  |  |

(unchanged since 2010).

Harvest ratio reference points (2010):

|  | Male | Female | Combined |
| :--- | :---: | :---: | :---: |
| $\mathbf{F}_{\text {max }}$ | 17.1 | 17.1 | $\mathbf{1 7 . 1}$ |
| $\mathrm{~F}_{0.1}$ | 11.0 | 10.2 | 10.6 |
| $\mathbf{F}_{35 \% \text { SpR }}$ | 14.1 | 12.7 | 13.4 |

The density of Nephrops in FU 15 is considered very high (average density $0.9 \mathrm{~m}^{-2}$ ). Recent harvest rates have been high (around $\mathrm{F}_{\text {max }}$ ) and the stock size has been stable at a high level. The exploitation rate between the sexes is similar. A harvest ratio consistent with a combined sex $\mathrm{F}_{\max }$ of $17.1 \%$ is suggested as a proxy for $\mathrm{F}_{\text {MSY }}$. A preliminary MSY $\mathrm{B}_{\text {trigger }}$ has been estimated using the longer time-series of survey trawl cpue.

## Outlook for 2014

Basis: $\mathrm{F}_{2013}=\mathrm{F}_{2012}=19.8 \%$; bias-corrected survey index $(2013)=4.31$ billion; mean weights in landings (2010$2012)=15.04 \mathrm{~g}$; dead discard rate $($ by number $)=25.7 \%$; mean weight in discards $(2010-2012)=7.95 \mathrm{~g}$, survey bias $=1.14$; discards survival rate $=10 \%$.

| Basis | Total <br> catches* | Landings | Dead discards** | Surviving <br> discards** | Harvest rate |
| :--- | :---: | :---: | :---: | :---: | :---: |
|  | $\mathrm{L}+\mathrm{DD}+\mathrm{SD}$ | L | DD | SD | for L+DD |
| $\mathrm{F}_{\text {MSY }}$ proxy | 9914 | 8244 | 1504 | 167 | $17.1 \%$ |
| $\mathrm{~F}_{2013}$ | 11486 | 9551 | 1742 | 194 | $19.8 \%$ |
| $\mathrm{~F}_{0.1}$ | 6144 | 5109 | 932 | 104 | $10.6 \%$ |
| $\mathrm{~F}_{35 \% \text { SPR }}$ | 7764 | 6456 | 1178 | 131 | $13.4 \%$ |

Weights in tonnes.

* Total catches are the landings plus dead and surviving discards.
** Total discard rate is assumed to be $27.9 \%$ of the catches (in number, average of the last three years, 2010-2012); discard survival is assumed to be $10 \%$.


## MSY approach

Following the ICES MSY approach implies that the harvest ratio for the western Irish Sea FU 15 is reduced to less than $17.1 \%$, resulting in landings of no more than 8244 t in 2014. If discard rates do not change from the average of the last three years (2010-2012, assuming 10\% discard survival), this implies total catches of no more than 9914 t .

## Additional considerations

The advice takes into account the 2013 UWTV survey results.
The Nephrops trawl fishery takes bycatches of other species, especially plaice, but also whiting and cod. In response to the long-term management plan for cod (EC 1342/2008), Northern Ireland and Ireland have introduced more species-selective gears primarily to reduce bycatch of cod, but the devices thus far introduced are also know to reduce discards of other species. Despite this, selectivity of this fishery needs to be further improved to reduce bycatches of juvenile whiting in particular.

The proportion of discarded Nephrops is substantial. On average over the last three years, around $28 \%$ in numbers (or $17 \%$ in weight) of the Nephrops caught are estimated to have been discarded.

The FU 15 Nephrops fishery first developed in the late 1950s. The environment in the Western Irish Sea is very suitable for Nephrops, with a large mud patch and a gyre that retains the larvae over the mud patch, thus ensuring good recruitment. The ground can be characterized as an area of very high densities of small Nephrops. All available information indicates that size structure of catches appears to have changed little since the fishery first began.

## Regulations and their effects

The cod long-term plan was introduced in 2009 (EC 1342/2008). Annual effort baselines in Nephrops trawl fisheries (Effort group TR2 OTB 70-99 mm) in Division VIIa have been reduced by $25 \%$ annually since 2009. There are provisions in the cod long-term plan to be exempt from these effort restrictions, or have it reduced, making the impact of this regulation on overall effort difficult to assess. The use of species-selective gears to mitigate effort restrictions to avoid effort limits has increased steadily since 2009. An authorisation was introduced by Ireland in March 2012 requiring the use of grids or separator panels for all TR2 boats fishing in the Irish Sea. Around $55 \%$ of the Irish vessels use separator trawls, while $45 \%$ have opted to use Swedish grids to reduce bycatch.

Since October 2012, all TR2 vessels in the UK (Northern Ireland) fleet are required to use a highly selective fishing gear. In the Irish Sea these currently include Seltra 300 mm box trawl, 270 mm diamond mesh panel Seltra box trawl, and 300 mm square mesh panel. All these gears are being developed with the aim of achieving
exemption from the cod recovery plan under Article 11 (less than $1.5 \%$ cod catch). Enforcement is through the issue of cod recovery zone fishing authorisations, where no authorisation is given to a vessel that is not using a highly selective gear.

The minimum landing size for Nephrops is 20 mm carapace length (CL), and less than $1 \%$ of the animals landed are undersized.

## Uncertainties in assessment and forecast

General comments of uncertainties in the assessment and forecast using the information from the UWTV surveys are discussed in the introduction of Section 5.4.21.

Uncertainties in the survey, in mean weight in the landings, and in discard rates are not taken into account in the advice. Mean weights in the landings and discard rates are based on 2010-2012 sampling by Northern Ireland and by Ireland.

The harvest ratio prior to 2006 may be underestimated due to underreporting of landings.
The calculation of harvest ratio and reference points $\mathrm{F}_{0.1}$ and $\mathrm{F}_{\max }$ is based on yield-per-recruit analyses and biological parameters, estimated under the assumption that the stock is in equilibrium. However, it is unlikely that the Nephrops in FU 15 is in equilibrium due to variable recruitment. In addition, important assumptions are made on growth, natural mortality, and discard rates in the derivation of reference points.

## Comparison with previous assessment and advice

The advice for 2014 was delayed until autumn to take account of the most up-to-date survey information.
The basis for the assessment and advice is the same as last year, the MSY approach.

## Sources

ICES. 2009. Report of the Benchmark Workshop on Nephrops (WKNEPH), 2-6 March 2009, Aberdeen, UK. ICES CM 2009/ACOM:33.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

## Effort - Different fleets



Figure 5.4.21.2.2 Nephrops Irish Sea West (FU 15). Effort trends of Nephrops fleets. Effort from UK Northern Ireland Nephrops trawlers fleet represented with dots and effort from Irish fleet represented with squares.


Figure 5.4.21.2.3 Nephrops Irish Sea West (FU 15). Annual length composition of catch (dashed) and landed (solid). Males (right) and females (left) from 1986 (bottom) to 2012 (top). The vertical dashed line is mean length in the catches and the vertical solid line is mean length in the landings. The straight vertical lines correspond to 20 mm (MLS) and 29 mm carapace length..


Figure 5.4.21.2.4 Nephrops Irish Sea West (FU 15). UWTV index (in billions) and scaled NI-NEP-Trawl-Summer survey. The green dotted line is MSY $\mathrm{B}_{\text {trigger }}$.

Table 5.4.21.2.1 Nephrops in Irish Sea West (FU 15). ICES advice, management, landings, and discards.

| Year | ICES advice | Predicted landings corresp. to advice (FU 15) | $\begin{aligned} & \text { Recommended } \\ & \text { landings } \\ & \text { (FUs } 14+15) \end{aligned}$ | $\begin{aligned} & \text { ICES } \\ & \text { landings } \\ & \text { (FU 15) } \end{aligned}$ | $\begin{gathered} \text { Discards }^{1)} \\ (\text { FU 15) } \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1989 |  |  |  | 8.1 | 0.7 |
| 1990 |  |  |  | 8.3 | 0.3 |
| 1991 |  |  |  | 9.6 | 0.3 |
| 1992 |  |  | 8.9 | 7.5 | 1.1 |
| 1993 |  |  | 9.4 | 8.1 | 1.6 |
| 1994 |  |  | 9.4 | 7.6 | 1.2 |
| 1995 |  |  | 9.4 | 7.8 | 1.7 |
| 1996 |  |  | 9.4 | 7.3 | 1.2 |
| 1997 |  |  | 9.4 | 10.0 | 1.3 |
| 1998 |  |  | 9.4 | 9.1 | 1.6 |
| 1999 |  |  | 9.4 | 10.8 | 2.9 |
| 2000 |  |  | 9.4 | 8.4 | 2.3 |
| 2001 |  |  | 9.4 | 7.4 | 2.1 |
| 2002 | Set TAC in line with 1995-99 landings |  | 9.55 | 6.8 | 1.7 |
| 2003 | Set TAC in line with 1995-99 landings |  | 9.55 | 7.1 | 2.7 |
| 2004 | Set TAC in line with 1995-99 landings |  | 9.55 | 7.3 | 2.0 |
| 2005 | Set TAC in line with 1995-99 landings |  | 9.55 | 6.5 | 1.4 |
| 2006 | No increase in effort |  | 9.55 | 7.5 | 2.3 |
| 2007 | No increase in effort |  | - | 8.4 | 3.2 |
| 2008 | No increase in effort |  | - | 10.5 | 1.4 |
| 2009 | No increase in effort and landings | $<8.5$ | - | 9.2 | 2.9 |
| 2010 | Harvest ratio no greater than that equivalent to fishing at $\mathrm{F}_{0.1}$ | $<5.5$ | - | 9.0 | 1.5 |
| 2011 | Transition scheme towards the ICES MSY framework | $<9.5$ | - | 10.2 | 2.7 |
| 2012 | MSY approach | $<9.8$ |  | 10.5 | 1.9 |
| 2013 | MSY approach | $<9.3$ |  |  |  |
| 2014 | MSY approach | $<8.2$ |  |  |  |

[^2]Table 5.4.21.2.2 Nephrops in Irish Sea West (FU 15). Landings (tonnes) by country, 1965-2012.

| Year | Ireland | UK | UK E\&W | UK NI | UK Scotland | UK Isle of Man | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1965 |  | 1.018 |  |  |  |  | 1.018 |
| 1966 |  | 1.701 |  |  |  |  | 1.701 |
| 1967 |  | 2.077 |  |  |  |  | 2.077 |
| 1968 |  | 1.987 |  |  |  |  | 1.987 |
| 1969 | 1.011 | 2.803 |  |  |  |  | 3.814 |
| 1970 | 1.392 | 3.001 |  |  |  |  | 4.393 |
| 1971 | 1.384 | 3.190 |  |  |  |  | 4.574 |
| 1972 | 1.604 | 4.120 |  |  |  |  | 5.724 |
| 1973 | 1.863 | 4.031 |  |  |  |  | 5.894 |
| 1974 | 982 | 2.689 |  |  |  |  | 3.671 |
| 1975 | 909 | 4.165 |  |  |  |  | 5.074 |
| 1976 | 1.614 | 3.989 |  |  |  |  | 5.603 |
| 1977 | 2.469 | 4.045 |  |  |  |  | 6.514 |
| 1978 | 2.921 | 4.375 |  |  |  |  | 7.296 |
| 1979 | 3.436 | 5.512 |  |  |  |  | 8.948 |
| 1980 | 1.709 | 2.869 |  |  |  |  | 4.578 |
| 1981 | 3.202 | 4.047 |  |  |  |  | 7.249 |
| 1982 | 4.398 | 4.917 |  |  |  |  | 9.315 |
| 1983 | 4.324 | 5.124 |  |  |  |  | 9.448 |
| 1984 | 3.306 | 4.454 |  |  |  |  | 7.760 |
| 1985 | 2.421 | 4.480 |  |  |  |  | 6.901 |
| 1986 | 4.682 | 5.296 |  |  |  |  | 9.978 |
| 1987 | 4.639 | 5.114 |  |  |  |  | 9.753 |
| 1988 | 3.201 | 5.385 |  |  |  |  | 8.586 |
| 1989 | 2.477 | 5.651 |  |  |  |  | 8.128 |
| 1990 | 2.710 | 5.590 |  |  |  |  | 8.300 |
| 1991 | 3.371 | 6.183 |  |  |  |  | 9.554 |
| 1992 | 2.370 | 5.171 |  |  |  |  | 7.541 |
| 1993 | 2.715 | 5.387 |  |  |  |  | 8.102 |
| 1994 | 1.768 | 5.838 |  |  |  |  | 7.606 |
| 1995 | 2.259 | 5.538 |  |  |  |  | 7.796 |
| 1996 | 1.574 | 5.673 |  |  |  |  | 7.247 |
| 1997 | 3.349 | 6.622 |  |  |  |  | 9.971 |
| 1998 | 3.101 | 6.027 |  |  |  |  | 9.128 |
| 1999 | 4.582 | 6.198 |  |  |  | 6 | 10.786 |
| 2000 | 3.433 | 4.937 |  |  |  | 0 | 8.370 |
| 2001 | 2.689 | 4.749 |  |  |  | 3 | 7.441 |
| 2002 | 2.291 | 4.501 |  |  |  | 1 | 6.793 |
| 2003 | 2.709 | 4.352 |  |  |  | 4 | 7.065 |
| 2004 | 2.786 | 4.470 |  |  |  | 13 | 7.270 |
| 2005 | 2.133 | 4.420 |  |  |  | 0 | 6.554 |
| 2006 | 2.051 |  | 56 | 5.429 | 23 | 1 | 7.561 |
| 2007 | 2.767 |  | 102 | 5.585 | 36 | 0 | 8.491 |
| 2008 | 3.132 |  | 131 | 7.166 | 26 | 50 | 10.508 |
| 2009 | 2.343 |  | 200 | 6.622 | 32 | 1 | 9.198 |
| 2010 | 2.578 |  | 100 | 6.251 | 33 | 0 | 8.963 |
| 2011 | 3.575 |  | 88 | 6.444 | 52 | 2 | 10.162 |
| 2012* | 3.794 |  | 106 | 6.586 | 39 | 2 | 10.527 |

[^3]Table 5.4.21.2.3 Nephrops in Irish Sea West (FU 15). Results from the UWTV-FU 15 survey of Nephrops grounds in 2003-2013.

| Ground | Year | Number of stations | Mean <br> density (No. $\left.\mathbf{m}^{-2}\right)$ | Domain $\operatorname{area}\left(\mathrm{km}^{2}\right)$ | Abundance estimate (billions) | CV on <br> burrow estimate |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Western Irish Sea | 2003 | 160 | 0.99 | 5295 | 5.5 | 3\% |
|  | 2004 | 147 | 1.00 | 5310 | 5.5 | 3\% |
|  | 2005 | 141 | 1.02 | 5281 | 5.7 | 4\% |
|  | 2006 | 138 | 0.97 | 5194 | 5.4 | 4\% |
|  | 2007 | 148 | 0.93 | 5285 | 5.1 | 3\% |
|  | 2008 | 141 | 0.77 | 5287 | 4.3 | 3\% |
|  | 2009 | 142 | 0.83 | 5267 | 4.6 | 3\% |
|  | 2010 | 149 | 0.90 | 5307 | 5.0 | 3\% |
|  | 2011 | 156 | 0.88 | 5289 | 4.9 | 2\% |
|  | 2012 | 99 | 0.91 | 5291 | 5.1 | 3\% |
|  | 2013 | 80 | 0.78 | 5278 | 4.3 | 3\% |

Table 5.4.21.2.4 Nephrops in Irish Sea West (FU 15). UWTV abundance, confidence intervals, harvest ratio, landings in number, and mean weight in landings. (Note: a $10 \%$ survivorship of discards is assumed in the calculation of removals and HR).

| Year | Landings in number (millions) | Discards in number (millions) | Removals in number (millions) | Proportion removals retained | Adjusted survey (billions) | Harvest ratio | $\begin{aligned} & \text { Landings } \\ & \text { (t) } \end{aligned}$ | Discards <br> (t) | Mean weight in landings (grams) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1986 | 740 | 268 | 981 |  |  |  | 9978 | 1680 |  |
| 1987 | 774 | 242 | 992 |  |  |  | 9753 | 1608 |  |
| 1988 | 576 | 104 | 669 |  |  |  | 8586 | 639 |  |
| 1989 | 644 | 121 | 753 |  |  |  | 8147 | 673 |  |
| 1990 | 678 | 53 | 726 |  |  |  | 8308 | 276 |  |
| 1991 | 792 | 65 | 850 |  |  |  | 9566 | 345 |  |
| 1992 | 525 | 151 | 661 |  |  |  | 7547 | 1079 |  |
| 1993 | 679 | 275 | 926 |  |  |  | 8102 | 1622 |  |
| 1994 | 619 | 203 | 801 |  |  |  | 7606 | 1185 |  |
| 1995 | 554 | 260 | 787 |  |  |  | 7796 | 1724 |  |
| 1996 | 469 | 170 | 622 |  |  |  | 7247 | 1202 |  |
| 1997 | 731 | 214 | 924 |  |  |  | 9971 | 1330 |  |
| 1998 | 616 | 229 | 822 |  |  |  | 9128 | 1560 |  |
| 1999 | 710 | 388 | 1060 |  |  |  | 10780 | 2913 |  |
| 2000 | 533 | 298 | 801 |  |  |  | 8370 | 2293 |  |
| 2001 | 573 | 315 | 857 |  |  |  | 7438 | 2112 |  |
| 2002 | 491 | 223 | 692 |  |  |  | 6792 | 1732 |  |
| 2003 | 404 | 291 | 666 | 0.61 | 5.5 | 0.12 | 7052 | 2659 | 17.5 |
| 2004 | 416 | 218 | 612 | 0.68 | 5.5 | 0.11 | 7267 | 1993 | 17.5 |
| 2005 | 346 | 157 | 488 | 0.71 | 5.7 | 0.09 | 6530 | 1412 | 18.9 |
| 2006 | 467 | 261 | 701 | 0.67 | 5.4 | 0.13 | 7534 | 2285 | 16.1 |
| 2007 | 511 | 375 | 848 | 0.60 | 5.1 | 0.16 | 8424 | 3246 | 16.5 |
| 2008 | 755 | 191 | 927 | 0.81 | 4.3 | 0.22 | 10478 | 1421 | 13.9 |
| 2009 | 567 | 335 | 868 | 0.65 | 4.6 | 0.19 | 9199 | 2934 | 16.2 |
| 2010 | 572 | 180 | 733 | 0.78 | 5.0 | 0.15 | 8963 | 1539 | 15.7 |
| 2011 | 644 | 332 | 943 | 0.68 | 4.9 | 0.19 | 10162 | 2683 | 15.8 |
| 2012 | 770 | 258 | 1003 | 0.77 | 5.1 | 0.20 | 10527 | 1866 | 13.7 |
| Max | 792 | 388 | 1060 | 0.81 | 5.67 | 0.22 | 10780 | 3246 | 18.9 |
| Min | 346 | 53 | 488 | 0.60 | 4.29 | 0.09 | 6530 | 276 | 13.7 |
| Average | 598 | 229 | 804 | 0.70 | 5.11 | 0.16 | 8565 | 1704 | 16.2 |

## Irish Sea Plaice

## (Division VIla)

## FEAS - SINGLE STOCK CONSIDERATIONS

The ICES advice is based on the approach for data limited stocks. Catches should be no more than I, 827 t implying landings 497 t in 2014. FEAS does not agree with this advice.

This stock falls into ICES category 3.2 .0 since the assessment is indicative of trends only. The SSB estimates for 2011-2012 are I\% higher than the previous three years (2008-20I0). The ICES advice is based on a $1 \%$ increase in average estimated catches. The current TAC is well above the recent average reported landings due


Red Box-TAC/Management Area Blue Shading- Assessment Area to a combination of differential uptake between countries and substantial discarding in mixed fisheries catching plaice. Reducing the TAC to the landings advice given by ICES would not be appropriate in this situation.

The qualitative indicators for this stock show that SSB is at a high level and the stock is not thought to be over exploited. Given the favourable status of plaice in the Irish Sea FEAS recommend that the TAC for 2014 should remain unchanged at $1,627 \mathrm{t}$. This implies an Irish quota of $1,063 \mathrm{t}$.

## CURRENT MANAGEMENT

- The TAC for 2013 was $1,627 \mathrm{t}$ with an associated Irish quota of I,063 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.
- The disparity between minimum landing size and mesh size of the gear being used is evidenced by very high discard rates (up to $80 \%$ by number).
- Effort reductions as part of the Cod Long Term Management Plan
 (EC Reg. $1342 / 2008$ ) will also reduce catch and discarding of plaice in this area.
- FEAS recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching plaice.


## ICES ADVICE 5.4.23 Plaice in Division VIIa (Irish Sea)

## Advice for 2014

Based on ICES approach to data-limited stocks, ICES advises that catches should be no more than 1827 t in 2014. If discard rates do not change from the average of the last three years (2010-2012), this implies landings of no more than 497 t in 2014.

## Stock status

|  | F (Fishing Mortality) |  |
| :---: | :---: | :---: |
|  | 2010-2012 |  |
| Qualitative evaluation | (v) | Below poss. reference points |
| SSB (Spawning-Stock Biomass) |  |  |
|  |  | 2008-2012 |
| Qualitative evaluation | (v) | Above poss. reference points |



Figure 5.4.23.1
Plaice in Division VIIa (Irish Sea). Upper left: Official landings (grey bars) and raised discard estimates (red bars from 2004). Upper right: SSB trend (mean standardized from the Aarts and Poos (2009) model output). Bottom: Harvest rate (total catch/annual egg production SSB).

The average of the stock size indicator in the last two years (2011-2012) is $1 \%$ higher than the average of the three previous years (2008-2010).

SSB trends show an increase in stock size since the mid-1990s to a stable level. Fishery-independent estimates of plaice SSB from the annual egg production method (AEPM) surveys increased from 9000 t in 1995 to 14 $000-15000 \mathrm{t}$ since 2006 . The recent fishing mortality is likely to be very low as the estimates of total catch (landings and discards) since 2006 are only around $15 \%$ of the AEPM estimates of SSB over this period, and the catches also include immature plaice.

## Management plans

No specific management objectives are known to ICES.

## Biology

There are considered to be three main spawning areas of plaice in the Irish Sea: one off the Irish coast, another northeast of the Isle of Man towards the Cumbrian coast, and the third off the north Wales coast. Cardigan Bay in St. George's Channel has also been identified as a spawning ground for plaice in the Irish Sea. The level of mixing between the eastern and western components of the Irish Sea stock appears small. Males are smaller than females and mean length at age of both sexes has generally declined since the mid-1990s. Survey data indicate that males of ages $1-5$ and females of age $1-3$ are generally below minimum landing size (MLS).

## Environmental influence on the stock

For all plaice stocks in the Northeast Atlantic there is a high degree of synchrony and significant negative relationships with sea surface temperature and recruitment.

## The fisheries

A very high proportion of the catch is discarded. In the eastern Irish Sea plaice are caught in the mixed demersal fishery, largely by UK otter trawlers, and as a bycatch in targeted sole beam trawl fisheries, dominated by Belgian trawlers. Total effort (hours fished) in the UK fleets targeting plaice have declined to the lowest levels recorded. Total effort by the Belgian beam trawl fleet has declined steadily from a peak in 2002. In the western Irish Sea, plaice are caught by the Irish and UK Nephrops fisheries: effort (in hours fished) by these fisheries is greater than in the mixed demersal and beam trawl fisheries combined. The regulations affecting plaice and other demersal stocks in Division VIIa remain linked to those implemented under the Irish Sea cod long-term management plan.

Catch distribution Catch (2012) $=1648 \mathrm{t}(30 \%$ landings, $70 \%$ discards $)$. Landings $=496 \mathrm{t}(48 \%$ beam trawl, $28 \%$ otter trawl, and $24 \%$ other gear types $)$. ICES estimates of discards $=1152 \mathrm{t}(24 \%$ beam trawl, $44 \%$ otter trawl, and $32 \%$ other gear types).

## Effects of the fisheries on the ecosystem

A proportion of the plaice catch is caught by beam trawl fisheries. Beam trawling, especially when using chainmat gear, is known to have a significant impact on the benthic communities, although less so on soft substrates and in areas which have been historically exploited by this fishing method.

## Quality considerations

As last year, the Aarts and Poos (2009) model continues to have difficulty in interpreting the data, although convergence properties have improved compared to last year's assessment. Despite these concerns with the model, the SSB trends from the model are still considered to be relevant.

The discard data are noisy and the assessment would benefit from increased sampling intensity. Discard information from Northern Irish and Irish Nephrops fleets became available for the first time this year, enabling improved discard estimates for the most recent years (2010-2012). Because no time-series of this information was available to be incorporated in the assessment model, the previous discards computation was used. However, the new discard information was used to quantify the catch advice.

The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished.

## Scientific basis

| Assessment type | Trends based on Aarts and Poos (2009) assessment model. |
| :--- | :--- |
| Stock data category | Category 3.2.0. |
| Input data | Commercial catches (international landings, ages and length frequencies from catch <br> sampling); three survey indices (UK (E\&W)-BTS-Q3, NIGFS-WIBTS-Q1, and |
|  | NIGFS-WIBTS-Q4); fixed maturity ogive; constant natural mortality. |
| Discards and bycatch | Discards were included in the assessment; time-series since 2004 from Belgian beam <br> trawl, UK(E\&W) beam trawl, and Irish miscellaneous gears. Northern Irish and Irish <br>  <br>  <br> Nephrops fleet discard information is available for 2010 onwards. |
|  |  |

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Indicators
Other information
Working group report

\subsection*{5.4.23}

\section*{ECOREGION Celtic Sea and West of Scotland STOCK Plaice in Division VIIa (Irish Sea)}

\section*{Reference points}

No reference points are defined for this stock.

\section*{Outlook for 2014}

No reliable forecast can be presented for this stock, because the assessment is only indicative of trends and the absolute level of stock size is uncertain.

\section*{ICES approach to data-limited stocks}

For data-limited stocks for which an abundance index is available, ICES uses as a harvest control rule an indexadjusted status quo catch. The advice is based on a comparison of the two most recent index values with the three preceding values, combined with recent catch or landings data. Knowledge about the exploitation status also influences the advised catch.

For this stock the biomass is estimated to have increased by \(1 \%\) between the periods 2008-2010 (average of the three years) and 2011-2012 (average of the two years). This implies an increase in catches of at most \(1 \%\) in relation to average catches of the last three years, corresponding to catches in 2014 of no more than 1827 t . If discard rates do not change from the average of the last three years (2010-2012), this implies landings in 2014 of no more than 497 t . Considering that recent fishing mortality is considered to be very low, no additional precautionary reduction is needed

\section*{Additional considerations}

The high level of discarding in this fishery indicates a mismatch between the minimum landing size and the mesh size of the gear being used. Measures, such as the introduction of grids to Nephrops trawlers, which reduce discarding will result in increased future yield potentials. Gear selectivity trials and monitoring from four Irish Nephrops trawlers using grids since 2009 indicate a potential \(75 \%\) drop in fish bycatch (BIM, 2009).

\section*{Regulations and their effects}

Technical measures in force are minimum mesh sizes and minimum landing size ( 27 cm ).
The TAC is not a constraint; from 1998 onwards landings have been consistently below the TAC. Of the countries with a TAC for plaice in the Irish Sea only Belgium took its allowance in 2012.

Considering the high level of discarding observed in this stock, gear selectivity regulations have had little effect. The closures of cod spawning grounds that have been in force since 2000 are unlikely to have had a significant impact on catches by the plaice fishery. In 2000, the closure covered the western and eastern Irish Sea. Since then, the closure has been mainly in the western part, whereas the majority of the plaice fishery has taken place in the eastern part of the Irish Sea.

\section*{Changes in fishing technology and fishing patterns}

Fishing effort in the Irish Sea beam trawl fleet declined significantly in 2008 and remained at a low level between 2009 and 2012. Fishing effort in larger mesh ( \(>100 \mathrm{~mm}\) ) otter trawl fleets declined substantially since 2002 with the introduction of the cod recovery plan. Total effort (hours fished) in these fleets has declined to the lowest level since 1979.

\section*{Data and methods}

Up to 2010 ICES carried out an assessment using landings-at-age data. Discard sampling studies have indicated variable discarding rates up to \(80 \%\) by number. In 2011, WKFLAT evaluated an assessment model that includes discard data since 2004 and it was decided to assess SSB and fishing mortality trends (ICES, 2011). In 2012, the model was not considered appropriate because of the reversal of the recruitment trend after the inclusion of the 2011 data (ICES, 2012).

The benchmark in 2011 investigated several assessment methods to explore options for incorporating a short time-series of discard observations into the assessment. None of the approaches examined proved to be entirely satisfactory. The Aarts and Poos (2009) method, developed initially for North Sea plaice, was chosen as a trends-only assessment for the provision of management advice but could not be used as a basis for predicting future catch options. The model continues to have difficulty in interpreting the data, although convergence properties have improved compared to last year's assessment.

Comparison with previous assessment and advice
The assessment model is the same as last year's, and the perception of the stock trends did not change from last year.

The basis for advice is the same as last year, i.e. ICES approach to data-limited stocks.

\section*{Sources}

Aarts, G., and Poos, J. J. 2009. Comprehensive discard reconstruction and abundance estimation using flexible selectivity functions. ICES Journal of Marine Science, 66: 763-771.
BIM. 2009. Summary report of Gear Trials to Support Ireland's Submission under Articles \(11 \& 13\) of Reg. 1342/2008. Nephrops Fisheries VIIa \& VIIb-k. Project 09.SM.T1.01. Bord Iascaigh Mhara (BIM), May 2009.

ICES. 2011. Report of the Benchmark Workshop on Flatfish (WKFLAT), 1-8 February 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:39.
ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9-18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Table 5.4.23.1 Plaice in Division VIIa (Irish Sea). ICES advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & ICES Advice & Predicted catch corresp. to advice & \begin{tabular}{l}
Agreed \\
TAC
\end{tabular} & Official landings & ICES landings \\
\hline 1987 & F high; no long-term gains in increasing F & 5.0 & 5.0 & 5.6 & 6.2 \\
\hline 1988 & No increase in F & 4.8 & 5.0 & 4.4 & 5.0 \\
\hline 1989 & 80\% of F (87); TAC & 5.8 & 5.8 & 4.2 & 4.4 \\
\hline 1990 & Halt decline in SSB; TAC & 5.1 & 5.1 & 4.0 & 3.3 \\
\hline 1991 & Rebuild SSB to SSB(90); TAC & 3.3 & 4.5 & 2.8 & 2.6 \\
\hline 1992 & \(70 \%\) of F(90) & 3.0 & 3.8 & 3.2 & 3.3 \\
\hline 1993 & \(\mathrm{F}=0.55 \sim 2800 \mathrm{t}\) & 2.8 & 2.8 & 2.0 & 2.0 \\
\hline 1994 & Long-term gains in decreasing F & \(<3.7\) & 3.1 & 2.1 & 2.1 \\
\hline 1995 & Long-term gains in decreasing F & \(2.4{ }^{1}\) & 2.8 & 2.0 & 1.9 \\
\hline 1996 & No long-term gain in increasing F & 2.5 & 2.45 & 1.9 & 1.7 \\
\hline 1997 & No advice & - & 2.1 & 2.0 & 1.9 \\
\hline 1998 & No increase in F & 2.4 & 2.4 & 1.8 & 1.8 \\
\hline 1999 & Keep \(F\) below \(\mathrm{F}_{\mathrm{pa}}\) & 2.4 & 2.4 & 1.6 & 1.6 \\
\hline 2000 & Keep \(F\) below \(\mathrm{F}_{\mathrm{pa}}\) & \(<2.3\) & 2.4 & 1.4 & 1.4 \\
\hline 2001 & Keep F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<2.4\) & 2.0 & 1.5 & 1.5 \\
\hline 2002 & Keep F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<2.8\) & 2.4 & 1.5 & 1.6 \\
\hline 2003 & No increase in F & 1.9 & 1.675 & 1.6 & 1.6 \\
\hline 2004 & \(\mathrm{F}<\mathrm{F}_{\mathrm{pa}}\) & 1.6 & 1.34 & 1.1 & 1.1 \\
\hline 2005 & \(\mathrm{F}<\mathrm{F}_{\mathrm{pa}}\) & 2.97 & 1.608 & 1.3 & 1.3 \\
\hline 2006 & \(\mathrm{F}<\mathrm{F}_{\mathrm{pa}}\) & 5.9 & 1.608 & 0.9 & 0.9 \\
\hline 2007 & \(\mathrm{F}<\mathrm{F}_{\mathrm{pa}}\) & 6.5 & 1.849 & 0.8 & 0.8 \\
\hline 2008 & \(\mathrm{F}<\mathrm{F}_{\mathrm{pa}}\) & 5.2 & 1.849 & 0.5 & 0.6 \\
\hline 2009 & No long-term gains in increasing F above \(\mathrm{F}_{0.1}\) & 1.43 & 1.43 & 0.48 & 0.46 \\
\hline 2010 & No long-term gains in increasing F above \(\mathrm{F}_{0.1}\) & 1.63 & 1.63 & 0.38 & 0.38 \\
\hline 2011 & Effort should be consistent with no increase in catches & - & 1.627 & 0.59 & 0.59 \\
\hline 2012 & Catches should not increase & - & 1.627 & 0.50 & 0.91 \\
\hline 2013 & Landings should be no more than \(2 \%\) more than recent landings (last 3 years) & \(<0.490^{2}\) & 1627 & & \\
\hline 2014 & Catches should be no more than \(1 \%\) more than recent catches (last 3 years) & 1.827 & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1}\) Catch at status quo F.
\({ }^{2}\) Landings component only.
}
Table 5.4.23.2 Plaice in Division VIIa (Irish Sea). Landings (tonnes) by country and ICES estimates of total catch.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & \(2012{ }^{1}\) \\
\hline Belgium & 321 & 128 & 332 & 327 & 344 & 459 & 327 & 275 & 325 & 482 & 636 & 628 & 431 & 566 & 343 & 194 & 157 & 197 & 138 & 332 & 236 \\
\hline France & 42 & 19 & 13 & 10 & 11 & 8 & 8 & 5 & 14 & 9 & 8 & 7 & 2 & 9 & 2 & 2 & 2 & 0.4 & 0.2 & 0.28 & 0.08 \\
\hline Ireland & 1355 & 654 & 547 & 557 & 538 & 543 & 730 & 541 & 420 & 378 & 370 & 490 & 328 & 272 & 179 & 194 & 102 & 73 & 89 & 118 & 106 \\
\hline Netherlands & - & - & - & - & 69 & 110 & 27 & 30 & 47 & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline UK (Eng.\&Wales) \({ }^{2}\) & 1381 & 1119 & 1082 & 1050 & 878 & 798 & 679 & 687 & 610 & 607 & 569 & 409 & 369 & 422 & 413 & 412 & 300 & 185 & 148 & 145 & 154 \\
\hline UK (Isle of Man) & 24 & 13 & 14 & 20 & 16 & 11 & 14 & 5 & 6 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 1 & ... & 0.5 & 0.25 & 0.11 \\
\hline UK (Scotland) & 70 & 72 & 63 & 60 & 18 & 25 & 18 & 23 & 21 & 11 & 7 & 9 & 4 & 1 & 0 & 0 & 1 & 2 & 3 & 0 & 0 \\
\hline Total & 3193 & 2005 & 2051 & 2024 & 1874 & 1954 & 1803 & 1566 & 1443 & 1488 & 1591 & 1544 & 1134 & 1270 & 937 & 802 & 562 & 457 & 379 & 594 & 496 \\
\hline Discards \({ }^{3}\) & - & - & - & - & - & - & - & - & - & - & - & - & 628 & 1210 & 1254 & 1743 & 1270 & 1131 & 2560 & 604 & 911 \\
\hline Unallocated & 74 & -9 & 15 & -150 & -167 & -83 & -38 & 34 & -72 & -15 & 32 & 15 & 9 & 11 & -5 & 3 & 1 & 2 & 0 & 0 & 0 \\
\hline ICES landings & 3267 & 1996 & 2066 & 1874 & 1707 & 1871 & 1765 & 1600 & 1371 & 1473 & 1623 & 1559 & 1771 & 2491 & 2186 & 2548 & 1833 & 1591 & 2938 & 1198 & 1407 \\
\hline
\end{tabular}

\({ }^{1}\) Provisional.
\({ }^{2}\) Northern Ireland included with England and Wales.
\({ }^{3}\) Discard data used in the assessment model.

Table 5.4.23.3 Plaice in Division VIIa (Irish Sea). Discard data used to quantify catch advice (Northern Ireland and Irish historic discard information was used to quantify the catch advice but was not included in the model).
\begin{tabular}{c|r|rrc}
\hline & \begin{tabular}{c} 
WKFLAT \\
method
\end{tabular} & \multicolumn{3}{|c}{ Using new updated discard data, including Northern } \\
Year & Discards & Discards & Landings & Catches \\
\hline 2010 & 2560 & 2171 & 379 & 2550 \\
2011 & 604 & 614 & 594 & 1208 \\
2012 & 911 & 1152 & 496 & 1648 \\
\hline
\end{tabular}

Table 5.4.23.4
Plaice in Division VIIa (Irish Sea). Absolute SSB (thousand tonnes) of the annual egg production estimates (AEPM), mean standardized SSB output from the Aarts and Poos model (AP), and catch (thousand tonnes) as used in the assessment and harvest rate (catch/AEPM SSB).
\begin{tabular}{ccccc}
\hline Year & \begin{tabular}{c} 
SSB- \\
AEPM \\
\((\mathbf{k t})\)
\end{tabular} & \begin{tabular}{c} 
Relative \\
SSB- \\
AP model
\end{tabular} & \begin{tabular}{c} 
Catch \(^{1}\) \\
\((\mathbf{k t})\)
\end{tabular} & \begin{tabular}{c} 
Harvest rate \\
\(\mathbf{( \% )}\)
\end{tabular} \\
\hline 1993 & & 0.4 & 1.996 & \\
1994 & & 0.37 & 2.066 & \\
1995 & 9.08 & 0.37 & 1.874 & 20.64 \\
1996 & & 0.42 & 1.707 & \\
1997 & & 0.45 & 1.871 & \\
1998 & & 0.58 & 1.765 & \\
1999 & & 0.67 & 1.6 & \\
2000 & 13.3 & 0.76 & 1.371 & 10.31 \\
2001 & & 0.94 & 1.473 & \\
2002 & & 1.1 & 1.623 & \\
2003 & & 1.35 & 1.559 & \\
2004 & & 1.34 & 1.771 & \\
2005 & & 1.36 & 2.491 & \\
2006 & 14.42 & 1.47 & 2.186 & 15.16 \\
2007 & & 1.3 & 2.548 & \\
2008 & 14.35 & 1.42 & 1.833 & 12.77 \\
2009 & & 1.38 & 1.591 & \\
2010 & 15.07 & 1.46 & 2.938 & 19.50 \\
2011 & & 1.51 & 1.198 & \\
2012 & & 1.37 & 1.407 & \\
\hline
\end{tabular}

\footnotetext{
\({ }^{1}\) Discard data only available from 2004 onwards.
}

\section*{Irish Sea Sole}

\section*{(Division VIla)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice is that on the basis of the MSY approach there should be no directed fisheries and that by-catch and discards should be minimised. FEAS agrees with this advice.

This stock falls in to ICES category I data-rich stocks for which a quantitative assessment is available. SSB has continuously declined


Red Box-TAC/Management Area Blue Shading-Assessment Area since 2001 and dropped below \(B_{\text {lim }}\) since 2006. In 2013 SSB declined to 961 t which is the lowest in the time series and less than half of \(B_{\text {lim }}\).

Fishing mortality has declined since the mid 1980s to a stable level in recent years. Recruitment has been low in the last decade exacerbating the decline of this stock.

\section*{CURRENT MANAGEMENT}
- The TAC area (Division VIla) corresponds to the assessment area.
- The TAC in 2013 was 140 t with an Irish quota of 58 t .
- There are no specific management plans for this stock.
- FEAS recommends that management objectives be established and that a management plan be developed and implemented for fisheries catching sole.
- Effort reductions as part of the Cod Long Term Management Plan (EC Reg. 1342/2008) will also reduce catch and discarding of sole in this area.


\section*{ICES ADVICE 5.4.34 Sole in Division VIIa (Irish Sea)}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that there should be no directed fisheries and that bycatch and discards should be minimized.

\section*{Stock status}
\begin{tabular}{|c|c|c|c|}
\hline \multicolumn{4}{|c|}{F (Fishing Mortality)} \\
\hline & 20102011 & \multicolumn{2}{|l|}{2012} \\
\hline MSY ( \(\mathrm{F}_{\text {MSY }}\) ) & \(x \rightarrow\) & * Above target & \\
\hline Precautionary approach ( \(\mathrm{F}_{\mathrm{pa}}, \mathrm{F}_{\mathrm{lim}}\) ) & ( 0 & - Increased risk & \\
\hline \multicolumn{4}{|c|}{SSB (Spawning-Stock Biomass)} \\
\hline & 20112012 & 2013 & \\
\hline MSY ( \(\mathrm{B}_{\text {trigger }}\) ) & \(x 3\) & * Below trigger & \\
\hline Precautionary \(\operatorname{approach}\left(\mathrm{B}_{\mathrm{pa}}, \mathrm{B}_{\mathrm{lim}}\right)\) & 3 & Reduced capacity & reproductive \\
\hline
\end{tabular}



Figure 5.4.34.1 Sole in Division VIIa. Summary of stock assessment (weights in thousand tonnes). Predicted recruitment value is shaded. Top right: \(\mathrm{SSB} / \mathrm{F}\) for the time-series used in the assessment.

SSB has continuously declined since 2001 and has been below \(\mathrm{B}_{\text {lim }}\) since 2006. The 2013 SSB is the lowest observed in the time-series. The fishing mortality has shown a declining trend since the mid-1980s; it has been relatively stable in recent years, but remains well above the \(\mathrm{F}_{\text {MSY }}\) proxy. Recent recruitments have been lower than earlier in the time-series, with the 2011 recruitment being the lowest.

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

Sole is a flatfish that mainly occurs in the temperate waters of the eastern Atlantic, with a preference for sandy and muddy bottoms. Juveniles are found in coastal nurseries, whereas adults migrate to deeper waters. Sole is a nocturnal predator feeding on worms, molluscs, and small crustaceans, and therefore more susceptible to capture by fisheries at night than in daylight. Recruitment is known to be variable in this species.

\section*{The fisheries}

Sole are predominantly caught by beam trawl fisheries. Sole is caught in a mixed fishery with other flatfish as well as gadoids. Information from observer trips indicates that the discarding of sole is between 0 and \(8 \%\) in weight.

Catch distribution Landings (2012) \(=294 \mathrm{t}(91 \%\) beam trawlers, \(8 \%\) otter trawlers, \(<2 \%\) other gears). Beam trawl discards were \(5 \%\) in weight.

\section*{Effects of the fisheries on the ecosystem}

Although discard rates of sole are low in these fisheries, discard rates of other (commercial and noncommercial) species can be considerable. Beam trawling, especially when using chain-mat gear, is known to have a significant impact on the benthic communities, although less so on soft substrates.

\section*{Quality considerations}

The assessment has shown consistency over the recent years in estimating SSB, fishing mortality, and recruitment. The forecasted landings in 2014 and SSB in 2015 are robust to the assumptions of the incoming recruitment.

Discards are currently not included in the assessment, but given the low discard rates of sole it is unlikely that the inclusion of discards would change the perception of the stock.


Figure 5.4.34.2 Sole in Division VIIa (Irish Sea). Historical assessment results (final-year recruitment estimates are included).

\section*{Scientific basis}
\(\left.\begin{array}{ll}\text { Assessment type } & \text { Age analytical assessment (XSA). } \\
\text { Stock data category } & \text { Category 1. } \\
\text { Input data } & \begin{array}{l}\text { Commercial catches (international landings, ages and length frequencies from catch } \\
\text { sampling); one survey index (UK(E\&W)-BTS-Q3); maturity data from UK survey }\end{array} \\
\text { information; natural mortality is assumed to be constant. }\end{array}\right]\)\begin{tabular}{l} 
Discards are assumed negligible and not included in the assessment, but are available for \\
monitoring (Belgium and Irish beam trawl fleets, UK(E\&W) and Irish otter trawl fleets). \\
Indicators \\
\begin{tabular}{l} 
Other information \\
Wone.
\end{tabular} \\
\begin{tabular}{l} 
This stock was benchmarked in 2011 (ICES, 2011).
\end{tabular} \\
\end{tabular}

\section*{STOCK Sole in Division VIIa (Irish Sea)}

\section*{Reference points}
\begin{tabular}{|c|c|c|c|}
\hline & Type & Value & Technical basis \\
\hline \multirow[t]{2}{*}{\begin{tabular}{l}
MSY \\
Approach
\end{tabular}} & MSY \(\mathrm{B}_{\text {trigger }}\) & 3100 t . & Default to value of \(\mathrm{B}_{\mathrm{pa}}\) \\
\hline & \(\mathrm{F}_{\text {MSY }}\) & 0.16 & Provisional proxy based on stochastic simulations, assuming a Ricker stock-recruitment relationship (range \(0.1-0.25\) ). \\
\hline \multirow{4}{*}{Precautionary Approach} & \(\mathrm{B}_{\text {lim }}\) & 2200 t . & \(\mathrm{B}_{\text {lim }}=\mathrm{B}_{\text {loss. }}\). The lowest observed spawning stock, followed by an increase in SSB. \\
\hline & \(\mathrm{B}_{\mathrm{pa}}\) & 3100 t . & \(\mathrm{B}_{\mathrm{pa}} \sim \mathrm{B}_{\mathrm{lim}} \times 1.4\). The minimum SSB required that ensures a high probability of maintaining SSB above its lowest observed value, taking into account the uncertainty of assessments. \\
\hline & \(\mathrm{F}_{\text {lim }}\) & 0.40 & \(\mathrm{F}_{\text {lim }}=\mathrm{F}_{\text {loss. }}\) Although poorly defined, there is evidence that fishing mortality in excess of 0.4 has led to a general stock decline and is only sustainable during periods of above-average recruitment. \\
\hline & \(\mathrm{F}_{\mathrm{pa}}\) & 0.30 & This F is considered to have a high probability of avoiding \(\mathrm{F}_{\text {lim }}\). \\
\hline
\end{tabular}
(unchanged since: 2010)
Outlook for 2014

Basis: \(\mathrm{F}(2013)=0.16\) TAC constraint; \(\mathrm{R}(2013)=\mathrm{RCT}=1388\) thousands; \(\mathrm{R}(2014)=\) GM 2003-2011 \(=1900\) thousands; Catches \((2013)=140\) (no discards); \(\operatorname{SSB}(2014)=1048\).
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Rationale & Catches
(2014) & Basis & F(2014) & SSB(2015) & \[
\begin{gathered}
\text { \%SSB } \\
\text { change }^{1)}
\end{gathered}
\] & \begin{tabular}{l}
\%TAC \\
Change \({ }^{2)}\)
\end{tabular} \\
\hline MSY approach & 52 & \[
\begin{gathered}
\mathrm{F}_{\text {HCR-MSY }}= \\
\mathrm{F}_{\mathrm{MSY}} \times \mathrm{SSB}_{(2014)} \mathrm{MSY} \\
\mathrm{~B}_{\text {trigger }}
\end{gathered}
\] & 0.05 & 1278 & +22\% & -62\% \\
\hline MSY transition & 95 & \[
\begin{gathered}
0.2 \times \mathrm{F}_{(2010)} \\
+0.8 \times \mathrm{F}_{\mathrm{HCR}-\mathrm{MSY}} \\
\hline
\end{gathered}
\] & 0.10 & 1237 & +18\% & -32\% \\
\hline Precautionar y approach & 0 & \(\mathrm{SSB}_{2015}>\mathrm{B}_{\mathrm{pa}}\) & 0 & 1328 & +27\% & -100\% \\
\hline Zero catch & 0 & \(\mathrm{F}=0\) & 0 & 1328 & +27\% & -100\% \\
\hline \multirow[t]{5}{*}{Other options} & 105 & TAC - 25\% ( \(\mathrm{F}_{2013} \times 0.69\) ) & 0.11 & 1228 & +17\% & -25\% \\
\hline & 119 & \(\mathrm{TAC}-15 \%\left(\mathrm{~F}_{2013} \times 0.78\right)\) & 0.13 & 1215 & +16\% & -15\% \\
\hline & 140 & Stable TAC & 0.15 & 1196 & +14\% & 0\% \\
\hline & 147 & \(\mathrm{F}_{2013}\) & 0.16 & 1189 & +13\% & +5\% \\
\hline & 161 & \(\mathrm{TAC}+15 \%\left(\mathrm{~F}_{2013} \times 1.08\right)\) & 0.18 & 1176 & +12\% & +15\% \\
\hline
\end{tabular}

Weights in tonnes.
\({ }^{1)}\) SSB 2015 relative to SSB 2014.
\({ }^{2)}\) Catches 2014 relative to TAC 2013.

\section*{MSY approach}

Following the ICES MSY approach implies fishing mortality to be reduced to 0.05 ( \(66 \%\) lower than the \(\mathrm{F}_{\text {MSY }}\) proxy because SSB in 2014 is below MSY \(B_{\text {trigger }}\) ), resulting in catches of less than 52 t in 2014. This is expected to lead to a SSB of 1278 t in 2015.

Following the transition towards the ICES MSY approach implies a fishing mortality of 0.10 for 2014. This results in catches of 95 t in 2014. This is expected to lead to an SSB of 1237 t in 2015.

However, considering the low SSB and low recruitment since 2000, it is not possible to identify any non-zero catch which would be compatible with the MSY approach.

\section*{Precautionary approach}

It is not possible to identify any non-zero catch that would be compatible with the precautionary approach.

\section*{Additional considerations}

\section*{Management considerations}

At the end of 2012 additional quota regulations were imposed by the Flemish government for the Belgian sole fishery in the Irish Sea. Because of this it is expected that landings in 2013 will be in line with the agreed TAC of 140 t .

\section*{Regulations and their effects}

Technical measures in force are minimum mesh sizes and minimum landing size \((24 \mathrm{~cm})\). In addition beam trawlers, fishing with mesh sizes equal to or greater than 80 mm , are obliged to have 180 mm mesh sizes in the entire upper half of the anterior part of their net.

A spawning closure for cod has been in force since 2000. The first year of the regulation the closure covered the Western and Eastern Irish Sea. Since then, the closure has been mainly in the Western part whereas the sole fishery takes place mainly in the Eastern part of the Irish Sea (Liverpool Bay and Cardigan Bay). No direct impact on the sole stock is expected from this closure.

There was a one-month closure (January 2013) in the Irish Sea for the Belgian beam trawl fleet (national legislation).

\section*{Changes in fishing technology and fishing patterns}

Beam trawl effort has declined by about 76\% between 2003 and 2012. Fishing mortality has reduced over the same period, but to a lesser extent.

\section*{Data and methods}

A TAC constraint was assumed for the forecast, because it is expected that landings in 2013 would be in line with the agreed TAC of 140 t . Assuming a TAC constraint for 2013 of 140 tonnes would imply a fishing mortality in 2013 of 0.16 , which is the lowest of the time-series.

\section*{Comparison with the previous assessment and advice}

The addition of the 2012 data did not affect the consistency of the trends in SSB and fishing mortality. F values for 2011 and SSB in 2012 have been revised upwards by \(9 \%\) and upwards \(6 \%\), respectively.

Last year's advice was based on the MSY approach. This year the advice is the same as for 2013.

\section*{Sources}

ICES. 2011. Report of the Benchmark Workshop on Flatfish (WKFLAT), 1-8 February 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:39. 257 pp.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.


Figure 5.4.34.3
Sole in Division VIIa (Irish Sea). Stock-recruitment plot (left panel) and yield-per-recruit analysis (right panel).

Table 5.4.34.1 Sole in Division VIIa (Irish Sea). Advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & ICES Advice & Predicted catch corresp. to advice & \begin{tabular}{l}
Agreed \\
TAC
\end{tabular} & Official landings & ICES landings \({ }^{2}\) \\
\hline 1987 & No increase in F & 1.9 & 2.1 & 2.0 & 2.8 \\
\hline 1988 & 80\% of F(86); TAC & 1.6 & 1.75 & 1.9 & 2.0 \\
\hline 1989 & 80\% of F(87); TAC & \(<1.48\) & 1.48 & 1.8 & 1.8 \\
\hline 1990 & Interim advice & \(1.05^{3}\) & 1.5 & 1.6 & 1.6 \\
\hline 1991 & 90\% of F(89); TAC & 1.3 & 1.5 & 1.2 & 1.2 \\
\hline 1992 & No long-term gains in increased F & \(1.2{ }^{1}\) & 1.35 & 1.2 & 1.3 \\
\hline 1993 & \(\mathrm{F}=\mathrm{F}(91) \sim 920 \mathrm{t}\) & 0.92 & 1.0 & 1.0 & 1.0 \\
\hline 1994 & No long-term gains in increased F & \(1.51{ }^{1}\) & 1.5 & 1.4 & 1.4 \\
\hline 1995 & 20\% reduction in F & 0.8 & 1.3 & 1.3 & 1.3 \\
\hline 1996 & 20\% reduction in F & 0.8 & 1.0 & 1.0 & 1.0 \\
\hline 1997 & 20\% reduction in F & 0.8 & 1.0 & 1.0 & 1.0 \\
\hline 1998 & 20\% reduction in F & 0.85 & 0.9 & 0.9 & 0.9 \\
\hline 1999 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & 0.83 & 0.9 & 0.8 & 0.9 \\
\hline 2000 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & < 1.08 & 1.08 & 0.8 & 0.8 \\
\hline 2001 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<0.93\) & 1.1 & 1.0 & 1.1 \\
\hline 2002 & Keep \(F\) below \(\mathrm{F}_{\mathrm{pa}}\) & \(<1.10\) & 1.1 & 1.0 & 1.1 \\
\hline 2003 & Keep F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<1.01\) & 1.01 & 1.0 & 1.0 \\
\hline 2004 & Maintain SSB above \(\mathrm{B}_{\mathrm{pa}}\) & \(<0.79\) & 0.80 & 0.6 & 0.7 \\
\hline 2005 & \(\mathrm{F}<\mathrm{F}_{\mathrm{pa}}\) & \(<1.00\) & 0.96 & 0.77 & 0.8 \\
\hline 2006 & Recent catch levels (2002-2004) & \(<0.93\) & 0.96 & 0.57 & 0.57 \\
\hline 2007 & Maintain SSB above \(\mathrm{B}_{\mathrm{pa}}\) & 0 & 0.82 & 0.49 & 0.49 \\
\hline 2008 & Zero catch & 0 & 0.669 & 0.33 & 0.33 \\
\hline 2009 & Zero catch and recovery plan & 0 & 0.502 & 0.34 & 0.32 \\
\hline 2010 & Zero catch and recovery plan & 0 & 0.402 & 0.28 & 0.28 \\
\hline 2011 & See scenarios & - & 0.390 & 0.33 & 0.33 \\
\hline 2012 & MSY transition & \(<0.20\) & 0.3 & 0.29 & 0.29 \\
\hline 2013 & No directed fisheries, bycatch and discards should be minimized & 0 & 0.14 & & \\
\hline 2014 & No directed fisheries, bycatch and discards should be minimized & 0 & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1)}\) Catch at status quo F.
\({ }^{2)}\) Not including misreporting.
\({ }^{3)}\) Revised in 1990 to 1.5 .
}

Table 5．4．34．2 Sole in Division VIIa（Irish Sea）．Landings in tonnes as officially reported to ICES，and ICES estimates．Last year＇s landings are preliminary．All catches are assumed to be landed．
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Year & \[
\frac{E_{0}^{E}}{0}
\] & \[
\begin{aligned}
& \text { U. } \\
& \text { تِّ } \\
& \text { 运 }
\end{aligned}
\] & \[
\begin{aligned}
& \text { ت口 } \\
& \text { ご } \\
& 0
\end{aligned}
\] &  & 3
4
4
4
5 & \[
\begin{aligned}
& \text { 俞 } \\
& \sum_{0} \\
& \frac{0}{0} \\
& \underset{y}{v}
\end{aligned}
\] &  &  & \[
\begin{aligned}
& \text { चु } \\
& \text { 0 } \\
& \text { 르 } \\
& \text { त } \\
& \text { 苟 } \\
& 0
\end{aligned}
\] &  & \[
\begin{aligned}
& 0 \\
& 0 \\
& 0 \\
& 0 \\
& 0 \\
& 0 \\
& 0 \\
& 0 \\
& 0 \\
& 0 \\
& 0
\end{aligned}
\] & \[
\stackrel{U}{K}
\] \\
\hline 1973 & 793 & 12 & 27 & 281 & 258 & － & 46 & 11 & 1428 & 0 & 1428 & \\
\hline 1974 & 664 & 54 & 28 & 320 & 218 & － & 23 & － & 1307 & 0 & 1307 & \\
\hline 1975 & 805 & 59 & 24 & 234 & 281 & － & 24 & 15 & 1442 & －1 & 1441 & \\
\hline 1976 & 674 & 72 & 74 & 381 & 195 & － & 49 & 18 & 1463 & 0 & 1463 & \\
\hline 1977 & 566 & 39 & 84 & 227 & 160 & － & 49 & 21 & 1146 & 1 & 1147 & \\
\hline 1978 & 453 & 65 & 127 & 177 & 189 & － & 57 & 30 & 1098 & 8 & 1106 & \\
\hline 1979 & 779 & 48 & 134 & 247 & 290 & － & 47 & 42 & 1587 & 27 & 1614 & \\
\hline 1980 & 1002 & 41 & 229 & 169 & 367 & － & 44 & 68 & 1920 & 21 & 1941 & \\
\hline 1981 & 884 & 13 & 167 & 186 & 311 & － & 41 & 45 & 1647 & 20 & 1667 & \\
\hline 1982 & 669 & 9 & 161 & 138 & 277 & － & 31 & 44 & 1329 & 9 & 1338 & \\
\hline 1983 & 544 & 3 & 203 & 224 & 219 & － & 33 & 29 & 1255 & －86 & 1169 & \\
\hline 1984 & 425 & 10 & 187 & 113 & 230 & － & 38 & 17 & 1020 & 38 & 1058 & \\
\hline 1985 & 589 & 9 & 180 & 546 & 269 & － & 36 & 28 & 1657 & －511 & 1146 & \\
\hline 1986 & 930 & 17 & 235 & － & 637 & 1 & 50 & 46 & 1916 & 79 & 1995 & \\
\hline 1987 & 987 & 5 & 312 & － & 599 & 3 & 72 & 63 & 2041 & 767 & 2808 & 2100 \\
\hline 1988 & 915 & 11 & 366 & － & 507 & 1 & 47 & 38 & 1885 & 114 & 1999 & 1750 \\
\hline 1989 & 1010 & 5 & 155 & － & 613 & 2 & ． & 38 & 1823 & 10 & 1833 & 1480 \\
\hline 1990 & 786 & 2 & 170 & － & 569 & 10 & ． & 39 & 1576 & 7 & 1583 & 1500 \\
\hline 1991 & 371 & 3 & 198 & － & 581 & 44 & ． & 26 & 1223 & －11 & 1212 & 1500 \\
\hline 1992 & 531 & 11 & 164 & － & 477 & 14 & ． & 37 & 1234 & 25 & 1259 & 1350 \\
\hline 1993 & 495 & 8 & 98 & － & 338 & 4 & ． & 28 & 971 & 52 & 1023 & 1000 \\
\hline 1994 & 706 & 7 & 226 & － & 409 & 5 & ． & 14 & 1367 & 7 & 1374 & 1500 \\
\hline 1995 & 675 & 5 & 176 & － & 424 & 12 & ． & 8 & 1300 & －34 & 1266 & 1300 \\
\hline 1996 & 533 & 5 & 133 & 149 & 194 & 4 & ． & 5 & 1023 & －21 & 1002 & 1000 \\
\hline 1997 & 570 & 3 & 130 & 123 & 189 & 5 & ． & 7 & 1027 & －24 & 1003 & 1000 \\
\hline 1998 & 525 & 3 & 134 & 60 & 161 & 3 & ． & 9 & 895 & 16 & 911 & 900 \\
\hline 1999 & 469 & ＜1 & 120 & 46 & 165 & 1 & ． & 8 & 810 & 53 & 863 & 900 \\
\hline 2000 & 493 & 3 & 135 & 60 & 133 & 1 & ． & 8 & 833 & －15 & 818 & 1080 \\
\hline 2001 & 674 & 4 & 135 & － & 195 & ＋ & ． & 4 & 1012 & 41 & 1053 & 1100 \\
\hline 2002 & 817 & 4 & 96 & － & 165 & ＋ & ． & 3 & 1085 & 5 & 1090 & 1100 \\
\hline 2003 & 687 & 4 & 103 & － & 217 & ＋ & ． & 3 & 1014 & 0 & 1014 & 1010 \\
\hline 2004 & 527 & 1 & 77 & － & 106 & ＋ & ． & 1 & 712 & －3 & 709 & 800 \\
\hline 2005 & 662 & 3 & 85 & － & 103 & ＋ & ． & 1 & 854 & 1 & 855 & 960 \\
\hline 2006 & 419 & 1 & 85 & － & 69 & ＋ & ． & 2 & 576 & －7 & 569 & 960 \\
\hline 2007 & 305 & 1 & 115 & － & 66 & ＜1 & ． & 4 & 491 & 1 & 492 & 820 \\
\hline 2008 & 216 & 1 & 66 & － & 37 & n／a & ． & n／a & 320 & 12 & 332 & 669 \\
\hline 2009 & 257 & n／a & 47 & － & 19 & 1 & & 1 & 325 & 0 & 325 & 502 \\
\hline 2010 & 217 & \(<1\) & 47 & － & 12 & \(<1\) & ． & n／a & 277 & 0 & 277 & 402 \\
\hline 2011 & 250 & \(<1\) & 48 & － & 31 & \(<1\) & ． & \(\mathrm{n} / \mathrm{a}\) & 330 & 0 & 330 & 390 \\
\hline 2012 & 222 & \(<1\) & 51 & － & 21 & \(<1\) & － & \(\mathrm{n} / \mathrm{a}\) & 294 & 0 & 294 & 300 \\
\hline
\end{tabular}

\footnotetext{
\({ }^{1} 1989\) onwards：N．Ireland included with England \＆Wales．
}

Table 5.4.34.3 Sole in Division VIIa. Summary of stock assessment. All catches are assumed to be landed.
\begin{tabular}{|c|c|c|c|c|}
\hline Year & Recruitment Age 2 thousands &  & \begin{tabular}{l}
Landings \\
tonnes
\end{tabular} & \begin{tabular}{l}
Mean F \\
Ages 4-7
\end{tabular} \\
\hline 1970 & 3695 & 6437 & 1785 & 0.3900 \\
\hline 1971 & 10178 & 6222 & 1882 & 0.4405 \\
\hline 1972 & 3186 & 5010 & 1450 & 0.4506 \\
\hline 1973 & 13136 & 5123 & 1428 & 0.4300 \\
\hline 1974 & 5872 & 5068 & 1307 & 0.4442 \\
\hline 1975 & 6681 & 5360 & 1441 & 0.3953 \\
\hline 1976 & 3857 & 4890 & 1463 & 0.4271 \\
\hline 1977 & 15773 & 4491 & 1147 & 0.3696 \\
\hline 1978 & 9042 & 5093 & 1106 & 0.3576 \\
\hline 1979 & 8854 & 5685 & 1614 & 0.4748 \\
\hline 1980 & 5074 & 5514 & 1941 & 0.6367 \\
\hline 1981 & 4505 & 5169 & 1667 & 0.4808 \\
\hline 1982 & 2469 & 4336 & 1338 & 0.4404 \\
\hline 1983 & 5570 & 4104 & 1169 & 0.4355 \\
\hline 1984 & 15547 & 4618 & 1058 & 0.3510 \\
\hline 1985 & 16341 & 5664 & 1146 & 0.3352 \\
\hline 1986 & 23939 & 6994 & 1995 & 0.4351 \\
\hline 1987 & 3477 & 7218 & 2808 & 0.8526 \\
\hline 1988 & 3523 & 5581 & 1999 & 0.6743 \\
\hline 1989 & 4400 & 4704 & 1833 & 0.5609 \\
\hline 1990 & 5615 & 3705 & 1583 & 0.6354 \\
\hline 1991 & 12790 & 3260 & 1212 & 0.4878 \\
\hline 1992 & 4992 & 3507 & 1259 & 0.5134 \\
\hline 1993 & 6240 & 3292 & 1023 & 0.5314 \\
\hline 1994 & 5302 & 4131 & 1374 & 0.4745 \\
\hline 1995 & 2011 & 3604 & 1266 & 0.4896 \\
\hline 1996 & 2513 & 2776 & 1002 & 0.5045 \\
\hline 1997 & 8514 & 2558 & 1003 & 0.5719 \\
\hline 1998 & 7030 & 3108 & 911 & 0.4803 \\
\hline 1999 & 5332 & 3408 & 863 & 0.4549 \\
\hline 2000 & 7017 & 3204 & 818 & 0.4373 \\
\hline 2001 & 4587 & 3656 & 1053 & 0.3333 \\
\hline 2002 & 2334 & 3685 & 1090 & 0.3669 \\
\hline 2003 & 3057 & 3322 & 1014 & 0.3472 \\
\hline 2004 & 3666 & 2364 & 709 & 0.2989 \\
\hline 2005 & 3017 & 2128 & 855 & 0.5377 \\
\hline 2006 & 1335 & 1686 & 569 & 0.4494 \\
\hline 2007 & 1855 & 1442 & 492 & 0.3222 \\
\hline 2008 & 1867 & 1368 & 332 & 0.3013 \\
\hline 2009 & 2412 & 1099 & 325 & 0.3721 \\
\hline 2010 & 1530 & 1231 & 277 & 0.2869 \\
\hline 2011 & 559 & 1095 & 330 & 0.3437 \\
\hline 2012 & 744 & 1126 & 294 & 0.3017 \\
\hline 2013 & 1388* & 961 & & \\
\hline Average & 5928 & 3841 & 1191 & 0.4471 \\
\hline
\end{tabular}

\footnotetext{
* RCT3 estimate.
}

\section*{Irish Sea Herring}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advice states that, based on the MSY approach, landings in 2014 should be no more than \(5,25 \mathrm{It}\). FEAS agrees with the ICES advice.
This stock has a quantitative assessment and forecast, and is placed in ICES category I. F is currently around \(F_{\text {MSY }}\), SSB is above MSY \(B_{\text {trigger }}\) and recruitment is increasing and estimated above the average of the time series since 2006. Following ICES advice would result in an Irish quota of \(1,365 \mathrm{t}\) in 2014.


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

A long term management plan is being developed for this stock. Management of the Irish Sea herring fishery should ensure that catches of Celtic Sea juveniles are avoided.

FEAS agrees with ICES that activities that have a negative impact on the spawning habitat of herring, such as extraction of marine aggregates and marine construction on the spawning grounds, should not occur.

\section*{CURRENT MANAGEMENT}
- The TAC for this stock is set by EU and was \(4,993 \mathrm{t}\) for 2013 . The Irish share of the TAC was 1300 t ( \(26 \%\) ).
- There is no overall management objective or management plan for this stock at present. Work is underway with stakeholders and managers to develop such a plan.
- There are two closed areas in operation to protect the spawning stock during part of the spawning season and to prevent exploitation of juveniles. These measures were introduced during the period of the industrial fishery in the Irish Sea (1969-1979). The area off the Louth and Down coast is closed from the \(21^{\text {st }}\)
 September \(-3 I^{\text {st }}\) December and the east of the Isle of Man is closed from \(2 I^{\text {st }}\) September until \(15^{\text {th }}\) November.
- Republic of Ireland vessels are not permitted to fish herring in the 6-12 mile limits from Anglesea to the Mull of Galloway (eastern Irish Sea) or around of the Isle of Man, except for an area of the western Manx coast from Jurby Point to the Chickens Rock. This is under the terms of an international agreement in the 1960s.
- Republic of Ireland vessels have rights to fish herring in the territorial limits of Northern Ireland under the so-called "Voisinage" understanding.
- The Douglas Bank area, east of the Isle of Man, \(21^{\text {st }}\) September to the \(15^{\text {th }}\) November each year by EU legislation.

\section*{ICES ADVICE 5.4.14 Irish Sea Herring (Division VIIa (North))}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that catches in 2014 should be no more than 5251 t . Discards are considered to be low and all catches are therefore assumed to be landed.

ICES advises that activities that have a negative impact on the spawning habitat of herring, such as extraction of marine aggregates and marine construction on the spawning grounds, should not occur.

\section*{Stock status}


Figure 5.4.14.1
Herring in Division VIIa North of \(52^{\circ} 30^{\prime} \mathrm{N}\) (Irish Sea). Summary of stock assessment with observed landings. Estimates are shaded. Top right: SSB/F over the time-series used in the assessment.

The spawning-stock biomass has been above MSY \(\mathrm{B}_{\text {trigger }}\) since 2006. Fishing mortality has decreased since 2003 to the lowest in the time-series and is now around \(\mathrm{F}_{\text {MSY }}\). Recruitment is increasing and estimated above the average of the time-series since 2006 (2004 year class).

\section*{Management plans}

No specific management objectives are known to ICES. A management plan is currently being developed for Division VIIa (North).

\section*{Biology}

Herring is an important prey species in the ecosystem and also one of the dominant planktivorous fish. This autumn-spawning stock is considered part of the Malin Shelf stock complex. A component of the Division VIIaN herring stock is known to mix seasonally with herring in Subarea VI, but the extent is unknown. Juvenile herring from the Celtic Sea herring stock are present in the Irish Sea. Spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Gravel extraction or disturbance in the close vicinity of any herring spawning will disturb that spawning activity and will reduce the available area for successful spawning.

\section*{Environmental influence on the stock}

There are irregular cycles in the productivity of herring stocks (weights-at-age and recruitment). It is thought that the environment plays an important role (through transport, prey, and predation).

