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Report of the ICES Advisory Committee 2013

Book 5 Celtic Sea and West of Scotland

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Conseil International pour l'Exploration de la Mer

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5 CELTIC SEA AND WEST OF SCOTLAND

5.1 Ecosystem overview

This Section has not been updated in 2013. The most recent ecosystem overview is available in ICES Advisory Report 2008, Section 5.1. This overview can also be found on the ICES website:

<http://www.ices.dk/committe/acom/comwork/report/2008/2008/5.1-5.2%20Celtic%20Sea%20ecosystem%20overview.pdf>.

5.2 The status of fish stocks and fisheries

ICES provides advice regarding the following stocks in this ecoregion

Stock	Basis for stock status and advice
Anglerfish (<i>Lophius piscatorius</i> and <i>L. budegassa</i>) in Divisions VIIb–k and VIIa,b,d	Data limited
Anglerfish (<i>Lophius piscatorius</i> and <i>L. budegassa</i>) in Division IIIa, and Subareas IV and VI	Data limited
European seabass in Divisions IVbc,VIIa and VIId-h (Irish Sea, English Channel and southern North Sea)	Data limited
European seabass in Divisions VIa, VIIb and VIIj (West of Scotland and Ireland)	Data limited
Cod in Divisions VIIe–k (Celtic Sea cod)	Analytical
Cod in Division VIIa (Irish Sea)	Data limited
Cod in Division VIb (Rockall)	Data limited
Cod in Division VIa (West of Scotland)	Analytical
Grey gurnard in Subarea VI and Divisions VIIa-c and e-k (Celtic Sea and West of Scotland)	Data limited
Haddock in Divisions VIIb–k	Analytical
Haddock in Division VIIa (Irish Sea)	Data limited
Haddock in Division VIb (Rockall)	Analytical
Haddock in Division VIa (West of Scotland)	Analytical
Herring in Division VIIa South of 52° 30' N and VIIg,h,j,k (Celtic Sea and South of Ireland)	Analytical
Herring in Divisions VIa (South) and VIIb,c	Data limited
Herring in Division VIIa North of 52° 30' N (Irish Sea)	Analytical
Herring in Division VIa (North)	Analytical
Blonde ray (<i>Raja brachyura</i>) in Division VIIe	
Megrim (<i>Lepidorhombus spp.</i>) in Divisions IVa and VIa	Analytical
Megrim (<i>Lepidorhombus spp.</i>) in ICES Division VIb (Rockall)	Data limited
Megrim (<i>Lepidorhombus whiffiagonis</i>) in Divisions VIIb–k and VIIa,b,d	Data limited
<i>Nephrops</i> in Division VIa (North Minch, FU 11)	Analytical
<i>Nephrops</i> in Division VIa (South Minch, FU 12)	Analytical
<i>Nephrops</i> in the Firth of Clyde (FU 13)	Analytical
<i>Nephrops</i> in the Sound of Jura (FU 13)	
<i>Nephrops</i> in Division VIIa (Irish Sea East, FU 14)	Analytical
<i>Nephrops</i> in Division VIIa (Irish Sea West, FU 15)	Analytical
<i>Nephrops</i> in Division VIIb,c,j,k (Porcupine Bank, FU 16)	Analytical
<i>Nephrops</i> on Aran Grounds (FU 17)	Analytical
<i>Nephrops</i> in Division VIIa,g,j (South East and West of IRL, FU 19)	Analytical
<i>Nephrops</i> in the FU 20 (Labadie, Baltimore and Galley), FU 21 (Jones and Cockburn)	Data limited
<i>Nephrops</i> in the Smalls (FU 22)	Analytical
Norway pout in Division VIa	Data limited
Plaice in Divisions VIIb,c (West of Ireland)	Data limited
Plaice in Divisions VIIh–k (Southwest of Ireland)	Data limited
Plaice in Divisions VIIf,g (Celtic Sea)	Data limited
Plaice in Division VIIe (Western Channel)	Analytical
Plaice in Division VIIa (Irish Sea)	Data limited
Pollack in Subareas VI and VII (Celtic Sea and West of Scotland)	Data limited
Other ray and skate species in Subarea VI and Divisions VIIa–c, e–j	Data limited

Stock	Basis for stock status and advice
Common skate (<i>Dipturus batis</i>) complex (flapper skate (<i>Dipturus cf. flossada</i>) and blue skate (<i>Dipturus cf. intermedia</i>)) in Subarea VI and Divisions VIIa–c, e–j	Data limited
Thornback ray (<i>Raja clavata</i>) in Divisions VIIa,f,g	Data limited
Thornback ray (<i>Raja clavata</i>) in Division VIIe	Data limited
Thornback ray (<i>Raja clavata</i>) in Subarea VI	Data limited
Small-eyed ray (<i>Raja microcellata</i>) in Division VIIf,g	Data limited
Small-eyed ray (<i>Raja microcellata</i>) in Division VIIe	
Shagreen ray (<i>Leucoraja fullonica</i>) in the Celtic Sea ecoregion	Data limited
Blonde ray (<i>Raja brachyura</i>) in Divisions VIIa,f,g	Data limited
Blonde ray (<i>Raja brachyura</i>) in Subarea VI	Data limited
Sandy ray (<i>Leucoraja circularis</i>) in the Celtic Sea ecoregion	Data limited
Spotted ray (<i>Raja montagui</i>) in Divisions VIIa,f,g	Data limited
Spotted ray (<i>Raja montagui</i>) in Subarea VI	Data limited
Cuckoo ray (<i>Leucoraja naevus</i>) in Subarea VI and Divisions VIIa–c, e–j	Data limited
Undulate ray (<i>Raja undulata</i>) in Division VIIj	Data limited
Sandeel in Division VIa	Data limited
Sole in Divisions VIIb,c (West of Ireland)	Data limited
Sole in Divisions VIIh–k	Data limited
Sole in Divisions VIIf,g (Celtic Sea)	Analytical
Sole in Division VIIe (Western Channel)	Analytical
Sole in Division VIIa (Irish Sea)	Analytical
Sprat in Subarea VI and Divisions VIIa–c and f–k (Celtic Sea and West of Scotland)	Data limited
Sprat in Divisions VIId,e	Data limited
Lesser-spotted dogfish (<i>Scyliorhinus canicula</i>) in Subarea VI and Divisions VIIa–c, e–j (Celtic Sea and West of Scotland)	Data limited
Whiting in Divisions VIIe–k	Analytical
Whiting in Division VIIa (Irish Sea)	Data limited
Whiting in Division VIb (Rockall)	Data limited
Whiting in Division VIa (West of Scotland)	Analytical

The state and advice of the individual stocks are presented in the stock sections. An overview of the status of the stocks for which information on fishing mortality and spawning stock biomass is available, as assessed for 2012 in 2013, is presented in table 5.2.1.

Table 5.2.1. Status of data rich stocks (n=24) for the Celtic Sea and West of Scotland stocks relative to MSY and PA reference points for Fishing Mortality (F) and Spawning Stock Biomass (SSB). Table shows percentage of stocks per stock status. Values in brackets denote the number of data rich stocks per stock status.

			Spawning Stock Biomass			
			is at or above MSY $B_{trigger}$ $SSB_{2013} \geq MSY B_{trigger}$	is below MSY $B_{trigger}$ $SSB_{2013} < MSY B_{trigger}$	is not defined	
MSY Approach	Fishing Mortality		✓	✗	?	
	is at or below MSY ($F_{2012} \leq F_{MSY}$)	✓	25% (6)	4% (1)	17% (4)	
	is above MSY ($F_{2012} > F_{MSY}$)	✗	33% (8)	8% (2)	8% (2)	
	is not defined	?	-	-	4% (1)	
			is at or above PA $SSB_{2013} \geq B_{pa}$	is at increased risk $B_{pa} > SSB_{2013} > B_{lim}$	is below limit $SSB_{2013} < B_{lim}$	is not defined
Precautionary Approach	Fishing Mortality		✓	○	✗	?
	is at or below P ($F_{2012} \leq F_{pa}$)	✓	4%(1)	4%(1)	4%(1)	-
	is at increased risk ($F_{lim} > F > F_{pa}$)	○	4%(1)	-	4%(1)	-
	is above PA ($F_{2012} > F_{pa}$)	✗	-	-	4%(1)	-
	is not defined	?	25 % (6)	-	-	50% (12)

Although there is considerable variation between stocks and large year-to-year variation for most stocks, the overall fishing mortality has been decreasing over the last couple of decades. The biomasses have overall in the last few years been increasing (figure 5.2.1-4).

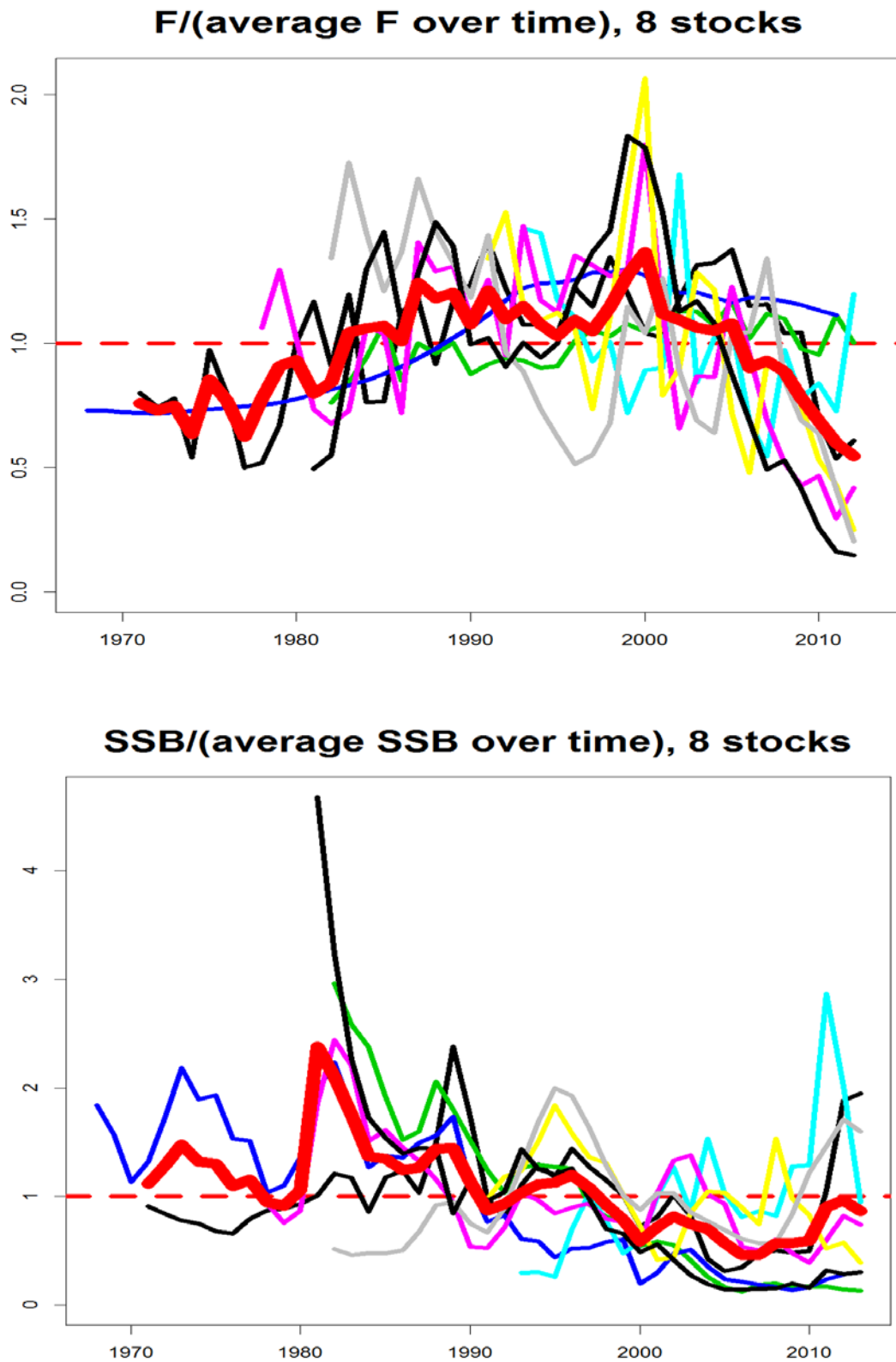


Figure 5.2.1. Trend in fishing mortality and spawning stock biomass relative to the average for each stock of cod, haddock and whiting over the time for which data are available. The graphs include data for the stocks for which such estimates are available. The thick (red) line represents the average for all the stocks.

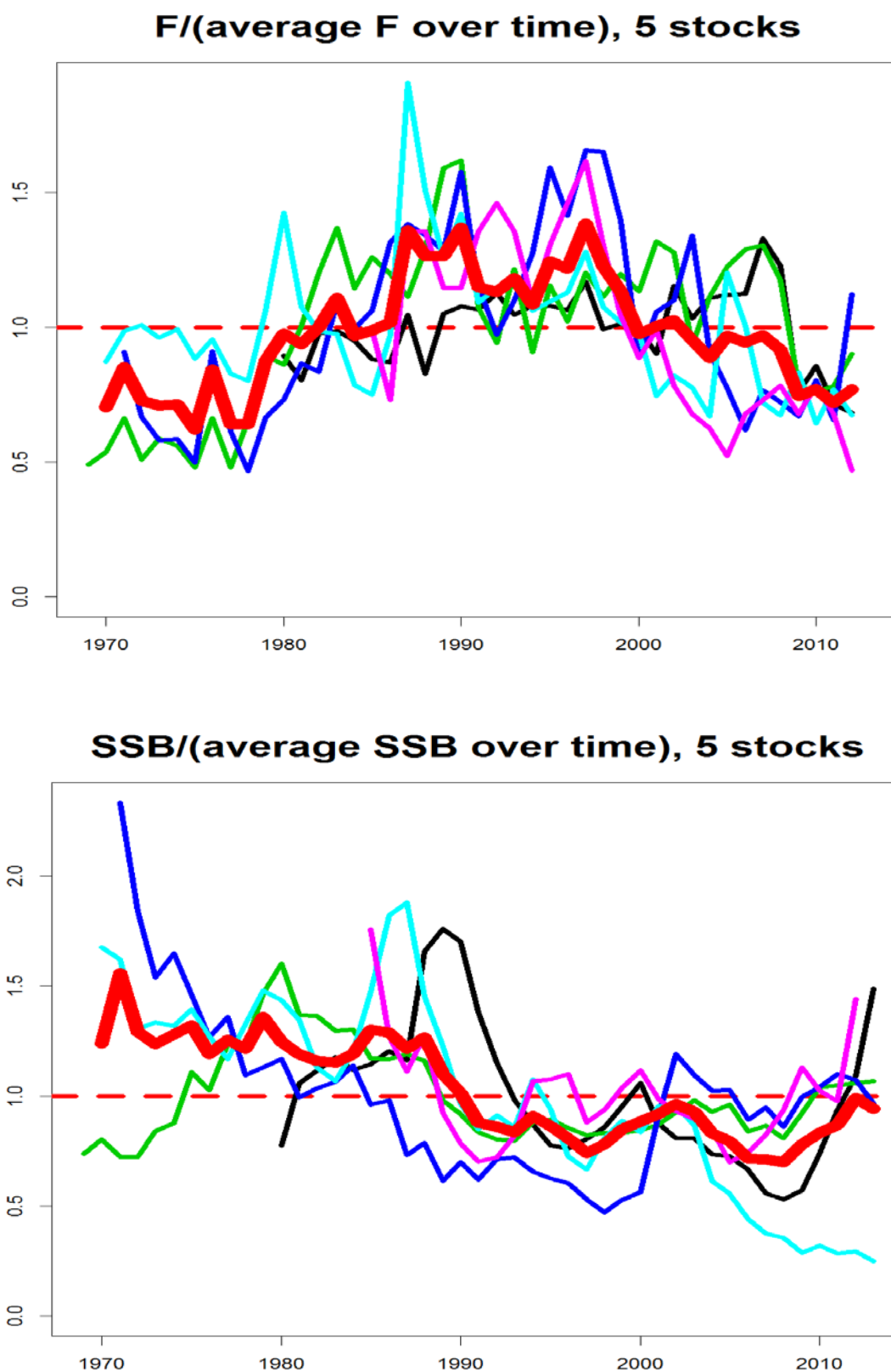


Figure 5.2.2. Trend in fishing mortality and spawning stock biomass relative to the average for each stock of plaice, sole and megrim over the time for which data are available. The graphs include data for the stocks for which such estimates are available. The thick (red) line represents the average for all the stocks.

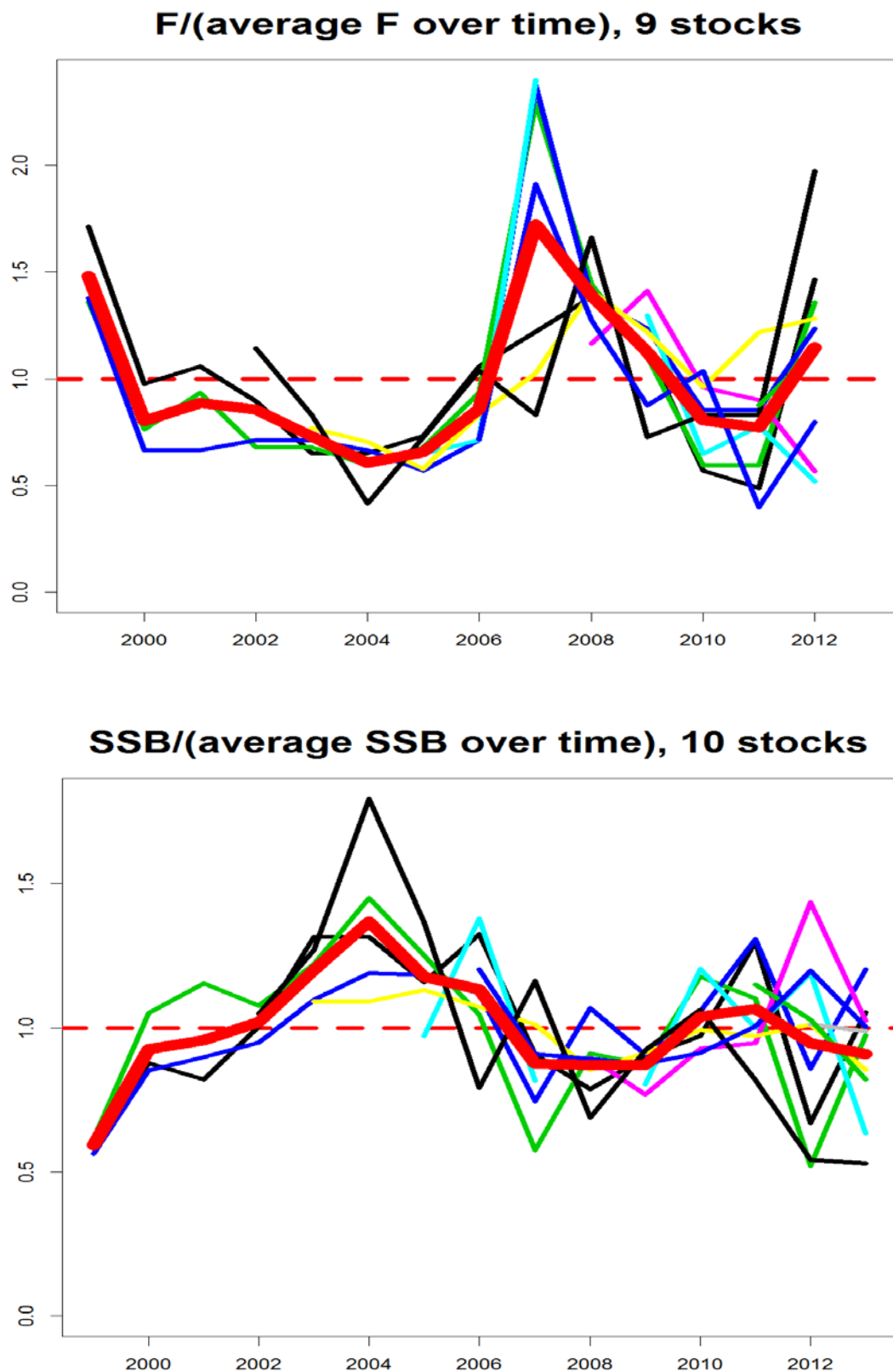


Figure 5.2.3. Trend in fishing mortality and spawning stock biomass relative to the average for each stock of *Nephrops* over the time for which data are available. The graphs include data for the stocks for which such estimates are available. The thick (red) line represents the average for all the stocks.

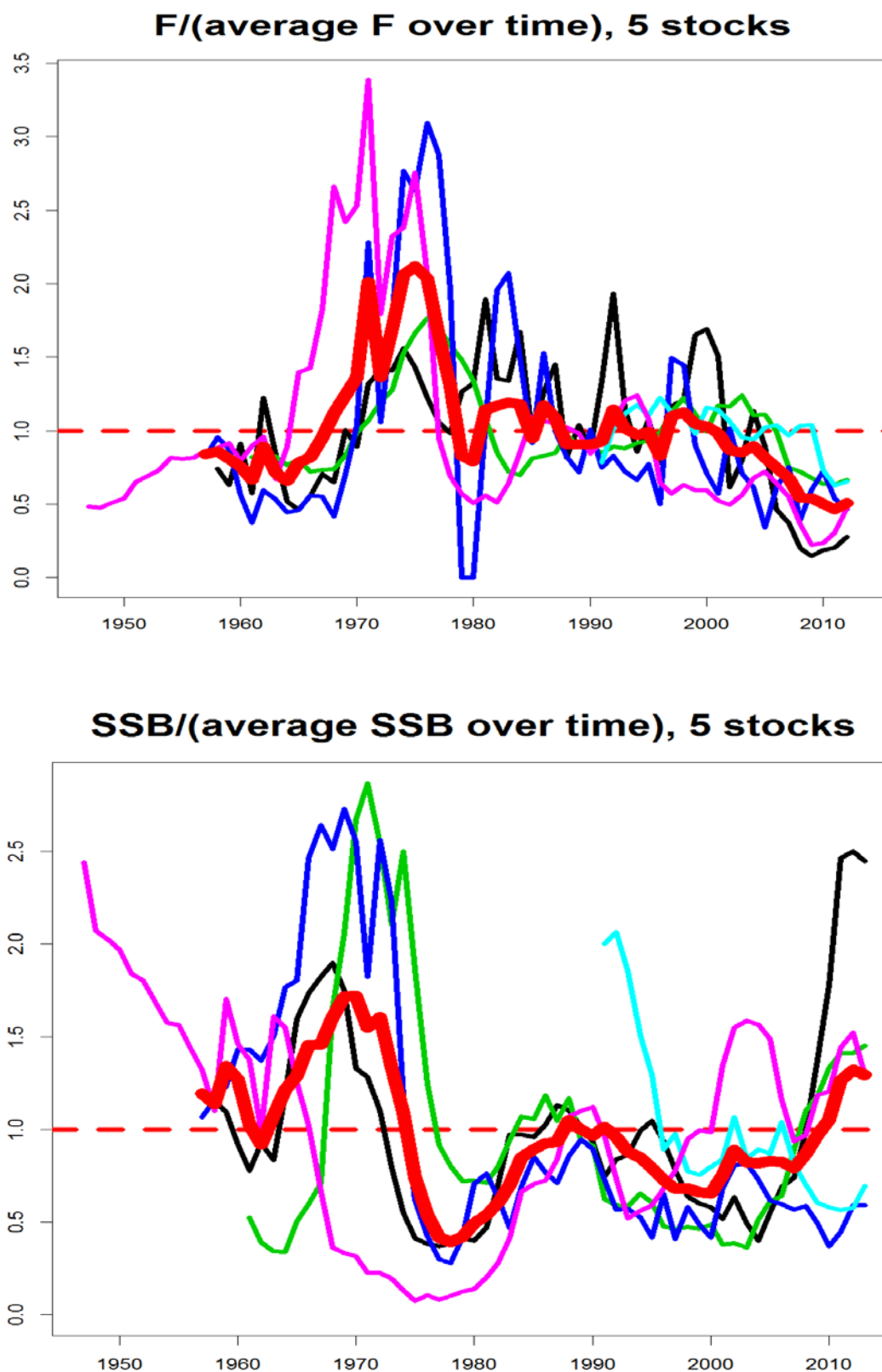


Figure 5.2.4. Trend in fishing mortality and spawning stock biomass relative to the average for each stock of herring including the North Sea over the time for which data are available. The graphs include data for the stocks for which such estimates are available. The thick (red) line represents the average for all the stocks.

Of the stocks for which information exists, fishing mortality are still for many stocks above been F_{msy} but some are actually substantially below F_{msy} . Of the stocks for which information exist many are now above MSY Btrigger. Some however are still struggling and not showing signs of improving towards MSY Btrigger (figures 5.2.5-8).

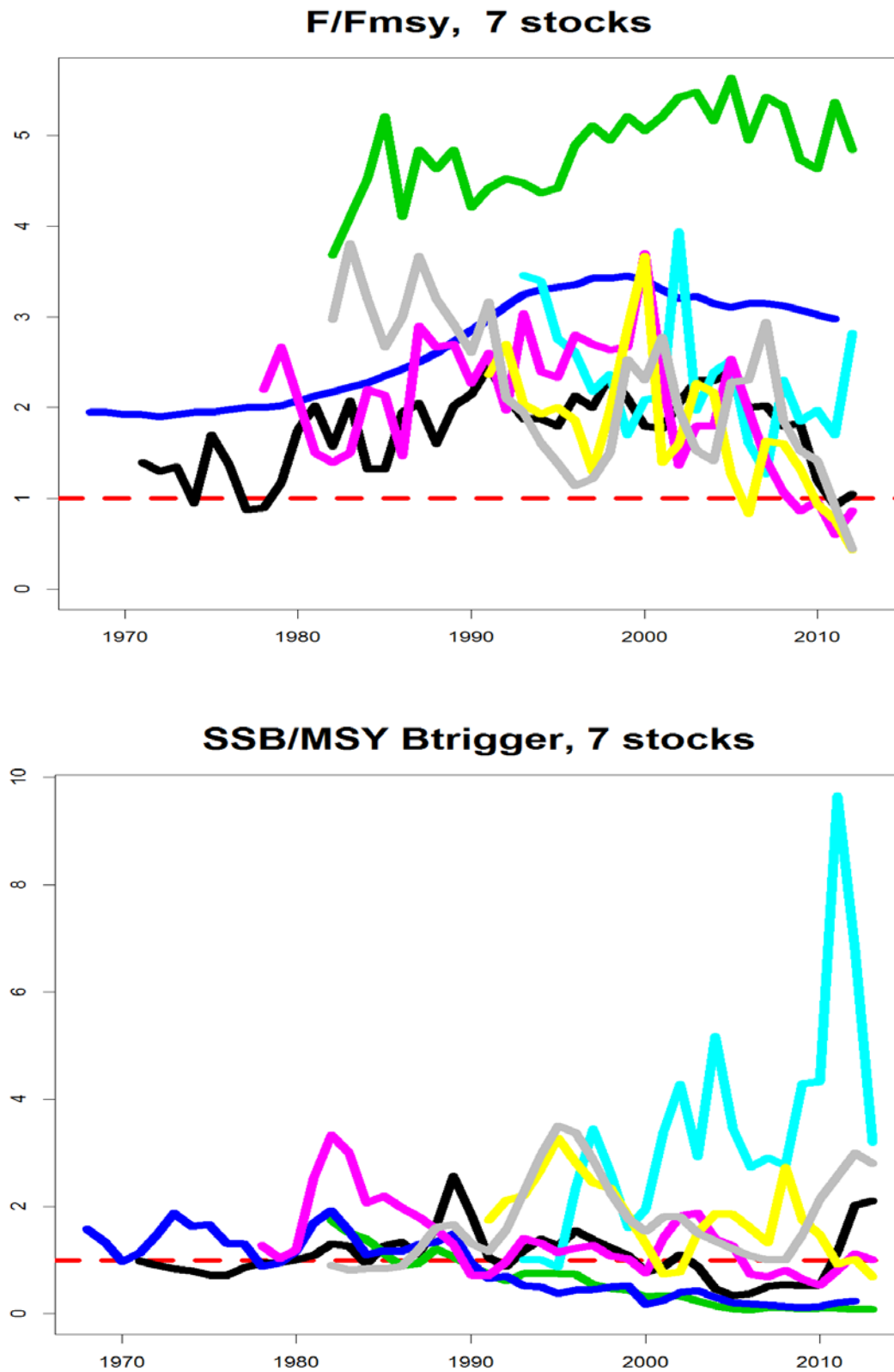


Figure 5.2.5. The status of fish stocks relative to reference points (F_{msy} , MSY Btrigger) for those cod, haddock and whiting stocks for which this is available. The dotted (red) line represents the ratio 1.

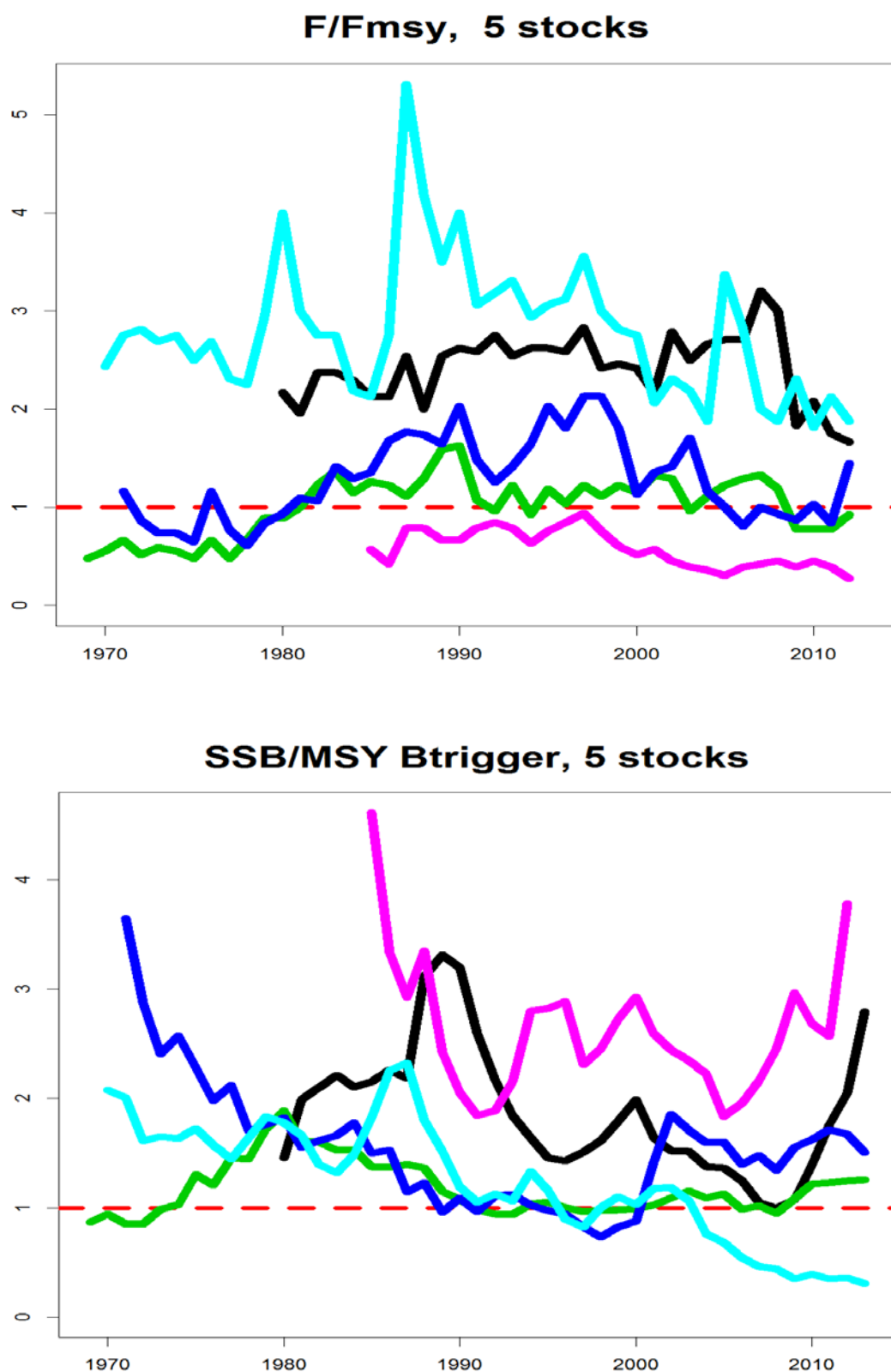


Figure 5.2.6. The status of fish stocks relative to reference points (Fmsy, MSY Btrigger) for those plaice, sole and megrim stocks for which this is available. The dotted (red) line represents the ratio 1.

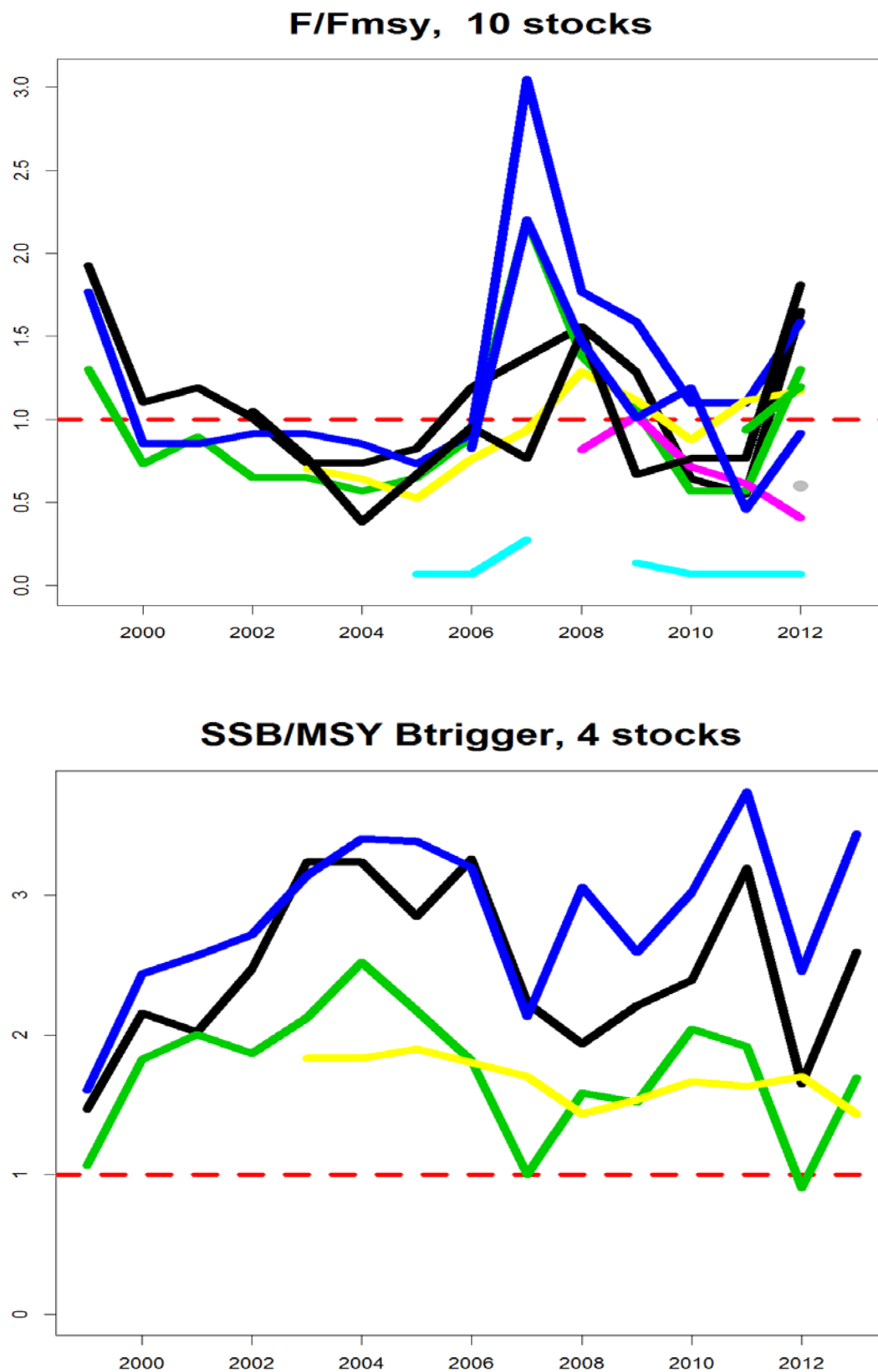


Figure 5.2.7. The status of fish stocks relative to reference points (Fmsy, MSY Btrigger) for those stocks for which this is available. The dotted (red) line represents the ratio 1.

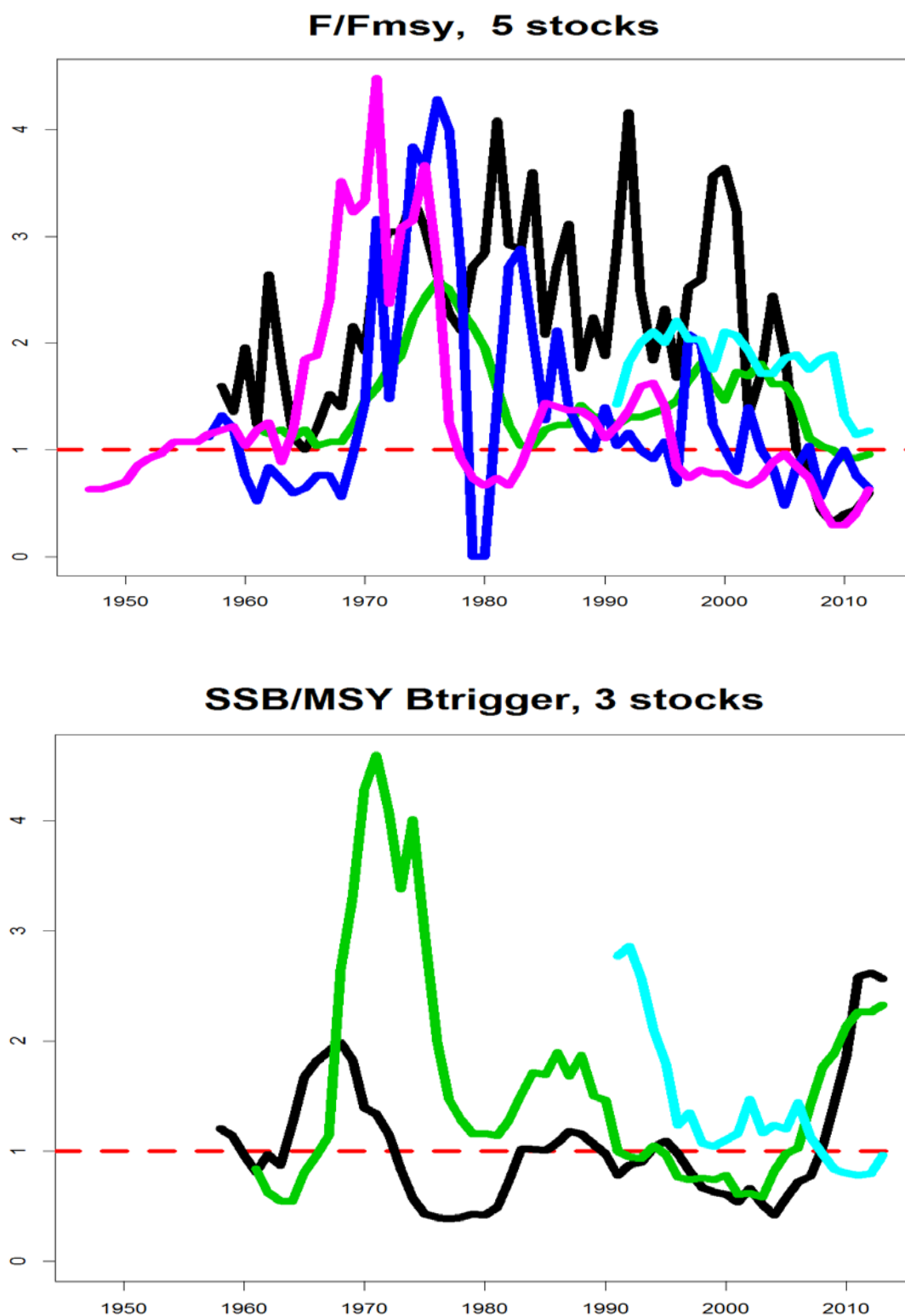


Figure 5.2.8. The status of fish stocks relative to reference points (F_{msy} , MSY Btrigger) for those herring stocks including the North Sea for which this is available. The dotted (red) line represents the ratio 1.

Large fish indicators

The amount of large fish (defined here as fish over 45 cm) in the western Scottish waters has decreased over the recent three decades (Figure 5.2.9)

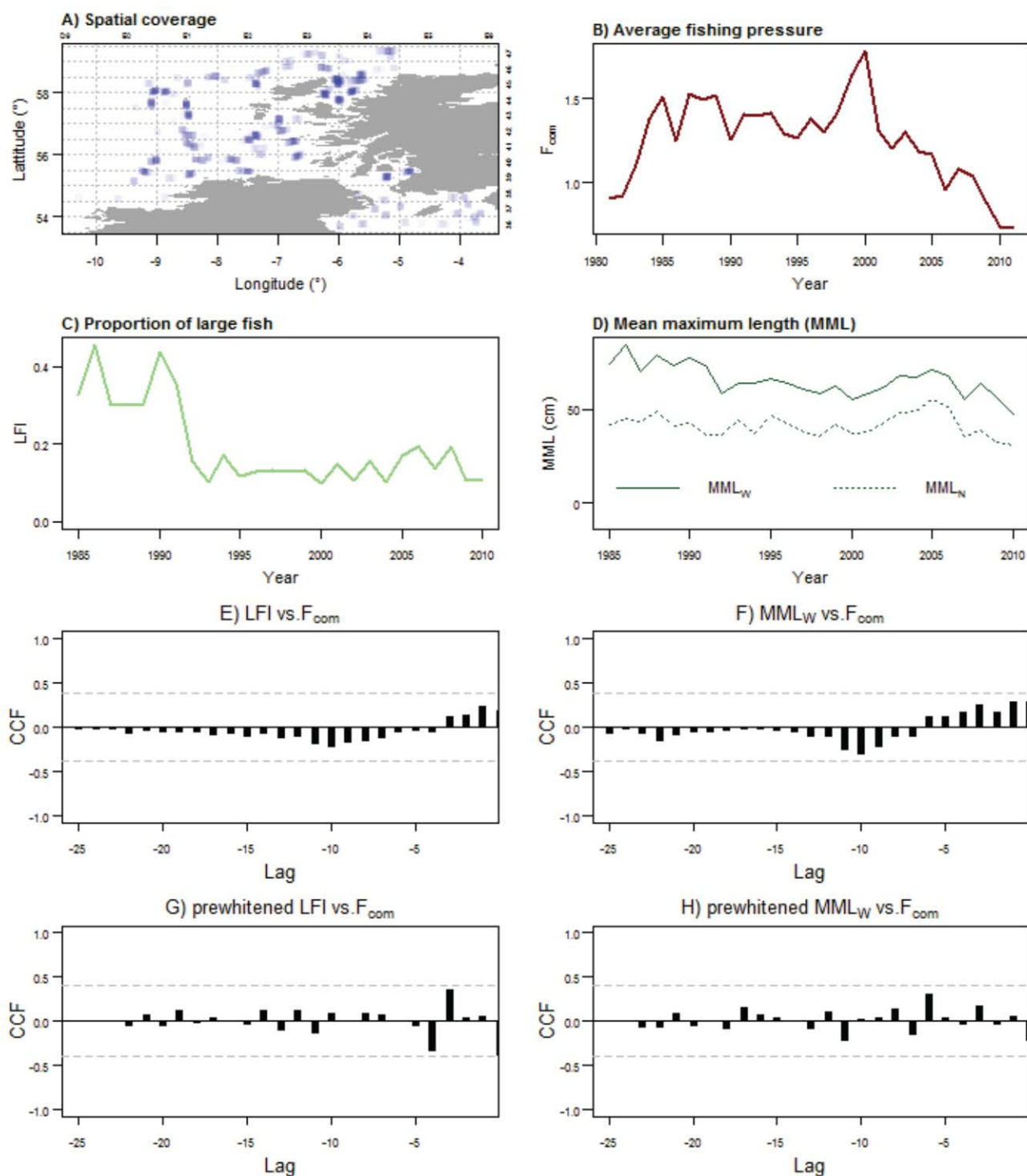


Figure 5.2.9. Community SBI of the Western Scottish Waters. A) Overlaid haul stations in the survey area. B) Time series of community fishing pressure (F_{com}) averaged across the relevant commercial stocks. C) Time series of the large fish indicator (LFI). D) Time series of mean maximum length by weight (MML_W) and numbers (MML_N). E) Cross-correlation function (CCF) of F_{com} vs. LFI. F) CCF of F_{com} vs. MML_W. G) Prewhitened CCF of F_{com} vs. LFI. H) Prewhitened CCF F_{com} vs. MML_W. From ICES. 2013. Report of the Workshop on DCF Indicators, 21 - 25 October 2013, ICES Headquarters, Copenhagen, Denmark. ICES CM 2013/ACOM:38. 81 pp.

The amount of large fish (defined here as fish over 50 cm) in the Celtic Sea has fluctuated without a trend over the recent decade (Figure 5.2.10)

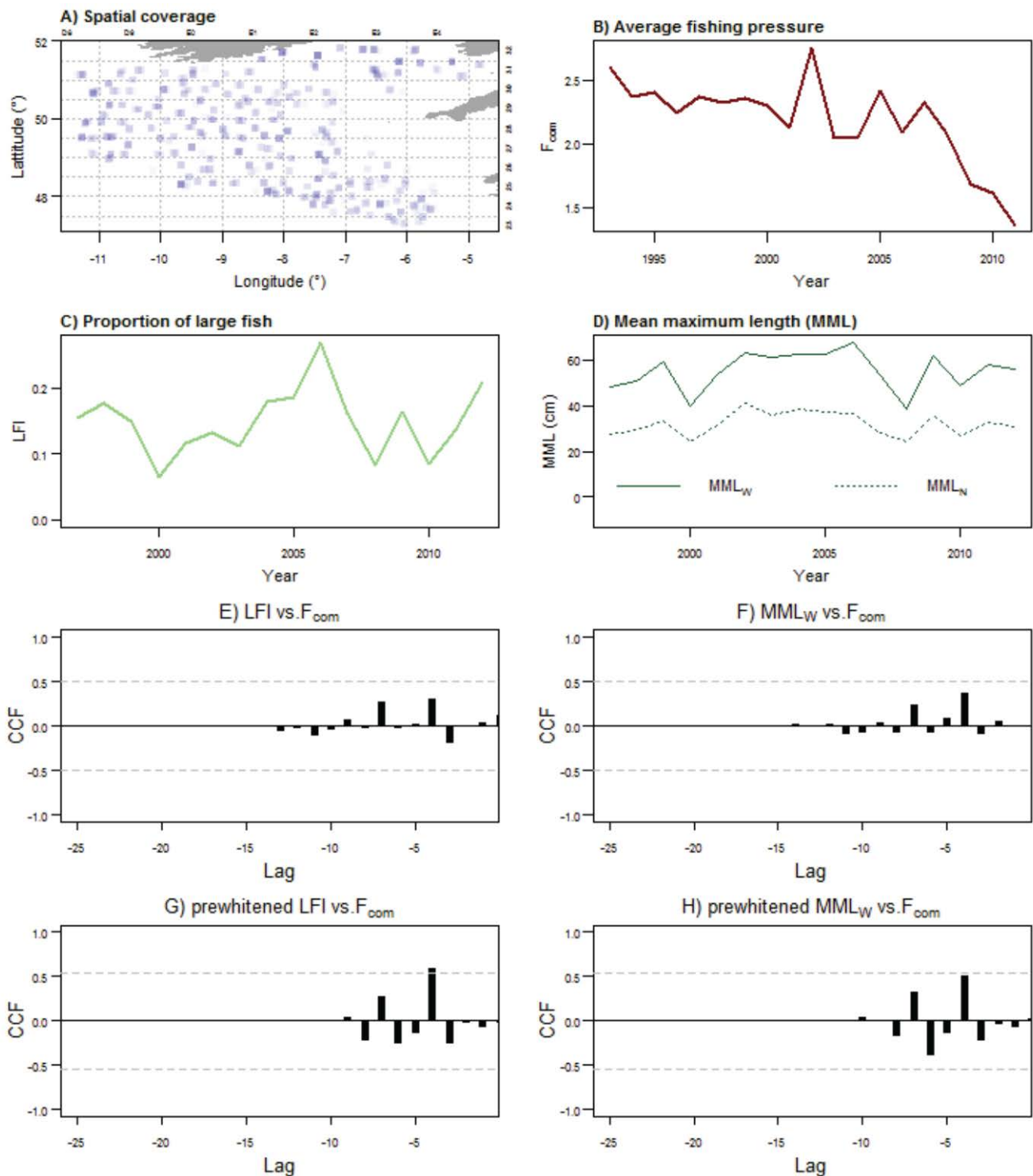


Figure 5.2.10. Community SBI of the Celtic Sea. A) Overlaid haul stations in the survey area. B) Time series of community fishing pressure (F_{com}) averaged across the relevant commercial stocks. C) Time series of the large fish indicator (LFI). D) Time series of mean maximum length by weight (MMLW) and numbers (MMLN). E) Cross-correlation function (CCF) of F_{com} vs. LFI. F) CCF of F_{com} vs. MMLW. G) Prewhitened CCF of F_{com} vs. LFI. H) Prewhitened CCF F_{com} vs. MMLW. From ICES. 2013. Report of the Workshop on DCF Indicators, 21 - 25 October 2013, ICES Headquarters, Copenhagen, Denmark. ICES CM 2013/ACOM:38. 81 pp.

5.3 Assessments and Advice

5.3.1 Assessment and advice regarding protection of biota and habitats

In 2013, ICES has not provided advice regarding protection of biota and habitats for this area.

5.3.2 Assessments and Advice regarding fisheries

In 2007 the timing of the advisory process for the North Sea was changed at the request of ICES clients. This means that the fisheries advice is delivered in the first half of the year instead of in October. To evaluate whether new information that becomes available after the advice is released would form a basis to update the advice ICES has developed a generic approach (AGCREFA, 2008a). The approach is based on a statistical evaluation of the importance of that information (e.g. new survey information available in August/September). On this basis, *Nephrops* FUs 16, 17 and 22 was updated in November.

The state and advice of the individual stocks are presented in the stock sections. The state of stocks and advice (according to the Section 1.2) are summarized in the table below.

5.3.2.1 Mixed fisheries and fisheries interactions

This Section has not been updated in 2013. The most recent description on mixed fisheries and fisheries interactions is available in ICES Advisory Report 2008, Section 5.3. This description can also be found on the ICES website: <http://www.ices.dk/committe/acom/comwork/report/2008/2008/5.3%20Celtic%20Seas%20advice%20overview.pdf>

5.3.3 Special requests

5.3.3.1

Special request, Advice May 2013

ECOREGION Celtic Sea and West of Scotland

SUBJECT Request from the European Commission on distribution of the stock of megrim in Subarea IV and Division VIa

Advice summary

1. The factors influencing long-term or cyclical changes in the distribution of megrim are unknown and are not expected to be known in the near future. ICES has not identified any long-term or cyclical changes in the distribution of megrim.
2. Currently, TACs are set separately for two areas: (i) ICES Subareas VI, XII, and XIV and Division Vb, and (ii) EU waters of Division IIa and Subarea IV. However, since 2011, ICES has considered megrim in Subarea IV and Division VIa as a single stock and has issued advice on that basis (ICES, 2011a). This has led to an inconsistency between the management and assessment units. ICES has no basis on which to advise a split of the TAC, and recommends a single TAC area.
3. The choice of having multiple TACs within a single stock unit is a management decision. From a biological perspective, the management and assessment units should be appropriately aligned and they should encompass the full spatial structure of the stock. ICES recommends that the management unit should match the assessment unit.

Request

On the basis of this misreporting and the information from the on-going surveys ICES are asked to provide advice on the current distribution of this stock between the two ICES sub divisions. In doing so ICES are asked to;

- *Identify any long term or cyclical change in distribution;*
- *Identify the split that could be applied in further management of two areas.*
- *Discuss the advantages and disadvantages of split management versus the possible merging of the two TAC areas; make a recommendation on the best way forward for the management of the stock.*

Elaboration on the advice

1. Identify any long-term or cyclical change in distribution.

No quantitative information is available that specifically describes the long term stock distribution of megrim across the two TAC areas, which could be used to determine whether there have been any long-term or cyclical changes in the relative distribution of megrim between the two TAC areas. It is plausible that the relative distribution may change throughout the year due to migration and spawning patterns (Anon., 2001). Over a longer time frame, the relative distribution may change due to stock size and demographic structure as there is evidence of age- and gender-specific bathymetric distributions (Sánchez *et al.*, 1998; Gerritsen *et al.*, 2010).

2. Identify the split that could be applied in further management of two areas.

A precautionary TAC based on average landings was first introduced in 1985 for Area 1 (ICES Subareas VI, XII, and XIV and Division Vb) while a TAC for Area 2 (EU waters in ICES Subarea IV and Division IIa), also based on average landings, was introduced later in 1998. This resulted in an Area 2 TAC that was ~60% of the Area 1 TAC (i.e. ~ 35 % of the total of the two TACs). The ratio of the two TACs has remained fairly stable since they were introduced.

Prior to 2009, ICES did not provide advice for megrim in Area 2 and as such there was no clear scientific basis for setting a TAC in this area. In 2008 ICES noted that “scientific surveys show that a significant population of megrim exists in the northern part of Division IVa and landings are reported from this area (ICES, 2008). However, this stock component is not considered by any ICES expert group”. ICES (2009) concluded that the spatial distribution of landings data and survey catches provide robust evidence that the megrim population is contiguous between ICES Divisions VIa and IVa. This has subsequently been supported through recent genetic studies (MacDonald and Prieto,

2012), indicating that one stock exists in Divisions IVa (northern North Sea) and VIa (West of Scotland) and another separate stock in Division VIb (Rockall). Combining megrim in Divisions VIa and IVa as a single stock unit in 2011 (ICES, 2011a, ICES 2011b) implies that the assessment unit and the management units are no longer consistent.

In 2012, ICES produced an analytical assessment and catch advice for the new assessment unit for the first time (ICES, 2012a, 2012b). This showed that the stock is exploited well below F_{MSY} and the advice for 2013 was that landings should be no more than 4700 tonnes. In order to provide advice consistent with the two management areas, STECF (2012) proposed that the relative proportions of megrim biomass observed from the Scottish and Irish anglerfish and megrim industry–science surveys (SAMISS/IAMISS) in Subarea IV and Division VIa could be used to distribute the TAC between the two areas. In an attempt to take account of year effects in the survey biomass estimates, STECF suggested using average values based on the three most recent years (2009–2011). In applying this approach, STECF considered that the average survey biomass estimates were 60% for Area 2 and 40% for Area 1. The European Commission TAC proposals for 2013 (Anon., 2012) were based on applying these proportions to the catches corresponding to ICES advice for Subarea IV and Division VIa (4 700 t). This implied catches in 2013 of 2820 t for Area 2, 2040 t for Area 1, and including an allocation of 160 t for Division VIb.

Over the seven-year period of the SAMISS/IAMISS surveys, the proportion of the stock occurring in Area 2 has shown moderate variation (in the range of 55–68%), despite a change in the timing from quarter four to quarter two. However, these surveys remain snapshots of the relative distribution between the two management areas and it is unknown whether they are representative of the distribution during other periods of the year. Additionally, area misreporting makes it difficult to reliably analyse seasonal and spatial trends based on commercial catch data, which might have otherwise provided further information on changes in the stock distribution. Further information on the spatial and temporal distribution of the stock is required to be able to provide advice on the overall annual stock distribution. Furthermore, given the relatively short survey time-series, it is not possible to verify if there have been long-term fluctuations in stock biomass between the two management areas. Therefore, the stability of the distribution between the two management areas over longer time periods remains unknown.

3. Discuss the advantages and disadvantages of split management versus the possible merging of the two TAC areas; make a recommendation on the best way forward for the management of the stock.

The choice of having multiple TACs within a single stock unit is a management decision. From a biological perspective, the management and assessment units should be appropriately aligned and should encompass the full distribution of the stock. Further spatial management may be necessary if there are concerns about the fishery targeting specific stock components, leading to increased risks of them becoming depleted. This requires reliable information on the existence of stock components and their dynamics. ICES advises that the management units should match the assessment units.

Basis of the advice

The advice is based on analyses in the reports referenced above as there was no basis for new analyses.

Sources

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ECOREGION Celtic Sea and West of Scotland
SUBJECT Request from NEAFC to evaluate the proposals for the harvest control components of the management plan for Rockall haddock fisheries

Advice summary

ICES advises that the proposed harvest control rule (HCR) for Rockall haddock fisheries, using the existing reference points, is not in accordance with the precautionary approach under the conditions of low recruitment that have prevailed since 2004. The proposed HCR implies that the stock will be below B_{lim} with a high probability under those recruitment conditions. The modification of the HCR introducing a parameter for low recruitment situations (the α parameter, to be used in paragraph 4 of the HCR definition) appears to have little impact on the performance of the HCR.

ICES advises that when SSB is greater than B_{pa} a maximum F value of 0.2 would be required for the HCR to be consistent with the precautionary approach even under a low recruitment regime. In the HCR that was found to be precautionary, the SSB value used in paragraph 4 is calculated directly applying $F = 0.2$ during the TAC year, without performing any iterative steps.

Request

The objective of the management plan is to be consistent with the precautionary approach, provide for the sustainable harvesting of the stock and maximize the yield.

In the following, the TACs refer to total catches, not just landings. Measure 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_{pa} and a minimum level of SSB greater than B_{lim} .*
- 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 either F_{msy} for appropriate age- groups, when the SSB at the end of the year in which the TAC is applied is estimated above B_{pa} .*
- 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:*

$$TAC_y = TAC_f + 0.2 \times (TAC_{y-1} - TAC_f)$$

where TAC_y is the TAC that is to be set by the management plan, TAC_{y-1} is the TAC that was fixed the previous year and TAC_f is the TAC resulting from the provisions in paragraphs 1 and 2.

- 4. Where the SSB referred to in paragraph 2 is estimated to be below B_{pa} but above B_{lim} , the TAC shall not exceed a level, which will result in a fishing mortality rate equal to*

$$F_{msy} - [F_{msy} \times (B_{pa} - SSB) / (B_{pa} - B_{lim})].$$

This consideration overrides paragraph 3.

- 5. Where the SSB referred to in paragraph 2 is estimated to be below B_{lim} , there should be no directed fishery for haddock ($F = 0.0$) and by-catch and discards of haddock should be minimised. 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 account inter alia advice from ICES concerning the performance of the Plan."*

As part of the evaluation, ICES is asked to determine the best proxy for F_{msy} and to advise on the most appropriate values for B_{lim} and $B_{trigger}$.

ICES is further requested to evaluate the above harvest control rule with paragraph 4 replaced by the following:

“Where the SSB referred to in paragraph 2 is estimated to be below B_{pa} but above B_{lim} , the TAC shall not exceed a level, which will result in a fishing mortality rate equal to

$$F_{msy} - [F_{msy} \times (B_{pa} - SSB) / (B_{pa} - \alpha \times B_{lim})]$$

where α takes a value greater than 1 when the stock is in a period of low recruitment.

This consideration overrides paragraph 3.”

ICES is requested to:

Advise on an appropriate methodology to define periods of low recruitment

Advise on the calculation of appropriate values of α

Indicate whether or not the inclusion of α makes the plan more consistent with the precautionary approach or has any significant implications for the delivery of its objectives

Elaboration of the advice

ICES has provided advice on the Rockall haddock HCR on two previous occasions (ICES, 2011 and ICES, 2012a).

In conducting the analyses for the present request, ICES considered that there was insufficient data to provide improved estimates of biomass and fishing mortality reference points for the Rockall haddock stock at this time. Precautionary approach (PA) reference points have been unchanged since 1998 (ICES, 1999), with B_{lim} set at 6000 t (lowest observed SSB) and B_{pa} set at 9000 t ($1.5 \times B_{lim}$, to account for assessment uncertainty). MSY reference points were evaluated in 2010 (ICES, 2010) and again in 2012 (ICES, 2012b). MSY $B_{trigger}$ is, for the time being, set equal to B_{pa} . The number of stock and recruit observations for this stock is fairly limited. Therefore, even though F_{MSY} values associated with different forms of the stock–recruit relationship can be formally calculated, there is high uncertainty associated with the resulting F_{MSY} estimates. Recent analyses (ICES, 2012b) suggest that yield-per-recruit for this stock, under the current exploitation pattern, is either maximized for an F of about 0.2 (with high uncertainty), or does not have a clearly defined maximum. The F_{MSY} proxy (0.3) for Rockall (and also for West of Scotland) haddock was chosen by analogy with the North Sea haddock stock; this is considered as a provisional proxy until further data or analyses are available for the Rockall haddock stock.

ICES reviewed analyses of the proposed harvest control rule (HCR) of a management plan for Rockall haddock fisheries in two approaches with slightly different treatment of uncertainty and error. Both analyses suggest that the proposed HCR based on the current F_{MSY} proxy (0.3) has a low long-term risk of the SSB being below B_{lim} , using simulated recruitment based on the assessment time-series since 1991 (“medium recruitment” scenario). However, analyses conducted with simulated recruitment based on the values observed from 2004 onward (“low recruitment” scenario) resulted in a greater than 5% probability of the SSB being below B_{lim} . Therefore, the HCR cannot be considered to be in accordance with the precautionary approach under the “low recruitment” scenario. Because haddock stocks are, in general, characterized as having periods of relatively poor recruitment interspaced with unpredictable periodic high recruitment events, it is important to consider periods of low recruitment as a realistic scenario in the HCR evaluation.

Evaluation of a new proposed element of the harvest control rule in the form of an α parameter to determine the slope of F when $SSB < B_{pa}$ in cases of low recruitment, suggested that the use of this additional parameter did not change the results of risk calculations significantly and, as such, did not appear to have much impact on the HCR’s performance. Therefore, appropriate methodology to define periods of low recruitment for the application of a modified HCR was not examined in detail.

Additional analyses of the HCR (unmodified, i.e. with $\alpha = 1$), using a maximum F of 0.2 instead of 0.3, indicated a less than 5% probability of SSB being below B_{lim} in the long term, even under the scenario where the generally low recruitment observed since 2004 persists in the future. In the short term (next few years), however, a higher than 5% probability of SSB being below B_{lim} is expected, because of the very low recruitment observed every year since 2007. Given the current poor stock situation, an HCR under which the probability of SSB being below B_{lim} is expected to be reduced to less than 5% within a few years, and to remain at this low value in the long term, has been considered to be precautionary.

As indicated in the advice issued by ICES in 2012 (ICES, 2012a), the definition of the HCR is open to interpretation when the SSB calculated in paragraph 2 of the management plan is less than B_{pa} . In that case, two different interpretations of the SSB value to be used in paragraph 4 are possible: 1) the SSB value calculated in paragraph 2, or 2) the SSB value that results from applying during the TAC year the F actually obtained in paragraph 4. The latter involves

an iteration process because the value of SSB at the end of the TAC year is part of the formula to calculate F. These two interpretations correspond to different definitions of the HCR and, hence, generate different Fs at stock biomasses below B_{pa} , with the first interpretation leading to lower Fs. The HCR that has been found to be precautionary in the analyses corresponds to the first interpretation, so if this HCR is implemented in practice, it should be applied using the first interpretation. This means that paragraphs 4 and 5 should be directly based on the SSB at the end of the TAC year obtained from applying $F = 0.2$ during the TAC year, without using any iteration process.

ICES considers $F = 0.3$ as a provisional F_{MSY} proxy for the Rockall haddock stock and given that the stock is currently at very low abundance, the main objective in the short term is to ensure that SSB recovers above B_{lim} and B_{pa} . As such, the HCR was not examined as to whether it is consistent with maximizing yield (when adequately implemented) at this time. Rather, the analyses focused on finding an HCR that could be considered precautionary even under low recruitment. The HCR that was found to be precautionary is more stringent than the standard ICES HCR for the MSY approach, as the maximum F (0.2) is lower than the provisional F_{MSY} proxy and F declines to 0 at B_{lim} . It is, however, noted that the SSB used in the HCR definition differs between the standard ICES HCR for the MSY approach (SSB at the start of the TAC year) and the HCR proposed by NEAFC and evaluated here (SSB at the end of the TAC year). The low recruitment regime is considered relevant for the HCR evaluation because it reflects the situation observed for almost a decade (since 2004). Whether this situation prevails in the future is uncertain, but if it does the findings here for the NEAFC-proposed HCR indicate that the standard ICES HCR for the MSY approach with the existing reference points would be unlikely to be precautionary.

ICES notes that the proposed HCR is an improvement compared to the current management approach, because the TAC would account for total catches (landings and discards) from all sources, including the international fishery.

Observed discard percentages of certain trawl fleets from the European Union have been as high as 52% to 87% by numbers, although much lower in recent years. The discarding percentage is highly dependent on the abundance of incoming recruitment because small fish are more likely to be discarded than large fish. The proposed HCR specifies that TACs refer to total catch, not just landings. ICES considers that controlling total catch is the only way to control fishing mortality. Closer monitoring of actual catches (instead of just landings) is therefore required. The long-term management plan needs to specify how this will be accomplished. ICES advises, in line with previous advice (ICES, 2011, 2012a), that it would be beneficial to develop and introduce fisheries practices and measures aimed at preventing catches of juvenile haddock.

Suggestions

The maximum value of F to be used in the HCR (at present advised to be 0.2 for consistency with the precautionary approach) could be reconsidered in a future review of the management plan approximately five years from now. A larger value of maximum F may be possible if recruitment improves with respect to what has been observed since 2004. The explorations during that review could, for example, consider a maximum F of 0.3, possibly in combination with a trigger biomass (from which F is reduced) larger than B_{pa} . This would allow a wider range of Fs within the HCR, depending on stock biomass. Consideration of yield maximization should be part of the evaluation at that time.

The formulation of the HCR should be clear, particularly in relation to the SSB value to be used in paragraphs 4 and 5. To avoid ambiguities, the HCR should be rewritten and the details of the calculations documented. It is suggested that the HCR that has been found to be consistent with the precautionary approach should be rewritten as follows:

“1. Every effort shall be made to maintain a level of spawning-stock biomass (SSB) greater than B_{pa} and a minimum level of SSB greater than B_{lim} .

In paragraphs 2–5, $SSB_{0.2}$ denotes the SSB 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 $SSB_{0.2}$ is estimated to be above B_{pa} .

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:

$$TAC_y = TAC_f + 0.2 \times (TAC_{y-1} - TAC_f)$$

where TAC_y is the TAC that is to be set by the management plan, TAC_{y-1} is the TAC that was fixed the previous year, and TAC_f is the TAC resulting from the provisions in paragraphs 1 and 2.

4. Where $SSB_{0.2}$ is estimated to be below B_{pa} but above B_{lim} , the TAC shall not exceed a level, which will result in a fishing mortality rate equal to

$$0.2 - [0.2 \times (B_{pa} - SSB_{0.2}) / (B_{pa} - B_{lim})].$$

This consideration overrides paragraph 3.

5. Where $SSB_{0.2}$ is estimated to be below B_{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.”

Basis of ICES advice

Background

The haddock stock at Rockall is a stock separate from that on the continental shelf of the British Isles. Rockall haddock have a lower growth rate and reach a lower maximum size than other haddock populations in the Atlantic. This stock shows the characteristics of typical haddock stocks in having no apparent stock-recruitment relationship. For example, recruitment for the last six years has been extremely low despite a moderately large SSB.

Discussions between the European Union (EU) and the Russian Federation (RF) on possible joint management measures for the Rockall haddock fishery have taken place for over ten years. Changes in the configuration of the EU Exclusive Economic Zone in 1999 led to a renewal of the RF Rockall haddock fishery, highlighting that joint management would be desirable although potentially difficult to implement. Meetings involving scientists and fisheries managers from both the EU and the RF have been held on an almost annual basis since 2001 to determine what is known about the fisheries, and how such information should be used to develop a productive and sustainable management system.

Building on the history of Rockall fisheries and the supporting scientific work presented by Newton *et al.* (2008) and Filina *et al.* (2009), the EU–RF Working Group on Rockall haddock met several times during 2008–2010 and produced a state-of-the-art review of available data and scientific analyses pertaining to Rockall haddock. EU–RF (2011) documents the first three of these meetings. At the fourth meeting in Edinburgh in September 2010, a proposal was drafted for a joint EU–RF management plan for Rockall haddock. Following further refinements, a final version was presented to NEAFC near the end of 2010. Subsequently, NEAFC forwarded the management plan proposal to ICES for evaluation in 2011. Analyses were conducted by ICES in 2011, but these were considered preliminary and incomplete, and ICES was unable to assess if the HCRs in the plan were consistent with the precautionary approach (ICES, 2011). This resulted in NEAFC making a new request in 2012 for evaluation of the HCR, with some modifications over the HCR presented in 2011. The modified 2011 HCR was found to be not consistent with the precautionary approach under the conditions of low recruitment that had existed since 2004 (ICES, 2012a, 2012c). NEAFC requested advice on a modified HCR for Rockall haddock again in 2013. The modification to the 2012 HCR included a decrease in F when $SSB < B_{pa}$ to $F = 0$ (as opposed to $F = 0.1$ in the 2012 request) when $SSB \leq B_{lim}$. Another potential modification to the HCR included the use of an additional parameter in the calculation of the reduction in fishing mortality under paragraph 4, for cases of low recruitment.

Results and conclusions

Under the proposed HCR, the 2013 analyses (ICES, 2013a) indicate that there is a greater than 5% probability that the spawning-stock biomass will be below B_{lim} , both in the short and long terms, if future recruitment is characteristic of the range observed since 2004 (see Table 5.3.3.2.1 for the long-term probabilities). This result is for an HCR based on the provisional F_{MSY} proxy of 0.3.

The analyses using an α parameter for low recruitment situations (assumed as ‘since 2004’), to be used in paragraph 4, as indicated in the NEAFC request, suggested that the use of the α parameter in the range of values tested did not have much impact on the performance of the HCR (Table 5.3.3.2.2). It should be noted that the differences in probabilities of $SSB < B_{lim}$ have to be treated with caution because the number of iterations (100) used for most of the analyses was small.

Following these analyses, supplementary analyses using a maximum $F = 0.2$ in the HCR (when $SSB > B_{pa}$) were conducted (for the unmodified HCR, i.e. with $\alpha = 1$). These were found to result in probabilities of $SSB < B_{lim}$ that are greater than 5% in the first few years of the simulation, but smaller than 5% in the long term (see Table 5.3.3.2.1 for

long-term probabilities and Figure 5.3.3.2.1 for a graphical display of development through time). Therefore, this HCR was considered to be consistent with the precautionary approach.

In determining the consistency of the HCR with the precautionary approach, consideration was given to the fact that current stock abundance is very low, following from the very low recruitments observed since 2007. Applying the HCR does not lead to a smaller than 5% probability of $SSB < B_{lim}$ in the immediate future. However, it is unlikely that such a low probability could be achieved immediately, even under no fishing. This will be highly dependent on the incoming recruitment in 2013 and subsequent years. In these circumstances, an HCR under which the probability of $SSB < B_{lim}$ is estimated to be $< 5\%$ after some initial years, while then remaining at $< 5\%$ in the long term, has been considered to be consistent with the precautionary approach.

Methods

Two different Management Strategy Evaluation (MSE) analyses were conducted to investigate the properties of the proposed HCR (ICES, 2013a). Both approaches were based on the most recent (2013) ICES assessment results of the Rockall haddock stock (ICES, 2013b), which uses an XSA model, with catch (landings and discards) numbers-at-age data and an abundance index provided by a Scottish survey conducted annually in Division VIb. In the ICES assessment, recruitment is at age 1, and the same age-at-recruitment was used in the MSE analyses. In forward simulations, both analyses used the mean of values observed in the most recent ten years for weights-at-age, exploitation patterns, and discarded proportion-at-age (for scenarios that considered discards). Two different recruitment scenarios were considered. One scenario (“medium recruitment”) was based on random draws from the historical estimates of recruitment over the full time-series of the assessment (1991–2012), while the other scenario (“low recruitment”) used random draws over the period 2004–2012, when recruitment has generally been low.

One of the analyses used the Fisheries Library in R (FLR; see Kell *et al.*, 2007; Needle, 2008). The HCR was applied to generate TACs for 2014 and future years. When paragraph 4 was invoked, the interpretation of the HCR used the SSB at the end of the TAC year corresponding to the F derived from the calculation in paragraph 4. This involved an iterative calculation of F because SSB at the end of the TAC year was part of the calculation. The assessment errors were limited to those associated with the recruitment assumptions. Each iteration was run for 32 years in the future, and the initial 10-year period was not included in the risk calculations. The calculations were initially performed with the maximum F corresponding to the provisional F_{MSY} proxy ($F = 0.3$) when $SSB > B_{pa}$.

The other analysis, carried out in Excel, shares many methodological features with the FLR one. In addition to incorporating variability in recruitment, assessment errors derived from retrospective analyses of past assessments were also included in the MSE loop. Unlike the FLR approach the iterative approach to calculate the F for the TAC year was not used. Simulations were run for the period 2013–2041 and the calculation of risk of falling below reference points was based on results from 2020–2040.

Both approaches used 100 iterations in the simulation. The analyses involved in the two approaches allowed for examination of results with:

- the two assumptions on recruitment: either a low scenario, based on the recruitments from 2004 onwards, or a medium scenario based on the full assessment time-series;
- two formulations of paragraph 4 (with and without the α parameter) for the low recruitment situation;
- with or without implementation errors, allowing a total catch value in excess of the TAC (referred to as ‘discards scenario’ in ICES (2013a));
- the TAC constraint in the HCR (paragraph 3) being enforced or not, explored only in the FLR analyses;
- different values of the minimum F in the HCR (when $SSB < B_{lim}$), explored only in the FLR analyses;
- different values of the maximum F in the HCR (when $SSB > B_{pa}$), initially explored only in the EXCEL analyses.

Not all of these analyses were part of the request, but were explored during the WKROCKHAD2 workshop (ICES, 2013a).

Following results of analyses carried out in EXCEL which suggested that the HCR with a maximum F of 0.2 may be consistent with the precautionary approach, an analysis was conducted with FLR using the same maximum F and the same approach to calculate the SSB in paragraph 4 as the EXCEL analyses (i.e. no iterative process). For this FLR analysis, 1000 iterations were conducted to get a more accurate estimation of risk, as this was very close to 5%.

Sources

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Table 5.3.3.2.1 Summary of long-term probability of $SSB < B_{lim}$, excluding the first 10 years in the simulation (unmodified HCR, i.e. $\alpha = 1$). The results are from the FLR (first value in each cell) and Excel (second value in each cell) analyses under two recruitment scenarios and two values of maximum F in the HCR (when $SSB > B_{pa}$). The number of iterations is indicated in parentheses.

Maximum F in the HCR*	Low (recent) recruitment	Medium (historical) recruitment
0.2	4.8% (1000) or 4.7% (100)	Not available
0.3	17.1% (100) or 7.1% (100)	0.2% (100) or 0.1 % (100)

*the interpretation of the SSB to be used in paragraph 4 of the HCR differed for the FLR (iterative calculation) and the EXCEL (non-iterative calculation) approaches for the analyses with maximum F = 0.3, whereas both approaches used the same interpretation (non-iterative calculation) for the analyses with maximum F = 0.2.

Table 5.3.3.2.2 Summary of long-term probability of $SSB < B_{lim}$, excluding the first 10 years in the simulation, with maximum F = 0.3 in the HCR and different values of α . The results in the first row are from the Excel analysis and correspond to the low recruitment scenario. The results in the second row are from the FLR analysis and correspond to the two recruitment scenarios (low and medium recruitment). The HCRs use values of $\alpha > 1$ when the three most recent recruitments are low, although the details of the implementation differ between the Excel and FLR analyses. All results in the table are based on 100 iterations.

Low (recent) recruitment, $\alpha = 1.3$: 6.2%	Low (recent) recruitment, $\alpha = 1.4$: 5.6%	Low (recent) recruitment, $\alpha = 1.5$: 4.9%
Low (recent) recruitment, variable α (1.1 or 1.25): 15.2%	Medium (historical) recruitment, variable α (1.1 or 1.25): 0.3%	

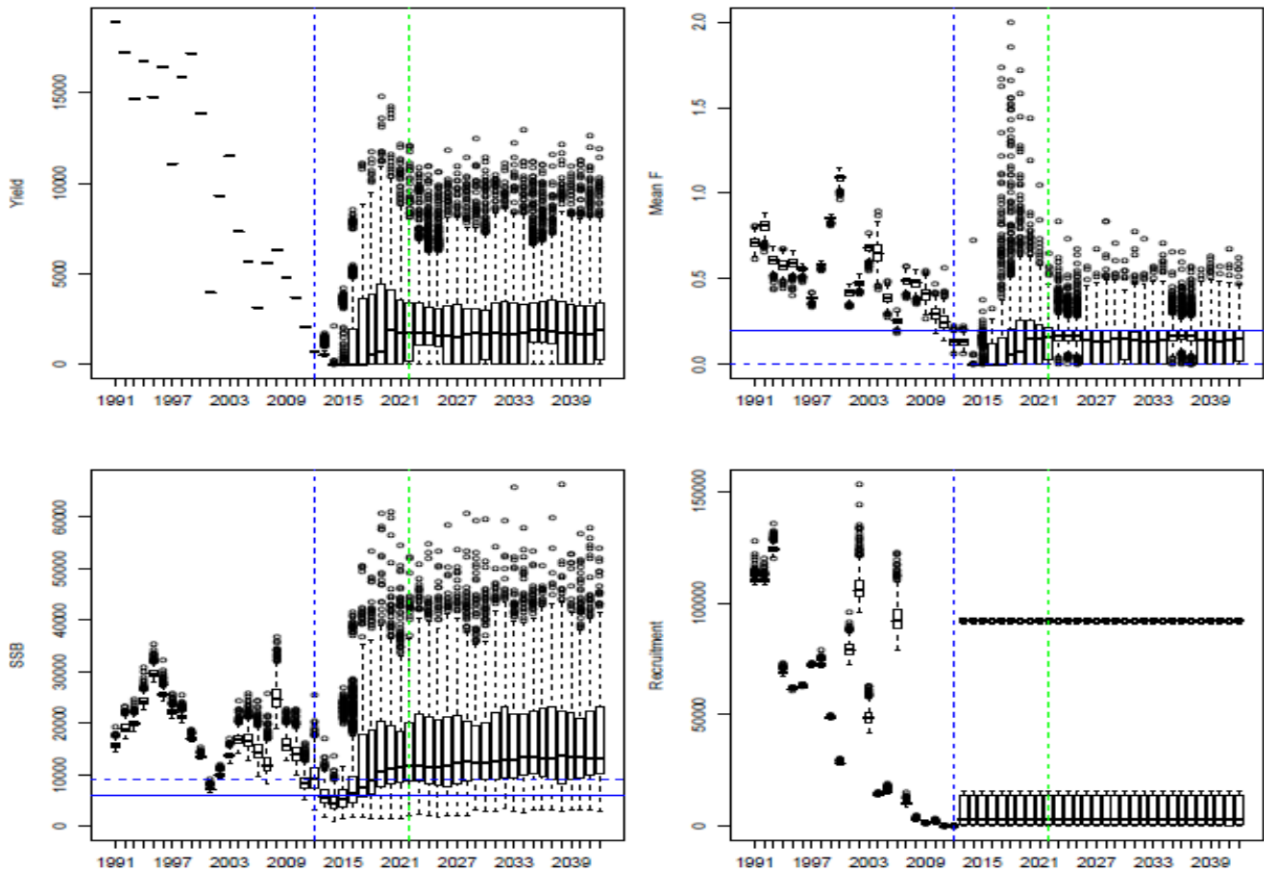


Figure 5.3.3.2.1 Summary plots for the HCR with maximum $F = 0.2$ (when $SSB > B_{pa}$). The graphs correspond to true population values from the 1000 simulation iterations for the run of the FLR MSE, assuming low recruitment (i.e. recruitment as observed since 2004). The panels show box-plots of yield (i.e. total catch; top left), F (top right), SSB (bottom left), and recruitment (bottom right). The short horizontal lines in the box-plots indicate the medians, the boxes the quartiles (25th and 75th percentiles), and the whiskers extend out to the most distant point which is at no more than 1.5 times the interquartile range distance from the end of the box. Outliers are shown by open circles. The horizontal lines in the top-right plot show $F = 0.2$ and $F = 0$, while those in the bottom-left plot show B_{pa} and B_{lim} . Vertical dashed blue lines show the last historical year, while the vertical green lines show the start of years that are included in risk analyses.

ECOREGION	Celtic Sea and West of Scotland
SUBJECT	Request from NEAFC on the closure area and additional measures for the protection of juvenile haddock on Rockall Bank

Advice summary

ICES advises that the overall impact of the current closure area on the Rockall haddock stock is difficult to assess. The closure area (Haddock Box) does not cover the whole area where juveniles are found and there is no evidence of a change in the fishery selection pattern on the stock after the closure. However, for most ages, haddock densities are now higher inside than outside the Haddock Box, whereas the opposite was the case before the closure.

ICES advises that a number of technical and operational measures could be examined to improve the fishing pattern of the entire fishery. The future discard ban for EU vessels is expected to encourage the avoidance of small fish, hence improving the fisheries selection pattern. An improvement in the selection pattern of all fleets would be beneficial for the stock.

Request

NEAFC recalls that it has had in place a closure in the NEAFC Regulatory Area since 2001 to protect the juvenile component of the Rockall haddock stock. Taking into account the latest information on the distribution of juveniles on Rockall bank, NEAFC requests ICES to advise on:

- a) whether the current closure area to protect juvenile Rockall haddock continues to be appropriate, or whether its boundaries should be modified;*
- b) additional or alternative measures that could be introduced to protect juvenile Rockall haddock.*

Elaboration on ICES advice

- a) Appropriateness of the closure area

Charts of the distribution of juvenile Rockall haddock from surveys indicate that the closed area does not cover the whole area where juveniles are found (Figure 5.3.3.3.1). Juveniles are widely distributed over the shallowest areas of the bank, but often not particularly concentrated inside the Haddock Box. The location of the higher density areas does not appear to be constant over time.

Haddock density has generally declined on Rockall in recent years. However, despite the fact that only a relatively low proportion of juvenile haddock is distributed inside the Haddock Box, the results of the investigation show that for most ages, haddock densities are now higher inside than outside the Box, whereas the opposite was the case before the closure (Figures 5.3.3.3.2 and 5.3.3.3.3). Whereas this change in relative densities may be attributed to the Haddock Box, it is not clear how the closure affects the whole Rockall haddock population. The increased difference in fish density between the Haddock Box and the area outside may be due to some relocation of fishing effort to the open part of the Rockall bank.

An examination of fishing mortality does not suggest a shift in the selection pattern away from juveniles after the Haddock Box closure was implemented (Figure 5.3.3.3.4). Based on these observations, it is not evident how the current boundaries of the Haddock Box would be effective in protecting juveniles of the whole stock. However, given the broad and variable distribution of juveniles, suggesting alternative boundaries that do not cover the entire shallow area is not possible.

- b) Additional or alternative measures

An improvement in the selection pattern (i.e. reducing the catch of young fish) in the Rockall haddock fishery (both for European Union (EU) and non-EU vessels) should result in an improvement in the stock status. Various technical and operational measures can improve the exploitation pattern, including increase in mesh size, adoption of selective devices (such as square mesh panels), and avoidance of areas or seasons with high concentrations of juveniles. Further analyses of the potential stock impacts associated with selection pattern changes should be undertaken.

Despite differences in mesh sizes (100–120 mm for EU trawlers and mainly below 70 mm for Russian Federation (RF) vessels), a comparison of selection patterns of the fleets involved in the fishery (EU and RF) revealed no significant

differences (ICES, 2012). This may be explained by technical specifications such as the twine material and thickness and/or by different fishing grounds of the fleets. Therefore, variations in the proportion of the catch taken by each fleet would not change the overall fishing pattern.

The treatment of the juveniles caught differs between the EU and RF vessels. The RF has a full retention policy, so all fish caught are utilized, whereas EU vessels discard all fish below minimum landing size (MLS; regulatory-induced discarding) and also a substantial amount of fish in the range 30–35 cm (market-induced discarding). Even though reducing the MLS would reduce discards (by allowing to land and sell smaller fish), it would not improve the selection pattern and, therefore, not improve the stock status. Whether caught and discarded, or caught and processed, these small fish are not allowed to grow and therefore cannot improve future yields, nor can they contribute to the spawning population.

The upcoming discard ban for EU vessels (landing obligation), if adequately implemented, is expected to provide an incentive for fishers to avoid capturing small fish (given that this fish will count against the quota but will be economically much less valuable), which would result in an improved selection pattern and potential improvement of the stock in the long term.

Basis of ICES advice

Background

The Rockall Haddock Box: purpose, history, and evaluations

In late 2000, NEAFC sent the following request to ICES:

“To evaluate the spatial distribution of the fishery, the spawning stock and the juvenile fish of the stock of haddock around Rockall, to allow NEAFC to consider the appropriateness of area and seasonal closures among other measures. Evaluation of the consequences of fishing with larger mesh sizes (within a range considered appropriate by ICES) is also requested.”

An *ad hoc* working group was convened by ICES, consisting of scientists from the UK, RF, and Norway, and this group met in Aberdeen in early 2001. Although the available information on spatial distribution of Rockall haddock was examined in detail, this group made no recommendations regarding appropriate locations of potential closures, and the subsequent ICES advice focused on distribution and technical selectivity characteristics (ICES, 2001).

Following this group, a NEAFC Extraordinary Meeting was held in London during March 2001, the remit of which included a consideration of the management of Rockall haddock (NEAFC, 2001). The report includes the following text:

“The EU and the Russian Federation proposed a recommendation on regulatory measures for the protection of Haddock in ICES Division VIb. The EU explained that extensive bilateral contacts had resulted in this proposal, the main components of which were as follows: in order to protect juvenile haddock on the Rockall Bank, the closure of a specified area for the remainder of 2001 was envisaged. More particularly, it was intended to prohibit all fishing, except long-lining, in the said Haddock box.”

The basis for the closed area is unclear, but as ICES (2001) had made no recommendations, it would appear that the location was specified via “bilateral contacts” between representatives of the EU and the RF.

The closure in the NEAFC-regulated international segment of statistical rectangle 42D5 was implemented in mid- to late 2001, with the EU segment following in early 2002. By the time of the annual NEAFC general meeting in November 2002, the closure had been formalized and extended (NEAFC, 2002):

“...the existing closed area established in internal EU waters to protect juvenile haddock, similar to the one established in NEAFC waters, would be extended.”

Scientific and management bilateral meetings between the EU and the Russian Federation to address the issue of the Rockall Haddock Box (amongst other management measures) have taken place at regular intervals since 2002. Those up to and including 2009 are summarized in the European Commission and Russian Federation report (EU–RF, 2009), while further annual meetings have taken place in 2010–2012. The issue has also been considered at several meetings of the ICES Working Group on the Assessment of Northern Shelf Stocks. The analyses presented by the ICES Workshop to evaluate the EU–Russian proposal for the harvest control component of the management plan for Rockall haddock (ICES, 2013a) build on the work of these earlier groups and represent the most complete summary of the effect of the Haddock Box that has thus far been available.

Results and conclusions

Figures 5.3.3.3.1–5.3.3.3.3 are based on data from the trawl survey that has been conducted annually in Rockall in August–September since 1989 (Rock-WIBTS-Q3 survey).

Figure 5.3.3.3.1 shows the average number of fish < 25 cm caught per tow, indicating a broad distribution of juveniles throughout the survey area, with the location of highest densities varying over time. Similar results were found by other surveys conducted in September 2000 and March 2005.

The left panel of Figure 5.3.3.3.2 displays, for each age, average haddock densities (log-transformed) inside and outside the Haddock Box, in the periods before and after the closure year (2001). The right panel shows the difference between haddock densities inside and outside the Box in the periods before (lower line) and after (upper line) the closure (with 95% confidence bands, estimated from an ANOVA model). The figure indicates that, whereas density of haddock was generally higher outside than inside the Box before the closure, the opposite happens after the closure. Figure 5.3.3.3.3 presents similar information in more detail, displaying haddock densities (log-transformed) inside and outside the Box by year. The improvement in stock status inside versus outside the Box, after the closure in 2001, is also apparent from this figure.

Figure 5.3.3.3.4 shows the time-series of mean fishing mortality of ages 1–2 divided by the mean fishing mortality of ages 3–6, as estimated in the latest ICES assessment. No change in the selection pattern can be observed after the closure of the Haddock Box.

Methods

The distribution of haddock on Rockall Bank was examined by plotting survey catch distribution results of juvenile haddock (< 25 cm) from trawl surveys conducted in August–September 1989–2012 (Rock-WIBTS-Q3 survey), as well as other trawl and acoustic surveys conducted in September 2000 with the RV “Atlantida” and the March 2005 trawl survey on the Rockall Bank with the RV “F. Nansen”.

Data collected during the Rockall Haddock Survey (Rock-WIBTS-Q3) in 1989–2012 were also used in the analysis of the effect of the closure on the fish density. These data include time, position, bottom depth for individual tows, and fish numbers at length by species. The data on length frequencies for haddock were converted to age using age–length keys. These were produced based on biological data on age collected during the survey. Numbers of fish per tow (for a standard tow duration of 30 minutes) at age were calculated and a two-way ANOVA model was used with the factors “area” (inside and outside the Haddock Box) and “period” (before and after the closure, in 2001). The data on fish density were log-transformed to achieve a normal distribution before statistical analyses. Depth and year were included in the model as other explanatory variables (covariates) to reduce the magnitude of error variance.

Finally, the ratio of the mean fishing mortality of ages 1 and 2 and mean fishing mortality of ages 3 to 6 for each year was calculated to determine whether there was evidence of a change in fishing pattern.

Sources

- EU–RF. 2009. Report of the European Community–Russian Federation Scientific Expert Working Group on Rockall Haddock. Moscow, Russia (8–11 April 2008 and 9–11 September 2009) and Edinburgh, Scotland (4–6 February 2009).
- ICES. 2001. Meeting to address Request from NEAFC to ICES on Rockall haddock. *In* Report of the ICES Advisory Committee on Fishery Management, 2001. ICES Cooperative Research Report, 246: 361–398.
- ICES. 2012. Evaluations of the EU–Russia proposal for the harvest control component of the management plan for Rockall haddock fisheries. *In* Report of the ICES Advisory Committee 2012. ICES Advice, 2012. Book 5, Section 5.3.3.1.
- ICES. 2013a. Report of the Second Workshop to evaluate the EU–Russian proposal for the harvest control component of the management plan for Rockall haddock, 4–6 June 2013, ICES HQ, Copenhagen, Denmark. ICES CM 2013/ACOM:67.
- ICES. 2013b. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 8–17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.
- NEAFC. 2001. Report of the Extraordinary Meeting of the North-East Atlantic Fisheries Commission, 22–23 March 2001, NEAFC Headquarters, London. Available at <http://archive.neafc.org/reports/annual-meeting/docs/>.
- NEAFC. 2002. Report of the 21st Annual Meeting of the North-East Atlantic Fisheries Commission, 12–15 November 2002. Available at <http://archive.neafc.org/reports/annual-meeting/docs/>.

