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**Book 5
Celtic Sea and West of Scotland**

International Council for the Exploration of the Sea

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5 CELTIC SEA AND WEST OF SCOTLAND

5.1 Ecosystem overview

This Section has not been updated in 2011. 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 Human impacts on the ecosystem

5.2.1 Fishery effects on benthos and fish communities

This Section has not been updated in 2011. The most recent description on Fishery effects on benthos and fish communities is available in ICES Advisory Report 2008, Section 5.2. This description 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>.

5.3 Assessments and Advice

5.3.1 Assessment and advice regarding protection of biota and habitats

In 2010, ICES has not provided advice regarding protection of biota and habitats for this area.

5.3.2 Assessments and Advice regarding fisheries





























Mixed fisheries and fisheries interactions

This Section has not been updated in 2011. 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>

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.

Table 5.3.2.1 State of the stock and advice for 2012 in the Celtic Seas ecoregion.

































Stock	State of the stock				Outlook options for 2012			ICES advice for 2012 (in tonnes or effort)
	Fishing mortality in relation to F_{MSY}	Fishing mortality in relation to precautionary limits (F_{PA}/F_{lim})	Spawning biomass in relation to $MSY B_{trigger}$	Spawning biomass in relation to precautionary limits (B_{PA}/B_{lim})	MSY approach (within the precautionary approach)	Precautionary approach considerations	Management plan	
Anglerfish (<i>L. piscatorius</i> and <i>L. budegassa</i>) in Divisions VIIb–k and VIIIa,b	Unknown ?	Unknown ?	Unknown ?	Unknown ?	-	Catches should be reduced	-	Precautionary considerations: catches should be reduced.
Anglerfish (<i>L. piscatorius</i> and <i>L. budegassa</i>) in Division IIa, IIIa, Subarea IV, and Subarea VI	Unknown ?	Unknown ?	Unknown ?	Unknown ?	-	Catches should be reduced	-	Precautionary considerations: catches should be reduced.
Cod in Division VIa (West of Scotland)	Unknown ?	Unknown ?	Below trigger ✗	Below B_{lim} ✗	Catches (mainly discards) of cod should be reduced to the lowest possible level.	Zero catch	-	Precautionary considerations: reduced to the lowest possible level.
Cod in Division VIb (Rockall)	Insufficient information ?	Insufficient information ?	Insufficient information ?	Insufficient information ?	-	No increase of the catch	-	Precautionary considerations: no increase of the catch.
Cod in Division VIIa (Irish Sea)	Above target ✗	Harvested unsustainably ✗	Below trigger ✗	Reduce reproductive capacity ✗	Zero catch	Zero catch	TAC and associated effort reduction of at least 25%	MSY approach: zero catch.
Cod in Divisions VIIe-k	Above target ✗	Harvested sustainably ✓	Above trigger ✓	Full reproductive capacity ✓	Landings less than 10 000 t	Landings less than 14 700 t	-	MSY approach: landings less than 10 000 t.
Haddock in Division VIa (West of Scotland)	At target ✓	Harvested sustainably ✓	Below trigger ✗	Reduced reproductive capacity ✗	Landings less than 10 200 t	Landings less than 15 700 t	TAC of 2506 t	MSY approach: landings more than 10 200 t. Selection pattern should be improved in the <i>Nephrops</i> (TR2) fleet.





















Stock	State of the stock				Outlook options for 2012			ICES advice for 2012 (in tonnes or effort)
	Fishing mortality in relation to F_{MSY}	Fishing mortality in relation to precautionary limits (F_{PA}/F_{lim})	Spawning biomass in relation to $MSY B_{trigger}$	Spawning biomass in relation to precautionary limits (B_{PA}/B_{lim})	MSY approach (within the precautionary approach)	Precautionary approach considerations	Management plan	
Haddock in Division VIb (Rockall)	Below target 	Harvest sustainably 	Above trigger 	Full reproductive capacity 	Landings of less than 3300 t	Landings less than 3800 t	-	MSY approach: landings no more than 3300 t.
Haddock in Division VIIa (Irish Sea)	Unknown 	Unknown 	Unknown 	Unknown 	-	Catches should be reduced, and uptake of further technical measures to reduce discards	-	Precautionary considerations: catches should be reduced, and uptake of further technical measures to reduce discards.
Haddock in Divisions VIIb-k	Unknown 	Unknown 	Unknown 	Unknown 	-	No increase in catches. Fishing effort should not be allowed to increase and technical measures should be introduced to reduce discards	-	Precautionary considerations: no increase in catch and technical measures to reduce discards rates.
Herring in VIa south and VIIb,c	Unknown 	Unknown 	Unknown 	Unknown 	-	Catches should be reduced	-	Precautionary considerations: catches should be reduced.
Herring in Division VIa North	Above target 	Undefined 	Undefined 	Above limit 	Landings less than 22 900 t	-	TAC of 22 900 t	Management plan: 22 900 t.
Herring in Division VIIa South of 52° 30' N and VIIg,h,j,k (Celtic Sea and South of Ireland)	Below target 	Undefined 	Undefined 	Full reproductive capacity 	Landings less than 26 900 t	-	TAC of 17 160 t	MSY approach: landings no more than 26 900 t.
Herring in Division VIIa North of 52° 30' N (Irish Sea)	Unknown 	Unknown 	Unknown 	Unknown 	-	Catches should not be allowed to increase	-	Precautionary considerations: catches should not be allowed to increase.

Stock	State of the stock				Outlook options for 2012			ICES advice for 2012 (in tonnes or effort)
	Fishing mortality in relation to F_{MSY}	Fishing mortality in relation to precautionary limits (F_{PA}/F_{lim})	Spawning biomass in relation to $MSY B_{trigger}$	Spawning biomass in relation to precautionary limits (B_{PA}/B_{lim})	MSY approach (within the precautionary approach)	Precautionary approach considerations /	Management plan	
Megrim (<i>Lepidorhombus whiffiagonis</i>) in Divisions VIIb–k and VIIIa,b,d ¹	Unknown ?	Unknown ?	Unknown ?	Unknown ?	Catch and effort reduction	No increase in catch and effort	-	MSY considerations: Catch and effort reduction.
Megrim (<i>Lepidorhombus</i> spp) in Divisions IVa and VIa)	Unknown ?	Unknown ?	Unknown ?	Unknown ?	-	Catches should not be allowed to increase	-	Precautionary considerations: catches should not be allowed to increase.
Megrim (<i>Lepidorhombus</i> spp) in ICES Division VIb (Rockall)	Unknown ?	Unknown ?	Unknown ?	Unknown ?	-	Catches should not be allowed to increase	-	Precautionary considerations: catches should not be allowed to increase
<i>Nephrops</i> in Division VIa, North Minch (FU11)	Below target ✓	Undefined ?	Above trigger ² ✓	Undefined ⁴ ?	Landings less than 3200 t	-	-	MSY approach: landings should be no more than 3200 t
<i>Nephrops</i> in Division VIa, South Minch (FU12)	Below target ✓	Undefined ?	Above trigger ⁴ ✓	Undefined ⁴ ?	Landings less than 5500 t	-	-	MSY approach: landings should be no more than 5500 t
<i>Nephrops</i> in the Firth of Clyde + Sound of Jura (FU 13)	Firth of Clyde: Above target ✗ Sound of Jura: Below target ✓	Firth of Clyde: Undefined ? Sound of Jura: Undefined ?	Firth of Clyde: Above trigger ⁴ ✓ Sound of Jura: Undefined ⁴ ?	Firth of Clyde: Undefined ⁴ ? Sound of Jura: Undefined ⁴ ?	Firth of Clyde: in landings of less than 4200 t Sound of Jura: in landings of less than 900 t	-	-	MSY approach: landings should be no more than 5100 t (4200 t for Firth of Clyde and 900 t for Sound of Jura).
<i>Nephrops</i> in Irish Sea East (FU14)	Below target ✓	Undefined ?	Undefined ⁴ ?	Undefined ⁴ ?	Landings less than 960 t	-	-	MSY approach: landings should be no more than 960 t
<i>Nephrops</i> in Divisions VIIa FU 15	Below target ✓	Undefined ?	Above trigger ⁴ ✓	Undefined ⁴ ?	Landings less than 9800 t	-	-	MSY approach: landings should be no more than 9800 t

UWTV abundance in relation to SSB reference points

Stock	State of the stock				Outlook options for 2012			ICES advice for 2012 (in tonnes or effort)
	Fishing mortality in relation to F_{MSY}	Fishing mortality in relation to precautionary limits (F_{PA}/F_{lim})	Spawning biomass in relation to $MSY B_{trigger}$	Spawning biomass in relation to precautionary limits (B_{PA}/B_{lim})	MSY approach (within the precautionary approach)	Precautionary approach considerations /	Management plan	
<i>Nephrops</i> in Sub-area VII: Porcupine bank (FU 16)	Undefined ?	Undefined ?	Undefined ?	Undefined ?	-	Catches should not increase to allow the stock to rebuild	-	Precautionary considerations: catches should not increase
<i>Nephrops</i> in Sub-area VII: Aran Grounds (FU 17)	Below target ✓	Undefined ?	Undefined ?	Undefined ?	Landings less than 1100 t	-	-	MSY approach: landings should be no more than 1100 t.
<i>Nephrops</i> off the south-eastern and south-western coasts of Ireland (FU 19) ¹	Unknown ?	Unknown ?	Unknown ?	Unknown ?	-	Catches should be reduced	-	Precautionary considerations: that catches should be reduced.
<i>Nephrops</i> in the Celtic Sea (FU 20–22) ¹	FU 20-21: Unknown ? FU 22: Appropriate ✓	FU 20-21: Unknown ? FU 22: Unknown ?	FU 20-21: Unknown ⁴ ? FU 22: Unknown ⁴ ?	FU 20-21: Unknown ? FU 22: Unknown ⁴ ?	FU 20-21: landings of less than 2300 t	FU 22: catches should be reduced	-	FU 20-21: MSY approach: landings should be no more than 2300 t. FU 22: precautionary considerations: landings should be reduced
Norway pout in Division VIa	Insufficient information ?	Insufficient information ?	Insufficient information ?	Insufficient information ?	-	No increase of the catches	-	Precautionary considerations: no increase of the catches should take place unless there is evidence that this will be sustainable
Plaice in VIIa (Irish Sea)	Unknown ?	Unknown ?	Unknown ?	Unknown ?	-	Catches of plaice should not increase and technical measures should be introduced to reduce discard rates.	-	Precautionary considerations: catches should not increase and technical measures should be introduced to reduce discard rates.
Plaice West of Ireland (Division VIIb,c)	Insufficient information ?	Insufficient information ?	Insufficient information ?	Insufficient information ?	-	No increase of the catch unless there is evidence that this will be sustainable.	-	Precautionary considerations: no increase of the catch should take place unless there is evidence that this will be sustainable

Stock	State of the stock				Outlook options for 2012			ICES advice for 2012 (in tonnes or effort)
	Fishing mortality in relation to F_{MSY}	Fishing mortality in relation to precautionary limits (F_{PA}/F_{lim})	Spawning biomass in relation to $MSY B_{trigger}$	Spawning biomass in relation to precautionary limits (B_{PA}/B_{lim})	MSY approach (within the precautionary approach)	Precautionary approach / considerations	Management plan	
Plaice in Division VIIe (Western Channel)	Above target 	Undefined 	Above trigger 	Undefined 	Landings less than 1440 t	-	-	MSY transition: that landings in 2012 should be no more than 1440 t.
Plaice in the Celtic Sea (Divisions VIIf and g)	Unknown 	Unknown 	Unknown 	Unknown 	Less than 500 t	Catches of plaice should be reduced and measures to reduce discards should be introduced.	-	Precautionary considerations: catches should be reduced. Discards exceed landings and technical measures should be introduced to reduce discard rates
Plaice Southwest of Ireland (VIIh-k)	Unknown 	Unknown 	Unknown 	Unknown 	-	Reduce catches	-	Precautionary considerations: catches should be reduced
Pollack in Subareas VI and VII (Celtic Sea and West of Scotland)	Insufficient information 	Insufficient information 	Insufficient information 	Insufficient information 		Catches should not be allowed to increase.		Precautionary consideration: catches should not be allowed to increase
Sandeel in Division VIa	Insufficient information 	Insufficient information 	Insufficient information 	Insufficient information 	-	No increase of the catches should take place unless there is evidence that this will be sustainable.	-	Precautionary considerations: no increase of the catches should take place unless there is evidence that this will be sustainable.
Sole VIIa	Above target 	Harvested sustainably 	Below trigger 	Reduced reproductive capacity 	Landings of 200 t	Zero catch	-	MSY approach: landings should be no more than 200 t.
Sole West of Ireland (Division VIIb,c)	Insufficient information 	Insufficient information 	Insufficient information 	Insufficient information 	-	No increase of the catch should take place unless there is evidence that this will be sustainable.	-	Precautionary considerations: no increase of the catch should take place unless there is evidence that this will be sustainable.
Sole in Division VIIe (Western Channel)	Appropriate 	Undefined 	Below trigger 	Undefined 	Landings less than 740 t	-	TAC of 777 t	MSY approach: landings should be less than 740 t

Stock	State of the stock				Outlook options for 2012			ICES advice for 2012 (in tonnes or effort)
	Fishing mortality in relation to F_{MSY}	Fishing mortality in relation to precautionary limits (F_{PA}/F_{lim})	Spawning biomass in relation to $MSY B_{trigger}$	Spawning biomass in relation to precautionary limits (B_{PA}/B_{lim})	MSY approach (within the precautionary approach)	Precautionary approach considerations /	Management plan	
Sole in the Celtic Sea (Divisions VII f and g)	Appropriate 	Harvest sustainably 	Above trigger 	Full reproductive capacity 	Landings less than 1060 t	Landings of less than 1230 t	-	MSY approach: landings should be no more than 1060 t
Sole Southwest of Ireland (Division VII h–k)	Unknown 	Unknown 	Unknown 	Unknown 	-	Catches should not be allowed to increase	-	Precautionary considerations: catches should not increase.
Sprat in Subarea VI and Divisions VII a–c and f–k (Celtic Sea and West of Scotland)	Insufficient information 	Insufficient information 	Insufficient information 	Insufficient information 	-	Catches should not be allowed to increase	-	Precautionary considerations: catches should not be allowed to increase.
Sprat in divisions VII d,e	Insufficient information 	Insufficient information 	Insufficient information 	Insufficient information 	-	Catches should be reduced.	-	Precautionary considerations: catches should be reduced.
Whiting in Division VII a	Unknown 	Unknown 	Unknown 	Unknown 	-	Catches (mainly discards) should be reduced to the lowest possible levels. Management measures should be introduced in the Irish Sea to reduce discarding of small whiting in order to maximize their contribution to future yield and SSB.	-	Precautionary considerations: catches should be reduced to the lowest possible levels and uptake of further technical measures to reduce discards.

Stock	State of the stock				Outlook options for 2012			ICES advice for 2012 (in tonnes or effort)
	Fishing mortality in relation to F_{MSY}	Fishing mortality in relation to precautionary limits (F_{PA}/F_{lim})	Spawning biomass in relation to $MSY B_{trigger}$	Spawning biomass in relation to precautionary limits (B_{PA}/B_{lim})	MSY approach (within the precautionary approach)	Precautionary approach considerations /	Management plan	
Whiting in Divisions VIIe-k	Unknown ?	Unknown ?	Unknown ?	Unknown ?	-	Catches should not be allowed to increase. Technical measures to minimise discards should be considered with urgency.	-	Precautionary considerations: catches should not be allowed to increase and technical measures should be introduced to reduce discard rates
Whiting West of Scotland	Unknown ?	Unknown ?	Unknown ?	Unknown ?	Lowest possible catch and reduce discards	Lowest possible catch	-	Precautionary considerations: catches should be reduced. The selection pattern should be improved in the <i>Nephrops</i> (TR2) fleet.
Whiting in Division VIb (Rockall)	Unknown ?	Unknown ?	Unknown ?	Unknown ?	-	No increase of the catch should take place unless there is evidence that this will be sustainable.	-	Precautionary considerations: no increase of the catch should take place unless there is evidence that this will be sustainable

Table 5.3.2.2 State of the stock and advice for 2012 in the Celtic Sea ecoregion, for stocks with biennial advice (advice from 2010, valid for 2011 and 2012).

Stock	State of the stock				Outlook options for 2012			ICES advice for 2012 (in tonnes or effort)
	Fishing mortality in relation to F_{MSY}	Fishing mortality in relation to precautionary limits (F_{PA}/F_{lim})	Spawning biomass in relation to $B_{trigger}$	Spawning biomass in relation to precautionary limits (B_{PA}/B_{lim})	MSY approach (within the precautionary approach)	Precautionary approach considerations /	Management plan	
Demersal elasmobranchs in the Celtic Sea and West of Scotland: Skates and Rays ³⁴	Unknown	Unknown	Unknown	Unknown	Landings less than 9 900 t for the main species	No target fishery on <i>Raja undulata</i> and <i>Dipturus batis</i> complex	-	Landings less than 9 900 t for the main species.
Demersal elasmobranchs in the Celtic Sea and West of Scotland: <i>Scyliorhinus canicula</i> (Lesser-spotted dogfish) ¹	Unknown	Unknown	Unknown	Unknown	Maintain catch at recent level	Maintain catch at recent level	-	Maintain catch at recent level.

Table 5.3.2.3 Summary of the state of the stock and advice in the Celtic Sea and West of Scotland ecoregion.

In this ecoregion, 49 stocks or stock complexes are given advice for, of which ICES provides advice on the basis of a forecast for 17 stocks (35%).

State of stock	Criteria	Number of stocks for which criteria are defined	Percentage of stocks for which criteria are met
Stocks fished at or below MSY level	$F_{2010} \leq F_{MSY}$	17	71%
Stocks fished precautionary	$F_{2010} \leq F_{PA}$	6	83%
Stocks above MSY $B_{trigger}$ biomass	$SSB_{2011} \geq MSY B_{trigger}$	13	62%
Stocks above precautionary biomass	$SSB_{2011} \geq B_{PA}$	9	56%
Stocks within safe biological limits	$F_{2010} \leq F_{PA}$ and $SSB_{2011} \geq B_{PA}$	6	50%
Stocks without a forecast for which the advice is “do not allow catches to increase”	Trends based assessment with non-reduction advice	21	43%

Sources of information

ICES. 2008. Report of the ICES Advisory Committee 2008. ICES Advice, 2008. Book 5, 267, pp.

ICES. 2010. Report of the ICES Advisory Committee 2010. ICES Advice, 2010. Book 5, 294, pp.

³ Biennial advice, given in 2010 (ICES, 2010).

⁴ See individual advice under section 5.4.37 of ICES Advisory Report 2010 (ICES, 2010).

ECOREGION Celtic Sea and West of Scotland
SUBJECT NEAFC request to evaluate proposal for harvest control rules for Rockall haddock

Advice Summary

ICES examined the proposed harvest control rules (HCRs) of a long-term management plan for Rockall haddock but the analyses are preliminary and incomplete. ICES, therefore, is unable to assess if the proposed HCRs are consistent with the precautionary approach. ICES notes, however, that the proposed harvest control rules would provide an improvement over recent management approaches, but the rules need to be further evaluated.

Request

NEAFC requests ICES to evaluate the following proposal for the harvest control component of a long-term management plan for Rockall haddock and in particular to consider whether the plan is consistent with the precautionary approach and will provide for the sustainable harvesting of the stock. ICES will also suggest an alternative approach if necessary.

Draft EU-Russia proposal for harvest control component of a long-term management plan for haddock at Rockall

In the following, the TACs refer to total catches, not just landings.

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_{pa} (0.4) or F_{msy} (0.3)] for appropriate age-groups, when the SSB in the end of the year in which the TAC is applied is estimated above B_{pa} .*
3. *The Parties agree 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:*

$$a. \quad TAC_y = TAC_f + 0.2 * (TAC_{y-1} - TAC_f)$$

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 $0.3 - 0.2 \times (B_{pa} - SSB) / (B_{pa} - B_{lim})$. This consideration overrides paragraph 3.*
5. *Where the SSB referred to in paragraph 2 is estimated to be below B_{lim} the TAC shall be set at a level corresponding to a total fishing mortality rate of no more than 0.1. This consideration overrides paragraph 3.*
6. *No later than 31 December [20XX], the parties shall review the arrangements in paragraphs 1 to 5 in order to ensure that they are consistent with the objective of the plan. This review shall be conducted after obtaining inter alia advice from ICES concerning the performance of the plan in relation to its objective.*

Elaboration on the Advice

ICES reviewed analyses of the proposed harvest control rules (HCRs) of a long-term management plan for Rockall haddock, but the simulations carried out were insufficient to determine whether or not the HCRs are consistent with the precautionary approach. The analyses suggested that the proposed HCR with an $F_{target} = 0.3$ had a low risk of the SSB falling below B_{lim} . In one of the analyses, the proposed HCR with an $F_{target} = 0.4$ had a greater than 10% risk of the SSB falling below B_{lim} . ICES considers that the analyses of both HCRs underestimate the risk that SSB will be less than B_{lim} because scenarios, consistent with the characteristics of the stock and fisheries, were not fully examined (see the Results and conclusions section).

Nevertheless, ICES notes that the proposed HCRs are an improvement compared to the management approaches implemented in recent years because the TAC would now account for total catches (landings and discards) from all sources, including the international fishery.

The proposed HCRs include two target fishing mortality proposals (0.3 and 0.4). When the estimated SSB value, referred to in Paragraph 2, is between B_{lim} and B_{pa} , Paragraph 4 is invoked. In this circumstance, if $F_{target} = 0.4$, there is a discontinuity in the F to be used in setting the TAC, depending on whether the SSB is just above or below B_{pa} . If the estimated SSB is below B_{pa} , an immediate drop to $F = 0.3$ is required, leading to large fluctuations in TAC and making

the application of this HCR very sensitive in situations where SSB is estimated to be around B_{pa} . ICES considers that the formula for determining the fishing mortality rate in Paragraph 4 should provide continuity with respect to the target F defined in Paragraph 2.

In the past, discards percentages of certain trawl fleets from the European Union have been observed to be as high as 52% to 87% by numbers. The discarding percentage is highly dependent on the abundance of incoming recruitment. The proposed HCRs specify 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 required. The long-term management plan needs to specify how this will be accomplished. ICES previously advised (ICES, 2011a) *that it would be beneficial to develop and introduce fisheries practices and measures aimed at preventing discards of haddock*.

Suggestions

Because the stock-recruitment relationship for this stock is poorly defined (as is the case for many other stocks and particularly so for haddock), a more complete evaluation of the HCRs requires conducting simulations under low recruitment conditions, as have been observed in recent years. Analyses including implementation errors (for example, catch exceeding the TAC), and explorations of the impact of errors in catch data on the assessment and of variations in the fishery selection pattern (due to fleet variability) would also be useful.

The TAC adjustment foreseen in Paragraph 3 could induce large percentage changes in TAC from year to year. This could simply result from strong recruitment. The performance of this, and other TAC constraints, should be examined in subsequent analyses.

Potential benefits, both to the industry and the stock, of improving the fishery selection pattern should also be evaluated.

Basis of advice

Background

The haddock stock at Rockall is a separate stock from that on the continental shelf of the British Isles. Rockall haddock have lower growth rates and reach a lower maximum size than other haddock populations in the Atlantic. There does not appear to be a significant stock-recruitment relationship for this stock, which is typical for haddock stocks. For example, recruitment for the last four years has been very 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 shape of the EU Exclusive Economic Zone in 1999 led to a renewal of the RF Rockall haddock fishery, making it clear that joint management would be desirable although potentially difficult to implement. Meetings involving both scientists and fisheries managers from the EU and the RF have been held on an almost annual basis since 2001 to determine what is known about these fisheries, and how such information can best 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 during September 2010, a proposal for a joint EU-RF management plan for Rockall haddock was drafted. Following further refinements, a final version was presented to the appropriate NEAFC plenary meeting towards the end of 2010. The decision was taken there to forward the HCRs proposal to ICES for evaluation.

Results and conclusions

The results of the analyses (ICES, 2011b) are preliminary, but ICES considers that the risk of the SSB falling below B_{lim} is underestimated and the simulations do not properly account for potential future conditions:

- The assumed stock-recruitment relationship makes the simulations very unlikely to reproduce a period of low recruitments under moderately high SSB, as experienced in recent years (even with the random variability assumed around the stock-recruitment relationship);
- The evaluation follows the example of the ICES stock assessment in not allowing explicitly for the presence of two fleets (EU and RF) with very different characteristics, especially in terms of fishing pattern. The relative catches of these two fleets have been highly variable in the past. Using a constant selection pattern in the simulations is unlikely to reflect future conditions;

- The analyses assumed perfect implementation, i.e. the set TAC is not exceeded.

Methods

Two different management strategy evaluation (MSE) analyses were conducted to investigate the properties of the proposed HCRs (ICES, 2011b). Both MSE analyses were based on the ICES assessment of this stock, 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.

The first analysis used the R library FLR (Kell *et al.*, 2007) and the XSA version provided within FLR, using the historical assessment data until 2009 with the same settings as in the ICES assessment. The assessment was rerun 500 times, assuming each time a random alteration of the original abundance index values. This produced 500 “true” population abundance values at the start of 2010 for each age older than 1. Recruitment in 2010 and subsequent years was derived from a stock-recruitment relationship, based on the fit to the historical data and incorporating random noise. The catch in 2010 was assumed equal to the EU TAC, and the proposed HCRs were used in setting the TACs in 2011-2030. This first analysis corresponds to a “standard” MSE, incorporating variability in recruitment, assessment error, and no implementation error.

The second analysis shares many methodological features with the first one; it was carried out using Excel, instead of the FLR software. This analysis used the most recent ICES assessment, leading to a single “true” population abundance value at the start of 2011 for each age older than 1. Recruitment in 2011 and subsequent years was derived from a stock-recruitment relationship, incorporating random variability based on the residuals from the fit to the historical data (100 recruitment values were simulated each year). *Status quo* F was used to calculate the catch in 2011 and the proposed HCRs were used in setting the TACs in 2012-2039. This second analysis also provides an MSE, incorporating variability in recruitment, assessment error (although following less standard procedures than in the first analysis), and no implementation error.

Both analyses used a Ricker stock-recruitment relationship, but the fits were slightly different. Both MSEs used a constant selection pattern and a constant discarding ratio at age, assumed perfect implementation, and evaluated F targets of 0.3 and 0.4. The second analysis investigated further changes in the HCRs, and also examined F targets of 0.2 and 0.5.

Sources

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5.4.1

Advice June 2011

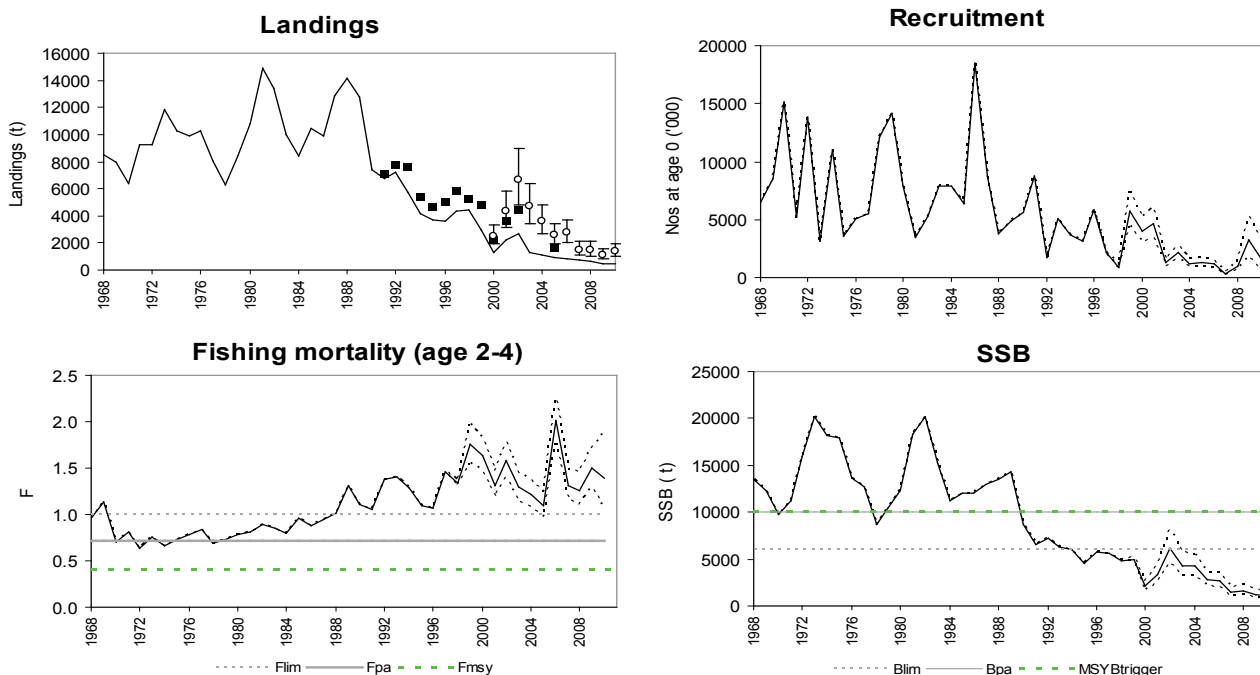
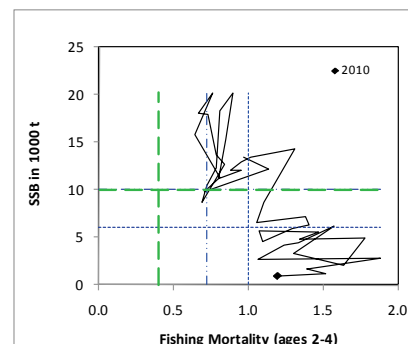
ECOREGION Celtic Sea and West of Scotland
STOCK Cod in Division VIIa (Irish Sea)

Advice for 2012

ICES advises on the basis of MSY approach that zero catches be taken in 2012.

Stock status

F (Fishing Mortality)			
	2008	2009	2010
MSY (F_{MSY})	✗	✗	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	✗	✗	✗ Harvested unsustainably
SSB (Spawning-Stock Biomass)			
	2008	2009	2010
MSY ($B_{trigger}$)	✗	✗	✗ Below trigger
Precautionary approach (B_{pa}, B_{lim})	✗	✗	✗ Reduce reproductive capacity

**Figure 5.4.1.1**

Cod in Division VIIa (Irish Sea). Summary of stock assessment (weights in tonnes) Landings: solid lines are reported landings; filled squares are landings incorporating sample-based estimates at three ports; circles are total removals estimates in excess of $M=0.2$ with 90% confidence intervals from B-Adapt. Recruitment, fishing mortality, and SSB: dotted lines are 5th and 95th bootstrap percentiles. Top right: SSB and F over the years.

The fishing mortality in recent years is uncertain, but total mortality remains very high. The spawning stock biomass has declined ten-fold since the late 1980s and has had reduced reproductive capacity since the mid-1990s. The spawning stock biomass remains well below B_{lim} . With the exception of the 2009 year class, recruitment has been low for the last 9 years.

Management plans

A long-term plan has been agreed by the EU in 2008 (Council Regulation [\(EC\) 1342/2008](#)) which results in a TAC of 380 t and effort reduction of 25%. ICES (2009a, b) evaluated the plan and considers the management plan not to be in accordance with the precautionary approach.

Biology

Due to the aggregating behaviour of cod it is still possible to find areas of high cod density even at low abundance. This can lead to high catches in localised areas and low levels of fishing effort causing high mortality on the stock is possible. Recent tagging experiments have shown migrations of cod out of the Irish Sea into the north Channel, and also migrations south through the deeper Channel into the Celtic Sea.

Environmental influence on the stock

There is evidence that the reduction in cod recruitment observed in the Irish Sea since the 1990s may be due to a combination of small spawning-stock biomass and poor environmental conditions, coinciding with a shift towards above-average sea temperatures.

The fisheries

The Irish Sea cod fishery has traditionally been carried out by otter trawlers targeting spawning cod in spring and juvenile cod in autumn and winter, and cod are also taken as a bycatch in fisheries for *Nephrops*, plaice, sole and rays. Available data indicates that until 2009 discarding was mainly a function of minimum landing size (MLS) and largely restricted to catches of 0 and 1 years old cod. In 2010 there appears to be a shift towards also discarding 2 years old fish. ICES estimates of the landing in 2010 were the lowest on record and ~30% below the TAC. The targeted whitefish fishery that developed during the 1990 using semi-pelagic trawls has continued to decline during 2010 to only four vessels mainly using the gear.

Catch by fleet	Total catch (2010) is unknown, landings estimated at 460 t, official landings were 28% higher, due to inaccurate area reporting. Accurate discard estimates are not available.
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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

The model estimates of total removals continue to vary around 2 to 3 times the reported landings, despite more accurate catch reporting and lack of evidence for significant highgrading of cod. There is currently very little direct evidence to evaluate the potential source(s) of this and how much is due to fishing in Division VIIa or elsewhere. Discard estimates are not currently integrated into the assessment.

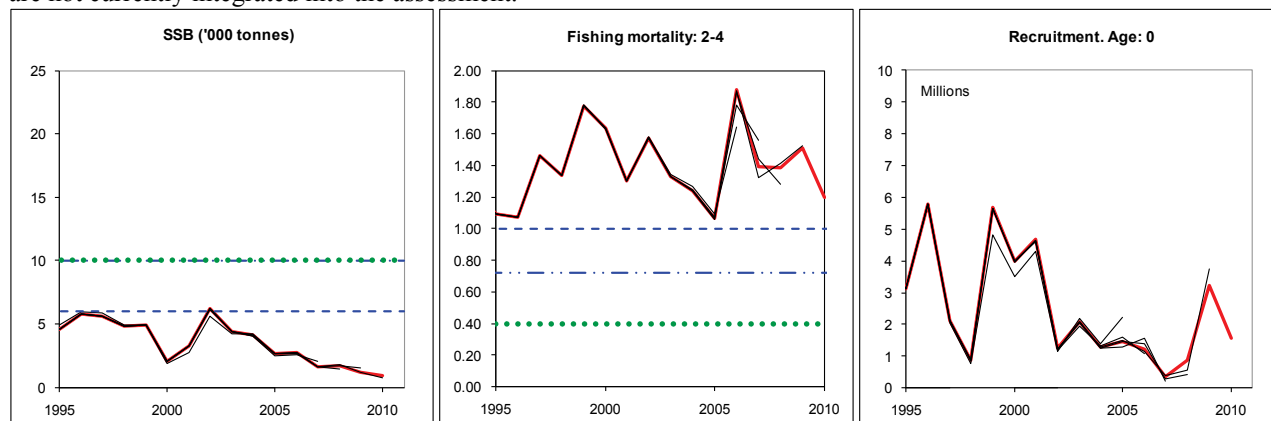


Figure 5.4.1.2 Cod in Division VIIa (Irish Sea) Historical assessment results (final year recruitment estimates included for SSB).

Scientific basis

Assessment type	Analytical assessment (B-Adapt).
Input data	Five survey indices (NIGFS-WIBTS-Q1,NIGFS-WIBTS-Q4,ScoGFS-WIBTS-Q1, UK(E&W)-BTS-3Q; NIMIK).
Discards and bycatch	Discards are not included in the assessment.
Indicators	Egg production (Irish Sea AEPM) and UK fisheries/science partnership survey (UK-FSP).
Other information	This stock is planned to be benchmarked in 2012.
Working group report	WGCSE

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

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B _{trigger}	10 000 t	B _{pa}
	F _{MSY}	0.4	Provisional proxy. Fishing mortalities in the range of 0.25–0.54 are consistent with F _{MSY}
Precautionary Approach	B _{lim}	6000 t	B _{lim} = B _{loss} lowest observed level.
	B _{pa}	10 000 t	B _{pa} = MBAL, this level affords a high probability of maintaining the SSB above B _{lim} . Below this value the probability of below-average recruitment increases.
	F _{lim}	1.00	F _{lim} = F _{med}
	F _{pa}	0.72	F _{pa} = F _{med} * 0.72. This F is considered to have a high probability of avoiding F _{lim} . Fishing mortalities above F _{pa} have been associated with the observed stock decline.

(unchanged since: 2010)

Yield and spawning biomass per Recruit F-reference points (2011):

	Fish Mort Ages 2–4	Yield/R	SSB/R
Average last 3 years	1.36	1.42	1.29
F _{max}	0.40	1.74	4.84
F _{0.1}	0.21	1.60	8.16
F _{med}	1.00	1.53	1.84

Outlook for 2012

No short term forecast is provided because recent mortality values are highly uncertain due to unaccounted mortality. However, assuming a 25% reduction in mortality in 2011, the spawning stock biomass is expected to increase in 2012 due to the higher recruitment estimated in 2009. Given the uncertainty in the F estimation the MSY results below should be treated with caution. Current landings (i.e. TAC), effort, and spatial management of fisheries catching cod in Division VIIa are not controlling mortality levels.

Management plan(s)

Following the cod long term management plan ([EC 1342/2008](#)) the stock is considered data poor which implies using article 9(a). This results in a TAC and associated effort reduction of at least 25%. ICES considers that article 10(2) may also apply.

ICES (2009a,b) evaluated the plan and considers the management plan not in accordance with the precautionary approach.

MSY approach

Fishing mortalities in the range 0.25–0.54 are consistent with maximising long-term yield for cod in Division VIIa. This is consistent with the management plan target fishing mortality of 0.4. Given the low SSB and low recruitment it is not possible to identify any non zero catch which would be compatible with the MSY transition scheme. This implies no targeted fishing should take place on cod in Division VIIa. Bycatches including discards of cod in all fisheries in Division VIIa should be reduced to the lowest possible level and uptake of further technical measures to reduce discards

PA considerations

No targeted fishing should take place on cod in Division VIIa. Bycatches including discards of cod in all fisheries in Division VIIa should be reduced to the lowest possible level.

Additional considerations

Management considerations

Both the recruitment and reproductive capacity of this stock have become severely impaired in recent years. Recruitment has been below average for the past eighteen years and eight of the last nine years of recruitment are amongst the lowest on record. The stock has been harvested unsustainably since the late 1980s. The fishing mortality in recent years is uncertain, but total mortality rates remain very high despite the establishment of a spawning closure since 2000, reductions in fishing effort and TAC reduction per year since 2006.

The 2009 year class is estimated to be more abundant, consequently additional measures to protect it are essential to ensure that it contributes to the rebuilding of the stock. It will be necessary to reduce all sources of fishing mortality on cod to as close to zero as possible if the stock is to recover above B_{lim} as quickly as possible. STECF (2010) data show that the main gear types catching cod in the Irish Sea in 2009, based on official landings data, were otter trawls and seines with 100 mm+ mesh (56% of cod landings), otter trawls with 70–99 mm mesh (mainly *Nephrops* gears; 29%), fixed nets (12%), and beam trawls (3%). Recent discard estimates available for some fleets indicate a potential shift from discarding mostly younger age 0 and 1 cod, to discarding age 2 fish also in 2010. It is not yet known if this is a long term change. Estimates of discarding are not used in the assessment due to the short time-series and variable quality of the data.

To minimize the impact of cod recovery measures on fisheries not targeting cod, there will be a need for gear designs and cod avoidance measures that can be proven effective in reducing by-catches of cod to as close to zero as possible. Council Regulation (EC) 1342/2008 states that Member States should introduce new mechanisms (developed in cooperation with the fishing industry) to encourage fishermen to engage in cod-avoidance programmes, and to exercise their power to allocate access to fishing for cod stocks so as to encourage their fishermen to fish in ways that result in more selective fishing and are less harmful to the environment. However it is necessary to quantify the impact of such measures, and they should be accompanied by appropriate monitoring and data collection schemes to determine if they are achieving their stated aims. This includes ensuring accurate data on quantities and composition of fishery removals from all sources.

Egg production surveys since 2006 (see Figure 5.4.1.4 for 2010 results) show that ~ 30 – 50% of the spawning took place in the eastern Irish Sea which is not included in the spring spawning closure, indicating that the design of the closure is not optimal.

There is evidence of substantial misreporting in the past, but observations at the ports indicate that the implementation of the Registration of Buyers and Sellers regulations since 2006 in the UK and Ireland has improved the accuracy of landings reporting.

In recent years, Irish landings of cod reported from ICES rectangles immediately north of the Irish Sea – Celtic Sea boundary have been re-allocated into the Celtic Sea as they represent a combination of inaccurate area reporting and catches of cod considered to be part of the Celtic Sea stock.

The ability to implement a management plan for this stock will remain compromised until all sources of significant unaccounted mortality are identified

Regulations and their effects

The regulations have had the following effects on Irish Sea cod and fisheries taking cod:

In 2000, a cod closure was introduced into Irish Sea, initially covering both cod spawning areas in the east and west of the Irish Sea, subsequently amended to only include the western Irish Sea. Derogations for *Nephrops* trawlers using separator panels was included. STECF (2007) was unable to determine the extent to which the closure has reduced fishing mortality STECF advised that a comprehensive evaluation of how fleet activities have been affected by the closure and other regulations and factors is required to evaluate the cod closure.

The cod recovery plan introduced a system for limiting fishing effort by adjusting the number of fishing days allowed for various vessel categories deploying gears with various mesh sizes. STECF, 2010 reported that

- *"Nominal effort (kW*days-at-sea) within the Irish Sea has decreased by 36% since 2000. The overall trend indicates historical effort was relatively stable until 2003, after which effort declined. Overall effort within the Irish Sea has declined by ~40% since 2003. An 11% decline occurred between 2008 and 2009."*

- “Over the time series available, Irish Sea fisheries have been dominated by demersal trawling and seining (TR category). This category accounts for around 60% of overall effort, mirroring the overall declining effort trend. Beam trawling has declined over time, now accounting for <10% in the last two years. All other regulated gears account for <1% combined.”

Changes in fishing technology and fishing patterns

The introduction of the effort control elements of the cod long term plan (LTP) is expected to lead to changes in fishing effort in different “effort groups”. This and the introduction of more selective gears are likely to change exploitation patterns in 2011. The impact of these is currently difficult to quantify. Four Irish vessels have gained exemption from the effort regulation by using a sorting grid to maintain cod catches below 1.5%. The use of grids in the *Nephrops* fishery should be promoted to reduce capture of cod, or selectivity devices that achieve equivalent or better improvements.

Data and methods

The quality of the commercial data for this stock deteriorated in the 1990s. ICES has attempted to improve the accuracy of the landings data by replacing the reported landings figures in 1991–1999 from three major Irish Sea ports by estimates derived from a sampling scheme.

The sampling scheme had insufficient coverage in some subsequent years, and the assessment model (B-Adapt) implements a procedure for estimating any unaccounted removals of cod since 2000. All removals prior to 2000 are assumed to be accounted for, apart from discards which are not included in the assessment. The procedure estimates the quantity of total removals since 2000 needed for catch-based estimates of abundance to follow the same trends over time given by several series of survey indices. The model estimates of removals since 2000 are up to three times larger than reported landings for those years. The existence of substantial unaccounted removals can explain the lack of any improvement in age structure of cod and the continuation of an apparently high mortality rate well in excess of the precautionary approach reference points.

Discard estimates prior to 2010 indicate a variable, but high discard rate for 0- and 1-year-old cod. Some 2010 data indicate a shift into discarding the larger 2-year-old cod along with the younger fish. Estimates of discarding are not used in the assessment due to the short time-series and variable quality of the data.

Information from the fishing industry

The UK Fisheries–Science Partnership surveys of the Irish Sea cod spawning grounds in spring 2005–2011, carried out using commercial trawlers, indicated a widespread distribution of cod mostly at low density but with some localized aggregations. The time-series of SSB indices shows a downward trend similar to the trends shown by the other surveys used in the assessment. The surveys also indicate a highly truncated age composition of cod, which supports the ICES assessment, indicating continuing high mortality rates.

Uncertainties in assessment and forecast

The assessment indicates additional, unaccounted removals from the stock in recent years, which are not explained from the recent observation of reported landings.

A large but variable proportion of the catch of 1-year-old cod is discarded and 2010 data suggests an increase number of discarded 2-year-old fish are discarded. Discards are not included in the assessment, leading to an underestimate of the mortality at this age.

Comparison with previous assessment and advice.

The perception of the stock has not changed since last year’s assessment. The basis for the advice is the same as last year.

Sources

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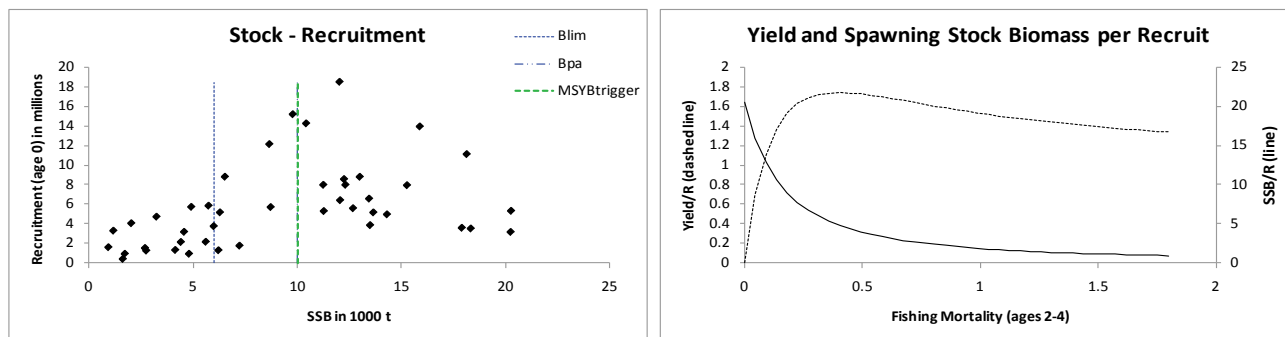


Figure 5.4.1.3 Cod in Division VIIa (Irish Sea). Stock–recruitment (left panel) and yield-per-recruit and SSB plot (right panel).

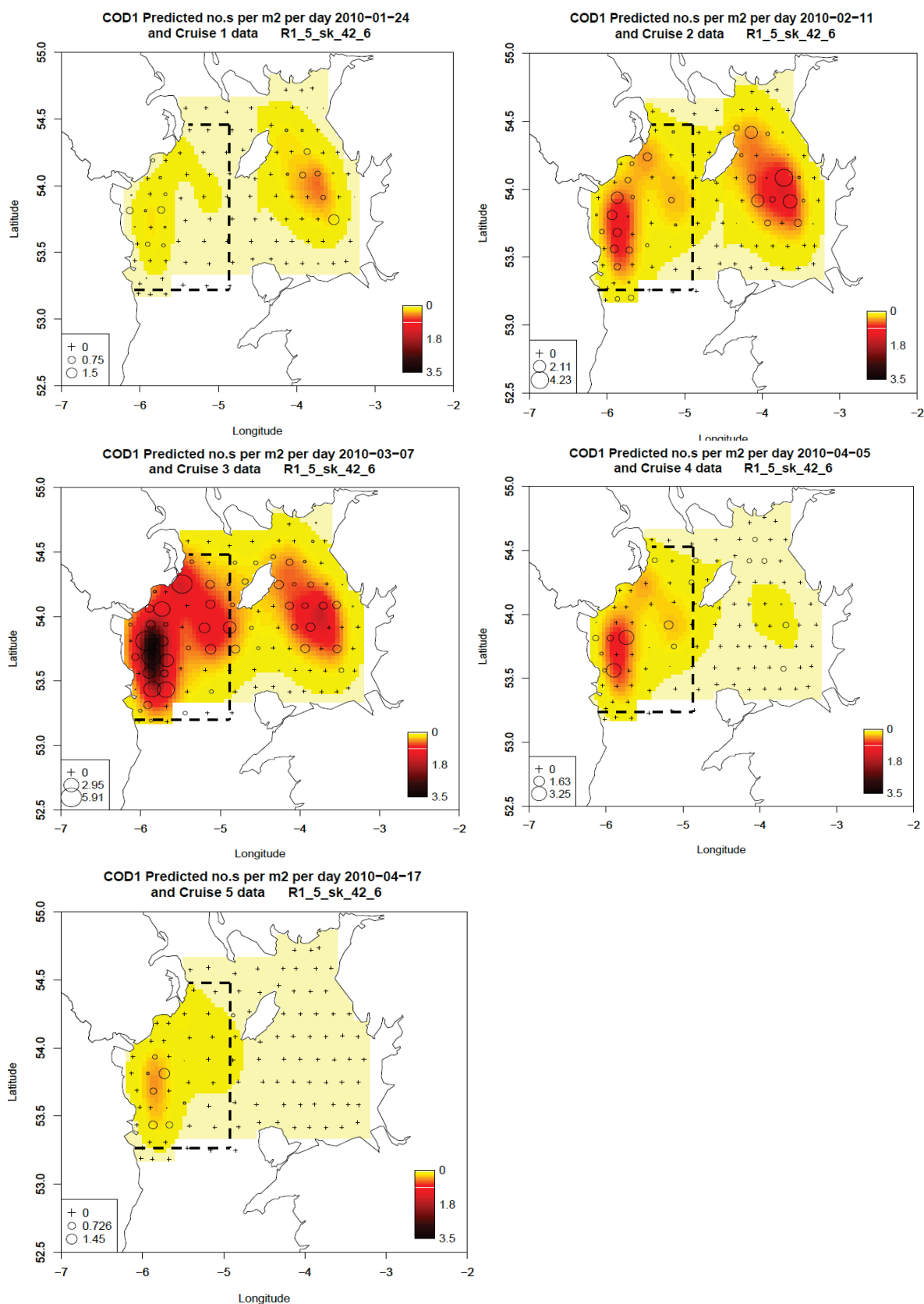


Figure 5.4.1.4 Cod in Division VIIa (Irish Sea). Annual Egg Production Method (AEPM) distribution of Stage 1 cod eggs during 2010. Station estimates of egg production given by circles, GAM predictions by contours. The dotted line gives an indication of the cod closed area.

Table 5.4.1.1 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
2010	Zero catch	0	0.674	0.59	0.46 ³
2011	Zero catch	0	0.506		
2012	Zero catch	0			

Weights in '000 t.

¹Preliminary.²Includes sample-based estimates of landings into three ports.³As reported to the WG.

Table 5.4.1.2 Cod in Division VIIa. Nominal landings (tonnes) of as officially reported to ICES, and used by ICES.

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010 ¹
Belgium	187	142	183	316	150	60	283	318	183	104	115	60	67	26	19	21
France	166	148	268	269	n/a	53	74	116	151	29	35	18 ²	17 ²	3	1 ²	1
Ireland	1,414	2,476	1,492	1,739	966	455	751	1,111	594	380	220	275	608	618 ²	323 ²	289
Netherlands	-	25	29	20	5	1	-	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-
UK (England, Wales & NI)	2,330	2,359	2,370	2,517	1,665	799	885	1,134	505	646	594	589 ²	423	543 ²	387 ²	282
UK (Isle of Man)	22	27	19	34	9	11	1	7	7	5	n/a	n/a	n/a	2 ²	1 ²	1
UK (Scotland)	414	126	80	67	80	38	32	29	23	15	3	6	2	1 ²	1 ²	-
Total	4,533	5,303	4,441	4,962	2,875	1,417	2,026	2,715	1,477	1,179	967	948	1,117	1224	754	594
Unallocated	54	-339	1,418	356	1,909	-143	226	-20	-192	-107	-57	-108	-415	-563	-286	-130
Total as used by WG	4587 ³	4964 ³	5859 ³	5318 ³	4784 ³	1274 ⁴	2252 ⁴	2695 ⁴	1285 ⁴	1072 ⁴	910 ⁴	840 ⁴	702 ⁴	661 ⁴	468 ⁴	464 ⁴

¹Preliminary. ²Revised. n/a = not available ³ includes sample-based estimates of landings into three ports ⁴ based on official data only. ⁵Estimate due to incorrect submission to ICES.

Table 5.4.1.3 Cod in Division VIIa (Irish Sea). Summary of the assessment (without SOP correction) “B-Adapt removals” are the estimated total removals from 2000 onwards in excess of removals due to the assumed natural mortality rate.

Year	Recruits age 0 (thousands)	Total biomass (t)	Spawning stock biomass (t)	Input landings (t)	B-Adapt removals (t)	FBAR 2- 4
1968	6512	19351	13444	8541		0.96
1969	8506	18040	12241	7991		1.14
1970	15131	17709	9785	6426		0.70
1971	5239	23476	11271	9246		0.81
1972	13883	26393	15873	9234		0.64
1973	3107	30044	20227	11819		0.76
1974	11055	27155	18121	10251		0.67
1975	3533	25060	17886	9863		0.73
1976	5103	21465	13647	10247		0.78
1977	5529	16614	12673	8054		0.84
1978	12082	14188	8662	6271		0.69
1979	14196	19638	10426	8371		0.72
1980	7923	26103	12310	10776		0.78
1981	3461	29723	18317	14907		0.81
1982	5264	27025	20249	13381		0.90
1983	7879	21842	15260	10015		0.85
1984	7922	18773	11249	8383		0.80
1985	6350	21980	12055	10483		0.95
1986	18442	20979	12026	9852		0.88
1987	8743	28289	12995	12894		0.95
1988	3803	26056	13492	14168		1.01
1989	4904	21061	14300	12751		1.31
1990	5648	14540	8725	7379		1.10
1991	8751	13177	6531	7095		1.05
1992	1709	15518	7231	7735		1.38
1993	5110	12376	6295	7555		1.41
1994	3699	10460	5995	5402		1.29
1995	3121	10439	4575	4587		1.10
1996	5793	10298	5747	4964		1.07
1997	2106	11796	5614	5859		1.46
1998	882	9889	4811	5318		1.34
1999	5672	6772	4920	4784		1.77
2000	4000	6647	2044	1274	2440	1.63
2001	4668	10227	3252	2252	4211	1.30
2002	1238	12227	6223	2695	6643	1.57
2003	2082	8417	4420	1285	4874	1.33
2004	1270	6970	4152	1072	3534	1.24
2005	1468	5083	2700	910	2431	1.06
2006	1203	4612	2763	840	2790	1.88
2007	352	3538	1637	702	1827	1.39
2008	881	2670	1733	662	1652	1.39
2009	3240	2231	1185	466	1084	1.51
2010	1551	5065	947	464	1192	1.19*
Average (1968-2010)	5651	15905	9256	6912	2971	1.10

(*) recent mortality values are poorly estimated due to unaccounted mortality

Annex 5.4.1

The European Commission has enacted a 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 Irish Sea 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.

3. 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 Divisions VIIe–k (Celtic Sea cod)

Advice for 2012

The strong 2009 year class is expected to bring the SSB above MSY B_{trigger} . Based on the MSY framework, ICES advises that F in 2012 be set at $F_{\text{MSY}} = 0.40$, resulting in landings of 10 000 t in 2012.

Stock status

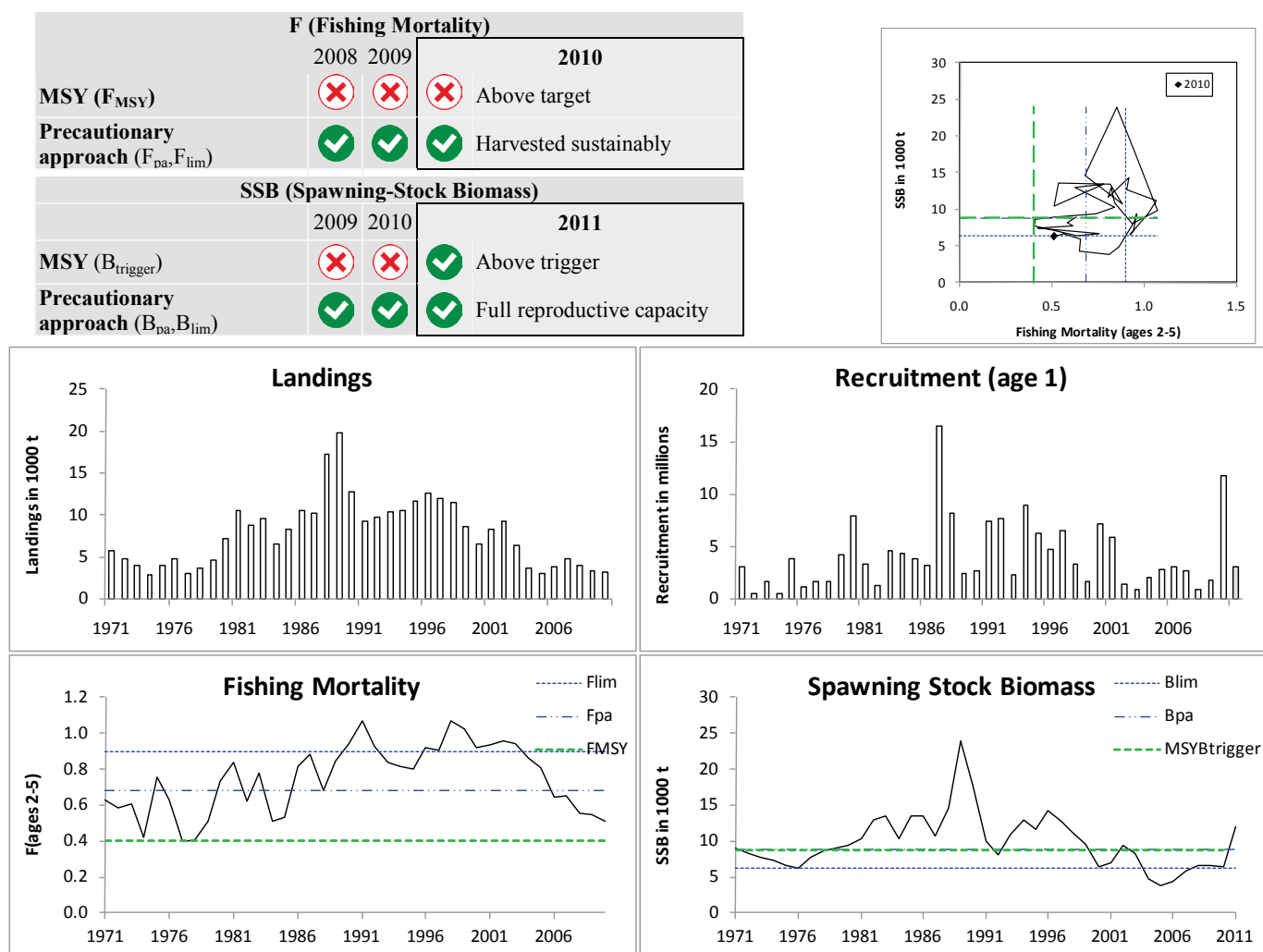


Figure 5.4.2.1 Cod in Divisions VIIe–k (Celtic Sea Cod). Summary of stock assessment (weights in thousand tonnes). Top right: SSB and F over the years.

More than 80% of the landings consist of 3 age groups (1–3) over the available time-series (Figure 5.4.2.4). Therefore the stock is highly dependent on incoming recruitment. Various sources indicate that the recruitment of the 2009 year class is the strongest since 2000. SSB is above B_{pa} and is expected to increase to a high level in the near future because of decreasing fishing mortality and strong incoming recruitment. However, it is known that discard rates have increased in some fleets in 2010, and this discard information is incomplete in the assessment; this means that the assessed and predicted stock size may be overestimated. Fishing mortality has been substantially decreasing since the late 1990s while landings are stable and close to their lowest historical levels. Current fishing mortality is above the potential proxy for F_{MSY} .

Management plans

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

Biology

Celtic Sea cod has higher growth rates and mature earlier than other cod stocks. There is a potential for a high yield if the fishing mortality can be reduced.

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 tends to decrease in warmer waters at the southern limits of the range.

The fisheries

Cod is caught in a range of fisheries, including gadoid trawlers, *Nephrops* trawlers, otter trawlers, beam trawlers, and gillnetters. Landings are made throughout the year, but are generally more abundant during the first semester. The TACs have constrained catches since 2003 and the impact of the Trevoise Head Closure applied since 2005 has resulted in landings being spread across the year.

Catch by fleet	Not available, but discard estimates are >500 t in 2010. Total landings (2010) = 3200 t (76% otter trawl, 12% beam trawl, 4% gillnets, and 8% other gears).
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Quality considerations

In previous assessments, the major sources of uncertainties were discard estimates (including highgrading) and misreporting. These problems occurred in 2003 and subsequent years, when quotas became increasingly restrictive. The magnitude of highgrading and misreporting has decreased since 2008. Estimates of highgrading have been included in this assessment. Landings have been revised to include misreporting from the southern part of the Irish Sea. Lpue for the French fleets for 2009 and 2010 are not available.

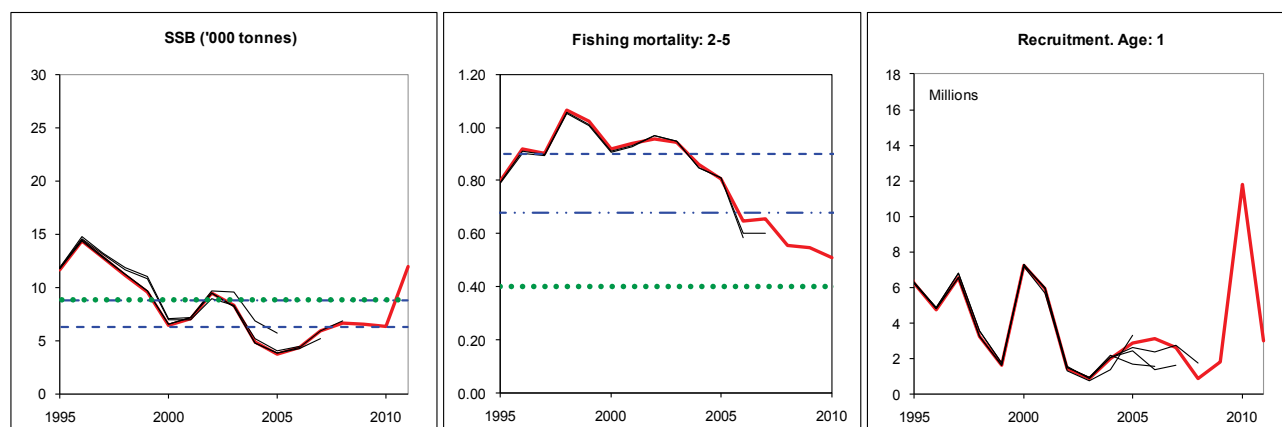


Figure 5.4.2.2 Cod in Divisions VIIe–k (Celtic Sea cod). Historical assessment results (final year recruitment estimates included).

Scientific basis

Assessment type	Age-based assessment (XSA).
Input data	Three survey indices (EVHOE-WIBTS-Q4; IGFS-WIBTS-Q4, UK-WCGFS-Q1); four commercial indices (FR-GADOIDQ234, FR-NEPHROPS, UK-WECOT, IR-7GJ-OTB).
Discards and bycatch	Highgrading has been included since 2011.
Indicators	None.
Other information	Benchmark at WKROUND 2009 and planned to be benchmarked in 2012.
Working group report	WGCSE

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}	8800 t	Provisionally set at B_{pa} .
	F_{MSY}	0.40	Provisional proxy based on F_{max} (ICES, 2011).
Precautionary Approach	B_{lim}	6300 t	$B_{\text{lim}} = B_{\text{loss}}$ (B76), the lowest observed spawning-stock biomass.
	B_{pa}	8800 t	$B_{\text{pa}} = B_{\text{lim}} * 1.4$. Biomass above this value affords a high probability of maintaining SSB above B_{lim} , taking into account the variability in the stock dynamics and the uncertainty in assessments.
	F_{lim}	0.90	The fishing mortality estimated to lead to potential collapse.
	F_{pa}	0.68	$F_{\text{pa}} = 5^{\text{th}}$ percentile of F_{loss} . This F is considered to have a high probability of avoiding F_{lim} and maintaining SSB above B_{pa} in the medium term (assuming normal recruitment), taking into account the uncertainty assessments.

(unchanged since: 2011)

Yield and spawning biomass per Recruit F -reference points (2011):

	Fish Mort Ages 2–5	Yield/R	SSB/R
Average last 3 years	0.54	2.15	4.47
F_{max}	0.40	2.20	6.87
$F_{0.1}$	0.26	2.08	11.62
F_{med}	0.71	2.03	2.82

Outlook for 2012

Basis: $F(2011) = F_{\text{sq}} = \text{mean}(F_{2008-2010})$ rescaled to $F_{2010} = 0.51$; $\text{SSB}(2012) = 21.2$ kt; $R(2011) = \text{GM}(1971-2008) = 3022$ (thousands); landings (2011) = 10.5 kt.

Rationale	Landings (2012)	Basis	F (2012)	SSB (2013)	%SSB change ¹⁾	% TAC change ²⁾
MSY framework	10.0	$F_{\text{MSY}} (F_{\text{sq}} * 0.78)$	0.40	21.9	+3%	+149%
MSY transition	11.3	$(F_{2010} * 0.6 + F_{\text{MSY}} * 0.4)$	0.47	20.4	-4%	+180%
Precautionary Approach	14.7	$F_{\text{pa}} (F_{\text{sq}} * 1.33)$	0.68	16.1	-24%	+266%
Zero catch	0	$F=0$	0.00	34.6	+63%	-100%
Status quo	11.2	$F_{\text{sq}} * 0.9$	0.46	20.5	-3%	+177%
	12.1	F_{sq}	0.51	19.4	-9%	+200%
	12.9	$F_{\text{sq}} * 1.1$	0.56	18.3	-14%	+221%
	3.420	$\text{TAC}-15\% (F_{\text{sq}} * 0.24)$	0.12	30.3	+43%	-15%
	4.023	$\text{TAC} (F_{\text{sq}} * 0.27)$	0.14	29.5	+39%	0%
	4.626	$\text{TAC}+15\% (F_{\text{sq}} * 0.31)$	0.16	28.7	+36%	+15%

Weights in '000 tonnes.

¹⁾ SSB 2013 relative to SSB 2012.

²⁾ Landings 2012 relative to TAC 2011.

MSY approach

The strong 2009 year class is expected to bring the SSB above MSY B_{trigger} . Based on the MSY framework, ICES advises that F in 2012 be set at $F_{\text{MSY}} = 0.40$, resulting in landings of 10 000 t in 2012. This is expected to lead to an SSB of 21 900 t in 2013.

Following the transition scheme towards the ICES MSY framework implies that F in 2012 ($F_{2010} * 0.6 + 0.4 * F_{\text{MSY}}$) is 0.47, resulting in landings of 11 300 t in 2012. This is expected to lead to an SSB of 20 400 t in 2013.

Precautionary considerations

The fishing mortality in 2012 should be no more than F_{pa} , corresponding to landings of less than 14 700 t in 2012. This is expected to keep SSB above B_{pa} in 2013.

Additional considerations

Management considerations

Because of the large 2009 year class is now entering the fishery, which was not anticipated in last year's advice or TAC, there will be a large inconsistency between the TAC set for 2011 (4023 t) and the predicted landings for that year, assuming the current fishing mortality (10 500 t). Therefore, in the absence of any effort limitation and/or TAC revision, high discarding will occur.

A truncated age structure has been observed in landings of this stock over many years. The historical dynamics of Celtic Sea cod have been "recruitment driven", i.e. the stock increased in response to good recruitments and decreased rapidly during times of poor recruitment. Recruitment in recent years has been poor except for the 2009 year class, which is estimated to be the strongest since 2000 (Figure 5.4.2.1). Fishing mortality should be reduced in the longer term to maximize the contributions of recruitment to future SSB and yield. This will result in reduced risk to the stock.

In recent years, Irish landings of cod reported from ICES rectangles immediately north of the Irish Sea–Celtic Sea boundary have been re-allocated into the Celtic Sea as they represent a combination of inaccurate area reporting; these catches of cod are considered to be part of the Celtic Sea stock.

Cod in Divisions VIIe–k are caught in a range of fisheries, including gadoid trawlers, *Nephrops* trawlers, otter trawlers, beam trawlers, and gillnetters. Other commercial species that are caught by these fisheries include haddock, whiting, *Nephrops*, plaice, sole, anglerfish, hake, megrim, and elasmobranchs.

In the recent past, there have been indications of underreporting of cod landings in some fleets. The introduction of the "buyers and sellers" legislation in the UK and Ireland may have reduced this, 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.

The displacement of effort from areas with existing effort control regimes (Division VIIa, Subareas VI and IV) could have a detrimental effect on measures to reduce the mortality of cod in the Celtic Sea.

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.

The effects of regulations

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 2003 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.

Technical measures applied to this stock are a minimum mesh size for beam and otter trawlers in Subarea VII and a minimum landing size (MLS) of 35 cm. For Belgian trawlers that land in Belgium the MLS has been 50 cm since 2008. 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 discarding is high and variable. They may account for 40–60% by number of all fish caught. These discards were mainly under the MLS until recently, when highgrading became more prominent in the fishery.

The most pertinent changes to the fishing pattern for cod have been the increased highgrading and discarding in response to restrictive quotas since 2002. Highgrading has occurred in French fisheries since 2003 and has also been apparent in UK fisheries since 2007. Highgrading has decreased in the major fleets catching cod since 2008.

Data and methods

The assessment methodology for this stock has been benchmarked in 2009 (ICES, 2009), but this process failed to develop an assessment procedure on account of recent deterioration in the quality of assessment input data for this stock. The major sources of uncertainties lie in the assessment of discard practices estimates (discards and highgrading) and landings misreporting. These problems occurred in 2003 and subsequent years, as quotas became increasingly restrictive. The magnitude of highgrading and misreporting has decreased since 2008. Estimates of highgrading have been included in this assessment. Landings have been revised to include misreporting from the southern part of the Irish Sea. The previous model (XSA) and settings (ICES, 2008) have been used this year pending new guidance from the next Benchmark, scheduled for 2012.

Self-sampling datasets obtained since 2008 have been applied to estimate the French highgrading, assuming that the discarding practices in 2006–2007 were the same as the practice observed in the self-sampling of the main fleet in 2008. However, applying this procedure back to 2003 was considered inappropriate.

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 estimates of discarding. The representatives of Fishers' Organisations at the WKROUND 2009 have indicated that the discarding level was probably not the same in earlier years as seen in recent years, and that this is linked to the level of TAC. French highgrading has decreased from 592 t in 2007 to 7 t in 2010.

In 2010 the Marine Institute and the Federation of Irish Fishermen initiated an annual Q1 fishery-independent survey for Celtic Sea cod. The data from the first survey have been presented to the expert group in 2011 and reveal an age structure similar to the one from the commercial catches.

Uncertainties in assessment and forecast

Misreporting, discard practices, and highgrading were the main cause of uncertainty affecting the assessment (WKROUND, 2009), especially in the 2003–2008 period when quotas were particularly restrictive. Most of these issues have been quantified and included in this year's assessment. Another source of uncertainty is the lack of usable effort data for France in 2009 and 2010, and thus of *Ipues* indices for the French commercial fleets for these two years.

The uncertainties in the forecasts are associated with the strength of the incoming and the assumed recent recruitment estimates.

Comparison with previous assessment and advice

This year the advice is based on an age-based assessment. Last year the advice to reduce catches was based on indicators in the catch-at-age, recruitment, and survey indices. This year, the advice takes into account the large increase in stock size due to the estimated outstanding 2009 year class.

Assessment and management area

From 2009 onwards the TAC covers Divisions VIIb,c,e–k, Subareas VIII, IX, and X, and EU waters of CECFAF 34.1.1 (a separate TAC was established for Division VIId). The exclusion of the ICES Division VIId in the TAC area since 2009 brings the management area more in line with the boundaries of the stock.

Sources

- ICES. 2008. Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 30 April–6 May 2008 (ICES CM 2008/ACOM:12).
- ICES. 2009. Report of the Benchmark and Data Compilation Workshop for Roundfish (WKROUND), 16–23 January 2009, Copenhagen, Denmark. ICES CM 2009/ACOM:32.
- ICES. 2010a. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 12–20 May 2010, Copenhagen, Denmark. ICES CM 2010/ACOM:12.
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- ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.
- STECF. 2007. Evaluation of closed area schemes (SGMOS-07-03).

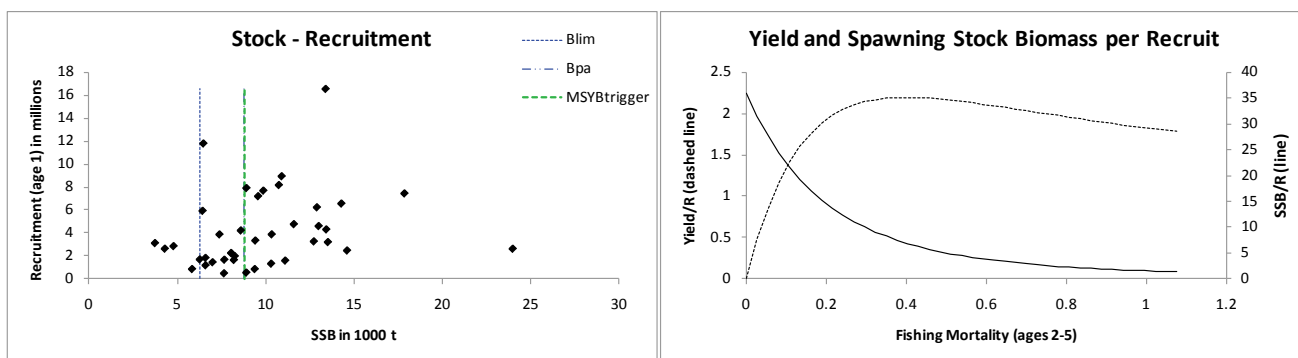


Figure 5.4.2.3 Cod in Divisions VIIe–k (Celtic Sea cod). Stock–recruitment plot (left) and yield-per-recruit analysis (right).

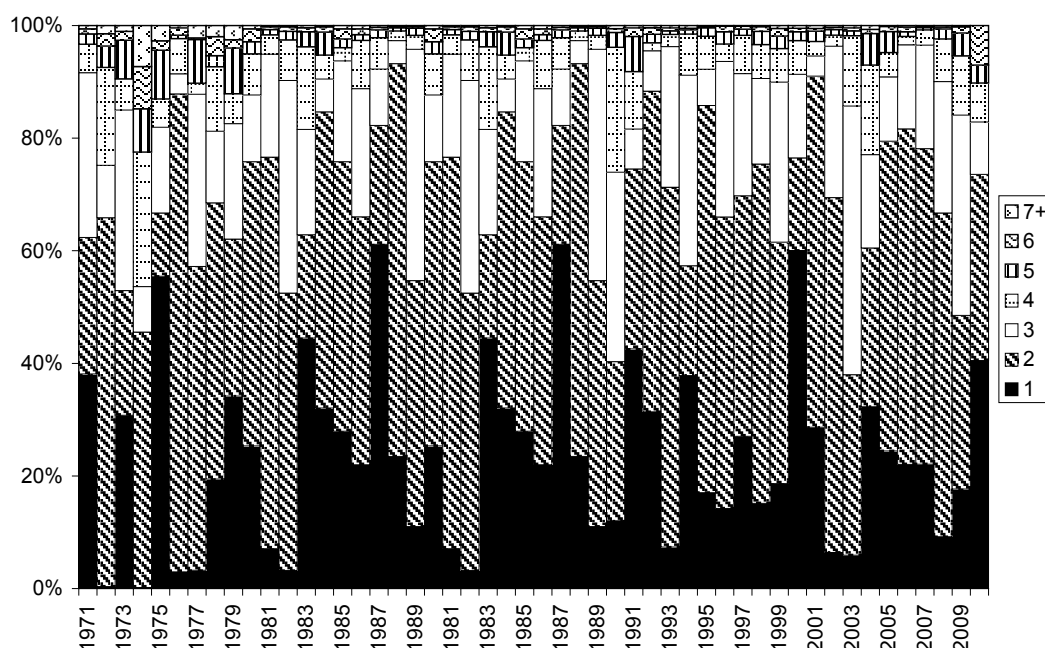


Figure 5.4.2.4 Cod in Divisions VIIe–k (Celtic Sea cod). Landings age composition in numbers.

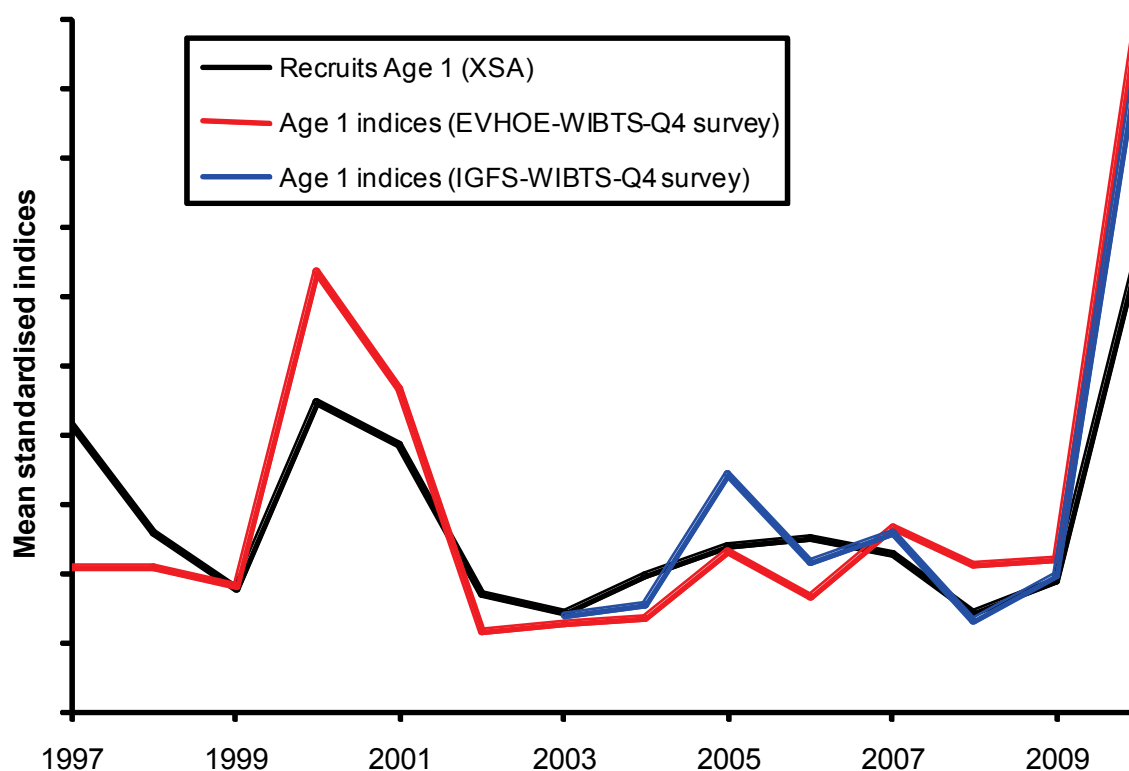


Figure 5.4.2.5 Cod in Divisions VIIe-k (Celtic Sea cod). Comparative trends of age 1 index of EVHOE-WIBTS-Q4 and IGFS-WIBTS-Q4 surveys and recruitment estimates from an exploratory eXtended Survivor Analysis (XSA).

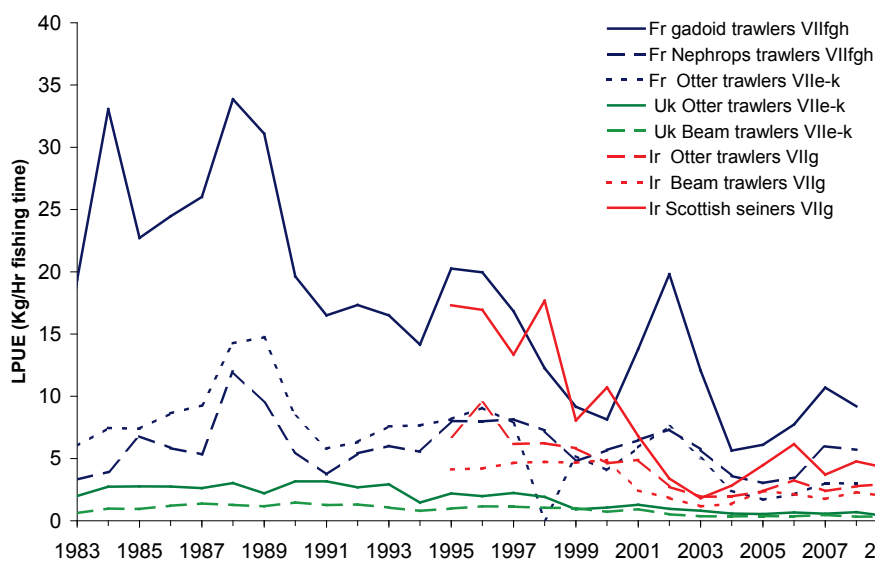


Figure 5.4.2.6 Cod in Divisions VIIe-k (Celtic Sea cod). Landings per unit effort (lpue) trends of the fishing fleets.

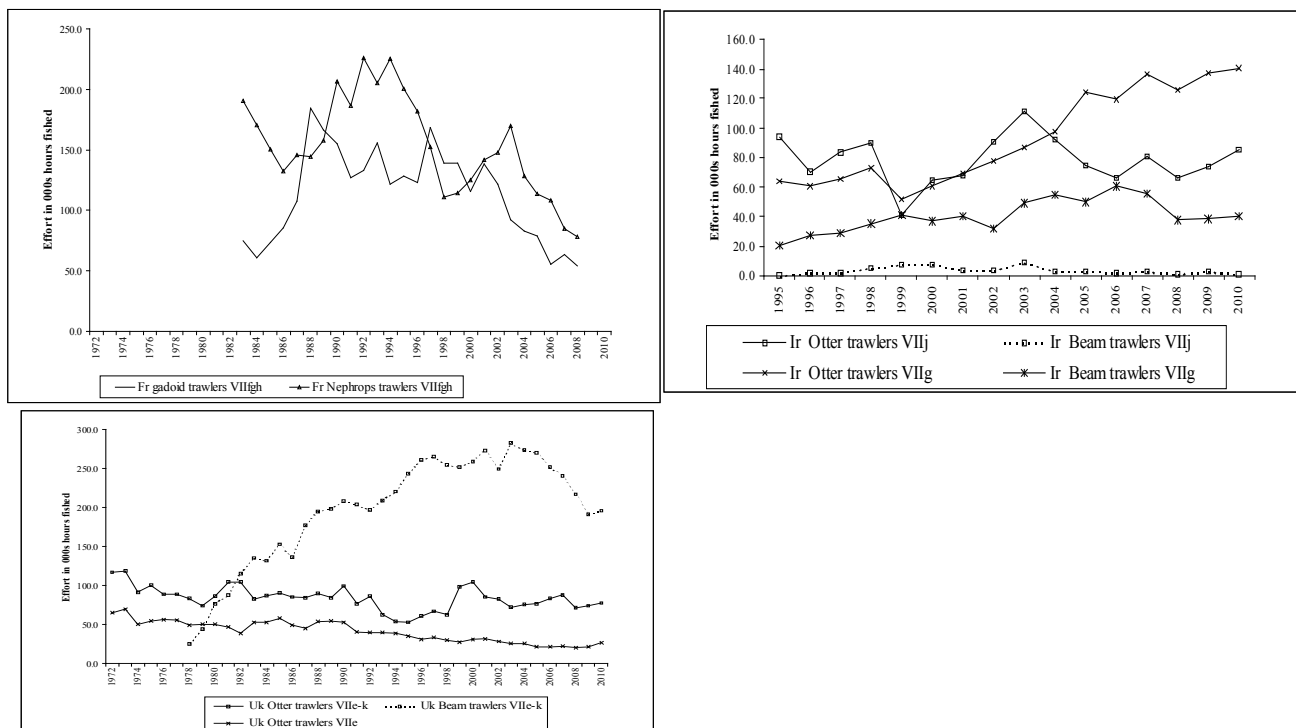


Figure 5.4.2.7 Cod in Divisions VIIe-k (Celtic Sea cod). Fishing effort trends of the fishing fleets.

Table 5.4.2.1 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 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	-	4.023			
2012	MSY framework	<10.0				

Weights in '000 t.

¹TAC 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).²For the Divisions VIIf,g stock component.³For the Divisions VIIf–h stock component.⁴For the Divisions VIIe–h stock component.⁵For the Divisions VIIe–k stock component.

Table 5.4.2.2

Cod in Divisions VIIe–k. Landings (in tonnes) of cod in Divisions VIIe–k used by the Working Group. Highgrading estimated by French self-sampling.

Year	Belgium	France	Ireland	UK	Others	France Highgrading	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	6430.9
2004	153	2425	663	282	0	148	3670.5
2005	186	1623	870	309	0	74	3062
2006	103	1896	959	368	0	432	3758
2007	108	2509	1210	412	0	592	4831
2008	65	2064	1221	289	0	322	3961
2009	49	2080	870	264	0	25	3288
2010	51	1853	1034	289	2	7	3236

* Provisional.

Scaled landings 1971–1987 (SSDS WG 1999).

Table 5.4.2.3 Cod in Divisions VIIe–k. Summary of stock assessment.

