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Book 5
Celtic Sea and West of Scotland

International Council for the Exploration of the Sea

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BOOK 5

Section **Page**

5 CELTIC SEA AND WEST OF SCOTLAND

5.1 Ecosystem overview

This Section has not been updated in 2012. 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 2012. 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 2012, ICES has not provided advice regarding protection of biota and habitats for this area.

5.3.2 Assessments and Advice regarding fisheries

5.3.2.1 Mixed fisheries and fisheries interactions

This Section has not been updated in 2012. The most recent description on mixed fisheries and fisheries interactions is available in ICES Advisory Report 2008, Section 5.3. This description can also be found on the ICES website: http://www.ices.dk/committe/acom/comwork/report/2008/2008/5.3%20Celtic%20Seas%20advice%20overview.pdf

5.3.2.2 Assessments and advice regarding fisheries

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

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

Table 5.3.2.1 State of the stock and advice for 2013 in the Celtic Seas ecoregion.

Stock	State of the stock				Outlook options for 2013			ICES advice for 2013 (in tonnes)
	Fishing mortality in relation to F_{MSY}	**Fishing mortality in relation to precautionary approach (F_{PA}/F_{lim})**	**Spawning biomass in relation to MSY $B_{trigger}$**	**Spawning biomass in relation to precautionary approach (B_{PA}/B_{lim})**	**MSY approach/DLS[1]** (within the precautionary approach)	**Precautionary approach / considerations**	**Management plan**	
Anglerfish (*L. piscatorius* and *L. budegassa)* in Divisions VIIb–k and VIIIa,b	Unknown ?	Unknown ?	Qualitative evaluation: Decreasing		*L. piscatorius:* catches of no more than 17 900 t *L. budegassa:* catches of no more than 6900 t The catch advice for the two species combined is 24 800 t.		-	DLS approach: catches should be no more than 24 800 tonnes
Anglerfish (*L. piscatorius* and *L. budegassa)* in Division IIa, IIIa, Subarea IV, and Subarea VI	Unknown ?	Unknown ?	Qualitative evaluation: Decreasing		20% decrease in catches		-	DLS approach: catches should be reduced by 20% in relation to the average of the last three years.
Cod in Division VIa (West of Scotland)	Above target ✗	Harvested unsustainably ✗	Below trigger ✗	Reduced reproductive capacity ✗	Zero catch.	Zero catch.	TAC of 460 t	MYS approach: zero catch.
Cod in Division VIb (Rockall)	Qualitative evaluation: Insufficient information ?		Qualitative evaluation: Insufficient information ?		Catches of no more than 70 t.		-	DLS approach: catches should be no more than 70 t.
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	Appropriate ✓	Undefined ?	Above trigger ✓	Full reproductive capacity ✓	Landings of 10 200 t.	-	-	MSY approach: landings should be no more than 10 200 t.
Grey gurnard in Subarea VI and Divisions VIIa-c and e-k (Celtic Sea and West of Scotland)	Qualitative evaluation: Insufficient information ?		Qualitative evaluation: Insufficient information ?		Catches should decrease by 20% in relation to the average catch of the last three years.		-	DLS approach: catches should be reduced by 20% in relation to the average catch of the last three years.

[1] Data Limited Stock.

Stock	State of the stock				Outlook options for 2013			ICES advice for 2013 (in tonnes)
	Fishing mortality in relation to F_{MSY}	**Fishing mortality in relation to precautionary approach (F_{PA}/F_{lim})**	**Spawning biomass in relation to MSY $B_{trigger}$**	**Spawning biomass in relation to precautionary approach (B_{PA}/B_{lim})**	**MSY approach/DLS[1]** (within the precautionary approach)	**Precautionary approach / considerations**	**Management plan**	
Haddock in Division VIa (West of Scotland)	Below target	Harvested sustainably	Below trigger	Increased risk	Landings of 3100 t.	Landings no more than 520 t.	Landings of 4500 t.	MSY approach: landings should be no more than 3100 t. Effective technical measures should be implemented to reduce high discard rates in the *Nephrops* fleet (TR2).
Haddock in Division VIb (Rockall)	Below target	Harvest sustainably	Above trigger	Full reproductive capacity	Zero catch.	Zero catch.	-	MSY approach: zero catch.
Haddock in Division VIIa (Irish Sea)	Unknown	Unknown	Qualitative evaluation: Decreasing		Catches of no more than 710 t.	Management measures should be introduced in the Irish Sea to reduce discarding of small haddock	-	DLS approach: catches should be no more than 710 tonnes and further technical measures should be introduced to reduce discards.
Haddock in Divisions VIIb–k	Above target	Undefined	Above trigger	Undefined	Landings of no more than 9500 t.	-	-	MSY transition: landings should be no more than 9500 t.
Herring in VIa south and VIIb,c	Above target	Unknown	Unknown	Reduced reproductive capacity	Zero catch.	-	-	MSY approach: no catches of this stock unless a rebuilding plan is implemented.
Herring in Division VIa North	Below target	Undefined	Undefined	Above limit	Landings of less than 31 000 t	-	TAC of 27 480 t.	Management plan: landings should be no more than 27 480 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 19 000 t.	-	Proposed rebuilding plan: TAC of 15 000 t. New proposed long term management plan: TAC of 17 000 t.	MSY approach: landings should be no more than 19 000 t.
Herring in Division VIIa North of 52° 30'N (Irish Sea)	Appropriate	Undefined	Above trigger	Full reproductive capacity	Landings of less than 5100 t.	-	-	MSY approach: landings should be no more than 5100 t.

Stock	State of the stock				Outlook options for 2013			ICES advice for 2013 (in tonnes)
	Fishing mortality in relation to F_{MSY}	**Fishing mortality in relation to precautionary approach (F_{PA}/F_{lim})**	**Spawning biomass in relation to MSY $B_{trigger}$**	**Spawning biomass in relation to precautionary approach (B_{PA}/B_{lim})**	**MSY approach/DLS[1]** (within the precautionary approach)	**Precautionary approach / considerations**	**Management plan**	
Lesser-spotted dogfish (*Scyliorhinus canicula*) in Subarea VI and Divisions VIIa–c, e–j (Celtic Sea and west of Scotland)	Qualitative evaluation: Decreasing		Qualitative evaluation: Increasing		Catch could increase by a maximum 20% in relation to the last three years average catch.		-	DLS approach: current catches could be increased by a maximum of 20%.
Megrim (*Lepidorhombus whiffiagonis*) in Divisions VIIb–k and VIIIa,b,d	Qualitative evaluation: Not available		Qualitative evaluation: Increasing		Landings of no more than 12 000 t.		-	DLS approach: landings of no more than 12 000 t.
Megrim (*Lepidorhombus* spp) in Divisions IVa and VIa)	Appropriate	Undefined	Above trigger	Full reproductive capacity	Landings of no more than 4700 t.	-	-	MSY approach: landings should be no more than 4700 t.
Megrim (*Lepidorhombus* spp) in ICES Division VIb (Rockall)	Qualitative evaluation: Below poss. reference points		Qualitative evaluation: Decreasing		Catches of no more than 160 t.		-	DLS approach: catches should be no more than 160 t.
Nephrops in Division VIa, North Minch (FU11)	Below target	Undefined	Above trigger[2]	Undefined	Landings should be no more than 4200 t.	-	-	MSY approach: landings should be no more than 4200 t.
Nephrops in Division VIa, South Minch (FU12)	Below target	Undefined	Above trigger[2]	Undefined	Landings of no more than 5800 t.	-	-	MSY approach: landings should be no more than 5800 t.
Nephrops 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[2] Sound of Jura: Undefined	Firth of Clyde: Undefined Sound of Jura: Undefined	Firth of Clyde: landings of no more than 5600 t. Sound of Jura: landings of no more than 800 t.	-	-	MSY approach: landings should be no more than 6400 t (5600 t for Firth of Clyde and 800 t for Sound of Jura).

[2] UWTV abundance in relation to SSB reference points

Stock	State of the stock				Outlook options for 2013			ICES advice for 2013 (in tonnes)
	Fishing mortality in relation to F_{MSY}	**Fishing mortality in relation to precautionary approach (F_{PA}/F_{lim})**	**Spawning biomass in relation to MSY $B_{trigger}$**	**Spawning biomass in relation to precautionary approach (B_{PA}/B_{lim})**	**MSY approach/DLS[1]** (within the precautionary approach)	**Precautionary approach / considerations**	**Management plan**	
Nephrops in Irish Sea East (FU14)	Below target	Undefined	Undefined	Undefined	Landings of no more than 880 t.	-	-	MSY approach: landings should be no more than 880 t.
Nephrops in Divisions VIIa (FU 15)	Below target	Undefined	Above trigger[2]	Undefined	Landings of 9300 t.	-	-	MSY approach: that landings should be no more than 9300 t.
Nephrops in Sub-area VII: Porcupine bank (FU 16)	Qualitative evaluation: Below possible reference points		Qualitative evaluation: Increasing		Landings of no more than 1800 t.	-	-	MSY approach[3]: landings should be no more than 1800 t.
Nephrops in Sub-area VII: Aran Grounds (FU 17)	Below target	Undefined	Qualitative evaluation: Lowest in the time series		Landings of no more than 590 t.	-	-	MSY approach[3]: landings should be no more than 590 t.
Nephrops off the south-eastern and south-western coasts of Ireland (FU 19)	Below target	Undefined	Qualitative evaluation: Without trend		Landings of no more than 820 t.	-	-	MSY approach: landings should be no more than 820 t.
Nephrops in Labadie, Baltimore, and Galley (FU 20) and Jones and Cockburn (FU 21)	Qualitative evaluation: Decreasing		Qualitative evaluation: Unknown		Landings of no more than 2500 tonnes		-	DLS approach: landings should be no more than 2500 t.
Nephrops in the Smalls (FU 22)	Appropriate	Unknown	Qualitative evaluation: Increasing		Landings no more than 3100 t.	-	-	MSY approach[3]: landings should be no more than 3100 t.
Norway pout in Division VIa	Qualitative evaluation: Insufficient information		Qualitative evaluation: Insufficient information		No increase of the catches.		-	DLS approach: no increase of the catches should take place unless there is evidence that this will be sustainable.
Plaice in VIIa (Irish Sea)	Qualitative evaluation: Below poss. reference points		Qualitative evaluation: Above poss. reference points		Landings of no more than 490 t.		-	DLS approach: landings should be no more than 490 t.
Plaice West of Ireland (Division VIIb,c)	Qualitative evaluation: Insufficient information		Qualitative evaluation: Insufficient information		Catches of no more than 30 t.		-	DLS approach: catches should be no more than 30 t.

[3] Update advice in November.

Stock	State of the stock				Outlook options for 2013			ICES advice for 2013 (in tonnes)
	Fishing mortality in relation to F_{MSY}	**Fishing mortality in relation to precautionary approach (F_{PA}/F_{lim})**	**Spawning biomass in relation to MSY $B_{trigger}$**	**Spawning biomass in relation to precautionary approach (B_{PA}/B_{lim})**	**MSY approach/DLS[1]** (within the precautionary approach)	**Precautionary approach / considerations**	**Management plan**	
Plaice in Division VIIe (Western Channel)	Above target	Undefined	Above trigger	Undefined	Landings of no more than 2100 t.	-	-	MSY transition: landings should be no more than 2100 t.
Plaice in the Celtic Sea (Divisions VIIf and g)	Qualitative evaluation: Above poss. reference points		Qualitative evaluation: Below poss. reference points		Landings of no more than 360 t.		-	DLS approach: landings should be no more than 360 t.
Plaice Southwest of Ireland (VIIh-k)	Qualitative evaluation: Above poss. reference points		Qualitative evaluation: Unknown		Catches of no more than 100 t.		-	DLS approach: catches should be no more than 100 t, and by-catch and discards should be reduced.
Pollack in Subareas VI and VII (Celtic Sea and West of Scotland)	Qualitative evaluation: Insufficient information		Qualitative evaluation: Insufficient information		Catches of no more than 4200 t.		-	DLS approach: catches should be no more than 4200 t.
Blonde ray (*Raja brachyura*) in Subarea VI (West of Scotland)	Qualitative evaluation: Unknown		Qualitative evaluation: Unknown		Catches should decrease by 20% in relation to the last three years' average[3].		-	DLS approach: that catches should be decreased by at least 20% [4].
Blonde ray (*Raja brachyura*) in Divisions VIIa, f, g (Irish and Celtic Sea)	Qualitative evaluation: Unknown		Qualitative evaluation: Unknown		Catches should decrease by 20% in relation to the last three years' average[3].		-	DLS approach: that catches should be decreased by at least 20%[4].
Blonde ray (*Raja brachyura*) in Division VIIe (Western English Channel)	This stock is believed to be part of the stock in the North Sea Divisions and Subarea IIIa, IV, VIId, and VIIe. Further information is available in the North Sea Advice section.							
Thornback ray (*Raja clavata*) in Subarea VI (West of Scotland)	Qualitative evaluation: Unknown		Qualitative evaluation: Increasing		Catches could be increased by a maximum of 20%[3].		-	DLS approach: Catches could be increased by a maximum of 20% [4].

[4] Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

Stock	State of the stock				Outlook options for 2013			ICES advice for 2013 (in tonnes)
	Fishing mortality in relation to F_{MSY}	**Fishing mortality in relation to precautionary approach (F_{PA}/F_{lim})**	**Spawning biomass in relation to MSY $B_{trigger}$**	**Spawning biomass in relation to precautionary approach (B_{PA}/B_{lim})**	**MSY approach/DLS[1]** (within the precautionary approach)	**Precautionary approach / considerations**	**Management plan**	
Thornback ray (*Raja clavata*) in Divisions VIIa, f, g (Irish and Celtic Sea)	Qualitative evaluation: Unknown		Qualitative evaluation: Increasing		Catches could be increased by a maximum of 20%[3].		-	DLS approach: Catches could be increased by a maximum of 20%[4].
Thornback ray (*Raja clavata*) in Division VIIe (Western English Channel)	This stock is believed to be part of the stock in the North Sea Divisions and Subarea IIIa, IV, VIId, and VIIe. Further information is available in the North Sea Advice section.							
Small-eyed ray (*Raja microocellata*) in Divisions VIIf, g (Celtic Sea)	Qualitative evaluation: Unknown		Qualitative evaluation: Decreasing 		Catches should decrease by 36% in relation to the last three years' average[3].		-	DLS approach: that catches should be decreased by at least 36%[4].
Small-eyed ray (*Raja microocellata*) in Division VIIe (Western English Channel)	This stock is believed to be part of the stock in the North Sea Divisions and Subarea IIIa, IV, VIId, and VIIe. Further information is available in the North Sea Advice section.							
Spotted ray (*Raja montagui*) in Subarea VI (West of Scotland)	Qualitative evaluation: Unknown 		Qualitative evaluation: Decreasing 		Catches should decrease by 23% in relation to the last three years' average[3].		-	DLS approach: that catches should be decreased by at least 23%[4].
Spotted ray (*Raja montagui*) in Divisions VIIa, f, g (Irish and Celtic Sea)	Qualitative evaluation: Unknown 		Qualitative evaluation: Increasing 		Catches could be increased by a maximum of 20%[3].		-	DLS approach: Catches could be increased by a maximum of 20%[4].
Undulate ray (*Raja undulata*) in Division VIIj (Great Sole Bank)	Qualitative evaluation: Unknown		Qualitative evaluation: Depleted 		-	No targeted fishery for undulate ray unless information is provided to show that these are sustainable. Measures to mitigate bycatch in coastal fisheries should be implemented	-	Precautionary approach: no targeted fishery for undulate ray unless information is provided to show that these are sustainable. Measures to mitigate bycatch in coastal fisheries should be implemented.

Stock	State of the stock				Outlook options for 2013			ICES advice for 2013 (in tonnes)
	Fishing mortality in relation to F_{MSY}	**Fishing mortality in relation to precautionary approach (F_{PA}/F_{lim})**	**Spawning biomass in relation to MSY $B_{trigger}$**	**Spawning biomass in relation to precautionary approach (B_{PA}/B_{lim})**	**MSY approach/DLS[1]** (within the precautionary approach)	**Precautionary approach / considerations**	**Management plan**	
Sandy ray (*Leucoraja circularis*) in the Celtic Sea ecoregion	Qualitative evaluation: Unknown 		Qualitative evaluation: Unknown 		Catches should decrease by 20% in relation to the last three years' average[3].		-	DLS approach: that catches should be decreased by at least 20% [4].
Shagreen ray (*Leucoraja fullonica*) in the Celtic Sea ecoregion	Qualitative evaluation: Unknown 		Qualitative evaluation: Unknown 		Catches should decrease by 20% in relation to the last three years' average[3].		-	DLS approach: that catches should be decreased by at least 20% [4].
Cuckoo ray (*Leucoraja naevus*) in Subarea VI and Divisions VIIa–c, e–j	Qualitative evaluation: Unknown 		Qualitative evaluation: Decreasing		Catches should decrease by 36% in relation to the last three years' average[3].		-	DLS approach: that catches should be decreased by at least 36% [4].
Common skate, *Dipturus batis* complex (flapper skate (*Dipturus* cf. *flossada*) and blue skate (*Dipturus* cf. *intermedia*)) in the Celtic Sea ecoregion	Qualitative evaluation: Unknown 		Qualitative evaluation: Depleted (Common skate) 		-	No targeted fishery for either *Dipturus* cf. *flossada* or *Dipturus* cf. *intermedia*. Measures should be taken to minimize bycatch[3].	-	Precautionary approach: no targeted fishery for either *Dipturus* cf. *flossada* or *Dipturus* cf. *intermedia*, and measures should be taken to minimize bycatch [4].
Other ray and skate species in the Celtic Sea ecoregion	Qualitative evaluation: Unknown 		Qualitative evaluation: Unknown 		Catches should be decreased by 20% [3].			DLS approach: catches should be decreased by 20%[4].
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.							
Sandeel in Division VIa	Qualitative evaluation: Insufficient information 		Qualitative evaluation: Insufficient information 		No increase of the catches should take place unless there is evidence that this will be sustainable.		-	DLS approach: no increase of the catches should take place unless there is evidence that this will be sustainable.
Sole VIIa	Above target 	Increased risk 	Below trigger 	Reduced reproductive capacity 	Zero catch	-	-	MSY approach: no directed fisheries and bycatch and discards should be minimised.

Stock	State of the stock				Outlook options for 2013			ICES advice for 2013 (in tonnes)
	Fishing mortality in relation to F_{MSY}	**Fishing mortality in relation to precautionary approach (F_{PA}/F_{lim})**	**Spawning biomass in relation to MSY $B_{trigger}$**	**Spawning biomass in relation to precautionary approach (B_{PA}/B_{lim})**	**MSY approach/DLS[1]** (within the precautionary approach)	**Precautionary approach / considerations**	**Management plan**	
Sole West of Ireland (Division VIIb,c)	Qualitative evaluation: Insufficient information ?		Qualitative evaluation: Insufficient information ?		Catches should be no more than 30 t.		-	DLS: catches should be no more than 30 t.
Sole in Division VIIe (Western Channel)	Appropriate ✓	Undefined ?	Above trigger ✓	Full reproductive capacity ✓	Landings less than 960 t.	-	TAC of 894 t.	MSY approach: landings should be less than 960 t.
Sole in the Celtic Sea (Divisions VIIf and g)	Appropriate ✓	Harvest sustainably ✓	Above trigger ✓	Full reproductive capacity ✓	Landings no more than 1100 t.	Landings of less than 1300 t	-	MSY approach: landings should be no more than 1100 t.
Sole Southwest of Ireland (Division VIIh–k)	Qualitative evaluation: close to current proxy for F_{MSY} ✓		Qualitative evaluation: Unknown ?		Catch of no more than 200 t.		-	DLS approach: catches should be no more than 200 t.
Sprat in Subarea VI and Divisions VIIa-c and f-k (Celtic Sea and West of Scotland)	Qualitative evaluation: Insufficient information ?		Qualitative evaluation: Insufficient information ?		Catches should be no more than 3500 t.		-	DLS approach: catches should be no more than 3500 t.
Sprat in divisions VII d,e	Qualitative evaluation: Insufficient information ?		Qualitative evaluation: Insufficient information ?		Catches should be no more than 2800 t.		-	DLS approach: catches should be no more than 2800 t.
Whiting in Division VIIa	Above poss. reference points ✗		Below poss. reference points ✗		-	Catches (mainly discards) of whiting should be reduced to the lowest possible levels.	-	Precautionary considerations catches should be reduced to the lowest possible levels and that effective technical measures should be implemented to reduce discards
Whiting in Divisions VIIe–k	Appropriate ✓	Undefined ?	Above trigger ✓	Full reproductive capacity ✓	Landings should be no more than 17 500 t. Effective measures should be implemented to reduce the high discards.	-	-	MSY approach: landings should be no more than 17 500 t. Effective measures should be implemented to reduce the high discards.

Stock	State of the stock				Outlook options for 2013			ICES advice for 2013 (in tonnes)
	Fishing mortality in relation to F_{MSY}	**Fishing mortality in relation to precautionary approach (F_{PA}/F_{lim})**	**Spawning biomass in relation to MSY $B_{trigger}$**	**Spawning biomass in relation to precautionary approach (B_{PA}/B_{lim})**	**MSY approach/DLS[1]** (within the precautionary approach)	**Precautionary approach / considerations**	**Management plan**	
Whiting West of Scotland	Unknown	Harvested sustainably 	Unknown 	Reduced reproductive capacity 	-	Catches should be reduced to the lowest possible level.	-	Precautionary approach: catches should be reduced to the lowest possible level and that effective technical measures should be implemented to reduce discards in the *Nephrops* (TR2) fleet.
Whiting in Division VIb (Rockall)	Qualitative evaluation: Insufficient information 		Qualitative evaluation: Insufficient information 		Catches should be no more than 11 t.		-	DLS approach: catches should be no more than 11 t.

Table 5.3.2.2 Summary of the stock categories in the Celtic Sea and west of Scotland ecoregion (see section 1.2 for categories definitions).

Total Number of stock in the ecoregion	62[5]
Data rich stocks	27
Data-limited stocks	35

[5] *Nephrops* in the Firth of Clyde + Sound of Jura (FU 13), where considered as two stocks considering the different stock status.

Table 5.3.2.3 Status of data rich stocks (n=27) for Celtic Sea ecoregion relative to MSY and PA reference points for Fishing Mortality (F) and Spawning Stock Biomass (SSB). Table shows percentage of stocks per stock status. Values in brackets denote the number of data rich stocks per stock status.

			Spawning Stock Biomass…		
			is at or above MSY $B_{trigger}$ $SSB_{2012} \geq$ MSY $B_{trigger}$	is below MSY $B_{trigger}$ $SSB_{2012} <$ MSY $B_{trigger}$	is not defined
MSY Approach	**Fishing Mortality…**		✓	✗	?
	is at or below MSY ($F_{2011} \leq F_{MSY}$)	✓	33% (9)	4% (1)	30% (8)
	is above MSY ($F_{2011} > F_{MSY}$)	✗	15% (4)	11% (3)	4% (1)
	is not defined	?	-	-	4 % (1)
			is at or above PA $SSB_{2012} \geq B_{pa}$	is at increased risk $B_{pa} > SSB_{2012} > B_{lim}$	is below limit $SSB_{2012} < B_{lim}$	is not defined
Precautionary Approach	**Fishing Mortality…**		✓	o	✗	?
	is at or below PA ($F_{2011} \leq F_{pa}$)	✓	7% (2)	4% (1)	4%(1)	4%(1)
	is at increased risk ($F_{lim} > F > F_{pa}$)	o	-	-	4% (1)	-
	is above PA ($F_{2011} > F_{pa}$)	✗	-	-	7% (2)	-
	is not defined	?	26% (7)	-	4% (1)	41% (11)

Table 8.3.2.4 Summary of the catch advice of Data Limited Stocks (n=35) in relation to recent catch, as an indicator of the stock status. Table shows percentage of stocks within each DLS category for which the advice corresponds to an increase or decrease in relation to recent catch. Values in brackets denote the number of stocks.

DLS Category[6]	Catch Advice Increase	No increase in catch advised	Catch Advice Decrease	Zero catch advised
2				1(3%)
3	5 (14%)		8 (23%)	
4	1 (3%)	1 (3%)	2 (6%)	
5			6 (17%)	
6		2 (6%)		1 (3%)

Sources of information

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

[6] Detailed categories are available under section 1.2.

5.3.3 Special Requests

5.3.3.1 Special request, Advice August 2012

ECOREGION Celtic Sea and West of Scotland
SUBJECT Evaluation of the EU–Russia proposal for the harvest control component of the management plan for Rockall haddock fisheries

Advice summary

ICES advises that the proposed harvest control rules (HCRs) of the management plan for Rockall haddock are in accordance with the precautionary approach if future recruitment is characteristic of the range observed in the full assessment time-series (1991–2011). However, if the generally poor recruitment observed from 2004 onward persists in the long term, the proposed HCRs imply that the stock will be below B_{lim} with a high probability (i.e. much greater than a 5% probability). In this case, ICES advises that F values lower than those currently in the HCRs would be required for the management plan to be consistent with the precautionary approach. ICES advises that the derivation of the SSB value to be used in paragraph 4 of the proposal needs to be clarified .

Request

NEAFC requests ICES to evaluate the EU-Russia proposal for the harvest control component of the management plan for Rockall haddock.

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

In the following, the TACs refer to total catches, not just landings. Measures shall be put in place to ensure that total catch does not exceed the established TAC including measures to minimise discards. After the introduction of these measures, the method of setting a human consumption TAC currently used by ICES shall not be applied.

1. Every effort shall be made to maintain a level of Spawning Stock Biomass (SSB) greater than Bpa and a minimum level of SSB greater than Blim.

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 for low recruitment (0.2) or Fmsy (0.3) for appropriate age-groups, when the SSB at the end of the year in which the TAC is applied is estimated above Bpa.

3. The Parties agreed that the TAC that results from the application of the fishing mortality referred to in paragraph 2 will be adjusted according to the following formula:

TACy = TACf + 0.2 x (TACy-1 - TACf)
Where TACy is the TAC that is to be set by the management plan, TACy-1 is the TAC that was fixed the previous year and TACf 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 Bpa but above Blim, the TAC shall not exceed a level, which will result in a fishing mortality rate equal to [0.2 or 0.3] - [0.1 or 0.2] x (Bpa- SSB) / (Bpa- Blim). This consideration overrides paragraph 3.

5. Where the SSB referred to in paragraph 2 is estimated to be below Blim, the TAC shall be set at a level corresponding to a total fishing mortality rate of no more than 0.1. This consideration overrides paragraph 3.

6. No later than the end of the third year after the implementation of the Plan, the Parties shall review the Plan taking into account inter alia advice from ICES concerning the performance of the Plan.

Elaboration of the advice

ICES reviewed analyses of the proposed harvest control rules (HCRs) of a management plan for Rockall haddock in two approaches with slightly different assumptions and model structure. The interpretation of the implementation of paragraph 4 also varied slightly between the two approaches. The definition of the HCR is open to interpretation when the SSB calculated in paragraph 2 (i.e., using the value of F indicated in that paragraph) is between B_{lim} and B_{pa}. In this case, F must follow the conditions set in paragraph 4 and the SSB to be used in the calculation of paragraph 4 can

therefore be interpreted in two ways: 1) the SSB that results from applying the value of F (0.3 or 0.2) in paragraph 2, or 2) the SSB that results from applying the value of F actually obtained in paragraph 4. The latter involves an iteration process because the value of SSB at the end of the TAC year is part of the formula to calculate F. These two interpretations correspond to somewhat different definitions of the HCR and, hence, generate a different F at stock biomasses below B_{pa}. This requires clarification to avoid ambiguity in application of the HCR.

Despite these differences, both analyses suggest that the proposed HCR with F = 0.3 in paragraph 2 has a low risk of the SSB falling below B_{lim} using simulated recruitment based on the assessment time-series since 1991 (referred to as 'medium recruitment scenario'). However, analyses conducted with simulated recruitment based on the low values observed from 2004 onward resulted in a greater than 5% probability of the SSB being below B_{lim}, even for the HCR with F = 0.2 in paragraph 2. Therefore, the HCRs would not be in accordance with the precautionary approach if the low current recruitment situation continues in the long term. ICES notes that haddock stocks in general are characterized as having periods of relatively poor recruitment interspaced with unpredictable periodic high recruitment events.

ICES conducted analyses to examine the impact of (1) any discarding above the agreed TAC, as the TAC is intended to include the total catch (i.e. reflecting imperfect implementation of the HCR, as actual catches would exceed those intended by the HCR), and (2) removing the TAC constraint in paragraph 3. Discarding above the agreed TAC significantly increases the risk of low stock biomass, whereas removing the TAC constraint generally leads to some reduction in risk. Despite the changes in risk, these results did not alter the conclusions above with respect to consistency with the precautionary approach.

Given that 0.3 is the F_{MSY} proxy for this stock, the HCRs – if adequately implemented and only under a medium recruitment regime – should be consistent with maximizing yield. However, this was not formally examined in the analyses conducted and thus ICES considers 0.3 as a provisional F_{MSY} for the Rockall haddock stock.

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

Observed discard percentages of certain trawl fleets from the European Union have been as high as 52% to 87% by numbers. The discarding percentage is highly dependent on the abundance of incoming recruitment because small fish are more likely to be discarded than large fish. The proposed 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 therefore required. The long-term management plan needs to specify how this will be accomplished. ICES previously advised (ICES, 2011a, 2012a) *that it would be beneficial to develop and introduce fisheries practices and measures aimed at preventing discards of haddock.*

Suggestions

If the generally poor recruitment conditions continue in the long term, values of F lower than those in the HCRs would be required for the management plan to be consistent with the precautionary approach. In a limited investigation of modifications to paragraph 5 of the HCR using F = 0 if SSB falls below B_{lim}, ICES found that, even in this situation, the risk of the stock falling below B_{lim} is greater than 5% when low recruitment conditions presist.

The simulated recruitments in the analyses were independent between years, which means that recruitment in a given year will only bear resemblance to recruitment in previous or subsequent years by chance. Future evaluations could consider other simulated recruitment patterns characteristic of haddock recruitment which can be sporadic. It should be noted that evaluations including potential shifts in recruitment regimes should include reconsideration of biomass reference points and a statistically-robust determination of when such regime shifts occur.

As the HCRs specify that different F values should be used under medium and low recruitment conditions (paragraph 2), a precise definition of what constitutes medium and low recruitment conditions will be required and the method of achieving the transition from one condition to another needs to be clearly defined. In practice, this may be difficult and an HCR which is not dependent on assumptions of recruitment regime may be more practical and robust.

Changes in the selection pattern of the fishery were also analyzed. An improvement in selection pattern (i.e. reducing the retention of age-1 fish) can result in an improvement in stock status. Various technical and operational measures can improve the exploitation pattern, including increases in mesh size and avoidance of areas with high concentrations of juveniles. Further analyses of the potential stock impacts associated with selection pattern changes should be undertaken, and these should include sensitivity to implementation error, post-escape mortality, and impact on the reproductive potential (population fecundity).

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 a lower growth rate and reach a lower maximum size than other haddock populations in the Atlantic. This stock shows the characteristic of typical haddock stocks in having no apparent stock-recruitment relationship. For example, recruitment for the last five years has been extremely low despite a moderately large SSB.

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

Building on the history of Rockall fisheries and the supporting scientific work presented by Newton *et al.* (2008) and Filina *et al.* (2009), the EU–RF Working Group on Rockall haddock met several times during 2008–2010 and produced a state-of-the-art review of available data and scientific analyses pertaining to Rockall haddock (EU–RF, 2011, documents the first three of these meetings). At the fourth meeting in Edinburgh in September 2010, a proposal was drafted for a joint EU–RF management plan for Rockall haddock. Following further refinements, a final version was presented to NEAFC near the end of 2010. Subsequently, NEACF forwarded the management plan proposal to ICES for evaluation in 2011. Analyses were conducted by ICES in 2011, but these were considered preliminary and incomplete, and ICES was unable to assess if the HCRs in the plan were consistent with the precautionary approach (ICES, 2011b). This resulted in NEAFC making a new request in 2012 for evaluation of the HCRs, with some modifications over the HCRs presented in 2011.

Results and conclusions

Under the proposed HCRs, the 2012 analyses (ICES, 2012b) indicate that there is a less than 5% probability that the fishery will reduce spawning-stock biomass to below B_{lim} if future recruitment is characteristic of the range observed in the full assessment time-series (1991–2011) (i.e., the medium recruitment scenario). This conclusion holds whether discards (assuming historical rates) are above the agreeded TAC (i.e., there is implementation error), and also with or without the TAC constraint (Table 5.3.3.1 and Figures 5.3.3.1, 5.3.3.2, and 5.3.3.3). However, discarding above the agreed TAC significantly increases the risk of low stock biomass. If the generally poor recruitment observed from 2004 onward persists in the long term, the HCRs are not precautionary (Table 5.3.3.1).

ICES notes that because of the very poor recruitment observed in the last five years, SSB is expected to fall below B_{lim} in the short term, even if there is no catch (ICES, 2012a). This would also be the case in the long term if recruitment remains poor in the future (ICES, 2012b).

A comparison of selection patterns of the fleets involved in the fishery (EU and RF) revealed no significant differences (Figure 5.3.3.4), suggesting that variations in the proportion of the catch taken by each fleet would not change the conclusion relative to the consistency of the HCRs with respect to the precautionary approach.

Methods

Two different Management Strategy Evaluation (MSE) analyses were conducted to investigate the properties of the proposed HCRs (ICES, 2012b). Both approaches were based on the most recent ICES assessment results of the Rockall haddock stock (ICES, 2012a), which uses an XSA model, with catch (landings and discards) numbers-at-age data and an abundance index provided by a Scottish survey conducted annually in Division VIb. In the ICES assessment, recruitment is at age 1, and the same age-at-recruitment was used in the MSE analyses. In forward simulations, both analyses used the mean of values observed in the past ten years (2002–2011) for weights-at-age, exploitation patterns, and discarded proportion-at-age (for scenarios that considered discards).

One of the analyses used the Fisheries Library in R (FLR; see Kell *et al.*, 2007; Needle, 2008). Future recruitment was stochastically generated around a simple geometric mean recruitment model using two different recruitment scenarios. The first scenario ("medium recruitment") was based on a geometric mean over the full time-series of the assessment (1991–2011), while the second scenario with generally poor recruitment ("low recruitment") used a geometric mean over the period 2004–2011, when recruitment has generally been low. The HCR was applied to generate TACs for 2013 and future years, and only the F value 0.3 was considered for paragraph 2 of the HCR. When paragraph 4 was invoked, the interpretation of the HCR used the SSB at the end of the TAC year corresponding to the F derived from the

calculation in paragraph 4. This involved an iterative calculation of F because SSB at the end of the TAC year was part of the calculation. This is the same procedure used in assessing HCRs for North Sea haddock and Division VIa haddock. The assessment errors were limited to those associated with the mean recruitment assumptions. Each iteration was run for 32 years in the future, and the initial 10-year burn-in period was not included in the risk calculations.

The other analysis, carried out in Excel, shares many methodological features with the FLR one. Future recruitment was simulated using random draws from historical estimates (estimates for 1991–2011 for the "medium recruitment" scenario; 2004–2011 for the "low recruitment" scenario; and 2007–2011 for a "very low recruitment" scenario). In addition to incorporating variability in recruitment, assessment errors derived from retrospective analyses of past assessments were also included in the MSE loop. Unlike the FLR approach where paragraph 4 was involved, SSB resulting from paragraph 2 was used in the calculation of the F for the TAC year. Therefore, there was no iterative step in the calculation and the value of F obtained differed from that in the FLR analysis. Simulations were run for the period 2012–2039 and the calculation of risk of falling below reference points was based on results from 2020–2039. The Excel analysis used 0.3 for paragraph 2 of the HCR in the evaluations with "medium recruitment" scenario, and 0.2 in the evaluations with "low recruitment" and "very low recruitment" scenarios.

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

- the two assumptions on recruitment: either a low scenario, based on the recruitments from 2004 onwards, or a medium scenario based on the full assessment time-series;
- the TAC constraint in the HCR (paragraph 3) being enforced or not; and
- discards above the agreed TAC (intended to include the total catch) occuring or not (i.e., with or without implementation errors).

No scenarios were tested where the F value in paragraph 2 alternated between 0.2 and 0.3, depending on the perceived recruitment regime at different points in time. However, this would not be expected to change the conclusions given above because the values used include a scenario with alternating F values.

Sources

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Needle , C. L. 2008. Management strategy evaluation for North Sea haddock. Fisheries Research, 94 (2008): 141–150.

Newton, A. W., Peach, K. J., Coull, K. A., Gault, M., and Needle, C. L. 2008. Rockall and the Scottish haddock fishery. Fisheries Research, 94(2): 133–140.

Table 5.3.3.1 Summary of long-term risk estimates of spawning-stock biomass falling below reference points, from FLR (first) and Excel (second) analyses. In each case the FLR estimate is given first, followed by the Excel estimate (if there is only one number, it is the FLR estimate). For the low recruitment scenario, the FLR results correspond to using 0.3 in paragraph 2 of the HCR, whereas the Excel results correspond to using 0.2.

***SSB* < B_{pa}:**

		Low Recruitment	Medium Recruitment
TAC constraint	Discards	52.7% or 49.20%	16.4% or 12.10%
	No discards	43.5% or 32.50%	5.1% or 0.65%
No TAC constraint	Discards	53.4%	12.0%
	No discards	41.5%	2.9%

***SSB* < B_{lim}:**

		Low Recruitment	Medium Recruitment
TAC constraint	Discards	28.1% or 20.05%	5.0% or 3.0%
	No discards	18.0% or 12.85%	1.0% or 0.15%
No TAC constraint	Discards	27.1%	1.7%
	No discards	15.0%	0.2%

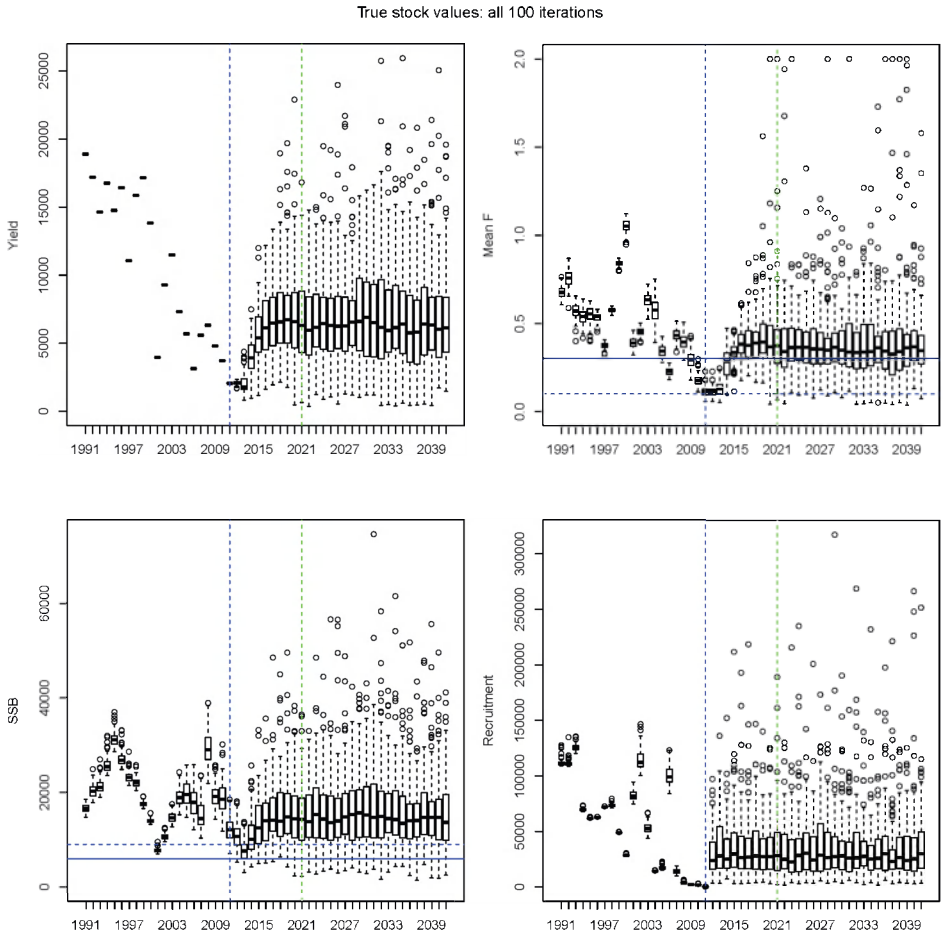

Figure 5.3.3.1 Summary plots of true population values from the 100 simulation iterations for the run of the FLR MSE, assuming medium recruitment, TAC constraint, and discards. The panels show: yield (i.e. total catch; top left), F (top right), SSB (bottom left), and recruitment (bottom right). The short horizontal lines indicate the medians, the boxes the quartiles (25th and 75th percentiles), and the whiskers extend out to either the most distant point or to 1.5 times the interquartile range, whichever is closest. Outliers are shown by open circles. The horizontal lines in the top-right plot show F = 0.3 and F = 0.1, while those in the bottom-left plot show B_{pa} and B_{lim}. Vertical dashed blue lines show the last historical year, while the vertical green lines show the end of the burn-in period (and the start of years that are included in risk analyses).

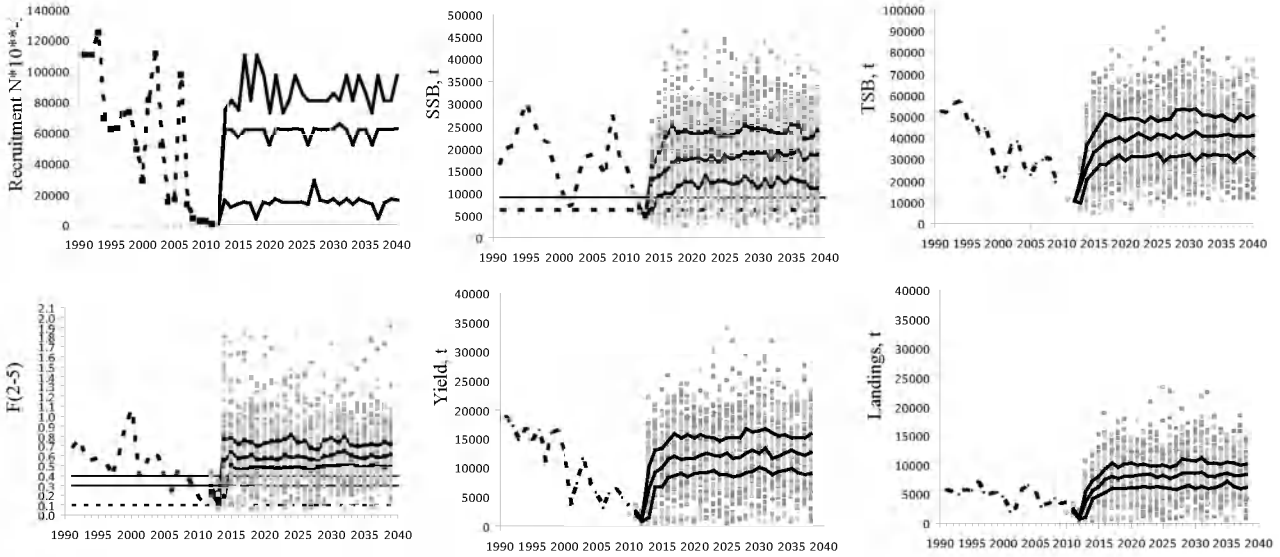

Figure 5.3.3.2 Summary plots of true population values from the 100 simulation iterations for the Excel MSE, assuming medium recruitment, TAC constraint, and discards. The top panels show: recruitment (left), SSB (middle), and total stock biomass (right). The bottom panels show: F (left), yield (i.e. total catch; middle), and landings (right). The solid lines indicate the 25th, 50th, and 75th percentiles. The thin solid horizontal lines show B_{pa}, F_{pa}, and F_{MSY}. The horizontal dashed lines show B_{lim} and F = 0.1.

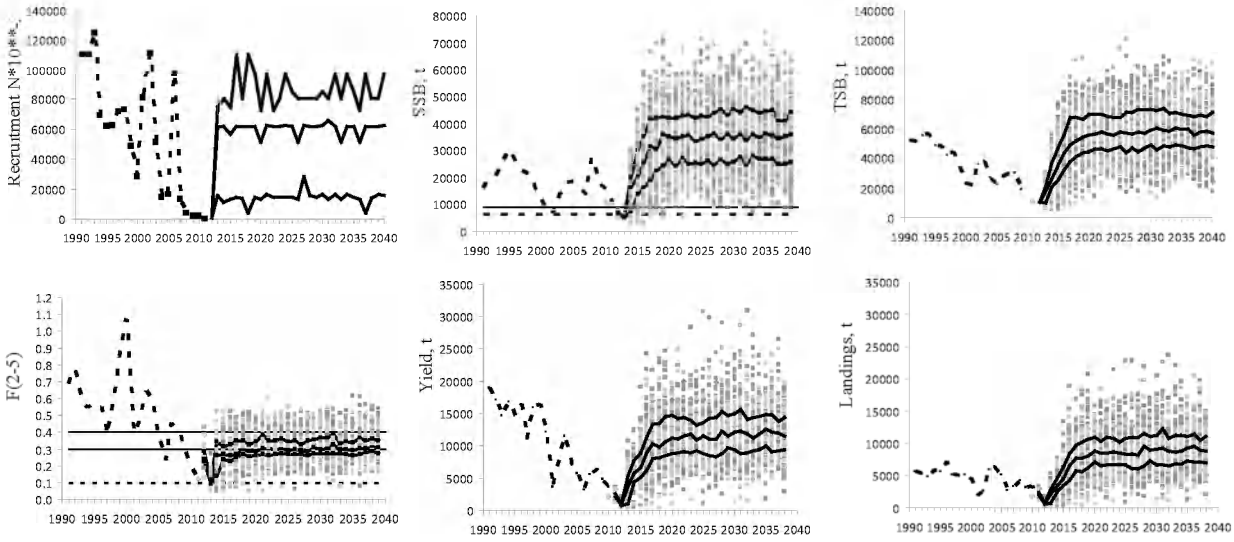

Figure 5.3.3.3 Summary plots of true population values from the 100 simulation iterations for the Excel MSE, assuming medium recruitment, TAC constraint, and no discards (or using the method of setting a human consumption TAC as currently used by ICES, assuming it takes perfect account of discards, so that there is no implementation error). The top panels show: recruitment (left), SSB (middle), and total stock biomass (right). The bottom panels show: F (left), yield (i.e. total catch; middle), and landings (right). The solid lines indicate the 25th, 50th, and 75th percentiles. The thin solid horizontal lines show B_{pa}, F_{pa}, and F_{MSY}. The horizontal dashed lines show B_{lim} and F = 0.1. If there are no discards, the landings will be equal to the yield and TAC; in this case the bottom right panel should be ignored. If there are discards and the TAC setting method currently used by ICES is applied and accounts perfectly for discards, then landings (bottom right panel) are lower than yield.

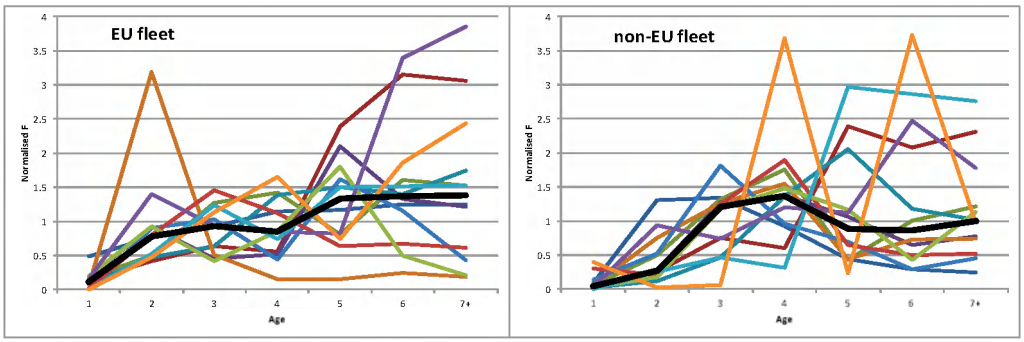

Figure 5.3.3.4 Comparison of selection patterns (normalized F-at-age) for EU (left) and non-EU (right) fleets: average pattern (50th percentile – solid black line) and annual patterns for the years 2000–2011.

ECOREGION Celtic Sea
SUBJECT Irish request to evaluate a long-term management plan proposal for Celtic Sea herring

Advice summary

ICES advises that the proposed long-term management plan for Celtic Sea herring is in accordance with the precautionary approach and leads to sustainable yield. The plan provides stability in catches over time, at the expense of maximizing yield.

ICES was not able to simulate the effect of the closed area, but from an operational point of view it seems to have worked to reduce F under the recent recovery plan.

Request

Ireland is requesting ICES to:

a) *Evaluate the proposed Celtic Sea herring long term management plan (2011) for its conformity to the precautionary approach to fisheries management and achieving MSY.*
b) *Furthermore we would request that ICES would further comment on any adjustments that may be required, to this end.*

Proposed Long Term Management Plan for Celtic Sea Herring

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, Sub-Division 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.*

Elaboration on the advice

The proposed harvest control rule (HCR) is in accordance with the precautionary approach, but it does not maximize yields. This is not a criticism of the plan, however, because it delivers stability in TAC over time at the expense of maximizing yield in any individual year.

The closure of Subdivision VIIaS during the recent rebuilding plan appears to have assisted recovery by reducing the efficiency of the fleet.

The proposed plan is robust to the most plausible range of uncertainties in both the assessment and implementation.

Interpretation of the request

The proposed plan consists of a stated biological objective (Clause 1), a harvest control rule (Clauses 2–4), rebuilding measures to be taken in the event of stock collapse (Clauses 5–7), and a requirement for participating vessels to accept observers (Clause 8). ICES evaluation covers Clauses 1–7, as this is the area within ICES remit.

The minimum spawning-stock biomass (SSB; 41 000 t) in Clause 1 is higher than the ICES B_{lim} (26 000 t). The relationship between SSB and recruitment does not show an increasing recruitment with increasing SSB, even for low SSBs; thus the present B_{lim} (corresponding to the lowest observed SSB) seems appropriate. ICES evaluated the risk of the SSB falling below B_{lim} to assess if the HCR was precautionary.

For Clauses 2 and 3, the SSB used in the HCR refers to the SSB in the TAC year (at the time of spawning as defined in the assessment).

Clauses 5 and 6 provide for a closed area. ICES was not able to simulate the effect of closed areas; however, the reduction in F, when this area was closed, is discussed.

ICES interpretation of Clause 7 is that it provides for unspecified extraordinary measures that may be necessary in the event of low SSB. In the simulations, ICES has not made assumptions on how much lower the final TAC should be. Rather, ICES used the HCR as stated in Clauses 2 to 4.

Suggestions

Clauses 5 and 6 provide for a closed area in the event of low biomass (SSB< 41 000 t). It would be useful to specify for how long such special measures should last, e.g. three years.

The long-term management plan is sensitive to the assumption of unaccounted discarding. New information from discarding is becoming available in 2012. Such information on discarding should be made available and included in the assessment and taken into account when setting the TAC.

Basis of the advice

Background

In 2008, the Irish local fishery management committee developed a rebuilding plan for herring in the Celtic Sea. In 2009, the plan was evaluated by ICES and found to be in accordance with the precautionary approach, within the estimated stock dynamics. The plan was adopted and used as a basis for setting the 2010 and 2011 TACs. The plan came to completion at the end of 2011, with full rebuilding; however, the HCR within this plan was used as the basis for setting the TAC in 2012. A long-term management plan to supersede the rebuilding plan has been proposed by the Irish industry, the local committee, and the Pelagic RAC. This plan has been forwarded to ICES by Ireland, to evaluate if it is in accordance with the precautionary approach and MSY.

Methods

The management strategy evaluation (MSE) was carried out using the HCS_10_3 program (Skagen, 2010), which is an ICES standard program for stochastic simulation of management decision rules. The program consists of a population model that generates yearly true stock numbers-at-age, an observation (assessment) model that transfers the stock numbers into "noisy", observed numbers, a decision rule through which a TAC is derived according to the observed stock, and an implementation model that translates the TAC into actual removals. These removals are then used to update the population model for the next time step.

The latest assessment (ICES, 2012) was used as a basis for the simulations and 2012 was used as the starting year of a 20-year simulation period. The stock–recruitment model chosen was the segmented regression, and it was fitted to the data from 1958 to 2009. The SSB change point was estimated at 39 000 t, and the plateau of recruitment at 415 million individuals.

In order to examine various uncertainties and to stress test the proposed rule, a number of scenarios were examined, screening over a range of errors and biases in both the assessment and the implementation of the advice. The most plausible combinations are presented in Table 5.3.3.2.1. An extended list of evaluations can be found in ICES (2012). The choice of values was based on evaluations of the data available and prevailing conditions in the fishery. Implementation error was set at 0.0, there being no basis to assume otherwise. The implementation bias was set at +10%, representing the possible upper bound of unaccounted discards. Uncertainty in the estimation of stock size (assessment error) was set at 24%, taken from the final assessment in 2012, and assessment bias was set at +3%, the average overestimation of stock size in recent years.

Table 5.3.3.2.1 Uncertainties used in the evaluation of the harvest control rule.

	Run			
	1	2	3	4
Parameter	Base case	Stress test of final	Low Bias	Unaccounted catch
Assessment bias factor	1.03	1.1	1.03	1.03
Assessment error (CV)	0.24	0.34	0.24	0.24
Implementation error (CV)	0.0	0.1	0.0	0.0
Implementation bias factor	1.1	1.2	0.93	1.2

Each scenario included 1000 iterations. A scenario was considered to be in conformity with the precautionary approach if the risk of SSB being below B_{lim} did not exceed 5% in any of the 20 simulation years.

Results and conclusions

Table 5.3.3.2.2 shows risk profiles, median values of F, TAC, and SSB, and realized average catch for the selected scenarios presented in Table 5.3.3.2.1.

Table 5.3.3.2.2 Results of selected scenarios representing various uncertainties.

	Median values			Average catch (t)			
Run	F	TAC (t)	SSB (t)	2012–2031	2012–2021	2022–2031	**Highest risk in any year (%)**
1 Base case	0.25	11 716	59 810	15 019	16 864	13 174	4.0
2 Stress test of final	0.32	9 423	47 456	15 184	19 160	11 208	23.2
3 Low bias	0.22	14 014	70 229	15 091	15 899	13 959	0.2
4 Unaccounted catch	0.34	10 817	55 192	16 134	18 129	10 723	8.2

The most plausible set of errors and biases tested (run 1) were associated with risks of SSB< B_{lim} smaller than 5% in all years. This base case scenario results in a median value of F equal to F_{MSY} (0.25). Stress testing (run 2) resulted in a risk greater than 5%; however, this is considered an extreme scenario. A scenario using a slight negative implementation bias that may be more representative of fishery conditions had very low risk (run 3). An additional simulation considering the effect of 20% positive bias, due to unaccounted catch was associated with a risk greater than 5% and a reduced TAC on average (run 4).

Two provisions are made for rebuilding the stock in the event of low SSB (SSB< 41 000 t): Clause 5, which closes Subdivision VIIaS, and Clause 7, which allows for more stringent cuts. Subdivision VIIaS is the main spawning area for the stock. The closure of this area during the recent rebuilding plan appears to have assisted recovery (Table 5.3.3.2.3). The closure of the area (with a small sentinel fishery) reduced the efficiency of the fleet by removing the fishing ground which delivered highest catch rates. This is considered to have contributed to the marked reduction in F that was observed during the recent rebuilding plan closure. Based on this information, the provisions of Clause 5 are considered appropriate. Clause 6 is also considered appropriate because the small percentage quota would not substantially

contribute to an F that is otherwise expected to be substantially reduced. The sentinel fishery also allows for monitoring of stock development during any closure.

Figure 5.3.3.2.1 presents risk profiles for SSB below B_{lim} for combinations of F targets, $B_{trigger}$ (defined in Clause 2 of the proposed management plan), and TAC constraints for the base run configuration, for several years. Due to the presently high stock size, the risk is less than 5% for the years 2012 and 2015 for all combinations tested. In the long term, risks less than 5% are associated with TAC constraints of 30% and an F target below 0.24. The risk profile is not sensitive to the chosen range of $B_{trigger}$. The highest yield (among the combinations found to be precautionary) is obtained for the TAC constraints that allow higher interannual variability (30% TAC constraint) (Figure 5.3.3.2.2).

The proposed plan was evaluated over a range of uncertainties. In particular, the plan is sensitive to unaccounted catch due to discarding. Assuming that maximum discarding is less than 10%, in addition to reported catch, the plan would still be consistent with the precautionary approach. However, if discarding is higher than 10%, the risk of the SSB falling below B_{lim} is more than 5%. The latest information from independent discard monitoring suggests that discarding is less than 10%. The proposed plan delivers stability in catch at the expense of maximizing yield. This is due to the TAC constraint being set at ±30%. Removing the TAC constraint allows a target F as high as 0.27 using the proposed trigger biomass, while still being precautionary. Average yield over the simulation period then increases to almost 17 000 t in contrast to 15 000 t in the base case (run 1). Further increases in target F to 0.3 are possible by increasing the trigger biomass.

Sources

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Table 5.3.3.2.3 Mean F from the 2012 assessment and when Subdivision VIIaS was closed (in frames). It can be seen that closures were associated with large reductions in F.

Fishing season	Status	F		Mean F
1999 / 2000	Open	0.91		
2000 / 2001	Open	0.93	Open	0.68
2001 / 2002	Closed 16/1/02–23/2/02	0.84	Closed	0.36
2002 / 2003	Closed	0.34	Partially closed	0.65
2003 / 2004	Closed 1/4/02–1/12/03	0.46	Totally closed	0.21
2004 / 2005	Open	0.68		
2005 / 2006	Open	0.57		
2006 / 2007	Open	0.30		
2007 / 2008	Closed	0.24		
2008 / 2009	Closed	0.14		
2009 / 2010	Closed	0.10		
2010 / 2011	Closed	0.13		
2011 / 2012	Closed	0.15		

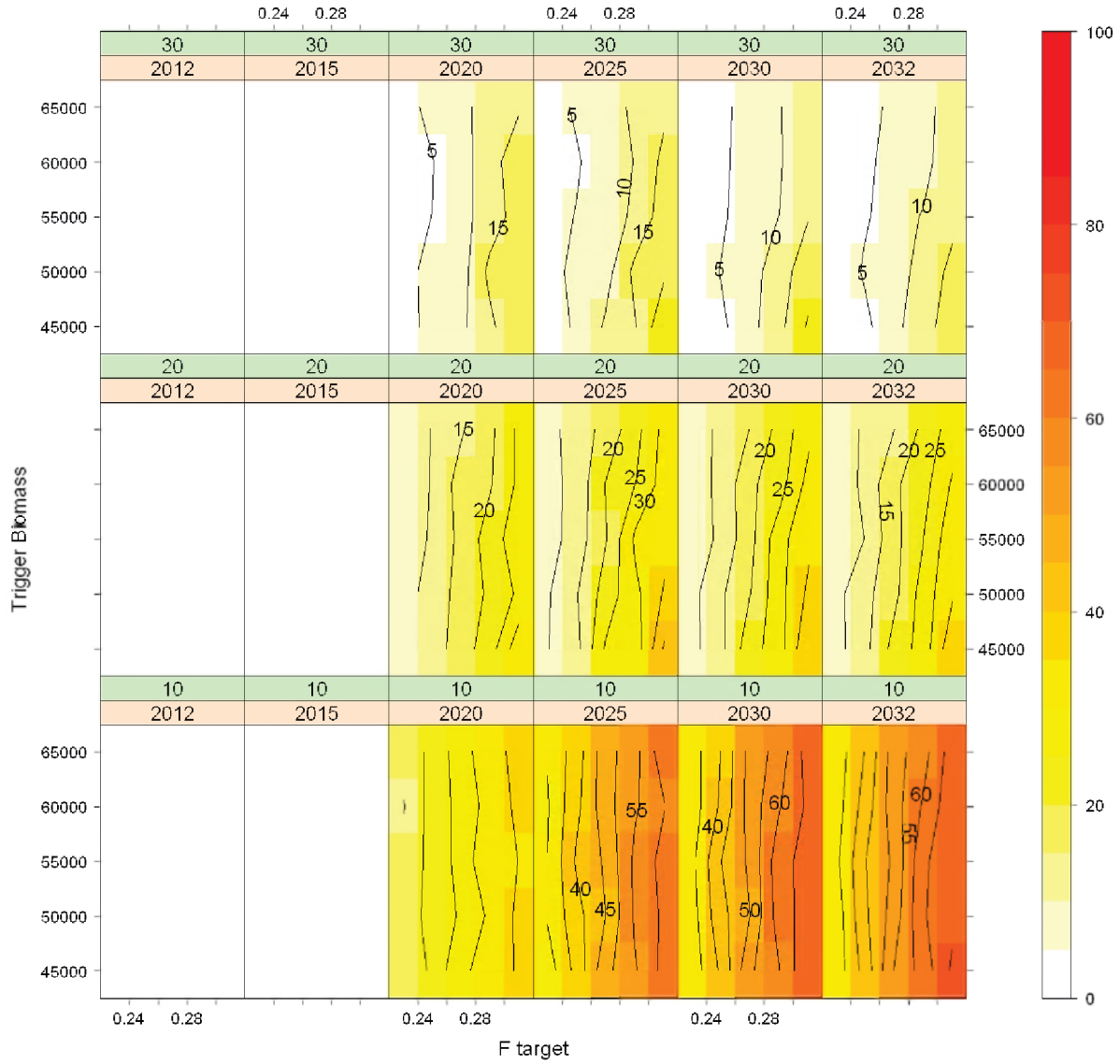


Figure 5.3.3.2.1 Risk profiles (SSB below B_{lim}) for any year for a range of F targets and percentage TAC constraints. For each plot, the value in the upper line gives the TAC constraints in percentage and the value in the second line gives the year.

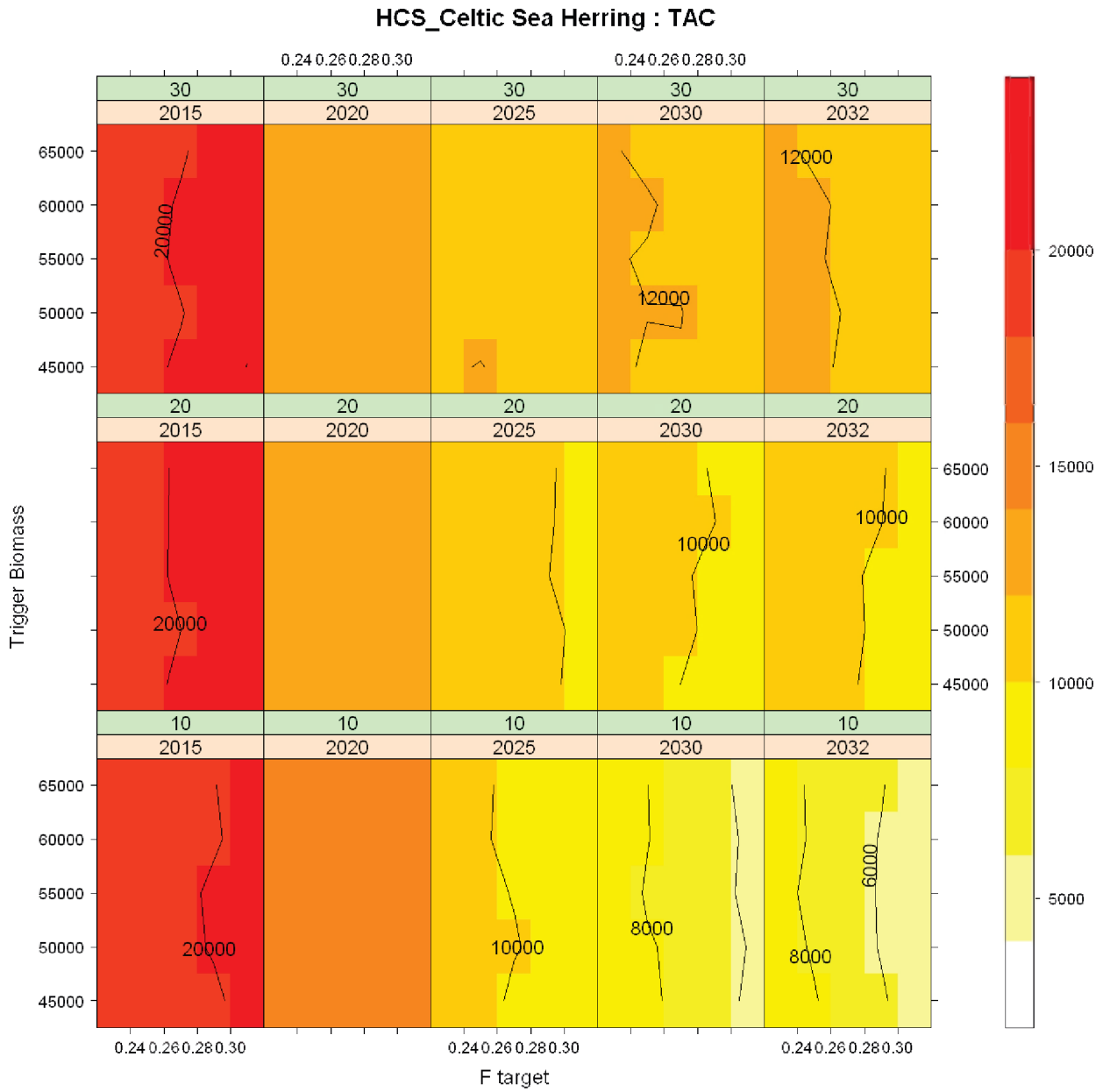


Figure 5.3.3.2.2 Scenario TACs (in tonnes) for any given year for a range of F targets and percentage TAC constraints. For each plot, the value in the upper line gives the TAC constraints in percentage and the value in the second line gives the year.