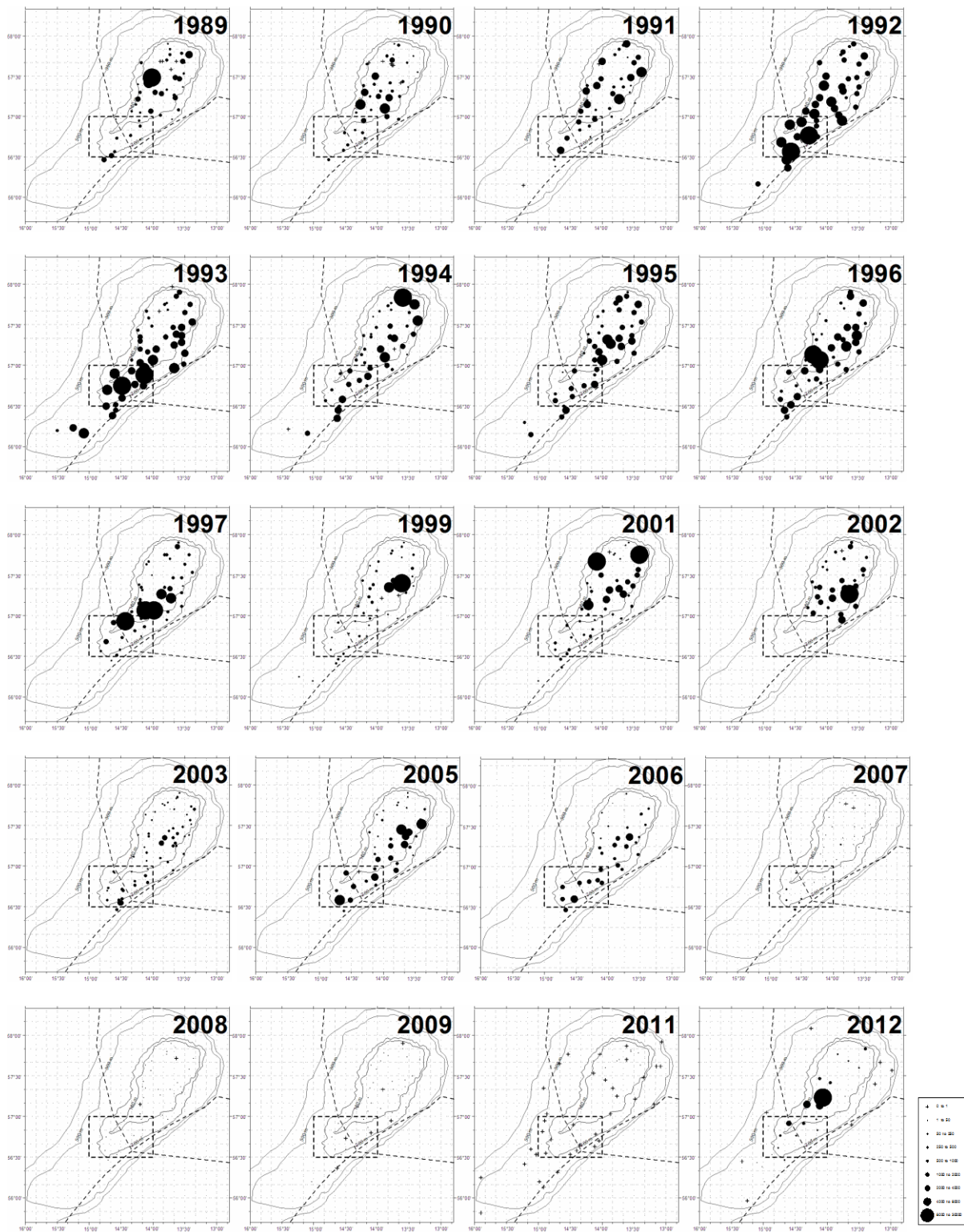


Figure 5.3.3.1 Distribution of haddock (catch per 30-min. haul, numbers of fish) less than 25 cm long from the Rockall haddock survey in August–September 1989–2012 (Rock-WIBTS-Q3).

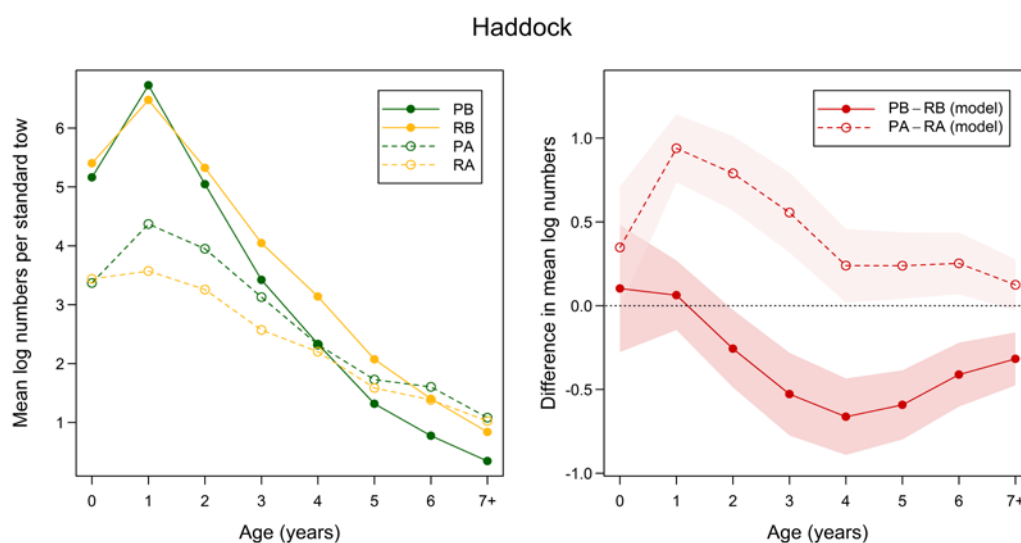


Figure 5.3.3.3.2 Left panel: Observed average haddock densities (log-transformed) inside the Haddock Box (labelled as “P” (“protected” area); in green) and outside (labelled as “R” (“reference” area); in yellow) in two periods: before the closure (full circles and solid line) and after the closure (empty circles and dashed line). Right panel: Estimated difference in density between the two areas (inside and outside the Haddock Box), before the closure (full circles and solid line) and after the closure (empty circles and dashed line), with 95% confidence bands. Labels: PB = protected area before closure, RB = reference area before closure, PA=protected area after closure, RA = reference area after closure.

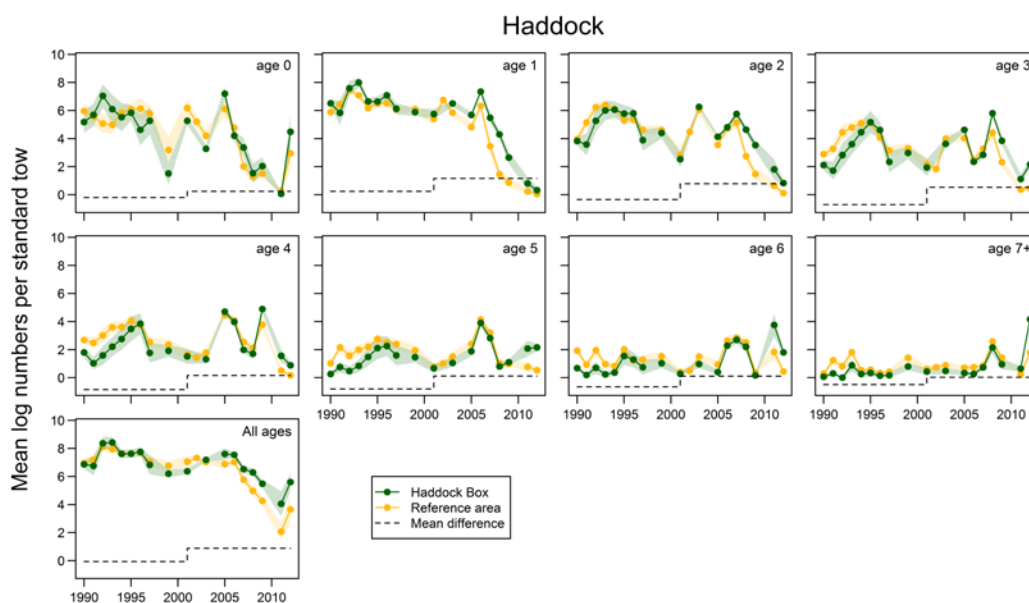


Figure 5.3.3.3.3 Observed average haddock densities (log-transformed) by age inside the Haddock Box (in green) and outside (labelled “Reference area”; in yellow), with 95% confidence bands. The dashed line shows the mean difference between the two areas (Haddock Box and reference area), in the two periods (before and after the closure).

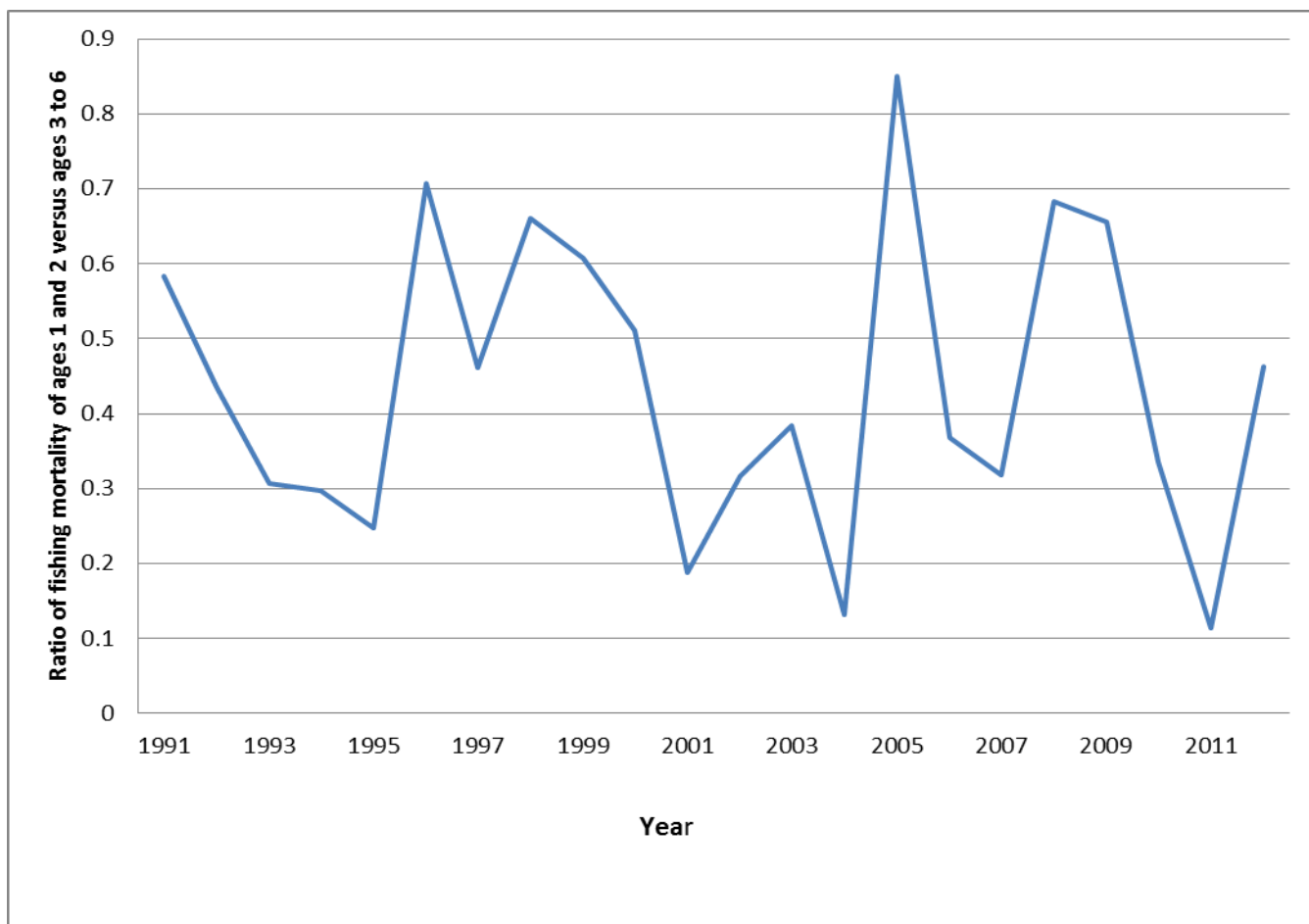


Figure 5.3.3.3.4 Ratio of the mean fishing mortality of ages 1 and 2 and mean fishing mortality of ages 3 to 6 for Rockall haddock, estimated from the latest ICES assessment (ICES, 2013b).

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

Advice for 2014

Based on ICES approach to data-limited stocks, ICES advises that catches should be no more than 10 231 t in 2014. All catches are assumed to be landed.

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

Stock status

F (Fishing Mortality)	
	2010–2012
Qualitative evaluation	? Insufficient information
SSB (Spawning-Stock Biomass)	
	2008–2012
Qualitative evaluation	↘ Decreasing

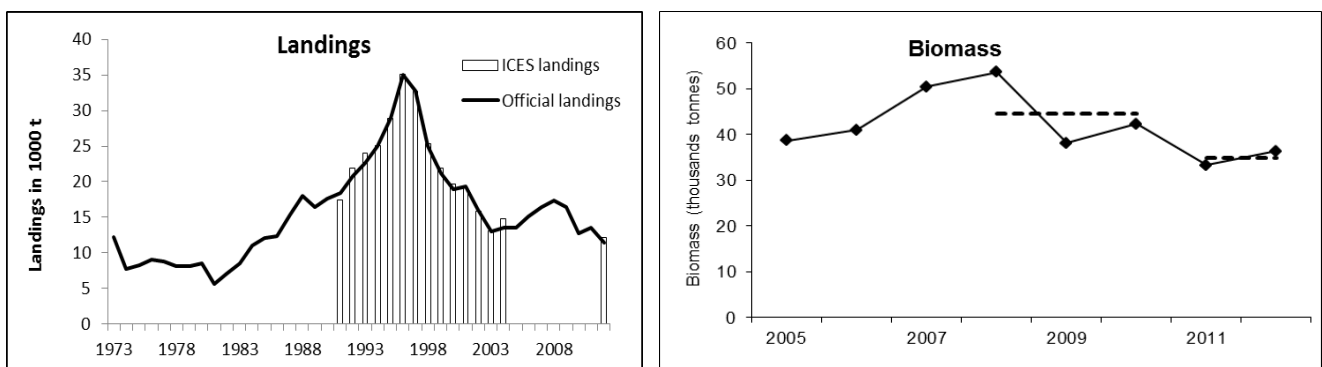


Figure 5.4.1.1 Anglerfish (*Lophius piscatorius* and *L. budegassa*). Left: Official and ICES landings (thousand tonnes) in Subareas IV and VI and Division IIIa. Right: Stock biomass (thousand tonnes) from SCO-IV-VI-AMISS-Q2. Dashed horizontal lines for SSB correspond to the average on the respective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

Management plans

No specific management objectives are known to ICES.

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.

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.

Catch distribution	Total landings in 2012 were 11 493 t (7351 t in Division IIIa and Subarea IV; 4142 t in Subarea VI). Discards from the Scottish, Irish, and Danish fleets were minimal in 2012 (64 t).
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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.

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 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

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

ECOREGION	Celtic Sea and West of Scotland+ North Sea
STOCK	Anglerfish (<i>Lophius piscatorius</i> and <i>L. budegassa</i>) in Division IIIa and Subareas IV and VI

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.

ICES approach to data-limited stocks

For data-limited stocks for which biomass estimates are 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 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 10 231 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.

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.

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.

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.

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.

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.

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).

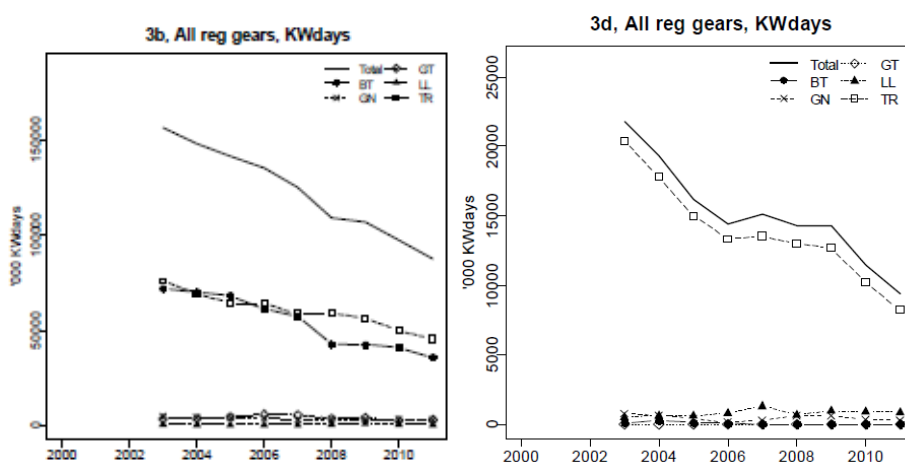


Figure 5.4.1.2 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa and Subareas IV and VI. Trends in nominal international fishing effort in Skagerrak, North Sea, and Eastern Channel (left) and West of Scotland (right), collated by STECF (2012).

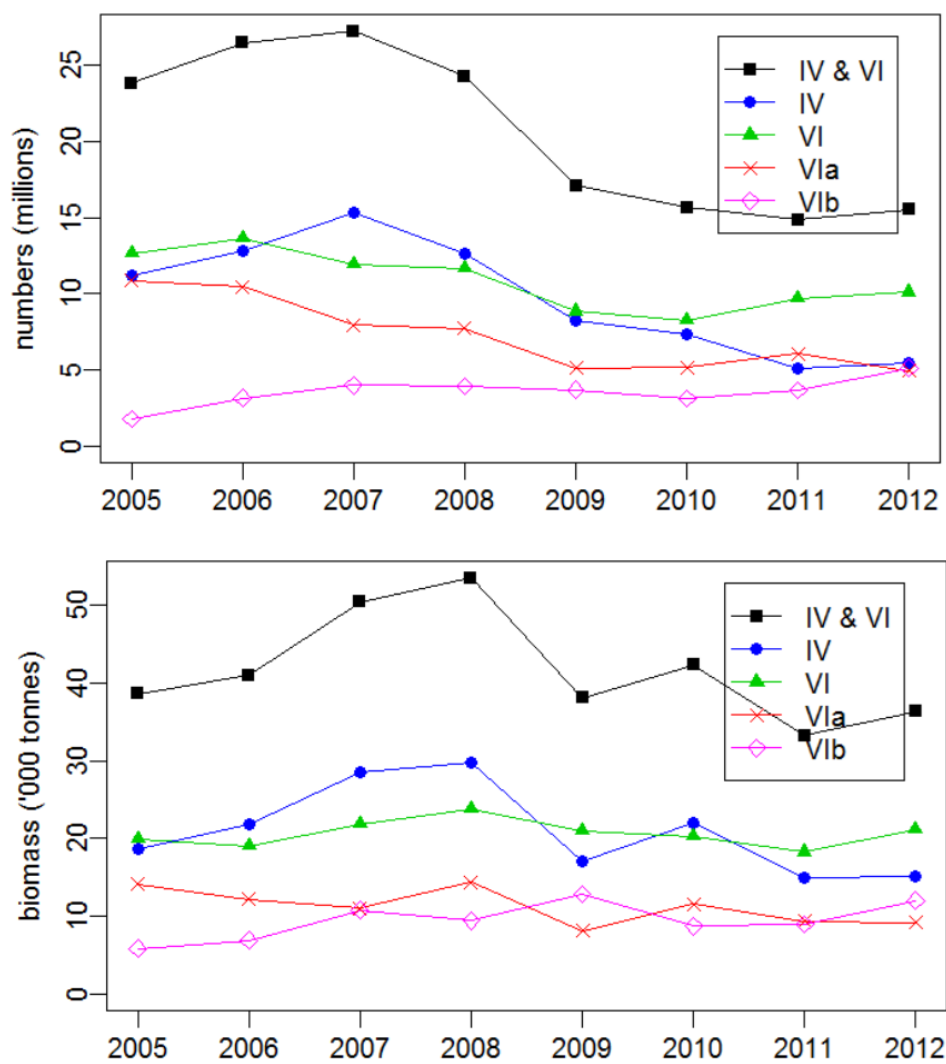


Figure 5.4.1.3

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).

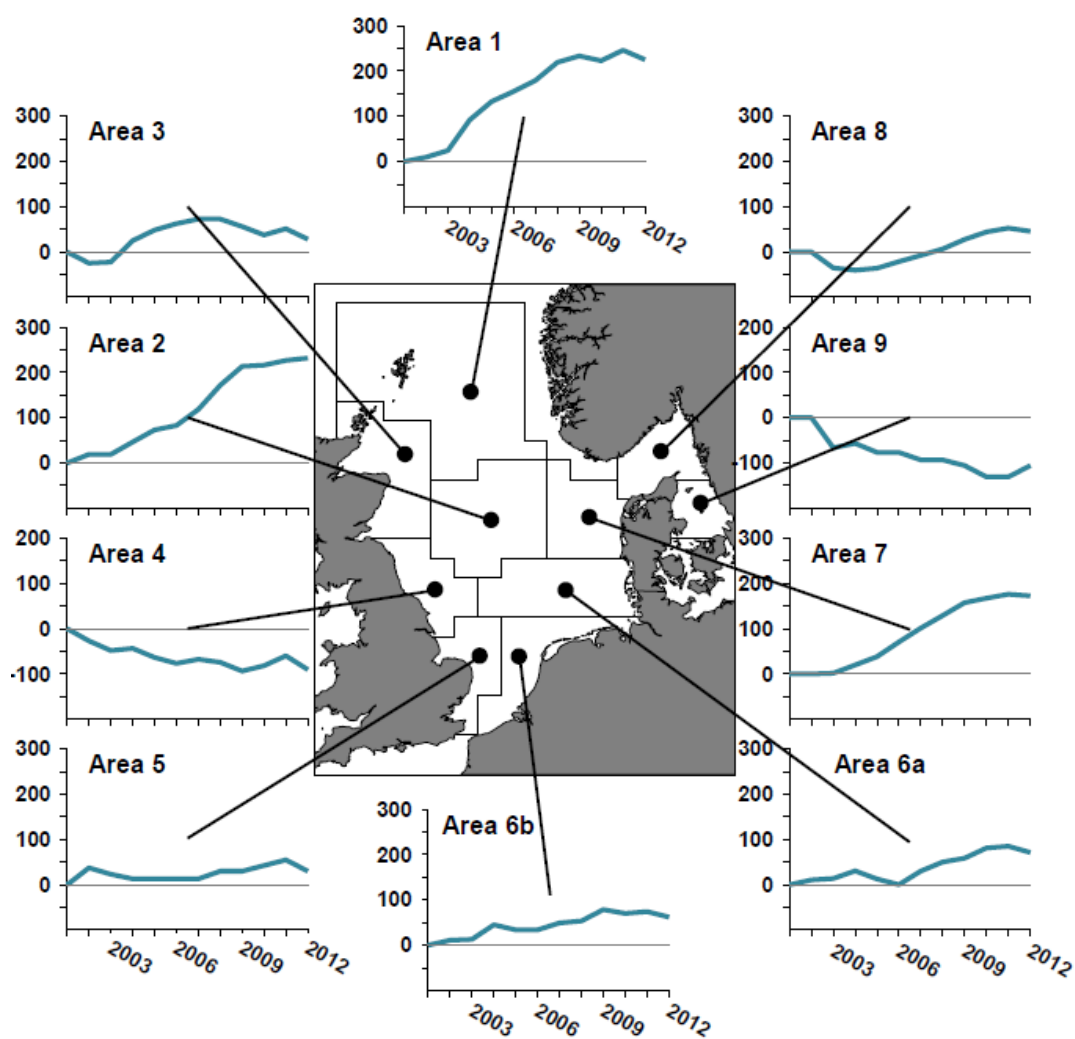


Figure 5.4.1.4 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Subarea IV. Results of the North Sea Commission fishers' survey perceptions of abundance by area, 2012 (Napier, 2012).

Table 5.4.1.1

Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa and Subareas IV and VI. ICES advice, management, and landings.

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
1990	Not assessed	-	-	-	8.6	17.6	16.6
1991	Not assessed	-	-	-	8.6	18.4	17.4
1992	Not assessed	-	-	-	8.6	20.8	21.9
1993	No long-term gain in increased F ³⁾	-	-	-	8.6	22.6	24.0
1994	No long-term gain in increased F ³⁾	-	-	-	8.6	25.0	25.1
1995	A precautionary TAC not exceeding recent catch levels ³⁾	-	-	-	8.6	28.9	28.9
1996	A precautionary TAC not exceeding recent catch levels ³⁾	-	-	-	8.6	35.0	35.1
1997	Reduction in fishing effort ³⁾	-	-	-	8.6	32.8	32.7
1998	Reduction in fishing effort ³⁾	-	-	-	30.7	25.1	25.3
1999	Reduce fishing effort, effective implementation of the TAC ³⁾	-	-	-	30.7	21.2	21.9
2000	40% reduction in catches	-	< 9.7	< 7.4	25.7	19.0	19.7
2001	2/3 of the catches in 1973–1990	-	5.7	4.3	20.5	19.3	19.2
2002	2/3 of the catches in 1973–1990	-	5.7	4.3	15.3	16.0	15.8
2003	Reduce F below F _{pa}	< 6.7 ²⁾	-	-	10.2	13.0	13.0
2004	Reduce F below F _{pa}	< 8.8	-	-	10.2	13.5	14.7
2005	No effort increase	-	-	-	15.0	13.6	n.a.
2006	No effort increase	-	-	-	15.0	15.2	n.a.
2007	No effort increase	-	-	-	16.5	16.4	n.a.
2008	No effort increase	-	-	-	16.5	17.3	n.a.
2009	Same advice as last year	-	-	-	16.9	16.4	n.a.
2010	No effort increase	-	-	-	16.9 ⁴⁾	12.7	n.a.
2011	Decrease effort	-	-	-	15.1 ⁵⁾	13.6	n.a.
2012	Reduce catch	-	-	-	14.344 ⁵⁾	11.4 ⁶⁾	12.1 ⁶⁾
2013	Decrease catches by 20%	-	-	-	13.627		
2014	Decrease catches by 20%	10.231	-	-			

Weights in thousand tonnes.

¹⁾ TAC for Subarea IV and Division IIa (EC) plus TAC for Division Vb(EC) and Subareas VI, XII, and XIV. Except TAC before 1998, which covered for Division Vb(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.

	IIIa	IVa	IVb	IVc	VIa	VIb	IV	VI	Total	ICES
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

*Preliminary.

Table 5.4.1.3 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).

VIa	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*
Belgium	3	2	9	6	5	-	5	2	-	-	+	+	-	+	-	-	-	-	-	-		
Denmark	1	3	4	5	10	4	1	2	1	+	+	-	+	+	-	-	-	-	-	-		
Estonia																						
Faroe Is.	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	3	2	1	2	4	1	+
France	1 910	2 308	2 467	2 382	2 648	2 899	2 058	1 634	1 814	1 132	943	739	1 212	1 191	1 392	1 314	1763	1746	1555	1 160	1 021	1 166
Germany	1	2	60	67	77	35	72	137	50	39	11	3	27	39	39	1	-	54	79	79	59	
Ireland	250	403	428	303	720	717	625	749	617	515	475	304	322	219	356	392	470	295	328	510	488	325
Netherlands	-	-	-	-	-	-	27	1	-	-	-	-	-	-	-	-	-	-	-	-	0	0
Norway	6	14	8	6	4	4	1	3	1	3	2	1	+	+	1	1	1	2	-	1	1	1
Russia																						
Spain	7	11	8	1	37	33	63	86	53	82	70	101	196	110	82	76	3	174	189	-	138	
UK(E W&NI)	270	351	223	370	320	201	156	119	60	44	40	32	31	30	20	24	42	5	12	393		
UK(Scot.)	2 613	2 385	2 346	2 133	2533	2 515	2 322	1 773	1 688	1 496	1 119	1 100	705	862	1 127	974	1 071	1096	864	1040		
UK (total)																			876	1 021	1 016	1 190
Total	5 061	5 479	5 553	5 273	6 354	6 408	5 330	4 506	4 284	3 311	2 660	2 280	2 493	2 453	3 019	2 785	3 352	3 373	3 029	3 187	2 724	2 682
Unallocated	296	2 638	3 816	2 766	5 112	11 148	7 506	5 234	3 799	3 114	2 068	1 882	985	1 938								72
ICES landings	5 357	8 117	9 369	8 039	11 466	17 556	12 836	9 740	8 083	6 425	4 728	4 162	3 478	4 391								2 754

*Preliminary.

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 estimated by ICES of anglerfish in Division VIb (Rockall).

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*
Belgium																						
Denmark																						
Estonia	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-		-			
Faroe Is.	-	2	-	-	-	15	4	2	2	-	1	-	-	-	-	-	-	1	4	8	+	5
France	-	-	29	-	-	-	1	1	-	48	192	43	191	175	293	224	327	327	637	23	515	456
Germany	-	-	103	73	83	78	177	132	144	119	67	35	64	66	77	72	222	0	132	87	90	
Ireland	272	417	96	135	133	90	139	130	75	81	134	51	26	13	35	53	70	76	91	107	108	-
Norway	18	10	17	24	14	11	4	6	5	11	5	3	6	5	4	6	7	5	9	12	7	0
Portugal	-	-	-	-	-	-	-	+	429	20	18	8	4	19	63	-	-	-	-			
Russia	-	-	-	-	-	-	-	-	-	-	1	-	-	2	4	1	1	35	-			
Spain	333	263	178	214	296	196	171	252	291	149	327	128	59	43	34	36	12	85	57		29	
UK(E W&NI)	99	173	76	50	105	144	247	188	111	272	197	133	133	54	93	46	146	5	48	15		
UK(Scot)	201	224	182	281	199	68	156	189	344	374	367	317	160	294	355	478	475	1096	1141	1171		
UK (total)																			1189	1192	1129	895
Total	923	1089	681	777	830	602	899	900	1401	1074	1309	718	643	671	958	916	1260	1629.6	2119	1423	1878	1356
Unallocated									-9	17	-178	-47	145	121								32
ICES landings	923	1 089	681	777	830	602	899	900	1392	1091	1131	671	788	792								1388

*Preliminary.

Table 5.4.1.5 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.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*
Belgium	3	2	9	6	5	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Denmark	1	3	4	5	10	4	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Faroe Is.	0	2	0	0	0	15	4	2	2	0	1	0	0	2	2	3	2	2	6	12	1	5
France	1910	2308	2496	2382	2648	2899	2059	1635	1814	1180	1135	782	1403	1366	1685	1538	2090	2073	2192	1183	1536	1622
Germany	1	2	163	140	160	113	249	269	194	158	78	38	91	105	116	73	222	54	211	166	149	0
Ireland	522	820	524	438	853	807	764	879	692	596	609	355	348	232	391	445	540	370.6	419	617	596	325
Netherlands																						
Norway	18	10	17	24	14	11	31	7	5	11	5	3	6	5	4	6	7	5	9	12	7	0
Portugal	6	14	8	6	4	4	1	3	430	23	20	9	4	19	64	1	1	2	0	1	1	1
Russia	0	0	0	0	0	0	0	0	0	0	1	0	0	2	4	1	1	35	0	0	0	0
Spain	340	274	186	215	333	229	234	338	344	231	397	229	255	153	116	112	15	259	246	0	167	
Sweden																						
UK(E,W&NI)	369	524	299	420	425	345	403	307	171	316	237	165	164	84	113	70	188	10	60	408		
UK(Scot)	2814	2609	2528	2414	2732	2583	2478	1962	2032	1870	1486	1417	865	1156	1482	1452	1546	2192	2005	2211		
UK (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2065	2213	2145	2085
Total	5984	6568	6234	6050	7184	7010	6229	5406	5685	4385	3969	2998	3136	3124	3977	3701	4612	5002.6	5148	4610	4602	4038
Unallocated	296	2638	3816	2766	5112	11148	7506	5234	3790	3131	1890	1835	1130	2059								104
ICES landings	6280	9206	10050	8816	12296	18158	13735	10640	9475	7516	5859	4833	4266	5183								4142

*Preliminary.

Table 5.4.1.6 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.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*
Belgium	2	9	3	3	2	8	4	1	5	12	-	8	1	-	-	-	-	-	-			
Denmark	1 245	1265	946	1 157	732	1 239	1 155	1 024	1 128	1 087	1 289	1 308	1 523	1 538	1 379	1 311	961	1 071	1 134	1	841	821
Faroes	1	-	10	18	20	-	15	10	6	-	2	+	3	11	22	2	+	-	4		0	0
France	124	151	69	28	18	7	7	3	18	8	9	8	8	8	4	7	13	13	48	6	12	14
Germany	71	68	100	84	613	292	601	873	454	182	95	95	65	20	84	173	186	344	216	124	46	
Ireland																					0	0
Netherlands	23	44	78	38	13	25	12	-	15	12	3	8	9	38	13	14	14	12	5	8	5	5
Norway	587	635	1 224	1 318	657	821	672	954	1 219	1 182	1 212	928	769	999	880	1 005	831	860	859	735	494	480
Sweden	14	7	7	7	2	1	2	8	8	78	44	56	8	6	5	5	20	67	-	4	9	7
UK(E W&NI)	129	143	160	169	176	439	2 174	668	781	218	183	98	104	83	34	99	303	13	320	371		
UK (Scotland)	7 039	7 887	9 712	11 683	15 658	22 344	18 783	13 319	9 710	9 559	10 024	8 539	6 033	6 284	6 003	7 722	8 304	8 658	7 510	5730		
UK (total)																			7 830	6101	6353	4849
Total	9 235	10 209	12 309	14 505	17 891	25 176	23 425	16 860	13 344	12 338	12 861	11 048	8 523	8 987	8 424	10 338	10 632	11 038	10 096	6 979	7 760	6 176

* 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 estimated by ICES of anglerfish in Division IVb.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*
Belgium	357	538	558	713	579	287	336	371	270	449	579	435	180	260	207	138	179	181	134	124	111	129
Denmark	345	421	347	350	295	225	334	432	368	260	251	255	191	274	237	276	173	237	248	194	286	301
Faroes	-	-	2	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	0	
France	-	1	-	2	-	-	-	-	-	-	-	-	-	+	-	-	-	-	9	6	4	+
Germany	4	2	13	15	10	9	18	19	9	14	9	17	11	11	9	14	12	22	17	21	17	
Ireland													1	-	-	-	-	-	-	-		
Netherlands	285	356	467	510	335	159	237	223	141	141	123	62	42	25	31	33	61	58	36	46	53	59
Norway	17	4	3	11	15	29	6	13	17	9	15	10	12	22	16	14	24	15	21	10	11	14
Sweden				3	2	1	3	3	4	3	2	9	2	1	4	4	6	9	-	5	7	7
UK(E W&NI)	669	998	1 285	1 277	919	662	664	603	364	423	475	236	167	120	96	108	122	105	85	88		
UK (Scotland)	845	733	469	564	472	475	574	424	344	318	378	210	241	138	88	98	172	142	103	125		
UK (total)																			193	213	284	195
Total	2 522	3 053	3 144	3 445	2 627	1 847	2 172	2 088	1 517	1 617	1 832	1 244	847	851	688	685	749	769	653	619	773	705

* Preliminary.

Table 5.4.1.8 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 IVc.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*
Belgium	13	12	34	37	26	28	17	17	11	15	15	16	9	5	4	3	3	4	6	7	6	2
Denmark	2	+	-	+	+	+	+	+	+	+	+	+	+	+	+	-	-		-	-	0	0
Faroes																						
France	-	-	-	-	-	-	-	10	-	+	-	+	-	-	-	-	-	+	-	1	1	+
Germany	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-		
Ireland																						
Netherlands	5	10	14	20	15	17	11	15	10	15	6	5	1	-	1	-	1	1	-	2	1	1
Norway	-	-	-	-	+	-	-	-	+	-	+	-	-	-	-	-	-	-	1	-		
Sweden																						
UK(E&W&NI)	6	17	18	136	361	256	131	36	3	1	-	-	10	3	-	-	-	-	1	1		
UK (Scotland)	-	-	-	17	-	3	1	+	+	+	-	-	-	7	-	-	-	-	-	-		
UK (Total)																		+	1	1	1	+

Total	26	39	66	210	402	304	160	78	24	31	21	21	20	15	5	3	4	5	8	12	9	4
* Preliminary.																						
Table 5.4.1.9 Anglerfish (<i>Lophius piscatorius</i> and <i>L. budegassa</i>) 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 IV.																						
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012 *
Belgium	372	559	595	753	607	323	357	389	286	476	594	459	190	265	211	141	182	184.6	140	131	117	131
Denmark	1592	1686	1293	1507	1027	1464	1489	1456	1496	1347	1540	1563	1714	1812	1616	1587	1134	1308	1382	195	1127	1122
Estonia																						
Faroes	1	0	12	18	20	0	15	10	6	0	2	10	3	11	22	2	0	0	4	0	0	0
France	124	152	69	30	18	7	7	13	18	8	9	8	8	8	4	7	13	13	57	13	17	14
Germany	75	70	113	99	623	301	619	892	463	196	104	112	76	31	93	187	198	366	233	145	63	0
Ireland	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Netherlands	313	410	559	568	363	201	260	238	166	168	132	75	52	63	45	47	76	71	41	56	59	65
Norway	604	639	1227	1329	672	850	678	967	1236	1191	1227	938	781	1021	896	1019	855	875	881	745	505	494
Portugal																						
Russia																						
Spain																						
Sweden	14	7	7	10	4	2	5	11	12	81	46	65	10	7	9	9	26	76	0	9	16	14
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
UK (Scotland)	7884	8620	10181	12264	16130	22822	19358	13743	10054	9877	10402	8749	6274	6429	6091	7820	8476	8800	7613	5855	0	0
UK (Total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8024	6315	6638	5044
Total	11783	13301	15519	18160	20920	27327	25757	19026	14885	13986	14714	12313	9390	9853	9117	11026	11385	5	10757	7609	8542	6884
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
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
* 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).

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*
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	...	43	26	43
Total	595	938	843	811	823	702	776	626	660	602	621	667	478	519	458	423	433	486	479	477	432	466
Unallocated																						9
ICES landings																						475

*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.

ICES Subarea / Division	Abundance (millions)							
	2005	2006	2007	2008	2009	2010	2011	2012
Subarea IV (partial)	11.168	12.844	15.304	12.613	8.279	7.366	5.150	5.432
Division VIa	10.866	10.459	7.956	7.718	5.144	5.161	6.057	4.961
Division VIb	1.800	3.174	4.000	3.952	3.688	3.131	3.669	5.135
Subarea VI	12.666	13.633	11.956	11.670	8.832	8.292	9.725	10.096
Total stock	23.833	26.477	27.261	24.283	17.111	15.658	14.875	15.528

ICES Subarea / Division	Biomass (thousand tonnes)							
	2005	2006	2007	2008	2009	2010	2011	2012
Subarea IV (partial)	18.642	21.921	28.534	29.721	17.058	21.944	14.949	15.106
Division VIa	14.096	12.175	11.072	14.383	8.150	11.590	9.330	9.213
Division VIb	5.879	6.889	10.786	9.442	12.852	8.745	8.974	12.005
Subarea VI	19.975	19.064	21.858	23.825	21.002	20.334	18.305	21.218
Total stock	38.617	40.985	50.392	53.546	38.060	42.279	33.254	36.325

ECOREGION Celtic Sea and West of Scotland
STOCK Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Divisions VIIb–k and VIIIa,b,d

Advice for 2014

Based on ICES approach to data-limited stocks, ICES advises that landings should be no more than 37 450 tonnes. Discards are known to take place but cannot be quantified; therefore, total catches cannot be calculated.

Stock status

<i>Lophius piscatorius</i>	
F (Fishing Mortality)	
Qualitative evaluation	2010–2012 ? Insufficient information
SSB (Spawning-Stock Biomass)	
Qualitative evaluation	2008–2012 ↗ Increasing

<i>Lophius budegassa</i>	
F (Fishing Mortality)	
Qualitative evaluation	2010–2012 ? Insufficient information
SSB (Spawning-Stock Biomass)	
Qualitative evaluation	2008–2012 ↗ Increasing

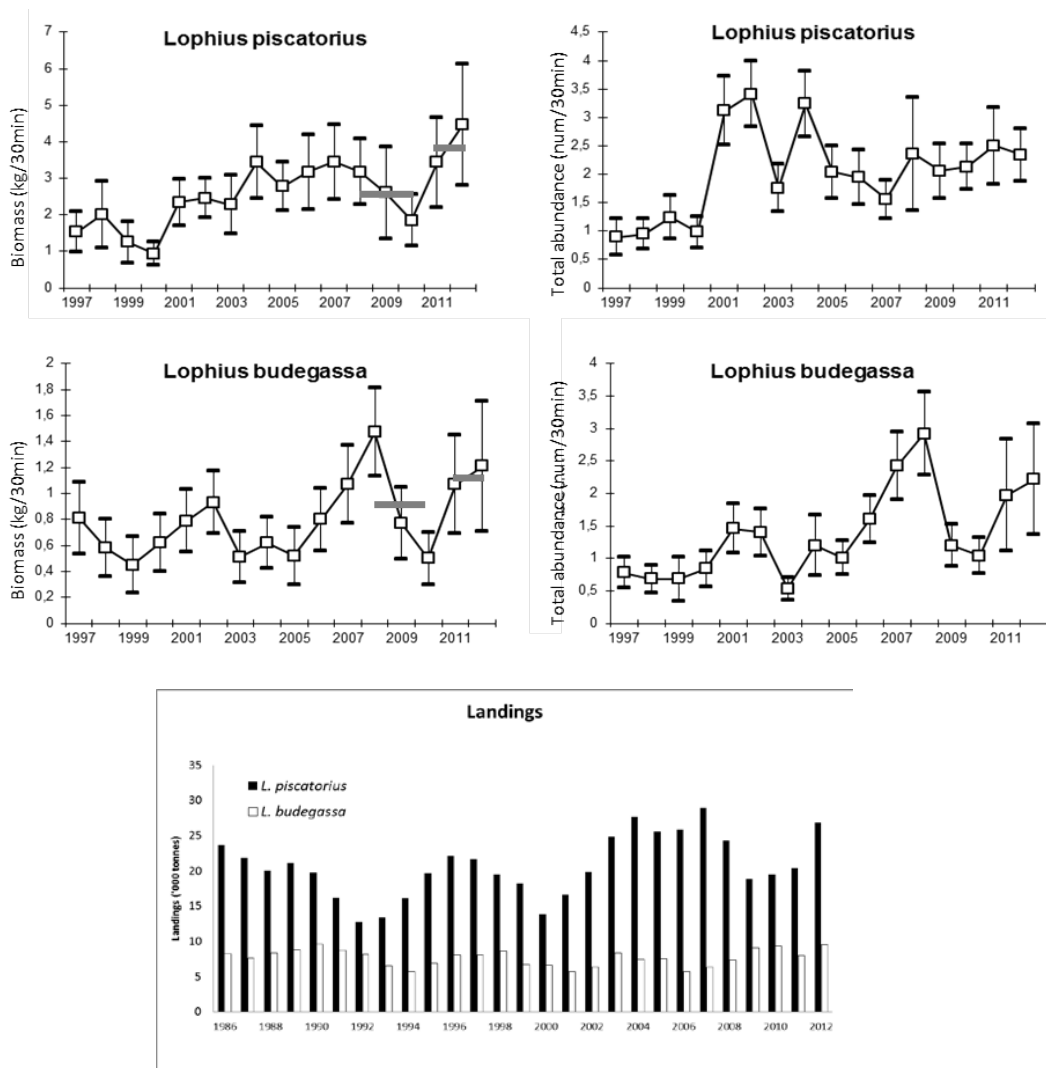


Figure 5.4.2.1 Anglerfish (*L. piscatorius* and *L. budegassa*) in Divisions VIIb–k and VIIIa,b,d. Bay of Biscay and Celtic Sea (EVHOE-WIBTS-Q4) indices: biomass (left panels, kg/30 min; horizontal lines correspond to the average of the

respective year range) and total abundance (right panels, number/30 min). Error bars indicate ± 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.

Management plans

No specific management objectives are known to ICES.

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.

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 (<i>L. piscatorius</i> , 26.9 kt: 76% otter trawl, 12% beam trawl, 11% gillnet, and 1% <i>Nephrops</i> trawl. <i>L. budegassa</i> , 9.5 kt: 91% otter trawl, 5% beam trawl, 3% <i>Nephrops</i> trawl, and 1% gillnet).
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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

Assessment type	Survey trends-based assessment.
Stock data category	Category 3.2.0.
Input data	Commercial landings; one survey index (EVHOE-WIBTS-Q4).
Discards and bycatch	Discards are known to occur, but they are not included in the assessment.
Indicators	Cpues from three surveys (FSP-Eng-Monk, SPPGFS-WIBTS-Q4, and IGFS-WIBTS-Q4) and lpues of five commercial fleets (EW-FU06, SP-VIGO7, SP-CORUTR7, SP-BAKON7, and SP-BAKON8).
Other information	These stocks were benchmarked in 2012 (WKFLAT; ICES, 2012).
Working group report	WGHMM (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK Anglerfish (*L. piscatorius* and *L. budegassa*) in Divisions VIIb–k and VIIa,b,d

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.

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.

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 26 691 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 10 757 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 37 448 t. Discards are known to take place but cannot be quantified; therefore, total catches cannot be calculated.

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 VIIa,b,d has declined progressively since the early 1990s (Figure 5.4.2.3).

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).

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).

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 VIIa,b,d,e. The advice applies to a smaller area (Divisions VIIb–k and VIIa,b,d) than the management area. However, the advice covers the majority of the area as recent landings in Division VIIa have been relatively small compared to the total TAC.

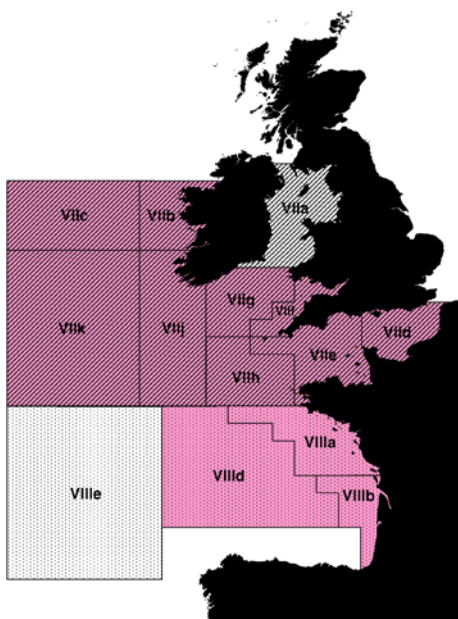


Figure 5.4.2.2 Anglerfish (*L. piscatorius* and *L. budegassa*). Assessment area Divisions VIIb–k and VIIIA,b,d (pink, shaded) and EU TAC areas VII (diagonal lines) and VIIIA,b,d,e (dotted).

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 Megrin (WGHMM), 10–16 May 2013, ICES Headquarters, Copenhagen. ICES CM 2013/ACOM:11.

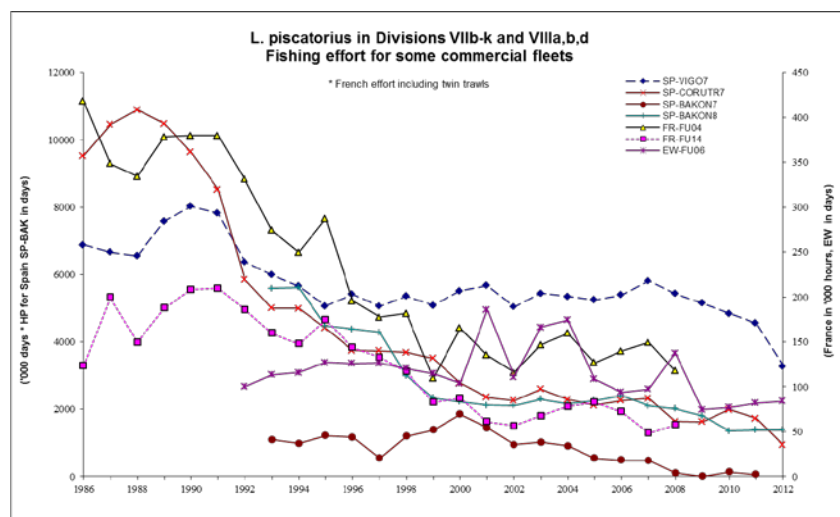


Figure 5.4.2.3

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.

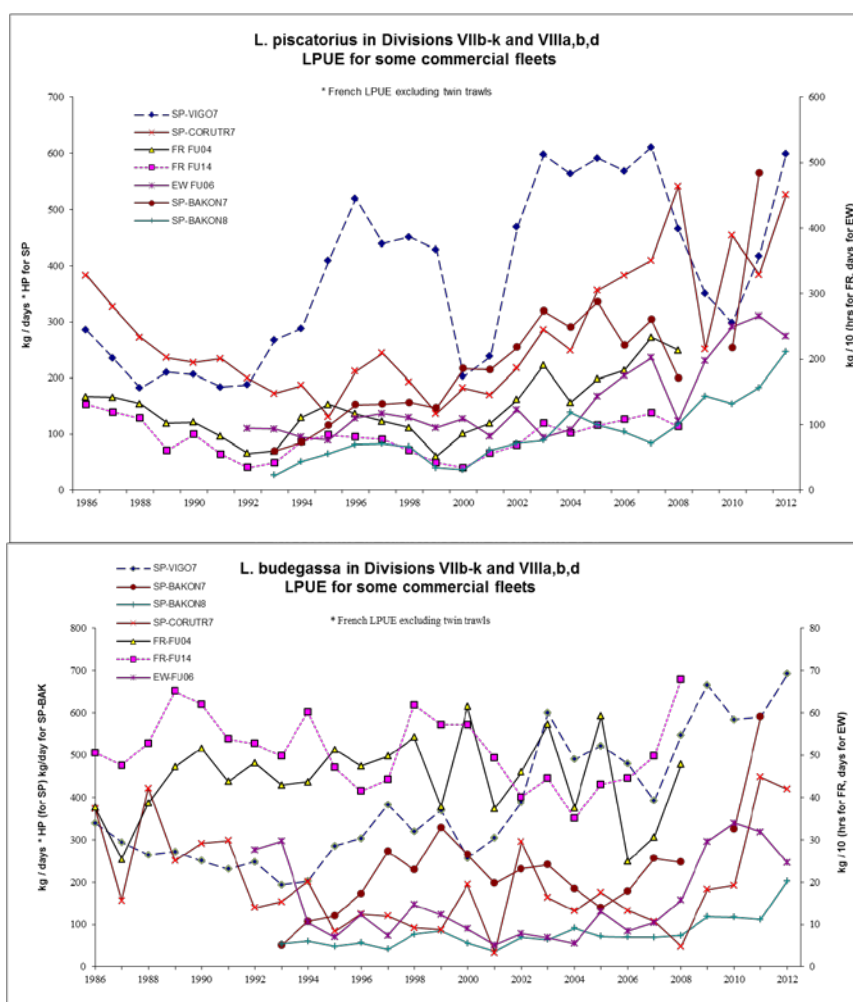


Figure 5.4.2.4

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.

Year	ICES Advice	Predicted catch corresp. advice	Agreed to TAC ¹⁾²⁾	ICES landings ¹⁾	Landings <i>L. piscatorius</i>	Landings <i>L. budegassa</i>
1987	Not assessed	-	39.08	29.5	21.9	7.6
1988	Not assessed	-	42.99	28.5	20.1	8.4
1989	Not assessed	-	42.99	30	21.1	8.8
1990	Not assessed	-	42.99	29.4	19.8	9.6
1991	No advice	-	42.99	24.9	16.2	8.8
1992	No advice	-	42.99	20.9	12.8	8.2
1993	Concern about <i>L. pisc.</i> SSB decrease	-	25.1	20.0	13.5	6.6
1994	SSB decreasing, still inside safe biological limits	-	23.9	21.9	16.1	5.7
1995	No increase in F	20.0	23.2	26.7	19.7	7.0
1996	No increase in F	30.3	30.4	20.3	22.2	8.1
1997	No increase in F	34.3	34.3	29.8	21.7	8.1
1998	No increase in F	33.0	34.3	28.2	19.6	8.6
1999	No increase in F	32.9	34.3	25.0	18.2	6.7
2000	At least 20% decrease in F	< 22.3	29.6	20.6	13.9	6.6
2001	Reduce F below F _{pa}	< 27.6	27.6	22.4	16.7	5.7
2002	Reduce F below F _{pa}	< 19.9	23.7	26.2	19.8	6.4
2003	At least 30% decrease in F	< 16.4	21.0	33.2	24.9	8.4
2004	At least 10% decrease in F	< 26.7	26.7	35.2	27.7	7.4
2005	Maintain F below F _{pa}	< 37.8	31.2	33.1	25.5	7.5
2006	Maintain F below F _{pa}	< 33.9	34.0	31.6	25.9	5.7
2007	Maintain F below F _{pa}	< 36.0	36.0	35.3	29.0	6.4
2008	Less than average landings	< 33.0	36.0	31.8	24.4	7.4
2009	Same advice as last year	< 33.0	36.0	27.9	18.8	9.1
2010	No increase in effort	-	41.4	28.9	19.5	9.4
2011	No increase in effort	-	40.9	28.4 ³	20.4 ³	8.0 ³
2012	Reduce catch	-	38.9	36.4	26.8	9.5
2013 ⁴	Reduce catch by the rate of biomass decrease (14% for <i>L. piscatorius</i> and 20% for <i>L. budegassa</i>)	< 24.8	37.0			
2014	Increase landings by the rate of biomass increase (20% for <i>L. piscatorius</i> and 20% for <i>L. budegassa</i>)	< 37.5				

Weights in thousand tonnes.

TAC was changed during 2003 from 19 400 t to 21 000 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.

Year	VIIb.c.e-k						VIIIa.b.d				TOTAL VII +VIII
	Medium/Deep		Shallow	Shallow/medium			Shallow		Medium/Deep	Unallocated	
	Gill-Net (Unit 3+13)	Trawl (Unit 4)	Trawl (Unit 5)	Beam Trawl (Unit 6)	Neph.Trawl (Unit 8)	Unallocated	Neph.Trawl (Unit 9)	Trawl (Unit 10)	Trawl (Unit 14)		
1986	429	13 781	2 877	1 437	1 021	0	746	720	2 657	0	23 666
1987	560	11 414	2 900	1 520	787	0	1 035	542	3 152	0	21 909
1988	643	9 812	3 105	1 814	774	0	927	534	2 487	0	20 095
1989	781	8 448	5 259	2 998	754	0	673	444	1 772	0	21 130
1990	1 021	8 787	3 950	1 736	880	0	410	391	2 578	0	19 753
1991	1 752	7 563	2 793	1 142	752	0	284	218	1 657	0	16 160
1992	1 773	6 254	1 492	998	887	0	254	166	942	0	12 766
1993	1 742	5 776	2 125	1 258	969	0	360	278	950	0	13 458
1994	1 377	7 344	2 595	1 523	1 236	0	261	198	1 586	0	16 120
1995	1 915	8 461	3 195	1 805	1 242	0	501	429	1 954	228	19 730
1996	2 244	9 796	2 658	2 189	1 149	138	441	379	2 229	938	22 162
1997	2 538	9 225	2 945	2 031	964	39	429	376	2 045	1 068	21 660
1998	3 398	8 714	2 138	1 722	812	3	397	149	1 699	542	19 572
1999	3 162	9 037	2 369	1 409	780	19	98	116	1 259	0	18 250
2000	2 034	7 067	1 642	1 434	726	6	91	77	863	0	13 941
2001	2 002	7 880	2 293	1 978	886	17	146	76	1 402	0	16 681
2002	2 719	9 465	2 609	1 836	924	22	247	96	1 908	0	19 826
2003	3 498	12 332	2 786	1 983	974	81	470	168	2 575	0	24 865
2004	5 004	12 770	2 642	2 460	852	14	457	218	3 296	0	27 714
2005	5 154	11 556	2 400	2 388	594	7	342	165	2 936	2	25 543
2006	3 741	13 409	2 216	2 421	700	3	429	218	2 758	2	25 898
2007	4 594	14 949	2 382	2 836	660	11	286	244	3 015	0	28 977
2008	5 107	11 766	1 885	1 990	491	10	227	325	2 573	1	24 376
2009	3 957	9 938	358	1 880	48	16	221	0	2 153	275	18 844
2010	3 398	9 851	539	2 503	21	31	301	0	2 373	504	19 521
2011*	2 152	8 968	548	3 019	12	1 658	231	0	2 285	1 497	20 370
2012**	2 905	12 821	513	3 231	14	1 260	195	0	3 731	2 168	26 837

* revised

** preliminar

Table 5.4.2.3

Anglerfish (*L. budegassa*) in Divisions VIIb–k and VIIIa,b,d. Landings in tonnes by fishery unit.

	VIIb.c.e-k						VIIIa.b.d				TOTAL VII +VIII
Year	Medium/Deep		Shallow	Shallow/medium			Neph.Trawl (Unit 9)	Shallow	Medium/Deep	Unallocated	
	Gill-Net (Unit 3+13)	Trawl (Unit 4)	Trawl (Unit 5)	Beam Trawl (Unit 6)	Neph.Trawl (Unit 8)	Trawl (Unit 10)		Trawl (Unit 14)			
1986	23	5 126	348	540	406	0	443	150	1 181	0	8 217
1987	30	3 493	696	462	434	0	483	116	1 904	0	7 619
1988	34	4 072	1 095	751	394	0	435	102	1 498	0	8 382
1989	40	4 398	976	505	515	0	446	112	1 829	0	8 820
1990	53	4 818	631	905	653	0	550	156	1 865	0	9 632
1991	0	4 416	934	397	507	0	475	117	1 933	0	8 780
1992	0	4 808	301	305	594	0	459	191	1 518	0	8 176
1993	0	3 415	429	405	399	0	433	101	1 385	0	6 566
1994	0	2 935	265	209	540	0	232	49	1 515	0	5 744
1995	10	3 963	455	159	617	0	312	62	1 286	90	6 953
1996	118	4 587	477	245	524	28	374	109	1 239	392	8 092
1997	134	4 836	602	132	474	9	313	17	1 128	471	8 114
1998	179	5 565	246	230	288	1	258	72	1 454	305	8 599
1999	18	4 311	119	282	338	0	144	76	1 450	0	6 739
2000	57	4 489	161	284	228	0	124	31	1 270	0	6 645
2001	41	3 758	107	266	306	0	121	29	1 100	0	5 728
2002	30	4 272	147	251	372	0	112	14	1 195	0	6 394
2003	92	5 748	337	342	376	5	195	26	1 248	0	8 368
2004	122	4 684	242	343	376	0	254	9	1 407	0	7 436
2005	73	4 837	162	409	329	0	235	56	1 431	0	7 532
2006	9	3 661	145	271	218	0	286	1	1 128	1	5 720
2007	92	3 874	168	306	250	0	243	0	1 424	0	6 357
2008	21	4 620	187	392	254	0	235	0	1 669	0	7 379
2009	72	5 963	24	441	36	0	354	0	2 047	145	9 082
2010	224	6 137	9	597	27	0	379	0	1 763	223	9 359
2011*	172	3 562	11	591	16	1 747	378	0	1 413	96	7 988
2012**	110	4 896	6	483	6	1 135	275	0	2 250	384	9 546

* revised

** preliminar

Table 5.4.2.4 Anglerfish (*L. piscatorius*) in Divisions VIIb–k and VIIa,b,d. Bay of Biscay and Celtic Sea (EVHOE-WIBTS-Q4) indices: biomass (kg/30 min) and total abundance (number/30 min).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
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	4.47
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	2.34

Table 5.4.2.5 Anglerfish (*L. budegassa*) in Divisions VIIb–k and VIIa,b,d. Bay of Biscay and Celtic Sea (EVHOE-WIBTS-Q4) indices: biomass (kg/30 min) and total abundance (number/30 min).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
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	1.21
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	2.22

ECOREGION Celtic Sea and West of Scotland

STOCK Cod in Division VIa (West of Scotland)

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.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✗	✗	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	✗	✗	✗ Harvest unsustainable

SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	✗	✗	✗ Below trigger
Precautionary approach (B_{pa}, B_{lim})	✗	✗	✗ Reduced reproductive capacity

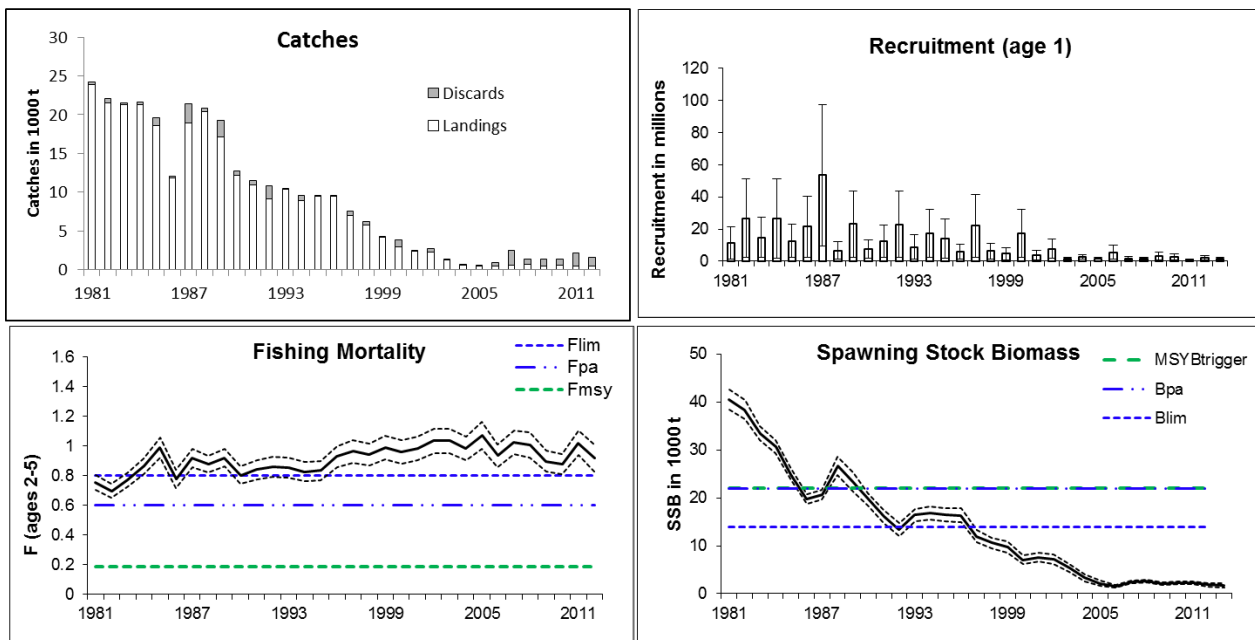
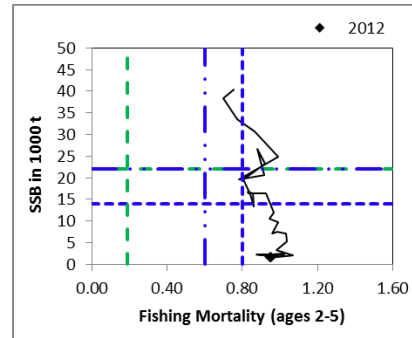


Figure 5.4.3.1 Cod in Division VIa (West of Scotland). ICES observed catches and summary of stock assessment (weights in thousand tonnes), dotted black lines are standard error for assessment estimates. Top right: SSB/F for the time-series used in the assessment.

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

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.

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.

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.

The fisheries

The >100 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 t, where 29% are reported landings adjusted for misreporting and 71% are discards.

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.

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-Q1 and 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.

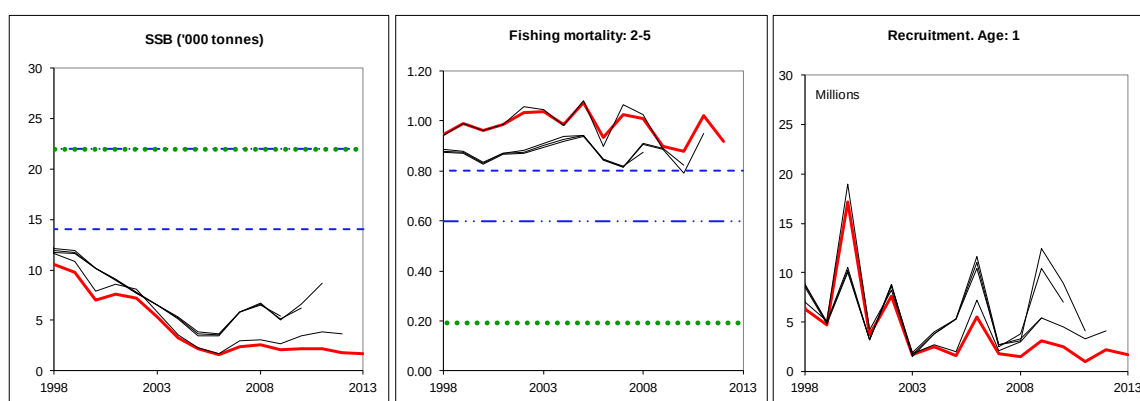


Figure 5.4.3.2 Cod in Division VIa (West of Scotland). Historical assessment results (final-year recruitment estimates included). This stock was benchmarked in 2012.

Scientific basis

Assessment type	Analytical age-based assessment (TSA).
Stock data category	Category 1.
Input data	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.
Discards and bycatch	Included in the assessment 1981–1990 and 2006 onwards, age structure only from 1991 to 2005, from (Scottish trawlers, Irish trawlers).
Indicators	Surveys: ScoGFS-WIBTS-Q4, IGFS-WIBTS-Q4, UKSGFS-WIBTS-Q1, and UKSGFS-WIBTS-Q4.

Other information	The stock was benchmarked in 2012 (WKROUND 2012; ICES, 2012).
Working group report	WGCSE (ICES, 2013).

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

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY $B_{trigger}$	22 000 t.	B_{pa} .
	F_{MSY}	0.19	Provisional proxy by analogy with North Sea cod F_{max} . Fishing mortalities in the range of 0.17–0.33 are consistent with F_{MSY} .
Precautionary Approach	B_{lim}	14 000 t.	$B_{lim} = B_{loss}$, the lowest observed spawning stock estimated in previous assessments.
	B_{pa}	22 000 t.	Considered to be the minimum SSB required to ensure a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of assessments. This also corresponds with the lowest range of SSB during the earlier, more productive historical period.
	F_{lim}	0.8	Fishing mortalities above this have historically led to stock decline.
	F_{pa}	0.6	This F is considered to have a high probability of avoiding F_{lim} .

(unchanged since: 2010)

Outlook for 2014

Basis: $F(2013) = F_{sq}(2010-2012) = 0.92$; $SSB(2014) = 1.68$; Recruitment (2013) = 1.74 millions; Landings (2013) = 0.42; Discards (2013) = 0.77.

Rationale	Catch Total (2014)	Landings (2014)	Discards (2014)	Basis	F Total (2014)	F Land (2014)	F Disc (2014)	SSB (2015)	%SSB change ¹⁾
MSY transition	0.33	0.11	0.22	$(F_{2010} \times 0.2) + ((F_{MSY} \times (SSB_{2014}/MSY B_{trigger})) \times 0.8)$	0.19	0.06	0.13	3.01	+79%
MSY approach	0.010	0.003	0.007	$F_{MSY} \times SSB_{2014}/MSY B_{trigger}$	0.01	0.003	0.007	3.44	+105%
Precautionary approach	0	0	0	B_{pa}	0	0	0	3.46	+106%
Management plan	0.98	0.31	0.67	$F = F_{2013} \times 0.75$	0.69	0.22	0.47	2.12	+26%
Zero catch	0	0	0	$F = 0$	0	0	0	3.46	+106%
Other options	0.32	0.10	0.22	$F_{2013} \times 0.2$	0.18	0.06	0.12	3.02	+80%
	0.59	0.19	0.40	$F_{2013} \times 0.4$	0.37	0.12	0.25	2.65	+58%
	0.83	0.26	0.57	$F_{2013} \times 0.6$	0.55	0.17	0.38	2.33	+39%
	1.03	0.32	0.71	$F_{2013} \times 0.8$	0.74	0.23	0.51	2.06	+23%
	1.20	0.37	0.83	$F_{2013} \times 1.0$	0.92	0.28	0.64	1.82	+8.3%
	1.35	0.41	0.94	$F_{2013} \times 1.2$	1.10	0.33	0.77	1.62	-3.6%

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.

MSY approach

Following the ICES MSY approach implies fishing mortality to be reduced to 0.01 (lower than the F_{MSY} proxy because SSB in 2014 is 92% below MSY $B_{trigger}$), 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 $(F_{2010} \times 0.2) + ((F_{MSY} \times (SSB_{2014}/MSY B_{trigger})) \times 0.8)$, 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 non-zero 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.

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.

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 $F_{2014} = 0.75 \times F_{2013}$. 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.

Additional considerations

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_{pa} 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.

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 $F = 0.4$ as a target for this stock. Based on the yield-per-recruit analysis, which estimates $F_{\max} = 0.17$ and the positive relationship of SSB and recruitment, the long-term target fishing mortality of 0.4 is not expected to achieve the management objective of maximum sustainable yield.

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.

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.

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.

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.

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.
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- Thomas, L. 2011. Estimating the size of the UK grey seal population between 1984 and 2010. SCOS Briefing Paper 11/02.

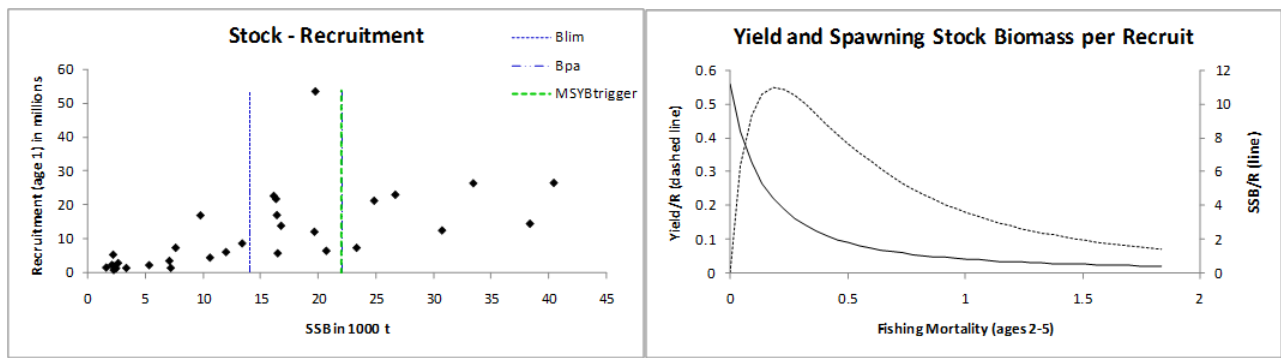


Figure 5.4.3.3 Cod in Division VIa. Stock–recruitment relationship (left panel) and yield-per-recruit analysis (right panel).

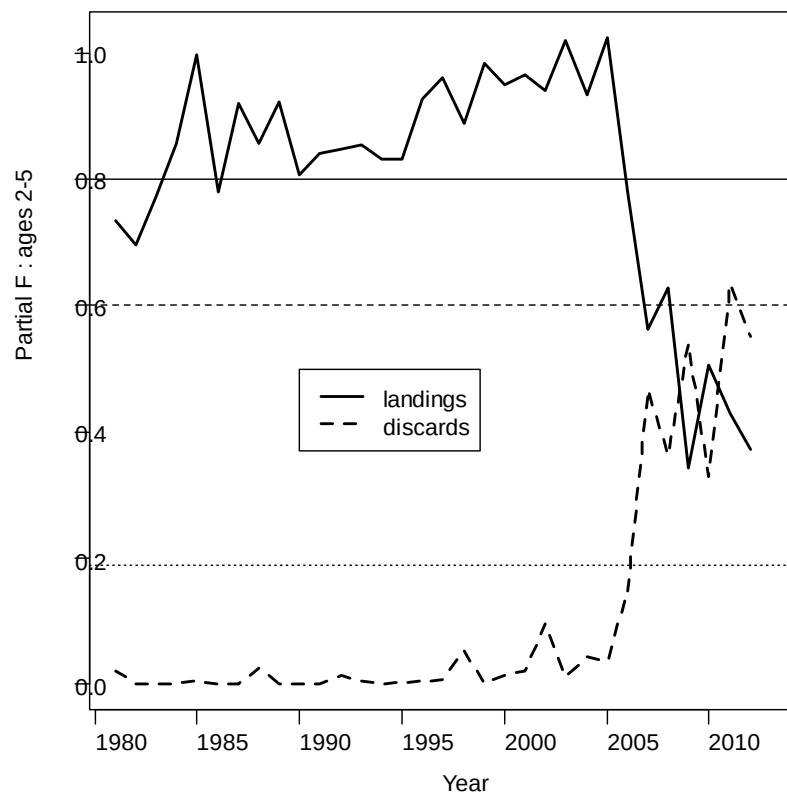


Figure 5.4.3.4 Cod in Division VIa. Partial mean F attributed to landings and discards. Horizontal lines represent F_{lim} (solid), F_{pa} (dashed), and F_{MSY} (dotted) reference points defined for the stock.

Table 5.4.3.1

Cod in Division VIa (West of Scotland). ICES advice, management, landings, discards, and catches.

Year	ICES advice Single-stock exploitation boundaries since 2004	Predicted catch corresp. to advice	Agreed TAC ¹	Agreed TAC ²	Official landings	ICES landings	ICES discards	ICES catch
1987	Reduce F towards F_{max}	18.0	22.0		19.2	19.0	2.39	21.39
1988	No increase in F; TAC	16.0	18.4		19.2	20.4	0.37	20.77
1989	80% of F(87); TAC	16.0	18.4		15.4	17.2	2.08	19.28
1990	80% of F(88); TAC	15.0	16.0		11.8	12.2	0.57	12.77
1991	70% of effort (89)	-	16.0		10.6	10.9 ³	0.62	11.52
1992	70% of effort (89)	-	13.5		9.0	9.7 ⁴	1.78	11.48
1993	70% of effort (89)	-	14.0		10.5	11.8 ⁴	0.14	11.94
1994	30% reduction in effort	-	13.0		9.1	10.8 ⁴	0.66	11.46
1995	Significant reduction in effort	-	13.0		9.7	9.6 ⁴	0.14	9.74
1996	Significant reduction in effort	-	13.0		9.6	9.4	0.06	9.46
1997	Significant reduction in effort	-	14.0		7.0	7.0	0.50	7.5
1998	20% reduction in F	9.5 ⁶	11.0		5.7	5.7	0.54	6.24
1999	F reduced to below F_{pa}	< 9.7 ⁶	11.8		4.3	4.2	0.07	4.27
2000	Recovery plan, 60% reduction in F	< 4.2	7.48		2.8 ⁵	3.0	0.82	3.82
2001	Lowest possible F, recovery plan	-	3.7		2.4	2.3	0.09	2.39
2002	Recovery plan or lowest possible F	-	4.6		2.2	2.2	0.48	2.68
2003	Closure	-	1.81		1.3	1.2	0.03	1.23
2004	Zero catch ⁷	0	0.85		0.6	0.5	0.07	0.57
2005	Zero catch ⁷	0	0.72		0.4	0.5	0.04	0.54
2006	Zero catch ⁷	0	0.613		0.5	0.49 ⁹	0.47	0.96
2007	Zero catch ⁷	0	0.49		0.5	0.60 ⁹	1.88	2.48
2008	Zero catch ⁷	0	0.402		0.4	0.68 ⁹	0.70	1.38
2009	Zero catch ⁷	0	0.302	0.240	0.23	0.41 ⁹	0.95	1.36
2010	Zero catch ⁷	0		0.240	0.25	0.56 ⁹	0.79	1.35
2011	Zero catch ⁷	0		0.182	0.22	0.45 ⁹	1.67	2.12
2012	Zero catch ⁷	0		0 ⁸	0.22	0.47 ⁹	1.17	1.64
2013	No directed fisheries, minimize by-catch and discards	0		0 ⁸				
2014	No directed fisheries, minimize by-catch and discards	0						

Weights in thousand tonnes.

¹ TAC is for the whole of Subdivision Vb₁ and Subareas VI, XII, and XIV.² TAC is for Subdivision Vb₁ and Division VIa.³ Not including misreporting.⁴ Including ICES estimates of misreporting.⁵ Incomplete data.⁶ For Division VIa only.⁷ Single-stock boundaries and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.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.⁹ Includes an adjustment for misreporting.

Table 5.4.3.2 Cod in Division VIa. Official landings (tonnes).

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Belgium	48	88	33	44	28	-	6	-	22	1	2	+	11	1	+	+	2	+
Denmark	-	-	4	1	3	2	2	3	2	+	4	2	-	-	+	-	-	-
Faroe Islands	-	-	-	11	26	-	-	-	-	-	-	-	-	-	-	-	-	-
France	7 411	5 096	5 044	7 669	3 640	2 220	2 503	1 957	3 047	2 488	2 533	2 253	956	714*	842*	236	391	208
Germany	66	53	12	25	281	586	60	5	94	100	18	63	5	6	8	6	4	+
Ireland	2 564	1 704	2 442	2 551	1 642	1 200	761	761	645	825	1 054	1 286	708	478	223	357	319	210
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-
Norway	204	174	77	186	207	150	40	171	72	51	61	137	36	36	79	114*	40*	88
Spain	28	-	-	-	85	-	-	-	-	-	16	+	6	42	45	14	3	11
UK (E. W. N.I.)	260	160	444	230	278	230	511	577	524	419	450	457	779	474	381	280	138	195
UK (Scotland)	8 032	4 251	11 143	8 465	9 236	7 389	6 751	5 543	6 069	5 247	5 522	5 382	4 489	3 919	2 711	2 057	1 544	1 519
UK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total landings	18 613	11 526	19 199	19 182	15 426	11 777	10 634	9 017	10 475	9 131	9 660	9 580	6 992	5 671	4 289	2 767	2 439	2 231

Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*
Belgium	-	-	-	-	-	-	-	0	0	0
Denmark	-	-	-	-	-	-	-	-	-	-
Faroe Islands	-	2	0	0.8	12	1		0.2	0	-
France	172	91	107	100.7	92	82	74	60.3	46	4.21
Germany	+			2	2	1	0	0	0	0.04
Ireland	120	34	27.9	18	70	58.2	24.4	48.7	41.3	17.8
Netherlands	-	-	-	-	-	-	0		0	0
Norway	45	10	17	30	30	65	18	20.7	8.3	56.2
Spain	3	-	-	-	-	-	-	-	-	-
UK (E. W. N.I.)	79	46	25	-	21	6	14	-	-	-
UK (Scotland)	879	413	243	-	260	232	-	-	-	-
UK	-	-	-	332.1	-	-	104	118.6	110	137.2
Total landings	1 298	596	419.9	483.6	487	445.2	234.4	248.5	205.6	215.5

* Preliminary.

Table 5.4.3.3 Cod in Division VIa (West of Scotland). Summary of stock assessment (weights in thousand tonnes).

Year	Catch	Catch estimate	Catch s.e.	Landings	Landings estimate	Landings s.e.	Discards	Discards estimate	Discard s.e.	meanF estimate	meanF s.e.	SSB estimate	SSB s.e.	TSB estimate	TSB s.e.	Recruit estimate	Recruit s.e.
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
1998	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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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

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 kg hr⁻¹ while cpue rates estimated from observer trips outside the closure gathered in the same period were 0.015 kg 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.

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).

Effort limitations

- Between 2003 and 2011 STECF (2012) reported that the fishing effort (in kW-days) of trawlers using >100 mm mesh declined by 59%. These vessels primarily targeted roundfish, including cod. Over the same period effort for trawlers using 70–99 mm mesh declined by 16%. These vessels primarily target *Nephrops* and in 2011 22% 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).

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.

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 lpu in the area. Estimates of continuing high discard rates in Division VIa indicate the scheme has not been effective west of Scotland.

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:

Article 7

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

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

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.*

ECOREGION Celtic Sea and West of Scotland
STOCK Cod in Division VIb (Rockall)

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.

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

Assessment type	No assessment.
Stock data category	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).

Outlook for 2015

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.

Additional considerations

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.

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.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings
2001	No advice	-	3700 ^{a)}	334
2002	No advice	-	4600 ^{a)}	115
2003	No advice	-	1808 ^{a)}	102
2004	No advice	-	848 ^{a)}	75
2005	No advice	-	721 ^{a)}	62
2006	No advice	-	613 ^{a)}	58
2007	No advice	-	490 ^{a)}	62
2008	No advice	-	402 ^{a)}	96
2009	No advice	-	302 ^{a)}	97
2010	No advice	-	80 ^{b)}	61
2011	No advice	-	78 ^{b)}	97
2012	No increase in catch	-	78 ^{b)}	32
2013	Reduce catch by 20%	< 70	74 ^{b)}	
2014	Same advice as for 2013	< 70		
2015	Same advice as for 2013	< 70		

Weights in tonnes.

^{a)} Subarea VI; EC waters of Division Vb; EC and international waters of Subareas XII and XIV.^{b)} Division VIb; EU and international waters of Division Vb west of 12°00'W and of Subareas XII and XIV.

ECOREGION Celtic Sea and West of Scotland
STOCK 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 time-series. 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 <i>et al.</i> (2004); fixed natural mortality.
Discards and bycatch	Discards were not included in the assessment but are being monitored.
Other information	This stock was benchmarked in 2012 (WKROUND).
Working group report	WGCSE (ICES, 2013).

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	ICES landings
1987	No increase in F; interaction with <i>Nephrops</i>	10.3	15.0	13.2	12.9
1988	No increase in F; interaction with <i>Nephrops</i>	10.1	15.0	15.8	14.2
1989	No increase in F	13.4	15.0	11.3 ¹	12.8
1990	F at F _{med} ; TAC	15.3	15.3	9.9 ¹	7.4
1991	Stop SSB decline; TAC	6.0	10.0	7.0 ¹	7.1 ²
1992	20% of F(90) ~ 10 000 t	10.0	10.0	7.4	7.7 ²
1993	F _{med} ~ 10 200 t	10.2	11.0	5.9	7.6 ²
1994	60% reduction in F	3.7	6.2	4.5	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 F _{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.

¹Preliminary.

²Includes sample-based estimates of landings into three ports.

³As reported to the working group.

ECOREGION Celtic Sea and West of Scotland
STOCK Cod in Divisions VIIe–k (Celtic Sea cod)

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.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✗	✓	✗ At target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined
SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	✓	✓	✓ Full reproductive capacity

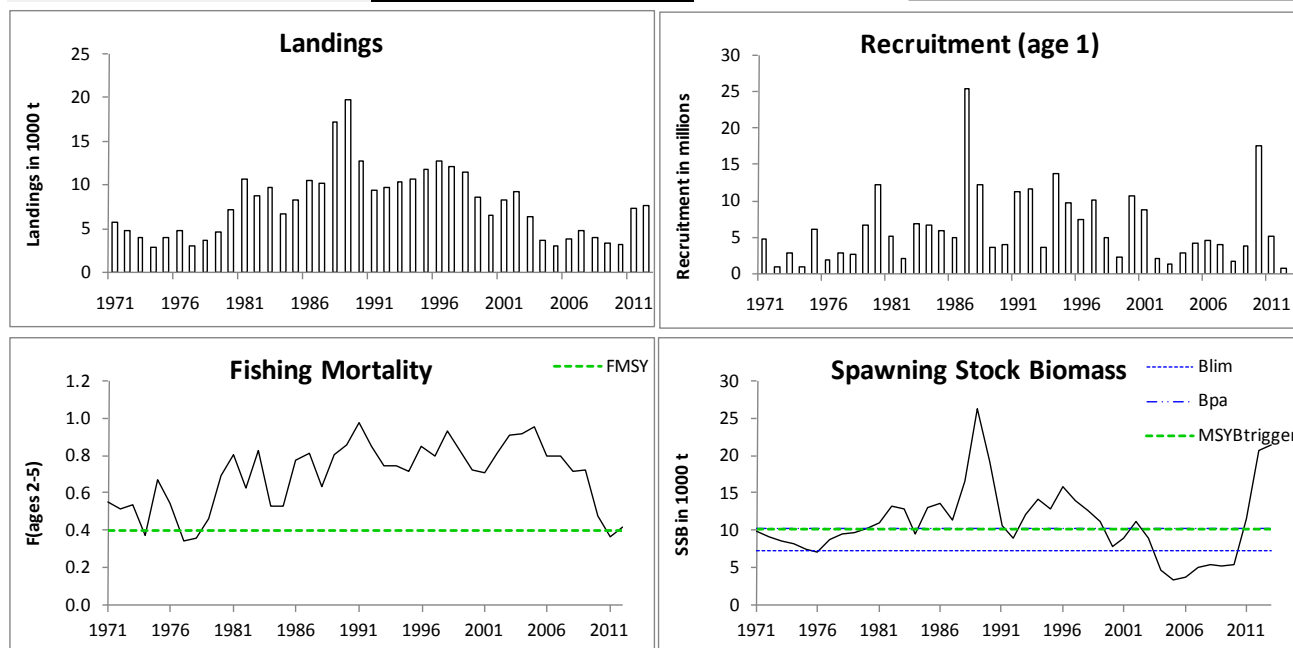
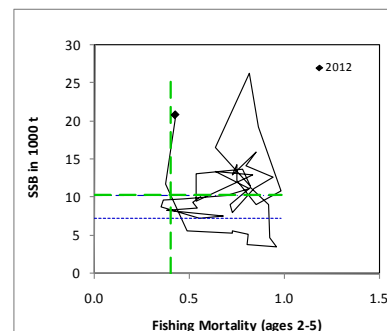


Figure 5.4.6.1 Cod in Divisions VIIe–k (Celtic Sea cod). Summary of stock assessment (weights in thousand tonnes). Predicted values are shaded. Top right: SSB/F for the time-series used in the assessment.

SSB has increased from below B_{lim} to well above MSY $B_{trigger}$ 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 F_{MSY} proxy.

Management plans

There are no specific management objectives or a management plan for this stock, but a plan is under development by the NWWAC and STECF.

Biology

Celtic Sea cod has higher growth rates and matures earlier than other cod stocks.

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.

The fisheries

- 1.
2. 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 Trevoise Head closure applied since 2005 has resulted in landings being spread throughout the year.
- 3.
4. 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.
- 5.

Catch distribution Total catch (2012) = 8644 t, where 7692 t (89%) were landings (71% otter trawl, 7% beam trawl, 8% gillnets, and 14% other gears) and 952 t (11%) discards.

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.

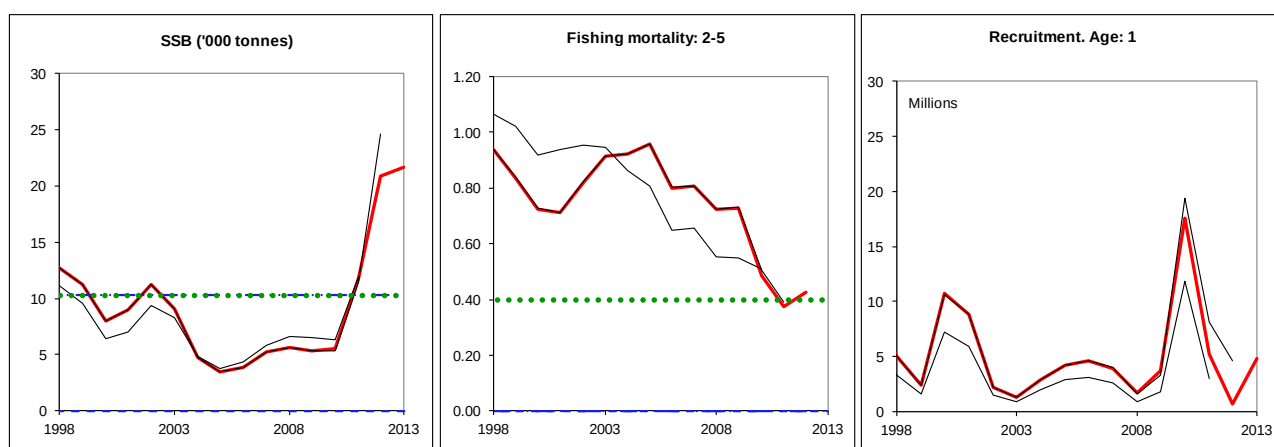


Figure 5.4.6.2 Cod in Divisions VIIe–k (Celtic Sea cod). Historical assessment results with final-year recruitment estimates included.

Scientific basis

Assessment type	Age-based analytical assessment (XSA).
Stock data category	Category 1.
Input data	Commercial catches (international landings, ages and length frequencies from catch sampling by metier); one combined survey index (EVHOE-WIBTS-Q4; IGFS-WIBTS-Q4); 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, <i>Nephrops</i> trawlers, otter trawlers, beam trawlers, and gillnetters).
Indicators	None.
Other information	Benchmarked at WKROUND 2012 (ICES, 2012).
Working group report	WGCSE (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK Cod in Divisions VIIe–k (Celtic Sea cod)

Reference points

	Type	Value	Technical basis
MSY Approach	MSY B_{trigger}	10 300 t.	Provisionally set at B_{pa} .
	F_{MSY}	0.40	Provisional proxy based on F_{max} (ICES, 2011).
Precautionary Approach	B_{lim}	7 300 t.	$B_{\text{lim}} = B_{\text{loss}}$ (B76), the lowest observed spawning-stock biomass.
	B_{pa}	10 300 t.	$B_{\text{pa}} = B_{\text{lim}} \times 1.4$. Biomass above this value affords a high probability of maintaining SSB above B_{lim} , taking into account the variability in the stock dynamics and the uncertainty in assessments.
Approach	F_{lim}	Undefined.	
	F_{pa}	Undefined.	

(Unchanged since: 2011).

Outlook for 2014

Basis: $F_{2013} = F_{\text{sq}} = (\text{mean } F_{2010} - F_{2012}) = 0.43$; $R_{2013} = \text{GM (1971–2010)} = 4830$ (thousands); landings (2013) = 8398 t; SSB (2014) = 17 206 t.

Rationale	Landings (2014)	Basis	F (2014)	SSB (2015)	%SSB change ¹⁾	% TAC change ²⁾
MSY approach	6 848	F_{MSY}	0.40	15 290	–11%	–33%
Zero catch	0	$F = 0$	0	22 782	+32%	–100%
Other options	7 211	F_{2013}	0.43	14 899	–13%	–29%
	8 670	TAC–15% ($F_{2013} \times 0.80$)	0.54	13 333	–23%	–15%
	10 200	Stable TAC	0.67	11 706	–32%	0%
	11 726	TAC+15% ($F_{2013} \times 1.15$)	0.82	10 102	–41%	+15%

Weights in tonnes.

¹⁾ SSB 2015 relative to SSB 2014.

²⁾ Landings 2014 relative to TAC 2013.

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 15 290 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 F_{MSY} proxy.

Precautionary approach

This stock is currently exploited around the F_{MSY} proxy and SSB is above B_{pa} and MSY B_{trigger} .

There is no F_{pa} reference point for application of the precautionary approach.

Additional considerations

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° 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.

- 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.

- 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.

Data and methods

Discards information (tonnage, ages, and length frequencies by country and main métier) 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.

- *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.

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.

Sources

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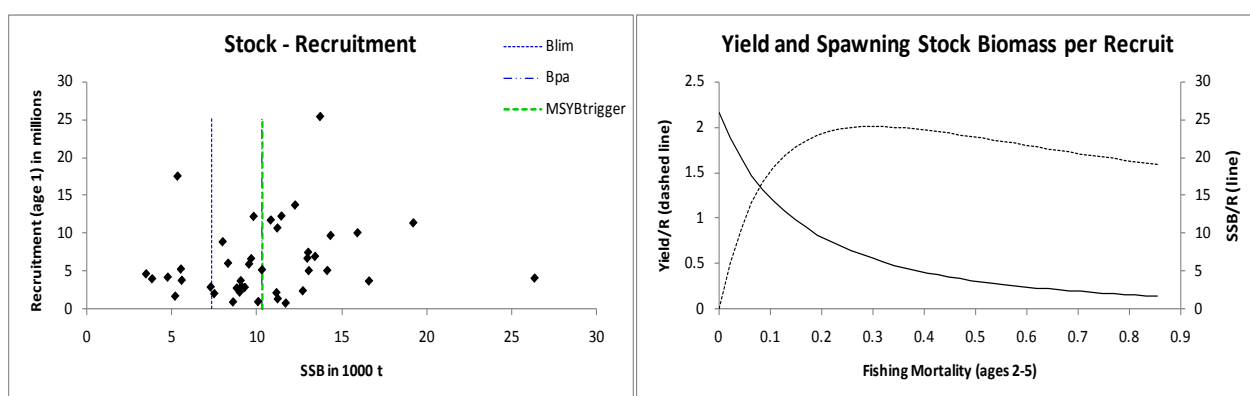


Figure 5.4.6.3 Cod in Divisions VIIe–k (Celtic Sea cod). Stock–recruitment plot (left) and yield-per-recruit analysis (right).