	Recruitment at age 1 (thousands)	TSB (tonnes)	SSB (tonnes)	Landings (tonnes)	Yield/SSB	Mean F Ages 2–5
1971	3075	12742	8928	5782	0.6476	0.6284
1972	565	10984	8225	4737	0.5759	0.5822
1973	1665	9815	7668	4015	0.5236	0.6096
1974	500	9127	7411	2898	0.391	0.4195
1975	3888	10062	6628	3993	0.6024	0.7551
1976	1201	10096	6301	4818	0.7646	0.6321
1977	1713	10314	7687	3059	0.398	0.3997
1978	1688	11621	8617	3647	0.4232	0.4056
1979	4233	13488	8934	4650	0.5205	0.508
1980	7925	18428	9436	7243	0.7676	0.7362
1981	3355	18058	10329	10597	1.026	0.8355
1982	1343	17453	13011	8766	0.6737	0.6252
1983	4614	17745	13443	9641	0.7172	0.7789
1984	4320	16078	10361	6631	0.64	0.507
1985	3892	20249	13534	8317	0.6145	0.5312
1986	3217	19104	13405	10475	0.7814	0.8169
1987	16551	22616	10764	10228	0.9502	0.8794
1988	8184	33674	14616	17191	1.1761	0.6791
1989	2486	33202	23970	19809	0.8264	0.8484
1990	2638	22592	17856	12749	0.714	0.9457
1991	7454	16116	9888	9336	0.9442	1.0699
1992	7698	17475	8069	9747	1.2079	0.9302
1993	2275	17729	10923	10425	0.9544	0.8386
1994	8950	21382	12912	10620	0.8225	0.8189
1995	6244	21480	11611	11709	1.0084	0.7997
1996	4778	22230	14295	12681	0.8871	0.9179
1997	6573	19808	12740	12035	0.9446	0.9029
1998	3278	16739	11123	11431	1.0277	1.0659
1999	1609	13644	9593	8594	0.8958	1.0232
2000	7212	11929	6457	6536	1.0122	0.9193
2001	5941	14933	7021	8308	1.1833	0.9377
2002	1465	13776	9402	9236	0.9824	0.9551
2003	871	10380	8275	6420	0.7758	0.9441
2004	1993	6791	4817	3672	0.7623	0.8616
2005	2870	6988	3768	3062	0.8126	0.807
2006	3133	8371	4325	3776	0.873	0.647
2007	2649	10160	5863	4830	0.8238	0.6547
2008	874	9426	6621	3961	0.5982	0.5548
2009	1845	9327	6503	3292	0.5062	0.5493
2010	11804	17449	6317	3229	0.5112	0.5106
2011	3022*		11944			
Mean	4164	15590	9791	7804	0.7817	0.7458

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

Advice for 2012

ICES advises based on precautionary considerations, that catches in 2012 should be reduced, and uptake of further technical measures to reduce discards.

Stock status

F (Fishing Mortality)		
2008 -2010		
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
SSB (Spawning-Stock Biomass)		
2009 - 2011		
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	✗	Below poss. reference points

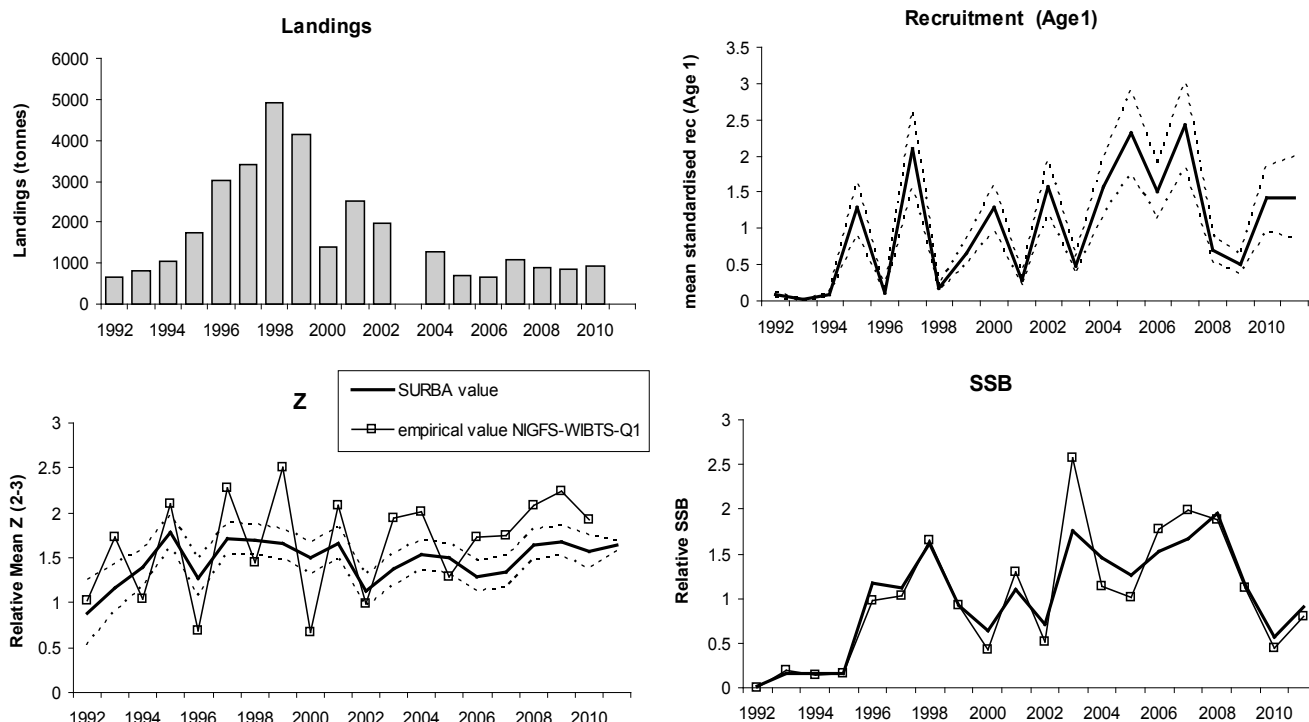


Figure 5.4.3.1 Haddock in Division VIIa (Irish Sea). Summary of trends in ICES estimates of landings (in tonnes, 2003 sampling was inadequate to derive catch age compositions), recruitment, total mortality (Z, empirical total mortality values from one survey are also shown for illustrative purposes), and spawning-stock biomass. Dotted lines are ± 1 standard error.

The assessment is indicative of trends only. Stock trends indicate an increase in SSB over the time-series, but a decrease since 2008. The strength of the 2010 year class is uncertain and the response to SSB is unknown due to the dependence on 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. Landings are made throughout the year, but are generally more abundant during the third quarter. Discarding is high and additional technical measures should be introduced, for example the use of sorting grids or large square mesh (>120 mm) panels in *Nephrops* fisheries. Discard estimates are very variables and estimates are large in some years.

Catch by fleet	Total catch (2010) is unknown; 840 t landings (44% <i>Nephrops</i> otter trawl, 26% midwater otter trawl, 7% seine, 1% beam, and 22% other gears), with discards data not raised to fleet level.
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Quality considerations

This assessment is based on survey trends only, as recent levels of catch are uncertain. This has been attributed to poor discard sampling, which however has improved considerably in the last two years.

Scientific basis

Assessment type	Surba analysis based on survey information, considered indicative of trends only.
Input data	1 trawl survey (NIGFS-WIBTS-Q1).
Discards and bycatch	Not included in the assessment.
Indicators	NIGFS-WIBTS-Q4, NIMIK, UK FSP survey, Irish Sea AEPM survey.
Other information	None.
Working group report	WGCSE

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 2012

The assessment is indicative of trends only. The main reason why no full analytical assessment is presented is uncertainty in absolute levels of recent catch. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

The exploitation status is unknown and SSB is fluctuating widely considering the full time series. Therefore catches should be reduced.

Management by TAC is inappropriate for this stock because landings – but not catches – are controlled. 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

Discarding is a serious problem for this stock. The discard rates for all fleets in 2010 were 92-100% for one-year-olds; 22–96% for two-year-olds and 3–68% 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). In order to minimise discards, a square mesh panel of at least 120 mm should be introduced for all fleets or selectivity devices that achieve equivalent or better improvements.

The Annual Egg Production (AEMP) survey estimates of haddock SSB confirm the trend in SSB from the assessment (Fig. 5.4.3.2). The absolute estimates in 2006 and 2008 (8.8 kt and 9.4 with CV of 32% and 24%, respectively) are very large compared to the WG landings of 650 and 870 t for these years. 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 for an age composition that would reflect low mortality. The AEMP estimate for 2010 is in contrast to the 2006 and 2008 estimates, substantially lower at 870 t (CV of 26%) corresponding to landing 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 2005–2008 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 UK Buyers and Sellers legislation has improved the quality of the landings data and there is little evidence of misreporting since 2006.

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. Four Irish vessels targeting *Nephrops* are now using selective grids and are exempted from the effort control regime. Grids have been shown to reduce haddock catches to negligible levels.

Uncertainties in the assessment

An assessment was carried out based on survey information only and is considered to be indicative of trends only. Both total mortality and SSB estimates are relative as survey catchabilities at age are not known. Recruitment estimates for the 2010 year class is uncertain with conflicting signals from the surveys.

Information from the fishing industry

The UK Fishery Science Partnership Irish Sea roundfish survey 2004–2009, 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 most recent SSB estimate indicates that the stock has declined since 2008. Last year the SSB was expected to remain at stable or increase; this year the SSB is expected to remain at current levels or decrease depending on the strength of recruitment.

The basis for the advice is the precautionary considerations.

Sources

- BIM. 2009. Summary report of Gear Trials to Support Ireland's Submission under Articles 11 & 13 of Reg. 1342/2008. *Nephrops* Fisheries VIIa & VIIb-k. Project 09.SM.T1.01. Bord Iascaigh Mhara (BIM) May 2009.
- ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

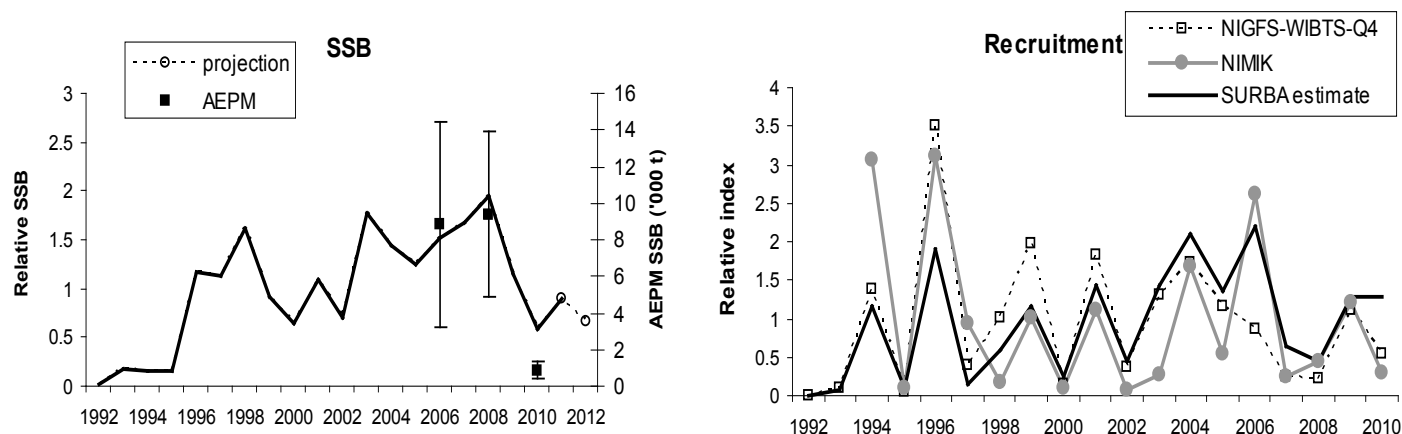


Figure 5.4.3.2 Haddock in Division VIIa (Irish Sea). Trend in SSB from 2010 SURBA projected to 2012 compared to the Irish Sea annual egg production method survey estimates of SSB (+ 2 SE) (left panel) and SURBA estimate of recruitment compared to available 0-gp indices (right panel). SSB and recruitment are standardised to the mean for years common to all series (1994-2010) in each plot.

Table 5.4.3.1 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
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	1.8
1996	No advice		7 ¹	1.5	3.0
1997	Means of setting catch limits req'd		14 ¹	1.9	3.4
1998	Catch limit for 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	2.5
2002	Reduce F below F _{pa}	<1.20	1.3 ²	1.1	2.0
2003	No cod catches	-	0.6 ²	0.7	n/a
2004	F < F _{pa}	<1.5	1.5 ²	0.8	1.3
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	1.1
2008	No increase in effort	-	1.238	0.9	0.9
2009	No increase in effort	-	1.424	0.8	0.8
2010	No increase in effort	-	1.424	0.9 ³	0.9 ³
2011	See scenarios	-	1.317		
2012	Reduce catch and improved selectivity	-			

Weights in '000 t.

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 5.4.3.2 Haddock in Division VIIa. Nominal landings (t) by country, as officially reported to ICES.

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

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

Country	2004	2005	2006	2007	2008	2009	2010
Belgium	15	22	23	30	15	7	9*
France	20	36	20	11	6	3	2*
Ireland	296	139	184	477	319	388	333*
Netherlands	-	-	-	-	-	-	-
UK (England & Wales) ¹	421	344	419	559	521	446	
UK (Isle of Man)	-	-	-	-	1	1	
UK (N. Ireland)	...	...	...	...	...	...
UK (Scotland)	9	6	9	1	17	1	
United Kingdom							591*
Total	761	547	655	1078	879	846	936*

*Preliminary.

¹1989–2008 Northern Ireland included with England and Wales.

n/a = not available.

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

Advice for 2012

Abundance of haddock is increasing due to a large recruiting year class, but exploitation status is unknown; therefore, ICES advises no increase in catch and technical measures to mitigate the increased discarding of the recruiting year class.

Standard short-term projections imply a TAC increase of around 300% for 2012 compared to 2011, under *status quo* F, although the precision is expected to be poor. Discarding rates will be high unless technical measures are implemented in 2011. During 2011 new data from surveys and the industry will be coming in that will improve the estimate of the year-class strength, and this may allow changes in management in 2012.

Stock status

F (Fishing Mortality)			
	2008	2009	2010
MSY (F_{MSY})	?	?	? Unknown
Precautionary approach (F_{pa}, F_{lim})	?	?	? Unknown
Qualitative evaluation	→	→	→ Stable
SSB (Spawning-Stock Biomass)			
	2009	2010	2011
MSY ($B_{trigger}$)	?	?	? Unknown
Precautionary approach (B_{pa}, B_{lim})	?	?	? Unknown
Qualitative evaluation	↗	↗	↗ Strong increase

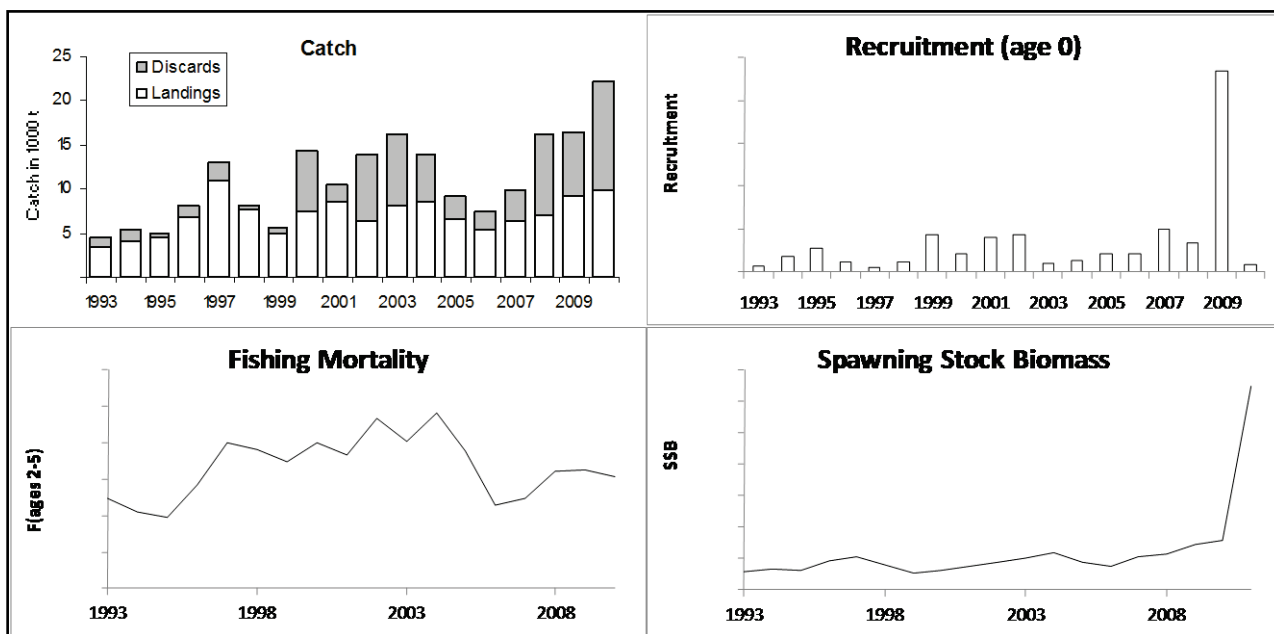


Figure 5.4.4.1 Haddock in Divisions VIIb–k. Summary of stock trends: Top right: SSB/F over the years. Y-axis starting at 0.

The assessment is indicative of trends only. SSB shows an increasing trend over the time-series. Recruitment is highly variable and in the past the SSB and catches have increased after good recruitment. Recruitment of the 2009 year class appears to be exceptionally good, and catches have increased in 2010. However, most of the increase in catch was discarded because these fish were under the minimum landing size. As these fish become of marketable size from age 2 onwards, they are likely to be discarded due to a restrictive TAC. Fishing mortality has been stable over the recent years.

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.

Catch by fleet	Total catch (2010) = 22.2 kt, of which 44% are landings (all fleets combined) and 56% 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. However, the estimates of F and trends in recruitment and SSB do not appear to be sensitive to the inclusion of the age classes at which the discarding takes place in the assessment.

Scientific basis

Assessment type	Age-analytical assessment (XSA) considered for trends only.
Input data	Two survey indices: EVHOE-WIBTS-Q4, IGFS-WIBTS-Q4 (7g); two commercial indices (FR-GAD; IR-7bj-OTB).
Discards and bycatch	Discards included in the assessment .
Indicators	None.
Other information	FR-GAD index was not available for 2009 and 2010.
Working group report	WGCSE

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

No reference points have been defined for this stock.

Outlook for 2012

A trends-only assessment is presented for this stock. The main reason why no full analytical assessment is presented is uncertainty in absolute levels of recent discards. Therefore, fishing possibilities cannot be projected.

A short-term forecast, used in relative terms, illustrates the drastic changes expected in yield and SSB at different levels of exploitation in relation to current F (Fig. 5.4.4.3). The landings in 2012 are expected to be 300% of the TAC (Divisions VIIb–k and Subareas VIII, IX, and X) in 2011. The high recruitment in 2009 is expected to account for a large proportion of the projected landings in 2012 and SSB in 2013. TACs will control landings, but not catches. A high level of discarding is therefore expected in 2011 and 2012.

Precautionary considerations

The underlying data do not support the provision of estimates of F_{MSY} . The exploitation status is thus unknown. Fishing mortality has been stable over the recent years. Therefore, there should be no increase in catches.

Future catches and SSB will be highly dependent on the strength of incoming year classes and their discard mortality. With the higher incoming recruitment of the 2009 year class, the stock should be managed by ensuring that fishing effort is not allowed to increase and technical measures should be introduced to reduce discards.

Additional considerations

Management by TAC is inappropriate for this stock because landings, and not catches, are controlled. 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 10 years 70% of the catch has been discarded (45% by weight). The TAC has not been restrictive in recent years, but since 2009 the national quotas of Ireland and Belgium appear to have become restrictive. The catches are increasing as the 2009 year class enters the fishery; and despite a moderate increase in TAC in 2011, the quota are likely to become restrictive for all countries, resulting in increased levels of discarding.

An analysis of Irish landings and discards by metier (Anon., in prep.) indicates that although the *Nephrops* fleets have very high discarding rates of haddock (>70% by weight), in absolute terms these fleets only contribute 10% of the Irish haddock discards in the Celtic Sea. The demersal otter bottom trawl (OTB) and Scottish seine (SSC) fleets in Divisions VIIgj contribute 82% of the haddock discards.

Technical measures can reduce discarding and could increase the yield considerably. Improved selectivity on younger ages will reduce discarding and promote stock increase when strong year classes occur. ICES recommends that an escape panel and minimum mesh size for the demersal fleet should be increased substantially and an analysis should be performed to estimate appropriate mesh size.

Comparison with previous assessment and advice

The basis for the assessment and the advice is the same as last year.

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 (Division VIIb–k). However, official international landings from Subareas VIII, IX, and X have been less than 2% of all landings in the TAC area in most years since 1973.



Figure 5.4.4.2 Haddock in Divisions VIIb–k. TAC area in the boxes outlined in red (Divisions VIIb–k and Subareas VII, IX, and X), assessment area in blue shading (Divisions VIIb–k).

Sources

Anon. In prep. Demersal discard atlas. An Overview of Irish Discarding and Potential Solutions .

ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

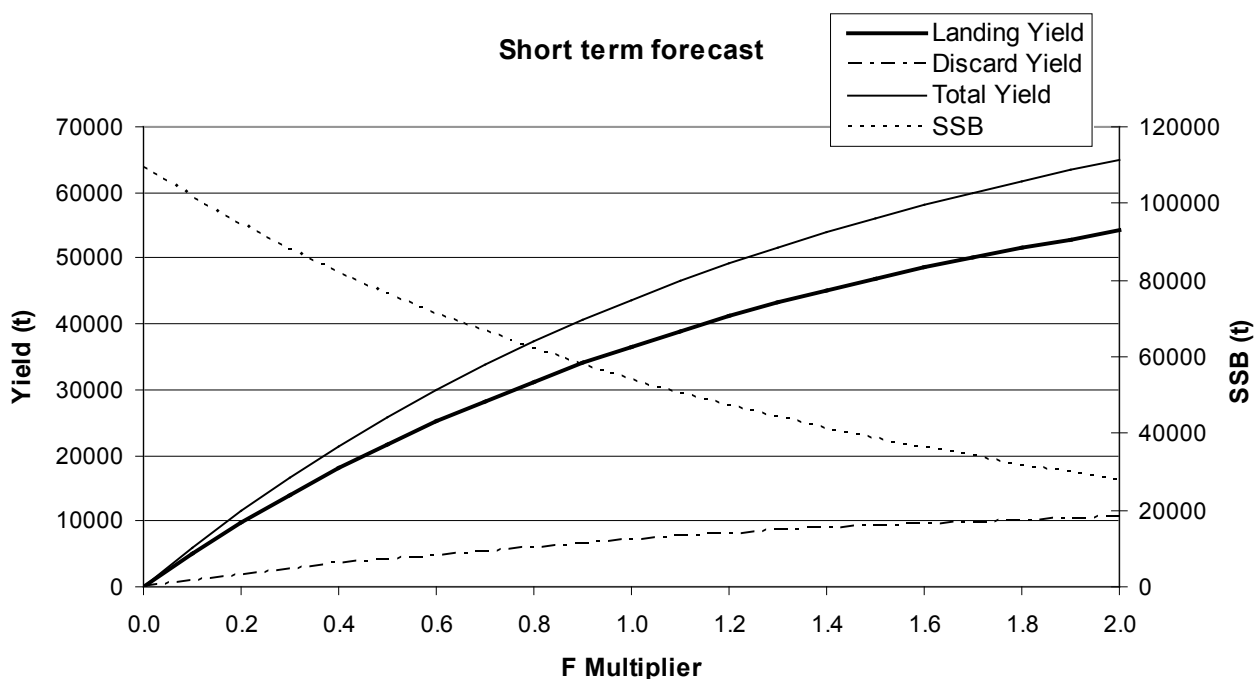


Figure 5.4.4.3 Haddock in Divisions VIIb–k. Short-term forecast (yield in 2012 and SSB in 2013).

Table 5.4.4.1 Haddock in Divisions VIIb–k. Advice, management, landings, discards, and catch.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	Official landings ²	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	4.5
1994	Not dealt with			4.1	4.1	1.2	5.3
1995	Not dealt with		6	4.5	4.5	0.5	4.9
1996	Not dealt with		7 ³	6.7	6.8	1.4	8.2
1997	Not dealt with		14	10.3	10.8	2.1	12.9
1998	Not dealt with		20	7.4	7.7	0.4	8.0
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	7.1	14.4
2001	No expansion of catches		12 ⁴	9.7	8.6	2.0	10.6
2002	No expansion of catches	8.0	9.3 ⁴	7.1	6.4	7.5	13.9
2003	No expansion of catches	7.2	8.185 ⁴	8.2	8.1	8.2	16.4
2004	No increase in F	-	9.600 ⁴	8.5	8.6	5.4	14.0
2005	No increase in effort	-	11.520 ⁴	6.9	6.6	2.6	9.2
2006	No increase in effort	-	11.520 ⁴	5.6	5.4	2.1	7.5
2007	No increase in effort	-	11.520 ⁴	6.6	6.5	3.3	9.8
2008	Same advice as last year	-	11.579 ⁴	6.2	7.0	9.3	16.3
2009	Same advice as last year	-	11.579 ⁵	9.3	10.0	7.1	17.1
2010	Same advice as last year	-	11.579 ⁵	9.9	9.9	12.4	22.2
2011	See scenarios	-	13.316 ⁵				
2012	No increase in catch and technical measures to reduce discards rates	-					

Weights in '000 t.

¹Applies to Subareas VII, VIII, IX, and X.²Possible underestimates due to misreporting.³Increased in-year to 14 000 t.⁴Includes separate Division VIIa allocation.⁵Applies to Divisions VIIb–k and Subareas VIII, IX, and X.

n/a = not available.

Table 5.4.4.2 Haddock in Divisions VIIb–k. **(a):** Official landings, landings and catches used by the working group (tonnes). **(b):** The landings used by the working group, disaggregated by country and the quota (tonnes).

(a) Year	Official landings						Un- allocated	Used by WG		
	Belgium	France	Ireland	UK	Others	Total		Landings	Discards	Catch
1993	51	1839	1262	256	0	3408	-60	3348	1193 ²	4541
1994	123	2788	908	240	17	4076	55	4131	1193 ²	5324
1995	189	2964	966	266	83	4468	2	4470	470	4941
1996	133	4527	1468	439	86	6653	103	6756	1398	8154
1997	246	6581	2789	569	85	10270	557	10827	2104	12931
1998	142	3674	2788	444	312	7360	308	7668	355	8023
1999	51	2725	2034	278	159	5247	-365	4882	620	5502
2000	90	3088	3066	289	123	6656	755	7411	6984	14395
2001	165	4842	3608	422	665	9702	-1070	8632	1941	10573
2002	132	4348	2188	315	106	7089	-686	6403	7506	13909
2003	118	5781	1867	393	82	8241	-95	8146	8194	16341
2004	136	6130	1715	313	159	8453	128	8581	5350	13931
2005	167	4174	2037	292	197	6867	-219	6648	2546	9194
2006	99	3190	1875	274	209	5647	-264	5383	2083	7466
2007	119	4142	1930	386	52	6629	-119	6510	3243	9753
2008	108	3639	1800	566	121	6234	815	7049	9277	16326
2009	131	5419	2983	716	48	9297	-21	9276	7276	16552
2010 ¹	170	6249	2611	850	1	9881	-17	9864	12369	22233

¹ Preliminary data.

² No discard data available, the average effort for **1995–1999** was used to estimate discards.

(b) Year	Landings used by WG (Quota in brackets)					
	Belgium	France	Ireland	UK	Others	Total
2002	134 (103)	3878 (6200)	2070 (2067)	301 (930)	21	6403 (9300)
2003	116 (91)	5960 (5456)	1667 (1819)	362 (819)	41	8146 (8185)
2004	137 (107)	6336 (6400)	1732 (2133)	303 (960)	73	8581 (9600)
2005	165 (128)	4096 (7680)	1991 (2560)	282 (1152)	20	6555 (11520)
2006	98 (128)	3151 (7680)	1857 (2560)	262 (1152)	14	5383 (11520)
2007	118 (128)	4073 (7680)	1925 (2560)	383 (1152)	10	6510 (11520)
2008	109 (129)	4587 (7719)	1794 (2573)	545 (1158)	14	7049 (11579)
2009	131 (129)	5455 (7719)	2986 (2573)	703 (1158)	2	9276 (11579)
2010	167 (148)	6267 (8877)	2609 (2959)	789 (1332)	34	9864 (13316)

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

Advice for 2012

ICES advises on the basis of precautionary considerations that catches should be reduced to the lowest possible levels and uptake of further technical measures to reduce discards.

Stock status

F (Fishing Mortality)		
2008 - 2010		
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
Qualitative evaluation	✗	Above poss. reference points
SSB (Spawning Stock Biomass)		
2009 - 2011		
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	✗	Below poss. reference points

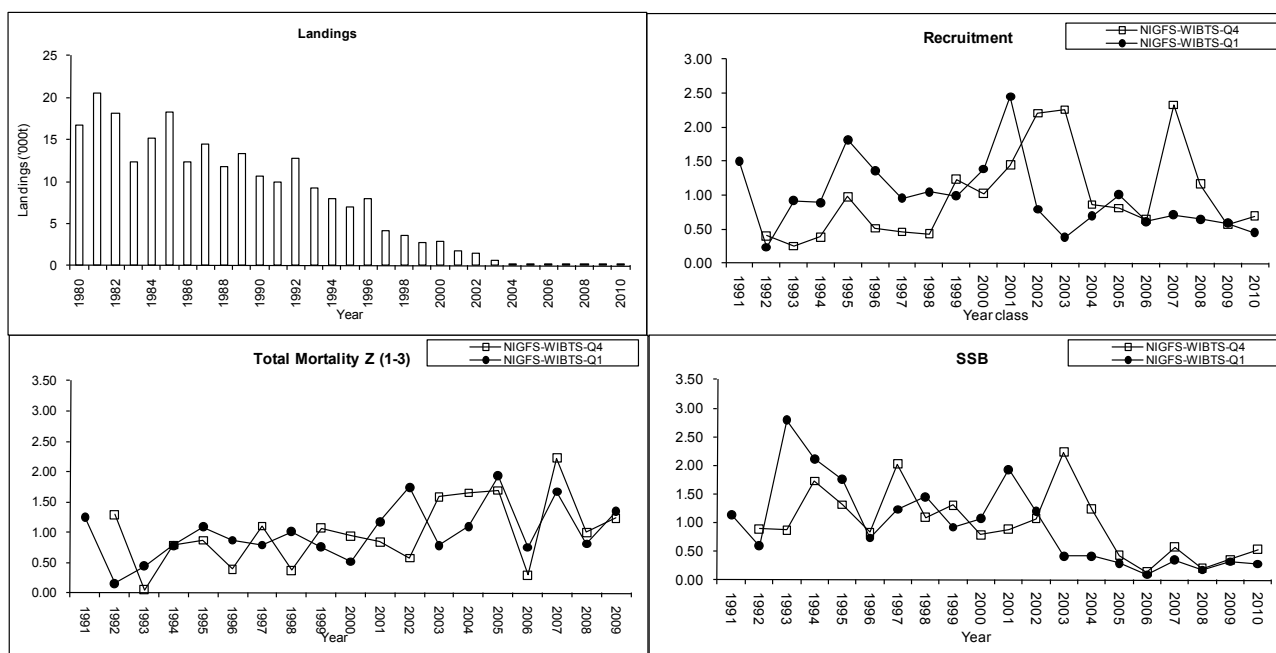


Figure 5.4.25.1 Whiting in Division VIIa (Irish Sea). Landings reported to the WG (in thousand tonnes, 1991-2002 estimates include sampled-based estimates of landings at a number of Irish Sea ports), and mean standardised: SSB, total mortality (Z), and recruitment estimates, from single fleet SURBA analysis.

The state of the stock is uncertain. Long-term information on the historical yield and catch composition indicate that the present stock size is extremely low and likely to be well below previously defined B_{lim} . Landings have seen a declining trend since the early 1980s, reaching lowest levels in the 2000s. The survey results indicate a decline in relative SSB. Total mortality has been variable over the time series. Current fishing mortality is likely to be above possible MSY targets.

Management plans

No specific management objectives are known to ICES.

Biology

The degree of mixing between this stock and other adjacent stocks is unclear and whiting in Division VIIa may be a component of a larger stock.

The fisheries

There is no targeted whiting fishery in the Irish Sea. Whiting are bycatch (and discarded) within in the main Irish Sea fisheries. Otter trawlers utilising 70–90 mm mesh sizes are the primary gear associated with whiting landings. This incorporates the *Nephrops* fishery, which shows high discard rates of whiting. Discard rates are very high likely due to the low market value of this species, particularly for smaller sizes.

Catch by fleet	Total catch (2010) is unknown. Total landings 0.1 kt, >1.0 kt estimated discards.
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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. Discard estimation and raising procedures are problematic and discard estimates may be imprecise. Survey data are consistent with increasing F and low stock size.

Scientific basis

Assessment type	Based on survey information only and is considered to be indicative of trends only
Input data	2 trawl survey indices (NIGFS-WIBTS-Q1, NIGFS-WIBTS-Q4)
Discards and bycatch	Not included in the assessment
Indicators	NIMIK, UK (E&W)-BTS-3Q, UK FSP survey
Other information	None
Working group report	WGCSE

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

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B_{trigger}	Undefined	
	F_{MSY}	Undefined	
Precautionary Approach	B_{lim}	5 000 t	B_{loss} (1998); the lowest observed SSB as estimated in previous assessment. There is no clear evidence of reduced recruitment at the lowest observed SSBs.
	B_{pa}	7 000 t	$B_{\text{loss}} * 1.4$; considered to be the minimum SSB required to ensure a high probability of maintaining SSB above its lowest observed value, taking into account the uncertainty of assessments.
	F_{lim}	0.95	The fishing mortality above which stock decline has been observed.
	F_{pa}	0.65	This F is considered to have a high probability of avoiding F_{lim} . It implies an equilibrium SSB of 10.6 kt, and a relatively low probability of $\text{SSB} < B_{\text{pa}}$ (= 7 kt), and is within the range of historic F s.

(unchanged since: 1998)

Outlook for 2012

No reliable assessment can be presented for this stock. The main cause of this is the limited data on discards. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

SSB has declined to a very low level. The underlying data do not support the provision of estimates of F_{MSY} . However, it is likely that current F is above F_{MSY} . Therefore, catches (mainly discards) of whiting should be reduced to the lowest possible levels.

Management by TAC is inappropriate for this stock because landings – but not catches – are controlled. Further management measures should be introduced in the Irish Sea to reduce discarding of small whiting in order to maximize their contribution to future yield and SSB.

Additional considerations

Management by TAC is inappropriate for this stock because landings, not catches, are controlled.

Catches of whiting have substantially reduced from the 1980s. Discarding remains a substantial problem for this stock, with almost all whiting caught being discarded. Of the onboard observer trips carried out in 2010 by the UK (E&W), UK (NI) and Ireland, negligible fish were retained on board while thousands of small fish were discarded. Raised discards from the main national fleets landing whiting show over 22 million whiting, greater than 1000 t in weight, were discarded in 2010. This focused on the two youngest ages, and to a lesser extent age 2. In some years up to age 4 fish are discarded.

Any measure to reduce discarding and to improve the fishing pattern should be actively encouraged. These might include spatial and temporal changes in fishing practises or technical measures such as increased codend mesh size, square mesh panels, separator trawls, and increased top sheet mesh in towed gears. These measures would also need to be evaluated in the context of other species caught in these mixed fisheries. In late 2009, a number of Irish vessels operating within the Irish Sea *Nephrops* fishery incorporated a Swedish grid into otter trawls, as part of the cod long term management plan. It is expected that this will reduce the whiting catches of these vessels by 60% in weight. Further more, a small number of vessels began utilizing an inclined separator panel expected to reduce whiting catch by 76% in weight.

Regulations and their effects

Various technical measures have been introduced in the past to mitigate bycatch of whiting, particularly in the *Nephrops* fishery, which operates on the whiting nursery grounds. It has proven difficult to evaluate the success of measures, such as the mandatory use of square mesh panels in *Nephrops* trawls since 1994. A minimum landing size of

≥ 27 cm is applied to this stock, however, discard data shows that individuals in excess of that size are also discarded. In addition to area and species related minimum mesh size restrictions applicable to mixed demersal fisheries.

Due to the bycatch of cod in fisheries taking whiting, the regulations affecting Division VIIa whiting remain linked to those implemented under the Irish Sea cod long term management plan, including effort restrictions. Although vessels catching whiting will be affected by this regulation at present it is not believed that the effort limitations will prove beneficial to the whiting stock.

The closure of the western Irish Sea to whitefish fishing from mid-February to the end of April, designed to protect cod, has been continued, though it is not clear to what extent these measures will protect whiting.

Uncertainty in the assessment

The primary deficiency is the limited availability of discard time series data. There are no reliable estimates of catch numbers-at-age since 2003 due to the low landings levels of whiting in recent years resulting in poor sampling. Discard estimation and raising procedures are problematic and discard estimates may be imprecise. Additionally, the stock structure of whiting in the Irish Sea is uncertain.

Comparison with previous assessment and advice

The basis for the assessment is the same as last year. The advice is the same as last year.

Sources

ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 11–19 May 2011, Copenhagen, Denmark ICES CM 2011/ACOM:12.

Table 5.4.5.1 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	Disc. ²	ICES Catch
1987	Reduce F	16.0	18.2	11.7	3.8	14.4
1988	No increase in F; enforce mesh regulations	12.0	18.2	11.5	1.9	11.9
1989	F = F _{high} ; enforce mesh regulations	11.0	18.2	11.3	2.0	13.4
1990	No increase in F; TAC	8.3 ¹	15.0	8.2	2.7	10.7
1991	Increase SSB to SSB(89)	6.4 ¹	10.0	7.4	2.7	9.9
1992	80% of F(90)	9.7 ¹	10.0	7.1	4.3	12.8 ³
1993	70% of F(91) ~ 6 500 t	6.5	8.5	6.0	2.7	9.2 ³
1994	Within safe biological limits	-	9.9	5.6	1.2	7.9 ³
1995	No increase in F	8.3 ¹	8.0	5.5	2.2	7.0 ³
1996	No increase in F	9.8 ¹	9.0	5.6	3.5	8.0 ³
1997	No advice given	-	7.5	4.5	1.9	4.2 ³
1998	20% reduction in F	3.8 ⁴	5.0	3.4	1.3	3.5 ³
1999	Reduce F below F _{pa}	3.5 ⁴	4.41	2.0	1.1	2.8 ³
2000	Reduce F below F _{pa}	<1.6 ⁴	2.64	1.1	2.1	2.9 ³
2001	Lowest possible F	~0	1.39	1.1	1.0	1.7 ³
2002	Lowest possible F	~0	1.00	0.7	0.7	1.5 ³
2003	Lowest possible F	~0	0.50	0.5	n.a.	n.a.
2004	zero catch	0	0.514	0.2	n.a.	n.a.
2005	zero catch	0	0.514	0.2	n.a.	n.a.
2006	lowest possible catch	0	0.437	0.08	n.a.	n.a.
2007	lowest possible catch	0	0.371	0.2	n.a.	n.a.
2008	lowest possible catch	0	0.278	0.08	n.a.	n.a.
2009	Same advice as last year	0	0.290	0.09	n.a.	n.a.
2010	Same advice as last year	0	0.157	0.12	n.a.	n.a.
2011	See scenarios	-	0.118			
2012	Lowest possible catch and improve selectivity	0				

Weights in '000 t.

¹ Not including discards from the *Nephrops* fishery.² From the *Nephrops* fishery.³ Including estimates of misreporting.⁴ Landings only, no discards included.

n.a. = not available.

Table 5.4.5.2 Whiting in Division VIIa (Irish Sea). Nominal catch (t), as officially reported to ICES and Working Group estimates of discards.

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Belgium	90	92	142	53	78	50	80	92	80	47	52
France	1,063	533	528	611	509	255	163	169	78	86	81
Ireland	4,394	3,871	2,000	2,200	2,100	1,440	1,418	1,840	1,773	1,119	1,260
Netherlands									17	14	7
UK(Engl. & Wales) ^a	1,202	6,652	5,202	4,250	4,089	3,859	3,724	3,125	3,557	3,152	1,900
Spain											
UK (Isle of Man)	15	26	75	74	44	55	44	41	28	24	33
UK (N.Ireland)	4,621										
UK (Scotland)	107	154	236	223	274	318	208	198	48	30	22
UK											
Total human consumption	11,492	11,328	8,183	7,411	7,094	5,977	5,637	5,465	5,581	4,472	3,355
Estimated Nephrops fishery discards used by the WG ^b	1,611	2,103	2,444	2,598	4,203	2,707	1,173	2,151	3,631	1,928	1,304
Working Group Estimates	11,856	13,408	10,656	9,946	12,791	9,230	7,936	7,044	7,966	4,205	3,533

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Belgium	46	30	27	22	13	11	10	4.2	3	2	2
France	150	59	25	33	29	8	13	3.7	3	2	
Ireland	509	353	482	347	265	96	94	55.3	187	68	78
Netherlands	6	1									
UK(Engl. & Wales) ^a	1,229	670	506	284	130	82	47	21.7	3	11	20
Spain					85						
UK (Isle of Man)	5	2	1	1	1	1			1	1	
UK (N.Ireland)											
UK (Scotland)	44	15	25	27	31	6	<0.5	<0.5	<0.5		
UK											
Total human consumption	1,989	1,130	1,066	714	554	204	164	84.9	197	84	100
Estimated Nephrops fishery discards used by the WG ^b	1,092	2,118	1,012	740	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Working Group Estimates	2,762	2,880	1,745	1,487	676	184	158	86	196	81	102

Country	2010*
Belgium	4.60
France	2.50
Ireland	96.93
Netherlands	
UK(Engl. & Wales) ^a	16.06
Spain	
UK (Isle of Man)	0.36
UK (N.Ireland)	
UK (Scotland)	
UK	
Total human consumption	120
Estimated Nephrops fishery discards used by the WG ^b	n/a
Working Group Estimates	121

^a 1989-onwards Northern Ireland included with England and Wales.

^b Based on UK(N.Ireland) and Ireland data.

* Preliminary.

ECOREGION Celtic Sea and West of Scotland
STOCK Whiting in Divisions VIIe–k

Advice for 2012

ICES advises based on precautionary considerations, that catches should not be allowed to increase and technical measures should be introduced to reduce discard rates.

Stock status

F (Fishing Mortality)		
	2008 - 2010	
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
SSB (Spawning Stock Biomass)		
	2008 - 2010	
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	↗	Increasing

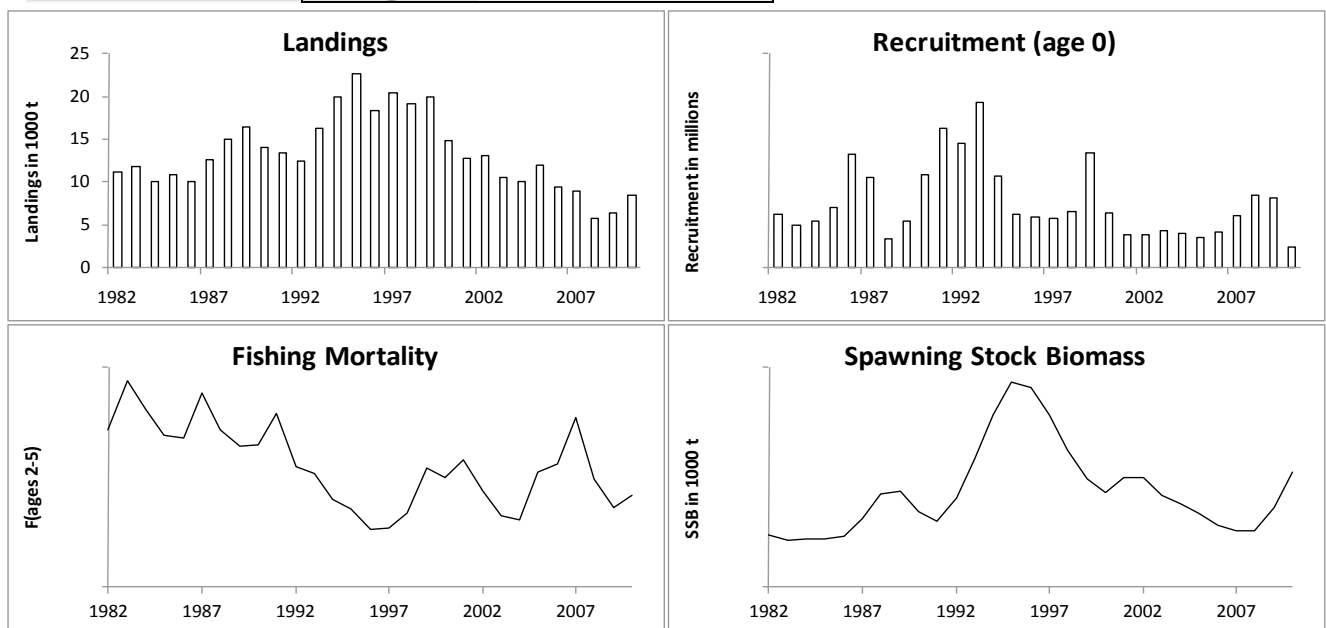


Figure 5.4.6.1 Whiting in Divisions VIIe–k. Summary of stock trends assessment.

The state of the stock is uncertain and the assessment is indicative of trends only. The stock is estimated to have declined since the mid 1990s and has recently increased to the long term average. SSB is highly dependent on incoming recruitment. Fishing mortality estimates are variable and recent trends suffer in precision due to lack of discard data in the assessment. Surveys indicate that the 2008 and 2009 year classes may be above average.

Management plans

No specific management objectives are known to ICES.

The fisheries

Celtic Sea whiting are taken in mixed species fisheries. Discard rates are very high due to the low market value of this species, particularly for smaller sizes. Otter trawlers are the primary gear associated with whiting landings from the Celtic Sea.

Catch by fleet	Total catch (2010) is unknown. Total landings 8.4 kt (% by gear unavailable), discard estimates are high (8–82% by weight depending on métier).
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Quality considerations

The main quality consideration is the non-inclusion of discard data in the assessment, which biases recruitment estimates and may explain changing catchabilities in commercial fleets observed throughout the assessment period. Surveys used in the assessment are prone to year effects, and often give very different estimates of the incoming year classes. The lack of French effort and *lpue* data for 2009 and 2010 is an additional uncertainty.

Scientific basis

Assessment type	Age based analytical assessment (XSA) considered for trends only
Input data	3 survey indices (EVHOF-WIBTS-Q4, IGFS-WIBTS-Q4, and UKWCGFS) 2 commercial indices (FR-Gadoid, FR-Nephrops)
Discards and bycatch	Not included in the assessment
Indicators	None
Other information	None
Working group report	WGCSE

ECOREGION Celtic Sea and West of Scotland
STOCK Whiting in Divisions VIIe–k

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B_{trigger}	Undefined	
	F_{MSY}	Undefined	
Precautionary Approach	B_{lim}	15 000 t	B_{loss} , the lowest observed spawning-stock biomass.
	B_{pa}	21 000 t	$B_{\text{pa}} = B_{\text{lim}} * 1.4$. 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: 1998)

Outlook for 2012

No reliable assessment can be presented for this stock. The main cause of this is high and uncertain discards which are not included in the assessments. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

The SSB estimates show an increase since 2007 and the exploitation status is unknown. Therefore, catches should not be allowed to increase.

Management by TAC is inappropriate for this stock because landings – but not catches – are controlled. Recruitment in 2008 and 2009 appears to be above average. Catches and SSB may increase in 2011 if effort remains constant. Technical measures to minimise discards should be considered with urgency.

Additional considerations

Discarding of this stock for different fleets is substantial and highly variable (9–82% by weight and 18–90% by number of total catch). Any measure to reduce discarding and to improve the fishing pattern as advised for haddock in Divisions VIIb–k would be beneficial to the whiting stock (see section 5.4.4). These might include spatial and temporal changes in fishing practises or technical measures such as increased cod-end mesh size, square mesh panels, separator trawls, and increased top sheet mesh in towed gears. These measures would also need to be evaluated in the context of other species caught in these mixed fisheries. ICES suggest that a square mesh panel of at least 120 mm should be introduced for the *Nephrops* fleet and a minimum mesh size of at least 100 mm with a square mesh panel of at least 110 mm for all other fleets or selectivity devices that achieve equivalent or better improvements.

Regulations and their effects

The stock is managed by a TAC and technical measures. The TAC has not been restrictive or approached restriction since the mid 1990s, a period of strong recruitment. Uptake since 2002 has been on average around 40%.

A closure of the three rectangles in the Celtic Sea has been in place annually during the first quarter, since 2005 to protect the cod stock. The impact of this on the whiting stock remains unclear. Whiting landings from these rectangles are lower than 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. The exception to this is the Irish otter trawl fleet in Division VIIg which showed increased effort, due to activity shifting into the area from Division VIIj. During this period, fleet modernisation has occurred, replacing old inefficient vessels with newer more efficient vessels. 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.

Comparison with previous assessment and advice

The basis for the assessment and advice is the same as last year.

Assessment and management area

The assessment area of this stock (Divisions VIIe–k) does not correspond to the TAC area (VIIb,c,d,e,f,g,h,j and k). Whiting in Divisions VIIb,c are not assessed and whiting in Division VIId is considered to be part of the North Sea stock (Subarea IV and Division VIId) (section 6.4.5). Division VIIj was without TAC constraint, from 2008–2010, but included again in 2011. Whatever management measures are implemented, they must be consistent with the assessment area.

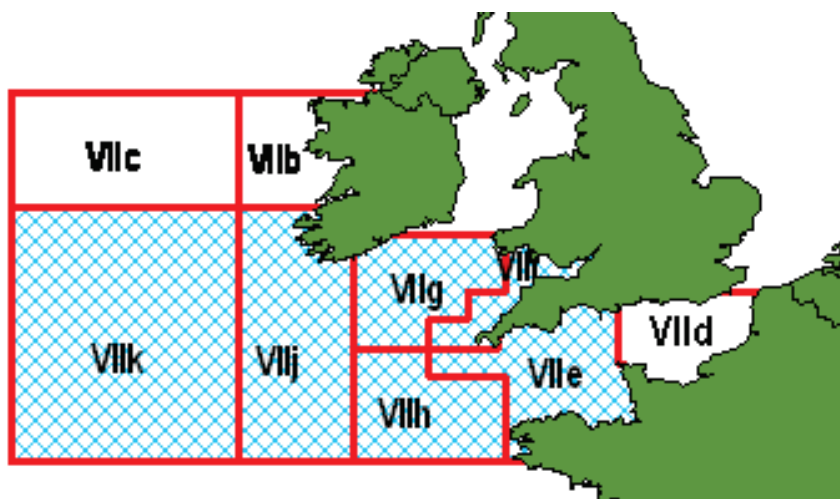


Figure 5.4.6.2 Whiting in Divisions VIIe–k. TAC Area in the boxes outlined in red, assessment area in blue shading.

Sources

ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 11–19 May 2011, Copenhagen, Denmark ICES CM 2011/ACOM:12.

Table 5.4.6.1 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		12.5
1988	Precautionary TAC	7.0 ²		14.8
1989	Precautionary TAC	7.9 ²		23.1
1990	No increase in F; TAC	8.4 ²		23.3
1991	Precautionary TAC	8.0 ²		13.8
1992	If required, precautionary TAC	8.0 ²		13.1
1993	Within safe biological limits	6.6 ²	22.0	16.9
1994	Within safe biological limits	< 9.4 ²	22.0	20.5
1995	20% reduction in F	8.2 ³	25.0	21.5
1996	20% reduction in F	8.6 ³	26.0	18.1
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	24.0
2000	17% reduction in F	< 13.1 ⁴	22.2	15.3
2001	No increase in F	13.5 ⁴	21.0	13.4
2002	No increase in F	27.7 ⁴	31.7	13.8
2003	No increase in F	20.2 ⁴	31.7	10.9
2004	No increase in F	14.0	27.0	9.9
2005	No increase in F	10.6	21.6	12.3
2006	No increase in F	10.8	19.9	9.8
2007	No increase in F	-	19.9	9.1
2008	Reduction in F	-	19.9 ⁵	6.1
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 ⁶	
2012	No increase catch and improved gear selection	-		

Weights in '000 t.

¹ TAC covers Subarea VII (except Division VIIa).² For the VII f,g stock component.³ For the VII f–h stock component.⁴ For the VII e–k stock component.⁵ For the VII b, VII c, VII d, VII e, VII f, VII g, VII h, and VII k.⁶ For the VII b, VII c, VII d, VII e, VII f, VII g, VII h, VII j and VII k.

Table 5.4.6.2 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
Belgium	130	158	160	107	112	159	295	317	304	111	145	228	205	268
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
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
Netherlands		398		124										8
Spain													4	31
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
UK(Scotland)						1	33	32	20	41	16	23	23	34
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
Unallocated	1,376	3,192	-135	-263	149	353	-6,535	-9,184	-248	-690	-532	-429	1,165	144
Total as used by Working Group	11,781	9,985	10,838	9,952	12,652	15,128	16,541	14,106	13,508	12,364	16,320	20,034	22,678	18,260

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010 ^a
Belgium	449	479	448	194	171	149	129	180	218	128	127	122	87	102
Denmark														
France	11,370	11,711	16,418 ^b	9,077	7,203	7,435	5,897	4,811	5,784	4,649	3,543	3,046	2,739	3,390
Germany														
Ireland	6,893	5,226	5,807	4,795	5,008	5,332	4,093	4,215	5,709	4,521	4,764	2,330	2,704	4,186
Netherlands		1			5	4	9	18	60	40	64	23	24	75
Spain	24	53	21	11	9	12	-	76	56	70	21	8	1	
UK (E/W/Nl)	1,742	1,706	1,344	1,249	943	843	758	586	471	402	569	610	764	
UK(Scotland)	42	68	3	2	11	12	5	7	-	6	4	7	63	
United Kingdom														785
Channel Islands		3	2	3	3	1	4	0	0	0	1	1	-	2
Total	20,520	19,247	24,043	15,331	13,353	13,788	10,895	9,893	12,298	9,816	9,093	6,147	6,382	8,540
Unallocated	12	-2	-4,128	-466	-583	-642	-312	61	-269	-283	-146	-410	-674	-116
Total as used by Working Group	20,532	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

^a: Preliminary

^b: Preliminary, Reported as VIIb-k

Table 5.4.6.3 Official landings (t) of whiting in Divisions VIIb,c (included in the TAC area).

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010a
France	57	76	65	37*	...1*	107	114	111	92	59	102	62	32	26	32	70
Ireland	1,894	1,233	403	323	206	563	357	386	423	135	65	49	100	76.0	94	143
Netherlands	-	-	-	-	-	-	2	-	3	-	2	-	-	-	-	-
Spain	+	+	-	27	1	4	-	6	-	31	18	19	1	4	-	-
UK(E/W/Nl)	24	96	75	49	10	6	5	4	5	1	11	5	1	1	2	0.4
UK(Scotland)	71	17	4	27	-	19	1	+	-	-	-	-	-	-	-	-
Total	2,046	1,422	547	463	217	699	479	507	523	226	198	135	134	107	128	214

*See VIIg-k.

^a provisional

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

Advice for 2012

ICES advises on the basis of precautionary considerations that catches of plaice should not increase and technical measures should be introduced to reduce discard rates.

Stock status

F (Fishing Mortality)		
2008-2010		
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
Qualitative evaluation	✓	Below poss. reference points
SSB (Spawning Stock Biomass)		
2008-2010		
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	✓	Above poss. reference points

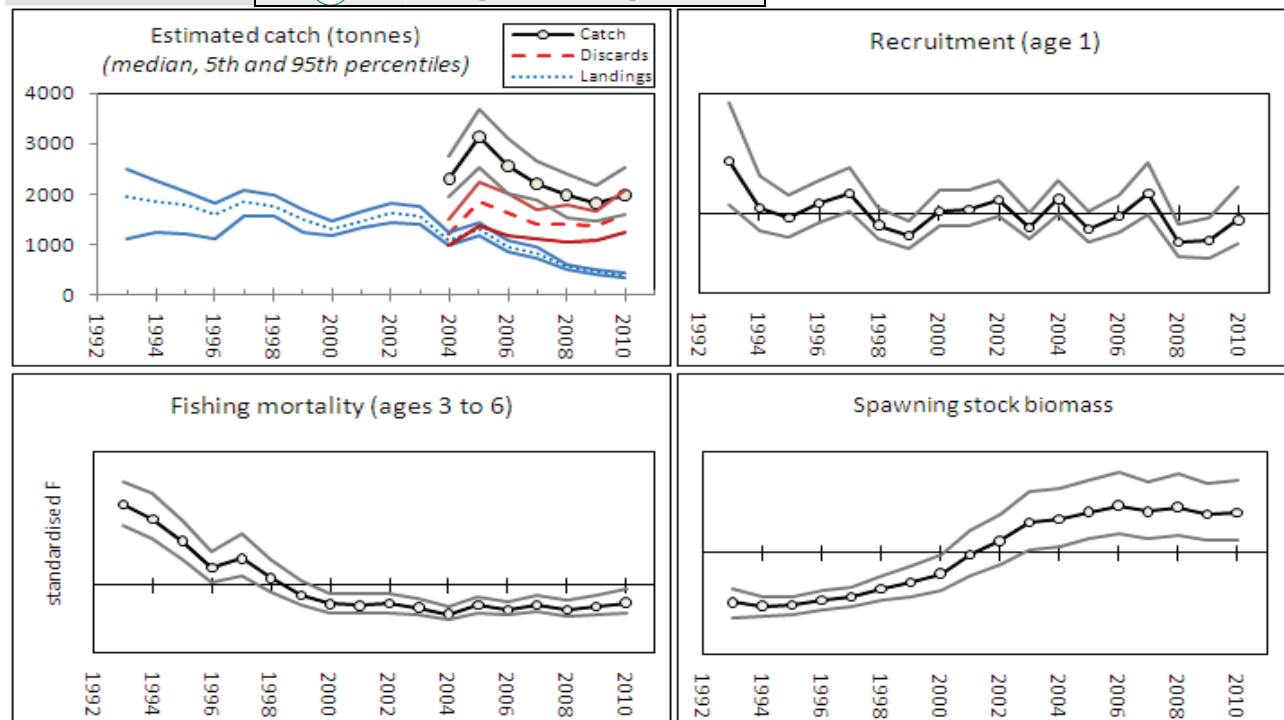


Figure 5.4.7.1 Plaice in Division VIIa. Estimated catch, landings and discards, Recruitment (age 1), Fishing mortality (ages 3-6) and SSB trends (Central trend lines are mean estimated values per year, surrounding lines are 90% confidence intervals. Horizontal lines in standardised plots are mean of the time series). Top right: SSB and F over the years.

The assessment is indicative of trends only. The SSB trends show an increase in stock size since the mid-1990s to a stable level. Fishery-independent estimates of plaice SSB from Annual Egg Production Method (AEPM) surveys increased from 9kt in 1995 to 14-15kt since 2006. Absolute estimates of SSB from the assessment are very uncertain but are >20kt since 2003. Fishing mortality from the assessment shows a declining trend since the early 1990s to a stable level. The recent F 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. Recruitment has been slightly lower than average in recent years.

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

Time series of recruitment estimates for all plaice stocks in waters around the UK (Irish Sea, Celtic Sea, western and eastern Channel, North Sea) show a high degree of synchrony and significant negative relationships with sea surface temperature.

The fisheries

A very high proportion of the catch is discarded. In the eastern Irish Sea plaice are caught by the mixed demersal fishery, largely 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 by these fisheries is greater than in the mixed demersal and beam 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 by fleet	Catch (2010) 2892 t where 13% landings, 87% discards. Landings: 377 t where 36% beam trawl and 64% otter trawl. ICES estimates of discards: 2516 t where 13% beam trawl and 87% otter trawl.
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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 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

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. This year, an assessment model that includes discard data since 2004, was used, and considered appropriate to assess SSB and fishing mortality trends. The discard data are noisy and the 2010 estimate will be revised when complete age data from observer trips become available. The high discard and catch estimates for 2007 and 2010 are downscaled by the assessment model. Estimation of partial fishing mortalities due to the landed and discarded component indicates that the fraction of F due to discarding has increased since 2004 (Figure 5.4.7.4).

Scientific basis

Assessment type	Trends only based on Aarts & Poos (2009) assessment model
Input data	3 survey indices (UK (E&W)-BTS-Q3, NIGFS-WIBTS-Q1, NIGFS-WIBTS-Q4)
Discards and bycatch	Discards included in the assessment (2004-2010)
Indicators	Annual egg production survey of spawning stock size
Other information	This stock was benchmarked in 2011 (WKFLAT 2011)
Working group report	WGCSE

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

No reference points are defined for this stock. Previous precautionary reference points (2010) are no longer considered appropriate.

Outlook for 2012

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.

Precautionary considerations

The exploratory assessment shows that SSB is stable at a high level above possible reference points. At the same time F is stable at a low level and considered to be below possible reference points. Therefore, catches of plaice should not increase and technical measures should be introduced to reduce discard rates.

Additional considerations

The high level of discarding (typically up to 80% in number) 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 discardings 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). The absolute level of catch estimates compared to independent estimates of spawning stock biomass using the Annual Egg Production Method, confirm that plaice in the Irish Sea is lightly exploited. SSB estimates for 2006-2010 were 14-15 kt (Fig. 5.4.7.3) compared to catch estimates 2-3 kt (which also include significant amount of discarded juvenile fish),.

Regulations and their effects

Technical measures in force are minimum mesh sizes and minimum landing size (27 cm).

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 in 2009 and 2010. 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

The benchmark 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.

Comparison with previous assessment and advice

Last year's assessment was based on survey trends. This year, an assessment using a new assessment model incorporating discard data from 2004 was performed and used as indicative of trends. Last year the SSB trends showed an increase in stock size since the mid-1990s to a stable level and this perception did not change this year. Last year's

total mortality showed a declining trend since the early 1990s. This year assessment shows a declining trend in fishing mortality since the early 1990s to a stable level.

The advice last year was based on precautionary considerations, extended with the MSY approach. This year's advice is based on precautionary considerations, considering the qualitative evaluation of trends in F and SSB and independent indicators of total spawning stock biomass.

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 Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.
- ICES. 2011. Report of the Benchmark Workshop on Flatfish (WKFLAT), 1–8 February 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:39.

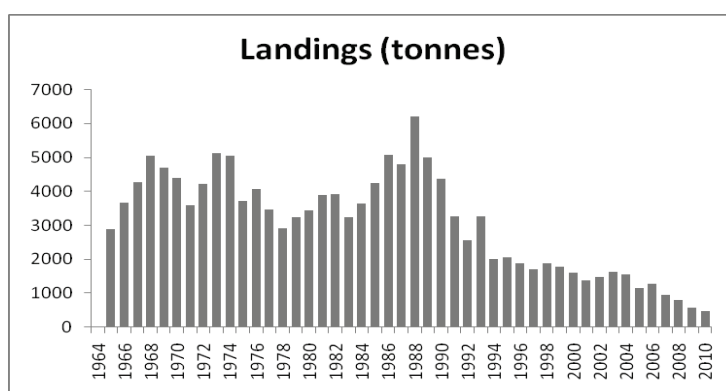


Figure 5.4.7.2 Plance in Division VIIa (Irish Sea). Official landings (in tonnes).

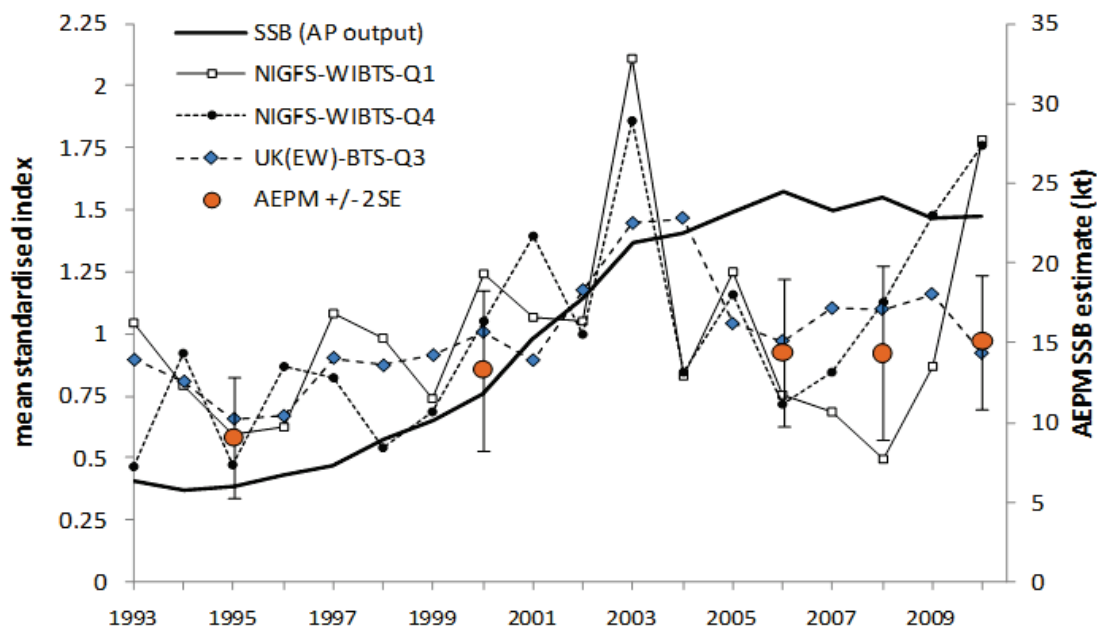


Figure 5.4.7.3 Plance in Division VIIa (Irish Sea). SSB trend (mean standardised, black line and crosses) and survey data: annual egg production estimates of SSB (circles) mean standardised indices of spawning biomass derived from NI groundfish surveys NI-GFS-WIBTS in March and in October (dashed and dotted lines respectively) and the biomass of ages 1-4 calculated from UK (E&W)-BTS-Q3 in September (solid line).

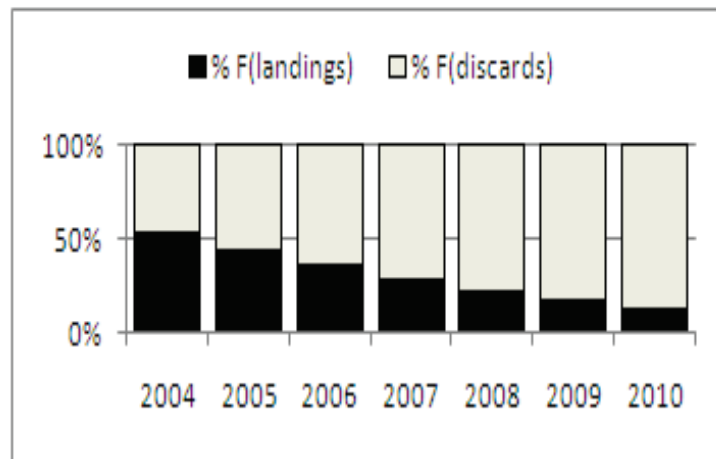


Figure 5.4.7.4 Plaice in Division VIIa (Irish Sea). Percentage of fishing mortality due to the landed and discarded components.

Table 5.4.7.1 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
2011	Effort should be consistent with no increase in catches	-	1.63		
2012	Catches should not increase	-	-		

Weights in '000 t.

¹ Catch at *status quo* F.

Table 5.4.7.2 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 ¹
Belgium	321	128	332	327	344	459	327	275	325	482	636	628	431	566	343	194	157	197	138
France	42	19	13	10	11	8	8	5	14	9	8	7	2	9	2	2	2	0.4	0.2
Ireland	1,355	654	547	557	538	543	730	541	420	378	370	490	328	272	179	194	102	101	89
Netherlands	-	-	-	-	69	110	27	30	47	-	-	-	-	-	-	-	-	-	-
UK (Eng.&Wales) ²	1,381	1,119	1,082	1,050	878	798	679	687	610	607	569	409	369	422	413	412	300	186	148
UK (Isle of Man)	24	13	14	20	16	11	14	5	6	1	1	1	0	0	0	0	1	...	0.5
UK (N. Ireland)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
UK (Scotland)	70	72	63	60	18	25	18	23	21	11	7	9	4	1	0	0	1	0	0.1
UK (Total)																			
Total	3,193	2,005	2,051	2,024	1,874	1,954	1,803	1,566	1,443	1,488	1,591	1,544	1,134	1,270	937	802	562	484	376
Discards	-	-	-	-	-	-	-	-	-	-	-	-	620	1,195	1,259	1,734	1,270	1,224	2,516
Unallocated	74	-9	15	-150	-167	-83	-38	34	-72	-15	32	15	9	11	-5	3	1	-28	2
Total figures used by the Working Group for stock assessment	3,267	1,996	2,066	1,874	1,707	1,871	1,765	1,600	1,371	1,473	1,623	1,559	1,763	2,476	2,191	2,539	1,833	1,680	2,893

¹Provisional.²Northern Ireland included with England and Wales.

{UK (Total) excludes Isle of Man data}.

ECOREGION Celtic Sea and West of Scotland
STOCK Plaice in Divisions VIIIf,g (Celtic Sea)

Advice for 2012

ICES advises on the basis of the precautionary considerations that catches should be reduced. Discards exceed landings and technical measures should be introduced to reduce discard rates.

Stock status

F (Fishing Mortality)				
	2008	2009	2010	
MSY (F_{MSY})	?	?	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	?	?	Unknown
Qualitative evaluation	↘	↘	✗	Above poss. reference points
SSB (Spawning Stock Biomass)				
	2009	2010	2011	
MSY ($B_{trigger}$)	?	?	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	?	?	Unknown
Qualitative evaluation	→	→	✗	Below poss. reference points

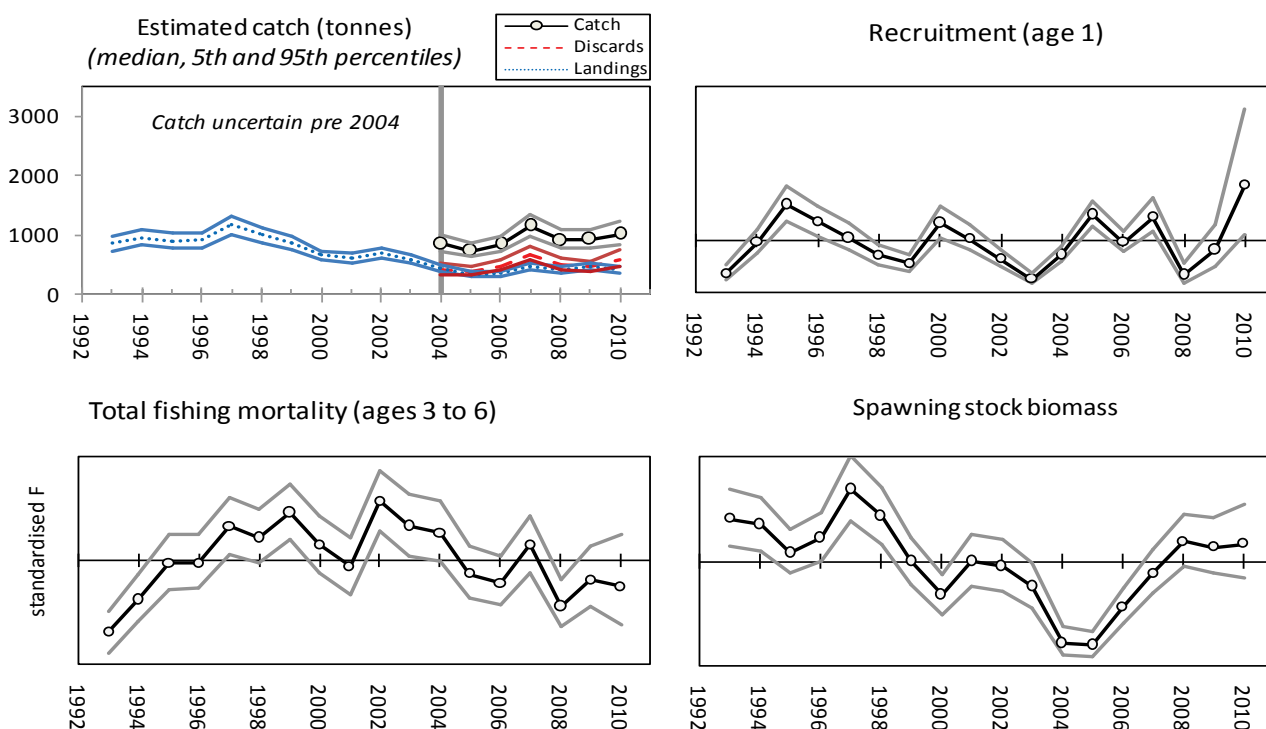


Figure 5.4.8.1 Plaice in Divisions VIIIf,g. Estimated catch, landings and discards; Recruitment (age 1); Fishing mortality (ages 3-6); and SSB trends (Central trend lines are the mean estimated values per year, surrounding lines are 90% confidence intervals. Horizontal lines in standardized plots are the mean of the time series).

The assessment is indicative of trends only. SSB has increased since 2004 to a stable level, but is considered to be well below historic levels. Fishing mortality shows a declining trend since 2002, but is considered to be above levels that would increase SSB and achieve high long term yields. Catch rates by commercial fleets and research surveys are well below historic levels and the stock is considered at a low level (Figure 5.4.8.2). Recruitment has been fluctuating without clear trend in recent years.

Management plans

No specific management objectives are known to ICES.

Biology

Plaice aggregate at spawning grounds of the North Cornwall 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 at maturity. The recruitment of Celtic Sea plaice and neighbouring stocks appear to be related to sea temperature changes.

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, about 20 to 25 miles offshore. Although plaice are taken throughout the year, the larger landings occur during February–March after the peak of spawning, and again in September. There is a high rate of discarding in both beam and otter trawl fisheries.

Catch by fleet	Catch (2010) 1133 t where 38% landings, 62% discards. Landings (2010) 433 t (of which 48% beam trawl, 42% otter trawl and 10% other), discards (2010) 700 t where 58% beam trawl and 39% otter trawl and 1% other
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Effects of the fisheries on the ecosystem

Beam trawling, especially 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

Discards are substantial and have ranged from 30% to 70% in number (mainly below the minimum landing size). In 2011 discards were been included in the assessment for the first time, although the time series of discard data available is short and consequently the revised assessment estimates are considered relative. Estimation of partial fishing mortalities due to the landed and discarded component indicates that the fraction of F due to discarding has increased since 2004 (Figure 5.4.8.3).

Scientific basis

Assessment type	Trends only based on Aarts & Poos (2009) assessment model
Input data	1 survey indices (UK (E&W)-BTS-Q3) 2 commercial indices (UK otter, UK beam)
Discards and bycatch	Discards included in the assessment (2004 - 2010)
Other information	Benchmarked at WKFLAT 2011
Working group report	WGCSE

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. Previous precautionary reference points (2010) are no longer considered appropriate.

Outlook for 2012

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.

Precautionary considerations

The stock is considered to be below any possible reference points, while the exploitation rate is deemed too high to improve this and thus above possible reference points. Therefore, catches of plaice should be reduced and measures to reduce discards should be introduced.

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 27cm.

Since 2005, ICES rectangles 30E4, 31E4, and 32E3 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. The effect this had on fishing mortality of plaice is uncertain.

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 Cornwall 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 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.

Comparison with previous assessment and advice

Last year there was a full analytical assessment and forecast. The stock was benchmarked this year, new assessment model was used and discards were included. However, the assessment including discards could only be used as indicative of trends. The basis for the advice is the precautionary considerations, and catch options cannot be provided.

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 Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.
- ICES. 2011. Report of the Benchmark Workshop on Flatfish (WKFLAT), 1–8 February 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:39.

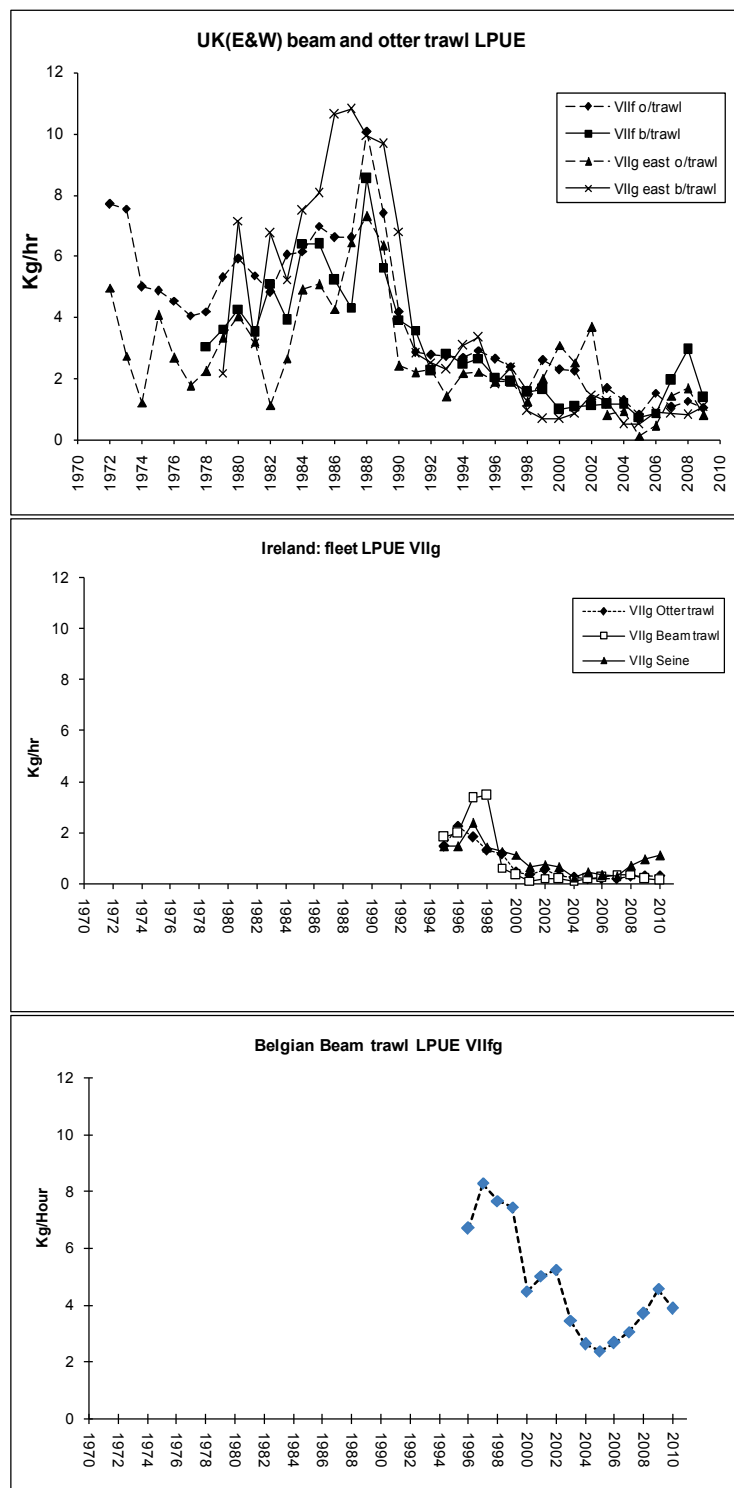


Figure 5.4.8.2a Plaice in Divisions VIIfg. Commercial landings per unit effort (lpue) for UK (in VIIfg), Ireland (VIIg) and Belgium (VIIfg).

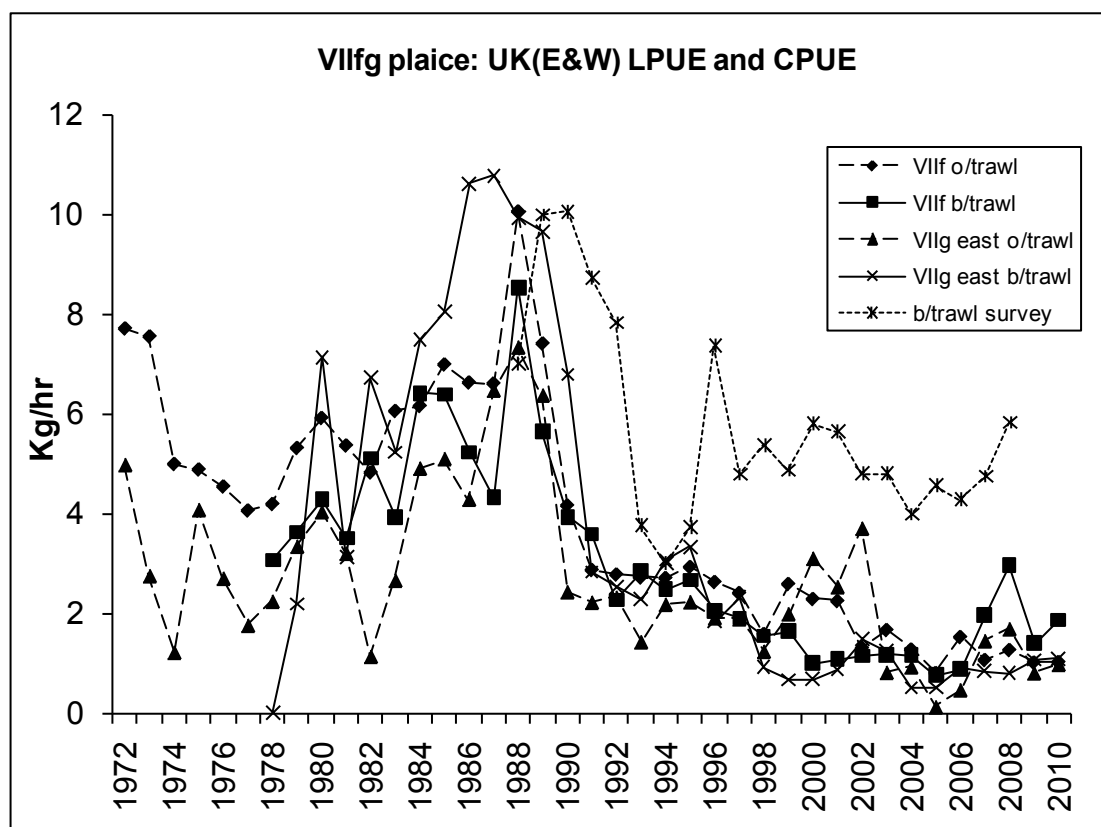


Figure 5.4.8.2b Plaice in Divisions VIIfg. UK bottom trawl survey (b/trawl survey) compared to Commercial landings per unit effort (lpue) for UK.

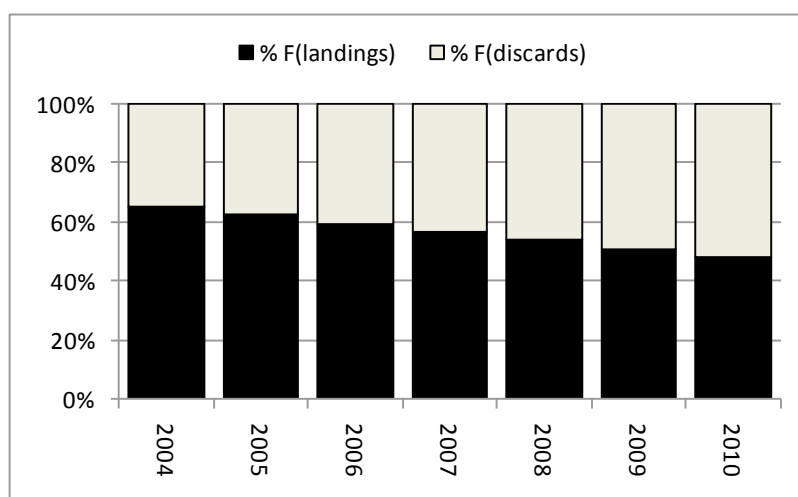


Figure 5.4.8.3 Plaice in Divisions VIIfg. Percentage of fishing mortality due to the landed and discarded component

Table 5.4.8.1 Plaice in Divisions VII f,g. ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings	ICES Landings
1987	TAC not to be restrictive on other species	-	1.8	1.91	1.90
1988	TAC not to be restrictive on other species	-	2.5	2.19	2.12
1989	TAC not to be restrictive on other species	-	2.5	2.58	2.15
1990	F likely to be F(88)	~1.9	1.9	2.22	2.08
1991	F likely to be F(89)	~1.7	1.9	1.83	1.50
1992	No long-term gains in increasing F	-	1.5	1.36	1.19
1993	No long-term gains in increasing F	-	1.4	1.30	1.11
1994	No long-term gains in increasing F	-	1.4	0.98	1.07
1995	No increase in F	1.29	1.4	0.96	1.03
1996	20% reduction in F	0.93	1.1	0.98	0.95
1997	20% reduction in F	1.10	1.1	1.26	1.22
1998	20% reduction in F	1.00	1.1	1.15	1.07
1999	35% reduction in F	0.67	0.9	0.66	0.97
2000	30% reduction in F	0.70	0.80	0.72	0.72
2001	40% reduction in F	0.60	0.76	0.68	0.71
2002	At least 35% reduction in F	0.68	0.68	0.62	0.64
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
2005	70% reduction in F or recovery plan	<0.25	0.48	0.40	0.39
2006	50% reduction in F or recovery plan	<0.40	0.48	0.41	0.40
2007	50% reduction in F or recovery plan	<0.38	0.42	0.42	0.41
2008	60% reduction in F	<0.24	0.49	0.38	0.44
2009	75% reduction in F	<0.17	0.42	N/A	0.46
2010	50% reduction in F	<0.33	0.45	0.44	0.43
2011	See scenarios	-	0.41		
2012	Reduce catches	-			

Weights in '000 t.

N/A French landings not available.

Table 5.4.8.2

Plaice in Divisions VII f,g. Nominal landings (in tonnes) as reported to ICES by country and total landings and catches as estimated by ICES.