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

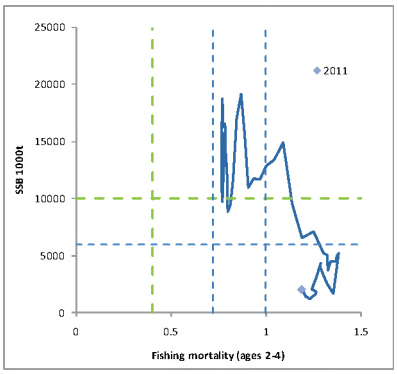
Advice for 2013 and 2014

ICES advises on the basis of the MSY approach that there should be no directed fisheries, and bycatch and discards should be minimized in 2013 and 2014.

Stock status

F (Fishing Mortality)	2009	2010	2011
MSY (F_{MSY})	✗	✗	✗ Above target
Precautionary approach (F_{pa},F_{lim})	✗	✗	✗ Harvested unsustainably

SSB (Spawning-Stock Biomass)	2010	2011	2012
MSY ($B_{trigger}$)	✗	✗	✗ Below trigger
Precautionary approach (B_{pa},B_{lim})	✗	✗	✗ Reduce reproductive capacity



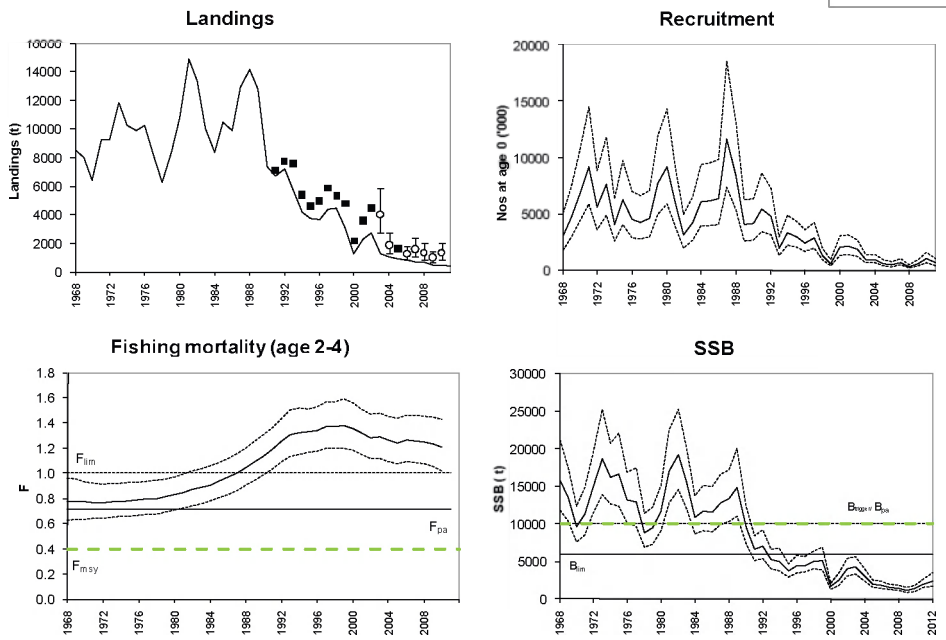


Figure 5.4.1.1 Cod in Division VIIa (Irish Sea). Summary of stock assessment (weights in tonnes). Landings: solid lines are reported landings; filled squares are landings incorporating sample-based estimates at three ports; circles are total removals estimates in excess of M = 0.2 with 90% confidence intervals. Recruitment, fishing mortality, and SSB: dotted lines indicate 5 and 95% confidence intervals. Top right: SSB/ F for the time-series used in the assessment.

The fishing mortality in recent years is declining and 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 increased from 2010 but remains well below B_{lim}. Recruitment has been low for the last ten 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 285 t and effort reduction of 25%. ICES (2009a, 2009b) 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 localized areas and low levels of fishing effort, making high mortality in the stock possible. Recent tagging experiments have shown that the majority of cod remains within the management area. The experiments also showed that migration of cod out of the Irish Sea could not account for the high mortality rates and, consequently, the estimated level of unallocated mortality.

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 low 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. Cod are also taken as a bycatch in fisheries for *Nephrops*, plaice, sole, and rays. Available data indicate that discarding has mainly been a function of minimum landing size (MLS), with the exception of 2010, and largely restricted to catches of 0- and 1-year-old cod. The targeted whitefish fishery using semi-pelagic trawls that developed during the 1990s, has declined to only four vessels.

Catch distribution	Total catches (2011): unknown. Landings are estimated at 370 t, but official landings were 24% higher, due to inaccurate area reporting. Discard estimates are available, but are not included in the assessment.

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. There is currently very little direct evidence to evaluate the potential source(s) of this. Tagging studies have indicated only limited movement of cod out of Division VIIa, therefore fishing outside of the area is not considered to be a major factor. Discard estimates are evaluated but not yet integrated into the assessment due to the short time-series. A new assessment method was adopted following the benchmarking of the stock – this has not changed the perception of the stock status, but indicates that mortality rates are declining.

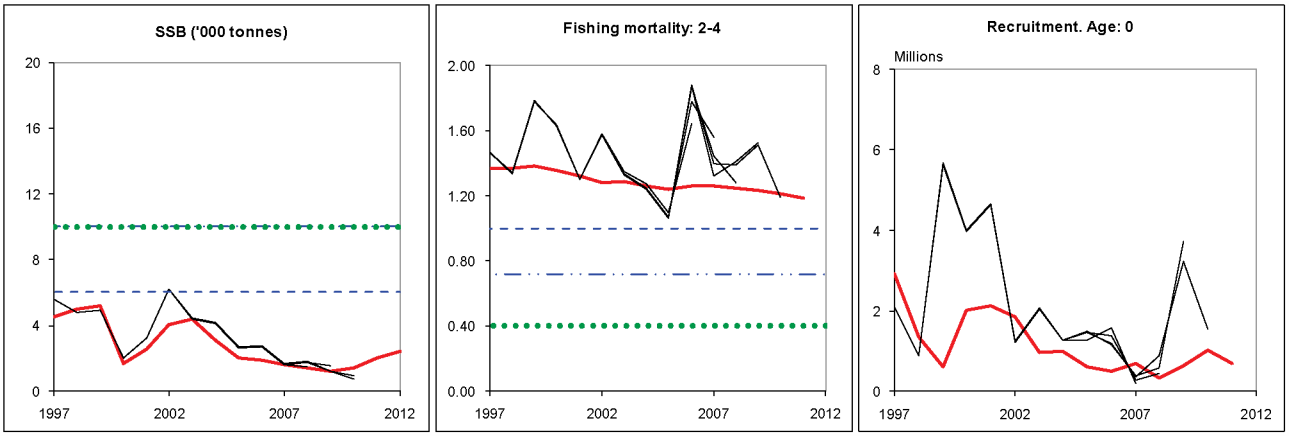


Figure 5.4.1.2 Cod in Division VIIa (Irish Sea) Historical assessment results.

Scientific basis

Assessment type	Analytical assessment SAM.
Input data	Seven survey indices (NIGFS-WIBTS-Q1, NIGFS-WIBTS-Q4, ScoGFS-WIBTS-Q1, UK(E&W)-BTS-3Q, NIMIK UK(E&W)FspE, UK(E&W)FspW, egg biomass SSB index).
Discards and bycatch	Discards are not included in the assessment.
Other information	This stock was benchmarked in 2012.
Working group report	WGCSE

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

Reference points

	Type	*Value*	*Technical basis*
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)

Outlook for 2013

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 2012, the spawning-stock biomass would be expected to continue to increase in 2013 if recent recruitment is protected. Current landings (i.e. TAC), effort, and spatial management of fisheries catching cod in Division VIIa are not controlling mortality rates.

MSY approach

Fishing mortalities in the range of 0.25–0.54 are consistent with maximizing 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 approach. 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 further technical measures to reduce catches should be implemented.

Precautionary 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.

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

Additional considerations

Management considerations

Both 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 every year since 2006.

Additional measures to protect incoming year classes were advised in 2011 to ensure that they contributed to the rebuilding of the stock. There is no evidence of cod avoidance or changes in selection that would reduce fishing and discard mortality rates on the immature cod. The industry is reporting even higher levels of highgrading during the first quarter of 2012. It is necessary to reduce all sources of mortality of cod resulting from fishing to as close to zero as possible if the stock is to recover above B_{lim}.

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 bycatches 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 fishers to engage in cod-avoidance programmes, exercising their power to devise ways of fishing for cod stocks that result in more selective fishing and are less harmful to the environment. Despite evidence that the measures are having an impact in the North Sea, this is not occurring in the Irish Sea.

Egg production surveys since 2006 show that ~ 30–50% of the spawning took place in the eastern Irish Sea, which is not included in the spring spawning closure. This indicates that the geographical area of the closure is not optimal.

The ability to implement a management plan for this stock will remain compromised until all sources of the significant unaccounted mortality are identified and reduced. There is evidence of substantial misreporting in the past, but observations at 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. Since 2004, 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. ICES estimates of the landings in the Irish Sea in 2011 were the lowest on record and ~30% below the TAC which is restrictive only for some member states.

Regulations and their effects

In 2000, a cod closure was introduced in 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 were 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 may change exploitation patterns. The impact of these is difficult to quantify, but there is no evidence of a change in selection and discarding is increasing. 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 assessment models for estimating any unaccounted removals of cod were developed. All removals prior to 2003 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 2003,

needed for catch-based estimates of abundance, to follow the same trends over time given by several series of survey indices.

Information from the fishing industry

The UK Fisheries–Science Partnership (FSP) 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 (Figure 5.4.1.4) show a downward trend during 2004–2010 with an increase in 2010 and 2011 – similar to the trends shown by the other surveys and the assessment. The commercial 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 model estimates of removals are up to three times larger than reported landings. The existence of substantial unaccounted removals explains 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.

A large but variable proportion of the catch of 1-year-old cod is discarded, and 2010 data suggest an increased number of discarded 2-year-old fish. Estimates of discarding are raised but are not currently used in the assessment due to the short time-series. Therefore, the mortality of 0- to 2-year-old cod is underestimated.

Comparison with previous assessment and advice.

The assessment model has changed to SAM following the benchmark which includes information from an egg survey and two commercial vessel indices. The perception of the stock and basis for advice have not changed since last year's assessment.

Sources

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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.

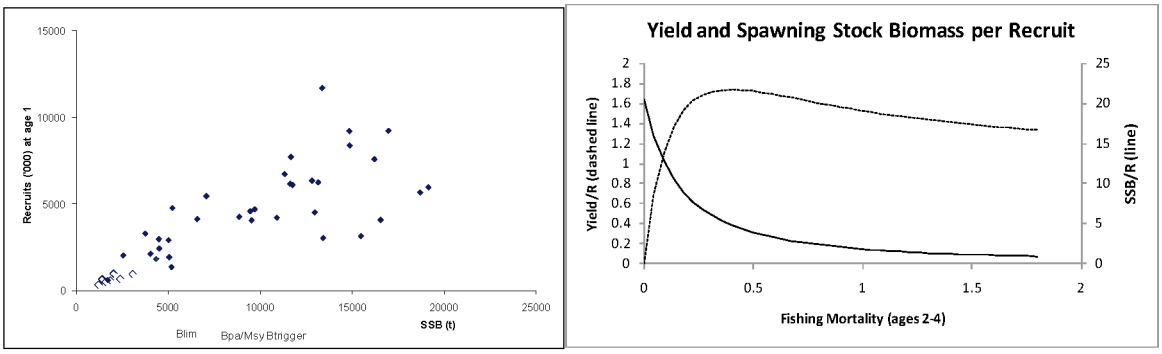


Figure 5.4.1.3 Cod in Division VIIa (Irish Sea). Stock–recruitment (left panel – open symbols indicate the most recent 10 years) and yield-per-recruit and SSB plot (right panel).

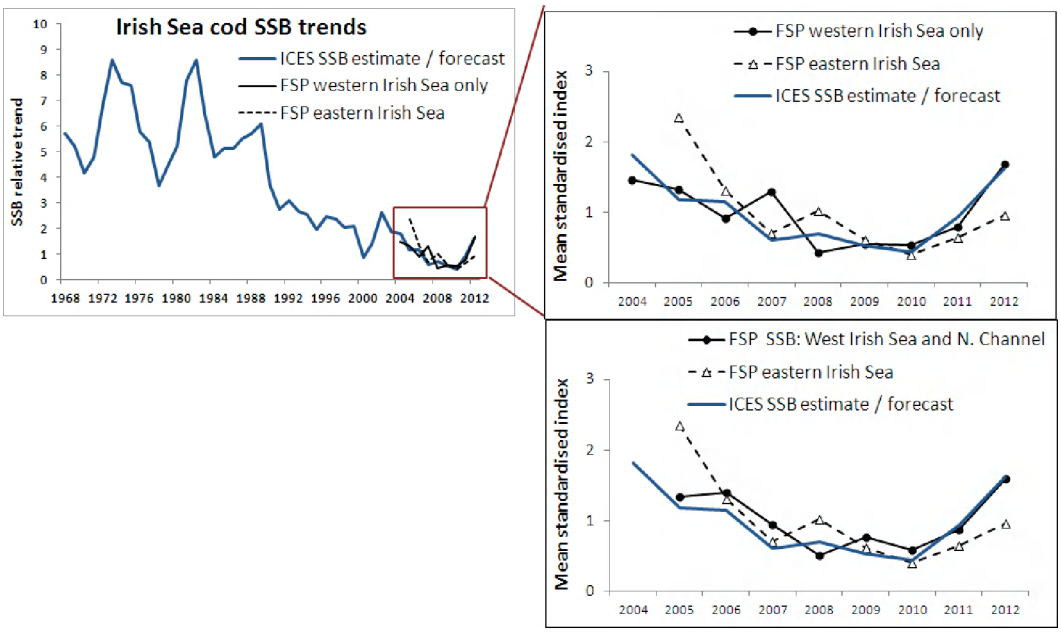


Figure 5.4.1.4 Cod in Division VIIa (Irish Sea). Trends in SSB of cod given by the FSP surveys of the western and eastern Irish Sea and the ICES (2011) assessments. The two right hand plots show the comparisons using the SSB index for the western Irish Sea only (excluding North Channel) and the index including the North Channel (no data for 2004).

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 *Nephrops*	10.3	15.0	13.2	12.9
1988	No increase in F; interaction with *Nephrops*	10.1	15.0	15.8	14.2
1989	No increase in F	13.4	15.0	11.3[1]	12.8
1990	F at F_{med}; TAC	15.3	15.3	9.9[1]	7.4
1991	Stop SSB decline; TAC	6.0	10.0	7.0[1]	7.1[2]
1992	20% of F(90) ~ 10 000 t	10.0	10.0	7.4	7.7[2]
1993	F_{med} ~ 10 200 t	10.2	11.0	5.9	7.6[2]
1994	60% reduction in F	3.7	6.2	4.5	5.4[2]
1995	50% reduction in F	3.9	5.8	4.5	4.6[2]
1996	30% reduction in F	5.4	6.2	5.30	4.96[2]
1997	30% reduction in F	5.9	6.2	4.44	5.86[2]
1998	No increase in F	6.2	7.1	4.96	5.31[2]
1999	Reduce F below F_{pa}	4.9	5.5	2.96	4.78[2]
2000	Lowest possible F	0	2.1	1.42	1.27[3]
2001	Lowest possible F	0	2.1	2.03	2.25[3]
2002	Establish recovery plan	-	3.2	2.7	2.69[3]
2003	Closure of all fisheries for cod	-	1.95	1.5	1.28[3]
2004	Zero catch	0	2.15	1.1	1.07[3]
2005	Zero catch	0	2.15	0.97	0.91[3]
2006	Zero catch	0	1.828	0.95	0.84[3]
2007	Zero catch	0	1.462	1.12	0.70[3]
2008	Zero catch	0	1.199	1.22	0.66[3]
2009	Zero catch	0	0.899	0.75	0.47[3]
2010	Zero catch	0	0.674	0.59	0.46[3]
2011	Zero catch	0	0.506	0.48	0.37[3]
2012	Zero catch	0	0.380		
2013	No directed fisheries, minimise bycatch and discards	0			
2014	Same advice as for 2013	0			

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

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

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[1]
Belgium	142	183	316	150	60	283	318	183	104	115	60	67	26	19	21	36
France	148	268	269	n/a	53	74	116	151	29	35	18[2]	17[2]	3	1[2]	1	3
Ireland	2476	1492	1739	966	455	751	1111	594	380	220	275	608	618[2]	323[2]	289	275
Netherlands	25	29	20	5	1	-	-	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	-
UK (England, Wales & NI)	2,359	2,370	2,517	1,665	799	885	1,134	505	646	594	589[2]	423	543[2]	387[2]	282	169
UK (Isle of Man)	27	19	34	9	11	1	7	7	5	n/a	n/a	n/a	2[2]	1[2]	1	1
UK (Scotland)	126	80	67	80	38	32	29	23	15	3	6	2	1[2]	1[2]	-	-
Total	5303	4441	4962	2875	1417	2026	2715	1477	1179	967	948	1117	1224	754	594	485
Unallocated	-339	1418	356	1909	-143	226	-20	-192	-107	-57	-108	-415	-563	-286	-130	-117
Total as used by WG	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]	368

[1]Preliminary.
[2]Revised.
[3] Includes sample-based estimates of landings into three ports.
[4] Based on official data only.
n/a = not available.

Table 5.4.1.3 Cod in DivisionVIIa (Irish Sea). Summary of the assessment. Removals are the estimated total removals in 2003/4 and 2006 onwards in excess of removals due to the assumed natural mortality rate.

Year	Recruits	Low	High	TSB	Low	High	SSB	Low	High	F24	Low	High	Reported Landings	WG estimates	Model estimates
1968	3038	1812	5096	21352	16448	27718	15796	11814	21120	0.777	0.626	0.964	8541		
1969	4693	2971	7412	18815	14925	23719	13444	10310	17531	0.777	0.635	0.95	7991		
1970	6722	4295	10519	17151	13522	21753	9707	7590	12414	0.77	0.636	0.932	6426		
1971	9194	5850	14449	21459	16661	27638	11342	8621	14924	0.767	0.639	0.922	9246		
1972	5661	3631	8826	25438	19477	33224	14874	11401	19407	0.765	0.641	0.914	9234		
1973	7580	4865	11811	26265	20516	33626	18734	13912	25227	0.771	0.648	0.917	11819		
1974	4090	2618	6389	25413	19717	32753	16236	12665	20814	0.776	0.655	0.92	10251		
1975	6242	4020	9692	22226	17427	28345	16577	12387	22185	0.783	0.662	0.926	9863		
1976	4511	2919	6971	21455	16655	27637	13175	10228	16971	0.789	0.668	0.932	10247		
1977	4262	2757	6588	17232	13459	22061	12986	9665	17448	0.795	0.674	0.938	8054		
1978	4585	2951	7123	14343	11333	18152	8870	6852	11482	0.8	0.678	0.942	6271		
1979	7711	4997	11899	17190	13637	21670	9464	7347	12192	0.811	0.69	0.954	8371		
1980	9212	5932	14308	23225	17987	29989	11687	9043	15104	0.828	0.706	0.971	10776		
1981	5962	3869	9187	27667	21298	35940	17002	12838	22517	0.847	0.724	0.992	14907		
1982	3152	1990	4993	26239	20695	33268	19180	14557	25271	0.869	0.744	1.015	13381		
1983	4210	2726	6501	21976	17640	27378	15506	11977	20076	0.887	0.76	1.034	10015		
1984	6091	3948	9398	18027	14543	22344	10925	8661	13780	0.907	0.779	1.057	8383		
1985	6165	4002	9498	21438	16875	27235	11778	9178	15115	0.936	0.806	1.087	10483		
1986	6342	4105	9797	21448	16869	27271	11640	9012	15035	0.966	0.834	1.119	9852		
1987	11681	7393	18456	25926	20371	32995	12846	9921	16633	1.002	0.867	1.158	12894		
1988	8368	5343	13107	26370	20119	34564	13397	10401	17257	1.043	0.905	1.202	14168		
1989	4055	2613	6293	23202	18029	29860	14897	11026	20126	1.09	0.948	1.254	12751		
1990	4127	2675	6368	15578	12425	19530	9540	7390	12314	1.135	0.989	1.303	7379		
1991	5457	3458	8613	13941	10958	17736	6581	5179	8363	1.187	1.035	1.361	6714	7095	
1992	4771	3118	7300	13585	10690	17264	7077	5411	9256	1.252	1.09	1.438	7173	7735	
1993	1940	1286	2925	10682	8223	13876	5223	4100	6654	1.302	1.132	1.499	5727	7555	
1994	3290	2215	4886	8652	6836	10952	5047	3720	6848	1.323	1.153	1.517	4187	5402	
1995	2972	2015	4383	8761	6948	11049	3747	2960	4743	1.326	1.162	1.512	3721	4587	
1996	2434	1650	3591	8569	6920	10611	4483	3488	5761	1.34	1.177	1.526	3622	4964	
1997	2917	1994	4266	8849	7173	10918	4510	3598	5652	1.369	1.198	1.564	4360	5859	
1998	1363	929	2000	8900	7014	11293	5011	3973	6319	1.371	1.199	1.568	4418	5310	
1999	613	405	927	6532	5110	8349	5180	3909	6863	1.382	1.202	1.589	2975	4784	
2000	2030	1361	3027	3687	2923	4651	1712	1352	2169	1.356	1.18	1.558	1274	2179	
2001	2125	1433	3151	5714	4367	7475	2545	1872	3458	1.319	1.151	1.511	2252	3598	
2002	1850	1257	2724	6475	5094	8231	4032	3014	5394	1.282	1.12	1.468	2695	4431	
2003	981	661	1456	6817	5353	8681	4374	3403	5623	1.286	1.119	1.478	1285		4027
2004	986	668	1455	4540	3617	5699	3083	2356	4035	1.262	1.096	1.455	1072		1884
2005	608	403	917	3115	2478	3917	2031	1612	2559	1.241	1.075	1.434	910	1646	
2006	505	325	786	2541	2030	3181	1852	1451	2363	1.263	1.091	1.462	840		1274
2007	681	457	1017	2564	2041	3221	1605	1268	2030	1.26	1.088	1.46	702		1606
2008	334	220	506	2016	1597	2546	1412	1105	1803	1.247	1.073	1.449	662		1335
2009	632	416	960	2039	1622	2565	1196	941	1519	1.232	1.053	1.442	466		994
2010	1012	654	1566	3144	2391	4133	1403	1071	1840	1.209	1.022	1.43	464		1335
2011	691	438	1089	3271	2505	4271	2033	1545	2675	1.187	0.987	1.427	365		1677
2012							2394	1662	3450						

(*) 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)

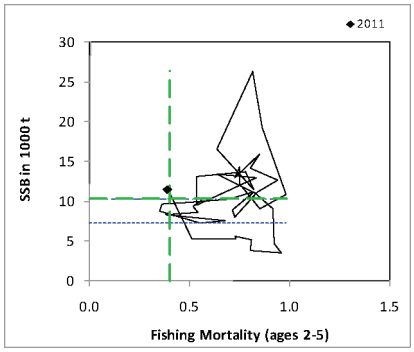
Advice for 2013

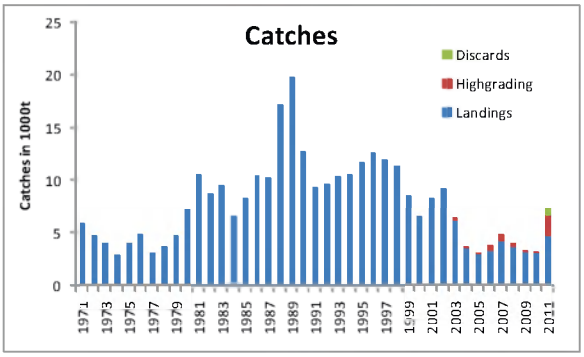
ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 10 200 t.

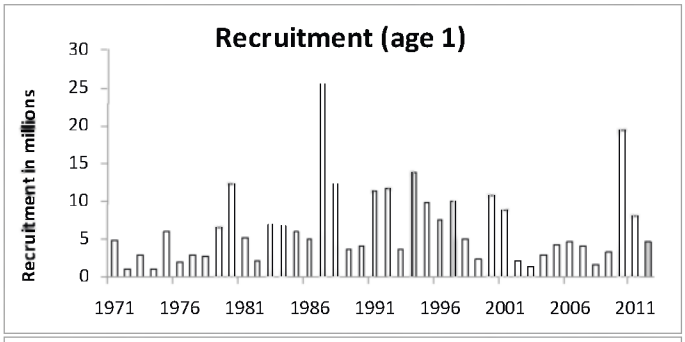
Stock status

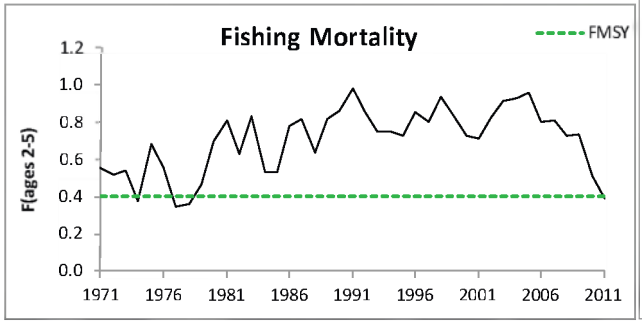
F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✗	✗	✓	Appropriate
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning-Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	✗	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	✗	✓	✓	Full reproductive capacity









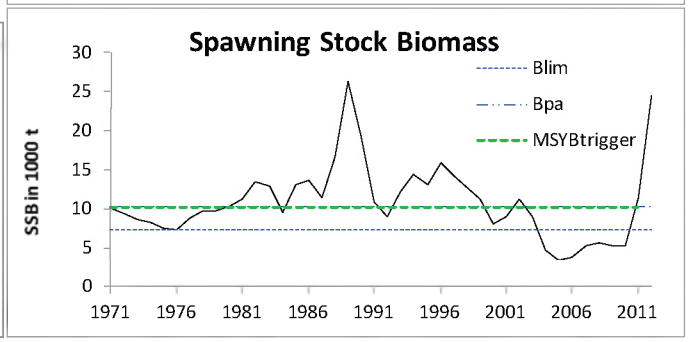


Figure 5.4.2.1 Cod in Divisions VIIe–k (Celtic Sea Cod). Time-series of catches, recruitment, fishing mortality, and spawning-stock biomass.

SSB has increased from below B_{lim} to well above MSY $B_{trigger}$ since 2010. Recruitment has been highly variable over time with occasional very high recruitment (1987, 2010). Fishing mortality increased from around 0.5 in 1971 to 0.8 in 1981 and varied without trend around this level until 2005, when it sharply declined to around F_{MSY} in 2011.

Management plans

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

Biology

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

Environmental influence on the stock

Cod in the Celtic Sea are at the southern limit of the range of the species' distribution in the Northeast Atlantic. It is known that recruitment 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 Trevose Head Closure applied since 2005 has resulted in landings being spread across the year.

Highgrading occurred during the first part of 2011 before the TAC was revised.

Catch distribution	Total catch (2011) = 7.3 kt, where 65% were landings (76% otter trawl, 12% beam trawl, 4% gillnets, and 8% other gears) and 35% discards (70% highgrading).

Quality considerations

Misreporting, discard practices, and highgrading are the main cause of uncertainty affecting the assessment (ICES, 2009), especially when quotas are particularly restrictive (2003–2008, 2011). Most of these issues have been quantified and included in this year's assessment. The assessment is also sensitive to the assumption regarding the appropriate level of effort in the commercial tuning fleet.

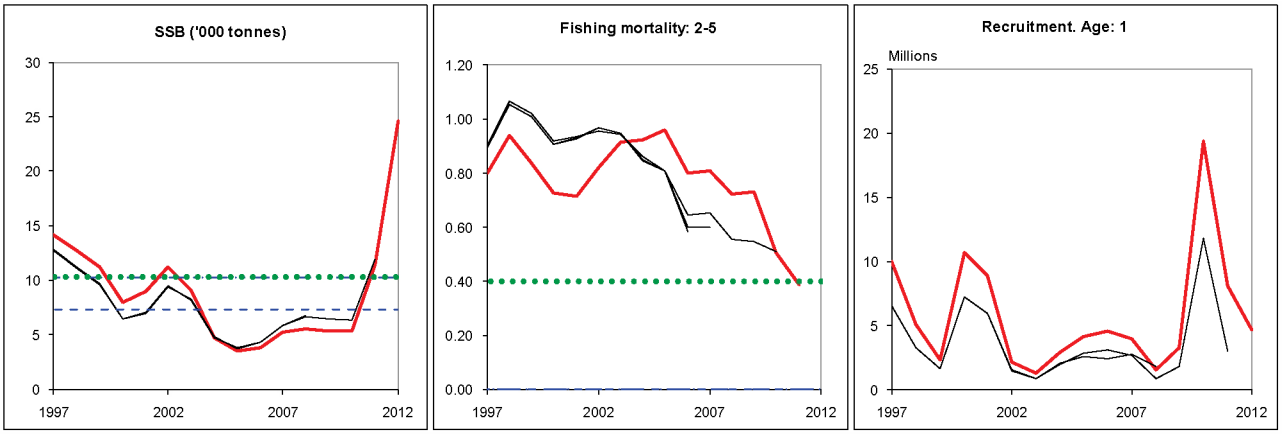


Figure 5.4.2.2 Cod in Divisions VIIe–k (Celtic Sea cod). Historical assessment results (final-year recruitment estimates included).

Scientific basis

Assessment type	Age-based assessment (XSA).
Input data	One combined survey index (EVHOE-WIBTS-Q4; IGFS-WIBTS-Q4); One commercial index (FR-OTDEF Q2-Q4 VIIek,).
Discards and bycatch	Discards have been included in 2012.
Indicators	None.
Other information	Benchmarked at WKROUND 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 $B_{trigger}$	10 300t	Provisionally set at B_{pa}.
	F_{MSY}	0.40	Provisional proxy based on F_{max} (ICES, 2011).
Precautionary Approach	B_{lim}	7 300 t	$B_{lim} = B_{loss}$ (B76), the lowest observed spawning-stock biomass.
	B_{pa}	10 300 t	$B_{pa} = B_{lim} * 1.4$. 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}	Undefined.	
	F_{pa}	Undefined.	

(unchanged since: 2012)

Yield and spawning biomass per Recruit F-reference points (2012):

	Fish Mort	Yield/R	SSB/R
	Ages 2–5		
Average last 3 years	0.54	1.40	2.67
F_{max}	0.37	1.45	4.03
$F_{0.1}$	0.20	1.33	6.79
F_{med}	0.74	1.32	1.85

Outlook for 2013

Basis: F_{2012} = 0.405 based on a TAC constraint of 10 059; SSB (2013) = 28 096; R (2012) = GM (1971–2009) = 4652(thousands); landings (2012) = 10 059.

Rationale	**Landings (2013)**	**Basis**	**F (2013)**	**SSB (2014)**	**%SSB change [1)]**	**% TAC change [2)]**
MSY framework	10.2	F_{MSY} (F_{2012}*0.99)	0.40	26.5	−6%	+2%
MSY transition	11.1	0.4* (F_{2010})+ 0.6 * F_{MSY}	0.44	25.5	−9%	+11%
Zero catch	0	F=0	0.00	38.3	+36%	−100%
Other options	9.9	F_{2012} * 0.9	0.38	26.9	−4%	−2%
	10.8	F_{2012}	0.43	25.9	−8%	+7%
	11.7	F_{2012} * 1.1	0.47	24.9	−11%	+16%
	8.6	TAC-15% (F_{2012}*0.80)	0.32	28.5	+1%	−15%
	10.1	TAC (F_{2012}*0.97)	0.39	26.7	−5%	0%
	11.6	TAC+15% (F_{2012}*1.15)	0.46	25.0	−11%	+15%

Weights in '000 tonnes.
[1)] SSB 2014 relative to SSB 2013.
[2)] Landings 2013 relative to TAC 2012.

MSY approach

Based on the MSY framework ICES advises that fishing mortality in 2013 should be set at 0.4, resulting in landings of 10 200 t.

Since the fishing mortality has reached F_{MSY} in 2011, the transition to MSY option is not relevant.

Precautionary approach

This stock is currently exploited at F_{MSY} and SSB is above B_{pa}. In the absence of an F_{pa} reference point for application of the precautionary approach, keeping SSB above B_{pa} in 2014 would allow a considerable increase in fishing mortality in 2013, which is not considered appropriate.

Additional considerations

Management considerations

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.

The large 2009 year class was not anticipated in the 2010 advice; the TAC set for 2011 (4023 t) led to unusually high levels of highgrading for all fleets. Subsequently there was an in-year TAC revision increasing the 2011 TAC to 5379 t. TAC for 2012 is set to 10 059 t, which should prevent further highgrading.

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.

Recent tagging studies using data storage and conventional tags have shown movement of cod between the estuaries on the south coast of Ireland (officially in Division VIIa) and their offshore feeding grounds in the Celtic Sea (mainly Division VIIg). Irish landings from the southern part of Division VIIa are included in the assessment for the Celtic Sea stock. Tagging shows some dispersal of cod tagged north of 53° in the Irish Sea into the deeper offshore waters of the Celtic Sea, but the proportion of the Irish Sea stock migrating into the Celtic Sea is unknown. There is also seasonal movement of fish tagged in Division VIIe to feeding grounds in Division VIIg.

More than 80% of the landings consist of three age groups (1–3) over the available time-series (Figure 5.4.2.4). The historical dynamics of Celtic Sea cod have been recruitment driven, i.e. the stock increased in response to good recruitment and decreased rapidly during times of poor recruitment.

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. Minimum landing sizes do not prevent cod from being discarded, but might prevent the targeting of juvenile cod. Recent sampling programmes in countries exploiting this stock indicate that the discarding pattern is variable. Highgrading appears and becomes the most prominent discard practice when quotas are restrictive. This situation, which can account for 40–60% by number of all fish caught, has occurred in French fisheries since 2003 and has also been apparent in UK fisheries since 2007. It has then decreased since 2008 to a few tonnes in 2010. In 2011, the initial low TAC in regards of the abundance of the 2009 year class has led to exceptionally high levels of highgrading for all fleets during the first part of the year. In response, the 2011 TAC has been strongly increased as cod catches being part of mixed fisheries, any measures would have not avoided a high level of catch of marketable fish and a too low TAC would have resulted in highgrading. All highgrading since 2003 has been corrected for in the assessment by the inclusion of highgrading estimates in the catch numbers-at-age.

Data and methods

The assessment methodology for this stock has been benchmarked in 2012 (ICES, 2012b). The assessment and forecast have been carried out according to the new procedure, as described in the stock annex. The only exception to the procedure is the necessary adjustment to the 2011 effort value in the commercial tuning fleet.

The outlook for 2013 assumes that all catches taken from the stock in 2012 and 2013 are landed.

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.

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

The major sources of uncertainty 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 and discards have been high in the first part of 2011 and are included in this assessment. Landings have been revised last year and include landings from the southern part of the Irish Sea (e.g. 150 t in 2011) as they are believed to be part of this stock. Lpue for the French demersal fleet have been revised and are available from 2000.

Effort estimation in the main commercial tuning series is currently based on a catch proportion threshold of 40% of gadoids per trip. With the recent strong recruitment the number of qualifying trips has increased dramatically despite no apparent change in the behaviour of the fleet (at a trip level). ICES made the most appropriate adjustment to the effort estimate, but the forecast is sensitive to this adjustment.

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

Due to the revisions in the data used, the estimates of SSB, F, and R have been somewhat revised. However, these revisions do not change the perception of the dynamics of the stock.

As last year the advice is based on the MSY framework.

Assessment and management area

From 2009 onwards the TAC covers Divisions VIIb,c,e–k, Subareas VIII, IX, and X, and EU waters of CECAF 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

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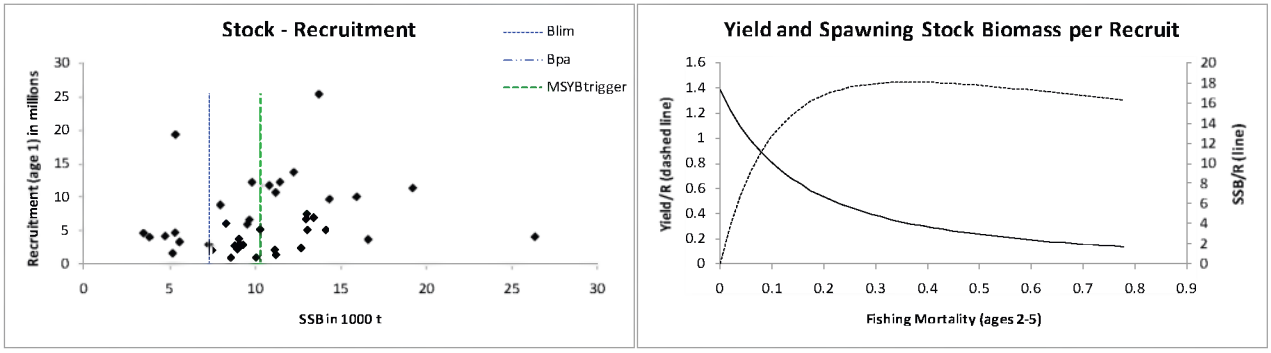

Figure 5.4.2.3 Cod in Divisions VIIe–k (Celtic Sea cod). Stock–recruitment plot (left) and yield-per-recruit analysis (right).

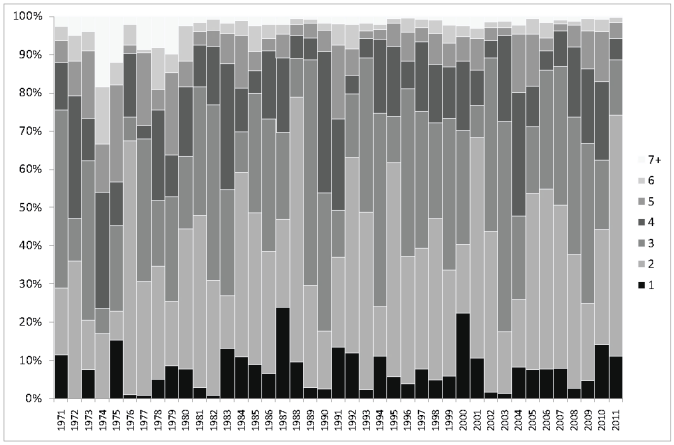

Figure 5.4.2.4 Cod in Divisions VIIe–k (Celtic Sea cod). Landings age composition in numbers.

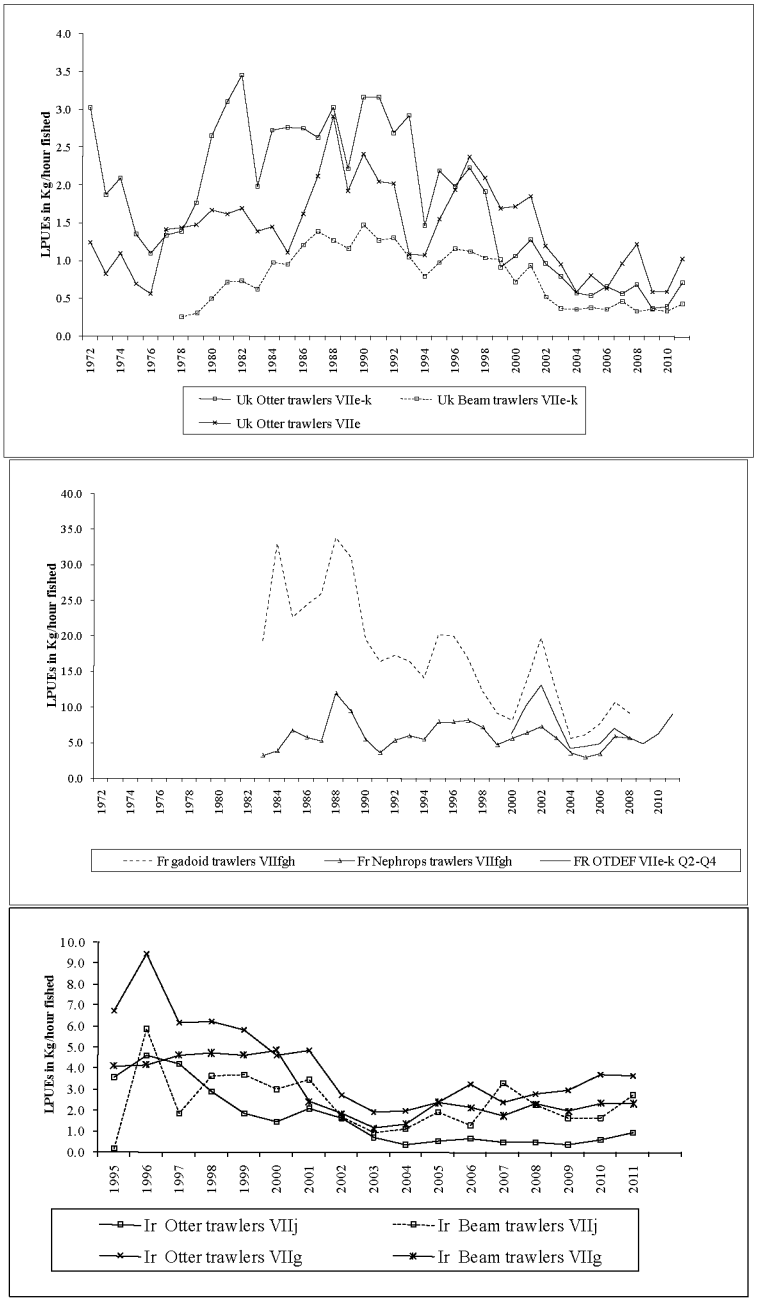

Figure 5.4.2.5 Cod in Divisions VIIe–k (Celtic Sea cod). Landings per unit effort (lpue) trends of the fishing fleets.

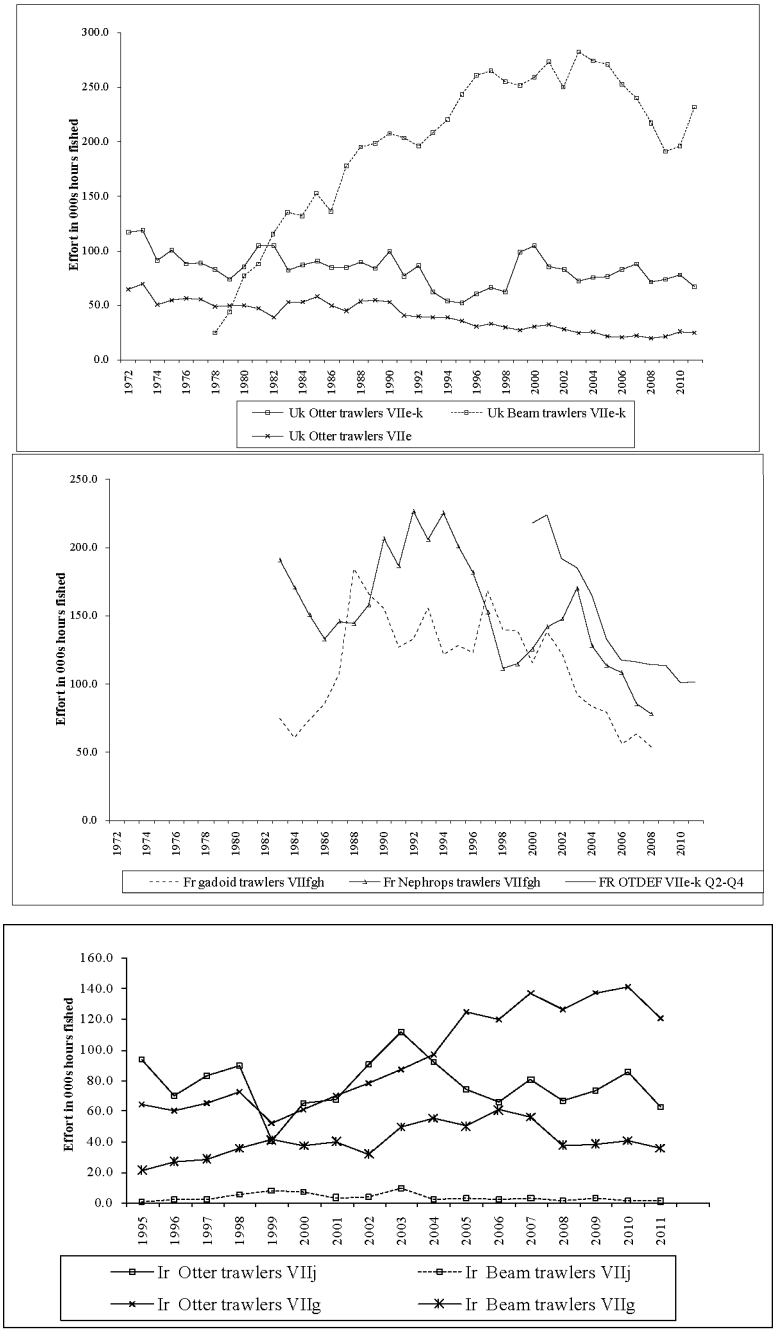

Figure 5.4.2.6 Cod in Divisions VIIe–k (Celtic Sea cod). Fishing effort trends of the fishing fleets.

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	-	5.379	4.7	7.3**
2012	MSY framework	<10.0	10.059		
2013	MSY framework	<10.2			

Weights in '000 t.
[1] TAC covers Subareas VII (except Division VIIa) and VIII. From 2009 onwards the TAC covers Divisions VIIb,c,e–k, Subareas VIII, IX, and X, and EU waters of CECAF 34.1.1 (with a separate TAC established for Division VIId).
[2] For the Divisions VIIf,g stock component.
[3] For the Divisions VIIf–h stock component.
[4] For the Divisions VIIe–h stock component.
[5] For the Divisions VIIe–k stock component.
**: Highgrading and discards estimate.

Table 5.4.2.2 Cod in Divisions VIIe–k. Landings (in tonnes) of cod in Divisions VIIe–k used by the working group.

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

[1]French highgrading estimates from self-sampling programme.
[2]International highgrading estimate.

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

	Recruitment at age 1 (thousands)	TSB (tonnes)	SSB (tonnes)	Catches (tonnes)	Yield/SSB	Mean F age 2–5
1971	4774	15358	10100	5782	0.57	0.556
1972	929	12830	9314	4737	0.51	0.517
1973	2810	11710	8625	4015	0.47	0.541
1974	888	10719	8330	2898	0.35	0.377
1975	6021	12574	7518	3993	0.53	0.678
1976	1986	12209	7307	4818	0.66	0.553
1977	2871	12543	8839	3059	0.35	0.349
1978	2738	13780	9688	3647	0.38	0.362
1979	6619	16323	9835	4650	0.47	0.468
1980	12215	22794	10329	7243	0.7	0.696
1981	5145	20623	11177	10597	0.95	0.812
1982	2115	18826	13451	8766	0.65	0.633
1983	6918	18539	13004	9641	0.74	0.833
1984	6690	17142	9568	6631	0.69	0.532
1985	5904	21773	13082	8317	0.64	0.533
1986	5034	21028	13752	10475	0.76	0.781
1987	25442	28586	11472	10228	0.89	0.819
1988	12267	41509	16629	17191	1.03	0.638
1989	3664	37673	26382	19809	0.75	0.813
1990	4046	25249	19240	12749	0.66	0.861
1991	11364	19519	10845	9336	0.86	0.981
1992	11740	21914	9073	9747	1.07	0.851
1993	3704	20978	12278	10425	0.85	0.748
1994	13726	26270	14367	10620	0.74	0.749
1995	9693	26049	13043	11709	0.9	0.724
1996	7458	26461	15950	12681	0.8	0.851
1997	10047	23529	14167	12035	0.85	0.8
1998	5053	19828	12721	11431	0.9	0.938
1999	2365	16393	11218	8594	0.77	0.837
2000	10685	15681	7993	6536	0.82	0.727
2001	8857	19435	8996	8308	0.92	0.713
2002	2190	16398	11245	9236	0.82	0.822
2003	1304	11575	9106	6420	0.7	0.916
2004	2941	7362	4768	3672	0.77	0.924
2005	4170	7656	3495	3062	0.88	0.959
2006	4605	9066	3850	3776	0.98	0.802
2007	3989	10635	5204	4830	0.93	0.808
2008	1581	9216	5601	3961	0.71	0.724
2009	3293	9781	5361	3292	0.61	0.733
2010	19370	23145	5337	3229	0.61	0.507
2011	8113	23358	11451	7261	0.63	0.389
2012	4652*		25453			
Mean	6471	18440	10934	7728	0.73	0.704

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STOCK Haddock in Division VIIa (Irish Sea)

Advice for 2013

Based on the ICES approach for data-limited stocks, ICES advises that catches should be no more than 710 tonnes and further technical measures should be introduced to reduce discards.

This is the first year ICES is providing quantitative advice for data-limited stocks (see Quality considerations).

Stock status

F (Fishing Mortality)		
		2009–2011
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa},F_{lim})	?	Unknown

SSB (Spawning-Stock Biomass)		
		2008–2012
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa},B_{lim})	?	Unknown
Qualitative evaluation	↘	Decreasing

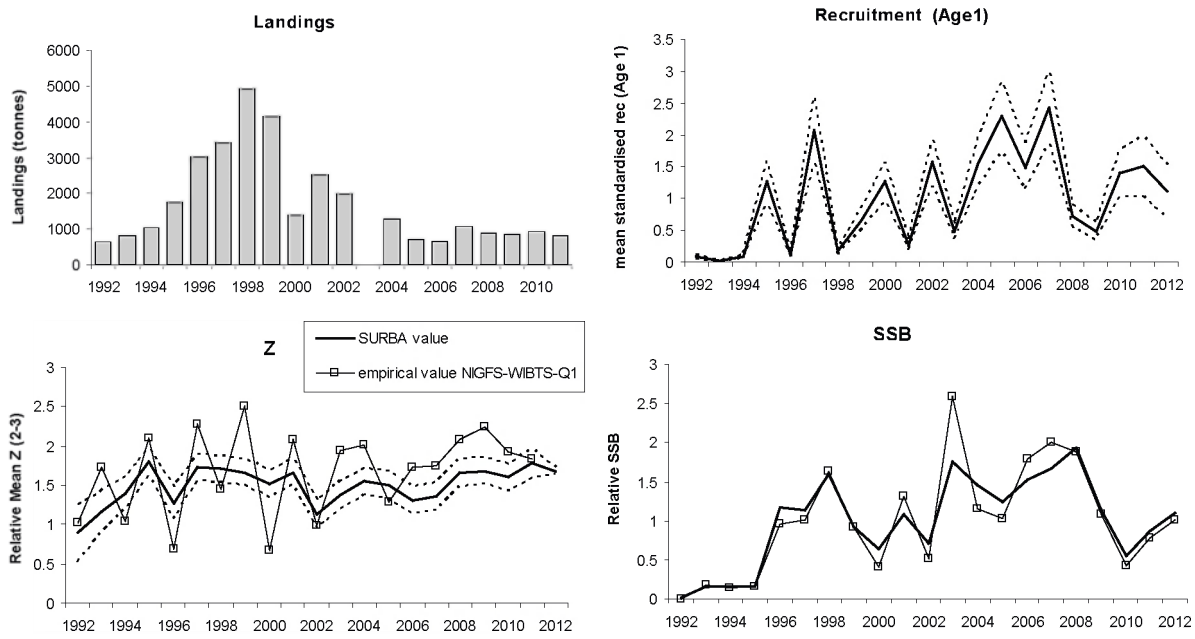

Figure 5.4.3.1 Haddock in Division VIIa (Irish Sea). Summary of trends in ICES estimates of landings (in tonnes; 2003 sampling was inadequate to derive catch age compositions), recruitment, total mortality (Z, empirical total mortality values from one survey are also shown for illustrative purposes),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

The assessment is indicative of trends only. Trends in SSB from the assessment indicate that the average of the biomass indicator in the last two years (2011–2012) is 18% lower than the average of the three previous years (2008–2010). SSB trends are fluctuating due to the dependence of incoming year classes. The strength of the 2011 year class is uncertain and the response in SSB is unknown.

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 variable, being large in some years.

Catch distribution	Total catch (2011) is unknown. 813 t landings (42% *Nephrops* otter trawl, 32% seine, 13% midwater otter trawl, 2% beam, and 10% other gears), with discards data not raised to fleet level.

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 and landing sampling in some years. Sampling levels, however, have improved considerably in the last three years.

The advice is based on an estimated spawning-stock biomass index used as indicator of stock size. The uncertainty associated with the index values is not available. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished.

Scientific basis

Assessment type	Surba analysis based on survey information, considered indicative of trends only.
Input data	One trawl survey (NIGFS-WIBTS-Q1) and ICES landings.
Discards and bycatch	Not included in the assessment.
Indicators	NIGFS-WIBTS-Q4, NIMIK, UK FSP survey, Irish Sea AEPM survey.
Other information	A benchmark is scheduled for 2013.
Working group report	WGCSE

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STOCK Haddock in Division VIIa (Irish Sea)

Reference points

	Type	*Value*	*Technical basis*
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 2013

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

ICES approach to data-limited stocks

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

For this stock the biomass is estimated to have decreased by 18% in 2008–2010 (average of the three years) and 2011–2012 (average of the two years). This implies a decrease of catches of 18% in relation to the average landings of the last three years, corresponding to catches of no more than 710 t. Considering that SSB has increased very significantly from the early 1990s and that the effort in the main fisheries has decreased, no additional precautionary reduction is needed.

Precautionary considerations

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

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

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

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

The Annual Egg Production Method (AEPM) survey estimates of haddock SSB confirm the trend in SSB from the assessment (Figure 5.4.3.2). The absolute estimates in 2006 and 2008 (8.8 kt and 9.4 kt with CV of 32% and 24%, respectively) are very large compared to the estimated landings of 650 and 870 t, respectively. Even when discard estimates at age 2+ are taken into account the total catch estimates are ~1000–1200 t during this period. This would imply a much lower mortality than given by the age profile in the survey used in the assessment. There is, however, no evidence from any fishery data for an age composition that would reflect low mortality. The AEPM estimate for 2010 is, in contrast to the 2006 and 2008 estimates, substantially lower at 870 t (CV of 26%), corresponding to landings of 940 t and catch estimates of ~1100 t.

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

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

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

Regulations and their effects

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

Changes in fishing technology and fishing patterns

The introduction of effort regulation has effectively encouraged vessel operators to reduce mesh size and shift to other fisheries, particularly to *Nephrops* trawling, in order to gain more days at sea. This has implications for catch compositions and the selectivity of the fishery. Since 2009, four Irish vessels targeting *Nephrops* are using selective grids and are exempted from the effort control regime. Grids have been shown to reduce catches of <25 cm haddock to negligible levels. The number of vessels increased to seven towards the end of 2011. A conditional national licence has been introduced by Ireland since March 2012, making the use of grids or separator panels mandatory for the *Nephrops* fleet fishing in the Irish Sea. The targeted whitefish fishery that developed during the 1990s using semi-pelagic trawls has declined to only four vessels.

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 2011 year class are uncertain, with conflicting signals from the surveys.

Information from the fishing industry

The UK Fishery–Science Partnership Irish Sea roundfish survey 2004–2011, 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 stable or decrease; this year the SSB is again expected to remain at current levels or decrease depending on the strength of recruitment.

The basis for the advice last year was the precautionary considerations. The basis for advice this year is the ICES approach to data-limited stocks.

Sources

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

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STECF. 2012. 39th Plenary Meeting Report of the Scientific, Technical and Economic Committee for Fisheries (PLEN-12-01). Luxembourg: Publications Office of the European Union. 2012.

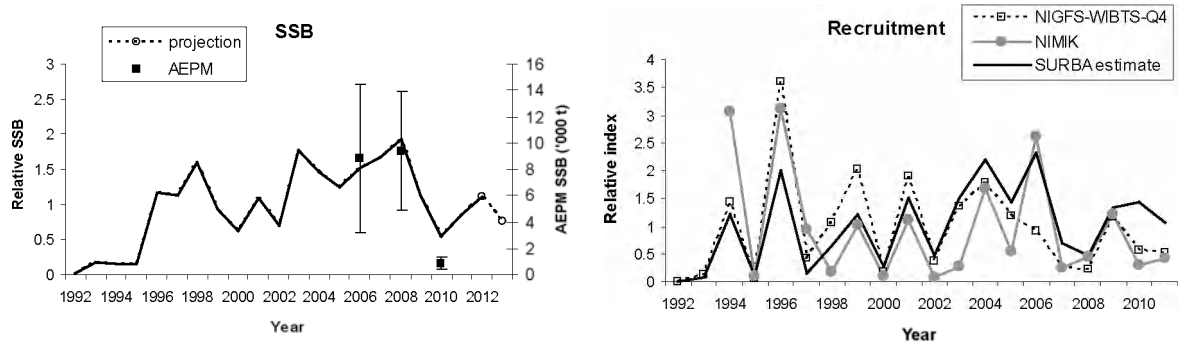

Figure 5.4.3.2 Haddock in Division VIIa (Irish Sea). Trend in SSB from 2012 SURBA projected to 2013 compared to the Irish Sea annual egg production method survey estimates of SSB (+ 2 SE) (left panel), and SURBA estimate of recruitment compared to available 0-group indices (right panel). SSB and recruitment are standardized to the mean for years common to all series (1994–2011) 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	0.9
2011	See scenarios	-	1.317	0.8 [3]	0.8 [3]
2012	Reduce catch and improved selectivity	-	1.215		
2013	Decrease catch by 18%	<0.71			

Weights in thousand tonnes.

[1] Precautionary TAC for Subareas VII, VIII, IX, and X up to 1998 and the Division VIIa allocation of precautionary TAC from 1999.

[2] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

[3] Preliminary.

Table 5.4.3.2 Haddock in Division VIIa. Nominal landings (t) by country, as officially reported to ICES. The total ICES landings used in the assessment are also shown.

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Belgium	3	4	5	10	12	4	4	1	8	18
France	38	31	39	50	47	n/a	n/a	n/a	73	41
Ireland	199	341	275	797	363	215	80	254	251	252
Netherlands	-	-	-	-	-	-	-	-	-	-
UK (England & Wales)[1]	29	28	22	41	74	252	177	204	244	260
UK (Isle of Man)	2	5	4	3	3	3	5	14	13	19
UK (N. Ireland)	38	215	358	230	196	…	…	…	…	…
UK (Scotland)	78	104	23	156	52	86	316	143	114	140
Total	387	728	726	1 287	747	560	582	616	703	730
	387	728	726	1 287	747	560	582	616	656	813

Country	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Belgium	22	32	34	55	104	53	22	68	44	20
France	22	58	105	74	86	n/a	49	184	72	146
Ireland	246	320	798	1 005	1 699	759	1 238	652	401	229
Netherlands	-	-	1	14	10	5	2	-	-	-
UK (England & Wales)[1]	301	294	463	717	1 023	1 479	1 061	1 238	551	248
UK (Isle of Man)	24	27	38	9	13	7	19	1	-	-
UK (N. Ireland)	…	…	…	…	…	…	…	…	…	…
UK (Scotland)	66	110	14	51	80	67	56	86	47	31
Total	681	841	1 453	1 925	3 015	2 370	2 447	2 229	1 115	674
	1 043	1 753	3 023	3 391	4 902	4 129	1 380	2 498	1 972	n/a

Country	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	15	22	23	30	15	7	9	16*
France	20	36	20	11	6	3	2	9*
Ireland	296	139	184	477	319	388	333	432*
Netherlands	-	-		-	-	-	-	-
UK (England & Wales)[1]	421	344	419	559	521	446	593	
UK (Isle of Man)	-	-	-	-	1	1	-	-
UK (N. Ireland)	…	…	…	…	…	…	…	…
UK (Scotland)	9	6	9	1	17	1	2	
United Kingdom								354*
Total	761	547	655	1 078	879	846	939	813*
	1 278	699	647	1 066	872	843	942	813*

*Preliminary.

[1]1989–2008 Northern Ireland included with England and Wales.

n/a = not available.

Table 5.4.3.3 Haddock in Division VIIa. SSB from the assessment model (standardized to the mean).

Year	SSB/SSB mean
2008	1.008
2009	0.591
2010	0.285
2011	0.451
2012	0.577

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Advice for 2013

ICES advises on the basis of the MSY transition that landings should be no more than 9500 tonnes.

Technical measures should be introduced to reduce discard rates in fisheries catching haddock.