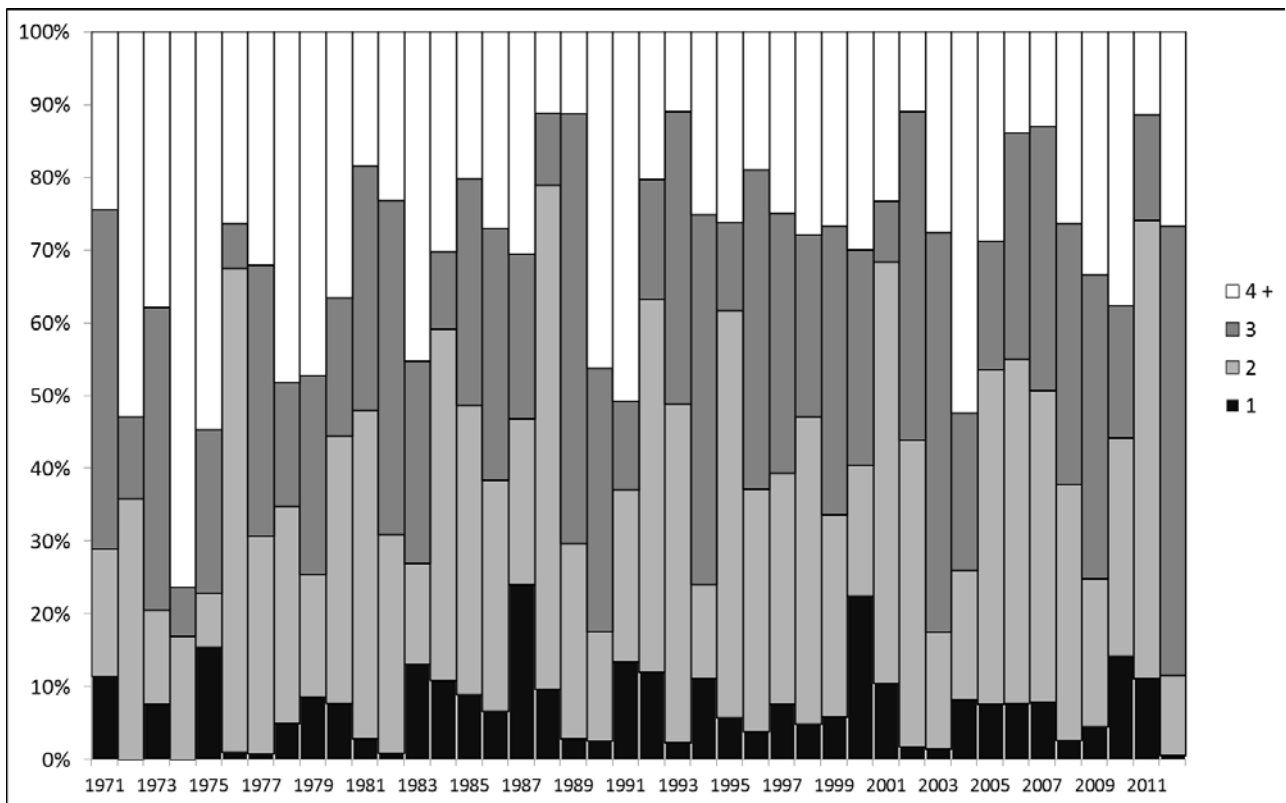


Figure 5.4.6.4 Cod in Divisions VIIe-k (Celtic Sea cod). Landings age composition in numbers.

Table 5.4.6.1

Cod in Divisions VIIe–k (Celtic Sea cod). ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	ICES landings	ICES landings and highgrading estimates
1987	Reduce F	< 6.4 ²		10.2	
1988	No increase in F; TAC	7.0 ²		17.2	
1989	No increase in F; TAC	8.6 ²		19.8	
1990	No increase in F; TAC	9.2 ²		12.7	
1991	TAC; SSB = mean	4.5 ²		9.3	
1992	Appropriate to reduce F	-		9.7	
1993	20% reduction in F	6.5 ²	19.0	10.4	
1994	20% reduction in F	5.6 ²	17.0	10.6	
1995	20% reduction in F	4.7 ³	17.0	11.7	
1996	20% reduction in F	4.7 ³	20.0	12.6	
1997	20% reduction in F	7.4 ⁴	20.0	12.0	
1998	10% reduction in F	8.8 ⁴	20.0	11.4	
1999	Reduce F below F _{pa}	9.2 ⁴	19.0	8.6	
2000	Reduce F below F _{pa}	< 7.6 ⁵	16.0	6.5	
2001	40% reduction in F	< 4.3 ⁵	10.5	8.3	
2002	45% reduction in F	< 5.3 ⁵	8.7	9.4	
2003	60% reduction in F	< 3.8 ⁵	6.7	6.2	6.4
2004	90% reduction in F or management plan	< 0.7	5.7	3.5	3.7
2005	17% reduction in F	< 5.2	6.2	3.1	3.1
2006	No increase in effort [should have been reduce effort]	Cannot be estimated	5.6	3.4	3.8
2007	Zero catch	0	4.7	4.3	4.8
2008	Zero catch	0	4.3	3.6	4.0
2009	50% reduction in F	< 2.6	4.023	3.2	3.2
2010	Substantial catch reduction	-	4.023	3.2	3.2
2011	Catch and effort reduction	-	5.379	4.7	7.3**
2012	MSY framework	< 10.0	10.059	7.7	8.6*
2013	MSY framework	< 10.2	10.200		
2014	MSY approach	< 6.848			

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 VIIId).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.

Year	Belgium	France	Ireland	UK	Others	Highgrading	Discards	Total
1971								5782
1972								4737
1973								4015
1974								2898
1975								3993
1976								4818
1977								3058
1978								3647
1979								4650
1980								7243
1981								10596
1982								8766
1983								9641
1984								6631
1985								8317
1986								10475
1987								10228
1988	554	13863	1480	1292	2			17191
1989	910	15801	1860	1223	15			19809
1990	621	9383	1241	1346	158			12749
1991	303	6260	1659	1094	20			9336
1992	195	7120	1212	1207	13			9747
1993	391	8317	766	945	6			10425
1994	398	7692	1616	906	8			10620
1995	400	8321	1946	1034	8			11709
1996	552	8981	1982	1166	0			12680
1997	694	8662	1513	1166	0			12035
1998	528	8096	1718	1089	0			11431
1999	326	5488	1883	897	0			8594
2000	208	4281	1302	744	0			6535
2001	347	6033	1091	838	0			8309
2002	555	7368	694	618	0			9235
2003	136	5222	517	346	0	210 ¹	na	6431
2004	153	2425	663	282	0	148 ¹	na	3671
2005	186	1623	870	309	0	74 ¹	na	3062
2006	103	1896	959	368	0	432 ¹	na	3758
2007	108	2509	1210	412	0	592 ¹	na	4831
2008	65	2064	1221	289	0	322 ¹	na	3961
2009	49	2080	870	264	0	25 ¹	na	3288
2010	51	1853	1034	289	2	7 ¹	na	3236
2011	124	3171	1011	414	17	1828 ²	696	7261
2012	290	5166	1536	701	0	na	952	8644

¹French highgrading estimates from self-sampling programme.

²International highgrading estimate.

Table 5.4.6.3

Cod in Divisions VIIe–k. Summary of stock assessment.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2–5
1971	4774	10100	5782	0.556
1972	929	9314	4737	0.517
1973	2810	8625	4015	0.541
1974	888	8330	2898	0.377
1975	6021	7518	3993	0.678
1976	1986	7307	4818	0.553
1977	2871	8839	3059	0.349
1978	2738	9688	3647	0.362
1979	6619	9835	4650	0.468
1980	12215	10329	7243	0.696
1981	5145	11177	10597	0.812
1982	2115	13451	8766	0.633
1983	6918	13004	9641	0.833
1984	6690	9568	6631	0.532
1985	5904	13082	8317	0.533
1986	5034	13752	10475	0.781
1987	25442	11472	10228	0.819
1988	12267	16629	17191	0.638
1989	3664	26382	19809	0.813
1990	4047	19240	12749	0.861
1991	11364	10845	9336	0.981
1992	11740	9073	9747	0.851
1993	3705	12278	10425	0.748
1994	13727	14367	10620	0.749
1995	9694	13044	11709	0.724
1996	7462	15953	12681	0.851
1997	10048	14173	12035	0.799
1998	5054	12733	11431	0.937
1999	2366	11234	8594	0.835
2000	10687	8011	6536	0.725
2001	8858	9022	8308	0.712
2002	2190	11257	9236	0.820
2003	1304	9117	6420	0.915
2004	2944	4776	3672	0.922
2005	4171	3502	3062	0.958
2006	4610	3857	3776	0.800
2007	3952	5214	4830	0.806
2008	1657	5603	3961	0.724
2009	3758	5354	3292	0.727
2010	17553	5551	3229	0.484
2011	5244	11726	7261	0.374
2012	736	20858	7692	0.424
2013	4830*	21632		
Average	6203	11089	7788	0.696

*GM 1971–2010.

ECOREGION Celtic Sea and West of Scotland
STOCK Grey gurnard in Subarea VI and Divisions VIIa–c and e–k (Celtic Sea and West of Scotland)

Advice for 2014

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)): “ICES advises on the ICES approach to data-limited stocks, implying that catches in 2013 should be reduced by 20% in relation to the average catch of the last three years. Because the data for catches of grey gurnard are considered highly unreliable, ICES is not in a position to quantify the result”.

The advice for 2014 is the same catch advised for 2013 (even though the value cannot be quantified), not that a further 20% reduction in catch be implemented.

Quality considerations

Because the species is largely discarded, landings data do not reflect the actual catches. Given the high discarding, only data collected at sea (as supported by the EU Data Collection Framework) can provide an accurate estimate of catches.

The EVHOE-WIBTS-Q4 survey could be used as an indicator of abundance of grey gurnard in Divisions VIIf,g,h,j. The availability of the time-series of abundance from the Spanish, UK, Russian, and Irish surveys should provide indications of trend in the northern and central parts of the ecoregion (Subarea VI and Divisions VIIa and VIIb,c).

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

Assessment type	No assessment.
Stock data category	Category 6.2.0.
Input data	None.
Discards and bycatch	No information on discards is used.
Indicators	None.
Other information	None.
Working group report	WGCSE (ICES, 2013).

Sources

- ICES. 2012. Grey gurnard in Subarea VI and Divisions VIIa–c and e–k. In Report of the ICES Advisory Committee, 2012, Section 5.4.1. ICES Advice, 2012. Book 5: 382–387.
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Table 5.4.7.1 Grey gurnard in Subarea VI and Divisions VIIa–c and e–k. ICES advice and official landings.

Year	ICES Advice	Predicted catch corresp. to advice	Official landings
2003		-	0.3
2004		-	1.5
2005		-	2.5
2006		-	0.2
2007		-	0.03
2008		-	0.01
2009		-	0.5
2010		-	0.08
2011		-	0.08
2012	No increase in catch	-	0.28 ¹⁾
2013	20% reduction in catches	-	
2014	Same catch value advised for 2013	-	

Weights in thousand tonnes.

¹⁾ Preliminary.

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

Advice for 2014

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).

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✓	✓	✓ Appropriate
Precautionary approach (F_{pa}, F_{lim})	✓	✓	✓ Harvested sustainably
SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	✗	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	○	✓	✓ Fully reproductive capacity

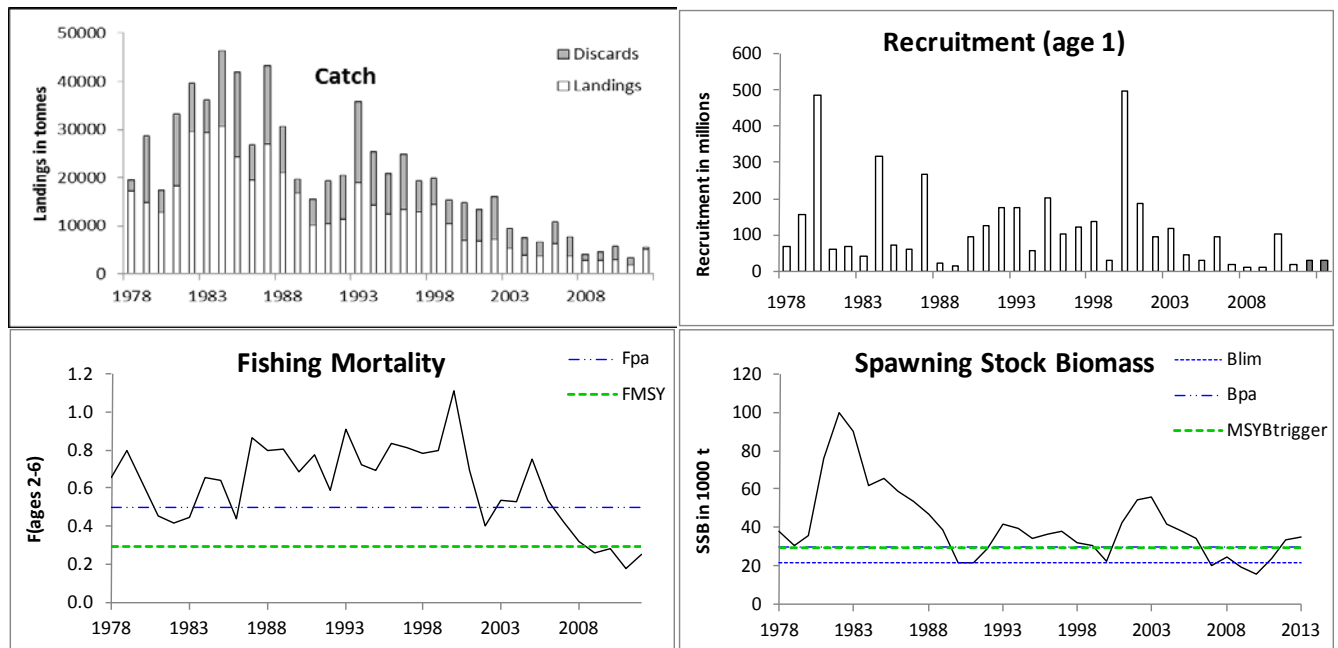
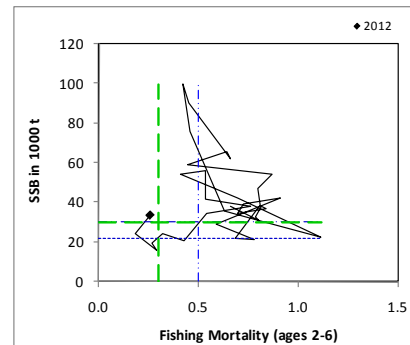


Figure 5.4.8.1 Haddock in Division VIa (West of Scotland). ICES observed catches and summary of stock assessment (weights in thousand tonnes). Predicted recruitment values are shaded. Top right: SSB/F for the time-series used in the assessment.

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 B_{pa} . F has been above F_{pa} in most years since 1987 and has been declining since 1999. F has been below the F_{MSY} proxy since 2009.

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 30 000 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 30 000 t. This proposal for a management plan has not been formally agreed.

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 stock–recruitment relationship for haddock is characterized by sporadic high recruitments. There may be periods of low recruitment at any stock size.

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 t, where the demersal fish fleet (TR1) contributes 4607 t (4457 t landed, 150 t discarded), the *Nephrops* fleet (TR2) 919 t (543 t landed, 376 t discarded), and other fleets caught 103 t..

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.

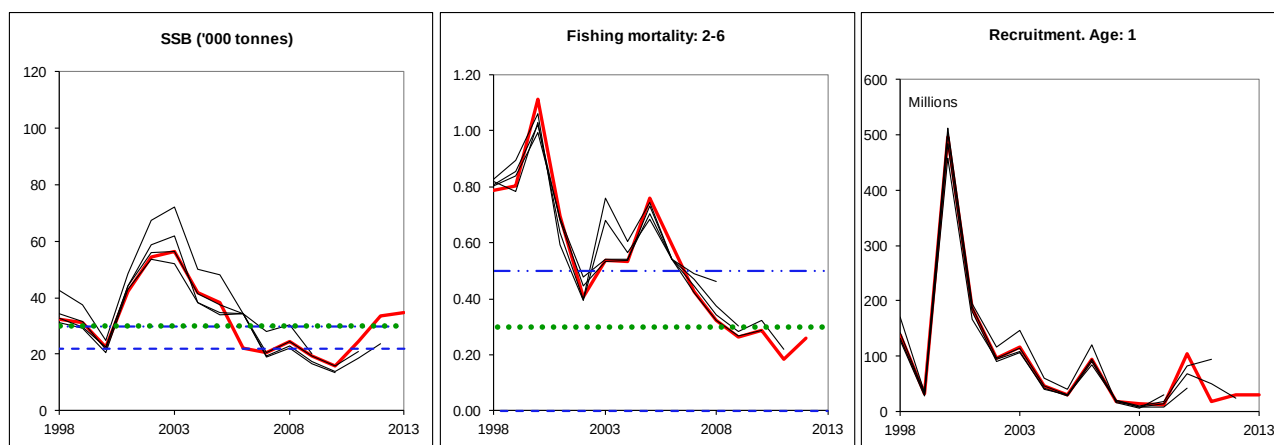


Figure 5.4.8.2 Haddock in Division VIa (West of Scotland). Historical assessment results (final-year recruitment estimates included).

Scientific basis

Assessment type	Analytical age-based assessment (TSA).
Stock data category	Category 1.
Input data	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).
Discards and bycatch	Discard data from the Scottish and Irish fleets have been included in the assessment since 1972.
Indicators	Surveys: IRGFS-WIBTS-Q4, UKSGFS-WIBTS-Q1, and UKSGFS-IBTS-Q4.
Other information	This stock is scheduled to be benchmarked in 2014.
Working group report	<u>WGCSE</u> (ICES, 2013).

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

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B_{trigger}	30 000 t.	B_{pa}
	F_{MSY}	0.3	Provisional proxy by analogy with North Sea haddock. Fishing mortalities in the range of 0.19–0.41 are consistent with F_{MSY} .
Precautionary Approach	B_{lim}	22 000 t.	$B_{\text{lim}} = B_{\text{loss}}$, the lowest observed spawning stock estimated since the reference point was established in 1998.
	B_{pa}	30 000 t.	$B_{\text{pa}} = B_{\text{lim}} \times 1.4$. This is considered to be the minimum SSB required to obtain a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of assessments.
	F_{lim}	Not defined.	
	F_{pa}	0.5	The F below which there is a high probability of avoiding $\text{SSB} < B_{\text{pa}}$.

(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: $F(2013) = F_{sq} = F(2010-2012) = 0.24$; $SSB(2014) = 26.377$; $R(2013) = \text{Geomean}(2004-2011) = 30.6$ million; $R(2014) = \text{Geomean}(2004-2011) = 30.6$ million; Catch (2013) = 6.673; Landings (2013) = 4.137; Discards (2013) = 2.536.

Rationale	Total catch (2014)	Landings (2014)	Discards (2014)	Basis	F Total (2014)	F landings (2014)	F Disc. (2014)	SSB (2015)	%SSB change ¹⁾	%TAC change ²⁾
MSY approach	6.432	3.988	2.444	$F_{MSY} \times SSB_{2014}/MSY B_{trigger}$	0.26	0.16	0.10	27.27	+3%	−5%
Precautionary approach	4.158	2.578	1.580	$SSB_{2015} > B_{pa}(F_{2013} \times 0.67)$	0.16	0.10	0.06	30.043	+14%	−39%
Proposal for Management plan	5.223	3.238	1.985	−23% TAC ($F_{2013} \times 0.86$)	0.21	0.13	0.08	28.743	+9%	−23%
Zero catch	0.000	0.000	0.000	$F = 0$	0.00	0.00	0.00	35.13	+33%	−100%
Other options	5.765	3.574	2.191	TAC −15% ($F_{2013} \times 0.96$)	0.23	0.14	0.09	28.082	+6%	−15%
	6.791	4.210	2.581	Stable TAC ($F_{2013} \times 1.156$)	0.28	0.17	0.11	26.832	+2%	0%
	5.978	3.706	2.272	F_{2013}	0.24	0.15	0.09	27.823	+5%	−12%
	7.811	4.843	2.968	TAC +15% ($F_{2013} \times 1.36$)	0.33	0.20	0.13	25.592	−3%	+15%

Weights in thousand tonnes.

¹⁾ SSB in 2015 relative to SSB in 2014.

²⁾ Landings in 2014 relative to TAC in 2013.

MSY approach

Following the ICES MSY approach implies fishing mortality at 0.26 (lower than the F_{MSY} proxy because SSB in 2014 is 12% below MSY $B_{trigger}$), 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 27 270 tonnes in 2015.

Since F is below the F_{MSY} proxy in 2012, the transition to the MSY option is not relevant.

Precautionary approach

A fishing mortality of 0.16 will lead to an SSB in 2015 around 30 000 tonnes (B_{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.

Management plan

ICES evaluated an EU management plan proposal (see Annex 5.4.8) and considered it to be precautionary. Following the plan would result in a 23% TAC decrease. This would result in catches of 5223 tonnes and landings of 3238 tonnes in 2014. This is expected to lead to an SSB of 28 743 tonnes in 2015.

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.

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) (~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. Single-rig *Nephrops* trawls in the 70–99 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.

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.

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.

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.

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.

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.

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.

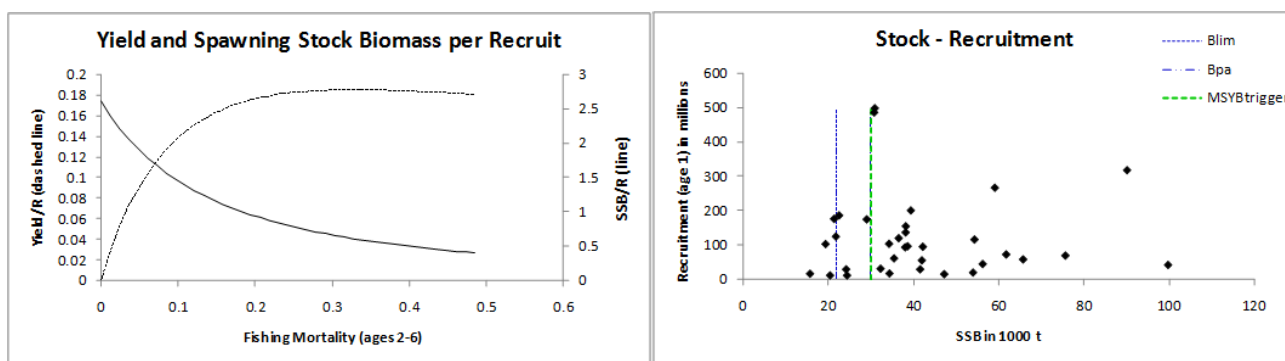


Figure 5.4.8.3 Haddock in Division VIa (West of Scotland). Yield-per-recruit analysis (left) and stock–recruitment plot (right).

Table 5.4.8.1

Haddock in Division VIa (West of Scotland). ICES advice, management, landings, and catches.

Year	ICES Advice/ Single-stock exploitation boundaries from 2004 onwards ⁴	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings	ICES landings	Discard	ICES catch
1987	Reduce F towards F_{max}	20.0	32.0	27	27.0	16.2	43.2
1988	No increase in F; TAC	25.0	35.0	21	21.2	9.5	30.7
1989	80% of F(87); TAC	15.0	35.0	24	16.7	3.0	19.7
1990	80% of F(88); TAC	14.0	24.0	13	10.1	5.4	15.5
1991	70% of effort (89)	-	15.2	10	10.6	8.7	19.2
1992	70% of effort (89)	-	12.5	7	11.4 ²	9.3 ²	20.5 ²
1993	70% of effort (89)	-	17.6	13	19.1 ²	16.8 ²	35.9 ²
1994	30% reduction in effort	-	16.0	9	14.2 ²	11.1 ²	25.3 ²
1995	Significant reduction in effort	-	21.0	13	12.4	8.6	20.9
1996	Significant reduction in effort	-	22.9	13	13.5	11.4	24.8
1997	Significant reduction in effort	-	20.0	13	12.9	6.5	19.3
1998	No increase in F	20.8 ³	25.7	14	14.4	5.5	19.9
1999	F reduced to F_{pa}	14.3 ³	19.0	11	10.5	4.9	15.3
2000	Maintain F below F_{pa}	< 14.9 ³	19.0	7	7.0	7.9	14.9
2001	Reduce F below F_{pa}	< 11.2 ³	13.9	7	6.87	6.6	13.4
2002	Reduce F below F_{pa}	< 14.1 ³	14.1	7	7.1	8.9	16.0
2003	No cod catches	-	8.7	4.9	5.3	4.1	9.4
2004	F_{pa} ⁴	12.2	6.5	3.0	3.9	3.7	7.6
2005	$\frac{3}{4} \times F_{pa}$ ⁴	7.6	7.6	3.2	3.8	2.9	6.7
2006	$0.7 \times F_{pa}$ ⁴	8.0	7.81	5.7	6.3	4.6	10.9
2007	$0.87 \times F_{pa}$ ⁴	7.2	7.2	3.7	3.8	4.0	7.7
2008	$SSB > B_{pa}$ ⁴	4.2	6.12	2.8	2.8	1.2	4.1
2009	No fishing and recovery plan ⁴	0	3.52	2.8	2.9	1.6	4.5
2010	No fishing and recovery plan	0	2.67	2.9	3.0	2.8	5.8
2011	See scenarios	0	2.005	1.7	1.7	1.5	3.3
2012	MSY framework ⁵	10.2 ⁵	6.015	5.0	5.1	0.5	5.6
2013	MSY framework	3.1	4.211				
2014	MSY approach	6.432 ⁶					

Weights in thousand tonnes.

¹ TAC is set for Divisions VIa and VIb (plus Subdivision Vb₁ and Subareas XII and XIV), combined with restrictions on the quantity that can be taken in Division VIa from 1990.² 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, 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.

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Belgium	9	-	9	1	7	1	-	1	3	2	2	1
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	-	282
Germany	-	-	1	2	9	19	14	2	1	1	2	1
Germany, F.R.	4	15	-	-	-	-	-	-	-	-	-	-
Ireland	2171	773	710	700	911	746	1406	1399	1447	1352	1054	677
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-
Norway	74	46	12	72	40	7	13	16	21	28	18	70
Spain	-	-	-	-	-	-	1	-	-	2	4	< 0.5
UK – (E&W) ¹⁾	235	164	137	132	155	254	322	448	493	458	315	199
UK – Scotland	19940	10964	8434	5263	10423	7421	10367	10790	10352	12125	8630	5933
USSR/Russia	-	-	59	-	-	-	-	-	-	-	-	-
Total reported	23781	12825	10124	6932	12678	9201	12795	13112	12587	14362	10025	7163
ICES estimates²⁾	16691	10141	10557	11351	19068	14272	12368	13466	12883	14401	10464	6958

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012 ³⁾
Belgium	2	-	-	< 0.5	-	-	-	-	-	-	-	-
Denmark	-	-	< 0.5	< 0.5	-	-	-	-	-	-	-	-
Faroe Islands	-	-	-	4	-	1	2	<0.5	-	-	.	0.314
France	160	151	183	173	273	291	211	151	136	89	74.83	31.75
Germany	1	-	-	-	1	7	-	1	-	1		0.079
Germany, F.R.	-	-	-	-	-	-	-	-	-	-	-	-
Ireland	744	672	497	194	152	526	759	879	297	396	290.39	844.98
Netherlands	-	-	-	1	-	-	-	-	-	-	-	-
Norway	32	30	23	4	21	17	16	28	18	11	4.109	0.184
Spain	4	4	5	-	47	44	5	10	21	28	-	-
UK – (E&W) ¹⁾	201	237	107	93	42	19	193	32	14	7	-	2.47
UK – Scotland	5886	5988	4582	2909	2025	4928	2587	1744	2366	2407	1373	41199
Russia	-	-	-	-	-	-	-	-	-	-	-	-
Total reported	7030	7082	5397	3378	2561	5833	3773	2845	2852	2939	1743	5000
ICES estimates²⁾	6762	7115	5337	3874	3792	6266	3777	2848	2851	3016	1737	5100

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.

Year	Landings (tonnes)			Discards (tonnes)			Total catches (tonnes)			Mean F(2–6)		SSB (tonnes)		Recruitment (thousands at age 1)	
	Obs.	Pred.	SE	Obs.	Pred.	SE	Obs.	Pred.	SE	Estimate	SE	Estimate	SE	Estimate	SE
1978	17187	18278	1654	2318	2413	542	19505	20666	1841	0.658	0.068	38345	1173	70314	8541
1979	14837	15808	1661	13841	10353	2102	28678	26674	3015	0.801	0.074	30935	2227	155234	16386
1980	12759	13553	1727	4715	15846	3254	17474	31214	4491	0.630	0.068	35596	2799	484376	44364
1981	18233	19443	2803	15048	13725	2771	33281	33701	4733	0.454	0.054	75788	5162	62310	7250
1982	29635	28634	4356	10063	6614	1362	39698	33547	4455	0.418	0.047	99880	7335	70471	8419
1983	29411	28459	3607	6781	5067	984	36192	33503	3850	0.451	0.047	90250	5964	43395	6427
1984	30689	26725	2625	15666	12727	3023	46355	39736	4635	0.661	0.065	61897	3353	317313	35181
1985	24451	24330	2621	17385	14983	2833	41837	38819	4577	0.643	0.063	65862	4235	73664	8654
1986	19561	19634	2654	7153	4645	918	26714	23091	2942	0.445	0.049	59237	4361	59337	6604
1987	27012	29060	2895	16193	15256	3595	43205	44441	5151	0.870	0.072	54120	3685	266636	35835
1988	21153	21688	2430	9519	9707	2029	30672	31254	3833	0.798	0.072	47363	3328	21313	4270
1989	16691	19183	2606	2979	2953	718	19669	21495	2804	0.810	0.077	38785	3242	16677	3938
1990	10141	11030	1567	5381	3123	713	15522	13231	1797	0.685	0.072	21931	1991	97374	12071
1991	10557	9948	1127	8691	9800	1887	19248	20381	2637	0.776	0.074	21527	1639	125401	13540
1992	11351	9496	1179	9161	8978	1495	20513	19315	2304	0.588	0.060	29180	2057	176446	17706
1993	19068	17957	1849	16803	15807	2248	35871	33831	3144	0.909	0.076	42114	2680	175131	19337
1994	14272	11756	1709	11070	12519	2267	25342	24877	3028	0.724	0.119	39529	2984	56505	11635
1995	12368	13269	4097	8552	11739	3722	20920	24768	6947	0.696	0.186	34427	5045	200961	28255
1996	13466	13433	4312	11351	14288	4218	24817	28176	7871	0.837	0.204	36682	5692	104512	20450
1997	12883	13952	4216	6461	12944	3736	19344	28007	6959	0.813	0.166	38315	5851	120679	21965
1998	14401	11111	3238	5535	13947	3929	19936	26183	6539	0.786	0.168	32425	4383	137487	22190
1999	10464	10057	3066	4856	9776	2843	15321	20848	5197	0.802	0.180	31073	4042	32330	9131

Table 5.4.8.3 (cont.)

Year	Landings (tonnes)			Discards (tonnes)			Total catches (tonnes)			Mean F(2–6)		SSB (tonnes)		Recruitment (thousands at age 1)	
	Obs.	Pred.	SE	Obs.	Pred.	SE	Obs.	Pred.	SE	Estimate	SE	Estimate	SE	Estimate	SE
2000	6958	10964	3213	7893	26420	9130	14851	38063	10933	1.113	0.225	22701	3616	496649	98523
2001	6762	7277	2893	6626	22434	7110	13389	31482	9674	0.696	0.159	42348	7472	186538	23567
2002	7115	9344	3836	8862	10946	3457	15977	19849	5568	0.407	0.097	54470	7238	95903	14946
2003	5337	16523	5043	4101	10513	3163	9438	25764	6123	0.536	0.123	56375	5985	116850	15095
2004	3874	12727	3764	3705	7012	2133	7579	18494	4827	0.535	0.131	41707	4621	45952	6802
2005	3792	15857	3980	2902	6248	1854	6694	20816	4570	0.759	0.138	38188	4238	30673	4327
2006	6266	7213	997	4618	5725	1035	10884	12810	1558	0.591	0.062	22029	1528	94376	7512
2007	3777	4100	516	3968	3762	662	7745	7842	996	0.427	0.051	20583	1280	18605	2676
2008	2848	3847	504	1229	2258	510	4077	6388	913	0.322	0.044	24562	1716	13036	1988
2009	2851	3386	511	1643	1304	319	4494	4644	601	0.264	0.040	19522	1547	12975	4121
2010	3016	3318	425	2812	1444	321	5828	4845	622	0.288	0.052	15876	1681	103714	19625
2011	1737	2207	283	1540	2338	540	3277	4600	722	0.182	0.040	24350	3694	17839	20294
2012	5100	4817	649	529	2641	854	5629	8417	1601	0.258	0.069	33663	8247	30629*	39733
2013	-	5416	2224	-	2979	1591	-	9095	3817	0.259	0.113	30365**	11751	30629*	-

*GM (2004–2011).

**Estimate using GM recruitment in 2012.

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_{pa}).*
2. *Where the SSB referred to in paragraph 1 is estimated to be below B_{pa} but above 22,000 tonnes (B_{lim}) the TAC shall not exceed a level which will result in a fishing mortality rate equal to $0.3 - 0.2 * (B_{pa} - SSB) / (B_{pa} - B_{lim})$.*
3. *Where the SSB referred to in paragraph 2 is estimated to be below B_{lim} 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_{pa} (30,000t) or B_{lim} , (22,000t) paragraphs 1-4 shall be reviewed.*

ECOREGION Celtic Sea and West of Scotland

STOCK Haddock in Division VIb (Rockall)

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.

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 B_{pa} . Fishing mortality has declined over time and is now below the F_{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.

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.

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.

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.

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.

Catch distribution Total catches (2012) = 726 t (710 t landings, 16 t discards (2% by weight and 14% by numbers)).

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.

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.

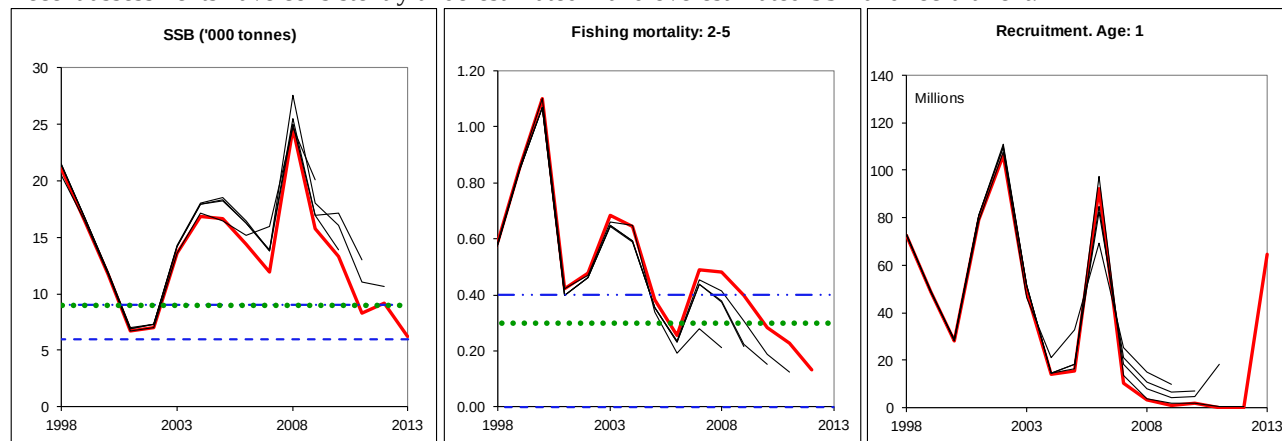


Figure 5.4.9.2 Haddock in Division VIb (Rockall). Historical assessment results (final-year recruitment estimates included).

Scientific basis

Assessment type	Analytical age-based assessment (XSA).
Stock data category	1
Input data	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).
Discards and bycatch	Discards have been included in the assessment since 1991, from UK (Scotland) and Ireland.
Indicators	None.
Other information	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).
Working group report	WGCSE (ICES, 2013b).

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Reference points

	Type	Value	Technical basis
MSY Approach	MSY B_{trigger}	9000 t	B_{pa}
	F_{MSY}	0.3	Provisional proxy by analogy with North Sea haddock. Fishing mortalities close to F_{sq} in 2010.
Precautionary Approach	B_{lim}	6000 t	$B_{\text{lim}} = B_{\text{loss}}$, the lowest observed spawning stock estimated in previous assessments.
	B_{pa}	9000 t	$B_{\text{pa}} = B_{\text{lim}} * 1.5$. This is considered to be the minimum SSB required to obtain a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of assessments.
	F_{lim}	Not defined.	Not defined due to uninformative stock recruitment data.
	F_{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 B_{pa} in the long term.

(Unchanged since: 2010).

Outlook for 2014

Basis: $F_{2013} = \text{TAC constraint} = 0.15$; $R(2013) [\text{RCT3}] = 64475$ thousands; TAC constraint for landings (2013) = 0.99; total catch (2013) = 1.22; SSB (2014) = 4.311; $R(2014)$ [25 percentile of the historical R time-series] = 10445 thousands.

Rationale	Catch (2014)	Landings (2014)	Discards (2014)	Basis	F total (2014)	F landings (2014)	F discards (2014)	SSB (2015)	%SSB change ¹	%TAC change ²
6. MSY approach	7. .62	8. .98	9. .64	10. $F_{\text{MSY}} \times \text{SSB}_{2014} / B_{\text{trigger}}$	12. .14	13. .11	14. .04	15. 1.7	16. 403%	17. 1%
18. Precautionary approach	19. .10	20. .43	21. .68	22. $F_{\text{pa}} = 0.4$	23. .40	24. .29	25. .11	26. 8.7	27. 334%	28. 145%
29. Proposed Management plan	30. .01	31. .21	32. .80	$F_{\text{HCR}} = 0.2$ and $\text{TAC}_{2014} = \text{TAC}_{F=0.2} + 0.2 \times (\text{TAC}_{2013} - \text{TAC}_{F=0.2})$	33. .18	34. .13	35. .05	36. 1.2	37. 393%	38. 22%
39. Zero catch	40. .0	41. .0	42. .0	43. $F = 0$	44. .0	45. .0	46. .0	47. 3.7	48. 446%	49. 100%
50. Other options	51. .20	52. .33	53. .88	54. $F_{\text{HCR}} = 0.2$	55. .20	56. .15	57. .05	58. 1.0	59. 387%	60. 34%
61.	62. .35	63. .42	64. .94	65. average $F_{2010-2012}$	66. .21	67. .16	68. .06	69. 0.8	70. 381%	71. 43%
72.	73. .38	74. .84	75. .55	76. -15% TAC	77. .12	78. .09	79. .03	80. 2.0	81. 410%	82. 15%
83.	84. .63	85. .99	86. .65	87. 0% TAC	88. .15	89. .11	90. .04	91. 1.7	92. 403%	93. 0%
94.	95. .20	96. .91	97. .29	98. F_{MSY}	99. .30	100. .22	101. .08	102. 9.8	103. 357%	104. 93%
105.	106. .89	107. .14	108. .75	109. +15% TAC	110. .17	111. .12	112. .05	113. 1.4	114. 396%	115. 15%

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.

MSY approach

Following the ICES MSY approach implies a fishing mortality at $F_{MSY-HCR} = F_{MSY} \times SSB_{2014}/MSY B_{trigger} = 0.14$, 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 21 700 t in 2015, which is above $MSY B_{trigger}$.

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

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 18 700 t in 2015, which is above B_{pa} .

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

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 $F = 0.2$ in 2014, then SSB is forecast to be above B_{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.

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 F_{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 VIIb 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.

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.

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 time-series 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.

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.

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.

Sources

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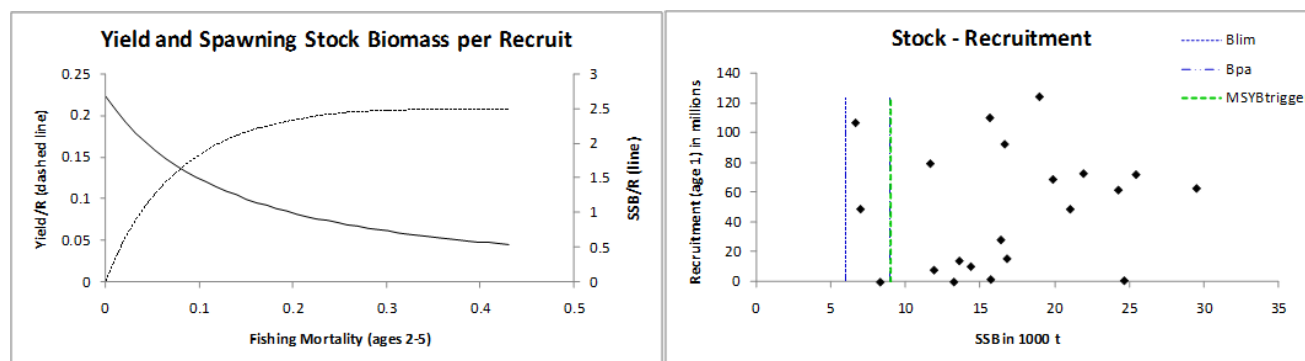


Figure 5.4.9.3 Haddock in Division VIb (Rockall). Yield-per-recruit analysis (left panel) and stock–recruitment relationship (right panel).

Table 5.4.9.1

Haddock in Division VIb (Rockall). ICES advice, management, landings, and discards.

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

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.

n/a = Not available.

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Table 5.4.9.2 Haddock in Division VIb (Rockall). Landings (tonnes) in 1995–2012, as officially reported to ICES, and ICES estimates.

COUNTRY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012 ¹
Faroe Islands	-	-	-	-	-	n/a	n/a	-	-	-	-	2	2	16	16	42	2	53
France	... ²	-	-	-	-	5	2	-	1	-	-	-	-	-	-	-	< 1	
Iceland	-	-	+	-	167	-	-	-	-	-	-	-	-	-	-	-	-	
Ireland	677	747	895	704	1021	824	357	206	169	19	105	41	338	721	352	169	123	31
Norway	29	24	24	40	61	152	70	49	60	32	33	123	84	36	71	65	40	48
Portugal	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Russian Federation	-	-	-	-	458	2154	630	1630	4237	5844	4708	2154	1282	1669	55	198	-	1
Spain	28	1	22	21	25	47	51	7	19	-	-	5	-	-	-	-	-	
UK (E,W&NI)	318	293	165	561	288	36	-	-	56	-	-	-	-	-	-	-	-	
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
Total	5491	6818	5220	5098	5990	5688	2315	3037	6148	6306	5178	2765	3349	4221	3445	3405	1903	710
Unallocated catch	-379	-543	-591	-599	-851	-357	-279	299	94 ⁵	139 ⁵	1	0	0	0	0	0	0	0
ICES estimate	5112	6275	4629	4499	5139	5331 ⁴	2036 ⁴	3336 ⁴	6242 ⁴	6445	5179	2765	3349	4221	3445	3405	1903	710

¹ Preliminary.

² Included in Division VIa.

³ Includes UK England, Wales, and N. Ireland landings.

⁴ Includes the total Russian catch.

⁵ Non-official.

n/a = not available.

Table 5.4.9.3 Haddock in Division VIb (Rockall). Summary of stock assessment.

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

* RCT3 estimate.

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_{pa} and a minimum level of SSB greater than B_{lim} .

In paragraphs 2–5, $SSB_{0.2}$ denotes the SSB 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 $SSB_{0.2}$ is estimated to be above B_{pa} .

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:

$$TAC_y = TAC_f + 0.2 \times (TAC_{y-1} - TAC_f)$$

where TAC_y is the TAC that is to be set by the management plan, TAC_{y-1} is the TAC that was fixed the previous year, and TAC_f is the TAC resulting from the provisions in paragraphs 1 and 2.

4. Where $SSB_{0.2}$ is estimated to be below B_{pa} but above B_{lim} , the TAC shall not exceed a level, which will result in a fishing mortality rate equal to

$$0.2 - [0.2 \times (B_{pa} - SSB_{0.2}) / (B_{pa} - B_{lim})].$$

This consideration overrides paragraph 3.

5. Where $SSB_{0.2}$ is estimated to be below B_{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.”

ECOREGION Celtic Sea and West of Scotland
STOCK 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 (F_{MSY})	?	Unknown
Precautionary approach (F_{pa} , F_{lim})	?	Unknown
SSB (Spawning-Stock Biomass)		
	2009–2013	
Qualitative evaluation	↗	Increasing

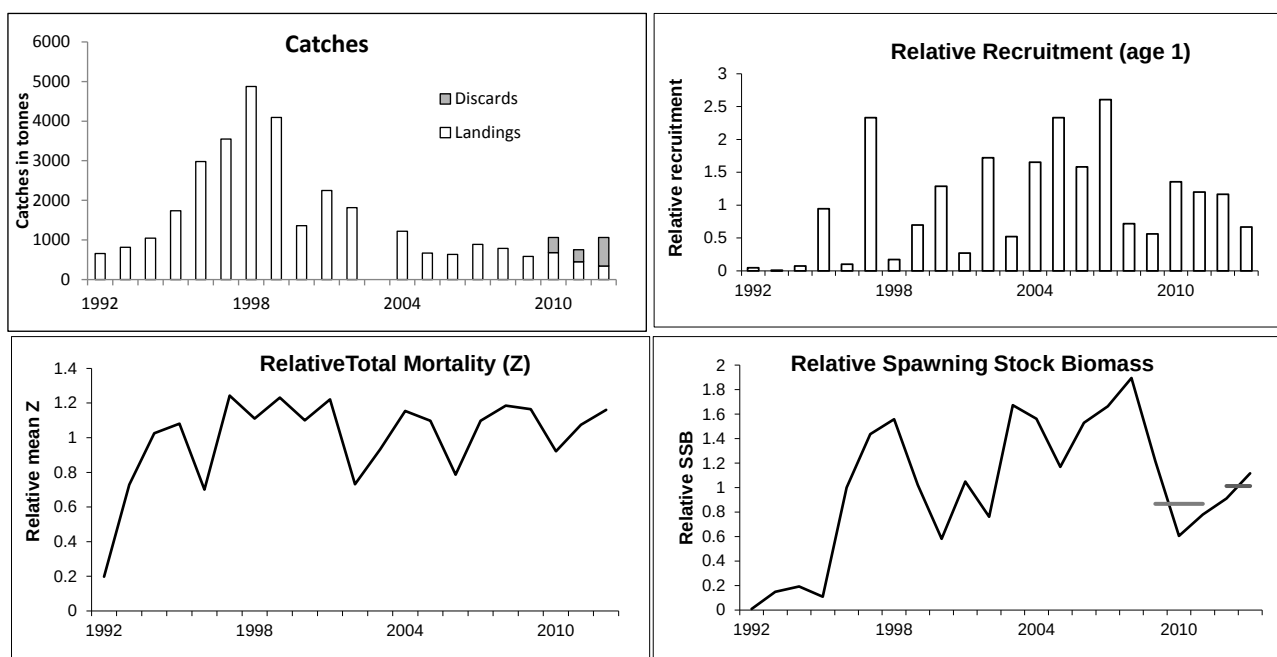


Figure 5.4.10.1 Haddock in Division VIIa (Irish Sea). Summary of trends in ICES estimates of landings (in tonnes; 2003 sampling was inadequate to derive catch age compositions), recruitment, total mortality, and spawning-stock biomass relative to the mean of the time-series. The horizontal lines in the 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).
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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 are not 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 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	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 NIGFS-WIBTS-Q1 survey.
Discards and bycatch	Discards were not included in the assessment but are available for monitoring for the otter and beam trawl fleets.
Indicators	NIGFS-WIBTS-Q4, NIMIK, UK-FSP (Eastern and Western Irish Sea), IS-AEPM surveys.
Other information	Benchmarked in 2013 (WKROUND; ICES, 2013a).
Working group report	WGCSE (ICES, 2013b).

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

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B_{trigger}	Not defined.	
	F_{MSY}	Not defined.	
Precautionary Approach	B_{lim}	Not defined.	
	B_{pa}	Not defined.	
	F_{lim}	Not defined.	
	F_{pa}	0.5	ICES proposed that F_{pa} be set at 0.5 by association with other haddock stocks.

(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 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 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 cm (STECF, 2012). The Irish *Nephrops* fleet have expanded the use of sorting grids and separator trawls as the use of more species-selective 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 ~1000–1200 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 ~1100 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 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

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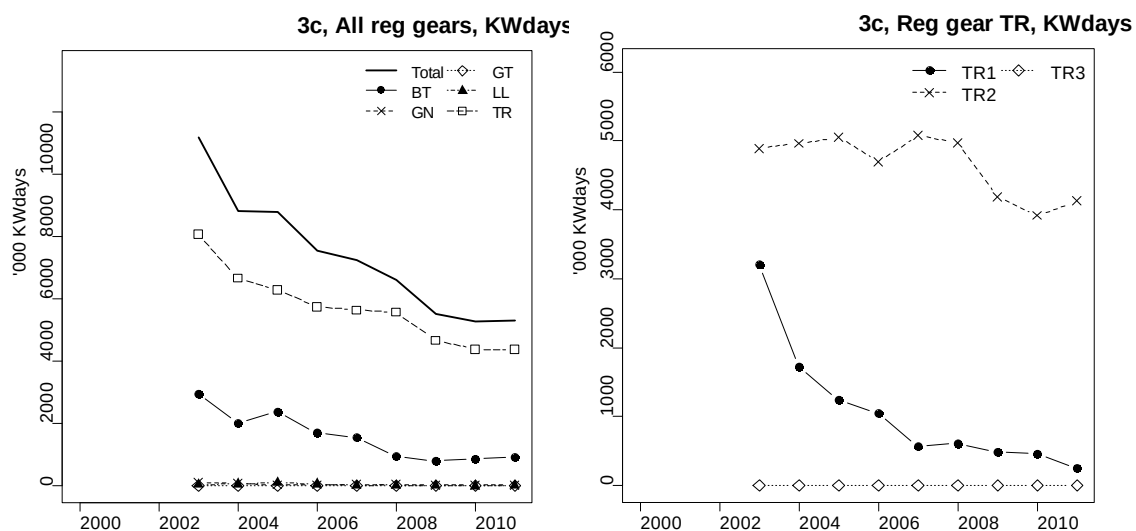


Figure 5.4.10.2 Haddock in Division VIIa (Irish Sea). Effort trends for regulated gears in the Irish Sea, showing decrease in TR1 effort.

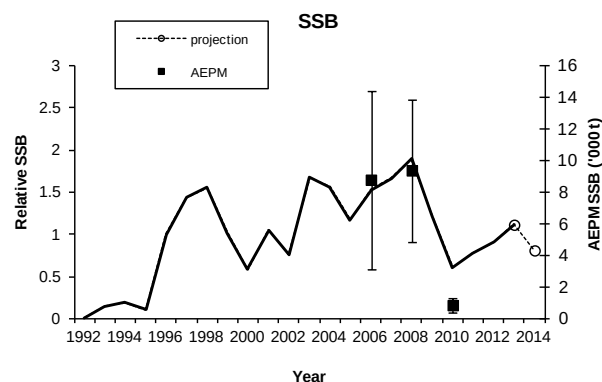


Figure 5.4.10.3 Haddock in Division VIIa (Irish Sea). Trends in SSB 2013 from the surba analysis projected to 2014 compared with the Irish Sea annual egg production method survey estimates of SSB ($+2 \times$ standard error).

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	ICES discards	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 F _{pa}	< 2.8	3.4 ²	2.4	1.4		
2001	Reduce F below F _{pa}	< 1.71	2.7 ²	2.2	2.2		
2002	Reduce F below F _{pa}	< 1.20	1.3 ²	1.1	1.8		
2003	No cod catches	-	0.6 ²	0.7	n/a		
2004	F < F _{pa}	< 1.5	1.5 ²	0.8	1.2		
2005	F < F _{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	n/a	n/a	n/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	...	...	...	...	...
UK (Scotland)	78	104	23	156	52	86	316	143	114	140
Total	387	728	726	1 287	747	560	582	616	703	730
ICES landings	387	728	726	1 287	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/a	49	184	72	146
Ireland	246	320	798	1 005	1 699	759	1 238	652	401	229
Netherlands	-	-	1	14	10	5	2	-	-	-
UK (England & Wales) ¹	301	294	463	717	1 023	1 479	1 061	1 238	551	248
UK (Isle of Man)	24	27	38	9	13	7	19	1	-	-
UK (N. Ireland)	...	...	...	...	...	...	...	...	...	...
UK (Scotland)	66	110	14	51	80	67	56	86	47	31
Total	681	841	1 453	1 925	3 015	2 370	2 447	2 229	1 115	674
ICES landings	1 042	1 736	2 981	3 547	4 874	4 095	1 357	2 246	1 817	n/a

Country	2004	2005	2006	2007	2008	2009	2010	2011	2012
Belgium	15	22	23	30	15	7	9	16	13*
France	20	36	20	11	6	3	2	8	3*
Ireland	296	139	184	477	319	388	333	434	561*
Netherlands	-	-	-	-	-	-	-	-	-
UK (England & Wales) ¹	421	344	419	559	521	446	593	355	-
UK (Isle of Man)	-	-	-	-	1	1	-	-	-
UK (N. Ireland)	...	...	...	...	...	...	...	...	...
UK (Scotland)	9	6	9	1	17	1	2	-	-
United Kingdom									236*
Total	761	547	655	1 078	879	846	939	813	813*
ICES landings	1 217	666	633	886	786	581	679	446	343*

*Preliminary.

¹Since 1989 Northern Ireland included with England and Wales.

n/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).

1

Year	Relative recruitment		Relative SSB		Relative TSB		Relative mean Z 2–3	
	estimates	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

ECOREGION Celtic Sea and West of Scotland

STOCK Haddock in Divisions VIIb–k

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.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✗	✗	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined

SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	? Undefined

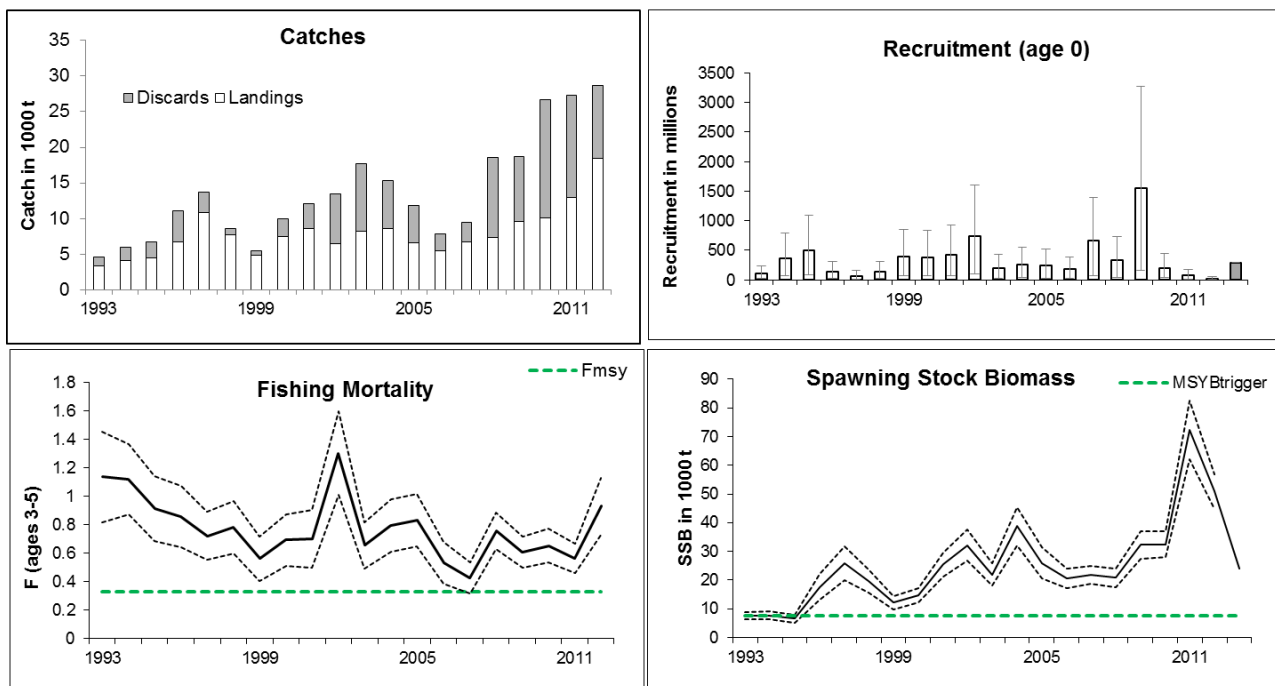
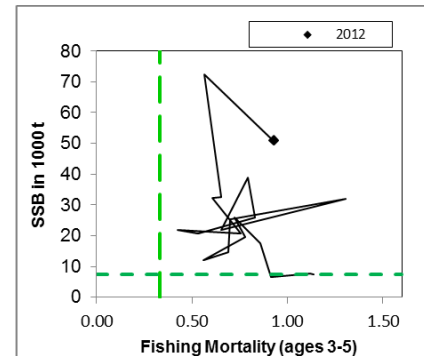


Figure 5.4.11.1 Haddock in Divisions VIIb–k. Summary of stock assessment (weights in thousand tonnes). Predicted recruitment values are shaded; Recruitment, fishing mortality, and SSB: dotted lines 1 standard error. Top right: SSB/F for the time-series used in the assessment.

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 F_{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.

Management plans

No specific management objectives are known to ICES.

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.

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 kt, of which 64% were landings (all fleets combined) and 36% discards.
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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..

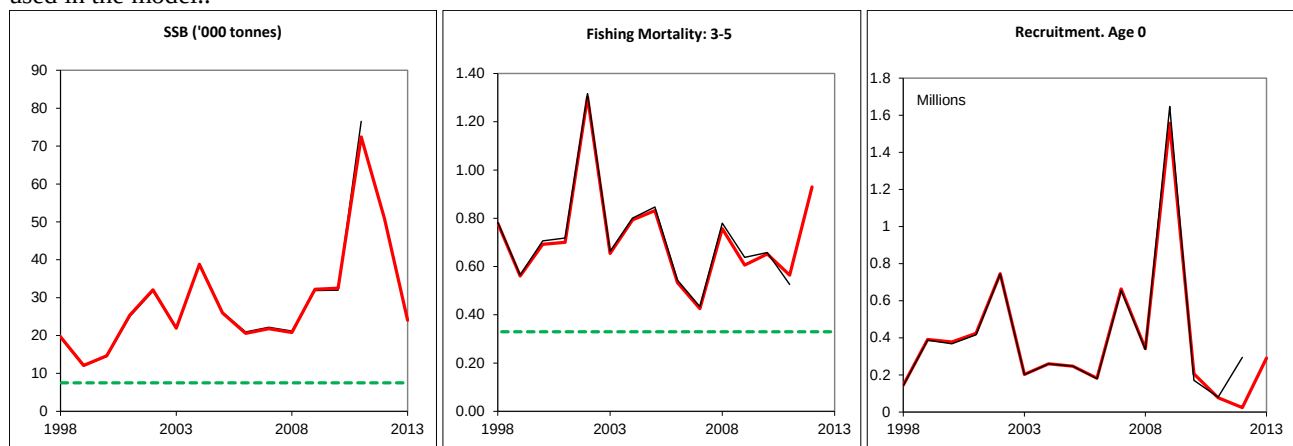


Figure 5.4.11.2 Haddock in Divisions VIIb–k. Historical assessment results. Final-year estimates are shown in red.

Scientific basis

Assessment type	ASAP (Age-Structured Assessment Programme; NOAA toolbox).
Stock data category	Category 1.
Input data	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 and bycatch	Discards have been included in the assessment since 1995 for the Irish OTB fleet, and since 2008 for the French fleet.
Indicators	None.
Other information	This stock was benchmarked in 2012 (ICES, 2012).
Working group report	WGCSE (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK Haddock in Divisions VIIb–k

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B_{trigger}	7500 t.	B_{loss}
	F_{MSY}	0.33	$F_{\text{max}}(\text{landings: } 0.28 + \text{discards: } 0.05)$.
Precautionary Approach	B_{lim}	Undefined.	
	B_{pa}	Undefined.	
	F_{lim}	Undefined.	
	F_{pa}	Undefined.	

(Unchanged since 2012)

Outlook for 2014

Basis: $F(2013) = F_{\text{sq}}(2010\text{--}2012) = 0.72$; $\text{SSB}(2014) = 12.6$; $R(2013) = 290.479$ million = $\text{GM}_{1993\text{--}2010}$; Landings (2013) = 10 061; Catches (2013) = 11 621.

Rationale	Catch (2014)	Land. (2014)	Disc. (2014)	Basis	F Total (2014)	F land ¹⁾ (2014)	F disc. ¹⁾ (2014)	SSB ⁵⁾ (2015)	%SSB ⁵⁾ change ²⁾	%TAC change ³⁾
MSY approach	4 521	3 098	1 423	$F_{\text{MSY}} = 0.33$	0.33	0.28	0.05	20 218	+60%	−78%
MSY transition	5 281	3 602	1 679	$(F_{2010} \times 0.2) + (F_{\text{MSY}} \times 0.8)$	0.39	0.34	0.06	19 398	+54%	−75%
Zero catch	0	0	0	$F = 0$	0	0	0	25 140	+99%	−100%
Other options	0	0	0	$F_{2013} \times 0.8$	0.57	0.49	0.09	17 329	+37%	−66%
	7 202	4 852	2 350	$F_{2013} \times 0.9$	0.64	0.55	0.1	16 576	+31%	−63%
	7 907	5 300	2 607	F_{2013}	0.72	0.61	0.11	15 863	+26%	−60%
	8 576	5 720	2 856	$F_{2013} \times 1.1$	0.79	0.67	0.12	15 187	+20%	−57%
	21 385	12 026	9 359	−15% TAC	3.99	3.39	0.59	3 077	−76%	−15%
		13 172		Stable TAC	$\text{inf}^{(4)}$					
		15 148		+15% TAC	$\text{inf}^{(4)}$					

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.

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 20 218 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 $(F_{2010} \times 0.2) + (F_{\text{MSY}} \times 0.8)$ (higher than the F_{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.

Additional considerations

Given the weak incoming recruitment the SSB can only be maintained above $MSY B_{trigger}$ 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 F_{MSY} proxy = F_{max} . Current F is above F_{max} . B_{loss} has been proposed as $MSY B_{trigger}$. Current SSB is more than six times as high as B_{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.

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 $MSY B_{trigger}$.

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.

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.

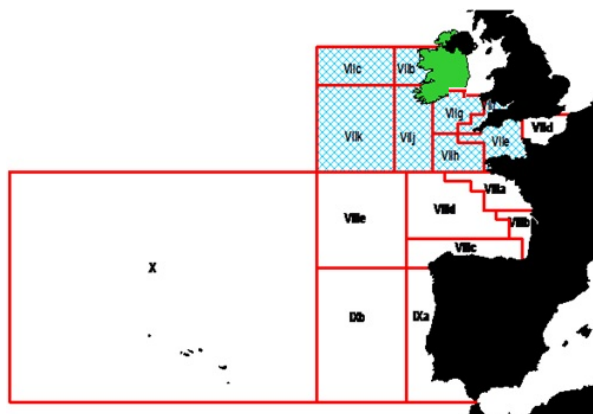


Figure 5.4.11.3 Haddock in Divisions VIIb–k. The red boxes are the TAC area (Divisions VIIb–k and Subareas VII, IX, and X), the blue shading the assessment area (Divisions VIIb–k).

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.

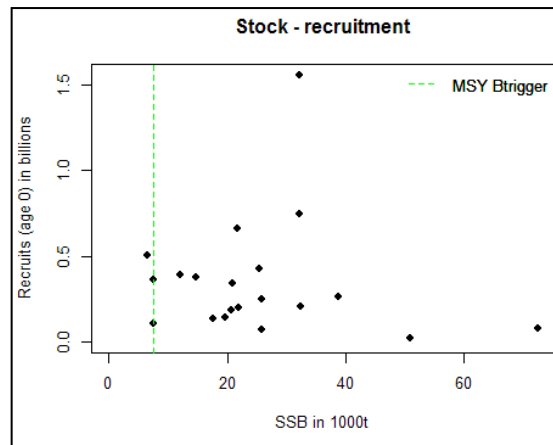
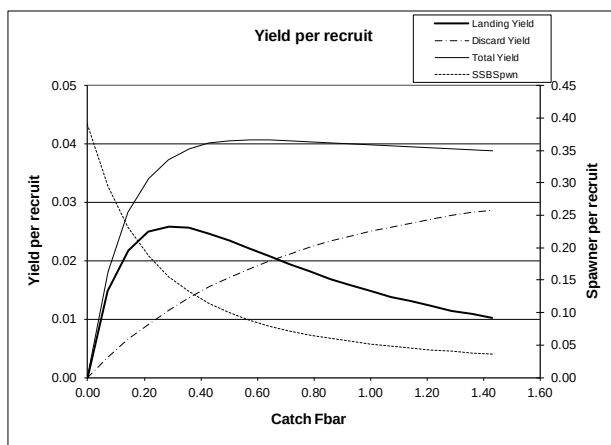


Figure 5.4.11.4 Haddock in Divisions VIIb–k. Yield-per-recruit (left panel) and stock–recruit relationship (right panel).

Table 5.4.11.1

Haddock in Divisions VIIb–k. Advice, management, landings, discards, and catch. Landings and catches were updated following the re-assignment of rectangles 33E2 and 33E3 from Division VIIa to Division VIIg.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings	Discards	ICES catch
1987	Not dealt with			3.0	2.6	n/a	2.6
1988	Not dealt with			4.0	3.6	n/a	3.6
1989	Not dealt with			4.2	3.2	n/a	3.2
1990	Not dealt with			2.9	2.0	n/a	2.0
1991	Not dealt with			2.9	2.3	n/a	2.3
1992	Not dealt with			2.9	2.7	n/a	2.7
1993	Not dealt with			3.4	3.3	1.2	4.6
1994	Not dealt with			4.1	4.1	1.9	6.0
1995	Not dealt with		6 ¹	4.5	4.5	2.2	6.7
1996	Not dealt with		7 ³	6.7	6.8	4.3	11.1
1997	Not dealt with		14	10.3	10.8	2.9	13.7
1998	Not dealt with		20	7.4	7.7	0.9	8.6
1999	Not dealt with		22 ⁴	5.2	4.9	0.6	5.5
2000	No expansion of catches		16.6 ⁴	6.7	7.4	2.5	9.9
2001	No expansion of catches		12 ⁴	9.7	8.6	3.4	12.1
2002	No expansion of catches	8.0	9.3 ⁴	7.1	6.4	7.1	13.5
2003	No expansion of catches	7.2	8.185 ⁴	8.2	8.2	9.5	17.7
2004	No increase in F	-	9.600 ⁴	8.5	8.6	6.7	15.4
2005	No increase in effort	-	11.520 ⁴	6.9	6.6	5.2	11.8
2006	No increase in effort	-	11.520 ⁴	5.6	5.4	2.5	7.9
2007	No increase in effort	-	11.520 ⁴	6.6	6.7	2.7	9.5
2008	Same advice as last year	-	11.579 ⁴	6.2	7.3	11.2	18.5
2009	Same advice as last year	-	11.579 ²	9.3	9.6	9.1	18.6
2010	Same advice as last year	-	11.579 ²	10.0	10.1	16.5	26.7
2011	See scenarios	-	13.316 ²	13.4	12.9	14.4	27.3
2012	No increase in catch and technical measures to reduce discards rates	-	16.645 ²	17.3	18.5	10.2	28.7
2013	MSY transition	< 9.5	14.148 ²	3.1			
2014	MSY transition	5.281 ⁵					

Weights in thousand tonnes.

¹Applies to Subareas VII, VIII, IX, and X.

²Applies to Divisions VIIb–k and Subareas VIII, IX, and X.

³Increased in-year to 14 000 t.

⁴Includes separate Division VIIa allocation.

⁵This 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.

n/a = not available.

Table 5.4.11.2 Haddock in Divisions VIIb–k. Official landings, ICES landings, discards, and catches (tonnes).

Year	Official landings						Un-allocated	Used by WG		
	BEL	FRA	IRL	UK	Others	Total		Landings	Discards	Catch
1993	51	1839	1262	256	0	3408	−60	3348	1208	4557
1994	123	2788	908	240	17	4076	55	4131	1886	6017
1995	189	2964	966	266	83	4468	2	4470	2218	6688
1996	133	4527	1468	439	86	6653	103	6756	4309	11064
1997	246	6581	2789	569	85	10270	557	10827	2883	13710
1998	142	3674	2788	444	312	7360	308	7668	934	8603
1999	51	2725	2034	278	159	5247	−365	4882	586	5468
2000	90	3088	3066	289	123	6656	755	7411	2503	9913
2001	165	4842	3608	422	665	9702	−1070	8632	3418	12050
2002	132	4348	2188	315	106	7089	−686	6403	7073	13476
2003	118	5781	1867	393	82	8241	−31	8210	9456	17666
2004	136	6130	1715	313	159	8453	181	8634	6750	15384
2005	167	4174	2037	292	197	6867	−277	6590	5191	11781
2006	99	3190	1875	274	209	5647	−239	5408	2484	7893
2007	119	4142	1930	386	52	6629	103	6732	2739	9471
2008	108	3639	1800	566	121	6234	1100	7334	11187	18521
2009	131	5429	2983	716	48	9307	254	9561	9080	18641
2010	170	6240	2609	853	128	10000	135	10135	16547	26682
2011	211	8070	3322	1658	129	13390	−492	12898	14378	27276
2012 ¹	232	11793	3307	1901	62	17294	1206	18501	10191	28691

¹ Preliminary.**Table 5.4.11.3** Haddock in Divisions VIIb–k. Summary of stock assessment (weights in tonnes).

Year	Landings	Discards	Catch	Predict. Catch	TSB	SSB	CV	Fbar ages 3–5	CV	Recruits (age 0)	CV
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*	-
Avg ₁₀₋₁₂	13844	13705	27550	-	-	51927	-	0.715	-	-	-

*GM 1993–2010.

ECOREGION Celtic Seas
STOCK Herring in Division VIa (North)

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 28 067 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.

Stock status

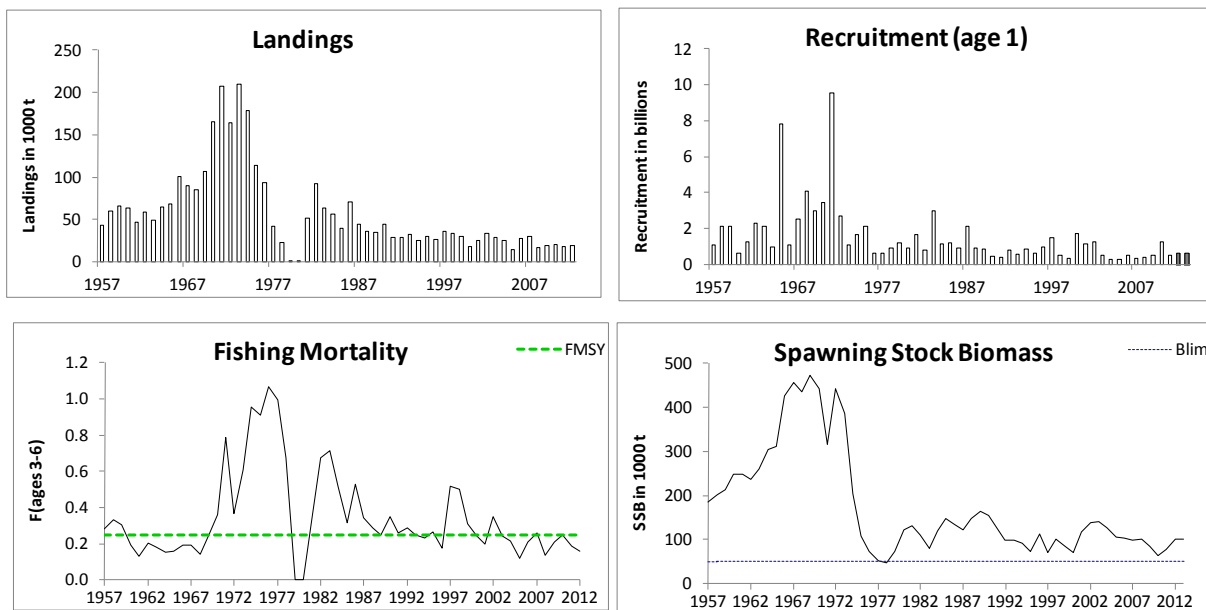
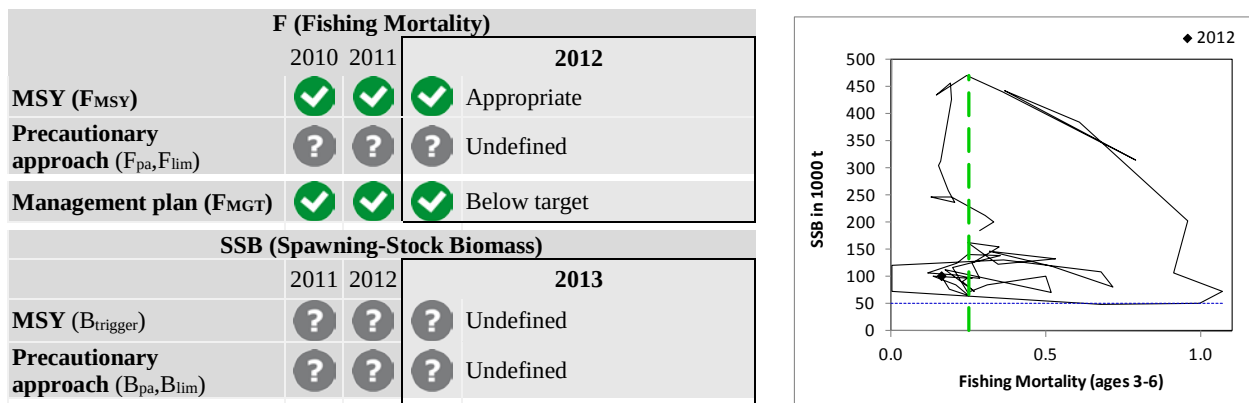


Figure 5.4.12.1 Herring in Division VIa (North). Summary of stock assessment (weights in thousand tonnes). Estimates are shaded. Top right: SSB and F over the time-series used in the assessment.

Since 1977, the stock has been fluctuating at a considerable lower biomass than in the previous 20 years. Fishing mortality has fluctuated around F_{MSY} in recent years, and recruitment is lower than in the historical period.

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.

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.

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.

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) = 18 516 t (42% pelagic freezer trawlers and 58% pelagic RSW trawlers).

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.

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.

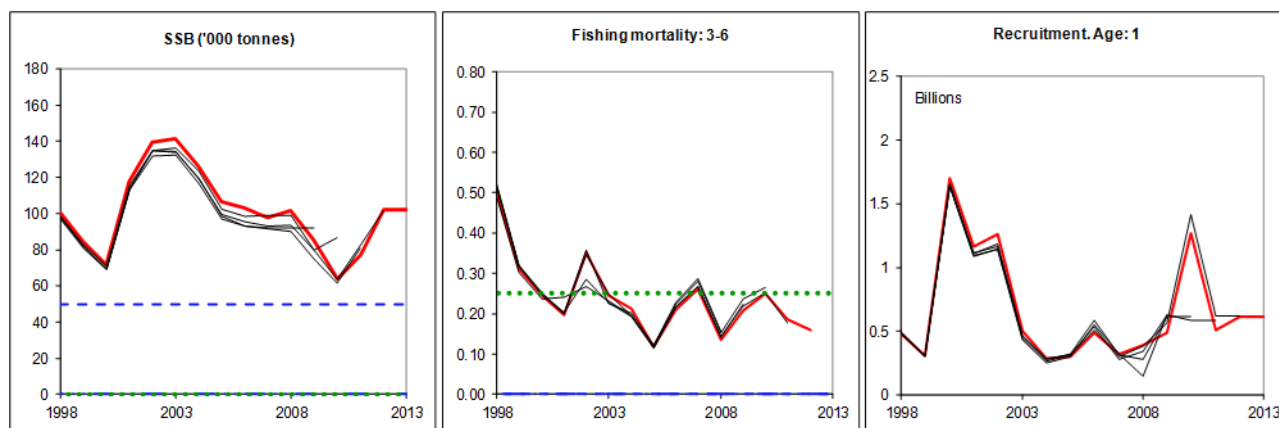


Figure 5.4.12.2 Herring in Division VIa North. Historical assessment results (final-year recruitment estimates not included).

Scientific basis

Assessment type	Age-based analytical (FLICA).
Stock data category	Category 1.
Input data	Commercial catches (international landings, weights, ages and length frequencies from catch sampling); one acoustic survey index (MSHAS_N); weights in the stock 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).
Discards and bycatch	Discards are not included in the assessment and are considered to be low.
Indicators	None.
Other information	Last informal full range of model settings tested in 2009. A benchmark is planned for 2015.

ECOREGION Celtic Seas
STOCK Herring in Division VIa (North)

Reference points

	Type	Value	Technical basis
Management plan	SSB _{MGT}	Not defined.	
	F _{MGT}	F ₃₋₆ = 0.25.	If SSB in TAC year $\geq 75\,000$ t ((EC) 1300/2008, Art. 3).
		F ₃₋₆ = 0.20.	If SSB in TAC year < 75 000 t and $\geq 50\,000$ t ((EC) 1300/2008, Art. 3).
		F ₃₋₆ = 0.00.	If SSB in TAC year < 50 000 t ((EC) 1300/2008, Art. 3).
MSY Approach	MSY B _{trigger}	Not defined.	
	F _{MSY}	0.25	Simulations under different productivity regimes (Simmonds and Keltz, 2007; ICES, 2010).
Precautionary approach	B _{lim}	50 000 t.	Lowest reliable estimate of SSB.
	B _{pa}	Not defined.	
	F _{lim}	Not defined.	
	F _{pa}	Not defined.	

(unchanged since: 2010)

Outlook for 2014

Basis: F (2013)¹ = F_{sq} (avg 2010–2012) = 0.20, SSB (2013)² = 101 920; catch (2013) = 22 057; R (2012–2014) = GM (1991–2011) = 616 million.

Rationale	Catch (2014)	SSB (2014) ²	Basis	F (2014)	SSB (2015)	SSB change ³	TAC change ⁴
Management plan	28 067	100 984	F _{sq} × 1.26	0.25	97 875	–3%	2%
MSY approach	28 067	100 984	F _{MSY}	0.25	97 875	–3%	2%
Zero catch	0	117 927	F = 0	0	138 454	+17%	–100%
Other options	21 984	104 753	F ₂₀₁₂ × 0.96	0.19	106 120	+1%	–20%
	27 480	101 358	F ₂₀₁₂ × 1.23	0.24	98 674	–3%	0%
	32 976	97 895	F ₂₀₁₂ × 1.51	0.30	91 441	–7%	+20%

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.

Management plan

The EU management plan (Council Regulation (EC) 1300/2008) is based on the following rule.

SSB in the year of the TAC	Fishing mortality	Maximum TAC variation
SSB > 75 000 t	F = 0.25	20%
SSB < 75 000 t	F = 0.2	20%
SSB < 62 500 t	F = 0.2	25%
SSB < 50 000 t (B _{lim})	F = 0	-

Following the agreed management plan implies a TAC of 28 067 t in 2014 which is equivalent to a TAC increase of 2%. SSB in 2014 is estimated to be above 75 000 t implying an F target of 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.

MSY approach

Following the ICES MSY approach implies a fishing mortality at $F_{MSY} = 0.25$, resulting in catches of no more than 28 067 t in 2014. This is expected to lead to an SSB of 100 984 t in 2014. As no MSY $B_{trigger}$ has been identified for this stock, the ICES MSY approach has been applied with F_{MSY} without consideration of SSB in relation to MSY $B_{trigger}$. Discards are considered to be low and all catches are therefore assumed to be landed.

Precautionary approach

The SSB is well above B_{lim} . In the short term, SSB is expected to stay above B_{lim} . F_{pa} is undefined, but the current F is below F_{MSY} .

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.

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.

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.

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.

Comparison with previous assessment and advice

Compared to the assessment in 2012, SSB(2011) was revised downwards by 6% and F (2011) upwards by 5%.

The basis for the advice (the agreed Division VIa (North) herring management plan) is the same as last year.

Sources

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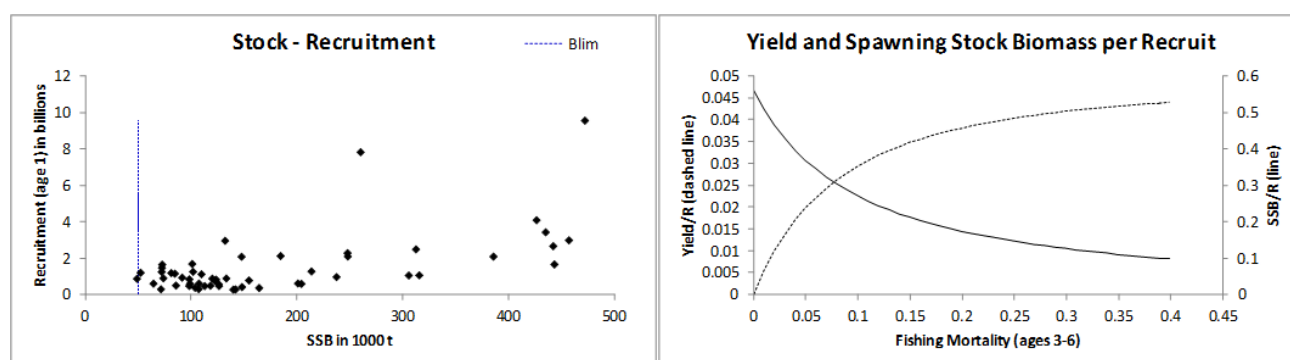


Figure 5.4.12.3 Herring in Division VIa North. Stock–recruitment relationship and yield- and SSB-per-recruit plot.

Table 5.4.12.1 Herring in Division VIa (North). ICES advice, management, and catches.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Disc. slip.	ICES atch ¹
1987	Reduce F to $F_{0.1}$ / <i>status quo</i> F	38–55	49.7		44
1988	TAC	46	49.8		36
1989	TAC	58	58	1.6	34
1990	TAC	61	75	1.3	45
1991	TAC	57	62	1.2	29
1992	TAC	62	62	0.2	29
1993	Catch at <i>status quo</i> F	54–58	62	0.8	32
1994	Catch at <i>status quo</i> F	50–60	62	0.7	24
1995	No specific advice	60 ²	77		30
1996	No advice because of misreporting	-	83.57		26
1997	Catch at <i>status quo</i> F		83.57	0.1	33 ³
1998	Catch at <i>status quo</i> F	59	80.37	0.9	33
1999	Average catches, 1991–1996	28	68		30
2000	Average catches, 1991–1996	28	42		18 ⁴
2001	Average catches, 1991–1999	30	36.36		24 ⁴
2002	Average catches, 1991–1999	30	36.36		33 ⁴
2003	Catch at <i>status quo</i> F	30	30		28 ⁴
2004	F=0.30	41	30	0.1	25 ⁴
2005	Catch at <i>status quo</i> F	30	30.1	0.8	14 ⁴
2006	Catch at <i>status quo</i> F	34	34	0.2	27
2007	<i>Status quo</i> TAC advice	34	34		30
2008	F = 0.2 (proposed management plan)	15	27.2		16
2009	F = 0.2 (proposed management plan)	13	21.76		19
2010	F = 0.25 (management plan)	24	24.42	0.1	20
2011	See scenarios	22.48	22.48		18
2012	F = 0.25 (management plan)	< 22.9	22.0		19
2013	Management plan	< 27.48	27.48		
2014	Management plan	< 28.067			

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.

Country	1989	1990	1991	1992	1993	1994	1995	1996
Denmark								
Faroes		326	482			274		2 297
France	1 342	1 287	1 168	119	818	5 087	3 672	7 836
Germany	4 290	7 096	6 450	5 640	4 693	7 938	3 733	9 721
Ireland	8 000	10 000	8 000	7 985	8 236	6 093	3 548	9 396
Netherlands	5 860	7 693	7 979	8 000	6 132	8 183	7 808	6 223
Norway		1 607	3 318	2 389	7 447	30 676	4 840	46 639
UK	29 874	38 253	32 628	32 730	32 602	-4 287	42 661	-17 753
Unallocated	2 123	2 397	-10 597	-5 485	-3 753	700	-4 541	
Discards	1 550	1 300	1 180	200				64 359
Total	53 039	69 959	50 608	51 578	56 175	54 664	61 271	-38 254
Area-Misreported	-19 013	-25 266	-22 079	-22 593	-24 397	-30 234	-32 146	26 105
ICES Estimate	34 026	44 693	28 529	28 985	31 778	24 430	29 575	1 997

Country	1997	1998	1999	2000	2001	2002	2003	2004
Faroes						800	400	228
France	3 093	1 903	463	870	760	1 340	1 370	625
Germany	8 873	8 253	6 752	4 615	3 944	3 810	2 935	1 046
Ireland	1 875	11 199	7 915	4 841	4 311	4 239	3 581	1 894
Netherlands	9 873	8 483	7 244	4 647	4 534	4 612	3 609	8 232
Norway	4 962	5 317	2 695					
UK	44 273	42 302	36 446	22 816	21 862	20 604	16 947	17 706
Unallocated	-8 015	-11 748	-8 155			878	-7	
Discards	62	90						123
Total	64 995	65 799	61 514	37 789	35 411	36 283	28 835	29 854
Area-Misreported	-29 766	-32 446	-23 623	-19 467	-11 132	-8 735	-3 581	-7 218
ICES Estimate	35 233	33 353	29 736	18 322	24 556	32 914	28 081	25 021

Country	2005	2006	2007	2008	2009	2010	2011	2012
Faroes	1 810	570	484	927	1 544	70		
France	613	701	703	564	1 049	511	504	244
Germany	2 691	3 152	1 749	2 526	27	3 583	3 518	1 829
Ireland	2 880	4 352	5 129	3 103	1 935	2 728	3 956	3 451
Netherlands	5 132	7 008	8 052	4 133	5 675	3 600	1 684	3 523
Norway								
UK	17 494	18 284	17 618	13 963	11 076	12 018	11 696	12 249
Unallocated								
Discards	772	163				95		
Total	31 392	34 230	33 735	25 216	21 306	22 510	21 358	
Area-Misreported	-17 263	-6 884	-4 119	-9 162	-2 798	-2 728	-3 599	-2 780
ICES Estimate	14 129	27 346	29 616	16 054	18 508	19 877	17 759	18 516

Table 5.4.12.3

Herring in Division VIa (North). Summary of stock assessment.

Year	Recruitment Age 1 Thousands)	TSB Tonnes	SSB	Fbar (Ages 3–6)	Landings Tonnes
1957	1 088 006	405 110	184 234	0.2834	43 438
1958	2 101 199	495 444	200 601	0.3305	59 669
1959	2 136 613	532 906	213 380	0.3028	65 221
1960	626 496	427 963	247 465	0.1948	63 759
1961	1 285 229	435 271	247 715	0.1294	46 353
1962	2 293 268	540 413	237 068	0.2059	58 195
1963	2 110 018	572 370	259 863	0.1833	49 030
1964	978 157	522 945	305 370	0.1535	64 234
1965	7 839 269	1 115 364	312 179	0.1592	68 669
1966	1 066 330	848 510	426 183	0.1932	100 619
1967	2 498 686	829 562	456 838	0.1903	90 400
1968	4 100 166	952 511	434 826	0.1435	84 614
1969	2 998 773	980 072	471 939	0.2419	107 170
1970	3 439 855	1 000 107	441 946	0.3587	165 930
1971	9 570 759	1 514 872	315 271	0.7883	207 167
1972	2 675 642	1 115 411	443 058	0.3651	164 756
1973	1 074 227	802 001	385 421	0.6056	210 270
1974	1 672 447	576 306	203 879	0.9572	178 160
1975	2 102 769	434 633	107 030	0.9101	114 001
1976	606 435	263 563	73 358	1.0693	93 642
1977	620 881	162 765	51 826	0.995	41 341
1978	911 556	170 356	48 384	0.6777	22 156
1979	1 216 825	215 739	72 243	0.0007	60
1980	885 161	252 021	121 982	0.0004	306
1981	1 660 162	364 259	131 719	0.3632	51 420
1982	769 613	305 358	109 385	0.6767	92 360
1983	2 971 919	426 039	80 836	0.7156	63 523
1984	1 132 803	352 884	119 689	0.518	56 012
1985	1 200 030	348 143	147 291	0.3164	39 142
1986	891 147	314 164	132 897	0.5284	70 764
1987	2 096 144	379 992	123 159	0.3454	44 360
1988	902 230	334 343	147 692	0.2855	35 591
1989	838 396	317 626	163 914	0.2474	34 026
1990	431 693	269 463	154 325	0.3485	44 693
1991	378 816	207 886	125 735	0.2593	28 529
1992	792 035	192 409	97 898	0.2864	28 985
1993	580 238	182 555	98 523	0.2492	31 778
1994	852 565	177 308	91 108	0.23	24 430
1995	606 827	156 988	72 006	0.2673	29 575
1996	945 694	194 589	112 492	0.1727	26 105
1997	1 478 749	207 795	71 103	0.5168	35 233
1998	483 440	186 104	100 631	0.5001	33 353
1999	309 652	143 978	84 196	0.3107	29 736
2000	1 699 208	205 590	71 766	0.2453	18 322
2001	1 163 240	231 314	117 823	0.1969	24 556
2002	1 261 566	271 054	139 460	0.3503	32 914
2003	500 703	229 446	141 591	0.2452	28 081
2004	289 252	180 050	125 948	0.2129	25 021
2005	299 687	150 525	106 730	0.1176	14 129
2006	487 235	168 782	103 289	0.2112	27 346
2007	321 578	151 578	97 849	0.2609	29 616
2008	393 522	143 883	101 432	0.1363	16 054
2009	490 750	164 109	85 295	0.2072	18 508
2010	1 267 874	167 515	64 021	0.2507	19 877
2011	513 121	160 497	76 985	0.187	17 759
2012*	616 136	197 434	102 008	0.1606	18 516
2013*	616 136		101 920		
Average	1 493 700				

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 75 000 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 75 000 tonnes but equal or superior to 50 000 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 62 500 tonnes but less than 75 000 tonnes;*
 - (b) *25% if the spawning stock biomass level is estimated to be equal or superior to 50 000 tonnes but less than 62 500 tonnes.*
4. *When STECF considers that the spawning stock biomass level will be less than 50 000 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.*

ECOREGION Celtic Seas
STOCK Herring in Divisions VIa (South) and VIIb,c

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.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✗	✗	? Unknown
Precautionary approach (F_{pa}, F_{lim})	✗	✗	? Unknown
SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	?	?	? Undefined
Precautionary approach (B_{pa}, B_{lim})	✗	✗	✗ Reduced reproductive capacity

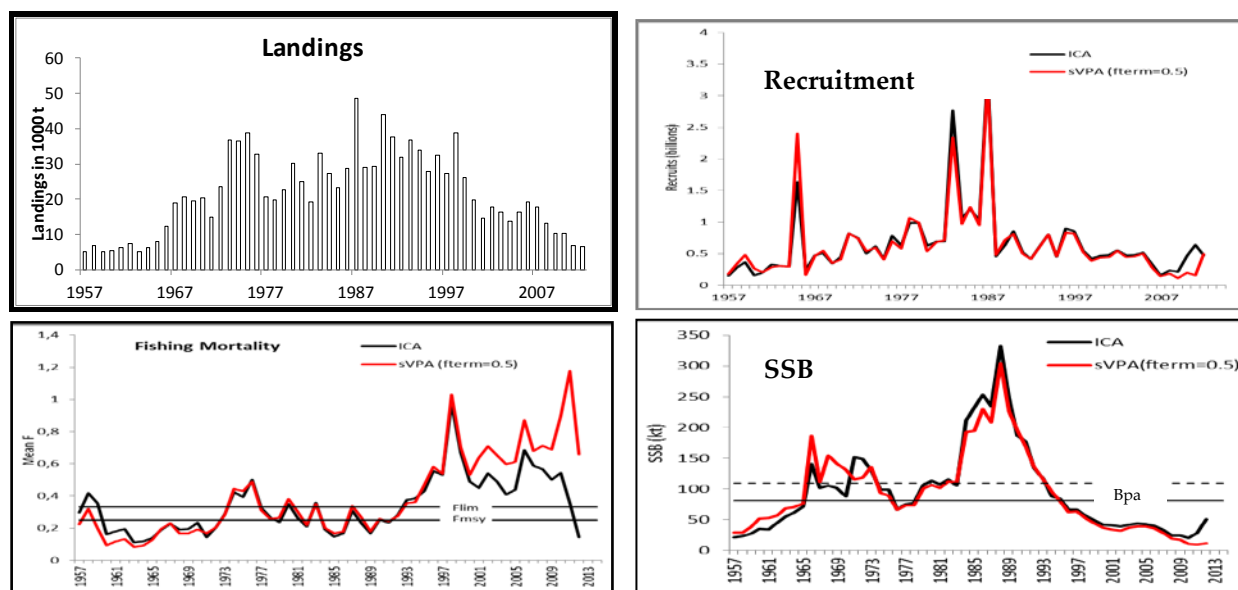


Figure 5.4.13.1 Herring in Divisions VIa (South) and VIIb,c. Results of the exploratory assessments using FLICA and sVPA.