\section*{The fisheries}

The fishery has not changed in recent years. UK pelagic trawlers take the majority of catches during the 3rd and 4th quarters. A small local gillnet fishery continues to record landings on the traditional Mourne herring grounds in the 4th quarter. Herring fisheries tend to be clean with little bycatch of other fish. There are no observations of discarding or slippage in the Irish Sea fisheries that target herring.
```

Catch distribution Total catch (2012) = 5.7 kt. 100% are assumed to be landed (99% pelagic trawlers and $1 \%$ gillnet).

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\section*{Effects of the fisheries on the ecosystem}

The human consumption fisheries for herring are considered relatively clean, with little bycatch of other fish or cetaceans.

\section*{Quality considerations}

The interannual variation in herring migration patterns affect the selectivity of both the fishery and acoustic survey. The assessment is performed on a mixed stock (including juveniles from the Celtic Sea), which affects the estimates of the younger ages. The acoustic survey data are uncertain and the timing of the survey is occastionally mismatched with the migration pattern of the spawning-stock biomass. Input data quality and sampling coverage is good for this stock.


Figure 5.4.14.1 Herring in Division VIIa North of \(52^{\circ} 30^{\prime} \mathrm{N}\) (Irish Sea). Historical assessment results (final-year recruitment estimates included). The stock was benchmarked in 2012.

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & Analytical assessment (FLSAM). \\
Stock data category & Category 1. \\
Input data & Two survey indices (Northern Ireland Acoustic Surveys AC(VIIaN)), larvae survey \\
& NINEL); commercial catch-at-age data and annual maturity ogives, annual stock \\
weights from AC(VIIaN). \\
Discards and bycatch & Discards are not included in the assessment and are considered to be low. \\
Indicators & Two survey indices (NIGFS-WIBTS-1Q and NIGFS-WIBTS-4Q). \\
Other information & Benchmarked in 2012 (WKPELA; ICES, 2012). \\
Working group report & HAWG (ICES, 2013).
\end{tabular}

\subsection*{5.4.14}

\section*{ECOREGION STOCK}

\section*{Celtic Seas}

Herring in Division VIIa North of \(\mathbf{5 2}^{\mathbf{3}} \mathbf{3 0}{ }^{\mathbf{\prime}} \mathbf{N}\) (Irish Sea)

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline MSY & MSY \(_{\text {Arigger }}\) & 9500 t. & Provisional based on \(\mathrm{B}_{\mathrm{pa}}\). \\
\hline Approach & \(\mathrm{F}_{\mathrm{MSY}}\) & 0.26 & Based on stochastic \\
\hline \multirow{4}{*}{\begin{tabular}{l} 
Precautionary \\
approach
\end{tabular}} & \(\mathrm{B}_{\text {lim }}\) & \(6000 \mathrm{t}\). & Lowest observed SSB of ICA assessment. \\
\cline { 2 - 4 } & \(\mathrm{B}_{\mathrm{pa}}\) & 9500 t. & \(\mathrm{B}_{\mathrm{pa}}=\) Blim \(\times 1.58\). \\
\cline { 2 - 4 } & \(\mathrm{F}_{\text {lim }}\) & \begin{tabular}{l} 
Not \\
defined.
\end{tabular} & \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{pa}}\) & \begin{tabular}{l} 
Not \\
defined.
\end{tabular} & \\
\hline
\end{tabular}

Unchanged since 2012.
Outlook for 2014

Basis: \(\mathrm{F}(2013)=\) TAC constraint \(=0.22\); SSB (2014) \(=22864 ; \mathrm{R}(2013)=145\) million; Catch \((2013)=4993\).
\begin{tabular}{|l|c|c|c|c|c|c|}
\hline \multirow{2}{*}{ Rationale } & Catch & Basis & \(\mathbf{F}\) & \(\mathbf{S S B}\) & \begin{tabular}{c} 
\%SSB \\
change \\
\(\mathbf{1})\)
\end{tabular} & \begin{tabular}{c} 
\%TAC \\
change \\
2)
\end{tabular} \\
\hline MSY approach & 5251 & \(\mathrm{~F}_{\mathrm{MSY}}\) & \(\mathrm{(2014)}\) & \(\mathbf{( 2 0 1 5 )}\) & 0.26 & 16275 \\
\hline \multirow{3}{*}{ Other options } & 0 & \(\mathrm{~F}=0\) & 0 & 23588 & \(5 \%\) \\
\hline \hline Zero catch & 4244 & \(\mathrm{TAC}-15 \%\left(\mathrm{~F}_{2012} \times 0.96\right)\) & 0.21 & 17559 & \(-23 \%\) & \(-15 \%\) \\
\hline
\end{tabular}

Weights in tonnes.
\({ }^{1)}\) SSB 2015 relative to SSB 2014.
\({ }^{2)}\) Human consumption catch 2014 relative to TAC 2013.

\section*{MSY approach}

Following the ICES MSY approach implies fishing mortality at \(\mathrm{F}_{\mathrm{MSY}}=0.26\), resulting in catches of less than 5251 t in 2014. This is expected to lead to an SSB of 16275 t in 2015. Discards are considered to be low, and therefore, all catches are assumed to be landed.

\section*{Precautionary approach}

The SSB is well above \(B_{p a}\) and \(F_{p a}\) is undefined, but current \(F\) is just below \(F_{\text {MSY }}\). ICES does not advise using \(\mathrm{B}_{\mathrm{pa}}\) as a target in 2014.

\section*{Additional considerations}

The catches have been close to TAC levels and the main fishing effort has not varied considerably.

The acoustic survey estimates since 2007 suggest that SSB is at highest abundance within the 18 -year timeseries. Estimates from an enhanced acoustic survey series since 2007 indicate and confirm the significant increase in 1+ herring biomass. The acoustic survey provides estimates of numbers-at-age; however, the 1- to 3ringers in the area are a mixture of at least two adjacent stocks, Celtic Sea and Division VIIa(N). Splitting the current acoustic spawning stock biomass estimates according to season of origin does not change the perception of a significant increase in Irish Sea "autumn" spawning biomass.

Gravel substrate is an important fish habitat for herring spawning. Herring spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Activities that have an impact on the spawning habitat of herring, such as extraction of marine aggregates (e.g. gravel and sand; Groot, 1979, 1996) and construction in the marine environment, can impact spawning. Herring regularly abandon and repopulate spawning grounds and absence of spawning in any particular year does not mean that the spawning ground is not required to maintain a resilient herring population.

\section*{Uncertainties in the assessment}

The final assessment model is dominated by information from the catch, with the survey information having less influence on the model fit. The assessment model describes the data reasonably well and there is very little retrospective pattern in the assessment. The largest occurrence of mixed fish from different spawning season origins is in the age 1 data (recruitment age in the assessment). The assessment model does not appear to estimate recruitment well and should be considered as a smoothed estimate.

An area east of the Isle of Man has been seasonally closed since 1973. The fleet is sometimes able to fish spawning aggregations if they occur outside the closed area. The effect of this is that the age structure of the catches from year to year can vary widely.

\section*{Comparison with previous assessment and advice}

The basis for the assessment has not changed from last year (MSY approach). Compared to the assessment in 2012, \(\mathrm{SSB}_{2012}\) is now estimated to be \(2 \%\) higher and \(\mathrm{F}_{2011} 4 \%\) lower.

\section*{Sources}

Groot, S. J. de. 1979. The potential environmental impact of marine gravel extraction in the North Sea. Ocean Managemen, 5: 233-249.
Groot, S. J. de. 1996. The physical impact of marine aggregate extraction in the North Sea. ICES Journal of Marine Science, 53: 1051-1053.
ICES. 2012. Report of the Benchmark Workshop on Pelagic Stocks (WKPELA 2012), 13-17 February 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:47.
ICES. 2013. Report of the Herring Assessment Working Group for the Area South of 62N, 12-21 March 2013. ICES CM 2013/ACOM:06.



Figure 5.4.14.2
Herring in Division VIIa North of \(52^{\circ} 30^{\prime} \mathrm{N}\) (Irish Sea). Stock-recruitment and yield-per-recruit analysis.

Table 5.4.14.1 Herring in Division VIIa North of \(52^{\circ} 30^{\prime} N\) (Irish Sea). ICES advice, management, and catch.
\begin{tabular}{llrrr}
\hline Year & ICES & \begin{tabular}{c} 
Predicted catch \\
corresp. to advice
\end{tabular} & \begin{tabular}{r} 
Agreed \\
TAC
\end{tabular} & \begin{tabular}{r} 
ICES \\
catch
\end{tabular} \\
\hline 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 & Status quo F & 6.5 & 9.0 & 4.9 \\
1999 & F =.Proposed F & pa \(=0.36\) & 4.9 & 6.6 \\
2000 & F =90\% F(98) \(=0.31\) & 3.9 & 5.4 & 4.1 \\
2001 & Status quo F = 0.26 & 5.1 & 6.9 & 5.5 \\
2002 & Average catch of 1996-2000 & 4.8 & 4.8 & 2.4 \\
2003 & 2002 TAC & 4.8 & 4.8 & 2.4 \\
2004 & Advice 2003 catch & 4.8 & 4.8 & 2.5 \\
2005 & Status quo TAC & 4.8 & 4.8 & 4.4 \\
2006 & Status quo TAC & 4.8 & 4.8 & 4.4 \\
2007 & Status quo TAC & 4.8 & 4.8 & 4.6 \\
2008 & Recent catches & 4.4 & 4.8 & 4.9 \\
2009 & Same advice as last year & 4.4 & 4.8 & 4.6 \\
2010 & Recent TAC & 4.8 & 4.8 & 4.9 \\
2011 & No increase in catch & \(<4.8\) & 5.2 & 5.2 \\
2012 & No increase in catch & -5.251 & 5.280 & 5.7 \\
2013 & MSY approach & 4.993 & \\
2014 & MSY approach & & \\
\hline
\end{tabular}

Weights in thousand tonnes.

Table 5.4.14.2 Herring in Division VIIa North of \(52^{\circ} 30^{\prime} \mathrm{N}\) (Irish Sea). ICES catch estimates in tonnes by country.
\begin{tabular}{|c|ccc|c|}
\hline Country & Ireland & UK & Unallocated & Total \\
\hline \(\mathbf{1 9 8 7}\) & 1200 & 3290 & 1333 & 5823 \\
\(\mathbf{1 9 8 8}\) & 2579 & 7593 & - & 10172 \\
\(\mathbf{1 9 8 9}\) & 1430 & 3532 & - & 4962 \\
\(\mathbf{1 9 9 0}\) & 1699 & 4613 & - & 6312 \\
\(\mathbf{1 9 9 1}\) & 80 & 4318 & - & 4398 \\
\(\mathbf{1 9 9 2}\) & 406 & 4864 & - & 5270 \\
\(\mathbf{1 9 9 3}\) & 0 & 4408 & - & 4408 \\
\(\mathbf{1 9 9 4}\) & 0 & 4828 & - & 4828 \\
\(\mathbf{1 9 9 5}\) & 0 & 5076 & - & 5076 \\
\(\mathbf{1 9 9 6}\) & 100 & 5180 & 22 & 5302 \\
\(\mathbf{1 9 9 7}\) & 0 & 6651 & - & 6651 \\
\(\mathbf{1 9 9 8}\) & 0 & 4905 & - & 4905 \\
\(\mathbf{1 9 9 9}\) & 0 & 4127 & - & 4127 \\
\(\mathbf{2 0 0 0}\) & 0 & 2002 & - & 2002 \\
\(\mathbf{2 0 0 1}\) & 862 & 4599 & - & 23933 \\
\(\mathbf{2 0 0 2}\) & 286 & 2107 & - & 2399 \\
\(\mathbf{2 0 0 3}\) & 0 & 2399 & - & 2531 \\
\(\mathbf{2 0 0 4}\) & 749 & 1782 & - & 4387 \\
\(\mathbf{2 0 0 5}\) & 1153 & 3234 & - & 4402 \\
\(\mathbf{2 0 0 6}\) & 581 & 3821 & 4629 \\
\(\mathbf{2 0 0 7}\) & 0 & 4629 & 4895 \\
\(\mathbf{2 0 0 8}\) & 0 & 4895 & & 4594 \\
\(\mathbf{2 0 0 9}\) & 0 & 4594 & & 4894 \\
\(\mathbf{2 0 1 0}\) & 0 & 4894 & & 5202 \\
\(\mathbf{2 0 1 1}\) & 0 & 5202 & & \\
\(\mathbf{2 0 1 2}\) & 18 & & & \\
\hline
\end{tabular}

Table 5.4.14.3 Herring in Division VIIa North of \(52^{\circ} 30^{\prime} \mathrm{N}\) (Irish Sea). Summary of the assessment. Low \(=\) lower limit and High = higher limit of \(95 \%\) confidence interval. Catches are estimated by the assessment and differ from the ICES catch statistics.

* Geometric mean recruitment 1996-2010 and SSB from assessment model.

\section*{Ecosystem overview for the West of Scotland and Rockall}

\section*{FEAS ECOSYSTEM CONSIDERATIONS}

FEAS advises that the following considerations should be taken into account when developing ecosystem based management objectives for fisheries in the West of Scotland and Rockall:
- Fishing has adversely impacted on commercial species, with cod in the west of Scotland now considered collapsed; a long term management plan is currently in place for cod.

- Demersal fisheries in the west of Scotland are mixed
fisheries, catching a large number of commercial and non-commercial species. Most species are discarded. Mixed fisheries do not only affect the commercial stocks which are presented in this Stock Book, but impact on the wider fish community.
- Demersal trawling impacts on benthic habitats and their communities. The resilience and recoverability of habitats vary depending on substrate type, biota and fishing gear. The overall impact of demersal trawling on the seabed west of Scotland needs to be evaluated in relation to the proportion of different habitats affected.
- This ecoregion harbours extensive populations of grey and harbour seals. The contribution of seal predation to total cod mortality is likely to be significant, but data are limited.
- In order to implement the ecosystem approach to fisheries (EAFM), fisheries management should incentivise fishing behaviour and approaches that are consistent with the EAFM, and introduce management tools which reduce the impact of fishing on the wider ecosystem.
\begin{tabular}{|l|l}
\hline Bathymetry & \begin{tabular}{l} 
Water depth at the Hebrides and Malin Shelves vary but are generally less than 250 m. \\
The area is bordered to the north by the Wyville-Thompson Ridge at a depth of \(500-\) \\
660 m and the entrance to the Rockall Trough at \(\sim 1,000 \mathrm{~m}\) depth and the Porcupine Bank \\
at a depth of \(\sim 3,500 \mathrm{~m}\) to the southwest (New and Smythe-Wright, 200I). To the west of \\
the shelf break is the Rockall Plateau with depths of less than 200m. The area contains \\
several volcanic seamounts: the Rosemary Bank, the Anton Dohrn and Hebrides \\
Seamounts, which have soft sediments on top and rocky slopes (Jacobs, 2006).
\end{tabular} \\
\hline Substrates & \begin{tabular}{l} 
The north-western shelf area consists primarily of sublittoral muds and sands and \\
infralittoral rock (Ellwood et al., 20II). Canyons, slides, gas seeps and pock marks, iceberg \\
plough marks, exposed rock, carbonate mounds and cold-water reefs are features of the \\
slope (Jacobs, 2006).
\end{tabular} \\
\hline \begin{tabular}{l} 
The shelf circulation is influenced by the poleward flowing European Slope Current. This \\
persists throughout the year north of the Porcupine Bank, but is stronger in the summer \\
(Hill and Mitchelson-Jacob, I993). This mixes with the Irish and Clyde Sea waters \\
flowing from the North Channel to form the Scottish Coastal Current. As this flows \\
northwards it mixes with less saline, terrestrially influenced coastal waters and \\
more saline shelf and slope waters (Inall and Sherwin, 2006).
\end{tabular} \\
\hline Fronts & \begin{tabular}{l} 
The Islay Front extends between the Scottish island of Islay and Malin Head in Northern \\
Ireland (Hill and Simpson, I989, Simpson et al., I979). It persists year-round at \\
approximately the 50 m isobath.
\end{tabular} \\
\hline Mean annual temperature in the upper 800 m of the Rockall Trough increased from \\
\(\sim 9.2^{\circ} \mathrm{C}\) in 2000 to \(10^{\circ} \mathrm{C}\) in 2006 . A decrease of \(0.5^{\circ} \mathrm{C}\) has been noted since then. Salinity
\end{tabular}
(1975-2011)
has shown a constant increase from the early nineties onwards with highest values in 2010 (ICES 2012b).


\section*{Biological Features}

Diatom and dinoflagellate abundances have increased since 2004 (O'Brien et al. 2012) but show a decline in the longterm using time series from 1958 (O'Brien et al. 2013). The five common dinoflagellate species found along the Malin Shelf and in the Rockall Trough region are Ceratium fusus, C. furca, C. tripos and Protoperidinium spp. and Dactyliosolen mediterraneus. The eight diatom species identified in the region are Thalassionema nitzschioides, Hyalochaete spp., Rhizosolenia alata alata, Rhizosolenia imbrica shrubsolei, Thalassiosira spp. and Phaeoceros spp.

Longterm times series starting in 1958 have shown a decline in overall zooplankton abundance (O'Brien et al. 2013). Four carnivorous zooplankton taxa are common to the Malin Shelf and Rockall Trough region. All of these (Euphausiids, Chaetognaths, Hyperiids and Pleuromamma spp.) have declined in abundance/biomass between 1960-1999 and 2000-2009. Five out of the six common herbivorous copepods (Calanus spp. I-IV, Acartia spp., the cold-water Calanus finmarchicus, Paracalanus spp. and small copepods \(<2 \mathrm{~mm}\) and Metridia lucens) have also decreased in abundance/biomass over the same period. The warm-water C. helgolandicus however has increased (McGinty et al., 2012).

Benthos and reef

Fish community

Proportion of large fish,入
Mean maximum length \(\geq\) (2004-2010)

Mammals
Grey seals \(\rightarrow\)
Harbour seals \(\geq\) (2005-2010) Sea Birds

Draft OSPAR ECO QO У
(2004-2012)

Climate change effects on finfish and shellfish stocks

The shelf megafauna are dominated by echinodermata and arthropoda, with some porifera and cnidaria. The macrofaunal community includes polychaetes, peracarid crustaceans, molluscs and nemertea and the meiofauna are dominated numerically by nematodes and harpacticoid copepods (Davies et al., 2006). Cold-water reef forming Lophelia pertusa is found on the north, south and west flanks of the Rockall Bank (Wilson, 1979), the Wyville Thomson Ridge, Lousy Bank and Hatton Bank (Roberts et al., 2003), in the Sea of the Hebrides between the Outer Hebrides and Scottish mainland (Roberts et al., 2005) and George Bligh Bank (Davies et al., 2006).

The large fish indicator which measures the proportion of fish \(>40 \mathrm{~cm}\) has shown an increase since 2004, while the mean maximum length of the fish community has shown a decrease during the same time period (ICES, 2012a. The West of Scotland bottom trawl survey records around 100 fish species per year with high numbers of blue whiting, grey gurnard, silvery pout and haddock (ICES, 2012c). Important commercial fisheries exist for haddock, megrim, anglerfish, saithe, ling and herring (ICES, 2013a). Herring have known spawning grounds in the area.

There are around ten cetacean species recorded in this area including Rockall (Berrow et al., 2010, Hebridean W\&D trust, 2012). The harbour porpoise, minke whale and common dolphin are the most common. Current grey and harbour seal estimates for western Scotland are both ~16,000, grey seal populations are stable since 2005, and harbour seals have declined (Thomas, 201I).

The OSPAR draft ECOQO for seabirds in OSPAR region III (Celtic Seas which includes west of Scotland) shows a downward trend since early 2000 (ICES 2013b). Thirty five species of seabirds have been sighted in the north-western shelf region (Mackey et al., 2004). The most common were the common guillemot, razorbill, Atlantic puffin, Northern fulmar, Manx shearwater, northern gannet and gulls.

Surface waters in western shelf waters and the Rockall Trough have displayed a general warming trend since the mid 1970s. When paired with abundance reductions in the copepod and general zooplankton communities there is cause for concern given the key role they play in marine food webs. A negative impact on recruitment with rising SST has been shown for cod in the west of Scotland (ICES, 2013a). Large grey seal populations are known to feed on this and other species and are likely contribute to total cod mortality. Productivity of the herring stock has reduced since the late 1980s. Again, there is a possible link to increasing SST (ICES, 2013a). Between 1991-2010 the subsurface waters of the Rockall Trough acidified by 0.03 pH units (McGrath et al.,

20I2). It is thought that adult finfish may be tolerant of changes in pH because \(\mathrm{CO}_{2}\) levels are variable as a result of activity, but larvae may be negatively affected (Ishimatsu et al., 2008). Changes in precipitation patterns, river discharges and salinity, particularly in coastal areas could also affect inshore species that rely on these areas for spawning or nursery grounds (Reid and Valdés, 2011).

\section*{Human pressures and impacts}

The main human activities in the West of Scotland and Rockall region are:

Fishing effort
(> IOm vessels)
\(\searrow\)
Overall fishing mortality
\(\pm\)
- Fishing
- Aquaculture
- Transport
- Dredging for shipping
- Offshore energy

\section*{Pressures associated with commercial fisheries are:}
- The removal of species
- Seafloor disturbance

Fishing effort west of Scotland has decreased by two thirds between peak levels in 2002 and 2011 (STECF, 2012). Of the 168 kt landed from the area \(73 \%\) comes from stocks that are fished at or below \(\mathrm{F}_{\text {MSY }}\). Six out of 18 stocks are equal to or above \(\mathrm{B}_{\text {trigger }}\). There are unsustainably high levels of discarding of cod, haddock and whiting (ICES, 2013a).Towed bottom fishing gears (trawls, dredges, drags, hydraulic devices) impact on seabed species and habitats. Gear type, intensity of trawling, sediment hardness (Foden et al., 2010) and hydrodymanic conditions (Collie et al., 2000, Kaiser et al., 2006) affect a system's ability to recover. Due to the presence of vulnerable deep water habitats in the region, large areas on the Rockall and Hatton Banks and in the Rockall region are closed to fishing. New records of VME indicators species have been found in unprotected areas of the northwest and southwest Rockall bank, the Hebrides Terrace Seamount and the Rosemary Bank Seamount (ICES, 2013c\&d).
A full reference list can be found in Appendix VI.

Fig. 1 Pressure \& state indicators


Fig. I Relative fishing pressure ( \(\mathrm{F} / \mathrm{F}_{\mathrm{msy}}\) ) and biomass ( \(\mathrm{SSB} / \mathrm{B}_{\text {trig }}\) ) for stocks west of Scotland, which have SSB and F related against reference points (msy where available, otherwise pa). This corresponds to 10 out of 18 stocks and \(83 \%\) of the landings. Stocks in the green region are exploited below \(\mathrm{F}_{\mathrm{msy}}\) and have an SSB that is above Briger.

Fig. 2 Stocks of unknown status in relation to reference points. The size of each bubble corresponds to the landings in 2012. The largest bubble corresponds to 77kt.

Fig. 2 Unknown status


\section*{Letter code for stock}

A \(\operatorname{Cod} \mathrm{Vla}\)
B \(\operatorname{Cod}\) VIb
C Haddock Vla
D Haddock VIb
E Whiting Vla
F Anglerfish VI, Ila, IIIa, IVa
G Megrim Vla and IV
H Megrim VIb
I Saithe IV \& VI and IIla
Ling Illa, IVa, VI, VII, VIII, IX,
J XII, and XIV
Plaice \(\mathrm{Vb}(E U\) waters), VI,
K XII, XIV
L Sole Vb(EU), VI, XII, XIV
M Nephrops (FUII) Vla
\(\mathrm{N} \quad\) Nephrops (FUI2) Vla
O Nephrops (FUI3) Vla
P Nephrops (VI outside) Vla
Q Pollock VI
R Herring VlaN

Fig. 3 F : Fmsy
Fig. 4 SSB : Btrigger



Fig. 3 Proportion of west of Scotland stocks fished at or below \(F_{\text {msy }}\) (green), above \(F_{\text {msy }}\) (red) and of unknown status in relation to fishing mortality reference points.

Fig. 4 Proportion of west of Scotland stocks with biomass above \(B_{\text {trigger }}\) (green), below B trigger (red) and of unknown status in relation to biomass reference points.


Fig. 5 Relative fishing mortality ( F to \(\mathrm{F}_{\text {msy }}\) ratios) of West of Scotland stocks, demersal F corresponds to Vla cod, haddock and whiting, VIb haddock, IVa and Vla megrim and saithe IIla, IV, VI; pelagic F corresponds to VlaN herring and shellfish F corresponds to nephrops FUII,FUI2 and FUI3.

Fig. 6 Relative biomass (SSB to \(\mathrm{B}_{\text {msy triger }}\) ratios) of West of Scotland stocks, demersal SSB corresponds to Vla cod, haddock and whiting, VIb haddock, IVa and Vla megrim and saithe in IIIa, IV,VI; pelagic SSB corresponds to VlaN herring and shellfish B corresponds to nephrops FUII,FUI2 and FUI3.

\section*{West of Scotland Cod}
(Division Vla)

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises on the basis of the MSY approach that there should be no directed fisheries and that by-catch and discards should be minimized in 2014. FEAS considers that this stock has collapsed and agrees with this advice.

This stock falls into ICES category I data-rich stocks with full analytical assessments. Fishing mortality remains well above \(\mathrm{F}_{\text {MSY }}\). SSB is stable at a very low level (less than I \(2 \%\) of the \(B_{\text {lim }}\) ).


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

FEAS notes that current management of fisheries catching cod in Division Vla are not reducing mortality levels. Despite a zero TAC in 2012, total catches were estimated to be \(\mathbf{1 , 6 3 2} \mathbf{t}\), which includes reported landings, area misreported landings and \(7 \mathrm{I} \%\) discards.

\section*{CURRENT MANAGEMENT}
- EU has adopted a long-term plan for cod stocks and the fisheries exploiting those stocks Council Regulation (EC) I342/2008.
- The TAC Area covers Division Vla, EU and international waters of Vb east of \(12^{\circ} 00^{\prime} \mathrm{W}\). The assessment covers Division Vla only. FEAS considers that the management area should correspond to the assessment area.
- The 2013 TAC was 0 t . By-catch of cod in the area covered by this TAC may be landed provided that it does not comprise more than \(1.5 \%\) of the live weight of the total catch retained on board per fishing trip.
- Ireland has a seasonal closure of the Cape fishing grounds. Historically, \(24 \%\) of Irish annual landings of cod were taken from this area.

\section*{ICES ADVICE 5.4.3 Cod in Division VIa (West of Scotland)}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that there should be no directed fisheries and that bycatch and discards should be minimized in 2014.

\section*{Stock status}






Figure 5.4.3.1
Cod in Division VIa (West of Scotland). ICES observed catches and summary of stock assessment (weights in thousand tonnes), dotted black lines are standard error for assessment estimates. Top right: \(\mathrm{SSB} / \mathrm{F}\) for the time-series used in the assessment.

Fishing mortality is high. The spawning-stock biomass has been below \(\mathrm{B}_{\text {lim }}\) since 1997 and has remained very low, well below \(\mathrm{B}_{\text {lim }}\) since 2006. Recruitment has been estimated to be low over the last decade and is considered impaired.

\section*{Management plans}

Cod in Division VIa is subject to the EU cod long-term management plan (EC 1342/2008). ICES has not evaluated whether the management plan is in accordance with the precautionary approach. However, management measures taken so far have not constrained catches and no increase in stock biomass has occurred.

\section*{Biology}

Cod are known to form aggregations, so it is still possible to find areas of high cod density at low stock abundance. This can lead to high catches in localized areas, generating high fishing mortality even with low fishing effort. Occasional large catches cause greater uncertainty in survey abundance indices. Relatively stable aggregations on timescales of several weeks are consistent with management measures based on temporary spatial closures.

\section*{Environmental influence on the stock}

With rising sea temperature a negative impact on recruitment has been shown for cod in the warmer waters of this species' range, including west of Scotland. Grey seal abundance is significant to the west of Scotland and they are known to feed on cod, among other species. The latest estimates of grey seal abundance over time show the
population in the area to have remained stable since the mid-1990s. The contribution of seal predation to total cod mortality is likely to be significant, but data are limited.

\section*{The fisheries}

The \(>100 \mathrm{~mm}\) otter trawl gear vessels targeting finfish (TR1) take roughly \(90-95 \%\) of the cod catch and the \(70-99\) mm Nephrops fleet (TR2) takes \(5-10 \%\) of the catch. Part of the landings comes from vessels using TR1 gear, fishing west of the line defined in the cod long-term management plan. Discards reported to ICES (all fleets combined) are 2.6 times greater than landings.

Catch distribution Total catch \((2012)=1632 \mathrm{t}\), where \(29 \%\) are reported landings adjusted for misreporting and \(71 \%\) are discards.

\section*{Effects of the fisheries on the ecosystem}

Cod is taken in mixed demersal fisheries and there are no impacts specific to the catching of cod.

\section*{Quality considerations}

Due to changes to the Scotland survey design and gear after 2010, later surveys must be considered a new abundance series (UKSGFS-WIBTS-Q1and Q4). No fisheries-independent abundance series were available for 2012. Predicted catch is divided into landings and discards. Discard information is imprecise compared to landings data because of lower sampling coverage. Because catch is now dominated by discards it is very important to maintain the highest possible sampling (observer) coverage of vessels in Division VIa. Scottish landings (from 2006) are adjusted by estimates of misreporting. The misreporting estimates will have uncertainty associated with them. Implementing surveys that provide estimates of consumption by seals would give greater confidence in natural mortality estimates.


Figure 5.4.3.2
Cod in Division VIa (West of Scotland). Historical assessment results (final-year recruitment estimates included). This stock was benchmarked in 2012.

\section*{Scientific basis}

Assessment type
Stock data category
Input data
Discards and bycatch

\section*{Indicators}

Other information Working group report

Analytical age-based assessment (TSA). Category 1.
Commercial catches (international landings, ages and length frequencies from catch sampling); one survey index (ScoGFS-WIBTS-Q1); maturity data from surveys; natural mortalities from M at mean weight model (Lorenzen), using mean weight data from market sampling and discard observations.
Included in the assessment 1981-1990 and 2006 onwards, age structure only from 1991 to 2005, from (Scottish trawlers, Irish trawlers).
Surveys: ScoGFS-WIBTS-Q4, IGFS-WIBTS-Q4, UKSGFS-WIBTS-Q1, and UKSGFS-WIBTS-Q4.
The stock was benchmarked in 2012 (WKROUND 2012; ICES, 2012). WGCSE (ICES, 2013).

\section*{ECOREGION Celtic Sea and West of Scotland \\ STOCK Cod in Division VIa (West of Scotland)}

\section*{Reference points}
\begin{tabular}{|c|c|c|c|}
\hline & Type & Value & Technical basis \\
\hline \multirow[t]{2}{*}{\begin{tabular}{l}
MSY \\
Approach
\end{tabular}} & MSY \(\mathrm{B}_{\text {trigger }}\) & 22000 t . & \(\mathrm{B}_{\mathrm{pa}}\). \\
\hline & \(\mathrm{F}_{\text {MSY }}\) & 0.19 & Provisional proxy by analogy with North Sea cod \(\mathrm{F}_{\text {max }}\). Fishing mortalities in the range of \(0.17-0.33\) are consistent with \(\mathrm{F}_{\mathrm{MSY}}\). \\
\hline \multirow{4}{*}{Precautionary Approach} & \(\mathrm{B}_{\lim }\) & 14000 t . & \(\mathrm{B}_{\text {lim }}=\mathrm{B}_{\text {loss }}\), the lowest observed spawning stock estimated in previous assessments. \\
\hline & \(\mathrm{B}_{\mathrm{pa}}\) & 22000 t . & Considered to be the minimum SSB required to ensure a high probability of maintaining SSB above \(\mathrm{B}_{\mathrm{lim}}\), taking into account the uncertainty of assessments. This also corresponds with the lowest range of SSB during the earlier, more productive historical period. \\
\hline & \(\mathrm{F}_{\text {lim }}\) & 0.8 & Fishing mortalities above this have historically led to stock decline. \\
\hline & \(\mathrm{F}_{\mathrm{pa}}\) & 0.6 & This F is considered to have a high probability of avoiding \(\mathrm{F}_{\text {lim }}\). \\
\hline
\end{tabular}
(unchanged since: 2010)

\section*{Outlook for 2014}

Basis: \(\mathrm{F}(2013)=\mathrm{F}_{\mathrm{sq}}(2010-2012)=0.92 ; \mathrm{SSB}(2014)=1.68\); Recruitment \((2013)=1.74\) millions; Landings \((2013)=0.42\); Discards \((2013)=0.77\).
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline Rationale & \[
\begin{gathered}
\text { Catch } \\
\text { Total } \\
(2014 \\
) \\
\hline
\end{gathered}
\] & Landings (2014) & \begin{tabular}{l}
Discards \\
(2014)
\end{tabular} & Basis & \[
\begin{gathered}
\hline F \\
\text { Total } \\
(\mathbf{2 0 1 4} \\
\mathbf{)} \\
\hline
\end{gathered}
\] & \[
\begin{gathered}
F \\
\text { Land } \\
\text { (2014 } \\
\text { ) } \\
\hline
\end{gathered}
\] & \[
\begin{gathered}
\text { F } \\
\text { Disc } \\
(2014 \\
) \\
\hline
\end{gathered}
\] & \[
\begin{gathered}
\text { SSB } \\
(\mathbf{2 0 1 5} \\
)
\end{gathered}
\] & \[
\begin{gathered}
\text { \%SSB } \\
\text { change }{ }^{1)}
\end{gathered}
\] \\
\hline MSY transition & 0.33 & 0.11 & 0.22 & \[
\begin{gathered}
\left(\mathrm{F}_{2010} \times 0.2\right)+ \\
\left(\left(\mathrm{F}_{\mathrm{MSY}} \times\right.\right. \\
\left(\mathrm{SSB}_{2014} / \mathrm{MSY}\right. \\
\left.\left.\left.\mathrm{B}_{\text {trigger }}\right)\right) \times 0.8\right) \\
\hline
\end{gathered}
\] & 0.19 & 0.06 & 0.13 & 3.01 & +79\% \\
\hline \begin{tabular}{l}
MSY \\
approach
\end{tabular} & 0.010 & 0.003 & 0.007 & \[
\begin{gathered}
\mathrm{F}_{\text {MSY }} \times \\
\text { SSB }_{2014} / \mathrm{MSY}_{\text {trigger }}
\end{gathered}
\] & 0.01 & 0.003 & 0.007 & 3.44 & +105\% \\
\hline Precautionar y approach & 0 & 0 & 0 & \(\mathrm{B}_{\text {pa }}\) & 0 & 0 & 0 & 3.46 & +106\% \\
\hline Management plan & 0.98 & 0.31 & 0.67 & \(\mathrm{F}=\mathrm{F}_{2013} \times 0.75\) & 0.69 & 0.22 & 0.47 & 2.12 & +26\% \\
\hline Zero catch & 0 & 0 & 0 & \(\mathrm{F}=0\) & 0 & 0 & 0 & 3.46 & +106\% \\
\hline \multirow[t]{6}{*}{Other options} & 0.32 & 0.10 & 0.22 & \(\mathrm{F}_{2013} \times 0.2\) & 0.18 & 0.06 & 0.12 & 3.02 & +80\% \\
\hline & 0.59 & 0.19 & 0.40 & \(\mathrm{F}_{2013} \times 0.4\) & 0.37 & 0.12 & 0.25 & 2.65 & +58\% \\
\hline & 0.83 & 0.26 & 0.57 & \(\mathrm{F}_{2013} \times 0.6\) & 0.55 & 0.17 & 0.38 & 2.33 & +39\% \\
\hline & 1.03 & 0.32 & 0.71 & \(\mathrm{F}_{2013} \times 0.8\) & 0.74 & 0.23 & 0.51 & 2.06 & +23\% \\
\hline & 1.20 & 0.37 & 0.83 & \(\mathrm{F}_{2013} \times 1.0\) & 0.92 & 0.28 & 0.64 & 1.82 & +8.3\% \\
\hline & 1.35 & 0.41 & 0.94 & \(\mathrm{F}_{2013} \times 1.2\) & 1.10 & 0.33 & 0.77 & 1.62 & -3.6\% \\
\hline
\end{tabular}

Units: thousand tonnes.
\({ }^{1)}\) SSB 2015 relative to SSB 2014.
Note: no information for \% TAC change can be shown as a zero TAC was set in 2013.

\section*{MSY approach}

Following the ICES MSY approach implies fishing mortality to be reduced to 0.01 (lower than the \(\mathrm{F}_{\text {MSY }}\) proxy because SSB in 2014 is \(92 \%\) below MSY \(\mathrm{B}_{\text {trigger }}\) ), resulting in total catches of no more than 10 tonnes in 2014. If discard rates do not change from the average of the last three years, this implies landings in 2014 of no more than 3 tonnes. This is expected to lead to an SSB of 3440 tonnes in 2015.

Following the transition scheme towards the ICES MSY approach implies fishing mortality to be reduced to 0.19 , based on \(\left(\mathrm{F}_{2010} \times 0.2\right)+\left(\left(\mathrm{F}_{\mathrm{MSY}} \times\left(\mathrm{SSB}_{2014} / \mathrm{MSY} \mathrm{B}_{\text {trigger }}\right)\right) \times 0.8\right)\), resulting in catches of no more than 330 tonnes in
2014. This is expected to lead to an SSB of 3010 tonnes in 2015. If discard rates do not change from the average of the last three years, this implies landings in 2014 of no more than 110 tonnes.

However, considering the low SSB and low recruitment over the last decade, it is not possible to identify any nonzero catch that would be compatible with the MSY approach. Bycatches, including discards of cod in all fisheries in Division VIa, should be reduced to the lowest possible level and further technical measures to reduce catches should be implemented.

\section*{Precautionary approach}

Given the low SSB and low recruitments in recent years, it is not possible to identify any non-zero catch which would be compatible with the precautionary approach. No targeted fishing should take place on cod in Division VIa. Bycatches, including discards of cod in all fisheries in Division VIa, should be reduced to the lowest possible level.

\section*{Management plan}

The fisheries on this stock are managed under the cod long-term management plan (EC 1342/2008). Until the 2012 assessment benchmark ICES did not consider it possible to assess unaccounted mortality accurately. As a consequence ICES has not yet evaluated whether the management plan is in accordance with the precautionary approach. However, management measures taken so far have not constrained catches and no increase in stock biomass has occurred.

There was no effort reduction in 2013 compared to 2012. Following the agreed management plan implies \(\mathrm{F}_{2014}=0.75 \times \mathrm{F}_{2013}\). This results in a TAC for 2014 of 310 tonnes. If discard rates do not change from the average of the last three years, this corresponds to catches in 2014 of 980 tonnes.

\section*{Additional considerations}

\section*{Management considerations}

Management measures taken thus far have not recovered the stock and not constrained catches.
The stock is suffering impaired recruitment. The 2008 year class is estimated to be more abundant and is estimated to have been discarded in large quantities at age 3 in 2011. Estimated mortality is increasingly due to discards (Figure 5.4.3.4). SSB is very low. It is necessary to reduce all sources of fishing mortality to recover the stock above \(B_{p a}\) as quickly as possible.

The zero TAC for this area and \(1.5 \%\) bycatch by live weight limit implemented in 2012 applies to the retained part of the catches and therefore does not constrain discards.

The cod long-term management plan (EC 1342/2008) includes a west of Scotland management line that follows the 200 m depth contour. Fleets fishing at depths less than 200 m (i.e. within the cod recovery zone) are subject to the effort restrictions of the management plan and new gear technical measures specified in EC 53/2010. Vessels fishing to the west of the management line are still subject to effort restrictions, but may apply for additional effort up to the point where fleet-aggregated effort equals that from the previous year (if fleet effort allowances were cut). Some landings from this stock are taken west of the line defined in EC 1342/2008. Some vessels using >100 mm otter trawl (TR1) gear had larger cod landings from west of the line than from within the cod recovery zone in 2010. In 2012, \(60 \%\) of Scottish cod landings are estimated to come from west of the line.

Grey seal abundance is significant west of Scotland and they are known to feed on cod, among other species. The latest estimates of grey seal abundance over time consider the population in the area to have remained stable since the mid-1990s (Thomas, 2011), but depending on the feeding behaviour seal predation mortality may still have increased in recent years. The contribution of seal predation to total cod mortality is likely to be significant and this may impair the ability of the cod stock to recover. Data on seal predation are insufficient for reliable estimation of predation mortality.

\section*{Management plan evaluations}

In 2009 the EU adopted a long-term plan for cod stocks and the fisheries exploiting those stocks (Council Regulation (EC) 1342/2008, see Annex 5.4.3.2). The objective of this regulation is to ensure the sustainable exploitation of the cod stocks on the basis of maximum sustainable yield, while maintaining a target fishing mortality of 0.4 on specified age groups.

In 2009 ICES evaluated this revised long-term plan for cod (Council Regulation (EC) 1342/2008) in relation to the precautionary approach. This evaluation concluded that assuming TAC and effort constraints would lead to rapid declines in fishing mortality, the stock would recover by 2015 . Given the recent changes in discarding in response to moderate year classes, ICES could not conclude the plan was precautionary.

ICES has previously commented on the appropriateness of \(\mathrm{F}=0.4\) as a target for this stock. Based on the yield-per-recruit analysis, which estimates \(\mathrm{F}_{\max }=0.17\) and the positive relationship of SSB and recruitment, the longterm target fishing mortality of 0.4 is not expected to achieve the management objective of maximum sustainable yield.

\section*{Regulations and their effects}

The fishery is managed by a combination of bycatch restriction, area closures, technical measures, and effort restrictions. TAC restrictions on landings and effort and spatial management of fisheries catching cod in Division VIa have not controlled mortality levels. Catch (landings + discards) is 3.6 times the reported landings. Details of the area closures, technical measures, effort restrictions, and other measures are given in Annex 5.4.3.1.

\section*{Changes in fishing technology and fishing patterns}

The implementation of the cod long-term plan effort controls (Annex IIa of Reg. (EC) 43/2009) and other technical measures including gear restriction in Division VIa (Annex III of Reg. (EC) 43/2009) was expected to lead to large changes in fishing patterns starting in 2009. Analysis is not yet available to evaluate this.

\section*{Uncertainties in assessment and forecast}

In an attempt to remove bias from underreporting, the assessment relies on survey data from 1995 to 2005. Catch data is re-introduced from 2006 but is dominated by discards in this period (Figure 5.4.3.4). Mortality estimates heavily based on survey and or discard data are considered to be poorly estimated. Scottish landings (from 2006) are adjusted by estimates of misreporting and the misreporting estimates will have uncertainty associated with them. However, historical trends in spawning biomass and recruitment appear to be robust measures of stock dynamics (see Figure 5.4.3.1).

Some changes have been made to the survey design in the past, but surveys are considered to be a reasonable indicator of stock trends from the mid-1990s. The survey gear changed in 2011 to bring it in line with other surveys in the area so that these can be combined in future to provide a more robust and precise survey index. Implementing surveys that provide estimates of consumption by seals would give greater confidence in natural mortality estimates.

The contribution of seal predation to total cod mortality is likely to be significant and this may impair the ability of the cod stock to recover, but data is limited. New mean weights-at-age that are dependent on natural mortalities-at-age have been adopted to better take account of higher natural mortality at younger ages, but it is not certain these values fully accommodate the possible large source of natural mortality from seals.

\section*{Comparison with previous assessment and advice}

The 2012 assessment adjusted Scottish landings and discards for estimates of misreporting, for 2006 onwards. In this year's assessment these data were revised and only landings were adjusted for misreporting.

The basis for the advice is the same as last year, the MSY approach.

\section*{Sources}

ICES. 2012. Report of the Benchmark Workshop on Western Waters Roundfish (WKROUND), 22-29 February 2012, Aberdeen, UK. ICES CM 2012/ACOM:49. 283 pp.
ICES. 2013. Report of the Working Group on Celtic Seas Ecosystems (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.
STECF. 2007. EU Scientific, Technical and Economic Committee for Fisheries. Evaluation of closed area schemes. SGMOS-07-03.
STECF. 2012. EU Scientific, Technical and Economic Committee for Fisheries. Evaluation of Fishing Effort Regimes in European Waters. STECF-12-16.
Thomas, L. 2011. Estimating the size of the UK grey seal population between 1984 and 2010. SCOS Briefing Paper 11/02.


Figure 5.4.3.3
Cod in Division VIa. Stock-recruitment relationship (left panel) and yield-per-recruit analysis (right panel).


Figure 5.4.3.4 Cod in Division VIa. Partial mean F attributed to landings and discards. Horizontal lines represent \(\mathrm{F}_{\text {lim }}\) (solid), \(\mathrm{F}_{\mathrm{pa}}\) (dashed), and \(\mathrm{F}_{\text {MSY }}\) (dotted) reference points defined for the stock.

Table 5.4.3.1
Cod in Division VIa (West of Scotland). ICES advice, management, landings, discards, and catches.
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline \begin{tabular}{l}
Year ICES advice \\
Single-stock exploitation boundaries since 2004
\end{tabular} & Predicted catch corresp. to advice & Agreed TAC \({ }^{1}\) & Agreed TAC \({ }^{2}\) & Official landings & \[
\begin{gathered}
\text { ICES } \\
\text { landings }
\end{gathered}
\] & \[
\begin{gathered}
\text { ICES } \\
\text { discards }
\end{gathered}
\] & ICES catch \\
\hline 1987 Reduce F towards \(\mathrm{F}_{\text {max }}\) & 18.0 & 22.0 & & 19.2 & 19.0 & 2.39 & 21.39 \\
\hline 1988 No increase in F; TAC & 16.0 & 18.4 & & 19.2 & 20.4 & 0.37 & 20.77 \\
\hline \(198980 \%\) of \(\mathrm{F}(87)\); TAC & 16.0 & 18.4 & & 15.4 & 17.2 & 2.08 & 19.28 \\
\hline \(199080 \%\) of \(\mathrm{F}(88)\); TAC & 15.0 & 16.0 & & 11.8 & 12.2 & 0.57 & 12.77 \\
\hline \(199170 \%\) of effort (89) & - & 16.0 & & 10.6 & \(10.9^{3}\) & 0.62 & 11.52 \\
\hline 1992 70\% of effort (89) & - & 13.5 & & 9.0 & \(9.7{ }^{4}\) & 1.78 & 11.48 \\
\hline 1993 70\% of effort (89) & - & 14.0 & & 10.5 & \(11.8{ }^{4}\) & 0.14 & 11.94 \\
\hline 1994 30\% reduction in effort & - & 13.0 & & 9.1 & \(10.8{ }^{4}\) & 0.66 & 11.46 \\
\hline 1995 Significant reduction in effort & - & 13.0 & & 9.7 & \(9.6{ }^{4}\) & 0.14 & 9.74 \\
\hline 1996 Significant reduction in effort & - & 13.0 & & 9.6 & 9.4 & 0.06 & 9.46 \\
\hline 1997 Significant reduction in effort & - & 14.0 & & 7.0 & 7.0 & 0.50 & 7.5 \\
\hline 1998 20\% reduction in F & \(9.5{ }^{6}\) & 11.0 & & 5.7 & 5.7 & 0.54 & 6.24 \\
\hline 1999 F reduced to below \(\mathrm{F}_{\mathrm{pa}}\) & \(<9.7^{6}\) & 11.8 & & 4.3 & 4.2 & 0.07 & 4.27 \\
\hline 2000 Recovery plan, \(60 \%\) reduction in F & \(<4.2\) & 7.48 & & \(2.8{ }^{5}\) & 3.0 & 0.82 & 3.82 \\
\hline 2001 Lowest possible F, recovery plan & - & 3.7 & & 2.4 & 2.3 & 0.09 & 2.39 \\
\hline 2002 Recovery plan or lowest possible F & - & 4.6 & & 2.2 & 2.2 & 0.48 & 2.68 \\
\hline 2003 Closure & - & 1.81 & & 1.3 & 1.2 & 0.03 & 1.23 \\
\hline 2004 Zero catch \({ }^{7}\) & 0 & 0.85 & & 0.6 & 0.5 & 0.07 & 0.57 \\
\hline 2005 Zero catch \({ }^{7}\) & 0 & 0.72 & & 0.4 & 0.5 & 0.04 & 0.54 \\
\hline 2006 Zero catch \({ }^{7}\) & 0 & 0.613 & & 0.5 & \(0.49{ }^{9}\) & 0.47 & 0.96 \\
\hline 2007 Zero catch \({ }^{7}\) & 0 & 0.49 & & 0.5 & \(0.60{ }^{9}\) & 1.88 & 2.48 \\
\hline 2008 Zero catch \({ }^{7}\) & 0 & 0.402 & & 0.4 & \(0.68{ }^{9}\) & 0.70 & 1.38 \\
\hline 2009 Zero catch \({ }^{7}\) & 0 & 0.302 & 0.240 & 0.23 & \(0.41{ }^{9}\) & 0.95 & 1.36 \\
\hline 2010 Zero catch \({ }^{7}\) & 0 & & 0.240 & 0.25 & \(0.56{ }^{9}\) & 0.79 & 1.35 \\
\hline 2011 Zero catch \({ }^{7}\) & 0 & & 0.182 & 0.22 & \(0.45^{9}\) & 1.67 & 2.12 \\
\hline 2012 Zero catch \({ }^{7}\) & 0 & & \(0^{8}\) & 0.22 & \(0.47^{9}\) & 1.17 & 1.64 \\
\hline 2013 No directed fisheries, minimize bycatch and discards & 0 & & \(0^{8}\) & & & & \\
\hline 2014 No directed fisheries, minimize bycatch and discards & 0 & & & & & & \\
\hline \multicolumn{8}{|l|}{Weights in thousand tonnes.} \\
\hline \multicolumn{8}{|l|}{\({ }^{1}\) TAC is for the whole of Subdivision \(\mathrm{Vb}_{1}\) and Subareas VI, XII, and XIV.} \\
\hline \multicolumn{8}{|l|}{\({ }^{2} \mathrm{TAC}\) is for Subdivision \(\mathrm{Vb}_{1}\) and Division VIa.} \\
\hline \multicolumn{8}{|l|}{\({ }^{3}\) Not including misreporting.} \\
\hline \multicolumn{8}{|l|}{\({ }^{4}\) Including ICES estimates of misreporting.} \\
\hline \multicolumn{8}{|l|}{\({ }^{5}\) Incomplete data.} \\
\hline \multicolumn{8}{|l|}{\({ }^{6}\) For Division VIa only.} \\
\hline \multicolumn{8}{|l|}{\({ }^{7}\) Single-stock boundaries and the exploitation of this stock should be conducted in the context of mixed fisherie protecting stocks outside safe biological limits.} \\
\hline \multicolumn{8}{|l|}{\({ }^{8}\) Bycatch of cod in the area covered by this TAC may be landed provided that it does not comprise more than \(1.5 \%\) of the live weight of the total catch retained on board per fishing trip.} \\
\hline \multicolumn{8}{|l|}{\({ }^{9}\) Includes an adjustment for misreporting.} \\
\hline
\end{tabular}
Table 5.4.3.2 Cod in Division VIa. Official landings (tonnes).
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1985 & 1986 & 1987 & 1988 & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 \\
\hline Belgium & 48 & 88 & 33 & 44 & 28 & - & 6 & - & 22 & 1 & 2 & + & 11 & 1 & + & + & 2 & + \\
\hline Denmark & - & - & 4 & 1 & 3 & 2 & 2 & 3 & 2 & + & 4 & 2 & - & - & + & - & & - \\
\hline Faroe Islands & - & - & - & 11 & 26 & - & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline France & 7411 & 5096 & 5044 & 7669 & 3640 & 2220 & 2503 & 1957 & 3047 & 2488 & 2533 & 2253 & 956 & 714* & 842* & 236 & 391 & 208 \\
\hline Germany & 66 & 53 & 12 & 25 & 281 & 586 & 60 & 5 & 94 & 100 & 18 & 63 & 5 & 6 & 8 & 6 & 4 & + \\
\hline Ireland & 2564 & 1704 & 2442 & 2551 & 1642 & 1200 & 761 & 761 & 645 & 825 & 1054 & 1286 & 708 & 478 & 223 & 357 & 319 & 210 \\
\hline Netherlands & - & - & - & - & - & - & - & - & - & - & - & - & 2 & 1 & - & - & - & - \\
\hline Norway & 204 & 174 & 77 & 186 & 207 & 150 & 40 & 171 & 72 & 51 & 61 & 137 & 36 & 36 & 79 & 114* & 40* & 88 \\
\hline Spain & 28 & - & - & - & 85 & - & - & - & - & - & 16 & + & 6 & 42 & 45 & 14 & 3 & 11 \\
\hline UK (E. W. N.I.) & 260 & 160 & 444 & 230 & 278 & 230 & 511 & 577 & 524 & 419 & 450 & 457 & 779 & 474 & 381 & 280 & 138 & 195 \\
\hline UK (Scotland) & 8032 & 4251 & 11143 & 8465 & 9236 & 7389 & 6751 & 5543 & 6069 & 5247 & 5522 & 5382 & 4489 & 3919 & 2711 & 2057 & 1544 & 1519 \\
\hline UK & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline Total landings & 18613 & 11526 & 19199 & 19182 & 15426 & 11777 & 10634 & 9017 & 10475 & 9131 & 9660 & 9580 & 6992 & 5671 & 4289 & 2767 & 2439 & 2231 \\
\hline
\end{tabular}
\[
\begin{array}{lrrrrrrrrrr}
\hline \text { Country } & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012^{*} \\
\hline \text { Belgium } & - & - & - & - & - & - & - & 0 & 0 & 0 \\
\text { Denmark } & - & - & - & - & - & - & - & - & - & - \\
\text { Faroe Islands } & - & 2 & 0 & 0.8 & 12 & 1 & & 0.2 & 0 & - \\
\text { France } & 172 & 91 & 107 & 100.7 & 92 & 82 & 74 & 60.3 & 46 & 4.21 \\
\text { Germany } & - & & & 2 & 2 & 1 & 0 & 0 & 0 & 0.04 \\
\text { Ireland } & 120 & 34 & 27.9 & 18 & 70 & 58.2 & 24.4 & 48.7 & 41.3 & 17.8 \\
\text { Netherlands } & - & - & - & - & - & - & 0 & & 0 & 0 \\
\text { Norway } & 45 & 10 & 17 & 30 & 30 & 65 & 18 & 20.7 & 8.3 & 56.2 \\
\text { Spain } & 3 & - & - & - & - & - & - & - & - & - \\
\text { UK (E. W. N.I.) } & 79 & 46 & 25 & - & 21 & 6 & 14 & - & - & - \\
\text { UK (Scotland) } & 879 & 413 & 243 & - & 260 & 232 & - & - & - & - \\
\text { UK } & - & - & - & 332.1 & - & - & 104 & 118.6 & 110 & 137.2 \\
\hline \text { Total landings } & 1298 & 596 & 419.9 & 483.6 & 487 & 445.2 & 234.4 & 248.5 & 205.6 & 215.5 \\
\text { * Preliminary. } & & & & & & & & & &
\end{array}
\]
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline \multicolumn{18}{|l|}{Cod in Division VIa (West of Scotland). Summary of stock assessment (weights in thousand tonnes).} \\
\hline Year & Catch & Catch estimate & Catch s.e. & Landings & Landings estimate & \[
\begin{gathered}
\text { Landings } \\
\text { s.e. }
\end{gathered}
\] & Discards & Discards estimate & Discard s.e. & \begin{tabular}{l}
meanF \\
estimat
\end{tabular} & \[
\begin{aligned}
& \text { meanF } \\
& \text { s.e. }
\end{aligned}
\] & \[
\underset{\text { estimate }}{\text { SSB }}
\] & SSB s.e. & \[
\underset{\text { estimate }}{\text { TSB }}
\] & TSB s.e. & Recruit. estimate & Recruit. s.e. \\
\hline 1982 & 22.082 & 21.846 & 1.333 & 21.511 & 21.272 & 1.351 & 0.571 & 0.574 & 0.241 & 0.698 & 0.045 & 38.353 & 2.016 & 58.275 & 2.643 & 26.670 & 2.236 \\
\hline 1983 & 21.503 & 20.536 & 1.054 & 21.305 & 20.310 & 1.050 & 0.197 & 0.226 & 0.117 & 0.775 & 0.049 & 33.439 & 1.417 & 48.940 & 2.102 & 14.680 & 2.122 \\
\hline 1984 & 21.601 & 20.631 & 1.049 & 21.272 & 20.023 & 1.076 & 0.329 & 0.607 & 0.248 & 0.865 & 0.054 & 30.726 & 1.355 & 52.759 & 2.074 & 26.574 & 1.860 \\
\hline 1985 & 19.570 & 18.025 & 0.880 & 18.607 & 17.559 & 0.885 & 0.963 & 0.466 & 0.144 & 0.991 & 0.067 & 24.827 & 1.118 & 35.863 & 1.637 & 12.684 & 2.194 \\
\hline 1986 & 12.083 & 12.363 & 0.815 & 11.820 & 11.763 & 0.787 & 0.263 & 0.599 & 0.191 & 0.780 & 0.061 & 19.728 & 1.010 & 34.107 & 1.676 & 21.430 & 2.253 \\
\hline 1987 & 21.358 & 18.205 & 1.219 & 18.971 & 17.009 & 1.139 & 2.388 & 1.196 & 0.533 & 0.919 & 0.061 & 20.676 & 1.020 & 43.414 & 3.239 & 53.594 & 9.642 \\
\hline 1988 & 20.781 & 19.428 & 1.732 & 20.413 & 19.190 & 1.723 & 0.368 & 0.237 & 0.111 & 0.880 & 0.056 & 26.670 & 1.870 & 43.155 & 3.500 & 6.685 & 1.283 \\
\hline 1989 & 19.246 & 17.040 & 1.499 & 17.169 & 15.957 & 1.452 & 2.076 & 1.082 & 0.376 & 0.921 & 0.058 & 23.310 & 1.960 & 37.134 & 2.626 & 23.191 & 2.592 \\
\hline 1990 & 12.746 & 12.532 & 0.895 & 12.175 & 12.386 & 0.886 & 0.571 & 0.146 & 0.059 & 0.805 & 0.058 & 19.647 & 1.354 & 27.440 & 1.838 & 7.566 & 1.856 \\
\hline 1991 & 11.549 & 10.774 & 1.095 & 10.927 & 10.446 & 1.062 & 0.622 & 0.328 & 0.141 & 0.841 & 0.065 & 16.117 & 1.408 & 24.016 & 2.198 & 12.291 & 2.153 \\
\hline 1992 & 10.865 & 9.632 & 1.009 & 9.086 & 8.958 & 0.976 & 1.779 & 0.674 & 0.211 & 0.863 & 0.068 & 13.375 & 1.282 & 23.773 & 2.009 & 22.837 & 2.156 \\
\hline 1993 & 10.453 & 11.231 & 1.054 & 10.314 & 10.848 & 1.043 & 0.139 & 0.383 & 0.136 & 0.854 & 0.068 & 16.388 & 1.305 & 28.304 & 2.118 & 8.875 & 1.031 \\
\hline 1994 & 9.588 & 10.930 & 1.048 & 8.928 & 10.397 & 1.011 & 0.661 & 0.533 & 0.178 & 0.827 & 0.066 & 16.750 & 1.356 & 26.691 & 2.121 & 17.203 & 2.364 \\
\hline 1995 & 9.580 & 10.995 & 1.076 & 9.439 & 10.658 & 1.053 & 0.141 & 0.337 & 0.112 & 0.835 & 0.065 & 16.459 & 1.365 & 27.252 & 2.262 & 14.060 & 1.894 \\
\hline 1996 & 9.489 & 11.288 & 1.164 & 9.427 & 11.089 & 1.146 & 0.063 & 0.199 & 0.071 & 0.928 & 0.072 & 16.315 & 1.478 & 24.130 & 2.266 & 5.978 & 1.291 \\
\hline 1997 & 7.533 & 9.588 & 1.092 & 7.034 & 8.848 & 1.023 & 0.499 & 0.740 & 0.272 & 0.966 & 0.076 & 11.970 & 1.289 & 24.211 & 2.325 & 21.951 & 2.646 \\
\hline 998 & 6.252 & 8.817 & 1.010 & 5.714 & 8.592 & 0.991 & 0.538 & 0.225 & 0.092 & 0.945 & 0.074 & 10.579 & 1.111 & 17.251 & 1.806 & 6.333 & 1.473 \\
\hline 1999 & 4.270 & 7.034 & 0.962 & 4.201 & 6.851 & 0.940 & 0.069 & 0.182 & 0.068 & 0.990 & 0.079 & 9.750 & 1.206 & 14.121 & 1.772 & 4.687 & 1.018 \\
\hline 2000 & 3.798 & 6.215 & 0.792 & 2.977 & 5.551 & 0.738 & 0.821 & 0.664 & 0.230 & 0.960 & 0.077 & 7.051 & 0.932 & 14.835 & 1.681 & 17.121 & 2.268 \\
\hline 2001 & 2.439 & 5.958 & 0.801 & 2.347 & 5.784 & 0.786 & 0.092 & 0.174 & 0.068 & 0.987 & 0.079 & 7.600 & 0.921 & 12.611 & 1.546 & 3.747 & 0.945 \\
\hline 2002 & 2.722 & 5.765 & 0.832 & 2.243 & 5.501 & 0.799 & 0.480 & 0.264 & 0.114 & 1.035 & 0.083 & 7.174 & 0.968 & 11.558 & 1.565 & 7.584 & 1.657 \\
\hline 2003 & 1.275 & 3.989 & 0.694 & 1.241 & 3.902 & 0.673 & 0.034 & 0.087 & 0.049 & 1.036 & 0.083 & 5.298 & 0.829 & 7.732 & 1.415 & 1.658 & 1.016 \\
\hline 2004 & 0.612 & 2.352 & 0.571 & 0.540 & 2.256 & 0.543 & 0.072 & 0.096 & 0.052 & 0.984 & 0.080 & 3.315 & 0.739 & 4.647 & 1.150 & 2.465 & 1.170 \\
\hline 2005 & 0.552 & 1.683 & 0.419 & 0.511 & 1.606 & 0.402 & 0.041 & 0.077 & 0.049 & 1.072 & 0.093 & 2.172 & 0.485 & 3.437 & 0.856 & 1.628 & 1.089 \\
\hline 2006 & 0.954 & 1.359 & 0.252 & 0.488 & 0.416 & 0.069 & 0.465 & 0.943 & 0.215 & 0.935 & 0.075 & 1.570 & 0.280 & 3.579 & 0.558 & 5.554 & 1.171 \\
\hline 2007 & 2.474 & 1.901 & 0.296 & 0.595 & 0.513 & 0.070 & 1.880 & 1.388 & 0.277 & 1.026 & 0.081 & 2.430 & 0.325 & 4.043 & 0.556 & 1.758 & 0.545 \\
\hline 2008 & 1.377 & 1.754 & 0.238 & 0.682 & 0.580 & 0.079 & 0.695 & 1.175 & 0.232 & 1.009 & 0.086 & 2.603 & 0.327 & 3.610 & 0.455 & 1.540 & 0.564 \\
\hline 2009 & 1.353 & 1.451 & 0.181 & 0.408 & 0.446 & 0.050 & 0.945 & 1.005 & 0.176 & 0.898 & 0.071 & 2.061 & 0.225 & 3.436 & 0.409 & 3.103 & 0.768 \\
\hline 2010 & 1.344 & 1.559 & 0.223 & 0.559 & 0.556 & 0.052 & 0.785 & 1.003 & 0.207 & 0.877 & 0.068 & 2.222 & 0.271 & 3.880 & 0.508 & 2.524 & 0.598 \\
\hline 2011 & 2.124 & 1.620 & 0.217 & 0.454 & 0.436 & 0.043 & 1.670 & 1.184 & 0.212 & 1.022 & 0.080 & 2.217 & 0.260 & 3.207 & 0.427 & 1.036 & 0.678 \\
\hline 2012 & 1.632 & 1.243 & 0.232 & 0.466 & 0.457 & 0.051 & 1.166 & 0.787 & 0.220 & 0.920 & 0.092 & 1.835 & 0.332 & 2.576 & 0.533 & 2.198 & 0.851 \\
\hline 2013 & - & 1.221 & 0.311 & - & 0.448 & 0.116 & - & 0.773 & 0.258 & 0.950 & 0.098 & 1.689 & 0.413 & 2.690 & 0.680 & 1.739 & 0.871 \\
\hline
\end{tabular}

\section*{Annex 5.4.3.1 Regulations and cod avoidance schemes relevant to Division VIa cod}

Area closures
- Clyde Sea area closure - STECF (2007) noted that the Clyde closure includes the main spawning area of a reproductively isolated aggregation of cod and concluded that the closure is likely to have a positive effect in reducing targeting of high densities of mature cod.
- Windsock closed area - STECF (2007) concluded that the extent of the Windsock closure is unlikely to be large enough to greatly reduce fishing mortality on cod, and its boundaries should be reconsidered. However, its removal would not help improve cod recovery.
- Since 2009, the Irish authorities introduced a seasonal closure in Division VIa. The closure covers ICES statistical rectangle 39E3 and is in force from October 31 to March 31. Historically, over \(40 \%\) of Irish cod landings from ICES Division VIa are from the closed area. For contrast, standardized cpue rates observed from a dedicated survey conducted inside the closed area in 2006 were on average \(26.8 \mathrm{~kg} \mathrm{hr}^{-1}\) while cpue rates estimated from observer trips outside the closure gathered in the same period were 0.015 \(\mathrm{kg} \mathrm{hr}^{-1}\). STECF (2012) concluded that, in accordance with the provisions of article \(13(1342 / 2008)\), the partial cod mortality associated with the Irish fleet had declined considerably ( \(>50 \%\) ) since the introduction of the cod closure and other measures, although it is not possible to disentangle the effects of the Cape closure from other measures.

\section*{Mesh sizes and catch composition rules}
- Catch composition rules related to days-at-sea allowances (Reg. (EC) 850/1998 Annex I and Reg. (EC) 2056/2001) - These rules legislate for landings compositions, but do not restrict discards.
- Emergency measures introduced in EC regulation 43/2009 (Annex III) (and rolled forward into 2010 and 2011) prohibited all fishing activity to the east of the West of Scotland Management (French) line in Division Via, with the exception of a number of derogated fisheries. These measures have been incorporated into a new EC regulation 227/2013. For demersal otter trawlers targeting whitefish this required an increase in mesh size to 120 mm and the inclusion of a 120 mm square-meshed panel (SMP). Vessels targeting Nephrops also require the 120 mm SMP or a sorting grid. More stringent catch composition rules have also been introduced. For Nephrops-directed fisheries, no more than \(10 \%\) of the retained catch can consist of cod, haddock, and whiting, where the limit is no more than \(30 \%\) for whitefish targeted vessels. For 2012 a zero TAC for cod and a \(1.5 \%\) bycatch by live weight limit was introduced and this was carried through to 2013, but in 2012 the catch composition limit on haddock was removed (Reg. (EU) 161/2012).

\section*{Effort limitations}
- Between 2003 and 2011 STECF (2012) reported that the fishing effort (in kW-days) of trawlers using \(>100 \mathrm{~mm}\) mesh declined by \(59 \%\). These vessels primarily targeted roundfish, including cod. Over the same period effort for trawlers using \(70-99 \mathrm{~mm}\) mesh declined by \(16 \%\). These vessels primarily target Nephrops and in \(201122 \%\) of the effort in this category was exempt from effort controls because of less than \(1.5 \%\) of cod in the catch, (article 11).
- Annex IIa of Reg. (EC) 39/2013 does not require effort reduction compared to 2012 except for French trawlers using >100 mm mesh ( \(20 \%\) reduction).

\section*{Supply chain traceability}

Unreported landings are expected to have reduced under the UK "Buyers and Sellers" and Irish "Sales Note" regulations. Observer data, however, show an increase in discards starting in 2006. The amount of discards relative to landings has increased and the age pattern of discarding has changed. Currently discards of fish aged 3 and above are being recorded.

\section*{Cod avoidance measures}

In 2008, Scotland introduced a voluntary programme known as "Conservation Credits", which involved seasonal closures, real-time closures (RTCs), and various selective gear options. This was designed to reduce mortality and discarding of cod. The number of RTCs west of Scotland were four in 2008, twenty in 2009, nineteen in 2010, four in 2011, and nine in 2012, representing \(27 \%, 14 \%, 12 \%, 2 \%\), and \(5 \%\) of the total RTCs in each year. RTCs
are determined by lpue, based on fine-scale VMS data and daily logbook records, and also by on-board inspections. The low number of RTCs west of Scotland result from few instances of high lpue in the area. Estimates of continuing high discard rates in Division VIa indicate the scheme has not been effective west of Scotland.

\section*{Annex 5.4.3.2 EU management plan}

The European Commission has adopted Council Regulation (EC) No. 1342/2008 which establishes measures for the recovery and long-term management of cod stocks. The stated objective of the plan is to ensure the sustainable exploitation of the cod stocks on the basis of maximum sustainable yield while maintaining a fishing mortality of 0.4 . Articles \(7-9\), describing aspects of the plan relevant for west of Scotland cod, are reproduced below:

\section*{Article 7}

\section*{Procedure for setting TACs for cod stocks in the Kattegat the west of Scotland and the Irish Sea}
1. Each year, the Council shall decide on the TAC for the following year for each of the cod stocks in the Kattegat, the west of Scotland and the Irish Sea. The TAC shall be calculated by deducting the following quantities from the total removals of cod that are forecast by STECF as corresponding to the fishing mortality rates referred to in paragraphs 2 and 3: (a) a quantity of fish equivalent to the expected discards of cod from the stock concerned; (b) as appropriate a quantity corresponding to other sources of cod mortality caused by fishing to be fixed on the basis of a proposal from the Commission.
2. The TAC shall, based on the advice of STECF, satisfy all of the following conditions: (a) if the size of the stock on 1 January of the year of application of the TAC is predicted by STECF to be below the minimum spawning biomass level established in Article 6, the fishing mortality rate shall be reduced by \(25 \%\) in the year of application of the TAC as compared with the fishing mortality rate in the previous year; (b) if the size of the stock on 1 January of the year of application of the TAC is predicted by STECF to be below the precautionary spawning biomass level set out in Article 6 and above or equal to the minimum spawning biomass level established in Article 6, the fishing mortality rate shall be reduced by \(15 \%\) in the year of application of the TAC as compared with the fishing mortality rate in the previous year; and (c) if the size of the stock on 1 January of the year of application of the TAC is predicted by STECF to be above or equal to the precautionary spawning biomass level set out in Article 6, the fishing mortality rate shall be reduced by \(10 \%\) in the year of application of the TAC as compared with the fishing mortality rate in the previous year.

If the application of paragraph 2(b) and (c) would, based on the advice of STECF, result in a fishing mortality rate lower than the fishing mortality rate specified in Article 5(2), the Council shall set the TAC at a level resulting in a fishing mortality rate as specified in that Article.
4. When giving its advice in accordance with paragraphs 2 and 3, STECF shall assume that in the year prior to the year of application of the TAC the stock is fished with an adjustment in fishing mortality equal to the reduction in maximum allowable fishing effort that applies in that year.
5. Notwithstanding paragraph 2(a), (b) and (c) and paragraph 3, the Council shall not set the TAC at a level that is more than \(20 \%\) below or above the TAC established in the previous year.

Article 9

\section*{Procedure for setting TACs in poor data conditions}

Where, due to lack of sufficiently accurate and representative information, STECF is not able to give advice allowing the Council to set the TACs in accordance with Articles 7 or 8, the Council shall decide as follows: (a) where STECF advises that the catches of cod should be reduced to the lowest possible level, the TACs shall be set according to a \(25 \%\) reduction compared to the TAC in the previous year; (b) in all other cases the TACs shall be set according to a \(15 \%\) reduction compared to the TAC in the previous year, unless STECF advises that this is not appropriate.

Article 10

\section*{Adaptation of measures}
1. When the target fishing mortality rate in Article 5(2) has been reached or in the event that STECF advises that this target, or the minimum and precautionary spawning biomass levels in Article 6 or the levels of fishing mortality rates given in Article 7(2) are no longer appropriate in order to maintain a low risk of stock depletion and a maximum sustainable yield, the Council shall decide on new values for these levels.
2. In the event that STECF advises that any of the cod stocks is failing to recover properly, the Council shall take a decision which: (a) sets the TAC for the relevant stock at a level lower than that provided for in Articles 7, 8 and 9; (b) sets the maximum allowable fishing effort at a level lower than that provided for in Article 12; (c) establishes associated conditions as appropriate.

\section*{Rockall Cod}
(Division VIb)

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice for this stock is biennial and last year's advice is valid for 2013 and 2014. The Joint statement by the Fisheries Council and European Commission states it would be desirable if the TAC for this stock be maintained for 5 years (subject to scientific advice). FEAS advise that the information remains the same and the 2013 TAC should be rolled over for 2014. This implies a TAC of 74 t and an Irish Quota of 16 t.

LPUE has declined substantially (Figures I \& 2) and FEAS considers that catches should be reduced to lowest possible levels. However, cod are a by-catch species in the mixed demersal fishery and FEAS considers that TAC adjustments are not likely to constrain fishing mortality. FEAS advises that technical and tactical measures to reduce catches be introduced as part of a mixed fisheries management plan.


Red Box-TAC/Management Area

\section*{CURRENT MANAGEMENT}
- The TAC area now covers Sub-areas VIb, EU and international waters of Vb west of \(12^{\circ} 00^{\prime} \mathrm{W}\) and of XII and XIV. The TAC applies to EU vessels only and not the international fishery at Rockall.
- The TAC in 2013 is 74 t , with an associated Irish quota of 16 t .
- In the "Communication from the Commission to the Council concerning a consultation on Fishing Opportunities for 2014" \(\operatorname{COM}(2013) 319\) final this stock is listed in Annex III as one of the Stocks where TAC levels are to be kept at those fixed for 2013 , unless the state of these stocks changes significantly


Otter Trawl


Figure 2. Cod in Division Vlb. Lpue (Kg/kWday) from Scottish Otter trawl fleet, 2003-2012.

\section*{ICES ADVICE 5.4.4 Cod in Division VIb (Rockall)}

\section*{Advice for 2014 and 2015}

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see ICES, 2012): " Based on the ICES approach for data-limited stocks, ICES advises that catches should be no more than 70 tonnes". ICES advises that the same catch advice is still applicable to 2015.

\section*{Quality considerations}

Available data provide information on landings only. There are doubts on the accuracy of the reported landings as these are reported by vessels operating in both Divisions VIa and VIb.

Scientific basis
\begin{tabular}{ll} 
Assessment type & No assessment. \\
Stock data category & Category 6.2.0. \\
Input data & Offical landings statistics. \\
Discards and bycatch & Not included in the assessment. \\
Indicators & None. \\
Other information & None. \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

Outlook for 2015

\section*{ICES approach to data-limited stocks}

Because the precautionary buffer ( \(20 \%\) reduction in catch) was applied in the advice issued in 2012, and catches are marginal, the same catch advice ( 70 t ) is also considered valid for 2015 .

\section*{Additional considerations}

\section*{Management considerations}

According to the "Joint statement by the Council and the Commission" (Council of the European Union Document Doc 5315/13 PECHE 15, 15 January 2013):

The Council and the Commission note that the fishing opportunities regulations include a number of TACs for stocks for which there is limited information on stock status and which are of low economic importance, or are taken only as by-catches, or which show low levels of quota uptake. In these cases, the Council and the Commission consider it appropriate to constrain catches at or below the TAC levels fixed for 2013. To this end, without prejudice to the Commission's right of initiative and the Council's prerogatives under Article 293(1) TFEU, the Commission and the Council consider that it would be desirable to maintain the 2013 TAC level for the stocks listed below for the following five years.

Cod TAC unit VIb (Rockall subunit) is included in the list of the Joint statement by the Council and the Commission.

\section*{Sources}

Council of the European Union Document Doc 5315/13 PECHE 15, 15 January 2013. "Joint statement by the Council and the Commission".
ICES. 2012. Cod in Division VIb (Rockall). In Report of the ICES Advisory Committee, 2012, Section 5.4.22. ICES Advice, 2012. Book 5: 188-191.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Table 5.4.4.1 Cod in Division VIb (Rockall). ICES advice, management, and official landings.
\begin{tabular}{lllll}
\hline Year & ICES Advice & \begin{tabular}{l} 
Predicted \\
catch \\
corresp. to \\
advice
\end{tabular} & Agreed TAC & Official landings \\
& & - & \(3700^{\text {a }}\) & \\
\hline 2001 & No advice & - & \(4600^{\text {a) }}\) & 334 \\
2002 & No advice & - & \(1808^{\text {a) }}\) & 115 \\
2003 & No advice & - & \(848^{\text {a) }}\) & 102 \\
2004 & No advice & - & \(721^{\text {a }}\) & 75 \\
2005 & No advice & - & \(613^{\text {a }}\) & 62 \\
2006 & No advice & - & \(490^{\text {a) }}\) & 58 \\
2007 & No advice & - & \(402^{\text {a }}\) & 62 \\
2008 & No advice & - & \(302^{\text {a) }}\) & 96 \\
2009 & No advice & - & \(80^{\text {b) }}\) & 97 \\
2010 & No advice & - & \(78^{\text {b) }}\) & 61 \\
2011 & No advice & \(78^{\text {b) }}\) & 97 \\
2012 & No increase in catch & - & \(74^{\text {b) }}\) & 32 \\
2013 & Reduce catch by \(20 \%\) & \(<70\) & & \\
2014 & Same advice as for 2013 & \(<70\) & & \\
2015 & Same advice as for 2013 & \(<70\) & & \\
\hline
\end{tabular}

Weights in tonnes.
\({ }^{\text {a) }}\) Subarea VI; EC waters of Division Vb; EC and international waters of Subareas XII and XIV.
\({ }^{\text {b) }}\) Division VIb; EU and international waters of Division Vb west of \(12^{\circ} 00^{\prime} \mathrm{W}\) and of Subareas XII and XIV.

\section*{West of Scotland Haddock \\ (Division VIa)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice, based on the MSY approach, is that catches should be no more than \(6,432 \mathrm{t}\), and if discard rates do not change from the average of the last three years this corresponds to landings of no more than \(3,988 \mathrm{t}\), implying an Irish landings quota of 653 t . Effective technical measures should be introduced to reduce discards rates in the TR2 fleet. FEAS agree with this advice.

This stock falls into ICES category I data-rich stocks with full analytical assessments. Fishing mortality is below \(F_{\text {msy }}\) and SSB is just above MSY \(B_{\text {trigger }}\), but recruitment is considered to be weak.

FEAS notes that a management plan has been evaluated by ICES and is considered precautionary. If applied, this would result in a decrease of \(23 \%\) resulting in a TAC in 2014 of \(4,115 \mathrm{t}\).


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

\section*{CURRENT MANAGEMENT}
- A management plan for haddock in Vla has been evaluated by ICES and is considered precautionary and has been used as the TAC setting mechanism in the past.
- EU has adopted a long-term plan for cod stocks and the fisheries exploiting those stocks Council Regulation (EC) I342/2008. This continues to have a large impact on fleets catching haddock in Vla.
- In 2004 the TAC area was revised to cover EU and international waters of Vb and Vla . The assessment area covers Division Vla only.
- The 2013 TAC allocated to this stock was \(4,211 \mathrm{t}\), with an Irish quota of 690 t .

- A "conservation credits" scheme (see ICES summary) has been in place on Scotland since January 2007.

\section*{ICES ADVICE 5.4.8 Haddock in Division VIa (West of Scotland)}

\section*{Advice for 2014}

Version 2, 03-10-2013
ICES advises on the basis of the MSY approach that catches should be no more than 6432 t . If discarding rates do not change from the average of the last three years, this corresponds to landings of no more than 3988 t .

Effective technical measures should be implemented to reduce high discard rates in the Nephrops fleet (TR2).

\section*{Stock status}



Figure 5.4.8.1 Haddock in Division VIa (West of Scotland). ICES observed catches and summary of stock assessment (weights in thousand tonnes). Predicted recruitment values are shaded. Top right: SSB/F for the timeseries used in the assessment.

The 2009 year class is above the average in the recent period, but is below the long-term average. Nevertheless, this year class is the main contributor to the increase of the SSB in 2012 to above \(\mathrm{B}_{\mathrm{pa}}\). F has been above \(\mathrm{F}_{\mathrm{pa}}\) in most years since 1987 and has been declining since 1999. F has been below the \(\mathrm{F}_{\text {MSY }}\) proxy since 2009.

\section*{Management plans}

An EU management plan proposal (See Annex 5.4.8) was evaluated by ICES and is considered to be precautionary. The aim of this plan is to keep the SSB above 30000 tonnes with a fishing mortality of no more than 0.3. The main elements in the plan are a \(25 \%\) constraint on TAC change between years and lower fishing mortality rates whenever the SSB is lower than 30000 t . This proposal for a management plan has not been formally agreed.

\section*{Biology}

Haddock are widely distributed across the continental shelf from the North Sea to the Celtic Sea. There is some connectivity with the haddock stock in the North Sea, which is assessed as a different stock. The stockrecruitment relationship for haddock is characterized by sporadic high recruitments. There may be periods of low recruitment at any stock size.

\section*{The fisheries}

Haddock in Division VIa is caught mainly by Scottish and Irish bottom trawlers, which target mixed demersal fish assemblages. Catches are widely distributed and are concentrated in several areas, e.g. Butt of Lewis and on the shelf west of the Outer Hebrides.

Catch distribution Total catch \((2012)=5629 \mathrm{t}\), where the demersal fish fleet (TR1) contributes \(4607 \mathrm{t}(4457 \mathrm{t}\) landed, 150 t discarded), the Nephrops fleet (TR2) 919 t (543 t landed, 376 t discarded), and other fleets caught 103 t ..

\section*{Quality considerations}

Due to uncertainties in the landings for several years, commercial catch numbers for 1995-2005 are excluded from the assessment. Data from 2006 onwards are included, based on improved accuracy of landings statistics. The survey design and gear of the Scottish west coast surveys (ScoGFS-WIBTS-Q1 and ScoGFS-WIBTS-Q4) were changed in 2011, and only commercial data from years 2011 onwards are used in the assessment. Recent recruitment is, therefore, poorly estimated by the assessment and, in addition, the new survey (UKSGFS-IBTS-Q1 and Q4) time-series is too short to quantify recruitment. Therefore, the last recruitment in the assessment (2012) was replaced by the geometric mean for 2004-2011.


Figure 5.4.8.2
Haddock in Division VIa (West of Scotland). Historical assessment results (final-year recruitment estimates included).

Scientific basis

Assessment type
Stock data category
Input data
\begin{tabular}{ll} 
& \begin{tabular}{l} 
sampling); two survey indices (ScoGFS-WIBTS-Q1 up to 2010, ScoGFS-WIBTS-Q4 \\
up to 2009); fixed maturity data from surveys (ScoGFS-WIBTS-Q1 and ScoGFS-
\end{tabular} \\
& WIBTS-Q4); and natural mortalities assumed to be constant (0.2).
\end{tabular}

Analytical age-based assessment (TSA). Category 1.
Commercial catches (international landings, ages and length frequencies from catch sampling); two survey indices (ScoGFS-WIBTS-Q1 up to 2010, ScoGFS-WIBTS-Q4 up to 2009); fixed maturity data from surveys (ScoGFS-WIBTS-Q1 and ScoGFS-WIBTS-Q4); and natural mortalities assumed to be constant (0.2).
Discard data from the Scottish and Irish fleets have been included in the assessment 1972 This stock is scheduled to be benchmarked in 2014. WGCSE (ICES, 2013)

ECOREGION Celtic Sea and West of Scotland
STOCK
Haddock in Division VIa (West of Scotland)

\section*{Reference points}
\begin{tabular}{|c|c|c|c|}
\hline & Type & Value & Technical basis \\
\hline \multirow[t]{2}{*}{\begin{tabular}{l}
MSY \\
Approach
\end{tabular}} & MSY \({ }_{\text {trigger }}\) & 30000 t . & \(\mathrm{B}_{\mathrm{pa}}\) \\
\hline & \(\mathrm{F}_{\text {MSY }}\) & 0.3 & Provisional proxy by analogy with North Sea haddock. Fishing mortalities in the range of 0.19-0.41 are consistent with \(\mathrm{F}_{\text {MSY }}\). \\
\hline \multirow[b]{2}{*}{Precautionary} & \(\mathrm{B}_{\text {lim }}\) & 22000 t . & \(\mathrm{B}_{\text {lim }}=\mathrm{B}_{\text {loss }}\), the lowest observed spawning stock estimated since the reference point was established in 1998. \\
\hline & \(\mathrm{B}_{\mathrm{pa}}\) & 30000 t . & \(\mathrm{B}_{\mathrm{pa}}=\mathrm{B}_{\mathrm{lim}} \times 1.4\). This is considered to be the minimum SSB required to obtain a high probability of maintaining SSB above \(\mathrm{B}_{\text {lim }}\), taking into account the uncertainty of assessments. \\
\hline \multirow[t]{2}{*}{Approach} & \(\mathrm{F}_{\text {lim }}\) & Not defined. & \\
\hline & \(\mathrm{F}_{\mathrm{pa}}\) & 0.5 & The F below which there is a high probability of avoiding \(\mathrm{SSB}<\mathrm{B}_{\mathrm{pa}}\). \\
\hline
\end{tabular}
(Unchanged since: 2010)
Outlook for 2014
The short-term forecast is presented in terms of total removals. These are then divided into landings ( \(62 \%\) ) and discards ( \(38 \%\) ) on the basis of the average proportions ( \(2010-\) 2012) of these catch components provided by the 2013 assessment.
Basis: \(\mathrm{F}(2013)=\mathrm{F}_{\mathrm{sq}}=\mathrm{F}(2010-2012)=0.24 ; \operatorname{SSB}(2014)=26.377 ; \mathrm{R}(2013)=\) Geomean \((2004-2011)=30.6\) million; \(\mathrm{R}(2014)=\) Geomean (2004-2011) \(=30.6\) million; Catch \((2013)=6.673\); Landings \((2013)=4.137\); Discards \((2013)=2.536\).
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline Rationale & Total catch (2014) & Landings (2014) & Discards (2014) & Basis & \[
\begin{gathered}
\text { F Total } \\
(2014)
\end{gathered}
\] & \(\underset{(2014)}{\underset{(20 n d i n g s}{\text { la }}}\) & F Disc. (2014) & \[
\begin{aligned}
& \text { SSB } \\
& \text { (2015) }
\end{aligned}
\] & \[
\begin{gathered}
\text { \%SSB } \\
\text { change }{ }^{1}
\end{gathered}
\] & \[
\begin{gathered}
\text { \%TAC } \\
\text { change }^{2)}
\end{gathered}
\] \\
\hline MSY approach & 6.432 & 3.988 & 2.444 & \(\mathrm{F}_{\mathrm{MSY}} \times \mathrm{SSB}_{2014} / \mathrm{MSY} \mathrm{B}_{\text {trigger }}\) & 0.26 & 0.16 & 0.10 & 27.27 & +3\% & -5\% \\
\hline Precautionary approach & 4.158 & 2.578 & 1.580 & \(\mathrm{SSB}_{2015}>\mathrm{B}_{\mathrm{pa}}\left(\mathrm{F}_{2013} \times 0.67\right)\) & 0.16 & 0.10 & 0.06 & 30.043 & +14\% & -39\% \\
\hline \begin{tabular}{lr} 
Proposal & for \\
Management & \\
plan* &
\end{tabular} & 6.014 & 3.729 & 2.285 & \[
\begin{gathered}
\mathrm{F} \leq 0.3-0.2 \times \\
\left(\mathrm{B}_{\mathrm{pa}}-\mathrm{SSB}_{2015}\right) /\left(\mathrm{B}_{\mathrm{pa}}-\mathrm{B}_{\mathrm{lim}}\right)
\end{gathered}
\] & 0.24 & 0.15 & 0.09 & 27.779 & +5\% & -11\% \\
\hline Zero catch & 0.000 & 0.000 & 0.000 & \(\mathrm{F}=0\) & 0.00 & 0.00 & 0.00 & 35.13 & +33\% & -100\% \\
\hline \multirow[t]{4}{*}{Other options} & 5.765 & 3.574 & 2.191 & \[
\begin{gathered}
\mathrm{TAC}-15 \% \\
\left(\mathrm{~F}_{2013} \times 0.96\right)
\end{gathered}
\] & 0.23 & 0.14 & 0.09 & 28.082 & +6\% & -15\% \\
\hline & 6.791 & 4.210 & 2.581 & Stable TAC
\(\left(\mathrm{F}_{2013} \times 1.156\right)\) & 0.28 & 0.17 & 0.11 & 26.832 & +2\% & 0\% \\
\hline & 5.978 & 3.706 & 2.272 & \(\mathrm{F}_{2013}\) & 0.24 & 0.15 & 0.09 & 27.823 & +5\% & -12\% \\
\hline & 7.811 & 4.843 & 2.968 & \[
\begin{gathered}
\mathrm{TAC}+15 \% \\
\left(\mathrm{~F}_{2013} \times 1.36\right) \\
\hline
\end{gathered}
\] & 0.33 & 0.20 & 0.13 & 25.592 & -3\% & +15\% \\
\hline
\end{tabular}
Weights in thousand tonnes.
\({ }^{1)} \mathrm{SSB}\) in 2015 relative to SSB in 2014.
\({ }^{2)}\) Landings in 2014 relative to TAC in 2013.
* Version 2: Values for the proposal for a management plan were corrected.

\section*{MSY approach}

Following the ICES MSY approach implies fishing mortality at 0.26 (lower than the \(\mathrm{F}_{\text {MSY }}\) proxy because SSB in 2014 is \(12 \%\) below MSY \(\mathrm{B}_{\text {trigger }}\) ), resulting in catches in 2014 of no more than 6432 tonnes. If discarding rates do not change from the average of the last three years, this corresponds to landings of no more than 3988 tonnes. This is expected to lead to an SSB of 27270 tonnes in 2015.

Since F is below the \(\mathrm{F}_{\text {MSY }}\) proxy in 2012, the transition to the MSY option is not relevant.

\section*{Precautionary approach}

A fishing mortality of 0.16 will lead to an SSB in 2015 around 30000 tonnes ( \(\mathrm{B}_{\mathrm{pa}}\) ), resulting in catches in 2014 of no more than 4158 tonnes. If discarding rates do not change from the average of the last three years, this corresponds to landings of no more than 2578 tonnes.

\section*{Management plan \({ }^{1}\)}

ICES evaluated an EU management plan proposal (see Annex 5.4.8) and considered it to be precautionary. Under \(\mathrm{F}=0.3\) in 2014, SSB is forecast to be less than Bpa at the start of 2015 and paragraph 2 of the management plan applies. Repeated application of the formula \(\mathrm{F}(2014)=0.3-0.2^{*}(\mathrm{Bpa}-\operatorname{SSB}(2015)) /(\mathrm{Bpa}-\mathrm{Blim})\) until convergence is achieved leads to \(\mathrm{F}(2014)=0.24\) and \(\operatorname{SSB}(2015)=27779\) tonnes. This results in catches of 6014 t and landings of 3729 t in 2014, corresponding to an \(11 \%\) TAC decrease.

\section*{Additional considerations}

EU emergency measures were implemented in 2009 in Division VIa. These measures include inter alia quite strict bycatch limits ( \(30 \%\) cod, haddock, and whiting combined). The recent improvement in stock condition has led to increased catches of haddock for which the current bycatch arrangements are inappropriate. To address this issue an EU Commission Regulation No. 161/2012 has been approved that suspends the catch composition rules as regards haddock.

\section*{Management considerations}

Special attention needs to be given to the sporadic nature of the haddock recruitment and how to manage periods of low recruitment interspersed with large, occasional pulses.

As in previous years the majority of discards occurred in the Nephrops fleet (TR2) ( \(\sim 70 \%\) of all discards). Any measure to reduce discarding and to improve the fishing pattern should be actively encouraged.

Effort data from 1998 onwards from UK vessels (one of the main countries fishing in the area) suggests that overall, effort has declined in recent years in Division VIa, and that declines in particular fleets have not been compensated for by rises in other fleets. Larger-meshed whitefish demersal trawls were the most important gears in Division VIa prior to 2002, but since then there has been a marked decline in kW-days by this category. Singlerig Nephrops trawls in the \(70-99 \mathrm{~mm}\) mesh category are the other major gears in use, but unlike TR1 vessels the effort seems to have been maintained at a fairly stable level throughout the time-series. However, since the start of the Fully Documented Fisheries (FDF) trials in 2009 and because vessels in the trial are exempt of effort control, an increase in effort from those vessels in the West of Scotland has been noted.

The management of fisheries on haddock will be strongly linked to those on cod, for which a management plan is currently in force.

\section*{Impacts of fisheries on the ecosystem}

In general, the impact of the fisheries concerns the effects of bottom trawling on benthos, poor selectivity of gear acting on mixed-fish assemblages, and the practice of discarding in response to, for example, available quota or market prices.

\footnotetext{
\({ }^{1}\) Version 2: The corresponding values for the proposal for a management plan were corrected.
}

\section*{Regulations and their effects}

The fishery is managed by a combination of TAC and technical measures, and in addition, the cod recovery plan measures (including effort restrictions and closed areas) are also expected to affect haddock. A detailed description of the effects of cod recovery measures and regulations and can be found in the Division VIa cod advice (Section 5.4.3).

The UK "Buyers and Sellers" and Irish "Sales Note" regulations have reduced unreported landings.

\section*{Data and methods}

The analytical assessment is based on landings-at-age data, discard-at-age data, and indices from research vessel surveys. Due to uncertainties in landings for several years, commercial catch numbers from 1995 to 2005 were not used in the assessment. In 2010 fishery landings and catch-at-age data from 2006 onwards were re-introduced in the assessment, based on the perception of improved accuracy of landings statistics.

\section*{Uncertainties in assessment and forecast}

The main uncertainty in the forecast is upcoming recruitments. Since the redesign of both ScoGFS-WIBTS-Q1 and Q4 the recruitment proxy has been assumed as the geometric mean of the last nine years in a conservative approach to account for the low recruitment values shown in the surveys.

The effect of the loss of two tuning surveys is unknown. The assessment has relied wholly on commercial catch-at-age data since 2010.

\section*{Comparison with previous assessment and advice}

In the assessment model removals since 2006 are fully allocated to landing and discards, therefore the forecast no longer includes unallocated removals. SSB in 2012 was revised upwards by \(10 \%\) and F in 2011 downwards by \(11 \%\) compared to last year's assessment.

The basis for the advice is the same as last year, the MSY approach.

\section*{Source}

ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.


Figure 5.4.8.3
Haddock in Division VIa (West of Scotland). Yield-per-recruit analysis (left) and stock-recruitment plot (right).

Table 5.4.8.1 Haddock in Division VIa (West of Scotland). ICES advice, management, landings, and catches.
\(\left.\begin{array}{llllllll}\hline \text { Year } & \begin{array}{ll}\text { ICES Advice/ Single-stock exploitation } \\ \text { boundaries from 2004 onwards }\end{array} \\ & \begin{array}{l}\text { Predicted } \\ \text { catch } \\ \text { corresp. } \\ \text { to advice }\end{array} & \begin{array}{l}\text { Agreed } \\ \text { TAC }^{1}\end{array} & & & \begin{array}{l}\text { Official } \\ \text { landings }\end{array} & \begin{array}{l}\text { ICES } \\ \text { landings }\end{array} & \text { Discard }\end{array} \begin{array}{l}\text { ICES } \\ \text { catch }\end{array}\right]\)

Weights in thousand tonnes.
\({ }^{1}\) TAC is set for Divisions VIa and VIb (plus Subdivision \(\mathrm{Vb}_{1}\) and Subareas XII and XIV), combined with restrictions on the quantity that can be taken in Division VIa from 1990.
\({ }_{3}^{2}\) Adjusted for misreporting.
\({ }^{3}\) For Division VIa only.
\({ }^{4}\) Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries, \({ }_{5}\) protecting stocks outside safe biological limits.
\({ }^{5}\) An error of this advice was detected in 2012. The correct MSY framework advice is 5.6 thousand tonnes.
\({ }^{6}\) This value (6.432) refers to total catch, including discards. Therefore, it is not directly comparable to the value advised for 2013 (3.1), which referred only to landings.

Table 5.4.8.2 Haddock in Division VIa. Landings (tonnes) by country since 1989.
\begin{tabular}{|lccccccccccc|}
\hline Country & \(\mathbf{1 9 8 9}\) & \(\mathbf{1 9 9 0}\) & \(\mathbf{1 9 9 1}\) & \(\mathbf{1 9 9 2}\) & \(\mathbf{1 9 9 3}\) & \(\mathbf{1 9 9 4}\) & \(\mathbf{1 9 9 5}\) & \(\mathbf{1 9 9 6}\) & \(\mathbf{1 9 9 7}\) & \(\mathbf{1 9 9 8}\) & \(\mathbf{1 9 9 9}\) \\
\hline Belgium & 9 & - & 9 & 1 & 7 & 1 & - & 1 & 3 & 2 & 2 \\
Denmark & \(<0.5\) & \(<0.5\) & \(<0.5\) & \(<0.5\) & 1 & - & 1 & 1 & - & - & - \\
Faroe Islands & 13 & - & 1 & - & - & - & - & - & - & - & - \\
France & 1335 & 863 & 761 & 762 & 1132 & 753 & 671 & 455 & 270 & 394 & - \\
Germany & - & - & 1 & 2 & 9 & 19 & 14 & 2 & 1 & 1 & 2 \\
Germany, F.R. & 4 & 15 & - & - & - & - & - & - & - & - & - \\
Ireland & 2171 & 773 & 710 & 700 & 911 & 746 & 1406 & 1399 & 1447 & 1352 & 1054 \\
Netherlands & - & - & - & - & - & - & - & - & - & - & - \\
Norway & 74 & 46 & 12 & 72 & 40 & 7 & 13 & 16 & 21 & 28 & 18 \\
Spain & - & - & - & - & - & - & 1 & - & - & 2 & 4 \\
UK - (E\&W) \({ }^{\mathbf{1}}\) & 235 & 164 & 137 & 132 & 155 & 254 & 322 & 448 & 493 & 458 & 315 \\
UK Scotland & 19940 & 10964 & 8434 & 5263 & 10423 & 7421 & 10367 & 10790 & 10352 & 12125 & 8630 \\
USSR/Russia & - & - & 59 & - & - & - & - & - & - & - & - \\
\hline
\end{tabular}
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & \(2012{ }^{3}\) \\
\hline Belgium & 2 & - & - & < 0.5 & - & - & - & - & - & - & - & - \\
\hline Denmark & - & - & \(<0.5\) & \(<0.5\) & - & - & - & - & - & - & - & - \\
\hline Faroe Islands & - & - & - & 4 & - & 1 & 2 & \(<0.5\) & - & - & . & 0.314 \\
\hline France & 160 & 151 & 183 & 173 & 273 & 291 & 211 & 151 & 136 & 89 & 74.83 & 31.75 \\
\hline Germany & 1 & - & - & - & 1 & 7 & - & 1 & - & 1 & & 0.079 \\
\hline Germany, F.R. & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline Ireland & 744 & 672 & 497 & 194 & 152 & 526 & 759 & 879 & 297 & 396 & 290.39 & 844.98 \\
\hline Netherlands & - & - & - & 1 & - & - & - & - & - & - & - & - \\
\hline Norway & 32 & 30 & 23 & 4 & 21 & 17 & 16 & 28 & 18 & 11 & 4.109 & 0.184 \\
\hline Spain & 4 & 4 & 5 & - & 47 & 44 & 5 & 10 & 21 & 28 & - & - \\
\hline \[
\mathbf{U K}-\left(\mathbf{E} \& \mathbf{W}^{1)}\right.
\] & 201 & 237 & 107 & 93 & 42 & 19 & 193 & 32 & 14 & 7 & - & 2.47 \\
\hline UK - Scotland & 5886 & 5988 & 4582 & 2909 & 2025 & 4928 & 2587 & 1744 & 2366 & 2407 & 1373 & 41199 \\
\hline Russia & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline Total reported & 7030 & 7082 & 5397 & 3378 & 2561 & 5833 & 3773 & 2845 & 2852 & 2939 & 1743 & 5000 \\
\hline ICES estimates \({ }^{2}\) & 6762 & 7115 & 5337 & 3874 & 3792 & 6266 & 3777 & 2848 & 2851 & 3016 & 1737 & 5100 \\
\hline
\end{tabular}
\({ }^{1)}\) 1989-2005 N. Ireland included with England and Wales.
\({ }^{2)}\) ICES estimates refers to the sum-of-products of landings and weights-at-age provided to the WGCSE, rather than the estimated removals produced in the final assessment.
\({ }^{3}\) Preliminary.
Table 5.4.8.3 Haddock in Division VIa (West of Scotland). Summary of stock assessment. SE is the standard error.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline \multirow[t]{2}{*}{Year} & \multicolumn{3}{|l|}{Landings (tonnes)} & \multicolumn{3}{|l|}{Discards (tonnes)} & \multicolumn{3}{|l|}{Total catches (tonnes)} & \multicolumn{2}{|l|}{Mean F(2-6)} & \multicolumn{2}{|l|}{SSB (tonnes)} & \multicolumn{2}{|l|}{Recruitment
(thousands at age 1)} \\
\hline & Obs. & Pred. & SE & Obs. & Pred. & SE & Obs. & Pred. & SE & Estimate & SE & Estimate & SE & Estimate & SE \\
\hline 1978 & 17187 & 18278 & 1654 & 2318 & 2413 & 542 & 19505 & 20666 & 1841 & 0.658 & 0.068 & 38345 & 1173 & 70314 & 8541 \\
\hline 1979 & 14837 & 15808 & 1661 & 13841 & 10353 & 2102 & 28678 & 26674 & 3015 & 0.801 & 0.074 & 30935 & 2227 & 155234 & 16386 \\
\hline 1980 & 12759 & 13553 & 1727 & 4715 & 15846 & 3254 & 17474 & 31214 & 4491 & 0.630 & 0.068 & 35596 & 2799 & 484376 & 44364 \\
\hline 1981 & 18233 & 19443 & 2803 & 15048 & 13725 & 2771 & 33281 & 33701 & 4733 & 0.454 & 0.054 & 75788 & 5162 & 62310 & 7250 \\
\hline 1982 & 29635 & 28634 & 4356 & 10063 & 6614 & 1362 & 39698 & 33547 & 4455 & 0.418 & 0.047 & 99880 & 7335 & 70471 & 8419 \\
\hline 1983 & 29411 & 28459 & 3607 & 6781 & 5067 & 984 & 36192 & 33503 & 3850 & 0.451 & 0.047 & 90250 & 5964 & 43395 & 6427 \\
\hline 1984 & 30689 & 26725 & 2625 & 15666 & 12727 & 3023 & 46355 & 39736 & 4635 & 0.661 & 0.065 & 61897 & 3353 & 317313 & 35181 \\
\hline 1985 & 24451 & 24330 & 2621 & 17385 & 14983 & 2833 & 41837 & 38819 & 4577 & 0.643 & 0.063 & 65862 & 4235 & 73664 & 8654 \\
\hline 1986 & 19561 & 19634 & 2654 & 7153 & 4645 & 918 & 26714 & 23091 & 2942 & 0.445 & 0.049 & 59237 & 4361 & 59337 & 6604 \\
\hline 1987 & 27012 & 29060 & 2895 & 16193 & 15256 & 3595 & 43205 & 44441 & 5151 & 0.870 & 0.072 & 54120 & 3685 & 266636 & 35835 \\
\hline 1988 & 21153 & 21688 & 2430 & 9519 & 9707 & 2029 & 30672 & 31254 & 3833 & 0.798 & 0.072 & 47363 & 3328 & 21313 & 4270 \\
\hline 1989 & 16691 & 19183 & 2606 & 2979 & 2953 & 718 & 19669 & 21495 & 2804 & 0.810 & 0.077 & 38785 & 3242 & 16677 & 3938 \\
\hline 1990 & 10141 & 11030 & 1567 & 5381 & 3123 & 713 & 15522 & 13231 & 1797 & 0.685 & 0.072 & 21931 & 1991 & 97374 & 12071 \\
\hline 1991 & 10557 & 9948 & 1127 & 8691 & 9800 & 1887 & 19248 & 20381 & 2637 & 0.776 & 0.074 & 21527 & 1639 & 125401 & 13540 \\
\hline 1992 & 11351 & 9496 & 1179 & 9161 & 8978 & 1495 & 20513 & 19315 & 2304 & 0.588 & 0.060 & 29180 & 2057 & 176446 & 17706 \\
\hline 1993 & 19068 & 17957 & 1849 & 16803 & 15807 & 2248 & 35871 & 33831 & 3144 & 0.909 & 0.076 & 42114 & 2680 & 175131 & 19337 \\
\hline 1994 & 14272 & 11756 & 1709 & 11070 & 12519 & 2267 & 25342 & 24877 & 3028 & 0.724 & 0.119 & 39529 & 2984 & 56505 & 11635 \\
\hline 1995 & 12368 & 13269 & 4097 & 8552 & 11739 & 3722 & 20920 & 24768 & 6947 & 0.696 & 0.186 & 34427 & 5045 & 200961 & 28255 \\
\hline 1996 & 13466 & 13433 & 4312 & 11351 & 14288 & 4218 & 24817 & 28176 & 7871 & 0.837 & 0.204 & 36682 & 5692 & 104512 & 20450 \\
\hline 1997 & 12883 & 13952 & 4216 & 6461 & 12944 & 3736 & 19344 & 28007 & 6959 & 0.813 & 0.166 & 38315 & 5851 & 120679 & 21965 \\
\hline 1998 & 14401 & 11111 & 3238 & 5535 & 13947 & 3929 & 19936 & 26183 & 6539 & 0.786 & 0.168 & 32425 & 4383 & 137487 & 22190 \\
\hline 1999 & 10464 & 10057 & 3066 & 4856 & 9776 & 2843 & 15321 & 20848 & 5197 & 0.802 & 0.180 & 31073 & 4042 & 32330 & 9131 \\
\hline
\end{tabular}
Table 5.4.8.3 (cont.)
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline \multirow[t]{2}{*}{Year} & \multicolumn{3}{|l|}{Landings (tonnes)} & \multicolumn{3}{|l|}{Discards (tonnes)} & \multicolumn{3}{|l|}{Total catches (tonnes)} & \multicolumn{2}{|l|}{Mean F(2-6)} & \multicolumn{2}{|l|}{SSB (tonnes)} & \multicolumn{2}{|l|}{Recruitment
(thousands at age 1)} \\
\hline & Obs. & Pred. & SE & Obs. & Pred. & SE & Obs. & Pred. & SE & Estimate & SE & Estimate & SE & Estimate & SE \\
\hline 2000 & 6958 & 10964 & 3213 & 7893 & 26420 & 9130 & 14851 & 38063 & 10933 & 1.113 & 0.225 & 22701 & 3616 & 496649 & 98523 \\
\hline 2001 & 6762 & 7277 & 2893 & 6626 & 22434 & 7110 & 13389 & 31482 & 9674 & 0.696 & 0.159 & 42348 & 7472 & 186538 & 23567 \\
\hline 2002 & 7115 & 9344 & 3836 & 8862 & 10946 & 3457 & 15977 & 19849 & 5568 & 0.407 & 0.097 & 54470 & 7238 & 95903 & 14946 \\
\hline 2003 & 5337 & 16523 & 5043 & 4101 & 10513 & 3163 & 9438 & 25764 & 6123 & 0.536 & 0.123 & 56375 & 5985 & 116850 & 15095 \\
\hline 2004 & 3874 & 12727 & 3764 & 3705 & 7012 & 2133 & 7579 & 18494 & 4827 & 0.535 & 0.131 & 41707 & 4621 & 45952 & 6802 \\
\hline 2005 & 3792 & 15857 & 3980 & 2902 & 6248 & 1854 & 6694 & 20816 & 4570 & 0.759 & 0.138 & 38188 & 4238 & 30673 & 4327 \\
\hline 2006 & 6266 & 7213 & 997 & 4618 & 5725 & 1035 & 10884 & 12810 & 1558 & 0.591 & 0.062 & 22029 & 1528 & 94376 & 7512 \\
\hline 2007 & 3777 & 4100 & 516 & 3968 & 3762 & 662 & 7745 & 7842 & 996 & 0.427 & 0.051 & 20583 & 1280 & 18605 & 2676 \\
\hline 2008 & 2848 & 3847 & 504 & 1229 & 2258 & 510 & 4077 & 6388 & 913 & 0.322 & 0.044 & 24562 & 1716 & 13036 & 1988 \\
\hline 2009 & 2851 & 3386 & 511 & 1643 & 1304 & 319 & 4494 & 4644 & 601 & 0.264 & 0.040 & 19522 & 1547 & 12975 & 4121 \\
\hline 2010 & 3016 & 3318 & 425 & 2812 & 1444 & 321 & 5828 & 4845 & 622 & 0.288 & 0.052 & 15876 & 1681 & 103714 & 19625 \\
\hline 2011 & 1737 & 2207 & 283 & 1540 & 2338 & 540 & 3277 & 4600 & 722 & 0.182 & 0.040 & 24350 & 3694 & 17839 & 20294 \\
\hline 2012 & 5100 & 4817 & 649 & 529 & 2641 & 854 & 5629 & 8417 & 1601 & 0.258 & 0.069 & 33663 & 8247 & 30629* & 39733 \\
\hline 2013 & & 5416 & 2224 & & 2979 & 1591 & & 9095 & 3817 & 0.259 & 0.113 & 30365** & 11751 & 30629* & \\
\hline
\end{tabular}
**Estimate using GM recruitment in 2012.

\section*{Annex 5.4.8 EU management proposal}

Option for a harvest rule for the management of haddock in Division VIa and EC waters of Division Vb:
1. For 2010 and subsequent years the TAC will be set consistent with a fishing mortality rate of no more than 0.3 for appropriate age-groups, when the SSB in the end of the year in which the TAC is applied is estimated to be above 30,000 tonnes ( \(B_{p a}\) ).
2. Where the SSB referred to in paragraph 1 is estimated to be below Bpabut above 22,000 tonnes (Blim) the TAC shall not exceed a level which will result in a fishing mortality rate equal to 0.3-0.2*( \(\left.B_{p a}-S S B\right) /\left(B_{p a}-B_{\text {lim }}\right)\).
3. Where the SSB referred to in paragraph 2 is estimated to be below Blim the TAC shall be set at a level corresponding to a total fishing mortality rate of no more than 0.1.
4. Where the rules in paragraphs 1-3 would lead to a TAC which deviates by more than \(25 \%\) from the TAC of the preceding year, the TAC will be set that is no more than \(25 \%\) greater or \(25 \%\) less than the TAC of the preceding year. This consideration overrides paragraphs 1-3.
5. In the event that STECF advises that changes are required to the precautionary reference points \(B_{p a}(30,000 t)\) or Blim, (22,000t) paragraphs 1-4 shall be reviewed.

\section*{Rockall Haddock}
(Division VIb)

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice, based on the MSY approach is that catches should be no more than \(1,620 t\) in 2014 and if discard rates do not change from the average of the last seven years, this corresponds to landings of no more than 980 t , implying an Irish quota of \(\mathbf{7 7} \mathrm{t}\). FEAS agrees with this advice.

This stock falls into category I for data-rich stocks with full analytical assessments. FEAS notes that this stock has suffered from extremely low recruitment in recent years, but in 2013 recruitment is estimated to be above the most recent estimates. SSB is predicted to increase from very low levels and be above B MSY trigger \(^{\text {in 2014. ICES further }}\) advises that measures should be introduced to reduce catches of small haddock and to protect the incoming recruitment in 2013. FEAS agrees with this advice.


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

Part of the fishery lies in international waters where catches are unregulated.

FEAS notes that there is a joint EC-Russian Federation management plan in development that requires all nationalities to adhere to the agreed TAC. ICES evaluated a new HCR proposal for the Rockall haddock stock in August 2013 and found that a maximum F of 0.2 was required in the HCR to ensure consistency with the precautionary approach, under the low recruitment conditions observed since 2004

\section*{CURRENT MANAGEMENT}
- Since 2004 an autonomous TAC has been set for EU fleets operating in Divisions VIb, and Sub -areas XII and XIV.
- The 2013 TAC was 990 t . The associated Irish quota was 78 t .
- Part of Division VIb falls (since 1999) within international waters fished by non EU vessels (mainly Russian) which are not subject to a TAC. This allows for an unregulated fishery in the Rockall area.
- Following the NEAFC agreement in March 2001, NEAFC has maintained an area closure to all fishing (except long-lining) in the SW corner of the Rockall Bank. Data are inadequate to fully evaluate the impact of this measure on the stock status.


\section*{ICES ADVICE 5.4.9 Haddock in Division VIb (Rockall)}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that catches should be no more than 1620 t in 2014. If discard rates (at age) do not change from the average of the last seven years (2006-2012), this implies landings of no more than 980 t .

Further management measures should be introduced to reduce catches of small haddock and to protect the incoming recruitment in 2013.

\section*{Stock status}


Figure 5.4.9.1 Haddock in Division VIb (Rockall). Summary of stock assessment (weights in thousand tonnes). Predicted recruitment values are shaded. Top right: SSB and F for the time-series used in the assessment.

The spawning-stock biomass increased up to 2008 as a result of the 2001 and 2005 year classes but has decreased constantly since then. SSB in 2013 is below \(\mathrm{B}_{\mathrm{pa}}\). Fishing mortality has declined over time and is now below the \(\mathrm{F}_{\text {MSY }}\) proxy. Recruitment during 2007-2012 is estimated to be extremely weak. The 2013 survey data indicate that the 2012 year class (corresponding to the 2013 recruitment) is above the most recent estimates of recruitment.

\section*{Management plans}

A management plan is under development and was evaluated by ICES in 2013 (ICES, 2013a). ICES concluded that a maximum F value of 0.2 in the HCR was required to ensure consistency with the precautionary approach under the low recruitment conditions observed since 2004.

\section*{Biology}

The haddock stock at Rockall is an entirely separate stock from that on the continental shelf of the British Isles. The Rockall haddock stock has lower growth rates and individuals achieve a smaller size than in other haddock populations in the Northeast Atlantic.

\section*{Environmental influence on the stock}

Recruitment during 2007-2012 has been extremely low despite a moderate SSB. This may be related to rising seawater temperature on the Rockall bank. An increase in temperature leads to an acceleration of metabolic processes and an increase in the energy and food consumption. At the same time there was a significant reduction of Calanus finmarchicus which is the main food item for larval and juvenile haddock at Rockall. This situation of
food scarcity could have resulted in increased predation and food competition by grey gurnard. All these factors may have led to a reduction in the recruitment of Rockall haddock.

\section*{The fisheries}

Haddock in Division VIb are caught in a directed fishery and as a bycatch in demersal trawl and gillnet fisheries. Haddock are mostly taken in fisheries deploying otter trawls, but also by pair trawlers and gillnetters. In recent years, discards have been significantly reduced as a result of the small number of young haddock in the population.

\section*{Catch distribution Total catches \((2012)=726 \mathrm{t}(710 \mathrm{t}\) landings, 16 t discards \((2 \%\) by weight and \(14 \%\) by numbers \()\) ).}

\section*{Effects of the fisheries on the ecosystem}

In order to protect cold-water corals, four areas (northwest Rockall, Logachev Mounds, west Rockall Mounds, and Empress of British Banks) have been closed to demersal mobile and static gears since 2007.

\section*{Quality considerations}

At the current low population abundance, the forecast of yield in 2014 and SSB in 2015 is highly dependent on the estimates of the 2012 year class (i.e. 2013 age 1 recruitment). The 2013 Rock-WIBTS-Q3 survey indicates that this year class is stronger than other recent year classes, in line with the results from the 2012 survey. Because of the extremely low recruitment during 2007-2012 most of the present haddock population is of age 1 or in the plus group. Hence the average fishing mortality of ages \(2-5\) (reference age range) does not cover the bulk of the population at present.

Recent assessments have consistently underestimated F and overestimated SSB and recruitment.


Figure 5.4.9.2 Haddock in Division VIb (Rockall). Historical assessment results (final-year recruitment estimates included).

Scientific basis
\begin{tabular}{ll} 
Assessment type & Analytical age-based assessment (XSA). \\
Stock data category & 1 \\
Input data & \begin{tabular}{l} 
Commercial catches (international landings, ages and length frequencies from catch and \\
landing samplings); one survey index (Rock-WIBTS-Q3); fixed maturity ogive (knife-edge \\
at age 3 years old), fixed natural mortality (0.2).
\end{tabular} \\
Discards and bycatch & \begin{tabular}{l} 
Discards have been included in the assessment since 1991, from UK (Scotland) and Ireland. \\
Indicators
\end{tabular} \\
Other information & \begin{tabular}{l} 
None \\
The 2013 Rock-WIBTS-Q3 was used to inform about recruitment in 2013. Russian trawl- \\
acoustic survey and the trawl survey-based assessment, statistical catch-at-age analysis \\
(StatCam analytical model).
\end{tabular} \\
Working group report & WGCSE (ICES, 2013b).
\end{tabular}

\section*{ECOREGION Celtic Sea and West of Scotland STOCK Haddock in Division VIb (Rockall)}

\section*{Reference points}
\begin{tabular}{|c|c|c|c|}
\hline & Type & Value & Technical basis \\
\hline \multirow[t]{2}{*}{\begin{tabular}{l}
MSY \\
Approach
\end{tabular}} & MSY \(\mathrm{B}_{\text {trigger }}\) & 9000 t & \(\mathrm{B}_{\mathrm{pa}}\). \\
\hline & \(\mathrm{F}_{\text {MSY }}\) & 0.3 & Provisional proxy by analogy with North Sea haddock. Fishing mortalities close to \(\mathrm{F}_{\mathrm{sq}}\) in 2010. \\
\hline \multirow{4}{*}{Precautionary Approach} & \(\mathrm{B}_{\text {lim }}\) & 6000 t & \(\mathrm{B}_{\text {lim }}=\mathrm{B}_{\text {loss, }}\), the lowest observed spawning stock estimated in previous assessments. \\
\hline & \(\mathrm{B}_{\mathrm{pa}}\) & 9000 t & \(\mathrm{B}_{\mathrm{pa}}=\mathrm{B}_{\mathrm{lim}} * 1.5\). This is considered to be the minimum SSB required to obtain a high probability of maintaining SSB above \(\mathrm{B}_{\mathrm{lim}}\), taking into account the uncertainty of assessments. \\
\hline & \(\mathrm{F}_{\text {lim }}\) & Not defined. & Not defined due to uninformative stock recruitment data. \\
\hline & \(\mathrm{F}_{\mathrm{pa}}\) & 0.4 & This F is adopted by analogy with other haddock stocks as the F that provides a small probability that SSB will fall below \(\mathrm{B}_{\mathrm{pa}}\) in the long term. \\
\hline
\end{tabular}
(Unchanged since: 2010).

\section*{Outlook for 2014}

Basis: \(\mathrm{F}_{2013}=\mathrm{TAC}\) constraint \(=0.15\); \(\mathrm{R}(2013)[\mathrm{RCT}]=64475\) thousands; TAC constraint for landings \((2013)=\) 0.99 ; total catch \((2013)=1.22 ; \mathrm{SSB}(2014)=4.311 ; \mathrm{R}(2014)\) [25 percentile of the historical R time-series] \(=\) 10445 thousands.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline Rationale & \[
\begin{aligned}
& \text { Catch } \\
& \text { (2014) }
\end{aligned}
\] & Landings
(2014) & Discards (2014) & Basis & \(F\)
total
\((2014)\) & landings (2014) &  & \[
\mid \underset{(\mathbf{2 0 1 5})}{\text { SSB }}
\] & \[
\begin{gathered}
\text { \%SSB } \\
\text { change }^{1}
\end{gathered}
\] & \[
\left\lvert\, \begin{gathered}
\text { \%TAC } \\
\text { change }^{2}
\end{gathered}\right.
\] \\
\hline MSY approach & 1.62 & 0.98 & 0.64 & \[
\begin{gathered}
\hline \mathrm{F}_{\text {MSY }} \times \mathrm{SSB}_{2014 /} / \\
\text { MSY B } \mathrm{B}_{\text {trigger }} \\
\hline
\end{gathered}
\] & 0.14 & 0.11 & 0.04 & 21.7 & +403\% & -1\% \\
\hline Precautionary approach & 4.10 & 2.43 & 1.68 & \(\mathrm{F}_{\mathrm{pa}}=0.4\) & 0.40 & 0.29 & 0.11 & 18.7 & +334\% & +145\% \\
\hline Proposed Management plan & 2.01 & 1.21 & 0.80 & \(\mathrm{F}_{\mathrm{HCR}}=0.2\) and
\(\mathrm{TAC}_{2014}=\mathrm{TAC}_{\mathrm{F}=0.2}+\)
\(0.2 \times\left(\mathrm{TAC}_{2013}-\right.\)
\(\left.\mathrm{TAC}_{\mathrm{F}=0.2}\right)\) & 0.18 & 0.13 & 0.05 & 21.2 & +393\% & +22\% \\
\hline Zero catch & 0.0 & 0.0 & 0.0 & \(\mathrm{F}=0\) & 0.0 & 0.0 & 0.0 & 23.7 & +446\% & -100\% \\
\hline \multirow[t]{6}{*}{Other options} & 2.20 & 1.33 & 0.88 & \(\mathrm{F}_{\text {HCR }}=0.2\) & 0.20 & 0.15 & 0.05 & 21.0 & +387\% & +34\% \\
\hline & 2.35 & 1.42 & 0.94 & average F 2010-2012 & 0.21 & 0.16 & 0.06 & 20.8 & +381\% & +43\% \\
\hline & 1.38 & 0.84 & 0.55 & -15\% TAC & 0.12 & 0.09 & 0.03 & 22.0 & +410\% & -15\% \\
\hline & 1.63 & 0.99 & 0.65 & 0\% TAC & 0.15 & 0.11 & 0.04 & 21.7 & +403\% & 0\% \\
\hline & 3.20 & 1.91 & 1.29 & \(\mathrm{F}_{\text {MSY }}\) & 0.30 & 0.22 & 0.08 & 19.8 & +357\% & +93\% \\
\hline & 1.89 & 1.14 & 0.75 & +15\% TAC & 0.17 & 0.12 & 0.05 & 21.4 & +396\% & +15\% \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1)}\) SSB 2015 relative to SSB 2014.
\({ }^{2)}\) Landings 2014 relative to TAC 2013.
Total catches have been divided into landings and discards using the average ratio (at age) of discards to catches over the period 2006-2012.

\section*{MSY approach}

Following the ICES MSY approach implies a fishing mortality at \(\mathrm{F}_{\mathrm{MSY}-\mathrm{HCR}}=\mathrm{F}_{\mathrm{MSY}} \times \mathrm{SSB}_{2014} / \mathrm{MSY} \mathrm{B}_{\text {trigger }}=0.14\), resulting in catches of no more than \(1620 t\) in 2014. If discard rates (at age) do not change from the average of the period 2006-2012, this implies landings of no more than 980 t . This is expected to lead to an SSB of 21700 t in 2015, which is above MSY \(B_{\text {trigger }}\).

Further management measures should be introduced to reduce catches of small haddock and to protect the incoming recruitment in 2013.

\section*{Precautionary approach}

Under the precautionary approach catches in 2014 should be no more than 4100 t . If discard rates (at age) do not change from the average of the period 2006-2012, this implies landings of no more than 2430 t . This is expected to lead to an SSB of 18700 t in 2015, which is above \(\mathrm{B}_{\mathrm{pa}}\).

Further management measures should be introduced to reduce catches of small haddock and to protect the incoming recruitment in 2013.

\section*{Management plan}

ICES evaluated a new HCR proposal for the Rockall haddock stock in August 2013 (ICES, 2013a) and found that a maximum F of 0.2 was required in the HCR to ensure consistency with the precautionary approach, under the low recruitment conditions observed since 2004. If \(\mathrm{F}=0.2\) in 2014, then SSB is forecast to be above \(\mathrm{B}_{\mathrm{pa}}\) at the end of 2014. In these circumstances, the proposed HCR initially calculates catches according to a fishing mortality of 0.2 in 2014, followed by the application of a TAC constraint adjustment. This results in F \(=0.18\) in 2014, corresponding to catches of no more than 2010 t in 2014. If discard rates (at age) do not change from the average of the period 2006-2012, this implies landings of no more than 1210 t .

The TAC in the proposed management plan refers to total catch, not just landings. The management plan additionally indicates that measures should be put in place to ensure that total catch does not exceed the established TAC, including measures to record and minimize discards. After the introduction of these measures, the human consumption TAC method currently used by ICES should not be applied.

\section*{Additional considerations}

ICES evaluation of a proposed HCR in August 2013 (ICES, 2013a) noted that if the low recruitment generally observed since 2004 were to prevail in the future, it is unlikely that the ICES HCR for the MSY approach with the existing reference points would be considered precautionary. This year the ICES MSY approach option corresponds to higher SSB in 2015 than the proposed management plan HCR (which has been evaluated and found to be precautionary). ICES is providing advice this year that follows the MSY approach with an \(\mathrm{F}_{\text {MSY }}\) proxy of 0.3 , but this may need to be reconsidered in the future.

The TAC presently only applies to catches in the EU zone. The TAC should apply to all areas and countries having fisheries for this stock. Since 1999 part of Division VIb has been in international waters where non-EU vessels are not subject to TAC. This allows for an unregulated fishery in the Rockall area. In later years, effort and catch of non-EU fleets have significantly declined and there was no non-EU fishery in 2011, whereas it was very low in 2012.

The forecast predicts future catches disaggregated into landing and discard components. The discard ratio (over the whole population) averages around \(60 \%\) (by weight) during 1991-2003 and 20\% in 2004-2011. In 2012 the discard ratio became very low as a result of poor year classes prior to 2012. Some countries land the whole catch while others discard part of the catch. Discards are expected to increase in 2013 and 2014 as a consequence of the stronger 2012 year class. Further management measures should be introduced to reduce catches of small haddock in order to maximize their contribution to future yield and SSB.

Haddock is taken in a mixed fishery together with monk and megrim. Some of the fisheries include substantial catches of blue whiting and non-assessed species such as grey gurnard.

\section*{The effects of regulations}

Following the NEAFC agreement in March 2001, an area of the NEAFC zone around Rockall was closed to fishing. In spring 2002, part of the shallow water in the EU component was also closed to trawling. The main goal of the ban was to protect young haddock distributed in shallow water. At the request of NEAFC, ICES has this year provided advice on the Rockall closure area and additional measures for the protection of juveniles (ICES, 2013b). ICES concluded that the overall impact of the current closure area is difficult to assess, and advised that a number of technical and operational measures could be examined to improve the selection pattern of the entire fishery.

\section*{Data and methods}

The assessment is based on catch numbers-at-age and one survey index (Rock-WIBTS-Q3). After an interruption in 2010, the survey was resumed in 2011 with a new gear, but an analysis showed that there was no detectable difference between the older and new survey on haddock indices (ICES, 2012). The survey area coverage was also reviewed and extended into deeper waters starting from 2011. In most cases the survey areas that include areas with depths less than 200 m are regarded as the standard survey areas. The indices obtained from the standard survey areas were used for the assessment. New survey indices will be used for the assessment once the timeseries for the whole area of haddock distribution is of sufficient length.

Discarding occurs in part of the fishery and has been estimated and used in the assessment.

\section*{Uncertainties in assessment and forecast}

A main uncertainty in the assessment concerns the estimates of discards in the EU fleets. In some years, including 2012, these are directly estimated from sampling on-board Scottish and Irish vessels, whereas in other years they are inferred using survey length frequencies, average fishery selectivity and discarding ogives, and length frequencies from port sampling. In 2010 there was no discard sampling or survey, and average discard rates were applied. Additionally, there are doubts on the degree of age-reading agreement by international experts. The determination of the fishing mortality for the latest strong year class (2005) is uncertain because that year class is now included in the plus group.

The 2005 and 2012 year classes are predicted to dominate the stock biomass in 2014 and 2015, and therefore the estimates of these year classes have a strong impact on the short-term forecast.

\section*{Comparison with previous assessment and advice}

The assessment is an update of last year's assessment. Fishing mortality in 2011 has been revised upward by \(85 \%\), and SSB in 2012 has been revised downward by \(13 \%\), when compared with last year's assessment.

The basis for the advice is the same as last year, the MSY approach.

\section*{Sources}

ICES, 2012. Report of the International Bottom Trawl Survey Working Group (IBTSWG), 27-30 March, Lorient, France. ICES CM 2012/SSGESST:03.
ICES. 2013a. Request from NEAFC to evaluate the proposals for the harvest control components of the management plan for Rockall haddock fisheries. In Report of the ICES Advisory Committee, 2013. ICES Advice 2013, Book 5, Section 5.3.3.2.
ICES. 2013b. Request from NEAFC on the closure area and additional measures for the protection of juvenile haddock on Rockall Bank. In Report of the ICES Advisory Committee, 2013. ICES Advice 2013, Book 5, Section 5.3.3.3.
ICES. 2013c. Report of the Working Group on Celtic Seas Ecosystems (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:13.


Figure 5.4.9.3

Haddock in Division VIb (Rockall). Yield-per-recruit analysis (left panel) and stock-recruitment relationship (right panel).

Table 5.4.9.1 Haddock in Division VIb (Rockall). ICES advice, management, landings, and discards.
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
ICES Advice \\
Single-stock exploitation boundaries from 2004 onwards
\end{tabular} & Predicted corresp. to advice & catch & Agreed TAC & Official landings & \begin{tabular}{l}
ICES \\
landings
\end{tabular} & Discards \\
\hline 1987 & Precautionary TAC & 10.0 & & & 8.0 & 8.4 & n/a \\
\hline 1988 & Precautionary TAC & 10.0 & & & 7.6 & 7.9 & n/a \\
\hline 1989 & Status quo F; TAC & 18.0 & & & 6.6 & 6.7 & n/a \\
\hline 1990 & Precautionary TAC & 5.5 & & & 8.2 & 3.9 & n/a \\
\hline 1991 & Precautionary TAC & 5.5 & & & 5.9 & 5.7 & 13.23 \\
\hline 1992 & Precautionary TAC & 3.8 & & & 4.5 & 5.3 & 11.87 \\
\hline 1993 & \(80 \%\) of F(91) & 3.0 & & & 4.1 & 4.8 & 9.85 \\
\hline 1994 & If required, precautionary TAC & - & & & 3.7 & \(5.7{ }^{1}\) & 11.02 \\
\hline 1995 & No long-term gain in increasing F & \(5.1{ }^{2}\) & & & 5.5 & 5.6 & 9.17 \\
\hline 1996 & No long-term gains in increasing F & \(6.9{ }^{2}\) & & & 6.8 & 7.1 & 9.36 \\
\hline 1997 & No advice given & \(4.9{ }^{2}\) & & & 5.2 & 5.2 & 5.89 \\
\hline 1998 & No increase in F & 4.9 & & & 5.1 & 4.5 & 10.86 \\
\hline 1999 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & 3.8 & & & 6.0 & 5.1 & 11.06 \\
\hline 2000 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<3.5\) & & & \(5.7^{3}\) & \(5.3{ }^{4}\) & 6.61 \\
\hline 2001 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<2.7\) & & & \(2.3{ }^{3}\) & \(2.0{ }^{4}\) & 1.54 \\
\hline 2002 & Reduce F below 0.2 & \(<1.3\) & & & 3.0 & 3.3 & 4.15 \\
\hline 2003 & Lowest possible F & - & & & 6.1 & 6.2 & 5.52 \\
\hline 2004 & Lowest possible catch \({ }^{5}\) & & & \(0.702^{8}\) & 6.3 & 6.4 & 0.88 \\
\hline 2005 & Lowest possible catch \({ }^{5}\) & & & \(0.702^{8}\) & 5.2 & 5.2 & 0.51 \\
\hline 2006 & Lowest possible catch \({ }^{5}\) & & & \(0.597^{8}\) & 2.8 & 2.8 & 0.39 \\
\hline 2007 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}{ }^{5}\) & \(<7.11\) & & \(4.615^{8}\) & 3.3 & 3.3 & 2.24 \\
\hline 2008 & Keep F below \(\mathrm{F}_{\mathrm{pa}}{ }^{5}\) & \(<10.6^{6}\) & & \(6.916^{8}\) & 4.2 & 4.2 & 2.10 \\
\hline 2009 & No long-term gains in increasing \(\mathrm{F}^{5}\) & \(<4.3^{7}\) & & \(5.879^{8}\) & 3.8 & 3.8 & 1.56 \\
\hline 2010 & No long-term gains in increasing \(\mathrm{F}^{5}\) & \(<3.3^{7}\) & & \(4.997{ }^{8}\) & 3.4 & 3.4 & 0.31 \\
\hline 2011 & See scenarios & - & & \(3.748^{8}\) & 1.9 & 1.9 & 0.15 \\
\hline 2012 & MSY approach & \(<3.3^{7}\) & & \(3.300^{8}\) & 0.7 & 0.7 & 0.02 \\
\hline 2013 & No directed fisheries, minimize bycatch and discards & 0 & & \(0.99{ }^{8}\) & & & \\
\hline 2014 & MSY approach & \(<1.62^{6}\) & & & & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1}\) Including misreporting.
\({ }^{2}\) Landings at status quo F.
\({ }^{3}\) Incomplete data.
\({ }^{4}\) Discards are not taken into account for the assessment, and data of the Russian fleet which lands the whole catch were adjusted to exclude fish below MLS of 30 cm .
\({ }^{5}\) Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.
\({ }^{6}\) This corresponds to catch (= landings + discards).
\({ }^{7}\) This corresponds to landings.
\({ }^{8}\) Agreed EU TAC for Division VIb and Subareas XII and XIV.
\(\mathrm{n} / \mathrm{a}=\) Not available .
Table 5.4.9.2 Haddock in Division VIb (Rockall). Landings (tonnes) in 1995-2012, as officially reported to ICES, and ICES estimates.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & \(2012{ }^{1}\) \\
\hline Faroe Islands & - & - & - & - & - & n/a & n/a & - & - & - & - & 2 & 2 & 16 & 16 & 42 & 2 & 53 \\
\hline France & \(\ldots{ }^{2}\) & - & - & - & - & 5 & 2 & - & 1 & - & - & - & - & - & - & - & <1 & \\
\hline Iceland & - & - & + & - & 167 & - & - & - & - & - & - & - & - & - & - & - & - & \\
\hline Ireland & 677 & 747 & 895 & 704 & 1021 & 824 & 357 & 206 & 169 & 19 & 105 & 41 & 338 & 721 & 352 & 169 & 123 & 31 \\
\hline Norway & 29 & 24 & 24 & 40 & 61 & 152 & 70 & 49 & 60 & 32 & 33 & 123 & 84 & 36 & 71 & 65 & 40 & 48 \\
\hline Portugal & - & - & - & 4 & - & - & - & - & - & - & - & - & - & - & - & - & - & \\
\hline Russian Federation & - & - & - & - & 458 & 2154 & 630 & 1630 & 4237 & 5844 & 4708 & 2154 & 1282 & 1669 & 55 & 198 & - & 1 \\
\hline Spain & 28 & 1 & 22 & 21 & 25 & 47 & 51 & 7 & 19 & - & - & 5 & - & - & - & - & - & \\
\hline UK (E,W\&NI) & 318 & 293 & 165 & 561 & 288 & 36 & - & - & 56 & - & - & - & - & - & - & - & - & \\
\hline UK (Scot.) & 4439 & 5753 & 4114 & 3768 & 3970 & 2470 & 1205 & \(1145^{3}\) & 1607 & \(411^{3}\) & \(332^{3}\) & \(440^{3}\) & \(1643^{3}\) & \(1779^{3}\) & \(2951{ }^{3}\) & \(2931{ }^{3}\) & \(1738^{3}\) & \(577^{3}\) \\
\hline Total & 5491 & 6818 & 5220 & 5098 & 5990 & 5688 & 2315 & 3037 & 6148 & 6306 & 5178 & 2765 & 3349 & 4221 & 3445 & 3405 & 1903 & 710 \\
\hline Unallocated catch & -379 & -543 & -591 & -599 & -851 & -357 & -279 & 299 & \(94^{5}\) & \(139^{5}\) & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline ICES estimate & 5112 & 6275 & 4629 & 4499 & 5139 & \(5331{ }^{4}\) & \(2036{ }^{4}\) & \(3336^{4}\) & \(6242^{4}\) & 6445 & 5179 & 2765 & 3349 & 4221 & 3445 & 3405 & 1903 & 710 \\
\hline
\end{tabular}

\footnotetext{
Preluded in Division VIa.
\({ }^{2}\) Inclat
\({ }^{3}\) Includes UK England, Wales, and N. Ireland landings.
\({ }_{5}^{4}\) Includes the total Russian catch.
\({ }^{5}\) Non-official.
}

Table 5.4.9.3 Haddock in Division VIb (Rockall). Summary of stock assessment.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline \begin{tabular}{l}
Year \\
Age 1 thousand
\end{tabular} & \begin{tabular}{l}
Recruitment \\
tonnes
\end{tabular} & \[
\begin{gathered}
\hline \text { SSB } \\
\text { tonnes }
\end{gathered}
\] & \begin{tabular}{l}
Catches \\
tonnes
\end{tabular} & \begin{tabular}{l}
Landings \\
tonnes
\end{tabular} & Discards tonnes & \begin{tabular}{l}
Mean F \\
Total \\
Ages 2-5
\end{tabular} \\
\hline 1991 & 109844 & 15667 & 18883 & 5655 & 13228 & 0.7131 \\
\hline 1992 & 109616 & 18986 & 17191 & 5320 & 11871 & 0.8117 \\
\hline 1993 & 123694 & 19888 & 14637 & 4784 & 9853 & 0.6145 \\
\hline 1994 & 68540 & 24268 & 16756 & 5733 & 11023 & 0.5807 \\
\hline 1995 & 61451 & 29501 & 14755 & 5587 & 9168 & 0.5976 \\
\hline 1996 & 62515 & 25451 & 16431 & 7075 & 9356 & 0.5632 \\
\hline 1997 & 71764 & 21934 & 11060 & 5166 & 5894 & 0.391 \\
\hline 1998 & 72446 & 21047 & 15846 & 4984 & 10862 & 0.5893 \\
\hline 1999 & 48687 & 16406 & 16283 & 5221 & 11062 & 0.8596 \\
\hline 2000 & 28204 & 11683 & 11167 & 4558 & 6609 & 1.099 \\
\hline 2001 & 79065 & 6680 & 3658 & 1918 & 1535 & 0.4201 \\
\hline 2002 & 106259 & 7010 & 7269 & 2571 & 4152 & 0.4791 \\
\hline 2003 & 48764 & 13627 & 11490 & 5961 & 5521 & 0.6838 \\
\hline 2004 & 14195 & 16820 & 7320 & 6400 & 883 & 0.646 \\
\hline 2005 & 15672 & 16662 & 5696 & 5191 & 505 & 0.3834 \\
\hline 2006 & 92038 & 14398 & 3142 & 2759 & 386 & 0.2544 \\
\hline 2007 & 10443 & 11930 & 5590 & 3348 & 2242 & 0.4888 \\
\hline 2008 & 3103 & 24655 & 6321 & 4205 & 2100 & 0.4808 \\
\hline 2009 & 1043 & 15733 & 4794 & 3237 & 1557 & 0.3994 \\
\hline 2010 & 1826 & 13262 & 3710 & 3404 & 306 & 0.2824 \\
\hline 2011 & 168 & 8333 & 2057 & 1905 & 152 & 0.2293 \\
\hline 2012 & 58 & 9218 & 726 & 710 & 16 & 0.1328 \\
\hline 2013 & 64475* & 6224 & & & & \\
\hline Average & 50733 & 16060 & 9763 & 4349 & 5376 & 0.532 \\
\hline
\end{tabular}
* RCT3 estimate.

\subsection*{5.4.9 Appendix: ICES suggestion for the Harvest Control Rule for Rockall haddock fishery}

ICES suggested in the harvest control rule advice provided in August 2013 (ICES, 2013a) that the HCR that was found to be consistent with the precautionary approach should be rewritten as follows, to avoid ambiguities in its application.

In the following, the TACs refer to total catches, not just landings. Measures shall be put in place to ensure that total catch does not exceed the established TAC, including measures to record and minimise discards. After the introduction of these measures, the method of setting a human consumption TAC currently used by ICES shall not be applied.
"1. Every effort shall be made to maintain a level of spawning-stock biomass (SSB) greater than \(B_{p a}\) and a minimum level of SSB greater than \(B_{\text {lim }}\).

In paragraphs 2-5, \(S S B_{0.2}\) denotes the \(S S B\) at the end of the year in which the TAC is applied, assuming \(F=0.2\) during that year. No iterative process is involved anywhere in the calculations in paragraphs 2-5.
2. For [20XX] and subsequent years the Parties agreed to set a TAC to be consistent with a fishing mortality rate of no more than 0.2 for appropriate age groups, when \(\operatorname{SSB}_{0.2}\) is estimated to be above \(B_{p a}\).
3. The Parties agreed that the TAC that results from the application of the fishing mortality referred to in paragraph 2 will be adjusted according to the following formula:
\[
T A C_{y}=T A C_{f}+0.2 \times\left(T A C_{y-1}-T A C_{f}\right)
\]
where \(T A C_{y}\) is the \(T A C\) that is to be set by the management plan, \(T A C_{y^{-1}}\) is the TAC that was fixed the previous year, and \(T A C_{f}\) is the \(T A C\) resulting from the provisions in paragraphs 1 and 2.
4. Where \(S S B_{0.2}\) is estimated to be below \(B_{p a}\) but above \(B_{\text {lim }}\), the TAC shall not exceed a level, which will result in a fishing mortality rate equal to
\[
0.2-\left[0.2 \times\left(B_{p a}-S S B_{0.2}\right) /\left(B_{p a}-B_{l i m}\right)\right] .
\]

This consideration overrides paragraph 3.
5. Where \(\operatorname{SSB}_{0.2}\) is estimated to be below \(B_{\text {lim }}\), there should be no directed fishery for haddock \((F=0.0)\) and bycatch and discards of haddock should be minimized. This consideration overrides paragraph 3.
6. No later than the end of the fifth year after the implementation of the Plan the Parties shall review the Plan, taking into account inter alia advice from ICES concerning the performance of the Plan."

\section*{West of Scotland Whiting}

\section*{(Division Vla)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises on the basis of the precautionary approach that catches in 2014 should be reduced to the lowest possible level and that effective technical measures should be implemented to reduce discards in the Nephrops (TR2) fleet. FEAS considers that this stock has collapsed and agrees with this advice.

This stock falls into ICES category I data-rich stocks with full analytical assessments. \(F_{\text {msy }}\) is not defined for this stock and advice is based on the precautionary approach. Fishing mortality is well below \(F_{p a}\), however due to continued weak recruitment SSB is below \(B_{\text {lim }}\).

FEAS notes that the majority of whiting catches are taken by the TR2 fleet and subsequently discarded.


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

\section*{CURRENT MANAGEMENT}
- The TAC area covers EC waters in Division Vb and Sub-areas VI, XII and XIV.
- The assessment area covers Division Vla only but landings from other areas are negligible.
- The TAC in 2013 was 292 t with an associated Irish quota of 87 t .
- There are no explicit management objectives or management plans for this stock.
- Whiting is taken with cod and haddock in mixed demersal fisheries and management advice should be considered in that context.

- There are strong indications that management control is not effective in limiting the catch. The whiting catches in 2012 were over three times the TAC and \(70 \%\) of the catch is discarded.
- Effort reductions as part of the Cod Long Term Management Plan (EC Reg.I342/2008) will also reduce catch and discarding of whiting in this area.

\section*{ICES ADVICE 5.4.41 Whiting in Division VIa (West of Scotland)}

\section*{Advice for 2014}

ICES advises on the basis of the precautionary approach that catches in 2014 should be reduced to the lowest possible level and that effective technical measures should be implemented to reduce discards in the Nephrops (TR2) fleet.

\section*{Stock status}


Figure 5.4.41.1
Whiting in Division VIa (West of Scotland). Observed catches and summary of stock assessment (weights in thousand tonnes). Top right: SSB and F for the time-series used in the assessment.

The spawning-stock biomass remains very low compared to the historical estimates (and well below \(\mathrm{B}_{\text {lim }}\) ). Fishing mortality has declined continuously since around 2000 and is now very low. Recruitment is estimated to have been very low over the last decade. The 2009 and, to a lesser degree, 2011 year classes are estimated to be above the recent average.

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

Whiting occurs throughout northeast Atlantic waters, in a wide range of depths, from shallow inshore waters down to 200 m . Adult whiting are widespread throughout Division VIa, while high numbers of juvenile fish occur in inshore areas. There may be a degree of mixing of adult fish between Division IVa whiting and the Division VIa component off the northwest of Scotland.

\section*{The fisheries}

Whiting is primarily taken as a bycatch with other species, such as haddock, cod, and anglerfish. Whiting in Division VIa are caught mainly by \(80-120 \mathrm{~m}\) trawlers. Since 2000 there has been a big reduction in the largemeshed (TR1) trawl and seine effort, but no reduction by smaller-meshed (TR2) gears. At present a higher proportion of the overall effort is by relatively small-meshed trawls. There has been a tendency to shift from the use of heavy groundgear (like rockhopper) to lighter groundgear.

\section*{Catch distribution Total catch \((2012)=1041 \mathrm{t}(30 \%\) landings \((313 \mathrm{t})\) and \(70 \%\) discards \()\).}

\section*{Quality considerations}

An analytic TSA assessment indicates an increasing mismatch between the survey catchability and the fishery. This may lead to unknown underestimation of stock size. The mean weights-at-age in the catch have also been quite variable in recent years because of low and patchy sampling levels. An increase in the mesh size of the TR1 fleet affects the fishing selectivity for approximately \(40 \%\) of the catch.

With the new legislation on reporting landings, the quality of landings data is likely to continue to improve. The inclusion of the two new Scottish survey time-series (initiated in 2011) in the coming years will enhance the assessment of this stock.


Figure 5.4.41.2 Whiting in Division VIa (West of Scotland).Historical assessment results (final-year recruitment estimates are included.

\section*{Scientific basis}
\begin{tabular}{|c|c|}
\hline Assessment type & Age-based analytic assessment (TSA). \\
\hline Stock category & Category 1. \\
\hline Input data & Commercial catches (international landings, ages and length frequencies from catch sampling); three survey indices (ScoGFS-WIBTS-Q1, ScoGFS-WIBTS-Q4, and IGFS-WIBTS-Q1); fixed maturity data from surveys; natural mortalities estimated from mean weight-at-age (Lorenzen's model) using mean weight data from market sampling and discard observations. \\
\hline Discards and bycatch & Included in the TSA assessment; from 1981 to 1994 and from 2006 onwards, age structure only used with unaccounted mortality from 1995 to 2005. Discards from Scottish trawlers and Irish trawlers. \\
\hline Indicators & Surveys: UKSGFS-WIBTS-Q1 and UKSGFS-WIBTS-Q4. \\
\hline Other information & The stock was benchmarked in 2012 (WKROUND; ICES, 2012). \\
\hline Working group report & WGCSE (ICES, 2013). \\
\hline
\end{tabular}

\section*{ECOREGION Celtic Sea and West of Scotland STOCK Whiting in Division VIa (West of Scotland)}

\section*{Reference points}
\begin{tabular}{|c|c|c|c|}
\hline & Type & Value & Technical basis \\
\hline \multirow[t]{2}{*}{MSY approach} & MSY B \({ }_{\text {trigger }}\) & Not defined. & \\
\hline & \(\mathrm{F}_{\text {MSY }}\) & Not defined. & \\
\hline \multirow{4}{*}{Precautionary approach} & \(\mathrm{B}_{\text {lim }}\) & 16000 t & Blim = Bloss(1998), the lowest observed spawning stock estimated in previous assessments. \\
\hline & \(\mathrm{B}_{\mathrm{pa}}\) & 22000 t & \(\mathrm{B}_{\mathrm{pa}}=\mathrm{B}_{\lim } \times 1.4\). This is considered to be the minimum SSB required to have a high probability of maintaining SSB above Blim, taking into account the uncertainty of assessments. \\
\hline & \(\mathrm{F}_{\text {lim }}\) & 1.0 & Flim is the fishing mortality above which stock decline has been observed. \\
\hline & \(\mathrm{F}_{\mathrm{pa}}\) & 0.6 & \(\mathrm{F}_{\mathrm{pa}}=0.6 \times\) Flim. This F is considered to have a high probability of avoiding Flim. \\
\hline
\end{tabular}
(unchanged since: 1998)

\section*{Outlook for 2014}

Basis: \(\mathrm{F}(2013)=\mathrm{F}_{\mathrm{sq}}(2010-2012\) rescaled to 2012 \()=0.07 ; \mathrm{SSB}(2014)=11200 ; \mathrm{R}(2013)=72.8\) million;
landings (2013) \(=339\);
Discards \((2013)=300\).
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline Rationale & \[
\begin{gathered}
\hline \text { Catch } \\
\text { Total } \\
(2014) \\
\hline
\end{gathered}
\] & \begin{tabular}{l}
Landings \\
(2014)
\end{tabular} & Discards
(2014) & Basis & \[
\begin{gathered}
\hline F \\
\text { Total } \\
(2014) \\
\hline
\end{gathered}
\] & \begin{tabular}{l}
F
Landings \\
(2014)
\end{tabular} & F
Discards (2014) & \[
\begin{gathered}
\text { SSB } \\
(2015)
\end{gathered}
\] & \[
\begin{gathered}
\hline \% \text { SSB } \\
\text { change }{ }^{1)}
\end{gathered}
\] \\
\hline Precautionary approach & 0 & 0 & 0 & \(\mathrm{B}_{\mathrm{pa}}\) & 0 & 0 & 0 & 12100 & 8.0\% \\
\hline Zero catch & 0 & 0 & 0 & \(\mathrm{F}=0\) & 0 & 0 & 0 & 12100 & 8.0\% \\
\hline \multirow[t]{6}{*}{Other options} & 126 & 65 & 62 & \(\mathrm{F}_{2013} \times 0.2\) & 0.014 & 0.007 & 0.007 & 11940 & 6.6\% \\
\hline & 251 & 128 & 123 & \(\mathrm{F}_{2013} \times 0.4\) & 0.028 & 0.013 & 0.014 & 11780 & 5.2\% \\
\hline & 375 & 191 & 183 & \(\mathrm{F}_{2013} \times 0.6\) & 0.042 & 0.02 & 0.021 & 11630 & 3.8\% \\
\hline & 496 & 253 & 243 & \(\mathrm{F}_{2013} \times 0.8\) & 0.054 & 0.026 & 0.028 & 11480 & 2.5\% \\
\hline & 616 & 314 & 302 & \(\mathrm{F}_{2013} \times 1.0\) & 0.069 & 0.033 & 0.036 & 11330 & 1.2\% \\
\hline & 735 & 374 & 361 & \(\mathrm{F}_{2013} \times 1.2\) & 0.082 & 0.04 & 0.042 & 11180 & -0.2\% \\
\hline
\end{tabular}

Weights in tonnes.
\({ }^{1)}\) SSB 2015 relative to SSB 2014.

\section*{Precautionary approach}

Given the low SSB and low recruitments in recent years, it is not possible to identify any non-zero catch which would be compatible with the precautionary approach. Catches should be reduced to the lowest possible level.

Effective technical measures should be implemented to improve the selection pattern and reduce discards in the Nephrops (TR2) fleet.

\section*{Additional considerations}

There are strong indications that management control is not effective in limiting the catch. The proportion of discarded fish is very high and appears to have increased in recent years. More than half of the annual catch weight consists of undersized or low-value whiting which are discarded. Approximately \(80 \%\) of these discards come from the Nephrops (TR2) fishery. Measures to reduce discards and to improve the exploitation pattern would be beneficial to the stock and to the fishery, particularly when there are indications that the 2009 and 2011 year classes are relatively strong compared to other recent recruitments.

\section*{Regulations and their effects}

The fishery is managed by a combination of TAC and technical measures, and in addition, the cod recovery plan measures (including effort restrictions and closed areas) are also expected to affect whiting. A detailed description of the effects of cod recovery measures and regulations can be found in the Division VIa cod advice (Section 5.4.3).

Unreported landings are expected to have reduced under the UK "Buyers and Sellers" regulation, the Irish "Sales Note" regulation, and other management measures to improve compliance. Discard rates have, however, remained high.

\section*{Changes in fishing technology and fishing patterns}

Whiting in Division VIa are caught mainly by Scottish trawlers. There has been a reduction in trawl and seine effort, but with a more moderate reduction by Nephrops trawlers. At present a higher proportion of the overall effort is by relatively small-meshed trawls. There has been a tendency to shift from the use of heavy groundgear (like rockhopper) to lighter groundgear.

Effort data from 1998 onwards from UK vessels (one of the main countries fishing in the area) suggest that overall, effort has declined in recent years in Division VIa, and that declines in particular categories have not been compensated for by rises in other categories. Larger-meshed whitefish demersal trawls were the most important gears in Division VIa prior to 2002, but since then there has been a marked decline in kW -days by this category. Single-rig Nephrops trawls in the 70-99 mm mesh category are the other major gears in use and effort by these seems to have been maintained at a fairly stable level throughout the time-series.

Numerous other gears make generally small contributions to the overall effort and the pattern in most of these has been either a downward trend (e.g. seine nets and midwater trawls) or a fluctuation without trend (e.g. fixed nets).

\section*{Uncertainties in assessment and forecast}

Some changes have been made to the survey design in the past, but surveys are considered to be a reasonable indicator of stock trends from the mid-1990s. The survey gear changed in 2011 to bring it in line with other surveys in the area so that these can be combined in future to provide a more robust and precise survey index. The opportunity was also taken to improve the survey design at this time; it is now random-stratified.

\section*{Comparison with previous assessment and advice}

This assessment is an update of the last year's assessment (TSA). The basis of this year's advice is the same as last year, the precautionary approach.

\section*{Sources}

ICES. 2012. Report of the Benchmark Workshop on Western Waters Roundfish (WKROUND), 22-29 February 2012, Aberdeen, UK. ICES CM 2012/ACOM:49. 283 pp.
ICES. 2013. Report of the Working Group on Celtic Seas Ecosystems (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:13.


Figure 5.4.41.3 Whiting in Division VIa (West of Scotland). Stock-recruitment relationship (left panel) and yield-perrecruit analysis (right panel).

Table 5.4.41.1 Whiting in Division VIa (West of Scotland). ICES advice, management, catch, and landings.
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
ICES Advice / \\
Single-stock exploitation boundaries since 2004
\end{tabular} & Predicted catch corresp. to advice & Agreed TAC & Official landings & ICES landings & Discards & ICES catch \\
\hline 1987 & No increase in F & 15.0 & 16.4 & 12.4 & 11.5 & 6.9 & 18.4 \\
\hline 1988 & No increase in F; TAC & 15.0 & 16.4 & 11.9 & 11.4 & 11.8 & 23.1 \\
\hline 1989 & No increase in F; TAC & 13.0 & 16.4 & 7.7 & 7.5 & 4.1 & 11.6 \\
\hline 1990 & No increase in F; TAC & 11.0 & 11.0 & 6.0 & 5.6 & 4.4 & 10.0 \\
\hline 1991 & \(70 \%\) of effort (89) & - & 9.0 & 6.9 & 6.7 & 5.3 & 12.0 \\
\hline 1992 & \(70 \%\) of effort (89) & - & 7.5 & 6.0 & 6.0 & 9.4 & 15.4 \\
\hline 1993 & \(70 \%\) of effort (89) & - & 8.7 & 6.8 & 6.9 & 8.5 & 15.4 \\
\hline 1994 & \(30 \%\) reduction in effort & - & 6.8 & 5.8 & 5.9 & 8.9 & 14.8 \\
\hline 1995 & Significant reduction in effort & - & 6.8 & 6.3 & 6.1 & 7.6 & 13.7 \\
\hline 1996 & Significant reduction in effort & - & 10.0 & 6.6 & 7.2 & 6.9 & 14.1 \\
\hline 1997 & Significant reduction in effort & - & 13.0 & 6.2 & 6.3 & 4.9 & 11.2 \\
\hline 1998 & No increase in F & 6.5 & 9.0 & 4.7 & 4.6 & 5.8 & 10.5 \\
\hline 1999 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & 4.3 & 6.3 & 4.7 & 4.6 & 3.1 & 7.7 \\
\hline 2000 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<4.3\) & 4.3 & 3.2 & 3.0 & 6.7 & 9.7 \\
\hline 2001 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & <4.2 & 4.0 & 2.5 & 2.4 & 2.4 & 4.9 \\
\hline 2002 & \(\mathrm{SSB}>\mathrm{B}_{\mathrm{pa}}\) in the short term & \(<2.0\) & 3.5 & 1.7 & 1.7 & 2.1 & 3.8 \\
\hline 2003 & No cod catches & - & 2.0 & 1.3 & 1.3 & 1.6 & 2.9 \\
\hline 2004 & \(\mathrm{SSB}>\mathrm{B}_{\mathrm{pa}}\) in the short term \({ }^{2}\) & \(<2.1^{3}\) & 1.6 & 0.8 & 0.8 & 2.6 & 3.4 \\
\hline 2005 & Exploitation not allowed to increase & < 1.6 & 1.6 & 0.29 & 0.3 & 0.9 & 1.2 \\
\hline 2006 & Lowest possible level & 0 & 1.36 & 0.38 & 0.4 & 0.9 & 1.3 \\
\hline 2007 & Lowest possible level & 0 & 1.02 & 0.48 & 0.5 & 0.3 & 0.8 \\
\hline 2008 & Lowest possible level & 0 & 0.765 & 0.44 & 0.4 & 0.2 & 0.4 \\
\hline 2009 & Same advice as last year & 0 & 0.574 & 0.49 & 0.5 & 0.4 & 0.9 \\
\hline 2010 & Same advice as last year & 0 & 0.431 & 0.35 & 0.3 & 0.9 & 1.2 \\
\hline 2011 & See scenarios & - & 0.323 & 0.23 & 0.2 & 0.3 & 0.6 \\
\hline 2012 & Reduce catches & - & \(0.307^{2}\) & 0.30 & 0.3 & 0.7 & 1.0 \\
\hline 2013 & Lowest possible catch, improve & 0 & \(0.292^{2}\) & & & & \\
\hline 2014 & Lowest possible catch, improve & 0 & & & & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1}\) TAC is set for Divisions VIa and VIb combined.
\({ }^{2}\) TAC is set for Division Vb and Subareas VI, XII, and XIV.
\({ }^{3}\) Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries, protecting stocks outside safe biological limits.
Table 5.4.41.2 Whiting in Division VIa (West of Scotland). Catch ( t ) as officially reported to ICES.
\begin{tabular}{lrrrrrrrrrrrrrrrrrrrrr}
\hline Country & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 \\
\hline Belgium & 1 & - & + & - & + & + & + & - & 1 & 1 & + & - & - & - & - & + & - & - & - \\
Denmark & 1 & + & 3 & 1 & 1 & + & + & + & + & - & - & - & - & - & + & + & - & - & - \\
Faroe Islands & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & + \\
France & 199 & 180 & 352 & 105 & 149 & 191 & 362 & 202 & 108 & 82 & 300 & 48 & 52 & 21 & 11 & 6 & 9 & 7 & 1 \\
Germany & + & + & + & 1 & 1 & + & - & + & - & - & + & - & - & - & - & - & - & + & 1 \\
Ireland & 1315 & 977 & 1200 & 1377 & 1192 & 1213 & 1448 & 1182 & 977 & 952 & 1121 & 793 & 764 & 577 & 568 & 356 & 172 & 196 & 56 \\
Norway & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - \\
Spain & - & - & - & - & - & - & 1 & - & 1 & 2 & + & - & 2 & - & - & - & - & - & - \\
UK (E W \& NI) & 44 & 50 & 218 & 196 & 184 & 233 & 204 & 237 & 453 & 251 & 210 & 104 & 71 & 73 & 35 & 13 & 5 & 2 & 1 \\
UK (Scot.) & 6109 & 4819 & 5135 & 4330 & 5224 & 4149 & 4263 & 5021 & 4638 & 3369 & 3046 & 2258 & 1654 & 1064 & 751 & 444 & 103 & 178 & 424 \\
UK (total) & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline
\end{tabular}
\begin{tabular}{llllllllllllllllllllllll}
\hline Total landings & 7669 & 6026 & 6908 & 6010 & 6751 & 5786 & 6278 & 6642 & 6178 & 4657 & 4677 & 3203 & 2543 & 1735 & 1365 & 819 & 289 & 383 & 484 \\
\hline
\end{tabular}

\footnotetext{
\begin{tabular}{llllll}
\hline Country & 2008 & 2009 & 2010 & 2011 & 2012* \\
\hline
\end{tabular}
\begin{tabular}{lrrrrr} 
Country & 2008 & 2009 & 2010 & 2011 & \(2012^{*}\) \\
\hline Belgium & - & - & - & - & -
\end{tabular}
Denmark - \(\quad-\quad-\quad-\)
Faroe Islands \(\quad+\quad-\quad+\)
\(\begin{array}{lllll}\text { France } & 3 & 1 & 3 & 2\end{array}\)
Germany - \(\quad-\quad\) -
\(\begin{array}{lllll}\text { Ireland } & 69 & 125 & 99 & 149\end{array}\)
Ireland
Spain
UK (E W \& NI)
UK (Scot.)
\begin{tabular}{lllrrr} 
UK (total) & 369 & 354 & 247 & 80 & 204 \\
\hline Total landings & 441 & 482 & 349 & 231 & 300 \\
\hline
\end{tabular}
\begin{tabular}{llllll}
\hline Total landings & 441 & 482 & 349 & 231 & 300 \\
\hline
\end{tabular}
}
* Preliminary.
Table 5.4.41.3 Whiting in Division VIa (West of Scotland). Summary of stock assessment (weights in tonnes). SE = standard error.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline \multirow[t]{2}{*}{Year} & \multicolumn{3}{|l|}{Landings (tonnes)} & \multicolumn{3}{|l|}{Discards (tonnes)} & \multicolumn{3}{|l|}{Total catches (tonnes)} & \multicolumn{2}{|l|}{Mean F(2-4)} & \multicolumn{2}{|l|}{SSB (tonnes)} & \multicolumn{2}{|l|}{TSB (tonnes)} & \multicolumn{2}{|l|}{Recruitment
(thousands at age 1)} \\
\hline & Obs. & Pred. & SE & Obs. & Pred. & SE & Obs. & Pred. & SE & Estimate & SE & Estimate & SE & Estimate & SE & Estimate & SE \\
\hline 1981 & 12194 & 10651 & 2721 & 2132 & 4863 & 2092 & 14325 & 15514 & 1767 & 0.232 & 0.034 & 132288 & 14975 & 167777 & 19069 & 206414 & 47769 \\
\hline 1982 & 13880 & 13354 & 1818 & 5485 & 3996 & 1238 & 19366 & 17350 & 1971 & 0.258 & 0.044 & 91403 & 10355 & 110148 & 13360 & 174046 & 51621 \\
\hline 1983 & 15962 & 17224 & 1839 & 6294 & 5259 & 1412 & 22257 & 22483 & 2490 & 0.439 & 0.083 & 64060 & 8678 & 95952 & 13705 & 210909 & 55201 \\
\hline 1984 & 16459 & 15209 & 1472 & 4017 & 6315 & 1552 & 20476 & 21524 & 2352 & 0.607 & 0.089 & 48810 & 5632 & 84674 & 8617 & 327863 & 49319 \\
\hline 1985 & 12879 & 11845 & 1290 & 4840 & 7214 & 1592 & 17719 & 19059 & 2071 & 0.677 & 0.098 & 43428 & 4731 & 79260 & 7471 & 304197 & 38750 \\
\hline 1986 & 8458 & 7949 & 897 & 2669 & 4973 & 1111 & 11127 & 12922 & 1493 & 0.506 & 0.080 & 39479 & 4021 & 71392 & 7278 & 273178 & 39480 \\
\hline 1987 & 11542 & 10106 & 989 & 11918 & 7136 & 1593 & 23460 & 17242 & 2017 & 0.599 & 0.092 & 40924 & 3634 & 75379 & 6704 & 377113 & 49037 \\
\hline 1988 & 11349 & 10594 & 1033 & 8132 & 4853 & 1090 & 19481 & 15448 & 1549 & 0.696 & 0.122 & 40673 & 3902 & 49419 & 6023 & 106461 & 38341 \\
\hline 1989 & 7523 & 7295 & 774 & 5876 & 5672 & 1325 & 13399 & 12967 & 1659 & 0.651 & 0.125 & 23929 & 3888 & 54620 & 7324 & 293930 & 43292 \\
\hline 1990 & 5642 & 5628 & 621 & 4530 & 4744 & 1120 & 10172 & 10372 & 1363 & 0.466 & 0.096 & 32573 & 4253 & 56791 & 9527 & 176271 & 46737 \\
\hline 1991 & 6658 & 5466 & 578 & 4883 & 4233 & 924 & 11541 & 9699 & 1209 & 0.478 & 0.093 & 27078 & 3584 & 50499 & 7098 & 236177 & 44106 \\
\hline 1992 & 6005 & 5065 & 615 & 9249 & 5435 & 1242 & 15253 & 10500 & 1574 & 0.424 & 0.102 & 29488 & 4174 & 63501 & 8565 & 300362 & 47143 \\
\hline 1993 & 6872 & 6248 & 674 & 4759 & 6253 & 1322 & 11631 & 12500 & 1598 & 0.469 & 0.105 & 40506 & 5659 & 69585 & 10299 & 236936 & 48508 \\
\hline 1994 & 5901 & 5840 & 633 & 3455 & 4614 & 929 & 9356 & 10455 & 1211 & 0.441 & 0.092 & 35282 & 5295 & 57181 & 8609 & 238176 & 49069 \\
\hline 1995 & 6078 & 6508 & 1087 & 5771 & 4659 & 1021 & 11849 & 11167 & 1816 & 0.468 & 0.070 & 34034 & 3571 & 52224 & 4761 & 238992 & 30202 \\
\hline 1996 & 7158 & 7244 & 1356 & 7940 & 5996 & 1376 & 15098 & 13241 & 2396 & 0.577 & 0.090 & 35533 & 3331 & 50444 & 4750 & 152370 & 24963 \\
\hline 1997 & 6290 & 6719 & 1139 & 5251 & 5758 & 1372 & 11542 & 12477 & 2188 & 0.640 & 0.110 & 27766 & 2938 & 44601 & 5478 & 146089 & 29939 \\
\hline 1998 & 4627 & 4898 & 863 & 9216 & 6120 & 1515 & 13843 & 11019 & 2092 & 0.681 & 0.106 & 19900 & 3197 & 38653 & 6121 & 187902 & 36576 \\
\hline 1999 & 4613 & 4324 & 951 & 3975 & 5681 & 1487 & 8588 & 10005 & 2196 & 0.858 & 0.118 & 18532 & 3761 & 30696 & 6491 & 137011 & 37556 \\
\hline 2000 & 3011 & 3210 & 923 & 13285 & 5609 & 1595 & 16296 & 8820 & 2282 & 0.837 & 0.106 & 13822 & 3703 & 29710 & 6551 & 210729 & 45229 \\
\hline 2001 & 2439 & 2775 & 793 & 4263 & 4392 & 1345 & 6702 & 7167 & 1988 & 0.714 & 0.105 & 15773 & 4034 & 25130 & 6908 & 93622 & 33088 \\
\hline 2002 & 1767 & 2176 & 663 & 2851 & 1811 & 719 & 4618 & 3986 & 1302 & 0.528 & 0.081 & 11819 & 3174 & 14779 & 4827 & 40120 & 26679 \\
\hline 2003 & 1355 & 1813 & 586 & 719 & 1535 & 709 & 2074 & 3347 & 1225 & 0.547 & 0.085 & 7714 & 2804 & 12721 & 4742 & 59949 & 26547 \\
\hline 2004 & 811 & 1005 & 383 & 2159 & 1313 & 621 & 2970 & 2318 & 960 & 0.505 & 0.089 & 5532 & 2206 & 8976 & 3436 & 39870 & 16811 \\
\hline 2005 & 341 & 640 & 173 & 629 & 744 & 258 & 970 & 1383 & 398 & 0.411 & 0.082 & 4088 & 841 & 6353 & 1301 & 25464 & 6907 \\
\hline
\end{tabular}
Table 5.4.41.3 (cont.)
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline \multirow[t]{2}{*}{Year} & \multicolumn{3}{|l|}{Landings (tonnes)} & \multicolumn{3}{|l|}{Discards (tonnes)} & \multicolumn{3}{|l|}{Total catches (tonnes)} & \multicolumn{2}{|l|}{Mean F(2-4)} & \multicolumn{2}{|l|}{SSB (tonnes)} & \multicolumn{2}{|l|}{TSB (tonnes)} & \multicolumn{2}{|l|}{Recruitment
(thousands at age 1)} \\
\hline & Obs. & Pred. & SE & Obs. & Pred. & SE & Obs. & Pred. & SE & Estimate & SE & Estimate & SE & Estimate & SE & Estimate & e SE \\
\hline 2006 & 380 & 549 & 65 & 946 & 531 & 121 & 1326 & 1079 & 160 & 0.322 & 0.051 & 4051 & 588 & 85517 & 760 & 30905 & 4903 \\
\hline 2007 & 427 & 440 & 47 & 317 & 390 & 91 & 745 & 830 & 116 & 0.231 & 0.045 & 4284 & 558 & 85989 & 907 & 20386 & 5007 \\
\hline 2008 & 445 & 447 & 47 & 314 & 485 & 114 & 759 & 931 & 140 & 0.248 & 0.047 & 4353 & 721 & 16120 & 1047 & 23103 & 5033 \\
\hline 2009 & 488 & 438 & 49 & 419 & 436 & 101 & 908 & 874 & 129 & 0.195 & 0.037 & 5622 & 1006 & 6 7204 & 1246 & 29664 & 5591 \\
\hline 2010 & 307 & 340 & 39 & 893 & 353 & 88 & 1200 & 693 & 107 & 0.121 & 0.026 & 4558 & 830 & - 7542 & 1228 & 76846 & 11992 \\
\hline 2011 & 230 & 265 & 30 & 339 & 213 & 53 & 569 & 478 & 71 & 0.076 & 0.016 & 9007 & 1442 & 29361 & 1582 & 11820 & 6021 \\
\hline 2012 & 313 & 296 & 39 & 727 & 216 & 69 & \(1039{ }^{\text {1) }}\) & 512 & 92 & 0.069 & 0.016 & 8028 & 1583 & 310139 & 2478 & 36880 & 18633 \\
\hline 2013* & NA & 396 & 125 & NA & 276 & 113 & NA & 672 & 219 & 0.071 & 0.027 & 8526 & 2423 & 311587 & 3102 & 72835 & 25147 \\
\hline
\end{tabular}

\footnotetext{
*Predictions from TSA.
\({ }^{1)}\) Total catches slightly different from 2012 catches in "catch distribution box" due to rounding of average weights in the calculation.
}

\section*{Rockall Whiting}
(Division VIb)

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The advice for this stock is biennial and the advice given last year is maintained for 2014; "based on the ICES approach for data-limited stocks, ICES advises that catches should be no more than II tonnes". FEAS does not agree with this advice.

This stock falls into ICES category 6.2.0, landings data only and no indication of where \(F\) is relative to proxies and no marked positive trends in stock indicators. As the TAC area covers both Divisions VIa and VIb, the TAC cannot be effective in limiting catches in VIb and FEAS has no basis on which to recommend a TAC specific to VIb.

Whiting are occasionally reported in the mixed demersal fishery. It is unlikely that there is a persistent whiting stock at Rockall therefore there are no specific management measures required.


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

\section*{CURRENT MANAGEMENT}
- The TAC is for the combined Divisions Vla and VIb; therefore, the TAC cannot be effective in limiting catches in Division VIb (Rockall).
- The Division VI TAC in 2013 is 292 t , with an associated Irish quota of 87 t .


\section*{ICES ADVICE 5.4.42 Whiting in Division VIb (Rockall)}

\section*{Advice for 2014 and 2015}

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see ICES, 2012): "Based on the ICES approach for data limited stocks, ICES advises that catches should be no more than 11 tonnes". ICES advises that the same catch advice is still applicable to 2015.

\section*{Quality considerations}

Available data provides information on landings only. There are doubts on the accuracy of the reported landings as these are reported by vessels operating in both Divisions VIa and VIb.

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & No assessment. \\
Stock data category & 6.2.0. \\
Input data & Official landings statistics. \\
Discards and bycatch & Not included in the assessment. \\
Indicators & None. \\
Other information & None. \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

\section*{Outlook for 2015}

\section*{ICES approach to data-limited stocks}

Because the precautionary buffer ( \(20 \%\) reduction in catch) was applied in the advice issued in 2012, and catches are marginal, the same catch advice ( 11 t ) is also considered valid for 2015.

\section*{Sources}

ICES. 2012. Whiting in Division VIb (Rockall). In Report of the ICES Advisory Committee 2012, Section 5.4.26. ICES Advice, 2012, Book 5: 217-221.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Table 5.4.42.1 Whiting in Division VIb (Rockall). ICES advice, management, and official landings.
\begin{tabular}{llllc}
\hline Year & ICES Advice & \begin{tabular}{l} 
Predicted \\
catch \\
corresp. to \\
advice
\end{tabular} & \begin{tabular}{l} 
Agreed \\
TAC
\end{tabular} & \begin{tabular}{l} 
Official \\
landings
\end{tabular} \\
& & - & 4000 & 14 \\
\hline 2001 & No advice & - & 3500 & 7 \\
2002 & No advice & - & 2000 & 13 \\
2003 & No advice & - & 1600 & 4 \\
2004 & No advice & - & 1600 & 4 \\
2005 & No advice & - & 1360 & 105 \\
2006 & No advice & - & 1020 & 17 \\
2007 & No advice & - & 765 & 31 \\
2008 & No advice & - & 547 & 16 \\
2009 & No advice & - & 431 & 18 \\
2010 & No advice & - & 323 & 9 \\
2011 & No advice & 11 & 207 & 1 \\
2012 & No increase in catch & 11 & & \\
2013 & 20\% reduction in catches & 11 & & \\
2014 & (last 3-year average) & Same advice as for 2013 & & \\
2015 & Same advice as for 2013 & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in tonnes.
\({ }^{1)}\) SubareaVI; EC waters of Division Vb; EC and international waters of Subareas XII and XIV.
}

\title{
West of Scotland and North Sea Megrim
}
(Sub-areas IVa \& VIa)
For latest information, see: http://www.ices.dk

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice, based on the MSY approach, is that catches in 2014 should be no more than \(\mathbf{7 , 0 0 0} t\) and if discard rates do not change from the average of the last three years this corresponds to landings of no more than \(5,950 \mathrm{t}\). ICES also advises that the management areas should be consistent with the advice areas. FEAS agree with this advice.

This stock falls into ICES category I for data-rich stocks with full analytical assessments. Fishing mortality is well below F MSY and biomass is well above MSY \(B_{\text {trigger }}\).

FEAS notes that there are major inconsistencies between the assessment and management area and that the current advice does not include Rockall (VIb) megrim which is part of the current TAC area. The initial EC proposals for TACs in Subareas VI and IV includes an additional allocation for VIb and is based on historical TAC splits between VI and IV. FEAS supports these proposals which retains relative stability and would result in an Irish landings quota in VI of 528 t .

\section*{CURRENT MANAGEMENT}
- There are two TAC areas covering (i) Sub-areas VI, XII, XIV and Division Vb and (ii) EU waters of Ila and IV.
- The assessment area covers Sub-division Vla and IVa (North Sea). This is because the spatial distribution of landings data and survey catches provide good evidence to suggest that the megrim population is contiguous between Divisions IVa and Vla.
- Recent reductions in effort in Scotland and Ireland are considered to have contributed to the decline of landings in Sub-area VI. In 2009 new mesh regulations introduced in Division Vla have increased the mesh size from 100 to 120 mm (vessels >15 m); this will result in an increase in the length of first capture.
- Landings in VI are well below the TAC. Uptake by France, who account for \(44 \%\) of the TAC, is very low (~11\%). Official landings in Sub-area IV and Division Ila in recent years are close to the TAC.
- The 2013 TAC in ICES Sub-areas VI, XII, XIV and Division Vb was set at \(3,387 \mathrm{t}\) with an Irish quota of 439 t .
- The 2013 TAC in EU waters of Ila and IV was set at I,937 t, Ireland has no quota in this area.


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


\section*{ICES ADVICE 5.4.17 Megrim in Subarea IVa (North Sea) and VIa (West of Scotland)}

\section*{Advice for 2014 and 2015}

ICES advises on the basis of the MSY approach that catches should be no more than 7000 t in 2014 and 2015. If discard rates do not change from the average of the last three years, this implies landings of no more than 5950 t .

\section*{Stock status}
\begin{tabular}{|c|c|c|}
\hline \multicolumn{3}{|c|}{F (Fishing Mortality)} \\
\hline & 20102011 & 2012 \\
\hline MSY ( \(\mathbf{F}_{\text {MSY }}\) ) & ( \(\downarrow\) & - Appropriate \\
\hline Precautionary approach \(\left(\mathrm{F}_{\mathrm{pa}}, \mathrm{F}_{\mathrm{lim}}\right)\) & ? ? & ? Undefined \\
\hline \multicolumn{3}{|c|}{Biomass} \\
\hline & 20112012 & 2013 \\
\hline MSY ( \(\mathrm{B}_{\text {trigger }}\) ) & ( ) & - Above trigger \\
\hline Precautionary approach \(\left(\mathrm{B}_{\mathrm{pa}}, \mathrm{B}_{\mathrm{lim}}\right)\) & ( \(\downarrow\) & - Full reproductive capacity \\
\hline
\end{tabular}





Figure 5.4.17.1
Megrim (Lepidorhombus spp.) in Divsions IVa and VIa. Summary of the stock assessment (weights in thousand tonnes). Top right: Biomass/F for the time-series used in the assessment.

Fishing mortality has been below \(\mathrm{F}_{\text {MSY }}\) for almost the full time-series and the biomass well above MSY \(\mathrm{B}_{\text {trigger }}\).

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

There are two separate TAC areas for megrim, Subareas VI and IV, but little evidence to suggest that the megrim in Subarea IV and Division VIa are separate stocks. ICES concluded in 2011 that megrim in Divisions VIa and IVa should be treated as a single stock and megrim in Division VIb (Rockall) should be treated as a separate stock.

\section*{The fisheries}

Megrim is predominantly caught using otter trawls.
\begin{tabular}{ll} 
Catch distribution & \begin{tabular}{l} 
Total catch \((2012)=3047 \mathrm{t}\), where \(85 \%\) were landings \((97 \%\) bottom otter trawl \(>100 \mathrm{~mm}\) \\
and \(3 \%\) bottom otter trawl \(<100 \mathrm{~mm})\) and \(15 \%\) discards.
\end{tabular}
\end{tabular}

\section*{Quality considerations}

Imprecise and missing age data hampers the ability of ICES to carry out an age-based assessment for this stock. In order to undertake an age-based approach in the future, depth- and sex-stratified age data from the surveys used in the current assessment model would be required.

Due to missing discards data, historical discard levels have been assumed to have declined from \(30 \%\) at the start of the time-series to \(15 \%\); this value is selected based on recent estimates. Simulations show that the assessment is not sensitive to the lack of discards data; the lack of these data has minimal impact on fishing mortality estimates and results in a slight higher estimate of biomass.

The outcomes of this assessment are robust regarding the status of the stock relative to reference points.


Figure 5.4.17.2 Megrim (Lepidorhombus spp.) in Divsions IVa and VIa. Historical assessment results.

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & Bayesian state-space biomass dynamic model. \\
Stock data category & Category 1. \\
Input data & Commercial sampling of landings and discards; six survey indices (SAMISS-Q2, IAMISS- \\
& Q2, Sco-IBTS-Q1, ScoIBTS-Q3, ScoWIBTS-Q1 until 2010, and Sco-WIBTS-Q4 until \\
Discards and bycatch & \begin{tabular}{l} 
2010). \\
Discards have been included in the assessment since 1985, from bottom otter trawl fleets \\
\(<100 \mathrm{~mm}\) and \(>100 \mathrm{~mm}\).
\end{tabular} \\
Indicators & \begin{tabular}{l} 
None.
\end{tabular} \\
Other information & This stock was benchmarked at WKFLAT (ICES, 2011) and at IBP-MEG (ICES, 2012). \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

\section*{ECOREGION \\ STOCK \\ Celtic Sea and West of Scotland}

Reference points
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline \multirow{3}{*}{\begin{tabular}{l} 
MSY \\
Approach
\end{tabular}} & MSY \(_{\text {trigger }}\) & 9740 t. & \(50 \% \mathrm{~B}_{\mathrm{MSY}}\) \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{MSY}}\) & 0.33 & \begin{tabular}{l} 
Estimated directly from the model. Fishing mortality values \\
expressed relative to \(\mathrm{F}_{\mathrm{MSY}}\).
\end{tabular} \\
\hline \multirow{3}{*}{\begin{tabular}{l} 
Precautionary \\
Approach
\end{tabular}} & \(\mathrm{B}_{\mathrm{lim}}\) & \(5844 \mathrm{t}\). & \(30 \% \mathrm{~B}_{\mathrm{MSY}}\) \\
\cline { 2 - 4 } & \(\mathrm{B}_{\mathrm{pa}}\) & Not defined. & \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{lim}}\) & Not defined. & \\
\cline { 2 - 5 } & \(\mathrm{F}_{\mathrm{pa}}\) & Not defined. & \\
\hline
\end{tabular}
(Technical basis unchanged since 2012).
Outlook for 2014 and 2015
Basis: \(\mathrm{F}_{2013} / \mathrm{F}_{\mathrm{MSY}}=\mathrm{F}_{2012} / \mathrm{F}_{\mathrm{MSY}}=0.33 ; \mathrm{B}_{2014} / \mathrm{B}_{\mathrm{MSY}}=1.41\).
\begin{tabular}{|c|c|c|c|c|c|c|c|c|}
\hline Rationale & \[
\begin{aligned}
& \text { Catch } \\
& \text { (2014) }
\end{aligned}
\] & \[
\begin{aligned}
& \text { Landings } \\
& (2014)^{1)}
\end{aligned}
\] & \[
\begin{aligned}
& \text { Discards } \\
& (2014)^{1)}
\end{aligned}
\] & Basis & Fishing mortality ( \(\mathrm{F}_{\mathbf{2 0 1 4}} / \mathrm{F}_{\mathrm{MSY}}\) ) & Stock size
\[
\left(\mathbf{B}_{2015} / \mathbf{B}_{\mathrm{MSY}}\right)
\] & \begin{tabular}{l}
Probability* of \\
Biomass \(_{2015}\) falling below MSY \(\mathbf{B}_{\text {trigger }}\)
\end{tabular} & \begin{tabular}{l}
Probability* \\
of \\
Biomass \(_{2015}\) \\
falling \\
below \(B_{\text {lim }}\)
\end{tabular} \\
\hline MSY approach & 7000 & 5950 & 1050 & \[
\begin{aligned}
& \mathrm{F}_{\mathrm{MSY}} \\
& (=0.33)
\end{aligned}
\] & 1.0 & 1.32 & 1\% & 0\% \\
\hline Zero catch & 0 & 0 & 0 & \(\mathrm{F}=0\) & & & 0\% & 0\% \\
\hline Other options & 6076 & 5164 & 911 & Longterm MSY & 0.86 & 1.42 & 1\% & 0\% \\
\hline & 6000 & 5100 & 900 & 0.36 & 0.85 & 1.41 & 1\% & 0\% \\
\hline & 5000 & 4250 & 750 & 0.21 & 0.65 & 1.53 & 1\% & 0\% \\
\hline & 4000 & 3400 & 600 & 0.16 & 0.48 & 1.59 & 1\% & 0\% \\
\hline
\end{tabular}

Weights in tonnes.
\({ }^{1)}\) Assuming a 2010-2012 landings:discards ratio of 0.85:0.15.
*Probabilities are based on bootstrap sampling.

\section*{MSY approach}

Following the ICES MSY approach implies a fishing mortality at \(\mathrm{F}_{\mathrm{MSY}}=0.33\), resulting in catches of no more than 7000 tonnes in 2014. If discard rates do not change from the average of the last three years, this implies landings of no more than 5950 tonnes. The probability of the biomass falling below MSY \(\mathrm{B}_{\text {trigger }}\) is \(1 \%\).

\section*{Additional considerations}

\section*{Management considerations}

The management of this stock should be considered within a mixed-fisheries context.
There have been substantial reductions in effort associated with the Scottish and Irish fleets since 2002; these are considered to have contributed to the decline of landings in Subarea VI, which are well below the TAC. Official landings in Subarea IV and Division IIa in recent years are close to the TAC.

Fishing effort in Divisions VIa and IVa has declined substantially since 2000.
Area misreporting has been prevalent as megrim catches were misreported from Subarea VI into Subarea IV, due to restrictive quotas for anglerfish (i.e. vessels targeting anglerfish misreported all landings, including megrim, from Subarea VI into Subarea IV). However, in the most recent years there is evidence to suggest that this has reversed as the Subarea IV TAC has become more restrictive, increasing targeting of megrim in response to more restrictive fishing opportunities for other species, e.g. cod. The extent of this problem is unknown and should be quantified through integrated logbook and VMS analysis. Combining the stocks of Divisions VIa and IVa also has the advantage of eliminating the impact of area misreporting between the two areas.

ICES notes that the current TAC area is inconsistent with the ICES stock and advisory area. Recent ICES advice (ICES, 2013a) recommends that the management unit should match the assessment unit and recommends a single TAC area.

\section*{The effects of regulations}

In 2010, new mesh regulations introduced in Division VIa increased the mesh size from 100 to 120 mm for vessels \(>15 \mathrm{~m}\), which resulted in an increase in the length of first capture. This management measure, coupled with further effort restrictions associated with the long-term management plan for cod (Council Regulation (EC) No. 1342/2008) is likely to result in further effort displacement away from the shelf fisheries in Division VIa. However, at this stage it is not possible to quantify this until an integrated analysis of VMS and logbook data is conducted.

\section*{Data and methods}

A Bayesian state-space biomass dynamic model is now used to provide quantitative management advice. The model utilizes indices from six fisheries-independent surveys and catch data. Due to paucity and absence of discard data, historical discards levels are assumed.

The timing of the Sco-AMISS-IV-VI surveys changed from November to April in 2008; the effect of this change has not been evaluated.

\section*{Comparison with previous assessment and advice}

Last year's assessment was based on the same model used this year. Stock biomass is estimated to have increased, resulting in a higher MSY yield.

The basis of the advice this year is the same as last year, the MSY approach.

\section*{Assessment and management area}

Since 2009, ICES advice on megrim has merged Division IVa (North Sea) and Division VIa. This is because the spatial distribution of landings data and the survey catches provide evidence that the megrim population is contiguous between Divisions IVa and VIa. Therefore, ICES now considers megrim in Divisions VIa and IVa as a single stock. This is inconsistent with the current management separation of Subareas VI and IV.


Figure 5.4.17.3
Megrim (Lepidorhombus spp.) in Divisions IVa and VIa. The two management areas (red boxes) for TAC areas VI, XII, XIVa, and XIVb (left panel) and TAC areas IV and IIa (right panel), and the single and assessment areas (blue hatched areas in both panels).

\section*{Sources}

ICES. 2011. Report of the Benchmark Workshop on Flatfish (WKFLAT), 1-8 February 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:39. 257 pp.
ICES. 2012. Report of the Inter-Benchmark Protocol for Megrim in Subarea IV and Division IVa (IBPMeg), 2-6 April 2012, by correspondence. ICES CM 2012/ACOM:67. 23 pp.
ICES. 2013a. Request from the European Commission on distribution of the stock of megrims in Subarea IV and Division VIa. In Report of the ICES Advisory Committee, 2013, Section 5.33.1. ICES Advice, 2013. Book 5.
ICES. 2013b. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.


Figure 5.4.17.4 Megrim (Lepidorhombus spp.) in Divisions IVa and VIa. Landings in tonnes (upper left panel). Survey indices from six individual international bottom trawl (IBTS and WIBTS) and anglerfish surveys (dots) with modelled catch per unit effort estimates from surplus production assessment (black line) and \(95 \%\) confidence intervals (dashed lines). SCO Q1 VIa and SCO Q4 VIa correspond to ScoWIBTS-Q1 and -Q4, respectively (units: kg hour \({ }^{-1}\) ), SCO Q1 IVa and SCO Q3 IVa correspond to ScoIBTS-Q1 and -Q3, respectively (units: kg hour \({ }^{-1}\) ), MONK VIa corresponds to the combined SAMISS-Q2 and IAMISS-Q2 in Division VIa (units: tonnes), and MONK IVa corresponds to SAMISS-Q2 (units: tonnes). Total biomass in tonnes.

Table 5.4.17.1
Megrim (Lepidorhombus spp.) in Divisions IVa and VIa. ICES advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline Year & ICES Advice \({ }^{1)}\) & Predicted landings corresp. to advice & \begin{tabular}{l}
Agreed \\
TAC \\
in Div. \\
IIa and \\
Subarea IV
\end{tabular} & Agreed TAC in Div. \(\mathrm{Vb}(\mathrm{EC})\) and Subareas VI, XII, and XIV & \begin{tabular}{l}
Official landings in \\
Subareas IV and IV
\end{tabular} & ICES landings \({ }^{2)}\) in Divisions IVa and VIa & ICES discards in Divisions IVa and VIa \\
\hline 1991 & No advice & - & - & 4.84 & 4.42 & 3.31 & 1.196 \\
\hline 1992 & No advice & - & - & 4.84 & 4.69 & 3.57 & 1.253 \\
\hline 1993 & No long-term gain in increased F & - & - & 4.84 & 4.79 & 3.80 & 1.293 \\
\hline 1994 & No long-term gain in increased F & - & - & 4.84 & 5.03 & 3.90 & 1.287 \\
\hline 1995 & No advice & - & - & 4.84 & 5.57 & 4.67 & 1.493 \\
\hline 1996 & No advice & - & - & 4.84 & 6.15 & 5.25 & 1.628 \\
\hline 1997 & No advice & - & - & 4.84 & 5.94 & 4.86 & 1.457 \\
\hline 1998 & Adequate catch controls & - & 3.0 & 4.84 & 5.42 & 4.25 & 1.235 \\
\hline 1999 & Maintain current TAC & 4.84 & 3.0 & 4.84 & 4.44 & 3.76 & 1.055 \\
\hline 2000 & Maintain current TAC & 4.84 & 3.0 & 4.84 & 4.50 & 3.49 & 0.948 \\
\hline 2001 & Maintain current TAC & 4.84 & 3.0 & 4.36 & 4.38 & 3.57 & 0.936 \\
\hline 2002 & Maintain current TAC & 4.36 & 3.0 & 4.36 & 3.27 & 2.80 & 0.709 \\
\hline 2003 & Maintain current TAC & 4.36 & 3.0 & 4.36 & 3.01 & 2.37 & 0.578 \\
\hline 2004 & Reduce TAC to recent landings & 3.6 & 1.89 & 3.6 & 2.55 & 2.07 & 0.486 \\
\hline 2005 & Reduce TAC to recent landings & 2.3 & 1.74 & 2.88 & 1.92 & 1.55 & 0.346 \\
\hline 2006 & Reduce TAC to recent landings & 2.3 & 1.74 & 2.88 & 2.40 & 2.05 & 0.447 \\
\hline 2007 & Reduce TAC to recent landings & 2.1 & 1.48 & 2.88 & 2.60 & 2.35 & 0.491 \\
\hline 2008 & Reduce TAC to recent landings & 1.4 & 1.59 & 2.59 & 3.18 & 2.89 & 0.581 \\
\hline 2009 & Same advice as last year & 1.4 & 1.59 & 2.79 & 3.10 & 2.87 & 0.532 \\
\hline 2010 & No increase in effort & - & 1.75 & 3.07 & 3.34 & 3.20 & 0.537 \\
\hline 2011 & No increase in catches & - & 1.845 & 3.387 & 2.87 & 2.71 & 0.478 \\
\hline 2012 & No increase in catches & - & 1.845 & 3.387 & 2.81 & 2.59 & 0.462 \\
\hline 2013 & MSY framework & 4.7 & & & & & \\
\hline 2014 & MSY approach & \(7.0^{3}\) & & & & & \\
\hline 2015 & Same advice as for 2014 & 7.0 & & & & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1)}\) Before 2011 advice was given for megrim in Divisions IVa, VIa, and VIb combined.
\({ }^{2)}\) Landings in Divisions IVa and VIa and unallocated landings from Subarea IV. Landings in Division Vb (EC) and Subareas XII and XIV are negligible.
\({ }^{3}\) This value ( 7.0 ) refers to total catch, including discards. Therefore, it is not directly comparable to the value advised for 2013 (4.7), which referred only to landings.
Megrim (Lepidorhombus spp.) Divisions IVa and VIa. Nominal catch ( t ) as officially reported to ICES by country, and ICES estimates of landings.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline Belgium & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline Denmark & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline France & 398 & 455 & 504 & 517 & 408 & 618 & 462 & 192 & 172 & 0 & 135 & 252 & 79 & 92 & 50 & 48 & 53 & 104 & 92 & 134 & 270 & 139 & 140 \\
\hline Ireland & 317 & 260 & 317 & 329 & 304 & 535 & 460 & 438 & 433 & 438 & 417 & 509 & 280 & 344 & 278 & 156 & 221 & 191 & 172 & 188 & 318 & 226 & 214 \\
\hline Netherlands & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline Spain & 91 & 48 & 25 & 7 & 1 & 24 & 22 & 87 & 111 & 83 & 98 & 92 & 89 & 98 & 45 & 69 & 52 & 5 & 149 & 112 & 288 & 227 & 189 \\
\hline UK - Eng+Wales+N.Irl. & 25 & 167 & 392 & 298 & 327 & 322 & 156 & 123 & 65 & 42 & 20 & 7 & 14 & 13 & 17 & 10 & 0 & 8 & 6 & & - & - & - \\
\hline UK-Scotland & 1093 & 1223 & 887 & 896 & 866 & 952 & 944 & 954 & 841 & 831 & 754 & 770 & 643 & 558 & 469 & 269 & 336 & 658 & 868 & 953 & & - & - \\
\hline UK & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & 822 & 705 & 589 \\
\hline & & & & & & & & & & & & & & & & & & & & & & & \\
\hline Official Total & 1924 & 2154 & 2125 & 2047 & 1907 & 2451 & 2044 & 1795 & 1622 & 1394 & 1424 & 1630 & 1105 & 1105 & 859 & 552 & 662 & 966 & 1287 & 1387 & 1698 & 1297 & 1132 \\
\hline & & & & & & & & & & & & & & & & & & & & & & & \\
\hline Unallocated & 286 & 278 & 424 & 674 & 786 & 1047 & 2010 & 1477 & 1083 & 1254 & 823 & 843 & 723 & 537 & 469 & 9 & 213 & n/a & 8 & 0 & 0 & 0 & 0 \\
\hline & & & & & & & & & & & & & & & & & & & & & & & \\
\hline ICES landings & 2210 & 2432 & 2549 & 2721 & 2693 & 3498 & 4054 & 3272 & 2705 & 2648 & 2247 & 2473 & 1828 & 1642 & 1328 & 561 & 875 & 1301 & 1545 & 1387 & 1698 & 1297 & 1132 \\
\hline & & & & & & & & & & & & & & & & & & & & & & & \\
\hline Area misreported landings & 339 & 338 & 466 & 735 & 871 & 1126 & 2062 & 1556 & 1156 & 1066 & 868 & 829 & 731 & 544 & 421 & n/a & 212 & 478 & 250 & 0 & 0 & 0 & 0 \\
\hline
\end{tabular}
Division IVa
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline Belgium & 4 & 3 & 2 & 7 & 2 & 7 & 5 & 3 & 5 & 4 & 10 & 2 & 5 & 3 & - & - & 2 & 6 & 3 & 1.6 & & 1.6 & 0.2 \\
\hline Denmark & 2 & 1 & 4 & 6 & 1 & 2 & 7 & 5 & 18 & 21 & 29 & 52 & 8 & 11 & 7 & 1 & 6 & 11 & 31 & & 22 & 25 & 36 \\
\hline France & - & - & 36 & 25 & 27 & 24 & 14 & 16 & 14 & . & 7 & 5 & 6 & 11 & 9 & 3 & 4 & 18 & 21 & & 5 & 6 & 5 \\
\hline Germany & - & 6 & 3 & 4 & 1 & 2 & 1 & 2 & 4 & 1 & 3 & 1 & - & 2 & 2 & 4 & 7 & 16 & 5 & 4 & & 5 & 4 \\
\hline Germany, Fed. Rep. of & 3 & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline Ireland & - & - & - & - & - & - & - & - & - & - & - & - & - & 1 & - & - & - & . & & & & - & - \\
\hline Netherlands & 24 & 28 & 27 & 30 & 28 & 26 & 9 & 20 & 30 & 26 & 20 & 11 & 9 & 7 & 11 & 19 & 22 & 20 & 3 & 2 & 1 & 16 & 16 \\
\hline Norway & - & - & - & - & - & - & - & - & - & - & - & - & - & \(<0.5\) & <0.5 & \(<0.5\) & 1 & 1 & 4 & & 2 & 1 & 0.6 \\
\hline Spain & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline Sweden & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline UK - Eng+Wales+N.Irl. & 17 & 9 & 47 & 8 & 19 & 44 & 4 & 3 & 5 & 4 & 2 & 2 & 3 & 1 & 1 & 1 & 9 & 17 & - & - & - & - & - \\
\hline UK - England \& Wales & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & 6 & - & - & - & - \\
\hline UK - N. Ireland & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline UK - Scotland & 1126 & 1169 & 1372 & 1736 & 2000 & 2193 & 3221 & 3091 & 2628 & 2121 & 2044 & 1854 & 1675 & 1235 & 1130 & 958 & 1340 & 1436 & 1526 & - & - & - & - \\
\hline UK & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & 1476 & 1469 & 1367 & 1397 \\
\hline
\end{tabular}
\begin{tabular}{lllllllllllllllllllllll}
\hline Official total & 1176 & 1216 & 1491 & 1816 & 2078 & 2298 & 3261 & 3140 & 2704 & 2177 & 2115 & 1927 & 1706 & 1271 & 1160 & 986 & 1391 & 1525 & 1599 & 1484 & 1499 & 1421.6 \\
\hline
\end{tabular}
\begin{tabular}{llllllllllllllllllllllllllllll}
\hline ICES landings & 837 & 878 & 1025 & 1081 & 1207 & 1172 & 1199 & 1584 & 1548 & 1111 & 1247 & 1098 & 975 & 727 & 739 & \(\mathrm{n} / \mathrm{a}\) & 1179 & 1047 & 1349 & 1484 & 1499 & 1421 & 1458.8 \\
\hline
\end{tabular}
\begin{tabular}{lllllllllllllllllllllll}
\hline Area misreported landings & 339 & 338 & 466 & 735 & 871 & 1126 & 2062 & 1556 & 1156 & 1066 & 868 & 829 & 731 & 544 & 421 & \(\mathrm{n} / \mathrm{a}\) & 212 & 478 & 250 & 0 & 0 & 0 \\
\hline
\end{tabular}

Table 5.4.17.3 Megrim (Lepidorhombus spp.) Divisions IVa and VIa. Summary of stock assessment (weights in tonnes).
\begin{tabular}{rrrrrrrr}
\hline Year & B/B MSY & F/F MSY & Biomass & Mean F & Landings & Catch & Discards \\
\hline 1985 & 2.41 & 0.58 & 44943 & 0.19 & 4499 & 6427 & 1928 \\
1986 & 1.75 & 0.44 & 32461 & 0.14 & 2858 & 4049 & 1191 \\
1987 & 1.54 & 0.82 & 28464 & 0.26 & 4614 & 6485 & 1871 \\
1988 & 1.77 & 0.85 & 32658 & 0.26 & 5212 & 7266 & 2054 \\
1989 & 1.28 & 0.7 & 23613 & 0.22 & 3451 & 4773 & 1322 \\
1990 & 1.09 & 0.7 & 20027 & 0.22 & 3047 & 4181 & 1134 \\
1991 & 0.97 & 0.85 & 17973 & 0.26 & 3310 & 4506 & 1196 \\
1992 & 1 & 0.9 & 18420 & 0.28 & 3574 & 4827 & 1253 \\
1993 & 1.14 & 0.84 & 20950 & 0.26 & 3802 & 5095 & 1293 \\
1994 & 1.48 & 0.68 & 27294 & 0.21 & 3900 & 5187 & 1287 \\
1995 & 1.49 & 0.81 & 27504 & 0.25 & 4670 & 6163 & 1493 \\
1996 & 1.53 & 0.9 & 28124 & 0.28 & 5253 & 6881 & 1628 \\
1997 & 1.22 & 1 & 22511 & 0.31 & 4856 & 6313 & 1457 \\
1998 & 1.3 & 0.8 & 23928 & 0.25 & 4253 & 5488 & 1235 \\
1999 & 1.44 & 0.64 & 26550 & 0.2 & 3759 & 4814 & 1055 \\
2000 & 1.55 & 0.55 & 28535 & 0.17 & 3494 & 4442 & 948 \\
2001 & 1.37 & 0.62 & 25282 & 0.19 & 3571 & 4507 & 936 \\
2002 & 1.29 & 0.5 & 23815 & 0.15 & 2803 & 3512 & 709 \\
2003 & 1.24 & 0.43 & 22890 & 0.13 & 2369 & 2947 & 578 \\
2004 & 1.18 & 0.39 & 21656 & 0.12 & 2067 & 2553 & 486 \\
2005 & 0.97 & 0.33 & 17880 & 0.1 & 1527 & 1873 & 346 \\
2006 & 1.03 & 0.42 & 19033 & 0.13 & 2054 & 2501 & 447 \\
2007 & 1.14 & 0.44 & 21077 & 0.14 & 2348 & 2839 & 491 \\
2008 & 1.3 & 0.49 & 23940 & 0.15 & 2894 & 3475 & 581 \\
2009 & 1.57 & 0.41 & 28903 & 0.13 & 2871 & 3291 & 420 \\
2010 & 1.42 & 0.49 & 26166 & 0.15 & 3197 & 3446 & 249 \\
2011 & 1.35 & 0.43 & 25004 & 0.13 & 2708 & 3186 & 478 \\
2012 & 2 & 0.3 & 36862 & 0.09 & 2618 & 3047 & 429 \\
\hline & & & & & & &
\end{tabular}

\section*{Rockall Megrim}
(Division VIb)

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice, based on the approach for data-limited stocks, is that landings should be no more than 207 tonnes. ICES also advises that the management area should be the same as the assessment area. FEAS agrees with this advice.

This stock falls in to ICES category \(\mathbf{3 . 2} .0\) as there is a biomass index available from a fishery independent survey. FEAS notes that the harvest ratio of \(<2 \%\) indicates that the stock is likely to be exploited at levels below \(F_{\text {msy }}\). Furthermore, the TAC advice is based on average landings for a period when fishing effort was low and the stock was underexploited.

FEAS notes that there are major inconsistencies between the assessment and management area and that the current advice does not include Rockall (VIb) megrim which is part of the TAC area. The initial EC proposals for TACs in Sub-areas VI and IV includes an additional allocation for VIb and is based on historical TAC splits between VI and IV. FEAS supports these proposals which retains relative stability and would result in an Irish landings quota in VI of


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

\section*{CURRENT MANAGEMENT}
- The TAC covers Sub-areas VI, XII, XIV and Division Vb.
- The assessment area covers Division VIb only.
- The 2012 TAC in Sub-area VI was set at \(3,387 \mathrm{t}\) with an Irish quota of 439 t .
- Landings in VI are well below the TAC. Uptake by France, who account for \(44 \%\) of the TAC, is very low ( \(\sim 11 \%\) ).


\section*{ICES ADVICE 5.4.18 Megrim in ICES Sub-division VIb (Rockall)}

\section*{Advice for 2014}

Based on ICES approach to data-limited stocks, ICES advises that landings should be no more than 207 t in 2014. Discards are known to take place but cannot be quantified; therefore total catches cannot be calculated.

ICES advises that the management area should be the same as the assessment area.

\section*{Stock status}
\begin{tabular}{|l|c|}
\hline \multicolumn{1}{c|}{ F (Fishing Mortality) } \\
\cline { 2 - 3 } & 2010-2012 \\
Qualitative evaluation & Below poss. reference points \\
\hline
\end{tabular}
QSB (Spawning-Stock Biomass)




Figure 5.4.18.1 Megrim (Lepidorhombus spp.) in Division VIb (Rockall). Landings (in tonnes) (left panel) and biomass index from survey (SCO-IV-VI-AMISS-Q2) (upper right panel, in tonnes) with \(95 \%\) confidence intervals (dashed lines indicate the average of the respective year range). Harvest ratio: landings/biomass (lower right panel).

There is no analytical assessment for this stock. Survey indices for Division VIb show an increase in biomass over the time-series from 2005 to 2010, followed by a decline in 2011. The 2012 survey data shows a substantive increase in biomass. The average of the stock size indicator, biomass from the survey, in the last two years (20112012 ) is \(52 \%\) higher than the average of the three previous years (2008-2010). The harvest ratio has been on a low and stable level since 2007.

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

There are two separate TAC areas for megrim, Subareas VI and IV, but little evidence to suggest that the megrim in Subarea IV and Division VIa are separate stocks. ICES concluded in 2011 that megrim in ICES Divisions VIa and IVa should be treated as a single stock and megrim in ICES Division VIb (Rockall) should be treated as a separate stock.

\section*{The fisheries}

Megrim is predominantly caught using otter trawls.
Total landings in \(2012=224 \mathrm{t}\), where \(100 \%\) were landings taken by bottom otter trawl \(>100 \mathrm{~mm}\). Discards are known to take place but were not quantified.

\section*{Quality considerations}

In the historical sampling data discards and landings have been assigned to ICES Subarea VI. It is important that sampling programmes are assigned at an ICES division level to obtain data from Divisions VIa and VIb separately. Depth- and sex-stratified age information should be collected from the fishery-independent surveys covering this stock.

The advice is based on survey cpue (SCO-IV-VI-AMISS-Q2), used as an indicator of stock size. The upward trend in biomass is consistent with the signal from the commercial lpue.

The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished.

Scientific basis
\begin{tabular}{ll} 
Assessment type & Survey trends-based assessment. \\
Stock data category & Category 3.2.0. \\
Input data & Commercial landings; one survey indices (SCO-IV-VI-AMISS-Q2). \\
Discards and bycatch & Discards are known to occur but were not included in the assessment. \\
Indicators & Commercial lpue index (IRE TR1). \\
Other information & Benchmarked by WKFLAT (ICES, 2011). \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

\subsection*{5.4.18}

Supporting information June 2013

\section*{ECOREGION Celtic Sea and West of Scotland \\ STOCK Megrim (Lepidorhombus spp.) in Division VIb (Rockall)}

\section*{Reference points}

No reference points have been defined for this stock.
Outlook for 2014
No analytical assessment can be presented for this stock. The main cause of this is the lack of basic data. Therefore, fishing possibilities cannot be projected.

\section*{ICES approach to data-limited stocks}

For data-limited stocks with an available biomass index ICES uses an index-adjusted status quo catch as harvest control rule. The advice is based on a comparison of the two most recent index values with the three preceding values, combined with recent catch or landings data. Knowledge about the exploitation status also influences the advised catch.

For this stock the biomass is estimated to have increased by more than \(20 \%\) between the periods \(2008-2010\) (average of the three years) and 2011-2012 (average of the two years). This implies increased landings of at most \(20 \%\) in relation to landings of the last three years, corresponding to landings in 2014 of no more than 207 t . Discards are known to take place but cannot be quantified; therefore total catches cannot be calculated.

Considering that harvest ratio is considered to be very low and the survey and commercial indices both indicate a substantial increase in biomass, no additional precautionary reduction is needed.

\section*{Additional considerations}

The harvest ratio was computed assuming that the survey biomass indicator corresponds to a catchability of 0.3. There is some uncertainty concerning this catchability value, but it is believed to be in the range of \(0.2-0.3\). This implies a biomass of megrim in Division VIb (Rockall) in excess of 14000 tonnes. Current landings are in the order of 200 tonnes, implying a harvest ratio of \(<2 \%\).

The extent of area misreporting between management or stock areas is unknown. For stocks like megrim on the northern shelf, there is a need for improved spatio-temporal resolution of commercial catch and effort data through integration of VMS and logbook data from countries engaged in the fishery.

Commercial lpue show an increase in recent years (Figure 5.4.18.3).

\section*{Management considerations}

There have been substantial reductions in effort associated with the Scottish and Irish fleets since 2002 and this is considered to have contributed to the decline of landings in Subarea VI. Landings in Subarea VI are well below the TAC.

ICES notes that the current TAC area is inconsistent with the ICES advice area.

\section*{Regulations and their effects}

Technical measures are in place and the minimum landing size is 20 cm .
Comparison with previous assessment and advice
This year's advice has the same basis as last year, i.e. ICES approach to data-limited stocks.

\section*{Assessment and management area}

ICES has considered megrim in Division VIb as a single separate stock since 2011. This is inconsistent with the current management area.

\section*{Sources}

ICES. 2011. Report of the Benchmark Workshop on Flatfish (/WKFLAT), 1-8 February 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:39. 257 pp.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.


Figure 5.4.18.3 Megrim (Lepidorhombus spp.) in Division VIb. Lpues for Irish otter trawl vessels (values in logarithmic scale).

Table 5.4.18.1 Megrim (Lepidorhombus spp.) in Division VIb. Advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|}
\hline Year & ICES Advice \({ }^{\text {1) }}\) & Predicted catch corresp. to advice & Agreed TAC Div. \(\mathrm{Vb}(\mathrm{EC})\) and Subareas VI, XII, XIV & Official landings Div. VIb \\
\hline 1990 & Not assessed & - & 4.84 & 0.804 \\
\hline 1991 & No advice & - & 4.84 & 1.045 \\
\hline 1992 & No advice & - & 4.84 & 1.073 \\
\hline 1993 & No long-term gain in increased F & - & 4.84 & 0.925 \\
\hline 1994 & No long-term gain in increased F & - & 4.84 & 1.046 \\
\hline 1995 & No advice & - & 4.84 & 0.816 \\
\hline 1996 & No advice & - & 4.84 & 0.843 \\
\hline 1997 & No advice & - & 4.84 & 1.009 \\
\hline 1998 & Adequate catch controls & - & 4.84 & 1.091 \\
\hline 1999 & Maintain current TAC & 4.84 & 4.84 & 0.866 \\
\hline 2000 & Maintain current TAC & 4.84 & 4.84 & 0.964 \\
\hline 2001 & Maintain current TAC & 4.84 & 4.36 & 0.824 \\
\hline 2002 & Maintain current TAC & 4.36 & 4.36 & 0.455 \\
\hline 2003 & Maintain current TAC & 4.36 & 4.36 & 0.632 \\
\hline 2004 & Reduce TAC to recent landings & 3.6 & 3.6 & 0.528 \\
\hline 2005 & Reduce TAC to recent landings & 2.3 & 2.88 & 0.382 \\
\hline 2006 & Reduce TAC to recent landings & 2.3 & 2.88 & 0.344 \\
\hline 2007 & Reduce TAC to recent landings & 2.1 & 2.88 & 0.106 \\
\hline 2008 & Reduce TAC to recent landings & 1.4 & 2.59 & 0.294 \\
\hline 2009 & Same advice as last year & 1.4 & 2.79 & 0.226 \\
\hline 2010 & No increase in effort & - & 3.079 & 0.139 \\
\hline 2011 & No increase in catches & - & 3.387 & 0.155 \\
\hline 2012 & No increase in catches & - & 3.387 & 0.224 \\
\hline 2013 & Catch decrease by 7\% & \(<0.160\) & 3.387 & \\
\hline 2014 & Landings increase of no more than \(20 \%\) & \(<0.207\) & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1)}\) Before 2011 advice was given for megrim in Divisions IVa, Via, and VIb combined.
Table 5.4.18.2 Megrim (Lepidorhombus spp.) in DivisionVIb. Nominal catch per country (in tonnes) as officially reported to ICES.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline France & - & - & - & - & - & - & - & - & - & . & 4 & <0.5 & <0.5 & - & - & - & - & - & & & & & \\
\hline Ireland & 196 & 240 & 139 & 128 & 176 & 117 & 124 & 141 & 218 & 127 & 167 & 176 & 87 & 83 & 43 & 68 & 95 & 87 & 68 & 48 & 47 & 72 & 120 \\
\hline Spain & 363 & 587 & 683 & 594 & 574 & 520 & 515 & 628 & 549 & 404 & 427 & 370 & 120 & 93 & 71 & 88 & 59 & 19 & 84 & 0 & 0 & 17 & 15 \\
\hline \[
\begin{array}{lr}
\hline \text { UK } & - \\
\text { Eng+Wales+N.Irl. }
\end{array}
\] & 19 & 14 & 53 & 56 & 38 & 27 & 92 & 76 & 116 & 57 & 57 & 42 & 41 & 74 & 42 & 19 & 9 & . & \({ }^{1}\) & & & & \\
\hline UK - Scotland & 226 & 204 & 198 & 147 & 258 & 152 & 112 & 164 & 208 & 278 & 309 & 236 & 207 & 382 & 372 & 207 & 181 & . & 141 & 178 & & & \\
\hline UK & & & & & & & & & & & & & & & & & & & & & 92 & 66 & 89 \\
\hline
\end{tabular}

\footnotetext{
Megrim (Lepidorhombus whiffiagonis) in DivisionVIb. Biomass index from the SCO-IV-VI-AMISS-Q2 survey (in tonnes) and harvest ratio: landings/biomass, assuming
} 0.3 catchability for the biomass index.
\begin{tabular}{c|c|c|c|c|}
\multirow{2}{*}{ Year } & \multicolumn{3}{|c|}{ Biomass index } & \multicolumn{2}{c|}{\begin{tabular}{c} 
Harvest ratio assuming \\
0.3 catchability for the \\
biomass index
\end{tabular}} \\
\cline { 2 - 4 } & (tonnes) & \multicolumn{2}{|c|}{\(95 \%\) confidence intervals } & lower \\
\cline { 2 - 3 } & & upper & \(17 \%\) \\
2005 & 679 & 197 & 1161 & \(11 \%\) \\
2006 & 910 & 485 & 1334 & \(2 \%\) \\
2008 & 1289 & 968 & 1610 & 2547 \\
2009 & 1728 & 908 & 1865 & \(5 \%\) \\
2010 & 1507 & 1149 & 2493 & \(4 \%\) \\
2011 & 1911 & 1330 & 1112 & \(2 \%\) \\
2012 & 885 & 658 & 6577 & \(5 \%\) \\
\hline
\end{tabular}

\title{
West of Scotland Rockall and North Sea Anglerfish
}

\section*{(Sub-area VI and Divisions IIa, IIIa, and IVa)}

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

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice is based on the approach for data limited stocks landings should be reduced by \(\mathbf{2 0 \%}\) in 2014 . FEAS agrees with this advice.

This stock falls in to ICES category \(\mathbf{3 . 2 . 0}\) for data-limited stocks for which a biomass index is available. For \(L\) piscatorius and L. budegassa the biomass index estimates for the most recent two years is \(22 \%\) lower than the previous three years.

Considering the economic importance of anglerfish in VI (and VII) FEAS considers that the current method for setting the TAC does not provide the best basis for advice and that investigations into alternative assessment methods and harvest control rules to generate catch advice are urgently needed.

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


\section*{CURRENT MANAGEMENT}
- There are two TACs covering the stock. A TAC for Division lla (EC waters) \& North Sea IV(EC waters) and a TAC for Sub-areas VI, XII, XIV and Division Vb (EC Waters).
- Ireland's quota for this stock was 492 t in 2013. This quota is taken exclusively from Sub-Area VI.
- Two species occur in these areas, Lophius piscatorius and L. budegassa, although catches are almost exclusively of the former.


\section*{ICES ADVICE 5.4.1 Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa, Subareas IV and VI}

\section*{Advice for 2014}

Based on ICES approach to data-limited stocks, ICES advises that catches should be no more than 10231 t in 2014. All catches are assumed to be landed.

ICES advises that the management area should be consistent with the assessment area.

\section*{Stock status}




Figure 5.4.1.1 Anglerfish (Lophius piscatorius and L. budegassa). Left: Official and ICES landings (thousand tonnes) in Subareas IV and VI and Division IIIa. Right: Stock biomass (thousand tonnes) from SCO-IV-VI-AMISS-Q2. Dashed horizontal lines for SSB correspond to the average on the respective year range.

Recent dedicated anglerfish surveys, the Scottish and Irish anglerfish and megrim industry/science surveys for the Northern shelf (SCO-IV-VI-AMISS-Q2) in Division IVa and Subarea VI, indicate a decline in biomass since 2008. The average biomass over this area in the last two years (2011-2012) is \(22 \%\) lower than the average biomass of the three previous years (2008-2010).

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

Anglerfish mature at large size, resulting in a large proportion of the catch consisting of immature fish. This makes the stock susceptible to overfishing and management measures are required to ensure sufficient numbers to survive to spawning size. Catches of anglerfish on the northern shelf (from Division VIb to Division IIIa) come from the same biological stock. Spawning appears to occur largely in deep water off the edge of the continental shelf.

\section*{The fisheries}

Anglerfish are caught in a targeted anglerfish fishery and as a bycatch in other demersal fisheries, including roundfish fisheries in Division VIa, the haddock fishery on Rockall Bank, Nephrops fisheries, and fisheries in deeper waters. In the North Sea, anglerfish are caught mainly as a bycatch in demersal fisheries for mixed roundfish and Nephrops and, to a lesser extent, in small-meshed Pandalus fisheries. A Norwegian large-meshed gillnet fishery targeting fish over 60 cm has developed along the Norwegian coast since the early 1990s.

\section*{Catch Total landings in 2012 were 11493 t (7351 t in Division IIIa and Subarea IV; 4142 t in Subarea \\ distribution VI). Discards from the Scottish, Irish, and Danish fleets were minimal in 2012 (64 t).}

\section*{Effects of the fisheries on the ecosystem}

The directed fishery takes place in deep water on the continental shelves in areas where cold-water corals (Lophelia spp.) occur, particularly at Rockall. However, demersal trawling is prohibited in several large areas at Rockall, and near the Wyville-Thomson ridge, which affords protection for corals in those areas.

\section*{Quality considerations}

The previous concerns about underreporting of landings are no longer considered an issue due to unrestrictive TACs and the substantial reduction in the offshore gillnet fishery. Accurate estimates of growth parameters are needed to facilitate the development of an analytical assessment. A dedicated Scottish and Irish industry/science anglerfish survey has operated from 2005-2012. The survey does not cover the southern and eastern parts of the North Sea and Skagerrak (Divisions IIIa, IVb, and IVc). Fisheries in these areas account for approximately 11\% of landings in the North Sea and Skagerrak since 2005, which adds uncertainty to the perception of stock trends. The timing of the Sco-AMISS-IV-VI surveys changed from November to April in 2008; however, the data used to estimate stock trends are all from surveys taking place in April.

The advice is based on biomass values from a survey. The methods applied to derive quantitative advice for datalimited stocks are expected to evolve as they are further developed and validated. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or the stock overfished.

Scientific basis
\begin{tabular}{ll} 
Assessment type & Survey trends. \\
Stock data category & \begin{tabular}{l} 
Category 3.2.0. \\
Input data
\end{tabular} \\
& International landings and dedicated anglerfish surveys in Subarea VI and Division \\
IVa (Scotland/Ireland SCO-IV-VI-AMISS-Q2). \\
Discards and bycatch & \begin{tabular}{l} 
Discards were not included in the assessment and are considered to be low. \\
Indicators
\end{tabular} \\
\begin{tabular}{l} 
None.
\end{tabular} \\
Other information & \begin{tabular}{l} 
The stock was benchmarked in 2013 (WKROUND; ICES, 2013a), but this did not \\
result in a revision of the assessment method.
\end{tabular} \\
Working group report & WGCSE (ICES, 2013b).
\end{tabular}

\subsection*{5.4.1}

Supporting information June 2013

\section*{ECOREGION Celtic Sea and West of Scotland+ North Sea \\ STOCK Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa and Subareas IV and VI}

\section*{Reference points}

No reference points have been defined for these two stocks. Because of identified problems with growth estimates and uncertainties in ageing, previous reference points are not considered to be valid.

Outlook for 2014

No analytical assessment can be presented for this stock. Because of uncertainties concerning catch-at-age data for anglerfish as well as limited knowledge about population dynamics, a forecast cannot be presented.

\section*{ICES approach to data-limited stocks}

For data-limited stocks for which biomass estimates are available, ICES uses as harvest control rule an indexadjusted status quo catch. The advice is based on a comparison of the two most recent biomass values with the three preceding values, combined with recent catch or landings data. Knowledge about the exploitation status also influences the advised catch.

For this stock the biomass is estimated to have decreased by more than \(20 \%\) between the periods \(2008-2010\) (average of the three years) and 2011-2012 (average of the two years). This implies a decrease in catches of at least \(20 \%\) in relation to the average catches of the last three years, corresponding to catches in 2014 of no more than 10231 t . All catches are assumed to be landed.

Though the exploitation status is unknown, the effort in the main fisheries has decreased until 2011 (Figure 5.4.1.2) and an increase in 2012 is not anticipated; therefore, no additional precautionary reduction is needed.

\section*{Additional considerations}

The distribution of anglerfish in the North Sea, Kattegat, and Skagerrak is associated with the distribution to the west of Scotland (Divisions VIa and VIb). It is likely that catches from these areas come from the same biological stock. Genetic studies have found no evidence of separate stocks and particle-tracking studies have indicated interchange of larvae between areas.

\section*{Information from the fishing industry}

The fishers' North Sea stock survey (Napier, 2012; Figure 5.4.1.4) shows that fishers' perceive the stock as increasing until approximately 2008 and remaining stable since then. The survey time-series for anglerfish in the North Sea shows a decrease after 2008 (Figure 5.4.1.3). Thus fishers' perceptions are very different from the trends apparent in the surveys. Fishers report that it has become increasingly difficult to fully utilize the North Sea anglerfish quota due to the very restrictive effort regime currently in place.

\section*{Regulations and their effects}

The current EU-agreed TAC for Subarea IV and the EC waters of Division IIa as well as the EU-Norway-agreed TAC for the Norwegian North Sea EEZ do not include Division IIIa: no internationally agreed management rules for anglerfish appear to exist in Division IIIa.

Underreporting of total landings is known to have been a significant problem in the past. Less restrictive quotas have reduced the incentive to misreport and the introduction of the registration of "buyers and sellers" legislation in Scotland and Ireland in 2006 has made it more difficult to make unreported landings. In addition, offshore gillnet fisheries carried out by "flag-vessels" targeting anglerfish (previously considered to be responsible for a significant amount of ghost fishing and subsequent discarding) are now considered to be much reduced. This is expected to have led to improved data on total catches of anglerfish.

International effort trends for the main gears in ICES Subarea IV and Division VIa, as collated and presented by the STECF effort group, show effort reductions in TR1 (larger-meshed trawls, the main gear catching anglerfish) in both areas, particularly in Division VIa ( \(48 \%\) between 2003 and 2010; around \(35 \%\) in 2011; Figure 5.4.1.2).
Changes in fishing technology and fishing patterns
Until the mid-1980s, anglerfish was taken mainly as a bycatch in bottom-trawl groundfish fisheries. Restrictive TACs for other species in Division VIa led to increased fishing pressure on anglerfish in that area, where they are now caught in a targeted anglerfish fishery and as a bycatch in other demersal fisheries.

The fishery has expanded into deeper waters since the mid-nineties, areas believed to have been a refuge for adult anglerfish, so this fishery increases the vulnerability of the stock to overexploitation. Immature fish are subjected to exploitation for a number of years prior to first maturity.

\section*{Comparison with previous assessment and advice}

The basis for the advice this year is the same as last year, i.e. ICES approach to data-limited stocks. Previous concerns about underreporting of landings are no longer considered an issue, and therefore ICES is able to provide quantified advice this year.

\section*{Assessment and management area}

Two TACs are set: i) EC waters of Division IIa and Subarea IV, and ii) Division Vb (EC) and Subareas VI, XII, and XIV. The management area should be the same as the assessment area.

\section*{Sources}

ICES. 2013a. Report of Benchmark Workshop on Roundfish Stocks, 4-8 February, Aberdeen. ICES CM 2013/ACOM:47.
ICES. 2013b. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.
Napier, I. R. 2012. Fishers' North Sea stock survey 2012. NAFC Marine Centre, University of the Highlands and Islands.
STECF. 2012. EU Scientific, Technical and Economic Committee for Fisheries. Evaluation of Fishing Effort Regimes in European Waters (STECF-12-16).


Figure 5.4.1.2 Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa and Subareas IV and VI. Trends in nominal international fishing effort in Skagerrak, North Sea, and Eastern Channel (left) and West of Scotland (right), collated by STECF (2012).


Figure 5.4.1.3
Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa and Subareas IV and VI. Total abundance (millions, upper panel) and stock biomass (thousand tonnes, lower panel) indices from SCO-IV-VI-AMISS-Q2 (black filled squares), with breakdown by area: Subarea IV (blue circles), Subarea VI (green triangles), Division VIa (red stars), and Division VIb (pink diamonds).


Figure 5.4.1.4
Anglerfish (Lophius piscatorius and L. budegassa) in Subarea IV. Results of the North Sea Commission fishers' survey perceptions of abundance by area, 2012 (Napier, 2012).
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Year ICES Advice & Predicted catch corresp. to advice & Predicted catch corresp. to advice for Division IIIa and Subarea IV & Predicted catch corresp. to advice Subarea VI & Agreed TAC \({ }^{1)}\) & Official landings & ICES landings \\
\hline 1990 Not assessed & - & - & - & 8.6 & 17.6 & 16.6 \\
\hline 1991 Not assessed & - & - & - & 8.6 & 18.4 & 17.4 \\
\hline 1992 Not assessed & - & - & - & 8.6 & 20.8 & 21.9 \\
\hline 1993 No long-term gain in increased \(\mathrm{F}^{3}\) & - & - & - & 8.6 & 22.6 & 24.0 \\
\hline 1994 No long-term gain in increased \(\mathrm{F}^{3}\) & - & - & - & 8.6 & 25.0 & 25.1 \\
\hline \begin{tabular}{l}
1995 \\
A precautionary TAC not exceeding recent catch levels \({ }^{3)}\)
\end{tabular} & - & - & - & 8.6 & 28.9 & 28.9 \\
\hline \begin{tabular}{l}
1996 \\
A precautionary TAC not exceeding recent catch levels \({ }^{3)}\)
\end{tabular} & - & - & - & 8.6 & 35.0 & 35.1 \\
\hline 1997 Reduction in fishing effort \({ }^{3}\) & - & - & - & 8.6 & 32.8 & 32.7 \\
\hline 1998 Reduction in fishing effort \({ }^{3}\) & - & - & - & 30.7 & 25.1 & 25.3 \\
\hline 1999 Reduce fishing effort, effective implementation of the TAC \({ }^{3)}\) & - & - & - & 30.7 & 21.2 & 21.9 \\
\hline \(200040 \%\) reduction in catches & - & \(<9.7\) & \(<7.4\) & 25.7 & 19.0 & 19.7 \\
\hline \(20012 / 3\) of the catches in 1973-1990 & - & 5.7 & 4.3 & 20.5 & 19.3 & 19.2 \\
\hline 2002 2/3 of the catches in 1973-1990 & - & 5.7 & 4.3 & 15.3 & 16.0 & 15.8 \\
\hline 2003 Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<6.7^{2)}\) & - & - & 10.2 & 13.0 & 13.0 \\
\hline 2004 Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<8.8\) & - & - & 10.2 & 13.5 & 14.7 \\
\hline 2005 No effort increase & - & - & - & 15.0 & 13.6 & n.a. \\
\hline 2006 No effort increase & - & - & - & 15.0 & 15.2 & n.a. \\
\hline 2007 No effort increase & - & - & - & 16.5 & 16.4 & n.a. \\
\hline 2008 No effort increase & - & - & - & 16.5 & 17.3 & n.a. \\
\hline 2009 Same advice as last year & - & - & - & 16.9 & 16.4 & n.a. \\
\hline 2010 No effort increase & - & - & - & \(16.9{ }^{4)}\) & 12.7 & n.a. \\
\hline 2011 Decrease effort & - & - & - & \(15.1{ }^{5}\) & 13.6 & n.a. \\
\hline 2012 Reduce catch & - & - & - & \(14.344^{5)}\) & \(11.4{ }^{6}\) & \(12.1{ }^{6}\) \\
\hline 2013 Decrease catches by 20\% & - & - & - & 13.627 & & \\
\hline 2014 Decrease catches by 20\% & 10.231 & - & - & & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1)}\) TAC for Subarea IV and Division IIa (EC) plus TAC for Division \(\mathrm{Vb}(\mathrm{EC})\) and Subareas VI, XII, and XIV. Except TAC before 1998, which covered for Division \(\mathrm{Vb}(\mathrm{EC})\) and Subareas VI, XII, and XIV.
\({ }^{2)}\) Advice for Division IIIa, Subarea IV, and Division VIa.
\({ }^{3)}\) For Subarea VI.
\({ }^{4)}\) An additional quota of \(1500 t\) was also available for EU vessels fishing in the Norwegian zone of Subarea IV in 2011.
\({ }^{5)}\) An additional quota of 1500 t was also available for EU vessels fishing in the Norwegian zone of Subarea IV in 2012.
\({ }^{6}\) ) Preliminary.
n.a. = not available.

Table 5.4.1.2 Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa and Subareas IV and VI. Officially reported landings and ICES WG estimates by ICES area.
\begin{tabular}{rrrrrrrrrrr}
\hline & IIIa & IVa & IVb & IVc & VIa & VIb & IV & VI & Total & ICES \\
\hline 1973 & 140 & 2085 & 575 & 41 & 9221 & 127 & 2701 & 9348 & 12189 & \\
1974 & 202 & 2737 & 1171 & 39 & 3217 & 435 & 3947 & 3652 & 7801 & \\
1975 & 291 & 2887 & 1864 & 59 & 3122 & 76 & 4810 & 3198 & 8299 & \\
1976 & 641 & 3624 & 1252 & 49 & 3383 & 72 & 4925 & 3455 & 9021 & \\
1977 & 643 & 3264 & 1278 & 54 & 3457 & 78 & 4596 & 3535 & 8774 & \\
1978 & 509 & 3111 & 1260 & 72 & 3117 & 103 & 4443 & 3220 & 8172 & \\
1979 & 687 & 2972 & 1578 & 112 & 2745 & 29 & 4662 & 2774 & 8123 & \\
1980 & 652 & 3450 & 1374 & 175 & 2634 & 200 & 4999 & 2834 & 8485 & \\
1981 & 549 & 2472 & 752 & 132 & 1387 & 331 & 3356 & 1718 & 5623 & \\
1982 & 529 & 2214 & 654 & 99 & 3154 & 454 & 2967 & 3608 & 7104 & \\
1983 & 506 & 2465 & 1540 & 181 & 3417 & 433 & 4186 & 3850 & 8542 & \\
1984 & 568 & 3874 & 1803 & 188 & 3935 & 707 & 5865 & 4642 & 11075 & \\
1985 & 578 & 4569 & 1798 & 77 & 4043 & 1013 & 6444 & 5056 & 12078 & \\
1986 & 524 & 5594 & 1762 & 47 & 3090 & 1326 & 7403 & 4416 & 12343 & \\
1987 & 589 & 7705 & 1768 & 66 & 3955 & 1294 & 9539 & 5249 & 15377 & \\
1988 & 347 & 7737 & 2061 & 95 & 6003 & 1730 & 9893 & 7733 & 17973 & \\
1989 & 334 & 7868 & 2121 & 86 & 5729 & 313 & 10075 & 6042 & 16451 & \\
1990 & 570 & 8387 & 2177 & 34 & 5615 & 822 & 10598 & 6437 & 17605 & \\
1991 & 595 & 9235 & 2522 & 26 & 5061 & 923 & 11783 & 5984 & 18362 & 17441 \\
1992 & 938 & 10209 & 3053 & 39 & 5479 & 1089 & 13301 & 6568 & 20807 & 21872 \\
1993 & 843 & 12309 & 3144 & 66 & 5553 & 681 & 15519 & 6234 & 22596 & 23971 \\
1994 & 811 & 14505 & 3445 & 210 & 5273 & 777 & 18160 & 6050 & 25021 & 25057 \\
1995 & 823 & 17891 & 2627 & 402 & 6354 & 830 & 20920 & 7184 & 28927 & 28913 \\
1996 & 702 & 25176 & 1847 & 304 & 6408 & 602 & 27327 & 7010 & 35039 & 35100 \\
1997 & 776 & 23425 & 2172 & 160 & 5330 & 899 & 25757 & 6229 & 32762 & 32728 \\
1998 & 626 & 16860 & 2088 & 78 & 4506 & 900 & 19023 & 5406 & 25058 & 25293 \\
1999 & 660 & 13344 & 1517 & 24 & 4284 & 1401 & 14867 & 5685 & 21230 & 21854 \\
2000 & 602 & 12338 & 1617 & 31 & 3311 & 1074 & 13986 & 4385 & 18973 & 19682 \\
2001 & 621 & 12861 & 1832 & 21 & 2660 & 1309 & 14714 & 3969 & 19304 & 19157 \\
2002 & 667 & 11048 & 1244 & 21 & 2280 & 718 & 12313 & 2998 & 15978 & 15834 \\
2003 & 478 & 8523 & 847 & 20 & 2493 & 643 & 9390 & 3136 & 13004 & 13017 \\
2004 & 519 & 8987 & 851 & 15 & 2453 & 671 & 9853 & 3124 & 13496 & 14729 \\
2005 & 458 & 8424 & 688 & 5 & 3019 & 958 & 9117 & 3977 & 13552 & \\
2006 & 423 & 10338 & 685 & 3 & 2785 & 916 & 11026 & 3701 & 15150 & \\
2007 & 433 & 10632 & 749 & 4 & 3352 & 1260 & 11385 & 4612 & 16430 & \\
2008 & 486 & 11038 & 769 & 5 & 3373 & 1630 & 11812 & 5003 & 17300 & \\
2009 & 479 & 10096 & 653 & 8 & 3029 & 2119 & 10757 & 5148 & 16384 & \\
2010 & 477 & 6979 & 619 & 12 & 3187 & 1423 & 7610 & 4610 & 12697 & \\
2011 & 432 & 7760 & 773 & 9 & 2724 & 1878 & 8542 & 4602 & 13576 & \\
\(2012 *\) & 466 & 6176 & 705 & 4 & 2682 & 1356 & 6885 & 4038 & 11389 & 12095 \\
\hline & & & & & & & & & & \\
\hline 10
\end{tabular}
*Preliminary.
Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) by country as officially reported to ICES and estimated by ICES of anglerfish in Division VIa (west of Scotland).
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012* \\
\hline Belgium & 3 & 2 & 9 & 6 & 5 & - & 5 & 2 & - & - & + & + & - & + & - & - & - & - & - & - & & \\
\hline Denmark & 1 & 3 & 4 & 5 & 10 & 4 & 1 & 2 & 1 & + & + & - & + & + & - & - & - & - & - & - & & \\
\hline \multicolumn{23}{|l|}{Estonia} \\
\hline Faroe Is. & - & - & - & - & - & - & - & - & - & - & - & - & - & 2 & 2 & 3 & 2 & 1 & 2 & 4 & 1 & + \\
\hline France & 1910 & 2308 & 2467 & 2382 & 2648 & 2899 & 2058 & 1634 & 1814 & 1132 & 943 & 739 & 1212 & 1191 & 1392 & 1314 & 1763 & 1746 & 1555 & 1160 & 1021 & 1166 \\
\hline Germany & 1 & 2 & 60 & 67 & 77 & 35 & 72 & 137 & 50 & 39 & 11 & 3 & 27 & 39 & 39 & 1 & - & 54 & 79 & 79 & 59 & \\
\hline Ireland & 250 & 403 & 428 & 303 & 720 & 717 & 625 & 749 & 617 & 515 & 475 & 304 & 322 & 219 & 356 & 392 & 470 & 295 & 328 & 510 & 488 & 325 \\
\hline Netherlands & - & - & - & - & - & - & 27 & 1 & - & - & - & - & - & - & - & - & - & - & - & - & 0 & 0 \\
\hline Norway & 6 & 14 & 8 & 6 & 4 & 4 & 1 & 3 & 1 & 3 & 2 & 1 & + & + & 1 & 1 & 1 & 2 & - & 1 & 1 & 1 \\
\hline \multicolumn{23}{|l|}{Russia} \\
\hline Spain & 7 & 11 & 8 & 1 & 37 & 33 & 63 & 86 & 53 & 82 & 70 & 101 & 196 & 110 & 82 & 76 & 3 & 174 & 189 & - & 138 & \\
\hline \[
\begin{gathered}
\text { UK(E } \\
\text { W\&NI) }
\end{gathered}
\] & 270 & 351 & 223 & 370 & 320 & 201 & 156 & 119 & 60 & 44 & 40 & 32 & 31 & 30 & 20 & 24 & 42 & 5 & 12 & 393 & & \\
\hline UK(Scot.) & 2613 & 2385 & 2346 & 2133 & 2533 & 2515 & 2322 & 1773 & 1688 & 1496 & 1119 & 1100 & 705 & 862 & 1127 & 974 & 1071 & 1096 & 864 & 1040 & & \\
\hline UK (total) & & & & & & & & & & & & & & & & & & & 876 & 1021 & 1016 & 1190 \\
\hline Total & 5061 & 5479 & 5553 & 5273 & 6354 & 6408 & 5330 & 4506 & 4284 & 3311 & 2660 & 2280 & 2493 & 2453 & 3019 & 2785 & 3352 & 3373 & 3029 & 3187 & 2724 & 2682 \\
\hline Unallocated & 296 & 2638 & 3816 & 2766 & 5112 & 11148 & 7506 & 5234 & 3799 & 3114 & 2068 & 1882 & 985 & 1938 & & & & & & & & 72 \\
\hline \[
\begin{gathered}
\hline \text { ICES } \\
\text { landings }
\end{gathered}
\] & 5357 & 8117 & 9369 & 8039 & 11466 & 17556 & 12836 & 9740 & 8083 & 6425 & 4728 & 4162 & 3478 & 4391 & & & & & & & & 2754 \\
\hline reliminary & & & & & & & & & & & & & & & & & & & & & & \\
\hline
\end{tabular}
Table 5.4.1.4 Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa, and in Subareas IV and VI. Nominal landings ( t ) by country as officially reported to ICES and
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012* \\
\hline \multicolumn{23}{|l|}{Belgium} \\
\hline \multicolumn{23}{|l|}{Denmark} \\
\hline Estonia & - & - & - & - & - & - & - & - & - & - & - & - & - & + & - & - & - & & - & & & \\
\hline Faroe Is. & - & 2 & - & - & - & 15 & 4 & 2 & 2 & - & 1 & - & - & - & - & - & - & 1 & 4 & 8 & + & 5 \\
\hline France & - & - & 29 & - & - & - & 1 & 1 & - & 48 & 192 & 43 & 191 & 175 & 293 & 224 & 327 & 327 & 637 & 23 & 515 & 456 \\
\hline Germany & - & - & 103 & 73 & 83 & 78 & 177 & 132 & 144 & 119 & 67 & 35 & 64 & 66 & 77 & 72 & 222 & 0 & 132 & 87 & 90 & \\
\hline Ireland & 272 & 417 & 96 & 135 & 133 & 90 & 139 & 130 & 75 & 81 & 134 & 51 & 26 & 13 & 35 & 53 & 70 & 76 & 91 & 107 & 108 & - \\
\hline Norway & 18 & 10 & 17 & 24 & 14 & 11 & 4 & 6 & 5 & 11 & 5 & 3 & 6 & 5 & 4 & 6 & 7 & 5 & 9 & 12 & 7 & 0 \\
\hline Portugal & - & - & - & - & - & - & - & + & 429 & 20 & 18 & 8 & 4 & 19 & 63 & - & - & - & - & & & \\
\hline Russia & - & - & - & - & - & - & - & - & - & - & 1 & - & - & 2 & 4 & 1 & 1 & 35 & - & & & \\
\hline Spain & 333 & 263 & 178 & 214 & 296 & 196 & 171 & 252 & 291 & 149 & 327 & 128 & 59 & 43 & 34 & 36 & 12 & 85 & 57 & & 29 & \\
\hline \[
\begin{gathered}
\text { UK(E } \\
\text { W\&NI) }
\end{gathered}
\] & 99 & 173 & 76 & 50 & 105 & 144 & 247 & 188 & 111 & 272 & 197 & 133 & 133 & 54 & 93 & 46 & 146 & 5 & 48 & 15 & & \\
\hline UK(Scot) & 201 & 224 & 182 & 281 & 199 & 68 & 156 & 189 & 344 & 374 & 367 & 317 & 160 & 294 & 355 & 478 & 475 & 1096 & 1141 & 1171 & & \\
\hline UK (total) & & & & & & & & & & & & & & & & & & & 1189 & 1192 & 1129 & 895 \\
\hline Total & 923 & 1089 & 681 & 777 & 830 & 602 & 899 & 900 & 1401 & 1074 & 1309 & 718 & 643 & 671 & 958 & 916 & 1260 & 1629.6 & 2119 & 1423 & 1878 & 1356 \\
\hline Unallocated & & & & & & & & & -9 & 17 & -178 & -47 & 145 & 121 & & & & & & & & 32 \\
\hline \[
\begin{gathered}
\hline \text { ICES } \\
\text { landings }
\end{gathered}
\] & 923 & 1089 & 681 & 777 & 830 & 602 & 899 & 900 & 1392 & 1091 & 1131 & 671 & 788 & 792 & & & & & & & & 1388 \\
\hline
\end{tabular}
Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) as officially reported to ICES and estimated by ICES of anglerfish in Subarea VI.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012* \\
\hline Belgium & 3 & 2 & 9 & 6 & 5 & 0 & 5 & 2 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline Denmark & 1 & 3 & 4 & 5 & 10 & 4 & 1 & 2 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline Estonia & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline Faroe Is. & 0 & 2 & 0 & 0 & 0 & 15 & 4 & 2 & 2 & 0 & 1 & 0 & 0 & 2 & 2 & 3 & 2 & 2 & 6 & 12 & 1 & 5 \\
\hline France & 1910 & 2308 & 2496 & 2382 & 2648 & 2899 & 2059 & 1635 & 1814 & 1180 & 1135 & 782 & 1403 & 1366 & 1685 & 1538 & 2090 & 2073 & 2192 & 1183 & 1536 & 1622 \\
\hline Germany & 1 & 2 & 163 & 140 & 160 & 113 & 249 & 269 & 194 & 158 & 78 & 38 & 91 & 105 & 116 & 73 & 222 & 54 & 211 & 166 & 149 & 0 \\
\hline Ireland & 522 & 820 & 524 & 438 & 853 & 807 & 764 & 879 & 692 & 596 & 609 & 355 & 348 & 232 & 391 & 445 & 540 & 370.6 & 419 & 617 & 596 & 325 \\
\hline \multicolumn{23}{|l|}{Netherlands} \\
\hline Norway & 18 & 10 & 17 & 24 & 14 & 11 & 31 & 7 & 5 & 11 & 5 & 3 & 6 & 5 & 4 & 6 & 7 & 5 & 9 & 12 & 7 & 0 \\
\hline Portugal & 6 & 14 & 8 & 6 & 4 & 4 & 1 & 3 & 430 & 23 & 20 & 9 & 4 & 19 & 64 & 1 & 1 & 2 & 0 & 1 & 1 & 1 \\
\hline Russia & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 2 & 4 & 1 & 1 & 35 & 0 & 0 & 0 & 0 \\
\hline Spain & 340 & 274 & 186 & 215 & 333 & 229 & 234 & 338 & 344 & 231 & 397 & 229 & 255 & 153 & 116 & 112 & 15 & 259 & 246 & 0 & 167 & \\
\hline \multicolumn{23}{|l|}{Sweden} \\
\hline UK(E,W\&NI) & 369 & 524 & 299 & 420 & 425 & 345 & 403 & 307 & 171 & 316 & 237 & 165 & 164 & 84 & 113 & 70 & 188 & 10 & 60 & 408 & & \\
\hline UK(Scot) & 2814 & 2609 & 2528 & 2414 & 2732 & 2583 & 2478 & 1962 & 2032 & 1870 & 1486 & 1417 & 865 & 1156 & 1482 & 1452 & 1546 & 2192 & 2005 & 2211 & & \\
\hline UK (total) & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 2065 & 2213 & 2145 & 2085 \\
\hline Total & 5984 & 6568 & 6234 & 6050 & 7184 & 7010 & 6229 & 5406 & 5685 & 4385 & 3969 & 2998 & 3136 & 3124 & 3977 & 3701 & 4612 & 5002.6 & 5148 & 4610 & 4602 & 4038 \\
\hline Unallocated & 296 & 2638 & 3816 & 2766 & 5112 & 11148 & 7506 & 5234 & 3790 & 3131 & 1890 & 1835 & 1130 & 2059 & & & & & & & & 104 \\
\hline \[
\begin{aligned}
& \hline \text { ICES } \\
& \text { landings }
\end{aligned}
\] & 6280 & 9206 & 10050 & 8816 & 12296 & 18158 & 13735 & 10640 & 9475 & 7516 & 5859 & 4833 & 4266 & 5183 & & & & & & & & 4142 \\
\hline
\end{tabular}
Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) by country as officially reported to ICES and estimated by ICES of anglerfish in Division IVa.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012* \\
\hline Belgium & 2 & 9 & 3 & 3 & 2 & 8 & 4 & 1 & 5 & 12 & - & 8 & 1 & - & - & - & - & - & - & & & \\
\hline Denmark & 1245 & 1265 & 946 & 1157 & 732 & 1239 & 1155 & 1024 & 1128 & 1087 & 1289 & 1308 & 1523 & 1538 & 1379 & 1311 & 961 & 1071 & 1134 & 1 & 841 & 821 \\
\hline Faroes & 1 & - & 10 & 18 & 20 & - & 15 & 10 & 6 & - & 2 & + & 3 & 11 & 22 & 2 & + & - & 4 & & 0 & 0 \\
\hline France & 124 & 151 & 69 & 28 & 18 & 7 & 7 & 3 & 18 & 8 & 9 & 8 & 8 & 8 & 4 & 7 & 13 & 13 & 48 & 6 & 12 & 14 \\
\hline Germany & 71 & 68 & 100 & 84 & 613 & 292 & 601 & 873 & 454 & 182 & 95 & 95 & 65 & 20 & 84 & 173 & 186 & 344 & 216 & 124 & 46 & \\
\hline Ireland & & & & & & & & & & & & & & & & & & & & & 0 & 0 \\
\hline Netherlands & 23 & 44 & 78 & 38 & 13 & 25 & 12 & - & 15 & 12 & 3 & 8 & 9 & 38 & 13 & 14 & 14 & 12 & 5 & 8 & 5 & 5 \\
\hline Norway & 587 & 635 & 1224 & 1318 & 657 & 821 & 672 & 954 & 1219 & 1182 & 1212 & 928 & 769 & 999 & 880 & 1005 & 831 & 860 & 859 & 735 & 494 & 480 \\
\hline Sweden & 14 & 7 & 7 & 7 & 2 & 1 & 2 & 8 & 8 & 78 & 44 & 56 & 8 & 6 & 5 & 5 & 20 & 67 & - & 4 & 9 & 7 \\
\hline UK(E W\&NI) & 129 & 143 & 160 & 169 & 176 & 439 & 2174 & 668 & 781 & 218 & 183 & 98 & 104 & 83 & 34 & 99 & 303 & 13 & 320 & 371 & & \\
\hline UK (Scotland) & 7039 & 7887 & 9712 & 11683 & 15658 & 22344 & 18783 & 13319 & 9710 & 9559 & 10024 & 8539 & 6033 & 6284 & 6003 & 7722 & 8304 & 8658 & 7510 & 5730 & & \\
\hline UK (total) & & & & & & & & & & & & & & & & & & & 7830 & 6101 & 6353 & 4849 \\
\hline Total & 9235 & 10209 & 12309 & 14505 & 17891 & 25176 & 23425 & 16860 & 13344 & 12338 & 12861 & 11048 & 8523 & 8987 & 8424 & 10338 & 10632 & 11038 & 10096 & 6979 & 7760 & 6176 \\
\hline
\end{tabular}

\footnotetext{
* Preliminary
}
Table 5.4.1.7 Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) by country as officially reported to ICES and
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012* \\
\hline Belgium & 357 & 538 & 558 & 713 & 579 & 287 & 336 & 371 & 270 & 449 & 579 & 435 & 180 & 260 & 207 & 138 & 179 & 181 & 134 & 124 & 111 & 129 \\
\hline Denmark & 345 & 421 & 347 & 350 & 295 & 225 & 334 & 432 & 368 & 260 & 251 & 255 & 191 & 274 & 237 & 276 & 173 & 237 & 248 & 194 & 286 & 301 \\
\hline Faroes & - & - & 2 & - & - & - & - & - & - & - & - & 10 & - & - & - & - & - & - & - & - & 0 & \\
\hline France & - & 1 & - & 2 & - & - & - & - & - & - & - & - & - & + & - & - & - & - & 9 & 6 & 4 & + \\
\hline Germany & 4 & 2 & 13 & 15 & 10 & 9 & 18 & 19 & 9 & 14 & 9 & 17 & 11 & 11 & 9 & 14 & 12 & 22 & 17 & 21 & 17 & \\
\hline Ireland & & & & & & & & & & & & & 1 & - & - & - & - & - & - & - & & \\
\hline Netherlands & 285 & 356 & 467 & 510 & 335 & 159 & 237 & 223 & 141 & 141 & 123 & 62 & 42 & 25 & 31 & 33 & 61 & 58 & 36 & 46 & 53 & 59 \\
\hline Norway & 17 & 4 & 3 & 11 & 15 & 29 & 6 & 13 & 17 & 9 & 15 & 10 & 12 & 22 & 16 & 14 & 24 & 15 & 21 & 10 & 11 & 14 \\
\hline Sweden & & & & 3 & 2 & 1 & 3 & 3 & 4 & 3 & 2 & 9 & 2 & 1 & 4 & 4 & 6 & 9 & - & 5 & 7 & 7 \\
\hline UK(E W\&NI) & 669 & 998 & 1285 & 1277 & 919 & 662 & 664 & 603 & 364 & 423 & 475 & 236 & 167 & 120 & 96 & 108 & 122 & 105 & 85 & 88 & & \\
\hline UK (Scotland) & 845 & 733 & 469 & 564 & 472 & 475 & 574 & 424 & 344 & 318 & 378 & 210 & 241 & 138 & 88 & 98 & 172 & 142 & 103 & 125 & & \\
\hline UK (total) & & & & & & & & & & & & & & & & & & & 193 & 213 & 284 & 195 \\
\hline Total & 2522 & 3053 & 3144 & 3445 & 2627 & 1847 & 2172 & 2088 & 1517 & 1617 & 1832 & 1244 & 847 & 851 & 688 & 685 & 749 & 769 & 653 & 619 & 773 & 705 \\
\hline Table 5.4.1.8 & \multicolumn{22}{|l|}{Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) by country as officially reported to ICES estimated by ICES of anglerfish in Division IVc.} \\
\hline & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012* \\
\hline Belgium & 13 & 12 & 34 & 37 & 26 & 28 & 17 & 17 & 11 & 15 & 15 & 16 & 9 & 5 & 4 & 3 & 3 & 4 & 6 & 7 & 6 & 2 \\
\hline Denmark & 2 & + & - & + & + & + & + & + & + & + & + & + & + & + & + & - & - & & - & - & 0 & 0 \\
\hline \multicolumn{23}{|l|}{Faroes} \\
\hline France & - & - & - & - & - & - & - & 10 & - & + & - & + & - & - & - & - & - & + & - & 1 & 1 & + \\
\hline Germany & - & - & - & - & - & - & - & - & - & + & - & + & + & - & - & - & - & - & - & - & & \\
\hline \multicolumn{23}{|l|}{Ireland} \\
\hline Netherlands & 5 & 10 & 14 & 20 & 15 & 17 & 11 & 15 & 10 & 15 & 6 & 5 & 1 & - & 1 & - & 1 & 1 & - & 2 & 1 & 1 \\
\hline Norway & - & - & - & - & + & - & - & - & + & - & + & - & - & - & - & - & - & - & 1 & - & & \\
\hline \multicolumn{23}{|l|}{Sweden} \\
\hline UK(E\&W\&NI) & 6 & 17 & 18 & 136 & 361 & 256 & 131 & 36 & 3 & 1 & - & - & 10 & 3 & - & - & - & - & 1 & 1 & & \\
\hline UK (Scotland) & - & - & - & 17 & - & 3 & 1 & + & \(+\) & + & - & - & - & 7 & - & - & - & - & - & - & & \\
\hline \multicolumn{23}{|l|}{} \\
\hline Total & 26 & 39 & 66 & 210 & 402 & 304 & 160 & 78 & 24 & 31 & 21 & 21 & 20 & 15 & 5 & 3 & 4 & 5 & 8 & 12 & 9 & 4 \\
\hline
\end{tabular}

\footnotetext{
* Preliminary.
}
Table 5.4.1.9 Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) as officially reported to ICES and estimated by ICES
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012* \\
\hline Belgium & 372 & 559 & 595 & 753 & 607 & 323 & 357 & 389 & 286 & 476 & 594 & 459 & 190 & 265 & 211 & 141 & 182 & 184.6 & 140 & 131 & 117 & 131 \\
\hline Denmark & 1592 & 1686 & 1293 & 1507 & 1027 & 1464 & 1489 & 1456 & 1496 & 1347 & 1540 & 1563 & 1714 & 1812 & 1616 & 1587 & 1134 & 1308 & 1382 & 195 & 1127 & 1122 \\
\hline \multicolumn{23}{|l|}{Estonia} \\
\hline Faroes & 1 & 0 & 12 & 18 & 20 & 0 & 15 & 10 & 6 & 0 & 2 & 10 & 3 & 11 & 22 & 2 & 0 & 0 & 4 & 0 & 0 & 0 \\
\hline France & 124 & 152 & 69 & 30 & 18 & 7 & 7 & 13 & 18 & 8 & 9 & 8 & 8 & 8 & 4 & 7 & 13 & 13 & 57 & 13 & 17 & 14 \\
\hline Germany & 75 & 70 & 113 & 99 & 623 & 301 & 619 & 892 & 463 & 196 & 104 & 112 & 76 & 31 & 93 & 187 & 198 & 366 & 233 & 145 & 63 & 0 \\
\hline Ireland & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline Netherlands & 313 & 410 & 559 & 568 & 363 & 201 & 260 & 238 & 166 & 168 & 132 & 75 & 52 & 63 & 45 & 47 & 76 & 71 & 41 & 56 & 59 & 65 \\
\hline Norway & 604 & 639 & 1227 & 1329 & 672 & 850 & 678 & 967 & 1236 & 1191 & 1227 & 938 & 781 & 1021 & 896 & 1019 & 855 & 875 & 881 & 745 & 505 & 494 \\
\hline \multicolumn{23}{|l|}{Portugal} \\
\hline \multicolumn{23}{|l|}{Russia} \\
\hline \multicolumn{23}{|l|}{Spain} \\
\hline Sweden & 14 & 7 & 7 & 10 & 4 & 2 & 5 & 11 & 12 & 81 & 46 & 65 & 10 & 7 & 9 & 9 & 26 & 76 & 0 & 9 & 16 & 14 \\
\hline UK(E\&W\&NI & 804 & 1158 & 1463 & 1582 & 1456 & 1357 & 2969 & 1307 & 1148 & 642 & 658 & 334 & 281 & 206 & 130 & 207 & 425 & 118 & 406 & 460 & 0 & 0 \\
\hline UK (Scotland) & 7884 & 8620 & 10181 & 12264 & 16130 & 22822 & 19358 & 13743 & 10054 & 9877 & 10402 & 8749 & 6274 & 6429 & 6091 & 7820 & 8476 & 8800 & 7613 & 5855 & 0 & 0 \\
\hline UK (Total) & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 8024 & 6315 & 6638 & 5044 \\
\hline Total & 11783 & 13301 & 15519 & 18160 & 20920 & 27327 & 25757 & 19026 & 14885 & 13986 & 14714 & 12313 & 9390 & 9853 & 9117 & 11026 & 11385 & 5 & 10757 & 7609 & 8542 & 6884 \\
\hline Unallocated & \(-1,217\) & -1,573 & \(-2,441\) & -2,730 & \(-5,126\) & 11,087 & -7,540 & -4,999 & -3,166 & -2,422 & -2,037 & \(-1,979\) & 1,117 & -826 & & & & & & & & 330 \\
\hline ICES landings & 10,566 & 11,728 & 13,078 & 15,430 & 15,794 & 16,240 & 18,217 & 14,027 & 11,719 & 11,564 & 12,677 & 10,334 & 8,273 & 9,027 & & & & & & & & 7214 \\
\hline
\end{tabular}

\footnotetext{
* Preliminary.
}
Table 5.4.1.10 Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) by country as officially reported to ICES and estimated by ICES of anglerfish in Division IIIa (Skagerrak, Kattegat).
\begin{tabular}{lrrrrrrrrrrrrrrrrrrrrrrrrrr}
\hline & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & \(2012^{*}\) \\
\hline Belgium & 15 & 48 & 34 & 21 & 35 & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - \\
Denmark & 493 & 658 & 565 & 459 & 312 & 367 & 550 & 415 & 362 & 377 & 375 & 369 & 215 & 311 & 274 & 227 & 255 & 287 & 344 & 270 & 251 & 308 \\
France & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - & + \\
Germany & - & - & 1 & - & - & 1 & 1 & 1 & & 2 & 1 & - & 1 & - & 1 & 1 & 2 & 1 & 1 & 1 & 1 & 2 & 0 \\
Netherlands & & & & & & & - & - & - & - & - & - & 3 & 4 & 4 & 3 & 1 & 3 & - & 5 & 0 & 0 \\
Norway & 64 & 170 & 154 & 263 & 440 & 309 & 186 & 177 & 260 & 197 & 200 & 242 & 189 & 130 & 100 & 137 & 132 & 144 & 134 & 158 & 153 & 115 \\
Sweden & 23 & 62 & 89 & 68 & 36 & 25 & 39 & 33 & 36 & 27 & 46 & 55 & 71 & 73 & 79 & 54 & 44 & 51 & \(\ldots\) & 43 & 26 & 43 \\
\hline Total & 595 & 938 & 843 & 811 & 823 & 702 & 776 & 626 & 660 & 602 & 621 & 667 & 478 & 519 & 458 & 423 & 433 & 486 & 479 & 477 & 432 & 466 \\
\hline Unallocated & & & & & & & & & & & & & & & & & & & & \\
\hline ICES landings & & & & & & & & & & & & & & & & & & & & & \\
\hline
\end{tabular}

\footnotetext{
*Preliminary.
}
Table 5.4.1.11 Anglerfish (Lophius piscatorius and L. budegassa) in Division IIIa and in Subareas IV and VI. Abundance (millions of individuals - age 1 and older) and biomass (thousands of tonnes - age 1 and older) estimates from the 2005-2012 anglerfish surveys (SCO-IV-VI-AMISS-Q2) by ICES subareas and divisions.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|}
\hline \multicolumn{9}{|l|}{Abundance (millions)} \\
\hline ICES Subarea / Division & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline Subarea IV (partial) & 11.168 & 12.844 & 15.304 & 12.613 & 8.279 & 7.366 & 5.150 & 5.432 \\
\hline Division VIa & 10.866 & 10.459 & 7.956 & 7.718 & 5.144 & 5.161 & 6.057 & 4.961 \\
\hline Division VIb & 1.800 & 3.174 & 4.000 & 3.952 & 3.688 & 3.131 & 3.669 & 5.135 \\
\hline Subarea VI & 12.666 & 13.633 & 11.956 & 11.670 & 8.832 & 8.292 & 9.725 & 10.096 \\
\hline Total stock & 23.833 & 26.477 & 27.261 & 24.283 & 17.111 & 15.658 & 14.875 & 15.528 \\
\hline \multicolumn{9}{|l|}{} \\
\hline \multicolumn{9}{|l|}{Biomass (thousand tonnes)} \\
\hline & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline Subarea IV (partial) & 18.642 & 21.921 & 28.534 & 29.721 & 17.058 & 21.944 & 14.949 & 15.106 \\
\hline Division VIa & 14.096 & 12.175 & 11.072 & 14.383 & 8.150 & 11.590 & 9.330 & 9.213 \\
\hline Division VIb & 5.879 & 6.889 & 10.786 & 9.442 & 12.852 & 8.745 & 8.974 & 12.005 \\
\hline Subarea VI & 19.975 & 19.064 & 21.858 & 23.825 & 21.002 & 20.334 & 18.305 & 21.218 \\
\hline Total stock & 38.617 & 40.985 & 50.392 & 53.546 & 38.060 & 42.279 & 33.254 & 36.325 \\
\hline
\end{tabular}

\section*{FU II-I3 Nephrops Northwest of Ireland and West of Scotland}

\section*{FEAS -MULTIPLE STOCK CONSIDERATIONS}

The ICES advice is mainly based on the ICES MSY approach and implies fishing stocks at sustainable harvest ratios. FEAS agrees with the ICES advice.

The advised landings in 2014 from Nephrops FUs in Sub-area VI are as follows:
\begin{tabular}{lcc}
\hline \begin{tabular}{c} 
Stock Area \\
(Functional Unit)
\end{tabular} & \begin{tabular}{c} 
Landings \\
(Tonnes)
\end{tabular} & \begin{tabular}{c} 
ICES \\
Category
\end{tabular} \\
\hline North Minch (FUII) & \(<3,485\) & I \\
South Minch (FUI2) & \(<5,21\) I & I \\
Firth of Clyde (FUI3) & \(<5,744\) & I \\
Sound of Jura (FUI3) & \(<521\) & I \\
Other rectangles & \(<326\) & 6.2 .0 \\
\hline
\end{tabular}


Red Boxes - TAC/Management Area Blue Shading - Functional Unit

The current TAC area and the stock assessment area do not match. FEAS agrees with the ICES and STECF advice that all Nephrops fisheries should be managed at an appropriate geographical scale i.e. Functional Unit. The cumulative advice for the Sub-area VI TAC area in 2014 is \(15,287 \mathrm{t}\). This implies an Irish quota of 206 t.

\section*{CURRENT MANAGEMENT}
- The TAC area covers Sub-area VI and Division Vb. Division Vla contains three main fisheries, the North Minch (FU II), South Minch (FU I2) and Firth of Clyde (FU 13). The assessment is based on a time series of UWTV surveys in these FUs.
- Irish landings mainly come from the component of this stock that is not currently assessed using UWTV surveys.
- The TAC in 2013 was \(16,690 \mathrm{t}\) with an Irish quota of 226 t .
- There are no explicit management objectives or management plan for these stocks but Nephrops fisheries in this area are affected by the cod long-term management plan.


\section*{ICES ADVICE 5.4.20 Nephrops in Division VIa}

See: http://www.ices.dk/sites/pub/Publication\%20Reports/Advice/2013/2013/Neph-VIa.pdf

\section*{Introduction}

Nephrops are limited to a muddy habitat. This means that the distribution of suitable sediment defines the species distribution and the stocks are therefore assessed as three separate functional units (FUs) (Figure 5.4.20.1). The advice for Nephrops stocks is given by functional units in Sections 5.4.20.1-3.
\begin{tabular}{lllll}
\hline Section & FU no. & Name & \begin{tabular}{l} 
ICES \\
Division
\end{tabular} & Statistical rectangles \\
\hline 5.4 .20 .1 & 11 & North Minch & VIa & \(44-46\) E3-E4 \\
5.4 .20 .2 & 12 & South Minch & VIa & \(41-43\) E2-E4 \\
5.4 .20 .3 & 13 & Firth of Clyde + Sound of Jura & VIa & \(39-40\) E4-E5 \\
\hline
\end{tabular}


Figure 5.4.20.1 Nephrops functional units in Subarea VIa and Division VIIa (see Section 5.4.21).

\section*{Summary of the advice for 2014}

A summary of the advice per functional unit can be found in Table 5.4.20.1.
To protect the Nephrops stocks in this management area, management should be implemented at the functional unit level.

There is no information available on the trends in the stock or exploitation status for the rectangles outside the FUs ('other rectangles') for which ICES provides advice. Based on the ICES approach to data-limited stocks, ICES advises that landings from the 'other rectangles' should be no more than 326 tonnes. No information on discards is available for these rectangles.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|}
\hline \multirow[b]{2}{*}{Year} & \multicolumn{6}{|c|}{Predicted landings corresponding to ICES advice} & \multirow[b]{2}{*}{\[
\begin{aligned}
& \text { Agreed } \\
& \text { TAC }^{1)}
\end{aligned}
\]} & \multirow[b]{2}{*}{ICES landings} \\
\hline & North Minch (FU11) & South Minch (FU12) & Firth of Clyde (FU13) & \begin{tabular}{l}
Sound of Jura \\
(FU13)
\end{tabular} & Other rectangles & Total advice & & \\
\hline 1992 & & & & & & \(\sim 11.4\) & 12.0 & 10.8 \\
\hline 1993 & & & & & & \(\sim 11.3\) & 12.0 & 11.3 \\
\hline 1994 & & & & & & 11.3 & 12.6 & 11.1 \\
\hline 1995 & & & & & & 11.3 & 12.6 & 12.8 \\
\hline 1996 & & & & & & 11.3 & 12.6 & 11.2 \\
\hline 1997 & & & & & & 11.3 & 12.6 & 11.2 \\
\hline 1998 & & & & & & 11.3 & 12.6 & 11.2 \\
\hline 1999 & & & & & & 11.3 & 12.6 & 11.5 \\
\hline 2000 & & & & & & 11.3 & 12.6 & 11.0 \\
\hline 2001 & & & & & & 11.3 & 11.34 & 10.9 \\
\hline 2002 & & & & & & 11.3 & 11.34 & 10.5 \\
\hline 2003 & & & & & & 11.3 & 11.34 & 10.8 \\
\hline 2004 & & & & & & 11.3 & 11.3 & 10.4 \\
\hline 2005 & & & & & & 11.3 & 12.7 & 10.5 \\
\hline 2006 & & & & & & -2) & 17.7 & 13.7 \\
\hline 2007 & 3.2 & 7.2 & 3.765 & & 0.8 & 15.0 & 19.9 & 16.3 \\
\hline 2008 & 3.2 & 7.2 & 3.765 & & 0.8 & 15.0 & 19.9 & 15.2 \\
\hline 2009 & <4.1 & \(<5.0\) & \(<5.7\) & & \(<0.3\) & 3) & 18.4 & 12.7 \\
\hline 2010 & \(<1.0\) & \(<4.1\) & \(<3.9\) & & \(<0.25\) & 3) & 16.1 & 12.2 \\
\hline 2011 & \(<3.1\) & \(<4.0\) & \(<4.1\) & \(<0.5\) & \(<0.25\) & 3) & 13.7 & 13.1 \\
\hline 2012 & \(<3.2\) & \(<5.5\) & < 4.2 & \(<0.9\) & 4) & 3) & 14.1 & 14.3 \\
\hline 2013 & \(<4.2\) & \(<5.8\) & \(<5.6\) & \(<0.8\) & 4) & 3) & 16.7 & \\
\hline 2014 & <3.485 & \(<5.211\) & \(<5.744\) & \(<0.521\) & \(<0.326\) & 3) & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1)}\) Subarea VI and EC waters of Division Vb.
\({ }^{2)}\) Effort should not be increased.
\({ }^{3)}\) ICES advises that stocks should be managed by functional unit.
\({ }^{4)}\) ICES advises that the catches in the other rectangles should not increase.

\section*{Biology}

Nephrops is limited to a muddy habitat and requires sediment with a silt and clay content of between \(10 \%\) and \(100 \%\) to excavate its burrows. This means that the distribution of suitable sediment defines the species distribution. Adult Nephrops only undertake very small-scale movements (a few 100 m ), but larval transfer may occur between separate mud patches in some areas. Catches typically consist of a smaller proportion of females than males, due to the lower burrow emergence (resulting in lower catchability) of females during the egg bearing. It is likely that maximum stock size and fishery potential is constrained by the available space since the species competes for space and there are upper limits on density. Males are limited in their geographical range for finding mates, hence low densities of males can have a significant impact upon stock spawning potential.

\section*{Environmental influence on the stock}

Temperature and hydrographic factors are critical to recruitment success in Nephrops, particularly during the larval phase. Different environmental factors such as sediment type and hydrography result in very different population structure, productivity, and vulnerability to fishing.

\section*{Effects of the fisheries on the ecosystem}

There is a bycatch of other species in the Nephrops fisheries in Division VIa. This bycatch reflects the species associated with muddy sediments. Estimates of discards of whiting and haddock are high in Division VIa. Bycatches of cod are low and the Scottish Conservation Credits Scheme is in place to minimize cod catches. The use of creels for Nephrops fishing has increased in inshore areas in the Division VIa FUs. Discards and bycatch in the creel fisheries are considered to be low. The high mud content and soft nature of Nephrops grounds means that
trawling readily marks the seabed, with trawl marks remaining visible for some time. Burrowing fauna can be seen re-emerging from freshly trawled grounds, implying that there is some resilience to trawling.
The survival rate of discarded trawl-caught Nephrops is highly variable and depends on many factors, including tow duration, catch composition, air temperature, and post capture handling. A value of \(25 \%\) is used for Nephrops in Division VIa, based on studies conducted off the Scottish coast (Sangster et al., 1997; Wileman et al., 1999) that show values in the range of \(20-40 \%\).

\section*{MSY approach for stocks with underwater TV surveys}

Most functional units are monitored by underwater TV (UWTV) surveys, in which burrows are counted by means of video analysis. For these FUs, MSY reference points for fishing mortality have been evaluated. No precautionary reference points have been defined for Nephrops.

Under the ICES MSY approach, exploitation rates which are likely to generate high long-term yield (and low probability of overfishing) have been evaluated and proposed for each functional unit. Owing to the way Nephrops are assessed, it is not possible to estimate \(\mathrm{F}_{\text {MSY }}\) directly and hence proxies for \(\mathrm{F}_{\mathrm{MSY}}\) have been determined. Three stock-specific candidates for \(\mathrm{F}_{\text {MSY }}\) proxies ( \(\mathrm{F}_{0.1}, \mathrm{~F}_{35 \% \text { SPR }}\), and \(\mathrm{F}_{\max }\) ) were derived from a lengthbased per-recruit analysis (these may be modified following further data exploration and analysis). An appropriate \(\mathrm{F}_{\text {MSY }}\) candidate was then selected for each individual functional unit, taking into account the following factors: observed burrow density, historical harvest rates, historical stability in stock size, knowledge of biological parameters (including factors affecting recruitment), and the nature of the fishery. The table below illustrates the framework against which stocks were evaluated and appropriate \(\mathrm{F}_{\text {MSY }}\) proxies chosen. In general, \(\mathrm{F}_{35 \% \text { SPR }}\) was used unless there were stock-specific justifications for either higher or lower harvest ratios.
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{2}{|l|}{\multirow[t]{2}{*}{}} & \multicolumn{3}{|r|}{Burrow density (average burrows \(\mathrm{m}^{-2}\) )} \\
\hline & & \[
\begin{aligned}
& \text { Low } \\
& <0.3 \\
& \hline
\end{aligned}
\] & Medium
\[
0.3-0.8
\] & \[
\begin{gathered}
\text { High } \\
>0.8
\end{gathered}
\] \\
\hline Observed harvest rate or landings compared to stock status (historical performance) & \[
\begin{array}{|l}
\hline>\mathrm{F}_{\max } \\
\mathrm{F}_{\max }-\mathrm{F}_{0.1} \\
<\mathrm{F}_{0.1} \\
\text { Unknown } \\
\hline
\end{array}
\] & \begin{tabular}{l}
\(\mathrm{F}_{35 \% \text { SPR }}\) \\
\(\mathrm{F}_{0.1}\) \\
\(\mathrm{F}_{0.1}\) \\
\(\mathrm{F}_{0.1}\)
\end{tabular} & \[
\begin{aligned}
& \mathrm{F}_{\max } \\
& \mathrm{F}_{35 \% \mathrm{SPR}} \\
& \mathrm{~F}_{0.1} \\
& \mathrm{~F}_{35 \% \mathrm{SPR}} \\
& \hline
\end{aligned}
\] & \begin{tabular}{l}
\(\mathrm{F}_{\text {max }}\) \\
\(\mathrm{F}_{\text {max }}\) \\
\(\mathrm{F}_{35 \% \text { SPR }}\) \\
\(\mathrm{F}_{35 \% \text { SPR }}\)
\end{tabular} \\
\hline Stock size estimates & \begin{tabular}{l}
Variable \\
Stable
\end{tabular} & \[
\begin{aligned}
& \mathrm{F}_{0.1} \\
& \mathrm{~F}_{0.1} \\
& \hline
\end{aligned}
\] & \[
\begin{aligned}
& \mathrm{F}_{0.1} \\
& \mathrm{~F}_{35 \% \mathrm{SPR}}
\end{aligned}
\] & \[
\begin{aligned}
& \hline \mathrm{F}_{35 \% \mathrm{SPR}} \\
& \mathrm{~F}_{\text {max }} \\
& \hline
\end{aligned}
\] \\
\hline Knowledge of biological parameters & \begin{tabular}{l}
Poor \\
Good
\end{tabular} & \[
\begin{aligned}
& \mathrm{F}_{0.1} \\
& \mathrm{~F}_{35 \% \text { SPR }}
\end{aligned}
\] & \[
\begin{aligned}
& \mathrm{F}_{0.1} \\
& \mathrm{~F}_{35 \% \mathrm{SPR}}
\end{aligned}
\] & \[
\begin{aligned}
& \hline \mathrm{F}_{35 \% \mathrm{SPR}} \\
& \mathrm{~F}_{\max } \\
& \hline
\end{aligned}
\] \\
\hline Fishery history & Stable spatially and temporally Sporadic Developing & \begin{tabular}{l}
\(\mathrm{F}_{35 \% \text { SPR }}\) \\
\(\mathrm{F}_{0.1}\) \\
\(\mathrm{F}_{0.1}\)
\end{tabular} & \begin{tabular}{l}
\(\mathrm{F}_{35 \% \text { SPR }}\) \\
\(\mathrm{F}_{0.1}\) \\
\(\mathrm{F}_{35 \% \text { SPR }}\)
\end{tabular} & \begin{tabular}{l}
\(\mathrm{F}_{\text {max }}\) \\
\(\mathrm{F}_{35 \% \text { SPR }}\) \\
\(\mathrm{F}_{35 \% \text { SPR }}\)
\end{tabular} \\
\hline
\end{tabular}

There may be great differences in the relative exploitation rates between the sexes for many stocks. To account for this, values for each of the candidates have been determined individually for males, females, and the two sexes combined. The combined sex \(\mathrm{F}_{\text {MSY }}\) proxy should be considered appropriate, provided that the resulting percentage of virgin spawner-per-recruit for males or females does not fall below \(20 \%\). If this happens a more conservative sex-specific \(\mathrm{F}_{\text {MSY }}\) proxy should be chosen instead of the combined proxy.

Where possible, a preliminary MSY \(\mathrm{B}_{\text {trigger }}\) was proposed based on the lowest observed UWTV burrow abundance, unless the stock has shown signs of stress at higher abundance (in which case a higher value is used).

\section*{Additional considerations}

\section*{Management considerations}

The overriding management consideration for these stocks is that management should be at the functional unit rather than the ICES subarea/division level. Management at the functional unit level should provide the controls to ensure that catch opportunities and effort are compatible and in line with the scale of the resources in each of the stocks defined by the functional units. Current management of Nephrops in Subarea VI (both in terms of TACs and effort) does not provide adequate safeguards to ensure that local effort is sufficiently limited to avoid depletion of resources in functional units. In the current situation vessels are free to move between grounds,
allowing effort to develop on some grounds in a largely uncontrolled way; this has historically resulted in inappropriate harvest rates from some parts.

There are also Nephrops catches in "other rectangles" in Division VIa, e.g. from offshore areas adjacent to Stanton Bank where Irish fishers frequently operate from the shelf edge.
There are no functional units in ICES Division VIb, but occasional small Nephrops landings occur (Table 5.4.20.4).

\section*{Change in the fisheries}

The Nephrops (TR2) fleet has been observed to have had high discard rates of haddock and whiting in recent years. The selectivity for this fleet needs to be improved. In 2009, under the west coast emergency measures a square-meshed panel of 120 mm was required in the Nephrops trawlers and the minimum mesh size is now 80 mm . This is likely to have had little effect on Nephrops selection. Twin-rig vessels tend to use a 200 mm square-meshed panel (with a 100 mm codend), and some of them are slightly bigger than that. This means that they do not catch bulk quantities and this leads to Nephrops of larger average size and better quality. Reported effort by all Scottish Nephrops trawlers has shown an increase in 2012, particularly during the first half of the year.

\section*{Regulations and their effects}

The minimum landing size for Nephrops is 20 mm carapace length (CL), and usually very few of the landed animals are under this size. The average discard rate of Nephrops by number over the last five years is below \(20 \%\). In 2009 the minimum mesh size was increased from 70 mm to 80 mm which is expected to have reduced slightly the small Nephrops in the catch.

Under the Scottish Conservation Credits Scheme and the west coast emergency measures, Nephrops trawlers are required to use more selective gears. However, these gears are designed to release fish and do not significantly improve selectivity of Nephrops. Under the EU Cod Recovery Plan, trawl effort in Division VIa has declined significantly. So far this has mainly affected effort in the larger mesh gears ( \(>100 \mathrm{~mm}\) ), with effort in the Nephrops fisheries remaining relatively stable.

\section*{Data and methods}

The assessments and advice for Nephrops stocks in all the FUs of Division VIa are primarily based on abundance estimates from underwater TV (UWTV) surveys together with fishery landings data and estimates of quantities of discards (from which dead discards are calculated). Additional indicators of changes in stocks are derived from trends in length compositions and sex ratio in the catches, and fishery lpue.

The advice for 'other rectangles' follows the ICES approach to data-limited stocks, and is based on a \(20 \%\) reduction (precautionary buffer) with respect to the average landings of the last three years (2010-2012), according to category 6.2 (ICES, 2012). No information on discards is available for 'other rectangles'.

The assessment procedure involves the following steps:
- Total population numbers are estimated from the UWTV surveys, including adjustments for a range of biases associated with the method. At the benchmark meetings (ICES, 2009, 2013a) it was proposed that the UWTV surveys provide abundance estimates for Nephrops of 17 mm carapace length and over.
- Historical harvest ratios are calculated as the ratio of total dead catch numbers (landings and dead discards) to population numbers from the UWTV survey in each year.
- Recent fishery length compositions (landings and dead discards) are analysed using a length-based assessment model to estimate population numbers and fishing mortality at length for Nephrops of 17 mm carapace length and over. This method assumes that the length compositions are representative of a population at equilibrium. The analysis is done separately for males and females using stock-specific growth and maturity parameters.
- Yield-per-recruit and spawning biomass-per-recruit curves are derived for male and female Nephrops, based on fishery selectivity parameters from the length-based assessment model. The harvest ratios associated with potential \(\mathrm{F}_{\mathrm{MSY}}\) proxies (e.g. \(\mathrm{F}_{0.1}, \mathrm{~F}_{\max }, \mathrm{F}_{35 \% \mathrm{SPR}}\) ) are computed for males and females individually, and for both sexes combined. These are conditional on a fishery selectivity pattern that includes fishing mortality due to landings and dead discards of Nephrops in the years covered by the assessment model.

Catch options tables for 2014 are derived for a range of \(\mathrm{F}_{\mathrm{MSY}}\) and other options by applying the appropriate harvest ratios to the population numbers estimated from the most recent UWTV survey. This assumes that population numbers remain stable in the interim year. Landings are derived from the resultant total catch numbers after multiplying by the recent average of proportion retained and the mean weight in the landings.

\section*{Uncertainties in assessment and forecast}

The calculations of MSY proxies are all based on yield-per-recruit analyses from a length-based age-structured population model. These analyses utilize average length-frequency data taken over a three-year period and therefore assume that the stock is in equilibrium. However, it is unlikely that the Nephrops stocks to which the approach has been applied are actually in equilibrium due to variable recruitment. MSY proxy estimates may vary in time due to changes in selection pattern.

Stock monitoring continues, and enhanced work on observer trips on-board commercial vessels should furnish additional data which will be beneficial in further developing assessment approaches. Vessel monitoring data from satellite (VMS) are being successfully used to match survey and fishery areas for vessels \(>15 \mathrm{~m}\).

The overall area of the ground is estimated by contoured sediment data. VMS data linked to landings (through interrogation of the Scottish FIN system) suggest that not all areas are covered in the current UWTV approach and as such, the absolute abundance estimate for this ground is likely to be an underestimate. In the North Minch, the survey area was extended in 2010 and refined in 2013 to include the VMS distribution of fishing effort.

In the provision of catch options based on the absolute survey estimates additional uncertainties related to mean weight in the landings, discard rates and discard survival also arise. A three-year average of discard rates (20102012) has been used in the calculation of catch options. The discard rates for some stocks in Division VIa have been quite variable.

There were concerns over the accuracy of historical landings and effort data prior to 2006 when the "buyers and sellers" legislation was introduced and the reliability began to improve. Harvest ratios since 2006 are also considered more reliable due to more accurate landings data reported under the new legislation. The incorporation of creel length compositions since the 2010 assessment has also improved estimates of harvest ratios.

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Table 5.4.20.2 Nephrops in Division VIa. Landings (tonnes) by country as officially reported to ICES.
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline & France & Ireland & Spain & UK - (Engl + Wales + N.Irl) & UK - Scotland & UK & TOTAL \\
\hline 1980 & 5 & 1 & - & - & 7422 & - & 7428 \\
\hline 1981 & 5 & 26 & - & - & 9519 & - & 9550 \\
\hline 1982 & 1 & 1 & - & 1 & 9000 & - & 9003 \\
\hline 1983 & 1 & 1 & - & 11 & 10706 & - & 10719 \\
\hline 1984 & 3 & 6 & - & 12 & 11778 & - & 11799 \\
\hline 1985 & 1 & 1 & 28 & 9 & 12449 & - & 12488 \\
\hline 1986 & 8 & 20 & 5 & 13 & 11283 & - & 11329 \\
\hline 1987 & 6 & 128 & 11 & 15 & 11203 & - & 11363 \\
\hline 1988 & 1 & 11 & 7 & 62 & 12649 & - & 12730 \\
\hline 1989 & - & 9 & 2 & 25 & 10949 & - & 10985 \\
\hline 1990 & - & 10 & 4 & 35 & 10042 & - & 10091 \\
\hline 1991 & - & 1 & - & 37 & 10458 & - & 10496 \\
\hline 1992 & - & 10 & - & 56 & 10783 & - & 10849 \\
\hline 1993 & - & 7 & - & 191 & 11178 & - & 11376 \\
\hline 1994 & 3 & 6 & - & 290 & 11047 & - & 11346 \\
\hline 1995 & 4 & 9 & 3 & 346 & 12527 & - & 12889 \\
\hline 1996 & - & 8 & 1 & 176 & 10929 & - & 11114 \\
\hline 1997 & - & 5 & 15 & 133 & 11104 & - & 11257 \\
\hline 1998 & - & 25 & 18 & 202 & 10949 & - & 11194 \\
\hline 1999 & - & 136 & 40 & 256 & 11078 & - & 11510 \\
\hline 2000 & 1 & 130 & 69 & 137 & 10667 & - & 11004 \\
\hline 2001 & 9 & 115 & 30 & 139 & 10568 & - & 10861 \\
\hline 2002 & - & 117 & 18 & 152 & 10225 & - & 10512 \\
\hline 2003 & - & 145 & 12 & 81 & 10450 & - & 10688 \\
\hline 2004 & - & 150 & 6 & 267 & 9941 & - & 10364 \\
\hline 2005 & - & 153 & 17 & 153 & 7616 & - & 7939 \\
\hline 2006 & - & 133 & 1 & 255 & 13419 & - & 13808 \\
\hline 2007 & - & 155 & - & 2088 & 14120 & - & 16363 \\
\hline 2008 & - & 56 & 1 & 419 & 14795 & - & 15271 \\
\hline 2009 & - & 53 & - & 1226 & 11462 & - & 12741 \\
\hline 2010 & - & 45 & 1 & 1962 & 10250 & - & 12258 \\
\hline 2011 & 35 & 76 & 0 & - & - & 12934 & 13045 \\
\hline 2012* & & 29 & & & & 14267 & 14296 \\
\hline
\end{tabular}
*Preliminary.

Table 5.4.20.3 Nephrops in Division VIa. Landings (tonnes) by functional unit plus other rectangles (creel landings are included).
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & FU11 & FU12 & FU13 & Other & Total \\
\hline 1981 & 2861 & 3651 & 2968 & 39 & 9519 \\
\hline 1982 & 2799 & 3552 & 2623 & 27 & 9001 \\
\hline 1983 & 3196 & 3412 & 4077 & 34 & 10719 \\
\hline 1984 & 4144 & 4300 & 3310 & 36 & 11790 \\
\hline 1985 & 4061 & 4008 & 4285 & 104 & 12458 \\
\hline 1986 & 3382 & 3484 & 4341 & 89 & 11296 \\
\hline 1987 & 4083 & 3891 & 3007 & 257 & 11238 \\
\hline 1988 & 4035 & 4473 & 3665 & 529 & 12702 \\
\hline 1989 & 3205 & 4745 & 2812 & 212 & 10974 \\
\hline 1990 & 2544 & 4430 & 2912 & 182 & 10068 \\
\hline 1991 & 2792 & 4442 & 3038 & 255 & 10527 \\
\hline 1992 & 3560 & 4237 & 2805 & 248 & 10849 \\
\hline 1993 & 3192 & 4455 & 3342 & 344 & 11332 \\
\hline 1994 & 3616 & 4415 & 2629 & 441 & 11101 \\
\hline 1995 & 3656 & 4680 & 3989 & 460 & 12785 \\
\hline 1996 & 2871 & 3995 & 4060 & 239 & 11165 \\
\hline 1997 & 3046 & 4345 & 3618 & 243 & 11252 \\
\hline 1998 & 2441 & 3730 & 4843 & 157 & 11171 \\
\hline 1999 & 3257 & 4051 & 3752 & 438 & 11498 \\
\hline 2000 & 3246 & 3952 & 3419 & 421 & 11038 \\
\hline 2001 & 3259 & 3992 & 3182 & 420 & 10853 \\
\hline 2002 & 3440 & 3305 & 3383 & 397 & 10525 \\
\hline 2003 & 3268 & 3879 & 3171 & 433 & 10751 \\
\hline 2004 & 3135 & 3868 & 3025 & 403 & 10431 \\
\hline 2005 & 2984 & 3841 & 3423 & 254 & 10502 \\
\hline 2006 & 4160 & 4554 & 4778 & 241 & 13733 \\
\hline 2007 & 3968 & 5451 & 6495 & 420 & 16334 \\
\hline 2008 & 3799 & 5347 & 5997 & 128 & 15271 \\
\hline 2009 & 3497 & 4282 & 4777 & 185 & 12741 \\
\hline 2010 & 2263 & 3725 & 5701 & 569 & 12258 \\
\hline 2011 & 2696 & 3699 & 6431 & 219 & 13045 \\
\hline 2012* & 3388 & 3889 & 6584 & 435 & 14296 \\
\hline
\end{tabular}

\footnotetext{
* Preliminary.
}

Table 5.4.20.4 Nephrops in Division VIb. Landings (tonnes) by country as officially reported to ICES.
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline & France & Germany & Ireland & Spain & UK -
(Engl+Wales+N.Irl) & UK - Scotland & TOTAL \\
\hline 1980 & - & - & - & - & - & - & 0 \\
\hline 1981 & - & - & - & - & - & - & 0 \\
\hline 1982 & - & - & - & - & - & - & 0 \\
\hline 1983 & - & - & - & - & - & - & 0 \\
\hline 1984 & - & - & - & - & - & - & 0 \\
\hline 1985 & - & - & - & - & - & - & 0 \\
\hline 1986 & - & - & - & 8 & - & - & 8 \\
\hline 1987 & - & - & - & 18 & 11 & - & 29 \\
\hline 1988 & - & - & - & 27 & 4 & - & 31 \\
\hline 1989 & - & - & - & 14 & - & - & 14 \\
\hline 1990 & - & - & - & 10 & 1 & - & 11 \\
\hline 1991 & - & - & - & 30 & - & - & 30 \\
\hline 1992 & - & - & - & 2 & 4 & 1 & 7 \\
\hline 1993 & - & - & - & 2 & 6 & 9 & 17 \\
\hline 1994 & - & - & - & 5 & 16 & 5 & 26 \\
\hline 1995 & 1 & - & - & 2 & 26 & 1 & 30 \\
\hline 1996 & - & 6 & - & 5 & 65 & 5 & 81 \\
\hline 1997 & - & - & 1 & 3 & 88 & 23 & 115 \\
\hline 1998 & - & - & 1 & 6 & 46 & 7 & 60 \\
\hline 1999 & - & - & - & 5 & 2 & 5 & 12 \\
\hline 2000 & 2 & - & 8 & 3 & 4 & 4 & 21 \\
\hline 2001 & 1 & - & 1 & 14 & 2 & 7 & 25 \\
\hline 2002 & 1 & - & - & 7 & 3 & 7 & 18 \\
\hline 2003 & - & - & 1 & 5 & 6 & 18 & 30 \\
\hline 2004 & - & - & - & 2 & 7 & 13 & 22 \\
\hline 2005 & 3 & - & 1 & 1 & 5 & 7 & 17 \\
\hline 2006 & - & - & - & - & 1 & 3 & 4 \\
\hline 2007 & - & - & - & 2 & 3 & - & 5 \\
\hline 2008 & - & - & - & - & - & - & 0 \\
\hline 2009 & - & - & - & - & - & - & 0 \\
\hline 2010 & - & - & - & - & - & - & 0 \\
\hline 2011 & - & - & - & - & - & - & 0 \\
\hline 2012* & - & - & - & - & - & - & 0 \\
\hline
\end{tabular}

\footnotetext{
* Preliminary.
}

\section*{West of Scotland and Rockall Plaice}

\section*{(Sub-area VI)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The status of this stock is unknown and there is no ICES advice. The Joint statement by the Fisheries Council and European Commission states it would be desirable if the TAC for this stock be maintained for 5 years (subject to scientific advice). FEAS advise that the information remains the same and the 2013 TAC should be rolled over for 2014. This implies a TAC of 658 t and an Irish Quota of 261 t.

Irish LPUE have decreased over the time series suggesting a decline in stock abundance. The TAC in recent years far exceeded recent landings. Technical measures and effort reduction (Council Regulation 43/2009) are expected to have significantly reduced mortality on Plaice in Division Vla. The Irish Groundfish Survey indicates an increase in abundance in recent years.

Given that fishing mortality is considered to be low and the stock is increasing FEAS advises that there is no requirement to adjust the current TAC. FEAS also advise that a mixed fisheries management plan be developed and implemented for fisheries catching plaice.


Red Box-TAC/Management Area

\section*{CURRENT MANAGEMENT}
- The TAC area covers Sub-areas VI and XII and XIV and Division Vb.
- The TAC in 2013 was 658 t with an associated Irish quota of 261 t .
- In the "Communication from the Commission to the Council concerning a consultation on Fishing Opportunities for 2014" \(\operatorname{COM}(2013) 319\) final this stock is listed in Annex III as one of the Stocks where TAC levels are to be kept at those fixed for 2013, unless the state of these stocks changes significantly
- There are no explicit management objectives or plans for this stock.
- The Emergency Measures (EC 43/2009) limits the mesh size of
 bottom trawls (TRI) in this area to \(>120 \mathrm{~mm}\).


Figure I. Irish LPUE (Kg/Hour) from ICES Sub-area Vla

Plaice Division VIa Landings (Source ICES Statlant database)
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1977 & 1978 & 1979 & 1980 & 1981 & 1982 & 1983 & 1984 & 1985 & 1986 & 1987 & 1988 \\
\hline Belgium & - & - & - & - & - & - & - & - & - & - & 3 & 1 \\
\hline Denmark & - & - & - & - & - & - & - & - & - & - & \(<0.5\) & \(<0.5\) \\
\hline Faeroe Islands & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline France & - & 66 & 67 & 58 & 50 & 44 & 55 & 40 & 57 & 57 & 49 & 44 \\
\hline Germany & . & . & . & . & . & . & . & . & . & . & . & . \\
\hline Germany, Fed. Rep. of & - & - & - & - & - & - & - & \(<0.5\) & \(<0.5\) & \(<0.5\) & \(<0.5\) & \(<0.5\) \\
\hline Ireland & 487 & 352 & 338 & 392 & 464 & 425 & 565 & 649 & 660 & 403 & 516 & 649 \\
\hline Netherlands & - & - & 1 & - & - & - & - & - & - & 204 & - & - \\
\hline Norway & - & \(<0.5\) & - & - & - & - & - & - & - & - & - & - \\
\hline Spain & - & - & - & - & - & - & 1 & - & - & - & - & - \\
\hline UK - Eng+Wales+N.Irl. & . & . & . & . & . & . & . & . & . & . & . & \\
\hline UK - England \& Wales & 172 & 123 & 88 & 65 & 58 & 65 & 38 & 41 & 31 & 34 & 19 & 9 \\
\hline UK - N. Ireland & 4 & 4 & 2 & 1 & 4 & 2 & 2 & 4 & - & 4 & 7 & 24 \\
\hline UK - Scotland & 887 & 731 & 864 & 1,049 & 1,065 & 947 & 967 & 1,070 & 1,065 & 1,046 & 1,149 & 1,000 \\
\hline Un. Sov. Soc. Rep. & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline Total & 1,550 & 1,276 & 1,360 & 1,565 & 1,641 & 1,483 & 1,628 & 1,804 & 1,813 & 1,748 & 1,743 & 1,727 \\
\hline & & & & & & & & & & & & \\
\hline Country & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 \\
\hline Belgium & 1 & - & - & - & 25 & 8 & 30 & 13 & 19 & 19 & 18 & 19 \\
\hline Denmark & \(<0.5\) & 7 & \(<0.5\) & \(<0.5\) & - & \(<0.5\) & \(<0.5\) & \(<0.5\) & - & \(<0.5\) & - & - \\
\hline Faeroe Islands & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline France & 24 & 62 & 23 & 19 & 16 & 4 & 6 & 1 & 2 & 1 & . & 1 \\
\hline Germany & . & . & - & \(<0.5\) & - & - & - & - & - & - & - & - \\
\hline Germany, Fed. Rep. of & - & - & . & - & - & - & - & - & . & . & . & . \\
\hline Ireland & 579 & 670 & 560 & 357 & 339 & 360 & 401 & 499 & 528 & 418 & 309 & 233 \\
\hline Netherlands & - & - & - & - & - & - & - & - & 19 & 11 & - & - \\
\hline Norway & - & - & - & \(<0.5\) & - & - & - & - & - & - & - & - \\
\hline Spain & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline UK - Eng+Wales+N.Irl. & 27 & 11 & 37 & 61 & 80 & 135 & 77 & 62 & 67 & 39 & 34 & 18 \\
\hline UK - England \& Wales & . & . & . & . & . & . & . & . & . & . & . & \\
\hline UK - N. Ireland & . & . & . & . & . & . & . & . & . & . & . & \\
\hline UK - Scotland & 1,185 & 1,097 & 1,433 & 1,292 & 1,095 & 1,181 & 1,344 & 1,266 & 1,052 & 973 & 657 & 387 \\
\hline Un. Sov. Soc. Rep. & - & - & - & . & . & . & . & . & . & . & . & . \\
\hline Total & 1,816 & 1,847 & 2,053 & 1,729 & 1,555 & 1,688 & 1,858 & 1,841 & 1,687 & 1,461 & 1,018 & 658 \\
\hline & & & & & & & & & & & & \\
\hline Country & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012* \\
\hline Belgium & 9 & - & - & - & - & - & - & - & . & . & . & 0 \\
\hline Denmark & \(<0.5\) & - & \(<0.5\) & - & - & - & . & . & . & . & . & \\
\hline Faeroe Islands & - & - & - & - & - & - & \(<0.5\) & \(<0.5\) & . & . & . & \\
\hline France & \(<0.5\) & \(<0.5\) & \(<0.5\) & \(<0.5\) & - & - & - & . & - & 0 & 0 & 0.9 \\
\hline Germany & - & - & - & - & - & - & - & . & . & . & . & . \\
\hline Germany, Fed. Rep. of & . & . & . & . & . & . & . & . & . & . & . & . \\
\hline Ireland & 187 & 146 & 150 & 62 & 46 & 28 & 32 & 17 & 13 & 28 & 17 & 12.4 \\
\hline Netherlands & - & - & - & - & - & - & - & - & . & . & . & 0 \\
\hline Norway & - & - & - & - & - & - & - & . & . & . & . & 0.1 \\
\hline Spain & - & - & - & - & - & - & . & . & . & . & . & \\
\hline UK - Eng+Wales+N.Irl. & 10 & 18 & 6 & 5 & 1 & 1 & 3 & \(<0.5\) & - & - & . & \\
\hline UK - England \& Wales & . & . & . & . & . & . & . & . & . & . & . & . \\
\hline UK - N. Ireland & . & . & . & - & . & . & - & . & - & . & - & . \\
\hline UK - Scotland & 491 & 323 & 243 & 130 & 15 & 44 & 44 & 32 & 34 & 30 & 30 & 40.3 \\
\hline Un. Sov. Soc. Rep. & & & . & & . & . & . & . & . & . & . & \\
\hline Total & 697 & 487 & 399 & 197 & 62 & 73 & 79 & 49 & 47 & 59 & 41 & 53.7 \\
\hline
\end{tabular}
* Data are preliminary for 2012

\section*{West of Scotland and Rockall Sole}

\section*{(Sub-area VI)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The status of this stock is unknown and there is no ICES advice. The Joint statement by the Fisheries Council and European Commission states it would be desirable if the TAC for this stock be maintained for 5 years (subject to scientific advice). FEAS advise that the information remains the same and the 2013 TAC should be rolled over for 2014. This implies a TAC of 57 t and an Irish Quota of 46 t .

Landings reached a peak of around IIO \(t\) in the late nineties, with rapid decline since then to the present value of 13.5 t for 2012.

The combination of technical measures (Council Regulation 43/2009) and effort reduction are expected to have significantly reduced mortality on Sole in Division Vla.


Red Box-TAC/Management Area

\section*{CURRENT MANAGEMENT}
- The TAC area covers Sub-areas VI, XII, XIV and Division Vb.
- The TAC in 2013 was 57 t with an associated Irish quota of 46 t .
- In the "Communication from the Commission to the Council concerning a consultation on Fishing Opportunities for 2014" \(\operatorname{COM}(2013) 319\) final this stock is listed in Annex III as one of the Stocks where TAC levels are to be kept at those fixed for 2013, unless the state of these stocks changes significantly.
- There are no explicit management objectives or plans for this stock.
- The Emergency Measures (EC 43/2009) limits the mesh size of
 bottom trawls (TRI) in this area to \(>120 \mathrm{~mm}\).

Sole Division Vla Landings (Source ICES Statlant database)
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1977 & 1978 & 1979 & 1980 & 1981 & 1982 & 1983 & 1984 & 1985 & 1986 & 1987 & 1988 \\
\hline Belgium & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline Denmark & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline France & 3 & 7 & <0.5 & 1 & 1 & 1 & - & - & 1 & - & - & - \\
\hline Ireland & 30 & 20 & 24 & 23 & 35 & 57 & 54 & 48 & 39 & 33 & 42 & 71 \\
\hline Netherlands & - & 1 & - & - & - & - & - & - & - & 1 & - & - \\
\hline Spain & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline UK - Eng+Wales+N.Irl. & . & . & . & . & . & . & . & . & . & . & . & . \\
\hline UK - England \& Wales & 2 & 2 & 1 & 1 & 1 & 2 & 1 & 9 & 13 & 4 & 2 & - \\
\hline UK - N. Ireland & - & - & - & - & - & - & 2 & \(<0.5\) & - & <0.5 & <0.5 & 1 \\
\hline UK - Scotland & 8 & 8 & 9 & 10 & 10 & 12 & 8 & 7 & 9 & 14 & 17 & 18 \\
\hline Total & 43 & 38 & 34 & 35 & 47 & 72 & 65 & 64 & 62 & 52 & 61 & 90 \\
\hline
\end{tabular}
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 \\
\hline Belgium & - & - & - & - & 1 & 4 & 11 & 2 & 9 & 8 & 3 & 3 \\
\hline Denmark & - & - & - & <0.5 & - & - & - & - & - & - & - & - \\
\hline France & - & - & - & - & 1 & - & 1 & - & - & - & . & 1 \\
\hline Ireland & 89 & 80 & 53 & 40 & 40 & 65 & 63 & 74 & 71 & 79 & 45 & 36 \\
\hline Netherlands & - & - & - & - & - & - & - & - & 7 & - & - & - \\
\hline Spain & - & - & - & - & - & - & - & - & - & - & - & - \\
\hline UK - Eng+Wales+N.Irl. & 2 & 1 & 4 & 20 & 22 & 19 & 21 & 20 & 19 & 13 & 12 & 6 \\
\hline UK - England \& Wales & . & . & . & . & . & . & . & . & . & . & . & . \\
\hline UK - N. Ireland & . & . & . & . & . & . & . & . & . & . & . & . \\
\hline UK - Scotland & 17 & 11 & 15 & 15 & 13 & 10 & 8 & 8 & 7 & 9 & 4 & 3 \\
\hline Total & 108 & 92 & 72 & 75 & 77 & 98 & 104 & 104 & 113 & 109 & 64 & 49 \\
\hline
\end{tabular}
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012* \\
\hline Belgium & 1 & - & - & - & - & - & - & - & . & . & . & 0.0 \\
\hline Denmark & - & - & - & - & - & - & . & . & . & . & . & \\
\hline France & - & - & <0.5 & <0.5 & - & - & - & - & . & 0 & 0 & 0.0 \\
\hline Ireland & 27 & 26 & 26 & 22 & 15 & 12 & 19 & 15 & 4 & 23 & 12 & 9.2 \\
\hline Netherlands & - & - & - & - & - & - & - & - & . & . & . & 0.0 \\
\hline Spain & - & - & - & - & - & - & . & . & . & . & . & \\
\hline UK - Eng+Wales+N.Irl. & 5 & 4 & 6 & 2 & - & 1 & 1 & 2 & 2 & 1 & 3 & 4.2 \\
\hline UK - England \& Wales & . & . & . & . & . & . & . & . & . & . & . & \\
\hline UK - N. Ireland & . & - & . & . & - & - & . & - & . & . & . & \\
\hline UK - Scotland & 3 & 2 & 2 & 2 & 1 & 1 & 1 & 2 & 2 & . & - & \\
\hline Total & 36 & 32 & 34 & 26 & 16 & 14 & 21 & 19 & 8 & 25 & 15 & 13.5 \\
\hline
\end{tabular}
* Preliminary data for 2012

\title{
North Sea and West of Scotland Saithe
}
(Sub-areas IV \& VI and Division IIIa)

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises on the basis of the EU-Norway management plan that landings in 2013 should be no more than 85,518 t for the whole assessment area. This implies an Irish quota of 382 t . FEAS agrees with this advice. Discards are known to occur but cannot be accurately quantified.

This stock falls in to ICES category I for data-rich stocks for which a quantitative assessment is available.


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

\section*{CURRENT MANAGEMENT}
- The assessment area comprises two TAC areas; the first TAC area comprises Divisions Ila, Illabcd, and Sub-area IV, the second TAC area covers Division Vb as well as Sub-areas VI, XII and XIV.
- The total EC TAC for Division Vb and Sub-areas VI, XII and XIV in 2013 was \(7,830 \mathrm{t}\), with an Irish quota of 450 t .
- There is a long-term management plan for this stock based on the EU-Norway agreement that states that every effort should be made to maintain SSB above \(106,000 \mathrm{t}\left(\mathrm{B}_{\mathrm{lim}}\right)\) and a TAC consistent with \(F=0.3\). Should SSB fall below \(B_{p a}\) this fishing
 mortality will be adapted in the light of the prevailing conditions (see ACOM advice for detailed description of the management plan).

\section*{ICES ADVICE 6.4.21 Saithe in IV, IIa and VI}

\section*{Advice for 2014}

ICES advises on the basis of the EU-Norway management plan that landings in 2014 should be no more than 85581 tonnes for the whole assessment area. Discards are known to take place but cannot be quantified, therefore total catches cannot be calculated.
Stock status




Figure 6.4.21.1 Saithe in Subareas IV and VI, and Division IIIa. Summary of stock assessment in April 2013 (weights in thousand tonnes). Assumed recruitment values are shaded. Top right: SSB and F for the time series used in the assessment.

SSB increased above \(\mathrm{B}_{\mathrm{pa}}\) in 1997, but has declined since 2005. The latest SSB estimate is close to \(\mathrm{B}_{\mathrm{pa}}\). Fishing mortality has fluctuated around \(\mathrm{F}_{\text {MSY }}\) since 1997. Recruitment has been below average since 2006 and shows a declining trend in recent years.

\section*{Management plans}

The EU-Norway management plan was reconsidered in February 2013 (Annex 6.4.21), but no modification was implemented. It was previously evaluated by ICES (ICES, 2012) and considered to be consistent with the precautionary approach in the short term ( \(<4\) years).

\section*{Biology}

The juveniles (ages \(0-2\) years) generally occur in shallow coastal areas where they are protected from large fisheries. The fish are long-lived (20+ years) and tend to form large aggregations to a higher extent than, for instance, cod. Saithe starts to mature at age \(4(15 \%\) mature \()\) and by age 7 , all fish can be regarded as being mature. Saithe is one of the top predators in the North Sea ecosystem and saithe abundance influences the yield and abundance of other commercially important species (e.g., whiting, haddock, herring and Norway pout).

\section*{Environmental influence on the stock}

Low recruitment since 2006 is not linked to low SSB, and may be related to changes in the environment. Current information is not sufficient to identify a relationship between recruitment and specific environmental factors (e.g., temperature, currents, availability of food).

\section*{The fisheries}

Saithe in the North Sea are mainly taken in a directed trawl fishery in deep water along the Northern Shelf edge and the Norwegian Trench. Analyses show a substantial shift in the Norwegian and German trawlers' fishing pattern after 2008, both in time and spatial distribution. The French fleet has returned to the northern fishing grounds, but the Norwegian and German fleet still have high effort in the southern area. Fishing on spawning aggregations in the first quarter has declined.

Catch distribution Landings \(2012=77.7 \mathrm{kt}\), of which approximately \(91 \%\) are taken by bottom trawl, \(8 \%\) by gillnets, and the remainder by other gears. Discards are not quantified, but considered low in the targeted fisheries, however can be high in the mixed fisheries.

\section*{Effects of the fisheries on the ecosystem}

Reduced benthic biomass is found in areas of bottom trawl activity compared to unfished areas. North Sea saithe fisheries are known to have less impact on the seafloor than most other bottom trawl fisheries.

\section*{Quality considerations}

Recent ecruitment estimates are poorly estimated with the current surveys. Additionally, surveys do not cover the areas inhabited by older fish and therefore commercial cpue indices are used for tuning, however there is a concern that use of commercial cpue indices for schooling species may have lead to bias in the assessment. Cpue data from the Norwegian fishing industry lack crucial information on gear specifics and should be improved.


Figure 6.4.21.2 Saithe in Subareas IV and VI, and Division IIIa. Historical assessment results (final-year recruitment estimates included). The 2010 assessment is not included since this was only a forecast based on the 2009 assessment.

Scientific basis
\begin{tabular}{ll} 
Assessment type & \begin{tabular}{l} 
Age-based assessment model (XSA). \\
Input data \\
Commercial catches include international landings, and ages and length frequencies from \\
catch sampling., two survey indices (NORACU, IBTS-Q3); Three commercial indices
\end{tabular} \\
& \begin{tabular}{l} 
(FRATRB_IV, GER_OTB_IV, NORTR_IV2). Maturity at age and natural mortality are
\end{tabular} \\
assumed to be constant.
\end{tabular}

\section*{ECOREGION STOCK}

North Sea
Saithe in Subarea IV (North Sea), Division IIIa (Skagerrak), and Subarea VI (West of Scotland and Rockall)

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline \multirow{3}{c|}{\begin{tabular}{l} 
Management \\
Plan
\end{tabular}} & \(\mathrm{SSB}_{\mathrm{MP}}\) & 200000 t & \(\mathrm{B}_{\mathrm{pa}}\) \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{MP}}\) & 0.3 & Or lower depending on SSB in relation to SSB target. \\
\hline \multirow{4}{*}{\begin{tabular}{l} 
MSY \\
Approach
\end{tabular}} & MSY \(_{\text {trigger }}\) & 200000 t & Default value \(\mathrm{B}_{\mathrm{pa}}\) \\
\hline \multirow{4}{*}{\begin{tabular}{l} 
Precautionary \\
approach
\end{tabular}} & \(\mathrm{F}_{\mathrm{MSY}}\) & 0.3 & Stochastic simulation using hockey-stick stock-recruitment. \\
\cline { 2 - 4 } & \(\mathrm{B}_{\text {lim }}\) & 106000 t & \(\mathrm{B}_{\text {loss }}=106000 \mathrm{t}\) (estimated in 1998). \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{lim}}\) & 200000 t & Affords a high probability of maintaining SSB above \(\mathrm{B}_{\text {lim }}\). \\
\hline
\end{tabular}
(unchanged since: 2011)

\section*{Outlook for 2014}

Basis: \(\mathrm{F}(2013)=0.37\) [TAC constraint]; R \((2012-2014)=\mathrm{GM}(1988-2010)=116.945\) million; \(\mathrm{SSB}(2014)=\) 162.125; landings (2013) \(=100.684\).
\begin{tabular}{|c|c|c|c|c|c|c|c|c|}
\hline Rationale & landings
\[
2014
\] & \[
\begin{array}{|c|}
\hline \text { landings } \\
\hline \text { IIIa\&IV } \\
\text { 2014 }{ }^{1}
\end{array}
\] & landings VI \(2014{ }^{1)}\) & Basis & \[
\begin{gathered}
F \\
2014
\end{gathered}
\] & \[
\begin{aligned}
& \hline \text { SSB } \\
& 2015
\end{aligned}
\] & \[
\begin{array}{|c}
\% \text { SSB } \\
\text { change }
\end{array}
\] & \% TAC change \\
\hline Management plan & 85.581 & 77.536 & 8.045 & \(15 \%\) TAC constraint & 0.31 & 176.056 & 8.5\% & -15\% \\
\hline MSY approach & 82.648 & 74.879 & 7.769 & \[
\begin{gathered}
\mathrm{F}_{\mathrm{MSY}} * \\
\left(\mathrm{SSB}_{2013} /\right. \text { Btrigger } \\
) \\
\hline
\end{gathered}
\] & 0.29 & 178.386 & +10\% & -18\% \\
\hline Precautionary approach & 56.181 & 50.900 & 5.281 & \(\mathrm{B}_{\mathrm{pa}}\left(\mathrm{F}_{2013} * 0.51\right)\) & 0.19 & 200.001 & +23\% & -44\% \\
\hline Zero catch & 0 & 0 & 0 & \(\mathrm{F}=0\) & 0.0 & 246.940 & +52\% & -100\% \\
\hline \multirow[t]{2}{*}{Other options} & 84.584 & 76.633 & 7.951 & \(\mathrm{F}_{\text {MSY }}\) & 0.3 & 176.820 & +9\% & -16\% \\
\hline & 100.869 & 91.387 & 9.481 & \(\mathrm{F}_{2013}\) & 0.37 & 163.723 & +1\% & 0\% \\
\hline \multicolumn{9}{|l|}{Mixed fisheries options - minor differences with calculation above can occur due to different methodology used (ICES, 2013b)} \\
\hline Maximum & 143.439 & 129.956 & 13.483 & A & 0.54 & 143.575 & -11\% & +42\% \\
\hline Minimum & 48.050 & 43.533 & 4.517 & B & 0.15 & 221.170 & +36\% & -52\% \\
\hline Cod_MP & 48.359 & 43.813 & 4.546 & C & 0.15 & 220.911 & +36\% & -52\% \\
\hline SQ Effort & 89.630 & 81.205 & 8.425 & D & 0.3 & 186.756 & +15\% & -11\% \\
\hline Effor_Mgt & 68.305 & 61.884 & 6.421 & E & 0.22 & 204.306 & +26\% & -32\% \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1)}\) Landings split according to the average in 1993-1998, i.e. \(90.6 \%\) in Subarea IV and Division IIIa West and 9.4\% in Subarea VI.
\({ }^{2}\) ) SSB 2015 relative to SSB 2014.
\({ }^{3)}\) Landings 2014 relative to TAC 2013.
Mixed-fisheries assumptions:
A. Maximum scenario: Fleets stop fishing when the last quota is exhausted.
B. Minimum scenario: Fleets stop fishing when the first quota is exhausted.
C. Cod management plan scenario: Fleets stop fishing when the cod quota is exhausted.
D. SQ effort scenario: Effort in 2012 and 2013 as in 2011.
E. Effort management scenario: Effort reductions according to cod and flatfish management plans.

\section*{Management plan}

The EU-Norway agreement management plan does not clearly state whether the SSB in the intermediate year or the SSB at the beginning or end of the TAC year should be used to determine the status of the stock. ICES interprets this as being the SSB at the beginning of the intermediate year (2013).
Since SSB at the beginning of 2013 is below \(\mathrm{B}_{\mathrm{pa}}\), paragraph 3 of the harvest control rule applies, resulting in a F of 0.29 and a TAC (landings) reduction of more than \(15 \%\). Therefore, the maximum TAC reduction of \(15 \%\) is applied (paragraph 5), resulting in landings of no more than 85581 t in 2014. This is expected to lead to an SSB of 176099 t in 2015 which is below \(\mathrm{B}_{\mathrm{pa}}\). Discards are known to take place but cannot be quantified, therefore total catches cannot be calculated.

\section*{MSY approach}

Following the ICES MSY framework implies a fishing mortality of 0.29 (below \(\mathrm{F}_{\text {MSY }}\) because SSB is below MSY Btrigger). This would result in landings of no more than 82600 t in 2014. This is expected to lead to an SSB in 2015 of 178400 t . Discards are known to take place but cannot be quantified, therefore total catches cannot be calculated.

\section*{Precautionary approach}

An \(49 \%\) reduction in F is needed to maintain SSB at \(\mathrm{B}_{\mathrm{pa}}\) in 2015 . This corresponds to landings of no more than 56 181 t in 2014. Discards are known to take place but cannot be quantified, therefore total catches cannot be calculated.

\section*{Mixed fisheries}

In contrast to single-species advice there is no single recommendation for mixed fisheries (ICES, 2013b), but rather a range of plausible scenarios, assuming fishing patterns and catchability in 2013 and 2014 are unchanged from those in 2012. Major differences between the outcomes of the various scenarios indicate potential undershoot or overshoot of the advised landings corresponding to the single-species advice. As a result, fleet dynamics may change, but cannot be determined.

Cod is the main limiting species for the North Sea demersal fisheries in 2014. Following the 'cod' scenario (full implementation of the cod management plan), and also the effort management scenario, the saithe management plan catch options could not be fully utilized. It is also noted that for the 'max' scenario the implied F would exceed \(\mathrm{F}_{\mathrm{pa}}\) which is not considered precautionary.

\section*{Additional considerations}

\section*{Management plan evaluations}

In 2012, an EU-Norway request was sent to ICES on options to revise the long-term management plan for saithe (ICES, 2012). ICES advised that all harvest control rule (HCR) options in the request result in less than \(5 \%\) annual risks of the stock being below the limit biomass reference point ( Blim ) in the short term (next 4 years).) The longterm performance of the HCRs is less clear, as it is uncertain whether the stock will develop in accordance with the precautionary approach (i.e. with less than \(5 \%\) risk of being below Blim) in the long term. No substantial differences were found between the options in terms of risk or yield, although the stability of yield is slightly more different between options. The EU and Norway agreed to keep the old management plan (Appendix).

Because the long-term performance is not clear, ICES advises that the HCR selected for management should be re-evaluated within 4 years (i.e. no later than 2016) and revised if necessary.

In 2013, the effects of interannual quota flexibility in the management plan for saithe were evaluated (ICES, 2013c). ICES concluded that the harvest control rules evaluated are robust to inclusion of inter-annual quota flexibility in terms of the probability of stock biomass falling below \(\mathrm{B}_{\mathrm{lim}}\), and average yield. This conclusion is conditional on the inter-annual quota flexibility being suspended when the stock is estimated to be outside safe biological limits and therefore the management plan should be re-evaluated in 2016 at the latest.

\section*{Management considerations}

The stock biomass is estimated to be close to \(\mathrm{B}_{\mathrm{pa}}\) and recruitment estimates for the terminal year are uncertain. The forecast and resulting advice are highly sensitive to the assumption on the incoming year class for which no information is available. This is likely to lead to greater interannual variability in the advice. The average recruitment assumed in 2013 and 2014 is high relative to recent values, however this does not affect the advice since this is already limited by the \(15 \%\) maximum TAC change.

ICES has developed a generic approach to evaluate whether new survey information that becomes available in September forms a basis to update the advice. If this is the case, ICES will publish new advice in November 2013.

The reported landings have been lower than the TACs since 2002, but the reduction of the TAC in recent years has gradually lessened the difference between landings and TAC.

\section*{Regulations and their effects}

Since 2009 the EU fleets fishing for saithe have fallen under the effort regime of the EU cod management plan (1342/2008). This may have contributed to a southern shift in geographical distribution and thereby a change in fishing pattern for the German fleet.

Effort restrictions in the EU were introduced in 2003 (annexes to the annual TAC regulations) for the protection of the North Sea cod stock. In addition, a long-term plan for the recovery of cod stocks was adopted in 2008 (EC regulation 1342/2008). In 2009, the effort management programme switched from a days-at-sea to a kW-day system ( EC regulation 43/2009), in which different amounts of kW -days are allocated within each area by member state to different groups of vessels depending on gear and mesh size. Effort ceilings are updated annually. However, for 2013, the European Council decided upon a roll-over of effort level of 2012 into 2013 for both the cod and the sole/plaice management plan.

Overall nominal effort (kW-days) by EU demersal trawls, seines, beam trawls, gill/trammel nets and longlines (all mesh sizes included) in the North Sea, Skagerrak, and Eastern Channel had been substantially reduced since the implementation of the two successive effort management plans in 2003 and \(2008(-40 \%\) between 2003 and 2012, \(-16 \%\) between 2008 and 2012). Following the introduction of days-at-sea regulations in 2003, there was a substantial switch from the larger mesh ( \(>100 \mathrm{~mm}\), TR1) gear to the smaller mesh ( \(70-99 \mathrm{~mm}\), TR2) gear. Subsequently, effort by TR1 has been relatively stable, whereas effort in TR2 and in small mesh beam trawl (80\(120 \mathrm{~mm}, \mathrm{BT} 2\) ), has shown a pronounced decline ( \(-14 \%,-45 \%\), and \(-48 \%\), respectively, between 2004 and 2012). Gill and trammel nets fisheries have remained stable (ICES, 2013b). Effort in large mesh size beam trawl (>=120 \(\mathrm{mm}, \mathrm{BT} 1\) ) has increased significantly in 2012 after a decade of continuous decline. Nominal effort reported by Norway has increased since 2011 due to the generalization of electronic logbooks.

Overall nominal effort (kW-days) by EU demersal trawls, seines, beam trawls, gill/trammel nets, and longlines (all mesh sizes included) in the North Sea, Skagerrak, and Eastern Channel had been substantially reduced since the implementation of the two successive effort management plans in 2003 and 2008 ( \(-40 \%\) between 2003 and 2012, \(-16 \%\) between 2008 and 2012). Following the introduction of days-at-sea regulations in 2003, there was a substantial switch from the larger mesh ( \(>100 \mathrm{~mm}\), TR1) gear to the smaller mesh ( \(70-99 \mathrm{~mm}\), TR2) gear. Subsequently, effort by TR1 has been relatively stable, whereas effort in TR2 and in small-mesh beam trawl (80120 mm , BT2), has shown a pronounced decline ( \(-14 \%,-45 \%\), and \(-48 \%\), respectively, between 2004 and 2012). Gill- and trammelnet fisheries have remained stable (ICES, 2013b). Effort in large mesh size beam trawl ( \(\geq 120\) \(\mathrm{mm}, \mathrm{BT} 1\) ) has increased significantly in 2012 after a decade of continuous decline. Nominal effort reported by Norway has increased since 2011 due to the generalization of electronic logbooks.

\section*{Information from the fishing industry}

Saithe has had growing importance for both the Danish and Scottish fleets. The fishers' survey (Napier, 2012) shows a perception of an increasing stock for the central north and eastern North Sea which is not in accordance with the latest assessment. Reports from Norwegian fishers show concerns about increased landings from pelagic trawling and a possible change in exploitation pattern towards younger year classes.

According to a NSRAC-meeting between scientists and fishers in Hanstholm in April 2012, the industry was worried about the decline in mean weight-at-age after 2000. German industry representatives confirmed changes in fishing pattern due to effort management. French industry representatives noted increased competition over fishing grounds between trawlers and gillnetters in Division VIa, especially in 2009 and 2010. No change in mean
age of the catch was observed due to this shift in fishing patterns. Industry commented on conflicting data sources and suggested that fishers' knowledge should be used for the interpretation of the data (i.e. commercial cpue indices). Survey data, especially those for young year classes before age 3, must be improved.

\section*{Uncertainties in assessment and forecast}

The NORASS survey was considered unreliable and did not track cohorts. Since this survey has been discontinued and only had a small influence the assessment, it has been excluded in the 2013 assessment. The NORACU and Norwegian trawl index were updated and revised.

Conflicting signals between the scientific surveys have become more apparent. All scientific surveys on adults have shortcomings in coverage (IBTS-Q3, NORACU). Survey data for young year classes before age 3 are needed. Catches from older age classes in the surveys are not representative and therefore commercial cpue indices are used for tuning. Commercial catch data from the Norwegian fishing industry lack crucial information on gear specifics and should be improved.

During the benchmark assessment (ICES, 2011) and the June 2011 assessment, the influence of the commercial cpue indices was reduced by using these indices to tune only the older ages (6-9) instead of using all ages (3-9). The latest information indicates strong year effects in the scientific surveys in the most recent years. The option to include the commercial cpue tuning fleets for ages 3-9 was considered appropriate in the November 2011 update, and also in the 2012 and 2013 assessment. However, the potential for bias in commercial cpue (for example hyper-stability) is a general concern for shoaling species such as saithe A reliable scientific survey is needed to address this issue.

\section*{Comparison with previous assessment and advice}

The current assessment estimates SSB in 2013 to be \(10 \%\) lower than estimated in 2012, and fishing mortality in 2011 is estimated \(6 \%\) higher than last year. The basis for the advice is the same as last year: the management plan.

\section*{Assessment and management area}

The ICES advice applies to saithe in Division IIIa and in Subareas IV and VI. For these areas, two TACs are set: one for Division IIIa and Subarea IV, and one for Subarea VI.

\section*{Sources}

ICES. 2008. Norway and EC request on management plan for saithe in the North Sea and West of Scotland. ICES Advice 2008, Book 6, Section 6.3.3.3.
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ICES. 2013a. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 24-30 April 2013. ICES CM 2013/ACOM:13.
ICES. 2013b Mixed fisheries advice North Sea. Report of the ICES Advisory Committee, 2013. ICES Advice, 2013. Book 6, Section 6.3.2.

ICES. 2013c EU request on inter-annual quota flexibility for saithe in the North Sea. ICES Advice, 2013. Book 6, Section 6.3.5.4.
Napier, I. R. 2012. Fishers' North Sea stock survey 2012. NAFC Marine Centre, Shetland, Scotland.

Figure 6.4.21.3 Saithe in Subareas IV and VI and Division IIIa. Stock-recruitment plot and yield-per-recruit analysis.



Figure 6.4.21.4 Saithe in Subareas IV and VI and in Division IIIa. Results of the North Sea Commission fishers' survey 2012 on abundance of saithe (Napier, 2012).

Table 6.4.21.1 Saithe in Subarea IV and Division IIIa. ICES advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
ICES \\
Advice
\end{tabular} & Predicted landings corresp. to advice & Agreed
TAC & Official landings & \[
\begin{gathered}
\text { ICES } \\
\text { landings }
\end{gathered}
\] \\
\hline 1987 & Reduce F & <198 & 173 & 154 & 149 \\
\hline 1988 & 60\% of F(86); TAC & 156 & 165 & 113 & 107 \\
\hline 1989 & No increase in F; TAC & 170 & 170 & 92 & 92 \\
\hline 1990 & No increase in F; TAC & 120 & 120 & 85 & 88 \\
\hline 1991 & No increase in F; TAC & 125 & 125 & 93 & 99 \\
\hline 1992 & No increase in F; TAC & 102 & 110 & 92 & 92 \\
\hline 1993 & \(70 \%\) of \(\mathrm{F}(91) \sim 93000 \mathrm{t}\) & 93 & 93 & 99 & 105 \\
\hline 1994 & Reduce F by \(30 \%\) & 72 & 97 & 90 & 102 \\
\hline 1995 & No increase in F & 107 & 107 & 97 & 113 \\
\hline 1996 & No increase in F & 111 & 111 & 96 & 110 \\
\hline 1997 & No increase in F & 113 & 115 & 86 & 103 \\
\hline 1998 & Reduce F by 20\% & 97 & 97 & 88 & 100 \\
\hline 1999 & Reduce F to \(\mathrm{F}_{\mathrm{pa}}\) & 104 & 110 & 108 & 107 \\
\hline 2000 & Reduce F by \(30 \%\) & 75 & 85 & 85 & 87 \\
\hline 2001 & Reduce F by 20 \% & 87 & 87 & 88 & 90 \\
\hline 2002 & \(\mathrm{F}<\mathrm{F}_{\mathrm{pa}}\) & \(<135\) & 135 & 115 & 116 \\
\hline 2003 & \(\mathrm{F}<\mathrm{F}_{\mathrm{pa}}\) & \(<176\) & 165 & 107 & 102 \\
\hline 2004 & \(\mathrm{F}<\mathrm{F}_{\mathrm{pa}}\) * & \(<211\) & 190 & 104 & 100 \\
\hline 2005 & F according to man. plan* & \(<137\) & 145 & 111 & 112 \\
\hline 2006 & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right) *\) & \(<123\) & 123 & 110 & 117 \\
\hline 2007 & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right) *\) & \(<124\) & 123 & 87 & 94 \\
\hline 2008 & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right) *\) & \(<137\) & 136 & 115 & 111 \\
\hline 2009 & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right) *\) & \(<126\) & 126 & 101 & 106 \\
\hline 2010 & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right) *\) & \(<107\) & 107 & 91 & 95 \\
\hline 2011 & See scenarios & - & 93 & 89 & 90 \\
\hline \(2012{ }^{1}\) & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right) *\) & \(<79.320\) & 79 & 69 & 70 \\
\hline 2013 & Management plan (TAC + 15\%)* & \(<91.219\) & 91.220 & & \\
\hline 2014 & Management plan (TAC - 15\%) * & \(<77.536\) & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
* Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries.
\({ }^{1}\) The June advice in 2011 was updated in November 2011.
}

Table 6.4.21.2 Saithe in Subarea VI. ICES advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
ICES \\
Advice
\end{tabular} & Predicted landings corresp. to advice & \begin{tabular}{l}
Agreed \\
TAC**
\end{tabular} & Official landings & \[
\begin{gathered}
\text { ICES } \\
\text { landings }
\end{gathered}
\] \\
\hline 1987 & F reduced towards \(\mathbf{F}_{\text {max }}\) & 19 & 27.8 & 32.5 & 31.4 \\
\hline 1988 & 80\% of F(86); TAC & 35 & 35 & 32.8 & 34.2 \\
\hline 1989 & \(\mathrm{F}<0.3\); TAC & 20 & 30 & 22.4 & 25.6 \\
\hline 1990 & \(80 \%\) of F(88); TAC & 24 & 29 & 18.0 & 19.9 \\
\hline 1991 & Stop SSB decline; TAC & 21 & 22 & 17.9 & 17.0 \\
\hline 1992 & Avoid further reduction in SSB & \(<19\) & 17 & 10.8 & 11.8 \\
\hline 1993 & \(\mathrm{F}=0.21\) & 6.3 & 14 & 14.5 & 13.9 \\
\hline 1994 & Lowest possible F & & 14 & \(13.0{ }^{2}\) & 12.8 \\
\hline 1995 & Significant reduction in effort & - & 16 & \(10.6{ }^{2}\) & 11.8 \\
\hline 1996 & No increase in F & \(10.2^{1}\) & 13 & \(9.4{ }^{2}\) & 9.4 \\
\hline 1997 & Significant reduction in F & & 12 & \(8.6{ }^{2}\) & 9.4 \\
\hline 1998 & 60\% Reduction in F & 4.8 & 10.9 & \(7.4{ }^{2}\) & 8.4 \\
\hline 1999 & 60\% reduction in F & 4.8 & 7.5 & 6.8 & 7.3 \\
\hline 2000 & Reduce F by \(30 \%\) & 6.0 & 7 & 6.4 & 5.9 \\
\hline 2001 & Reduce F by \(20 \%\) & 9.0 & 9 & 8.7 & 8.4 \\
\hline 2002 & \(\mathrm{F}<\mathrm{F}_{\mathrm{pa}}\) & \(<13\) & 14 & 5.6 & 5.2 \\
\hline 2003 & \(\mathrm{F}<\mathrm{F}_{\mathrm{pa}}\) & \(<17\) & 17.1 & 5.0 & 5.3 \\
\hline 2004 & \(\mathrm{F}<\mathrm{F}_{\mathrm{pa}}{ }^{*}\) & \(<21\) & 20 & 1.6 & 4.4 \\
\hline 2005 & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right) *\) & \(<14\) & 15 & 8.7 & 5.7 \\
\hline 2006 & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right)^{*}\) & \(<12\) & 13 & 9.4 & 8.6 \\
\hline 2007 & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right) *\) & \(<12\) & 13 & 6.7 & 6.8 \\
\hline 2008 & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right) *\) & \(<14\) & 14 & 6.0 & 7.2 \\
\hline 2009 & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right) *\) & \(<13\) & 13 & 6.2 & 7.0 \\
\hline 2010 & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right) *\) & \(<11\) & 11 & 6.2 & 6.9 \\
\hline 2011 & See scenarios & - & 10 & 7.3 & 7.4 \\
\hline \(2012{ }^{3}\) & F according to man. plan \(\left(<\mathrm{F}_{\mathrm{pa}}\right) *\) & \(<8.230\) & 8 & 7.6 & 7.2 \\
\hline \[
\begin{array}{r}
2013 \\
2014 \\
\hline
\end{array}
\] & \begin{tabular}{l}
Management plan (TAC + 15\%) * \\
Management plan (TAC-15\%)*
\end{tabular} & \[
\begin{array}{r}
<9.464 \\
<8.045 \\
\hline
\end{array}
\] & 9.464 & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1}\) Status quo catch.
\({ }^{2}\) Incomplete data.
\({ }^{3}\) The June advice in 2012 was updated in November 2012.
* Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries.
** Since 1996, the saithe in this area has been assessed together with North Sea/Skagerrak saithe, with allocation of TAC based on historical landings. In recent years TACs in Subarea VI have been included in a total TAC for Divisions VIIb and VIIc, but it is unclear if anything is added. The areas were combined shortly after the Saithe Study Group meeting in 1995. Presumably the assessment was merged in 1996, and used in the advice for 1997.

Table 6.4.21.3
Saithe in Subarea IV, Division IIIa (Skagerrak), and Subarea VI. Officially reported landings and ICES estimates (in tonnes).

SAITHE IV and IIIa
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 2002 & 2003 & 2004* & 2005* & 2006 & 2007* & 2008* & 2009 & 2010 & 2011* & 2012* \\
\hline Belgium & 107 & 45 & 22 & 28 & 16 & 18 & 7 & 27 & 15 & 2 & 1 \\
\hline Denmark & 5668 & 6954 & 7991 & 7498 & 7471 & 5458 & 8069 & 8802 & 8019 & 6325 & 5170 \\
\hline Faroe Isl. & 872 & 495 & 558 & 184 & 62 & 15 & 108 & - & 146 & 0 & 8 \\
\hline France & 25441 & 18001 & 13628 & 10768 & 15739 & 13043 & 15302 & 5445* & 4582* & 13856 & 14093 \\
\hline Germany & 10999 & 8956 & 9589 & 12401 & 14390 & 12790 & 14141 & 13689 & 11192 & 10234 & 8007 \\
\hline Greenland & 62 & 1616 & 403 & - & - & - & - & - & - & 0 & - \\
\hline Ireland & - & - & 1 & - & 0 & - & 81 & 81 & - & 0 & 0 \\
\hline Netherlands & 6 & 11* & 3 & 40 & 28 & 5 & 3 & 17 & 3 & 24 & 34 \\
\hline Norway & 60013 & 61735 & 62783 & 67365 & 61268 & 45395 & 62055 & 57708 & 53031 & 46778 & 33028 \\
\hline Poland & 752 & 734* & 0 & 1100 & - & - & 1407 & 988 & 654 & 584 & - \\
\hline Russia & & - & - & 35 & 2 & 5 & 5 & 13 & - & 0 & - \\
\hline Sweden & 1863 & 1876 & 2249 & 2114 & 1695 & 1380 & 1639 & 1363 & 1545 & 1331 & 1305 \\
\hline UK (E/W/NI) & 2521 & 1215 & 457 & 1190 & 9129** & 9628** & 11701** & 12545** & 11887** & 10148** & 7287** \\
\hline UK (Scotland) & 6596 & 5829 & 5924 & 7703 & & \(9628 *\) & 11701 & 12545** & 11887** & \(10148 *\) & \(7287 *\) \\
\hline Total reported & 114900 & 107467 & 103608 & 110575 & 109800 & 87377 & 114517 & 100678 & 91074 & 89282 & 68933 \\
\hline Unallocated & 1291 & -5809 & -3646 & 968 & 7312 & 6241 & -3084 & 4851 & 4026 & 422 & 952 \\
\hline ICES estimate & 116191 & 101658 & 99962 & 111543 & 117112 & 93618 & 111433 & 105529 & 95100 & 89704 & 69885 \\
\hline TAC & 135000 & 165000 & 190000 & 145000 & 123250 & 135900 & 135900 & 125934 & 107000 & 93600 & 79320 \\
\hline
\end{tabular}
*Preliminary, \(\quad{ }^{2}\) Preliminary data reported in Iva, \(\quad\) **Scotland+E/W/NI combined
SAITHE VI
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 2002 & 2003 & 2004* & 2005* & 2006 & 2007* & 2008* & 2009 & 2010 & 2011* & 2012* \\
\hline Faroe Islands & & 2 & 34 & 21 & 76 & 32 & 23 & - & 24 & 5 & 6 \\
\hline France & 3062 & 3499 & 3053 & 3452 & 5782 & 3956 & 2617 & 2093 & 2003 & 2382 & 2612 \\
\hline Germany & 467 & 54 & 4 & 373 & 532 & 580 & 147 & 298 & 257 & 0 & 9 \\
\hline Ireland & 91 & 170 & 95 & 168 & 243 & 322 & 208 & 208 & 519 & 359 & 341 \\
\hline Netherlands & - & - & - & - & - & - & 1 & - & & 0 & 0 \\
\hline Norway & 12 & 28 & 16 & 20 & 28 & 377 & 78 & 68 & 249 & 160 & 47 \\
\hline Russia & 1 & 6 & 6 & 25 & 7 & 2 & 50 & 4 & 2 & 0 & - \\
\hline Spain & 4 & 6 & 2 & 3 & - & - & - & - & & 0 & - \\
\hline UK (E/W/NI) & 307 & 263 & 37 & 203 & 2748** & 1419** & 2887** & 3501** & 3168** & 4399** & 4549** \\
\hline UK (Scotland) & 1567 & 1189 & 1563 & 4433 & & 1419 & 2887 & & 3168 & 4399** & 4549** \\
\hline Total reported & 5513 & 5215 & 4810 & 8699 & 9416 & 6688 & 6011 & 6172 & 6222 & 7305 & 7564 \\
\hline Unallocated & -327 & 35 & -296 & -2960 & 848 & 98 & 1223 & 791 & 666 & 95 & -357 \\
\hline ICES estimate & 5186 & 5250 & 4514 & 5739 & 8568 & 6786 & 7234 & 6963 & 6840 & 7400 & 7207 \\
\hline TAC & 14000 & 17119 & 20000 & 15044 & 12787 & 14100 & 14100 & 13066 & 11000 & 9570 & 8230 \\
\hline
\end{tabular}
*Preliminary **Scotland+E/W/NI combined
\begin{tabular}{llllllllllll}
\multicolumn{2}{c}{ SAITHE IV, IIIa and VI } \\
& 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline ICES estimate & 121377 & 106908 & 104476 & 117282 & 125680 & 100404 & 118667 & 112492 & 101940 & 97104 & 77717 \\
\hline TAC & 149000 & 182119 & 210000 & 160044 & 136037 & 150000 & 150000 & 139000 & 118000 & 103170 & 87550 \\
\hline
\end{tabular}

Table 6.4.21.4 Saithe in Subarea IV, Division IIIa (Skagerrak), and Subarea VI. Summary of stock assessment. (landings for fish age 3-10+)
\begin{tabular}{rrrcc}
\hline Year & \begin{tabular}{r} 
Recruitment \\
Age 3 \\
thousands
\end{tabular} & SSB & Landings & Mean F \\
& 127000 & 150800 & Ages 3-6
\end{tabular}

\footnotetext{
* Geometric mean recruitment 1988-2010.
}

\section*{Annex 6.4.21 EU-Norway Management plan}

In 2013, EU and Norway renewed the existing agreement on "a long-term plan for the saithe stock in the Skagerrak, the North Sea and west of Scotland, which is consistent with a precautionary approach and designed to provide for sustainable fisheries and high yields. The plan shall consist of the following elements. The 2008 management plan was extended without changes.
1. Every effort shall be made to maintain a minimum level of Spawning Stock Biomass (SSB) greater than 106,000 tonnes (Blim).
2. Where the SSB is estimated to be above 200,000 tonnes the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality rate of no more than 0.30 for appropriate age groups.
3. Where the SSB is estimated to be below 200,000 tonnes but above 106,000 tonnes, the TAC shall not exceed a level which, on the basis of a scientific evaluation by ICES, will result in a fishing mortality rate equal to 0.30-0.20*(200,000-SSB)/94,000.
4. Where the SSB is estimated by the ICES to be below the minimum level of SSB of 106,000 tonnes the TAC shall be set at a level corresponding to a fishing mortality rate of no more than 0.1.
5. Where the rules in paragraphs 2 and 3 would lead to a TAC which deviates by more than \(15 \%\) from the TAC of the preceding year the Parties shall fix a TAC that is no more than \(15 \%\) greater or \(15 \%\) less than the TAC of the preceding year.
6. Notwithstanding paragraph 5 the Parties may where considered appropriate reduce the TAC by more than \(15 \%\) compared to the TAC of the preceding year.
7. A review of this arrangement shall take place no later than 31 December 2015.
8. This arrangement enters into force on 1 January 2009."

\section*{Ling (Molva molva)}

\section*{(Divisions IIIa and IVa, and in Sub-areas VI,VII,VIII, IX, XII, and XIV (other areas)}

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

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES provides advice on ling in other areas on a biennial basis. The 2012 ICES advice also applies to 2013. This advice can be found in the 2012 Stock Book.

Based on the ICES approach for data-limited stocks, ICES advised that catches should be no more than \(10,800 \mathrm{t}\). FEAS did not agree with this advice. The TAC was not changed in 2013 .

In 2012, this stock fell into ICES Category 3 for-data limited stocks, as there is a time-series of abundance in the form of commercial CPUEs. The CPUE series cover the major fishing areas (Divisions Vla, IVa, and VIb) and are interpreted as being either stable or increasing, implying that abundance is at least stable at the current volume of catch. The CPUEs are not standardised and do not account for changes in fishing patterns, therefore they cannot be considered to show precise changes in abundance over time. As exploitation is unknown, ICES advised that catches should decrease


Red Box - TAC/Management Area Blue Shading - Assessment Area by \(20 \%\) as a precautionary buffer. A \(20 \%\) reduction of the mean catch 2009-20II equals to \(10,800 \mathrm{t}\), which equated to a \(38 \%\) reduction in the 2012 TAC.

In the absence of an analytical assessment FEAS consider that multi-annual advice is more appropriate. FEAS reiterates its 2012 advice that the TAC should be gradually reduced until it can be shown that \(F\) is below FMSY. A gradual reduction may be in the order of \(5 \%\) annually giving an EU TAC for sub-areas VI, VII, VIII, IX, X, XII, XIV of \(7,623 \mathrm{t}\) with an associated Irish quota of 56 I t in 2014.

\section*{CURRENT MANAGEMENT}
- The TAC areas do not correspond to the assessment area.
- Since 2003, the EU has set TACs for EU vessels fishing in community waters and waters not under the control of third countries. Between 2003 and 2007, ling was covered by the biennial regulations for deep-water species; however, from 2008 it has been included in annual TAC regulation covering other species. EU TACs for ling in 2013 were: \(2,428 \mathrm{t}\) for EU waters of Sub-area
 IV and \(8,024 \mathrm{t}\) for Sub-area VI, VII, VIII, IX, X, XII, XIV with an Irish quota of 59I t . There is no speciesspecific regulation in the Norwegian EEZ, but a TAC is negotiated for Norwegian vessels fishing in EU waters. In 2013, the Norwegian quota for ling in the EU zone was 6,140 t. The quota for the EU in Norwegian waters in Area IV was 945 t.
- There was a prohibition in 2013 to fish or retain on board tusk, blue ling and ling in the Porcupine Bank during the period from I May to 3I May.

\section*{West of Scotland Herring}

\section*{(Division Vla (North))}

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

\begin{abstract}
FEAS - SINGLE STOCK CONSIDERATIONS
ICES advise that following the agreed management plan implies a TAC of \(28,067 \mathrm{t}\) in 2014. The target \(F\) in the management plan is 0.25 , corresponding to \(F_{\text {MSY }}\). FEAS agrees with ICES and advises that the management plan be followed. However, FEAS considers that in the coming years, a new assessment and management plan is required for this stock, which recognises the connectivity with the stock of herring in VIaS and VIIbc.

This stock has a quantitative assessment and forecast, and is placed in ICES category I. SSB has been fluctuating at a low level, F is fluctuating around \(F_{\text {MSY }}\), and recruitment is low. The advised TAC would result in an Irish quota of \(4,210 \mathrm{t}\) in 2014 .
\end{abstract}


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

FEAS is concerned that a proportion of catches in this area, particularly in the south, may be of the Northwest of Ireland herring stock. This would lead to additional mortality on that stock. The main fishery, by Scottish boats, takes in August and September, mainly north of \(58^{\circ} \mathrm{N}\). The Irish fishery for this stock opens on the \(I^{\text {st }}\) October each season. The effect of this late opening date is that Irish vessels miss the opportunity to fish the stock at the appropriate time. To avoid catches of NW Ireland herring by Irish vessels in this fishery, FEAS suggests that the season for Irish vessels in this fishery should open on the \(I^{\text {st }}\) August and close of the \(30^{\text {th }}\) September.

FEAS notes that this stock is considered a part of the Malin Shelf Stock Complex. An ICES study group carried out an evaluation of assessment and management strategies of the western herring stocks in the Malin Shelf Complex. This group have recommended that no changes to the current assessment and management units be made. However further work is underway to assess the level of mixing that takes place between stocks during the summer acoustic surveys on the feeding grounds. ICES is working to achieve an assessment that takes this mixing into account.

FEAS notes that the proposed rebuilding plan for herring off NW Ireland includes a temporary exclusion zone prohibiting herring fishing between \(56^{\circ} \mathrm{N}\) and \(57^{\circ} 30 \mathrm{~N}\), in Sub-division VlaN (only affecting the Irish Fleet in Sub-division VlaN).

FEAS agrees with ICES that activities that have a negative impact on the spawning habitat of herring, such as extraction of marine aggregates and marine construction on the spawning grounds, should not occur.

\section*{CURRENT MANAGEMENT}
- The EU TAC in 2013 was \(27,480 \mathrm{t}\). The Irish share of the EU quota was 4,I5I t. (as per COUNCIL REGULATION (EU) No 40/20I3).
- The EU adopted a management plan for this stock in December 2008.
- The main fishery, by Scottish boats, takes in August and September, mainly north of \(58^{\circ} \mathrm{N}\). The Irish fishery for this stock opens on the \(I^{\text {st }}\) October each season. The effect of this late opening date is that Irish vessels miss the opportunity to fish the stock at the appropriate time, and are incentivised to target fish along the \(56^{\circ} \mathrm{N}\) boundary with VlaS, with a high risk of catching of \(\mathrm{VlaS} / \mathrm{Vllbc}\) herring against the VlaN quota. Many of the main herring fishing grounds in VlaN are within these territorial limits.

- Irish and Dutch vessels are not allowed to fish herring inside the UK (Scottish) 6-12 mile limits, including the outlying Hebridean Islands. German and French vessels have access to herring fishing between 6 and 12 miles in Scottish waters, in most areas, excluding the mainland limits east of the Butt of Lewis.
- There is an annual seasonal closure of the Butt of Lewis spawning area from the \(15^{\text {th }}\) August to the \(15^{\text {th }}\) September each year.
- It is noted that the proposed rebuilding plan for northwest Ireland herring contains an exclusion zone between \(56^{\circ} \mathrm{N}\) and \(57^{\circ} 30 \mathrm{~N}\) for Irish vessels only.

\section*{ICES ADVICE 5.4.12 Herring in Division VIa (North)}

\section*{Advice summary for 2014}

ICES advises on the basis of the agreed West of Scotland herring management plan that landings should be no more than 28067 t in 2014. Discards are considered to be low and all catches are therefore assumed to be landed.

ICES advises that activities that have a negative impact on the spawning habitat of herring, such as extraction of marine aggregates and marine construction on the spawning grounds, should not occur.

\section*{Stock status}




Figure 5.4.12.1
Herring in Division VIa (North). Summary of stock assessment (weights in thousand tonnes). Estimates are shaded. Top right: SSB and F over the time-series used in the assessment.

Since 1977, the stock has been fluctuating at a considerable lower biomass than in the previous 20 years. Fishing mortality has fluctuated around \(\mathrm{F}_{\mathrm{MSY}}\) in recent years, and recruitment is lower than in the historical period.

\section*{Management plans}

A management plan has been adopted by the EU in 2008 (Council Regulation (EC) 1300/2008, Annex 5.4.12). The main aim of the plan is to manage the fisheries on the basis of maximum sustainable yield. ICES has evaluated the plan and concludes that it is in accordance with the precautionary approach.

\section*{Biology}

This autumn-spawning stock is considered part of the Malin Shelf stock complex. Components of the neighbouring herring stocks to the south are known to be present seasonally in Division VIa (North). Studies in the acoustic survey are ongoing to evaluate the level of mixing. Spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Gravel extraction or disturbance in the close vicinity of any herring spawning will disturb that spawning activity and will reduce the area available for successful spawning.

\section*{Environmental influence on the stock}

Temperatures and salinity in this area have been increasing over recent decades. Similar environmental changes have affected North Sea herring. Productivity of the Division VIa (North) stock has been reduced since the late 1980s.

\section*{The fisheries}

The fishery is conducted by single and pair Refrigerated Sea Water (RSW) trawlers and single-trawl freezer trawlers. Prior to 2006 there was a fairly even distribution of effort, both temporally and spatially. Since 2006 the majority has been fished in the northern part of Division VIa (North) in the 3rd quarter.

Catch distribution Catch (2012) = \(18516 \mathrm{t}(42 \%\) pelagic freezer trawlers and \(58 \%\) pelagic RSW trawlers).

\section*{Effects of the fisheries on the ecosystem}

Herring fisheries tend to be clean with little bycatch of other fish. Scottish discard observer programmes since 1999 indicate that discarding of herring in these directed fisheries are at a low level. These discard observer programmes have recorded occasional catches of seals and zero catches of cetaceans.

\section*{Quality considerations}

The assessment is considered to be noisy, but unbiased. Area misreporting has been a problem in the past. Minimum sampling requirements have been met only in quarter four in 2012. Sampling in the other quarters was not adequate and does not represent the major fishery in the area. Samples from all quarters where there is fishing activity would improve allocation of sampled métiers in the stock-raising process.


Figure 5.4.12.2 Herring in Division VIa North. Historical assessment results (final-year recruitment estimates not included).

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & Age-based analytical (FLICA). \\
Stock data category & \begin{tabular}{l} 
Category 1. \\
Commercial catches (international landings, weights, ages and length frequencies \\
from catch sampling); one acoustic survey index (MSHAS_N); weights in the stock
\end{tabular} \\
fnd data \\
and annual maturity ogives from MSHAS_N. Natural mortality values correspond to \\
estimates for North Sea herring based on recommendations by the Multispecies WG \\
(ICES, 1987a) that were applied to adjacent areas (ICES, 1987b).
\end{tabular}

\section*{ECOREGION Celtic Seas \\ STOCK Herring in Division VIa (North)}

\section*{Reference points}
\begin{tabular}{|c|c|c|c|}
\hline & Type & Value & Technical basis \\
\hline \multirow[t]{4}{*}{Management plan} & \(\mathrm{SSB}_{\text {MGT }}\) & Not defined. & \\
\hline & \multirow[t]{3}{*}{\(\mathrm{F}_{\text {MGT }}\)} & \(\mathrm{F}_{3-6}=0.25\). & If SSB in TAC year \(\geqq 75000 \mathrm{t}\) ((EC) 1300/2008, Art. 3). \\
\hline & & \(\mathrm{F}_{3-6}=0.20\). & If SSB in TAC year \(<75000 \mathrm{t}\) and \(\geqq 50000 \mathrm{t}(\) (EC) 1300/2008, Art. 3). \\
\hline & & \(\mathrm{F}_{3-6}=0.00\). & If SSB in TAC year < 50000 t ((EC) 1300/2008, Art. 3). \\
\hline MSY & MSY \(\mathrm{B}_{\text {trigger }}\) & Not defined. & \\
\hline Approach & \(\mathrm{F}_{\text {MSY }}\) & 0.25 & Simulations under different productivity regimes (Simmonds and Keltz, 2007; ICES, 2010). \\
\hline \multirow{4}{*}{Precautionary approach} & \(\mathrm{B}_{\text {lim }}\) & 50000 t . & Lowest reliable estimate of SSB. \\
\hline & \(\mathrm{B}_{\mathrm{pa}}\) & Not defined. & \\
\hline & \(\mathrm{F}_{\text {lim }}\) & Not defined. & \\
\hline & \(\mathrm{F}_{\mathrm{pa}}\) & Not defined. & \\
\hline
\end{tabular}
(unchanged since: 2010)

Outlook for 2014
Basis: \(\mathrm{F}(2013)^{1}=\mathrm{F}_{\mathrm{sq}}(\operatorname{avg} 2010-2012)=0.20, \mathrm{SSB}(2013)^{2}=101920\); catch \((2013)=22057 ; \mathrm{R}(2012-2014)=\) GM \((1991-2011)=616\) million.
\begin{tabular}{|l|c|c|c|c|c|c|c|}
\hline Rationale & \begin{tabular}{c} 
Catch \\
\((\mathbf{2 0 1 4})\)
\end{tabular} & \begin{tabular}{c} 
SSB \\
\((\mathbf{2 0 1 4})^{2}\)
\end{tabular} & Basis & \begin{tabular}{c} 
F \\
\(\mathbf{( 2 0 1 4 )}\)
\end{tabular} & \begin{tabular}{c} 
SSB \\
\(\mathbf{( 2 0 1 5 )}\)
\end{tabular} & \begin{tabular}{c} 
SSB \\
change \(^{3}\)
\end{tabular} & \begin{tabular}{c} 
TAC \\
change \(^{4}\)
\end{tabular} \\
\hline \begin{tabular}{l} 
Management \\
plan
\end{tabular} & 28067 & 100984 & \(\mathrm{~F}_{\mathrm{sq}} \times 1.26\) & 0.25 & 97875 & \(-3 \%\) & \(2 \%\) \\
\hline \begin{tabular}{l} 
MSY \\
approach
\end{tabular} & 28067 & 100984 & \(\mathrm{~F}_{\mathrm{MSY}}\) & 0.25 & 97875 & \(-3 \%\) & \(2 \%\) \\
\hline Zero catch & 0 & 117927 & \(\mathrm{~F}=0\) & 0 & 138454 & \(+17 \%\) & \(-100 \%\) \\
\hline \begin{tabular}{l} 
Other \\
options
\end{tabular} & 21984 & 104753 & \(\mathrm{~F}_{2012} \times 0.96\) & 0.19 & 106120 & \(+1 \%\) & \(-20 \%\) \\
\hline
\end{tabular}

Weights in tonnes.
\({ }^{1)}\) The assumption about F (2013) reflects the amount of TAC undershoot observed in recent years (around 20\%).
\({ }^{2)}\) For autumn-spawning stocks, the SSB is determined at spawning time and is influenced by fisheries between 1 January and spawning.
\({ }^{3)}\) SSB 2015 relative to SSB 2014.
\({ }^{4)}\) Catch 2014 relative to TAC 2013.

\section*{Management plan}

The EU management plan (Council Regulation (EC) 1300/2008) is based on the following rule.
\begin{tabular}{|c|c|c|}
\hline SSB in the year of the TAC & Fishing mortality & Maximum TAC variation \\
\hline \(\mathrm{SSB}>75000 \mathrm{t}\) & \(\mathrm{F}=0.25\) & \(20 \%\) \\
\hline \(\mathrm{SSB}<75000 \mathrm{t}\) & \(\mathrm{F}=0.2\) & \(20 \%\) \\
\hline \(\mathrm{SSB}<62500 \mathrm{t}\) & \(\mathrm{F}=0.2\) & \(25 \%\) \\
\hline \(\mathrm{SSB}<50000 \mathrm{t}\left(\mathrm{B}_{\mathrm{lim}}\right)\) & \(\mathrm{F}=0\) & - \\
\hline
\end{tabular}

Following the agreed management plan implies a TAC of 28067 t in 2014 which is equivalent to a TAC increase of \(2 \%\). SSB in 2014 is estimated to be above 75000 t implying an F target of \(\mathrm{F}=0.25\), constrained by a maximum \(20 \%\) TAC increase.

A similar management plan was evaluated by ICES in 2005 and found to be consistent with the precautionary approach. In 2008 ICES checked that the changes in stock dynamics and the changes to the plan had not significantly increased the risks.

Discards are considered to be low and all catches are therefore assumed to be landed.

\section*{MSY approach}

Following the ICES MSY approach implies a fishing mortality at \(\mathrm{F}_{\mathrm{MSY}}=0.25\), resulting in catches of no more than 28067 t in 2014. This is expected to lead to an SSB of 100984 t in 2014. As no MSY \(\mathrm{B}_{\text {trigger }}\) has been identified for this stock, the ICES MSY approach has been applied with \(\mathrm{F}_{\text {MSY }}\) without consideration of SSB in relation to MSY \(\mathrm{B}_{\text {trigger }}\). Discards are considered to be low and all catches are therefore assumed to be landed.

\section*{Precautionary approach}

The SSB is well above \(\mathrm{B}_{\text {lim }}\). In the short term, SSB is expected to stay above \(\mathrm{B}_{\text {lim }} . \mathrm{F}_{\mathrm{pa}}\) is undefined, but the current \(F\) is below \(\mathrm{F}_{\text {MSY }}\).

\section*{Additional considerations}

Gravel substrate is an important fish habitat for herring spawning. Herring spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Activities that have an impact on the spawning habitat of herring, such as extraction of marine aggregates (e.g. gravel and sand) and construction in the marine environment, can impact spawning. Herring regularly abandon and repopulate spawning grounds and absence of spawning in any particular year does not mean that the spawning ground is not required to maintain a resilient
herring population. Scientific information (Groot, 1979, 1996) supports the advice that no gravel extraction should occur in areas with spawning grounds.

\section*{Ecosystem changes}

Grey seal abundance is significant to the west of Scotland and they are known to feed on herring, among other species. The latest estimates of grey seal abundance over time show that the population in the area has remained stable since the mid-1990s (Thomas, 2011). The contribution of seal predation to total herring mortality may be significant, but data are limited. Because the consumption of herring by seals is estimated with great uncertainty, the impact on the stock cannot be estimated accurately.

\section*{Fishing patterns and fishing technology changes}

Prior to 2006 there was a fairly even seasonal and spatial distribution of effort. Since 2006 the majority of the fishery has taken place in quarter 3 west and north of the Hebrides and to the north of Scotland.

\section*{Uncertainties in assessment and catch options}

The assessment is noisy, leading to annual revisions of SSB and F. The management plan has been designed to cope with this by applying a constraint on year-on-year change in TAC. Revisions in SSB can be upwards or downwards, so it is important to maintain the restrictions on change in TAC both when the stock is revised upwards and downwards. Asymmetrical responses have not been tested and may be significantly more risky.

The stock identity of herring west of the British Isles was reviewed by the EU-funded project WESTHER. This identified Division VIa (North) as an area where acoustic survey catches contain a mixture of fish from Divisions VIa (North), VIa (South), VIIb,c, and VIIa (North). The extent of stock mixing in Division VIa (North) catches is unknown. In 2008 ICES began to evaluate the management for Divisions VIa (South), VIIb,c, and Division VIIa (North). ICES is working to produce an assessment that takes mixing into account. Efforts to split the Malin Shelf acoustic survey according to stock component are underway and should continue.

Minimum sampling requirements have been met only in quarter four in 2012. Sampling in the other quarters was not adequate and does not represent the major fishery in the area. Samples from all quarters where there is fishing activity would improve allocation of sampled métiers in the stock-raising process.

\section*{Comparison with previous assessment and advice}

Compared to the assessment in 2012, \(\operatorname{SSB}(2011)\) was revised downwards by \(6 \%\) and \(\mathrm{F}(2011)\) upwards by \(5 \%\).
The basis for the advice (the agreed Division VIa (North) herring management plan) is the same as last year.

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Figure 5.4.12.3 Herring in Division VIa North. Stock-recruitment relationship and yield- and SSB-perrecruit plot.

Table 5.4.12.1 Herring in Division VIa (North). ICES advice, management, and catches.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
ICES \\
Advice
\end{tabular} & Predicted catch corresp. to advice & Agreed TAC & Disc. slip. & \[
\begin{aligned}
& \text { ICES } \\
& \text { atch }^{1}
\end{aligned}
\] \\
\hline 1987 & Reduce F to \(\mathrm{F}_{0.1} /\) status quo F & 38-55 & 49.7 & & 44 \\
\hline 1988 & TAC & 46 & 49.8 & & 36 \\
\hline 1989 & TAC & 58 & 58 & 1.6 & 34 \\
\hline 1990 & TAC & 61 & 75 & 1.3 & 45 \\
\hline 1991 & TAC & 57 & 62 & 1.2 & 29 \\
\hline 1992 & TAC & 62 & 62 & 0.2 & 29 \\
\hline 1993 & Catch at status quo F & 54-58 & 62 & 0.8 & 32 \\
\hline 1994 & Catch at status quo F & 50-60 & 62 & 0.7 & 24 \\
\hline 1995 & No specific advice & \(60^{2}\) & 77 & & 30 \\
\hline 1996 & No advice because of misreporting & - & 83.57 & & 26 \\
\hline 1997 & Catch at status quo F & & 83.57 & 0.1 & \(33^{3}\) \\
\hline 1998 & Catch at status quo F & 59 & 80.37 & 0.9 & 33 \\
\hline 1999 & Average catches, 1991-1996 & 28 & 68 & & 30 \\
\hline 2000 & Average catches, 1991-1996 & 28 & 42 & & \(18^{4}\) \\
\hline 2001 & Average catches, 1991-1999 & 30 & 36.36 & & \(24^{4}\) \\
\hline 2002 & Average catches, 1991-1999 & 30 & 36.36 & & \(33^{4}\) \\
\hline 2003 & Catch at status quo F & 30 & 30 & & \(28^{4}\) \\
\hline 2004 & \(\mathrm{F}=0.30\) & 41 & 30 & 0.1 & \(25^{4}\) \\
\hline 2005 & Catch at status quo F & 30 & 30.1 & 0.8 & \(14^{4}\) \\
\hline 2006 & Catch at status quo F & 34 & 34 & 0.2 & 27 \\
\hline 2007 & Status quo TAC advice & 34 & 34 & & 30 \\
\hline 2008 & \(\mathrm{F}=0.2\) (proposed management plan) & 15 & 27.2 & & 16 \\
\hline 2009 & \(\mathrm{F}=0.2\) (proposed management plan) & 13 & 21.76 & & 19 \\
\hline 2010 & \(\mathrm{F}=0.25\) (management plan) & 24 & 24.42 & 0.1 & 20 \\
\hline 2011 & See scenarios & 22.48 & 22.48 & & 18 \\
\hline 2012 & \(\mathrm{F}=0.25\) (management plan) & \(<22.9\) & 22.0 & & 19 \\
\hline 2013 & Management plan & <27.48 & 27.48 & & \\
\hline 2014 & Management plan & \(<28.067\) & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1)}\) Adjusted for misreporting.
\({ }^{2}\) ) Catch at status quo F .
\({ }^{3)}\) Revised in 1999 .
\({ }^{4}\) ) Revised in 2007.
}

Table 5.4.12.2 Herring in Division VIa (North). Catch in tonnes by country. These figures do not correspond in all cases to the official statistics and cannot be used for management purposes.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|}
\hline Country & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 \\
\hline \multicolumn{9}{|l|}{Denmark} \\
\hline Faroes & & 326 & 482 & & & 274 & & 2297 \\
\hline France & 1342 & 1287 & 1168 & 119 & 818 & 5087 & 3672 & 7836 \\
\hline Germany & 4290 & 7096 & 6450 & 5640 & 4693 & 7938 & 3733 & 9721 \\
\hline Ireland & 8000 & 10000 & 8000 & 7985 & 8236 & 6093 & 3548 & 9396 \\
\hline Netherlands & 5860 & 7693 & 7979 & 8000 & 6132 & 8183 & 7808 & 6223 \\
\hline Norway & & 1607 & 3318 & 2389 & 7447 & 30676 & 4840 & 46639 \\
\hline UK & 29874 & 38253 & 32628 & 32730 & 32602 & -4 287 & 42661 & -17753 \\
\hline Unallocated & 2123 & 2397 & -10597 & -5 485 & -3753 & 700 & -4 541 & \\
\hline Discards & 1550 & 1300 & 1180 & 200 & & & & 64359 \\
\hline Total & 53039 & 69959 & 50608 & 51578 & 56175 & 54664 & 61271 & -38254 \\
\hline Area-Misreported & -19013 & -25 266 & -22079 & -22 593 & -24 397 & -30 234 & -32 146 & 26105 \\
\hline ICES Estimate & 34026 & 44693 & 28529 & 28985 & 31778 & 24430 & 29575 & 1997 \\
\hline \multicolumn{9}{|l|}{} \\
\hline Country & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 \\
\hline Faroes & & & & & & 800 & 400 & 228 \\
\hline France & 3093 & 1903 & 463 & 870 & 760 & 1340 & 1370 & 625 \\
\hline Germany & 8873 & 8253 & 6752 & 4615 & 3944 & 3810 & 2935 & 1046 \\
\hline Ireland & 1875 & 11199 & 7915 & 4841 & 4311 & 4239 & 3581 & 1894 \\
\hline Netherlands & 9873 & 8483 & 7244 & 4647 & 4534 & 4612 & 3609 & 8232 \\
\hline Norway & 4962 & 5317 & 2695 & & & & & \\
\hline UK & 44273 & 42302 & 36446 & 22816 & 21862 & 20604 & 16947 & 17706 \\
\hline Unallocated & -8 015 & -11748 & -8 155 & & & 878 & -7 & \\
\hline Discards & 62 & 90 & & & & & & 123 \\
\hline Total & 64995 & 65799 & 61514 & 37789 & 35411 & 36283 & 28835 & 29854 \\
\hline Area-Misreported & -29 766 & -32446 & -23 623 & -19467 & -11132 & -8735 & -3 581 & -7 218 \\
\hline ICES Estimate & 35233 & 33353 & 29736 & 18322 & 24556 & 32914 & 28081 & 25021 \\
\hline \multicolumn{9}{|l|}{} \\
\hline Country & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline Faroes & 1810 & 570 & 484 & 927 & 1544 & 70 & & \\
\hline France & 613 & 701 & 703 & 564 & 1049 & 511 & 504 & 244 \\
\hline Germany & 2691 & 3152 & 1749 & 2526 & 27 & 3583 & 3518 & 1829 \\
\hline Ireland & 2880 & 4352 & 5129 & 3103 & 1935 & 2728 & 3956 & 3451 \\
\hline Netherlands & 5132 & 7008 & 8052 & 4133 & 5675 & 3600 & 1684 & 3523 \\
\hline \multicolumn{9}{|l|}{Norway} \\
\hline UK & 17494 & 18284 & 17618 & 13963 & 11076 & 12018 & 11696 & 12249 \\
\hline \multicolumn{9}{|l|}{Unallocated} \\
\hline Discards & 772 & 163 & & & & 95 & & \\
\hline Total & 31392 & 34230 & 33735 & 25216 & 21306 & 22510 & 21358 & \\
\hline Area-Misreported & -17263 & -6884 & -4 119 & -9 162 & -2 798 & -2 728 & -3 599 & -2780 \\
\hline ICES Estimate & 14129 & 27346 & 29616 & 16054 & 18508 & 19877 & 17759 & 18516 \\
\hline
\end{tabular}

Table 5.4.12.3 Herring in Division VIa (North). Summary of stock assessment.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & Recruitment Age 1 (Thousands) & \begin{tabular}{l}
TSB \\
Tonnes
\end{tabular} & SSB & \[
\begin{gathered}
\text { Fbar } \\
\text { (Ages 3-6) }
\end{gathered}
\] & Landings Tonnes \\
\hline 1957 & 1088006 & 405110 & 184234 & 0.2834 & 43438 \\
\hline 1958 & 2101199 & 495444 & 200601 & 0.3305 & 59669 \\
\hline 1959 & 2136613 & 532906 & 213380 & 0.3028 & 65221 \\
\hline 1960 & 626496 & 427963 & 247465 & 0.1948 & 63759 \\
\hline 1961 & 1285229 & 435271 & 247715 & 0.1294 & 46353 \\
\hline 1962 & 2293268 & 540413 & 237068 & 0.2059 & 58195 \\
\hline 1963 & 2110018 & 572370 & 259863 & 0.1833 & 49030 \\
\hline 1964 & 978157 & 522945 & 305370 & 0.1535 & 64234 \\
\hline 1965 & 7839269 & 1115364 & 312179 & 0.1592 & 68669 \\
\hline 1966 & 1066330 & 848510 & 426183 & 0.1932 & 100619 \\
\hline 1967 & 2498686 & 829562 & 456838 & 0.1903 & 90400 \\
\hline 1968 & 4100166 & 952511 & 434826 & 0.1435 & 84614 \\
\hline 1969 & 2998773 & 980072 & 471939 & 0.2419 & 107170 \\
\hline 1970 & 3439855 & 1000107 & 441946 & 0.3587 & 165930 \\
\hline 1971 & 9570759 & 1514872 & 315271 & 0.7883 & 207167 \\
\hline 1972 & 2675642 & 1115411 & 443058 & 0.3651 & 164756 \\
\hline 1973 & 1074227 & 802001 & 385421 & 0.6056 & 210270 \\
\hline 1974 & 1672447 & 576306 & 203879 & 0.9572 & 178160 \\
\hline 1975 & 2102769 & 434633 & 107030 & 0.9101 & 114001 \\
\hline 1976 & 606435 & 263563 & 73358 & 1.0693 & 93642 \\
\hline 1977 & 620881 & 162765 & 51826 & 0.995 & 41341 \\
\hline 1978 & 911556 & 170356 & 48384 & 0.6777 & 22156 \\
\hline 1979 & 1216825 & 215739 & 72243 & 0.0007 & 60 \\
\hline 1980 & 885161 & 252021 & 121982 & 0.0004 & 306 \\
\hline 1981 & 1660162 & 364259 & 131719 & 0.3632 & 51420 \\
\hline 1982 & 769613 & 305358 & 109385 & 0.6767 & 92360 \\
\hline 1983 & 2971919 & 426039 & 80836 & 0.7156 & 63523 \\
\hline 1984 & 1132803 & 352884 & 119689 & 0.518 & 56012 \\
\hline 1985 & 1200030 & 348143 & 147291 & 0.3164 & 39142 \\
\hline 1986 & 891147 & 314164 & 132897 & 0.5284 & 70764 \\
\hline 1987 & 2096144 & 379992 & 123159 & 0.3454 & 44360 \\
\hline 1988 & 902230 & 334343 & 147692 & 0.2855 & 35591 \\
\hline 1989 & 838396 & 317626 & 163914 & 0.2474 & 34026 \\
\hline 1990 & 431693 & 269463 & 154325 & 0.3485 & 44693 \\
\hline 1991 & 378816 & 207886 & 125735 & 0.2593 & 28529 \\
\hline 1992 & 792035 & 192409 & 97898 & 0.2864 & 28985 \\
\hline 1993 & 580238 & 182555 & 98523 & 0.2492 & 31778 \\
\hline 1994 & 852565 & 177308 & 91108 & 0.23 & 24430 \\
\hline 1995 & 606827 & 156988 & 72006 & 0.2673 & 29575 \\
\hline 1996 & 945694 & 194589 & 112492 & 0.1727 & 26105 \\
\hline 1997 & 1478749 & 207795 & 71103 & 0.5168 & 35233 \\
\hline 1998 & 483440 & 186104 & 100631 & 0.5001 & 33353 \\
\hline 1999 & 309652 & 143978 & 84196 & 0.3107 & 29736 \\
\hline 2000 & 1699208 & 205590 & 71766 & 0.2453 & 18322 \\
\hline 2001 & 1163240 & 231314 & 117823 & 0.1969 & 24556 \\
\hline 2002 & 1261566 & 271054 & 139460 & 0.3503 & 32914 \\
\hline 2003 & 500703 & 229446 & 141591 & 0.2452 & 28081 \\
\hline 2004 & 289252 & 180050 & 125948 & 0.2129 & 25021 \\
\hline 2005 & 299687 & 150525 & 106730 & 0.1176 & 14129 \\
\hline 2006 & 487235 & 168782 & 103289 & 0.2112 & 27346 \\
\hline 2007 & 321578 & 151578 & 97849 & 0.2609 & 29616 \\
\hline 2008 & 393522 & 143883 & 101432 & 0.1363 & 16054 \\
\hline 2009 & 490750 & 164109 & 85295 & 0.2072 & 18508 \\
\hline 2010 & 1267874 & 167515 & 64021 & 0.2507 & 19877 \\
\hline 2011 & 513121 & 160497 & 76985 & 0.187 & 17759 \\
\hline 2012* & 616136 & 197434 & 102008 & 0.1606 & 18516 \\
\hline 2013* & 616136 & & 101920 & & \\
\hline Average & 1493700 & & & & \\
\hline
\end{tabular}
*Geometric mean 1989-2011; 2013 predicted SSB.

\section*{Annex 5.4.12 \\ Agreed management plan for Division VIa (North) herring: Council} Regulation (EC) 1300/2008
1. Each year, the Council, acting by qualified majority on the basis of a proposal from the Commission, shall fix for the following year the TAC applicable to the herring stock in the area west of Scotland, in accordance with paragraphs 2 to 6 .
2. When STECF considers that the spawning stock biomass level will be equal or superior to 75000 tonnes in the year for which the TAC is to be fixed, the TAC shall be set at a level which, according to the advice of STECF, will result in a fishing mortality rate of 0.25 per year. However, the annual variation in the TAC shall be limited to \(20 \%\).
3. When the STECF considers that the spawning stock biomass level will be less than 75000 tonnes but equal or superior to 50000 tonnes in the year for which the TAC is to be fixed, the TAC shall be set at a level which, according to the advice of STECF, will result in a fishing mortality rate of 0.2 per year. However, the annual variation of the TAC shall be limited to:
(a) \(20 \%\) if the spawning stock biomass level is estimated to be equal or superior to 62500 tonnes but less than
75000 tonnes;
(b) \(25 \%\) if the spawning stock biomass level is estimated to be equal or superior to 50000 tonnes but less than
62500 tonnes.
4. When STECF considers that the spawning stock biomass level will be less than 50000 tonnes in the year for which the TAC is to be fixed, the TAC shall be set at 0 tonnes.
5. For the purposes of the calculation to be carried out in accordance with paragraphs 2 and 3, STECF shall assume that the stock will experience a fishing mortality rate of 0.25 in the year prior to the year for which the TAC is to be fixed.
6. By way of derogation from paragraphs 2 or 3, if STECF considers that the herring stock in the area west of Scotland is failing properly to recover, the TAC shall be set at a level lower than that provided for in those paragraphs.

\title{
West of Scotland and Ireland Sea Bass
}

\section*{Divisions Vla, VIIb, and VIIj}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

FEAS agrees with ICES advice that based on their approach to data-limited stocks, commercial landings should not be more than 18 tonnes in 2014. No information on discards is available, therefore it is not possible to provide commercial catch advice. Also, recreational catches cannot be quantified. Therefore total catches cannot be calculated.

Currently there is no TAC for this species in this area, and it is not clear whether this should constitute a separate management unit. FEAS and ICES does not necessarily advocate the introduction of a TAC for sea bass in this area. FEAS notes that there is no scientific basis to separate management of seabass in this area since there is insufficient evidence to suggest that they are different stocks.

FEAS agrees with the ICES recommendation that catch limitations that incite discarding should be avoided. FEAS also advises that whatever management measures are implemented, they should take into account


Blue Shading - Assessment Area both target fisheries and incidental by catches in mixed fisheries. Any consideration of catch limitation (output control) would need to take into account that sea bass are a bycatch in mixed fisheries to a varying extent, depending on gear and country. A bycatch provision should be part of any management measure. This would allow for incidental unavoidable bycatches to be landed.

Management of sea bass fisheries needs to take into account the distinctive characteristics, economic value, and objectives of the different fisheries that share the resource. Sea bass is of high social and economic value to the large inshore artisanal fleets and to sea angling and other recreational fishing that contribute substantially to local economies.

\section*{CURRENT MANAGEMENT}
- There is no TAC for sea bass anywhere in Europe, at present.
- The Bass (Conservation of Stocks) Order, 1990 prohibits the retention on board or transhipment of sea bass by Irish registered vessels. Incidental commercial catches of sea bass by Irish vessels must be legally discarded.
- The Bass (Restrictions on Sale) Regulations 2007 (S.I. 367/2007) prohibits the sale of sea bass in Ireland except for fish that have been imported.
- The Bass Fishing Conservation Bye-law No. 826 of 2007 (SI 386/2007) imposes an angling bag limit of 2 fish per 24 hour period and bans angling from the 15 May to 15 June.

\section*{ICES ADVICE 5.4.33 Sea bass in Divisions VIa, VIIb, and VIIj (West of Scotland and Ireland)}

\section*{Advice for 2014}

Based on ICES approach to data-limited stocks, ICES advises commercial landings of no more than 18 tonnes in 2014. No information on discards is available, therefore it is not possible to provide commercial catch advice. Also, recreational catches cannot be quantified. Therefore total catches cannot be calculated.

Currently there is no TAC for this species in this area, and it is not clear whether this should constitute a separate management unit. ICES does not necessarily advocate the introduction of a TAC for sea bass in this area.

\section*{Stock status}



Figure 5.4.33.1
European sea bass in Divisions VIa, VIIb, and VIIj. Official landings (tonnes). Data available for 2012 are preliminary.

Official reported landings are higher than one tonne after 2000 (except in 2012, but the landings estimate is still preliminary). Sea bass official landings have been around 10 tonnes after 2007, with the exception of 2011, when higher catch values were recorded. Most of the catches are taken from Division VIIj.

\section*{Management plans}

No specific management objectives are known to ICES. There is no TAC for this species.

\section*{Biology}

Sea bass grow slowly, do not mature until 4-7 years of age, and have been recorded up to 28 years of age. Juvenile bass up to three years of age occupy nursery areas in estuaries whilst adults undertake seasonal migrations from inshore habitats to offshore spawning sites. It is not known to what extent adults from this stock are caught by pelagic trawlers targeting mature sea bass at spawning sites in Divisions VIIe-h. After spawning, sea bass tend to return to the same coastal sites each year. The combination of slow growth, late maturity, spawning aggregation, and strong site fidelity, increases the vulnerability of sea bass to overexploitation and localized depletion. A new stock definition is considered in 2013; however, it is not clear if sea bass in Divisions VIa, VIIb, and VIIj constitutes a separate stock. It is possible that sea bass in the area has a connection with sea bass in Division VIIg.

\section*{Environmental influence on the stock}

Ocean warming in recent decades has likely led to the more northerly distribution of sea bass.

\section*{The fisheries}

Sea bass is an important recreational fishing target around the coast of Ireland. A moratorium on commercial fishing for this species by Irish vessels has been in place since 1990; as a result, unavoidable catches of Irish commercial vessels are discarded. The very small commercial catches are made predominantly by French vessels.

\section*{Catch distribution Official landings 2012 are less than 1 tonne, but the available value is still preliminary. No discards information is available, but discarding is known to occur.}

\section*{Quality considerations}

The only available information is official landings. Recreational fisheries, which are subject to bag limits and size limits for sea bass in Irish waters, will result in fishery removals, and time-series of catches, releases, and size/age composition are needed. Time-series of relative abundance indices are needed for both the adult and pre-recruit components of the stock.

The advice is based on a precautionary reduction of catches because of missing or non-representative data. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis
\begin{tabular}{ll} 
Assessment type & No assessment. \\
Stock data category & Category 6.2.0. \\
Input data & Official landings. \\
Discards and bycatch & Not available. \\
Indicators & None. \\
Other information & \begin{tabular}{l} 
The combined sea bass stock was benchmarked in 2012 (ICES, 2012), where a new \\
stock definition was proposed.
\end{tabular} \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

\section*{ECOREGION Celtic Sea and West of Scotland \\ STOCK European sea bass in Divisions VIa, VIIb, and VIIj (West of Scotland and Ireland)}

\section*{Reference points}

No reference points have been defined for this stock.
Outlook for 2013
No analytical assessment is currently available for European sea bass in Divisions VIa, VIIb, and VIIj. Therefore, no catch projections are available.

\section*{ICES approach to data-limited stocks}

For data-limited stocks without information on biomass or abundance or exploitation ICES considers that a precautionary reduction of catches should be implemented, unless there is ancillary information clearly indicating that the current exploitation is appropriate for the stock.

For this stock, ICES advises that landings should decrease by \(20 \%\) in relation to the average of the last three years with official landings information (2009-2011), corresponding to commercial landings of no more than 18 tonnes in 2014. No information on discards is available, therefore it is not possible to provide commercial catch advice.

\section*{Additional considerations}

\section*{Management considerations}

ICES does not necessarily advocate the introduction of a TAC for sea bass in this area. ICES reiterates its previous recommendation that implementation of 'input' controls (preferably through technical measures aimed at protecting juvenile fish, in conjunction with entry limitations into the offshore fishery in particular) should be promoted (ICES, 2004). Any consideration of catch limitation (output control) would need to take into account that sea bass are a bycatch in mixed fisheries to a varying extent, depending on gear and country. A bycatch provision should be part of any management measure, allowing incidental unavoidable bycatches to be landed. Catch limitations that incite discarding should be avoided. At present discarding is mainly an issue with otter trawlers using \(80-90 \mathrm{~mm}\) mesh in or near areas where juvenile bass are most abundant. However, even without discards included in the assessment, the length at \(50 \%\) fishing selection in the overall fisheries is below the age at first maturity. Improvements to fishery selectivity are needed to allow more fish to spawn at least once before capture. This would require changes to gear designs and spatial management approaches that do not incite discarding.

Management of sea bass fisheries needs to take into account the distinctive characteristics and economic value of the different fisheries. Sea bass is of high social and economic value to sea angling in Ireland which contributes substantially to local economies.

\section*{Biology}

The larvae drift inshore to nursery areas in creeks, estuaries, and shallow bays where they remain for at least two years. Three-year-old fish migrate to overwintering areas in deeper water, returning to large estuaries in summer. Older bass are more wide-ranging, and mature individuals undertake annual migrations between inshore feeding areas and offshore spawning sites. Tagging studies in other areas show that sea bass are often recaptured close to where they were released, despite mixing on offshore spawning grounds, indicating strong association with particular coastal sites.

\section*{Quality considerations}

This advice is based on landings data that do not include recreational catches.

\section*{Regulations}

A moratorium on commercial fishing for sea bass has been in place for Irish vessels fishing in Subareas VI and VII since 1990, and a minimum landing size (MLS) of 40 cm applies to Irish fisheries. The official minimum landing size for non-Irish vessels is 36 cm (EC regulation 850/98). In addition, a variety of national restrictions on commercial sea bass fishing are also in place for non-Irish vessels, including licensing, individual landings limitations, larger MLS, and seasonal/area closures. Recreational fishing for sea bass in Ireland is prohibited from 15 May to 15 June, and a bag limit of two fish per 24 hours is in place.

\section*{Data requirements}

Time-series of relative abundance indices need to be developed throughout the range of the stock, for both the adult and pre-recruit components of the stock.

There is a need to develop a time-series of recreational fishery catch, effort, and catch composition. Catch locations and composition of significant commercial landings should be monitored to help establish the stock affiliation.

Further studies using tagging, genetics, and other stock and individual markers are needed to more accurately define stock boundaries suitable for assessment and management purposes.

Studies are needed to document the survival of recreationally caught and released sea bass.

\section*{Comparison with previous assessment and advice}

The advice last year was based on ICES approach to data-limited stocks, considering a combined stock for the whole ICES area. After a benchmark process last year (ICES, 2012), the combined stock was divided in four stocks. The present advice only concerns the European sea bass in Divisions VIa, VIIb, and VIIj.

The basis for the advice this year is ICES approach to data-limited stocks.

\section*{Sources}

ICES. 2004. Report of the ICES Advisory Committee on Fishery Management and Advisory Committee on Ecosystems (Section 4.4.15, Atlantic sea bass), 2004. ICES Advice. Volume 1, Number 2. 1544 pp.
ICES. 2012. Report of the Inter-Benchmark Protocol on New Species (Turbot and Sea bass; IBPNew 2012), 1-5 October 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:45. 239 pp.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Table 5.4.33.1 European sea bass in Divisions VIa, VIIb, and VIIj. ICES advice, management, and official landings.
\begin{tabular}{|c|c|c|c|c|}
\hline Year & ICES Advice & Predicted catch corresp. to advice & Agreed TAC & Official landings \\
\hline 2000 & - & - & none & 1 \\
\hline 2001 & - & - & none & 4 \\
\hline 2002 & No increase in effort or \(\mathrm{F}^{1)}\) & - & none & 4 \\
\hline 2003 & No increase in effort or \(\mathrm{F}^{1)}\) & - & none & 2 \\
\hline 2004 & No increase in effort or \(\mathrm{F}^{1)}\) & - & none & 8 \\
\hline 2005 & - & - & none & 4 \\
\hline 2006 & - & - & none & 2 \\
\hline 2007 & - & - & none & 10 \\
\hline 2008 & - & - & none & 10 \\
\hline 2009 & - & - & none & 7 \\
\hline 2010 & - & - & none & 15 \\
\hline 2011 & - & - & none & 47 \\
\hline 2012 & No increase in catch \({ }^{1)}\) & , & none & \(1^{2)}\) \\
\hline 2013 & 20\% reduction in catches (last 3 years' average) \({ }^{\text {1) }}\) & \(<6.0^{1)}\) & & \\
\hline 2014 & \(20 \%\) reduction in commercial landings (last 3 years' average 2009-2011) & 0.018 & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1)}\) Advice for the European sea bass in the Northeast Atlantic (combined stock).
\({ }^{2)}\) Preliminary.

European sea bass in Divisions VIa, VIIb, and VIIj. Official landings by country (tonnes). Source: ICES official catch statistics.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline & Belgium & Spain & France & UK & Ireland & Total \\
\hline 1995 & & & & + & & 0 \\
\hline 1996 & & & & & & 0 \\
\hline 1997 & & & & & & 0 \\
\hline 1998 & & + & & & & 0 \\
\hline 1999 & & & & & & 0 \\
\hline 2000 & & & 1 & & & 1 \\
\hline 2001 & & & 4 & & & 4 \\
\hline 2002 & & 0 & 4 & & & 4 \\
\hline 2003 & & & 2 & & & 2 \\
\hline 2004 & 0 & 2 & 6 & 0 & & 8 \\
\hline 2005 & & & 4 & & & 4 \\
\hline 2006 & & & 2 & 0 & & 2 \\
\hline 2007 & & & 10 & 0 & & 10 \\
\hline 2008 & & 0 & 10 & 0 & & 10 \\
\hline 2009 & & & 6 & 0 & 1 & 7 \\
\hline 2010 & & & 15 & & & 15 \\
\hline 2011 & & & 47 & 0 & & 47 \\
\hline 2012* & & & \(<0.5\) & \(<1\) & & <1 \\
\hline
\end{tabular}

\section*{Irish Sea, Celtic Sea etc. Sea Bass}

\section*{Divisions IVbc,VIIa, and VIId-h}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice for this stock is that the total biomass is estimated to have decreased by more than \(20 \%\) between the periods 2008-2010 (average of the three years) and 201I-2012 (average of the two years). This implies a decrease in commercial landings of least \(20 \%\) compared to the average landings of the last three years. Additionally, given that the stock is considered to be overexploited, ICES advises that commercial landings should decrease by a further \(20 \%\) as a precautionary buffer. This results in commercial landings of no more than 2,707 t in 2014. Discards are known to take place but the data are insufficient to estimate a discard proportion that could be applied to give catch advice. Also,


Blue Shading - Assessment Area recreational catches cannot be quantified. Therefore total catches cannot be calculated. FEAS agree with this ICES advice.

FEAS also agrees with the ICES recommendation that catch limitations that incite discarding should be avoided. FEAS also advise that whatever management measures are implemented, they should take into account both target fisheries and incidental by catches in mixed fisheries. Any consideration of catch limitation (output control) would need to take into account that sea bass are a bycatch in mixed fisheries to a varying extent, depending on gear and country. A bycatch provision should be part of any management measure. This would allow for incidental unavoidable bycatches to be landed.

Management of sea bass fisheries needs to take into account the distinctive characteristics, economic value, and objectives of the different fisheries that share the resource. Sea bass is of high social and economic value to the large inshore artisanal fleets and to sea angling and other recreational fishing that contribute substantially to local economies.

FEAS notes that there is no good scientific basis for separate management of sea bass in VIa, VIIb and VIIj.

\section*{CURRENT MANAGEMENT}
- There is no TAC for sea bass anywhere in Europe, at present.
- The Bass (Conservation of Stocks) Order, 1990. prohibits the retention on board or transhipment of sea bass by Irish registered vessels. Incidental commercial catches of sea bass by Irish vessels must be legally discarded.
- The Bass (Restrictions on Sale)Regulations 2007 (S.I. 367/2007) prohibits the sale of sea bass in Ireland except for fish that have been imported.
- The Bass Fishing Conservation Bye-law No. 826 of 2007 (SI 386/2007) imposes an angling bag limit of 2 fish per 24 hour period and bans angling from the 15 May to 15 June.

\section*{ICES ADVICE 5.4.32 Sea bass in Divisions IVbe, VIIa, and VIId-h (Irish Sea, Celtic Sea, English Channel, and southern North Sea)}

\section*{Advice for 2014}

Based on ICES approach to data-limited stocks, ICES advises that commercial landings should be no more than 2707 tonnes in 2014. Discards are known to take place but the data are insufficient to estimate a discard proportion that could be applied to give catch advice. Also, recreational catches cannot be quantified. Therefore total catches cannot be calculated.

\section*{Stock status \\ \begin{tabular}{|c|c|c|c|}
\hline \multicolumn{4}{|c|}{F (Fishing Mortality)} \\
\hline & & 2010-2012 & \\
\hline Qualitative evaluation & \[
x
\] & Above possibl points & reference \\
\hline \multicolumn{4}{|c|}{SSB (Spawning Stock Biomass)} \\
\hline & & 2008-2012 & \\
\hline Qualitative evaluation & (4) & Decreasing & \\
\hline
\end{tabular}



Figure 5.4.32.1 European sea bass in Divisions IVbc, VIIa, and VIId-h. Summary of stock assessment: landings in thousand tonnes; recruitment, fishing mortality, and biomass relative to the average of the time-series. Long term recruitment mean are shaded. Bottom right: Total stock biomass (TSB), dashed lines indicate the average TSB for the respective year range. Top right: relative TSB/relative F for the timeseries used in the assessment.

Fishing mortality is increasing, and an exploratory evaluation indicates that F is above a possible \(\mathrm{F}_{\text {MSY }}\) proxy. The total biomass has been declining since 2005. Total biomass, assumed as the best stock size indicator in the last two years (2011-2012), was \(32 \%\) lower than the total biomass in the three previous years (2008-2010).

\section*{Management plans}

No specific management objectives are known to ICES. There is no TAC for this species.

\section*{Biology}

Sea bass grow slowly, do not mature until 4-7 years of age, and have been recorded up to 28 years of age. Juvenile bass up to three years of age occupy nursery areas in estuaries whilst adults undertake seasonal migrations from inshore habitats to offshore spawning sites where they are targeted by pelagic trawlers. After spawning, sea bass tend to return to the same coastal sites each year. The combination of slow growth, late maturity, spawning aggregation, and strong site fidelity increases the vulnerability of sea bass to overexploitation and localized depletion. A new stock definition is considered in 2013; however, it is not clear if sea bass in Divisions IVbc, VIIa, and VIId-h constitutes a separate stock. It is possible that sea bass in the area has a connection with sea bass in Division VIIj.

\section*{Environmental influence on the stock}

Ocean warming in recent decades has likely led to the more northerly distribution of sea bass, which are now found further north into the North Sea. Above-average sea temperatures are expected to be favourable for survival of young bass in estuarine nursery areas, which may explain the increased frequency of strong year classes from the mid-1990s to the early 2000s. The increase in sea temperature may also have been responsible for adult sea bass remaining for a longer period of the year in the near-shore areas of the English Channel and Celtic Sea. More recent years have been characterized by colder winters, which may explain the apparent decline in recruitment.

\section*{The fisheries}

Sea bass are targeted by pelagic pair trawlers on offshore spawning grounds during December to April, and are taken as seasonal target or bycatch by a large fleet of inshore vessels using a variety of gears. Discarding is low, except for some small-mesh trawl fleets operating inshore near nursery areas. Sea bass is an important marine recreational angling species in the UK, Ireland, France, and the Netherlands. A moratorium on commercial fishing for this species by Irish vessels has been in effect since 1990; as a result, unavoidable catches of Irish commercial vessels are discarded.

Catch distribution Commercial landings (2012) \(=4060 \mathrm{t}\) (UK and France: 24\% bottom trawlers; 29\% pelagic pair trawlers; \(14 \%\) fixed/drift nets; \(12 \%\) lines; \(7 \%\) other gears. Other countries: \(14 \%\) all gears).

\section*{Quality considerations}

Recent surveys indicate that recreational fishery harvests could amount to \(20 \%\) of total fishery removals of sea bass, but there are no data on long-term trends in such catches and no procedure to include the recent data in the assessment. Stock structure in Subareas IV, VII, and VIII remains poorly defined and further studies are needed using tagging, genetics, and other population/individual markers. Historical sampling of fishery catches is of variable quality, and data should be collected representatively across the fleets taking sea bass. Time-series of relative abundance indices are needed for both the adult and pre-recruit components of the stock. Pre-recruit survey series included in the assessment were terminated in 2009 and 2011. More up-to-date estimates of maturity across the full stock range are needed.

The basis for the advice is an analytical assessment, presented for this stock this year for the first time. The assessment is considered to be appropriate to describe stock status trends.

The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished.

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & Trends-based age and length analytical assessment (Stock Synthesis 3; NOAA Toolbox). \\
Stock data category & \begin{tabular}{l} 
Category 3.2.0.
\end{tabular} \\
Input data & \begin{tabular}{l} 
Commercial landings (international landings, ages and length frequencies from catch \\
sampling); three pre-recruit survey indices (UK Solent spring and autumn surveys;
\end{tabular} \\
& \begin{tabular}{l} 
Thames trawl survey); growth and maturity data (sampling of commercial catches and \\
surveys); natural mortality (inferred from life history parameters and maximum observed \\
ages).
\end{tabular} \\
Discards and bycatch & A low rate of discarding is observed in most sea bass fisheries. Discards were not
\end{tabular}

\title{
ECOREGION Celtic Sea and West of Scotland + North Sea
}

\section*{Reference points}

No reference points are defined for this stock.

\section*{Outlook for 2014}

There are no estimates of recruitment since 2009 and no catch projections are available. If the reduction in recruitment observed up to 2009 continues and fishing mortality remains high, a continued decline in biomass is expected although the rate of decline cannot be accurately projected.

\section*{ICES approach to data-limited stocks}

For data-limited stocks for which a biomass estimates are available, ICES uses as harvest control rule an indexadjusted status quo catch. The advice is based on a comparison of the two most recent index values with the three preceding values, combined with recent catch or landings data. Knowledge about the exploitation status also influences the advised catch.

For this stock the total biomass is estimated to have decreased by more than \(20 \%\) between the periods 2008-2010 (average of the three years) and 2011-2012 (average of the two years). This implies a decrease in commercial landings of least \(20 \%\) compared to the average landings of the last three years, corresponding to commercial landings of no more than 3383 t .

Additionally, considering that the stock is considered overexploited, ICES advises that commercial landings should decrease by a further \(20 \%\) as a precautionary buffer. This results in commercial landings of no more than 2707 t in 2014. Discards are known to take place but the data are insufficient to estimate a discard proportion that could be applied to give catch advice. Also, recreational catches cannot be quantified. Therefore total catches cannot be calculated.

\section*{Additional considerations}

\section*{Management considerations}

A combination of continued high fishing mortality and continued below-average recruitment will lead to a continuing decline in spawning-stock biomass and progressive loss of older fish, and cause increasing dependence of egg production on younger and less fecund fish. A reduction in fishing mortality on sea bass is needed to prevent SSB declining to such an extent that the stock's ability to produce strong recruitment in more favourable environmental conditions is impaired.

ICES recommends that tailored measures for target and bycatch fisheries should be implemented. Any consideration of catch limitation (output control) would need to take into account that sea bass are a bycatch in mixed fisheries to a varying extent, depending on gear and country. A bycatch provision should be part of any management measure. This would allow for incidental unavoidable bycatches to be landed. Discarding is mainly an issue at present with otter trawlers using \(80-90 \mathrm{~mm}\) mesh in or near areas where juvenile bass are most abundant, for example in coastal waters of the eastern Channel. However, even without discards included in the assessment, the length at \(50 \%\) fishing selection in the overall fisheries is below the length at first maturity. Improvements to fishery selectivity are needed to allow more fish to spawn at least once before capture. This would require changes to gear designs and spatial management approaches that do not incite discarding.

Management of sea bass fisheries needs to take into account the distinctive characteristics, economic value, and objectives of the different fisheries that share the resource. Sea bass is of high social and economic value to the large inshore artisanal fleets and to sea angling and other recreational fishing that contribute substantially to local economies. Data from France indicate that the first-sale value of the lower quality, high-volume catches of sea bass caught by pelagic trawlers targeting offshore spawning fish during December to March has been up to three times lower per kg than for smaller-volume sales of higher quality fish for other metiers fishing inshore (Drogou et al., 2011).

As sea bass is at present a non-TAC species, there is potential for displacement of fishing effort from other species with limiting quotas. The effort of the French pelagic fisheries for sea bass during winter and spring can shift between the Bay of Biscay and the English Channel, and there is evidence for such a shift to the Channel in recent years. These developments are likely to have increased the fishing mortality on sea bass in Subarea VII.

\section*{Biology}

The stock structure of sea bass is currently uncertain, although the populations around southern Ireland and in the Bay of Biscay are treated as separate from sea bass populations in the eastern Celtic Sea, English Channel, and North Sea. The sea bass at the north Brittany coast may mix with the population in the Bay of Biscay.

Mature sea bass aggregate offshore to spawn, which occurs from February to May in the English Channel and eastern Celtic Sea. The larvae drift inshore to nursery areas in creeks, estuaries, and shallow bays where they remain for at least two years. Three-year-old fish migrate to over-wintering areas in deeper water, returning to large estuaries in summer. Older bass are more wide-ranging, and mature individuals undertake annual migrations between inshore feeding areas and offshore spawning sites. Tagging studies show that sea bass are often recaptured close to where they were released, despite mixing on offshore spawning grounds, indicating strong association with particular coastal sites.

\section*{Quality considerations}

Recreational catches are substantial but not included in the stock assessment due to the very short series of estimates. Surveys in France in 2009-2010 estimated that the recreational fishery (angling and non-angling gears) in Subarea VII caught \(1270 t\) of sea bass, of which \(330 t\) was released. In comparison, commercial fisheries in France landed around 3400 t in 2010. A survey in the Netherlands in 2010 estimated 130 t of recreational landings. UK recreational catch estimates for 2012 will be available late 2013.

The historical fishery catch data are subject to several biases. From 1999 to 2010, French landings data from the ICES commercial landings database are replaced by more accurate figures from a separate analysis of logbook and auction data. From 2011 onwards, the official and scientific French landings use the same analysis of logbook, auction, and VMS data. Official French landings figures prior to 1999 have had to be redistributed between ICES areas according to the average spatial pattern observed from 1999 onwards. Historical landings data of small-scale national fisheries not supplying EU logbooks are known to be inaccurate, particularly in earlier years. Discard rates are considered low in most sea bass fisheries. Estimates of discards are available only from the early 2000s, but do not cover all fisheries, are imprecise, and are not included in the assessment.

Termination of the UK juvenile bass surveys between 2009 and 2011 has meant there is no information available on recent year classes after 2009, and recent year classes up to 2009 are poorly estimated. Stock projections are therefore not possible, and the lack of survey data will progressively degrade the ability to detect recent changes in abundance unless other equivalent data series can be developed.

\section*{Regulations}

The official minimum landing size is 36 cm (EC regulation 850/98). In addition, a variety of national restrictions on commercial and/or recreational sea bass fishing are also in place, including licensing, individual landings limitations, larger minimum landing size (MLS), seasonal/area closures, and weekly limits on individual vessel landings.

A moratorium on commercial fishing for sea bass by Irish vessels in Subareas VI and VII has been in place since 1990.

\section*{Data requirements}

Time-series of relative abundance indices need to be developed throughout the range of the stock, for both the adult and pre-recruit components of the stock.

There is a need to ensure adequate and representative sampling coverage of fleets catching sea bass, including developing regional time-series of recreational fishery catch, effort, and catch composition.

Further studies using tagging, genetics, and other stock and individual markers are needed to more accurately define stock boundaries suitable for assessment and management purposes.

Studies are needed to estimate the survival of recreationally caught and released sea bass.
Comparison with previous assessment and advice
The advice last year was based on ICES approach to data-limited stocks, considering a combined stock for the whole ICES area. After a benchmark process last year (ICES, 2012), the combined stock was divided in four stocks. The present advice only concerns the European sea bass in Divisions IVbc, VIIa, and VIId-h.

This year there is additional information from an analytical assessment, and advice is based on the ICES approach to data-limited stocks using method 2.1.4.

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Figure 5.4.32.2

\footnotetext{
European sea bass in Divisions IVbc, VIIa, and VIId-h. Yield- and SSB-per-recruit analysis.
}

Table 5.4.32.1 European sea bass in Divisions IVbc, VIIa, and VIId-h. ICES advice, management, official landings, and ICES landings.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & ICES Advice & Predicted catch corresp. to advice \({ }^{1}\) & Agreed TAC & Official landings & ICES landings \\
\hline 2000 & - & - & none & 2.1 & 2.4 \\
\hline 2001 & - & - & none & 2.2 & 2.5 \\
\hline 2002 & No increase in effort or F & - & none & 2.4 & 2.6 \\
\hline 2003 & No increase in effort or F & - & none & 2.9 & 3.4 \\
\hline 2004 & No increase in effort or F & - & none & 3.0 & 3.7 \\
\hline 2005 & - & - & none & 3.2 & 4.4 \\
\hline 2006 & - & - & none & 3.4 & 4.5 \\
\hline 2007 & - & - & none & 3.5 & 4.2 \\
\hline 2008 & - & - & none & 3.0 & 4.2 \\
\hline 2009 & - & - & none & 4.3 & 4.0 \\
\hline 2010 & - & - & none & 4.9 & 4.8 \\
\hline 2011 & - & - & none & 3.9 & 3.9 \\
\hline 2012 & No increase in catch & - & none & 3.9 & 4.1 \\
\hline 2013 & 20\% Reduction in catches (last 3 years' average) & \(<6.0\) & & & \\
\hline 2014 & \(36 \%\) reduction in commercial landings ( \(20 \%\) reduction, followed by \(20 \%\) precautionary reduction) & \(<2.707\) & & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1}\) Advice prior to 2014 was given for sea bass in the Northeast Atlantic.

Table 5.4.32.2 European sea bass in Divisions IVbc, VIIa, and VIId-h. Official landings by area/country and ICES estimates of landings ( t ).
\begin{tabular}{lcccccccc}
\hline & Belgium & Denmark & France \(^{\mathbf{1}}\) & UK & Netherlands & \begin{tabular}{c} 
Channel \\
Is.
\end{tabular} & Total & \begin{tabular}{c} 
ICES \\
landings \(^{2}\)
\end{tabular} \\
\hline 1985 & 0 & 0 & 620 & 105 & 0 & 18 & 743 & 1076 \\
1986 & 0 & 0 & 841 & 124 & 0 & 15 & 980 & 1315 \\
1987 & 0 & 0 & 1226 & 123 & 0 & 14 & 1363 & 1979 \\
1988 & 0 & 18 & 714 & 173 & 8 & 12 & 925 & 1238 \\
1989 & 0 & 2 & 675 & 191 & 2 & 48 & 918 & 1161 \\
1990 & 0 & 0 & 609 & 189 & 0 & 25 & 823 & 1033 \\
1991 & 0 & 0 & 726 & 239 & 0 & 16 & 981 & 1225 \\
1992 & 0 & 0 & 721 & 148 & 0 & 36 & 905 & 1184 \\
1993 & 0 & 1 & 718 & 230 & 0 & 45 & 994 & 1251 \\
1994 & 0 & 0 & 593 & 535 & 0 & 49 & 1177 & 1370 \\
1995 & 0 & 1 & 801 & 707 & 0 & 69 & 1578 & 1777 \\
1996 & 0 & 1 & 1703 & 562 & 8 & 56 & 2330 & 3023 \\
1997 & 0 & 1 & 1429 & 560 & 1 & 74 & 2065 & 2620 \\
1998 & 0 & 2 & 1363 & 487 & 48 & 79 & 1979 & 2388 \\
1999 & 0 & 1 & 0 & 684 & 32 & 108 & 825 & 2665 \\
2000 & 0 & 5 & 1522 & 406 & 60 & 130 & 2123 & 2397 \\
2001 & 0 & 2 & 1619 & 458 & 77 & 80 & 2236 & 2482 \\
2002 & 0 & 1 & 1580 & 627 & 96 & 73 & 2377 & 2628 \\
2003 & 154 & 1 & 1903 & 586 & 163 & 84 & 2891 & 3445 \\
2004 & 159 & 1 & 1883 & 617 & 191 & 159 & 3010 & 3730 \\
2005 & 206 & 1 & 1937 & 512 & 327 & 220 & 3203 & 4392 \\
2006 & 211 & 2 & 2116 & 574 & 308 & 193 & 3404 & 4522 \\
2007 & 178 & 1 & 2074 & 713 & 376 & 160 & 3502 & 4213 \\
2008 & 188 & 0 & 1506 & 791 & 380 & 143 & 3008 & 4244 \\
2009 & 173 & 0 & 2905 & 697 & 395 & 103 & 4273 & 4013 \\
2010 & 215 & 4 & 3441 & 736 & 399 & 144 & 4939 & 4758 \\
2011 & 152 & 2 & 2526 & 795 & 395 & 0 & 3870 & 3870 \\
2012 & 149 & 3 & 2492 & 885 & 372 & 46 & 3946 & 4060 \\
\hline & Source: Official catch statistics \(1950-2010\) dataset 2011 and \(1992-2011\) dataset 2013, ICES, Copenhagen. \\
& \({ }^{1}\) Landings for \(2000-2010\) supplied by fremer. & & & & \\
Includes adjustments to pre-2000 French statistics in line with ratio of Ifremer to official figures in later years. \\
\hline & & & & & &
\end{tabular}

Table 5.4.32.3 European sea bass in Divisions IVbc, VIIa, and VIId-h. Assessment summary. Recruitment, SSB, TSB, and F are relative to the time-series mean. Recruitment from 2010 to 2012 are based on the longterm geometric mean
\begin{tabular}{cccccc}
\hline Year & \begin{tabular}{c} 
Recruits \\
(age 0)
\end{tabular} & SSB & TSB & F(5-11) & \begin{tabular}{c} 
Landings \\
(tonnes)
\end{tabular} \\
\hline 1985 & 0.013 & 1.276 & 0.959 & 0.356 & 1076 \\
1986 & 0.053 & 1.131 & 0.901 & 0.481 & 1315 \\
1987 & 0.329 & 1.031 & 0.825 & 0.790 & 1979 \\
1988 & 0.386 & 0.909 & 0.703 & 0.534 & 1238 \\
1989 & 3.114 & 0.857 & 0.637 & 0.546 & 1161 \\
1990 & 0.698 & 0.773 & 0.607 & 0.554 & 1033 \\
1991 & 0.574 & 0.676 & 0.657 & 0.775 & 1225 \\
1992 & 0.834 & 0.562 & 0.720 & 0.813 & 1184 \\
1993 & 0.479 & 0.593 & 0.810 & 0.696 & 1251 \\
1994 & 1.219 & 0.759 & 0.906 & 0.569 & 1370 \\
1995 & 1.813 & 0.963 & 0.985 & 0.626 & 1777 \\
1996 & 0.198 & 1.093 & 1.039 & 1.055 & 3023 \\
1997 & 1.951 & 1.032 & 1.014 & 0.981 & 2620 \\
1998 & 1.013 & 0.974 & 1.010 & 0.926 & 2388 \\
1999 & 1.990 & 0.982 & 1.049 & 1.014 & 2665 \\
2000 & 1.025 & 0.989 & 1.086 & 0.874 & 2397 \\
2001 & 1.364 & 1.050 & 1.163 & 0.855 & 2482 \\
2002 & 1.836 & 1.117 & 1.238 & 0.839 & 2628 \\
2003 & 1.719 & 1.216 & 1.315 & 1.034 & 3445 \\
2004 & 1.273 & 1.259 & 1.352 & 1.093 & 3730 \\
2005 & 1.054 & 1.269 & 1.376 & 1.313 & 4392 \\
2006 & 0.968 & 1.219 & 1.347 & 1.399 & 4522 \\
2007 & 0.701 & 1.183 & 1.296 & 1.312 & 4213 \\
2008 & 0.512 & 1.187 & 1.243 & 1.326 & 4244 \\
2009 & 0.576 & 1.160 & 1.153 & 1.309 & 4013 \\
2010 & \((0.770)\) & 1.098 & 1.041 & 1.764 & 4758 \\
2011 & \((0.770)\) & 0.907 & 0.854 & 1.753 & 3870 \\
2012 & \((0.770)\) & 0.738 & 0.714 & 2.415 & 4060 \\
\hline & & & & & \\
\hline & & & & & \\
\hline
\end{tabular}

\section*{Ecosystem overview for the Celtic Sea}

\section*{FEAS ECOSYSTEM CONSIDERATIONS}

FEAS advises that the following considerations should be taken into account when developing ecosystem based management objectives for Celtic Sea fisheries:
- Demersal fisheries in the Celtic Sea are mixed fisheries, catching a large number of commercial and non commercial species. Most species are discarded. Mixed fisheries do not only affect the commercial stocks which are presented in this Stock Book, but impact on the
 wider fish community.
- Discarding rates are also high on many commercial species. Recently introduced technical measures such as increased cod-end mesh size and square mesh panels need to be monitored in order to evaluate their effectiveness. The obligation to land all catch (i.e. no discarding policy) as introduced by the newly reformed CFP, may offer a reduction in discarding practices if efficiently implemented.
- Demersal trawling impacts on benthic habitats and their communities. The resilience and recoverability of habitats varies depending on substrate type, biota and type of fishing gear. The overall impact of demersal trawling on the Celtic Sea seabed needs to be evaluated in relation to the proportion of different habitats impacted.
- A number of rare endangered and/or vulnerable species of cetaceans, seals, seabirds and elasmobranchs are resident or transient in the Celtic Sea. The management of fisheries needs to ensure that the conservation of these species is not compromised.
- In order to implement the ecosystem approach to fisheries (EAFM), fisheries management should incentivise fishing behaviour and introduce management tools which reduce the impact of fishing on the wider ecosystem.
\begin{tabular}{|l|l}
\hline Bathymetry & \begin{tabular}{l} 
The Celtic Sea region is an extended shelf south of Ireland, limited to the west by the \\
slope of the Porcupine Seabight and Goban Spur. The topography drops to \(80-100 \mathrm{~m}\) \\
within 20 km of the coast and extends to the shelf edge (up to 500 km from the coast) as \\
a relatively flat plateau. Coastal areas consist of shallow bays in the south and sites fully \\
exposed to the Northeast Atlantic Ocean in the west (OSPAR, 2000).
\end{tabular} \\
\hline Substrates & \begin{tabular}{l} 
Deep circalittoral (below low water mark) sand (EUNIS Habitat A5.27) is dominant in the \\
Celtic Sea (MESH, 20IO). A deep circalittoral mud habitat (A5.37) is found below 70 m the \\
Celtic Deep and deep circalittoral coarse sediments (A5. I5) are found south of the \\
Waterford and Cork coastlines. The net movement of sediment is in a southwest \\
direction towards the Celtic Sea from the St Georges and Bristol Channels resulting in \\
deposition in the central Celtic Sea region (Nairn et al., I I995).
\end{tabular} \\
\hline Circulation & \begin{tabular}{l} 
The poleward flowing Shelf Edge Current (SEC) runs from south to north from the Iberian \\
margin to the Norwegian Sea (White \& Bowyer, I997). Thermal stratification and tidal \\
mixing generates the seasonal Irish Coastal Current (ICC) (Horsburgh et al., I998, Brown \\
et al., 2003, Fernand et al., 2006). This flows westwards from the northern Cornish coast \\
along the south and west of Ireland and northwards towards Malin Head and Scotland.
\end{tabular} \\
\hline
\end{tabular}
\begin{tabular}{|c|c|}
\hline Fronts & The year-round tidally mixed Irish Shelf Front is located to the south and west of Ireland at \(11{ }^{\circ} \mathrm{W}\) (Huang et al., 1991). The Ushant Front runs between Northern France and the mouth of the English Channel (Le Boyer et al., 2009) and the Celtic Sea Front marks the ecological boundary between the Irish Sea and Celtic Sea (Simpson, 1976). \\
\hline Temperature
\[
\frac{\pi}{|959-20| \mid}
\] & Mean annual SSTs in the Celtic Sea are around 12.5 to \(13^{\circ} \mathrm{C}\) with a range of 8 to \(20^{\circ} \mathrm{C}\). Mean salinity is ca 35 PSU with a range of 32.7 to 35.5 (recorded at weather buoys M3 2004-2010: \(51.22^{\circ} \mathrm{N} 10.55^{\circ} \mathrm{W}\) and M5 2004-2008: \(51.69^{\circ} \mathrm{N} 06.70^{\circ} \mathrm{W}\) ). Longterm datasets from the Malin shelf (1959+) indicate a steady increase in SSTs with mid-2000s values being the highest on record (ICES, 2012b). \\
\hline & Biological Featu \\
\hline \begin{tabular}{l}
Phytoplankton \\
Diatoms ス \\
Dinoflagellates \\
\(\pi\) \\
(1990-2010)
\end{tabular} & Diatom and dinoflagellate species abundances are increasing in coastal waters, south and southwest off Ireland based on time series from 1990 to 2010 (O'Brien et al. 2012). Along the south coast diatom abundance generally peaks in July/August and dinoflagellates in October. In the southwest diatom abundance peaks in May and July and dinoflagellates in September (O'Brien et al., 2012). The ICC is thought to be a mechanism that transports blooms around the coast in a clockwise direction (Silke et al., 2005, Fernand et al., 2006). \\
\hline \begin{tabular}{l}
Zooplankton \\
Overall Abundance
(1958-2010)
\end{tabular} & Longterm times series starting in 1958 show a decline in overall zooplankton abundance in the Celtic Sea (O’Brien et al. 2013). Common carnivorous zooplankton Euphausiids, Chaetognaths, Hyperiids, Decapod, Candacia spp., Euchaeta spp. and Corycaeus spp. have all decreased in abundance in the Celtic Sea between 1960-1999 and 2000-2009. Herbivorous copepods Calanus spp. I-IV, Acartia spp., Paracalanus spp., Centropages typicus and Pseudocalanus spp. have also decreased in abundance while the warm-water copepod Calanus helgolandicus has increased (McGinty et al., 2012) and shifted northwards in response to ocean warming (Beaugrand et al., 2002). Gelatinous nonexploited jellyfish species (Cnidaria) have also increased in abundance since 2002 (Licandro et al., 2010). \\
\hline Benthos and biogenic habitats & Bivalve mollusc (Abra) and brittle star (Amphiura) communities have been identified with the deep circalittoral sand and deep circalittoral mud habitat (Ellis et al. 2001). Dublin Bay prawn Nephrops norvegicus and seapen Virgularia mirabilis are also associated with his habitat (Doyle et al., 201I). The dominant species associated with the shelf edge are the hermit crab Pagurus prideaux and anemone Actinauge richardii (Ellis et al., 2001). Two types of reef have been identified: biogenic reef (Belgica Mound Province) comprising Lophelia pertusa and Madrepora oculata (NPWS, 2006) and rocky reef (Haig Fras) dominated by the jewel anemone Corynactis viridis (Rees, 2000). \\
\hline Fish community
LFI
\(\rightarrow\)
MML
\(\overrightarrow{(1995-2012)}\) & The most abundant demersal species identified in Irish Groundfish Surveys (2005-20II) were Norway pout, haddock, poor cod and whiting and the pelagic species were blue whiting, mackerel, sprat and horse mackerel (Marine Institute, 2012). The size based fish community indicators "proportion of large fish" and "mean maximum length" are variable but without trends in the Celtic Sea (ICES, 2013e). The Celtic Sea harbours important spawning grounds for demersal species (hake, megrim, anglerfish, cod, whiting and haddock) and pelagic species such as herring, mackerel, horse mackerel, blue whiting, boarfish and sprat. \\
\hline \begin{tabular}{l}
Mammals \\
Grey seal pup production入 (1978-2005) Harbour seal pop. (1978-2003)
\end{tabular} & Fourteen cetacean species have been identified in the Celtic Sea between 2000 and 2009 (Berrow et al., 2010). The harbour porpoise, short-beaked common dolphin, common bottlenose dolphin and minke whales are the most common sighting. Two species of seal are found in the Celtic Sea. The grey seal is more abundant than the harbour seal. The largest grey seal populations are found at Great Blasket Island (Co. Kerry), Western Calf Island, Low Island and Carbery Island (Co. Cork), Great Saltee Island and Raven Point (Co. Wexford) and an increase in pup production has been noted between 1995 and 2005(Ó Cadhla and Strong, 2007). Harbour seal populations are found in Bantry Bay, Dunmanus Bay, Roaringwater Bay and Kenmare River (Co. Kerry) (Cronin et al., 2007) and have increased in abundance since late seventies. \\
\hline Seabirds & Ireland provides essential habitat and prey for internationally important breeding and \\
\hline
\end{tabular}

\begin{tabular}{l|l}
\hline & Human pressures and impacts \\
& The main human activities in the Celtic Sea are: \\
Fishing effort & - Fishing \\
\((>10 \mathrm{~m}\) vessels \()\) & - Aquaculture \\
\(\geq\)
\end{tabular}\(\quad\)\begin{tabular}{l} 
- Transport \\
Overall fishing
\end{tabular}

Pressures associated with commercial fisheries are:
- The removal of species
- Seafloor disturbance

About 65\% landings in the Celtic Seas region come from stocks which have an analytical assessment. Five stocks are considered to be fished at or below \(F_{\text {msy }}\), four above and 15 are unknown. A high level of discarding is linked to trawl mixed fisheries. Discards of the main commercial demersal stocks by all métiers in the Celtic Sea between 2003-2009 ranges from II\% (cod) to \(73 \%\) (plaice). I00\% discarding is common for non-commercial demersal species (Anon., 2011). Towed bottom fishing gears (trawls, dredges, drags, hydraulic devices) impact on seabed species and habitats. Gear type, intensity of trawling, sediment hardness (Foden et al., 2010) and hydrodymanic conditions (Collie et al., 2000, Kaiser et al., 2006) affect a system's ability to recover. Gerritsen et al. (2013) estimated that that \(68 \%\) of their study area, in the Irish EEZ of the Celtic Sea, was impacted at least once by trawling during 2011. A considerable portion of the area ( \(46 \%\) ) was impacted at least twice, and \(13 \%\) of the area was impacted at least five times. Some of these regions were even impacted ten times or more, although this occurred in \(<2 \%\) of the area. Biota removal could lead to shifts in fish community structures as predator-prey relationships are altered (Kaiser and Jennings, 1998).
A full reference list can be found in Appendix VI .

\section*{Letter code for stock}

Fig. 1 Pressure \& state indicators


Fig. I Relative fishing pressure ( \(F / F_{m s y}\) ) and biomass (SSB/Btrig) for Celtic Sea stocks, which have SSB and F related against reference points (msy where available, otherwise pa or qualitative). This corresponds to 6 out of 24 stocks and \(65 \%\) of the landings. Stocks in the green region are exploited below \(F_{m s y}\) and have an SSB that is above \(B_{\text {trigger. }}\)

Fig. 2 Stocks of unknown status in relation to reference points. The size of each bubble corresponds to the landings in 2012. The largest bubble corresponds to 75kt.

Fig. 2 Unknown status


A Cod VIle-k
B Haddock VIIb-k
C Whiting VIle-k
D Pollock VII
E Saithe VII, VIII, IX, X,
F Plaice VIlfg
G Plaice VIlbc
H Plaice VIIhjk
I Sole VIlfg
J Sole VIIbc
K Sole VIIhjk
L Nephrops (FUI9) VIljg
M Nephrops (FU20-2I) VIIgh
N Nephrops (FU22) VIIg
O Nephrops (FUI7) VIIb
P Nephrops (FUI6) VIIck
Q Megrim VIIb-k \& VIIlabe
R Anglerfish VII \& VIII
S Hake II, III, IV, VI, VII, VIII
T Skates \& Rays VI \& VII (excl. VIId)
U Grey gurnard VI \& VII (excl. VIId)
V Sprat VI and VII (excl. VIId and VIIe)
W Herring VIIaS VIIg,j
X Herring VlaS VIIbc


Fig. 3 Proportion of Celtic Sea stocks fished at or below \(\mathrm{F}_{\text {msy }}\) (green), above \(\mathrm{F}_{\text {msy }}\) (red) and of unknown status in relation to fishing mortality reference points.

Fig. 4 Proportion of Celtic Sea stocks with biomass above \(B_{\text {msy trigger }}\) (green), below \(B_{\text {msy }}\) trigger (red) and of unknown status in relation to biomass reference points.


Fig. 6 Relative SSB


Fig. 5 Relative fishing mortality ( \(F\) to \(F_{\text {msy }}\) ratios) of Celtic Sea stocks, demersal \(F\) corresponds to cod \(7 \mathrm{e}-\mathrm{k}\), haddock 7b-k,northern hake, Celtic Sea sole and whiting 7e-k, pelagic F corresponds to herring VlaS and Celtic Sea herring, shellfish F corresponds to Nephrops FUI7, 19 and 22.

Fig. 6 Relative biomass (SSB to \(\mathrm{B}_{\text {msy trigger }}\) ratios) of Celtic Sea stocks, demersal SSB corresponds to cod 7e-k, haddock 7b-k, Celtic Sea sole and whiting 7e-k and pelagic F corresponds to herring VlaS and Celtic Sea herring.

\section*{Northern Hake}

\section*{(Division Ila, IIIa-d, Vb, VIIIabde and Sub-areas IV, VI, VII, XII \& XIV)}

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

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advice based on the MSY approach that landings should be no more than \(81,846 \mathrm{t}\) in 2014. FEAS agrees with this advice. Only partial discard information is available for this stock. Therefore ICES does not provide advice on total catches.

This stock falls into ICES category I with full analytical assessments. Fishing mortality has decline since 2005 and is close to \(F_{\text {msy }}\) since 2010. Stock biomass is close to the highest observed although no \(B_{\text {msy }}\) trigger has been defined. This stock is forecast to increase further in the short term with good incoming recruitment.


Red Box-TAC/Management Area Blue Shading-Assessment Area
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline & IIIa; EC waters of Subdivisions 22-32 & EC waters of Ila and IV & VI and VII; EC waters of \(\mathbf{V b}\); international waters of XII and XIV & VIIIa, VIIIb, VIIId and VIIIe & All Areas Combined & 2013 Irish Quota & \\
\hline 2013 TAC & 1,66 I & 1,935 & 30,900 & 20,609 & 55,105 & I,704 & \\
\hline & FEAS Advice & tions For & 4 disaggregat & TAC area & & Corresponding 2014 Irish quota & \% Change relative to 2013 \\
\hline \begin{tabular}{l}
2014 \\
Advice
\end{tabular} & 2,467 & 2,874 & 45,895 & 30,610 & 81,846 & 2,531 & 49\% \\
\hline 2014 EC proposal & 2,466 & 2,874 & 45,896 & 30,610 & 81,846 & 2,53 I & 49\% \\
\hline
\end{tabular}

\section*{CURRENT MANAGEMENT}
- The Northern hake was managed for several years by means of a recovery plan in 2004 (EC 81I/2004). The stock has recovered and a new stock assessment methodology is in place so there is a need to develop a new multi-annual plan with new reference points and targets for this stock.
- Annex III (9.4 c) of EC reg 43/2009 states for gillnets in ICES Zones IIIa, IVa, Vb, Vla, VIb, VIIb, c, j, k and XII East of \(27^{\circ} \mathrm{W}\) that mesh sizes between 100 and 130 mm are allowed in water depths between 200 and 600 m if the proportion of hake in the catches is at least \(85 \%\).

- The current assessment area covers Division Illa, Sub-areas IV, VI, VII and Divisions VIIla,b,d. This corresponds to four TAC areas (see Table above).
- The combined TAC has been overshot considerably in recent years.
- The 2013 TAC for Sub-areas VI and VII; EC waters of Division Vb; international waters of Sub-area XII and was \(30,900 \mathrm{t}\) with an associated Irish quota of I,704 t

\section*{ICES ADVICE 9.4.10 Hake - Northern Stock (Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d)}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that landings should be no more than 81846 t in 2014. Even though some discards are included in the assessment, the total amount of discards cannot be quantified. Therefore total catches cannot be calculated.

\section*{Stock status}


Figure 9.4.10.1 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Summary of stock assessment (weights in thousand tonnes). Assumed values are shaded. Top right: \(\mathrm{SSB} / \mathrm{F}\) for the time-series used in the assessment.

The spawning biomass has been increasing since 1998 and is estimated to be record high in 2013. Fishing mortality has decreased sharply in recent years and was equal to the \(\mathrm{F}_{\text {MSY }}\) proxy in 2011 and 2012. Recruitment fluctuations appear to be without substantial trend over the whole series. After low recruitments in 2009, 2010, and 2011, the last recruitment (2012) is estimated to be the highest in the time-series.

\section*{Management plans}

A recovery plan was agreed by the EU in 2004 (EC Reg. No. 811/2004, Annex 9.4.10). The aim of the plan is to increase the SSB to above \(140000 t\) with a fishing mortality ( \(\mathrm{F}_{\mathrm{MP}}\) ) of 0.25 , constrained by a year-to-year change in TAC of \(15 \%\) when SSB is above 100000 t . This plan has not been evaluated by ICES

\section*{Biology}

European hake is widely distributed over the Northeast Atlantic shelf. Although there is no clear evidence of multiple populations in the Northeast Atlantic, ICES assumes two different stock units. The northern stock is distributed over a wide area. There are two major nursery areas: in the Bay of Biscay and off southern Ireland.

\section*{The fisheries}

Hake is caught in mixed fisheries together with megrim, anglerfish, and Nephrops. Discards of juvenile hake can be substantial in some areas and fleets. An important increase in landings has occurred in the northern part of the distribution area (Division IIIa, and Subareas IV and VI) in recent years. Several changes in fishing technology have occured in the fishery in recent years : increased mesh sizes in several gears, introduction of the high vertical opening trawls in the mid-1990s, and introduction of selective gears in the Nephrops trawl fishery of the Bay of Biscay (square mesh panel).

Catch distribution Total landings (2012) = 75.2 kt ( \(20 \%\) trawl, \(21 \%\) gillnet, \(18 \%\) longline, and \(41 \%\) unspecified gears). Discards of 14.6 kt ( \(16 \%\) of catches). Discard data are only available for some of the fleets and not all data are included in the assessment.

\section*{Effects of the fisheries on the ecosystem}

Because hake is a top predator, its abundance has implications on the survival of conspecifics (cannibalism) and other species, e. g. blue whiting, horse mackerel, and sardine.

\section*{Quality considerations}

The assessment suffers from some shortage of tuning data, particularly in relation to earlier years, for areas outside of Subareas VII and VIII and for the larger individuals in the population. Discards have increased sharply in the last year in northern areas (Subareas IV and VI), but they are not included in the assessment. Some discards from Subareas VII and VIII are included in the assessment. Model growth estimates are uncertain, but they are in accordance with the tagging information.


Figure 9.4.10.2 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Historical assessment results (final-year recruitment estimates are included). F is based on lengths \(15-80 \mathrm{~cm}\), corresponding to approximately 1-5 years old; in previous assessment years the F age range was 2-6 years old.

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & Length-based model (SS3). \\
Stock data category & \begin{tabular}{l} 
Category 1. \\
Input data
\end{tabular} \\
& \begin{tabular}{l} 
Commercial landings; \\
Four survey indices (EVHOE-WIBTS-Q4, SpPGFS-WIBTS-Q4, IGFS-WIBTS-Q4, \\
and RESSGASC);
\end{tabular} \\
& \begin{tabular}{l} 
Maturity data: constant maturity used (Martin, 1991); \\
\\
Natural mortality: constant value (0.4) used.
\end{tabular} \\
\begin{tabular}{l} 
Discards and bycatch \\
Indicators
\end{tabular} & \begin{tabular}{l} 
Partial discard estimates have been included in the assessment since 2003. \\
None.
\end{tabular} \\
Other information & \begin{tabular}{l} 
This stock will be benchmarked in 2014.
\end{tabular} \\
Working group report & WGHMM (ICES, 2013).
\end{tabular}

\section*{ECOREGION Widely distributed and migratory stocks \\ STOCK Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d}

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline \multirow{3}{l|}{\begin{tabular}{l} 
MSY \\
Approach
\end{tabular}} & MSY \(\mathrm{B}_{\text {trigeer }}\) & Not defined. & \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{MSY}}\) & 0.24 & \(\mathrm{~F}_{30 \% \text { SPR }}\) (Section 9.3.2.1 in ICES, 2010). \\
\hline \multirow{3}{*}{\begin{tabular}{l} 
Precautionary \\
Approach
\end{tabular}} & \(\mathrm{B}_{\text {lim }}\) & Not defined. & \\
\cline { 2 - 4 } & \(\mathrm{B}_{\mathrm{pa}}\) & Not defined. & \\
\cline { 2 - 4 } & \(\mathrm{F}_{\text {lim }}\) & Not defined. & \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{pa}}\) & Not defined. & \\
\hline
\end{tabular}
(unchanged since: 2010)
Outlook for 2014
Basis: \(\mathrm{F}(2013)=\) Mean \(\mathrm{F}_{2010-12}=0.24\); SSB (2014) \(=269.937\); R (2013) \(=315\) million (GM 1979-2010); landings \((2013)=69.440\); discards \((2013)=3.823\).
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline Rationale & Human consump. landings (2014) & Basis & \[
\begin{aligned}
& \text { F Total } \\
& (2014)
\end{aligned}
\] & \[
\begin{gathered}
\text { F HC } \\
(2014)
\end{gathered}
\] & \[
\begin{aligned}
& \text { F Disc } \\
& (2014)
\end{aligned}
\] & \[
\begin{gathered}
\text { Disc. } \\
(2014)
\end{gathered}
\] & Catch Total (2014) & \[
\begin{gathered}
\text { SSB } \\
(2015)
\end{gathered}
\] & \begin{tabular}{l}
\%SSB \\
change
\end{tabular} & \begin{tabular}{l}
\%TAC \\
change
\end{tabular} \\
\hline MSY approach & 81.846 & \[
\begin{gathered}
\mathrm{F}_{\mathrm{MSY}} \\
\left(\mathrm{~F}_{\mathrm{sq}} \times 0.99\right) \\
\hline
\end{gathered}
\] & 0.24 & 0.20 & 0.04 & 2.265 & 84.111 & 333 & +23\% & +49\% \\
\hline Recovery plan & 63.397 & \[
\begin{gathered}
+15 \% \mathrm{TAC} \\
\left(\mathrm{~F}_{\mathrm{sq}} \times 0.745\right) \\
\hline \hline
\end{gathered}
\] & 0.18 & 0.15 & 0.03 & 1.733 & 65.129 & 352 & 30\% & 15\% \\
\hline Zero catch & 0.0 & \(\mathrm{F}=0\) & 0.00 & 0.00 & 0.00 & 0.0 & 0.0 & 417 & +55\% & -100\% \\
\hline \multirow[t]{10}{*}{Other options} & 9.195 & \(\mathrm{F}_{\mathrm{sq}} \times 0.1\) & 0.02 & 0.02 & 0.00 & 0.243 & 9.438 & 408 & +51\% & -83\% \\
\hline & 26.924 & \(\mathrm{F}_{\text {sq }} \times 0.3\) & 0.07 & 0.06 & 0.01 & 0.719 & 27.644 & 390 & +44\% & -51\% \\
\hline & 46.679 & \[
\begin{gathered}
\hline-15 \% \text { TAC } \\
\left(\mathrm{F}_{\mathrm{sq}} \times 0.535\right) \\
\hline
\end{gathered}
\] & 0.13 & 0.11 & 0.02 & 1.262 & 47.941 & 370 & +37\% & -15\% \\
\hline & 43.808 & \(\mathrm{F}_{\text {sq }} \times 0.5\) & 0.12 & 0.10 & 0.02 & 1.183 & 44.991 & 372 & +38\% & -21\% \\
\hline & 55.145 & \[
\begin{aligned}
& \text { Equal TAC } \\
& \left(\mathrm{F}_{\mathrm{sq}} \times 0.64\right) \\
& \hline
\end{aligned}
\] & 0.16 & 0.13 & 0.02 & 1.499 & 56.644 & 361 & +34\% & +0\% \\
\hline & 63.397 & \[
\begin{aligned}
& \hline+15 \% \text { TAC } \\
& \left(\mathrm{F}_{\mathrm{sq}} \times 0.745\right) \\
& \hline
\end{aligned}
\] & 0.18 & 0.15 & 0.03 & 1.733 & 65.129 & 352 & 30\% & 15\% \\
\hline & 59.886 & \(\mathrm{F}_{\text {sq }} \times 0.7\) & 0.17 & 0.14 & 0.03 & 1.633 & 61.519 & 356 & +32\% & +10\% \\
\hline & 75.197 & \(\mathrm{F}_{\mathrm{sq}} \times 0.9\) & 0.22 & 0.19 & 0.03 & 2.071 & 77.268 & 340 & +26\% & +36\% \\
\hline & 82.576 & \(\mathrm{F}_{\mathrm{sq}} \times 1\) & 0.24 & 0.21 & 0.04 & 2.286 & 84.862 & 332 & +23\% & +50\% \\
\hline & 96.804 & \(\mathrm{F}_{\text {sq }} \times 1.2\) & 0.29 & 0.25 & 0.04 & 2.707 & 99.511 & 318 & +18\% & +76\% \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1)}\) SSB 2015 relative to SSB 2014.
\({ }^{2)}\) Human consumption landings 2014 relative to TAC 2013.

\section*{MSY approach}

Because MSY \(\mathrm{B}_{\text {trigger }}\) has not been identified for this stock, the ICES MSY approach has been applied without considering SSB in relation to MSY \(\mathrm{B}_{\text {trigger }}\).

Following the ICES MSY approach implies fishing mortality at \(\mathrm{F}_{\text {MSY }}=0.24\), resulting in catches of no more than 84111 t in 2014. This is expected to lead to an SSB of 333 kt in 2015. If discard rates do not change, this implies landings of no more than 81846 t in 2014.

Not all discards are accounted for in the model and in the forecast, and therefore cannot be quantified even though they are substantial (in 2012 other observed, but also partial, discards accounted for \(10 \%\) by weight of the total catch).

\section*{Management plan(s)}

The current recovery plan (EC Reg. No. 811/2004) uses target values based on precautionary reference points that are no longer appropriate.

\section*{Additional considerations}

Discards of juvenile hake can be substantial in some areas and fleets. The spawning-stock biomass and the longterm yield can be substantially improved by reducing mortality of small fish. This could be achieved by measures that reduce unwanted bycatch through shifting the selection pattern towards larger fish. TACs have been ineffective in regulating the fishery in recent years as landings greatly exceeded the TACs.

Hake in the ICES area is managed and assessed as two separate stocks. There is no biological basis for the current ICES stock definition of northern and southern hake. These stocks have similar biology with an unknown degree of mixing.

\section*{Data and methods}

The assessment is carried out with partial discards included. There is large uncertainty associated with estimation of discards.

In order to reduce uncertainty in discards estimates, an increased sampling level for on-board observer programmes is needed for some fleets (non-Nephrops trawlers, gillnetters, and longliners). Hake otoliths are currently collected but not used in the assessment due to lack of a validated ageing method. It is therefore important that research on hake ageing from otoliths be continued.

\section*{Management considerations}

The fast growth rate and the assumed high natural mortality generates a rapid turn-over of the hake stock dynamics. This means that short-term projections of SSB and landings are more sensitive to variations in recruitment.

The current SSB is above any potential candidate value for MSY \(\mathrm{B}_{\text {trigger }}\).

\section*{Uncertainties in assessment and forecast}

There is some concern that the steep estimated increase in SSB and decrease in F may not be totally accurate, although all signals coming from the surveys and the fishery are consistent in showing a strong increase in stock biomass. The strong 2008 year class can be seen clearly in the landings. There will be a benchmark in 2014, where issues with the assessment will be considered.

The short-term forecast of SSB and yield obtained by this year's assessment are influenced by the high recruitment estimated in 2012, which is based on consistent observations from two surveys.

Only partial discards are included in the assessment and forecast.
The overall dynamics of the stock are sensitive to the growth parameters estimated in the model.

\section*{Comparison with previous assessment}

There was no assessment in 2012. Compared to the 2011 assessment, the current assessment estimates of SSB in 2011 have been revised upwards by \(70 \%\) and the F in 2010 revised downwards by \(36 \%\) because of upward revisions of incoming recruits. The advice is based on the MSY approach.

\section*{Sources}

ICES. 2010. Report of the ICES Advisory Committee, 2010. ICES Advice 2010, Book 9. 299 pp.
ICES. 2011. Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim (WGHMM), 5-11 May 2011, ICES Headquarters, Copenhagen. ICES CM 2011/ACOM:11.

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Martín, I. 1991. A preliminary analysis of some biological aspects of hake (Merluccius merluccius) L.1758) in the Bay of Biscay. ICES CM 1991/G :54.

\section*{Long-term projections}



Figure 9.4.10.3

Figure 9.4.10.4
Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Equilibrium projections of long-term yield-per-recruit (upper panel) and SSB-per-recruit (lower panel) at different fishing mortality rates.
 landings, discards, and catches.
\begin{tabular}{llccccr}
\hline Year & ICES & \begin{tabular}{c} 
Predicted \\
landings \\
corresp. to \\
advice
\end{tabular} & Agreed & TAC & ICES & Discards \({ }^{1}\)
\end{tabular} ICES

\footnotetext{
Weights in thousand tonnes.
\({ }^{1}\) Sum of area TACs, corresponding to northern stock plus Division IIa (EC zone only).
\({ }^{2} 2010\) new discard estimates. In years marked with *, partial discard estimates are available and used in the assessment. For remaining years for which no values are presented, some estimates are available but not considered valid and thus not used in the assessment.
}

Table 9.4.10.2 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Estimated landings, discards, and catches (in thousand tonnes), by ICES area.
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline \multirow[b]{2}{*}{Year} & \multicolumn{5}{|c|}{Landings (1)} & \multirow[t]{2}{*}{\[
\begin{gathered}
\hline \text { Discards (2) } \\
\hline \text { Total } \\
\hline
\end{gathered}
\]} & \multirow[t]{2}{*}{\[
\begin{gathered}
\hline \text { Catches (3) } \\
\hline \text { Total }
\end{gathered}
\]} \\
\hline & IVa+VI & VII & VIIIa,b & Unallocated & Total & & \\
\hline 1961 & - & - & - & 95.6 & 95.6 & - & 95.6 \\
\hline 1962 & - & - & - & 86.3 & 86.3 & - & 86.3 \\
\hline 1963 & - & - & - & 86.2 & 86.2 & - & 86.2 \\
\hline 1964 & - & - & - & 76.8 & 76.8 & - & 76.8 \\
\hline 1965 & - & - & - & 64.7 & 64.7 & - & 64.7 \\
\hline 1966 & - & - & - & 60.9 & 60.9 & - & 60.9 \\
\hline 1967 & - & - & - & 62.1 & 62.1 & - & 62.1 \\
\hline 1968 & - & - & - & 62.0 & 62.0 & - & 62.0 \\
\hline 1969 & - & - & - & 54.9 & 54.9 & - & 54.9 \\
\hline 1970 & - & - & - & 64.9 & 64.9 & - & 64.9 \\
\hline 1971 & 8.5 & 19.4 & 23.4 & 0 & 51.3 & - & 51.3 \\
\hline 1972 & 9.4 & 14.9 & 41.2 & 0 & 65.5 & - & 65.5 \\
\hline 1973 & 9.5 & 31.2 & 37.6 & 0 & 78.3 & - & 78.3 \\
\hline 1974 & 9.7 & 28.9 & 34.5 & 0 & 73.1 & - & 73.1 \\
\hline 1975 & 11.0 & 29.2 & 32.5 & 0 & 72.7 & - & 72.7 \\
\hline 1976 & 12.9 & 26.7 & 28.5 & 0 & 68.1 & - & 68.1 \\
\hline 1977 & 8.5 & 21.0 & 24.7 & 0 & 54.2 & - & 54.2 \\
\hline 1978 & 8.0 & 20.3 & 24.5 & -2.2 & 50.6 & - & 50.6 \\
\hline 1979 & 8.7 & 17.6 & 27.2 & -2.4 & 51.1 & - & 51.1 \\
\hline 1980 & 9.7 & 22.0 & 28.4 & -2.8 & 57.3 & - & 57.3 \\
\hline 1981 & 8.8 & 25.6 & 22.3 & -2.8 & 53.9 & - & 53.9 \\
\hline 1982 & 5.9 & 25.2 & 26.2 & -2.3 & 55.0 & - & 55.0 \\
\hline 1983 & 6.2 & 26.3 & 27.1 & -2.1 & 57.5 & - & 57.5 \\
\hline 1984 & 9.5 & 33.0 & 22.9 & -2.1 & 63.3 & - & 63.3 \\
\hline 1985 & 9.2 & 27.5 & 21.0 & -1.6 & 56.1 & - & 56.1 \\
\hline 1986 & 7.3 & 27.4 & 23.9 & -1.5 & 57.1 & - & 57.1 \\
\hline 1987 & 7.8 & 32.9 & 24.7 & -2.0 & 63.4 & - & 63.4 \\
\hline 1988 & 8.8 & 30.9 & 26.6 & -1.5 & 64.8 & - & 64.8 \\
\hline 1989 & 7.4 & 26.9 & 32.0 & 0.2 & 66.5 & - & 66.5 \\
\hline 1990 & 6.7 & 23.0 & 34.4 & -4.2 & 60.0 & - & 60.0 \\
\hline 1991 & 8.3 & 21.5 & 31.6 & -3.4 & 58.1 & - & 58.1 \\
\hline 1992 & 8.6 & 22.5 & 23.5 & 2.1 & 56.6 & - & 56.6 \\
\hline 1993 & 8.5 & 20.5 & 19.8 & 3.3 & 52.1 & - & 52.1 \\
\hline 1994 & 5.4 & 21.1 & 24.7 & 0.0 & 51.3 & * & 51.3 \\
\hline 1995 & 5.3 & 24.1 & 28.1 & 0.1 & 57.6 & - & 57.6 \\
\hline 1996 & 4.4 & 24.7 & 18.0 & 0.0 & 47.2 & - & 47.2 \\
\hline 1997 & 3.3 & 18.9 & 20.3 & -0.1 & 42.5 & - & 42.5 \\
\hline 1998 & 3.2 & 18.7 & 13.1 & 0.0 & 35.1 & - & 35.1 \\
\hline 1999 & 4.3 & 24.0 & 11.6 & 0.0 & 39.8 & * & 39.8 \\
\hline 2000 & 4.0 & 26.0 & 12.0 & 0.0 & 42.0 & * & 42.0 \\
\hline 2001 & 4.4 & 23.1 & 9.2 & 0.0 & 36.7 & - & 36.7 \\
\hline 2002 & 2.9 & 21.2 & 15.9 & 0.0 & 40.1 & - & 40.1 \\
\hline 2003 & 3.3 & 25.4 & 14.4 & 0.0 & 43.2 & * & 43.2 \\
\hline 2004 & 4.4 & 27.5 & 14.5 & 0.0 & 46.4 & * & 46.4 \\
\hline 2005 & 5.5 & 26.6 & 14.5 & 0.0 & 46.6 & 4.0 & 50.6 \\
\hline 2006 & 6.1 & 24.7 & 10.6 & 0.0 & 41.5 & * & 41.5 \\
\hline 2007 & 7.0 & 27.5 & 10.6 & 0.0 & 45.1 & 2.1 & 47.2 \\
\hline 2008 & 10.7 & 22.8 & 14.3 & 0.0 & 47.8 & 3.5 & 51.3 \\
\hline 2009 & 13.1 & 25.3 & 20.4 & 0.0 & 58.8 & 7.1 & 65.9 \\
\hline 2010 & 14.2 & 33.5 & 25.1 & 0.0 & 72.8 & 6.5 & 79.3 \\
\hline 2011 & 18.8 & 18.6 & 16.6 & 25.7 & 79.7 & 8.0 & 87.7 \\
\hline 2012 & 22.4 & 22.2 & 16.7 & 13.9 & 75.2 & 14.6 & 89.8 \\
\hline
\end{tabular}
(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.
Divisions IIIa and IVb,c are included in column "IIIa, IV and VI" only after 1976
There are some unallocated landings ( moreover for the period 1961-1970).
(2) Discard estimates from observer programmes. In years marked with *,
partial discard estimates are available and used in the assessment.
For remaining years for which no values are presented,
some estimates are available but not considered valid and thus not used in the assessment
In the years with data, only discards from Spanish trawlers and French Nephrops trawlers are included.
(3) From 1978 total catches used for the Working Group.

Table 9.4.10.3 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Summary of stock assessment.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
Recruit \\
Age 0
\end{tabular} & \begin{tabular}{l}
Total \\
Biomass
\end{tabular} & Total SSB & Landings & Discards \({ }^{(1)}\) & Catch & Yield/SSB & \[
\begin{gathered}
F \\
(15-80 \mathrm{~cm})
\end{gathered}
\] \\
\hline 1978 & 297262 & 122583 & 84662 & 50551 & - & 50551 & 0.6 & 0.49 \\
\hline 1979 & 278999 & 131744 & 104320 & 51096 & - & 51096 & 0.49 & 0.54 \\
\hline 1980 & 304135 & 128884 & 105914 & 57265 & - & 57265 & 0.54 & 0.65 \\
\hline 1981 & 585050 & 110911 & 90579 & 53918 & - & 53918 & 0.6 & 0.65 \\
\hline 1982 & 397753 & 101948 & 73550 & 54994 & - & 54994 & 0.75 & 0.68 \\
\hline 1983 & 139173 & 107878 & 71003 & 57507 & - & 57507 & 0.81 & 0.61 \\
\hline 1984 & 287105 & 113716 & 83975 & 63286 & - & 63286 & 0.75 & 0.64 \\
\hline 1985 & 634204 & 99158 & 80138 & 56099 & - & 56099 & 0.7 & 0.82 \\
\hline 1986 & 359131 & 81764 & 59999 & 57092 & - & 57092 & 0.95 & 0.92 \\
\hline 1987 & 437719 & 76002 & 44039 & 63369 & - & 63369 & 1.44 & 0.95 \\
\hline 1988 & 501222 & 77776 & 46755 & 64823 & 2 & 64825 & 1.39 & 0.98 \\
\hline 1989 & 493085 & 78076 & 46067 & 66473 & 73 & 66546 & 1.44 & 1.06 \\
\hline 1990 & 499562 & 71904 & 43387 & 59954 & - & 59954 & 1.38 & 1.01 \\
\hline 1991 & 275234 & 68435 & 42122 & 58129 & - & 58129 & 1.38 & 0.95 \\
\hline 1992 & 307086 & 67310 & 40359 & 56617 & - & 56617 & 1.4 & 0.98 \\
\hline 1993 & 514309 & 59988 & 39523 & 52144 & - & 52144 & 1.32 & 1.04 \\
\hline 1994 & 283699 & 53176 & 30970 & 51259 & 356 & 51615 & 1.66 & 1.05 \\
\hline 1995 & 147168 & 59270 & 29878 & 57621 & - & 57621 & 1.93 & 1.09 \\
\hline 1996 & 360880 & 54758 & 35278 & 47210 & - & 47210 & 1.34 & 0.93 \\
\hline 1997 & 251875 & 47505 & 30735 & 42465 & - & 42465 & 1.38 & 1.05 \\
\hline 1998 & 405088 & 44459 & 24740 & 35060 & - & 35060 & 1.42 & 0.95 \\
\hline 1999 & 210872 & 48747 & 28101 & 39814 & 349 & 40163 & 1.42 & 0.94 \\
\hline 2000 & 180789 & 54147 & 30895 & 42026 & 83 & 42109 & 1.36 & 0.87 \\
\hline 2001 & 333523 & 54665 & 36748 & 36675 & - & 36675 & 1 & 0.72 \\
\hline 2002 & 275228 & 58001 & 38342 & 40107 & - & 40107 & 1.05 & 0.79 \\
\hline 2003 & 150981 & 63026 & 38685 & 43162 & 1752 & 44914 & 1.12 & 0.78 \\
\hline 2004 & 349111 & 66202 & 44149 & 46417 & 2393 & 48810 & 1.05 & 0.78 \\
\hline 2005 & 234131 & 63158 & 43648 & 46550 & 3802 & 50352 & 1.07 & 0.86 \\
\hline 2006 & 331394 & 63125 & 37774 & 41467 & 1331 & 42798 & 1.1 & 0.69 \\
\hline 2007 & 534271 & 75990 & 48870 & 45028 & 1801 & 46829 & 0.92 & 0.55 \\
\hline 2008 & 631126 & 104096 & 63878 & 47739 & 2802 & 50541 & 0.75 & 0.41 \\
\hline 2009 & 161039 & 166893 & 103116 & 58818 & 6735 & 65553 & 0.57 & 0.31 \\
\hline 2010 & 176706 & 251106 & 180564 & 72799 & 4989 & 77788 & 0.4 & 0.25 \\
\hline 2011 & 229398 & 303098 & 261990 & 79628 & 6241 & 85869 & 0.3 & 0.24 \\
\hline 2012 & 743242 & 307548 & 277794 & 75232 & 6042 & 81274 & 0.27 & 0.24 \\
\hline 2013 & 31453* & & 260690 & & & & & \\
\hline h.Mean & 351473 & 98201 & 69787 & 53497 & 2583 & 54604 & & \\
\hline Units & Thousands & Tonnes & Tonnes & Tonnes & Tonnes & Tonnes & & \\
\hline
\end{tabular}
\({ }^{(1)}\) Discards used in the assessment. In years with (-) discards are not available or considered unreliable.
* GM (1979-2010).

\section*{Celtic Sea and Western Channel Cod \\ (Divisions VIIe-k \& VIIbc)}

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

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 6,848 t. FEAS agrees with this advice. Discards are known to occur but cannot be accurately quantified.

This stock falls in to ICES category I data-rich stocks for which a quantitative assessment is available.

The TAC area includes VIIbc. There is no ICES advice for Divisions VIlbc where recent landings have been around 60 t. Including recent average landings for VIIbc, would result in total landings of \(6,907 \mathrm{t}\) for the entire TAC area. This implies an Irish quota of \(1,002 \mathrm{t}\).


Blue Shading - Assessment Area


First quarter cod area closures

\section*{ICES ADVICE}

Advice for 2014
ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 6848 tonnes. Discards are known to take place but cannot be quantified; therefore total catches cannot be calculated.

\section*{Stock status}


Figure 5.4.6.1
Cod in Divisions VIIe-k (Celtic Sea cod). Summary of stock assessment (weights in thousand tonnes). Predicted values are shaded. Top right: SSB/F for the time-series used in the assessment.

SSB has increased from below \(B_{\text {lim }}\) to well above MSY \(B_{\text {trigger }}\) since 2010. Recruitment has been highly variable over time with occasional very high recruitment (e.g. 1987 and 2010). Fishing mortality shows a declining trend since 2005 and is now around the \(\mathrm{F}_{\text {MSY }}\) proxy.

\section*{Management plans}

There are no specific management objectives or a management plan for this stock, but a plan is under development by the NWWRAC and STECF.

\section*{Biology}

Celtic Sea cod has higher growth rates and matures earlier than other cod stocks.

\section*{Environmental influence on the stock}

Cod in the Celtic Sea are at the southern limit of the range of the species' distribution in the Northeast Atlantic. It is known that recruitment is lower in warmer years at the southern limit of the distribution range.

\section*{The fisheries}

Cod is caught in a range of fisheries, including otter trawl fisheries targeting gadoids, Nephrops, or mixed demersal fish, beam trawl fisheries, and gillnet fisheries. Landings are made throughout the year, but tend to be higher during the first half of the year. The TACs have constrained catches since 2003 and the impact of the Trevose Head closure applied since 2005 has resulted in landings being spread throughout the year.

Highgrading occurred during the first part of 2011 before the TAC was revised. In 2012, the TAC was not fully caught, mainly due to restricted TACs on haddock for France. The level and length composition of the discards in 2012 is similar to the situation observed in the time-series before 2011.
```