	1977	1978	1979	1980
Belgium	214	196	171	372
UK (Engl. & Wales)	150	152	176	227
France	365	527	467	706
Ireland	28	0	49	61
Scotland	0	0	0	7
Total	757	875	863	1373
Discards	N/A	N/A	N/A	N/A
Unallocated	0	0	0	0
Landings used by WG	757	875	863	1373
Total as used by WG	N/A	N/A	N/A	N/A

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Belgium	365	341	314	283	357	665	581	617	843	794
UK (Engl. & Wales)	251	196	279	366	466	529	496	629	471	497
France	697	568	532	558	493	878	708	721	1089	767
Ireland	64	198	48	72	91	302	127	226	180	160
N. Ireland								1		
Netherlands						9				
Scotland	0	0	0	0	0	1				1
Total	1377	1303	1173	1279	1407	2384	1912	2194	2583	2219
Discards	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unallocated	0	0	-27	-69	345	-693	-11	-78	-432	-137
Landings used by WG	1377	1303	1146	1210	1752	1691	1901	2116	2151	2082
Total as used by WG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Belgium	836	371	542	350	346	410	594	540	371	224
UK (Engl. & Wales)	392	302	290	251	284	239	258	176	170	134
France	444	504	373	298	254	246	329	298		287
Ireland	155	180	89	82	70	83	78	135	115	76
Scotland		5	9	1	2					
Total reported	1827	1362	1303	982	956	978	1259	1149	656	721
Discards	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unallocated	-326	-174	-189	88	72	-26	-42	-82	312	-3
Landings used by WG	1501	1188	1114	1070	1028	952	1217	1067	968	718
Total as used by WG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Belgium	241	248	221	212	168	172	194	187	216	188
UK (Engl. & Wales)	136	105	127	87	55	88	61	63	55	54
France	262	186	165	145	132	106	104	62	N/A	136
Ireland	45	79	51	45	44	48	58	63	63	63
Total reported	684	618	564	489	399	414	417	375	N/A	442
Discards	N/A	N/A	N/A	247	309	451	1283	580	604	700
Unallocated	30	24	30	21	-13	-10	-7	62	N/A	-9
Landings used by WG	714	642	594	510	386	404	410	437	463	433
Total as used by WG	N/A	N/A	N/A	757	695	855	1693	1017	1067	1133

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

Advice for 2012

ICES advises on the basis of the transition to the MSY approach that landings in 2012 should be no more than 1440 t.

Stock status

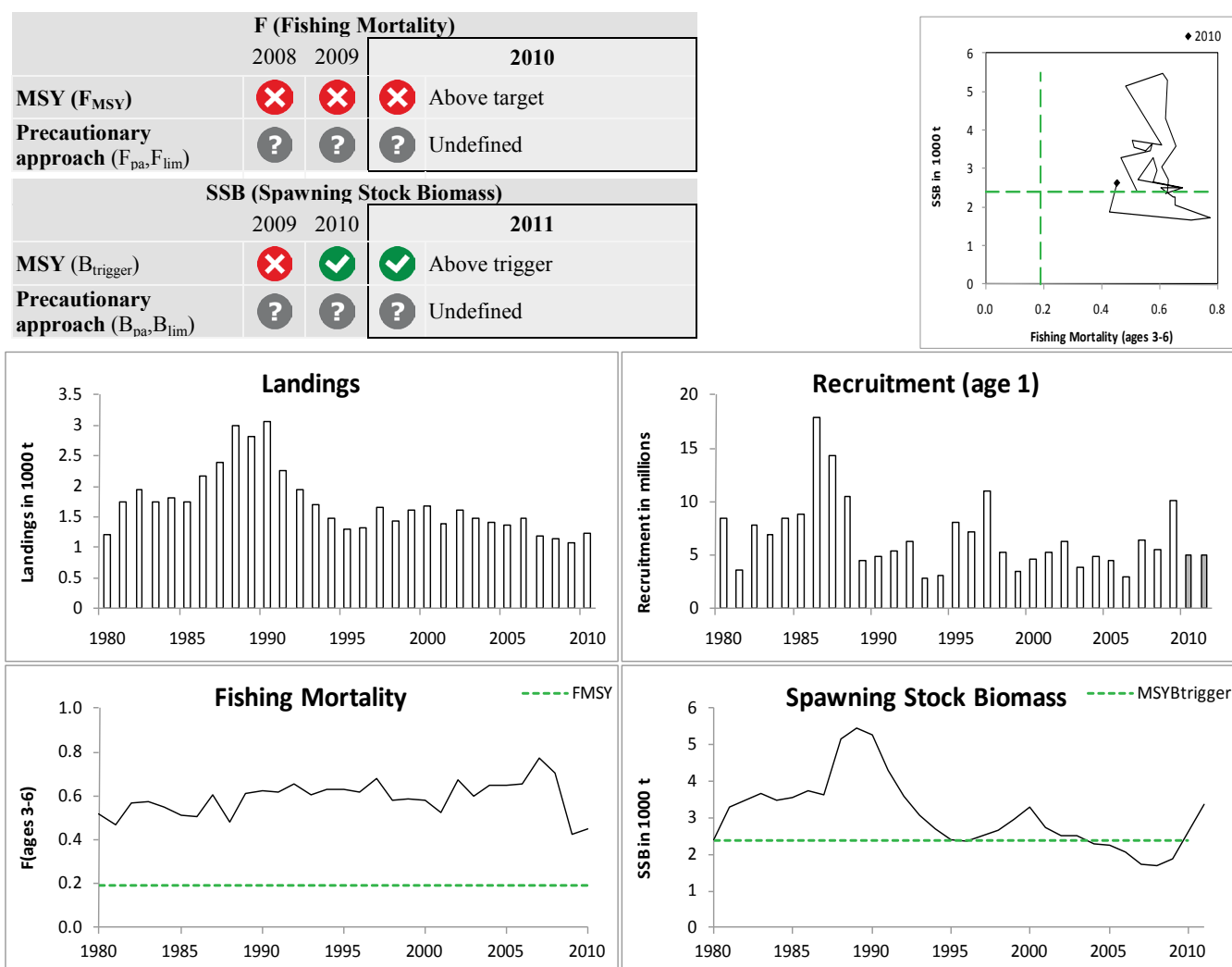


Figure 5.4.9.1 Plaice in Division VIIe (Western Channel). Summary of stock assessment (weights in '000 tonnes). Estimates are shaded. Top right: SSB and F over the years.

The large reduction of F in 2009 and subsequent increase in 2010 reflects the recent changes in fishing effort. Fishing mortality is well above F_{MSY} . SSB has increased to above $MSY B_{trigger}$ in last two years. The 2008 year class was well above average.

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 VIId to VIIe 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 VIIe. Suitable sites for nurseries are located in shallow waters, close to fresh and cool seasonal water input.

The fisheries

Plaice are taken as a bycatch in the beam trawl fishery mainly targeting 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 are usually during February, March, October, and November. Discarding appears to be higher in quarters 1 and 2 in this fishery, but is low compared to other plaice stocks.

Catch by fleet	Landings in 2010 were 1078 t (57% beam, 31% otter (dem), 3% gillnets, 2% otter (mol) and 7% other (mostly caught by the above gears, but not available separately by all countries). In addition, 149 t landed from division VIId are included in the assessment reflecting the 15% Q1 migration correction (unknown gear).
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Effects of the fisheries on the ecosystem

Beam trawling, especially 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, which is now partially corrected for in the assessment by an added element of VIId catches and age information to account for migration (ICES 2010). There is a heavy reliance 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 and their omission is unlikely to significantly alter SSB and mortality trends.

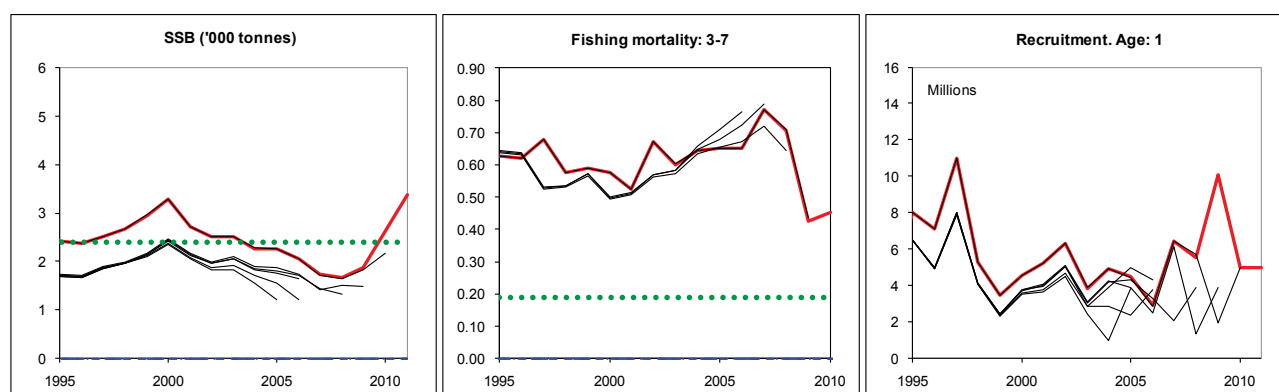


Figure 5.4.9.2 Plaice in Division VIIe (Western Channel). Historical assessment results (final year recruitment estimates included).

Scientific basis

Assessment type	Age based analytical assessment (XSA)
Input data	1 fishery independent survey index (UK-WEC-BTS) 1 industry-science survey (FSP-7e UK-(E+W)) 3 commercial lpue indices (UK WECOT, UK WECBT, UK WECOT historic)
Discards and bycatch	Not included in the assessment
Indicators	None
Other information	Benchmarked in 2010 WKFLAT 2010
Working group report	WGCSE

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

Reference points

	Type	Value	Technical basis
MSY	MSY B _{trigger}	2400	Preliminary based on lowest SSB (in converged part of XSA) from which the stock has recovered
Approach	F _{MSY}	0.19	Provisional proxy by analogy with plaice in the Celtic Sea. Fishing mortalities in the range 0.14 – 0.31 are consistent with F _{msy}
Precautionary Approach	B _{lim}	Not defined	
	B _{pa}	Not defined	
	F _{lim}	Not defined	
	F _{pa}	Not defined	

(unchanged since: 2011)

Yield and spawning biomass per Recruit F-reference points (2011):

	Fish Mort Ages 3-6	Yield/R	SSB/R
Average last 3 years	0.53	0.30	0.54
F _{max} *	-	-	-
F _{0.1}	0.11	0.28	2.28
F _{med}	0.59	0.29	0.49

* F_{max} is not well defined

Outlook for 2012

Basis: F(2011) = F_{sq} = mean(F2008-2010) rescaled to F2010 = 0.45; SSB(2012) = 3751 t; R (2011) = GM (1989-2008) = 5007 (Thousands); landings (2011) = 1755 t.

Rationale	Landings (2012)	Basis	F (2012)	SSB (2013)	%SSB change ¹⁾
MSY framework	840	F _{MSY} (F _{sq} * 0.42)	0.19	4620	+23%
MSY transition	1440	(0.6 * F ₂₀₁₀ + 0.4 * F _{MSY}) = F _{sq} * 0.78	0.35	4030	+7%
Zero catch	0	F=0	0	5430	+45%
Status quo	980	F _{sq} * 0.5 _q	0.23	4480	+19%
	1150	F _{sq} * 0.6	0.27	4310	+15%
	1320	F _{sq} * 0.7	0.32	4150	+11%
	1480	F _{sq} * 0.8	0.36	4000	+7%
	1630	F _{sq} * 0.9	0.41	3850	+3%
	1770	F _{sq} * 1.0	0.45	3710	-1%
	1910	F _{sq} * 1.1	0.50	3580	-5%

Weights in tonnes.

¹⁾ SSB 2013 relative to SSB 2012.

MSY approach

Following the ICES MSY framework implies fishing mortality to be reduced to 0.19 (at F_{MSY} as SSB in 2012 is above MSY B_{trigger}), resulting in landings of 840 t in 2012. This is expected to lead to an SSB of 4620 t in 2013.

Following the transition scheme towards the ICES MSY framework implies fishing mortality of 0.35 for 2012. This results in landings of 1440 t in 2012. This is expected to lead to an SSB of 4030 t in 2013.

Additional considerations

Management considerations

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

In addition to the days-at-sea regulations there has been a recent UK decommissioning scheme that has reduced the number of beam trawlers in the southwest fleet. Fishing mortality declined in 2009 and stayed at this level in 2010 and this is consistent with the recent development in effort in the main fleet exploiting this stock.

Regulations and their effects

Technical measures include mesh size and 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, trammel nets, and tangle nets 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 in plaice. The UK has introduced a single area licensing scheme in November 2008 which appears to be effective at enforcing the required reductions in effort.

Information from the fishing industry

The fisheries science partnership (FSP) conducted cooperatively with Cefas and the UK industry has provided some evidence for the widespread distribution and broad age distribution for this stock.

Uncertainties in the assessment

There is a heavy reliance on the age composition data derived from UK(E+W) sample data. 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.

Comparison with previous assessment and advice

The assessment is similar to the previous assessment in terms of F, with a downward revision of 3% in F(2009), but there is a 21% upwards revision in SSB (2010). The estimate of the 2008 year class has been revised upwards by >500% in this assessment as a result the additional year's survey data being included.

The basis for the advice is the same as last year.

Assessment and management area

Stock is assessed for ICES Division VIIe, but is managed for ICES Divisions VIId and VIIe combined. The advice for Division VIId plaice can be found in Section 6.4.8 of the ICES 2011 advice.

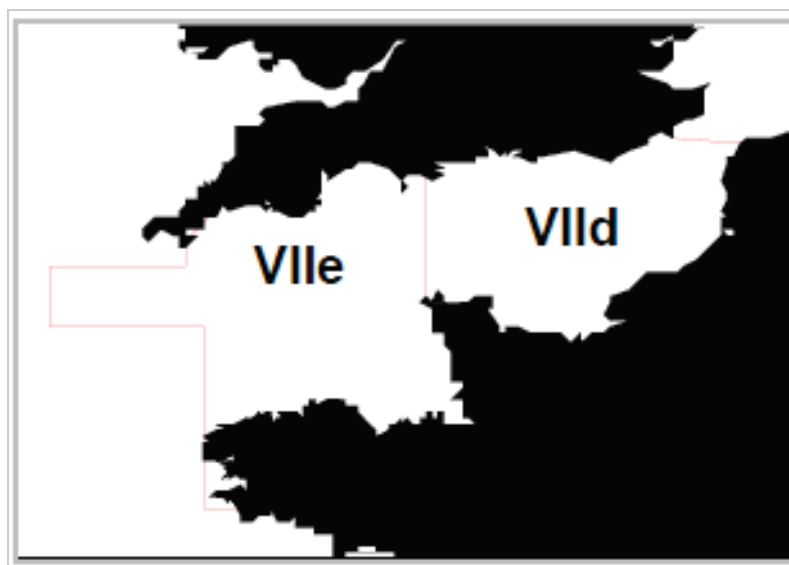


Figure 5.4.9.3 Plaice in Division VIIe (Western Channel). Assessment area VIIe and TAC area VIId,e.

Sources

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

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

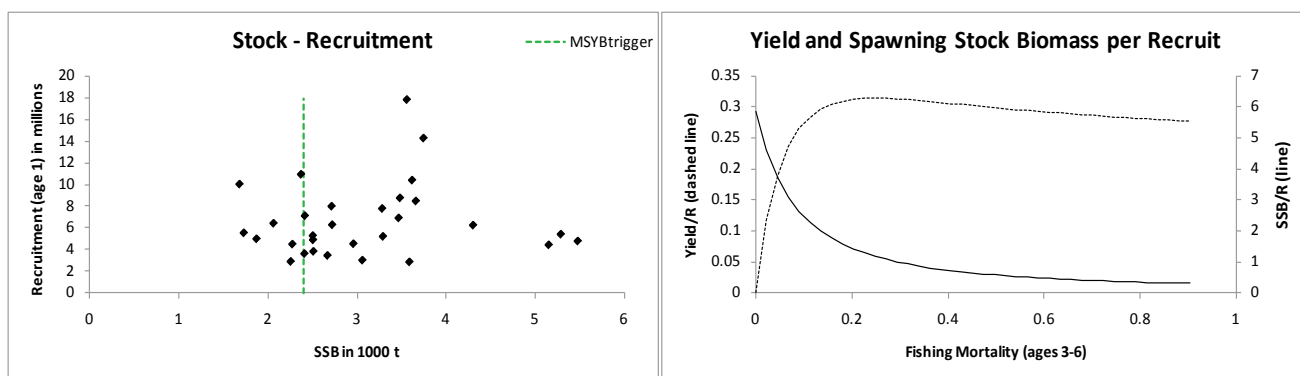


Figure 5.4.9.4 Plaice in Division VIIe (Western Channel). Stock-recruitment plot and yield per recruit analysis.

Table 5.4.9.1 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	1.23
2011	See scenarios	-	4.67		
2012	MSY Framework	<1.44 ²			

Weights in '000 t.

¹ TACs for Divisions VIIId,e.² For Division VIIe only.

Table 5.4.9.2 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) inc. CI's.	Others	Total reported	Unallocated ¹	Total	VIIe stock caught in VIIId ⁴	As used by WG
1976	5	-	-	323	312	-	640	-	640	-	640
1977	3	-	-	336	363	-	702	-	702	-	702
1978	3	-	-	314	467	-	784	-	784	-	784
1979	2	-	-	458	515	-	975	2	977	-	977
1980	23	-	-	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	-	1111	-33	1078	149	1227

¹Estimated by the Working Group.

²Divisions VIIId,e = 4,739 t.

³Included in Division VIIId

⁴Migration correction (15% of VIIId Qtr 1) added to stock.

Table 5.4.9.3

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	8426	2406	1215	0.5209
1981	3635	3279	1746	0.4668
1982	7808	3464	1938	0.5681
1983	6936	3657	1754	0.5735
1984	8502	3479	1813	0.5515
1985	8787	3556	1751	0.5115
1986	17872	3743	2161	0.5058
1987	14314	3615	2388	0.6078
1988	10429	5149	2994	0.4815
1989	4450	5475	2808	0.6113
1990	4802	5285	3058	0.6260
1991	5433	4300	2250	0.6206
1992	6267	3585	1950	0.6555
1993	2874	3057	1691	0.6079
1994	3033	2711	1471	0.6282
1995	8019	2411	1295	0.6275
1996	7137	2368	1321	0.6194
1997	10969	2500	1654	0.6800
1998	5302	2665	1430	0.5778
1999	3470	2956	1616	0.5893
2000	4553	3288	1678	0.5775
2001	5230	2718	1379	0.5260
2002	6307	2507	1608	0.6734
2003	3849	2503	1478	0.6017
2004	4912	2271	1402	0.6458
2005	4517	2252	1370	0.6515
2006	2913	2059	1466	0.6524
2007	6445	1725	1184	0.7723
2008	5560	1677	1144	0.7073
2009	10062	1868	1065	0.4247
2010	5007*	2629	1227	0.4520
2011	5007*	3371		
Average	6651	3079	1720	0.5908

*Geometric Mean (1989-2008)

ECOREGION Celtic Sea and West of Scotland
STOCK Plaice in Divisions VIIh–k (Southwest of Ireland)

Advice for 2012

ICES advises on the basis of precautionary considerations that catches in 2012 should be reduced.

Stock status

F (Fishing Mortality)		
		2008-2010
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
Qualitative evaluation	✗	Above poss. reference points
SSB (Spawning Stock Biomass)		
		2009-2011
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown

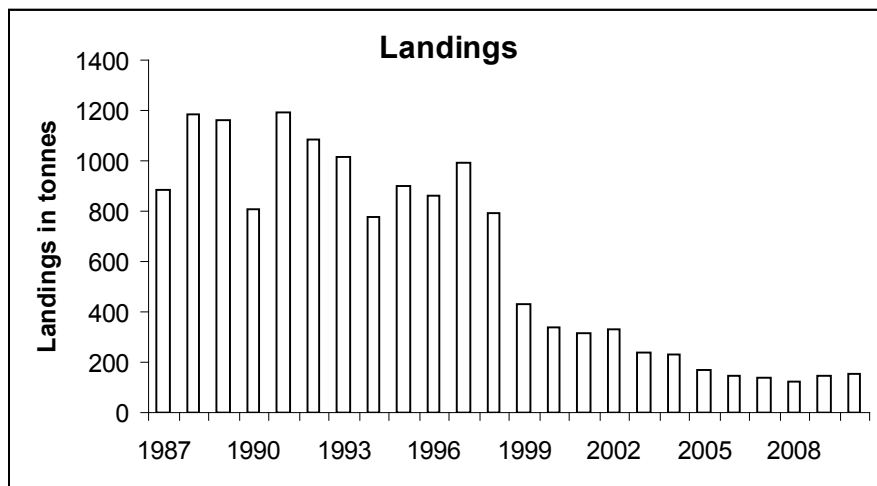


Figure 5.4.10.1 Plaice in Divisions VIIh–k. Official landings (tonnes).

There is no accepted analytical assessment for this stock and the state of the stock is unknown. However, exploratory estimates of mortality suggest that recent fishing mortality for the major component of the catch is greater than a proxy for F_{MSY} .

Management plans

No specific management objectives are known to ICES.

The fisheries

Plaice in Division VIIh–k are mainly taken by inshore fisheries in Division VIIj.

Scientific basis

Assessment type	Catch curve
Input data	Catch statistics
Discards and bycatch	Not included in the assessment and Y/R analysis
Indicators	None
Other information	-
Working group report	WGCSE

ECOREGION Celtic Sea and West of Scotland
STOCK Plaice in Divisions VIIh–k (Southwest of Ireland)

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B_{trigger}	Not defined	
	F_{MSY}	0.24	Provisional proxy based on WGCSE 2010 estimate of F_{max}
Precautionary Approach	B_{lim}	Not defined	
	B_{pa}	Not defined	
	F_{lim}	Not defined	
	F_{pa}	Not defined	

(unchanged since 2010)

Outlook for 2012

No reliable assessment can be presented for this stock. The main cause of this is that catch numbers-at-age are only available for Irish landings. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

The state of the stock is unknown, but exploratory estimates of mortality suggest that recent fishing mortality for the landings component of the catch is greater than F_{max} which is used as a proxy for F_{MSY} (Figure 5.4.10.3). Therefore, catches should be reduced.

Additional considerations

A proxy for total mortality (Z) was estimated from the Irish catch numbers at age in Division VIIj-k (Figure 5.4.10.2). Exploratory estimates of mortality suggest that the current fishing mortality in the VIIj-k part of the stock is greater than F_{MSY} estimated from a yield per recruit analysis. The estimated levels of Z are quite high compared to other plaice stocks. There is a possibility that this can be the consequence of migration. If young fish are highly concentrated in inshore areas and have a higher catchability than older fish, which might be distributed more widely further offshore, this could result in apparent high levels of Z .

The only data available for Division VIIh are landings data.

Comparison with previous assessment and catch options

The assessment is based on a catch curve through landings-at-age data for plaice in Division VIIj-k, which is the same as last year. Exploratory estimates of mortality and F_{msy} are similar to last year. The basis for the advice is the same as last year.

Sources

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

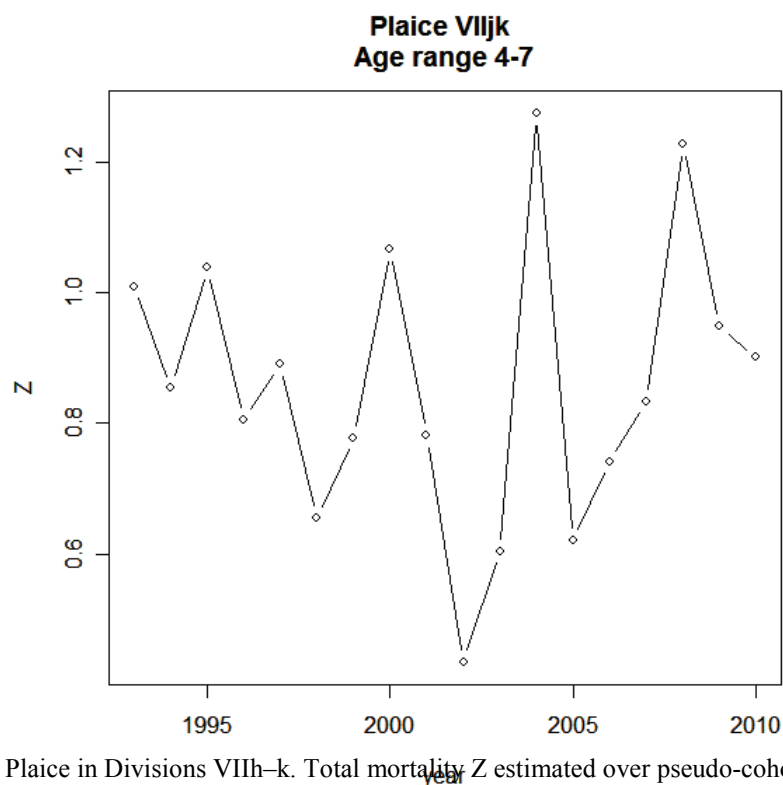


Figure 5.4.10.2 Plaice in Divisions VIIh-k. Total mortality Z estimated over pseudo-cohorts as the slope of the log catch numbers.

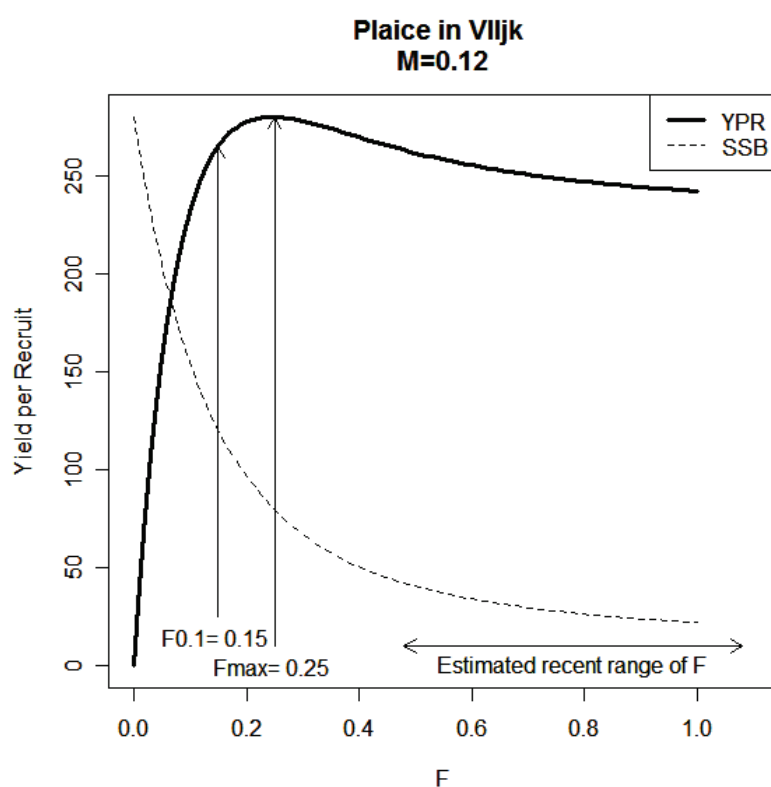


Figure 5.4.10.3 Plaice in Divisions VIIh-k. Yield per recruit plot and the range of recent fishing mortality estimates.

Table 5.4.10.1 Plaice in Divisions VIIh–k. ICES advice, management and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings
1993	-	-	-	1020
1994	-	-	-	780
1995	-	-	-	900
1996	-	-	-	860
1997	-	-	-	990
1998	-	-	-	790
1999	-	-	-	430
2000	-	-	-	340
2001	-	-	1 215	310
2002	-	-	1 080	330
2003	Reduce TAC to recent average (1998–2000)	450	582	240
2004	Reduce TAC to recent average (2000–2002)	320	466	230
2005	Reduce TAC to recent average (2001–2003)	271	466	170
2006	Reduce TAC to recent average (2002–2004)	245	396	140
2007	Reduce TAC to recent average (2003–2005)	196	337	140
2008	Reduce TAC to recent average (2004–2006)	177	303	120
2009	Same advice as last year ¹	177	256	150
2010	Reduce TAC	-	218	150
2011	See scenarios	-		
2012	Reduce catches			

Weights in tonnes.

Table 5.4.10.2 Plaice in Divisions VIIh–k. Landings (t), as officially reported to 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 – E, W & NI	.	.	73	88	287	264	218	258	282
UK – E & W	246	433	.	.	.	.	.	.	.
UK - Scot	-	1	-	1	1	6	7	1	4
Total	882	1184	1160	805	1191	1083	1016	775	902

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 – E, W & NI	154	138	106	82	75	73	59	56	36
UK – E & W	.	.	.	.	.	.	.	.	.
UK - Scot	1	1	1	1	1	-	-	-	-
Total	864	994	790	428	341	313	330	241	232

Country	2005	2006	2007	2008	2009	2010
Belgium	32	22	7	25	1	0
Denmark						0
France	20	37	30	12	43	53
Ireland	90	65	72	72	71	66
Netherlands	.					
Spain	.	1	13	1		
UK – E, W & NI	28	18	20	12	32	35
UK – E & W	.					
UK - Scot	.					
Total	170	143	142	122	147	154

* Belgian Landings up to 1998 include VIIg

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

Advice for 2012

There is insufficient information to evaluate the status of the stock. Therefore, based on precautionary considerations, ICES advises that no increase of the catch should take place unless there is evidence that this will be sustainable.

Stock status

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

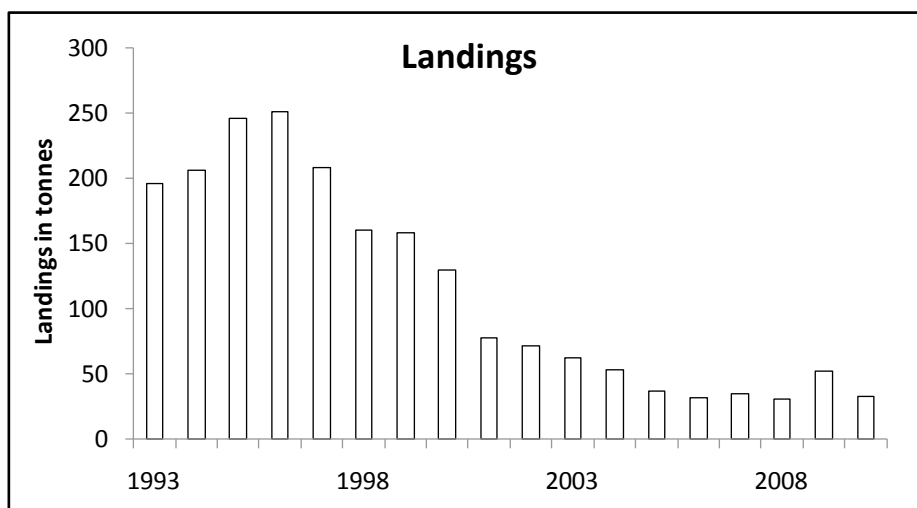


Figure 6.4.11.1 Plaice in Divisions VIIb,c (West of Ireland). Official landings (in tonnes).

The stock status is unknown and the available catch statistics are not considered reliable indicators of abundance.

Management plans

No specific management objectives are known to ICES.

Scientific basis

Assessment type	No assessment
Input data	Catch statistics
Discards and bycatch	Not available
Indicators	None
Other information	-
Working group report	WGCSE

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

Reference points

No reference points are defined for this stock.

Outlook for 2012

No reliable assessment can be presented for this stock. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

There is insufficient information to evaluate the status of the stock. Therefore, based on precautionary considerations, ICES advises that no increase of the catch should take place unless there is evidence that this will be sustainable.

Sources

ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 11–19 May 2011, Copenhagen, Denmark ICES CM 2011/ACOM:12.

Table 5.4.11.1 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	
2012	No increase in catch	-		

Weights in tonnes.

Table 5.4.11.2 Plaice in Divisions VIIb,c. Nominal landings (t) by country as officially reported to ICES.

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Denmark	-	-	-	-	-	-	2	-	-	-	-	-	-
France	60	45	10	9	4	16	6	12	9	8.00	37	2	10
Ireland	124	106	153	133	135	122	117	142	135	122	108	110	150
Spain	-	-	-	-	-	-	-	65	58	22	7	-	-
UK - Eng+Wales+N.Irl.	-	-	-	-	-	-	-	-	-	-	-	-	-
UK - England & Wales	1	1	-	-	-	-	-	-	4	4	-	3	7
UK - Scotland	-	-	-	-	-	-	-	-	-	-	-	3	-
Total	185	152	163	142	139	138	125	219	206	156	152	118	167

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark	-	-	-	-	-	-	-	-	-	-	-	-	-
France	11	13	9	1	11	9	3	2	1	5	1	3	-
Ireland	114	153	157	159	130	179	180	191	200	239	248	206	160
Spain	-	-	-	-	-	-	-	-	-	-	-	-	-
UK - Eng+Wales+N.Irl.	-	-	-	1	2	-	6	1	2	1	2	-	1
UK - England & Wales	5	1	2	-	-	-	-	-	-	-	-	-	-
UK - Scotland	-	-	-	13	90	3	3	2	3	1	-	-	-
Total	130	167	168	174	233	191	192	196	206	246	251	209	161

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Denmark	-	-	-	-	-	-	-	-	-	-	-	-
France	-	31	8	17	7	14	12	11	12	9	7	6
Ireland	157	99	70	51	56	39	25	20	23	21	45	27
Spain	-	-	-	2	-	-	-	1	-	1	-	-
UK - Eng+Wales+N.Irl.	-	-	-	2	-	0	0	0	-	-	-	-
UK - England & Wales	-	-	-	-	-	-	-	-	-	-	-	-
UK - Scotland	2	-	-	-	0	-	-	-	-	-	-	-
Total	159	130	78	72	63	53	37	31.6	35.3	31	52	33

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

Advice for 2012

ICES advises on the basis of the transition to the MSY approach that landings in 2012 should be no more than 200 t.

Stock status

	F (Fishing Mortality)		
	2008	2009	2010
MSY (F_{MSY})	✗	✗	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	✓	✗	✓ Harvested sustainably
	SSB (Spawning Stock Biomass)		
	2009	2010	2011
MSY ($B_{trigger}$)	✗	✗	✗ Below trigger
Precautionary approach (B_{pa}, B_{lim})	✗	✗	✗ Reduced reproductive capacity

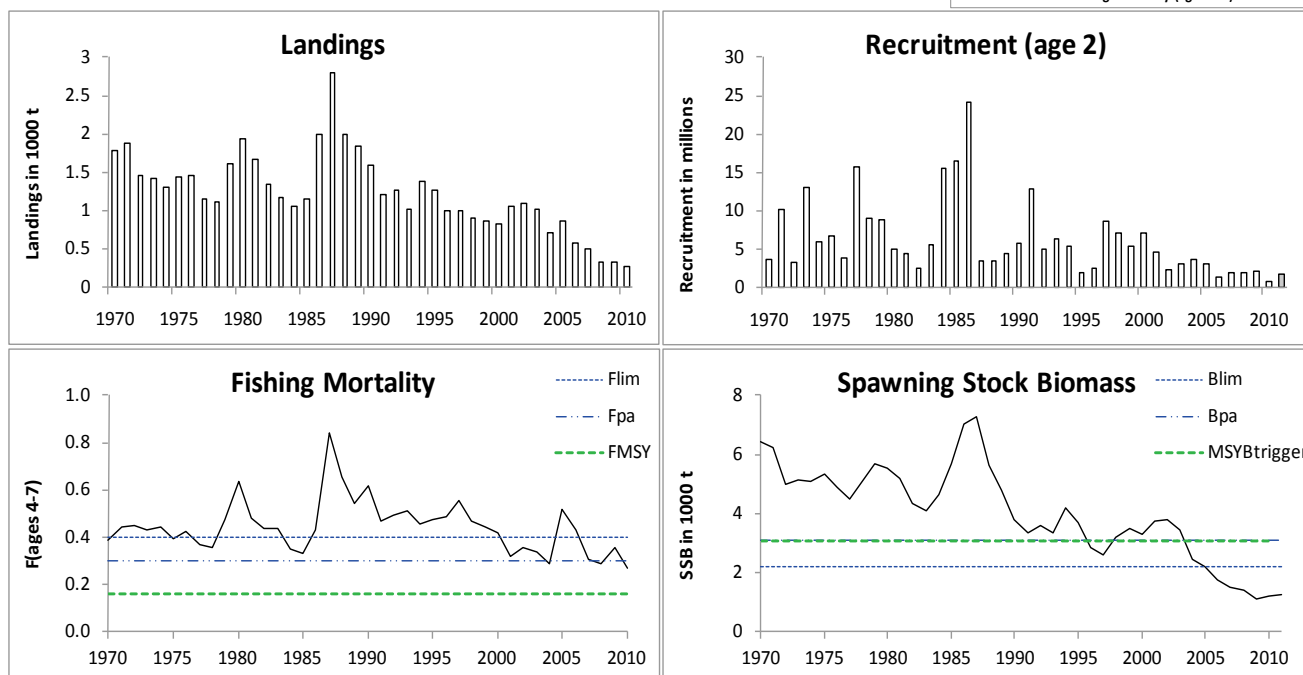
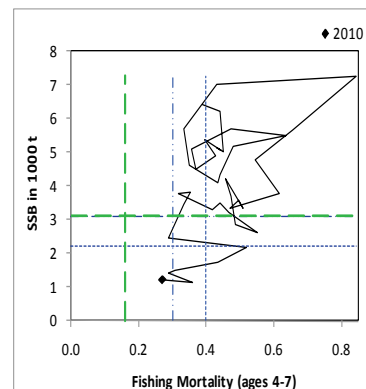


Figure 5.4.12.1 Sole in Division VIIa. Summary of stock assessment (weights in '000 t). Estimates are shaded. Top right: SSB and F over the years.

SSB has continuously declined since 2001 and dropped below B_{lim} since 2006. In 2009 SSB reached the lowest level. The fishing mortality shows a declining trend since the mid 1980s to a stable level in recent years. Recent recruitment levels have been lower than earlier in the time-series, with the incoming recruitment being the lowest in the time series.

Management plans

No specific management objectives are known to ICES.

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 by fleet Landings (2010) = 275 t (92% beam trawlers, 8% otter trawlers, <1% other gears). Beam trawl discards between 0% and 8% 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 using chain-mat gear, is known to have a significant impact on the benthic communities, although less so on soft substrates.

Quality considerations

Given the low stock size, predictions become more dependent on the assumed incoming recruitment. 30% of the predicted landings in 2012 and 45% of the predicted SSB in 2013 are based on the assumed geometric mean recruitment.

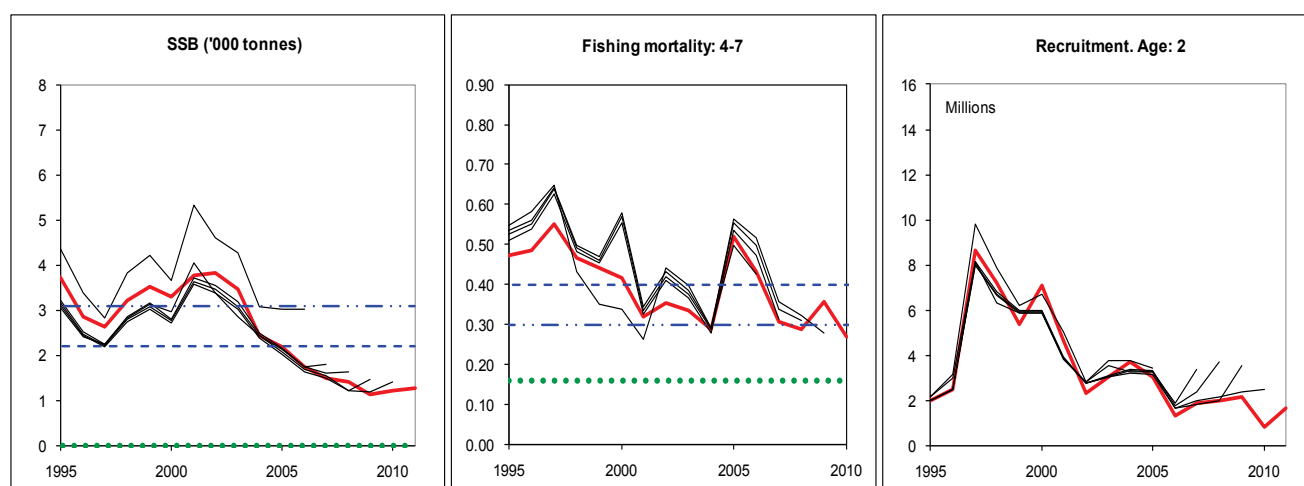


Figure 5.4.12.2 Sole in Division VIIa (Irish Sea). Historical assessment results (final year recruitment estimates included).

Scientific basis

Assessment type	Age analytical assessment (XSA)
Input data	1 survey index (UK(E&W)-BTS-Q3)
Discards and bycatch	Not included in the assessment
Indicators	None
Other information	This stock was benchmarked in WKFLAT (ICES, 2011b)
Working group report	WGCSE

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

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
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 S/R 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	$B_{\text{pa}} \sim B_{\text{lim}} * 1.4$. The minimum SSB required ensuring a high probability of maintaining SSB above its lowest observed value, taking into account the uncertainty of assessments.
	F_{lim}	0.40	$F_{\text{lim}} = F_{\text{loss}}$. 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)

Yield and spawning biomass per Recruit F-reference points (2011):

	Fish Mort Ages 4-7	Yield/R	SSB/R
Average last 3 years	0.31	0.17	0.66
$F_{\text{max}}^{[*]}$	-	-	-
$F_{0.1}$	0.18	0.15	1.01
F_{med}	0.21	0.16	0.88

^[*] F_{max} not well defined

Outlook for 2012

Basis: $F(2011) = F_{\text{sq}} = \text{mean}(F_{2008-2010}) = 0.31$; $R(2011) = RCT3 = 1680$ thousands; $R(2012) = \text{GM } 2001-2009 = 2520$ thousands; Landings(2011) = 320 t; SSB(2012) = 1280 t.

Rationale	Landings (2012)	Basis	F(2012)	SSB(2013)	%SSB change ¹⁾	%TAC Change ²⁾
MSY framework	80	$F_{\text{HCR-MSY}} = F_{\text{MSY}} * \text{SSB}_{(2012)} / B_{\text{trigger}}$	0.07	1520	+23%	-80%
MSY transition	200	$0.6 * F_{(2010)} + 0.4 * F_{\text{HCR-MSY}}$	0.19	1390	+14%	-49%
Zero catch	0	$F=0$	0.0	1600	+30%	-100%
Status quo	220	$F_{\text{sq}} * 0.7$	0.21	1370	+12%	-43%
	170	$F_{\text{MSY}}(F_{\text{sq}} * 0.52)$	0.16	1420	+16%	-56%
	280	$F_{\text{sq}} * 0.9$	0.27	1310	+7%	-29%
	300	$F_{\text{pa}}(F_{\text{sq}} * 0.98)$	0.3	1290	+5%	-23%
	300	F_{sq}	0.31	1290	+5%	-22%
	330	$\text{TAC} - 15\% (F_{\text{sq}} * 1.1)$	0.34	1260	+3%	-15%
	390	$\text{TAC}_{\text{sq}} (F_{\text{sq}} * 1.34)$	0.41	1200	-2%	0%
	450	$\text{TAC} + 15\% (F_{\text{sq}} * 1.59)$	0.49	1140	-7%	+15%

Weights in tonnes.

¹⁾ SSB 2013 relative to SSB 2012.

²⁾ Landings 2012 relative to TAC 2011.

MSY approach

Following the ICES MSY framework implies fishing mortality to be reduced to 0.07 (56% lower than F_{MSY} because SSB is 56% below MSY B_{trigger}), resulting in landings of less than 80 t in 2012. This is expected to lead to a SSB of 1520 t in 2013.

Following the transition scheme towards the ICES MSY framework implies fishing mortality of 0.19 for 2012. This results in landings of 200 t in 2012. This is expected to lead to an SSB of 1390 in 2013.

PA approach

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

Additional considerations

Regulations and their effects

Technical measures in force are minimum mesh sizes and minimum landing size (24 cm).

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

Changes in fishing technology and fishing patterns

Beam trawl effort has decline by 75% between 2003 and 2010. Fishing mortality has reduced over the same period, but to a lesser extent.

Comparison with previous assessment and advice

The poor biological sampling coverage of sole in VIIa was the main issue that has been addressed on the WKFLAT 2011. The resulting changes from the benchmarked assessment) did not affect the consistency of the trends in SSB and fishing mortality. F values for 2009 have been revised upwards by 28%, and SSB in 2010 has been revised downwards by 14%.

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

Sources

ICES. 2011a. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

ICES. 2011b. Report of the Benchmark Workshop on Flatfish (WKFLAT), 1–8 February 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:39. 257 pp.

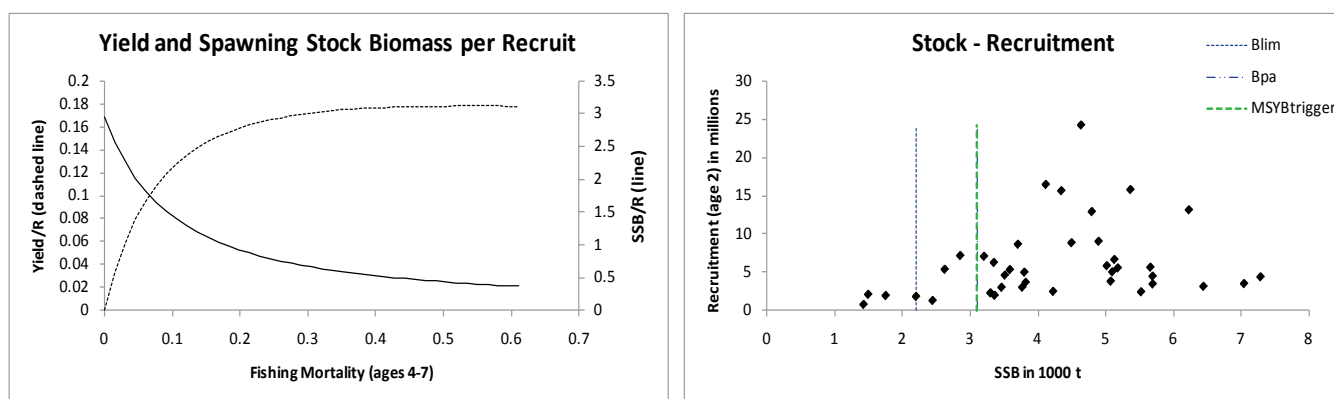


Figure 5.4.12.3 Sole in Division VIIa (Irish Sea). Stock-recruitment plot and yield per recruit analysis.

Table 5.4.12.1 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		
2012	MSY transition	< 0.20			

Weights in '000 t.

¹⁾ Catch at *status quo* F.²⁾ Not including misreporting.³⁾ Revised in 1990 to 1.5.

Table 5.4.12.2 Sole in Division VIIa (Irish Sea). Landings in tonnes as officially reported to ICES, and ICES estimates. Last year's landings are preliminary.

Year	Belgium	France	Ireland	Netherlands	UK (E+W)	UK (Isle of Man)	UK (N. Ireland) ¹	UK (Scotland)	Officially reported	Unallocated	Total used by WG	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	0.5	120	46	165	1	.	8	809.5	53.5	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	419.3	1	85	-	69	+	.	2	576.3	-7.3	569	960
2007	305	1	115	-	66	<0.5	.	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	0.2	47.28	-	11.9	0.5	.	n/a	277	-2	275	402

¹ 1989 onwards: N. Ireland included with England & Wales

Table 5.4.12.3 Sole in Division VIIa. Summary of stock assessment.

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	5011	1450	0.4506
1973	13136	5123	1428	0.4300
1974	5872	5069	1307	0.4442
1975	6682	5360	1441	0.3953
1976	3858	4890	1463	0.4271
1977	15776	4491	1147	0.3696
1978	9045	5093	1106	0.3575
1979	8860	5687	1614	0.4747
1980	5077	5517	1941	0.6364
1981	4511	5173	1667	0.4805
1982	2476	4340	1338	0.4399
1983	5582	4111	1169	0.4347
1984	15623	4632	1058	0.3500
1985	16437	5688	1146	0.3339
1986	24165	7036	1995	0.4325
1987	3503	7279	2808	0.8425
1988	3547	5654	1999	0.6563
1989	4425	4790	1833	0.5435
1990	5678	3795	1583	0.6157
1991	12905	3345	1212	0.4707
1992	5029	3581	1259	0.4956
1993	6295	3356	1023	0.5103
1994	5361	4219	1374	0.4576
1995	2019	3700	1266	0.4728
1996	2529	2849	1002	0.4871
1997	8663	2620	1003	0.5524
1998	7195	3200	911	0.4665
1999	5405	3507	863	0.4411
2000	7098	3294	818	0.4174
2001	4648	3764	1053	0.3189
2002	2346	3814	1090	0.3536
2003	3078	3458	1014	0.3350
2004	3705	2441	709	0.2894
2005	3063	2197	855	0.5202
2006	1349	1749	569	0.4328
2007	1872	1491	492	0.3083
2008	1991	1422	332	0.2892
2009	2144	1130	325	0.3580
2010	834	1218	275	0.2695
2011	1679*	1276		
Average	6203	4025	1234	0.4437

* RCT3 estimate

ECOREGION Celtic Sea and West of Scotland
STOCK Sole in Divisions VIIIf,g (Celtic Sea)

Advice for 2012

ICES advises on the basis of the MSY approach that landings in 2012 should be no more than 1060 t.

Stock status

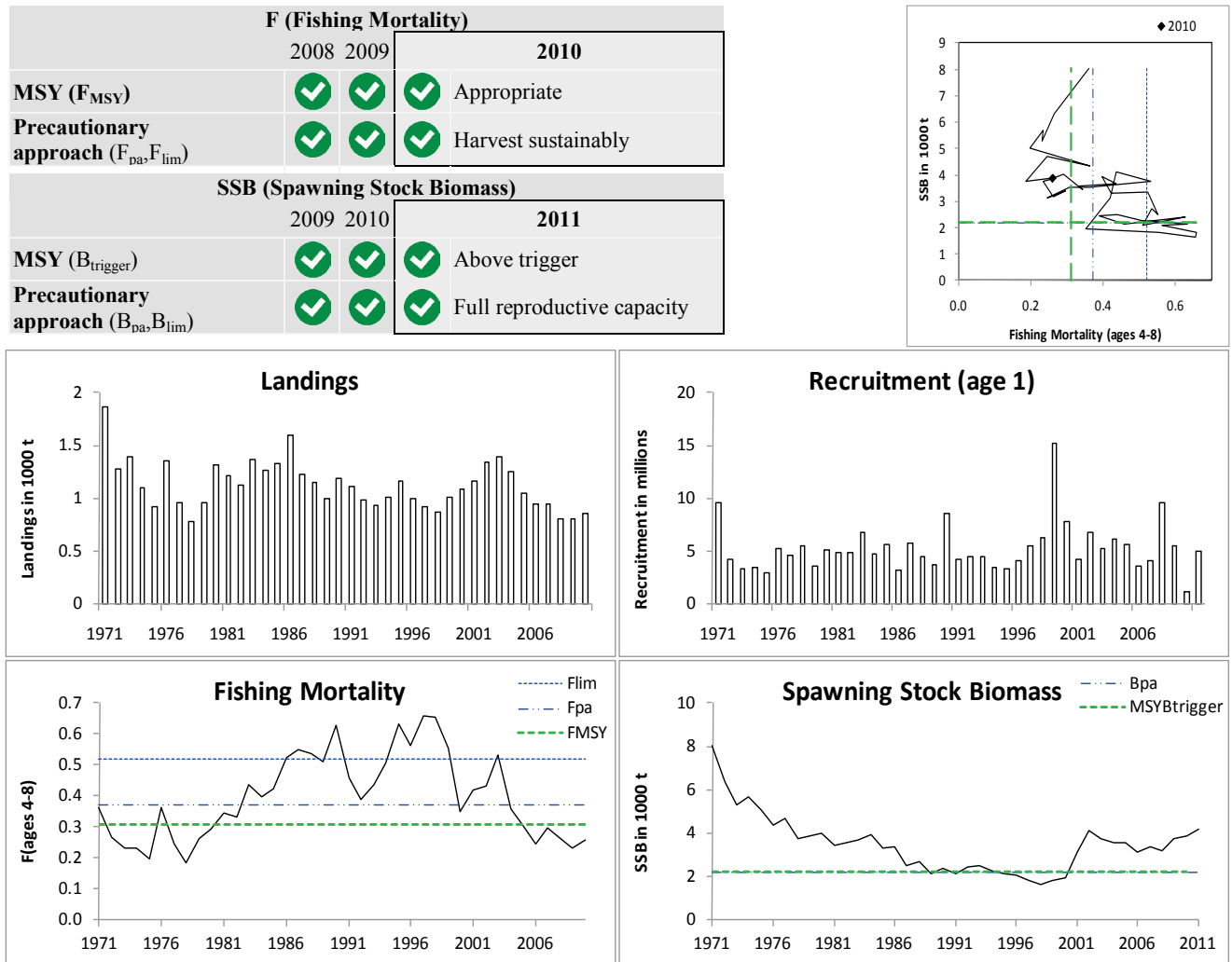


Figure 5.4.13.1 Sole in Divisions VIIIf,g. Summary of stock assessment. Top right: SSB and F over the years.

The spawning stock biomass has been above MSY $B_{trigger}$ since 2001. Fishing mortality has decreased from F_{lim} in 2003 to the lowest level in the time series and is now below F_{MSY} . The 2007 year class is estimated to be above average while 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 by fleet	Total landings (2010) were 862 t - (of which 91% beam trawlers – 8% otter trawlers – 1% Other gear). Beam trawl discards about 5% in weight.
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Effects of the fisheries on the ecosystem

Although discard rates of sole are low in beam trawl fisheries (about 5% in weight), discard rates of other (commercial and non-commercial) species can be considerable. Beam trawling, especially 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 very strong year classes at age 1 may be overestimated and needs to be adjusted in accordance with the historical performance of the assessment. However, this year the incoming recruitment is low. The research beam trawl survey and commercial indices show divergent signals on year class strength. 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.

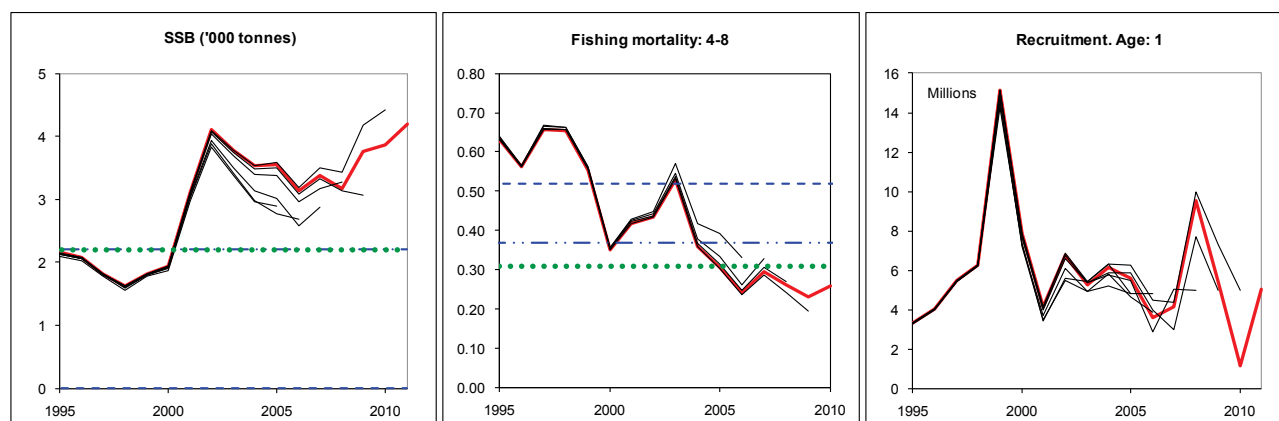


Figure 5.4.13.2 Sole in Divisions VIIIf,g (Celtic Sea). Historical assessment results (final year recruitment estimates included).

Scientific basis

Assessment type	Age based analytical assessment (XSA)
Input data	1 survey index (UK(E&W)-BTS-Q3)) 2 commercial indices (BE-CBT,UK(E&W)-CBT)
Discards and bycatch	Not included in the assessment
Indicators	None
Other information	None
Working group report	WGCSE

ECOREGION Celtic Sea and West of Scotland
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Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
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	$F_{\text{lim}}: F_{\text{loss}}$
	F_{pa}	0.37	This F is considered to have a high probability of avoiding F_{lim} and maintaining SSB above B_{pa} in 10 years, taking into account the uncertainty of assessments. $F_{\text{pa}}: F_{\text{lim}} \times 0.72$ implies a less than 5% probability that ($\text{SSB}_{\text{MT}} < B_{\text{pa}}$).

(unchanged since: 2010)

Yield and spawning biomass per Recruit F-reference points (2011):

	Fish Mort Ages 4-8	Yield/R	SSB/R
Average last 3 years	0.25	0.18	0.82
$F_{\text{max}}^{[*]}$	-	-	-
$F_{0.1}$	0.14	0.16	1.39
F_{med}	0.29	0.18	0.69

[*] F_{max} not well defined

Outlook for 2012

Basis: $F(2011) = F_{\text{sq}} = \text{mean}(F_{2008-2010}) = 0.25$; $\text{SSB}(2012) = 4100$ t; $R(2011) = \text{GM}(1972-2008) = 5025$ (thousands); Landings (2011) = 960 t.

Rationale	Landings (2012)	Basis	F (2012)	SSB (2013)	%SSB change ¹⁾	% TAC change ²⁾
MSY framework	1060	$F_{\text{MSY}} (F_{\text{sq}} * 1.24)$	0.31	3600	-11%	-15%
Precautionary Approach	1230	$F_{\text{pa}} (F_{\text{sq}} * 1.48)$	0.37	3400	-16%	-1%
Zero catch	0	$F=0$	0.00	4800	+17%	-100%
Status quo	800	$F_{\text{sq}} * 0.9$	0.23	3900	-4%	-35%
	880	F_{sq}	0.25	3800	-6%	-29%
	960	$F_{\text{sq}} * 1.1$	0.28	3700	-8%	-23%
	1030	$F_{\text{sq}} * 1.2$	0.30	3600	-10%	-17%
	1060	$\text{TAC} - 15\% (F_{\text{sq}} * 1.24)$	0.31	3600	-11%	-15%
	1241	$\text{TAC}_{\text{sq}} (F_{\text{sq}} * 1.50)$	0.37	3400	-16%	0%
	1430	$\text{TAC} - 15\% (F_{\text{sq}} * 1.78)$	0.44	3200	-21%	+15%

Weights in tonnes.

¹⁾ SSB 2013 relative to SSB 2012.

²⁾ Landings 2012 relative to TAC 2011.

MSY approach

Following the ICES MSY framework implies fishing mortality to be 0.31, resulting in landings of 1060 t in 2012. This is expected to lead to an SSB of 3600 t in 2013.

PA approach

The fishing mortality in 2012 should be no more than F_{pa} corresponding to landings of less than 1230 t in 2012. This is expected to keep SSB above B_{pa} in 2013.

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. Both of the latter stocks require a reduction in fishing mortality.

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 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.

Benthic drop-out panels have been shown to release around 75% of benthic invertebrates from the catches. Information from the UK industry (Trebilcock and Rozarieux, 2009) suggests that use of the panels in 2008 was minimal.

Factors affecting the fisheries and the stock

The fisheries for sole in the Celtic Sea and Bristol Channel involve vessels from Belgium taking two thirds, the UK one quarter, and France and Ireland taking minimal amounts of the total landings. The sole fishery is concentrated on the northern Cornish coast off Trevoze Head and around Lands End. Effort of the two main fleets (Belgian and UK beam trawl fleets) has decreased substantially over the last few years.

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 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.

Comparison with previous assessment and advice

Trends in SSB and fishing mortality are consistent with last year's assessment. F values for 2009 have been revised upwards by 20%, and SSB in 2010 has been revised downwards by 12%.

Last year the advice was based on the precautionary and MSY approach. This year the basis is the MSY approach.

Sources

- ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.
- 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.

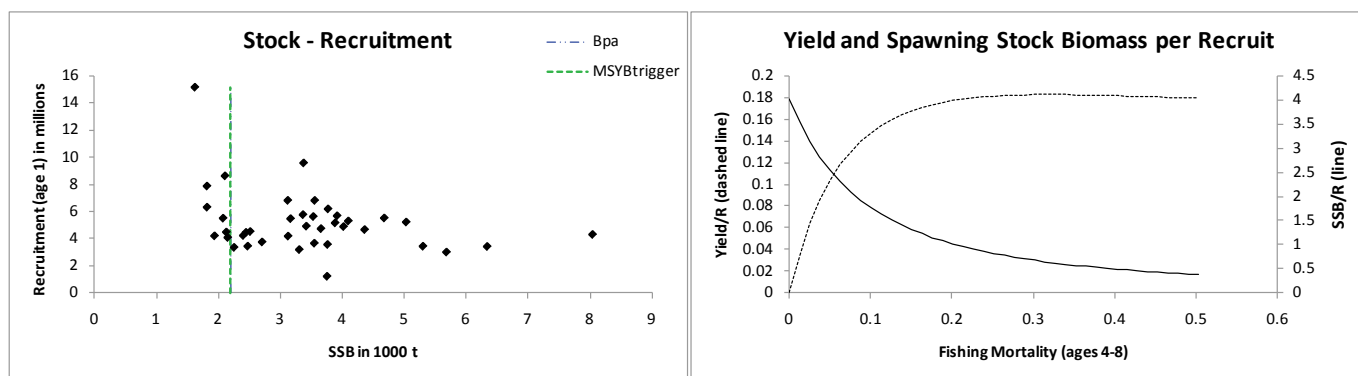


Figure 5.4.13.3 Sole in Divisions VIIIf,g (Celtic Sea). Stock-recruitment plot and yield per recruit analysis.

Table 5.4.13.1 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		
2012	MSY approach	<1.06			

Weights in '000 t.

Table 5.4.13.2 Sole in Divisions VII f,g (Celtic Sea). Official Nominal landings (t), 1986–2010 and data used by the Working Group.

Year	Belgium	Denmark	France	Ireland	UK (E.&W,NI)	UK (Scotland)	Netherlands	Total- Official	Unallocated	Used by WG
1986	1039 *	2	146	188	611	-	3	1989	-389	1600
1987	701 *	-	117	9	437	-	-	1264	-42	1222
1988	705 *	-	110	72	317	-	-	1204	-58	1146
1989	684 *	-	87	18	203	-	-	992	0	992
1990	716 *	-	130	40	353	0	-	1239	-50	1189
1991	982 *	-	80	32	402	0	-	1496	-389	1107
1992	543 *	-	141	45	325	6	-	1060	-79	981
1993	575 *	-	108	51	285	11	-	1030	-102	928
1994	619 *	-	90	37	264	8	-	1018	-9	1009
1995	763 *	-	88	20	294	-	-	1165	-8	1157
1996	695 *	-	102	19	265	0	-	1081	-86	995
1997	660 *	-	99	28	251	0	-	1038	-111	927
1998	675 *	-	98	42	198	-	-	1013	-138	875
1999	604	-	61	51	231	0	-	947	65	1012
2000	694	-	74	29	243	-	-	1040	51	1091
2001	720	-	77	35	288	-	-	1120	48	1168
2002	703	-	65	32	318	+	-	1118	227	1345
2003	715	-	124	26	342	+	-	1207	185	1392
2004	735	-	79	33	283	-	-	1130	119	1249
2005	645	-	101	34	217	-	-	997	47	1044
2006	576	-	75	38	232	-	-	921	25	946
2007	582	-	85	32	244	-	-	943	2	945
2008	466	-	68	28	218	-	-	780	20	800
2009	513	-	74	26	194	-	-	807	-2	805
2010 ¹	620	-	45	27	179	-	-	871	-9	862

¹ Preliminary

* including VII g-k

Table 5.4.13.3

Sole in Divisions VIIIf,g (Celtic Sea). Summary of stock assessment.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4-8
1971	9610	8038	1861	0.3613
1972	4276	6339	1278	0.2649
1973	3387	5304	1391	0.2305
1974	3404	5683	1105	0.2323
1975	2973	5034	919	0.1980
1976	5193	4364	1350	0.3616
1977	4636	4680	961	0.2444
1978	5493	3766	780	0.1851
1979	3534	3888	954	0.2644
1980	5131	4024	1314	0.2911
1981	4859	3424	1212	0.3445
1982	4889	3559	1128	0.3317
1983	6792	3660	1373	0.4372
1984	4706	3920	1266	0.3961
1985	5657	3310	1328	0.4221
1986	3158	3370	1600	0.5240
1987	5740	2519	1222	0.5505
1988	4490	2711	1146	0.5349
1989	3720	2113	992	0.5102
1990	8609	2407	1189	0.6275
1991	4200	2134	1107	0.4572
1992	4456	2451	981	0.3870
1993	4427	2479	928	0.4375
1994	3411	2259	1009	0.5063
1995	3319	2157	1157	0.6328
1996	4054	2082	995	0.5612
1997	5478	1823	927	0.6569
1998	6292	1627	875	0.6548
1999	15162	1822	1012	0.5540
2000	7854	1944	1091	0.3506
2001	4173	3125	1168	0.4188
2002	6795	4101	1345	0.4345
2003	5273	3774	1392	0.5304
2004	6166	3536	1249	0.3594
2005	5601	3553	1044	0.3070
2006	3628	3130	946	0.2435
2007	4153	3380	945	0.2954
2008	9563	3170	800	0.2625
2009	5444	3758	805	0.2326
2010	1181	3869	862	0.2597
2011	5025*	4187		
Average	5266	3475	1125	0.3964

* Geometric Mean (71–08)

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

Advice for 2012

ICES advises on the basis of the MSY framework that landings in 2012 should be less than 740 t.

Stock status

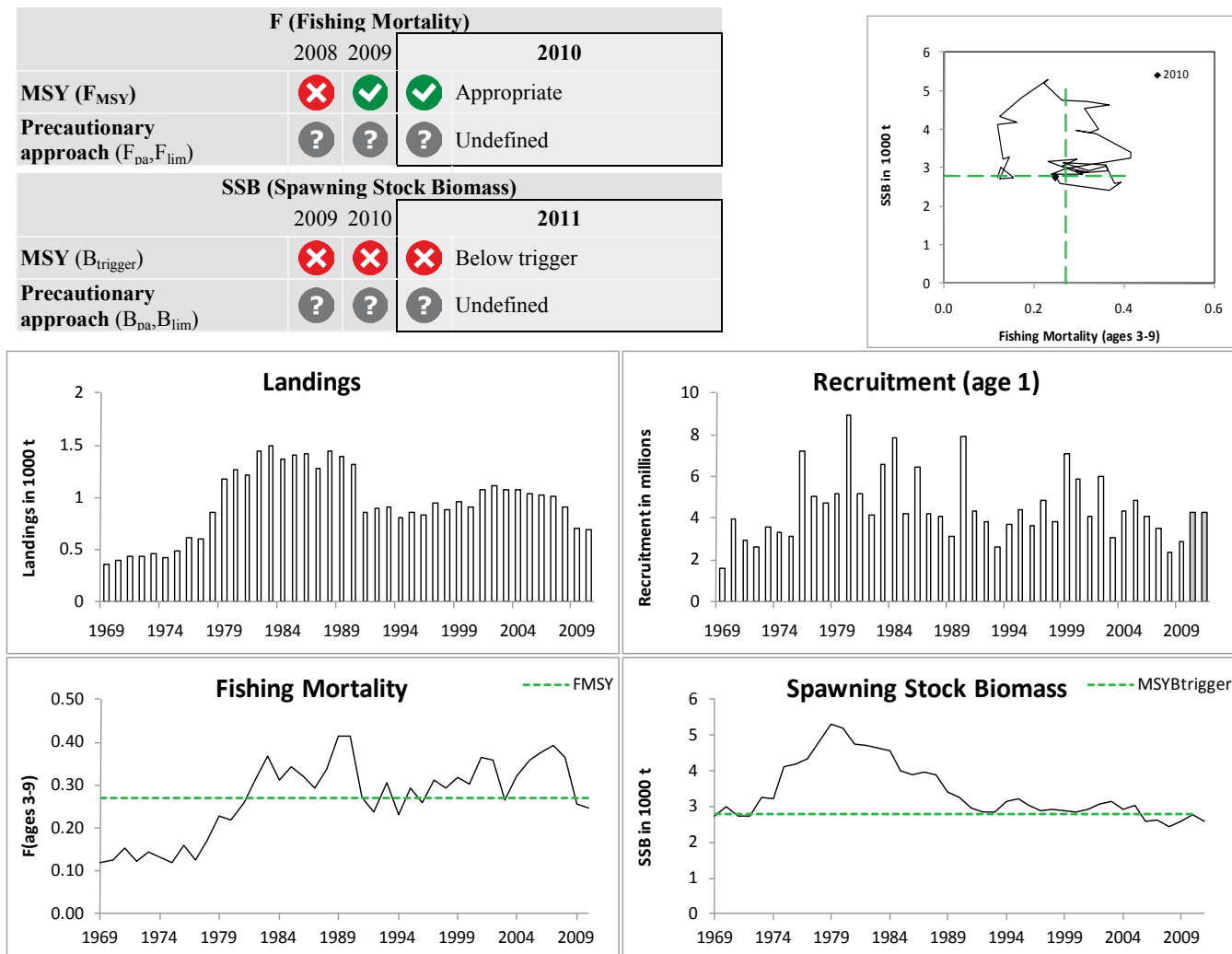


Figure 5.4.14.1 Sole in Division VIIe (Western Channel). Summary of stock assessment. Estimates are shaded. Top right: SSB and F over the years.

The significant reduction of F in 2009 reflects the reduction in fishing effort. SSB is around the lowest observed values in the time series. Recruitment has been fluctuating without trend.

Management plans

Council Regulation ([EC. No. 509/2007](#)) establishes a multi-annual plan for the sustainable exploitation of Division VIIe sole. This results in a TAC of 777 t in 2012. This plan has not been evaluated by ICES.

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 south Cornish and Devon coast. This fishery also takes substantial catches of plaice, anglerfish, lemon sole, and cuttlefish. Otter trawlers and gillnetters take sole mainly as a bycatch fishery, and a targeted fishery at spawning time. Discarding of sole is considered small.

Catch by fleet	Landings in 2010 were 688 t (52% beam, 16% otter, 8% gillnets, 3% dredge, 21% other (mostly caught by the above gears, but not available separately by all countries))
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Effects of the fisheries on the ecosystem

Beam trawling, especially 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

Key uncertainties with regards to the data quality / assessment quality of this stock are the uncertainty regarding the degree of mixing between this and adjacent stocks, particularly with regards to recruitments, and the fact that the survey covers only part of the stock. The 2009 yearclass was estimated to be strong by the assessment, but has been replaced in the assessment with GM_{69-08} due to uncertainties. This precautionary outlook is to some degree balanced by a likely underestimate of F_{sq} for 2011 which is the rescaled F_{2010} as neither F_{08-10} nor a TAC constraint could be scientifically supported.

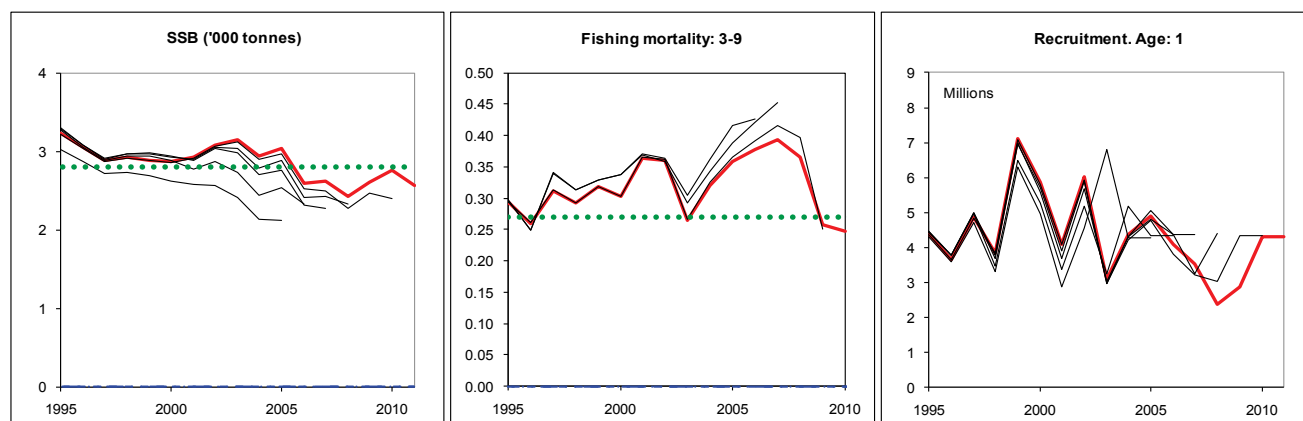


Figure 5.4.14.2 Sole in Division VIIe (Western Channel). Historical assessment results (final year recruitment estimate has been replaced by the GM_{69-08}). Note that the age range for F changed from 3–7 to 3–9 in 2009.

Scientific basis

Assessment type	Age based analytical assessment (XSA)
Input data	Commercial catch-at-age data, 1 survey index (UK-WEC-BTS) 2 current commercial tuning fleets (UK-CBT and UK-COT), 2 historic commercial tuning fleets prior to 1987 (UK-inshore and UK offshore)
Discards and bycatch	Not relevant (low discards) to the assessment
Indicators	Western Channel Sole and Plaice FSP survey
Other information	WKFLAT (ICES, 2009) rejected the assessment because of a retrospective pattern and removed the precautionary reference points. The assessment was accepted again in 2010 since the retrospective pattern was no longer apparent.
Working group report	WGCSE

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Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY $B_{trigger}$	2800 t	Provisional based on former B_{pa}
	F_{MSY}	0.27	Provisionally based on STECF management plan impact assessment SG-MOS-1006 (Part C)
Precautionary approach	B_{lim}	Not defined	
	B_{pa}	Not defined	
	F_{lim}	Not defined	
	F_{pa}	Not defined	

(unchanged since: 2010)

Yield and spawning biomass per Recruit F-reference points (2011):

	Fish Mort Ages 3-9	Yield/R	SSB/R
Average last 3 years	0.29	0.22	0.72
F_{max}^*	-	-	-
$F_{0.1}$	0.11	0.20	1.63
F_{med}	0.28	0.22	0.76

* F_{max} not well defined

Outlook for 2012

Basis: $F(2011) = F_{sq} = F_{08-10}$ (rescaled to F_{2010}) = 0.247; $SSB(2012) = 2650$; $R(2011) = GM_{69-08}$ = 4301 thousand; landings (2011) = 670.

Rationale	Landings (2012)	Basis	F (2012)	SSB (2013)	%SSB change ¹⁾	% TAC change ²⁾
MSY framework	740	$F_{MSY} * (SSB_{2012}/MSY B_{trigger})$ (= $F_{sq} * 1.03$)	0.26	2810	+6	+4
F_{MSY}	780	$F_{MSY} (= F_{sq} * 1.09)$	0.27	2770	+5	+9
Management plan	777	$F_{MP} (= F_{MSY})$	0.27	2770	+5	+9
Zero catch	0	0	0.00	3520	+33	-100
<i>Status quo</i>	380	$F_{sq} * 0.5$	0.12	3150	+19	-46
	450	$F_{sq} * 0.6$	0.15	3090	+16	-36
	520	$F_{sq} * 0.7$	0.17	3020	+14	-27
	590	$F_{sq} * 0.8$	0.20	2950	+12	-17
	605	TAC – 15% ($F_{sq} * 0.83$)	0.204	2940	+11	-15
	650	$F_{sq} * 0.9$	0.22	2890	+9	-8
	710	TAC _{sq} ($F_{sq} * 0.99$)	0.244	2840	+7	0
	720	F_{sq}	0.25	2830	+7	+1
	817	TAC + 15% ($F_{sq} * 1.16$)	0.286	2730	+3	+15

Weights in tonnes.

¹⁾ SSB 2013 relative to SSB 2012.

²⁾ Landings 2012 relative to TAC 2011.

Management plan

Council Regulation (EC) No. 509/2007 establishes a multi-annual plan for the sustainable exploitation of Division VIIe sole. Years 2007–2009 were deemed a recovery plan, with subsequent years being deemed a management plan. For 2010, 2011, and 2012 the TAC shall be set at the highest value resulting from either a 15% reduction in F compared to average F (2007–2009) or an F of 0.27, with a maximum TAC variation of no more than 15%.

Following the agreed management plan implies an F for 2011 of 0.27 (F_{MP} , the management plan long-term target), suggesting a TAC of 777 t in 2012 which is less than the 15% TAC increase cap in the plan. This is expected to lead to a SSB increase of 5% in 2013. This plan has not been evaluated by ICES.

MSY approach

Following the ICES MSY framework implies fishing mortality to be at 0.26 (6% lower than F_{MSY} because SSB is 6% below $\text{MSY } B_{\text{trigger}}$). This implies landings of less than 740 t in 2012.

Additional considerations

Management considerations

Sole are widespread and usually taken in conjunction with other species to varying degrees, dependent 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 largely been eliminated in recent years.

Regulations and their effects

In addition to the days-at-sea regulations there has been a recent UK decommissioning scheme that has reduced the number of beam trawlers in the southwest fleet. Fishing mortalities from 2009 onwards are estimated to have declined which is consistent with the decline in effort in the main fleet exploiting this stock.

Management of this stock is mainly by TAC, which has largely been ineffective at regulating the fishery prior to 2009. In 2005 effort restrictions were implemented for beam trawlers in this fishery in order to enforce the TAC and improve data quality. These restrictions were not been limiting this fishery despite a decommissioning scheme, in part due to the large numbers of days available, but also because in the UK fleet there appears to be some latent effort / over capacity in the beam trawl fleet. Since November 2008 the UK has been enforcing a single area licensing scheme which has been highly effective in reducing UK catches.

Technical measures applied to this stock include a minimum landing size (24 cm) and minimum mesh size of 80 mm for beam trawlers. Local regulations restricting certain gear and vessel types are also in place.

Discarding in the towed gears using 80mm mesh sizes, which are responsible for the large majority of the landings, is very small (<5% by number) by number and small (5-10%) for the much smaller gillnet fishery. Other spatially or temporally restricted métiers show higher values of discarding (10-40% averaged over years) have very limited effort and hence contribute only a very small percentage to the landings (<5%). The gears used to target sole are highly selective for fish above the minimum landing size, and only a few sporadic cases of high-grading (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.

Comparison with previous assessment and advice

The F_{2009} is revised up by 2% and SSB_{2010} is revised up by 15% compared to last years assessment. These revisions are partly influenced by a 12% upward revision of the 2009 catch.

The basis for the advice this year is the same as last year and was based on the MSY framework.

Sources

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2010/ACOM:12.

ICES. 2009. Report of the Benchmark and Data Compilation Workshop for Flatfish (WKFLAT 2009), 6–13 February 2009, Copenhagen, Denmark. ICES CM 2009/ACOM:31.

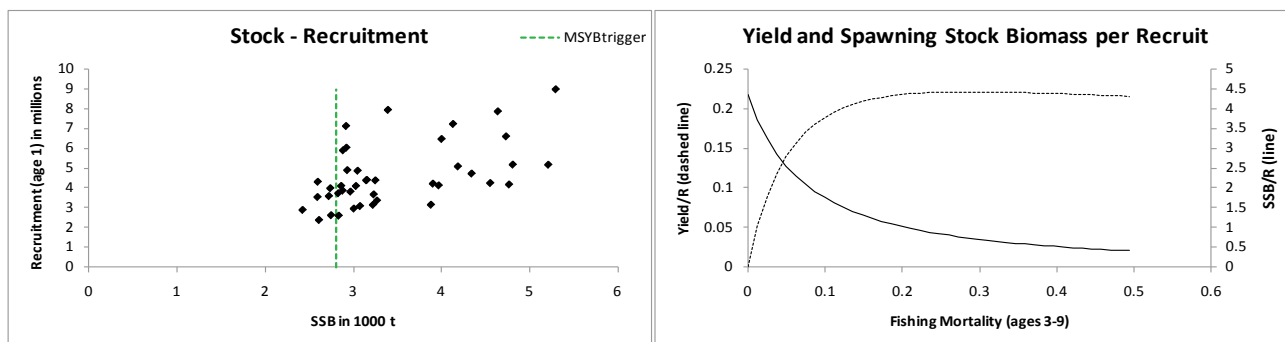


Figure 5.4.14.1 Sole in Division VIIe (Western Channel). Yield per recruit analysis and stock–recruitment plot.

Table 5.4.14.1 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(90)	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	F96 < F94	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 Fpa	0.67	0.7	0.66	0.96
2000	Reduce F below Fpa	< 0.64	0.64	0.66	0.92 ¹
2001	Reduce F below Fpa	< 0.58	0.6	0.65	1.07
2002	Reduce F below Fpa	< 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 ¹	0.70 ¹
2010	Reduce fishing effort and catches	-	0.62	0.74 ²	0.68 ²
2011	MSY framework	< 0.66	0.71		
2012	MSY framework	< 0.74			

Weights in '000 t.

¹⁾ Revisions by WGCSE 2011.

²⁾ Preliminary.

Table 5.4.14.2 Sole in Division VIIe (Western Channel). Landings (in tonnes) as used by ICES. 2010 landings are preliminary.

Year	Belgium	Denmark	France	Netherlands	Ireland	Jersey	Guernsey	UK-E+W+Ni	UK-other	Unallocated	Total
1974			323							104	427
1975	3		271				2	215	2	0	491
1976	4		352				1	259	1	0	616
1977	3		331					272		0	606
1978	4		384					453		20	861
1979	1		515				2	663	2	0	1181
1980	45		447		13		1	763	1	0	1269
1981	16		415	1			4	784	4	-5	1215
1982	98		321				15	1013	15	-1	1446
1983	47		405	3		2	16	1025	18	0	1498
1984	48		421			9	14	878	23	0	1370
1985	58		130			9	8	894	17	310	1409
1986	62		467			3	6	831	9	50	1419
1987	48		432			1	5	626	6	168	1280
1988	67		98			0.5	4	780	4	495	1444
1989	69		112	6			3	610	3	590	1390
1990	41	0.5	81			1	3	632	4	556.5	1315
1991	35		325					477		15	852
1992	41		267				2	457	11	119	895
1993	59		236			1		479	19	111	904
1994	33		257					546	2	-38	800
1995	21		294			1	2	562	3	-24	856
1996	8		297					428	9	91	833
1997	13		348		1	13	13	470	26	91	949
1998	40		343			17	3	369	20	108	880
1999	13					18	3	375	21	548	957
2000	4		241			22	5	386	27	256	914
2001	19		224			20	5	382	25	419	1069
2002	33		198			15	5	289	20	566	1106
2003	1		363		1	15	5	235	20	458	1078
2004	7		302			7	6	172	13	581	1075
2005	26		406			17	5	505	22	80	1039
2006	32		357			4	4	568	8	57	1022
2007	34		383		2	2		525	5	69	1015
2008	28		183		0.3	2	6	463	8	230	908
2009	17		285			1	3	354	8	37	701
2010	17		359			1.5		362	1.5	-51.5	688

Table 5.4.14.2

Sole in Division VIIe (Western Channel). Assessment summary table.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-9
1969	1610	2742	353	0.119
1970	3976	3008	391	0.126
1971	2955	2751	432	0.154
1972	2619	2726	437	0.122
1973	3580	3270	459	0.144
1974	3357	3225	427	0.131
1975	3143	4131	491	0.118
1976	7206	4186	616	0.160
1977	5072	4341	606	0.124
1978	4714	4807	861	0.171
1979	5164	5293	1181	0.229
1980	8948	5209	1269	0.220
1981	5157	4765	1215	0.260
1982	4165	4731	1446	0.316
1983	6581	4638	1498	0.367
1984	7838	4552	1370	0.312
1985	4237	4001	1409	0.343
1986	6451	3903	1419	0.322
1987	4208	3969	1280	0.293
1988	4118	3881	1444	0.337
1989	3148	3394	1390	0.413
1990	7912	3252	1315	0.413
1991	4371	2970	852	0.270
1992	3806	2837	895	0.238
1993	2598	2832	904	0.307
1994	3723	3156	800	0.230
1995	4390	3233	856	0.294
1996	3666	3051	833	0.260
1997	4856	2881	949	0.312
1998	3854	2920	880	0.292
1999	7102	2886	957	0.318
2000	5881	2865	914	0.302
2001	4093	2924	1069	0.364
2002	6015	3078	1106	0.360
2003	3079	3149	1078	0.264
2004	4377	2934	1075	0.321
2005	4885	3032	1039	0.358
2006	4088	2597	1023	0.377
2007	3534	2614	1015	0.393
2008	2379	2428	908	0.366
2009	2886	2600	701	0.257
2010	4301 ^{a)}	2760	688	0.247
2011	4301 ^{b)}	2571		
Average	4520	3421	949	0.270

^{a)} 2010 recruitment value from the XSA (8060) replaced by Geometric Mean ₍₆₉₋₀₈₎^{b)} Geometric Mean ₍₆₉₋₀₈₎

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

Advice for 2012

ICES advises on the basis of precautionary considerations that catches in 2012 should not be allowed to increase.