Stock status

F (Fishing Mortality)	2009	2010	2011
MSY (F_{MSY})	✗	✗	✗ Above target
Precautionary approach (F_{pa},F_{lim})	?	?	? Undefined

SSB (Spawning-Stock Biomass)	2010	2011	2012
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa},B_{lim})	?	?	? Undefined

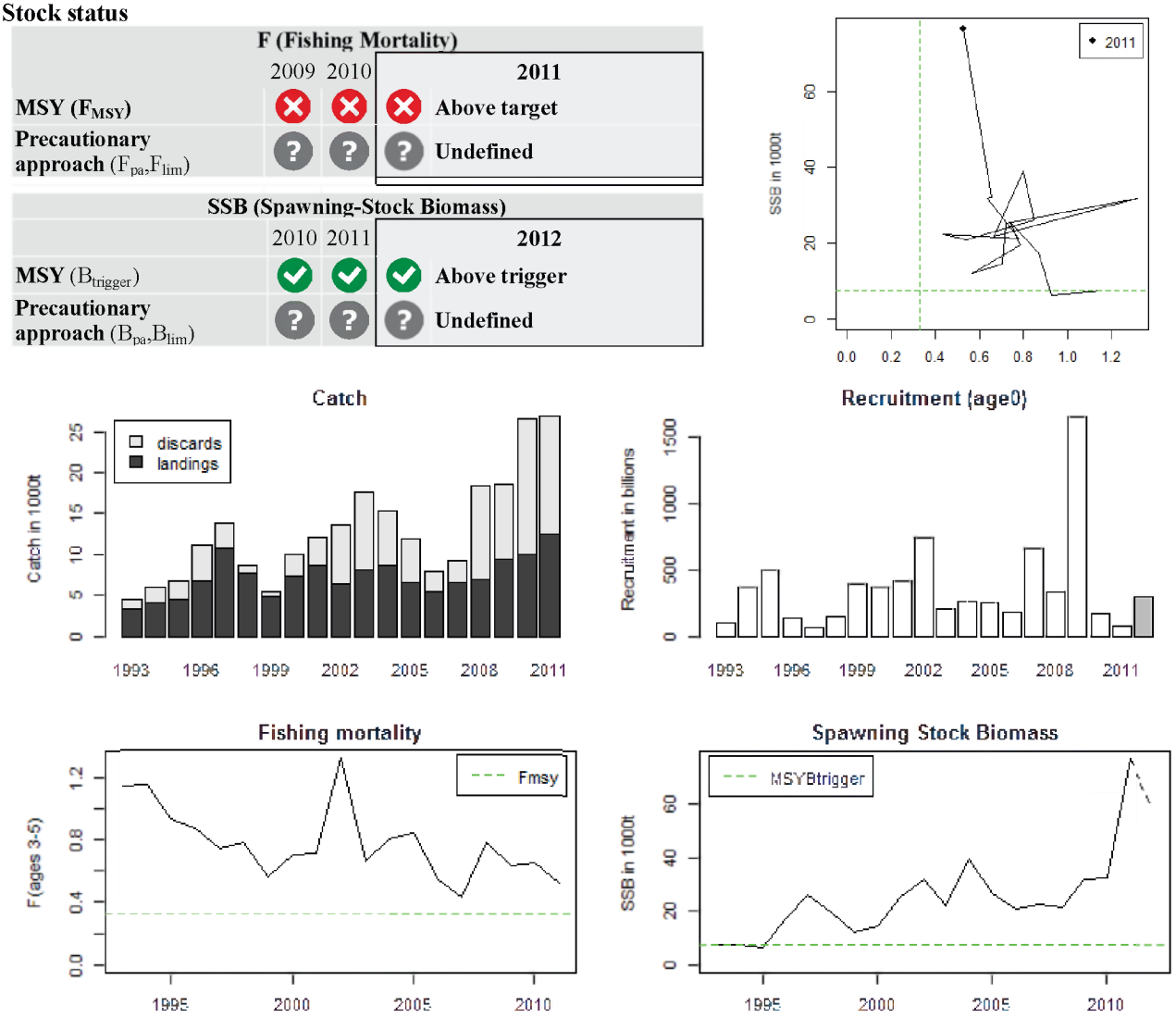

Figure 5.4.4.1 Haddock in Divisions VIIb–k. Summary of stock assessment (weights in thousand tonnes). Top right: SSB/F for the time-series used in the assessment. Predicted recruitment values are shaded; predicted SSB is shown by dashed line.

SSB shows a slowly increasing trend over the time-series and is well above MSY $B_{trigger}$. Fishing mortality remains above F_{MSY} and shows a declining trend over the time-series with some fluctuations. Recruitment is highly variable and in the past the SSB and catches have increased after good recruitment. Recruitment of the 2009 year class was exceptionally good, and catches have increased since 2010. However, most of the increase in catch is being discarded because these fish were under the minimum landing size (mainly in 2010) and over-quota (mainly in 2011).

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 distribution	Total catch (2011) = 26.8 kt, of which 47% are landings (all fleets combined) and 53% discards.

Quality considerations

There is considerable uncertainty around the estimated discard numbers-at-age due to the diverse fishing (and discarding) practices and relatively low numbers of discard samples. Improving discard estimates would require a significant increase in the number of observer trips or other monitoring means.

The estimates of F and trends in recruitment and SSB appear to be quite robust to the absolute level of discards used in the model.

Scientific basis

Assessment type	ASAP (Age-Structured Assessment Programme; NOAA toolbox).
Input data	Catch-at-age; combined French/Irish WIBTS groundfish survey; Irish commercial tuning index.
Discards and bycatch	Discards included in the assessment.
Indicators	None.
Other information	This stock was benchmarked in 2012
Working group report	WGCSE

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

Reference points

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

(established in 2012)

Yield and spawning biomass per Recruit F-reference points (2012):

	Fish Mort Ages 3–5	Yield/R	SSB/R
Average last 3 years	0.61	0.02	0.09
F_{max}	0.33	0.03	0.14
$F_{0.1}$	0.22	0.03	0.19
F_{med}	0.73	0.02	0.07

Outlook for 2013

Basis: F (2012) = F_{sq} (2009–2011) = 0.61; SSB (2013) = 34.2; R (2012) = 294 million; Landings (2012) = 19.7, Catches (2012) = 24.4.

Rationale	2013 Land (HC)	Basis	2013 Disc	2013 catch	F Total 2013	F land 2013 [3]	F dis 2013 [3]	SSB 2014	%SSB change [1]	%TAC change [2]
MSY framework	7.5	$F=F_{MSY}$ = 0.33 (0.28+0.05)	2.1	9.6	0.33	0.28	0.05	36.9	+8%	−54%
MSY transition	9.5	$(F_{2010}*0.4)+(F_{HCR-MSY}*0.6)$	2.7	12.2	0.43	0.37	0.07	34.0	−1%	−42%
Zero catch	0		0	0	0	0	0	48.2	+41%	−100%
Other options	10.4	F_{2012} * 0.8	3	13.4	0.49	0.41	0.07	32.6	−5%	−37%
	11.4	F_{2012} * 0.9	3.3	14.7	0.55	0.46	0.08	31.1	−9%	−30%
	12.4	F_{2012}	3.6	16.0	0.61	0.52	0.09	29.6	−13%	−25%
	13.3	F_{2012} * 1.1	3.9	17.2	0.67	0.57	0.1	28.3	−17%	−19%
	14	−15% TAC	4.1	18.1	0.72	0.61	0.11	27.2	−20%	−15%
	16.4	TAC	5	21.4	0.91	0.77	0.14	23.5	−31%	+0%
	18.9	+15% TAC	5.9	24.8	1.14	0.97	0.17	19.8	−42%	+15%

Weights in thousand tonnes.
[1] SSB 2014 relative to SSB 2013.
[2] Human consumption (HC) landings 2013 relative to TAC 2012 (16 645t).
[3] Total F was split into a discards and landings component based on the average ratio of landings and discards in the last three years.

MSY approach

Following the ICES MSY framework implies fishing mortality to be reduced to 0.33 (F_{MSY}), resulting in landings of no more than 7.5 kt and discards of 2.1 kt in 2013. This is expected to lead to an SSB of 36.9 kt in 2014.

Following the transition scheme towards the ICES MSY framework implies fishing mortality to be reduced to 0.43 based on $(F_{2010}*0.4)+(F_{MSY}*0.6)$ (higher than F_{MSY}), resulting in landings of no more than 9.5 kt and discards of no more than 2.7 kt in 2013. This is expected to lead to an SSB of 34.0 kt in 2014.

ICES continues to advise that effective measures be implemented to reduce the high discards of haddock in the Celtic Sea.

Additional considerations

Due to erratic recruitment, only a flat stock–recruit relationship can be assumed, in which case $F_{MSY} = F_{MAX}$. Current F is above F_{MAX} but is relatively low compared to previous years. B_{LOSS} has been proposed as MSY $B_{trigger}$. Current SSB is more than ten times as high as B_{LOSS}. Future catches and SSB will be highly dependent on the strength of incoming year classes and their discard mortality. The stock should be managed by ensuring that fishing effort is not allowed to increase and technical measures should be introduced to reduce discards.

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 ten years 81% of the catch (in numbers) has been discarded (49% by weight). The TAC appears to have been restrictive in 2011 and since 2009 the national quotas of Ireland and Belgium appear to have been restrictive. The catches are likely to exceed the TAC in 2012, resulting in continued high levels of discarding.

Technical measures can reduce discarding and could increase the yield considerably. ICES notes that the NWWRAC have recently supported the introduction of square mesh panels in all trawl fisheries operating in ICES Divisions VIIf,g. These measures have already been introduced by the main fleets operating in this area. It is important that these are fully implemented and their effectiveness in reducing discards and impact on commercial catches are monitored and evaluated.

Uncertainties in the assessment and forecast

There is considerable uncertainty around the estimated discard numbers-at-age due to the diverse fishing (and discarding) practices and relatively low numbers of discard samples. However, the assessment appears to be relatively robust to the absolute levels of discards. The forecasted landings in 2013 are mainly based on the 2009 year class (68% contribution). Recruitment in 2009 was estimated with a relatively good precision and shows no retrospective pattern, suggesting that the size of this year class is well estimated. The estimated recruitment used in the forecast does not contribute to the forecasted landings in 2013 (<1% contribution); however the 2014 SSB estimate is highly dependent on the recruitment assumption (72% contribution). Therefore, the 2014 SSB forecast is very uncertain.

Comparison with previous assessment and advice

A benchmark assessment was performed in 2012; before that the advice was based on a trends-only assessment. The perception of the stock has not changed although absolute estimates of recruitment have increased due to a change in the assumed natural mortality, which particularly affected the young ages.

The advice last year was based on precautionary considerations. This year it is based on the MSY approach and the transition to F_{MSY} by 2015.

Assessment and management area

The TAC for haddock is set for all of Divisions VIIb–k and Subareas VIII, IX, and X, which does not correspond to the stock assessment area (Divisions VIIb–k). 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. The red boxes are the TAC area (Divisions VIIb–k and Subareas VII, IX, and X), the blue shading the assessment area (Divisions VIIb–k).

Sources

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

ICES. 2012a. Report of the Working Group on Celtic Seas Ecosystems (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

ICES. 2012b. Report of the Benchmark Workshop on Western Waters Roundfish (WKROUND), 22–29 February 2012, Aberdeen, UK. ICES CM 2012/ACOM:49.

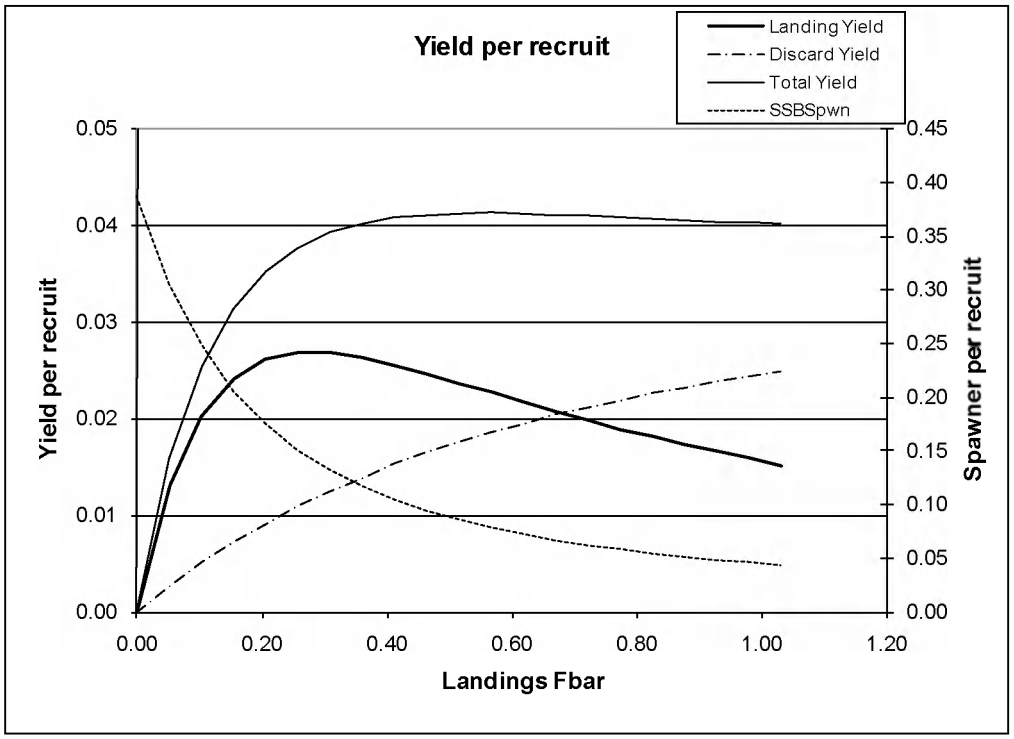

Figure 5.4.4.3 Haddock in Divisions VIIb–k. Yield-per-recruit.

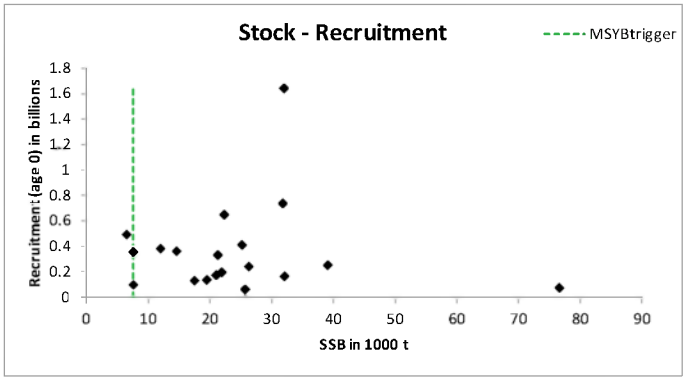

Figure 5.4.4.4 Haddock in Divisions VIIb–k. Stock–recruitment scatterplot.

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	Official landings	ICES landings	Discards	ICES Catch
1987	Not dealt with			3.0	2.6	n/a	2.6
1988	Not dealt with			4.0	3.6	n/a	3.6
1989	Not dealt with			4.2	3.2	n/a	3.2
1990	Not dealt with			2.9	2.0	n/a	2.0
1991	Not dealt with			2.9	2.3	n/a	2.3
1992	Not dealt with			2.9	2.7	n/a	2.7
1993	Not dealt with			3.4	3.3	1.2	4.6
1994	Not dealt with			4.1	4.1	1.9	6.0
1995	Not dealt with		6[1]	4.5	4.5	2.2	6.7
1996	Not dealt with		7[3]	6.7	6.8	4.3	11.1
1997	Not dealt with		14	10.3	10.8	2.9	13.7
1998	Not dealt with		20	7.4	7.7	0.9	8.6
1999	Not dealt with		22[4]	5.2	4.9	0.6	5.5
2000	No expansion of catches		16.6[4]	6.7	7.4	2.5	9.9
2001	No expansion of catches		12[4]	9.7	8.6	3.4	12.1
2002	No expansion of catches	8.0	9.3[4]	7.1	6.4	7.1	13.5
2003	No expansion of catches	7.2	8.185[4]	8.2	8.1	9.4	17.5
2004	No increase in F	-	9.600[4]	8.5	8.6	6.7	15.3
2005	No increase in effort	-	11.520[4]	6.9	6.6	5.2	11.7
2006	No increase in effort	-	11.520[4]	5.6	5.4	2.5	7.9
2007	No increase in effort	-	11.520[4]	6.6	6.5	2.7	9.2
2008	Same advice as last year	-	11.579[4]	6.2	7.0	11.2	18.2
2009	Same advice as last year	-	11.579[2]	9.3	9.3	9.1	18.4
2010	Same advice as last year	-	11.579[2]	10.0	9.9	16.5	26.4
2011	See scenarios	-	13.316[2]	13.3	12.5	14.3	26.8
2012	No increase in catch and technical measures to reduce discards rates	-	16.645[2]				
2013	MSY transition	<9.5[5]					

Weights in thousand tonnes.
[1]Applies to Subareas VII, VIII, IX, and X.
[2]Applies to Divisions VIIb–k and Subareas VIII, IX, and X.
[3]Increased in-year to 14 000 t.
[4]Includes separate Division VIIa allocation.
[5] This indicate landings.
n/a = not available.

Table 5.4.4.2 Haddock in Divisions VIIb–k. Official landings, landings, and catches used by the working group (tonnes).

	Official landings						Un-	Used by WG		
Year	**Belgium**	**France**	**Ireland**	**UK**	**Others**	**Total**	**allocated**	**Landings**	**Discards**	**Catch**
1993	51	1839	1262	256	0	3408	-60	3348	1208	4557
1994	123	2788	908	240	17	4076	55	4131	1886	6017
1995	189	2964	966	266	83	4468	2	4470	2218	6688
1996	133	4527	1468	439	86	6653	103	6756	4309	11064
1997	246	6581	2789	569	85	10270	557	10827	2883	13710
1998	142	3674	2788	444	312	7360	308	7668	934	8603
1999	51	2725	2034	278	159	5247	-365	4882	586	5468
2000	90	3088	3066	289	123	6656	755	7411	2503	9913
2001	165	4842	3608	422	665	9702	-1070	8632	3418	12050
2002	132	4348	2188	315	106	7089	-686	6403	7073	13476
2003	118	5781	1867	393	82	8241	-95	8146	9351	17497
2004	136	6130	1715	313	159	8453	128	8581	6750	15331
2005	167	4174	2037	292	197	6867	-312	6555	5191	11746
2006	99	3190	1875	274	209	5647	-264	5383	2484	7867
2007	119	4142	1930	386	52	6629	-119	6510	2739	9249
2008	108	3639	1800	566	121	6234	815	7049	11187	18236
2009	131	5429	2983	716	48	9307	-31	9276	9080	18356
2010	170	6240	2609	853	128	10000	-132	9868	16547	26415
2011[1]	210	8073	3311	1656	35	13285	-762	12524	14275	26799

[1] Preliminary.

Table 5.4.4.3 Haddock in Divisions VIIb–k. Summary of stock assessment (weights in tonnes).

Year	**Landings**	**Discards**	**Catch**	**Predicted catch***	**SSB**	**TSB**	**Fbar3–5**	**Recruits**
1993	3348	1208	4557	4847	7487	16288	1.142	103631
1994	4131	1886	6017	5370	7528	26303	1.152	361773
1995	4470	2218	6688	6363	6430	42590	0.927	498846
1996	6756	4309	11064	11706	17385	42207	0.870	136646
1997	10827	2883	13710	12650	25645	33562	0.741	68416
1998	7668	934	8603	8866	19375	27096	0.783	142699
1999	4882	586	5468	5520	11947	28212	0.565	387747
2000	7411	2503	9913	9870	14511	40020	0.706	368499
2001	8632	3418	12050	14690	25076	48055	0.718	415874
2002	6403	7073	13476	21654	31733	64199	1.316	743927
2003	8146	9351	17497	15787	21831	59366	0.663	201781
2004	8581	6750	15331	20189	39000	57273	0.801	259417
2005	6555	5191	11746	13582	26170	48709	0.847	247037
2006	5383	2484	7867	9798	20943	42358	0.544	179943
2007	6510	2739	9249	7936	22197	58870	0.434	654746
2008	7049	11187	18236	14551	21193	70740	0.780	337842
2009	9276	9080	18356	15416	31897	126036	0.638	1647390
2010	9868	16547	26415	24995	31965	117937	0.658	170908
2011	12524	14275	26799	27229	76541	87878	0.526	80308
GM 93–09								294359

* Assessment output.

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

Advice for 2013 and 2014

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

Stock status

F (Fishing Mortality)		2009–2011
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

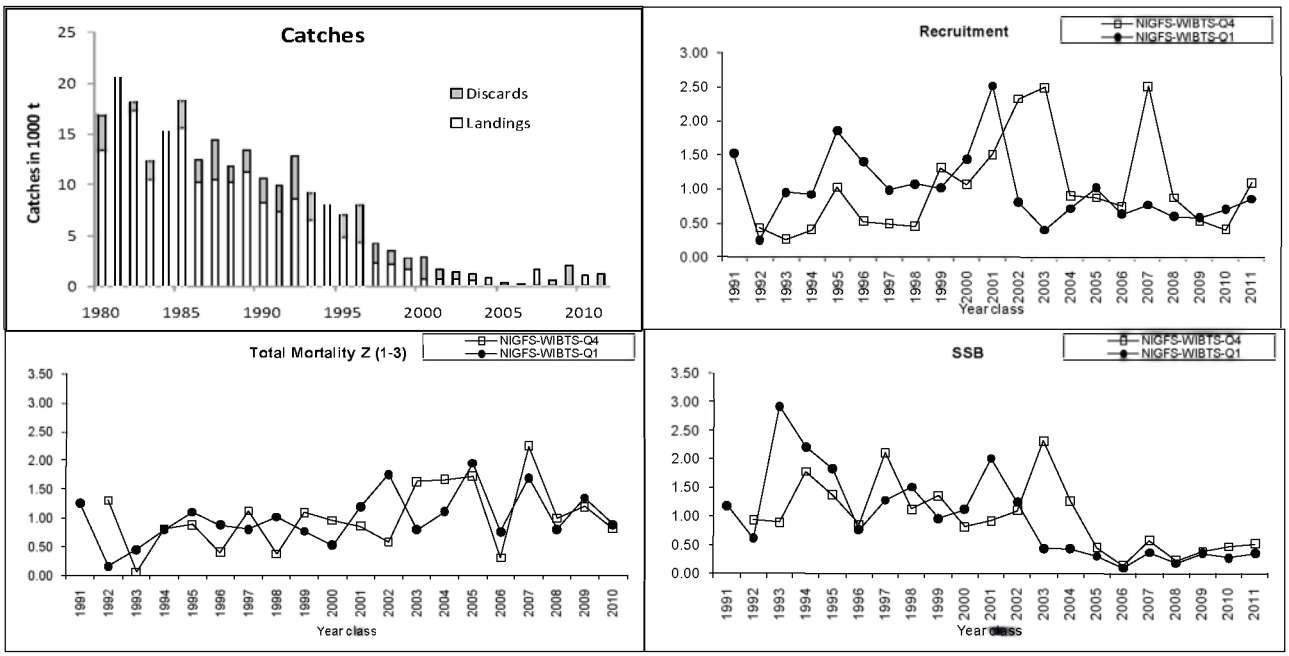

Figure 5.4.5.1 Whiting in Division VIIa (Irish Sea). Catch reported to the WG (in thousand tonnes, 1991–2002 estimates include sampled-based estimates of landings at a number of Irish Sea ports, discards included 1980–2011), and mean standardised: SSB, total mortality (Z), and recruitment estimates, 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 B_{lim}. Landings have been declining 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 remaining 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 distribution	Total catch (2011): >1.2 kt, total landings: 0.1 kt; estimated discards:>1.2 kt.

Quality considerations

Since 2003 the low landing levels have resulted in poor sampling coverage of the stock and no reliable estimates of catch numbers-at-age. After a period of incomplete discard information between 2003–2011 discard estimates are available for the main fleets but are imprecise. Survey data are consistent with a high total mortality and low stock size.

Scientific basis

Assessment type	Based on survey information and considered to be indicative of trends only.
Input data	2 trawl survey indices (NIGFS-WIBTS-Q1 and 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

	Type	*Value*	*Technical basis*
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**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 SSB < **B**pa (= 7 kt), and is within the range of historic Fs.

(unchanged since: 1998)

Outlook for 2013 and 2014

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. Even though the underlying data do not support the provision of estimates of F_{MSY}, it is likely that current F is above F_{MSY}. Given the poor stock status, using the survey trends to identify a non-zero catch is not considered appropriate. Therefore, ICES advises that 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

Catches of whiting have substantially reduced from the 1980s. Discarding remains a substantial problem for this stock, with almost all whiting caught now 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. These measures would also need to be evaluated in the context of other species caught in these mixed fisheries. ICES notes that there have been a number of industry and national initiatives to reduce discarding associated with *Nephrops* fisheries. The Northern Irish fleet have voluntarily introduced novel square mesh panel designs (Briggs, 2010). This measure has been evaluated by STECF who conclude that based on the experimental trials, the proposed gear should lead to a large reduction in the discarding of haddock and whiting < 20 cm (STECF, 2012). The Irish *Nephrops* fleet have expanded the use of sorting grids and separator trawls as the use of more species selective is now mandatory. Such initiatives should lead to significant reductions in discards (60–76% by weight (Anon., 2011)) if effectively implemented into the fisheries. It is important that the effectiveness of these devices and their impact on discards and landings are monitored and evaluated.

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. Discarding above minimum landing size occurs. 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 assessment is based only on survey trends as the catch is mainly comprised of discards, for which the time series of estimates is incomplete. 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

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Briggs, R.P. 2010. A novel escape panel for trawl nets used in the Irish Sea Nephrops fishery. Short Communication , Fisheries Research, 105: 118–134

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STECF. 2012. 39th Plenary Meeting Report of the Scientific, Technical and Economic Committee for Fisheries (PLEN-12-01). Luxembourg: Publications Office of the European Union. 2012.

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	0.5	n.a.
2004	zero catch	0	0.514	0.2	0.7	n.a.
2005	zero catch	0	0.514	0.2	0.2	n.a.
2006	lowest possible catch	0	0.437	0.08	0.2	n.a.
2007	lowest possible catch	0	0.371	0.2	1.5	n.a.
2008	lowest possible catch	0	0.278	0.08	1.6	n.a.
2009	Same advice as last year	0	0.290	0.1	1.9	2.0
2010	Same advice as last year	0	0.157	0.12	1.0	1.3
2011	See scenarios	-	0.118	0.11	1.2	1.2
2012	Lowest possible catch and improve selectivity	0	0.089			
2013	Lowest possible catch and improve selectivity	0				
2014	Same advice as for 2013	0				

Weights in '000 t.
[1] Not including discards from the *Nephrops* fishery.
[2] From the *Nephrops* fishery from 1987 to 2002;
[3] Including estimates of misreporting.
[4] Landings only, no discards included.
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
Estimated Discards from IR-OTB fleet[c]											
Estimated Discards from NI Nephrops fishery[d]											
Working Group Estimate of Landings	10245	11305	8212	7348	8588	6523	6763	4893	4335	2277	2229
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
Estimated Discards from IR-OTB fleet[c]					524	680	201	223	1545	585	892
Estimated Discards from NI Nephrops fishery[d]											1019
Working Group Estimate of Landings	1670	762	733	747	676	184	158	86	196	81	102
Working Group Estimates	2,762	2,880	1,745	1,487	1200	864	359	309	1740	666	2013

Country	2010	2011*
Belgium	5	4
France	3	3
Ireland	97	94
Netherlands		
UK(Engl. & Wales)[a]	16	6
Spain		
UK (Isle of Man)	<0.5	<0.5
UK (N.Ireland)		
UK (Scotland)		
UK		
Total human consumption	121	108
Estimated Nephrops fishery discards used by the WG[b]		
Estimated Discards from IR-OTB fleet[c]	330	269
Estimated Discards from NI Nephrops fishery[d]	704	903
Working Group Estimate of Landings	121	74
Working Group Estimates	1,154	1,246

[a] 1989-onwards Northern Ireland included with England and Wales.
[b] Based on UK(N.Ireland) and Ireland data.
[c] Based on data from Ireland.
[d] Based on data from Northern Ireland.
* Preliminary (and rounded).

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

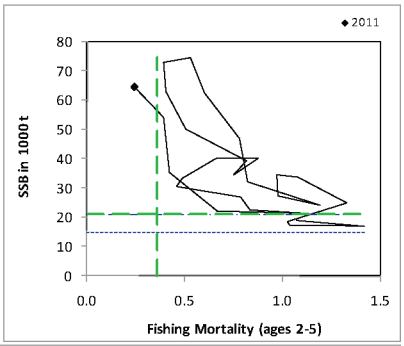
Advice for 2013

ICES advises based on MSY approach that landings in 2013 should be no more than 17 500 tonnes. Technical measures should be introduced to reduce discard rates in fisheries catching whiting.

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✗	✗	✓	Appropriate
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	✓	✓	✓	Full reproductive capacity



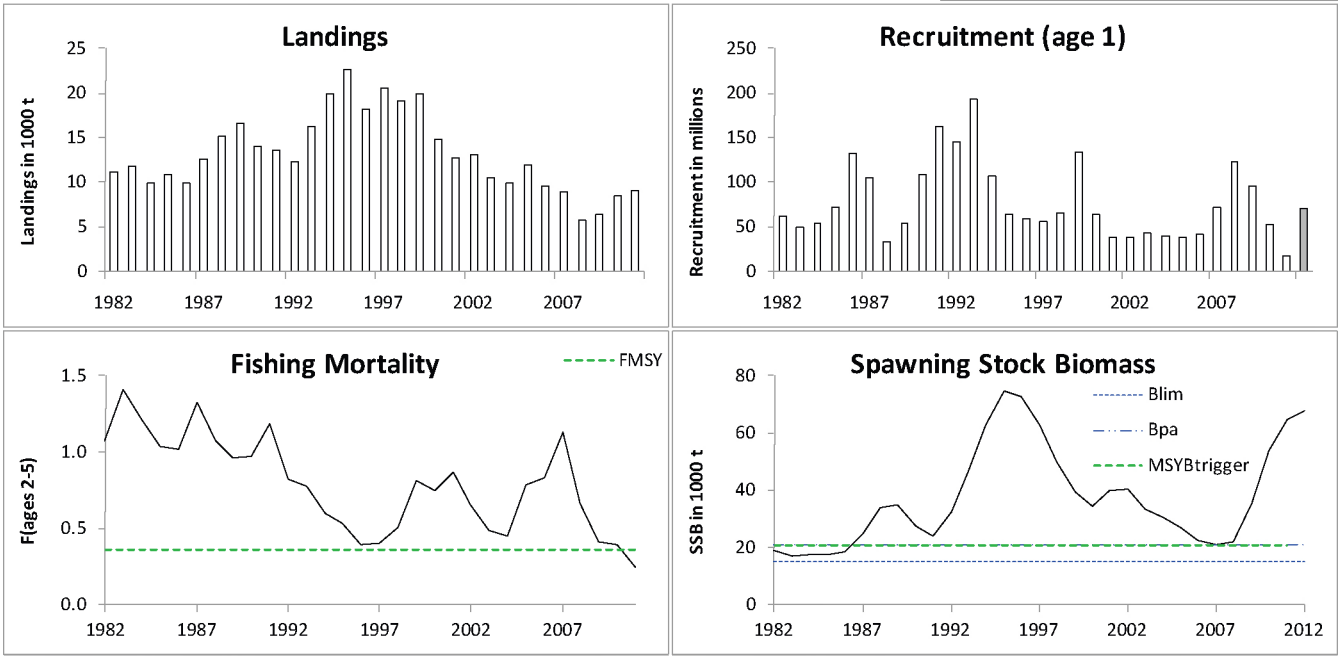


Figure 5.4.6.1 Whiting in Divisions VIIe–k. Summary of stock trends assessment. Predicted recruitment values are shaded. Top right: SSB/F for the time series used in the assessment.

Spawning stock biomass has been increasing and is well above $MSYB_{trigger}$. Fishing mortality has shown a declining trend since 2007 and is now below F_{MSY}. There have been two above average recruitments (2008 and 2009) entering the fishery and spawning stock.

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 (mainly ages 1 and 2) 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 distribution	Total Landings (2011) were 8.6 kt where an estimated additional 5.7 Kt was discarded. Preliminary figures suggest 85% of the total international catch discards are from the otter trawl fleets, 1% seiners, <1% beam trawlers and 14% others.

Quality considerations

The main quality consideration is the non-inclusion of discard data in the assessment, the lack of update of the French commercial lpue series since 2009 is an additional uncertainty.

There is a need for all countries to provide discard estimates of whiting raised to fleet level for inclusion in future assessments after a benchmark procedure.

Scientific basis

Assessment type	Age based analytical assessment (XSA).
Input data	3 survey indices (EVHOE-WIBTS-Q4, IGFS-WIBTS-Q4, and UKWCGFS). 2 commercial indices (FR-Gadoid, FR-Nephrops) up to 2008.
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

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	21 000 t	Provisionally based on B_{pa}
	F_{MSY}	0.36	$F_{35\%\ SPR}$ by analogy with other gadoid stocks
Precautionary Approach	B_{lim}	15 000 t	$\mathbf{B}_{loss}$, the lowest observed spawning-stock biomass.
	B_{pa}	21 000 t	$\mathbf{B}_{pa} = \mathbf{B}_{lim} * 1.4$. Biomass above this affords a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of the assessment.
	F_{lim}	Undefined	
	F_{pa}	Undefined	

(unchanged since: 2012)

ICES considers $F_{35\%SPR}$ to be an appropriate interim F_{MSY} proxy for this stock based on the following considerations: There is no apparent stock-recruit relationship and the yield per recruit analysis is very flat topped. $F_{35\%SPR}$ has been used worldwide as suitable F_{MSY} proxy for a number of other similar stocks.

Yield and spawning biomass per Recruit F-reference points (2012):

	Fish Mort Ages 2–5	**Yield/R**	**SSB/R**
Average last 3 years	**0.35**	**0.21**	**0.87**
Fmax	**0.71**	**0.22**	**0.63**
F0.1	**0.19**	**0.19**	**1.17**
F35% SPR	**0.36**	**0.21**	**0.88**

Outlook for 2013

Basis: F(2012) =mean(2009–2011)=0.35; SSB (2013) = 59.0; R (2012–2013) = $GM_{82\text{-}09}$=71 mln; Landings (2012) = 19.1.

Rationale	**Human Consumption landings (2013)**	**Basis**	**F Total (2013)**	**SSB (2014)**	**%SSB change** [1)]
MSY framework	17.5	F_{MSY}	0.36	53.7	-9%
Zero catch	0	F=0	0	73.1	24%
Other options	12.8	F_{sq} *0.7	0.25	58.9	0%
	14.3	F_{sq}*0.8	0.28	57.2	-3%
	15.8	F_{sq}*0.9	0.32	55.6	-6%
	17.2	F_{sq}*1	0.35	54.1	-8%
	18.5	F_{sq}*1.1	0.39	52.6	-11%
	19.8	F_{sq}*1.2	0.42	51.2	-13%
	23.3	F_{sq}*1.5	0.53	47.4	-20%

Units: '000 tonnes.
[1)] SSB 2014 relative to SSB 2013.
Note: No information for % TAC change can be shown as the TAC area covers VIIb–k landings from VIId and VIIbc.

MSY approach

Following the ICES MSY framework implies fishing mortality at F_{MSY}=0.36 resulting in landings of 17 500 t in 2013. This is expected to lead to an SSB of 53 700 t in 2014. ICES continues to advise that effective measures should be implemented to reduce the high discards of whiting in the Celtic Sea.

Additional considerations

At status quo F predicted landings in 2012 will be well above the remaining TAC after reduction of average landings in VIId (6 kt). However, this predicted landings value (19 kt) takes into account the increase in SSB and likely increase of discards because of the TAC constraint.

Historically, discarding of this stock for different fleets is substantial and highly variable. ICES notes that the NWWRAC have recently supported the introduction of square mesh panels in all trawl fisheries operating in ICES Divisions VIIfg. These measures have already been introduced by the main fleets operating in this area. It is important that these are fully implemented and their effectiveness in reducing discards and the impact on commercial catches is monitored and evaluated.

Regulations and their effects

The stock is managed by a TAC and technical measures. The TAC includes VIId and VIIbc and is becoming more restrictive in recent years

A closure of the three rectangles in the Celtic Sea to protect the cod stock has been in place annually during the first quarter, since 2005. The impact of this on the whiting stock remains unclear. Whiting landings from these rectangles are lower than the surrounding area and remaining quarters.

Changes in fishing technology and fishing patterns

There have been major changes in fleet dynamics over the period of the assessment. Effort in the majority of fleets has been declining since the late 1990s or early 2000s. Since the early 2000s a number of decommissioning schemes have been carried out by several nations including France, UK and Ireland, to reduce fleet capacity. A number of schemes have been aimed at reducing whitefish fleet capacity. However, this has not always been as effective because of low participation rates in such schemes by vessels targeting whiting or targeting other species groups.

Uncertainties in the assessment and forecast

Discards are not included in this assessment. Historically this caused problems forecasting stock development in the short-term due to retrospective revision of recruitment estimates. While discards are still not included in the assessment this retrospective pattern has improved and more recent recruit estimates have little impact on the catch and SSB forecasts (Figure 5.4.6.4).

A correction was made to one of the tuning fleets used in last year's assessment. The new updated assessment is very consistent with the current assessment. The stock assessments in recent years have been extremely consistent in terms of trends and levels. The issue in the recent past has been the accuracy of forecasts from the assessment due to retrospective reductions in recruit estimates. This is no longer a major concern and the assessment and forecast are considered a suitable basis for management advice.

Since the age-range for F includes age 2 which is subject to large discards additional analysis were made using age-range 3–5 (Figure 5.4.6.5). The result is a scaling up of F value and F_{MSY} proxy without changing the trend. Furthermore, the ratio current F/F_{MSY} remains unchanged. Therefore, this advice remains based on the age range used in the assessment (2–5).

Comparison with previous assessment and advice

Previously the assessment was used as indicative of trends but not considered suitable for forecast. This year the assessment is used for forecast and advice.

The advice last year was based on precautionary considerations. This year the advice is based on MSY approach.

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). Whatever management measures are implemented, they must be consistent with the assessment area.

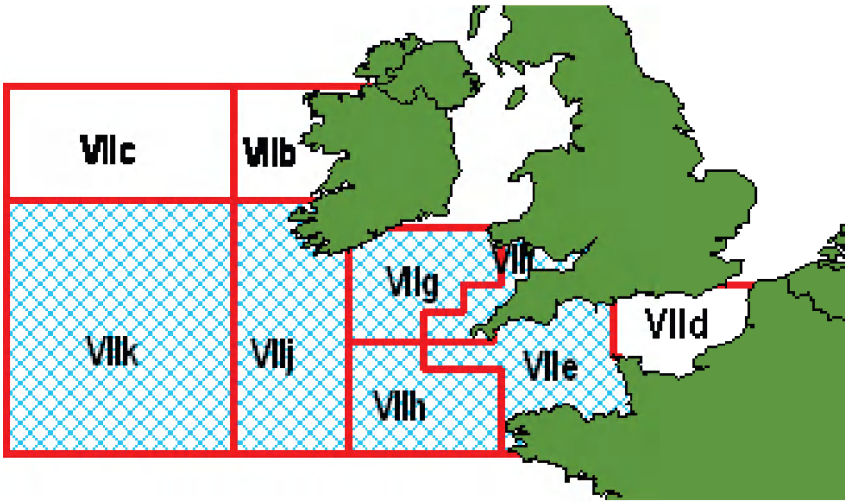


Figure 5.4.6.2 Whiting in Divisions VIIe–k. TAC area in the boxes outlined in red, assessment area in blue shading.

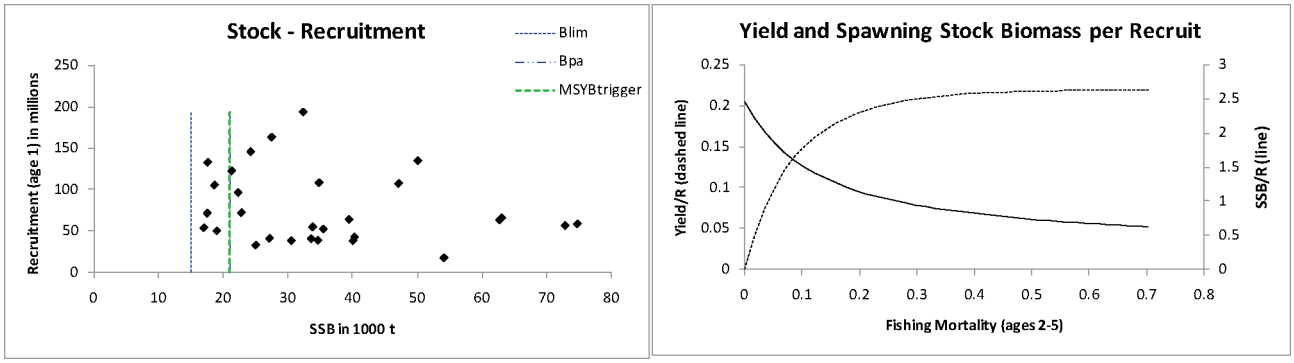


Figure 5.4.6.3 Whiting in Divisions VIIe–k. Stock recruitment plot and yield per recruit analysis..

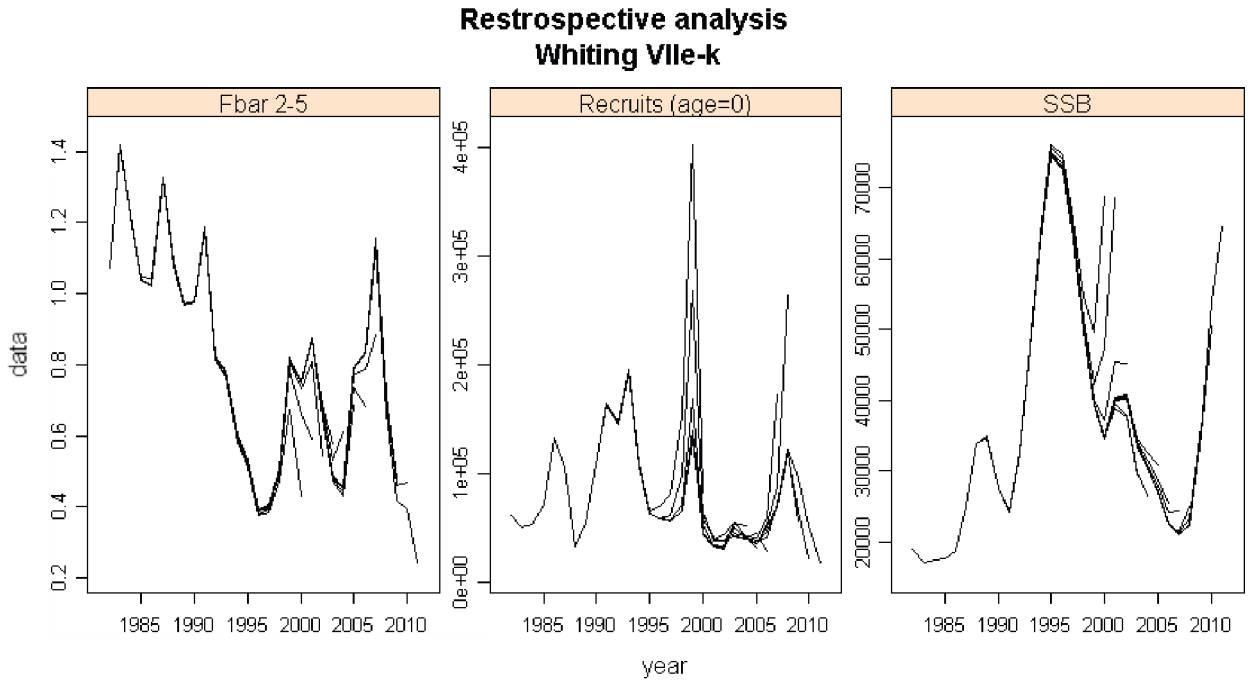


Figure 5.4.6.4 Whiting in Divisions VIIe–k. Retrospective plots.

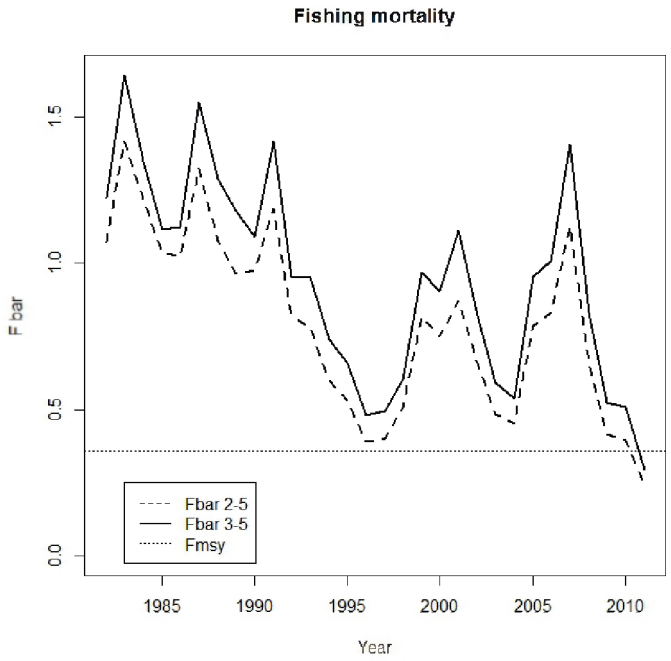


Figure 5.4.6.5 Whiting in Divisions VIIe–k. Comparing Fbar 2–5 with Fbar 3–5.

Sources

ICES. 2011. Report of the Working Group on Celtic Seas Ecosystems, 9–18 May 2012, Copenhagen, Denmark ICES CM 2012/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	*Status quo* 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	8.6
2012	No increase catch and improved gear selection	-	19.053	
2013	MSY Approach	<17.5		

Weights in '000 t.
[1] TAC covers Subarea VII (except Division VIIa).
[2] For the VIIf,g stock component.
[3] For the VIIf–h stock component.
[4] For the VIIe–k stock component.
[5] For the VIIb, VIIc, VIId, VIIe, VIIf, VIIg, VIIh, and VIIk.

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	1997
Belgium	130	158	160	107	112	159	295	317	304	111	145	228	205	268	449
Denmark															
France	7,572	4,024	7,819	7,763	9,773	10,947	19,771	19,348	10,006	9,620	11,285	13,535	13,400	9,936	11,370
Germany										14					
Ireland	1,511	1,227	2,241	1,309	1,518	2,036	1,651	1,764	1,403	1,875	3,630	5,053	6,077	6,115	6,893
Netherlands		398		124										8	
Spain													4	31	24
UK (E/W/NI)	1,192	986	751	910	1,098	1,632	1,326	1,829	2,023	1,393	1,776	1,624	1,803	1,724	1,742
UK(Scotland)						1	33	32	20	41	16	23	23	34	42
United Kingdom															
Channel Islands			2	2	2								1	1	
Total	10,405	6,793	10,973	10,215	12,503	14,775	23,076	23,290	13,756	13,054	16,852	20,463	21,513	18,116	20,520
Unallocated	1,376	3,192	-135	-263	149	353	-6,535	-9,184	-248	-690	-532	-429	1,165	144	12
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	20,532

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[a]
Belgium	479	448	194	171	149	149	129	180	218	128	127	87	101	99
Denmark														
France	11,711	16,418[b]	9,077	7,203	7,435	7,435	5,897	4,811	5,784	4,649	3,543	2,739	3,397	3,390
Germany														
Ireland	5,226	5,807	4,795	5,008	5,332	5,332	4,093	4,215	5,709	4,521	4,764	2,704	4,187	4,205
Netherlands	1			5	4	4	9	18	60	40	64	24	76	170
Spain	53	21	11	9	12	12	-	76	56	70	21	1	6	
UK (E/W/NI)	1,706	1,344	1,249	943	843	843	758	586	471	402	569	764	757	
UK(Scotland)	68	3	2	11	12	12	5	7	-	6	4	63	35	
United Kingdom														689
Channel Islands	3	2	3	3	1	1	4	0	0	0	1	-	4	1
Total	19,247	24,043	15,331	13,353	13,788	13,788	10,895	9,893	12,298	9,816	9,093	6,382	8,563	8,555
Unallocated	-2	-4,128	-466	-583	-642	-3,205	-942	2,137	-2,765	-869	-3,356	-674	-139	523
Total as used by Working Group	19,245	19,915	14,865	12,770	13,146	10,583	9,954	12,030	9,533	8,948	5,737	5,708	8,424	9,077

[a]: Preliminary

[b]: Preliminary, Reported as VIIb-k

Table 5.4.6.3 Whiting in Divisions VIIe–k. 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	2010	2011a
France	57	76	65	37*	...1*	107	114	111	92	59	102	62	32	26	32	67	46
Ireland	1,894	1,233	403	323	206	563	357	386	423	135	65	49	100	76.0	94	144	195
Netherlands	-	-	-	-	-	-	2	-	3	-	2	-	-	-	-	-	-
Spain	+	+	-	27	1	4	-	6	-	31	18	19	1	4	-	4	-
UK(E/W/NI)	24	96	75	49	10	6	5	4	5	1	11	5	1	1	2	-	5.1
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	215	246

*See VIIg-k.

Table 5.4.6.4 Whiting in Divisions VIIe–k. Summary of stock assessment (weights in tonnes).

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2–5
1982	62046	18983	11225	1.0732
1983	50255	16986	11781	1.4159
1984	53996	17509	9985	1.2200
1985	71465	17574	10838	1.0375
1986	133034	18628	9952	1.0209
1987	105426	25009	12652	1.3249
1988	33074	33778	15128	1.0757
1989	55016	34797	16541	0.9668
1990	108400	27470	14106	0.9771
1991	163413	24235	13508	1.1876
1992	145916	32337	12364	0.8218
1993	193753	47082	16320	0.7801
1994	107308	62659	20034	0.5999
1995	63292	74701	22678	0.5303
1996	58627	72810	18260	0.3917
1997	56795	63036	20532	0.4041
1998	65959	50046	19245	0.5046
1999	135002	39435	19915	0.8169
2000	63991	34625	14865	0.7507
2001	38810	40051	12770	0.8736
2002	38413	40270	13146	0.6592
2003	42749	33569	10583	0.4862
2004	40570	30513	9953	0.4538
2005	38429	27127	12030	0.7869
2006	41180	22789	9533	0.8335
2007	72182	21287	8947	1.1277
2008	122602	22276	5737	0.6650
2009	96491	35447	6386	0.4180
2010	52601	54084	8442	0.3935
2011	17706	64640	9077	0.2416
2012	71030*	67942		
Average	77404	37797	13218	0.7946

*GM (1982–2009)

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

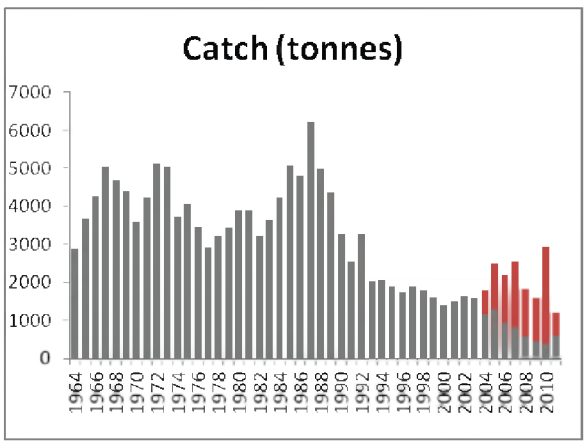
Advice for 2013

Based on the ICES approach for data limited stocks, ICES advises that landings should be no more than 490 tonnes.

This is the first year that ICES is providing quantitative advice for data limited stocks (see Quality considerations).

Stock status

F (Fishing Mortality)		
	2009-2011	
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa},F_{lim})	?	Unknown
Qualitative evaluation	✓	Below poss. reference points
SSB (Spawning Stock Biomass)		
	2008-2012	
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa},B_{lim})	?	Unknown
Qualitative evaluation	✓	Above poss. reference points



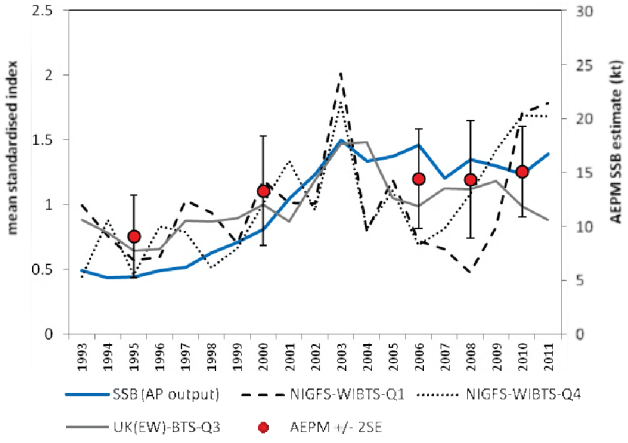


Figure 5.4.7.1 Plaice in Division VIIa (Irish Sea). Lower left: Official landings (grey bars) and estimated discards (red bars from 2004). Lower right: SSB trend from Aarts and Poos model (mean standardised, blue line) and survey data: annual egg production estimates (AEPM) of SSB (red circles) mean standardised indices of SSB derived from NI groundfish surveys NI-GFS-WIBTS-Q1 and Q4 (dashed and dotted black lines, respectively) and the biomass of ages 1–4 calculated from UK beam trawl survey (UK(E&W)–BTS-Q3) (solid grey line). Upper right: SSB and F over the years for the time series used in the assessment.

The average of the stock size indicator (mean standardized SSB from the A&P model output) in the last two years (2010–2011) is about 2% higher than the average of the three previous years (2007–2009).

The surveys and SSB trends show an increase in stock size since the mid-1990s to a stable level. Fishery-independent estimates of plaice SSB from the annual egg production method (AEPM) surveys increased from 9000 t in 1995 to 14000–15000 t since 2006. The recent fishing mortality is likely to be very low as the estimates of total catch (landings and discards) since 2006 are only around 15% of the AEPM estimates of SSB over this period, and the catches also include immature plaice. Total mortality from the assessment shows a declining trend since the early 1990s to a stable level. The recruitment as assessed by the beam trawl survey has been varying without trends 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 distribution	Catch (2011) 1198 t where 50% landings, 50% discards. Landings: 594 t where 70% beam trawl and 30% otter trawl. ICES estimates of discards: 604 t where 49% beam trawl and 51% otter trawl.

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

ICES considered that the Aarts and Poos assessment model might no longer be appropriate due to the revision of recruitment trends after the inclusion of the 2011 data. The assessment this year uses all survey data in addition to the Aarts and Poos (2009) assessment model to show SSB and mortality trends. All survey information is displaying similar trends. Given the existing information, ICES considers the recent trends from the Aarts and Poos assessment model still to be relevant. Therefore, the advice is based on relative trends of SSB derived from Aarts and Poos (2009) assessment model.

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

Scientific basis

Assessment type	Trends based on Aarts and Poos (2009) assessment model and survey trends.
Input data	3 survey indices (UK (E&W)-BTS-Q3, NIGFS-WIBTS-Q1, NIGFS-WIBTS-Q4), annual egg production survey of spawning stock size.
Discards and bycatch	Discards included in the assessment.
Indicators	None.
Other information	Scheduled for benchmark in 2013.
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.

Outlook for 2013

No reliable forecast can be presented for this stock, because absolute level of stock size is uncertain.

ICES approach to data limited stocks

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

For this stock the abundance is estimated to have increased by about 2% between 2007–2009 (average of the three years) and 2010–2011 (average of the two years). This implies an increase of landings of at most 2% in relation to the last three years average landings, corresponding to landings of no more than 490 t.

Considering that the stock is below possible fishing mortality reference points, no additional precautionary reduction is needed.

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 discarding will result in increased future yield potentials. Gear selectivity trials and monitoring from four Irish *Nephrops* trawlers using grids since 2009 indicate a potential 75% drop in fish bycatch (BIM, 2009). 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 (Figure 5.4.7.3) compared to catch estimates 2–3 kt (which also include significant amount of discarded juvenile fish),

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 explored, and it was not considered appropriate to assess SSB and fishing mortality trends because of the reversal of the recruitment trend after the inclusion of the 2011 data. The high discard and catch estimates for 2007 and 2010 are downscaled by the assessment model, while the low discards estimate in 2011 has not been tracked by the model. The discard data are noisy and the assessment would benefit from increased sampling intensity. Estimation of partial fishing mortalities due to the landed and discarded component indicates that the fraction of fishing mortality due to discarding has increased since 2004 (Figure 5.4.7.4).

Regulations and their effects

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

The TAC is not constraining: from 1998 onwards landings have been consistently below the TAC. Of the countries with a TAC for plaice in the Irish Sea only Belgium took its allowance in 2011.

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 in 2011 investigated several assessment methods to explore options for incorporating a short time-series of discard observations into the assessment. None of the approaches examined proved to be entirely satisfactory. The Aarts and Poos (2009) method, developed initially for North Sea plaice, was chosen to 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. Due to the revision of recruitment trends after the inclusion of the 2011 data, ICES considers that this assessment might no longer be appropriate. Trends in SSB and mortality were assessed using all available survey data. Given the existing information, ICES considers that recent trends from the Aarts and Poos model are still appropriate for the basis of management advice.

Comparison with previous assessment and advice

The assessment model is the same as last year's model, but due to the uncertainty in the Aarts and Poos assessment model all survey data were used in addition to show SSB and mortality trends. The perception of the stock trends did not change from last year.

Last year the basis for the advice was the precautionary considerations, and this year the basis for the advice is the ICES approach to Data Limited Stocks.

Sources

Aarts, G., and Poos, J.J. 2009. Comprehensive discard reconstruction and abundance estimation using flexible selectivity functions. ICES Journal of Marine Science, 66: 763–771.

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

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

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9-18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

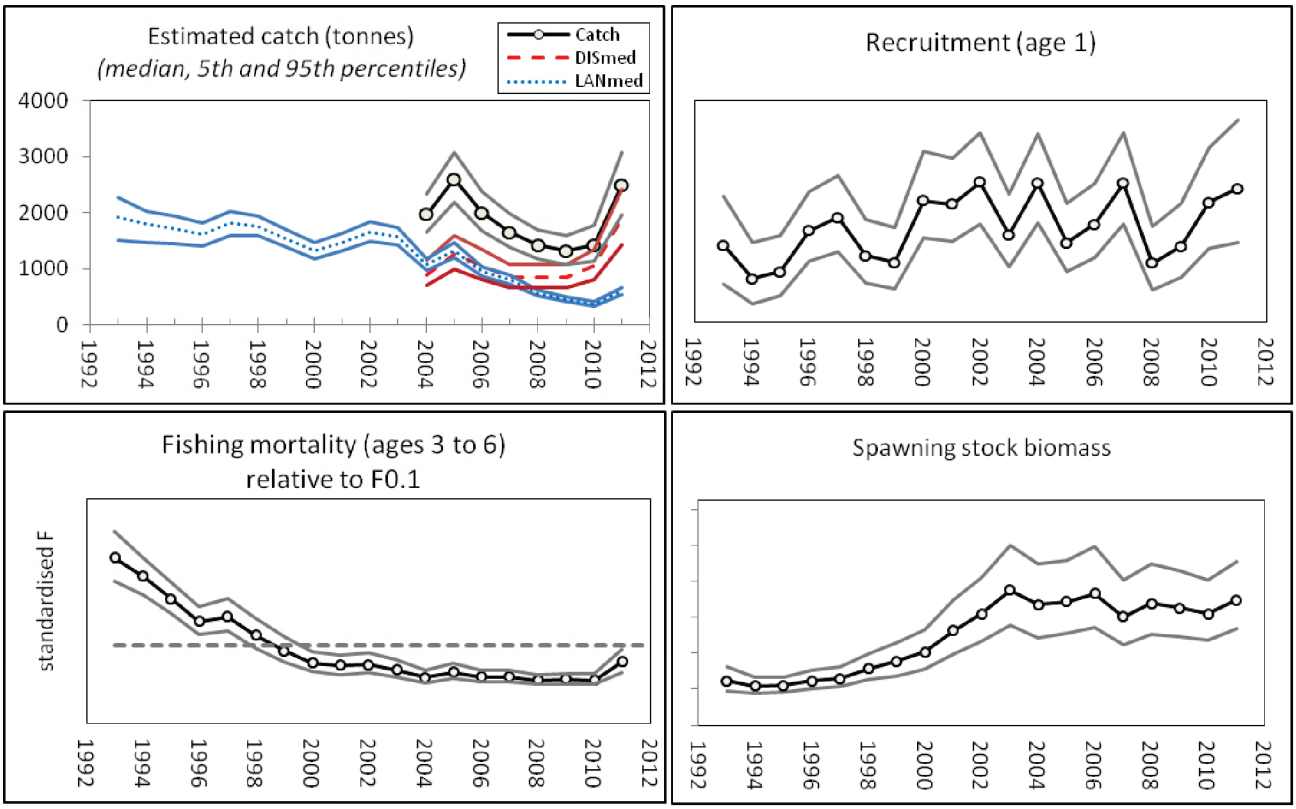


Figure 5.4.7.2 Plaice in Division VIIa. Estimated catch, landings and discards, Recruitment (age 1), Fishing mortality (ages 3-6) and SSB trends (Central trend lines are mean estimated values per year, surrounding lines are 90% confidence intervals. Horizontal lines in standardised plots are mean of the time series).

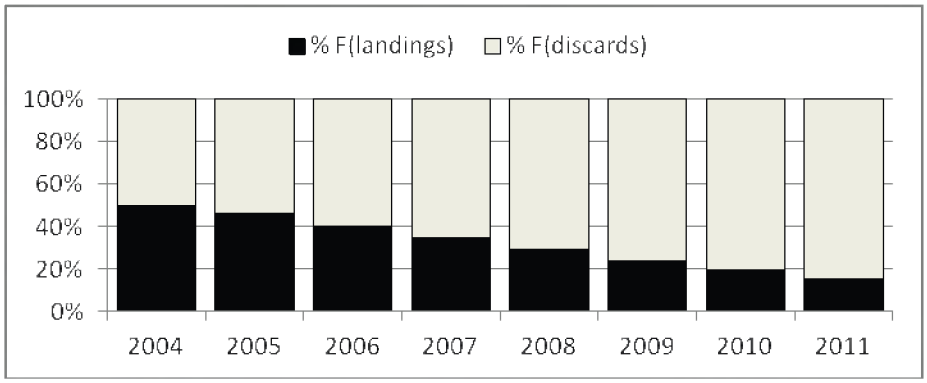


Figure 5.4.7.3 Plaice in Division VIIa (Irish Sea). Percentage of fishing mortality due to the landed and discarded components.

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	-	1.627	0.59	0.59
2012	Catches should not increase	-	1.627		
2013	Landings should be no more than 2% more than recent landings (last 3 years)	<0.490			

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	2011 [1]
Belgium	321	128	332	327	344	459	327	275	325	482	636	628	431	566	343	194	157	197	138	332
France	42	19	13	10	11	8	8	5	14	9	8	7	2	9	2	2	2	0.4	0.2	0.28
Ireland	1,355	654	547	557	538	543	730	541	420	378	370	490	328	272	179	194	102	73	89	118
Netherlands	-	-	-	-	69	110	27	30	47	-	-	-	-	-	-	-	-	-	-	-
UK (Eng.&Wales)[2]	1381	1119	1082	1050	878	798	679	687	610	607	569	409	369	422	413	412	300	185	148	145
UK (Isle of Man)	24	13	14	20	16	11	14	5	6	1	1	1	0	0	0	0	1	…	0.5	0.25
UK (N. Ireland)	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…
UK (Scotland)	70	72	63	60	18	25	18	23	21	11	7	9	4	1	0	0	1	2	3	0
UK (Total)																				
Total	3193	2005	2051	2024	1874	1954	1803	1566	1443	1488	1591	1544	1134	1270	937	802	562	457	379	594
Discards	-	-	-	-	-	-	-	-	-	-	-	-	628	1210	1254	1743	1270	1131	2560	604
Unallocated	74	-9	15	-150	-167	-83	-38	34	-72	-15	32	15	9	11	-5	3	1	2	0	0
Total figures used by the Working Group for stock assessment	3267	1996	2066	1874	1707	1871	1765	1600	1371	1473	1623	1559	1771	2491	2186	2548	1833	1591	2938	1198

[1]Provisional.

[2]Northern Ireland included with England and Wales.

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

Table 5.4.7.2 Plaice in Division VIIa (Irish Sea). Absolute SSB (000 t) of the annual egg production estimates (AEPM), relative SSB (kg / 3 miles) derived from NI groundfish surveys NI-GFS-WIBTS-Q1 and Q4, the relative biomass (kg / km) of ages 1–4 calculated from UK beam trawl survey (UK(E&W)–BTS-Q3) and the mean standardised SSB output from the AP model.

Year	AEPM	NIGFS-WIBTS-Q1	NIGFS-WIBTS-Q4	UK(EW)-BTS-Q3	AP model
1993		13.27	4.64	1.49	0.49
1994		10.09	9.20	1.32	0.44
1995	9.08	7.59	4.77	1.09	0.44
1996		7.96	8.69	1.11	0.50
1997		13.73	8.22	1.48	0.52
1998		12.50	5.39	1.46	0.63
1999		9.37	6.90	1.51	0.71
2000	13.30	15.79	10.50	1.69	0.81
2001		13.52	13.93	1.47	1.05
2002		13.36	9.98	2.00	1.24
2003		26.79	18.65	2.47	1.50
2004		10.55	8.49	2.49	1.34
2005		15.86	11.58	1.77	1.37
2006	14.42	9.57	7.20	1.66	1.46
2007		8.73	8.48	1.90	1.21
2008	14.35	6.33	11.28	1.89	1.35
2009		11.00	14.83	1.99	1.30
2010	15.07	22.67	17.61	1.66	1.24
2011		23.68	17.57	1.49	1.39

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

Advice for 2013

Based on the ICES approach for data limited stocks, ICES advises that landings should be no more than 360 tonnes.