Catch distribution Total catch (2012) = 8644t, where 7692 t (89%) were landings (71% otter trawl, 7% beam
trawl, 8% gillnets, and 14% other gears) and 952 t (11%) discards.

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\section*{Quality considerations}

This assessment is consistent with last year's assessment. Misreporting, discard practices, and highgrading are the main cause of uncertainty affecting the assessment (ICES, 2009), especially when quotas are particularly restrictive (2003-2008, 2011). Most of these issues have been quantified and included.


Figure 5.4.6.2 Cod in Divisions VIIe-k (Celtic Sea cod). Historical assessment results with final-year recruitment estimates included.

\section*{Scientific basis}

Age-based analytical assessment (XSA).
Category 1.
Commercial catches (international landings, ages and length frequencies from catch sampling by metier); one combined survey index (EVHOE-WIBTS-Q4; IGFS-WIBTSQ4); one commercial indices (FR-OTDEF Q2 \(+3+4\) trawlers in Division VIIe-k); maturity data from UK-WCGFS survey-Q1 since 1999; age-dependent natural mortalities from Lorenzen (1996).
Discards and bycatch Discards were not included in the assessment (except for 2011) because estimates were not available for the full time-series. Recent estimates are available from monitoring (gadoid trawlers, Nephrops trawlers, otter trawlers, beam trawlers, and gillnetters).
None.
Benchmarked at WKROUND 2012 (ICES, 2012).
WGCSE (ICES, 2013).

\section*{ECOREGION Celtic Sea and West of Scotland \\ STOCK \\ Cod in Divisions VIIe-k (Celtic Sea cod)}

\section*{Reference points}
\begin{tabular}{|c|c|c|c|}
\hline & Type & Value & Technical basis \\
\hline \multirow[t]{2}{*}{\begin{tabular}{l}
MSY \\
Approach
\end{tabular}} & MSY \(\mathrm{B}_{\text {trigger }}\) & 10300 t . & Provisionally set at \(\mathrm{B}_{\mathrm{pa}}\). \\
\hline & \(\mathrm{F}_{\text {MSY }}\) & 0.40 & Provisional proxy based on \(\mathrm{F}_{\text {max }}\) (ICES, 2011). \\
\hline \multirow[b]{2}{*}{Precautionary} & \(\mathrm{B}_{\text {lim }}\) & 7300 t . & \(\mathrm{B}_{\mathrm{lim}}=\mathrm{B}_{\text {loss }}\) ( B 76\()\), the lowest observed spawning-stock biomass. \\
\hline & \(\mathrm{B}_{\mathrm{pa}}\) & 10300 t . & \(\mathrm{B}_{\mathrm{pa}}=\mathrm{B}_{\mathrm{lim}} \times 1.4\). Biomass above this value affords a high probability of maintaining SSB above \(\mathrm{B}_{\mathrm{lim}}\), taking into account the variability in the stock dynamics and the uncertainty in assessments. \\
\hline \multirow[t]{2}{*}{Approach} & \(\mathrm{F}_{\text {lim }}\) & Undefined. & \\
\hline & \(\mathrm{F}_{\mathrm{pa}}\) & Undefined. & \\
\hline
\end{tabular}
(Unchanged since: 2011).
Outlook for 2014
Basis: \(\mathrm{F}_{2013}=\mathrm{F}_{\mathrm{sq}}=\left(\right.\) mean \(\left.\mathrm{F}_{2010}-\mathrm{F}_{2012}\right)=0.43 ; \mathrm{R}_{2013}=\mathrm{GM}(1971-2010)=4830\) (thousands); landings \((2013)=\) 8398 t; SSB (2014) \(=17206 \mathrm{t}\).
\begin{tabular}{|l|c|c|c|c|c|c|}
\hline Rationale & \begin{tabular}{c} 
Landings \\
(2014)
\end{tabular} & Basis & \begin{tabular}{c} 
F \\
\((2014)\)
\end{tabular} & \begin{tabular}{c} 
SSB \\
\((2015)\)
\end{tabular} & \begin{tabular}{c} 
\%SSB \\
change
\end{tabular} & \begin{tabular}{c} 
\% TAC \\
change
\end{tabular} \\
\hline MSY approach & 6848 & \(\mathrm{~F}_{\mathrm{MSY}}\) & 0.40 & 15290 & \(-11 \%\) & \(-33 \%\) \\
\hline Zero catch & 0 & \(\mathrm{~F}=0\) & 0 & 22782 & \(+32 \%\) & \(-100 \%\) \\
\hline Other options & 7211 & \(\mathrm{~F}_{2013}\) & 0.43 & 14899 & \(-13 \%\) & \(-29 \%\) \\
\cline { 2 - 7 } & 8670 & \begin{tabular}{c}
\(\mathrm{TAC}-15 \%\) \\
\(\left(\mathrm{~F}_{2013} \times 0.80\right)\)
\end{tabular} & 0.54 & 13333 & \(-23 \%\) & \(-15 \%\) \\
\cline { 2 - 8 } & 10200 & Stable TAC & 0.67 & 11706 & \(-32 \%\) & \(0 \%\) \\
\cline { 2 - 8 } & 11726 & \begin{tabular}{c}
\(\mathrm{TAC}+15 \%\) \\
\(\left(\mathrm{~F}_{2013} \times 1.15\right)\)
\end{tabular} & 0.82 & 10102 & \(-41 \%\) & \(+15 \%\) \\
\hline
\end{tabular}

Weights in tonnes.
\({ }^{1)}\) SSB 2015 relative to SSB 2014.
\({ }^{2)}\) Landings 2014 relative to TAC 2013.

\section*{MSY approach}

Following the ICES MSY approach implies fishing mortality to be reduced to 0.4 , resulting in the landings of no more than 6848 t in 2014. This is expected to lead to an SSB of 15290 t in 2015. Discards have been estimated for 2011 and 2012, but this is not considered sufficient to estimate a discard proportion that could be applied to give catch advice; therefore total catches cannot be calculated.

No transition to the MSY approach is needed since current fishing mortality is estimated to be at the \(\mathrm{F}_{\text {MSY }}\) proxy.

\section*{Precautionary approach}

This stock is currently exploited around the \(\mathrm{F}_{\text {MSY }}\) proxy and \(\operatorname{SSB}\) is above \(\mathrm{B}_{\mathrm{pa}}\) and MSY \(\mathrm{B}_{\text {trigger }}\).
There is no \(\mathrm{F}_{\mathrm{pa}}\) reference point for application of the precautionary approach.

\section*{Additional considerations}

\section*{Management considerations}

In 2012, the TAC was not fully caught, mainly due to restricted TACs on haddock for France.
The introduction of the "buyers and sellers" legislation in the UK and Ireland in 2006 may have reduced the underreporting of cod landings, but may also have increased discards. Measures aimed at reducing discarding and improving the fishing pattern should be encouraged. These might include spatial and temporal changes in fishing practices or technical measures, such as grids. These measures would need to be evaluated in the context of other species caught in mixed fisheries.

Recent tagging studies using data storage and conventional tags have shown movement of cod between the estuaries on the south coast of Ireland (officially in Division VIIa) and their offshore feeding grounds in the Celtic Sea (mainly Division VIIg). Irish landings from the southern part of Division VIIa are included in the assessment for the Celtic Sea stock. Tagging shows some dispersal of cod tagged north of \(53^{\circ}\) in the Irish Sea into the deeper offshore waters of the Celtic Sea, but the proportion of the Irish Sea stock migrating into the Celtic Sea is unknown. There is also seasonal movement of fish tagged in Division VIIe to feeding grounds in Division VIIg.

More than \(80 \%\) (in numbers) of the landings consist of three age groups (1-3) (Figure 5.4.6.4). The historical dynamics of Celtic Sea cod have been recruitment driven, i.e. the stock increased in response to good recruitment and decreased rapidly during times of poor recruitment.

\section*{Regulations and their effect}

Fishing effort for the main fleets targeting gadoids have significantly decreased in the last \(5-10\) years. This is particularly the case for the French fleets for which the number of vessels involved in the fishery has been reduced, partly due to a decommissioning scheme. The estimated decline in fishing mortality since 2005 is consistent with this decrease in effort for the main fleets exploiting this stock.

Since 2005, ICES rectangles 30E4, 31E4, and 32E3 have been closed during the first quarter (Council Regulations \(27 / 2005,51 / 2006\), and \(41 / 2007,40 / 2008\), and \(43 / 2009\) ) with the intention of reducing the fishing mortality of cod. STECF (2007) concluded that the closure is a potentially effective measure for displacing fishing activities away from spawning aggregations off North Cornwall and hence making vessels less efficient at catching cod. The major impact of the closure appears to have been on French trawlers that historically have taken a large proportion of the cod landings in Divisions VIIe-k. The effectiveness of the closed rectangle off the Irish coast is less evident, due to its lesser importance as a fishing ground for the EU whitefish fleets and the poorer knowledge of the distribution of cod spawning activity off the southeast coast of Ireland. The quantitative impact of this closure was evaluated by ICES in 2007 in response to a special request from the EC and it could not be quantitatively disentangled from other factors (ICES, 2007).

Technical measures applied to this stock are a minimum mesh size (MMS) for beam and otter trawlers in Subarea VII and a minimum landing size (MLS) of 35 cm . Minimum landing sizes do not prevent cod from being discarded, but might prevent the targeting of juvenile cod. Recent sampling programmes in countries exploiting this stock indicate that the discarding pattern is variable. When quotas are restrictive highgrading appears and becomes the most prominent discard practice. This situation, which can account for \(40-60 \%\) by number of all fish caught, has occurred in French fisheries since 2003 and has also been apparent in UK fisheries since 2007. It has decreased since 2008 to a few tonnes in 2010. In 2011, the initial low TAC in regards of the abundance of the 2009 year class led to exceptionally high levels of highgrading for all fleets during the first part of the year. In response, the 2011 TAC was greatly increased, as cod catches are part of mixed fisheries and a too low TAC would have resulted in highgrading.
All highgrading since 2003 has been corrected for in the assessment by the inclusion of highgrading estimates in the catch numbers-at-age.

\section*{Information from the fishing industry}

The industry has cooperated in a number of scientific endeavours with regards to improving the information base for this stock.

The French industry has been involved in a self-sampling project since 2008 and has proved to be efficient in providing quarterly length distribution of catches and estimates of discards.

\section*{Data and methods}

Discards information (tonnage, ages, and length frequencies by country and main metier) are available from sampling programmes. In contrast to 2011, the length frequency and amount of discards in 2012 were back to the normal situation of the time-series: around \(10 \%\) of discard in weight and fish mainly under the MLS. Discards have been higher in some years due to TAC constraints and the occurrence of strong year classes. In line with the benchmark conclusions, discards are not included in the assessment. The only exception to this is year 2011, for which they are included, to better deal with the unusual pattern caused by the very abundant 2009 year class in combination with a restrictive TAC.

Discarding (including highgrading) and misreporting occurred in 2003 and subsequent years, when quotas became increasingly restrictive. The magnitude of highgrading and misreporting has decreased since 2008. All highgrading estimates since 2003 are included in the catch numbers-at-age used for the assessment. Because the quota was quite high in 2012 and not fully caught, highgrading in 2012 is low for most fleets.

Landings have been revised in 2010 and include landings from the southern part of the Irish Sea (e.g. 150 t in 2011) as they are believed to be part of this stock. Lpue for the French demersal fleet have been revised in 2011 and are available from 2000.

\section*{Uncertainties in assessment and forecast}

The mean weight-at-age in the landings provided by France, particularly in the 2nd quarter, was unrealistically lower than the values observed by other countries and was replaced by the 1st quarter values.

\section*{Comparison with previous assessment and advice}

The assessment and advice are consistent with last year. The basis for the advice is the same as last year, the MSY approach.

\section*{Sources}

ICES. 2007. Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks (WGSSDS). Annex 2: Effect on fishing activity on the 2007 Celtic Sea (30E4, 31E4 and 32E3) closure. 26 June-5 July 2007. ICES CM 2007/ACOM:28.

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STECF. 2007. Evaluation of closed area schemes (SGMOS-07-03). Subgroup on management of stocks
(SGMOS), of the Scientific, Technical and Economic Committee for Fisheries (STECF).


Figure 5.4.6.3
Cod in Divisions VIIe-k (Celtic Sea cod). Stock-recruitment plot (left) and yield-per-recruit analysis (right).


Figure 5.4.6.4 Cod in Divisions VIIe-k (Celtic Sea cod). Landings age composition in numbers.

Table 5.4.6.1 Cod in Divisions VIIe-k (Celtic Sea cod). ICES advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & ICES Advice & Predicted catch corresp. to advice & Agreed TAC \({ }^{1}\) & ICES landings & \begin{tabular}{l}
ICES \\
landings and highgrading estimates
\end{tabular} \\
\hline 1987 & Reduce F & \(<6.4^{2}\) & & 10.2 & \\
\hline 1988 & No increase in F; TAC & \(7.0^{2}\) & & 17.2 & \\
\hline 1989 & No increase in F; TAC & \(8.6{ }^{2}\) & & 19.8 & \\
\hline 1990 & No increase in F; TAC & \(9.2^{2}\) & & 12.7 & \\
\hline 1991 & TAC; SSB = mean & \(4.5^{2}\) & & 9.3 & \\
\hline 1992 & Appropriate to reduce F & - & & 9.7 & \\
\hline 1993 & 20\% reduction in F & \(6.5^{2}\) & 19.0 & 10.4 & \\
\hline 1994 & 20\% reduction in F & \(5.6{ }^{2}\) & 17.0 & 10.6 & \\
\hline 1995 & 20\% reduction in F & \(4.7^{3}\) & 17.0 & 11.7 & \\
\hline 1996 & 20\% reduction in F & \(4.7{ }^{3}\) & 20.0 & 12.6 & \\
\hline 1997 & 20\% reduction in F & \(7.4{ }^{4}\) & 20.0 & 12.0 & \\
\hline 1998 & 10\% reduction in F & \(8.8{ }^{4}\) & 20.0 & 11.4 & \\
\hline 1999 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & 9.24 & 19.0 & 8.6 & \\
\hline 2000 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<7.6^{5}\) & 16.0 & 6.5 & \\
\hline 2001 & 40\% reduction in F & \(<4.3{ }^{5}\) & 10.5 & 8.3 & \\
\hline 2002 & 45\% reduction in F & \(<5.3^{5}\) & 8.7 & 9.4 & \\
\hline 2003 & 60\% reduction in F & \(<3.8{ }^{5}\) & 6.7 & 6.2 & 6.4 \\
\hline 2004 & \(90 \%\) reduction in F or management plan & \(<0.7\) & 5.7 & 3.5 & 3.7 \\
\hline 2005 & 17\% reduction in F & \(<5.2\) & 6.2 & 3.1 & 3.1 \\
\hline 2006 & No increase in effort [should have been reduce effort] & Cannot be estimated & 5.6 & 3.4 & 3.8 \\
\hline 2007 & Zero catch & 0 & 4.7 & 4.3 & 4.8 \\
\hline 2008 & Zero catch & 0 & 4.3 & 3.6 & 4.0 \\
\hline 2009 & 50\% reduction in F & <2.6 & 4.023 & 3.2 & 3.2 \\
\hline 2010 & Substantial catch reduction & - & 4.023 & 3.2 & 3.2 \\
\hline 2011 & Catch and effort reduction & - & 5.379 & 4.7 & 7.3** \\
\hline 2012 & MSY framework & \(<10.0\) & 10.059 & 7.7 & 8.6* \\
\hline 2013 & MSY framework & < 10.2 & 10.200 & & \\
\hline 2014 & MSY approach & <6.848 & & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1}\) TAC covers Subareas VII (except Division VIIa) and VIII. From 2009 onwards the TAC covers Divisions VIIb,c,e-k, Subareas VIII, IX, and X, and EU waters of CECAF 34.1.1 (with a separate TAC established for Division VIId).
\({ }^{2}\) For the Divisions VIIf,g stock component.
\({ }^{3}\) For the Divisions VIIf-h stock component.
\({ }^{4}\) For the Divisions VIIe-h stock component.
\({ }^{5}\) For the Divisions VIIe-k stock component.
** Highgrading and discards estimate.
* Discards estimate.

Table 5.4.6.2 Cod in Divisions VIIe-k. Landings and discards (in tonnes) of cod in Divisions VIIe-k used by the working group.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|}
\hline Year & Belgium & France & Ireland & UK & Others & Highgrading & Discards & Total \\
\hline 1971 & & & & & & & & 5782 \\
\hline 1972 & & & & & & & & 4737 \\
\hline 1973 & & & & & & & & 4015 \\
\hline 1974 & & & & & & & & 2898 \\
\hline 1975 & & & & & & & & 3993 \\
\hline 1976 & & & & & & & & 4818 \\
\hline 1977 & & & & & & & & 3058 \\
\hline 1978 & & & & & & & & 3647 \\
\hline 1979 & & & & & & & & 4650 \\
\hline 1980 & & & & & & & & 7243 \\
\hline 1981 & & & & & & & & 10596 \\
\hline 1982 & & & & & & & & 8766 \\
\hline 1983 & & & & & & & & 9641 \\
\hline 1984 & & & & & & & & 6631 \\
\hline 1985 & & & & & & & & 8317 \\
\hline 1986 & & & & & & & & 10475 \\
\hline 1987 & & & & & & & & 10228 \\
\hline 1988 & 554 & 13863 & 1480 & 1292 & 2 & & & 17191 \\
\hline 1989 & 910 & 15801 & 1860 & 1223 & 15 & & & 19809 \\
\hline 1990 & 621 & 9383 & 1241 & 1346 & 158 & & & 12749 \\
\hline 1991 & 303 & 6260 & 1659 & 1094 & 20 & & & 9336 \\
\hline 1992 & 195 & 7120 & 1212 & 1207 & 13 & & & 9747 \\
\hline 1993 & 391 & 8317 & 766 & 945 & 6 & & & 10425 \\
\hline 1994 & 398 & 7692 & 1616 & 906 & 8 & & & 10620 \\
\hline 1995 & 400 & 8321 & 1946 & 1034 & 8 & & & 11709 \\
\hline 1996 & 552 & 8981 & 1982 & 1166 & 0 & & & 12680 \\
\hline 1997 & 694 & 8662 & 1513 & 1166 & 0 & & & 12035 \\
\hline 1998 & 528 & 8096 & 1718 & 1089 & 0 & & & 11431 \\
\hline 1999 & 326 & 5488 & 1883 & 897 & 0 & & & 8594 \\
\hline 2000 & 208 & 4281 & 1302 & 744 & 0 & & & 6535 \\
\hline 2001 & 347 & 6033 & 1091 & 838 & 0 & & & 8309 \\
\hline 2002 & 555 & 7368 & 694 & 618 & 0 & & & 9235 \\
\hline 2003 & 136 & 5222 & 517 & 346 & 0 & \(210^{1}\) & na & 6431 \\
\hline 2004 & 153 & 2425 & 663 & 282 & 0 & \(148{ }^{1}\) & na & 3671 \\
\hline 2005 & 186 & 1623 & 870 & 309 & 0 & \(74^{1}\) & na & 3062 \\
\hline 2006 & 103 & 1896 & 959 & 368 & 0 & \(432{ }^{1}\) & na & 3758 \\
\hline 2007 & 108 & 2509 & 1210 & 412 & 0 & \(592{ }^{1}\) & na & 4831 \\
\hline 2008 & 65 & 2064 & 1221 & 289 & 0 & \(322{ }^{1}\) & na & 3961 \\
\hline 2009 & 49 & 2080 & 870 & 264 & 0 & \(25^{1}\) & na & 3288 \\
\hline 2010 & 51 & 1853 & 1034 & 289 & 2 & \(7^{1}\) & na & 3236 \\
\hline 2011 & 124 & 3171 & 1011 & 414 & 17 & \(1828^{2}\) & 696 & 7261 \\
\hline 2012 & 290 & 5166 & 1536 & 701 & 0 & na & 952 & 8644 \\
\hline
\end{tabular}
\({ }^{\mathrm{T}}\) French highgrading estimates from self-sampling programme.
\({ }^{2}\) International highgrading estimate.

Table 5.4.6.3 Cod in Divisions VIIe-k. Summary of stock assessment.
\begin{tabular}{|c|c|c|c|c|}
\hline Year & Recruitment Age 1 thousands & \begin{tabular}{l}
SSB \\
tonnes
\end{tabular} & Landings tonnes & \[
\begin{gathered}
\hline \text { Mean F } \\
\text { Ages 2-5 }
\end{gathered}
\] \\
\hline 1971 & 4774 & 10100 & 5782 & 0.556 \\
\hline 1972 & 929 & 9314 & 4737 & 0.517 \\
\hline 1973 & 2810 & 8625 & 4015 & 0.541 \\
\hline 1974 & 888 & 8330 & 2898 & 0.377 \\
\hline 1975 & 6021 & 7518 & 3993 & 0.678 \\
\hline 1976 & 1986 & 7307 & 4818 & 0.553 \\
\hline 1977 & 2871 & 8839 & 3059 & 0.349 \\
\hline 1978 & 2738 & 9688 & 3647 & 0.362 \\
\hline 1979 & 6619 & 9835 & 4650 & 0.468 \\
\hline 1980 & 12215 & 10329 & 7243 & 0.696 \\
\hline 1981 & 5145 & 11177 & 10597 & 0.812 \\
\hline 1982 & 2115 & 13451 & 8766 & 0.633 \\
\hline 1983 & 6918 & 13004 & 9641 & 0.833 \\
\hline 1984 & 6690 & 9568 & 6631 & 0.532 \\
\hline 1985 & 5904 & 13082 & 8317 & 0.533 \\
\hline 1986 & 5034 & 13752 & 10475 & 0.781 \\
\hline 1987 & 25442 & 11472 & 10228 & 0.819 \\
\hline 1988 & 12267 & 16629 & 17191 & 0.638 \\
\hline 1989 & 3664 & 26382 & 19809 & 0.813 \\
\hline 1990 & 4047 & 19240 & 12749 & 0.861 \\
\hline 1991 & 11364 & 10845 & 9336 & 0.981 \\
\hline 1992 & 11740 & 9073 & 9747 & 0.851 \\
\hline 1993 & 3705 & 12278 & 10425 & 0.748 \\
\hline 1994 & 13727 & 14367 & 10620 & 0.749 \\
\hline 1995 & 9694 & 13044 & 11709 & 0.724 \\
\hline 1996 & 7462 & 15953 & 12681 & 0.851 \\
\hline 1997 & 10048 & 14173 & 12035 & 0.799 \\
\hline 1998 & 5054 & 12733 & 11431 & 0.937 \\
\hline 1999 & 2366 & 11234 & 8594 & 0.835 \\
\hline 2000 & 10687 & 8011 & 6536 & 0.725 \\
\hline 2001 & 8858 & 9022 & 8308 & 0.712 \\
\hline 2002 & 2190 & 11257 & 9236 & 0.820 \\
\hline 2003 & 1304 & 9117 & 6420 & 0.915 \\
\hline 2004 & 2944 & 4776 & 3672 & 0.922 \\
\hline 2005 & 4171 & 3502 & 3062 & 0.958 \\
\hline 2006 & 4610 & 3857 & 3776 & 0.800 \\
\hline 2007 & 3952 & 5214 & 4830 & 0.806 \\
\hline 2008 & 1657 & 5603 & 3961 & 0.724 \\
\hline 2009 & 3758 & 5354 & 3292 & 0.727 \\
\hline 2010 & 17553 & 5551 & 3229 & 0.484 \\
\hline 2011 & 5244 & 11726 & 7261 & 0.374 \\
\hline 2012 & 736 & 20858 & 7692 & 0.424 \\
\hline 2013 & 4830* & 21632 & & \\
\hline Average & 6203 & 11089 & 7788 & 0.696 \\
\hline
\end{tabular}

Table 7.3.1. Landings \((t)\) of cod in Division VIIb,c for 1995-2012 as officially reported to ICES.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 \\
\hline France & 91 & 115 & 71 & 44 & 1 & 46 & 38 & 54 & 33 \\
\hline Germany & - & - & 3 & - & - & - & - & - & \\
\hline Ireland & 282 & 353 & 177 & 234 & 154 & 141 & 107 & 59 & 59 \\
\hline Netherlands & - & - & - & - & - & - & + & - & 1 \\
\hline Norway & 3 & 1 & 6 & & 11 & + & 1 & 5 & \\
\hline Spain & 6 & 3 & & 6 & 2 & 3 & 1 & 1 & \\
\hline UK(E/W/NI) & 25 & 35 & 37 & 25 & 4 & 4 & 2 & 1 & 8 \\
\hline UK(Scotland) & 66 & 12 & 7 & 9 & 1 & - & & 1 & 1 \\
\hline \multicolumn{10}{|l|}{UK} \\
\hline Total & 473 & 519 & 301 & 318 & 172 & 194 & 150 & 122 & 102 \\
\hline Country & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline France & 13 & 13 & 10 & 18 & 14 & 5 & 17 & 697* & 48 \\
\hline \multicolumn{10}{|l|}{Germany} \\
\hline Ireland & 60 & 32 & 16 & 11 & 18 & 29 & 37 & 36 & 39 \\
\hline \multicolumn{10}{|l|}{Netherlands} \\
\hline Norway & & & 1 & 1 & & & & & 1 \\
\hline \multicolumn{10}{|l|}{Spain} \\
\hline UK(E/W/NI) & & 0 & 1 & 2 & 1 & & 1 & & 1 \\
\hline UK(Scotland) & 10 & & 0 & & & & & & \\
\hline \multicolumn{10}{|l|}{UK} \\
\hline Total & 83 & 45 & 28 & 32 & 33 & 34 & 55 & 36 & 89 \\
\hline
\end{tabular}

\footnotetext{
* Official french landings in 2011 are probably incorrect, last year the preliminary 2011 landings for France were 42 t.
}

\section*{West of Ireland and Celtic Sea Haddock \\ (Divisions VIIb-k)}

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

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice, based on the MSY transition, is that catches should be no more than 5,28I \(\mathbf{t}\) in 2014. If discard rates do not change from the average of the last three years, this implies landings of no more than \(3,602 \mathrm{t}\). This implies an Irish landings quota of 800 t and total catch of I, I74 t. FEAS agrees with this advice.

This stock falls into ICES category I for data-rich stocks with full analytical assessments. SSB has increased strongly as the exceptionally large 2009 cohort reached maturity. However recruitment has been weak since 2010


Red Box-TAC/Management Area Blue Shading - Assessment Area and the stock is predicted to decline rapidly in the coming years as a consequence.

Over the last 10 years \(48 \%\) of the catch has been discarded ( \(79 \%\) by numbers). Technical measures, including 110 mm square mesh panel, have been introduced to reduce discarding since mid-2012. These should reduce fishing mortality on recruiting year classes but will have little impact on the landings prediction in the 2014 forecast which is mainly based on the 2009 year class ( \(63 \%\) contribution).

Haddock are caught with cod and whiting in mixed fisheries in the Celtic Sea and management actions should take this interaction into account. The sporadic nature of strong year classes in this stock should also be taken into account in the management of the mixed fisheries in the Celtic Sea.

\section*{CURRENT MANAGEMENT}
- The TAC area covers Divisions VIlbcefghjk, and Sub-areas VIII, IX and \(X\) and EU waters of CECAF 34.I.I. The assessment area covers Divisions VIlbcefghjk
- The TAC for 2013 was \(14,148 \mathrm{t}\) with an Irish quota of \(3,144 \mathrm{t}\) (22\%). France was allocated the largest share of the TAC (67\%).
- This stock is taken in a mixed fishery, mainly by otter trawlers from France and Ireland.
- There is a management plan in development by the NWWRAC for
 mixed demersal fisheries catching haddock in Vllfg. FEAS supports the development of this plan. Technical Measures initially proposed and developed through the NWWRAC have been introduced since September 2012 in the Celtic Sea in with the aim of improving selection and reducing discards of haddock and other gadoids.

\section*{ICES ADVICE 5.4.11 Haddock in Divisions VIIb-k}

\section*{Advice for 2014}

ICES advises on the basis of MSY transition that catches should be no more than 5281 t in 2014. If discard rates do not change from the average of the last three years, this implies landings of no more than 3602 t .

\section*{Stock status}







Figure 5.4.11.1 Haddock in Divisions VIIb-k. Summary of stock assessment (weights in thousand tonnes). Predicted recruitment values are shaded; Recruitment, fishing mortality, and SSB: dotted lines 1 standard error. Top right: SSB/F for the time-series used in the assessment.

SSB shows a slowly increasing trend over the time-series and a sharp increase in 2011 with the maturing of the strong 2009 cohort; SSB is now declining as this cohort is reduced. Fishing mortality remains above the \(\mathrm{F}_{\text {MSY }}\) proxy and appears to have increased in 2012. Recruitment in 2009 was exceptionally good, but has been below average since then. Recruitment in 2012 was the lowest in the time-series.

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

Adult haddock appear to be continuously distributed from the north of Biscay along the Irish coasts and the west of Scotland into the North Sea. It is not clear from their distribution if the Divisions VIIb-k stock is distinct from the surrounding areas.

\section*{The fisheries}

Haddock are caught in mixed demersal fisheries. Some fleets are using 80 mm mesh to target Nephrops, 90 mm mesh in mixed fisheries, and 100 mm to target gadoids and other species, with mandatory use of a 110 mm square mesh panel in Nephrops trawls and a 100 mm panel in gadoid fisheries

Catch distribution Total catch \((2012)=28.7 \mathrm{kt}\), of which \(64 \%\) were landings (all fleets combined) and \(36 \%\) discards.

\section*{Quality considerations}

There is considerable uncertainty around the estimated discard numbers-at-age due to the diverse fishing (and discarding) practices and relatively low numbers of discard samples. Improving discard estimates would require a significant increase in the number of observer trips or other monitoring means.

The estimates of F and trends in recruitment and SSB are not strongly dependent upon the absolute level of discards used in the model.


Figure 5.4.11.2 Haddock in Divisions VIIb-k. Historical assessment results. Final-year estimates are shown in red.

Scientific basis

\section*{Assessment type Stock data category \\ Input data}
\begin{tabular}{ll} 
& \begin{tabular}{l} 
discards); survey indices (IGFS-WIBTS-Q4 and EVHOE-WIBTS-Q4); commercial \\
indices (IRL_OTB_HAD); maturity data (surveys and observer data; same for all
\end{tabular} \\
years); natural mortalities (based on Lorenzen, 1996).
\end{tabular}

ASAP (Age-Structured Assessment Programme; NOAA toolbox). Category 1.
Commercial catches (international landings, ages composition of landings and discards); survey indices (IGFS-WIBTS-Q4 and EVHOE-WIBTS-Q4); commercial indices (IRL_OTB_HAD); maturity data (surveys and observer data; same for all years); natural mortalities (based on Lorenzen, 1996).
Discards have been included in the assessment since 1995 for the Irish OTB fleet, and since 2008 for the French fleet.

None.
WGCSE (ICES, 2013).

\section*{ECOREGION Celtic Sea and West of Scotland STOCK Haddock in Divisions VIIb-k}

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline \multirow{3}{c|}{\begin{tabular}{l} 
MSY \\
Approach
\end{tabular}} & MSY \(_{\text {trigger }}\) & 7500 t. & \(\mathrm{B}_{\text {loss. }}\) \\
\cline { 2 - 4 } & \(\mathrm{F}_{\text {MSY }}\) & 0.33 & \(\mathrm{~F}_{\max }\) (landings: \(0.28+\) discards: 0.05). \\
\hline \multirow{4}{*}{\begin{tabular}{l} 
Precautionary \\
Approach
\end{tabular}} & \(\mathrm{B}_{\text {lim }}\) & Undefined. & \\
\cline { 2 - 4 } & \(\mathrm{B}_{\mathrm{pa}}\) & Undefined. & \\
\cline { 2 - 4 } & \(\mathrm{F}_{\text {lim }}\) & Undefined. & \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{pa}}\) & Undefined. & \\
\hline
\end{tabular}
(Unchanged since 2012)
Outlook for 2014
Basis: \(\mathrm{F}(2013)=\mathrm{F}_{\mathrm{sq}}(2010-2012)=0.72 ; \mathrm{SSB}(2014)=12.6 ; \mathrm{R}(2013)=290.479\) million \(=\mathrm{GM}_{1993-2010}\); Landings \((2013)=10061\); Catches \((2013)=11621\).
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline Rationale & \begin{tabular}{l}
Catch \\
(2014 \\
)
\end{tabular} & \begin{tabular}{l}
Land. \\
(2014 \\
)
\end{tabular} & \[
\begin{gathered}
\text { Disc. } \\
(\mathbf{2 0 1 4} \\
) \\
\hline
\end{gathered}
\] & Basis & \[
\begin{gathered}
F \\
\text { Total } \\
(2014) \\
\hline
\end{gathered}
\] & \[
\underset{(2014)}{\left(F \text { land }^{1)}\right.}
\] & \[
\underset{(2014)}{\left(\text { F disc. }^{1)}\right.}
\] & \[
\begin{gathered}
\text { SSB }^{\mathbf{5})} \\
(\mathbf{2 0 1 5} \\
\mathrm{f} \\
\hline
\end{gathered}
\] & \[
\begin{aligned}
& \mathbf{\% S S B}^{\mathbf{5}} \\
& \text { change }{ }^{2)}
\end{aligned}
\] & \[
\begin{gathered}
\text { \%TAC } \\
\text { change }^{3}
\end{gathered}
\] \\
\hline MSY approach & 4521 & 3098 & 1423 & \(\mathrm{F}_{\text {MSY }}=0.33\) & 0.33 & 0.28 & 0.05 & \[
\begin{gathered}
20 \\
218 \\
\hline
\end{gathered}
\] & +60\% & -78\% \\
\hline MSY transition & 5281 & 3602 & 1679 & \[
\begin{gathered}
\left(\mathrm{F}_{2010} \times 0.2\right)+ \\
\left(\mathrm{F}_{\mathrm{MSY}} \times 0.8\right)
\end{gathered}
\] & 0.39 & 0.34 & 0.06 & \[
\begin{gathered}
19 \\
398
\end{gathered}
\] & +54\% & -75\% \\
\hline Zero catch & 0 & 0 & 0 & \(\mathrm{F}=0\) & 0 & 0 & 0 & \[
\begin{gathered}
\hline 25 \\
140 \\
\hline
\end{gathered}
\] & +99\% & -100\% \\
\hline \multirow{7}{*}{Other options} & 0 & 0 & 0 & \(\mathrm{F}_{2013} \times 0.8\) & 0.57 & 0.49 & 0.09 & \[
\begin{gathered}
\hline 17 \\
329 \\
\hline
\end{gathered}
\] & +37\% & -66\% \\
\hline & 7202 & 4852 & 2350 & \(\mathrm{F}_{2013} \times 0.9\) & 0.64 & 0.55 & 0.1 & \[
\begin{gathered}
16 \\
576 \\
\hline
\end{gathered}
\] & +31\% & -63\% \\
\hline & 7907 & 5300 & 2607 & \(\mathrm{F}_{2013}\) & 0.72 & 0.61 & 0.11 & \[
\begin{gathered}
\hline 15 \\
863 \\
\hline
\end{gathered}
\] & +26\% & -60\% \\
\hline & 8576 & 5720 & 2856 & \(\mathrm{F}_{2013} \times 1.1\) & 0.79 & 0.67 & 0.12 & \[
\begin{gathered}
\hline 15 \\
187 \\
\hline
\end{gathered}
\] & +20\% & -57\% \\
\hline & \[
\begin{gathered}
21 \\
385
\end{gathered}
\] & \[
\begin{gathered}
12 \\
026
\end{gathered}
\] & 9359 & -15\% TAC & 3.99 & 3.39 & 0.59 & 3077 & -76\% & -15\% \\
\hline & & \[
\begin{gathered}
\hline 13 \\
172
\end{gathered}
\] & & Stable TAC & inf \({ }^{\text {4 }}\) & & & & & \\
\hline & & \[
\begin{gathered}
15 \\
148
\end{gathered}
\] & & +15\% TAC & inf \({ }^{4}\) & & & & & \\
\hline
\end{tabular}

\section*{Weights in tonnes.}
\({ }^{1)}\) Total F was split into a discards and landings component based on the average ratio of landings and discards in the last three years.
\({ }^{2)}\) SSB 2015 relative to SSB 2014.
\({ }^{3)}\) Commercial landings 2014 relative to TAC 2013 (14 148 t).
\({ }^{4)}\) Due to the projected decline in the population it will not be possible to land more than approx 13.2 kt in 2014, even at very high F.
\({ }^{5)}\) The projected SSB in 2015 is highly dependent on assumed recruitment in 2013 and therefore very uncertain.

\section*{MSY approach}

Following the ICES MSY approach implies fishing mortality to be reduced to 0.33 , resulting in catches of no more than 4521 t . If discard rates do not change from the average of the last three years, this implies landings in 2014 of no more than 3098 t . This is expected to lead to an SSB of 20218 t in 2015, assuming an average recruitment in 2013.

Following the transition scheme towards the ICES MSY approach implies fishing mortality to be reduced to 0.39 based on \(\left(\mathrm{F}_{2010} \times 0.2\right)+\left(\mathrm{F}_{\text {MSY }} \times 0.8\right)\) (higher than the \(\mathrm{F}_{\text {MSY }}\) proxy), resulting in catches of no more than 5281 t . Advice relates to catches. If discard rates do not change from the average of the last three years, this implies landings in 2014 of no more than 3602 t and discards of 1679 t in 2013. This is expected to lead to an SSB of 19 398 t in 2015, assuming an average recruitment in 2013.

\section*{Additional considerations}

Given the weak incoming recruitment the SSB can only be maintained above MSY \(\mathrm{B}_{\text {trigger }}\) in 2015 by the 2013 year class. The strength of the 2013 year class is not yet known but is assumed as the geometric mean of the recruitment time-series from 1993 to 2010 in the forecast.

Due to erratic recruitment, only a flat stock-recruit relationship can be assumed, in which case the \(\mathrm{F}_{\text {MSY }}\) proxy \(=\) \(F_{\text {max }}\). Current \(F\) is above \(F_{\text {max }}\). \(B_{\text {loss }}\) has been proposed as MSY \(B_{\text {trigger }}\). Current SSB is more than six times as high as \(\mathrm{B}_{\text {loss. }}\). Future catches and SSB will be highly dependent on the strength of incoming year classes and their discard mortality. Fisheries management of the stock should ensure that fishing effort is not allowed to increase, and technical measures should be in place to reduce discards.

Haddock are caught in a mixed fishery, so TAC management can lead to discarding of over-quota fish in addition to the already considerable discarding of undersized fish.

Discarding is a serious problem for this stock; over the last ten years \(79 \%\) of the catch (in numbers) has been discarded ( \(48 \%\) by weight). The TAC appears to have been restrictive since 2011 and significant numbers of fish over the minimum landing size (MLS) are being discarded.

Technical measures have been introduced to reduce discards of undersize gadoids ( 110 mm square mesh panel in the Nephrops fisheries and 100 mm in the gadoid fisheries). It is not clear whether this is sufficient to reduce discard mortality of future cohorts, but with the recent very low recruitment many of the current discards are above the MLS. It is important that technical measures are fully implemented and their effectiveness in reducing discards and impact on commercial catches monitored and evaluated.

\section*{Uncertainties in the assessment and forecast}

There is considerable uncertainty around the estimated discard numbers-at-age due to the diverse fishing (and discarding) practices and relatively low numbers of discard samples. However, the assessment appears to be relatively robust to the absolute levels of discards.

The forecasted landings in 2014 are still mainly based on the 2009 year class ( \(63 \%\) contribution). Recruitment in 2009 was estimated with relatively good precision and shows no retrospective pattern, suggesting that the size of this year class is well estimated. The estimated recruitment used in the forecast does not contribute to the forecasted landings in 2014 ( \(1 \%\) contribution); however the 2015 SSB estimate is highly dependent on the recruitment assumption ( \(64 \%\) contribution). Therefore, the 2015 SSB forecast is very uncertain and there is an increased risk that SSB will fall below MSY \(\mathrm{B}_{\text {trigger }}\).

\section*{Comparison with previous assessment and advice}

This year's assessment is consistent with last year's assessment. The basis of the advice is the same as last year, the MSY transition. The stock is declining due to low recruitment and high mortality. The advice for 2014 is therefore substantially lower than last year's advice.

\section*{Assessment and management area}

The TAC for haddock is set for all of Divisions VIIb-k and Subareas VIII, IX, and X, which does not correspond to the stock assessment area (Divisions VIIb-k + rectangles 33E2 and 33E3 in Division VIIa). Haddock in Division VIId is scarce. Some landings of haddock, up to 300 t , are reported in Subarea VIII that is not part of the assessment area.


Figure 5.4.11.3 Haddock in Divisions VIIb-k. The red boxes are the TAC area (Divisions VIIb-k and Subareas VII, IX, and X), the blue shading the assessment area (Divisions VIIb-k).

\section*{Sources}

ICES. 2012. Report of the Benchmark Workshop on Western Waters Roundfish (WKROUND), 22-29 February 2012, Aberdeen, UK. ICES CM 2012/ACOM:49.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.
Lorenzen. 1996. The relationship between body weight and natural mortality in juvenile and adult fish: a comparison of natural ecosystems and aquaculture. Journal of Fish Biology, 49(4): 627-642.


Figure 5.4.11.4 Haddock in Divisions VIIb-k. Yield-per-recruit (left panel) and stock-recruit relationship (right panel).

Haddock in Divisions VIIb-k. Advice, management, landings, discards, and catch. Landings and catches were updated following the re-assignment of rectangles 33E2 and 33E3from Division VIIa to Division VIIg.
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline Year & ICES Advice & Predicted catch corresp. to advice & Agreed TAC & Official landings & ICES
landings & Discards & ICES catch \\
\hline 1987 & Not dealt with & & & 3.0 & 2.6 & n/a & 2.6 \\
\hline 1988 & Not dealt with & & & 4.0 & 3.6 & \(\mathrm{n} / \mathrm{a}\) & 3.6 \\
\hline 1989 & Not dealt with & & & 4.2 & 3.2 & \(\mathrm{n} / \mathrm{a}\) & 3.2 \\
\hline 1990 & Not dealt with & & & 2.9 & 2.0 & \(\mathrm{n} / \mathrm{a}\) & 2.0 \\
\hline 1991 & Not dealt with & & & 2.9 & 2.3 & \(\mathrm{n} / \mathrm{a}\) & 2.3 \\
\hline 1992 & Not dealt with & & & 2.9 & 2.7 & n/a & 2.7 \\
\hline 1993 & Not dealt with & & & 3.4 & 3.3 & 1.2 & 4.6 \\
\hline 1994 & Not dealt with & & & 4.1 & 4.1 & 1.9 & 6.0 \\
\hline 1995 & Not dealt with & & \(6^{1}\) & 4.5 & 4.5 & 2.2 & 6.7 \\
\hline 1996 & Not dealt with & & \(7^{3}\) & 6.7 & 6.8 & 4.3 & 11.1 \\
\hline 1997 & Not dealt with & & 14 & 10.3 & 10.8 & 2.9 & 13.7 \\
\hline 1998 & Not dealt with & & 20 & 7.4 & 7.7 & 0.9 & 8.6 \\
\hline 1999 & Not dealt with & & \(22^{4}\) & 5.2 & 4.9 & 0.6 & 5.5 \\
\hline 2000 & No expansion of catches & & \(16.6^{4}\) & 6.7 & 7.4 & 2.5 & 9.9 \\
\hline 2001 & No expansion of catches & & \(12^{4}\) & 9.7 & 8.6 & 3.4 & 12.1 \\
\hline 2002 & No expansion of catches & 8.0 & \(9.3{ }^{4}\) & 7.1 & 6.4 & 7.1 & 13.5 \\
\hline 2003 & No expansion of catches & 7.2 & \(8.185^{4}\) & 8.2 & 8.2 & 9.5 & 17.7 \\
\hline 2004 & No increase in F & - & \(9.600^{4}\) & 8.5 & 8.6 & 6.7 & 15.4 \\
\hline 2005 & No increase in effort & - & \(11.520^{4}\) & 6.9 & 6.6 & 5.2 & 11.8 \\
\hline 2006 & No increase in effort & - & \(11.520^{4}\) & 5.6 & 5.4 & 2.5 & 7.9 \\
\hline 2007 & No increase in effort & - & \(11.520^{4}\) & 6.6 & 6.7 & 2.7 & 9.5 \\
\hline 2008 & Same advice as last year & - & \(11.579^{4}\) & 6.2 & 7.3 & 11.2 & 18.5 \\
\hline 2009 & Same advice as last year & - & \(11.579^{2}\) & 9.3 & 9.6 & 9.1 & 18.6 \\
\hline 2010 & Same advice as last year & - & \(11.579^{2}\) & 10.0 & 10.1 & 16.5 & 26.7 \\
\hline 2011 & See scenarios & - & \(13.316^{2}\) & 13.4 & 12.9 & 14.4 & 27.3 \\
\hline 2012 & No increase in catch and technical measures to reduce discards rates & - & \(16.645^{2}\) & 17.3 & 18.5 & 10.2 & 28.7 \\
\hline 2013 & MSY transition & \(<9.5\) & \(14.148^{2}\) & 3.1 & & & \\
\hline 2014 & MSY transition & \(5.281{ }^{5}\) & & & & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1}\) Applies to Subareas VII, VIII, IX, and X.
\({ }^{2}\) Applies to Divisions VIIb-k and Subareas VIII, IX, and X.
\({ }^{3}\) Increased in-year to 14000 t .
\({ }^{4}\) Includes separate Division VIIa allocation.
\({ }^{5}\) This value ( 5.281 ) refers to total catch, including discards. Therefore, it is not directly comparable to the value advised for 2013 (9.5), which referred only to landings.
\(\mathrm{n} / \mathrm{a}=\) not available.

Table 5.4.11.2 Haddock in Divisions VIIb-k. Official landings, ICES landings, discards, and catches (tonnes).
\begin{tabular}{l|rrrrrr|rrrr}
\hline & \multicolumn{6}{|c|}{ Official landings } & \multicolumn{3}{c|}{ Un- } & \multicolumn{2}{c}{ Used by WG } \\
Year & BEL & FRA & \multicolumn{1}{c|}{ IRL } & \multicolumn{1}{c|}{ UK } & \multicolumn{1}{c}{ Others } & \multicolumn{1}{c}{ Total } & allocated & Landings & Discards & Catch \\
\hline \(\mathbf{1 9 9 3}\) & 51 & 1839 & 1262 & 256 & 0 & 3408 & -60 & 3348 & 1208 & 4557 \\
\(\mathbf{1 9 9 4}\) & 123 & 2788 & 908 & 240 & 17 & 4076 & 55 & 4131 & 1886 & 6017 \\
\(\mathbf{1 9 9 5}\) & 189 & 2964 & 966 & 266 & 83 & 4468 & 2 & 4470 & 2218 & 6688 \\
\(\mathbf{1 9 9 6}\) & 133 & 4527 & 1468 & 439 & 86 & 6653 & 103 & 6756 & 4309 & 11064 \\
\(\mathbf{1 9 9 7}\) & 246 & 6581 & 2789 & 569 & 85 & 10270 & 557 & 10827 & 2883 & 13710 \\
\(\mathbf{1 9 9 8}\) & 142 & 3674 & 2788 & 444 & 312 & 7360 & 308 & 7668 & 934 & 8603 \\
\(\mathbf{1 9 9 9}\) & 51 & 2725 & 2034 & 278 & 159 & 5247 & -365 & 4882 & 586 & 5468 \\
\(\mathbf{2 0 0 0}\) & 90 & 3088 & 3066 & 289 & 123 & 6656 & 755 & 7411 & 2503 & 9913 \\
\(\mathbf{2 0 0 1}\) & 165 & 4842 & 3608 & 422 & 665 & 9702 & -1070 & 8632 & 3418 & 12050 \\
\(\mathbf{2 0 0 2}\) & 132 & 4348 & 2188 & 315 & 106 & 7089 & -686 & 6403 & 7073 & 13476 \\
\(\mathbf{2 0 0 3}\) & 118 & 5781 & 1867 & 393 & 82 & 8241 & -31 & 8210 & 9456 & 17666 \\
\(\mathbf{2 0 0 4}\) & 136 & 6130 & 1715 & 313 & 159 & 8453 & 181 & 8634 & 6750 & 15384 \\
\(\mathbf{2 0 0 5}\) & 167 & 4174 & 2037 & 292 & 197 & 6867 & -277 & 6590 & 5191 & 11781 \\
\(\mathbf{2 0 0 6}\) & 99 & 3190 & 1875 & 274 & 209 & 5647 & -239 & 5408 & 2484 & 7893 \\
\(\mathbf{2 0 0 7}\) & 119 & 4142 & 1930 & 386 & 52 & 6629 & 103 & 6732 & 2739 & 9471 \\
\(\mathbf{2 0 0 8}\) & 108 & 3639 & 1800 & 566 & 121 & 6234 & 1100 & 7334 & 11187 & 18521 \\
\(\mathbf{2 0 0 9}\) & 131 & 5429 & 2983 & 716 & 48 & 9307 & 254 & 9561 & 9080 & 18641 \\
\(\mathbf{2 0 1 0}\) & 170 & 6240 & 2609 & 853 & 128 & 10000 & 135 & 10135 & 16547 & 26682 \\
\(\mathbf{2 0 1 1}\) & 211 & 8070 & 3322 & 1658 & 129 & 13390 & -492 & 12898 & 14378 & 27276 \\
\(\mathbf{2 0 1 2}\) & 232 & 11793 & 3307 & 1901 & 62 & 17294 & 1206 & 18501 & 10191 & 28691 \\
\hline
\end{tabular}

\footnotetext{
\({ }^{1}\) Preliminary.
}

Table 5.4.11.3 Haddock in Divisions VIIb-k. Summary of stock assessment (weights in tonnes).
\begin{tabular}{cccccccccccc}
\hline Year & Landings & Discards & Catch & \begin{tabular}{c} 
Predict. \\
Catch
\end{tabular} & TSB & SSB & CV & \begin{tabular}{c} 
Fbar \\
ages 3-5
\end{tabular} & CV & \begin{tabular}{c} 
Recruits \\
age 0)
\end{tabular} & CV \\
\hline 1993 & 3348 & 1208 & 4557 & 4857 & 16421 & 7529 & \(18 \%\) & 1.136 & \(28 \%\) & 105044 & \(22 \%\) \\
1994 & 4131 & 1886 & 6017 & 5338 & 26534 & 7578 & \(18 \%\) & 1.119 & \(22 \%\) & 364916 & \(19 \%\) \\
1995 & 4470 & 2218 & 6688 & 6429 & 42977 & 6526 & \(22 \%\) & 0.912 & \(25 \%\) & 502667 & \(16 \%\) \\
1996 & 6756 & 4309 & 11064 & 11844 & 42664 & 17587 & \(25 \%\) & 0.857 & \(25 \%\) & 139106 & \(20 \%\) \\
1997 & 10827 & 2883 & 13710 & 12661 & 33897 & 25842 & \(23 \%\) & 0.721 & \(23 \%\) & 69534 & \(22 \%\) \\
1998 & 7668 & 934 & 8603 & 9030 & 27499 & 19670 & \(20 \%\) & 0.78 & \(24 \%\) & 144567 & \(20 \%\) \\
1999 & 4882 & 586 & 5468 & 5575 & 28521 & 12087 & \(19 \%\) & 0.56 & \(28 \%\) & 391231 & \(18 \%\) \\
2000 & 7411 & 2503 & 9913 & 9926 & 40572 & 14683 & \(16 \%\) & 0.692 & \(26 \%\) & 377376 & \(21 \%\) \\
2001 & 8632 & 3418 & 12050 & 14825 & 48877 & 25382 & \(16 \%\) & 0.7 & \(29 \%\) & 424171 & \(18 \%\) \\
2002 & 6403 & 7073 & 13476 & 22148 & 64929 & 32082 & \(17 \%\) & 1.303 & \(22 \%\) & 746077 & \(14 \%\) \\
2003 & 8210 & 9456 & 17666 & 15976 & 59586 & 21940 & \(18 \%\) & 0.654 & \(25 \%\) & 202417 & \(16 \%\) \\
2004 & 8634 & 6750 & 15384 & 20467 & 57105 & 38793 & \(17 \%\) & 0.793 & \(23 \%\) & 259653 & \(14 \%\) \\
2005 & 6590 & 5191 & 11781 & 13482 & 48522 & 25946 & \(21 \%\) & 0.832 & \(22 \%\) & 247711 & \(13 \%\) \\
2006 & 5408 & 2484 & 7893 & 9804 & 42008 & 20550 & \(17 \%\) & 0.533 & \(28 \%\) & 182215 & \(15 \%\) \\
2007 & 6732 & 2739 & 9471 & 7993 & 58823 & 21815 & \(15 \%\) & 0.425 & \(25 \%\) & 663176 & \(11 \%\) \\
2008 & 7334 & 11187 & 18521 & 14573 & 70472 & 20796 & \(16 \%\) & 0.757 & \(17 \%\) & 341849 & \(14 \%\) \\
2009 & 9561 & 9080 & 18641 & 15406 & 122027 & 32216 & \(15 \%\) & 0.606 & \(18 \%\) & 1556140 & \(11 \%\) \\
2010 & 10135 & 16547 & 26682 & 24849 & 114928 & 32478 & \(14 \%\) & 0.652 & \(18 \%\) & 205776 & \(18 \%\) \\
2011 & 12898 & 14378 & 27276 & 28593 & 85690 & 72429 & \(14 \%\) & 0.564 & \(18 \%\) & 77212 & \(24 \%\) \\
2012 & 18501 & 10191 & 28691 & 28237 & 55765 & 50873 & \(12 \%\) & 0.93 & \(22 \%\) & 23796 & \(40 \%\) \\
2013 & - & - & - & - & - & 24006 & - & - & - & \(290479 *\) & - \\
\hline Avg \(10-12\) & 13844 & 13705 & 27550 & - & - & 51927 & - & 0.715 & - & - & - \\
\hline
\end{tabular}

\footnotetext{
*GM 1993-2010.
}

\section*{Celtic Sea and Western Channel Whiting}

\section*{(Division VIIe-k and VIIb,c)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice is based on the MSY approach that landings in 2013 should be no more than \(15,562 \mathrm{t}\). FEAS agrees with this advice. Discards are known to be high but cannot be accurately quantified.

This stock falls into ICES category I for data-rich stocks with full analytical assessments. Spawning stock biomass has been increasing in recent years and fishing mortality has declined sharply since 2007. The 20II and 2012 year classes are estimated to be the lowest of the time-series. Consequently, the SSB and catches are forecast to decline from recent levels.

The TAC area includes VIIbc and VIId. FEAS agrees with the ICES advice of 5,106 \(\mathbf{t}\) for VIId whiting. There is no ICES advice for VIIbc where recent landings have been around 310 t . Including the ICES advice for VIId and recent average landings for VIIbc, would result in total landings of 20,978 t for the entire VIIb-k TAC area. This implies an Irish quota of \(\mathbf{5 , 8 3 2} \mathbf{t}\).

\section*{CURRENT MANAGEMENT}
- The TAC area covers Divisions Vllb-k, and the assessment area covers Divisions VIIe-k.
- The 2013 TAC was set at \(24,500 \mathrm{t}\) with an associated Irish quota of \(6,812 \mathrm{t}\).
- There is a management plan in development by the NWWRAC for mixed demersal fisheries catching whiting in VIIfg. FEAS supports the development of this plan.
- Technical Measures initially proposed and developed through
 the NWWRAC have been introduced since September 2012 in the Celtic Sea in with the aim of improving selection and reducing discards of whiting and other gadoids.

\section*{ICES ADVICE 5.4.44 Whiting in Divisions VIIe-k}

\section*{Advice for 2014}

ICES advises based on the MSY approach that landings in 2014 should be no more than 15562 tonnes. Discards are known to take place but cannot be quantified; therefore, total catches cannot be calculated.

\section*{Stock status}
\begin{tabular}{|c|c|c|}
\hline \multicolumn{3}{|c|}{F (Fishing Mortality)} \\
\hline & 20102011 & 2012 \\
\hline MSY ( \(\mathrm{F}_{\text {MSY }}\) ) & \(x \vee\) & ( Appropriate \\
\hline Precautionary \(\operatorname{approach}\left(\mathbf{F}_{\mathrm{pa}}, \mathrm{F}_{\text {lim }}\right)\) & ? ? & ? Undefined \\
\hline
\end{tabular}
\begin{tabular}{|c|c|c|}
\hline \multicolumn{3}{|c|}{SSB (Spawning-Stock Biomass)} \\
\hline & 20112012 & 2013 \\
\hline MSY ( \(\mathbf{B}_{\text {trigger }}\) ) & ( \(\downarrow\) & ( Above trigger \\
\hline Precautionary approach ( \(\mathrm{B}_{\mathrm{pa}}, \mathrm{B}_{\mathrm{lim}}\) ) &  & ( Full reproductive capacity \\
\hline
\end{tabular}



Figure 5.4.44.1
Whiting in Divisions VIIe-k. Summary of stock assessment (weights in thousand tonnes). Assumed recruitment values are shaded. Top right: SSB/F for the time-series used in the assessment.

Spawning-stock biomass has been increasing since 2008 and is well above MSY \(\mathrm{B}_{\text {trigger }}\). Fishing mortality has shown a declining trend since 2007 and has been below the \(\mathrm{F}_{\text {MSY }}\) proxy since 2011. Two recruitments have been above average, 2008 and 2009; they have now entered the fishery and are contributing to the spawning stock. The 2011 and 2012 year class are estimated to be the lowest of the time-series.

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{The fisheries}

Celtic Sea whiting are taken in a mixed-species fisheries. Discard rates are very high (mainly ages 1 and 2 ) due to the low market value of this species. Otter trawls are the primary gear associated with whiting landings from the Celtic Sea.

Catch distribution Total landings \((2012)=9976\) tonnes. The total international landings are primarily taken by the otter trawl fleets ( \(60 \%\) ); the rest are taken by seiners ( \(26 \%\) ), beam trawlers ( \(2 \%\) ), gillnets ( \(1 \%\) ), and other gears (11\%). Discards are known to be high; however, they cannot be quantified.

\section*{Quality considerations}

The main quality consideration is the non-inclusion of discard data in the assessment. There is a need for all countries to provide discard estimates of whiting raised to fleet level for inclusion in future assessments after a benchmark procedure.


Figure 5.4.44.2 Whiting in Divisions VIIe-k. Historical assessment results (final-year recruitment estimates are included).

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & Age-based analytical assessment (XSA). \\
Stock data category & Category 1. \\
Input data & \begin{tabular}{l} 
Commercial catches (international landings and ages from catch sampling); three survey \\
indices (EVHOE-WIBTS-Q4, IGFS-WIBTS-Q4, and UKWCGFS); two commercial
\end{tabular} \\
& \begin{tabular}{l} 
indices up to 2008 (FR-Gadoid and FR-Nephrops); maturity based on data from UK
\end{tabular} \\
& WCGFS (Moore and Warnes, 2006); natural mortalities assumed (0.2). \\
Discards and bycatch & Discards were not included since no time-series is available. \\
Indicators & None. \\
Other information & This stock is scheduled to be benchmarked in 2014. \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

\section*{ECOREGION Celtic Sea and West of Scotland \\ STOCK}

\section*{Reference points}
\begin{tabular}{|c|c|c|c|}
\hline & Type & Value & Technical basis \\
\hline \multirow[t]{2}{*}{\begin{tabular}{l}
MSY \\
Approach
\end{tabular}} & MSY B \({ }_{\text {trigger }}\) & 21000 t . & Provisionally based on \(\mathrm{B}_{\mathrm{pa}}\). \\
\hline & \(\mathrm{F}_{\text {MSY }}\) & 0.36 & \(\mathrm{F}_{35 \%}\) SPR by analogy with other gadoid stocks. \\
\hline \multirow[b]{2}{*}{Precautionary} & \(\mathrm{B}_{\mathrm{lim}}\) & 15000 t . & Bloss, the lowest observed spawning-stock biomass. \\
\hline & \(\mathrm{B}_{\mathrm{pa}}\) & 21000 t . & \(\mathrm{B}_{\mathrm{pa}}=\mathrm{B}_{\lim } \times\) 1.4. Biomass above this affords a high probability of maintaining SSB above Blim, taking into account the uncertainty of the assessment. \\
\hline \multirow[t]{2}{*}{Approach} & \(\mathrm{F}_{\text {lim }}\) & Undefined. & \\
\hline & \(\mathrm{F}_{\mathrm{pa}}\) & Undefined. & \\
\hline
\end{tabular}
(Unchanged since: 2012).

\section*{Outlook for 2014}

Basis: \(\mathrm{F}(2013)=\) mean \((2010-2012)=0.33 ; \mathrm{SSB}(2014)=49354 ; \mathrm{R}(2013-2014)=\mathrm{GM}_{1982-2010}=68.473\) millions; Landings \((2013)=18392\).
\begin{tabular}{|l|c|c|c|c|c|}
\hline \multicolumn{1}{|c|}{ Rationale } & \begin{tabular}{c} 
Landings \\
(2014)
\end{tabular} & Basis & \begin{tabular}{c}
\(\mathbf{F}_{\text {landings }}\) \\
\((\mathbf{2 0 1 4 )}\)
\end{tabular} & \begin{tabular}{c} 
SSB \\
\(\mathbf{( 2 0 1 5 )}\)
\end{tabular} & \begin{tabular}{c} 
\%SSB \\
change \\
\(\mathbf{1 )}\)
\end{tabular} \\
\hline MSY approach & 15562 & \(\mathrm{~F}_{\mathrm{MSY}}\) & 0.36 & 45329 & \(-8 \%\) \\
\hline Precautionary approach & 38505 & \(\mathrm{~B}_{\mathrm{pa}}\) & 1.08 & 21000 & \(-57 \%\) \\
\hline Zero catch & 0 & \(\mathrm{~F}=0\) & 0 & 62023 & \(26 \%\) \\
\hline \multirow{2}{*}{ Other options } & 14618 & \(\mathrm{~F}_{2013}\) & 0.33 & 46331 & \(-6 \%\) \\
\hline
\end{tabular}

Units: tonnes.
\({ }^{1)}\) SSB 2015 relative to SSB 2014.
Note: No information for \% TAC change can be shown as the TAC area covers Divisions VIIb-k landings from Divisions VIId and VIIb,c.

\section*{MSY approach}

Following the ICES MSY framework implies fishing mortality at the \(\mathrm{F}_{\text {MSY }}\) proxy ( \(=0.36\) ), resulting in landings of no more than 15562 tonnes in 2014. This is expected to lead to an SSB of 45329 tonnes in 2015. Discards are known to occur, but cannot be quantified.

\section*{Precautionary approach}

No precautionary fishing mortality reference points are defined. SSB is expected to remain far above \(B_{p a}\), in the short term.

\section*{Additional considerations}

\section*{Regulations and their effects}

During the 2011 December EU Fisheries Council meeting, Ireland, UK, and France agreed to introduce additional technical measures to reduce the high levels of haddock and whiting discards observed in the Celtic Seas in 2010. In consultation with national governments and the NWWRAC it was agreed to introduce the mandatory use of a 110 mm square mesh panel in Nephrops trawls and a 100 mm panel in gadoid fisheries. While the regulation was not introduced until 14 August 2012 (EC Regulation 737/2012), it is understood that for both French and Irish fleets, the technical measures were in practice introduced much earlier in the year by the national administrations. Following the outcome of the 2012 December Fisheries Council, EU Member States committed to an evaluation of the effectiveness of the technical measures and to introduce additional measures if required (see STECF, 2013).

The EC is in the process of collating information from Member States to allow STECF to undertake an evaluation of the technical measures at the 2013 winter plenary meeting.

The stock is managed by a TAC and technical measures. The TAC includes Divisions VIId and VIIb,c and has become more restrictive in recent years.

A closure of the three rectangles in the Celtic Sea to protect the cod stock has been in place annually during the first quarter, since 2005. The impact of this on the whiting stock remains unclear. Whiting landings from these rectangles are lower than from the surrounding area and remaining quarters.

\section*{Changes in fishing technology and fishing patterns}

There have been major changes in fleet dynamics over the period of the assessment. Effort in the majority of fleets has been declining since the late 1990s or early 2000s. Since the early 2000s a number of decommissioning schemes have been carried out by several nations including France, UK, and Ireland, to reduce fleet capacity. A number of schemes have been aimed at reducing whitefish fleet capacity. However, this has not always been as effective because of low participation rates in such schemes by vessels targeting whiting or targeting other species groups.

\section*{Uncertainties in the assessment and forecast}

Historically, discarding of this stock for different fleets is substantial and highly variable. Discards are not included in this assessment. This caused problems in forecasting stock development in the short term due to retrospective revision of recruitment estimates. While discards are still not included in the assessment, this retrospective pattern has improved and more recent recruit estimates have little impact on the catch and SSB forecasts (Figure 5.4.44.4).

\section*{Data and methods}

The available discard data are partial; it is therefore not appropriate to estimate a discard proportion that could be applied to give catch advice, and total catches can thus not be calculated.

Comparison with previous assessment and advice
The assessment is consistent with last year's assessment. This year the basis for the advice is the same as last year, the MSY approach

\section*{Assessment and management area}

The assessment area of this stock (Divisions VIIe-k) does not correspond to the TAC area (Divisions VIIb,c,d,e,f,g,h,j, and k).Whiting in Divisions VIIb,c are not assessed and whiting in Division VIId is considered to be part of the North Sea stock (Subarea IV and Division VIId; Section 6.4.34). Whatever management measures are implemented, they must be consistent with the assessment area.


Figure 5.4.44.3 Whiting in Divisions VIIe-k. TAC area in the boxes outlined in red, assessment area in blue shading.


Figure 5.4.44.4 Whiting in Divisions VIIe-k. Yield-per-recruit analysis (left panel) and stock-recruitment plot (right panel).

\section*{Sources}

ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.
Moore, S-J., and Warnes, S. 2006. A new maturity ogive for whiting VIIe-k. Working Document 03. In Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks (WGSSDS), 27 June-6 July 2006, ICES Headquarters, Denmark. ICES CM 2006/ACFM:33. 694 pp.
STECF. 2013. Scientific, Technical and Economic Committee for Fisheries (STECF) - 42nd Plenary Meeting Report (PLEN-13-01). 2013. Publications Office of the European Union, Luxembourg, 85 pp.