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 in 1987. 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).

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.

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.

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.

Catch distribution	Total landings (2012) = 6571 t (100% pelagic trawls).
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Effects of the fisheries on the ecosystem

The fisheries are considered relatively clean, with little bycatch of other fish and cetaceans.

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

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); Malin Shelf Acoustic Survey data (MSHAS), annual weights in the stock, fixed maturity ogive, natural mortality assumed to be constant.
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).

ECOREGION Celtic Seas
STOCK Herring in Divisions VIa (South) and VIIb,c

Reference points

	Type	Value	Technical basis
MSY Approach	MSY $B_{trigger}$	Undefined.	Under development.
	F_{MSY}	0.25	Stochastic simulations on segmented regression stock–recruitment relationship, under different productivity regimes.
Precautionary approach	B_{lim}	81 000 t.	Lowest reliable estimate.
	B_{pa}	110 000 t.	1.4 B_{lim}
	F_{lim}	0.33	F_{loss}
	F_{pa}	Undefined.	

(unchanged since 2011)

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.

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.

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.

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.

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.

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.

Comparison with previous assessment and advice

The basis of the advice is the same as last year, precautionary considerations for data-limited stocks.

Sources

- Groot, S. J. de. 1979. The potential environmental impact of marine gravel extraction in the North Sea. *Ocean Management*, 5: 233–249.
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- ICES. 2013. Report of the Herring Assessment Working Group for the Area South of 62°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.

Year	ICES Advice / Single-stock exploitation boundaries	Predicted catch corresp. to advice	Agreed TAC	Official landings	Disc. slip.	ICES catch
1987	TAC	18	17	17	-	49
1988	TAC depending on whether 1987 TAC is taken	11–18	14	15	-	29
1989	TAC	15	20	21	1.0	29
1990	TAC depending on whether 1989 TAC is taken	25–27	27.5	28	2.5	44
1991	TAC	< 26	27.5	23	3.4	38
1992	TAC (including discards)	29	28	27	0.1	32
1993	Precautionary TAC (including discards)	29	28	30	0.3	37
1994	Precautionary TAC	28	28	27	0.7	34
1995	Precautionary TAC (including discards)	36	28	27	-	28
1996	If required, precautionary TAC	34	28	25	-	33
1997	Catches below 25	< 25	28	28	0.1	27
1998	Catches below 25	< 25	28	28	-	39
1999	F 70% of F(97)	19	21	18	-	26
2000	F 40% of F(98) = Proposed F_{pa}	14	14	10	-	20
2001	F 40% of F(99) F = 0.2	14	14	13	-	15
2002	No increase in catches	14	14	14	-	18
2003	No increase in catches	14	14	14	-	17
2004	No increase in catches	14	14	11	-	14
2005	No increase in catches	14	14	13	-	16
2006	No increase in catches	14	15.4	15.2	-	19
2007	No fishing without a rebuilding plan*	-	13.8	12.6	-	18
2008	No fishing without a rebuilding plan*	-	11.6	10.2	-	13
2009	Same advice as last year	-	9.3	8.5	-	10
2010	Same advice as last year	-	7.4	7.5	-	10
2011	See scenarios	-	4.4	4.2	-	6.9
2012	Reduce catch	-	4.2	3.7		6.5
2013	No catches without a rebuilding plan	0				
2014	No catches without a rebuilding plan	0				

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).

Country	1989	1990	1991	1992	1993	1994	1995	1996
France	-	+	-	-	-	-	-	-
Germany, Fed.Rep.	-	-	-	250	-	-	11	-
Ireland	18 200	25 000	22 500	26 000	27 600	24 400	25 450	23 800
Netherlands	2 900	2 533	600	900	2 500	2 500	1 207	1 800
UK (N.Ireland)	-	80	-	-	-	-	-	-
UK (England + Wales)	-	-	-	-	-	50	24	-
UK Scotland	+	-	+	-	200	-	-	-
Total landings	21 100	27 613	23 100	27 150	30 300	26 950	26 692	25 600
Unallocated/ area misreported	7 100	13 826	11 200	4 600	6 250	6 250	1 100	6 900
Discards	1 000	2 530	3 400	100	250	700	-	-
ICES catch	29 200	43 969	37 700	31 850	36 800	33 900	27 792	32 500

Country	1997	1998	1999	2000	2001	2002	2003	2004
France	-	-	-	-	-	515	-	-
Germany, Fed.Rep.	-	-	-	-	-	-	-	-
Ireland	24 400	25 200	16 325	10 164	11 278	13 072	12 921	10 950
Netherlands	3 400	2 500	1 868	1 234	2 088	366	-	64
UK (N.Ireland)	-	-	-	-	-	-	-	-
UK (England + Wales)	-	-	-	-	-	-	-	-
UK Scotland	-	-	-	-	-	-	-	-
Total landings	27 800	27 700	18 193	11 398	13 366	13 953	12 921	11 014
Area misreported	-700	11 200	7 916	8 448	1 390	3 873	3 581	2 813
Unallocated								
Discards	50		-	-	-	-	-	-
ICES catch	27 150	38 900	26 109	19 846	14 756	17 826	16 502	13 827

Country	2005	2006	2007	2008	2009	2010	2011	2012
France	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	-	-	-	-	-	-	-	-
Ireland	13 351	14 840	12 662	10 237	8 533	7 513	4 247	3 791
Netherlands	-	353	13	-	-	-	-	-
UK (N.Ireland)	-	-	-	-	-	-	-	-
UK (England + Wales)	-	-	-	-	-	-	-	-
UK Scotland	-	6	-	-		-	-	-
Total landings	13 351	15 199	12 675	10 237	8 533	7 513	4 247	3 791
Area misreported	2 880	4 353	5 129	3 103	1 935	2 728	2 672	2 780
Unallocated		-353	-13	-	-	-	-	-
Discards	-	-	-	-	-	-	-	-
ICES catch	16 231	19 193	17 791	13 340	10 468	10 241	6 919	6 571

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).

Year	Recruitment	TSB	SSB	Fbar	Landings tonnes	Landings SOP
1957	149976	47132	21978	0.2945	5070	10 000
1958	280587	66075	23597	0.4187	6825	0.9996
1959	363725	79717	27248	0.3545	5226	10 002
1960	157083	64503	35478	0.1632	5401	0.9999
1961	201981	67403	34443	0.1783	6182	10 000
1962	330113	95449	44642	0.1939	7399	0.9995
1963	308011	102917	55090	0.1126	5059	10 005
1964	296615	109417	61422	0.1166	6169	0.9998
1965	1636705	282416	71667	0.1378	8016	0.9993
1966	233894	201674	140360	0.1878	12215	10 002
1967	474429	184590	101930	0.228	18881	10 003
1968	510336	197280	106054	0.1911	20731	0.9999
1969	346469	171715	101335	0.1945	19607	0.9999
1970	444323	173065	88483	0.2345	20306	11 150
1971	818663	278807	151341	0.1443	15044	11 491
1972	745054	277791	148753	0.202	23474	11 146
1973	499296	236556	131017	0.2877	36719	0.9834
1974	616217	216485	98894	0.4249	36589	10 243
1975	412893	190157	98716	0.3938	38764	0.8900
1976	782419	194629	66881	0.502	32767	0.9547
1977	635472	179740	75549	0.326	20567	0.9275
1978	987171	221707	76821	0.2649	19715	0.9842
1979	986530	258820	107014	0.2363	22608	0.9379
1980	622241	229870	113824	0.3506	30124	10 379
1981	686907	223043	107468	0.2642	24922	0.9698
1982	697142	229291	115502	0.2082	19209	0.9710
1983	2770018	478551	105254	0.3592	32988	0.9957
1984	1057929	397010	211256	0.1929	27450	10 320
1985	1210194	405464	232538	0.148	23343	10 154
1986	1020234	409686	253418	0.1662	28785	10 168
1987	3372908	642272	235164	0.3088	48600	10 538
1988	461544	461558	332418	0.2289	29100	10 008
1989	642258	391640	248469	0.1669	29210	0.9988
1990	853240	338571	187241	0.2499	43969	0.9991
1991	524697	282428	177468	0.2324	37700	10 031
1992	413360	217124	133623	0.2795	31856	10 052
1993	623830	234789	116112	0.3759	36763	0.9939
1994	806286	206897	88239	0.3837	33908	10 020
1995	448764	158766	83953	0.4294	27792	0.9501
1996	896472	179027	66009	0.5552	32534	10 045
1997	859204	178775	66286	0.5297	27225	0.9985
1998	544263	148271	56196	0.974	38895	10 013
1999	423410	121646	48730	0.6693	26109	0.9982
2000	469847	110852	42333	0.4898	19846	0.9989
2001	479829	102546	41313	0.4496	14756	10 013
2002	550071	109779	39148	0.5383	17826	10 008
2003	472256	106161	42223	0.4886	16502	0.9979
2004	480194	100689	44471	0.4099	13727	0.9994
2005	518674	111476	43196	0.4383	16231	10 013
2006	331451	92191	40425	0.6859	19193	0.9989
2007	157861	69024	32897	0.5869	17791	10 000
2008	234132	60845	24400	0.5673	13340	10 001
2009	217811	51398	24177	0.5011	10468	10 014
2010	463138	73984	20734	0.5423	10241	0.9992
2011	640329	90674	27994	0.3554	6919	10 003
2012	473928	1814346	50924	0.1437	6571	10 004

Table 5.4.13.4

Herring in Divisions VIaS and VIIb,c. Summary of the exploratory assessment (SVPA).

Year	Recruitment	SSB	Landings	FBar
1957	175035	29604	5070	0.2237
1958	334545	29246	6825	0.3183
1959	483127	38618	5226	0.2011
1960	262908	51660	5401	0.0943
1961	207384	52632	6182	0.1181
1962	286854	56939	7399	0.1323
1963	311539	68642	5059	0.0838
1964	295696	70265	6169	0.0894
1965	2398901	76202	8016	0.1252
1966	165998	186353	12215	0.1954
1967	467097	111919	18881	0.2289
1968	544310	154698	20731	0.1685
1969	350895	142235	19607	0.1685
1970	406447	131405	20306	0.1917
1971	821830	115527	15044	0.1678
1972	739502	118711	23474	0.2031
1973	538189	136269	36719	0.2835
1974	593233	93965	36589	0.4443
1975	412251	88800	38764	0.4299
1976	695167	66526	32767	0.4882
1977	583445	73229	20567	0.3101
1978	1068757	73157	19715	0.2565
1979	994125	100768	22608	0.2651
1980	541049	107024	30124	0.3812
1981	683312	101506	24922	0.3022
1982	711052	112140	19209	0.2184
1983	2341228	110910	32988	0.3506
1984	970610	193053	27450	0.1992
1985	1238781	194278	23343	0.1672
1986	951309	229871	28785	0.1774
1987	3238964	208289	48600	0.337
1988	481007	304341	29100	0.2655
1989	716019	226952	29210	0.1794
1990	809513	196016	43969	0.2571
1991	502888	169160	37700	0.2419
1992	415472	135537	31856	0.2737
1993	616187	114926	36763	0.3543
1994	802983	96314	33908	0.362
1995	457753	79903	27792	0.4676
1996	831805	62879	32534	0.5825
1997	820655	63944	27225	0.5358
1998	526653	52302	38895	1.031
1999	386516	44466	26109	0.7026
2000	436156	37018	19846	0.5305
2001	444252	34287	14756	0.638
2002	543141	32738	17826	0.7089
2003	445267	37385	16502	0.6525
2004	460864	39159	13727	0.5957
2005	503977	38816	16231	0.6097
2006	279962	36402	19193	0.8687
2007	141074	28294	17791	0.6784
2008	182609	19600	13340	0.7129
2009	116490	17600	10468	0.6875
2010	196498	10964	10241	0.897
2011	159239	9461	6919	1.1766
2012	498780*	11588	6571	0.6583
Mean	498780	93295	21558	0.3927

* Geometric mean recruitment 1957-2011.

ECOREGION Celtic Seas
STOCK Herring in Division VIIa North of 52°30'N (Irish Sea)

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.

Stock status

	F (Fishing Mortality)		
	2010	2011	2012
MSY (F_{MSY})	✓	✓	✓ Appropriate
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined
	SSB (Spawning-Stock Biomass)		
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	✓	✓	✓ Full reproductive capacity

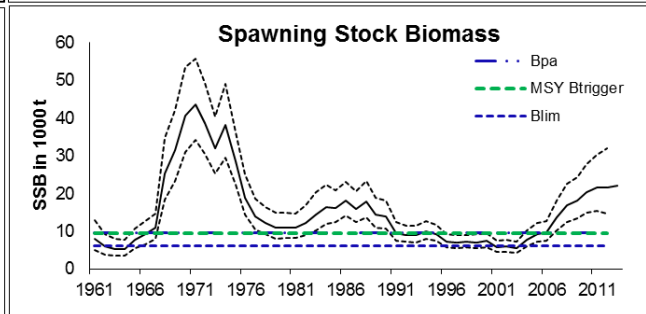
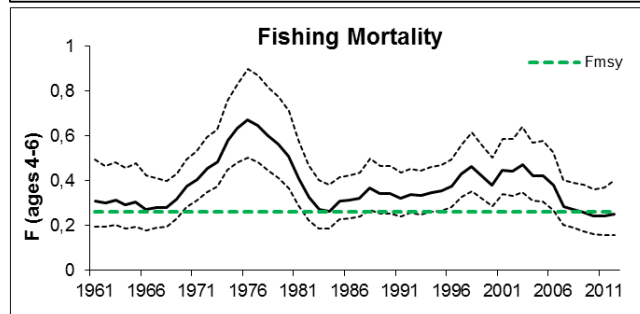
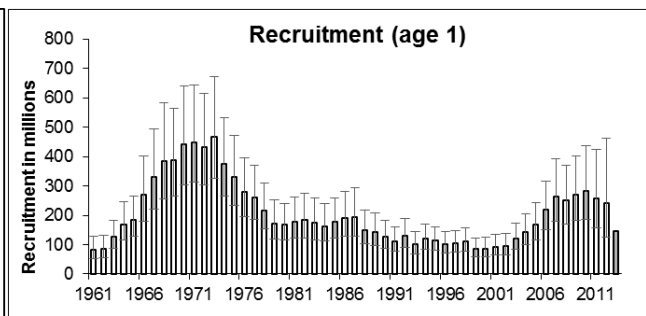
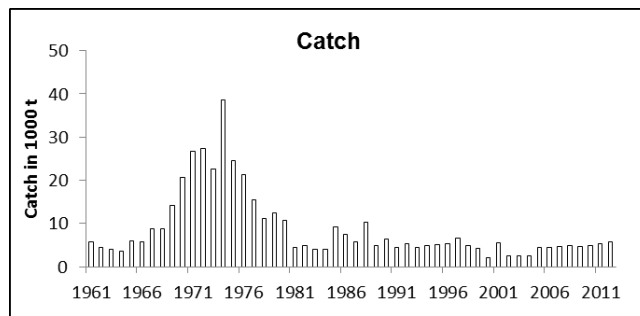
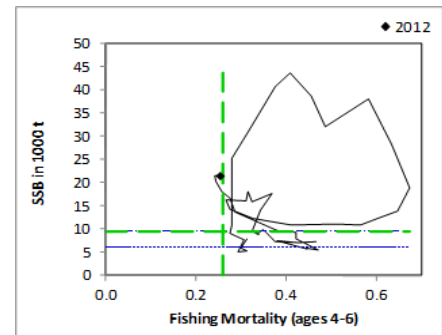


Figure 5.4.14.1 Herring in Division VIIa North of 52°30'N (Irish Sea). Summary of stock assessment with observed landings. Estimates are shaded. Top right: SSB/F over the time-series used in the assessment.

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

Management plans

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

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.

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).

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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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.

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 occasionally mismatched with the migration pattern of the spawning-stock biomass. Input data quality and sampling coverage is good for this stock.

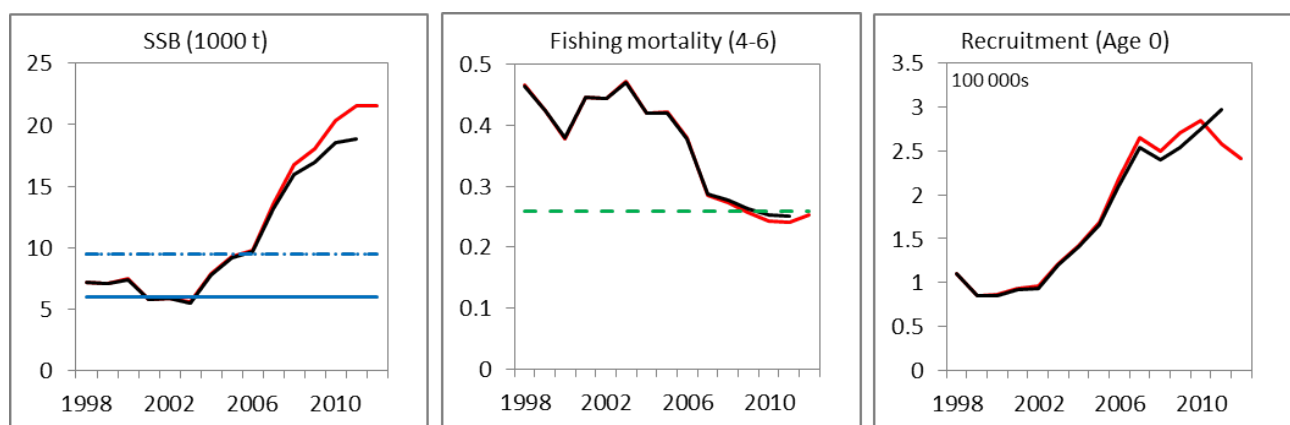


Figure 5.4.14.1 Herring in Division VIIa North of 52°30'N (Irish Sea). Historical assessment results (final-year recruitment estimates included). The stock was benchmarked in 2012.

Scientific basis

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).

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Reference points

	Type	Value	Technical basis
MSY	MSY $B_{trigger}$	9 500 t.	Provisional based on B_{pa} .
Approach	F_{MSY}	0.26	Based on stochastic simulations (ICES, 2012).
Precautionary approach	B_{lim}	6 000 t.	Lowest observed SSB of ICA assessment.
	B_{pa}	9 500 t.	$B_{pa} = B_{lim} \times 1.58$.
	F_{lim}	Not defined.	
	F_{pa}	Not defined.	

Unchanged since 2012.

Outlook for 2014

Basis: F (2013) = TAC constraint = 0.22; SSB (2014) = 22 864; R (2013) = 145 million; Catch (2013) = 4 993.

Rationale	Catch (2014)	Basis	F (2014)	SSB (2015)	%SSB change ¹⁾	%TAC change ²⁾
MSY approach	5 251	F_{MSY}	0.26	16 275	-13%	5%
Zero catch	0	$F = 0$	0	23 588	3%	-100%
Other options	4 244	TAC -15% ($F_{2012} \times 0.96$)	0.21	17 559	-10%	-15%
	4 993	Stable TAC ($F_{2012} \times 1.15$)	0.22	16 596	-14%	0%
	5 742	TAC +15% ($F_{2012} \times 1.34$)	0.29	15 669	-15%	+15%

Weights in tonnes.

¹⁾ SSB 2015 relative to SSB 2014.

²⁾ Human consumption catch 2014 relative to TAC 2013.

MSY approach

Following the ICES MSY approach implies fishing mortality at $F_{MSY} = 0.26$, resulting in catches of less than 5251 t in 2014. This is expected to lead to an SSB of 16 275 t in 2015. Discards are considered to be low, and therefore, all catches are assumed to be landed.

Precautionary approach

The SSB is well above B_{pa} and F_{pa} is undefined, but current F is just below F_{MSY} . ICES does not advise using B_{pa} as a target in 2014.

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 time-series. 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 3-ringers 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.

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.

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, SSB_{2012} is now estimated to be 2% higher and F_{2011} 4% lower.

Sources

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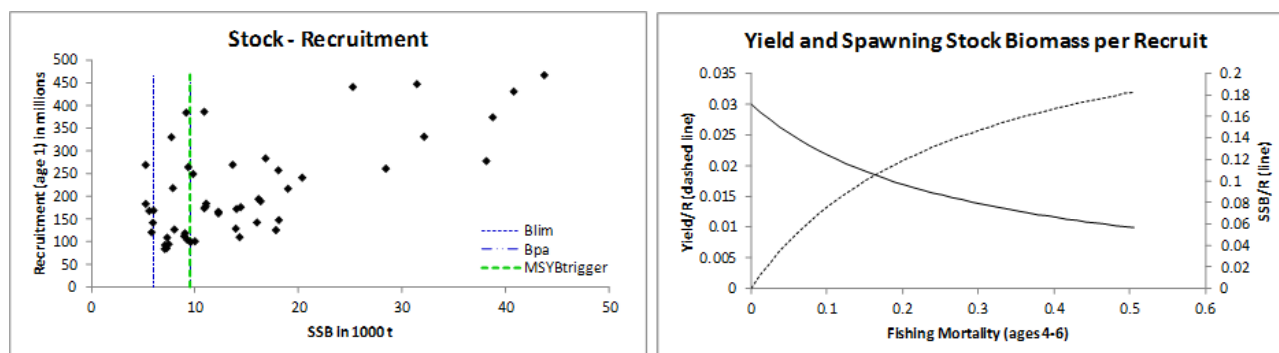


Figure 5.4.14.2 Herring in Division VIIa North of 52°30'N (Irish Sea). Stock–recruitment and yield-per-recruit analysis.

Table 5.4.14.1

Herring in Division VIIa North of 52°30'N (Irish Sea). ICES advice, management, and catch.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ICES catch
1987	TAC	4.3	4.5	5.8
1988	TAC (Revised advice in 1988)	10.5 (5.6)	10.5	10.2
1989	TAC	5.5	6.0	5.0
1990	Precautionary TAC	5.7	7.0	6.3
1991	TAC	5.6	6.0	4.4
1992	TAC	6.6	7.0	5.3
1993	TAC	4.9–7.4	7.0	4.4
1994	Precautionary TAC	5.3	7.0	4.8
1995	Precautionary TAC	5.1	7.0	5.1
1996	If required, precautionary TAC	5.0	7.0	5.3
1997	No advice given	-	9.0	6.6
1998	<i>Status quo</i> F	6.5	9.0	4.9
1999	F = Proposed $F_{pa} = 0.36$	4.9	6.6	4.1
2000	F = 90% F(98) = 0.31	3.9	5.4	2.0
2001	<i>Status quo</i> F = 0.26	5.1	6.9	5.5
2002	Average catch of 1996–2000	4.8	4.8	2.4
2003	2002 TAC	4.8	4.8	2.4
2004	Advice 2003 catch	4.8	4.8	2.5
2005	<i>Status quo</i> TAC	4.8	4.8	4.4
2006	<i>Status quo</i> TAC	4.8	4.8	4.4
2007	<i>Status quo</i> TAC	4.8	4.8	4.6
2008	<i>Recent catches</i>	4.4	4.8	4.9
2009	<i>Same advice as last year</i>	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	-	5.280	5.7
2013	MSY approach	< 5.1	4.993	
2014	MSY approach	< 5.251		

Weights in thousand tonnes.

Table 5.4.14.2

Herring in Division VIIa North of 52°30'N (Irish Sea). ICES catch estimates in tonnes by country.

Country	Ireland	UK	Unallocated	Total
1987	1 200	3 290	1 333	5 823
1988	2 579	7 593	-	10 172
1989	1 430	3 532	-	4 962
1990	1 699	4 613	-	6 312
1991	80	4 318	-	4 398
1992	406	4 864	-	5 270
1993	0	4 408	-	4 408
1994	0	4 828	-	4 828
1995	0	5 076	-	5 076
1996	100	5 180	22	5 302
1997	0	6 651	-	6 651
1998	0	4 905	-	4 905
1999	0	4 127	-	4 127
2000	0	2 002	-	2 002
2001	862	4 599	-	5 461
2002	286	2 107	-	2 393
2003	0	2 399	-	2 399
2004	749	1 782	-	2 531
2005	1 153	3 234	-	4 387
2006	581	3 821	-	4 402
2007	0	4 629	-	4 629
2008	0	4 895	-	4 895
2009	0	4 594	-	4 594
2010	0	4 894	-	4 894
2011	0	5 202	-	5 202
2012	18	5 675	-	5 693

Table 5.4.14.3

Herring in Division VIIa North of 52°30'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.

Year	Recruits Age 0 (Thousands)	Recruits		Total biomass (tonnes)	Total biomass		Spawning biomass (tonnes)	Spawning biomass		Catches (tonnes)	Yield / SSB (ratio)	Mean F ages 4-6	Mean F	Mean F
	Mean	Low	High	Mean	Low	High	Mean	Low	High			Mean	Low	High
1961	81 146	50 845	129 503	26 108	19 860	34 323	7 969	4 945	12 842	5 418	0.68	0.312	0.196	0.497
1962	85 648	55 803	131 455	19 908	15 212	26 056	5 955	3 845	9 222	3 952	0.664	0.3	0.194	0.465
1963	127 644	88 491	184 120	21 093	16 369	27 180	5 201	3 381	7 999	3 613	0.695	0.314	0.204	0.484
1964	169 566	116 712	246 357	26 849	20 678	34 863	5 194	3 513	7 679	4 140	0.797	0.292	0.186	0.459
1965	184 057	127 171	266 389	31 351	24 455	40 192	7 689	5 484	10 779	5 512	0.717	0.307	0.196	0.478
1966	269 952	180 948	402 736	47 052	35 646	62 106	9 112	6 549	12 680	5 844	0.641	0.274	0.178	0.422
1967	331 042	221 119	495 610	64 861	48 922	85 993	10 853	7 980	14 761	8 224	0.758	0.279	0.189	0.413
1968	385 001	254 792	581 750	81 634	61 684	108 036	25 210	18 281	34 765	10 131	0.402	0.28	0.196	0.399
1969	386 930	265 509	563 879	93 620	73 604	119 080	31 382	23 380	42 123	14 564	0.464	0.317	0.232	0.432
1970	441 529	303 867	641 558	119 731	95 327	150 381	40 741	31 033	53 488	18 836	0.462	0.375	0.283	0.497
1971	447 754	311 919	642 744	127 644	102 991	158 198	43 695	34 248	55 749	22 948	0.525	0.407	0.311	0.534
1972	431 490	302 741	614 994	107 152	87 808	130 757	38 716	30 388	49 326	22 561	0.583	0.455	0.349	0.594
1973	467 428	324 280	673 766	102 334	83 668	125 165	32 080	25 409	40 503	22 902	0.714	0.486	0.375	0.63
1974	374 745	263 965	532 016	101 215	82 634	123 973	38 101	29 558	49 113	29 057	0.763	0.582	0.448	0.756
1975	332 036	234 153	470 839	79 063	65 037	96 114	28 396	22 250	36 239	23 249	0.819	0.633	0.483	0.831
1976	278 452	195 297	397 012	64 667	52 848	79 128	18 941	14 368	24 970	19 370	1.023	0.673	0.504	0.898
1977	261 712	184 571	371 095	53 263	43 384	65 392	13 966	10 503	18 572	14 983	1.073	0.648	0.483	0.869
1978	217 510	152 752	309 721	47 193	38 151	58 378	12 218	9 183	16 258	12 641	1.035	0.602	0.445	0.815
1979	172 992	119 004	251 472	42 277	33 853	52 798	10 995	8 072	14 977	11 950	1.087	0.564	0.411	0.775
1980	166 875	115 666	240 756	35 066	28 122	43 726	11 039	8 244	14 782	8 754	0.793	0.511	0.366	0.712
1981	178 260	121 766	260 965	32 338	25 202	41 495	10 849	8 096	14 537	5 504	0.507	0.412	0.29	0.584
1982	184 795	123 678	276 113	36 461	27 667	48 050	12 232	8 832	16 940	5 092	0.416	0.325	0.225	0.471
1983	174 556	117 275	259 815	40 660	30 676	53 893	14 376	10 187	20 286	4 916	0.342	0.274	0.187	0.403
1984	163 244	111 509	238 982	43 958	34 072	56 714	16 309	11 863	22 423	5 322	0.326	0.266	0.186	0.381
1985	176 840	121 071	258 298	46 958	37 416	58 932	16 102	12 418	20 879	6 523	0.405	0.31	0.229	0.418
1986	189 852	128 712	280 034	45 890	36 879	57 102	18 057	14 154	23 036	6 995	0.387	0.315	0.234	0.423
1987	194 853	128 691	295 030	40 619	32 343	51 014	15 945	12 302	20 667	6 222	0.39	0.323	0.24	0.435
1988	148 449	101 646	216 804	42 404	33 991	52 899	17 785	13 573	23 303	7 121	0.4	0.368	0.271	0.499
1989	143 344	98 107	209 438	38 369	30 528	48 224	14 271	10 828	18 809	5 678	0.398	0.343	0.252	0.467
1990	126 500	87 287	183 331	36 607	29 446	45 510	13 905	10 685	18 096	5 784	0.416	0.342	0.252	0.465
1991	110 857	76 250	161 171	30 394	24 667	37 450	9 539	7 336	12 402	4 872	0.511	0.323	0.239	0.437
1992	129 703	89 151	188 699	25 438	20 721	31 229	8 999	7 149	11 329	4 165	0.463	0.34	0.256	0.452
1993	100 208	69 609	144 256	28 970	23 664	35 465	8 917	7 033	11 305	4 715	0.529	0.335	0.251	0.447
1994	119 491	83 611	170 770	26 213	21 551	31 882	9 965	7 923	12 533	4 439	0.445	0.348	0.261	0.463
1995	113 210	80 127	159 952	25 463	20 936	30 971	9 232	7 330	11 627	4 808	0.521	0.355	0.267	0.47
1996	101 722	71 608	144 500	23 086	19 091	27 918	7 274	5 740	9 219	5 007	0.688	0.375	0.284	0.495
1997	104 820	74 131	148 214	21 343	17 644	25 819	7 037	5 537	8 943	4 878	0.693	0.429	0.328	0.562
1998	109 864	76 662	157 446	20 492	16 674	25 185	7 213	5 771	9 017	4 030	0.559	0.466	0.352	0.616
1999	84 965	58 892	122 583	19 881	16 202	24 395	7 064	5 505	9 066	3 750	0.531	0.424	0.321	0.559
2000	86 336	59 726	124 802	18 303	14 915	22 459	7 418	5 819	9 455	2 975	0.401	0.379	0.286	0.502
2001	93 526	64 837	134 910	18 266	14 667	22 749	5 774	4 477	7 446	3 490	0.605	0.447	0.341	0.587
2002	95 511	65 339	139 616	18 915	14 978	23 886	5 897	4 568	7 612	2 798	0.474	0.443	0.334	0.588
2003	121 662	84 929	174 281	19 776	15 554	25 143	5 540	4 316	7 110	2 440	0.44	0.472	0.348	0.639
2004	142 629	99 591	204 264	21 985	17 369	27 827	7 824	5 973	10 248	2 713	0.347	0.421	0.311	0.57
2005	168 721	117 400	242 476	25 694	20 222	32 646	9 309	7 106	12 195	3 596	0.386	0.422	0.307	0.58
2006	218 819	151 239	316 596	29 231	22 838	37 414	9 782	7 496	12 766	3 761	0.384	0.379	0.272	0.529
2007	265 136	179 826	390 919	39 696	30 367	51 891	13 602	10 256	18 041	4 203	0.309	0.286	0.202	0.405
2008	249 946	168 846	369 999	44 312	34 008	57 736	16 778	12 505	22 509	4 915	0.293	0.274	0.191	0.392
2009	270 222	181 310	402 736	46 630	35 487	61 271	18 010	13 289	24 409	4 937	0.274	0.258	0.173	0.384
2010	284 361	185 327	436 316	48 582	36 670	64 363	20 315	14 851	27 788	4 975	0.245	0.243	0.163	0.364
2011	258 074	156 837	424 657	48 630	35 721	66 205	21 530	15 310	30 278	5 292	0.246	0.242	0.158	0.371
2012	241 832	126 238	463 274	48 291	33 273	70 087	21 541	14 529	31 937	5 767	0.268	0.253	0.159	0.403
2013*	144 514						22 114							

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

ECOREGION Celtic Seas
STOCK Herring in Divisions VIIa (South of 52°30'N) and VIIg,h,j,k (Celtic Sea and South of Ireland)

Advice for 2014

ICES advises on the basis of the MSY approach that catches should be no more than 35 942 t in 2014. 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.

Stock status

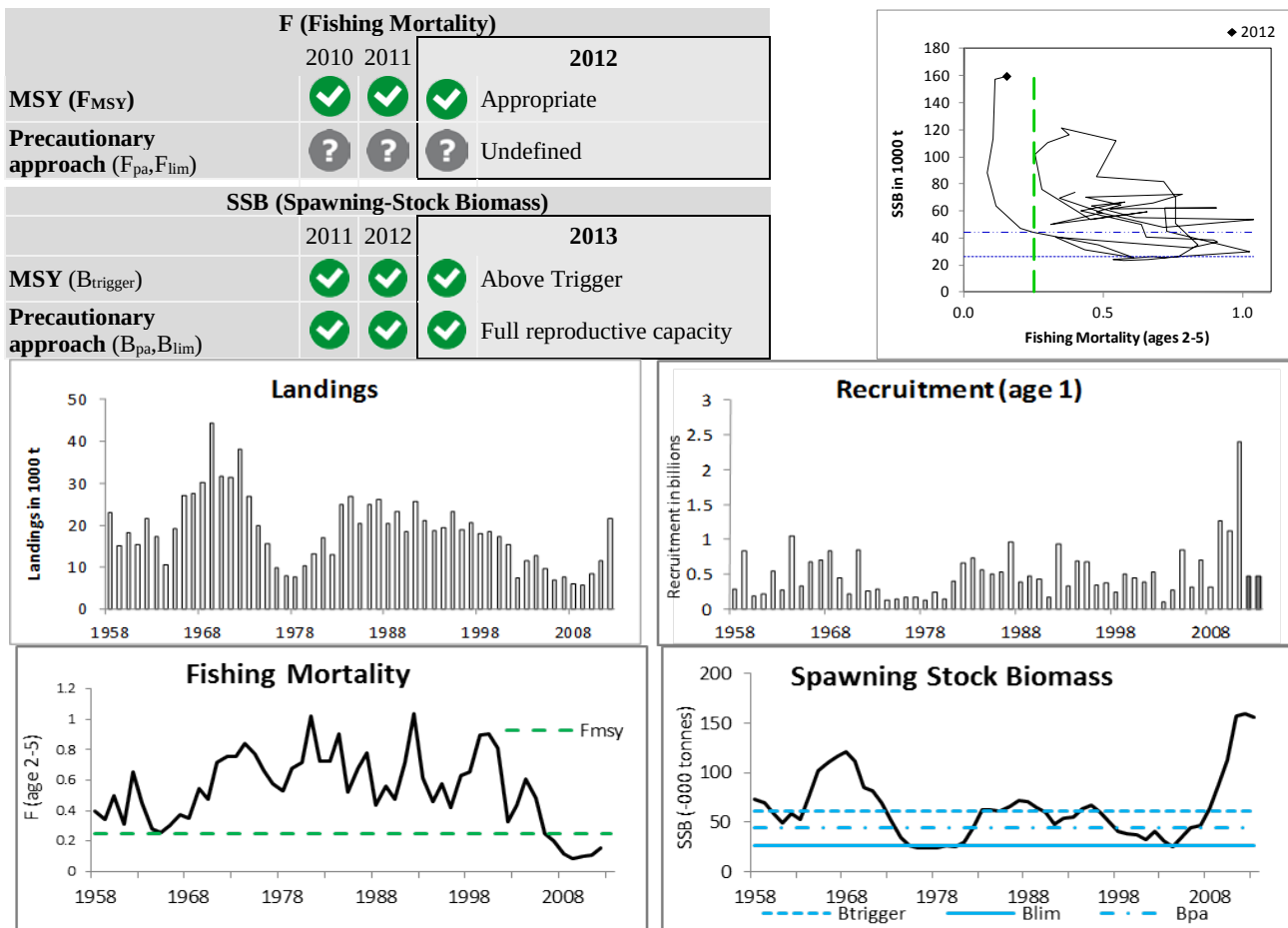


Figure 5.4.15.1 Herring in Divisions VIIa (South of 52°30'N) and VIIg,h,j,k (Celtic Sea and South of Ireland). Summary of the stock assessment. Estimates are shaded. Top right: F and SSB over the time-series in the assessment.

The current SSB is the highest since the 1960s. F is well below F_{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.

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. The 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 outlook table. This plan has a target $F = 0.23$ and a 30% constraint in TAC change. This plan would result in catch advice of 22 360 t for 2014.

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.

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.

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 distribution Total landings (2012/2013) = 21 604 t, of which 100% were caught by pelagic trawl.

Effects of the fisheries on the ecosystem

Herring fisheries for human consumption are considered relatively clean, with little bycatch of other fish.

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.

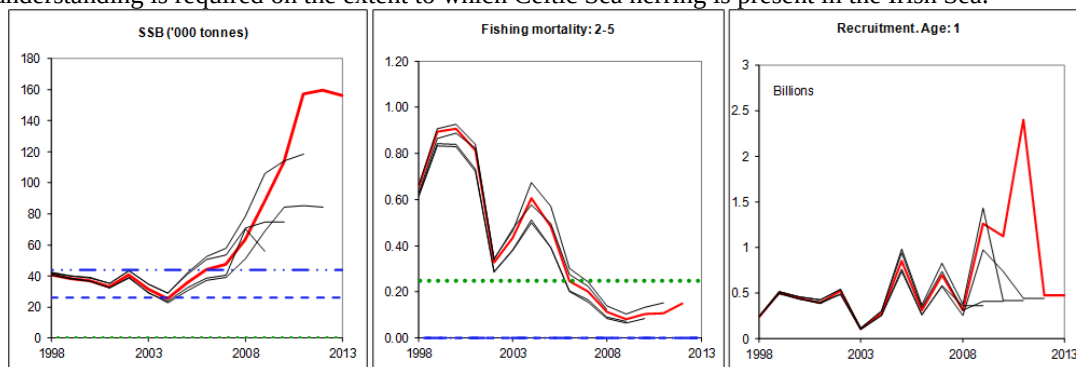


Figure 5.4.15.2 Herring in Divisions VIIa (South of 52°30'N) and VIIg,h,j,k (Celtic Sea and South of Ireland). Historical assessment results (final-year predicted SSB and recruitment estimates included).

Scientific basis

Assessment type	Age-based analytical assessment (FLICA).
Stock data category	Category 1.
Input data	Commercial catches, (weights, ages and length frequencies from catch sampling); Acoustic survey index (CSHAS), annual weights in the stock, fixed maturity ogive, natural mortality assumed to be constant.
Discards and bycatch	Discards are not included in the assessment and are considered to be low.
Indicators	None.
Other information	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.

ECOREGION Celtic Seas
STOCK Herring in Divisions VIIa (South of 52°30'N) and VIIg,h,j,k (Celtic Sea and South of Ireland)

Reference points

	Type	Value	Technical basis
MSY	MSY $B_{trigger}$	61 000 t.	Stochastic simulations on segmented regression stock–recruitment relationship.
Approach	F_{MSY}	0.25	Stochastic simulations on segmented regression stock–recruitment relationship.
Management Plan	SSB_{MGT}	61 000 t.	Stochastic simulations on segmented regression stock recruit relationship.
	F_{MGT}	0.23	If SSB in TAC year >61 000.
Precautionary approach	B_{lim}	26 000 t.	The lowest stock observed.
	B_{pa}	44 000 t.	Low probability of low recruitment.
	F_{lim}	Not defined.	
	F_{pa}	Not defined.	

(Changed in 2013)

Outlook for 2014

Basis: F (2013/2014) = F (catch constraint 2013/2014) = 0.12; R (2012–2014) = GM (1981–2010) = 474 million; SSB (2013/2014) = 156 355; catch (2013/2014) = 19 063.

Rationale	Catch (2014)	SSB (2014) ¹⁾	Basis	F (2014)	SSB (2015)	%SSB Change ²⁾	% TAC Change ³⁾
MSY approach	35 942	136 113	F_{MSY}	0.25	115 063	–15%	+109%
Long-term management plan	22 360	144 226	Management plan	0.15	133 211	–8%	+30%
Zero catch	0	156 805	Zero catch	0	165 458	+6%	–100%
Other options	22 737	144 006	F_{2012}	0.15	132 692	–8%	+32%
	17 200	147 209	<i>status quo</i> catch	0.11	140 396	–5%	0%

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.

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 35 942 t in 2014. This is expected to lead to an SSB of 115 063 t in 2015. Discards are considered to be low, and therefore, all catches are assumed to be landed. Because F has been below F_{MSY} since 2007, a transition to MSY is not relevant.

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 22 360 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.

Precautionary approach

The SSB is well above B_{pa} . F_{pa} is undefined, but current F is well below F_{MSY} . ICES does not advise using B_{pa} as a target in 2014.

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.

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 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.

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 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.

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).

Sources

Groot, S. J. de. 1979. The potential environmental impact of marine gravel extraction in the North Sea. *Ocean Management*, 5: 233–249.

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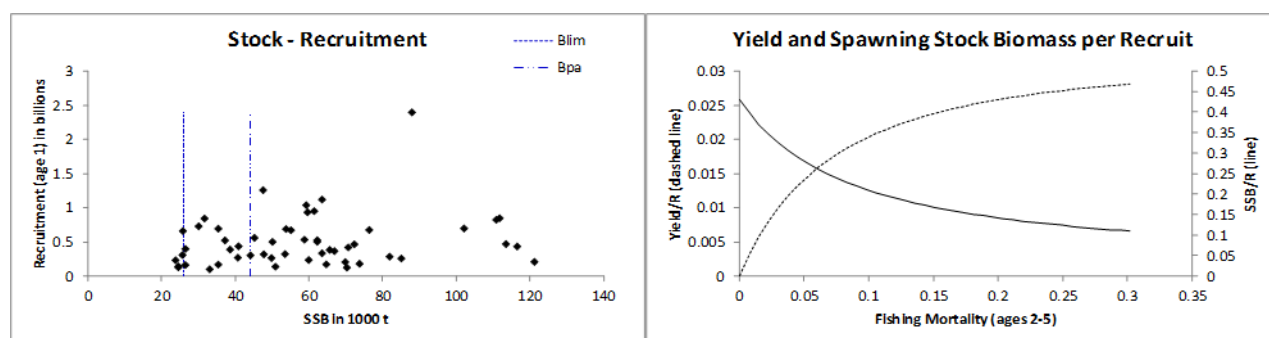


Figure 5.4.15.3 Herring in Divisions VIIa (South of 52°30'N) and VIIg,h,j,k (Celtic Sea and South of Ireland). Stock–recruitment plot and yield-per-recruit analysis.

Table 5.4.15.1 Herring in Divisions VIIa (South of 52°30'N) and VIIg,h,j,k (Celtic Sea and South of Ireland). ICES advice, management, and landings/catches.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	Discards	ICES catch ¹
1987	Precautionary TAC	18	18	18	4.2	27.3
1988	TAC	13	18	17	2.4	19.2
1989	TAC	20	20	18	3.5	22.7
1990	TAC	15	17.5	17	2.5	20.2
1991	TAC (TAC excluding discards)	15 (12.5)	21	21	1.9	23.6
1992	TAC	27	21	19	2.1	23.0
1993	Precautionary TAC (including discards)	20–24	21	20	1.9	21.1
1994	Precautionary TAC (including discards)	20–24	21	19	1.7	19.1
1995	No specific advice	-	21	18	0.7	19.1
1996	TAC	9.8	16.5–21 ²	21	3	21.8
1997	If required, precautionary TAC	< 25	22	20.7	0.7	18.8
1998	Catches below 25	< 25	22	20.5	0	20.3
1999	F = 0.4	19	21	19.4	0	18.1
2000	F < 0.3	20	21	18.8	0	18.3
2001	F < 0.34	17.9	20	19	0	17.7
2002	F < 0.35	11	11	11.5	0	10.6
2003	Substantially less than recent catches	-	13	12	0	10.9
2004	60% of average catch 1997–2000	11	13	12	-	11.1
2005	60% of average catch 1997–2000	11	13	10	-	8.5
2006	Further reduction 60% avg. catch 2002–2004	6.7	11	9	-	8.5
2007	No fishing without rebuilding plan	--	9.4	9.6	-	8.3
2008	No targeted fishing without rebuilding plan	--	7.9	7.8	-	6.9
2009	No targeted fishing without rebuilding plan	--	5.9	6.2	(3)	5.8
2010	F _{mgt} = 0.19	10.15	10.15	9.6	(3)	8.4
2011	See scenarios	-	13.2	11.7	(3)	11.5
2012	MSY approach	< 26.9	21.1	21.6	-	21.6
2013	MSY approach	< 18.5				
2014	MSY approach	< 35.942				

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°30'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.

Year	France	Germany	Ireland	Netherlands	U.K.	Unallocated	Discards	Total
1988	-	-	16 800	-	-	-	2 400	19 200
1989	+	-	16 000	1 900	-	1 300	3 500	22 700
1990	+	-	15 800	1 000	200	700	2 500	20 200
1991	+	100	19 400	1 600	-	600	1 900	23 600
1992	500	-	18 000	100	+	2 300	2 100	23 000
1993	-	-	19 000	1 300	+	-1 100	1 900	21 100
1994	+	200	17 400	1 300	+	-1 500	1 700	19 100
1995	200	200	18 000	100	+	-200	700	19 000
1996	1 000	0	18 600	1 000	-	-1 800	3 000	21 800
1997	1 300	0	18 000	1 400	-	-2 600	700	18 800
1998	+	-	19 300	1 200	-	-200	-	20 300
1999		200	17 900	1 300	+	-1 300	-	18 100
2000	573	228	18 038	44	1	-617	-	18 267
2001	1 359	219	17 729	-	-	-1 578	-	17 729
2002	734	-	10 550	257	-	-991	-	10 550
2003	800	-	10 875	692	14	-1 506	-	10 875
2004	801	41	11 024	-	-	-801	-	11 065
2005	821	150	8 452	799	-	-1 770	-	8 452
2006	-	-	8 530	518	5	-523	-	8 530
2007	581	248	8 268	463	63	-1 355	-	8 268
2008	503	191	6 853	291		-985	-	6 853
2009	364	135	5 760			-499	-	5 760
2010	636	278	8 406	325		-1 239	na	8 406
2011	241		11 503	7		-248	na	11 503
2012	3	230	16 132	3 135		2 104	na	21 604

na = Not available.

Table 5.4.15.3 Herring in Divisions VIIa (South of 52°30'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.

Year	France	Germany	Ireland	Netherlands	U.K.	Unallocated	Discards	Total
1988	-	-	16 800	-	-	-	2 400	19 200
1989	+	-	16 000	1 900	-	1 300	3 500	22 700
1990	+	-	15 800	1 000	200	700	2 500	20 200
1991	+	100	19 400	1 600	-	600	1 900	23 600
1992	500	-	18 000	100	+	2 300	2 100	23 000
1993	-	-	19 000	1 300	+	-1 100	1 900	21 100
1994	+	200	17 400	1 300	+	-1 500	1 700	19 100
1995	200	200	18 000	100	+	-200	700	19 000
1996	1 000	0	18 600	1 000	-	-1 800	3 000	21 800
1997	1 300	0	18 000	1 400	-	-2 600	700	18 800
1998	+	-	19 300	1 200	-	-200	-	20 300
1999		200	17 900	1 300	+	-1 300	-	18 100
2000	573	228	18 038	44	1	-617	-	18 267
2001	1 359	219	17 729	-	-	-1 578	-	17 729
2002	734	-	10 550	257	-	-991	-	10 550
2003	800	-	10 875	692	14	-1 506	-	10 875
2004	801	41	11 024	-	-	-801	-	11 065
2005	821	150	8 452	799	-	-1 770	-	8 452
2006	-	-	8 530	518	5	-523	-	8 530
2007	581	248	8 268	463	63	-1 355	-	8 268
2008	503	191	6 853	291		-985	-	6 853
2009	364	135	5 760			-499	-	5 760
2010	636	278	8 406	325		-1 239	na	8 406
2011	241		11 503	7		-248	na	11 503
2012	3	230	16 132	3 135		2 104	na	21 604

na = Not available.

Table 5.4.15.4

Herring in Divisions VIIa (South of 52°30'N) and VIIg,h,j,k (Celtic Sea and South of Ireland). Summary of stock assessment (weights in tonnes).

Year	Recruitment age		SSB	Fbar	Landings
	1	TSB			
1958	288 373	103 700	73 614	0.40	22 978
1959	837 830	128 408	69 732	0.34	15 086
1960	185 856	82 550	58 650	0.49	18 283
1961	210 142	71 131	49 703	0.31	15 372
1962	537 886	109 309	59 144	0.66	21 552
1963	270 227	82 363	53 377	0.45	17 349
1964	1 043 566	159 436	76 250	0.28	10 599
1965	327 806	141 067	101 991	0.25	19 126
1966	679 877	182 800	110 738	0.30	27 030
1967	702 422	191 042	116 417	0.38	27 658
1968	829 536	206 978	121 112	0.35	30 236
1969	438 644	171 065	111 653	0.54	44 389
1970	212 938	119 642	84 961	0.48	31 727
1971	852 710	164 750	81 779	0.71	31 396
1972	263 048	112 910	70 178	0.76	38 203
1973	290 193	87 998	50 778	0.76	26 936
1974	128 521	56 925	35 244	0.84	19 940
1975	143 143	45 867	26 301	0.77	15 588
1976	173 512	45 273	24 406	0.66	9 771
1977	168 125	43 278	23 658	0.57	7 833
1978	133 883	40 641	24 429	0.53	7 559
1979	236 786	51 778	26 336	0.68	10 321
1980	146 966	43 350	25 628	0.71	13 130
1981	402 717	68 337	29 930	1.02	17 103
1982	665 373	104 604	45 077	0.73	13 000
1983	734 069	129 830	62 115	0.72	24 981
1984	564 655	112 412	62 120	0.90	26 779
1985	508 250	108 687	61 286	0.52	20 426
1986	529 559	119 222	65 520	0.68	25 024
1987	956 849	148 814	72 186	0.78	2 6200
1988	388 948	109 853	70 550	0.44	20 447
1989	471 462	110 838	64 580	0.56	23 254
1990	425 497	98 532	59 496	0.47	1 8404
1991	177 221	70 596	47 619	0.72	25 562
1992	939 386	125 591	53 654	1.04	21 127
1993	324 272	87 125	54 981	0.62	18 618
1994	694 262	120 157	63 426	0.46	19 300
1995	676 645	119 982	66 791	0.58	23 305
1996	339 848	91 363	59 809	0.42	18 816
1997	370 991	83 718	49 968	0.63	20 496
1998	240 786	65 760	40 753	0.65	18 041
1999	506 060	77 994	38 459	0.89	18 485
2000	442 034	73 450	37 066	0.91	17 191
2001	393 052	62 587	32 913	0.81	15 269
2002	527 809	80 799	40 574	0.33	7 465
2003	105 670	47 981	31 500	0.43	11 536
2004	274 962	50 633	25 520	0.61	12 743
2005	848 467	86 480	35 251	0.48	9 494
2006	313 288	71 712	43 986	0.25	6 944
2007	698 959	87 587	47 422	0.20	7 636
2008	308 671	90 849	63 421	0.11	5 872
2009	1 263 455	163 298	87 849	0.08	5 745
2010	1 125 320	187 401	113 374	0.10	8 370
2011	2 402 231	288 026	157 338	0.11	11 470
2012*	474 106	296 392	159 776	0.15	21 604
2013*	474 106		156 355		

*Geometric Mean Recruitment 1981–2010.

**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 (B_{trigger}) the TAC will be set consistent with a fishing mortality, for appropriate age groups, of 0.23 (F_{target}).*
3. *Where the SSB is estimated to be below 61,000 tonnes, the TAC will be set consistent with a fishing mortality of:*

$$\text{SSB} * 0.23 / 61,000$$

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 small-scale 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.*

ECOREGION Celtic Sea and west of Scotland
STOCK Lesser-spotted dogfish (*Scyliorhinus canicula*) in Subarea VI and Divisions VIIa–c, e–j (Celtic Sea and west of Scotland)

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19. 547 pp.

Table 5.4.16.1 Lesser-spotted dogfish in the Celtic seas. ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings
2007	No advice		No TAC	4.3
2008	No advice		No TAC	4.1
2009	<i>Status quo</i> catch		No TAC	3.2
2010	No new advice, same as for 2009		No TAC	3.3
2011	Maintain catch at recent level		No TAC	4.7
2012	No new advice, same as for 2011		No TAC	
2013	Increase catch by maximum 20% + no species specific TAC	-		
2014	No new advice, same as for 2013	-		

Weights in thousand tonnes.

ECOREGION Celtic Sea and West of Scotland
STOCK Megrim (*Lepidorhombus* spp.) in Divisions IVa and VIa

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.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✓	✓	✓ Appropriate
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined

Biomass			
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	✓	✓	✓ Full reproductive capacity

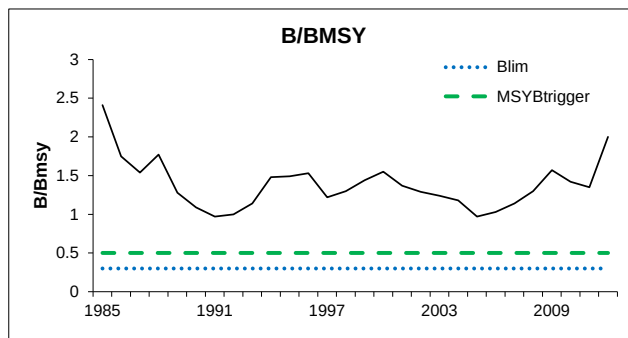
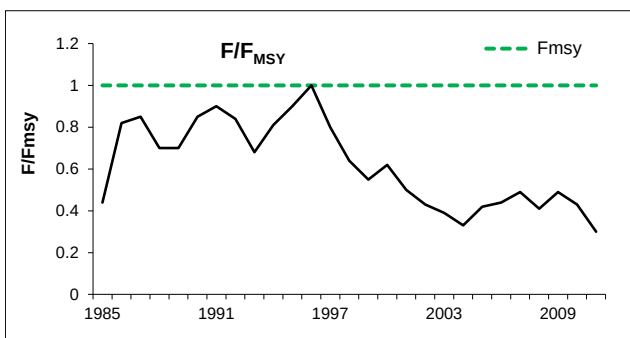
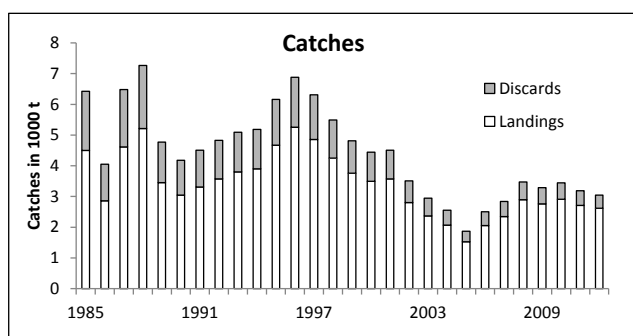
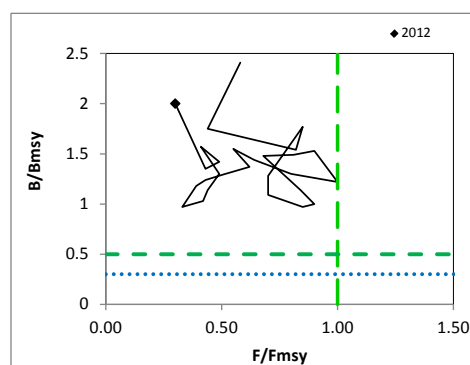


Figure 5.4.17.1 Megrim (*Lepidorhombus* spp.) in Divisions IVa and VIa. Summary of the stock assessment (weights in thousand tonnes). Top right: Biomass/F for the time-series used in the assessment.

Fishing mortality has been below F_{MSY} for almost the full time-series and the biomass well above MSY $B_{trigger}$.

Management plans

No specific management objectives are known to ICES.

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.

The fisheries

Megrim is predominantly caught using otter trawls.

Catch distribution Total catch (2012) = 3047 t, where 85% were landings (97% bottom otter trawl >100 mm and 3% bottom otter trawl < 100 mm) and 15% discards.

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.

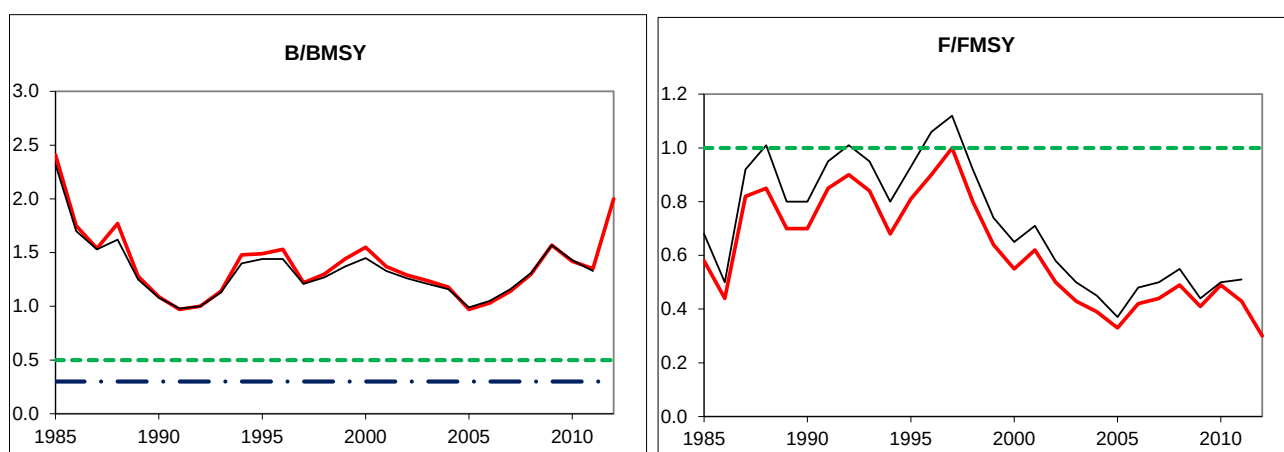


Figure 5.4.17.2 Megrim (*Lepidorhombus* spp.) in Divisions IVa and VIa. Historical assessment results.

Scientific basis

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 2010).
Discards and bycatch	Discards have been included in the assessment since 1985, from bottom otter trawl fleets < 100 mm and >100 mm.
Indicators	None.
Other information	This stock was benchmarked at WKFLAT (ICES, 2011) and at IBP-MEG (ICES, 2012).
Working group report	WGCSE (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK Megrim (*Lepidorhombus* spp.) in Divisions IVa and VIa

Reference points

	Type	Value	Technical basis
MSY Approach	MSY B_{trigger}	9740 t.	50% B_{MSY} .
	F_{MSY}	0.33	Estimated directly from the model. Fishing mortality values expressed relative to F_{MSY} .
Precautionary Approach	B_{lim}	5844 t.	30% B_{MSY} .
	B_{pa}	Not defined.	
	F_{lim}	Not defined.	
	F_{pa}	Not defined.	

(Technical basis unchanged since 2012).

Outlook for 2014 and 2015

Basis: $F_{2013}/F_{\text{MSY}} = F_{2012}/F_{\text{MSY}} = 0.33$; $B_{2014}/B_{\text{MSY}} = 1.41$.

Rationale	Catch (2014)	Landings (2014) ¹⁾	Discards (2014) ¹⁾	Basis	Fishing mortality (F_{2014}/F_{MSY})	Stock size (B_{2015}/B_{MSY})	Probability* of Biomass ₂₀₁₅ falling below MSY B_{trigger}	Probability* of Biomass ₂₀₁₅ falling below B_{lim}
MSY approach	7000	5950	1050	F_{MSY} (= 0.33)	1.0	1.32	1%	0%
Zero catch	0	0	0	$F = 0$			0%	0%
Other options	6076	5164	911	Long-term MSY	0.86	1.42	1%	0%
	6000	5100	900	0.36	0.85	1.41	1%	0%
	5000	4250	750	0.21	0.65	1.53	1%	0%
	4000	3400	600	0.16	0.48	1.59	1%	0%

Weights in tonnes.

¹⁾ Assuming a 2010–2012 landings:discards ratio of 0.85:0.15.

*Probabilities are based on bootstrap sampling.

MSY approach

Following the ICES MSY approach implies a fishing mortality at $F_{\text{MSY}} = 0.33$, 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 B_{trigger} is 1%.

Additional considerations

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.

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 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.

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.

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.

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.

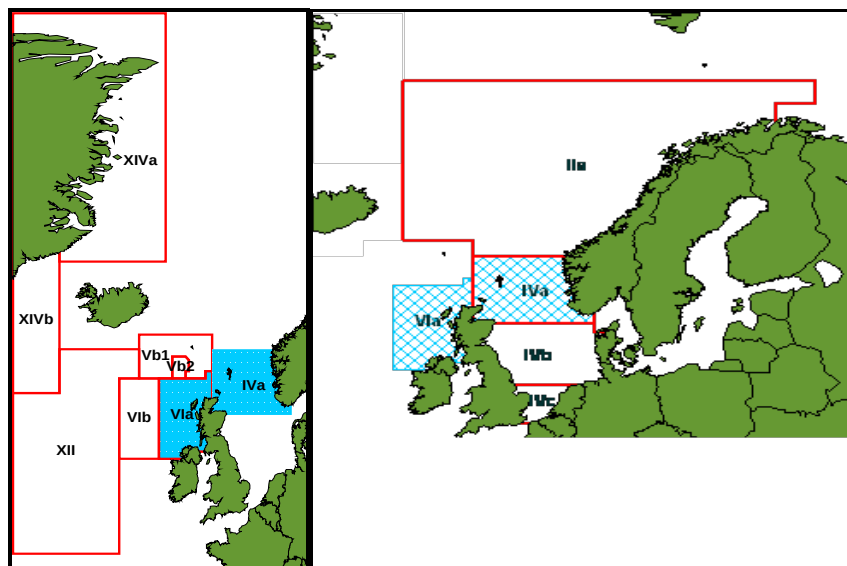


Figure 5.4.17.3 Megrim (*Lepidorhombus* spp.) in Divisions IVa and VIa. The two management areas (red boxes) for TAC areas VI, XII, XIVa, and XIVb (left panel) and TAC areas IV and IIa (right panel), and the single and assessment areas (blue hatched areas in both panels).

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.

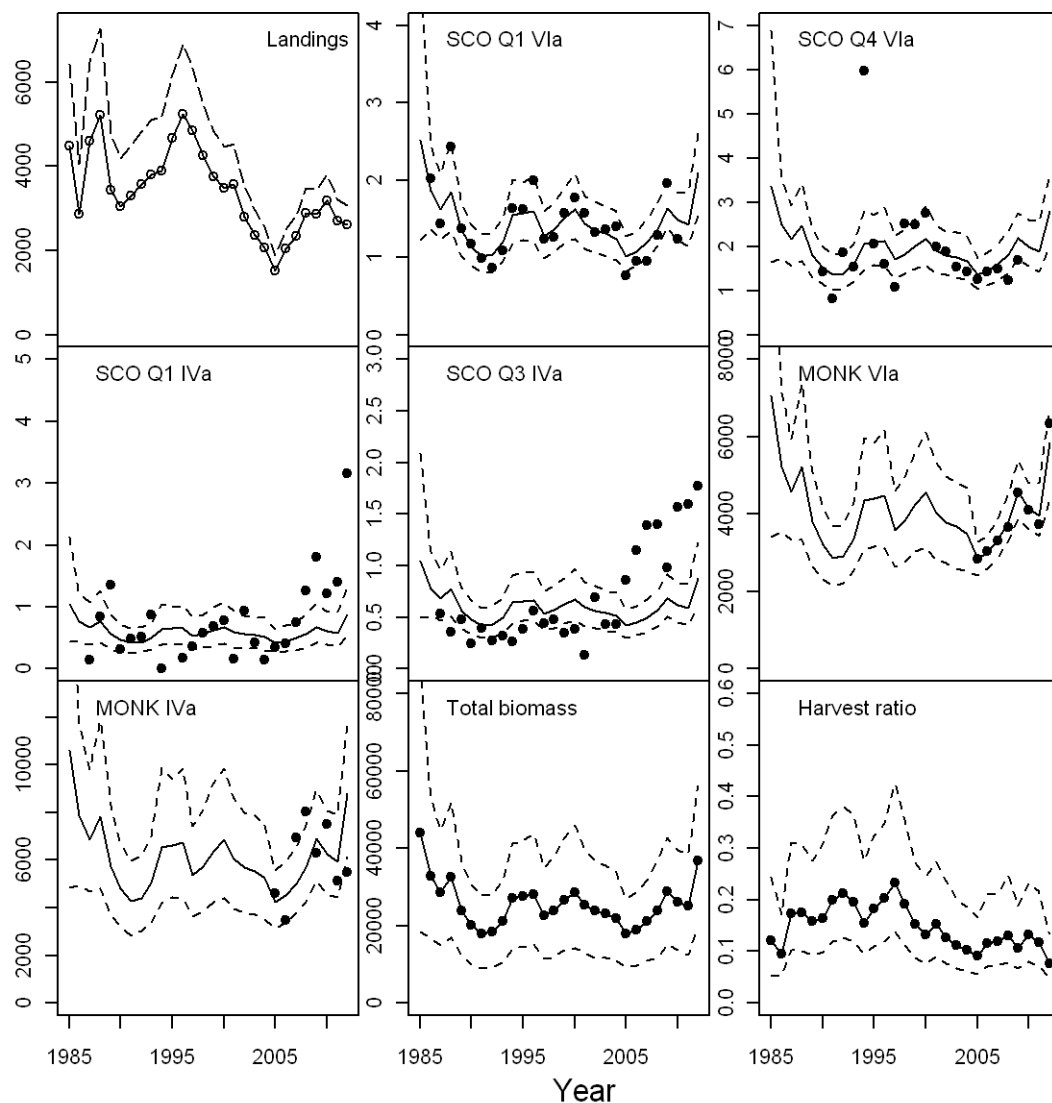


Figure 5.4.17.4

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.

Year	ICES Advice ¹⁾	Predicted landings corresp. to advice	Agreed TAC in Div. IIa and Subarea IV	Agreed TAC in Div. Vb(EC) and Subareas VI, XII, and XIV	Official landings in Subareas IV and IV	ICES landings ²⁾ in Divisions IVa and VIa	ICES discards in Divisions IVa and VIa
1991	No advice	-	-	4.84	4.42	3.31	1.196
1992	No advice	-	-	4.84	4.69	3.57	1.253
1993	No long-term gain in increased F	-	-	4.84	4.79	3.80	1.293
1994	No long-term gain in increased F	-	-	4.84	5.03	3.90	1.287
1995	No advice	-	-	4.84	5.57	4.67	1.493
1996	No advice	-	-	4.84	6.15	5.25	1.628
1997	No advice	-	-	4.84	5.94	4.86	1.457
1998	Adequate catch controls	-	3.0	4.84	5.42	4.25	1.235
1999	Maintain current TAC	4.84	3.0	4.84	4.44	3.76	1.055
2000	Maintain current TAC	4.84	3.0	4.84	4.50	3.49	0.948
2001	Maintain current TAC	4.84	3.0	4.36	4.38	3.57	0.936
2002	Maintain current TAC	4.36	3.0	4.36	3.27	2.80	0.709
2003	Maintain current TAC	4.36	3.0	4.36	3.01	2.37	0.578
2004	Reduce TAC to recent landings	3.6	1.89	3.6	2.55	2.07	0.486
2005	Reduce TAC to recent landings	2.3	1.74	2.88	1.92	1.55	0.346
2006	Reduce TAC to recent landings	2.3	1.74	2.88	2.40	2.05	0.447
2007	Reduce TAC to recent landings	2.1	1.48	2.88	2.60	2.35	0.491
2008	Reduce TAC to recent landings	1.4	1.59	2.59	3.18	2.89	0.581
2009	Same advice as last year	1.4	1.59	2.79	3.10	2.87	0.532
2010	No increase in effort	-	1.75	3.07	3.34	3.20	0.537
- 2 011	- No increase in catches	-	1.845	3.387	2.87	2.71	0.478
- 2 012	- No increase in catches	-	1.845	3.387	2.81	2.59	0.462
- 2 013	- MSY framework	4.7					
- 2 014	- MSY approach	7.0 ³					
- 2 015	- Same advice as for 2014	7.0					

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.

Table 5.4.17.2 Megrim (*Lepidorhombus* spp.) Divisions IVa and VIa. Nominal catch (t) as officially reported to ICES by country, and ICES estimates of landings.

Division VIa

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Belgium	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France	398	455	504	517	408	618	462	192	172	0	135	252	79	92	50	48	53	104	92	134	270	139	140
Ireland	317	260	317	329	304	535	460	438	433	438	417	509	280	344	278	156	221	191	172	188	318	226	214
Netherlands	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	91	48	25	7	1	24	22	87	111	83	98	92	89	98	45	69	52	5	149	112	288	227	189
UK - Eng+Wales+N.Irl.	25	167	392	298	327	322	156	123	65	42	20	7	14	13	17	10	0	8	6	-	-	-	-
UK – Scotland	1093	1223	887	896	866	952	944	954	841	831	754	770	643	558	469	269	336	658	868	953	-	-	-
UK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	822	705	589
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
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
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
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

Table 5.4.17.2 (cont.)

Division IVa

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Belgium	4	3	2	7	2	7	5	3	5	4	10	2	5	3	-	-	2	6	3	1.6		1.6	0.2
Denmark	2	1	4	6	1	2	7	5	18	21	29	52	8	11	7	1	6	11	31		22	25	36
France	-	-	36	25	27	24	14	16	14	.	7	5	6	11	9	3	4	18	21		5	6	5
Germany	-	6	3	4	1	2	1	2	4	1	3	1	-	2	2	4	7	16	5	4		5	4
Germany, Fed. Rep. of	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	.				-	-
Netherlands	24	28	27	30	28	26	9	20	30	26	20	11	9	7	11	19	22	20	3	2	1	16	16
Norway	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	1	1	4		2	1	0.6
Spain	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sweden	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UK - Eng+Wales+N.Irl.	17	9	47	8	19	44	4	3	5	4	2	2	3	1	1	1	9	17	-	-	-	-	-
UK - England & Wales	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-
UK - N. Ireland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UK - Scotland	1126	1169	1372	1736	2000	2193	3221	3091	2628	2121	2044	1854	1675	1235	1130	958	1340	1436	1526	-	-	-	-
UK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1476	1469	1367	1397
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	1458.8
ICES landings	837	878	1025	1081	1207	1172	1199	1584	1548	1111	1247	1098	975	727	739	n/a	1179	1047	1349	1484	1499	1421	1458.8
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

Table 5.4.17.3 Megrim (*Lepidorhombus* spp.) Divisions IVa and VIa. Summary of stock assessment (weights in tonnes).

Year	B/B _{MSY}	F/F _{MSY}	Biomass	Mean F	Landings	Catch	Discards
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

ECOREGION Celtic Sea and West of Scotland
STOCK Megrim (*Lepidorhombus* spp.) in ICES Division VIb (Rockall)

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.

Stock status

F (Fishing Mortality)	
	2010–2012
Qualitative evaluation	✓ Below poss. reference points
SSB (Spawning-Stock Biomass)	
	2008–2012
Qualitative evaluation	↗ Increasing

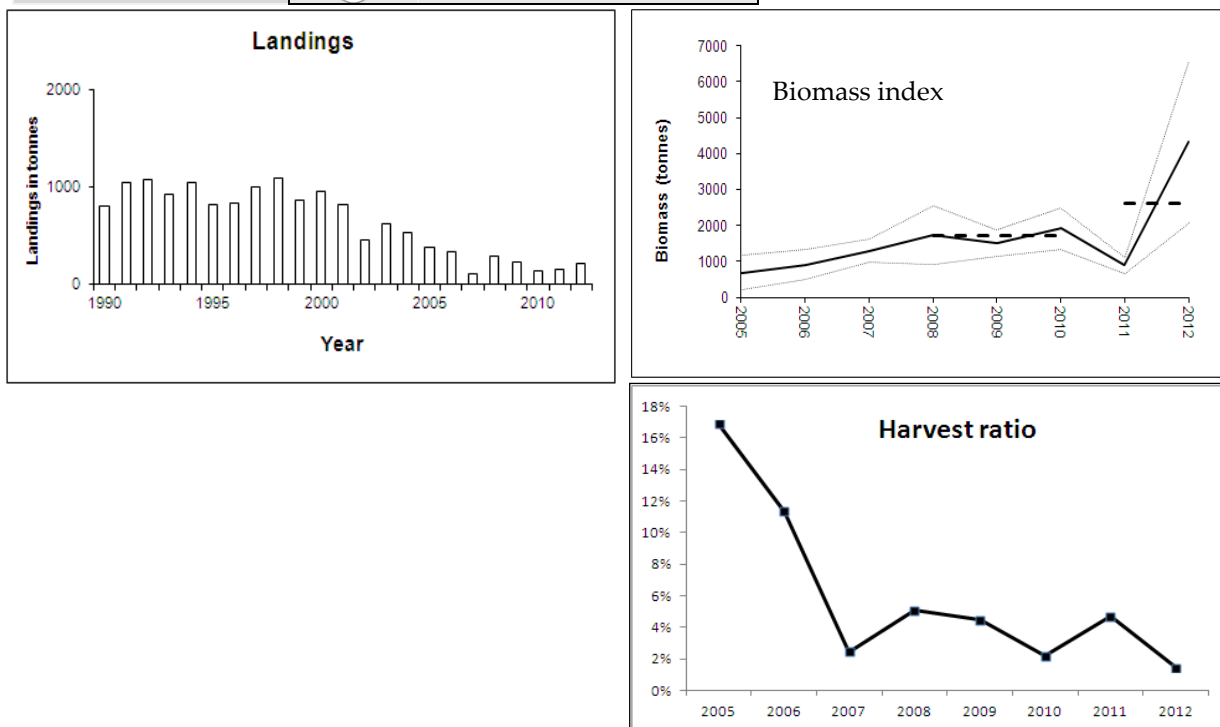


Figure 5.4.18.1 Megrim (*Lepidorhombus* spp.) in Division VIb (Rockall). Landings (in tonnes) (left panel) and biomass index from survey (SCO-IV-VI-AMISS-Q2) (upper right panel, in tonnes) with 95% confidence intervals (dashed lines indicate the average of the respective year range). Harvest ratio: landings/biomass (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 (2011–2012) 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.

Management plans

No specific management objectives are known to ICES.

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.

The fisheries

Megrim is predominantly caught using otter trawls.

Catch distribution	Total landings in 2012 = 224 t, where 100% were landings taken by bottom otter trawl >100 mm. Discards are known to take place but were not quantified.
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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

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).

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

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.

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.

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 14 000 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 landings show an increase in recent years (Figure 5.4.18.3).

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.

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.

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.

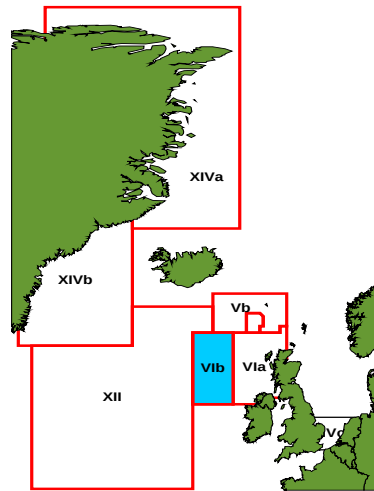


Figure 5.4.18.2 Megrim (*Lepidorhombus* spp.) in Division VIb. Megrim management area (red boxes) and assessment area (blue hatched area).

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.

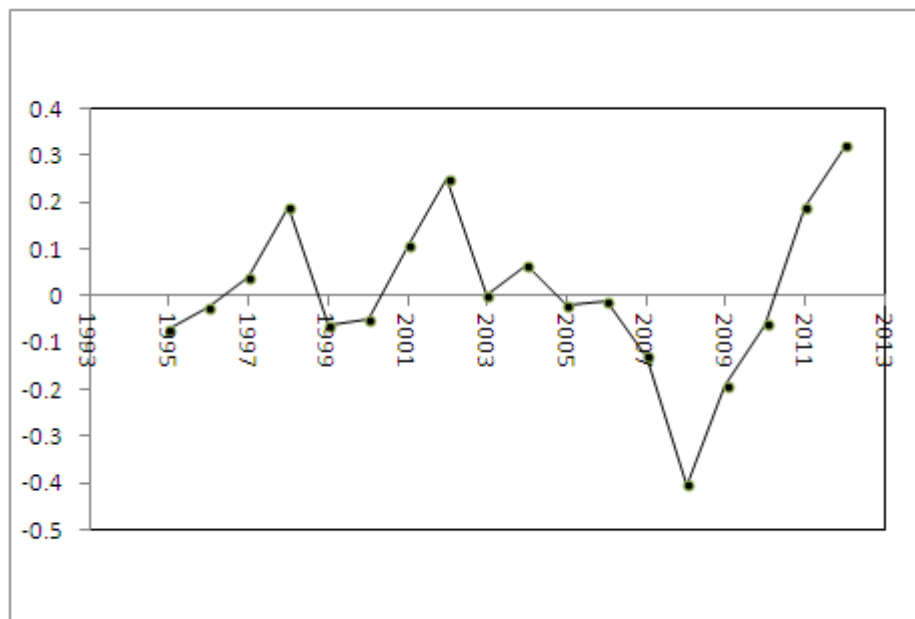


Figure 5.4.18.3 Megrim (*Lepidorhombus* spp.) in Division VIb. Logues for Irish otter trawl vessels (values in logarithmic scale).

Table 5.4.18.1 Megrim (*Lepidorhombus* spp.) in Division VIb. Advice, management, and landings.

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

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 Division VIb. Nominal catch per country (in tonnes) as officially reported to ICES.

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
France	-	-	-	-	-	-	-	-	-	.	4	<0.5	<0.5	-	-	-	-
Ireland	196	240	139	128	176	117	124	141	218	127	167	176	87	83	43	68	1
Spain	363	587	683	594	574	520	515	628	549	404	427	370	120	93	71	88	3
UK - Eng+Wales+N.Irl.	19	14	53	56	38	27	92	76	116	57	57	42	41	74	42	19	1
UK - Scotland	226	204	198	147	258	152	112	164	208	278	309	236	207	382	372	207	1
UK																	
Official Total	804	1045	1073	925	1046	816	843	1009	1091	866	964	824	455	632	528	382	3

Table 5.4.18.3 Megrim (*Lepidorhombus whiffiagonis*) in Division VIb. 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.

Year	Biomass index			Harvest ratio assuming 0.3 catchability for the biomass index
	(tonnes)	95% confidence intervals		
		lower	upper	
2005	679	197	1161	17%
2006	910	485	1334	11%
2007	1289	968	1610	2%
2008	1728	908	2547	5%
2009	1507	1149	1865	4%
2010	1911	1330	2493	2%
2011	885	658	1112	5%
2012	4321	2062	6577	2%

ECOREGION Celtic Sea and West of Scotland
STOCK Megrim (*Lepidorhombus whiffiagonis*) in Divisions VIIb–k and VIIa,b,d

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 12 000 tonnes.*

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.

Scientific basis

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); Survey indices: EVHOE-WIBTS-Q4 and SP-PGFS-WIBTS-Q4; Commercial indices: SP-VIGOTR7 (VIGO84, VIGO99), and IRTBB; Annual maturity ogive from BIOSDEF, 1998; Natural mortalities: a fixed 0.2 is used for all age groups and all years.
Discards and bycatch	Available discard data are incorporated, missing discards estimated by model. Discards included in the assessment since 1990 (Spain and Ireland) and since 2000 UK
Indicators	None.
Other information	The stock was benchmarked in 2012 (WKFLAT; ICES, 2012b).
Working group report	WGHMM (ICES, 2013).

Sources

- ICES. 2012a. Megrim (*Lepidorhombus whiffiagonis*) in Divisions VIIb–k and VIIa,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.

Table 5.4.19.1 Megrim (*Lepidorhombus whiffiagonis*) in Divisions VIIb–k and VIIIa,b,d. ICES advice, management, and catch.

Year	ICES Advice	Predicted catch /landings corresp. to advice	Agreed TAC ¹⁾²⁾	ICES landings	Disc. Slip.	ICES catch
- 1987	Not assessed	-	16.46	17.1	1.7	18.8
- 1988	Not assessed	-	18.1	17.6	1.7	19.3
- 1989	Not assessed	-	18.1	19.2	2.6	21.8
- 1990	Not assessed	-	18.1	14.4	3.3	17.7
- 1991	No advice	-	18.1	15.1	3.3	18.4
- 1992	No advice	-	18.1	15.6	3.0	18.6
- 1993	Within safe biological limits	-	21.46	14.9	3.1	18.0
- 1994	Within safe biological limits	-	20.33	13.7	2.7	16.4
- 1995	No particular concern	-	22.59	15.9	3.2	19.1
- 1996	No long-term gain in increased F	16.6	21.20	15.1	3.0	18.1
- 1997	No advice	14.3	25.0	14.2	3.1	17.3
- 1998	No increase in F	15.2	25.0	14.3	5.4	19.7
- 1999	Reduce F below F_{pa}	14.6	25.0	13.3	3.3	16.6
- 2000	Reduce F below F_{pa}	< 14.2	20.0	15.0	1.9	16.9
- 2001	Reduce F below F_{pa}	< 14.1	16.8	15.8	2.3	18.0
- 2002	Reduce F below F_{pa}	< 13.0	14.9	16.0	2.8	18.8
- 2003	Reduce F below F_{pa}	< 16.1	16.0	15.7	4.0	19.7
- 2004	Reduce F below F_{pa}	< 20.2	20.2	14.3	5.2	19.5
- 2005	Reduce F below F_{pa}	< 22.6	21.5	12.7	2.6	15.3
- 2006	Reduce F below F_{pa}	< 13.6	20.4	12.0	3.4	15.4
- 2007	Less than average landings 2003–05	< 14.2	20.4	13.0	2.7	15.8
- 2008	Less than average landings 2004–06	< 13.0	20.4	10.9	2.5	13.4
- 2009	Same advice as last year	< 13.0	20.4	13.3	2.6	16.0
- 2010	No increase in effort	< 13.0	20.4	13.2	4.4	17.6
- 2011	- See scenarios	-	20.1	11.9	3.3	15.3
- 2012	- Catch and effort reduction	-	20.1	12.1	2.9	15.0
- 2013	- Decrease landings by 4% (20% increase, followed by 20% PA reduction)	< 12.0	19.1			
- 2014	- Same advice as 2013	< 12.0				

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 VIIa,b,d. ICES estimates of landings and catches (in tonnes). Preliminary values are indicated.

	Total landings	Total discards	Total catches	Agreed TAC ⁽¹⁾
1984	16 659	2169	18 828	
1985	17 865	1732	19 597	
1986	18 927	2321	21 248	
1987	17 114	1705	18 819	16 460
1988	17 577	1725	19 302	18 100
1989	19 233	2582	21 815	18 100
1990	14 370	3284	17 654	18 100
1991	15 094	3282	18 376	18 100
1992	15 600	2988	18 588	18 100
1993	14 929	3108	18 037	21 460
1994	13 684	2700	16 384	20 330
1995	15 862	3206	19 068	22 590
1996	15 109	3026	18 135	21 200
1997	14 230	3066	17 296	25 000
1998	14 345	5371	19 716	25 000
1999	13 305	3297	16 602	20 000
2000	1 5031	1870	16 901	20 000
2001	15 778	2262	18 040	16 800
2002	15 987	2813	18 800	14 900
2003	15 687	4008	19 695	16 000
2004	14 300	5240	19 539	20 200
2005	12 703	2578	15 281	21 500
2006	12 000	3368	15 369	20 425
2007	13 048	2703	15 750	20 425
2008	10 853	2531	13 384	20 425
2009	13 348	2604	15 952	20 425
2010	13185	4406	17 590	20 106
2011	11 923	3340	15 263	20 106
2012	12 080	2902	14 982	19 101

⁽¹⁾ For both megrim species and Division VIIa included.

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* in Division VIa

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.

Section	FU no.	Name	ICES Division	Statistical rectangles
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

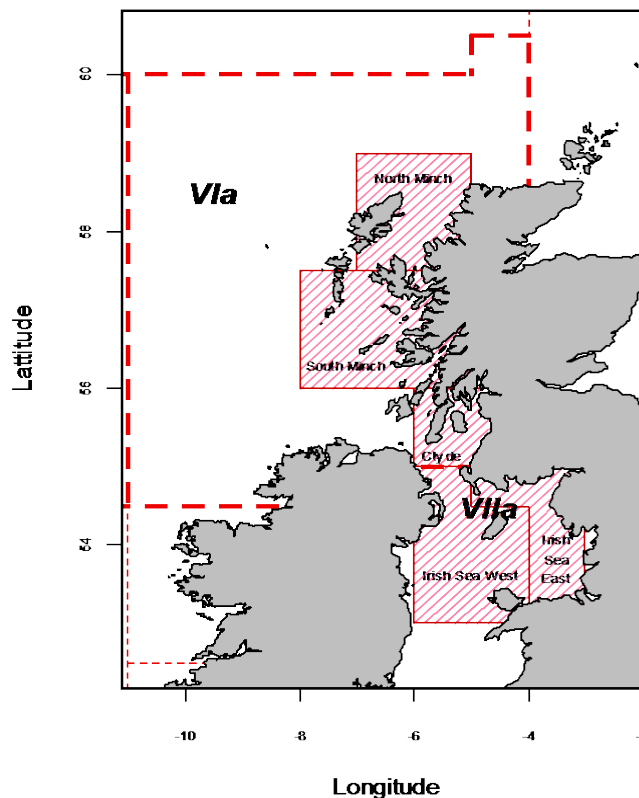


Figure 5.4.20.1 *Nephrops* functional units in Subarea VIa and Division VIIa (see Section 5.4.21).

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.

Table 5.4.20.1 *Nephrops* in Division VIa. Summary of ICES advice by functional unit (FU) plus other rectangles.

Year	Predicted landings corresponding to ICES advice						Agreed TAC ¹⁾	ICES landings
	North Minch (FU11)	South Minch (FU12)	Firth of Clyde (FU13)	Sound of Jura (FU13)	Other rectangles	Total advice		
1992						~11.4	12.0	10.8
1993						~11.3	12.0	11.3
1994						11.3	12.6	11.1
1995						11.3	12.6	12.8
1996						11.3	12.6	11.2
1997						11.3	12.6	11.2
1998						11.3	12.6	11.2
1999						11.3	12.6	11.5
2000						11.3	12.6	11.0
2001						11.3	11.34	10.9
2002						11.3	11.34	10.5
2003						11.3	11.34	10.8
2004						11.3	11.3	10.4
2005						11.3	12.7	10.5
2006						²⁾	17.7	13.7
2007	3.2	7.2	3.765		0.8	15.0	19.9	16.3
2008	3.2	7.2	3.765		0.8	15.0	19.9	15.2
2009	< 4.1	< 5.0	< 5.7		< 0.3	³⁾	18.4	12.7
2010	< 1.0	< 4.1	< 3.9		< 0.25	³⁾	16.1	12.2
2011	< 3.1	< 4.0	< 4.1	< 0.5	< 0.25	³⁾	13.7	13.1
2012	< 3.2	< 5.5	< 4.2	< 0.9	⁴⁾	³⁾	14.1	14.3
2013	< 4.2	< 5.8	< 5.6	< 0.8	⁴⁾	³⁾	16.7	
2014	< 3.485	< 5.211	< 5.744	< 0.521	< 0.326	³⁾		

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.

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.

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.

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%.

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 F_{MSY} directly and hence proxies for F_{MSY} have been determined. Three stock-specific candidates for F_{MSY} proxies ($F_{0.1}$, $F_{35\%SPR}$, and F_{max}) were derived from a length-based per-recruit analysis (these may be modified following further data exploration and analysis). An appropriate F_{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 F_{MSY} proxies chosen. In general, $F_{35\%SPR}$ was used unless there were stock-specific justifications for either higher or lower harvest ratios.

		Burrow density (average burrows m ⁻²)		
		Low < 0.3	Medium 0.3–0.8	High > 0.8
Observed harvest rate or landings compared to stock status (historical performance)	> F_{max}	$F_{35\%SPR}$	F_{max}	F_{max}
	$F_{max}-F_{0.1}$	$F_{0.1}$	$F_{35\%SPR}$	F_{max}
	< $F_{0.1}$	$F_{0.1}$	$F_{0.1}$	$F_{35\%SPR}$
	Unknown	$F_{0.1}$	$F_{35\%SPR}$	$F_{35\%SPR}$
Stock size estimates	Variable	$F_{0.1}$	$F_{0.1}$	$F_{35\%SPR}$
	Stable	$F_{0.1}$	$F_{35\%SPR}$	F_{max}
Knowledge of biological parameters	Poor	$F_{0.1}$	$F_{0.1}$	$F_{35\%SPR}$
	Good	$F_{35\%SPR}$	$F_{35\%SPR}$	F_{max}
Fishery history	Stable spatially and temporally	$F_{35\%SPR}$	$F_{35\%SPR}$	F_{max}
	Sporadic	$F_{0.1}$	$F_{0.1}$	$F_{35\%SPR}$
	Developing	$F_{0.1}$	$F_{35\%SPR}$	$F_{35\%SPR}$

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 F_{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 F_{MSY} proxy should be chosen instead of the combined proxy.

Where possible, a preliminary MSY $B_{trigger}$ 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).

Additional considerations

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).

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.

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 mm), with effort in the *Nephrops* fisheries remaining relatively stable.

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 F_{MSY} proxies (e.g. $F_{0.1}$, F_{max} , $F_{35\%SPR}$) 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 F_{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.

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 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 (2010–2012) 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.

Sources

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Table 5.4.20.2 *Nephrops* in Division VIa. Landings (tonnes) by country as officially reported to ICES.

	France	Ireland	Spain	UK – (Engl+Wales+N.Irl)	UK – Scotland	UK	TOTAL
1980	5	1	-	-	7 422	-	7 428
1981	5	26	-	-	9 519	-	9 550
1982	1	1	-	1	9 000	-	9 003
1983	1	1	-	11	10 706	-	10 719
1984	3	6	-	12	11 778	-	11 799
1985	1	1	28	9	12 449	-	12 488
1986	8	20	5	13	11 283	-	11 329
1987	6	128	11	15	11 203	-	11 363
1988	1	11	7	62	12 649	-	12 730
1989	-	9	2	25	10 949	-	10 985
1990	-	10	4	35	10 042	-	10 091
1991	-	1	-	37	10 458	-	10 496
1992	-	10	-	56	10 783	-	10 849
1993	-	7	-	191	11 178	-	11 376
1994	3	6	-	290	11 047	-	11 346
1995	4	9	3	346	12 527	-	12 889
1996	-	8	1	176	10 929	-	11 114
1997	-	5	15	133	11 104	-	11 257
1998	-	25	18	202	10 949	-	11 194
1999	-	136	40	256	11 078	-	11 510
2000	1	130	69	137	10 667	-	11 004
2001	9	115	30	139	10 568	-	10 861
2002	-	117	18	152	10 225	-	10 512
2003	-	145	12	81	10 450	-	10 688
2004	-	150	6	267	9 941	-	10 364
2005	-	153	17	153	7 616	-	7 939
2006	-	133	1	255	13 419	-	13 808
2007	-	155	-	2 088	14 120	-	16 363
2008	-	56	1	419	14 795	-	15 271
2009	-	53	-	1 226	11 462	-	12 741
2010	-	45	1	1 962	10 250	-	12 258
2011	35	76	0	-	-	12 934	13 045
2012*		29				14 267	14296

*Preliminary.