This is the first year that ICES is providing quantitative advice for data limited stocks (see Quality considerations).

Discards exceed landings and technical measures should be introduced to reduce discard rates.

Stock status

	F (Fishing Mortality)		
	2009	2010	2011
MSY (F_{MSY})	?	?	? Unknown
Precautionary approach (F_{pa},F_{lim})	?	?	? Unknown
Qualitative evaluation	↗	↗	✗ Above poss. reference points

	SSB (Spawning Stock Biomass)	
	2007-2011	
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa},B_{lim})	?	Unknown
Qualitative evaluation	✗	Below poss. reference points

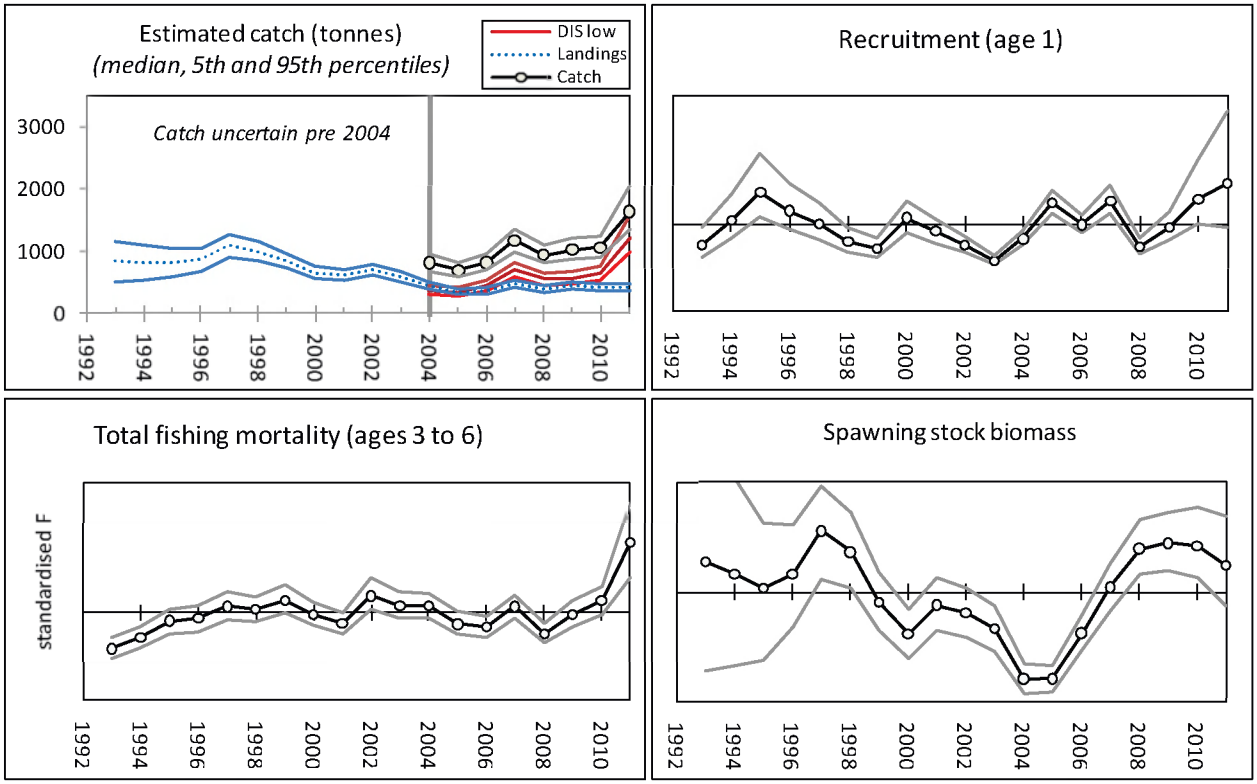


Figure 5.4.8.1 Plaice in Divisions VIIfg. Estimated catch, landings and discards; Recruitment (age 1); Fishing mortality (ages 3-6); and SSB trends (Central trend lines are the mean estimated values per year, surrounding lines are 90% confidence intervals. Horizontal lines in standardized plots are the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

The assessment is indicative of trends only. SSB has increased since 2004 but is considered to be well below historic levels (based on commercial lpue series starting in the 1970s). Fishing mortality remained stable from 2000, but is estimated to have increased in 2011 resulting from increased discarding. The increase in F in 2011 is considered

uncertain but fishing mortality is considered to be well above levels that would increase SSB to historic levels and achieve high long term yields. Recruitment has been fluctuating without clear trend in recent years.

The average of the stock size indicator (SSB) in the last two years (2010–2011) is 1.5 % higher than the average of the three previous years (2007–2009).

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 distribution	Catches (2011) = 1528 t where 28% landings (421 t), 72% discards (1107 t).

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 (mainly below the minimum landing size) and have ranged from 30% to 70% in number. In 2011 discards have been included in the assessment for the first time. The time series of discard data available is short and consequently the revised assessment estimates are considered relative. Additionally, low levels of at sea sampling attribute to uncertainties. 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 and is considered high but uncertain during 2011 (Figure 5.4.8.3).

The advice is based on the relative trends in SSB derived from the Aarts and Poos (2009) assessment model. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished. The methods applied to derive quantitative advice for data limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

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

ECOREGION Celtic Sea and West of Scotland
STOCK Plaice in Divisions VIIf,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 2013

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

ICES approach to data limited stocks

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

For this stock the biomass is estimated to have increased by 1.5% between 2007–2009 (average of the three years) and 2010–2011 (average of the two years). This implies an increase of landings of at most 1.5% in relation to the last three years average landings, corresponding to landings of no more than 446 t. Additionally, considering that is considered overexploited, ICES advises that landings should decrease by a further 20% as a precautionary buffer. This results in landings of no more than 360 t in 2013.

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.

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).

Regulations and their effects

Plaice in the Bristol Channel and Celtic Sea (ICES Divisions VIIf,g) are managed by TAC and technical measures. Technical measures in force for this stock are minimum mesh sizes, minimum landing size, and restricted areas for certain classes of vessels. The minimum landing size for plaice in Divisions VIIf,g is 27 cm.

Since 2005, ICES rectangles 30E4, 31E4, and 32E3 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 VIIf,g were displacement of effort due to the cod recovery zone; and the restrictions on the use of 80 mm mesh west of 7° 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

The assessment model is the same as last year's model.

Last year the basis for the advice was the precautionary considerations, and this year the basis for the advice is the ICES approach to Data Limited Stocks.

Sources

Aarts, G., and Poos, J.J. 2009. Comprehensive discard reconstruction and abundance estimation using flexible selectivity functions. ICES Journal of Marine Science, 66: 763–771.

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9-18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

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

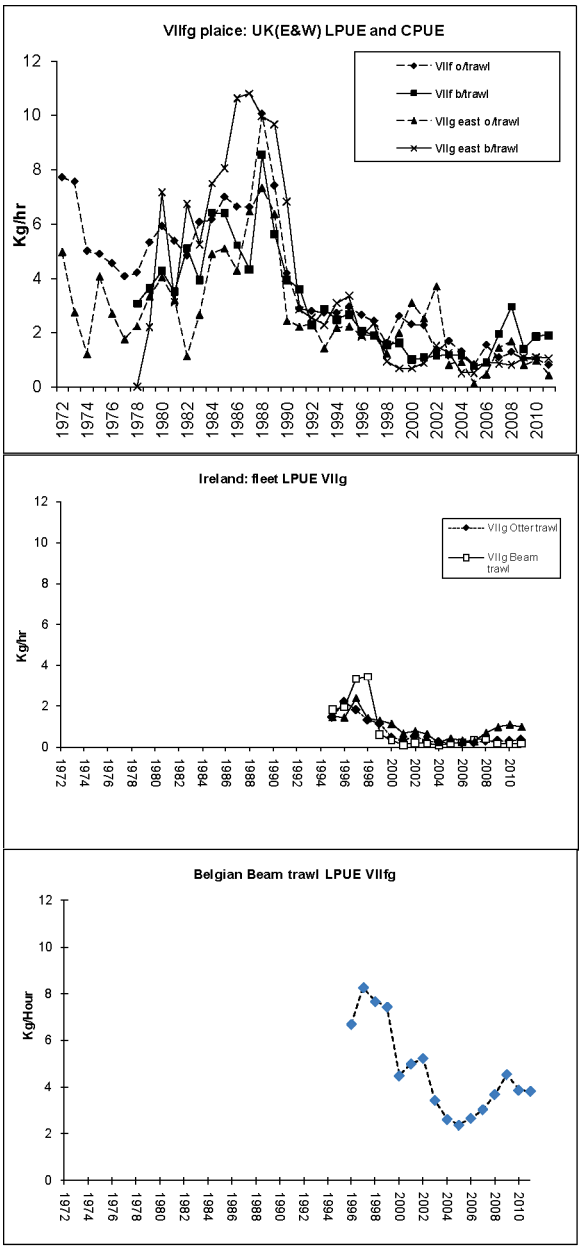


Figure 5.4.8.2a Plaice in Divisions VIIfg. Commercial landings per unit effort (lpue) for the UK (in VIIfg), Ireland (VIIg) and Belgium (VIIfg).

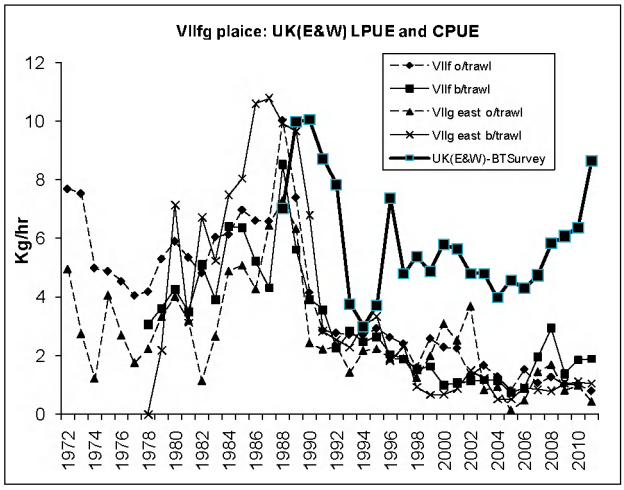


Figure 5.4.8.2b Plaice in Divisions VIIfg. UK bottom trawl survey (b/trawl survey) compared to commercial landings per unit effort (lpue) for the UK.

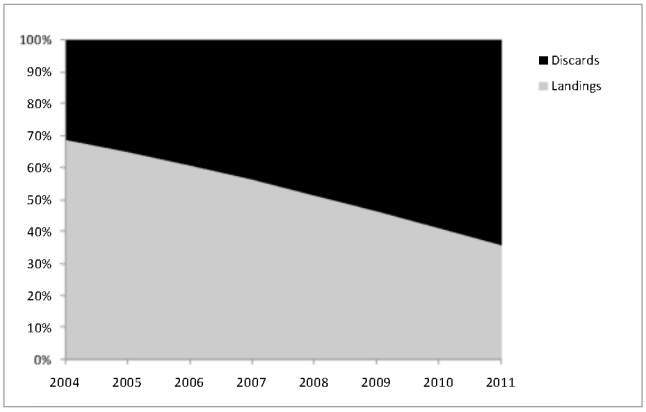


Figure 5.4.8.3 Plaice in Divisions VIIfg. Percentage of fishing mortality due to the landed and discarded component.

Table 5.4.8.1 Plaice in Divisions VIIf.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		0.42
2012	Reduce catches	-	0.37		
2013	Decrease landings by 19% (1.5% increase followed by 20% PA reduction)	<0.36			

Weights in '000 t.
N/A French landings not available.

Table 5.4.8.2 Plaice in Divisions VIIf,g. Nominal landings (in tonnes) as reported to ICES by country and total landings and catches as estimated by ICES.

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Belgium	214	196	171	372	365	341	314	283	357	665
UK (Engl. & Wales)	150	152	176	227	251	196	279	366	466	529
France	365	527	467	706	697	568	532	558	493	878
Ireland	28	0	49	61	64	198	48	72	91	302
N. Ireland										
Netherlands										9
Scotland	0	0	0	7	0	0	0	0	0	1
Total reported	757	875	863	1373	1377	1303	1173	1279	1407	2384
Discards	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unallocated	0	0	0	0	0	0	-27	-69	345	-693
ICES Landings	757	875	863	1373	1377	1303	1146	1210	1752	1691
ICES Catch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Belgium	581	617	843	794	836	371	542	350	346	410
UK (Engl. & Wales)	496	629	471	497	392	302	290	251	284	239
France	708	721	1089	767	444	504	373	298	254	246
Ireland	127	226	180	160	155	180	89	82	70	83
N. Ireland		1								
Scotland				1		5	9	1	2	
Total reported	1912	2194	2583	2219	1827	1362	1303	982	956	978
Discards	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unallocated	-11	-78	-432	-137	-326	-174	-189	88	72	-26
ICES Landings	1901	2116	2151	2082	1501	1188	1114	1070	1028	952
ICES Catch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	594	540	371	224	241	248	221	212	168	172
UK (Engl. & Wales)	258	176	170	134	136	105	127	87	55	88
France	329	298		287	262	186	165	145	132	106
Ireland	78	135	115	76	45	79	51	45	44	48
Total reported	1259	1149	656	721	684	618	564	489	399	414
Discards	N/A	N/A	N/A	N/A	N/A	N/A	N/A	274	321	453
Unallocated	-42	-82	312	-3	30	24	30	21	-13	-10
ICES Landings	1217	1067	968	718	714	642	594	510	386	404
ICES Catch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	784	707	857

	2007	2008	2009	2010	2011
Belgium	194	187	216	188	210
UK (Engl. & Wales)	61	63	55	54	45
France	104	62	N/A	136	98
Ireland	58	63	63	63	67
Total reported	417	375	N/A	442	420
Discards	1288	583	608	670	1107
Unallocated	-7	62	N/A	-9	1
ICES Landings	410	437	463	433	421
ICES Catch	1698	1020	1071	1103	1528

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

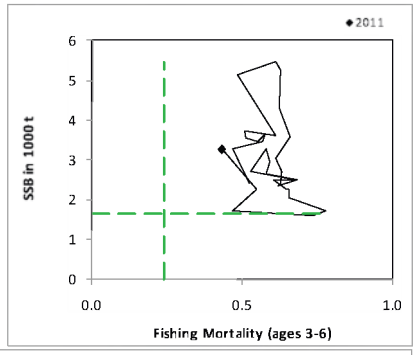
Advice for 2013

ICES advises on the basis of the transition to the MSY approach that landings of plaice in Division VIIe in 2013 should be no more than 2100 t.

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✗	✗	✗	Above target
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	?	?	?	Undefined



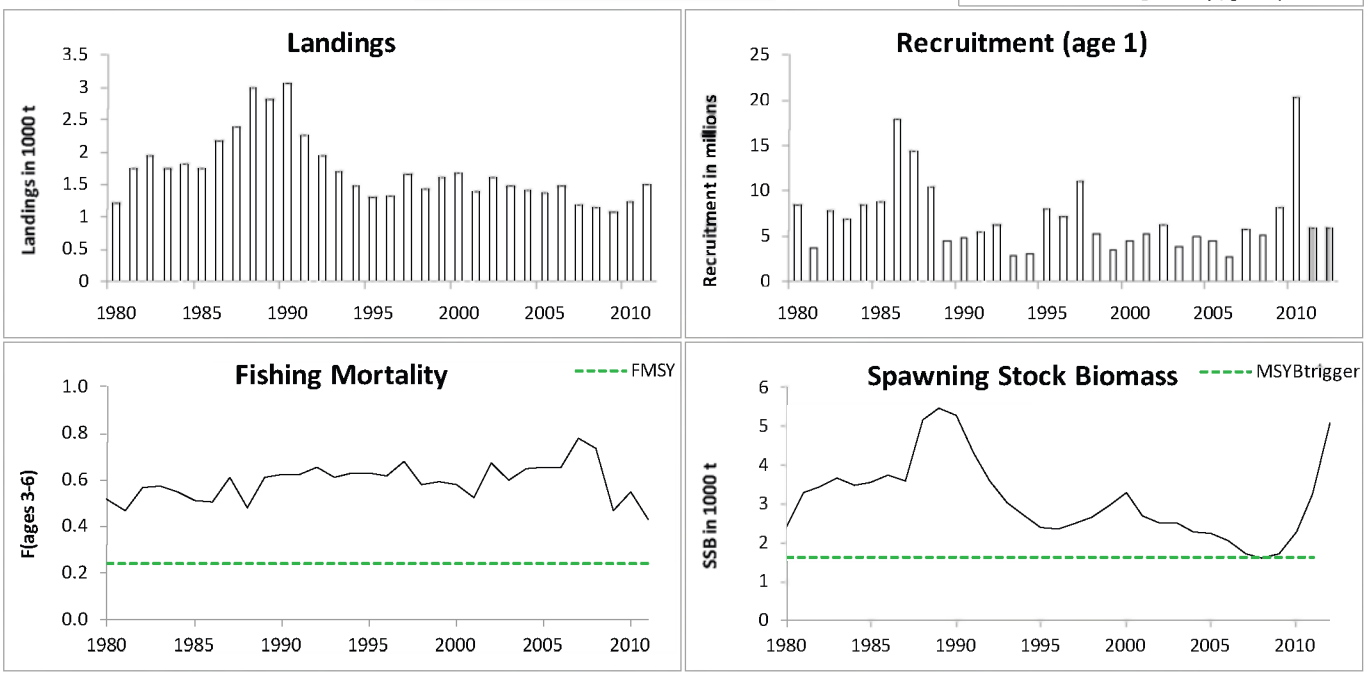


Figure 5.4.9.1 Plaice in Division VIIe (Western Channel). Summary of stock assessment (weights in thousand tonnes). Predicted recruitment values are shaded. Top right: SSB and F for the time-series used in the assessment.

The large reduction of F in 2009 is confirmed in subsequent years' estimates, but remains well above F_{MSY}. SSB has increased in the last three years and is currently well above MSY $B_{trigger}$ due to the large recruitment in 2010. The recent dynamics of the stock has caused a revision of MSY $B_{trigger}$.

Management plans

No specific management objectives are known to ICES.

Biology

Plaice aggregate at spawning grounds in the 1st quarter of the year. The condition factor for plaice is highest in summer/autumn on the more dispersed feeding grounds. Tagging studies show spawning migrations from Division VIIe to VIId during the 1st quarter of the year. It is assumed that 15% of the 1st quarter plaice catch in Division VIId consists

of fish from Division VIIe. Suitable sites for nurseries are located in shallow waters, close to fresh and cool seasonal water inflow.

The fisheries

Plaice are taken as a bycatch in the beam trawl fishery 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 distribution	Landings in 2011 were 1332 t (55% beam, 40% otter (dem), 2% gillnets, and 3% other gear (mostly caught by the above gears, but not available separately by all countries). In addition, 173 t landed from Division VIId are included in the assessment, reflecting the 15% Q1 migration correction (unknown gear). Total catch (2011) = 1505 kt, where 100% were landings (no discards, industrial bycatch, or unaccounted removals)

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 Division 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.

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

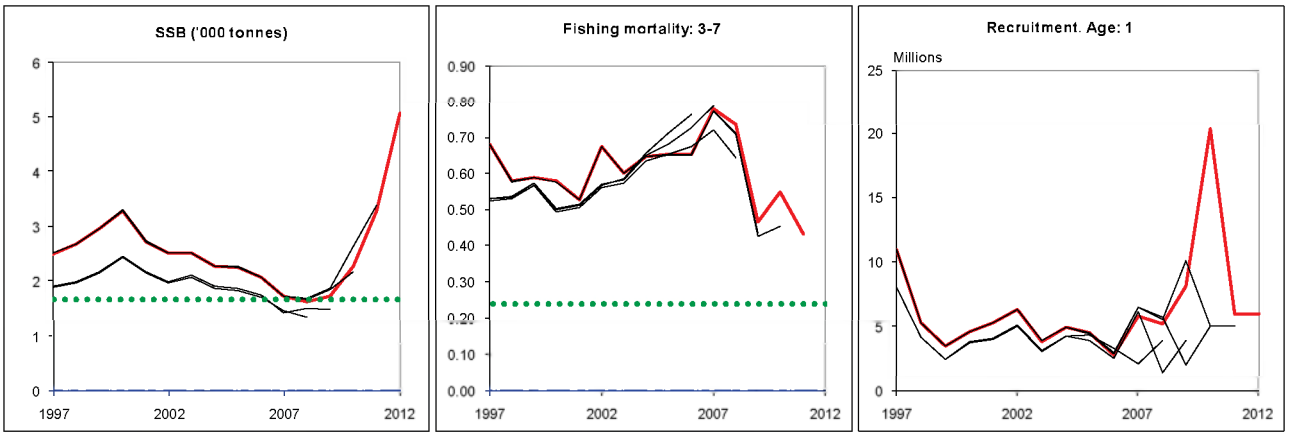


Figure 5.4.9.2 Plaice in Division VIIe (Western Channel). Historical assessment results (final-year recruitment estimates included). The stock was benchmarked in 2010, resulting in the step change in the SSB in this plot.

Scientific basis

Assessment type	Age-based analytical assessment (XSA).
Input data	One fishery independent survey index (UK-WEC-BTS); one industry–science survey (FSP-7e UK-(E+W)); three commercial lpue indices (UK WECOT, UK WECBT, UK WECOT historical).
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 Approach	MSY $B_{trigger}$	1650	Preliminary based on lowest SSB (in converged part of XSA) from which the stock has recovered.
	F_{MSY}	0.24	F_{max}2012. This value is stock specific.
Precautionary Approach	B_{lim}	Not defined.	
	B_{pa}	Not defined.	
	F_{lim}	Not defined.	
	F_{pa}	Not defined.	

(unchanged since: 2012)

Yield and spawning biomass per Recruit F-reference points (2012:

	Fish Mort Ages 3–6	Yield/R	SSB/R
Average last 3 years	0.48	0.30	0.61
F_{max}	0.24	0.32	1.25
$F_{0.1}$	0.11	0.29	2.32
F_{med}	0.61	0.29	0.47

Outlook for 2013

Basis: F (2012) = F_{sq} = mean F (2009–2011) = 0.48; SSB (2013) = 5800 t; R (2012) = GM (1980–2009) = 6000 (thousands); landings (2012) = 3000 t.

Rationale	**Landings (2013)[1)]**	**Basis**	**F (2013)**	**SSB (2014)**	**%SSB change [2)]**
MSY framework	1.4	F_{MSY} (F_{2012} * 0.50)	0.24	6.7	+15%
MSY transition	2.1	(0.4*F_{2010}+0.6*F_{MSY}) = F_{2012}*0.75	0.36	6.0	+3%
Zero catch	0	F=0	0.00	8.3	+43%
Other options	1.4	F_{2012} * 0.5	0.24	6.7	+15%
	1.7	F_{2012} * 0.6	0.29	6.4	+10%
	2.0	F_{2012} * 0.7	0.34	6.1	+5%
	2.2	F_{2012} * 0.8	0.39	5.9	+1%
	2.5	F_{2012} * 0.9	0.43	5.6	−3%
	2.7	F_{2012} * 1.0	0.48	5.4	−7%
	3.0	F_{2102} * 1.1	0.53	5.2	−11%

Weights in thousand tonnes.
No information for percentile TAC changes can be shown as the TAC is for Divisions VIId,e.
[1)] Landings of plaice in Division VIIe, calculated as the projected total stock landings less the stock landings that occur in Division VIId. The subtracted value (180 t) is estimated based on the plaice catch advice for Division VIId for 2013, using the recent 3-year average (2009–2011) proportion of the Division VIIe plaice stock in the annual plaice landings in Division VIId.
[2)] SSB 2014 relative to SSB 2013.

MSY approach

Following the ICES MSY framework implies fishing mortality to be reduced to 0.24 (at F_{MSY} as SSB in 2013 is above MSY $B_{trigger}$), resulting in landings of 1400 t in 2013. This is expected to lead to an SSB of 6700 t in 2014.

Following the transition scheme towards the ICES MSY framework implies fishing mortality of 0.36 for 2013. This results in landings of 2100 t in 2013. This is expected to lead to an SSB of 6000 t in 2014.

Additional considerations

Management considerations

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

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

Regulations and their effects

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

Effort management is implemented for beam trawlers (> 80 mm) and for static demersal nets including gillnets, 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.

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

Comparison with previous assessment and advice

The assessment is similar to the previous assessment in terms of F, with an upward revision of 22% in F (2010), and there is a 14% downwards revision in SSB (2010). The estimate of the 2009 year class has been revised downwards by 4% in this assessment and is still estimated to be the highest in the time-series. Last year this estimate was replaced by a GM value due to uncertainty in the estimate, but the addition of another year's data has confirmed the scale of this year class.

The revision of reference points (MSY $B_{trigger}$) is motivated by the confirmed rebuilding of the stock. The former F_{MSY} was chosen by analogy to the former Celtic Sea plaice stock value. This year the F_{MSY} was set equal to the F_{max} as estimated specifically for this stock. Revised reference points give a more optimistic perception of the stock status compared to last year.

The advice for plaice in Division VIIe this year takes account of the catches of Division VIIe plaice taken in Division VIId.

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 catches of plaice in Division VIId can be found in Section 6.4.8 of the ICES 2012 advice.

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

Sources

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

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

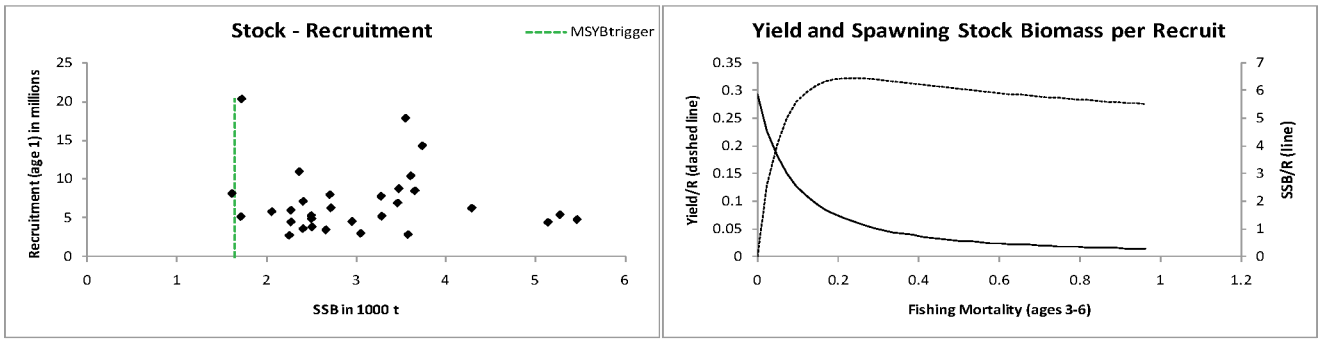


Figure 5.4.9.4 Plaice in Division VIIe (Western Channel). Stock–recruitment plot and yield-per-recruit analysis.

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	1.24
2011	See scenarios	-	4.67	1.34	1.51
2012	MSY Framework	<1.44[2]	5.06		
2013	MSY Framework	<2.10[3]			

Weights in thousand tonnes.
[1] TACs for Divisions VIId,e.
[2] For the plaice stock in Division VIIe only.
[3] For plaice catches in Division VIIe accounting for the Q1 migration correction.

Table 5.4.9.2 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 VIId[4]	As used by WG
1976	5	-[3]	.	323	312	-	640	-	640	-	640
1977	3	-[3]	.	336	363	-	702	-	702	-	702
1978	3	-[3]	.	314	467	-	784	-	784	-	784
1979	2	-[3]	.	458	515	-	975	2	977	-	977
1980	23	-[3]	.	325	609	9	966	113	1079	136	1215
1981	27	-	.	537	953	-	1517	-16	1501	245	1746
1982	81	-	.	363	1109	-	1553	135	1688	250	1938
1983	20	-	.	371	1195	-	1586	-91	1495	259	1754
1984	24	-	.	278	1144	-	1446	101	1547	266	1813
1985	39	-	.	197	1122	-	1358	83	1441	310	1751
1986	26	-	.	276	1389	- [1]	1691	119	1810	351	2161
1987	68	-	.	435	1419	-	1922	36	1958	430	2388
1988	90	-	.	584	1654	-	2328	130	2458	536	2994
1989	89	-	.	448 [1]	1712	-	2250	108	2358	450	2808
1990	82	2	.	N/A [2]	1891	2	1979	614	2593	465	3058
1991	57	-	.	251 [1]	1326	-	1635	213	1848	402	2250
1992	25	-	.	419	1110	14	1568	56	1624	326	1950
1993	56	-	.	284	1080	24	1444	-27	1417	274	1691
1994	10	-	.	277	998	-	1285	-129	1156	315	1471
1995	13	-	.	288	857	-	1158	-127	1031	264	1295
1996	4	-	.	279	855	-	1138	-94	1044	277	1321
1997	6	-	.	329	1038	1	1374	-51	1323	331	1654
1998	22	-	.	327	892	1	1242	-111	1131	299	1430
1999	12	-	.	194 [1]	947	-	1154	117	1271	345	1616
2000	4	-	.	360	926	+	1290	-9	1281	397	1678
2001	12	-	.	303	797	-	1112	-6	1106	273	1379
2002	27	-	.	242	978	+	1247	10	1257	351	1608
2003	39	-	.	216	985	-	1240	-22	1218	260	1478
2004	46	-	.	184	912	-	1142	12	1154	248	1402
2005	48	-	.	198	887	-	1133	66	1199	171	1370
2006	52	-	.	223	966	-	1241	72	1313	153	1466
2007	84	-	.	202	679	-	965	38	1003	181	1184
2008	66	-	.	148	677	-	891	83	974	170	1144
2009	53	-	2	193	724	5	978	-55	923	142	1065
2010	51	-	2	220	838	2	1113	-21	1092	149	1241
2011	140	-	3	264	930	-	1337	-5	1332	173	1505

[1] Estimated by the Working Group.

[2]Divisions VIId,e = 4,739 t.

[3]Included in Division VIId

[4]Migration correction (15% of VIId 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	0.5210
1981	3634	3278	1746	0.4669
1982	7806	3463	1938	0.5683
1983	6933	3656	1754	0.5738
1984	8500	3477	1813	0.5519
1985	8784	3553	1751	0.5117
1986	17866	3740	2161	0.5063
1987	14311	3610	2388	0.6087
1988	10427	5145	2994	0.4821
1989	4449	5470	2808	0.6120
1990	4801	5279	3058	0.6268
1991	5432	4293	2250	0.6212
1992	6266	3579	1950	0.6560
1993	2873	3050	1691	0.6084
1994	3033	2706	1471	0.6285
1995	8017	2407	1295	0.6279
1996	7137	2364	1321	0.6197
1997	10970	2498	1654	0.6804
1998	5302	2662	1430	0.5782
1999	3470	2955	1616	0.5897
2000	4552	3286	1678	0.5779
2001	5230	2717	1379	0.5259
2002	6307	2506	1608	0.6731
2003	3837	2502	1478	0.6015
2004	4912	2271	1402	0.6457
2005	4487	2252	1370	0.6523
2006	2767	2056	1466	0.6540
2007	5812	1711	1184	0.7788
2008	5192	1612	1144	0.7349
2009	8148	1720	1065	0.4655
2010	20328	2271	1241	0.5471
2011	5988*	3271	1505	0.4314
2012	5988*	5070		
Average	7030	3116	1713	0.5915

*Geometric mean (1980–2009).

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

Advice for 2013 and 2014

Based on the ICES approach for data limited stocks, ICES advises that catches should be no more than 100 tonnes, and by-catch and discards should be reduced.

This is the first year that ICES is providing quantitative advice for data limited stocks (see Quality considerations).

Stock status

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

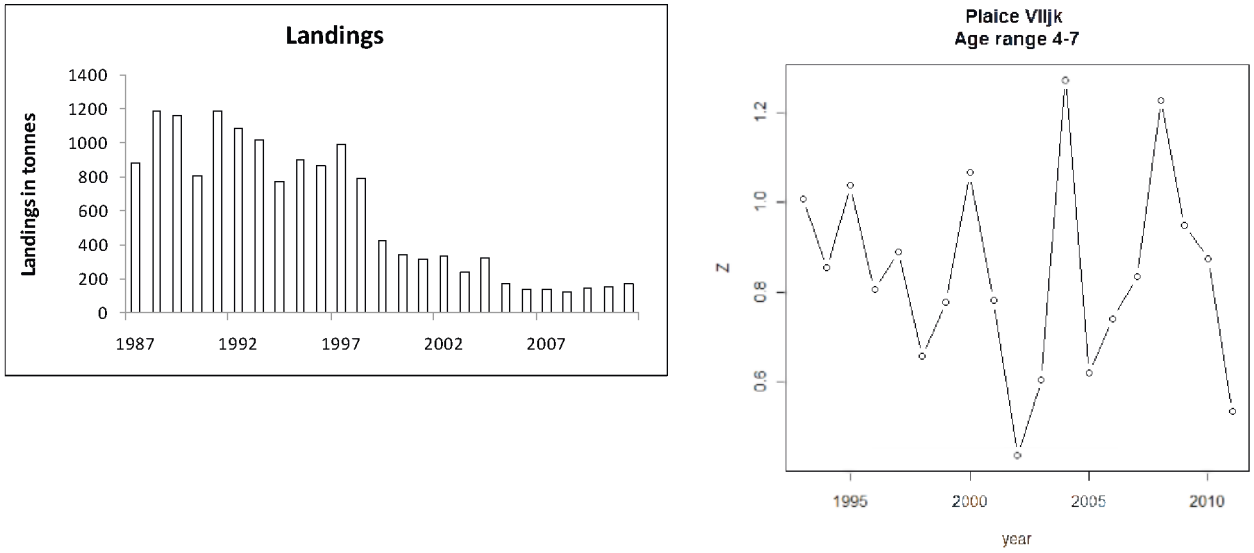


Figure 5.4.10.1 Plaice in Divisions VIIh–k. official landings (left plot). Catch curves analysis (right plot).

The state of the stock is unknown; however, exploratory estimates show that fishing mortality has decreased since 2008, but it remains above potential F_{MSY} proxies. Recent values of Z ranged from 0.55 to 1.2, with M=0.12 this would result in an F of between 0.43 and 1.08.

Management plans

No specific management objectives are known to ICES.

The fisheries

Plaice in Division VIIh–k are mainly taken as by-catch in mixed inshore fisheries in Division VIIj. Discard rates are very high >60% by weight.

Catch distribution	Total landings (2011) 180 t, Discards ~ 200 t.

Quality Considerations

There is no accepted analytical assessment for this stock.

Catch numbers at age are only available for Irish landings. Total mortality (Z) estimates are extremely volatile from one year to another, but always above any MSY proxy. ICES considered that the average fishing mortality estimates over the last 3 years derived from catch curves analysis were reliable enough and could be used as a basis for advice.

The advice is based on a catch curve analysis used as an indicator of fishing mortality. The uncertainty associated with the estimates is not quantified.

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

Scientific basis

Assessment type	Catch curves analysis.
Input data	Official landings at age 1993-2011 for Divisions VIIjk only.
Discards and bycatch	Not included in the assessment.
Indicators	None.
Other information	Yield per recruit analysis.
Working group report	WGCSE

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

Reference points

	Type	*Value*	*Technical basis*
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 2013 and 2014

No reliable assessment can be presented for this stock.

ICES approach to data limited stocks

For data limited stocks for which fishing mortality is available and estimated above F_{MSY}, ICES advice is based on a reduction of the catches equal to the reduction from current F to F_{MSY}.

For this stock, the ratio of F_{MSY} to current F (2009-2011 average) is 0.4. However, as a 20% uncertainty cap is applied, this results in a decrease of 20% with respect to the last three years landings average, corresponding to catches of no more than 128 t. Additionally, considering that the stock is estimated to be overexploited and that the SSB level is unknown, ICES advises that catches should decrease by a further 20% as a precautionary buffer. This results in catches of no more than 100 t.

Additional considerations

Management considerations

The assessment area covers the area VIIjk and the management area covers VIIh-k.

Plaice are caught as a by-catch in mixed demersal trawl fisheries mainly in coastal areas of VIIj. Discards rates are high >50% (Anon., 2011) and are bound to increase if TAC is becoming more restrictive. ICES therefore advise that bycatch and discards should be reduced.

For Division VIIh there is only landings data available. It is likely that Plaice in VIIh are more connected with plaice in VIIefg than VIIj. Landings in VIIh have fluctuated around 50% of the total landings in VIIh-k since 1993.

Data and methods

Inputs to the Yield per recruit analysis include selectivity parameters derived from the catch at age. The natural mortality is approximated from the values of plaice VIIfg. The Fmax derived from this method (Figure 5.4.10.3) is poorly defined and could not be used as a proxy for F_{MSY}; therefore, the F_{MSY} proxy used in 2010 and 2011 was used for this year's advice.

Comparison with previous assessment and catch options

As for last year, this assessment was based on a pseudo-cohort catch curve analysis.

The advice last year was based on precautionary considerations. The basis for this year's advice is the ICES data limited approach.

Sources

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

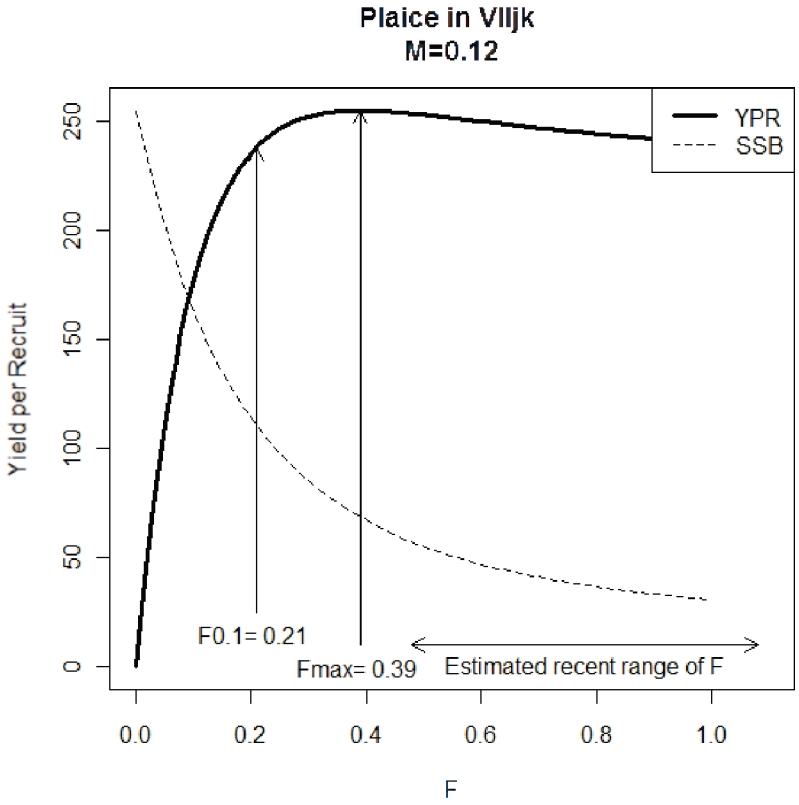


Figure 5.4.10.31 Plaice in Divisions VIIh–k. Yield per recruit plot and the range of recent fishing mortality estimates based on catch curves.

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	160
2011	See scenarios	-	185	180
2012	Reduce catches		176	
2013	Decrease catches by 36% (20% decrease, followed by 20% PA reduction)	<100		
2014	Same catch advice as 2013	<100		

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 - Eng+Wales+N	.	.	73	88	287	264	218	258	282
UK - England & Wa	246	433	.	.	.	.	.	.	.
UK - Scotland	-	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 - Eng+Wales+N	154	138	106	82	75	73	59	56	36
UK - England & Wa	.	.	.	.	.	.	.	.	.
UK - Scotland	1	1	1	1	1	-	-	-	-
Total	864	994	790	428	341	313	330	241	232

Country	2005	2006	2007	2008	2009	2010	2011
Belgium	32	22	7	25	1		4
Denmark							
France	20	37	30	12	44	55	57
Ireland	90	65	72	72	71	66	71
Netherlands	.						
Spain	.	1	13	1			
UK - Eng+Wales+N	28	18	20	12	32	35	44
UK - England & Wa	.						
UK - Scotland	.						
Total	170	143	142	122	148	156	176

* Belgium landings 1987-1998 may not be representative of landings taken in VIIh.

Table 5.4.10.3 Plaice in Divisions VIIh-k. Total mortality Z estimated over pseudo-cohorts as the slope of the log catch numbers.

Year	Z
1993	1.009
1994	0.854
1995	1.038
1996	0.806
1997	0.890
1998	0.655
1999	0.778
2000	1.067
2001	0.781
2002	0.434
2003	0.604
2004	1.274
2005	0.620
2006	0.740
2007	0.833
2008	1.227
2009	0.948
2010	0.873
2011	0.533

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

Advice for 2013 and 2014

Based on the ICES approach for data limited stocks, ICES advises that catches should be no more than 30 tonnes.

This is the first year that ICES is providing quantitative advice for data limited stocks (see Quality considerations).

Stock status

F (Fishing Mortality)	
	2009-2011
Qualitative evaluation	? Insufficient information

SSB (Spawning Stock Biomass)	
	2009-2011
Qualitative evaluation	? Insufficient information

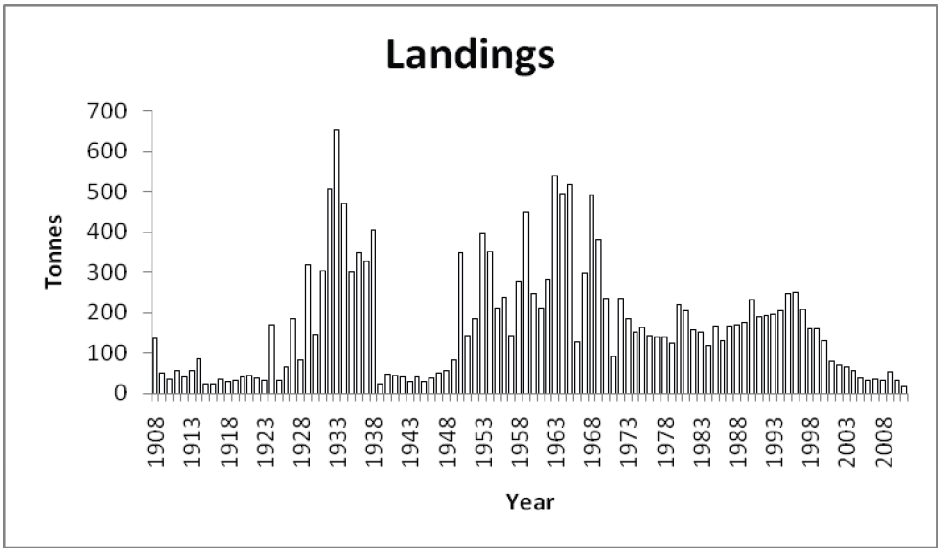


Figure 5.4.11.1 Plaice in Divisions VIIb,c (West of Ireland). Official landings (in tonnes).

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.

Quality considerations

The advice is based on a precautionary reduction of catches because of missing or non representative data. The methods applied to derive quantitative advice for data limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	No assessment.
Input data	Landings 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 2013 and 2014

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

ICES approach to data limited stocks

For data limited stocks without information on abundance or exploitation ICES considers that a precautionary reduction of catches should be implemented, unless there is ancillary information clearly indicating that the current level of exploitation is appropriate for the stock.

For this stock, ICES advises that catches should decrease by 20% in relation to the last three years average landings, corresponding to catches of no more than 30 t.

Additional considerations

Plaice are caught as a minor bycatch species in mixed demersal trawl fisheries in Division VIIb. In the mid to late 1990s most of the Irish landings were made in Donegal Bay. It is likely that there is significant mixing with plaice in Division VIa which is not currently assessed by ICES.

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

Comparison with previous advice

The advice last year was based on precautionary considerations. This year the advice is based on the ICES approach to data limited stocks.

Sources

ICES. 2012. Report of the Working Group on Celtic Seas Ecosystems, 9–18 May 2012, Copenhagen, Denmark ICES CM 2012/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	18
2012	No increase in catch	-	78	
2013	20% reduction in catches (last 3 years average)	<30		
2014	Same catch advice as for 2013	<30		

Weights in tonnes.

Table 5.4.11.2 Plaice in Divisions VIIb,c. Nominal landings (t) by country as officially reported to ICES and ICES estimates since 1996.

Year	FRA	UK	IRL	OTH	TOT
1908	0	0	135	0	135
1909	0	0	49	0	49
1910	0	0	36	0	36
1911	0	2	54	0	56
1912	0	1	40	0	41
1913	0	0	54	0	54
1914	0	0	85	0	85
1915	0	1	23	0	24
1916	0	0	22	0	22
1917	0	0	36	0	36
1918	0	0	29	0	29
1919	0	1	32	0	33
1920	0	25	15	0	40
1921	0	9	34	0	43
1922	0	1	37	0	38
1923	0	1	30	0	31
1924	0	4	166	0	170
1925	0	5	28	0	33
1926	13	10	42	0	65
1927	126	14	45	0	185
1928	40	7	35	0	82
1929	262	25	31	0	318
1930	96	6	44	0	146
1931	238	8	58	0	304
1932	411	19	76	0	506
1933	595	29	29	0	653
1934	406	31	33	0	470
1935	249	18	33	0	300
1936	265	47	37	0	349
1937	242	59	25	0	326
1938	359	25	20	0	404
1939	0	0	24	0	24
1940	0	0	47	0	47
1941	0	0	43	0	43
1942	0	0	41	0	41
1943	0	0	29	0	29
1944	0	0	42	0	42
1945	0	0	30	0	30
1946	0	5	32	0	37
1947	0	9	36	5	50
1948	0	8	47	0	55
1949	0	20	63	0	83
1950	289	16	42	0	347
1951	100	12	31	0	143
1952	120	18	46	0	184
1953	340	8	48	0	396
1954	273	5	72	0	350
1955	111	3	96	0	210
1956	174	1	64	0	239
1957	80	1	60	0	141
1958	204	0	71	0	275
1959	392	5	54	0	451
1960	197	3	46	0	246

Year	FRA	UK	IRL	OTH	TOT	Unalloc	ICES est
1961	182	0	30	0	212		
1962	239	0	42	0	281		
1963	471	2	67	0	540		
1964	427	2	66	0	495		
1965	417	2	99	0	518		
1966	0	1	127	0	128		
1967	182	2	112	0	296		
1968	403	0	89	0	492		
1969	281	2	99	0	382		
1970	124	0	110	0	234		
1971	0	1	89	0	90		
1972	110	0	124	0	234		
1973	60	1	124	0	185		
1974	45	1	106	0	152		
1975	10	0	153	0	163		
1976	9	0	133	0	142		
1977	4	0	135	0	139		
1978	16	0	122	0	138		
1979	6	0	117	2	125		
1980	12	0	142	65	219		
1981	9	4	135	58	206		
1982	8	4	122	22	156		
1983	37	0	108	7	152		
1984	2	6	110	0	118		
1985	10	7	150	0	167		
1986	11	5	114	0	130		
1987	13	1	153	0	167		
1988	9	2	157	0	168		
1989	1	14	159	0	174		
1990	11	92	130	0	233		
1991	9	3	179	0	191		
1992	3	9	180	0	192		
1993	2	3	191	0	196		
1994	1	5	200	0	206		
1995	5	2	239	0	246		
1996	1	2	248	0	251	-11	240
1997	3	0	206	0	209	4	213
1998	0	1	160	0	161	22	183
1999	0	2	157	0	159	13	172
2000	31	0	99	0	130	-22	108
2001	8	0	70	0	78	9	87
2002	17	2	51	0	70	1	71
2003	7	0	56	2	65	7	72
2004	14	0	39	1	54	1	55
2005	12	0	25	0	37	1	38
2006	11	0	20	1	32	-2	30
2007	12	0	23	0	35	-1	34
2008	9	0	21	1	31	4	35
2009	7	0	45	0	52	1	53
2010	6	0	27	0	33	0	33
2011	2	0	16	0	18	-2	16

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

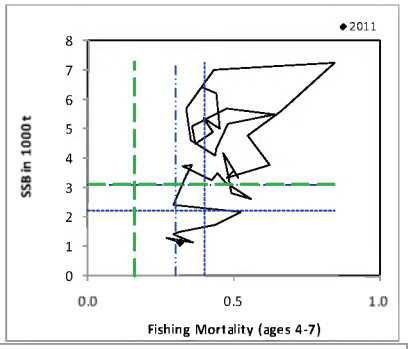
Advice for 2013 and 2014

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

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✗	✗	✗	Above target
Precautionary approach (F_{pa},F_{lim})	o	✓	o	Increased risk

SSB (Spawning Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	✗	✗	✗	Below trigger
Precautionary approach (B_{pa},B_{lim})	✗	✗	✗	Reduced reproductive capacity



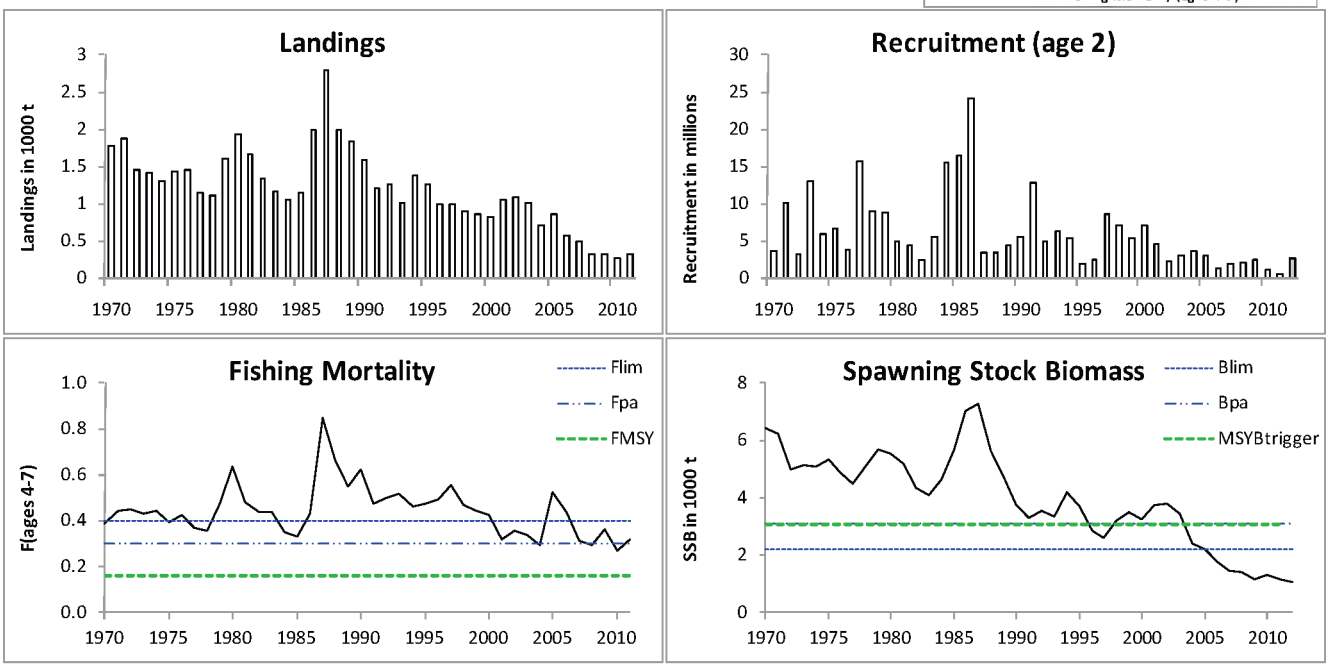


Figure 5.4.12.1 Sole in Division VIIa. Summary of stock assessment (weights in '000 t). Predicted recruitment value is shaded. Top right: SSB/F for the time series used in the assessment

SSB has continuously declined since 2001 and is below B_{lim} since 2006. In 2012 SSB reached the lowest level. The fishing mortality shows a declining trend since the mid 1980s to a stable level in recent years, well above F_{MSY}. Recent recruitment levels have been lower than earlier in the time-series, with the 2011 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 distribution	Landings (2011) = 330 t (89% beam trawlers, 11% 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. 36% of the predicted landings in 2013 and 50% of the predicted SSB in 2014 are based on the assumed geometric mean recruitment.

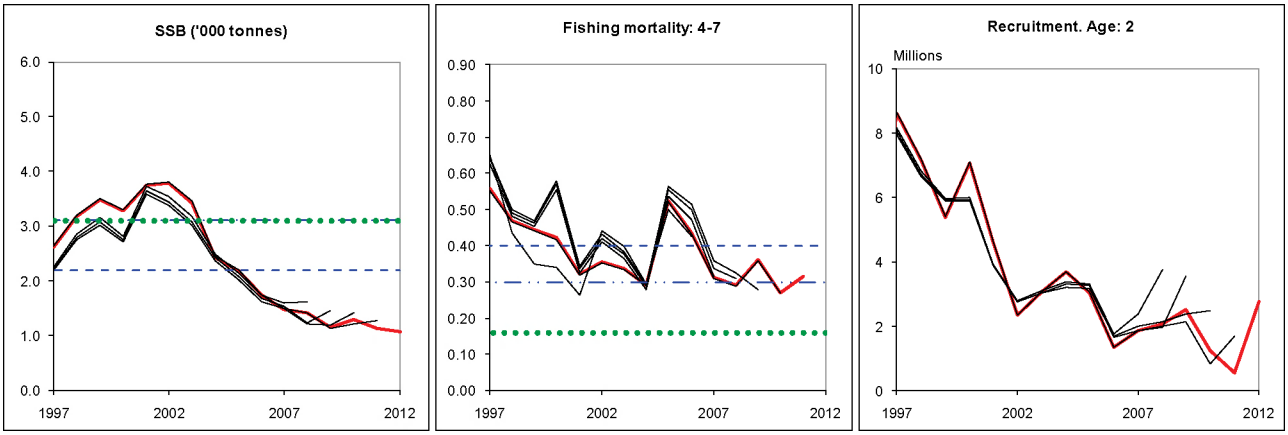


Figure 5.4.12.2 Sole in Division VIIa (Irish Sea). Historical assessment results (final year recruitment estimates included).

Scientific basis

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

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

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	3100 t	Default to value of B_{pa}
	F_{MSY}	0.16	Provisional proxy based on stochastic simulations assuming a Ricker S/R relationship (range 0.1–0.25)
Precautionary Approach	B_{lim}	2200 t	$B_{lim} = B_{loss}$. The lowest observed spawning stock, followed by an increase in SSB.
	B_{pa}	3100 t	$B_{pa} \sim B_{lim} * 1.4$. 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	$F_{lim} = F_{loss.}$ Although poorly defined, there is evidence that fishing mortality in excess of 0.4 has led to a general stock decline and is only sustainable during periods of above-average recruitment.
	F_{pa}	0.30	This F is considered to have a high probability of avoiding F_{lim}.

(unchanged since: 2010)

Outlook for 2013 and 2014

Basis: F(2012) = F_{sq} = mean(F2009–2011) = 0.32; R(2012) = RCT3 = 2750 thousands; R(2013)=GM 2002–2010=2200 thousands; landings(2012) = 280 t; SSB(2013) =1100 t.

Rationale	Landings (2013)	Basis	F(2013)	SSB(2014)	%SSB change [1)]	%TAC Change [2)]
MSY framework	60	$F_{HCR-MSY} = F_{MSY} * SSB_{(2013)} / MSY\ B_{trigger}$	0.06	1500	+30%	-80%
MSY transition	140	$0.4 * F_{(2010)} + 0.6 * F_{HCR-MSY}$	0.14	1400	+23%	-52%
Precautionary approach	0	$SSB_{2014} > B_{pa}$	0	1500	+35 %	
Zero catch	0	F=0	0	1500	+35%	-100%
Other options	230	TAC – 25% (F_{2012} *0.73)	0.23	1300	+16%	-25%
	255	TAC – 15% (F_{2012} *0.84)	0.26	1300	+14%	-15%
	300	Stable TAC (F_{2012})	0.32	1200	+10%	0%
	345	TAC + 15% (F_{2012} *1.18)	0.37	1200	+6%	+15%

Weights in tonnes.
[1)] SSB 2014 relative to SSB 2013.
[2)] Landings 2013 relative to TAC 2012.

MSY approach

Following the ICES MSY framework implies fishing mortality to be reduced to 0.06 (63% lower than F_{MSY} because SSB is 64% below MSY $B_{trigger}$), resulting in landings of less than 60 t in 2013. This is expected to lead to a SSB of 1500 t in 2014.

Following the transition scheme towards the ICES MSY framework implies fishing mortality of 0.14 for 2012. This results in landings of 140 t in 2013. This is expected to lead to an SSB of 1400 in 2014.

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

Additional considerations

Regulations and their effects

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

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 about 75% between 2003 and 2011. Fishing mortality has reduced over the same period, but to a lesser extent.

Comparison with previous assessment and advice

The addition of the 2011 data did not affect the consistency of the trends in SSB and fishing mortality. F values for 2010 have been revised by 0%, and SSB in 2011 has been revised downwards by 11%.

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

Sources

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

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

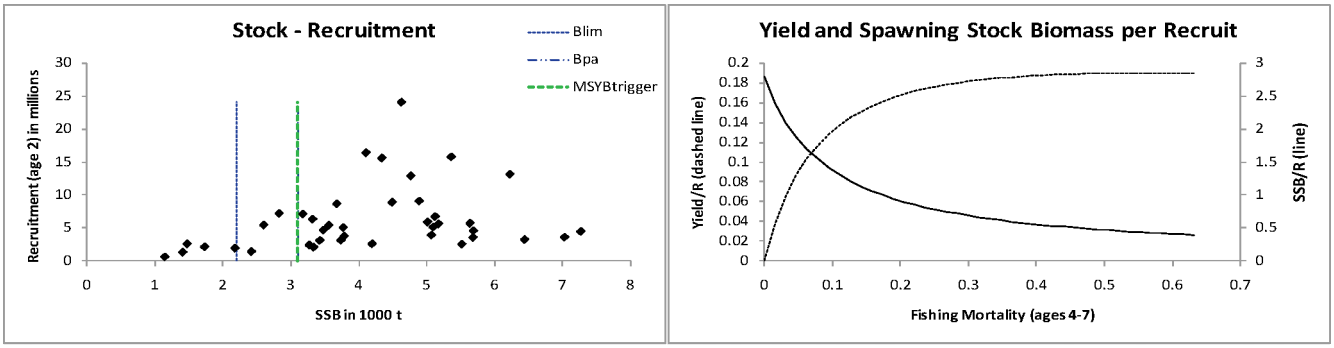


Figure 5.4.12.3 Sole in Division VIIa (Irish Sea). Stock-recruitment plot (left panel) and yield per recruit analysis (right panel).

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	0.33	0.33
2012	MSY transition	<0.20	0.3		
2013	No directed fisheries, bycatch and discards should be minimised	0			
2014	Same advice as for 2013	0			

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	<1	120	46	165	1	.	8	810	53	863	900
2000	493	3	135	60	133	1	.	8	833	-15	818	1080
2001	674	4	135	-	195	+	.	4	1012	41	1053	1100
2002	817	4	96	-	165	+	.	3	1085	5	1090	1100
2003	687	4	103	-	217	+	.	3	1014	0	1014	1010
2004	527	1	77	-	106	+	.	1	712	-3	709	800
2005	662	3	85	-	103	+	.	1	854	1	855	960
2006	419	1	85	-	69	+	.	2	576	-7	569	960
2007	305	1	115	-	66	<1	.	4	491	1	492	820
2008	216	1	66	-	37	n/a	.	n/a	320	12	332	669
2009	257	n/a	47	-	19	1	.	1	325	0	325	502
2010	217	<1	47	-	12	<1	.	n/a	277	0	277	402
2011	250	<1	48	-	31	<1	.	n/a	330	0	330	390

[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	6681	5360	1441	0.3953
1976	3857	4890	1463	0.4271
1977	15776	4491	1147	0.3696
1978	9044	5093	1106	0.3575
1979	8858	5686	1614	0.4747
1980	5076	5516	1941	0.6365
1981	4509	5172	1667	0.4806
1982	2474	4339	1338	0.4400
1983	5579	4109	1169	0.4349
1984	15603	4628	1058	0.3503
1985	16411	5681	1146	0.3343
1986	24106	7025	1995	0.4332
1987	3495	7263	2808	0.8452
1988	3540	5635	1999	0.6610
1989	4419	4767	1833	0.5480
1990	5665	3771	1583	0.6210
1991	12872	3323	1212	0.4752
1992	5020	3561	1259	0.5004
1993	6282	3339	1023	0.5159
1994	5345	4197	1374	0.4615
1995	2017	3677	1266	0.4767
1996	2525	2830	1002	0.4915
1997	8628	2605	1003	0.5569
1998	7160	3178	911	0.4698
1999	5388	3483	863	0.4444
2000	7081	3274	818	0.4219
2001	4637	3740	1053	0.3222
2002	2343	3785	1090	0.3564
2003	3073	3429	1014	0.3374
2004	3697	2424	709	0.2913
2005	3053	2183	855	0.5238
2006	1345	1736	569	0.4363
2007	1868	1480	492	0.3113
2008	2084	1416	332	0.2919
2009	2515	1152	325	0.3611
2010	1246	1290	277	0.2693
2011	541	1137	330	0.3164
2012	2748*	1063		
Average	6108	3944	1213	0.4428

* RCT3 estimate

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

Advice for 2013

ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 1100 t.

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✓	✓	✓	Appropriate
Precautionary approach (F_{pa},F_{lim})	✓	✓	✓	Harvested sustainably

SSB (Spawning Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	✓	✓	✓	Full reproductive capacity

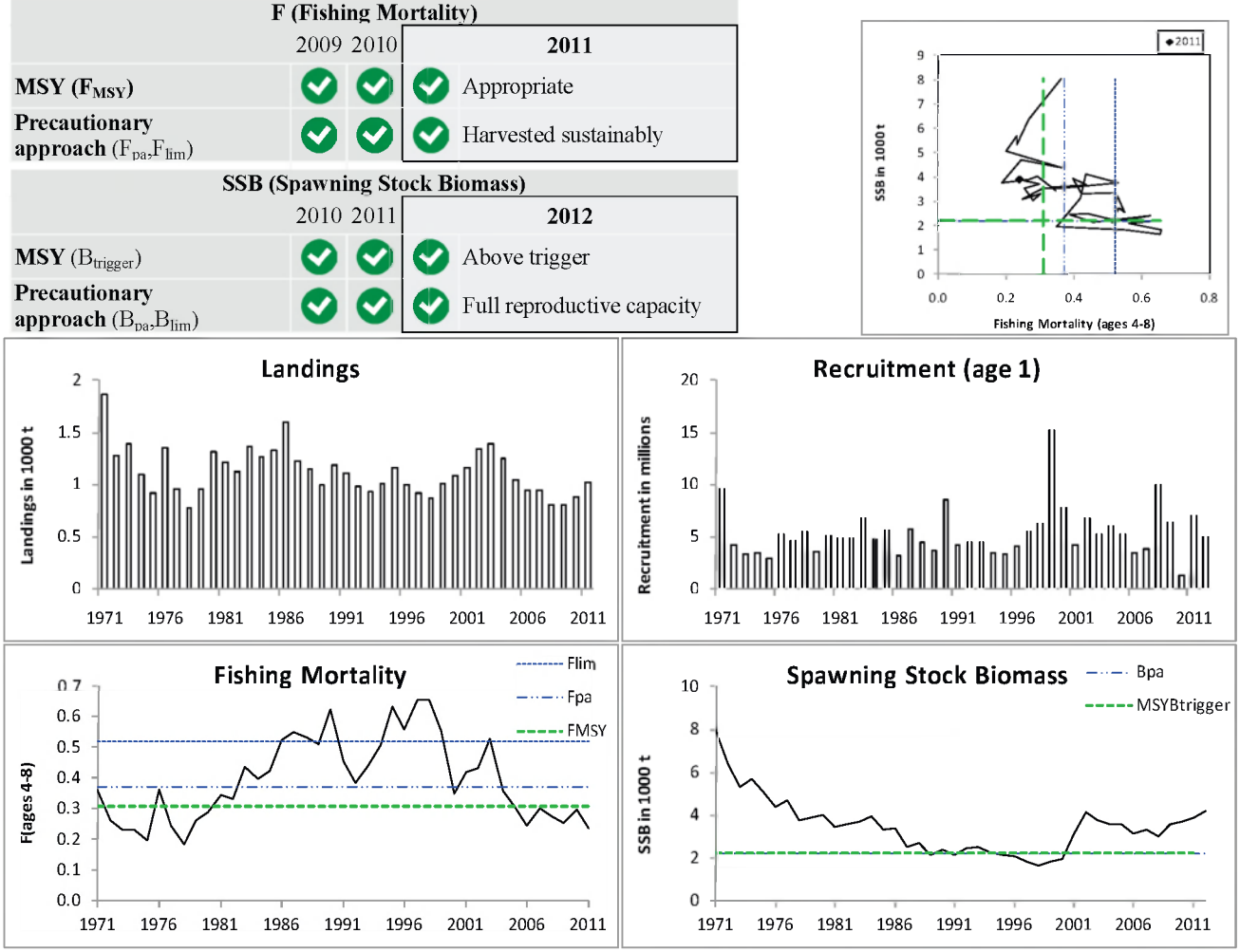


Figure 5.4.13.1 Sole in Divisions VIIf,g. Summary of stock assessment. Predicted recruitment value are shaded. Top right: SSB/F for the time series used in the assessment

The spawning stock biomass has been above MSY $B_{trigger}$ since 2001. Fishing mortality has decreased from F_{lim} in 2003 to the lowest levels 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 VIIf) and adjacent areas (Division VIIg).