Table 5.4.44.1 Whiting in Divisions VIIe-k. ICES advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
ICES \\
Advice
\end{tabular} & Predicted catch corresp. to advice & Agreed TAC \({ }^{1}\) & \[
\begin{gathered}
\hline \text { ICES } \\
\text { landings } \\
\hline
\end{gathered}
\] \\
\hline 1987 & Status quo F; TAC & \(7.1^{2}\) & & 12.7 \\
\hline 1988 & Precautionary TAC & \(7.0^{2}\) & & 15.1 \\
\hline 1989 & Precautionary TAC & \(7.9^{2}\) & & 16.5 \\
\hline 1990 & No increase in F; TAC & \(8.4{ }^{2}\) & & 14.1 \\
\hline 1991 & Precautionary TAC & \(8.0^{2}\) & & 13.5 \\
\hline 1992 & If required, precautionary TAC & \(8.0^{2}\) & & 12.4 \\
\hline 1993 & Within safe biological limits & \(6.6{ }^{2}\) & 22.0 & 16.3 \\
\hline 1994 & Within safe biological limits & \(<9.4{ }^{2}\) & 22.0 & 20 \\
\hline 1995 & 20\% reduction in F & \(8.2{ }^{3}\) & 25.0 & 22.7 \\
\hline 1996 & 20\% reduction in F & \(8.6{ }^{3}\) & 26.0 & 18.3 \\
\hline 1997 & At least 20\% reduction in F & \(<7.3^{4}\) & 27.0 & 20.5 \\
\hline 1998 & At least 20\% reduction in F & \(<8.2^{4}\) & 27.0 & 19.2 \\
\hline 1999 & No increase in F & \(12.4{ }^{4}\) & 25.0 & 19.9 \\
\hline 2000 & 17\% reduction in F & \(<13.1{ }^{4}\) & 22.2 & 14.9 \\
\hline 2001 & No increase in F & \(13.5{ }^{4}\) & 21.0 & 12.8 \\
\hline 2002 & No increase in F & \(27.7{ }^{4}\) & 31.7 & 13.1 \\
\hline 2003 & No increase in F & \(20.2{ }^{4}\) & 31.7 & 10.6 \\
\hline 2004 & No increase in F & 14.0 & 27.0 & 10 \\
\hline 2005 & No increase in F & 10.6 & 21.6 & 12 \\
\hline 2006 & No increase in F & 10.8 & 19.9 & 9.5 \\
\hline 2007 & No increase in F & - & 19.9 & 8.9 \\
\hline 2008 & Reduction in F & - & \(19.9{ }^{5}\) & 5.7 \\
\hline 2009 & Same advice as last year & - & \(16.95{ }^{5}\) & 6.4 \\
\hline 2010 & Same advice as last year & - & \(14.407^{5}\) & 8.4 \\
\hline 2011 & See scenarios & - & 16.658 & 9.1 \\
\hline 2012 & No increase catch and improved gear selection & - & 19.053 & 10.0 \\
\hline 2013 & MSY approach \({ }^{6}\) & \(<17.5\) & 24.5 & \\
\hline 2014 & MSY approach \({ }^{6}\) & < 15.562 & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1}\) TAC covers Subarea VII (except Division VIIa).
\({ }^{2}\) For the Divisions VIIf,g stock component.
\({ }^{3}\) For the Divisions VIIf-h stock component.
\({ }^{4}\) For the Divisions VIIe-k stock component.
\({ }^{5}\) For Divisions VIIb, VIIc, VIId, VIIe, VIIf, VIIg, VIIh, and VIIk.
\({ }^{6}\) Landings.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline & 1983 & 1984 & 1985 & 1986 & 1987 & 1988 & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 \\
\hline Belgium & 130 & 158 & 160 & 107 & 112 & 159 & 295 & 317 & 304 & 111 & 145 & 228 & 205 & 268 & 449 \\
\hline \multicolumn{16}{|l|}{Denmark} \\
\hline France & 7572 & 4024 & 7819 & 7763 & 9773 & 10947 & 19771 & 19348 & 10006 & 9620 & 11285 & 13535 & 13400 & 9936 & 11370 \\
\hline Germany & & & & & & & & & & 14 & & & & & \\
\hline Ireland & 1511 & 1227 & 2241 & 1309 & 1518 & 2036 & 1651 & 1764 & 1403 & 1875 & 3630 & 5053 & 6077 & 6115 & 6893 \\
\hline Netherlands & & 398 & & 124 & & & & & & & & & & 8 & \\
\hline Spain & & & & & & & & & & & & & 4 & 31 & 24 \\
\hline UK (E/W/NI) & 1192 & 986 & 751 & 910 & 1098 & 1632 & 1326 & 1829 & 2023 & 1393 & 1776 & 1624 & 1803 & 1724 & 1742 \\
\hline UK(Scotland) & & & & & & 1 & 33 & 32 & 20 & 41 & 16 & 23 & 23 & 34 & 42 \\
\hline \multicolumn{16}{|l|}{United Kingdom} \\
\hline Channel Islands & & & 2 & 2 & 2 & & & & & & & & 1 & 1 & \\
\hline Total & 10405 & 6793 & 10973 & 10215 & 12503 & 14775 & 23076 & 23290 & 13756 & 13054 & 16852 & 20463 & 21513 & 18116 & 20520 \\
\hline Unallocated & 1376 & 3192 & -135 & -263 & 149 & 353 & -6535 & -9 184 & -248 & -690 & -532 & -429 & 1165 & 144 & 12 \\
\hline ICES landings & 11781 & 9985 & 10838 & 9952 & 12652 & 15128 & 16541 & 14106 & 13508 & 12364 & 16320 & 20034 & 22678 & 18260 & 20532 \\
\hline
\end{tabular}
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012* \\
\hline Belgium & 479 & 448 & 194 & 171 & 149 & 149 & 129 & 180 & 218 & 128 & 127 & 87 & 101 & 100 & 167 \\
\hline \multicolumn{16}{|l|}{Denmark} \\
\hline France & 11711 & \(16418{ }^{\text {b }}\) & 9077 & 7203 & 7435 & 7435 & 5897 & 4811 & 5784 & 4649 & 3543 & 2739 & 3397 & 4079 & 3629 \\
\hline \multicolumn{16}{|l|}{Germany} \\
\hline Ireland & 5226 & 5807 & 4795 & 5008 & 5332 & 5332 & 4093 & 4215 & 5709 & 4521 & 4764 & 2704 & 4187 & 4547 & 5455 \\
\hline Netherlands & 1 & & & 5 & 4 & 4 & 9 & 18 & 60 & 40 & 64 & 24 & 76 & 166 & 135 \\
\hline Spain & 53 & 21 & 11 & 9 & 12 & 12 & - & 76 & 56 & 70 & 21 & 1 & 6 & 7 & \\
\hline UK (E/W/NI) & 1706 & 1344 & 1249 & 943 & 843 & 843 & 758 & 586 & 471 & 402 & 569 & 764 & 757 & & \\
\hline UK(Scotland) & 68 & 3 & 2 & 11 & 12 & 12 & 5 & 7 & - & 6 & 4 & 63 & 35 & & \\
\hline United Kingdom & & & & & & & & & & & & & & 739 & 749 \\
\hline Channel Islands & 3 & 2 & 3 & 3 & 1 & 1 & 4 & 0 & 0 & 0 & 1 & - & 4 & 1 & 1 \\
\hline Total & 19247 & 24043 & 15331 & 13353 & 13788 & 13788 & 10895 & 9893 & 12298 & 9816 & 9093 & 6382 & 8563 & & 10136 \\
\hline Unallocated & -2 & -4128 & -466 & -583 & -642 & -3205 & -942 & 2137 & -2765 & -869 & -3 356 & -674 & -139 & & -160 \\
\hline ICES landings & 19245 & 19915 & 14865 & 12770 & 13146 & 10583 & 9954 & 12030 & 9533 & 8948 & 5737 & 5708 & 8424 & 9639 & 9976 \\
\hline
\end{tabular}

\footnotetext{
*Preliminary
}

Table 5.4.44.3 Whiting in Divisions VIIe-k. Summary of stock assessment (weights in tonnes).
\begin{tabular}{ccccccc}
\hline Year & \begin{tabular}{c} 
Recruits \\
Age 0
\end{tabular} & Total Biomass & SSB & Landings & Yield / SSB & \begin{tabular}{c} 
Mean \\
F(2 \(\mathbf{- 5})\)
\end{tabular} \\
\hline 1982 & 62095 & 22706 & 19055 & 11225 & 0.5891 & 1.0651 \\
1983 & 50135 & 22887 & 17053 & 11781 & 0.6909 & 1.3703 \\
1984 & 53843 & 23458 & 17582 & 9985 & 0.5679 & 1.1453 \\
1985 & 71585 & 23342 & 17621 & 10838 & 0.6151 & 0.9601 \\
1986 & 133370 & 26065 & 18615 & 9952 & 0.5346 & 1.0821 \\
1987 & 105949 & 37465 & 24881 & 12652 & 0.5085 & 1.3174 \\
1988 & 33446 & 45865 & 33827 & 15128 & 0.4472 & 1.1518 \\
1989 & 54976 & 39650 & 34872 & 16541 & 0.4743 & 1.0502 \\
1990 & 110493 & 32932 & 27642 & 14106 & 0.5103 & 0.9388 \\
1991 & 162714 & 33850 & 24583 & 13508 & 0.5495 & 1.1378 \\
1992 & 142343 & 48760 & 32870 & 12364 & 0.3761 & 0.7646 \\
1993 & 189188 & 61989 & 47415 & 16320 & 0.3442 & 0.7031 \\
1994 & 103136 & 81515 & 62323 & 20034 & 0.3215 & 0.5832 \\
1995 & 62050 & 82687 & 73504 & 22678 & 0.3085 & 0.4952 \\
1996 & 57721 & 77382 & 71009 & 18260 & 0.2571 & 0.409 \\
1997 & 56598 & 64844 & 60307 & 20532 & 0.3405 & 0.4379 \\
1998 & 65253 & 52636 & 47346 & 19245 & 0.4065 & 0.5384 \\
1999 & 126729 & 42076 & 37383 & 19915 & 0.5327 & 0.9105 \\
2000 & 62684 & 42540 & 32297 & 14865 & 0.4603 & 0.8264 \\
2001 & 38752 & 45902 & 37960 & 12770 & 0.3364 & 1.0009 \\
2002 & 38755 & 43011 & 37990 & 13146 & 0.346 & 0.7055 \\
2003 & 42935 & 35998 & 31548 & 10583 & 0.3355 & 0.5467 \\
2004 & 39838 & 32869 & 28512 & 9953 & 0.3491 & 0.5079 \\
2005 & 37885 & 29452 & 25399 & 12030 & 0.4736 & 0.8218 \\
2006 & 39735 & 26670 & 22489 & 9533 & 0.4239 & 0.8306 \\
2007 & 62861 & 25918 & 21078 & 8947 & 0.4245 & 1.064 \\
2008 & 93413 & 29151 & 21171 & 5737 & 0.271 & 0.6743 \\
2009 & 97998 & 44568 & 30912 & 6386 & 0.2066 & 0.5482 \\
2010 & 46667 & 61056 & 44977 & 8442 & 0.1877 & 0.5054 \\
2011 & 20661 & 61623 & 53833 & 9077 & 0.1686 & 0.3288 \\
2012 & 22786 & 66721 & 62920 & 9976 & 0.1585 & 0.1614 \\
2013 & \(68473 *\) & & 58883 & & & \\
\hline & & & & & \\
\hline
\end{tabular}
*GM (1982-2010).
Table 7.16.1. Nominal Landings ( \(\mathbf{t}\) ) of Whiting in Division VIIb,c for 1995-2012.
\begin{tabular}{llllllllllllllllll}
\hline Country & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 \\
\hline France & 57 & 76 & 65 & \(37^{*}\) & \(\ldots 1^{*}\) & 107 & 114 & 111 & 92 & 59 & 102 & 62 & 32 & 26 & 32 & 67 & 44 \\
\hline Ireland & 1,894 & 1,233 & 403 & 323 & 206 & 563 & 357 & 386 & 423 & 135 & 65 & 49 & 100 & 76.0 & 94 & 144 & 205 \\
\hline Netherlands & - & - & - & - & - & - & 2 & - & 3 & - & 2 & - & - & - & - \\
\hline Spain & + & + & - & 27 & 1 & 4 & - & 6 & - & 31 & 18 & 19 & 1 & 4 & - \\
\hline UK(E/W/NI) & 24 & 96 & 75 & 49 & 10 & 6 & 5 & 4 & 5 & 1 & 11 & 5 & 1 & 1 & 2 & - \\
\hline UK(Scotland) & 71 & 17 & 4 & 27 & - & 19 & 1 & + & - & - & - & - & - & - & - \\
\hline & & & & & & & & & & & & & - \\
\hline Total & 2,046 & 1,422 & 547 & 463 & 217 & 699 & 479 & 507 & 523 & 226 & 198 & 135 & 134 & 107 & 128 & 215 & 249 \\
\hline See VIIg-k. & & & & & & & & & & & & & - \\
\hline Provisional.
\end{tabular}

\section*{Celtic Sea and Bay of Biscay Anglerfish}

\section*{(Divisions VIIb-k and VIIla,b,d)}

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

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice is based on the approach for data limited stocks landings should be no more than \(37,450 \mathrm{t}\) in 2014. FEAS does not agree with this advice.

This stock falls in to ICES category \(\mathbf{3 . 2 . 0}\) for data-limited stocks for which a biomass index is available. For L. piscatorius the biomass index estimates for the most recent two years are 55\% higher than the previous three years and for L. budegassa, the biomass index is \(25 \%\) higher. ICES also say that the long-term trend in biomass is stable for both species. The ICES advice is based on 20\% increase in average reported landings of \(L\) piscatorius and L budegassa.


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

Considering the economic importance of anglerfish in VII/VIII (and VI/IV) FEAS considers that the current method for setting the TAC does not provide the best basis for advice and that investigations into alternative assessment methods and harvest control rules to generate catch advice are urgently needed.

The biomass index for both species has been fluctuating and FEAS consider that the longer term trend is stable or increasing. Although effort has reduced in fisheries catching anglerfish the exploitation status of both species remains unknown. In the absence of an analytical assessment FEAS consider that multi-annual advice is more appropriate. FEAS advised last year that the TAC should be gradually reduced, in the order of \(-5 \% / y r\), until it can be shown that \(F\) is below \(F_{\text {msr- }}\) Maintaining this advice for 2014 implies a Sub-area VII TAC of \(\mathbf{2 7 , 6 8 7} \mathbf{t}\) (total landings of 34,763 t for both TAC areas) with an associated Irish quota of \(2,099 \mathrm{t}\).

\section*{CURRENT MANAGEMENT}
- There are two separate TACs set for anglerfish in this area; one for Sub-area VII and a second for TAC for Divisions VIllabde. The TAC area does not correspond to the assessment area (Divisions VIIb-k and VIIla,b). An additional allocation needs to be made for Division VIla.
- Two species; white bellied (L piscatorious) and black bellied (L. budegassa) are caught in this assessment area. These species are not routinely separated by the industry. Therefore a combined TAC is set for both species.
- The 2013 TAC for Sub-area VII was \(29,144 \mathrm{t}\) with an associated Irish quota of \(2,209 \mathrm{t}\). Ireland has no quota in TAC area Divisions VIllabde.

- Most countries have high levels of quota uptake except France with only \(55 \%\) uptake in 2010,
- There are no explicit management objectives or plans for this stock.
- There is no minimum legal landing size for anglerfish. However, EC Reg. No 2406/96 dealing with common marketing standards fixes a minimum weight of 500 g for anglerfish.
- There is a ban on fishing gillnets in Divisions Vla,b and VIlb,c,j,k in more than 200 m depth (EC Reg. No 5I/2006).

\section*{ICES ADVICE 5.4.2 Anglerfish in Divisions VIIb-k and VIIIa,b,d (Lophius piscatorius and L. budegassa)}

\section*{Advice for 2014}

Based on ICES approach to data-limited stocks, ICES advises that landings should be no more than 37450 tonnes. Discards are known to take place but cannot be quantified; therefore, total catches cannot be calculated.

\section*{Stock status}


SSB (Spawning-Stock Biomass)
\begin{tabular}{l|r|}
\hline \multicolumn{2}{|c|}{ SSB (Spawning-Stock Biomass) } \\
\cline { 2 - 3 } & 2008-2012 \\
\hline
\end{tabular}
Lophius budegassa
F (Fishing Mortality)
\begin{tabular}{lc|} 
& F (Fishing Mortality) \\
\\
\begin{tabular}{l} 
Qualitative \\
evaluation
\end{tabular} & \begin{tabular}{l} 
2010-2012 \\
Insufficient \\
information
\end{tabular} \\
\hline
\end{tabular}
\begin{tabular}{|l|r|}
\hline \multicolumn{2}{c|}{ SSB (Spawning-Stock Biomass) } \\
\cline { 2 - 3 } & 2008-2012 \\
\begin{tabular}{l} 
Qualitative \\
evaluation
\end{tabular} & Increasing \\
\hline
\end{tabular}






Figure 5.4.2.1 Anglerfish (L. piscatorius and L. budegassa) in Divisions VIIb-k and VIIIa,b,d. Bay of Biscay and Celtic Sea (EVHOE-WIBTS-Q4) indices: biomass (left panels, \(\mathrm{kg} / 30 \mathrm{~min}\); horizontal lines correspond to the average of the respective year range) and total abundance (right panels, number \(/ 30 \mathrm{~min}\) ). Error bars indicate \(\pm 2\) s.d. Lower panel: landings (thousand tonnes).

The long-term trend in biomass is stable for L. budegassa and increasing for L. piscatorius. For L. piscatorius the average of the stock biomass indicator in the last two years (2011-2012) is \(55 \%\) higher than the average of the three previous years (2008-2010). For L. budegassa the average of the stock biomass indicator in the last two years (2011-2012) is \(25 \%\) higher than the average of the three previous years (2008-2010). For L. piscatorius there is evidence of medium recruitments in the period 2008 to 2012, whereas strong recruitment for L. budegassa is evident in 2008, 2011, and 2012.

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

Lophius budegassa has a more southern distribution than L. piscatorius. Although ICES considers different anglerfish stocks in different areas for each species, the boundaries are not based on biological criteria.

\section*{The fisheries}

The majority of anglerfish catches consists of immature fish. There are indications that discarding of small anglerfish has increased in recent years.

Catch distribution Total landings (2012) = 36.4 kt (L. piscatorius, 26.9 kt : 76\% otter trawl, \(12 \%\) beam trawl, \(11 \%\) gillnet, and 1\% Nephrops trawl. L. budegassa, 9.5 kt : \(91 \%\) otter trawl, \(5 \%\) beam trawl, \(3 \%\) Nephrops trawl, and 1\% gillnet).

\section*{Quality considerations}

The increase in discarding in recent years has resulted in uncertainties in recent catch values.
Improved sampling of length composition and accurate estimates of growth parameters are needed to facilitate the development of an analytical assessment. An ageing exchange study for L. piscatorius took place in 2011 to compare the different approaches that are used (otoliths and illicia).

The advice is based on a biomass index from one survey, used as an indicator of stock size. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or the stock overfished.

Scientific basis
\begin{tabular}{ll} 
Assessment type & \begin{tabular}{l} 
Survey trends-based assessment. \\
Category 3.2.0. \\
Stock data category \\
Input data
\end{tabular} \\
& \begin{tabular}{l} 
Commercial landings; \\
one survey index (EVHOE-WIBTS-Q4).
\end{tabular} \\
Discards and bycatch & \begin{tabular}{l} 
Discards are known to occur, but they are not included in the assessment. \\
Cpues from three surveys (FSP-Eng-Monk, SPPGFS-WIBTS-Q4, and IGFS-WIBTS- \\
Indicators
\end{tabular} \\
& \begin{tabular}{l} 
Q4) and lpues of five commercial fleets (EW-FU06, SP-VIGO7, SP-CORUTR7, SP-
\end{tabular} \\
BAKON7, and SP-BAKON8).
\end{tabular}

\section*{ECOREGION Celtic Sea and West of Scotland STOCK Anglerfish (L. piscatorius and L. budegassa) in Divisions VIIb-k and VIIIa,b,d}

\section*{Reference points}

There are no reference points defined for these stocks. As a consequence of identified problems with growth estimates, previous reference points are not considered to be valid.

\section*{Outlook for 2014}

No analytical assessment is available for this stock. The main cause of this is the lack of discard data and the low quality of other parameters (e.g. ageing). Therefore, no forecast can be presented.

\section*{ICES approach to data-limited stocks}

For data-limited stocks for which a biomass index is available, ICES uses a harvest control rule based on an index-adjusted status quo catch. The advice is based on a comparison of the two most recent biomass index values with the three preceding values, combined with recent catch or landings data. Knowledge about the exploitation status also influences the advised catch.

For \(L\). piscatorius the biomass is estimated to have increased by more than \(20 \%\) between the periods 2008-2010 (average of the three years) and 2011-2012 (average of the two years). This implies an increase in landings of at most \(20 \%\) in relation to the average landings of the last three years, corresponding to landings in 2014 of no more than 26691 t . Considering that effort in the main fisheries has decreased steadily and SSB has increased by more than \(50 \%\), no additional precautionary action is needed.

For L. budegassa the biomass is estimated to have increased by more than \(20 \%\) between the periods 2008-2010 (average of the three years) and 2011-2012 (average of the two years). This implies an increase in landings of at most \(20 \%\) in relation to the average landings of the last three years, corresponding to landings in 2014 of no more than 10757 t . Considering that effort in the main fisheries has decreased steadily, no additional precautionary action is needed.

The landings advice for the two species combined is 37448 t . Discards are known to take place but cannot be quantified; therefore, total catches cannot be calculated.

\section*{Additional considerations}

Improved sampling of length composition and accurate estimates of growth parameters are needed to facilitate the development of an analytical assessment.

Reliable estimates of discards are not available. The increase in discarding may be related to larger year classes recruiting in the fishery. Information from research surveys indicates an increase in smaller fish on the fishing grounds in recent years. Discarding is also known to be partly dependent on market conditions and quota restrictions. Efforts should be made to obtain reliable estimates of total catches in order to improve the assessment.
L. piscatorius and L. budegassa are both caught on the same grounds and by the same fleets, and they are usually not separated in the landings. Management measures for both species must be considered together and in conjunction with other species caught in these fisheries (sole, cod, rays, megrim, Nephrops, and hake).

Effort of many commercial fishing fleets in Divisions VIIb-k and VIIIa,b,d has declined progressively since the early 1990s (Figure 5.4.2.3).

\section*{Regulations and their effects}

There is no minimum landing size for anglerfish, but an EU Council Regulation (No. 2406/96) laying down common marketing standards for certain fishery products fixes a minimum weight of 500 g for anglerfish. Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a "biologically sensitive area" in Divisions VIIb, VIIj, VIIg, and VIIh. Effort exerted within the "biologically sensitive area" by the vessels of each EU Member State may not exceed their average annual effort (calculated over the period 1998-2002).

\section*{Information from the fishing industry}

All the fleets fishing in this area are reporting very large quantities of anglerfish on the fishing grounds and that these quantities have been increasing over the last number of years. The quota has been restrictive for some fleets, leading to an increased risk of discarding.

Comparison with previous assessment and advice
The basis for the assessment and advice is the same as last year (data-limited approach 3.2.0).

\section*{Assessment and management area}

Two separate TACs are set for both species combined. There is a TAC for Subarea VII and a TAC for Divisions VIIIa,b,d,e. The advice applies to a smaller area (Divisions VIIb-k and VIIIa,b,d) than the management area. However, the advice covers the majority of the area as recent landings in Division VIIa have been relatively small compared to the total TAC.


Figure 5.4.2.2
Anglerfish (L. piscatorius and L. budegassa). Assessment area Divisions VIIb-k and VIIIa,b,d (pink, shaded) and EU TAC areas VII (diagonal lines) and VIIIa,b,d,e (dotted).

\section*{Sources}

ICES. 2012. Report of the Benchmark Workshop on Flatfish Species and Anglerfish (WKFLAT), 1-8 March 2012, Bilbao, Spain. ICES CM 2012/ACOM:46. 283 pp.
ICES. 2013. Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim (WGHMM), 10-16 May 2013, ICES Headquarters, Copenhagen. ICES CM 2013/ACOM:11.


Figure 5.4.2.3
Anglerfish (L. piscatorius and L. budegassa) in Divisions VIIb-k and VIIIa,b,d. Fishing effort of commercial fleets in Divisions VIIb-k and VIIIa,b,d.


Figure 5.4.2.4
Anglerfish (L. piscatorius and L. budegassa) in Divisions VIIb-k and VIIIa,b,d. Lpues of commercial fleets in Divisions VIIb-k and VIIIa,b,d.

Table 5.4.2.1 Anglerfish (L. piscatorius and L. budegassa) in Divisions VIIb-k and VIIIa,b,d. ICES advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Year & ICES Advice & Predicted catch corresp. to advice & Agreed TAC \({ }^{12)}\) & \begin{tabular}{l}
ICES \\
landings \({ }^{1}{ }^{1}\)
\end{tabular} & Landings \(L\). piscatorius & \begin{tabular}{l}
Landings \(L\). \\
budegassa
\end{tabular} \\
\hline 1987 & Not assessed & - & 39.08 & 29.5 & 21.9 & 7.6 \\
\hline 1988 & Not assessed & - & 42.99 & 28.5 & 20.1 & 8.4 \\
\hline 1989 & Not assessed & - & 42.99 & 30 & 21.1 & 8.8 \\
\hline 1990 & Not assessed & - & 42.99 & 29.4 & 19.8 & 9.6 \\
\hline 1991 & No advice & - & 42.99 & 24.9 & 16.2 & 8.8 \\
\hline 1992 & No advice & - & 42.99 & 20.9 & 12.8 & 8.2 \\
\hline 1993 & Concern about L. pisc. SSB decrease & - & 25.1 & 20.0 & 13.5 & 6.6 \\
\hline 1994 & SSB decreasing, still inside safe biological limits & - & 23.9 & 21.9 & 16.1 & 5.7 \\
\hline 1995 & No increase in F & 20.0 & 23.2 & 26.7 & 19.7 & 7.0 \\
\hline 1996 & No increase in F & 30.3 & 30.4 & 20.3 & 22.2 & 8.1 \\
\hline 1997 & No increase in F & 34.3 & 34.3 & 29.8 & 21.7 & 8.1 \\
\hline 1998 & No increase in F & 33.0 & 34.3 & 28.2 & 19.6 & 8.6 \\
\hline 1999 & No increase in F & 32.9 & 34.3 & 25.0 & 18.2 & 6.7 \\
\hline 2000 & At least 20\% decrease in F & <22.3 & 29.6 & 20.6 & 13.9 & 6.6 \\
\hline 2001 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & <27.6 & 27.6 & 22.4 & 16.7 & 5.7 \\
\hline 2002 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & < 19.9 & 23.7 & 26.2 & 19.8 & 6.4 \\
\hline 2003 & At least 30\% decrease in F & < 16.4 & 21.0 & 33.2 & 24.9 & 8.4 \\
\hline 2004 & At least 10\% decrease in F & <26.7 & 26.7 & 35.2 & 27.7 & 7.4 \\
\hline 2005 & Maintain F below \(\mathrm{F}_{\mathrm{pa}}\) & < 37.8 & 31.2 & 33.1 & 25.5 & 7.5 \\
\hline 2006 & Maintain F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<33.9\) & 34.0 & 31.6 & 25.9 & 5.7 \\
\hline 2007 & Maintain F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<36.0\) & 36.0 & 35.3 & 29.0 & 6.4 \\
\hline 2008 & Less than average landings & <33.0 & 36.0 & 31.8 & 24.4 & 7.4 \\
\hline 2009 & Same advice as last year & <33.0 & 36.0 & 27.9 & 18.8 & 9.1 \\
\hline 2010 & No increase in effort & - & 41.4 & 28.9 & 19.5 & 9.4 \\
\hline 2011 & No increase in effort & - & 40.9 & \(28.4{ }^{3}\) & \(20.4{ }^{3}\) & \(8.0{ }^{3}\) \\
\hline 2012 & Reduce catch & - & 38.9 & 36.4 & 26.8 & 9.5 \\
\hline \(2013{ }^{4}\) & Reduce catch by the rate of biomass decrease ( \(14 \%\) for L. piscatorius and 20\% for \(L\). budegassa) & <24.8 & 37.0 & & & \\
\hline 2014 & Increase landings by the rate of biomass increase ( \(20 \%\) for L. piscatorius and \(20 \%\) for \(L\). budegassa) & < 37.5 & & & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
TAC was changed during 2003 from 19400 t to 21000 t following fast-track advice from ICES.
\({ }^{1}\) Includes Divisions VIIa and VIIIe.
\({ }^{2}\) Applies to both species.
\({ }^{3}\) Revised.
\({ }^{4}\) Advice refers to landings, not catch.

Table 5.4.2.2 Anglerfish (L. piscatorius) in Divisions VIIb-k and VIIIa,b,d. Landings in tonnes by fishery unit.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline \multirow[b]{3}{*}{Year} & \multicolumn{6}{|c|}{VIlb,c,e-k} & \multicolumn{4}{|c|}{VIIIa,b,d} & \multirow[b]{3}{*}{TOTAL VII + VIII} \\
\hline & & Medium/Deep & Shallow & & hallow/medium & & & Shallow & Medium/Deep & & \\
\hline & \begin{tabular}{l}
Gill-Net \\
(Unit 3+13)
\end{tabular} & Trawl (Unit 4) & Trawl (Unit 5) & Beam Trawl (Unit 6) & Neph.Trawl (Unit 8) & Unallocated & Neph.Trawl (Unit 9) & \begin{tabular}{l}
Trawl \\
(Unit 10)
\end{tabular} & Trawl (Unit 14) & Unallocated & \\
\hline 1986 & 429 & 13781 & 2877 & 1437 & 1021 & 0 & 746 & 720 & 2657 & 0 & 23666 \\
\hline 1987 & 560 & 11414 & 2900 & 1520 & 787 & 0 & 1035 & 542 & 3152 & 0 & 21909 \\
\hline 1988 & 643 & 9812 & 3105 & 1814 & 774 & 0 & 927 & 534 & 2487 & 0 & 20095 \\
\hline 1989 & 781 & 8448 & 5259 & 2998 & 754 & 0 & 673 & 444 & 1772 & 0 & 21130 \\
\hline 1990 & 1021 & 8787 & 3950 & 1736 & 880 & 0 & 410 & 391 & 2578 & 0 & 19753 \\
\hline 1991 & 1752 & 7563 & 2793 & 1142 & 752 & 0 & 284 & 218 & 1657 & 0 & 16160 \\
\hline 1992 & 1773 & 6254 & 1492 & 998 & 887 & 0 & 254 & 166 & 942 & 0 & 12766 \\
\hline 1993 & 1742 & 5776 & 2125 & 1258 & 969 & 0 & 360 & 278 & 950 & 0 & 13458 \\
\hline 1994 & 1377 & 7344 & 2595 & 1523 & 1236 & 0 & 261 & 198 & 1586 & 0 & 16120 \\
\hline 1995 & 1915 & 8461 & 3195 & 1805 & 1242 & 0 & 501 & 429 & 1954 & 228 & 19730 \\
\hline 1996 & 2244 & 9796 & 2658 & 2189 & 1149 & 138 & 441 & 379 & 2229 & 938 & 22162 \\
\hline 1997 & 2538 & 9225 & 2945 & 2031 & 964 & 39 & 429 & 376 & 2045 & 1068 & 21660 \\
\hline 1998 & 3398 & 8714 & 2138 & 1722 & 812 & 3 & 397 & 149 & 1699 & 542 & 19572 \\
\hline 1999 & 3162 & 9037 & 2369 & 1409 & 780 & 19 & 98 & 116 & 1259 & 0 & 18250 \\
\hline 2000 & 2034 & 7067 & 1642 & 1434 & 726 & 6 & 91 & 77 & 863 & 0 & 13941 \\
\hline 2001 & 2002 & 7880 & 2293 & 1978 & 886 & 17 & 146 & 76 & 1402 & 0 & 16681 \\
\hline 2002 & 2719 & 9465 & 2609 & 1836 & 924 & 22 & 247 & 96 & 1908 & 0 & 19826 \\
\hline 2003 & 3498 & 12332 & 2786 & 1983 & 974 & 81 & 470 & 168 & 2575 & 0 & 24865 \\
\hline 2004 & 5004 & 12770 & 2642 & 2460 & 852 & 14 & 457 & 218 & 3296 & 0 & 27714 \\
\hline 2005 & 5154 & 11556 & 2400 & 2388 & 594 & 7 & 342 & 165 & 2936 & 2 & 25543 \\
\hline 2006 & 3741 & 13409 & 2216 & 2421 & 700 & 3 & 429 & 218 & 2758 & 2 & 25898 \\
\hline 2007 & 4594 & 14949 & 2382 & 2836 & 660 & 11 & 286 & 244 & 3015 & 0 & 28977 \\
\hline 2008 & 5107 & 11766 & 1885 & 1990 & 491 & 10 & 227 & 325 & 2573 & 1 & 24376 \\
\hline 2009 & 3957 & 9938 & 358 & 1880 & 48 & 16 & 221 & 0 & 2153 & 275 & 18844 \\
\hline 2010 & 3398 & 9851 & 539 & 2503 & 21 & 31 & 301 & 0 & 2373 & 504 & 19521 \\
\hline 2011* & 2152 & 8968 & 548 & 3019 & 12 & 1658 & 231 & 0 & 2285 & 1497 & 20370 \\
\hline 2012** & 2905 & 12821 & 513 & 3231 & 14 & 1260 & 195 & 0 & 3731 & 2168 & 26837 \\
\hline
\end{tabular}

Table 5.4.2.3 Anglerfish (L. budegassa) in Divisions VIIb-k and VIIIa,b,d. Landings in tonnes by fishery unit.


Table 5.4.2.4 Anglerfish (L. piscatorius) in Divisions VIIb-k and VIIIa,b,d. Bay of Biscay and Celtic Sea (EVHOE-WIBTS-Q4) indices: biomass ( \(\mathrm{kg} / 30 \mathrm{~min}\) ) and total abundance (number \(/ 30 \mathrm{~min}\) ).
\begin{tabular}{l|ccccccccccccccc} 
& 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 \\
\hline Biomass & 1.53 & 2.01 & 1.25 & 0.94 & 2.34 & 2.46 & 2.27 & 3.44 & 2.77 & 3.17 & 3.45 & 3.18 & 2.6 & 1.85 & 3.43 \\
Abundance & 0.89 & 0.95 & 1.24 & 0.98 & 3.12 & 3.41 & 1.76 & 3.24 & 2.04 & 1.94 & 1.56 & 2.36 & 2.06 & 2.13 & 2.5 \\
A.34
\end{tabular}

Table 5.4.2.5 Anglerfish (L. budegassa) in Divisions VIIb-k and VIIIa,b,d. Bay of Biscay and Celtic Sea (EVHOE-WIBTS-Q4) indices: biomass ( \(\mathrm{kg} / 30 \mathrm{~min}\) ) and total abundance (number/30 min).
\begin{tabular}{l|ccccccccccccccc} 
& 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 \\
\hline Biomass & 0.81 & 0.58 & 0.45 & 0.62 & 0.79 & 0.93 & 0.51 & 0.62 & 0.52 & 0.8 & 1.07 & 1.47 & 0.77 & 0.5 & 1.07 \\
\hline Abundance & 0.78 & 0.68 & 0.68 & 0.84 & 1.46 & 1.4 & 0.53 & 1.2 & 1.01 & 1.6 & 2.42 & 2.92 & 1.2 & 1.04 & 1.97 \\
\hline
\end{tabular}

\section*{Celtic Sea and Bay of Biscay Megrim}
(Sub-area VII and Divisions VIIIa,b,d,e)
For latest information, see: http://www.ices.dk

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice remains the same as last year and is based on the approach for data limited stocks, landings from Sub-area VII should be no more than \(12,000 \mathrm{t}\) in 2014. FEAS do not agree with this advice.

This stock falls in to ICES category 3.2.0 data-limited stocks for which a biomass index is available. The ICES approach last year was to apply a \(5 \%\) reduction to average reported landings where differential uptake of national quotas and substantial discarding was occurring in fisheries catching megrim.


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

The qualitative indicators for this stock show that biomass estimates and survey indices have been increasing in recent years while recruitment is stable. Effort has reduced in fisheries catching megrim but the exploitation status remains unknown. In the absence of an analytical assessment last year FEAS advised that the TAC should be gradually reduced, in the order of \(5 \%\), until it can be shown that \(F\) is below F Msy . Maintaining this approach for 2014 would imply a Sub-area VII TAC of \(16,5 \mathrm{I} 6 \mathrm{t}\) ( \(\mathrm{I} 9,10 \mathrm{I} \mathrm{t}\) for both TAC areas) with an associated Irish quota of 2,734 t .

\section*{CURRENT MANAGEMENT}
- There are two TAC areas covering the assessment area for this stock; Sub-area VII and Divisions VIIla,b,d,e. The assessment area for this stock is Sub-area VII and Divisions VIIla,b,d,e. Landings of megrim from Division VIla are not considered in the assessment and advice. However, recent official data suggests landings are minor (<10 t).
- The TAC is also set for two species, Lepidorhombus whiffiagonis and L. boscii, combined. L. boscii accounts for around \(5 \%\) of the landings.

- FEAS advises that a management plan be developed and implemented for fisheries taking megrim.
- The minimum landing size of Lepidorhombus spp. was reduced from 25 to 20 cm in 2000 , to match selection pattern of the gear. However high-grading continues for market reasons.
- The 2013 VII TAC was set at \(17,385 \mathrm{t}\) with an Irish quota of \(2,878 \mathrm{t}\).
- FEAS note that three of the five countries harvesting this stock fail to land their allocated quota since 2003 (see Figure I on the following page).
- This stock was benchmarked in 2012 but the assessment was accepted as trends only.


Figure I Megrim in Divisions VIIb-k and VIIla,b,d. Historical quota allocation and nominal landings reported to the working group by country 1986-2012 (Note: 2012 Landings are preliminary and unallocated landings were 2074t and 1080t in 201 I and 2012 respectively).

\section*{ICES ADVICE 5.4.19 Megrim in Divisions VIIb-k and VIIIa,b,d}

\section*{Advice for 2014}

New data (landings, discards and surveys) available for this stock do not change the perception of the stock; therefore, the advice for this fishery in 2014 is the same as the advice for 2013 (see ICES, 2012a): Based on the ICES approach for data limited stocks, ICES advises that landings should be no more than 12000 tonnes.

\section*{Quality considerations}

This stock was benchmarked in 2012. The lack of confidence in the data used made it impossible to accept the absolute values of model results. The model gave promising results and seemed to be able to deal with the heterogeneity in the data. The model fit to the data was adequate but can only be interpreted as trends.

An important contributor to the megrim catches, France, has not provided discard estimates in the last decade.
The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished.

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & Statistical catch-at-age model, indicative of trends. \\
Stock data category & Category 3.2.0. \\
Input data & Commercial catches (international landings, ages and length frequencies from catch \\
sampling);
\end{tabular}

\section*{Sources}

ICES. 2012a. Megrim (Lepidorhombus whiffiagonis) in Divisions VIIb-k and VIIIa,b,d. In Report of the ICES Advisory Committee 2012, Section 5.4.19. ICES Advice, 2012, Book 5: 160-167.
ICES. 2012b. Report of the Benchmark Workshop on Flatfish Species and Anglerfish (WKFLAT), 1-8 March 2012, Bilbao, Spain. ICES CM 2012/ACOM:46. 283 pp.
ICES. 2013. Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim (WGHMM), 10-16 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12. and catch.
\(\left.\begin{array}{lllllll}\hline \text { Year } & \text { ICES Advice } & \begin{array}{l}\text { Predicted } \\ \text { catch } \\ \text { /landings } \\ \text { corresp. to } \\ \text { advice }\end{array} & \begin{array}{l}\text { Agreed } \\ \text { TAC }\end{array} & & \begin{array}{l}\text { ICES } \\ \text { landings }\end{array} & \begin{array}{l}\text { Disc. } \\ \text { Slip. }\end{array} \\ & & - & 16.46 & 17.1 & & \\ \text { lCES } \\ \text { catch }\end{array}\right]\)

Weights in thousand tonnes.
\({ }^{1}\) Includes L. boscii.
\({ }^{2}\) Includes Divisions VIIa and VIIIe.

Table 5.4.19.2 Megrim (Lepidorhombus whiffiagonis) in Divisions VIIb-k and VIIIa,b,d. ICES estimates of landings and catches (in tonnes). Preliminary values are indicated.
\begin{tabular}{|c|c|c|c|c|}
\hline & Total landings & Total discards & Total catches & Agreed TAC \({ }^{(1)}\) \\
\hline 1984 & 16659 & 2169 & 18828 & \\
\hline 1985 & 17865 & 1732 & 19597 & \\
\hline 1986 & 18927 & 2321 & 21248 & \\
\hline 1987 & 17114 & 1705 & 18819 & 16460 \\
\hline 1988 & 17577 & 1725 & 19302 & 18100 \\
\hline 1989 & 19233 & 2582 & 21815 & 18100 \\
\hline 1990 & 14370 & 3284 & 17654 & 18100 \\
\hline 1991 & 15094 & 3282 & 18376 & 18100 \\
\hline 1992 & 15600 & 2988 & 18588 & 18100 \\
\hline 1993 & 14929 & 3108 & 18037 & 21460 \\
\hline 1994 & 13684 & 2700 & 16384 & 20330 \\
\hline 1995 & 15862 & 3206 & 19068 & 22590 \\
\hline 1996 & 15109 & 3026 & 18135 & 21200 \\
\hline 1997 & 14230 & 3066 & 17296 & 25000 \\
\hline 1998 & 14345 & 5371 & 19716 & 25000 \\
\hline 1999 & 13305 & 3297 & 16602 & 20000 \\
\hline 2000 & 15031 & 1870 & 16901 & 20000 \\
\hline 2001 & 15778 & 2262 & 18040 & 16800 \\
\hline 2002 & 15987 & 2813 & 18800 & 14900 \\
\hline 2003 & 15687 & 4008 & 19695 & 16000 \\
\hline 2004 & 14300 & 5240 & 19539 & 20200 \\
\hline 2005 & 12703 & 2578 & 15281 & 21500 \\
\hline 2006 & 12000 & 3368 & 15369 & 20425 \\
\hline 2007 & 13048 & 2703 & 15750 & 20425 \\
\hline 2008 & 10853 & 2531 & 13384 & 20425 \\
\hline 2009 & 13348 & 2604 & 15952 & 20425 \\
\hline 2010 & 13185 & 4406 & 17590 & 20106 \\
\hline 2011 & 11923 & 3340 & 15263 & 20106 \\
\hline 2012 & 12080 & 2902 & 14982 & 19101 \\
\hline
\end{tabular}

\footnotetext{
\({ }^{(1)}\) For both megrim species and Division VIIa included.
}

\title{
Celtic Sea and West of Scotland Pollack
}
(Sub-areas VII an VI)
For latest information, see: http://www.ices.dk

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The advice for Pollack is biennial and was not updated this year. Last year's advice was based on the ICES approach for data limited stocks, ICES advises that catches should be no more than 4,200 t. FEAS does not agree with this advice.

This stock falls into ICES category 5 "where landings data only are available". The current TACs are well above the recent average reported landings due to substantial differential uptake between countries or reductions in fisheries catching pollock. In fact commercial landing may not reflect the true outtake of Pollock since recreational fisheries may well be significant. FEAS consider that the \(69 \%\) TAC reduction implied by the ICES advice is well in excess of any reduction in fishing mortality that might be required for pollock.

FEAS point out that pollack are mainly distributed and fished in inshore areas and consequently, the current TAC area may contain several smaller stocks. Various dedicated studies are needed to evaluate the basic biology, life history parameters and stock structure of pollack around Ireland before the stock status can be assessed and more appropriate management be developed. Current fishing surveys, commercial fishery data and sampling do not provide sufficient information to adequately assess stock trends or exploitation rates.



Red Box-TAC/Management Areas

Given that the current TAC has delivered reported landings in the range of those estimated to be sustainable in the longer term. FEAS advise that the TACs for pollock should remain unchanged at \(13,495 \mathrm{t}\) in Sub-area VII and 397 t in Sub-area VI . for 2014. This implies an Irish quota of I,030 t and 56 t for VII and VI respectively.

\section*{CURRENT MANAGEMENT}
- There are two TAC areas for which Ireland has quota.
- The "Joint statement by the Council and the Commission" states it would be desirable if the TAC for Pollock in VI; EU and international waters of Vb ; international waters of XII and XIV of 397 t with an Irish quota of 56 t was maintained for 5 years (subject to scientific advice).
- The "joint statement" does not appear to extend to VII Pollock. The 2013 TAC for VII was \(13,495 \mathrm{t}\) with an associated Irish quota of \(\mathrm{I}, 030 \mathrm{t}\). Quota uptake by Ireland has been high in recent years and is being actively managed in 2012 to remain below the quota.
- There are no explicit management plans for this stock.
- FEAS advises that management objectives be established and that a management plan be developed and implemented for fisheries catching pollack.


\subsection*{5.4.28 Pollack in Subareas VI and VII (Celtic Sea and West of Scotland)}

\section*{Advice for 2014}

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see ICES, 2012): "Based on the ICES approach for data limited stocks, ICES advises that catches should be no more than 4200 tonnes". The new data available for this stock do not change the perception of the stock.

\section*{Quality considerations}

Pollack has a preference for wrecks and rocky bottom habitat, making it difficult to catch with trawls and therefore poorly suited for monitoring by research surveys. Some length frequency data are available for recent years, but area-specific data on life history parameters are missing and should be collected in surveys and through market sampling. Data on growth and maturity, as well as more information from the fisheries, are needed. Landings figures are incomplete and erratic and further scrutiny of this information is required.

More information is needed on: stock identity of pollack within the ICES area; details of the fisheries (more spatial detail in landings data - especially for the earlier years in the time-series, landings by gear, length compositions, discards); life history/biological parameters (surveys and commercial sampling); and recreational fisheries (catch and effort statistics).

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & DCAC (Depletion-Corrected Average Catch). \\
Stock data category & Category 4.1.2. \\
Input data & Official landings. \\
Discards and bycatch & Not included in the assessment. \\
Indicators & None. \\
Other information & None. \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

\section*{Additional considerations}

\section*{Management considerations}

Although the overall TAC is not limiting, in some countries quotas are limiting. The need and relevance of assessing this stock properly must be evaluated, since this would imply collecting data from recreational fisheries on a routine basis. Getting a better understanding of sub-population structures would also imply small-scale research projects. This could be done through pilot studies within the data collection programmes.

The "Joint statement by the Council and the Commission" (Council of the European Union Document Doc 5315/13 PECHE 15, 15 January 2013) states:

The Council and the Commission note that the fishing opportunities regulations include a number of TACs for stocks for which there is limited information on stock status and which are of low economic importance, or are taken only as by-catches, or which show low levels of quota uptake. In these cases, the Council and the Commission consider it appropriate to constrain catches at or below the TAC levels fixed for 2013. To this end, without prejudice to the Commission's right of initiative and the Council's prerogatives under Article 293(1) TFEU, the Commission and the Council consider that it would be desirable to maintain the 2013 TAC level for the stocks listed below for the following five years.

Pollack TAC unit Vb (EU waters), VI, XII, and XIV is included in the list of the Joint statement by the Council and the Commission.

\section*{Sources}

Council of the European Union Document Doc 5315/13 PECHE 15, 15 January 2013. "Joint statement by the Council and the Commission".
ICES. 2012. Pollack in Subareas VI and VII (Celtic Sea and West of Scotland). In Report of the ICES Advisory Committee 2012, Section 5.4.39. ICES Advice, 2012, Book 5: 377-381.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Table 5.4.28.1 Pollack in Subareas VI and VII. ICES advice, management, and official landings.
\begin{tabular}{lccccccc}
\hline Year ICES Advice & \begin{tabular}{c} 
Predicted \\
catch \\
corresp. \\
to advice
\end{tabular} & \begin{tabular}{c} 
EU \\
TAC \\
Subarea \\
VI
\end{tabular} & \begin{tabular}{c} 
EU TAC \\
Subarea \\
VII
\end{tabular} & \begin{tabular}{c} 
Total \\
official \\
landings \\
Subarea \\
VI
\end{tabular} & \begin{tabular}{c} 
Total official \\
landings \\
Subarea \\
VII
\end{tabular} & \begin{tabular}{c} 
Total official \\
landings
\end{tabular} \\
& & - & 1100 & 17000 & 191 & 5377 & \\
\hline 2000 & - & 1100 & 17000 & 217 & 5885 & 6568 \\
2001 & - & 1100 & 17000 & 131 & 5922 & 6053 \\
2002 & - & 880 & 17000 & 203 & 5348 & 5551 \\
2003 & - & 704 & 17000 & 136 & 4786 & 4922 \\
2004 & - & 563 & 17000 & 67 & 4725 & 4792 \\
2005 & - & 450 & 15300 & 37 & 4661 & 4698 \\
2006 & - & 450 & 15300 & 58 & 4611 & 4669 \\
2007 & & - & 450 & 15300 & 53 & 3861 & 3914 \\
2008 & - & 450 & 15300 & 36 & 4063 & 4099 \\
2009 & - & 450 & 13770 & 78 & 4065 & 4142 \\
2010 & & - & 397 & 13495 & 45 & 4072 & 4117 \\
2011 & & - & 397 & 13495 & 45 & 4432 & 4477 \\
2012 & No increase in catch & & & & & & \\
2013 & Catch should be no more than \(1 \%\) & \(<4200\) & 397 & 13495 & & & \\
& more than recent catch (last 3 years) & & & & & & \\
2014 & Same advice as 2013 & \(<4200\) & & & & & \\
\hline
\end{tabular}

Weights in tonnes.
\({ }^{1)}\) Subarea VI; EC waters of Division Vb; international waters of Subareas XII and XIV.


Figure 5.4.28.1 Pollack in Subareas VI and VII. Time-series of landings (tonnes) and outputs of DCAC analysis. The thick lines and grey box correspond to the period used for the analysis and the sensitivity of the input parameters to the model.

\section*{Celtic Sea Plaice}
(Division VIIfg)

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advice is based on the approach for data limited stocks, that catches should be no more than I,608 t , If discard rates do not change from the average of the last three years, this implies landings of no more than 519 t in 2014. This implies an Irish quota of 277 t . FEAS agree with this advice.

This stock falls in to ICES category 3.2.0 for data-limited stocks for which an abundance index is available. Discards exceed landings


Red Box - TAC/Management Area Blue Shading - Assessment Area and technical measures should be introduced to limit the by-catch of this species.

\section*{CURRENT MANAGEMENT}
- The TAC area covers Divisions VIIfg. The assessment area is the same as the TAC area.
- The 2013 TAC was 369 t with an associated Irish quota of 197 t .
- There are no explicit management objectives or plans for this stock. The NWWRAC is developing a mixed fisheries management plan for VIIfg.


\section*{ICES ADVICE 5.4.26 Celtic Sea plaice (Divisions VIIf and g)}

\section*{Advice for 2014}

Based on ICES approach to data-limited stocks, ICES advises that catches should be no more than 1608 tonnes. If discard rates do not change from the average of the last three years, this implies landings of no more than 519 tonnes.

Discards exceed landings and technical measures should be introduced to reduce discard rates.

\section*{Stock status}
\begin{tabular}{l|l|}
\multicolumn{1}{c|}{} & F (Fishing Mortality) \\
\cline { 2 - 3 } & \multicolumn{4}{|c|}{ 2010-2012 } \\
Qualitative evaluation & \(?\)
\end{tabular}
\begin{tabular}{|c|c|}
\multicolumn{1}{c|}{ SSB (Spawning-Stock Biomass) } \\
\cline { 2 - 4 } & 2008-2012 \\
Qualitative evaluation & Increasing \\
\hline
\end{tabular}


Figure 5.4.26.1
Plaice in Divisions VIIfg. Left: Reported landings and discards (tonnes); discards were reported from 2004 to 2012. Right: SSB from the UK (E\&W)-BTS-Q3 survey \(\left(\mathrm{kg} \mathrm{km}^{-1}\right)\); the dashed horizontal lines indicate the average SSB for the respective year range.

Since 2004 the landings have been relatively stable but the discards have been increasing. The average of the stock size indicator (SSB from the survey) in the last two years (2011-2012) is \(50 \%\) higher than the average of the three previous years (2008-2010).

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

Plaice aggregate in spawning grounds off the north Cornish coast in the 1st quarter of the year. The condition factor for plaice is highest in summer/autumn on the more dispersed feeding grounds.

\section*{Environmental influence on the stock}

Juvenile plaice are distributed inshore and migrate offshore once individuals reach maturity. The recruitment of Celtic Sea plaice and neighbouring stocks appear to be related to sea surface temperature variations.

\section*{The fisheries}

The mixed plaice and sole fishery is dominated by beam trawls and otter trawls, with bycatch of both commercial and non-commercial species. The main fishery occurs in the spawning area off the north Cornish coast, at depths greater than 40 m , approximately 20 to 25 miles offshore. Although plaice are taken throughout the year, the bulk of landings occur during February-March following the peak of spawning, and again in September. There is a high rate of discarding in both beam and otter trawl fisheries. Recent discard rates are very high, more than double the landings in 2011 and 2012. ICES estimates that total international landings for 2012 were \(443 \mathrm{t}, \sim 17 \%\) above the TAC of 369 t .
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Catch
Catches (2012) = 1390 t , where $32 \%$ were landings (443 t) and $68 \%$ discards $(947 \mathrm{t})$.
distribution

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\section*{Effects of the fisheries on the ecosystem}

Beam trawling, especially using chain-mat gear, significantly impacts benthic communities, albeit less so on soft substrates and in areas which have been historically exploited by this fishing method.

\section*{Quality considerations}

Discards are substantial, consisting mainly of fish below the minimum landing size.

The advice is based on trends derived from the UK(England \& Wales) beam trawl survey. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished.

The commercial lpue time-series used in the previous assessment is not representative of the abundance in the stock, because discards are not included in the lpue series.

The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis
\begin{tabular}{ll} 
Assessment type & Survey trends. \\
Stock data category & Category 3.2.0. \\
Input data & One survey index (UK (E\&W)-BTS-Q3); \\
& Commercial catches (international landings and discards). \\
Discards and bycatch & Discards are available from 2004 to 2012 and included to provide catch advice. \\
Other information & Benchmarked in 2011 (ICES, 2011). \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

\section*{ECOREGION Celtic Sea and West of Scotland STOCK Plaice in Divisions VIIf,g (Celtic Sea)}

\section*{Reference points}

No reference points are defined for this stock.
Outlook for 2014
No analytical assessment is presented for this stock. The main cause of this is problems with the agreed assessment model. Therefore, fishing possibilities cannot be projected.

\section*{ICES approach to data-limited stocks}

For data-limited stocks for which a biomass index is available, ICES uses as harvest control rule index-adjusted status quo landings. The advice is based on a comparison of the two most recent index values with the three preceding values, combined with recent catch or landings data. Knowledge about the exploitation status also influences the advised landings.

For this stock, the spawning-stock biomass from the survey is estimated to have increased by more than \(20 \%\) between the periods 2008-2010 (average of the three years) and 2011-2012 (average of the two years). This implies an increase in catches of \(20 \%\) in relation to average catches of the last three years, corresponding to catches in 2014 of no more than 1608 t . Assuming that the discard rate remains the same as the average of the last three years ( \(68 \%\) ), the corresponding landings in 2014 are 519 t .

Considering that the biomass has increased by \(50 \%\), no additional precautionary reduction is needed.

\section*{Additional considerations}

\section*{Management considerations}

Discard rates are high for this stock in some seasons/fleets. The high level of discarding indicated in this mixed fishery would suggest a mismatch between the mesh size employed and the size of the fish landed. Increases in the mesh size of the gear will result in fewer discards and in increased yield from the fishery. The use of largermesh gear should be encouraged in this fishery in instances where mixed-fishery issues allow for it.

\section*{Regulations and their effects}

Plaice in the Bristol Channel and Celtic Sea (ICES Divisions VIIf,g) are managed by TAC and technical measures. Technical measures in force for this stock are minimum mesh sizes, minimum landing size, and restricted areas for certain classes of vessels. The minimum landing size for plaice in Divisions VIIf,g is 27 cm .

Since 2005, ICES rectangles 30E4, 31E4, and 32E3 (Division VIIf) have been closed during the first quarter with the intention of reducing the fishing mortality of cod. There is evidence that this closure has redistributed effort to other areas. Closures may have decreased fishing mortality on Celtic Sea plaice, but the degree to which this is effective is unknown.

\section*{Information from the fishing industry}

The UK Fisheries Science Partnership investigations conducted in the Eastern Celtic Sea and Bristol Channel during 2005 confirmed the presence of spawning aggregations off the north Cornish coast. The main issues for the fishery in Divisions VIIf,g were displacement of effort due to the cod recovery zone; and the restrictions on the use of 80 mm mesh west of \(7^{\circ} \mathrm{West}\).

\section*{Data and methods}

The benchmark (ICES, 2011) investigated several assessment methods to explore options for incorporating a short time-series of discard observations into the assessment. None of the approaches examined proved to be entirely satisfactory. The group concluded that the Aarts and Poos (2009) method, developed initially for North Sea plaice, could be used as a trends-only assessment for the provision of management advice, but could not be used as a basis for predicting future catch options. In 2013, the Aarts and Poos (2009) model failed to converge and could not provide realistic representations of observed landings and discards. Moreover, trends in commercial lpue (which conflict with the survey trends) are considered not to be representative of trends in the stock due to the lack of discards. Consequently, ICES provided advice on the basis of trends derived from fishery-independent data (the UK(E\&W) beam trawl survey) that was previously used in the exploratory assessment. This changed the perception of the stock.

Information derived from the fishery-independent \(\mathrm{UK}(\mathrm{E} \& \mathrm{~W})\) beam trawl survey indicates that there has been a reduction in average fishing mortality since 2004 (Figure 5.4.26.3) and a commensurate increase ( \(\sim 50 \%\) ) in spawning-stock biomass over the same period.

\section*{Comparison with previous assessment and advice}

In 2012, advice was provided on the basis of trends derived from the Aarts and Poos (2009) model fitted to catch and tuning series data. In 2013, it proved impossible to use the same basis for advice as last year. Instead, the UK (E\&W) beam trawl survey was used to infer trends in recruitment, stock size (spawning-stock biomass), and fishing mortality.

It is no longer possible to assess fishing mortality trends with respect to F reference points. The survey-based evaluation of SSB trends is also different from that generated by the assessment model last year. As a result, this year's advice is for an increase in catches, as opposed to a decrease in catches.

For last year and this year, the basis for the advice is ICES approach to data-limited stocks.

\section*{Sources}

Aarts, G., and Poos, J. J. 2009. Comprehensive discard reconstruction and abundance estimation using flexible selectivity functions. ICES Journal of Marine Science, 66: 763-771.
ICES. 2011. Report of the Benchmark Workshop on Flatfish (WKFLAT), 1-8 February 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:39.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.


Figure 5.4.26.2a
Plaice in Divisions VIIfg. Commercial landings per unit effort (lpue) for the UK (in Division VIIfg), Ireland (Division VIIg), and Belgium (Division VIIfg) between 1972 and 2012.


Figure 5.4.26.2b
Plaice in Divisions VIIfg. UK(E\&W) beam trawl survey (UK(E\&W) BTSurvey) catch per unit effort (cpue) compared to commercial landings per unit effort (lpue) for the UK between 1972 and 2012.


Figure 5.4.26.3
Plaice in Divisions VIIfg. Time-series of mean fishing mortality at ages 2-5 for the UK(E\&W) Beam Trawl Survey (UK(E\&W)-BTS-Q3) from 1990 to 2012.

Table 5.4.26.1
Plaice in Divisions VIIf,g (Celtic Sea). ICES advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Year & ICES Advice & Predicted catch corresp. to advice & Agreed TAC & Official landings & ICES landings & ICES discards \({ }^{1}\) \\
\hline 1987 & TAC not to be restrictive on other species & - & 1.8 & 1.91 & 1.90 & - \\
\hline 1988 & TAC not to be restrictive on other species & - & 2.5 & 2.19 & 2.12 & - \\
\hline 1989 & TAC not to be restrictive on other species & - & 2.5 & 2.58 & 2.15 & - \\
\hline 1990 & F likely to be F(88) & \(\sim 1.9\) & 1.9 & 2.22 & 2.08 & - \\
\hline 1991 & F likely to be F(89) & \(\sim 1.7\) & 1.9 & 1.83 & 1.50 & - \\
\hline 1992 & No long-term gains in increasing F & - & 1.5 & 1.36 & 1.19 & - \\
\hline 1993 & No long-term gains in increasing F & - & 1.4 & 1.30 & 1.11 & - \\
\hline 1994 & No long-term gains in increasing F & - & 1.4 & 0.98 & 1.07 & - \\
\hline 1995 & No increase in F & 1.29 & 1.4 & 0.96 & 1.03 & - \\
\hline 1996 & 20\% reduction in F & 0.93 & 1.1 & 0.98 & 0.95 & - \\
\hline 1997 & 20\% reduction in F & 1.10 & 1.1 & 1.26 & 1.22 & - \\
\hline 1998 & 20\% reduction in F & 1.00 & 1.1 & 1.15 & 1.07 & - \\
\hline 1999 & 35\% reduction in F & 0.67 & 0.9 & 0.66 & 0.97 & - \\
\hline 2000 & \(30 \%\) reduction in F & 0.70 & 0.80 & 0.72 & 0.72 & - \\
\hline 2001 & 40\% reduction in F & 0.60 & 0.76 & 0.68 & 0.71 & - \\
\hline 2002 & At least 35\% reduction in F & 0.68 & 0.68 & 0.62 & 0.64 & - \\
\hline 2003 & At least 40\% reduction in F & < 0.66 & 0.66 & 0.56 & 0.59 & - \\
\hline 2004 & \(\mathrm{F}<0.10\) or recovery plan & \(<0.21\) & 0.56 & 0.49 & 0.51 & 0.27 \\
\hline 2005 & \(70 \%\) reduction in F or recovery plan & \(<0.25\) & 0.48 & 0.40 & 0.39 & 0.32 \\
\hline 2006 & \(50 \%\) reduction in F or recovery plan & \(<0.40\) & 0.48 & 0.41 & 0.40 & 0.45 \\
\hline 2007 & \(50 \%\) reduction in F or recovery plan & \(<0.38\) & 0.42 & 0.42 & 0.41 & 1.29 \\
\hline 2008 & 60\% reduction in F & \(<0.24\) & 0.49 & 0.38 & 0.44 & 0.58 \\
\hline 2009 & 75\% reduction in F & \(<0.17\) & 0.42 & N/A & 0.46 & 0.61 \\
\hline 2010 & 50\% reduction in F & \(<0.33\) & 0.45 & 0.44 & 0.43 & 0.67 \\
\hline 2011 & See scenarios & - & 0.41 & 0.42 & 0.42 & 1.11 \\
\hline 2012 & Reduce catches & - & 0.37 & 0.45 & 0.44 & 0.95 \\
\hline 2013 & Decrease landings by \(19 \%\) ( \(1.5 \%\) increase followed by \(20 \%\) PA reduction) & \(<0.36\) & 0.37 & & & \\
\hline 2014 & Increase catches by \(20 \%\) & \(1.608^{2}\) & & & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
N/A = French landings not available.
\({ }^{1}\) Discards only available from 2004 to 2012.
\({ }^{2}\) This value (1.068) refers to total catch, including discards. Therefore, it is not directly comparable to the value advised for 2013 (0.36), which referred only to landings. landings and catches as estimated by ICES.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline & 1977 & 1978 & 1979 & 1980 & 1981 & 1982 & 1983 & 1984 & 1985 & 1986 \\
\hline Belgium & 214 & 196 & 171 & 372 & 365 & 341 & 314 & 283 & 357 & 665 \\
\hline UK (Engl. \& Wales) & 150 & 152 & 176 & 227 & 251 & 196 & 279 & 366 & 466 & 529 \\
\hline France & 365 & 527 & 467 & 706 & 697 & 568 & 532 & 558 & 493 & 878 \\
\hline Ireland & 28 & 0 & 49 & 61 & 64 & 198 & 48 & 72 & 91 & 302 \\
\hline N. Ireland & & & & & & & & & & \\
\hline Netherlands & & & & & & & & & & 9 \\
\hline Scotland & 0 & 0 & 0 & 7 & 0 & 0 & 0 & 0 & 0 & 1 \\
\hline Total reported & 757 & 875 & 863 & 1373 & 1377 & 1303 & 1173 & 1279 & 1407 & 2384 \\
\hline Discards & N/A & N/A & N/A & N/A & N/A & N/A & N/A & N/A & N/A & N/A \\
\hline Unallocated & 0 & 0 & 0 & 0 & 0 & 0 & -27 & -69 & 345 & -693 \\
\hline Landings used by WG & 757 & 875 & 863 & 1373 & 1377 & 1303 & 1146 & 1210 & 1752 & 1691 \\
\hline Catch as used by WG & N/A & N/A & N/A & N/A & N/A & N/A & N/A & N/A & N/A & N/A \\
\hline & 1987 & 1988 & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 \\
\hline Belgium & 581 & 617 & 843 & 794 & 836 & 371 & 542 & 350 & 346 & 410 \\
\hline UK (Engl. \& Wales) & 496 & 629 & 471 & 497 & 392 & 302 & 290 & 251 & 284 & 239 \\
\hline France & 708 & 721 & 1089 & 767 & 444 & 504 & 373 & 298 & 254 & 246 \\
\hline Ireland & 127 & 226 & 180 & 160 & 155 & 180 & 89 & 82 & 70 & 83 \\
\hline N. Ireland & & 1 & & & & & & & & \\
\hline Scotland & & & & 1 & & 5 & 9 & 1 & 2 & \\
\hline Total reported & 1912 & 2194 & 2583 & 2219 & 1827 & 1362 & 1303 & 982 & 956 & 978 \\
\hline Discards & N/A & N/A & N/A & N/A & N/A & N/A & N/A & N/A & N/A & N/A \\
\hline Unallocated & -11 & -78 & -432 & -137 & -326 & -174 & -189 & 88 & 72 & -26 \\
\hline Landings used by WG & 1901 & 2116 & 2151 & 2082 & 1501 & 1188 & 1114 & 1070 & 1028 & 952 \\
\hline Catch as used by WG & N/A & N/A & N/A & N/A & N/A & N/A & N/A & N/A & N/A & N/A \\
\hline
\end{tabular}
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 \\
\hline Belgium & 594 & 540 & 371 & 224 & 241 & 248 & 221 & 212 & 168 & 172 \\
\hline UK (Engl. \& Wales) & 258 & 176 & 170 & 134 & 136 & 105 & 127 & 87 & 55 & 88 \\
\hline France & 329 & 298 & & 287 & 262 & 186 & 165 & 145 & 132 & 106 \\
\hline Ireland & 78 & 135 & 115 & 76 & 45 & 79 & 51 & 45 & 44 & 48 \\
\hline Total reported & 1259 & 1149 & 656 & 721 & 684 & 618 & 564 & 489 & 399 & 414 \\
\hline Discards & N/A & N/A & N/A & N/A & N/A & N/A & N/A & 274 & 321 & 453 \\
\hline Unallocated & -42 & -82 & 312 & -3 & 30 & 24 & 30 & 21 & -13 & -10 \\
\hline Landings used by WG & 1217 & 1067 & 968 & 718 & 714 & 642 & 594 & 510 & 386 & 404 \\
\hline Catch as used by WG & N/A & N/A & N/A & N/A & N/A & N/A & N/A & 784 & 707 & 857 \\
\hline
\end{tabular}
\begin{tabular}{|l|r|r|r|r|r|r|}
\cline { 2 - 8 } \multicolumn{1}{c|}{} & \multicolumn{2}{c|}{\(\mathbf{2 0 0 7}\)} & \multicolumn{2}{c|}{\(\mathbf{2 0 0 8}\)} & \(\mathbf{2 0 0 9}\) & \(\mathbf{2 0 1 0}\) \\
\hline Belgium & 194 & 187 & 216 & 188 & 210 & 204 \\
UK (Engl. \& Wales) & 61 & 63 & 55 & 54 & 45 & 44 \\
France & 104 & 62 & \(\mathrm{~N} / \mathrm{A}\) & 136 & 100 & 125 \\
Ireland & 58 & 63 & 63 & 63 & 67 & 76 \\
\hline Total reported & 417 & 375 & \(\mathrm{~N} / \mathrm{A}\) & 442 & 422 & 450 \\
\hline Discards & 1288 & 583 & 608 & 670 & 1107 & 947 \\
\hline Unallocated & -7 & 62 & \(\mathrm{~N} / \mathrm{A}\) & -9 & -1 & -7 \\
\hline Landings used by WG & 410 & 437 & 463 & 433 & 421 & 443 \\
\hline Catch as used by WG & 1698 & 1020 & 1071 & 1103 & 1528 & 1390 \\
\hline
\end{tabular}

\section*{Southwest of Ireland Plaice \\ (Divisions VIIh-k)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice, based on the approach for data-limited stocks, is that landings should be no more than 135 t . This implies an Irish quota of 58 t . FEAS agree with this advice.

This stock falls into ICES category 3.2.0, stocks for which timeseries relative biomass is available. SSB has been increasing. An exploratory assessment suggests that \(F\) has declined recently but it remains above any potential \(\mathrm{F}_{\text {MSY }}\) proxies. Discarding of plaice is in the order of \(30 \%\) by weight so measures should be introduced to reduce plaice by-catch and discards.


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

\section*{CURRENT MANAGEMENT}
- The TAC area covers Divisions VIlh-k. The assessment is carried out using data from VIlj only.
- The 2013 TAC was 141 t with an associated Irish quota of 61 t (44\%). The Irish quota has become very restrictive and was fully utilised by August 2013.
- There are no specific management objectives for this stock.
- This stock is mainly caught within coastal mixed fisheries by otter trawlers in VIIj.


\section*{ICES ADVICE 5.4.27 South West of Ireland Plaice (Divisions VIIh-k)}

\section*{Advice for 2014}

Based on ICES approach to data-limited stocks, ICES advises that landings in 2014 should be no more than 135 t . Discards are known to take place but cannot be quantified; therefore total catches cannot be calculated.

\section*{Stock status}



Figure 5.4.27.1
Plaice in Divisions VIIh-k. Summary of stock assessment based on ICES landings from Divisions VIIj-k. Upper left panel: ICES landings from Division VIIh-k, in tonnes (2012 ICES landings are not available). Other panels: Recruitment, F, and SSB relative to the mean of the time-series. The dashed horizontal lines for SSB indicate the average for the respective year range.

Fishing mortality has been stable since 2008; it remains above potential reference points. The average spawningstock biomass in the last two years (2011-2012) is \(33 \%\) higher than the average of the three previous years (20082010). Recruits of age 4 have shown an increasing trend since 2006.

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

Plaice in Division VIIh are also considered part of this stock for management purposes, but there is no evidence to suggest that there is a biological link between Divisions VIIjk and VIIh.

\section*{The fisheries}

Plaice in Division VIIj are mainly caught by Irish vessels on sandy grounds off the southwest of Ireland. Plaice catches in Division VIIk are negligible. Discard rates are high; in 2012 42\% of the plaice caught in Divisions VIIjk were discarded ( \(30 \%\) by weight).

Catch distribution Total official landings \((2012)=200 \mathrm{t}\). Discards \(=30 \%\) (by weight).

\section*{Quality considerations}

The assessment is carried out for the Divisions VIIjk part of the stock area only. There are evidences that plaice in Division VIIh are not part of the same plaice stock, and this should be further investigated. Furthermore, data on plaice in Division VIIh are scarce. Catch advice was based on ICES landings for Divisions VIIh-k.

The assessment is only based on age 4 and older; ICES does not have information on younger ages. Discards are not included in the assessment since there is no time-series available. Nevertheless, a large proportion of age 4 and 5 are discarded.

The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished.
\begin{tabular}{ll} 
Assessment type & Separable VPA indicative of stock trends. \\
Stock data category & \begin{tabular}{l} 
Category 3.2.0. \\
Commercial catches (international landings from Divisions VIIjk, Irish age \\
compositions from catch sampling); maturity data from plaice in Divisions VIIfg;
\end{tabular} \\
& \begin{tabular}{l} 
natural mortalities from plaice in Divisions VIIfg.
\end{tabular} \\
Discards and bycatch & \begin{tabular}{l} 
Discards were not included since no time series is available. \\
Indicators
\end{tabular} \\
\begin{tabular}{ll} 
None.
\end{tabular} \\
Other information & None. \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

\section*{ECOREGION Celtic Sea and West of Scotland STOCK Plaice in Divisions VIIh-k (Southwest of Ireland)}

\section*{Reference points}

No reference points are defined for this stock since the analysis for this assessment area is based on landings only and does not account for discards which are considered to be substantial.

Outlook for 2014
No reliable forecast can be presented for this stock, because the assessment is only indicative of trends and the absolute level of stock size is uncertain.

\section*{ICES approach to data-limited stocks}

For data-limited stocks for which biomass trends are available, ICES uses as harvest control rule an indexadjusted status quo catch. The advice is based on a comparison of the two most recent index values with the three preceding values, combined with recent catch or landings data. Knowledge about the exploitation status also influences the advised catch.

For this stock the SSB is estimated to have increased by more than \(20 \%\) between the periods 2008-2010 (average of the three years) and 2011-2012 (average of the two years). This implies an increase of landings of at most \(20 \%\) in relation to the last available three-year average landings (i.e. 2009-2011), corresponding to landings of no more than 169 t . Additionally, as the stock is considered overexploited ICES advises that landings should decrease by \(20 \%\) as a precautionary buffer. This results in landings of no more than 135 t in 2014.

Discards are known to take place but are only quantified for 2012; therefore total catches cannot be calculated.

\section*{Additional considerations}

\section*{Management considerations}

The stock area includes Division VIIh. However, the landings from Divisions VIIjk are taken in the northeastern part of Division VIIj which is remote from the northern part of Division VIIh, where most of the Division VIIh landings are taken. It is likely that the plaice from Division VIIh are part of the Divisions VIIe or VIIfg stocks. This needs to be further evaluated. In the lack of firm conclusions, ICES prefers to keep the current stock area.

For Division VIIh, only landings data are available, but not for 2012. Landings in Division VIIh have fluctuated around \(50 \%\) of the total landings of the stock (i.e. in Divisions VIIh-k) since 1993.

The catches are taken in a mixed fishery and should be managed as such. Because plaice are caught in spatially distinct areas, restricting effort in these areas will be more effective than limiting landings. Additionally, management should focus on reducing discards. The recently introduced square mesh panels will have no effect on catches of undersized plaice. An increase in mesh size could improve selection, but will also affect the catches of marketable fish.

\section*{Data and methods}

Natural mortality and maturity are approximated from values used for plaice in Divisions VIIfg. The assessment is based on landings from Divisions VIIjk only.

Comparison with previous assessment and catch options
As last year, the basis for advice is ICES approach to data-limited stocks. Last year category 4 methods were used; this year an index-adjusted status quo catch (i.e. category 3.2.0 methods) is used.

\section*{Sources}

ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Table 5.4.27.1 Plaice in Divisions VIIh-k. ICES advice, management, and landings.
\begin{tabular}{llcccc}
\hline Year & ICES Advice & \begin{tabular}{c} 
Predicted \\
catch corresp. \\
to advice
\end{tabular} & \begin{tabular}{c} 
Agreed \\
TAC
\end{tabular} & \begin{tabular}{c} 
Official \\
landings
\end{tabular} & \begin{tabular}{c} 
ICES \\
landings
\end{tabular} \\
\hline 1993 & - & - & - & 1020 & 655 \\
1994 & - & - & - & 780 & 577 \\
1995 & - & - & - & 900 & 542 \\
1996 & - & - & - & 860 & 453 \\
1997 & - & - & - & 990 & 645 \\
1998 & - & - & - & 790 & 444 \\
1999 & - & - & - & 430 & 406 \\
2000 & - & - & - & 340 & 299 \\
2001 & - & - & 1215 & 310 & 261 \\
2002 & - & - & 1080 & 330 & 313 \\
2003 & Reduce TAC to recent average (1998-2000) & 450 & 582 & 240 & 217 \\
2004 & Reduce TAC to recent average (2000-2002) & 320 & 466 & 230 & 221 \\
2005 & Reduce TAC to recent average (2001-2003) & 271 & 466 & 170 & 164 \\
2006 & Reduce TAC to recent average (2002-2004) & 245 & 396 & 140 & 147 \\
2007 & Reduce TAC to recent average (2003-2005) & 196 & 337 & 140 & 120 \\
2008 & Reduce TAC to recent average (2004-2006) & 177 & 303 & 120 & 135 \\
2009 & Same advice as last year & 177 & 256 & 150 & 148 \\
2010 & Reduce TAC & - & 218 & 160 & 155 \\
2011 & See scenarios & - & 185 & 180 & 120 \\
2012 & Reduce catches & & 176 & 200 & n.a. \\
2013 & Decrease catches by \(36 \%\) (20\% decrease, followed & \(<100\) & 141 & & \\
\hline by 20\% PA reduction) & & & & \\
2014 & Decrease landings by 4\% (20\% increase, followed & \(<135\) & & & \\
\hline by 20\% PA reduction) & & & & \\
\hline
\end{tabular}

Weights in tonnes.
n.a. \(=\) not available.

Table 5.4.27.2 Plaice in Divisions VIIh-k. Official landings (tonnes) by country, and landings used by ICES.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1987 & 1988 & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 \\
\hline Belgium* & 250 & 245 & 403 & 301 & 252 & 246 & 344 & 197 & 235 \\
\hline Denmark & 1 & 1 & 1 & - & - & - & - & - & - \\
\hline France & 85 & 135 & 229 & 77 & 173 & 90 & 64 & 48 & 60 \\
\hline Ireland & 300 & 369 & 454 & 338 & 478 & 477 & 383 & 271 & 321 \\
\hline Netherlands & - & - & - & - & - & - & - & - & - \\
\hline Spain & - & - & - & - & - & - & - & - & - \\
\hline UK - Eng+Wales+ \(\uparrow\) & . & . & 73 & 88 & 287 & 264 & 218 & 258 & 282 \\
\hline UK - England \& Wa & 246 & 433 & . & . & . & . & . & . & . \\
\hline UK - Scotland & - & 1 & - & 1 & 1 & 6 & 7 & 1 & 4 \\
\hline Total & 882 & 1184 & 1160 & 805 & 1191 & 1083 & 1016 & 775 & 902 \\
\hline Unallocated & & & & & & & -361 & -198 & -360 \\
\hline WG estimate & & & & & & & 655 & 577 & 542 \\
\hline Country & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 \\
\hline Belgium* & 304 & 442 & 335 & 45 & 4 & 27 & 69 & 20 & 67 \\
\hline Denmark & - & - & - & - & - & - & - & - & - \\
\hline France & 48 & 69 & 49 & . & 54 & 50 & 45 & 32 & 32 \\
\hline Ireland & 305 & 344 & 286 & 299 & 200 & 160 & 155 & 127 & 91 \\
\hline Netherlands & 52 & - & 13 & 1 & 2 & - & - & - & - \\
\hline Spain & - & - & - & 1 & 5 & 3 & 2 & 6 & 6 \\
\hline UK - Eng+Wales+ \(\uparrow\) & 154 & 138 & 106 & 82 & 75 & 73 & 59 & 56 & 36 \\
\hline UK - England \& W & . & . & . & . & . & . & . & . & . \\
\hline UK - Scotland & 1 & 1 & 1 & 1 & 1 & - & - & - & - \\
\hline Total & 864 & 994 & 790 & 428 & 341 & 313 & 330 & 241 & 232 \\
\hline Unallocated & -411 & -349 & -346 & -22 & -42 & -52 & -17 & -24 & -11 \\
\hline WG estimate & 453 & 645 & 444 & 406 & 299 & 261 & 313 & 217 & 221 \\
\hline
\end{tabular}
\begin{tabular}{lcccccccc}
\hline Country & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline Belgium & 32 & 22 & 7 & 25 & 1 & & 4 & 1 \\
Denmark & & & & & & & & \\
France & 20 & 37 & 30 & 12 & 44 & 55 & 54 & 62 \\
Ireland & 90 & 65 & 72 & 72 & 71 & 66 & 73 & 99 \\
Netherlands & \(\cdot\) & & & & & & & \\
Spain & - & 1 & 13 & 1 & & & & \\
UK - Eng+Wales+r & 28 & 18 & 20 & 12 & 32 & 35 & 44 & 38 \\
UK - England \& Wa & \(\cdot\) & & & & & & & \\
UK - Scotland & - & & 143 & 142 & 122 & 148 & 156 & 175 \\
\hline Total & 170 & -6 & 4 & -22 & 13 & 1 & -1 & -55 \\
\hline Unallocated & 164 & 147 & 120 & 135 & 148 & 155 & 120 & \\
WG estimate & & & & & & \\
\hline
\end{tabular}

\footnotetext{
* Belgian Landings up to 1998 include VIlg
}

Table 5.4.27.3 Plaice in Divisions VIIh-k. Summary of stock assessment. Landings in tonnes for Divisions VIIjk. Recruitment, SSB, and fishing mortality are relative to the average of the time-series.
\begin{tabular}{ccccc}
\hline Year & Landings & \begin{tabular}{c} 
Recruitment \\
(age 4)
\end{tabular} & SSB & \begin{tabular}{c} 
Fbar \\
\(\mathbf{4 - 6}\)
\end{tabular} \\
\hline 1993 & 437 & 2.341 & 1.745 & 1.311 \\
1994 & 317 & 1.682 & 1.549 & 1.046 \\
1995 & 419 & 2.144 & 1.593 & 0.934 \\
1996 & 336 & 1.534 & 1.684 & 0.907 \\
1997 & 375 & 1.534 & 1.880 & 1.074 \\
1998 & 306 & 1.162 & 1.562 & 1.130 \\
1999 & 353 & 1.259 & 1.571 & 1.172 \\
2000 & 229 & 1.117 & 1.310 & 0.921 \\
2001 & 182 & 0.743 & 1.114 & 0.767 \\
2002 & 197 & 0.833 & 0.857 & 1.841 \\
2003 & 151 & 0.471 & 0.583 & 1.018 \\
2004 & 104 & 0.581 & 0.513 & 0.809 \\
2005 & 94 & 0.526 & 0.492 & 1.353 \\
2006 & 71 & 0.316 & 0.400 & 1.199 \\
2007 & 94 & 0.426 & 0.339 & 1.311 \\
2008 & 79 & 0.572 & 0.361 & 0.614 \\
2009 & 79 & 0.678 & 0.527 & 0.669 \\
2010 & 78 & 0.633 & 0.601 & 0.600 \\
2011 & 79 & 0.542 & 0.601 & 0.586 \\
2012 & 113 & 0.904 & 0.718 & 0.739 \\
\hline
\end{tabular}

\section*{West of Ireland Plaice (Divisions VIIb,c)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice for this stock is biennial and last year's advice is valid for 2013 and 2014. The Joint statement by the Fisheries Council and European Commission states it would be desirable if the TAC for this stock be maintained for 5 years (subject to scientific advice). FEAS advise that the information remains the same and the 2013 TAC should be rolled over for 2014. This implies a TAC of 74 t and an Irish Quota of 63 t .


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

- IRE 63 t
-FRA 11 t

\section*{CURRENT MANAGEMENT}
- The TAC covers Divisions VIIb and VIIc. The assessment area is the same as the TAC area.
- The 2013 TAC was 74 t with an associated Irish quota of 63 t ( \(79 \%\) ). Ireland was allocated the largest share of the TAC.
- In the "Communication from the Commission to the Council concerning a consultation on Fishing Opportunities for 2014" \(\operatorname{COM}(2013) 319\) final this stock is listed in Annex III as one of the Stocks where TAC levels are to be kept at those fixed for 2013, unless the state of these stocks changes significantly
- This stock is mainly caught within coastal mixed fisheries by Irish otter trawlers.
- The stock is managed by TAC and although recent landings have been below the TAC. If it is further reduced, the TAC might become restrictive.

\section*{ICES ADVICE 5.4.24 West of Ireland Plaice (Divisions VIIb,c)}

\section*{Advice for 2014 and 2015}

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see ICES, 2012). "Based on the ICES approach for data limited stocks, ICES advises that catches should be no more than 30 tonnes". ICES advises that the same catch advice is also applicable for 2015.

\section*{Quality considerations}

Catches in this area are too low to support the collection of the necessary information for an assessment of the stock status.

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & No assessment. \\
Stock data category & Category 6.2.0. \\
Input data & Official landings statistics. \\
Discards and bycatch & Not available. \\
Indicators & None. \\
Other information & None. \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

\section*{Outlook for 2015}

\section*{ICES approach to data-limited stocks}

Because the precautionary buffer ( \(20 \%\) reduction in catch) was applied in the advice issued in 2012, and catches are marginal, the same catch advice ( 30 t ) is also considered valid for 2015.

\section*{Additional considerations}

\section*{Management considerations}

According to the "Joint statement by the Council and the Commission" (Council of the European Union Document Doc 5315/13 PECHE 15, 15 January 2013):

The Council and the Commission note that the fishing opportunities regulations include a number of TACs for stocks for which there is limited information on stock status and which are of low economic importance, or are taken only as by-catches, or which show low levels of quota uptake. In these cases, the Council and the Commission consider it appropriate to constrain catches at or below the TAC levels fixed for 2013. To this end, without prejudice to the Commission's right of initiative and the Council's prerogatives under Article 293(1) TFEU, the Commission and the Council consider that it would be desirable to maintain the 2013 TAC level for the stocks listed below for the following five years.

Plaice TAC unit VIIbc is included in the list of the Joint statement by the Council and the Commission.

\section*{Sources}

Council of the European Union Document Doc 5315/13 PECHE 15, 15 January 2013. "Joint statement by the Council and the Commission".
ICES. 2012. Plaice in Divisions VIIb,c (West of Ireland). In Report of the ICES Advisory Committee 2012, Section 5.4.11. ICES Advice 2012, Book 5: 108-111.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Table 5.4.24.1
Plaice in Divisions VIIb,c. Advice, management, and landings.
\begin{tabular}{llccc}
\hline Year & ICES Advice & \begin{tabular}{c} 
Predicted catch \\
corresp. to advice
\end{tabular} & \begin{tabular}{c} 
Agreed \\
TAC
\end{tabular} & \begin{tabular}{c} 
Official \\
landings
\end{tabular} \\
\hline 1993 & - & - & - & 196 \\
1994 & - & - & - & 206 \\
1995 & - & - & - & 246 \\
1996 & - & - & - & 251 \\
1997 & - & - & - & 209 \\
1998 & - & - & - & 161 \\
1999 & - & - & - & 159 \\
2000 & - & - & - & 130 \\
2001 & - & - & 240 & 78 \\
2002 & No advice & 90 & 180 & 72 \\
2003 & Reduce TAC to recent landings & 76 & 63 \\
2004 & Reduce TAC to recent av. landings (2000-2002) & 65 & 160 & 53 \\
2005 & Reduce TAC to recent av. landings (2001-2003) & 55 & 160 & 37 \\
2006 & Reduce TAC to recent av. landings (2002-2004) & 40 & 122 & 32 \\
2007 & Reduce TAC to recent av. landings (2003-2005) & 40 & 110 & 35 \\
2008 & Reduce TAC to recent av. landings (2004-2006) & 33 & 94 & 31 \\
2009 & Same advice as last year & - & 52 \\
2010 & Reduce TAC to recent av. landings (2006-2008) & 33 & 80 & 33 \\
2011 & No advice & - & 78 & 18 \\
2012 & No increase in catch & - & 78 & 29 \\
2013 & 20\% reduction in catches (last 3 years' average) & \(<30\) & 74 & \\
2014 & Same catch advice as for 2013 & \(<30\) & & \\
2015 & Same catch advice as for 2013 & \(<30\) & & \\
\hline
\end{tabular}

Weights in tonnes.

\section*{Celtic Sea Sole}

\section*{(Divisions VIIfg)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice, based on the MSY approach, is that landings in 2014 should be no more than 920 t. This implies an Irish quota of 28 t . FEAS agrees with this advice.

This stock falls in to ICES category I for data-rich stocks for which a quantitative assessment is available.


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

\section*{CURRENT MANAGEMENT}
- The TAC area covers Divisions VIlfg. The assessment area is the same as the TAC area.
- The 2013 TAC was I, 100 t with an associated Irish quota of 34 t .
- There is no explicit management plan or objectives for this stock.


\section*{ICES ADVICE 5.4.37 Sole in Divisions VIIf,g (Celtic Sea)}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that catches in 2014 should be no more than 920 t . Discards are considered to be low; therefore all catches are assumed to be landed.

\section*{Stock status}
\begin{tabular}{|c|c|c|}
\hline \multicolumn{3}{|c|}{F (Fishing Mortality)} \\
\hline & 20102011 & 2012 \\
\hline MSY ( \(\mathrm{F}_{\text {MSY }}\) ) & * & ( Above target \\
\hline Precautionary approach \(\left(\mathrm{F}_{\mathrm{pa}}, \mathrm{F}_{\mathrm{lim}}\right)\) & ( \(\downarrow\) & (0) Increased risk \\
\hline \multicolumn{3}{|c|}{SSB (Spawning-Stock Biomass)} \\
\hline & 20112012 & 2013 \\
\hline MSY ( \(\mathrm{B}_{\text {trigger }}\) ) & \(\checkmark \checkmark\) & ( Above trigger \\
\hline Precautionary approach \(\left(\mathrm{B}_{\mathrm{pa}}, \mathrm{B}_{\mathrm{lim}}\right)\) & ( \(\downarrow\) & - Full reproductive capacity \\
\hline
\end{tabular}



Figure 5.4.37.1
Sole in Divisions VIIf,g. Summary of stock assessment. Predicted recruitment values are shaded. Top right: \(\mathrm{SSB} / \mathrm{F}\) for the time-series used in the assessment. Catches and landings are assumed to be the same.

The spawning-stock biomass has been above MSY \(\mathrm{B}_{\text {trigger }}\) since 2001. Fishing mortality has decreased from \(\mathrm{F}_{\text {lim }}\) in 2003 to \(\mathrm{F}_{\text {MSY }}\) in 2005 and remained there until 2011. In 2012 it increased to above \(\mathrm{F}_{\mathrm{pa}}\). Recruitment has been fluctuating around average. The 2009 year class is the lowest of the time-series.

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

The main spawning areas for sole in the Celtic Sea are in waters \(40-75 \mathrm{~m}\) deep, off Trevose Head. Spawning usually takes place between February and April. Juvenile sole are found in relatively high abundance in depths up to 40 m , while 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 (Division VIIf) and adjacent areas (Division VIIg).

\section*{The fisheries}

Sole are taken mainly in a beam trawl fishery that started in the early 1960 s 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 increased during the mid-1970s, and the Belgian otter trawlers have now been almost entirely replaced by beam trawlers. In the Celtic Sea, the beam and otter trawl fleets also take other demersal species such as plaice, cod, rays, brill, turbot, and anglerfish.

Catch distribution Total landings (2012) = \(1096 \mathrm{t}(86 \%\) beam trawlers, \(13 \%\) otter trawlers, and \(1 \%\) Other gear). Beam trawl discards were \(2-5 \%\) in weight.

\section*{Effects of the fisheries on the ecosystem}

Although discard rates of sole are low in beam trawl fisheries (about 2-5\% in weight), discard rates of other (commercial and non-commercial) species can be considerable. Beam trawling, especially when using chain-mat gear, is known to have a significant impact on the benthic communities, although less so on soft substrates and in areas which have been historically exploited by this fishing method. Benthic drop-out panels have been shown to release around \(75 \%\) of benthic invertebrates from the catches. Quality considerations

Incoming recruitment of strong year classes may be overestimated. The research beam trawl survey and commercial indices show divergent signals on recruitment. Discards are currently not included in the assessment, but given the low discard rates of sole it is unlikely that the inclusion of discards would change the perception of the stock. There is a tendency to overestimate SSB and underestimate fishing mortality.


Figure 5.4.37.2 Sole in Divisions VIIf,g (Celtic Sea). Historical assessment results (final-year recruitment estimates are included).

Scientific basis
\begin{tabular}{ll} 
Assessment type & Age-based analytical assessment (XSA). \\
Stock data category & \begin{tabular}{l} 
Category 1. \\
Input data
\end{tabular} \\
& \begin{tabular}{l} 
Commercial catches: international landings, ages and length frequencies from catch \\
sampling by métier; one survey index (UK(E\&W)-BTS-Q3); two commercial indices \\
(BE-CBT and UK(E\&W)-CBT); maturity data from a combined-sex maturity (ICES,
\end{tabular} \\
& \begin{tabular}{l} 
1998); natural mortality is assumed to be constant.
\end{tabular} \\
Discards and bycatch & Discards are assumed low and not included in the assessment. \\
Indicators & None. \\
Other information & None. \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

\section*{ECOREGION Celtic Sea and West of Scotland \\ STOCK}

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline \multirow{4}{l|}{\begin{tabular}{l} 
MSY \\
Approach
\end{tabular}} & MSY \(\mathrm{B}_{\text {triger }}\) & 2200 t. & \(\mathrm{B}_{\mathrm{pa}}\). \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{MSY}}\) & 0.31 & Provisional proxy based on stochastic simulations. \\
\hline \multirow{4}{*}{\begin{tabular}{l} 
Precautionary \\
Approach
\end{tabular}} & \(\mathrm{B}_{\text {lim }}\) & Not defined. & \\
\cline { 2 - 4 } & \(\mathrm{B}_{\mathrm{pa}}\) & 2200 t. & \begin{tabular}{l} 
There is no evidence of reduced recruitment at the lowest \\
biomass observed and \(\mathrm{B}_{\mathrm{pa}}\) can therefore be set equal to the \\
lowest observed SSB.
\end{tabular} \\
\cline { 2 - 4 } & \(\mathrm{F}_{\text {lim }}\) & 0.52 & \(\mathrm{~F}_{\text {lim }}: \mathrm{F}_{\text {loss. }}\) \\
\cline { 2 - 5 } & \(\mathrm{F}_{\mathrm{pa}}\) & 0.37 & \begin{tabular}{l} 
This F is considered to have a high probability of avoiding \(\mathrm{F}_{\text {lim }}\) \\
and maintaining SSB above \(\mathrm{B}_{\mathrm{pa}}\) for ten years, taking into \\
account the uncertainty of assessments. \(\mathrm{F}_{\mathrm{pa}}: \mathrm{F}_{\text {lim }} \times 0.72\) implies a \\
less than \(5 \%\) probability that \(\left(\mathrm{SSB}_{\mathrm{MT}}<\mathrm{B}_{\mathrm{pa}}\right)\).
\end{tabular} \\
\hline
\end{tabular}
(unchanged since: 2010)

\section*{Outlook for 2014}

Basis: \(\mathrm{F}(2013)=\mathrm{F}_{\mathrm{sq}}=\) mean \((\mathrm{F} 2010-2012)=0.34 ; \mathrm{R}(2013)=\mathrm{GM}(1972-2010)=4848\) (thousands); Catches (2013) \(=986\) (no discards); SSB \((2014)=3285\).
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Rationale & \[
\begin{gathered}
\text { Catches } \\
\text { (2014) }
\end{gathered}
\] & Basis & \[
\begin{gathered}
F \\
(2014)
\end{gathered}
\] & \[
\begin{gathered}
\hline \text { SSB } \\
(2015)
\end{gathered}
\] & \[
\begin{gathered}
\text { \%SSB } \\
\text { change }{ }^{1)}
\end{gathered}
\] & \begin{tabular}{l}
\% TAC \\
change
\end{tabular} \\
\hline MSY approach & 920 & \(\mathrm{F}_{\text {MSY }}\) & 0.31 & 3465 & +5\% & -16\% \\
\hline Precautionary approach & 1071 & \(\mathrm{F}_{\mathrm{pa}}\) & 0.37 & 3316 & +1\% & -3\% \\
\hline Zero catch & 0 & \(\mathrm{F}=0\) & 0.00 & 4377 & +33\% & -100\% \\
\hline \multirow[t]{4}{*}{Other options} & 935 & \[
\begin{gathered}
\mathrm{TAC}-15 \% \\
\left(\mathrm{~F}_{2013} \times 0.92\right) \\
\hline
\end{gathered}
\] & 0.32 & 3450 & +5\% & -15\% \\
\hline & 1004 & \(\mathrm{F}_{2013}\) & 0.34 & 3382 & +3\% & -9\% \\
\hline & 1100 & \[
\begin{gathered}
\text { Stable TAC } \\
\left(\mathrm{F}_{2013} \times 1.11\right) \\
\hline
\end{gathered}
\] & 0.38 & 3287 & 0\% & 0\% \\
\hline & 1265 & \[
\begin{gathered}
\mathrm{TAC}+15 \% \\
\left(\mathrm{~F}_{2013} \times 1.29\right) \\
\hline
\end{gathered}
\] & 0.45 & 3126 & -5\% & +15\% \\
\hline
\end{tabular}

Weights in tonnes.
\({ }^{1)}\) SSB 2015 relative to SSB 2014.
\({ }^{2)}\) Catches 2014 relative to TAC 2013.

\section*{MSY approach}

Following the ICES MSY approach implies a fishing mortality at 0.31 , resulting in catches of 920 t in 2014. This is expected to lead to an SSB of 3465 t in 2015 . Discards are considered to be low; therefore all catches are assumed to be landed.

No transition to the ICES MSY approach is needed since in 2010 the fishing mortality was already below \(\mathrm{F}_{\text {MSY }}\).

\section*{Precautionary approach}

The fishing mortality in 2014 should be no more than \(\mathrm{F}_{\mathrm{pa}}\), corresponding to catches of less than 1071 t in 2014. This is expected to keep SSB above \(\mathrm{B}_{\mathrm{pa}}\) in 2015. Discards are considered to be low; therefore all catches are assumed to be landed.

\section*{Additional considerations}

Sole are mainly taken in a beam trawl fishery as part of a mixed demersal fishery with plaice and, to a lesser extent, cod.

The Celtic Sea is an area without days-at-sea limitations for demersal fisheries. In the past this has resulted in increased effort in the Celtic Sea as a direct result of restrictive effort in other areas. This was particularly the case in 2004-2005 when effort in the sole fishery increased because of restrictive days-at-sea in the eastern Channel (Division VIId). The removal of the restrictive days-at-sea EU regulation in Division VIId that was in place prior to 2006, resulted in an area shift of the Belgian beam trawl fleet back to Division VIId and a strong decrease in effort deployment in the Celtic Sea by that fleet. Since 2008 the effort of this fleet has gradually increased to the levels observed before the days-at-sea limitations were introduced in Division VIId.

\section*{Regulations and their effects}

Since 2005, ICES rectangles \(30 \mathrm{E} 4,31 \mathrm{E} 4\), and 32 E 3 have been closed during the first quarter (in EU Council Regulations for TACs) with the intention of reducing the fishing mortality of cod. The effects of the closure on sole are not known although there have been spatial and temporal changes in the distribution of effort.

\section*{Changes in fishing technology and fishing patterns}

Beam trawlers account for the majority of the vessels targeting sole. High fuel costs may have contributed to a reduction in effort in Divisions VIIf,g since 2008. In addition, several vessels of this fleet segment are developing methods to reduce fuel costs. Effort deployment of the Belgian beam trawl fleet increased substantially in 2012.

\section*{Uncertainty in the assessment and the forecast}

The higher estimate of fishing mortality in 2012 is considered to be uncertain.

\section*{Comparison with previous assessment and advice}

Historical trends in SSB and fishing mortality are consistent with last year's assessment. The most recent F values (2011) have been revised upwards by \(10 \%\), and SSB in 2012 has been revised downwards by \(12 \%\).

The basis for advice this year is the same as last year.

\section*{Sources}

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9-18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.
ICES. 1998. Working Group on Southern Shelf Demersal Stocks (WGSSDS). ICES CM 1998/Assess:04. WD presented to the WGSSDS by Pawson, M. G., and Harley, B. F. M: Revision of maturity ogives for plaice and sole in the Celtic Sea (ICES Div. VIIf +g ).
Trebilcock, P., and de Rozarieux, N. 2009. National Federation Fishermen's Organisation Annual Fisheries Reports. Cornish Fish Producers Organisation / Seafood Cornwall Training Ltd, March 2009.


Figure 5.4.37.3
Sole in Divisions VIIf,g (Celtic Sea). Stock-recruitment (left panel) and yield-per-recruit analysis (right panel) plots.

Table 5.4.37.1 Sole in Divisions VIIf,g (Celtic Sea). Advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & ICES Advice & Predicted catch corresp. to advice & Agreed TAC & Official landings & ICES landings \\
\hline 1987 & Status quo F; TAC & 1.6 & 1.6 & 1.23 & 1.22 \\
\hline 1988 & \(\mathrm{F}=\mathrm{F}(\mathrm{pre}-86) ; \mathrm{TAC}\) & 0.9 & 1.1 & 1.2 & 1.15 \\
\hline 1989 & F at F (81-85); TAC & 1.0 & 1.0 & 0.99 & 0.99 \\
\hline 1990 & No increase in F & 1.2 & 1.2 & 1.24 & 1.19 \\
\hline 1991 & No increase in F & 1.1 & 1.2 & 1.50 & 1.11 \\
\hline 1992 & No long-term gains in increasing F & 1.1 & 1.2 & 1.06 & 0.98 \\
\hline 1993 & No long-term gains in increasing F & - & 1.1 & 1.03 & 0.93 \\
\hline 1994 & No long-term gains in increasing F & - & 1.1 & 1.02 & 1.01 \\
\hline 1995 & No increase in F & 1.0 & 1.1 & 1.17 & 1.16 \\
\hline 1996 & 20\% reduction in F & 0.8 & 1.0 & 1.08 & 1.00 \\
\hline 1997 & 20\% reduction in F & 0.8 & 0.9 & 1.04 & 0.93 \\
\hline 1998 & 20\% reduction in F & 0.7 & 0.85 & 1.01 & 0.88 \\
\hline 1999 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & 0.81 & 0.96 & 0.95 & 1.01 \\
\hline 2000 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & < 1.16 & 1.16 & 1.04 & 1.09 \\
\hline 2001 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<0.81\) & 1.02 & 1.12 & 1.17 \\
\hline 2002 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & < 1.00 & 1.07 & 1.12 & 1.35 \\
\hline 2003 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<1.24\) & 1.24 & 1.21 & 1.39 \\
\hline 2004 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & < 1.00 & 1.05 & 1.13 & 1.25 \\
\hline 2005 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<0.84\) & 1.00 & 1.00 & 1.04 \\
\hline 2006 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<0.88\) & 0.95 & 0.89 & 0.95 \\
\hline 2007 & Reduce F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<0.84\) & 0.89 & 0.94 & 0.95 \\
\hline 2008 & Keep F below \(\mathrm{F}_{\mathrm{pa}}\) & \(<1.00\) & 0.964 & 0.75 & 0.80 \\
\hline 2009 & No long-term gain in increasing F & \(<0.94\) & 0.993 & 0.73 & 0.79 \\
\hline 2010 & No long-term gain in increasing F & \(<0.92\) & 0.993 & 0.87 & 0.86 \\
\hline 2011 & See scenarios & - & 1.241 & 1.01 & 1.03 \\
\hline 2012 & MSY approach & < 1.06 & 1.060 & 1.08 & 1.10 \\
\hline 2013 & MSY approach & < 1.10 & 1.100 & & \\
\hline 2014 & MSY approach & \(<0.92\) & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
}
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline \multicolumn{12}{|l|}{Table 5.4.37.2} \\
\hline Year & Belgium & Denmark & France & Ireland & UK(E.\&W,NI.) & UK(Scotland) & Netherlands & TotalOfficial & Unallocated & Used by ICES & TAC \\
\hline 1986 & 1039 * & 2 & 146 & 188 & 611 & - & 3 & 1989 & -389 & 1600 & \\
\hline 1987 & 701 * & - & 117 & 9 & 437 & - & - & 1264 & -42 & 1222 & 1600 \\
\hline 1988 & 705 * & - & 110 & 72 & 317 & - & - & 1204 & -58 & 1146 & 1100 \\
\hline 1989 & 684 * & - & 87 & 18 & 203 & - & - & 992 & 0 & 992 & 1000 \\
\hline 1990 & 716 * & - & 130 & 40 & 353 & 0 & - & 1239 & -50 & 1189 & 1200 \\
\hline 1991 & 982 * & - & 80 & 32 & 402 & 0 & - & 1496 & -389 & 1107 & 1200 \\
\hline 1992 & 543 * & - & 141 & 45 & 325 & 6 & - & 1060 & -79 & 981 & 1200 \\
\hline 1993 & 575 * & - & 108 & 51 & 285 & 11 & - & 1030 & -102 & 928 & 1100 \\
\hline 1994 & 619 * & - & 90 & 37 & 264 & 8 & - & 1018 & -9 & 1009 & 1100 \\
\hline 1995 & 763 * & - & 88 & 20 & 294 & - & - & 1165 & -8 & 1157 & 1100 \\
\hline 1996 & 695 * & - & 102 & 19 & 265 & 0 & - & 1081 & -86 & 995 & 1000 \\
\hline 1997 & 660 * & - & 99 & 28 & 251 & 0 & - & 1038 & -111 & 927 & 900 \\
\hline 1998 & 675 * & - & 98 & 42 & 198 & - & - & 1013 & -138 & 875 & 850 \\
\hline 1999 & 604 & - & 61 & 51 & 231 & 0 & - & 947 & 65 & 1012 & 960 \\
\hline 2000 & 694 & - & 74 & 29 & 243 & - & - & 1040 & 51 & 1091 & 1160 \\
\hline 2001 & 720 & - & 77 & 35 & 288 & - & - & 1120 & 48 & 1168 & 1020 \\
\hline 2002 & 703 & - & 65 & 32 & 318 & + & - & 1118 & 227 & 1345 & 1070 \\
\hline 2003 & 715 & - & 124 & 26 & 342 & + & - & 1207 & 185 & 1392 & 1240 \\
\hline 2004 & 735 & - & 79 & 33 & 283 & - & - & 1130 & 119 & 1249 & 1050 \\
\hline 2005 & 645 & - & 101 & 34 & 217 & - & - & 997 & 47 & 1044 & 1000 \\
\hline 2006 & 576 & - & 75 & 38 & 232 & - & - & 921 & 25 & 946 & 950 \\
\hline 2007 & 582 & - & 85 & 32 & 244 & - & - & 943 & 2 & 945 & 890 \\
\hline 2008 & 466 & - & 68 & 28 & 218 & - & - & 780 & 20 & 800 & 964 \\
\hline 2009 & 513 & - & 74 & 26 & 194 & - & - & 807 & -2 & 805 & 993 \\
\hline 2010 & 620 & - & 45 & 27 & 179 & - & - & 871 & 5 & 876 & 993 \\
\hline 2011 & 766 & - & 50 & 30 & 168 & - & - & 1013 & 16 & 1029 & 1241 \\
\hline \(2012{ }^{1}\) & 827 & - & 48 & 33 & 170 & - & - & 1078 & 18 & 1096 & 1060 \\
\hline
\end{tabular}

\footnotetext{
Preliminary.
}

Sole in Divisions VIIf,g (Celtic Sea). Summary of stock assessment (all catches are assumed to be landed).
\begin{tabular}{crcrc}
\hline Year & \(\begin{array}{c}\text { Recruitment } \\
\text { Age 1 } \\
\text { thousands }\end{array}\) & \multicolumn{1}{l}{ SSB } & \multicolumn{1}{l}{ Landings } & \(\begin{array}{c}\text { Mean F } \\
\text { tonnes }\end{array}\) \\
& 9602 & 8020 & 1861 & 0.3619 \\
tonnes
\end{tabular}\(]\)

\footnotetext{
* Geometric mean (1971-2010).
}

\section*{Southwest of Ireland Sole \\ (Divisions VIIh-k)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice, based on the approach for data-limited stocks, is that catches should be no more than 252 t. This implies an Irish quota of II3 t. FEAS does not agree with this advice.

This stock falls into ICES category 3.2.0, stocks for which timeseries relative biomass is available. SSB has been increasing. An exploratory assessment suggests that \(F\) is below the current proxy for \(F_{\text {MSY }}\). The ICES advice is based on an II\% increase on average reported landings which are well below the recent TACs


Red Box-TAC/Management Area Blue Shading- Assessment Area due to various national uptake differences.

FEAS consider that the current TAC management has resulted in a stock that appears to be exploited sustainably. Therefore FEAS recommend that the TAC for 2014 should remain unchanged at 402 t . This implies an Irish quota of 18 It .

\section*{CURRENT MANAGEMENT}
- The TAC area covers Divisions VIlh-k. The assessment is carried out using data from VIlj only.
- The 2013 TAC was 402 t with an associated Irish quota of I8I t (45\%). Ireland was allocated the largest share of the TAC.
- This stock is mainly caught within coastal mixed fisheries by otter trawlers in VIIj.
- The stock is managed by TAC and recent landings have been below the TAC.


ICES ADVICE

\subsection*{5.4.38 Sole southwest of Ireland (Division VIIh-k)}

\section*{Advice for 2014}

Based on ICES approach to data-limited stocks, ICES advises that that catches should be no more than 252 t in 2014. All catches are assumed to be landed.

\section*{Stock status}



Figure 5.4.38.1 Sole in Divisions VIIh-k. Summary of stock assessment, based on Division VIIj,k ICES landings. Upper left panel: official landings from Division VIIh-k, in tonnes. Other panels: Recruitment, F, and SSB relative to the mean of the time-series. The dashed horizontal lines for SSB indicate the average for the respective year range.

Fishing mortality had a substantial decrease over the period 2003-2006, and has since then remained around one third of the 1993-2003 average. SSB has been increasing since 2005. The average SSB in the last two years (2011-2012) is \(11 \%\) higher than the average of the three previous years (2008-2010).

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

Sole is a flatfish that mainly occurs in the temperate waters of the eastern Atlantic, with a preference for sandy and muddy bottoms. Juveniles are found in coastal nurseries, whereas adults migrate to deeper waters. Sole is a nocturnal predator feeding on worms, molluscs, and small crustaceans, and is therefore more susceptible to capture by fisheries at night than in daylight. Recruitment is known to be variable in this species.

Sole in Division VIIh are also considered part of this stock for management purposes, but there is no evidence to suggest a biological link between Divisions VIIjk and VIIh.

\section*{The fisheries}

Sole in Division VIIj are mainly caught by Irish vessels on sandy grounds off the southwest of Ireland. Catches in Division VIIk are negligible.

Catch distribution Official landings (2012) were 233 t . ICES landings in Division VIIjk \(=94 \mathrm{t}\). Discards are considered to be negligible.

\section*{Quality considerations}

The landings-at-age data used in the assessment are derived from Divisions VIIjk only. There is sufficient contrast in the landings-at-age matrix to inform the model. However, no tuning data were available, and there may be some data issues between 1999 and 2003 which result in erratic F estimates. The trend in SSB is broadly in line with lpue trends from the Irish OTB fishery in the areas where the majority of the catches are taken. Therefore, assessment results are only used as indicative of stock trends.

The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished.

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & Separable VPA indicative of stock trends. \\
Stock data category & \begin{tabular}{l} 
Category 3.2.0. \\
Commercial catches (international landings from Divisions VIIjk, Irish age \\
composition from catch sampling); natural mortalities and maturity data from sole
\end{tabular} \\
& \begin{tabular}{l} 
stock in Divisions VIIfg.
\end{tabular} \\
Discards and bycatch & \begin{tabular}{l} 
Discards were not included in the assessment and are considered negligible.
\end{tabular} \\
\begin{tabular}{ll} 
Indicators
\end{tabular} & None. \\
Other information & This stock is scheduled to be benchmarked next year. \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

\section*{ECOREGION Celtic Sea and West of Scotland \\ STOCK Sole in Divisions VIIh-k}

\section*{Reference points}

No reference points are defined for this stock. Previous defined reference points were provisional.

\section*{ICES approach to data-limited stocks}

For data-limited stocks for which a biomass index is available, ICES uses as harvest control rule an index-adjusted status quo catch. The advice is based on a comparison of the two most recent index values with the three preceding values, combined with recent catch or landings data. Knowledge about the exploitation status also influences the advised catch.

For this stock the biomass is estimated to have increased by \(11 \%\) between the periods 2008-2010 (average of the three years) and 2011-2012 (average of the two years). This implies an increase of catches of at most \(11 \%\) in relation to average official landings of the last three years, corresponding to catches in 2014 of no more than 252 tonnes. All catches are assumed to be landed. Considering that fishing mortality has reduced significantly, no additional precautionary reduction is needed.

\section*{Additional considerations}

\section*{Management considerations}

The stock area includes Division VIIh. However, the landings in Divisions VIIj,k are taken in the northeastern part of Division VIIj, which is about 250 km away from the northern part of Division VIIh where most of the landings from Division VIIh are taken. It is likely that sole in Division VIIh is part of the Division VIIe or Division VIIf stocks. This needs to be further evaluated. In the lack of firm conclusions, ICES prefers to keep the current stock area.

The TAC is not restrictive, but for some countries the quota appears to have become restrictive.

\section*{Data and methods}

The landings-at-age data used in the assessment are derived from Divisions VIIj,k only. Estimates of natural mortality and maturity are approximated from values used for the sole stock in Divisions VIIf,g.

\section*{Comparison with previous assessment and catch options}

As last year, the basis for advice is ICES approach to data-limited stocks. Last year the category 4 method was used, and this year an index-adjusted status quo catch (i.e. category 3.2.0 method) is used.

\section*{Source}

ICES. 2013. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Table 5.4.38.1 Sole in Divisions VIIjh-k. Advice, management, and landings.
\begin{tabular}{llcccc}
\hline Year & ICES Advice & \begin{tabular}{c} 
Predicted catch \\
corresp. to \\
advice
\end{tabular} & \begin{tabular}{c} 
Agreed \\
TAC
\end{tabular} & \begin{tabular}{c} 
Official \\
landings
\end{tabular} & \begin{tabular}{c} 
ICES \\
landings
\end{tabular} \\
\hline 1996 & No advice & - & - & 826 & 443 \\
1997 & No advice & - & - & 742 & 564 \\
1998 & No advice & - & - & 759 & 423 \\
1999 & No advice & - & - & 406 & 381 \\
2000 & No advice & - & - & 303 & 329 \\
2001 & No advice & - & 650 & 352 & 325 \\
2002 & No advice & - & 650 & 517 & 430 \\
2003 & Reduce TAC to recent landings & 330 & 390 & 486 & \\
2004 & Reduce TAC to recent average (2000-2002) & 360 & 390 & 450 & \\
2005 & Reduce TAC to recent average (2001-2003) & 335 & 650 & 395 & \\
2006 & Reduce TAC to recent average (2002-2004) & 380 & 650 & 279 & \\
2007 & Reduce TAC to recent average (2003-2005) & 287 & 650 & 278 & \\
2008 & Reduce TAC to recent average (2004-2006) & 300 & 650 & 219 & \\
2009 & Same advice as last year & 300 & 553 & 208 & \\
2010 & No advice & - & 498 & 229 & \\
2011 & No increase in catches & - & 423 & 218 & \\
2012 & No increase in catches & - & 423 & 233 & \\
2013 & Decrease catches by \(8 \%\) (15\% increase, followed & \(<200\) & 402 & & \\
2014 & by 20\% PA reduction & & & & \\
\hline Increase catches by \(11 \%\) & \(<252\) & & & \\
\hline
\end{tabular}

Weights in tonnes.

Table 5.4.38.2 Sole in Divisions VIIh-k. Landings ( t ) per country as officially reported to ICES.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1973 & 1974 & 1975 & 1976 & 1977 & 1978 & 1979 & 1980 & 1981 & 1982 \\
\hline Belgium & 406 & 369 & 210 & 638 & 519 & 290 & 384 & 522 & 576 & 471 \\
\hline Denmark & - & - & - & - & - & - & & - & - & - \\
\hline France & 390 & 143 & 207 & 19 & 103 & 23 & 29 & 27 & 107 & 104 \\
\hline Ireland & 108 & 116 & 97 & 152 & 126 & 73 & 109 & 162 & 195 & 172 \\
\hline Netherlands & 4 & 15 & 2 & 33 & 140 & 60 & - & - & & \\
\hline Spain & 190 & 153 & 152 & 131 & 26 & 1 & 8 & 2 & & \\
\hline UK - Eng+Wales+N. & . & . & . & . & . & . & . & . & . & . \\
\hline UK - England \& Wal & 6 & 5 & 24 & 11 & 12 & 11 & 18 & 42 & 83 & 108 \\
\hline UK - Scotland & - & - & - & - & - & - & - & - & - & - \\
\hline Total & 1104 & 801 & 692 & 984 & 926 & 458 & 548 & 755 & 961 & 855 \\
\hline Country & 1983 & 1984 & 1985 & 1986 & 1987 & 1988 & 1989 & 1990 & 1991 & 1992 \\
\hline Belgium & 411 & 474 & 318 & 442 & 271 & 254 & 252 & 353 & 358 & 312 \\
\hline Denmark & - & - & - & - & - & - & - & - & - & - \\
\hline France & 176 & 120 & 25 & 38 & 44 & 53 & 84 & 66 & 55 & 43 \\
\hline Ireland & 176 & 156 & 201 & 188 & 168 & 182 & 206 & 266 & 306 & 255 \\
\hline Netherlands & 51 & 194 & 280 & 3 & & - & - & - & - & - \\
\hline Spain & 38 & & & & & - & - & - & - & - \\
\hline UK - Eng+Wales+N. & . & . & . & . & . & . & 177 & 144 & 234 & 215 \\
\hline UK - England \& Wal & 129 & 151 & 200 & 261 & 193 & 166 & . & . & . & . \\
\hline UK - Scotland & - & - & - & - & - & - & - & - & - & 2 \\
\hline Total & 981 & 1095 & 1024 & 932 & 676 & 655 & 719 & 829 & 953 & 827 \\
\hline Country & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 \\
\hline Belgium & 317 & 338 & 433 & 375 & 368 & 346 & 101 & 8 & 13 & 154 \\
\hline Denmark & - & - & - & - & - & - & - & - & - & - \\
\hline France & 44 & 42 & 47 & 50 & 58 & 74 & . & 79 & 103 & 108 \\
\hline Ireland & 237 & 184 & 243 & 183 & 203 & 221 & 207 & 111 & 125 & 130 \\
\hline Netherlands & - & - & - & 70 & - & 7 & 1 & 10 & - & - \\
\hline Spain & - & - & - & - & - & - & - & - & - & 1 \\
\hline UK - Eng+Wales+N. & 209 & 172 & 192 & 148 & 113 & 111 & 97 & 95 & 111 & 124 \\
\hline UK - England \& Wal & . & . & . & . & . & . & . & . & . & . \\
\hline UK - Scotland & 5 & 2 & - & - & - & - & - & - & - & - \\
\hline Total & 812 & 738 & 915 & 826 & 742 & 759 & 406 & 303 & 352 & 517 \\
\hline Unallocated & & & & -383 & -178 & -336 & -25 & 26 & -27 & -87 \\
\hline WG estimate & & & & 443 & 564 & 423 & 381 & 329 & 325 & 430 \\
\hline & & & & & & & & & & \\
\hline Country & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline Belgium & 170 & 157 & 90 & 36 & 31 & 10 & 11 & 20 & 10 & 17 \\
\hline Denmark & - & - & & & & & & & & \\
\hline France & 133 & 103 & 93 & 92 & 78 & 57 & 79 & 87 & 90 & 85 \\
\hline Ireland & 105 & 111 & 98 & 63 & 78 & 72 & 60 & 71 & 64 & 85 \\
\hline Netherlands & - & - & & 1 & & & & & & \\
\hline Spain & - & - & 2 & & & & & & & \\
\hline UK - Eng+Wales+N. & 78 & 79 & 112 & 87 & 91 & 80 & 58 & 51 & 54 & 46 \\
\hline UK - England \& Wal & . & . & & & & & & & & \\
\hline UK - Scotland & - & - & & & & & & & & \\
\hline Total & 486 & 450 & 395 & 279 & 278 & 219 & 208 & 229 & 218 & 233 \\
\hline
\end{tabular}

Sole in Divisions VIIh-k. Summary of stock assessment :landings (in tonnes) and assessment results are from Divisions VIIjk. Recruitment, SSB, and F are relative to the mean of the time-series.
\begin{tabular}{ccccc}
\hline Year & Landings & \begin{tabular}{c} 
Recruitment \\
(Age 2)
\end{tabular} & SSB & \begin{tabular}{c} 
Mean F \\
\((\mathbf{3 - 8})\)
\end{tabular} \\
\hline 1993 & 246 & 1.148 & 1.436 & 1.486 \\
1994 & 178 & 1.883 & 1.436 & 0.876 \\
1995 & 241 & 0.744 & 1.332 & 1.333 \\
1996 & 166 & 1.217 & 1.251 & 0.876 \\
1997 & 191 & 1.234 & 1.369 & 1.029 \\
1998 & 219 & 1.101 & 1.246 & 1.219 \\
1999 & 296 & 1.058 & 1.115 & 2.362 \\
2000 & 117 & 1.444 & 0.826 & 1.029 \\
2001 & 134 & 1.005 & 0.936 & 1.410 \\
2002 & 213 & 0.734 & 0.995 & 1.714 \\
2003 & 150 & 0.613 & 0.758 & 1.562 \\
2004 & 87 & 0.659 & 0.608 & 0.914 \\
2005 & 77 & 0.825 & 0.588 & 0.838 \\
2006 & 61 & 1.715 & 0.603 & 0.495 \\
2007 & 83 & 0.866 & 0.779 & 0.495 \\
2008 & 77 & 0.800 & 0.848 & 0.457 \\
2009 & 69 & 0.877 & 0.877 & 0.419 \\
2010 & 82 & 1.314 & 0.986 & 0.533 \\
2011 & 86 & 0.416 & 0.974 & 0.457 \\
2012 & 94 & 0.348 & 1.036 & 0.495 \\
\hline
\end{tabular}

\section*{West of Ireland Sole \\ (Divisions VIIb,c)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice for this stock is biennial and last year's advice is valid for 2013 and 2014. The Joint statement by the Fisheries Council and European Commission states it would be desirable if the TAC for this stock be maintained for 5 years (subject to scientific advice). FEAS advise that the information remains the same and the 2013 TAC should be rolled over for 2014. This implies a TAC of 42 t an Irish Quota of 36 t .

\section*{CURRENT MANAGEMENT}
- The TAC covers Divisions VIIb and VIIc. The assessment area is the same as the TAC area.
- The 2013 TAC was 42 t with an associated Irish quota of 36 t .
- There are no explicit management objectives or plan for this stock.
- This stock is mainly caught within coastal mixed fisheries by Irish otter trawlers.
- The stock is managed by TAC and although recent landings have been below the TAC. If it is further reduced, the TAC is likely to become


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


\section*{ICES ADVICE \(\quad\) 5.4.35 Sole west of Ireland (Divisions VIIb,c)}

\section*{Advice for 2014 and 2015}

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see ICES, 2012). "Based on the ICES approach for data-limited stocks, ICES advises that catches should be no more than 30 tonnes". ICES advises that the same catch advice is still applicable for 2015.

\section*{Quality considerations}

Catches in this area are too low to support the collection of the necessary information for an assessment of the stock status.

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & No assessment. \\
Stock data category & Category 6.2.0. \\
Input data & Official landings. \\
Discards and bycatch & Not available. \\
Indicators & Lpue from Irish otter trawl fleet. \\
Other information & None. \\
Working group report & WGCSE (ICES, 2013).
\end{tabular}

\section*{Outlook for 2015}

\section*{ICES approach to data-limited stocks}

Because the precautionary buffer ( \(20 \%\) reduction in catch) was applied in the advice issued in 2012, and catches are marginal, the same catch advice ( 30 t ) is also considered valid for 2015 .

\section*{Additional considerations}

Management considerations
The "Joint statement by the Council and the Commission" (Council of the European Union Document Doc 5315/13 PECHE 15, 15 January 2013) states:

The Council and the Commission note that the fishing opportunities regulations include a number of TACs for stocks for which there is limited information on stock status and which are of low economic importance, or are taken only as by-catches, or which show low levels of quota uptake. In these cases, the Council and the Commission consider it appropriate to constrain catches at or below the TAC levels fixed for 2013. To this end, without prejudice to the Commission's right of initiative and the Council's prerogatives under Article 293(1) TFEU, the Commission and the Council consider that it would be desirable to maintain the 2013 TAC level for the stocks listed below for the following five years.

Sole TAC unit VIIbc is included in the list of the Joint statement by the Council and the Commission

\section*{Sources}

Council of the European Union Document Doc 5315/13 PECHE 15, 15 January 2013. "Joint statement by the Council and the Commission".
ICES. 2012. Sole in Divisions VIIb,c (West of Ireland). In Report of the ICES Advisory Committee 2012, Section 5.4.36. ICES Advice, 2012, Book 5: 356-359.

ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Table 5.4.35.1 Sole in Divisions VIIb,c. Advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|}
\hline Year & ICES Advice & Predicted catch corresp. to advice & Agreed TAC & Official landings \\
\hline 1993 & - & - & - & 60 \\
\hline 1994 & - & - & - & 61 \\
\hline 1995 & - & - & - & 61 \\
\hline 1996 & - & - & - & 54 \\
\hline 1997 & - & - & - & 55 \\
\hline 1998 & - & - & - & 49 \\
\hline 1999 & - & - & - & 68 \\
\hline 2000 & - & - & - & 77 \\
\hline 2001 & - & - & 80 & 60 \\
\hline 2002 & No advice & - & 80 & 64 \\
\hline 2003 & Reduce TAC to recent landings & 65 & 80 & 69 \\
\hline 2004 & Reduce TAC to recent landings (1998-2002) & 65 & 65 & 67 \\
\hline 2005 & Reduce TAC to recent landings (1999-2003) & 62 & 65 & 45 \\
\hline 2006 & No increase in catches & 64 & 65 & 43 \\
\hline 2007 & No increase in catches & 64 & 65 & 41 \\
\hline 2008 & No increase in catches & 50 & 59 & 37 \\
\hline 2009 & Same advice as last year & 50 & 50 & 50 \\
\hline 2010 & No advice & - & 45 & 43 \\
\hline 2011 & No advice & - & 44 & 26 \\
\hline 2012 & No increase in catch & - & 44 & 44 \\
\hline 2013 & 20\% reduction in catches (last 3 years' average) & \(<30\) & 42 & \\
\hline 2014 & Same catch advice as for 2013 & \(<30\) & & \\
\hline 2015 & Same catch advice as for 2013 & \(<30\) & & \\
\hline
\end{tabular}

Weights in tonnes.

\section*{FU 16 Nephrops on the Porcupine Bank}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises on the basis of the MSY approach that catches from FU 16 in 2014 should be no more than I,848 t (All catches are assumed to be landed). FEAS agrees with this advice.

This stock fall into category I with an analytical UWTV based assessment. The data available to assess this stock has improved significantly since 2010 due to collaborations with the fishing industry (through the Irish Fisheries Science Research Partnership IFSRP).


Red Boxes - TAC/Management Area Blue Shading - Functional Unit FEAS has carried out fishing surveys funded using "scientific quota" on this stock in July 2010, 2011 and 2012. The Irish industry provided detailed grade information for \(\mathbf{> 4 5 \%}\) of the landings in 2012 . FEAS also carried out UWTV surveys on this stock in 2012 and 2013. The advice for 2014 is based on the results of the 2013 UWTV survey.

The current TAC area and the stock assessment areas do not match for Nephrops in VII (see the overview for Nephrops stocks in Sub-area VII on page 42). However, specific management measures are in place for FUl6 (spatio-temporal closure and of which quota limit for FUl6) see below.

\section*{CURRENT MANAGEMENT}
- For current management see the overview for Nephrops stocks in Sub-area VII on page 42.
- Since 201I an 'of which' clause was introduced to the area VII TAC specifically for the Porcupine Bank. This limited landings in 2013 to less than \(\mathrm{I}, 800 \mathrm{t}\).
- Very restrictive quota limits have been introduced for Irish vessels since February 201I. This has increased the risks of area misreporting and/or high grading in the fishery. Management measures should be put in place to discourage misreporting or discarding.

2013 Porcupine Quota Share of VII TAC

- A spatio-temporal closure of the Porcupine bank for fisheries was in place between I May - 31 July 20102012. The period of the closure was reduced to May only in 2013. To date the closure has been respected by the fleet and has afforded some protection to the majority of the stock area ( \(\sim 75 \%\) ). For this part of the stock area fishing effort and mortality will have been reduced at a time of peak female emergence and typically high LPUE and landings. The closure has inadvertently concentrated effort and fishing mortality \(\sim 25 \%\) of the stock area not currently covered by the closure.

- The area on the Porcupine Bank closed from \(I^{\text {st }}\) May- \(3 I^{\text {st }}\) July in 2010,11 and 12 and May 2013 is shown as a green line overlaid on the distribution of recent (2006-2008) Irish fishing effort directed towards Nephrops. The 200 m and 500 m depth contours are shown as black lines. The boundary of the quota management area for the Porcupine Bank - Unit 16 (NEP/*07UI6) is shown as a red line.

\section*{ICES ADVICE 5.4.21.3 Nephrops on Porcupine Bank (FU 16)}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that catches from FU 16 in 2014 should be no more than 1848 tonnes. All catches are assumed to be landed.

\section*{Stock status}
\begin{tabular}{l|c|c|c|c|}
\multicolumn{1}{c|}{} & \multicolumn{3}{c|}{ F (Fishing Mortality) } \\
\cline { 2 - 5 } & 2010 & 2011 & \(\mathbf{2 0 1 2}\) \\
\hline MSY \(\left(F_{\text {MSY }}\right)\) & \(?\) & \(?\) & & Appropriate \\
\begin{tabular}{l} 
Precautionary \\
approach \(\left(\mathrm{F}_{\mathrm{pa}}, \mathrm{F}_{\mathrm{lim}}\right)\)
\end{tabular} & \(?\) & \(?\) & \(?\) & Undefined \\
\cline { 2 - 5 } & & & &
\end{tabular}

SSB (Spawning-Stock Biomass)
\begin{tabular}{l|rl|}
\multicolumn{1}{l|}{} & \multicolumn{1}{c|}{ SSB (Spawning-Stock Biomass) } \\
\cline { 2 - 3 } & \multicolumn{4}{c|}{ 2012-2013 } \\
MSY \(\left(\mathrm{B}_{\text {trigger }}\right)\) & \(?\) & Undefined \\
\begin{tabular}{l} 
Precautionary \\
approach \(\left(\mathrm{B}_{\mathrm{pa}}, \mathrm{B}_{\mathrm{lim}}\right)\)
\end{tabular} & \(?\) & Undefined \\
\begin{tabular}{l} 
Qualitative \\
evaluation
\end{tabular} & \(\Rightarrow\) & Stable (based on UWTV abundance) \\
\hline
\end{tabular}


Figure 5.4.21.3.1 Nephrops on the Porcupine Bank (FU 16). Top left: ICES landings. Bottom left: exploitation proxy derived from catch length distributions. Top right: Abundance estimate (in numbers haul \({ }^{-1}\) ) from Sp -PGFS-WBITS-Q4 survey. Bottom right: UWTV abundance survey.

UWTV surveys for FU 16 were carried out in 2012 and 2013; these provide abundance estimates for this stock. The 2012 harvest ratio (removals/UWTV abundance) is estimated to be \(3.2 \%\), which is below the \(\mathrm{F}_{\text {MSY }}\) proxy ( \(5 \%\) ). Other indicators show that the exploitation rates increased during the 2000s but declined significantly in 2011 and remain low. Bottom trawl survey cpue increased significantly in 2010 and this has been linked to a stronger recruitment first observed in the survey in 2009.

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

Nephrops on the Porcupine Bank are fished in relatively deep waters occurring over a fairly widespread area at relatively low abundance. In the past there was a wide variation in size structure of the catches spatially and between fleets. The switch in sex ratio in commercial landings and survey catches in 2008-2009 (see Figure 5.4.21.3.3) is thought to be the result of overexploitation of the male component of the stock, leading to sperm limitation for females in those years. The sex ratio since 2010 has switched back to a more normal situation where male Nephrops make up the majority of the catches.

\section*{Environmental influence on the stock}

Increased storminess related to the North Atlantic Oscillation (NAO) has been linked to reduced recruitment and low lpues on the Porcupine Bank several years later (González Herraiz et al., 2009). Favourable environmental conditions in 2006 are thought to have led to a good recruitment after several years of poor recruitment. The fishery is now dependent on the 2006 year class ( 2009 recruitment).

\section*{The fisheries}

The fishery takes place throughout the year with a peak between April and July. A seasonal closure covering much of the stock distribution area has been in place between 1 May and 31 July each year from 2010 to 2012. In 2013 the closure was only in place in the month of May. Most vessels are relatively large (between 20 and 35 m in total length) multi-purpose otter trawlers using single or twin rigs. Freezing of catches at sea has become increasingly prevalent since 2006.
```

Catch distribution Total landings (2012) were 1260 t ( $100 \%$ otter trawl). Available discard estimates show discarding to be negligible ( $<2 \%$ by number).

```

\section*{Effects of the fisheries on the ecosystem}

Discarding by the Nephrops trawl fishery is around \(50 \%\) of the total catch by weight. The main species that are discarded by weight are blue-mouth redfish, blue whiting, and argentines (Anon., 2011). Discarding of Nephrops in the fishery has been negligible up to 2011 (ICES, 2013a, 2013b).

\section*{Quality considerations}

The landings are considered fairly well estimated (an unallocated component related to area misreporting and nonreporting is included from 2011). Discard observer coverage is low and should be increased, to sample the landings and any discards that might be occurring.

Two years of UWTV survey data are now available and the abundance estimates have high precision. Landings length-frequency data have improved significantly since 2010. The fishing industry has collaborated with scientists by providing data on the grade composition of landings since 2010 and carrying out a trawl survey between 2010 and 2012. This survey provides information on population structure across the ground, grade structure, and maturity-at-length.

\section*{Scientific basis}
\(\left.\begin{array}{ll}\text { Assessment type } & \text { UWTV and trends of the size structure of catches. } \\
\text { Stock data category } & 1\end{array} \begin{array}{l}\text { Commercial catches (international landings and length frequencies reconstructed from } \\
\text { Input data }\end{array} \begin{array}{l}\text { sampling and industry data); one UWTV survey (UWTV-FU 16); fixed maturity and } \\
\text { natural mortality. }\end{array}\right]\)\begin{tabular}{l} 
Discards were not included and are assumed negligible. \\
Discards and bycatch \\
Indicators \\
Other information \\
Two trawl surveys (SpPGFS-WIBTS-Q4, Irish IFSRP), cpue, and catch size. \\
Commercial lpue for Ireland, Spain, and France. Sex ratio. This stock was benchmarked in \\
Working group report \\
2013 (ICES, 2013a).
\end{tabular}

\section*{ECOREGION Celtic Sea and West of Scotland STOCK}

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline \multirow{2}{l|}{\begin{tabular}{l} 
MSY \\
approach
\end{tabular}} & MSY B \(_{\text {trigger }}\) & Not defined. & \\
\cline { 2 - 4 } \begin{tabular}{l} 
Precautionary \\
approach
\end{tabular} & \(\mathrm{F}_{\text {MSY }}\) & Not defined. & Eq 5.0\%.
\end{tabular}
(unchanged since 2013)
Harvest ratio reference points (2013):
\begin{tabular}{lrrr}
\hline & Male & Female & Combined \\
\hline \(\mathrm{F}_{\max }\) & \(6.6 \%\) & \(19.0 \%\) & \(11.1 \%\) \\
\(\mathrm{~F}_{0.1}\) & \(4.2 \%\) & \(12.3 \%\) & \(\mathbf{5 . 0 \%}\) \\
\(\mathrm{~F}_{35 \% \mathrm{SpR}}\) & \(5.0 \%\) & \(14.3 \%\) & \(7.7 \%\) \\
\hline
\end{tabular}

The density of Nephrops in FU 16 is considered very low (low density \(<0.3 \mathrm{~m}^{-2}\) ). The stock size has increased in recent years and exploitation rates have declined. For this FU, the exploitation rate on males is higher than on females. A harvest ratio consistent with a combined sex \(\mathrm{F}_{0.1}\) of \(5.0 \%\) is suggested as a proxy for \(\mathrm{F}_{\text {MSY }}\).

Outlook for 2014
Basis: \(\mathrm{F}_{2013}=\mathrm{F}_{2012}=3.2 \%\), Bias-corrected survey index \((2013)=768\) million; Mean weights in landings \((48.1 \mathrm{~g}\), 2011-2012); discard rates by number ( \(0 \%\) ). Survey bias \(=1.26\).
\begin{tabular}{|l|c|c|c|c|c|}
\hline \multirow{2}{*}{ Basis } & \begin{tabular}{c} 
Total \\
Catches*
\end{tabular} & Landings & \begin{tabular}{c} 
Dead \\
Discards**
\end{tabular} & \begin{tabular}{c} 
Surviving \\
Discards**
\end{tabular} & \begin{tabular}{c} 
Harvest \\
Rate
\end{tabular} \\
\cline { 2 - 6 } & L+DD+SD & L & DD & SD & \begin{tabular}{c} 
for \\
\(\mathrm{L}+\mathrm{DD}\)
\end{tabular} \\
\hline \(\mathrm{F}_{\mathrm{MSY}}\) proxy & 1848 & 1848 & 0 & 0 & \(5.0 \%\) \\
\hline \(\mathrm{~F}_{2013}\) & 1183 & 1183 & 0 & 0 & \(3.2 \%\) \\
\hline \(\mathrm{~F}_{35 \% \mathrm{SpR}}\) & 2846 & 2846 & 0 & 0 & \(7.7 \%\) \\
\hline \(\mathrm{~F}_{\max }\) & 4103 & 4103 & 0 & 0 & \(11.1 \%\) \\
\hline
\end{tabular}

Weights in tonnes.
* Total catches are the landings plus dead and surviving discards.
** Based on negligible discards during observer trips.

\section*{MSY approach}

No MSY \(\mathrm{B}_{\text {trigger }}\) has been identified for this FU. Following the ICES MSY approach implies a harvest ratio for the FU 16 that is less than \(5 \%\), resulting in catches of no more than 1848 t in 2014. All catches are assumed to be landed.

\section*{Additional considerations}

The advice takes into account the 2013 UWTV survey results.
Since 2011 a maximum limit on landings from FU 16 is included in the TAC regulation (the "of which limit"). This has increased the risk of highgrading and area-misreporting in this fishery. Area misreporting and highgrading in the fishery should be discouraged through management measures.

A seasonal closed area (1 May-31 July) was in place between 2010 and 2012. The duration of the closure was reduced to one month (May) in 2013. The closure has been respected by the fleet and has therefore afforded some protection to the majority of the stock area ( \(\sim 75 \%)\). For this part of the stock area fishing effort and mortality has
been reduced at a time of peak female emergence and typically high lpue and landings. The closure will also have inadvertently concentrated effort and fishing mortality in the \(\sim 25 \%\) of the stock area that is not currently covered by the closure. Survey information indicates that abundance was 2.5 times higher inside the closed area than outside in 2011.

Productivity of deep-water Nephrops stocks is generally lower than in shelf waters, though individual Nephrops grow to relatively large sizes and attain high market prices. Other deep-water Nephrops stocks off the Spanish and Portuguese coast have collapsed and have been subject to recovery measures for several years, e.g. in FUs 25, 26, 27, and 31. Recruitment in Nephrops populations in deep water may be more sporadic than for shelf stocks with strong larval retention mechanisms. This makes these stocks more vulnerable to overexploitation and potential recruitment failure as has been observed on the Porcupine Bank over the last decade.

\section*{Changes in fishing technology and fishing patterns}

In the past the Nephrops fishery on the Porcupine Bank has been both seasonal and opportunistic, with increased targeting during periods of high Nephrops emergence and good weather. Freezing of catches at sea has become increasingly prevalent since 2006 and the fishery now operates throughout the year, mainly targeting larger Nephrops in lower volumes. Fishing effort has fluctuated considerably in the recent past in response to the availability of Nephrops (Figure 5.4.21.3.2). Lpue have increased since 2008 (Figure 5.4.21.3.2).

\section*{Information from the fishing industry}

The Irish industry has provided grade information for around \(45 \%\) of the landings in 2012. Graded landings data have been used to reconstruct the size distribution of landings between 2010 and 2012. The industry has also been collaborating on the development of a trawl survey largely funded by the allocation of scientific quota between 2010 and 2012. These are major improvements to the information base for this stock and should be maintained.

\section*{Data and methods}

The short time-series of UWTV survey is used as the basis for advice. The Spanish Porcupine survey (SpPGFS-WIBTS-Q4) and commercial fisheries data provide longer-term stock indicators. A historical exploitation proxy is derived from commercial catch, based on the slope of annual length-frequency distributions for male Nephrops with carapace lengths between 41 and 56 mm , which are considered fully selected in the fishery. The benchmark meeting (ICES, 2013a) concluded that the Irish industry trawl survey initiated in 2010 is too short (with changes in coverage, gears, and vessels) to be used as an indicator of stock abundance. The survey, however, provides useful data on population structure across the ground, grade structure, and maturity-at-length.

\section*{Uncertainties in assessment and forecast}

General comments of uncertainties in the assessment and forecast using the information from the UWTV surveys are discussed in the introduction of Section 5.4.21.

This stock was benchmarked in 2013 (ICES, 2013a) and the UWTV survey approach used was accepted as an appropriate basis for assessment and catch advice. The 2013 survey achieved good spatial coverage of the ground and the abundance estimate is expected to be accurate and have high precision. New harvest ratio reference points were estimated in 2013 and these were similar to the provisional ones established in 2012. The main uncertainties relate to catch, i.e. accuracy of landings and discard practices (discard sampling levels remain low and there is thought to be increased risk of highgrading due to restrictive quotas). The impact of this is likely to be a small underestimate of harvest rate.

\section*{Comparison with previous assessment and advice}

The assessment is based on indicators and an UWTV survey as last year. The advice for 2014 was delayed until autumn to take account of the most up-to-date survey information.

This year's advice is based on the MSY approach, as last year.

\section*{Sources}

Anon. 2011. Atlas of Demersal Discarding, Scientific Observations and Potential Solutions, Marine Institute, Bord Iascaigh Mhara, September 2011. ISBN 978-1-902895-50-5. 82 pp.
González Herraiz, I,, Torres, M. A., Farina, A. C, Freire, J., and Cancelo, J. R. 2009. The NAO index and the long-term variability of Nephrops norvegicus population and fishery off West of Ireland. Fisheries Research, 98: 1-7.
ICES 2013a. Report of the Benchmark Workshop on Nephrops assessment (WKNEPH). ICES CM: 2013/ACOM:45.
ICES. 2013b. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.



Figure 5.4.21.3.2 Nephrops on the Porcupine Bank (FU 16). Lpue and Nephrops-directed effort trends for fleets. Dotted line indicates that lpue values should be considered uncertain (an unallocated component related to area misreporting and non-reporting is included since 2011 for the Irish landings; the French landings and effort have been very low since 2008).


Figure 5.4.21.3.3 Nephrops on the Porcupine Bank (FU 16). Sex ratio of landings and survey (SpPGFS-WIBTS-Q4) catches.

Table 5.4.21.3.1 Nephrops on the Porcupine Bank (FU 16). ICES advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & ICES advice & Predicted landings corresp. to advice (FU 16) & 'Of which limit' in TAC regulation & Recommended landings in Divisions VIIbcjk \({ }^{1}\) &  \\
\hline 1987 & & & & & 2.5 \\
\hline 1988 & & & & & 2.4 \\
\hline 1989 & & & & & 2.1 \\
\hline 1990 & & & & & 1.9 \\
\hline 1991 & & & & & 1.6 \\
\hline 1992 & & & & 3.8 & 2.0 \\
\hline 1993 & & & & \(\sim 4.0\) & 1.9 \\
\hline 1994 & & & & \(\sim 4.0\) & 2.5 \\
\hline 1995 & & & & \(\sim 4.0\) & 2.9 \\
\hline 1996 & & & & 4.0 & 2.2 \\
\hline 1997 & & & & 4.0 & 2.4 \\
\hline 1998 & & & & 4.0 & 2.2 \\
\hline 1999 & & & & 4.0 & 2.3 \\
\hline 2000 & & & & 4.0 & 0.9 \\
\hline 2001 & & & & 4.0 & 1.2 \\
\hline 2002 & & & & 4.44 & 1.3 \\
\hline 2003 & & & & 4.44 & 0.9 \\
\hline 2004 & Restrict landings to 2000-2002 levels & & & 3.3 & 1.5 \\
\hline 2005 & Restrict landings to 2000-2002 levels & & & 3.3 & 2.3 \\
\hline 2006 & Restrict landings to 2000-2002 levels & & & 3.3 & 2.1 \\
\hline 2007 & Constrain effort at recent levels & & & -- & 2.2 \\
\hline 2008 & Constrain effort at recent levels & & & -- & 1.0 \\
\hline 2009 & No increase in effort, and average landings (2000-2003) & \(<1.0\) & & & 0.8 \\
\hline 2010 & Reduce catches to lowest possible level & 0 & & & 0.9 \\
\hline 2011 & Reduce catches to lowest possible level & 0 & 1.26 & & 1.2 \\
\hline 2012 & No increase in catch & - & 1.26 & & 1.26 \\
\hline 2013 & MSY approach (updated November 2012) & \(<1.8\) & 1.8 & & \\
\hline 2014 & MSY approach & < 1.848 & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1}\) Previously ICES gave combined advice for FUs \(16,17,18\), and 19 , and "other rectangles" in this area.
\({ }^{2}\) This includes inshore rectangles along the southern and southeastern coast of Ireland.
}

Table 5.4.21.3.2 Nephrops on the Porcupine Bank (FU 16). ICES landings (tonnes) by country.
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline Year & France & Ireland & Spain & UK E\& W & UK Scotland & Unallocated & Total \\
\hline 1965 & 514 & & & & & & 514 \\
\hline 1966 & 0 & & & & & & 0 \\
\hline 1967 & 441 & & & & & & 441 \\
\hline 1968 & 441 & & & & & & 441 \\
\hline 1969 & 609 & & & & & & 609 \\
\hline 1970 & 256 & & & & & & 256 \\
\hline 1971 & 500 & & 1444 & & & & 1944 \\
\hline 1972 & 0 & & 1738 & & & & 1738 \\
\hline 1973 & 811 & & 2135 & & & & 2946 \\
\hline 1974 & 900 & & 1894 & & & & 2794 \\
\hline 1975 & 0 & & 2150 & & & & 2150 \\
\hline 1976 & 6 & & 1321 & & & & 1327 \\
\hline 1977 & 0 & & 1545 & & & & 1545 \\
\hline 1978 & 2 & & 1742 & & & & 1744 \\
\hline 1979 & 14 & & 2255 & & & & 2269 \\
\hline 1980 & 21 & & 2904 & & & & 2925 \\
\hline 1981 & 66 & & 3315 & & & & 3381 \\
\hline 1982 & 358 & & 3931 & & & & 4289 \\
\hline 1983 & 615 & & 2811 & & & & 3426 \\
\hline 1984 & 1067 & & 2504 & & & & 3571 \\
\hline 1985 & 1181 & & 2738 & & & & 3919 \\
\hline 1986 & 1060 & & 1462 & 69 & & & 2591 \\
\hline 1987 & 609 & & 1677 & 213 & & & 2499 \\
\hline 1988 & 600 & & 1555 & 220 & & & 2375 \\
\hline 1989 & 324 & 350 & 1417 & 24 & & & 2115 \\
\hline 1990 & 336 & 169 & 1349 & 41 & & & 1895 \\
\hline 1991 & 348 & 170 & 1021 & 101 & & & 1640 \\
\hline 1992 & 665 & 311 & 822 & 217 & & & 2015 \\
\hline 1993 & 799 & 206 & 752 & 100 & & & 1857 \\
\hline 1994 & 1088 & 512 & 809 & 103 & & & 2512 \\
\hline 1995 & 1234 & 971 & 579 & 152 & & & 2936 \\
\hline 1996 & 1069 & 508 & 471 & 182 & & & 2230 \\
\hline 1997 & 1028 & 653 & 473 & 255 & & & 2409 \\
\hline 1998 & 879 & 598 & 405 & 273 & & & 2155 \\
\hline 1999 & 1047 & 609 & 448 & 185 & & & 2290 \\
\hline 2000 & 351 & 227 & 213 & 120 & & & 910 \\
\hline 2001 & 425 & 369 & 270 & 158 & & & 1222 \\
\hline 2002 & 369 & 543 & 276 & 139 & & & 1327 \\
\hline 2003 & 131 & 307 & 333 & 108 & 29 & & 908 \\
\hline 2004 & 289 & 494 & 588 & 126 & 28 & & 1526 \\
\hline 2005 & 397 & 754 & 799 & 208 & 156 & & 2315 \\
\hline 2006 & 462 & 731 & 571 & 201 & 155 & & 2120 \\
\hline 2007 & 302 & 1060 & 496 & 146 & 183 & & 2186 \\
\hline 2008 & 26 & 562 & 234 & 41 & 138 & & 1000 \\
\hline 2009 & 4 & 356 & 294 & 13 & 159 & & 825 \\
\hline 2010 & 4 & 579 & 235 & 10 & 90 & & 917 \\
\hline 2011 & 8 & 643 & 109 & 23 & 122 & 301 & 1205 \\
\hline 2012* & 0 & 605 & 201 & 0 & 134 & 320 & 1260 \\
\hline
\end{tabular}
* Preliminary.

Table 5.4.21.3.3 Nephrops on the Porcupine Bank (FU 16). UWTV abundance, confidence intervals, harvest ratio, landings by number, mean weight in landings (na - not available).
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{c} 
UWTV \\
abundance \\
(millions)
\end{tabular} & \(95 \% \mathrm{CI}\) & Harvest ratio & \begin{tabular}{c} 
Landings by number \\
(millions)
\end{tabular} & \begin{tabular}{c} 
Mean weight in landings \\
\((\mathrm{g})\)
\end{tabular} \\
\hline 2011 & na & na & na & na & 45.8 \\
2012 & 787 & 78.7 & \(3.2 \%\) & 25.0 & 50.4 \\
2013 & 768 & 61.4 & na & na & na \\
\hline
\end{tabular}

\section*{FUI7 Nephrops on the Aran Grounds}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 591 t. If total discard rates do not change from the average of the last three years (20I0-20I2), this implies total catches of no more than 669 t . FEAS agrees with the ICES advice.

This stock falls in to ICES category I for data-rich stocks for which a quantitative assessment is available.


Red Boxes - TAC/Management Area Blue Shading - Functional Unit

The current TAC area and the stock assessment areas do not match for Nephrops in VII (see the overview for Nephrops stocks in Sub-area VII on page 42). FEAS agrees with the ICES and STECF advice that all Nephrops fisheries should be managed at an appropriate geographical scale i.e. Functional Unit.

\section*{CURRENT MANAGEMENT}
- For current management see the overview for Nephrops stocks in Sub-area VII on page 42.

\section*{ICES ADVICE 5.4.34.4 Nephrops on Aran Grounds (FU 17)}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 591 tonnes. If total discard rates do not change from the average of the last three years (2010-2012), this implies total catches of no more than 669 tonnes. Note that this figure includes discards expected to survive the discarding process - assumed to be \(10 \%\) of the total number discarded for this stock.

In order to ensure the stock in this FU is exploited sustainably, management should be implemented at the functional unit level.

\section*{Stock status}

\(2010 \quad 2011 \square \mathbf{2 0 1 2}\)
\(\operatorname{MSY}\left(\mathrm{F}_{\text {MSY }}\right)\)
Precautionary \(\operatorname{approach}\left(\mathrm{F}_{\mathrm{pa}}, \mathrm{F}_{\mathrm{lim}}\right)\)

SSB (Spawning-Stock Biomass)

Qualitative evaluation
\begin{tabular}{l|rl|}
\multicolumn{2}{c|}{ SSB (Spawning-Stock Biomass) } \\
\cline { 2 - 3 } \multicolumn{1}{l|}{} & \multicolumn{2}{c|}{ 2011-2013 } \\
MSY \(\left(\mathrm{B}_{\text {trigger }}\right)\) & ? & Undefined \\
\hline Precautionary \\
approach \(\left(\mathrm{B}_{\mathrm{pa}}, \mathrm{B}_{\text {lim }}\right)\) & \(?\) & Undefined \\
Qualitative evaluation & \(\boldsymbol{4}\) & Decreasing \\
\hline
\end{tabular}




Figure 5.4.21.4.1 Nephrops on the Aran Grounds (FU 17). Landings (in tonnes), UWTV abundance (in millions; SSB proxy), and harvest rates ( \(\mathrm{F}_{\text {MSY }}\) proxy shown as the dashed green line).