Table 5.4.20.3 *Nephrops* in Division VIa. Landings (tonnes) by functional unit plus other rectangles (creel landings are included).

Year	FU11	FU12	FU13	Other	Total
1981	2861	3651	2968	39	9519
1982	2799	3552	2623	27	9001
1983	3196	3412	4077	34	10719
1984	4144	4300	3310	36	11790
1985	4061	4008	4285	104	12458
1986	3382	3484	4341	89	11296
1987	4083	3891	3007	257	11238
1988	4035	4473	3665	529	12702
1989	3205	4745	2812	212	10974
1990	2544	4430	2912	182	10068
1991	2792	4442	3038	255	10527
1992	3560	4237	2805	248	10849
1993	3192	4455	3342	344	11332
1994	3616	4415	2629	441	11101
1995	3656	4680	3989	460	12785
1996	2871	3995	4060	239	11165
1997	3046	4345	3618	243	11252
1998	2441	3730	4843	157	11171
1999	3257	4051	3752	438	11498
2000	3246	3952	3419	421	11038
2001	3259	3992	3182	420	10853
2002	3440	3305	3383	397	10525
2003	3268	3879	3171	433	10751
2004	3135	3868	3025	403	10431
2005	2984	3841	3423	254	10502
2006	4160	4554	4778	241	13733
2007	3968	5451	6495	420	16334
2008	3799	5347	5997	128	15271
2009	3497	4282	4777	185	12741
2010	2263	3725	5701	569	12258
2011	2696	3699	6431	219	13045
2012*	3388	3889	6584	435	14296

* Preliminary.

Table 5.4.20.4 *Nephrops* in Division VIb. Landings (tonnes) by country as officially reported to ICES.

	France	Germany	Ireland	Spain	UK - (Engl+Wales+N.Irl)	UK - Scotland	TOTAL
1980	-	-	-	-	-	-	0
1981	-	-	-	-	-	-	0
1982	-	-	-	-	-	-	0
1983	-	-	-	-	-	-	0
1984	-	-	-	-	-	-	0
1985	-	-	-	-	-	-	0
1986	-	-	-	8	-	-	8
1987	-	-	-	18	11	-	29
1988	-	-	-	27	4	-	31
1989	-	-	-	14	-	-	14
1990	-	-	-	10	1	-	11
1991	-	-	-	30	-	-	30
1992	-	-	-	2	4	1	7
1993	-	-	-	2	6	9	17
1994	-	-	-	5	16	5	26
1995	1	-	-	2	26	1	30
1996	-	6	-	5	65	5	81
1997	-	-	1	3	88	23	115
1998	-	-	1	6	46	7	60
1999	-	-	-	5	2	5	12
2000	2	-	8	3	4	4	21
2001	1	-	1	14	2	7	25
2002	1	-	-	7	3	7	18
2003	-	-	1	5	6	18	30
2004	-	-	-	2	7	13	22
2005	3	-	1	1	5	7	17
2006	-	-	-	-	1	3	4
2007	-	-	-	2	3	-	5
2008	-	-	-	-	-	-	0
2009	-	-	-	-	-	-	0
2010	-	-	-	-	-	-	0
2011	-	-	-	-	-	-	0
2012*	-	-	-	-	-	-	0

* Preliminary.

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* in North Minch (FU 11)

Advice for 2014

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 3485 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 3702 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.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✓	✓	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Not defined

SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	? Not defined

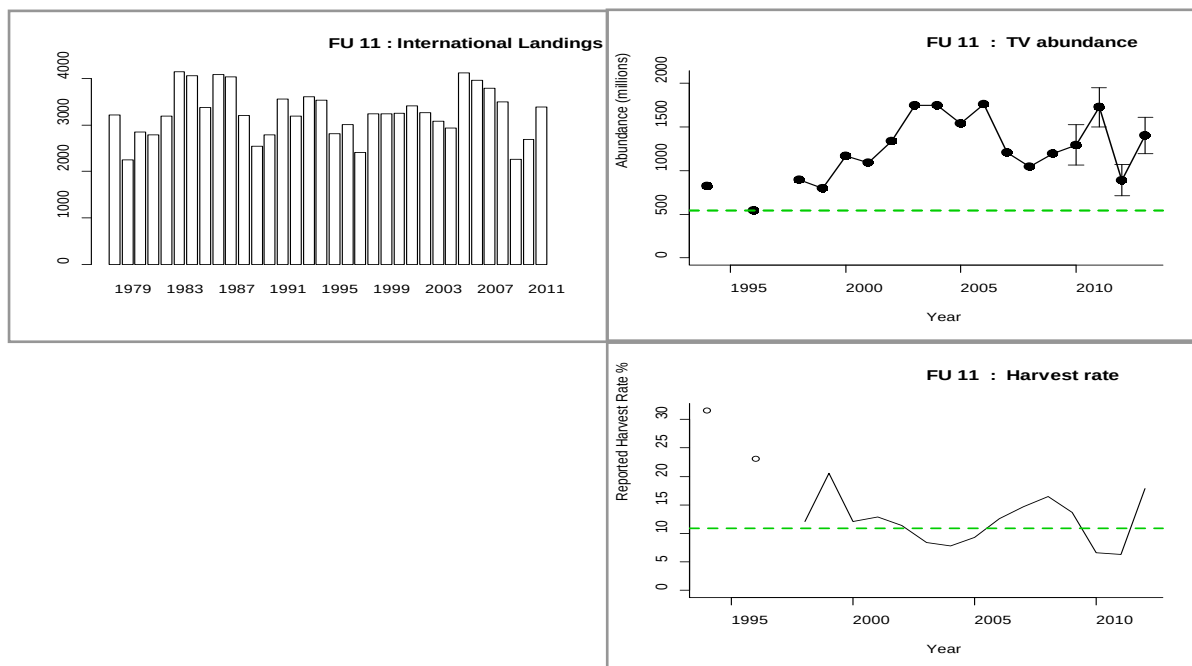


Figure 5.4.20.1 *Nephrops* in North Minch (FU 11). Landings (tonnes), UWTv survey abundance (millions; SSB proxy; 95% confident intervals), and harvest rate (fishing mortality proxy). Harvest rates before 2006 may be unreliable due to underreporting of landings. Green dashed lines represent MSY $B_{trigger}$ and F_{MSY} harvest ratio proxy.

The stock has been above MSY $B_{trigger}$ for more than 15 years. The results from the UWTv survey indicate that the abundance has decreased in 2012 and recovered in 2013 to an abundance similar to those observed in 2010–2011. The historical harvest ratios (removals/UWTv abundance) have fluctuated around the F_{MSY} proxy. The harvest ratio in 2012 increased to 17.9% and is above the F_{MSY} proxy.

Management plans

No specific management objectives are known to ICES.

Biology

The general biology of *Nephrops* is discussed in the overview (Section 5.4.20). The North Minch stock consistently exhibits medium densities compared to other stocks.

The fisheries

The fishery has been fairly stable over the time-series. Landings have increased in the last two years and the drop observed in 2010 seems to be mainly related to market conditions. Reported effort by all Scottish *Nephrops* trawlers has shown an increase in 2012 particularly during the first semester. It is an all-year-round fishery and creel fishing takes place mainly in the sea-loch areas, but has recently extended also to further offshore. Overall effort in terms of creel numbers is not known and there are no limits on the number of creels.

Catch distribution	Total catch (2012) = 3592 t, where 3388 t are landings (84% trawl, 16% creel) and 204 t discards.
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Effects of the fisheries on the ecosystem

There is a bycatch of other species, particularly haddock and whiting, in *Nephrops* fisheries in the North Minch.

Quality considerations

Harvest ratios since 2006 are considered reliable due to more accurate landings data reported under the new legislation. The survey area was extended in 2010 and refined at the latest benchmark in 2013 and now corresponds to the VMS distribution of fishing effort. From 1999, the incorporation of creel length compositions of catches has also improved estimates of harvest ratios.

Scientific basis

Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data.
Stock data category	1
Input data	One survey index (UWTV-FU11); commercial catches (international landings, length frequencies from Scottish catch sampling); fixed maturity parameters from survey data; fixed natural mortalities. Discard survival rate.
Discards and bycatch	Discards from Scottish trawls were included in the assessment.
Indicators	Size structure of catches, mean size, lpue.
Other information	Latest benchmark (based on the UWTV survey) was performed in 2013 (WKNEPH; ICES, 2013a).
Working group report	WGCSE (ICES, 2013b).

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* in North Minch (FU 11)

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY	MSY B _{trigger}	541 million individuals	Bias-adjusted lowest observed UWTV survey estimate of abundance.
approach	F _{MSY}	10.9% harvest rate	Equivalent to F _{35%SpR} combined sex. F _{MSY} proxy based on length-based yield-per-recruit analysis.
Precautionary approach	Not defined.		

(unchanged since: 2013)

Harvest ratio reference points (2013):

	Male	Female	Combined
F _{max}	11.1	23.0	13.2
F _{0.1}	6.9	12.8	7.7
F_{35%SpR}	8.2	19.6	10.9

For this FU, the absolute density observed in the UWTV survey is medium (~ 0.59 burrows m⁻²). Historical harvest ratios in this FU have been around those equivalent to fishing at F_{35%SpR} and landings have been relatively stable in the past thirty years. F_{35%SpR} (combined between sexes) is expected to deliver high long-term yield with a low probability of recruitment overfishing and is therefore chosen as a proxy for F_{MSY}. New size-at-maturity parameters were available at the 2013 benchmark, leading to revisions in the harvest rate reference points.

Outlook for 2014

Basis: F₂₀₁₃ = F₂₀₁₂ = 17.9%; Bias-corrected survey index (2013) = 1403 million; Mean weight in landings (1999–2012) = 25.33 g; Dead discard rate (by number) = 10.0%; Mean weight in discards (1999–2012) = 10.64 g; Survey bias = 1.33; Discard survival rate = 25%.

Basis	Total catches*	Landings	Dead discards**	Surviving discards**	Harvest rate
	L+DD+SD	L	DD	SD	for L+DD
F _{MSY} proxy	3702	3485	163	54	10.9%
F ₂₀₁₃	6081	5725	267	89	17.9%
F _{0.1}	2615	2462	115	38	7.7%
F _{max}	4486	4223	197	66	13.2%

Weights in tonnes.

* Total catches are the landings, plus dead and surviving discards.

** The total discard rate is assumed to be 12.9% of the catches (in number, average of the last three years, 2010–2012); discard survival is assumed to be 25%.

MSY approach

Following the ICES MSY approach implies the harvest ratio for the North Minch functional unit should be reduced to less than 10.9%, resulting in landings of no more than 3485 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 3702 tonnes.

Additional considerations

The advice takes into account the 2013 UWTV survey results.

Recent work using VMS has refined the estimate of the area. Results from a recent study on mapping the spatial extent of *Nephrops* habitat in the North Minch sea lochs indicate that the muddy habitat in the lochs is only a very small proportion of the total *Nephrops* grounds in this FU.

The minimum landing size for *Nephrops* in Division VIa is 20 mm carapace length. Discarding of both undersize and poor quality *Nephrops* sometimes takes place in this FU. Discard rates have been variable but generally lower than 20%. The mean sizes in the length compositions of larger individuals (>35 mm CL) are relatively stable (Figure 5.4.20.1.2), but the mean weight in landings has increased markedly in 2010 and decreased again in the last two years. To dampen this variability, the time-series average (1999–2012) was used as input for the mean weight in landings for the catch forecasts.

Data and methods

The long-term average (rather than a three-year average) was considered to be more appropriate as input for the mean weight in landings, due to the interannual variation.

Underwater TV (UWTV) surveys have been conducted for this stock since 1994, with annual surveys available since 1998.

Anecdotal evidence from the fishing industry that some areas outside the “sediment area” traditionally used to conduct the UWTV survey could be suitable ground for *Nephrops* was confirmed by VMS data linked to landings and as such, it was considered likely that the absolute abundance estimate was an underestimate. To account for this, the VMS area in the North Minch was used to generate the sampling stations since 2010. A correction ratio calculated as 1.64 (VMS area/sediment area) was applied to back-calculate the abundance estimates in previous years.

Uncertainties in the assessment and forecast

The method to derive landings for the catch options is sensitive to the input of discard rate, survival of discards, and mean weight in landings. A recent fluctuation in the mean weights in landings for this functional unit introduces uncertainties in the catch forecasts.

As the VMS areas are calculated only for vessels of 15 m and over, the inclusion of vessels smaller than 15 m would likely increase the fished area in some of the inshore locations. A number of UWTV surveys have taken place in the major North Minch sea lochs in an attempt to improve estimates of the ground area and *Nephrops* abundance. Work presented to the ICES working group (2013b) showed that the total area of the sea lochs is 105 km², which is considerably smaller than the offshore VMS area estimated at 2908 km². Therefore, it is unlikely that the exclusion of these inshore areas from the survey have an impact on the mean densities and overall abundance of *Nephrops* in the North Minch.

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

Sources

ICES. 2013a. Report of the Benchmark Workshop on *Nephrops* (WKNEPH), 25 February–1 March 2013, Lysekil, Sweden. ICES CM 2013/ACOM: 45.

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

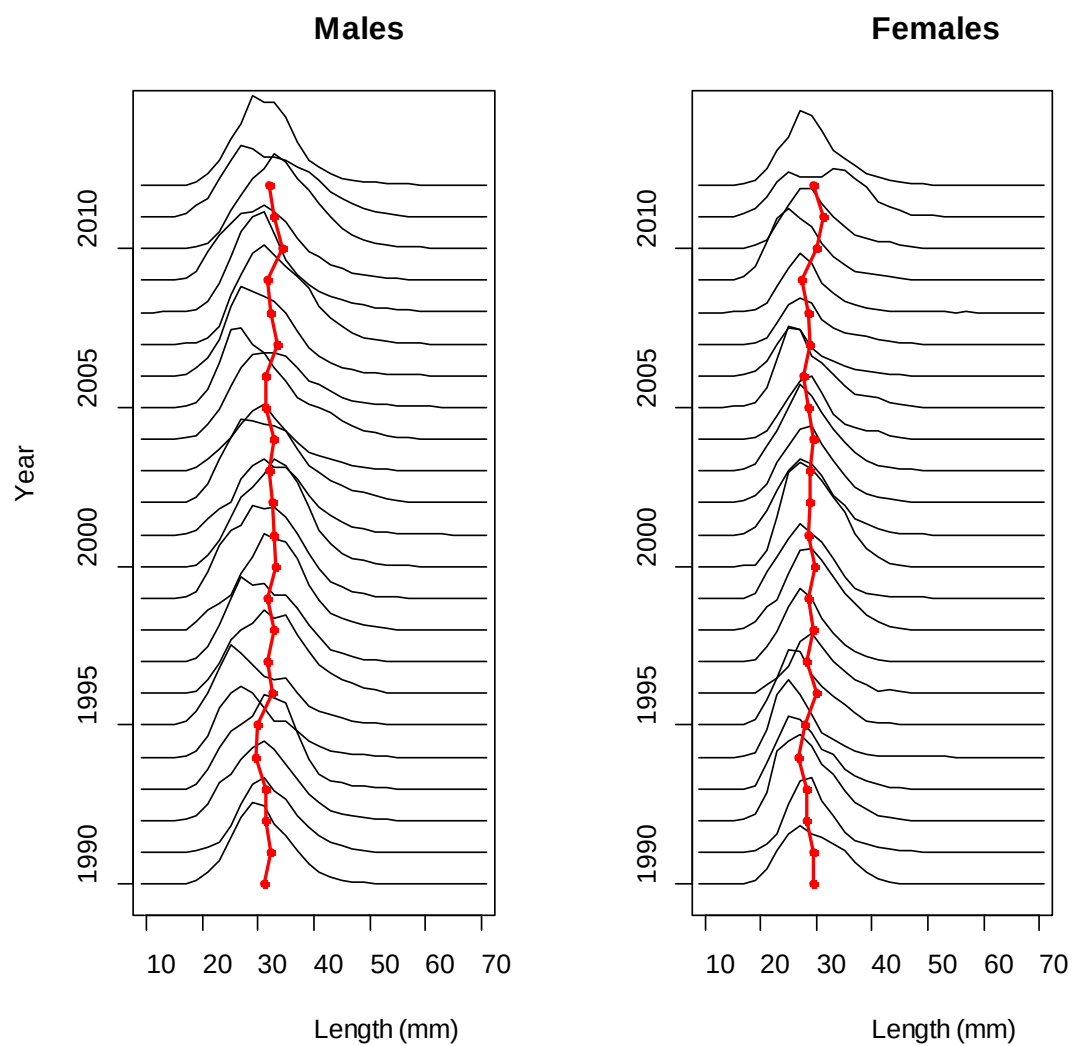


Figure 5.4.20.1.2 *Nephrops* in North Minch (FU 11). Annual length composition (black lines) of catch of males (left) and females (right) from 1990 (bottom) to 2012 (top). Mean sizes of catch (red line) are also shown.

Table 5.4.20.1.1 *Nephrops* in North Minch (FU 11). ICES advice, management, landings, and discards.

Year	ICES advice	Predicted landings corresp. to advice North Minch (FU 11)	ICES landings (FU 11)	Total discards ¹ (FU 11)
1989			3.2	
1990			2.5	
1991			2.8	
1992	maintain current effort		3.6	
1993	maintain current effort		3.2	
1994	maintain current effort		3.6	
1995	maintain current effort		3.7	
1996	maintain current effort		2.9	
1997	as for 1996		3.0	
1998	maintain current effort		2.4	
1999	as for 1998		3.3	0.3
2000	maintain current effort		3.2	0.1
2001	as for 2000		3.3	0.2
2002	maintain current effort		3.4	0.3
2003	as for 2002		3.3	0.3
2004	maintain current effort		3.1	0.2
2005	as for 2004		3.0	0.5
2006	No increase in effort		4.2	0.8
2007	No increase effort and harvest rate of 15%	3.2	4.0	0.2
2008	As for 2007	3.2	3.8	0.2
2009	No increase effort and recent average catch	< 4.1	3.5	0.3
2010	Harvest rate no greater than that equivalent to fishing at $F_{0.1}$	< 1.0	2.3	0.1
2011	MSY transition scheme	< 3.1	2.7	0.2
2012	MSY approach	< 3.2	3.4	0.2
2013	MSY approach	< 4.2		
2014	MSY approach	< 3.5		

Weights in thousand tonnes.

¹⁾ Assumed survival rate of 25%.

Table 5.4.20.1.2 *Nephrops* in North Minch (FU 11). Landings (tonnes) reported to ICES (ICES estimates).

Year	UK Scotland				Other UK & Ireland	Total
	<i>Nephrops</i> trawl	Other trawl	Creel	Subtotal		
1981	2320	170	371	2861	0	2861
1982	2323	105	371	2799	0	2799
1983	2784	95	317	3196	0	3196
1984	3449	161	534	4144	0	4144
1985	3236	117	708	4061	0	4061
1986	2642	203	537	3382	0	3382
1987	3458	143	482	4083	0	4083
1988	3449	149	437	4035	0	4035
1989	2603	112	490	3205	0	3205
1990	1941	134	469	2544	0	2544
1991	2228	125	439	2792	0	2792
1992	2978	150	432	3560	0	3560
1993	2699	85	408	3192	0	3192
1994	2916	246	454	3616	0	3616
1995	2940	184	532	3656	0	3656
1996	2355	147	369	2871	0	2871
1997	2553	102	391	3046	0	3046
1998	2023	67	351	2441	0	2441
1999	2791	56	410	3257	0	3257
2000	2695	28	523	3246	0	3246
2001	2651	41	567	3259	0	3259
2002	2775	79	586	3440	0	3440
2003	2607	44	617	3268	0	3268
2004	2400	25	710	3135	0	3135
2005	2267	18	699	2984	0	2984
2006	3446	17	697	4160	0	4160
2007	3362	16	590	3968	0	3968
2008	3230	12	557	3799	0	3799
2009	2858	26	613	3497	0	3497
2010	1717	6	540	2263	0	2263
2011	2110	16	570	2696	0	2696
2012*	2844	6	536	3386	2	3388

*Provisional.

Table 5.4.20.1.3 *Nephrops* in North Minch (FU 11). Time-series of UWTV survey results (after correction for bias), with 95% confidence intervals.

Year	Number of valid stations	Mean density burrows/m ²	Abundance (Sediment) millions	95% confidence interval (sediment) millions	Abundance (VMS) millions	95% confidence interval (VMS) millions
1994	41	0.38	500	74	820	-
1995			No survey			
1996	38	0.25	330	47	541	-
1997			No survey			
1998	38	0.41	547	77	898	-
1999	36	0.36	484	89	794	-
2000	39	0.53	711	82	1166	-
2001	56	0.50	666	81	1092	-
2002	37	0.61	815	91	1337	-
2003	41	0.80	1068	129	1751	-
2004	38	0.80	1068	107	1751	-
2005	41	0.70	939	100	1540	-
2006	30	0.81	1075	101	1762	-
2007	36	0.55	736	91	1206	-
2008	41	0.48	638	95	1047	-
2009	26	0.55	729	138	1195	-
2010	37	0.59	-	-	1293	231
2011	41	0.79	-	-	1726	226
2012	41	0.41	-	-	891	181
2013	41	0.64	-	-	1403	206

Table 5.4.20.1.4 *Nephrops* in North Minch (FU 11). Adjusted TV survey abundance, landings, total discard rate (proportion by number), dead discard rate (by number), and estimated harvest rate.

Year	Landings in number (millions)	Discards in number (millions)	Removals in number (millions)**	Adjusted survey VMS (millions)	Harvest ratio VMS*	Landings (tonnes)	Discard (tonnes)	Discard rate	Dead discard rate***	Mean weight in landings (g)
1999	145	28	164	794	20.6	3257	275	16.4	12.8	22.7
2000	133	10	141	1166	12.1	3246	98	6.9	5.2	24.19
2001	130	17	141	1092	12.9	3259	161	11.7	9.1	25.33
2002	132	28	153	1337	11.4	3440	276	17.6	13.8	25.93
2003	127	30	148	1751	8.4	3268	303	19.2	15.2	26.03
2004	123	18	136	1751	7.8	3135	203	13.0	10.1	25.16
2005	108	51	144	1540	9.3	2984	514	32.0	26.1	27.65
2006	171	74	223	1762	12.6	4160	762	30.3	24.6	24.52
2007	170	12	177	1206	14.7	3968	216	6.5	5.0	23.61
2008	162	19	173	1047	16.5	3799	198	10.5	8.1	23.81
2009	145	37	164	1195	13.7	3497	344	20.3	16.0	25.34
2010	77	11	85	1293	6.6	2263	121	12.4	9.6	29.33
2011	96	16	108	1726	6.3	2696	154	14.2	11.0	27.56
2012	145	20	159	891	17.9	3388	204	12.0	9.3	23.43
2013				1403						
Average									10.0	25.33

* Harvest rates previous to 2006 are unreliable.

** Removals numbers take the dead discard rate into account.

*** Dead discards: average of 2010–2012; Mean weight in landings: average of 1999–2012.

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* in South Minch (FU 12)

Advice for 2014

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 5211 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 5394 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.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✓	✓	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Not defined
SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✗	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	? Not defined

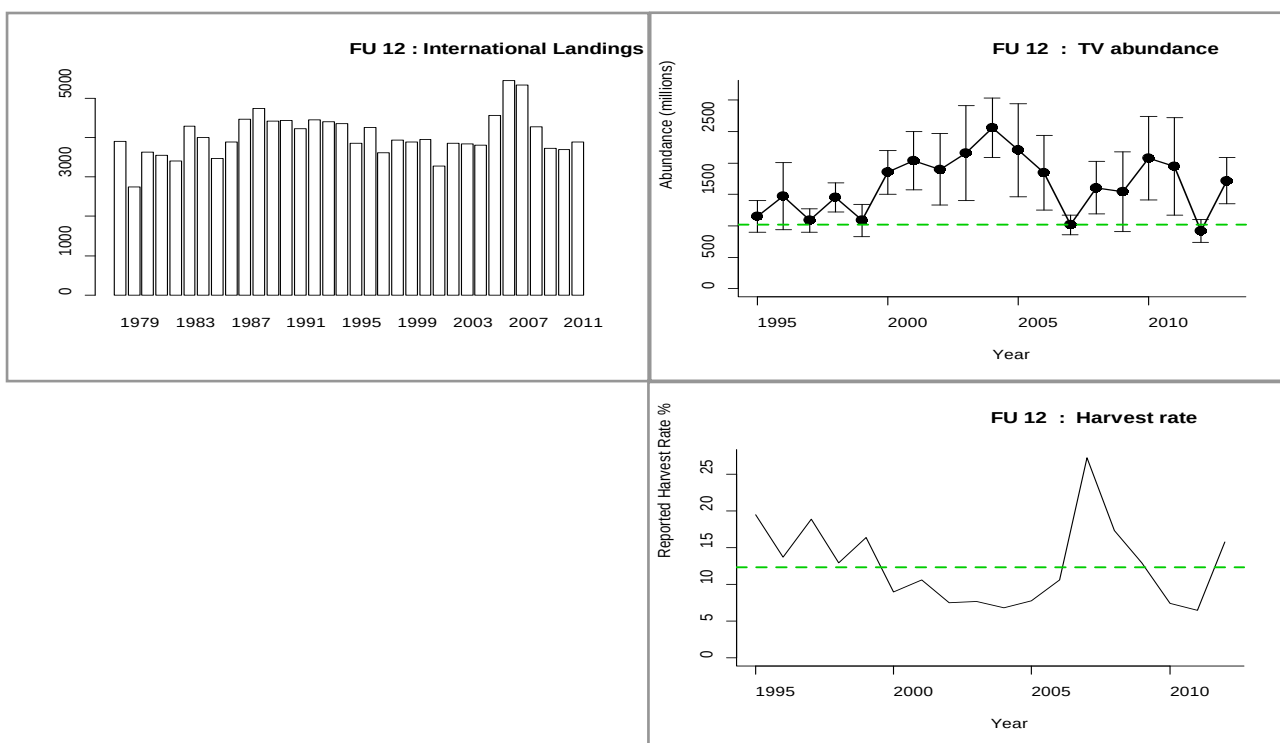


Figure 5.4.20.2.1 *Nephrops* in South Minch (FU 12). Long-term trends in landings (tonnes), UWTV survey (millions; SSB proxy; confidence intervals 95%), and harvest rate (fishing mortality proxy). Harvest rates before 2006 may be unreliable due to underreporting of landings. Green dashed lines represent MSY $B_{trigger}$ and F_{MSY} harvest ratios.

The stock fell below MSY $B_{trigger}$ in 2012 but increased in 2013 and is now above MSY $B_{trigger}$. The results from the TV survey indicate that the abundance has decreased in 2012 and recovered in 2013 to levels similar to those observed in 2011. The harvest ratio (removals/UWTV abundance) has increased to 15.8% in 2012 and is now above F_{MSY} proxy.

Management plans

No specific management objectives are known to ICES.

Biology

The general biology of *Nephrops* is discussed in the overview (Section 5.4.20). The South Minch stock consistently exhibits medium densities (compared to other stocks).

The fisheries

Trawling is the predominant fishing method and fishing takes place all year round. Landings have been fairly stable in the last four years but length sampling information suggests a series of low recruitments in recent years. Reported effort by all Scottish *Nephrops* trawlers has shown an increase in 2012, particularly during the first semester. Inshore trawlers are mainly small, but in the offshore areas of this FU larger boats operate. Creel fishing takes place mainly in inshore areas (including the sea-lochs), but has extended further offshore in recent years. Overall effort in terms of creel numbers is not known and there are no limits on the number of creels.

Catch distribution	Total catch (2012) = 4034 t, where 3889 t are landings (81% trawl and 19% creel) and 145 t discards from the trawl fleet. Discards from the creel fishery are considered to be very low.
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Effects of the fisheries on the ecosystem

There is a bycatch of other species, particularly haddock and whiting, in the *Nephrops* fisheries in the South Minch.

Quality considerations

Harvest ratios since 2006 are considered reliable due to more accurate landings data reported under the new legislation. From 1999, the incorporation of creel length compositions of catches has also improved estimates of harvest ratios.

Scientific basis

Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data.
Stock data category	1
Input data	One survey index (UWTV-FU12); commercial catches (international landings, length frequencies from Scottish catch sampling); fixed maturity parameters (from survey data) and natural mortality. Discard survival rate.
Discards and bycatch	Discards from Scottish trawls were included in the assessment.
Indicators	Size structure of catches, mean size, lpue.
Other information	Latest benchmark (based on the UWTV survey) was performed in 2009 (ICES, 2009).
Working group report	WGCSE (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK Nephrops in South Minch (FU 12)

Reference points

	Type	Value	Technical basis
MSY approach	MSY B_{trigger}	1016 million individuals.	Bias-adjusted lowest observed UWTV survey estimate of abundance.
	F_{MSY}	12.3% harvest rate.	Equivalent to $F_{35\%SPR}$ combined sex. F_{MSY} proxy based on length-based yield-per-recruit analysis.
Precautionary approach	Not defined.		

(unchanged since: 2011)

Harvest ratio reference points (2011):

	Male	Female	Combined
F_{max}	13.3	26.8	16.1
$F_{0.1}$	7.8	13.8	8.7
$F_{35\%SPR}$	9.6	18.3	12.3

For this FU, the absolute density observed in the UWTV survey is medium (~ 0.44 burrows m^{-2}). The fishery in this area has been in existence since the 1960s. Historical harvest ratios in this FU have been variable, but generally around $F_{35\%SPR}$. $F_{35\%SPR}$ (combined between sexes) is expected to deliver high long-term yield with a low probability of recruitment overfishing and is therefore chosen as a proxy for F_{MSY} .

Outlook for 2014

Basis: $F_{2013} = F_{2012} = 15.8\%$; Bias-corrected survey index (2013) = 1718 million; Mean weight in landings (1999–2012) = 26.45 g; Dead discard rate (by number) = 6.8%; Mean weight in discards (1999–2012) = 9.53 g; Survey bias = 1.32; Discards survival rate = 25%.

Basis	Total catches*	Landings	Dead discards**	Surviving discards**	Harvest rate
	L+DD+SD	L	DD	SD	for L+DD
F_{MSY} proxy	5394	5211	137	46	12.3%
F_{2013}	6927	6692	176	59	15.8%
$F_{0.1}$	3813	3684	97	32	8.7%
F_{max}	7058	6819	179	60	16.1%

Weights in tonnes.

* Total catches are the landings plus dead and surviving discards.

** Total discard rate is assumed to be 8.9% of the catches (in number, average of the last three years, 2010–2012), discard survival is assumed to be 25%.

MSY approach

Following the ICES MSY approach implies that the harvest ratio for the South Minch functional unit is reduced to less than 12.3%, resulting in landings of no more than 5211 tonnes in 2014. If discard rates do not change from the average of the last three years (2010–2012, assuming a 25% discard survival), this implies total catches of no more than 5394 tonnes.

Additional considerations

The advice takes into account the 2013 UWTV survey results.

Work comparing the area based on available VMS and sediment data on which the UWTV survey is based showed no major differences between the two; the original area of ground was therefore retained for the UWTV survey. However,

the survey should still be considered as a minimum estimate since areas of suitable sediment in the sea lochs are not included.

The minimum landing size for *Nephrops* in Division VIa is 20 mm carapace length. Discarding of both undersize and poor quality *Nephrops* sometimes takes place in this FU. Discard rates have been variable but generally lower than 20%. The mean sizes in the length compositions of smaller individuals (< 35 mm CL) has increased consistently (Figure 5.4.20.2.2), suggesting low recruitment in the last four years. The mean weight in landings has increased markedly in recent years and the time-series average (1999–2012) was used as input for the mean weight in landings for the catch forecasts.

Data and methods

Underwater TV surveys have been conducted for this stock every year since 1995.

The long-term average (rather than a three-year average) was considered to be more appropriate as input for the mean weight in landings, due to the interannual variation.

Uncertainties in the assessment and forecast

Abundance bias estimates for FU 12 are largely based on expert opinion. The precision of these bias corrections cannot yet be quantified.

Mean weights in the landings were relatively high in the last three years compared to the long-term average.

The overall area of the ground is estimated from the available British Geological Survey contoured sediment data and at present this is considered to be a minimum estimate. It is known that most of the sea lochs have areas of mud substrate and are typically fished by creel boats, but not by the trawl fleet. Limited TV surveys have taken place in some of the sea lochs and attempts are being made to utilize these data to improve estimates of mud area and *Nephrops* abundance in the South Minch.

The UWTV-FU12 is targeted at known areas of mud, sandy mud, and muddy sand within the South Minch. The variance of density estimates in the South Minch is relatively high, particularly in the sandy mud strata (e.g. 77% of total variance in 2011). This results in large confidence intervals and a greater uncertainty on the abundance estimates. There is a need to explore options to implement further stratification of the South Minch survey area.

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 this year's 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 on the Celtic Seas Ecoregion (WGCSE), 8–17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM: 12.

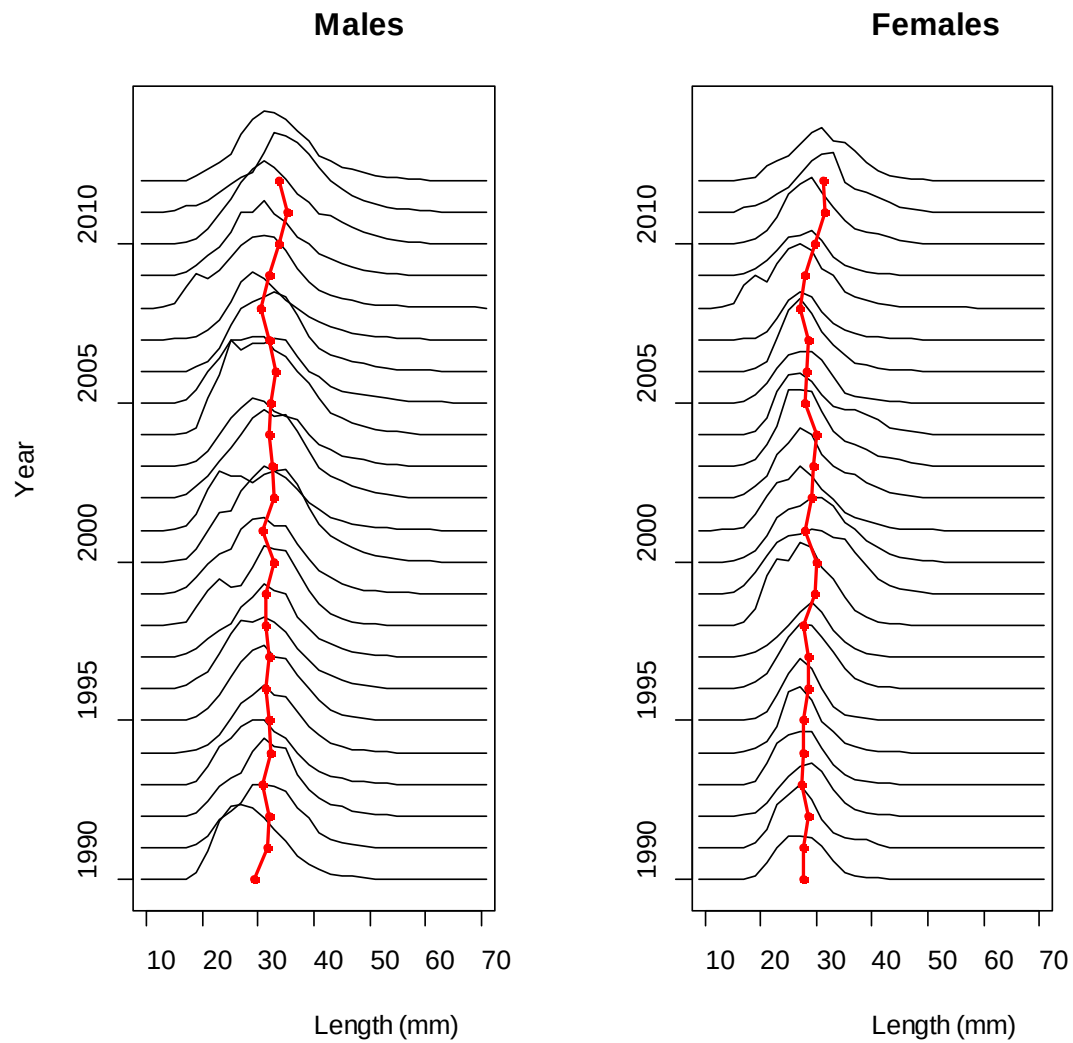


Figure 5.4.20.2.2 *Nephrops* in South Minch (FU 12). Annual length composition (black lines) of catch of males (left) and females (right) from 1990 (bottom) to 2012 (top). Mean sizes of catch (red line) are also shown.

Table 5.4.20.2.1 *Nephrops*, South Minch (FU 12). ICES advice, management, landings, and discards.

Year	ICES advice	Predicted landings corresp. to advice for South Minch (FU 12)	ICES landings (FU 12)	Total discards ¹ (FU12)
1989			4.7	
1990			4.4	
1991			4.4	
1992	maintain current effort		4.2	
1993	maintain current effort		4.5	
1994	maintain current effort		4.4	
1995	maintain current effort		4.7	
1996	maintain current effort		4.0	
1997	as for 1996		4.3	
1998	maintain current effort		3.7	
1999	as for 1998		4.1	0.2
2000	maintain current effort		4.0	0.3
2001	as for 2000		4.0	0.6
2002	maintain current effort		3.3	0.2
2003	as for 2002		3.9	0.4
2004	maintain current effort		3.9	0.4
2005	as for 2004		3.8	0.4
2006	No increase in effort		4.6	0.3
2007	No increase in effort and harvest rate of 15%	7.2	5.5	0.9
2008	as for 2007	7.2	5.3	0.6
2009	No increase effort and recent average catch	< 5.0	4.3	0.2
2010	Harvest rate no greater than that equivalent to fishing at $F_{0.1}$	< 4.1	3.7	0.1
2011	MSY transition scheme	< 4.0	3.7	0.1
2012	MSY approach	< 5.5	3.9	0.1
2013	MSY approach	< 5.8		
2014	MSY approach	< 5.2		

Weights in thousand tonnes.

¹⁾ Assumed survival rate of 25 %.

Table 5.4.20.2.2 *Nephrops* in South Minch (FU 12). Landings (tonnes) reported to ICES (ICES estimates).

Year	UK Scotland				Other UK	Ireland	Total
	<i>Nephrops</i> trawl	Other trawl	Creel	Sub-total			
1981	2965	254	432	3651	0	0	3651
1982	2925	207	420	3552	0	0	3552
1983	2595	361	456	3412	0	0	3412
1984	3228	478	594	4300	0	0	4300
1985	3096	424	488	4008	0	0	4008
1986	2694	288	502	3484	0	0	3484
1987	2927	418	546	3891	0	0	3891
1988	3544	364	555	4463	10	0	4473
1989	3846	338	561	4745	0	0	4745
1990	3732	262	436	4430	0	0	4430
1991	3597	341	503	4441	1	0	4442
1992	3479	208	549	4236	1	0	4237
1993	3608	193	649	4450	5	0	4455
1994	3743	265	404	4412	3	0	4415
1995	3442	716	508	4666	14	0	4680
1996	3107	419	468	3994	1	0	3995
1997	3519	331	492	4342	3	1	4345
1998	2851	340	538	3729	0	0	3730
1999	3165	359	513	4037	0	14	4051
2000	2939	312	699	3950	0	2	3952
2001	2823	393	767	3983	0	9	3992
2002	2234	315	742	3291	0	14	3305
2003	2812	203	858	3873	0	6	3879
2004	2865	104	880	3849	0	19	3868
2005	2810	46	953	3809	1	31	3841
2006	3569	19	922	4510	9	35	4554
2007	4436	8	958	5402	19	30	5451
2008	4432	5	895	5332	2	13	5347
2009	3347	20	900	4267	4	11	4282
2010	2801	13	889	3703	16	6	3725
2011	2878	6	783	3667	23	9	3699
2012*	3102	20	742	3864	19	6	3889

* Provisional.

Table 5.4.20.2.3 *Nephrops* in South Minch (FU 12). Time-series of UWTV survey results (after correction for bias), with 95% confidence intervals.

Year	Number of Stations	Mean density	Abundance	95% confidence interval
		burrows/m ²	millions	millions
1995	33	0.30	1152	251
1996	21	0.38	1473	530
1997	36	0.28	1086	185
1998	38	0.38	1452	232
1999	37	0.28	1086	260
2000	41	0.48	1854	348
2001	47	0.53	2037	459
2002	31	0.49	1899	567
2003	25	0.56	2157	756
2004	38	0.67	2558	473
2005	33	0.57	2208	740
2006	36	0.48	1845	598
2007	39	0.26	1016	155
2008	33	0.42	1608	415
2009	25	0.40	1542	634
2010	34	0.54	2076	665
2011	36	0.51	1945	779
2012	38	0.24	919	185
2013	38	0.44	1718	365

Table 5.4.20.2.4 *Nephrops* in South Minch (FU 12). Adjusted TV survey abundance, landings, total discard rate (proportion by number), dead discard rate (by number), and estimated harvest rate.

Year	Landings in number (millions)	Discards in number (millions)	Removals in number (millions)**	Adjusted Survey (millions)	Harvest Ratio*	Landings (tonnes)	Discard (tonnes)	Discard rate	Dead discard rate	Mean weight in landings (g)
1999	154	28	178	1086	16.4	4051	196	15.4	12.0	25.14
2000	140	32	168	1854	9.0	3952	275	18.7	14.7	27.3
2001	160	62	215	2037	10.6	3992	562	27.9	22.5	23.79
2002	119	25	142	1899	7.5	3305	239	17.6	13.8	26.83
2003	139	38	167	2157	7.7	3879	380	21.3	16.9	27.86
2004	138	43	173	2558	6.8	3868	443	23.8	19.0	27.37
2005	135	49	173	2208	7.8	3841	447	26.5	21.2	28.11
2006	174	29	196	1845	10.6	4554	320	14.3	11.1	26.24
2007	227	65	277	1016	27.2	5451	896	22.4	17.8	23.95
2008	224	74	279	1608	17.3	5347	605	24.7	19.8	23.84
2009	179	25	199	1542	12.9	4282	215	12.5	9.6	23.79
2010	142	12	153	2076	7.4	3725	127	7.7	5.9	25.79
2011	118	11	126	1945	6.5	3699	92	8.2	6.3	31.10
2012	133	16	145	919	15.8	3889	145	10.8	8.3	29.17
2013				1718						
Average***									6.8%	26.45

* Harvest rates previous to 2006 are unreliable.

** Removals numbers take the dead discard rate into account.

*** Dead discard: average of 2010–2012; Mean weight in landings: average of 1999–2012.

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* in the Firth of Clyde + Sound of Jura (FU 13)

Advice for 2014

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 6265 tonnes (5744 tonnes for Firth of Clyde and 521 tonnes for Sound of Jura). 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 6959 tonnes (6382 tonnes for Firth of Clyde and 577 tonnes for Sound of Jura). Note that this figure includes discards expected to survive the discarding process – assumed to be 25% of the total number discarded for this functional unit.

In order to ensure the stock is exploited sustainably, management of *Nephrops* should be implemented at the functional unit level. In this FU the two subareas imply that additional controls maybe required to ensure that the landings taken in each subarea are in line with the advice.

Stock status

Firth of Clyde			
F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✗	✗	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	?	?	?
SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	?

Sound of Jura			
F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✓	✓	✓ Below target
Precautionary approach (F_{pa}, F_{lim})	?	?	?
SSB (Spawning-Stock Biomass)			
	2011 -2013		
MSY ($B_{trigger}$)	?		
Precautionary approach (B_{pa}, B_{lim})	?		
Qualitative evaluation	↘		

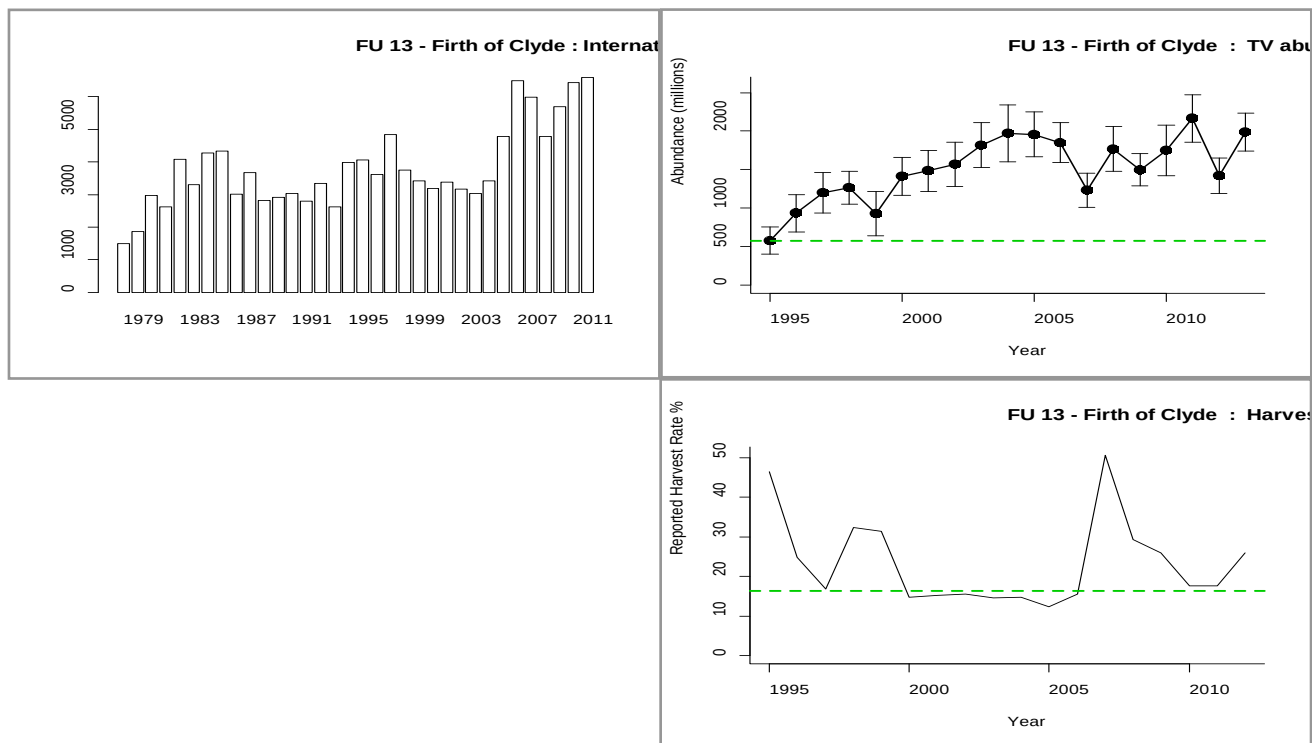


Figure 5.4.20.3.1 *Nephrops* in the **Firth of Clyde** (FU 13). Long-term trends in landings (tonnes), UWTV survey (in millions; SSB proxy), and harvest rate (fishing mortality proxy). Harvest rates before 2006 may be unreliable due to underreporting of landings. Green dashed lines represent MSY $B_{trigger}$ and F_{MSY} harvest ratios.

UWTV abundance remains above the MSY $B_{trigger}$. Harvest rates (removals/UWTV abundance) for *Nephrops* in the Firth of Clyde have increased in 2012 to 26.0% and remain above the proposed F_{MSY} proxy.

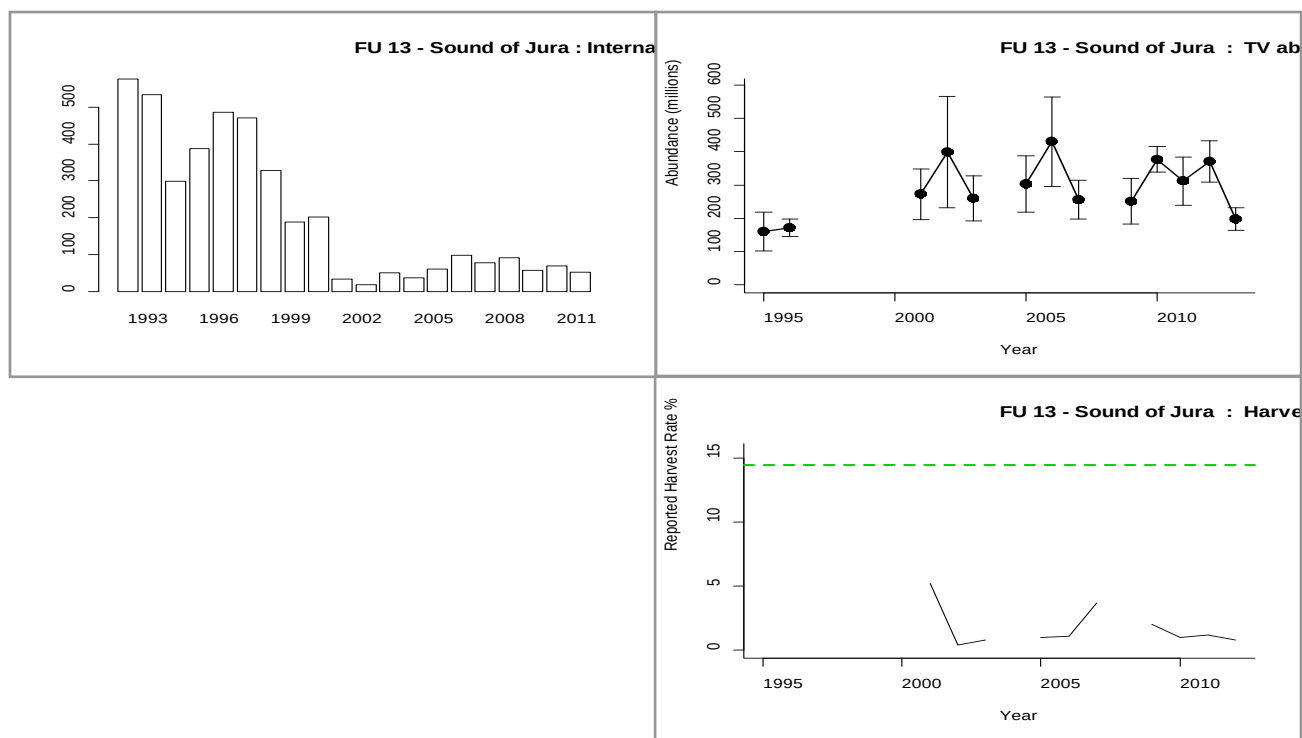


Figure 5.4.20.3.2 *Nephrops* in the **Sound of Jura** (FU 13). Long-term trends in landings (tonnes), UWTV survey (millions; SSB proxy), and harvest rate (fishing mortality proxy). Harvest rates before 2006 may be unreliable due to underreporting of landings. Green dashed line represents F_{MSY} harvest ratios.

Harvest rates (removals/UWTV abundance) for *Nephrops* in the Sound of Jura have been well below the proposed F_{MSY} proxy in recent years. UWTV abundance remains higher than observed at the start of the series, but the series is too short and patchy to propose a MSY $B_{trigger}$.

Management plans

No specific management objectives are known to ICES.

Biology

The general biology of *Nephrops* is discussed in the overview (Section 5.4.20). *Nephrops* in the Firth of Clyde and the Sound of Jura occur at a very high density (average around $0.8 \text{ burrows m}^{-2}$) and have a smaller average size and size-at-maturity than most other stocks. The high observed density implies intense competition for space and food on the seabed. This is thought to make the stock resilient to high fishing pressure. The habitat in Firth of Clyde is a relatively continuous patch of muddy sediment apart from the sea lochs, while the Sound of Jura consists of a single patch of muddy sediment.

The fisheries

Trawling is the predominant fishing method and fishing takes place all year round. The fishery has been fairly stable over the recent time-series. An increasing number of creel boats operate in the Clyde due to temporal and area bans on trawling. *Nephrops* discard rates from trawl fleets in this functional unit are higher than in other FUs in Division VIa.

Catch distribution Total catch (2012) in Firth of Clyde + Sound of Jura = 7630 t, where 6584 t are landings (97% trawl and 3% creel) and 1046 t discards from the trawl fleet. Discards from the creel fishery are considered to be very low.

Effects of the fisheries on the ecosystem

The *Nephrops* trawl fisheries in this functional unit has a bycatch of other species, including cod, haddock, and whiting. Bycatches of cod in the Clyde are generally low, but are higher than in other Division VIa FUs. This is an important area for cod spawning.

Quality considerations

Harvest ratios since 2006 are considered reliable due to more accurate landings data reported under the new legislation. In 2011 and 2012 no commercial catch-at-length samples were collected from Sound of Jura and data from 2008–2010 were used to calculate the mean weight in landings. The discard rates and mean weight of discards assumed for the Sound of Jura advice are estimates from the Firth of Clyde.

Scientific basis

Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data.
Stock data category	1
Input data	One survey index (UWTV-FU13); commercial catches (international landings, length frequencies from Scottish catch sampling); fixed maturity parameters (from survey data); fixed natural mortalities. Discard survival rate.
Discards and bycatch	Discards from Scottish trawls were included in the assessment.
Indicators	Size structure of catches, mean size, <i>l_{pue}</i> .
Other information	Latest benchmark (based on the UWTV survey) was performed in 2009 (ICES, 2009).
Working group report	<u>WGCSE</u> (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK Nephrops in the Firth of Clyde + Sound of Jura (FU 13)

Reference points – Firth of Clyde

	Type	Value	Technical basis
MSY approach	MSY B _{trigger}	579 millions.	Lowest observed abundance estimate.
	F _{MSY}	16.4% harvest rate.	Equivalent to F _{max} combined sex. F _{MSY} proxy based on length-based yield-per-recruit analysis.
Precautionary approach	Not defined.		

(unchanged since 2011)

Reference points – Sound of Jura

	Type	Value	Technical basis
MSY approach	MSY B _{trigger}	Not defined.	
	F _{MSY}	14.5% harvest rate.	Equivalent to F _{35%SPR} combined sex.
Precautionary approach	Not defined		

(unchanged since 2011)

Harvest ratio reference points (2011):

	Male	Female	Combined
F_{max}	13.6	34.0	16.4
F _{0.1}	8.7	21.1	9.7
F_{35%SPR}	10.7	25.7	14.5

For the Firth of Clyde subarea of this FU, the absolute density observed in the UWTV survey is generally high (over 0.8 burrows m⁻² for the entire series and around 1.0 burrows m⁻² in the last five years), suggesting that the stock has relatively high productivity. The fishery in this area has been in existence since the 1960s and the population and biological parameters have been studied numerous times. Historical harvest ratios in this FU have been generally high, at or above F_{max}. F_{max} is considered an appropriate F_{MSY} proxy and is expected to deliver high long-term yield with a low probability of recruitment overfishing.

For the Sound of Jura subarea of this FU, the absolute density observed on the UWTV survey is generally high (over 0.8 burrows m⁻² for the entire series and around 1.0 burrows m⁻² in the last five years), suggesting that the stock has relatively high productivity. The fishery in this area has been sporadic over its history and effort and landings have been low in the last decade. The population and biological parameters have been studied numerous times, but the time-series of UWTV data is more fragmented and sampling is at a relatively low level. A more cautious F_{35%SPR} is considered an appropriate F_{MSY} proxy for this stock.

Outlook for 2014

Firth of Clyde

Basis: $F_{2013} = F_{2012} = 26.0\%$; Bias-corrected survey index (2013) = 1990 million; Mean weight in landings (2010–2012) = 20.78 g; Dead discard rate (by number) = 15.3%; Mean weight in discards (2010–2012) = 9.58 g; Survey bias = 1.19; Discards survival rate = 25%.

Basis	Total catches*	Landings	Dead discards**	Surviving discards**	Harvest rate
	L+DD+SD	L	DD	SD	for L+DD
F_{MSY} proxy	6382	5744	478	159	16.4%
F_{2013}	10118	9106	759	253	26.0%
$F_{0.1}$	3775	3398	283	94	9.7%
$F_{35\%SPR}$	5642	5079	422	141	14.5%

Weights in tonnes.

* Total catches are the landings plus dead and surviving discards.

** Total discard rate is assumed to be 19.5% of the catches (in number, average of the last three years, 2010–2012); discard survival is assumed to be 25%.

Sound of Jura

Basis: $F_{2013} = F_{2012} = 0.8\%$; Bias-corrected survey index (2013) = 198 million; Mean weight in landings (2008–2010) = 21.44 g; Dead discard rate (by number) = 15.3%; Mean weight in discards (2010–2012) = 9.58 g; Survey bias = 1.19; Discards survival rate = 25%.

Basis	Total catches*	Landings	Dead discards**	Surviving discards**	Harvest rate
	L+DD+SD	L	DD	SD	for L+DD
F_{MSY} proxy	577	521	42	14	14.5%
F_{2013}	31	28	2	1	0.8%
$F_{0.1}$	385	347	28	9	9.7%
F_{max}	653	590	48	16	16.4%

Weights in tonnes.

* Total catches are the landings plus dead and surviving discards.

** Total discard rate is assumed to be 19.5% (from Firth of Clyde estimates); discard survival is assumed to be 25%.

MSY approach

Following the ICES MSY approach implies the harvest ratio for the Firth of Clyde subarea should be reduced to less than 16.4%, resulting in landings of no more than 5744 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 6382 tonnes.

Following the ICES MSY approach implies the harvest ratio for the Sound of Jura subarea should be reduced to be less than 14.5%, resulting in landings of no more than 521 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 577 tonnes.

Additional considerations

The advice takes into account the 2013 UWTV survey results.

An increasing number of creel boats operate in the Clyde. Creeling activity often takes place during the weekend when the trawlers are not allowed to fish. One third of the creelers operate throughout the year, the rest prosecute a summer fishery.

Regulations and their effects

The minimum landing size for *Nephrops* in the Division VIa is 20 mm carapace length. Discarding of both undersize and poor quality individuals takes place in Clyde.

Data and methods

Underwater TV surveys have been conducted for the Firth of Clyde subarea every year since 1995. Confidence intervals around the abundance estimates are stable throughout the series and relatively low compared with other FUs in Division VIa. Underwater TV surveys for the Sound of Jura subarea have been more fragmented and sampling is at a relatively low level; confidence intervals are larger.

Uncertainties in assessment and forecast

In 2011 and 2012 no samples were collected from Sound of Jura due to lack of sampling opportunities related to low fishing effort. Yield-per-recruit analysis is not yet available for the Sound of Jura subarea, therefore F proxies from the Firth of Clyde have been used.

The overall area of the ground is estimated from the available British Geological Survey contoured sediment data and at present may be a minimum estimate, although the possible underestimation is less severe than in the North Minch. Examination of VMS data shows a close correspondence with the area estimated by sediment. In the Clyde, the underestimated sea loch areas are relatively small, when compared with other FUs of Division VIa.

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 method is consistent with last year. The advice is based on the MSY approach, as last year.

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 Celtic Seas Ecoregion (WGCSE), 8–17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

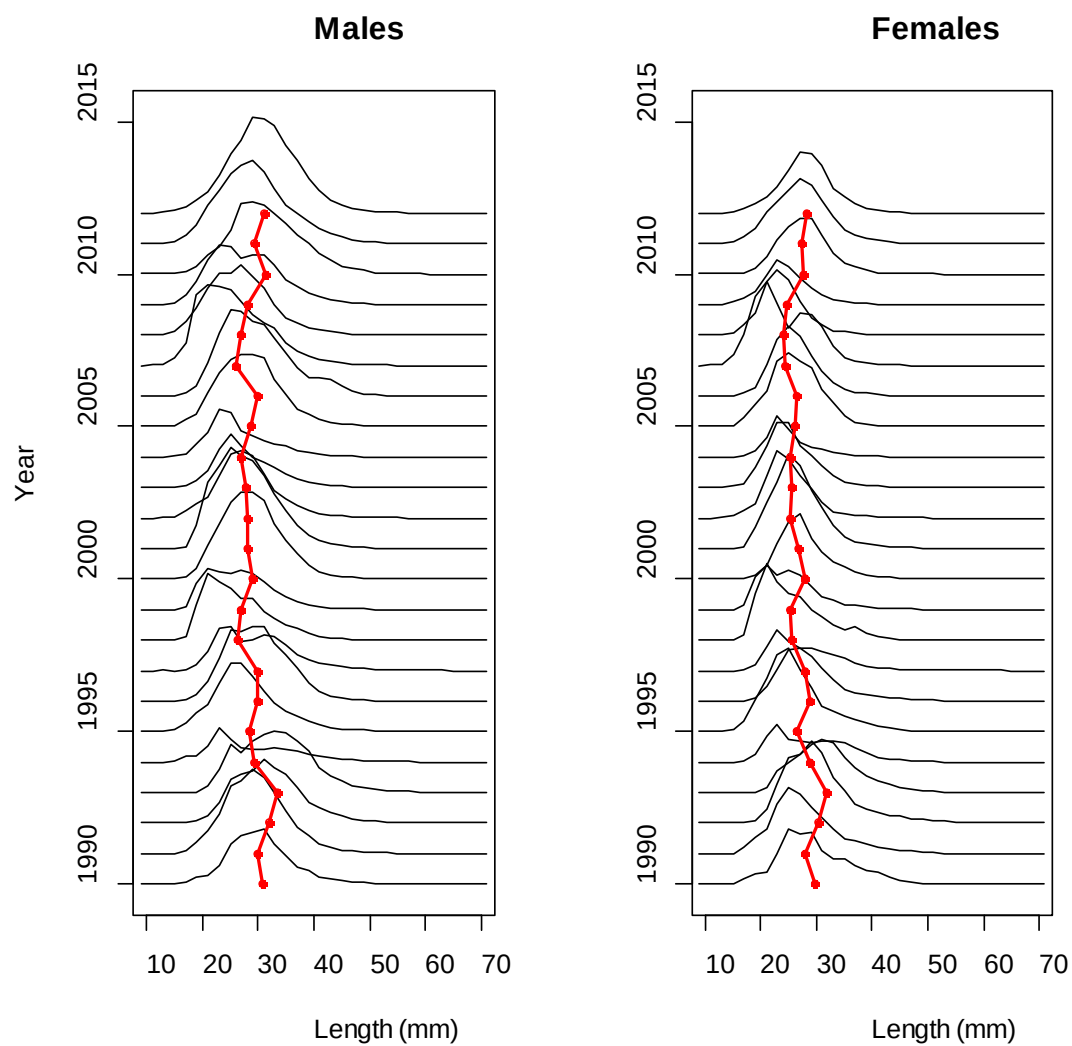


Figure 5.4.20.3.3 *Nephrops* in Clyde (FU 13). Annual length composition (black lines) of catch of males (left) and females (right) from 1990 (bottom) to 2012 (top). Mean sizes of catch (red line) are also shown.

Table 5.4.20.3.1 *Nephrops* in the Firth of Clyde + Sound of Jura (FU 13). ICES advice, management, landings, and discards.

Year	ICES advice	Predicted landings corresp. to advice for Firth of Clyde (FU 13)	Predicted landings corresp. to advice for Sound of Jura (FU 13)	ICES landings (FU 13)	Total discards ¹ (FU13)
1989				2.8	
1990				2.9	
1991				3.0	
1992	maintain current effort			2.8	
1993	maintain current effort			3.3	
1994	maintain current effort			2.6	
1995	maintain current effort			4.0	
1996	maintain current effort			4.0	
1997	as for 1996			3.6	
1998	maintain current effort			4.8	
1999	as for 1998			3.8	0.5
2000	maintain current effort			3.4	0.4
2001	as for 2000			3.2	0.6
2002	maintain current effort			3.4	0.4
2003	as for 2002			3.2	1.2
2004	maintain current effort			3.0	1.3
2005	as for 2004			3.4	0.6
2006	No increase in effort			4.8	0.5
2007	No increase in effort and harvest rate no more than 15%	3.765		6.5	2.4
2008	as for 2007(no new advice)	3.765		5.9	1.3
2009	No increase effort and recent average catch	< 5.7		4.7	1.2
2010	Harvest rate no greater than that equivalent to fishing at F_{max}	< 3.9		5.7	0.5
2011	MSY transition scheme in Firth of Clyde and MSY framework in Sound of Jura	< 4.1	< 0.5	6.4	0.6
2012	MSY transition scheme in Firth of Clyde and MSY framework in Sound of Jura	< 4.2	< 0.9	6.6	1.0
2013	MSY approach both in Firth of Clyde and Sound of Jura	< 5.6	< 0.8		
2014	MSY approach both in Firth of Clyde and Sound of Jura	< 5.7	< 0.5		

Weights in thousand tonnes.

¹⁾ Assumed survival rate of 25%. Only includes estimates from Firth of Clyde.

Table 5.4.20.3.2 *Nephrops* in the Firth of Clyde + Sound of Jura (FU 13). ICES estimates of landings (tonnes).

Year	UK Scotland				Other UK	Total **
	<i>Nephrops</i> trawl	Other trawl	Creel	Sub-total		
1981	2498	404	66	2968	0	2968
1982	2373	171	79	2623	0	2623
1983	3890	120	53	4063	14	4077
1984	3069	154	77	3300	10	3310
1985	3921	293	64	4278	7	4285
1986	4074	175	79	4328	13	4341
1987	2859	80	65	3004	3	3007
1988	3507	108	43	3658	7	3665
1989	2577	184	35	2796	16	2812
1990	2732	122	24	2878	34	2912
1991	2845	145	25	3015	23	3038
1992	2532	246	10	2788	17	2805
1993	3199	110	5	3314	28	3342
1994	2503	49	28	2580	49	2629
1995	3767	132	26	3925	64	3989
1996	3880	111	27	4018	42	4060
1997	3486	44	25	3555	63	3618
1998	4539	81	40	4660	183	4843
1999	3475	29	38	3542	210	3752
2000	3143	63	76	3282	137	3419
2001	2889	67	94	3050	132	3182
2002	3074	53	105	3232	151	3383
2003	2954	20	117	3091	80	3171
2004	2659	18	90	2767	258	3025
2005	3166	14	95	3275	148	3423
2006	4446	0	0	4534	244	4778
2007	6129	0	0	6129	366	6495
2008	5382	2	197	5581	416	5997
2009	4305	0	189	4494	283	4777
2010	5050	0	186	5236	465	5701
2011	5672	0	219	5891	540	6431
2012*	5523	4	194	5721	863	6584

*Provisional.

** Total also includes Rep. of Ireland.

Table 5.4.20.3.3 *Nephrops* in the Firth of Clyde (FU 13). Time-series of UWTV survey results (after correction for bias), with 95% confidence intervals.

Year	Stations	Mean density	Abundance	95% confidence interval
		burrows/m ²	millions	millions
1995	29	0.33	579	176
1996	38	0.54	935	242
1997	31	0.68	1198	262
1998	38	0.72	1262	213
1999	39	0.53	930	289
2000	40	0.81	1411	246
2001	39	0.85	1486	268
2002	36	0.90	1571	288
2003	37	1.04	1817	292
2004	32	1.13	1970	367
2005	44	1.12	1959	287
2006	43	1.05	1851	257
2007	40	0.71	1233	218
2008	38	1.01	1769	291
2009	39	0.86	1499	210
2010	37	1.00	1750	327
2011	40	1.24	2165	305
2012	37	0.81	1421	227
2013	34	1.14	1990	246

Table 5.4.20.3.4 *Nephrops* in the Sound of Jura (FU 13). Time-series of UWTV survey index estimates (after correction for bias), with 95% confidence intervals.

Year	Stations	Mean density	Abundance	95% confidence interval
		burrows/m ²	millions	millions
1995	7	0.50	160	58
1996	10	0.53	171	26
1997				
1998				
1999			no surveys	
2000				
2001	13	0.85	272	76
2002	9	1.24	398	167
2003	12	0.81	260	68
2004			no survey	
2005	11	0.94	303	84
2006	10	1.34	430	134
2007	10	0.80	255	58
2008			no survey	
2009	12	0.78	251	68
2010	12	1.17	376	38
2011	12	0.97	312	73
2012	12	1.16	371	61
2013	9	0.62	198	35

Table 5.4.20.2.5 *Nephrops* in the Firth of Clyde (FU 13). Adjusted TV survey abundance, landings, total discard rate (proportion by number), dead discard rate (by number), and estimated harvest rate.

Year	Landing s in number (million s)	Discards in number (million s)	Removals in number (millions)*	Adjusted survey (million s)	Harvest ratio*	Landing s (tonnes)	Discard d (tonnes)	Discard d rate	Dead discard rate	Mean weight in landings (g)
1999	189	79	267	930	28.7	3424	481	29.6	24.0	16.88
2000	154	43	197	1411	14.0	3230	418	21.8	17.3	19.82
2001	141	71	211	1486	14.2	2980	584	33.5	27.4	19.45
2002	193	47	243	1571	15.4	3349	379	19.4	15.3	16.3
2003	161	130	264	1817	14.5	3153	1209	44.7	37.8	19.16
2004	143	152	284	1970	14.4	2975	1298	51.5	44.4	18.81
2005	179	66	240	1959	12.3	3387	580	26.9	21.6	17.97
2006	234	52	286	1851	15.4	4717	487	18.3	14.3	19.28
2007	323	357	614	1233	49.8	6397	2372	52.5	45.3	19.05
2008	332	192	513	1769	29.0	5919	1329	36.6	30.2	16.42
2009	236	152	382	1499	25.5	4686	1248	39.1	32.5	18.09
2010	236	48	306	1750	17.5	5643	460	16.8	13.1	21.16
2011	326	73	380	2165	17.6	6362	556	18.2	14.3	19.34
2012	300	92	369	1421	26.0	6532	1046	23.4	18.6	21.83
2013				1990						
Average 2010– 2012									15.33	20.78

* Harvest rates previous to 2006 are unreliable.

** Removals numbers take the dead discard rate into account.

Table 5.4.20.2.6 *Nephrops* in the Sound of Jura (FU 13). Adjusted TV survey abundance, landings, total discard rate (proportion by number), dead discard rate (by number), and estimated harvest rate.

Year	Removals in number (millions)	Adjusted survey (millions)	Harvest ratio	Landings (tonnes)	Discard rate*	Dead discard rate*	Mean weight in landings (g)
2005	2.9	303	1.0	36	26.9	21.6	15.47
2006	4.7	430	1.1	61	18.3	14.3	15.05
2007	9.4	255	3.7	98	52.5	45.3	19.02
2008	5.1	NA	NA	78	36.6	30.2	21.60
2009	5.0	251	2.0	91	39.1	32.5	25.58
2010	3.9	376	1.0	58	16.8	13.1	17.13
2011	3.6**	312	1.2	69	18.2	14.3	na
2012	2.3**	371	0.8	52	23.4	18.6	na
2013		198					
Average 2010-2012						15.33	21.44**

* Discard rates assumed to be the same as in the Firth of Clyde.

** Average mean weight in landings and removals numbers were calculated from years 2008–2010 as there were no samples in 2011 and 2012.

ECOREGION Celtic Sea and West of Scotland
STOCK *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 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

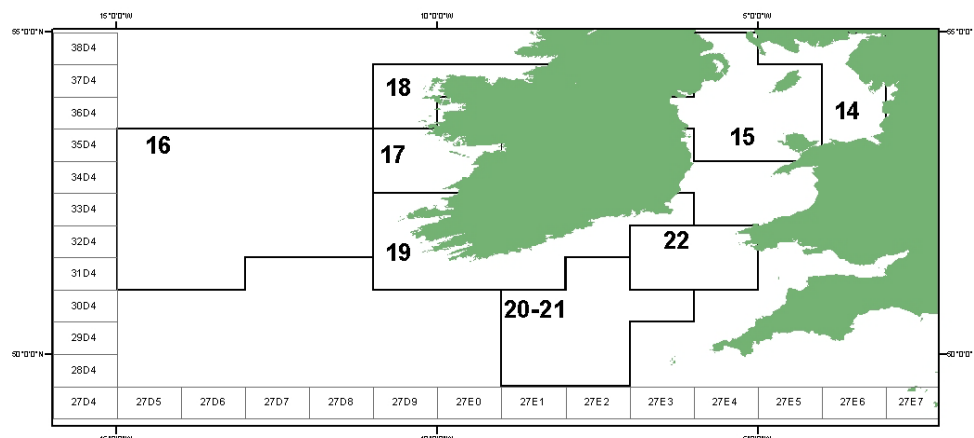


Figure 5.4.21.1 *Nephrops* functional units in Subarea VII (around Ireland).

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 data-limited 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 TAC	ICES landings
	Irish Sea East (FU 14)	Irish Sea West (FU 15)	Porcupine Bank (FU 16)	Aran Grounds (FU 17)	Ireland SW and SE coasts (FU 19)	Celtic Sea – Labadie (FUs 20–21)	Celtic 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		~3.8			20.0	15.8
1993	9.4			~4.0		3.8			20.0	16.6
1994	9.4			~4.0		3.8			20.0	17.2
1995	9.4			~4.0		3.8			20.0	18.5
1996	9.4			4.0		3.8			23.0	16.6
1997	9.4			4.0		3.8			23.0	18.9
1998	9.4			4.0		3.8			23.0	18.3
1999	9.4			4.0		3.8			23.0	18.7
2000	9.4			4.0		3.8			21.0	16.4
2001	9.4			4.0		3.8			18.9	16.1
2002	9.55			4.44		3.8			17.79	16.1
2003	9.55			4.44		3.8			17.79	15.7
2004	9.55			3.3		4.6			17.45	15.3
2005	9.55			3.3		4.6			19.544	16.0
2006	9.55			3.3		4.6			21.498	16.2
2007	²⁾	²⁾	³⁾	³⁾	³⁾	²⁾			25.153	19.0
2008	²⁾	²⁾	³⁾	³⁾	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 ($>0.7 \text{ m}^{-2}$) 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 F_{MSY} directly and hence proxies for F_{MSY} are determined. Three candidates for F_{MSY} proxies are $F_{0.1}$, $F_{35\%SpR}$, and F_{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 F_{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 F_{MSY} proxies. These may be modified following further data exploration and analysis. The combined sex F_{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 F_{MSY} proxy should be chosen over the combined proxy.

		Burrow density (average burrow m ⁻²)		
		Low < 0.3	Medium 0.3–0.8	High >0.8
Observed harvest rate or landings compared to stock status (historical performance)	$>F_{max}$	$F_{35\%SpR}$	F_{max}	F_{max}
	$F_{max}-F_{0.1}$	$F_{0.1}$	$F_{35\%SpR}$	F_{max}
	$< F_{0.1}$	$F_{0.1}$	$F_{0.1}$	$F_{35\%SpR}$
	Unknown	$F_{0.1}$	$F_{35\%SpR}$	$F_{35\%SpR}$
Stock size estimates	Variable	$F_{0.1}$	$F_{0.1}$	$F_{35\%SpR}$
	Stable	$F_{0.1}$	$F_{35\%SpR}$	F_{max}
Knowledge of biological parameters	Poor	$F_{0.1}$	$F_{0.1}$	$F_{35\%SpR}$
	Good	$F_{35\%SpR}$	$F_{35\%SpR}$	F_{max}
Historical fishery	Stable spatially and temporally	$F_{35\%SpR}$	$F_{35\%SpR}$	F_{max}
	Sporadic	$F_{0.1}$	$F_{0.1}$	$F_{35\%SpR}$
	Developing	$F_{0.1}$	$F_{35\%SpR}$	$F_{35\%SpR}$

Preliminary $MSY B_{trigger}$ 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 $MSY B_{trigger}$.

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 F_{MSY} proxies (e.g. $F_{0.1}$, F_{max} , $F_{35\%SPR}$) 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 F_{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 $F_{0.1}$ and F_{max} are all based on yield-per-recruit analyses. In addition, important assumptions are made on growth, natural mortality, and discard rates in the derivation of reference points.

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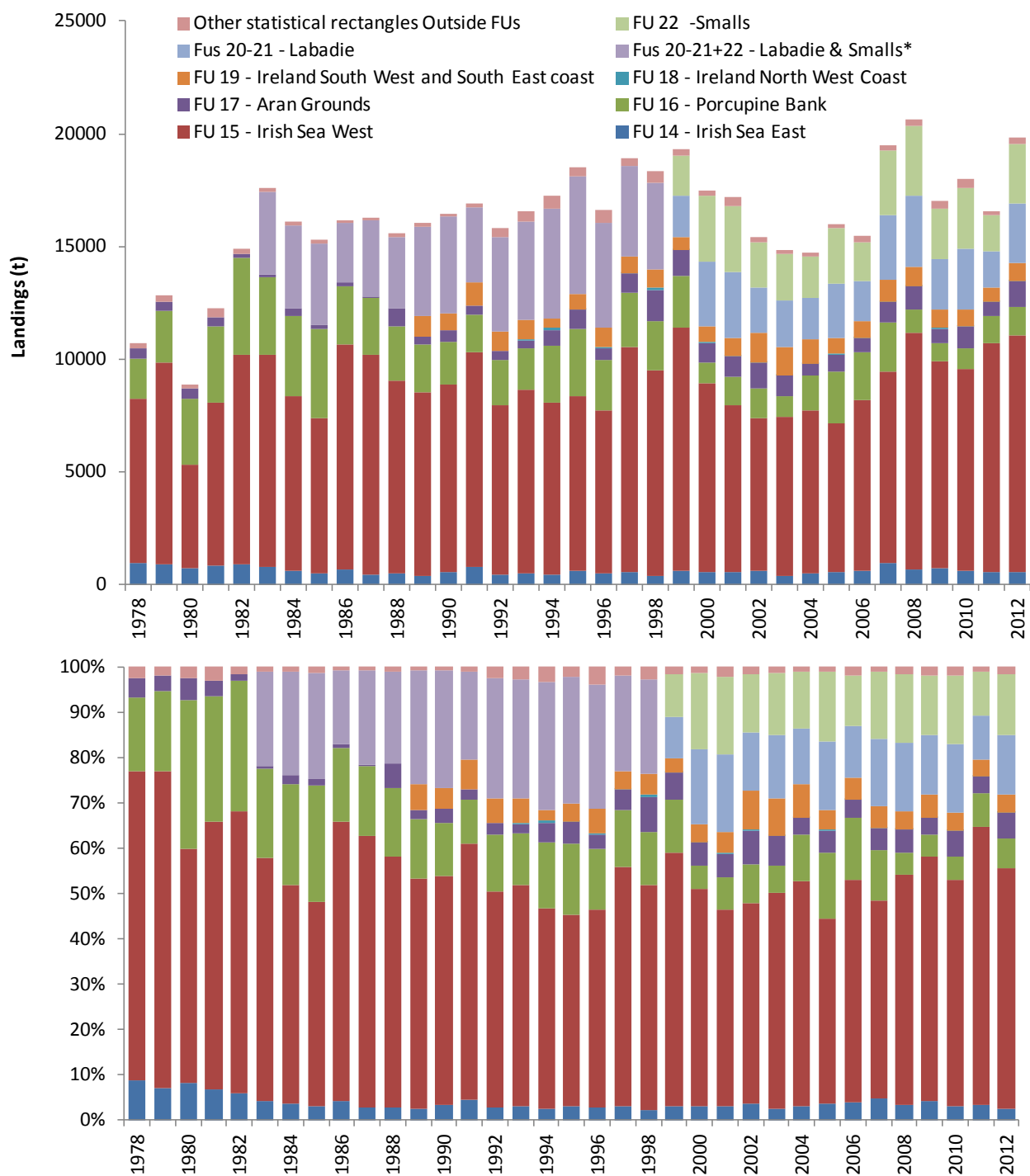


Figure 5.4.21.2 *Nephrops* in Subarea VII. Top: Total landings (in tonnes). Bottom: percentage of the total landings by functional unit (FU) and from rectangles outside the FUs. Landings from FUs 20–21 and FU 22 are combined prior to 1999.

Table 5.4.21.2

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

Year	FU 14 Irish Sea East	FU 15 Irish Sea West	FU 16 Porcupine Bank	FU 17 Aran Grounds	FU 18 Ireland Northwest Coast	FU 19 Ireland Southwest and Southeast coasts	FUs 20–21+22 Labadie & the Smalls*	FUs 20–21 Labadie*	FU 22 the Smalls*	Other statistical rectangles outside FUs	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

*Landings from FUs 20–21 and FU 22 are combined prior to 1999.

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.

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* in Irish Sea East (FU 14)

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)			
	2010	2011	2012
MSY (F_{MSY})	✓	✓	✓ Below target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined
SSB (Spawning-Stock Biomass)			
	2011–2013		
MSY ($B_{trigger}$)	? Undefined		
Precautionary approach (B_{pa}, B_{lim})	? Undefined		
Qualitative evaluations	→ Stable		

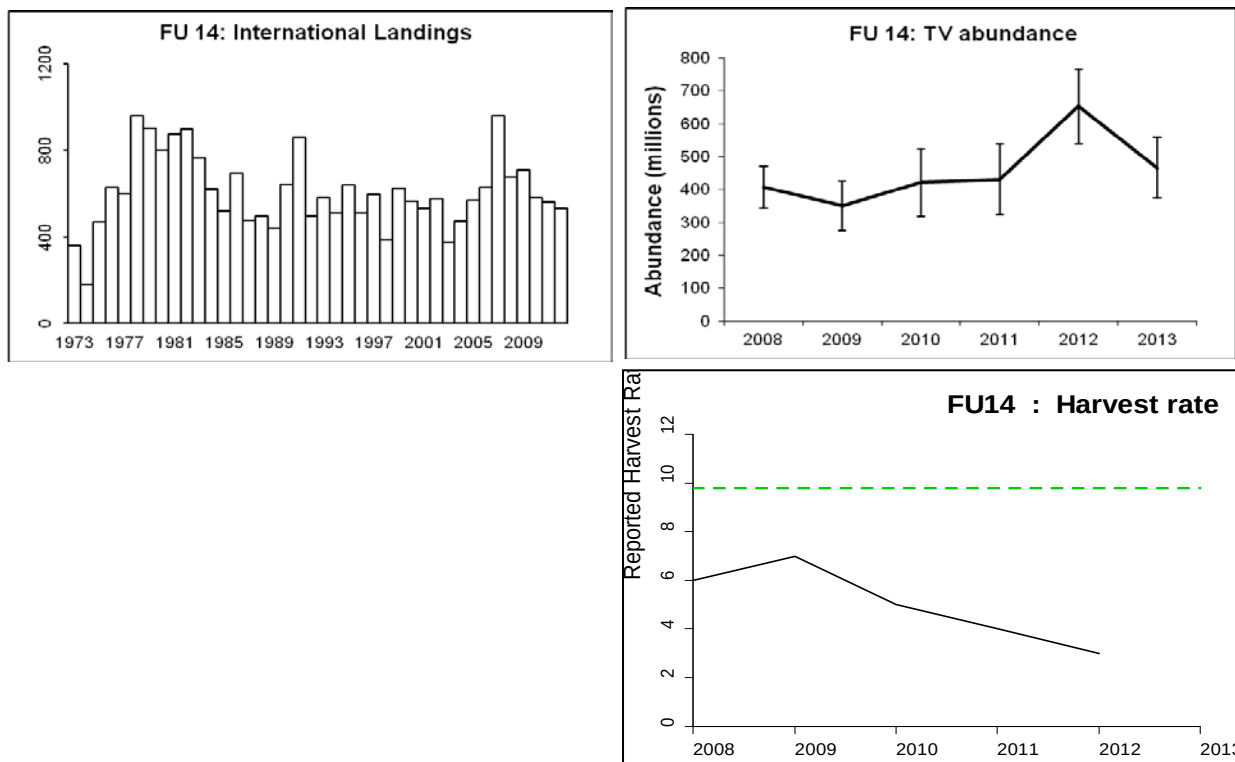


Figure 5.4.21.1.1 *Nephrops*, Irish Sea East (FU 14). Long-term trends in landings (in tonnes); UWTV survey abundance with 95% confidence limits (in millions); and harvest rate (green dashed line is the F_{MSY} proxy).

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 $B_{trigger}$. The current harvest rate (removals/UWTV abundance) is below the F_{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 (~ 0.3 to 0.4 burrows 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 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 multi-riggers 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 <i>Nephrops</i> 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	<u>WGCSE</u> (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* in Irish Sea East (FU 14)

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY approach	MSY $B_{trigger}$	Not defined.	No available reference. UWTV time-series too short.
	F_{MSY}	Harvest ratio 9.8%.	Equivalent to $F_{0.1}$ for combined sexes. F_{MSY} proxy based on length-based yield-per-recruit analysis.
Precautionary approach	Not defined.		

(unchanged since 2011)

Harvest ratio reference points (2010):

	Male	Female	Combined
F_{max}	15.8%	17.4%	16.4%
$F_{0.1}$	9.6%	10.2%	9.8%
$F_{35\%SpR}$	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 ($< 0.39 \text{ m}^{-2}$) 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 l_{pue} 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 $F_{0.1}$. In this instance, therefore, the use of $F_{0.1}$ as a proxy for F_{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: $F_{2013} = F_{2012} = 3.9\%$; adjusted survey index (2013) = 465.7 millions; mean weight in landings (2006–2008) = 28.9 g; mean weight in discards (2006–2008) = 14.1 g; dead discards in number (27.9%) based on 2006–2008 sampling; survival rate = 0%.

Basis	Total catches*	Landings	Dead discards**	Surviving discards**	Harvest rate (%)
	L+DD+SD	L	DD	SD	for L+DD
F_{MSY} proxy	1131	951	180	0	9.8
F_{2013}	450	378	71	0	3.9
$F_{35\%SpR}$ Combined	1500	1261	238	0	13
F_{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 2006–2008); discard survival is assumed to be 0%.

MSY approach

No MSY $B_{trigger}$ 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 Deep *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.

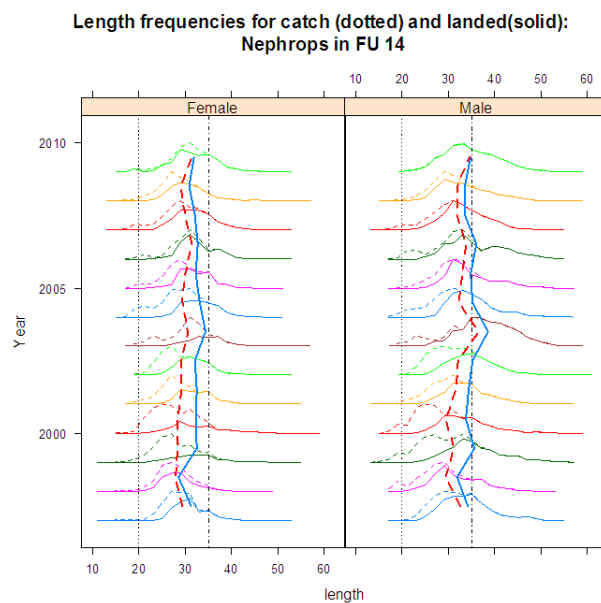


Figure 5.4.21.1.2 *Nephrops* in Irish Sea East (FU 14). Annual length composition of catch (dotted) and landed (solid) of males (right) and females (left) from 1996 (bottom) to 2009 (top). Mean sizes of catch and landings (using same line types) is shown in relation to minimum landing size (MLS). The 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 framework	< 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 valid stations	Mean station density (no./m ²)	Mean krigged density (no./m ²)	Abundance (millions) including Wigtown Bay	95% CI	Landings	Removals (millions)	Harvest 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.

Year	Landings in number (millions)	Discards in number (millions)	Removals in number (millions)	Proportion removals retained	Adjusted survey (millions)	Harvest ratio (%)	Landings (t)	Discards (t)	Dead discard rate	Mean weight in landings (grams)
2003	9.6	8.7	18.4	0.52			376.7	151	0.48	39.2
2004	14.9	11.3	26.2	0.57			472.2	150	0.43	31.6
2005	18.5	8.6	27.1	0.68			569.7	128	0.32	30.7
2006	19.8	6.9	26.7	0.74			627.3	111	0.26	31.6
2007	34.1	13.7	47.8	0.71			958.5	178	0.29	28.1
2008	24.2	9.8	34.0	0.71	407.6	8	676.0	138	0.29	27.9
2009	22.5	1.8	24.3	0.92	350.0	9.7	694.5	33	0.08	30.9
2010					422.0	6.6	582			
2011					431.0	6.2	561			
2012		-	-	-	652.7	3.9	530		-	-
2013	-	-	-	-	465.7	-	-	-	-	-

**ECOREGION
STOCK**
**Celtic Sea and West of Scotland
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)		
	2010	2011	2012
MSY (F_{MSY})	✓	✗	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined

	SSB (Spawning-Stock Biomass)		
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	? Undefined

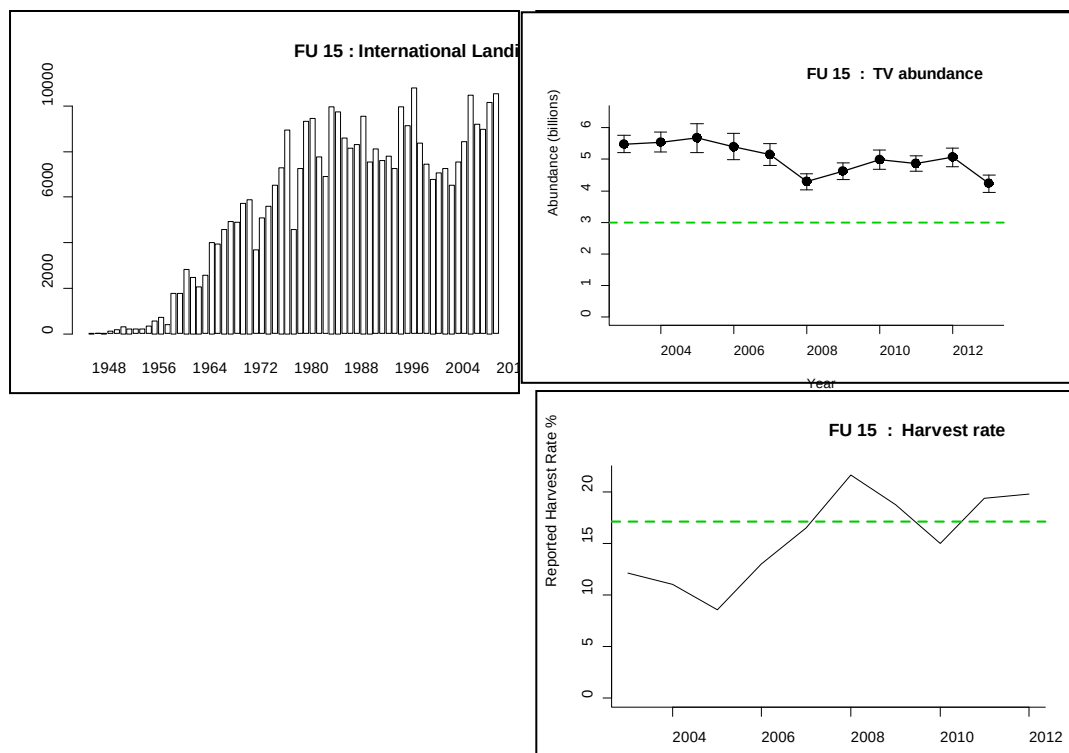


Figure 5.4.21.2.1 *Nephrops* in Irish Sea West (FU 15). Long-term trends in landings (tonnes); recent UWTV abundance (in billions; SSB proxy); and harvest rates (prior to 2007 the harvest rate is considered to be a minimum estimate due to possible underreporting of landings). The horizontal lines represent MSY $B_{trigger}$ (upper panel) and F_{MSY} (lower panel).¹

¹ Version 2: UWTV abundance plot corrected

Since 2003 stock abundance has been above $MSY B_{trigger}$. Recent harvest rates (removals/UWTV abundance) have fluctuated around the F_{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 $0.9 \text{ burrow m}^{-2}$) 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 ~30% increase in *Nephrops* catch rates and a reduction in fish bycatch of ~30% due to the lower headline height.

Catch distribution Total catch (2012) = 12.4 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	UWTV and trends, catch options based on UWTV and F_s from per-recruit analysis.
Stock data category	1
Input data	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 and bycatch	Discards included in the assessment from the Irish directed <i>Nephrops</i> fleet and the UK(NI) directed <i>Nephrops</i> fleet.
Indicators	One trawl survey index (NI-NEP-Trawl-Summer). Size structure of catches, sex ratio, and l_{pue} .
Other information	The latest benchmark (based on the UWTV survey) was performed in 2009 (ICES, 2009).
Working group report	WGCSE (ICES, 2013).