The fisheries

Sole are taken mainly in a beam trawl fishery that started in the early 1960s and, to a lesser extent, in the longer established otter trawl fisheries. In the 1970s, the fishery was mainly carried out by Belgian beam trawlers and Belgian and UK otter trawlers. The use of beam trawls increased during the mid-1970s, and the Belgian otter trawlers have now been almost entirely replaced by beam trawlers. In the Celtic Sea, the beam and otter trawl fleets also take other demersal species such as plaice, cod, rays, brill, turbot, and anglerfish.

Catch distribution	Total landings (2011) were 1029 t - (of which 83% beam trawlers – 16% otter trawlers – 1% Other gear). Beam trawl discards 2–5 % in weight.

Effects of the fisheries on the ecosystem

Although discard rates of sole are low in beam trawl fisheries (about 2–5% in weight), discard rates of other (commercial and non-commercial) species can be considerable. Beam trawling, especially 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. This year the incoming recruitment is above average. 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.

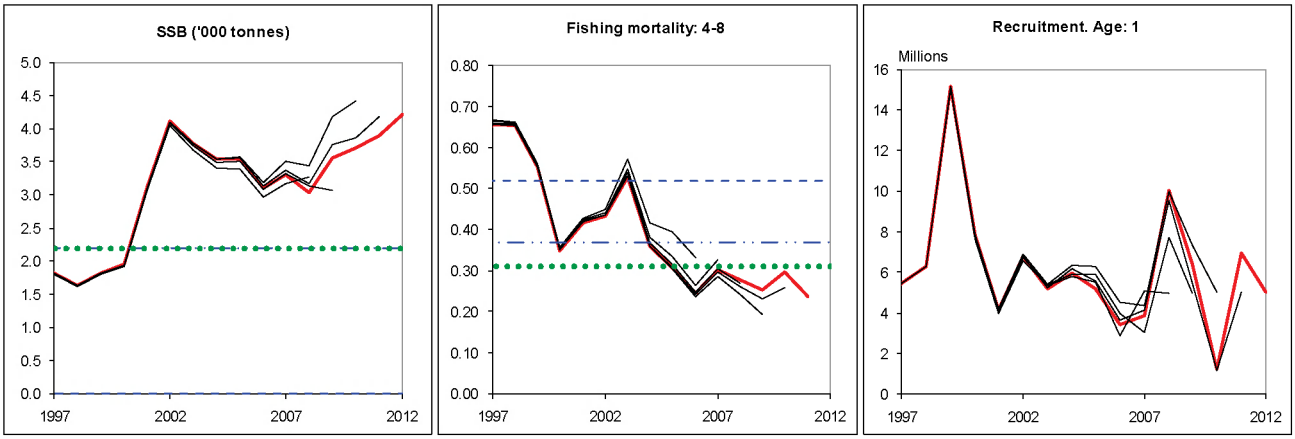


Figure 5.4.13.2 Sole in Divisions VIIf,g (Celtic Sea). Historical assessment results (final year recruitment estimates included).

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
STOCK Sole in Divisions VIIf,g (Celtic Sea)

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	2200 t	Bpa
	F_{MSY}	0.31	Provisional proxy based on stochastic simulations
Precautionary Approach	B_{lim}	Not defined	
	B_{pa}	2200 t	There is no evidence of reduced recruitment at the lowest biomass observed and B_{pa} can therefore be set equal to the lowest observed SSB.
	F_{lim}	0.52	F_{lim}: F_{loss}.
	F_{pa}	0.37	This F is considered to have a high probability of avoiding F_{lim} and maintaining SSB above B_{pa} in 10 years, taking into account the uncertainty of assessments. F_{pa}: $F_{lim} \times 0.72$ implies a less than 5% probability that ($SSB_{MT} < B_{pa}$).

(unchanged since: 2010)

Outlook for 2013

Basis: F(2012) = F_{sq} = mean(F2009–2011) = 0.26; SSB(2013) = 4100 t; R (2012) = GM (1972–2009) = 5000 (thousands); Landings (2012) = 1000 t.

Rationale	**Landings (2013)**	**Basis**	**F (2013)**	**SSB (2014)**	**%SSB change [1)]**	**% TAC change [2)]**
MSY framework	1.1	F_{MSY}	0.31	4.0	-1%	+6%
Precautionary Approach	1.3	F_{pa}	0.37	3.8	-5%	+24%
Zero catch	0	F=0	0	5.1	+27%	-100%
Other options	0.9	TAC – 15% (F_{2012} * 0.92)	0.24	4.2	+5%	-15%
	1.0	F_{2012}	0.26	4.2	+3%	-8%
	1.1	Stable TAC (F_{2012} * 1.10)	0.29	4.1	+1%	0%
	1.2	TAC + 15% (F_{2012} * 1.29)	0.34	3.9	-3%	+15%

Weights in '000 tonnes.
[1)] SSB 2014 relative to SSB 2013.
[2)] Landings 2013 relative to TAC 2012.

MSY approach

Following the ICES MSY framework implies fishing mortality to be 0.31, resulting in landings of 1100 t in 2013. This is expected to lead to an SSB of 4000 t in 2014.

Precautionary approach

The fishing mortality in 2013 should be no more than F_{pa} corresponding to landings of less than 1300 t in 2013. This is expected to keep SSB above B_{pa} in 2014.

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. Plaice requires 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 VIId). The removal of the restrictive days-at-sea EU regulation in Division VIId prior to 2006 resulted an area shift of the Belgian beam trawl fleet back to Division VIId and a strong decrease in effort deployment in the Celtic Sea by that fleet.

Ecosystem considerations

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 Trevose Head and around Lands End.

Regulations and their effects

Since 2005, ICES rectangles 30E4, 31E4, and 32E3 have been closed during the first quarter (in EU Council Regulations for TACs) with the intention of reducing the fishing mortality of cod. The effects of the closure on sole are not known although there have been spatial and temporal changes in the distribution of effort.

Changes in fishing technology and fishing patterns

Beam trawlers account for the majority of the vessels targeting sole. High fuel costs may have contributed to a reduction in effort in Divisions VIIf,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 2010 have been revised upwards by 14%, and SSB in 2011 has been revised downwards by 7%.

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

Sources

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

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.

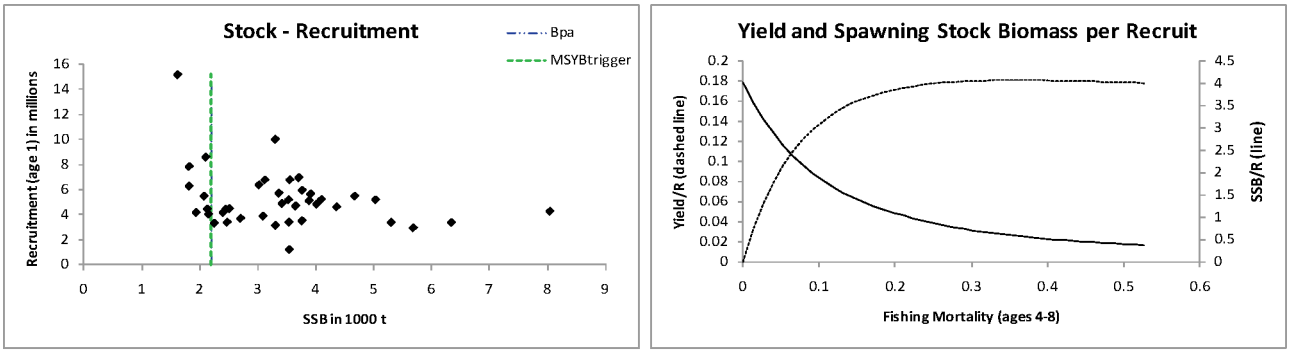


Figure 5.4.13.3 Sole in Divisions VIIf,g (Celtic Sea). Stock-recruitment (left panel) and yield per recruit analysis (right panel) plots.

Table 5.4.13.1 Sole in Divisions VIIf,g (Celtic Sea). Advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES Landings
1987	*Status quo* F; TAC	1.6	1.6	1.23	1.22
1988	F = F(pre-86); TAC	0.9	1.1	1.2	1.15
1989	F at F(81–85); TAC	1.0	1.0	0.99	0.99
1990	No increase in F	1.2	1.2	1.24	1.19
1991	No increase in F	1.1	1.2	1.50	1.11
1992	No long-term gains in increasing F	1.1	1.2	1.06	0.98
1993	No long-term gains in increasing F	-	1.1	1.03	0.93
1994	No long-term gains in increasing F	-	1.1	1.02	1.01
1995	No increase in F	1.0	1.1	1.17	1.16
1996	20% reduction in F	0.8	1.0	1.08	1.00
1997	20% reduction in F	0.8	0.9	1.04	0.93
1998	20% reduction in F	0.7	0.85	1.01	0.88
1999	Reduce F below F_{pa}	0.81	0.96	0.95	1.01
2000	Reduce F below F_{pa}	<1.16	1.16	1.04	1.09
2001	Reduce F below F_{pa}	< 0.81	1.02	1.12	1.17
2002	Reduce F below F_{pa}	< 1.00	1.07	1.12	1.35
2003	Reduce F below F_{pa}	< 1.24	1.24	1.21	1.39
2004	Reduce F below F_{pa}	< 1.00	1.05	1.13	1.25
2005	Reduce F below F_{pa}	< 0.84	1.00	1.00	1.04
2006	Reduce F below F_{pa}	< 0.88	0.95	0.89	0.95
2007	Reduce F below F_{pa}	< 0.84	0.89	0.94	0.95
2008	Keep F below F_{pa}	< 1.00	0.964	0.75	0.80
2009	No long-term gain in increasing F	< 0.94	0.993	0.73	0.79
2010	No long-term gain in increasing F	< 0.92	0.993	0.87	0.86
2011	See scenarios	-	1.241	1.01	1.03
2012	MSY approach	<1.06	1.060		
2013	MSY approach	<1.10			

Weights in '000 t.

Table 5.4.13.2 Sole in Divisions VIIf,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 ICES	TAC
1986	1039 *	2	146	188	611	-	3	1989	-389	1600	
1987	701 *	-	117	9	437	-	-	1264	-42	1222	1600
1988	705 *	-	110	72	317	-	-	1204	-58	1146	1100
1989	684 *	-	87	18	203	-	-	992	0	992	1000
1990	716 *	-	130	40	353	0	-	1239	-50	1189	1200
1991	982 *	-	80	32	402	0	-	1496	-389	1107	1200
1992	543 *	-	141	45	325	6	-	1060	-79	981	1200
1993	575 *	-	108	51	285	11	-	1030	-102	928	1100
1994	619 *	-	90	37	264	8	-	1018	-9	1009	1100
1995	763 *	-	88	20	294	-	-	1165	-8	1157	1100
1996	695 *	-	102	19	265	0	-	1081	-86	995	1000
1997	660 *	-	99	28	251	0	-	1038	-111	927	900
1998	675 *	-	98	42	198	-	-	1013	-138	875	850
1999	604	-	61	51	231	0	-	947	65	1012	960
2000	694	-	74	29	243	-	-	1040	51	1091	1160
2001	720	-	77	35	288	-	-	1120	48	1168	1020
2002	703	-	65	32	318	+	-	1118	227	1345	1070
2003	715	-	124	26	342	+	-	1207	185	1392	1240
2004	735	-	79	33	283	-	-	1130	119	1249	1050
2005	645	-	101	34	217	-	-	997	47	1044	1000
2006	576	-	75	38	232	-	-	921	25	946	950
2007	582	-	85	32	244	-	-	943	2	945	890
2008	466	-	68	28	218	-	-	780	20	800	964
2009	513	-	74	26	194	-	-	807	-2	805	993
2010	620	-	45	27	179	-	-	871	5	876	993
2011 [1]	766	-	50	30	168	-	-	1013	16	1029	1241

[1] Preliminary
* including VIIg–k

Table 5.4.13.3 Sole in Divisions VIIf,g (Celtic Sea). Summary of stock assessment.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4–8
1971	9614	8049	1861	0.3609
1972	4277	6347	1278	0.2646
1973	3389	5312	1391	0.2303
1974	3405	5692	1105	0.2321
1975	2974	5041	919	0.1978
1976	5194	4370	1350	0.3613
1977	4637	4686	961	0.2441
1978	5494	3771	780	0.1849
1979	3535	3893	954	0.2642
1980	5132	4028	1314	0.2909
1981	4859	3428	1212	0.3442
1982	4890	3563	1128	0.3314
1983	6794	3663	1373	0.4368
1984	4708	3923	1266	0.3958
1985	5660	3313	1328	0.4218
1986	3159	3373	1600	0.5236
1987	5742	2522	1222	0.5499
1988	4491	2714	1146	0.5341
1989	3720	2115	992	0.5092
1990	8610	2411	1189	0.6257
1991	4200	2139	1107	0.4559
1992	4457	2456	981	0.3863
1993	4429	2482	928	0.4367
1994	3412	2261	1009	0.5056
1995	3320	2160	1157	0.6318
1996	4055	2085	995	0.5606
1997	5480	1825	927	0.6558
1998	6294	1630	875	0.6533
1999	15180	1825	1012	0.5524
2000	7857	1947	1091	0.3496
2001	4170	3130	1168	0.4180
2002	6783	4107	1345	0.4338
2003	5216	3779	1392	0.5290
2004	5961	3541	1249	0.3588
2005	5202	3548	1044	0.3069
2006	3422	3102	946	0.2449
2007	3889	3312	945	0.3011
2008	10033	3032	800	0.2774
2009	6384	3554	805	0.2541
2010	1239	3717	876	0.2971
2011	6973	3898	1029	0.2380
2012	5031*	4212		
Average	5316	3475	1123	0.3939

* Geometric Mean (71–09)

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

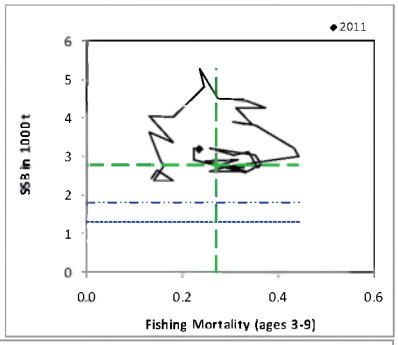
Advice for 2013

ICES advises on the basis of the MSY framework that landings in 2013 should be less than 960 tonnes.

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✓	✓	✓	Appropriate
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	✓	✓	✓	Full reproductive capacity



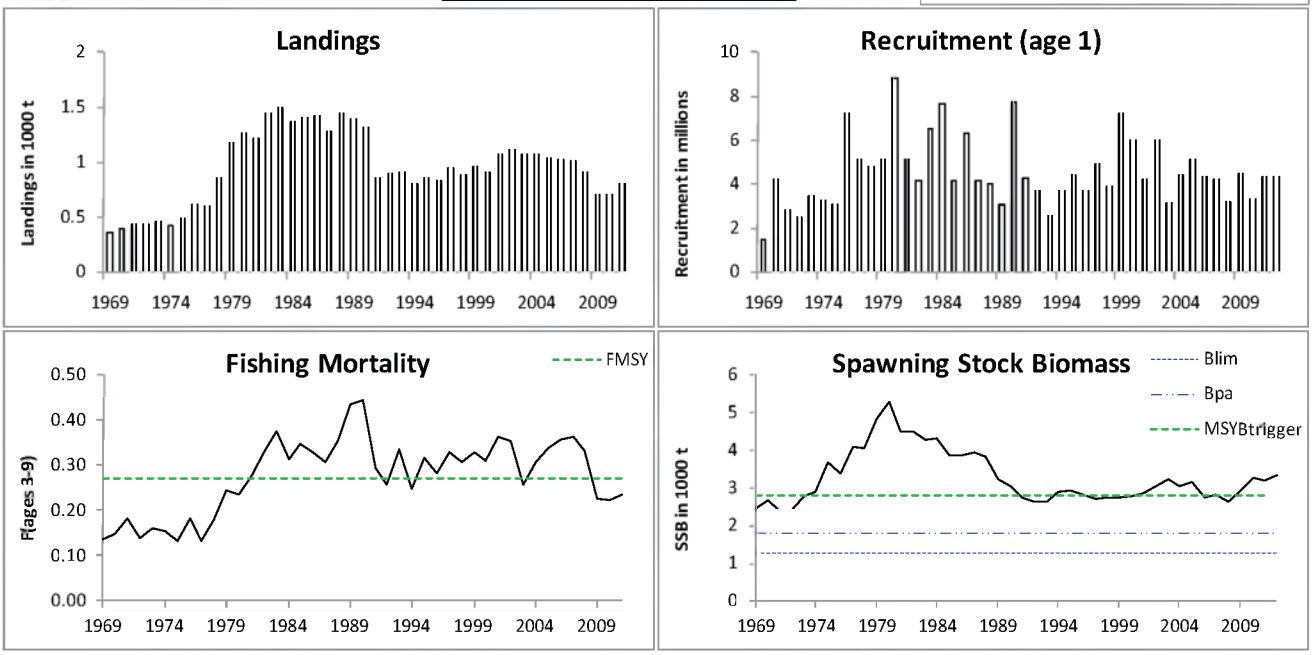


Figure 5.4.14.1 Sole in Division VIIe (Western Channel). Summary of stock assessment. Predicted recruitment values are shaded. Top right: SSB and F for the time-series from the assessment.

The significant reduction of F in 2009 reflects the reduction in fishing effort. SSB has been around MSY $B_{trigger}$ for about two decades, with an increase since 2009. 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 896 t in 2013. 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 southern Cornish and Devon coasts. This fishery also takes substantial catches of plaice, anglerfish, lemon sole, and cuttlefish. Otter trawlers and gillnetters take sole mainly as a bycatch fishery, and a targeted fishery at spawning time. Discarding of sole is considered small.

Catch distribution	Landings in 2011 were 801 t (52% beam, 16% otter, 8% gillnets, 3% dredge, and 21% other gear (mostly caught by the above gears, but not available separately by all countries) Total catch (2011) was 810 kt, where 99% were landings, 1% discards, and no industrial bycatch or unaccounted removals.

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

The new assessment methodology has produced a significantly improved assessment with respect to the biases experienced previously, and with little loss in precision. The balance of the various information sources as characterized by the assessment weights indicate a more robust approach. Some differences in the trends from different information sources do indicate the potential for some retrospective bias returning to the assessment in the future. However, management in the form of the current management plan is stable and apparently robust to the remaining uncertainties in the assessment.

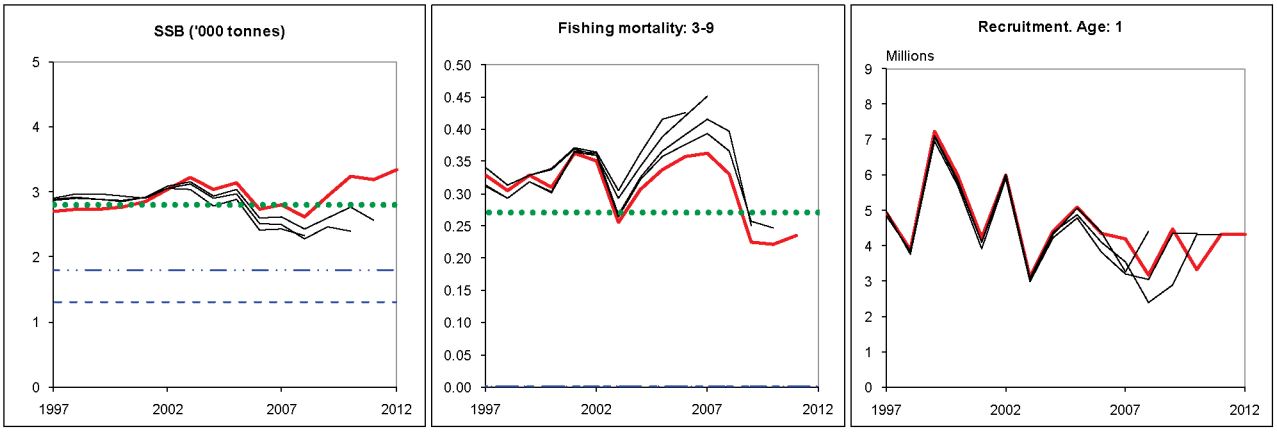


Figure 5.4.14.2 Sole in Division VIIe (Western Channel). Historical assessment results (final-year recruitment estimate included). Note that the age range for F changed from 3–7 to 3–9 in 2009.

Scientific basis

Assessment type	Age-based analytical assessment (XSA).
Input data	Commercial catch-at-age data, three survey indices (UK-WEC-BTS, UK-FSP, Q1SWBeam), and three commercial tuning fleets (UK-CBTearly, UK-CBTlate, and UK-COT).
Discards and bycatch	Not relevant (low discards) to the assessment.
Indicators	Western Channel sole and plaice FSP survey.
Other information	Stock benchmarked in 2012 (WKFLAT).
Working group report	WGCSE

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

Reference points

	Type	*Value*	*Technical basis*
MSY	MSY $B_{trigger}$	2800 t	Based on the lower 95% confidence limits with exploitation at F=0.27 from LT simulations.
Approach	F_{MSY}	0.27	Based on stochastic LT simulations.
Precautionary approach	B_{lim}	1300 t	WKFRAME 2 meta-analysis (ICES, 2011).
	B_{pa}	1800 t	WKFRAME 2 meta-analysis (ICES, 2011).
	F_{lim}	Not defined.	
	F_{pa}	Not defined.	

(changed in WKFLAT 2012)

Yield and spawning biomass per Recruit F-reference points (2012):

	Fish Mort Ages 3–9	Yield/R	SSB/R
Average last 3 years	0.23	0.23	0.97
F_{max}	0.31	0.23	0.73
$F_{0.1}$	0.12	0.20	1.64
F_{med}	0.31	0.23	0.71

Outlook for 2013

Basis: F (2012) = F_{sq} = $F_{09\text{-}11}$ = 0.23; SSB (2013) = 3500; R (2012) = $GM_{69\text{-}09}$ = 4300 thousand; landings (2012) = 790.

Rationale	**Landings (2013)**	**Basis**	**F (2013)**	**SSB (2014)**	**%SSB change [1)]**	**% TAC change [2)]**
MSY framework	960	F_{MSY} (= F_{2012}*1.19)	0.27	3500	0	+23
Management plan	894	F_{MP} (= F_{MSY}*0.93) TAC constraint	0.25	3530	+2	+15
Zero catch	0	0	0	4400	+28	−100
Other options	430	F_{2012} * 0.5	0.11	4000	+15	−44
	510	F_{2012} * 0.6	0.14	3900	+13	−34
	590	F_{2012} * 0.7	0.16	3800	+11	−24
	670	F_{2012} * 0.8	0.18	3800	+9	−14
	663	–15% TAC (F_{2012} * 0.83)	0.18	3760	+9	−15
	750	F_{2012} * 0.9	0.20	3700	+6	−4
	777	0%TAC (F_{2012} * 0.94)	0.21	3650	+6	0
	820	F_{2012}	0.23	3600	+4	+6
	894	+15% TAC (F_{2012} * 1.1)	0.25	3530	+2	+15

Weights in tonnes.
[1)] SSB 2014 relative to SSB 2013.
[2)] Landings 2013 relative to TAC 2012.

MSY approach

Following the ICES MSY framework implies fishing mortality to be at 0.27. This implies landings of less than 960 t in 2012.

Management plan

Council Regulation (EC) No. 509/2007 establishes a multi-annual plan for the sustainable exploitation of sole in Division VIIe. The years 2007–2009 were deemed a recovery plan, with subsequent years being deemed a management plan.

Following the agreed management plan implies an F for 2013 of 0.27 (F_{MP}, the management plan long-term target), suggesting a TAC of 958 t in 2013 which is greater than the 15% TAC increase cap in the plan. Consequently the

management plan implies a TAC for 2013 of 894 t (F = 0.25). Fishing at this level is expected to lead to an SSB increase of 2% in 2014. ICES has not evaluated this management plan.

Additional considerations

Data and methods

The benchmark in 2012 agreed on a new analytical assessment for this stock, based on two commercial tuning fleets, the UK-EW-BTS survey, and two new spatially more extensive surveys. The objective of reducing the retrospective trends was met and the new assessment methodology, together with more realistic reference points, promises more appropriate advice in the near future. In the longer term the hope is to move to a more fisheries-independent approach in assessing the stock.

Sampling levels by fleet are sufficient to provide high precision in the assessment, though some improvement in the age sampling in France would be desirable. Discarding in the fishery, though minor, where present is sporadic and most frequently a result of the minimum landing size**.** A more detailed examination of the discard practices in the French fleet may improve our understanding of the frequencies of and the portion of the stock affected by such stochastic events.

Uncertainty in data and assessment

The precision of the assessment is sufficiently high to detect relatively small changes in the major stock dynamics. Some minor dynamics, such as partial intra-mixing of the stock and changes in fleet distribution, are not captured by the model, and potentially lead to qualitatively undesirable effects such as retrospective patterns, but these small effects are only apparent because of the overall high precision of the assessment. Assessment and management are currently sufficiently robust to deal with these effects so that the sensitivity on these comparatively minor issues does not compromise the high quality of the information on which the assessment is based. In addition, there is considerable uncertainty in the source of recruitment to the fished stock. It is known that some recruitment to the population occurs from outside the management area, the scale of which is unknown (ICES, 2012a). However, once recruited the population appears to be suitably 'closed' for assessment purposes. A better understanding of the recruitment dynamics may lead to a better estimation of MSY reference points for this stock.

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 been largely eliminated in recent years.

Regulations and their effects

In addition to the days-at-sea regulations a recent UK decommissioning scheme 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 to enforce the TAC and improve data quality. These restrictions have not been limiting this fishery despite the 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.

A catch quota scheme implemented for beam trawlers in the UK in 2010 and 2011 is based on discard rates of 30% by weight, which is in excess of the estimates of discarding in the fishery. In 2012 5–6 UK beam trawlers have joined this scheme which may potentially increase F slightly above the level assumed in the interim year in this assessment, though it is likely to remain below F_{MSY}.

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

Discarding in the towed gears using 80 mm mesh sizes, which are responsible for the large majority of the landings, is very small (<5% by number) and small (5–10%) for the much smaller gillnet fishery. Other spatially or temporally restricted métiers that show higher values of discarding (10–40% averaged over years) have very limited effort and hence contribute only a 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 highgrading (included in the numbers above) have been observed.

Information from the fishing industry

The fisheries–science partnership, conducted cooperatively between CEFAS and the UK industry has provided evidence for the wide dispersal and broad age distribution for this stock.

Comparison with previous assessment and advice

The F in 2010 is revised down by 16% and SSB_{2010} is revised up by 25% compared to last year's assessment, mainly as a consequence of the new assessment methodology.

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

Sources

ICES. 2011. Report of the Workshop on Implementing the ICES F_{MSY} Framework (WKFRAME-2), 10–14 January 2011, ICES, Denmark. ICES CM 2011/ACOM:33. 110 pp.

ICES. 2012a. Report of the Benchmark and Data Compilation Workshop for Flatfish (WKFLAT2012), 1–8 March 2012, Bilbao, Spain. ICES CM 2012/ACOM:46.

ICES. 2012b. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

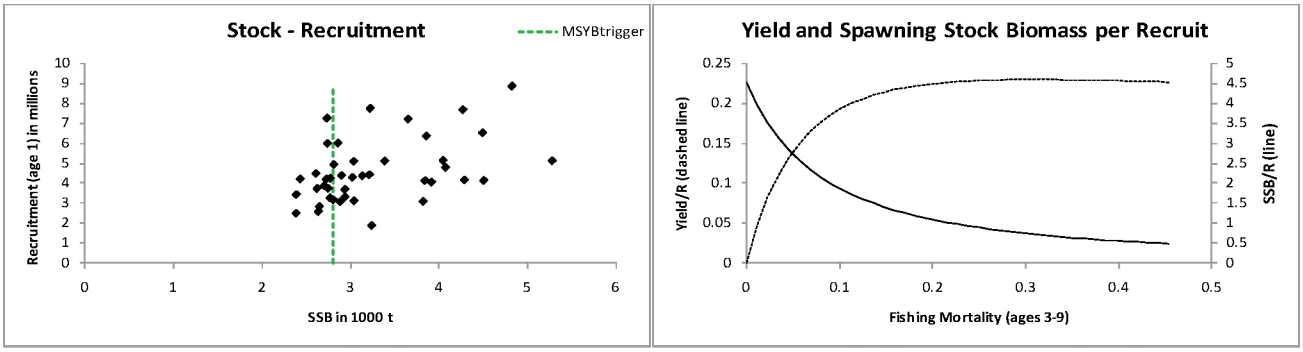


Figure 5.4.14.3 Sole in Division VIIe (Western Channel). Stock–recruitment (left panel) and yield-per-recruit analysis (right panel) plots.

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 F_{pa}	0.67	0.7	0.66	0.96
2000	Reduce F below F_{pa}	< 0.64	0.64	0.66	0.92[1]
2001	Reduce F below F_{pa}	<0.58	0.6	0.65	1.07
2002	Reduce F below F_{pa}	<0.45	0.53	0.54	1.11
2003	Rebuilding plan or F=0	-	0.39	0.62	1.08
2004	F=0 or recovery plan 1	0	0.3	0.49	1.08
2005	80% reduction in F or recovery plan	<0.23	0.865	0.96	1.04
2006	80% reduction in F or recovery plan	<0.24	0.94	0.97	1.02
2007	68% reduction in F or recovery plan	<0.35	0.9	0.82	1.02
2008	75% reduction in F	<0.26	0.765	0.67	0.91
2009	70% reduction in F	<0.32	0.65	0.64	0.70
2010	Reduce fishing effort and catches	-	0.62	0.76[1]	0.70[1]
2011	MSY framework	<0.66	0.71	0.74[2]	0.80[2]
2012	MSY framework	<0.74	0.78		
2013	MSY framework	<0.96			

Weights in thousand tonnes.
[1)] Revisions by WGCSE 2012.
[2)] Preliminary.

Table 5.4.14.2 Sole in Division VIIe (Western Channel). Landings (in tonnes) as used by ICES. Landings in 2011 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			491
1976	4		352				1	239			616
1977	3		331					272			606
1978	4		384					453		20	861
1979	1		515				2	663			1181
1980	45		447		13		1	763			1269
1981	16		415	1			4	784		-5	1215
1982	98		321				15	1013		-1	1446
1983	47		405	3		2	16	1025			1498
1984	48		421			9	14	878			1370
1985	58		130			9	8	894		310	1409
1986	62		467			3	6	831		50	1419
1987	48		432			1	5	626		168	1280
1988	67		98			0	4	780		495	1444
1989	69		112	6			3	610		590	1390
1990	41	0	81			1	3	632		556	1315
1991	35		325					477		15	852
1992	41		267				2	457	9	119	895
1993	59		236			1		479	18	111	904
1994	33		257					546		-38	800
1995	21		294			1	2	562		-24	856
1996	8		297					428		91	833
1997	13		348		1	13	13	470		91	949
1998	40		343			17	3	369		108	880
1999	13					18	3	375		548	957
2000	4		241			22	5	386		256	914
2001	19		224			20	5	382		419	1069
2002	33		198			15	5	289		566	1106
2003	1		363		1	15	5	235		458	1078
2004	7		302			7	6	172		581	1075
2005	26		406			17	5	505		80	1039
2006	32		357			4	4	568	0	56	1022
2007	34		384		2	2		525	4	64	1015
2008	28		312		0	2	6	464		96	908
2009	17		386			1	3	374	3	-82	701
2010	17		375			2	3	361	2	-62	698
2011	22		290			2	4	422		62	801

Table 5.4.14.3 Sole in Division VIIe (Western Channel). Assessment summary.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3–9
1969	1481	2432	353	0.134
1970	4212	2647	391	0.146
1971	2829	2383	432	0.181
1972	2493	2388	437	0.139
1973	3425	2767	459	0.160
1974	3267	2884	427	0.153
1975	3068	3652	491	0.131
1976	7196	3386	616	0.181
1977	5106	4074	606	0.131
1978	4778	4047	861	0.179
1979	5131	4825	1181	0.244
1980	8842	5282	1269	0.235
1981	5113	4507	1215	0.274
1982	4131	4492	1446	0.328
1983	6513	4270	1498	0.374
1984	7674	4287	1370	0.312
1985	4160	3857	1409	0.345
1986	6357	3843	1419	0.328
1987	4125	3918	1280	0.305
1988	4045	3821	1444	0.352
1989	3085	3223	1390	0.434
1990	7733	3021	1315	0.442
1991	4287	2749	852	0.293
1992	3738	2636	895	0.257
1993	2583	2622	904	0.333
1994	3731	2897	800	0.248
1995	4385	2935	856	0.316
1996	3689	2813	833	0.280
1997	4925	2703	949	0.329
1998	3870	2734	880	0.305
1999	7241	2738	957	0.328
2000	5981	2771	914	0.310
2001	4234	2857	1069	0.362
2002	5998	3039	1106	0.351
2003	3116	3213	1078	0.256
2004	4414	3038	1075	0.306
2005	5087	3135	1039	0.337
2006	4360	2727	1023	0.357
2007	4198	2806	1015	0.363
2008	3168	2607	908	0.330
2009	4480	2936	701	0.224
2010	3310	3240	698	0.222
2011	4332[a)]	3190	801	0.235
2012	4332[b)]	3339		
Average	4495	3267	946	0.276

[a)] 2011 recruitment value from the XSA replaced by the Geometric Mean$_{(69\text{-}09)}$.
[b)] Geometric Mean $_{(69\text{–}09)}$.

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

Advice for 2013

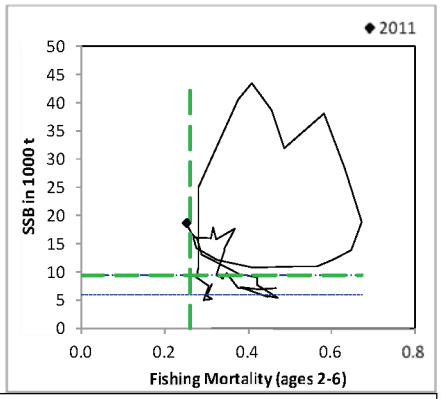
ICES advises on the basis of MSY approach that landings in 2013 should be no more than 5100 t.

ICES advises that activities that impact on the seabed should not take place in spawning grounds unless they can be shown not to have a negative impact on spawning, larval production or stock dynamics.

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✗	✓	✓	Appropriate
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	✓	✓	✓	Full reproductive capacity



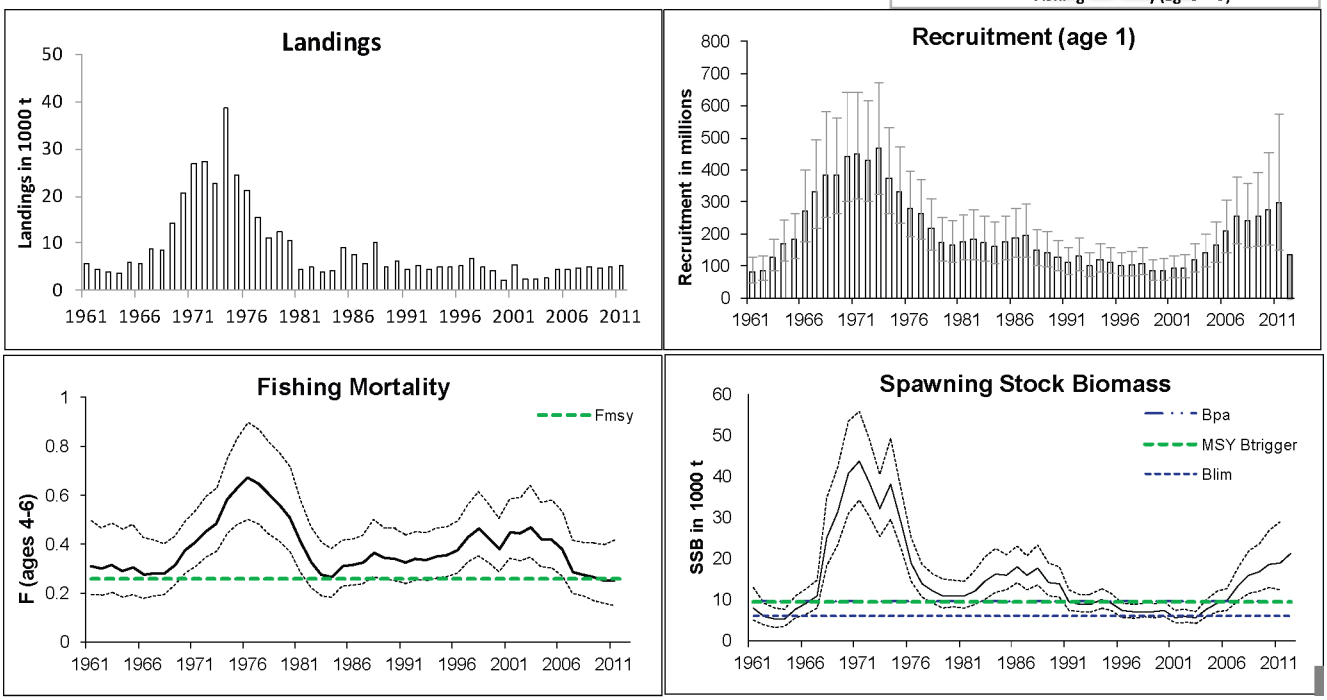


Figure 5.4.15.1 Herring in Division VIIa North of 52° 30'N (Irish Sea). Summary of stock assessment with observed landings. Estimates are shaded. Top right: F and SSB over the time series used in the assessment.

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

Management plans

No specific management objectives are known to ICES. ICES recommends that a management plan for Division VIIa (North) should be developed.

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. Spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Gravel extraction or disturbance in the close vicinity of any herring spawning will disturb that spawning activity and will reduce the available area for successful spawning.

Environmental influence on the stock

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

The fisheries

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

Catch distribution	Total catch (2011) 5.2 kt where 100 % landings (97% from pelagic trawlers and 3% gillnet)

Effects of the fisheries on the ecosystem

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

Quality considerations

The inter-annual variation in herring migration patterns affect the selectivity of both the fishery and acoustic survey. The assessment is done on a mixed stock (juveniles from the Celtic Sea), affecting the estimates of the younger ages. The acoustic survey are uncertain and the 2011 acoustic survey is considered an underestimate of abundance at older ages, having a mismatch with the migration pattern of the spawning stock biomass and affected by adverse weather conditions. Input data quality and sampling coverage is good for this stock.

Scientific basis

Assessment type	Analytical assessment (FLSAM)
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	Benchmarked in 2012 (WKPELA).
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 $B_{trigger}$	9500 t	Provisional based on B_{pa}
Approach	F_{MSY}	0.26	Based on stochastic simulations (ICES, 2012a)
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 2012

Outlook for 2013

Basis: F(2012) = TAC constraint = 0.21; SSB (2013) = 22; R (2012) = 133 mln; Landings (2012) = 5.2.

Rationale	Landings (2013)	Basis	F (2013)	SSB (2014)	%SSB change [1)]	%TAC change [2)]
MSY	5.1	F_{MSY}	0.26	18	-15%	8%
Zero catch	0	F = 0	0	23	2%	-100%
Other options	4.039	TAC-15% (F_{2012}*0.96)	0.20	17	-11%	-15%
	4.752	Stable TAC (F_{2012}*1.15)	0.24	16	-14%	0%
	5.465	TAC+15% (F_{2012}*1.34)	0.28	15	-16%	+ 15%

Weights in thousand tonnes.
[1)] SSB 2014 relative to SSB 2013.
[2)] Human Consumption landings 2013 relative to TAC 2012.

MSY approach

Following the ICES MSY framework implies fishing mortality at F_{MSY} = 0.26, resulting in landings of less than 5100 t in 2013. This is expected to lead to an SSB of 18 000 t in 2014.

Precautionary approach

The SSB is well above B_{pa} and F_{pa} is undefined but current F is just below F_{MSY}. ICES does not advise to use B_{pa} as a target in 2013.

Additional considerations

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

The acoustic survey estimates since 2007 suggest that SSB is at highest abundance within the 18 year time-series. The 2011 survey series was severly effected by adverse weather conditions and mismatched with the timing of the spawning stock biomass migration. Evidence from the commercial fishery and preliminary results from successive surveys indicate high abundance and catch rates on the main spawning grounds post survey. The 2011 survey is considered to be an underestimate of abundance of older ages (3+). 1-ringer+ biomass also remains high. Estimates from an enhanced acoustic survey series since 2007 indicate and confirm the significant increase in 1+ herring biomass. The acoustic survey provides estimates of numbers-at-age, however the 1 to 3-ringers in the area are a mixture of at least two adjacent stocks, (Celtic Sea and Division VIIa(N)). Splitting the current acoustic spawning stock biomass estimates according to season of origin, does not change the perception of a significant increase in Irish Sea "autumn" spawning biomass.

Actions which perturb or pollute herring spawning beds or increase turbidity after spawning are likely to have a negative effect on recruitment. Such activities include aggregate extraction, dumping of dredge spoil and the placement of certain structures on or over the seabed. Placement of structures on or over the seabed in spawning grounds should only be permitted if it can be shown that they do not disturb individual spawning beds or negatively impact spawning, larval production or stock dynamics.

Uncertainties in the assessment

The final assessment model is dominated by information from the catch, with the survey information having less influence on the model fit. The assessment model describes the data reasonably well and there is very little retrospective pattern in the assessment. The 2011 survey data are considered not to reflect the spawning stock biomass and age structure, which results in an underestimate of SSB and an overestimate of F in the model. The largest occurrence of mixed fish from different spawning season origins is in the age 1 data (recruitment age in the assessment). The assessment model does not appear to estimate recruitment well and should be considered as a smoothed estimate.

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

Last year the assessment was based on trends only. This year an analytical assessment and short term forecast are presented for this stock. The advice for 2012 is based on MSY approach (F_{MSY}).

Sources

ICES. 2012a. Report of the Benchmark Workshop on Pelagic Stocks (WKPELA 2012), 13–17 February 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:47.

ICES. 2012b. Report of the Herring Assessment Working Group for the Area South of 62°N, 13–22 March 2012. ICES CM 2012/ACOM:06.

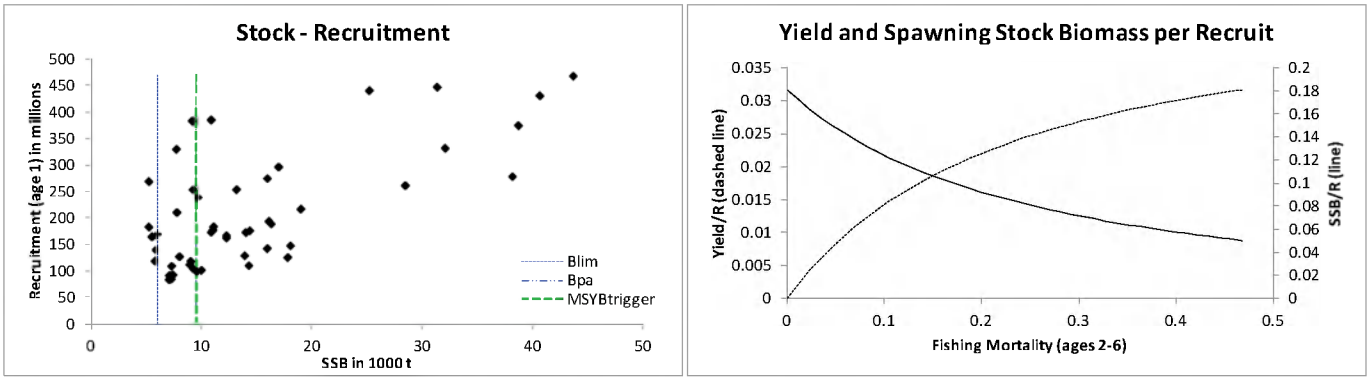


Figure 5.4.15.2 Herring in Division VIIa North of 52° 30'N (Irish Sea). Stock recruitment and yield per recruit analysis.

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	*Status quo* 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	*Status quo* F= 0.26	5.1	6.9	5.5
2002	Average catch of 1996–2000	4.8	4.8	2.4
2003	2002 TAC	4.8	4.8	2.4
2004	Advice 2003 catch	4.8	4.8	2.5
2005	*Status quo* TAC	4.8	4.8	4.4
2006	*Status quo* TAC	4.8	4.8	4.4
2007	*Status quo* TAC	4.8	4.8	4.6
2008	*Recent catches*	4.4	4.8	4.9
2009	*Same advice as last year*	4.4	4.8	4.6
2010	Recent TAC	4.8	4.8	4.9
2011	No increase in catch	< 4.8	5.2	5.2
2012	No increase in catch	-	4.752	
2013	MSY approach	< 5.1		

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.

Country	Ireland	UK	Unallocated	Total
1987	1 200	3 290	1 333	5 823
1988	2 579	7 593	-	10 172
1989	1 430	3 532	-	4 962
1990	1 699	4 613	-	6 312
1991	80	4 318	-	4 398
1992	406	4 864	-	5 270
1993	0	4 408	-	4 408
1994	0	4 828	-	4 828
1995	0	5 076	-	5 076
1996	100	5 180	22	5 302
1997	0	6 651	-	6 651
1998	0	4 905	-	4 905
1999	0	4 127	-	4 127
2000	0	2 002	-	2 002
2001	862	4 599	-	5 461
2002	286	2 107		2 393
2003	0	2 399	-	2 399
2004	749	1 782	-	2 531
2005	1 153	3 234	-	4 387
2006	581	3821	-	4 402
2007	0	4 629		4 629
2008	0	4895		4895
2009	0	4594		4594
2010	0	4894	-	4894
2011	0	5202		5202

Table 5.4.15.3 Herring in Division VIIa North of 52° 30'N (Irish Sea). Summary of the assessment. Low = lower limit and High = higher limit of 95% confidence interval. Landings are estimated by the assessment and differ from the observed catch statistics.

Year	Recruits Age 0 (Thousands) Mean	Recruits Low	Recruits High	Total biomass (tonnes) Mean	Total biomass Low	Total biomass High	Spawing biomass (tonnes) Mean	Spawing biomass Low	Spawing biomass High	Landings (tonnes)	Yield / SSB (ratio)	Mean F ages 4-6 Mean	Mean F Low	Mean F High
1961	81389	50886	130178	26108	19830	34374	7959	4925	12861	5413	0.680	0.312	0.195	0.499
1962	85734	55728	131896	19904	15187	26087	5947	3831	9231	3951	0.664	0.300	0.193	0.467
1963	127772	88451	184572	21091	16347	27212	5195	3371	8007	3612	0.695	0.314	0.203	0.485
1964	169566	116506	246792	26849	20649	34912	5191	3504	7688	4141	0.798	0.292	0.186	0.460
1965	183689	126708	266295	31320	24399	40203	7684	5471	10792	5512	0.717	0.307	0.196	0.479
1966	269682	180247	403494	47005	35529	62187	9102	6525	12695	5839	0.642	0.275	0.178	0.425
1967	330380	220003	496134	64731	48711	86020	10840	7947	14786	8230	0.759	0.280	0.189	0.415
1968	383847	253214	581874	81471	61391	108119	25160	18183	34813	10137	0.403	0.280	0.196	0.401
1969	385771	264128	563436	93433	73306	119087	31320	23265	42162	14561	0.465	0.317	0.232	0.434
1970	441088	302939	642237	119491	94962	150357	40619	30867	53453	18807	0.463	0.375	0.282	0.498
1971	447754	311436	643740	127516	102761	158235	43652	34160	55780	22948	0.526	0.407	0.310	0.535
1972	431490	302302	615887	107045	87618	130778	38677	30310	49354	22561	0.583	0.455	0.348	0.594
1973	468364	324439	676134	102334	83561	125325	32048	25345	40525	22880	0.714	0.486	0.375	0.631
1974	375120	263831	533352	101316	82599	124275	38139	29521	49273	29057	0.762	0.582	0.447	0.757
1975	332369	234042	472004	79063	64949	96244	28424	22225	36353	23249	0.818	0.633	0.481	0.832
1976	278730	195164	398079	64731	52829	79316	18964	14349	25064	19376	1.022	0.672	0.502	0.899
1977	261974	184516	371947	53263	43332	65470	13984	10490	18643	14988	1.072	0.647	0.481	0.870
1978	217728	152681	310487	47193	38110	58441	12221	9168	16290	12642	1.034	0.602	0.444	0.817
1979	173338	119058	252366	42277	33802	52878	10998	8053	15020	11945	1.086	0.564	0.410	0.776
1980	166875	115505	241091	35102	28117	43821	11052	8237	14830	8749	0.792	0.510	0.366	0.712
1981	178082	121392	261246	32306	25141	41513	10849	8083	14561	5508	0.508	0.412	0.290	0.585
1982	184425	123080	276345	36425	27570	48123	12221	8797	16978	5097	0.417	0.326	0.225	0.473
1983	174033	116606	259743	40579	30517	53958	14347	10121	20338	4922	0.343	0.275	0.187	0.407
1984	162918	111075	238958	43827	33871	56709	16256	11771	22449	5324	0.327	0.267	0.186	0.384
1985	176663	120720	258531	46864	37272	58924	16054	12351	20866	6507	0.405	0.310	0.229	0.419
1986	189662	128291	280391	45844	36782	57139	18028	14105	23042	6990	0.388	0.315	0.234	0.424
1987	194464	128044	295337	40579	32249	51060	15919	12259	20673	6220	0.391	0.323	0.239	0.437
1988	148301	101345	217013	42362	33909	52922	17767	13538	23317	7111	0.400	0.367	0.270	0.499
1989	143200	97796	209684	38330	30437	48270	14254	10791	18828	5676	0.398	0.344	0.252	0.468
1990	126374	87046	183471	36571	29366	45543	13887	10647	18112	5784	0.416	0.343	0.252	0.466
1991	110747	76065	161241	30364	24603	37473	9525	7308	12416	4874	0.512	0.324	0.239	0.438
1992	129573	88829	189006	25413	20657	31262	8986	7121	11339	4163	0.463	0.340	0.255	0.454
1993	99907	69257	144123	28912	23577	35453	8904	7001	11323	4717	0.530	0.335	0.251	0.448
1994	119134	83137	170716	26134	21433	31867	9938	7876	12539	4433	0.446	0.348	0.261	0.465
1995	113210	79931	160344	25413	20844	30982	9203	7282	11631	4807	0.522	0.355	0.267	0.473
1996	102130	71726	145421	23063	19026	27957	7250	5701	9220	5001	0.690	0.375	0.284	0.497
1997	104925	74016	148740	21361	17620	25895	7044	5525	8979	4880	0.693	0.429	0.327	0.563
1998	109645	76211	157745	20482	16621	25239	7215	5754	9047	4032	0.559	0.465	0.351	0.617
1999	84288	58320	121820	19807	16112	24350	7043	5469	9070	3753	0.533	0.424	0.321	0.561
2000	85477	59075	123678	18182	14791	22351	7368	5758	9427	2973	0.403	0.380	0.286	0.505
2001	92319	63941	133290	18130	14543	22600	5743	4442	7425	3483	0.606	0.447	0.340	0.588
2002	93807	64107	137268	18710	14810	23637	5849	4521	7569	2796	0.478	0.444	0.334	0.590
2003	119850	83387	172259	19518	15317	24871	5473	4252	7043	2434	0.445	0.471	0.347	0.640
2004	140646	97953	201946	21727	17119	27574	7726	5873	10162	2713	0.351	0.421	0.309	0.572
2005	165380	114688	238477	25336	19889	32275	9196	6993	12092	3604	0.392	0.421	0.305	0.582
2006	211082	144849	307600	28624	22246	36831	9629	7323	12660	3790	0.394	0.379	0.270	0.532
2007	254231	170360	379394	38369	29052	50673	13129	9767	17649	4243	0.323	0.288	0.200	0.415
2008	239426	158815	360953	42447	32049	56217	15924	11619	21825	4974	0.312	0.277	0.189	0.405
2009	254486	164903	392733	44267	32804	59737	16948	12101	23736	5051	0.298	0.264	0.171	0.406
2010	275130	166702	454083	45661	32812	63541	18542	12854	26748	5066	0.273	0.252	0.160	0.398
2011	296855	152957	576129	47005	31115	71009	18862	12273	28988	5437	0.288	0.251	0.151	0.416
2012*	133430						21155							

* geometric mean recruitment 1995–2009 and SSB from assessment model

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

Advice for 2013

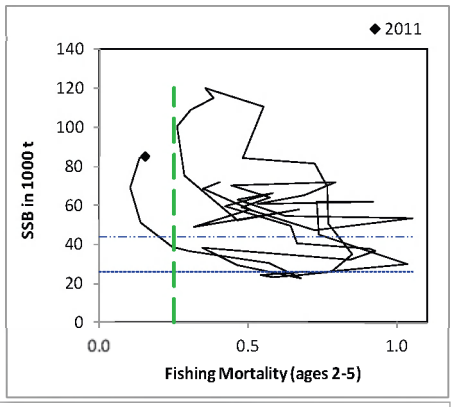
ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 19 000 t

ICES advises that activities that impact on the seabed should not take place in spawning grounds unless they can be shown not to have a negative impact on spawning, larval production or stock dynamics.

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✓	✓	✓	Below target
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning-Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	?	?	?	Undefined
Precautionary approach (B_{pa},B_{lim})	✓	✓	✓	Full reproductive capacity



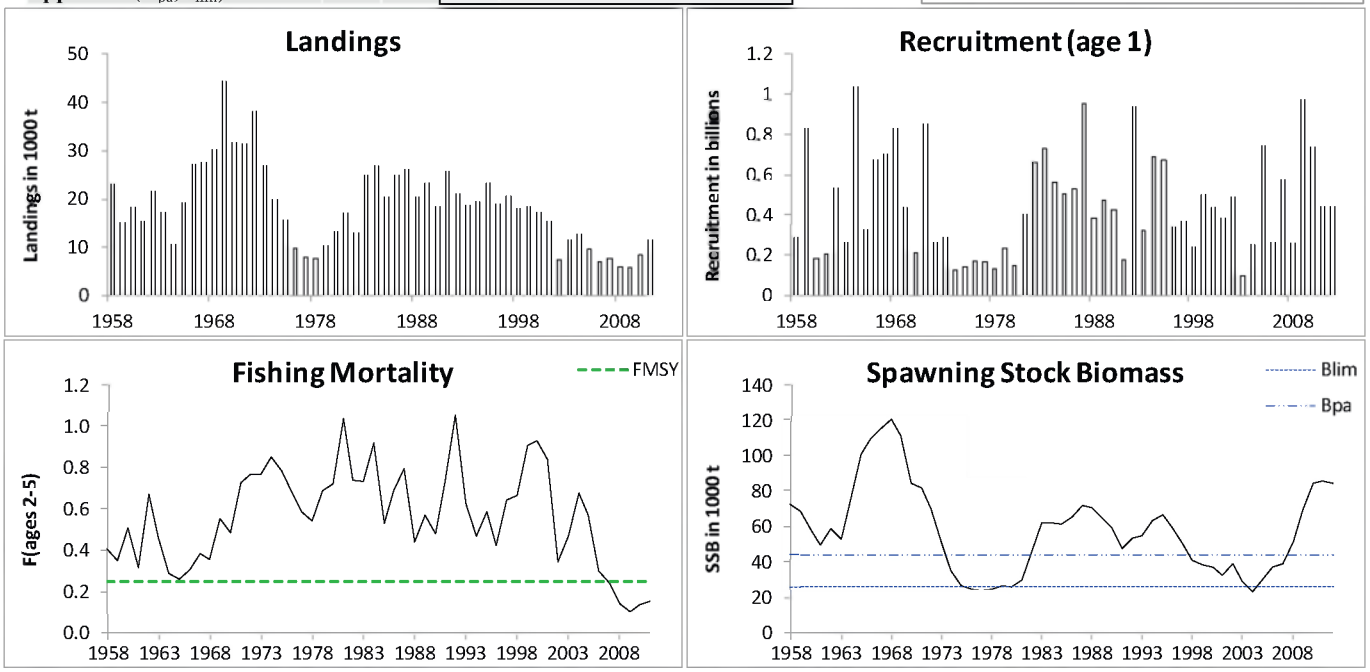


Figure 5.4.16.1 Herring in Divisions VIIa (South of 52° 30' N) and VIIg,h,j,k (Celtic Sea and South of Ireland). Summary of stock assessment. Estimates are shaded. Top right: F and SSB over the time series in the assessment.

The current assessment shows SSB at the highest level since the 1960s. F is well below F_{MSY} but has increased slightly in 2011. There are three recent strong year classes (2003/4, 2005/6, and 2007/8) in the fishery. The 2008–2009 year classes also look above average.

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 2013. ICES has been requested to evaluate the plan in 2012. 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 14 500 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. Spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Gravel extraction or disturbance in the close vicinity of any herring spawning will disturb that spawning activity and will reduce the available area for successful spawning.

Environmental influence on the stock

Temperatures 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. Discards have become an increasing feature of the fishery in the last two years due to the quota management system.

Catch distribution	Total landings (2011/2012): 11.47 kt of which 100% caught by pelagic trawl

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.

Improved information on discards is required as this is understood to have become a feature of this fishery in recent years. Greater understanding is required on the extent to which Celtic Sea herring is present in the Irish Sea

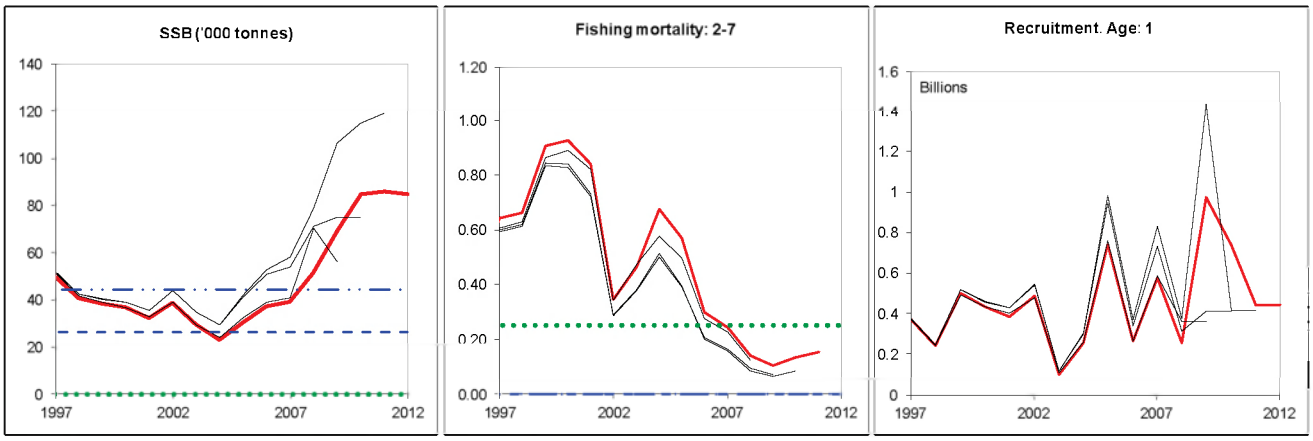


Figure 5.4.16.2 Herring in Division VIIa South of 52° 30' N and VIIg,h,j,k (Celtic Sea and South of Ireland). Historical assessment results (final year predicted SSB and recruitment estimates included).

Scientific basis

Assessment type	Age-based analytical assessment (FLICA).
Input data	Acoustic survey index (CSHAS); catch-at-age data.
Discards and bycatch	Discarding has become a feature of this fishery since 2010 but is not included in the assessment.
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 Celtic Seas
STOCK 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)

Outlook for 2013

Basis: F (2012/2013) = F (catch constraint 2012/2013) = 0.22; R (2011–2013) = GM (1981–2009) = 441 million; SSB (2012/2013) = 84.3; landings (2012/2013) = 18.

Rationale	Catch (2013)	SSB (2013)[1]	Basis	F (2013)	SSB (2014)	%SSB Change [2]	% TAC Change [3]
Proposed Rebuilding Plan	15	80	$F_{0.1}$	0.19	78	-3%	-31%
Proposed Long term management plan	17	79	Mgt Plan	0.23	75	-5%	-18%
MSY framework	19	78	F_{MSY}	0.25	73	-6%	-12%
Zero catch	0	88	Zero catch	0	99	+13%	-100%
Other Options	12	82	F_{2012}	0.15	82	0%	-45%
	21	76	status quo catch	0.29	69	-9%	0%

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 2014 relative to SSB 2013.

[3] Catch (assumed same as landings) 2013 relative to TAC 2012.

Management plan

The proposed rebuilding plan implies a TAC of 15 000t in 2013. This rebuilding plan was proposed by the Irish industry in 2008 (Annex 5.4.16), evaluated by ICES and found to be precautionary and was subsequently used to set the catch levels, although it was never formally adopted in EU legislation. By 2011, the stock had been above B_{pa} (44 000 t) for three consecutive years and the rebuilding plan expired. Under the terms of this rebuilding plan it should have been replaced by a long term management plan in 2012. However, the HCR within the rebuilding plan were used to set the TAC (21 100 t) for 2012.

In 2011 the Pelagic RAC agreed a new proposed long term management plan (Annex 5.4.16). This plan has a target F of 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 plan would lead to a TAC in 2013 of 17 000 t. This plan has not yet been evaluated by ICES, but initial evaluation by the Irish Marine Institute concluded it to be precautionary. An evaluation of the management plan will be conducted in 2012 on the basis of a request by Ireland.

MSY approach

Following the ICES MSY framework implies fishing mortality be increased to 0.25 which is higher than current F (0.15), resulting in landings of less than 19 000 t in 2013. This is expected to lead to an SSB of 73 000 t in 2014. No MSY $B_{trigger}$ has been derived for this stock although it is likely that the current SSB would be above any candidate value.

Precautionary 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 2013.

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. Actions which perturb or pollute herring spawning beds or increase turbidity after spawning are likely to have a negative effect on recruitment. Such activities include aggregate extraction, dumping of dredge spoil, waste from fish cages and the placement of certain structures on or over the seabed. Placement of structures on or over the seabed in spawning grounds should only be permitted if it can be shown that they do not disturb individual spawning beds or negatively impact spawning, larval production or stock dynamics.

There is evidence that discarding of herring by larger vessels has become a feature of this fishery in 2010 and 2011. Efforts are required to quantify the amount of catch that is discarded.