The abundance decreased significantly in 2012 and the 2013 survey estimate is not significantly different (although it is the lowest in the time-series). The harvest rate (removals/UWTV abundance) has increased significantly to \(19.2 \%\) in 2012 and is now above the \(\mathrm{F}_{\text {MSY }}\) proxy.

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

The Aran Grounds can be characterized as an area with moderate density of small Nephrops. The sex ratio in the catches has a strong seasonal pattern.

\section*{Environmental influence on the stock}

The larval retention mechanisms on the Aran Grounds are not well understood, but fluctuations in UWTV burrow abundance may reflect quite variable recruitment relative to other areas in Subarea VII.

\section*{The fisheries}

Landings and effort of twin-rig vessels have increased and now account for over \(90 \%\) of the fishery. In the last few years the fishery has exploited more of the male component of the stock as a higher proportion of catches have been taken in the autumn.

Catch distribution Total catch \((2012)=1.2 \mathrm{kt}\), where \(93 \%\) were landings \((100 \%\) otter trawl \()\) and \(7 \%\) discards.

\section*{Effects of the fisheries on the ecosystem}

Nephrops fisheries in this area also have catches of hake, megrim, and monkfish.

\section*{Quality considerations}

Biological sampling for this stock is very good. There is a dedicated annual UWTV survey since 2002 which gives abundance estimates for the Aran grounds with high precision. Although the boundaries of the Aran ground could be improved and populations in Galway Bay and Slyne head could be better integrated the current procedure for calculating catch options is considered adequate.

Scientific basis

Assessment type
Stock data category
Input data

Discards and bycatch
Indicators
Other information
Working group report

UWTV and trends of the size structure of catches. 1
One survey index (UWTV-FU 17); commercial catches (international landings, length frequencies from Irish catch sampling); maturity data (commercial catch and discard sampling, survey sampling); fixed natural mortality. Discard survival rate. Discards from the Irish Nephrops-directed fleet are included in the assessment. Sex ratio and lpue.
The latest benchmark (based on the UWTV survey) was performed in 2009 (ICES, 2009). WGCSE (ICES, 2013).

\section*{ECOREGION Celtic Sea and West of Scotland STOCK}

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline \begin{tabular}{l} 
MSY \\
approach
\end{tabular} & MSY B \(_{\text {trigger }}\) & Not defined. & \\
\cline { 2 - 4 } \begin{tabular}{l} 
Precautionary \\
approach
\end{tabular} & Not defined. & HR 10.5\%. & Equivalent to \(\mathrm{F}_{35 \% \text { SPR }}\) for combined sexes in 2010. \\
\hline
\end{tabular}
(unchanged since 2010)
\begin{tabular}{lcrr}
\multicolumn{4}{l}{ Harvest ratio reference points (2010): } \\
& Male & Female & Combined \\
\hline \(\mathrm{F}_{\max }\) & \(9.8 \%\) & \(13.0 \%\) & \(11.1 \%\) \\
\(\mathrm{~F}_{0.1}\) & \(6.4 \%\) & \(9.1 \%\) & \(7.2 \%\) \\
\(\mathrm{~F}_{35 \% \mathrm{SpR}}\) & \(8.4 \%\) & \(12.8 \%\) & \(\mathbf{1 0 . 5} \%\) \\
\hline
\end{tabular}

The density of Nephrops in FU 17 is considered to be moderate (average density \(0.6 \mathrm{~m}^{-2}\) ). Recent harvest rates have been low and the stock size has been fluctuating. For this FU, the exploitation rate on males is usually higher than on females. A harvest ratio consistent with a combined-sex \(\mathrm{F}_{35 \% \mathrm{SpR}}\) of \(10.5 \%\) is suggested as a proxy for \(\mathrm{F}_{\mathrm{MSY}}\).

\section*{Outlook for 2014}

Basis: \(\mathrm{F}_{2013}=\mathrm{F}_{2012}=19.2 \%\). Bias-corrected survey index (2013) \(=317\) million; Mean weights in landings (2010 \(2012,21.4 \mathrm{~g}\) ), mean weights in discards (2010-2012, 12.2 g ); Dead discard rate (by number) \(=17.3 \%(2010-2012\) sampling). Discards survival rate \(=10 \%\).
\begin{tabular}{|l|c|c|c|c|c|}
\hline \multirow{2}{*}{ Basis } & Total catches* & Landings & \begin{tabular}{c} 
Dead \\
discards**
\end{tabular} & \begin{tabular}{c} 
Surviving \\
discards**
\end{tabular} & Harvest rate \\
\cline { 2 - 6 } & L+DD+SD & L & DD & SD & for L+DD \\
\hline \(\mathrm{F}_{\mathrm{MSY}}\) proxy & 669 & 591 & 70 & 8 & \(10.5 \%\) \\
\hline \(\mathrm{~F}_{2013}\) & 1223 & 1080 & 129 & 14 & \(19.2 \%\) \\
\hline \(\mathrm{~F}_{0.1 \text { Combined }}\) & 459 & 405 & 48 & 5 & \(7.2 \%\) \\
\hline \(\mathrm{~F}_{\max }\) & 707 & 625 & 74 & 8 & \(11.1 \%\) \\
\hline
\end{tabular}

Weights in tonnes.
* Total catches are the landings, plus dead and surviving discards.
** Total discard rate is assumed to be \(18.8 \%\) of the catches (in number, average of the last three years, 2010-2012); discard survival is assumed to be \(10 \%\).

\section*{MSY approach}

No MSY \(\mathrm{B}_{\text {trigger }}\) has been identified for this FU. Following the ICES MSY approach for the Aran Grounds FU 17 implies a harvest ratio of less than \(10.5 \%\), resulting in landings of no more than 591 t in 2014 . If discard rates do not change from the average of the last three years (2010-2012, assuming \(10 \%\) discard survival), this implies total catches of no more than 669 t .

\section*{Additional considerations}

The advice takes into account the 2013 UWTV survey results.
The low abundance in 2012 and 2013 cannot be linked to causative factors as yet. Discard rates were a little lower in 2012, but the mean size data on the survey or in the fishery does not suggest weak recruitment or other problems in the stock.

Total discards of Nephrops and other organisms by the Nephrops trawl fleet is around \(47 \%\) of the total catch by weight. The main discards are small Nephrops. The main fish species discarded are dogfish, haddock, whiting, and megrim (Anon., 2011).

The proportion of discarded Nephrops is substantial. On average over the last three years, around 19\% (in numbers) or \(12 \%\) (in weight) of the Nephrops caught are estimated to have been discarded.

\section*{Changes in fishing technology and fishing patterns}

In recent years several newer vessels specializing in Nephrops fishing have participated in this fishery. These vessels target Nephrops on several other grounds within the TAC area and move around to optimize catch rates. Effort shows a decreasing trend since 1998 (Figure 5.4.21.4.2). Lpue shows an increase in trends since 2004 (Figure 5.4.21.4.2).

\section*{Uncertainties in assessment}

General comments of uncertainties in the assessment and forecast using the information from the UWTV surveys are discussed in the introduction of Section 5.4.21.

There are several uncertainties in the survey, mean weight in the landings, and discard rates that are not taken into account in the advice. The length-based model and yield-per-recruit analysis used to determine harvest ratio reference points were based on 2008 and 2009 sampling data; the fit of the length-based model to the data was problematic, so \(\mathrm{F}_{\mathrm{MSY}}\) proxies are likely to be uncertain.

\section*{Comparison with previous assessment and advice}

The assessment is based on indicators and an UWTV survey as last year. The advice for 2014 was delayed until autumn to take account of the most up-to-date survey information.

This year's advice is based on the MSY approach as was done last year.

\section*{Sources}

Anon. 2011. Atlas of Demersal Discarding, Scientific Observations and Potential Solutions, Marine Institute, Bord Iascaigh Mhara, September 2011. ISBN 978-1-902895-50-5. 82 pp .
ICES. 2009. Report of the Benchmark Workshop on Nephrops (WKNEPH), 2-6 March 2009, Aberdeen, UK ICES CM 2009/ACOM:33.
ICES. 2013. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.



Figure 5.4.21.4.2 Nephrops on the Aran Grounds (FU 17). Irish effort (top) and lpue (bottom) for the Nephrops-directed fleet.

\section*{Length frequencies for catch (dotted) and landed(solid): \\ Nephrops in FU17}


Figure 5.4.21.4.3 Nephrops on the Aran Grounds (FU 17). Annual length composition of catch (dashed) and landings (solid). Males (right) and females (left) from 1995 (bottom) to 2012 (top). The vertical dashed line is mean length in the catches and the vertical solid line is mean length in the landings. The straight vertical lines correspond to 25 mm (MLS) and 33 mm carapace length.

Table 5.4.21.4.1 Nephrops on the Aran Grounds (FU 17). ICES advice, management, landings, and discards.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & ICES advice & Predicted landings corresp. to advice (FU 17) & Recommended landings Divisions VIIbcjk \({ }^{1}\) & ICES landings FU 17 & \[
\begin{gathered}
\text { Discards }^{2} \\
\text { FU } 17
\end{gathered}
\] \\
\hline 1987 & & & & 0.1 & \\
\hline 1988 & & & & 0.1 & \\
\hline 1989 & & & & 0.8 & \\
\hline 1990 & & & & 0.3 & \\
\hline 1991 & & & & 0.5 & \\
\hline 1992 & & & 3.8 & 0.4 & \\
\hline 1993 & & & \(\sim 4.0\) & 0.4 & \\
\hline 1994 & & & \(\sim 4.0\) & 0.7 & \\
\hline 1995 & & & \(\sim 4.0\) & 0.9 & \\
\hline 1996 & & & 4.0 & 0.5 & \\
\hline 1997 & & & 4.0 & 0.8 & \\
\hline 1998 & & & 4.0 & 1.4 & \\
\hline 1999 & & & 4.0 & 1.1 & \\
\hline 2000 & & & 4.0 & 0.9 & \\
\hline 2001 & & & 4.0 & 0.9 & \\
\hline 2002 & & & 4.44 & 1.2 & 0.2 \\
\hline 2003 & & & 4.44 & 0.9 & 0.2 \\
\hline 2004 & Restrict landings to 2000-2002 levels & & 3.3 & 0.5 & 0.1 \\
\hline 2005 & Restrict landings to 2000-2002 levels & & 3.3 & 0.8 & 0.2 \\
\hline 2006 & Restrict landings to 2000-2002 levels & & 3.3 & 0.6 & \\
\hline 2007 & Constrain effort at recent levels & & -- & 0.9 & \\
\hline 2008 & Constrain effort at recent levels & & -- & 1.1 & 0.2 \\
\hline 2009 & No increase in effort and landings (2007) & \(<0.9\) & & 0.6 & 0.3 \\
\hline 2010 & Harvest ratio no greater than the lower bound of the range of \(\mathrm{F}_{0.1}\) for similar stocks & \(<0.5\) & & 1.0 & 0.2 \\
\hline 2011 & MSY approach & \(<0.95\) & & 0.6 & 0.1 \\
\hline 2012 & MSY approach & < 1.1 & & 1.1 & 0.1 \\
\hline 2013 & MSY approach (Updated November 2012) & \(<0.59\) & & & \\
\hline 2014 & MSY approach & \(<0.59\) & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1}\) Previously ICES gave combined advice for FUs \(16,17,18\), and 19 , and other rectangles in this area.
\({ }^{2}\) Discard survival is assumed at \(10 \%\).
}

Table 5.4.21.4.2 Nephrops on the Aran Grounds (FU 17). Landings (tonnes) by country.
\begin{tabular}{|c|c|c|c|c|}
\hline & \multicolumn{4}{|c|}{FU 17} \\
\hline Year & France & Rep. of Ireland & UK & Total \\
\hline 1974 & 477 & & & 477 \\
\hline 1975 & 822 & & & 822 \\
\hline 1976 & 131 & & & 131 \\
\hline 1977 & 272 & & & 272 \\
\hline 1978 & 481 & & & 481 \\
\hline 1979 & 452 & & & 452 \\
\hline 1980 & 442 & & & 442 \\
\hline 1981 & 414 & & & 414 \\
\hline 1982 & 210 & & & 210 \\
\hline 1983 & 131 & & & 131 \\
\hline 1984 & 324 & & & 324 \\
\hline 1985 & 207 & & & 207 \\
\hline 1986 & 147 & & 1 & 148 \\
\hline 1987 & 62 & & 0 & 62 \\
\hline 1988 & 14 & 814 & & 828 \\
\hline 1989 & 27 & 317 & 3 & 347 \\
\hline 1990 & 30 & 489 & & 519 \\
\hline 1991 & 11 & 399 & & 410 \\
\hline 1992 & 11 & 361 & 2 & 374 \\
\hline 1993 & 11 & 361 & 0 & 372 \\
\hline 1994 & 18 & 707 & 4 & 729 \\
\hline 1995 & 91 & 774 & 2 & 867 \\
\hline 1996 & 2 & 519 & 7 & 528 \\
\hline 1997 & 2 & 839 & 0 & 841 \\
\hline 1998 & 9 & 1401 & 0 & 1410 \\
\hline 1999 & 0 & 1140 & 0 & 1140 \\
\hline 2000 & 1 & 879 & 0 & 880 \\
\hline 2001 & 1 & 912 & 0 & 913 \\
\hline 2002 & 2 & 1152 & 0 & 1154 \\
\hline 2003 & 0 & 933 & 0 & 933 \\
\hline 2004 & 0 & 525 & 0 & 525 \\
\hline 2005 & 0 & 778 & 0 & 778 \\
\hline 2006 & 0 & 637 & 0 & 637 \\
\hline 2007 & 0 & 913 & 0 & 913 \\
\hline 2008 & 0 & 1050 & 7 & 1057 \\
\hline 2009 & 0 & 625 & 0 & 625 \\
\hline 2010 & 0 & 991 & 9 & 1000 \\
\hline 2011 & 0 & 600 & 0 & 600 \\
\hline 2012* & 0 & 1135 & 0 & 1135 \\
\hline
\end{tabular}

\footnotetext{
* Preliminary.
}

Table 5.4.21.4.3 Nephrops on the Aran Grounds (FU 17). Results from the UWTV-FU 17 survey of Nephrops on the Aran Grounds.
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{c} 
Number \\
of \\
stations
\end{tabular} & \begin{tabular}{c} 
Burrow \\
count
\end{tabular} & \begin{tabular}{c} 
Mean \\
density \\
adjusted \\
(burrows/m²
\end{tabular} & \begin{tabular}{c} 
Estimation \\
standard \\
deviation
\end{tabular} & \begin{tabular}{c} 
Domain \\
area (km \({ }^{2}\) )
\end{tabular} & \begin{tabular}{c} 
Geostatistical \\
abundance \\
estimate adjusted \\
(millions of
\end{tabular} & \begin{tabular}{c} 
CV on \\
burrow \\
estimate
\end{tabular} \\
\hline 2002 & 49 & 7036 & 0.65 & 0.04 & 943 & 629 & \\
2003 & 41 & 9814 & 0.78 & 0.06 & 943 & 761 & \(4 \%\) \\
2004 & 64 & 10687 & 1.10 & 0.05 & 943 & 1075 & \(5 \%\) \\
2005 & 70 & 8774 & 0.84 & 0.03 & 936 & 818 & \(3 \%\) \\
2006 & 67 & 6928 & 0.49 & 0.02 & 932 & 474 & \(3 \%\) \\
2007 & 71 & 10272 & 0.71 & 0.03 & 942 & 697 & \(3 \%\) \\
2008 & 63 & 7617 & 0.43 & 0.02 & 906 & 412 & \(3 \%\) \\
2009 & 82 & 6585 & 0.56 & 0.02 & 940 & 552 & \(3 \%\) \\
2010 & 91 & 8091 & 0.65 & 0.01 & 937 & 636 & \(2 \%\) \\
2011 & 76 & 7365 & 0.51 & 0.02 & 909 & 491 & \(2 \%\) \\
2012 & \(31^{*}\) & 1271 & 0.34 & 0.02 & 942 & 325 & \(3 \%\) \\
2013 & \(31^{*}\) & 1937 & 0.32 & 0.00 & 941 & \(5 \%\) \\
\hline
\end{tabular}
- Preliminary
Table 5.4.21.4.4 Nephrops on the Aran Grounds (FU 17). Landings, discards, and removals by number, proportion retained, adjusted UWTV survey abundance, estimated
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline Year & Landings in number (millions) & Discards in number (millions) & Removals in number (millions) & Proportion removals retained & Adjusted survey (millions) & Harvest rate & \begin{tabular}{l}
Landings \\
(t)
\end{tabular} & \begin{tabular}{l}
Discards \\
(t)
\end{tabular} & Mean weight in landings (g) & Mean weight in discards (g) \\
\hline 2001 & 48.7 & 25.4 & 71.6 & 0.68 & & & 912 & & & \\
\hline 2002 & 54.5 & 17.7 & 70.4 & 0.77 & 629 & 11.2\% & 1152 & 192 & 21.2 & 10.8 \\
\hline 2003 & 44.1 & 18.3 & 60.6 & 0.73 & 761 & 8.0\% & 933 & 183 & 21.2 & 10.0 \\
\hline 2004 & 29.0 & 11.4 & 39.3 & 0.74 & 1075 & 3.7\% & 525 & 112 & 18.1 & 9.9 \\
\hline 2005 & 42.4 & 19.7 & 60.1 & 0.70 & 818 & 7.4\% & 778 & 182 & 18.4 & 9.2 \\
\hline 2006 & na & na & 49.5* & na & 474 & 10.4\% & 636 & na & na & na \\
\hline 2007 & na & na & 57.3* & na & 697 & 8.2\% & 913 & na & na & na \\
\hline 2008 & 46.9 & 21.6 & 66.3 & 0.71 & 412 & 16.1\% & 1050 & 245 & 22.4 & 11.3 \\
\hline 2009 & 23.5 & 15.7 & 37.6 & 0.62 & 552 & 6.8\% & 625 & 256 & 26.6 & 16.3 \\
\hline 2010 & 41.0 & 13.3 & 53.0 & 0.77 & 636 & 8.3\% & 1000 & 194 & 24.4 & 14.5 \\
\hline 2011 & 30.8 & 7.7 & 37.7 & 0.82 & 491 & 7.7\% & 600 & 83 & 19.5 & 10.8 \\
\hline 2012 & 55.6 & 7.6 & 62.4 & 0.89 & 325 & 19.2\% & 1135 & 85 & 20.4 & 11.3 \\
\hline 2013 & na & na & na & na & 317 & na & na & na & na & na \\
\hline \[
\begin{gathered}
\text { Avg. } \\
2010-12 \\
\hline
\end{gathered}
\] & 42.5 & 9.5 & 51.0 & 0.83 & 484 & 12\% & 912 & 121 & 21.4 & 12.2 \\
\hline
\end{tabular}
na= not available.
* No discard samples; an average discard rate was used to estimate removals (including dead discards).

\section*{FU 19 Nephrops Stocks on the SE and SW Coast of Ireland}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 521 t . If total discard rates do not change from the average of the last three years (2010-20|2), this implies total catches of no more than 618 t . FEAS agrees with the ICES advice.

This stock falls in to ICES category I for data-rich stocks for which a quantitative assessment is available.


Red Boxes - TAC/Management Area Blue Shading - Functional Unit

The current TAC area and the stock assessment areas do not match for Nephrops in VII (see the overview for Nephrops stocks in Sub-area VII on page 42). FEAS agrees with the ICES and STECF advice that all Nephrops fisheries are managed at an appropriate geographical scale i.e. Functional Unit.

\section*{CURRENT MANAGEMENT}
- For current management see the overview for Nephrops stocks in Sub-area VII on page 42.

\section*{ICES ADVICE 5.4.21.5 Nephrops off the South-eastern and South-western coasts of Ireland (FU 19)}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 521 tonnes. If total discard rates do not change from the average of the last three years (2010-2012), this implies total catches of no more than 618 tonnes. Note that this figure includes discards expected to survive the discarding process - assumed to be \(10 \%\) of the total number discarded for this stock.

In order to ensure the stock in this FU is exploited sustainably, management should be implemented at the functional unit level.

\section*{Stock status}

\begin{tabular}{|c|c|c|}
\hline \multicolumn{3}{|r|}{SSB (Spawning-Stock Biomass)} \\
\hline & & 2011-2013 \\
\hline MSY ( \(\mathrm{B}_{\text {trigger }}\) ) & ? & Undefined \\
\hline \begin{tabular}{l}
Precautionary \\
approach ( \(\mathrm{B}_{\mathrm{pa}}, \mathrm{B}_{\text {lim }}\) )
\end{tabular} & \[
?
\] & Undefined \\
\hline Qualitative evaluation & (4) & Decreasing \\
\hline
\end{tabular}


Figure 5.4.21.5.1 Nephrops off the southeastern and southwestern coasts of Ireland (FU 19). Landings (in tonnes), UWTV abundance (in millions; SSB proxy, confidence intervals \(95 \%\) ), and harvest rates ( \(\mathrm{F}_{\text {MSY }}\) proxy shown as the dashed green line).

Recent harvest rates (removals/UWTV abundance) are around the \(\mathrm{F}_{\text {MSY }}\) proxy. The time-series of reliable abundance estimates is too short to detect a significant trend within the uncertainty bounds, but appears to be decreasing.

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

This area has numerous small and spatially distinct mud patches. Survey information indicates consistent differences in catches and their mean length between mud patches, suggesting variable population densities and growth; however, mean size over the whole area has remained stable over time. Sampling of commercial landings shows large variations in size because of this.

\section*{The fisheries}

The Nephrops fishery in this functional unit is mainly an otter trawl fishery using single- and twin-rigs and a codend mesh size of \(80-99 \mathrm{~mm}\).

Catch distribution Total catch \((2012)=919 \mathrm{t}\), where \(84 \%\) were landings ( \(100 \%\) otter trawl \()\) and \(16 \%\) discards.

\section*{Effects of the fisheries on the ecosystem}

Nephrops fisheries in this area have bycatches of megrim, hake, and monkfish.

\section*{Quality considerations}

A relatively extensive UWTV survey was conducted for the third time in 2013. In addition, there was also a survey in 2006 with a low number of stations. The most recent survey gives estimates of burrow densities for the main patches of Nephrops habitat in FU 19. Although the ground boundaries in FU 19 could be improved, the current procedure for calculating catch options is considered adequate.

Mean size in the landings has been quite variable over the time-series, partially reflecting the difference in mean sizes of patches with different underlying densities. Adequate catch sampling remains difficult for such a heterogeneous area.

Scientific basis
\begin{tabular}{|c|c|}
\hline Assessment type & UWTV survey and trends in size structure of catches. \\
\hline Stock data category & 1 ( 1 \\
\hline Input data & Commercial catches (international landings Ireland, France and UK); length frequencies from catch and discard sampling (Ireland); one UWTV survey indices (UWTV-FU 19); maturity data from commercial catch and survey sampling; fixed natural mortality. Discard survival rate. \\
\hline Discards and bycatch & Discards included in the assessment from Irish Nephrops-directed fleet. \\
\hline Indicators & Mean size in landings and bottom trawl survey (IRGFS-WIBTS-Q4). Commercial Irish lpue. \\
\hline Other information & This stock is scheduled to be benchmarked in 2014. \\
\hline Working group report & WGCSE (ICES, 2013). \\
\hline
\end{tabular}

\section*{ECOREGION Celtic Sea and West of Scotland \\ STOCK Nephrops off the southeastern and southwestern coasts of Ireland (FU 19)}

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline \multirow{2}{l|}{\begin{tabular}{l} 
MSY \\
approach
\end{tabular}} & MSY B \(_{\text {triger }}\) & Not defined. & \\
\cline { 2 - 4 } \begin{tabular}{l} 
Precautionary \\
approach
\end{tabular} & Not defined. & HR 7.5\%. & Equivalent to \(\mathrm{F}_{0.1}\) for combined sexes in 2012. \\
\hline
\end{tabular}
(unchanged since 2012)
\begin{tabular}{lccr}
\multicolumn{4}{l}{ Harvest ratio reference points (2012): } \\
\hline & Male & Female & Combined \\
\hline \(\mathrm{F}_{\max }\) & \(10.4 \%\) & \(21.9 \%\) & \(12.7 \%\) \\
\(\mathrm{~F}_{0.1}\) & \(6.5 \%\) & \(14.2 \%\) & \(7.5 \%\) \\
\(\mathrm{~F}_{35 \% \mathrm{SpR}}\) & \(8.3 \%\) & \(21.8 \%\) & \(12.1 \%\) \\
\hline
\end{tabular}

The density of Nephrops in FU 19 is considered moderate (average density \(0.3 \mathrm{~m}^{-2}\) ). Recent harvest rates (7-9\%) are low in comparison to other FUs and the mean size and lpue indicators appear stable. For this FU, the exploitation rate on males is usually higher than on females. A harvest ratio consistent with a combined-sex \(\mathrm{F}_{0.1}\) of \(7.5 \%\) is suggested as a proxy for \(\mathrm{F}_{\mathrm{MSY}}\)

Basis: \(\mathrm{F}_{2013}=\mathrm{F}_{2012}=9.3 \%\); Bias-corrected survey index (2013) \(=397\) million; Mean weight in landings (2010\(2012)=23.84 \mathrm{~g}\); Dead discard rate \((\) by number \()=26.6 \%\); Mean weight in discards \((2010-2012)=11.03 \mathrm{~g}\); survey bias \(=1.3 ;\) Discard survival \(=10 \%\).
\begin{tabular}{|c|c|c|c|c|c|}
\hline \multirow[t]{2}{*}{Basis} & Total catches* & Landings & \[
\begin{gathered}
\text { Dead } \\
\text { discards** }
\end{gathered}
\] & Surviving discards** & Harvest rate \\
\hline & L+DD+SD & L & DD & SD & for \(\mathrm{L}+\mathrm{DD}\) \\
\hline \(\mathrm{F}_{\mathrm{MSY}}\) proxy & 618 & 521 & 87 & 10 & 7.5\% \\
\hline \(\mathrm{F}_{2013}\) & 768 & 648 & 108 & 12 & 9.3\% \\
\hline \(\mathrm{F}_{35 \% \mathrm{SpR}}\) & 997 & 841 & 141 & 16 & 12.1\% \\
\hline \(\mathrm{F}_{\text {max }}\) & 1047 & 883 & 148 & 16 & 12.7\% \\
\hline
\end{tabular}

Weights in tonnes.
* Total catches are the landings plus dead and surviving discards.
** Total discard rate is assumed to be \(28.7 \%\) of the catches (in number, average of the last three years, 2010-2012); discard survival is assumed to be \(10 \%\)

\section*{MSY approach}

No MSY B \(_{\text {trigger }}\) has been identified for this FU. Following the ICES MSY approach implies the harvest ratio for FU 19 should be reduced to less than \(7.5 \%\), resulting in landings of no more than 521 t in 2014 . If discard rates do not change from the average of the last three years (2010-2012, assuming \(10 \%\) discard survival), this implies total catches of no more than 618 t .

\section*{Additional considerations}

The advice takes into account the 2013 UWTV survey results.

\section*{Management considerations}

The abundance estimates and the \(\mathrm{F}_{\text {MSY }}\) harvest rate are considered conservative; the time-series of UWTV observations is short, and scientific knowledge about Nephrops populations and fisheries in this area is limited but improving.

Nephrops fisheries in this area are fairly mixed, landing also megrim, anglerfish, haddock, and other demersal species. Around \(44 \%\) of the total catch by weight is discarded. The main discarded fish species are haddock and boarfish (Anon., 2011).

The proportion of discarded Nephrops is substantial. On average over the last three years, around \(29 \%\) (in numbers) or \(16 \%\) (in weight) of the Nephrops caught are estimated to have been discarded.

\section*{Changes in fishing technology and fishing patterns}

Vessels smaller than 18 m are the main participants in the Nephrops fishery in FU 19 as most of the discrete grounds are mainly found inshore. Effort of larger vessels ( \(>18 \mathrm{~m}\) ) has been declining since 2003 (Figure 5.4.21.5.3).

\section*{Uncertainties in the assessment and forecast}

General comments of uncertainties in the assessment and forecast using the information from the UWTV surveys are discussed in the introduction of Section 5.4.21.

For this area, the main uncertainties relate to the heterogeneity in size and density of the Nephrops populations in the different discrete patches within FU 19. This underlying variability results in relatively high spatio-temporal variability estimates of mean weight and discard parameters. There is also some uncertainty relating to ground boundaries in FU 19 which are likely to be underestimates in most cases.

The assessment is based on indicators and an UWTV survey as last year. The advice for 2014 was delayed until autumn to take account of the most up-to-date survey information.

Last year's advice was based on the MSY approach. This year's advice is on the same basis.

\section*{Sources}

Anon. 2011. Atlas of Demersal Discarding, Scientific Observations and Potential Solutions, Marine Institute, Bord Iascaigh Mhara, September 2011. ISBN 978-1-902895-50-5. 82 pp .
ICES. 2009. Report of the Benchmark Workshop on Nephrops (WKNEPH), 2-6 March 2009, Aberdeen, UK. ICES CM 2009/ACOM:33.
ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.


Figure 5.4.21.5.2 Nephrops off the southeastern and southwestern coasts of Ireland (FU 19). Annual length composition of IRGFS-WIBTS-Q4 survey catch. Males (right) and females (left) from 2003 (bottom) to 2012 (top). The vertical solid line is the mean length in the survey catch. The straight vertical lines correspond to 25 mm (MLS) and 33 mm carapace length. .


Figure 5.4.21.5.3 Nephrops off the southeastern and southwestern coasts of Ireland (FU 19). Fishing effort and lpue by all Irish vessels targeting Nephrops (black line) and by vessels \(>18 \mathrm{~m}\) total length (blue line).

Table 5.4.21.5.1 Nephrops off the southeastern and southwestern coasts of Ireland (FU 19). ICES advice, management, landings, and discards.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & ICES advice & Predicted landings corresp. to advice (FU 19) & Recommended landings Divisions VIIbcjk \({ }^{1}\) & ICES
landings FU 19 & Total
discards \(^{2} \mathrm{FU}\)
19 \\
\hline 1992 & & & 3.8 & 0.9 & \\
\hline 1993 & & & \(\sim 4.0\) & 0.9 & \\
\hline 1994 & & & \(\sim 4.0\) & 0.4 & \\
\hline 1995 & & & \(\sim 4.0\) & 0.7 & \\
\hline 1996 & & & 4.0 & 0.9 & \\
\hline 1997 & & & 4.0 & 0.8 & \\
\hline 1998 & & & 4.0 & 0.8 & \\
\hline 1999 & & & 4.0 & 0.6 & \\
\hline 2000 & & & 4.0 & 0.7 & \\
\hline 2001 & & & 4.0 & 0.8 & \\
\hline 2002 & & & 4.44 & 1.3 & \\
\hline 2003 & & & 4.44 & 1.2 & \\
\hline 2004 & Restrict landings to 2000-2002 levels & & 3.3 & 1.1 & \\
\hline 2005 & Restrict landings to 2000-2002 levels & & 3.3 & 0.7 & \\
\hline 2006 & Restrict landings to 2000-2002 levels & & 3.3 & 0.7 & 0.0 \\
\hline 2007 & Constrain effort at recent levels & & -- & 1.0 & 0.0 \\
\hline 2008 & Constrain effort at recent levels & & -- & 0.9 & 0.0 \\
\hline 2009 & No increase in effort and landings (2007) & \(<0.8\) & -- & 0.8 & 0.1 \\
\hline 2010 & No new advice, same as for 2009 & \(<0.8\) & -- & 0.7 & 0.1 \\
\hline 2011 & See scenarios & - & & 0.6 & 0.1 \\
\hline 2012 & Reduce catches & - & & 0.8 & 0.1 \\
\hline 2013 & MSY approach & \(<0.82\) & & & \\
\hline 2014 & MSY approach & \(<0.521\) & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1}\) Previously ICES gave combined advice for FUs \(16,17,18\), and 19 , and other rectangles in this area.
\({ }^{2}\) Assumed survival rate of \(10 \%\).
}

Table 5.4.21.5.2 Nephrops off the southeastern and southwestern coasts of Ireland (FU 19). Landings (in tonnes).
\begin{tabular}{|c|c|c|c|c|}
\hline \multirow{2}{*}{ Year } & \multicolumn{5}{|c|}{ FU 19 } \\
\cline { 2 - 5 } & France & \begin{tabular}{c} 
Rep. of \\
Ireland
\end{tabular} & UK & Total \\
\hline 1989 & 245 & 652 & 2 & 899 \\
1990 & 181 & 569 & 4 & 754 \\
1991 & 212 & 860 & 5 & 1077 \\
1992 & 233 & 640 & 15 & 888 \\
1993 & 229 & 672 & 4 & 905 \\
1994 & 216 & 153 & 21 & 390 \\
1995 & 175 & 507 & 12 & 695 \\
1996 & 145 & 736 & 7 & 888 \\
1997 & 93 & 656 & 7 & 756 \\
1998 & 92 & 733 & 2 & 827 \\
1999 & 77 & 499 & 3 & 579 \\
2000 & 144 & 541 & 11 & 696 \\
2001 & 111 & 702 & 2 & 815 \\
2002 & 188 & 1130 & 0 & 1318 \\
2003 & 165 & 1075 & 0 & 1239 \\
2004 & 76 & 997 & 1 & 1074 \\
2005 & 62 & 648 & 2 & 711 \\
2006 & 65 & 675 & 1 & 741 \\
2007 & 63 & 894 & 0 & 957 \\
2008 & 46 & 805 & 15 & 866 \\
2009 & 55 & 764 & 15 & 833 \\
2010 & 14 & 694 & 13 & 722 \\
2011 & 23 & 585 & 1 & 608 \\
\(2012^{*}\) & 11 & 758 & 1 & 770 \\
\hline
\end{tabular}
* Preliminary.

Table 5.4.21.5.3 Nephrops off the southeastern and southwestern coasts of Ireland (FU 19). Results from the UWTV-FU 19 survey of Nephrops grounds in 2006 and 2011-2013.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
Number \\
of \\
stations
\end{tabular} & Area surveye d ( \(\mathbf{k m}^{2}\) ) & \[
\begin{gathered}
\text { Area } \\
\text { estimate } \\
\left(\mathbf{k m}^{2}\right)
\end{gathered}
\] & \[
\begin{aligned}
& \text { Burrow } \\
& \text { count }
\end{aligned}
\] & Mean observed density adjusted (burrow/ m²) & Standard deviation & Raised abundance estimate adjusted (million burrows) & \[
95 \% \text { CI on }
\]
abundance & CVs \\
\hline 2006 & 6 & 0.93 & 1,653 & 293 & 0.21 & 0.18 & 342 & 320 & 36\% \\
\hline 2007 & \multicolumn{9}{|c|}{\multirow{4}{*}{No Survey Data}} \\
\hline 2008 & & & & & & & & & \\
\hline 2009 & & & & & & & & & \\
\hline 2010 & & & & & & & & & \\
\hline 2011 & 35 & 5 & 1,653 & 2616 & 0.34 & 0.26 & 557 & 148 & 13\% \\
\hline 2012 & 40 & 9 & 1,653 & 4124 & 0.30 & 0.18 & 498 & 96 & 9\% \\
\hline 2013 & 40 & 6 & 1,653 & 1884 & 0.25 & 0.26 & 397 & 139 & 17\% \\
\hline
\end{tabular}

Table 5.4.21.5.4 Nephrops off the southeastern and southwestern coasts of Ireland (FU 19). Landings, discards, and removals in number, dead discard rate, UWTV abundance, harvest ratio, and total weight and mean weight of landings and discards.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline Year & Landing \(s\) in number (millions ) & Discards in number (millions ) & Removal \(s\) in number (millions ) & Dead discard rate (by number ) & Adjusted survey (millions ) & Harves t ratio & Landings (t) & Discard
\[
s(t)
\] & Mean weight in landing s (g) & Mean weight in discard \(s\) (g) \\
\hline 2006 & 25.1 & 2.5 & 27.3 & 0.08 & & & 741 & 41 & 29.5 & \\
\hline 2007 & 29.9 & 1.5 & 31.3 & 0.04 & & & 957 & 27 & 32.0 & \\
\hline 2008 & 26.6 & 1.4 & 27.8 & 0.04 & & & 866 & 23 & 32.6 & \\
\hline 2009 & 30.1 & 6.9 & 36.3 & 0.17 & & & 833 & 87 & 27.7 & \\
\hline 2010 & 27.3 & 9.0 & 35.4 & 0.23 & & & 722 & 106 & 26.4 & 11.8 \\
\hline 2011 & 27.4 & 12.6 & 38.8 & 0.29 & 557 & 7.0\% & 608 & 137 & 22.2 & 10.9 \\
\hline 2012 & 33.5 & 14.3 & 46.4 & 0.28 & 498 & 9.3\% & 770 & 149 & 23.0 & 10.4 \\
\hline 2013 & & & & & 397 & & & & & \\
\hline \[
\begin{array}{r}
\text { Avg. 2010- } \\
12 \\
\hline
\end{array}
\] & & & & 0.266 & & & & & 23.84 & 11.03 \\
\hline
\end{tabular}

\section*{FU 20-2I Nephrops Stocks in the Celtic Sea}

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

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice for this stock was not updated in 2013. The advice given last year is maintained for 2014 as follows; "Based on ICES approach to data-limited stocks, ICES advises that landings should be no more than 2,500 t". FEAS agrees with the ICES advice.

FEAS have carried out UWTV surveys on the Labadie and other parts of FU20-2I in 2012 and 2013. The results of these surveys will be considered at a benchmark meeting in 2014 and should form the basis of a new assessment and advice for this stock in 2014.


Red Boxes - TAC/Management Area Blue Shading - Functional Unit

\section*{CURRENT MANAGEMENT}
- For current management see the overview for Nephrops stocks in Sub-area VII on page 42.

\section*{ICES ADVICE 5.4.21.6 Nephrops in the FU 20 (Labadie, Baltimore and Galley), FU21 Jones and Cockburn)}

\section*{Advice for 2014}

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see ICES, 2012a): "Based on ICES approach to data-limited stocks, ICES advises that landings should be no more than 2500 tonnes. [...].To protect the stock in this functional unit, management should be implemented at the functional unit level."

\section*{Quality considerations}

Discards of Nephrops are thought to be extensive, but observations are insufficient to provide a reliable timeseries. The data from sampling programmes in France and Ireland are patchy, leading to some uncertainty in the estimation of mean weight in the landings and discard rates.

The area of the Nephrops habitat in FUs 20-21 is uncertain. There seems to be a geographically broad distribution of the population (broader than the fishery), but the habitat is particularly complex and heterogeneous; this may lead to problems assessing the actual area.

Very few UWTV observations of density exist although more extensive surveys were carried out in 2012 and 2013. The observed densities are moderate ( \(0.3-0.8\) burrow \(\mathrm{m}^{-2}\) ) but there is large variability in the density structure.

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & Data-limited method for Nephrops. \\
Stock data category & \begin{tabular}{l} 
4.1.4
\end{tabular} \\
Input data & Habitat extent, mean size, landings and estimate discard rates from sampling, burrow \\
density estimates.
\end{tabular} Discards and bycatch \begin{tabular}{l} 
Discards rates from French and Irish fleets were included in the assessment, but not as \\
a time-series.
\end{tabular}
\begin{tabular}{ll} 
Indicators & \begin{tabular}{l} 
Trends based on lpue information and mean sizes in the catches (commercial index: \\
French trawlers - threshold \(10 \%\), Irish trawlers - threshold: 30\%). One UWTV survey \\
(UWTV-FU2021) and two bottom trawl surveys (IGFS-WIBTS-Q4 and EVHOE-
\end{tabular} \\
& WIBTS-Q4).
\end{tabular}

\section*{Sources}

ICES. 2012a. Nephrops in FU 20 (Labadie, Baltimore, and Galley) and FU 21 (Jones and Cockburn). In Report of the ICES Advisory Committee 2012, Section 5.4.34.6. ICES Advice 2012, Book 5: 336-341.
ICES. 2012b. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9-18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.
ICES. 2013. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

Table 5.4.21.6.1 Nephrops in FU 20 (Labadie, Baltimore, and Galley) and FU 21 (Jones and Cockburn). ICES advice, management, and landings.
\(\left.\begin{array}{llcc}\hline \text { Year } & \text { ICES advice }{ }^{\text {1) }} & \begin{array}{c}\text { Predicted landings } \\ \text { corresp. to advice } \\ \text { (FUs 20-21) }\end{array} & \begin{array}{c}\text { ICES landings ICES landings } \\ \text { FUs 20-22 }\end{array} \\ \text { FUs 20-21 }\end{array}\right]\)

\footnotetext{
Weights in thousand tonnes.
\({ }^{1)}\) Advice prior to 2013 applies to FUs 20-22.
}

Table 5.4.21.6.2 Nephrops in FU 20 (Labadie, Baltimore, and Galley) and FU 21 (Jones and Cockburn). Landings (t) by country as used by ICES.
\begin{tabular}{|c|c|r|c|c|}
\cline { 2 - 5 } \multicolumn{1}{c|}{} & \multicolumn{4}{c|}{ FU 20-21 Landings (t) } \\
\hline Year & France & \begin{tabular}{c} 
Rep. of \\
Ireland
\end{tabular} & UK & Total \\
\hline 1999 & 1051 & 83 & 18 & 1152 \\
2000 & 1661 & 107 & 10 & 1778 \\
2001 & 1750 & 69 & 14 & 1833 \\
2002 & 2559 & 104 & 11 & 2674 \\
2003 & 2796 & 148 & 9 & 2953 \\
2004 & 2140 & 299 & 4 & 2443 \\
2005 & 2008 & 455 & 6 & 2469 \\
2006 & 2066 & 450 & 7 & 2523 \\
2007 & 1816 & 600 & 3 & 2419 \\
2008 & 2036 & 937 & 7 & 2980 \\
2009 & 1930 & 1202 & 13 & 3145 \\
2010 & 975 & 756 & 62 & 1793 \\
2011 & 566 & 637 & 34 & 1237 \\
2012 & 453 & 708 & 28 & 1189 \\
\hline
\end{tabular}

\section*{FU 22 Nephrops Stocks in the Smalls}

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

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises on the basis of the MSY approach that landings from FU 22 in 2014 should be no more than \(2,674 \mathrm{t}\). If total discard rates do not change from the average of the last three years (20I0-20I2), this implies total catches of no more than \(2,937 \mathrm{t}\). FEAS agrees with the ICES advice.

This stock falls in to ICES category I for data-rich stocks for which a quantitative assessment is available.

The current TAC area and the stock assessment areas do not match for Nephrops in VII (see the overview for Nephrops stocks in Sub-area VII on page 42). FEAS agrees with the ICES and STECF advice that all Nephrops fisheries should be managed at an appropriate geographical scale i.e. Functional Unit.

\section*{CURRENT MANAGEMENT}
- For current management see the overview for Nephrops stocks in Sub-area VII on page 42.

\section*{ICES ADVICE 5.4.21.7 Nephrops in Functional Unit 22, The Smalls}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that landings from FU 22 in 2014 should be no more than 2674 tonnes. If total discard rates do not change from the average of the last three years (2010-2012), this implies total catches of no more than 2937 tonnes. Note that this figure includes discards expected to survive the discarding process - assumed to be \(25 \%\) of the total number discarded for this stock.

In order to ensure the stock in this FU is exploited sustainably, management should be implemented at the functional unit level.

\section*{Stock status}
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|c|}{F (Fishing Mortality)} \\
\hline & 2010 & 2011 & & 2012 \\
\hline MSY ( \(\mathrm{F}_{\text {MSY }}\) ) & \(\times\) & \(\checkmark\) & & Appropriate \\
\hline Precautionary \(\operatorname{approach}\left(\mathrm{F}_{\mathrm{pa}}, \mathrm{F}_{\mathrm{lim}}\right)\) & (?) & ? & & Unknown \\
\hline
\end{tabular}

SSB (Spawning-Stock Biomass)
2011-2013
MSY ( \(\mathrm{B}_{\text {trigger }}\) )
Precautionary
\(\operatorname{approach}\left(\mathrm{B}_{\mathrm{pa}}, \mathrm{B}_{\mathrm{lim}}\right)\)
Qualitative evaluation
? Undefined
? Undefined
Stable


Figure 5.4.21.7.1 Nephrops in the Smalls (FU 22). Top left: Landings in tonnes. Top right: UWTV survey abundance (proxy for SSB, \(95 \%\) confident intervals). Bottom right: harvest rate (green dashed line represents \(\mathrm{F}_{\text {MSY }}\) harvest ratio proxy).

The FU 22 stock component is considered to be stable. Harvest rates (removals/UWTV abundance) have decreased since 2007 and are below the \(\mathrm{F}_{\text {MSY }}\) proxy.

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{Biology}

The "Smalls" can be characterized as an area of moderate density of Nephrops.

\section*{The fisheries}

Irish vessels account for around \(95 \%\) of the landings. These vessels mainly use twin otter trawls. The fishery occurs throughout the year with a seasonal peak in activity in May.

Catch distribution Total catch \((2012)=2.8 \mathrm{kt}\), where \(90 \%\) were landings \((100 \%\) otter trawl \()\) and \(10 \%\) discards.

\section*{Effects of the fisheries on the ecosystem}

Nephrops fishery in the Celtic Sea has bycatches of whiting and cod, and to a lesser extent of haddock and hake.

\section*{Quality considerations}

Sampling of this stock is good. A dedicated annual UWTV survey has taken place since 2006 which gives abundance estimates for the Smalls grounds with high precision.

\section*{Scientific basis}

Assessment type
Stock data category
Input data

Discards and bycatch
Indicators
Other information
Working group report

UWTV and trends of the size structure of catches
1
One survey index (UWTV-FU 22), commercial catches (international landings (Ireland, France and UK), length frequencies from Irish catch and discard sampling); maturity data (from commercial catch sampling and during surveys), fixed natural mortality. Discard survival rate.
Discards from the Irish Nephrops-directed fleet are included in the assessment.
Mean size and lpue.
None.
WGCSE (ICES, 2013).
5.4.21.7

\section*{ECOREGION Celtic Sea and West of Scotland STOCK Nephrops in the Smalls (FU 22)}

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline \begin{tabular}{l} 
MSY \\
approach
\end{tabular} & MSY B \(_{\text {trigger }}\) & Not defined. & \\
\cline { 2 - 4 } & \begin{tabular}{l}
\(\mathrm{F}_{\text {MSY }}\) (FU 22) \\
harvest rate.
\end{tabular} & \(10.9 \%\) & Equivalent to \(\mathrm{F}_{35 \% \text { SPR }}\) for combined sexes in 2011. \\
\hline \begin{tabular}{l} 
Precautionary \\
approach
\end{tabular} & Not defined. & \\
\hline
\end{tabular}
(unchanged since 2011)

Harvest ratio reference points (2011):
\begin{tabular}{lccr}
\hline & Male & Female & Combined \\
\hline \(\mathrm{F}_{\max }\) & \(10.9 \%\) & \(17.7 \%\) & \(12.3 \%\) \\
\(\mathrm{~F}_{0.1}\) & \(6.5 \%\) & \(10.9 \%\) & \(7.5 \%\) \\
\(\mathrm{~F}_{35 \% \mathrm{SPR}}\) & \(8.4 \%\) & \(15.3 \%\) & \(10.9 \%\) \\
\hline
\end{tabular}

For FU 22, the absolute density observed during the UWTV survey is medium ( \(\sim 0.5 \mathrm{~m}^{-2}\) ), suggesting the stock has moderate productivity. The fishery in this area has been in existence since the 1960s and has been relatively stable for many years. Recent harvest ratios in this FU have been variable but generally around the \(\mathrm{F}_{35 \% \mathrm{SpR}} . \mathrm{F}_{35 \% \mathrm{SpR}}\) (combined between sexes) is expected to deliver high long-term yield with a low probability of recruitment overfishing and therefore is chosen as the \(\mathrm{F}_{\text {MSY }}\) proxy for FU 22.

Outlook for 2014
FU 22: Basis: \(\mathrm{F}_{2013}=\mathrm{F}_{2012}=9.5 \%\); Bias-corrected survey index (2013) \(=1254\) million; Mean weight in landings \((2003-2012)=22.08 \mathrm{~g}\); Dead discard rate \((\) by number \()=11.4 \%\); Mean weight in discards \((2003-2012)=12.62 \mathrm{~g}\); Survey bias \(=1.3\); Discards survival rate \(=25 \%\).
\begin{tabular}{|l|c|c|c|c|c|}
\hline \multirow{2}{*}{ Basis } & Total catches* & Landings & \begin{tabular}{c} 
Dead \\
discards**
\end{tabular} & \begin{tabular}{c} 
Surviving \\
discards**
\end{tabular} & Harvest rate \\
\cline { 2 - 6 } & \(\mathrm{L}+\mathrm{DD}+\mathrm{SD}\) & L & DD & SD & for L+DD \\
\hline \(\mathrm{F}_{\text {MSY }}\) proxy & 2937 & 2674 & 197 & 66 & \(10.9 \%\) \\
\hline \(\mathrm{~F}_{2013}\) & 2551 & 2323 & 171 & 57 & \(9.5 \%\) \\
\hline \(\mathrm{~F}_{0.1 \text { Combined }}\) & 2021 & 1840 & 136 & 45 & \(7.5 \%\) \\
\hline \(\mathrm{~F}_{\max }\) & 3314 & 3018 & 222 & 74 & \(12.3 \%\) \\
\hline
\end{tabular}

\section*{Weights in tonnes.}
* Total catches are the landings plus dead and surviving discards.
** Total discard rate is assumed to be \(14.7 \%\) of the catches (in number, average of the last three years, 2010-2012), discard survival is assumed to be \(25 \%\).

\section*{MSY approach}

No MSY \(\mathrm{B}_{\text {trigger }}\) has been identified for this FU. Following the ICES MSY approach implies that the harvest ratio for the Smalls FU 22 should be reduced to less than \(10.9 \%\), resulting in landings of no more than 2674 tonnes in 2014. If discard rates do not change from the average of the last three years (2010-2012, assuming \(25 \%\) discard survival), this implies total catches of no more than 2937 tonnes.

\section*{Additional considerations}

The advice takes into account the 2013 UWTV survey results.
Cod, whiting, and to a lesser extent haddock are landed together with Nephrops. The Nephrops trawl fleet operating in Divisions VIIgfh discards around \(38 \%\) of its total catch by weight. Small Nephrops are the main species in the discards and the main fish species discarded are whiting, haddock, and dogfish (Anon., 2011).

The proportion of discarded Nephrops is substantial. On average over the last three years, around \(15 \%\) in numbers (or \(9 \%\) in weight) of the Nephrops caught are estimated to have been discarded.

\section*{Changes in fishing techniques and fishing patterns}

In recent years several newer vessels specializing in Nephrops fishing have participated in this fishery. These vessels target Nephrops on several other grounds within the TAC area and move around to optimize catch rates. Irish fishing effort has declined from a peak in 2007, while French effort has shown a declining trend since 1999. The lpue of the Irish Nephrops-directed fleet has been increasing since 2004 (see Figure 5.4.21.7.2).

\section*{Data and methods}

The long-term average (2003-2012) for the mean weight in landings (rather than a three-year average) was considered to be more appropriate as an input to calculate catch options, due to the interannual variation. The proportions retained by the fishery were averaged over the last three years \((2010-2012)\) to reflect current retention practices.

\section*{Uncertainties in assessment and forecast}

General comments of uncertainties in the assessment and forecast using the information from the UWTV surveys are discussed in the introduction of Section 5.4.21.

The main uncertainties in FU 22 relate to the mean weight in the landings, which is variable. Accordingly, a longer period for the calculation of mean weight has been used.

\section*{Comparison with previous assessment and advice}

The assessment is based on indicators and an UWTV survey as last year. The advice for 2014 was delayed until autumn to take account of the most up-to-date survey information.

This year's advice is based on the MSY approach, as last year.

\section*{Sources}

Anon. 2011. Atlas of Demersal Discarding, Scientific Observations and Potential Solutions, Marine Institute, Bord Iascaigh Mhara, September 2011. ISBN 978-1-902895-50-5. 82 pp.
ICES. 2013. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 8-17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.


Figure 5.4.21.7.2 Nephrops in the Smalls (FU 22). Trends in effort (top) and lpue (bottom) for the Irish Nephropsdirected fleet.

\section*{Length frequencies for Landings: Nephrops in FU22}


Figure 5.4.21.7.3 Nephrops in the Smalls (FU 22). Annual length distributions in the catches 2003-2012. Annual length composition of catch (dotted) and landed (solid). Males (right) and females (left) from 2003 (bottom) to 2012 (top). The vertical dashed line is mean length in the catches and the vertical solid line is mean length in the landings. The straight vertical lines correspond to 25 mm (MLS) and 30 mm carapace length.

Table 5.4.21.7.1 Nephrops in the Smalls (FU 22). ICES advice, management, landings, and discards.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & ICES advice \({ }^{1}\) & Predicted landings corresp. to advice (FU 22) \({ }^{1)}\) & ICES landings FU 22 & \[
\begin{gathered}
\text { Total } \\
\text { discards } \\
\text { FU } 22
\end{gathered}
\] & ICES landings FUs 20-22 \\
\hline 1987 & & & & & 3.4 \\
\hline 1988 & & & & & 3.2 \\
\hline 1989 & & & & & 4.0 \\
\hline 1990 & & & & & 4.3 \\
\hline 1991 & & & & & 3.3 \\
\hline 1992 & & \(\sim 3.8\) & & & 4.2 \\
\hline 1993 & & 3.8 & & & 4.6 \\
\hline 1994 & & 3.8 & & & 5.1 \\
\hline 1995 & & 3.8 & & & 5.5 \\
\hline 1996 & & 3.8 & & & 4.8 \\
\hline 1997 & & 3.8 & & & 4.2 \\
\hline 1998 & & 3.8 & & & 3.9 \\
\hline 1999 & & & 1.8 & & 3.0 \\
\hline 2000 & & 3.8 & 2.9 & & 4.7 \\
\hline 2001 & & 3.8 & 2.9 & & 4.8 \\
\hline 2002 & & 3.8 & 2 & & 4.7 \\
\hline 2003 & & 3.8 & 2.1 & 0.5 & 5.0 \\
\hline 2004 & Adjust TAC in line with landings of most recent 10 years & 4.6 & 1.8 & 0.1 & 4.3 \\
\hline 2005 & Adjust TAC in line with landings of most recent 10 years & 4.6 & 2.4 & 0.6 & 4.9 \\
\hline 2006 & Recent average landings 2000-2002 & 4.6 & 1.8 & 0.6 & 4.3 \\
\hline 2007 & No increase in effort & - & 2.9 & 1.5 & 5.4 \\
\hline 2008 & No increase in effort & \(<5.3\) & 3.1 & 0.8 & 6.4 \\
\hline 2009 & No increase in effort & \(<5.3\) & 2.2 & 0.6 & 5.8 \\
\hline 2010 & No new advice, same as for 2009 & \(<5.3\) & 2.7 & 0.4 & 4.8 \\
\hline 2011 & See scenarios & - & 1.6 & 0.1 & 2.9 \\
\hline 2012 & FUs 20-21: reduce catch FU 22: MSY approach & \[
2.3^{-}
\] & 2.6 & 0.3 & 3.8 \\
\hline 2013 & FU 22: MSY approach (updated November 2012) & \(3.1{ }^{3}\) & & & \\
\hline 2014 & FU 22: MSY approach & \(2.7^{3)}\) & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1)}\) Advice prior to 2014 applies to FUs 20-22.
\({ }^{2)}\) Discards survival rate is \(10 \%\).
\({ }^{3)}\) Applies to FU 22 only.
}

Table 5.4.21.7.2 Nephrops in the Smalls (FU 22). Landings (t) by country as used by ICES.
\begin{tabular}{|c|c|c|c|c|}
\cline { 2 - 5 } \multicolumn{1}{c|}{} & \multicolumn{4}{c|}{ FU 22 } \\
\hline Year & France & \begin{tabular}{c} 
Rep. of \\
Ireland
\end{tabular} & UK & Total \\
\hline 1999 & 1027 & 741 & 20 & 1788 \\
2000 & 1186 & 1687 & 34 & 2907 \\
2001 & 876 & 2054 & 5 & 2935 \\
2002 & 595 & 1392 & 3 & 1990 \\
2003 & 799 & 1241 & 10 & 2050 \\
2004 & 465 & 1330 & 33 & 1827 \\
2005 & 494 & 1931 & 0 & 2425 \\
2006 & 302 & 1398 & 52 & 1752 \\
2007 & 218 & 2614 & 48 & 2881 \\
2008 & 312 & 2474 & 328 & 3114 \\
2009 & 235 & 1642 & 368 & 2245 \\
2010 & 136 & 2220 & 351 & 2708 \\
2011 & 54 & 1548 & 15 & 1617 \\
\(2012^{*}\) & 65 & 2509 & 59 & 2633 \\
\hline
\end{tabular}
* Preliminary.

Table 5.4.21.7.3 Nephrops in the Smalls (FU 22). Results from UWTV survey of the Smalls Nephrops grounds.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{c} 
Number of \\
stations
\end{tabular} & \begin{tabular}{c} 
Mean density \\
adjusted \\
(burrow \(\mathbf{m}^{-2}\) )
\end{tabular} & \begin{tabular}{c} 
Domain \\
area \(\left(\mathbf{k m}^{2}\right)\)
\end{tabular} & \begin{tabular}{c} 
Geostatistical \\
abundance \\
adjusted \\
(millions of \\
burrows)
\end{tabular} & \begin{tabular}{c} 
CV on \\
burrow \\
estimate
\end{tabular} \\
\hline 2006 & 100 & 0.49 & 2962 & 1503 & \(2 \%\) \\
2007 & 107 & 0.37 & 2955 & 1136 & \(6 \%\) \\
2008 & 76 & 0.36 & 2698 & 1114 & \(6 \%\) \\
2009 & 67 & 0.36 & 2824 & 1093 & \(5 \%\) \\
2010 & 90 & 0.37 & 2861 & 1141 & \(4 \%\) \\
2011 & 107 & 0.41 & 2881 & 1256 & \(3 \%\) \\
2012 & 47 & 0.49 & 2934 & 1498 & \(8 \%\) \\
2013 & 41 & 0.41 & 2975 & 1254 & \(7 \%\) \\
\hline
\end{tabular}

Table 5.4.21.7.4 Nephrops in the Smalls (FU 22). Landings, discards, and removals in number, UWTV survey abundance estimates, harvest ratio, and total weight and mean weights of landings and discards.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{c} 
Landings \\
in number \\
(millions)
\end{tabular} & \begin{tabular}{c} 
Discards \\
in \\
number \\
(millions)
\end{tabular} & \begin{tabular}{c} 
Removals \\
in \\
number \\
(millions; \\
25\% \\
discard \\
survival)
\end{tabular} & \begin{tabular}{c} 
Dead \\
discards \\
in \\
number \\
(millions)
\end{tabular} & \begin{tabular}{c} 
Adjusted \\
survey \\
(millions)
\end{tabular} & \begin{tabular}{c} 
Harvest \\
ratio
\end{tabular} & \begin{tabular}{c} 
FU 22 \\
Landings \\
(t)
\end{tabular} & \begin{tabular}{c} 
FU 22 \\
Discards \\
(t)
\end{tabular} & \begin{tabular}{c} 
Mean \\
weight \\
in \\
landings \\
(g)
\end{tabular} & \begin{tabular}{c} 
Mean \\
weight \\
in \\
discards \\
(g)
\end{tabular} \\
\hline 2003 & 95.71 & 54.22 & 136.4 & 0.30 & Na & & 2050 & 535 & 21.4 & 9.9 \\
2004 & 71.65 & 8.53 & 78.1 & 0.08 & Na & & 1828 & 76 & 25.5 & 8.9 \\
2005 & 114.71 & 90.81 & 182.8 & 0.37 & Na & & 2425 & 647 & 21.1 & 7.1 \\
2006 & 97.18 & 54.67 & 138.2 & 0.30 & 1503 & \(9.2 \%\) & 1752 & 593 & 18.0 & 10.8 \\
2007 & 164.78 & 149.88 & 277.2 & 0.41 & 1136 & \(24.4 \%\) & 2880 & 1513 & 17.5 & 10.1 \\
2008 & 131.90 & 60.52 & 177.3 & 0.26 & 1114 & \(15.9 \%\) & 3114 & 764 & 23.6 & 12.6 \\
2009 & 92.75 & 31.08 & 116.1 & 0.20 & 1093 & \(10.6 \%\) & 2245 & 589 & 24.2 & 19.0 \\
2010 & 129.70 & 28.36 & 151.0 & 0.14 & 1141 & \(13.2 \%\) & 2840 & 439 & 21.9 & 15.5 \\
2011 & 61.55 & 6.65 & 66.5 & 0.07 & 1256 & \(5.3 \%\) & 1617 & 144 & 26.3 & 21.7 \\
2012 & 123.82 & 24.00 & 141.8 & 0.13 & 1498 & \(9.5 \%\) & 2633 & 256 & 21.3 & 10.7 \\
2013 & & & & & 1254 & & & & & \\
\hline
\end{tabular}

\section*{West of Ireland and Celtic Sea Saithe}

\section*{(Sub-area VII)}

\section*{FEAS -SINGLE STOCK CONSIDERATIONS}

The status of this stock is unknown and there is no ICES advice. The Joint statement by the Fisheries Council and European Commission states it would be desirable if the TAC for this stock be maintained for 5 years (subject to scientific advice). FEAS advise that the information remains the same and the 2013 TAC should be rolled over for 2014. This implies a TAC of \(3,176 \mathrm{t}\) and an Irish Quota of \(I, 491 t\).

Studies need to be carried out to evaluate the exploitation status and stock structure of saithe.

\section*{CURRENT MANAGEMENT}
- The TAC covers Sub-areas VII, VIII, IX and X.
- Ireland holds the greatest TAC share, \(45 \%\) followed by France (41\%).
- The 2013 TAC was \(3,176 \mathrm{t}\) with an associated Irish quota of l,49lt.
- In the "Communication from the Commission to the Council concerning a consultation on Fishing Opportunities for 2014" COM (2013) 319 final this stock is listed in Annex III as one of the Stocks where TAC levels are to be kept at those fixed for 2013, unless the state of these stocks changes significantly.
- The TAC is not restrictive on catch.
- Given the mixed nature of fisheries catching saithe, it is unrealistic to develop a management plan for this stock. Ireland, as the main participant in this fishery, has an opportunity to develop and implement a management strategy for mixed fisheries in this area.


Red Box -TAC/Management Area


\section*{Saithe Division VII official nominal landings by country}
(Source: ICES STATLANT database, 2012 landings are provisional)
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1986 & 1987 & 1988 & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & \\
\hline Belgium & 25 & 20 & 23 & 15 & 9 & 5 & 2 & 4 & 9 & 8 & 5 & 9 & 8 & \\
\hline Channel Islands (ns) & & & & & & & & & & & 2 & & & \\
\hline Channel Islands (Guernsey) & 2 & 3 & 4 & 3 & 3 & & 1 & & & 8 & & 4 & & \\
\hline \multicolumn{15}{|l|}{Channel Islands (Jersey)} \\
\hline Denmark & & & & & & & & & 1 & & 2 & & & \\
\hline \multicolumn{15}{|l|}{Faeroe Islands} \\
\hline France & 8256 & 6210 & 6185 & 8278 & 6625 & 7286 & 1911 & 1778 & 3234 & 2119 & 2101 & 1615 & 1537 & \\
\hline Germany & & & 124 & 30 & & & & & & & & & & \\
\hline Ireland & 1739 & 1624 & 1400 & 2165 & 1068 & 1495 & 1721 & 2010 & 1915 & 2382 & 2062 & 1384 & 1431 & \\
\hline Isle of Man & 6 & 3 & 4 & 2 & 3 & 10 & 8 & 5 & 4 & 11 & 11 & 9 & 7 & \\
\hline Netherlands & & & & & & 1 & & & & & 3 & 2 & & \\
\hline Norway & 40 & 2 & 1 & 16 & 24 & 29 & 38 & & 7 & 14 & 13 & 7 & & \\
\hline \multicolumn{15}{|l|}{Poland} \\
\hline Spain & & & & & & & & & & 13 & 27 & 23 & 68 & \\
\hline UK - Eng+Wales+N.Irl. & & & & 1157 & 1021 & 1040 & 1217 & 984 & 1059 & 991 & 1340 & 954 & 594 & \\
\hline UK - England \& Wales & 646 & 372 & 762 & & & & & & & & & & & \\
\hline UK - N. Ireland & 635 & 571 & 491 & & & & & & & & & & & \\
\hline UK - Scotland & 488 & 1064 & 142 & 131 & 1040 & 1093 & 705 & 1113 & 979 & 861 & 878 & 557 & 382 & \\
\hline \multicolumn{15}{|l|}{Un. Sov. Soc. Rep.} \\
\hline Total & 11837 & 9869 & 9136 & 11797 & 9793 & 10959 & 5603 & 5894 & 7208 & 6407 & 6444 & 4564 & 4027 & \\
\hline Country & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline Belgium & 7 & 4 & 7 & 13 & 3 & 1 & 1 & & 1 & 1 & 1 & 1 & 1 & 2 \\
\hline \multicolumn{15}{|l|}{Channel Islands (ns)} \\
\hline Channel Islands (Guernsey) & 2 & & & & & & & & & & & & & \\
\hline \multicolumn{15}{|l|}{Channel Islands (Jersey)} \\
\hline \multicolumn{15}{|l|}{Denmark} \\
\hline Faeroe Islands & & & & & & & & & & & 1 & & & \\
\hline France & & 2621 & 647 & 507 & 351 & 618 & 387 & 267 & 318 & 246 & 200 & 250 & 228 & 315.54 \\
\hline \multicolumn{15}{|l|}{Germany} \\
\hline Ireland & 1352 & 1325 & 1644 & 1263 & 754 & 629 & 394 & 393 & 286 & 163 & 254 & 303 & 683 & 981.2 \\
\hline Isle of Man & 2 & 1 & & 4 & 4 & 3 & & & 2 & 1 & 2 & 7 & 2 & 1.373 \\
\hline \multicolumn{15}{|l|}{Netherlands} \\
\hline Norway & 5 & 1 & 67 & 3 & & 3 & & 9 & & & & & & \\
\hline \multicolumn{15}{|l|}{Poland} \\
\hline Spain & 33 & 35 & 18 & 13 & 8 & 3 & 21 & 21 & 4 & 5 & 3 & 7 & & \\
\hline UK - Eng+Wales+N.Irl. & 413 & 291 & 306 & 286 & 338 & 304 & 208 & 115 & 82 & 74 & 109 & 82 & 68 & 146.45 \\
\hline UK - England \& Wales & & & & & & & & & & & & & & \\
\hline UK - N. Ireland & & & & & & & & & & & & & & \\
\hline UK - Scotland & 299 & 161 & 33 & 6 & 24 & 36 & 2 & 1 & & 1 & 1 & 1 & & \\
\hline \multicolumn{15}{|l|}{Un. Sov. Soc. Rep.} \\
\hline Total & 2113 & 4439 & 2722 & 2095 & 1482 & 1597 & 1013 & 806 & 693 & 491 & 571 & 651 & 982 & 1447 \\
\hline
\end{tabular}

\section*{Celtic Sea Herring \\ (Divisions VIIaS,VIIg-k)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises on the basis of the MSY approach \(\left(F_{m s y}=0.25\right)\) that catches in 2014 should be no more than \(35,942 \mathrm{t}\). FEAS disagrees with this advice and notes that a long term management plan has been proposed by the Pelagic RAC, and replaces the rebuilding plan. This management plan has been has been evaluated by ICES and found to be consistent with the precautionary approach, and to deliver stability in yield, though


Red Box -TAC/Management Area Blue Shading - Assessment Area not maximising outtake in any year. FEAS advise that the management plan should be followed and this would imply a TAC of 22,360 \(t\) and an Irish quota of 19,230 \(t\) for 2014.

FEAS notes the STECF comment that giving advice on the basis of MSY is not consistent with the European Commission policy, COM (2013) 319, where a long term management plan is consistent with the PA and MSY approach.

This stock has a quantitative assessment and forecast, and is placed in ICES category I. SSB is currently at the highest level in the series, \(F\) is well below \(F_{\text {MSY }}\) (although there was a slight increase since 2010), and there are three recent strong year classes in the fishery.

FEAS notes that juveniles of this stock are present in the Irish Sea. Management of the Irish Sea herring fishery should ensure that catches of Celtic Sea juveniles are avoided.

FEAS agrees with ICES that activities that have a negative impact on the spawning habitat of herring, such as extraction of marine aggregates and marine construction on the spawning grounds, should not occur.

FEAS is aware of updated information on discarding. This work suggests that discard rates are lower than the maximum possible rates considered by the ICES in a sensitivity analysis in 2012. FEAS recommends that estimates of discards be incorporated in the assessment and management process.

\section*{CURRENT MANAGEMENT}
- The TAC is set on an annual basis but the assessments are carried out on a seasonal basis (Ist April - 31st March).
- The TAC in 2013 was 17,200 t, with an Irish quota of \(14,864 \mathrm{t}\).
- The Irish quota accounts for \(86 \%\) of the total TAC.
- The closure of Spawning Box C (Division VIlaS), to protect first time spawners was instituted by Irish statute in 2008. This fishery is confined to vessels of no more than 50 feet length. A maximum catch limitation of \(8 \%\) of the Irish quota is exclusively allocated to this sentinel fishery.

- In 2013/2014, spawning box \(C\) was closed as part of the triennial box closures that are enshrined in EC legislation.

\section*{ICES ADVICE 5.4.15 Celtic Sea and South of Ireland (Division VIIa South of \(52^{\circ} \mathbf{3 0}{ }^{\prime} \mathrm{N}\) and VIIg,h,j,k)}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that catches should be no more than 35942 t in 2014. Discards are considered to be low, therefore, all catches are assumed to be landed.

ICES advises that activities that have a negative impact on the spawning habitat of herring, such as extraction of marine aggregates and marine construction on the spawning grounds, should not occur.

\section*{Stock status}







Figure 5.4.15.1
Herring in Divisions VIIa (South of \(52^{\circ} 30^{\prime} \mathrm{N}\) ) and VIIg,h,j,k (Celtic Sea and South of Ireland). Summary of the stock assessment. Estimates are shaded. Top right: F and SSB over the time-series in the assessment.

The current SSB is the highest since the 1960s. F is well below \(\mathrm{F}_{\mathrm{MSY}}\) but has increased slightly since 2010. There are three recent strong year classes (2003/4, 2005/6, and 2007/8) in the fishery. The 2008/9 and 2009/10 year classes are currently estimated to be above average.

\section*{Management plans}

A long-term management plan was agreed by the Pelagic RAC in 2011 (Annex 5.4.15). In 2012 ICES evaluated this plan and found it to be in accordance with the precautionary approach. This plan has a target \(\mathrm{F}=0.23\) and a \(30 \%\) constraint in TAC change and would result in catch advice of 22360 t for 2014. The European Commission has communicated to ICES that its preference is that ICES advice follows the ICES MSY transitional framework, while the outcomes from following this plan should be presented in the catch options table. Because F has been below \(\mathrm{F}_{\text {MSY }}\) since 2007, this corresponds to the ICES MSY approach.

\section*{Biology}

This stock can be divided into autumn and winter spawning components. Spawning begins in October and can continue until February. A proportion of this stock, mainly first-time spawners, return from the Irish Sea to spawn in the Celtic Sea. The spawning grounds are located inshore, close to the coast, and consist of either gravel or flat stone. Spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Gravel extraction or disturbance in the close vicinity of any herring spawning will disturb that spawning activity and will reduce the available area for successful spawning.

\section*{Environmental influence on the stock}

Temperatures have been increasing for several decades and salinity may also be increasing. Recruitment in this stock has fluctuated widely, although studies have yet to demonstrate a relationship to environmental change(s). The impact of the highly variable environment on the stock is unclear.

\section*{The fisheries}

There has been considerable efficiency creep in the fishery since the 1980s with a greater ability to locate fish. Under the current management regime the quality of the catch data has improved. Discarding is thought to be low, and there are no observations of discarding or slippage in the Celtic Sea fisheries that target herring. In 2010 and 2011 there were concerns of an elevated risk of discarding due to the quota management system. However, in 2012 this risk is thought to be lower, given the flexibility incorporated into the weekly quota system whereby a vessel could use some of the following week's quota to avoid slippage. In this area sprat landings have increased substantially and misreporting of sprat and herring occur. There is also a concern that sprat in this area may be fished together with bycatches of juvenile herring.
```

Catch
Total landings $(2012 / 2013)=21604 t$, of which $100 \%$ were caught by pelagic trawl.
distribution

```

\section*{Effects of the fisheries on the ecosystem}

Herring fisheries for human consumption are considered relatively clean, with little bycatch of other fish.

\section*{Quality considerations}

There is a large uncertainty in the estimation of 1-ringers. As these contribute to the SSB ( \(50 \%\) mature) this influences estimates and forecasts. The biomass estimate from the acoustic survey doubled between 2011 and 2012 to a level that has not been previously seen in the time-series. This will be further investigated as part of the benchmark in 2014. Improved information on discards is required as this appears to have become a feature of this fishery in recent years; however, after the changes in the regulations of weekly quota allocations in 2012, the risk of discarding is reduced. Greater understanding is required on the extent to which Celtic Sea herring is present in the Irish Sea.


Figure 5.4.15.2 Herring in Divisions VIIa (South of \(52^{\circ} 30^{\prime} \mathrm{N}\) ) and VIIg,h,j,k (Celtic Sea and South of Ireland). Historical assessment results (final-year predicted SSB and recruitment estimates included).

\section*{Scientific basis}
\(\left.\begin{array}{ll}\text { Assessment type } & \text { Age-based analytical assessment (FLICA). } \\
\text { Stock data category } & \begin{array}{l}\text { Category 1. } \\
\text { Commercial catches, (weights, ages and length frequencies from catch sampling); Acoustic } \\
\text { Input data }\end{array} \\
\text { survey index (CSHAS), annual weights in the stock, fixed maturity ogive, natural mortality } \\
\text { assumed to be constant. }\end{array}\right]\)\begin{tabular}{l} 
Discards are not included in the assessment and are considered to be low. \\
Discards and bycatch \\
Indicators \\
Other information \\
None.
\end{tabular} \begin{tabular}{l} 
Celtic Sea and Division VIIj herring are assessed on a seasonal basis, 1 April-31 March, to \\
allow for the inclusion of the spawning cycle in the assessment period.
\end{tabular}

\section*{ECOREGION Celtic Seas STOCK \\ Herring in Divisions VIIa (South of \(52^{\circ}{ }^{\circ}{ }^{\prime}\) N) and VIIg,h,j,k (Celtic Sea and South of Ireland)}

\section*{Reference points}
\begin{tabular}{|c|c|c|c|}
\hline & Type & Value & Technical basis \\
\hline MSY & MSY \(\mathrm{B}_{\text {trigger }}\) & 61000 t . & Stochastic simulations on segmented regression stockrecruitment relationship. \\
\hline Approach & \(\mathrm{F}_{\text {MSY }}\) & 0.25 & Stochastic simulations on segmented regression stockrecruitment relationship. \\
\hline \multirow[t]{2}{*}{Management Plan} & \(\mathrm{SSB}_{\mathrm{MGT}}\) & 61000 t . & Stochastic simulations on segmented regression stock recruit relationship. \\
\hline & \(\mathrm{F}_{\text {MGT }}\) & 0.23 & If SSB in TAC year >61 000. \\
\hline \multirow{4}{*}{Precautionary approach} & \(\mathrm{B}_{\text {lim }}\) & 26000 t . & The lowest stock observed. \\
\hline & \(\mathrm{B}_{\mathrm{pa}}\) & 44000 t . & Low probability of low recruitment. \\
\hline & \(\mathrm{F}_{\text {lim }}\) & Not defined. & \\
\hline & \(\mathrm{F}_{\mathrm{pa}}\) & Not defined. & \\
\hline
\end{tabular}
(Changed in 2013)

\section*{Outlook for 2014}

Basis: \(\mathrm{F}(2013 / 2014)=\mathrm{F}(\) catch constraint 2013/2014) \(=0.12 ; \mathrm{R}(2012-2014)=\mathrm{GM}(1981-2010)=474\) million; \(\operatorname{SSB}(2013 / 2014)=156355\); catch \((2013 / 2014)=19063\).
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline Rationale & Catch
(2014) & \[
\underset{(2014){ }^{1)}}{ }
\] & Basis & \[
\begin{gathered}
F \\
(2014)
\end{gathered}
\] & \[
\begin{gathered}
\text { SSB } \\
(2015)
\end{gathered}
\] & \[
\begin{gathered}
\text { \%SSB } \\
\text { Change }^{2)}
\end{gathered}
\] & \[
\begin{gathered}
\text { \% TAC } \\
\text { Change }^{3}
\end{gathered}
\] \\
\hline MSY approach & 35942 & 136113 & \(\mathrm{F}_{\text {MSY }}\) & 0.25 & 115063 & -15\% & +109\% \\
\hline Long-term management plan & 22360 & 144226 & Management plan & 0.15 & 133211 & -8\% & +30\% \\
\hline Zero catch & 0 & 156805 & Zero catch & 0 & 165458 & +6\% & -100\% \\
\hline \multirow[t]{2}{*}{Other options} & 22737 & 144006 & \(\mathrm{F}_{2012}\) & 0.15 & 132692 & -8\% & +32\% \\
\hline & 17200 & 147209 & status quo catch & 0.11 & 140396 & -5\% & 0\% \\
\hline
\end{tabular}

Weights in tonnes.
\({ }^{1)}\) For this autumn-spawning stock, the SSB is determined at spawning time and is influenced by fisheries between 1st April and spawning.
\({ }^{2}\) ) SSB 2015 relative to SSB 2014.
\({ }^{3}\) Catch (assumed equal to landings) 2014 relative to TAC 2013.

\section*{MSY approach}

Following the ICES MSY approach implies fishing mortality be increased to 0.25 which is higher than the current F (0.15), resulting in landings of less than 35942 t in 2014. This is expected to lead to an SSB of 115063 t in 2015. Discards are considered to be low, and therefore, all catches are assumed to be landed. Because F has been below FMSY since 2007, a transition to MSY is not relevant.

\section*{Management plan}

In 2011 the Pelagic RAC agreed a new proposed long-term management plan (Annex 5.4.15). This plan has a target F of 0.23 and a \(30 \%\) constraint on TAC change. This TAC constraint prevents sudden changes of the TAC and accounts for uncertainties in the assessment and forecast in the event of strong or low incoming recruitment. This plan would lead to a TAC in 2014 of 22360 t . In 2012 ICES evaluated this plan and found it to be in accordance with the precautionary approach. It leads to sustainable yield and provides stability in catches over time, at the expense of maximizing yield. ICES was not able to simulate the effect of the closed area, but from an operational point of view it seems to have worked to reduce F under the recent recovery plan.

\section*{Precautionary approach}

The SSB is well above \(\mathrm{B}_{\mathrm{pa}}\). \(\mathrm{F}_{\mathrm{pa}}\) is undefined, but current F is well below \(\mathrm{F}_{\mathrm{MSY}}\). ICES does not advise using \(\mathrm{B}_{\mathrm{pa}}\) as a target in 2014.

\section*{Additional considerations}

Gravel substrate is an important fish habitat for herring spawning. Herring spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Activities that have an impact on the spawning habitat of herring, such as extraction of marine aggregates (e.g. gravel and sand; Groot, 1979, 1996) and construction in the marine environment, can impact spawning. Herring regularly abandon and repopulate spawning grounds and absence of spawning in any particular year does not mean that the spawning ground is not required to maintain a resilient herring population.

There was concern of an increased risk of discarding of herring in 2010 and 2011. This risk is thought to have diminished in 2012, given the changes in the regulations of weekly quota allocations.

\section*{Regulations and their effects}

There is evidence that the closure of Division VIIaS under the rebuilding plan, in reducing the efficiency of the fleet has helped to substantially reduce fishing mortality. This closed area has been the dominant spawning area, and before the closure a large proportion of the catch was taken from it. There is no evidence that this closure has led to improved recruitment. However, this area, particularly the area off Dunmore East, is important for recruit spawners. This area was reopened in January 2012, although vessels \(>50 \mathrm{ft}\) remain excluded. The abundance of herring in this area has attracted more vessels to the fishery and resulted in increased catches outside the closed area.

\section*{Uncertainties in assessment and advice}

There has been retrospective overestimation of F in recent years. There is uncertainty in the estimation of 1-ring recruits. As these contribute to the \(\operatorname{SSB}(50 \%\) mature at 1 ring) this causes some uncertainty in the estimated SSB.

The reason for the large increase in the biomass estimate from the 2012 acoustic survey is not known and will be investigated as part of the benchmark in 2014.

Juveniles caught in the sprat fishery should be better understood in order to improve the estimates of juvenile fishing mortality.

\section*{Comparison with previous assessment and advice}

The 2013 assessment shows an upward revision in SSB 2012 by \(90 \%\), while F for 2011 is estimated to be \(28 \%\) lower. The basis for this year's advice is the same as last year (MSY approach).

\section*{Sources}

Groot, S. J. de. 1979. The potential environmental impact of marine gravel extraction in the North Sea. Ocean Management, 5: 233-249.
Groot, S. J. de. 1996. The physical impact of marine aggregate extraction in the North Sea. ICES Journal of Marine Science, 53: 1051-1053.
ICES. 2013. Report of the Herring Assessment Working Group for the Area South of 62N, 12-21 March 2013. ICES CM 2013/ACOM:06.


Figure 5.4.15.3
Herring in Divisions VIIa (South of \(52^{\circ} 30^{\prime} \mathrm{N}\) ) and VIIg,h,j,k (Celtic Sea and South of Ireland). Stockrecruitment plot and yield-per-recruit analysis.

Table 5.4.15.1 Herring in Divisions VIIa (South of \(52^{\circ} 30^{\prime} \mathrm{N}\) ) and VIIg,h,j,k (Celtic Sea and South of Ireland). ICES advice, management, and landings/catches.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
ICES \\
Advice
\end{tabular} & Predicted catch corresp. to advice & Agreed TAC & Official landings & Discards & \[
\begin{aligned}
& \text { ICES } \\
& \text { catch }
\end{aligned}
\] \\
\hline 1987 & Precautionary TAC & 18 & 18 & 18 & 4.2 & 27.3 \\
\hline 1988 & TAC & 13 & 18 & 17 & 2.4 & 19.2 \\
\hline 1989 & TAC & 20 & 20 & 18 & 3.5 & 22.7 \\
\hline 1990 & TAC & 15 & 17.5 & 17 & 2.5 & 20.2 \\
\hline 1991 & TAC (TAC excluding discards) & 15 (12.5) & 21 & 21 & 1.9 & 23.6 \\
\hline 1992 & TAC & 27 & 21 & 19 & 2.1 & 23.0 \\
\hline 1993 & Precautionary TAC (including discards) & 20-24 & 21 & 20 & 1.9 & 21.1 \\
\hline 1994 & Precautionary TAC (including discards) & 20-24 & 21 & 19 & 1.7 & 19.1 \\
\hline 1995 & No specific advice & - & 21 & 18 & 0.7 & 19.1 \\
\hline 1996 & TAC & 9.8 & \(16.5-21^{2}\) & 21 & 3 & 21.8 \\
\hline 1997 & If required, precautionary TAC & \(<25\) & 22 & 20.7 & 0.7 & 18.8 \\
\hline 1998 & Catches below 25 & <25 & 22 & 20.5 & 0 & 20.3 \\
\hline 1999 & \(\mathrm{F}=0.4\) & 19 & 21 & 19.4 & 0 & 18.1 \\
\hline 2000 & \(\mathrm{F}<0.3\) & 20 & 21 & 18.8 & 0 & 18.3 \\
\hline 2001 & \(\mathrm{F}<0.34\) & 17.9 & 20 & 19 & 0 & 17.7 \\
\hline 2002 & F<0.35 & 11 & 11 & 11.5 & 0 & 10.6 \\
\hline 2003 & Substantially less than recent catches & - & 13 & 12 & 0 & 10.9 \\
\hline 2004 & 60\% of average catch 1997-2000 & 11 & 13 & 12 & - & 11.1 \\
\hline 2005 & 60\% of average catch 1997-2000 & 11 & 13 & 10 & - & 8.5 \\
\hline 2006 & Further reduction 60\% avg. catch 2002-2004 & 6.7 & 11 & 9 & - & 8.5 \\
\hline 2007 & No fishing without rebuilding plan & -- & 9.4 & 9.6 & - & 8.3 \\
\hline 2008 & No targeted fishing without rebuilding plan & -- & 7.9 & 7.8 & - & 6.9 \\
\hline 2009 & No targeted fishing without rebuilding plan & -- & 5.9 & 6.2 & (3) & 5.8 \\
\hline 2010 & \(\mathrm{F}_{\text {mgt }}=0.19\) & 10.15 & 10.15 & 9.6 & (3) & 8.4 \\
\hline 2011 & See scenarios & - & 13.2 & 11.7 & (3) & 11.5 \\
\hline 2012 & MSY approach & < 26.9 & 21.1 & 21.6 & & 21.6 \\
\hline 2013 & MSY approach & < 18.5 & & & & \\
\hline 2014 & MSY approach & <35.942 & & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1)}\) By calendar year.
\({ }^{2)}\) Revised in 1996 after the ACFM May meeting.
\({ }^{3)}\) Increased risk of discarding.
}

Table 5.4.15.2 Herring in Divisions VIIa (South of \(52^{\circ} 30^{\prime} \mathrm{N}\) ) and VIIg,h,j,k (Celtic Sea and South of Ireland). Landings in tonnes by quota year as estimated by ICES. These figures may not correspond to the official statistics in all cases and cannot be used for management purposes.
\begin{tabular}{lrrrrrrrr}
\hline Year & France & Germany & Ireland & Netherlands & U.K. & Unallocated & Discards & Total \\
\hline & & & & & & & & \\
1988 & - & - & 16800 & - & - & - & 2400 & 19200 \\
1989 & + & - & 16000 & 1900 & - & 1300 & 3500 & 22700 \\
1990 & + & - & 15800 & 1000 & 200 & 700 & 2500 & 20200 \\
1991 & + & 100 & 19400 & 1600 & - & 600 & 1900 & 23600 \\
1992 & 500 & - & 18000 & 100 & + & 2300 & 2100 & 23000 \\
1993 & - & - & 19000 & 1300 & + & -1100 & 1900 & 21100 \\
1994 & + & 200 & 17400 & 1300 & + & -1500 & 1700 & 19100 \\
1995 & 200 & 200 & 18000 & 100 & + & -200 & 700 & 19000 \\
1996 & 1000 & 0 & 18600 & 1000 & - & -1800 & 3000 & 21800 \\
1997 & 1300 & 0 & 18000 & 1400 & - & -2600 & 700 & 18800 \\
1998 & + & - & 19300 & 1200 & - & -200 & - & 20300 \\
1999 & & 200 & 17900 & 1300 & + & -1300 & - & 18100 \\
2000 & 573 & 228 & 18038 & 44 & 1 & -617 & - & 18267 \\
2001 & 1359 & 219 & 17729 & - & - & -1578 & - & 17729 \\
2002 & 734 & - & 10550 & 257 & - & -991 & - & 10550 \\
2003 & 800 & - & 10875 & 692 & 14 & -1506 & - & 10875 \\
2004 & 801 & 41 & 11024 & - & - & -801 & - & 11065 \\
2005 & 821 & 150 & 8452 & 799 & - & -1770 & - & 8452 \\
2006 & - & - & 8530 & 518 & 5 & -523 & - & 8530 \\
2007 & 581 & 248 & 8268 & 463 & 63 & -1355 & - & 8268 \\
2008 & 503 & 191 & 6853 & 291 & & -985 & - & 6853 \\
2009 & 364 & 135 & 5760 & & -499 & - & 5760 \\
2010 & 636 & 278 & 8406 & 325 & & -1239 & na & 8406 \\
2011 & 241 & & 11503 & 7 & & -248 & \(n a\) & 11503 \\
2012 & 3 & 230 & 16132 & 3135 & & 2104 & na & 21604 \\
\hline & & & & & & & & \\
\hline
\end{tabular}
na \(=\) Not available.

Table 5.4.15.3 Herring in Divisions VIIa (South of \(52^{\circ} 30^{\prime} \mathrm{N}\) ) and VIIg,h,j,k (Celtic Sea and South of Ireland). Landings in tonnes by assessment year (1 April-31 March) as estimated by ICES. These figures may not correspond to the official statistics in all cases and cannot be used for management purposes.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|}
\hline Year & France & Germany & Ireland & Netherlands & U.K. & Unallocated & Discards & Total \\
\hline 1988 & - & - & 16800 & - & - & - & 2400 & 19200 \\
\hline 1989 & + & - & 16000 & 1900 & - & 1300 & 3500 & 22700 \\
\hline 1990 & + & - & 15800 & 1000 & 200 & 700 & 2500 & 20200 \\
\hline 1991 & + & 100 & 19400 & 1600 & - & 600 & 1900 & 23600 \\
\hline 1992 & 500 & - & 18000 & 100 & + & 2300 & 2100 & 23000 \\
\hline 1993 & - & - & 19000 & 1300 & + & -1 100 & 1900 & 21100 \\
\hline 1994 & + & 200 & 17400 & 1300 & + & -1500 & 1700 & 19100 \\
\hline 1995 & 200 & 200 & 18000 & 100 & + & -200 & 700 & 19000 \\
\hline 1996 & 1000 & 0 & 18600 & 1000 & - & -1800 & 3000 & 21800 \\
\hline 1997 & 1300 & 0 & 18000 & 1400 & - & -2 600 & 700 & 18800 \\
\hline 1998 & + & - & 19300 & 1200 & - & -200 & - & 20300 \\
\hline 1999 & & 200 & 17900 & 1300 & + & -1300 & - & 18100 \\
\hline 2000 & 573 & 228 & 18038 & 44 & 1 & -617 & - & 18267 \\
\hline 2001 & 1359 & 219 & 17729 & - & - & -1578 & - & 17729 \\
\hline 2002 & 734 & - & 10550 & 257 & - & -991 & - & 10550 \\
\hline 2003 & 800 & - & 10875 & 692 & 14 & -1506 & - & 10875 \\
\hline 2004 & 801 & 41 & 11024 & - & - & -801 & - & 11065 \\
\hline 2005 & 821 & 150 & 8452 & 799 & - & -1770 & - & 8452 \\
\hline 2006 & - & - & 8530 & 518 & 5 & -523 & - & 8530 \\
\hline 2007 & 581 & 248 & 8268 & 463 & 63 & -1355 & - & 8268 \\
\hline 2008 & 503 & 191 & 6853 & 291 & & -985 & - & 6853 \\
\hline 2009 & 364 & 135 & 5760 & & & -499 & - & 5760 \\
\hline 2010 & 636 & 278 & 8406 & 325 & & -1 239 & na & 8406 \\
\hline 2011 & 241 & & 11503 & 7 & & -248 & na & 11503 \\
\hline 2012 & 3 & 230 & 16132 & 3135 & & 2104 & na & 21604 \\
\hline
\end{tabular}
\(\mathrm{na}=\) Not available.

Table 5.4.15.4 Herring in Divisions VIIa (South of \(52^{\circ} 30^{\prime} \mathrm{N}\) ) and VIIg,h,j,k (Celtic Sea and South of Ireland). Summary of stock assessment (weights in tonnes).
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & Recruitment age 1 & TSB & SSB & Fbar & Landings \\
\hline 1958 & 288373 & 103700 & 73614 & 0.40 & 22978 \\
\hline 1959 & 837830 & 128408 & 69732 & 0.34 & 15086 \\
\hline 1960 & 185856 & 82550 & 58650 & 0.49 & 18283 \\
\hline 1961 & 210142 & 71131 & 49703 & 0.31 & 15372 \\
\hline 1962 & 537886 & 109309 & 59144 & 0.66 & 21552 \\
\hline 1963 & 270227 & 82363 & 53377 & 0.45 & 17349 \\
\hline 1964 & 1043566 & 159436 & 76250 & 0.28 & 10599 \\
\hline 1965 & 327806 & 141067 & 101991 & 0.25 & 19126 \\
\hline 1966 & 679877 & 182800 & 110738 & 0.30 & 27030 \\
\hline 1967 & 702422 & 191042 & 116417 & 0.38 & 27658 \\
\hline 1968 & 829536 & 206978 & 121112 & 0.35 & 30236 \\
\hline 1969 & 438644 & 171065 & 111653 & 0.54 & 44389 \\
\hline 1970 & 212938 & 119642 & 84961 & 0.48 & 31727 \\
\hline 1971 & 852710 & 164750 & 81779 & 0.71 & 31396 \\
\hline 1972 & 263048 & 112910 & 70178 & 0.76 & 38203 \\
\hline 1973 & 290193 & 87998 & 50778 & 0.76 & 26936 \\
\hline 1974 & 128521 & 56925 & 35244 & 0.84 & 19940 \\
\hline 1975 & 143143 & 45867 & 26301 & 0.77 & 15588 \\
\hline 1976 & 173512 & 45273 & 24406 & 0.66 & 9771 \\
\hline 1977 & 168125 & 43278 & 23658 & 0.57 & 7833 \\
\hline 1978 & 133883 & 40641 & 24429 & 0.53 & 7559 \\
\hline 1979 & 236786 & 51778 & 26336 & 0.68 & 10321 \\
\hline 1980 & 146966 & 43350 & 25628 & 0.71 & 13130 \\
\hline 1981 & 402717 & 68337 & 29930 & 1.02 & 17103 \\
\hline 1982 & 665373 & 104604 & 45077 & 0.73 & 13000 \\
\hline 1983 & 734069 & 129830 & 62115 & 0.72 & 24981 \\
\hline 1984 & 564655 & 112412 & 62120 & 0.90 & 26779 \\
\hline 1985 & 508250 & 108687 & 61286 & 0.52 & 20426 \\
\hline 1986 & 529559 & 119222 & 65520 & 0.68 & 25024 \\
\hline 1987 & 956849 & 148814 & 72186 & 0.78 & 26200 \\
\hline 1988 & 388948 & 109853 & 70550 & 0.44 & 20447 \\
\hline 1989 & 471462 & 110838 & 64580 & 0.56 & 23254 \\
\hline 1990 & 425497 & 98532 & 59496 & 0.47 & 18404 \\
\hline 1991 & 177221 & 70596 & 47619 & 0.72 & 25562 \\
\hline 1992 & 939386 & 125591 & 53654 & 1.04 & 21127 \\
\hline 1993 & 324272 & 87125 & 54981 & 0.62 & 18618 \\
\hline 1994 & 694262 & 120157 & 63426 & 0.46 & 19300 \\
\hline 1995 & 676645 & 119982 & 66791 & 0.58 & 23305 \\
\hline 1996 & 339848 & 91363 & 59809 & 0.42 & 18816 \\
\hline 1997 & 370991 & 83718 & 49968 & 0.63 & 20496 \\
\hline 1998 & 240786 & 65760 & 40753 & 0.65 & 18041 \\
\hline 1999 & 506060 & 77994 & 38459 & 0.89 & 18485 \\
\hline 2000 & 442034 & 73450 & 37066 & 0.91 & 17191 \\
\hline 2001 & 393052 & 62587 & 32913 & 0.81 & 15269 \\
\hline 2002 & 527809 & 80799 & 40574 & 0.33 & 7465 \\
\hline 2003 & 105670 & 47981 & 31500 & 0.43 & 11536 \\
\hline 2004 & 274962 & 50633 & 25520 & 0.61 & 12743 \\
\hline 2005 & 848467 & 86480 & 35251 & 0.48 & 9494 \\
\hline 2006 & 313288 & 71712 & 43986 & 0.25 & 6944 \\
\hline 2007 & 698959 & 87587 & 47422 & 0.20 & 7636 \\
\hline 2008 & 308671 & 90849 & 63421 & 0.11 & 5872 \\
\hline 2009 & 1263455 & 163298 & 87849 & 0.08 & 5745 \\
\hline 2010 & 1125320 & 187401 & 113374 & 0.10 & 8370 \\
\hline 2011 & 2402231 & 288026 & 157338 & 0.11 & 11470 \\
\hline 2012* & 474106 & 296392 & 159776 & 0.15 & 21604 \\
\hline 2013* & 474106 & & 156355 & & \\
\hline
\end{tabular}
*Geometric Mean Recruitment 1981-2010.

\section*{Annex 5.4.15 Long-term management plan for herring in the Celtic Sea and Division VIIj, as agreed by the Pelagic RAC}
1. Every effort shall be made to maintain a minimum level of Spawning Stock Biomass (SSB) greater than 41,000 t, the level below which recruitment becomes impaired.
2. Where the SSB, in the year for which the TAC is to be fixed, is estimated to be above \(61,000 t\left(B_{\text {trigger }}\right)\) the TAC will be set consistent with a fishing morality, for appropriate age groups, of \(0.23\left(F_{\text {target }}\right)\).
3. Where the SSB is estimated to be below 61,000 tonnes, the TAC will be set consistent with a fishing mortality of:
\(S S B * 0.23 / 61,000\)
4. Where the rules in paragraphs 2 and 3 would lead to a TAC which deviates by more than \(30 \%\) from the TAC of the preceding year, the TAC will be fixed such that it is not more than \(30 \%\) greater or 30 \(\%\) less than the TAC of the preceding year.
5 Where the SSB is estimated to be below 41,000 tonnes, Subdivision VIIaS will be closed until the SSB has recovered to above 41,000 tonnes.
6. Where the SSB is estimated to be below 41,000 tonnes, and Sub-Division VIIaS is closed, a smallscale sentinel fishery will be permitted in the closed area. This fishery will be confined to vessels, of no more than 50 feet in registered length. A maximum catch limitation of \(8 \%\) of the Irish quota will be exclusively allocated to this sentinel fishery.
7. Notwithstanding paragraphs 2, 3 and 4, if the SSB is estimated to be at or below the level consistent with recruitment impairment \((41,000 t)\), then the TAC will be set at a lower level than that provided for in those paragraphs.
8. No vessels participating in the fishery, if requested, will refuse to take on-board any observer for the purposes of improving the knowledge on the state of the stock. All vessels will, upon request, provide samples of catches for scientific analyses.
9. Every three years from the date of entry into force of this Regulation, the Commission will request ICES and STECF to review and evaluate the plan.
10. This arrangement enters into force on 1st January, 2012.

\title{
North West of Ireland Herring \\ (Divisions Vla South and VIIb,c)
}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

FEAS agrees with ICES that, on the basis of the MSY approach, that there should be no catches of this stock unless a rebuilding plan is implemented. A rebuilding plan has been proposed by the Federation of Irish Fishermen and the Pelagic RAC (see below).

This stock has a trends based exploratory assessment and no projected fishing possibilities and is therefore placed in ICES Category two. However the Category 2.I.3 assessment and a


Red Box-TAC/Management Area Blue Shading - Assessment Area forecast based on the proposed rebuilding plan were evaluated by STECF to give advice for 2014.

FEAS agrees with STECF that the plan can rebuild the stock to \(B_{p a}\) by 2020. However this recovery is unlikely unless trans-boundary catch is eliminated. The plan is projected to deliver yearly increases in stock size from its current level, below Blim. It does not strictly conform, to the precautionary approach because initial stock size is well below \(B_{\text {lim }}\). The plan implies low catches and \(F<F_{\text {ms }}\) during the first years of implementation. Though not consistent with MSY by 2015, the average probability of reaching exploitation levels consistent with MSY would occur later.

FEAS and STECF note that following Clause 2 and 3 of the proposed rebuilding plan implies catches of 3,676 t in 2014. As noted by STECF, Clause 6 of the proposed plan in 2014 may reduce trans-boundary catches, but is, unlikely to eliminate them. STECF suggested that this catch advice could be reduced to a lower level, invoking Clause 4, subtracting the putative trans-boundary catch from the advised TAC leading to catches in 2014 of 519 t . FEAS advises that the TAC be set at \(3,676 \mathrm{t}\) in 2014 , resulting from an increase in estimated SSB, if accompanied by the following additional measures under Clause 4:
I. precluding fishing of herring in VlaN and VlaS/VIIbc the same season.
2. extending the southern boundary of the exclusion zone into Sub-area VIaS, at least as far as \(55^{\circ} \mathbf{3 0} \mathbf{N}\).

If measure 1 alone, or measures \(I\) and 2 together, are not implemented, FEAS advises that the STECF suggestion to invoke Clause 4 be used to set a TAC of 519 t in 2014.

FEAS is concerned that the small quota available could lead to unintended slippage, because individual boat quotas may be too small to be caught without wastage. Therefore FEAS encourages quota management that would avoid awarding quotas that are smaller than the amount that a boat is capable of taking in a single haul.

FEAS notes that this stock is considered a part of the Malin Shelf Stock Complex. An ICES study group carried out an evaluation of assessment and management strategies of the western herring stocks in the Malin Shelf Complex. This group have recommended that no changes to the current assessment and management units are undertaken. However further work is underway to assess the level of mixing that takes place between stocks during the summer acoustic surveys on the feeding grounds. It is hoped that this will lead to more accurate assessments of these stocks.

ICES advises that activities that have a negative impact on the spawning habitat of herring, such as extraction of marine aggregates and marine construction on the spawning grounds, should not occur. (see Appendix IV for Approximate Locations of Herring Spawning Grounds around Ireland).

\section*{CURRENT MANAGEMENT}
- The TAC, set by the EU for 2013 is \(1,500 \mathrm{t}\), of which the Irish quota is \(1,364 \mathrm{t}\).
- The Irish herring fishery in Vla opens on the \(I^{\text {st }}\) October each season. This is an appropriate opening date for this stock, but not for the VlaN stock, where the main fishing season begins in August. The \(1^{\text {st }}\) October opening date incentivises Irish vessels to target fish along the \(56^{\circ} \mathrm{N}\) boundary with VlaS , with a high risk of catching of \(\mathrm{VlaS} / \mathrm{VIlbc}\) herring against the VlaN quota (see also
 West of Scotland Herring).
- Changes to the management of this stock in recent years have influenced the way the fishery is prosecuted in space and time. Large RSW vessels do not now have access to the areas inside the 12 mile limit.
- The \(56^{\circ} \mathrm{N}\) boundary between this stock unit and herring in VlaN is not biologically meaningful. It was created in 1981, and corresponds roughly to the boundary of the Irish and UK fishery patrol zones, or "EEZs". The boundary cuts through both the summer feeding grounds and the winter spawning grounds, and thus the fishing grounds too.

\section*{ICES ADVICE 5.4.13 Herring in Divisions VIa (South) and VIIb, c}

\section*{Advice for 2014}

ICES advises on the basis of precautionary considerations that there should be no catches of this stock unless a rebuilding plan is implemented. Discards are considered to be low and all catches are therefore assumed to be landed.

ICES advises that activities that have a negative impact on the spawning habitat of herring, such as extraction of marine aggregates and marine construction on the spawning grounds, should not occur.

\section*{Stock status}
\begin{tabular}{|c|c|c|}
\hline & (Fishing M & ortality) \\
\hline & 20102011 & 2012 \\
\hline MSY ( \(\mathrm{F}_{\text {MSY }}\) ) & \(x x\) & ? Unknown \\
\hline Precautionary \(\operatorname{approach}\left(\mathrm{F}_{\mathrm{pa}}, \mathrm{F}_{\mathrm{lim}}\right)\) & \(x \times\) & ? Unknown \\
\hline & awning-St & ck Biomass) \\
\hline & 20112012 & 2013 \\
\hline MSY ( \(\mathrm{B}_{\text {trigger }}\) ) & ? ? & ? Undefined \\
\hline Precautionary approach \(\left(\mathrm{B}_{\mathrm{pa}}, \mathrm{B}_{\mathrm{lim}}\right)\) &  & Reduced reproductive capacity \\
\hline
\end{tabular}


Figure 5.4.13.1 Herring in Divisions VIa (South) and VIIb,c. Results of the exploratory assessments using FLICA and sVPA.

An exploratory assessment (ICA, including survey data from the Malin shelf acoustic survey) shows that SSB is increasing but is likely to be low, whereas F has declined since the high in1998. Although there is little information on recruitment available and it is very uncertain, it does not appear to be above average, according to this assessment. Another exploratory assessment (SVPA) shows different trends in recent years, but also estimates very low SSB. The last recruitment estimate of the SVPA assessment is uncertain and has been replaced by an average recruitment (1957-2011).

\section*{Management plans}

There is no explicit management plan for this stock. A revised rebuilding plan was proposed by the Pelagic RAC in 2012. STECF evaluated this plan in 2012-2013, but further evaluation is needed. To date ICES has not been requested to evaluate this plan.

\section*{Biology}

This autumn- and winter-/spring-spawning stock is considered part of the Malin Shelf stock complex. The stock identity is complex as the juveniles mix with those from the west of Scotland and the adults mix with those from the Irish Sea and Division VIaN over the shelf areas to the west of Scotland after spawning. Fish of this stock are expected to mix with VIa North herring in that area. Spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Gravel extraction or disturbance in the close vicinity of any herring spawning will disturb that spawning activity and will reduce the available area for successful spawning.

\section*{The fisheries}

Herring fisheries in this area are only for human consumption. The fisheries take place using pelagic trawls in quarters 1 and 4 . The low TAC has led to a much shorter fishing season that now consists of only a few days, compared to the five-month fishery prior to 2003. In 2012 the fishery only took place in quarter 4. Discarding does occur, but is thought to be low.

\section*{Catch distribution Total landings (2012) \(=6571 \mathrm{t}(100 \%\) pelagic trawls \()\)}

\section*{Effects of the fisheries on the ecosystem}

The fisheries are considered relatively clean, with little bycatch of other fish and cetaceans.

\section*{Quality considerations}

The exploratory assessments are the ones considered most reliable for historical trends. The exploratory assessment using separable VPA displays the most consistency and least retrospective bias and hence was chosen from among several separable VPA runs.

The FLICA exploratory assessment uses a survey for tuning (Malin Shelf acoustic survey, MSHAS 2008-2012) that is known to contain herring from a mixture of stocks, and therefore is not an optimal tuning index for this stock. However, if it is possible to disaggregate the index according to stock component, then it could provide a basis for an assessment.

Both assessment approaches, however, give the same signals of the status of the stock being below biological reference points.

Scientific basis
\begin{tabular}{ll} 
Assessment type & Trends-based exploratory assessments (FLICA, Separable VPA). \\
Stock data category & Category 2.1.3. \\
Input data & Commercial catches, (weights, ages and length frequencies from catch sampling); \\
& \begin{tabular}{l} 
Malin Shelf Acoustic Survey data (MSHAS), annual weights in the stock, fixed maturity \\
ogive, natural mortality assumed to be constant.
\end{tabular} \\
Discards and bycatch & Discards are not included in the assessment and are considered to be low. \\
Indicators & None. \\
Other information & A benchmark is planned for 2015. \\
Working group report & HAWG (ICES, 2013).
\end{tabular}

\section*{ECOREGION Celtic Seas \\ STOCK Herring in Divisions VIa (South) and VIIb,c}

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline \multirow{3}{l|}{\begin{tabular}{l} 
MSY \\
Approach
\end{tabular}} & MSY \(\mathrm{B}_{\text {trigger }}\) & Undefined. & Under development. \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{MSY}}\) & 0.25 & \begin{tabular}{l} 
Stochastic simulations on segmented regression stock- \\
recruitment relationship, under different productivity regimes.
\end{tabular} \\
\hline \multirow{4}{*}{\begin{tabular}{l} 
Precautionary \\
approach
\end{tabular}} & \(\mathrm{B}_{\text {lim }}\) & \(81000 \mathrm{t}\). & Lowest reliable estimate. \\
\cline { 2 - 4 } & \(\mathrm{B}_{\mathrm{pa}}\) & \(110000 \mathrm{t}\). & \(1.4 \mathrm{~B}_{\text {lim }}\) \\
\cline { 2 - 4 } & \(\mathrm{F}_{\text {lim }}\) & 0.33 & \(\mathrm{~F}_{\text {loss }}\) \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{pa}}\) & Undefined. & \\
\hline
\end{tabular}
(unchanged since 2011)

\section*{Outlook for 2014}

Two exploratory assessments are indicative of stock trends, but they were not used to provide a forecast. The main cause of this is the lack of a split survey data series that accounts for stock mixing with other herring stocks. Particularly F is highly uncertain. Therefore, fishing possibilities cannot be projected.

\section*{Precautionary considerations}

The stock trend is uncertain for recent years, and the stock is considered well below biomass reference points.
There should be no catches of this stock unless a rebuilding plan is implemented.

\section*{Additional considerations}

Gravel substrate is an important fish habitat for herring spawning. Herring spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Activities that have an impact on the spawning habitat of herring, such as extraction of marine aggregates (e.g. gravel and sand) and construction in the marine environment, can impact spawning. Herring regularly abandon and repopulate spawning grounds and absence of spawning in any particular year does not mean that the spawning ground is not required to maintain a resilient herring population. Scientific information (Groot, 1979, 1996) supports the advice that no gravel extraction should occur in areas with spawning grounds.

\section*{Information from the fishing industry}

The pelagic RAC questions ICES interpretation of the poor status of this stock and has put forward a revised rebuilding plan in 2012 for evaluation. The industry is concerned that problems still exist with the assessment, particularly the mixing issue. The Irish authorities, the industry, and the scientists are working together to resolve the problem with the assessment and surveys. Quota restrictions result in only one or two principal grounds off Glen Head and off Tory Island being exploited at present for a very limited period of time. The traditional grounds in Division VIIb, for instance, have not been fished very much in recent years. Fleets fishing in this fishery have reported large and increasing quantities of herring on the grounds, particularly in the northern part of the area in the last four years. This was especially the case during 2011 and 2012, and in spring 2013.

\section*{Ecosystem changes}

Grey seal abundance is significant to the west of Scotland and they are known to feed on herring, among other species. The latest estimates of grey seal abundance over time show the population in the area to have remained stable since the mid-1990s (Thomas, 2011). The contribution of seal predation to total herring mortality may be significant, but data are limited. Because the consumption of herring by seals is estimated with great uncertainty, the impact on the stock cannot be estimated accurately.

\section*{Uncertainty in the assessment}

Two exploratory assessments are indicative of stock trends, but they were not used to provide a forecast. The main uncertainty relates to the lack of a tuning series specific for this stock.

Fishery catch data for this specific population may be affected by mixing with neighbouring stocks. The effect of mixing in the acoustic surveys in this area contributes to uncertainty in the assessment. The current assessment includes an acoustic tuning series that is not specific to this stock alone.

The stock identity of herring west of the British Isles was reviewed by the EU-funded project WESTHER. This identified Division VIa (North) as an area where acoustic survey catches consist of a mixture of fish from Divisions VIa (North), VIa (South), VIIb,c, and VIIa (North). The extent of stock mixing in Division VIa (North) catches is unknown. In 2008 ICES began to evaluate the management for Divisions VIa (South), VIIb, c, and VIIa (North). ICES is working to produce an assessment that takes mixing into account. Efforts to split the Malin Shelf acoustic survey according to stock component are underway and should continue.

\section*{Comparison with previous assessment and advice}

The basis of the advice is the same as last year, precautionary considerations for data-limited stocks.

\section*{Sources}

Groot, S. J. de. 1979. The potential environmental impact of marine gravel extraction in the North Sea. Ocean Management, 5: 233-249.
Groot, S. J. de. 1996. The physical impact of marine aggregate extraction in the North Sea. ICES Journal of Marine Science, 53: 1051-1053.
ICES. 2013. Report of the Herring Assessment Working Group for the Area South of \(62^{\circ}\) N, 13-22 March 2013. ICES CM 2013/ACOM:06.
Thomas, L. 2011. Estimating the size of the UK grey seal population between 1984 and 2010. SCOS Briefing Paper 11/02.

Table 5.4.13.1 Herring in Divisions VIaS and VIIb,c. ICES advice, management, landings, and catches.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Year & ICES Advice
Single-stock exploitation boundaries & / Predicted catch corresp. to advice & Agreed TAC & Official landings & Disc. slip. & ICES catch \\
\hline 1987 & TAC & 18 & 17 & 17 & - & 49 \\
\hline 1988 & TAC depending on whether 1987 TAC is taken & 11-18 & 14 & 15 & - & 29 \\
\hline 1989 & TAC & 15 & 20 & 21 & 1.0 & 29 \\
\hline 1990 & TAC depending on whether 1989 TAC is taken & 25-27 & 27.5 & 28 & 2.5 & 44 \\
\hline 1991 & TAC & <26 & 27.5 & 23 & 3.4 & 38 \\
\hline 1992 & TAC (including discards) & 29 & 28 & 27 & 0.1 & 32 \\
\hline 1993 & Precautionary TAC (including discards) & 29 & 28 & 30 & 0.3 & 37 \\
\hline 1994 & Precautionary TAC & 28 & 28 & 27 & 0.7 & 34 \\
\hline 1995 & Precautionary TAC (including discards) & 36 & 28 & 27 & - & 28 \\
\hline 1996 & If required, precautionary TAC & 34 & 28 & 25 & - & 33 \\
\hline 1997 & Catches below 25 & \(<25\) & 28 & 28 & 0.1 & 27 \\
\hline 1998 & Catches below 25 & \(<25\) & 28 & 28 & - & 39 \\
\hline 1999 & F 70\% of F(97) & 19 & 21 & 18 & - & 26 \\
\hline 2000 & \(\mathrm{F} 40 \%\) of \(\mathrm{F}(98)=\) Proposed \(\mathrm{F}_{\mathrm{pa}}\) & 14 & 14 & 10 & - & 20 \\
\hline 2001 & F \(40 \%\) of \(\mathrm{F}(99) \mathrm{F}=0.2\) & 14 & 14 & 13 & - & 15 \\
\hline 2002 & No increase in catches & 14 & 14 & 14 & - & 18 \\
\hline 2003 & No increase in catches & 14 & 14 & 14 & - & 17 \\
\hline 2004 & No increase in catches & 14 & 14 & 11 & - & 14 \\
\hline 2005 & No increase in catches & 14 & 14 & 13 & - & 16 \\
\hline 2006 & No increase in catches & 14 & 15.4 & 15.2 & - & 19 \\
\hline 2007 & No fishing without a rebuilding plan* & - & 13.8 & 12.6 & - & 18 \\
\hline 2008 & No fishing without a rebuilding plan* & - & 11.6 & 10.2 & - & 13 \\
\hline 2009 & Same advice as last year & - & 9.3 & 8.5 & - & 10 \\
\hline 2010 & Same advice as last year & - & 7.4 & 7.5 & - & 10 \\
\hline 2011 & See scenarios & - & 4.4 & 4.2 & - & 6.9 \\
\hline 2012 & Reduce catch & - & 4.2 & 3.7 & & 6.5 \\
\hline 2013 & No catches without a rebuilding plan & 0 & & & & \\
\hline 2014 & No catches without a rebuilding plan & 0 & & & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
* 2007 advice revised to be consistent with the single-stock exploitation boundaries.

Table 5.4.13.2 Herring in Divisions VIaS and VIIb,c. Official landings and ICES estimated catch (in tonnes).
\begin{tabular}{lllllllll}
\hline Country & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 \\
\hline France & - & + & - & - & - & - & - & - \\
Germany, Fed.Rep. & - & - & - & 250 & - & - & 11 & - \\
Ireland & 18200 & 25000 & 22500 & 26000 & 27600 & 24400 & 25450 & 23800 \\
Netherlands & 2900 & 2533 & 600 & 900 & 2500 & 2500 & 1207 & 1800 \\
UK (N.Ireland) & - & 80 & - & - & - & - & - & - \\
UK (England + Wales) & - & - & - & - & - & 50 & 24 & - \\
UK Scotland & + & - & + & - & 200 & - & - & - \\
Total landings & 21100 & 27613 & 23100 & 27150 & 30300 & 26950 & 26692 & 25600 \\
Unallocated/ area & 7100 & 13826 & 11200 & 4600 & 6250 & 6250 & 1100 & 6900 \\
misreported & 1000 & 2530 & 3400 & 100 & 250 & 700 & - & - \\
Discards & 29200 & 43969 & 37700 & 31850 & 36800 & 33900 & 27792 & 32500 \\
ICES catch & & & & & & & &
\end{tabular}
\begin{tabular}{lllllllll}
\hline Country & 1997 & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 \\
\hline France & - & - & - & - & - & 515 & - & - \\
Germany, Fed.Rep. & - & - & - & - & - & - & - & - \\
Ireland & 24400 & 25200 & 16325 & 10164 & 11278 & 13072 & 12921 & 10950 \\
Netherlands & 3400 & 2500 & 1868 & 1234 & 2088 & 366 & - & 64 \\
UK (N.Ireland) & - & - & - & - & - & - & - & - \\
UK (England + Wales) & - & - & - & - & - & - & - & - \\
UK Scotland & - & - & - & - & - & - & - & - \\
Total landings & 27800 & 27700 & 18193 & 11398 & 13366 & 13953 & 12921 & 11014 \\
Area misreported & -700 & 11200 & 7916 & 8448 & 1390 & 3873 & 3581 & 2813 \\
Unallocated & & & & & & & & \\
Discards & 50 & & - & - & - & - & - & - \\
ICES catch & 27150 & 38900 & 26109 & 19846 & 14756 & 17826 & 16502 & 13827 \\
\hline
\end{tabular}
\begin{tabular}{lllllllll}
\hline Country & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline France & - & - & - & - & - & - & - & - \\
Germany, Fed.Rep. & - & - & - & - & - & - & - & - \\
Ireland & 13351 & 14840 & 12662 & 10237 & 8533 & 7513 & 4247 & 3791 \\
Netherlands & - & 353 & 13 & - & - & - & - & - \\
UK (N.Ireland) & - & - & - & - & - & - & - & - \\
UK (England + Wales) & - & - & - & - & - & - & - & - \\
UK Scotland & - & 6 & - & - & & - & - & - \\
Total landings & 13351 & 15199 & 12675 & 10237 & 8533 & 7513 & 4247 & 3791 \\
Area misreported & 2880 & 4353 & 5129 & 3103 & 1935 & 2728 & 2672 & 2780 \\
Unallocated & & -353 & -13 & - & - & - & - & - \\
Discards & - & - & - & - & - & - & - & - \\
ICES catch & 16231 & 19193 & 17791 & 13340 & 10468 & 10241 & 6919 & 6571 \\
\hline
\end{tabular}

Table 5.4.13.3 Herring in Divisions VIaS and VIIb,c. Summary of the exploratory assessment (ICA, including survey data from the Malin shelf acoustic survey).
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Year & Recruitment & TSB & SSB & Fbar & Landings tonnes & \begin{tabular}{l}
Landings \\
SOP
\end{tabular} \\
\hline 1957 & 149976 & 47132 & 21978 & 0.2945 & 5070 & 10000 \\
\hline 1958 & 280587 & 66075 & 23597 & 0.4187 & 6825 & 0.9996 \\
\hline 1959 & 363725 & 79717 & 27248 & 0.3545 & 5226 & 10002 \\
\hline 1960 & 157083 & 64503 & 35478 & 0.1632 & 5401 & 0.9999 \\
\hline 1961 & 201981 & 67403 & 34443 & 0.1783 & 6182 & 10000 \\
\hline 1962 & 330113 & 95449 & 44642 & 0.1939 & 7399 & 0.9995 \\
\hline 1963 & 308011 & 102917 & 55090 & 0.1126 & 5059 & 10005 \\
\hline 1964 & 296615 & 109417 & 61422 & 0.1166 & 6169 & 0.9998 \\
\hline 1965 & 1636705 & 282416 & 71667 & 0.1378 & 8016 & 0.9993 \\
\hline 1966 & 233894 & 201674 & 140360 & 0.1878 & 12215 & 10002 \\
\hline 1967 & 474429 & 184590 & 101930 & 0.228 & 18881 & 10003 \\
\hline 1968 & 510336 & 197280 & 106054 & 0.1911 & 20731 & 0.9999 \\
\hline 1969 & 346469 & 171715 & 101335 & 0.1945 & 19607 & 0.9999 \\
\hline 1970 & 444323 & 173065 & 88483 & 0.2345 & 20306 & 11150 \\
\hline 1971 & 818663 & 278807 & 151341 & 0.1443 & 15044 & 11491 \\
\hline 1972 & 745054 & 277791 & 148753 & 0.202 & 23474 & 11146 \\
\hline 1973 & 499296 & 236556 & 131017 & 0.2877 & 36719 & 0.9834 \\
\hline 1974 & 616217 & 216485 & 98894 & 0.4249 & 36589 & 10243 \\
\hline 1975 & 412893 & 190157 & 98716 & 0.3938 & 38764 & 0.8900 \\
\hline 1976 & 782419 & 194629 & 66881 & 0.502 & 32767 & 0.9547 \\
\hline 1977 & 635472 & 179740 & 75549 & 0.326 & 20567 & 0.9275 \\
\hline 1978 & 987171 & 221707 & 76821 & 0.2649 & 19715 & 0.9842 \\
\hline 1979 & 986530 & 258820 & 107014 & 0.2363 & 22608 & 0.9379 \\
\hline 1980 & 622241 & 229870 & 113824 & 0.3506 & 30124 & 10379 \\
\hline 1981 & 686907 & 223043 & 107468 & 0.2642 & 24922 & 0.9698 \\
\hline 1982 & 697142 & 229291 & 115502 & 0.2082 & 19209 & 0.9710 \\
\hline 1983 & 2770018 & 478551 & 105254 & 0.3592 & 32988 & 0.9957 \\
\hline 1984 & 1057929 & 397010 & 211256 & 0.1929 & 27450 & 10320 \\
\hline 1985 & 1210194 & 405464 & 232538 & 0.148 & 23343 & 10154 \\
\hline 1986 & 1020234 & 409686 & 253418 & 0.1662 & 28785 & 10168 \\
\hline 1987 & 3372908 & 642272 & 235164 & 0.3088 & 48600 & 10538 \\
\hline 1988 & 461544 & 461558 & 332418 & 0.2289 & 29100 & 10008 \\
\hline 1989 & 642258 & 391640 & 248469 & 0.1669 & 29210 & 0.9988 \\
\hline 1990 & 853240 & 338571 & 187241 & 0.2499 & 43969 & 0.9991 \\
\hline 1991 & 524697 & 282428 & 177468 & 0.2324 & 37700 & 10031 \\
\hline 1992 & 413360 & 217124 & 133623 & 0.2795 & 31856 & 10052 \\
\hline 1993 & 623830 & 234789 & 116112 & 0.3759 & 36763 & 0.9939 \\
\hline 1994 & 806286 & 206897 & 88239 & 0.3837 & 33908 & 10020 \\
\hline 1995 & 448764 & 158766 & 83953 & 0.4294 & 27792 & 0.9501 \\
\hline 1996 & 896472 & 179027 & 66009 & 0.5552 & 32534 & 10045 \\
\hline 1997 & 859204 & 178775 & 66286 & 0.5297 & 27225 & 0.9985 \\
\hline 1998 & 544263 & 148271 & 56196 & 0.974 & 38895 & 10013 \\
\hline 1999 & 423410 & 121646 & 48730 & 0.6693 & 26109 & 0.9982 \\
\hline 2000 & 469847 & 110852 & 42333 & 0.4898 & 19846 & 0.9989 \\
\hline 2001 & 479829 & 102546 & 41313 & 0.4496 & 14756 & 10013 \\
\hline 2002 & 550071 & 109779 & 39148 & 0.5383 & 17826 & 10008 \\
\hline 2003 & 472256 & 106161 & 42223 & 0.4886 & 16502 & 0.9979 \\
\hline 2004 & 480194 & 100689 & 44471 & 0.4099 & 13727 & 0.9994 \\
\hline 2005 & 518674 & 111476 & 43196 & 0.4383 & 16231 & 10013 \\
\hline 2006 & 331451 & 92191 & 40425 & 0.6859 & 19193 & 0.9989 \\
\hline 2007 & 157861 & 69024 & 32897 & 0.5869 & 17791 & 10000 \\
\hline 2008 & 234132 & 60845 & 24400 & 0.5673 & 13340 & 10001 \\
\hline 2009 & 217811 & 51398 & 24177 & 0.5011 & 10468 & 10014 \\
\hline 2010 & 463138 & 73984 & 20734 & 0.5423 & 10241 & 0.9992 \\
\hline 2011 & 640329 & 90674 & 27994 & 0.3554 & 6919 & 10003 \\
\hline 2012 & 473928 & 1814346 & 50924 & 0.1437 & 6571 & 10004 \\
\hline
\end{tabular}

Table 5.4.13.4 Herring in Divisions VIaS and VIIb,c. Summary of the exploratory assessment (SVPA).
\begin{tabular}{|c|c|c|c|c|}
\hline Year & Recruitment & SSB & Landings & FBar \\
\hline 1957 & 175035 & 29604 & 5070 & 0.2237 \\
\hline 1958 & 334545 & 29246 & 6825 & 0.3183 \\
\hline 1959 & 483127 & 38618 & 5226 & 0.2011 \\
\hline 1960 & 262908 & 51660 & 5401 & 0.0943 \\
\hline 1961 & 207384 & 52632 & 6182 & 0.1181 \\
\hline 1962 & 286854 & 56939 & 7399 & 0.1323 \\
\hline 1963 & 311539 & 68642 & 5059 & 0.0838 \\
\hline 1964 & 295696 & 70265 & 6169 & 0.0894 \\
\hline 1965 & 2398901 & 76202 & 8016 & 0.1252 \\
\hline 1966 & 165998 & 186353 & 12215 & 0.1954 \\
\hline 1967 & 467097 & 111919 & 18881 & 0.2289 \\
\hline 1968 & 544310 & 154698 & 20731 & 0.1685 \\
\hline 1969 & 350895 & 142235 & 19607 & 0.1685 \\
\hline 1970 & 406447 & 131405 & 20306 & 0.1917 \\
\hline 1971 & 821830 & 115527 & 15044 & 0.1678 \\
\hline 1972 & 739502 & 118711 & 23474 & 0.2031 \\
\hline 1973 & 538189 & 136269 & 36719 & 0.2835 \\
\hline 1974 & 593233 & 93965 & 36589 & 0.4443 \\
\hline 1975 & 412251 & 88800 & 38764 & 0.4299 \\
\hline 1976 & 695167 & 66526 & 32767 & 0.4882 \\
\hline 1977 & 583445 & 73229 & 20567 & 0.3101 \\
\hline 1978 & 1068757 & 73157 & 19715 & 0.2565 \\
\hline 1979 & 994125 & 100768 & 22608 & 0.2651 \\
\hline 1980 & 541049 & 107024 & 30124 & 0.3812 \\
\hline 1981 & 683312 & 101506 & 24922 & 0.3022 \\
\hline 1982 & 711052 & 112140 & 19209 & 0.2184 \\
\hline 1983 & 2341228 & 110910 & 32988 & 0.3506 \\
\hline 1984 & 970610 & 193053 & 27450 & 0.1992 \\
\hline 1985 & 1238781 & 194278 & 23343 & 0.1672 \\
\hline 1986 & 951309 & 229871 & 28785 & 0.1774 \\
\hline 1987 & 3238964 & 208289 & 48600 & 0.337 \\
\hline 1988 & 481007 & 304341 & 29100 & 0.2655 \\
\hline 1989 & 716019 & 226952 & 29210 & 0.1794 \\
\hline 1990 & 809513 & 196016 & 43969 & 0.2571 \\
\hline 1991 & 502888 & 169160 & 37700 & 0.2419 \\
\hline 1992 & 415472 & 135537 & 31856 & 0.2737 \\
\hline 1993 & 616187 & 114926 & 36763 & 0.3543 \\
\hline 1994 & 802983 & 96314 & 33908 & 0.362 \\
\hline 1995 & 457753 & 79903 & 27792 & 0.4676 \\
\hline 1996 & 831805 & 62879 & 32534 & 0.5825 \\
\hline 1997 & 820655 & 63944 & 27225 & 0.5358 \\
\hline 1998 & 526653 & 52302 & 38895 & 1.031 \\
\hline 1999 & 386516 & 44466 & 26109 & 0.7026 \\
\hline 2000 & 436156 & 37018 & 19846 & 0.5305 \\
\hline 2001 & 444252 & 34287 & 14756 & 0.638 \\
\hline 2002 & 543141 & 32738 & 17826 & 0.7089 \\
\hline 2003 & 445267 & 37385 & 16502 & 0.6525 \\
\hline 2004 & 460864 & 39159 & 13727 & 0.5957 \\
\hline 2005 & 503977 & 38816 & 16231 & 0.6097 \\
\hline 2006 & 279962 & 36402 & 19193 & 0.8687 \\
\hline 2007 & 141074 & 28294 & 17791 & 0.6784 \\
\hline 2008 & 182609 & 19600 & 13340 & 0.7129 \\
\hline 2009 & 116490 & 17600 & 10468 & 0.6875 \\
\hline 2010 & 196498 & 10964 & 10241 & 0.897 \\
\hline 2011 & 159239 & 9461 & 6919 & 1.1766 \\
\hline 2012 & 498780* & 11588 & 6571 & 0.6583 \\
\hline Mean & 498780 & 93295 & 21558 & 0.3927 \\
\hline
\end{tabular}

\footnotetext{
* Geometric mean recruitment 1957-2011.
}

\section*{Proposed Rebuilding Plan for Herring in VIaS and VIIbc (July 2013)}
1. The aim of this plan is to rebuild SSB to above the level consistent with unacceptable risk of recruitment impairment.
2. For 2014, and subsequent years, the TAC shall be set based on fishing mortalities, as follows:
a. \(\quad \mathrm{SSB}>\mathrm{B}_{\mathrm{pa}}, \mathrm{F}=\mathrm{F}_{0.1}\)
b. \(\quad \mathrm{SSB}<\mathrm{B}_{\mathrm{pa}} \mathrm{F}=\mathrm{SSB}^{*}\left(\mathrm{~F}_{0.1} / \mathrm{B}_{\mathrm{pa}}\right)\)
3. If an assessment is available, but is considered by ICES to be indicative of trends, rather than as an estimation of stock size, (ICES DLS Category 2),, then the TAC settings in paragraph 2 shall apply, but the TAC shall be down-weighted by a factor \(\left(\mathrm{G}^{*}\right)\) (see explanation below) based on the level of uncertainty.
4. The TAC for the following year shall be set at a lower level than provided for in Paragraphs 2 or 3, based on advice from ICES or STECF, if, in the opinion of ICES, SSB is at risk of being below Blim and if these agencies consider such additional action to be appropriate.
5. In order to provide for separate management of this stock, relative to that in VIaN, every effort shall be made to disaggregate abundance-at-age data in Division VIa.
6. In order to avoid by catches and unaccounted mortality of this stock, and in light of the problem of disaggregating stock-specific data, it is necessary to establish an interim temporary exclusion zone for 2 years. In anticipation of results of the analyses being conducted by ICES, and until better information on stock mixing is available, a temporary exclusion zone, prohibiting herring fishing, shall be established that lies between \(56^{\circ} \mathrm{N}\) and \(57^{\circ} 30 \mathrm{~N}\), in Sub-Division VIa N. This exclusion only applies outside 6 nautical miles. It should be noted that this exclusion will only affect catches of herring by the Irish Fleet in VIaN.
7. When SSB is deemed to have recovered to a size equal to or greater than Bpa in three consecutive years, the rebuilding plan will be superseded by a long-term management plan.

\section*{*Uncertainty down-weighting parameter G}

The parameter \(G\) is defined as follows:
\(\mathrm{G}=\mathrm{TAC}{ }^{*} \exp { }^{(-1.645 * \sigma)}\)
where \(\sigma\) refers to the Coefficient of Variation of the final year SSB estimate.

\title{
Celtic Sea and West of Scotland Sprat
}
(Sub area VI and Divisions VIIa-c and f-k)
For latest information, see: http://www.ices.dk

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice for 2014 is the same as for 2013. The ICES advice is based on the approach for data limited stocks; catches should be no more than \(3,500 \mathrm{t}\). Currently there is no TAC for this species in this area, and it is not clear whether there should be one or several management units.

FEAS agrees with the broad approach of ICES that a reduction in outtake is required in the absence of better information on sustainable harvest rates. However, as stock identity is poorly understood and catch data require further scrutiny, it is not possible to quantify the catch level.

A management plan for sprat is required. This should incorporate precautionary reductions in the absence of information to advise on


Blue Shading - Assessment Area sustainable harvest rates. If no such plan is developed, a precautionary TAC should be implemented at the level of the ICES advice.

FEAS agrees with ICES that this advice is not dedicated to a 'stock'. The stock structure of sprat populations in this eco-region is not clear. Preliminary studies suggest at least three somewhat discrete populations in this region; one on the south, west and northwest coasts of Ireland, one in the Irish Sea and one in the Clyde. Management should, at least initially, be framed on this spatial structure.

This stock falls into ICES Category 5, as only landings data are available.
Given their importance as forage fish, sufficient information should be made available to assess the resource, the impact of the fisheries on the resource, and their role in the ecosystem.

\section*{CURRENT MANAGEMENT}
- There are no TACs for sprat in Irish waters. TACs are in place in the English Channel and in the North Sea.
- EC vessels are restricted in the gear they can use to target sprat. Mesh sizes of 16 mm and above are permitted when sprat is the target species. There are also restrictions on the by-catch of most pelagic and demersal species covered by the TAC and quota system. Further restrictions on mesh size of above 32 mm apply, if demersal TAC species are a by-catch in sprat fisheries.

\section*{ICES ADVICE 5.4.39 Sprat in Subarea VI and Divisions VIIa-c and f-k}

\footnotetext{
Advice for 2014
New data available for this stock do not change the perception of the stock; therefore, the advice for this fishery in 2014 is the same as the advice for 2013 (see ICES, 2012): "Based on the ICES approach for data limited stocks,
}

ICES advises that catches should be no more than 3500 tonnes. Currently there is no TAC for this species in this area, and it is not clear whether there should be one or several management units".

\section*{The fisheries}

Most sprat in the Celtic Seas ecoregions are caught by small pelagic vessels that also target herring, mainly Irish and Scottish vessels. In Ireland, many multi-purpose vessels target sprat on an opportunistic basis. At other times these boats target a large variety of other species. Fisheries can be highly variable depending on availability of sprat abundance. Catches by vessels under 10 metres and beach-based fisheries may not be included in official landings. In this area, the sprat landings have increased substantially and mis-reporting of sprat and herring is assumed to occur. There is also a concern that sprat in this area may be fished together with juvenile herring bycatches.

\section*{Quality considerations}

This advice is not dedicated to a 'stock'. It relates to a species in a wider region where data are available. The stock structure of sprat populations in this ecoregion is not clear. ICES does not necessarily advocate that Subarea VI and Divisions VIIa-c, f-k constitute a management unit for sprat, and further work is required. Additionally, the relationship with sprat in Divisions VIId,e is also unknown.

Because of the potential misreporting issue, the landings may not be fully accurate and ICES does not change the advice based on the sudden peak of landings in 2012.

The advice is based on a precautionary reduction of catches because of missing or non-representative data. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis
\begin{tabular}{ll} 
Assessment type & No assessment. \\
Stock data category & Category 5.2.0. \\
Input data & Landing statistics. \\
Discards and bycatch & \begin{tabular}{l} 
Not available. \\
Indices from the Irish (AC(VIIaN)) and Celtic Sea Acoustic (CSHAS) surveys; the \\
Indicators
\end{tabular} \\
& \begin{tabular}{l} 
Irish Sea (NIGFS-WIBTS-1Q and NIGFS-WIBTS-4Q), Celtic Sea (WCGFS and \\
SWIBTS), and west of Scotland (ScoGFS-WIBTS-Q1 and ScoGFS-WIBTS-Q4) \\
groundfish surveys; Irish groundfish surveys (IRGFS-WIBS-Q4).
\end{tabular} \\
Other information & \begin{tabular}{l} 
The stock was benchmarked in 2013 (ICES, 2013a), but this did not result in a \\
revision of the assessment method.
\end{tabular} \\
Working group report & HAWG (ICES, 2013b).
\end{tabular}

\section*{Sources}

ICES. 2012. Sprat in the Celtic Sea and West of Scotland. In Report of the ICES Advisory Committee 2012, Section 5.4.28. ICES Advice, 2012, Book 5: 223-231.
ICES. 2013a. Report of the Benchmark Workshop on Sprat Stocks (WKSPRAT), 11-15 February 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:48. 220 pp.
ICES. 2013b. Report of the Herring Assessment Working Group for the Area South of \(62^{\circ} \mathrm{N}\) (HAWG), 14-21 March 2013 ICES CM 2013/ACOM:06.

Sprat in the Celtic Sea and West of Scotland. ICES advice, management, and official landings.
\begin{tabular}{llcc}
\hline Year & ICES Advice & \begin{tabular}{c} 
Predicted \\
catch corresp. \\
to advice
\end{tabular} & \begin{tabular}{c} 
ICES \\
landings
\end{tabular} \\
\hline \(2000-\) & - & 10.6 \\
\(2001-\) & - & 2.1 \\
\(2002-\) & - & 4.7 \\
\(2003-\) & - & 9.0 \\
\(2004-\) & - & 5.6 \\
\(2005-\) & - & 6.8 \\
\(2006-\) & - & 2.1 \\
\(2007-\) & - & 3.8 \\
\(2008-\) & - & 2.4 \\
\(2009-\) & - & 3.8 \\
2010 & - & - & 3.7 \\
2011 & - & \(<3.5\) & \(11.4^{1)}\) \\
2012 & No increase in catch & \(<3.5\) & \\
2013 & 20\% reduction on catches & - & \\
2014 & Same advice as last year & - & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1)}\) Preliminary.
}

\title{
Rays and Skates in the Celtic Seas
}
(Sub-area VI and Divisions VIIa-c,e-k)

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES provides advice on elasmobranchs on a biennial basis. The advice for 2013 applies in 2014. This advice can be found in the 2012 Stock Book.

ICES provides overall advice for rays and skates as a mixed fishery and also advice on the catch of individual species and stocks within the Celtic Seas. The individual species/stock advice is based on the approach for data limited stocks. This individual stock advice is in the context of adjustments to current catch. However, because current catch data are incomplete, the ICES advice does not provide a quantification of catch, but rather directional advice on overall exploitation. FEAS agrees with ICES that these adjustments in exploitation can be achieved through management measures other than TAC.

These stocks mainly fall into ICES Category 3, where survey


Red Boxes-TAC/Management Area Blue Shading-Assessment Area information is available or otherwise fall into ICES Category 5. Landings of skates and rays in the Celtic Seas have generally declined, and this is associated with changes in species composition and relative abundance.

ICES and FEAS advise that species-specific TACs should not be established, at present. Closure of spawning and/or nursery grounds to fishing, and measures to protect the spawning component of the population could be effective tools to protect rays and skates. ICES and FEAS advise that measures such as these should be incorporated into management plans involving all stakeholders.

A summary of the stock-specific advice is provided in Table I.
FEAS agrees with the ICES stock-specific advice. FEAS does not recommend individual TACs be established for these stocks.

FEAS also recommends that angel shark, Squatina squatina, and white skate, Rostroraja alba should remain on the prohibited species list within the Celtic Seas ecoregion. There should be no targeted fishery for undulate ray Raja undulata, or the common skate complex (Dipturus batis complex).

\section*{CURRENT MANAGEMENT}
- The TAC for this assemblage of species was set at \(8,924 \mathrm{t}\) for 2013 for Divisions Vla, VIb, Vlla-c and VIle-k.
- This TAC does not apply to common skate, white skate, undulate ray and angel shark, all of which are on the prohibited species list. By-caught specimens of these species are to be returned unharmed where practicable.
- A management plan for skates and rays in VI and VII was developed by the North-Western Waters RAC. This would initially apply on a voluntary basis. This plan has not yet been presented to the EC for assessment and acceptance.
- Skate and ray landings must be declared by species. It is no longer permissible to use generic categories such as "Rays". FEAS provides simple keys to aid this process.

Table 1. FEAS summary of ICES advice for ray and skate stocks in the Celtic Seas. FEAS agrees with this advice.
\begin{tabular}{|c|c|c|c|}
\hline Stock & Stock status & ICES Category for data-limited stocks & ICES advice \\
\hline Blonde ray (Raja brachyura) in Subarea VI (West of Scotland) & Unknown & Category 5 & Catches should be decreased by at least \(20 \%\) \\
\hline Blonde ray (Raja brachyura) in Divisions VIIa, f, g (Irish and Celtic Sea) & Unknown & Category 5 & Catches should be decreased by at least \(20 \%\) \\
\hline Blonde ray (Raja brachyura) in Division VIIe (Western English Channel) (Part of North Sea Stock) & Unknown & Category 5 & Catches should be decreased by at least \(20 \%\) \\
\hline Thornback ray (Raja clavata) in Subarea VI (West of Scotland) & Increasing & Category 3 & Catches could be increased by a maximum of \(20 \%\) \\
\hline Thornback ray (Raja clavata) in Divisions VIIa, f, g (Irish and Celtic Sea) & Increasing & Category 3 & Catches could be increased by a maximum of 20\% \\
\hline Thornback ray (Raja clavata) in Division VIIe (Western English Channel) (Part of North Sea Stock) & Increasing & Category 3 & Catches could be increased by a maximum of \(20 \%\) \\
\hline Small-eyed ray (Raja microocellata) in Divisions VIIf, g (Celtic Sea) & Decreasing & Category 3 & Catches should be decreased by at least \(36 \%\) \\
\hline Small-eyed ray (Raja microocellata) in Division VIIe (Western English Channel) (Part of North Sea Stock) & Unknown & Category 5 & Catches should be decreased by at least \(20 \%\) \\
\hline Spotted ray (Raja montagui) in Subarea VI (West of Scotland) & Decreasing & Category 3 & Catches should be decreased by at least \(23 \%\) \\
\hline Spotted ray (Raja montagui) in Divisions VIIa, f, g (Irish and Celtic Sea) & Increasing & Category 3 & Catches could be increased by \(20 \%\) \\
\hline Undulate ray (Raja undulata) in Division VIIj (Great Sole Bank) & Depleted & n/a. Precautionary approach. & No targeted fishery \\
\hline Sandy ray (Leucoraja circularis) in the Celtic Sea ecoregion & Unknown & Category 5 & Catches should be decreased by \(20 \%\) \\
\hline Shagreen ray (Leucoraja fullonica) in the Celtic Sea ecoregion & Unknown & Category 5 & Catches should be decreased by at least \(20 \%\) \\
\hline Cuckoo ray (Leucoraja naevus) in the Celtic Sea ecoregion & Decreasing & Category 3 & Catches should be decreased by at least \(36 \%\) \\
\hline Common skate, Dipturus batis complex (flapper skate (Dipturus cf. flossada) and blue skate (Dipturus cf. intermedia)) in the Celtic Sea ecoregion & Depleted & n/a. Precautionary approach. & No targeted fishery \\
\hline Other ray and skate species in the Celtic Sea ecoregion & Unknown & Category 5 & Catches should be decreased by at least \(20 \%\) \\
\hline
\end{tabular}

The complete ICES advice for rays and skates in the Celtic Seas can be found in the 2012 Stock Book.