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

Reference points

	Type	Value	Technical basis
MSY	MSY B _{trigger}	3 billion individuals.	Minimum abundance observed based on a scaled trawl survey.
approach	F _{MSY}	HR 17.1%.	Equivalent to F _{max} for combined sexes in 2010.
Precautionary approach	Not defined.		

(unchanged since 2010).

Harvest ratio reference points (2010):

	Male	Female	Combined
F_{max}	17.1	17.1	17.1
F _{0.1}	11.0	10.2	10.6
F_{35%SpR}	14.1	12.7	13.4

The density of *Nephrops* in FU 15 is considered very high (average density 0.9 m⁻²). Recent harvest rates have been high (around F_{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 F_{max} of 17.1% is suggested as a proxy for F_{MSY}. A preliminary MSY B_{trigger} has been estimated using the longer time-series of survey trawl cpue.

Outlook for 2014

Basis: F₂₀₁₃ = F₂₀₁₂ = 19.8%; bias-corrected survey index (2013) = 4.31 billion; mean weights in landings (2010–2012) = 15.04 g; dead discard rate (by number) = 25.7%; mean weight in discards (2010–2012) = 7.95 g, survey bias = 1.14; discards survival rate = 10%.

Basis	Total catches*	Landings	Dead discards**	Surviving discards**	Harvest rate
	L+DD+SD	L	DD	SD	for L+DD
F _{MSY} proxy	9914	8244	1504	167	17.1%
F ₂₀₁₃	11486	9551	1742	194	19.8%
F _{0.1}	6144	5109	932	104	10.6%
F _{35%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 UWTW 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 known 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 $F_{0.1}$ and 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.

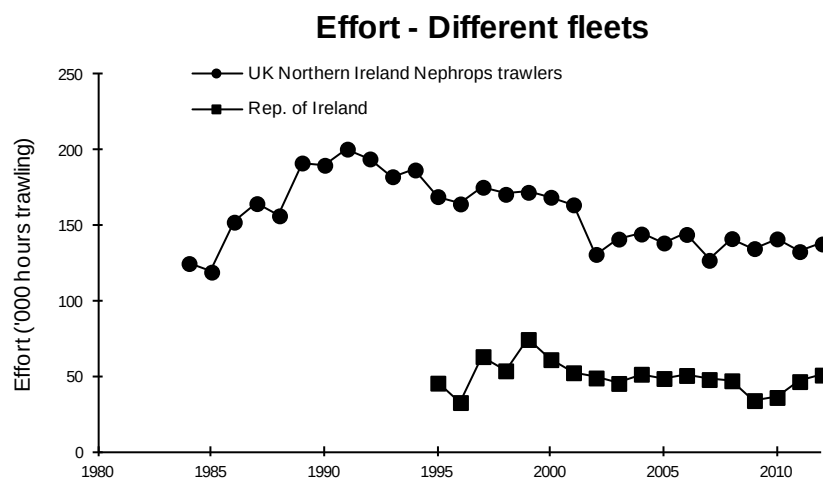


Figure 5.4.21.2.2 *Nephrops* Irish Sea West (FU 15). Effort trends of *Nephrops* fleets. Effort from UK Northern Ireland *Nephrops* trawlers fleet represented with dots and effort from Irish fleet represented with squares.

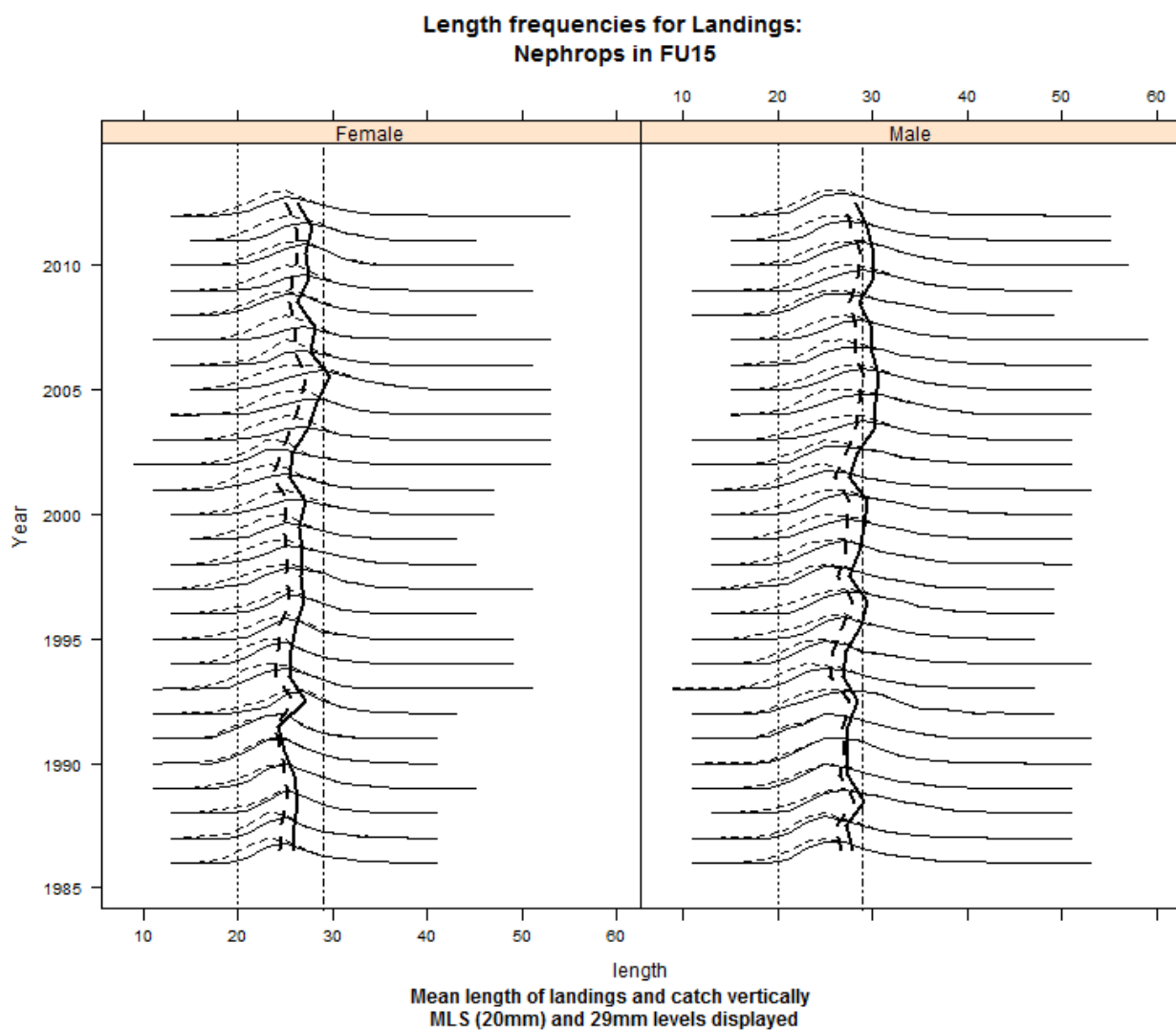


Figure 5.4.21.2.3 *Nephrops* Irish Sea West (FU 15). Annual length composition of catch (dashed) and landed (solid). Males (right) and females (left) from 1986 (bottom) to 2012 (top). The vertical dashed line is mean length in the catches and the vertical solid line is mean length in the landings. The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

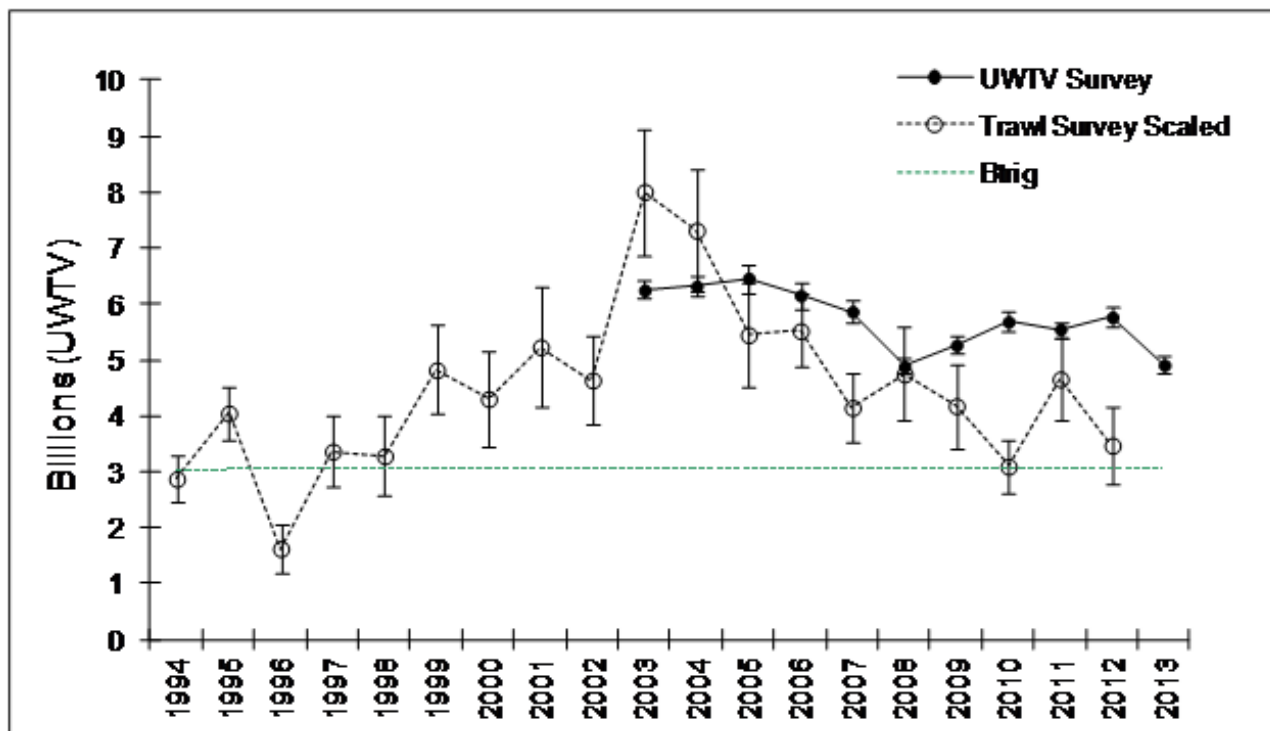


Figure 5.4.21.2.4 *Nephrops* Irish Sea West (FU 15). UWTV index (in billions) and scaled NI-NEP-Trawl-Summer survey. The green dotted line is MSY $B_{trigger}$. Abundance figures have not been bias corrected.²

² Version 2: Added sentence 'Abundance figures have not been bias corrected'

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)	Recommended landings (FUs 14 + 15)	ICES landings (FU 15)	Discards ¹⁾ (FU 15)
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 $F_{0.1}$	< 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			

Weights in thousand tonnes.

¹⁾ The discard survival rate is assumed at 10%.

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

* Provisional.

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 density (No. m ⁻²)	Domain area (km ²)	Abundance estimate (billions)	CV on 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	Landings (t)	Discards (t)	Mean weight in landings (grams)
1986	740	268	981				9 978	1 680	
1987	774	242	992				9 753	1 608	
1988	576	104	669				8 586	639	
1989	644	121	753				8 147	673	
1990	678	53	726				8 308	276	
1991	792	65	850				9 566	345	
1992	525	151	661				7 547	1 079	
1993	679	275	926				8 102	1 622	
1994	619	203	801				7 606	1 185	
1995	554	260	787				7 796	1 724	
1996	469	170	622				7 247	1 202	
1997	731	214	924				9 971	1 330	
1998	616	229	822				9 128	1 560	
1999	710	388	1060				10 780	2 913	
2000	533	298	801				8 370	2 293	
2001	573	315	857				7 438	2 112	
2002	491	223	692				6 792	1 732	
2003	404	291	666	0.61	5.5	0.12	7 052	2 659	17.5
2004	416	218	612	0.68	5.5	0.11	7 267	1 993	17.5
2005	346	157	488	0.71	5.7	0.09	6 530	1 412	18.9
2006	467	261	701	0.67	5.4	0.13	7 534	2 285	16.1
2007	511	375	848	0.60	5.1	0.16	8 424	3 246	16.5
2008	755	191	927	0.81	4.3	0.22	10 478	1 421	13.9
2009	567	335	868	0.65	4.6	0.19	9 199	2 934	16.2
2010	572	180	733	0.78	5.0	0.15	8 963	1 539	15.7
2011	644	332	943	0.68	4.9	0.19	10 162	2 683	15.8
2012	770	258	1003	0.77	5.1	0.20	10 527	1 866	13.7
Max	792	388	1060	0.81	5.67	0.22	10 780	3 246	18.9
Min	346	53	488	0.60	4.29	0.09	6 530	276	13.7
Average	598	229	804	0.70	5.11	0.16	8 565	1 704	16.2

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* on Porcupine Bank (FU 16)

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.

Stock status

	F (Fishing Mortality)			
	2010	2011	2012	
MSY (F_{MSY})	?	?	✓	Appropriate
Precautionary approach (F_{pa}, F_{lim})	?	?	?	Undefined

	SSB (Spawning-Stock Biomass)	
	2012–2013	
MSY ($B_{trigger}$)	?	Undefined
Precautionary approach (B_{pa}, B_{lim})	?	Undefined
Qualitative evaluation	➡	Stable (based on UWTV abundance)

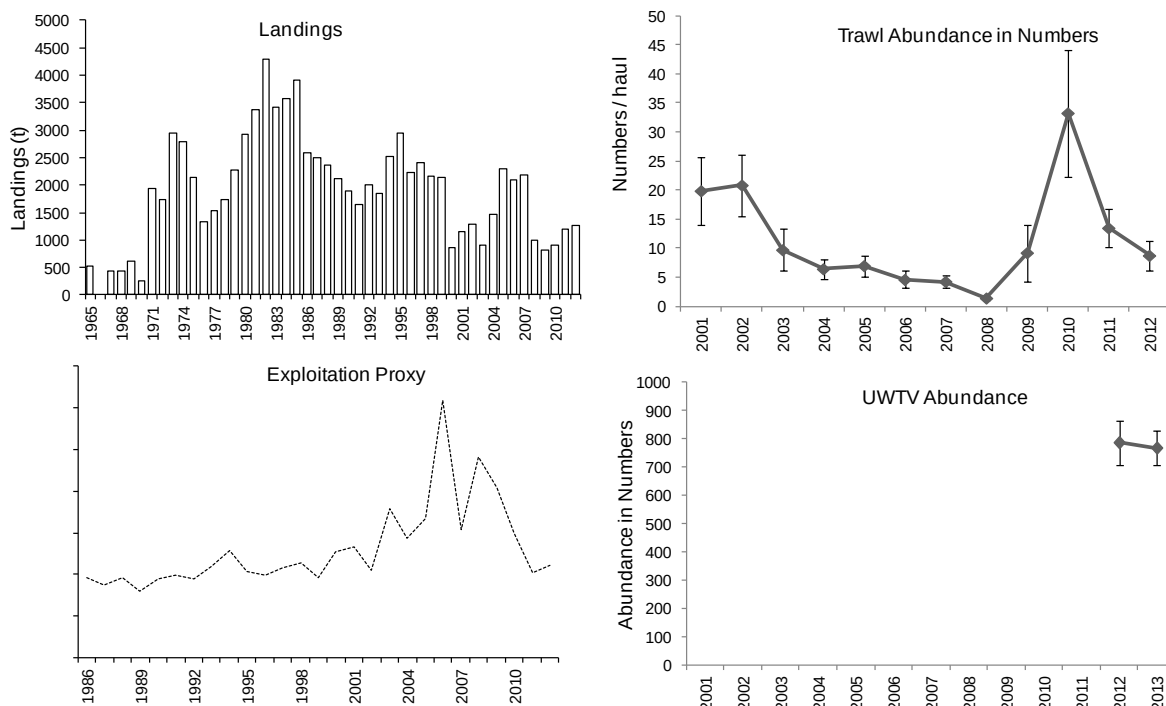


Figure 5.4.21.3.1 *Nephrops* on the Porcupine Bank (FU 16). Top left: ICES landings. Bottom left: exploitation proxy derived from catch length distributions. Top right: Abundance estimate (in numbers haul⁻¹) from Sp-PGFS-WBITS-Q4 survey. Bottom right: UWTV abundance survey.

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 F_{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.

Management plans

No specific management objectives are known to ICES.

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.

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).

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).
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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 argenterines (Anon., 2011). Discarding of *Nephrops* in the fishery has been negligible up to 2011 (ICES, 2013a, 2013b).

Quality considerations

The landings are considered fairly well estimated (an unallocated component related to area misreporting and non-reporting 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.

Scientific basis

Assessment type	UWTV and trends of the size structure of catches.
Stock data category	1
Input data	Commercial catches (international landings and length frequencies reconstructed from sampling and industry data); one UWTV survey (UWTV-FU 16); fixed maturity and natural mortality.
Discards and bycatch	Discards were not included and are assumed negligible.
Indicators	Two trawl surveys (SpPGFS-WIBTS-Q4, Irish IFSRP), cpue, and catch size.
Other information	Commercial lpue for Ireland, Spain, and France. Sex ratio. This stock was benchmarked in 2013 (ICES, 2013a).
Working group report	WGCSE (ICES, 2013b).

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Reference points

	Type	Value	Technical basis
MSY approach	MSY B _{trigger}	Not defined.	
	F _{MSY}	HR 5.0%.	Equivalent to F _{0.1} for combined sex in 2013.
Precautionary approach	Not defined.		

(unchanged since 2013)

Harvest ratio reference points (2013):

	Male	Female	Combined
F _{max}	6.6%	19.0%	11.1%
F _{0.1}	4.2%	12.3%	5.0%
F _{35%SpR}	5.0%	14.3%	7.7%

The density of *Nephrops* in FU 16 is considered very low (low density < 0.3 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 F_{0.1} of 5.0% is suggested as a proxy for F_{MSY}.

Outlook for 2014

Basis: F₂₀₁₃ = F₂₀₁₂ = 3.2%, Bias-corrected survey index (2013) = 768 million; Mean weights in landings (48.1 g, 2011–2012); discard rates by number (0%). Survey bias = 1.26.

Basis	Total Catches*	Landings	Dead Discards**	Surviving Discards**	Harvest Rate
	L+DD+SD	L	DD	SD	for L+DD
F _{MSY} proxy	1848	1848	0	0	5.0%
F ₂₀₁₃	1183	1183	0	0	3.2%
F _{35%SpR}	2846	2846	0	0	7.7%
F _{max}	4103	4103	0	0	11.1%

Weights in tonnes.

* Total catches are the landings plus dead and surviving discards.

** Based on negligible discards during observer trips.

MSY approach

No MSY B_{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.

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 (~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 ~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.

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).

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.

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.

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.

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.

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.

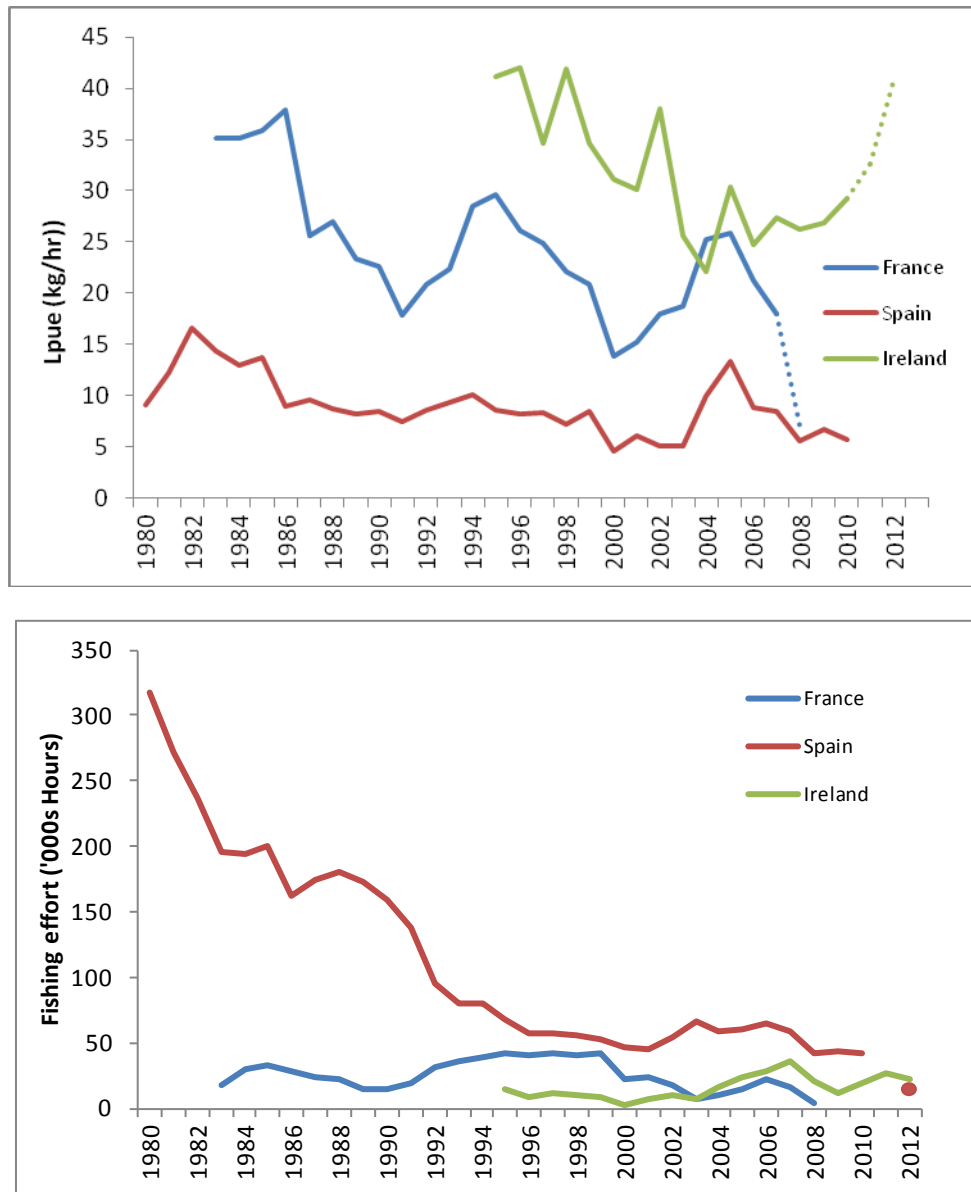


Figure 5.4.21.3.2 *Nephrops* on the Porcupine Bank (FU 16). Lpue and *Nephrops*-directed effort trends for fleets. Dotted line indicates that lpue values should be considered uncertain (an unallocated component related to area misreporting and non-reporting is included since 2011 for the Irish landings; the French landings and effort have been very low since 2008).

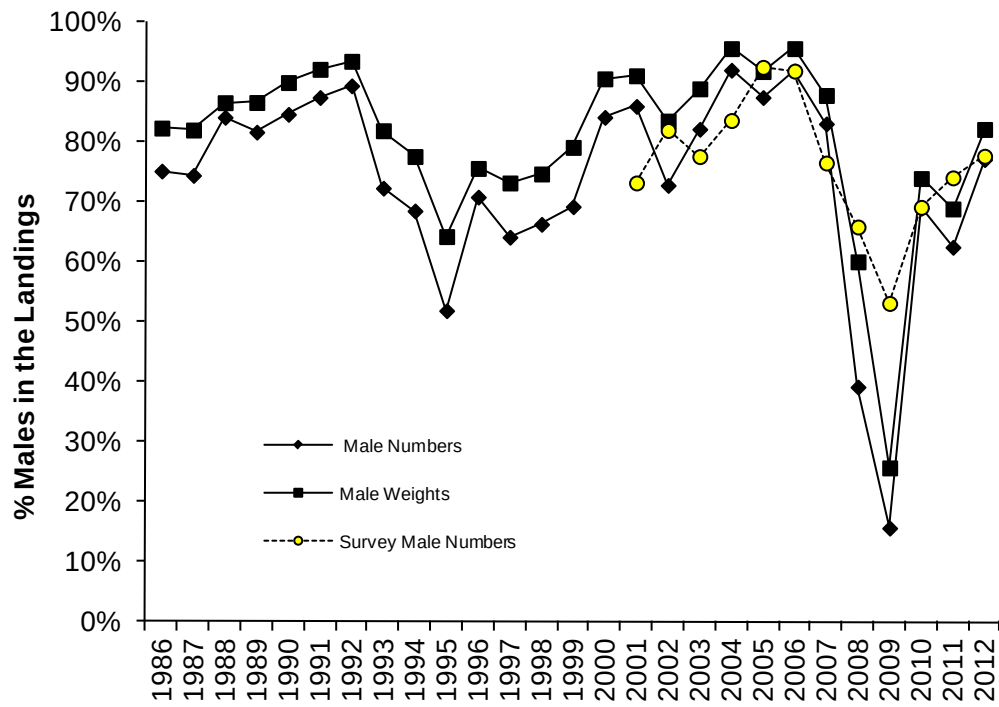


Figure 5.4.21.3.3 *Nephrops* on the Porcupine Bank (FU 16). Sex ratio of landings and survey (SpPGFS-WIBTS-Q4) catches.

Table 5.4.21.3.1 *Nephrops* on the Porcupine Bank (FU 16). ICES advice, management, and landings.

Year	ICES advice	Predicted landings corresp. to advice (FU 16)	'Of which limit' in TAC regulation	Recommended landings in Divisions VIIbcjk ¹	ICES landings FU 16 ²
1987					2.5
1988					2.4
1989					2.1
1990					1.9
1991					1.6
1992				3.8	2.0
1993				~4.0	1.9
1994				~4.0	2.5
1995				~4.0	2.9
1996				4.0	2.2
1997				4.0	2.4
1998				4.0	2.2
1999				4.0	2.3
2000				4.0	0.9
2001				4.0	1.2
2002				4.44	1.3
2003				4.44	0.9
2004	Restrict landings to 2000–2002 levels			3.3	1.5
2005	Restrict landings to 2000–2002 levels			3.3	2.3
2006	Restrict landings to 2000–2002 levels			3.3	2.1
2007	Constrain effort at recent levels			--	2.2
2008	Constrain effort at recent levels			--	1.0
2009	No increase in effort, and average landings (2000–2003)	< 1.0			0.8
2010	Reduce catches to lowest possible level	0			0.9
2011	Reduce catches to lowest possible level	0	1.26		1.2
2012	No increase in catch	-	1.26		1.26
2013	MSY approach (updated November 2012)	< 1.8	1.8		
2014	MSY approach	< 1.848			

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.

Year	France	Ireland	Spain	UK E& W	UK Scotland	Unallocated	Total
1965	514						514
1966	0						0
1967	441						441
1968	441						441
1969	609						609
1970	256						256
1971	500		1444				1944
1972	0		1738				1738
1973	811		2135				2946
1974	900		1894				2794
1975	0		2150				2150
1976	6		1321				1327
1977	0		1545				1545
1978	2		1742				1744
1979	14		2255				2269
1980	21		2904				2925
1981	66		3315				3381
1982	358		3931				4289
1983	615		2811				3426
1984	1067		2504				3571
1985	1181		2738				3919
1986	1060		1462	69			2591
1987	609		1677	213			2499
1988	600		1555	220			2375
1989	324	350	1417	24			2115
1990	336	169	1349	41			1895
1991	348	170	1021	101			1640
1992	665	311	822	217			2015
1993	799	206	752	100			1857
1994	1088	512	809	103			2512
1995	1234	971	579	152			2936
1996	1069	508	471	182			2230
1997	1028	653	473	255			2409
1998	879	598	405	273			2155
1999	1047	609	448	185			2290
2000	351	227	213	120			910
2001	425	369	270	158			1222
2002	369	543	276	139			1327
2003	131	307	333	108	29		908
2004	289	494	588	126	28		1526
2005	397	754	799	208	156		2315
2006	462	731	571	201	155		2120
2007	302	1060	496	146	183		2186
2008	26	562	234	41	138		1000
2009	4	356	294	13	159		825
2010	4	579	235	10	90		917
2011	8	643	109	23	122	301	1205
2012*	0	605	201	0	134	320	1260

* 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).

Year	UWTV abundance (millions)	95% CI	Harvest ratio	Landings by number (millions)	Mean weight in landings (g)
2011	na	na	na	na	45.8
2012	787	78.7	3.2%	25.0	50.4
2013	768	61.4	na	na	na

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STOCK *Nephrops* on the Aran Grounds (FU 17)

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.

Stock status

		F (Fishing Mortality)		
		2010	2011	2012
MSY (F_{MSY})				Above target
Precautionary approach (F_{pa}, F_{lim})				Undefined
SSB (Spawning-Stock Biomass)				
		2011–2013		
			Undefined	
			Undefined	
			Decreasing	

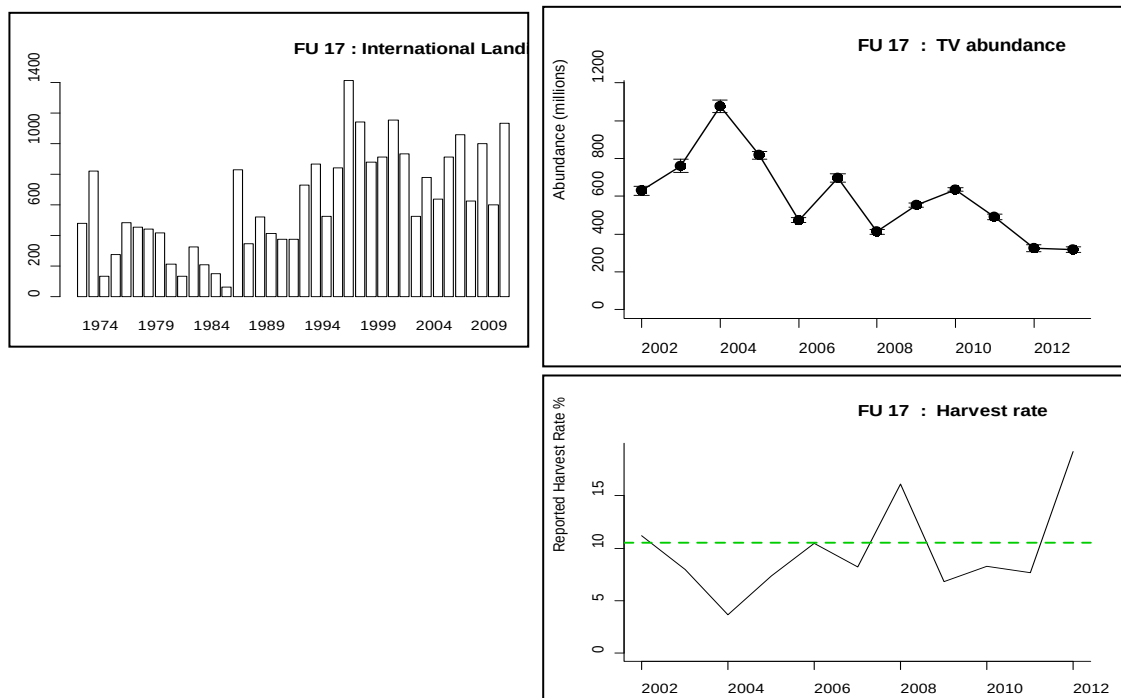


Figure 5.4.21.4.1 *Nephrops* on the Aran Grounds (FU 17). Landings (in tonnes), UWTV abundance (in millions; SSB proxy), and harvest rates (F_{MSY} proxy shown as the dashed green line).

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 F_{MSY} proxy.

Management plans

No specific management objectives are known to ICES.

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.

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.

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 kt, where 93% were landings (100% otter trawl) and 7% discards.

Effects of the fisheries on the ecosystem

Nephrops fisheries in this area also have catches of hake, megrim, and monkfish.

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	UWTV and trends of the size structure of catches.
Stock data category	1
Input data	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 and bycatch	Discards from the Irish <i>Nephrops</i> -directed fleet are included in the assessment.
Indicators	Sex ratio and lpue.
Other information	The latest benchmark (based on the UWTV survey) was performed in 2009 (ICES, 2009).
Working group report	WGCSE (ICES, 2013).

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STOCK *Nephrops* on the Aran Grounds (FU 17)

Reference points

	Type	Value	Technical basis
MSY approach	MSY B_{trigger}	Not defined.	
	F_{MSY}	HR 10.5%.	Equivalent to $F_{35\% \text{ SPR}}$ for combined sexes in 2010.
Precautionary approach	Not defined.		

(unchanged since 2010)

Harvest ratio reference points (2010):

	Male	Female	Combined
F_{max}	9.8%	13.0%	11.1 %
$F_{0.1}$	6.4%	9.1%	7.2 %
$F_{35\% \text{ SPR}}$	8.4%	12.8%	10.5 %

The density of *Nephrops* in FU 17 is considered to be moderate (average density 0.6 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 $F_{35\% \text{ SPR}}$ of 10.5% is suggested as a proxy for F_{MSY} .

Outlook for 2014

Basis: $F_{2013} = F_{2012} = 19.2\%$. Bias-corrected survey index (2013) = 317 million; Mean weights in landings (2010–2012, 21.4 g), mean weights in discards (2010–2012, 12.2 g); Dead discard rate (by number) = 17.3% (2010–2012 sampling). Discards survival rate = 10%.

Basis	Total catches*	Landings	Dead discards**	Surviving discards**	Harvest rate
	L+DD+SD	L	DD	SD	for L+DD
$F_{\text{MSY proxy}}$	669	591	70	8	10.5%
F_{2013}	1223	1080	129	14	19.2%
$F_{0.1 \text{ Combined}}$	459	405	48	5	7.2%
F_{max}	707	625	74	8	11.1%

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%.

MSY approach

No MSY B_{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.

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.

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).

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 F_{MSY} proxies are likely to be uncertain.

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.

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.

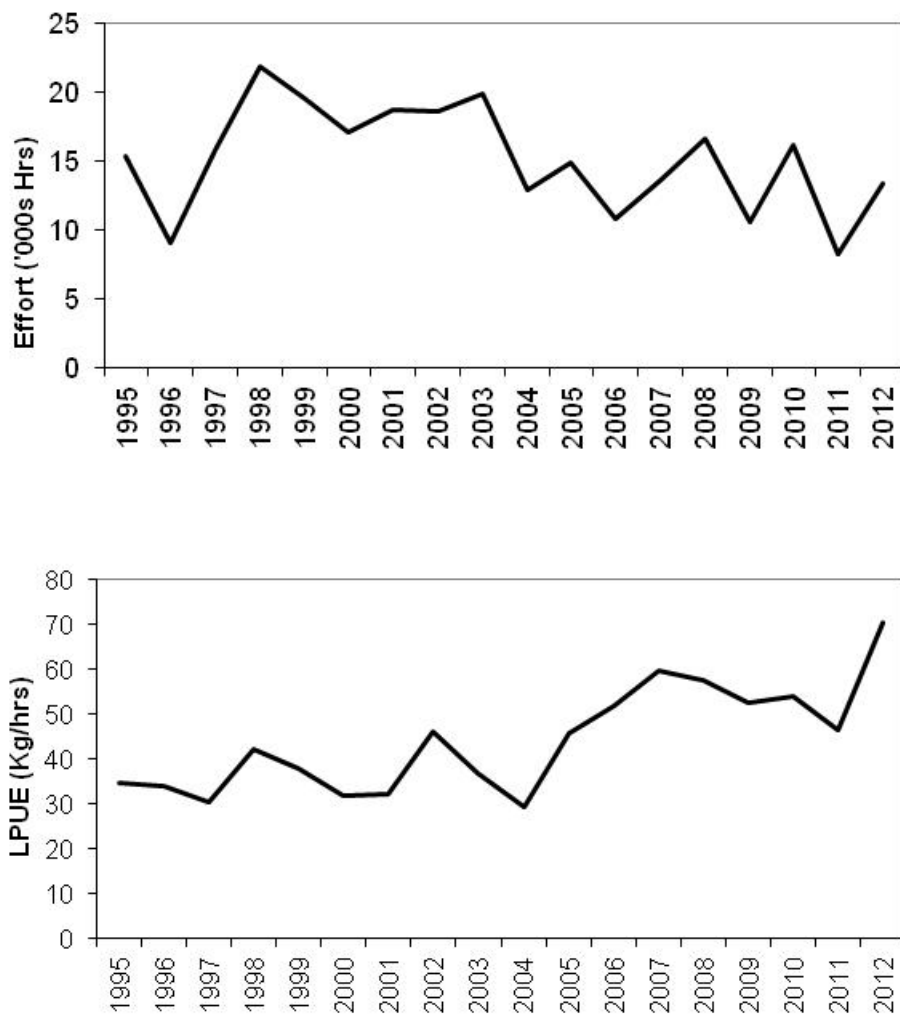


Figure 5.4.21.4.2 *Nephrops* on the Aran Grounds (FU 17). Irish effort (top) and lpue (bottom) for the *Nephrops*-directed fleet.

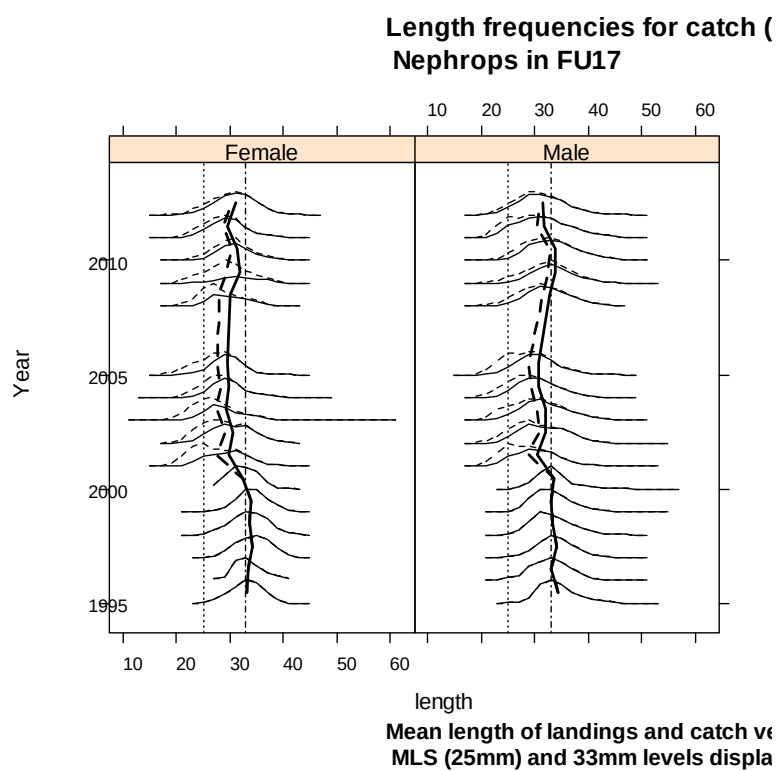


Figure 5.4.21.4.3 *Nephrops* on the Aran Grounds (FU 17). Annual length composition of catch (dashed) and landings (solid). Males (right) and females (left) from 1995 (bottom) to 2012 (top). The vertical dashed line is mean length in the catches and the vertical solid line is mean length in the landings. 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.

Year	ICES advice	Predicted landings corresp. to advice (FU 17)	Recommended landings Divisions VIIbcjk ¹	ICES landings FU 17	Discards ² FU 17
1987				0.1	
1988				0.1	
1989				0.8	
1990				0.3	
1991				0.5	
1992			3.8	0.4	
1993			~4.0	0.4	
1994			~4.0	0.7	
1995			~4.0	0.9	
1996			4.0	0.5	
1997			4.0	0.8	
1998			4.0	1.4	
1999			4.0	1.1	
2000			4.0	0.9	
2001			4.0	0.9	
2002			4.44	1.2	0.2
2003			4.44	0.9	0.2
2004	Restrict landings to 2000–2002 levels		3.3	0.5	0.1
2005	Restrict landings to 2000–2002 levels		3.3	0.8	0.2
2006	Restrict landings to 2000–2002 levels		3.3	0.6	
2007	Constrain effort at recent levels		--	0.9	
2008	Constrain effort at recent levels		--	1.1	0.2
2009	No increase in effort and landings (2007)	< 0.9		0.6	0.3
2010	Harvest ratio no greater than the lower bound of the range of $F_{0.1}$ for similar stocks	< 0.5		1.0	0.2
2011	MSY approach	< 0.95		0.6	0.1
2012	MSY approach	< 1.1		1.1	0.1
2013	MSY approach (Updated November 2012)	< 0.59			
2014	MSY approach	< 0.59			

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.

Year	FU 17			
	France	Rep. of Ireland	UK	Total
1974	477			477
1975	822			822
1976	131			131
1977	272			272
1978	481			481
1979	452			452
1980	442			442
1981	414			414
1982	210			210
1983	131			131
1984	324			324
1985	207			207
1986	147		1	148
1987	62		0	62
1988	14	814		828
1989	27	317	3	347
1990	30	489		519
1991	11	399		410
1992	11	361	2	374
1993	11	361	0	372
1994	18	707	4	729
1995	91	774	2	867
1996	2	519	7	528
1997	2	839	0	841
1998	9	1 401	0	1 410
1999	0	1 140	0	1 140
2000	1	879	0	880
2001	1	912	0	913
2002	2	1 152	0	1 154
2003	0	933	0	933
2004	0	525	0	525
2005	0	778	0	778
2006	0	637	0	637
2007	0	913	0	913
2008	0	1050	7	1057
2009	0	625	0	625
2010	0	991	9	1 000
2011	0	600	0	600
2012*	0	1 135	0	1 135

* 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.

Year	Number of stations	Burrow count	Mean density adjusted (burrows/m ²)	Estimation standard deviation	Domain area (km ²)	Geostatistical abundance estimate adjusted (millions of burrows)	CV on burrow estimate
2002	49	7 036	0.65	0.04	943	629	4%
2003	41	9 814	0.78	0.06	943	761	5%
2004	64	10 687	1.10	0.05	943	1075	3%
2005	70	8 774	0.84	0.03	936	818	3%
2006	67	6 928	0.49	0.02	932	474	3%
2007	71	10 272	0.71	0.03	942	697	3%
2008	63	7 617	0.43	0.02	906	412	3%
2009	82	6 585	0.56	0.02	940	552	2%
2010	91	8 091	0.65	0.01	937	636	2%
2011	76	7 365	0.51	0.02	909	491	3%
2012	31*	1 271	0.34	0.02	942	325	5%
2013	31*	1 937	0.32	0.00	941	317	4%

• 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 harvest rate, and landings and discards mean weights.

Year	Landings in number (million s)	Discards in number (million s)	Removals in number (million s)	Proportion on removals retained	Adjusted survey (million s)	Harvest rate	Landings (t)	Discards (t)	Mean weight in landings (g)	Mean weight in discards (g)
2001	48.7	25.4	71.6	0.68			912			
2002	54.5	17.7	70.4	0.77	629	11.2%	1 152	192	21.2	10.8
2003	44.1	18.3	60.6	0.73	761	8.0%	933	183	21.2	10.0
2004	29.0	11.4	39.3	0.74	1075	3.7%	525	112	18.1	9.9
2005	42.4	19.7	60.1	0.70	818	7.4%	778	182	18.4	9.2
2006	na	na	49.5*	na	474	10.4%	636	na	na	na
2007	na	na	57.3*	na	697	8.2%	913	na	na	na
2008	46.9	21.6	66.3	0.71	412	16.1%	1 050	245	22.4	11.3
2009	23.5	15.7	37.6	0.62	552	6.8%	625	256	26.6	16.3
2010	41.0	13.3	53.0	0.77	636	8.3%	1 000	194	24.4	14.5
2011	30.8	7.7	37.7	0.82	491	7.7%	600	83	19.5	10.8
2012	55.6	7.6	62.4	0.89	325	19.2%	1 135	85	20.4	11.3
2013	na	na	na	na	317	na	na	na	na	na
Avg. 2010–12	42.5	9.5	51.0	0.83	484	12%	912	121	21.4	12.2

na= not available.

* No discard samples; an average discard rate was used to estimate removals (including dead discards).

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19)

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.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	?	✓	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined
SSB (Spawning-Stock Biomass)			
	2011–2013		
MSY ($B_{trigger}$)	?	Undefined	
Precautionary approach (B_{pa}, B_{lim})	?	Undefined	
Qualitative evaluation	↘	Decreasing	

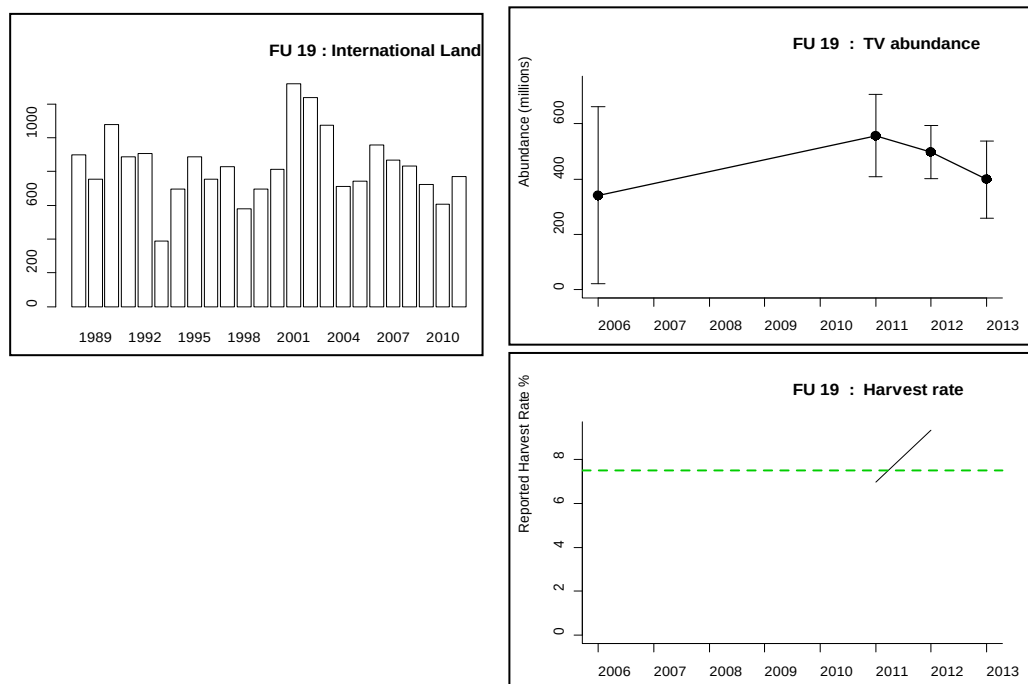


Figure 5.4.21.5.1 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19). Landings (in tonnes), UWTV abundance (in millions; SSB proxy, confidence intervals 95%), and harvest rates (F_{MSY} proxy shown as the dashed green line).

Recent harvest rates (removals/UWTV abundance) are around the F_{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.

Management plans

No specific management objectives are known to ICES.

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.

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 mm.

Catch distribution Total catch (2012) = 919 t, where 84% were landings (100% otter trawl) and 16% discards.

Effects of the fisheries on the ecosystem

Nephrops fisheries in this area have bycatches of megrim, hake, and monkfish.

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

Assessment type	UWTV survey and trends in size structure of catches.
Stock data category	1
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.
Discards and bycatch	Discards included in the assessment from Irish <i>Nephrops</i> -directed fleet.
Indicators	Mean size in landings and bottom trawl survey (IRGFS-WIBTS-Q4). Commercial Irish lpue.
Other information	This stock is scheduled to be benchmarked in 2014.
Working group report	WGCSE (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19)

Reference points

	Type	Value	Technical basis
MSY approach	MSY B_{trigger}	Not defined.	
	F_{MSY}	HR 7.5%.	Equivalent to $F_{0.1}$ for combined sexes in 2012.
Precautionary approach	Not defined.		

(unchanged since 2012).

Harvest ratio reference points (2012):

	Male	Female	Combined
F_{max}	10.4%	21.9%	12.7 %
$F_{0.1}$	6.5%	14.2%	7.5 %
$F_{35\%SpR}$	8.3%	21.8%	12.1 %

The density of *Nephrops* in FU 19 is considered moderate (average density 0.3 m^{-2}). Recent harvest rates (7–9%) are low in comparison to other FUs and the mean size and l_{pue} 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 $F_{0.1}$ of 7.5% is suggested as a proxy for F_{MSY} .

Outlook for 2014

Basis: $F_{2013} = F_{2012} = 9.3\%$; Bias-corrected survey index (2013) = 397 million; Mean weight in landings (2010–2012) = 23.84 g; Dead discard rate (by number) = 26.6%; Mean weight in discards (2010–2012) = 11.03 g; survey bias = 1.3; Discard survival = 10%.

Basis	Total catches*	Landings	Dead discards**	Surviving discards**	Harvest rate
	L+DD+SD	L	DD	SD	for L+DD
$F_{\text{MSY proxy}}$	618	521	87	10	7.5%
F_{2013}	768	648	108	12	9.3%
$F_{35\%SpR}$	997	841	141	16	12.1%
F_{max}	1047	883	148	16	12.7%

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%

MSY approach

No MSY B_{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.

Additional considerations

The advice takes into account the 2013 UWTV survey results.

Management considerations

The abundance estimates and the F_{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.

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 m) has been declining since 2003 (Figure 5.4.21.5.3).

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.

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.

Last year's advice was based on the MSY approach. This year's advice is on the same basis.

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.

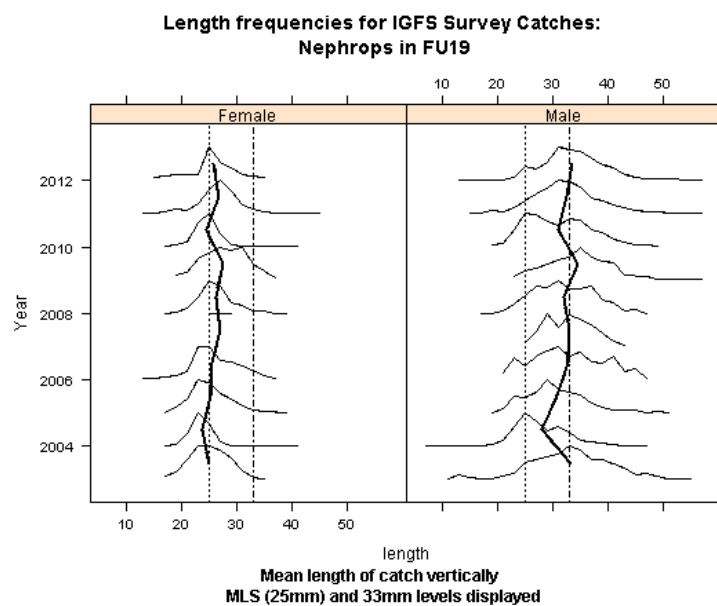


Figure 5.4.21.5.2 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19). Annual length composition of IRGFS-WIBTS-Q4 survey catch. Males (right) and females (left) from 2003 (bottom) to 2012 (top). The vertical solid line is the mean length in the survey catch. The straight vertical lines correspond to 25 mm (MLS) and 33 mm carapace length. .

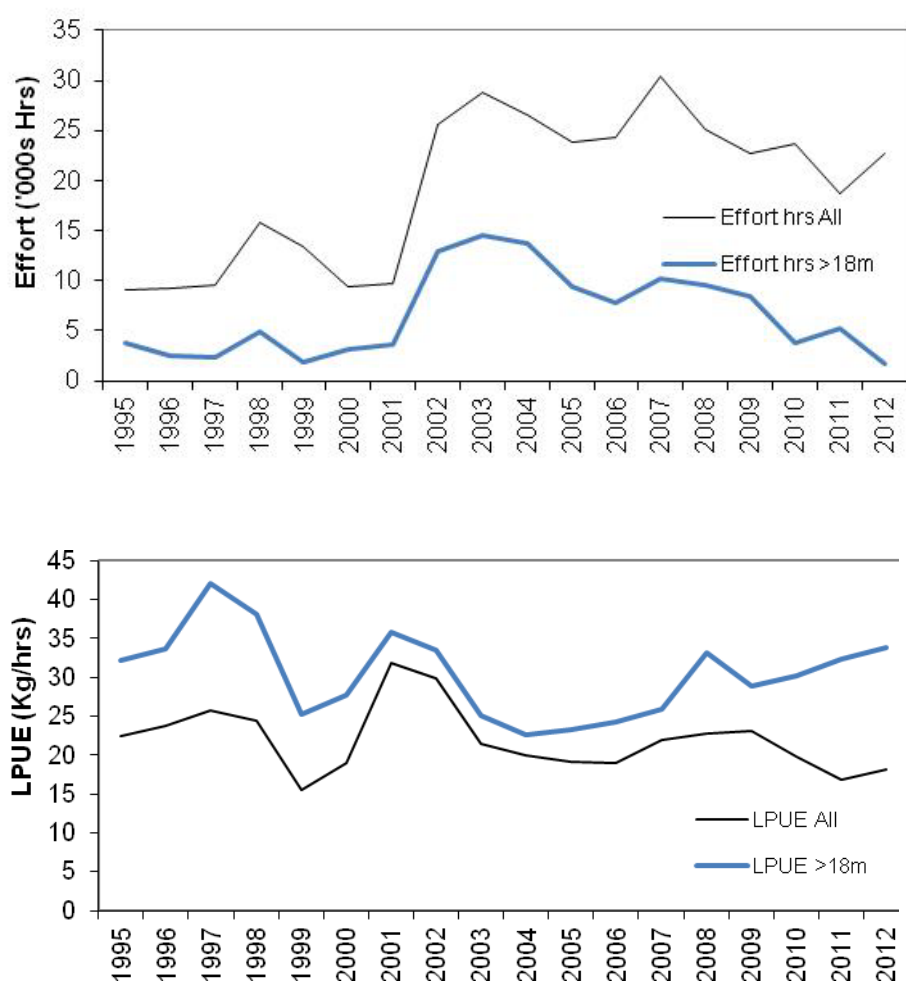


Figure 5.4.21.5.3 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19). Fishing effort and lpue by all Irish vessels targeting *Nephrops* (black line) and by vessels >18 m total length (blue line).

Table 5.4.21.5.1 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19). ICES advice, management, landings, and discards.

Year	ICES advice	Predicted landings corresp. to advice (FU 19)	Recommended landings Divisions VIIbcjk ¹	ICES landings FU 19	Total discards ² FU 19
1992			3.8	0.9	
1993			~4.0	0.9	
1994			~4.0	0.4	
1995			~4.0	0.7	
1996			4.0	0.9	
1997			4.0	0.8	
1998			4.0	0.8	
1999			4.0	0.6	
2000			4.0	0.7	
2001			4.0	0.8	
2002			4.44	1.3	
2003			4.44	1.2	
2004	Restrict landings to 2000–2002 levels		3.3	1.1	
2005	Restrict landings to 2000–2002 levels		3.3	0.7	
2006	Restrict landings to 2000–2002 levels		3.3	0.7	0.0
2007	Constrain effort at recent levels		--	1.0	0.0
2008	Constrain effort at recent levels		--	0.9	0.0
2009	No increase in effort and landings (2007)	< 0.8	--	0.8	0.1
2010	No new advice, same as for 2009	< 0.8	--	0.7	0.1
2011	See scenarios	-		0.6	0.1
2012	Reduce catches	-		0.8	0.1
2013	MSY approach	< 0.82			
2014	MSY approach	< 0.521			

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).

Year	FU 19			
	France	Rep. of Ireland	UK	Total
1989	245	652	2	899
1990	181	569	4	754
1991	212	860	5	1 077
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	1 130	0	1 318
2003	165	1 075	0	1 239
2004	76	997	1	1 074
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

* 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.

Year	Number of stations	Area surveyed (km ²)	Area estimate (km ²)	Burrow count	Mean observed density adjusted (burrow/ m ²)	Standard deviation	Raised abundance estimate adjusted (million burrows)	95% CI on abundance	CVs
2006	6	0.93	1,653	293	0.21	0.18	342	320	36%
2007	No Survey Data								
2008									
2009									
2010									
2011	35	5	1,653	2616	0.34	0.26	557	148	13%
2012	40	9	1,653	4124	0.30	0.18	498	96	9%
2013	40	6	1,653	1884	0.25	0.26	397	139	17%

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.

Year	Landings in number (millions)	Discards in number (millions)	Removals in number (millions)	Dead discard rate (by number)	Adjusted survey (millions)	Harvest ratio	Landings (t)	Discards (t)	Mean weight in landings (g)	Mean weight in discards (g)		
2006	25.1	2.5	27.3	0.08			741	41	29.5			
2007	29.9	1.5	31.3	0.04			957	27	32.0			
2008	26.6	1.4	27.8	0.04			866	23	32.6			
2009	30.1	6.9	36.3	0.17			833	87	27.7			
2010	27.3	9.0	35.4	0.23	557	7.0%	722	106	26.4	11.8		
2011	27.4	12.6	38.8	0.29			608	137	22.2	10.9		
2012	33.5	14.3	46.4	0.28			498	9.3%	770	149	23.0	10.4
2013							397					
Avg. 2010–12				0.266					23.84	11.03		

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* in FU 20 (Labadie, Baltimore, and Galley) and FU 21 (Jones and Cockburn)

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.”

Quality considerations

Discards of *Nephrops* are thought to be extensive, but observations are insufficient to provide a reliable time-series. 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 m⁻²) but there is large variability in the density structure.

Scientific basis

Assessment type	Data-limited method for <i>Nephrops</i> .
Stock data category	4.1.4
Input data	Habitat extent, mean size, landings and estimate discard rates from sampling, burrow density estimates.
Discards and bycatch	Discards rates from French and Irish fleets were included in the assessment, but not as a time-series.
Indicators	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-WIBTS-Q4).
Other information	This stock is scheduled to be benchmarked in 2014.
Working group report	WGCSE (ICES, 2013) .

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.

Year ICES advice ¹⁾	Predicted landings corresp. to advice (FUs 20–21) ¹⁾	ICES landings	
		FUs 20–22	FUs 20–21
1987		3.4	
1988		3.2	
1989		4	
1990		4.3	
1991		3.3	
1992	~3.8	4.2	
1993	3.8	4.8	
1994	3.8	4.9	
1995	3.8	5.2	
1996	3.8	4.6	
1997	3.8	4	
1998	3.8	3.8	
1999	3.8	2.9	1.2
2000	3.8	4.7	1.8
2001	3.8	4.8	1.8
2002	3.8	4.7	2.7
2003	3.8	5.0	3.0
2004 Adjust TAC in line with landings of most recent 10 years	4.6	4.3	2.4
2005 Adjust TAC in line with landings of most recent 10 years	4.6	4.9	2.5
2006 Recent average landings 2000–2002	4.6	4.3	2.5
2007 No increase in effort	-	5.3	2.4
2008 No increase in effort	< 5.3	6.4	3.0
2009 No increase in effort	< 5.3	5.8	3.1
2010 No new advice, same as for 2009	< 5.3	4.9	1.8
2011 See scenarios	-	2.9	1.2
less than 2300 t for FU 22, reduce landings below			
2012 the recent level of 2600 t for FUs 20–21			1.2
2013 Average landings (last 10 yrs)	< 2.5		
2014 No new advice, same as for 2013	< 2.5		

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.

Year	FU 20–21 Landings (t)			
	France	Rep. of Ireland	UK	Total
1999	1 051	83	18	1 152
2000	1 661	107	10	1 778
2001	1 750	69	14	1 833
2002	2 559	104	11	2 674
2003	2 796	148	9	2 953
2004	2 140	299	4	2 443
2005	2 008	455	6	2 469
2006	2 066	450	7	2 523
2007	1 816	600	3	2 419
2008	2 036	937	7	2 980
2009	1 930	1 202	13	3 145
2010	975	756	62	1 793
2011	566	637	34	1 237
2012	453	708	28	1 189

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* in the Smalls (FU 22)

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.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✗	✓	✓ Appropriate
Precautionary approach (F_{pa}, F_{lim})	?	?	? Unknown

SSB (Spawning-Stock Biomass)	
	2011–2013
MSY ($B_{trigger}$)	? Undefined
Precautionary approach (B_{pa}, B_{lim})	? Undefined
Qualitative evaluation	➡ Stable

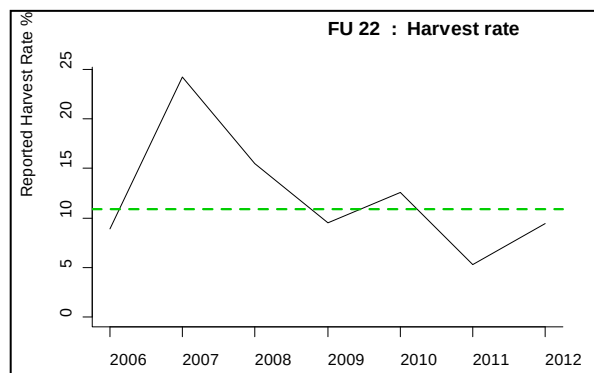
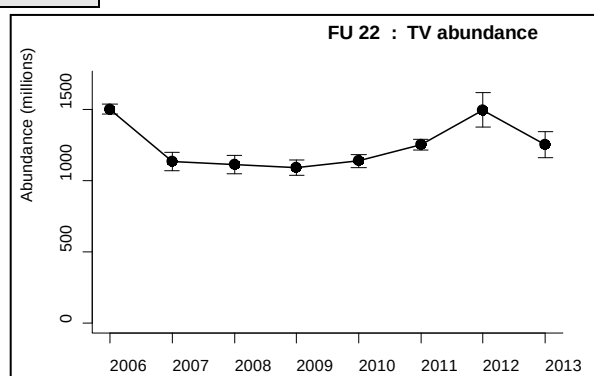
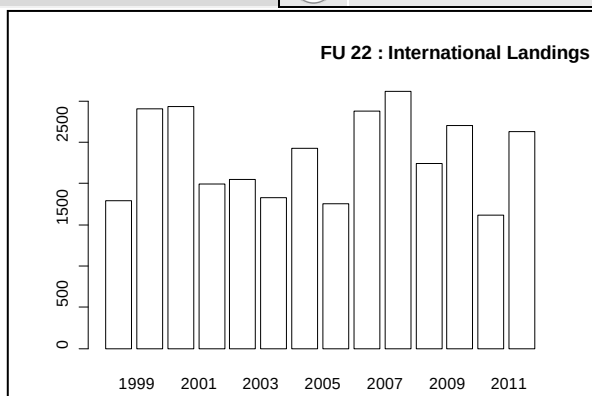


Figure 5.4.21.7.1 *Nephrops* in the Smalls (FU 22). Top left: Landings in tonnes. Top right: UWT survey abundance (proxy for SSB, 95% confident intervals). Bottom right: harvest rate (green dashed line represents F_{MSY} harvest ratio proxy).

The FU 22 stock component is considered to be stable. Harvest rates (removals/UWTV abundance) have decreased since 2007 and are below the F_{MSY} proxy.

Management plans

No specific management objectives are known to ICES.

Biology

The “Smalls” can be characterized as an area of moderate density of *Nephrops*.

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 kt, where 90% were landings (100% otter trawl) and 10% discards.

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.

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.

Scientific basis

Assessment type	UWTV and trends of the size structure of catches.
Stock data category	1
Input data	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 and bycatch	Discards from the Irish <i>Nephrops</i> -directed fleet are included in the assessment.
Indicators	Mean size and l _{pue} .
Other information	None.
Working group report	WGCSE (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* in the Smalls (FU 22)

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY approach	MSY B_{trigger}	Not defined.	
	F_{MSY} (FU 22) harvest rate.	10.9%	Equivalent to $F_{35\% \text{SPR}}$ for combined sexes in 2011.
Precautionary approach	Not defined.		

(unchanged since 2011)

Harvest ratio reference points (2011):

	Male	Female	Combined
F_{max}	10.9%	17.7%	12.3 %
$F_{0.1}$	6.5%	10.9%	7.5 %
$F_{35\% \text{SPR}}$	8.4%	15.3%	10.9%

For FU 22, the absolute density observed during the UWTV survey is medium ($\sim 0.5 \text{ m}^{-2}$), 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 $F_{35\% \text{SPR}}$. $F_{35\% \text{SPR}}$ (combined between sexes) is expected to deliver high long-term yield with a low probability of recruitment overfishing and therefore is chosen as the F_{MSY} proxy for FU 22.

Outlook for 2014

FU 22: Basis: $F_{2013} = F_{2012} = 9.5\%$; Bias-corrected survey index (2013) = 1254 million; Mean weight in landings (2003–2012) = 22.08 g; Dead discard rate (by number) = 11.4%; Mean weight in discards (2003–2012) = 12.62 g; Survey bias = 1.3; Discards survival rate = 25%.

Basis	Total catches*	Landings	Dead discards**	Surviving discards**	Harvest rate
	L+DD+SD	L	DD	SD	for L+DD
F_{MSY} proxy	2937	2674	197	66	10.9%
F_{2013}	2551	2323	171	57	9.5%
$F_{0.1}$ Combined	2021	1840	136	45	7.5%
F_{max}	3314	3018	222	74	12.3%

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%.

MSY approach

No MSY B_{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.

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.

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 lpu of the Irish *Nephrops*-directed fleet has been increasing since 2004 (see Figure 5.4.21.7.2).

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.

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.

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.

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.

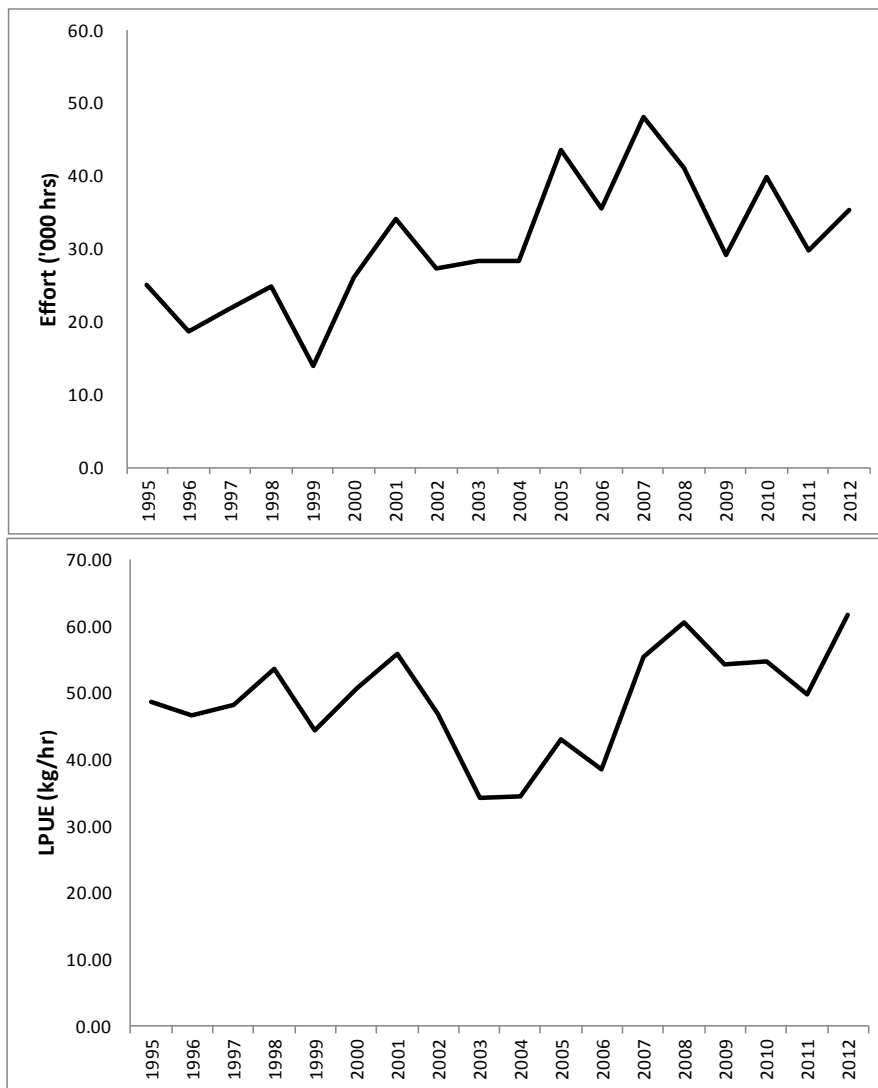


Figure 5.4.21.7.2 *Nephrops* in the Smalls (FU 22). Trends in effort (top) and lpue (bottom) for the Irish *Nephrops*-directed fleet.

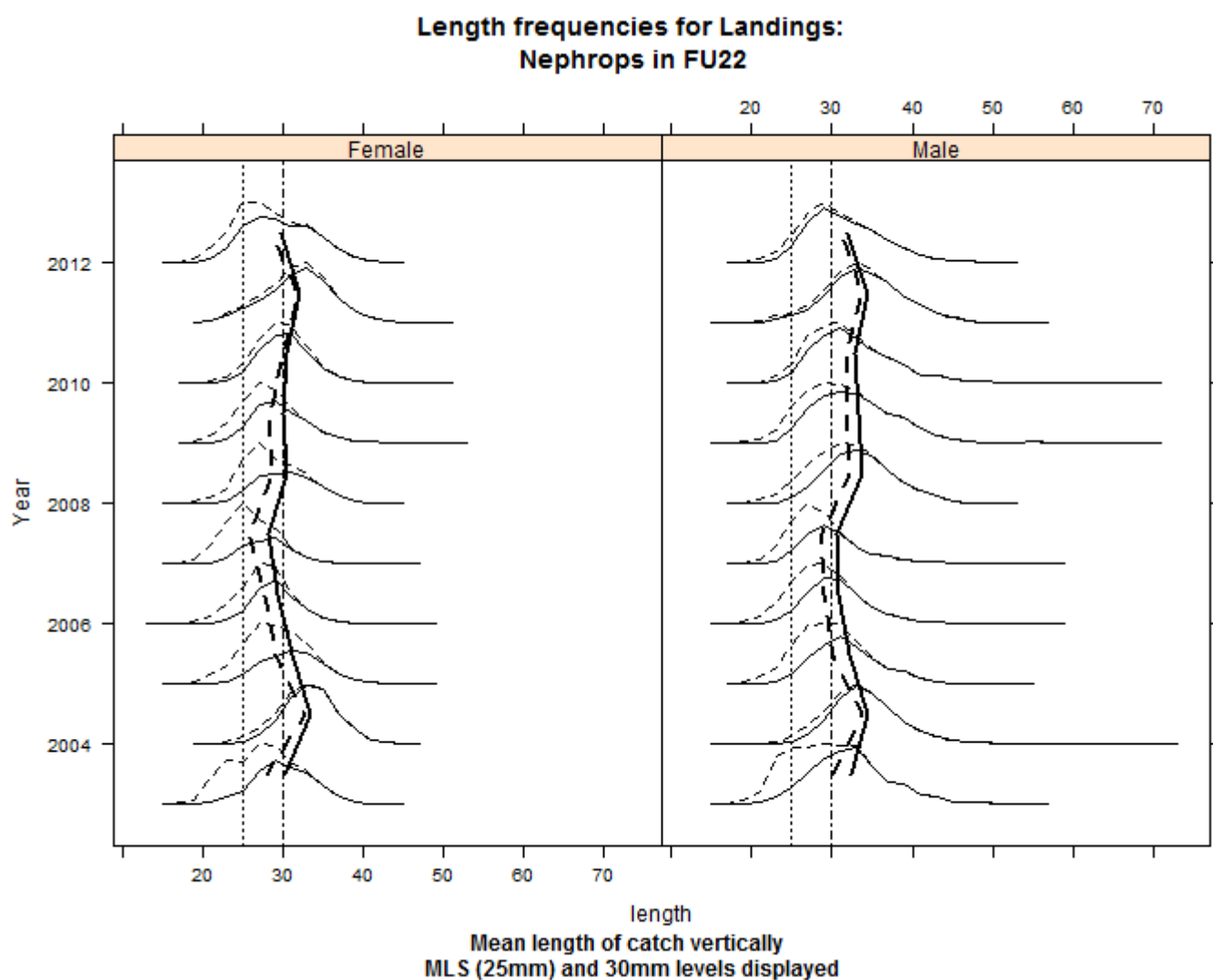


Figure 5.4.21.7.3 *Nephrops* in the Smalls (FU 22). Annual length distributions in the catches 2003–2012. Annual length composition of catch (dotted) and landed (solid). Males (right) and females (left) from 2003 (bottom) to 2012 (top). The vertical dashed line is mean length in the catches and the vertical 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.

Year	ICES advice ¹⁾	Predicted landings corresp. to advice (FU 22) ¹⁾	ICES landings FU 22	Total discards ²⁾ FU 22	ICES landings FUs 20–22
1987					3.4
1988					3.2
1989					4.0
1990					4.3
1991					3.3
1992		~3.8			4.2
1993		3.8			4.6
1994		3.8			5.1
1995		3.8			5.5
1996		3.8			4.8
1997		3.8			4.2
1998		3.8			3.9
1999		3.8			3.0
2000			1.8		4.7
2000		3.8	2.9		4.8
2001		3.8	2.9		4.7
2002		3.8	2		5.0
2003		3.8	2.1	0.5	4.3
2004	Adjust TAC in line with landings of most recent 10 years	4.6	1.8	0.1	4.9
2005	Adjust TAC in line with landings of most recent 10 years	4.6	2.4	0.6	4.3
2006	Recent average landings 2000–2002	4.6	1.8	0.6	5.4
2007	No increase in effort	-	2.9	1.5	6.4
2008	No increase in effort	< 5.3	3.1	0.8	5.8
2009	No increase in effort	< 5.3	2.2	0.6	4.8
2010	No new advice, same as for 2009	< 5.3	2.7	0.4	2.9
2011	See scenarios	-	1.6	0.1	3.8
2012	FUs 20–21: reduce catch	-	2.6	0.3	
2013	FU 22: MSY approach	2.3 ³⁾			
	FU 22: MSY approach (updated November 2012)	3.1 ³⁾			

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.

Year	FU 22			
	France	Rep. of Ireland	UK	Total
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

* Preliminary.

Table 5.4.21.7.3 *Nephrops* in the Smalls (FU 22). Results from UWTV survey of the Smalls *Nephrops* grounds.

Year	Number of stations	Mean density adjusted (burrow m ⁻²)	Domain area (km ²)	Geostatistical abundance adjusted (millions of burrows)	CV on burrow estimate
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%

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

Year	Landings in number (millions)	Discards in number (millions)	Removals in number (millions; 25% discard survival)	Dead discards in number (millions)	Adjusted survey (millions)	Harvest ratio	FU 22 Landings (t)	FU 22 Discards (t)	Mean weight in landings (g)	Mean weight in discards (g)
2003	95.71	54.22	136.4	0.30	Na		2 050	535	21.4	9.9
2004	71.65	8.53	78.1	0.08	Na		1 828	76	25.5	8.9
2005	114.71	90.81	182.8	0.37	Na		2 425	647	21.1	7.1
2006	97.18	54.67	138.2	0.30	1503	9.2%	1 752	593	18.0	10.8
2007	164.78	149.88	277.2	0.41	1136	24.4%	2 880	1 513	17.5	10.1
2008	131.90	60.52	177.3	0.26	1114	15.9%	3 114	764	23.6	12.6
2009	92.75	31.08	116.1	0.20	1093	10.6%	2 245	589	24.2	19.0
2010	129.70	28.36	151.0	0.14	1141	13.2%	2 840	439	21.9	15.5
2011	61.55	6.65	66.5	0.07	1256	5.3%	1 617	144	26.3	21.7
2012	123.82	24.00	141.8	0.13	1498	9.5%	2 633	256	21.3	10.7
2013					1254					

ECOREGION Celtic Sea and West of Scotland
STOCK Norway pout in Division VIa

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 to data limited stocks, and taking into account the absence of landings in recent years, ICES advises that no increase of the catches should take place unless there is evidence that this will be sustainable”.

Sources

ICES. 2012. Norway pout in Division VIa. In ICES. 2012. Report of the ICES Advisory Committee 2012, Section 5.4.31.

ICES Advice, 2012, Book 5: 253–254.

ICES. 2013. Eurostat/ICES database on catch statistics. ICES, Copenhagen.

Table 5.4.22.1 Norway pout in Division VIa. ICES advice, management, and official landings.

Year	ICES advice	Predicted catch corresp. to advice	TAC	Official landings
2010	No advice		No TAC	0
2011	No advice		No TAC	0
2012	No increase of catches	-	No TAC	0
2013	No increase of catches	-	No TAC	
2014	Same advice as 2013	-		

ECOREGION Celtic Sea and West of Scotland
STOCK 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	✓	Below poss. reference points
SSB (Spawning-Stock Biomass)		
	2008–2012	
Qualitative evaluation	✓	Above poss. reference points

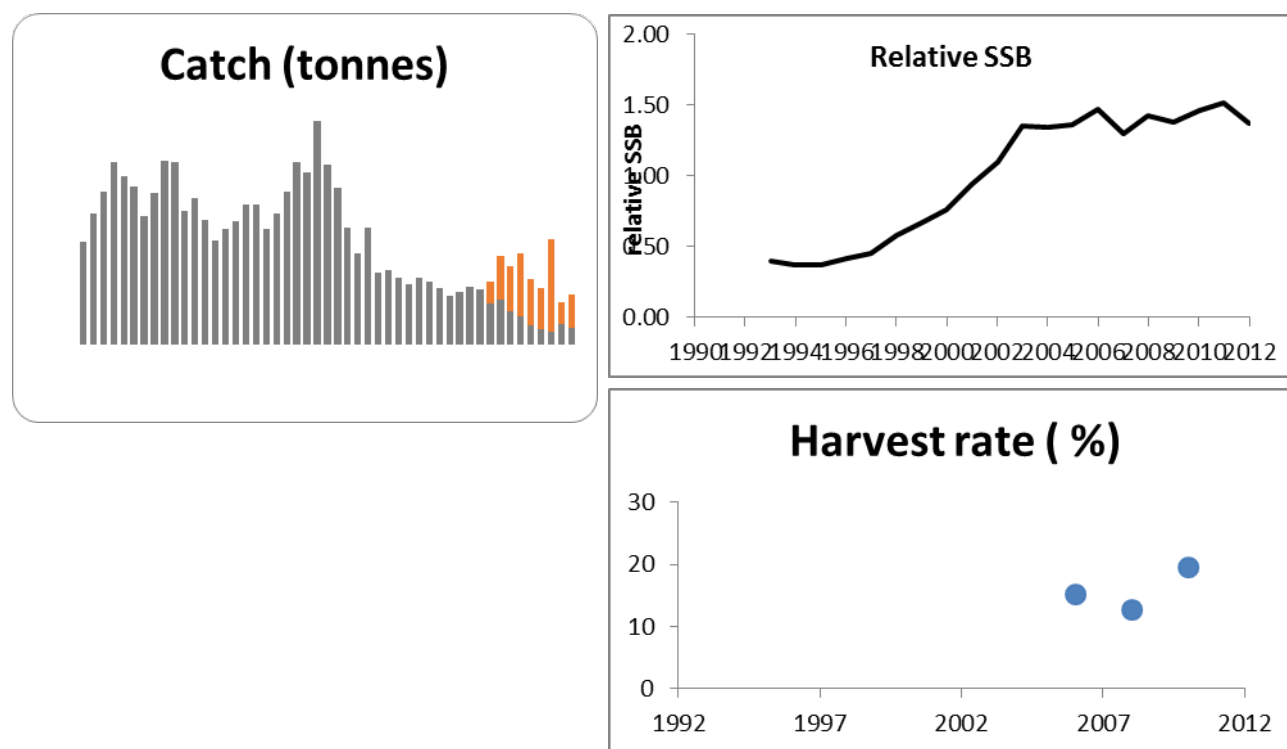


Figure 5.4.23.1 Plaice in Division VIIa (Irish Sea). Upper left: Official landings (grey bars) and raised discard estimates (red bars from 2004). Upper right: SSB trend (mean standardized from the Aarts and Poos (2009) model output). Bottom: Harvest rate (total catch/annual egg production SSB).

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 14 000–15 000 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 t (30% landings, 70% discards). Landings = 496 t (48% beam trawl, 28% otter trawl, and 24% other gear types). ICES estimates of discards = 1152 t (24% beam trawl, 44% otter trawl, and 32% other gear types).
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Effects of the fisheries on the ecosystem

A proportion of the plaice catch is caught by beam trawl fisheries. 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.

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 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 trawl, UK(E&W) beam trawl, and Irish miscellaneous gears. Northern Irish and Irish <i>Nephrops</i> fleet discard information is available for 2010 onwards.
Indicators	Annual egg production survey used to calculate a proxy of fishing mortality.
Other information	Last benchmark in 2011 (ICES, 2011); next benchmark is planned for 2014.

ECOREGION Celtic Sea and West of Scotland
STOCK Plaice in Division VIIa (Irish Sea)**Reference points**

No reference points are defined for this stock.

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.

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 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 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.

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).

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.

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 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.

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.

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.
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Table 5.4.23.1 Plaice in Division VIIa (Irish Sea). ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings
1987	F high; no long-term gains in increasing F	5.0	5.0	5.6	6.2
1988	No increase in F	4.8	5.0	4.4	5.0
1989	80% of F(87); TAC	5.8	5.8	4.2	4.4
1990	Halt decline in SSB; TAC	5.1	5.1	4.0	3.3
1991	Rebuild SSB to SSB(90); TAC	3.3	4.5	2.8	2.6
1992	70% of F(90)	3.0	3.8	3.2	3.3
1993	F = 0.55 ~ 2800 t	2.8	2.8	2.0	2.0
1994	Long-term gains in decreasing F	< 3.7	3.1	2.1	2.1
1995	Long-term gains in decreasing F	2.4 ¹	2.8	2.0	1.9
1996	No long-term gain in increasing F	2.5	2.45	1.9	1.7
1997	No advice	-	2.1	2.0	1.9
1998	No increase in F	2.4	2.4	1.8	1.8
1999	Keep F below F _{pa}	2.4	2.4	1.6	1.6
2000	Keep F below F _{pa}	< 2.3	2.4	1.4	1.4
2001	Keep F below F _{pa}	< 2.4	2.0	1.5	1.5
2002	Keep F below F _{pa}	< 2.8	2.4	1.5	1.6
2003	No increase in F	1.9	1.675	1.6	1.6
2004	F < F _{pa}	1.6	1.34	1.1	1.1
2005	F < F _{pa}	2.97	1.608	1.3	1.3
2006	F < F _{pa}	5.9	1.608	0.9	0.9
2007	F < F _{pa}	6.5	1.849	0.8	0.8
2008	F < F _{pa}	5.2	1.849	0.5	0.6
2009	No long-term gains in increasing F above F _{0.1}	1.43	1.43	0.48	0.46
2010	No long-term gains in increasing F above F _{0.1}	1.63	1.63	0.38	0.38
2 2011	3 Effort should be consistent with no increase in catches	-	1.627	0.59	0.59
4 2012	5 Catches should not increase	-	1.627	0.50	0.91
6 2013	7 Landings should be no more than 2% more than recent landings (last 3 years)	< 0.490 ²	1.627		
8 2014	9 Catches should be no more than 1% more than recent catches (last 3 years)	1.827			

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.

Country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012 ¹
Belgium	321	128	332	327	344	459	327	275	325	482	636	628	431	566	343	194	157	197	138	332	236
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
Ireland	1355	654	547	557	538	543	730	541	420	378	370	490	328	272	179	194	102	73	89	118	106
Netherlands	-	-	-	-	69	110	27	30	47	-	-	-	-	-	-	-	-	-	-	-	-
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
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
UK (Scotland)	70	72	63	60	18	25	18	23	21	11	7	9	4	1	0	0	1	2	3	0	0
Total	3193	2005	2051	2024	1874	1954	1803	1566	1443	1488	1591	1544	1134	1270	937	802	562	457	379	594	496
Discards ³	-	-	-	-	-	-	-	-	-	-	-	-	628	1210	1254	1743	1270	1131	2560	604	911
Unallocated	74	-9	15	-150	-167	-83	-38	34	-72	-15	32	15	9	11	-5	3	1	2	0	0	0
ICES landings	3267	1996	2066	1874	1707	1871	1765	1600	1371	1473	1623	1559	1771	2491	2186	2548	1833	1591	2938	1198	1407

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).

Year	WKFLAT method	Using new updated discard data, including Northern Irish and Irish discard data		
	Discards	Discards	Landings	Catches
2010	2560	2171	379	2550
2011	604	614	594	1208
2012	911	1152	496	1648

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).

Year	SSB- AEPM (kt)	Relative SSB- AP model	Catch ¹ (kt)	Harvest rate (%)
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	

¹ Discard data only available from 2004 onwards.

ECOREGION Celtic Sea and West of Scotland
STOCK Plaice in Divisions VIIb,c (West of Ireland)

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.

Quality considerations

Catches in this area are too low to support the collection of the necessary information for an assessment of the stock status.

Scientific basis

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).

Outlook for 2015

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.

Additional considerations

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.

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.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings
1993	-	-	-	196
1994	-	-	-	206
1995	-	-	-	246
1996	-	-	-	251
1997	-	-	-	209
1998	-	-	-	161
1999	-	-	-	159
2000	-	-	-	130
2001	-	-	240	78
2002	No advice	-	180	72
2003	Reduce TAC to recent landings	90	160	63
2004	Reduce TAC to recent av. landings (2000–2002)	77	160	53
2005	Reduce TAC to recent av. landings (2001–2003)	65	160	37
2006	Reduce TAC to recent av. landings (2002–2004)	55	144	32
2007	Reduce TAC to recent av. landings (2003–2005)	40	122	35
2008	Reduce TAC to recent av. landings (2004–2006)	40	110	31
2009	Same advice as last year	33	94	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		

Weights in tonnes.

ECOREGION Celtic Sea and West of Scotland
STOCK Plaice in Division VIIe (Western Channel)

Advice for 2014

ICES advises on the basis of MSY transition that landings of plaice in Division VIIe in 2014 should be no more than 1397 t. Discards are known to take place but cannot be quantified; therefore the total catch cannot be calculated.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✗	✗	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined
SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	? Undefined

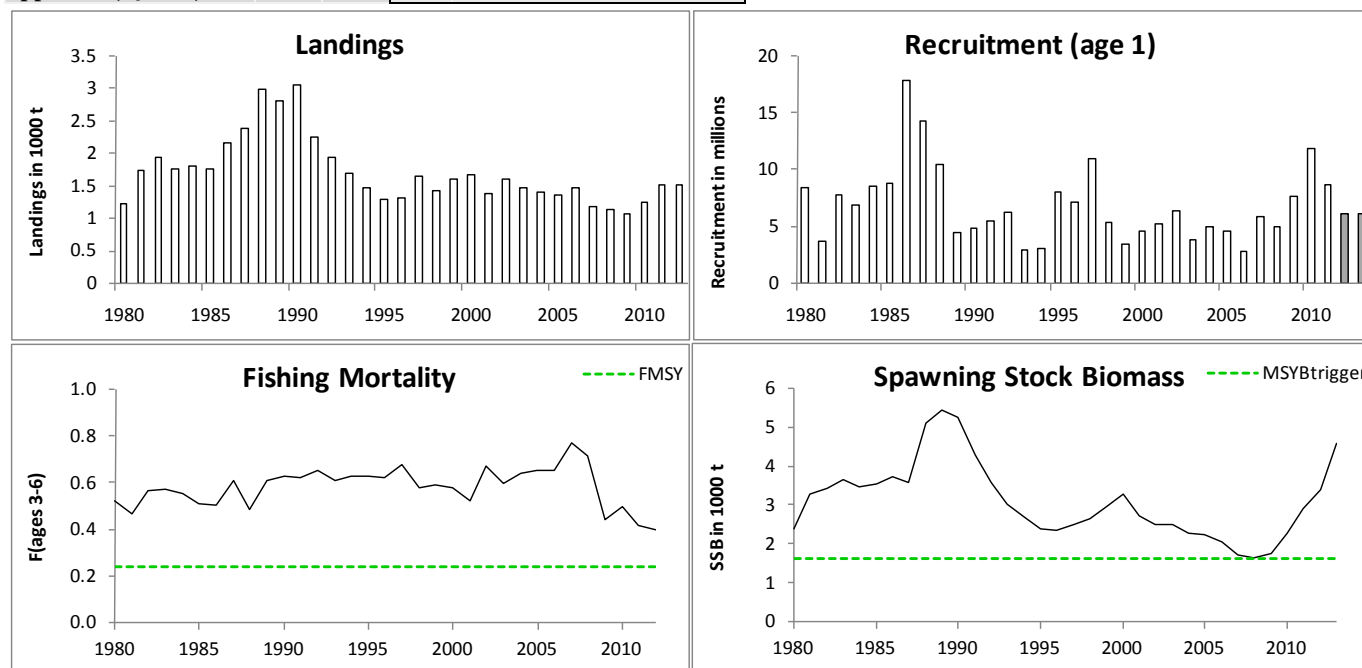


Figure 5.4.25.1 Plaice in Division VIIe (Western Channel). Summary of stock assessment (weights in thousand tonnes). Predicted recruitment values are shaded. Top right: SSB and F for the time-series used in the assessment.

The large reduction of F in 2009 was followed by smaller decreases in 2011–2012, but F still remains well above the F_{MSY} proxy. SSB has increased since 2008 and is currently well above MSY $B_{trigger}$ due to the above-average recruitments in 2009–2011.

Management plans

No specific management objectives are known to ICES.

Biology

Plaice aggregate at spawning grounds in the 1st quarter of the year. The condition factor for plaice is highest in summer/autumn on the more dispersed feeding grounds. Tagging studies show spawning migrations from Division VIIe

to VIId during the 1st quarter of the year. It is assumed that 15% of the 1st quarter plaice catch in Division VIId consists of fish from Division VIIe. Suitable sites for nurseries are located in shallow waters, close to fresh and cool seasonal water inflow.

The fisheries

Plaice are taken as a bycatch in the beam trawl fishery that mainly targets sole and anglerfish, and as part of a mixed demersal fishery by otter trawlers. The main fishery is south and west of Start Point. Although plaice are taken throughout the year, the larger landings in the most recent years have been between May and November. Discarding appears to be higher in quarters 1 and 2 in this fishery, but is low compared to other plaice stocks (about 20%).

Catch distribution	Landings from Division VIIe in 2012 were 1365 t (56% beam trawl, 35% otter trawl, 3% gillnets, and 6% other gear). In addition, 155 t landed from Division VIId are included in the assessment, reflecting the 15% 1st quarter migration correction (unknown gear). Total landings (2012) = 1520 t. Discards are not quantified.
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Effects of the fisheries on the ecosystem

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. Some beam trawlers are experimenting with benthic drop-out panels that release about 75% of benthic invertebrates from the catches. Full square mesh codends are being tested in order to reduce the capture of benthos further and improve the selection profile of gadoids.

Quality considerations

There is uncertainty about the stock structure due to migration between this area and the Eastern Channel during the spawning period; this is now partially corrected for in the assessment by an added element of Division VIId catches and age information to account for migration. The assessment relies heavily on the age composition data derived from UK(E+W) sample data. Discards are not included in the assessment. Discard rates of plaice in Division VIIe are much lower compared to other plaice stocks; omitting them is thus unlikely to significantly alter SSB and mortality trends.

This assessment would benefit from the addition of age composition information from both the French and Belgian fleets who collectively account for 30% of the total landings for this stock. Including discard estimates would also improve the assessment.

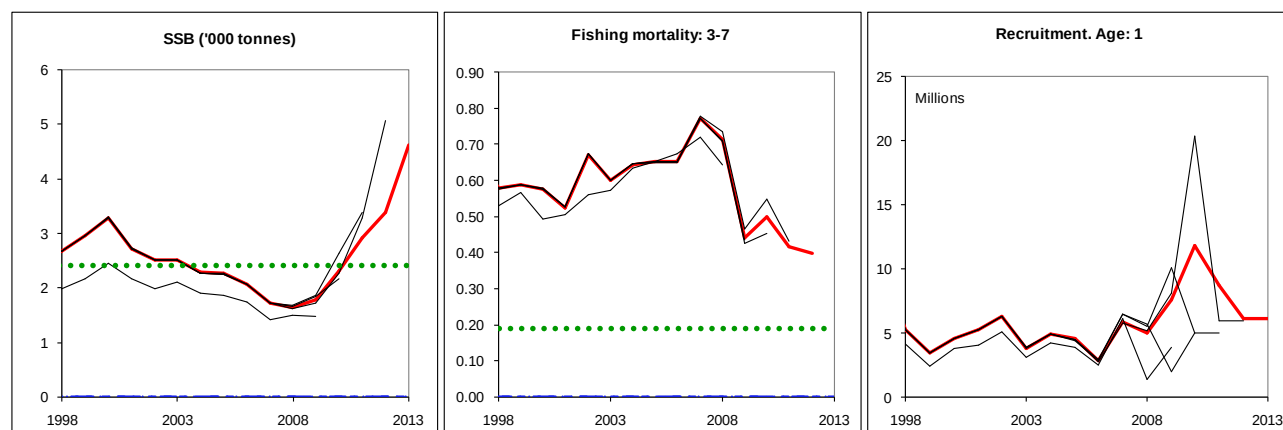


Figure 5.4.25.2 Plaice in Division VIIe (Western Channel). Historical assessment results (final-year recruitment estimates included). The stock was benchmarked in 2010, resulting in the step change in the SSB in this plot.