Regulations and their effects

There is evidence that closure of Division VIIaS, under the rebuilding plan, has helped to reduce fishing mortality substantially by reducing the efficiency of the fleet. This closed area has been the dominant spawning area, and before the closure a large proportion of the catch was taken from it. There is no evidence that this closure has led to improved recruitment, however, this area, particularly the area off Dunmore East, is important for recruit spawners. This area was reopened in January 2012, although vessels of over 50ft remain excluded. The abundance of herring in this area has attracted more vessels to the fishery and resulted in increased catches outside the closed area.

Uncertainties in assessment and advice

Estimation of F has improved in recent years but there is a retrospective underestimation. 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 compromised 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.

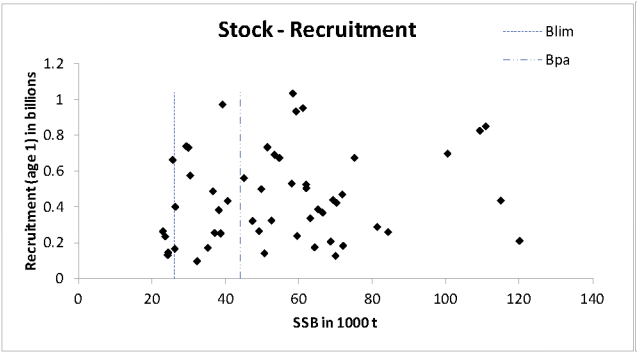
Discarding is understood to have become a feature of this fishery but cannot be quantified and included in the assessment. This will contribute to the uncertainty in the assessed SSB and fishing mortality estimates.

Comparison with previous assessment and advice

The 2012 assessment shows a downward revision in SSB 2011 by 28%, while F for 2010 is estimated to be 40% higher. The basis for the advice is the MSY approach.

Source

ICES. 2012. Report of the Herring Assessment Working Group for the Area South of 62°N, 13–22 March 2012. ICES CM 2012/ACOM:06.



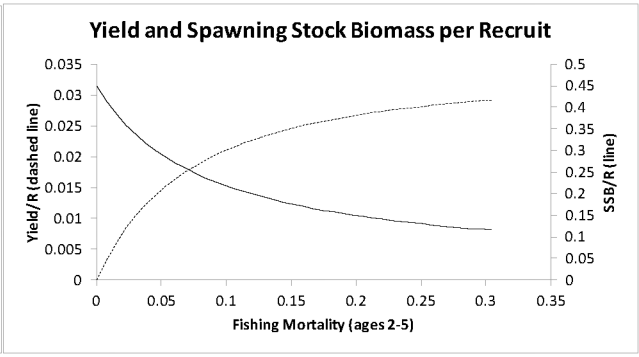


Figure 5.4.16.3 Herring in Divisions VIIa (South of 52° 30' N) and VIIg,h,j,k (Celtic Sea and South of Ireland). Stock-recruitment plot and yield per recruit analysis.

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	[3]	5.8
2010	F_{mgt} =0.19	10.15	10.15	9.6	[3]	8.4
2011	See scenarios	-	13.2	11.7	[3]	11.5
2012	MSY Approach	< 26.9	21.1			
2013	MSY Approach	<18.5				

Weights in '000 t.
[1] By calendar year.
[2] Revised in 1996 after the ACFM May meeting.
[3] Discarding is understood to have taken place but cannot be quantified

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
2011	241		11,503	7	4	-252	-	11,503

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
2011/2012	241	-	11,470	7	4	-252	-	11,470

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 tonnes).

Year	Recruitment Age 1	TSB	SSB	Fbar Ages 2–5	Landings
1958	286622	101832	71927	0.406	22978
1959	830660	126714	68519	0.348	15086
1960	184682	81647	57878	0.504	18283
1961	208247	70235	48985	0.316	15372
1962	531941	107917	58223	0.669	21552
1963	266394	81043	52392	0.464	17349
1964	1036046	157607	75047	0.286	10599
1965	325446	139161	100370	0.261	19126
1966	675316	180763	109178	0.306	27030
1967	699244	189155	114876	0.385	27658
1968	827891	205614	119957	0.355	30236
1969	437470	170041	110764	0.550	44389
1970	212444	118789	84182	0.482	31727
1971	851386	164070	81208	0.724	31396
1972	262343	112506	69844	0.764	38203
1973	289768	87666	50487	0.767	26936
1974	128146	56664	35020	0.849	19940
1975	142607	45583	26069	0.780	15588
1976	173161	44981	24152	0.672	9771
1977	167703	43074	23500	0.583	7833
1978	133648	40467	24282	0.540	7559
1979	236556	51625	26206	0.686	10321
1980	146590	43203	25512	0.722	13130
1981	402166	68172	29806	1.034	17103
1982	663810	104311	44913	0.735	13000
1983	731882	129433	61894	0.729	24981
1984	563104	112020	61842	0.917	26779
1985	506486	108222	60969	0.530	20426
1986	527669	118670	65131	0.687	25024
1987	953073	148078	71712	0.793	26200
1988	387774	109278	70091	0.442	20447
1989	470429	110310	64149	0.571	23254
1990	424832	98090	59116	0.479	18404
1991	176486	70206	47279	0.724	25562
1992	935404	124931	53243	1.052	21127
1993	322727	86599	54581	0.625	18618
1994	692030	119549	62996	0.465	19300
1995	674689	119386	66336	0.584	23305
1996	339057	90854	59374	0.422	18816
1997	370002	83320	49644	0.643	20496
1998	239756	65385	40456	0.662	18041
1999	500937	77284	38068	0.907	18485
2000	434916	72424	36511	0.926	17191
2001	383353	61215	32130	0.841	15269
2002	488667	76094	38575	0.344	7465
2003	99458	45139	29223	0.464	11536
2004	254265	46721	22819	0.676	12743
2005	740249	75795	30274	0.569	9494
2006	265977	61142	36930	0.300	6944
2007	576876	73035	39072	0.242	7636
2008	256275	74525	51306	0.139	5872
2009	974482	128240	69145	0.104	5745
2010	735244	135432	84263	0.134	8370
2011*	440602	162519	85366	0.152	11470
2012*	440602		84281		

*Geometric Mean Recruitment 1981–2009.

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 morality, 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 for 2013

ICES advises on the basis of MSY approach that there should be no catches of this stock unless a rebuilding plan is implemented.

ICES advises that activities that impact on the seabed should not take place in spawning grounds unless they can be shown not to have a negative impact on spawning, larval production or stock dynamics.

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✗	✗	✗	Above target
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	?	?	?	Undefined
Precautionary approach (B_{pa},B_{lim})	✗	✗	✗	Reduced reproductive capacity

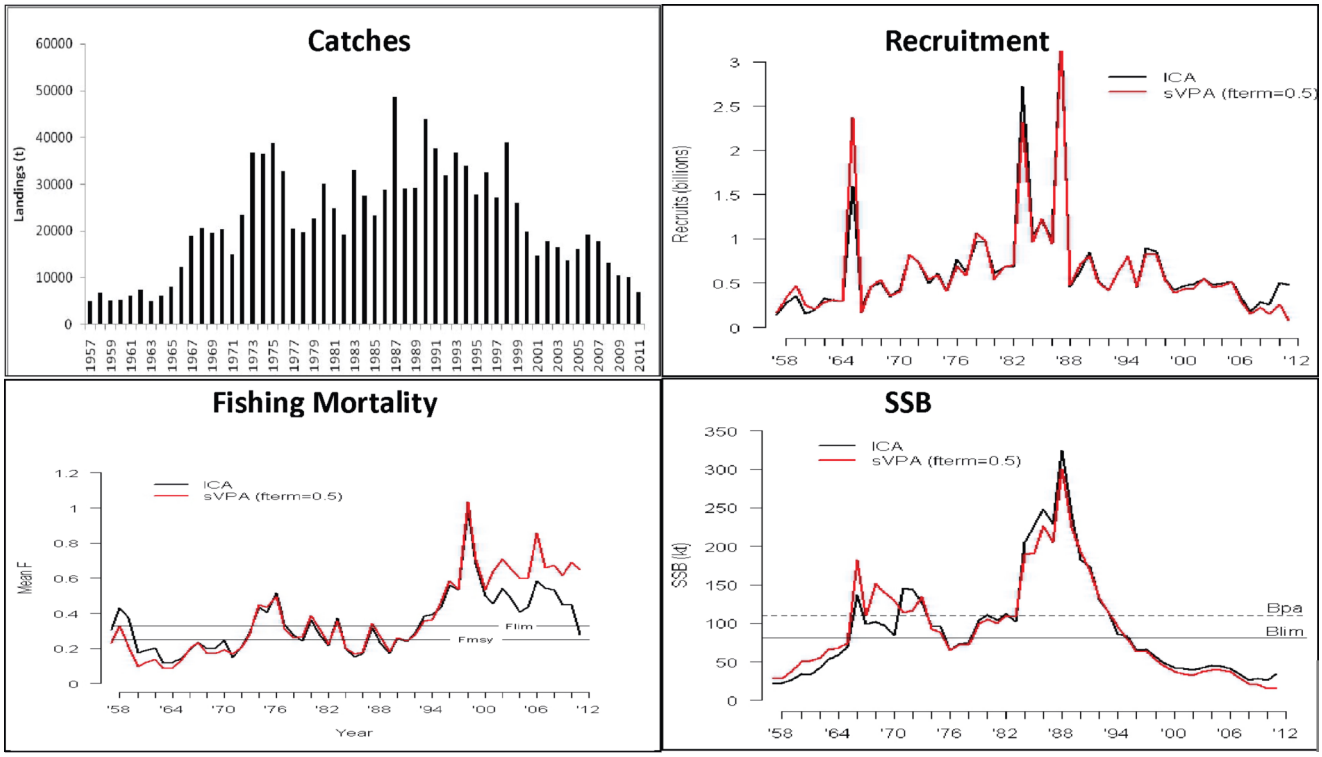


Figure 5.4.17.1 Herring in Divisions VIa (South) and VIIb,c. ICES estimates of catches (tonnes), recruitment, SSB ('000 tonnes) and fishing mortality from a separable VPA (terminal fishing mortality=0.5) and ICA run.

An exploratory assessment (including survey data from the Malin shelf acoustic survey) shows that SSB is below B_{lim}. The exploratory assessments show different trends in F: one assessment shows a stable trend at high values, whereas another one shows a decrease since 2006. In both cases F is still above F_{MSY}. Recruitment has been low since 2000.

Management plans

There is currently no explicit management plan for this stock. A rebuilding plan was proposed by the Pelagic RAC in 2011. ICES has not been requested to evaluate this plan.

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. Spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Gravel extraction or disturbance in the close vicinity of any herring spawning will disturb that spawning activity and will reduce the available area for successful spawning.

The fisheries

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, compared to a 5 months fishery prior to 2003.

Catch distribution	Total landings (2011) = 6 919 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 and cetaceans.

Quality considerations

The exploratory separable VPA 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 is short (2008–2011) and has been used in a new exploratory ICA assessment. This ICA assessment gave similar results to the separable VPA for SSB, but resulted in very different trends in F. The inclusion of fisheries independent information in the ICA run is considered to be an improvement in 2012. There is some evidence of a stronger (2008) cohort recruiting to the stock, but it is not yet possible to estimate its strength.

Efforts to split the Malin shelf acoustic survey data according to stock component should continue. Improved information is required to the extent to which catches of this component are taken in Division VIaN.

Scientific basis

Assessment type	Trends-based exploratory assessments (Separable VPA, FLICA).
Input data	Commercial catch--at age data. Acoustic survey data (MSHAS).
Discards and bycatch	Not considered relevant.
Indicators	None.
Other information	A benchmark is suggested for 2014.
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 2013

No reliable assessment can be presented for this stock. The main cause of this is the lack of sufficiently long survey data series that account for stock mixing with the VIaN herring stock. Particularly F is highly uncertain. Therefore, fishing possibilities cannot be projected.

MSY approach

The stock trend is uncertain in recent years, but the stock is considered well below biomass reference points. Exploitation is considered to be above F_{MSY}. There should be no catches of this stock unless a rebuilding plan is implemented.

The proposed plan from the Pelagic RAC can form the basis for this. Such a plan should include, possibly area closures, and should cover all areas where the stock is caught.

Additional considerations

Actions which perturb or pollute herring spawning beds or increase turbidity after spawning are likely to have a negative effect on recruitment. Such activities include aggregate extraction, dumping of dredge spoil and the placement of certain structures on or over the seabed. Placement of structures on or over the seabed in spawning grounds should only be permitted if it can be shown that they do not disturb individual spawning beds or negatively impact spawning, larval production or stock dynamics.

Information from the fishing industry

The pelagic RAC does not accept ICES interpretation of the poor status of this stock and has put forward a rebuilding plan in 2011 for evaluation. The industry is concerned that problems still exist with the assessment. 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 Division 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. This was especially the case during 2011.

Ecosystem changes

Grey seal abundance is significant to the west of Scotland and they are known to feed on herring, among other species. Latest estimates of grey seal abundance over time show the population in the area to have remained stable since the mid 1990s (Thomas, 2011). The contribution of seal predation to total herring mortality may be significant, but data are limited. Because the consumption of herring by seals is estimated with great uncertainty, the impact on the stock cannot be estimated accurately.

Uncertainty in the assessment

Fishery catch data for this specific population may be affected by mixing with neighbouring stocks. The effect of mixing in the acoustic surveys in this area contribute to uncertainty in the assessment.
The current assessment includes an acoustic tuning series that is not specific to this stock alone.

Comparison with previous assessment and advice

Although no forecast is produced, the assessment is considered to provide an improved indicator of stock status in relation to reference points. The advice this year is based on the ICES precautionary considerations for stocks without forecasts.

Source

ICES. 2012. Report of the Herring Assessment Working Group for the Area South of 62°N, 13–22 March 2012. ICES CM 2012/ACOM:06.

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

Table 5.4.17.1 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	4.2	-	6.9
2012	Reduce catch	-	4.2			
2013	No catches without a rebuilding plan	0				

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 VIIb,c. Official landings and ICES estimated catch (in tonnes).

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	-	-	+	-	-	-	-	-
Germany, Fed.Rep.	-	-	-	-	250	-	-	11
Ireland	15,000	18,200	25,000	22,500	26,000	27,600	24,400	25,450
Netherlands	300	2,900	2,533	600	900	2,500	2,500	1,207
UK (N.Ireland)	-	-	80	-	-	-	-	-
UK (England + Wales)	-	-	-	-	-	-	50	24
UK Scotland	-	+	-	+	-	200	-	-
Total landings	15,300	21,100	27,613	23,100	27,150	30,300	26,950	26,692
Unallocated/ area misreported	13,800	7,100	13,826	11,200	4,600	6,250	6,250	1,100
Discards	-	1,000	2,530	3,400	100	250	700	-
ICES catch	29,100	29,200	43,969	37,700	31,850	36,800	33,900	27,792

Country	1996	1997	1998	1999	2000	2001	2002	2003
France	-	-	-	-	-	-	515	-
Germany, Fed.Rep.	-	-	-	-	-	-	-	-
Ireland	23,800	24,400	25,200	16,325	10,164	11,278	13,072	12,921
Netherlands	1,800	3,400	2,500	1,868	1,234	2,088	366	-
UK (N.Ireland)	-	-	-	-	-	-	-	-
UK (England + Wales)	-	-	-	-	-	-	-	-
UK Scotland	-	-	-	-	-	-	-	-
Total landings	25,600	27,800	27,700	18,193	11,398	13,366	13,953	12,921
Area misreported	6,900	-700	11,200	7,916	8,448	1,390	3,873	3,581
Unallocated	-	50		-				
Discards					-	-	-	-
ICES catch	32,500	27,150	38,900	26,109	19,846	14,756	17,826	16,502

Country	2004	2005	2006	2007	2008	2009	2010	2011
France	-	-	-	-	-	-		
Germany, Fed.Rep.	-	-	-	-	-	-		
Ireland	10,950	13,351	14,840	12,662	10,237	8,533	7,513	4,247
Netherlands	64	-	353	13				
UK (N.Ireland)	-	-	-	-	-	-		
UK (England + Wales)	-	-	-	-	-	-		
UK Scotland	-	-	6	-	-			
Total landings	11,014	13,351	15,199	12,675	10,237	8,533	7,513	4,247
Area misreported	2,813	2,880	4,353	5,129	3,103	1,935	2,728	2,672
Unallocated			-353	-13				
Discards	-	-	-	-	-			
ICES catch	13,827	16,231	19,193	17,791	13,340	10,468	10,241	6,919

ECOREGION Celtic Sea / North Sea
STOCK Sprat in Divisions VIId,e

Advice 2013

Based on the ICES approach for data limited stocks, ICES advises that catches should be no more than 2800 t.

This is the first year that ICES is providing quantitative advice for data limited stocks (see Quality considerations).

Stock status

F (Fishing Mortality)	2009–2011
Qualitative evaluation	? Insufficient information

SSB (Spawning Stock Biomass)	2009–2011
Qualitative evaluation	? Insufficient information

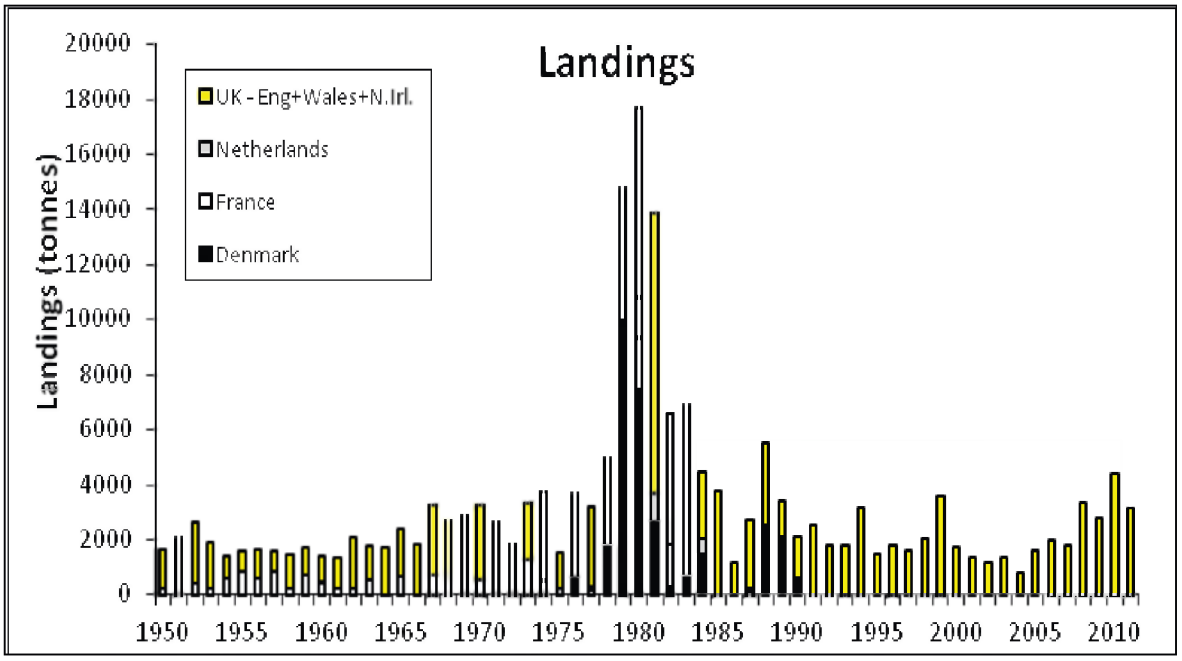


Figure 5.4.18.1 Sprat in Divisions VIId,e. Official landings by country (main fisheries) in tonnes.

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 predatorts in this area.

The fisheries

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 economic exploitation.

Effects of the fisheries on the ecosystem

The fishery is primarily carried out by midwater trawl which has negligible impact on the marine seabed.

Quality considerations

The stock structure of sprat populations in the Celtic Seas eco-region is not clear (Section 5.4.28). ICES does not necessarily advocate that Division VIId,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.

The advice is based on a precautionary reduction of catches because of missing or non representative data. The methods applied to derive quantitative advice for data limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	No assessment.
Discards and bycatch	Not available.
Indicators	Landings statistics and surplus production model, English Sprat acoustic survey; landings and fishing effort data.
Other information	Time-series of midwater trawl lpue.
Working group report	HAWG

ECOREGION Celtic Sea and West of Scotland
STOCK Sprat in Divisions VIId,e

Reference points

No reference points are defined.

Outlook for 2013

The available data are not reliable indicators of sprat abundance in Divisions VIId,e. Stock structure in relation to appropriate management units is unknown.

ICES approach to data limited stocks

For data limited stocks without information on abundance or exploitation ICES considers that a precautionary reduction of catches should be implemented, unless there is ancillary information clearly indicating that the current level of exploitation is appropriate for the stock.

For this stock, ICES advises that catches should decrease by 20% in relation to the last three years average catch, corresponding to catches of no more than 2800 t in 2013.

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 Seas eco region (Section 5.4.28).

An acoustic survey in Division VIIe was carried out for the first time in 2011. Sprat biomass was estimated to be between 16 600 and 50 000 tonnes depending on the acoustic target strength applied. A second acoustic survey will be carried out in the same area in 2012. A survey time series of at least 5 years would be required to evaluate stock status.

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.

An exploratory analysis of landings per unit effort (lpue) is 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 hast fluctuated over time with a slight increasing trend.

Comparison with previous advice

The advice last year was based on precautionary considerations. This year the advice is based on the ICES approach to data limited stocks.

Sources

ICES. 2012. Report of the Herring Assessment Working Group for the Area South of 62°N, 16–24 March 2012, ICES CM 2012/ACOM:06.

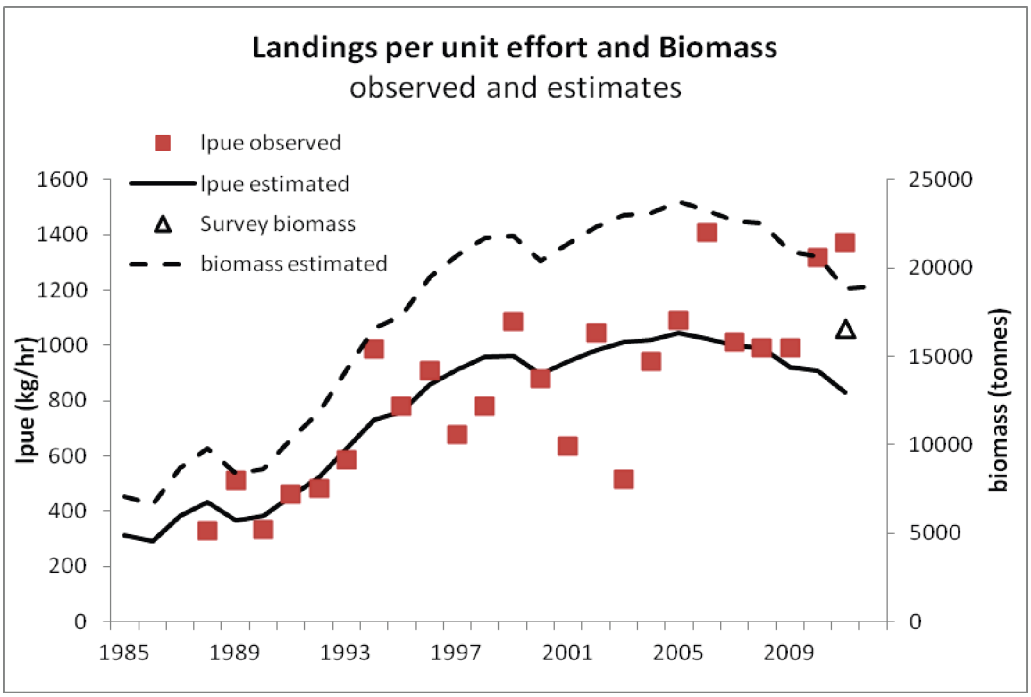


Figure 5.4.18.1 Sprat in Divisions VIId,e. Surplus production model fit (lines) to the commercial landings per unit effort (lpue) data and the acoustic survey estimate of 16 600 t.

Table 5.4.18.1 Sprat in Divisions VIId,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	3.1
2012	Reduce catches	-		
2013	20% reduction in catches (last 3 year average)	< 2.8		

Weights in '000 tonnes.

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

Country	Denmark	France	Netherlands	Wales+N.Irl. K - Scotland		Total
1985	0	14	0	3771	0	3785
1986	15	0	0	1163	0	1178
1987	250	23	0	2441	0	2714
1988	2529	2	1	2944	0	5476
1989	2092	10	0	1520	0	3622
1990	608	79	0	1562	0	2249
1991	0	0	0	2567	0	2567
1992	5389	35	0	1791	0	7215
1993	0	3	0	1798	0	1801
1994	3572	1	0	3176	40	6789
1995	2084	0	0	1516	0	3600
1996	0	2	0	1789	0	1791
1997	1245	1	0	1621	0	2867
1998	3741	0	0	1973	0	5714
1999	3064	0	1	3558	0	6623
2000	0	1	1	1693	0	1695
2001	0	0	0	1349	0	1349
2002	0	0	0	1196	0	1196
2003	0	2	72	1368	0	1442
2004	0	6	0	836	0	842
2005	0	0	0	1635	0	1635
2006	0	7	0	1969	0	1976
2007	0	0	0	2706	0	2706
2008	0	0	0	3367	0	3367
2009	0	2	0	2773	0	2775
2010	0	0	0	4404	0	4404
2011	0	0	0	3136	0	3136

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

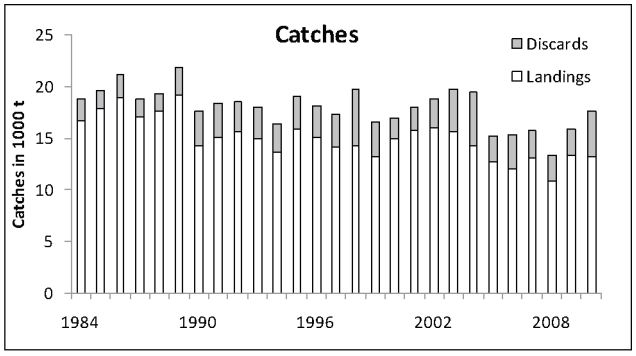
Advice for 2013

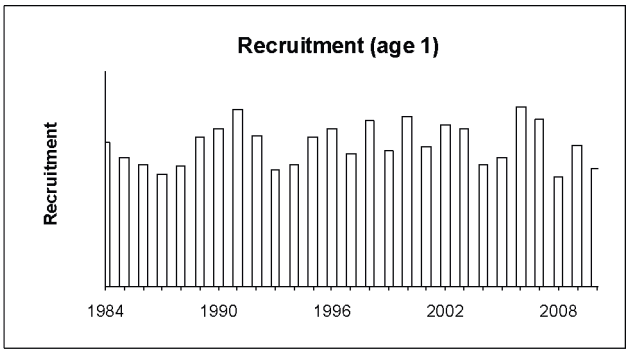
Based on the ICES approach for data limited stocks, ICES advises that landings should be no more than 12 000 tonnes. This is the first year that ICES is providing quantitative advice for data limited stocks (see Quality considerations).

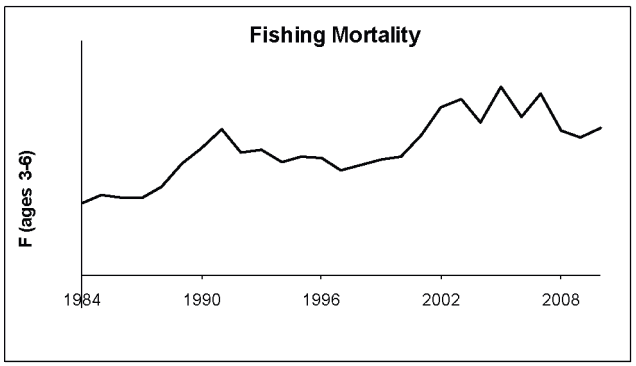
Stock status

F (Fishing Mortality)	2002 -2010	2011	
MSY (F_{MSY})	?	?	Not available
Precautionary approach (F_{pa},F_{lim})	?	?	Not available
Qualitative evaluation	→	?	Not available

SSB (Spawning Stock Biomass)	2006 - 2010	2011	
MSY ($B_{trigger}$)	?	?	Not available
Precautionary approach (B_{pa},B_{lim})	?	?	Not available
Qualitative evaluation	↗	↗	Increasing







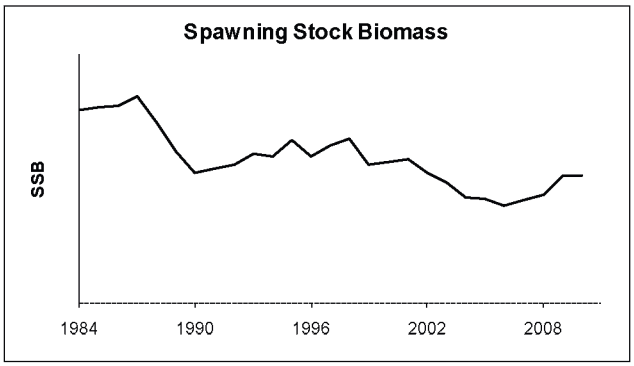


Figure 5.4.19.1 Megrim (*Lepidorhombus whiffiagonis*) in Divisions VIIb–k and VIIIa,b,d. Summary of stock assessment (weights in '000 tonnes).Top right: SSB/F for the time series used in the assessment.

The stock status is based on an assessment using data only until 2010. The analytical assessment should only be considered as indicative of trends. Trends in SSB from the assessment which includes surveys and commercial data indicate an SSB increase of 25% in the last two years (2009–2010) relative to the three previous years (2006–2008). However, the stock is below the long term average. Fishing mortality in the last decade has been stable but above long-term average.

Management plans

No specific management objectives are known to ICES.

Biology

Megrim (*L. whiffiagonis*) is found at depths ranging from 50 to 800 metres, but with highest abundance around 100–300 metres.

The fisheries

Megrim is caught in mixed fisheries, mostly by trawlers. Spanish and French vessels report more than 75% of the total landings.

Catch by fleet	Total catch (2010) 17.6 kt where 75% landings (70% trawl aprox., 30% not provided), 25% discards. There were insufficient data to update this information for 2011. However, values for 2010 were still considered appropriate.

Quality considerations

This stock was benchmarked in 2012. The lack of confidence in the data used made it impossible to accept the absolute values of model results. The model gave promising results and seemed to be able to deal with the heterogeneity in the data. The model fit to the data was adequate but can only be interpreted as trends.

It was not possible to include Spanish commercial data for 2011 in the assessment, as they were not available. Therefore, the assessment model could not be updated this year. The assessment conducted in the 2012 benchmark was used, incorporating data only until 2010, which increases the uncertainty in the advice. In addition, an important contributor to the megrim catches, France, has not provided discards estimates in the last decade.

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

Scientific basis

Assessment type	Statistical catch at age model accepted for trends.
Input data	Landings and discards. Indices from two surveys (EVHOE-WIBTS-Q4 and SP-PGFS-WIBTS-Q4), cpue from a Spanish fleet and lpue from an Irish fleet.
Discards and bycatch	Available discards data incorporated, missing discards estimated by model.
Indicators	None.
Other information	The stock was benchmarked in 2012 (WKFLAT).
Working group report	WGHMM

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

Reference points

No reference points are defined for this stock. The previously defined reference points were based on previous assessment results, which are no longer valid. Due to the poor quality of the data ICES could not provide new reference points.

Outlook for 2013

No analytical assessment is available for this stock. The main cause of this is poor data quality. Therefore, no forecast can be presented.

ICES approach to data limited stocks

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

For this stock the spawning stock biomass is estimated to have increased by more than 20% between 2006–2008 (average of the three years) and 2009–2010 (average of the two years). This implies an increase of landings of at most 20% in relation to the average of the last three years of available landings (2008–2010), corresponding to landings of no more than 14 954 t. Additionally, considering that exploitation is unknown, ICES advises that landings should decrease by 20% as a precautionary buffer. This results in landings of no more than 12 000 t in 2013.

Additional considerations

The 2011 survey information is consistent with the increasing trend of the SSB given by the assessment (Figure 5.4.19.3).

Management considerations

The 2012 TAC was set at 20 100 t, including a 5% contribution of *L. boscii* in the landings.

Discarding of smaller megrim even above the minimum landing size (MLS) of 20 cm is substantial. Improving the selection pattern should benefit the stock and result in a higher long-term yield.

Regulations and their effects

The MLS of megrim was reduced from 25 to 20 cm length in 2000, to match the selection pattern of the gear. However, high-grading continues for market reasons.

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).

Fishing patterns

Megrim is caught in mixed fisheries, mostly by trawlers. Spanish and French vessels report more than 75% of the total landings. French benthic trawlers operating in the Celtic Sea target benthic and demersal species, catching megrim as bycatch. Spanish fleets catch megrim both targeting it and in mixed fisheries for hake, anglerfish, *Nephrops* and other species. Otter trawlers account for the majority of Spanish landings from Subarea VII, while the remainder is taken by gillnetters prosecuting a mixed fishery for anglerfish, hake, and megrim on the shelf edge around the 200 m contour to the south and west of Ireland. Vigo catches alone comprise around 54% of the total catches. Most UK catches of megrim correspond to beam trawlers fishing in Divisions VIIe,f,g,h. Irish catches are mostly taken by multi-purpose vessels fishing in Divisions VIIb,c,g for gadoids, plaice, sole and anglerfish.

Data

Since 2012, discards data are available by country for the last decade. Filling in the missing years is problematic because discarding practices in the fisheries are very variable over time. An important contributor to the megrim catches, France, has not provided discard estimates in the last decade. Some commercial lpue tuning series are pending revision.

Comparison with previous assessment and advice

The results of the current assessment is consistent with previous assessments. The advice last year was catch and effort reduction, based on precautionary considerations. The advice this year is quantitative, based on the ICES approach for data limited stocks.

Assessment and management area

The assessment area of this stock (Divisions VIIb–k and VIIIa,b,d) does not correspond to the TAC areas (one TAC for VII, one for VIIIa,b,d,e). Megrim in VIIa and VIIIe are not assessed. The assessment area officially encompasses VIId, but no catches have been reported from that area recently.

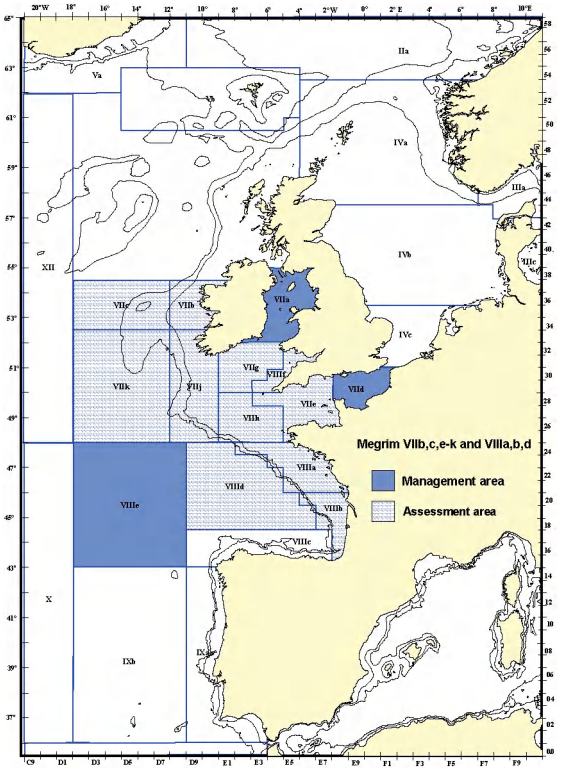


Figure 5.4.19.2 Megrim in Divisions VIIb–k and VIIIa,b,d. ICES assessment areas and EU TAC regulation management areas.

Sources

ICES. 2012. Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim (WGHMM), 10–16 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

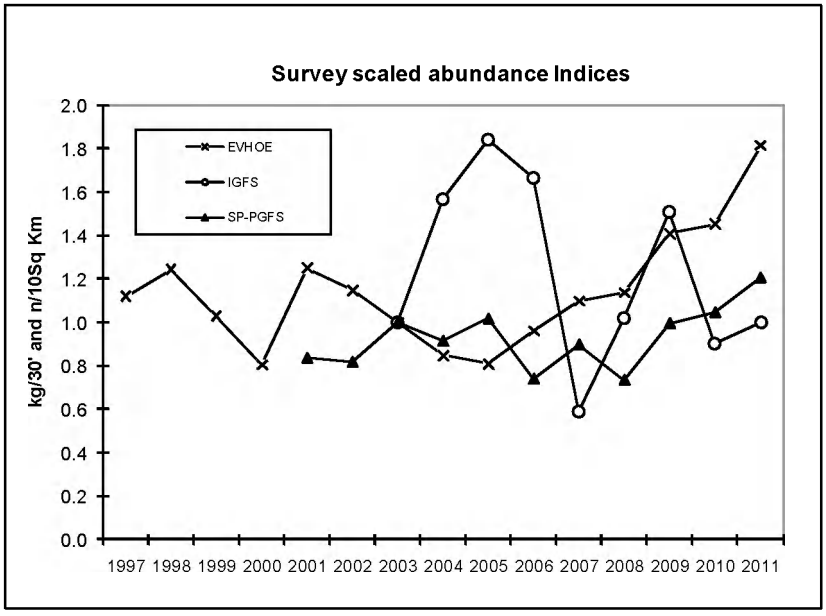


Figure 5.4.19.3 Megrim (*Lepidorhombus whiffiagonis*) in Divisions VIIb–k and VIIIa,b,d. Survey scaled indices in Bay of Biscay and Celtic Sea (EVHOE-WIBTS-Q4; biomass), Porcupine (SpPGFS-WIBTS-Q4; biomass) and platform north, west and south of Ireland (IGFS-WIBTS-Q4; numbers). As the survey indices have been scaled to facilitate comparison, the numbers on the vertical axis cannot be interpreted as absolute values.

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

Year	ICES Advice	Predicted catch /landings corresp. to advice	Agreed TAC[1)2)]	ICES Landings	Disc. Slip.	ICES Catch
1987	Not assessed	-	16.46	17.1	1.7	18.8
1988	Not assessed	-	18.1	17.6	1.7	19.3
1989	Not assessed	-	18.1	19.2	2.6	21.8
1990	Not assessed	-	18.1	14.4	3.3	17.7
1991	No advice	-	18.1	15.1	3.3	18.4
1992	No advice	-	18.1	15.6	3.0	18.6
1993	Within safe biological limits	-	21.46	14.9	3.1	18.0
1994	Within safe biological limits	-	20.33	13.7	2.7	16.4
1995	No particular concern	-	22.59	15.9	3.2	19.1
1996	No long-term gain in increased F	16.6	21.20	15.1	3.0	18.1
1997	No advice	14.3	25.0	14.2	3.1	17.3
1998	No increase in F	15.2	25.0	14.3	5.4	19.7
1999	Reduce F below F_{lim}	14.6	25.0	13.3	3.3	16.6
2000	Reduce F below F_{lim}	<14.2	20.0	15.0	1.9	16.9
2001	Reduce F below F_{lim}	< 14.1	16.8	15.8	2.3	18.0
2002	Reduce F below F_{lim}	< 13.0	14.9	16.0	2.8	18.8
2003	Reduce F below F_{lim}	< 16.1	16.0	15.7	4.0	19.7
2004	Reduce F below F_{lim}	< 20.2	20.2	14.3	5.2	19.5
2005	Reduce F below F_{lim}	< 22.6	21.5	12.7	2.6	15.3
2006	Reduce F below F_{pa}	< 13.6	20.4	12.0	3.4	15.4
2007	Less than average landings 2003–05	< 14.2	20.4	13.0	2.7	15.8
2008	Less than average landings 2004–06	< 13.0	20.4	10.9	2.5	13.4
2009	Same advice as last year	< 13.0	20.4	13.3	2.6	16.0
2010	No increase in effort	< 13.0	20.4	13.2	4.4	17.6
2011	See scenario's	-	20.1	6.0*	1.2*	7.2*
2012	Catch and effort reduction	-	20.1			
2013	Decrease landings by 4% (20% increase, followed by 20% PA reduction)	<12.0				

. Weights in '000 t.
[1] Includes *L. boscii*.
[2] Includes Division VIIa and Divisions VIIIe.
(*) Without Spanish data.

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	14370	3284	17654	18100
1991	15094	3282	18376	18100
1992	15600	2988	18588	18100
1993	14929	3108	18037	21460
1994	13684	2700	16384	20330
1995	15862	3206	19068	22590
1996	15109	3026	18135	21200
1997	14230	3066	17296	25000
1998	14345	5371	19716	25000
1999	13305	3297	16602	20000
2000	15031	1870	16901	20000
2001	15778	2262	18040	16800
2002	15987	2813	18800	14900
2003	15687	4008	19695	16000
2004	14300	5240	19539	20200
2005	12703	2578	15281	21500
2006	12000	3368	15369	20425
2007	13048	2703	15750	20425
2008	10853	2531	13384	20425
2009	13348	2604	15952	20425
2010	13185	4406	17590	20106
2011 (*)	5983	1242	7225	20106

(*) Without Spanish data.

[1)] for both megrim species and VIIa and VIIIe included.

Table 5.4.19.3 Megrim (*Lepidorhombus whiffiagonis*) in Divisions VIIb–k and VIIIa,b,d. SSB from the assessment model (standardized to the mean).

Year	SSB/SSB mean (1984-2010)
1984	1.3372
1985	1.3549
1986	1.3666
1987	1.4323
1988	1.2459
1989	1.0490
1990	0.9041
1991	0.9285
1992	0.9615
1993	1.0346
1994	1.0146
1995	1.1287
1996	1.0159
1997	1.0873
1998	1.1338
1999	0.9603
2000	0.9737
2001	0.9970
2002	0.9006
2003	0.8301
2004	0.7319
2005	0.7204
2006	0.6757
2007	0.7061
2008	0.7445
2009	0.8826
2010	0.8823

ECOREGION Celtic Sea and West of Scotland

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

Advice for 2013

Based on the ICES approach for data-limited stocks, ICES advises that catches should be no more than 24 800 tonnes.

This is the first year ICES is providing quantitative advice for data-limited stocks (see Quality considerations).

Stock status

Lophius piscatorius

	F (Fishing Mortality)		
	2009–2010	2011	
MSY (F_{MSY})	?	?	Not available
Precautionary approach (F_{pa},F_{lim})	?	?	Not available

	Total Stock Biomass		
		2007–2011	
MSY ($B_{trigger}$)	?		Unknown
Precautionary approach (B_{pa},B_{lim})	?		Unknown
Qualitative evaluation	↘		Decreasing

Lophius budegassa

	F (Fishing Mortality)		
	2009–2010	2011	
MSY (F_{MSY})	?	?	Not available
Precautionary approach (F_{pa},F_{lim})	?	?	Not available

	Total Stock Biomass		
		2007–2011	
MSY ($B_{trigger}$)	?		Unknown
Precautionary approach (B_{pa},B_{lim})	?		Unknown
Qualitative evaluation	↘		Decreasing

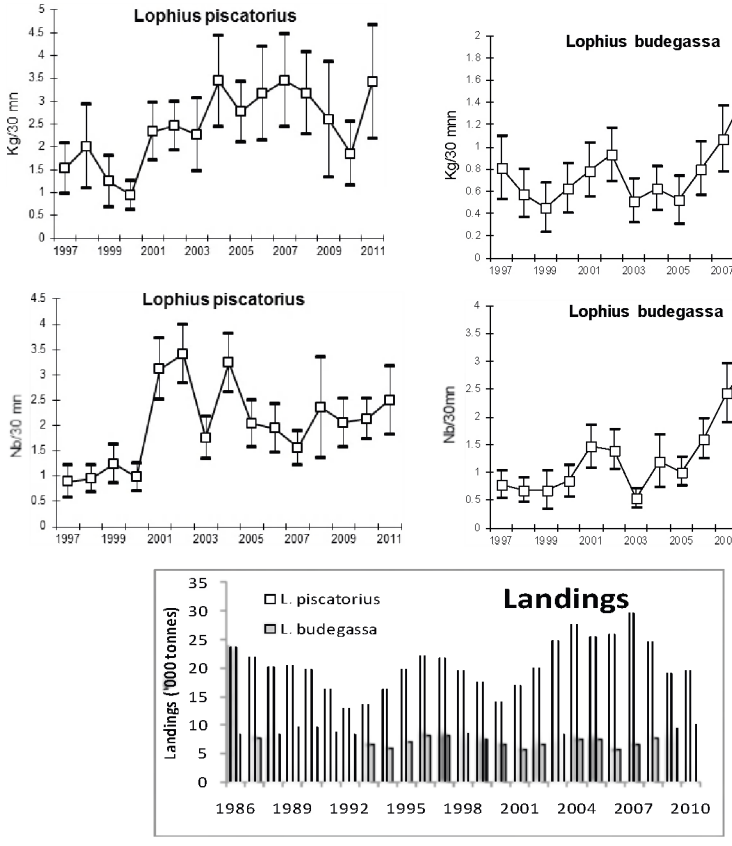


Figure 5.4.20.1 Anglerfish (*L. piscatorius* and *L. budegassa*) in Divisions VIIb–k and VIIIa,b,d. Bay of Biscay and Celtic Sea (EVHOE-WIBTS-Q4) indices: biomass (top panel, kg/30 min) and total abundance (middle panel, number/30 min). Error bars indicate ± 2 s.d. Lower panel: landings (thousand tonnes).

The long-term trend in biomass is stable for both species. Survey data indicate that the biomass of both species has been increasing until 2008. This is followed by a biomass decline in recent years. For *L. piscatorius* the average of the stock biomass indicator in the last two years (2010–2011) is 14% lower than the average of the three previous years (2007–2009). For *L. budegassa* the average of the stock biomass indicator in the last two years (2010–2011) is 29% lower than the average of the three previous years (2007–2009). For *L. piscatorius* there is evidence of good recruitments in the period 2008 to 2011, whereas strong recruitment for *L. budegassa* is evident in 2008 and 2011. Landings data in 2011 are incomplete, therefore only landings until 2010 were considered in this year's assessment.

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 areas for each species, the boundaries are not based on biological criteria.

The fisheries

The majority of anglerfish catches consists of young fish. There are indications that discarding of small anglerfish 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 distribution	Total landings (2010) = 29.7 kt (*L. piscatorius*, 19.5 kt: 65% otter trawl, 17% gillnet, 13% beam trawl, and 2% *Nephrops* trawl. *L. budegassa*, 10.2 kt: 86% otter trawl, 6% beam trawl, 4% *Nephrops* trawl, and 2% gillnet). The data were insufficient to update this information for 2011; however, values for 2010 are still considered appropriate.

Quality considerations

It was not possible to include Spanish commercial data for 2011 in the assessment. Therefore, the assessment conducted in 2012 follows the same approach as last year but omits Spanish commercial data for 2011. This increases the uncertainty in the advice.

The increase in discarding in recent years has resulted in uncertainties in recent levels of catch.

Improved sampling of length composition and accurate estimates of growth parameters are needed to facilitate the development of an analytical assessment. An ageing exchange study for *L. piscatorius* took place in 2011 to compare the different approaches that are used (otoliths and *illicia*).

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

Scientific basis

Assessment type	Survey trends-based assessment.
Input data	Biomass and abundance indices from of one survey (EVHOE-WIBTS-Q4).
Discards and bycatch	Not included in the assessment.
Indicators	Cpues from three surveys (FSP-Eng-Monk, SPPGFS-WIBTS-Q4, and IGFS-WIBTS-Q4) and lpues of three commercial fleets (EW-FU06, SP-BAKON7, and SP-BAKON8).
Other information	These stocks were benchmarked in 2012 (WKFLAT 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 identified problems with growth estimates, previous reference points are not considered to be valid.

Outlook for 2013

No analytical assessment is available for this stock. The main cause of this is the lack of discard data and the low quality of other parameters (e.g. ageing). Therefore, no forecast can be presented.

ICES approach to data-limited stocks

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

For *L. piscatorius* the biomass is estimated to have decreased by 14% in 2007–2009 (average of the three years) and 2010–2011 (average of the two years). This implies a 14% decrease in catches compared to the average of the last three years with landings information (2008–2010), corresponding to catches of no more than 17 900 t. Considering that effort in the main fisheries has decreased steadily, no additional precautionary reduction is needed.

For *L. budegassa* the biomass is estimated to have decreased by more than 20% in 2007–2009 (average of the three years) and 2010–2011 (average of the two years). This implies a 20% decrease in catches compared to the average of the last three years with landings information (2008–2010), corresponding to catches of no more than 6900 t. Considering that effort in the main fisheries has decreased steadily, no additional precautionary reduction is needed.

The catch advice for the two species combined is 24 800 t.

Additional considerations

Improved sampling of length composition and accurate estimates of growth parameters are needed to facilitate the development of an analytical assessment.

Reliable estimates of discards are not available. The increase in discarding may be related to larger year classes recruiting in the fishery. Information from research surveys indicates an increase in smaller fish on the fishing grounds in recent years. Discarding is also known to be partly dependent on market conditions and quota restrictions.

L. piscatorius and *L. budegassa* are both caught on the same grounds and by the same fleets, and they are usually not separated in the landings. Management measures for both species must be considered together and in conjunction with other species caught in these fisheries (sole, cod, rays, megrim, *Nephrops*, and hake).

Effort of many commercial fishing fleets in Divisions VIIb–k and VIIIa,b,d has declined progressively since the early 1990s (Figure 5.4.20.3).

Regulations and their effects

There is no minimum landing size for anglerfish, but an EU Council Regulation (No. 2406/96) laying down common marketing standards for certain fishery products fixes a minimum weight of 500 g for anglerfish. Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a 'biologically sensitive area' in Divisions VIIb, VIIj, VIIg, and VIIh. Effort exerted within the 'biologically sensitive area' by the vessels of each EU member state may not exceed their average annual effort (calculated over the period 1998–2002).

Information from the fishing industry

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.

Comparison with previous assessment and advice

The basis for the assessment is the same as last year. The perception of the stocks remains uncertain. The advice last year was to reduce catch, based on precautionary considerations. The advice this year is quantitative, based on the ICES approach for data-limited stocks.

Assessment and management area

Two separate TACs are set for both species combined. There is a TAC for Subarea VII and a TAC for Divisions VIIIa,b,d,e. The advice applies to a smaller area (Divisions VIIb–k and VIIIa,b,d) than the management area. However, the advice covers the majority of the area as recent landings in Division VIIa have been relatively small compared to the total TAC.

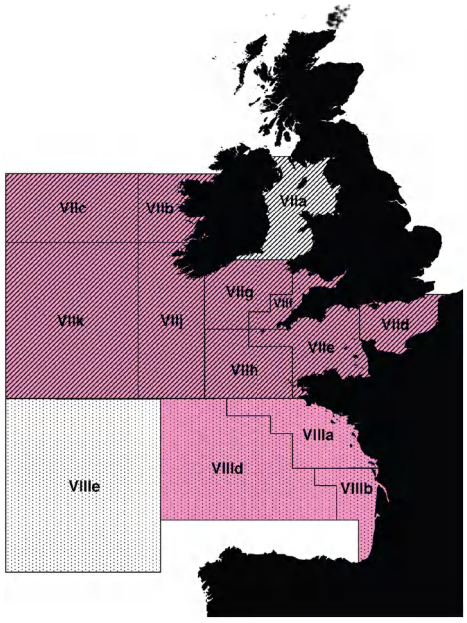


Figure 5.4.20.2 Anglerfish (*L. piscatorius* and *L. budegassa*). Assessment area Divisions VIIb–k and VIIIa,b,d (pink, shaded) and EU TAC areas VII (diagonal lines) and VIIIa,b,d,e (dotted).

Source

ICES. 2012. Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim (WGHMM), 10–16 May 2012, ICES Headquarters, Copenhagen. ICES CM 2012/ACOM:11.

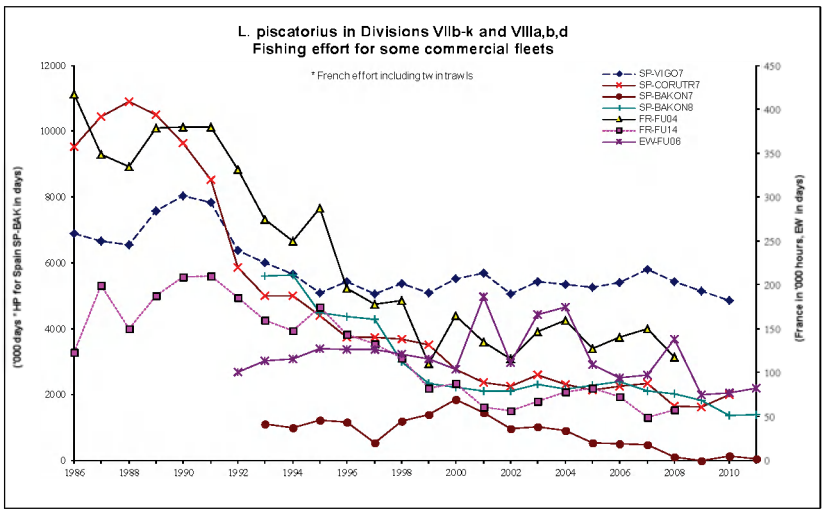


Figure 5.4.20.3 Anglerfish (*L. piscatorius* and *L. budegassa*) in Divisions VIIb–k and VIIIa,b,d. Fishing effort of commercial fleets in Divisions VIIb–k and VIIIa,b,d.

Table 5.4.20.1 Anglerfish (*L. piscatorius* and *L. budegassa*) in Divisions VIIb–k and VIIIa,b,d. ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. advice	Agreed to TAC[1)2)]	ICES Landings[1)]	Landings *L. piscatorius*	Landings *L. budegassa*
1987	Not assessed	-	39.08	29.5	21.9	7.6
1988	Not assessed	-	42.99	28.5	20.1	8.4
1989	Not assessed	-	42.99	30	21.1	8.8
1990	Not assessed	-	42.99	29.4	19.8	9.6
1991	No advice	-	42.99	24.9[3]	16.2[3]	8.8[3]
1992	No advice	-	42.99	20.9[3]	12.8[3]	8.2[3]
1993	Concern about *L. pisc.* SSB decrease	-	25.1	20.0[3]	13.5[3]	6.6[3]
1994	SSB decreasing, still inside safe biological limits	-	23.9	21.9[3]	16.1[3]	5.7[3]
1995	No increase in F	20.0	23.2	26.7[3]	19.7[3]	7.0[3]
1996	No increase in F	30.3	30.4	20.3[3]	22.2[3]	8.1[3]
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[3]	19.6[3]	8.6[3]
1999	No increase in F	32.9	34.3	25.0	18.2	6.7
2000	At least 20% decrease in F	< 22.3	29.6	20.6	13.9	6.6
2001	Reduce F below F_{pa}	< 27.6	27.6	22.4[3]	16.7[3]	5.7[3]
2002	Reduce F below F_{pa}	< 19.9	23.7	26.2	19.8	6.4
2003	At least 30% decrease in F	< 16.4	21.0	33.2	24.9	8.4
2004	At least 10% decrease in F	< 26.7	26.7	35.2	27.7	7.4
2005	Maintain F below F_{pa}	< 37.8	31.2	33.1[3]	25.5[3]	7.5[3]
2006	Maintain F below F_{pa}	<33.9	34.0	31.6[3]	25.9[3]	5.7[3]
2007	Maintain F below F_{pa}	<36.0	36.0	35.3[3]	29.0[3]	6.4[3]
2008	Less than average landings	<33.0	36.0	31.8[3]	24.4[3]	7.4[3]
2009	Same advice as last year	<33.0	36.0	27.9[3]	18.8[3]	9.1[3]
2010	No increase in effort	-	41.4	28.9[3]	19.5[3]	9.4[3]
2011	No increase in effort	-	40.9	21.9[4]	17.1[4]	4.8[4]
2012	Reduce catch	-	38.877			
2013	Reduce catch by the rate of biomass decrease (14% for *L. piscatorius* and 20% for *L. budegassa*)	<24.8				

Weights in thousand tonnes.
TAC was changed during 2003 from 19 400 t to 21 000 t following fast-track advice from ICES.
[1] Includes Divisions VIIa and VIIIe.
[2] Applies to both species.
[3] Revised.
[4] Partial, without Spanish landings.

Table 5.4.20.2 Anglerfish (*L. piscatorius*) in Divisions VIIb–k and VIIIa,b,d. Landings in tonnes by fishery unit.

	VIIb,c,e-k						VIIIa,b,d				
Year	Gill-Net (Unit 3+13)	Medium/Deep Trawl (Unit 4)	Shallow Trawl (Unit 5)	Shallow/medium 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	TOTAL VII +VIII
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	1736	880		410	391	2578		19753
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	8714	2138	1722	812	3	397	149	1699	542	19572
1999	3162	9037	2369	1409	780	19	98	116	1259	0	18250
2000	2034	7067	1642	1434	726	6	91	77	863	0	13941
2001*	2002	7880	2293	1978	886	17	146	76	1402	0	16681
2002*	2719	9465	2609	1836	924	22	247	96	1908	0	19826
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	14949	2382	2836	660	11	286	244	3015	0	28977
2008*	5107	11766	1885	1990	491	10	227	325	2573	1	24376
2009*	3957	9938	358	1880	48	16	221	0	2153	275	18844
2010*	3398	9851	539	2503	21	31	301	0	2373	504	19521
2011**	2152	7785	548	3019	12	42	231	0	1908	1452	17149

* revised

** preliminar, no Spanish reliable data

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

	VIIb,c,e-k						VIIIa,b,d				
Year	Gill-Net (Unit 3+13)	Medium/Deep Trawl (Unit 4)	Shallow Trawl (Unit 5)	Shallow/medium 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	TOTAL VII +VIII
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	505	515	0	446	112	1829	0	8820
1990*	53	4818	631	905	653	0	550	156	1865	0	9632
1991*	0	4416	934	397	507	0	475	117	1933	0	8780
1992*	0	4808	301	305	594	0	459	191	1518	0	8176
1993*	0	3415	429	405	399	0	433	101	1385	0	6566
1994*	0	2935	265	209	540	0	232	49	1515	0	5744
1995*	10	3963	455	159	617	0	312	62	1286	90	6953
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	4311	119	282	338	0	144	76	1450	0	6739
2000	57	4489	161	284	228	0	124	31	1270	0	6645
2001*	41	3758	107	266	306	0	121	29	1100	0	5728
2002*	30	4272	147	251	372	0	112	14	1195	0	6394
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	3874	168	306	250	0	243	0	1424	0	6357
2008*	21	4620	187	392	254	0	235	0	1669	0	7379
2009*	72	5963	24	441	36	0	354	0	2047	145	9082
2010*	224	6137	9	597	27	0	379	0	1763	223	9359
2011**	172	2495	11	591	16	0	378	0	1065	44	4773

* revised

** preliminar, no Spanish reliable data

Table 5.4.20.4 Anglerfish (*L. piscatorius*) in Divisions VIIb–k and VIIIa,b,d. Bay of Biscay and Celtic Sea (EVHOE-WIBTS-Q4) indices: biomass (kg/30 min) and total abundance (number/30 min).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Biomass	1.53	2.01	1.25	0.94	2.34	2.46	2.27	3.44	2.77	3.17	3.45	3.18	2.6	1.85	3.43
Abundance	0.89	0.95	1.24	0.98	3.12	3.41	1.76	3.24	2.04	1.94	1.56	2.36	2.06	2.13	2.5

Table 5.4.20.5 Anglerfish (*L. budegassa*) in Divisions VIIb–k and VIIIa,b,d. Bay of Biscay and Celtic Sea (EVHOE-WIBTS-Q4) indices: biomass (kg/30 min) and total abundance (number/30 min).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Biomass	0.81	0.58	0.45	0.62	0.79	0.93	0.51	0.62	0.52	0.8	1.07	1.47	0.77	0.5	1.07
Abundance	0.78	0.68	0.68	0.84	1.46	1.4	0.53	1.2	1.01	1.6	2.42	2.92	1.2	1.04	1.97

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

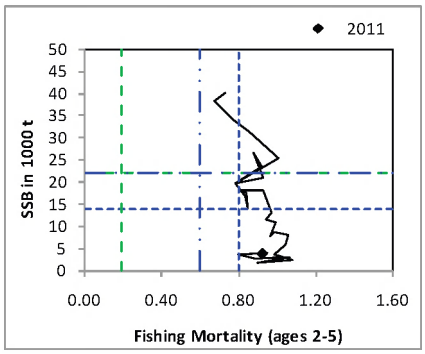
Advice for 2013 and 2014

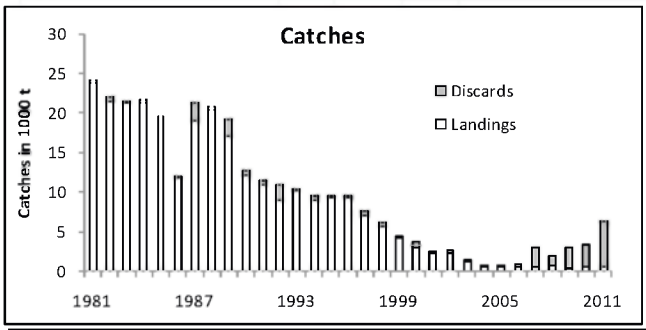
ICES advises on the basis of the MSY approach that there should be no directed fisheries and that bycatch and discards should be minimized in 2013 and 2014.

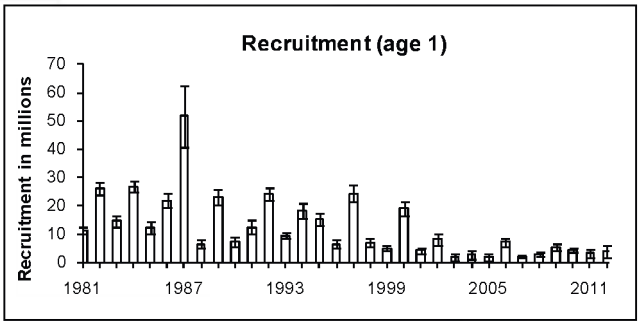
Stock status

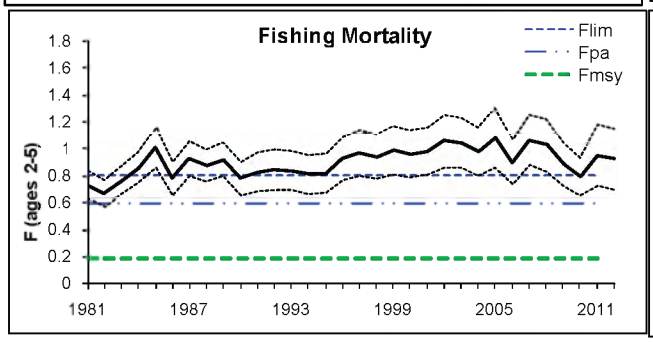
F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	⊗	⊗	⊗	Above target
Precautionary approach (F_{pa},F_{lim})	⊗	⊗	⊗	Harvest unsustainable

SSB (Spawning-Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	⊗	⊗	⊗	Below trigger
Precautionary approach (B_{pa},B_{lim})	⊗	⊗	⊗	Reduced reproductive capacity









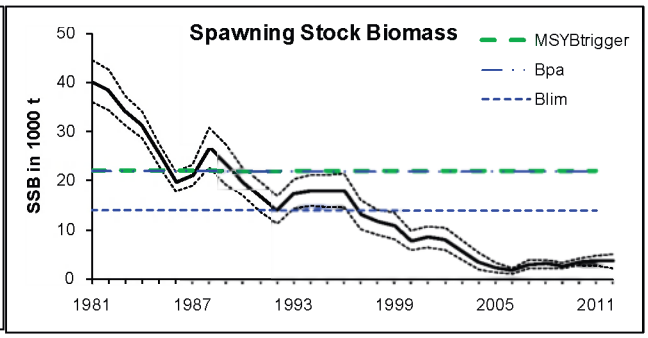


Figure 5.4.21.1 Cod in Division VIa (West of Scotland). ICES observed catches and summary of stock assessment (weights in thousand tonnes), dotted black lines are assessment estimates' standard error. Top right: SSB/F for the time-series used in the assessment.