Stock status

F (Fishing Mortality)	
2008-2010	
MSY (F_{MSY})	? Unknown
Precautionary approach (F_{pa}, F_{lim})	? Unknown
Qualitative evaluation	↘ decreasing
SSB (Spawning-Stock Biomass)	
2009-2011	
MSY ($B_{trigger}$)	? Unknown
Precautionary approach (B_{pa}, B_{lim})	? Unknown
Qualitative evaluation	↗ Increasing

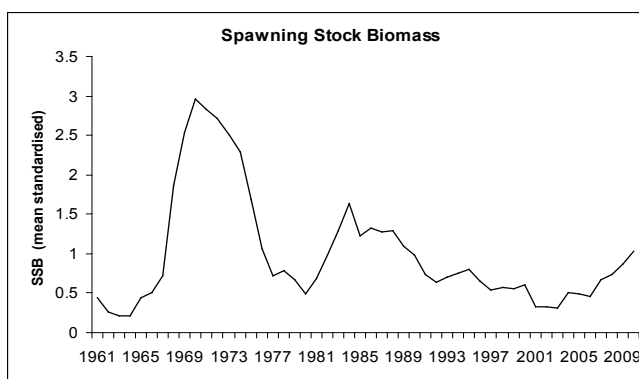
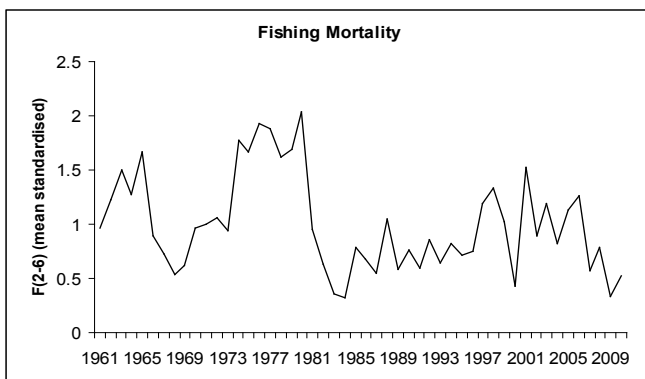
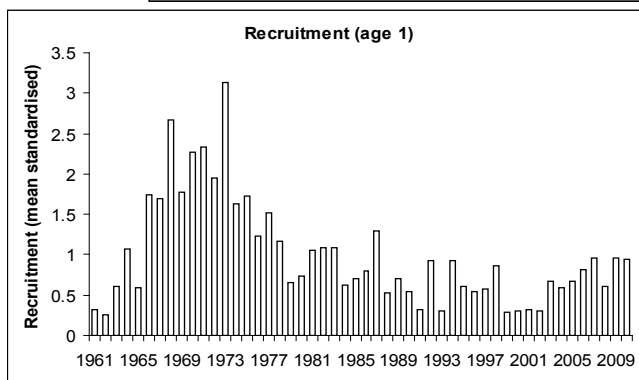
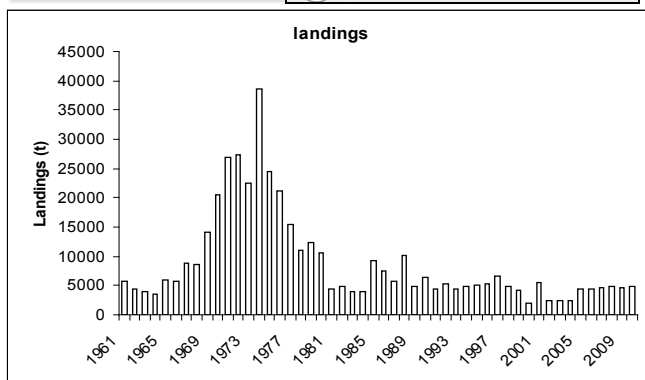
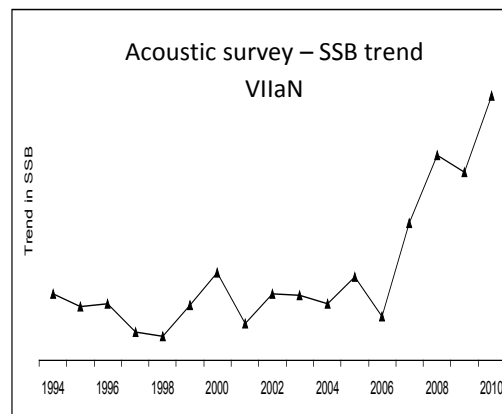


Figure 5.4.15.1 Herring in Division VIIa North of 52° 30'N (Irish Sea). Summary of stock trends from exploratory assessment with standardised values, landings in tonnes. Top right: Trend in acoustic SSB estimate in Subdivision VIIaN since 1994.

The assessment is indicative of trends only. The catches have been close to TAC levels and the main fishing activity has not varied considerably. The 2010 acoustic survey estimates suggest that SSB is at its highest abundance in the 18 year time-series. Recruitment in recent years has been stable close to average recruitment in the time series. Increasing SSB and stable catches suggests decreasing exploitation.

Management plans

No specific management objectives are known to ICES.

Biology

Herring are an important prey species in the ecosystem and also one of the dominant planktivorous fish. This autumn spawning stock is considered a part of the Malin Shelf Stock Complex. A component of the 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.

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. A pair of UK pair trawlers takes the majority of catches during the 3rd and 4th quarters. A small local fishery continues to record landings on the traditional Mourne herring grounds during the 4th quarter. Herring fisheries tend to be clean with little bycatch of other fish. There are no estimates of discarding or slippage in the Irish Sea fisheries that target herring. Discarding however is not thought to be a feature of this fishery.

Catch by fleet	Total catch (2010) = 4.9 kt, of which 97% are from pair-trawlers and 3% 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.

Quality considerations

The exploratory assessment is indicative of recent trends only. The present assessment model is sensitive to the annual changes in fishing pattern.

Scientific basis

Assessment type	Analytical assessment (FLICA) considered for trends.
Input data	Two survey indices (Northern Ireland Acoustic Surveys AC(VIIaN)), larvae survey NINEL); commercial catch-at-age data.
Discards and bycatch	Not considered relevant.
Indicators	Two survey indices (NIGFS-WIBTS-1Q, NIGFS-WIBTS-4Q).
Other information	Benchmark is planned for 2012.
Working group report	HAWG

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

Reference points

	Type	Value	Technical basis
MSY	MSY $B_{trigger}$	Not defined.	
Approach	F_{MSY}	Not defined.	
Precautionary approach	B_{lim}	6000 t	Lowest observed SSB.
	B_{pa}	9500 t	$B_{pa} = B_{lim} * 1.58$
	F_{lim}	Not defined.	
	F_{pa}	Not defined.	

Unchanged since 2004

Outlook for 2012

No analytical assessment is available for this stock and no forecast is possible.

Precautionary considerations

Recent SSB trends show an increase in herring biomass. Current exploitation appears to be declining but the exploitation status is unknown. Therefore the catches should not be allowed to increase.

Additional considerations

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

2010 Acoustic survey estimates suggest that SSB is at its highest abundance in the 18 year time-series. 1-ringer+ biomass is also high. Estimates from an enhanced acoustic survey series in 2007 to 2009 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 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.

Herring are an important prey species in the ecosystem and also one of the dominant planktivorous fish. The stock identity of herring west of the British Isles was reviewed by the EU-funded project WESTHER. This identified Division VIaN as an area where catches comprise a mixture of fish from Divisions VIaN, VIaS, and VIIaN. In 2008 ICES began to evaluate management for this Division VIa(South) and VIIa (North). It will be a number of years before ICES can provide a fully operational integrated strategy for these units. In this context ICES recommends that a management plan for Division VIIa (North) should be developed.

Uncertainties in the assessment

Results of exploratory assessments are not considered reliable for absolute values of SSB and F during the recent period. The exploratory analysis suggests an increasing trend in SSB. There is evidence from acoustic surveys that recent recruitment has been high.

There is a seasonal closed area east of the Isle of Man since 1973. The fleet sometimes is 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 is the same as last year. The advice for 2012 is based on precautionary considerations.

Sources

- ICES. 2010. Report of the Study Group on the evaluation of assessment and management strategies of the western herring stocks (SGHERWAY), 14–18 June 2010, Dublin, Ireland. ICES CM 2010/SSGSUE:08. 194 pp.
- ICES. 2011. Report of the Herring Assessment Working Group for the Area South of 62°N, 16–24 March 2011. ICES CM 2011/ACOM:06.

Table 5.4.15.1 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	
2012	No increase in catch	-		

Weights in '000 t.

Table 5.4.15.2 Herring in Division VIIa North of 52° 30'N (Irish Sea). ICES catch estimates in tonnes by country.

Year	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

ECOREGION
STOCK

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

Advice summary for 2012

ICES advises on the basis of the MSY approach that landings in 2012 should be no more than 26 900 t.

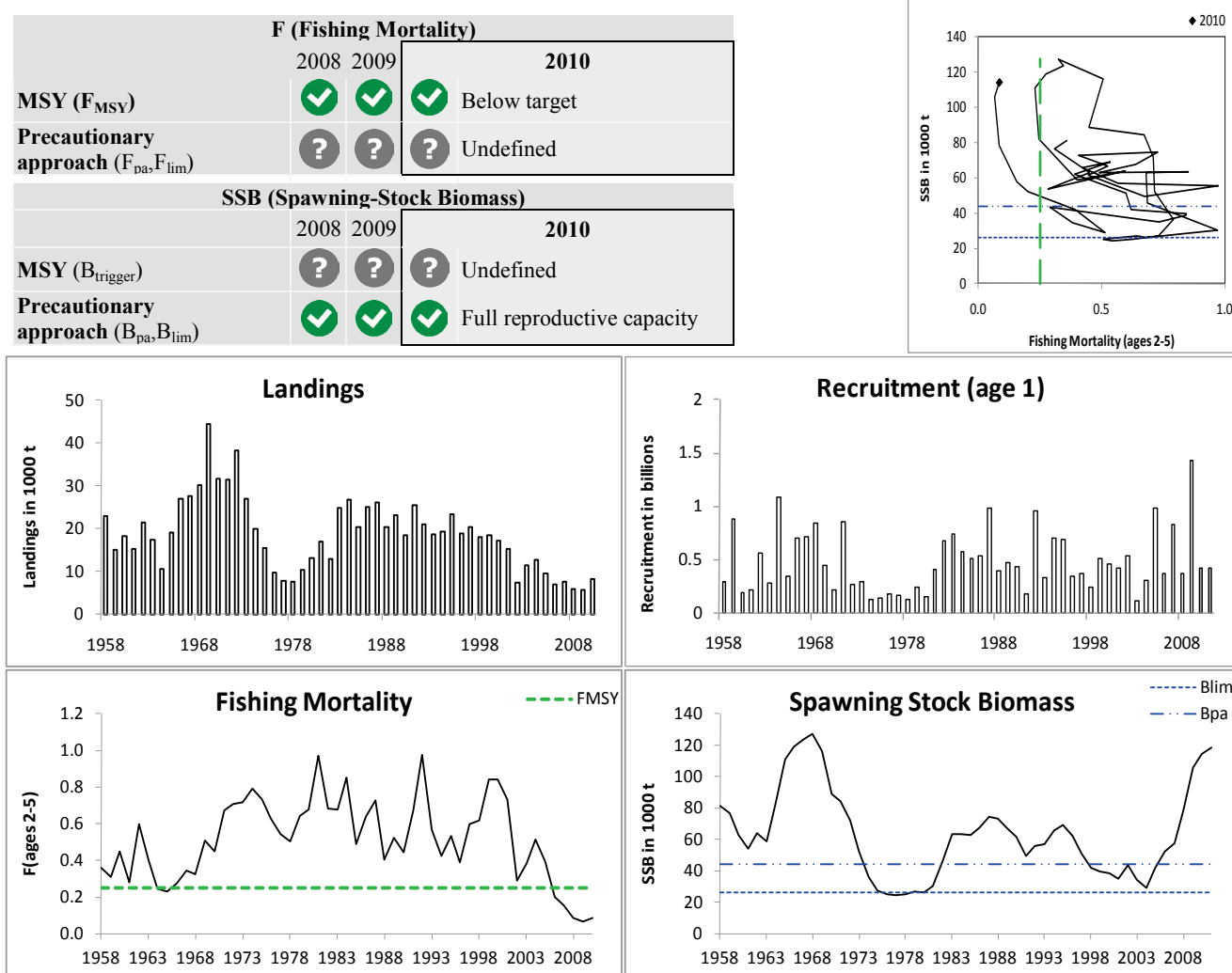
Stock status


Figure 5.4.16.1 Herring in Divisions VIIa (South of 52° 30' N) and VIIg,h,j,k (Celtic Sea and South of Ireland). Summary of stock assessment. Estimates are shaded. Top right: F and SSB over the years.

The current assessment shows the stock continues to improve. SSB is at the highest level since the 1960s and continues to increase. F is well below F_{msy} . There are three recent strong year classes (2003/4, 2005/6, and 2007/8).

Management plans

A long-term management plan has been agreed by the Irish industry in 2011 (Annex 5.4.16). This plan has a target $F=0.23$ and a 30% constraint in TAC change. This plan results in a TAC of 17 200 t for 2012. ICES has not yet evaluated the plan.

A rebuilding plan has been in place since 2009 although it has not yet been formally adopted in law (Annex 5.4.16). The target F is equal to 0.19 and no TAC constraint applies. The rebuilding plan implies a TAC of 21 100 t in 2012.

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 juveniles is present in the Irish Sea and return to spawn in the Celtic Sea. The spawning grounds for herring in the Celtic Sea are located inshore close to the coast and consist of either gravel or flat stone. ICES has consistently advised that activities that perturb herring spawning grounds should be avoided.

Environmental influence on the stock

Temperatures in this area have been increasing over the last number of decades, and indications are that salinity is also increasing. Recruitment in this stock has fluctuated widely, although studies to date have not been able to demonstrate any relationship to environmental changes.

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.

Catch by fleet Total catch (2010/2011): 8.37 kt of which 98% caught by pelagic trawl, 2% by drift nets.

Effects of the fisheries on the ecosystem

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

Quality considerations

There is a large uncertainty in estimation of 1-ringers. As these contribute to the SSB (50% mature) this influences estimates and forecasts. There is uncertainty in the 2010 acoustic survey due to the substitution of the sounder frequency from 38 kHz to 18 kHz.

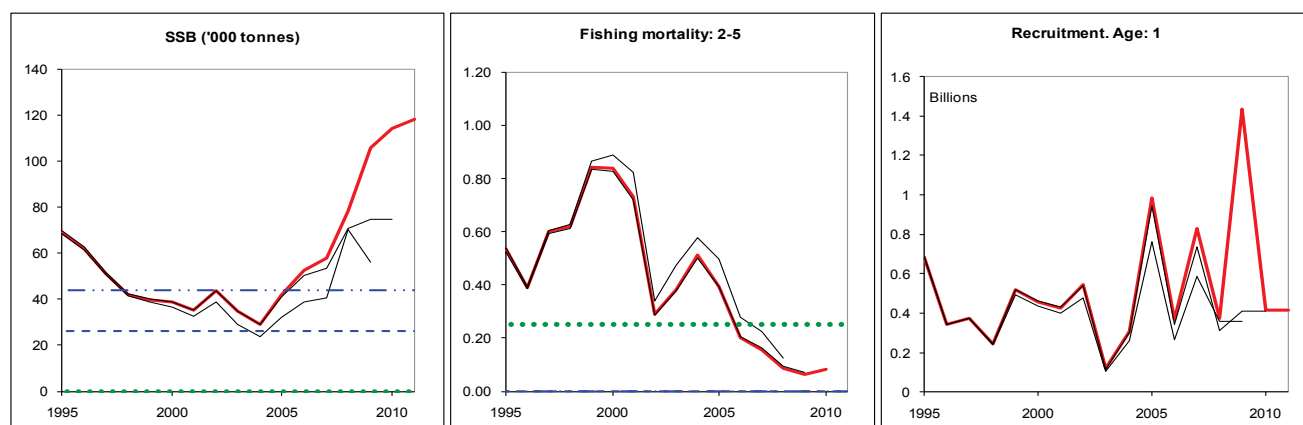


Figure 5.4.16.2 Herring in Division VIIa South of 52° 30' N and VIIg,h,j,k (Celtic Sea and South of Ireland). Historical assessment results (final year predicted SSB and recruitment estimates included).

Scientific basis

Assessment type	Age-based analytical assessment (FLICA).
Input data	Acoustic survey index (CSHAS); catch-at-age data.
Discards and bycatch	Not considered relevant.
Indicators	None.
Other information	Celtic Sea and Division VIIj herring are assessed on a seasonal basis, 1st April to 31st March, to allow for the inclusion of the spawning cycle in the assessment period.
Working group report	HAWG

ECOREGION
STOCK

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

Reference points

	Type	Value	Technical basis
MSY Approach	MSY B_{trigger}	Not defined.	
	F_{MSY}	0.25	Stochastic simulations on segmented regression stock recruit relationship.
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.	

(Unchanged since 2010)

Yield and spawning biomass per Recruit F-reference points (2011).

	Fish Mort Ages 2–5	Yield/R	SSB/R
Average last 3 years	0.08	0.02	0.26
F _{max} [*]	-	-	-
F _{0.1}	0.18	0.03	0.17
F _{med}	0.24		

[*]F_{max} is not well defined.

Outlook for 2012

Basis: F (2011/2012) = F (catch constraint 2011/2012) = 0.14; R (2010–2012) = GM (1995–2008) = 417 million; SSB (2011/2012) = 118,4; landings (2011/2012) = 16.

Rationale	Catch (2012)	SSB (2012) ¹	Basis	F (2012)	SSB (2013)	%SSB Change ²⁾	% TAC Change ³⁾
MSY framework	26.9	106	F=0.25	0.25	92	-13%	+104%
Proposed Long term management plan	17.2	111	Mgt Plan	0.15	105	-5%	+30%
Proposed Rebuilding Plan	21.1	109	F _{0.1}	0.19	100	-8%	+60%
Zero catch	0	121	Zero catch	0	130	7%	-100%
Status quo	11.2	114	F ₂₀₁₁ *0.71	0.10	113	-1%	-15%
	13.2	113	F ₂₀₁₁ *0.79	0.11	110	-3%	0%
	15.2	112	F ₂₀₁₁ *0.93	0.13	108	-4%	+15%
	15.9	112	F ₂₀₁₁	0.14	107	-4%	+20%

Weights in '000 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 2013 relative to SSB 2012.

³⁾ Catch (assumed same as landings) 2012 relative to TAC 2011.

Management plan

A rebuilding plan has been proposed by the Irish industry in 2008 (Annex 5.4.16). The stock has been above B_{pa} (44 000 t) for three consecutive years and the target of the rebuilding plan has thus been met. This plan has not been formally adopted in EU legislation. Under the terms of this rebuilding plan it should be replaced by a long term management plan in 2012. The rebuilding plan implies a TAC of 21 100 t in 2012.

In 2011 the Irish Industry has agreed a new proposed long term management plan (Annex 5.4.16). This plan has a target F = 0.23 and a 30% constraint in TAC change. This TAC constraint prevents sudden changes of the TAC and accounts for uncertainties in the assessment and forecast in case of strong incoming recruitment. This would lead to a 30% increase in TAC to 17 160 t. This plan has not yet been evaluated by ICES, but evaluation by the Irish Marine Institute concluded it to be precautionary.

MSY approach

Following the ICES MSY framework implies fishing mortality be increased to 0.25 which is higher than current F (0.14), resulting in landings of less than 26 900 t in 2012. This is expected to lead to an SSB of 92 000 t in 2013.

PA approach

The SSB is well above B_{pa} and F_{pa} is undefined but current F is well below F_{MSY} . ICES does not advise to use B_{pa} as a target in 2012.

Additional considerations

The spawning grounds for herring in the Celtic Sea are located inshore close to the coast and consist of either gravel or flat stone. Spawning grounds tend to be vulnerable to anthropogenic influences such as dredging, sand and gravel extraction, dumping of dredge spoil and waste from fish cages. There have been several proposals for extraction of gravel and to dump dredge spoil in recent years. Many of these proposals relate to known herring spawning grounds. ICES has consistently advised that activities that perturb herring spawning grounds should be avoided. There may also be proposals to build wind farms on known spawning grounds. Other negative impacts may include benthic fishing and marine energy construction projects.

Regulations and their effects

There is evidence that closure of Division VIIaS, under the rebuilding plan, has helped to reduce fishing mortality substantially. 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. Under the terms of the rebuilding plan the stock is considered to have recovered and this area will be partially reopened in January 2012.

Revisions in data and methodologies

There were no changes to the methods used in 2011. A full analytical assessment was accepted in 2009. The assessment was an extension of the benchmark carried out in 2007, with some revisions of the input data. Since 2007 a longer time-series of reliable surveys was available. Therefore, in 2009, the unreliable surveys (pre-2002) were removed. The plus group was reduced to account for smaller numbers at older ages. In 2009, the plus group was further reduced on this basis and led to much improved model fitting.

Uncertainties in assessment and advice

Estimation of F is considered quite precise in recent years. There is uncertainty in estimation of 1-ring recruits. As these contribute to the SSB (50% mature) this means that there is some uncertainty in SSB.

The 2010 acoustic survey estimate was compromise because of transducer failure. Therefore, data from a transducer of different frequency (18 instead of 38 kHz) had to be substituted. This departure from standard procedures will be further evaluated by ICES. Consequently, there is uncertainty in the 2010 acoustic survey estimate.

Comparison with previous assessment and advice

The 2011 assessment shows an upward revision in SSB 2010 by 52%, while F for 2009 is estimated to be rather similar. The basis for the advice is the MSY approach.

Source

ICES. 2011. Report of the Herring Assessment Working Group for the Area South of 62°N, 16–24 March 2011. ICES CM 2011/ACOM:06.

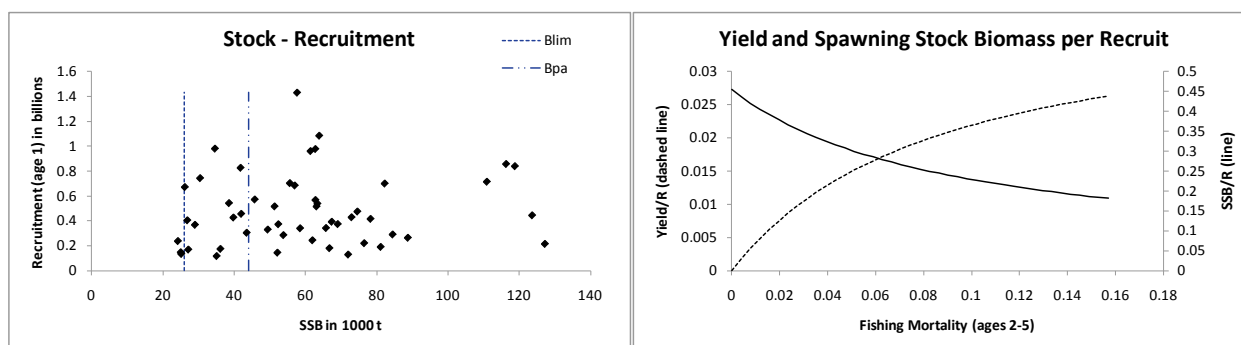


Figure 5.4.16.3 Herring in Divisions VIIa (South of 52° 30' N) and VIIg,h,j,k (Celtic Sea and South of Ireland). Stock-recruitment plot and yield per recruit analysis.

Table 5.4.16.1 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	-	5.8
2010	F _{mgt} = 0.19	10.15	10.15	9.6	-	8.4
2011	See scenarios	-	13.2			
2012	MSY Approach	< 26.9				

Weights in '000 t.

¹⁾ By calendar year.

²⁾ Revised in 1996 after the ACFM May meeting.

Table 5.4.16.2 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	1300	+	-1300	-	18,100
2000	573	228	18,038	44	1	-617	-	18,267
2001	1,359	219	17,729	-	-	-1578	-	17,729
2002	734	-	10,550	257	-	-991	-	10,550
2003	800	-	10,875	692	14	-1,506	-	10,875
2004	801	41	11,024	-	-	-801	-	11,065
2005	821	150	8452	799	-	-1770	-	8,452
2006	-	-	8,530	518	5	-523	-	8,530
2007	581	248	8,268	463	63	-1355	-	8,268
2008	503	191	6,853	291		-985	-	6,853
2009	364	135	5,760			-499	-	5,760
2010	636	278	8406	325		-1239	-	8,406

Table 5.4.16.3 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 (1st April–31st 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
1988/1989	-	-	17,000	-	-	-	3,400	20,400
1989/1990	+	-	15,000	1,900	-	2,600	3,600	23,100
1990/1991	+	-	15,000	1,000	200	700	1,700	18,600
1991/1992	500	100	21,400	1,600	-	-100	2,100	25,600
1992/1993	-	-	18,000	1,300	-	-100	2,000	21,200
1993/1994	-	-	16,600	1,300	+	-1,100	1,800	18,600
1994/1995	+	200	17,400	1,300	+	-1,500	1,900	19,300
1995/1996	200	200	20,000	100	+	-200	3,000	23,300
1996/1997	1,000	-	17,900	1,000	-	-1,800	750	18,800
1997/1998	1,300	-	19,900	1,400	-	-2100	-	20,500
1998/1999	+	-	17,700	1,200	-	-700	-	18,200
1999/2000		200	18,300	1300	+	-1300	-	18,500
2000/2001	573	228	16,962	44	1	-617	-	17,191
2001/2002	-	-	15,236	-	-	-	-	15,236
2002/2003	734	-	7,465	257	-	-991	-	7,465
2003/2004	800	-	11,536	610	14	-1,424	-	11,536
2004/2005	801	41	12,702	-	-	-801	-	12,743
2005/2006	821	150	9,494	799	-	-1770	-	9,494
2006/2007	-	-	6,944	518	5	-523	-	6,944
2007/2008	379	248	7,636	327	-	-954	-	7,636
2008/2009	503	191	5,872	150		-844	-	5,872
2009/2010	364	135	5,745		-	-499	-	5,745
2010/2011	636	278	8,370	325	-	-1239	-	8,370

Table 5.4.16.4 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 '000 t)

Year	Recruitment Age 1	TSB tonnes	SSB tonnes	Fbar Ages 2–5	Landings
1958	296749	112164	81192	0.3578	22978
1959	877840	137942	76574	0.3078	15086
1960	191417	87465	62882	0.4498	18283
1961	221309	76365	53899	0.2815	15372
1962	569088	116616	63954	0.5958	21552
1963	286381	89078	58590	0.4008	17349
1964	1086254	168997	82323	0.2453	10599
1965	341357	151680	110992	0.2282	19126
1966	701444	193253	118863	0.2742	27030
1967	715913	199852	123705	0.3455	27658
1968	840789	214451	127286	0.3235	30236
1969	445612	176603	116398	0.5068	44389
1970	215682	123926	88822	0.4478	31727
1971	858507	168019	84550	0.6735	31396
1972	265141	115031	72075	0.71	38203
1973	291594	89570	52212	0.7155	26936
1974	130011	58047	36224	0.792	19940
1975	145243	46988	27215	0.7308	15588
1976	175521	46334	25252	0.6265	9771
1977	170146	44122	24284	0.542	7833
1978	134982	41415	25071	0.505	7559
1979	238310	52522	26929	0.6422	10321
1980	148348	44083	26233	0.6795	13130
1981	405412	69129	30520	0.971	17103
1982	672638	105980	45850	0.6842	13000
1983	744616	131762	63199	0.6792	24981
1984	573187	114355	63446	0.8508	26779
1985	517083	111009	62863	0.4892	20426
1986	539118	121991	67457	0.637	25024
1987	979144	152842	74656	0.728	26200
1988	394043	112886	73026	0.405	20447
1989	476177	113542	66817	0.5245	23254
1990	430086	100951	61509	0.4448	18404
1991	181263	72762	49500	0.6752	25562
1992	962532	129137	55704	0.974	21127
1993	331174	89834	57086	0.567	18618
1994	704501	123430	65853	0.423	19300
1995	685674	122999	69150	0.534	23305
1996	343402	93948	62043	0.3908	18816
1997	374906	85469	51419	0.599	20496
1998	244778	67378	42061	0.6198	18041
1999	517528	80110	39862	0.8435	18485
2000	457689	76047	38625	0.8402	17191
2001	427987	66907	35157	0.733	15269
2002	543683	85152	43584	0.2905	7465
2003	117836	52029	34682	0.382	11536
2004	305664	55944	29076	0.513	12743
2005	982324	99896	41875	0.3932	9494
2006	369330	84614	52471	0.2005	6944
2007	827993	104459	57743	0.1562	7636
2008	373767	110744	78351	0.0855	5872
2009	1432574	191440	105903	0.0652	5745
2010*	417056	168141	114319	0.0845	8370
2011*	417056		118399		

*Geometric Mean Recruitment 1995–2008.

Annex 5.4.16

Rebuilding Plan proposed by the Celtic Sea Management Advisory Committee, Ireland, for this stock.

1. For 2009, the TAC shall be reduced by 25% relative to the current year (2008).
2. In 2010 and subsequent years, the TAC shall be set equal to a fishing mortality of $F_{0.1}$.
3. If, in the opinion of ICES and STECF, the catch should be reduced to the lowest possible level, the TAC for the following year will be reduced by 25%.
4. Division VIIaS will be closed to herring fishing for 2009, 2010 and 2011.
5. A small-scale sentinel fishery will be permitted in the closed area, Division VIIaS. This fishery shall be confined to vessels, of no more than 65 feet length. A maximum catch limitation of 8% of the Irish quota shall be exclusively allocated to this sentinel fishery.
6. Every three years from the date of entry into force of this Regulation, the Commission shall request ICES and STECF to evaluate the progress of this rebuilding plan.
7. When the SSB is deemed to have recovered to a size equal to or greater than B_{pa} in three consecutive years, the rebuilding plan will be superseded by a long-term management plan

Long Term Management Plan for Herring in the Celtic Sea and Division VIIj proposed by Celtic Sea Management Advisory Committee, Ireland, in 2011, to supersede the rebuilding plan above.

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:

$$SSB * 0.23 / 61,000$$

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

Advice summary for 2012

ICES advises on the basis of precautionary considerations that landings in 2012 should be reduced.

Stock status

F (Fishing Mortality)	
	2008-2010
MSY (F_{MSY})	? Unknown
Precautionary approach (F_{pa}, F_{lim})	? Unknown
Qualitative evaluation	✗ Above poss. reference points
SSB (Spawning-Stock Biomass)	
	2008-2010
MSY ($B_{trigger}$)	? Unknown
Precautionary approach (B_{pa}, B_{lim})	? Unknown
Qualitative evaluation	✗ Below poss. reference points

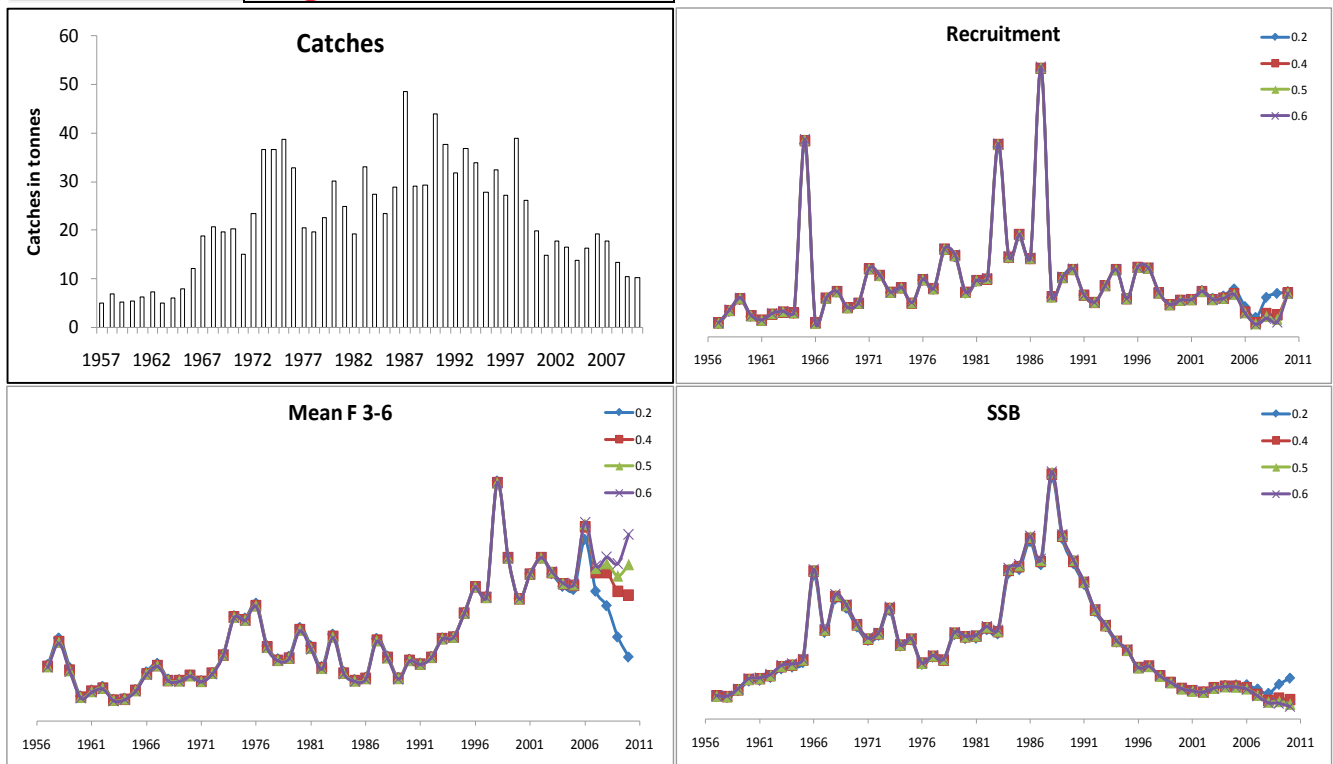


Figure 5.4.17.1 Herring in Divisions VIa (South) and VIIb,c. ICES estimates of catches ('000 tonnes) and trends in recruitment, SSB and fishing mortality, with fishing mortality in 2010 assumed between 0.2 – 0.6. Y-axis for recruitment, F and SSB are arbitrary scales and all start at 0.

The assessment is indicative for trends only. Recent F is unknown, but is likely to be above F_{MSY} (0.25). The current level of SSB is uncertain, but is likely to be below possible reference points. Recruitment has been low since 2000.

Management plans

There is no explicit management plan for this stock.

Biology

This autumn and winter/spring-spawning stock is considered a 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. This could lead to catches and acoustic survey registration of this stock in VIa North.

The fisheries

The fisheries take place using pelagic trawls in quarter 1 and 4. The low TAC has led to a much shorter fishing season now consisting of only a few days.

Catch by fleet	Catch (2010) = 10 241 t, 100% pelagic trawls.
-----------------------	---

Effects of the fisheries on the ecosystem

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

Quality considerations

The exploratory assessment is uncertain as it is based on catch at age data only. The spatially and temporally truncated fishing season results in catch at age data that may be less informative of overall population age structure. The current survey series (2008-2010) is too short to be used in tuning the assessment. There is some evidence of a stronger (2008) cohort recruiting to the stock, but until another observation is available from the 2011 acoustic survey, it is not possible to estimate its strength.

Scientific basis

Assessment type	Trends-based exploratory assessment (Separable VPA).
Input data	Commercial catch--at age data.
Discards and bycatch	Not considered relevant.
Indicators	None.
Other information	Survey data from MSHAS_S is not used in the assessment yet.
Working group report	HAWG

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 recruit 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 2012

No reliable assessment can be presented for this stock. The main cause of this is the lack of sufficiently long survey data series. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

The stock trend is uncertain in recent years, but the stock is considered below possible reference points. Exploitation is considered to be above F_{MSY} . Therefore, catches should be reduced.

Additional considerations

Information from the fishing industry

The pelagic RAC does not accept ICES interpretation of the poor status of this stock. The industry is concerned that, due to the change in fishing pattern because of restrictive quota, an incomplete account is being taken of the stock structure. The pelagic RAC has encouraged the Irish authorities, the industry and the scientists to work together to resolve the problem with the assessment. Quota restrictions result in only one or two principal grounds off Glen Head and off Tory Island being exploited at present. The traditional grounds in VIIb, for instance, are not being fished very much in recent years. Fleets fishing in this fishery have reported that there are large and increasing quantities of herring on the grounds particularly in the northern part of the area in the last four years.

Ecosystem changes

A recent study (Hammond and Harris, 2006) of seal diets off western Scotland revealed that grey seals may be an important predator for herring in this area. The numbers of seals in Division VIaN is thought to have increased over the last decades. 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

The exploratory assessment is only capable of evaluating long term trends, and is not suitable for determining recent trends in fishing mortality and abundance. The overall decline trend in spawning stock since the 1980s and increase in fishing mortality is probably robust to choice of assessment model.

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 and especially in VIaN contribute to uncertainty in the assessment of both stocks.

Comparison with previous assessment and advice

The basis for the assessment is the same as last year. The advice this year is based on the ICES precautionary considerations for stocks without forecasts.

Source

Hammond, P. S., and Harris, R. N. 2006. Grey seal diet composition and prey consumption off western Scotland and Shetland. Final Report to Scottish Executive, Environment and Rural Affairs Department and Scottish Natural Heritage.

ICES. 2011. Report of the Herring Assessment Working Group for the Area South of 62°N, 16–24 March 2011. ICES CM 2011/ACOM:06.

Table 5.4.17.1 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			
2012	Reduce catch	-				

Weights in '000 tonnes.

* 2007 advice revised to be consistent with the single-stock exploitation boundaries.

Table 5.4.17.2 Herring in Divisions VIaS and VIIbc. ICES landings and estimated catch (in tonnes).

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
France	-	-	+	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	-	-	-	-	250	-	-	11	-	-	-
Ireland	15000	18200	25000	22500	26000	27600	24400	25450	23800	24400	25200
Netherlands	300	2900	2533	600	900	2500	2500	1207	1800	3400	2500
UK (N.Ireland)	-	-	80	-	-	-	-	-	-	-	-
UK (England + Wales)	-	-	-	-	-	-	50	24	-	-	-
UK Scotland	-	+	-	+	-	200	-	-	-	-	-
Total landings	15300	21100	27613	23100	27150	30300	26950	26692	25600	27800	27700
Unallocated/ area misreported	13800	7100	13826	11200	4600	6250	6250	1100	6900	-700	11200
Discards	-	1000	2530	3400	100	250	700	-	-	50	
WG catch	29100	29200	43969	37700	31850	36800	33900	27792	32500	27150	38900

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
France	-	-	-	515	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	-	-	-	-	-	-	-	-	-	-	-	-
Ireland	16325	10164	11278	13072	12921	10950	13351	14840	12662	10237	8533	7513
Netherlands	1868	1234	2088	366	-	64	-	353	13			
UK (N.Ireland)	-	-	-	-	-	-	-	-	-	-	-	-
UK (England + Wales)	-	-	-	-	-	-	-	-	-	-	-	-
UK Scotland	-	-	-	-	-	-	-	6	-	-		
Total landings	18193	11398	13366	13953	12921	11014	13351	15199	12675	10237	8533	7513
Area misreported	7916	8448	1390	3873	3581	2813	2880	4353	5129	3103	1935	2728
Unallocated								-353	-13			
Discards	-	-	-	-	-	-	-	-	-	-	-	-
WG catch	26109	19846	14756	17826	16502	13827	16231	19193	17791	13340	10468	10241

ECOREGION Celtic Seas / North Sea
STOCK Sprat in Divisions VIIId,e

Advice 2012

ICES advises based on precautionary considerations that catches should be reduced.

Stock status

F (Fishing Mortality)	
	2009
Qualitative evaluation	? Insufficient information
SSB (Spawning Stock Biomass)	
	2010
Qualitative evaluation	? Insufficient information

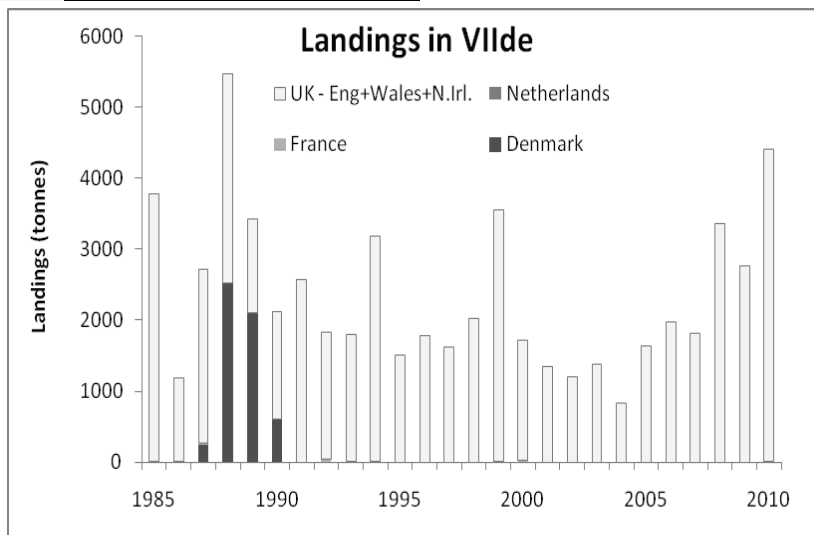


Figure 5.4.18.1 Sprat in Divisions VIIId,e. ICES landings in tonnes.

As last year, the information available is insufficient to evaluate stock trends and exploitation.

Management plans

No specific management objectives are known to ICES.

Quality considerations

This advice sheet is not dedicated to a 'stock', it relates to sprat in the English Channel (Division VIIId,e) where data are available. The stock structure of sprat populations in the Celtic Seas eco-region is not clear (Section 5.4.38). ICES does not necessarily advocate that Division VIIId,e constitutes a management unit for sprat, and further work is required.

Given discrepancies between national and official landings data, further scrutiny of some of the landings data is required.

Scientific basis

Assessment type	No assessment
Input data	Catch statistics
Discards and bycatch	Not available
Indicators	None
Other information	Time-series of midwater trawl lpue
Working group report	HAWG

ECOREGION Celtic Sea and West of Scotland
STOCK Sprat in Divisions VIIId,e**Reference points**

No reference points are defined.

Outlook for 2012

The available landings and lpue data are not reliable indicators of sprat abundance in Divisions VIIId,e. Stock structure in relation to appropriate management units is unknown. Therefore, fishing opportunities cannot be projected.

Precautionary considerations

No information is available on stock trends and exploitation status. Therefore, catches should be reduced.

Additional considerations

It is unclear what the appropriate stock units should be and how these relate to management units. Work is ongoing to understand stock structure in the Celtic Sea eco region (Section 5.4.38).

Most of sprat landings in this area are taken by the English fleet and are used 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. Skippers then go back to other trawling activity.

Landings per unit effort (lpue) series are available based on the data from the English trawlers targeting sprat and for all midwater trawlers. Although lpue data should be interpreted with caution when based on landings from a shoaling species such as sprat, the data suggest that sprat in this area has fluctuated over time with a slight increasing trend.

Sources

ICES. 2011. Report of the Herring Assessment Working Group for the Area South of 62°N, 16–24 March 2011 ICES CM 2011/ACOM:06.

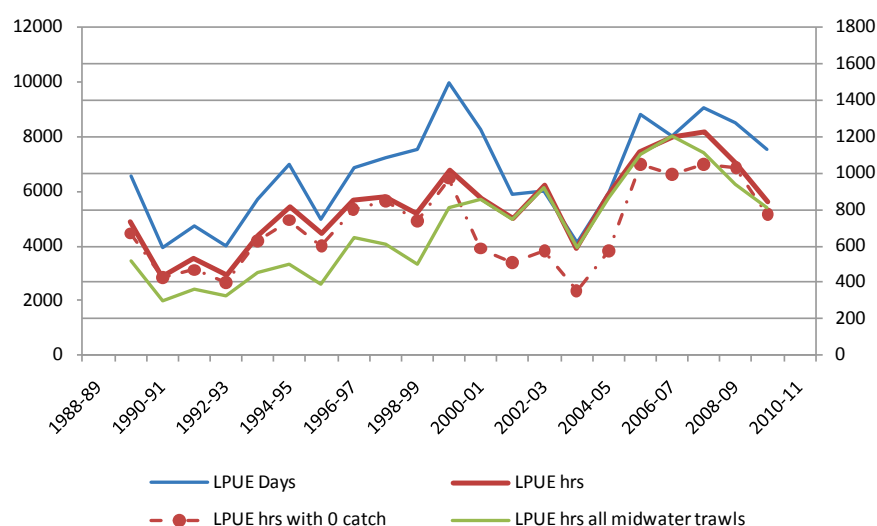


Figure 5.4.18.1 Sprat in Divisions VIIId,e. Landings (in tonnes) per unit of effort (lpue) for vessels that target sprat: with positive landings of sprat (in days left axis and hours right axis) and, with zero landings included (in hours); for all mid-water trawls (in hours).

Table 5.4.18.1 Sprat in Divisions VIIId,e. ICES advice, management, and official landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings
1987	No advice	-	5	2.7
1988	No advice	-	5	5.5
1989	No advice	-	12	3.4
1990	No advice	-	12	2.1
1991	No advice	-	12	2.6
1992	No advice	-	12	1.8
1993	No advice	-	12	1.8
1994	No advice	-	12	3.2
1995	No advice	-	12	1.5
1996	No advice	-	12	1.8
1997	No advice	-	12	1.6
1998	No advice	-	12	2.0
1999	No advice	-	6.3	3.6
2000	No advice	-	12	1.7
2001	No advice	-	12	1.3
2002	No advice	-	12	1.2
2003	No advice	-	9.6	1.4
2004	No advice	-	9.6	0.8
2005	No advice	-	7.7	1.6
2006	No advice	-	6.1	2.0
2007	No advice	-	6.1	1.8
2008	No advice	-	6.1	3.4
2009	No advice	-	6.1	2.8
2010	No advice	-	5.5	4.4
2011	No advice	-	5.4	
2012	Reduce catches	-		

Weights in '000 tonnes.

Table 5.4.18.2 Sprat in Divisions VIIId,e. Official landings (t) by country.

Country	Denmark	France	Netherlands	UK (Engl.&Wales)	Total
1985		14		3771	3785
1986	15			1163	1178
1987	250	23		2441	2714
1988	2529	2		2944	5475
1989	2092	10		1319	3421
1990	608			1508	2116
1991				2567	2567
1992		35		1790	1825
1993		2		1798	1800
1994		1		3177	3178
1995		0		1515	1515
1996				1789	1789
1997				1621	1621
1998				2024	2024
1999			1	3559	3560
2000		18	1	1692	1711
2001				1349	1349
2002				1196	1196
2003				1377	1377
2004				836	836
2005				1635	1635
2006				1974	1974
2007				1819	1819
2008				3366	3366
2009				2765	2765
2010		3		4404	4407

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

Advice for 2012

New data from 2010 do not change the perception of the stock status. The advice for the fishery in 2012 is therefore the transition to the MSY approach given in 2010 for the 2011 fishery: “*Catch and effort reduction*”.

This stock is scheduled to be benchmarked in 2012.

Sources

ICES. 2010. Report of the ICES Advisory Committee 2010. ICES Advice, 2010. Book 5, 294, pp.

ICES. 2011. Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim (WGHMM), 5–11 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:11.

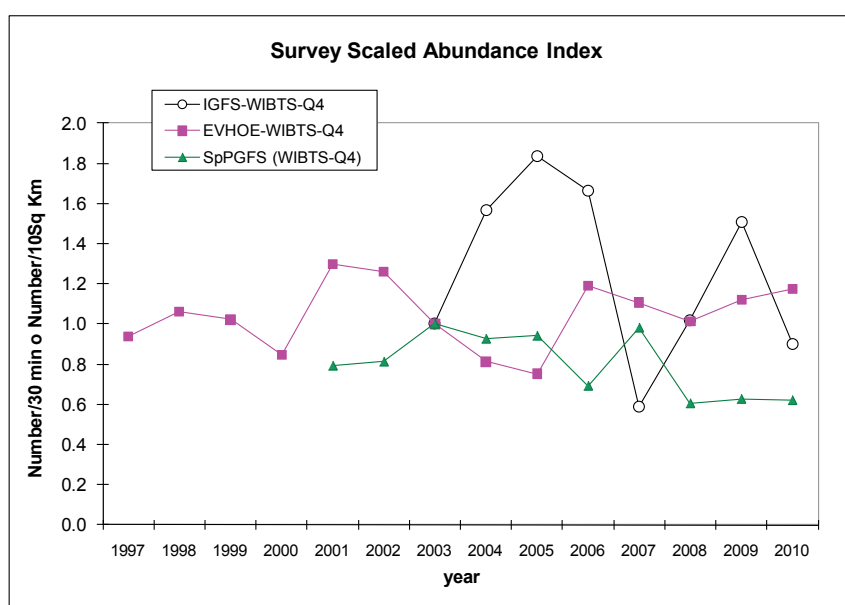


Figure 5.4.19.1 Megrim (*Lepidorhombus whiffiagonis*) in Divisions VIIb–k and VIIa,b,d. Survey scaled abundance indices in Bay of Biscay and Celtic Sea (EVHOE-WIBTS-Q4), Porcupine (SpPGFS-WIBTS-Q4) and platform north, west and south of Ireland (IGFS-WIBTS-Q4). As the survey indices have been scaled to facilitate comparison, the numbers on the vertical axis cannot be interpreted in an absolute sense.

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

Year	ICES Advice	Predicted catch 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	14.3	3.1	17.3
1998	No increase in F	15.2	25.0	14.3	5.4	19.7
1999	Reduce F below F_{pa}	14.6	25.0	13.7	3.1	16.9
2000	Reduce F below F_{pa}	<14.2	20.0	15.0	2.3	17.3
2001	Reduce F below F_{pa}	< 14.1	16.8	15.8	1.3	17.1
2002	Reduce F below F_{pa}	< 13.0	14.9	15.9	1.5	17.4
2003	Reduce F below F_{pa}	< 16.1	16.0	15.6	3.1	18.8
2004	Reduce F below F_{pa}	< 20.2	20.2	14.3	4.5	18.8
2005	Reduce F below F_{pa}	< 22.6	21.5	12.7	1.8	14.5
2006	Reduce F below F_{pa}	< 13.6	20.4	12.0	2.5	14.5
2007	Less than average landings 2003–05	< 14.2	20.4	13.3	2.2	15.6
2008	Less than average landings 2004–06	< 13.0	20.4	11.3	1.4	12.7
2009	Same advice as last year	< 13.0	20.4	14.4*	2.0*	16.4
2010	No increase in effort	< 13.0	20.4	14.9*	4.3*	19.2
2011	See scenario's	-	20.1			
2012	Catch and effort reduction	-				

Weights in '000 t.

¹ Includes *L. boschii*.

² Includes Division VIIa and Divisions VIIle.

*Preliminary.

Table 5.4.19.2 Megrim (*Lepidorhombus whiffiagonis*) in Divisions VIIb–k and VIIIa,b,d. ICES estimates of landings and catches (in tonnes) . Preliminary values are indicated.

	Total landings	Total discards	Total catches	Agreed TAC ⁽¹⁾
1984	16659	2169	18828	
1985	17865	1732	19597	
1986	18927	2321	21248	
1987	17114	1705	18819	16460
1988	17577	1725	19302	18100
1989	19233	2582	21815	18100
1990	14371	3284	17655	18100
1991	15094	3282	18376	18100
1992	15600	2988	18588	18100
1993	14929	3108	18037	21460
1994	13685	2700	16385	20330
1995	15862	3206	19068	22590
1996	15109	3026	18135	21200
1997	14230	3066	17296	25000
1998	14345	5371	19716	25000
1999	13715	3135	16850	20000
2000	14485	1033	15517	20000
2001	15806	1275	17081	16800
2002	15988	1466	17454	14900
2003	15414	3147	18561	16000
2004	14300	4511	18811	20200
2005	12712	1831	14542	21500
2006	12015	2468	14483	20425
2007	13330	2238	15568	20425
2008	11282	1442	12724	20425
2009*	14414	2028	16442	20425
2010*	14942	4297	19239	20425

*: French data are preliminary

⁽¹⁾ for both megrim species and VIIa and VIIIe included

ECOREGION

Celtic Sea and West of Scotland

STOCK

Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Divisions VIIb–k and VIIa,b,d

Advice for 2012

ICES advises on the basis of the precautionary considerations that catches should be reduced.

Stock status

Lophius piscatorius

F (Fishing Mortality)			
	2008	2009	2010
MSY (F_{MSY})	?	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	?	Unknown
SSB (Spawning-Stock Biomass)			
	2008	2009	2010
MSY ($B_{trigger}$)	?	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	?	Unknown
Qualitative evaluation	→	→	Decreasing

Lophius budegassa

F (Fishing Mortality)			
	2008	2009	2010
MSY (F_{MSY})	?	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	?	Unknown
SSB (Spawning-Stock Biomass)			
	2008	2009	2010
MSY ($B_{trigger}$)	?	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	?	Unknown
Qualitative evaluation	↗	↘	Decreasing

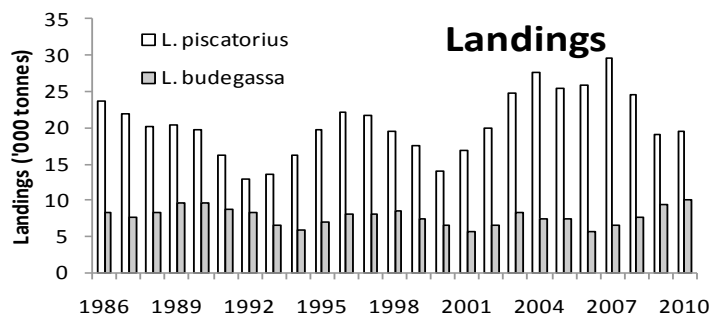
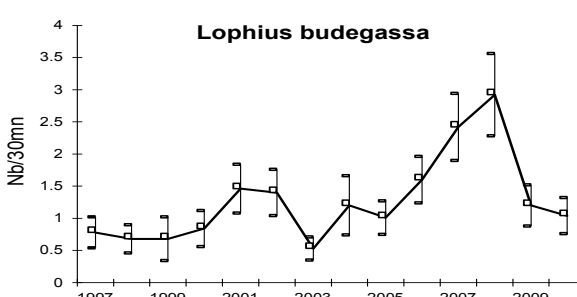
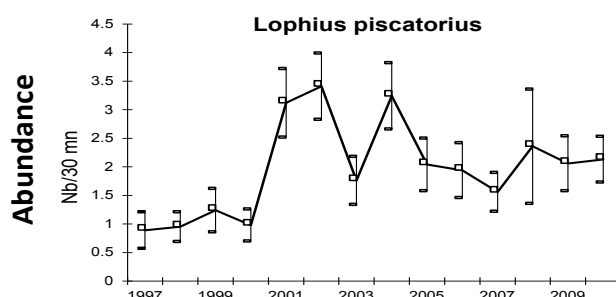
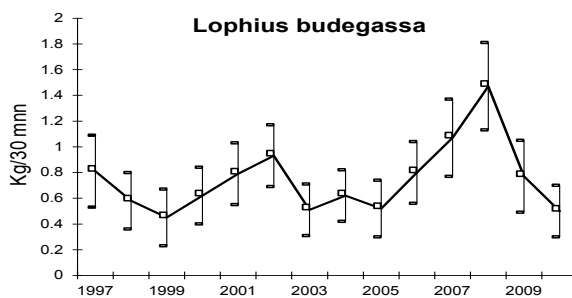
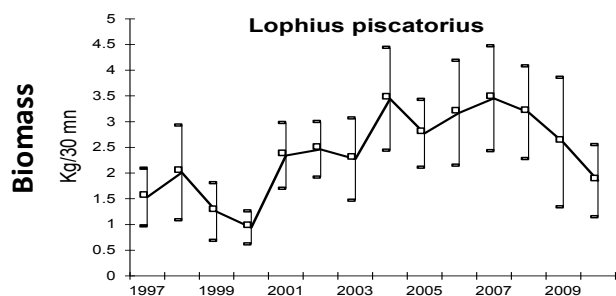


Figure 5.4.20.1

Anglerfish (*L. piscatorius* and *L. budegassa*) in Divisions VIIb–k and VIIa,b,d. Bay of Biscay and Celtic Sea (EVH0E-WIBTS-Q4) indices: biomass (top line, kg/30 min) and total abundance (middle line, number/30 min). Error bars indicate ± 2 s.d. Lower panel: landings ('000 tonnes, 2010 and 2009 data are preliminary).

Survey data (biomass and abundance indices, length distribution) give indication that the biomass of both species has been increasing until 2008 as a consequence of the good recruitment. After 2008, biomass of the two species has decreased. For *L. piscatorius* there is evidence of good recruitments in 2008-2010, whereas the last strong recruitment for *L. budegassa* occurred in 2008.

Management plans

No specific management objectives are known to ICES.

Biology

Lophius budegassa has a more southern distribution than *L. piscatorius*. Though ICES considers different anglerfish stocks in different area for each species, the boundaries are not based on biological criteria.

The fisheries

The majority of the anglerfish catch consists of young fish. There are indications that discarding has increased in recent years. There has been an expansion of the French gillnet fishery in the Celtic Sea and in the north of the Bay of Biscay in the last decade, mainly by vessels landing in Spain and fishing in medium-to-deep waters.

Catch by fleet	Total preliminary landings (2010) = 29.7 kt, with <i>L. piscatorius</i> 19.5 kt: 65% otter trawl, 17% gillnet, 13% beam trawl, and 2% <i>Nephrops</i> trawl; and <i>L. budegassa</i> 10.2 kt: 86% otter trawl, 6% beam trawl, 4% <i>Nephrops</i> trawl, and 2% gillnet.
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Quality considerations

The increase in discarding in recent years has resulted in uncertainties in recent levels of catch. The 2009 and 2010 French landings are preliminary

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* is taking place in 2011 to compare the different approaches that are used (otoliths and *illicia*).

Scientific basis

Assessment type	Survey trends-based assessment.
Input data	Biomass and abundance indices, and length distribution of two surveys (EVHOE-WIBTS-Q4 and FSP-Eng-Monk).
Discards and bycatch	Not included in the assessment.
Indicators	None.
Other information	These stocks are scheduled to be benchmarked in 2012.
Working group report	WGHMM

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

Reference points

There are no reference points defined for these stocks. As a consequence of recently identified problems with growth estimates, previous reference points are not considered to be valid.

Outlook for 2012

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 (ageing). Therefore, no forecast can be presented

Precautionary considerations

Stock trends from survey data are stable over the long term, although they show a decrease in the most recent years (particularly for *L.budegassa*). The exploitation status is unknown. Therefore, catches should be reduced.

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 TAC restrictions.

L. piscatorius and *L. budegassa* are both caught on the same grounds and by the same fleets and usually are 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).

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).

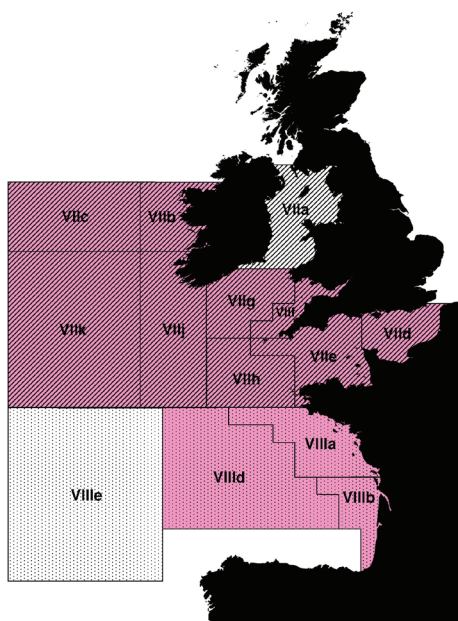
Information from the fishing industry

The quota has been restrictive for some fleets and substantial underreporting of landings is known to have occurred. Information from the Irish fishery indicates that underreporting of total landings has been a problem before 2005, due to restrictive individual vessel quotas. Since 2005 specific anglerfish licences have been introduced in Ireland to improve compliance. There has been an increased enforcement on anglerfish quotas.

Comparison with previous assessment and advice

The basis for the assessment and advice is the same as last year. The perception of the stocks has changed from last year, since a decline in biomass indices in recent years is now more evident.

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.



Source

ICES Advice 2011, Book 5

Table 5.4.20.1 Anglerfish (*L. piscatorius* and *L. budegassa*) in Divisions VIIb–k and VIIa,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	30.0	20.5	9.5
1990	Not assessed	-	42.99	29.4	19.8	9.6
1991	No advice	-	42.99	25.1	16.2	8.8
1992	No advice	-	42.99	21.1	12.8	8.3
1993	Concern about <i>L. pisc.</i> SSB decrease	-	25.1	20.1	13.5	6.7
1994	SSB decreasing, still inside safe biological limits	-	23.9	21.9	16.1	5.8
1995	No increase in F	20.0	23.2	26.8	19.7	7.1
1996	No increase in F	30.3	30.4	30.2	22.1	8.1
1997	No increase in F	34.3	34.3	29.8	21.7	8.1
1998	No increase in F	33.0	34.3	28.2	19.6	8.6
1999	No increase in F	32.9	34.3	25.03	17.63	7.4 ³
2000	At least 20% decrease in F	< 22.3	29.6	20.63	14.03	6.6 ³
2001	Reduce F below F_{pa}	< 27.6	27.6	22.63	16.83	5.8 ³
2002	Reduce F below F_{pa}	< 19.9	23.7	26.43	20.03	6.5
2003	At least 30% decrease in F	< 16.4	21.0	33.23	24.93	8.4 ³
2004	At least 10% decrease in F	< 26.7	26.7	35.13	27.73	7.5 ³
2005	Maintain F below F_{pa}	< 37.8	31.2	32.83	25.33	7.5 ³
2006	Maintain F below F_{pa}	< 33.9	34.0	31.23	25.53	5.7 ³
2007	Maintain F below F_{pa}	< 36.0	36.0	36.1	29.7	6.4
2008	Less than average landings	< 33.0	36.0	32.2	24.6	7.6
2009	Same advice as last year	< 33.0	36.0	28.5 ⁴	19.0 ⁴	9.4 ⁴
2010	No increase in effort	-	41.4	29.7 ⁴	19.5 ⁴	10.2 ⁴
2011	No increase in effort	-	40.9			
2012	Reduce catch	-				

Weights in '000 t.

TAC was changed during 2003 from 19 400 t to 21 000 t following fast-track advice from ICES.

¹ Includes Division VIIa and Divisions VIIc.

² Applies to both species.

³ Revised.

⁴ Preliminary

Table 5.4.20.2 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
	Gill-Net (Unit 3+13)	Medium/Deep Trawl (Unit 4)	Shallow Trawl (Unit 5)	Beam Trawl (Unit 6)	Shallow/medium Neph. Trawl (Unit 8)	Other	Neph. Trawl (Unit 9)	Shallow Trawl (Unit 10)	Medium/Deep Trawl (Unit 14)	Unallocated	
1986	429	13781	2877	1437	1021		746	720	2657		23666
1987	560	11414	2900	1520	787		1035	542	3152		21909
1988	643	9812	3105	1814	774		927	534	2487		20095
1989*	781	8448	5259	2998	754		673	444	1772		21130
1990*	1021	8787	3950	2251	880		410	391	2578		20268
1991*	1752	7563	2793	1142	752		284	218	1657		16160
1992*	1773	6254	1492	998	887		254	166	942		12766
1993*	1742	5776	2125	1258	969		360	278	950		13458
1994	1377	7344	2595	1523	1236		261	198	1586		16120
1995	1915	8461	3195	1805	1242		501	429	1954	228	19730
1996*	2244	9796	2658	2189	1149	138	441	379	2229	938	22162
1997	2538	9225	2945	2031	964	39	429	376	2045	1068	21660
1998*	3398	8688	2138	1722	812	3	397	149	1699	542	19546
1999*	3162	8441	2369	1409	780	19	98	116	1259	0	17654
2000*	2034	7067	1642	1434	726	6	91	77	863	0	13941
2001*	2002	8023	2293	1978	886	17	146	76	1402	0	16824
2002*	2719	9626	2609	1836	924	22	247	96	1908	0	19986
2003*	3498	12332	2786	1983	974	81	470	168	2575	0	24865
2004*	5004	12770	2642	2460	852	14	457	218	3296	0	27714
2005*	5154	11556	2400	2388	594	7	342	165	2936	2	25543
2006*	3741	13409	2216	2421	700	3	429	218	2758	2	25898
2007*	4594	15588	2382	2836	660	11	286	244	3015	0	29616
2008*	5107	11974	1885	1990	491	10	227	325	2573	1	24584
2009**	3957	10119	358	1880	48	16	221	0	2153	275	19024
2010**	3398	9863	539	2484	21	31	301	0	2373	504	19513

* revised

** preliminar (French data)

Table 5.4.20.3 Anglerfish (*L. budegassa*) in Divisions VIIb–k and VIIIa,b,d. Landings in tonnes by Fishery Unit.

Year	VIIb.c.e-k						VIIIa.b.d				TOTAL VII + VIII
	Gill-Net (Unit 3+13)	Medium/Deep Trawl (Unit 4)	Shallow Trawl (Unit 5)	Beam Trawl (Unit 6)	Shallow/medium Neph. Trawl (Unit 8)	Other	Neph. Trawl (Unit 9)	Shallow Trawl (Unit 10)	Medium/Deep Trawl (Unit 14)	Unallocated	
1986	23	5126	348	540	406	0	443	150	1181	0	8217
1987	30	3493	696	462	434	0	483	116	1904	0	7619
1988	34	4072	1095	751	394	0	435	102	1498	0	8382
1989	40	4398	976	1217	515	0	446	112	1829	0	9533
1990	53	4818	631	905	653	0	550	156	1865	0	9632
1991	88	4414	921	384	507	0	475	117	1933	0	8840
1992	90	4808	301	305	594	0	459	191	1518	0	8266
1993	93	3415	429	405	399	0	433	101	1385	0	6659
1994	70	2935	265	209	540	0	232	49	1515	0	5814
1995	110	3963	455	159	617	0	312	62	1286	90	7053
1996	118	4587	477	245	524	28	374	109	1239	392	8092
1997	134	4836	602	132	474	9	313	17	1128	471	8114
1998	179	5565	246	230	288	1	258	72	1454	305	8599
1999*	18	4906	119	282	338	0	144	76	1450	0	7334
2000*	57	4489	161	284	228	0	124	31	1270	0	6645
2001*	41	3812	107	266	306	0	121	29	1100	0	5782
2002*	30	4328	147	251	372	0	112	14	1195	0	6450
2003*	92	5748	337	342	376	5	195	26	1248	0	8368
2004*	122	4684	242	343	376	0	254	9	1407	0	7436
2005*	73	4837	162	409	329	0	235	56	1431	0	7532
2006*	9	3661	145	271	218	0	286	1	1128	1	5720
2007*	92	3987	168	306	250	0	243	0	1424	0	6469
2008*	21	4831	187	392	254	0	235	0	1669	0	7590
2009**	72	6312	24	441	36	0	354	0	2047	145	9431
2010**	224	6962	9	587	27	0	379	0	1763	223	10173

* revised

** preliminar (French data)

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

Advice for 2012

ICES advises on the basis of the precautionary considerations that catches in 2012 should be reduced to the lowest possible level.

Stock status

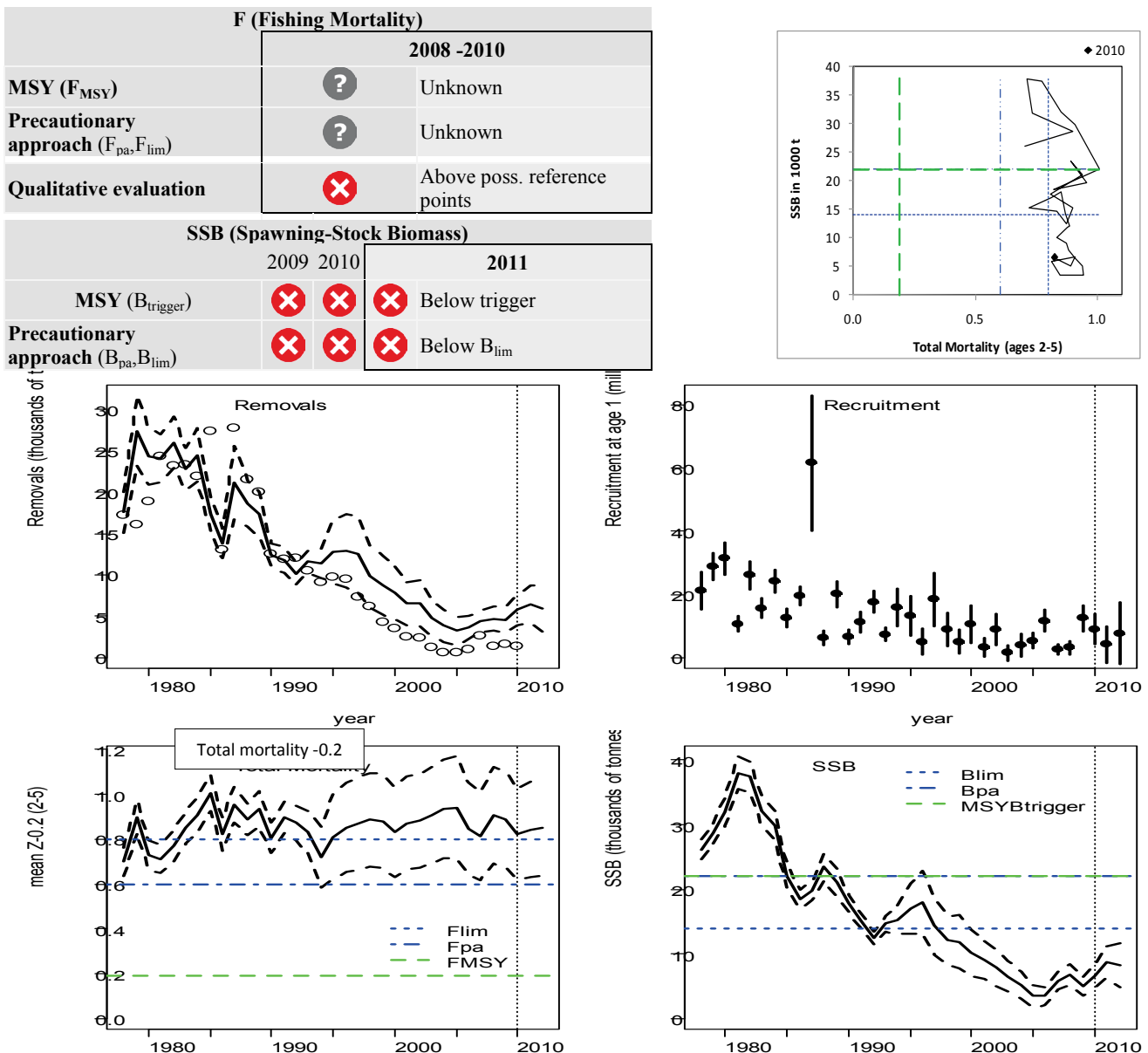


Figure 5.4.21.1 Cod in Division VIa (West of Scotland). Summary of stock assessment (weights in thousand tonnes). Removals: open circles = observed catches, lines = estimated removals. Dashed lines are 95% confidence bounds. The vertical line in each plot delineates the last year of the historical assessment (2010); estimates to the right of these lines are forecasts. Top right: SSB and total mortality-0.2 over the years.

Total mortality is high, but cannot be accurately partitioned into fishing mortality and natural mortality. The spawning-stock biomass continues to increase from an all time low in 2006, but remains well below B_{lim} . Recruitment has been estimated to be low over the last decade. The 2005 and 2008 year classes are estimated to be the largest since 1997 and comparable with the long-term geometric mean.

Management plans

In the cod long-term management plan ([EC 1342/2008](#)) the stock is considered data poor. Article 9(a) implies a TAC and associated effort reduction of 25%, translating to a TAC of less than 137 t. ICES considers that article 10(2) may also apply. ICES cannot yet evaluate if the management plan is in accordance with the precautionary approach.

Biology

Cod are known to be a hyper-aggregating species, so at low abundance it is still possible to find areas of high cod density. This can lead to high catches in localized areas, with the possibility of low levels of fishing effort causing high mortality on the stock. Occasional large catches cause greater uncertainty in survey abundance indices. Relatively stable aggregations on timescales of several weeks are consistent with management by temporary spatial closures.

Environmental influence on the stock

Grey seal abundance has increased between 30% and 160% (dependant on estimation model) west of Scotland over the recent decades (Thomas and Harwood, 2009). Seals are known to feed on cod, among other species. The contribution of seal predation to total cod mortality is likely to be significant and likely to have increased in recent years. This may impair the ability of the cod stock to recover. A negative impact on recruitment with rising sea temperature has been shown for cod in the warmer waters of this species' range, including cod west of Scotland.

The fisheries

The >100 mm otter trawl gear vessels targeting finfish (TR1) take roughly 80% of the cod catch and the 70–99 mm *Nephrops* fleet (TR2) takes 15–20% of the catch. A proportion of the landings come 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 five times greater than landings, making catch (landings + discards) six times greater than landings.

Catch by fleet	Total catch (2010) = 1400 t, where 17% are reported landings (76% TR1, 1% TR2, and 23% other gears) and 83% discards (86% TR1 and 14% TR2).
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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

Quantities of landings and discards are not included in the model (only weights-at-age information) because of concerns over unreliability in the historical commercial data. Mortality estimates arising from this assessment – based on survey data – are poorly estimated. Because of uncertainties in the level and trend of natural mortality it is not possible to predict landings estimates from the forecast, only removals associated with both fishing and unaccounted natural mortality. There have been changes to the survey design and gear and the impact on the assessment is unknown.

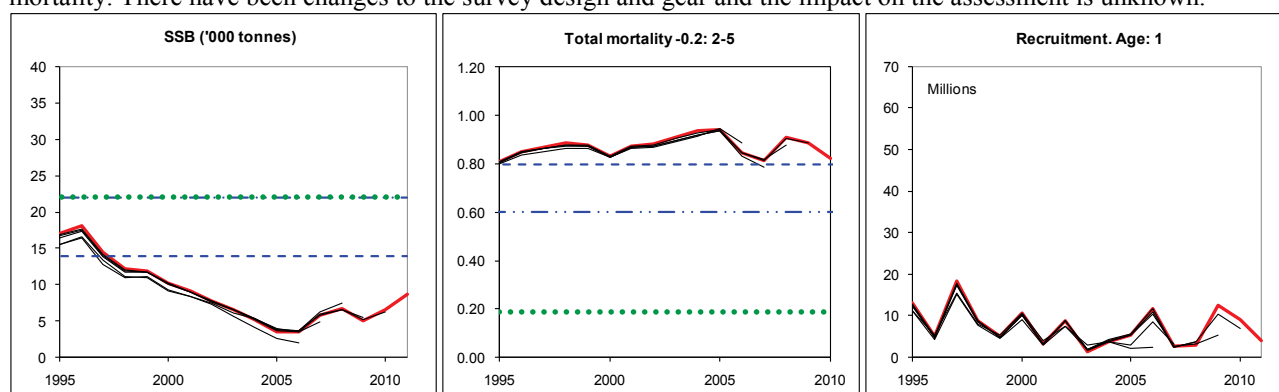


Figure 5.4.21.2 Cod in Division VIa (West of Scotland). Historical assessment results (final year recruitment estimates included).

Scientific basis

Assessment type	Analytical age-based assessment (TSA).
Input data	1 survey index (ScoGFS-WIBTS-Q1).
Discards and bycatch	Included in the assessment 1978–1994, excluded from 1995 onward.
Indicators	ScoGFS-WIBTS-Q4, IRGFS-WIBTS-Q4, SAMISS and IAMISS Q2.
Other information	Landings and discard data are excluded from 1995 onwards. Benchmark planned for 2012.
Working group report	WGCSE

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 0.17–0.33 are consistent with F_{MSY} .
Precautionary Approach	B_{lim}	14 000 t	$B_{\text{lim}} = B_{\text{loss}}$, 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 2012

No short-term forecast is provided because recent mortality values are highly uncertain due to unaccounted mortality.

Management plan

The stock is considered data poor under the definitions of article 9 (EC 1342/2008). Following the cod long-term management plan (EC 1342/2008) article 9(a) implies a TAC and associated effort reduction of 25%. This translates to a TAC of less than 137 t. ICES considers that article 10(2) may also apply. Because it is not possible at present to assess unaccounted mortality accurately, ICES cannot yet evaluate if the management plan is in accordance with the precautionary approach.

MSY approach

Estimates of F_{MSY} for this stock are uncertain because of the absence of fisheries data in the assessment since 1994. However, the estimates are consistent with the proposed F_{MSY} for the neighbouring North Sea cod stock. There is no estimate of the current fishing mortality for this stock. However, it is likely that the current F is above F_{MSY} . SSB has declined to a very low level. Therefore, catches (mainly discards) of cod should be reduced to the lowest possible level.

PA considerations

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.

The 2008 year class is estimated to be more abundant and consequently additional measures (such as real-time closures) to protect it are essential to ensure that it contributes to the rebuilding of the stock. It will be necessary to reduce all sources of fishing mortality on cod to as close to zero as possible if the stock is to recover above B_{pa} as quickly as possible.

Additional considerations

Management considerations

The stock is suffering impaired recruitment. 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. Management measures taken thus far have not recovered the stock.

The previous cod recovery plan did not apply west of a line known as the west of Scotland management line. 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 have larger cod landings from west of the line than from within the cod recovery zone.

Grey seal abundance, in west of Scotland, has increased from between 30% and 160% (dependant on estimation model) over the recent decades (Thomas and Harwood, 2009). Seals are known to feed on cod, among other species, and the mortality of cod due to seal predation is likely to have increased in recent years. The contribution of seal predation to total cod mortality is likely to be significant (Pope and Holmes, 2008). This may impair the ability of the cod stock to recover.

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 5.4.21). This regulation has the objective of ensuring 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 a moderate year class and the difficulty in partitioning the total mortality into that attributable to landings, discards, other causes due to fishing, and natural mortality in excess of the assumed 0.2, 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 $F_{\max} = 0.22$ 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 TAC, area closures, technical measures, and effort restrictions. Current landings (i.e. TAC) effort and spatial management of fisheries catching cod in Division VIa are not controlling mortality levels. Catch (landings + discards) is six times the reported landings.

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 (2010) 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. 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.

- The latest assessment for Division VIa haddock suggests the emergency measure catch composition rules will be restrictive for haddock and may lead to discarding..

Effort limitations

- Between 2003 and 2009 STECF (2010) reported that the fishing effort (in kW-days) of trawlers using >100 mm mesh declined by 43%. These vessels primarily targeted roundfish, including cod. Over the same period effort for trawlers using 70–99 mm mesh declined by 26%. These vessels primarily target *Nephrops*.
- Further effort reductions have been implemented since February 2011 under Annex IIa of Reg. (EC) 57/2011. This includes a 25% reduction in effort for all trawl fleets relative to a recent average effort. ‘Buy back’ of this effort reduction is possible after adoption of cod avoidance measures or proof of operating west of the cod management line.

Supply chain traceability

U.K. “Buyers and Sellers” regulation and Irish “Sales Note” regulation – Unreported landings are expected to have reduced under these 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 4 in 2008, 20 in 2009, and 19 in 2010, representing 27%, 14%, and 12% of the total RTCs in each year. RTCs are determined by lpue, based on fine-scale VMS data and daily logbook records, and also by on-board inspections. The low number of RTCs west of Scotland result from few instances of high lpue in the area. Early indications are that the scheme has not so far been as effective as in the North Sea, with discard rates remaining high in Division VIa.

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

Survey information shows that the total removal of cod in Division VIa may have been underestimated in the past decade relative to earlier periods. In an attempt to remove bias in the assessment a catch-at-age model was used that ignored landings and discard numbers from 1995 onwards, relying on survey data for this later period. It is, however, considered that mortality estimates arising from this assessment heavily or wholly based on survey data are poorly estimated. In contrast, historical trends in spawning biomass and recruitment appear to be robust measures of stock dynamics, see Figure 5.4.21.1.

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. The opportunity was also taken to improve the survey design at this time: it is now random-stratified. This only affects our perception of stock metrics in 2011 and does not influence the basis for the advice.

Because of uncertainties in the level and trend of natural mortality it is not possible to predict landings estimates from a forecast, only removals associated with both fishing and unaccounted natural mortality.

Comparison with previous assessment and advice

The basis for the assessment is the same as last year. The advice is the same as last year.

Sources

- ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.
- Pope, J. G., and Holmes, S. J. 2008. Length-based Approaches compared to Age-based Approaches to Determining the Significance of Grey Seal Feeding on Cod in ICES Division VIa. ICES CM 2008/F:08.
- STECF. 2007. Evaluation of closed area schemes (SGMOS-07-03).
- STECF. 2010. Report of the STECF SGMOS-10-05 Working Group on Fishing Effort Regimes Regarding Annexes IIA, IIB and IIC of TAC & Quota Regulations, Celtic Sea and Bay of Biscay. 27 September–1 October 2010, Edinburgh, Scotland.
- Thomas, L., and Harwood, J. 2009. Estimating the size of the UK grey seal population between 1984 and 2008. SCOS Briefing Paper 09/2.

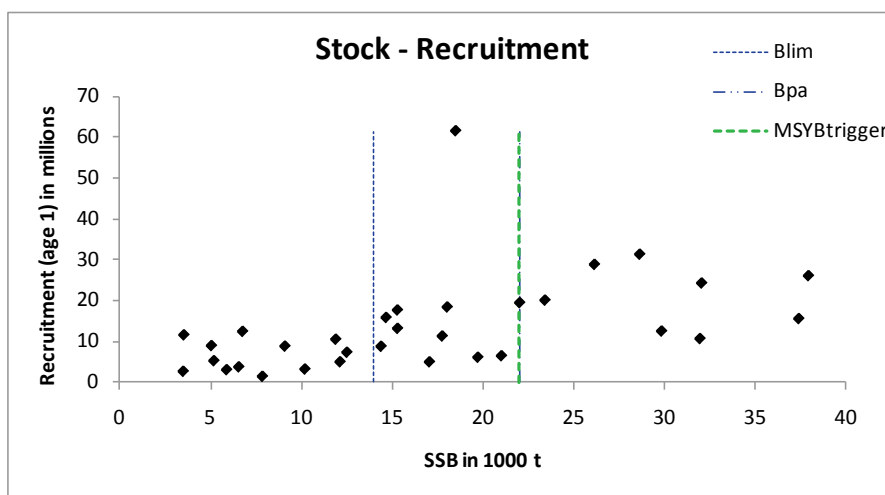


Figure 5.4.21.3 Cod in Division VIa. Stock and recruitment relationship.

Table 5.4.21.1 Cod in Division VIa (West of Scotland). ICES advice, management, and landings.

Year	ICES advice Single-stock exploitation boundaries since 2004	Predicted catch corresp. to advice	Agreed TAC ¹	Agreed TAC ²	Official landings	ICES landings
1987	Reduce F towards F_{\max}	18.0	22.0		19.2	19.0
1988	No increase in F; TAC	16.0	18.4		19.2	20.4
1989	80% of F(87); TAC	16.0	18.4		15.4	17.2
1990	80% of F(88); TAC	15.0	16.0		11.8	12.2
1991	70% of effort (89)	-	16.0		10.6	10.9 ³
1992	70% of effort (89)	-	13.5		9.0	9.7 ⁴
1993	70% of effort (89)	-	14.0		10.5	11.8 ⁴
1994	30% reduction in effort	-	13.0		9.1	10.8 ⁴
1995	Significant reduction in effort	-	13.0		9.7	9.6 ⁴
1996	Significant reduction in effort	-	13.0		9.6	9.4
1997	Significant reduction in effort	-	14.0		7.0	7.0
1998	20% reduction in F	9.5 ⁶	11.0		5.7	5.7
1999	F reduced to below F_{pa}	<9.7 ⁶	11.8		4.3	4.2
2000	Recovery plan, 60% reduction in F	<4.2	7.48		2.8 ⁵	3.0
2001	Lowest possible F, recovery plan	-	3.7		2.4	2.3
2002	Recovery plan or lowest possible F	-	4.6		2.2	2.2
2003	Closure	-	1.81		1.3	1.2
2004	Zero catch ⁷	0	0.85		0.6	0.5
2005	Zero catch ⁷	0	0.72		0.4	0.5
2006	Zero catch ⁷	0	0.613		0.5	0.5
2007	Zero catch ⁷	0	0.49		0.5	0.5
2008	Zero catch ⁷	0	0.402		0.4	0.5
2009	Zero catch ⁷	0	0.302	0.240	0.23	0.22
2010	Zero catch ⁷	0		0.240	0.25	0.24
2011	Zero catch ⁷	0		0.182		
2012	Zero catch	0				

Weights in '000 t.

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.

Table 5.4.21.2 Cod in Division VIa. Official landings (tonnes).

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	48	88	33	44	28	-	6	-	22	1	2	+	11
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
Germany	66	53	12	25	281	586	60	5	94	100	18	63	5
Ireland	2,564	1,704	2,442	2,551	1,642	1,200	761	761	645	825	1,054	1,286	708
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	2
Norway	204	174	77	186	207	150	40	171	72	51	61	137	36
Spain	28	-	-	-	85	-	-	-	-	-	16	+	6
UK (E., W., N.I.)	260	160	444	230	278	230	511	577	524	419	450	457	779
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
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

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010*
Belgium	1	+	+	2	+								0
Denmark	-	+	-	-	-								
Faroe Islands	-	-	-	-	-		2	0	0.8	12	1		0.2
France	714*	842*	236	391	208	172	91	107	100.7	92	82	74	60.3
Germany	6	8	6	4	+	+			2	2	1	0	0
Ireland	478	223	357	319	210	120	34	27.9	18	70	58.2	24.4	48.7
Netherlands	1	-	-	-	-	-							0
Norway	36	79	114*	40*	88	45	10	17	30	30	65	18	20.7
Spain	42	45	14	3	11	3							
UK (E., W., N.I.)	474	381	280	138	195	79	46	25		21	6	14	
UK (Scotland)	3,919	2,711	2,057	1,544	1,519	879	413	243		260	232		
UK									332.1			104	118.6
Total landings	5,671	4,289	2,767	2,439	2,231	1,298	596	419.9	483.6	487	445.2	234.4	248.5

* Preliminary.

Table 5.4.21.3 Cod in Division VIa (West of Scotland). Summary of stock assessment (weights in tonnes). Total removals (TSA) are the estimated total removals in excess of removals due to the assumed natural mortality rate. Mean Z-0.2 is the estimated mortality corresponding to total removals.