\title{
Ecosystem overview for Widely Distributed Stocks
}

\section*{FEAS -ECOSYSTEM CONSIDERATIONS}

FEAS recommends that the following considerations should be taken into account when developing ecosystem based management objectives for fisheries on widely distributed stocks:
- The fishing mortality on widely distributed stocks has reduced in the last two decades and is now at or below \(F_{\text {msy }}\) for most stocks. Western Horse mackerel is currently overexploited.
- Atlantic tuna stocks (Albacore and Bluefin) and spurdog have biomasses below reference points. These species are top predators in the pelagic food chain and their low abundance suggests that not all elements of the pelagic food chain are in a healthy state.
- Pelagic fish species such as boarfish, blue whiting, mackerel and horse mackerel are keystone food web species and changes in their abundance can have significant consequences up the marine food chain.
- Mueller's pearlside, glacial lantern fish and lancet fish are the dominant mesopelagic species. These species are important prey for mackerel, hake and blue whiting. Given their key role in the marine food web, fisheries should not be allowed to develop unless the impact of outtake on the ecosystem - particular on predators is understood.
- In pelagic fisheries discarding occurs primarily in the form of slippage when the entire catch is released. Slipping is highly sporadic and difficult to quantify. The obligation to land all catch (i.e. no discarding policy) as introduced by the newly reformed CFP, is intending to address pelagic slipping and discarding as a priority.
\begin{tabular}{|c|c|}
\hline & Physical Features \\
\hline Bathymetry & The shelf extends up to 500 km from the west of Ireland. Water depths on the shelf are typically \(100-150 \mathrm{~m}\) from Biscay to Scotland (Hutchance et al., 2009). The Porcupine Bank to the southwest and Slyne ( \(50-1,000 \mathrm{~m}\) water depth), Erris ( \(50-2,000 \mathrm{~m}\) water depth) and Donegal Basins ( \(50-200 \mathrm{~m}\) water depth) to the west and northwest are found at the shelf edge. \\
\hline Substrates & The seabed is largely shaped by several glacial periods (iceberg rafting, debris flow) when large volumes of material were eroded from the land and deposited at the shelf edge and over the continental slope. Sediments in VlaS and VIIbcjk are principally muddy sand with gravel, pebbles, cobbles and boulders (Rice, 2004). The modern day sedimentary regime is characterised by sediment reworking and redistribution by near bottom currents and gravity-driven processes (Hartley Anderson, 2005). \\
\hline Circulation & A number of water masses with distinct temperature and salinity characteristics converge to the west of Ireland (New and Smythe-Wright, 2001). The strength of the subpolar gyre (Hatun et al., 2005) and changes in the mean North Atlantic wind-field (Nolan et al., 2009) influence the variability of the path of warm and saline North Atlantic Current (NAC) from the southwest and Eastern North Atlantic Water (ENAW), which is formed in the Bay of Biscay and carried northwards by the Shelf Edge Current (SEC). A warm high-salinity core of water has been identified in the upper 300 m moving up and down the shelf edge (White and Bowyer, 1997, New and Smythe-Wright, 2001). The seasonal Irish Coastal Current is known to flow around the southwest and west coast of Ireland (McMahon et al., 1995, Horsburgh et al., 1998, Brown et al., 2003, Fernand et al., 2006). \\
\hline Fronts & The main oceanographic front in the area is the year-round Irish Shelf Front at approximately \(11^{\circ}\) W around the 150 m contour (Huang et al., 1991). With a total extent of \(\sim 500 \mathrm{~km}\) it occurs to the south and west of Ireland and creates a separation between saline Atlantic waters and fresher inshore waters. \\
\hline
\end{tabular}
\begin{tabular}{|c|c|}
\hline Temperature and salinity & Mean annual temperature in the upper 800 m of the Rockall Trough increased from \(\sim 9.2^{\circ} \mathrm{C}\) in 2000 to \(10^{\circ} \mathrm{C}\) in 2006. A decrease of \(0.5^{\circ} \mathrm{C}\) has been noted since then. Salinity has shown a constant increase from the early nineties onwards with highest values in 2010 (ICES 20I2b). \\
\hline \[
\begin{gathered}
\lambda \\
(1975-2011)
\end{gathered}
\] & \\
\hline & Biological F \\
\hline \begin{tabular}{l}
Phytoplankton \\
Diatoms \\
\(\searrow\) \\
Dinoflagellates \\
\(\searrow\) \\
(1958-2010)
\end{tabular} & Diatom and dinoflagellate species abundances in shelf and oceanic waters west of the European shelf show a longterm decline using time series froml958 (O'Brien et al. 2013). All four common dinoflagellate species/groups (Ceratium fusus, C. furca, C. tripos and Protoperidinium spp.) found at the shelf edge have declined in abundance/biomass between 1960-1999 and 20002009. No species/groups increased over this period. Three out of five diatom species/groups (Hyalochaete spp., Thalassionema nitzschioides and Rhizosolenia alata alata) likewise decreased in abundance/biomass and two species/groups increased (Thalassiosira spp. and Phaeoceros spp.) (McGinty et al., 2012). \\
\hline \begin{tabular}{l}
Zooplankton \\
Overall Abundance \\
(1958-2010)
\end{tabular} & Longterm times series starting in 1958 show a decline in overall zooplankton abundance in shelf and oceanic waters west of the European shelf (O'Brien et al. 2013). Seven species/groups of carnivorous zooplankton (Euphausiids, Chaetognaths, Hyperiids, Decapods, Pleuromamma spp., Candacia spp. and Corycaeus spp.) and five species/groups of herbivorous copepods (Calanus spp. I-IV, Acartia spp., Paracalanus spp. and small copepods \(<2 \mathrm{~mm}\), Centropages typicus and Calanus finmarchicus) in the shelf edge region have declined in abundance/biomass during the periods 1960-1999 and 2000-2009. One Carnivorous zooplankton group (Euchaeta spp.) and one herbivorous copepod species (C. helgolandicus) has increased in abundance/biomass during the same periods (McGinty et al., 2012). Calanus spp. are used as indicators of increasing SST in the Northeast Atlantic region (Beaugrand et al., 2002). \\
\hline \begin{tabular}{l}
Fish community \\
Blue whiting \\
\(\lambda\)
\end{tabular} & Several important pelagic NEA stocks migrate and spawn along the western European slope, namely blue whiting, mackerel, horse mackerel and boarfish. Hydrographic conditions and food supplies in the shelf edge region play an important part in each stage of their life cycle. \\
\hline |98|-20|3 & Northeastern Atlantic blue whiting is distributed from the Canary Islands to Spitsbergen along the continental margin. The Porcupine Bank, St. Kilda and Rockall are the main spawning areas \\
\hline \[
\begin{gathered}
\text { Mackerel } \\
\pi \\
1990-2013
\end{gathered}
\] & (Heino and Godo, 2002). Nursery areas are found along shelf edges from Morocco to northern Norway. Migration patterns from the spawning grounds are thought to be influenced by the strength of the subpolar gyre. Feeding areas include the Faroe/Shetland area, south of Iceland and along the continental shelf edge from the Bay of Biscay to the Barents Sea (Petitgas, 2010). \\
\hline \begin{tabular}{l}
Horse Mackerel
1982-2013 \\
Boarfish \\
7
\end{tabular} & Northeastern Atlantic mackerel distribution extends along the Western European Continent from Iberia to Northern Norway (Uriarte and Lucio, 200I). Nursery areas are found adjacent to coastlines (Borja et al., 2002) and the two main recruitment areas are the Porcupine Bank and the south-eastern Bay of Biscay (Bartsch and Coombs, 2004). Adult mackerel migrate along the shelf edge to northern feeding grounds located in the Norwegian Seas and North Sea in late summer/autumn (Petitgas, 2010). \\
\hline \multirow[t]{2}{*}{1991-2013} & Horse mackerel is widely distributed along the Western European shelf from West Africa/Cape Verde Islands into the Norwegian Sea. Spawning areas and migration routes generally follow those of mackerel. \\
\hline & Boarfish is associated with zones of high offshore productivity (Lopes et al., 2006) and distributed from Norway to Senegal at depths from \(40-600 \mathrm{~m}\) (Blanchard and Vandermeirsch, 2005). Nursery areas are found close to the seabed in the Celtic Sea and shelf sea areas. Post spawning mature boarfish move from the shelf to form dense feeding aggregations on the offshore banks in the Celtic Sea. \\
\hline Mammals & The most abundant cetaceans in European offshore waters are common, striped and bottlenose dolphins; long-finned pilot whales, fin whales, minke whales, beaked whales and sperm whales (CODA, 2009), \\
\hline Seabirds
\(\qquad\) & Hydrographic conditions and prey availability make the Atlantic margin an area of high seabird diversity. At least 26 species have been identified in this area. Northern fulmar, Northern gannet, Black-legged kittiwake and Manx shearwater are dominant (Mackey et al., 2004). The OSPAR draft ECOQO for seabirds in OSPAR region III (Celtic Seas which includes west of Scotland) shows a downward trend since early 2000 (ICES 2013b). \\
\hline
\end{tabular}
\begin{tabular}{lll}
\hline Climate change & \begin{tabular}{l} 
Increasing SST and changes in zooplankton community structures are likely to impact on life \\
histories of migratory species (Edwards and Richardson, 2004, Brunel and Boucher, 2007). Large \\
effects on finfish \\
increases in boarfish abundance have been attributed to increases in temperature throughout the
\end{tabular} \\
and shellish & \begin{tabular}{l} 
water column as well as a general absence of predators (Blanchard and Vandermeirsch, 2005). The \\
strength of the subpolar gyre is thought to influence spawning distribution and success of blue
\end{tabular} \\
whiting (Hatun et al., 2009a, 2009b). Good recruitment may be associated with a weak gyre. \\
Feeding and migration of horse mackerel patterns appear to be closely related to water \\
temperature (Macer, I977, Lockwood and Johnson, I977, Eaton, I983). Timing and the path of the \\
mackerel migration is influenced by temperature (Jansen et al. 20I2; Reid et al., I997, Reid et al., \\
200I). Water turbulence, shelf upwelling conditions and the atmospheric North Atlantic Oscillation \\
are possible factors affecting juvenile survival and recruitment (Borja et al., 2002).
\end{tabular}
Human pressures and impacts
The main human activities in the shelf break/slope region are:
\(\bullet\) - Fishing
\(\bullet\) - Oransport

Pressures associated with commercial fisheries are:
- The removal of species
- Seafloor disturbance

Of the 2.4 million tons of landings from the widely distributed stocks covered in this section, about \(63 \%\) comes from stocks that are sustainably fished (ie. \(\leq \mathrm{F}_{\text {MSY }}\) ), while around \(8 \%\) of the landings come from stocks that are overexploited, i.e. western horse mackerel. Both Atlantic tuna stocks and spurdog are below biomass reference points. In pelagic fisheries discarding occurs primarily in the form of slippage when the entire catch is released. Reasons for this are quota limitations and fish that are of sizes that are either illegal or have lower market value (high-grading). Slipping is highly sporadic, which makes it difficult to quantify pelagic discarding and published values of \(1 \%\) to \(7 \%\) (eg mackerel and horse mackerel) are considered underestimates (ICES, 2012e). Small pelagic and mesopelagic species such as sprat, herring as well as Mueller's pearlside, glacial lantern fish and lancet fish are an important food resource for many predatory species, and fisheries for these species need to take consideration of their role in the ecosystem.
A full reference list can be found in Appendix VI.

Fig. 1 Pressure \& state indicators


Fig. 2 Unknown status


\section*{Letter code for stocks}

A NEA mackerel
B Blue whiting
C Western Horse mackerel
D Herring in the NE Atlantic
E Spurdog in the NE Atlantic
F Boarfish
G Albacore Tuna
H North Sea horse mackerel
I Bluefin Tuna

Fig. I Relative fishing pressure ( \(F / F_{\text {msy }}\) ) and biomass ( \(\mathrm{SSB} / \mathrm{B}_{\text {trig }}\) ) for widely distributed stocks, which have SSB and F related against reference points (msy where available, otherwise pa). This corresponds to 5 out of 9 stocks and \(51 \%\) of the landings. Stocks in the green region are exploited below \(F_{\text {msy }}\) and have an SSB that is above \(B_{\text {trig }}\). Fig. 2 Stocks of unknown status in relation to reference points. The size of each bubble corresponds to the landings in 2012. The largest bubble corresponds to 880 kt .

Fig. 3 F : Fmsy
Fig. 4 SSB : Btrigger


Fig. 3 Proportion of widely distributed stocks fished at or below Fmsy (green), above Fmsy (red) and of unknown status in relation to fishing mortality reference points.

Fig. 4 Proportion of widely distributed stocks with biomass above \(B\) trigger (green), below B trigger (red) and of unknown status in relation to biomass reference points.


Fig. 5 Relative fishing mortality ( F to \(\mathrm{F}_{\text {msy }}\) ratios) of widely distributed stocks, demersal F corresponds to NEA spurdog, pelagic F corresponds to western horse mackerel, NEA blue whiting, NSS herring and NEA boarfish.

Fig. 6 Relative biomass (SSB to \(B_{\text {msy trigeer }}\) ratios) of widely distributed stocks, relative SSB corresponds to NEA blue whiting and NSS herring.

\title{
Herring in the Northeast Atlantic \\ (Norwegian spring-spawning herring)
}

\section*{Sub-areas I and II}

\author{
For latest information, see: http://www.ices.dk
}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

FEAS agrees with ICES that following the agreed management plan implies landings of no more than \(418,487 \mathrm{t}\) in 2014 . The TAC should therefore be set according to the plan. This would lead to an Irish quota of 2,598 t .

This stock falls into ICES Category I as there is a full analytical assessment and forecast. SSB is declining but is estimated to be at \(B_{p a}\) in 2013. Recruitment has been low since 2005. F in 201 I and 2012 is slightly below both \(F_{\text {MSY }}\) and \(F_{p a}\), but above the management plan target \(F\).

FEAS notes that the management plan TAC of \(418,487 \mathrm{t}\) in 2014 would result in an SSB below \(B_{\text {trigger }}\) in 2015 . However, even without any fishery in 2014 , SSB is expected to fall below \(B_{\text {trigger }}\).

\section*{CURRENT MANAGEMENT}
- A long term management plan has been agreed for this fishery since 1999 between the EU, Faroe Islands, Iceland, Norway and Russia. The plan aims at preventing SSB from falling below \(\mathrm{B}_{\text {lim }}\) of 2.5 million tonnes, and restricting the TACs consistent with a fishing mortality of less than 0.125 . Provisions are also made to reduce this \(F\), should the SSB fall below \(B_{p a}\) of 5 million tonnes.
- ICES considers that this agreement is consistent with the precautionary approach.
- In 2013, the agreed TAC was in accordance with the
 management plan and was \(619,000 \mathrm{t}\).
- In 2013 the EU TAC was \(40,297 \mathrm{t}\). The quota for Ireland, including carryover was \(3,574 \mathrm{t}\).
- The Irish quota is allocated to a small number of vessels on a lottery basis.
- In recent years, the EU has been granted access to the Norwegian sector where the most fishable aggregations occur. However this access is negotiated on a yearly basis. The Irish quota is not useable without EU access to the Norwegian EEZ.
- The management plan for Norwegian Spring Spawning Herring has a target fishing mortality rate that is lower than \(\mathrm{F}_{\text {MSY }}\).

\section*{ICES ADVICE 9.4.11 Norwegian Spring-Spawning Herring}

\section*{Advice for 2014}

ICES advises on the basis of the management plan of EU, Faroe Islands, Iceland, Norway, and Russia that landings in 2014 should be no more than 418487 t . Minor discards are known to take place, but cannot be quantified accurately; the proportion of discards in the total catches are considered negligible.

\section*{Stock status}


Figure 9.4.11.1 Herring in Subareas I, II, and V, and in Divisions IVa and XIVa (Norwegian spring-spawning herring). Summary of stock assessment. Top right: SSB and F over the years.

The stock is declining and estimated at \(\mathrm{B}_{\mathrm{pa}}\) in 2013. In the last 15 years, five large year classes have been produced (1998, 1999, 2002, 2003, and 2004). However, the available information indicates that year classes born after 2004 have been small. Fishing mortality in 2011 and 2012 is slightly below \(\mathrm{F}_{\mathrm{pa}}\) and \(\mathrm{F}_{\mathrm{MSY}}\), but above the management plan target F .

\section*{Management plans}

A long-term management plan was agreed by the EU, Faroe Islands, Iceland, Norway, and Russia in 1999 (Section 9.4.11.1 Annex). The management plan aims to constrain harvesting within safe biological limits and is designed to provide sustainable fisheries in the long term. ICES has evaluated the plan and concluded that it is consistent with the precautionary approach.

\section*{Biology}

Norwegian spring-spawning herring is a widely migrating stock. The feeding grounds of the adults are in the Norwegian Sea. Spawning takes place in late winter and early spring along the Norwegian coast. In general, most juveniles occur in the Barents Sea and move to the Norwegian Sea when they mature.

\section*{Environmental influence on the stock}

Norwegian spring-spawning herring migrations have been linked to changes in climate and to the distribution of zooplankton, the main prey of herring. The average biomass of zooplankton in the total area in May had a
decreasing trend from around 2002 until 2009, but an upward trend since then. Over this period, no stock-wide negative impact has been observed on herring condition, based on trends in weight-at-age.

\section*{The fisheries}

In general, the fishery follows the migration of the stock as it moves from the wintering and spawning grounds along the Norwegian coast to the summer feeding grounds in the EU, Faroese, Icelandic, Jan Mayen, Svalbard, and international areas. The spatial distribution of the catches is shown in Figure 9.4.11.3. There is little quantitative information on the bycatches in the fisheries for herring, but these are thought to be small in most fisheries, even though the recent expansion of the mackerel stock has resulted in mixed catches in some areas.

Catch distribution Total catch \((2012)=825999 \mathrm{t}\), where \(100 \%\) are landings (mainly purse-seiners and pelagic trawls). Discards are considered to be low, but some slippage is known to occur.

\section*{Effects of the fisheries on the ecosystem}

Little information is available on the impact of the herring fishery on the ecosystem. However, research evaluating the impacts is on-going (ICES WGINOR). The fishery is entirely pelagic and thus not impacting the benthic habitat.

\section*{Quality considerations}

Previous assessments have shown a retrospective pattern that overestimates SSB and underestimates F; this is also the case with the present assessment, but to a much smaller extent. Estimates of recruiting year-class strength are uncertain. However, all available information indicates that year classes after 2004 are weak. Recent recruitment estimates do not have a large influence on the predicted yields and SSBs in the short-term forecasts. Preliminary exploration of data indicates that change of catchability of herring in the main survey in relation to changes in the behaviour of herring could explain (part of) the retrospective behaviour of the assessment. Further studies are planned in the ICES benchmark process.




Figure 9.4.11.2 Herring in Subareas I, II, and V, and in Divisions IVa and XIVa (Norwegian spring-spawning herring). Historical assessment results (final-year recruitment estimates included).

Scientific basis
Assessment type
Input data

Age-based analytical (TASACS). Assessment period 1988-2013: Commercial catches (international landings, ages, and weight-at-age from catch sampling). Eight survey indices: one larval survey (NHLS), two recruitment surveys (indices from Eco-NoRu-Q3 (Ace), and for surveys covering the adult stock, including one survey which provides an index of the abundance of young herring in the Barents Sea (including IESNS). No commercial indices, Maturity ogive variable by year-class strength, Natural mortalities are fixed values from historical analyses.
Discards are not included and are considered negligible. None.
This stock was benchmarked in 2008. WGWIDE 2013 (ICES, 2013b).

\section*{ECOREGION Widely distributed and migratory stocks \\ STOCK \\ Herring in Subareas I, II, and V, and in Divisions IVa and XIVa (Norwegian spring-spawning herring)}

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline \multirow{2}{*}{\begin{tabular}{l} 
Management \\
plan
\end{tabular}} & \(\mathrm{SSB}_{\mathrm{MP}}\) & 5.0 million t & Medium-term simulations conducted in 2001. \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{MP}}\) & 0.125 & Medium-term simulations conducted in 2001. \\
\hline \multirow{3}{*}{\begin{tabular}{l} 
ASY
\end{tabular}} & \(\mathrm{MSY}_{\mathrm{trigger}}\) & 5.0 million t & \(\mathrm{B}_{\mathrm{pa}}\) \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{MSY}}\) & 0.15 & \begin{tabular}{l} 
Stochastic equilibrium analysis using a Beverton-Holt stock- \\
recruitment relationship with data from 1950 to 2009.
\end{tabular} \\
\hline \multirow{3}{*}{\begin{tabular}{l} 
Precautionary \\
Approach
\end{tabular}} & \(\mathrm{B}_{\mathrm{lim}}\) & 2.5 million t & MBAL (accepted in 1998). \\
\cline { 2 - 4 } & \(\mathrm{B}_{\mathrm{pa}}\) & 5.0 million t & \(\mathrm{B}_{\mathrm{lim}} \times \exp (0.4 \times 1.645)\). \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{lim}}\) & Not defined. & - \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{pa}}\) & 0.15 & Based on medium-term simulations. \\
\hline
\end{tabular}
(unchanged since: 2010)
The fishing mortality reference points presented in the advice and used in management are the average of ages 514 weighted over the population numbers. The MSY and PA reference points have been reviewed by ICES in 2013 (ICES, 2013c) and kept unchanged.

Outlook for 2014
Basis: \(\mathrm{F}_{\mathrm{w}}(2013)^{1)}=0.15\); SSB \((2014)=4123\) thousand tonnes; Recruitment \((2013-2015)=79\) billions (geometric mean recruitment 1988-2009); Landings (2013) \(=692\) thousand tonnes ( \(=\) sum of declared national quotas).
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Rationale & Landings (2014) & Basis & \(\mathrm{F}_{\mathrm{w}}(2014)\) & SSB (2015) & \%
change \({ }^{\text {2 }}\) SB & \[
\begin{aligned}
& \text { \% TAC } \\
& \text { change }{ }^{3)}
\end{aligned}
\] \\
\hline Agreed management plan & 419 & F management plan & 0.099 & 3541 & -16 & -32 \\
\hline MSY & 512 & \(0.82 * \mathrm{~F}_{\mathrm{MSY}}\) & 0.124 & 3457 & -19 & -17 \\
\hline Precautionary Approach & 0 & Even no fishing will bring SSB above Bpa & 0.000 & 3914 & -5 & -100 \\
\hline Zero catch & 0 & \(\mathrm{F}=0\) & 0.000 & 3914 & -5 & -100 \\
\hline \multirow[t]{6}{*}{Other options} & 588 & \(F_{2012}\) & 0.144 & 3390 & -22 & -5 \\
\hline & 112 & \(F_{\text {management }} \times 0.25\) & 0.025 & 3814 & -8 & -82 \\
\hline & 211 & \(F_{\text {management }} \times 0.5\) & 0.049 & 3725 & -11 & -66 \\
\hline & 454 & \(F_{\text {management }} \times 1.1\) & 0.109 & 3509 & -17 & -27 \\
\hline & 513 & \(F_{\text {management }} \times 1.25\) & 0.124 & 3456 & -19 & -17 \\
\hline & 519 & Management plan target F & 0.125 & 3451 & -20 & -16 \\
\hline
\end{tabular}

Landings and stock biomass weights in thousand tonnes.
\({ }^{1)} \mathrm{F}_{\mathrm{w}}=\) Fishing mortality weighted by population numbers (age groups 5-14). \(\mathrm{F}_{\mathrm{w}}>\mathrm{F}_{\mathrm{MP}}\) to account for expected catch in 2013.
\({ }^{2}\) ) SSB 2015 relative to SSB 2014.
\({ }^{3)}\) Catch/landings 2014 relative to TAC 2013.

\section*{Management plan}

Following the long-term management plan agreed by the EU, Faroe Islands, Iceland, Norway, and Russia implies a TAC of 418487 tonnes in 2014. This is expected to lead to an SSB of 3.5 million tonnes in 2015.

\section*{MSY approach}

Following the ICES MSY framework implies a fishing mortality of 0.124 (MSY \(\mathrm{B}_{\text {trigger }} / \mathrm{SSB}(2014) * \mathrm{~F}_{\text {msy }}\) ) because \(\mathrm{SSB}(2014)\) is below MSY \(\mathrm{B}_{\text {trigger }}\), resulting in landings of 512000 tonnes in 2014. This is expected to lead to a decline in SSB in 2015 to 3.5 million tonnes.

Fishing mortality in 2012 is below \(\mathrm{F}_{\text {MSY }}\), therefore the transition scheme towards the ICES MSY framework does not apply.

\section*{Precautionary approach}

The precautionary approach states that should the SSB fall below \(\mathrm{B}_{\mathrm{pa}}\) the fishing mortality should be reduced to ensure a safe and rapid recovery of the \(\mathrm{B}_{\mathrm{pa}}\). Even zero catches in 2014 is expected to lead to a reduction in SSB in 2015 to 3.9 million tonnes.

\section*{Additional considerations}

\section*{Ecosystem considerations}

Herring in the Northeast Atlantic is a widely distributed stock. Juveniles and adults of this stock form an important part of the ecosystem in the Northeast Atlantic. Herring are an important food resource for higher trophic level predators (e.g. large fish, seabirds, and marine mammals), and are also a consumer of zooplankton in the Norwegian Sea and a predator of capelin larvae in the Barents Sea.

\section*{Management considerations}

The management plan for this stock is considered to be precautionary. Recent years have shown large downward revisions of the SSB in the assessment (Figure 9.4.11.2). As a consequence the realized F values are higher than the management plan dictates, even though this plan has been followed.

The short-term prognoses indicate a decline in SSB from 5 million tonnes in 2013 to 4.1 and 3.5 million tonnes in 2014 and 2015, respectively, assuming that declared catches are taken in 2013 and exploitation in 2014 is in accordance with the management plan. The observed decline in the stock is consistent with previous assessments and forecasts; last year it was expected that the SSB in 2013 would decline to 5.1 million tonnes compared to this year's estimate of 5 million tonnes. Because the SSB in 2014 is assumed to be below \(\mathrm{B}_{\mathrm{p}}\), the advice is based on article 3 of the management plan, which will be applied for the first time. As a result, the fishing mortalities will be lower than the target \(\mathrm{F}_{\mathrm{MP}}\) of 0.125 . Given the low recruitment in recent years, it is expected that SSB will remain below \(\mathrm{B}_{\mathrm{pa}}\) in the short term. This situation will continue until large year classes appear and recruit into the spawning stock, and because of the maturation taking place between the ages of 4 and 6 it will take at least four years until a strong year class contributes to an increase in the SSB. Surveys carried out in recent years in the Norwegian Sea and Barents Sea show no signs of new strong year classes after 2004.

The extent of the present period of low recruitment is unknown and may continue for a number of years. An evaluation of the expected dynamics of the stock under continued poor recruitment conditions was presented in the ICES advice released earlier in 2013 (ICES, 2013c). This evaluation indicates that under the present management plan, in the absence of strong year classes, SSB is expected to fluctuate around 4 million tonnes and catches will vary between 300 and 400 thousand tonnes.

In 2013, a lack of agreement by the Coastal States on their share in the TAC has led to unilaterally set quotas which together are higher than the TAC indicated by the management plan. If this situation continues, the high catches will accelerate the present decline of the stock and increase the risk of the stock going below \(\mathrm{B}_{\text {lim }}\).

In recent years the distribution area of mackerel has expanded to the north and west and now overlaps the distributional area of herring in summer. As a consequence, mackerel and herring catches are now mixed in these areas. This implies a potential for discarding.

\section*{Data and methods}

The present assessment is an updated assessment, using the models, configurations, and procedures agreed at the benchmark held in 2008, with two exceptions. From 2010 onwards, new maturity-at-age information was used for the whole time-series. This revision contributes to the change in perception of estimated SSB in the 2010 and later
assessments compared to previous assessments. In 2013, an updated algorithm was implemented to derive the terminal fishing mortalities on the oldest age groups in the assessment for cohorts where there is insufficient information to estimate these. The new algorithm has increased the stability in the assessment.

While discarding of this stock is considered to be low, slippage occurs. The amount of slippage is unquantified and thus cannot be accounted for in the assessment.

The International Ecosystem Survey in the Nordic Seas (IESNS) in May is the most important survey in the assessment and is expected to remain the main basis for future assessments. It is important that this survey be maintained and that the vessels participating in the survey have access to the survey grounds. It is essential to maintain good geographical survey coverage to avoid increases in assessment uncertainty and to maintain the integrity of the assessment.

\section*{Uncertainties in assessment and forecast}

Applying the new algorithm for calculating terminal Fs significantly reduces the retrospective pattern in the earlier half of 1990s and reduces it to some degree in recent times. However, a strong retrospective pattern still remains in the recent assessments, with annual downward revisions. This pattern in the recent years is likely partly due to changes in survey catchability. This needs to be addressed in a benchmark.

There is little uncertainty that year classes since 2005 are weak and that SSB has reduced and is expected to reduce further. Assumptions on recent recruitment have little impact on the prediction of the catch and the SSB in the projection.

\section*{Comparison with previous assessment and advice}

A comparison between the assessments 2009-2013 is shown in Figure 9.4.11.2. This year's assessment is consistent with last year's assessment. In the current assessment, the SSB in 2012 is about \(5 \%\) lower than estimated last year. The fishing mortality in 2010 is now estimated about \(6 \%\) higher than in last year's assessment. The basis for advice is the same as last year, taking into account that the estimated SSB is below \(\mathrm{SSB}_{\mathrm{MP}}\).

\section*{Sources}

ICES. 2013a. Report of the Blue Whiting/Norwegian Spring-Spawning (Atlanto-Scandian) Herring Workshop (WKBWNSSH). ICES CM 2013/ACOM:69.
ICES. 2013b. Report of the Working Group on Widely Distributed Stocks (WGWIDE), 27 August-02 September 2013, ICES Headquarters, Copenhagen. ICES CM 2013/ACOM:15.
ICES. 2013c. NEAFC request to ICES to evaluate possible modifications of the long-term management arrangement for the Norwegian spring-spawning herring stock. In Report of ICES Advisory Committee, 2013. ICES Advice 2013, Book 9, Section 9.3.3.2.


Figure 9.4.11.3 Total reported catches of Norwegian spring-spawning herring in 2012 by quarter and ICES rectangle. Grading of the symbols: black dots less than 300 t , open squares \(300-3000 \mathrm{t}\), and black squares > 3000 t .


Figure 9.4.11.4 Herring in Subareas I, II, and V, and in Divisions IVa and XIVa (Norwegian spring-spawning herring). Historical perspective of the stock. Data from 1950-1987 are from a previous assessment model that is no longer used. Data from 1988 to 2012 are from this year's assessment. Note that the SSB data prior to 1988 do not include the new maturity ogive.


Figure 9.4.11.5 Herring in Subareas I, II, and V, and in Divisions IVa and XIVa (Norwegian spring-spawning herring). Stock-recruitment observations for 1950-2012.

Table 9.4.11.1 Herring in Subareas I, II, and V, and in Divisions IVa and XIVa (Norwegian spring-spawning herring). ICES advice, management, and catches.
\begin{tabular}{llrrr}
\hline Year & \begin{tabular}{l} 
ICES \\
Advice
\end{tabular} & \begin{tabular}{l} 
Predicted catch \\
corresp. to advice
\end{tabular} & \begin{tabular}{r} 
Agreed \\
TAC
\end{tabular} & \begin{tabular}{r} 
ICES \\
Catch
\end{tabular} \\
\hline 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 & \(1220^{4}\) \\
1997 & Keep SSB above 2.5 million t & - & 1500 & \(1427^{4}\) \\
1998 & Do not exceed the harvest control rule & - & 1300 & 1223 \\
1999 & Do not exceed the harvest control rule & 1263 & 1300 & 1235 \\
2000 & Do not exceed the harvest control rule & Max & 1500 & 1250 \\
2001 & Do not exceed the harvest control rule & 753 & 850 & 1207 \\
2002 & Do not exceed the harvest control rule & 853 & 850 & \(766^{4}\) \\
2003 & Do not exceed the harvest control rule & 710 & \(708^{4}\) \\
2004 & Do not exceed the harvest control rule & 825 & \(821^{3}\) & \(790^{4}\) \\
2005 & Do not exceed the harvest control rule & 890 & \(1005^{3}\) & 794 \\
2006 & Do not exceed the harvest control rule & 732 & \(967^{3}\) & 1003 \\
2007 & Do not exceed the harvest control rule & 1280 & 1280 & 969 \\
2008 & Do not exceed the harvest control rule & 1518 & 1518 & 1267 \\
2009 & Do not exceed the harvest control rule & 1643 & 1642 & 1546 \\
2010 & Do not exceed the harvest control rule & 1483 & 1483 & 1687 \\
2011 & See scenarios & \(988-1170\) & 988 & 1457 \\
2012 & Follow the management plan & 833 & 833 & 993 \\
2013 & Follow the management plan & 619 & \(692^{5}\) & 826 \\
2014 & Follow the management plan & 418.487 & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1}\) Autonomous TACs totaling 900000 t .
\({ }^{2}\) Autonomous TACs totaling 1425000 t were set by April 1996.
\({ }^{3}\) There was no agreement on the TAC, the number is the sum of autonomous quotas from the individual Parties.
\({ }^{4}\) Revised in 2010.
\({ }^{5}\) Sum of the national quotas.
Table 9.4.11.2 Herring in Subareas I, II, and V, and in Divisions IVa and XIVa (Norwegian spring-spawning herring). Total catch (tonnes) since 1987. Data provided by Working Group
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Year & Norway & \[
\begin{aligned}
& \text { USSR/ } \\
& \text { RUSSIA }
\end{aligned}
\] & Denmark & Faroes & Iceland & Ireland & Netherlands & Greenland & UK (Scotland) & Germany & France & Poland & Sweden & Total \\
\hline 1987 & 108417 & 18889 & - & - & - & - & - & - & - & - & - & - & - & 127306 \\
\hline 1988 & 115076 & 20225 & - & - & - & - & - & - & - & - & - & - & - & 135301 \\
\hline 1989 & 88707 & 15123 & - & - & - & - & - & - & - & - & - & - & - & 103830 \\
\hline 1990 & 74604 & 11807 & - & - & - & - & - & - & - & - & - & - & - & 86411 \\
\hline 1991 & 73683 & 11000 & - & - & - & - & - & - & - & - & - & - & - & 84683 \\
\hline 1992 & 91111 & 13337 & - & - & - & - & - & - & - & - & - & - & - & 104448 \\
\hline 1993 & 199771 & 32645 & - & - & - & - & - & - & - & - & - & - & - & 232457 \\
\hline 1994 & 380771 & 74400 & - & 2911 & 21146 & - & - & - & - & - & - & - & - & 479228 \\
\hline 1995 & 529838 & 101987 & 30577 & 57084 & 174109 & - & 7969 & 2500 & 881 & 556 & - & - & - & 905501 \\
\hline 1996 & 699161 & 119290 & 60681 & 52788 & 164957 & 19541 & 19664 & - & 46131 & 11978 & - & - & 22424 & 1220283 \\
\hline 1997 & 860963 & 168900 & 44292 & 59987 & 220154 & 11179 & 8694 & - & 25149 & 6190 & 1500 & - & 19499 & 1426507 \\
\hline 1998 & 743925 & 124049 & 35519 & 68136 & 197789 & 2437 & 12827 & - & 15971 & 7003 & 605 & - & 14863 & 1223131 \\
\hline 1999 & 740640 & 157328 & 37010 & 55527 & 203381 & 2412 & 5871 & - & 19207 & - & - & - & 14057 & 1235433 \\
\hline 2000 & 713500 & 163261 & 34968 & 68625 & 186035 & 8939 & - & - & 14096 & 3298 & - & - & 14749 & 1207201 \\
\hline 2001 & 495036 & 109054 & 24038 & 34170 & 77693 & 6070 & 6439 & - & 12230 & 1588 & - & - & 9818 & 766136 \\
\hline 2002 & 487233 & 113763 & 18998 & 32302 & 127197 & 1699 & 9392 & - & 3482 & 3017 & - & 1226 & 9486 & 807795 \\
\hline 2003* & 477573 & 122846 & 14144 & 27943 & 117910 & 1400 & 8678 & - & 9214 & 3371 & - & - & 6431 & 789510 \\
\hline 2004 & 477076 & 115876 & 23111 & 42771 & 102787 & 11 & 17369 & - & 1869 & 4810 & 400 & - & 7986 & 794066 \\
\hline 2005 & 580804 & 132099 & 28368 & 65071 & 156467 & - & 21517 & - & - & 17676 & 0 & 561 & 680 & 1003243 \\
\hline 2006** & 567237 & 120836 & 18449 & 63137 & 157474 & 4693 & 11625 & - & 12523 & 9958 & 80 & - & 2946 & 968958 \\
\hline 2007 & 779089 & 162434 & 22911 & 64251 & 173621 & 6411 & 29764 & 4897 & 13244 & 6038 & 0 & 4333 & 0 & 1266993 \\
\hline 2008 & 961603 & 193119 & 31128 & 74261 & 217602 & 7903 & 28155 & 3810 & 19737 & 8338 & 0 & 0 & 0 & 1545656 \\
\hline 2009 & 1016675 & 210105 & 32320 & 85098 & 265479 & 10014 & 24021 & 3730 & 25477 & 14452 & 0 & 0 & 0 & 1687371 \\
\hline 2010 & 871113 & 199472 & 26792 & 80281 & 205864 & 8061 & 26695 & 3453 & 24151 & 11133 & 0 & 0 & 0 & 1457015 \\
\hline 2011 & 572641 & 144428 & 26740 & 53271 & 151074 & 5727 & 8348 & 3426 & 14045 & 13296 & 0 & 0 & 0 & 992997 \\
\hline 2012 & 491005 & 118595 & 21754 & 36190 & 120956 & 4813 & 6237 & 1490 & 12310 & 11945 & 0 & 0 & 705 & 826000 \\
\hline
\end{tabular}

\footnotetext{
*In 2003 the Norwegian catches were raised by 39433 tonnes to account for changes in percentages of water content.
}

Table 9.4.11.3 Herring in Subareas I, II, and V, and in Divisions IVa and XIVa (Norwegian spring-spawning herring). Summary of the stock assessment.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Year & Recruit & TSB & SSB & Landings & Unweighted & Weighted F with stock numbers \\
\hline & Age 0 in billions & Million tonnes & Million tonnes & tonnes & \(\mathrm{F}_{5-14}\) & \(\mathrm{WF}_{5-14}\) \\
\hline 1988 & 26.078 & 3.430 & 2.006 & 135301 & 0.729 & 0.049 \\
\hline 1989 & 71.645 & 4.089 & 3.260 & 103830 & 0.254 & 0.030 \\
\hline 1990 & 109.326 & 4.623 & 3.840 & 86411 & 0.452 & 0.022 \\
\hline 1991 & 309.141 & 5.263 & 3.748 & 84683 & 0.107 & 0.024 \\
\hline 1992 & 368.141 & 6.302 & 3.830 & 104448 & 0.114 & 0.028 \\
\hline 1993 & 113.296 & 7.374 & 3.775 & 232457 & 0.034 & 0.065 \\
\hline 1994 & 38.788 & 8.427 & 3.905 & 479228 & 0.183 & 0.133 \\
\hline 1995 & 19.595 & 9.219 & 3.862 & 905501 & 0.273 & 0.235 \\
\hline 1996 & 58.595 & 9.304 & 4.339 & 1220283 & 0.239 & 0.201 \\
\hline 1997 & 33.618 & 9.192 & 5.553 & 1426507 & 0.303 & 0.190 \\
\hline 1998 & 253.704 & 8.049 & 6.235 & 1223131 & 0.213 & 0.161 \\
\hline 1999 & 170.765 & 9.164 & 6.353 & 1235433 & 0.258 & 0.198 \\
\hline 2000 & 57.601 & 8.517 & 5.396 & 1207201 & 0.329 & 0.231 \\
\hline 2001 & 34.675 & 7.129 & 4.386 & 766136 & 0.188 & 0.196 \\
\hline 2002 & 375.973 & 7.593 & 3.847 & 807795 & 0.219 & 0.215 \\
\hline 2003 & 165.960 & 9.121 & 4.746 & 789510 & 0.220 & 0.132 \\
\hline 2004 & 289.718 & 11.042 & 5.905 & 794066 & 0.321 & 0.118 \\
\hline 2005 & 62.009 & 11.574 & 5.966 & 1003243 & 0.256 & 0.159 \\
\hline 2006 & 70.164 & 12.475 & 6.204 & 968958 & 0.246 & 0.165 \\
\hline 2007 & 24.334 & 11.867 & 6.957 & 1266993 & 0.193 & 0.143 \\
\hline 2008 & 16.972 & 11.679 & 7.532 & 1545656 & 0.247 & 0.180 \\
\hline 2009 & 47.926 & 10.823 & 8.528 & 1687373 & 0.283 & 0.177 \\
\hline 2010 & 7.966 & 9.191 & 7.919 & 1457014 & 0.321 & 0.185 \\
\hline 2011 & 19.336 & 7.524 & 6.729 & 992998 & 0.331 & 0.142 \\
\hline 2012 & 5.649 & 6.539 & 5.832 & 825999 & 0.266 & 0.144 \\
\hline 2013 & 79.000* & 5.573 & 5.006 & & & \\
\hline
\end{tabular}
* The GM recruitment over the years 1988-2009 is 79 billion.

\subsection*{9.4.11.1 Annex}

The EU, Faroe Islands, Iceland, Norway, and Russia agreed in 1999 on a long-term management plan. This plan consists of the following elements:
1. Every effort shall be made to maintain a level of Spawning Stock Biomass (SSB) greater than the critical level ( \(B_{\text {lim }}\) ) of \(2500000 t\).
2. For the year 2001 and subsequent years, the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality rate of less than 0.125 for appropriate age groups as defined by ICES, unless future scientific advice requires modification of this fishing mortality rate.
3. Should the SSB fall below a reference point of \(5000000 t\left(B_{p a}\right)\), the fishing mortality rate referred to under paragraph 2, shall be adapted in the light of scientific estimates of the conditions to ensure a safe and rapid recovery of the SSB to a level in excess of \(5000000 t\). The basis for such an adaptation should be at least a linear reduction in the fishing mortality rate from 0.125 at \(B_{p a}(5000000 t)\) to 0.05 at \(B_{\text {lim }}(2500\) \(000 t\) ).
4. The Parties shall, as appropriate, review and revise these management measures and strategies on the basis of any new advice provided by ICES.

\section*{Northeast Atlantic Mackerel}
(combined Southern, Western and North Sea spawning components)

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

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises that in the absence of an assessment, and having consideration for survey indicators on the stock that the landings of mackerel in 2014 should not exceed 889,886 t (based on average landings 2010-2012)

Due to the exceptional nature of the failure of the assessment and the change in advice, ICES has given advice based on average catch this year as a temporary measure. Catches of mackerel have been increasing since 2005 and have been around 900 kt since 2010. The mackerel egg survey index show a doubling of the SSB since 2004, and a 30\% increase from 2010 to 2013 (a preliminary value).

FEAS notes that the last egg survey is preliminary and that the magnitude of the SSB increase from the egg surveys is uncertain. FEAS further notes that although the recent catches do not appear to have been detrimental to the stock, that there are indications that mortality on older fish has increased over this period also.


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

\section*{CURRENT MANAGEMENT}
- In 2008, the then coastal states (EU, Norway \& Faroe Islands) agreed an HCR for setting the TAC for the stock. This HCR is based on simulations and is quoted overleaf in the ACOM advice summary. Iceland and Russia were not parties to this agreement, however was allocated a share to fish in international waters.
- Historically the TAC has been divided into a number of components: North Sea TAC (EU and Norway), Western TAC (EU, Norway and Faroes), Southern TAC (EU only) and NEAFC TAC (Coastal States, and Russia).
- There was no TAC agreed for 2013. However, the EU and Norway continued the sharing ratio agreed in 2010, and bilaterally declared catch limits based on a TAC of 542,000 t with
a provision of \(4.8 \%\) for Faroes, \(4.5 \%\) for Russia and \(0.3 \%\) for Iceland. In addition, the Faroes unilaterally declared a catch limit of \(125,852 \mathrm{t}\), Iceland unilaterally declared a catch limit of \(123,182 \mathrm{t}\), Greenland unilaterally declared a catch limit of \(50,044 \mathrm{t}\) and Russia a unilaterally claimed catch limit of \(68,359 \mathrm{t}\). The EU catch limit was \(338,392 \mathrm{t}\) including the southern areas and the Irish share of the EU allocation was \(57,753 \mathrm{t}\). The sum of the expected catches in 2013 is \(895,336 \mathrm{t}\). The sum of the Irish quota and transfers in 2013 was \(57,753 \mathrm{t}\).
- The Irish quota is allocated to the pelagic, polyvalent and hook and line fleets in different ways. The hook and line fishery for vessels under 15 m in overall length is allocated 400 tonnes under current arrangements. The 400 tonnes is taken off the top of the quota before the polyvalent /pelagic segment split is made. The polyvalent segment allocation is \(13 \%\) of the remainder of the national annual quota ( \(7,433 \mathrm{t}\) in 2013) of which \(2.5 \%\) of this ( 186 t in 2013 ) is allocated for vessels under 18 m . The remainder \((49,74 \mathrm{It}\) in 2013 ) is allocated to the pelagic segment according to an allocation key.
- The Cornwall box remains closed to directed trawling for mackerel.
- Measures to protect the North Sea spawning component remain in place.
- In 2013 Spain was subject to a payback penalty of \(8,126 \mathrm{t}\) for its over catch in 2010 .

\section*{ICES ADVICE 9.4.17 Northeast Atlantic mackerel (combined Southern, Western, and North Sea spawning components)}

\section*{Advice for 2014}

ICES advises on the basis of the recent three years' landings (see Quality considerations) that landings should be no more than 889886 t in 2014. Discards are known to take place, but cannot be quantified accurately; therefore total catches cannot be calculated.

ICES advises that the existing measures to protect the North Sea spawning component should remain in place.

\section*{Stock status}


Figure 9.4.17.1 Mackerel in the Northeast Atlantic. Landings in thousand tonnes (left) and SSB index from the triennial mackerel egg survey (right). Confidence intervals are currently not available for the egg survey index. In the catch plot the years prior to 2005 are shaded, indicating that the catch data are less certain in these years.

Catches of mackerel have been increasing since 2005 and have been around 900 kt since 2010. The mackerel egg survey index show a doubling of the SSB since 2004, and a \(30 \%\) increase from 2010 to 2013 (a preliminary value).

\section*{Management plan}

A management plan was agreed by Norway, Faroe Islands, and the EU in October 2008. ICES has evaluated the plan and concluded that it is precautionary (ICES, 2008). However, since 2009, there has been no international agreement on TAC. The plan requires an agreed assessment which is currently not available for this stock.

\section*{Biology}

The combined Northeast Atlantic (NEA) mackerel is assessed as one stock, but comprises three spawning components. Spawning areas of mackerel are widely spread, and only the North Sea component is sufficiently distinct to be clearly identified as a separate spawning component. Mackerel from the southern and western areas migrate to feed in the Nordic seas and the North Sea during the second half of the year, and then mix with the North Sea component.

\section*{Environmental influence on the stock}

Catch and survey data from recent years indicate that the stock has expanded north-westwards during spawning and the summer feeding migration. This distributional change is likely a reflection of increased stock size coupled with changes in the physical environment and in the zooplankton concentration and distribution.

\section*{The fisheries}

Traditionally, the fishing areas with higher catches of mackerel have been in the northern North Sea (along the border of Divisions IVa and IIa), around the Shetland Islands, and off the west coast of Scotland and Ireland. The southern fishery off Spain's northern coast has also accounted for significant catches. In recent years significant catches have also been taken in Icelandic and Faroese waters, areas where almost no catches were reported prior to 2008. In 2012, catches in this area constituted approximately half of the total reported landings. Catches from Greenland were reported for the first time in 2011, and have increased in 2012. In the Icelandic and Faroese fisheries, in the north-western part of the distribution area, mackerel are caught together with herring. In the southern part of the distribution area, Atlantic mackerel (Scomber scombrus) can be caught together with Spanish mackerel (Scomber colias). Catches of both species are reported separately.

\section*{Catch \\ distribution \\ Total catch \((2012)=893 \mathrm{kt}\), where \(\sim 98.3 \%\) are landings (pelagic trawls, purse-seine nets, and handlines) and \(1.7 \%\) discards (the latter is only available from a limited number of fleets and considered to be an underestimate).}

\section*{Effects of the fisheries on the ecosystem}

There is relatively little bycatch of non-target species in the mackerel fishery, which tends to operate with pelagic trawl gear, purse-seine nets, and handlines.

\section*{Quality considerations}

This year ICES was requested to examine the effect of uncertainty in the catch. No specific guidance on the levels of uncertainty were given by the client, however a published study (Simmonds, 2010) had indicated that there was unaccounted mortality which could be explained by errors in reporting historical catches between factors of 1.6 and 3.6 times the reported catches. This range of uncertainty was chosen as the basis for a sensitivity analysis for unaccounted catches prior to 2005 . This analysis showed that the assessment model used until 2012 would underestimate stock size if catches have been correctly reported since 2005. Overall the consideration of catch uncertainty was based both on this published evidence of unaccounted mortality and also on anecdotal evidence of the accuracy of the catch information from the fishing industry. This uncertainty was restricted to the period before 2005. After this date more effective catch reporting was instituted. Based on this sensitivity analysis and the perception of uncertainty in historical catches ICES concluded that potential catch for this stock had been underestimated in the recent past and that the previous stock assessment method was no longer an appropriate basis for providing catch advice for this stock. Continued use of this modelling approach would have given landings of approximately 790000 t .

ICES also has available a triennial egg survey, which might be used as a relative index of spawning stock size, and combined with recent average landings to give advice under the ICES approach to data-limited stocks, DLS category 3.2. The 2013 surveys have only just been completed and only a preliminary point estimate of egg production and biomass is available. A final value for the 2013 survey and estimates of precision will be available in 2014. Until the necessary analyses are finalized it is not possible to use the survey in this DLS method because without information on precision it is not possible to determine whether the precautionary buffer should be applied or not. This index is unaffected by the uncertainty in the catch and has been used in the past as an index of SSB within the assessment model.

The survey results, taken together with estimates of mortality based on catch, give strong indications that there has been an increase in stock size and that current levels of catch and landings do not pose a threat to the stock. Advice is based on landings from the three most recent years, but this advice is seen as an interim measure. ICES
will attempt to incorporate more stock size information in an appropriate assessment model at the benchmark in 2014. Should this approach be unsuccessful a DLS approach will be developed based specifically on the triennial regime of survey data.

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment & \begin{tabular}{l} 
No analytic assessment is available. \\
Discards have been included in the assessment since 1978, from Germany, Ireland, \\
Discards \\
the Netherlands, Spain, and the UK. Discards cannot be quantified accurately and are \\
regarded to be underestimated.
\end{tabular} \\
Indicators & None. \\
Other information & A benchmark is scheduled for 2014. \\
Working group report & WGWIDE (ICES, 2013a).
\end{tabular}

\section*{ECOREGION Widely distributed and migratory stocks STOCK Mackerel in the Northeast Atlantic (combined Southern, Western,
and North Sea spawning components)}

\section*{Reference points}

Previous reference points are not cited here because the model basis for the assessment has been rejected.

\section*{Outlook for 2014}

No analytical assessment can be presented. The main cause is a change in the perception of the accuracy of the catch data prior to 2005 . Sensitivity runs with alternative catch series demonstrated that the assessment model configuration was dependent on the accuracy of the historical catch data series. A benchmark assessment is scheduled for February 2014 which will consider alternative models as well as a suite of possible survey indices not currently used in the assessment. In the interim, considering that recent landings have been stable and that the stock appears to have increased, ICES considers that the current exploitation is appropriate in the short term. Therefore, ICES advises that catches should not increase in relation to the last three years' average. This corresponds to landings of no more than 889886 t in 2014. Discards are known to take place, but cannot be quantified accurately; therefore total catches cannot be calculated.

\section*{ICES approach to data-limited stocks}

For data-limited stocks for which a biomass index is available, ICES would normally use status quo landings adjusted by the survey index as a harvest control rule. This approach has not been used as the basis for the advice here because the survey is only conducted every third year and results from the most recent year (2013) are preliminary. Given that the survey results are preliminary and that mortality signals are equivocal, ICES is unable to determine if a precautionary buffer according to the data-limited approach should be applied (giving landings = 854291 t); however, ICES notes that advising an even larger increase in catch, as would be the case otherwise (giving landings \(=1067863 \mathrm{t}\) ), would not be precautionary. ICES is therefore unable to give advice based on the DLS approach and as an interim measure advises not to increase recent landings compared to the last three years (see above).

\section*{Additional considerations}

\section*{Ecosystem considerations}

The changes in mackerel distribution and migration have been investigated in an \(A d\) hoc Group on the Distribution and Migration of Northeast Atlantic Mackerel (AGDMM; ICES, 2013b). The accepted consensus of the AGDMM was that there has been an expansion of the distribution of spawning over time in the western component. This expansion has been geographically large, but is thought to contain a marginal proportion of total spawning. There has also been an expansion in the temporal distribution of spawning in the western and southern components to earlier in the year. The distribution of juvenile mackerel is very patchy, and abundance is highly variable between years. A northern expansion of the western component is indicated by the recent summer surveys in the Nordic

Seas (IESSNS). Likewise a westward expansion in the summer distribution of adult mackerel has been observed in the Nordic Seas since 2007, as far west as southeast Greenlandic waters. The distribution of fish tends to be less patchy and more spread out during the summer feeding phase. There have also been physical changes in the environment with record high sea temperatures in recent years facilitating a large potential habitat for mackerel. Furthermore, the expansion could in part be due to a reduction in available food, requiring fish to spread out further to find adequate resources. Overwintering in Icelandic waters, never previously observed, occurred in 2010 and 2011 but not 2012, and in recent years (winter 2006/2007 and since 2009) the Faroe Plateau has been used as a nursery area for 0 - and 1-group mackerel.

The question remains as to whether or not this expansion in distribution of mackerel is permanent or cyclical. Whatever the driving forces behind this are, it is likely to be a dynamic process, including interactions between several factors (stock size, temperature, zooplankton, oceanographic conditions, etc.). While the marginal distribution has changed notably, the spawning area has remained remarkably inert at its core. If oceanographic drivers are influential, then changes are likely to occur on the decadal scale, though the impact of climate change on these processes requires much further research. Likewise, if stock (size and structure) and prey (zooplankton) dynamics are important, then changes are unlikely to be permanent.

\section*{Management considerations}

The advice for 2014 results in advised landings of no more than 889886 tonnes; this is considerably higher than the TACs advised in recent years. The age-based assessment was rejected; therefore, the basis for advice is the average of the most recent three years' landings. A discussion of the basis for the advice is given in Quality considerations.

\section*{The fishery}

Mackerel is mainly exploited in a directed fishery for human consumption. This fishery tends to target bigger fish and there is evidence of discarding of smaller, less marketable fish.

\section*{Regulations and their effects}

Prior to the late 1960s, spawning biomass of North Sea mackerel was estimated to be above 3 million tonnes. Subsequently, overexploitation occurred and recruitment has failed since 1969, leading to a marked decline in the size of the North Sea component. The measures advised by ICES have been aimed at protecting the North Sea spawning component and promoting stock recovery. Despite a small increase in the North Sea spawning up to 1999, the SSB has most recently declined again from 2005 to 2011.

The closure of the mackerel fishery in Divisions IVb,c and IIIa throughout the whole year is designed to protect the North Sea component in this area, and also to protect juvenile Western mackerel which are numerous, particularly in Divisions IVb,c during the second half of the year. Unfortunately, the closure has resulted in increased discards of mackerel in the non-directed fisheries (especially horse mackerel fisheries) in these areas as vessels are currently permitted to take only \(10 \%\) of their catch as mackerel bycatch. As estimates of mackerel bycatch are not available, the reported landings of mackerel in Divisions IIIa and IVb,c from 1997 and onwards underestimate catches because they do not include discarded bycatch.

The advised fishery closure of Division IVa during the first half of the year is based on the perception that the Western mackerel enter the North Sea in July/August, and stay there until December before migrating back to their spawning areas. Observations in the late 1990s suggested that this return migration started in mid- to late February. Since 2009, the return migration seems to occur earlier again. According to the EU TAC regulation some smaller quotas are assigned to Divisions IIIa and IVb,c. In the same regulation it is also stated that within the limits of the quota for the western component (Subareas and Divisions VI, VII, VIIIa,b,d,e, Vb (EU), IIa (nonEU), XII, and XIV), a certain quantity of this stock may be caught in Division IVa, but only during the periods 1 January to 15 February and 1 September to 31 December.

Existing measures to protect the North Sea spawning component are:
- There should be no fishing for mackerel in Divisions IIIa and IVb,c at any time of the year;
- There should be no fishing for mackerel in Division IVa during the period 15 February-31 July;
- The 30 cm minimum landing size at present in force in Subarea IV should be maintained.

In the southern area a new Spanish national regulation affecting mackerel catches of Spanish fisheries has been implemented in 2010, distributing the Spanish catch quota by gear ( \(30.5 \%\) quota for trawlers, \(27.7 \%\) for purseseiners, and \(34.6 \%\) for artisanal fisheries), half-year, and area. Additionally, a stricter control on mackerel landings was enforced by the Spanish fishery administration. In 2011 the EU introduced a new regulation scheduling payback until 2015 due to overfishing of the mackerel quota allocated to Spain in 2010 (Commission Regulation (EU) No. 165/2011). A similar regulation applied to Scottish and Irish vessels expires in 2012.

\section*{Other factors}

Stock components: ICES currently uses the term "Mackerel in the Northeast Atlantic" 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. Catches cannot be allocated specifically to spawning area components on biological grounds, but by convention; catches from the Southern and Western components are separated according to the areas in which these are taken.

To keep track of the development of spawning biomass in the different spawning areas, mackerel in the Northeast Atlantic stock are divided into three area components: the Western Spawning Component, the North Sea Spawning Component, and the Southern Spawning Component.
\begin{tabular}{|l|l|l|l|}
\hline \multicolumn{4}{|l|}{ Mackerel in the Northeast Atlantic } \\
\hline Mainly distributed and fished in ICES Subareas and Divisions IIII, IV, V, VI, VII, VIII, and IXa \\
\hline Spawning component & Western & Southern & North Sea \\
\hline Main spawning areas & VI, VII, VIIIa,b,d,e, & VIIIc, IXa & IV, IIIa \\
\hline
\end{tabular}

The Western component is defined as mackerel spawning in the western area (ICES Divisions and Subareas VI, VII, and VIII a,b,d,e). This component currently accounts for \(\sim 75 \%\) of the entire Northeast Atlantic stock. Similarly, the Southern component ( \(\sim 22 \%\) ) 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, ICES considers that the North Sea component still exists as a discrete unit ( \(\sim 3 \%\) ). This component spawns in the North Sea and Skagerrak (ICES Subarea IV and Division IIIaN). Current knowledge of the state of the spawning components is summarized below.

Western component: The catches of this component were low in the 1960s, but have increased since. The main catches are taken in directed fisheries by mid-water trawlers and purse-seiners. Large catches of the western component are taken in the northern North Sea, west of Scotland, and in the Nordic seas. A separate assessment for this stock component has not been conducted in recent years, as an extension of the time-series of mackerel in the Northeast Atlantic data allows the estimation of the mean recruitment from 1972 onwards. Preliminary estimates of the SSB of the Western component derived from egg surveys indicate an increase from 3.43 million \(t\) in 2010 to 4.30 million t in 2013.

North Sea component: Very large catches were taken in the late 1960s in the purse-seine fishery, reaching a maximum of about 1 million tonnes in 1967. The component subsequently collapsed and catches declined to less than 100000 tonnes in the late 1970s. Annual catches in the last ten years are assumed to be about 10000 tonnes. Estimates of the SSB of the North Sea component derived from the North Sea egg survey indicate a decrease from 0.22 million t in 2005 to 0.17 million t in 2011.

Southern component: Mackerel in this component are taken in a mixture of purse-seine, demersal trawl, line, and gillnet fisheries. 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, the catches are mainly taken in Division IXa and contain a high proportion of juveniles. Catches from the Southern component increased from about 20000 t in the early 1990s to about 40000 tonnes in the early 2000s, reaching a peak at 108000 tonnes in 2009 and decreasing to 19000 tonnes in 2011. The 2011 decline was due to pay-back of 18000 tonnes and tighter regulations. Preliminary estimates of the SSB of the Southern component derived from egg surveys indicate an increase from 0.85 million tonnes in 2010 to 1.27 million tonnes in 2013.

\section*{Data and methods}

The advice is partly based on the trend in SSB as reflected by the triennial mackerel egg survey estimates of SSB from 2007 to 2013.

The SSB is estimated using the annual egg production method. The survey samples the density of mackerel eggs during six periods from January to July and is designed to cover the spawning distribution during each period. Samples of adult fish are also taken to estimate the fecundity of females.

Additional information on data available is described in ICES (2013c).

\section*{Information from the fishing industry}

Over the last five years the pelagic industry has encountered large shoals of mackerel over the entire distribution area which has expanded both south and north. This is not confined to one area or one fleet. Based on its qualitative information from the fishing grounds the industry is of the firm view that the abundance of mackerel has increased over the last number of years. The industry is also seeing signs of very good recruitment (above average) over the last number of years, particularly in 2009, 2010 and 2011. The industry believes that the ICES advice for 2014 is too conservative. The widespread distribution over the entire area creates problems with unwanted bycatches for some fleets targeting species other than mackerel. Stakeholders are actively seeking mechanisms that would allow inclusion of fishing industry information into the assessment process, and are involved in a number of pilot projects in this regard. Industry has scaled up its participation in the mackerel RFID tagging project; processing plants in Denmark, Iceland, Ireland and Scotland are now equipped to read mackerel tags, in addition to the existing tag reading facilities in Norway.

\section*{Comparison with previous assessment and advice}

ICES normally provides advice on mackerel in relation to the management plan. This year, however, ICES was unable to give advice in relation to the management plan as there was no accepted analytical assessment for mackerel in 2013. The assessment was not accepted because the perception it gave of the recent trends in biomass and development of fishing mortality were considered unreliable: the catch data prior to 2005 have been considered by ICES to be unreliable, but analyses carried out this year indicate that the effect of the unreliable historical catch is leading to increasing errors in the perception of the stock, more than had previously been perceived. The problems with the assessment could be addressed using an adapted or different assessment model and ICES has scheduled to undertake this work in 2014. In the absence of an analytical assessment and following the ICES protocol for giving advice, ICES provides an interim advice for 2014, based on average landings. In 2012 the advice was based on the management plan.

\section*{Sources}

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Table 9.4.17.1 Mackerel in the Northeast Atlantic. Advice, management, and catch data for the combined area.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Year & ICES Advice & Predicted catch corresp. to advice & Total agreed
\[
\mathrm{TAC}^{3}
\] & Official landings \({ }^{5}\) & \[
\begin{aligned}
& \text { Disc. }{ }^{1} \\
& \text { slip } \\
& \hline
\end{aligned}
\] & ICES catch \(^{2,4}\) \\
\hline 1987 & Given by stock component & & 442 & 616 & 11 & 655 \\
\hline 1988 & Given by stock component & & 610 & 622 & 36 & 680 \\
\hline 1989 & Given by stock component & & 532 & 576 & 7 & 590 \\
\hline 1990 & Given by stock component & & 562 & 580 & 16 & 628 \\
\hline 1991 & Given by stock component & & 612 & 609 & 31 & 668 \\
\hline 1992 & Given by stock component & & 707 & 729 & 25 & 760 \\
\hline 1993 & Given by stock component & & 767 & 784 & 18 & 825 \\
\hline 1994 & Given by stock component & & 837 & 794 & 5 & 821 \\
\hline 1995 & Given by stock component & & 645 & 729 & 8 & 756 \\
\hline 1996 & Significant reduction in F & - & 452 & 509 & 11 & 564 \\
\hline 1997 & Significant reduction in F & - & 470 & 517 & 19 & 570 \\
\hline 1998 & \(F\) between 0.15 and 0.2 & 498 & 549 & 627 & 8 & 667 \\
\hline 1999 & \(F\) of 0.15 consistent with & 437 & 562 & 585 & \(\mathrm{n} / \mathrm{a}\) & 640 \\
\hline 2000 & \(\mathrm{F}=0.17 \mathrm{~F} \mathrm{~F}_{\mathrm{pa}}\) & 642 & 612 & 655 & 2 & 738 \\
\hline 2001 & \(\mathrm{F}=0.17: \mathrm{F}_{\mathrm{pa}}\) & 665 & 670 & 660 & 1 & 737 \\
\hline 2002 & \(\mathrm{F}=0.17\) : \(\mathrm{F}_{\mathrm{pa}}\) & 694 & 683 & 685 & 24 & 773 \\
\hline 2003 & \(\mathrm{F}=0.17\) : \(\mathrm{F}_{\mathrm{pa}}\) & 542 & 583 & 600 & 9 & 670 \\
\hline 2004 & \(\mathrm{F}=0.17\) : \(\mathrm{F}_{\mathrm{pa}}\) & 545 & 532 & 587 & 11 & 650 \\
\hline 2005 & \(\mathrm{F}=0.15\) to 0.20 & [320-420] & 422 & 447 & 20 & 543 \\
\hline 2006 & \(\mathrm{F}=0.15\) to 0.20 & [373-487] & 444 & \(318^{6}\) & 18 & 473 \\
\hline 2007 & \(\mathrm{F}=0.15\) to 0.20 & [390-509] & 502 & 558 & 8 & 579 \\
\hline 2008 & \(\mathrm{F}=0.15\) to 0.20 & [349-456] & 458 & 420 & 27 & 611 \\
\hline 2009 & \(\mathrm{F}=0.15\) to 0.20 & [443-578] & \(605^{7}\) & 442 & 13 & 735 \\
\hline 2010 & harvest control rule & [527-572] & \(885^{8}\) & 862 & 7 & 869 \\
\hline 2011 & See scenarios & 529-672 & \(959{ }^{8}\) & 930 & 9 & 939 \\
\hline 2012 & Follow the management plan & [586-639] & \(927{ }^{8}\) & 877 & 15 & 893 \\
\hline 2013 & Follow the management plan & [497-542] & \(906{ }^{8}\) & & & \\
\hline 2014 & Recent landings (3years) & \(<889.886\) & & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1}\) Data on discards and slipping from only two fleets.
\({ }^{2}\) Landings and discards from Divisions and Subareas IIa, IIIa, IV, V, VI, VII, VIII, and IXa.
\({ }^{3}\) For all areas, except some catches in international waters in Subarea II.
\({ }^{4}\) Catches updated in 2003 with revisions from SGDRAMA in 2002.
\({ }^{5}\) Updated with ICES FishStats data.
\({ }^{6}\) Incomplete.
\({ }^{7}\) Does not include the unilateral Norway/Faroe Islands TAC first declared in 2009, nor the Icelandic TAC.
\({ }^{8}\) No internationally agreed TAC for 2010, 2011, and 2012. Values presented are the sum of unilateral TACs.
}

Table 9.4.17.2 Mackerel in the Northeast Atlantic. Advice, management, and catch data for the Western component.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
ICES \\
Advice
\end{tabular} & Predicted catch corresp. to advice & \begin{tabular}{l}
Agreed \\
TAC
\end{tabular} & \begin{tabular}{l}
Disc. \\
slip
\end{tabular} & ICES catch \(^{2,4}\) \\
\hline 1987 & SSB \(=1.5\) mill. t ; TAC & 380 & 405 & 11 & 633 \\
\hline 1988 & \(\mathrm{F}=\mathrm{F}_{0.1}\); TAC; closed area; landing size & 430 & 573 & 36 & 656 \\
\hline 1989 & Halt SSB decline; TAC & 355 & 495 & 7 & 571 \\
\hline 1990 & TAC; \(\mathrm{F}=\mathrm{F}_{0.1}\) & 480 & 525 & 16 & 606 \\
\hline 1991 & \(\mathrm{TAC} ; \mathrm{F}=\mathrm{F}_{0.1}\) & 500 & 575 & 31 & 647 \\
\hline 1992 & TAC for both 1992 and 1993 & 670 & 670 & 25 & 742 \\
\hline 1993 & TAC for both 1992 and 1993 & 670 & 730 & 18 & 805 \\
\hline 1994 & No long-term gains in increased F & \(831{ }^{3}\) & 800 & 5 & 796 \\
\hline 1995 & 20\% reduction in F & 530 & 608 & 8 & 728 \\
\hline 1996 & No separate advice & - & 422 & 11 & 529 \\
\hline 1997 & No separate advice & - & 416 & 19 & 529 \\
\hline 1998 & No separate advice & - & 514 & 8 & 623 \\
\hline 1999 & No separate advice & - & 520 & 0 & 597 \\
\hline 2000 & No separate advice & - & 573 & 2 & 703 \\
\hline 2001 & No separate advice & - & 630 & 1 & 694 \\
\hline 2002 & No separate advice & - & 642 & 24 & 723 \\
\hline 2003 & No separate advice & - & 548 & 9 & 644 \\
\hline 2004 & No separate advice & - & 500 & 11 & 615 \\
\hline 2005 & No separate advice & - & 397 & 20 & 494 \\
\hline 2006 & No separate advice & - & \(418{ }^{5}\) & 17 & 420 \\
\hline 2007 & No separate advice & - & 472 & 8 & 519 \\
\hline 2008 & No separate advice & - & 431 & 27 & 552 \\
\hline 2009 & No separate advice & - & 569 & 13 & 627 \\
\hline 2010 & No separate advice & - & ---- \({ }^{6}\) & 4 & 817 \\
\hline 2011 & No separate advice & - & --- \({ }^{6}\) & 8 & 920 \\
\hline 2012 & No separate advice & - & ---6 \({ }^{6}\) & 11 & 864 \\
\hline 2013 & No separate advice & - & --- \({ }^{6}\) & & \\
\hline 2014 & No separate advice & - & & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1}\) TAC for mackerel taken in all Divisions and Subareas VI, VII, VIIIa,b,d, Vb, IIa, IIIa, and IVa.
\({ }^{2}\) Landings and discards of the Western component; includes some catches from the North Sea component.
\({ }^{3}\) Catch at status quo F.
\({ }^{4}\) Catches updated in 2003 with revisions from SGDRAMA in 2002.
\({ }^{5}\) Revised from previous year (was 392).
\({ }^{6}\) No internationally agreed TAC.
\begin{tabular}{|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
ICES \\
Advice
\end{tabular} & Predicted catch corresp. to advice \({ }^{1}\) & Agreed TAC \({ }^{2}\) & \[
\begin{aligned}
& \hline \text { ICES } \\
& \text { catch }^{3}
\end{aligned}
\] \\
\hline 1987 & Lowest practical level & LPL & 55 & 3 \\
\hline 1988 & Closed areas and seasons; min. landing size; bycatch regulations & LPL & 55 & 6 \\
\hline 1989 & Closed areas and seasons; min. landing size; bycatch regulations & LPL & 49.2 & 7 \\
\hline 1990 & Closed areas and seasons; min. landing size; bycatch regulations & LPL & 45.2 & 10 \\
\hline 1991 & Closed areas and seasons; min. landing size; bycatch regulations & LPL & 65.5 & \(-4\) \\
\hline 1992 & Closed areas and seasons; min. landing size; bycatch regulations & LPL & 76.3 & - \({ }^{4}\) \\
\hline 1993 & Maximum protection; closed areas and seasons; min landing size & LPL & 83.1 & - \({ }^{4}\) \\
\hline 1994 & Maximum protection; closed areas and seasons; min landing size & LPL & 95.7 & \(-4\) \\
\hline 1995 & Maximum protection; closed areas and seasons; min landing size & LPL & 76.3 & \(-4\) \\
\hline 1996 & Maximum protection; closed areas and seasons; min landing size & LPL & 52.8 & 4 \\
\hline 1997 & Maximum protection; closed areas and seasons; min landing size & LPL & 52.8 & \(-4\) \\
\hline 1998 & Maximum protection; closed areas and seasons; min landing size & LPL & 62.5 & - \({ }^{4}\) \\
\hline 1999 & Maximum protection; closed areas and seasons; min landing size & LPL & 62.5 & - \({ }^{4}\) \\
\hline 2000 & Maximum protection; closed areas and seasons; min landing size & LPL & 69.7 & - \({ }^{4}\) \\
\hline 2001 & Maximum protection; closed areas and seasons; min landing size & LPL & 71.4 & - 4 \\
\hline 2002 & Maximum protection; closed areas and seasons; min landing size & LPL & 72.9 & \(-4\) \\
\hline 2003 & Maximum protection; closed areas and seasons; min landing size & LPL & 62.5 & - 4 \\
\hline 2004 & Maximum protection; closed areas and seasons; min landing size & LPL & 57.7 & - \({ }^{4}\) \\
\hline 2005 & Maximum protection; closed areas and seasons; min landing size & LPL & 44.9 & - 4 \\
\hline 2006 & Maximum protection; closed areas and seasons; min landing size & LPL & 47.1 & - \({ }^{4}\) \\
\hline 2007 & Maximum protection; closed areas and seasons; min landing size & LPL & 53.1 & \(-{ }^{4}\) \\
\hline 2008 & Maximum protection; closed areas and seasons; min landing size & LPL & 48.6 & - 4 \\
\hline 2009 & Maximum protection; closed areas and seasons; min landing size & LPL & 63.8 & - \({ }^{4}\) \\
\hline 2010 & Maximum protection; closed areas and seasons; min landing size & LPL & - & - \({ }^{4}\) \\
\hline 2011 & Maximum protection; closed areas and seasons; min landing size & LPL & - & \(-4\) \\
\hline 2012 & Maximum protection; closed areas and seasons; min landing size & LPL & - & \(-4\) \\
\hline 2013 & Maximum protection; closed areas and seasons; min landing size & LPL & - & \(-4\) \\
\hline 2014 & Maximum protection; closed areas and seasons; min landing size & LPL & - & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1}\) Subarea IV and Division IIIa.
\({ }^{2}\) TAC for Subarea IV, Divisions IIIa, IIIb,c,d (EU zone), and Division IIa (EU zone).
\({ }^{3}\) Estimated landings of the North Sea component.
\({ }^{4}\) No information.
LPL \(=\) Lowest Practical Level.
}

Table 9.4.17.4 Mackerel in the Northeast Atlantic. Advice, management, and catch data for the Southern component.
\begin{tabular}{|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
ICES \\
Advice
\end{tabular} & Predicted catch corresp. to advice & Agreed TAC \({ }^{1}\) & \begin{tabular}{l}
ICES \\
Catch \({ }^{2}\)
\end{tabular} \\
\hline 1987 & Reduce juvenile exploitation & - & 36.57 & 22 \\
\hline 1988 & Reduce juvenile exploitation & - & 36.57 & 25 \\
\hline 1989 & No advice & - & 36.57 & 18 \\
\hline 1990 & Reduce juvenile exploitation & - & 36.57 & 21 \\
\hline 1991 & Reduce juvenile exploitation & - & 36.57 & 21 \\
\hline 1992 & No advice & - & 36.57 & 18 \\
\hline 1993 & No advice & - & 36.57 & 20 \\
\hline 1994 & No advice & - & 36.57 & 25 \\
\hline 1995 & No advice & - & 36.57 & 28 \\
\hline 1996 & No separate advice & - & 30.00 & 34 \\
\hline 1997 & No separate advice & - & 30.00 & 41 \\
\hline 1998 & No separate advice & - & 35.00 & 44 \\
\hline 1999 & No separate advice & - & 35.00 & 44 \\
\hline 2000 & No separate advice & - & 39.20 & 36 \\
\hline 2001 & No separate advice & - & 40.18 & 43 \\
\hline 2002 & No separate advice & - & 41.10 & 50 \\
\hline 2003 & No separate advice & - & 35.00 & 26 \\
\hline 2004 & No separate advice & - & 32.31 & 35 \\
\hline 2005 & No separate advice & - & 24.87 & 50 \\
\hline 2006 & No separate advice & - & 26.18 & 53 \\
\hline 2007 & No separate advice & - & 29.61 & 63 \\
\hline 2008 & No separate advice & - & 27.01 & 60 \\
\hline 2009 & No separate advice & - & 35.83 & 108 \\
\hline 2010 & No separate advice & - & 33.88 & 52 \\
\hline 2011 & No separate advice & - & 37.14 & 19 \\
\hline 2012 & No separate advice & - & 36.74 & 29 \\
\hline 2013 & No separate advice & - & 31.16 & \\
\hline 2014 & No separate advice & - & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1}\) Division VIIIc, Subareas IX and X, and CECAF Division 34.1.1 (EU waters only).
\({ }^{2}\) Catches updated in 2003 with revisions from SGDRAMA in 2002.
}
Mackerel in the Northeast Atlantic (combined Southern, Western, and North Sea spawning components). Catches (in tonnes) by country 1988-2012 (data submitted by
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1988 & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 & 2001 \\
\hline Belgium & 20 & 37 & & 125 & 102 & 191 & 351 & 106 & 62 & 114 & 125 & 177 & 146 & 97 \\
\hline Denmark & 36853 & 34264 & 35800 & 41505 & 42164 & 42502 & 50145 & 36780 & 28526 & 21971 & 27416 & 30011 & 29177 & 22522 \\
\hline Estonia & & & & & 616 & & 3302 & 2286 & 3741 & 4422 & 7356 & 3595 & 2673 & 219 \\
\hline Faroe Islands & 2622 & 5032 & 10000 & 11131 & 3347 & 12575 & 21568 & 31199 & 16851 & 11513 & 11229 & 11620 & 21023 & 24184 \\
\hline France & 10706 & 14911 & 19000 & 6480 & 962 & 3836 & 11573 & 11782 & 15663 & 20916 & 17835 & 16367 & 19445 & 20956 \\
\hline Germany, Fed. Rep. & 16457 & 22512 & 21600 & 14537 & 13719 & 13236 & 26508 & 24415 & 16227 & 15374 & 21412 & 19949 & 22979 & 25307 \\
\hline Germany, Dem. Rep. & & 2409 & & & & & & & & & & & & \\
\hline Guernsey & & & & & & & & & & & & & & \\
\hline Iceland & & & & & & & & & 92 & 925 & 357 & 357 & & \\
\hline Ireland & 85800 & 69980 & 74300 & 30138 & 35088 & 36982 & 89028 & 78534 & 54313 & 53129 & 66650 & 59675 & 71233 & 70452 \\
\hline Jersey & & & & & & & & & & & & & & \\
\hline Latvia & & & & & 311 & 4700 & 1508 & 389 & 233 & & & & & \\
\hline Lithuania & & & & & & & & & & & & & 2085 & \\
\hline Netherlands & 28664 & 31343 & 38200 & 69418 & 82860 & 89543 & 44335 & 35789 & 36760 & 23700 & 30163 & 28621 & 32385 & 36095 \\
\hline Norway & 163450 & 150400 & 151700 & 208266 & 239965 & 257800 & 258094 & 202205 & 136436 & 137523 & 158177 & 160738 & 174098 & 180372 \\
\hline Poland & & & & & & 600 & & & & 22 & & & & \\
\hline Portugal & 4388 & 3112 & 3819 & 2789 & 3576 & 2015 & 2158 & 2893 & 3023 & 2080 & 2897 & 2002 & 2253 & 3119 \\
\hline Romania & & & & & & & 2903 & & & & & & & \\
\hline Spain & 21884 & 16609 & 17892 & 22011 & 17234 & 20864 & 27113 & 29165 & 33371 & 46470 & 44607 & 45915 & 38321 & 44142 \\
\hline Sweden & 1003 & 6601 & 6400 & 4227 & 5100 & 5934 & 7099 & 6285 & 5307 & 4714 & 5146 & 5233 & 4994 & 5098 \\
\hline United Kingdom & 210815 & 187760 & 193900 & 200019 & 232829 & 256275 & 237841 & 212147 & 146205 & 321821 & 185948 & 160152 & 184902 & 192631 \\
\hline Russia/USSR & 27924 & 12088 & 28900 & 13361 & 42440 & 49600 & 28041 & 44537 & 44545 & 53732 & 67836 & 51348 & 50772 & 41567 \\
\hline Misreported & & & & & & & 109625 & 18647 & & & & -211 & 4816 & \\
\hline Unallocated & 34330 & 25361 & 8100 & 12956 & 15038 & & 4632 & 29228 & 10839 & 5679 & 11498 & 38996 & 66325 & 62825 \\
\hline Discards & 35576 & 7090 & 15600 & 30750 & 25000 & 18380 & 5370 & 7721 & 11415 & 18864 & 8030 & & 3832 & 1188 \\
\hline Total & 680492 & 589509 & 625211 & 667713 & 760351 & 815033 & 931194 & 774108 & 563610 & 742969 & 666682 & 634545 & 731459 & 730774 \\
\hline
\end{tabular}
Table 9.4.17.5b Mackerel in the Northeast Atlantic (combined Southern, Western, and North Sea spawning components). Catches (in tonnes) by country 1988-2012 (cont.) (data submitted
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline Belgium & 22 & 2 & 5 & 1 & 3 & 1 & 2 & 3 & 29 & 21 & 39 \\
\hline Denmark & 34376 & 27900 & 25665 & 23212 & 24219 & 25223 & 26726 & 23491 & 41445 & 35958 & 36501 \\
\hline Estonia & & & & & & & & & & & \\
\hline Faroe Islands & 19768 & 14014 & 13029 & 9769 & 12067 & 13429 & 11289 & 14062 & 70987 & 122050 & 107630 \\
\hline France & 21878 & 22906 & 20266 & 16338 & 14953 & 20038 & 15602 & 18340 & 11379 & 12766 & 20467 \\
\hline Germany, Fed. Rep. & 26532 & 24061 & 23244 & 19040 & 16608 & 18221 & 15502 & 22703 & 19055 & 24083 & 18944 \\
\hline Germany, Dem. Rep. & & & & & & & & & & & \\
\hline Greenland & & & & & & & & & & 62 & 5284 \\
\hline Guernsey & & & & & 10 & & & & & 10 & 5 \\
\hline Iceland & 53 & 122 & & 363 & 4222 & 36706 & 112286 & 116160 & 121008 & 159263 & 149282 \\
\hline Ireland & 72172 & 67355 & 61102 & 45687 & 40664 & 49260 & 44759 & 61056 & 57994 & 61596 & 63049 \\
\hline Jersey & & & & 9 & 8 & 6 & 7 & 8 & 6 & 7 & \\
\hline Latvia & & & & & & & & & & & \\
\hline Lithuania & & & & & 95 & 7 & & & & 23 & \\
\hline Netherlands & 33444 & 30424 & 27532 & 25127 & 24157 & 24234 & 19972 & 23568 & 23088 & 28395 & 25817 \\
\hline Norway & 184291 & 163406 & 157364 & 119678 & 121993 & 131691 & 121524 & 121229 & 233952 & 208065 & 176023 \\
\hline Poland & & & & 570 & & 978 & & & & & \\
\hline Portugal & 2934 & 2749 & 2289 & 1509 & 2620 & 2605 & 2381 & 1753 & 2363 & 962 & 824 \\
\hline Romania & & & & & & & & & & & \\
\hline Spain & 50123 & 23762 & 34455 & 52753 & 54136 & 62946 & 64648 & 114074 & 52737 & 18725 & 19386 \\
\hline Sweden & 5232 & 445 & 4437 & 3204 & 3209 & 3858 & 3664 & 7303 & 3429 & 3249 & 4564 \\
\hline United Kingdom & 194045 & 183008 & 174730 & 152801 & 95815 & 133688 & 112149 & 157010 & 160417 & 180971 & 169745 \\
\hline Russia/USSR (Russia from 1990) & 45811 & 40026 & 49489 & 40495 & 33580 & 35408 & 32728 & 41414 & 59310 & 73601 & 74587 \\
\hline Misreported & 6009 & & 31 & & & & & & & & \\
\hline Unallocated & 50543 & 59172 & 46596 & 13171 & 4954 & 12453 & 1069 & -139 & 5271 & & 5237 \\
\hline Discards & 23774 & 9481 & 10972 & 19760 & 17970 & 8615 & 26766 & 12854 & 6981 & 9012 & 15380 \\
\hline Total & 771007 & 668833 & 651206 & 543487 & 471283 & 579367 & 611074 & 734889 & 869451 & 938819 & 892762 \\
\hline
\end{tabular}
Table 9.4.17.6a Mackerel in the Northeast Atlantic (combined Southern, Western, and North Sea spawning components). Catches by area. Discards not estimated prior to 1978 (data submitted by Working Group members).

\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline Year & \multicolumn{3}{|l|}{Subarea VI} & \multicolumn{3}{|l|}{\begin{tabular}{l}
Subarea VII and \\
Divisions ViIIabde
\end{tabular}} & \multicolumn{3}{|l|}{Subareas III and IV} & \multicolumn{3}{|l|}{\[
\begin{aligned}
& \text { Subareas I,II,V } \\
& \text { and XIV }
\end{aligned}
\]} & \multicolumn{3}{|l|}{Divisions VIIIC and IXA} & \multicolumn{3}{|l|}{Total} \\
\hline & Ldg & Disc & Catch & Ldg & Disc & Catch & Ldg & Disc & Catch & Ldg & Disc & Catch & Ldg & Disc & Catch & Ldg & Disc & Catch \\
\hline 1991 & 109,500 & 10,700 & 120,200 & 50,500 & 12,800 & 63,300 & 358,700 & 7,200 & 365,900 & 97,800 & & 97,800 & 20,683 & & 20,683 & 637,183 & 30,700 & 667,883 \\
\hline 1992 & 141,906 & 9,620 & 151,526 & 72,153 & 12,400 & 84,553 & 364,184 & 2,980 & 367,164 & 139,062 & & 139,062 & 18,046 & & 18,046 & 735,351 & 25,000 & 760,351 \\
\hline 1993 & 133,497 & 2,670 & 136,167 & 99,828 & 12,790 & 112,618 & 387,838 & 2,720 & 390,558 & 165,973 & & 165,973 & 19,720 & & 19,720 & 806,856 & 18,180 & 825,036 \\
\hline 1994 & 134,338 & 1,390 & 135,728 & 113,088 & 2,830 & 115,918 & 471,247 & 1,150 & 472,397 & 72,309 & & 72,309 & 25,043 & & 25,043 & 816,025 & 5,370 & 821,395 \\
\hline 1995 & 145,626 & 74 & 145,700 & 117,883 & 6,917 & 124,800 & 321,474 & 730 & 322,204 & 135,496 & & 135,496 & 27,600 & & 27,600 & 748,079 & 7,721 & 755,800 \\
\hline 1996 & 129,895 & 255 & 130,150 & 73,351 & 9,773 & 83,124 & 211,451 & 1,387 & 212,838 & 103,376 & & 103,376 & 34,123 & & 34,123 & 552,196 & 11,415 & 563,611 \\
\hline 1997 & 65,044 & 2,240 & 67,284 & 114,719 & 13,817 & 128,536 & 226,680 & 2,807 & 229,487 & 103,598 & & 103,598 & 40,708 & & 40,708 & 550,749 & 18,864 & 569,613 \\
\hline 1998 & 110141 & 71 & 110,212 & 105,181 & 3,206 & 108,387 & 264,947 & 4,735 & 269,682 & 134,219 & & 134,219 & 44,164 & & 44,164 & 658,652 & 8,012 & 666,664 \\
\hline 1999 & 116,362 & & 116,362 & 94,290 & & 94,290 & 313,014 & & 313,014 & 72,848 & & 72,848 & 43,796 & & 43,796 & 640,311 & & 640,311 \\
\hline 2000 & 187,595 & 1 & 187,595 & 115,566 & 1,918 & 117,484 & 285,567 & 165 & 304,898 & 92,557 & & 92,557 & 36,074 & & 36,074 & 736,524 & 2,084 & 738,608 \\
\hline 2001 & 143,142 & 83 & 143,142 & 142,890 & 1,081 & 143,971 & 327,200 & 24 & 339,971 & 67,097 & & 67,097 & 43,198 & & 43,198 & 736,274 & 1,188 & 737,462 \\
\hline 2002 & 136,847 & 12,931 & 149,778 & 102,484 & 2,260 & 104,744 & 375,708 & 8,583 & 394,878 & 73,929 & & 73,929 & 49,576 & & 49,576 & 749,131 & 23,774 & 772,905 \\
\hline 2003 & 142,728 & 91 & 142,819 & 89,492 & & 89,492 & 334,639 & 9,390 & 357,766 & 53,701 & & 53,701 & 25,823 & & 25,823 & 660,119 & 9,481 & 669,600 \\
\hline 2004 & 134,251 & 240 & 134,491 & 99,922 & 1,862 & 101,784 & 300,768 & 8,870 & 316,620 & 62,486 & & 62,486 & 34,840 & & 34,840 & 639,248 & 10,972 & 650,221 \\
\hline 2005 & 79,960 & 11,400 & 91,361 & 90,278 & 5,878 & 96,156 & 249,740 & 2,482 & 252,223 & 54,129 & & 54,129 & 49,618 & & 49,618 & 523,726 & 19,760 & 543,486 \\
\hline 2006 & 88,077 & 6,031 & 94,108 & 66,209 & 6,556 & 72,765 & 200,929 & 5,383 & 206,312 & 46,716 & & 46,716 & 52,751 & & 52,751 & 454,682 & 17,970 & 472,652 \\
\hline 2007 & 110,788 & 405 & 111,193 & 71,235 & 2,024 & 73,259 & 253,013 & 6,187 & 259,200 & 72,891 & & 72,891 & 62,834 & & 62,834 & 570,761 & 8,616 & 579,379 \\
\hline 2008 & 76,358 & 21,793 & 98,151 & 73,377 & 1,987 & 75,364 & 227,251 & 2,986 & 230,237 & 148,669 & & 148,669 & 59,859 & & 59,859 & 584,297 & 26,766 & 611,063 \\
\hline 2009 & 135,468 & 1,255 & 136,723 & 88,287 & 4,387 & 92,674 & 226,928 & 7,212 & 234,140 & 163,604 & & 163,604 & 107,747 & & 107,747 & 732,034 & 12,854 & 734,889 \\
\hline 2010 & 106,732 & 114 & 106,846 & 104,127 & 3,723 & 107,850 & 246,817 & 14 & 246,831 & 355,724 & 5 & 355,729 & 49,068 & 3,126 & 52,194 & 862,470 & 6,981 & 869,451 \\
\hline 2011 & 160,756 & 1,633 & 162,389 & 50,699 & 6,027 & 56,726 & 301,746 & 790 & 302,536 & 370,761 & & 370,761 & 18,430 & 562 & 19,037 & 929,807 & 9,012 & 938,819 \\
\hline 2012 & 121,115 & 26 & 121,141 & 65,720 & 10,965 & 76,685 & 218,400 & 540 & 218,940 & 447,207 & & 447,207 & 24,940 & 3,849 & 28,789 & 877,382 & 15,380 & 892,762 \\
\hline
\end{tabular}

Table 9.4.17.7 Mackerel in the Northeast Atlantic (combined Southern, Western, and North Sea spawning components). Estimated catches for 2013.
\begin{tabular}{|l|r|l|}
\cline { 2 - 4 } \multicolumn{1}{l|}{ Estimation of 2013 catch } & \multicolumn{1}{l|}{ Tonnes } & Reference \\
\hline EU quota and Swedish quota & 338,392 & European Council Regulation 2013/297 \\
UK-Ireland payback & 0 & European Council Regulation 2012/147 \\
Spanish payback & \(-8,126\) & European Council Regulation 2012/976 \\
& & http://ec.europa.eu/fisheries/cfp/fishing_rules/tacs/info/quota- \\
Other EU payback & -6 & deductions-for-2013.pdf \\
Norwegian quota & 153,597 & European Council Regulation 2013/297 \\
Russian quota & 68,359 & WGWIDE estimate \\
Discards & 15,380 & Previous years estimate \\
Icelandic quota & 123,182 & Ministry of Industries and Innovation: Press release 2 Feb. \\
& 2,827 & WGWIDE estimate \\
Inter-annual quota transfer 2012->2013 & 125,852 & Ministry of Fisheries: Press release 26 Mar 2013 \\
Faroese quota & 32,000 & Ministry of Fisheries: Press release 26 Mar 2013 \\
Inter-annual quota transfer 2012->2013 & 50,044 & WGWIDE estimate \\
Greenland expected catch & \(-6,165\) & Based on 2012 over-catch percentage \\
Expected over-catch & 895,336 & \multicolumn{2}{|l}{} \\
\hline Total expected catch (incl. discard) & \multicolumn{2}{|l}{}
\end{tabular}


Figure 9.4.17.2 Northeast Atlantic mackerel. Commercial catches in 2012, quarters 1-4.

\subsection*{9.4.17.1}

Annex

ICES evaluated the following harvest control rule contained in the Norway, Faroe Islands, and EU management plan for mackerel in the Northeast Atlantic, agreed in October 2008:
1. For the purpose of this long-term management plan, "SSB" means the estimate according to ICES of the spawning stock biomass at spawning time in the year in which the TAC applies, taking account of the expected catch.
2. When the SSB is above 2,200,000 tonnes, the TAC shall be fixed according to the expected landings, as advised by ICES, on fishing the stock consistent with a fishing mortality rate in the range of 0.20 to 0.22 for appropriate age groups as defined by ICES.
3. When the SSB is lower than 2,200,000 tonnes, the TAC shall be fixed according to the expected landings as advised by ICES, on fishing the stock at a fishing mortality rate determined by the following:

Fishing mortality \(F=0.22 * S S B / 2,200,000\)
4. Notwithstanding paragraph 2, the TAC shall not be changed by more than \(20 \%\) from one year to the next, including from 2009 to 2010.
5. In the event that the ICES estimate of SSB is less than 1,670,000 tonnes, the Parties shall decide on a \(T A C\) which is less than that arising from the application of paragraphs 2 to 4.
6. The Parties may decide on a TAC that is lower than that determined by paragraphs 2 to 4 .
7. The Parties shall, as appropriate, review and revise these management measures and strategies on the basis of any new advice provided by ICES.

\title{
Western Horse Mackerel
}
(Divisions IIa, IVa,Vb,VIa,VIIa-c,e-k,VIII)
For latest information, see: http://www.ices.dk

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than IIO,546 t. FEAS agrees with the ICES advice.

According to the most recent assessment fishing mortality has been rising since 2007 and is now above \(F_{\text {MSY }}\). SSB is declining and recruitment has been low since 2004.

A management plan, used for TAC setting, from 2008 to 2011 is no longer the basis for advice. ICES reviewed elements of the plan in 2013 and concluded that in its current form it was not consistent with the PA. The advice implies an Irish quota of about \(24,500 \mathrm{t}\). Currently there are fisheries outside of the TAC area. FEAS notes that the management plan review is due for completion in 2014. FEAS also notes that the management plan operates on a banking and borrowing principle and that the


Red Boxes-TAC/Management Areas Blue Shading- Assessment Area Purple Shading - Quarters \(3 \& 4\) application of the management plan for some years since 2008 has been on the basis of banking (i.e. exploiting the stock below \(\mathrm{F}_{\text {MSY }}\) ), in this context there should be some scope to moderate the catch reductions when the biomass is declining.

\section*{CURRENT MANAGEMENT}
- The TAC only applies to EU waters. There are fisheries outside the TAC areas which are not limited by the TAC.
- Since 2005, when it was determined that catches from Division VIIIc were from the western stock, the management advice for the western stock has included an allocation for Division VIIIc.
- The sum of the agreed TAC's for 2013 in Sub-areas VI, and Divisions Ila, IVa, VIla-c, VIIe-k and VIII was I83,000 t, of which the Irish quota was \(40,803 \mathrm{t}\). (as per COUNCIL REGULATION (EU) No 297/2013)
- The TAC proposed by the commission only covers EU waters

-IRE 40803 t
©DEN 15702 t
-GER 12251 t
- FRA 6306 t
- NL 49156 t

ロUK 14775 t
-SPA 16711 t
-POR 1610 t
aSWE 675 t whereas the management plan TAC covers all waters where the stock is fished.
- Catches in VIIIc are part of the western stock, but the EC is still declaring an VIIIc TAC separately from the rest of the western area. However the sum of the VIIIc and western TAC's are still within the management plan limit.

\section*{ICES ADVICE 9.4.12 Western horse mackerel (Trachurus trachurus) (Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e)}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 110546 t . Even though some discards are included in the assessment, the total amount of discards cannot be quantified. Therefore total catches cannot be calculated.

\section*{Stock status}
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|c|}{F (Fishing Mortality)} \\
\hline & 2010 & 2011 & & 2012 \\
\hline MSY ( \(\mathrm{F}_{\text {MSY }}\) ) & ( & * & ( & Above target \\
\hline Precautionary approach ( \(\mathrm{F}_{\mathrm{pa}}, \mathrm{F}_{\mathrm{lim}}\) ) & ? & ? & & Undefined \\
\hline \multicolumn{5}{|c|}{SSB (Spawning-Stock Biomass)} \\
\hline & 2011 & 2012 & & 2013 \\
\hline MSY ( \(\mathrm{B}_{\text {trigger }}\) ) & ? & ? & \(?\) & Undefined \\
\hline Precautionary approach \(\left(\mathrm{B}_{\mathrm{pa}}, \mathrm{B}_{\mathrm{lim}}\right)\) & ? & \(?\) & ? & Undefined \\
\hline Qualitative evaluation & (4) & (4) & & declining \\
\hline
\end{tabular}






Figure 9.4.12.1 Horse mackerel in Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e (Western stock). Summary of stock assessment (weights in thousand tonnes; the estimated shaded recruitment 2013 is the geometric mean of 1983-2011). Top right: SSB and F time-series.

The SSB, which has varied between 0.65 and 1.72 million tonnes during 1995-2012, is estimated to be at 0.84 million tonnes in 2013. Fishing mortality has been increasing since 2007 and is now above \(\mathrm{F}_{\text {MSY }}\). Recruitment has been low from 2004 onwards.

\section*{Management plans}

In 2007, a management plan based on the triennial egg survey was proposed by the Pelagic RAC (Section 9.4.12.1 Annex) and has been used by the EU since 2008 to set the EU TAC. The management plan was initially appraised by ICES in 2007 and was deemed to be precautionary in the short term only, because some relevant scenarios were not evaluated. Further evaluation in 2013 suggests that in its current configuration the HCR is not robust to more than 2 years of very low recruitment (ICES, 2013b).

\section*{Biology}

The western horse mackerel stock extends from Subarea VIII in the south to Division IIa in the north, except for the North Sea which is considered a separate stock. However, the western stock is also considered to extend into Divisions IVa and IIIa in quarters 3 and 4. Horse mackerel recruitment is characterized by infrequent extremely large year classes. There is evidence that horse mackerel fecundity is not determinate and this might create uncertainties in the relationship between SSB and egg abundance.

\section*{Environmental influence on the stock}

Since 1987, when the strong 1982 year class of the western stock first began to appear in the North Sea, there has been a good correspondence in most years between the influx of Atlantic water to the North Sea in the first quarter and the horse mackerel catches by Norwegian purse-seiners in the Norwegian EEZ (NEZ) during the late (October-November) period of the same year (Iversen et al., 2002, 2007). It is unclear whether the strong relationship between influx of Atlantic water and the occurrence of horse mackerel in NEZ still holds, since in recent years horse mackerel has occurred together with mackerel in this area and Norwegian fishers have avoided fishing horse mackerel there.

\section*{The fisheries}

There are several fisheries for horse mackerel. The adults are caught in targeted fisheries to the west, and as target species and bycatch in the south, while a juvenile fishery has historically occurred mainly in Divisions VIIe-h and VIIIa-d. This juvenile fishery developed in 1993 and reached a peak in 2003, but has declined as a proportion of the overall catch in the past ten years. The proportion of juveniles in the fishery from this area has been variable in the past ten years, reaching a peak of about \(10 \%\) (by weight) in 2010 and declining since then.

Catch distribution Total catch \((2012)=173141\) tonnes (mainly pelagic trawl); discards are underestimated, with discards data available for some of the main fleets.

\section*{Quality considerations}

There is large uncertainty in the absolute estimates of SSB. The only fishery-independent information for this stock is a measure of egg production from surveys conducted every three years. The assessment assumes that fecundity-at-size varies with no trend over time. If this assumption is incorrect, then the assessment results may also be biased.

Discards are included in the assessment. However, not all countries provide data on discards; consequently, there is no estimate of the total amount of discards in the horse mackerel fisheries. The landings fraction sampled to estimate biological parameters has been declining in recent years; it is important to keep those levels on target. As in previous years, and despite the data sampling regulations for EU countries, some countries with major catches have not conducted biological sampling programmes.


Figure 9.4.12.2
Horse mackerel in Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e (Western stock). Historical assessment results (final-year recruitment estimates included). The fishing mortality age ranges for the 2008 and 2009 assessment years were calculated using ages 4-8, while for the 2010 and 2011 assessments, ages \(1-10\) were used. The dotted line corresponds to the \(\mathrm{F}_{\text {MSY }}\) reference point.
\begin{tabular}{|c|c|}
\hline Assessment type & Age-based analytical (Linked Separable Adapt VPA). \\
\hline \multirow[t]{5}{*}{Input data} & Commercial catches: international catches and ages from catch sampling. \\
\hline & One survey index: Triennial egg survey index. \\
\hline & One tuning index: potential fecundity vs fish weight 1987, 1992, 1995, 1998, 2000, 2001. \\
\hline & Annual maturity data: constant since 1998. \\
\hline & Natural mortalities: a constant value (0.15) was used. \\
\hline \multirow[t]{2}{*}{Discards and bycatch} & Discard data are available for some of the main fleets. \\
\hline & Discards were included in the assessment for some years, from Dutch, Spanish, Irish, and German fleets. \\
\hline Indicators & None. \\
\hline Other information & None. \\
\hline Working group report & WGWIDE (ICES, 2013a). \\
\hline
\end{tabular}

\subsection*{9.4.12}

Supporting information October 2013

\section*{ECOREGION Widely distributed and migratory stocks \\ STOCK \\  VIIa-c,e-k, and VIIIa-e (Western stock)}

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\cline { 2 - 4 } \multicolumn{1}{c|}{} & Type & Value & Technical basis \\
\hline \multirow{3}{c|}{\begin{tabular}{l} 
MSY \\
Approach
\end{tabular}} & MSY B \(_{\text {trigger }}\) & Not defined. & \\
\cline { 2 - 4 } & \(\mathrm{F}_{\text {MSY }}\) & 0.13 & \(\mathrm{~F}_{0.1}\) from the yield-per-recruit (Section 5.7 in ICES, 2010). \\
\hline \multirow{3}{*}{\begin{tabular}{l} 
Precautionary \\
Approach
\end{tabular}} & \(\mathrm{B}_{\text {lim }}\) & Not defined. \({ }^{1)}\) & \\
\cline { 2 - 4 } & \(\mathrm{B}_{\text {pa }}\) & Not defined. \({ }^{1)}\) & \\
\cline { 2 - 4 } & \(\mathrm{F}_{\text {lim }}\) & Not defined. & \\
\cline { 2 - 4 } & \(\mathrm{F}_{\mathrm{pa}}\) & Not defined. & \\
\hline
\end{tabular}

\footnotetext{
(unchanged since: 2013)
}
\({ }^{1)}\) Previous PA biomass reference points were considered not consistent with the perceived state of the stock, the exploitation rate, and the evaluation of MSY reference points.

Basis: Catch \((2013)=183(\) EU TAC \() ; \mathrm{F}_{2013}=0.19 ; \mathrm{R}(2013-2015)=2.3\) billion \((\) GM 1983-2011 \(\left.) ; \operatorname{SSB}(2013)^{1}\right)=\) 835.879.
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline Rationale & \[
\begin{aligned}
& \text { Catch } \\
& \text { (2014) }
\end{aligned}
\] & Basis & \[
\begin{gathered}
F \\
(2014)
\end{gathered}
\] & \[
\underset{(2014)^{1)}}{\text { SSBB }}
\] & \[
\underset{(2015)^{1)}}{\text { SSBB }}
\] & \begin{tabular}{l}
\%SSB \\
change \({ }^{2)}\)
\end{tabular} & \begin{tabular}{l}
\% TAC \\
change \({ }^{3)}\)
\end{tabular} \\
\hline MSY approach & 110.546 & \(\mathrm{F}_{\text {MSY }}\) & 0.13 & 665 & 554 & -20 & -40 \\
\hline Zero catch & 0 & \(\mathrm{F}=0\) & 0 & 700 & 655 & -7 & -100 \\
\hline Management plan & 137.524 & Management plan & 0.16 & 656 & 531 & -24 & -25 \\
\hline \multirow[t]{6}{*}{Other options} & 146.4 & \[
\begin{gathered}
\hline 20 \% \mathrm{TAC} \\
\text { reduction } \\
\left(\mathrm{F}_{2012} \times 0.91\right) \\
\hline
\end{gathered}
\] & 0.18 & 654 & 523 & -25 & -20 \\
\hline & 155.55 & \[
\begin{gathered}
15 \% \mathrm{TAC} \\
\text { reduction } \\
\left(\mathrm{F}_{2012} \times 0.97\right)
\end{gathered}
\] & 0.19 & 651 & 515 & -26 & -15 \\
\hline & 159.347 & \(\mathrm{F}_{2012}\) & 0.19 & 649 & 511 & -27 & -13 \\
\hline & 183 & \[
\begin{gathered}
\hline \text { Roll-over } \\
\text { TAC } \\
\left(\mathrm{TAC}_{2013}\right) \\
\hline
\end{gathered}
\] & 0.22 & 641 & 492 & -30 & 0 \\
\hline & 210.45 & \[
\begin{gathered}
15 \% \mathrm{TAC} \\
\text { increase } \\
\left(\mathrm{F}_{2012} \times 1.36\right) \\
\hline
\end{gathered}
\] & 0.26 & 632 & 468 & -35 & 15 \\
\hline & 219.6 & \[
\begin{gathered}
20 \% \mathrm{TAC} \\
\text { increase } \\
\left(\mathrm{F}_{2011} \times 1.03\right) \\
\hline
\end{gathered}
\] & 0.28 & 628 & 460 & -37 & 20 \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1)}\) SSB at spawning time.
\({ }^{2)}\) SSB 2015 relative to SSB 2014 at spawning time.
\({ }^{3)}\) Catch 2014 relative to TAC 2013.

\section*{MSY approach}

Following the ICES MSY approach requires fishing mortality to be reduced to 0.13 in 2014, resulting in catches of less than 110546 tonnes in 2014. This is expected to lead to an SSB of 554 kt in 2015.

\section*{Management plan}

ICES does not advise according to the management plan because it has recently concluded that, in its current configuration, the HCR is not consistent with the PA (ICES, 2013c). However, this work also showed that the plan could be made consistent with the PA through the introduction of a biomass trigger in the HCR (ICES, 2013b). Thus, ICES advises that these modifications to the HCR would need to be made before the plan is used to give catch advice.

\section*{Additional considerations}

Note that the TAC advice based on the MSY approach results in a lower SSB in 2015 than the lowest SSB in the time-series, and it is uncertain if this low SSB will lead to reduced recruitment.

The TAC should apply to all areas where Western horse mackerel is caught. The advice for horse mackerel assumes that all landings are counted against the TAC for each stock separately.

Western horse mackerel are taken in a variety of fisheries for human consumption, with juvenile fish directed mostly at the Japanese market and large fish at the African market. Since 2003, the fishery has been more directed toward younger fish (ages \(1-3\) ) than fish of ages 4 to 8 . In 2012, fishing mortality on younger ages reached a record-high level.

\section*{Data and methods}

The assessment is carried out with some discards included; however, discards for 2012 were not included in this year's assessment.

The raising methodology for international landings this year was carried out using InterCatch whereas in previous years landings were raised using Salloc. The effect of the change in raising methodology was not assessed during this year's working group due to limited time so there is uncertainty in the potential differences in the 2012 catch-at-age data used in the assessment.

\section*{Management considerations}

The 2001 year class has now entered the plus group and there are no detectable strong year classes entering the fishery. This year a preliminary egg abundance estimate is available from the 2013 egg survey that has changed the perception of the stock. However, the declining trend in SSB and upward trajectory of \(\mathrm{F}_{1-10}\) remains the same. SSB in 2013 was estimated at 0.84 Mt , among the lowest in the time-series. The short-term forecast of SSB and yield obtained this year show a declining SSB in 2015 relative to SSB in 2014. This applies to all options, including zero catches which results in a \(7 \%\) reduction.

The assessment estimate of SSB is very uncertain, and historically it has revised the perception of the development of the stock over time. The assessment has no independent information to determine whether increased proportions of young fish in the catches are due to increased mortality or increased recruitment. Currently this situation is explained as increased mortality in the assessment, implying low recruitment. When a new survey index is introduced to the data every three years (as in 2013) the assessment is rescaled to the most recent survey observation. The effect of this rescaling is to significantly change the yield advice and the perception of mortality in the stock.

Comparison with previous assessment
SSB in 2012 has been revised down by \(36 \%\). Fishing mortality in 2011 for ages \(1-10\) has been revised upward by \(25 \%\). The estimated catch for 2012 in last year's forecast was overestimated by \(5 \%\).

\section*{Sources}

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Figure 9.4.12.3 Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e (Western stock). Stock-recruitment (left panel) and yield-per-recruit plot (right panel).

Table 9.4.12.1 Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e (Western stock). ICES advice, management, landings, discards, and catches.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Year & \begin{tabular}{l}
ICES \\
Advice
\end{tabular} & Predicted catch corresp. to advice \({ }^{2}\) & \[
\begin{gathered}
\hline \text { Agreed } \\
\text { TAC }^{1} \\
\hline
\end{gathered}
\] & \begin{tabular}{l}
ICES \\
Landings \({ }^{2}\)
\end{tabular} & Disc. Slip \(^{2}\) & \[
\begin{gathered}
\hline \text { ICES } \\
\text { Catch }^{2}
\end{gathered}
\] \\
\hline 1987 & Not assessed & - & 155 & 157 & - & 157 \\
\hline 1988 & No increase in catches & 102 & 169 & 184 & 4 & 188 \\
\hline 1989 & If sustained catches required; TAC & 100 & 153 & 267 & 1 & 269 \\
\hline 1990 & TAC & \(\sim 200\) & 203 & 363 & 10 & 373 \\
\hline 1991 & Within safe biological limits & - & 230 & 328 & 5 & 334 \\
\hline 1992 & Within safe biological limits & - & 250 & 369 & 2 & 371 \\
\hline 1993 & Within safe biological limits & - & 250 & 424 & 9 & 433 \\
\hline 1994 & Prudent not to increase F & - & 300 & 385 & 4 & 389 \\
\hline 1995 & Reduction in catch & - & 300 & 509 & 2 & 511 \\
\hline 1996 & Reduction in catch & - & 300 & 379 & 17 & 397 \\
\hline 1997 & Reduction in F & 173 & 300 & 440 & 3 & 443 \\
\hline 1998 & Reduction in F to 0.15 & 150 & 320 & 296 & 1 & 304 \\
\hline 1999 & Effectively limit catches to 200000 t & <200 & 265 & 274 & - & 274 \\
\hline 2000 & Effectively limit catches to 200000 t & <200 & 240 & 175 & - & 175 \\
\hline 2001 & Effectively limit catches to 224000 t & <224 & 233 & 191 & - & 191 \\
\hline 2002 & Effectively limit catches to 98000 t & \(<98\) & 150 & 172 & - & 172 \\
\hline 2003 & Effectively limit catches to 113000 t & \(<113\) & 137 & \(190^{3}\) & \(-{ }^{3}\) & \(190^{3}\) \\
\hline 2004 & Limit catches to less than 130000 t & \(<130\) & 137 & \(157^{3}\) & \(1^{3}\) & \(158^{3}\) \\
\hline 2005 & Limit catches to less than 150000 t & \(<150^{3}\) & 137 & 182 & 1 & 182 \\
\hline 2006 & Limit catches to less than 150000 t & \(<150^{3}\) & 137 & 155 & 0 & 155 \\
\hline 2007 & Limit catches to less than 150000 t & \(<150^{3}\) & 137 & 123 & 0 & 123 \\
\hline 2008 & Follow proposed management plan & \(180^{4}\) & 170 & 140 & 0 & 140 \\
\hline 2009 & Follow proposed management plan & \(180^{4}\) & 170 & 177 & 0 & 177 \\
\hline 2010 & Follow proposed management plan & \(180^{4}\) & 185 & 204 & 15 & 218 \\
\hline 2011 & See scenarios & 181-229 & 184 & 193 & 7 & 200 \\
\hline 2012 & MSY framework & 211 & 183 & 170 & 3 & 173 \\
\hline 2013 & MSY framework & 126 & 183 & & & \\
\hline 2014 & MSY approach & 110.546 & & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1}\) Applies to EU waters only.
\({ }^{2}\) Divisions IIa, IVa, Vb, VIa, VIIa-c, VIIe-k, and VIIIa,b,d,e.
\({ }^{3}\) Including Division VIIIc.
\({ }^{4}\) For the whole distribution area.
}

Table 9.4.12.2
Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e (Western stock). Horse mackerel landings ( t ) in Subarea II. (Data as submitted by Working Group members.)
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1980 & 1981 & 1982 & 1983 & 1984 & & 1985 & 1986 & 1987 \\
\hline Denmark & - & - & - & - & - & & - & - & 39 \\
\hline France & - & - & - & - & 1 & & 1 & \(-^{2}\) & \(-^{2}\) \\
\hline Germany, Fed. Rep & - & + & - & - & - & & - & - & - \\
\hline Norway & - & - & - & 412 & 22 & & 78 & 214 & 3,272 \\
\hline USSR & - & - & - & - & & & - & - & - \\
\hline \multirow[t]{2}{*}{Total} & - & + & - & 412 & 23 & & 79 & 214 & 3,311 \\
\hline & 1988 & 1989 & 1990 & 1991 & 1992 & & 1993 & 1994 & 1995 \\
\hline Faroe Islands & & - & 9643 & 1,115 & 9,157 \({ }^{3}\) & & 1,068 & - & 950 \\
\hline Denmark & - & - & - & - & - & & - & - & 200 \\
\hline France & -2 & - & - & - & - & & - & 55 & - \\
\hline Germany, Fed. Rep. & 64 & 12 & + & - & - & & - & - & - \\
\hline Norway & 6,285 & 4,770 & 9,135 & 3,200 & 4,300 & & 2,100 & 4 & 11,300 \\
\hline USSR (Russia from 1992 on) & 469 & 27 & 1,298 & 172 & - & & - & 700 & 1,633 \\
\hline UK (England + Wales) & - & - & 17 & & - & & - & - & - \\
\hline \multirow[t]{2}{*}{Total} & 6,818 & 4,809 & 11,414 & 4,487 & 13,457 & & 3,168 & 759 & 14,083 \\
\hline & 1996 & 1997 & 1998 & 1999 & 2000 & & 2001 & 2002 & 2003 \\
\hline Faroe Islands & 1,598 & \(799{ }^{3}\) & \(188{ }^{3}\) & \(132^{3}\) & \(250^{3}\) & & - & - & - \\
\hline Denmark & - & - & 1,755 \({ }^{3}\) & - & & & - & - & - \\
\hline France & - & - & - & - & & & - & - & - \\
\hline Germany & - & - & - & - & & & - & - & - \\
\hline Norway & 887 & 1,170 & 234 & 2,304 & 841 & & 44 & 1,321 & 22 \\
\hline Russia & 881 & 648 & 345 & 121 & \(84^{3}\) & & 16 & 3 & 2 \\
\hline UK (England + Wales) & - & - & - & - & - & & - & - & - \\
\hline Estonia & - & - & 22 & - & - & & - & - & - \\
\hline \multirow[t]{2}{*}{Total} & 3,366 & 2,617 & 2,544 & 2,557 & 1,175 & & 60 & 1,324 & 24 \\
\hline & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & \(2010^{1}\) & 2011 & 2012 \\
\hline Faroe Islands & - & - & 3 & - & - & - & \(2923{ }^{3}\) & \(349^{4}\) & - \\
\hline Denmark & - & - & - & - & - & - & - & - & - \\
\hline France & - & - & - & - & - & - & - & - & + \\
\hline Germany & - & - & - & \(6^{4}\) & - & - & - & - & - \\
\hline Ireland & - & - & - & \(366^{4}\) & - & - & - & - & \\
\hline Netherlands & - & - & - & - & - & - & - & 1 & - \\
\hline Norway & 42 & 176 & 27 & - & 572 & 1,847 & 1,364 & 298 & 66 \\
\hline Russia & - & - & - & - & - & - & - & - & - \\
\hline UK (England + Wales) & - & - & - & - & - & - & - & - & - \\
\hline Estonia & - & - & - & - & - & - & - & - & - \\
\hline Total & 42 & 176 & 30 & 366 & 572 & 1,847 & 4,287 & 648 & 66 \\
\hline
\end{tabular}
\({ }^{1}\) Preliminary. \({ }^{2}\) Included in Subarea IV. \({ }^{3}\) Includes landings in Division Vb . \({ }^{4}\) Taken in Division Vb .

Table 9.4.12.3 Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e (Western stock). Horse mackerel landings ( t ) in the North Sea (Subarea IV and Skagerrak Division IIIa) by country (data submitted by Working Group members). Catches partly concern the North Sea horse mackerel.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1980 & 1981 & 1982 & 1983 & 1984 & 1985 & 1986 & 1987 & 1988 \\
\hline Belgium & 8 & 34 & 7 & 55 & 20 & 13 & 13 & 9 & 10 \\
\hline Denmark & 199 & 3,576 & 1,612 & 1,590 & 23,730 & 22,495 & 18,652 & 7,290 & 20,323 \\
\hline Faroe Islands & 260 & - & - & - & - & - & - & - & - \\
\hline France & 292 & 421 & 567 & 366 & 827 & 298 & \(231{ }^{2}\) & \(189{ }^{2}\) & \(784{ }^{2}\) \\
\hline Germany, Fed. Rep. & + & 139 & 30 & 52 & + & + & - & 3 & 153 \\
\hline Ireland & 1,161 & 412 & - & - & - & - & - & - & - \\
\hline Netherlands & 101 & 355 & 559 & 2,029 \({ }^{3}\) & 824 & \(160^{3}\) & \(600^{3}\) & \(850^{4}\) & 1,060 \({ }^{3}\) \\
\hline Norway \({ }^{2}\) & 119 & 2,292 & 7 & 322 & 3 & 203 & 776 & 11,728 \({ }^{4}\) & \(34,425^{4}\) \\
\hline Poland & - & - & - & 2 & 94 & - & - & - & - \\
\hline Sweden & - & - & - & - & - & - & 2 & - & - \\
\hline UK (Engl. + Wales) & 11 & 15 & 6 & 4 & - & 71 & 3 & 339 & 373 \\
\hline UK (Scotland) & - & - & - & - & 3 & 998 & 531 & 487 & 5,749 \\
\hline USSR & - & - & - & - & 489 & - & - & - & - \\
\hline Total & 2,151 & 7,253 & 2,788 & 4,420 & 25,987 & 24,238 & 20,808 & 20,895 & 62,877 \\
\hline & & & & & & & & & \\
\hline Country & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 \\
\hline Belgium & 10 & 13 & - & + & 74 & 57 & 51 & 28 & - \\
\hline Denmark & 23,329 & 20,605 & 6,982 & 7,755 & 6,120 & 3,921 & 2,432 & 1,433 & 648 \\
\hline Estonia & - & - & - & 293 & - & & 17 & - & - \\
\hline Faroe Islands & - & 942 & 340 & - & 360 & 275 & - & - & 296 \\
\hline France & 248 & 220 & 174 & 162 & 302 & & - & - & - \\
\hline Germany, Fed. Rep. & 506 & 2,469 \({ }^{5}\) & 5,995 & 2,801 & 1,570 & 1,014 & 1,600 & 7 & 7,603 \\
\hline Ireland & - & 687 & 2,657 & 2,600 & 4,086 & 415 & 220 & 1,100 & 8,152 \\
\hline Netherlands & 14,172 & 1,970 & 3,852 & 3,000 & 2,470 & 1,329 & 5,285 & 6,205 & 37,778 \\
\hline Norway & 84,161 & 117,903 & 50,000 & 96,000 & 126,800 & 94,000 & 84,747 & 14,639 & 45,314 \\
\hline Poland & - & - & - & - & - & - & - & - & - \\
\hline Sweden & - & 102 & 953 & 800 & 697 & 2,087 & - & 95 & 232 \\
\hline UK (Engl. + Wales) & 10 & 10 & 132 & 4 & 115 & 389 & 478 & 40 & 242 \\
\hline UK (N. Ireland) & - & - & 350 & - & - & & - & - & - \\
\hline UK (Scotland) & 2,093 & 458 & 7,309 & 996 & 1,059 & 7,582 & 3,650 & 2,442 & 10,511 \\
\hline USSR (Russia from 1992 on) & - & - & & & & & & & \\
\hline Unallocated + discards & \(12,482^{4}\) & \(-317^{4}\) & \(-750^{4}\) & \(-278{ }^{6}\) & -3,270 & 1,511 & -28 & 136 & -31,615 \\
\hline Total & 112,047 & 145,062 & 77,904 & 114,133 & 140,383 & 112,580 & 98,452 & 26,125 & 79,161 \\
\hline & & & & & & & & & \\
\hline Country & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & \(2006{ }^{1}\) \\
\hline Belgium & 19 & 21 & 19 & 19 & 1,004 & 5 & 4 & 6 & 3 \\
\hline Denmark & 2,048 & 8,006 & 4,409 & 2,288 & 1,393 & 3,774 & 8,735 & 4,258 & 1,343 \\
\hline Estonia & 22 & - & - & & & & & & \\
\hline Faroe Islands & 28 & 908 & 24 & - & 699 & 809 & & 35 & \\
\hline France & 379 & 60 & 49 & 48 & - & 392 & 174 & 3,876 & 2,380 \\
\hline Germany & 4,620 & 4,071 & 3,115 & 230 & 2,671 & 3,048 & 4,905 & 1,811 & 965 \\
\hline Ireland & - & 404 & 103 & 375 & 72 & 93 & 379 & 753 & 2,077 \\
\hline Lithuania & & & & & & & & & 2,354 \\
\hline Netherlands & 3,811 & 3,610 & 3,382 & 4,685 & 6,612 & 17,354 & 21,418 & 24,679 & 20,984 \\
\hline Norway & 13,129 & 44,344 & 1,246 & 7,948 & 35,368 & 20,493 & 10,709 & 24,937 & 27,200 \\
\hline Russia & - & - & 2 & - & - & - & & & \\
\hline Sweden & 3,411 & 1,957 & 1,141 & 119 & 575 & 1,074 & 665 & 239 & 491 \\
\hline UK (Engl. + Wales) & 2 & 11 & 15 & 317 & 1,191 & 1,192 & 2,552 & 1,778 & 423 \\
\hline UK (Scotland) & 3,041 & 1,658 & 3,465 & 3,161 & 255 & 1 & 1 & 22 & 314 \\
\hline Unallocated+discards & 737 & -325 & 14613 & 649 & -149 & -14,009 & -19,103 & -21,830 & -19,623 \\
\hline Total & 31,247 & 64,725 & 31583 & 19,839 & 49,691 & 34,226 & 30,435 & 40,564 & 38,911 \\
\hline
\end{tabular}

Table 9.4.12.3 cont. Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e (Western stock). Horse mackerel landings ( t ) in the North Sea (Subarea IV and Skagerrak Division IIIa) by country (data submitted by Working Group members). Catches partly concern the North Sea horse mackerel.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Country & 2007 & 2008 & 2009 & 2010 & 2011 & \(2012{ }^{1}\) \\
\hline Belgium & 5 & 2 & 4 & 12 & - & - \\
\hline Denmark & 329 & 59 & 279 & 75 & 20 & 9 \\
\hline Faroe Islands & 3 & 55 & - & 81 & - & - \\
\hline France & 457 & 943 & - & 173 & 2682 & \\
\hline Germany & 93 & 1,167 & 1,299 & 242 & - & -- \\
\hline Ireland & 652 & 1,186 & 342 & 12 & 755 & 25 \\
\hline Netherlands & 20,027 & 9,400 & 10,077 & 1,342 & 81 & 92 \\
\hline Lithuania & 98 & - & - & - & - & - \\
\hline Norway & 5.423 & 11652 & 70,745 & 11,082 & 13,409 & 3,183 \\
\hline Sweden & 130 & 45 & 660 & 2 & 90 & - \\
\hline UK (Engl. + Wales) & 2,966 & - & - & - & - & - \\
\hline UK (Scotland) & 626 & 20 & 51 & 646 & 101 & 12 \\
\hline Unallocated + discards & -14,403 & -9,151 & -5,898 & 0 & - & - \\
\hline Total & 16,407 & 15,377 & 78,595 & 13,667 & 14,725 & 3,321 \\
\hline
\end{tabular}
\({ }^{1}\) Preliminary. \({ }^{2}\) Includes Division IIa. \({ }^{3}\) Estimated from biological sampling. \({ }^{4}\) Assumed to be misreported. \({ }^{5}\) Includes 13 t from the German Democratic Republic. \({ }^{6}\) Includes negative unallocated landings of -4000 t .

Table 9.4.12.4 Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e (Western stock). Horse mackerel landings ( t ) in Subarea VI by country (data submitted by Working Group members).
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1980 & 1981 & 1982 & 1983 & 1984 & 1985 & 1986 & 1987 & 1988 \\
\hline Denmark & 734 & 341 & 2,785 & 7 & - & - & - & 769 & 1,655 \\
\hline Faroe Islands & - & - & 1,248 & - & - & 4,014 & 1,992 & 4,450 \({ }^{3}\) & 4,000 \({ }^{3}\) \\
\hline France & 45 & 454 & 4 & 10 & 14 & 13 & 12 & 20 & 10 \\
\hline Germany, Fed. Rep. & 5,550 & 10,212 & 2,113 & 4,146 & 130 & 191 & 354 & 174 & 615 \\
\hline Ireland & - & - & - & 15,086 & 13,858 & 27,102 & 28,125 & 29,743 & 27,872 \\
\hline Netherlands & 2,385 & 100 & 50 & 94 & 17,500 & 18,450 & 3,450 & 5,750 & 3,340 \\
\hline Norway & - & 5 & - & - & - & & 83 & 75 & 41 \\
\hline Spain & - & - & - & - & - & & \({ }^{2}\) & \(-^{2}\) & \({ }^{2}\) \\
\hline UK (Engl. + Wales) & 9 & 5 & + & 38 & + & 996 & 198 & 404 & 475 \\
\hline UK (N. Ireland) & & & & & & & - & - & \\
\hline UK (Scotland) & 1 & 17 & 83 & - & 214 & 1,427 & 138 & 1,027 & 7,834 \\
\hline USSR. & - & - & - & & - & - & - & - & - \\
\hline Unallocated + disc & & & & & & -19,168 & -13,897 & -7,255 & - \\
\hline Total & 8,724 & 11,134 & 6,283 & 19,381 & 31,716 & 33,025 & 20,455 & 35,157 & 45,842 \\
\hline Country & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 \\
\hline Denmark & 973 & 615 & - & 42 & & 294 & 106 & 114 & 780 \\
\hline Faroe Islands & 3,059 & 628 & 255 & - & 820 & 80 & - & - & - \\
\hline France & 2 & 17 & 4 & 3 & + & - & - & - & 52 \\
\hline Germany, Fed. Rep. & 1,162 & 2,474 & 2,500 & 6,281 & 10,023 & 1,430 & 1,368 & 943 & 229 \\
\hline Ireland & 19,493 & 15,911 & 24,766 & 32,994 & 44,802 & 65,564 & 120,124 & 87,872 & 22,474 \\
\hline Netherlands & 1,907 & 660 & 3,369 & 2,150 & 590 & 341 & 2,326 & 572 & 498 \\
\hline Norway & - & - & - & - & - & - & - & - & \\
\hline Spain & - \({ }^{2}\) & - \({ }^{2}\) & 1 & 3 & - & - & - & - & - \\
\hline UK (Engl. + Wales) & 44 & 145 & 1,229 & 577 & 144 & 109 & 208 & 612 & 56 \\
\hline UK (N.Ireland) & - & - & 1,970 & 273 & - & - & - & - & 767 \\
\hline UK (Scotland) & 1,737 & 267 & 1,640 & 86 & 4,523 & 1,760 & 789 & 2,669 & 14,452 \\
\hline USSR/Russia (1992-) & - & 44 & - & - & - & - & - & - & - \\
\hline Unallocated + disc. & 6,493 & 143 & -1,278 & -1,940 & \(-6,960^{4}\) & -51 & -41,326 & -11,523 & 837 \\
\hline Total & 34,870 & 20,904 & 34,456 & 40,469 & 53,942 & 69,527 & 83,595 & 81,259 & 40,145 \\
\hline
\end{tabular}

Table 9.4.12.4 cont. Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e (Western stock). Horse mackerel landings (t) in Subarea VI by country (data submitted by Working Group members).
\begin{tabular}{lrrrrrrrrr}
\hline Country & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 \\
\hline Denmark & - & - & - & - & - & - & - & - & - \\
Faroe Islands & - & - & - & - & - & - & - & - & - \\
France & 221 & 25,007 & - & 428 & 55 & 209 & 172 & 41 & 411 \\
Germany & 414 & 1,031 & 209 & 265 & 149 & 1,337 & 1,413 & 1,958 & 1,025 \\
Ireland & 21,608 & 31,736 & 15,843 & 20,162 & 12,341 & 20,915 & 15,702 & 12,395 & 9,780 \\
Lithuania & & & & & & & & & 2,822 \\
Netherlands & 885 & 1,139 & 687 & 600 & 450 & 847 & 3,701 & 6,039 & 1,892 \\
Spain & - & - & - & - & - & - & - & - & - \\
UK (Engl.+Wales) & 10 & 344 & 41 & 91 & - & 46 & 5 & 52 & - \\
UK (N.Ireland) & 1,132 & - & - & & & 453 & & 210 & 82 \\
UK (Scotland) & 10,447 & 4,544 & 1,839 & 3,111 & 1,192 & & 377 & 62 & 43 \\
Unallocated+disc. & 98 & 1,507 & 2,038 & -21 & 3 & -553 & 559 & 1,298 & -304 \\
\hline Total & 34,815 & 65,308 & 20,657 & 24,636 & 14,190 & 23,254 & 21,929 & 22,055 & 15,751 \\
\hline
\end{tabular}
\begin{tabular}{lrrrrrr}
\hline Country & 2007 & 2008 & 2009 & 2010 & 2011 & \(2012^{1}\) \\
\hline Denmark & - & - & - & - & 58 & 1131 \\
Faroe Islands & - & 573 & - & - & - \\
France & - & 74 & - & - & \(246^{5}\) & - \\
Germany & 1,835 & 5,097 & 635 & 773 & 6,508 & 672 \\
Ireland & 20,341 & 18,786 & 16,565 & 19,985 & 23,556 & 29,283 \\
Lithuania & 80 & 641 & - & - & - & - \\
Netherlands & 2,177 & 3,904 & 2,332 & 1,685 & 6,353 & 12,653 \\
Norway & 2 & 20 & 27 & 18 & 48 & 2 \\
Russia & - & - & - & - & - & - \\
Spain & - & - & - & - & - & - \\
UK (Engl. + Wales) & 232 & - & - & - & - & - \\
UK (Scotland) & 38 & 588 & 243 & 89 & 2,528 & 1,232 \\
Unallocated+disc. & 1,474 & \(-3,781\) & \(-2,057\) & 62 & 230 & 2 \\
\hline Total & 26,279 & 25,902 & 17,776 & 22,613 & 39,528 & 44,975 \\
\hline
\end{tabular}
\({ }^{1}\) Preliminary. \({ }^{2}\) Included in Subarea VII. \({ }^{3}\) Includes Divisions IIIa, IVa,b, and VIb. \({ }^{4}\) Includes negative unallocated landings of -7000 t .
\({ }^{5}\) French catches landed in the Netherlands.

Table 9.4.12.5 Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e (Western stock). Horse mackerel landings (t) in Subarea VII by country (data submitted by the Working Group members).
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline Country & 1980 & 1981 & 1982 & 1983 & 1984 & 1985 & 1986 & 1987 & 1988 \\
\hline Belgium & - & 1 & 1 & - & - & + & + & 2 & - \\
\hline Denmark & 5,045 & 3,099 & 877 & 993 & 732 & 1,477 \({ }^{2}\) & 30,408 \({ }^{2}\) & 27,368 & 33,202 \\
\hline France & 1,983 & 2,800 & 2,314 & 1,834 & 2,387 & 1,881 & 3,801 & 2,197 & 1,523 \\
\hline Germany, Fed.Rep. & 2,289 & 1,079 & 12 & 1,977 & 228 & - & 5 & 374 & 4,705 \\
\hline Ireland & - & 16 & - & - & 65 & 100 & 703 & 15 & 481 \\
\hline Netherlands & 23,002 & 25,000 & 27,500 \({ }^{2}\) & 34,350 & 38,700 & 33,550 & 40,750 & 69,400 & 43,560 \\
\hline Norway & 394 & - & - & - & - & - & - & - & - \\
\hline Spain & 50 & 234 & 104 & 142 & 560 & 275 & 137 & 148 & 150 \\
\hline UK (Engl. + Wales) & 12,933 & 2,520 & 2,670 & 1,230 & 279 & 1,630 & 1,824 & 1,228 & 3,759 \\
\hline UK (Scotland) & 1 & - & - & - & 1 & 1 & + & 2 & 2,873 \\
\hline USSR & - & - & - & - & - & 120 & - & - & - \\
\hline Total & 45,697 & 34,749 & 33,478 & 40,526 & 42,952 & 39,034 & 77,628 & 100,734 & 90,253 \\
\hline & & & & & & & & & \\
\hline Country & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 \\
\hline Faroe Islands & & 28 & & & & & & & \\
\hline Belgium & - & + & - & - & - & 1 & - & - & 18 \\
\hline Denmark & 34,474 & 30,594 & 28,888 & 18,984 & 16,978 & 41,605 & 28,300 & 43,330 & 60,412 \\
\hline France & 4,576 & 2,538 & 1,230 & 1,198 & 1,001 & - & - & - & 27,201 \\
\hline Germany, Fed.Rep. & 7,743 & 8,109 & 12,919 & 12,951 & 15,684 & 14,828 & 17,436 & 15,949 & 28,549 \\
\hline Ireland & 12,645 & 17,887 & 19,074 & 15,568 & 16,363 & 15,281 & 58,011 & 38,455 & 43,624 \\
\hline Netherlands & 43,582 & 111,900 & 104,107 & 109,197 & 157,110 & 92,903 & 116,126 & 114,692 & 81,464 \\
\hline Norway & - & - & - & - & - & - & - & - & - \\
\hline Spain & 14 & 16 & 113 & 106 & 54 & 29 & 25 & 33 & - \\
\hline UK (Engl. + Wales) & 4,488 & 13,371 & 6,436 & 7,870 & 6,090 & 12,418 & 31,641 & 28,605 & 17,464 \\
\hline UK (N.Ireland) & - & - & 2,026 & 1,690 & 587 & 119 & - & - & 1,093 \\
\hline UK (Scotland) & + & 139 & 1,992 & 5,008 & 3,123 & 9,015 & 10,522 & 11,241 & 7,931 \\
\hline USSR / Russia (1992-) & - & - & - & - & - & - & - & - & - \\
\hline Unallocated + discards & 28,368 & 7,614 & 24,541 & 15,563 & 4,010 \({ }^{3}\) & 14,057 & 68,644 & 26,795 & 58,718 \\
\hline Total & 135,890 & 192,196 & 201,326 & 188,135 & 221,000 & 200,256 & 330,705 & 279,100 & 326,474 \\
\hline & & & & & & & & & \\
\hline Country & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 \\
\hline Faroe Islands & - & - & 550 & - & - & - & - & 3,660 & 1,201 \\
\hline Belgium & 18 & - & - & - & 1 & - & + & + & + \\
\hline Denmark & 25,492 & 19,223 & 13,946 & 20,574 & 10,094 & 10,867 & 11,529 & 9,939 & 6,838 \\
\hline France & 24,223 & - & 20,401 & 11,049 & 6,466 & 7,199 & 8,083 & 8,469 & 7,928 \\
\hline Germany & 25,414 & 15,247 & 9,692 & 8,320 & 10,812 & 13,873 & 16,352 & 10,437 & 7,139 \\
\hline Ireland & 51,720 & 25,843 & 32,999 & 30,192 & 23,366 & 13,533 & 8,470 & 20,406 & 16,841 \\
\hline Lithuania & & & & & & & & & 3,569 \\
\hline Netherlands & 91,946 & 56,223 & 50,120 & 46,196 & 37,605 & 48.222 & 41,123 & 31,156 & 35,467 \\
\hline Spain & - & - & 50 & 7 & 0 & 1 & 27 & 12 & 60 \\
\hline UK (Engl. + Wales) & 12,832 & 8,885 & 2,972 & 8,901 & 5,525 & 4,186 & 7,178 & 4,752 & 2,935 \\
\hline UK (N.Ireland) & - & - & - & - & - & & & 217 & 142 \\
\hline UK (Scotland) & 5,095 & 4,994 & 5,152 & 1,757 & 1,461 & 268 & 1,146 & 59 & 413 \\
\hline Unallocated+discards & 12,706 & 31,239 & 1,884 & 11,046 & 2,576 & 24,897 & 18,485 & 18,368 & 19,379 \\
\hline Total & 249,446 & 161,654 & 137,766 & 138,042 & 97,906 & 123,046 & 112,393 & 107,475 & 101,912 \\
\hline
\end{tabular}

Table 9.4.12.5 cont. Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e (Western stock). Horse mackerel landings (t) in Subarea VII by country (data submitted by the Working Group members).
\begin{tabular}{lrrrrrr}
\hline Country & 2007 & 2008 & 2009 & 2010 & 2011 & \(2012^{1}\) \\
\hline Faroe Islands & 475 & 212 & - & - & - & - \\
Belgium & + & + & 1 & 24 & 2 & + \\
Denmark & 4,806 & 1,970 & 2,710 & 5,247 & 5,831 & 2,281 \\
France & 6,844 & 11,008 & - & 899 & \(7431^{2}\) & 579 \\
Germany & 3.943 & 5,700 & 14,204 & 20,404 & 14,545 & 16,391 \\
Ireland & 8,039 & 16,293 & 23,841 & 24,490 & 14,154 & 15,893 \\
Lithuania & 5,585 & 4,907 & - & - & - & - \\
Netherlands & 38,034 & 43,514 & 47,741 & 75,475 & 49,207 & 53,644 \\
Norway & - & - & - & 40 & - & - \\
Spain & - & 11 & 6 & 6 & - & 58 \\
Sweden & 55 & - & - & - & - & - \\
UK (Engl. + Wales) & 9,105 & - & - & - & 11,688 & 12,122 \\
UK (Scotland) & 738 & 476 & 1,123 & 1,723 & 299 & 91 \\
Unallocated+discards & 15,460 & 14,656 & -61 & 17,534 & - & 3039 \\
\hline Total & 93,084 & 98,746 & 89,565 & 145,839 & 103,156 & 104,098
\end{tabular}
\({ }^{1}\) Preliminary. \({ }^{2}\) Includes landings from Subarea VI.

Table 9.4.12.6 Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c,e-k, and VIIIa-e (Western stock). Horse mackerel landings (t) in Subarea VIII by country. (Data submitted by Working Group members).
\begin{tabular}{lrrrrrrrrr}
\hline Country & 1980 & 1981 & 1982 & 1983 & 1984 & 1985 & 1986 & 1987 & 1988 \\
\hline Denmark & - & - & - & - & \(-\overline{2}\) & - & 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 & - \\
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 & - & - \\
\hline Total & 37,495 & 40,073 & 22,684 & 28,223 & 25,629 & 27,740 & 45,362 & 37,703 & 34,177 \\
\hline
\end{tabular}
\begin{tabular}{lrrrrrrrrr}
\hline Country & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 \\
\hline 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 & \(-2,944\) \\
\hline Total & 38,686 & 43,496 & 46,396 & 54,186 & 53,709 & 35,500 & 28,709 & 48,269 & 40,930 \\
\hline
\end{tabular}
\begin{tabular}{lrrrrrrrrr}
\hline Country & 1998 & 1999 & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 \\
\hline Denmark & 1,728 & 4,818 & 2,584 & 582 & - & - & & - & 1,513 \\
France & 1,844 & 74 & 7 & 5,316 & 13,676 & - & 2,161 & 3,540 & 3,944 \\
Germany & 3,268 & 3,197 & 3,760 & 3,645 & 2,249 & 4,908 & 72 & 4,776 & 3,325 \\
Ireland & - & - & 6,485 & 1,483 & 704 & 504 & 1,882 & 1,808 & 158 \\
Lithuania & & & & & & & & & 401 \\
Netherlands & 6,604 & 22,479 & 11,768 & 36,106 & 12,538 & 1,314 & 1,047 & 6,607 & 6,073 \\
Russia & - & - & - & - & - & 6,620 & & & - \\
Spain & 23,599 & 24,190 & 24,154 & 23,531 & 22,110 & 24,598 & 16,245 & 16,624 & 13,874 \\
UK (Engl. + Wales) & 9 & 29 & 112 & 1,092 & 157 & 982 & 516 & 838 & 821 \\
UK (Scotland) & - & - & 249 & - & \(-\overline{7}\) & - & & - & - \\
Unallocated+discards & 1,884 & -8658 & 5,093 & 4,365 & 1,705 & 2,785 & 2,202 & 7,302 & 4,013 \\
\hline Total & 38,936 & 46,129 & 54,212 & 76,120 & 54,560 & 41,711 & 24,125 & 41,495 & 34,122 \\
\hline
\end{tabular}
\begin{tabular}{lrrrrrr}
\hline Country & 2007 & 2008 & 2009 & 2010 & 2011 & \(2012^{1}\) \\
\hline Denmark & 2,687 & 3,289 & 3,109 & 632 & 200 & 581 \\
France & 10,741 & 2,848 & - & - & \(326^{3}\) & 1216 \\
Germany & - & 918 & 281 & 64 & 61 & - \\
Ireland & 69 & 246 & - & - & - & 39 \\
Lithuania & - & - & - & - & - & - \\
Netherland & - & 6,269 & 1,849 & 97 & 49 & 7 \\
Russia & - & - & - & - & - & - \\
Spain & 13,853 & 19,840 & 21,071 & 38,740 & 34,581 & 13,502 \\
UK (Engl. + Wales) & - & - & - & - & 28 & \\
UK (Scotland) & - & - & - & - & - & - \\
Unallocated+discards & 412 & 482 & 7,045 & 3,694 & & 2057 \\
\hline Total & 28,387 & 33,892 & 33,355 & 43,227 & 35,245 & 17,402 \\
\hline
\end{tabular}

\footnotetext{
\({ }^{1}\) Preliminary. \({ }^{2}\) Included in Subarea VII. \({ }^{3}\) French landings landed in the Netherlands.
}

Table 9.4.12.7 Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c, e-k, and VIIIa-e (Western stock). National catches of the Western horse mackerel stock (in tonnes).


Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c, e-k, and VIIIa-e (Western stock). Time-series of egg production estimates ( \(10^{-12} \mathrm{eggs}\) ).
\begin{tabular}{cc}
\hline Year & Total egg production \\
\hline 1983 & 513 \\
1989 & 1762 \\
1992 & 1712 \\
1995 & 1265 \\
1998 & 1136 \\
2001 & 821 \\
2004 & 889 \\
2007 & 1640 \\
2010 & 1093 \\
2013 & 395 \\
\hline
\end{tabular}

Table 9.4.12.9 Horse mackerel (Trachurus trachurus) in Divisions IIa, IVa, Vb, VIa, VIIa-c, e-k, and VIIIa-e (Western stock). Summary of stock assessment.
\begin{tabular}{r|rrrrrrrr}
\hline & \begin{tabular}{r}
R (age 0) \\
(thousands)
\end{tabular} & \begin{tabular}{r} 
SSB \\
(tons)
\end{tabular} & \begin{tabular}{r} 
TSB \\
(tons)
\end{tabular} & \begin{tabular}{r} 
Catch \\
(tons)
\end{tabular} & Yield/SSB & \(F(1-3)\) & \(F(4-8)\) & \(F(1-10)\) \\
\hline 1982 & 68205100 & 1757500 & 2026211 & 61197 & 0.035 & 0.018 & 0.030 & 0.024 \\
1983 & 523432 & 1718920 & 1976636 & 90442 & 0.053 & 0.008 & 0.086 & 0.067 \\
1984 & 1533880 & 1553030 & 4044381 & 96744 & 0.062 & 0.004 & 0.091 & 0.068 \\
1985 & 2764570 & 2540690 & 4901736 & 103843 & 0.041 & 0.010 & 0.044 & 0.035 \\
1986 & 3895300 & 3245300 & 5155557 & 145999 & 0.045 & 0.002 & 0.059 & 0.054 \\
1987 & 5204280 & 3816590 & 5086453 & 187338 & 0.049 & 0.000 & 0.036 & 0.032 \\
1988 & 2000750 & 4334570 & 4986941 & 214729 & 0.050 & 0.003 & 0.049 & 0.039 \\
1989 & 2116470 & 3969210 & 4751200 & 296037 & 0.075 & 0.003 & 0.045 & 0.047 \\
1990 & 1847750 & 3376680 & 4132867 & 398645 & 0.118 & 0.031 & 0.066 & 0.085 \\
1991 & 3376740 & 3206120 & 3913068 & 357288 & 0.111 & 0.036 & 0.120 & 0.101 \\
1992 & 6218310 & 2628280 & 3182140 & 394793 & 0.150 & 0.064 & 0.083 & 0.117 \\
1993 & 7394680 & 2452960 & 3027730 & 458628 & 0.187 & 0.028 & 0.142 & 0.105 \\
1994 & 7765340 & 2070370 & 2744053 & 413022 & 0.199 & 0.109 & 0.120 & 0.120 \\
1995 & 4541700 & 1593980 & 2368836 & 538131 & 0.338 & 0.096 & 0.189 & 0.178 \\
1996 & 2512130 & 1452310 & 2293398 & 420942 & 0.290 & 0.130 & 0.113 & 0.129 \\
1997 & 2165440 & 1250850 & 2094639 & 471700 & 0.377 & 0.143 & 0.272 & 0.280 \\
1998 & 3696410 & 1050380 & 1611378 & 326443 & 0.311 & 0.139 & 0.202 & 0.236 \\
1999 & 4474880 & 1002470 & 1463947 & 298076 & 0.297 & 0.083 & 0.237 & 0.262 \\
2000 & 4649920 & 936161 & 1332253 & 196911 & 0.210 & 0.042 & 0.157 & 0.154 \\
2001 & 19221600 & 654540 & 1137827 & 212090 & 0.324 & 0.061 & 0.190 & 0.176 \\
2002 & 4045760 & 803772 & 1354238 & 194292 & 0.242 & 0.047 & 0.133 & 0.120 \\
2003 & 2954300 & 897376 & 1988895 & 190183 & 0.212 & 0.071 & 0.101 & 0.105 \\
2004 & 1526300 & 1104180 & 2322130 & 157627 & 0.143 & 0.051 & 0.079 & 0.085 \\
2005 & 963118 & 1588190 & 2402837 & 181994 & 0.115 & 0.106 & 0.077 & 0.092 \\
2006 & 750974 & 1608280 & 2061751 & 155094 & 0.096 & 0.045 & 0.055 & 0.055 \\
2007 & 1099860 & 1490340 & 1796163 & 123408 & 0.083 & 0.057 & 0.053 & 0.053 \\
2008 & 1916170 & 1621390 & 1907317 & 143106 & 0.088 & 0.071 & 0.067 & 0.066 \\
2009 & 796954 & 1721220 & 2028638 & 183400 & 0.107 & 0.088 & 0.084 & 0.082 \\
2010 & 267717 & 1393710 & 1742984 & 218143 & 0.157 & 0.146 & 0.137 & 0.136 \\
2011 & 329094 & 1256400 & 1551752 & 199593 & 0.159 & 0.155 & 0.146 & 0.144 \\
2012 & 22983521 & 1058800 & 1272916 & 173141 & 0.164 & 0.207 & 0.195 & 0.193 \\
2013 & & 835853 & & & & & & \\
\hline
\end{tabular}

\footnotetext{
Note: the final estimate of SSB assumes the same F-at-age as in the preceding year.
}
\({ }^{1} \mathrm{R}(\) age 0\()\) in 2011 and 2012 is the geometric mean of the time-series 1983 to 2010.

\subsection*{9.4.12.1 Annex}

Extract from the plan agreed by the Executive Committee of the Pelagic RAC on the 13 July for submission to the European Commission.

\section*{1. General provisions}

The parties agree on a management plan for the western horse mackerel stock, with the following general provisions:
- The plan provides for conditions for sustainable long term yield for the stock.
- The plan provides for achievement of acceptable year to year stability in the TAC.
- A unified management regime across all areas where the stock is distributed.
- That there are not additional catches to those covered by the TAC.
- The industry agrees to partake in studies to demonstrate that there are no additional catches above the level of the TAC.
- Productivity of the stock assumed to reflect the conditions of the period 1982 to 2005. However, the plan was tested under conditions where no strong year classes of the magnitude of the 1982 year class occur.
- That the TAC is set on a triennial basis on egg abundance from the most recent three surveys.
- Target fisheries will proceed with minimum ecological impact. The industry undertakes to partake in studies to quantify the levels of the non-target by-catch.
2. Normal decision rule

For 2008 and subsequent years the TAC will be set according to the following rules:
1. The TAC will be set for 3 years following the years of the most recent survey.
2. The TAC will be fixed at the set level for a period of 3 years.
3. In the event of the TAC being overshooting in any year in the fixed period, the overshoot (as estimated by ICES) will be subtracted from the following years TAC. This needs to be tested by simulation
4. In the event of a survey results not being available, ICES will asked to advise on the state of the stock and the exploitation boundaries with the Precautionary Approach.
5. The TAC will be set according to the following rule:
\[
T A C_{y+1 \text { to } y+3}=1.07\left[\frac{T A C_{r e f}}{2}+\frac{T A C_{y-2 \text { to } y} s l}{2}\right]
\]

Where \(y\) is the year an egg survey becomes available, \(T A C_{r e f}=150,000 t\) and sl is a function of the slope of the most recent egg abundance estimates from surveys.

Arrangements for reviewing the decision rules.
The plan will be reviewed and re-evaluated in 2009 and on the three yearly intervals thereafter to ensure that:
1. \(\operatorname{SSB}\) has been maintained above \(\operatorname{SSB}_{1982}\).
2. That the uncertainties and bias in the fishery and biological system remain within the bounds of those tested, and that the assumptions made in the simulation testing phase are still valid.

If either of the above has been violated the plan will be modified to adapt the decision rule to make it consistent with the Precautionary Approach.
3. Special conditions to apply in times of high stock productivity

If a recruitment event is the same or greater than that which occurred in 1982, as determined by ICES, the following will apply:
- The detection of the recruitment event will be established no sooner than 4 years after its occurrence.
- The level of the recruitment will be established based on ICES interpretation of the most valid assessment.
- After verification of such an event, by ICES, the decision rule will be adapted for as long as that year class contributes to the stock and the fisheries. ICES is asked to develop a metric to determine the duration this period of elevated productivity. Such metric would identify when the terms of the normal decisions rule above will be reverted to.

\section*{North Sea Horse Mackerel}
(Division IIIa (eastern part), Divisions IVb,c and VIId)

\author{
For latest information, see: http://www.ices.dk
}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advice for this stock remains unchanged from last year. That advice was that catches should be no more \(25,500 \mathrm{t}\) and that the advice should remain in place for 3 years. FEAS agrees with this advice and the multi-annual approach.

North Sea Horse Mackerel is an ICES Category 5 stock. New information on the stock this year does not change the perception of last year.

FEAS agrees with the ICES advice that catches in 2014 should be no more than \(\mathbf{2 5 , 5 0 0} \mathbf{t}\). This is expected to lead to an Irish quota of 763 t . FEAS further notes that catches are consistently below the TAC.


Red Boxes-TAC/Management Areas Blue Shading- Assessment Area Purple Shading - Quarters 1 \& 2

\section*{CURRENT MANAGEMENT}
- The stock distribution area is Divisions IIIa, IVb,c, VIId and IVa in quarters I \& 2 .
- There is no management plan for the fishery.
- The agreed TAC applies to EU waters in Division IVb,c and VIId. There is no TAC covering Norwegian waters or the small EU fisheries in Illa.
- The agreed TAC for 2013 in Division IVb,c and VIId was \(37,950 \mathrm{t}\), of which the EU TAC was \(34,400 \mathrm{t}\) and Irish quota was \(1,029 \mathrm{t}\).