Total mortality is high, and is increasingly the result of mortality due to discarding. The spawning-stock biomass continues to increase from an all-time low in 2006, but remains at a very low level (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 above recent average.

Management plans

Cod in Division VIa is subject to the EU cod long-term management plan (EC 1342/2008). ICES has not evaluated 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

A negative impact on recruitment with rising sea temperature has been shown for cod in the warmer waters of this species' range, including west of Scotland. Grey seal abundance is significant to the west of Scotland and they are known to feed on cod, among other species. The latest estimates of grey seal abundance over time show the population in the area to have remained stable since the mid-1990s (Thomas, 2011). The contribution of seal predation to total cod mortality is likely to be significant, but data are limited.

The fisheries

The >100 mm otter trawl gear vessels targeting finfish (TR1) take roughly 80% of the cod catch and the 70–99 mm *Nephrops* fleet (TR2) takes 15–20% of the catch. Part 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 11 times greater than landings, making catch (landings + discards) 12 times greater than landings.

Catch distribution	Total catch (2011) = 6364 t, where 8% are reported landings and 92% discards.

Effects of the fisheries on the ecosystem

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

Quality considerations

Due to changes to the Scotland survey design and gear after 2010, later surveys have to be considered as a new abundance series (UKSGFS-WIBTS-Q1 Q4). No fisheries-independent abundance series were available for 2011. Predicted catch is divided into landings and discards. Discard information is imprecise compared to landings data because of lower sampling coverage. Because catch is now dominated by discards it is very important to maintain the highest possible sampling (observer) coverage of vessels in Division VIa. Scottish landings and discards (from 2006) are adjusted by estimates of misreporting. The misreporting estimates will have uncertainty associated with them. Implementing surveys giving estimates of consumption by seals would give greater confidence in natural mortality estimates.

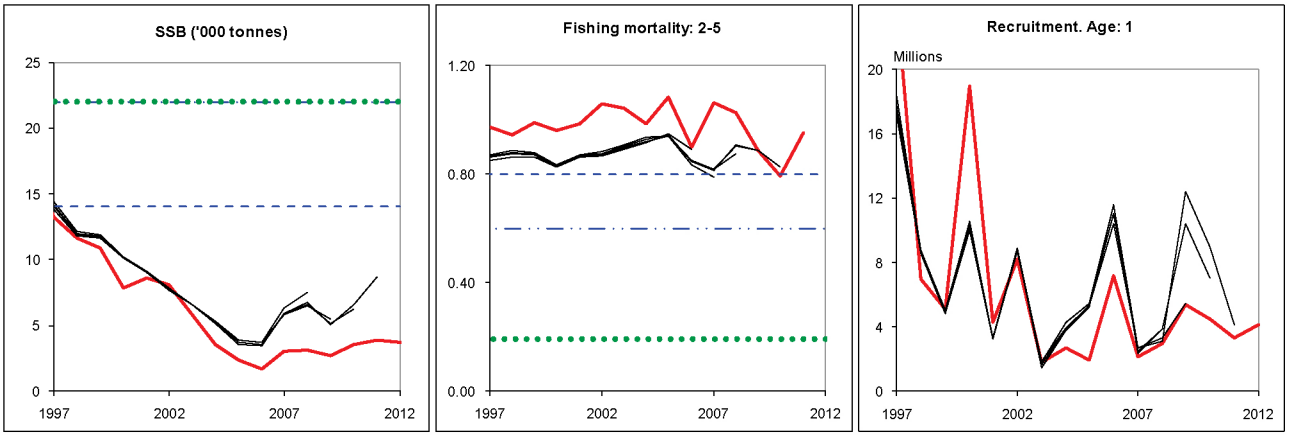


Figure 5.4.21.2 Cod in Division VIa (West of Scotland). Historical assessment results (final-year recruitment estimates included).

Scientific basis

Assessment type	Analytical age-based assessment (TSA).
Input data	One survey index (ScoGFS-WIBTS-Q1): 1985–2010.
Discards and bycatch	Included in the assessment 1978–1990 and 2006 onwards, age structure only from 1991 to 2005. Adjusted for misreporting 2006–onwards.
Indicators	ScoGFS-WIBTS-Q4, IGFS-WIBTS-Q4, UKSGFS-WIBTS-Q1, UKSGFS-WIBTS-Q4.
Other information	The stock was benchmarked in 2012.
Working group report	WGCSE

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

Reference points

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

(unchanged since: 2010)

Outlook for 2013 and 2014

Outlook Table A Basis: Management plan assumption mean F (2012) = mean F (2011)×0.75 = 0.71; Recruitment (2012) = 4.12 mln; SSB (2013) = 4.06; HC landings (2012) = 0.45; Discards (2012) = 1.74.

Rationale	Human Consumption landings (2013)	Basis	F Total (2013)	F HC (2013)	F Disc (2013)	Catch Total (2013)	Discards (2013)	SSB (2014)	%SSB change [1]
Management plan	0.46	F =0.75*0.75*F(2011) = 0.53	0.53	0.13	0.40	1.91	1.45	4.87	+20%

Units: '000 tonnes.
[1] SSB 2014 relative to SSB 2013.
Note: no information for % TAC change can be shown as a zero TAC was set in 2012.

Outlook Table B Basis: F(2012) = Fsq (2009-2011) = 0.88; SSB (2013) = 3.62; Recruitment (2012) = 4.12 mln; HC landings (2012) = 0.52; Discards (2012) = 2.02.

Rationale	Human Consumption landings (2013)	Basis	F Total (2013)	F HC (2013)	F Disc (2013)	Catch Total (2013)	Discards (2013)	SSB (2014)	%SSB change [1]
MSY transition	0.27	$(F_{2010}*0.4)+(F_{HCR-MSY}*0.6)$	0.34	0.07	0.27	1.18	0.91	5.24	+45%
MSY framework	0.03	$F_{MSY} * SSB_{2013}/MSY\ B_{trigger}$	0.03	0.01	0.02	0.12	0.09	6.63	+83%
Precautionary approach	0	B_{pa}	0	0	0	0	0	6.79	+88%
Zero catch	0	F = 0	0	0	0	0	0	6.79	+88%
Other options	0.15	$(F_{2012}*0.2)$	0.18	0.04	0.14	0.66	0.50	5.93	+64%
	0.28	$(F_{2012}*0.4)$	0.35	0.07	0.28	1.22	0.94	5.19	+43%
	0.39	$(F_{2012}*0.6)$	0.53	0.11	0.42	1.71	1.32	4.56	+26%
	0.48	$(F_{2012}*0.8)$	0.7	0.14	0.56	2.13	1.65	4.02	+11%
	0.55	$(F_{2012}*1.0)$	0.88	0.18	0.7	2.49	1.94	3.56	-1.7%
	0.61	$(F_{2012}*1.2)$	1.05	0.21	0.84	2.81	2.19	3.15	-13%

Units: '000 tonnes.
[1] SSB 2014 relative to SSB 2013.
Note: no information for % TAC change can be shown as a zero TAC was set in 2012.

MSY approach

Following the ICES MSY framework implies fishing mortality to be reduced to 0.03 (lower than F_{MSY} because SSB in 2013 is 84% below MSY $B_{trigger}$), resulting in landings of no more than 30 tonnes in 2013. This is expected to lead to an SSB of 6630 tonnes in 2014.

Following the transition scheme towards the ICES MSY framework implies fishing mortality to be reduced to 0.34, based on $(F_{2010}*0.4)+((F_{MSY}*(SSB_{2013}/MSY\ B_{trigger}))*0.6)$, resulting in landings of no more than 270 t in 2013. This is expected to lead to an SSB of 5240 tonnes in 2014.

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

Management plan

The stock is managed under the cod long-term management plan (EC 1342/2008). Until the 2012 assessment benchmark ICES considered it not possible to assess unaccounted mortality accurately. As a consequence ICES has not yet evaluated if the management plan is in accordance with the precautionary approach.

Following the agreed management plan implies F(2013) = 0.75 F(2012), where F(2012) has been assumed to correspond to the same reduction from F(2011) as the effort reduction imposed in 2012 with respect to the effort allowed in 2011. The effort reduction in 2011 was 25%. This results in a TAC of 460 t.

Precautionary 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.

Additional considerations

Management considerations

The stock is suffering impaired recruitment. The 2008 year class is estimated to be more abundant and is estimated to have been discarded in large quantities at age 3 in 2011. Estimated mortality is increasingly due to discards (Figure 5.4.21.4). SSB is very low. It is necessary to reduce all sources of fishing mortality to recover the stock above B_{pa} as quickly as possible.

Management measures taken thus far have not recovered the stock. There is a zero TAC for this area in 2012 and a 1.5% bycatch by live weight limit. This 1.5% rule applies to the retained part of the catches and therefore does not constrain discards.

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

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

Management plan evaluations

In 2009 the EU adopted a long-term plan for cod stocks and the fisheries exploiting those stocks (Council Regulation (EC) 1342/2008, see Annex 5.4.21). 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 moderate year classes, ICES could not conclude the plan was precautionary.

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

Regulations and their effects

The fishery is managed by a combination of TAC, area closures, technical measures, and effort restrictions. TAC restrictions on landings and effort and spatial management of fisheries catching cod in Division VIa have not controlled mortality levels. Catch (landings + discards) is 12 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 (2011) 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. For 2012 there is a zero TAC for cod and a 1.5% bycatch by live weight limit, but the catch composition limit on haddock has been removed (Reg. (EU) 161/2012).

Effort limitations

- Between 2003 and 2010 STECF (2011) reported that the fishing effort (in kW-days) of trawlers using >100 mm mesh declined by 48%. These vessels primarily targeted roundfish, including cod. Over the same period effort for trawlers using 70–99 mm mesh declined by 35%. These vessels primarily target *Nephrops*.
- Further effort reductions have been implemented since February 2012 under Annex IIa of Reg. (EC) 43/2012. 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

UK "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 four in 2008, twenty in 2009, nineteen in 2010, and four in 2011, representing 27%, 14%, 12%, and 2% of the total RTCs in each year. RTCs are determined by lpue, based on fine-scale VMS data and daily logbook records, and also by on-board inspections. The low number of RTCs west of Scotland result from few instances of high lpue in the area. Estimates of continuing high discard rates in Division VIa indicate the scheme has not been effective west of Scotland.

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 to 2005, relying on survey data for this period. Discard information is imprecise compared to landings data because of lower sampling coverage. Catch of this stock has been dominated by discards in recent years, see Figure 5.4.21.4. Mortality estimates arising from this assessment (heavily based on survey and or discard data) are considered to be 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. Scottish landings and discards (from 2006) are adjusted by estimates of misreporting. The misreporting estimates will have uncertainty associated with them.

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

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

Comparison with previous assessment and advice

The assessment is now fully quantitative with quantitative short-term prediction, while last year mortality estimates were considered too uncertain for providing predictions. The basis for the advice last year was precautionary considerations. The basis this year is the MSY approach.

Sources

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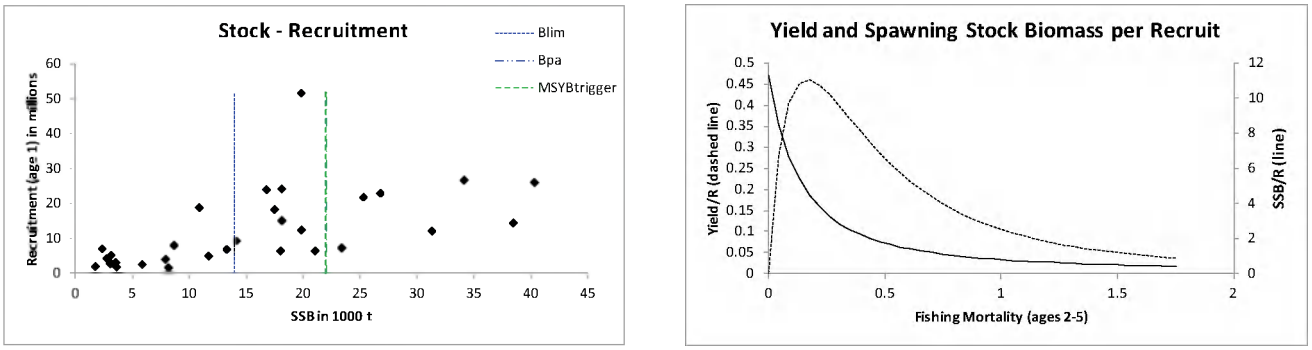


Figure 5.4.21.3 Cod in Division VIa. Stock–recruitment relationship (left panel) and yield-per-recruit analysis (right panel).

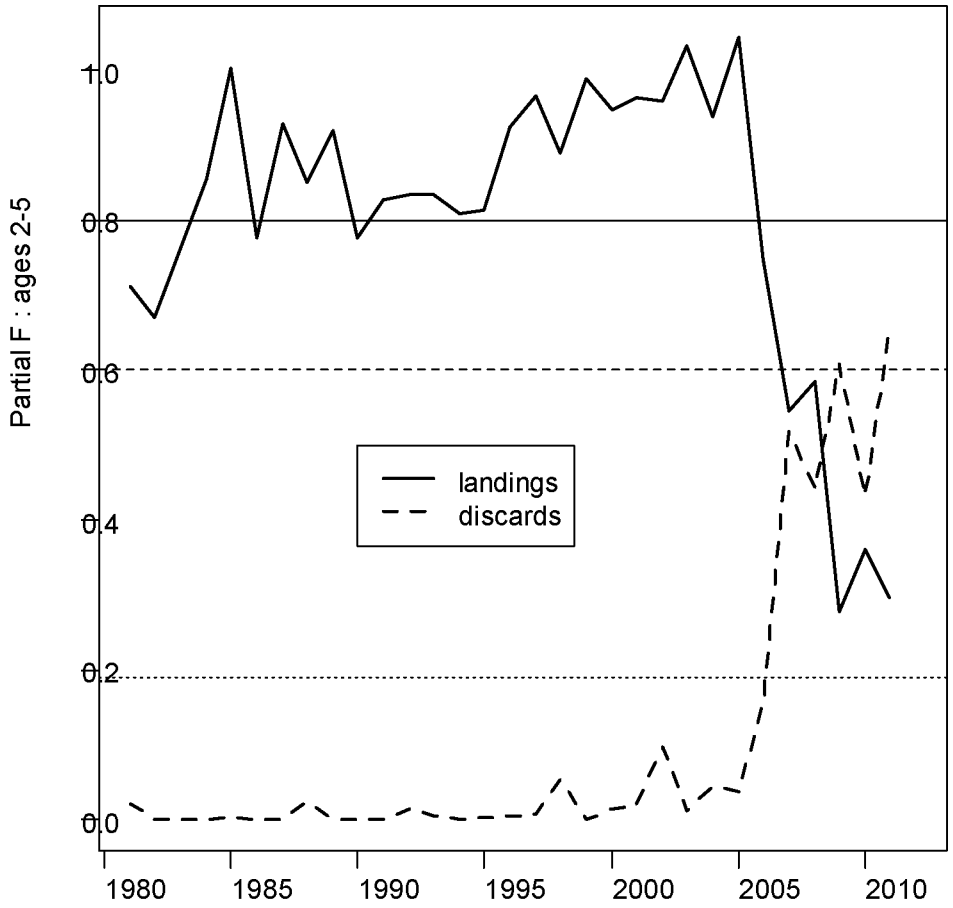


Figure 5.4.21.4 Cod in Division VIa. Partial mean F attributed to landings and discards. Horizontal lines represent F_{lim} (solid), F_{pa} (dashed), and F_{MSY} (dotted) values for the stock.

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

Year	ICES advice Single-stock exploitation boundaries since 2004	Predicted catch corresp. to advice	Agreed TAC[1]	Agreed TAC[2]	Official landings	ICES landings	ICES discards	ICES catch
1987	Reduce F towards F_{max}	18.0	22.0		19.2	19.0	2.39	21.39
1988	No increase in F; TAC	16.0	18.4		19.2	20.4	0.37	20.77
1989	80% of F(87); TAC	16.0	18.4		15.4	17.2	2.08	19.28
1990	80% of F(88); TAC	15.0	16.0		11.8	12.2	0.57	12.77
1991	70% of effort (89)	-	16.0		10.6	10.9[3]	0.62	11.52
1992	70% of effort (89)	-	13.5		9.0	9.7[4]	1.78	11.48
1993	70% of effort (89)	-	14.0		10.5	11.8[4]	0.14	11.94
1994	30% reduction in effort	-	13.0		9.1	10.8[4]	0.66	11.46
1995	Significant reduction in effort	-	13.0		9.7	9.6[4]	0.14	9.74
1996	Significant reduction in effort	-	13.0		9.6	9.4	0.06	9.46
1997	Significant reduction in effort	-	14.0		7.0	7.0	0.50	7.5
1998	20% reduction in F	9.5[6]	11.0		5.7	5.7	0.54	6.24
1999	F reduced to below F_{pa}	<9.7[6]	11.8		4.3	4.2	0.07	4.27
2000	Recovery plan, 60% reduction in F	<4.2	7.48		2.8[5]	3.0	0.82	3.82
2001	Lowest possible F, recovery plan	-	3.7		2.4	2.3	0.09	2.39
2002	Recovery plan or lowest possible F	-	4.6		2.2	2.2	0.48	2.68
2003	Closure	-	1.81		1.3	1.2	0.03	1.23
2004	Zero catch [7]	0	0.85		0.6	0.5	0.07	0.57
2005	Zero catch [7]	0	0.72		0.4	0.5	0.04	0.54
2006	Zero catch [7]	0	0.613		0.5	0.49[9]	0.50	0.99
2007	Zero catch [7]	0	0.49		0.5	0.59[9]	2.36	2.95
2008	Zero catch [7]	0	0.402		0.4	0.68[9]	1.36	2.04
2009	Zero catch [7]	0	0.302	0.240	0.23	0.41[9]	2.54	2.95
2010	Zero catch [7]	0		0.240	0.25	0.56[9]	2.88	3.44
2011	Zero catch [7]	0		0.182	0.22	0.52[9]	5.84	6.36
2012	Zero catch [7]	0		0[8]				
2013	No directed fisheries, minimise by-catch and discards	0						
2014	Same advice as for 2013	0						

Weights in thousand tonnes.

[1] TAC is for the whole of Subdivision Vb_1 and Subareas VI, XII, and XIV.

[2] TAC is for Subdivision Vb_1 and Division VIa.

[3] Not including misreporting.

[4] Including ICES estimates of misreporting.

[5] Incomplete data.

[6] For Division VIa only.

[7] Single-stock boundaries and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

[8] Bycatch of cod in the area covered by this TAC may be landed provided that it does not comprise more than 1.5% of the live weight of the total catch retained on board per fishing trip.

[9] Includes an adjustment for misreporting.

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

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Belgium	48	88	33	44	28	-	6	-	22	1	2	+	11	1	+
Denmark	-	-	4	1	3	2	2	3	2	+	4	2	-	-	+
Faroe Islands	-	-	-	11	26	-	-	-	-	-	-	-	-	-	-
France	7411	5096	5044	7669	3640	2220	2503	1957	3047	2488	2533	2253	956	714*	842*
Germany	66	53	12	25	281	586	60	5	94	100	18	63	5	6	8
Ireland	2564	1704	2442	2551	1642	1200	761	761	645	825	1054	1286	708	478	223
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-
Norway	204	174	77	186	207	150	40	171	72	51	61	137	36	36	79
Spain	28	-	-	-	85	-	-	-	-	-	16	+	6	42	45
UK (E., W., N.I.)	260	160	444	230	278	230	511	577	524	419	450	457	779	474	381
UK (Scotland)	8032	4251	11143	8465	9236	7389	6751	5543	6069	5247	5522	5382	4489	3919	2711
UK															
Total landings	18613	11526	19199	19182	15426	11777	10634	9017	10475	9131	9660	9580	6992	5671	4289
ICES landings	18607	11820	18971	20413	17169	12175	10927	9086	10314	8928	9439	9427	7033	5714	4201

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010*	2011*
Belgium	+	2	+								0	0
Denmark	-	-	-									
Faroe Islands	-	-	-		2	0	0.8	12	1		0.2	0
France	236	391	208	172	91	107	100.7	92	82	74	60.3	58.5
Germany	6	4	+	+			2	2	1	0	0	
Ireland	357	319	210	120	34	27.9	18	70	58.2	24.4	48.7	41.3
Netherlands	-	-	-	-						0		0
Norway	114*	40*	88	45	10	17	30	30	65	18	20.7	8.3
Spain	14	3	11	3								
UK (E., W., N.I.)	280	138	195	79	46	25		21	6	14		
UK (Scotland)	2057	1544	1519	879	413	243		260	232			
UK							332.1			104	118.6	109.1
Total landings	2767	2439	2231	1298	596	419.9	483.6	487	445.2	234.4	248.5	217.2
ICES landings	2977	2347.0	2242.6	1241.1	540.2	511.4	488.3	594.6	681.9	408.3	559.2	523.0

* Preliminary.

Table 5.4.21.3 Cod in Division VIa (West of Scotland). Summary of stock assessment (weights in thousand tonnes).

year	catch	catch. estimate	catch. se	landings	landings estimate	landings. se	discards	discards estimate	discards se	meanF. estimate	meanF se	SSB. estimate	SSB se	TSB estimate	TSB se	recruit. estimate	recruit se
1981	24.168	23.881	1.497	23.865	23.760	1.494	0.303	0.121	0.082	0.734	0.051	40.261	2.139	58.553	3.160	11.348	1.334
1982	22.082	21.141	1.279	21.511	20.586	1.294	0.571	0.555	0.233	0.671	0.048	38.418	2.033	58.057	2.680	26.247	2.107
1983	21.503	20.601	1.044	21.305	20.389	1.039	0.197	0.213	0.115	0.764	0.052	34.088	1.463	49.539	2.173	14.585	2.070
1984	21.601	20.785	1.019	21.272	20.072	1.044	0.329	0.713	0.269	0.857	0.056	31.261	1.357	53.536	2.105	26.873	1.830
1985	19.570	18.444	0.870	18.607	18.061	0.876	0.963	0.384	0.137	1.009	0.074	25.256	1.138	36.265	1.696	12.293	2.206
1986	12.083	12.364	0.813	11.820	11.688	0.775	0.263	0.676	0.197	0.778	0.063	19.789	1.025	34.445	1.730	21.939	2.313
1987	21.358	18.305	1.282	18.971	17.342	1.146	2.388	0.963	0.476	0.929	0.065	21.015	1.047	43.426	3.667	51.726	10.962
1988	20.781	19.264	1.824	20.413	19.043	1.813	0.368	0.221	0.095	0.875	0.059	26.751	2.063	43.125	3.881	6.615	1.286
1989	19.246	16.926	1.546	17.169	15.950	1.492	2.076	0.976	0.346	0.920	0.061	23.338	2.075	37.106	2.797	23.052	2.641
1990	12.746	12.303	0.875	12.175	12.178	0.867	0.571	0.125	0.051	0.778	0.061	19.806	1.394	27.692	1.916	7.504	1.824
1991	11.549	11.009	1.198	10.927	10.716	1.166	0.622	0.293	0.129	0.829	0.071	16.740	1.532	24.855	2.394	12.549	2.294
1992	10.865	10.055	1.140	9.086	9.356	1.100	1.779	0.699	0.213	0.849	0.075	14.071	1.411	25.027	2.216	24.097	2.343
1993	10.453	11.846	1.208	10.314	11.476	1.194	0.139	0.370	0.132	0.838	0.074	17.447	1.450	30.198	2.362	9.556	1.124
1994	9.588	11.656	1.201	8.928	11.128	1.159	0.661	0.528	0.183	0.811	0.072	18.081	1.514	28.782	2.396	18.445	2.705
1995	9.580	11.829	1.261	9.439	11.475	1.235	0.141	0.354	0.118	0.818	0.071	17.973	1.568	29.745	2.614	15.296	2.162
1996	9.489	12.492	1.396	9.427	12.276	1.376	0.063	0.215	0.076	0.929	0.080	18.079	1.728	26.699	2.632	6.588	1.416
1997	7.533	10.705	1.308	7.034	9.883	1.226	0.499	0.822	0.307	0.972	0.086	13.240	1.486	26.814	2.708	24.361	3.102
1998	6.252	9.683	1.221	5.714	9.447	1.204	0.538	0.236	0.098	0.942	0.083	11.656	1.291	19.043	2.105	7.003	1.618
1999	4.270	7.808	1.140	4.201	7.610	1.115	0.069	0.198	0.073	0.990	0.089	10.833	1.394	15.656	2.042	5.113	1.141
2000	3.798	6.823	0.918	2.977	6.175	0.855	0.821	0.648	0.238	0.960	0.087	7.856	1.038	16.497	1.931	18.982	2.693
2001	2.439	6.785	0.948	2.347	6.596	0.931	0.092	0.190	0.077	0.984	0.089	8.604	1.054	14.316	1.786	4.254	1.070
2002	2.722	6.524	1.006	2.243	6.259	0.969	0.480	0.265	0.120	1.057	0.096	8.107	1.134	12.932	1.840	8.206	1.942
2003	1.275	4.398	0.826	1.241	4.304	0.802	0.034	0.094	0.056	1.044	0.094	5.824	0.967	8.508	1.654	1.827	1.164
2004	0.612	2.534	0.665	0.540	2.435	0.634	0.072	0.100	0.057	0.983	0.090	3.574	0.848	5.023	1.330	2.699	1.365
2005	0.552	1.832	0.497	0.511	1.738	0.477	0.041	0.093	0.059	1.082	0.109	2.312	0.555	3.764	0.986	1.969	1.288
2006	0.992	1.494	0.288	0.488	0.402	0.069	0.504	1.092	0.251	0.900	0.081	1.700	0.317	4.231	0.667	7.198	1.484
2007	2.957	2.441	0.396	0.595	0.516	0.071	2.363	1.925	0.378	1.063	0.093	3.018	0.418	5.094	0.722	2.125	0.685
2008	2.045	2.208	0.322	0.682	0.564	0.082	1.363	1.644	0.317	1.026	0.098	3.102	0.413	4.548	0.583	2.958	0.795
2009	2.946	2.037	0.263	0.408	0.435	0.052	2.538	1.602	0.258	0.885	0.078	2.727	0.300	5.113	0.566	5.392	1.125
2010	3.440	2.375	0.338	0.559	0.543	0.057	2.881	1.831	0.327	0.793	0.068	3.498	0.411	6.396	0.779	4.470	0.904
2011	6.364	2.798	0.378	0.523	0.496	0.052	5.840	2.302	0.376	0.951	0.114	3.865	0.480	5.934	0.791	3.291	1.454
2012	NA	2.665	0.557	NA	0.764	0.244	NA	1.901	0.494	0.924	0.114	3.707	0.708	5.846	1.246	4.124	2.201

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 2013 and 2014

Based on the ICES approach for data-limited stocks, ICES advises that catches should be no more than 70 tonnes.

This is the first year ICES is providing quantitative advice for data-limited stocks (see Quality considerations).

Stock status

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	? Insufficient information

SSB (Spawning-Stock Biomass)	
	2009–2011
Qualitative evaluation	? Insufficient information

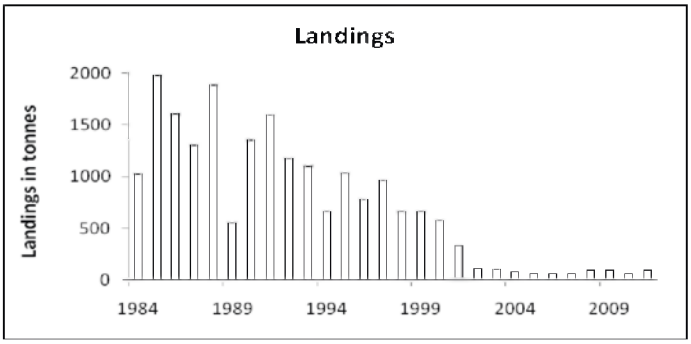


Figure 5.4.22.1 Cod in Division VIb (Rockall). Official landings (tonnes).

Landings have decreased from 2000 to less than 100 tonnes from 2002 onwards.There are doubts on the accuracy of the reported landings as these are reported by vessels operating in both Divisions VIa and VIb.

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 distribution	Official landings 2011 are 96.8 t. No discards information.

Quality considerations

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

The advice is based on a precautionary reduction of catches because of missing or non-representative data. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	No assessment.
Input data	Offical landings statistics.
Discards and bycatch	Not included in the assessment.
Indicators	Lpue from Irish and Scottisch otter trawl fleet.
Other information	None.
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 2013 and 2014

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

ICES approach to data-limited stocks

For data-limited stocks without information on abundance or exploitation ICES considers that a precautionary reduction of catches should be implemented, unless there is ancillary information clearly indicating that the current level of exploitation is appropriate for the stock.

For this stock, ICES advises that catches should decrease by 20% in relation to the last three years' average landings, corresponding to catches of no more than 70 t.

Additional consideration

The Irish trawlers lpue displays similar trends as the landings over the same period (Figure 5.4.22.2).

Comparison with previous advice

The advice last year was based on precautionary considerations. This year the advice is based on the ICES approach to data-limited stocks.

Source

ICES. 2012. Report of the Working Group on Celtic Seas Ecosystems (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM: 12.

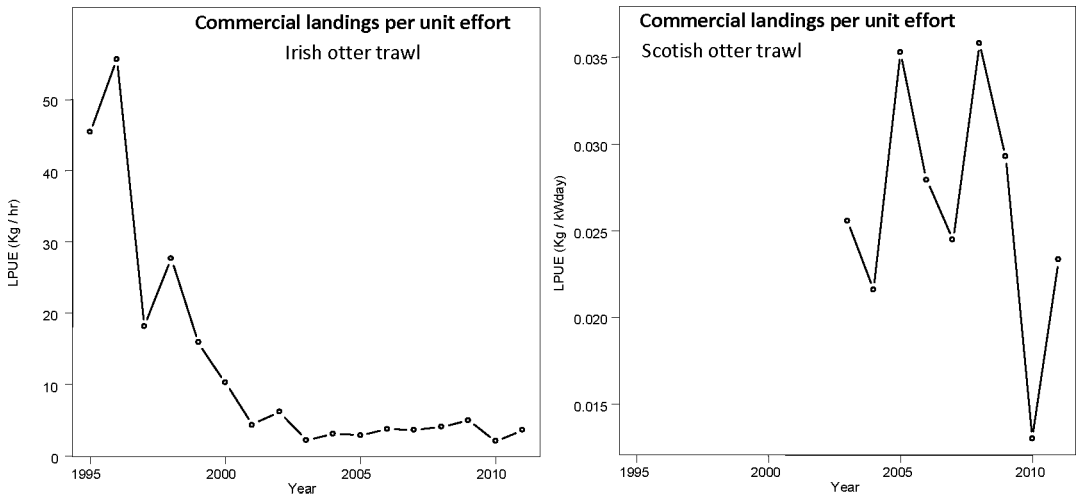


Figure 5.4.22.2 Cod in Division VIb (Rockall). Lpue of Irish otter trawl fleet (kg/hour) (left panel) and Scottish otter trawl fleet (kg/kW-days) (right panel).

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

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

Weights in tonnes.
[a)] Subarea VI; EC waters of Division Vb; EC and international waters of Subareas XII and XIV.
[b)] Division VIb; EU and international waters of Division Vb west of 12°00′W and of Subareas XII and XIV.

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	1023	1973	1600	1298	1886	549	1349	1596	1176	1097	661	1031

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	2011*
Faroe Islands	-		3	4.9	0.07
France	-			0	
Germany	-				
Ireland	24	40.7	20.4	6.4	11.7
Norway	12	14	25	27.2	48.9
Portugal	-				
Russia	-		1		
Spain	-				
UK (E. & W. & N.I.)					
UK (Scotland)	26	41.3	47.8		
UK				22.7	36.1
Total	62	96.0	97.2	61.2	96.8

* Preliminary.

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

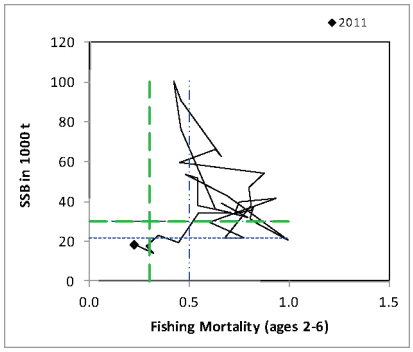
Advice for 2013

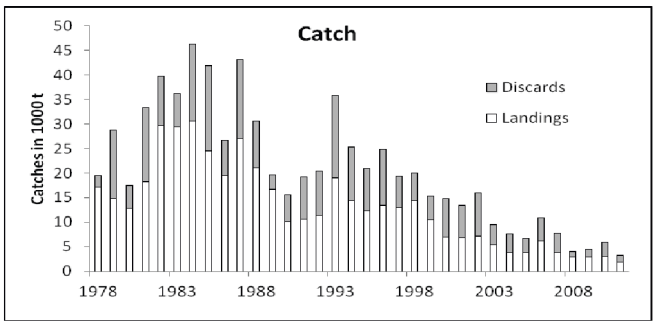
ICES advises on the basis of the MSY framework that landings in 2013 should be no more than 9300 t. Effective technical measures should be implemented to reduced high discard rates in the *Nephrops* fleet (TR2).

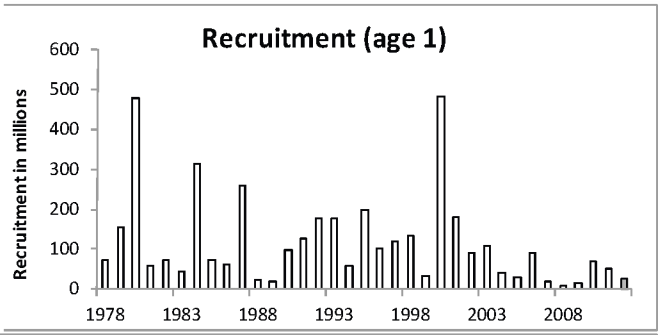
Stock status

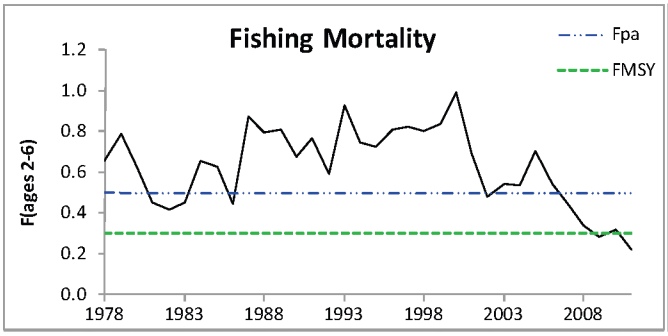
F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✓	✗	✓	Below target
Precautionary approach (F_{pa},F_{lim})	✓	✓	✓	Harvested sustainably

SSB (Spawning-Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	✗	✗	✗	Below trigger
Precautionary approach (B_{pa},B_{lim})	✗	✗	o	Increased risk









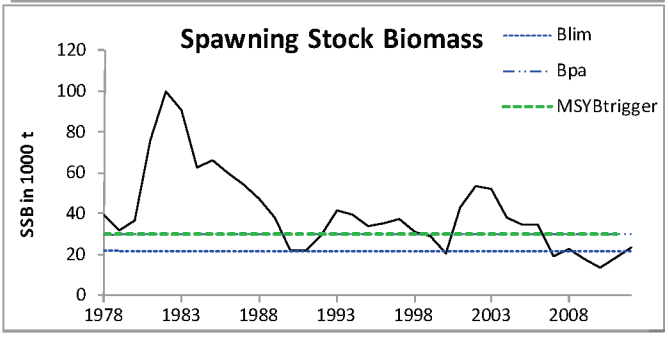


Figure 5.4.23.1 Haddock in Division VIa (West of Scotland). ICES observed catches and summary of stock assessment (weights in thousand tonnes). Predicted recruitment values are shaded. Top right: SSB/ F for the time-series used in the assessment.

The 2009 year class is above the average in the recent period, but is below the long-term average. Nevertheless, this year class is the main contributor to the increase of the SSB in 2012 to above B_{lim}. F has been above F_{pa} in most years since 1987 and has been declining since 1999. F is now below F_{MSY}.

Management plans

An EU management plan proposal (See Annex 5.4.23) was evaluated by ICES and is considered to be precautionary. The aim of this plan is to keep the SSB above 30 000 tonnes with a fishing mortality of no more than 0.3. The main elements in the plan are a 25% constraint on TAC change between years and lower fishing mortality rates whenever the SSB is lower than 30 000 t.

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 3227 tonnes; 46% of these are discards. Splitting discards by fleet shows that *Nephrops* vessels (TR2) are responsible for ~80% of all discards while landing only 80 tonnes, less than 5% of the total landings (1742 tonnes).

Catch distribution	Total catch (2011) = 3227 t, where the demersal fish fleet (TR1) contributes 1916 t (1633 t landed, 284 t discarded) and the *Nephrops* fleet (TR2) 1236 t (80 t landed, 1156 t discarded). Unaccounted removals are ~2%, representing ~75 t.

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 landings statistics. The survey design and gear of the Scottish west coast surveys (ScoGFS-WIBTS-Q1 and ScoGFS-WIBTS-Q4) were changed and will be maintained hereafter. Since 2011, the assessment has been relying on new catch data. With no survey to give indication on recruitment, the last recruitment was calculated from the geometric mean for (2004–2009).

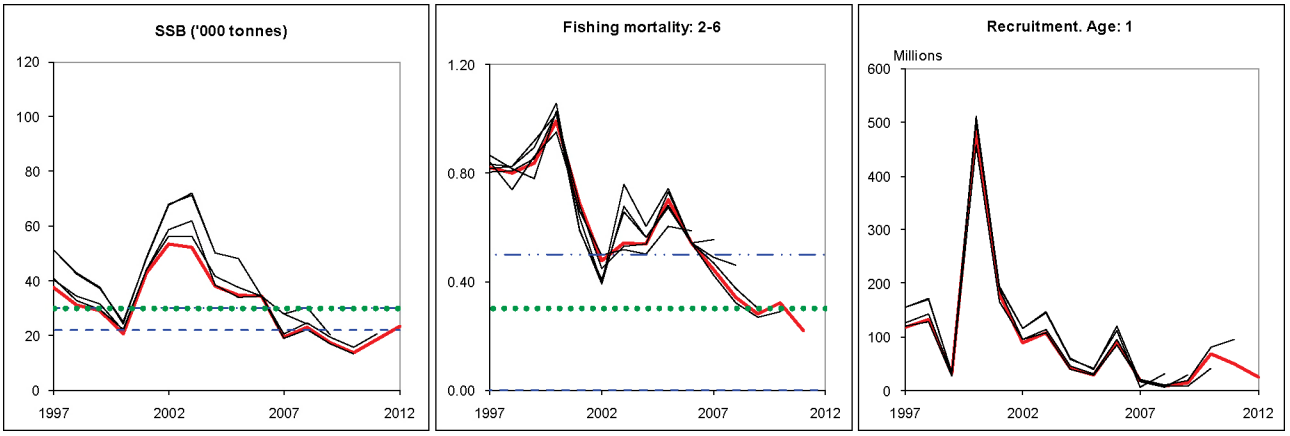


Figure 5.4.23.2 Haddock in Division VIa (West of Scotland). Historical assessment results (final-year recruitment estimates included).

Scientific basis

Assessment type	Analytical age-based assessment (TSA).
Input data	Two survey indices (ScoGFS-WIBTS-Q1 up to 2010, ScoGFS-WIBTS-Q4 up to 2009).
Discards and bycatch	Included in the assessment.
Indicators	IRGFS-WIBTS-Q4, UKSGFS-WIBTS-Q1, and UKSGFS-IBTS-Q4.
Other information	Catch data were re-introduced for years since 2006.
Working group report	WGCSE

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

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	30 000 t	B_{pa}
	F_{MSY}	0.3	Provisional proxy by analogy with North Sea haddock. Fishing mortalities in the range of 0.19–0.41 are consistent with F_{MSY}.
Precautionary Approach	B_{lim}	22 000 t	$B_{lim} = B_{loss}$, the lowest observed spawning stock estimated since the reference point was established in 1998.
	B_{pa}	30 000 t	$B_{pa} = B_{lim}$ *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 SSB< B_{pa}.

(unchanged since: 2010)

Outlook for 2013

The short-term forecast is presented in terms of total removals. These are then divided into landings (56%), discards (36%), and unallocated removals (8%), using the most recent assessment to calculate the average proportions of these catch components over the last three years.

Basis: F(2012) = F_{sq} = F (2009–2011) = 0.27 ; SSB (2013) = 31.6; R (2013) = GM (2004–2009) = 24.8 million, R (2014) = GM (2004–2009) = 24.8 million; Removals (2012) = 10.9.

Rationale	Human Consumption landings (2013)	Basis	F Total (2013)	F HC (2013	F Discard (2013)	F Unallocated (2013)	Catch Total (2013)	Discards (2013)	Unallocated removals (2013)	SSB (2014)	%SSB change 1)	%TAC change 2)
Management plan proposal	7.519	+25%TAC (F_{sq} *0.86)	0.24	0.13	0.08	0.02	13.4	4.8	1.1	35.5	+12%	+25%
MSY framework	9.3	F_{MSY} (F_{sq}*1.1)	0.30	0.17	0.11	0.02	16.7	6.0	1.3	33.3	+5%	+55%
Precautionary approach	11.5	$SSB_{2014}>B_{pa}$	0.38	0.21	0.14	0.03	20.4	7.4	1.6	30.8	−3%	+90%
Zero catch	0	F = 0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	44.5	+41%	−100%
Other options	6.0	F_{sq} *0.673	0.18	0.10	0.07	0.01	10.7	3.9	0.9	37.3	+18%	0%
	4.5	F_{sq} *0.493	0.14	0.08	0.05	0.01	8.1	2.9	0.6	39.1	+24%	−25%
	8.6	F_{sq}*1	0.27	0.15	0.10	0.02	15.3	5.5	1.2	34.2	+8%	+43%

Weights in thousand tonnes.

1) SSB 2014 relative to SSB 2013.

2) Human consumption (HC) landings 2013 relative to TAC 2012.

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MSY approach

Following the ICES MSY framework implies a fishing mortality less than 0.3, resulting in landings of 9300 tonnes in 2013. This is expected to lead to an SSB of 33 300 tonnes in 2014.

Since F is below F_{MSY} in 2011, the transition to MSY option is not relevant.

Management plan

ICES evaluated an EU management plan proposal (see Annex 5.4.23) and considered it to be precautionary. Following the plan would result in a 25% TAC increase. This would result in removals from the stock of 13 400 tonnes, and landings of 7519 tonnes in 2013. This is expected to lead to an SSB of 35 500 tonnes in 2014.

Precautionary approach

A fishing mortality of 0.38 is needed to increase SSB to around B_{pa} in 2014. This corresponds to landings no more than 11 450 tonnes 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. To address this issue an EU Commission Regulation No. 161/2012 has been approved that suspends the catch composition rules as regards haddock.

Management considerations

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

As in previous years the majority of discards occurred in the *Nephrops* fleet (TR2) (~80% of all discards). Any measure to reduce discarding and to improve the fishing pattern should be actively encouraged.

Effort data 1998–2011 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, but unlike TR1 vessels the effort 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 to 2005 were not used

in the assessment. In 2010 fishery landings and catch-at-age data from 2006 onwards were re-introduced in the assessment, based on the perception of improved accuracy of landings statistics.

Uncertainties in assessment and forecast

The main uncertainty in the forecast is upcoming recruitments. Since the redesign of both ScoGFS-WIBTS-Q1 and Q4 the recruitment has been assumed as a geometric mean of the last 6 years in a conservative approach to account for low recruitment values shown in the surveys (used as proxy).

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

Comparison with previous assessment and advice

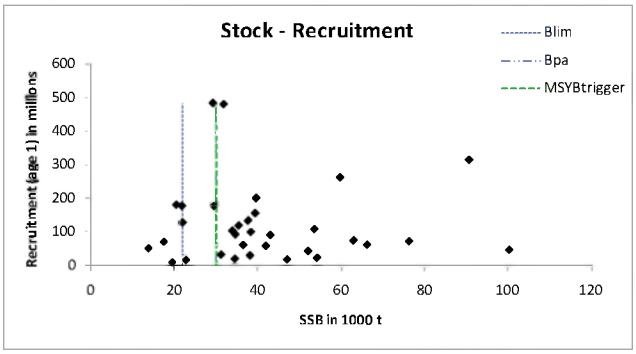
SSB in 2011 was revised downwards by 10% and F in 2010 upwards by 11% compared to last year's assessment.

With the 2005 year classes moving quickly out of the population another decline in SSB is expected. Last year's assessment forecasted a recruitment for 2011 of ~95 million, but all the indicators used in assessment show that the 2011 recruitment was overestimated.

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

Source

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



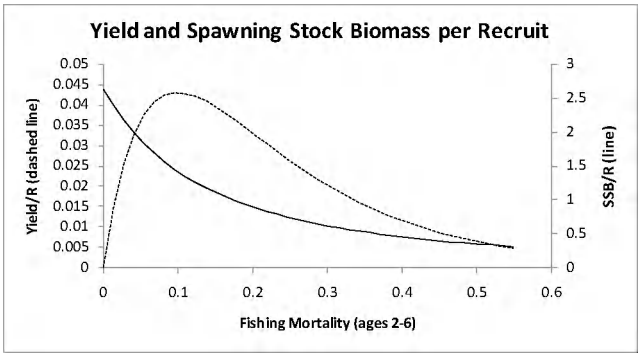


Figure 5.4.23.3 Haddock in Division VIa (West of Scotland). Yield-per-recruit analysis (left) and stock–recruitment plot (right).

Table 5.4.23.1 Haddock in Division VIa (West of Scotland). ICES advice, management, 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	¾* 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	1.7	1.7	n/a	n/a
2012	MSY framework	10.2	6.015				
2013	MSY framework	9.3					

Weights in thousand tonnes.

[1] TAC is set for Divisions VIa and VIb (plus Subdivision Vb_1 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 1989.

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Belgium	9	-	9	1	7	1	-	1	3	2	2	1
Denmark	<0.5	<0.5	<0.5	<0.5	1	-	1	1	-	-	-	-
Faroe Islands	13	-	1	-	-	-	-	-	-	-	-	-
France	1335	863	761	762	1132	753	671	455	270	394	.	282
Germany	.	.	1	2	9	19	14	2	1	1	2	1
Germany, F.R.	4	15	.	.	.	.	.	.	.	.	.	.
Ireland	2171	773	710	700	911	746	1406	1399	1447	1352	1054	677
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-
Norway	74	46	12	72	40	7	13	16	21	28	18	70
Spain	-	-	-	-	-	-	1	-	-	2	4	<0.5
UK – (E&W)[2]	235	164	137	132	155	254	322	448	493	458	315	199
UK - Scotland	19940	10964	8434	5263	10423	7421	10367	10790	10352	12125	8630	5933
Un. Sov. Soc. Rep.	-	-	59	.	.	.	.	.	.	.	.	.
Total reported	23781	12825	10124	6932	12678	9201	12795	13112	12587	14362	10025	7163
WG estimates	16691	10141	10557	11351	19068	14272	12368	13466	12883	14401	10464	6958

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[1]
Belgium	2	-	-	<0.5	-	-	-	-	.	.	.
Denmark	-	-	<0.5	<0.5	-	-	.	.	.	.	.
Faroe Islands	-	-	-	4	-	1	2	<0.5	-	-	.
France	160	151	183	173	273	291	211	151	136	89	75
Germany	1	-	-	-	1	7	-	1	-	1	
Germany, F.R.	.	.	.	.	.	.	.	.	.	.	
Ireland	744	672	497	194	152	526	759	879	297	396	291
Netherlands	-	-	-	1	-	-	-	-	.	.	
Norway	32	30	23	4	21	17	16	28	18	11	4
Spain	4	4	5	-	47	44	5	10	21	28	
UK – (E&W)[2]	201	237	107	93	42	19	193	32	14	7	
UK - Scotland	5886	5988	4582	2909	2025	4928	2587	1744	2366	2407	1373
Un. Sov. Soc. Rep.	.	.	.	.	.	.	.	.	.	.	
Total reported	7030	7082	5397	3378	2561	5833	3773	2845	2852	2939	1743
WG estimates	6762	7115	5337	3874	3792	6266	3777	2848	2851	3016	1737

[1]Preliminary.
[2]1989–2005 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 Division VIa (West of Scotland). Summary of stock assessment.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Discards tonnes	Catches tonnes	Mean F Ages 2–6
1978	72985	39393	17187	2318	19505	0.658
1979	154490	31819	14837	13841	28678	0.789
1980	478997	36522	12759	4715	17474	0.627
1981	59881	76293	18233	15048	33281	0.455
1982	70906	100293	29635	10063	39698	0.419
1983	45651	90641	29411	6781	36192	0.455
1984	313813	62972	30689	15666	46355	0.659
1985	73622	66221	24451	17385	41836	0.630
1986	60114	59727	19561	7153	26714	0.447
1987	261243	54258	27012	16193	43205	0.872
1988	21680	47080	21153	9519	30672	0.794
1989	17085	38327	16691	2979	19670	0.807
1990	98097	21993	10141	5381	15522	0.680
1991	127085	21819	10557	8691	19248	0.770
1992	176428	29519	11351	9161	20512	0.596
1993	175661	41949	19068	16803	35871	0.931
1994	57053	39646	14272	11070	25342	0.746
1995	199819	33882	12368	8552	20920	0.725
1996	102735	35438	13466	11351	24817	0.809
1997	117965	37685	12883	6461	19344	0.822
1998	132662	31226	14401	5535	19936	0.802
1999	31438	29225	10464	4856	15320	0.838
2000	483398	20505	6958	7893	14851	0.994
2001	180209	43053	6762	6626	13388	0.690
2002	89625	53595	7115	8862	15977	0.478
2003	106972	52071	5337	4101	9438	0.541
2004	41658	38164	3874	3705	7579	0.540
2005	28892	34601	3792	2902	6694	0.704
2006	91247	21175	6266	4618	10884	0.599
2007	18173	19566	3777	3968	7745	0.444
2008	7859	22844	2848	1229	4077	0.342
2009	14759	17550	2851	1643	4494	0.281
2010	68637	13890	3016	2812	5828	0.321
2011	50295	18624	1737	1540	3277	0.219
2012	24779*	24804				
Average	118563	40634	13086	7630	20716	0.632

* $GM_{04–09}$.

Annex 5.4.23 EU management proposal

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)

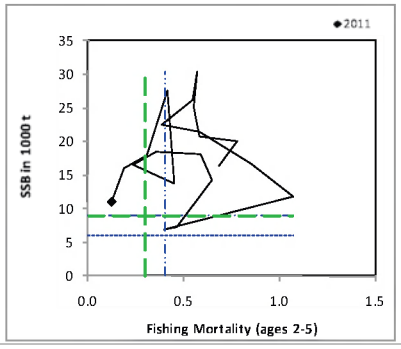
Advice for 2013

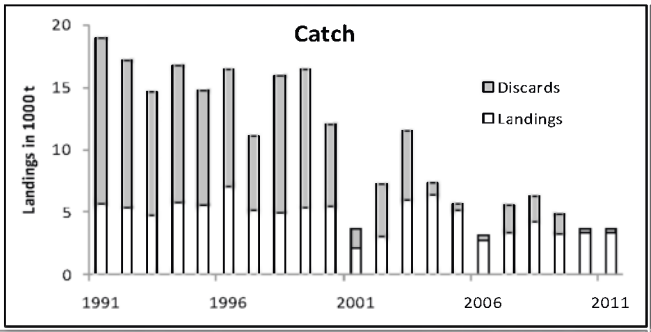
ICES advises on the basis of the MSY approach that there should be no directed fisheries and that bycatch and discards should be minimized in 2013. Due to extremely low recruitment in recent years, SSB is predicted to decrease strongly and be below B_{lim} in 2013 and 2014.

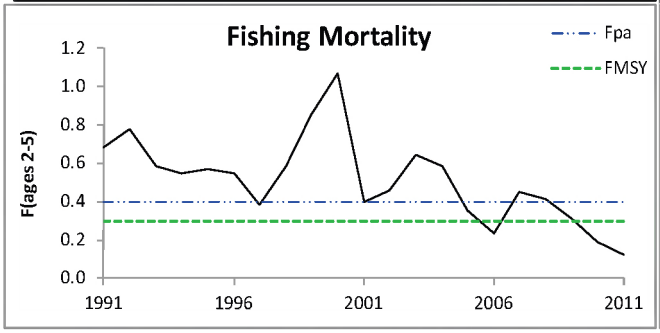
Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✗	✓	✓	Below target
Precautionary approach (F_{pa},F_{lim})	✓	✓	✓	Harvest sustainably

SSB (Spawning-Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	✓	✓	✓	Full reproductive capacity







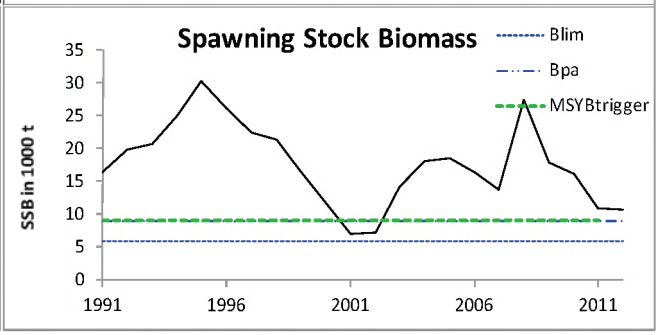


Figure 5.4.24.1 Haddock in Division VIb (Rockall). Summary of stock assessment (weights in thousand tonnes). Recruitment in 2012 is predicted. Top right: SSB and F for the time-series used in the assessment.

Recruitments since 2007 are estimated to be extremely weak. The spawning-stock biomass increased up to 2008 as a result of the 2001 and 2005 year classes and has decreased constantly since then. SSB has been above MSY $B_{trigger}$ since 2003 but is now expected to decrease below B_{lim}. Fishing mortality has declined over time and is now below F_{MSY}.

Management plans

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

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. An increase in temperature leads to an acceleration of metabolic processes and an increase in the energy and food consumption. At the same time there was a significant reduction of *Calanus finmarchicus* which is the main food item for larval and juvenile haddock at Rockall. In this situation of food scarcity a negative impact on juveniles has increased predation and food competition from the grey gurnard. All these factors led to a reduction in the recruitment of Rockall haddock.

The fisheries

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

Catch distribution	Total catches (2011) = 2.1 kt, where 1.9 kt were landings (93%) and 0.2 kt discards (7% by weight and 11% by numbers).

Effects of the fisheries on the ecosystem

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

Quality considerations

An improved time-series of landings and discards is needed for this assessment. The survey used in the assessment was not carried out in 2010. The survey was resumed in 2011 in an attempt to make the assessment more robust. The effect of the new survey design needs to be further evaluated.

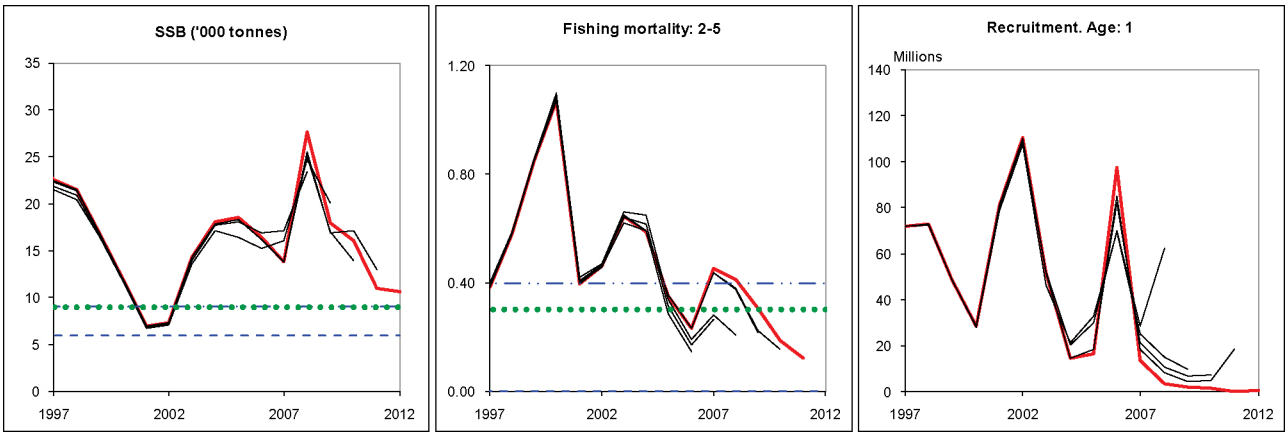


Figure 5.4.24.2 Haddock in Division VIb (Rockall). Historical assessment results (final-year recruitment estimates included).

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	None.
Other information	Russian trawl-acoustic survey and the trawl survey-based assessment.
Working group report	WGCSE

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

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	9000 t	B_{pa}
	F_{MSY}	0.3	Provisional proxy by analogy with North Sea haddock. Fishing mortalities close to F_{sq} in 2010.
Precautionary Approach	B_{lim}	6000 t	$B_{lim} = B_{loss}$, the lowest observed spawning stock estimated in previous assessments.
	B_{pa}	9000 t	$B_{pa} = B_{lim} * 1.5$. This is considered to be the minimum SSB required to obtain a high probability of maintaining SSB above B_{lim}, taking into account the uncertainty of assessments.
	F_{lim}	Not defined.	Not defined due to uninformative stock recruitment data.
	F_{pa}	0.4	This F is adopted by analogy with other haddock stocks as the F that provides a small probability that SSB will fall below B_{pa} in the long term.

(unchanged since: 2010; Bpa basis corrected in 2012)

Outlook for 2013

Basis: $F_{2012} = F_{sq}$ = F (2009–2011) = 0.21; SSB (2013) = 5.76; R (2012) = 398 thousands; R (2013) = 13 432 thousands; Landings (2012) = 3.26; Total catch (2012) = 3.43.

Rationale	**Human consumption (2013)**	**Basis**	**F (2013)**	**Catch Total (2013)**	**SSB (2014)**	**SSB_{2014}/ MSY $B_{trigger}$**	**%SSB change** [1)]	**%TAC change** [2)]
MSY framework	1.7	F_{MSY} *SSB_{2013}/MSY $B_{trigger}$	0.19	1.9	3.4	0.38	-41.2	-48.5
Precautionary approach	SSB<B_{pa} for all scenarios	Maintain SSB>B_{pa}	-	-	-	-	-	-
Zero catch	0.0	F=0	0.0	0.0	5.0	0.55	-11.8	-100.0
Other options	0.4	F_{2012} *0.2	0.04	0.5	4.6	0.51	-13.6	-87.9
	1.1	$F_{0.1}$ (F_{2012}*0.55)	0.11	1.2	3.9	0.43	-32.6	-66.7
	1.6	F_{2012} *0.8	0.16	1.7	3.5	0.39	-39.5	-51.5
	1.7	F_{2012} *0.9	0.19	1.9	3.4	0.38	-41.2	-48.5
	1.9	F_{2012}	0.21	2.0	3.2	0.36	-44.7	-42.4
	2.805	-15% TAC (F_{2012}*1.7)	0.35	3.0	2.4	0.27	-58.5	-15.0
	3.3	0% TAC (F_{2012}*2.2)	0.45	3.6	1.9	0.21	-67.2	0.0
	3.0	F_{pa} (F_{2012}*1.95)	0.4	3.3	2.1	0.23	-63.7	-9.1
	3.795	+15% TAC (F_{2012}*2.9)	0.6	4.2	1.4	0.16	-75.8	15.0
	3.1	F_{2012} *2.0	0.41	3.4	2.1	0.23	-63.7	-6.1

Weights in thousand tonnes.

[1)] SSB 2014 relative to SSB 2013.

[2)] Human consumption landings 2013 relative to TAC 2012.

Total catches have been divided into landings and discards using the average ratio of discards to catches over the period 1999–2011.

MSY approach

Following the ICES MSY framework implies fishing mortality at $F_{MSY-HCR}$ = F_{MSY} *SSB_{2013}/MSY $B_{trigger}$ = 0.19, resulting in landings of no more than 1700 t in 2013. This is expected to lead to an SSB of 3400 t in 2014, which is below MSY $B_{trigger}$.

However, considering the extremely low recruitment since 2007 and that SSB will be below MSY $B_{trigger}$ in 2014 for all catch scenarios, it is not possible to identify any non-zero catch which would be compatible with the MSY approach.

Also, bycatches including discards of haddock in all fisheries in Division VIb should be reduced to the lowest possible level. Further management measures should be introduced to reduce discarding of small haddock in order to maximize their contribution to future yield and SSB.

Precautionary approach

SSB in 2014 is estimated to be below B_{lim} for all scenarios. It is not possible to identify any non-zero catch which would be compatible with the precautionary approach.

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 extremely low. There is a high probability that the SSB will decrease to levels below MSY $B_{trigger}$ and to B_{pa} already in 2013.

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 later years, effort and catch of non-EU fleets have significantly declined and there was no fishery without TAC in 2011, but the stock declined significantly. 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 averages around 60% (by weight) over 1991–2003 and 20% in the recent period (2004–2011). Some countries land the whole catch while others discard part of the catch. For the latter, discard rates on observer trips in the past were as high as 52–87% in numbers. In later years the discards ratio has declined as a result of the poor year classes and decreasing number of small haddock. 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 increased in 2003–2008 but has decreased since 2009. The fishing mortality has decreased since 2004. In 2006 and 2011, mortality reached the lowest estimates for the last 20 years. Fishing mortality has decreased for small individuals (ages 1 and 2) since 2001.The recruitment has been extremely low since 2007.

Data and methods

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

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

Uncertainties in assessment and forecast

A main uncertainty in the assessment and forecast concerns the estimates of discards in the EU fleets. In some years, including 2011, these are directly estimated from sampling on-board 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. Furthermore, in 2010 there was no discard sampling or survey, and average discard rates were applied. There are doubts on the level of agreement of age reading by international experts.

Comparison with previous assessment and advice

The assessment is an update of last year's assessment with the resumption of the survey in 2011. Fishing mortality in 2010 has been revised upward by 18%, and SSB in 2010 has been revised downward by 6%, when compared with last year's assessment.

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

Sources

ICES. 2012a. Report of the Working Group on Celtic Seas Ecosystems (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

ICES, 2012b. Report of the International Bottom Trawl Survey Working Group (IBTSWG), 27–30 March, Lorient, France. ICES CM 2012/SSGESST:03.

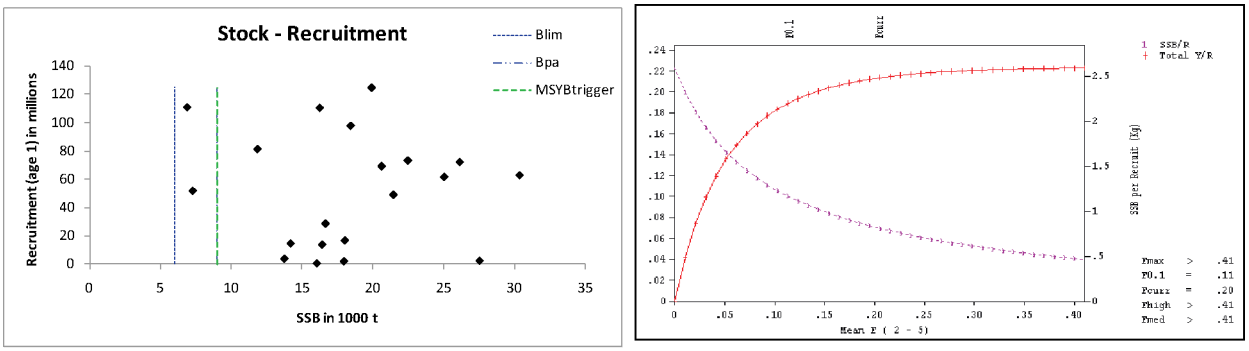


Figure 5.4.24.3 Haddock in Division VIb (Rockall). Stock–recruitment relationship (left panel) and yield-per-recruit analysis (right panel).