Year	Recruitment Age 1 thousands	SSB tonnes	Total removals (TSA) tonnes	Landings used by ICES WG	Discards used by ICES WG	Mean Z-0.2 Ages 2–5
1978	21238	26159	17567	13521	3678	0.700
1979	28821	28656	27429	16087	54	0.900
1980	31308	31982	24340	17879	996	0.731
1981	10682	37966	24105	23866	520	0.712
1982	26057	37432	26007	21510	1652	0.773
1983	15567	32073	22809	21305	2026	0.852
1984	24265	29863	24508	21271	635	0.907
1985	12522	22034	17397	18608	8812	1.006
1986	19467	18503	13786	11820	1201	0.822
1987	61497	19727	21178	18975	8767	0.954
1988	6119	23430	18636	20413	1217	0.889
1989	20081	21029	17300	17171	2833	0.936
1990	6482	17761	12366	12176	326	0.806
1991	11312	15289	11726	10926	917	0.897
1992	17674	12501	10099	9086	2897	0.874
1993	7340	14664	11594	10315	192	0.832
1994	15847	15296	11381	8929	186	0.720
1995	13179	17056	12840	9438	257	0.811
1996	4997	18036	12876	9425	87	0.852
1997	18408	14387	12512	7033	354	0.869
1998	8796	12124	9820	5714	423	0.886
1999	5007	11887	8739	4201	98	0.878
2000	10528	10186	7864	2977	607	0.833
2001	3236	9083	6508	2347	224	0.872
2002	8840	7840	6548	2242	169	0.882
2003	1454	6537	4851	1241	49	0.909
2004	3770	5163	3841	540	75	0.936
2005	5277	3507	3261	479	57	0.941
2006	11594	3471	3636	463	478	0.847
2007	2690	5867	4358	525	2104	0.813
2008	3081	6747	4718	451	909	0.909
2009	12445	5028	4555	222	1401	0.888
2010	8966	6581	5761	239	1183	0.824*
2011	4122	8720				
Average	13608	16370	12876	9739	1375	0.856

(*) Recent mortality values are poorly estimated due to unaccounted mortality.

5.4.21 Annex

The European Commission has adopted a 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 2012

There is insufficient information to evaluate the status of the stock. Therefore, based on precautionary considerations, ICES advises that no increase of the catch should take place unless there is evidence that this will be sustainable.

Stock status

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

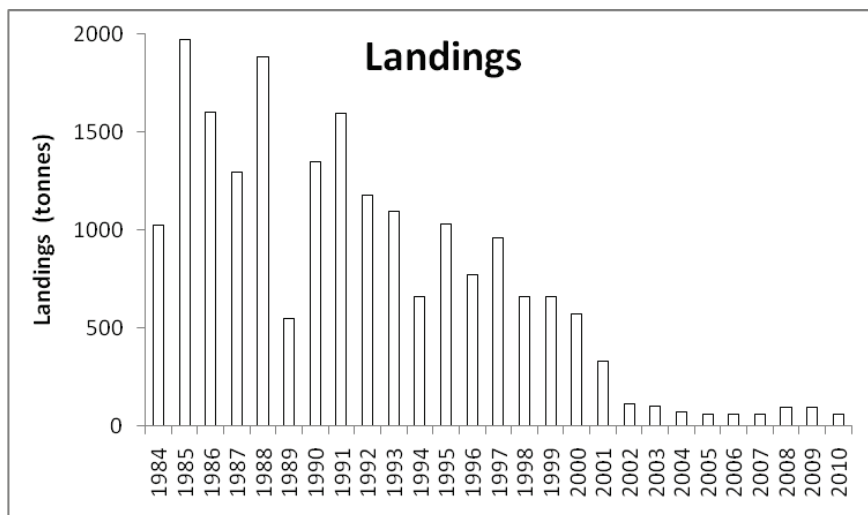


Figure 5.4.22.1 Cod in Division VIb (Rockall). ICES estimates of landings.

The information available is insufficient to evaluate stocks trends and exploitation.

Management plans

No specific management objectives are known to ICES.

The fisheries

Cod in Division VIb are taken in otter trawl fisheries targeting haddock or anglerfish.

Catch by fleet	Not available.
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Quality considerations

Available data provides information on landings.

Scientific basis

Assessment type	No assessment.
Input data	Landings statistics.
Discards and bycatch	Not included in the assessment.
Indicators	None.
Other information	Lpue from Irish and Scottish otter trawl fleet available since 2010 and 2011 respectively.
Working group report	WGCSE

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

Reference points

No reference points are defined for this stock.

Outlook for 2012

No analytical assessment is available for this stock. The main cause of this is lack of data. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

There is insufficient information to evaluate the status of the stock. Therefore, based on precautionary considerations, ICES advises that no increase of the catch should take place unless there is evidence that this will be sustainable.

Sources

ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

Table 5.4.22.1 Cod in Division VIb (Rockall). ICES advice, management, and official landing.

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)}	
2012	No increase in catch	-		

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.

Table 5.4.22.2 Cod in Division VIb (Rockall). Official landing statistics (tonnes) by country.

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Faroe Islands	18	-	1	-	31	5	-	-	-	1	-	-
France	9	17	5	7	2	-	-	-	-	-	-	-
Germany	-	3	-	-	3	-	-	126	2	-	-	-
Ireland	-	-	-	-	-	-	400	236	235	472	280	477
Norway	373	202	95	130	195	148	119	312	199	199	120	92
Portugal	-	-	-	-	-	-	-	-	-	-	-	-
Russia	-	-	-	-	-	-	-	-	-	-	-	-
Spain	241	1200	1219	808	1345	-	64	70	-	-	-	2
UK (E. & W. & N.I.)	161	114	93	69	56	131	8	23	26	103	25	90
UK (Scotland)	221	437	187	284	254	265	758	829	714	322	236	370
Total	1,023	1,973	1,600	1,298	1,886	549	1,349	1,596	1,176	1,097	661	1,031
Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	
Faroe Islands	-	-	-	-	n/a	n/a	n/a					
France	-	-	-	-	+	+	1			0.08		
Germany	10	22	3	11	1	-	-					
Ireland	436	153	227	148	119	40	18	11	7	12	22.7	
Norway	91	55*	51*	85*	152*	89	28	25	23	7	7	
Portugal	-	5	-	-	-	-	-					
Russia	-	-	-	-	7	26	-					
Spain	5	1	6	4	3	1		6				
UK (E. & W. & N.I.)	23	20	32	22	4	2	2	3				
UK (Scotland)	210	706	341	389	286	176	67	57	45	43		
UK											28.7	
Total	775	962	660	659	572	334	115	102	75	62	58.4	
Country	2007	2008	2009	2010*								
Faroe Islands	-		3	4.9								
France	-			0								
Germany	-											
Ireland	24	40.7	20.4	6.4								
Norway	12	14	25	27.2								
Portugal	-											
Russia	-		1									
Spain	-											
UK (E. & W. & N.I.)												
UK (Scotland)	26	41.3	47.8									
UK				22.7								
Total	62	96.0	97.2	61.2								

* Preliminary.

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Advice for 2012

ICES advises on the basis of the MSY framework that landings in 2012 should be no more than 10 200 t. The selection pattern should be improved in the *Nephrops* (TR2) fleet to reduce its high proportion of discards.

Stock status

F (Fishing Mortality)			
	2008	2009	2010
MSY (F_{MSY})	✗	✓	✓ At target
Precautionary approach (F_{pa}, F_{lim})	✓	✓	✓ Harvested sustainably
SSB (Spawning-Stock Biomass)			
	2009	2010	2011
MSY ($B_{trigger}$)	✗	✗	✗ Below trigger
Precautionary approach (B_{pa}, B_{lim})	✗	✗	✗ Reduced reproductive capacity

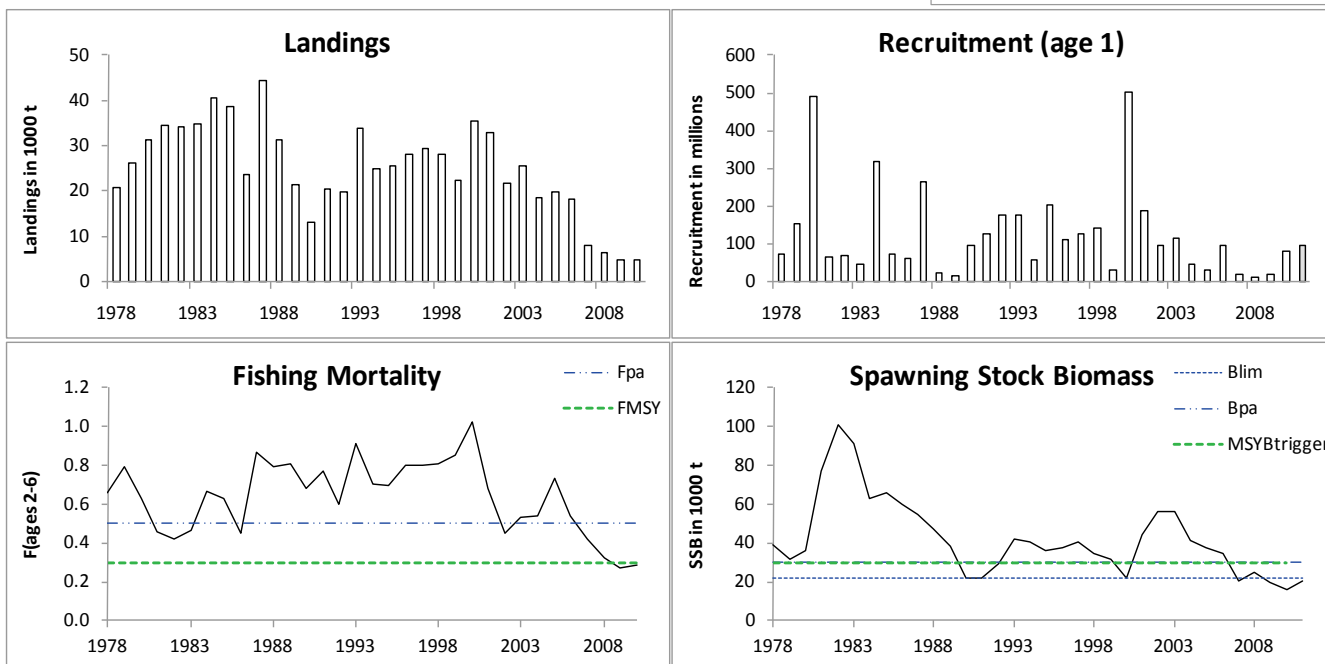
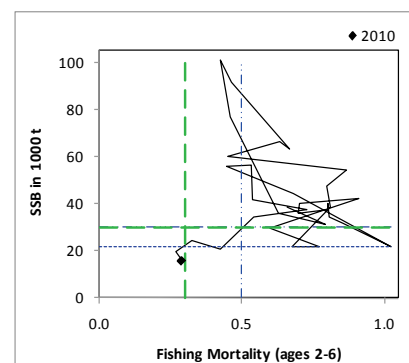


Figure 5.4.23.1 Haddock in Division VIa (West of Scotland). Summary of stock assessment (weights in '000 tonnes). Predicted values are shaded. Top right: SSB and F over the years.

The 2009 year class is strong relative to others in the recent period, but still below the long-term average. Nevertheless, this year class contributes to the rise of the SSB in 2011 estimated at 20.8 thousand tonnes. F has been above F_{pa} in most years since 1987, but dropped below F_{pa} in 2007 and at F_{MSY} since 2008.

Management plans

A management plan is under development (See Annex 5.4.23). Following the annex would result in a 2012 TAC of 2506 t and a decrease in F of 77%. The aim of this plan is to keep the SSB above 30 000 tonnes with a fishing mortality 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.

Early in 2010, ICES evaluated an earlier version of the plan (with a +/- 15% TAC constraint applied only when SSB was greater than B_{pa}) and concluded that it was in accordance with the precautionary principle. The revised plan (with a TAC constraint of +/- 25%) has not yet been fully evaluated.

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–recruit 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. The total catch for haddock is estimated to be 5830 tonnes; 51% of these are discards. Splitting discards by fleet shows that *Nephrops* vessels (TR2) are responsible for ~88% of all discards while landing only 21 tonnes, less than 1% of the total landings (2882 tonnes).

Catch by fleet	Total catch (2010) = 5830 t, where the demersal fish fleet (TR1) contributes 3217 t (2861 t landed, 356 t discarded) and the <i>Nephrops</i> fleet (TR2) 2613 t (21 t landed, 2592 t discarded).
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Quality considerations

In 2010 the catch-at-age data from 2006 onwards were re-introduced to the assessment, based on evidence from the improved accuracy of landing statistics. The survey design and gear were changed in the Scottish west coast survey (ScoGFS-WIBTS-Q1 and ScoGFS-WIBTS-Q4) in the first quarter of 2011 (and the changes will be maintained hereafter). The impact on the assessment is unknown, although survey-based analyses suggest that the catchability of the new survey configuration for haddock may be higher for all ages. For these reasons the 2011 data for the Q1 survey (ScoGFS-WIBTS-Q1) were not used in the assessment until further analysis can be made. No survey data for the 2010 Q4 (ScoGFS-WIBTS-Q4) were available due to a ship breakdown.

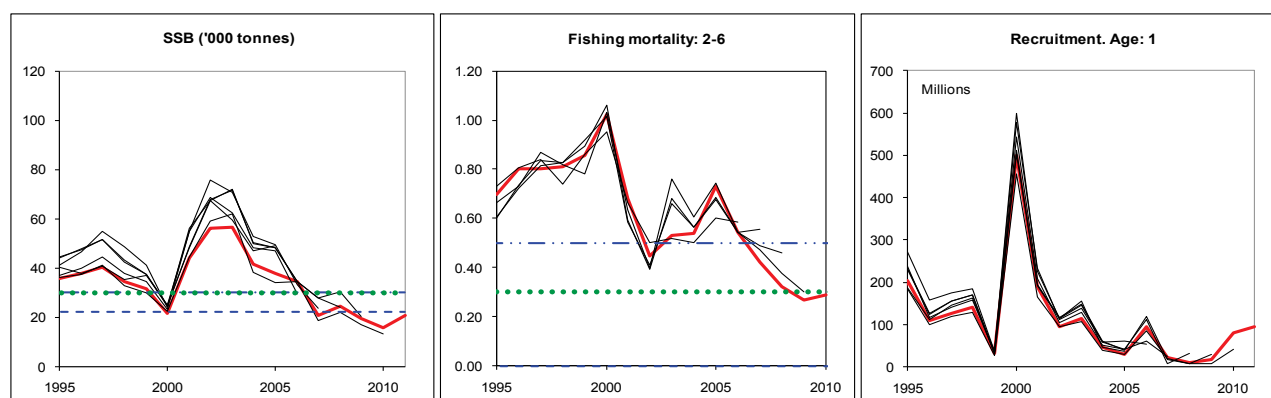


Figure 5.4.23.2 Haddock in Division VIa (West of Scotland). Historical assessment results (final year recruitment estimates included).

Scientific basis

Assessment type	Analytical age-based assessment (TSA).
Input data	Two survey indices (ScoGFS-WIBTS-Q1, ScoGFS-WIBTS-Q4).
Discards and bycatch	Included in the assessment.
Indicators	IRGFS-WIBTS-Q4, SAMISS and IAMISS Q2.
Other information	Catch data were re-introduced for years since 2006.
Working group report	WGCSE

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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 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	$B_{\text{pa}} = B_{\text{lim}} * 1.4$. 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)

Yield and spawning biomass per Recruit F-reference points (2011):

	Fish Mort Ages 2–6	Yield/R	SSB/R
Average last 3 years	0.29	0.18	0.64
F_{max}^*	-	-	-
$F_{0.1}$	0.16	0.16	1.05
F_{med}	0.43	0.17	0.43

[*] F_{max} is not well defined.

Outlook for 2012

The short-term forecast is presented in terms of total removals. These are then divided into landings (55%), discards (36%), and unallocated removals (9%), using the most recent assessment to calculate the average proportions of these catch components over the last three years.

Basis: $F(2011) = F_{sq} = F(2008-2010) = 0.29$; $SSB(2012) = 31.3$; $R(2012) = \text{TSA model estimate} = 105.1$ million, $R(2013) = \text{GM} = 82.7$ million; Removals (2011) = 8.21.

Rationale	Human Consumption landings (2012) ³⁾	Basis	F Total (2012)	F HC (2012)	F Disc (2012)	F Unallocated (2012)	Catch Total (2012)	Discards (2012)	Unallocated removals (2012)	SSB (2013)	%SSB change ¹⁾	%TAC change ²⁾
MSY framework	10.2	F_{MSY} ($F_{sq} * 1.025$)	0.30	0.17	0.11	0.03	18.6	6.7	1.7	40.7	+30%	+410%
Precautionary approach	15.7	F_{pa} ($=F_{sq} * 1.71$)	0.50	0.28	0.18	0.05	28.6	10.3	2.6	34.2	+9%	+684%
Management plan	2.506	TAC + 25% ($F_{sq} * 0.227$)	0.07	0.04	0.02	0.01	4.5	1.6	0.4	50.0	+59%	+25%
Zero catch	0.0	$F = 0$	0.00	0.00	0.00	0.00	0.0	0.0	0.0	53.0	+69%	-100%
<i>Status quo</i>	1.5	TAC - 25% ($F_{sq} * 0.135$)	0.04	0.02	0.01	0.00	2.7	1.0	0.2	51.2	+63%	-25%
	2.0	No TAC change ($F_{sq} * 0.18$)	0.05	0.02	0.02	0.01	3.7	1.3	0.3	50.6	+61%	0%
	2.5	TAC + 25% ($F_{sq} * 0.23$)	0.07	0.04	0.02	0.01	4.5	1.6	0.4	50.0	+59%	+25%
	10.0	$F_{sq} * 1$	0.29	0.00	0.11	0.03	18.1	6.5	1.6	41.0	+31%	+399%

Weights in '000 tonnes.

¹⁾ SSB 2013 relative to SSB 2012.

²⁾ Total removals 2012 relative to TAC 2011.

³⁾ Human consumption landings 2012 relative to TAC 2011. Note: this is the percentage TAC change as it was used in the management plan evaluation.

Management plan

A management plan is under development (See Annex 5.4.23). Following the annex would result in a 25% increase in landings. This would result in removals from the stock of 4600 tonnes, and landings of 2506 tonnes in 2012. This is expected to lead to an SSB of 50 000 tonnes in 2013.

The management plan is not yet in operation and has not yet been fully evaluated by ICES. Therefore, the advice is not based on this plan.

MSY approach

Following the ICES MSY framework implies a fishing mortality less than 0.3, resulting in landings of 10 200 tonnes in 2012. This is expected to lead to an SSB of 40700 tonnes in 2013. Haddock is caught in a mixed fishery where other species such as cod and whiting are present.

PA approach

The fishing mortality in 2012 should be no more than F_{pa} , corresponding to landings of less than 15 700 t in 2012. This is expected to keep SSB above B_{pa} in 2013.

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 improving stock condition and associated advice assuming the management plan or the MSY approach will lead to increased catches of haddock for which the current bycatch arrangements will be inappropriate.

Management considerations

ICES recommends a management plan which would offer maximum protection to the haddock, recognizing that it is caught in a mixed fishery. 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. In recent years around 50% of the total catch in weight has been discarded, so restricting landings alone may not achieve the necessary increase in SSB.

One-year-olds comprised the largest proportion (~82%) of total numbers of haddock caught in 2010 and the majority of these were discarded in the *Nephrops* fleet (TR2). Any measure to reduce discarding and to improve the fishing pattern should be actively encouraged. Such measures should include the adoption of a sorting grid as well as appropriately located square-meshed panels.

Effort data 1998–2010 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 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.

The management of haddock will be strongly linked to that of 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 5.4.21).

The UK “Buyers and Sellers” regulation and Irish “Sales Note” regulation have reduced unreported landings. Discard rates have, however, remained stubbornly high.

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 1995–2005 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 landing statistics.

Uncertainties in assessment and forecast

The main uncertainty in the forecast is the strength of the 2009 year class. The various surveys and discard sampling information have indicated that the 2009 year class is strong relative to others in the recent period, but still below the long-term average. The absolute magnitude of the year class will have a strong impact on the catch predictions.

The ScoGFS-WIBTS-Q4 did not take place in 2010. However, due to the introduction of catch-at-age data this has less affect on the quality of the assessment than previously when the recent catch was excluded. There have been changes to the survey design and gear in the ScoGFS-WIBTS-Q1 in 2011 and the impact of this is unknown. For that reason the survey data for the first quarter of 2011 was not used in the assessment until further analysis can be made.

Comparison with previous assessment and advice

Last year's assessment indicated that the SSB would continue to decline as the 1999 and 2005 year classes move out of the population. Last year's assessment forecasted a small increase in the recruitment for 2010. The 2010 year class has been estimated as stronger than expected, resulting in an increase in SSB to 20 800 tonnes. The recruitment forecast for the 2011 year-class is estimated to be ~15 million higher than in 2010.

The basis for the advice is the same as last year.

Source

ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

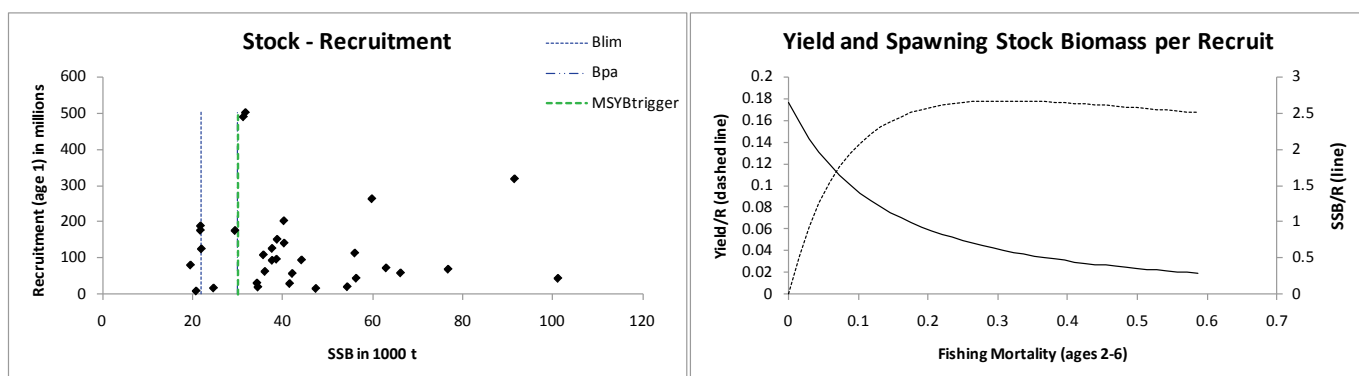


Figure 5.4.23.3 Haddock in Division VIa (West of Scotland). Yield-per-recruit analysis (left) and stock–recruitment plot (right).

Table 5.4.23.1 Haddock in Division VIa (West of Scotland). ICES advice, management, and 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	21.1	10.2	31.3
1989	80% of F(87); TAC	15.0	35.0	24	16.7	3.2	19.9
1990	80% of F(88); TAC	14.0	24.0	13	10.1	5.4	15.5
1991	70% of effort (89)	-	15.2	10	10.6	9.2	19.8
1992	70% of effort (89)	-	12.5	7	11.4 ²	9.4 ²	20.8 ²
1993	70% of effort (89)	-	17.6	13	19.1 ²	16.9 ²	36.0 ²
1994	30% reduction in effort	-	16.0	9	14.2 ²	11.2 ²	25.4 ²
1995	Significant reduction in effort	-	21.0	13	12.4	8.8	21.2
1996	Significant reduction in effort	-	22.9	13	13.4	11.8	25.3
1997	Significant reduction in effort	-	20.0	13	12.9	6.6	19.5
1998	No increase in F	20.8 ³	25.7	14	14.4	5.7	20.1
1999	F reduced to F_{pa}	14.3 ³	19.0	11	10.4	5.1	15.6
2000	Maintain F below F_{pa}	<14.9 ³	19.0	7	6.9	8.2	15.2
2001	Reduce F below F_{pa}	<11.2 ³	13.9	7	6.7	7.2	14.0
2002	Reduce F below F_{pa}	<14.1 ³	14.1	7	7.1	8.6	15.2
2003	No cod catches	-	8.7	4.9	5.3	4.2	9.6
2004	F_{pa} ⁴	12.2	6.5	3.0	3.2	n/a ⁵	n/a ⁵
2005	$\frac{3}{4} * F_{pa}$ ⁴	7.6	7.6	3.2	3.1	n/a	n/a
2006	$0.7 * F_{pa}$ ⁴	8.0	7.81	5.7	5.7	n/a	n/a
2007	$0.87 * F_{pa}$ ⁴	7.2	7.2	3.7	3.7	n/a	n/a
2008	$SSB > B_{pa}$ ⁴	4.2	6.12	2.8	2.8	n/a	n/a
2009	No fishing and recovery plan ⁴	0	3.52	2.8	2.8	n/a	n/a
2010	No fishing and recovery plan	0	2.67	2.9	3.0	n/a	n/a
2011	See scenarios	0	2.005				
2012	MSY framework	10.2					

All weights in '000 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 From 2004 the assessment chosen has generated estimates of total removals – not divided into landings and discards.

Table 5.4.23.2 Haddock in Division VIa. Landings (tonnes) by country since 1988.

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Belgium	8	9	-	9	1	7	1	-	1	3	2	2
Denmark	+	+	+	+	+	1	-	1	1	-	-	-
Faeroe Islands	-	13	-	1	-	-	-	-	-	-	-	-
France	3001	1335	863	761	762	1132	753	671	455	270	394	-
Germany	-	-	-	1	2	9	19	14	2	1	1	2
Germany	4	4	15	-	-	-	-	-	-	-	-	-
Ireland	2731	2171	773	710	700	911	746	1406	1399	1447	1352	1054
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-
Norway	54	74	46	12	72	40	7	13	16	21	28	18
Spain	-	-	-	-	-	-	-	1	-	-	2	4
UK – (E&W) ³		235	164	137	132	155	254	322	448	493	458	315
UK – E & W	114	-	-	-	-	-	-	-	-	-	-	-
UK - NI	35	-	-	-	-	-	-	-	-	-	-	-
						1042						
UK – Scot.	15151	19940	10964	8434	5263	3	7421	10367	10790	10352	12125	8630
UK(Total)	-	-	-	-	-	-	-	-	-	-	-	-
Un. Sov. Soc. Rep.	-	-	-	59	-	-	-	-	-	-	-	-
				1012		1267						
Total reported	21098	23781	12825	4	6932	8	9201	12795	13112	12587	14362	10025
				1055	1135	1906	1427					
WG estimates	21153	16691	10141	7	1	8	2	12368	13466	12883	14401	10464

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Belgium	1	2	-	-	+	-	-	-	-	-	-
Denmark	-	-	-	+	+	-	-	-	-	-	-
Faeroe Islands	-	-	-	-	4	-	1	2	+	-	0
France	282	160	151	183	173	273	291	211	151	139	88
Germany	1	1	-	-	-	1	7	-	1	-	-
Germany	-	-	-	-	-	-	-	-	-	-	1
Ireland	677	744	672	497	194	152	526	759	879	297	396
Netherlands	-	-	-	-	1	-	-	-	-	-	-
Norway	70	32	30	23	4	21	17	16	28	18	11
Spain	+	4	4	5	-	47	44	5	10	21	-
UK – (E&W) ³	199	201	237	107	93	42	19	193	32	14	-
UK E&W	-	-	-	-	-	-	-	-	-	-	-
UK - NI	-	-	-	-	-	-	-	-	-	-	-
UK - Sco	5933	5886	5988	4582	2909	2025	4928	2587	1744	2366	-
UK (Total)	-	-	-	-	-	-	-	-	-	-	2414
Un. Sov. Soc. Rep.	-	-	-	-	-	-	-	-	-	-	-
Total reported	7163	7030	7082	5397	3378	2561	5833	3773	2845	2855	2911
WG estimates	6958	6762	7115	5337	3874	3792	6266	3777	2848	2851	3016

¹Preliminary.²Includes Divisions Vb(EC) and VIb.³1989–2005 N. Ireland included with England and Wales.

n/a = Not available.

WG estimates refers to the sum-of-products of landings and weights-at-age provided to the WG, rather than the estimated removals produced in the final assessment.

Table 5.4.23.3 Haddock in VIa (West of Scotland). Summary of stock assessment.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2–6
1978	71511	38778	20895	0.657922
1979	152330	31282	26183	0.793236
1980	489170	36057	31299	0.629368
1981	63918	76811	34403	0.459261
1982	70160	101242	34211	0.423228
1983	45008	91590	34798	0.463362
1984	318687	63019	40655	0.666318
1985	73687	66234	38586	0.632285
1986	59942	59858	23590	0.449115
1987	263894	54378	44356	0.868974
1988	21886	47396	31321	0.796115
1989	17132	38639	21332	0.809788
1990	97618	21933	13106	0.677919
1991	125985	21720	20539	0.772255
1992	177127	29409	19787	0.597633
1993	176515	42151	33920	0.912258
1994	58444	40281	24831	0.701636
1995	203277	35728	25472	0.696101
1996	109566	37650	28196	0.800637
1997	127295	40347	29291	0.803815
1998	141955	34290	28246	0.808495
1999	32178	31731	22346	0.854208
2000	500855	21736	35601	1.022047
2001	189241	44217	32871	0.680981
2002	95560	56055	21605	0.447401
2003	114604	56357	25435	0.532256
2004	45357	41566	18565	0.538205
2005	30639	37671	19927	0.730514
2006	94621	34509	18240	0.542700
2007	20966	20764	8133	0.423595
2008	10158	24634	6270	0.322924
2009	18365	19515	4741	0.268492
2010	81533	15868	4824	0.288114
2011	95194	20778		
Average	123364	42182	24957	0.638520

¹TSA estimates of total catch.² Survey estimate.

Annex 5.4.23

Option for a harvest rule for the management of haddock in zones VIa and EC waters of 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 2012

ICES advises on the basis of the MSY approach that landings in 2012 should be no more than 3300 t.

Stock status

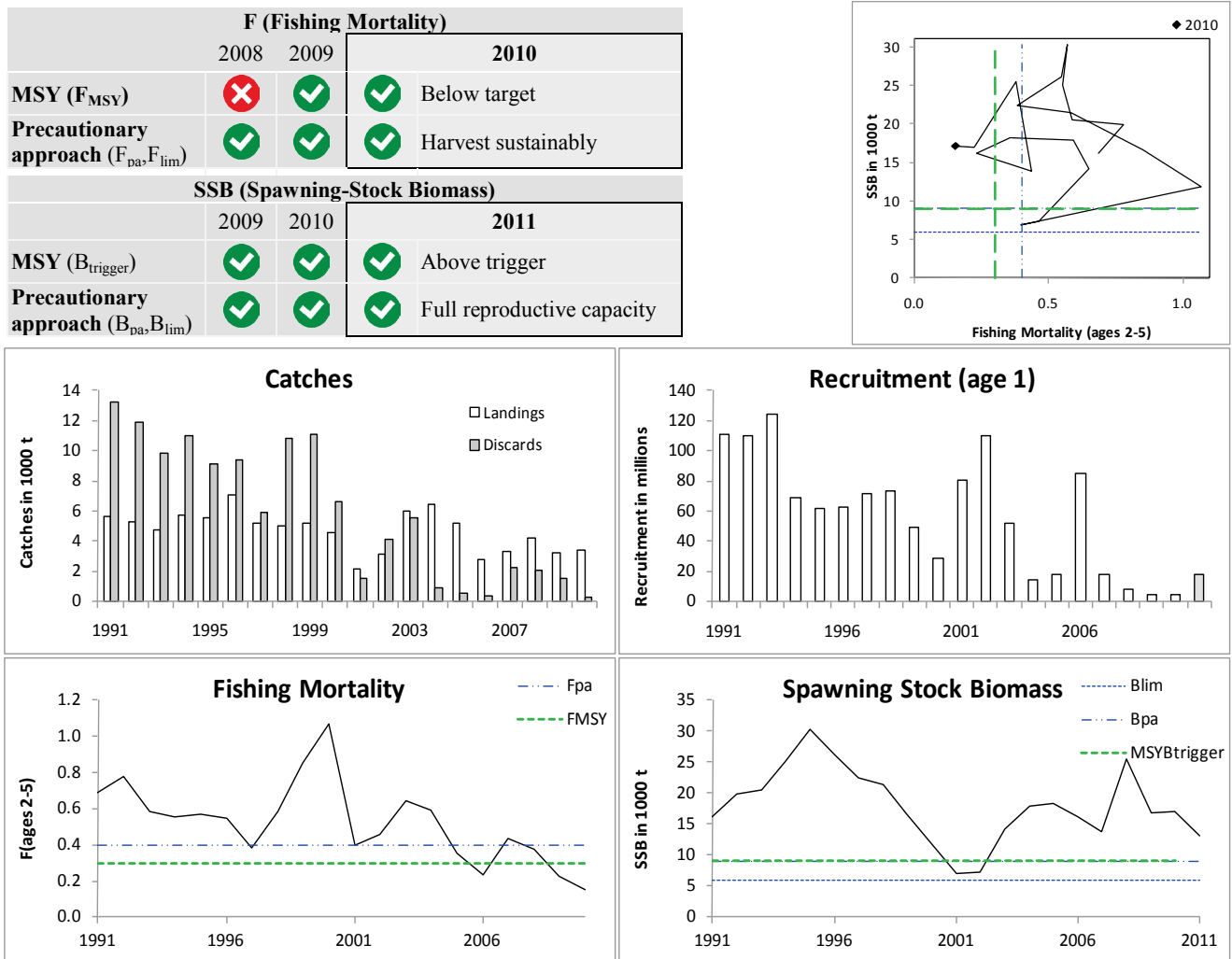


Figure 5.4.24.1 Haddock in Division VIb (Rockall). Summary of stock assessment (weights in '000 tonnes). Predicted values are shaded. Top right: SSB and F over the years.

Spawning biomass has increased in recent years as a result of the 2001 and 2005 year classes. SSB has been above B_{pa} since 2003. Fishing mortality has declined over time and is now below F_{MSY} . Recruitments since 2007 are estimated to be extremely weak and there is a high probability that SSB will decrease to levels below B_{pa} in 2013.

Management plans

A management plan is under development and is currently being evaluated.

Biology

The haddock stock at Rockall is an entirely separate stock from that on the continental shelf of the British Isles. Rockall haddock have lower growth rates and reach a lower maximum size than other haddock populations in the Atlantic.

Environmental influence on the stock

Recruitment for the last four years has been low despite a large SSB. This may be related to rising seawater temperature on the Rockall bank.

The fisheries

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

Catch by fleet	Total catch (2010) = 3.7 kt, where 92% are landings (93% otter trawl, 5% pair trawl, and 2% other gears) and 8% discards.
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Effects of the fisheries on the ecosystem

In order to protect cold water corals, four areas (North West Rockall, Logachev Mounds, West Rockall Mounds, and Empress of British Banks) have been closed since 2007.

Quality considerations

An improved time-series of landings and discard is needed for this assessment. The survey area coverage has been reviewed and will be extended into deeper waters in 2011. The survey used in the assessment was not carried out in 2010 and therefore the only additional data used this year compared to last year are catch-at-age data for 2010. This makes this year's assessment more uncertain than in the past years.

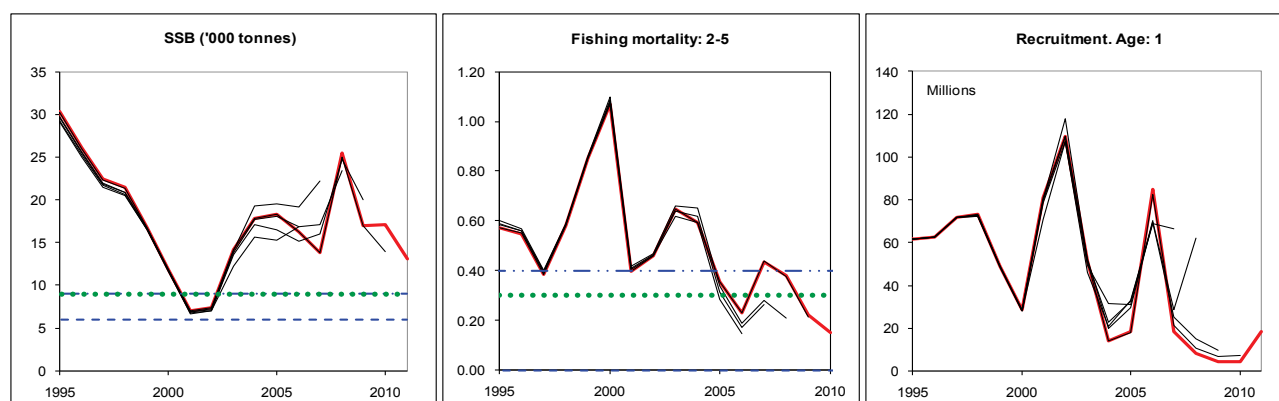


Figure 5.4.24.2 Haddock in Division VIb (Rockall). Historical assessment results (final year recruitment estimates included).

Scientific basis

Assessment type	Analytical catch-at-age assessment (XSA).
Input data	One survey index (Rock-WIBTS-Q3).
Discards and bycatch	Included in the assessment.
Indicators	IAMISS-Q2 and SAMISS-Q2 surveys.
Other information	Russian trawl-acoustic survey.
Working group report	WGCSE

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

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
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	$B_{\text{pa}} = B_{\text{lim}} * 1.4$. 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.	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)

Yield and spawning biomass per recruit F-reference points (2011):

	Fish Mort Ages 2–5	Yield/R	SSB/R
Average last 3 years			
F_{max}^*	0.25	0.17	0.74
$F_{0.1}$	-	-	-
F_{med}	0.12	0.16	1.19
	0.52	0.14	0.41

* F_{max} is not well defined.

Outlook for 2012

Basis: $F_{2011} = F_{sq} = F(2008-2010) = 0.25$; $SSB(2012) = 10.1$; $R(2011, 2012) = 18\ 353$ thousands; Landings (2011) = 3.5; Total catch (2011) = 4.

Rationale	Human consumption (2012)	Basis	F (2012)	Catch Total (2012)	SSB (2013)	%SSB change ¹⁾	%TAC change ²⁾
MSY framework	3.3	$F_{MSY} (F_{sq} * 1.2)$	0.30	4.0	9.6	-5%	-11%
Precautionary approach	3.8	$B_{pa} (F_{sq} * 1.44)$	0.36	4.6	9.0	-11%	+3%
Zero catch	0.0	$F=0$	0.00	0.0	13.7	+35%	-100%
Status quo	0.7	$F_{sq} * 0.2$	0.05	0.8	12.9	+27%	-82%
	2.1	$F_{0.1} (F_{sq} * 0.7)$	0.18	2.6	11.1	+10%	-43%
	2.4	$F_{sq} * 0.8$	0.20	2.9	10.8	+6%	-36%
	2.7	$F_{sq} * 0.9$	0.23	3.2	10.5	+3%	-29%
	2.9	F_{sq}	0.25	3.5	10.2	+0%	-23%
	3.2	-15% TAC ($F_{sq} * 1.12$)	0.28	3.8	9.8	-3%	-15%
	3.7	0% TAC ($F_{sq} * 1.4$)	0.35	4.5	9.1	-10%	0%
	4.2	$F_{pa} (F_{sq} * 1.6)$	0.40	5.1	8.6	-15%	+12%
	4.3	+15% TAC ($F_{sq} * 1.68$)	0.42	5.2	8.4	-17%	+15%
	4.9	$F_{sq} * 2.0$	0.50	6.0	7.7	-24%	+30%

Weights in '000 tonnes.

¹⁾ SSB 2013 relative to SSB 2012.

²⁾ Human consumption landings 2012 relative to TAC 2011.

Total catches have been divided into landings and discards using the average ratio of discards to catches over the period 1999–2009.

MSY approach

A fishing mortality of 0.3 ($= F_{MSY}$) corresponds to landings of less than 3300 t in 2012 and is expected to lead to an SSB of 9600 t.

Because F in 2010 is below F_{MSY} , no transition scheme is necessary.

Further management measures should be introduced to reduce discarding of small haddock in order to maximize their contribution to future yield and SSB.

PA approach

A fishing mortality of 0.4 ($= F_{pa}$) corresponds to landings of 4200 t in 2012 and is expected to lead to an SSB of 8600 t which will be below B_{pa} in 2013. To keep SSB above B_{pa} , landings in 2012 should be less than 3800 t.

Additional considerations

The European Community and the Russian Federation have proposed a draft plan for the harvest control component of a long-term management plan for haddock at Rockall. NEAFC requests ICES to evaluate this component of the long-term management plan for Rockall haddock.

In 2012 SSB is at B_{pa} but the incoming recruitment for the last five years has been low. There is a high probability that the SSB will decrease to levels below B_{pa} .

The TAC only applies to catches in the EU zone. The TAC should apply to all areas and countries having fisheries for this stock. Since 1999 part of Division VIb has been in international waters where non-EU vessels are not subject to TAC. This allows for an unregulated fishery in the Rockall area. In addition, misreporting and discarding can lead to removals that exceed the TAC.

The forecast predicts future catches disaggregated into landing and discard components. The discard ratio is around 47% in 1991–2009 and 34% in the recent period (1999–2009). Some countries land the whole catch while others discard part of the catch. For countries which discard part of the catch the discard rate in the past was as high as 52–87% by numbers by results of discards trips. It would be beneficial to develop and introduce into fisheries practices

measures aimed at preventing discards of haddock. Elaboration of such measures comply with recommendations under the UNGA Resolution 61/105 that urge states to take action to reduce or eliminate fish discards (UNGA Resolution 61/105, 2007, Chapter VIII, item 60).

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. Effort in the rectangle containing the closure declined when the closure came into effect. There was also a decline in UK effort across the bank as a whole at this time, but an increase of effort in other areas of Division VIb. Spawning biomass has increased since 2003, and the fishing mortality has decreased since 2004. In 2006 and 2010, mortality reached the lowest estimates for the last 15 years. Fishing mortality has decreased for small individuals (ages 1 and 2) since 2001. However, it is difficult to determine the extent to which this may be caused by the effort made to protect juveniles in the closed area.

Data and methods

The assessment is based on catch numbers-at-age and one survey index (Rock-WIBTS-Q3). 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 and forecast is the estimates of discards in the EU fleets. In some years these are directly estimated from sampling aboard Scottish and Irish vessels, and in other years 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.

The survey covers only part of the currently known distribution area of haddock that raises uncertainty of an assessment. The survey area coverage has been reviewed and will be extended into deeper waters in 2011. The survey used in the assessment was not carried out in 2010.

Comparison with previous assessment and advice

Fishing mortality in 2009 has been revised upward by 4%, and SSB in 2010 has been revised downward by 23%, when compared with last year's assessment.

The basis for the advice is the same as last year, but extended by MSY considerations.

Source

ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

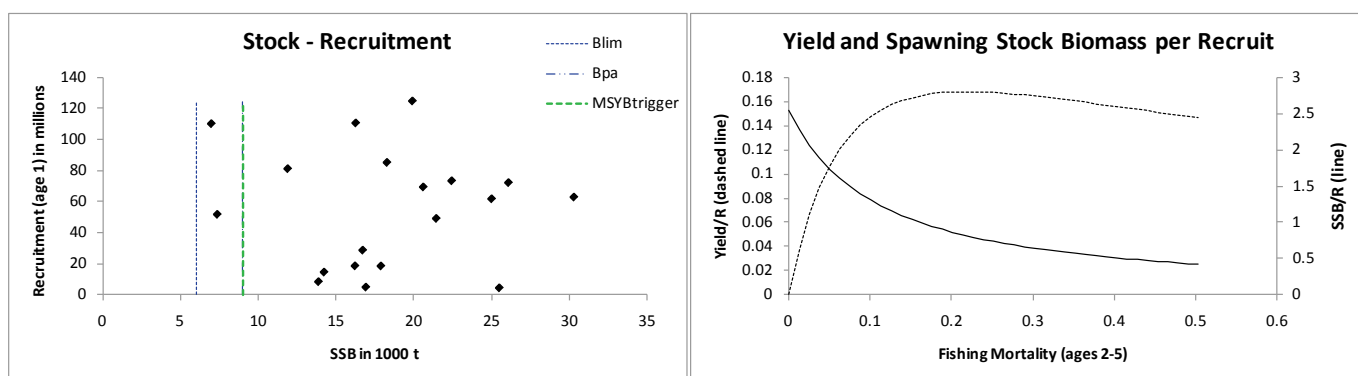


Figure 5.4.24.3 Haddock in Division VIb (Rockall). Stock–recruitment relationship (left) and yield-per-recruit analysis (right).

Table 5.4.24.1 Haddock in Division VIb (Rockall). ICES advice, management, and landings.

Year	ICES Advice, Single-stock exploitation boundaries from 2004 onwards	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings
1987	Precautionary TAC	10.0		8.0	8.4
1988	Precautionary TAC	10.0		7.6	7.9
1989	<i>Status quo</i> F; TAC	18.0		6.6	6.7
1990	Precautionary TAC	5.5		8.2	3.9
1991	Precautionary TAC	5.5		5.9	5.7
1992	Precautionary TAC	3.8		4.5	5.3
1993	80% of F(91)	3.0		4.1	4.8
1994	If required, precautionary TAC	-		3.7	5.7 ¹
1995	No long-term gain in increasing F	5.1 ²		5.5	5.6
1996	No long-term gains in increasing F	6.9 ²		6.8	7.1
1997	No advice given	4.9 ²		5.2	5.2
1998	No increase in F	4.9		5.1	4.5
1999	Reduce F below F _{pa}	3.8		6.0	5.1
2000	Reduce F below F _{pa}	< 3.5		5.7 ³	5.3 ⁴
2001	Reduce F below F _{pa}	< 2.7		2.3 ³	2.0 ⁴
2002	Reduce F below 0.2	<1.3		3.0	3.3
2003	Lowest possible F	-		6.1	6.2
2004	Lowest possible catch ⁵		0.702 ⁸	6.3	6.4
2005	Lowest possible catch ⁵		0.702 ⁸	5.2	5.2
2006	Lowest possible catch ⁵		0.597 ⁸	2.8	2.8
2007	Reduce F below F _{pa} ⁵	<7.11	4.615 ⁸	3.3	3.3
2008	Keep F below F _{pa} ⁵	<10.6 ⁶	6.916 ⁸	4.2	4.2
2009	No long-term gains in increasing F ⁵	<4.3 ⁷	5.879 ⁸	3.8	3.8
2010	No long-term gains in increasing F ⁵	<3.3 ⁷	4.997 ⁸	3.4	3.4
2011	See scenarios	-	3.748 ⁸		
2012	MSY approach	<3.3			

Weights in '000 t.

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.

Table 5.4.24.2 Nominal catch (tonnes) of haddock in Division VIb, 1992–2010, as officially reported to ICES.

COUNTRY	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009 ¹	2010 ¹
Faroe Islands	-	-	-	-	-	-	-	-	n/a	n/a	-	-	-	-	2	2	16	16	42
France	...2	...2	...2	...2	-	-	-	-	5	2	-	1	-	-	-	-	-	-	-
Iceland	-	-	-	-	-	+	-	167	-	-	-	-	-	-	-	-	-	-	-
Ireland	571	692	956	677	747	895	704	1021	824	357	206	169	19	105	41	338	721	352	169
Norway	47	68	75	29	24	24	40	61	152	70	49	60	32	33	123	84	36	71	65
Portugal	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Russian Federation	-	-	-	-	-	-	-	458	2154	630	1630	4237	5844	4708	2154	1282	1669	55	198
Spain	51	-	-	28	1	22	21	25	47	51	7	19	-	-	5	-	-	-	-
UK (E,W&NI)	74	308	169	318	293	165	561	288	36	-	-	56	-	-	-	-	-	-	-
UK (Scot.)	3777	3045	2535	4439	5753	4114	3768	3970	2470	1205	1145 ³	1607	411 ³	332 ³	440 ³	1643 ³	1779 ³	2951 ³	2931 ³
Total	4520	4113	3735	5491	6818	5220	5098	5990	5688	2315	3037	6148	6306	5178	2765	3349	4221	3445	3405
Unallocated catch	800	671	1998	-379	-543	-591	-599	-851	-357	-279	299	945	1395	1	0	0	0	0	0
WG estimate	5320	4784	5733	5112	6275	4629	4499	5139	53314	20364	33364	62424	6445	5179	2765	3349	4221	3445	3405

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

Year	Recruitment	SSB	Catches	Landings	Discards	Mean F Total Ages 2–5
	Age 1 thousand	tonnes	tonnes	tonnes	tonnes	
1991	110570	16259	18883	5655	13228	0.686700
1992	110317	19909	17191	5320	11871	0.778100
1993	124464	20607	14637	4784	9853	0.585775
1994	69122	25008	16756	5733	11023	0.551975
1995	61508	30305	14755	5587	9168	0.571300
1996	62627	26093	16431	7075	9356	0.548825
1997	71924	22438	11060	5166	5894	0.383625
1998	73106	21444	15846	4984	10862	0.581675
1999	48875	16708	16283	5221	11062	0.851050
2000	28455	11879	11167	4558	6609	1.069650
2001	80889	6961	3658	2123	1535	0.397525
2002	109870	7344	7269	3117	4152	0.460750
2003	51500	14220	11490	5969	5521	0.647850
2004	14336	17881	7320	6437	883	0.591500
2005	18278	18270	5696	5191	505	0.355925
2006	84910	16212	3142	2756	386	0.231675
2007	18353	13861	5590	3348	2242	0.436200
2008	8170	25502	6321	4221	2100	0.378575
2009	4202	16911	4794	3237	1557	0.223675
2010	4674	17109	3710	3404	306	0.152875
2011	18353*	13036				
Average	55929	17998	10600	4694	5906	0.524261

*- on the level of rank the 25th percentile 1991–2009.

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

Advice for 2012

ICES advises on the basis of the precautionary considerations that catches in 2012 should be reduced. The selection pattern should be improved in the *Nephrops* (TR2) fleet.

Stock status

F (Fishing Mortality)		
2008 - 2010		
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
Qualitative evaluation	✓	At poss. reference points
SSB (Spawning-Stock Biomass)		
2009 - 2011		
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	✗	Below poss. reference points

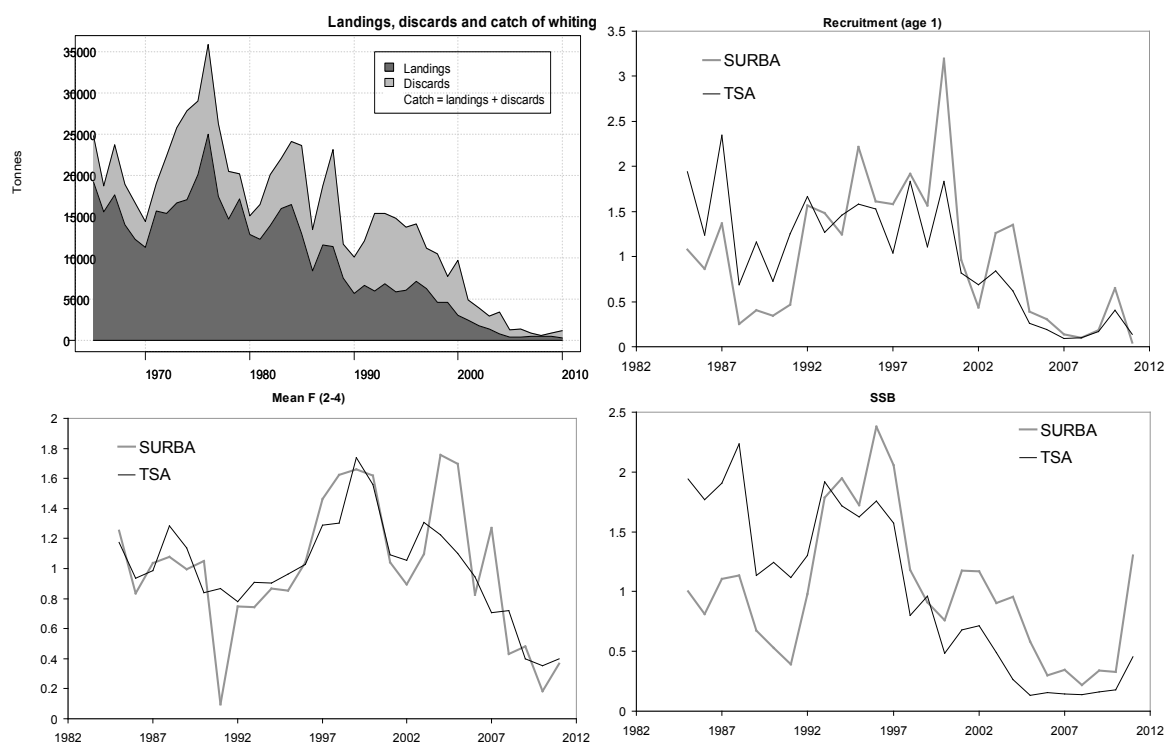


Figure 5.4.25.1 Whiting in Division VIa (West of Scotland). Comparison of trends-based assessment final run outputs (SURBA) with exploratory analytical assessment (TSA) estimates. Recruitment, fishing mortality, and biomass are mean-standardized over 1985–2010 (the length of the tuning series used in TSA).

The state of the stock is unknown, but long-term information on the historical yield and catch composition, a survey-based assessment, and an exploratory analytical assessment covering the more recent period, all indicate that the present stock size is at a historical low. Fishing mortality estimates have declined since around 2005. Recruitments in the most recent years are estimated to be very low, although there are several indications that recruitment increased in 2010 (year class 2009).

Management plans

No specific management objectives are known to ICES.

Biology

Whiting occur 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 has never been a particularly valuable species and 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 mm 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 by fleet	Total catch (2010) = 1193 t, where TR1 takes 451 t (301 t landed, 150 t discarded) and TR2 742 t (6 t landed, 736 t discarded).
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Quality considerations

An exploratory analytical assessment was presented this year that indicates increasing catchability of the survey over the time-series. The mean weights-at-age in the catch are also 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 38% of the catch. There have been changes to the survey design and gear and the impact on the exploratory assessment is unknown.

Scientific basis

Assessment type	Trends-based assessment and an exploratory analytical assessment (SURBA and TSA.)
Input data	Landings and discards 1965 to 1994 and 2006 to 2010; one survey index (ScoGFS-WIBTS-Q1, years 1985–2011).
Discards and bycatch	Included in the TSA exploratory assessment.
Indicators	ScoGFS-WIBTS-Q4, IGFS-WIBTS-Q4.
Other information	The stock is planned to be benchmarked in 2012.
Working group report	<u>WGCSE</u>

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

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}	16 000 t	$B_{\text{lim}} = B_{\text{loss}}(1998)$, the lowest observed spawning stock estimated in previous assessments.
	B_{pa}	22 000 t	$B_{\text{pa}} = B_{\text{lim}} * 1.4$. 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	$F_{\text{pa}} = 0.6 * F_{\text{lim}}$. This F is considered to have a high probability of avoiding F_{lim} .

(unchanged since: 1998)

A yield-per-recruit analysis using the results from the exploratory assessment indicates a reasonably well defined F_{max} , which is where the current fishing mortality is estimated to be.

Outlook for 2012

No reliable assessment can be presented for this stock. The main cause of this is due to historic uncertainties in the reported landings. However, based on the recent decline in trends of fishing mortality and the increased abundance of the 2009 year class, the stock would be expected to increase if the 2009 year class does not continue to be discarded at the rate observed in 2010.

Precautionary considerations

The stock trend is considered to be close to the historically low level; the qualitative evaluation suggests that fishing mortality has declined and is now close to its historically lowest value, but this is uncertain. Catches should be reduced. The selection pattern should be improved in the TR2 fleet.

Additional considerations

There are strong indications that management control is not effective in limiting the catch. The proportion of fish discarded is very high and appears to have increased in recent years. More than half of the annual catch weight comprises undersized or low-value whiting which are discarded. 83% of these discards come from the TR2 (*Nephrops*) 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 year class is relatively strong. Such measures should include the adoption of a sorting grid as well as appropriately located square-meshed panels.

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 and can be found in the Division VIa cod advice (Section 5.4.21).

Unreported landings are expected to have reduced under the UK “Buyers and Sellers” regulation, the Irish “Sales Note” regulation and other 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 1998–2010 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 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. This only affects our perception of SSB in 2011 and does not influence the basis for the advice.

Comparison with previous assessment and advice

Last year's assessment provided trends only for the stock; a new exploratory assessment this year gives similar trends. The advice is based on precautionary considerations.

Sources

ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

Table 5.4.25.1 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. to advice	Agreed TAC ¹	Official landings	ICES landings	Discards	ICES catch
1987	No increase in F	15.0	16.4	12.4	11.5	6.9	18.4
1988	No increase in F; TAC	15.0	16.4	11.9	11.4	11.8	23.1
1989	No increase in F; TAC	13.0	16.4	7.7	7.5	4.1	11.6
1990	No increase in F; TAC	11.0	11.0	6.0	5.6	4.4	10.0
1991	70% of effort (89)	-	9.0	6.9	6.7	5.3	12.0
1992	70% of effort (89)	-	7.5	6.0	6.0	9.4	15.4
1993	70% of effort (89)	-	8.7	6.8	6.9	8.5	15.4
1994	30% reduction in effort	-	6.8	5.8	5.9	8.9	14.8
1995	Significant reduction in effort	-	6.8	6.3	6.1	7.6	13.7
1996	Significant reduction in effort	-	10.0	6.6	7.2	6.9	14.1
1997	Significant reduction in effort	-	13.0	6.2	6.3	4.9	11.2
1998	No increase in F	6.5	9.0	4.7	4.6	5.8	10.5
1999	Reduce F below F_{pa}	4.3	6.3	4.7	4.6	3.1	7.7
2000	Reduce F below F_{pa}	<4.3	4.3	3.2	3.0	6.7	9.7
2001	Reduce F below F_{pa}	<4.2	4.0	2.5	2.4	2.4	4.9
2002	$SSB > B_{pa}$ in short term	<2.0	3.5	1.7	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 ²	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	-	0.32				
2012	Reduce catches	-					

Weights in '000 t.

n.a. = not available.

¹ TAC is set for Divisions VIa and VIb combined.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.

Table 5.4.25.2 Whiting in Division VIa. 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	2009	2010*
Belgium	1	-	+	-	+	+	+	-	1	1	+	-	-	-	-	+	-	-	-	-	-	-
Denmark	1	+	3	1	1	+	+	+	+	-	-	-	-	-	+	+	-	-	-	-	-	-
Faroe Islands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+
France	199 ^{1,2}	180	352 ^{1,2}	105	149	191	362	202	108	82	300	48	52	21	11	6	9	7	1	3	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	125	99
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	1	-	1	2	+	-	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	354	247
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	482	349

* Preliminary.

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

Advice for 2012

There is insufficient information to evaluate the status of the stock. Therefore, based on precautionary considerations, ICES advises that no increase of the catch should take place unless there is evidence that this will be sustainable.

Stock status

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

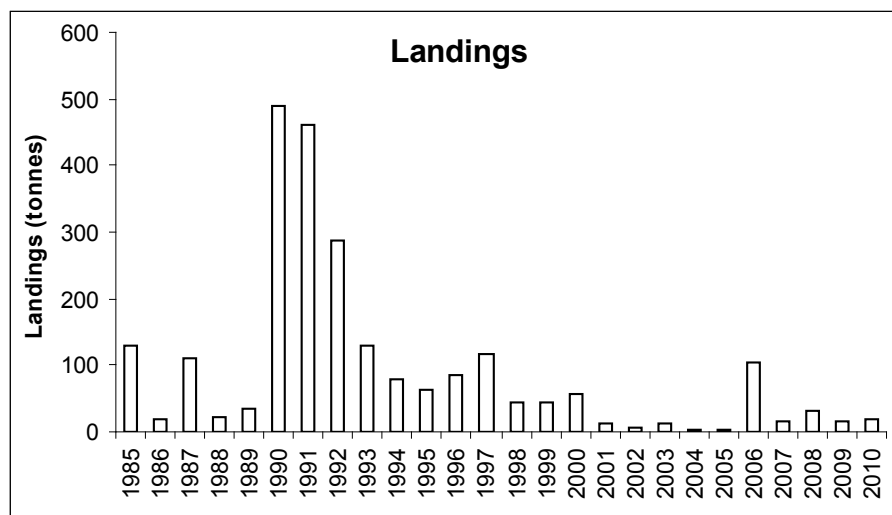


Figure 5.4.26.1 Whiting in Division VIb (Rockall). Official landings in tonnes.

The available information is insufficient to evaluate the stocks trends and exploitation. Landings of whiting from Division VIb are negligible (18 t in 2010).

Management plans

No specific management objectives are known to ICES.

Scientific basis

Assessment type	No assessment
Input data	Catch statistics
Discards and bycatch	Not included in the assessment
Indicators	None
Other information	-
Working group report	WGCSE

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

Reference points

No reference points are defined for this stock.

Outlook for 2012

No analytical assessment is available for this stock. The main cause of this is lack of data. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

There is insufficient information to evaluate the status of the stock. Therefore, based on precautionary considerations, ICES advises that no increase of the catch should take place unless there is evidence that this will be sustainable.

Sources

ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 11–19 May 2011, Copenhagen, Denmark ICES CM 2011/ACOM:12.

Table 5.4.26.1 Whiting in Division VIb (Rockall). ICES advice, management and official landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ^{a)}	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	
2012	No increase in catch	-		

Weights in tonnes.

^{a)} VI; EC waters of Vb; EC and international waters of XII and XIV.

Table 5.4.26.2 Whiting in Division VIb (Rockall). Official landing statistics (tonnes) by country.

Country	Spain	Faroe Islands	France	Ireland	UK	Total
1985	123	-	2	-	6	131
1986	-	-	-	-	18	18
1987	-	-	-	-	112	112
1988	-	-	-	-	23	23
1989	-	-	-	-	34	34
1990	-	-	-	-	488	488
1991	-	-	-	-	460	460
1992	-	-	-	-	288	288
1993	-	-	-	32	96	128
1994	-	-	-	10	70	80
1995	-	-	-	4	58	62
1996	-	-	-	23	62	85
1997	-	-	-	3	114	117
1998	-	-	-	1	43	44
1999	-	-	-	-	44	44
2000	-	-	-	-	58	58
2001	-	-	-	10	4	14
2002	-	-	-	-	7	7
2003	-	-	-	2	11	13
2004	-	-	-	3	1	4
2005	-	-	-	3	1	4
2006	-	-	-	104	1	105
2007	-	-	-	16	1	17
2008	-	-	-	23	8	31
2009				4	12	16
2010*				2	16	18

*Preliminary.

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 6.4.12.

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 2012

This is the first time that ICES analyses data for sprat in the Celtic Sea and West of Scotland. 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. There is insufficient information to evaluate the status of sprat in this area. Therefore, based on precautionary consideration, ICES advises that catches should not be allowed to increase in 2012.

State of the stock

F (Fishing Mortality)	
	2007-2009
Qualitative evaluation	? Insufficient information
SSB (Spawning Stock Biomass)	
	2008-2010
Qualitative evaluation	? Insufficient information

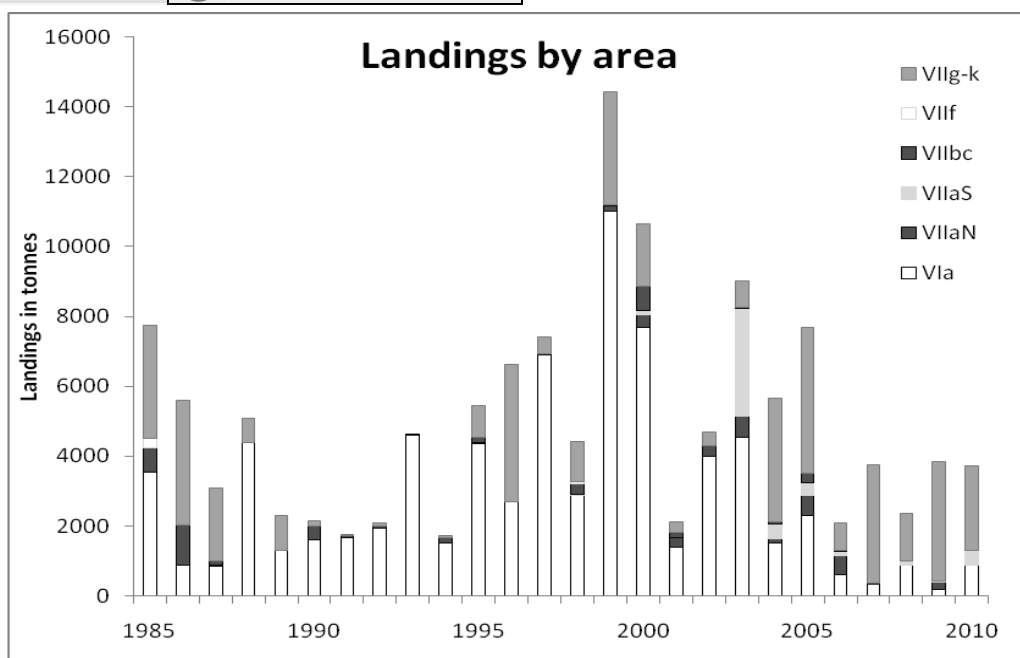


Figure 5.4.28.1 Sprat in the Celtic Sea and West of Scotland. ICES landings (in tonnes) by area.

The information available is insufficient to evaluate stock trends and exploitation.

Management plans

No specific management objectives are known to ICES.

Biology

Sprat is a relatively short lived species that shows large inter-annual 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 both 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 Celtic Sea is a feeding ground for several species of large baleen whales that prey largely on herring and sprat.

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. Targeted fishing takes place when there are known sprat abundances.

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 eco-region is not clear. ICES does not necessarily advocate that VI and VII constitutes a management unit for sprat, and further work is required.

Given discrepancies between national and official landings data further scrutiny of some of the landings data is required.

Scientific basis

Assessment type	No assessment
Input data	Catch statistics
Discards and by-catch	Not available
Indicators	Indices from the Irish (AC(VIIaN)) and Celtic Sea Acoustic (CSHAS) Surveys and Irish Sea (NIGFS-WIBTS-1Q;NIGFS-WIBTS-4Q) and west of Scotland (ScoGFS-WIBTS-Q1 and ScoGFS-WIBTS-Q4) ground fish surveys
Other information	None
Working group report	HAWG

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)

Reference points

No reference points have been defined.

Outlook for 2012

No reliable assessment can be presented for sprat in this Ecoregion and stock structure in relation to appropriate management units is unknown. Therefore, fishing opportunities cannot be projected.

Precautionary considerations

This is the first time that ICES analyses data for sprat in the Celtic Sea and West of Scotland. 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. There is insufficient information to evaluate the status of sprat in this area. Therefore, based on precautionary consideration, ICES advises that catches should not be allowed to increase in 2012.

Additional considerations

It is unclear what the appropriate stock units should be and how these relate to management units. Work is ongoing to understand stock structure in the Celtic Sea eco region. The relationship between sprat in VIId,e (Section 5.4.18) and the wider Celtic Sea ecoregion is unclear.

Sprat landings are used for both human consumption and fish meal. No sprat quotas exist for the management areas in this ecoregion with the exception of sprat in Divisions VIId,e which is subject to a TAC and a separate advice is provided in section 5.4.18 of this report.

Sources

ICES. 2011. Report of the Herring Assessment Working Group for the Area South of 62°N, 16–24 March 2011 ICES CM 2011/ACOM:06.

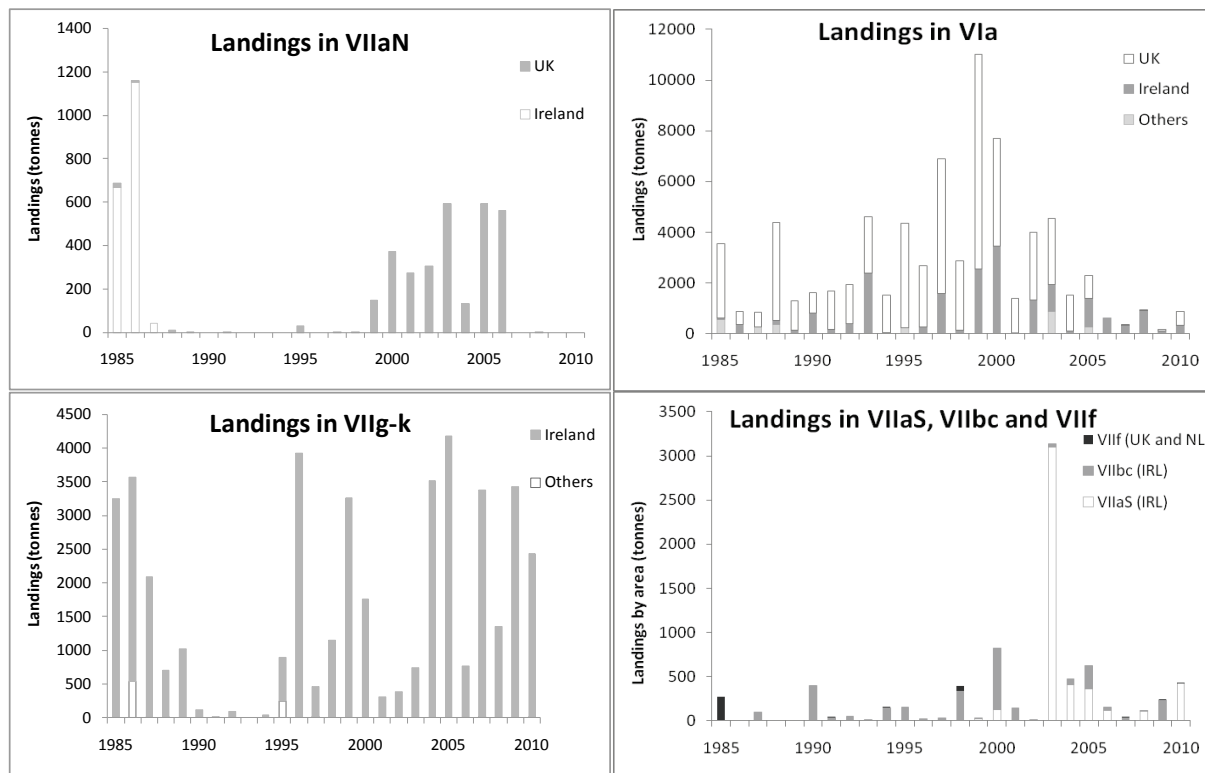


Figure 5.4.28.2 Sprat in the Celtic Sea and West of Scotland. ICES landings (tonnes) by country by area.

Table 5.4.28.1 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			12.3
2001			3.5
2002			5.9
2003			10.5
2004			6.5
2005			8.4
2006			4.0
2007			6.5
2008			5.7
2009			6.6
2010			8.1 ¹⁾
2011			
2012	No increase in catch	-	

Weights in '000 t.

¹⁾ preliminary.

Table 5.4.28.2 Sprat in the Celtic Sea and West of Scotland. Total ICES landings (tonnes) by country. 2010 landings are preliminary

Country	Denmark	Faeroe Islands	France	Isle of Man	Ireland	Netherlands	Norway	Spain	UK – England & Wales	UK - Scotland	Total
1985	0	0	14	0	3964	273	557	0	3791	2946	11545
1986	553	0	0	1	4532	0	0	0	1173	520	6779
1987	519	0	24	0	2230	0	0	0	2441	582	5796
1988	2893	0	2	0	853	2	0	0	2948	3870	10568
1989	2092	0	10	0	1163	0	0	0	1521	1146	5932
1990	608	0	79	0	1325	0	0	0	1562	813	4387
1991	0	0	0	0	205	0	0	0	2571	1526	4302
1992	28	0	35	0	508	0	0	0	1791	1555	3917
1993	22	0	3	0	2353	0	0	0	1798	2230	6406
1994	0	0	1	0	232	0	0	0	3178	1531	4942
1995	491	0	0	0	799	0	0	0	1546	4124	6960
1996	0	0	2	0	4214	0	0	0	1789	2350	8355
1997	0	0	1	0	2085	0	0	0	1629	5313	9028
1998	40	0	0	0	1578	0	0	0	2027	3467	7112
1999	0	0	0	0	5826	1	0	0	4014	8161	18002
2000	0	0	1	0	6032	1	0	0	2064	4238	12336
2001	0	0	0	0	455	0	0	0	1716	1297	3468
2002	0	0	0	0	1729	0	0	0	1502	2657	5888
2003	887	0	2	0	4948	72	0	0	1960	2593	10462
2004	0	0	6	0	4096	0	0	0	970	1416	6488
2005	0	252	0	0	5928	0	0	0	2239	0	8419
2006	0	0	7	0	1523	0	0	0	2532	0	4062
2007	0	0	0	0	3745	0	0	1	2708	14	6468
2008	0	0	0	0	2353	0	0	0	3369	0	5722
2009	0	0	2	0	3773	0	0	0	2774	70	6619
2010	0	0	3	0	3189	0	0	0	4411	537	8140

Table 5.4.28.3 Sprat in the Celtic Sea and West of Scotland. ICES landings (tonnes) by country in Subarea Via

Via	Denmark	Faeroe Islands	Ireland	Norway	UK - Eng+ Wales+N.Irl.	UK - Scotland	Total
1985	0	0	51	557	0	2946	3554
1986	0	0	348	0	2	520	870
1987	269	0	0	0	0	582	851
1988	364	0	150	0	0	3864	4378
1989	0	0	147	0	0	1146	1293
1990	0	0	800	0	0	813	1613
1991	0	0	151	0	0	1526	1677
1992	28	0	360	0	0	1555	1943
1993	22	0	2350	0	0	2230	4602
1994	0	0	39	0	0	1491	1530
1995	241	0	0	0	0	4124	4365
1996	0	0	269	0	0	2418	2687
1997	0	0	1596	0	0	5313	6909
1998	40	0	94	0	0	2749	2883
1999	0	0	2533	0	310	8160	11003
2000	0	0	3447	0	0	4238	7685
2001	0	0	4	0	98	1294	1396
2002	0	0	1333	0	0	2657	3990
2003	887	0	1060	0	0	2593	4540
2004	0	0	97	0	0	1416	1513
2005	0	252	1134	0	13	894	2293
2006	0	0	601	0	0	0	601
2007	0	0	333	0	0	13.59	346.59
2008	0	0	892	0	0	0.1	892.1
2009	0	0	104	0	0	70	174
2010	0	0	332	0	0	537	869

Table 5.4.28.4 Sprat in the Celtic Sea and West of Scotland. ICES landings (tonnes) by country in Subarea VIIaN

VIIaN	Ireland	Isle of Man	UK - Eng+ Wales +N.Irl.	UK - Scotland	Total
1985	668	0	20	0	688
1986	1152	1	6	0	1159
1987	41	0	0	0	41
1988	0	0	4	6	10
1989	0	0	1	0	1
1990	0	0	0	0	0
1991	0	0	3	0	3
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	30	0	30
1996	0	0	0	0	0
1997	0	0	2	0	2
1998	0	0	3	0	3
1999	0	0	146	0	146
2000	0	0	371	0	371
2001	0	0	269	3	272
2002	0	0	306	0	306
2003	0	0	592	0	592
2004	0	0	134	0	134
2005	0	0	591	0	591
2006	0	0	563	0	563
2007	0	0	0	0	0
2008	0	0	2	0	2
2009	0	0	0	0	0
2010	0	0	0	0	0
Note:Irish Landings from 1950-1994 may be from VIIaN or VIIaS					

Table 5.4.28.5 Sprat in the Celtic Sea and West of Scotland. ICES landings (tonnes) by country in Subarea VIIg-k

VIIg-k	Denmark	France	Ireland	Netherlands	Spain	UK - Eng+Wales+N.Irl.	Total
1985	0	0	3245	0	0	0	3245
1986	538	0	3032	0	0	2	3572
1987	0	1	2089	0	0	0	2090
1988	0	0	703	1	0	0	704
1989	0	0	1016	0	0	0	1016
1990	0	0	125	0	0	0	125
1991	0	0	14	0	0	0	14
1992	0	0	98	0	0	0	98
1993	0	0	0	0	0	0	0
1994	0	0	48	0	0	0	48
1995	250	0	649	0	0	0	899
1996	0	0	3924	0	0	0	3924
1997	0	0	461	0	0	6	467
1998	0	0	1146	0	0	0	1146
1999	0	0	3263	0	0	0	3263
2000	0	0	1764	0	0	0	1764
2001	0	0	306	0	0	0	306
2002	0	0	385	0	0	0	385
2003	0	0	747	0	0	0	747
2004	0	0	3523	0	0	0	3523
2005	0	0	4173	0	0	0	4173
2006	0	0	768	0	0	0	768
2007	0	0	3380	0	1	0	3381
2008	0	0	1358	0	0	0	1358
2009	0	0	3431	0	0	0	3431
2010	0	0	2435	0	0	0	2435

Table 5.4.28.6 Sprat in the Celtic Sea and West of Scotland. ICES landings (tonnes) by country in Subarea VIIaS, VIIbc, and VIIf

Country	VIIaS Ireland,	VIIbc Ireland	VII f Netherlands	VII f UK - Eng+Wales+N.Irl.
1985	0	0	273	0
1986	0	0	0	0
1987	0	100	0	0
1988	0	0	0	0
1989	0	0	0	0
1990	0	400	0	0
1991	0	40	0	1
1992	0	50	0	0
1993	0	3	0	0
1994	0	145	0	2
1995	0	150	0	0
1996	0	21	0	0
1997	0	28	0	0
1998	7	331	0	51
1999	25	5	0	0
2000	123	698	0	0
2001	7	138	0	0
2002	0	11	0	0
2003	3103	38	0	0
2004	408	68	0	0
2005	361	260	0	0
2006	114	40	0	0
2007	0	32	0	2
2008	102	1	0	0
2009	0	238	0	1
2010	422	0	0	7

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

Advice for 2012

ICES advises on the basis of precautionary considerations that catches in 2012 should be reduced.

Stock status

	F (Fishing Mortality)	
	2008 -2010	
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
	SSB (Spawning-Stock Biomass)	
	2008 - 2010	
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	→	Stable

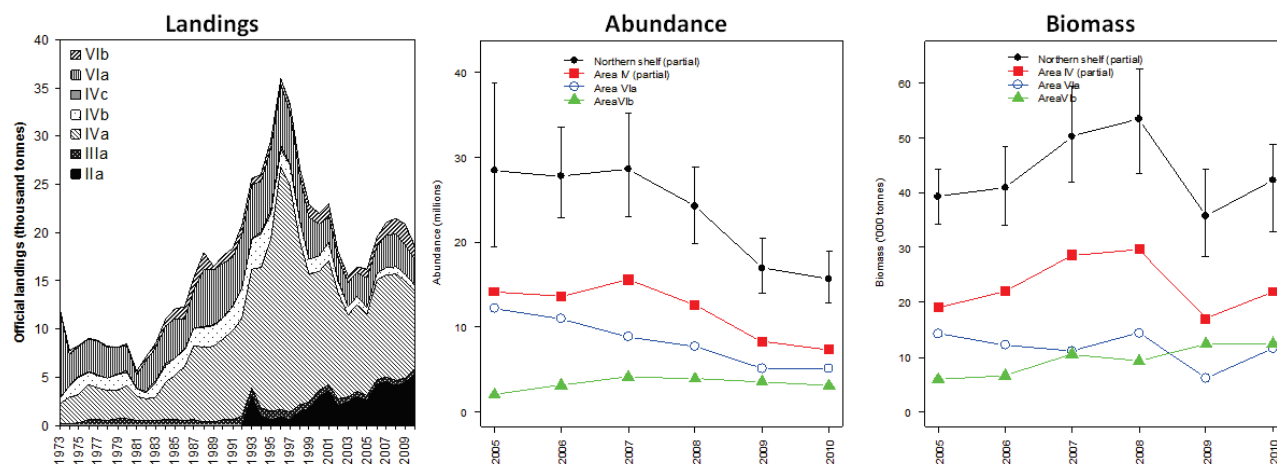


Figure 5.4.29.1 Anglerfish (*Lophius piscatorius* and *L. budegassa*). Left: Official landings ('000 t). Middle and right: Total abundance and stock biomass index from the Scottish and Irish anglerfish and megrim industry science survey for the Northern shelf (black filled circles with 95% confidence limits), with breakdown by area: Subarea IV (red squares), Division VIa (blue open circles), and Division VIb (green triangles).

Recent dedicated anglerfish surveys (SCO-IV-VI-AMISS-Q2) in Division IVa and Subarea VI indicate a decline in trends of abundance in 2007–2009 and stable biomass in recent years.

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 recruitment 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 IIIa) come from the same biological stock. Spawning appears to occur largely in deep water off the edge of the continental shelf, although mature females are rarely encountered.

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; in Division IIa this fishery has expanded in recent years.

Catch by fleet	Total catch value is not available; official total landings in 2010 were 9000 t in Division IIIa and Subarea IV; 4000 t in Subarea VI, and 5400 t in Division IIa. Discards from the Scottish fleet were minimal in 2010 (<1%).
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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

Improved landing and effort data are needed. Accurate estimates of growth parameters are needed to facilitate the development of an analytical assessment. An anglerfish ageing exchange study is planned in 2011 to compare the different approaches that are used (otoliths and *illicia*). A dedicated Scottish and Irish industry/science anglerfish survey has operated from 2005–2010. However, the survey does not cover the eastern part of the North Sea and Skagerrak, where significant fisheries take place, which adds uncertainty to the stock trends perception.

Scientific basis

Assessment type	Survey trends.
Input data	Dedicated anglerfish surveys in Subarea VI and Division IVa (Scotland/Ireland) SCO-IV-VI-AMISS-Q2.
Discards and bycatch	Not relevant to this assessment.
Indicators	Abundance and biomass in Subarea VI and Division IVa.
Other information	Anglerfish are scheduled to be benchmarked in 2012.
Working group report	WGCSE

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

Reference points

No reference points have been defined for these stocks. Because of recently identified problems with growth estimates, previous reference points are no longer considered to be valid.

Outlook for 2012

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

Precautionary considerations

Recent trends in abundance and biomass have shown different results, from reductions to relatively stable. The available information is insufficient to evaluate exploitation status. Therefore, catches should be reduced.

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.

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.

Information from several fisheries indicates that underreporting of total landings has been a problem in recent years due to restrictive individual vessel quotas. In 2005 the TACs of the North Sea Subarea VI were raised to countermand underreporting practices, but the extent to which this has resolved the reporting problems in this fishery is not known. However, improved compliance and the registration of “buyers and sellers” legislation in Scotland and Ireland, should make it more difficult to make unreported landings of this species (and others). The legislation came into effect at the beginning of 2006. There has been increased enforcement on anglerfish quotas since 2006. This is expected to have led to improved data on total catches of anglerfish.

Estimates accounting for area misreporting indicate that the percentage of the catch in the years 1993–2002 averaged 60% from Division IIIa and Subarea IV, and 40% from Divisions VIa and VIb. In previous years, these proportions have been used to allocate TAC between these areas. The ratio in biomass between ICES Subareas IV and VI from recently developed surveys was approximately 52:48% (IV:VI) in 2010, although the survey does not cover all of Subarea IV.

Ghost fishing and discarding of fish not suitable for consumption due to long soaking times are considered to be a problem in some offshore gillnet fisheries carried out by “flag-vessels” targeting anglerfish in Subareas IV, VI, and VII. How effective the regulations (Council Regulation (EC) No. 43/2009) on gear length and soak time have been in mitigating this phenomenon is unknown.

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 assessment (analysis of survey trends) has not changed since last year. The abundance has decreased since 2009, but the biomass has remained relatively stable in the last two years. However, the provision of the 2011 survey data will be important in validating recent trends. The basis for the advice is the same as last year.

Assessment and management area

Two TACs are set: one TAC for EC waters of Division IIa and Subarea IV, and one for Division Vb (EC) and Subareas VI, XII, and XIV.

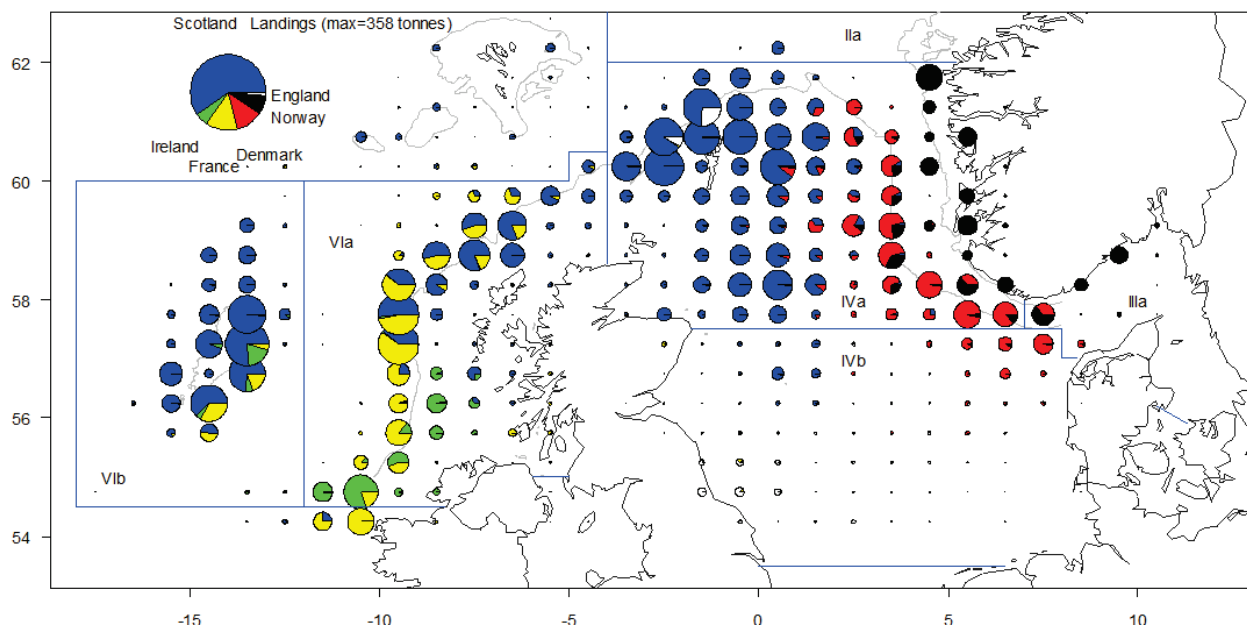


Figure 5.4.29.2 Anglerfish (*Lophius piscatorius* and *L. budegassa*). Map of the European Northern Shelf showing the distribution of reported landings of anglerfish for 2010 from Scotland, Ireland, France, Denmark, Norway, and England & Wales. The circles are centred on each ICES rectangle and segmented according to the landings of each country according to the legend (top left). The legend is divided according to the total reported landings of each country. The area of each circle is proportional to the landings in tonnes relative to the maximum as indicated. The Scottish data have been corrected according to certain assumptions about area misreporting.