-IRE 1029 t - BEL 38 t -DEN 16367 t -GER 1445 t -FRA 1358 t - NL 9854 t -UK 3895 t - SPA 304 t -POR 35 t - SWE 75 t

\section*{ICES ADVICE 6.4.19 North Sea horse mackerel (Trachurus trachurus) Divisions IIIa, IVb,c, and VIId (North Sea stock)}

\section*{Advice for 2014}

New data on survey indices available for this stock do not change the perception of the stock; therefore, the advice for this fishery in 2014 is the same as the advice for 2013 (see ICES, 2012): Based on the ICES approach to datalimited stocks, ICES advises that landings should be no more than 25500 t . Discards are known to take place but cannot be quantified; therefore total catches cannot be calculated.

\section*{Stock status}


Figure 6.4.10.1 Horse mackerel in Divisions IIIa, IVb,c, and VIId (North Sea stock). Left: Landings from Divisions IIIa and IVa (quarters 1 and 2), IVb,c, and VIId (all quarters) (thousand tonnes). Right: Relative biomass index of fish \(\geq 20 \mathrm{~cm}\) long (quarter 3 IBTS).

The available information, while broadly informative, is insufficient to evaluate recent stock trends and exploitation status. Therefore, the state of the horse mackerel in the North Sea is unknown. Landings in recent years (2010-2012) have been around 25 kt .

\section*{Management plans}

No specific management objectives are known to ICES.

\section*{The fisheries}

Catches by the Danish industrial fleet for reduction into fishmeal and fish oil formed the majority of North Sea horse mackerel catches throughout the 1970s and 1980s. Catches were taken in the fourth quarter, mainly in Divisions IVb and VIId. The 1990s saw a drop in the value of industrial resources, limited fishing opportunities, and steep increases in fuel costs. In 2001, an individual quota scheme was introduced in Denmark, which resulted in a rapid restructuring of the fleet. Since then the fleet size has been radically reduced and now numbers less than \(20 \%\) that in the 1980s; additionally, Danish North Sea horse mackerel catches have diminished. Since the 1990s, a larger portion of catches has been taken in a directed horse mackerel fishery for human consumption by the Dutch and German freezer-trawler fleet. Denmark has traded a limited part of its quota with other EU member states for fishing opportunities for other species. However, since only a limited amount of quota is made available to other countries the TAC has been consistently underutilized in recent years (approximately \(50 \%\) in 2010-2012).

\section*{Catch by fleet Total landings (2012) \(=21426\) tonnes (mainly mid-water trawl); discards are only partly} quantified.

\section*{Quality considerations}

The survey index which provides information on the development of the stock and its response to the fishery was available for the first time this year. The survey index has not been used as the basis for advice under the datalimited stocks (DLS) category 3, because the lack of measures of uncertainty limits interpretation of annual changes of this index.

The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished.

\section*{Scientific basis}
\begin{tabular}{ll} 
Assessment type & \begin{tabular}{l} 
Data-limited stocks, category 5.2.0. \\
Commercial landings (international landings, ages and length frequencies from catch \\
Input data
\end{tabular} \\
\begin{tabular}{l} 
sampling), one survey index (IBTS Q3).
\end{tabular} \\
Discards and bycatch & \begin{tabular}{l} 
Discards are known to occur. Some discard data available from the Netherlands and \\
Germany.
\end{tabular} \\
Indicators & None. \\
Other information & None. \\
Working group report & WGWIDE (ICES, 2013).
\end{tabular}

\section*{ECOREGION North Sea \\ STOCK Horse mackerel (Trachurus trachurus) in Divisions IIIa, IVb,c, and VIId (North Sea stock)}

\section*{Reference points}

No reference points are defined for this stock.
Outlook for 2014
No quantitative assessment can be presented for this stock. Therefore, fishing possibilities cannot be projected.

\section*{ICES approach to data-limited stocks}

The survey index, which provides information on the development of the stock and its response to the fishery, was available for the first time this year. The survey index has not been used as the basis for advice under DLS category 3 , because the lack of measures of uncertainty limits interpretation of annual changes of this index. This implies that the information available does not significantly alter the perception of the stock from last year, and therefore the advice from 2012 which was to be applied for three years is still relevant.

Advice relates to landings. Discards are known to take place but cannot be quantified, therefore total catches cannot be calculated.

\section*{Additional considerations}

The new information presented this year in the form of an exploitable biomass index was developed based on a new definition of an index area coinciding with the distribution area of the stock at the time of the IBTS Q3 survey being conducted. Further work on utilization of the developed index in developing an assessment model and TAC setting based on a HCR is planned. Additional data collection to this purpose is planned in cooperation with the industry. The aim is to improve the assessment of this stock to category 1 within 3-5 years.

\section*{Comparison with previous assessment and advice}

Last year's advice was based on average catches adjusted by the PA buffer. This year a new biomass index was available, which is considered more reliable than previously available indices. However, this year's information does not significantly alter the perception of the state of the stock given the uncertainties and therefore last year's advice still applies.

\section*{Assessment and management area}

Since 2010, the EU TAC for the North Sea area has included Divisions IVb,c and VIId. In the past, Division VIId was not considered in the North Sea TAC regulation area. The assessment area of North Sea horse mackerel also includes catches from Division IVa during the first two quarters of the year. The TAC for Division IVa is included in a different management area together with Divisions IIa, VIIa-c, VIIe-k, VIIIa, VIIIb, VIIId, VIIIe, Subarea VI, EU and international waters of Division Vb, and international waters of Subareas XII and XIV. There is no TAC for Division IIIa.

\section*{Source}

ICES. 2012. Report of the Working Group on Widely Distributed Stocks (WGWIDE), 21-27 August 2012. ICES CM 2012/ACOM:16.
ICES. 2013. Report of the Working Group on Widely Distributed Stocks (WGWIDE), 27 August-02 September 2013. ICES CM 2013/ACOM:15.


Figure 6.4.10.3
Horse mackerel in Divisions IIIa, IVb,c, and VIId (North Sea stock). Age distribution in the catches of North Sea horse mackerel 1995-2011.

Table 6.4.10.1 Horse mackerel in Divisions IIIa, IVb,c, and VIId (North Sea stock). ICES advice, management, and landings.
\begin{tabular}{llccc}
\hline Year & ICES & \begin{tabular}{c} 
Predicted catch \\
corresp. to advice
\end{tabular} & \begin{tabular}{c} 
Agreed \(^{4}\) \\
TAC
\end{tabular} & \begin{tabular}{l} 
ICES \\
landings \(^{2}\)
\end{tabular} \\
\hline 1987 & Not assessed & - & \(30^{1}\) & 12 \\
1988 & No advice & - & \(50^{1}\) & 24 \\
1989 & No advice & - & \(45^{1}\) & 33 \\
1990 & No advice & - & \(40^{1}\) & 19 \\
1991 & No advice & - & \(45^{1}\) & 12 \\
1992 & No advice & - & \(55^{1}\) & 15 \\
1993 & No advice & - & \(60^{1}\) & 14 \\
1994 & No advice & - & \(60^{1}\) & 14 \\
1995 & No advice & - & \(60^{1}\) & 6 \\
1996 & No advice & - & \(60^{1}\) & 17 \\
1997 & No advice & - & \(60^{1}\) & 19 \\
1998 & Develop and implement management plan & - & \(60^{1}\) & 20 \\
1999 & Develop and implement management plan & - & \(60^{1}\) & 31 \\
2000 & Develop and implement management plan & - & \(51^{1}\) & 37 \\
2001 & No increase in catch & - & \(51^{1}\) & 48 \\
2002 & No increase in catch from 1982-1997 average & \(<18\) & \(58^{1}\) & 46 \\
2003 & No increase in catch from 1982-1997 average & \(<18\) & \(50^{1}\) & 23 \\
2004 & No increase in catch from 1982-1997 & \(<18\) & \(42^{1}\) & 32 \\
2005 & No increase in catch from 1982-1997 & \(<18\) & \(43^{1}\) & 35 \\
2006 & No increase in catch from 1982-1997 & \(<18\) & \(43^{1}\) & 29 \\
2007 & No increase in catch from 1982-1997 & \(<18\) & \(43^{1}\) & 36 \\
2008 & No increase in catch from 1982-1997 & \(<18\) & \(39^{1}\) & 41 \\
2009 & Same advice as last year & \(<18\) & \(39^{1}\) & 36 \\
2010 & Same advice as last year & \(<18\) & \(47^{3}\) & 45 \\
2011 & No advice & - & \(40^{3}\) & 24 \\
2012 & Reduce catches & - & \(34^{3}\) & 29 \\
2013 & Reduce catches by 20\% & \(<25.5\) & 23 \\
2014 & Same advice as last year & & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1}\) Division IIa and Subarea IV (EU waters only).
\({ }^{2}\) Catch of North Sea stock (Divisions IVa (quarters 1-2), IIIa (except western part in quarters 3-4), IVb,c, and VIId).
\({ }^{3}\) Divisions IVb,c and VIId.
\({ }^{4}\) Applies to EU waters only.
}

Table 6.4.10.2 Horse mackerel in Divisions IIIa, IVb,c, and VIId (North Sea stock). Landings and discards (t) by Division.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Year & IIIa & IVa & IVb,c & Discards & VIId & Total \\
\hline 1982 & \(2788^{1}\) & & - & & 1247 & 4035 \\
\hline 1983 & \(4420^{1}\) & & - & & 3600 & 8020 \\
\hline 1984 & \(25893{ }^{1}\) & & - & & 3585 & 29478 \\
\hline 1985 & - & & 22897 & & 2715 & 26750 \\
\hline 1986 & - & & 19496 & & 4756 & 24648 \\
\hline 1987 & 1138 & & 9477 & & 1721 & 11634 \\
\hline 1988 & 396 & & 18290 & & 3120 & 23671 \\
\hline 1989 & 436 & & 25830 & & 6522 & 33265 \\
\hline 1990 & 2261 & & 17437 & & 1325 & 18762 \\
\hline 1991 & 913 & & 11400 & & 600 & 12000 \\
\hline 1992 & & & 13955 & 400 & 688 & 15043 \\
\hline 1993 & & & 3895 & 930 & 8792 & 13617 \\
\hline 1994 & & & 2496 & 630 & 2503 & 5689 \\
\hline 1995 & 112 & & 7948 & 30 & 8666 & 16756 \\
\hline 1996 & 1657 & & 7558 & 212 & 9416 & 18843 \\
\hline 1997 & & & 14078 & 10 & 5452 & 19540 \\
\hline 1998 & 3693 & & 10530 & 83 & 16194 & 30500 \\
\hline 1999 & & & 9335 & & 27889 & 37224 \\
\hline 2000 & & & 25954 & & 22471 & 48425 \\
\hline 2001 & 85 & 69 & 8157 & & 38114 & 46356 \\
\hline 2002 & & & 12636 & 20 & 10723 & 23379 \\
\hline 2003 & 48 & 623 & 10309 & & 21098 & 32078 \\
\hline 2004 & 351 & & 18348 & & 16455 & 35154 \\
\hline 2005 & 357 & & 13892 & 62 & 15460 & 29711 \\
\hline 2006 & 1099 & 2661 & 7998 & 78 & 23790 & 35626 \\
\hline 2007 & 63 & 2056 & 9118 & 139 & 29788 & 41164 \\
\hline 2008 & 27 & 1003 & 2330 & & 31389 & 34749 \\
\hline 2009 & 38 & 72 & 18711 & 1036 & 24366 & 44223 \\
\hline 2010 & \(<1\) & 100 & 1965 & 2 & 20188 & 22255 \\
\hline 2011 & 0 & & 10458 & & 18886 & 29344 \\
\hline 2012 & 1 & 4056 & 2596 & & 14722 & 21375 \\
\hline
\end{tabular}

\footnotetext{
\({ }^{1}\) Divisions IIIa and IVb,c combined.
}
\begin{tabular}{|r|r|r|}
\hline & \multicolumn{1}{|c|}{\begin{tabular}{r} 
Fishable \\
Biomass \(20 \mathrm{~cm}+\)
\end{tabular}} & \multicolumn{1}{l}{ Relative Index } \\
\hline 1995 & 12016183.87 & 0.154327817 \\
\hline 1996 & 11587486.14 & 0.148821911 \\
\hline 1997 & 4050763.77 & 0.052025297 \\
\hline 1998 & 3071869.49 & 0.039453034 \\
1999 & 3020550.37 & 0.038793926 \\
\hline 2000 & 8858869.43 & 0.113777385 \\
\hline 2001 & 6029482.32 & 0.077438632 \\
\hline 2002 & 6833491.88 & 0.087764793 \\
\hline 2003 & 3264509.43 & 0.041927172 \\
\hline 2004 & 2631894.20 & 0.033802286 \\
\hline 2005 & 3860080.12 & 0.049576284 \\
\hline 2006 & 3007696.15 & 0.038628835 \\
\hline 2007 & 564070.50 & 0.007244544 \\
\hline 2008 & 2155096.97 & 0.027678622 \\
\hline 2009 & 755114.01 & 0.009698179 \\
\hline 2010 & 1559471.94 & 0.020028813 \\
\hline 2011 & 1273166.02 & 0.016351692 \\
\hline 2012 & 3321629.15 & 0.04266078 \\
\hline SUM & 77861425.74 & \\
\hline
\end{tabular}

\section*{Blue Whiting}
(Sub-areas I-IX, XII and XIV)

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

FEAS agrees with ICES that following the management plan, agreed by Norway, the EU, the Faroe Islands, and Iceland, implies that landings in 2014 should be no more than \(948,950 \mathrm{t}\).

This stock falls into ICES Category I and its assessment was benchmarked in 2012. The SSB has almost doubled from 2010 to 2013 and is well above \(B_{p a}\). This increase is due to the lowest Fs in the time series in 201I and 2012, in combination with increased recruitment since 2010. The EU TAC and subsequently the Irish quota may be adjusted subject to transfers in the EU Norway agreement.

FEAS notes that the management plan reacts directly to fluctuations in estimates of stock biomass and does not include constraints in TAC change.

\section*{CURRENT MANAGEMENT}

2013 EU Quota Allocations
- In 2005, the coastal states (EU, Norway, Iceland and Faroe Islands) agreed a sharing arrangement for the blue whiting stock with catches allocated as follows: EU 30.5\%, Faroe Islands 26.125\%, Norway 25.745\% and Iceland 17.63\%. Russia is accommodated by transfers from the Faroe Islands and additional catches in the NEAFC regulatory area.
- Ireland has a share of the EU quota, in Sub-areas I-VII, VIIIa, VIIIb, VIIId, VIIIe, XII and XIV. In 2013 this EU share was I \(16,032 \mathrm{t}\) and the Irish quota was \(13,718 \mathrm{t}\).
- Separate EU quotas exist for VIIIc, IX and X, and for Norwegian and Faroese waters. There are no Irish quotas in these areas.
in EC \& International Waters

-IRE 13718 t
CDEN 17715 t
-GER 6888 t
-FRA 12328 t
■NL21601 t
-UK 22987 t
\(\square\) SPA 15018 t
-POR 1395 t
aSWE4382 t
- The Russian NEAFC quota was reduced annually and was phased out entirely by 2012.
- The EU TAC may be adjusted subject to transfers in the EU Norway agreement.
- The current management plan (agreed in 2008) does not have a constraint on TAC fluctuation. The 2014 advice represents a \(48 \%\) increase in TAC.

\section*{ICES ADVICE 9.4.5 Blue Whiting Combined Stock (Subareas I-IX, XII, and XIV)}

\section*{Advice for 2014}

ICES advises on the basis of the management plan agreed by Norway, the EU, the Faroe Islands, and Iceland that landings in 2014 should be no more than 948950 tonnes. All catches are assumed to be landed.

\section*{Stock status}






Figure 9.4.5.1
Blue whiting in Subareas I-IX, XII, and XIV. Summary of stock assessment.
SSB has almost doubled from 2010 ( 2.9 million tonnes) to 2013 ( 5.5 million tonnes) and is well above \(\mathrm{B}_{\mathrm{pa}}\) ( 2.25 million tonnes). This increase is due to the lowest Fs in the time-series in 2011 and 2012, in combination with increased recruitment since 2010.

\section*{Management plans}

A management plan (Section 9.4.5.1 Annex) was agreed by Norway, the EU, the Faroe Islands, and Iceland in 2008. The plan uses i) a target fishing mortality ( \(\mathrm{F}=0.18\) ) if \(\operatorname{SSB}\) is above \(\operatorname{SSB}_{\mathrm{MP}}\left(=\mathrm{B}_{\mathrm{pa}}\right)\), ii) a linear reduction to \(\mathrm{F}=0.05\) if SSB is between \(\mathrm{B}_{\mathrm{pa}}\) and \(\mathrm{B}_{\mathrm{lim}}\), and iii) \(\mathrm{F}=0.05\) if SSB is below \(\mathrm{B}_{\text {lim }}\). ICES evaluated the plan in 2008 and concluded that it is in accordance with the precautionary approach (PA; ICES, 2008). ICES evaluated a NEAFC request concerning an alternative management plan in May 2013 (ICES, 2013a) and further in October 2013 (ICES, 2013b).

\section*{Biology}

Blue whiting is widely distributed in the eastern part of the North Atlantic from Norway to the south of Portugal, with the highest concentrations along the edge of the continental shelf between 300 and 600 m . Most spawning takes place along the shelf edge and on banks west of the British Isles. Juveniles are also widely distributed, including in the Bay of Biscay and Iberian waters, with the main nursery area believed to be in the Norwegian Sea.

\section*{Environmental influence on the stock}

The position and strength of the North Atlantic subpolar gyre (SPG) appears to influence the spawning distribution of blue whiting (Hátún et al., 2009). The strong gyre constrains spawning distribution. This gyre may influence recruitment success through food availability and/or predation levels (Payne et al., 2012). However, these mechanisms are not fully understood and are being explored further.

\section*{The fishery}

The main fisheries on blue whiting in 2012 were conducted west of Scotland, around the Porcupine Bank, and south of the Faroe Islands. Most blue whiting catches occurred in the first half of the year. Catches have become increasingly used for human consumption rather than industrial purposes.

Catch distribution Total landings (2012) = 384 kt (mainly pelagic trawl). Discards are considered negligible.

\section*{Effects of the fisheries on the ecosystem}

Blue whiting feed on zooplankton and small fish in the same areas as herring and mackerel, but at greater depth.

\section*{Quality considerations}

The principal survey for the adult part of this stock conducted in 2013 had high quality coverage of the survey area in space and time and is considered to have provided good quality data. Incoming recruitment is poorly estimated due to a lack of juvenile indices suitable for inclusion in the assessment model. The new modelling framework used is likely to result in more stable assessments than in previous years.


Figure 9.4.5.2
Blue whiting in Subareas I-IX, XII, and XIV. Historical assessment results. Horizontal lines represent reference points.

\section*{Scientific basis}
\(\left.\begin{array}{ll}\text { Assessment type } & \begin{array}{l}\text { Age-based analytical (SAM). } \\
\text { Commercial catches from international landings, ages and length frequencies from } \\
\text { catch sampling. }\end{array} \\
& \begin{array}{l}\text { One survey index (International blue whiting spawning stock survey (IBWSS) 2004- } \\
\text { 2013, excluding 2010). }\end{array} \\
& \text { No commercial indices. } \\
\text { Annual maturity data from fixed values, estimated in 1994 by combining maturity } \\
\text { ogives from the southern and northern areas. } \\
& \text { Natural mortalities fixed at 0.2, derived in the 1980s from age compositions before the } \\
\text { industrial fishery started. }\end{array}\right]\)\begin{tabular}{l} 
Discards are not included and assumed negligible. \\
Discards and bycatch \\
Indicators \\
Not used. \\
Other information \\
Working group report
\end{tabular} \begin{tabular}{l} 
The stock was benchmarked in February 2012 (ICES, 2012b). \\
\end{tabular}

\section*{ECOREGION Widely distributed and migratory stocks \\ STOCK}

\section*{Reference points}
\begin{tabular}{|c|c|c|c|}
\hline & Type & Value & Technical basis \\
\hline \multirow[t]{2}{*}{Management plan} & \(\mathrm{SSB}_{\mathrm{MP}}\) & 2.25 million t & \(\mathrm{B}_{\mathrm{pa}}\) \\
\hline & \(\mathrm{F}_{\text {MP }}\) & 0.18 & Management strategy evaluation conducted in 2008 (Anon., 2008; ICES, 2008). \\
\hline \multirow[t]{3}{*}{MSY approach} & MSY \(\mathrm{B}_{\text {trigger }}\) & 2.25 million t & \(\mathrm{B}_{\mathrm{pa}}\) (ICES, 2013a). \\
\hline & \(\mathrm{F}_{0.1}\) & 0.22 & Yield per recruit (ICES, 2013a, 2013c). \\
\hline & \(\mathrm{F}_{\text {MSY }}\) & 0.30 & Simulations in 2013 (ICES, 2013a). \\
\hline \multirow[t]{4}{*}{Precautionary approach} & \(\mathrm{B}_{\mathrm{lim}}\) & 1.50 million t & Approximately \(\mathrm{B}_{\text {loss }}\) (confirmed by ICES, 2013a). \\
\hline & \(\mathrm{B}_{\mathrm{pa}}\) & 2.25 million t & \(\mathrm{B}_{\mathrm{lim}} \exp (1.645 \times \sigma)\), with \(\sigma=0.25\). \\
\hline & \(\mathrm{F}_{\text {lim }}\) & 0.48 & Equilibrium stochastic simulations (ICES, 2013a). \\
\hline & \(\mathrm{F}_{\mathrm{pa}}\) & 0.32 & Based on \(\mathrm{F}_{\text {lim }}\) and assessment uncertainties (ICES, 2013a). \\
\hline
\end{tabular}
(unchanged since: 2013)
\(\mathrm{F}_{\text {MSY }}=0.30\) gives a high yield and a low risk of \(\mathrm{SSB}<\mathrm{B}_{\text {lim }}\).

\section*{Outlook for 2014}

Basis: \(\mathrm{F}(2013)=0.14\) (catch constraint \(=643=\mathrm{TAC}) . \mathrm{SSB}(2014)=6715 . \mathrm{R}(2013), \mathrm{R}(2014)\), and \(\mathrm{R}(2015)=\mathrm{GM}(1981-\) \(2010)=13463\) million at age 1 .
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Rationale & \[
\begin{aligned}
& \text { Catch } \\
& (2014)
\end{aligned}
\] & Basis & \[
\begin{gathered}
F \\
2014
\end{gathered}
\] & \[
\underset{(2015)}{\text { SSB }}
\] & \[
\begin{gathered}
\text { \% SSB } \\
\text { change }^{1)}
\end{gathered}
\] & \[
\begin{gathered}
\text { \% TAC } \\
\text { change }
\end{gathered}
\] \\
\hline Management plan & 948.950 & \[
\begin{gathered}
\mathrm{F}=0.18 \text { for } \\
\operatorname{SSB}(2014)>2250 \\
\hline
\end{gathered}
\] & 0.18 & 6958 & 4 & 48 \\
\hline NEAFC request & 1140 & Management plan,
\[
\mathrm{F}=0.22
\] & 0.22 & 6767 & 1 & 77 \\
\hline NEAFC request & 1279 & Management plan,
\[
\mathrm{F}=0.25
\] & 0.25 & 6635 & -1 & 99 \\
\hline NEAFC request & 1502 & Management plan,
\[
\mathrm{F}=0.30
\] & 0.30 & 6422 & -4 & 134 \\
\hline MSY framework & 1502 & \(\mathrm{F}_{\mathrm{MSY}}=0.30\) & 0.30 & 6422 & -4 & 134 \\
\hline \(\mathrm{F}_{\mathrm{pa}} 0.32\) & 1588 & \(\mathrm{F}_{\mathrm{pa}}\) & 0.32 & 6333 & -6 & 144 \\
\hline \(\mathrm{F}_{\text {lim }} 0.48\) & 2232 & \(\mathrm{F}_{\text {lim }}\) & 0.48 & 5723 & -15 & 247 \\
\hline Zero catch & 0 & & 0.00 & 7877 & 17 & -100 \\
\hline \(1.00 \times \mathrm{F}(2012)\) & 562 & \(1.00 \times \mathrm{F}(2012)\) & 0.10 & 7336 & 9 & -13 \\
\hline \(0.50 \times \mathrm{F}(2013)\) & 401 & \(0.50 \times \mathrm{F}(2013)\) & 0.07 & 7484 & 11 & -38 \\
\hline Status quo F & 777 & \(1.00 \times \mathrm{F}(2013)\) & 0.15 & 7131 & 6 & 21 \\
\hline \(1.50 \times \mathrm{F}(2013)\) & 1129 & \(1.50 \times \mathrm{F}(2013)\) & 0.22 & 6779 & 1 & 75 \\
\hline \(2.00 \times \mathrm{F}(2013)\) & 1460 & \(2.00 \times \mathrm{F}(2013)\) & 0.29 & 6465 & -4 & 127 \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{\text {1) }}\) SSB 2015 relative to SSB 2014.
\({ }^{2)}\) Catch 2014 relative to TAC 2013 (643).

\section*{Management plan}

The management plan agreed by Norway, EU, the Faroe Islands, and Iceland in November 2008 (see Section 9.4.5.1 Annex) implies a TAC of 949000 tonnes in 2014, compared to 643000 tonnes in 2013. This is expected to lead to an increase in SSB in 2015 to 6.96 million tonnes, which is above \(\mathrm{SSB}_{\mathrm{MP}}\). The stock projection for 2013-2015, with uncertainties included for this option, is shown in Figure 9.4.5.6.

\section*{MSY approach}

Following the ICES MSY framework implies a TAC of 1502000 t in 2014 based on a fishing mortality at \(\mathrm{F}_{\text {MSY }}=\) 0.30 . This is expected to lead to a decrease in SSB in 2015 to 6.42 million tonnes, which is above MSY \(\mathrm{B}_{\text {trigger }}\) ( 2.25 million tonnes).

\section*{Precautionary approach}

Following the ICES precautionary approach implies a TAC of 1588000 tonnes in 2014 based on a fishing mortality at \(\mathrm{F}_{\mathrm{pa}}=0.32\). This is expected to lead to a decrease in SSB in 2015 to 6.33 million tonnes, which is above \(\mathrm{B}_{\mathrm{PA}}\) ( 2.25 million tonnes).

\section*{Additional considerations}

\section*{Management considerations}

The assessment shows a moderate uncertainty of the absolute estimate of F and SSB, and a higher uncertainty on the recruiting year classes. Due to good planning and favorable weather conditions the implementation of the survey in 2013 resulted in high quality data, even though the Norwegian vessel did not participate in 2013. It is essential that this survey be maintained and it is important to maintain good geographical survey coverage within the agreed time window to avoid increases in assessment uncertainty.

Recruitment (age 1) is estimated significantly higher in 2011-2013 than in the years 2007-2009 with the historically low recruitments. The forecast and catch options for 2014 use recruitment (age 1) in 2012 from the assessment and an assumed average recruitment in 2013-2015. A TAC derived from the target F at 0.18 (or from higher F at 0.22 ) from the management plan is expected to lead to an SSB well above \(\mathrm{B}_{\mathrm{pa}}\) in 2015.

There are uncertainties about the stock structure even though ICES (2012b) evaluated available evidence on substock structure and came to the conclusion that there is no scientific evidence in support of multiple stocks with distinct spawning locations or timings. The emerging picture is one of a single stock whose large-scale spatial spread varies as a function of hydrographical conditions and total abundance; this is commonly described as an abundance-occupancy relationship. Further, there seem to be a number of core nursery and feeding areas with marginal areas being occupied at times of high stock abundance. As a result, ICES considers blue whiting in ICES Subareas I-IX, XII, and XIV as a single stock for assessment purposes.

\section*{Data and methods}

The assessment is based on catch-at-age data from commercial catches in 1981-2012 and one international blue whiting spawning stock survey (IBWSS) 2004-2013. The IBWSS survey is the only survey that covers almost the entire distributional area of the spawning stock.

Recruitment in the forecast is based on a qualitative analysis of trawl surveys covering parts of the distribution area for juveniles. The five available indices indicate that the 2012 year class is near average. The new information regarding the 2011 year class suggests that this is at or above average. ICES therefore decided to use the geometric mean of the whole period (1981-2010) for the 2012 and 2013 year classes, and the estimate from the assessment for the 2011 year class (above the geometric mean).

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

\section*{Comparison with previous assessment}

In the 2013 assessment, SSB in 2012 was estimated at \(9 \%\) higher than in the previous assessment. Estimated fishing mortality in 2011 was \(7 \%\) lower than in the previous assessment. The basis for advice was the same as last year.

\section*{Sources}

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Figure 9.4.5.3
Blue whiting in Subareas I-IX, XII, and XIV. Stock-recruitment relationship.


Figure 9.4.5.4
Blue whiting in Subareas I-IX, XII, and XIV. Total stock biomass and \(50 \%\) and \(95 \%\) confidence limits from the IBWSS survey, 2004-2013. The SSB index from the 2010 survey was excluded from the assessment.


Figure 9.4.5.5
Blue whiting in Subareas I-IX, XII, and XIV. Total blue whiting catches (t) in 2012 by ICES rectangle. Catches below 10 t are not shown on the map.


Figure 9.4.5.6
Blue whiting in Subareas I-IX, XII, and XIV. Stock projection 2013-2015 following the management plan. Mean value and \(95 \%\) confidence intervals are shown.

Table 9.4.5.1 Blue whiting in Subareas I-IX, XII, and XIV. ICES advice, management, and landings.
\begin{tabular}{|c|c|c|c|c|}
\hline Year & ICES Advice & \begin{tabular}{l}
Predicted \\
catch corresp. to advice
\end{tabular} & Agreed TAC & \[
\begin{aligned}
& \text { ICES } \\
& \text { catch }
\end{aligned}
\] \\
\hline 1987 & TAC for northern areas; no advice for southern areas & 950 & - & 665 \\
\hline 1988 & TAC for northern areas; no advice for southern areas & 832 & - & 558 \\
\hline 1989 & TAC for northern areas; no advice for southern areas & 630 & - & 627 \\
\hline 1990 & TAC for northern areas; no advice for southern areas & 600 & - & 562 \\
\hline 1991 & TAC for northern areas; no advice for southern areas & 670 & - & 370 \\
\hline 1992 & No advice & - & - & 475 \\
\hline 1993 & Catch at status quo F (northern areas); no assessment for southern areas & 490 & - & 481 \\
\hline 1994 & Precautionary TAC (northern areas); no assessment for southern areas & 485 & \(650{ }^{1}\) & 459 \\
\hline 1995 & Precautionary TAC for combined stock & 518 & \(650{ }^{1}\) & 579 \\
\hline 1996 & Precautionary TAC for combined stock & 500 & \(650{ }^{1}\) & 646 \\
\hline 1997 & Precautionary TAC for combined stock & 540 & & 672 \\
\hline 1998 & Precautionary TAC for combined stock & 650 & & 1125 \\
\hline 1999 & Catches above 650000 t may not be sustainable in the long run & 650 & & 1256 \\
\hline 2000 & F should not exceed the proposed \(\mathrm{F}_{\mathrm{pa}}\) & 800 & & 1412 \\
\hline 2001 & F should not exceed the proposed \(\mathrm{F}_{\mathrm{pa}}\) & 628 & & 1780 \\
\hline 2002 & Rebuilding plan & 0 & & 1556 \\
\hline 2003 & F should be less than the proposed \(\mathrm{F}_{\mathrm{pa}}\) & 600 & & 2321 \\
\hline 2004 & Achieve \(50 \%\) probability that F will be less than \(\mathrm{F}_{\mathrm{pa}}\) & 925 & & 2378 \\
\hline 2005 & Achieve \(50 \%\) probability that F will be less than \(\mathrm{F}_{\mathrm{pa}}\) & 1075 & & 2027 \\
\hline 2006 & F old management plan & 1500 & \(2100^{2}\) & 1966 \\
\hline 2007 & F should be less than the proposed \(\mathrm{F}_{\mathrm{pa}}\) & 980 & \(1847{ }^{3}\) & 1612 \\
\hline 2008 & F should be less than \(\mathrm{F}_{\mathrm{pa}}\) & 835 & \(1250{ }^{4}\) & 1246 \\
\hline 2009 & Maintain stock above \(\mathrm{B}_{\mathrm{pa}}\) & 384 & \(606^{5}\) & 636 \\
\hline 2010 & Follow the agreed management plan & 540 & 548 & 540 \\
\hline 2011 & See scenarios & 40-223 & 40 & 105 \\
\hline 2012 & Follow the agreed management plan & 391 & 391 & 384 \\
\hline 2013 & Follow the agreed management plan & 643 & 643 & \\
\hline 2014 & Follow the agreed management plan & 948.950 & & \\
\hline
\end{tabular}

\footnotetext{
Weights in thousand tonnes.
\({ }^{1}\) NEAFC proposal for NEAFC regions 1 and 2.
\({ }^{2}\) Agreed TAC from four Coastal States of 2 million tonnes, and an additional allocation to Russia in the international zone of 100000 t.
\({ }^{3}\) Agreed TAC from four Coastal States of 1.7 million tonnes, and an additional allocation to Russia and Greenland of 147000 t .
\({ }^{4}\) Agreed TAC from four Coastal States of 1.1 million tonnes, and an additional allocation to Russia and Greenland.
\({ }^{5}\) Agreed TAC from four Coastal States of 0.59 million tonnes, and an additional allocation to Russia ( 0.016 million tonnes).
}
Table 9.4.5.2 Blue whiting in Subareas I-IX, XII, and XIV. Landings (tonnes) by country for the period 2004-2012, as estimated by the Working Group.

* Reported to the EU but not to the ICES WGNPBW. (Landings of 19467 tonnes).
** Imprecise estimates for Sweden: reported catch of 34265 t in 1993 is replaced by
** Imprecise estimates for Sweden: reported catch of 34265 t in 1993 is replaced by the mean of 1992 and 1994, i.e. 2867 t , which is used in the assessment.
** 2012 only UK split into England and Scotland.

Table 9.4.5.3 Blue whiting in Subareas I-IX, XII, and XIV. Landings (tonnes) by main areas.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Area & Norwegian Sea fishery (SAs 1+2; Divs. Va, XIVa-b) & Fishery in the spawning area (SA XII; Divs. Vb, VIa-b, VIIa-c) & Directedand mixed fisheries in the North Sea (SA IV; Div. IIIa) & Total northern areas & Total southern areas (SAs VIII+IX; Divs. VIId-k) & \[
\begin{gathered}
\hline \text { Grand } \\
\text { total }
\end{gathered}
\] \\
\hline 1988 & 55829 & 426037 & 45143 & 527009 & 30838 & 557847 \\
\hline 1989 & 42615 & 475179 & 75958 & 593752 & 33695 & 627447 \\
\hline 1990 & 2106 & 463495 & 63192 & 528793 & 32817 & 561610 \\
\hline 1991 & 78703 & 218946 & 39872 & 337521 & 32003 & 369524 \\
\hline 1992 & 62312 & 318081 & 65974 & 446367 & 28722 & 475089 \\
\hline 1993 & 43240 & 347101 & 58082 & 448423 & 32256 & 480679 \\
\hline 1994 & 22674 & 378704 & 28563 & 429941 & 29473 & 459414 \\
\hline 1995 & 23733 & 423504 & 104004 & 551241 & 27664 & 578905 \\
\hline 1996 & 23447 & 478077 & 119359 & 620883 & 25099 & 645982 \\
\hline 1997 & 62570 & 514654 & 65091 & 642315 & 30122 & 672437 \\
\hline 1998 & 177494 & 827194 & 94881 & 1099569 & 29400 & 1128969 \\
\hline 1999 & 179639 & 943578 & 106609 & 1229826 & 26402 & 1256228 \\
\hline 2000 & 284666 & 989131 & 114477 & 1388274 & 24654 & 1412928 \\
\hline 2001 & 591583 & 1045100 & 118523 & 1755206 & 24964 & 1780170 \\
\hline 2002 & 541467 & 846602 & 145652 & 1533721 & 23071 & 1556792 \\
\hline 2003 & 931508 & 1211621 & 158180 & 2301309 & 20097 & 2321406 \\
\hline 2004 & 921349 & 1232534 & 138593 & 2292476 & 85093 & 2377569 \\
\hline 2005 & 405577 & 1465735 & 128033 & 1999345 & 27608 & 2026953 \\
\hline 2006 & 404362 & 1428208 & 105239 & 1937809 & 28331 & 1966140 \\
\hline 2007 & 172709 & 1360882 & 61105 & 1594695 & 17634 & 1612330 \\
\hline 2008 & 68352 & 1111292 & 36061 & 1215704 & 30761 & 1246465 \\
\hline 2009 & 46629 & 533996 & 22387 & 603012 & 32627 & 635639 \\
\hline 2011 & 20599 & 72279 & 7524 & 100401 & 3191 & 103592 \\
\hline 2012 & 24391 & 324545 & 5678.346 & 354614 & 29402 & 384016 \\
\hline
\end{tabular}

Table 9.4.5.4 Blue whiting in Subareas I-IX, XII, and XIV (Combined Stock). Summary of stock assessment.
\begin{tabular}{|c|c|c|c|c|}
\hline Year & Recruitment Age 1 thousands & \[
\begin{gathered}
\hline \mathrm{SSB} \\
\text { tonnes }
\end{gathered}
\] & \begin{tabular}{l}
Landings \\
Tonnes
\end{tabular} & \[
\begin{gathered}
\text { Mean F } \\
\text { Ages 3-7 }
\end{gathered}
\] \\
\hline 1981 & 4,004,783 & 2,916,807 & 922,980 & 0.275 \\
\hline 1982 & 5,378,930 & 2,319,820 & 550,643 & 0.222 \\
\hline 1983 & 21,274,080 & 1,903,110 & 553,344 & 0.263 \\
\hline 1984 & 20,645,336 & 1,848,712 & 615,569 & 0.322 \\
\hline 1985 & 10,099,536 & 2,233,320 & 678,214 & 0.344 \\
\hline 1986 & 7,018,078 & 2,380,926 & 847,145 & 0.457 \\
\hline 1987 & 8,632,114 & 1,916,479 & 654,718 & 0.425 \\
\hline 1988 & 6,205,832 & 1,613,635 & 552,264 & 0.438 \\
\hline 1989 & 8,520,623 & 1,550,364 & 630,316 & 0.511 \\
\hline 1990 & 17,663,307 & 1,341,099 & 558,128 & 0.532 \\
\hline 1991 & 9,248,760 & 1,732,368 & 364,008 & 0.268 \\
\hline 1992 & 7,167,016 & 2,533,215 & 474,592 & 0.232 \\
\hline 1993 & 5,309,456 & 2,610,363 & 475,198 & 0.209 \\
\hline 1994 & 7,377,903 & 2,497,998 & 457,696 & 0.195 \\
\hline 1995 & 9,761,923 & 2,282,998 & 505,175 & 0.249 \\
\hline 1996 & 29,063,685 & 2,178,180 & 621,104 & 0.306 \\
\hline 1997 & 45,947,041 & 2,470,670 & 639,680 & 0.3 \\
\hline 1998 & 28,459,711 & 3,752,752 & 1,131,954 & 0.415 \\
\hline 1999 & 21,316,671 & 4,597,393 & 1,261,033 & 0.359 \\
\hline 2000 & 36,947,184 & 4,295,163 & 1,412,449 & 0.472 \\
\hline 2001 & 58,002,693 & 4,676,217 & 1,771,805 & 0.454 \\
\hline 2002 & 48,983,791 & 5,298,848 & 1,556,955 & 0.492 \\
\hline 2003 & 52,483,007 & 7,167,016 & 2,365,319 & 0.463 \\
\hline 2004 & 34,726,026 & 7,039,164 & 2,400,795 & 0.534 \\
\hline 2005 & 20,419,482 & 6,212,041 & 2,018,344 & 0.504 \\
\hline 2006 & 7,594,995 & 6,312,233 & 1,956,239 & 0.418 \\
\hline 2007 & 4,155,736 & 5,045,463 & 1,612,269 & 0.423 \\
\hline 2008 & 5,142,243 & 3,801,856 & 1,251,851 & 0.381 \\
\hline 2009 & 5,666,034 & 2,919,725 & 634,978 & 0.238 \\
\hline 2010 & 18,774,310 & 2,908,069 & 539,539 & 0.182 \\
\hline 2011 & 27,098,800 & 3,020,703 & 103,771 & 0.04 \\
\hline 2012 & 21,834,460 & 4,164,055 & 375,692 & 0.103 \\
\hline 2013 & & 5,531,668* & & \\
\hline
\end{tabular}

\footnotetext{
*SSB in 2013 is based on survivors, age 1 numbers as in 2012 and mean weight-at-age as in 2012.
}

\subsection*{9.4.5.1 Annex}

The management plan below was agreed by Norway, the EU, the Faroe Islands, and Iceland, and endorsed by NEAFC in November 2008.
1. The Parties agree to implement a long term management plan for the fisheries on the Blue Whiting stock, which is consistent with the precautionary approach, aiming at ensuring harvest within safe biological limits and designed to provide for fisheries consistent with maximum sustainable yield, in accordance with advice from ICES.
2. For the purpose of this long term management plan, in the following text, "TAC" means the sum of the coastal State TAC and the NEAFC allowable catches.
3. As a priority, the long term plan shall ensure with high probability that the size of the stock is maintained above 1.5 million tonnes ( \(B_{\text {lim }}\) ).
4. The Parties shall aim to exploit the stock with a fishing mortality of 0.18 on relevant age groups as defined by ICES.
5. While fishing mortality exceeds that specified in paragraph 4 and 6, the Parties agree to establish the TAC consistent with reductions in fishing mortality of \(35 \%\) each year until the fishing mortality established in paragraph 4 and 6 has been reached. This paragraph shall apply only during 2009 and 2010.

For the purposes of this calculation, the fishing percentage mortality reduction should be calculated with respect to the year before the year in which the TAC is to be established. For this year, it shall be assumed that the relevant TAC constrains catches.
6. When the fishing mortality in paragraph 4 has been reached, the Parties agree to establish the TAC in each year in accordance with the following rules:
- In the case that the spawning biomass is forecast to reach or exceed 2.25 million tonnes (SSB trigger level) on 1 January of the year for which the TAC is to be set, the TAC shall be fixed at the level consistent with the specified fishing mortality.
- In the case that the spawning biomass is forecast to be less than 2.25 million tonnes on 1 January of the year for which the TAC is to be set (B), the TAC shall be fixed that is consistent with a fishing mortality given by:
\[
\mathrm{F}=0.05+\left[(\mathrm{B}-1.5)^{*}(0.18-0.05) /(2.25-1.5)\right]
\]

In the case that spawning biomass is forecast to be less than 1.5 million tonnes on 1 January of the year for which the TAC is to be set, the TAC will be fixed that is consistent with a fishing mortality given by \(F=0.05\).
7. When the fishing mortality rate on the stock is consistent with that established in paragraph 4 and the spawning stock size on 1 January of the year for which the TAC is to be set is forecast to exceed 2.25 million tonnes, the Parties agree to discuss the appropriateness of adopting constraints on TAC changes within the plan.
8. The Parties, on the basis of ICES advice, shall review this long term management plan at intervals not exceeding five years and when the condition specified in paragraph 4 is reached.

\section*{North Atlantic Albacore Tuna}

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

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICCAT conducted an updated assessment in 2013. The SSB is estimated to be below SSB MSY ( \(94 \%\) of SSB MSY ), while \(F\) is estimated to be below \(F_{\text {MSY }}\) ( \(72 \%\) of \(F_{\text {MSY }}\) ).

ICCAT projections at the current TAC level \((28,000 t)\) indicate that the stock would rebuild by 2019 with \(53 \%\) probability, or by 2016 if the TAC is \(\mathbf{2 0 , 0 0 0}\) t. FEAS notes that a probability of \(\mathbf{5 3 \%}\) implies that there is almost as great a likelihood of the target not being met. It is noted that ICCAT risk policy for bluefin tuna rebuilding is \(60 \%\).

FEAS advises that the decision on the TAC for 2014 and subsequent years will be based on the timeline to reach the target and the acceptable risk level. Based on ICCAT policies, FEAS interprets the target as being \(S S B>S S B_{M S Y}\) and \(F<F_{\text {MSY }}\), and that this be achieved over as short a period as possible. In general, the EC aims to achieve exploitation at \(F_{\text {msy }}\) by 2015, or 2020 at the latest. The shortest time frame for achieving the target within the ICCAT assessment cycle for albacore would be 2016, or 2017. Based on these considerations, managers may choose a TAC based on the following levels of risk (probability) and timelines considered appropriate:
\begin{tabular}{lccc} 
Probability (with explanation) & by 2016 & by 2017 & by 2020 \\
\hline \(53 \%\) (almost neutral) & \(20,500 \mathrm{t}\) & \(\mathbf{2 4 , 0 0 0 ~ t}\) & \(28,857 \mathrm{t}\) \\
\(60 \%\) (as per ICCAT bluefin tuna rebuilding plan) & \(16,250 \mathrm{t}\) & \(21,200 \mathrm{t}\) & \(27,000 \mathrm{t}\) \\
\(75 \%\) (as per ICES salmon stocks) & \(\mathbf{6 , 8 7 5} \mathrm{t}\) & \(11,429 \mathrm{t}\) & \(\mathbf{2 2 , 0 0 0} \mathrm{t}\) \\
\hline
\end{tabular}
\begin{tabular}{clccccc}
\hline Year & TAC & Official Catch & \begin{tabular}{c} 
Irish \\
Quota \\
(t)
\end{tabular} & \begin{tabular}{c} 
Irish \\
catch \\
(t)
\end{tabular} & \begin{tabular}{c} 
ICCAT \\
Advice \\
(t)
\end{tabular} & \begin{tabular}{c} 
FEAS \\
Advice \\
(t)
\end{tabular} \\
\hline 2000 & Effort restriction & 34,500 & - & 3,274 & \(<34,000\) & - \\
2001 & 34,500 & 26,592 & 3,158 & 2,004 & \(<34,000\) & - \\
2002 & 34,500 & 22,685 & 3,158 & 1,100 & \(<34,000\) & \(<34,000\) \\
2003 & 34,500 & 25,505 & 3,158 & 755 & \(<34,000\) & \(<31,000\) \\
2004 & 34,500 & 25,605 & 3,158 & 175 & \(<34,000\) & \(<31,000\) \\
2005 & 34,500 & 35,830 & 3,158 & 306 & \(<31,000\) & \(<31,000\) \\
2006 & 34,500 & 36,077 & 5,679 & 521 & \(<31,000\) & \(<31,000\) \\
2007 & 34,500 & 21,549 & 8,326 & 596 & \(<31,000\) & \(<31,000\) \\
2008 & 30,200 & 20,225 & 6,696 & 1,517 & \(<30,000\) & \(<30,000\) \\
2009 & 30,200 & 15,364 & 6,696 & 1,997 & \(<28,000\) & \(<28,000\) \\
2010 & 28,000 & 19,647 & 4,356 & 755 & \(<28,000\) & \(<28,000\) \\
2011 & 28,000 (EC TAC= 27,917) & 20,044 & 3,554 & 3,597 & \(<28,000\) & Recent average \\
2012 & 28,000 (EC TAC= 26,939) & 26,237 & 3,896 & 3,575 & \(<28,000\) & \(<28,000\) \\
2013 & 28,000 (EC TAC= 26,939) & na & 2,371 & na & \(<28,000\) & \(<28,000\) \\
2014 & & & & & \(20,000-28,000\) & 22,000 \\
\hline
\end{tabular}

\section*{CURRENT MANAGEMENT}
- The management area and the assessment area for North Atlantic albacore tuna cover the whole of the Atlantic, north of \(5^{\circ} \mathrm{N}\), and excluding the Mediterranean Sea.
- A 1998 recommendation that limits fishing capacity to the average of 1993-1995, remains in force. This limits the number of Irish vessels that may fish for tuna to a maximum of 50 vessels.
- The international TAC in 2013 is \(28,000 \mathrm{t}\), and the EC TAC is \(26,939 \mathrm{t}\). The Irish quota in 2013 is \(2,37 \mathrm{It}\).
- Unused quota in 2013 may be carried over until 2015/2016 only. The maximum allowed increment is \(25 \%\) of the initial quota in those years. ICCAT undertakes to implement additional measures if carried over quota leads to a TAC in excess of \(28,000 \mathrm{t}\).

2013 EU Quota Allocations



Figure I. Northern albacore tuna: landings data 1982 to 2012 inc.


Figure 2. Stock status of northern albacore tuna according to base case as well as different models and runs considered during the ICCAT assessment.

\section*{Extracts from the ICCAT}

\section*{Standing Committee on Research and Statistics (SCRS) Report 2013}

\subsection*{8.4 ALB - ALBACORE}

ALB-2. Description of fisheries or fishery indicators
North Atlantic
The northern stock is exploited by surface fisheries targeting mainly immature and sub-adult fish (50 cm to 90 cm FL) and longline fisheries targeting immature and adult albacore ( 60 cm to 130 cm FL). The main surface fisheries are carried out by EU fleets (Ireland, France, Portugal and Spain) in the Bay of Biscay, in the adjacent waters of the northeast Atlantic and in the vicinity of the Canary and Azores Islands in summer and autumn. The main longline fleet is the Chinese Taipei fleet which operates in the central and western North Atlantic year round. However, Chinese Taipei fishing effort decreased in late 1980s due to a shift towards targeting on tropical tuna, and then continued at this lower level to the present. Over time, the relative contribution of different fleets to the total catch of North Atlantic albacore has changed, which resulted in differential effects on the age structure of the stock. Since the 1980s, a significant reduction of the effective albacore area fished was observed for both longline and surface fisheries.

Total reported landings, steadily increased since 1930 to peak above 60,000 t in the early 1960 s, declining afterwards, largely due to a reduction of fishing effort by the traditional surface (troll and baitboat) and longline fisheries (ALB-Table 1; ALB-Figure 2a). Some stabilization was observed in the 1990s, mainly due to increased effort and catch by new surface fisheries (driftnet and mid-water pair pelagic trawl), with a maximum catch in 2006 at \(36,989 \mathrm{t}\) and, since then, a decreasing trend of catch is observed in the North Atlantic.

The total catch in 2012 was \(26,237 \mathrm{t}\), and the average catch in the last five years has remained about \(20,000 \mathrm{t}\), the lowest recorded in the time series since 1950 . During these years, the surface fisheries contributed to approximately \(85 \%\) of the total catch (ALB-Table 1). The reported catch in 2012 for EUFrance, EU-Ireland and EU-Spain was above the average of the last five years.

Longline catch contributed to approximately \(15 \%\) of the total catch during the last five years. During the last decades, both Chinese Taipei and Japan have reduced their fishing effort directed to albacore. In the case of Japan, albacore is taken mainly as by-catch. Still, the catch reported in 2012 for Japan was above the last 5 year average, and for Chinese Taipei it was similar to the average for the last five years.

The trend in mean weight for northern albacore remained stable between 1975 and 2011, ranging between 7 and 11 kg . The mean weight for surface fleets (baitboat and troll) showed a stable trend with an average of 7 kg (range: 4-10), and for longline fleets it showed no clear trend with an average of 19 kg , but some important fluctuations between 15 and 26 kg since the 1990 (ALB-Figure 3a).

\section*{ALB-3. State of stocks}

\section*{North Atlantic}

A thorough revision of North Atlantic Task I and Task II data was conducted and catch rate analyses were improved and updated with new information for the northern albacore fisheries. The base case assessment during the 2013 assessment session was based on similar methods and assumptions as in the previous assessment conducted in 2009. However, this time, a wider range of assessment methods were considered in sensitivity runs, including some that do not assume that catch-at-age is perfectly known. The approach provided the opportunity to evaluate a range of biological assumptions and hypothesis about how the fisheries operated over time and their impact on the population. The results of these efforts are reflected in the following summaries of stock status that analyzed data through 2011.

The CPUE trends for the various surface fleets, based upon the most recent available data showed somewhat different patterns from each other. This was also the case for the different longline fleets (ALB-Figure 4). The Spanish troll CPUE series showed a rather flat trend compared to the Spanish baitboat CPUE series that showed a more upward trend in the last three decades. For the longline fleets,
the general trend in CPUE indices is a decline over time up until the mid 80 ies , with varying rates, with some stability afterwards and a slight increase in the last few years. Comparatively, the Japanese CPUE showed steeper declines at the beginning of the series and the Chinese Taipei CPUE showed steeper increasing trends during the last years. Given the variability associated with these catch rate estimates, definitive conclusions about recent trends could not be reached just by examining the CPUE trends alone.

The data sets used for the analyses from 1930 to 2011 were compiled and screened during the April 2013 data preparatory meeting. The basic input data, catch, effort and catch-at-size were revised due to updates in the ICCAT Task I (ALB-Table 1) and Task II database, and the indices to be used in assessments were specified. The definition of the fisheries was also revised and 12 fishery units were agreed for the base case Multifan-CL assessment (compared to 10 fishery units used in the last assessment). In general, the base case included similar but not exactly the same model specifications and datasets used in 2009. Decisions on the final specifications of the base case model were guided by first principles (e.g. knowledge of the fisheries) and diagnostics (e.g. goodness of fit of the model to the data).

There is substantial uncertainty on current stock status, since different models and assumptions provide a wide range of \(\mathrm{B} / \mathrm{B}_{\text {msy }}\) and \(\mathrm{F} / \mathrm{Fmsy}_{\text {m }}\) estimates (ALB-Figure 5). However, most of them agreed on the view that spawning stock biomass decreased since the 1930s and started to recover since the currently the stock is not undergoing overfishing but the spawning stock biomass is overfished. According to the base case assessment which considers catch and effort since the 1930s and size frequency since 1959, the spawning stock size has declined and in 2011 was about one third of the peak levels estimated for the late-1940s. Estimates of recruitment to the fishery, although variable, have shown generally higher levels in the 1960s and earlier periods with a declining trend thereafter (ALB-Figure 7).

The assessment indicated that the stock has remained overfished with SSB below SSBmsy since the mid-1980s but has improved since the lowest levels around \(30 \%\) in the late 1990s, and current \(\mathrm{SSB}_{2011}\) is approximately \(94 \%\) of SSB at MSY (ALB-Figure 8). Corresponding fishing mortality rates have been above Fmsy between the mid-1960s and the mid 2000's. Peak relative fishing mortality levels in the order of 2.5 were observed in the mid 90ies and remained below 1 afterwards, current \(\mathrm{F}_{2011} / \mathrm{F}_{\text {msy }}\) ratio being 0.72 (ALB-Figure 8). According to the base case assessment, the probability of the stock being overfished and overfishing (red) is \(0,2 \%\), of being neither overfished nor overfishing (green) is \(27.4 \%\), and of being overfished or overfishing (yellow) is 72.4\% (ALB-Figure 9).

\section*{ALB-4. Outlook}

\section*{North Atlantic}

The stock projected under different scenarios indicates that if catch in the future were on average similar to those observed over the recent five years (about \(20,000 \mathrm{t}\) ) or around the current TAC \((28,000\) t ), the biomass would continue to increase from its level of 2012 (ALB-Table 2).

Considering the Commission's decision framework in Rec. [11-13] (ALB-Figure 14), and noting that the Commission requested SCRS to identify a limit reference point for northern Albacore (Rec [1104]), the outlook for stock status under the Commission's decision guidelines was projected making use of Harvest Control Rule (HCR, ALB-Figure 15) options (ALB-Table 3) consistent with the policies identified in Rec [11-13], using an interim biomass limit of 0.4 B msy that should be further tested, together with other candidate reference points, using the MSE framework. Projections were constructed in this way to inform the Commission's choice of 'high probability' and 'short period' (ALB-Figure 14), considering the uncertainty in stock status evaluations that could be quantified and assuming that the indicated strategy could be perfectly implemented.

ALB-Table 4 provides the results of the HCR evaluations and indicate the projected probability of being 'Green' within the time-frame indicated. Expected catch along different timeframes are also shown, allowing the Commission to choose appropriate probability and time frames and weigh tradeoffs with expected catch.

\section*{ALB-5. Effect of current regulations \\ North Atlantic}

In 2011, the Commission established a TAC for 2012 and 2013 of 28,000 t [Rec. 11-04], but included several provisions that allow the catch to exceed this level.
Furthermore, a 1998 recommendation that limits fishing capacity to the average of 1993-1995, remains in force.
The Committee noted that, since the establishment of the TAC in the year 2001, catch remained substantially below the TAC in all but two years (ALB-Figure 2). This might have accelerated rebuilding over the last decade.

\section*{ALB-6. Management recommendations}

\section*{North Atlantic}

Projections at the current TAC level (28,000 t) indicate that the stock would rebuild by 2019 with \(53 \%\) probability, which would meet the objective of the albacore recovery plan (11-04). The recovery of the stock with similar probabilities would be faster (by 2016) if the catches remain at the level of recent catches (around \(20,000 \mathrm{t}\) ). Higher probabilities of rebuilding would require longer timeframes. For instance, \(75 \%\) probability of rebuilding would be achieved by 2019 with a constant catch of \(20,000 \mathrm{t}\), and by 2027 with a constant catch of \(28,000 \mathrm{t}\). Catches above \(32,000 \mathrm{t}\) would not rebuild the stock with at least \(50 \%\) probability in the projected timeframes (ALB-Table 2).

These projections were complemented by a set of projections under alternative provisional HCRs that could serve the Commission to decide on desired timeframes and probabilities for recovering the north Atlantic stock and which are consistent with the decision framework of Rec [11-13] in that there is a high probability of \(\mathrm{F}<\) Fmsy in as short a time as possible. A range of time-frames and probability levels for achieving the Commission's goals established in Rec [11-13] are provided in ALB-Table 4. Longer time frames provide more options for HCR parameters that project higher probabilities of being 'Green'. The HCR projections indicate, for example, should the Commission wish to have a 'high probability' of \(75 \%\) within a 10 year time-frame, then the HCR with a Biomass Threshold at BMSY paired with a Target F of .9 F msy would provide the highest expected 10 year cumulative catch amongst options and the average catch expected from 2014-2016 would be approximately \(26,260 \mathrm{t}\). Should the Commission consider a 'high probability' of \(60 \%\) sufficient within a five year time-frame, then the HCR with a Biomass Threshold at Bmsy paired with a Target F of .9Fmsy would also meet that objective and provide the highest expected cumulative catch amongst options that would provide at least \(60 \%\) probability within five years and the average catch from 2014-2016 would remain approximately \(26,260 \mathrm{t}\). Unlike the constant catch projections, the HCR projections imply increasing catch as the population biomass increases resulting in higher cumulative catch over time to achieve equivalent conservation objectives of a constant catch policy. This can be evaluated by comparing ALB-Tables 2 and 4. Consideration of implementation and other uncertainties in these projections would likely change the probability level estimates.

\section*{Bluefin Tuna}

\section*{(East Atlantic and Mediterranean)}

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

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICCAT carried out an updated assessment of bluefin tuna in 2012. While evaluations all show that there has been a recent increase in SSB, the magnitude and rate of the increase remain highly uncertain. The 2012 updated stock assessment confirmed 2010 findings, according to which the rebuilding of bluefin tuna to SSB \(_{\text {F0.I }}\) level with a probability of at least \(60 \%\) could be achieved by 2022 with catch close to current TAC ( \(12,900 \mathrm{t}\) ) or 2010 TAC ( \(13,500 \mathrm{t}\) ). FEAS notes that there were significant data limitations and high levels of uncertainty in this assessment.

Ireland has no target fisheries and bycatches in pelagic fisheries are subject to an unallocated bycatch quota for EU vessels (27.93 t in 2013). The species migrates to Irish waters each year, from its spawning grounds in the Mediterranean and has been important for sport fisheries on the Irish coast, as well as a by-catch in some fisheries, particularly the albacore fishery. In 2012 Ireland bycaught 10 t of bluefin tuna in the albacore tuna fishery.

FEAS notes that recent management measures have resulted in reductions in catch and fishing mortality rates. However FEAS has concerns that these catch estimates are quite uncertain.

FEAS further notes that, since the fishery is currently adapting to these new management measures, the full implications of these management measures can not yet be measured. Therefore FEAS recommends that catches of bluefin tuna in the East Atlantic and Mediterranean should remain below the current TAC of \(12,900 \mathrm{t}\). This is consistent with the ICCAT goal of attaining \(\mathbf{S S B}_{\mathrm{F0.1}}\) by 2022.
\begin{tabular}{|cccl|}
\hline Year & TAC & Estimated Catch & \multicolumn{1}{c|}{ FEAS Advice } \\
\hline 2003 & 32,000 & 31,164 & Catches above \(26,000 \mathrm{t}\) are not sustainable \\
2004 & 32,000 & 31,381 & Catches above \(26,000 \mathrm{t}\) are not sustainable \\
2005 & 32,000 & 35,845 & Catches above \(26,000 \mathrm{t}\) are not sustainable \\
2006 & 32,000 & 30,069 & Catches above \(26,000 \mathrm{t}\) are not sustainable \\
2007 & 29,500 & 34,516 & Catches \(<15,000 \mathrm{t}\) and develop management plan \\
2008 & 28,500 & 23,849 & Catches much less than \(15,000 \mathrm{t}\) \\
2009 & 22,000 & \(19,75 \mathrm{I}\) & Catches much less than \(15,000 \mathrm{t}\) \\
2010 & 13,500 & 11,328 & Catches much less than \(15,000 \mathrm{t}\) \\
2011 & 12,900 & 9,779 & Catches less than \(13,500 \mathrm{t}\) \\
2012 & 12,900 & 11,473 & Catches less than \(12,900 \mathrm{t}\) \\
2013 & 13,400 & NA & Catches less than \(12,900 \mathrm{t}\) \\
\hline
\end{tabular}

\section*{CURRENT MANAGEMENT}
- The TAC for 2013 is \(13,400 \mathrm{t}\). The EC has a large share of this TAC ( \(7,548 \mathrm{t}\) ) but Ireland has no quota. An EC by-catch quota of 27.93 t that is otherwise unallocated is available to Ireland. By-catches by Ireland and other countries not having a quota must not exceed this level.
- The TAC covers the entire east Atlantic Ocean and the Mediterranean Sea.
- In 2006, the Commission adopted a recovery plan for this stock. This plan includes various conservation measures, largely consisting of a TAC together with extended time/area closures and minimum size. Management measures to reduce fishing mortality were introduced in 2008. These measures included lower TACs, increased control and enforcement measures, particularly within the Mediterranean sea, and a requirement for all purse seine vessels targeting bluefin tuna for farming in cages to carry observers on board.


Figure I. Bluefin tuna in East Atlantic and Mediterranean: landings data.

\section*{Boarfish}

\section*{(Sub-areas VI, VII and VIII)}

\section*{FEAS - ADVICE}

ICES advises on the basis of the MSY approach that catches in 2013 should be no more than \(133,957 \mathrm{t}\). If discard rates do not change from the average of the last ten years this implies landings of no more than \(\mathbf{I 2 7 , 5 0 9} \mathrm{t}\). FEAS agrees with this advice.

This is an ICES category I stock as an analytical assessment and forecast is available. \(F\) is below \(F_{\text {MSY }}\) and biomass is likely to be above any candidate for MSY \(B_{\text {trigger }}\).

A management plan has been proposed by the Pelagic RAC (presented below) but has yet to be fully evaluated by ICES. However, in 2013, ICES advised that Tier I.I of the plan can be considered precautionary for TAC setting in 2014. The TAC in 2014 based on Tier I.I of the plan would be \(127,509 \mathrm{t}\).


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

\section*{CURRENT MANAGEMENT}
- The TAC for 20 I 3 for \(\mathrm{VI}, \mathrm{VII}\) and VIII is \(82,000 \mathrm{t}\). Ireland has a quota of \(56,666 \mathrm{t}\).
- In October 2010, the European Commission notified member states that species not specifically identified in Annex I of Regulation 850/98 (and cited as "all other species"), such as boarfish may not be targeted with nets of mesh size smaller than 100 mm . This was changed in 2011 allowing fishing using mesh sizes ranging from 32 to 54 mm for boarfish only.
- An interim management plan proposed by the Pelagic RAC,
 has not been fully evaluated by ICES or adopted by the EU. However the fishing industry adopted the closed season that was included in the plan.
- A closed season from 15 March to 3I August has been followed by participating vessels on a voluntary basis in 2011-2013, as anecdotal evidence suggested that mackerel and boarfish are caught in mixed aggregations during this period.
- A closed season was also proposed in Division VIIg to prevent catches of Celtic Sea herring, known to form feeding aggregations in this region at these times.
- If catches of a single species other than boarfish totals more than \(5 \%\) of the total catch in the boarfish fishery, by day and by ICES statistical rectangle, and this species is covered by a TAC, then boarfish fishery must cease in that rectangle.

\section*{Proposed management plan}
I) The TAC setting rules I.I-I. 6 shall apply. Precedence is in decreasing order from Rule I.I. These are shown in the table below. The decision year for TAC setting is the last year in the assessment, and not the TAC year.
\begin{tabular}{|c|c|c|c|c|}
\hline Rule & Assessment & Uncertainty & Condition & Procedure \\
\hline I.I.a & SSB and \(F\) & Low & SSB \(>\mathrm{B}_{\text {trigger }}\) & \(\mathrm{F}_{\text {target }}\) \\
\hline I.I.b & & & SSB < Btrigger & SSB * ( F target \(^{\text {/ }}\) Brigger \({ }_{\text {) }}\) \\
\hline 1.2.a & SSB and F & Higher & SSB \(>\mathrm{B}_{\text {trigger }}\) & \(\mathrm{F}_{\text {target }}\) \\
\hline I.2.b & & & SSB < Brrigger & SSB * ( \(\left.\mathrm{Ftarget}^{\text {/ }} \mathrm{Brtrigger}\right) * \mathrm{G}\) \\
\hline 1.3.a & F & Any & \(F<\mathrm{F}_{\text {target }}\) & Reference TAC * \\
\hline I.3.b & & & \(F>\mathrm{F}_{\text {target, }}\) & RTAC + (-RTAC / Flim- \(\mathrm{F}_{\mathrm{pa}}\) ) \({ }^{\left(\mathrm{F}-\mathrm{F}_{\mathrm{pa}}\right) * \mathrm{G}}\) \\
\hline 1.4.a & U & Any & \(\mathrm{U}>\mathrm{U}_{\mathrm{pa}}, \mathrm{TAC}=\) & Reference TAC * \\
\hline I.4.b & & & \(\mathrm{U}<\mathrm{U}_{\mathrm{pa}}, \mathrm{TAC}=\) & \(\mathrm{U} *\left(\right.\) Reference TAC / \(\mathrm{Upa}^{\text {a }}\) ) \(\mathrm{G}^{\text {a }}\) \\
\hline 1.5. & Survey biomass & Any & TAC \(\mathrm{y}, \mathrm{q} 3,4=\mathrm{TACy}+\mathrm{l}, \mathrm{qI}=\) & \[
\begin{aligned}
& \mathrm{ASB} * 1-\operatorname{exp-} \mathrm{F}_{0.1} * \mathrm{G} * 0.62 \\
& \mathrm{ASB} * 1-\exp -\mathrm{F}_{0.1}=\mathrm{G} * 0.38
\end{aligned}
\] \\
\hline 1.6 & None & & No information on stock status and no risk of recruitment impairment & TAC \(=33,000 \mathrm{t}\) (interim management plan TAC) \\
\hline
\end{tabular}

2 ) Notwithstanding Paragraph I, if in the opinion of ICES, the stock is at risk of recruitment impairment, a TAC shall be based on advice given by ICES, and at a lower level than provided for in Paragraph I, rules I.I to I.6.
3 ) Closed seasons, closed areas and moving on procedures shall apply to all directed boarfish fisheries as follows:
i A closed season shall operate from I5th March to the 3Ist August. This is because it is known that herring and mackerel are present in these areas and may be caught with boarfish.
ii A closed area shall be implemented inside the Irish 12 mile limit south of \(52^{\circ} 30\) from 12th February to 31st October, in order to prevent catches of Celtic Sea herring, known to form aggregations at these times.
iii If catches of other species covered by TAC, amount to more than \(5 \%\) of the total catch by day by ICES statistical rectangle, then all fishing must cease in that rectangle for 5 consecutive days.
The \(F_{\text {msy }}\) catch option is consistent with rules \(I\) and 2 of the proposed management plan for boarfish. In view of the developing nature of the boarfish fishery and paying further attention to the precautionary approach, rule 2 of the proposed management plan is appropriate. Hence the projected catch for 2013 , at \(F_{\text {msy }}\), should be down weighted by the following factor:
\(\exp (-1.645 * \sigma)\)
where \(\sigma\) is the standard error of the biomass estimate, in this case 0.29 , leading to a down weighting factor of 0.62 .

\section*{ICES ADVICE}

\subsection*{9.4.6 Boarfish in the Northeast Atlantic}

\section*{Advice for 2014}

ICES advises on the basis of the MSY approach that catches in 2014 should be no more than 133957 t . If discard rates do not change from the average of the last ten years this implies landings of no more than 127509 t .

\section*{Stock status}





Figure 9.4.6.1 Boarfish in the Northeast Atlantic. Top left panel: Catches. Bottom left panel: fishing mortality. Bottom right panel: Total stock biomass. No recruitment index was available from the model. Dotted lines on the total stock biomass and fishing mortality plots indicate the \(95 \%\) credible interval.

\section*{Stock status}
\(F\) is below \(\mathrm{F}_{\text {MSY }}\) and biomass is likely to be above any candidate for MSY \(\mathrm{B}_{\text {trigger }}\).

\section*{Management plans}

No specific management objectives are known to ICES. A management plan has been proposed by the Pelagic RAC, but has not yet been evaluated by ICES (see 9.4.6.1 Annex).

\section*{Biology}

Boarfish (Capros aper) is a small, pelagic, planktivorous, shoaling species, found at depths of 0 to 600 m . The species is widely distributed from Norway to Senegal, including the Mediterranean and oceanic island waters. Boarfish recruit to the fishery at around three to four years of age, although the maximum age of boarfish is about 30 years (Hüssy et al., 2012a, 2012b). Spawning occurs on the Celtic Sea shelf edge during June and July. Boarfish are asynchronous batch spawners with indeterminate fecundity and thus, under optimal conditions, are capable of spawning over an extended period of time. Maturation occurs at 3.5 years, corresponding to a total length of approximately 10 cm (Farrell et al., 2012). The maximum size of this species is about 18 cm . Boarfish does not appear to be an important prey species in the Celtic Sea area.

\section*{Environmental influence on the stock}

Boarfish feed primarily on Calanus helgolandicus which has increased in abundance in recent years. It is suggested that the increase in abundance of boarfish observed in the EVHOE survey during the 1990s and 2000s was a result of an increase in water temperature during the spawning season which may have enhanced recruitment (Blanchard and Vandermeirsch, 2005).

\section*{The fishery}

The fishery for boarfish is conducted with pelagic trawls. The catches are currently used for reduction to fish meal and oil, but development of a human consumption market is underway. The majority of landings to date have come from ICES Divisions VIIj (75\%) and VIIh (18\%) (Figure 9.4.6.2). The recent development and expansion of the fishery was enabled by developments in the pumping technology for boarfish catches. These changes made it easier to pump boarfish ashore. The number of vessels in the fishery has been increasing, although the recent introduction of a TAC is expected to limit further effort expansion.
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Catch by fleet Total catch (2012) = 87355 t, including discards (8% discards in non-directed fisheries,
92% landings).

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\section*{Quality considerations}

The 2012 and 2013 acoustic survey data were considered reliable, but there is high uncertainty in the estimates of total biomass due to the short time-series. Bottom-trawl survey indices were considered indicative of trends in their respective areas. The commercial catch data are thought to be quite complete, including discards from other fisheries from 2003 onwards. It is thought that discarding due to bycatch fisheries prior to 2003 were likely to have been small in comparison with subsequent catches.

ICES considers the current basis for the advice on this stock to be an interim measure prior to development of an age-based assessment. There was concern in the appropriateness of the use of a production model in this case because the exploitation history of this stock is very short. The application of a production model to derive reference points and advice are largely dependent on model assumptions that may not hold (ICES, 2012).

Scientific basis
\begin{tabular}{ll} 
Assessment type & Bayesian-Schaefer surplus production model. \\
Input data & Commercial catches (international landings and discards). \\
& Two combined acoustic surveys - MSHAS \& BFAS; Six bottom-trawl survey indices \\
& EVHOE, Q4; IGFS, Q4; WCSGFS, Q1 and Q4; SPPGFS, Q3; SPNGFS, Q3/Q4; \\
& ECSGFS, Q4.
\end{tabular}

\section*{ECOREGION Widely distributed and migratory stocks \\ STOCK Boarfish in the Northeast Atlantic}

\section*{Reference points}
\begin{tabular}{|l|l|l|l|}
\hline & Type & Value & Technical basis \\
\hline \multirow{2}{*}{\begin{tabular}{l} 
MSY \\
approach
\end{tabular}} & MSY B \(_{\text {trigger }}\) & Not defined. & \multicolumn{1}{|l|}{\begin{tabular}{l} 
r 2 from Schaefer surplus production \\
model.
\end{tabular}} \\
\cline { 2 - 4 } & \(\mathrm{F}_{\text {MSY }}\) & 0.23 & \\
\hline \begin{tabular}{l} 
Precautionary \\
reference points
\end{tabular} & & Not defined. & \\
\hline
\end{tabular}
(Unchanged since 2013)
Outlook for 2014
Basis: Catch \((2013)=88448\) tonnes \((E U\) TAC \(=82000 \mathrm{t}\) and average discards 2003-2012 \(=6448 \mathrm{t}) ; \mathrm{F}_{2013}=\) 0.145 ; TSB (2014) \(=651968\) tonnes.
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline Rationale & \[
\begin{aligned}
& \text { Catch } \\
& \text { (2014) }
\end{aligned}
\] & Basis & \[
\underset{(2014)}{F}
\] & \[
\begin{gathered}
\text { TSB } \\
(2015)
\end{gathered}
\] & \[
\begin{gathered}
\text { \%TSB } \\
\text { change }^{1)}
\end{gathered}
\] & \begin{tabular}{l}
\% TAC \\
change \({ }^{2)}\)
\end{tabular} \\
\hline MSY approach & 133.957 & \(\mathrm{F}_{\text {MSY }}\) & 0.23 & 580.672 & -10.9 & +51.5 \\
\hline \multirow[t]{4}{*}{} & 0 & Zero catch & 0 & 729.252 & +11.9 & -100 \\
\hline & 70.758 & \begin{tabular}{l}
\(20 \%\) TAC \\
reduction
\end{tabular} & 0.112 & 652.967 & +0.2 & -20 \\
\hline & 88.448 & Roll-over TAC (same as intermediate year) & 0.141 & 629.760 & -3.4 & 0 \\
\hline & 106.138 & 20\% TAC increase & 0.172 & 617.487 & -5.3 & +20 \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1)}\) TSB 2015 relative to TSB 2014 at start of year.
\({ }^{2)}\) Catch 2014 relative to TAC 2013.

\section*{MSY approach}

Following the MSY approach implies a fishing mortality at \(\mathrm{F}_{\mathrm{MSY}}=0.23\). On this basis, ICES advises that catches in 2014 should not be more than 133957 t . If discard rates do not change from the average of the last 10 years 2003 to \(2012(6448 \mathrm{t})\) should be subtracted from this, resulting in landings in 2014 of no more than 127509 t .

\section*{Additional considerations}

\section*{Management considerations}

In 2010 an interim management plan, proposed by Ireland, included a number of measures to mitigate potential bycatch of other TAC species in the boarfish fishery. A closed season from 15 March to 31 August was proposed, as anecdotal evidence suggested that mackerel and boarfish are caught in mixed aggregations during this period. This proposed closed season has been followed by participating vessels on a voluntary basis in 2011 and 2012. A closed season was also proposed in Division VIIg to prevent catches of Celtic Sea herring, known to form feeding aggregations in this region at these times. If catches of a single species other than boarfish totals more than \(5 \%\) of the total catch in the boarfish fishery, by day and by ICES statistical rectangle, and this species is covered by a TAC, then boarfish fishery must cease in that rectangle. In 2012, a management plan was submitted by the Pelagic RAC. This plan has yet to be evaluated by ICES.

Bottom-trawl survey data suggest a continuity of distribution spanning ICES Subareas IV, VI, VII, VIII, and IX (Figure 9.4.6.3). Isolated small occurrences appear in the North Sea (ICES Subarea IV) in some years. A
discontinuity in distribution was suggested between ICES Divisions VIIIc and IXa as boarfish were considered very rare in northern Portuguese waters but abundant further south (Cardador and Chaves, 2010); however, it is unclear if this suggested discontinuity represents a stock separation. Based on these data, a single stock is considered to exist in ICES Subareas IV, VI, VII, and VIII, and in Division IXa. This distribution is broader than the current EC TAC area (Subareas VI, VII, and VIII) and for the purposes of assessment in 2013 only data from these areas were utilized. A dedicated study on the stock structure of boarfish within the Northeast Atlantic and the Mediterranean Sea will commence in October 2013, the results of which will feed into future assessments.

\section*{Regulations and their effects}

In 2010, the European Commission notified member states that mesh sizes less than 100 mm were illegal and that fisheries for boarfish should not be prosecuted with mesh sizes of less than 100 mm . However, in 2011, the European Parliament voted to change Regulation 850/1998 to allow fishing for boarfish using mesh sizes ranging from 32 to 54 mm . In 2011 EC introduced a precautionary TAC. In 2012 the TAC was based on ICES advice. Prior to 2011 the fishery was unregulated.

\section*{Information from the fishing industry}

Due to developments in the pumping technology a number of Danish and Irish pelagic vessels have targeted boarfish in recent years, encountering large quantities of boarfish in ICES Divisions VIIj and VIIh. Both fleets consider that there is a very large stock of boarfish distributed over a large area. Other fishing vessels (demersal vessels and pelagic freezer trawlers) operating in the Celtic Sea are experiencing increases in their bycatches of boarfish, which they consider a nuisance as they can damage both the quality of the catch and their nets. Since the beginning of 2010, the Danish and Irish pelagic fleets have been actively involved in providing scientific samples of boarfish. They have also directly funded biological studies, target strength research, and dedicated boarfish acoustic surveys (2011-2013). The pelagic RAC has developed the proposed fisheries management plan for boarfish.

\section*{Data requirements}

Prior to 2010, commercial sampling effort was poor, with sampling conducted by only a small number of Irish and Danish vessels. Since 2010 sampling has been considered adequate, although boarfish is not currently included under the EU Data Collection Framework. A comprehensive and coordinated sampling scheme and a continuation of the targeted acoustic survey are needed to provide the scientific basis for advice on this species.

\section*{Comparison with previous assessment and advice}

In 2013 the advice is based on the results of a Schaefer surplus production model and follows the MSY approach. In 2012, the advice was based on the 2012 acoustic biomass survey estimate and an \(\mathrm{F}_{\text {MSY }}\) proxy. In 2011, the advice was based on average catches in 2008-2010.

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Figure 9.4.6.2 Boarfish in the Northeast Atlantic. Irish catches by rectangle 2003-2012 (being representative of the area where all countries are fishing).


Figure 9.4.6.3 Boarfish distribution in the Northeast Atlantic. Presence and absence in the IBTS and WIBTS surveys.


Figure 9.4.6.4
Boarfish in the Northeast Atlantic. Catch in tonnes (upper left panel). Survey indices from the boarfish acoustic survey, five individual international bottom-trawl surveys (IBTS), and the English Celtic Sea Groundfish Survey (dots), with modelled catch per unit effort estimates from surplus production assessment (black line) and \(95 \%\) confidence intervals (dashed lines). Total biomass in tonnes. Harvest ratio is total catch divided by total biomass.

Table 9.4.6.1 Boarfish in the Northeast Atlantic. ICES advice, management, and landings.
\begin{tabular}{cccccc}
\hline Year & ICES Advice & \begin{tabular}{c} 
Predicted catch corresp. \\
to advice
\end{tabular} & TAC \(^{1}\) & Bycatch quota \(^{2}\) & ICES Catch \\
\hline 2001 & None & - & None & None & 0.1 \\
2002 & None & - & None & None & 0.9 \\
2003 & None & - & None & None & 11.3 \\
2004 & None & - & None & None & 5.0 \\
2005 & None & - & None & None & 5.9 \\
2006 & None & - & None & None & 7.1 \\
2007 & None & - & None & None & 21.0 \\
2008 & None & - & None & None & 33.8 \\
2009 & None & - & None & None & 89.9 \\
2010 & None & - & None & None & 143.9 \\
2011 & None & - & 33 & 9.8 & 36.9 \\
2012 & No increase in catches & 82 & 82 & 9.9 & 80.7 \\
2013 & MSY approach & 82 & 82 & 9.5 & \\
2014 & MSY approach & 127.509 & & & \\
\hline
\end{tabular}

Weights in thousand tonnes.
\({ }^{1}\) EU and international waters of Subareas VI, VII, and VIII.
\({ }^{2}\) The maximum permitted bycatch (5\%) of boarfish allowed to be subtracted from the EC quotas for western and for North Sea horse mackerel. The 5\% applies to boarfish, whiting, haddock, and/or mackerel.

Table 9.4.6.2 Boarfish in the Northeast Atlantic. Working Group estimates of landings by country and total discards (tonnes).
\begin{tabular}{ccccccc}
\hline Year & Ireland & Denmark & Scotland & \begin{tabular}{c} 
Total \\
landings
\end{tabular} & \begin{tabular}{c} 
Estimated \\
discards
\end{tabular} & \begin{tabular}{c} 
Total catch including \\
discards
\end{tabular} \\
\hline \(\mathbf{2 0 0 1}\) & 120 & 0 & 0 & 120 & NA & 120 \\
\(\mathbf{2 0 0 2}\) & 91 & 0 & 0 & 91 & NA & 91 \\
\(\mathbf{2 0 0 3}\) & 458 & 0 & 0 & 458 & 10929 & 11387 \\
\(\mathbf{2 0 0 4}\) & 675 & 0 & 0 & 675 & 4476 & 5151 \\
\(\mathbf{2 0 0 5}\) & 165 & 0 & 0 & 165 & 5795 & 5959 \\
\(\mathbf{2 0 0 6}\) & 2772 & 0 & 0 & 2772 & 4365 & 7137 \\
\(\mathbf{2 0 0 7}\) & 17615 & 0 & 772 & 18387 & 3189 & 21576 \\
\(\mathbf{2 0 0 8}\) & 21585 & 3098 & 0.45 & 24683 & 10068 & 34751 \\
\(\mathbf{2 0 0 9}\) & 68629 & 15059 & 0 & 83688 & 6682 & 90370 \\
\(\mathbf{2 0 1 0}\) & 88457 & 39805 & 9241 & 137503 & 6544 & 144047 \\
\(\mathbf{2 0 1 1}\) & 20685 & 7797 & 2813 & 31295 & 5802 & 37096 \\
\(\mathbf{2 0 1 2}\) & 55949 & 19888 & 4884 & 80720 & 6634 & 87355 \\
\hline
\end{tabular}

Table 9.4.6.3 "Low" and "High" in the table below indicate the \(95 \%\) credible intervals (Bayesian analogue of confidence intervals) spanning \(2.5-97.5 \%\) of the density.
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline \multicolumn{2}{|r|}{\multirow[b]{2}{*}{Low}} & \multicolumn{3}{|l|}{TSB (t)} & \multicolumn{3}{|l|}{Yield (t)} & \multicolumn{2}{|l|}{F} \\
\hline & & Mean & High & Catch & Landings & Discards & Low & Mean & High \\
\hline 1991 & 185405 & 402420 & 865890 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline 1992 & 294500 & 599420 & 1262950 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline 1993 & 349105 & 718212 & 1513975 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline 1994 & 408708 & 840629 & 1800900 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline 1995 & 363405 & 740344 & 1550950 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline 1996 & 361600 & 750564 & 1594975 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline 1997 & 328002 & 660890 & 1401000 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline 1998 & 422200 & 858262 & 1801975 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline 1999 & 333402 & 675083 & 1407975 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline 2000 & 282600 & 573745 & 1218975 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline 2001 & 301502 & 593448 & 1249975 & 120 & 120 & 0 & 0 & 0 & 0 \\
\hline 2002 & 277102 & 548569 & 1165000 & 91 & 91 & 0 & 0 & 0 & 0 \\
\hline 2003 & 271905 & 535535 & 1116000 & 11387 & 458 & 10929 & 0.01 & 0.024 & 0.042 \\
\hline 2004 & 369702 & 729284 & 1531000 & 5151 & 675 & 4476 & 0.003 & 0.008 & 0.014 \\
\hline 2005 & 361408 & 704629 & 1469000 & 5959 & 165 & 5795 & 0.004 & 0.01 & 0.016 \\
\hline 2006 & 394618 & 768741 & 1612000 & 7137 & 2772 & 4365 & 0.004 & 0.011 & 0.018 \\
\hline 2007 & 323300 & 637403 & 1321975 & 21576 & 18387 & 3189 & 0.016 & 0.038 & 0.067 \\
\hline 2008 & 404700 & 781097 & 1606000 & 34751 & 24683 & 10068 & 0.022 & 0.05 & 0.086 \\
\hline 2009 & 398400 & 761783 & 1571975 & 90370 & 83688 & 6682 & 0.057 & 0.134 & 0.227 \\
\hline 2010 & 606225 & 1153265 & 2371900 & 144047 & 137503 & 6544 & 0.061 & 0.141 & 0.238 \\
\hline 2011 & 509708 & 974025 & 2007975 & 37096 & 31295 & 5802 & 0.018 & 0.043 & 0.073 \\
\hline 2012 & 605610 & 1084655 & 2194975 & 87355 & 80720 & 6634 & 0.04 & 0.09 & 0.144 \\
\hline 2013 & 331202 & 653668 & 1365000 & & & & & & \\
\hline
\end{tabular}

\subsection*{9.4.6.1 Annex}

\section*{Proposed management plan}

A management plan has been proposed by the Pelagic RAC. This management plan has not yet been evaluated by ICES. The plan is presented below.

1 ) The TAC setting rules 1.1-1.6 shall apply. Precedence is in decreasing order from Rule 1.1. These are shown in the table below. The decision year for TAC setting is the last year in the assessment, and not the TAC year.
\begin{tabular}{|c|c|c|c|c|}
\hline Rule & Assessment & Uncertainty & Condition & Procedure \\
\hline 1.1.a & SSB and F & Low & \(\mathrm{SSB}>\mathrm{B}_{\text {trigger }}\) & \(\mathrm{F}_{\text {target }}\) \\
\hline 1.1.b & & & \(\mathrm{SSB}<\mathrm{B}_{\text {trigger }}\) & \(\mathrm{SSB} \times\left(\mathrm{F}_{\text {target }} / \mathrm{B}_{\text {trigger }}\right)\) \\
\hline 1.2.a & SSB and F & Higher & \(\mathrm{SSB}>\mathrm{B}_{\text {trigger }}\) & \(\mathrm{F}_{\text {target }}\) \\
\hline 1.2.b & & & \(\mathrm{SSB}<\mathrm{B}_{\text {trigger }}\) & \(\mathrm{SSB} \times\left(\mathrm{F}_{\text {target }} / \mathrm{B}_{\text {trigger }}\right) \times \mathrm{G}\) \\
\hline 1.3.a & F & Any & \(\mathrm{F}<\mathrm{F}_{\text {target }}\) & Reference TAC * G \\
\hline 1.3.b & & & \(\mathrm{F}>\mathrm{F}_{\text {target, }}\) & \(\mathrm{RTAC}+\left(-\mathrm{RTAC} / \mathrm{F}_{\mathrm{lim}}-\mathrm{F}_{\mathrm{pa}}\right) \times\left(\mathrm{F}-\mathrm{F}_{\mathrm{pa}}\right) \times \mathrm{G}\) \\
\hline 1.4.a & U & Any & \(\mathrm{U}>\mathrm{U}_{\mathrm{pa},}, \mathrm{TAC}=\) & Reference TAC \(\times \mathrm{G}\) \\
\hline 1.4.b & & & \(\mathrm{U}<\mathrm{U}_{\mathrm{pa}}, \mathrm{TAC}=\) & \(\mathrm{U} \times\left(\right.\) Reference \(\left.\mathrm{TAC} / \mathrm{U}_{\mathrm{pa}}\right) \times \mathrm{G}\) \\
\hline 1.5. & Survey biomass & Any & \[
\begin{aligned}
& \mathrm{TAC} \mathrm{y}, \mathrm{q} 3,4= \\
& \mathrm{TACy}+1, \mathrm{q} 1=
\end{aligned}
\] &  \\
\hline . 6 & None & & \begin{tabular}{l}
No information on stock status \\
and \\
no risk of recruitment impairment
\end{tabular} & TAC \(=33000 \mathrm{t}\) (interim management plan TAC) \\
\hline
\end{tabular}

2 ) Notwithstanding Paragraph 1, if in the opinion of ICES, the stock is at risk of recruitment impairment, a TAC shall be based on advice given by ICES, and at a lower level than provided for in Paragraph 1, rules 1.1 to 1.6 .

3 ) Closed seasons, closed areas, and moving on procedures shall apply to all directed boarfish fisheries as follows:
i A closed season shall operate from 15th March to the 31 st August. This is because it is known that herring and mackerel are present in these areas and may be caught with boarfish.
ii A closed area shall be implemented inside the Irish 12 mile limit south of \(52^{\circ} 30^{\prime} \mathrm{N}\) from 12th February to 31st October, in order to prevent catches of Celtic Sea herring, known to form aggregations at these times.
iii If catches of other species covered by TAC amount to more than \(5 \%\) of the total catch by day by ICES statistical rectangle, then all fishing must cease in that rectangle for five consecutive days.

\title{
Northeast Atlantic Pelagic Sharks
}

For latest information, see: http://www.ices.dk and http://www.iccat.int

ICES provides advice on the status of pelagic sharks on a two year cycle. The ICES advice provided in 2012 also applies in 2013.ICCAT also provides advice on pelagic sharks.

Basking shark and great white shark are prohibited species in European fisheries legislation. This means it is illegal to fish for, to retain on board, to transship or to land either species in all Community and non-Community waters. The situation whereby ICES and ICCAT both give advice on pelagic sharks has led to confusion. Some sharks such as porbeagle are subject to management by the EU, but not by other ICCAT contracting parties.

\section*{Basking Shark in the Northeast Atlantic}

No ACOM information has been included for this stock
For latest information, see: http://www.ices.dk

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises on the basis of the precautionary approach that there should be no catches of basking shark, and that it should remain a species prohibited from being fished. FEAS agrees with this advice

This stock falls into Category 6 for data limited stocks where there are negligible landings and stocks are caught in minor amounts as bycatch.

Basking shark is thought to be particularly slow growing, has a high age-at-maturity and a low reproductive capacity. The stock structure is unknown and, in the absence of such information, there is presumed to be a single stock in the NE Atlantic.

The basking shark has a high conservation status, is legally protected on the national wildlife legislation of some EC member states, and is included on Appendix II of CITES.


Figure I Total landings (tonnes) of basking sharks, 1977 to 201 I.

\section*{Porbeagle in the Northeast Atlantic}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES advises on the basis of the precautionary approach that no fishing for porbeagle should be permitted. A rebuilding plan should be developed for this stock. FEAS agrees with this advice. FEAS further recommends that spatial avoidance measures be put in place to avoid large catches of accidental bycatch. This would involve mandatory discard reporting.

This stock falls into category 5, where only landings information is currently available.
There is no new information to alter the perception of the depleted nature of the stock. In view of the low reproductive capacity of porbeagle, a zero fishing mortality appears the only option that can allow a recovery of the stock. There should be no fishery, and landings of porbeagle should not be allowed. A rebuilding plan should be developed for this stock, noting that the time for recovery will exceed a decadal time frame.

Porbeagle are particularly vulnerable to exploitation, because the population productivity is low (long-lived, slow-growing, high age-at-maturity, low fecundity, and a protracted gestation period) and they have an aggregating behavior.

\section*{CURRENT MANAGEMENT}
- There is a zero TAC for porbeagle within EU waters, and porbeagle is on the EU prohibited species list in international waters.
- Bycatches of porbeagle occur in fisheries such as tuna, and may be retained by non-EU vessels fishing outside EU waters.


Figure 2 ICES estimates of landings of porbeagle in the NE Atlantic from 1926-2011. While these catches are considered to be the best available, they are believed to underestimate the pelagic longline catches of this species.

\section*{Blue Shark in the North Atlantic}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICCAT has responsibility for providing advice for this species. Blue shark were last assessed in 2008. FEAS notes that the biomass in 2008 of the North Atlantic blue shark stock appears to be above the biomass that would support MSY and current harvest levels are below \(\mathrm{F}_{\text {MSY }}\), although there is uncertainty in the assessment. Catch records from the bycatch in tuna and swordfish fisheries may be underestimated. Therefore, FEAS agrees with ICCAT recommendations that catch records of blue shark are required for accurate assessments.

\section*{CURRENT MANAGEMENT}
- There is no TAC for blue shark in EU waters.
- It is considered that there is one North Atlantic stock of blue shark.


Figure 3 Total landings (tonnes) of blue shark in the North Atlantic, 1987 to 2011. Landings data for 2011 is considered preliminary.

\title{
Spurdog in the Northeast Atlantic \\ (Sub-areas I-XIV)
}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICESs provides advice for spurdog on a biennial cycle. The advice for 2013 also applies for 2014 . The ICES advice is based on the precautionary approach and states that there should be no target fishery and that bycatch in mixed fisheries should be reduced to the lowest possible level. A rebuilding plan should be developed for this stock. FEAS agrees with this advice. FEAS further recommends that spatial avoidance measures be put in place to avoid large catches of accidental bycatch. This would involve mandatory discard reporting.

This stock falls into category 2 for data-limited stocks - stocks with analytical assessments and forecasts that are only treated qualitatively.

The stock suffered a high fishing mortality for more than four decades, and was not managed during this time. Management measures have been restrictive only since 2007. The spawning biomass and recruitment have declined substantially since the 1960s and are now stable at a low level. Exploitation is estimated to be below the MSY exploitation ratio.

Spurdog have low productivity and are vulnerable to fishing because they form dense aggregations that can be easily fished. The stock currently appears stable at a low level, but the recent period of stability is short compared to the longevity of the species. Given this longevity, stock recovery will be slow.

\section*{CURRENT MANAGEMENT}
- The EU TAC for spurdog in 2012 is set at zero.
- A maximum landings size of 100 cm was in place in 2009 and 2010 before the TAC was set at zero in 2011.

\section*{ICES ADVICE Spurdog (Squalus acanthias) in the Northeast Atlantic}

ICES advice for spurdog can be found in the 2012 Stock Book.

\title{
Ecosystem overview for Deepwater Stocks
}

\section*{FEAS - ECOSYSTEM CONSIDERATIONS}

FEAS advises that the following considerations should be taken into account when developing ecosystem based management objectives for deepwater fisheries:
- Due to their low reproductive output and longevity, many deepwater fish species are very vulnerable to overfishing. High levels of exploitation have led to the depletion of many deepwater fish stocks in ICES subareas VI and VII.
- Fisheries management has addressed the difficulties of ensuring sustainable deepwater exploitation, resulting in a drastic reduction of fishing opportunities for deepwater fleets in the last 10 years. The fisheries for some of the most vulnerable deepwater species such as deepwater sharks and orange roughy are now closed.
- In the last management cycle (TACs for 2013 and 2014), fishing opportunities for roundnose grenadier in VI and VII has increased by \(\mathbf{4 0 \%}\) for 2013 and \(\mathbf{8 0 \%}\) for 2014. For black scabbard in VI/VII the TAC has increased by almost \(70 \%\) for both years. Although this is within single species boundaries of MSY, the impact of this potential increase in fishing effort on depleted stocks and species of unknown status has not been evaluated. Deepwater fishing opportunities should be considered in a mixed fisheries context, taking into consideration all, including the most vulnerable bycatch species. Zero TACs without allowing a bycatch can potentially lead to discarding if existing fisheries overlap with the distribution of protected or depleted species. The lack of fisheries dependant data and independent monitoring programmes means there is currently insufficient data to examine the recovery of depleted stocks in ICES Areas VI and VII. Careful monitoring of the spatial overlap of existing fisheries with their distribution as well as proportion of vulnerable/depleted species in the catch composition is required to manage their protection and recovery.
- Zero catch advice for deepwater sharks is in place since 2006, but there have been no concrete measures to reduce the catch of these severely depleted species. The 0-TACs in place are not effective because sharks continue to be caught, and discarded.
- The ban of bottom trawling in the deepsea has been proposed by the EC to protect the vulnerability of the deepwater ecosystem including its fish species. Exclusion of bottom trawling from the deepsea does not guarantee the protection of VMEs and vulnerable species. Although the spatial footprint of longlining is smaller than that of bottom trawling, when spatially overlapping with VMEs such as cold water corals, this gear can also cause considerable and irreversible damage. Longlining also selectively catches deepwater sharks. Spatial management applied with a precautionary approach and underpinned by habitat mapping is the only effective measure to protect VMEs.
- NEAFC and the EU have already closed a number of areas on the Rockall Bank, the Hatton Bank, the Porcupine Bank and the western European Slope to bottom impacting fishing gear, where cold water corals are known to occur. However, many areas in the deepsea ecoregion remain to be surveyed for Lophelia pertusa. In addition, the impact of fishing on other biogenic habitats such as deepwater sponge beds needs to be considered and evaluated further. Deepwater species are dependent on nutrient input from the upper ocean layers via planktonic snow, mesopelagic species and fall of carcasses. This should be taken into account when considering fisheries for mesopelagic species.
\begin{tabular}{|l|l}
\hline Physieal Features \\
\hline Bathymetry & \begin{tabular}{l} 
The dominant topographical features of the continental slope region are the northeast to \\
southwest trending Rockall Trough \(\left(1,000 \mathrm{~m}\right.\) at \(60^{\circ} \mathrm{N}\) to \(4,000 \mathrm{~m}\) depth at \(\left.53^{\circ} \mathrm{N}\right)\) and the \\
Porcupine Seabight \((350-3,000 \mathrm{~m})\). Both open out onto the Porcupine Abyssal Plain. The \\
Rockall Trough is bounded to the north by the Wyville-Thompson Ridge, the Rockall and \\
Hatton Banks to the west, the Slyne and Erris Basin to the east and the Porcupine Bank \\
and Ridge to the south. The Porcupine Seabight is bordered to the east by the Irish \\
continental shelf, to the west and north by the Porcupine Bank and Ridge and the Goban \\
Spur to the south.
\end{tabular} \\
\hline Substrates & \begin{tabular}{l} 
The seabed consists of fine sediments (silts/clays) and mixed substrata including sands and \\
gravelly sands on the slopes (Rice, 2004). Seabed features include carbonate mound \\
systems e.g. the Logachev Mounds, Pelagica Mounds and Porcupine Bank Canyon
\end{tabular} \\
Mounds, which are made up of layers of foraminifera and coral debris (Kenyon et al., \\
2003) and volcanic seamounts e.g. Hebrides Terrace and Anton Dohrn Seamount whose \\
topography and current regime provide suitable environmental conditions for a wide \\
diversity of marine species. Carbonate mounds and seamounts have been included on \\
OSPAR's list of threatened and/or declining habitats and species (OSPAR, 2008). \\
Pockmarks, canyons, slides, channels, sandbanks, iceberg scours, contourites and drifts \\
are also found on the continental slope and the abyssal seabed (Sacchetti et al., 20II).
\end{tabular}

Circulation Deepwater oceanography to the west of Ireland is complex. Near-surface layers (500700 m ) consist of the saline Eastern North Atlantic Water (ENAW), a poleward Shelf Edge Current (SEC) and a branch of the North Atlantic Current (NAC). Intermediate depth water masses \((700-2,000 \mathrm{~m})\) include the Labrador Sea Water (LSW) (I,600-I,900m) which flows from the west and the dense Norwegian Sea Deep Water (NSDW) which flows southwards over the Wyville-Thomson Ridge. Where the two mix a salinity maximum known as the North East Atlantic Deep Water (NEADW) is formed at about \(2,500 \mathrm{~m}\). Below \(3,000 \mathrm{~m}\), the salinity again decreases, indicating the likely presence of the fresher silicate-rich Antarctic Bottom Water (AABW) (New and Smythe-Wright, 2001).

\section*{Temperature Between 1850 and 2008 the sea surface temperature (SST) warming trend in the} Northeast Atlantic Ocean was \(+0.49^{\circ} \mathrm{C}\) (based on data from the HadSST2 dataset, AVHRR satellite derived SST anomalies and Malin Head coastal station) (Nolan et al., 2009). The northern North Atlantic exhibits multi-decadal-scale variability in mean ocean salinity cycle, with a maximum in the early 1960s and minimum in the mid-1990s (Peterson et al., 2006, Holliday et al., 2009). Salinity in the upper 800 m of the Rockall Trough has remained nearly constant between 2003 and 2010. In early 2010, the deeper water masses increased in salinity by 0.01 .This continued into 2011 and has leveled off in early 2012 (ICES, 20I2b).
\begin{tabular}{lll}
\hline Benthos and & \begin{tabular}{l} 
Biological Features \\
reef
\end{tabular} & \begin{tabular}{l} 
Deep soft sediments support diverse communities of polychaetes and bivalves. \\
Megabenthos groups include: porifera, cnidarians, echinodermata, crustaceans, \\
branchiopoda and fish (Rice, 2004). Cold water habitat-forming corals Lophelia pertusa and \\
Madrepora oculata are found in Irish waters at depths ranging from \(500-1,200 \mathrm{~m}\) (Wheeler \\
et al., 2007) and can tolerate temperatures from \(4^{\circ}-13^{\circ} \mathrm{C}\) and salinities between \(32-38.8\) \\
(Freiwald et al., 2004). Living at depth in the dark they have no symbiotic algae and rely on \\
a supply of current-transported particulate organic matter and zooplankton for food.
\end{tabular} \\
\begin{tabular}{l} 
Their branching carbonate frames support a diverse community of over I,300 species \\
(Roberts et al., 2006).
\end{tabular} \\
\hline Fish community & \begin{tabular}{l} 
The deepwater slopes to the west of Ireland provide habitat for a rich and diverse fish \\
community. Over I70 fish species have been caught and identified by Irish deepwater \\
trawl surveys (Marine Institute, 20I2). The number of species peaks at ca. I 200 to I600m \\
depth. Grenadiers such as roundnose, spearsnouted and Gunther's are very abundant as \\
are smooth rat tails, Baird's smoothhead, Lepidion eques and black scabbard. Roundnose
\end{tabular} \\
\hline
\end{tabular}
grenadier and black scabbard still support limited deepwater fisheries. Many shark species can be considered true deepwater species as they occupy large depth and horizontal ranges on the continental slope. Two species, Centrophorus squamosus and Centroscymnus coelolepis have historically supported commercial fisheries. Many of the other species such as Centroscymnus crepidater and Centroscyllium fabricii are caught commercially as bycatch. On occasion these are landed but generally they are discarded. Deepwater elasmobranchs, chimaerids and rhinochimaerids, also known as rabbit fish, are widespread throughout the area.

\section*{Human pressures and impacts}

The main human activities in the deepwater region are:
- Fishing
- Transport
- Offshore energy

Pressures associated with deepwater commercial fisheries are:
- The removal of species
- Seafloor disturbance

The status of most deepwater stocks is unknown. Exploitation of these stocks has substantially decreased in recent years due to stringent management measures and increased fuel prices. There has been a reduction in deepwater fishing effort of over \(75 \%\) in ICES Areas VI and VII from peak levels in 2002 to current levels. Of the 14 deepwater stocks for which Ireland has a quota, three are believed to be depleted, while three further stocks are believed to be at or above biomass reference points. Where exploitation rates are known, stocks are now fished at sustainable levels. The decline in deepwater fishing effort has led to the subsequent reduction in discarding of threatened or vulnerable elasmobranch species. However, due to their late age at maturity and low levels of fecundity, it will take time before these stocks can recover to previous levels.

Biogenic habitat such as those formed by the cold water coral Lophelia pertusa occur along the slope, on the offshore banks (Rockall and Hatton), on the mid-Atlantic Ridge and on seamounts supporting rich and diverse faunal assemblages. Deepwater trawling as well as set nets and longlining are known to have negative impacts on these habitats (ICES, 2012d). A full reference list can be found in Appendix VI.

\section*{Deepwater Stocks South of \(63^{\circ} \mathrm{N}\)}

Management advice on deepwater species is biennial and was last given in 2012. EU fishing opportunities for deepwater species are also biennial except for tusk, ling, greater silver smelt and blue ling in ICES Areas V, VI and VII which are managed by annual TACs. While deep water species still present an opportunity for the Irish fleet, with increased fuel prices, low TAC share and sustainability issues, they are now of minor importance, with the exception of ling. Therefore FEAS does not offer advice for deepwater species, except for ling in Divisions IIla and IVa, and in Subareas VI, VII, VIII, IX, XII, and XIV (other areas). This advice can be found in the Celtic Sea section.

This year's chapter on deepwater fisheries includes TACs for 2013 and 2014 for deepwater species with an Irish quota and a summary of their 2012 ICES advice.

Table I. 2013 and 2014 TACs for deep water stocks with Irish quota.
\begin{tabular}{|c|c|c|c|c|c|}
\hline Species: & ICES Zones & \[
\begin{array}{r}
2013 \\
\text { TAC }
\end{array}
\] & \[
\begin{array}{r}
2013 \\
\text { Irish } \\
\text { Quota }
\end{array}
\] & \[
\begin{array}{r}
2014 \\
\text { TAC }
\end{array}
\] & \[
\begin{array}{r}
2014 \\
\text { Irish } \\
\text { Quota }
\end{array}
\] \\
\hline Deep Sea Sharks & V, VI, VII,VIII, IX & 0 & 0 & 0 & 0 \\
\hline Deep Sea Sharks & XII & 0 & 0 & 0 & 0 \\
\hline Black scabbardfish & V, VI, VII, XII & 3,051 & 87 & 3,966 & 113 \\
\hline Alfonsinos & I, II, III, IV, V, VI, VII,VIII, IX, X,XII, XIV & 312 & 10 & 296 & 9 \\
\hline Roundnose grenadier & Vb, VI, VII & 4,297 & 279 & 4,297 & 279 \\
\hline Roundnose grenadier & VIII, IX, X, XII, XIV & 3,581 & 5 & 3,223 & 4 \\
\hline Orange roughy & VI & 0 & 0 & 0 & 0 \\
\hline Orange roughy & VII & 0 & 0 & 0 & 0 \\
\hline Orange roughy & \[
\begin{aligned}
& \text { I, II, III, IV,V, VIII, IX,X, XI, } \\
& \text { XII,XIV }
\end{aligned}
\] & 0 & 0 & 0 & 0 \\
\hline Red seabream & VI, VII, VIII & 196 & 6 & 178 & 5 \\
\hline Forkbeards & V, VI, VII & 2,028 & 260 & 2,028 & 260 \\
\hline Blue ling & Vb, VI, VII & 2,540 & 7 & & \\
\hline Silver smelt & III,IV & 1,176 & 8 & & \\
\hline Silver smelt & V,VI,VII & 4,691 & 331 & & \\
\hline Tusk & V,VI,VII & 3,860 & 53 & & \\
\hline Ling & VI-XIV & 14,164 & 591 & & \\
\hline
\end{tabular}

\section*{Summary of 2012 ICES stock status and management advice for NEA deepwater stocks for which Ireland has a quota.}

Table I. Stock status and management advice for NEA deep water stocks 2012, with Irish quota. Ticks are at or below reference level for \(F\) and at or above reference level for SSB, Crosses are above the reference level for \(F\) and below the reference level for SSB. Green/red on white symbols- qualitative estimates; white on green/redquantitative estimates; arrows indicate directional trends.
\begin{tabular}{|c|c|c|c|c|}
\hline \multirow[t]{2}{*}{Species:} & \multirow[t]{2}{*}{ICES Zones} & \multicolumn{2}{|l|}{Stock status} & \multirow[t]{2}{*}{ICES Advice} \\
\hline & & F~msy & \begin{tabular}{l}
SSB~ \\
Btrig
\end{tabular} & \\
\hline Deep Sea Sharks & NEA & \(?\) & (x) & No catches of Portuguese dogfish, leafscale gulper shark and no targeted fishery for kitefin shark. \\
\hline Black scabbardfish Aphanopus carbo & Vb, VI, VII, XIIb &  &  & Catches should be no more than 4,700 tonnes \\
\hline \begin{tabular}{l}
Alfonsinos \\
Beryx spp
\end{tabular} & I, II, III, IV,V, VI, VII, VIII, IX, X, XII, XIV & \[
?
\] & ? & Catches should be no more than 280 tonnes \\
\hline Roundnose grenadier Coryphaenoides rupestris & Vb, VI, VII, XIIb &  &  & Catches should be no more than 6,000 t \\
\hline Roundnose grenadier Coryphaenoides rupestris & MAR ( Xb, XIlc, VaI, XIIaI, XIVbI) & ? & ? & Catches should be no more than 1,350t \\
\hline Roundnose grenadier Coryphaenoides rupestris & Subareas I, II, IV, VIII, and IX, Division XIVa, and Subdivisions Va2 and XIVb2 & ? & \(?\) & Fisheries should not be allowed to expand from \(120 t\) \\
\hline Orange roughy Hoplostethus atlanticus & NEA & \[
?
\] & ? & No directed fishery \\
\hline \begin{tabular}{l}
Blue ling \\
Molva dypterygia
\end{tabular} & Vb, VI, VII &  & (11) & Catches should be no higher than 3,900t \\
\hline \begin{tabular}{l}
Blue ling \\
Molva dypterygia
\end{tabular} & IIIa and IVa, and Subareas I, II, VIII, IX, and XII & \[
?
\] & (X) & No directed fisheries and reduction in bycatch \\
\hline \begin{tabular}{l}
Red seabream \\
Pagellus bogaraveo
\end{tabular} & VI, VII, and VIII & ? & \[
\boldsymbol{x}
\] & No directed fisheries, and measures should be put in place to reduce bycatch \\
\hline Greater Forkbeard Phycis blennoides. & NEA & \[
?
\] & \[
\Leftrightarrow
\] & Catches should be no more than 1,000 tonnes \\
\hline Ling & \[
\begin{aligned}
& \text { III, IV,VI, VII, VIII, IX, } \\
& \text { X,XII, XIV }
\end{aligned}
\] &  &  & Catches should be no more than 10,800 tonnes \\
\hline \begin{tabular}{l}
Tusk \\
Brosme brosme
\end{tabular} & Divisions IIla, Vb, Vla, and XIIb, and Subareas IV, VII, VIII, and IX (other areas) & ? &  & Catches should be no more than 8,500 tonnes \\
\hline Greater Silver Smelt & Subareas I, II, IV, VI, VII, VIII, IX, X, XII, and XIV, and Divisions IIla and Vb (other areas) & \(?\) & \(?\) & Catches should be no more than 32,000 tonnes \\
\hline
\end{tabular}

\section*{Industrial Fisheries}

Industrial fisheries are here defined as those that catch fish for rendering into fishmeal and not for human consumption.

\section*{Sandeel Division Vla}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

There is no TAC for this stock. In 2012 ICES advised for 2013 and 2014, based on the ICES approach to data limited stocks, and taking into account the absence of landings in recent years, that no increase of catches should take place unless there is evidence that this will be sustainable. FEAS agrees with this advice.

This stock falls into Category 6, as landings are negligible.
Given their importance as forage fish, FEAS recommends that fisheries should not be allowed to develop until sufficient information is available to assess the resource, the impact of the fisheries on the resource, and the role of sandeel in the ecosystem.


Figure I. International Sandeel Landings in Vla

\section*{CURRENT MANAGEMENT}
- There is no TAC for Norway pout in Vla.
- EC vessels are restricted to using gears of no less than 16 mm in targeting this species.

Table I. Sandeel, Division VIa Landings (tonnes), 1981-201I, as officially reported to ICES
\begin{tabular}{lccccccccccccccc}
\hline & 1981 & 1982 & 1983 & 1984 & 1985 & 1986 & 1987 & 1988 & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 \\
\hline Denmark & - & - & - & - & - & - & - & - & - & - & - & - & 80 & - & - \\
Faeroe Islands & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - \\
UK - Scotland & 5972 & 10873 & 13051 & 14166 & 18586 & 24469 & 14479 & 24465 & 18785 & 16515 & 8532 & 4985 & 6156 & 10627 & 7111 \\
13257 \\
\hline TOTAL & 5972 & 10873 & 13051 & 14166 & 18586 & 24469 & 14479 & 24465 & 18785 & 16515 & 8532 & 4985 & 6236 & 10627 & 7111 \\
13257 \\
\hline \hline & & & & & & & & & & & & & & & \\
\hline & & & & & & & & & & & & \\
\hline Denmark & - & - & - & - & - & - & - & - & - & - & - & - & - & - & - \\
Faeroe Islands & - & - & - & - & - & - & - & - & - & - & 57 & - & - & - & - \\
UK - Scotland & 12679 & 5320 & 2627 & 5771 & 295 & 706 & - & 566 & - & - & - & - & - & - & - \\
\hline TOTAL & 12679 & 5320 & 2627 & 5771 & 295 & 706 & 0 & 566 & 0 & 0 & 57 & 0 & 0 & 0 & 0 \\
\hline
\end{tabular}

\section*{Norway pout Division Vla}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

There is no TAC for this stock. In 2012 ICES advised for 2013 and 2014, based on the ICES approach to data limited stocks, and taking into account the absence of landings in recent years, that no increase of catches should take place unless there is evidence that this will be sustainable.
FEAS agrees with this advice.
This stock falls into Category 6, as landings are negligible.
Given Norway pout's importance as forage fish, FEAS recommends that fisheries should not be allowed to develop until sufficient information is available to assess the resource, the impact of the fisheries on the resource, and their role in the ecosystem.

\section*{CURRENT MANAGEMENT}
- There is no TAC for Norway pout in Vla. A preliminary TAC is put in place each year in Divisions Illa, IVa and Ila . EC vessels are restricted to using gears of no less than 16 mm in targeting this species.


Figure 2. Norway pout in Division Vla (West of Scotland)

Table 2 Norway pout in Division Vla. Officially reported landings (tonnes). Source FAO
\begin{tabular}{lcccccccccccc}
\hline & 1989 & 1990 & 1991 & 1992 & 1993 & 1994 & 1995 & 1996 & 1997 & 1998 & 1999 & 2000 \\
\hline Denmark & 28180 & 3316 & 4348 & 5147 & 7338 & 14147 & 24431 & 6175 & 9549 & 7186 & 4624 & 2005 \\
Faeroe Islands & 11 & - & - & - & - & - & - & - & - & - & - & - \\
Germany & - & - & - & - & - & - & 1 & - & - & - & - & - \\
Netherlands & - & - & - & 10 & - & - & 7 & 7 & - & - & 1 & - \\
UK - Eng+Wales+N.Irl. & - & - & - & 1 & - & 1 & - & - & - & - & - & - \\
UK - Scotland & 5 & - & - & - & - & - & - & 140 & 13 & - & - & - \\
\hline TOTAL & 28196 & 3316 & 4348 & 5158 & 7338 & 14148 & 24439 & 6322 & 9562 & 7186 & 4625 & 2005 \\
\hline \hline & & & & & & & & & & & \\
\hline & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline Denmark & 3214 & 4815 & 6395 & 2281 & - & 32 & - & - & - & - & - & - \\
Faeroe Islands & - & 4 & - & - & - & - & - & - & - & - & - & - \\
Germany & - & - & 2 & - & - & - & - & - & - & - & - & - \\
Netherlands & - & - & - & - & - & - & - & - & - & - & - & - \\
UK - Eng+Wales+N.Irl. & - & - & - & - & - & - & - & - & - & - & - & - \\
UK - Scotland & - & - & - & 4 & - & - & - & - & - & - & - & - \\
\hline TOTAL & 3214 & 4819 & 6397 & 2285 & 0 & 32 & 0 & 0 & 0 & 0 & 0 & 0 \\
\hline
\end{tabular}

\section*{Lanternfish, Pearlsides and Other Mesopelagic Species}

\section*{Sub-areas VI and VII}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

ICES does not provide advice for these species, nor is there is a TAC. There have been recent fishing trials by Scottish and Irish vessels. Iceland began a fishery in 2009, and in the early 2000s Russia had a fishery in Faroese waters.

Though not assessed by ICES, these stocks would belong to Category 6, as only landings information is available.

Results from exploratory fishing, and from recent blue whiting acoustic surveys in VI and VII showed that the most abundant species are Mueller's pearlside, glacial lantern fish and lancet fish, as well as Euphausid crustaceans, though Mueller's pearl side constituted a clean catch in the exploratory fishery. These species are well-documented food fish, especially for mackerel, hake and blue whiting Given their importance as food fish, FEAS advises that fisheries should not be allowed to develop in VI and VII, or elsewhere unless the impact of outtake on the ecosystem - in particular on predators is understood, the sustainable harvest rates are identified, and there is adequate information on the levels and species composition of any by-catch. In particular it will be necessary to have detailed information on food web interactions of these species in the wider pelagic/deepsea ecosystem.

\section*{CURRENT MANAGEMENT}
- There are no TACs for mesopelagic species in the NE Atlantics.
- EC vessels are not allowed to target these species with any towed gear or net with mesh sizes of less than 100 mm , under Regulation 850/98.
- In 2013, Irish and Scottish industry-funded exploratory voyages were conducted under derogations from Regulation 850/98, allowing use of mesh sizes of less than 100 mm .

Table 3 Lanternfish. Officially reported landings (tonnes). Source FAO
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline & 2000 & 2001 & 2002 & 2003 & 2004 & 2005 & 2006 & 2007 & 2008 & 2009 & 2010 & 2011 & 2012 \\
\hline Sub-area Ila & - & - & 842 & 46 & - & 2 & - & 8 & - & - & - & - & na \\
\hline Sub-area Va & - & - & - & - & - & - & - & - & - & 46206 & 17912 & - & na \\
\hline Sub-area Vb 1 & 998 & 1412 & 9026 & 460 & 9 & - & - & 13 & 15 & - & - & - & na \\
\hline Sub-area Vla & - & - & - & - & - & - & - & 1 & 10 & - & - & - & na \\
\hline Sub-area VIb & - & 1803 & 11 & - & - & - & - & - & - & - & - & - & na \\
\hline Sub-area XII & - & - & - & - & - & 1 & - & - & - & - & - & - & na \\
\hline Sub-area XIVb & - & - & 293 & 180 & 166 & 187 & 1 & 2 & - & - & - & - & na \\
\hline Total & 998 & 3215 & 10172 & 686 & 175 & 190 & 1 & 24 & 25 & 46206 & 17912 & - & na \\
\hline
\end{tabular}

\title{
Arctic Stocks (Cod, Haddock and Saithe)
}

There are a number of Arctic stocks in which Ireland has an interest. EU quota allocations for this area include a portion of the annual TAC for the Irish fleet.

Ireland has taken part in these fisheries in recent years and the main catches have been taken by a small number of trawlers that started fishing in the 1990s. These fisheries are important to Norway and Russia but a number of other countries including Iceland, Faroe Islands, United Kingdom, Spain, Poland and Greenland also take catches.

The main stocks that are exploited by the Irish fleet are Cod, Haddock, and Saithe. Summaries of the state of each stock and of the ICES advice for each stock are presented below. The full analyses of these stock carried out by ICES are available on the ICES web site http://www.ices.dk/advice/icesadvice.asp

\section*{Cod in Sub-areas I and II}

\section*{North-East Arctic Cod}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice is based on the joint Russian-Norwegian management plan and stipulates that catches in 2014 should be no more than 993 kt.

This stock falls into category I as there is a full analytical assessment and forecast. SSB is currently at a record high. Applying the management plan leads to a fishing mortality below \(F_{p a}\) and SSB in 2015 above \(B_{p a}\) and close to the historical high.

FEAS agrees with ICES that the management plan is in accordance with the precautionary approach and is therefore the basis for the advice.

\section*{CURRENT MANAGEMENT}
- A management plan has been in place since 2004 (amended in 2009). ICES considers the amended plan to be in accordance with the precautionary approach and not in contradiction with the MSY approach. The plan aims to maintain \(F\) at \(F_{p a}(0.40)\) and to restrict between-year TAC changes to \(\pm 10 \%\). However, should \(F\) fall below 0.3, the TAC should be increased (without restriction) to a level corresponding to a fishing mortality of 0.30 . This is the situation that is currently relevant with \(\mathrm{F}=0.26\). The plan stipulates that should SSB fall below \(B_{p a}\), the target \(F\) should be reduced with no limitation on year-to-year variation in TAC.
- The 2013 TAC is \(1,000,000 \mathrm{t}\). The EU allocation (Norwegian waters only) is \(19,97 \mathrm{I} \mathrm{t}\) and the Irish allocation in 2013 was 299 t .

\section*{Haddock in Sub-areas I and II}

\section*{North-East Arctic Haddock}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice is based on the joint Russian-Norwegian management plan and stipulates that catches in 2014 should be no more than 150 kt.

This stock falls into category I as there is a full analytical assessment and forecast. SSB increased significantly from 2000 until 2010 and is currently well above \(B_{p a}\). Fishing mortality has been around \(F_{\text {MSY }}\) since the mid-1990s but has recently increased.

FEAS agrees with the ICES advice that the agreed management plan is consistent with the precautionary approach and is therefore the basis for the advice. FEAS notes that the 25\% TAC change limit as specified in the management plan is expected to lead to a fishing mortality in 2014 that is substantially higher than \(\mathrm{F}_{\text {MSY }}\).

\section*{CURRENT MANAGEMENT}
- A management plan has been in place since 2004. In 2007 it was modified from a three-year rule to a oneyear rule. The HCR is based on F \(_{\text {MSY }}\) with TAC changes limited to \(+-25 \%\), provided SSB remains above \(B_{p a}\). More stringent action is taken in the event of spawning stock biomass falling below \(B_{p a}\).
- The management plan is to remain in place until 2015.
- The 20I3 TAC for this stock was \(200,000 \mathrm{t}\). The EU allocation (Norwegian waters only) was I,48It. There is no Irish allocation for this stock.

\section*{Saithe in Sub-areas I and II}

\section*{North-East Arctic Saithe}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice is no longer based on the management plan as the assessment has been rejected. However, exploratory assessments and forecasts that are considered to be coherent with the objectives of the management plan lead to an advice of 140 kt in 2014.

There is no accepted assessment for this stock. Exploratory assessments indicate that SSB has declined since 2005 and is likely to be close to \(B_{p a}\) in 2013 . Fishing mortality has increased since 2005 and is likely close to \(\mathrm{F}_{\text {MP }}\) (0.35). MSY reference points are undefined for this stock.

\section*{CURRENT MANAGEMENT}
- Although ICES evaluated the Harvest Control Rule (HCR) and concluded that it was consistent with the precautionary approach, it is not possible to implement it without an accepted assessment.
- The management plan had been in place since 2007 and aimed to maintain \(F\) at \(F_{p a}\) with between-year TAC changes limited to \(+/-15 \%\) unless SSB falls below \(B_{p a}\) when more stringent action is required.
- The 2013 TAC set by Norwegian authorities for Sub-areas I and II is I40,000 t. The EU has a quota for 20I3 of \(2,550 \mathrm{t}\). There is no Irish allocation for this stock.
- In addition to TAC regulations there are minimum mesh sizes, minimum catch size (increased in 1999) and closed area regulations in operation.

\title{
Capelin in the Iceland, East Greenland, Jan Mayen area
}

\section*{(Sub-areas V and XIV and Division Ila west of \(5^{\circ} \mathrm{W}\) )}

\author{
For the latest ICES information, see: http://www.ices.dk
}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

The ICES advice is based on precautionary considerations and recommends that there be no fishery until new information on stock size predicts SSB to be above the escapement threshold.

As capelin is a short-lived species, SSB is comprised of only one or two age groups and is therefore highly dependent on recruitment. The annual acoustic autumn survey that took place in October 2012 was used to predict the SSB of capelin. The predicted SSB in March 2014 is likely to be below the 400 kt escapement threshold. Following previous recommendations, ICES trialled two other assessment methods in 2013. These gave lower predicted SSB values.

FEAS agrees with the ICES advice. FEAS also notes that ICES has not evaluated the management plan.

\section*{CURRENT MANAGEMENT}
- The assessment is completely based on a number of acoustic surveys.
- The fishery is managed according to a two-part harvest control rule which aims for a predicted SSB of at least \(400,000 \mathrm{t}\) at the end of the fishing season. ICES has not evaluated the management plan with respect to its conformity to the precautionary approach.
- The TAC is set in two parts. The first part of the TAC, which applies for only the first half of the season (August-November), is limited to \(66 \%\) of the total advised TAC for the entire season. The TAC for the remainder of the season is reviewed to ensure that the SSB at the end of the season will be above \(400,000 \mathrm{t}\).
- Immediate, temporary area closures in the fishery are introduced when high abundance of juveniles are measured in the catch (i.e. if more than \(20 \%\) of the catch is composed of fish less than 13 cm ). These closures are enforced using on board observers.
- Ireland has not participated in this fishery to date. However, the EU negotiates an annual quota share with Denmark and Greenland and Ireland is entitled to a share of this.


\section*{Sardines}

\section*{(Sub-areas VI,VII and Divisions VIIIa, b, d \& e)}

\section*{FEAS - SINGLE STOCK CONSIDERATIONS}

FEAS agrees with the ICES advice that, based on the precautionary principle, catches should be no more than 27,554 t in Sub-area VII and Divisions VIIIa, b \& d. This figure is likely close to MSY. This is the first time that ICES has provided advice for sardines in this area. There is no ICES advice for Sub-area VI. There are no quota or management regulations for Sardines in Sub-areas VI, VII and Divisions VIIIabde.
International landings of sardines have fluctuated over time. It is not clear if this fluctuation is related to changing abundance, or changing fishing patterns. The average of the combined biomass indices in the last two years (20II-20I2) is around \(27 \%\) lower than the average of the three previous years (2008-20I0) in Divisions VIIIa,b,d. Survey information is not available in other areas.

Fisheries may develop on this species in future years due to the management restrictions placed on the herring fishery in these areas. Landings should be monitored to verify species composition, and developing fisheries should be accompanied by programmes to assess what sustainable harvest rates should be.

\section*{CURRENT MANAGEMENT}
- No management regulations or TACs exist for sardine fisheries in ICES Sub-areas VI, VII and Divisions VIIla,b,d,e.
- No TAC exists for the VIIIc/lXa fishery although advice for 2014 is for catches of no more than \(17,000 \mathrm{t}\).


Official sardine landings figures, 1992-20I2. 20II and 2012 landins should be considered preliminary.

Appendix I

\section*{Nephrops Functional Units (FUs) around Ireland}


Appendix II

\section*{Restrictions on Mackerel \& Herring}

(Map courtesy of B.I.M.)

\section*{Appendix III}

Herring Spawning Boxes off the South Coast


Appendix IV

\section*{Approximate Locations of Herring Spawning Grounds and Areas}


\section*{AppendixV}

\section*{Cod and Hake Recovery Boxes in 2012}


\section*{IRISH SEA COD BOX}

Closed to all fishing with any demersal trawl, seine or similar towed net, any gill net, trammel net or similar static net or any fishing gear incorporating hooks from the \(14^{\text {th }}\) of February to \(30^{\text {th }}\) April.

Fishing is permitted with a prawn net in the areas of the closed boxes coloured green provided:
-A minimum of \(35 \%\) live weight of prawns is on board; - Only one mesh size range is carried on board, \(70-79 \mathrm{~mm}\) or \(80-99 \mathrm{~mm}\);
- No other type of gear is carried on board.;
- No mesh in any part of the net is greater than 300 mm

Fishing is permitted with a prawn net in this areas provided that in addition to the above:
- It complies with the provisions made for the green zone; • It included an inclined separator panel.

\section*{CELTIC SEA CONSERVATION AREA}

From \(1^{\text {st }}\) February to \(31^{\text {st }}\) of March the highlighted areas are closed to all fishing except with pots and creels provided no fish other than shellfish are retained on board or Pelagic trawls with a codend mesh size of \(\leq 55 \mathrm{~mm}\) provided no fish other than herring, mackerel, pilchard/sardines, sardinelles, horse mackerel, sprat, blue whiting and argentines are retained on board.

\section*{HAKE BOX}

Within this area a minimum mesh size of 100 mm must be used for all towed gears and a minimum mesh size of 120 mm used for all gillnets, entangling and trammel nets. Beam trawls of between \(55-99 \mathrm{~mm}\) maybe used east of \(7^{\circ} 30^{\prime}\) west in the period April to October.

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\section*{Definition of fisheries technical terms and acronyms}

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.

ACOM Advisory Committee is the sole competent body for ICES for scientific advice in support of the management of coastal and ocean resources and ecosystems. It is a merger of the former ACFM, ACE and ACME advice groups.

Acoustic surveys Acoustic surveys use sound waves emitted from a "transducer" to estimate the density of plankton and fish shoals. The survey vessel tows the transducer under water, which is linked to an echo sounder in the vessel which records the shoals of fish as "marks" on a screen or paper trace. The density of these marks is used to calculate total biomass of a stock.

Age The number of years of life completed, here indicated by an Arabic numeral, followed by a plus sign if there is any possibility of ambiguity (age 5, age 5+)

Benthic Anything living on, or in, the sea floor.
Boreal species Species originating in a temperate climate e.g. Northern Europe.
BIM An Bord lascaigh Mhara, The Irish Sea Fisheries Board, charged with responsibility for development of the fishing and aquaculture industries in Ireland. (see http://www.bim.ie)
Biomass Measure of the quantity, usually by weight in metric tons ( 2,205 pounds \(=1\) metric ton \()\), of a stock at a given time.
Biological reference points Various reference points can been defined for fished stocks. These can be used as a management target or a management trigger (i.e. point where more stringent management action is required) Examples include fishing mortality reference points \(\mathrm{F}_{0.1}, \mathrm{~F}_{\text {max }}, \mathrm{F}_{\text {med }}, \mathrm{F}_{\mathrm{pa}}\) and biomass reference points \(\mathrm{B}_{\mathrm{pa}}\) and \(\mathrm{Blim}_{\text {lim }}\).
\(B_{l i m}\) The \(B_{l i m}\) is the limit of the spawning stock biomass, below which recruitment is impaired or the dynamics of the stock are unknown.

BMSY Spawning stock biomass (SSB) that results from fishing at FMSY for a long time.
\(B_{p a} B_{p a}\) is the Spawning Stock Biomass (SSB) level above which the stock should be maintained to ensure a low risk to recruitment impairment. In stocks where there has been no evidence of reduced recruitment below a certain SSB size, \(\mathrm{B}_{\mathrm{pa}}\) has been calculated by multiplying Bloss (the lowest observed SSB) by uncertainty factor ( \(\mathrm{e}^{-1.645}\) ) to take into account assessment uncertainty.
\(B_{\text {trigger }} B_{\text {MsY-trigg }}\) is a biomass reference point that triggers a cautious response, The cautious response is to reduce fishing mortality to reinforce the tendency for a stock to rebuild and fluctuate around a notional value of BMSY (even though the notional value is not specified in the framework) when \(\mathrm{F} \leq \mathrm{FMSY}\).

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
CECAF Fisheries Committee for the Eastern Central Atlantic - a committee of FAO (see below) and web page http://www.fao.org/fi/body/rfb/cecaf/cecaf_home.htm
CFP / Common Fisheries Policy The instrument of fisheries management within the European community (see http://ec.europa.eu/fisheries/ reform/index_en.htm)
Collapse FEAS consider a stock to have collapsed when the spawning stock biomass has been below \(\mathbf{B l i m}_{\text {lim }}\) for three consecutive years.

CPUE /Catch Per Unit of Effort The catch of fish, in numbers or in weight, taken by a defined unit of fishing effort e.g \(\mathrm{Kg} /\) hour or numbers/hr. CPUE is used as a proxy for stock abundance for some stocks and often an input to assessment models.

Closed areas Various temporal and spatial area closures have been implemented as fisheries management and environmental conservation tools. Normally these involve a prohibition on the use of certain fishing gears for a defined area and/or period.
Data Rich stocks those stocks for which a quantitative population estimate and forecast is available (e.g ICES Category I \& 2).

Data limited stocks those stocks for which there is not a population estimate \& forecast available whether through reason of lack of appropriate data or adequate time series (e.g. ICES categories 3-6).

DCF / Data Collection Framework EU Commission Regulation 665/2008 establishes the Data Collection Framework (DCF), a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy (CFP). Under this regulation the European Commission requires Member States to collect data on Biological and Economic aspects of many European fisheries and related fisheries sectors. (see: https://datacollection.jrc.ec.europa.eu/)

DELASS Developing Elasmobranch Stock Assessments - An EU-funded project aimed at species identification, stock identification and discrimination, as well as data preparation and exchange on elasmobranch species such as sharks and rays.

Demersal Fish, such as cod, whiting, haddock, sole, plaice, skates and rays, that normally swim in mid-water at or close to the sea floor.

Discard Discards are defined as that part of the catch returned to the sea as a result of economic, legal or other considerations.

Discard rate The percentage (or proportion) of the total catch which is discarded.
Ecosystems are composed of living animals, plants and non living structures that exist together and 'interact' with each other. Ecosystems can be very small (the area around a boulder), they can be medium sized (the area around a coral reef) or they can be very large (the Irish Sea or even the eastern Atlantic).

Ecosystem approach Ecosystem approach to fisheries management. Management that takes into account the effects of fisheries on the ecosystem and the effects of the ecosystem on the fish stocks.
Effective fishing effort Fishing effort or intensity standardised in some way e.g. hours fished in an area.
Elasmobranchs Fish, such as skates, rays, sharks and dogiish, whose skeletons are cartilagenous rather than boney (as in the teleost species such as cod, whiting, plaice and herring).

Emergency Measures Measures adopted by the EU prior to the introduction of cod and hake as part of the recovery plan.
Exploitation boundary Threshold on exploitation (catch, mortality, effort) that is consistent with a management strategy or international agreement (e.g. exploitation boundary consistent with precautionary approach).

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 I 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).

Fcube (Fleet and Fisheries Forecast). Method to forecast simulations of stocks and fleet dynamics are performed to evaluate the consequences of various management scenarios (Ulrich et al 201I).

FEAS / Fisheries Ecosystems Advisory Services - One of five service areas of the Marine Institute, FEAS's mission is to Assess, Research and Advise on the marine fisheries resource in Irish waters - (see: http://www.marine.ie/)
Fecundity In general, the potential reproductive capacity of an organism or population expressed in the number of eggs (or offspring) produced during each reproductive cycle. Fecundity in fish usually increases with age.
Fishery Group of vessel voyages targeting the same (assemblage of) species and/or stocks, using similar gear, during the same period of the year and within the same area (e.g. the Irish flatfish-directed beam trawl fishery in the Irish Sea).

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

Fleet A physical group of vessels sharing similar characteristics in terms of technical features and/or major activity (e.g. the Irish beam trawler fleet < 300 hp , regardless of which species or species groups they are targeting).
F / Fishing Mortality Deaths in a fish stock caused by fishing. Instantaneous Rate of Fishing Mortality. When fishing and natural mortality act concurrently, F is equal to the instantaneous total mortality rate ( Z ), multiplied by the ratio of fishing deaths to all deaths. Expressed on an exponential scale: \(F=0.5\) means that \(I-\operatorname{EXP}(-0.5)=39 \%\) are removed.
Flim is the limit fishing mortality. Flim should be avoided with high probability because it is associated with unknown stock dynamics or stock collapse.
\(F_{\text {max }}\) The fishing mortality for a given exploitation pattern rate of growth and natural mortality, that results in the maximum level of yield-per-recruit.

Fmed Fishing mortality rate F corresponding to a \(\operatorname{SSB} / \mathrm{R}\) equal to the inverse of the 50 th percentile of the observed \(\mathrm{R} / \mathrm{SSB}\).

FMP Fishing mortality reference point as defined in management plans.
Fmsy The fishing mortality rate, which, if applied constantly, would result in Maximum Sustainable Yield (MSY). The largest annual catch that may be taken from a stock continuously without affecting the catch of future years; a constant longterm MSY is not a reality in most fisheries, where stock sizes vary with the strength of year classes moving through the fishery. For practical purposes, ICES uses proxies such as \(F_{\text {max }}, F_{35 \% s p r}\) or \(F_{0.1}\) for \(F_{\text {MSY }}\).
\(F_{0.1}\) The fishing mortality at which the increase in yield-per-recruit in weight for an increase in a unit-of-effort is only 10 percent of the yield-per-recruit produced by the first unit of effort on the unexploited stock (i.e., the slope of the yield-per-recruit curve for the \(\mathrm{F}_{0.1}\) is only one-tenth the slope of the curve at its origin).
\(\mathrm{F}_{\mathrm{pa}}\) is a precautionary reference point designed to ensure that there is a high probability that \(\mathrm{F}_{\text {lim }}\) will be avoided and that spawning stock biomass will remain above the threshold ( \(\mathrm{B}_{\mathrm{pa}}\) ).
\(F_{\text {sq }}\) is some estimate of recent fishing mortality. A three year average is used for most stocks since in most assessments the most recent F estimate is the most uncertain.

Front The transition from one ecological regime to another e.g. where mixed and stratified (see below) waters converge
Gadoids An important family of food fish, including cod, haddock, rocklings, hake, whiting, blue whiting and ling. Usually characterised by the presence of a barbel on the chin.

Gill nets Static nets suspended in the water column to trap fish by the gills.
Groundfish Species of demersal fish such as cod, whiting, haddock, sole, plaice, skates and rays, dwelling on, or close to the sea floor, as targeted in the annual FEAS groundfish surveys around the Irish coast.

\section*{Growth overfishing Occurs when fishing mortality exceeds Fmax. \(^{\text {mat }}\)}

Harvest Control Rule (HCR) A predefined rule governing the exploitation of fish stock such that management targets are achieved. These vary from the simple to the extremely complex.

Harvest rate (= harvest ratio) Ratio between landings and total stock abundance (e.g. as estimated from TV surveys for Nephrops).

Hydrodynamic Studies into the motion of water/fluids.
ICES International Council for the Exploration of the Seas -Ireland shares the Total Allowable Catches TACs for many stocks we exploit with our European Union partners. Because of this international dimension many stocks need to be assessed in an international fora such as ICES. (see: http://www.ices.dk/)
ICCAT International Commission for the Conservation of Atlantic Tuna - (see: http://www.iccat.int/en/)
IFI / Inland Fisheries Ireland the state agency responsible for the protection, management and conservation of Ireland's inland fisheries and sea angling resources. (see: http://www.fisheriesireland.ie/)
IFREMER France's national marine research agency - (see: http://www.ifremer.fr/anglais/)
Infralittoral zone The algal dominated zone to approximately five metres below the low water mark
Inshore fisheries There are various definitions of inshore fisheries including those fisheries that are conducted within 12 miles of the shore, including demersal, pelagic, shellfish and sea angling fisheries.
ISWPAC Irish South and West Pelagic Advisory Committee.
Keystone species A species that plays a critical role in maintaining the structure of an ecological community and whose impact on the community is greater than would be expected based on its relative abundance or total biomass. Without these species an ecosystem would be structured differently or cease to exist.

LPUE /Landings Per Unit of Effort The landing of fish in weight taken by a defined unit of fishing effort e.g. \(\mathrm{kg} / \mathrm{hr}\). Lpue is normally based on landings and effort reported in commercial logbooks and maybe subject to various biases. Lpue is used as a proxy for stock abundance for some stocks and often an input to assessment models.

Lusitanian Species with a southern/Mediterranean origin.
Macrofauna Marine species that can be retained on a 0.5 mm sieve.
Management Plan is a agreed plan to mange a stock. With defined objectives, implementation measures, review processes and stakeholder agreement and involvement.

Maximum Sustainable Yield (MSY) 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, I991 - (see: http://www.marine.ie/)
Megafauna Species larger than the meiofauna and macrofauna (see above and below).
Meiofauna Generally defined as organisms that can pass through a 1 mm sieve but will be retained by a 0.5 mm sieve.
Metapopulation consists of a group of spatially separated populations of the same species which interact at some level.
Métier Homogeneous Subdivision of a fishery by vessel type (e.g. the Irish flatfish-directed beam trawl fishery by vessels < 300 hp in the Irish Sea).

MPA / Marine Protected Area A conservation area in the sea usually designated for the protection and maintenance of biological diversity and natural and cultural resources.

MSY Maximum Sustainable Yield. The largest average catch or yield that can continuously be taken from a stock under existing environmental conditions.
MSY \(B_{\text {escapement }}\) A biomass reference point for short-lived species within the ICES MSY framework (see ICES Advice, Section I.2) where the target is to leave the reference spawning stock biomass to spawn the next year.

MSY \(B_{\text {trigger }}\) A biomass reference point that triggers a cautious response within the ICES MSY framework (see ICES Advice, Section 1.2).

Natural Mortality Deaths in a fish stock caused by predation, illness, pollution, old age, etc., but not fishing.
NEAFC / North Eastern Atlantic Fisheries Commission - A commission that manages fisheries off Scandinavia and north-eastern Europe - (see http://www.neafc.org/)

Nominal catch The sum of the catches that are landed (expressed as live weight or equivalents). Nominal catches do not include unreported discards.
NOAA / National Oceanic and Atmospheric Administration FEAS co-operate with NOAA, our US counterparts, on a number of strategic projects. (see http://www.noaa.gov)
OSPAR The Oslo and Paris Commissions, which have the objective of protecting the Northeast Atlantic against pollution. Member countries range from Finland to Portugal and Iceland.
Pelagic Fish that spend most of their life swimming in the water column, as opposed to resting on the bottom, are known as pelagic species.
Precautionary Approach The precautionary approach should be widely applied to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment. The absence of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures.
Quota A portion of a total allowable catch (TAC) allocated to an operating unit, such as a Vessel class or size, or a country.
RAC Regional Advisory Councils are stakeholder-led organisations established by the Commission in order to deepen stakeholder participation in policy making. e.g. Pelagic RAC. (see http://ec.europa.eu/fisheries/partners/regional_advisory_councils/index_en.htm)

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.

\section*{Rebuilding Plan (See Recovery Plan)}

Recovered FEAS consider a stock to have recovered when the spawning stock biomass has been above \(\mathbf{B}_{\mathrm{pa}}\) for three consecutive years
Recovery Plan This is a multi-annual plan to recover seriously depleted stock. The plans general involve agreed Harvest control Rules, Technical Measures, effort controls and various control and enforcement measures.
Recruitment The amount of fish added to the exploitable stock each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to the fishing gear in one year would be the recruitment to the fishable population that year. This term is also used in referring to the number of fish from a year class reaching a certain age. For example, all fish reaching their second year would be age 2 recruits.
Recruitment overfishing The rate of fishing above which the recruitment to the exploitable stock becomes significantly reduced. This is characterised by a greatly reduced spawning stock, a decreasing proportion of older fish in the catch, and generally very low recruitment year after year.

SACs Special Areas of Conservation, sites designated under the European Community Habitats Directive, to protect internationally important natural habitats and species.
Sample A proportion or a segment of a fish stock which is removed for study, and is assumed to be representative of the whole. The greater the effort, in terms of both numbers and magnitude of the samples, the greater the confidence that the information obtained is a true reflection of the status of a stock (level of abundance in terms of numbers or weight, age composition, etc.)
Shellfish Fisheries Those fisheries were the target species are either crustaceans (e.g. Nephrops, lobsters, crabs and crayfish) or molluscs (Cephalopods, scallops, oysters etc.).
SSB / Spawning Stock Biomass The total weight of all sexually mature fish in the population. The size of SSB for a stock depends on abundance of year classes, the exploitation pattern, the rate of growth, fishing and natural mortality rates, the onset of sexual maturity and environmental conditions.
Spawning stock biomass-per-recruit (SSB/R) The expected lifetime contribution to the spawning stock biomass for a recruit of a specific age (e.g., per age 2 individual). For a given exploitation pattern, rate of growth, and natural mortality, an expected equilibrium value of SSB/R can be calculated for each level of \(F\). A useful reference point is the level of \(S S B / R\) that would be realised if there were no fishing. This is a maximum value for \(S S B / R\), 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 I .
STECF The Scientific Technical and Economic Committee on Fisheries. Established by the European Commission and comprises fisheries scientists and economists from the member states. The role of STECF is to advise the European Commission on scientific, technical and economic issues related to the management of fisheries resources that are exploited worldwide by members of the European Union. (see https://stecf.jrc.ec.europa.eu/)
Stock A "stock" is a population of a species living in a defined geographical area with similar biological parameters (e.g. growth, size at maturity, fecundity etc.) and a shared mortality rate. A thorough understanding of the fisheries biology of any species is needed to define these biological parameters.

Stocklettes Is a small localised population of a species living in a defined geographical area that mixes with other populations at a meta-population level perhaps during breeding phase of the life-cycle but may have different biological parameters and mortality rates.

Stratification When water masses with different properties e.g. salinity, density or temperature form layers that act as barriers to water mixing. The least dense water masses sit above the more dense layers. Stratification creates barriers to nutrient mixing between layers and can affect primary production by limiting photosynthetic processes.

Sublittoral zone An area that is permanently submerged and spans from the low tide mark to the edge of the continental shelf.
Sustainable yield The number or weight of fish in a stock that can be taken by fishing without reducing the stock biomass from year to year, assuming that environmental conditions remain the same.

TAC / Total Allowable Catch is the total regulated catch from a stock in a given time period, usually a year.
Tangle nets Static nets lain on the bottom of the sea, aimed at trapping fish and shellfish by entanglement in their meshes.
Teleost Type of fish - such as cod, mackerel, plaice and sole - have skeletons made of bone, as opposed to elasmobranches - such as sharks and rays - whose skeleton is composed of cartilage.
TCM / Technical Conservation Measures These measures take the form of closed areas, increased mesh sizes and gear modifications (such as separator panels) and are aimed at protecting specific stocks, or age-classes within that stock, from overfishing (See also Recovery Plans).
U An index of exploitable biomass.
\(\mathbf{U}_{\text {lim }}\) For deepwater stocks has been calculated as \(0.2 * \mathbf{U}_{\text {max }}\) (may be a smoothed abundance index).
\(\mathbf{U}_{\mathrm{pa}}\) For deepwater stocks has been calculated as \(0.5 * \mathbf{U}_{\text {max. }}\). For redfish \(\mathbf{U}_{\mathrm{pa}}=0.6 * \mathbf{U}_{\text {max }}\).
Unaccounted mortality Any mortality that is not accounted for properly in a stock assessment model. Potential causes of unaccounted mortality include illegal or misreported landings; escapement or avoidance mortality that occurs when fish are injured by fishing gear but are not captured; and ghost fishing mortality, caused by lost gear (e.g., traps and gillnets) that continues to catch fish.
Unaccounted removals Any removal that are not accounted for properly in a stock assessment model. Potential causes include unaccounted mortality, migrations changes in natural mortality due to starvation, competition, predation, disease or mass mortality events.
Upwelling Wind-driven motion of dense, cool, and usually nutrient-rich water towards the ocean surface, replacing the warmer, usually nutrient-depleted surface water.

VPA Virtual Population Analysis. An algorithm for computing historical fishing mortality rates and stock sizes by age, based on data on catches, natural mortality, and certain assumptions about mortality for the last year and last age group. A VPA essentially reconstructs the history of each cohort, assuming that the observed catches are known without error (Powers \& Restrepo, 1992). VPA is often used as a generic description of an age-based stock assessment but this is not necessarily true because many stock assessments are based on different (statistical) assumptions.

Whitefish Term used to describe demersal species such as cod, plaice, ray etc., as opposed to pelagic or salmonid species.
WWF World Wide Fund for Nature - The Conservation Organization (known as World Wildlife Fund in certain countries)

XSA Extended Survivors Analysis; Stock assessment method.
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 I 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 \(F\).
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[^0]:    ${ }^{6}$ After simulation the distinction between categories 5 and 6 was not clear as catch curves did not perform well within the context of the HCR (RGLIFE Report, ICES 2012)

[^1]:    *Landings from FUs 20-21 and FU 22 are combined prior to 1999.

[^2]:    Weights in thousand tonnes.
    ${ }^{1)}$ The discard survival rate is assumed at $10 \%$.

[^3]:    * Provisional.