Scientific basis

Assessment type	Age-based analytical assessment (XSA).
Stock data category	Category 1.
Input data	Commercial catches (international landings, ages and length frequencies from catch sampling); two survey indices (UK-WEC-BTS, FSP-7e UK-(E+W)); three commercial indices (UK WECOT, UK WECBT, and UK WECOT historical).
Discards and bycatch	Discards are known to occur but are not included in the assessment.
Indicators	None.
Other information	Benchmarked in 2010 (WKFLAT 2010 ; ICES, 2010).
Working group report	WGCSE (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK Plaice in Division VIIe (Western Channel)

Reference points

	Type	Value	Technical basis
MSY Approach	MSY $B_{trigger}$	1650 t.	Preliminary based on lowest SSB (in converged part of XSA) from which the stock has recovered.
	F_{MSY}	0.24	$F_{max\ 2012}$. This value is stock specific.
Precautionary Approach	B_{lim}	Not defined.	
	B_{pa}	Not defined.	
	F_{lim}	Not defined.	
	F_{pa}	Not defined.	

(Unchanged since: 2012)

Outlook for 2014

Basis: F (2013) = mean F (2010–2012) scaled to F (2012) = 0.40; SSB (2014) = 4615; R (2013) = GM (1980–2010) = 6114 (thousands); landings (2013) = 2100.

Rationale	Landings (2014) ¹⁾	Basis	F (2014)	SSB (2015)	%SSB change ²⁾
MSY approach	1148	F_{MSY} ($F_{2013} \times 0.60$)	0.24	5467	+18%
MSY transition	1397	$(0.2 \times F_{2010} + 0.8 \times F_{MSY}) = F_{2013} \times 0.73$	0.29	5227	+13%
Zero catch	0	$F = 0$	0.00	6778	+47%
Other options	948	$F_{2013} \times 0.5$	0.20	5663	+23%
	1148	$F_{2013} \times 0.6$	0.24	5467	+18%
	1341	$F_{2013} \times 0.7$	0.28	5278	+14%
	1526	$F_{2013} \times 0.8$	0.32	5096	+10%
	1704	$F_{2013} \times 0.9$	0.36	4922	+7%
	1875	$F_{2013} \times 1.0$	0.40	4755	+3%
	2040	$F_{2013} \times 1.1$	0.44	4594	–1%

Weights in tonnes.

No information for percentile TAC changes can be shown as the TAC is for Divisions VIId and VIIe combined.

¹⁾ Landings of plaice in Division VIIe, calculated as the projected total stock landings less the stock landings that occur in Division VIId. The subtracted value (179 tonnes, see also management considerations) is estimated based on the plaice catch advice for Division VIId for 2014, using the recent three-year average (2011–2013) proportion of the Division VIIe plaice stock in the annual plaice landings in Division VIId.

²⁾ SSB 2015 relative to SSB 2014.

MSY approach

Following the ICES MSY approach implies fishing mortality to be reduced to 0.24 (= F_{MSY} proxy), resulting in landings of 1148 t in 2014. This is expected to lead to an SSB of 5467 t in 2015. Discards are known to take place but cannot be quantified; therefore the total catch cannot be calculated.

Following the transition scheme towards the ICES MSY framework implies a fishing mortality of 0.29 for 2014. This results in landings of 1397 t in 2014, which is expected to lead to an SSB of 5227 t in 2015. Discards are known to take place but cannot be quantified; therefore the total catch cannot be calculated.

Additional considerations

Management considerations

When setting the advice for this stock, consideration must be given to the consistency of the advice between the stocks of Divisions VIIe and VIId plaice given that the two stocks are managed by a single TAC. The advice for plaice in Division VIId for 2014 allows for an increase in landings, whereas the advice for Division VIIe is for reduced catches. Moreover, increasing the landings in Division VIId would result in an increased risk of higher catches of Division VIIe plaice that migrated to Division VIId in quarter 1.

The catch of plaice in Division VIIe is managed by a TAC applied to Divisions VIId (Eastern Channel) and VIIe combined. Consequently, the TAC management does not control fishing mortality in the Division VIIe stock. Splitting the TAC area into separate components will ignore the migration of the Division VIIe stock into Division VIId where they are taken in the first quarter spawning fishery. Whatever management measures are implemented, they must control fishing mortality in both stocks effectively. A spawning migration correction assumes that a constant 15% of quarter 1 catches in Division VIId originate from Division VIIe, based on historical tagging information.

In addition to the days-at-sea regulations a recent UK decommissioning scheme has reduced the number of beam trawlers in the southwest fleet. The recent decline in fishing mortality (2011–2012) is not evident in the effort data for the major fleet, which has seen an increase in this period. This may be explained by recent changes to the spatial distribution of the effort for this fleet.

Regulations and their effects

Technical measures include mesh size and minimum landing size (MLS, 27 cm) for this species. There is some discarding, in particular of fish below the MLS in the first two quarters, but this is relatively low compared to other plaice stocks.

Effort management is implemented for beam trawlers (>80 mm) and for static demersal nets including gillnets, trammelnets, and tanglenets on an annual basis in the EC TAC regulations. Otter trawlers contribute to a large proportion of the landings, but are not under effort restrictions.

Council Regulation (EC) No. 509/2007 establishes a multi-annual plan for the sustainable exploitation of sole in Division VIIe. Reductions in fishing mortality for sole will likely also reduce fishing mortality of the plaice stock. The UK introduced a single-area licensing scheme in November 2008 which appears to be effective at enforcing the required reductions in effort.

Uncertainties in the assessment

There is a heavy reliance on the age composition data derived from UK(E+W) sample data, with 30% of landings being unsampled. Discards are not included in the assessment, but discard rates of plaice in Division VIIe are much lower compared to other plaice stocks. The proportion of discards in number ranges from 5% to 40%, depending on the season and fishery. Both the UK-WEC BTS and the FSP-7e UK (E&W) surveys are spatially restricted to the same area as the commercial tuning fleets, and little information exists on stock dynamics on the French coast.

The 2011 year class has been estimated as the weakest in the time-series by the survey but was replaced by the geometric mean (GM) for the forecast, as the survey is often unreliable at age 1.

Comparison with previous assessment and advice

The assessment is similar to the previous assessment in terms of F , with a 2% downwards revision of F (2011) and a 33% downwards revision of SSB (2012). The large estimate of the 2009 year class has been revised downwards again in this assessment, but is still estimated to be above average. Last year's estimate of the 2010 year class as the highest in the time-series was replaced by the geometric mean (GM) value due to uncertainty with the estimate. This year class has been greatly reduced this year but is still estimated to be above average.

This year's advice for plaice in Division VIIe takes into account the catches of Division VIIe plaice taken in Division VIId.

The basis for this year's advice is the same as last year, the MSY transition.

Assessment and management area

The stock is assessed for ICES Division VIIe, but is managed for ICES Divisions VIId and VIIe combined. The advice for catches of plaice in Division VIId can be found in Section 6.4.19 of the ICES 2013 advice.

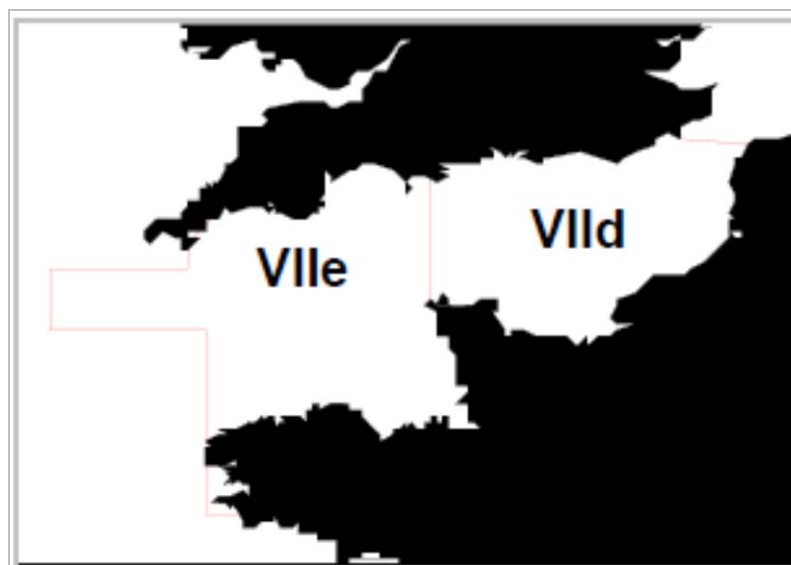


Figure 5.4.25.3 Plaice in Division VIIe (Western Channel). Assessment area: Division VIIe and TAC area: Divisions VIId,e.

Sources

ICES. 2010. Report of the Benchmark Workshop on Flatfish (WKFLAT), 25 February–4 March 2010, Copenhagen, Denmark. ICES CM 2010/ACOM:37. 270 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.

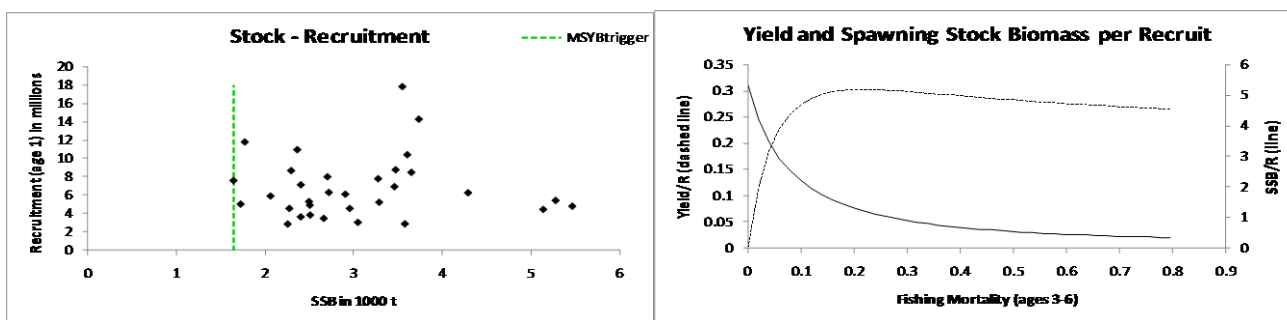


Figure 5.4.25.4 Plaice in Division VIIe (Western Channel). Stock–recruitment plot and yield-per-recruit analysis.

Table 5.4.25.1 Plaice in Division VIIe (Western Channel). Advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings	ICES landings
1987	Precautionary TAC	6.8	8.3	1.92	2.39
1988	Precautionary TAC	6.9	9.96	2.33	2.99
1989	No increase in effort; TAC	11.7	11.7	2.25	2.81
1990	No increase in F; TAC	10.7	10.7	1.98	3.06
1991	50% reduction in F in VIIe	8.8	10.7	1.64	2.25
1992	Sq. F gives over mean SSB	2.0 ²	9.6	1.57	1.95
1993	Not outside safe biological limits	-	8.5	1.44	1.69
1994	Within safe biological limits	-	9.1	1.29	1.47
1995	No increase in F	1.4 ²	8.0	1.16	1.30
1996	60% reduction in F	0.6 ²	7.5	1.14	1.32
1997	60% reduction in F	0.51 ²	7.09	1.37	1.65
1998	60% reduction in F	0.5 ²	5.7	1.24	1.43
1999	Reduce F below F _{pa}	1.1 ²	7.4	1.15	1.62
2000	Reduce F below F _{pa}	< 1.08 ²	6.5	1.29	1.68
2001	Reduce F below F _{pa}	< 0.93 ²	6.0	1.11	1.38
2002	Reduce F below F _{pa}	< 0.89 ²	6.7	1.25	1.61
2003	At least 50% reduction in F	< 0.53 ²	5.97	1.24	1.48
2004	A 55% reduction in F	< 0.660 ²	6.06	1.14	1.40
2005	A 64% reduction in F	< 0.580 ²	5.15	1.13	1.37
2006	Substantial reduction in catch	-	5.15	1.24	1.47
2007	Substantial reduction in catch	-	5.05	0.97	1.18
2008	Substantial reduction in catch	-	5.05	0.89	1.14
2009	Same advice as last year	-	4.65	0.98	1.07
2010	Substantial reduction in catch	-	4.27	1.11	1.24
2011	See scenarios	-	4.67	1.34	1.51
2012	MSY Framework (F _{MSY})	< 1.44 ²	5.06	1.37	1.52
2013	MSY Framework (F _{MSY})	< 2.10 ³	6.40		
2014	MSY transition	< 1.397 ³			

Weights in thousand tonnes.

¹ TACs for Divisions VIId,e.² For the plaice stock in Division VIIe only.³ For plaice catches in Division VIIe, accounting for the Q1 migration correction.

Table 5.4.25.2 Plaice in Division VIIe (Western Channel). Official landings (tonnes) by country, and landings used by ICES. Landings in the last year are preliminary.

Year	Belgium	Denmark	Netherlands	France	UK (E & W) incl. CI's.	Others	Total reported	Unallocated ¹	Total	VIIe stock caught in VIIId ⁴	As used by WG
1976	5	- ³	-	323	312	-	640	-	640	-	640
1977	3	- ³	-	336	363	-	702	-	702	-	702
1978	3	- ³	-	314	467	-	784	-	784	-	784
1979	2	- ³	-	458	515	-	975	2	977	-	977
1980	23	- ³	-	325	609	9	966	113	1079	136	1215
1981	27	-	-	537	953	-	1517	-16	1501	245	1746
1982	81	-	-	363	1109	-	1553	135	1688	250	1938
1983	20	-	-	371	1195	-	1586	-91	1495	259	1754
1984	24	-	-	278	1144	-	1446	101	1547	266	1813
1985	39	-	-	197	1122	-	1358	83	1441	310	1751
1986	26	-	-	276	1389	- ¹	1691	119	1810	351	2161
1987	68	-	-	435	1419	-	1922	36	1958	430	2388
1988	90	-	-	584	1654	-	2328	130	2458	536	2994
1989	89	-	-	448	¹ 1712	-	2250	108	2358	450	2808
1990	82	2	-	N/A	² 1891	2	1979	614	2593	465	3058
1991	57	-	-	251	¹ 1326	-	1635	213	1848	402	2250
1992	25	-	-	419	1110	14	1568	56	1624	326	1950
1993	56	-	-	284	1080	24	1444	-27	1417	274	1691
1994	10	-	-	277	998	-	1285	-129	1156	315	1471
1995	13	-	-	288	857	-	1158	-127	1031	264	1295
1996	4	-	-	279	855	-	1138	-94	1044	277	1321
1997	6	-	-	329	1038	1	1374	-51	1323	331	1654
1998	22	-	-	327	892	1	1242	-111	1131	299	1430
1999	12	-	-	194	¹ 947	-	1154	117	1271	345	1616
2000	4	-	-	360	926	+	1290	-9	1281	397	1678
2001	12	-	-	303	797	-	1112	-6	1106	273	1379
2002	27	-	-	242	978	+	1247	10	1257	351	1608
2003	39	-	-	216	985	-	1240	-22	1218	260	1478
2004	46	-	-	184	912	-	1142	12	1154	248	1402
2005	48	-	-	198	887	-	1133	66	1199	171	1370
2006	52	-	-	223	966	-	1241	72	1313	153	1466
2007	84	-	-	202	679	-	965	38	1003	181	1184
2008	66	-	-	148	677	-	891	83	974	170	1144
2009	53	-	2	193	724	5	978	-55	923	142	1065
2010	51	-	2	220	838	2	1113	-21	1092	149	1241
2011	141	-	3	259	927	-	1330	4	1334	173	1507
2012	131	-	2	224	981	-	1338	27	1365	155	1520

¹Estimated by the Working Group.

²Divisions VIIId,e = 4739 t.

³Included in Division VIIId.

⁴Migration correction (15% of VIIId Qtr 1) added to stock.

Table 5.4.25.3

Plaice in Division VIIe (Western Channel). Summary of stock assessment.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3–6
1980	8422	2404	1215	0.5212
1981	3633	3276	1746	0.4671
1982	7803	3460	1938	0.5686
1983	6932	3651	1754	0.5745
1984	8500	3473	1813	0.5528
1985	8783	3549	1751	0.5127
1986	17866	3735	2161	0.5069
1987	14310	3605	2388	0.6092
1988	10427	5137	2994	0.4823
1989	4449	5465	2808	0.6121
1990	4802	5276	3058	0.6270
1991	5432	4290	2250	0.6213
1992	6266	3578	1950	0.6562
1993	2873	3048	1691	0.6085
1994	3033	2705	1471	0.6287
1995	8017	2405	1295	0.6280
1996	7140	2364	1321	0.6200
1997	10976	2497	1654	0.6806
1998	5305	2663	1430	0.5782
1999	3471	2956	1616	0.5894
2000	4554	3288	1678	0.5773
2001	5230	2720	1379	0.5250
2002	6308	2510	1608	0.6719
2003	3839	2506	1478	0.6006
2004	4909	2276	1402	0.6450
2005	4556	2257	1370	0.6516
2006	2852	2063	1466	0.6538
2007	5911	1726	1184	0.7733
2008	5028	1646	1144	0.7150
2009	7605	1773	1065	0.4419
2010	11820	2296	1241	0.4983
2011	8690	2906	1507	0.4155
2012	6114*	3388	1520	0.3978
2013	6114*	4615		
Average	6823	3103	1707	0.5822

*Geometric mean (1980–2010).

ECOREGION Celtic Sea and West of Scotland
STOCK Plaice in Divisions VIIg, (Celtic Sea)

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.

Stock status

F (Fishing Mortality)	
2010–2012	
Qualitative evaluation	? Unknown
SSB (Spawning-Stock Biomass)	
2008–2012	
Qualitative evaluation	↗ Increasing

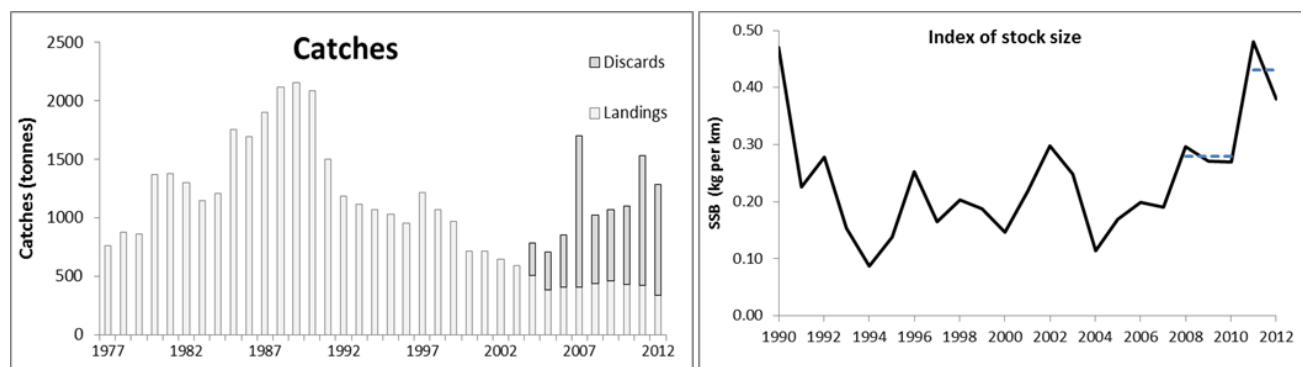


Figure 5.4.26.1 Plaice in Divisions VIIg. Left: Reported landings and discards (tonnes); discards were reported from 2004 to 2012. Right: SSB from the UK (E&W)-BTS-Q3 survey (kg km^{-1}); the dashed horizontal lines indicate the average SSB for the respective year range.

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).

Management plans

No specific management objectives are known to ICES.

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.

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.

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 t, ~17% above the TAC of 369 t.

Catch distribution Catches (2012) = 1390 t, where 32% were landings (443 t) and 68% discards (947 t).

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.

Quality considerations

Discards are substantial, consisting mainly of fish below the minimum landing size, ranging from 30% to 70% of catch numbers.

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

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).

ECOREGION Celtic Sea and West of Scotland
STOCK Plaice in Divisions VIIIf,g (Celtic Sea)**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.

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.

Additional considerations***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 larger-mesh gear should be encouraged in this fishery in instances where mixed-fishery issues allow for it.

Regulations and their effects

Plaice in the Bristol Channel and Celtic Sea (ICES Divisions VIIIf,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 VIIIf,g is 27 cm.

Since 2005, ICES rectangles 30E4, 31E4, and 32E3 (Division VIIIf) 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.

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 VIIIf,g were displacement of effort due to the cod recovery zone; and the restrictions on the use of 80 mm mesh west of 7°West.

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 UK(E&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 (~50%) in spawning-stock biomass over the same period.

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.

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.

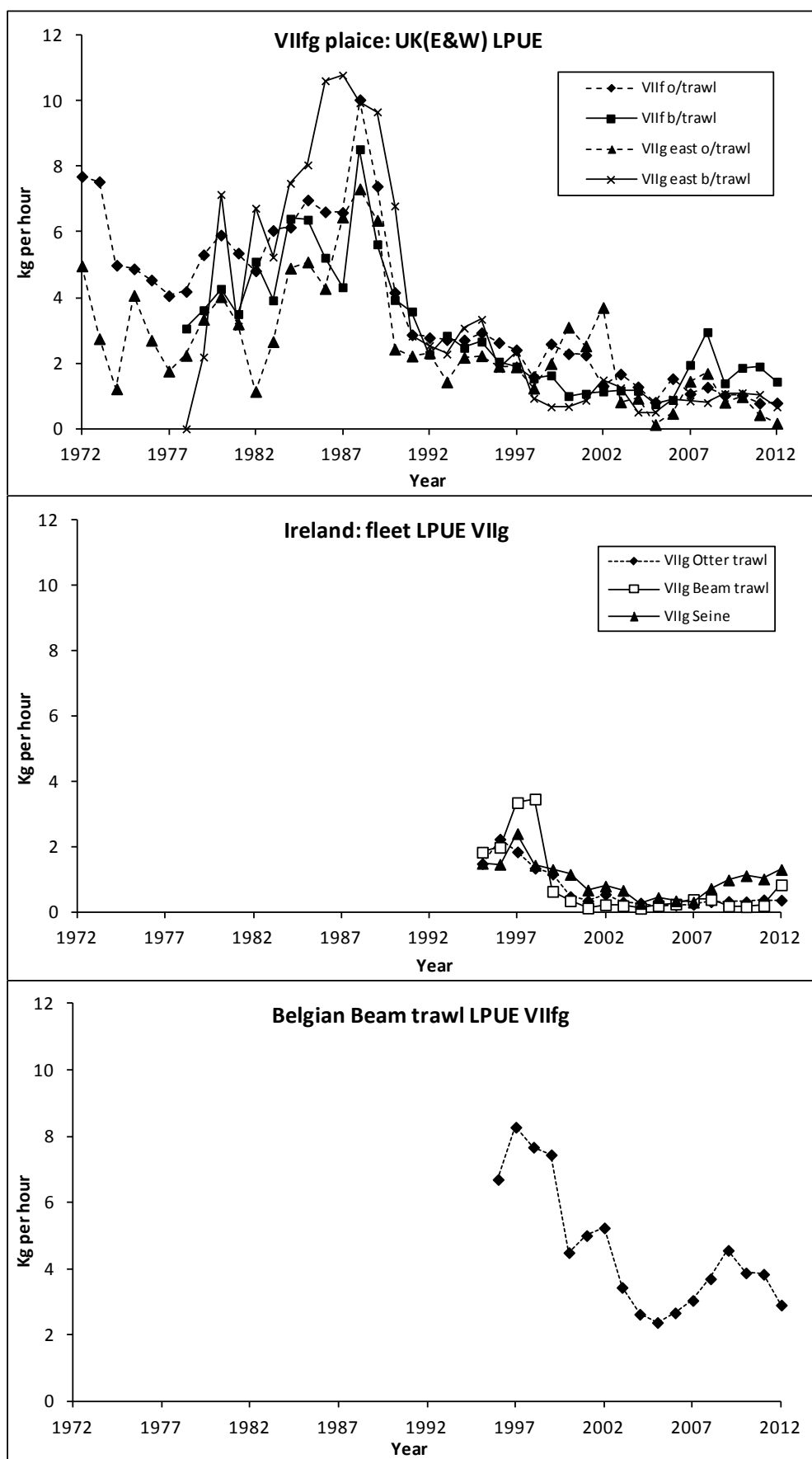


Figure 5.4.26.2a Plaice in Divisions VIIfg. Commercial landings per unit effort (lpue) for the UK (in Division VIIfg), Ireland (Division VIIg), and Belgium (Division VIIfg) between 1972 and 2012.

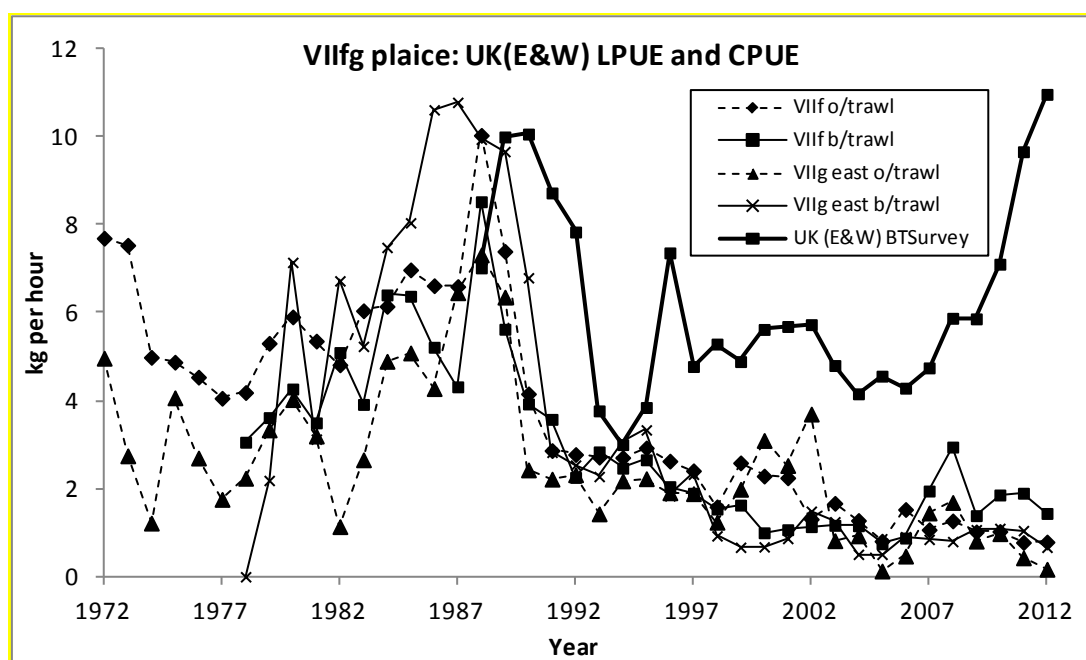


Figure 5.4.26.2b Plaice in Divisions VIIIfg. UK(E&W) beam trawl survey (UK(E&W) BTSurvey) catch per unit effort (cpue) compared to commercial landings per unit effort (lpue) for the UK between 1972 and 2012.

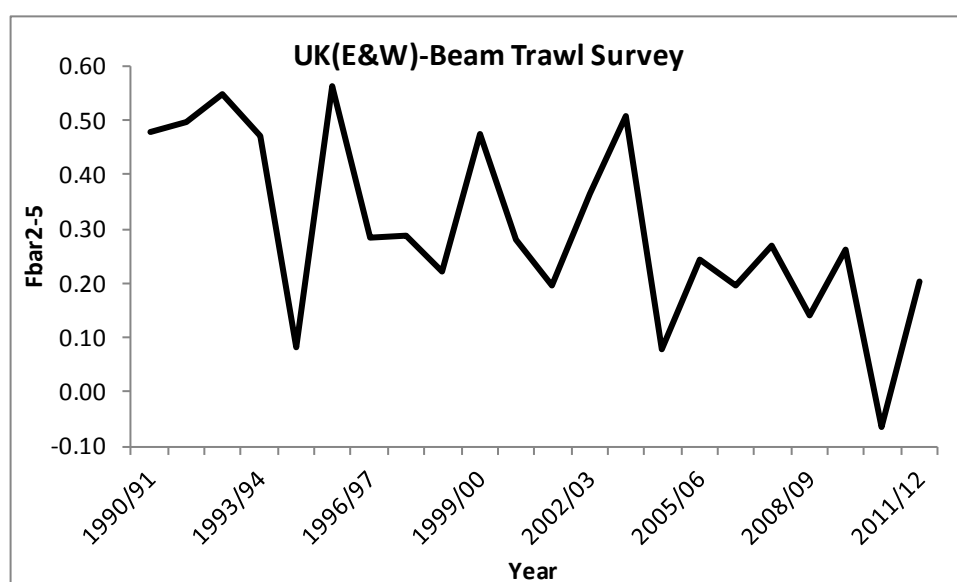


Figure 5.4.26.3 Plaice in Divisions VIIIfg. Time-series of mean fishing mortality at ages 2–5 for the UK(E&W) Beam Trawl Survey (UK(E&W)-BTS-Q3) from 1990 to 2012.

Table 5.4.26.1

Plaice in Divisions VIIIf,g (Celtic Sea). ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings	ICES discards ¹
1987	TAC not to be restrictive on other species	-	1.8	1.91	1.90	—
1988	TAC not to be restrictive on other species	-	2.5	2.19	2.12	—
1989	TAC not to be restrictive on other species	-	2.5	2.58	2.15	—
1990	F likely to be F(88)	~1.9	1.9	2.22	2.08	—
1991	F likely to be F(89)	~1.7	1.9	1.83	1.50	—
1992	No long-term gains in increasing F	-	1.5	1.36	1.19	—
1993	No long-term gains in increasing F	-	1.4	1.30	1.11	—
1994	No long-term gains in increasing F	-	1.4	0.98	1.07	—
1995	No increase in F	1.29	1.4	0.96	1.03	—
1996	20% reduction in F	0.93	1.1	0.98	0.95	—
1997	20% reduction in F	1.10	1.1	1.26	1.22	—
1998	20% reduction in F	1.00	1.1	1.15	1.07	—
1999	35% reduction in F	0.67	0.9	0.66	0.97	—
2000	30% reduction in F	0.70	0.80	0.72	0.72	—
2001	40% reduction in F	0.60	0.76	0.68	0.71	—
2002	At least 35% reduction in F	0.68	0.68	0.62	0.64	—
2003	At least 40% reduction in F	< 0.66	0.66	0.56	0.59	—
2004	F < 0.10 or recovery plan	< 0.21	0.56	0.49	0.51	0.27
2005	70% reduction in F or recovery plan	< 0.25	0.48	0.40	0.39	0.32
2006	50% reduction in F or recovery plan	< 0.40	0.48	0.41	0.40	0.45
2007	50% reduction in F or recovery plan	< 0.38	0.42	0.42	0.41	1.29
2008	60% reduction in F	< 0.24	0.49	0.38	0.44	0.58
2009	75% reduction in F	< 0.17	0.42	N/A	0.46	0.61
2010	50% reduction in F	< 0.33	0.45	0.44	0.43	0.67
- 2011	- See scenarios	-	0.41	0.42	0.42	1.11
- 2012	- Reduce catches	-	0.37	0.45	0.44	0.95
	- Decrease landings by 19%	< 0.36	0.37			
- 2013	(1.5% increase followed by 20% PA reduction)					
- 2014	- Increase catches by 20%	1.608 ²				

Weights in thousand tonnes.

N/A = French landings not available.

¹Discards only available from 2004 to 2012.²This 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.

Table 5.4.26.2

Plaice in Divisions VIIIf,g. Nominal landings (in tonnes) as reported to ICES by country and total landings and catches as estimated by ICES.

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Belgium	214	196	171	372	365	341	314	283	357	665
UK (Engl. & Wales)	150	152	176	227	251	196	279	366	466	529
France	365	527	467	706	697	568	532	558	493	878
Ireland	28	0	49	61	64	198	48	72	91	302
N. Ireland										
Netherlands										9
Scotland	0	0	0	7	0	0	0	0	0	1
Total reported	757	875	863	1373	1377	1303	1173	1279	1407	2384
Discards	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unallocated	0	0	0	0	0	0	-27	-69	345	-693
Landings used by WG	757	875	863	1373	1377	1303	1146	1210	1752	1691
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

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Belgium	581	617	843	794	836	371	542	350	346	410
UK (Engl. & Wales)	496	629	471	497	392	302	290	251	284	239
France	708	721	1089	767	444	504	373	298	254	246
Ireland	127	226	180	160	155	180	89	82	70	83
N. Ireland		1								
Scotland				1		5	9	1	2	
Total reported	1912	2194	2583	2219	1827	1362	1303	982	956	978
Discards	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unallocated	-11	-78	-432	-137	-326	-174	-189	88	72	-26
Landings used by WG	1901	2116	2151	2082	1501	1188	1114	1070	1028	952
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

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	594	540	371	224	241	248	221	212	168	172
UK (Engl. & Wales)	258	176	170	134	136	105	127	87	55	88
France	329	298		287	262	186	165	145	132	106
Ireland	78	135	115	76	45	79	51	45	44	48
Total reported	1259	1149	656	721	684	618	564	489	399	414
Discards	N/A	N/A	N/A	N/A	N/A	N/A	N/A	274	321	453
Unallocated	-42	-82	312	-3	30	24	30	21	-13	-10
Landings used by WG	1217	1067	968	718	714	642	594	510	386	404
Catch as used by WG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	784	707	857

	2007	2008	2009	2010	2011	2012
Belgium	194	187	216	188	210	204
UK (Engl. & Wales)	61	63	55	54	45	44
France	104	62	N/A	136	100	125
Ireland	58	63	63	63	67	76
Total reported	417	375	N/A	442	422	450
Discards	1288	583	608	670	1107	947
Unallocated	-7	62	N/A	-9	-1	-7
Landings used by WG	410	437	463	433	421	443
Catch as used by WG	1698	1020	1071	1103	1528	1390

ECOREGION Celtic Sea and West of Scotland
STOCK Plaice in Divisions VIIh–k (Southwest of Ireland)

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.

Stock status

F (Fishing Mortality)	
2010-2012	
Qualitative evaluation	✗ Above possible reference points
SSB (Spawning-Stock Biomass)	
2008-2012	
Qualitative evaluation	↗ Increasing

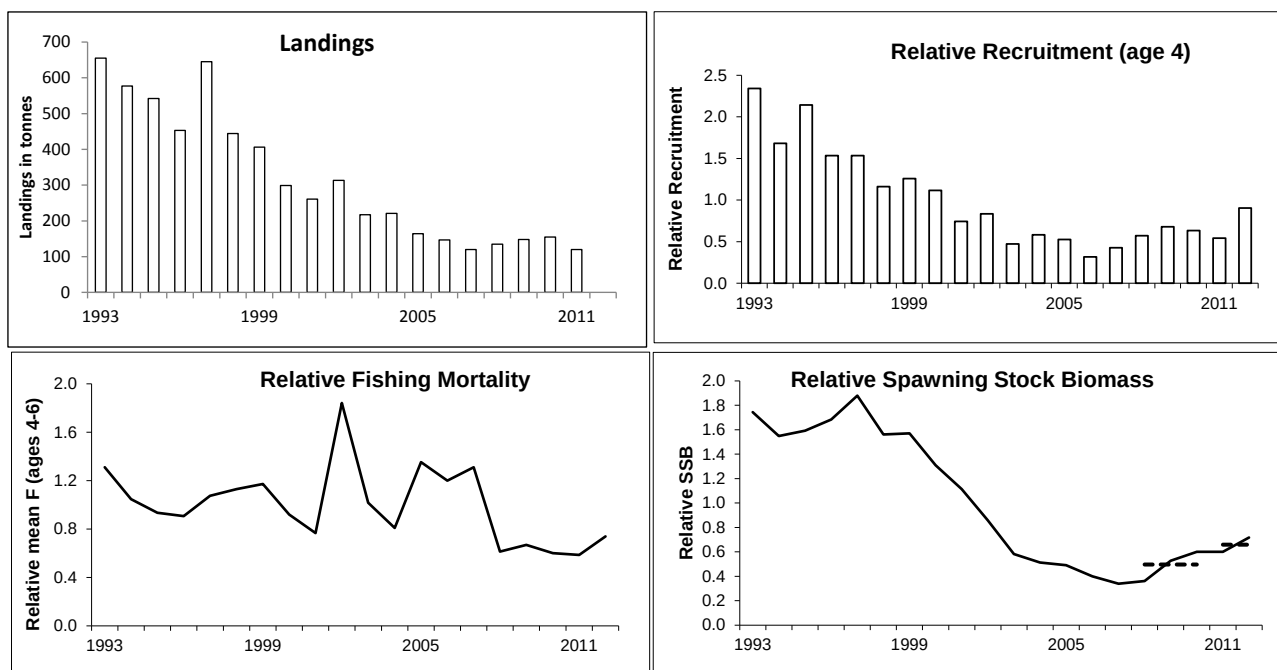


Figure 5.4.27.1

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 spawning-stock biomass in the last two years (2011–2012) is 33% higher than the average of the three previous years (2008–2010). Recruits of age 4 have shown an increasing trend since 2006.

Management plans

No specific management objectives are known to ICES.

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.

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 t. Discards = 30% (by weight).

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.

Scientific basis

Assessment type	Separable VPA indicative of stock trends.
Stock data category	Category 3.2.0.
Input data	Commercial catches (international landings from Divisions VIIjk, Irish age compositions from catch sampling); maturity data from plaice in Divisions VIIfg; natural mortalities from plaice in Divisions VIIfg.
Discards and bycatch	Discards were not included since no time series is available.
Indicators	None.
Other information	None.
Working group report	WGCSE (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK Plaice in Divisions VIIh–k (Southwest of Ireland)

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.

ICES approach to data-limited stocks

For data-limited stocks for which biomass trends are 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 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.

Additional considerations

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.

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.

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.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings
1993	-	-	-	1 020	655
1994	-	-	-	780	577
1995	-	-	-	900	542
1996	-	-	-	860	453
1997	-	-	-	990	645
1998	-	-	-	790	444
1999	-	-	-	430	406
2000	-	-	-	340	299
2001	-	-	1 215	310	261
2002	-	-	1 080	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 by 20% PA reduction)	< 100	141		
2014	Decrease landings by 4% (20% increase, followed by 20% PA reduction)	< 135			

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.

Country	1987	1988	1989	1990	1991	1992	1993	1994	1995
Belgium*	250	245	403	301	252	246	344	197	235
Denmark	1	1	1	-	-	-	-	-	-
France	85	135	229	77	173	90	64	48	60
Ireland	300	369	454	338	478	477	383	271	321
Netherlands	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	-	-
UK - Eng+Wales+NI	.	.	73	88	287	264	218	258	282
UK - England & Wales	246	433	.	.	.	.	.	.	.
UK - Scotland	-	1	-	1	1	6	7	1	4
Total	882	1184	1160	805	1191	1083	1016	775	902
Unallocated							-361	-198	-360
WG estimate							655	577	542

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004
Belgium*	304	442	335	45	4	27	69	20	67
Denmark	-	-	-	-	-	-	-	-	-
France	48	69	49	.	54	50	45	32	32
Ireland	305	344	286	299	200	160	155	127	91
Netherlands	52	-	13	1	2	-	-	-	-
Spain	-	-	-	1	5	3	2	6	6
UK - Eng+Wales+NI	154	138	106	82	75	73	59	56	36
UK - England & Wales	.	.	.	.	.	.	.	.	.
UK - Scotland	1	1	1	1	1	-	-	-	-
Total	864	994	790	428	341	313	330	241	232
Unallocated	-411	-349	-346	-22	-42	-52	-17	-24	-11
WG estimate	453	645	444	406	299	261	313	217	221

Country	2005	2006	2007	2008	2009	2010	2011	2012
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	.							
Spain	.	1	13	1				
UK - Eng+Wales+NI	28	18	20	12	32	35	44	38
UK - England & Wales	.							
UK - Scotland	.							
Total	170	143	142	122	148	156	175	200
Unallocated	-6	4	-22	13	1	-1	-55	
WG estimate	164	147	120	135	148	155	120	

* Belgian Landings up to 1998 include VIIg

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.

Year	Landings	Recruitment (age 4)	SSB	Fbar 4–6
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

ECOREGION Celtic Sea and West of Scotland
STOCK Pollack in Subareas VI and VII (Celtic Sea and West of Scotland)

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.

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).

Scientific basis

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).

Additional considerations

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 PECH 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.

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.

Year	ICES Advice	Predicted catch corresp. to advice	EU TAC Subarea VI ¹⁾	EU TAC Subarea VII	Total official landings Subarea VI ¹⁾	Total official landings Subarea VII	Total official landings
2000		-	1100	17000	191	5377	5568
2001		-	1100	17000	217	5885	6102
2002		-	1100	17000	131	5922	6053
2003		-	880	17000	203	5348	5551
2004		-	704	17000	136	4786	4922
2005		-	563	17000	67	4725	4792
2006		-	450	15300	37	4661	4698
2007		-	450	15300	58	4611	4669
2008		-	450	15300	53	3861	3914
2009		-	450	15300	36	4063	4099
2010		-	450	13770	78	4065	4142
2011		-	397	13495	45	4072	4117
2012	No increase in catch	-	397	13495	45	4432	4477
2013	Catch should be no more than 1% more than recent catch (last 3 years)	< 4200	397	13495			
2014	Same advice as 2013	< 4200					

Weights in tonnes.

¹⁾ Subarea VI; EC waters of Division Vb; international waters of Subareas XII and XIV.

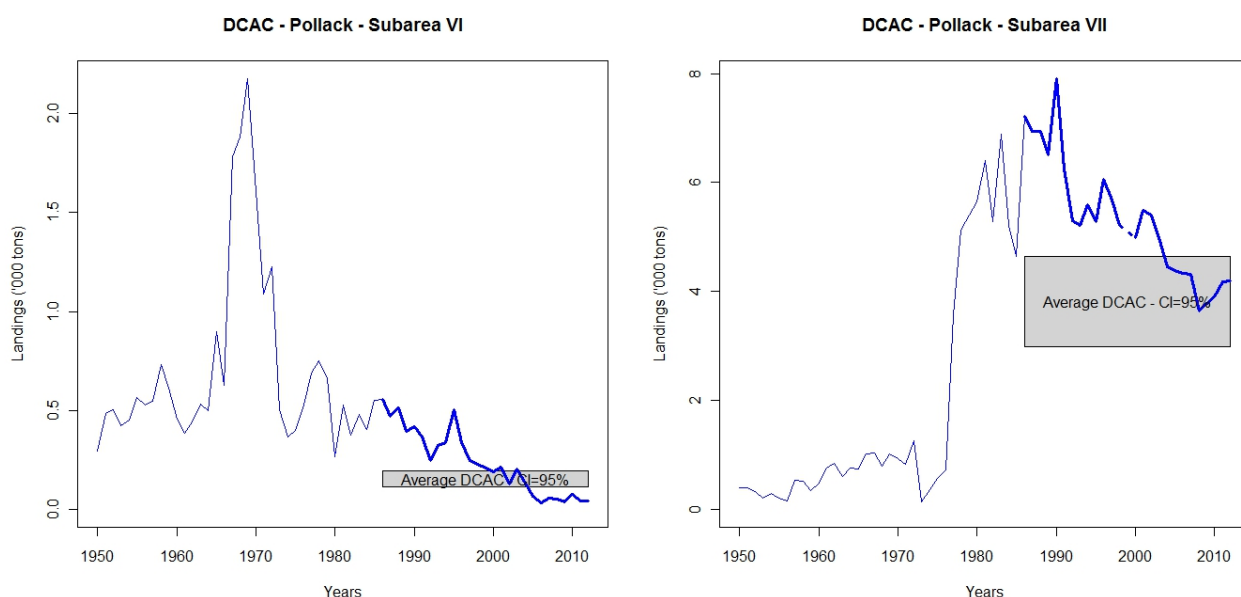


Figure 5.4.28.1 Pollack in Subareas VI and VII. Time-series of landings (tonnes) and outputs of DCAC analysis. The thick lines and grey box correspond to the period used for the analysis and the sensitivity of the input parameters to the model.

ECOREGION	Celtic Sea and west of Scotland
STOCK	Rays and skates in the Celtic Seas Ecoregion

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19. 547 pp.

Table 5.4.29.1 Rays and skates in the Celtic Sea. ICES advice, management and landings.

	Advised percentage change in catch (landings and discards)																
Area	VI	VIIa,f,g	VI	VIIa,f,g	VIIIf,g	VI	VIIa,f,g	VIIIf,g	VI, VII	VI, VII	VI, VII	VI, VII	VI, VII				
Stock	Blonde ray	Blonde ray	Thornback ray	Thornback ray	Small –eyed ray	Spotted ray	Spotted ray	Undeulate ray	Sandy ray	Shagreen ray	Cuckoo ray	Common skate	Other rays and skates	Total advice	General advice	Agreed TAC ¹	ICES landings
Section	1	2	4	5	7	9	10	11	12	13	14	15	16				
2009	-	-	-	-	-	-	-	D	-	-	-	D	-	<12.0	Status quo ³	15.7 ²	9.0
2010	-	-	-	-	-	-	-	D	-	-	-	D	-		No new advice, same as for 2009	13.4	9.2
2011	-	-	-	-	-	-	-	D	-	-	-	D	-	<9.9	Average landings 2006–08 ³	11.4	8.6
2012	-	-	-	-	-	-	-	D	-	-	-	D	-		No new advice, same as for 2011	9.9	
2013	-20	-20	+20	+20	-36	-23	+20	D	-20	-20	-36	D	-20	-	No TAC + species –specific measures ⁴		
2014	No new advice, same as for 2013														No new advice, same as for 2013		

Weights in thousand tonnes.

D – Depleted stock, no targeted fishery, minimize bycatch.

¹EU only.

² Does not apply to Undulate ray (*Raja undulata*), common skate (*Dipturus batis*), Norwegian skate (*Raja (Dipturus) nidarosiensis*), and white skate (*Rostroraja alba*).

³ Zero-catch advice for depleted species.

⁴ Additional species-specific measures (see main text).

ECOREGION Celtic Sea and west of Scotland
STOCK Blonde ray (*Raja brachyura*) in Subarea VI

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19. 547 pp.

Table 5.4.29.1.1 Blonde ray in the Subarea VI. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		8
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 20%.	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Blonde ray (*Raja brachyura*) in Divisions VIIa, f, g

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19. 547 pp.

Table 5.4.29.2.1 Blonde ray in Divisions VIIa, f, g. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		1 106
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 20%.	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Blonde ray (*Raja brachyura*) in Division VIIe

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). This stock is believed to be part of the stock in the North Sea Divisions and Subarea IIIa, IV, VIId, and VIIe. Further information is available in the North Sea Advice section.

ECOREGION Celtic Sea and west of Scotland
STOCK Thornback ray (*Raja clavata*) in Subarea VI

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19.

Table 5.4.29.4.1 Thornback ray in Subdivision VI. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		120
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch could increase by up to 20%	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Thornback ray (*Raja clavata*) in Divisions VIIa, f, g

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19.

Table 5.4.29.5.1 Thornback ray in Divisions VIIa, f, g. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		897
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch could increase by up to 20%	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Thornback ray (*Raja clavata*) in Division VIIe

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). This stock is believed to be part of the stock in the North Sea Divisions and Subarea IIIa, IV, VIIId, and VIIe. Further information is available in the North Sea Advice section.

ECOREGION Celtic Sea and west of Scotland
STOCK Small-eyed ray (*Raja microocellata*) in Divisions VIIIf, g

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19.

Table 5.4.29.7.1 Small-eyed ray in Divisions VIIIf, g. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		306
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 36 % (reduction of 20% followed by 20% PA buffer).	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Small-eyed ray (*Raja microcellata*) in Division VIIe

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). This stock is believed to be part of the stock in the North Sea Divisions and Subarea IIIa, IV, VIId, and VIIe. Further information is available in the North Sea Advice section.

ECOREGION Celtic Sea and west of Scotland
STOCK Spotted ray (*Raja montagui*) in Subarea VI

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19.

Table 5.4.29.9.1 Spotted ray in Subarea VI. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		34
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 23% (reduction of 4% followed by 20% PA buffer).	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Spotted ray (*Raja montagui*) in Divisions VIIa, f, g

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19.

Table 5.4.29.10.1 Spotted ray in Divisions VIIa, f, g. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		781
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch could increase by up to 20%.	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Undulate ray (*Raja undulata*) in Division VIIj

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19.

Table 5.4.29.11.1 Undulate ray in Division VIIj. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2009	No target fishery	0	NA
2010	No new advice, same as 2009	0	
2011	No target fishery	0	
2012	No new advice, same as 2011	0	
2013	No target fishery	0	
2014	No new advice, same as 2013	0	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Sandy ray (*Leucoraja circularis*) in the Celtic Sea ecoregion

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19.

Table 5.4.29.12.1 Sandy ray in Subarea VI. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		12
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 20%.	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Shagreen ray (*Leucoraja fullonica*) in the Celtic Sea ecoregion

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19.

Table 5.4.29.13.1 Shagreen ray in the Celtic Sea ecoregion. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		240
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 20%.	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Cuckoo ray (*Leucoraja naevus*) in Subarea VI and Divisions VIIa–c, e–j

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19.

Table 5.4.29.14.1 Cuckoo ray in Subarea VI and Divisions VIIa–c, e–j. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2009	No specific advice		
2010	No specific advice		
2011	No specific advice		2606
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 36% (20% reduction followed by 20% PA buffer).	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Common skate (*Dipturus batis*) complex (flapper skate (*Dipturus cf. flossada*) and blue skate (*Dipturus cf. intermedia*)) in Subarea VI and Divisions VIIa–c, e–j

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19.

Table 5.4.29.14.1 The common skate (*Dipturus batis*) complex in the Celtic Sea ecoregion. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2009	No targeted fishery	0	NA
2010	No new advice, same as 2009	0	NA
2011	No target fishery. Retain on Prohibited Species List	0	NA
2012	No new advice, same as 2011	0	
2013	No target fishery	0	
2014	No new advice, same as 2013	0	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Other ray and skate species in Subarea VI and Divisions VIIa–c, e–j

Advice for 2014

The advice given in 2012 for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)). The advice is summarized in the table below.

Source

ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–26 June 2012, Lisbon, Portugal. ICES CM 2012/ACOM:19.

Table 5.4.29.16.1 Other skates and rays in Divisions VIIa–c, e–j. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		69
2012	No specific advice		
2013	Decrease by up to 20%	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and West of Scotland
Saithe in Subarea VI (West of Scotland and Rockall)

This stock has now been combined with saithe in Subarea IV (North Sea), Division IIIa (Skagerrak), and Subarea VI (West of Scotland and Rockall) and can be found in Book 6 North Sea, Section 6.4.21.

ECOREGION Celtic Sea and West of Scotland
STOCK Sandeel in Division VIa

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 to data limited stocks, and taking into account the absence of landings in recent years, ICES advises that no increase of the catches should take place unless there is evidence that this will be sustainable”.

Sources

ICES. 2012. Sandeel in Division VIa. In Report of the ICES Advisory Committee 2012, Section 5.4.32. ICES Advice 2012, Book 5: 255–256.

ICES. 2013. Eurostat/ICES database on catch statistics. ICES, Copenhagen.

Table 5.4.31 Sandeel in Division VIa. ICES advice, management, and official landings.

Year	ICES Advice	Predicted catch corresp. To advice	TAC	Official landings
2010	No advice	-	No TAC	0
2011	No advice	-	No TAC	0
2012	No increase of catches	-	No TAC	0
2013	No increase of catches	-	No TAC	
2014	Same advice as for 2013	-		

ECOREGION Celtic Sea and West of Scotland + North Sea
STOCK European sea bass in Divisions IVbc, VIIa, and VIId–h (Irish Sea, Celtic Sea, English Channel, and southern North Sea)
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.

Stock status

F (Fishing Mortality)	
2010–2012	
Qualitative evaluation	✗ Above possible reference points
SSB (Spawning Stock Biomass)	
2008–2012	
Qualitative evaluation	↘ Decreasing

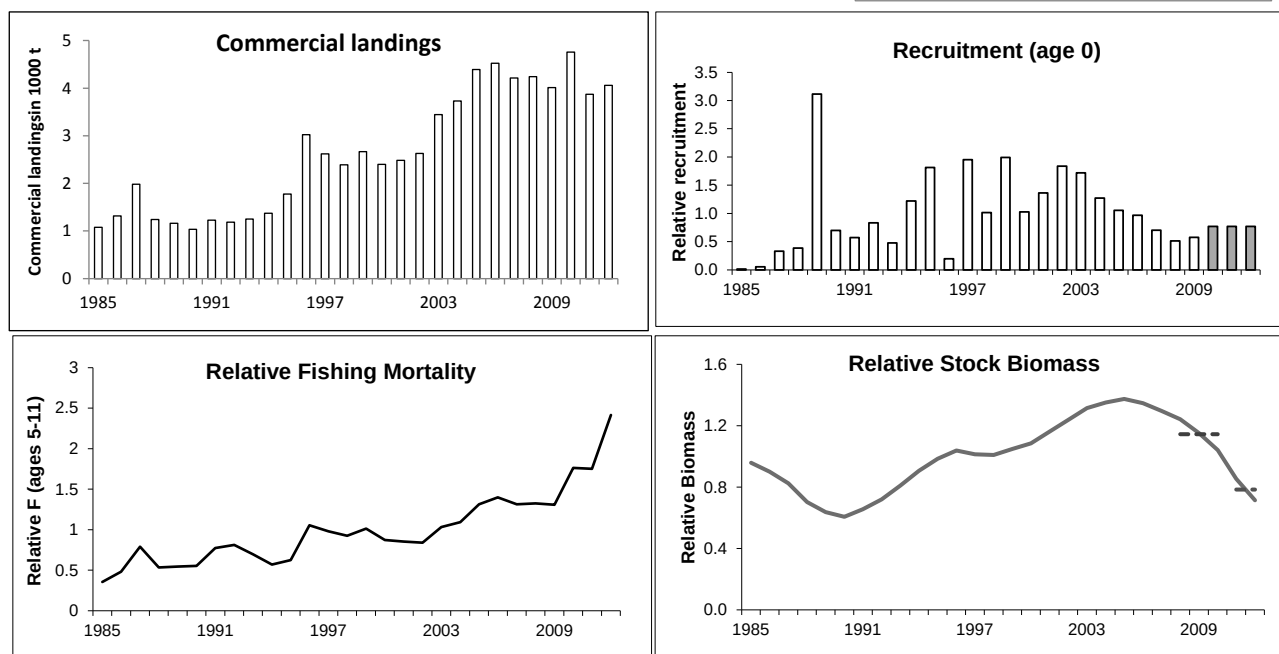
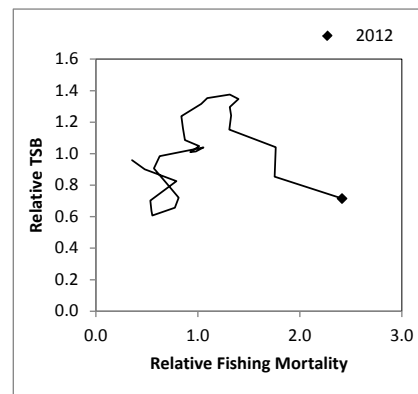


Figure 5.4.32.1 European sea bass in Divisions IVbc, VIIa, and VIId–h. Summary of stock assessment: landings in thousand tonnes; recruitment, fishing mortality, and biomass relative to the average of the time-series. Predicted recruitment values are shaded. Bottom right: Total stock biomass (TSB), dashed lines indicate the average TSB for the respective year range. Top right: relative TSB/relative F for the time-series used in the assessment.

Fishing mortality is increasing, and an exploratory evaluation indicates that F is above a possible F_{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).

Management plans

No specific management objectives are known to ICES. There is no TAC for this species.

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 VIIId–h constitutes a separate stock. It is possible that sea bass in the area has a connection with sea bass in Division VIIj.

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.

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 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).
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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.

Scientific basis

Assessment type	Trends-based age and length analytical assessment (Stock Synthesis 3; NOAA Toolbox).
Stock data category	Category 3.2.0.
Input data	Commercial landings (international landings, ages and length frequencies from catch sampling); three pre-recruit survey indices (UK Solent spring and autumn surveys; Thames trawl survey); growth and maturity data (sampling of commercial catches and surveys); natural mortality (inferred from life history parameters and maximum observed ages).
Discards and bycatch	A low rate of discarding is observed in most sea bass fisheries. Discards were not included in the assessment but are available for monitoring (UK and France).
Indicators	None.
Other information	This stock was benchmarked in 2012 (ICES, 2012).
Working group report	WGCSE (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland + North Sea
STOCK European sea bass in Divisions IVbc, VIIa, and VIIId–h (Irish Sea, Celtic Sea, English Channel, and southern North Sea)

Reference points

No reference points are defined for this stock.

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.

ICES approach to data-limited stocks

For data-limited stocks for which a biomass estimates are 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 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.

Additional considerations

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. Catch limitations that incite discarding should be avoided. Discarding is mainly an issue at present with otter trawlers using 80–90 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 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, 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 métiers 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.

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.

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.

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.

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 VIIId–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.

Sources

Drogou, M., Biseau, A., Berthou, P., de Pontual, H., Habasque, J., and le Grand, C. 2011. Synthèse des informations disponibles sur le Bar: flottilles, captures, marché. Reflexions autour de mesures de gestion. <http://archimer.ifremer.fr/doc/00035/14577/11879.pdf>.

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.

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

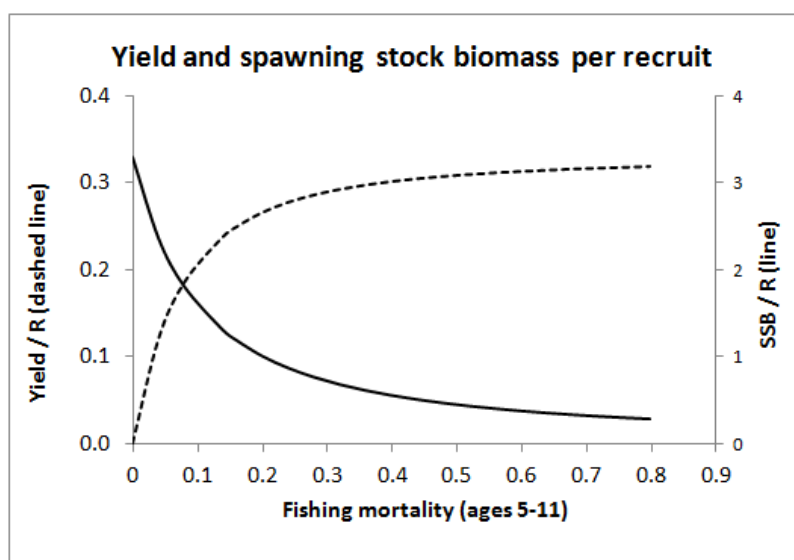


Figure 5.4.32.2 European sea bass in Divisions IVbc, VIIa, and VIIId–h. Yield- and SSB-per-recruit analysis.

Table 5.4.32.1 European sea bass in Divisions IVbc, VIIa, and VIId–h. ICES advice, management, official landings, and ICES landings.

Year	ICES Advice	Predicted catch corresp. to advice ¹	Agreed TAC	Official landings	ICES landings
2000	-	-	none	2.1	2.4
2001	-	-	none	2.2	2.5
2002	No increase in effort or F	-	none	2.4	2.6
2003	No increase in effort or F	-	none	2.9	3.4
2004	No increase in effort or F	-	none	3.0	3.7
2005	-	-	none	3.2	4.4
2006	-	-	none	3.4	4.5
2007	-	-	none	3.5	4.2
2008	-	-	none	3.0	4.2
2009	-	-	none	4.3	4.0
2010	-	-	none	4.9	4.8
2011	-	-	none	3.9	3.9
2012	No increase in catch	-	none	3.9	4.1
2013	20% Reduction in catches (last 3 years' average)	< 6.0			
2014	36% reduction in commercial landings (20% reduction, followed by 20% precautionary reduction)	<2.707			

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).

	Belgium	Denmark	France ¹	UK	Netherlands	Channel Is.	Total	ICES landings ²
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

Source: Official catch statistics 1950–2010 dataset 2011 and 1992–2011 dataset 2013, ICES, Copenhagen.

¹ Landings for 2000–2010 supplied by Ifremer.

² Includes adjustments to pre-2000 French statistics in line with ratio of Ifremer to official figures in later years.

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 long-term geometric mean.

Year	Recruits (age 0)	SSB	TSB	F(5–11)	Landings (tonnes)
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

ECOREGION Celtic Sea and West of Scotland
STOCK European sea bass in Divisions VIa, VIIb, and VIIj (West of Scotland and Ireland)

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.

Stock status

F (Fishing Mortality)	
2010–2012	
Qualitative evaluation	? Insufficient information
SSB (Spawning-Stock Biomass)	
2011–2013	
Qualitative evaluation	? Insufficient information

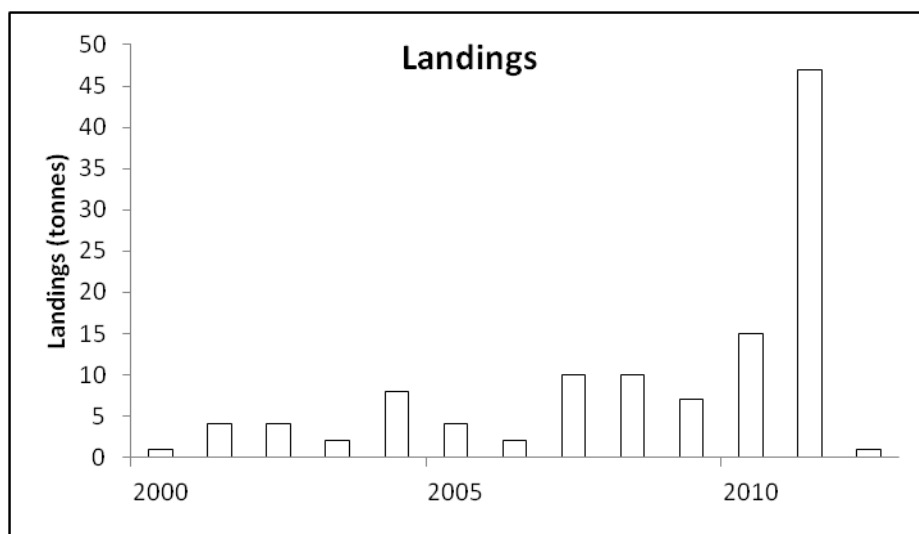


Figure 5.4.33.1 European sea bass in Divisions VIa, VIIb, and VIIj. Official landings (tonnes). Data available for 2012 are preliminary.

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.

Management plans

No specific management objectives are known to ICES. There is no TAC for this species.

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.

Environmental influence on the stock

Ocean warming in recent decades has likely led to the more northerly distribution of sea bass.

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.

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.
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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

Assessment type	No assessment.
Stock data category	Category 6.2.0.
Input data	Official landings.
Discards and bycatch	Not available.
Indicators	None.
Other information	The combined sea bass stock was benchmarked in 2012 (ICES, 2012), where a new stock definition was proposed.
Working group report	WGCSE (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK European sea bass in Divisions VIa, VIIb, and VIIj (West of Scotland and Ireland)

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.

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.

Additional considerations***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 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.

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.

Quality considerations

This advice is based on landings data that do not include recreational catches.

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.

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.

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.

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.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings
2000	-	-	none	1
2001	-	-	none	4
2002	No increase in effort or F ¹⁾	-	none	4
2003	No increase in effort or F ¹⁾	-	none	2
2004	No increase in effort or F ¹⁾	-	none	8
2005	-	-	none	4
2006	-	-	none	2
2007	-	-	none	10
2008	-	-	none	10
2009	-	-	none	7
2010	-	-	none	15
2011	-	-	none	47
2012	No increase in catch ¹⁾	-	none	1 ²⁾
2013	20% reduction in catches (last 3 years' average) ¹⁾	< 6.0 ¹⁾		
2014	20% reduction in commercial landings (last 3 years' average 2009-2011)	0.018		

Weights in thousand tonnes.

¹⁾Advice for the European sea bass in the Northeast Atlantic (combined stock).

²⁾Preliminary.

Table 5.4.33.2

European sea bass in Divisions VIa, VIIb, and VIIj. Official landings by country (tonnes). Source: [ICES official catch statistics](#).

	Belgium	Spain	France	UK	Ireland	Total
1995				+		0
1996						0
1997						0
1998		+				0
1999						0
2000			1			1
2001			4			4
2002		0	4			4
2003			2			2
2004	0	2	6	0		8
2005			4			4
2006			2	0		2
2007			10	0		10
2008		0	10	0		10
2009			6	0	1	7
2010			15			15
2011			47	0		47
2012*			<0.5	<1		<1

*Preliminary

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

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.

Stock status

	F (Fishing Mortality)		
	2010	2011	2012
MSY (F_{MSY})	✗	✗	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	✓	○	○ Increased risk
	SSB (Spawning-Stock Biomass)		2013
	2011	2012	
MSY ($B_{trigger}$)	✗	✗	✗ Below trigger
Precautionary approach (B_{pa}, B_{lim})	✗	✗	✗ Reduced reproductive capacity

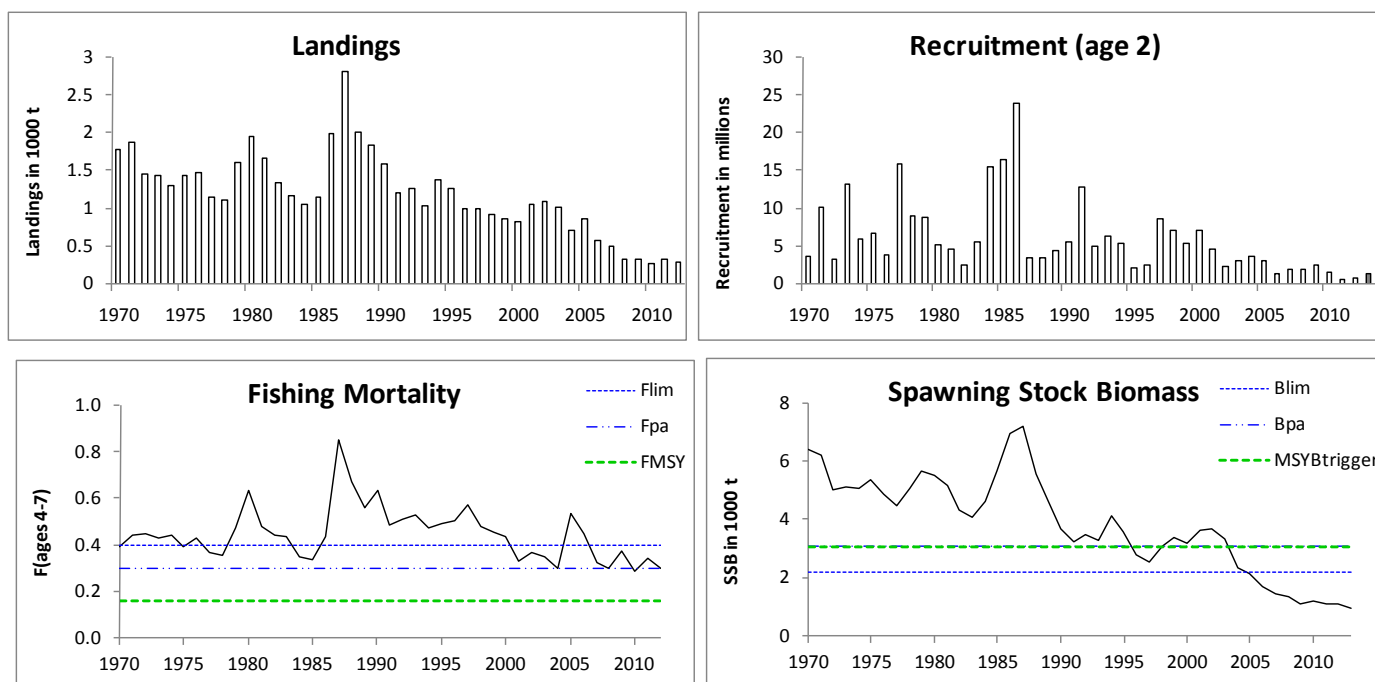
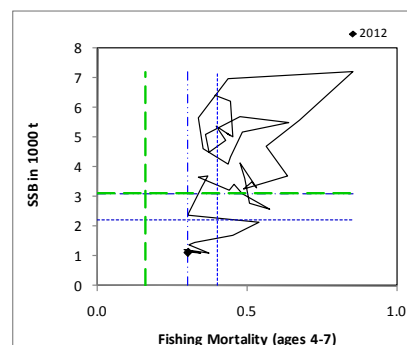


Figure 5.4.34.1 Sole in Division VIIa. Summary of stock assessment (weights in thousand tonnes). Predicted recruitment value is shaded. Top right: SSB/F for the time-series used in the assessment.

SSB has continuously declined since 2001 and has been below B_{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 F_{MSY} proxy. Recent recruitments have been lower than earlier in the time-series, with the 2011 recruitment being the lowest.

Management plans

No specific management objectives are known to ICES.

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.

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 t (91% beam trawlers, 8% otter trawlers, < 2% other gears). Beam trawl discards were 5% in weight.

Effects of the fisheries on the ecosystem

Although discard rates of sole are low in these fisheries, 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.

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.

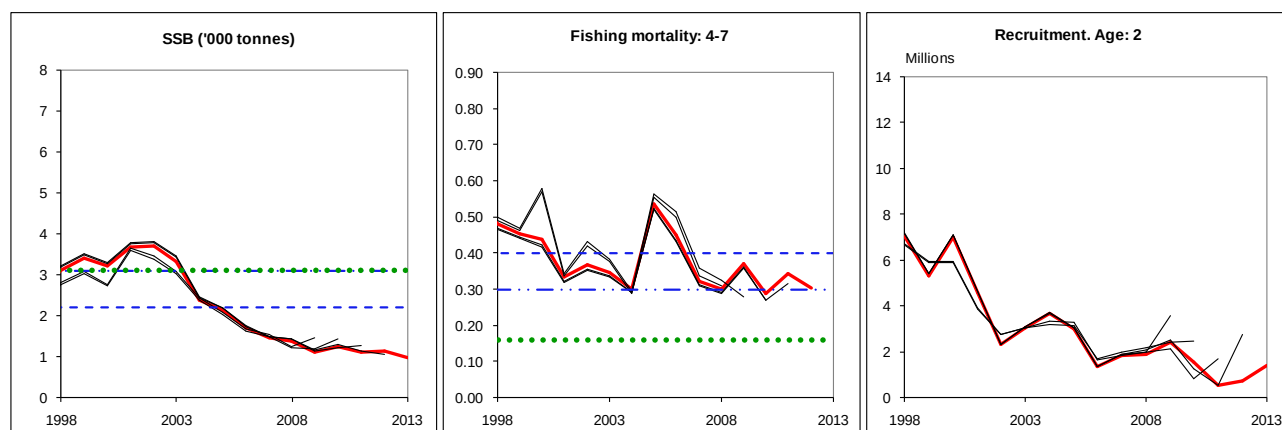


Figure 5.4.34.2 Sole in Division VIIa (Irish Sea). Historical assessment results (final-year recruitment estimates are included).

Scientific basis

Assessment type	Age analytical assessment (XSA).
Stock data category	Category 1.
Input data	Commercial catches (international landings, ages and length frequencies from catch sampling); one survey index (UK(E&W)-BTS-Q3); maturity data from UK survey information; natural mortality is assumed to be constant.
Discards and bycatch	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	None.
Other information	This stock was benchmarked in 2011 (ICES, 2011).
Working group report	WGCSE (ICES, 2013).

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

Reference points

	Type	Value	Technical basis
MSY Approach	MSY B_{trigger}	3100 t.	Default to value of B_{pa}
	F_{MSY}	0.16	Provisional proxy based on stochastic simulations, assuming a Ricker stock–recruitment relationship (range 0.1–0.25).
Precautionary Approach	B_{lim}	2200 t.	$B_{\text{lim}} = B_{\text{loss}}$. The lowest observed spawning stock, followed by an increase in SSB.
	B_{pa}	3100 t.	$B_{\text{pa}} \sim B_{\text{lim}} \times 1.4$. The minimum SSB required that ensures a high probability of maintaining SSB above its lowest observed value, taking into account the uncertainty of assessments.
	F_{lim}	0.40	$F_{\text{lim}} = F_{\text{loss}}$. 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.
	F_{pa}	0.30	This F is considered to have a high probability of avoiding F_{lim} .

(unchanged since: 2010)

Outlook for 2014

Basis: $F(2013) = 0.16$ TAC constraint; $R(2013) = RCT3 = 1388$ thousands; $R(2014) = GM\ 2003\text{--}2011 = 1900$ thousands; Catches (2013) = 140 (no discards); $SSB(2014) = 1048$.

Rationale	Catches (2014)	Basis	F(2014)	SSB(2015)	%SSB change ¹⁾	%TAC Change ²⁾
MSY approach	52	$F_{\text{HCR-MSY}} = F_{\text{MSY}} \times SSB(2014)/MSY B_{\text{trigger}}$	0.05	1278	+22%	–62%
MSY transition	95	$0.2 \times F(2010) + 0.8 \times F_{\text{HCR-MSY}}$	0.10	1237	+18%	–32%
Precautionary approach	0	$SSB_{2015} > B_{\text{pa}}$	0	1328	+27%	–100%
Zero catch	0	$F = 0$	0	1328	+27%	–100%
Other options	105	$TAC - 25\% (F_{2013} \times 0.69)$	0.11	1228	+17%	–25%
	119	$TAC - 15\% (F_{2013} \times 0.78)$	0.13	1215	+16%	–15%
	140	Stable TAC	0.15	1196	+14%	0%
	147	F_{2013}	0.16	1189	+13%	+5%
	161	$TAC + 15\% (F_{2013} \times 1.08)$	0.18	1176	+12%	+15%

Weights in tonnes.

¹⁾ SSB 2015 relative to SSB 2014.

²⁾ Catches 2014 relative to TAC 2013.

MSY approach

Following the ICES MSY approach implies fishing mortality to be reduced to 0.05 (66% lower than the F_{MSY} proxy because SSB in 2014 is below MSY B_{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.

Precautionary approach

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

Additional considerations

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.

Regulations and their effects

Technical measures in force are minimum mesh sizes and minimum landing size (24 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).

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.

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.

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.

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.

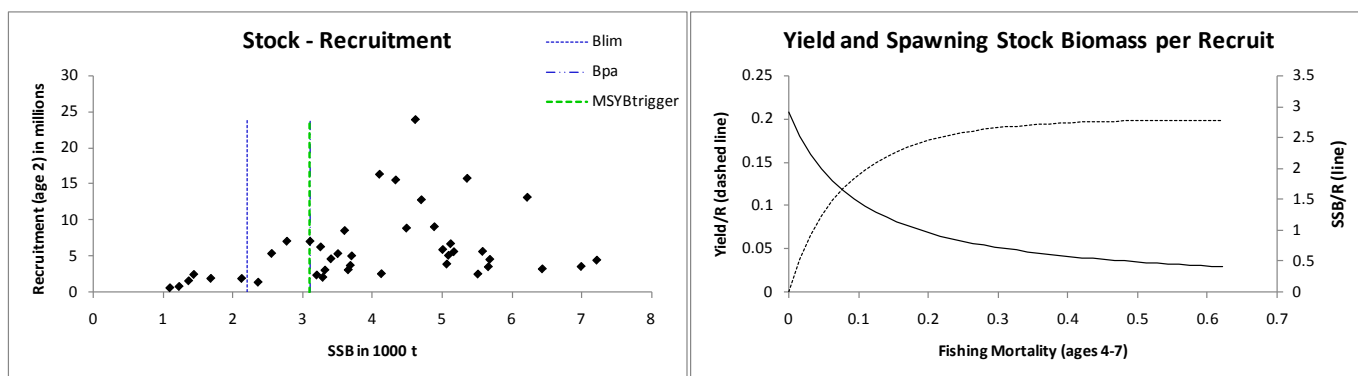


Figure 5.4.34.3 Sole in Division VIIa (Irish Sea). Stock–recruitment plot (left panel) and yield-per-recruit analysis (right panel).

Table 5.4.34.1 Sole in Division VIIa (Irish Sea). Advice, management, and landings.

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

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.

Year	Belgium	France	Ireland	Netherlands	UK (E+W)	UK (Isle of Man)	UK (N. Ireland) ¹	UK (Scotland)	Officially reported	Unallocated	Total used by ICES	TAC
1973	793	12	27	281	258	-	46	11	1428	0	1428	
1974	664	54	28	320	218	-	23	-	1307	0	1307	
1975	805	59	24	234	281	-	24	15	1442	-1	1441	
1976	674	72	74	381	195	-	49	18	1463	0	1463	
1977	566	39	84	227	160	-	49	21	1146	1	1147	
1978	453	65	127	177	189	-	57	30	1098	8	1106	
1979	779	48	134	247	290	-	47	42	1587	27	1614	
1980	1002	41	229	169	367	-	44	68	1920	21	1941	
1981	884	13	167	186	311	-	41	45	1647	20	1667	
1982	669	9	161	138	277	-	31	44	1329	9	1338	
1983	544	3	203	224	219	-	33	29	1255	-86	1169	
1984	425	10	187	113	230	-	38	17	1020	38	1058	
1985	589	9	180	546	269	-	36	28	1657	-511	1146	
1986	930	17	235	-	637	1	50	46	1916	79	1995	
1987	987	5	312	-	599	3	72	63	2041	767	2808	2100
1988	915	11	366	-	507	1	47	38	1885	114	1999	1750
1989	1010	5	155	-	613	2	.	38	1823	10	1833	1480
1990	786	2	170	-	569	10	.	39	1576	7	1583	1500
1991	371	3	198	-	581	44	.	26	1223	-11	1212	1500
1992	531	11	164	-	477	14	.	37	1234	25	1259	1350
1993	495	8	98	-	338	4	.	28	971	52	1023	1000
1994	706	7	226	-	409	5	.	14	1367	7	1374	1500
1995	675	5	176	-	424	12	.	8	1300	-34	1266	1300
1996	533	5	133	149	194	4	.	5	1023	-21	1002	1000
1997	570	3	130	123	189	5	.	7	1027	-24	1003	1000
1998	525	3	134	60	161	3	.	9	895	16	911	900
1999	469	<1	120	46	165	1	.	8	810	53	863	900
2000	493	3	135	60	133	1	.	8	833	-15	818	1080
2001	674	4	135	-	195	+	.	4	1012	41	1053	1100
2002	817	4	96	-	165	+	.	3	1085	5	1090	1100
2003	687	4	103	-	217	+	.	3	1014	0	1014	1010
2004	527	1	77	-	106	+	.	1	712	-3	709	800
2005	662	3	85	-	103	+	.	1	854	1	855	960
2006	419	1	85	-	69	+	.	2	576	-7	569	960
2007	305	1	115	-	66	<1	.	4	491	1	492	820
2008	216	1	66	-	37	n/a	.	n/a	320	12	332	669
2009	257	n/a	47	-	19	1	.	1	325	0	325	502
2010	217	<1	47	-	12	<1	.	n/a	277	0	277	402
2011	250	<1	48	-	31	<1	.	n/a	330	0	330	390
2012	222	<1	51	-	21	<1	-	n/a	294	0	294	300

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.

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

* RCT3 estimate.

ECOREGION Celtic Sea and West of Scotland
STOCK Sole in Divisions VIIb,c (West of Ireland)

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.

Quality considerations

Catches in this area are too low to support the collection of the necessary information for an assessment of the stock status.

Scientific basis

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).

Outlook for 2015

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.

Additional considerations

Management considerations

The “Joint statement by the Council and the Commission” (Council of the European Union Document [Doc 5315/13 PECH 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.

Sources

- Council of the European Union Document Doc 5315/13 PECH 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.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings
1993	-	-	-	60
1994	-	-	-	61
1995	-	-	-	61
1996	-	-	-	54
1997	-	-	-	55
1998	-	-	-	49
1999	-	-	-	68
2000	-	-	-	77
2001	-	-	80	60
2002	No advice	-	80	64
2003	Reduce TAC to recent landings	65	80	69
2004	Reduce TAC to recent landings (1998–2002)	65	65	67
2005	Reduce TAC to recent landings (1999–2003)	62	65	45
2006	No increase in catches	64	65	43
2007	No increase in catches	64	65	41
2008	No increase in catches	50	59	37
2009	Same advice as last year	50	50	50
2010	No advice	-	45	43
2011	No advice	-	44	26
2012	No increase in catch	-	44	44
2013	20% reduction in catches (last 3 years' average)	<30	42	
2014	Same catch advice as for 2013	<30		
2015	Same catch advice as for 2013	<30		

Weights in tonnes.

ECOREGION Celtic Sea and West of Scotland
STOCK Sole in Division VIIe (Western Channel)

Advice for 2014

ICES advises on the basis of the MSY approach that catches in 2014 should be no more than 832 tonnes. All catches are assumed to be landed.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✓	✓	✓ Appropriate
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined
SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	✓	✓	✓ Full reproductive capacity

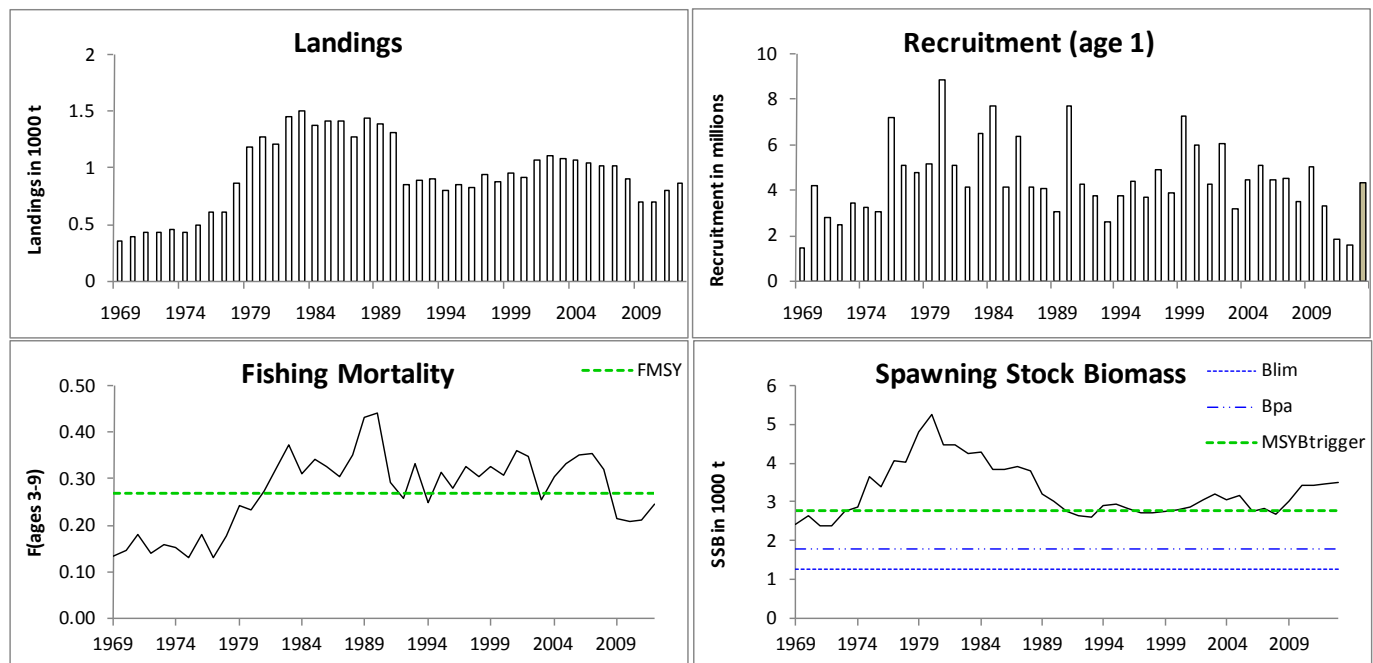
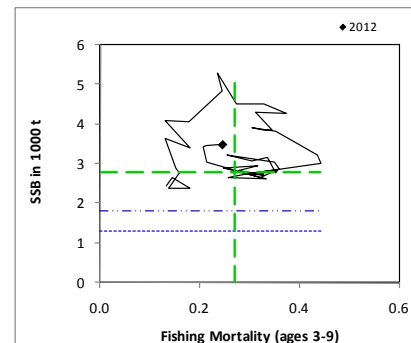


Figure 5.4.36.1 Sole in Division VIIe (Western Channel). Summary of stock assessment. Assumed recruitment values are shaded. Top right: SSB and F for the time-series from the assessment.

The fishing mortality has fluctuated around F_{MSY} since the early 1990s and is estimated to have been below F_{MSY} since 2009. SSB has been around $MSY B_{trigger}$ for about two decades, with an increase since 2009. Recruitment has been fluctuating without trend. The 2010 and 2011 year classes are estimated to be below average.

Management plans

A management plan has been agreed by the EU in 2007 (Council Regulation [EC. No. 509/2007](#)). Following the recovery of the stock in 2011 the plan has moved into the management plan phase where it aims to keep F at the target value of 0.27. This plan has not been evaluated by ICES.

Biology

Tagging information of juvenile sole, mostly 1–3 year olds, show that there is ingress of sole from the adjacent ICES Division VIId. Given the limited nursery habitat and the abundance of sole recruits in Division VIIe it seems reasonable to assume that there is a net inwards migration of pre-recruits that remain in the area following maturation.

The fisheries

The principal gears used for this stock are beam trawls, otter trawls, and gillnets. Sole is the target species of an offshore beam trawl fleet, which is concentrated off the southern Cornish and Devon coasts. This fishery also takes substantial catches of plaice, anglerfish, lemon sole, and cuttlefish. Otter trawlers and gillnetters take sole mainly as a bycatch, although there is also a fishery targeting sole at spawning time. Discarding of sole is considered low.

Catch distribution	Landings (2012) = 871 t (55% beam trawl, 22% otter trawl, 11% gillnets, and 11% other gear). Discarding from the UK fleets (>55% of landings) are negligible
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Effects of the fisheries on the ecosystem

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. Discard rates of non-commercial species and commercial species of unmarketable size are substantial. Some beam trawlers are experimenting with benthic drop-out panels that release about 75% of benthic invertebrates from the catches. Full square mesh codends are being tested in order to reduce the capture of benthos further and improve the selection profile of gadoids.

Quality considerations

The assessment methodology introduced in 2012 has produced a significantly improved assessment with respect to the biases experienced previously, and with little loss in precision. Nevertheless, there is still a tendency to overestimate fishing mortality and underestimate SSB.

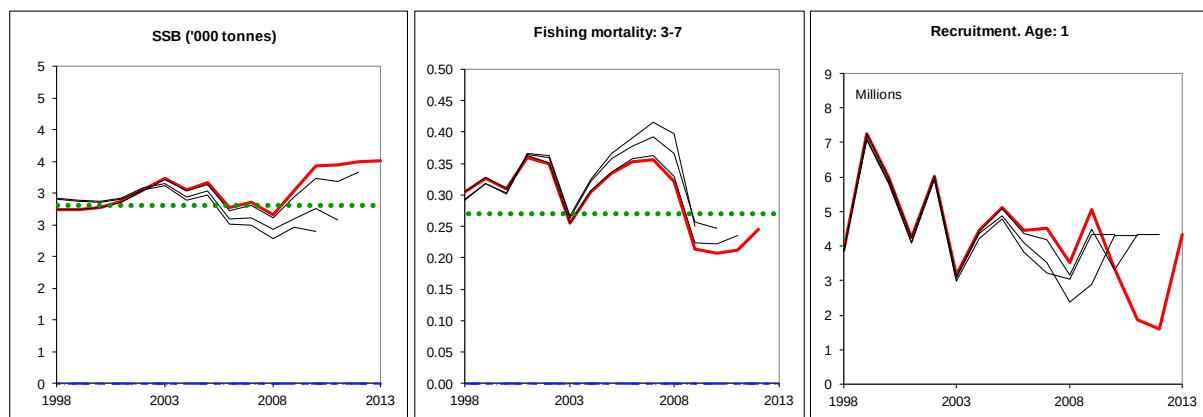


Figure 5.4.36.2 Sole in Division VIIe (Western Channel). Historical assessment results (final-year recruitment estimate included). Note that the age range for F changed from 3–7 to 3–9 in 2009.

Scientific basis

Assessment type	Age-based analytical assessment (XSA).
Stock category	Category 1.
Input data	Commercial catch-at-age data, three survey indices (UK-WEC-BTS, UK-FSP, and Q1SWBeam), and three commercial tuning fleets (UK-CBTearly, UK-CBTlate, and UK-COT); natural mortality is assumed constant over ages and years at 0.1; fixed maturity ogive from Divisions VIIfg.
Discards and bycatch	Discards are considered to be low and are not included in the assessment.
Indicators	None.
Other information	The stock was benchmarked in 2012 (WKFLAT; ICES, 2012).
Working group report	WGCSE (ICES, 2013) .

ECOREGION Celtic Sea and West of Scotland
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Reference points

	Type	Value	Technical basis
MSY	MSY B _{trigger}	2800 t.	Based on the lower 95% confidence limits with exploitation at $F = 0.27$ from LT simulations.
Approach	F _{MSY}	0.27	Based on stochastic LT simulations.
Precautionary approach	B _{lim}	1300 t.	WKFRAME 2 meta-analysis (ICES, 2011).
	B _{pa}	1800 t.	WKFRAME 2 meta-analysis (ICES, 2011).
	F _{lim}	Not defined.	
	F _{pa}	Not defined.	

(Unchanged since 2012 (WKFLAT 2012)).

Outlook for 2013

Basis: $F(2013) = F_{sq} = F_{2010-2012}$ rescaled = 0.25; SSB (2014) = 3129; R (2013) = $GM_{1969-2010}$ = 4345 thousand; landings (2013) = 866.

Rationale	Catch (2014)	Basis	F_{total} (2014)	SSB (2015)	%SSB Change¹⁾	%TAC Change²⁾
MSY approach	832	F _{MSY}	0.27	2894	-8%	-7%
Management Plan	832	F _{MP} target	0.27	2894	-8%	-7%
Zero catch	0	F = 0	0	3713	+19%	-100%
Other options	764	TAC ₂₀₁₃ - 15%	0.24	2961	-5%	-15%
	1028	TAC ₂₀₁₃ + 15%	0.35	2701	-14%	+15%
	483	F ₂₀₁₃ × 0.6	0.15	3237	+3%	-46%
	628	F ₂₀₁₃ × 0.8	0.20	3093	-1%	-30%
	898	F ₂₀₁₃ × 1.2	0.30	2829	-10%	0%
	1023	F ₂₀₁₃ × 1.4	0.35	2706	-14%	114%

Weights in tonnes.

¹⁾ SSB 2015 relative to SSB 2014.

²⁾ Catches 2014 relative to TAC 2013.

MSY approach

Following the ICES MSY framework implies a fishing mortality at 0.27, resulting in catches of 832 t in 2014. All catches are assumed to be landed. This is expected to lead to an SSB of 2894 t in 2015.

Management plan

Council Regulation (EC) No. 509/2007 establishes a multi-annual plan for the sustainable exploitation of sole in Division VIIe. The years 2007–2009 were deemed a recovery plan, with subsequent years being deemed a management plan.

Following the agreed management plan implies an F for 2014 of 0.27 (F_{MP}, the management plan long-term target), suggesting a TAC of 832 t in 2014 which is less than the 15% annual TAC deviation cap in the plan. Consequently the management plan implies a TAC for 2014 of 832 t ($F = 0.27$). Fishing at this level is expected to lead to an SSB of 2894 t in 2015.