Source

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

Table 5.4.29.1 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in **Division IIIa and Subarea IV** (North Sea). ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹⁾	Official landings	ICES landings
1990	Not assessed	-	-	12.4	9.5
1991	Not assessed	-	-	14.2	10.6
1992	Not assessed	-	-	16.4	11.7
1993	Not assessed	-	-	19.0	13.1
1994	Not assessed	-	-	21.7	15.4
1995	Not assessed	-	-	28.0	15.8
1996	Not assessed	-	-	26.5	16.2
1997	Not assessed	-	-	19.6	18.2
1998	Not assessed	-	22.1	15.5	14.0
1999	Not assessed	-	22.1	14.6	11.7
2000	40% reduction in catches	<9.7	17.66	15.3	11.6
2001	2/3 of the catches in 1973–1990	5.7	14.13	13.0	12.7
2002	2/3 of the catches in 1973–1990	5.7	10.50	9.9	10.3
2003	Reduce F below F_{pa}	<6.7 ²	7.0	10.4	8.3
2004	Reduce F below F_{pa}	<8.8-	7.0	9.6	9.0
2005	No effort increase	-	10.31	11.4	n.a.
2006	No effort increase	-	10.31	11.8	n.a.
2007	No effort increase	-	11.34	12.3	n.a.
2008	No effort increase	-	11.34	11.2	n.a.
2009	Same advice as last year	-	11.34	9.1	n.a.
2010	No effort increase	-	11.345 ³	12.4	n.a.
2011	Decrease effort	-	9.64		
2012	Reduce catch	-			

Weights in '000 t.

¹ TAC for EC waters of Division IIa and Subarea IV (i.e. not Division IIIa).

² Advice for Division IIIa, Subarea IV, and Division VIa combined.

³ An additional quota of 1540 t is also available for EU vessels fishing in the Norwegian zone of Subarea IV in 2010.
n.a. = not available.

Table 5.4.29.2 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in **Subarea VI** – West of Scotland and Rockall. ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹⁾	Official landings	ICES landings ²⁾
1987	Not assessed	-	7.8	5.2	5.6
1988	Not assessed	-	8.6	7.7	7.7
1989	Not assessed	-	8.6	6.0	7.3
1990	Not assessed	-	8.6	6.4	6.6
1991	No advice	-	8.6	6.0	6.3
1992	No advice	-	8.6	6.6	9.2
1993	No long-term gain in increased F	-	8.6	6.2	10.1
1994	No long-term gain in increased F	-	8.6	6.1	8.8
1995	A precautionary TAC not exceeding recent catch levels	-	8.6	7.2	12.3
1996	A precautionary TAC not exceeding recent catch levels	-	8.6	7.0	18.2
1997	Reduction in fishing effort	-	8.6	6.2	13.7
1998	Reduction in fishing effort	-	8.6	5.4	10.6
1999	Reduce fishing effort, effective implementation of the TAC	-	8.6	5.7	8.4
2000	40% reduction in catches	<7.4	8.0	4.4	7.5
2001	2/3 of the catches in 1973–1990	4.3	6.4	4.0	5.9
2002	2/3 of the catches in 1973–1990	4.3	4.8	3.0	4.8
2003	Reduce F below F_{pa}	<6.7 ³	3.18	3.1	4.1
2004	Reduce F below F_{pa}	-	3.18	3.1	3.3
2005	No effort increase	-	4.69	4.0	n.a.
2006	No effort increase	-	4.69	3.7	n.a.
2007	No effort increase	-	5.15	4.6	n.a.
2008	No effort increase	-	5.15	5.0	n.a.
2009	Same advice as last year	-	5.57	5.1	n.a.
2010	No effort increase	-	5.57	4.0	n.a.
2011	Decrease effort	-	5.46		
2012	Reduce catch	-			

Weights in '000 t.

¹⁾Division Vb(EC) and Subareas VI, XII, and XIV.

²⁾Division VIa only.

³⁾Advice for Division IIIa, Subarea IV, and Division VIa combined.

n.a. = not available.

Table 5.4.29.3 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in **Division IIIa and Subareas IV and VI combined**. ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹⁾	Official landings	ICES landings
2003	Reduce F below F_{pa}	<6.7	10.2	13.0	n.a.
2004	Reduce F below F_{pa}	<8.8	10.2	13.5	n.a.
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	13.1	n.a.
2011	Decrease effort	-	15.1		
2012	Reduce catch	-			

Weights in '000 t.

¹⁾Subarea IV, Divisions IIa (EC) and Vb(EC), and Subareas VI, XII, and XIV.

n.a. = not available.

Table 5.4.29.4 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa and Subareas IV and VI. Officially reported landings by ICES area.

	IIIa	IVa	IVb	IVc	VIa	VIb	Total
1973	140	2085	575	41	9221	127	12189
1974	202	2737	1171	39	3217	435	7801
1975	291	2887	1864	59	3122	76	8299
1976	641	3624	1252	49	3383	72	9021
1977	643	3264	1278	54	3457	78	8774
1978	509	3111	1260	72	3117	103	8172
1979	687	2972	1578	112	2745	29	8123
1980	652	3450	1374	175	2634	200	8485
1981	549	2472	752	132	1387	331	5623
1982	529	2214	654	99	3154	454	7104
1983	506	2465	1540	181	3417	433	8542
1984	568	3874	1803	188	3935	707	11075
1985	578	4569	1798	77	4043	1013	12078
1986	524	5594	1762	47	3090	1326	12343
1987	589	7705	1768	66	3955	1294	15377
1988	347	7737	2061	95	6003	1730	17973
1989	334	7868	2121	86	5729	313	16451
1990	570	8387	2177	34	5615	822	17605
1991	595	9235	2522	26	5061	923	18362
1992	938	10209	3053	39	5479	1089	20807
1993	843	12309	3144	66	5553	681	22596
1994	811	14505	3445	210	5273	777	25021
1995	823	17891	2627	402	6354	830	28927
1996	702	25176	1847	304	6408	602	35039
1997	776	23425	2172	160	5330	899	32762
1998	626	16857	2088	78	4506	900	25055
1999	660	13326	1517	24	4284	1401	21212
2000	602	12338	1617	31	3311	1074	18973
2001	621	12861	1832	21	2660	1309	19304
2002	667	11048	1244	21	2280	718	15978
2003	478	8523	847	20	2493	643	13004
2004	519	8987	851	15	2453	671	13496
2005	458	8424	688	5	3019	958	13552
2006	423	10338	685	3	2785	916	15150
2007	433	10632	749	4	3352	1260	16430
2008	486	11038	769	5	3373	1630	17300
2009	479	10096	658	8	3029	2119	16389
2010	476	7997	598	11	2696	1342	13120
Min	140	2214	575	3	1387	29	5623
Max	938	25176	3445	402	9221	2119	35039
Average	560	8743	1572	81	3972	797	15724

Table 5.4.29.5 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Divisions IIa and 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)**.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010*
Belgium	3	2	9	6	5	-	5	2	-	-	+	+	-	+	-	-	-	-	-	-
Denmark	1	3	4	5	10	4	1	2	1	+	+	.	+	+	-	-	-	-	-	-
Faroe Is.	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	3	2	1	2	4
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	1,763	1,746	1555	1,160
Germany	1	2	60	67	77	35	72	137	50	39	11	3	27	39	39	1	-	54	79	-
Ireland	250	403	428	303	720	717	625	749	617	515	475	304	322	219	356	392	470	295	328	510
Netherlands	-	-	-	-	-	-	27	1	-	-	-	-	-	-	-	-	-	-	-	-
Norway	6	14	8	6	4	4	1	3	1	3	2	1	+	+	1	1	1	2	-	1
Spain	7	11	8	1	37	33	63	86	53	82	70	101	196	110	82	76	3	174	189	-
UK(E,W&NI)	270	351	223	370	320	201	156	119	60	44	40	32	31	30	20	24	42	5	-	-
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	-	-
UK (total)																			876	1,021
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	2,696
Unallocated	296	2,638	3,816	2,766	5,112	11,148	7,506	5,234	3,799	3,114	2,068	1,882	985	1,938						
As used by WG	5,357	8,117	9,369	8,039	11,466	17,556	12,836	9,740	8,083	6,425	4,728	4,162	3,478	4,391						-

*Preliminary.

Table 5.4.29.6 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Divisions IIa and 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*
Estonia	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
Faroe Is.	-	2	-	-	-	15	4	2	2	-	1	-	-	-	-	-	-	1	4	8
France	-	-	29	-	-	-	1	1	...	48	192	43	191	175	293	224	327	327	637	23
Germany	-	-	103	73	83	78	177	132	144	119	67	35	64	66	77	72	222	0	132	
Ireland	272	417	96	135	133	90	139	130	75	81	134	51	26	13	35	53	70	76	91	107
Norway	18	10	17	24	14	11	4	6	5	11	5	3	6	5	4	6	7	5	9	12
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	
UK(E,W&NI)	99	173	76	50	105	144	247	188	111	272	197	133	133	54	93	46	146	5	-	
UK(Scot)	201	224	182	281	199	68	156	189	344	374	367	317	160	294	355	478	475	1096	-	
UK (total)																			1189	1192
Total	923	1089	681	777	830	602	899	900	1401	1074	1309	718	643	671	958	916	1260	1630	2119	1342
Unallocated									-9	17	-178	-47	145	121						
As used by WG	923	1,089	681	777	830	602	899	900	1392	1091	1131	671	788	792						

*Preliminary.

Table 5.4.29.7 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Divisions IIa and IIIa, and in Subareas IV and VI. Nominal landings (t) as officially reported to ICES and estimated by ICES of anglerfish in **Subarea VI**.

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2008	2009	2010*
Total official	5,984	6,568	6,234	6,050	7,184	7,010	6,229	5,406	5,685	4,385	3,969	2,998	3,136	3,124	3,977	3,701	5,003	5,148	4,038
Total ICES	6,280	9,206	10,050	8,816	12,296	18,158	13,735	10,640	9,475	7,516	5,859	4,833	4,266	5,183					

*Preliminary.

Table 5.4.29.8 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Divisions IIa and 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*
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	1,143
Faroes	1	-	10	18	20	-	15	10	6	.	2	+	3	11	22	2	+	-	4	
France	124	151	69	28	18	7	7	3*	18 ^{1*}	8	9	8	8	8	4	7	13	13	48	6
Germany	71	68	100	84	613	292	601	873	454	182	95	95	65	20	84	173	186	344	216	
Netherlands	23	44	78	38	13	25	12	-	15	12	3	8	9	38	13	14	14	12	5	8
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
Sweden	14	7	7	7	2	1	2	8	8	78	44	56	8	6	5	5	20	67	...	4
UK(E, W&NI)	129	143	160	169	176	439	2,174											13		
UK	7,039	7,887	9,712	11,683	15,658	22,344	18,783	668	781	218	183	98	104	83	34	99	303			
(Scotland)																				
UK (total)								13,319	9,710	9,559	10,024	8,539	6,033	6,284	6,003	7,722	8304			
																			7,830	6101
Total	9,235	10,209	12,309	14,505	17,891	25,176	23,425	16,857	13,326	12,338	12,861	11,048	8,523	8,987	8,424	10,338	10,632	11,038	10,096	7,997

* Preliminary.

Table 5.4.29.9 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Divisions IIa and 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*
Belgium	357	538	558	713	579	287	336	371	270	449	579	435	180	260	207	138	179	181	134	124
Denmark	345	421	347	350	295	225	334	432	368	260	251	255	191	274	237	276	173	237	248	194
Faroes	-	-	2	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-
France	-	1	-	2	-	-	-	-*	... ^{1*}	-	-	-	-	+	-	-	-	-	9	6
Germany	4	2	13	15	10	9	18	19	9	14	9	17	11	11	9	14	12	22	17	-
Ireland													1	-	-	-	-	-	-	-
Netherlands	285	356	467	510	335	159	237	223	141	141	123	62	42	25	31	33	61	58	36	46
Norway	17	4	3	11	15	29	6	13	17	9	15	10	12	22	16	14	24	15	21	10
Sweden	-	-	-	3	2	1	3	3	4	3	2	9	2	1	4	4	6	9	-	5
UK(E, W&NI)	669	998	1,285	1,277	919	662	664	603	364	423	475	236	167							
UK	845	733	469	564	472	475	574	424	344	318	378	210	241	120	96	108	122	105		
(Scotland)																				
UK (total)														138	88	98	172	142		
																			193	213
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	658	598

* Preliminary.

Table 5.4.29.10 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Divisions IIa and 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*
Belgium	13	12	34	37	26	28	17	17	11	15	15	16	9	5	4	3	3	4	6	7
Denmark	2	+	-	+	+	+	+	+	+	+	+	+	+	+	+	-	-		-	-
France	-	-	-	-	-	-	-	10	-	+	-	+	-	-	-	-	-	+	-	1
Germany	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-
Netherlands	5	10	14	20	15	17	11	15	10	15	6	5	1	-	1	-	1	1	-	2
Norway	-	-	-	-	+	-	-	-	+	-	+	-	-	-	-	-	-	-	1	-
UK(E&W&NI)	6	17	18	136	361	256	131	36	3	1	-	-	10	3	-	-	-	...	-	-
UK (Scotland)	-	-	-	17	-	3	1	+	+	+	-	-	-	7	-	-	-	...	-	-
UK (Total)																		+	1	1
Total	26	39	66	210	402	304	160	78	24	31	21	21	20	15	5	3	4	5	8	11

* Preliminary.

Table 5.4.29.11 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Divisions IIa and 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*
Total	11,783	13,301	15,519	18,162	20,920	27,327	25,757	19,023	14,867	13,986	14,714	12,313	9,390	9,853	9,117	11,026	11,385	11,812	10,762	8,606
WG estimate	10,566	11,728	13,078	15,432	15,794	16,240	18,217	14,027	11,719	11,564	12,677	10,334	8,273	9,027						
Unallocated	-1,217	-1,573	-2,441	-2,730	-5,126	-	-7,540	-4,996	-3,148	-2,422	-2,037	-1,979	-	-826						
						11,087							1,117							

* Preliminary.

Table 5.4.29.12 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Divisions IIa and 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*
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
Germany	-	-	1	-	-	1	1	1	2	1	-	1	-	1	1	2	1	1	1	-
Netherlands							-	-	-	-	-	.	3	4	4	3	1	3	-	5
Norway	64	170	154	263	440	309	186	177	260	197	200	242	189	130	100	137	132	144	134	158
Sweden	23	62	89	68	36	25	39	33	36	27	46	55	71	73	79	54	44	51	...	43
Total	595	938	843	811	823	702	776	626	660	602	621	667	478	519	458	423	433	486	479	476

*Preliminary.

Table 5.4.29.13 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Divisions IIa and 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 IIa**.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010*
Denmark											2			1						
Faroes	2										1	1	2	5	11	4	7	4	2	1
France																1				
Germany	1	1	2	3	1	4	20	53	4	17	65	59	55	70	55					
Norway	180	488	3044	1027	526	893	576	1488	1731	2952	3552	2000	2404	2906	2649	4253	4455	3999	4289	5351
Sweden																				
UK(E, W&NI)	1	1	1	2		13	1											1		
UK (Scotland)	1				74	2	4	1	1	20		1				1	105			40
UK (total)								6	5	10	2	10						137		
													15	18	19	85	10		152	
Total	185	490	3047	1032	601	912	601	1548	1741	2999	3620	2071	2476	2999	2734	4344	4577	4143	4451	5392

*Preliminary.

ECOREGION Celtic Seas
STOCK Herring in Division VIa (North)

Advice summary for 2012

ICES advises on the basis of the agreed west of Scotland herring management plan that the TAC for 2012 should be set at 22 900 t.

Stock status

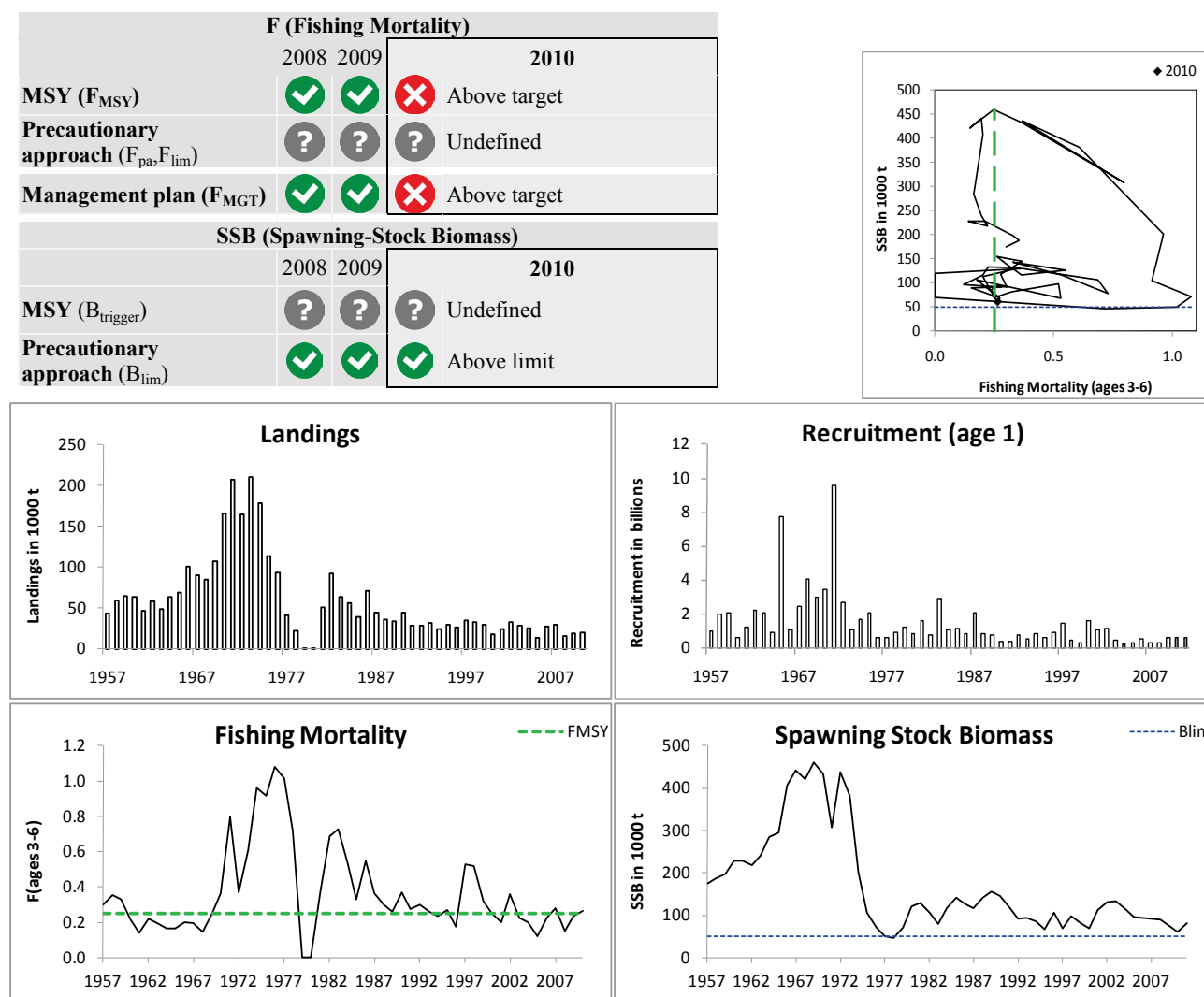


Figure 5.4.30.1 Herring in Division VIa (North). Summary of stock assessment (weights in '000 tonnes). Estimates are shaded Top right: SSB and F over the years.

ICES considers that the stock over recent years has been fluctuating at a low level. Fishing mortality has fluctuated around F_{MSY} in recent years. Recruitment has been low since 2003.

Management plans

A management plan has been adopted by the EU in 2008 ([Council Regulation \(EC\) 1300/2008](#)). ICES has evaluated the plan and concludes that it is in accordance with the precautionary approach.

Biology

This autumn-spawning stock is considered a 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 are ongoing to evaluate the level of mixing in the acoustic survey. The effect of mixing in the fishery is expected to be lower than in previous years, but is unknown.

Environmental influence on the stock

Temperatures and salinity in this area have been increasing over recent decades. It is known that similar environmental changes have affected the North Sea herring. There has been a reduction of the productivity of the Division VIa (North) stock since the late 1980s.

The fisheries

Fisheries take place in pair trawlers in shallow, coastal waters, and single trawls, purse seiners and freezer trawlers offshore. 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 by fleet Catch (2010) = 19 877t (68% pelagic freezer trawlers and 32% 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 continues to be a problem, with almost all countries taking catches of herring in other areas and reporting it into Division VIa (North). However, routine use of VMS has reduced the problem.

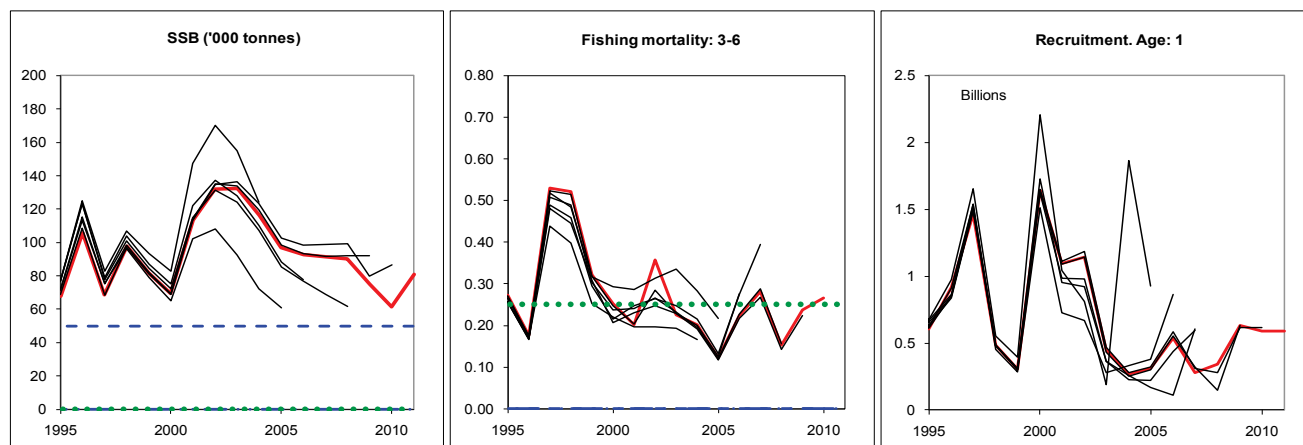


Figure 5.4.30.2 Herring in Division VIa North. Historical assessment results (final year recruitment estimates included).

Scientific basis

Assessment type	Age-based analytical (FLICA).
Input data	One acoustic survey index (MSHAS_N); commercial landing data.
Discards and bycatch	Not considered relevant.
Indicators	None.
Other information	Last informal full range of model settings tested in 2009.
Working group report	HAWG

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). HAWG 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)

Yield and spawning biomass per Recruit F-reference points (2011):

	Fish Mort Ages 3-6	Yield/R	SSB/R
Average last 3 years	0.22	0.04	0.17
F _{max} ^[*]	-	-	-
F _{0.1}	0.18	0.04	0.20
F _{35%SPR}	0.18	0.04	0.20

^[*]F_{max} is not well defined.

Outlook for 2012

Basis: F (2011) = F_{sq} (avg 2008–2010)scaled = 0.26, SSB (2011)¹ = 81; landings (2011) = 18.5 R(2010–2012) = (GM1989–2009) = 588.1 million.

Rationale	Landings (2012)	SSB (2012) ¹	Basis	F (2012)	SSB (2013)	SSB change ²	TAC change ³
Management Plan	22.9	85.4	F _{sq} *0.945	0.25	87.7	+ 3 %	+ 2 %
MSY Framework	22.9	85.4	F _{MSY}	0.25	87.7	+ 3 %	+ 2 %
Zero catch	0	98.9	F=0	0	120.8	+ 22 %	- 100 %
Status quo	18.0	88.3	F _{sq} *0.725	0.193	94.3	+ 7 %	- 20 %
	22.5	85.6	F _{sq} *0.925	0.246	88.3	+ 3 %	0 %
	27.0	82.8	F _{sq} *1.14	0.303	82.3	- 1 %	+ 20 %

Weights in '000 tonnes.

¹⁾For autumn-spawning stocks, the SSB is determined at spawning time and is influenced by fisheries between 1 January and spawning.

²⁾SSB 2013 relative to SSB 2012.

³⁾Landings 2012 relative to TAC 2011.

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 22 900 t in 2012 which is expected to lead to a TAC increase of 2%.

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 recent changes in stock dynamics and the changes to the plan had not significantly increased the risks.

MSY approach

Following the ICES MSY framework implies fishing mortality at $F_{MSY} = 0.25$, resulting in landings of less than 22 900 t in 2012. This is expected to lead to an SSB of 87 700 t in 2013. As no MSY $B_{trigger}$ has been identified for this stock, the ICES MSY framework has been applied with F_{MSY} without consideration of SSB in relation to MSY $B_{trigger}$.

Additional considerations

Ecosystem changes

A recent study (Hammond and Harris, 2006) of seal diets off western Scotland revealed that grey seals may be an important predator for herring in this area. The numbers of seals in Division VIaN is thought to have increased over the last decades. 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 takes place in quarter 3 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 or 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 catches comprise a mixture of fish from Divisions VIa (North), VIa (South) and VIIb,c, and VIIaN. If there is an increasing catch on the mixed fishery in Division VIa (North), this should be considered in the management of the Division VIaS and VIIb,c component, which is in a depleted state. In 2008 ICES began to evaluate management for this Division VIa (South) and VIIb,c and VIIa (North). ICES is working to achieve an assessment take mixing into account.

Comparison with previous assessment and advice

SSB(2010) was revised downwards by 35% and F(2009) upwards by 6 % this year compared to last year.

The basis for the advice is the same as last year.

Sources

- Hammond, P. S., and Harris, R. N. 2006. Grey seal diet composition and prey consumption off western Scotland and Shetland. Final Report to Scottish Executive, Environment and Rural Affairs Department and Scottish Natural Heritage.
- ICES. 2011. Report of the Herring Assessment Working Group for the Area South of 62°N, 16–24 March 2011. ICES CM 2011/ACOM:06.
- Simmonds, J. and Keltz, S., 2007. Management implications and options for a stock with unstable or uncertain dynamics: West of Scotland herring. ICES Journal of Marine Science, 64: 679–685.

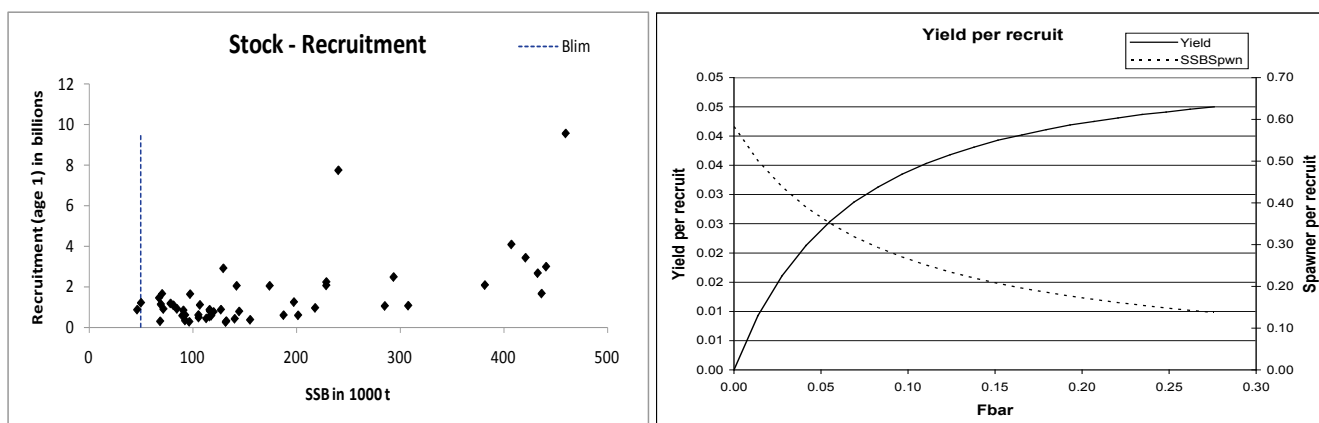


Figure 5.4.30.3 Herring in Division VIa North. Stock–recruitment relationship and yield- and SSB-per-recruit plot.

Table 5.4.30.1 Herring in Division VIa (North). ICES advice, management, and catches.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Disc. slip.	ICES Catch 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 (agreed management plan)	24	24.42	0.1	20
2011	See scenarios	22.48	22.48		
2012	F = 0.25 (agreed management plan)	< 22.9			

Weights in '000 t.

¹⁾ Adjusted for misreporting.²⁾ Catch at *status quo* F.³⁾ Revised in 1999.⁴⁾ Revised in 2007.

Table 5.4.30.2

Herring in Division VIa (North). Catch in tonnes by country, 1987–2010. These figures do not correspond in all cases to the official statistics and cannot be used for management purposes.

Country	1987	1988	1989	1990	1991	1992	1993	1994
Denmark								
Faroes				326	482			274
France	136	44	1342	1287	1168	119	818	5087
Germany	1711	1860	4290	7096	6450	5640	4693	7938
Ireland	6800	6740	8000	10000	8000	7985	8236	6093
Netherlands	5212	6131	5860	7693	7979	8000	6132	8183
Norway	4300	456		1607	3318	2389	7447	30676
UK	26810	26894	29874	38253	32628	32730	32602	-4287
Unallocated	18038	5229	2123	2397	-	-5485	-3753	700
Discards			1550	1300	1180	200		
Total	63007	47354	53039	69959	50608	51578	56175	54664
Area-	-18647	-11763	-19013	-	-	-22593	-24397	-30234
WG Estimate	44360	35591	34026	44693	28529	28985	31778	24430
Source (WG)	1989	1990	1991	1993	1993	1994	1995	1996

Country	1995	1996	1997	1998	1999	2000	2001	2002
Faroes								800
France	3672	2297	3093	1903	463	870	760	1340
Germany	3733	7836	8873	8253	6752	4615	3944	3810
Ireland	3548	9721	1875	11199	7915	4841	4311	4239
Netherlands	7808	9396	9873	8483	7244	4647	4534	4612
Norway	4840	6223	4962	5317	2695			
UK	42661	46639	44273	42302	36446	22816	21862	20604
Unallocated	-4541	-17753	-8015	-	-8155			878
Discards			62	90				
Total	61271	64359	64995	65799	61514	37789	35411	36283
Area-	-32146	-38254	-29766	-	-	-19467	-11132	-8735
WG Estimate	29575	26105	35233*	33353	29736	18322 ^s	24556 ^s	32914 ^s
Source (WG)	1997	1997	1998	1999	2000	2001	2002	2003

Country	2003	2004	2005	2006	2007	2008	2009	2010
Faroes	400	228	1810	570	484	927	1544	70
France	1370	625	613	701	703	564	1049	511
Germany	2935	1046	2691	3152	1749	2526	27	3583
Ireland	3581	1894	2880	4352	5129	3103	1935	2728
Netherlands	3609	8232	5132	7008	8052	4133	5675	3600
Norway								
UK	16947	17706	17494	18284	17618	13963	11076	12018
Unallocated	-7							
Discards		123	772	163				95
Total	28835	29854	31392	34230	33735	25216	21306	22510
Area-	-3581	-7218	-17263	-6884	-4119	-9162	-2798	-2728
WG Estimate	28081 ^s	25021 ^s	14129 ^s	27346	29616	16054	18508	19877
Source (WG)	2004	2005	2006	2007	2008	2009	2010	2011

Table 5.4.30.3

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

Year	Recruitment Age 1 (thousands)	SSB Tonnes	Fbar (Ages 3-6)	Landings Tonnes
1957	1030679	174398	0.2993	43438
1958	2009074	187830	0.3536	59669
1959	2051919	197825	0.3288	65221
1960	605231	229110	0.2128	63759
1961	1249162	229080	0.1397	46353
1962	2240089	218288	0.2217	58195
1963	2071905	240738	0.1956	49030
1964	963114	285512	0.1635	64234
1965	7747943	294012	0.1672	68669
1966	1058405	407680	0.2022	100619
1967	2485734	441171	0.196	90400
1968	4091826	421337	0.1471	84614
1969	2996445	460042	0.2476	107170
1970	3438117	433059	0.3647	165930
1971	9564545	308128	0.7983	207167
1972	2674778	436835	0.3688	164756
1973	1073108	382076	0.6093	210270
1974	1669559	201883	0.9622	178160
1975	2087623	105647	0.9153	114001
1976	599081	71891	1.0802	93642
1977	615080	50275	1.0181	41341
1978	906923	46608	0.7166	22156
1979	1214030	70607	0.0008	60
1980	877303	120278	0.0004	306
1981	1653290	129730	0.368	51420
1982	763072	107109	0.6861	92360
1983	2915059	78734	0.7292	63523
1984	1110270	116420	0.5328	56012
1985	1185789	142534	0.329	39142
1986	875469	127401	0.5501	70764
1987	2051745	116879	0.3637	44360
1988	876338	140689	0.2999	35591
1989	806790	155587	0.2591	34026
1990	426677	145013	0.3676	44693
1991	376175	118059	0.2765	28529
1992	788857	91153	0.3018	28985
1993	574682	92859	0.2601	31778
1994	842040	85041	0.2358	24430
1995	603039	67752	0.2723	29575
1996	914121	105933	0.176	26105
1997	1463902	68773	0.5293	35233
1998	486706	97683	0.5206	33353
1999	303901	81518	0.3214	29736
2000	1641178	69353	0.2519	18322
2001	1093739	113311	0.2023	24556
2002	1142677	132036	0.3575	32914
2003	446257	132540	0.2247	28081
2004	266886	116523	0.2022	25021
2005	312348	96873	0.1219	14129
2006	535371	92837	0.2244	27346
2007	277382	91319	0.2807	29616
2008	342339	90128	0.1522	16054
2009	630167	74800	0.2376	18508
2010*	588137	61649	0.2656	19877
2011*	588137	80998		
Average	1494622			

*geometric mean 1989-2009; 2011 predicted SSB

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

Advice for 2012

There is insufficient information to evaluate the status of stock. Therefore, based on precautionary considerations, ICES advises that no increase of the catches should take place unless there is evidence that this will be sustainable.

Stock status

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

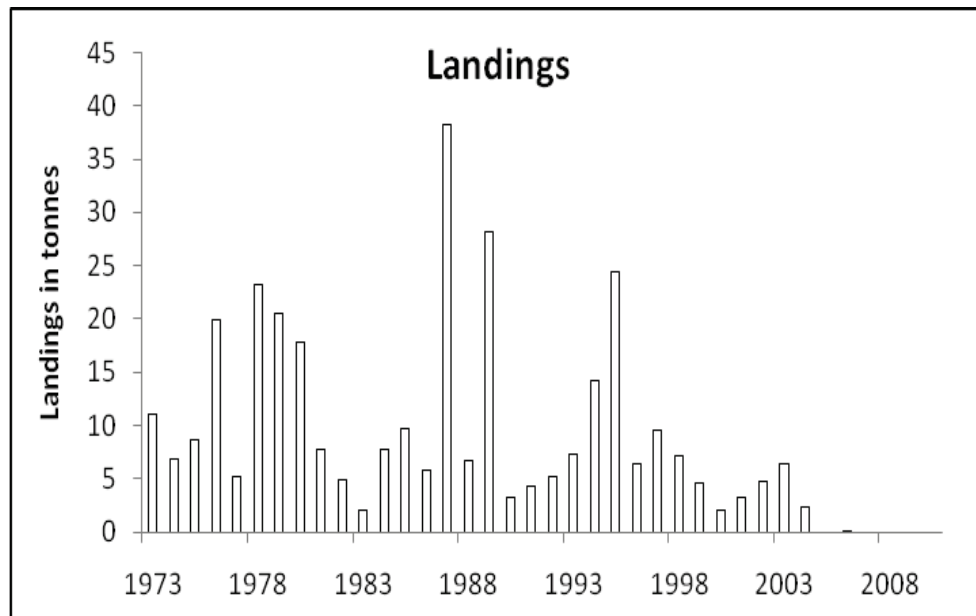


Figure 5.4.31.1 Norway pout in Division VIa. Total landings (tonnes).

The available information is inadequate to evaluate stock trends relative to risk, so the state of the stock is unknown. The only data available are official landings statistics which have been highly variable and do not provide an adequate basis for scientific advice.

Sources

Eurostat/ICES database on catch statistics - ICES 2010 Copenhagen

Table 5.4.31.1 Norway pout in Division VIa (West of Scotland). Official landings (tonnes) by country.

	Denmark	Faeroe Islands	Germany	Netherlands	Norway	Poland	Sweden	UK	Russia	Total
1971	363	0	0	0	0	0	0	1621	0	1984
1972	186	0	0	0	0	0	6786	3757	0	10729
1973	42	1743	0	0	0	0	0	9276	0	11061
1974	0	1581	179	0	144	75	0	4826	50	6855
1975	193	1524	0	322	0	0	0	6620	36	8695
1976	0	6203	8	147	82	0	0	6346	7147	19933
1977	0	2177	0	230	0	0	0	2799	0	5206
1978	4443	18484	0	21	0	0	0	302	0	23250
1979	15609	4772	0	98	0	0	0	23	0	20502
1980	13070	3530	0	68	0	0	0	1202	0	17870
1981	2877	3540	0	182	0	0	0	1158	0	7757
1982	751	3026	0	548	0	0	0	586	0	4911
1983	530	0	0	1534	0	0	0	0	0	2064
1984	4301	3400	0	0	0	0	0	23	0	7724
1985	8547	998	0	139	0	0	0	13	0	9697
1986	5832	0	0	0	0	0	0	1	0	5833
1987	37714	0	0	0	0	0	0	553	0	38267
1988	5849	376	0	0	0	0	0	517	0	6742
1989	28180	11	0	0	0	0	0	5	0	28196
1990	3316	0	0	0	0	0	0	0	0	3316
1991	4348	0	0	0	0	0	0	0	0	4348
1992	5147	0	0	10	0	0	0	1	0	5158
1993	7338	0	0	0	0	0	0	0	0	7338
1994	14147	0	0	0	0	0	0	1	0	14148
1995	24431	0	1	7	0	0	0	0	0	24439
1996	6175	0	0	7	0	0	0	140	0	6322
1997	9549	0	0	0	0	0	0	13	0	9562
1998	7186	0	0	0	0	0	0	0	0	7186
1999	4624	0	0	1	0	0	0	0	0	4625
2000	2005	0	0	0	0	0	0	0	0	2005
2001	3214	0	0	0	0	0	0	0	0	3214
2002	4815	4	0	0	0	0	0	0	0	4819
2003	6395	0	2	0	0	0	0	0	0	6397
2004	2281	0	0	0	0	0	0	4	0	2285
2005	0	0	0	0	0	0	0	0	0	0
2006	32	0	0	0	0	0	0	0	0	32
2007	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0

ECOREGION Celtic Sea and West of Scotland
STOCK Sandeel in Division VIa

Advice for 2012

There is insufficient information to evaluate the status of stock. Therefore, based on precautionary considerations, ICES advises that no increase of the catches should take place unless there is evidence that this will be sustainable.

Stock status

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

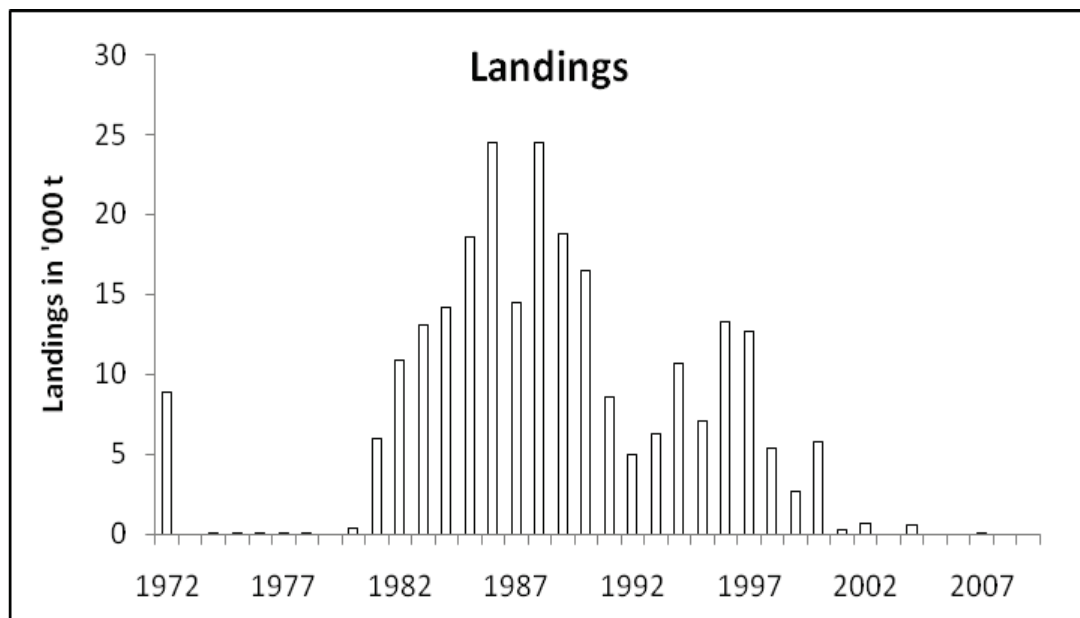


Figure 5.4.32.1 Sandeel in Division VIa. Total landings (tonnes).

The available information is inadequate to evaluate stock trends relative to risk, so the state of the stock is unknown. The only recent data available are official landings statistics which have been highly variable and do not provide an adequate basis for scientific advice. The stock was last assessed in 1996.

Sources

Eurostat/ICES database on catch statistics - ICES 2010 Copenhagen

Figure 5.4.32.1 Sandeel in Division VIa. Total landings per country (tonnes).

Country	Denmark	Faeroe Islands	Norway	Spain	Sweden	UK - Scotland	Total
1972	-	.	-	-	8847	-	8847
1973	-	.	-	-	-	-	0
1974	-	.	-	-	-	<0.5	<0.5
1975	-	.	19	-	-	<0.5	19.5
1976	-	.	17	-	-	<0.5	17.5
1977	-	.	54	-	-	13	67
1978	-	.	-	-	-	<0.5	<0.5
1979	-	.	-	-	-	-	0
1980	109	.	-	-	-	211	320
1981	-	.	-	-	-	5972	5972
1982	-	.	-	-	-	10873	10873
1983	-	.	-	-	-	13051	13051
1984	-	.	-	-	-	14166	14166
1985	-	.	-	-	-	18586	18586
1986	-	.	-	-	-	24469	24469
1987	-	.	-	-	-	14479	14479
1988	-	.	-	-	-	24465	24465
1989	-	.	-	-	-	18785	18785
1990	-	.	-	-	-	16515	16515
1991	-	.	-	-	-	8532	8532
1992	-	.	-	-	-	4985	4985
1993	80	.	-	-	-	6156	6236
1994	-	.	-	-	-	10627	10627
1995	-	.	-	-	-	7111	7111
1996	-	.	-	-	-	13257	13257
1997	-	.	-	-	-	12679	12679
1998	-	.	-	5	-	5320	5325
1999	-	.	-	-	-	2627	2627
2000	-	.	-	-	-	5771	5771
2001	-	.	-	-	-	295	295
2002	-	.	-	-	-	706	706
2003	-	.	-	-	-	-	0
2004	-	.	-	-	-	566	566
2005	-	.	-	-	-	-	0
2006	-	.	-	-	.	.	0
2007	.	57	-	.	.	.	57
2008	.	-	.	.	.	.	0
2009	.	.	.	.	.	.	0

ECOREGION Celtic Sea
STOCK *Nephrops* in Division VIa

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 (FU) (Figure 5.4.33.1).

Section	FU no.	Name	ICES area	Statistical rectangles
5.4.33.1	11	North Minch	VIa	44–46 E3–E4
5.4.33.2	12	South Minch	VIa	41–43 E2–E4
5.4.33.3	13	Firth of Clyde + Sound of Jura	VIa	39–40 E4–E5

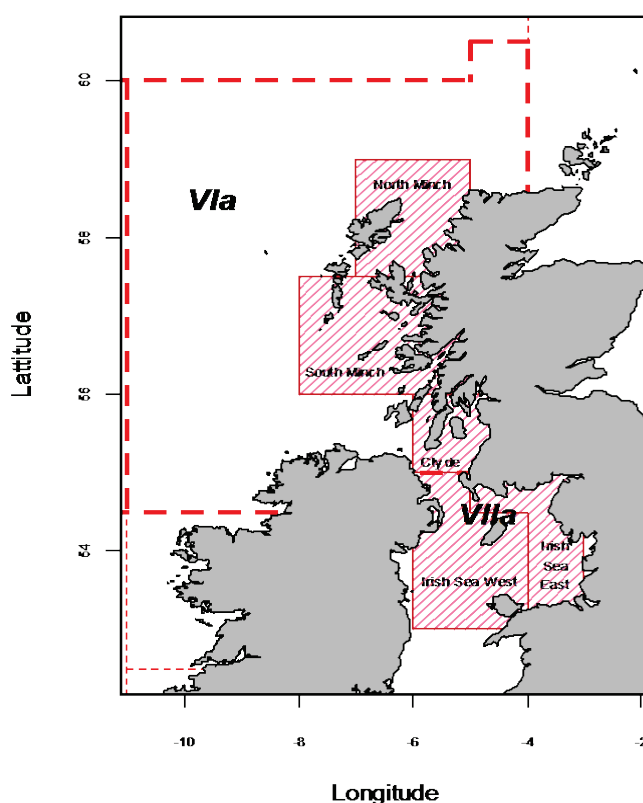


Figure 5.4.33.1 *Nephrops* functional units in Subarea IV and Division VIIa (see Section 5.4.34).

Advice for 2012

The advice for *Nephrops* stocks is given by functional units in Sections 5.4.33.1–3. A summary can be found in Table 5.4.33.1.

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. Advice for the FUs in Division VIa has slightly increased. On the basis of precautionary considerations, ICES advises that the catches in the other rectangles should not increase.

Table 5.4.33.1 *Nephrops* in Division VIa. Summary of ICES advice by functional unit 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	
2012	< 3.2	< 5.5	< 4.2	< 0.9	⁴⁾	- ³⁾		

Weights in '000 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 lower 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.

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 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.

Additional considerations

MSY approach for stocks with UWTV surveys

No precautionary reference points have been defined for *Nephrops*. Under the new ICES MSY framework, 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} ($F_{0.1}$, $F_{35\%SPR}$, and F_{max}) were derived from a length-based per recruit analysis (these may be modified following further data exploration and analysis). Then an appropriate F_{MSY} candidate was selected for each functional unit independently, taking into account the following factors: observed burrow density, harvest rates, 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	> 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 strong difference in relative exploitation rates between the sexes in 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 picked instead of the combined proxy.

Where possible, a preliminary MSY $B_{trigger}$ was proposed based on the lowest observed UWTV abundance.

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 and this has historically resulted in inappropriate harvest rates from some parts.

Following changes to UK legislation in 2006, the reliability of UK landings data is considered to have significantly improved. Provided this is true and that it continues in the future, assessment scientists will eventually have data which could be used to parameterize dynamic stock assessment models, which in turn will allow direct estimation of F_{MSY} rather than having to rely on proxies. Until this point, the decision of which F_{MSY} proxy is suitable for which FU will inherently be a subjective process, but the process outlined above should provide sufficient justification to support the decision.

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. To provide some guidance on appropriate future landings for these areas, ICES advises that the catches in the other rectangles should not increase.

There are no functional units in ICES Division VIb, but occasional small *Nephrops* landings occur (Table 5.4.33.4).

Factors affecting the fisheries and the stock

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 20%. In 2009 the mesh size was increased from 70 mm to 80 mm.

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) and effort in the *Nephrops* fisheries has been relatively stable.

Scientific basis

Data and methods

The assessment and advice for *Nephrops* stocks in Division VIa is primarily based on abundance estimates from underwater TV (UWTV) surveys together with fishery landings data and estimates of quantities of discards. Additional indicators of changes in stocks are derived from trends in length compositions and sex ratio in the catches. 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. WKNEPH (ICES, 2009) 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 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 discarding of dead *Nephrops* in the years covered by the assessment model.

Catch options tables for 2011 are derived for a range of F_{MSY} 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 of proportion retained and the mean weight in the landings.

Uncertainties in assessment and forecast

There is a gap of 18 months between the survey and the start of the year for which the assessment is used to set management levels. It is assumed that the stock is in equilibrium during this period (i.e. recruitment and growth balance mortality) although this is rarely the case. The effect of this on the accuracy of the catch forecast has not been investigated. 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 3-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 proxies 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. New 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 in 2010 was extended 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 and the discard rates also arise. A three-year average of discard rates (2008–2010) 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. Because of this the final assessment adopted is independent of official statistics. Harvest ratios since 2006 are also considered more reliable due to more accurate landings data reported under new legislation. The incorporation of creel length compositions since the 2010 assessment has also improved estimates of harvest ratios.

Sources

ICES. 2009. Report of the Benchmark Workshop on *Nephrops* (WKNEPH), 2–6 March 2009, Aberdeen, UK. ICES CM 2009/ACOM:33.

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

Table 5.4.33.2 *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	-	-	-	12,199	12,244

*Preliminary.

Table 5.4.33.3 *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	555	12244

* Provisional.

Table 5.4.33.4 *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

* Provisional.

ECOREGION Celtic Sea
STOCK *Nephrops* in North Minch (FU 11)

Advice for 2012

ICES advises on the basis of the MSY approach that landings in 2012 should be no more than 3200 t.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)			
	2008	2009	2010
MSY (F_{MSY})	✗	✗	✓
Precautionary approach (F_{pa}, F_{lim})	?	?	?

SSB (Spawning-Stock Biomass)			
	2009	2010	2011
MSY ($B_{trigger}$)	✓	✓	✓
Precautionary approach (B_{pa}, B_{lim})	?	?	?

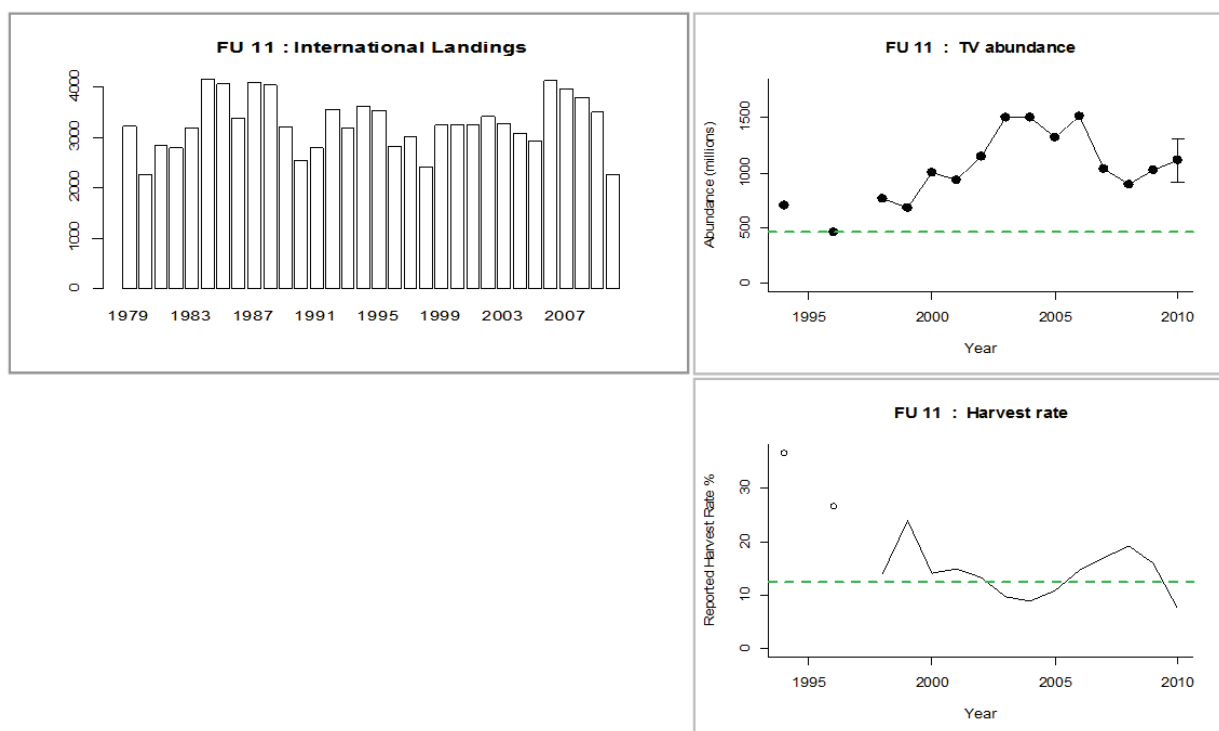


Figure 5.4.33.1.1 *Nephrops* in North Minch (FU 11). Landings (tonnes), UWTV survey abundance (millions; SSB proxy), and harvest rate (fishing mortality proxy). Harvest rates before 2006 may be unreliable due to underreporting of landings. Green dashed lines represent MSY $B_{trigger}$ and F_{MSY} harvest ratios.

The harvest ratios (dead removals/TV abundance) has fluctuated around the F_{MSY} proxy. The stock has been above MSY $B_{trigger}$ for more than 10 years.

Management plans

No specific management objectives are known to ICES.

Biology

The general biology of *Nephrops* is discussed in the overview (Section 5.4.33). The North Minch stock consistently exhibits medium densities compared to other stocks.

The fisheries

The fishery has been fairly stable over the time-series, but a 35% drop in landings has been observed in 2010 which seems to be mainly related to market conditions. 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 creel numbers is not known and measures to regulate the fishery are not in place.

Catch by fleet	Total catch (2010) = 2384 t, where 2263 t are landings (76% <i>Nephrops</i> trawl, 24% creel) and 121 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 new legislation. Incorporation of length compositions of creel catches has also improved estimates of harvest ratios. The survey area in 2010 was extended and now corresponds to the VMS distribution of fishing effort.

Scientific basis

Assessment type	UWTV and trends.
Input data	One survey index (UWTV-FU11).
Discards and bycatch	Discards included in the assessment.
Indicators	Size structure of catches.
Other information	Latest benchmark was performed in 2009.
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* in North Minch (FU 11)

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY	MSY B _{trigger}	465 million individuals	Bias-adjusted lowest observed UWTV survey estimate of abundance
Approach	F _{MSY}	12.5% harvest rate	Equivalent to F _{35%SpR} combined sex in 2010
Precautionary Approach	Not agreed		
	Not agreed		

(unchanged since: 2011)

MSY B_{trigger} was revised to take account of VMS area and rescaling of the historic abundance estimates in 2011.

Harvest ratio reference points (2010):

	Male	Female	Combined
F _{max}	12.2	37.2	16.6
F _{0.1}	7.4	19.8	8.7
F _{35%SpR}	8.7	21.7	12.5

For this FU, the absolute density observed on the UWTV survey is medium (~0.59 burrow/m²). Historical harvest ratios in this FU have been above that equivalent to fishing at F_{max} and landings have been relatively stable in the last thirty years. F_{35%SpR} (combined between sexes) is expected to deliver high long term yield with a low probability of recruitment overfishing and therefore is chosen as a proxy for F_{MSY}.

All F_{MSY} proxy harvest rate and MSY B_{trigger} values remain preliminary and may be modified following further data exploration and analysis.

Outlook for 2012

Basis: F₂₀₁₁ = F₂₀₁₀ = 7.6 %; Bias corrected survey index (2010) = 1115 million; Mean weight in landings (08-10) = 26.16 g; Dead discard rate (by number) = 11.2 %; Survey bias = 1.33.

	Harvest rate	Landings (tonnes)
F _{MSY}	12.5%	3200
F ₂₀₁₁	7.6%	2000
F _{0.1}	8.7%	2300
F _{35%SpR}	12.5%	3200
F _{max}	16.6%	4300

MSY approach

Following the ICES MSY framework implies the harvest ratio for the North Minch Functional Unit to be less than 12.5 %, resulting in landings less than 3200 t in 2012.

Additional considerations

Mean sizes in the length compositions of catches (of individuals >35 mm CL) are stable (Figure 5.4.33.1.2). Recent work using VMS has refined the estimate of the area. However, the survey should still be considered as a minimum estimate since areas of suitable sediment in the sea lochs are not included.

Change in the fisheries

The *Nephrops* (TR2) fleet has been observed to have extremely 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. Twin-rig vessels tend to use a 200 mm square-meshed panel (with a 100 mm codend). This means that they do not catch bulk quantities and this leads to *Nephrops* of larger average size and quality suitable for storage using 'individual tubing'. Reported effort by all Scottish *Nephrops* trawlers has shown a gradual decreasing trend since 2002.

Data and methods

Underwater TV (UWTV) surveys have been conducted for this stock since 1994, with annual surveys available since 1998. There is a gap of 18 months between the survey and the start of the year for which the assessment is used to set management levels. It is assumed that the stock is in equilibrium during this period (i.e. recruitment and growth balance mortality) although this is rarely the case. The effect of this assumption on precision of the catch forecast has not been investigated.

Anecdotal evidence from the fishing industry that some areas outside the "Sediment area" could be suitable ground for *Nephrops* were confirmed by new VMS data linked to landings and as such, the absolute abundance estimate was likely to be an underestimate. To account for this, the VMS area in the North Minch was used to generate the sampling stations for the 2010 survey and the burrow densities were raised accordingly. A correction ratio calculated as 1.41 (VMS area / Sediment area) was applied to back-calculate the abundance estimates in previous years.

Uncertainties in the assessment and forecast

The discard rate has been highly variable in recent years and a large decline in discard rates in 2010 was observed. This introduces uncertainties in F_{MSY} estimates and catch forecast. The cumulative bias estimates for empty burrows for FU 11 are largely based on expert opinion. The precision of these bias corrections cannot yet be characterized.

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. It is known that most of the sea lochs have areas of mud substrate and are typically fished by creel boats. In recent years, 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.

Comparison with previous assessment and advice

The basis for the advice is the same as last year. The survey area in 2010 was based on the VMS distribution of fishing effort (rather than the British Geological Survey sediment area estimate). Last year's advice was based on a transition to a F_{MSY} proxy, this year the harvest rate is below F_{MSY} and the advice is based on the MSY framework.

Source

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

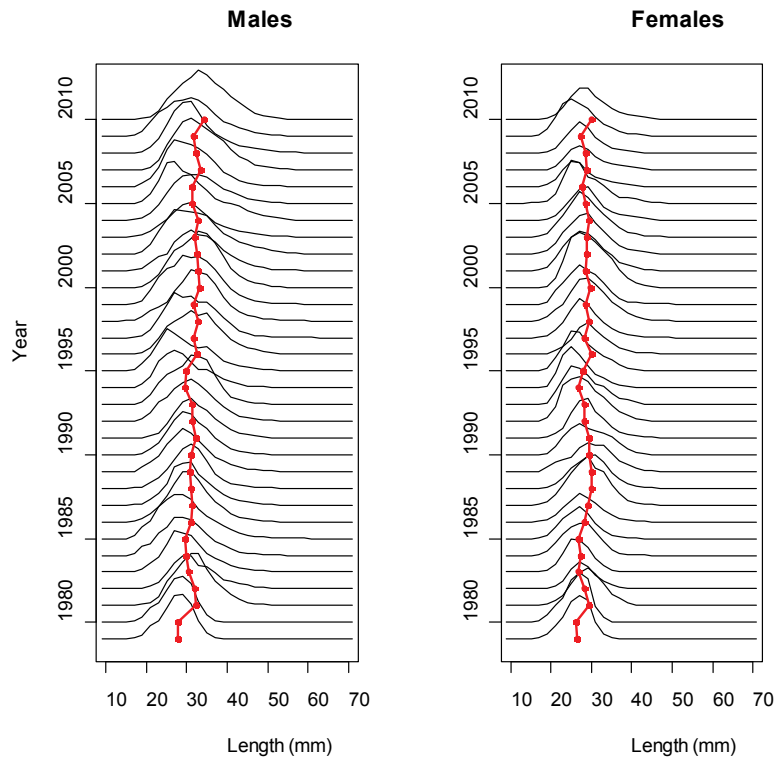


Figure 5.4.33.1.2 *Nephrops* in North Minch (FU 11). Length composition of catch of males (left) and females (right) from 1979 (bottom) to 2010 (top). Mean sizes of catch (red line) is also shown.

Table 5.4.33.1.1 *Nephrops* in North Minch (FU 11). ICES advice, management, and landings.

Year	ICES advice	Advice for North Minch (FU 11)	ICES landings (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
2000	maintain current effort		3.2
2001	as for 2000		3.3
2002	maintain current effort		3.4
2003	as for 2002		3.3
2004	maintain current effort		3.1
2005	as for 2004		3.0
2006	No increase in effort		4.2
2007	No increase effort and harvest rate of 15%	3.2	4.0
2008	As for 2007	3.2	3.8
2009	No increase effort and recent average catch	< 4.1	3.5
2010	Harvest Rate no greater than that equivalent to fishing at $F_{0.1}$	< 1.0	2.3
2011	MSY transition scheme	< 3.1	
2012	MSY framework	< 3.2	

Weights in '000' tonnes.

Table 5.4.33.1.2 *Nephrops* in North Minch (FU 11). Time-series of UWTV survey index estimates (before correction for bias), with 95% confidence intervals.

Year	Number of valid stations	Mean density	Abundance (Sediment)	95% confidence interval (sediment)	Abundance (VMS)	95% confidence interval (VMS)
		burrows/m ²	millions	millions	millions	millions
1994	41	0.38	665	99	938	-
1995			No survey			
1996	38	0.25	439	62	619	-
1997			No survey			
1998	38	0.41	728	103	1026	-
1999	36	0.36	644	119	908	-
2000	39	0.53	946	109	1334	-
2001	56	0.50	886	108	1249	-
2002	37	0.61	1084	121	1528	-
2003	41	0.80	1420	171	2002	-
2004	38	0.80	1420	142	2002	-
2005	41	0.70	1249	133	1761	-
2006	30	0.81	1429	134	2015	-
2007	36	0.55	978	122	1379	-
2008	41	0.48	848	127	1196	-
2009	26	0.55	969	184	1366	-
2010	37	0.59	-	-	1483	265

Table 5.4.33.1.3 *Nephrops* in North Minch (FU 11). ICES estimates of landings (tonnes).

Year	UK Scotland			
	<i>Nephrops</i> trawl	Other trawl	Creel	Total**
1981	2320	170	371	2861
1982	2323	105	371	2799
1983	2784	95	317	3196
1984	3449	161	534	4144
1985	3236	117	708	4061
1986	2642	203	537	3382
1987	3458	143	482	4083
1988	3449	149	437	4035
1989	2603	112	490	3205
1990	1941	134	469	2544
1991	2228	125	439	2792
1992	2978	150	432	3560
1993	2699	85	408	3192
1994	2916	246	454	3616
1995	2940	184	532	3656
1996	2355	147	369	2871
1997	2553	102	391	3046
1998	2023	67	351	2441
1999	2791	56	410	3257
2000	2695	28	523	3246
2001	2651	41	567	3259
2002	2775	79	586	3440
2003	2607	44	617	3268
2004	2400	25	710	3135
2005	2267	18	699	2984
2006	3446	17	697	4160
2007	3362	16	590	3968
2008	3230	12	557	3799
2009	2858	26	613	3497
2010*	1717	6	540	2263
* Provisional.				
** There are no landings by other countries from this FU.				

ECOREGION Celtic Sea
STOCK *Nephrops* in South Minch (FU 12)

Advice for 2012

ICES advises on the basis of the MSY approach that landings in 2012 should be no more than 5500 t.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)			
	2008	2009	2010
MSY (F_{MSY})	✗	✗	✓ Below target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Not defined
SSB (Spawning-Stock Biomass)			
	2009	2010	2011
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	? Not defined

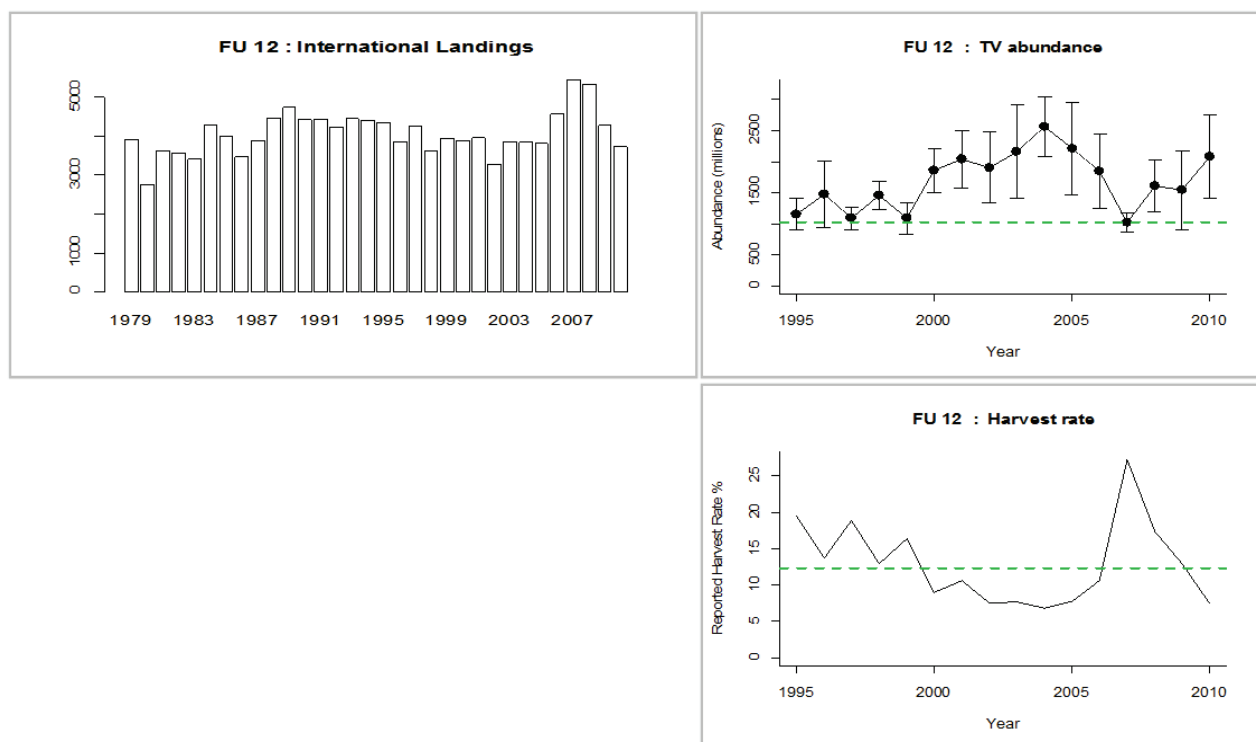


Figure 5.4.33.2.1 *Nephrops* in South Minch (FU 12). Long-term trends in landings (tonnes), UWTV survey (millions; SSB proxy; Confidence intervals 95%), and harvest rate (fishing mortality proxy). Harvest rates before 2006 may be unreliable due to underreporting of landings. Green dashed lines represent MSY $B_{trigger}$ and F_{MSY} harvest ratios.

The harvest ratios (dead removals/TV abundance) has fluctuated around the F_{MSY} proxy. The stock has been above MSY $B_{trigger}$ the full time-series.

Management plans

No specific management objectives are known to ICES.

Biology

The general biology of *Nephrops* is discussed in the overview (Section 5.4.33). 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. The fishery has been fairly stable for the time-series and the recent decrease in landings seems to be mainly related to market conditions. 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 creel numbers is not known and measures to regulate the fishery are not in place.

Catch by fleet	Total catch (2010) = 3852 t, where 3725 t are landings (76% trawl, 24% creel) and 127 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. Bycatches of cod are low and the Scottish Conservation Credits Scheme is in place to minimize cod catches.

Quality considerations

Harvest ratios since 2006 are considered reliable due to more accurate landings data reported under new legislation. Incorporation of creel length compositions has also improved estimates of harvest ratios.

Scientific basis

Assessment type	UWTV and trends.
Input data	One survey index (UWTV-FU12).
Discards and bycatch	Discards included in the assessment.
Indicators	Size structure of catches.
Other information	Latest benchmark was performed in 2009.
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* in South Minch (FU 12)

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY	MSY B _{trigger}	1016 million individual.s	Bias-adjusted lowest observed UWTV survey estimate of abundance.
Approach	F _{MSY}	12.3% harvest rate.	Equivalent to F _{35%SPR} combined sex.
Precautionary	Not agreed.		
Approach	Not agreed.		

(unchanged since: 2010)

Harvest ratio reference points (2010):

	Male	Female	Combined
F _{max}	13.3	26.8	16.1
F _{0.1}	7.8	13.8	8.7
F _{35%}	9.6	18.3	12.3

For this FU, the absolute density observed on 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 the 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}.

All F_{MSY} proxy harvest rate and MSY B_{trigger} values remain preliminary and may be modified following further data exploration and analysis.

Outlook for 2012

Basis: F₂₀₁₁ = F₂₀₁₀ = 7.4%; Bias-corrected survey index (2010) = 2076 million; Mean weight in landings (2008–2010) = 24.47 g; Dead discard rate (by number) = 11.8%; Survey bias = 1.32.

	Harvest rate	Landings (tonnes)
F _{MSY}	12.3%	5500
F ₂₀₁₁	7.4%	3300
F _{0.1}	8.7%	3900
F _{35%SPR}	12.3%	5500
F _{max}	16.1%	7200

MSY approach

Following the ICES MSY framework implies the harvest ratio for the South Minch functional unit to be less than 12.3%, resulting in landings of less than 5500 t in 2012.

Additional considerations

Mean sizes in the length compositions of catches (of individuals >35 mm CL) are stable. Recent work comparing the area based on VMS and on sediment showed only a small difference between them and the original area of ground has been retained. However, the survey should still be considered as a minimum estimate since areas of suitable sediment in the sea lochs are not included.

Change in the fisheries

The *Nephrops* (TR2) fleet has been observed to have extremely 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. 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 quality suitable for storage using 'individual tubing'. Reported effort by all Scottish *Nephrops* trawlers has shown a gradual decreasing trend since 2001.

Data and methods

Underwater TV surveys have been conducted for this stock every year since 1995. Confidence intervals for the abundance estimates are on average greater in the most recent years, when abundance estimates have been slightly higher. The overlap of confidence intervals makes it difficult to determine which population changes are significant.

In the 2010 assessment, length frequencies from the trawl and creel components of the fishery were incorporated for the first time.

Uncertainties in the assessment and forecast

The recent observed discard rate shows a decline in discards from 2008 coincident with an increase in the survey abundance and a further decrease in harvest rates in 2010. The cumulative bias estimates for FU 12 are largely based on expert opinion. The precision of these bias corrections cannot yet be characterized.

The overall area of the ground is estimated from the available British Geological Survey contoured sediment data and at present is considered to be a minimum estimate although the problem is less severe than in the North Minch. On average the area estimates for the sediment maps exceed those estimated for the VMS by a factor of around 1.1. The inclusion of vessels smaller than 15 m would likely increase the VMS area. On the other hand, 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.

Comparison with previous assessment and advice

The basis for the advice and the assessment method is the same as last year. Last year's advice was based on a transition to a F_{MSY} proxy, this year the harvest rate is below F_{MSY} and the advice is based on the MSY framework.

Source

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

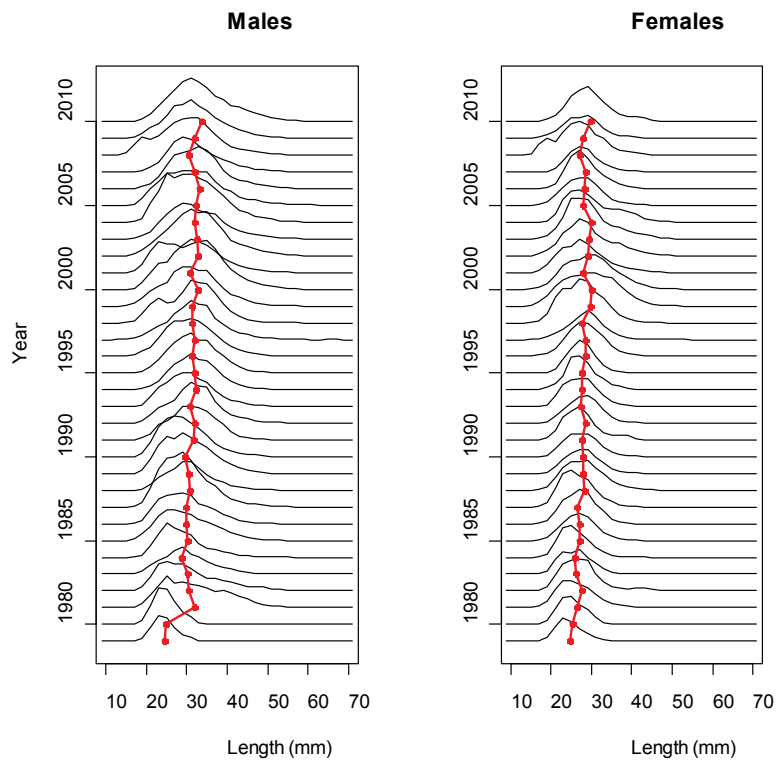


Figure 5.4.33.2.2 *Nephrops* in South Minch (FU 12). Length composition of catch of males (left) and females (right) from 1979 (bottom) to 2010 (top). Mean sizes of catch (red line) is also shown.

Table 5.4.33.2.1 *Nephrops*, South Minch (FU 12). ICES advice, management, and landings.

Year	ICES advice	ICES Advice for South Minch (FU 12)	ICES landings (FU 12)
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
2000	maintain current effort		4.0
2001	as for 2000		4.0
2002	maintain current effort		3.3
2003	as for 2002		3.9
2004	maintain current effort		3.9
2005	as for 2004		3.8
2006	No increase in effort		4.6
2007	No increase in effort and harvest rate of 15%	7.2	5.5
2008	as for 2007	7.2	5.3
2009	No increase effort and recent average catch	< 5.0	4.3
2010	Harvest Rate no greater than that equivalent to fishing at $F_{0.1}$	< 4.1	3.7
2011	MSY transition scheme	< 4.0	
2012	MSY framework	< 5.5	

Weights in '000 tonnes.

Table 5.4.33.2.2 *Nephrops* in South Minch (FU 12). Time-series of UWTV survey index estimates (before correction for bias), with 95% confidence intervals.

Year	Stations	Mean density	Abundance	95% confidence interval
		burrows/m ²	millions	millions
1995	33	0.30	1520	331
1996	21	0.38	1945	700
1997	36	0.28	1434	244
1998	38	0.38	1916	306
1999	37	0.28	1433	343
2000	41	0.48	2447	460
2001	47	0.53	2689	606
2002	31	0.49	2507	749
2003	25	0.56	2847	998
2004	38	0.67	3377	625
2005	33	0.57	2914	977
2006	36	0.48	2436	789
2007	39	0.26	1341	205
2008	33	0.42	2123	548
2009	25	0.40	2035	837
2010	34	0.54	2740	878

Table 5.4.33.2.3 *Nephrops* in South Minch (FU 12). ICES estimates of landings (tonnes).

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

* Provisional.

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

Advice for 2012

ICES advises on the basis of the MSY approach that landings in 2012 should be no more than 5100 t (4200 t for Firth of Clyde and 900 t for Sound of Jura).

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 landings advice.

Stock status

Firth of Clyde				Sound of Jura			
F (Fishing Mortality)				F (Fishing Mortality)			
	2008	2009	2010		2008	2009	2010
MSY (F_{MSY})	✗	✗	✗ Above target	MSY (F_{MSY})	?	✓	✓ Below target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Not defined	Precautionary approach (F_{pa}, F_{lim})	?	?	? Not defined
SSB (Spawning-Stock Biomass)				SSB (Spawning-Stock Biomass)			
	2009	2010	2011		2009	2010	2011
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger	MSY ($B_{trigger}$)	?	?	? Not defined
Precautionary approach (B_{pa}, B_{lim})	?	?	? Not defined	Precautionary approach (B_{pa}, B_{lim})	?	?	? Not defined

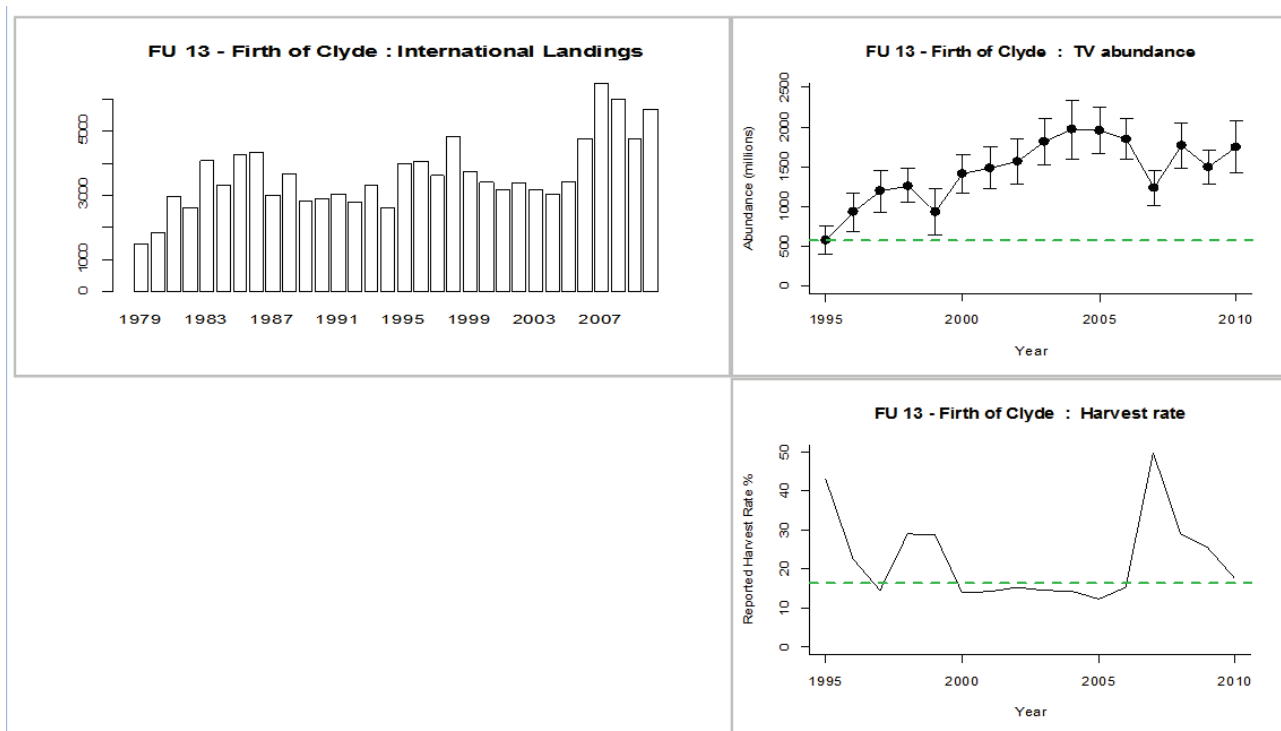


Figure 5.4.33.1 *Nephrops* in the **Firth of Clyde** (FU 13). Long-term trends in landings (tonnes), UWTV survey (in millions; SSB proxy), and harvest rate (fishing mortality proxy). Harvest rates before 2006 may be unreliable due to underreporting of landings. Green dashed lines represent MSY $B_{trigger}$ and F_{MSY} harvest ratios.

Harvest rates for *Nephrops* in the Firth of Clyde have been above the proposed F_{MSY} proxy since 2007. UWTV abundance remains well above the MSY $B_{trigger}$.

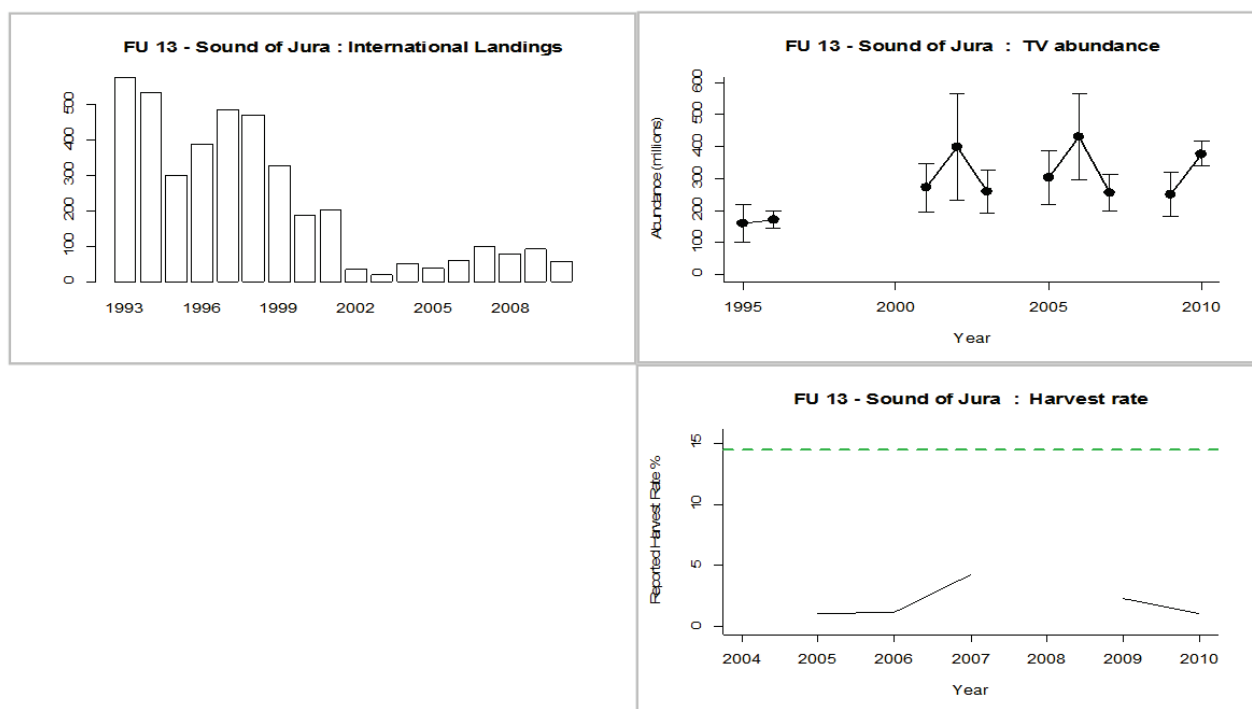


Figure 5.4.33.2 *Nephrops* in the **Sound of Jura** (FU 13). Long-term trends in landings (tonnes), UWTV survey (millions; SSB proxy), and harvest rate (fishing mortality proxy). Harvest rates before 2006 may be unreliable due to underreporting of landings. Green dashed line represents F_{MSY} harvest ratios.

Harvest rates 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 5.4.33). The Firth of Clyde stock consistently exhibits high densities (over $0.8 \text{ burrows m}^{-2}$) compared with other stocks. 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 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 high (33% by number on average over the past 10 years).

Catch by fleet	Total catch (2010) in Firth of Clyde + Sound of Jura = 6161 t, where 5701 t are landings (97% trawl, 3% creel) and 460 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, including cod, haddock and whiting in the *Nephrops* trawl fisheries in this functional unit. 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 new legislation. Incorporation of creel length compositions has also improved estimates of harvest ratios.

Scientific basis

Assessment type	UWTV and trends.
Input data	One survey index (UWTV-FU13).
Discards and bycatch	Discards included.
Indicators	Size structure of catches.
Other information	Latest benchmark was performed in 2009.
Working group report	WGCSE

ECOREGION Celtic Sea

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.
Precautionary Approach	Not agreed.	Not defined.	
	Not agreed.	Not defined.	

(unchanged since 2010)

Reference points – Sound of Jura

	Type	Value	Technical basis
MSY Approach	MSY B_{trigger}	Not defined.	
	F_{MSY}	14.5% harvest rate.	Equivalent to $F_{35\% \text{SPR}}$ combined sex.
Precautionary Approach	Not agreed	Not defined.	
	Not agreed	Not defined.	

(unchanged since 2010)

Harvest ratio reference points (2010):

	Male	Female	Combined
F_{max}	13.6	34.0	16.4
$F_{0.1}$	8.7	21.1	9.7
$F_{35\%}$	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} for the last 5 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} for the last 5 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 are more fragmented and sampling is at a relatively low level. A more cautious $F_{35\% \text{SPR}}$ is considered an appropriate F_{MSY} proxy for this stock.

All F_{MSY} proxy harvest rate values and MSY B_{trigger} remain preliminary and may be modified following further data exploration and analysis.

Outlook for 2012

Firth of Clyde

Basis: $F_{2011} = F_{2010} = 17.5\%$; Bias-corrected survey index (2010) = 1750 million; Mean weight in landings (2008–2010) = 18.56 g; Discard rate (by number) = 25.3%; Survey bias = 1.19.

	Harvest rate	Landings (tonnes)
F_{MSY}	16.4%	4000
$F_{MSY \text{ transition}}$	17.1%	4200
$F_{0.1}$	9.7%	2400
$F_{35\%SPR}$	14.5%	3500
F_{max}	16.4%	4000
F_{2010}	17.5%	4200

Sound of Jura

Basis: $F_{2011} = F_{2010} = 1.1\%$; Bias-corrected survey index (2010) = 376 million; Mean weight in landings (2008–2010) = 21.44 g; Discard rate (by number) = 25.3%; Survey bias = 1.19.

	Harvest rate	Landings (tonnes)
F_{MSY}	14.5%	900
$F_{0.1}$	9.7%	600
$F_{35\%SPR}$	14.5%	900
F_{max}	16.4%	1000
F_{2010}	1.1%	70

MSY approach

Following the ICES MSY framework implies the harvest ratio for the Firth of Clyde subarea to be reduced to less than 16.4%, resulting in landings of less than 4000 t in 2012. Following the transition scheme towards the ICES MSY framework implies the harvest ratio for the Firth of Clyde should be reduced to less than 17.1% ($0.6 \times \text{harvest ratio}(F_{2010}) + 0.4 \times \text{harvest ratio}(F_{MSY})$), resulting in landings of less than 4200 t in 2012.

Following the ICES MSY framework implies the harvest ratio for the Sound of Jura subarea to be less than 14.5%, resulting in landings of less than 900 t in 2012. For the Sound of Jura no transition is needed as the harvest rate is already below the F_{MSY} proxy.

Additional considerations

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.

A seasonal closure to protect spawning cod is in place, but there is derogation for the *Nephrops* fleet and the Scottish Conservation Credits Scheme is in place to minimize cod catches.

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.

In the 2010 assessment, length frequencies from the trawl and creel components of the fishery were incorporated for the first time.

Uncertainties in assessment and forecast

Discard rates have fluctuated over the time-series and are in 2010 estimated to be at the lowest level in the last 10 years. Mean weight has fluctuated without trends over the time-series. These uncertainties are not taken into account in the forecast. The cumulative bias estimates for the FU 13 Clyde and Jura component are largely based on expert opinion. The precision of these bias corrections cannot yet be characterized.

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. However, examination of VMS data shows 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 basis for the advice and the assessment method is consistent with last year.

Source

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

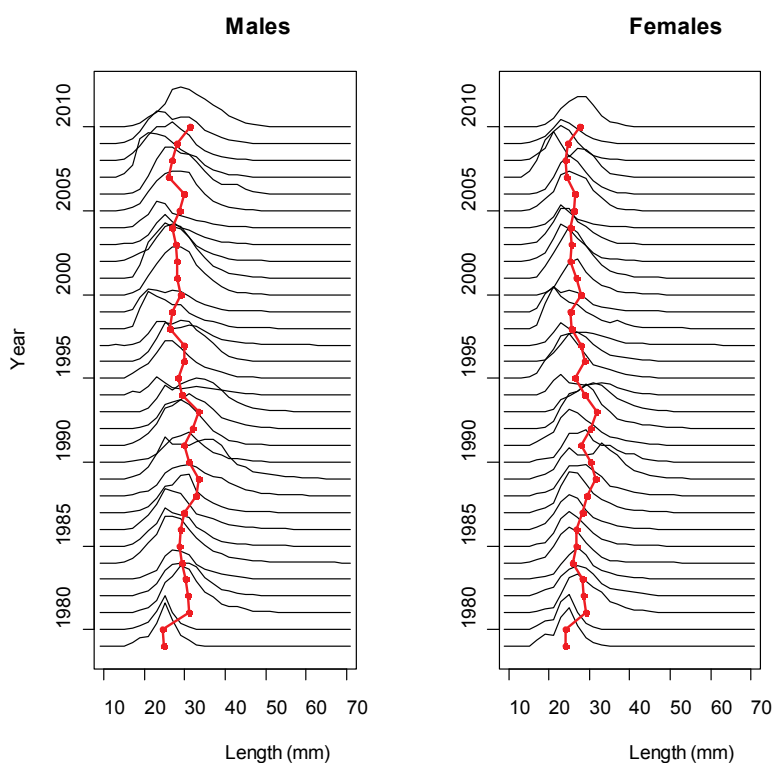


Figure 5.4.33.3 *Nephrops* in the Firth of Clyde + Sound of Jura (FU 13). Length composition of catch of males (left) and females (right) from 1979 (bottom) to 2010 (top). Mean sizes of catch (red line) is also shown.

Table 5.4.33.3.1 *Nephrops* in the Firth of Clyde + Sound of Jura (FU 13). ICES advice, management, and landings.

Year	ICES advice	ICES Advice for Firth of Clyde (FU 13)	ICES Advice for Sound of Jura (FU 13)	ICES landings (FU 13)
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
2000	maintain current effort			3.4
2001	as for 2000			3.2
2002	maintain current effort			3.4
2003	as for 2002			3.2
2004	maintain current effort			3.0
2005	as for 2004			3.4
2006	No increase in effort			4.8
2007	No increase in effort and harvest rate no more than 15%	3.765		6.5
2008	as for 2007(no new advice)	3.765		5.9
2009	No increase effort and recent average catch	< 5.7		4.7
2010	Harvest Rate no greater than that equivalent to fishing at F_{max}	< 3.9		5.7
2011	MSY transition scheme in Firth of Clyde and MSY framework in Sound of Jura	< 4.1	< 0.5	
2012	MSY transition scheme in Firth of Clyde and MSY framework in Sound of Jura	< 4.2	< 0.9	

Weights in '000 tonnes.

Table 5.4.33.3.2 *Nephrops* in the **Firth of Clyde** (FU 13). Time-series of UWTV survey index estimates (before correction for bias), with 95% confidence intervals.

Year	Stations	Mean density	Abundance	95% confidence interval
		burrows/m ²	millions	millions
1995	29	0.33	689	210
1996	38	0.54	1113	288
1997	31	0.68	1426	312
1998	38	0.720	1502	254
1999	39	0.532	1107	344
2000	40	0.807	1679	293
2001	39	0.850	1768	319
2002	36	0.899	1870	343
2003	37	1.039	2162	347
2004	32	1.127	2344	437
2005	44	1.121	2331	342
2006	43	1.050	2203	306
2007	40	0.705	1467	260
2008	38	1.012	2105	346
2009	39	0.86	1784	250
2010	37	1.001	2083	389

Table 5.4.33.3.3 *Nephrops* in the **Sound of Jura** (FU 13). Time-series of UWTV survey index estimates (before correction for bias), with 95% confidence intervals.

Year	Stations	Mean density	Abundance	95% confidence interval
		burrows/m ²	millions	millions
1995	7	0.50	190	69
1996	10	0.53	204	31
1997	no surveys			
1998				
1999				
2000				
2001	13	0.85	324	90
2002	9	1.24	474	199
2003	12	0.81	309	81
2004	no survey			
2005	11	0.94	360	100
2006	10	1.34	512	160
2007	10	0.80	304	69
2008	no survey			
2009	12	0.78	299	81
2010	12	1.173	448	46

Table 5.4.33.3.4 *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

* Provisional.

** Total also includes the Republic of Ireland.

ECOREGION Celtic Sea
STOCK *Nephrops* in Subarea VII

Nephrops are limited to a muddy habitat and the distribution of suitable sediment defines the species distribution. The stocks are assessed as six separate Functional Units (FU) as shown in Figure 5.4.34.1. There are also some smaller catches from areas outside these Functional Units.

Section	FU no.	Name	ICES Divisions	Statistical rectangles
5.4.34.1	14	Irish Sea East	VIIa	35–38E6; 38E5
5.4.34.2	15	Irish Sea West	VIIa	36E3; 35–37 E4–E5; 38E4
5.4.34.3	16	Porcupine Bank	VIIb,c,j,k	31–35 D5–D6; 32–35 D7–D8
5.4.34.4	17	Aran Grounds	VIIb	34–35 D9–E0
5.4.34.5	19	Ireland SW and SE coast	VIIa,g,j	31–33 D9–E0; 31E1; 32E1–E2; 33E2–E3
5.4.34.6	20-21 and 22	Celtic Sea	VIIg,h	28–30 E1; 28–31 E2; 30–32 E3; 31 E4

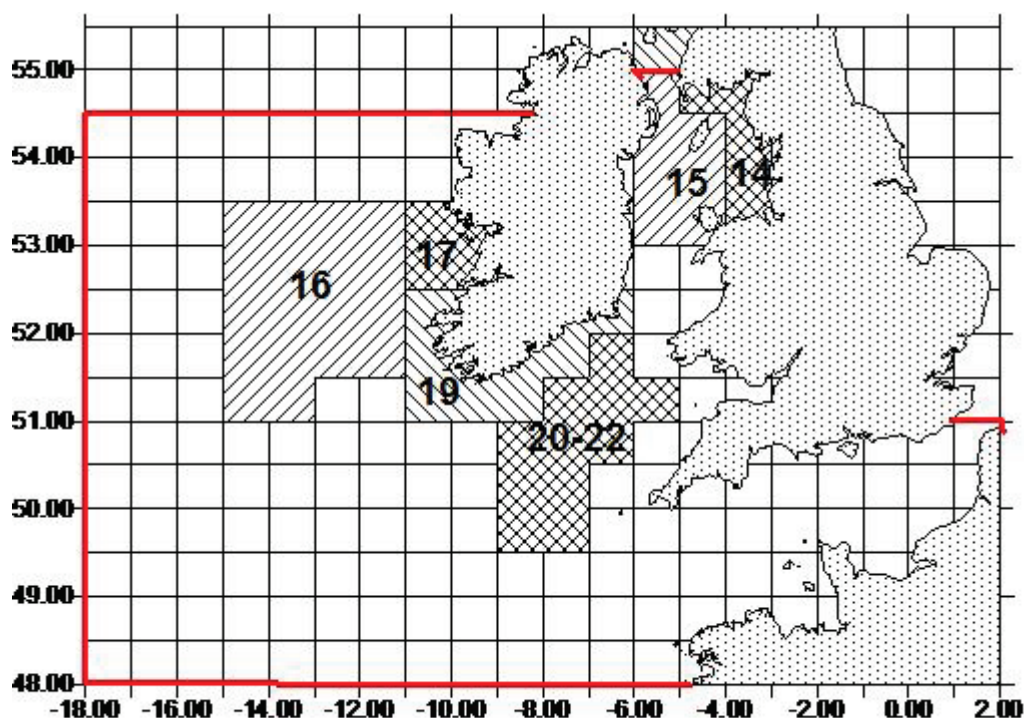


Figure 5.4.34.1 *Nephrops* Functional Units in Subarea VII (around Ireland). The TAC for Subarea VII applies to the area bounded by the red line. The FUs within the TAC area are shaded.

Advice for 2012

The advice for *Nephrops* stocks is given by functional units in sections 5.4.34.1 – 6. A summary can be found in table 5.4.34.1.

There is no information available on the trends in the stock or exploitation status for FU18 and the rectangles outside the FUs ('other rectangles') for which ICES provides advice. Advice for the FUs in Subarea VIa have slightly increased. On the basis of precautionary considerations, ICES advises that the catches in the FU18 and other rectangles should not increase.

Table 5.4.34.1 *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 (FU14)	Irish Sea West (FU15)	Porcupine Bank (FU16)	Aran Grounds (FU17)	Ireland SW and SE Coast (FU19)	Celtic Sea (FU20–22)	Other rectangles ¹⁾		
Manag. Area Division	MA J VIIa		MA L VIIbcjk		MA M VIIfgh			VII	VII
1992	8.9			3.8		~3.8		20.0	15.8
1993	9.4			~4.0		3.8		20.0	16.9
1994	9.4			~4.0		3.8		20.0	17.5
1995	9.4			~4.0		3.8		20.0	18.8
1996	9.4			4.0		3.8		23.0	16.9
1997	9.4			4.0		3.8		23.0	19.1
1998	9.4			4.0		3.8		23.0	18.4
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	⁴⁾	⁴⁾	⁴⁾	⁴⁾	⁴⁾	⁴⁾		25.153	19.1
2008	⁴⁾	⁴⁾	⁴⁾	⁴⁾	⁴⁾	< 5.3		25.153	20.4
2009	<1.0	< 8.5	< 1.0	< 0.9	< 0.8	< 5.3	< 0.2	24.650	17.6
2010 ²⁾	<1.0	< 5.5	0	< 0.5	< 0.8	< 5.3	< 0.2	22.432	
2011	<0.68	<9.5	0	<0.9	³⁾	³⁾	< 0.2		
2012	<0.96	<9.8	⁴⁾	<1.1	⁴⁾	<2.3 ^{4) 5)}	⁶⁾		

Weights in '000 t.

¹⁾ Prior to advice for 2009, landings corresponding to advice for other rectangles and FU 18 were included in relevant 'Management Areas (MA)'.

²⁾ The advice for FU 14, 16 and 19-22 was biennial and valid for 2009 and 2010.

³⁾ See scenarios.

⁴⁾ ICES is not advising an absolute level of catches for FU16, FU19 and FU20-21

⁵⁾ Predicted catch corresponding to advice for FU22

⁶⁾ ICES advises that the catches in the FU18 and other rectangles should not increase.

Biology

Nephrops is limited to muddy habitat, and requires sediment with a silt and clay content of between 10–100% 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 localised 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 male *Nephrops* grow faster and attain a large size than female. Density limits growth and grounds with high *Nephrops* density (>0.7/m²) have smaller average size than those with low density.

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 FU15 have well known and understood larval retention mechanisms (i.e. Western Irish Sea Gyre). Other stocks such as the Porcupine Bank 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 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) burrowing fauna can be seen re-emerging from freshly trawled grounds, implying that there is some resilience to trawling.

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 to ensure 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. This appears to have been a particular problem in the Porcupine Bank where a large increase in effort occurred from 2002 up to 2007 and the stock declined substantially.

Landings from the northwest coast of Ireland NW (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 FU18 and the rectangles outside the FUs ('other rectangles') for which ICES provides advice. Advice for the FUs in Subarea VII has slightly increased. On the basis of precautionary considerations, ICES advises that the catches in the other rectangles and FU18 should not increase.

Landings 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.

MSY approach

There are no precautionary reference points defined for *Nephrops*. Under the new ICES MSY framework, exploitation rates which are 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} are $F_{0.1}$, $F_{35\%SpR}$ and F_{max} . There may be strong difference in relative exploitation rates between the sexes in many stocks. To account for this, values for each of the candidates have been determined for males, females and 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 vs 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 picked over the combined proxy.

		Burrow Density (average burrow/m ²)		
		Low	Medium	High
		<0.3	0.3-0.8	>0.8
Observed harvest rate or landings compared to stock status	> 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}
History 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 observed UWTV abundance. 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 has been used to estimate a preliminary MSY B_{trigger}.

Factors affecting the fisheries and the stock

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.

Scientific basis

Data and methods

The assessments and advice for *Nephrops* stocks in Functional Units 14 and 15 (Irish Sea), 17 (Aran), and 22 (the Smalls) are primarily based on abundance estimates from under-water TV (UWTV) surveys together with fishery landings data and estimates of quantities of discards. Additional indicators of changes in stocks are derived from trends in length compositions and sex ratio in the catches, fishery lpue, and (for FU15) trawl survey catch rates. The assessments and advice for FU 16 (Porcupine Bank) and FU 20–21 (Celtic Sea) are based on a range of indicators of stock trends including fishery lpue, trawl survey catch-rates, size compositions and sex ratio.

For FUs 14, 15, 17, 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. WKNEPH (ICES, 2009) proposed that the UWTV surveys provide abundance estimates for *Nephrops* of 17mm carapace length and over.
- Historical harvest ratios are calculated as the ratio of total 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 both sexes combined are computed. These are conditional on a fishery selectivity pattern that includes fishing mortality due to discarding of dead *Nephrops* in the years covered by the assessment model.

Catch options tables for 2012 are derived for a range of F_{MSY} and other options by applying the appropriate harvest ratios to the population numbers estimate from the most recent UWTV survey. This assumes the 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

ICES expert groups in preparation of the benchmark of UWTV assessments (ICES, 2009) 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 bias factors applied to UWTV abundance estimates and these were last estimated in 2009. As further research is conducted and better understanding of the UWTV process is gained, these bias estimates will require revision.

In the provision of catch options based on the survey estimates additional uncertainties related to mean weight in the landings and to the discard rates also arise. The procedure outlined in WKNEPH (ICES, 2009) is to use a multi-annual average to dampen variability. The variability in mean weight and discarding is a key uncertainty in the derivation of catch options. Improved quality of fishery data and knowledge of growth rates are needed for development of analytical assessment models and improvement of MSY reference points.

There is a gap of 16-18 months between the survey and the start of the year for which the assessment is used in management advice. It is assumed that the stock is in equilibrium during this period (i.e. recruitment and growth balance mortality) although this is rarely the case. The effect of this assumption on realised harvest rates has not been investigated. 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.

Trends in lpue data are subject to uncertainties as a measure of stock abundance due to changes in fishing practices.

Sources of information

ICES. 2009. Report of the Benchmark Workshop on *Nephrops* (WKNEPH), 2–6 March 2009, Aberdeen, UK. ICES CM 2009/ACOM:33.

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011 ICES CM 2011/ACOM:12.

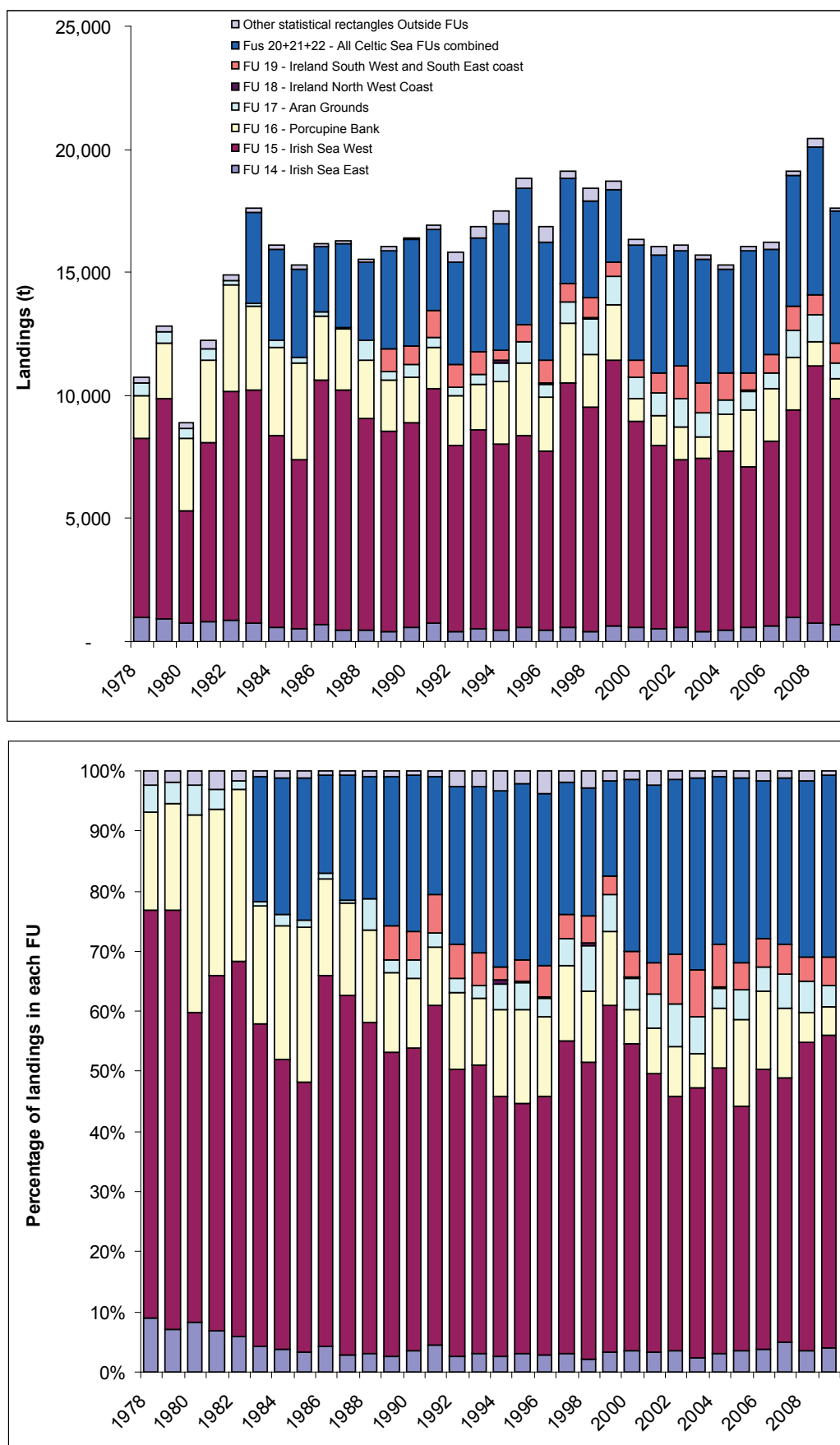


Figure 5.4.34.2 *Nephrops* in Subarea VII. Total landings (in tonnes, top) and percentage of the total landings (bottom) by Functional Unit (FU) and from rectangle outside FUs.

Table 5.4.34.2 *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 North West Coast	FU 19 - Ireland South West and South East coast	FUs 20+21+22 - All Celtic Sea FUs combined	Other statistical rectangles Outside FUs	Total Landings ICES Sub-area VII	TAC for 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				174	13942	
1984	602	7760	3571	324				187	12444	
1985	498	6901	3919	207				194	11719	
1986	671	9978	2591	147				113	13500	
1987	449	9753	2499	62				107	12870	24700
1988	462	8586	2375	828				140	12391	24700
1989	401	8128	2115	344		899		134	12021	26000
1990	563	8300	1895	519		754		102	12133	26000
1991	747	9554	1640	410		1077		169	13597	26000
1992	427	7541	2015	372		888		409	11652	20000
1993	515	8102	1857	372	10	905	4358	455	16574	20000
1994	447	7606	2512	729	126	390	4843	570	17223	20000
1995	584	7796	2936	866	26	695	5198	397	18498	23000
1996	475	7247	2230	525	46	888	4602	623	16636	23000
1997	566	9971	2409	841	15	756	3991	340	18889	23000
1998	388	9128	2155	1410	78	827	3819	514	18319	23000
1999	624	10786	2290	1140	16	579	2862	322	18619	23000
2000	567	8370	910	880	9	696	4642	243	16317	21000
2001	532	7441	1222	913	2	815	4736	368	16029	18900
2002	577	6793	1327	1154	14	1318	4623	243	16049	17790
2003	376	7052	908	933	16	1239	5003	186	15713	17790
2004	472	7266	1526	525	22	1074	4270	161	15316	17450
2005	570	6529	2315	778	15	711	4942	180	16040	19544
2006	628	7535	2120	637	14	741	4248	270	16193	21498
2007	959	8424	2186	913	3	957	5300	206	18948	25153
2008	681	10482	1000	1057	1	866	6001	322	20410	25153
2009	708	9166	825	625	10	833	5387	107	17661	24650
2010	563	8929	917	1000	7	722	4622	359	17119	22432
Average	609	8241	2191	631	24	846	4636	270	15043	

ECOREGION Celtic Sea
STOCK *Nephrops* in Irish Sea East (FU14)

Advice for 2012

ICES advises on the basis of the MSY approach that landings in 2012 should be no more than 960 t.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)			
	2008	2009	2010
MSY (F_{MSY})	✓	✓	✓ Below target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined
SSB (Spawning Stock Biomass)			
	2008	2009	2010
MSY ($B_{trigger}$)	?	?	? Undefined
Precautionary approach (B_{pa}, B_{lim})	?	?	? Undefined

Landings - International

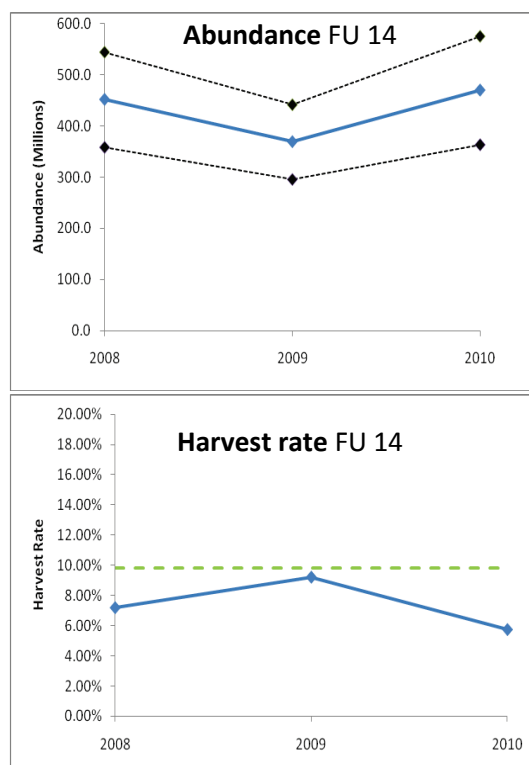
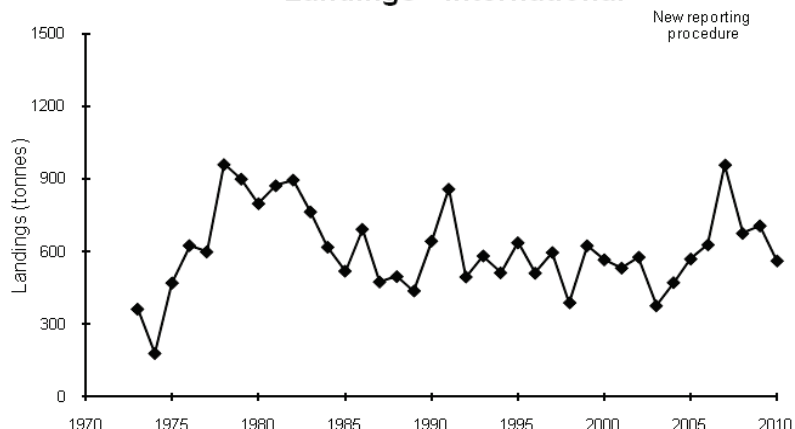


Figure 5.4.34.1.1 *Nephrops*, Irish Sea East (FU14): Long-term trends in landings (in tonnes), UWTV survey abundance with 95% confidence limits (in millions; SSB proxy) and harvest rate (green dashed line is F_{MSY} proxy).

There is not a long enough time series to determine a candidate for MSY $B_{trigger}$. Current harvest rate 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 burrows/m²) 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 south coast of Scotland. 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.

The fisheries

The fleet is made of around 30 English vessels almost entirely single otter trawling and around 40 generally larger Northern Irish vessels over half of which fish multi-rig trawls. The multi riggers take around 1/3 of the landings. 80 mm cod ends are commonly used for both types of trawl. The fishery takes place mainly in spring and early summer, when male *Nephrops* predominate.

Catch by fleet	Total landings (2010): 563 t (32% twin rig otter trawls, 67% single otter trawl). Additional discards estimated at 28% by number.
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Effects of the fisheries on the ecosystem

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

Quality considerations

The survey series commenced in 2007. Because of reduced discard sampling in 2009 the discard rate and catch composition for 2009 is uncertain. No reliable length composition is available from 2010.

Scientific basis

Assessment type	UWTV and trends
Input data	1 survey index (UWTV-FU14-15)
Discards and bycatch	Discards included in the assessment and forecast
Indicators	Size structure of catches, sex ratio and <i>l</i> _{pue}
Other information	Process benchmarked at WKNEPH 2009 considered appropriate for this stock
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* in Irish Sea East (FU14)

Reference points

	Type	Value	Technical basis
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.
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 (around 0.3/m²) 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 *Ipue* 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 should deliver high long term yield with a low probability of recruitment over-fishing.

All F_{MSY} proxy harvest rate values are considered preliminary and may be modified following further data exploration and analysis.

Outlook for 2012

Basis: F₂₀₁₁ = F₂₀₀₈₋₁₀ = 7.4%, Bias corrected survey index (2010) = 469 million, Mean weight in landings (2006-08) = 28.9 g, and retention factors (72.1%) based on 2006–2008 sampling.

Basis	Harvest rate (%)	Landings 2012 (tonnes)
Closure	0%	0
F _{sq}	7.4%	700
F _{35%SpR}	13%	1270
MSY framework	9.8%	960
F _{max}	16.4%	1600

MSY approach

Following the ICES MSY framework implies the harvest ratio to be no more than 9.8%, resulting in landings of 960 t in 2012.

Additional considerations

The *Nephrops* trawl fishery takes by-catches 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

The fishery peaks in summer. Some UK vessels temporarily relocate, targeting the Farn Deep's *Nephrops* fishery on the east coast of England for the winter months.

The effects of regulations

The cod recovery measures introduced in 2000 includes effort limitations. The cod long-term plan was introduced in 2009 (EC 1342/2008). Annual effort in *Nephrops* trawl fisheries (Effort group TR2 OTB 70–99 mm) in Division VIIa as a whole has been reduced by 25% in 2009 and a further 25% in 2010. However, *Nephrops* effort is free to move between FUs and therefore the effect of this regulation may not be restrictive on a FU basis.

Changes in fishing technology and fishing patterns

In contrast to the overall effort reductions in Division VIIa, effort in FU 14 has remained relatively stable since 2001. Fuel prices have affected the choice of gears. Despite reasonable catch rates some skippers are less inclined to go to sea unless they can guarantee to cover their costs. This might bias the lpues as a measure of stock abundance.

Uncertainties in assessment and forecast

General comments are made at the start of section 5.4.34.

The short time series of more 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

In the 2010 advice for the fishery in 2011 the evaluation was based on trends in population indicators and catch options derived from short time series of UWTV surveys. The present assessment is based on revised survey data. The present advice for the fishery in 2012 is based on the MSY approach adopting $F_{0.1}$ as an F_{MSY} proxy.

Sources

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

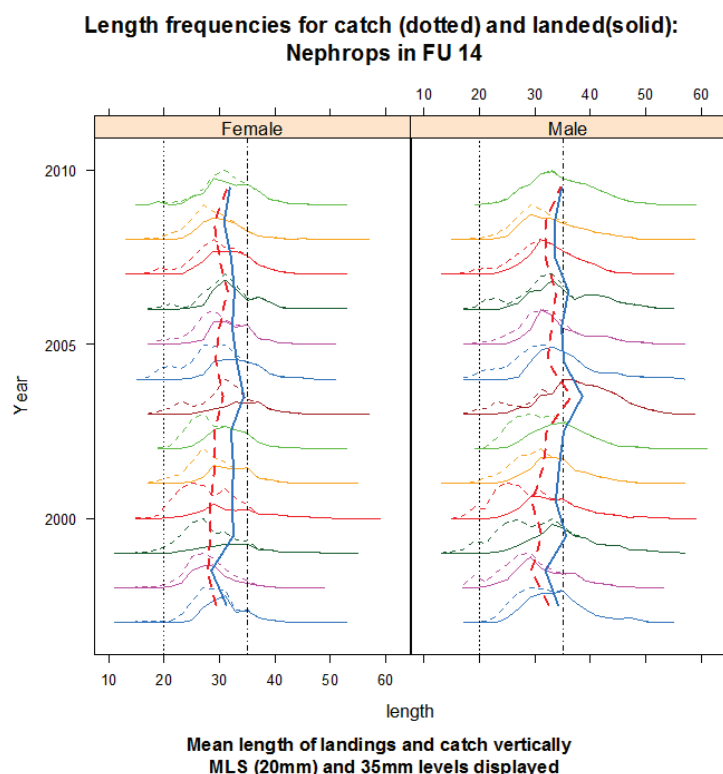


Figure 5.4.34.1.2 *Nephrops* in Irish Sea East (FU 14). Length composition of catch (dotted) and landed (solid) of males (right) and females left from 1996 (bottom) to 2009 (top). Mean sizes of catch and landings (using same line types) is shown in relation to Minimum Landing Size (MLS). Sampling levels in 2010 were insufficient to provide robust data, this figure was not, therefore, updated.



Figure 5.4.34.1.3 *Nephrops* in Irish Sea East (FU 14). Time-series of sex ratio in the landings of *Nephrops* - directed trawlers. Sampling levels in 2010 were insufficient to provide robust data, this figure was not, therefore, updated.

Table 5.4.34.1.1 *Nephrops* in Irish Sea East (FU14). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU14)	Recommended Landings (FU14 +FU15)	ICES Landings (FU14)
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
2004	Set TAC in line with 1995–99 landings		9.55	0.47
2005	Set TAC in line with 1995–99 landings		9.55	0.57
2006	No increase in effort		9.55	0.63
2007	No increase in effort		-	0.96
2008	As for 2007		-	0.68
2009	No increase in effort and landings (2007)	<1.0	-	0.70
2010	No new advice, same as for 2009	<1.0	-	0.56
2011	Transition towards the ICES MSY framework	<0.68	**	
2012	MSY framework	<0.96	**	

Weights in '000 t.

*Preliminary.

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

Table 5.4.34.1.2 *Nephrops* in Irish Sea East (FU 14). Landings (tonnes) by country.

	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	25	538	0	563

Table 5.4.34.1.3 *Nephrops* in Irish Sea East (FU 14). Results from UWTV-FU14 survey of *Nephrops* grounds in 2008–2010.

Year	No stations	Mean station density	Mean Kriged density	Bias-corrected abundance (millions)	95% CI	Removals (millions)	Harvest Rate
2008	32	0.43	0.49	451.4	93	32.4	7.19%
2009	32	0.33	0.40	369.0	73	33.9	9.20%
2010	26	0.42	0.51	469.5	106	27.0	5.75%

ECOREGION Celtic Sea
STOCK *Nephrops* in Irish Sea West (FU 15)

Advice for 2012

ICES advises on the basis of the MSY approach that landings in 2012 should be no more than 9800 t.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)			
	2008	2009	2010
MSY (F_{MSY})	✗	✗	✓ Below target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined

SSB (Spawning Stock Biomass)			
	2008	2009	2010
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	? Undefined

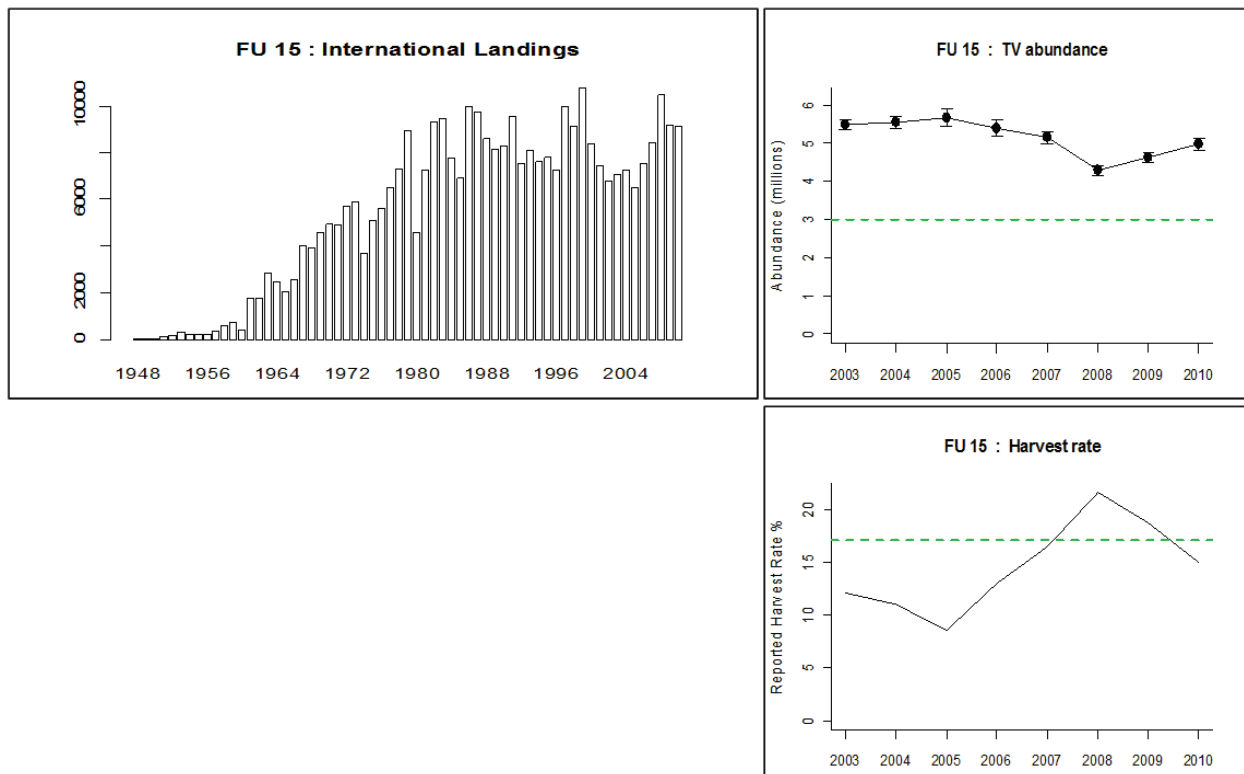


Figure 5.4.34.2.1 *Nephrops* in Irish Sea West (FU 15). Long-term trends in landings (tonnes), recent UWTV abundance (in millions; SSB proxy) (with scaled trawl survey cpue) and harvest rates (prior to 2007 the harvest rate is considered to be a minimum estimate due to possible under-reporting of landings). The horizontal lines represent MSY $B_{trigger}$ (upper panel) F_{MSY} (lower panel).

This stock has sustained landings at around 9000 t for many years. The stock increased until 2003, based on information from the NI-NEP-Trawl-Summer survey (Figure 5.4.34.2.4). Since then, the stock has decreased, but is still at high levels and above MSY $B_{trigger}$. Recent harvest rates have fluctuated around F_{MSY} .

Management plans

No specific management objectives are known to ICES.

Biology

Nephrops in the Western Irish Sea occur at very high density (average 1.1 burrow/m²) 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 sea bed. 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 gyre which retains the larvae over the mud patch thus ensuring good recruitment. *Nephrops* are a major food species of cod in the Irish Sea.

The fisheries

Gears used are a mixture of single and twin-rig otter trawls. Around 16% of Irish vessels are using separator trawls and Swedish grids to reduce bycatch.

Catch by fleet	Total catch (2010) 10.7 kt where 9.0 kt landings (>99% otter trawls), 1.5 kt discards.
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Effects of the fisheries on the ecosystem

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

Quality considerations

The assessment is mainly based on an UWTV survey which is considered to be very precise but various uncertainties and assumptions do arise in the estimation by expert judgement of the bias correction factor. In the provision of catch options based on the survey estimates additional uncertainties related to mean weight in the landings and to the discard rates also arise. Harvest ratios since 2006 are considered reliable due to more accurate landings data reported under new legislation.

Scientific basis

Assessment type	UWTV and trends, catch options based on UWTV and Fs from per-recruit analysis
Input data	One survey index (UWTV (FU 14 & 15)) One trawl survey index (NI-NEP-Trawl-Summer)
Discards and bycatch	Discards included in the assessment
Indicators	Size structure of catches, sex ratio and <i>l_{pue}</i>
Other information	Latest benchmark was performed in 2009
Working group report	WGCSE

ECOREGION Celtic Sea
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 in 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).

Yield and spawning biomass per Recruit F-reference points (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%

Density of *Nephrops* in FU15 is considered very high (average density 1.1/m²). Recent harvest rates have been high (>F_{max}) and the stock size has been stable at a high level. The stock has sustained landing around 9000 t for more than 35 years and knowledge of the biological parameters in the stock is good. 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.

All F_{MSY} proxy harvest rate values are considered preliminary and may be modified following further data exploration and analysis.

Outlook for 2012

Basis: F₂₀₁₁=F₂₀₁₀= 15%, Bias corrected survey index (2010) = 5.0 billion, Mean weights in landings (2009-10, 16.5g) and retention factors (70%) based on 2009–2010 sampling.

Basis	Harvest ratio	Landings 2012 (tonnes)
MSY framework	17.1%	9800
F ₂₀₁₁	15.0%	8600
F _{0.1}	11.0%	6300
F _{35%}	13.4%	7700

MSY approach

Following the ICES MSY framework implies a harvest ratio to be less than 17.1%, resulting in landings of 9800 t in 2012.

Additional considerations

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

The FU15 *Nephrops* fishery first developed in the late 1950s. Since then it has sustained landings of around 9000 t for more than 35 years. The environment in the Western Irish Sea is very suitable for *Nephrops* with a large mud patch and gyre which retains the larvae over the mud patch thus ensuring good recruitment. The ground can be characterised 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 has been reduced by 25% in 2009 and a further 25% in 2010. Irish effort in 2010 decreased by 23% relative to 2008, UK-NI effort in 2010 is similar to 2008. Since 2009, four Irish vessels have been using “Swedish grids” in the fishery to reduced bycatches of cod, whiting and haddock.

The minimum landing size for *Nephrops* is 20 mm carapace length (CL), and less than 5% of the animals landed are under sized. Highgrading of *Nephrops* from FU15 since 2009 has increased.

Nephrops vessels are derogated to fish in designated parts of the cod closed area (early spring) in the western Irish Sea.

Uncertainties in assessment and forecast

General comments are found at the start of section 5.4.34.

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 2008–2010 sampling by Northern Ireland and Ireland.

The harvest ratio prior to 2006 maybe underestimated due to underreporting of landings.

The calculation of harvest ratio and reference points $F_{0.1}$ and F_{\max} are based on yield-per-recruit analyses and biological parameters estimated assuming the stock is in equilibrium. However, it is unlikely that the *Nephrops* in FU15 is 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 assessment in 2011 is based on trends in population indicators and catch options derived from UWTV surveys as last year. The advice for 2012 is based on the MSY approach adopting F_{\max} as an appropriate F_{MSY} proxy as last year.

Source

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

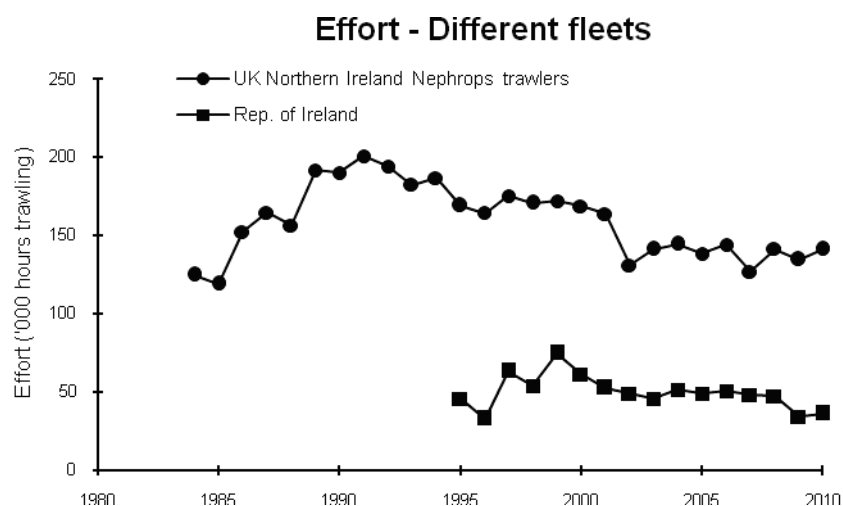


Figure 5.4.34.2.2 *Nephrops* Irish Sea West (FU 15). Effort trends of *Nephrops* fleets.

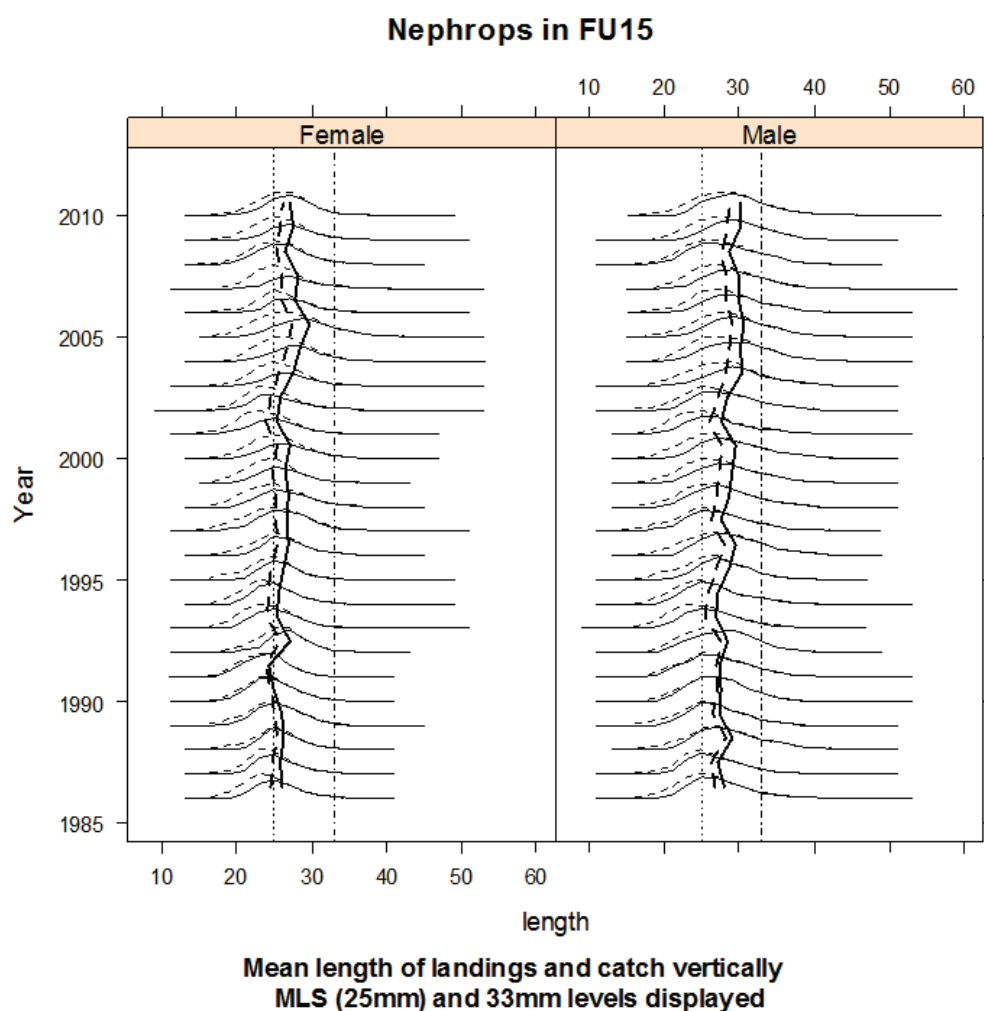


Figure 5.4.34.2.3 *Nephrops* Irish Sea West (FU 15). Length composition of catch (dotted) and landed (solid) of males (right) and females left from 2000 (bottom) to 2010 (top).

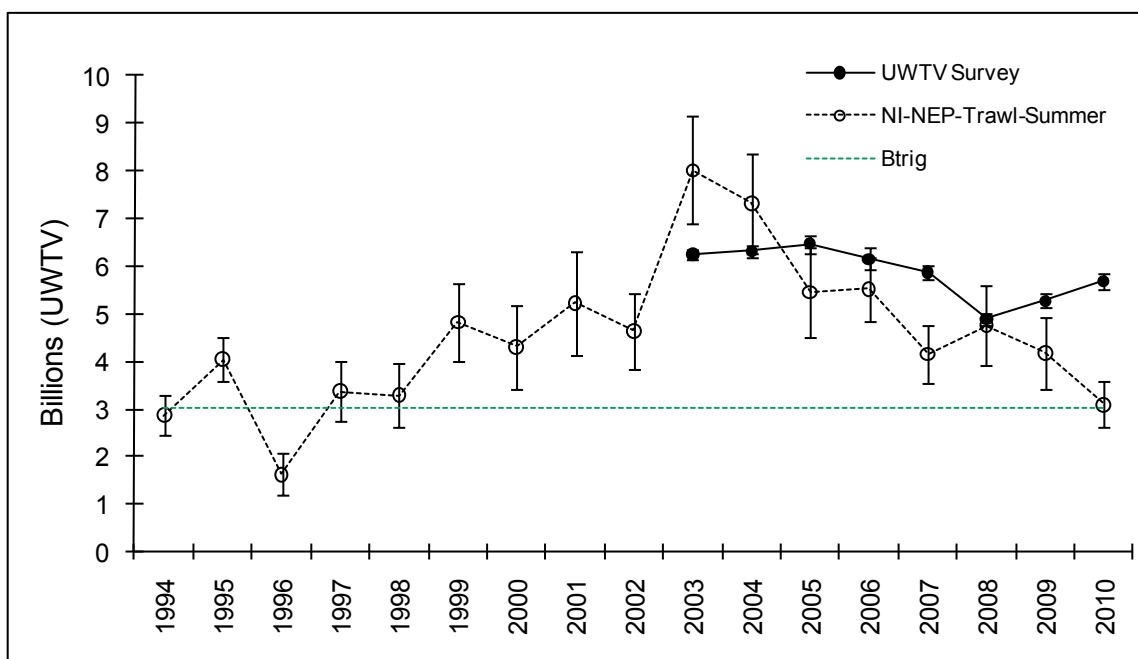


Figure 5.4.34.2.4 *Nephrops* Irish Sea West (FU 15). UWTV index (in billions) and scaled NI-NEP-Trawl-Summer survey. Green dotted line is MSY $B_{trigger}$.

Table 5.4.34.2.1 *Nephrops* in Irish Sea West (FU 15). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU 15)	Recommended Landings (FU14 + FU15)	ICES Landings (FU15)
1989				8.1
1990				8.3
1991				9.6
1992			8.9	7.5
1993			9.4	8.1
1994			9.4	7.6
1995			9.4	7.8
1996			9.4	7.3
1997			9.4	10.0
1998			9.4	9.1
1999			9.4	10.8
2000			9.4	8.4
2001			9.4	7.4
2002	Set TAC in line with 1995–99 landings		9.55	6.8
2003	Set TAC in line with 1995–99 landings		9.55	7.1
2004	Set TAC in line with 1995–99 landings		9.55	7.3
2005	Set TAC in line with 1995–99 landings		9.55	6.5
2006	No increase in effort		9.55	7.5
2007	No increase in effort		-	8.4
2008	No increase in effort		-	10.5
2009	No increase in effort and landings	< 8.5	-	9.2
2010	Harvest Ratio no greater than that equivalent to fishing at $F_{0.1}$	< 5.5	-	9.0
2011	Transition scheme towards the ICES MSY framework	<9.5	-	
2012	MSY framework	<9.8		

Weights in '000 t.

Table 5.4.34.2.3 *Nephrops* in Irish Sea West (FU 15). Results from UWTV-FU15 survey of *Nephrops* grounds in 2003–2010.

Ground	Year	Number of stations	Mean Density (No./M ²)	Domain Area (km ²)	Revised Estimate (billions)	CV on Burrow estimate
Western Irish Sea	2003	160	1.12	5295	6.3	3%
	2004	147	1.13	5310	6.3	3%
	2005	141	1.16	5281	6.5	4%
	2006	138	1.10	5194	6.2	4%
	2007	148	1.06	5285	5.9	3%
	2008	141	0.88	5287	4.9	3%
	2009	142	0.95	5267	5.3	3%
	2010	149	1.02	5307	5.7	3%

Table 5.4.34.2.4 *Nephrops* in Irish Sea West (FU 15). Landings (tonnes) by country, 1965–2010.

Year	Ireland	UK	UK E&W	UK NI	UK Isle of Man	Grand 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	2,696		4,352		4	7,052	
2004	2,782		4,470		13	7,266	
2005	2,116		4,413		0	6,529	
2006	2,048			56	5,429	1	7,535
2007	2,736			102	5,585	0	8,424
2008	3,132			131	7,166	50	10,482
2009	2,343			200	6,622	1	9,166
2010*	2,578			100	6,251		8,929

* Provisional

ECOREGION Celtic Sea
STOCK *Nephrops* on Porcupine Bank (FU 16)

Advice for 2012

ICES advises on the basis of precautionary considerations that catches in 2012 should not increase to allow the stock to rebuild.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

	F (Fishing Mortality)	
	2008-2010	
MSY (F_{MSY})	?	Undefined
Precautionary approach (F_{pa}, F_{lim})	?	Undefined
Qualitative evaluation	✗	High exploitation rate
	SSB (Spawning Stock Biomass)	
	2008-2010	
MSY ($B_{trigger}$)	?	Undefined
Precautionary approach (B_{pa}, B_{lim})	?	Undefined
Qualitative evaluation	↗	Increasing, from critically low abundance

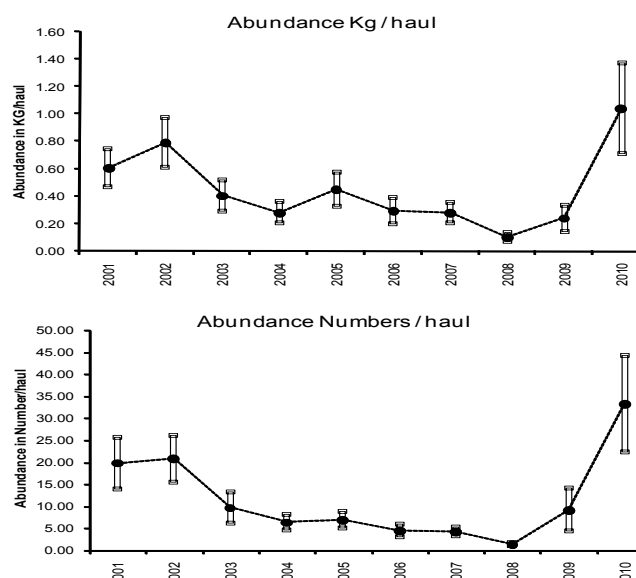
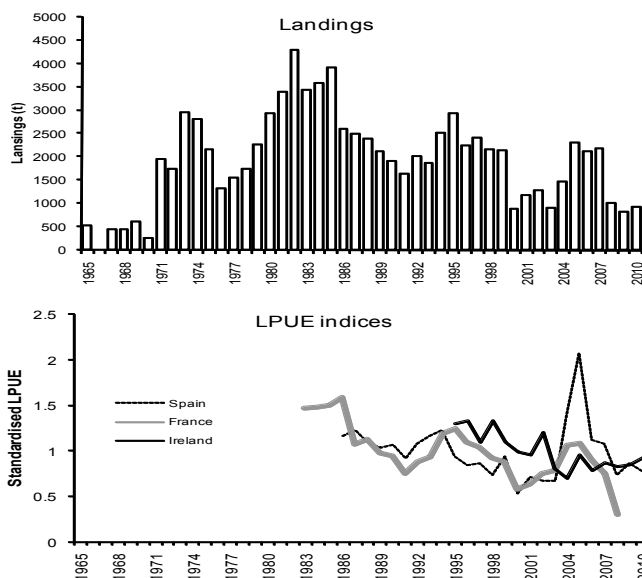
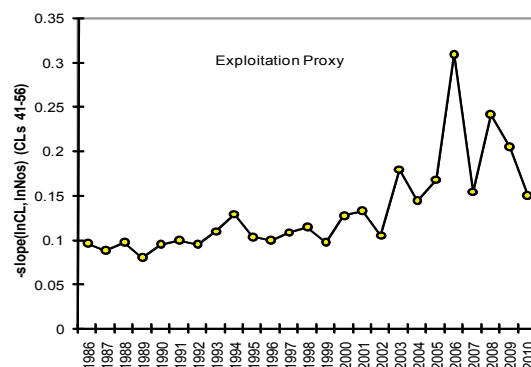


Figure 5.4.34.3.1 *Nephrops*, on the Porcupine Bank (FU16): Left, top; ICES landings over the years, bottom; standardised (scaled to mean by index) lpues by fleet (bottom). Right, top; Trends in an exploitation proxy for this stock (this is derived from the slope of the length-frequency for male *Nephrops* between carapace lengths of 41–56 mm which are considered fully selected in the fishery), middle; Trends over the years in biomass (in kg/haul) (top), bottom; abundance (individuals/haul) from the Sp-PGFS-WBITS-Q4 survey.

Effort, landings and size distribution indicate that exploitation rate has been high in the last 7 years. Survey information indicates that recruitment to the fishery has been very weak between 2004 and 2008 and the stock declined to a low level. The average recruitment observed in the 2009 survey has resulted in increased abundance and biomass in 2010. The fisheries lpue in 2010 is influenced by the seasonal closure introduced between May-July 2010.

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. There is a wide variation in size structure of the catches spatially and temporally. Given the sedentary nature of *Nephrops* populations closed areas may be an appropriate management tool to recover the stock. The switch in sex ratio in landings and catches in 2007-2009 may be the result of over exploitation of the male component of the stock leading to sperm limitation in those years. The sex ratio in 2010 has switched back to a more usual situation where males account for the majority of the catches.

Environmental influence on the stock

Productivity of deep water *Nephrops* stocks is generally lower than those on the shelf although 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. FUs 25, 26, 27 and 31. Increased storminess related to the NAO has been linked to reduced recruitment and low lpues several years later on the Porcupine Bank (González Herraiz *et al*, 2009).

The fisheries

The fishery takes place throughout the year with a peak between April and July. A seasonal closure was introduced between May-July 2010 that covers much of the stock distribution area. 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 by fleet	Total catch (2010) >917 t where 917 t landings (100% otter) and minimal discards.
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Effects of the fisheries on the ecosystem

Fishing effort directed at *Nephrops* will also have bycatches of hake, megrim, and anglerfish in mixed fisheries.

Quality considerations

The survey series is short but gives consistent indications of recent changes in the stock. Landings length frequency data for all countries involved in the fishery have been very sparse in recent years. This influences the calculation of exploitation and recruitment proxies. There are concerns about the accuracy of the catch statistics and lpue information in some fleets. Growth rates cannot be well determined. Analytical assessments are not feasible at present.

Scientific basis

Assessment type	Trends based on cpue and lpue and size composition in the catches and landings
Input data	1 trawl survey (SpPGFS-WIBTS-Q4) cpue and catch size Commercial lpue for Ireland, Spain and France
Discards and bycatch	Not included in the assessment and estimated to be minimal
Indicators	Sex ratio
Other information	Irish industry science survey in 2010
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* on Porcupine Bank (FU 16)

Reference points

No reference points are defined for this stock.

Outlook for 2012

The assessment is based on several indicators, including survey cpue, commercial lpue, size and sex ratio. All of these indicate that the stock has decline to a very low abundance in 2008. The improved recruitment observed in the 2009 survey catches has resulted in a stock size increase for the first time in several years.

Precautionary considerations

Effort, landings and size distribution data indicate that the stock is overfished. Biomass has increased in the last year. Therefore, catches should not increase to allow the stock to rebuild.

Additional considerations

The *Nephrops* trawl fishery takes by-catches 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

The closure introduced between May and July 2010 was respected by the fleet. It has therefore afforded some protection to the majority of the stock area (~75%). For this part of the stock area fishing effort and mortality will have been reduced at a time of peak female emergence and typically high lpue and landings. The closure will also have inadvertently concentrated effort and fishing mortality ~25% of the stock area not currently covered by the closure.

Nephrops on the Porcupine Bank are fished in relatively deep waters over a widespread area where they occur at low abundance. Given the sedentary nature of *Nephrops* populations the closure of the Porcupine bank for fisheries (1 May – 31 July) as introduced in 2010 (EC Reg. 53/2010) may be an appropriate management tool to substantially reduce catches and allow the stock to recover.

Productivity of deep water *Nephrops* stocks is generally lower than that 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. 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 over exploitation and potential recruitment failure as has been observed on the Porcupine Bank over the last decade.

Landings per unit effort (lpue) show a generally declining trend in most fleets over the time-series available. Mean size indicators in all commercial fleets and a survey indicate a large increase in mean size for both sexes in the past six years. There has been a large change in sex ratio in the survey catches and fishery landings with females *Nephrops* accounting for a larger proportion. Landings in 2009 ~825 t are the lowest observed since the development for the fishery.

Changes in fishing technology and fishing patterns

In the past the *Nephrops* fishery on the Porcupine Bank was 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 availability of *Nephrops*.

Uncertainties in assessment and forecast

Large differences are seen in the length compositions from different countries, this could indicate different selection patterns or different high grading practices between fleets, but is more likely to be because of spatial differences in size structure. Nevertheless all data shows a similar trend to larger size over the last decade due to poor recruitment. International landed length distributions are used to calculate the exploitation and recruitment proxies. Several uncertainties are associated with this approach, particularly the poor levels of catch sampling.

The size distribution and catch rates in fishery-independent survey confirm the weak recent recruitment (except 2009) and decline in stock abundance up to 2008.

The increase in the length based proxy for exploitation rate coincides with an increase in effort and landings. There are concerns about the accuracy of the l_{pue} information in some fleets due to change fishing practices. Growth rates cannot be well determined. Analytical assessments or catch forecasts are not feasible at present.

Comparison with previous assessment and advice

The assessment and advice is based on similar indicators to last year. The 2010 data confirm a good recruitment for the first time in several years. The survey abundance indices show a stock increase to the highest levels observed in the last decade.

The advice last year was to reduce catches to the lowest possible level. The advice this year is less stringent because of the recent increase in stock size.

Sources

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, pp1–7.
ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

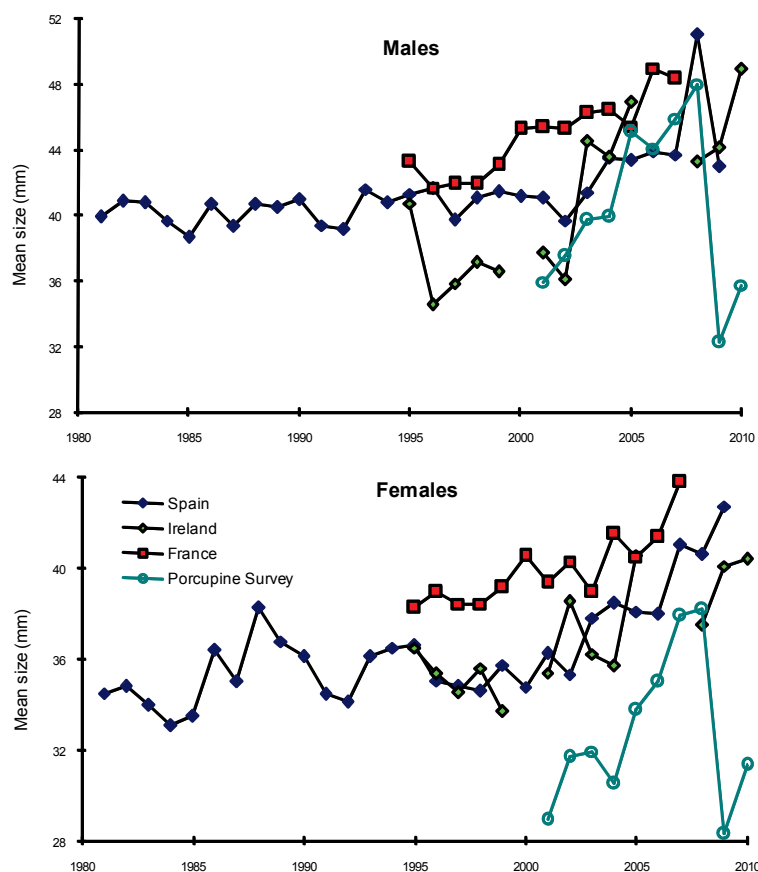


Figure 5.4.34.3.2 *Nephrops* on Porcupine Bank (FU 16). Mean sizes of ICES landings by sex and country and in mean size in the catch for the SpPGFS-WIBTS-Q4 survey.

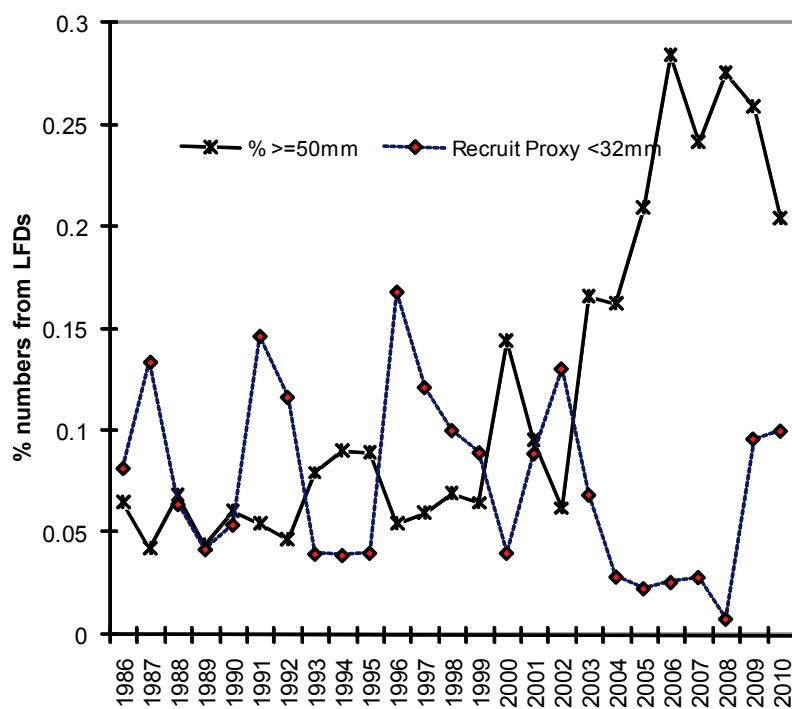


Figure 5.4.34.3.3 *Nephrops* on Porcupine Bank (FU 16). Trends in the percentages of the sampled male *Nephrops* landings <32 mm carapace length (a possible recruitment proxy) and >50 mm carapace length.

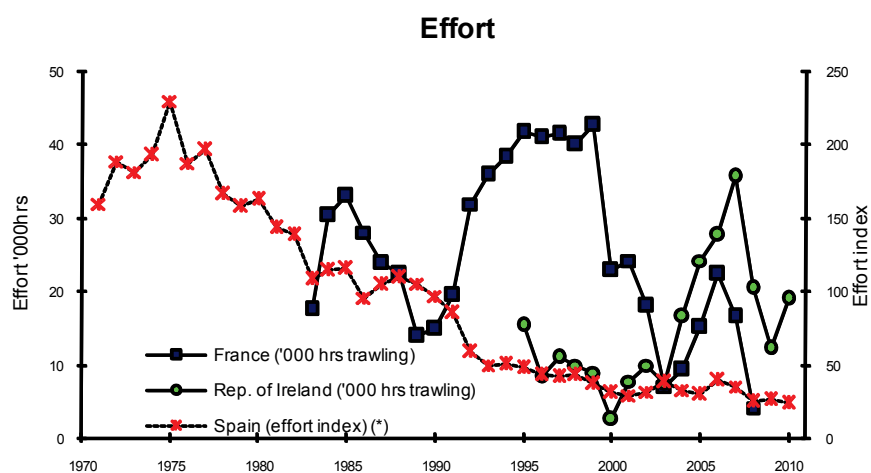


Figure 5.4.34.3.4 *Nephrops* on Porcupine Bank (FU 16). Effort trends for fleets.

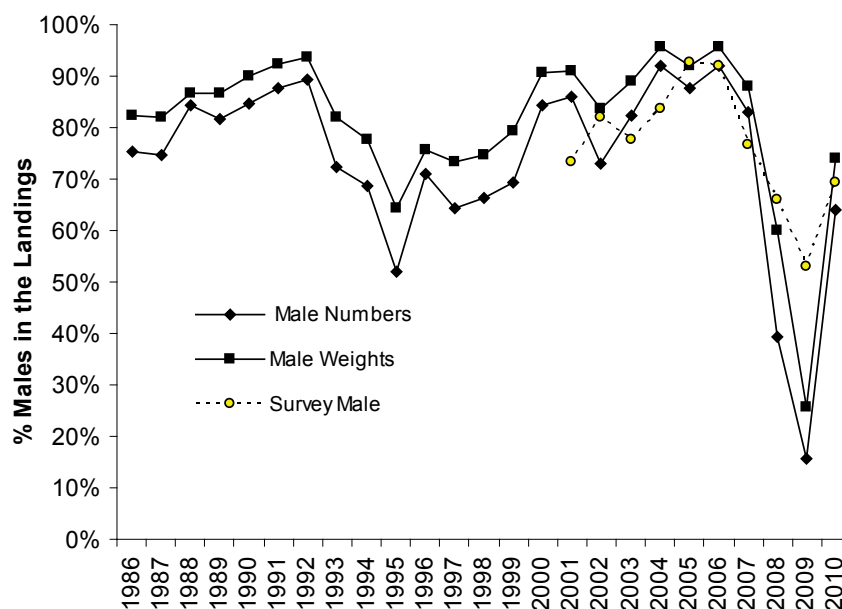


Figure 5.4.34.3.5 *Nephrops* on Porcupine Bank (FU 16). Sex ratio of landings and survey (SpPGFS-WIBTS-Q4) catches.

Table 5.4.34.3.1 *Nephrops* on Porcupine Bank (FU 16). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU16)	Recommended Landings VIIbcjk ¹	ICES Landings FU16 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		--	10.0
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		
2012	No increase in catch	-		

Weights in '000t

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 5.4.34.3.2 *Nephrops* on Porcupine Bank (FU 16). ICES landings (tonnes) by country.

Year	France	Rep. of Ireland	Spain	UK E& W	UK Scotland	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

ECOREGION Celtic Sea
STOCK *Nephrops* on Aran Grounds (FU 17)

Advice for 2012

ICES advises on the basis of the MSY approach that landings in 2012 should be no more than 1100 t.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)			
	2008	2009	2010
MSY (F_{MSY})	✗	✓	✓ Below target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined
SSB (Spawning Stock Biomass)			
	2008	2009	2010
MSY ($B_{trigger}$)	?	?	? Undefined
Precautionary approach (B_{pa}, B_{lim})	?	?	? Undefined

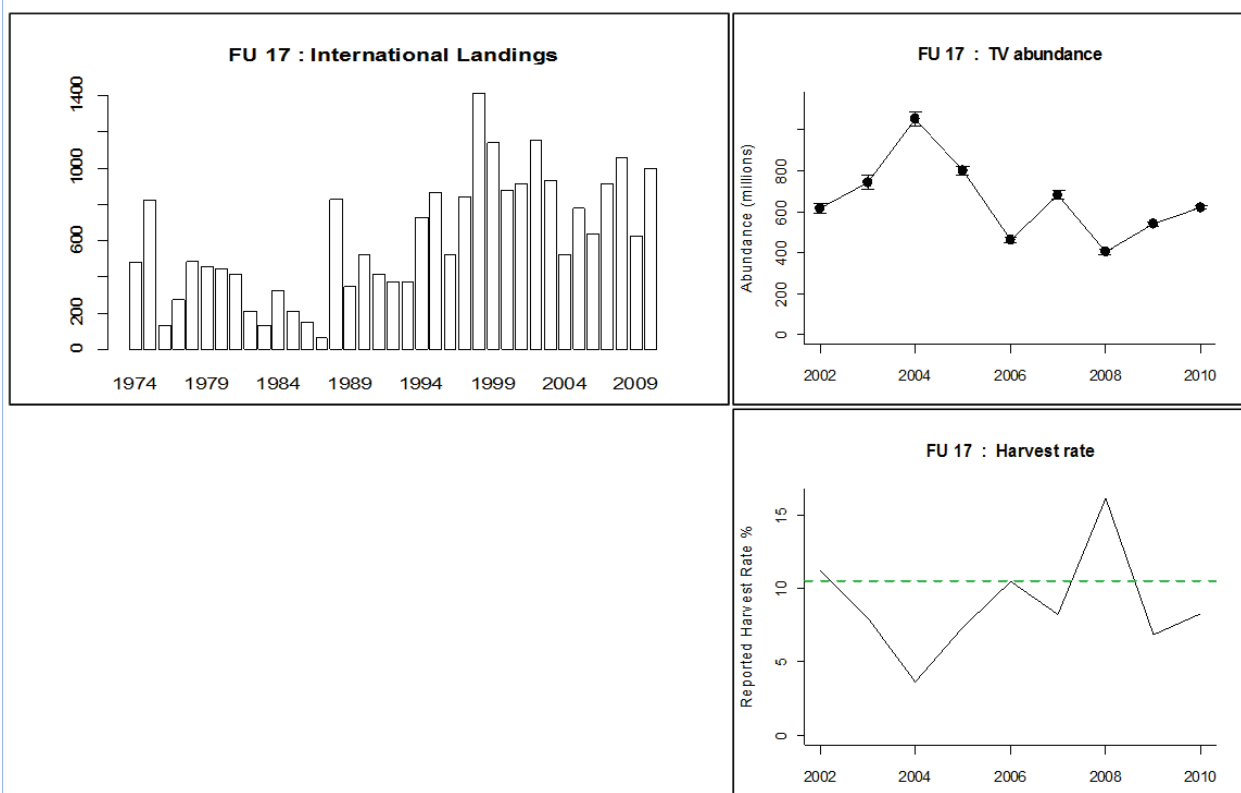


Figure 5.4.34.4.1 *Nephrops* on Aran Grounds (FU 17). Long-term trends in landings (in tonnes), UWTV abundance (in millions; SSB proxy) and harvest rates (F_{MSY} proxy shown as the broken green line).

The UWTV surveys conducted since 2002 give estimates of abundance that have fluctuated widely without a significant trend. The generally low harvest rate (9% average) appears to have little impact on observed stock fluctuations and is below F_{MSY} .

Management plans

No specific management objectives are known to ICES.

Biology

The Aran grounds can be characterised as an area of relatively high 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 has increased to 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 by fleet	Total catch (2010) 1.2 kt where 1.0 kt landings (99% otter trawls, 1% other gear-types), 0.2 kt discards
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Effects of the fisheries on the ecosystem

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

Quality considerations

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

Scientific basis

Assessment type	UWTV and trends of the size structure of catches
Input data	One survey index (UWTV-FU17), size structure of catches
Discards and bycatch	Discards are included in the assessment
Indicators	Sex ratio and <i>Ipue</i>
Other information	Latest benchmark was performed in 2009
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* on Aran Grounds (FU 17)

Reference points

	Type	Value	Technical basis
MSY	MSY B _{trigger}	Not defined	
Approach	F _{MSY}	HR 10.5%	Equivalent to F _{35% SPR} for combined sex in 2010
Precautionary Approach			No reference points are 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%SpR}	8.4%	12.8%	10.5 %

Density of *Nephrops* in FU17 is considered high (average density 0.9/m²), 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%SpR} of 10.5% is suggested as a proxy for F_{MSY}.

All F_{MSY} proxy harvest rate values are considered preliminary and may be modified following further data exploration and analysis.

Outlook for 2012

Basis: F₂₀₁₁ = F₂₀₁₀ = 8.3%; Bias corrected survey index (2010) = 827 million, Mean weights in landings (2008–2010, 24.5 g) and retention factors based (70%) on 2008–10 sampling.

Basis	Harvest ratio	Landings 2012 (tonnes)
MSY framework	10.5%	1100
F _{0.1} Combined	7.2%	800
F ₂₀₁₁	8.3%	900
F _{35%Combined}	10.5%	1100
F _{max} Combined	11.1%	1200

MSY approach

No MSY B_{trigger} has been identified for this FU. Hence the ICES MSY framework has been applied only in relation to F_{MSY}. This implies harvest ratio of 10.5 %, resulting in landings of 1100 t in 2012.

Additional considerations

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

Changes in fishing technology and fishing patterns

In recent years several newer vessels specialising in *Nephrops* fishing have participated in this fishery. These vessels target *Nephrops* on several other grounds within the TAC area and move around to optimise catch rates. Since the introduction of effort management associated with the cod long term plan (EC 1342/2008) there have been concerns that effort could be displaced towards the Aran and other *Nephrops* grounds where effort control has not been put in

place. Effort decreased in 2009 due to decommissioning of several vessels that actively participated in the fishery but effort in 2010 increased again.

Uncertainties in assessment

Some general uncertainties are discussed in section 5.4.34.

New UWTV survey information should be available after June 2011 which will provide a more up to date prognosis of stock status. The use of the most up to date survey information will be evaluated by ICES, and if appropriate this advice might be revised during this year.

There are several uncertainties in the survey, mean weight in the landings and discard rates which are not taken into account in the advice. The Separable Cohort Analysis (SCA) and yield per recruit analysis was based on 2008 and 2009 sampling, the fit to the SCA model was problematic so F_{MSY} proxies are likely to be uncertain.

Comparison with previous assessment and advice

The assessment and advice basis is consistent with last year.

Sources

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

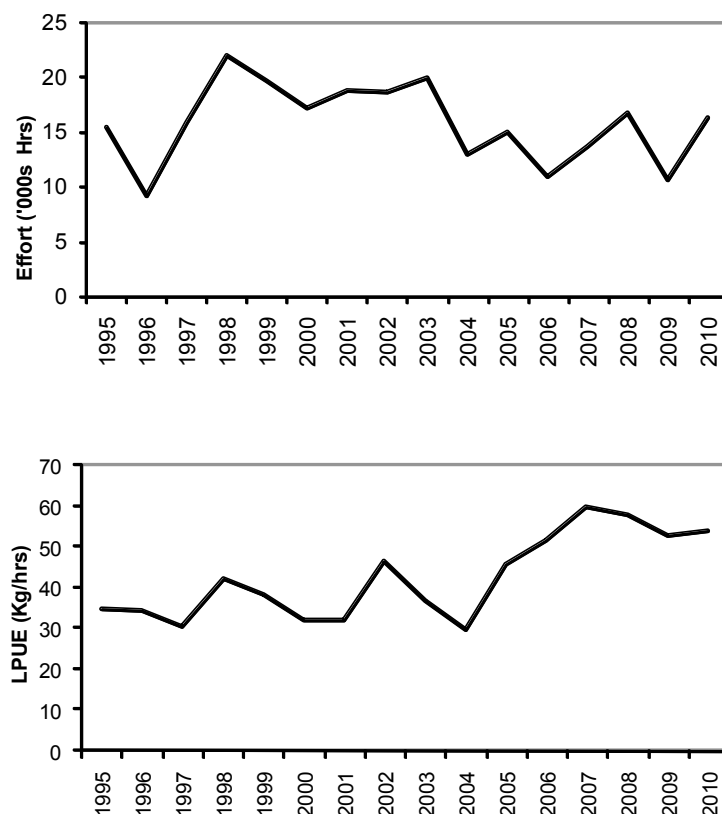


Figure 5.4.34.4.2 *Nephrops* in Aran Grounds (FU 17). Irish effort and lpue for *Nephrops*-directed fleet.

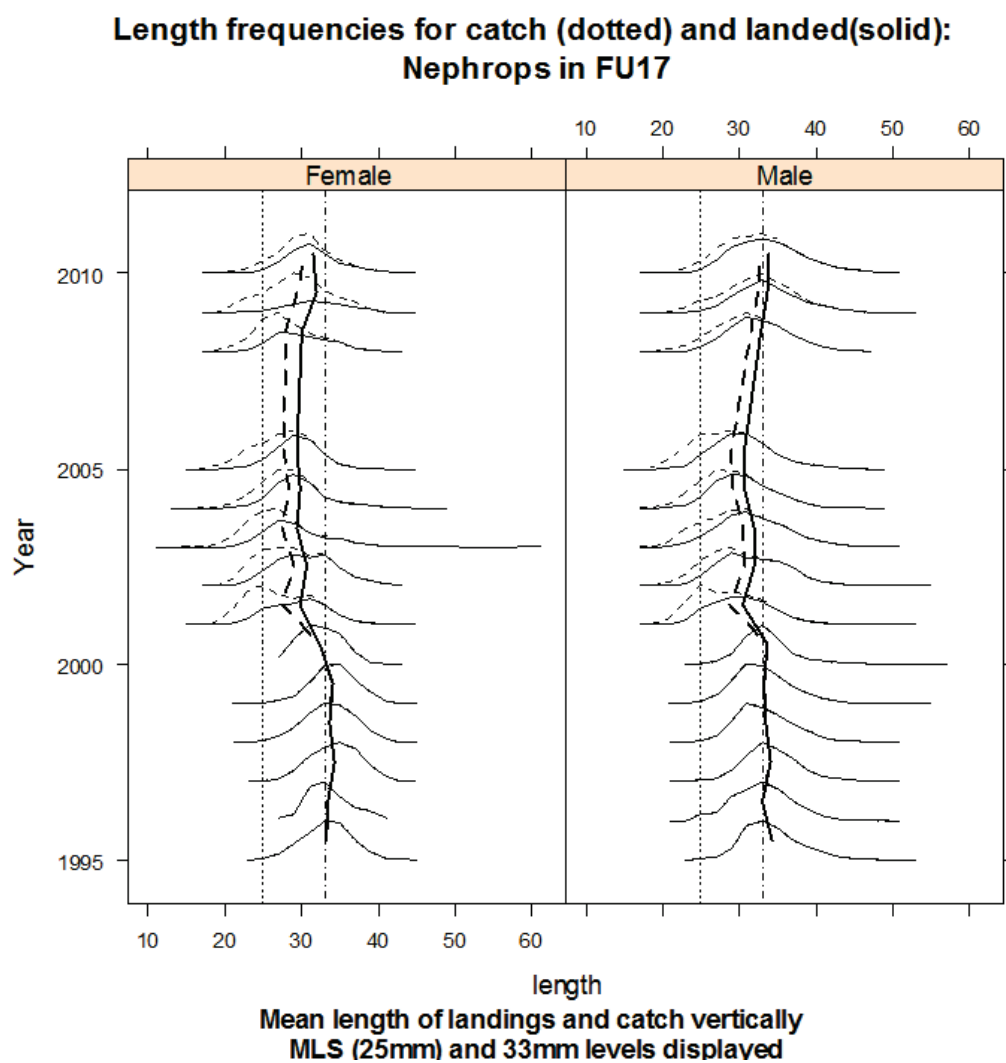


Figure 5.4.34.4.3 *Nephrops* in Aran Grounds (FU 17) Length distributions in the catches 2001–2005, 2008–2010 and in the landings 1995–2001.

Table 5.4.34.4.1 *Nephrops* in Aran Grounds (FU 17). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU17)	Recommended TAC VIIbcjk ¹	ICES Landings FU17 ²
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
2003			4.44	0.9
2004	Restrict landings to 2000–2002 levels		3.3	0.5
2005	Restrict landings to 2000–2002 levels		3.3	0.8
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
2009	No increase in effort and landings (2007)	< 0.9		0.6
2010	Harvest Ratio no greater than the lower bound of the range of $F_{0.1}$ for similar stocks	< 0.5		1.0
2011	MSY framework	<0.95		
2012	MSY framework	<1.1		

Weights in '000t

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 5.4.34.4.2 *Nephrops* in Aran Grounds (FU17). 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	1401	0	1410
1999	0	1140	0	1140
2000	1	879	0	880
2001	1	912	0	913
2002	2	1152	0	1154
2003	0	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	1000

Table 5.4.34.4.3 *Nephrops* in Aran Grounds (FU 17). Results from UWTV-FU17 survey of *Nephrops* Aran grounds in 2002–2010.

Ground	Year	Number of stations	Mean Density (No./M ²)	Domain Area (km ²)	Revised Estimate (millions)	CV on Burrow estimate
Aran Grounds	2002	49	0.84	943	818	4%
	2003	41	1.01	943	989	5%
	2004	64	1.43	943	1397	3%
	2005	70	1.09	936	1063	3%
	2006	67	0.64	932	616	3%
	2007	71	0.93	942	906	3%
	2008	63	0.56	906	536	3%
	2009	82	0.73	940	718	2%
	2010	91	0.85	937	827	2%

ECOREGION Celtic Sea**STOCK *Nephrops* off the south-eastern and south-western coasts of Ireland (FU 19)****Advice for 2012**

ICES advises on the basis of the precautionary considerations that catches in 2012 should be reduced.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)		
		2008-2010
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
SSB (Spawning Stock Biomass)		
		2008-2010
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	→	Stable

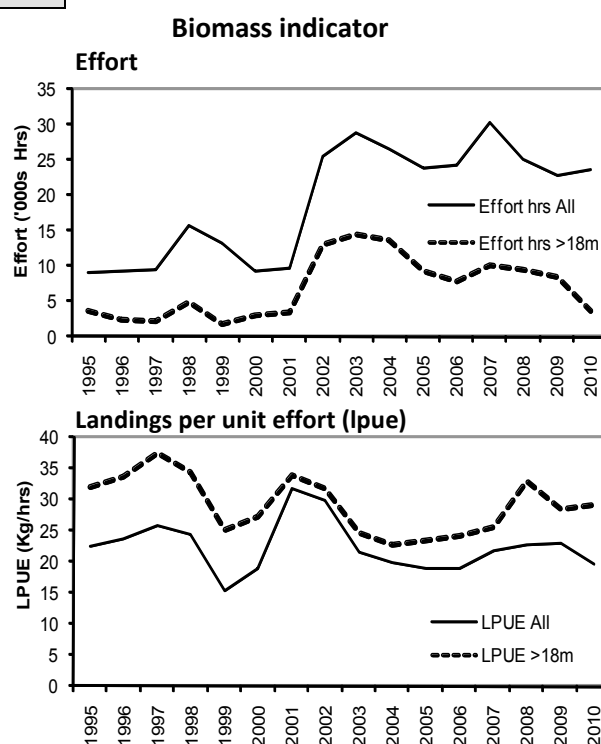
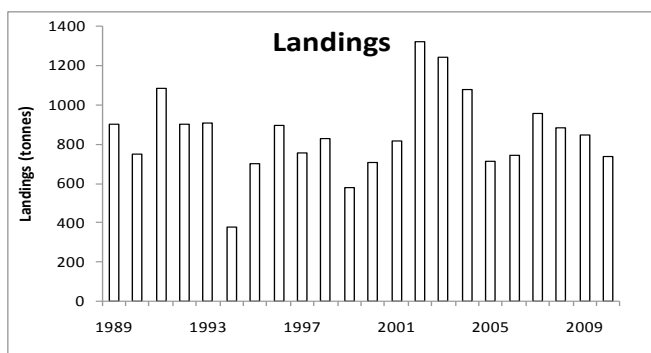


Figure 5.4.34.5.1 *Nephrops* off the south-eastern and south-western coasts of Ireland (FU 19): Long-term trends in landings (tonnes) top left. Fishing effort by all Irish *Nephrops* targeting vessels (solid line) and vessels >18m total length (dashed line) top right. Landings per unit effort (lpue, kg/hr) for all *Nephrops* targeting vessels (solid line) and those >18m total length (dashed line) bottom right.