Additional considerations*Management considerations*

Sole is widespread and usually taken in conjunction with other species to varying degrees, depending on location and season. Fisheries with beam trawls can target sole, anglerfish, and cuttlefish depending on season and vessel size. The most productive sole fishery grounds are located close to ports, while the highest catches of anglerfish for example are

taken further south and west in Division VIIe. Therefore, effort restrictions and/or high fuel costs will have a tendency to increase F in sole and reduce F in anglerfish. Area-misreported landings between Divisions VIId and VIIe have been a problem in the past, but the problem has been largely eliminated in recent years.

Regulations and their effects

Management of this stock is mainly by TAC, which is ineffective at regulating the fishery. In 2005 effort restrictions were implemented for beam trawlers in this fishery to enforce the TAC and improve data quality. These restrictions have not been limiting this fishery despite the decommissioning scheme, due in part to the large number of days available, but also because there appears to be some latent effort overcapacity in the UK beam trawl fleet. Since November 2008 the UK has been enforcing a single-area licensing scheme which has been effective in reducing UK catches. Gillnets are the only other gear with effort restrictions, but because of the nature of the fishery days-at-sea restrictions are ineffective.

A catch quota scheme implemented for beam trawlers in the UK since 2010 is based on inappropriate discard rates well in excess of the estimates of discarding in the fishery. In 2013 additional quota allocations of 15% have so far been unable to convince fishers to participate in the scheme.

Technical measures applied to this stock include a minimum landing size of 24 cm and a minimum mesh size of 80 mm for beam trawlers. Local regulations restricting certain gear and vessel types are also in place.

The gears used to target sole are selective for fish above the minimum landing size, and only a few sporadic cases of highgrading (included in the numbers above) have been observed.

Information from the fishing industry

The fisheries–science partnership, conducted cooperatively between CEFAS and the UK industry, has provided evidence for the wide dispersal and broad age distribution for this stock.

Data and methods

The benchmark in 2012 agreed on a new analytical assessment for this stock, based on two commercial tuning fleets, the UK-EW-BTS survey, and two new spatially more extensive surveys. The objective of reducing the retrospective trends was met and the new assessment methodology, together with more realistic reference points, promises more appropriate advice in the near future.

Sampling levels by fleet are sufficient to provide high precision in the assessment, though some improvement in the age sampling in France would be desirable. Discarding in the fishery is minor and frequently the result of the minimum landing size. A more detailed examination of the discard practices in the French fleet may improve our understanding of the frequencies of and the portion of the stock affected by such stochastic events.

Uncertainty in data, assessment, and forecast

The precision of the assessment is sufficiently high to detect relatively small changes in the major stock dynamics. However, there is uncertainty in the source of recruitment to the fished stock. It is known that there is an ingress of sole (1–3 years old) from the adjacent ICES Division VIId, the scale of which is unknown (ICES, 2012).

The assessment estimate (from XSA) of the 2012 recruitment (2011 year class) has been used for the short-term forecast. Based on survey indices, there is evidence that the stock is suffering two consecutive low recruitments. It must be noticed that the stock is harvested sustainably and the final F estimates are persistently revised downwards (10% in this assessment), due to a remaining retrospective pattern. The forecast using a scaled F and the XSA estimates for the 2011 year class are therefore conservative.

Comparison with previous assessment and advice

The F in 2011 is revised down by 10% and SSB in 2012 is revised up by 4% compared to last year's assessment.

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

Sources

ICES. 2011. Report of the Workshop on Implementing the ICES FMSY Framework (WKFRAME-2), 10–14 January 2011, ICES, Denmark. ICES CM 2011/ACOM:33. 110 pp.

ICES. 2012. Report of the Benchmark and Data Compilation Workshop for Flatfish (WKFLAT2012), 1–8 March 2012, Bilbao, Spain. ICES CM 2012/ACOM:46.

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

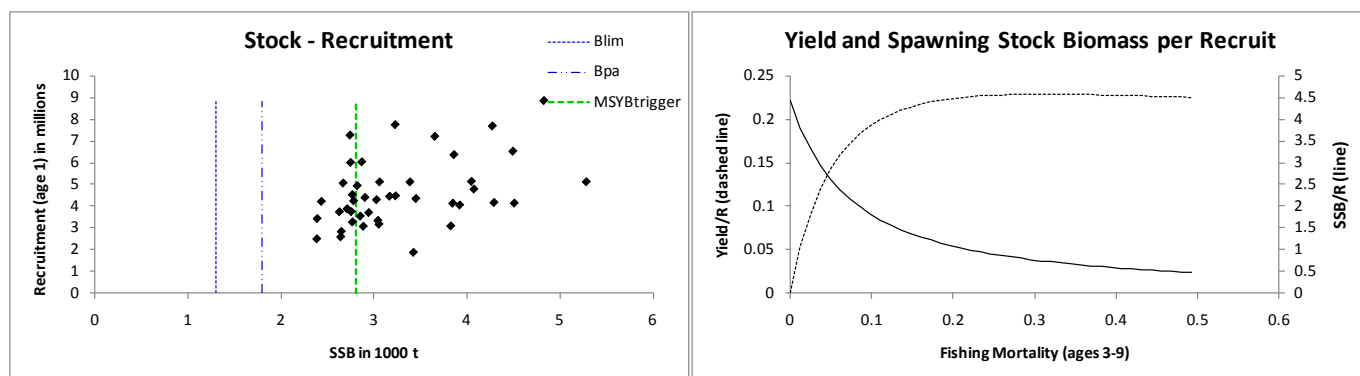


Figure 5.4.36.3 Sole in Division VIIe (Western Channel). Stock–recruitment (left panel) and yield-per-recruit analysis (right panel) plots.

Table 5.4.36.1 Sole in Division VIIe (Western Channel). Advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings
1987	No increase in F	1.15	1.15	1.11	1.28
1988	No decrease in SSB; TAC	1.3	1.3	0.95	1.44
1989	No decrease in SSB; TAC	1	1	0.8	1.39
1990	SSB = 3000 t; TAC	0.9	0.9	0.75	1.31
1991	TAC	0.54	0.8	0.84	0.85
1992	70% of F_{1990}	0.77	0.8	0.77	0.89
1993	35% reduction in F	0.7	0.9	0.79	0.9
1994	No increase in F	1	1	0.84	0.8
1995	No increase in F	0.86	0.95	0.88	0.86
1996	$F_{1996} < F_{1994}$	0.68	0.7	0.74	0.83
1997	No increase in F	0.69	0.75	0.86	0.95
1998	No increase in F	0.67	0.67	0.77	0.88
1999	Reduce F below F_{pa}	0.67	0.7	0.66	0.96
2000	Reduce F below F_{pa}	< 0.64	0.64	0.66	0.92
2001	Reduce F below F_{pa}	< 0.58	0.6	0.65	1.07
2002	Reduce F below F_{pa}	< 0.45	0.53	0.54	1.11
2003	Rebuilding plan or $F = 0$	-	0.39	0.62	1.08
2004	$F = 0$ or recovery plan 1	0	0.3	0.49	1.08
2005	80% reduction in F or recovery plan	< 0.23	0.865	0.96	1.04
2006	80% reduction in F or recovery plan	< 0.24	0.94	0.97	1.02
2007	68% reduction in F or recovery plan	< 0.35	0.9	0.82	1.02
2008	75% reduction in F	< 0.26	0.765	0.67	0.91
2009	70% reduction in F	< 0.32	0.65	0.64	0.70
2010	Reduce fishing effort and catches	-	0.62	0.76	0.70
2011	MSY framework	< 0.66	0.71	0.75	0.80
2012	MSY framework	< 0.74	0.78	0.80 ¹	0.87 ¹
2013	MSY framework	< 0.96	0.89		
2014	MSY approach	< 0.832			

Weights in thousand tonnes.

¹Preliminary.

Table 5.4.36.2 Sole in Division VIIe (Western Channel). Landings (in tonnes) as used by ICES.

Year	Belgium	Denmark	France	Netherlands	Ireland	Jersey	Guernsey	UK- E+W+NI	UK- other	Unalloc.	Total
1974	-	-	323	-	-	-	-	-	-	104	427
1975	3	-	271	-	-	-	2	215	-	0	491
1976	4	-	352	-	-	-	1	259	-	0	616
1977	3	-	331	-	-	-	-	272	-	0	606
1978	4	-	384	-	-	-	-	453	-	20	861
1979	1	-	515	-	-	-	2	663	-	0	1181
1980	45	-	447	-	13	-	1	763	-	0	1269
1981	16	-	415	1	-	-	4	784	-	-5	1215
1982	98	-	321	-	-	-	15	1013	-	-1	1446
1983	47	-	405	3	-	2	16	1025	-	0	1498
1984	48	-	421	-	-	9	14	878	-	0	1370
1985	58	-	130	-	-	9	8	894	-	310	1409
1986	62	-	467	-	-	3	6	831	-	50	1419
1987	48	-	432	-	-	1	5	626	-	168	1280
1988	67	-	98	-	-	0.5	4	780	-	495	1444
1989	69	-	112	6	-	-	3	610	-	590	1390
1990	41	0.5	81	-	-	1	3	632	-	556.5	1315
1991	35	-	325	-	-	-	-	477	-	15	852
1992	41	-	267	-	-	-	2	457	9	119	895
1993	59	-	236	-	-	1	-	479	18	111	904
1994	33	-	257	-	-	-	-	546	-	-38	800
1995	21	-	294	-	-	1	2	562	-	-24	856
1996	8	-	297	-	-	-	-	428	-	91	833
1997	13	-	348	-	1	13	13	470	-	91	949
1998	40	-	343	-	-	17	3	369	-	108	880
1999	13	-	-	-	-	18	3	375	-	548	957
2000	4	-	241	-	-	22	5	386	-	256	914
2001	19	-	224	-	-	20	5	382	-	419	1069
2002	33	-	198	-	-	15	5	289	-	566	1106
2003	1	-	363	-	1	15	5	235	-	458	1078
2004	7	-	302	-	-	7	6	172	-	581	1075
2005	26	-	406	-	-	17	5	505	-	80	1039
2006	32	-	357	-	-	4	4	568	0.5	56.5	1022
2007	34	-	384	-	2	2	-	525	4	64	1015
2008	28	-	312	-	0.3	2	6	464	-	95.7	908
2009	17	-	386	-	-	1	3	374	3	83	701
2010	17	-	375	-	-	2	3	361	2	62	698
2011	22	-	401	-	-	1.5	4	422	-	49.5	801
2012*	37	-	325	-	0.2	-	2	490	-	-16.8	871

*Landings in 2012 are preliminary.

Table 5.4.36.3

Sole in Division VIIe (Western Channel). Assessment summary.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3–9
1969	1481	2433	353	0.134
1970	4212	2647	391	0.146
1971	2830	2384	432	0.181
1972	2493	2388	437	0.139
1973	3425	2767	459	0.160
1974	3268	2884	427	0.153
1975	3069	3653	491	0.131
1976	7197	3386	616	0.181
1977	5107	4074	606	0.131
1978	4779	4047	861	0.179
1979	5132	4826	1181	0.244
1980	8843	5283	1269	0.235
1981	5114	4508	1215	0.274
1982	4133	4493	1446	0.328
1983	6516	4272	1498	0.374
1984	7676	4290	1370	0.312
1985	4162	3859	1409	0.344
1986	6359	3846	1419	0.327
1987	4128	3921	1280	0.304
1988	4046	3825	1444	0.352
1989	3086	3227	1390	0.434
1990	7737	3026	1315	0.442
1991	4290	2754	852	0.293
1992	3740	2641	895	0.257
1993	2585	2627	904	0.332
1994	3735	2902	800	0.248
1995	4391	2942	856	0.315
1996	3699	2819	833	0.279
1997	4930	2710	949	0.328
1998	3875	2741	880	0.304
1999	7257	2747	957	0.327
2000	6001	2780	914	0.309
2001	4241	2868	1069	0.360
2002	6028	3053	1106	0.349
2003	3164	3231	1078	0.255
2004	4466	3059	1075	0.304
2005	5108	3167	1039	0.334
2006	4450	2766	1023	0.352
2007	4524	2851	1015	0.356
2008	3534	2667	908	0.321
2009	5055	3041	701	0.214
2010	3338	3423	698	0.208
2011	1872	3450	801	0.213
2012	1585	3488	871	0.246
2013	4345*	3517		
Average	4528	3295	944	0.273

*GM_{1969–2010}.**5.4.37****Advice June 2013**

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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.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✗	✓	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	✓	✓	⚠ Increased risk
SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	✓	✓	✓ Full reproductive capacity

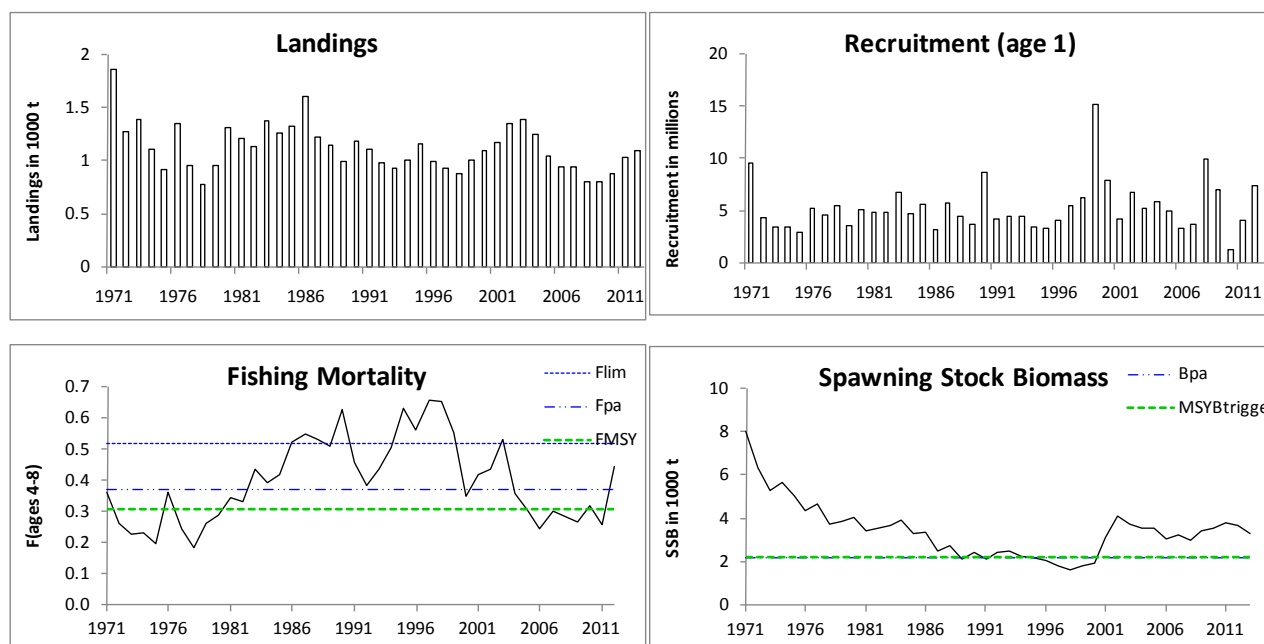
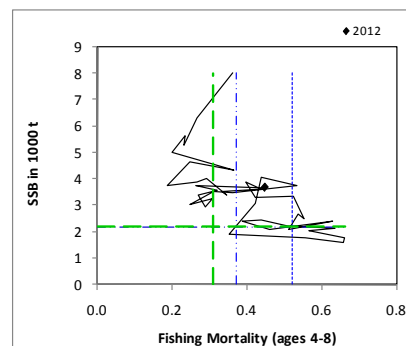


Figure 5.4.37.1 Sole in Divisions VIIIf,g. Summary of stock assessment. Predicted recruitment values are shaded. Top right: SSB/F for the time-series used in the assessment. Catches and landings are assumed to be the same.

The spawning-stock biomass has been above MSY $B_{trigger}$ since 2001. Fishing mortality has decreased from F_{lim} in 2003 to F_{MSY} in 2005 and remained there until 2011. In 2012 it increased to above F_{pa} . Recruitment has been fluctuating around average. The 2009 year class is the lowest of the time-series.

Management plans

No specific management objectives are known to ICES.

Biology

The main spawning areas for sole in the Celtic Sea are in waters 40–75 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 VIIIf) and adjacent areas (Division VIIg).

The fisheries

Sole are taken mainly in a beam trawl fishery that started in the early 1960s and, to a lesser extent, in the longer established otter trawl fisheries. In the 1970s, the fishery was mainly carried out by Belgian beam trawlers and Belgian and UK otter trawlers. The use of beam trawls 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 t (86% beam trawlers, 13% otter trawlers, and 1% Other gear). Beam trawl discards were 2–5% in weight.

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.

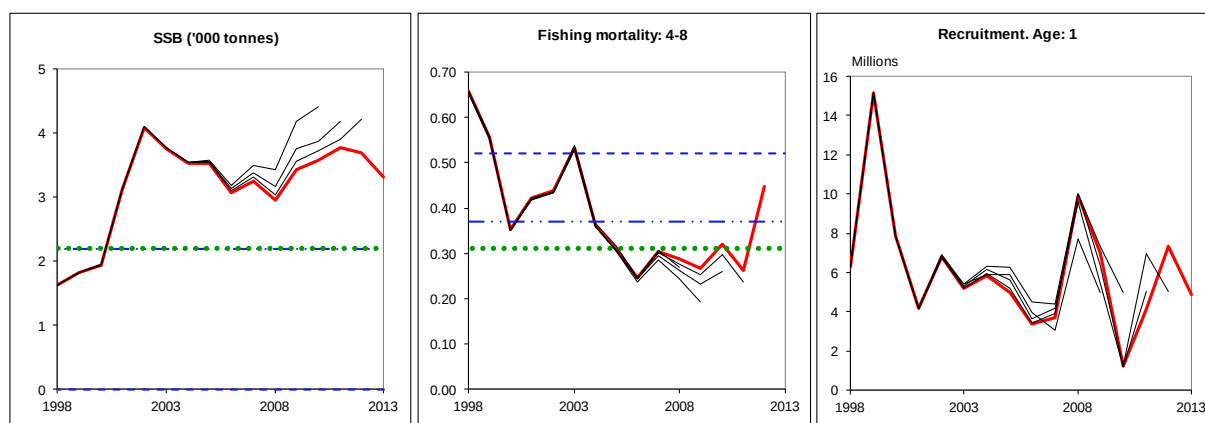


Figure 5.4.37.2 Sole in Divisions VIIIf,g (Celtic Sea). Historical assessment results (final-year recruitment estimates are included).

Scientific basis

Assessment type	Age-based analytical assessment (XSA).
Stock data category	Category 1.
Input data	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, 1998); natural mortality is assumed to be constant.
Discards and bycatch	Discards are assumed low and not included in the assessment.
Indicators	None.
Other information	None.
Working group report	WGCSE (ICES, 2013).

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Reference points

	Type	Value	Technical basis
MSY Approach	MSY $B_{trigger}$	2200 t.	B_{pa} .
	F_{MSY}	0.31	Provisional proxy based on stochastic simulations.
Precautionary Approach	B_{lim}	Not defined.	
	B_{pa}	2200 t.	There is no evidence of reduced recruitment at the lowest biomass observed and B_{pa} can therefore be set equal to the lowest observed SSB.
	F_{lim}	0.52	F_{lim} : F_{loss} .
	F_{pa}	0.37	This F is considered to have a high probability of avoiding F_{lim} and maintaining SSB above B_{pa} for ten years, taking into account the uncertainty of assessments. F_{pa} : $F_{lim} \times 0.72$ implies a less than 5% probability that ($SSB_{MT} < B_{pa}$).

(unchanged since: 2010)

Outlook for 2014

Basis: F (2013) = F_{sq} = mean (F 2010–2012) = 0.34; R (2013) = GM (1972–2010) = 4848 (thousands); Catches (2013) = 986 (no discards); SSB (2014) = 3285.

Rationale	Catches (2014)	Basis	F (2014)	SSB (2015)	%SSB change ¹⁾	% TAC change ²⁾
MSY approach	920	F_{MSY}	0.31	3465	+5%	–16%
Precautionary approach	1071	F_{pa}	0.37	3316	+1%	–3%
Zero catch	0	$F = 0$	0.00	4377	+33%	–100%
Other options	935	TAC – 15% ($F_{2013} \times 0.92$)	0.32	3450	+5%	–15%
	1004	F_{2013}	0.34	3382	+3%	–9%
	1100	Stable TAC ($F_{2013} \times 1.11$)	0.38	3287	0%	0%
	1265	TAC + 15% ($F_{2013} \times 1.29$)	0.45	3126	–5%	+15%

Weights in tonnes.

¹⁾ SSB 2015 relative to SSB 2014.²⁾ Catches 2014 relative to TAC 2013.**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 F_{MSY} .

Precautionary approach

The fishing mortality in 2014 should be no more than F_{pa} , corresponding to catches of less than 1071 t in 2014. This is expected to keep SSB above B_{pa} in 2015. Discards are considered to be low; therefore all catches are assumed to be landed.

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 VIIId). The removal of the restrictive days-at-sea EU regulation in Division VIIId that was in place prior to 2006, resulted in an area shift of the Belgian beam trawl fleet back to Division VIIId 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 VIIId.

Regulations and their effects

Since 2005, ICES rectangles 30E4, 31E4, and 32E3 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.

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 VIIIf,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.

Uncertainty in the assessment and the forecast

The higher estimate of fishing mortality in 2012 is considered to be uncertain.

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.

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.
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- 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.

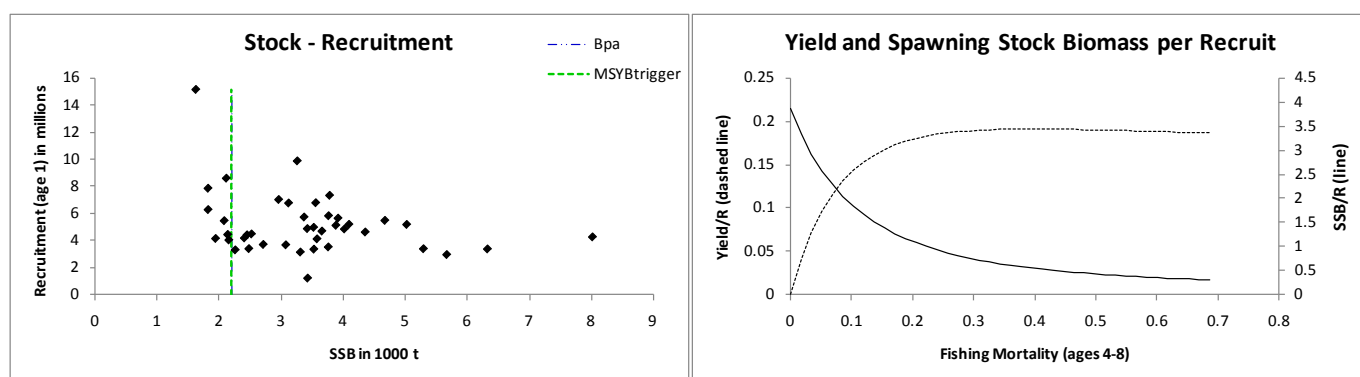


Figure 5.4.37.3 Sole in Divisions VIIIf,g (Celtic Sea). Stock–recruitment (left panel) and yield-per-recruit analysis (right panel) plots.

Table 5.4.37.1 Sole in Divisions VIIIf,g (Celtic Sea). Advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings
1987	<i>Status quo</i> F; TAC	1.6	1.6	1.23	1.22
1988	F = F(pre-86); TAC	0.9	1.1	1.2	1.15
1989	F at F(81–85); TAC	1.0	1.0	0.99	0.99
1990	No increase in F	1.2	1.2	1.24	1.19
1991	No increase in F	1.1	1.2	1.50	1.11
1992	No long-term gains in increasing F	1.1	1.2	1.06	0.98
1993	No long-term gains in increasing F	-	1.1	1.03	0.93
1994	No long-term gains in increasing F	-	1.1	1.02	1.01
1995	No increase in F	1.0	1.1	1.17	1.16
1996	20% reduction in F	0.8	1.0	1.08	1.00
1997	20% reduction in F	0.8	0.9	1.04	0.93
1998	20% reduction in F	0.7	0.85	1.01	0.88
1999	Reduce F below F_{pa}	0.81	0.96	0.95	1.01
2000	Reduce F below F_{pa}	< 1.16	1.16	1.04	1.09
2001	Reduce F below F_{pa}	< 0.81	1.02	1.12	1.17
2002	Reduce F below F_{pa}	< 1.00	1.07	1.12	1.35
2003	Reduce F below F_{pa}	< 1.24	1.24	1.21	1.39
2004	Reduce F below F_{pa}	< 1.00	1.05	1.13	1.25
2005	Reduce F below F_{pa}	< 0.84	1.00	1.00	1.04
2006	Reduce F below F_{pa}	< 0.88	0.95	0.89	0.95
2007	Reduce F below F_{pa}	< 0.84	0.89	0.94	0.95
2008	Keep F below F_{pa}	< 1.00	0.964	0.75	0.80
2009	No long-term gain in increasing F	< 0.94	0.993	0.73	0.79
2010	No long-term gain in increasing F	< 0.92	0.993	0.87	0.86
2011	See scenarios	-	1.241	1.01	1.03
2012	MSY approach	< 1.06	1.060	1.08	1.10
2013	MSY approach	< 1.10	1.100		
2014	MSY approach	< 0.92			

Weights in thousand tonnes.

Table 5.4.37.2 Sole in Divisions VII f,g (Celtic Sea). Official nominal landings (t), 1986–2010, and data used by ICES (all catches are assumed to be landed).

Year	Belgium	Denmark	France	Ireland	UK(E.&W,Nl.)	UK(Scotland)	Netherlands	Total- Official	Unallocated	Used by ICES	TAC
1986	1039 *	2	146	188	611	-	3	1989	-389	1600	
1987	701 *	-	117	9	437	-	-	1264	-42	1222	1600
1988	705 *	-	110	72	317	-	-	1204	-58	1146	1100
1989	684 *	-	87	18	203	-	-	992	0	992	1000
1990	716 *	-	130	40	353	0	-	1239	-50	1189	1200
1991	982 *	-	80	32	402	0	-	1496	-389	1107	1200
1992	543 *	-	141	45	325	6	-	1060	-79	981	1200
1993	575 *	-	108	51	285	11	-	1030	-102	928	1100
1994	619 *	-	90	37	264	8	-	1018	-9	1009	1100
1995	763 *	-	88	20	294	-	-	1165	-8	1157	1100
1996	695 *	-	102	19	265	0	-	1081	-86	995	1000
1997	660 *	-	99	28	251	0	-	1038	-111	927	900
1998	675 *	-	98	42	198	-	-	1013	-138	875	850
1999	604	-	61	51	231	0	-	947	65	1012	960
2000	694	-	74	29	243	-	-	1040	51	1091	1160
2001	720	-	77	35	288	-	-	1120	48	1168	1020
2002	703	-	65	32	318	+	-	1118	227	1345	1070
2003	715	-	124	26	342	+	-	1207	185	1392	1240
2004	735	-	79	33	283	-	-	1130	119	1249	1050
2005	645	-	101	34	217	-	-	997	47	1044	1000
2006	576	-	75	38	232	-	-	921	25	946	950
2007	582	-	85	32	244	-	-	943	2	945	890
2008	466	-	68	28	218	-	-	780	20	800	964
2009	513	-	74	26	194	-	-	807	-2	805	993
2010	620	-	45	27	179	-	-	871	5	876	993
2011	766	-	50	30	168	-	-	1013	16	1029	1241
2012 ¹	827	-	48	33	170	-	-	1078	18	1096	1060

¹ Preliminary.

* Including Divisions VII g–k.

Table 5.4.37.3

Sole in Divisions VIIIf,g (Celtic Sea). Summary of stock assessment (all catches are assumed to be landed).

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4–8
1971	9602	8020	1861	0.3619
1972	4273	6325	1278	0.2654
1973	3385	5292	1391	0.2310
1974	3401	5668	1105	0.2328
1975	2972	5022	919	0.1983
1976	5192	4353	1350	0.3623
1977	4634	4670	961	0.2449
1978	5491	3757	780	0.1855
1979	3533	3880	954	0.2648
1980	5130	4017	1314	0.2915
1981	4859	3418	1212	0.3449
1982	4887	3554	1128	0.3322
1983	6793	3654	1373	0.4378
1984	4703	3914	1266	0.3966
1985	5655	3306	1328	0.4226
1986	3157	3366	1600	0.5244
1987	5738	2517	1222	0.5509
1988	4490	2707	1146	0.5353
1989	3718	2111	992	0.5111
1990	8602	2403	1189	0.6282
1991	4197	2133	1107	0.4586
1992	4455	2445	981	0.3875
1993	4426	2475	928	0.4383
1994	3410	2255	1009	0.5074
1995	3316	2152	1157	0.6343
1996	4050	2077	995	0.5633
1997	5470	1817	927	0.6601
1998	6288	1619	875	0.6575
1999	15144	1816	1012	0.5562
2000	7860	1938	1091	0.3525
2001	4158	3116	1168	0.4211
2002	6773	4090	1345	0.4379
2003	5198	3761	1392	0.5339
2004	5835	3521	1249	0.3614
2005	4977	3524	1044	0.3086
2006	3370	3071	946	0.2463
2007	3690	3256	945	0.3051
2008	9876	2956	800	0.2878
2009	7030	3423	805	0.2669
2010	1237	3575	876	0.3200
2011	4130	3778	1029	0.2616
2012	7338	3686	1096	0.4472
2013	4848*	3319		
Average	5286	3436	1123	0.3985

* Geometric mean (1971–2010).

ECOREGION Celtic Sea and West of Scotland
STOCK Sole in Divisions VIIh–k

Advice for 2014

Based on ICES approach to data-limited stocks, ICES advises that catches should be no more than 252 t in 2014. All catches are assumed to be landed.

Stock status

F (Fishing Mortality)	
2010–2012	
Qualitative evaluation	✓ Below possible reference points
SSB (Spawning-Stock Biomass)	
2009–2012	
Qualitative evaluation	↗ Increasing

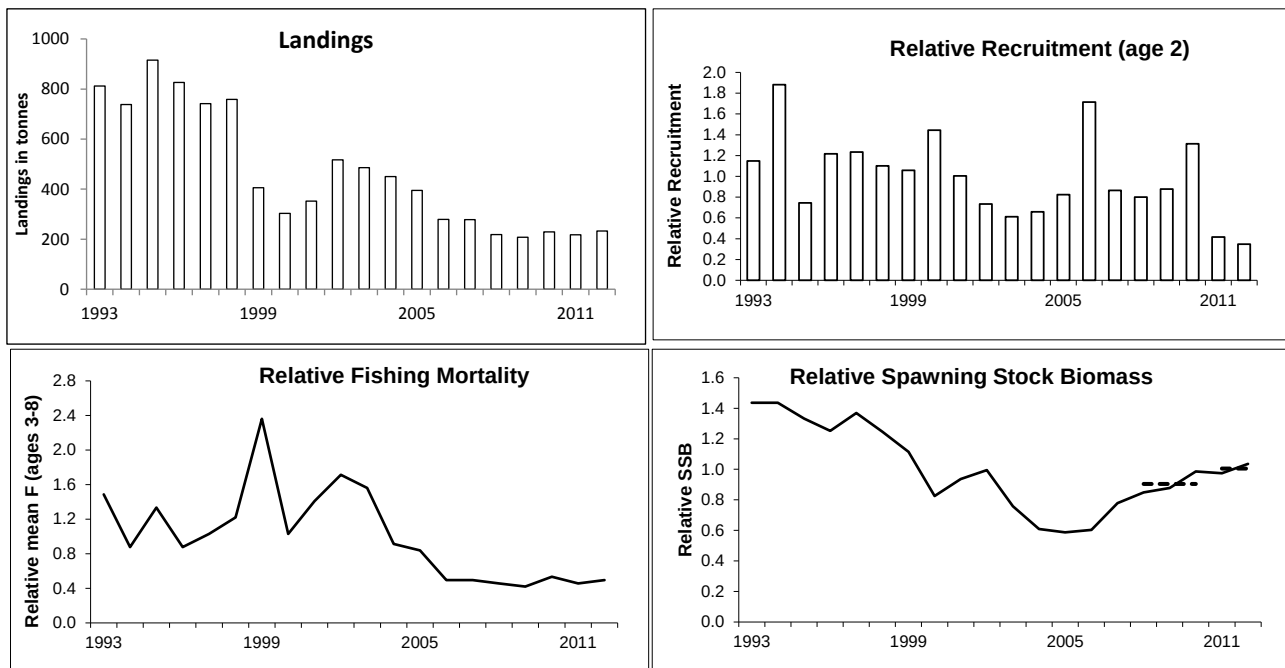


Figure 5.4.38.1 Sole in Divisions VIIh–k. Summary of stock assessment, based on Division VIIj,k ICES landings. Upper left panel: official landings from Division VIIh–k, in tonnes. Other panels: Recruitment, F, and SSB relative to the mean of the time-series. The dashed horizontal lines for SSB indicate 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).

Management plans

No specific management objectives are known to ICES.

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.

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 t. Discards are considered to be negligible.
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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.

Scientific basis

Assessment type	Separable VPA indicative of stock trends.
Stock data category	Category 3.2.0.
Input data	Commercial catches (international landings from Divisions VIIjk, Irish age composition from catch sampling); natural mortalities and maturity data from sole stock in Divisions VIIfg.
Discards and bycatch	Discards were not included in the assessment and are considered negligible.
Indicators	None.
Other information	This stock is scheduled to be benchmarked next year.
Working group report	WGCSE (ICES, 2013).

ECOREGION Celtic Sea and West of Scotland
STOCK Sole in Divisions VIIh–k**Reference points**

No reference points are defined for this stock. Previous defined reference points were provisional.

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.

Additional considerations***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.

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.

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.

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 VIIj–k. Advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings
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 by 20% PA reduction)	< 200	402		
2014	Increase catches by 20%	< 252			

Weights in tonnes.

Table 5.4.38.2

Sole in Divisions VIIh–k. Landings (t) per country as officially reported to ICES.

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Belgium	406	369	210	638	519	290	384	522	576	471
Denmark	-	-	-	-	-	-	-	-	-	-
France	390	143	207	19	103	23	29	27	107	104
Ireland	108	116	97	152	126	73	109	162	195	172
Netherlands	4	15	2	33	140	60	-	-	-	-
Spain	190	153	152	131	26	1	8	2	-	-
UK - Eng+Wales+N.	-	-	-	-	-	-	-	-	-	-
UK - England & Wal	6	5	24	11	12	11	18	42	83	108
UK - Scotland	-	-	-	-	-	-	-	-	-	-
Total	1104	801	692	984	926	458	548	755	961	855

Country	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Belgium	411	474	318	442	271	254	252	353	358	312
Denmark	-	-	-	-	-	-	-	-	-	-
France	176	120	25	38	44	53	84	66	55	43
Ireland	176	156	201	188	168	182	206	266	306	255
Netherlands	51	194	280	3	-	-	-	-	-	-
Spain	38	-	-	-	-	-	-	-	-	-
UK - Eng+Wales+N.	-	-	-	-	-	-	177	144	234	215
UK - England & Wal	129	151	200	261	193	166	-	-	-	-
UK - Scotland	-	-	-	-	-	-	-	-	-	2
Total	981	1095	1024	932	676	655	719	829	953	827

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Belgium	317	338	433	375	368	346	101	8	13	154
Denmark	-	-	-	-	-	-	-	-	-	-
France	44	42	47	50	58	74	-	79	103	108
Ireland	237	184	243	183	203	221	207	111	125	130
Netherlands	-	-	-	70	-	7	1	10	-	-
Spain	-	-	-	-	-	-	-	-	-	1
UK - Eng+Wales+N.	209	172	192	148	113	111	97	95	111	124
UK - England & Wal	-	-	-	-	-	-	-	-	-	-
UK - Scotland	5	2	-	-	-	-	-	-	-	-
Total	812	738	915	826	742	759	406	303	352	517
Unallocated				-383	-178	-336	-25	26	-27	-87
WG estimate				443	564	423	381	329	325	430

Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Belgium	170	157	90	36	31	10	11	20	10	17
Denmark	-	-	-	-	-	-	-	-	-	-
France	133	103	93	92	78	57	79	87	90	85
Ireland	105	111	98	63	78	72	60	71	64	85
Netherlands	-	-	-	1	-	-	-	-	-	-
Spain	-	-	2	-	-	-	-	-	-	-
UK - Eng+Wales+N.	78	79	112	87	91	80	58	51	54	46
UK - England & Wal	-	-	-	-	-	-	-	-	-	-
UK - Scotland	-	-	-	-	-	-	-	-	-	-
Total	486	450	395	279	278	219	208	229	218	233

Table 5.4.38.3

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.

Year	Landings	Recruitment (Age 2)	SSB	Mean F (3–8)
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

ECOREGION Celtic Sea and West of Scotland
STOCK Sprat in Subarea VI and Divisions VIIa–c and f–k (Celtic Sea and West of Scotland)

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 3 500 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”.

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.

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 VII d,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

Assessment type	No assessment.
Stock data category	Category 5.2.0.
Input data	Landing statistics.
Discards and bycatch	Not available.
Indicators	Indices from the Irish (AC(VIIaN)) and Celtic Sea Acoustic (CSHAS) surveys; the 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).
Other information	The stock was benchmarked in 2013 (ICES, 2013a), but this did not result in a revision of the assessment method.
Working group report	HAWG (ICES, 2013b).

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°N (HAWG), 14–21 March 2013 ICES CM 2013/ACOM:06.

Table 5.4.39.1

Sprat in the Celtic Sea and West of Scotland. ICES advice, management, and official landings.

Year	ICES Advice	Predicted catch corresp. to advice	ICES landings
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	-	-	4.5
2012	No increase in catch	-	11.4 ¹⁾
2013	20% reduction on catches (10-year average)	< 3.5	
2014	Same advice as last year	< 3.5	

Weights in thousand tonnes.

¹⁾ Preliminary.

ECOREGION Celtic Sea and West of Scotland
STOCK Sprat in Divisions VIIId,e

Advice 2014

Based on ICES approach to data-limited stocks, ICES advises that catches should be no more than 3832 tonnes. All catches are assumed to be landed.

Stock status

F (Fishing Mortality)	
2010–2012	
Qualitative evaluation	 Insufficient information
SSB (Spawning-Stock Biomass)	
2008–2012	
Qualitative evaluation	 Increasing

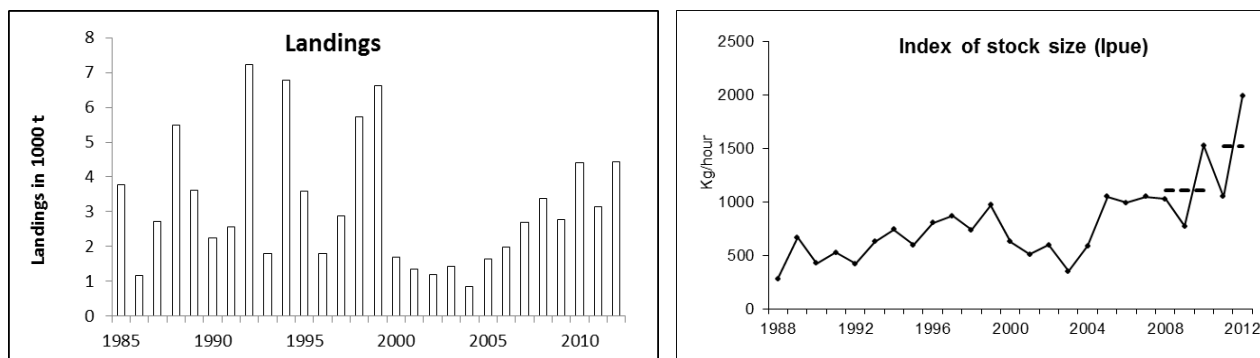


Figure 5.4.40.1 Sprat in Divisions VIIId,e. ICES landings (thousand tonnes). Lpue from the mid-water trawl (kg hour⁻¹).

The average lpue of mid-water trawl is considered a stock size indicator (kg hour⁻¹). In the last two years (2011–2012) it has been 137% higher than the average of the three previous years (2008–2010).

Biology

Sprat is a relatively short-lived species that shows large interannual variations in biomass, mainly driven by recruitment variability. Multispecies investigations in the North Sea have demonstrated that sprat is one of the important prey species in the North Sea ecosystem, for fish, seabirds, and sea mammals. At present, there are no data available on the total amount of sprat taken by these predators in this area.

The fisheries

Most of the sprat landings in this area are taken by the English fleet in the vicinity of Lyme Bay and are used for human consumption. The availability of sprat for the fishery does vary, with the occasional offshore movement of the sprat shoals in this area.

Catch distribution Total landings (2012) = 4435 t (100% are assumed to be landed and 100% caught by mid-water trawl).

Effects of the fisheries on the ecosystem

The fishery is primarily carried out by mid-water trawl which has negligible impact on the marine seabed.

Quality considerations

The stock structure of sprat populations in the Celtic Seas ecoregion is unknown (Section 5.4.39). ICES does not necessarily advocate that Divisions VII,d,e constitute a management unit for sprat, and further work is required.

The advice is based on an abundance index from landings per unit effort (lpue) used as an indicator of stock size. The uncertainty associated with the index values is not available. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	Lpue trends.
Stock data category	Category 3.2.0.
Input Data	Time-series of mid-water trawl lpue, landings statistics.
Discards and bycatch	Discards are not included in the assessment and are considered to be low.
Indicators	English sprat acoustic survey, surplus production model, and fishing effort data.
Other information	This stock was benchmarked in 2013 (ICES, 2013a).
Working group report	HAWG (ICES, 2013b).

ECOREGION Celtic Sea and West of Scotland
STOCK Sprat in Divisions VII_{d,e}

Reference points

No reference points are defined.

Outlook for 2014

No analytical assessment can be presented for this stock. The main cause of this is lack of fisheries-independent data. Therefore, fishing possibilities cannot be projected.

ICES approach to data limited stocks

For data-limited stocks for which a biomass index (i.e. *lpue*) 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 *lpue* 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 at most 20% in relation to the average catch of the last three years, corresponding to catches in 2014 of no more than 4790 tonnes. All catches are assumed to be landed.

Considering that the exploitation status is unknown, precautionary reduction is needed and a precautionary 20% buffer was applied. This results in catches of no more than 3832 tonnes in 2014.

Additional considerations

An acoustic survey in Division VII_e was carried out for the first time in 2011. Sprat biomass was estimated to be at a comparable level as the *lpue* from the mid-water trawl. A survey time-series of at least five years would be required to evaluate stock status on the basis of these data.

Most of sprat landings in this area are taken by the English fleet for human consumption. In recent years the fishery has been managed by applying the “use it or lose it” policy whereby TACs have been cut simply because catches have been “low”. The UK has a history of taking their quota, but sprat is found by sonar search and sometimes the shoals have been too far offshore for sensible economic exploitation.

Management considerations

The “Joint statement by the Council and the Commission” (Council of the European Union Document [Doc 5315/13 PECH](#) 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.

Sprat TAC unit VII_{d,e} is included in the list of the Joint statement by the Council and the Commission.

Data and methods

An exploratory analysis of landings per unit effort (*lpue*), based on the data from the English trawlers targeting sprat and the 2011 and 2012 acoustic surveys, was performed in the Benchmark Workshop (ICES, 2013a). Two statistically different surplus production models were run in parallel and gave similar results. Although *lpue* data should be interpreted with caution when based on landings from a shoaling species such as sprat, ICES concluded that the *lpue*

series can be used as an indicator of stock trends. The catch advice was based on trends in the *lpue* series. The *lpue* data correspond to 94% of the landings in Divisions VIIId,e. The index is computed from August to March of the following year.

Comparison with previous advice

The advice last year was based on the ICES data-limited method 5.2.0 (landings only). This year the advice is based on the ICES approach to data-limited stocks method 3.2.0 (using the *lpue* trends from the mid-water trawlers).

Sources

Council of the European Union Document Doc 5315/13 PECHE 15, 15 January 2013. “Joint statement by the Council and the Commission”.

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°N (HAWG), 16–24 March 2013. ICES CM 2013/ACOM:06.

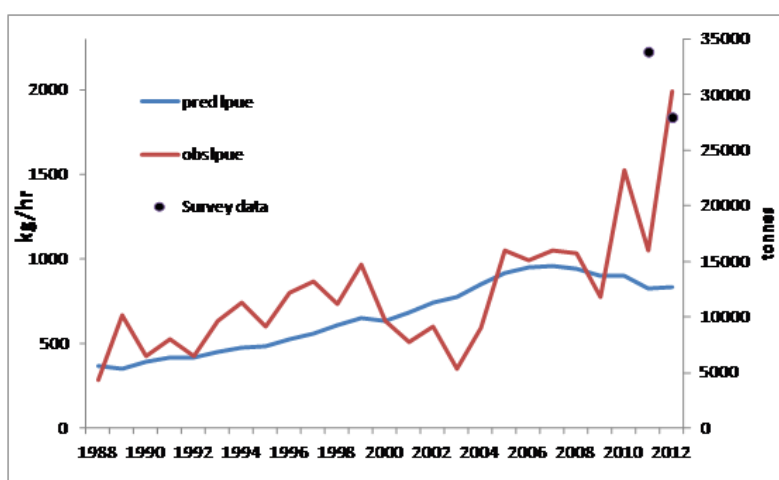


Figure 5.4.40.2 Sprat in Divisions VIIId,e. Surplus production model fit (blue line, *pred lpue*) to the commercial landings per unit effort (red line, *obs lpue*) data and the acoustic survey (*Survey data*) estimates of 33 861 tonnes in 2011 and 27 971 tonnes in 2012.

Table 5.4.40.1 Sprat in Divisions VIIId,e. ICES advice, management, official landings, and ICES catch.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES catch
1987	No advice	-	5	2.7	2.7
1988	No advice	-	5	5.5	5.5
1989	No advice	-	12	3.4	3.6
1990	No advice	-	12	2.1	2.2
1991	No advice	-	12	2.6	2.6
1992	No advice	-	12	1.8	7.2
1993	No advice	-	12	1.8	1.8
1994	No advice	-	12	3.2	6.8
1995	No advice	-	12	1.5	3.6
1996	No advice	-	12	1.8	1.8
1997	No advice	-	12	1.6	2.9
1998	No advice	-	12	2.0	5.7
1999	No advice	-	6.3	3.6	6.6
2000	No advice	-	12	1.7	1.7
2001	No advice	-	12	1.3	1.3
2002	No advice	-	12	1.2	1.2
2003	No advice	-	9.6	1.4	1.4
2004	No advice	-	9.6	0.8	0.8
2005	No advice	-	7.7	1.6	1.6
2006	No advice	-	6.1	2.0	2.0
2007	No advice	-	6.1	1.8	2.7
2008	No advice	-	6.1	3.4	3.4
2009	No advice	-	6.1	2.8	2.8
2010	No advice	-	5.5	4.4	4.4
2011	No advice	-	5.4	3.1	3.1
2012	Reduce catches	-	5.1	4.4	4.4
2013	20% reduction in catches (last 3-year average)	< 2.8	4.1		
2014	Decrease catches by 4% (20% increased followed by a 20% precautionary reduction)	< 3.832			

Weights in thousand tonnes.

Table 5.4.40.2 Sprat in Divisions VII,d,e. Official landings (thousand tonnes) by country.

Year	Belgium	Denmark	Faeroe Islands	France	Germany	Ireland	Isle of Man	Netherlands	Norway	Poland	Spain	Sweden	UK - England & Wales	UK - Scotland	Un. Sov. Soc. Rep.	Total
1950	0	0	0	240	0	346	0	0	0	0	0	0	1434	0	0	2020
1951	0	0	0	700	0	88	0	0	0	0	0	0	1672	4	0	2464
1952	0	0	0	418	2	10	0	0	0	0	0	0	2236	6	0	2672
1953	0	0	0	308	0	20	0	0	0	0	0	0	1709	0	0	2037
1954	0	0	0	636	0	85	0	0	0	0	0	0	764	0	0	1485
1955	0	0	0	865	0	74	0	0	0	0	0	0	742	0	0	1681
1956	0	0	0	652	0	9	0	0	0	0	0	0	998	0	0	1659
1957	0	0	0	849	0	824	0	0	0	6	0	0	762	124	0	2565
1958	0	0	0	557	0	8	0	0	0	0	0	0	1254	91	0	1910
1959	0	0	0	725	0	22	0	0	0	2	0	0	1093	0	0	1842
1960	0	0	0	460	0	5	0	0	0	17	0	0	946	0	0	1428
1961	0	0	0	280	0	1380	0	0	0	0	0	0	1068	76	0	2804
1962	0	0	0	261	0	95	0	48	0	0	0	0	1836	2193	0	4433
1963	0	0	0	573	0	419	0	0	0	0	0	0	1259	1306	0	3557
1964	0	0	0	35	0	1696	0	0	0	2	0	0	3446	1809	0	6988
1965	0	0	0	700	0	1508	0	0	0	0	0	0	4623	687	0	7518
1966	0	0	0	1002	1	1550	0	0	0	0	0	0	2069	81	0	4703
1967	0	0	0	768	68	494	0	0	0	0	0	7302	2556	9	0	11197
1968	0	0	0	451	8	1428	0	3	0	0	0	9264	2309	3854	0	17317
1969	0	0	0	435	1	2358	0	34	0	0	0	3885	2456	2910	0	12079
1970	0	0	0	599	0	5476	0	20	0	0	0	10864	2699	5241	0	24899
1971	0	0	0	501	0	5536	0	49	0	0	0	12196	2212	1179	0	21673
1972	0	0	0	488	0	5845	0	213	0	11	0	11334	1378	5225	0	24494
1973	13	0	1	1269	43	7641	0	719	0	81	0	0	1994	7501	0	19262
1974	0	0	109	520	641	7310	0	1047	0	58	0	0	3298	6429	0	19412
1975	0	0	56	147	719	3505	0	2122	0	104	0	0	1349	8187	30	16219
1976	0	447	187	117	1633	8577	0	1439	35	0	0	0	3158	5764	0	21357
1977	0	74	0	120	5155	6060	0	1617	267	0	0	0	2938	3772	0	20003
1978	0	2055	0	225	3204	9118	0	3052	0	0	0	0	2144	12084	0	31882
1979	0	9981	0	2373	2373	1893	0	1094	1908	0	0	0	2064	1099	0	22785
1980	0	7483	0	1867	629	9350	0	4355	65	0	0	0	7013	3015	0	33777
1981	0	2787	0	146	6	4676	0	4598	0	0	0	0	10298	1488	0	23999
1982	0	286	0	44	0	4109	0	7135	0	0	0	0	4792	1057	0	17423
1983	3	638	0	60	0	5511	0	4687	0	0	0	0	4761	1971	0	17631
1984	0	1417	0	47	0	4655	0	831	0	0	0	0	2408	2456	0	11814
1985	0	0	0	14	0	3964	0	273	557	0	0	0	3791	2946	0	11545
1986	0	553	0	0	0	4532	1	0	0	0	0	0	1173	520	0	6779
1987	0	519	0	24	0	2230	0	0	0	0	0	0	2441	582	0	5796
1988	0	2893	0	2	0	853	0	1	0	0	0	0	2948	3870	0	10567
1989	0	2092	0	10	0	1163	0	0	0	0	0	0	1320	1146	0	5731
1990	0	608	0	0	0	1325	0	0	0	0	0	0	1508	813	0	4254

Table 5.4.40.2 (continued) Sprat in Divisions VII,d,e. Official landings (thousand tonnes) by country.

Year	Belgium	Denmark	Faeroe Islands	France	Germany	Ireland	Isle of Man	Netherlands	Norway	Poland	Spain	Sweden	UK - England & Wales	UK - Scotland	Un. Sov. Soc. Rep.	Total
1991	0	0	0	0	0	205	0	0	0	0	0	0	2571	1526	0	4302
1992	0	28	0	35	0	508	0	0	0	0	0	0	1790	1555	0	3916
1993	0	22	0	2	0	2353	0	0	0	0	0	0	1798	2230	0	6405
1994	0	0	0	1	0	232	0	0	0	0	0	0	3179	1491	0	4903
1995	0	491	0	0	0	799	0	0	0	0	0	0	1545	4124	0	6959
1996	0	0	0	0	0	4214	0	0	0	0	0	0	1789	2418	0	8421
1997	0	0	0	0	0	2085	0	0	0	0	0	0	1629	5313	0	9027
1998	0	40	0	0	0	1578	0	0	0	0	0	0	2078	2749	0	6445
1999	0	0	0	0	0	5826	0	1	0	0	0	0	4015	8160	0	18002
2000	0	0	0	18	0	6032	0	1	0	0	0	0	2063	4238	0	12352
2001	0	0	0	0	0	455	0	0	0	0	0	0	1716	1297	0	3468
2002	0	0	0	0	0	1729	0	0	0	0	0	0	1502	2657	0	5888
2003	0	887	0	0	0	4948	0	0	0	0	0	0	1969	2593	0	10397
2004	0	0	0	0	0	4096	0	0	0	0	0	0	970	1416	0	6482
2005	0	0	252	0	0	5928	0	0	0	0	0	0	2239	894	0	9313
2006	0	0	0	0	0	1523	0	0	0	0	0	0	2537	0	0	4060
2007	0	0	0	0	0	3745	0	0	0	0	1	0	1821	14	0	5581
2008	0	0	0	0	0	2353	0	0	0	0	0	0	3368	0	0	5721
2009	0	0	0	0	0	3773	0	0	0	0	0	0	2766	70	0	6609
2010	0	0	0	3	0	3189	0	0	0	0	0	0	4411	537	0	8140
2011	0	0	0	0	0	3753	0	0	0	0	0	0	3396	507	0	7656
2012	0	0	0	0	0	9663	0	0	0	0	0	0	4435	1688	0	15798

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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.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	?	?	? Unknown
Precautionary approach (F_{pa}, F_{lim})	✓	✓	✓ Harvested sustainably

SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	?	?	? Unknown
Precautionary approach (B_{pa}, B_{lim})	✗	✗	✗ Reduced reproductive capacity

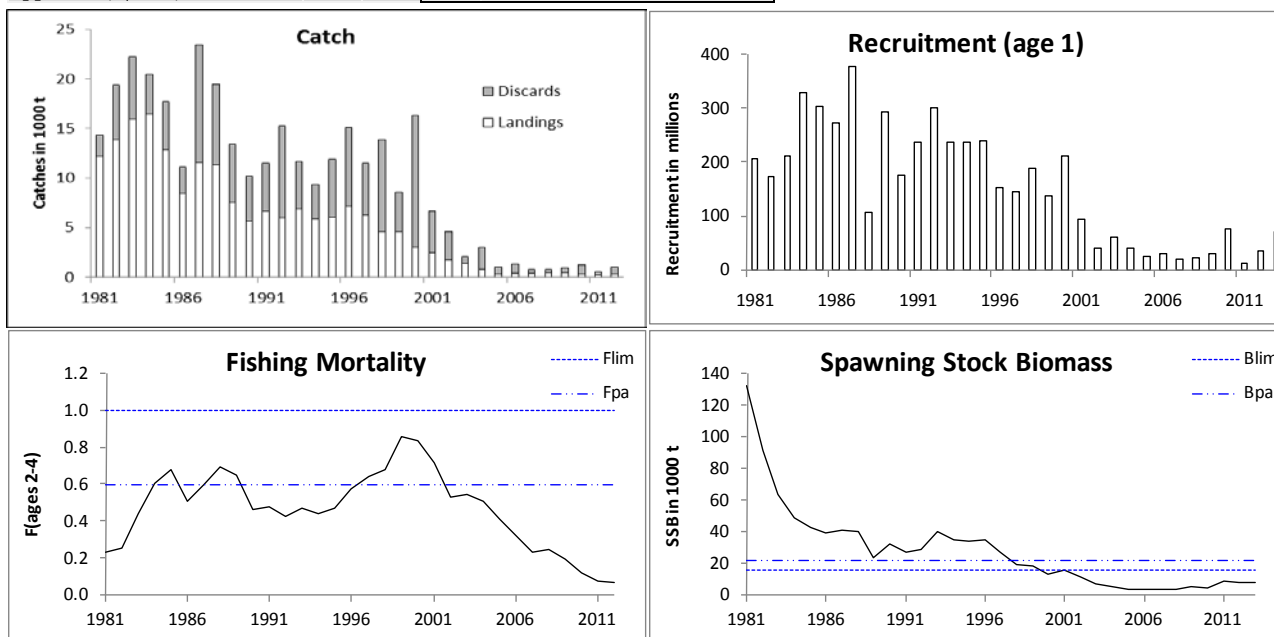
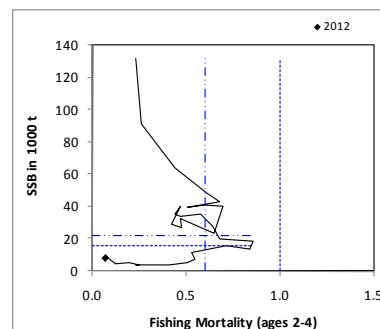


Figure 5.4.41.1 Whiting in Division VIa (West of Scotland). Observed catches and summary of stock assessment (weights in thousand tonnes). Top right: SSB and F for the time-series used in the assessment.

The spawning-stock biomass remains very low compared to the historical estimates (and well below B_{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.

Management plans

No specific management objectives are known to ICES.

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.

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 m trawlers. Since 2000 there has been a big reduction in the large-meshed (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.

Catch distribution Total catch (2012) = 1041 t (30% landings (313 t) and 70% discards).

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.

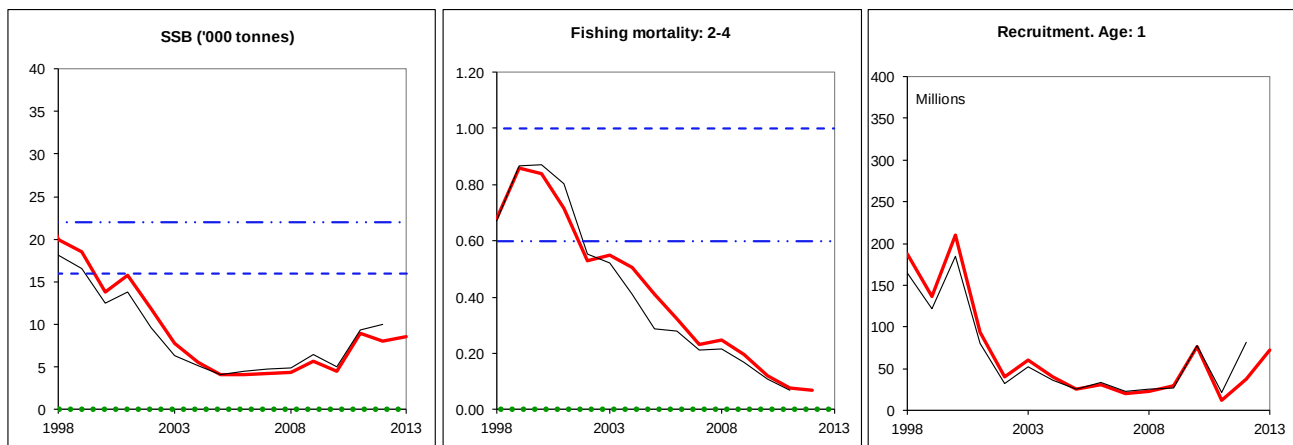


Figure 5.4.41.2 Whiting in Division VIa (West of Scotland). Historical assessment results (final-year recruitment estimates are included).

Scientific basis

Assessment type	Age-based analytic assessment (TSA).
Stock category	Category 1.
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.
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.
Indicators	Surveys: UKSGFS-WIBTS-Q1 and UKSGFS-WIBTS-Q4.
Other information	The stock was benchmarked in 2012 (WKROUND; ICES, 2012).
Working group report	WGCSE (ICES, 2013).

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Reference points

	Type	Value	Technical basis
MSY approach	MSY B_{trigger}	Not defined.	
	F_{MSY}	Not defined.	
Precautionary approach	B_{lim}	16 000 t	$B_{\text{lim}} = B_{\text{loss}}(1998)$, the lowest observed spawning stock estimated in previous assessments.
	B_{pa}	22 000 t	$B_{\text{pa}} = B_{\text{lim}} \times 1.4$. This is considered to be the minimum SSB required to have a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of assessments.
	F_{lim}	1.0	F_{lim} is the fishing mortality above which stock decline has been observed.
	F_{pa}	0.6	$F_{\text{pa}} = 0.6 \times F_{\text{lim}}$. This F is considered to have a high probability of avoiding F_{lim} .

(unchanged since: 1998)

Outlook for 2014

Basis: $F(2013) = F_{\text{sq}}(2010\text{--}2012 \text{ rescaled to } 2012) = 0.07$; $\text{SSB}(2014) = 11\,200$; $R(2013) = 72.8$ million; landings (2013) = 339;
Discards (2013) = 300.

Rationale	Catch Total (2014)	Landings (2014)	Discards (2014)	Basis	F Total (2014)	F Landings (2014)	F Discards (2014)	SSB (2015)	% SSB change ¹⁾
Precautionary approach	0	0	0	B_{pa}	0	0	0	12100	8.0%
Zero catch	0	0	0	$F = 0$	0	0	0	12100	8.0%
Other options	126	65	62	$F_{2013} \times 0.2$	0.014	0.007	0.007	11940	6.6%
	251	128	123	$F_{2013} \times 0.4$	0.028	0.013	0.014	11780	5.2%
	375	191	183	$F_{2013} \times 0.6$	0.042	0.02	0.021	11630	3.8%
	496	253	243	$F_{2013} \times 0.8$	0.054	0.026	0.028	11480	2.5%
	616	314	302	$F_{2013} \times 1.0$	0.069	0.033	0.036	11330	1.2%
	735	374	361	$F_{2013} \times 1.2$	0.082	0.04	0.042	11180	-0.2%

Weights in tonnes.

¹⁾ SSB 2015 relative to SSB 2014.

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.

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.

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.

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).

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.

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.

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.

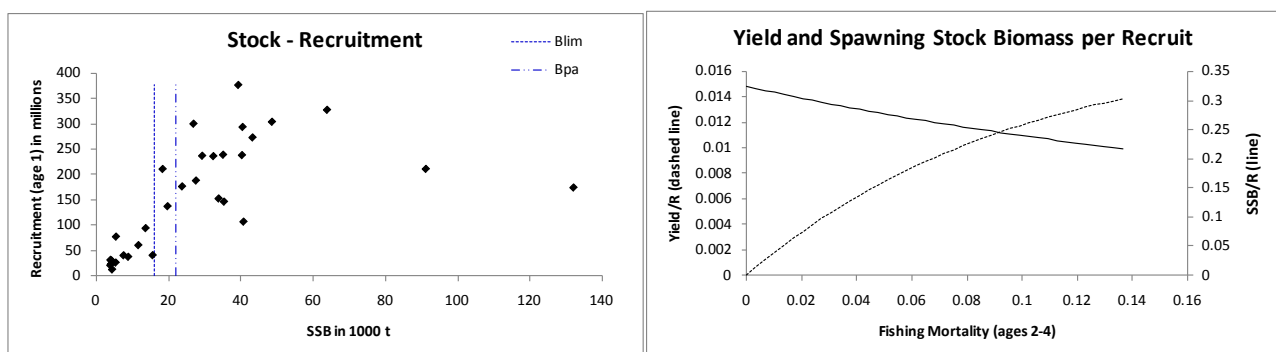


Figure 5.4.41.3 Whiting in Division VIa (West of Scotland). Stock–recruitment relationship (left panel) and yield-per-recruit analysis (right panel).

Table 5.4.41.1 Whiting in Division VIa (West of Scotland). ICES advice, management, catch, and landings.

Year	ICES Advice / Single-stock exploitation boundaries since 2004	Predicted catch corresp.	Agreed TAC ¹	Official landings	ICES landings	Discards	ICES catch
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		to advice					
1987	No increase in F	15.0	16.4	12.4	11.5	6.9	18.4
1988	No increase in F; TAC	15.0	16.4	11.9	11.4	11.8	23.1
1989	No increase in F; TAC	13.0	16.4	7.7	7.5	4.1	11.6
1990	No increase in F; TAC	11.0	11.0	6.0	5.6	4.4	10.0
1991	70% of effort (89)	-	9.0	6.9	6.7	5.3	12.0
1992	70% of effort (89)	-	7.5	6.0	6.0	9.4	15.4
1993	70% of effort (89)	-	8.7	6.8	6.9	8.5	15.4
1994	30% reduction in effort	-	6.8	5.8	5.9	8.9	14.8
1995	Significant reduction in effort	-	6.8	6.3	6.1	7.6	13.7
1996	Significant reduction in effort	-	10.0	6.6	7.2	6.9	14.1
1997	Significant reduction in effort	-	13.0	6.2	6.3	4.9	11.2
1998	No increase in F	6.5	9.0	4.7	4.6	5.8	10.5
1999	Reduce F below F_{pa}	4.3	6.3	4.7	4.6	3.1	7.7
2000	Reduce F below F_{pa}	< 4.3	4.3	3.2	3.0	6.7	9.7
2001	Reduce F below F_{pa}	< 4.2	4.0	2.5	2.4	2.4	4.9
2002	SSB > B_{pa} in the short term	< 2.0	3.5	1.7	1.7	2.1	3.8
2003	No cod catches	-	2.0	1.3	1.3	1.6	2.9
2004	SSB > B_{pa} in the short term ²	< 2.1 ³	1.6	0.8	0.8	2.6	3.4
2005	Exploitation not allowed to increase	< 1.6	1.6	0.29	0.3	0.9	1.2
2006	Lowest possible level	0	1.36	0.38	0.4	0.9	1.3
2007	Lowest possible level	0	1.02	0.48	0.5	0.3	0.8
2008	Lowest possible level	0	0.765	0.44	0.4	0.2	0.4
2009	Same advice as last year	0	0.574	0.49	0.5	0.4	0.9
2010	Same advice as last year	0	0.431	0.35	0.3	0.9	1.2
2011	See scenarios	-	0.323	0.23	0.2	0.3	0.6
2012	Reduce catches	-	0.307 ²	0.30	0.3	0.7	1.0
2013	Lowest possible catch, improve selectivity	0	0.292 ²				
2014	Lowest possible catch, improve selectivity	0					

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.

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
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	3
Germany	+	+	+	1	1	+	-	+	-	-	+	-	-	-	-	-	-	+	1	-
Ireland	1 315	977	1 200	1 377	1 192	1 213	1 448	1 182	977	952	1 121	793	764	577	568	356	172	196	56	69
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.)	6 109	4 819	5 135	4 330	5 224	4 149	4 263	5 021	4 638	3 369	3 046	2 258	1 654	1 064	751	444	103	178	424	-
UK (total)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	369
Total landings	7 669	6 026	6 908	6 010	6 751	5 786	6 278	6 642	6 178	4 657	4 677	3 203	2 543	1 735	1 365	819	289	383	484	441

Country	2009	2010	2011	2012*
Belgium	-	-	-	-
Denmark	-	-	-	-
Faroe Islands	-	+	+	1
France	1	3	2	+
Germany	-	-	-	-
Ireland	125	99	149	96
Norway	2	-	-	-
Spain	-	-	-	-
UK (E W & NI)	-	-	-	-
UK (Scot.)	-	-	-	-
UK (total)	354	247	80	204
Total landings	482	349	231	300

* Preliminary.

Table 5.4.41.3 Whiting in Division VIa (West of Scotland). Summary of stock assessment (weights in tonnes). SE = standard error.

Year	Landings (tonnes)			Discards (tonnes)			Total catches (tonnes)			Mean F(2–4)		SSB (tonnes)		TSB (tonnes)		Recruitment (thousands at age 1)	
	Obs.	Pre d.	SE	Obs.	Pre d.	SE	Obs.	Pre d.	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
1981	121	106	27	213	486	20	143	155	17		0.0	13228	149	16777	190	20641	
1982	94	51	21	2	3	92	25	14	67	0.232	34	8	75	7	69	4	47769
1983	138	133	18	548	399	12	193	173	19		0.0		103	11014	133	17404	
1984	80	54	18	5	6	38	66	50	71	0.258	44	91403	55	8	60	6	51621
1985	159	172	18	629	525	14	222	224	24		0.0		867		137	21090	
1986	62	24	39	4	9	12	57	83	90	0.439	83	64060	8	95952	05	9	55201
1987	164	152	14	401	631	15	204	215	23		0.0		563		861	32786	
1988	59	09	72	7	5	52	76	24	52	0.607	89	48810	2	84674	7	3	49319
1989	128	118	12	484	721	15	177	190	20		0.0		473		747	30419	
1990	79	45	90	0	4	92	19	59	71	0.677	98	43428	1	79260	1	7	38750
1991	845	794	89	266	497	11	111	129	14		0.0		402		727	27317	
1992	8	9	7	9	3	11	27	22	93	0.506	80	39479	1	71392	8	8	39480
1993	115	101	98	119	713	15	234	172	20		0.0		363		670	37711	
1994	42	06	9	18	6	93	60	42	17	0.599	92	40924	4	75379	4	3	49037
1995	113	105	10	813	485	10	194	154	15		0.1		390		602	10646	
1996	49	94	33	2	3	90	81	48	49	0.696	22	40673	2	49419	3	1	38341
1997	752	729	77	587	567	13	133	129	16		0.1		388		732	29393	
1998	3	5	4	6	2	25	99	67	59	0.651	25	23929	8	54620	4	0	43292
1999	564	562	62	453	474	11	101	103	13		0.0		425		952	17627	
2000	2	8	1	0	4	20	72	72	63	0.466	96	32573	3	56791	7	1	46737
2001	665	546	57	488	423	92	115	969	12		0.0		358		709	23617	
2002	8	6	8	3	3	4	41	9	09	0.478	93	27078	4	50499	8	7	44106
2003	600	506	61	924	543	12	152	105	15		0.1		417		856	30036	
2004	5	5	5	9	5	42	53	00	74	0.424	02	29488	4	63501	5	2	47143
2005	687	624	67	475	625	13	116	125	15		0.1		565		102	23693	
2006	2	8	4	9	3	22	31	00	98	0.469	05	40506	9	69585	99	6	48508
2007	590	584	63	345	461	92	935	104	12		0.0		529		860	23817	
2008	1	0	3	5	4	9	6	55	11	0.441	92	35282	5	57181	9	6	49069
2009	607	650	10	577	465	10	118	111	18		0.0		357		476	23899	
2010	8	8	87	1	9	21	49	67	16	0.468	70	34034	1	52224	1	2	30202
2011	715	724	13	794	599	13	150	132	23		0.0		333		475	15237	
2012	8	4	56	0	6	76	98	41	96	0.577	90	35533	1	50444	0	0	24963
2013	629	671	11	525	575	13	115	124	21		0.1		293		547	14608	
2014	0	9	39	1	8	72	42	77	88	0.640	10	27766	8	44601	8	9	29939
2015	462	489	86	921	612	15	138	110	20		0.1		319		612	18790	
2016	7	8	3	6	0	15	43	19	92	0.681	06	19900	7	38653	1	2	36576
2017	461	432	95	397	568	14	858	100	21		0.1		376		649	13701	
2018	3	4	1	5	1	87	8	05	96	0.858	18	18532	1	30696	1	1	37556
2019	301	321	92	132	560	15	162	882	22		0.1		370		655	21072	
2020	1	0	3	85	9	95	96	0	82	0.837	06	13822	3	29710	1	9	45229
2021	243	277	79	426	439	13	670	716	19		0.1		403		690		
2022	9	5	3	3	2	45	2	7	88	0.714	05	15773	4	25130	8	93622	33088
2023	176	217	66	285	181	71	461	398	13		0.0		317		482		
2024	7	6	3	1	1	9	8	6	02	0.528	81	11819	4	14779	7	40120	26679
2025	135	181	58		153	70	207	334	12		0.0		280		474		
2026	5	3	6	719	5	9	4	7	25	0.547	85	7714	4	12721	2	59949	26547
2027		100	38	215	131	62	297	231	96		0.0		220		343		
2028	811	5	3	9	3	1	0	8	0	0.505	89	5532	6	8976	6	39870	16811
2029			17			25		138	39		0.0				130		
2030	341	640	3	629	744	8	970	3	8	0.411	82	4088	841	6353	1	25464	6907

Table 5.4.41.3 (cont.)

Year	Landings (tonnes)		Discards (tonnes)		Total catches (tonnes)		Mean F(2–4)		SSB (tonnes)		TSB (tonnes)		Recruitment (thousands at age 1)	
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	Ob s.	Pre d.	SE	Ob s.	Pre d.	SE	Obs .	Pre d.	SE	Estim ate	SE	Estim ate	SE	Estim ate	SE	Estimate	S E
200							12	132	107		0.0					309	490
6	380	549	65	946	531	1	6	9	160	0.322	51	4051	588	5517	760	05	3
200											0.0					203	500
7	427	440	47	317	390	91	745	830	116	0.231	45	4284	558	5989	907	86	7
200						11					0.0					104	231
8	445	447	47	314	485	4	759	931	140	0.248	47	4353	721	6120	7	03	3
200						10					0.0		100			124	296
9	488	438	49	419	436	1	908	874	129	0.195	37	5622	6	7204	6	64	1
201							120				0.0					122	768
0	307	340	39	893	353	88	0	693	107	0.121	26	4558	830	7542	8	46	92
201											0.0		144			158	118
1	230	265	30	339	213	53	569	478	71	0.076	16	9007	2	9361	2	20	1
201							103				0.0		158	1013	247	368	186
2	313	296	39	727	216	69	9 ¹⁾	512	92	0.069	16	8028	3	9	8	80	33
201			12			11					0.0		242	1158	310	728	251
3*	NA	396	5	NA	276	3	NA	672	219	0.071	27	8526	3	7	2	35	47

*Predictions from TSA.

¹⁾Total catches slightly different from 2012 catches in “catch distribution box” due to rounding of average weights in the calculation.

ECOREGION Celtic Sea and West of Scotland
STOCK Whiting in Division VIb (Rockall)

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.

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.

Scientific basis

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).

Outlook for 2015

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.

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.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹⁾	Official landings
2001	No advice	-	4000	14
2002	No advice	-	3500	7
2003	No advice	-	2000	13
2004	No advice	-	1600	4
2005	No advice	-	1600	4
2006	No advice	-	1360	105
2007	No advice	-	1020	17
2008	No advice	-	765	31
2009	No advice	-	547	16
2010	No advice	-	431	18
2011	No advice	-	323	9
2012	No increase in catch	-	307	1
2013	20% reduction in catches (last 3-year average)	11	292	
2014	Same advice as for 2013	11		
2015	Same advice as for 2013	11		

Weights in tonnes.

¹⁾ Subarea VI; EC waters of Division Vb; EC and international waters of Subareas XII and XIV.

ECOREGION Celtic Sea and West of Scotland
STOCK 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 ~50 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 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 TAC	Official landings	ICES landings	Disc. ²	ICES catch
1987	Reduce F	16.0	18.2	11.7	-	-	-
1988	No increase in F enforce mesh regulations	12.0	18.2	11.5	10.24	1.90	12.14
1989	F = F _{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 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) ~ 6 500 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 F _{pa}	3.5 ⁴	4.41	2.0	1.67	1.10	2.77
2000	Reduce F below F _{pa}	<1.6 ⁴	2.64	1.1	0.76	2.10	2.86
2001	Lowest possible F	~0	1.39	1.1	0.73	1.00	1.73
2002	Lowest possible F	~0	1.00	0.7	0.75	0.70	1.45
2003	Lowest possible F	~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.

ECOREGION Celtic Sea and West of Scotland
STOCK Whiting in Divisions VIIe–k

Advice for 2014

ICES advises based on the MSY approach that landings in 2014 should be no more than 15 562 tonnes. Discards are known to take place but cannot be quantified; therefore, total catches cannot be calculated.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✗	✓	✓ Appropriate
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined

SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	✓	✓	✓ Full reproductive capacity

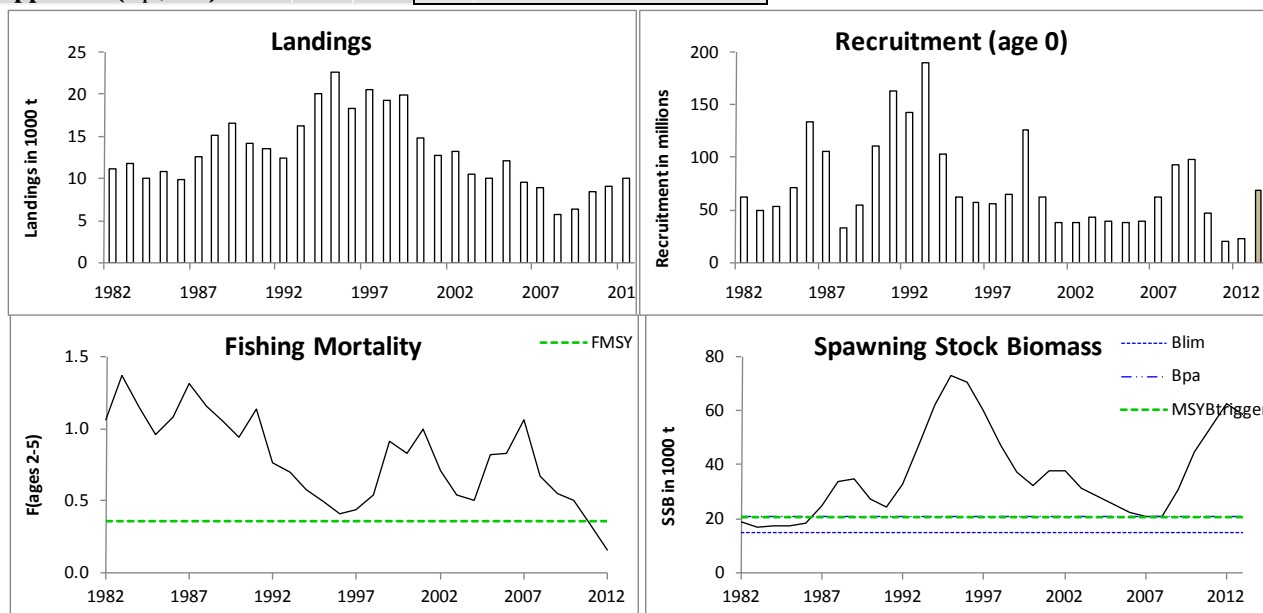
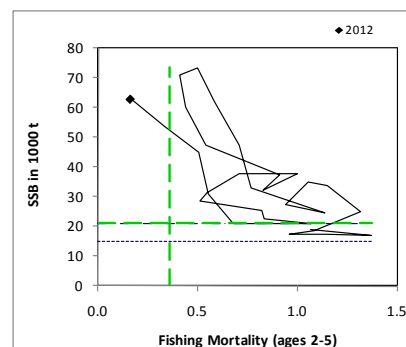


Figure 5.4.44.1 Whiting in Divisions VIIe–k. Summary of stock assessment (weights in thousand tonnes). Assumed recruitment values are shaded. Top right: SSB/F for the time-series used in the assessment.

Spawning-stock biomass has been increasing since 2008 and is well above MSY $B_{trigger}$. Fishing mortality has shown a declining trend since 2007 and has been below the F_{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.

Management plans

No specific management objectives are known to ICES.

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.

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.

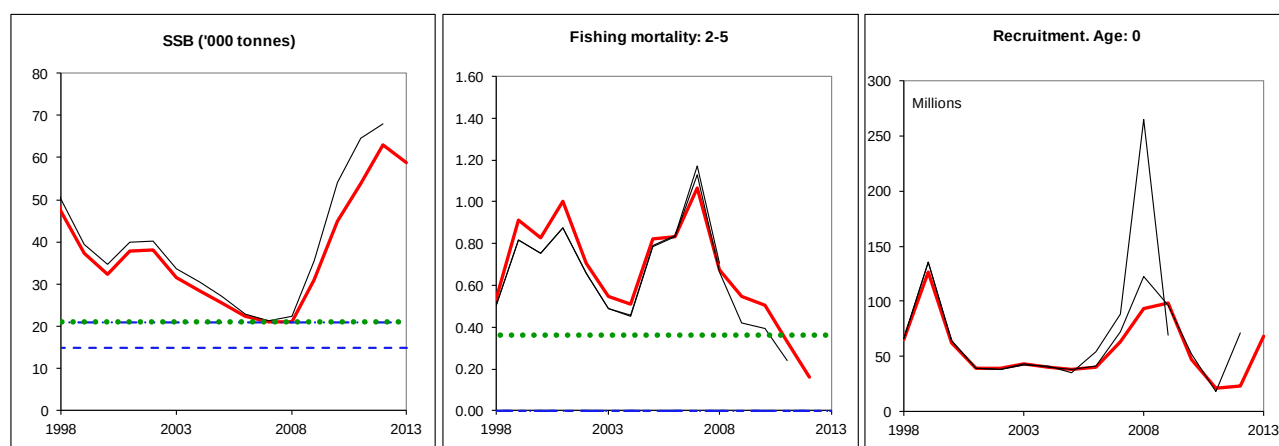


Figure 5.4.44.2 Whiting in Divisions VIIe–k. Historical assessment results (final-year recruitment estimates are included).

Scientific basis

Assessment type	Age-based analytical assessment (XSA).
Stock data category	Category 1.
Input data	Commercial catches (international landings and ages from catch sampling); three survey indices (EVHOE-WIBTS-Q4, IGFS-WIBTS-Q4, and UKWCGFS); two commercial indices up to 2008 (FR-Gadoid and FR- <i>Nephrops</i>); maturity based on data from UK 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).

ECOREGION Celtic Sea and West of Scotland
STOCK Whiting in Divisions VIIe–k

Reference points

	Type	Value	Technical basis
MSY Approach	MSY B_{trigger}	21 000 t.	Provisionally based on B_{pa} .
	F_{MSY}	0.36	$F_{35\% \text{ SPR}}$ by analogy with other gadoid stocks.
Precautionary Approach	B_{lim}	15 000 t.	B_{loss} , the lowest observed spawning-stock biomass.
	B_{pa}	21 000 t.	$B_{\text{pa}} = B_{\text{lim}} \times 1.4$. Biomass above this affords a high probability of maintaining SSB above B_{lim} , taking into account the uncertainty of the assessment.
Approach	F_{lim}	Undefined.	
	F_{pa}	Undefined.	

(Unchanged since: 2012).

Outlook for 2014

Basis: F (2013) = mean (2010–2012) = 0.33; SSB (2014) = 49 354; R (2013–2014) = $GM_{1982-2010}$ = 68.473 millions; Landings (2013) = 18 392.

Rationale	Landings (2014)	Basis	F_{landings} (2014)	SSB (2015)	%SSB change ¹⁾
MSY approach	15 562	F_{MSY}	0.36	45 329	–8%
Precautionary approach	38 505	B_{pa}	1.08	21 000	–57%
Zero catch	0	$F = 0$	0	62 023	26%
Other options	14 618	F_{2013}	0.33	46 331	–6%
	16 791	$F_{2013} \times 1.2$	0.40	44 027	–11%
	18 769	$F_{2013} \times 1.4$	0.46	41 938	–15%

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.

MSY approach

Following the ICES MSY framework implies fishing mortality at the F_{MSY} proxy (= 0.36), resulting in landings of no more than 15 562 tonnes in 2014. This is expected to lead to an SSB of 45 329 tonnes in 2015. Discards are known to occur, but cannot be quantified.

Precautionary approach

No precautionary fishing mortality reference points are defined. SSB is expected to remain far above B_{pa} , in the short term.

Additional considerations*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 NWWAC 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 VIIId 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.

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.

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).

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.

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 VIIId is considered to be part of the North Sea stock (Subarea IV and Division VIIId; Section 6.4.34). Whatever management measures are implemented, they must be consistent with the assessment area.

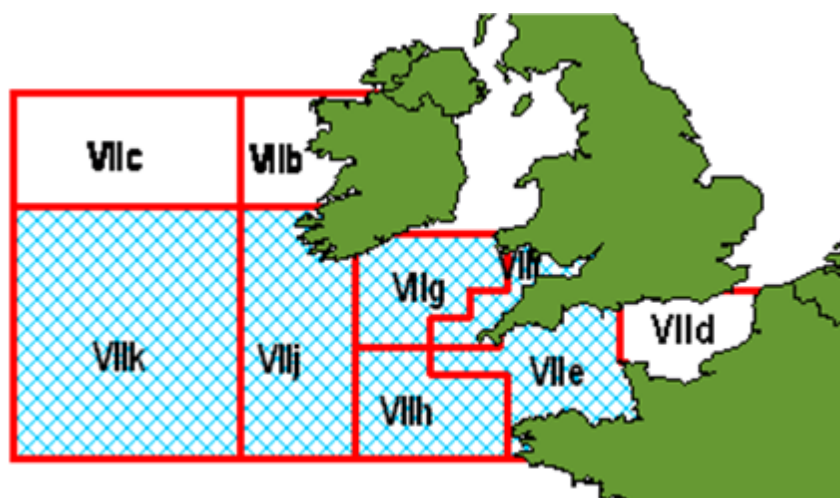


Figure 5.4.44.3 Whiting in Divisions VIIe–k. TAC area in the boxes outlined in red, assessment area in blue shading.

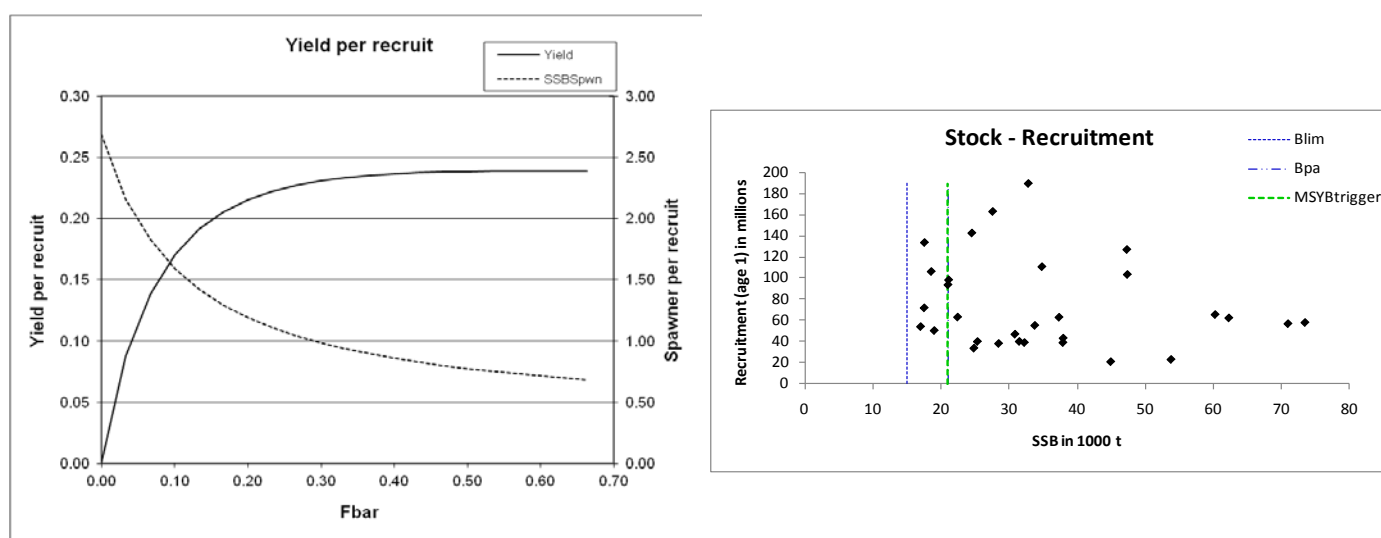


Figure 5.4.44.4 Whiting in Divisions VIIe-k. Yield-per-recruit analysis (left panel) and stock-recruitment plot (right panel).

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.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	ICES landings
1987	<i>Status quo</i> F; TAC	7.1 ²		12.7
1988	Precautionary TAC	7.0 ²		15.1
1989	Precautionary TAC	7.9 ²		16.5
1990	No increase in F; TAC	8.4 ²		14.1
1991	Precautionary TAC	8.0 ²		13.5
1992	If required, precautionary TAC	8.0 ²		12.4
1993	Within safe biological limits	6.6 ²	22.0	16.3
1994	Within safe biological limits	< 9.4 ²	22.0	20
1995	20% reduction in F	8.2 ³	25.0	22.7
1996	20% reduction in F	8.6 ³	26.0	18.3
1997	At least 20% reduction in F	< 7.3 ⁴	27.0	20.5
1998	At least 20% reduction in F	< 8.2 ⁴	27.0	19.2
1999	No increase in F	12.4 ⁴	25.0	19.9
2000	17% reduction in F	< 13.1 ⁴	22.2	14.9
2001	No increase in F	13.5 ⁴	21.0	12.8
2002	No increase in F	27.7 ⁴	31.7	13.1
2003	No increase in F	20.2 ⁴	31.7	10.6
2004	No increase in F	14.0	27.0	10
2005	No increase in F	10.6	21.6	12
2006	No increase in F	10.8	19.9	9.5
2007	No increase in F	-	19.9	8.9
2008	Reduction in F	-	19.9 ⁵	5.7
2009	Same advice as last year	-	16.95 ⁵	6.4
2010	Same advice as last year	-	14.407 ⁵	8.4
2011	See scenarios	-	16.658	9.1
2012	No increase catch and improved gear selection	-	19.053	10.0
2013	MSY approach ⁶	< 17.5	24.5	
2014	MSY approach ⁶	< 15.562		

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.

Table 5.4.44.2 Whiting in Divisions VIIe–k. Official landings (t) as reported to ICES, and total landings as used by the ICES Working Group.

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	130	158	160	107	112	159	295	317	304	111	145	228	205	268	449
Denmark															
France	7 572	4 024	7 819	7 763	9 773	10 947	19 771	19 348	10 006	9 620	11 285	13 535	13 400	9 936	11 370
Germany										14					
Ireland	1 511	1 227	2 241	1 309	1 518	2 036	1 651	1 764	1 403	1 875	3 630	5 053	6 077	6 115	6 893
Netherlands		398		124										8	
Spain													4	31	24
UK (E/W/Nl)	1 192	986	751	910	1 098	1 632	1 326	1 829	2 023	1 393	1 776	1 624	1 803	1 724	1 742
UK(Scotland)						1	33	32	20	41	16	23	23	34	42
United Kingdom															
Channel Islands			2	2	2								1	1	
Total	10 405	6 793	10 973	10 215	12 503	14 775	23 076	23 290	13 756	13 054	16 852	20 463	21 513	18 116	20 520
Unallocated	1 376	3 192	-135	-263	149	353	-6 535	-9 184	-248	-690	-532	-429	1 165	144	12
ICES landings	11 781	9 985	10 838	9 952	12 652	15 128	16 541	14 106	13 508	12 364	16 320	20 034	22 678	18 260	20 532

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*
Belgium	479	448	194	171	149	149	129	180	218	128	127	87	101	100	167
Denmark															
France	11 711	16 418 ^b	9 077	7 203	7 435	7 435	5 897	4 811	5 784	4 649	3 543	2 739	3 397	4 079	3 629
Germany															
Ireland	5 226	5 807	4 795	5 008	5 332	5 332	4 093	4 215	5 709	4 521	4 764	2 704	4 187	4 547	5 455
Netherlands	1			5	4	4	9	18	60	40	64	24	76	166	135
Spain	53	21	11	9	12	12	-	76	56	70	21	1	6	7	
UK (E/W/Nl)	1 706	1 344	1 249	943	843	843	758	586	471	402	569	764	757		
UK(Scotland)	68	3	2	11	12	12	5	7	-	6	4	63	35		
United Kingdom														739	749
Channel Islands	3	2	3	3	1	1	4	0	0	0	1	-	4	1	1
Total	19 247	24 043	15 331	13 353	13 788	13 788	10 895	9 893	12 298	9 816	9 093	6 382	8 563		10 136
Unallocated	-2	-4 128	-466	-583	-642	-3 205	-942	2 137	-2 765	-869	-3 356	-674	-139		-160
ICES landings	19 245	19 915	14 865	12 770	13 146	10 583	9 954	12 030	9 533	8 948	5 737	5 708	8 424	9 639	9 976

*Preliminary.

Table 5.4.44.3

Whiting in Divisions VIIe–k. Summary of stock assessment (weights in tonnes).

Year	Recruits Age 0	Total Biomass	SSB	Landings	Yield / SSB	Mean F(2 –5)
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			

*GM (1982–2010).