The available information is insufficient to evaluate the exploitation status. Commercial landing per unit effort (lpue) has fluctuated without trend since 1995. Therefore, the state of the stock is considered stable.

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 mean length in catches between mud patches, suggesting variable population densities and growth. Sampling of commercial landings shows large variations in size because of this.

The fisheries

This is mainly an otter trawl fishery using single and twin-rigs and cod end mesh size of 80–99 mm.

Catch by fleet	Total catch (2010) 700 t where 700 t landings (98% otter trawls, 2% other gear-types), and unknown discards.
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Effects of the fisheries on the ecosystem

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

Quality considerations

Lpue data are the only available indicator of stock trend. The accuracy of this is uncertain because of changes in fleet composition, targeting behaviour, fishing patterns and the patchy distribution of *Nephrops* within this area.

Scientific basis

Assessment type	Survey trends
Input data	Landings, effort and lpue
Discards and bycatch	Unknown
Indicators	Mean size in landings. Historical survey indicators (UK-WCGFS) discontinued since 2006
Other information	None
Working group report	WGCSE

ECOREGION Celtic Sea**STOCK** *Nephrops* off the south-eastern and south-western coasts of Ireland (FU 19)**Reference points**

No reference points are defined for this stock.

Outlook for 2012

No assessment can be presented for this stock.

Precautionary considerations

The exploitation status is unknown and stock trends indicators have been stable. Therefore, ICES considers that catches should be reduced.

Additional considerations

Nephrops fisheries in this area are fairly mixed also landing megrim, anglerfish, haddock and other demersal species. The main discarded species are haddock, whiting and dogfish. ”

Comparison with previous assessment and advice

The perception of the stock has not changed. The advice in 2010 was based on the transition to the MSY approach and precautionary considerations. This year the advice is based on precautionary considerations.

Sources

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

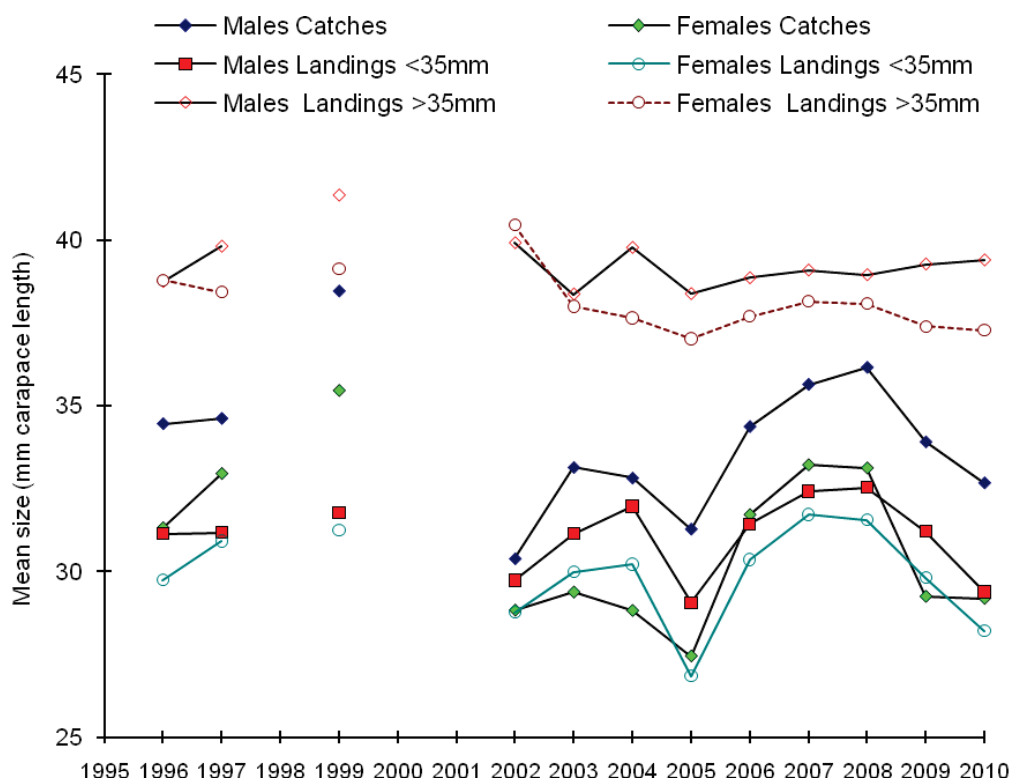


Figure 5.4.34.5.2 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19). Mean size trends for catches and whole landings by sex.

Table 5.4.34.5.1 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU19)	Recommended Landings VIIbcjk ¹	ICES Landings FU19 ²
1989				0.9
1990				0.8
1991				1.1
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
2007	Constrain effort at recent levels		--	1.0
2008	Constrain effort at recent levels		--	0.9
2009	No increase in effort and landings (2007)	<0.8	--	0.8
2010	No new advice, same as for 2009	<0.8	--	0.7
2011	See scenarios	-		
2012	Reduce catches	-		

Weights in '000t

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 5.4.34.5.2 *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	1077
1992	233	640	15	888
1993	229	672	4	905
1994	216	153	21	390
1995	175	507	12	695
1996	145	736	7	888
1997	93	656	7	756
1998	92	733	2	827
1999	77	499	3	579
2000	144	541	11	696
2001	111	702	2	815
2002	188	1130	0	1318
2003	165	1075	0	1239
2004	76	997	1	1074
2005	62	648	2	711
2006	65	675	1	741
2007	63	894	0	957
2008	46	805	15	866
2009	55	764	15	833
2010	14	694	13	722

ECOREGION Celtic Sea
STOCK *Nephrops* in the Celtic Sea (FU 20–22)

Advice for 2012

ICES advises on the basis of the MSY approach that landings from FU22 in 2012 should be no more than 2300 t. For the remaining areas FU20-21 ICES advise on the basis of precautionary considerations that landings should be reduced.

To protect the stock in these functional units, management should be implemented at the functional unit level.

Stock status

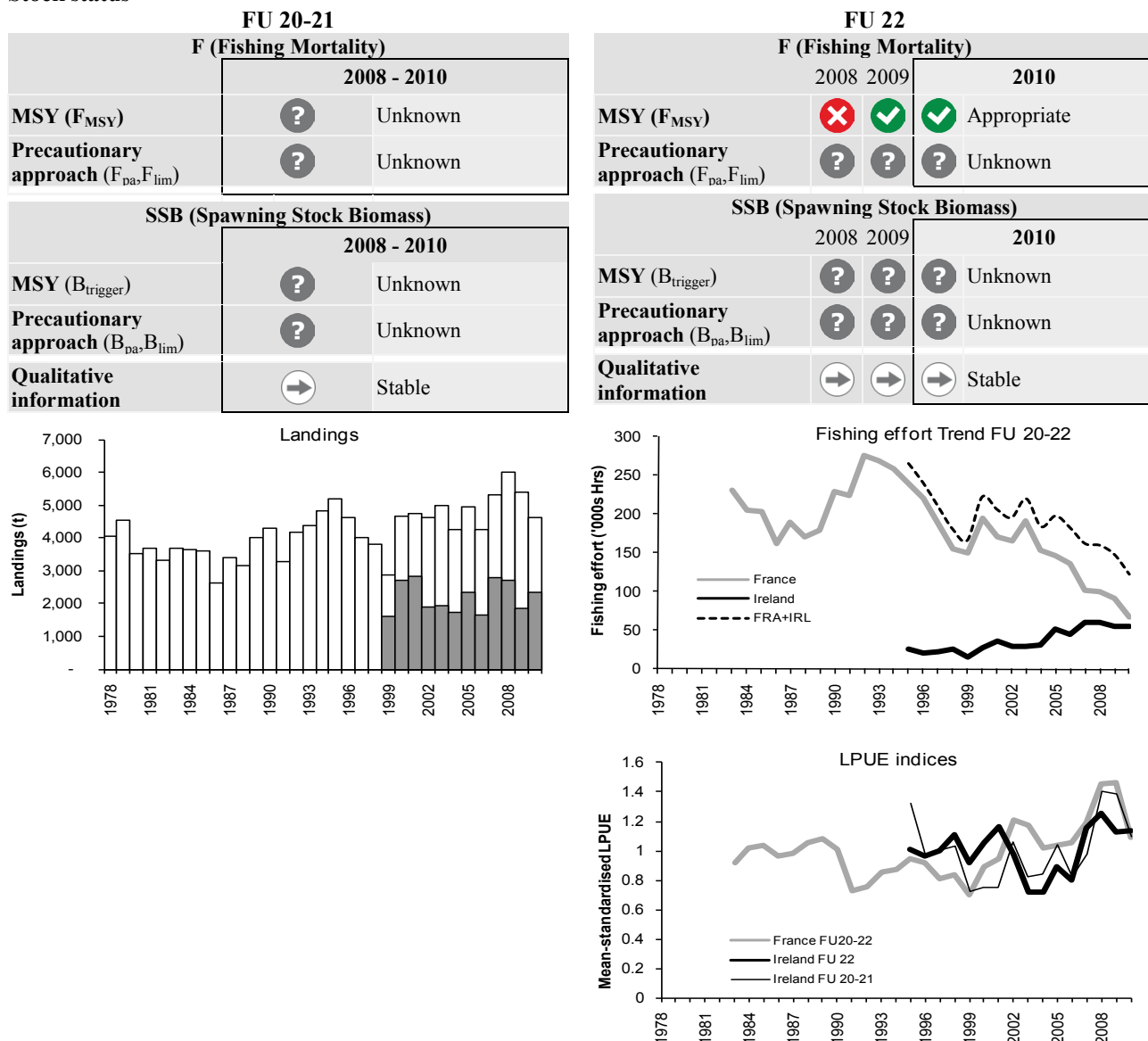


Figure 5.4.34.6.1 *Nephrops* in the Celtic Sea (FU 20–22). Long-term trends landings (t) for the whole area and from FU 22 since 1999 (grey bars) (top left). *Nephrops* directed fishing effort by country and total *Nephrops* directed effort (top right). Mean standardise lpue indices for Ireland FU 22 and FU 20-21 and France for FU 20-22 (mainly operating in FU20-21 during the last decade) (bottom right).

The status of the FU20-21 component of the stock is unknown. Landings are stable and the effort by the French and Irish fleets are showing opposite direction, respectively downward and upward. Overall, the effort is steadily decreasing since the early 90's. The lpues of the French and Irish fleets in this area, although variable, are very similar over the last 5 years (when the figures may be compared since the French fleet has mainly operated in FU20-21 during that period). The lpues alternate period of increasing and decreasing trends, so that the overall perception is mainly stability.

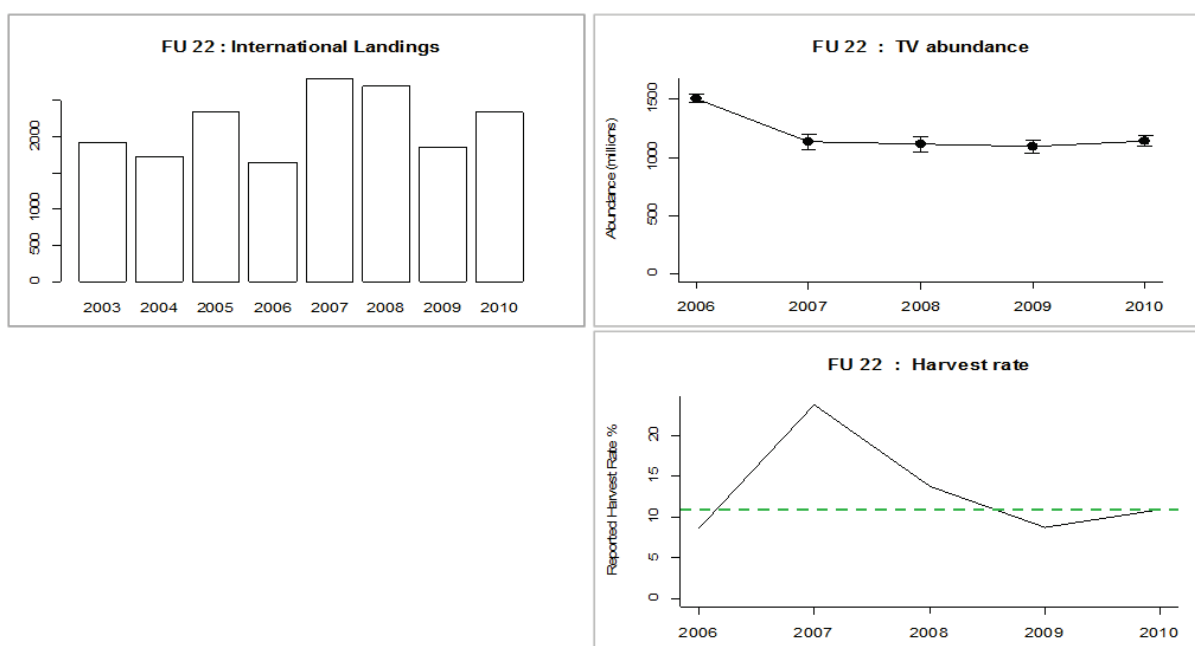


Figure 5.4.34.6.2 *Nephrops* in the Celtic Sea (**FU 22**). Recent international landings in tonnes for FU22 (Smalls) (top left); UWTV survey abundance for FU 22 (top right, proxy for SSB), and harvest rate (green dashed line represents F_{MSY} harvest ratio) (bottom right).

The FU 22 stock component is considered to be stable based on indicators (lpue, mean size) and recent UWTV survey data. There have been indications of strong recruitment in recent years (e.g. 2006) as underlined by the Irish UWTV survey in 2006 and by commercial lpue for Irish in 2007 and for French trawlers in 2008 and 2009 (Figure 5.4.34.6.1).

Management plans

No specific management objectives are known to ICES.

Biology

This area has several distinct mud patches. Survey information indicates consistent differences in mean size of catches between mud patches, suggesting variable population densities and growth. Sampling of commercial landings shows large variations in size between areas within FU20-22.

The fisheries

The fishery is prosecuted by twin and single trawlers. Landings are almost exclusively (more than 90%) provided by France and Republic of Ireland.

Catch by fleet Total catch (2010) 4.62 kt landings (100% trawling); total discards 1.23 kt

Effects of the fisheries on the ecosystem

Nephrops fishery in Celtic Sea has bycatches of whiting, cod, and to a lesser extent haddock and hake.

Quality considerations

Discards are thought to be extensive, but observations are insufficient to provide a reliable time-series.

Scientific basis

Assessment type	UWTV and trends, catch options based on UWTV for FU 22
Input data	1 commercial index (French trawlers: threshold 10%; Irish trawlers: threshold: 30% split in two components: Smalls ground [FU 22] surveyed by the UWTV and other areas [FU 20-21]) and 1 survey index (UWTV-FU22).
Discards and bycatch	Used for FU 22, historical discards for other areas uncertain.
Indicators	Mean size.
Other information	None.
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* in the Celtic Sea (FU 20–22)

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B_{trigger}	Not defined	
	F_{MSY} (whole FU20-22) harvest rate	Not defined	
	F_{MSY} (FU22) harvest rate	10.9%	MSY under SCA model
Precautionary Approach		Not defined	

(updated in 2011)

For FU 22, the absolute density observed on 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 1960's 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 FU22 F_{MSY} proxy.

For FU 20 and 21 it is not possible to currently estimate an F_{MSY} proxy.

All F_{MSY} proxies remain preliminary and may be modified following further data exploration and analysis. The time series is too short to propose a MSY B_{trigger} .

Outlook for 2012

There is no analytical assessment or UWTV survey for FU 20-21 and it is therefore not possible to provide catch options for 2012.

Catch options can be proposed for the Smalls (FU 22) based on an UWTV survey and sampling for that component of the stock.

FU 22: Basis: $F_{2011}=F_{2010}= 10.9\%$; bias corrected survey index (2010) = 1.1 billion; mean weights in landings (2009-10, 23.2g) and retention factors based (80%) on 2009–2010 sampling.

Basis	Harvest ratio	Landings 2012 in the Smalls (FU 22) (tonnes)
MSY framework	10.9%	2300
F_{2011}	10.9%	2320
$F_{0.1}$	7.5%	1580
$F_{35\%}$	10.9%	2300
F_{max}	12.3%	2600

MSY approach

Following the ICES MSY framework implies the harvest ratio for the Smalls FU22 to be less than 10.9 %, resulting in landings of less than 2300 t in 2012.

Precautionary considerations

Considering the recent stable lpues and unknown exploitation status for FU20 and 21, catches should be reduced.

Additional considerations

The *Nephrops* trawl fishery take bycatches of other species, especially whiting, much of which is discarded. Any measure to reduce discarding and to improve the fishing pattern would be beneficial to the whiting stock (see section 5.4.6).

In 2010, French official landings reached the lowest historical level mainly due to the strong reduction of the number of vessels because of European decommissioning schemes. Fishing effort in this fleet has declined more than 70% since early-1990. This fleet operates mainly in FU 20-21. The Irish effort has increased over time mainly in FU 22. Irish landings declined between 2008 and 2009 although they changed upwards in 2010. However, information on mean sizes in landings, discard rate, abundances provided by UWTV survey suggest no major change in the status of this stock.

French *Nephrops* trawlers usually switch to finfish (cod, whiting, and haddock) when *Nephrops* catch rates are low. This can occur within a trip (e.g. because of diurnal variations of catchability for *Nephrops*) making the analysis of catches of fish from so-called *Nephrops* trips difficult. An analysis of the catch composition on a haul by haul basis is needed to estimate the actual amount of by-catch and discards really caught in *Nephrops*-directed activity.

The effects of regulations

The minimum EU landing size (MLS) for *Nephrops* in this area is 8.5 cm of total size (25 mm CL), whereas French Producers' Organizations adopted for a long time a specific regulation of 11.5 cm of total size (35 mm CL). This has led to discarding of *Nephrops* above the legal minimum landing size by the French fleet. The proportion of individuals landed as tails in French landings increased significantly over the recent period (up to 20% in the late 2000s). These are mainly individuals below 35 mm (CL) which would have been discarded previously. French fleet use mesh size 100 mm, and Irish fleet 80 mm.

Uncertainties in assessment and forecast

The discards observations are insufficient to provide a full time-series of discards.

There are several key uncertainties and bias sources in the method base on UWTV survey used for projections in FU22. The survey estimates themselves are very precisely estimated (CVs 2–6%) given the homogeneous distribution of burrow density and the modelling of spatial structuring. The cumulative bias estimates for FU22 are largely based on expert opinion. The precision of these bias corrections cannot yet be characterised, but is likely to be lower than that observed in the survey.

In the provision of catch options based on the absolute survey estimates additional uncertainties related to mean weight in the landings and the discard rates also arise. For FU22 deterministic estimates of the mean weight in the landings and discard rates for 2008-2010 are used although there is some variability in these over time. Particularly when large recruitments are observed in the stock as was the case in 2006 and 2007.

Comparison with previous assessment and advice

This year the assessment was extended to make use of the FU22 UWTV survey to provide catch options for that component of the stock. The basis of the advice is precautionary considerations for FU20-21 and MSY approach for FU22.

Source

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

Table 5.4.34.6.1 *Nephrops* in the Celtic Sea (FU 20–22). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU 20-22)	ICES landings ²
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	2.9
2000		3.8	4.7
2001		3.8	4.8
2002		3.8	4.7
2003		3.8	5.0
2004	Adjust TAC in line with landings of most recent 10 years	4.6	4.3
2005	Adjust TAC in line with landings of most recent 10 years	4.6	4.9
2006	Recent average landings 2000–2002	4.6	4.3
2007	No increase in effort	-	5.3
2008	No increase in effort	<5.3	6.0
2009	No increase in effort	<5.3	5.4
2010	No new advice, same as for 2009	<5.3	4.6
2011	See scenarios	-	
2012	FU20-21: reduce catch	-	
	FU22: MSY framework	2.3	

Weights in '000 t.

¹⁾ Subarea VII.

²⁾ Does not include discards.

Table 5.4.34.6.2 *Nephrops* in the Celtic Sea (FU 20–22). Landings (t) by FU as used by ICES.

Year	FU20-22	FU22	FU20-21
1978	4056		
1979	4542		
1980	3535		
1981	3680		
1982	3316		
1983	3667		
1984	3653		
1985	3599		
1986	2638		
1987	3409		
1988	3165		
1989	4005		
1990	4290		
1991	3295		
1992	4165		
1993	4358		
1994	4843		
1995	5198		
1996	4602		
1997	3991		
1998	3819		
1999	2862	1588	1274
2000	4642	2702	1940
2001	4736	2817	1919
2002	4623	1881	2742
2003	5003	1921	3082
2004	4270	1726	2544
2005	4942	2355	2587
2006	4248	1647	2601
2007	5300	2807	2493
2008	6001	2704	3297
2009	5387	1857	3530
2010*	4622	2345	2277

*Preliminary

Table 5.4.34.6.3 *Nephrops* in the Celtic Sea (FU 20–22). Landings (t) by country as used by ICES.

Year	France	Rep. of Ireland	UK	Other Countries ¹	Total reported	Unallocated	Total
1983	3667		65				
1984	3653		36				
1985	3599		3				
1986	2638						
1987	3080	329					
1988	2926	239	1				
1989	3221	784	13				
1990	3762	528	14				
1991	2651	644	13				
1992	3415	750	84				
1993	3815	770	47	0	4632	-274	4358
1994	3658	1415	42	2	5117	-274	4843
1995	3803	1575	100	2	5480	-282	5198
1996	3363	1377	77	2	4819	-217	4602
1997	2589	1552	59	4	4204	-213	3991
1998	2241	1619	48	1	3909	-90	3819
1999	2078	824	38	0	2940	-78	2862
2000	2848	1793	44	1	4686	-44	4642
2001	2626	2123	19	1	4769	-33	4736
2002	3154	1496	15	8	4673	-50	4623
2003	3595	1389	19	N/A	5003	0	5003
2004	2605	1629	36	N/A	4270	0	4270
2005	2502	2387	53	N/A	4942	0	4942
2006	2368	1848	32	N/A	4248	0	4248
2007	2033	3214	47	6	5300	0	5300
2008	2348	3411	242	N/A	6001	0	6001
2009	2165	2844	378	N/A	5387	0	5387
2010	1112	3110	400	N/A	4565	0	4622

¹Other countries include Belgium**Table 5.4.34.6.4** *Nephrops* in Smalls FU22 (Celtic Sea). Results from UWTV survey of *Nephrops* Smalls grounds in 2006–2010.

Ground	Year	Number of stations	Mean Density (No./M ²)	Domain Area (km ²)	Revised Estimate (millions)	CV on Burrow estimate
Smalls	2006	100	0.63	2962	1954	2%
	2007	107	0.48	2955	1477	6%
	2008	76	0.47	2698	1448	6%
	2009	67	0.47	2824	1421	5%
	2010	90	0.49	2861	1483	4%

ECOREGION Celtic Sea and West of Scotland
STOCK Sole in Divisions VIIh–k

Advice for 2012

ICES advises on the basis of precautionary considerations that catches in 2012 should not increase.

Stock status

F (Fishing Mortality)		
2008-2010		
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
Qualitative evaluation	✓	close to current proxy for F_{MSY}
SSB (Spawning Stock Biomass)		
2009-2011		
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown

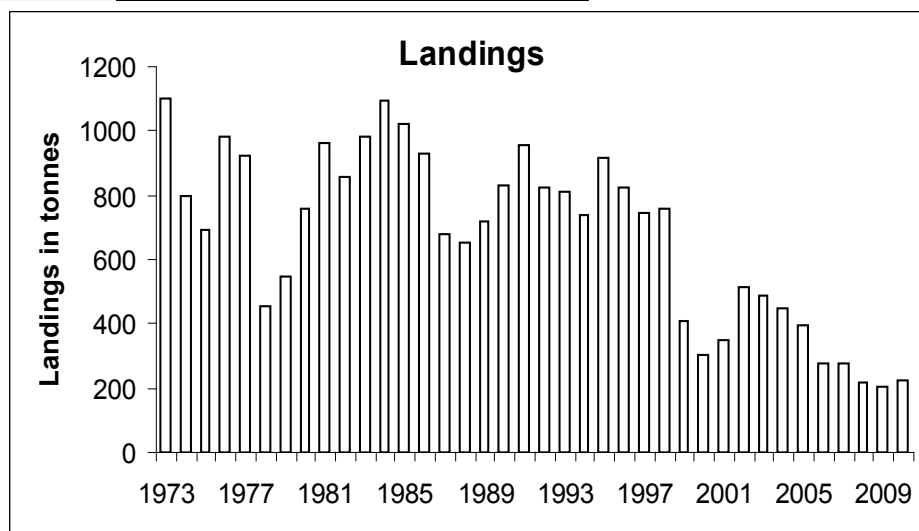


Figure 5.4.35.1 Sole in Divisions VIIh–k. Official landings in tonnes.

The state of sole stock biomass in Divisions VIIh–k is unknown. However, exploratory estimates of mortality suggest that the current fishing mortality in VIIjk is close to current proxy for F_{MSY} .

Management plans

No specific management objectives are known to ICES.

The fisheries

Sole in Divisions VIIh-k are mainly taken by otter trawlers and beam trawlers.

Scientific basis

Assessment type	Catch curve analysis
Input data	Catch statistics
Discards and bycatch	Not included in the assessment
Indicators	None
Other information	None
Working group report	WGCSE

ECOREGION Celtic Sea and West of Scotland
STOCK Sole in Divisions VIIh–k

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B_{trigger}	Not defined	
	F_{MSY}	0.31	Provisional proxy based on WGCSE 2010 estimate of F_{max}
Precautionary Approach	B_{lim}	Not defined	
	B_{pa}	Not defined	
	F_{lim}	Not defined	
	F_{pa}	Not defined	

(unchanged since 2010)

Outlook for 2012

No reliable assessment can be presented for this stock. The main cause of this is that catch numbers-at-age are only available for Irish landings. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

The state of the stock biomass is unknown, but exploratory estimates of mortality suggest that recent fishing mortality for the major component of the catch is too close to F_{max} which is used as a proxy for F_{MSY} (Figure 5.4.10.3). Therefore, catches should not be allowed to increase in 2012.

Additional considerations

A proxy for total mortality (Z) was estimated from the Irish catch numbers at age in VIIjk (Figure 5.4.10.2). Exploratory estimates of mortality suggest that the current fishing mortality in the VIIjk part of the stock is around or below F_{MSY} estimated from a yield per recruit analysis.

Comparison with previous assessment and catch options

The assessment is based on a catch curve through landings-at-age data for sole in Divisions VIIjk which is the same as last year. Exploratory estimates of mortality and F_{msy} are similar to last year. The basis for the advice is the same as last year.

Sources

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

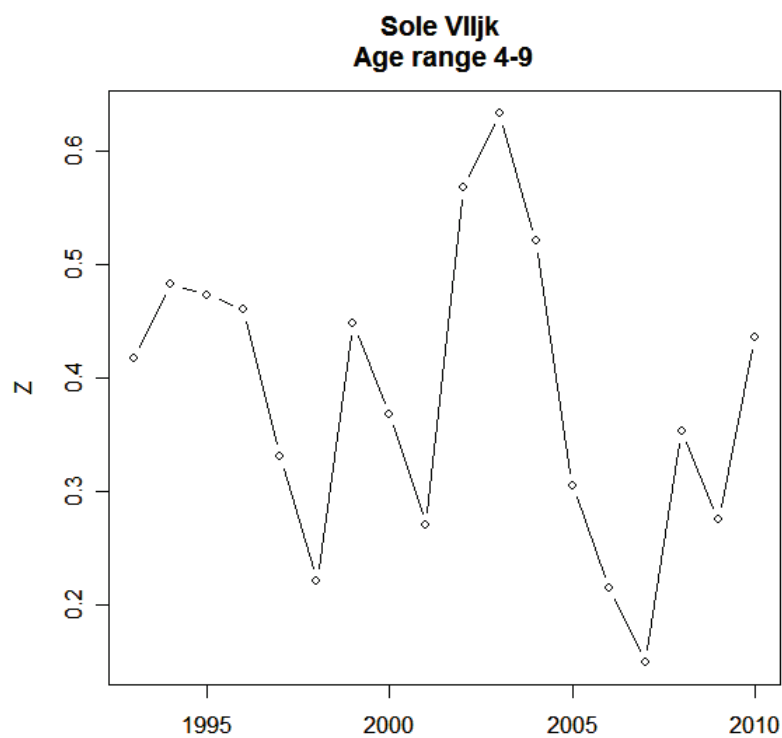


Figure 5.4.35.2 Sole in Divisions VIIh–k. Total mortality Z estimated over pseudo-cohorts as the slope of the log catch numbers.

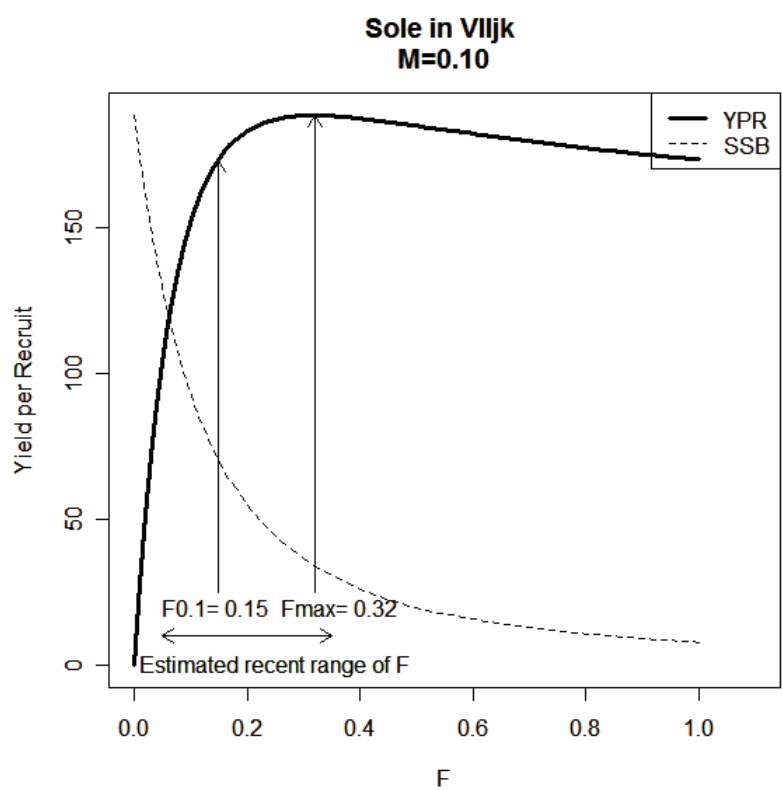


Figure 5.4.35.3 Sole in Divisions VIIh–k. Yield per recruit plot and the recent range of F estimates for this stock.

Table 5.4.35.1 Sole in Divisions VIIh–k. Advice, management and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings
1996	No advice	-	-	830
1997	No advice	-	-	740
1998	No advice	-	-	760
1999	No advice	-	-	410
2000	No advice	-	-	300
2001	No advice	-	650	350
2002	No advice	-	650	520
2003	Reduce TAC to recent landings	330	390	490
2004	Reduce TAC to recent average (2000–2002)	360	390	450
2005	Reduce TAC to recent average (2001–2003)	335	650	400
2006	Reduce TAC to recent average (2002–2004)	380	650	280
2007	Reduce TAC to recent average (2003–2005)	287	650	280
2008	Reduce TAC to recent average (2004–2006)	300	650	220
2009	Same advice as last year	300	553	210
2010	No advice	-	498	230
2011	No increase in catches	-	423	
2012	No increase in catches	-		

Weights in t.

Table 5.4.35.2 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 – E, W & NI	.	.	.	.	.	.	.	.	.	.
UK – E & W	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 – E, W & NI	.	.	.	.	.	.	177	144	234	215
UK – E & W	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 – E, W & NI	209	172	192	148	113	111	97	95	111	124
UK – E & W	.	.	.	.	.	.	.	.	.	.
UK - Scotland	5	2	-	-	-	-	-	-	-	-
Total	812	738	915	826	742	759	406	303	352	517

Country	2003	2004	2005	2006	2007	2008	2009	2010
Belgium	170	157	90	36	31	10	11	20
Denmark	-	-	-	-	-	-	-	-
France	133	103	93	92	78	57	77	83
Ireland	105	111	98	63	78	72	60	71
Netherlands	-	-	-	1	-	-	-	-
Spain	-	-	2	-	-	-	-	-
UK – E, W & NI	78	79	112	87	91	80	58	51
UK – E & W	.	.	-	-	-	-	-	-
UK - Scotland	-	-	-	-	-	-	-	-
Total	486	450	395	279	278	219	206	225

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

Advice for 2012

There is insufficient information to evaluate the status of the stock. Therefore, based on precautionary considerations, ICES advises that no increase of the catch should take place unless there is evidence that this will be sustainable.

Stock status

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

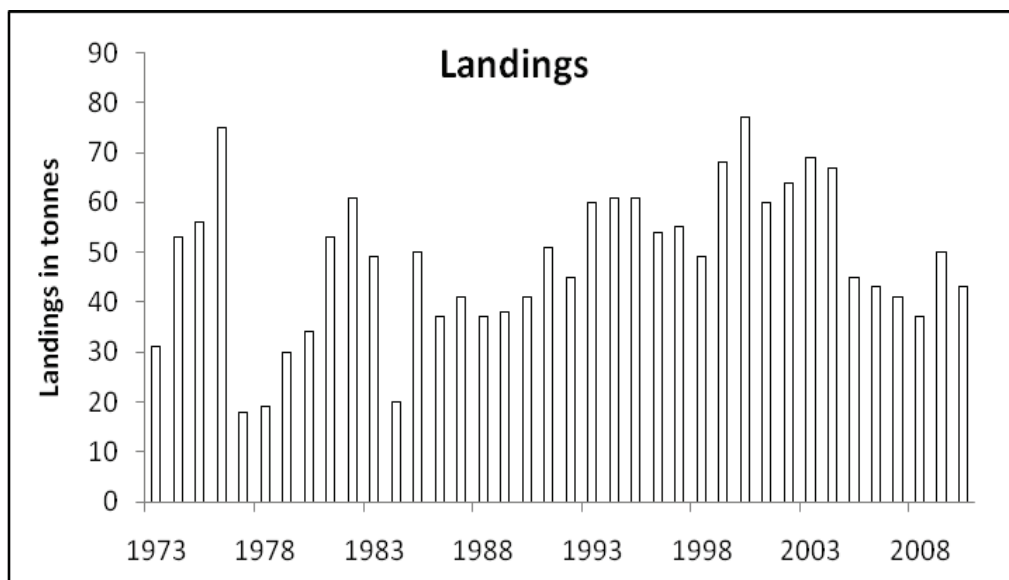


Figure 5.4.36.1 Sole in Divisions VIIb,c (West of Ireland). Official landings in tonnes.

The state of the stock is unknown.

Management plans

No specific management objectives are known to ICES.

Scientific basis

Assessment type	No assessment
Input data	Catch statistics
Discards and bycatch	Not available
Indicators	None
Other information	-
Working group report	WGCSE

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

Reference points

No reference points are defined for this stock.

Outlook for 2012

No reliable assessment can be presented for this stock. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

There is insufficient information to evaluate the status of the stock. Therefore, based on precautionary considerations, ICES advises that no increase of the catch should take place unless there is evidence that this will be sustainable.

Sources

ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 11–19 May 2011, Copenhagen, Denmark ICES CM 2011/ACOM:12.

Table 5.4.36.1 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	
2012	No increase in catch	-		

Weights in tonnes.

Table 5.4.36.2 Sole in Divisions VIIb,c (West of Ireland). Landings (t), as officially reported to ICES.

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
France	-	25	7	6	3	3	6	9	6	5	9	3	6
Ireland	12	12	19	44	14	16	13	24	47	55	40	17	44
Spain	19	16	30	25	1	-	11	1	-	-	-	-	-
UK - Eng+I	-	-	-	-	-	-	-	-	-	-	-	-	-
UK - Engla	-	-	-	-	-	-	-	-	-	1	-	-	-
Total	31	53	56	75	18	19	30	34	53	61	49	20	50

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
France	8	2	2	-	-	5	2	1	1	2	2	3	-
Ireland	29	39	34	38	41	46	43	59	60	59	52	51	49
Spain	-	-	-	-	-	-	-	-	-	-	-	-	-
UK - Eng+I	-	-	-	-	-	-	-	-	-	-	-	1	-
UK - Engla	-	-	1	-	-	-	-	-	-	-	-	-	-
Total	37	41	37	38	41	51	45	60	61	61	54	55	49

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
France	-	12	7	14	19	18	7	12	7	6	4	8
Ireland	68	65	53	50	50	49	38	31	34	31	46	35
Spain	-	-	-	-	-	-	-	-	-	-	-	-
UK - Eng+I	-	-	-	-	0	-	-	-	-	-	-	-
UK - Engla	-	-	-	-	-	-	-	-	-	-	-	0
Total	68	77	60	64	69	67	45	43	41	37	50	43

ECOREGION Celtic Seas**STOCK Demersal elasmobranchs in the Celtic Sea and West of Scotland****Advice for 2012**

The advice given in 2010 for these stocks is biennial and valid for 2011 and 2012 (see [ICES, 2010](#)). This year ICES adopts the transition to the MSY approach as the basis for advice, which corresponds to landings less than 9900 t for the main species of skates and rays, and no increase in catches for *Scyliorhinus canicula* (Lesser-spotted dogfish). Advice given for individual stocks is given below.

Advice for 2011 and 2012 by individual stocks

Species	Area	Advice
Common skate complex (= <i>D. batis</i> , which has recently been differentiated into <i>D. flossasda</i> and <i>D. intermedia</i> , see Additional Considerations)	VI	No targeted fishery
	VII	No targeted fishery
<i>R. clavata</i> (thornback ray)	VI	Status quo catch
	VIIa,f,g	Status quo catch
	VIIe	Status quo catch
<i>R. montagui</i> (spotted ray).	VI	Status quo catch
	VIIa,f,g	Status quo catch
	VIIe	Status quo catch
<i>L. naevus</i> (cuckoo ray)	VI	Reduce from recent catch level
	VII	Reduce from recent catch level
<i>R. brachyura</i> (blonde ray)	VIa	No advice
	VIIa	No advice
	VIIe	No advice
	VIIIf	No advice
<i>R. undulata</i> (undulate ray)	VIIj	No targeted fishery
	VIIId,e	No targeted fishery
<i>R. microocellata</i> (small-eyed ray)	VIIIf	Status quo catch
<i>L. circularis</i> (sandy ray)	VI	No advice
	VIIbc,h-k	No advice
<i>R. fullonica</i> (shagreen ray)	VI	No advice
	VIIbc,g-k	No advice
<i>Dipturus oxyrinchus</i> (long-nose skate)	VI-VII	No advice
<i>Dipturus nidarosiensis</i> (Norwegian skate)	VI	No advice
<i>S. canicula</i> (lesser spotted dogfish)	VI and VII	Status quo catch
<i>S. stellaris</i> (greater spotted dogfish)	VIIa,e,f	No advice
<i>Mustelus</i> spp. (smooth-hounds)	VII	Status quo catch
<i>Squatina squatina</i> (Angel shark)	VI,VII	Retain on prohibited species list
<i>Rostroraja alba</i> (White skate)	VII	Retain on prohibited species list

Sources

ICES. 2010. Report of the ICES Advisory Committee, 2010. ICES Advice, 2010, Section 5.4.37.

Table 5.4.37.1 Demersal Elasmobranchs in the Celtic Seas. ICES biennial advice, management and landings.

Year	ICES Advice	Predicted catch corresponding to advice	Agreed TAC ¹	ICES landings
1992	No advice		No TAC	16.6
1993	No advice		No TAC	14.5
1994	No advice		No TAC	13.9
1995	No advice		No TAC	15.3
1996	No advice		No TAC	19.0
1997	No advice		No TAC	20.5
1998	No advice		No TAC	20.0
1999	No advice		No TAC	19.9
2000	No advice		No TAC	19.9
2001	No advice		No TAC	17.8
2002	No advice		No TAC	18.8
2003	No advice		No TAC	17.6
2004	No advice		No TAC	13.2
2005	No advice		No TAC	13.0
2006	No advice		No TAC	10.0
2007	No advice		No TAC	10.1
2008	No advice		No TAC	9.5
2009	Status quo catch for main commercial species ⁽³⁾	na	15.7 ⁽¹⁾	4.6 ⁽²⁾
2010	Status quo catch for main commercial species ⁽³⁾	na	13.4 ⁽¹⁾	
2011	Recent average catch (2006-2008) for main species ⁽³⁾	< 9.9		
2012	No new advice, same as for 2011	< 9.9		

Weights in '000 t

¹⁾ Does not apply to Undulate ray (*Raja undulata*), Common skate (*Dipturus batis*), Norwegian skate (*Raja (Dipturus) nidarosiensis*) and White skate (*Rostroraja alba*).

²⁾ Does not include French landings which were unavailable for this year.

³⁾ See species table and no target fishery on *Raja undulata* and *Dipturus batis* complex

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

Advice for 2012

ICES advises on the basis of precautionary considerations that there should be no increase in catch.

Stock status

F (Fishing Mortality)		
		2008-2010
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
Qualitative evaluation	→	Stable at low level
SSB (Spawning Stock Biomass)		
		2008-2010
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	↗	Increasing

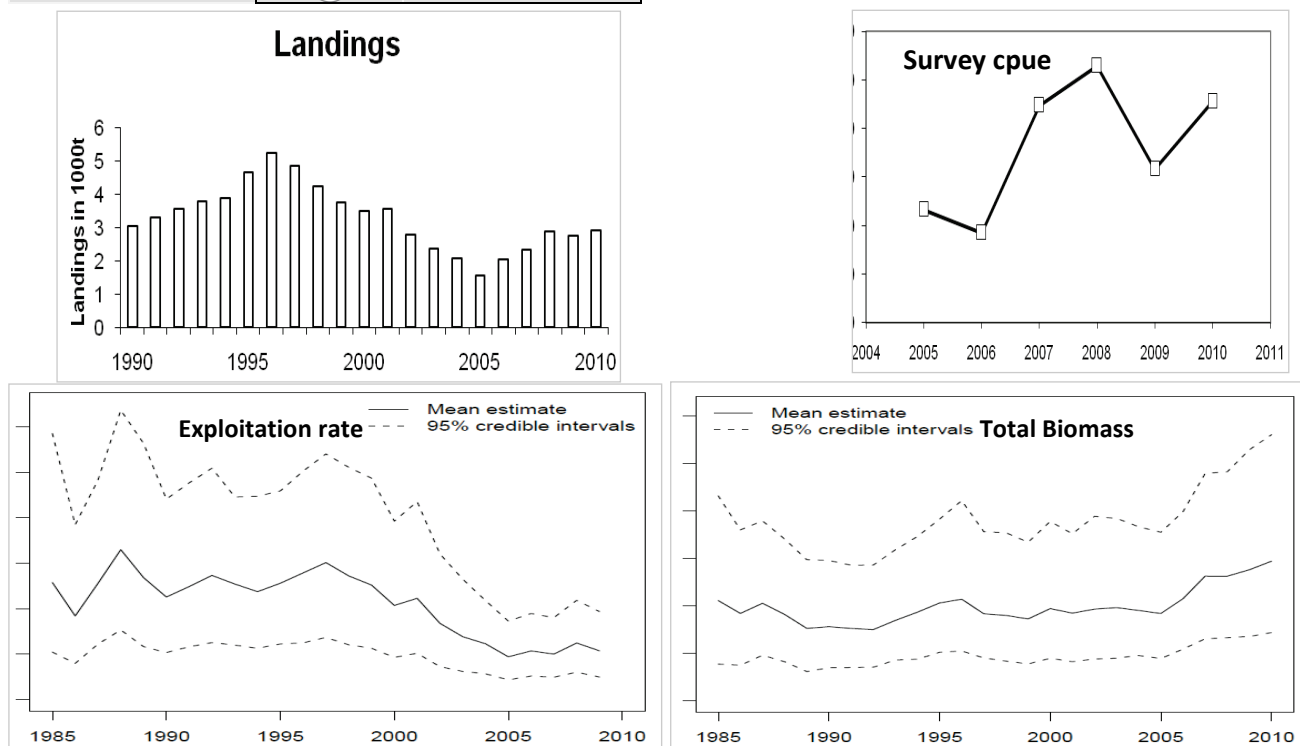


Figure 5.4.38.1 Megrim (*Lepidorhombus* spp) in Divisions IVa and VIa. Landings ('000 t) and trends in biomass from the combined fishery independent survey [upper panel]. Trends in exploitation rate and total biomass from exploratory state-space biomass dynamic model based on fishery independent survey data [lower panels]. Y-axis of survey cpue, exploitation rate, and total biomass are arbitrary scales and all start at 0.

There is no analytical assessment for this stock. Survey indices show an increase in biomass over the time series (2005 to 2010). An exploratory state-space surplus production model indicates that the overall mortality rate has declined and stabilised at reduced levels in recent years and total biomass has increased.

Management plans

No specific management objectives are known to ICES.

Biology

There are two separate TAC areas for megrim, VI and IV, but there is little evidence to suggest that the megrim in Subarea IV and Division VIa are separate stocks. ICES (2011b) concluded 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 are predominantly caught using otter trawls.

Catch by fleet	Total catch 2909 t discards range 1 – 23% by weight.
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Quality considerations

Imprecise and missing age data hampers the ability of ICES to carry out an age-based assessment for this stock. The extent of area misreporting between management or stock areas is unknown and for stocks like megrim and anglerfish on the northern shelf, there is a general need for improved spatio-temporal resolution of commercial catch and effort data through integration of VMS and logbook data from countries engaged in the fishery.

Scientific basis

Assessment type	Landings and survey trends based assessment
Input data	Landings data, commercial lpue indices (SCO TR1; IRE TR1; FR TR1 for VI; SCO TR1 and SCO TR2 for IV) and survey cpue trends (SCO-IV-VI-AMISS-Q2, IRL-IV-VI-AMISS)
Discards and bycatch	Not included in the assessment
Indicators	Survey based abundance on biomass
Other information	Benchmarked at WKFLAT (ICES 2011b). Exploratory biomass dynamic model is run. Advice for Division VIb is available in section 5.4.39.
Working group report	WGCSE

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

Reference points

No reference points have been defined for this stock.

Outlook for 2012

The exploratory state-space model is only considered to evaluate stock trends. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

Survey information shows an increasing trend in biomass and exploratory analysis shows that the exploitation has decreased substantially in recent years. Therefore, catches should not be allowed to increase.

Additional considerations

Management considerations

There have been substantial reductions in effort associated with the Scottish and Irish fleets since 2002 and are considered to have contributed to the decline of landings in Subarea VI. Landings in Subarea VI are well below the TAC. Uptake by France, accounting for 44% of the TAC, is very low (~11%). Official landings in Subarea IV and Division IIa in recent years are close to the TAC.

Fishing effort in 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 and 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. Redistribution of landings between VIa and IVa has not been undertaken by ICES in recent years. Combining the stocks of VIa and IVa also has the advantage of negating the impact of area misreporting between the two areas.

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

The effects of regulations

In 2010, new mesh regulations introduced in Division VIa which have increased the mesh size from 100 to 120 mm (vessels >15 m) has resulted in an increase in the length of first capture. This 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.

No information is available on changes in the French and Spanish fleets operating in this area.

Data and methods

The information basis for megrim is being developed, with improvements to both industry-related data and surveys.

Commercial lpue's from four fleets in VIa and two fleets in IVa may be considered indicative of stock trends, but these should be treated with caution as they may give an overly optimistic view of stock abundance as there is evidence of increased targeting in recent years. Exploratory analysis using a state space surplus production model that uses all available survey data in Division VIa and IVa, are informative as relative trends in biomass and exploitation rate.

Comparison with previous assessment and advice

Last year's assessment was based on survey trends. A new exploratory assessment was used in 2011 as basis for an assessment, following recommendations from the benchmark assessment meeting (ICES, 2011a). WKFLAT(ICES, 2011a), based on survey data(SCO-IV-VI-AMISS-Q2), concluded that megrim in Division VIb is a separate stock. The advice given this year is applicable to megrim in Divisions IVa and VIa. Advice for Division VIb is available in section 5.4.39.

The advice is the same as last year for the combined stocks, but extended by ICES new form of advice for data poor stocks.

Assessment and management area

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

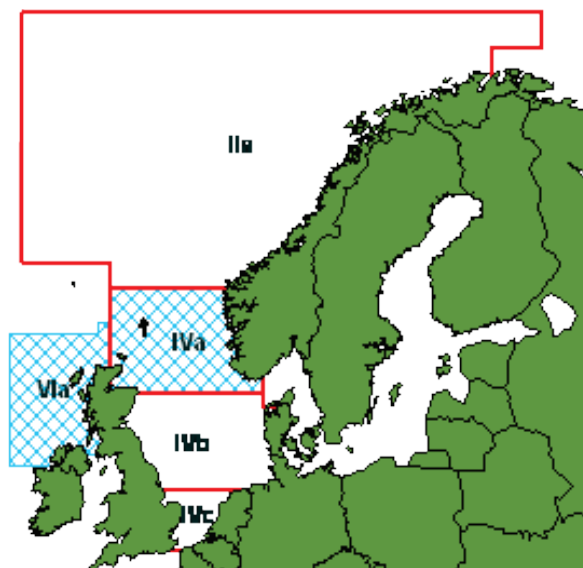


Figure 5.4.38.2 Megrim (*Lepidorhombus* spp) in Divisions IVa and VIa. Management area (red boxes) and assessment area (blue hatched area).

Sources

ICES. 2011a. Report of the Benchmark Workshop on Flatfish (WKFLAT), 1–8 February 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:39. 257 pp.

ICES. 2011b. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

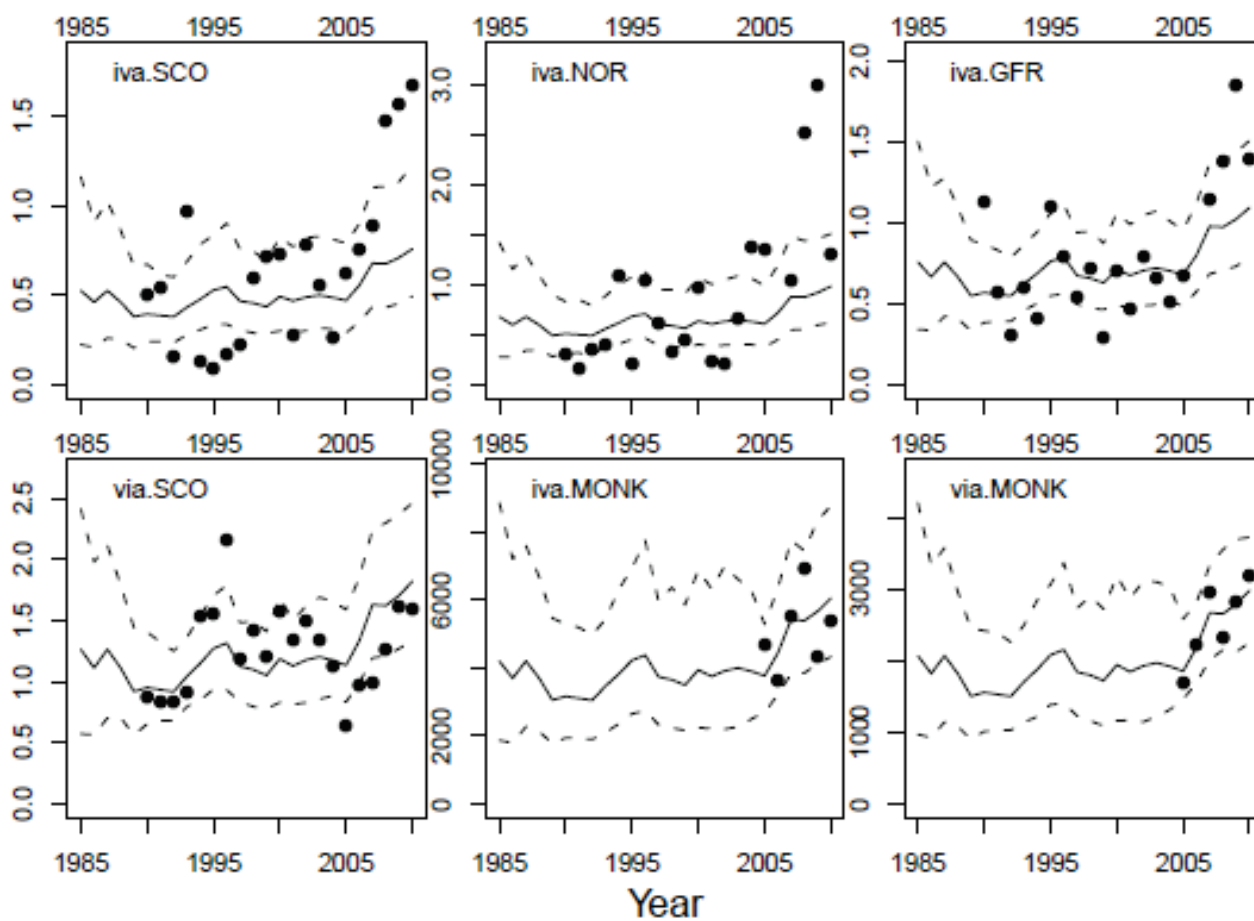


Figure 5.4.38.3 Megrin (*Lepidorhombus* spp) in Divisions IVa and VIa. Survey indices from six individual IBTS and anglerfish surveys (dots) with modelled catch per unit effort estimates from the exploratory surplus production assessment (black line) and 95% confidence intervals (dashed lines).

Table 5.4.38.1 Megrin (*Lepidorhombus* spp) in Divisions IVa and VIa. ICES advice, management and landings.

Year	ICES Advice ¹⁾	Predicted catch corresp. to advice	Agreed TAC IIa + IV	Agreed TAC Vb(EC) VI, XII, XIV	Official Landings IV + IV	ICES Landings ²⁾ IVa + IVa
1987	Not assessed	-		4.4	3.9	-
1988	Not assessed	-		4.84	4.5	-
1989	Not assessed	-		4.84	2.7	-
1990	Not assessed	-		4.84	2.7	3.7
1991	No advice	-		4.84	3.2	3.7
1992	No advice	-		4.84	3.2	4.8
1993	No long-term gain in increased F	-		4.84	3	4.3
1994	No long-term gain in increased F	-		4.84	3	4.3
1995	No advice	-		4.84	3.3	4.6
1996	No advice	-		4.84	2.9	5.3
1997	No advice	-		4.84	2.8	4.6
1998	Adequate catch controls	-		4.84	2.7	4.2
1999	Maintain current TAC	4.84		4.84	2.5	3.8
2000	Maintain current TAC	4.84		4.84	2.4	3.6
2001	Maintain current TAC	4.84		4.36	2.4	3.3
2002	Maintain current TAC	4.36		4.36	1.6	2.3
2003	Maintain current TAC	4.36		4.36	1.7	2.3
2004	Reduce TAC to recent landings	3.6	1.89	3.6	1.4	1.8
2005	Reduce TAC to recent landings	2.3	1.74	2.88	0.9	n/a
2006	Reduce TAC to recent landings	2.3	1.74	2.88	0.9	1.1
2007	Reduce TAC to recent landings	2.1	1.48	2.88	1.01	1.3
2008	Reduce TAC to recent landings	1.4	1.59	2.59	1.38	1.6
2009	Same advice as last year	1.4	1.59	2.79	1.35	1.35
2010	No increase in effort	-	1.75	3.07	1.59	
2011	No increase in catches	-	1.845	3.387		
2012	No increase in catches	-				

Weights in '000 t.

¹⁾ Before 2011 advice was given for Megrin in Division IVa, VIa and VIb combined.²⁾ Landings in Divisions IVa and VIa and unallocated landings from Subarea IV. Landings in Vb (EC), XII, and XIV are negligible.

Table 5.4.38.2 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
Belgium	0	1	0	0	1	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
Ireland	317	260	317	329	304	535	460	438	433	438	417	509	280	344	278	156	221	191	172	188	318
Netherlands	0	0	0	0	0	0	0	1	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		
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
Offical Total	1924	2154	2125	2047	1907	2451	2044	1795	1622	1394	1424	1630	1105	1105	859	552	662	966	1287	1275	1410
Unallocated	286	278	424	674	786	1047	2010	1477	1083	1254	823	843	723	537	469	9	213	n/a	8	0	0
As used by WG	2210	2432	2549	2721	2693	3498	4054	3272	2705	2648	2247	2473	1828	1642	1328	561	875	1301	1545	1275	1410
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

Division IVa

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Belgium	4	3	2	7	2	7	5	3	5	4	10	2	5	3	-	-	2	6	3	1.6	
Denmark	2	1	4	6	1	2	7	5	18	21	29	52	8	11	7	1	6	11	31		22
France	-	-	36	25	27	24	14	16	14	.	7	5	6	11	9	3	4	18	21		5
Germany	.	6	3	4	1	2	1	2	4	1	3	1	-	2	2	4	7	16	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
Norway	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	1	1	4		2
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 - Scotland	1126	1169	1372	1736	2000	2193	3221	3091	2628	2121	2044	1854	1675	1235	1130	958	1340	1436	1526		
UK																				1476	1469
Official total	1176	1216	1491	1816	2078	2298	3261	3140	2704	2177	2115	1927	1706	1271	1160	986	1391	1525	1599	1484	1499
As used by WG	837	878	1025	1081	1207	1172	1199	1584	1548	1111	1247	1098	975	727	739	n/a	1179	1047	1349	1484	1499
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

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

Advice for 2012 and 2013

ICES advises on the basis of precautionary considerations there should be no increase in catch.

Stock status

F (Fishing Mortality)		
		2010
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
SSB (Spawning Stock Biomass)		
		2010
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	↗	increasing

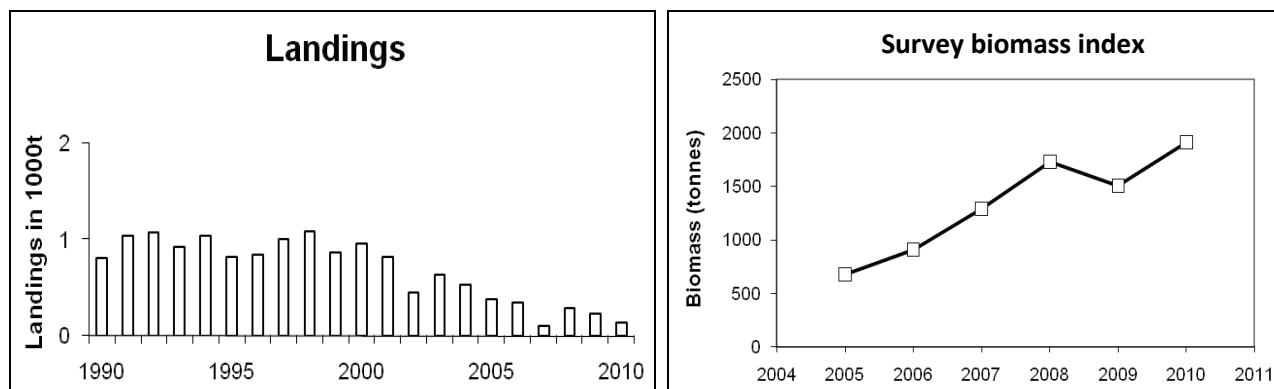


Figure 5.4.39.1 Megrim (*Lepidorhombus* spp) in Division VIb (Rockall). Landings (in '000 t) and survey cpue based on fishery independent survey data.

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.

Management plans

No specific management objectives are known to ICES.

Biology

There are two separate TAC areas for megrim, VI and IV, but there is little evidence to suggest that the megrim in Subarea IV and VIa are separate stocks. WKFLAT(2011) concluded 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 2011 advice is on this basis.

The fisheries

Megrim is predominantly caught using otter trawls.

Catch by fleet	Total catch 139 t. Discard data not available.
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Quality considerations

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

Scientific basis

Assessment type	Landings and survey trends based assessment
Input data	Landings data, commercial lpue indices (SCO TR1; IRE TR1) and survey cpue trends (SCO-IV-VI-AMISS-Q2)
Discards and bycatch	Not included in the assessment
Indicators	Survey based abundance on biomass
Other information	Benchmarked at WKFLAT (2011).
Working group report	WGCSE

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

Reference points

No reference points have been defined for this stock.

Outlook for 2012 and 2013

No reliable assessment can be presented for this stock. The main cause of this is the lack of basic data. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

Trends in biomass in recent years have increased. However, because the exploitation rate is unknown, catches should not be allowed to increase.

Additional considerations

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 VI are well below the TAC.

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

The effects of regulations

Technical measures are in place and the minimum landing size is 20cm.

No information is available on changes in the French and Spanish fleets operating in this area.

Data and methods

The information basis for megrim is being developed, with improvements to both industry-related data and surveys.

There is currently six years of survey data, which is now considered sufficient to provide advice on stock trends.

Comparison with previous assessment and advice

Last year's advice was based on survey trends in combined stocks (including Division Iva and VIa).

The advice is the same as last year for the combined stocks, but extended by ICES new form of advice for data poor stocks.

Assessment and management area

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

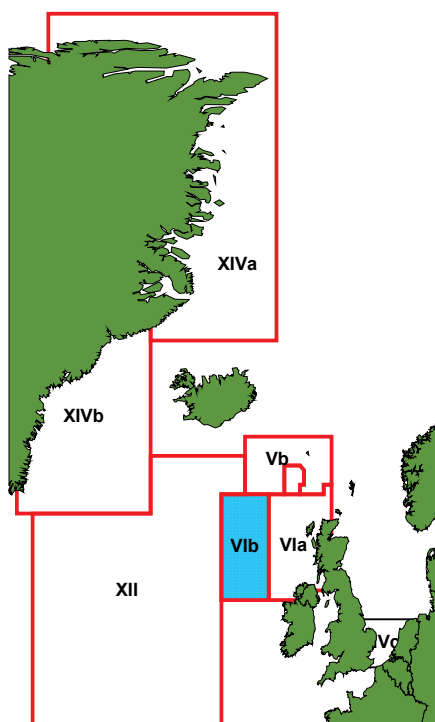


Figure 5.4.39.2 Megrin (*Lepidorhombus* spp) management area (red boxes) and assessment area (blue hatched area).

Sources

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

Table 5.4.39.1 Megrim (*Lepidorhombus* spp) in Subarea VIb. Advice, management and landings.

Year	ICES Advice ¹⁾	Predicted catch corresp. to advice	Agreed TAC Vb(EC) VI, XII, XIV	Official Landings 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	
2012	No increase in catches	-		
2013	No new advice, same as for 2012	-		

Weights in '000 t.

¹⁾ Before 2011 advice was given for Megrim in Division IVa, VIa and VIb combined.

Table 5.4.39.2 Megrim (*Lepidorhombus* spp) in Subarea VIb. Nominal catch per country (in tonnes) as officially reported to ICES.

Country	France	Ireland	Spain	UK – Eng+Wales +N.Irl.	UK – England + Wales	UK - Scotland	UK	Official Total
1990	-	196	363	19	.	226		804
1991	-	240	587	14	.	204		1045
1992	-	139	683	53	.	198		1073
1993	-	128	594	56	.	147		925
1994	-	176	574	38	.	258		1046
1995	-	117	520	27	.	152		816
1996	-	124	515	92	.	112		843
1997	-	141	628	76	.	164		1009
1998	-	218	549	116	.	208		1091
1999	.	127	404	57	.	278		866
2000	4	167	427	57	.	309		964
2001	<0.5	176	370	42	.	236		824
2002	<0.5	87	120	41	.	207		455
2003	-	83	93	74	.	382		632
2004	-	43	71	42	.	372		528
2005	-	68	88	19		207		382
2006	-	95	59	9	.	181		344
2007	-	87	19	.	.	.		106
2008		68	84		1	141		294
2009		48	0			178		226
2010		47	0				92	139

ECOREGION Celtic Sea and West of Scotland
STOCK Pollack in Subareas VI and VII (Celtic Sea and West of Scotland)

Advice for 2012

This is the first time that ICES analyses data for pollack in the Celtic Sea and West of Scotland. Currently it is not clear whether there should be one or several management units. There is insufficient information to evaluate the status of pollack in this area. Therefore, based on precautionary consideration, ICES advises that catches should not be allowed to increase in 2012.

Stock status

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

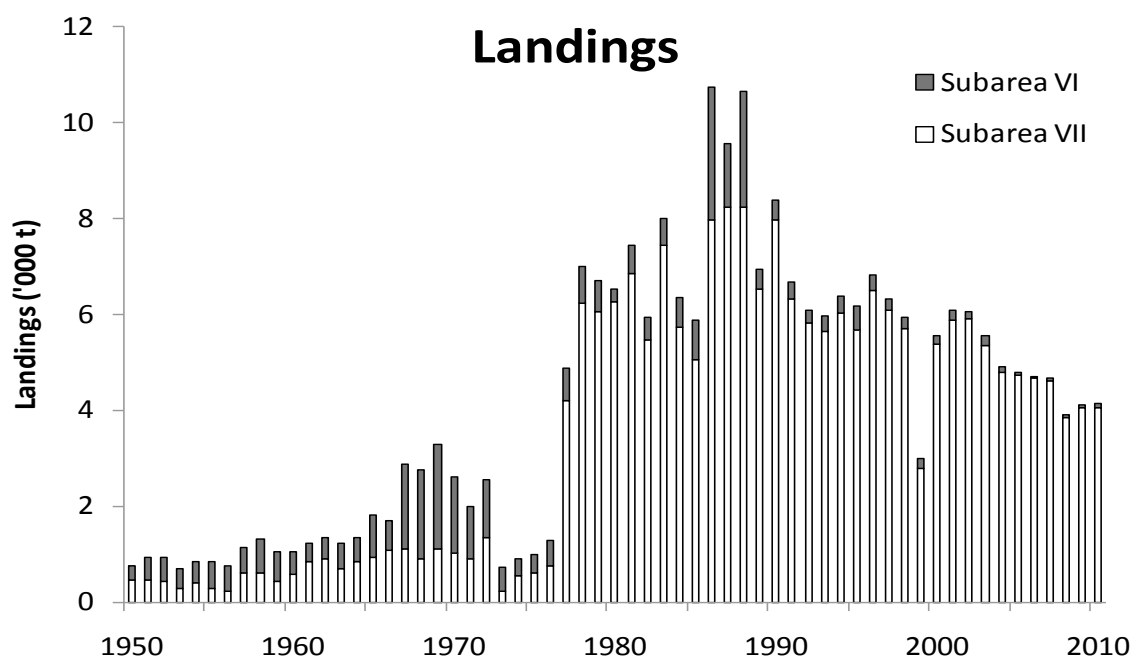


Figure 5.4.40.1 Pollack in Subareas VI and VII. Total official landings (tonnes) per country (2010 data is preliminary).

The available information is insufficient to evaluate the exploitation and the trends of pollack in the Celtic Sea ecoregion.

Management plans

No specific management objectives are known to ICES.

Biology

Pollack in the 0-group are found in shallow coastal waters and may therefore be protected from fisheries in the early life stages. Pollack is benthopelagic, found mostly close to the shore over hard bottom. It usually occurs at 40-100 m depth, but is found down to 200 m. A maximum size of 130 cm, a maximum weight of 18.1 kg and a maximum age of 15 years are reported. Growth is thus fairly rapid, approaching 10 cm per year. There is a migration from the coast to deeper waters as it grows. Maturity occurs at approximately 3 years and spawning occurs mainly in the first half of the year, at about 100 m depth. The stock structure of pollack populations in this eco-region is not clear. ICES does not necessarily advocate that Subareas VI and VII constitutes a management unit for pollack.

The fisheries

Most pollack in the Celtic Sea ecoregion is caught by trawls and gillnets, and other gears come to complement the landings, such as trolling line, seine nets or beam trawls (Figure 5.4.40.4). The overall gear contribution is unknown due to the lack of complete statistics. In 2010, 98% of the landings originated from the Subarea VII, and Ireland, UK and France together comprised 99% of the official landings.

Catch by fleet	Total landings (2010) 4143t. Other removals unknown.
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Quality considerations

Pollock has a preference for wrecks and rocky bottom, 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. Data on growth and maturity, as well as more information from the fisheries are needed. Landings figures are clearly incomplete and erratic and further scrutiny is required.

The stock unit definition of pollack is not yet available due to lack of data.

Scientific basis

Assessment type	No assessment
Input data	Catch statistics
Discards and bycatch	Not included in the assessment
Indicators	None
Other information	None
Working group report	WGCSE

ECOREGION Celtic Sea and West of Scotland
STOCK Pollack in Subareas VI and VII (Celtic Sea and West of Scotland)

Reference points

No reference points have been defined for this stock.

Outlook for 2012

No reliable assessment can be presented for this species in the Celtic Sea ecoregion. The main cause of this is lack of reliable data. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

This is the first time that ICES analyzes data for pollack in the Celtic Sea and West of Scotland. Currently it is not clear whether there should be one or several management units. There is insufficient information to evaluate the status of pollack in this area. Therefore, based on precautionary consideration, ICES advises that catches should not be allowed to increase in 2012.

Additional considerations

This advice is not dedicated to a 'stock'. It relates to a species in a wider region where data are available. Further work is required of stock identity of all pollack stocks within ICES area.

The ICES official landings statistics displays erratic time series per country. For example in the period 1965-1972, Sweden is declaring substantial landings, whereas it is Spain during the period 1981-1988 (both included in 'Other' countries on Figure 5.4.40.1, see also Table 5.4.40.2). France, a major contributor to the landings, starts declaring in 1977 and has no declarations in 1999. From 1977 onwards, the picture shows a long term downward trend, due mainly to the French threefold reduction of landings over the time period. The erratic overall landings data are still more visible in the landings per areas (Figure 5.4.40.2). Nevertheless, it is possible to note that the Celtic Sea (i.e. Divisions VIIf-k) and the Western Channel (i.e. Division VIIe) compose the majority of the landings (Figure 5.4.40.2), and the Subarea VI as lost almost all of its past landings.

It must be noted that pollack is a target for recreational fisheries, especially angling from shore and from boat and spearfishing from shore and from boat. A survey conducted by France in 2006—2008 estimated annual recreational catches of pollack to be 3500t. +/-2500t. (ICES, 2010b).

Data requirements

Further investigation on stock identity of pollack within the ICES areas is need, as well as more information on life history parameters, namely growth and maturity. Landings data figures are clearly incomplete and erratic and further scrutiny is required.

Sources

- ICES. 2010. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 12–20 May 2010, Copenhagen, Denmark. ICES CM 2010/ACOM:12. 1435 pp.
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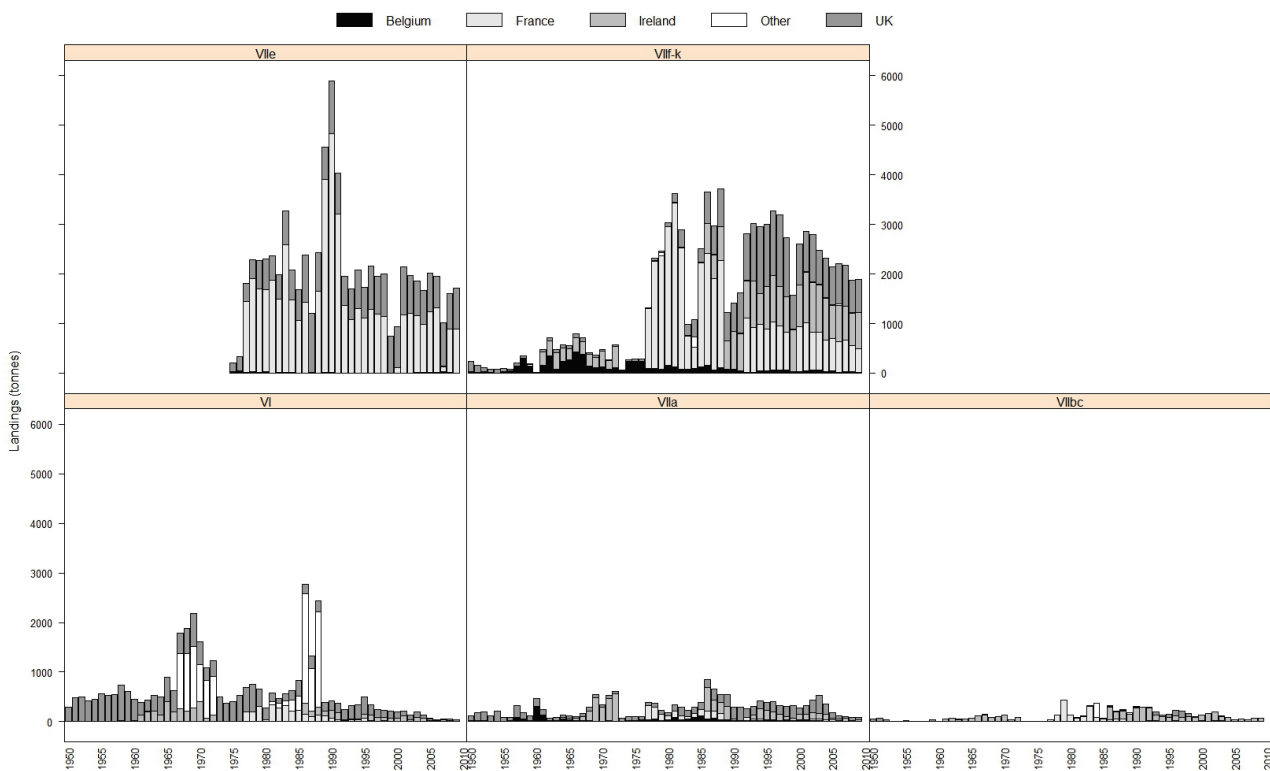


Figure 5.4.40.2 Pollack in Subareas VI and VII. Total official landings (tonnes) per country and ICES Division (2010 data are preliminary).

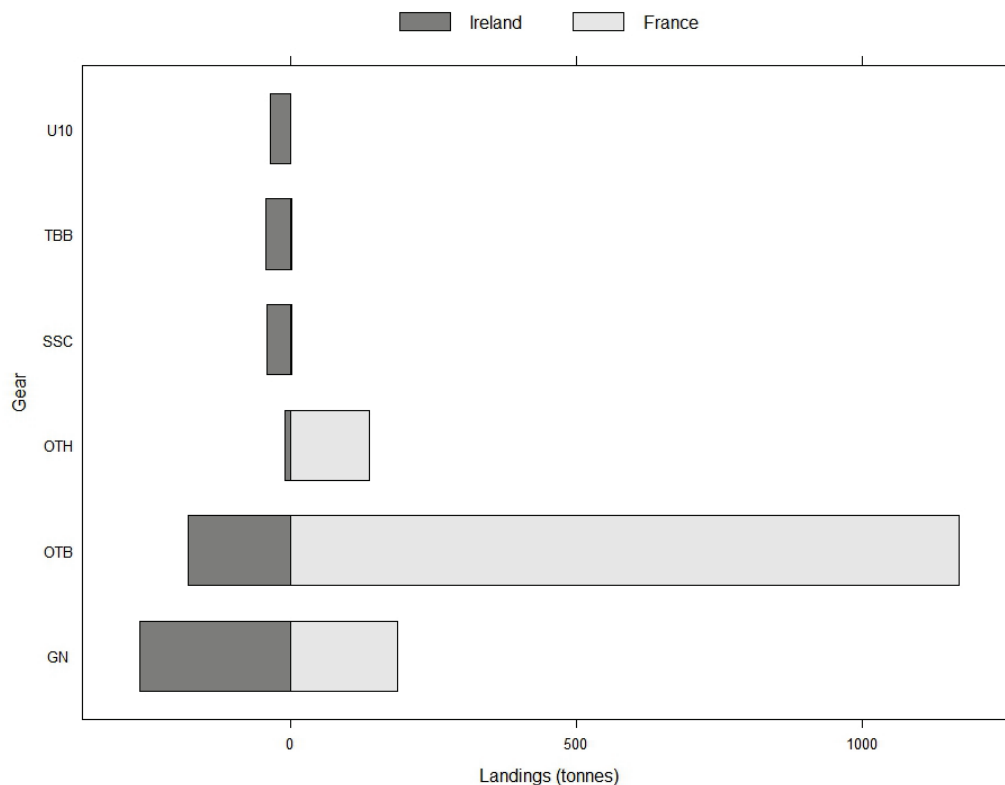


Figure 5.4.40.3 Pollack in Subareas VI and VII. Landings by gear for Ireland and France. Annual mean over the period 2003-2008.(U10: vessels <10m, and is specific to Ireland data; TBB: beam trawl; SSC: Scottish seine; OTH: other gear, mainly hooks and lines for France; OTB: otter bottom trawl; GN: gillnets).

Table 5.4.40.1 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 ²⁾	Total Official landings Subarea VII ²⁾	Total Official landings ²⁾
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			
2012 No increase in catch	-					

Weights in tonnes.

¹⁾ VI; EC waters of Vb; international waters of XII and XIV.²⁾ 2010 landings are preliminary.

Table 5.4.40.2 Pollack in Subareas VI and VII. Total international landings by country in Subarea VI.

	Belg.	Denm.	Fran.	Germ.	Irel.	Neth.	Norw.	Port.	Spain	Swed.	UK	Total VI
1950	1	-	-	-	-	-	-	-	-	-	295	296
1951	-	-	-	-	-	-	-	-	-	-	484	484
1952	-	-	-	-	-	1	-	-	-	-	503	504
1953	-	-	-	-	-	-	-	-	-	-	422	422
1954	-	-	-	-	-	-	-	-	-	-	452	452
1955	-	-	-	-	-	-	-	-	-	-	566	566
1956	-	-	-	-	-	-	-	-	-	-	528	528
1957	-	-	-	-	-	-	-	-	-	-	547	547
1958	.	-	-	23	-	-	-	-	-	-	710	733
1959	1	-	-	6	-	-	-	-	-	-	607	614
1960	15	-	-	-	-	-	-	-	-	-	441	456
1961	1	-	-	1	125	-	-	-	-	-	259	386
1962	2	-	-	8	197	-	-	-	-	-	235	442
1963	6	-	-	2	204	-	-	-	-	-	320	532
1964	1	-	-	1	130	-	-	-	-	-	368	500
1965	1	-	-	1	402	-	-	-	-	-	496	900
1966	2	-	-	-	200	-	-	-	-	-	428	630
1967	1	-	-	1	263	-	-	-	-	1106	413	1784
1968	5	-	-	2	214	-	148	-	-	1012	500	1881
1969	1	-	-	4	282	-	-	-	-	1224	667	2178
1970	2	-	-	1	398	-	-	-	-	756	447	1604
1971	1	-	-	5	75	-	-	-	-	750	256	1087
1972	1	-	-	1	127	-	-	-	-	779	317	1225
1973	2	-	-	-	-	-	-	-	-	-	503	505
1974	6	-	-	-	-	3	-	-	-	-	359	368
1975	<0.5	-	-	1	-	1	4	-	-	-	393	399
1976	7	-	-	-	-	1	-	-	-	-	519	527
1977	-	-	196	-	-	1	2	-	-	-	493	692
1978	-	-	196	-	-	-	4	-	-	-	553	753
1979	-	-	310	-	-	-	-	-	-	-	350	660
1980	-	-	36	-	-	-	-	-	-	-	233	269
1981	-	-	342	-	-	-	-	-	55	-	185	582
1982	-	<0.5	272	-	-	-	-	-	95	-	103	470
1983	-	-	331	-	-	-	-	-	86	-	148	565
1984	-	-	212	-	-	-	-	-	222	-	194	628
1985	<0.5	-	224	1	-	-	-	-	283	-	328	836
1986	-	-	145	-	223	-	-	-	2217	-	187	2772
1987	-	<0.5	108	-	103	-	-	-	860	-	259	1330
1988	-	<0.5	128	-	163	-	-	-	1925	-	221	2437
1989	-	<0.5	111	1	103	-	-	-	-	-	179	394
1990	-	-	76	-	150	-	1	-	-	-	192	419
1991	-	-	31	-	145	-	-	-	4	-	189	369
1992	-	<0.5	21	-	23	-	-	-	-	-	203	247
1993	-	-	39	-	12	-	-	-	-	-	273	324
1994	-	-	34	-	26	-	-	-	-	-	276	336
1995	-	-	64	3	83	-	-	-	-	-	354	504
1996	-	<0.5	29	-	97	-	1	-	-	-	210	337
1997	-	-	14	1	69	-	2	-	-	-	162	248
1998	-	-	21	-	60	-	-	<0.5	-	-	147	228
1999	-	-	-	-	73	-	3	-	-	-	136	212
2000	-	-	11	2	62	-	-	-	-	-	116	191
2001	-	-	8	-	108	-	-	-	-	-	101	217
2002	-	-	9	-	26	-	-	-	-	-	96	131
2003	<0.5	-	3	-	88	-	1	-	-	-	111	203
2004	<0.5	-	2	-	68	-	1	-	-	-	65	136
2005	-	-	23	-	28	-	-	-	-	-	16	67
2006	-	-	3	-	25	-	-	-	4	-	5	37
2007	-	.	10	-	21	-	6	.	-	-	21	58
2008	-	.	8	-	21	-	1	.	-	-	23	53
2009	.	.	6	-	5	.	-	.	-	-	25	36
2010*	-	-	4	-	34	-	<0.5	-	-	-	39	78

* Preliminary

Table 5.4.40.3 Pollack in Subareas VI and VII. Total international landings by country in Subarea VII.

	Belg.	Denm.	Fran.	Germ.	Irel.	Neth.	Norw.	Spain	UK	Total VII
1950	93	-	-	-	-	-	-	-	375	468
1951	74	-	-	2	-	-	-	-	380	456
1952	80	-	-	10	-	-	-	-	336	426
1953	34	-	-	-	-	-	-	-	252	286
1954	17	-	-	4	-	-	-	-	365	386
1955	38	-	-	-	-	-	-	-	247	285
1956	67	-	-	1	-	-	-	-	155	223
1957	219	-	-	6	-	-	-	-	367	592
1958	342	-	-	17	-	-	-	-	233	592
1959	158	-	-	32	-	-	-	-	251	441
1960	317	-	-	-	-	-	-	-	267	584
1961	268	-	-	-	360	-	-	-	210	838
1962	367	-	-	1	369	-	-	-	170	907
1963	95	-	-	-	411	-	-	-	176	682
1964	299	-	-	-	342	-	-	-	194	835
1965	362	-	-	-	335	-	-	-	231	928
1966	456	-	-	-	438	-	-	-	175	1069
1967	417	-	-	-	474	-	-	-	202	1093
1968	214	-	-	-	508	-	-	-	167	889
1969	142	-	-	-	794	-	-	-	161	1097
1970	165	-	-	1	724	-	-	-	120	1010
1971	114	-	-	-	673	-	-	-	116	903
1972	142	-	-	-	1073	-	-	-	123	1338
1973	89	-	-	-	-	3	-	-	127	219
1974	299	-	-	-	-	13	-	-	223	535
1975	295	-	-	-	-	17	-	-	290	602
1976	339	-	-	-	-	4	-	-	421	764
1977	157	1	3569	-	-	1	-	-	465	4193
1978	186	21	5496	14	-	8	-	-	515	6240
1979	151	18	5119	76	-	1	-	-	696	6061
1980	237	7	5242	-	-	1	-	1	769	6257
1981	244	-	5814	-	-	3	-	23	780	6864
1982	154	-	4253	-	-	-	-	32	1022	5461
1983	167	-	6214	-	-	-	-	26	1045	7452
1984	207	-	3927	-	-	-	-	486	1100	5720
1985	269	-	3741	-	-	-	-	20	1022	5052
1986	241	-	4574	-	1335	-	-	17	1795	7962
1987	149	-	5213	-	848	-	-	19	2010	8239
1988	191	-	5211	-	1066	-	-	22	1740	8230
1989	145	-	3893	-	994	-	-	18	1487	6537
1990	133	-	4831	-	1066	-	-	26	1914	7970
1991	76	-	3211	-	1045	-	-	22	1962	6316
1992	62	-	2849	-	1014	-	-	19	1889	5833
1993	55	-	2325	-	1137	-	-	7	2135	5659
1994	94	-	2621	-	921	-	-	8	2391	6035
1995	88	2	2315	-	1107	-	-	4	2168	5684
1996	94	-	2684	-	1190	6	-	5	2519	6498
1997	99	-	2443	-	984	4	<0.5	7	2540	6077
1998	92	-	2375	-	886	1	-	11	2347	5712
1999	86	-	-	-	976	-	3	19	1703	2787
2000	71	-	2422	-	1069	-	-	5	1810	5377
2001	100	-	2515	-	1274	-	-	9	1987	5885
2002	117	-	2481	-	1308	-	-	17	1999	5922
2003	113	-	2284	-	1151	-	-	12	1788	5348
2004	104	-	1914	-	1049	1	-	13	1705	4786
2005	98	-	2198	-	728	1	-	16	1684	4725
2006	79	-	2213	-	809	1	-	28	1531	4661
2007	91	-	1970	-	782	3	-	1	1764	4611
2008	76	-	1579	-	738	1	.	14	1453	3861
2009	42	-	1641	-	828	4	.	3	1545	4063
2010*	35	-	1709	-	935	2	-	-	1384	4065

* Preliminary