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	*Status quo* 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]	1.9	1.9
2012	MSY approach	<3.3[7]	3.300[8]		
2013	No directed fisheries, minimize bycatch and discards	0			

Weights in thousand tonnes.
[1] Including misreporting.
[2] Landings at *status quo* F.
[3] Incomplete data.
[4] Discards are not taken into account for the assessment, and data of the Russian fleet which lands the whole catch were adjusted to exclude fish below MLS of 30 cm.
[5] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.
[6] This corresponds to catch (= landings + discards).
[7] This corresponds to landings.
[8] Agreed EU TAC for Division VIb and Subareas XII and XIV.

Table 5.4.24.2 Haddock in Division VIb (Rockall). Nominal catch (tonnes), 1994–2011, as officially reported to ICES.

COUNTRY	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010[1]	2011[1]
Faroe Islands	-	-	-	-	-	-	n/a	n/a	-	-	-	-	2	2	16	16	42	2
France	…[2]	…[2]	-	-	-	-	5	2	-	1	-	-	-	-	-	-	-	<1
Iceland	-	-	-	+	-	167	-	-	-	-	-	-	-	-	-	-	-	-
Ireland	956	677	747	895	704	1021	824	357	206	169	19	105	41	338	721	352	169	123
Norway	75	29	24	24	40	61	152	70	49	60	32	33	123	84	36	71	65	40
Portugal	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Russian Federation	-	-	-	-	-	458	2154	630	1630	4237	5844	4708	2154	1282	1669	55	198	-
Spain	-	28	1	22	21	25	47	51	7	19	-	-	5	-	-	-	-	-
UK (E,W&NI)	169	318	293	165	561	288	36	-	-	56	-	-	-	-	-	-	-	-
UK (Scot.)	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]	1,738[3]
Total	3735	5491	6818	5220	5098	5990	5688	2315	3037	6148	6306	5178	2765	3349	4221	3445	3405	1,903
Unallocated catch	1998	-379	-543	-591	-599	-851	-357	-279	299	94[5]	139[5]	1	0	0	0	0	0	0
WG estimate	5733	5112	6275	4629	4499	5139	5331[4]	2036[4]	3336[4]	6242[4]	6445	5179	2765	3349	4221	3445	3405	1,903

[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 Age 1 thousand	Recruitment tonnes	SSB tonnes	Catches tonnes	Landings tonnes	Discards tonnes	Mean F Total Ages 2–5
1991	110673	16293	18883	5655	13228	0.6852
1992	110396	19953	17191	5320	11871	0.7753
1993	124613	20664	14637	4784	9853	0.5827
1994	69113	25074	16756	5733	11023	0.5498
1995	61545	30389	14755	5587	9168	0.5681
1996	62632	26169	16431	7075	9356	0.5472
1997	71929	22500	11060	5166	5894	0.3826
1998	73055	21499	15846	4984	10862	0.5814
1999	48873	16713	16283	5221	11062	0.8502
2000	28468	11892	11167	4558	6609	1.0698
2001	81110	6952	3658	1918	1535	0.3974
2002	110762	7338	7269	2571	4152	0.461
2003	51510	14244	11490	5961	5521	0.6459
2004	14318	18064	7320	6400	883	0.5868
2005	16583	18479	5696	5191	505	0.353
2006	97604	16459	3142	2759	386	0.2339
2007	13432	13797	5590	3348	2242	0.452
2008	3617	27573	6321	4205	2100	0.4131
2009	1991	17991	4794	3237	1557	0.3054
2010	1667	16090	3710	3404	306	0.1872
2011	260	11007	2057	1905	152	0.1241
2012	398*	10654				
Average	54960	18054	10193	4523	5632	0.512

* RCT3 estimates.

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

Advice for 2013

ICES advises on the basis of the precautionary approach that catches in 2013 should be reduced to the lowest possible level and that effective technical measures should be implemented to reduce discards in the *Nephrops* (TR2) fleet.

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	?	?	?	Unknown
Precautionary approach (F_{pa},F_{lim})	✓	✓	✓	Harvested sustainably

SSB (Spawning Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	?	?	?	Unknown
Precautionary approach (B_{pa},B_{lim})	✗	✗	✗	Reduced reproductive capacity

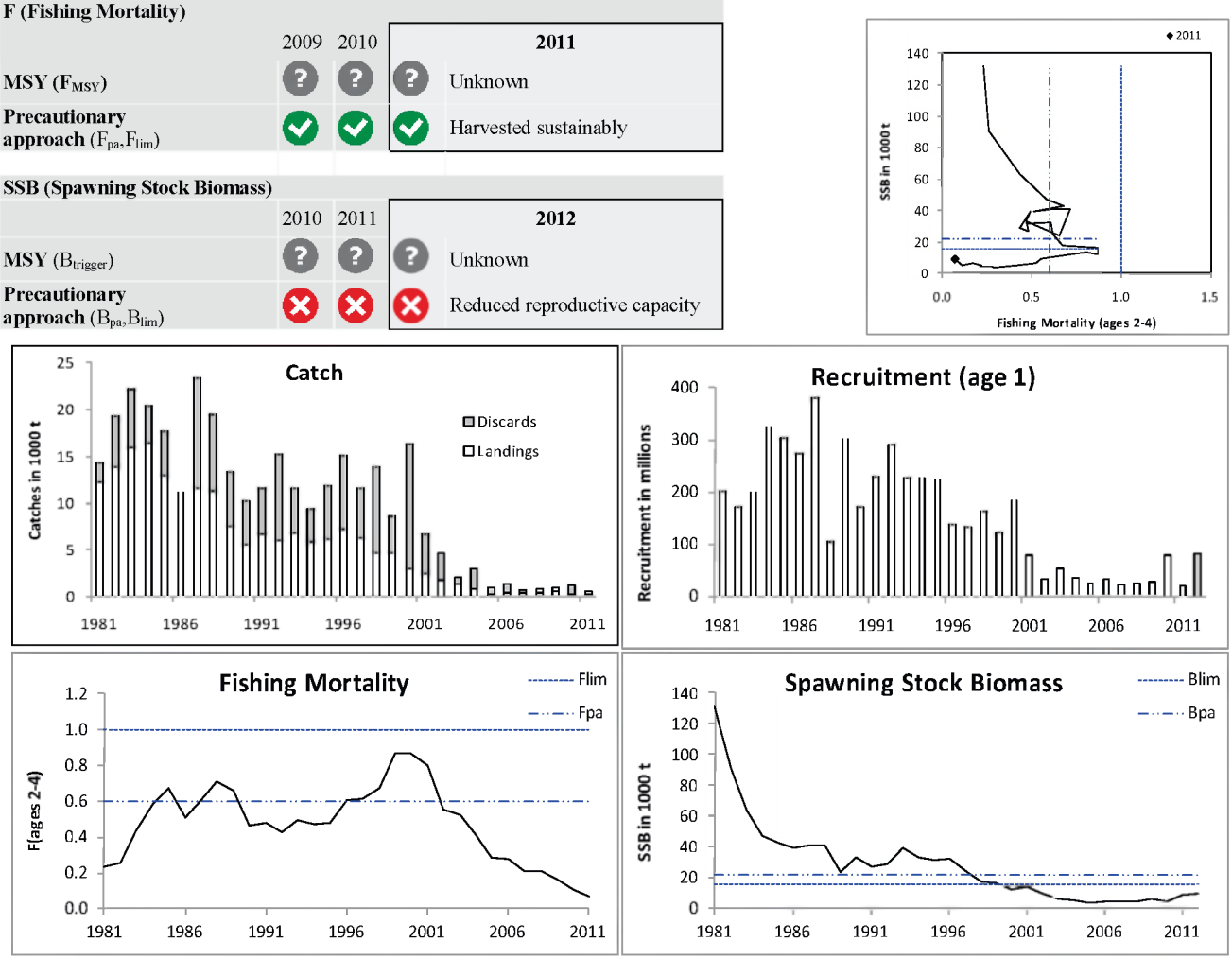


Figure 5.4.25.1 Whiting in Division VIa (West of Scotland). Observed catches and summary of stock assessment (weights in thousand tonnes). Top right: SSB and F for the time-series used in the assessment.

The spawning-stock biomass has increased slightly since an all-time low in 2005, but remains very low compared to the historical estimates (and well below B_{lim}). Fishing mortality has declined continuously since around 2000 and is now very low. Recruitment is estimated to have been very low over the last decade. The 2009 year class is estimated to be above the recent average.

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 distribution	Total catch (2011) was 0.569 kt, where 40% were landings (230 t) and 60% discards.

Quality considerations

An analytic TSA assessment presented this year indicates increasing catchability of the survey over the time-series. The mean weights-at-age in the catch have also been quite variable in recent years because of low and patchy sampling levels. An increase in the mesh size of the TR1 fleet affects the fishing selectivity for approximately 40% of the catch.

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

Scientific basis

Assessment type	Analytic assessment (TSA.)
Input data	Landings and discards 1981 to 1994 and 2006 to 2011, age structure only used with unaccounted mortality estimated 1995 to 2005; three survey indices (ScoGFS-WIBTS-Q1, years 1985–2010, ScoGFS-WIBTS-Q4, years 1996–2009, IGFS-WIBTS-Q1, years 2003–2011).
Discards and bycatch	Included in the TSA assessment.
Indicators	None.
Other information	The stock was benchmarked in 2012 (WKROUND).
Working group report	WGCSE

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

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	Not defined.	
	F_{MSY}	Not defined.	
Precautionary Approach	B_{lim}	16 000 t	$B_{lim} = B_{loss}(1998)$, the lowest observed spawning stock estimated in previous assessments.
	B_{pa}	22 000 t	$B_{pa} = B_{lim} * 1.4$. 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	$F_{pa} = 0.6 * F_{lim}$. This F is considered to have a high probability of avoiding F_{lim}.

(unchanged since: 1998)

Outlook for 2013

Basis: F (2012) = F_{sq} (2009–2011 rescaled to 2011) = 0.07; SSB (2013) = 14.1; R (2012) = 81 million; human consumption (HC) landings (2012) = 0.36; Discards (2012) = 0.32.

Rationale	Human consumption landings (2013)	Basis	F Total (2013)	F HC (2013)	F Disc (2013)	Catch Total (2013)	Discards (2013)	SSB (2014)	% SSB change[1)]	% TAC change[2)]
Precautionary approach	0	B_{pa}	0	0	0	0	0	14.4	+2%	−100 %
Zero catch	0	F = 0	0	0	0	0	0	14.4	+2%	−100%
Other options	0.11	(F_{2012}*0.2)	0.01	0.01	0.01	0.17	0.07	14.2	+1%	−65%
	0.21	(F_{2012}*0.4)	0.03	0.02	0.01	0.34	0.13	14.0	–1%	−31%
	0.32	(F_{2012}*0.6)	0.04	0.02	0.02	0.51	0.19	13.8	–2%	+3%
	0.42	(F_{2012}*0.8)	0.05	0.03	0.02	0.67	0.25	13.6	–4%	+37%
	0.52	(F_{2012}*1.0)	0.07	0.04	0.03	0.84	0.32	13.4	–5%	+70%
	0.62	(F_{2012}*1.2)	0.08	0.05	0.03	1.00	0.38	13.3	–6%	+103%

Weights in thousand tonnes.
[1)] SSB 2014 relative to SSB 2013.
[2)] Human consumption landings in 2013 relative to TAC in 2012 (307 t).

Precautionary approach

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

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

Additional considerations

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

Regulations and their effects

The fishery is managed by a combination of TAC and technical measures, and in addition, the cod recovery plan measures (including effort restrictions and closed areas) are also expected to affect whiting. A detailed description of the effects of cod recovery measures and regulations can be found in the Division VIa cod advice (Section 5.4.21).

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 1998–2011 from UK vessels (one of the main countries fishing in the area) suggest that overall, effort has declined in recent years in Division VIa, and that declines in particular categories have not been compensated for by rises in other categories. Larger-meshed whitefish demersal trawls were the most important gears in Division VIa prior to 2002, but since then there has been a marked decline in kW-days by this category. Single-rig *Nephrops* trawls in the 70–99 mm mesh category are the other major gears in use and effort by these seems to have been maintained at a fairly stable level throughout the time-series.

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

Uncertainties in assessment and forecast

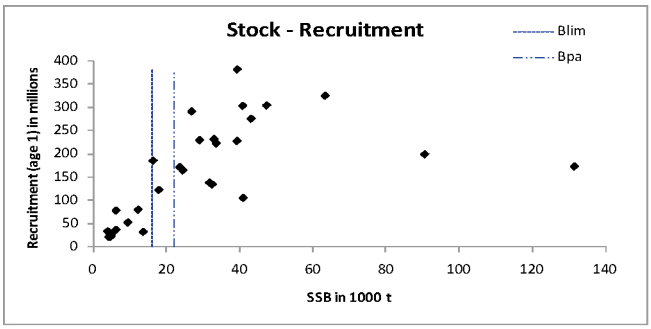
Some changes have been made to the survey design in the past, but surveys are considered to be a reasonable indicator of stock trends from the mid-1990s. The survey gear changed in 2011 to bring it in line with other surveys in the area so that these can be combined in future to provide a more robust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

Source

ICES. 2012. Report of the Working Group on Celtic Seas Ecosystems (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.



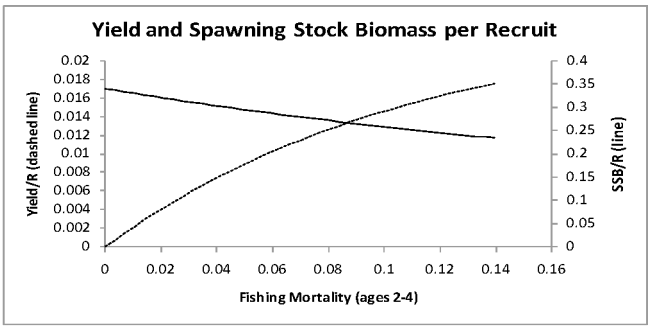


Figure 5.4.25.2 Whiting in Division VIa (West of Scotland). Stock–recruitment relationship and short-term forecast.

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[3]	1.6	0.8	0.8	2.6	3.4
2005	Exploitation not allowed to increase	<1.6	1.6	0.29	0.3	0.9	1.2
2006	Lowest possible level	0	1.36	0.38	0.4	0.9	1.3
2007	Lowest possible level	0	1.02	0.48	0.5	0.3	0.8
2008	Lowest possible level	0	0.765	0.44	0.4	0.2	0.4
2009	Same advice as last year	0	0.574	0.49	0.5	0.4	0.9
2010	Same advice as last year	0	0.431	0.35	0.3	0.9	1.2
2011	See scenarios	-	0.32	0.23	0.2	0.3	0.6
2012	Reduce catches	-	0.307[2]				
2013	Lowest possible catch, improve selectivity	0					

Weights in thousand tonnes.
n.a. = not available.
[1] TAC is set for Divisions VIa and VIb combined.
[2] TAC is set for Division Vb and Subareas VI, XII, and XIV.
[3] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

Table 5.4.25.2 Whiting in Division VIa (West of Scotland). Catch (t) as officially reported to ICES.

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
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	4
Germany	+	+	+	1	1	+	-	+	-	-	+	-	-	-	-	-	-	+	1	-	-	-	-
Ireland	1315	977	1200	1377	1192	1213	1448	1182	977	952	1121	793	764	577	568	356	172	196	56	69	125	99	149
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Spain	-	-	-	-	-	-	1	-	1	2	+	-	2	-	-	-	-	-	-	-	-	-	-
UK (E W & NI)	44	50	218	196	184	233	204	237	453	251	210	104	71	73	35	13	5	2	1	-	-	-	-
UK (Scot.)	6109	4819	5135	4330	5224	4149	4263	5021	4638	3369	3046	2258	1654	1064	751	444	103	178	424	-	-	-	-
UK (total)																				369	354	247	77
Total landings	7669	6026	6908	6010	6751	5786	6278	6642	6178	4657	4677	3203	2543	1735	1365	819	289	383	484	441	482	349	230

* Preliminary.

Table 5.4.25.3 Whiting in Division VIa (West of Scotland). Summary of stock assessment (weights in tonnes).

Year	Recruitment Age 1 thousands	SSB tonnes	Catches* tonnes	Landings* tonnes	Discards* tonnes	Mean F Ages 2–4
1981	201495	131708	15501	10856	4645	0.230
1982	172550	90800	17190	12958	4232	0.257
1983	198523	63578	21965	16950	5014	0.434
1984	323972	47559	20660	15348	5312	0.584
1985	303170	43321	18853	11900	6953	0.676
1986	274758	39512	12920	8088	4832	0.508
1987	380175	41183	17488	10389	7099	0.608
1988	105115	41030	15777	10818	4959	0.714
1989	302262	23836	12960	7243	5717	0.656
1990	171174	33162	10293	5614	4679	0.467
1991	230989	27082	9683	5776	3908	0.481
1992	290236	29263	10430	5215	5215	0.430
1993	228829	39476	12590	6438	6152	0.493
1994	226911	33811	10482	5805	4677	0.469
1995	221888	31955	10594	5969	4625	0.479
1996	138024	32694	12544	6659	5884	0.606
1997	133926	24668	10805	5817	4988	0.617
1998	164154	18099	9707	4231	5477	0.674
1999	122221	16540	8994	3941	5052	0.865
2000	184783	12436	8084	2862	5222	0.869
2001	79829	13843	6871	2531	4340	0.802
2002	32450	9657	3322	1766	1556	0.554
2003	52579	6369	2598	1332	1266	0.521
2004	36715	5101	1749	681	1067	0.412
2005	25095	4109	1004	443	561	0.287
2006	33709	4434	1044	495	549	0.278
2007	22090	4805	856	440	416	0.211
2008	25139	4907	932	450	483	0.215
2009	27293	6406	851	446	405	0.168
2010	78131	4961	671	327	344	0.108
2011	21897	9324	488	263	225	0.070
2012	81086**	10000				
Average	152849	28301	9287	5550	3737	0.476

*TSA estimates.
** 2012 recruitment prediction from TSA.

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

Advice for 2013 and 2014

Based on the ICES approach for data limited stocks, ICES advises that catches should be no more than 11 tonnes.

This is the first year that ICES is providing quantitative advice for data limited stocks (see Quality considerations).

Stock status

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	? Insufficient information

SSB (Spawning Stock Biomass)	
	2009–2011
Qualitative evaluation	? Insufficient information

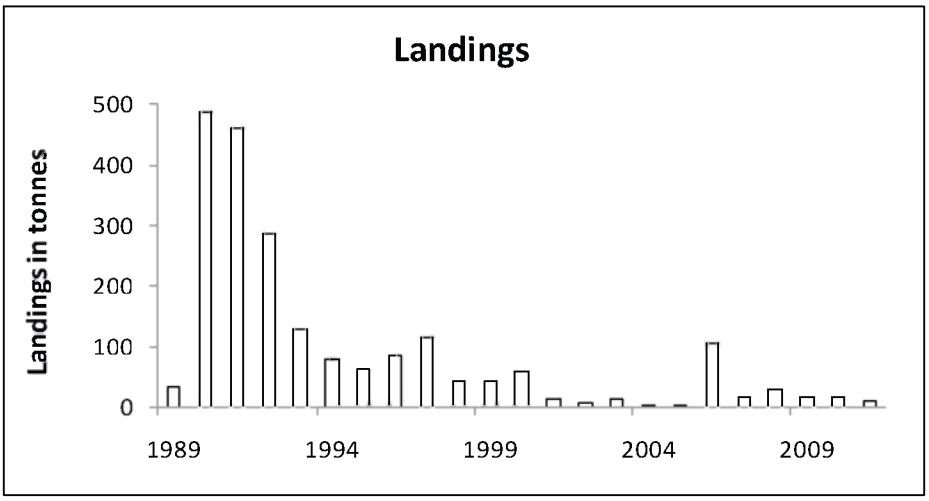


Figure 5.4.26.1 Whiting in Division VIb (Rockall). Official landings in tonnes.

The available information is insufficient to evaluate the stock trends and exploitation. Landings of whiting from Division VIb are currently negligible.

Management plans

No specific management objectives are known to ICES.

Biology

There is an absence of information on whiting stock structure in this region and whiting caught in Division VIb (Rockall) may potentially be part of the adjacent whiting stock in Division VIa.

The fisheries

Whiting in Division VIb (Rockall) is taken as a bycatch in fisheries for other species such as haddock and anglerfish.

Catch distribution	Total official landings (2011) = 9 t. Discards are unknown.

Quality considerations

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

The advice is based on a precautionary reduction of catches because of missing or non representative data. The methods applied to derive quantitative advice for data limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	No assessment.
Input data	Official landings statistics.
Discards and bycatch	Not included in the assessment.
Indicators	-
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 2013 and 2014

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

ICES approach to data limited stocks

For data limited stocks without information on abundance or exploitation ICES considers that a precautionary reduction of catches should be implemented, unless there is ancillary information clearly indicating that the current level of exploitation is appropriate for the stock.

For this stock, ICES advises that catches should decrease by 20% in relation to the last three years average landing (14 t), corresponding to catches of no more than 11 t.

Additional considerations

The official landings have in the past shown very high inter-annual variation and it is not known whether these are a true reflection of removals.

Management consideration

The TAC is for the combined Divisions VIa and VIb; therefore, the TAC cannot be effective in limiting catches in Division VIb (Rockall).

Sources

ICES. 2012. Report of the Working Group on Celtic Seas Ecosystems, 9–18 May 2012, Copenhagen, Denmark ICES CM 2012/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	**9**
2012	No increase in catch	-	307	
2013	20% Reduction in catches (last 3 year average)	11		
2014	Same advice as for 2013	11		

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	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
Faroe Islands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
France	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	32	10	4	23	3	1	-	-	10		2	3	3	104	16	23	4	2	3
Spain	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
UK (E.& W, NI)	16	6	1	5	10	2	5	26	49	20	+	+	-	-	-	-	-	-	-	-	-	-	-
UK (Scotland)	18	482	459	283	86	68	53	36	65	23	44	58	4	7	11	1	1	1	1	8	12	16	
UK (all)																							6
Total	34	488	460	288	128	80	62	85	117	44	44	58	14	7	13	4	4	105	17	31	16	18	9

*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 2013

Based on the ICES approach for data limited stocks, ICES advises that catches should be no more than 3500 tonnes.

This is the first year that ICES is providing quantitative advice for data limited stocks (see Quality considerations).

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.

State of the stock

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	? Insufficient information

SSB (Spawning Stock Biomass)	
	2009–2011
Qualitative evaluation	? Insufficient information

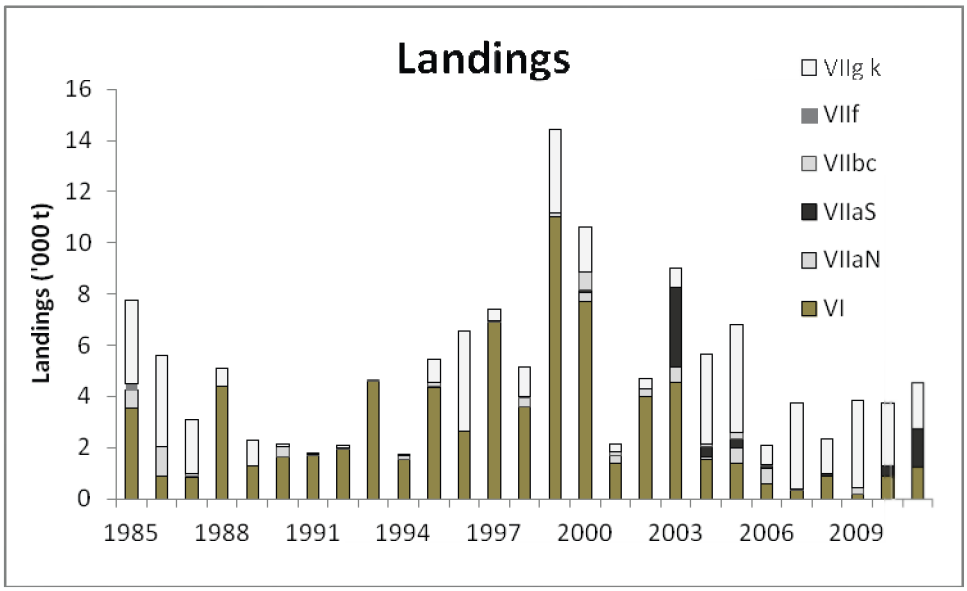


Figure 5.4.28.1 Sprat in the Celtic Sea and West of Scotland. ICES landings (in '000 t) by area.

The information available is insufficient to evaluate stock trends and exploitation. Stock identity for this species in this area is not defined.

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 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 targets a large variety of other species. Fisheries can be spasmodic depending on availability of sprat abundance. Catches by under-10 meter vessels and beach based fisheries may not be included in official landings.

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 Subarea VI and Divisions VIIa–c, f–k constitute a management unit for sprat, and further work is required. Additionally, the relationship with Divisions VIIde sprat is also unknown. Given the discrepancies between national and official landings data, further scrutiny of the landings data is required.

The advice is based on a precautionary reduction of catches because of missing or non representative data. The methods applied to derive quantitative advice for data limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	No assessment
Discards and bycatch	Not available
Indicators	Landing statistics and 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; Irish Ground fish surveys (IRGFS-WIBS-Q4)
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 2013

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.

ICES approach to data limited stocks

For data limited stocks without information on abundance or exploitation ICES considers that a precautionary reduction of catches should be implemented, unless there is ancillary information clearly indicating that the current exploitation is appropriate for the stock.

For this stock, ICES advises that catches should decrease by 20% in relation to the last ten year average landings, corresponding to catches of no more than 3500 t in 2013. ICES deviates from the standard three-year average because of the high variation in landings over the past decades (Figure 5.4.28.1). Therefore, a 10-year landings period was chosen as a reference because it covers the variability of landings in the different subareas.

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.

Information from the fishing industry

The industry considers that the landings data for Divisions VIa and VIIj–k are underestimated due to catches taken by vessels under 10 meters and other methods such as beach seining. Fisheries in Division VIa can be spasmodic. The industry is also of the view that separate stocks exist within the Celtic Seas ecosystem.

Comparison with previous advice

The advice last year was based on precautionary considerations. This year the advice is based on the ICES approach to data limited stocks.

Sources

ICES. 2012. Report of the Herring Assessment Working Group for the Area South of 62°N, 13–22 March 2012 ICES CM 2012/ACOM:06.

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			10.6
2001			2.1
2002			4.7
2003			9.0
2004			5.6
2005			6.8
2006			2.1
2007			3.8
2008			2.4
2009			3.8
2010			3.7
2011			4.5[1)]
2012	No increase in catch	-	
2013	20% Reduction on catches (10 year average)	<3.5	

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 (2011 landings are preliminary).

Country	Belgium	Denmark	Faeroe Isla	France	Ireland	Isle of Man	Netherland	Norway	Spain	UK - Engla	UK - Scotla	Total
1985	0	0	0	0	3964	0	273	557	0	20	2946	7760
1986	0	538	0	0	4532	1	0	0	0	10	520	5601
1987	0	269	0	1	2230	0	0	0	0	0	582	3082
1988	0	364	0	0	853	0	1	0	0	4	3870	5092
1989	0	0	0	0	1163	0	0	0	0	1	1146	2310
1990	0	0	0	0	1325	0	0	0	0	0	813	2138
1991	0	0	0	0	205	0	0	0	0	4	1526	1735
1992	0	28	0	0	508	0	0	0	0	0	1555	2091
1993	0	22	0	0	2353	0	0	0	0	0	2230	4605
1994	0	0	0	0	232	0	0	0	0	2	1491	1725
1995	0	491	0	0	799	0	0	0	0	30	4124	5444
1996	0	0	0	0	4214	0	0	0	0	0	2350	6564
1997	0	0	0	0	2085	0	0	0	0	8	5313	7406
1998	0	40	0	0	1578	0	0	0	0	54	3467	5139
1999	0	0	0	0	5826	0	0	0	0	456	8161	14443
2000	0	0	0	0	6032	0	0	0	0	371	4238	10641
2001	0	0	0	0	455	0	0	0	0	367	1297	2119
2002	0	0	0	0	1729	0	0	0	0	306	2657	4692
2003	0	887	0	0	4948	0	0	0	0	592	2593	9020
2004	0	0	0	0	4096	0	0	0	0	134	1416	5646
2005	0	0	252	0	5928	0	0	0	0	604	0	6784
2006	0	0	0	0	1523	0	0	0	0	563	0	2086
2007	0	0	0	0	3745	0	0	0	1	2	14	3762
2008	0	0	0	0	2353	0	0	0	0	2	0	2355
2009	0	0	0	0	3773	0	0	0	0	1	70	3844
2010	0	0	0	0	3189	0	0	0	0	7	537	3733
2011	0	0	0	0	3753	0	0	0	0	260	507	4520

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

Country	Denmark	eroe Islands	Ireland	Norway	Wales+N.Irl.	K - 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	2350	2619
1997	0	0	1596	0	0	5313	6909
1998	40	0	94	0	0	3467	3601
1999	0	0	2533	0	310	8161	11004
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	0	1399
2006	0	0	601	0	0	0	601
2007	0	0	333	0	0	14	347
2008	0	0	892	0	0	0	892
2009	0	0	104	0	0	70	174
2010	0	0	332	0	0	537	869
2011	0	0	464	0	248	507	1219

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

Country	Ireland	Isle of Man	UK - Eng+W	UK - Scotlar	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
2011	0	0	0	0	0

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

Country	Denmark	France	Ireland	Netherlands	Spain	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	2435.532	0	0	0	2436
2011	0	0	1767.475	0	0	12	1779

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	Ireland	Netherland	UK - Eng+\	TOTAL
1985	0	273	0	273
1986	0	0	0	0
1987	100	0	0	100
1988	0	0	0	0
1989	0	0	0	0
1990	400	0	0	400
1991	40	0	1	41
1992	50	0	0	50
1993	3	0	0	3
1994	145	0	2	147
1995	150	0	0	150
1996	21	0	0	21
1997	28	0	0	28
1998	338	0	51	389
1999	30	0	0	30
2000	821	0	0	821
2001	145	0	0	145
2002	11	0	0	11
2003	3141	0	0	3141
2004	476	0	0	476
2005	621	0	0	621
2006	154	0	0	154
2007	32	0	2	34
2008	103	0	0	103
2009	238	0	1	239
2010	422	0	7	429
2011	1522	0	0	1522

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

Advice for 2013

Based on the ICES approach to data-limited stocks, ICES advises that catches should be reduced by 20% in relation to the average of the last three years. Due to the uncertainty in the landings data, ICES is not able to quantify the resulting catch.

This is the first year ICES is providing quantitative advice for data-limited stocks (see Quality considerations).

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

Stock status

F (Fishing Mortality)		
	2009–2011	
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa},F_{lim})	?	Unknown
SSB (Spawning-Stock Biomass)		
	2007–2011	
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa},B_{lim})	?	Unknown
Qualitative evaluation	↘	Decreasing

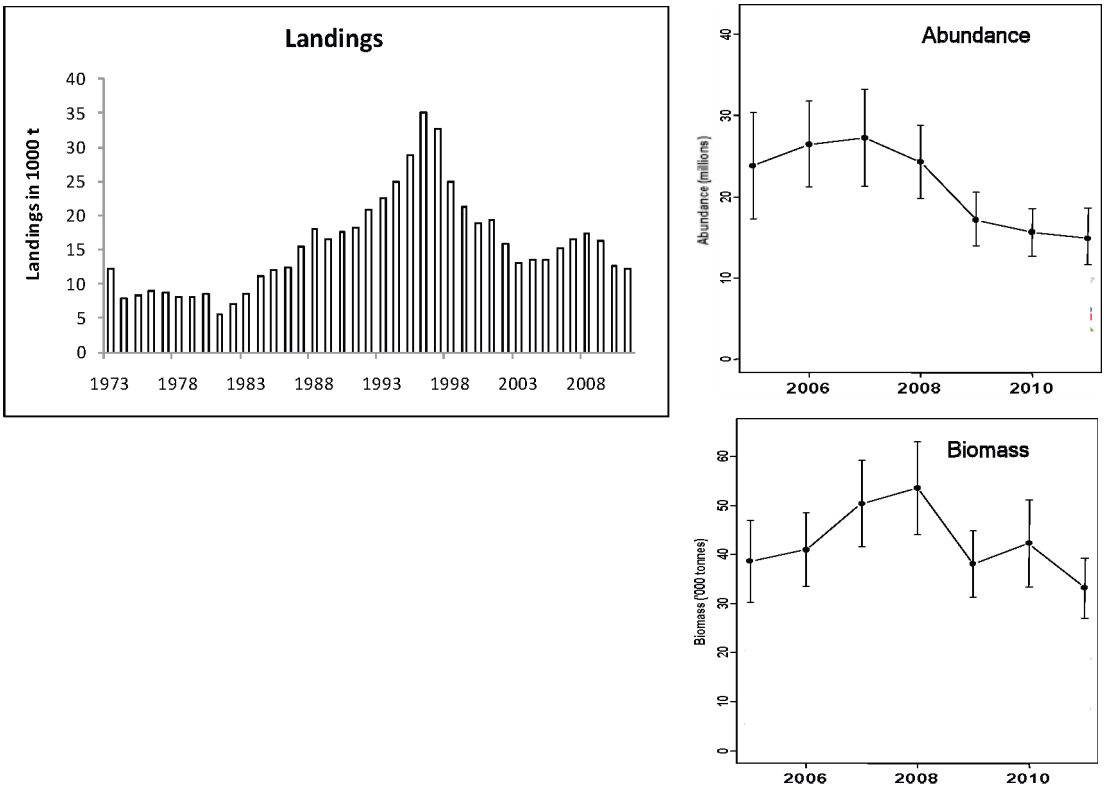


Figure 5.4.29.1 Anglerfish (*Lophius piscatorius* and *L. budegassa*). Upper left: Official landings (thousand tonnes) in Subareas IV and VI and Division IIIa. Right: Total abundance (millions) (upper panel) and stock biomass (thousand tonnes, with 95% confidence limits) (lower panel) from SCO-IV-VI-AMISS-Q2.

Recent dedicated anglerfish surveys, the Scottish and Irish anglerfish and megrim industry/science survey for the Northern shelf (SCO-IV-VI-AMISS-Q2) in Division IVa and Subarea VI, indicate a decline in abundance and biomass

since 2008. The average biomass over this area in the last two years (2010–2011) is 20% lower than the average biomass of the three previous years (2007–2009).

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 Division 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.

Catch distribution	Total landings value is not available; official total landings in 2011 were 8662 t in Division IIIa and Subarea IV; 3570 t in Subarea VI. Discards from the Scottish fleet were minimal in 2011 (<0.5 t). Official landings in Division IIa (outside the stock distribution area): 5077 t.

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

Although landings data have improved in recent years, there is still concern about underreporting and area misreporting, therefore ICES is not able to provide quantified advice. Accurate estimates of growth parameters are needed to facilitate the development of an analytical assessment. A dedicated Scottish and Irish industry/science anglerfish survey has operated from 2005–2011. The survey does not cover the southern and eastern parts of the North Sea and Skagerrak (Divisions IIIa, IVb, and IVc). Fisheries in these areas account for approximately 11% of landings in the North Sea and Skagerrak since 2005, which adds uncertainty to the perception of stock trends.

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

Scientific basis

Assessment type	Survey trends.
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	The stock was benchmarked in 2012, but no revision to assessment method was accepted.
Working group report	WGCSE

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

Reference points

No reference points have been defined for these stocks. Because of identified problems with growth estimates and uncertainties in ageing, previous reference points are no longer considered to be valid.

Outlook for 2013

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

ICES approach to data-limited stocks

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

For this stock the biomass is estimated to have decreased by 20% in 2007–2009 (average of the three years) and 2010–2011 (average of the two years). This implies a 20% decrease in catches. Due to the uncertainty of landings, ICES is not able to quantify the resulting catch. Considering that the effort in the main fisheries has decreased significantly no additional precautionary reduction is needed.

Additional considerations

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

Significant landings of anglerfish are taken in Division IIa. Anglerfish in Division IIa are not considered to be part of the same biological stock as Division IIIa and Subareas IV and VI. ICES has not provided advice on anglerfish in Division IIa.

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 and 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. Enforcement of anglerfish quotas has been increased 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 45:55 (IV:VI) in 2011 and has fluctuated around 50:50 since the surveys began in 2005, although the surveys do 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.

International effort trends for the main gears in ICES Subarea IV and Division VIa, as collated and presented by the STECF effort group, show effort reductions in TR1 (larger meshed trawls, the main gear catching anglerfish) in both areas, particularly in Division VIa (48% between 2003 and 2010; around 35% in 2011).

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. Last year the basis for advice was the precautionary considerations, this year it is the ICES approach to data-limited stocks.

Assessment and management area

Two TACs are set: i) EC waters of Division IIa and Subarea IV, and ii) Division Vb (EC) and Subareas VI, XII, and XIV. The assessment presented here is based on survey information from Division IVa and Subarea VI.

Source

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

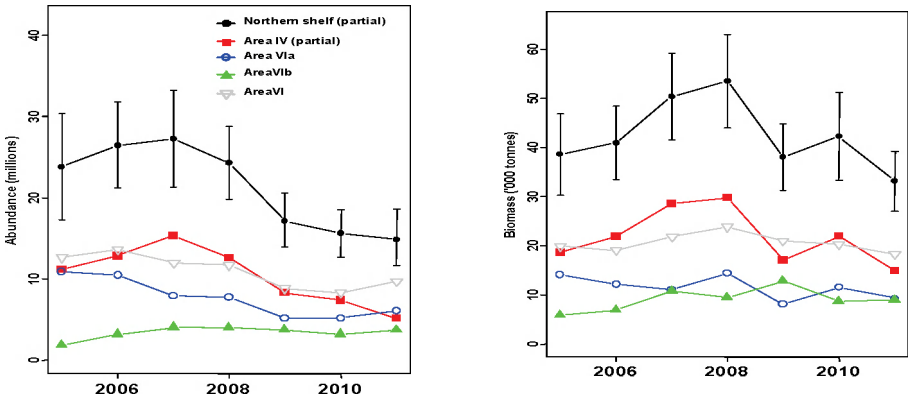


Figure 5.4.29.2 Anglerfish (*Lophius piscatorius* and *L. budegassa*). Total abundance (millions) and stock biomass (thousand tonnes) index from SCO-IV-VI-AMISS-Q2 (black filled circles with 95% confidence limits, labeled as "Northern shelf (partial)"), with breakdown by area: Subarea IV (red squares), Subarea VI (grey triangles), Division VIa (blue open circles), and Division VIb (green triangles).

Table 5.4.29.1 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	Predicted catch corresp. to advice for Division IIIa and Subarea IV	Predicted catch corresp. to advice Subarea VI	Agreed TAC[1)]	Official landings in Division IIa	Official landings[2)]	ICES Landings[2)]
1990	Not assessed	-	-	-	8.6	0.18	17.6	16.1
1991	Not assessed	-	-	-	8.6	0.19	18.4	16.9
1992	Not assessed	-	-	-	8.6	0.5	20.8	20.9
1993	No long-term gain in increased F[3)]	-	-	-	8.6	3.0	22.6	23.2
1994	No long-term gain in increased F[3)]	-	-	-	8.6	1.0	25.0	24.2
1995	A precautionary TAC not exceeding recent catch levels[3)]	-	-	-	8.6	0.6	28.9	28.1
1996	A precautionary TAC not exceeding recent catch levels[3)]	-	-	-	8.6	0.9	35.0	34.4
1997	Reduction in fishing effort[3)]	-	-	-	8.6	0.6	32.8	31.9
1998	Reduction in fishing effort[3)]	-	-	-	30.7	1.5	25.1	24.6
1999	Reduce fishing effort, effective implementation of the TAC[3)]	-	-	-	30.7	1.7	21.2	20.1
2000	40% reduction in catches	-	<9.7	<7.4	25.7	3.0	19.0	19.1
2001	2/3 of the catches in 1973–1990	-	5.7	4.3	20.5	3.6	19.3	18.6
2002	2/3 of the catches in 1973–1990	-	5.7	4.3	15.3	2.1	16.0	15.1
2003	Reduce F below F_{pa}	<6.7	-	-	10.2	2.5	13.0	12.4
2004	Reduce F below F_{pa}	<8.8	-	-	10.2	3.0	13.5	12.3
2005	No effort increase	-	-	-	15.0	2.7	13.6	n.a.
2006	No effort increase	-	-	-	15.0	4.3	15.2	n.a.
2007	No effort increase	-	-	-	16.5	4.6	16.4	n.a.
2008	No effort increase	-	-	-	16.5	4.1	17.3	n.a.
2009	Same advice as last year	-	-	-	16.9	4.5	16.4	n.a.
2010	No effort increase	-	-	-	16.9[4)]	5.5	12.7	n.a.
2011	Decrease effort	-	-	-	15.1[5)]	5.1[6)]	12.2[6)]	n.a.
2012	Reduce catch	-	-	-	14.344 [5)]			
2013	Decrease catches by 20%	-	-	-				

Weights in thousand tonnes.

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

[2)] Division IIIa, Subarea IV, and Division VIa.

[3)] For Subarea VI.

[4)] An additional quota of 1540 t was also available for EU vessels fishing in the Norwegian zone of Subarea IV in 2010.

[5)] An additional quota of 1500 t was also available for EU vessels fishing in the Norwegian zone of Subarea IV.

[6)] Preliminary.

n.a. = not available.

Table 5.4.29.2 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa and Subareas IV and VI. Officially reported landings by ICES area.

Year	IIIa	IVa	IVb	IVc	VIa	VIb	IV	VI	Total
1973	140	2085	575	41	9221	127	2701	9348	12189
1974	202	2737	1171	39	3217	435	3947	3652	7801
1975	291	2887	1864	59	3122	76	4810	3198	8299
1976	641	3624	1252	49	3383	72	4925	3455	9021
1977	643	3264	1278	54	3457	78	4596	3535	8774
1978	509	3111	1260	72	3117	103	4443	3220	8172
1979	687	2972	1578	112	2745	29	4662	2774	8123
1980	652	3450	1374	175	2634	200	4999	2834	8485
1981	549	2472	752	132	1387	331	3356	1718	5623
1982	529	2214	654	99	3154	454	2967	3608	7104
1983	506	2465	1540	181	3417	433	4186	3850	8542
1984	568	3874	1803	188	3935	707	5865	4642	11075
1985	578	4569	1798	77	4043	1013	6444	5056	12078
1986	524	5594	1762	47	3090	1326	7403	4416	12343
1987	589	7705	1768	66	3955	1294	9539	5249	15377
1988	347	7737	2061	95	6003	1730	9893	7733	17973
1989	334	7868	2121	86	5729	313	10075	6042	16451
1990	570	8387	2177	34	5615	822	10598	6437	17605
1991	595	9235	2522	26	5061	923	11783	5984	18362
1992	938	10209	3053	39	5479	1089	13301	6568	20807
1993	843	12309	3144	66	5553	681	15519	6234	22596
1994	811	14505	3445	210	5273	777	18160	6050	25021
1995	823	17891	2627	402	6354	830	20920	7184	28927
1996	702	25176	1847	304	6408	602	27327	7010	35039
1997	776	23425	2172	160	5330	899	25757	6229	32762
1998	626	16857	2088	78	4506	900	19023	5406	25055
1999	660	13326	1517	24	4284	1401	14867	5685	21212
2000	602	12338	1617	31	3311	1074	13986	4385	18973
2001	621	12861	1832	21	2660	1309	14714	3969	19304
2002	667	11048	1244	21	2280	718	12313	2998	15978
2003	478	8523	847	20	2493	643	9390	3136	13004
2004	519	8987	851	15	2453	671	9853	3124	13496
2005	458	8424	688	5	3019	958	9117	3977	13552
2006	423	10338	685	3	2785	916	11026	3701	15150
2007	433	10632	749	4	3352	1260	11385	4612	16430
2008	486	11038	769	5	3373	1630	11812	5003	17300
2009	479	10096	658	8	3029	2119	10757	5148	16389
2010	477	6979	619	11	3187	1423	7609	4610	12696
2011*	432	7477	745	8	2378	1192	8230	3570	12232

*Preliminary.

Table 5.4.29.3 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) by country as officially reported to ICES and estimated by ICES of anglerfish in **Division VIa (west of Scotland)**.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
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	1
France	1910	2308	2467	2382	2648	2899	2058	1634	1814	1132	943	739	1212	1191	1392	1314	1763	1746	1555	1160	912
Germany	1	2	60	67	77	35	72	137	50	39	11	3	27	39	39	1	-	54	79	79	
Ireland	250	403	428	303	720	717	625	749	617	515	475	304	322	219	356	392	470	295	328	510	488
Netherlands	-	-	-	-	-	-	27	1	-	-	-	-	-	-	-	-	-	-	-	-	0
Norway	6	14	8	6	4	4	1	3	1	3	2	1	+	+	1	1	1	2	-	1	1
Russia																					
Spain	7	11	8	1	37	33	63	86	53	82	70	101	196	110	82	76	3	174	189	-	
UK(EW&NI)	270	351	223	370	320	201	156	119	60	44	40	32	31	30	20	24	42	5	12	393	
UK(Scot.)	2613	2385	2346	2133	2533	2515	2322	1773	1688	1496	1119	1100	705	862	1127	974	1071	1096	864	1040	
UK (total)																					976
Total	5061	5479	5553	5273	6354	6408	5330	4506	4284	3311	2660	2280	2493	2453	3019	2785	3352	3373	3029	3187	2378
Unallocated	296	2638	3816	2766	5112	11148	7506	5234	3799	3114	2068	1882	985	1938							
As used by WG	5357	8117	9369	8039	11466	17556	12836	9740	8083	6425	4728	4162	3478	4391							

*Preliminary.

Table 5.4.29.4 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) by country as officially reported to ICES and estimated by ICES of anglerfish in **Division VIb (Rockall).**

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
Belgium														+							
Denmark															-	-	-		-		
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	14
Germany	-	-	103	73	83	78	177	132	144	119	67	35	64	66	77	72	222	0	132	87	
Ireland	272	417	96	135	133	90	139	130	75	81	134	51	26	13	35	53	70	76	91	107	108
Norway	18	10	17	24	14	11	4	6	5	11	5	3	6	5	4	6	7	5	9	12	0
Portugal	-	-	-	-	-	-	-	+	429	20	18	8	4	19	63	-	-	-	-		
Russia	-	-	-	-	-	-	-	-	-	-	1	-	-	2	4	1	1	35	-		
Spain	333	263	178	214	296	196	171	252	291	149	327	128	59	43	34	36	12	85	57		
UK(E,W&NI)	99	173	76	50	105	144	247	188	111	272	197	133	133	54	93	46	146	5	48	15	
UK(Scot)	201	224	182	281	199	68	156	189	344	374	367	317	160	294	355	478	475	1096	1141	1171	
UK (total)																					1070
Total	923	1089	681	777	830	602	899	900	1401	1074	1309	718	643	671	958	916	1260	1630	2119	1423	1192
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 5.4.29.5 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) as officially reported to ICES and estimated by ICES of anglerfish in **Subarea VI**.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
Belgium	3	2	9	6	5	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Denmark	1	3	4	5	10	4	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Faroe Is.	0	2	0	0	0	15	4	2	2	0	1	0	0	2	2	3	2	2	6	12	1
France	1910	2308	2496	2382	2648	2899	2059	1635	1814	1180	1135	782	1403	1366	1685	1538	2090	2073	2192	1183	926
Germany	1	2	163	140	160	113	249	269	194	158	78	38	91	105	116	73	222	54	211	166	
Ireland	522	820	524	438	853	807	764	879	692	596	609	355	348	232	391	445	540	370.6	419	617	596
Netherlands																					
Norway	18	10	17	24	14	11	31	7	5	11	5	3	6	5	4	6	7	5	9	12	0
Portugal	6	14	8	6	4	4	1	3	430	23	20	9	4	19	64	1	1	2	0	1	1
Russia	0	0	0	0	0	0	0	0	0	0	1	0	0	2	4	1	1	35	0	0	0
Spain	340	274	186	215	333	229	234	338	344	231	397	229	255	153	116	112	15	259	246	0	0
Sweden																					
UK(E,W&NI)	369	524	299	420	425	345	403	307	171	316	237	165	164	84	113	70	188	10	60	408	0
UK(Scot)	2814	2609	2528	2414	2732	2583	2478	1962	2032	1870	1486	1417	865	1156	1482	1452	1546	2192	2005	2211	0
UK (total)																					2046
Total	5984	6568	6234	6050	7184	7010	6229	5406	5685	4385	3969	2998	3136	3124	3977	3701	4612	5003	5148	4610	3570
Unallocated																					
As used by WG	923	1089	681	777	830	602	899	5406	5685	4385	3969	2998	3136	3124							

*Preliminary.

Table 5.4.29.6 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) by country as officially reported to ICES and estimated by ICES of anglerfish in **Division IVa**.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
Belgium	2	9	3	3	2	8	4	1	5	12	-	8	1	-	-	-	-	-	-		
Denmark	1245	1265	946	1157	732	1239	1155	1024	1128	1087	1289	1308	1523	1538	1379	1311	961	1071	1134	1	841
Faroes	1	-	10	18	20	-	15	10	6	.	2	+	3	11	22	2	+	-	4		0
France	124	151	69	28	18	7	7	3	18	8	9	8	8	8	4	7	13	13	48	6	7
Germany	71	68	100	84	613	292	601	873	454	182	95	95	65	20	84	173	186	344	216	124	
Netherlands	23	44	78	38	13	25	12	-	15	12	3	8	9	38	13	14	14	12	5	8	5
Norway	587	635	1224	1318	657	821	672	954	1219	1182	1212	928	769	999	880	1005	831	860	859	735	490
Sweden	14	7	7	7	2	1	2	8	8	78	44	56	8	6	5	5	20	67	...	4	9
UK(E W&NI)	129	143	160	169	176	439	2174	668	781	218	183	98	104	83	34	99	303	13			
UK (Scotland)	7039	7887	9712	11683	15658	22344	18783	13319	9710	9559	10024	8539	6033	6284	6003	7722	8304	8658			
UK (total)																			7830	6101	6125
Total	9235	10209	12309	14505	17891	25176	23425	16857	13326	12338	12861	11048	8523	8987	8424	10338	10632	11038	10096	6979	7477

* Preliminary.

Table 5.4.29.7 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) by country as officially reported to ICES and estimated by ICES of anglerfish in **Division IVb**.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010*	2011*
Belgium	357	538	558	713	579	287	336	371	270	449	579	435	180	260	207	138	179	181	134	124	112
Denmark	345	421	347	350	295	225	334	432	368	260	251	255	191	274	237	276	173	237	248	194	287
Faroes	-	-	2	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	0
France	-	1	-	2	-	-	-	-	-	-	-	-	-	+	-	-	-	-	9	6	4
Germany	4	2	13	15	10	9	18	19	9	14	9	17	11	11	9	14	12	22	17	21	
Ireland													1	-	-	-	-	-	-	-	
Netherlands	285	356	467	510	335	159	237	223	141	141	123	62	42	25	31	33	61	58	36	46	53
Norway	17	4	3	11	15	29	6	13	17	9	15	10	12	22	16	14	24	15	21	10	11
Sweden	-	-	-	3	2	1	3	3	4	3	2	9	2	1	4	4	6	9	-	5	7
UK(E W&NI)	669	998	1285	1277	919	662	664	603	364	423	475	236	167	120	96	108	122	105			
UK (Scotland)	845	733	469	564	472	475	574	424	344	318	378	210	241	138	88	98	172	142			
UK (total)																			193	213	271
Total	2522	3053	3144	3445	2627	1847	2172	2088	1517	1617	1832	1244	847	851	688	685	749	769	658	619	745

* Preliminary.

Table 5.4.29.8 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) by country as officially reported to ICES and estimated by ICES of anglerfish in **Division IVc**.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
Belgium	13	12	34	37	26	28	17	17	11	15	15	16	9	5	4	3	3	4	6	7	6
Denmark	2	+	-	+	+	+	+	+	+	+	+	+	+	+	+	-	-		-	-	0
France	-	-	-	-	-	-	-	10	-	+	-	+	-	-	-	-	-	+	-	1	+
Germany	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-
Netherlands	5	10	14	20	15	17	11	15	10	15	6	5	1	-	1	-	1	1	-	2	1
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	1
Total	26	39	66	210	402	304	160	78	24	31	21	21	20	15	5	3	4	5	8	11	8

* Preliminary.

Table 5.4.29.9 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) as officially reported to ICES and estimated by ICES of anglerfish in **Subarea IV**.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
Belgium	372	559	595	753	607	323	357	389	286	476	594	459	190	265	211	141	182	184.6	140	131	118
Denmark	1592	1686	1293	1507	1027	1464	1489	1456	1496	1347	1540	1563	1714	1812	1616	1587	1134	1308	1382	195	1128
Faroes	1	0	12	18	20	0	15	10	6	0	2	10	3	11	22	2	0	0	4	0	0
France	124	152	69	30	18	7	7	13	18	8	9	8	8	8	4	7	13	13	57	13	11
Germany	75	70	113	99	623	301	619	892	463	196	104	112	76	31	93	187	198	366	233	145	0
Ireland	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Netherlands	313	410	559	568	363	201	260	238	166	168	132	75	52	63	45	47	76	71	41	56	59
Norway	604	639	1227	1329	672	850	678	967	1236	1191	1227	938	781	1021	896	1019	855	875	881	745	501
Sweden	14	7	7	10	4	2	5	11	12	81	46	65	10	7	9	9	26	76	0	9	16
UK(E&W&NI)	804	1158	1463	1582	1456	1357	2969	1307	1148	642	658	334	281	206	130	207	425	118	406	460	0
UK (Scotland)	7884	8620	10181	12264	16130	22822	19358	13743	10054	9877	10402	8749	6274	6429	6091	7820	8476	8800	7613	5855	0
UK (Total)																					6397
Total	11783	13301	15519	18160	20920	27327	25757	19026	14885	13986	14714	12313	9390	9853	9117	11026	11385	11812	10757	7609	8230

* Preliminary.

Table 5.4.29.10 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa, and in Subareas IV and VI. Nominal landings (t) by country as officially reported to ICES and estimated by ICES of anglerfish in **Division IIIa (Skagerrak, Kattegat).**

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
Belgium	15	48	34	21	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Denmark	493	658	565	459	312	367	550	415	362	377	375	369	215	311	274	227	255	287	344	270	251
Germany	-	-	1	-	-	1	1	1	2	1	-	1	-	1	1	2	1	1	1	1	2
Netherlands							-	-	-	-	-	.	3	4	4	3	1	3	-	5	0
Norway	64	170	154	263	440	309	186	177	260	197	200	242	189	130	100	137	132	144	134	158	153
Sweden	23	62	89	68	36	25	39	33	36	27	46	55	71	73	79	54	44	51	...	43	26
Total	595	938	843	811	823	702	776	626	660	602	621	667	478	519	458	423	433	486	479	477	432

*Preliminary.

Table 5.4.29.11 Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Division IIIa, and in Subareas IV and VI. Abundance (millions of individuals – age 1 and older) and biomass (thousands of tonnes – age 1 and older) estimates from the 2005–2011 anglerfish surveys (SCO-IV-VI-AMISS-Q2) by ICES subareas and divisions.

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

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

ECOREGION Celtic Seas
STOCK Herring in Division VIa (North)

Advice summary for 2013

ICES advises on the basis of the agreed West of Scotland herring management plan that landings in 2013 should be no more than 27 480 t.

ICES advises that activities that impact on the seabed should not take place in spawning grounds unless they can be shown not to have a negative impact on spawning, larval production, or stock dynamics.

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✓	✓	✓	Below target
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined
Management plan (F_{MGT})	✓	✓	✓	Below target

SSB (Spawning-Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	?	?	?	Undefined
Precautionary approach (B_{lim})	✓	✓	✓	Above limit

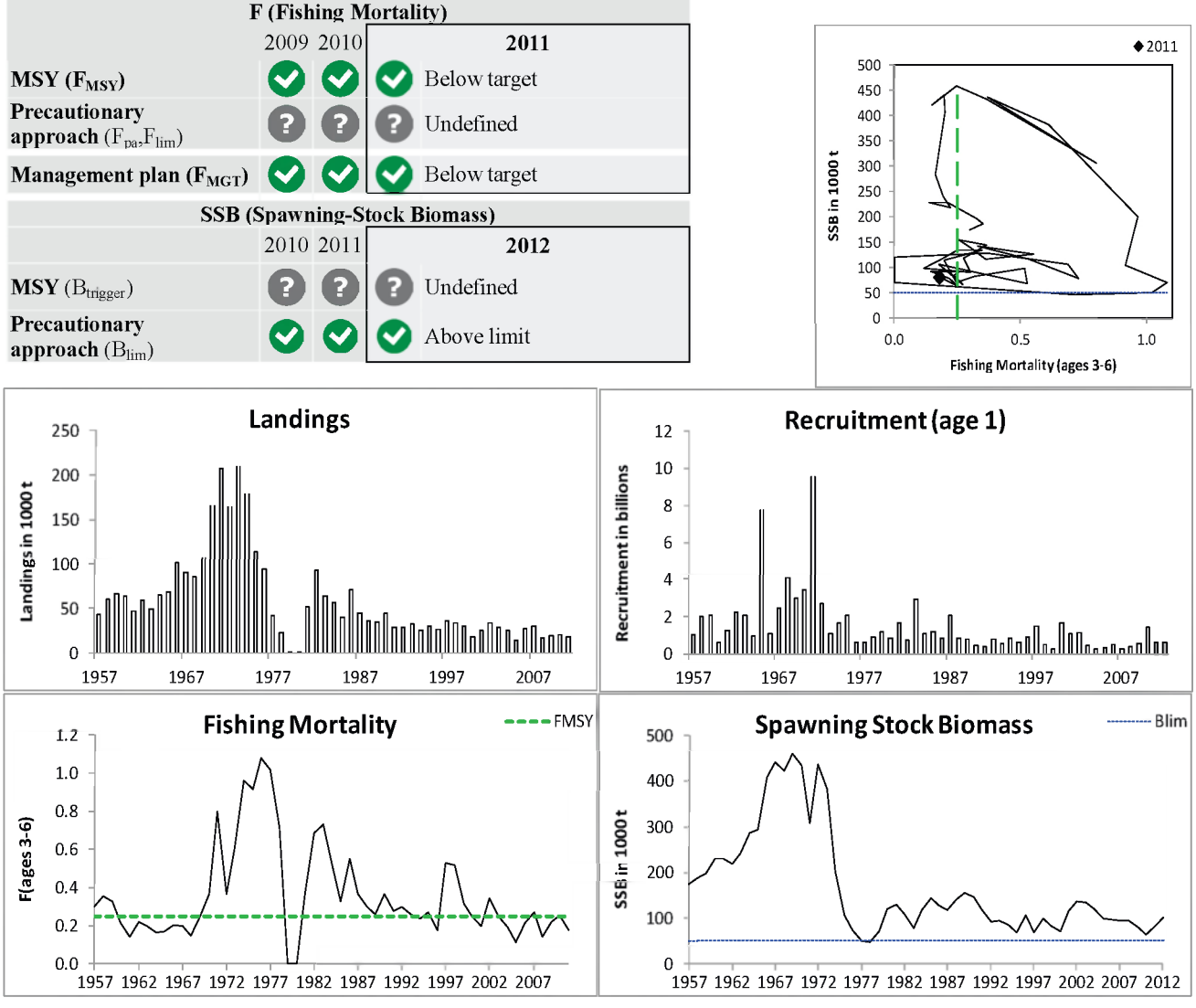


Figure 5.4.30.1 Herring in Division VIa (North). Summary of stock assessment (weights in thousand tonnes). Estimates are shaded. Top right: SSB and F over the time-series used in the assessment.

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. The current recruitment is lower than in the historical period.

Management plans

A management plan has been adopted by the EU in 2008 (Council Regulation (EC) 1300/2008, Annex 5.4.30). The main aim of the plan is to manage the fisheries on the basis of maximum sustainable yield. ICES has evaluated the plan and concludes that it is in accordance with the precautionary approach.

Biology

This autumn-spawning stock is considered 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 in the acoustic survey are ongoing to evaluate the level of mixing. Spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Gravel extraction or disturbance in the close vicinity of any herring spawning will disturb that spawning activity and will reduce the area available for successful spawning.

Environmental influence on the stock

Temperatures and salinity in this area have been increasing over recent decades. It is known that similar environmental changes have affected the North Sea herring. Productivity of the Division VIa (North) stock has been reduced since the late 1980s.

The fisheries

The fishery is conducted by single and pair Refrigerated Sea Water (RSW) trawlers and single-trawl freezer trawlers. Prior to 2006 there was a fairly even distribution of effort, both temporally and spatially. Since 2006 the majority has been fished in the northern part of Division VIa (North) in the 3rd quarter.

Catch distribution	Catch (2011) = 17 759 t (50% pelagic freezer trawlers and 50% 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.

Minimum sampling requirements are met in some quarters of the fishery. Samples from all quarters where there is fishing activity would improve allocation of sampled métiers in the stock-raising process.

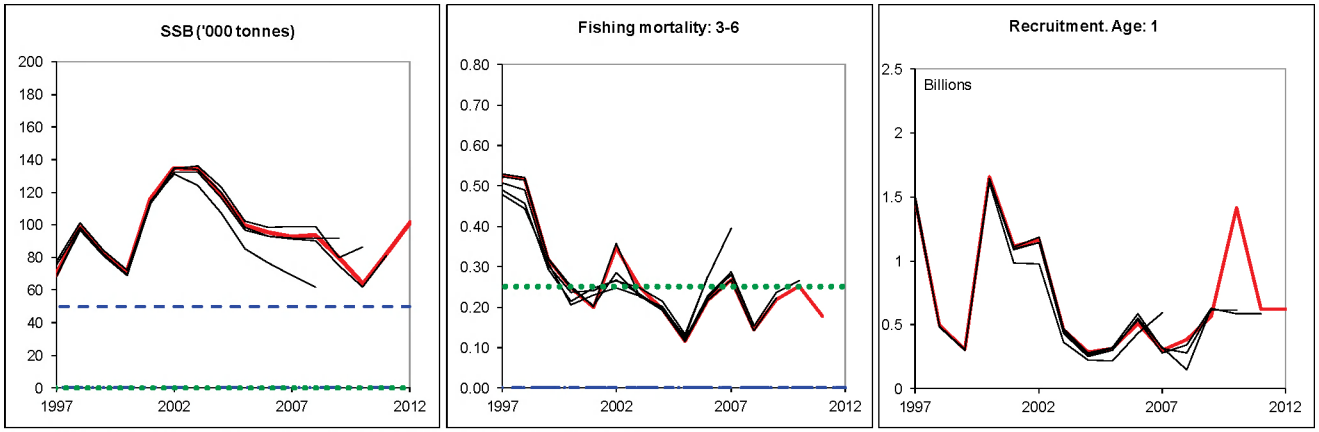


Figure 5.4.30.2 Herring in Division VIa North. Historical assessment results (final-year recruitment estimates included).

Scientific basis

Assessment type	Age-based analytical (FLICA).
Input data	One acoustic survey index (MSHAS_N); commercial landings 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 ≥ 75 000 t ((EC) 1300/2008, Art. 3).
		F_{3-6} = 0.20	If SSB in TAC year <75 000 t and ≥ 50 000 t ((EC) 1300/2008, Art. 3).
		F_{3-6} = 0.00	If SSB in TAC year <50 000 t ((EC) 1300/2008, Art. 3).
MSY Approach	MSY $B_{trigger}$	Not defined.	
	F_{MSY}	0.25	Simulations under different productivity regimes (Simmonds and Keltz, 2007; ICES, 2010).
Precautionary approach	B_{lim}	50 000 t	Lowest reliable estimate of SSB.
	B_{pa}	Not defined.	
	F_{lim}	Not defined.	
	F_{pa}	Not defined.	

(unchanged since: 2010)

Outlook for 2013

Basis: F (2012) = F_{sq} (avg 2009–2011) = 0.22, SSB (2012) [1] =101; landings (2012) = 26; R (2011–2013) = GM (1990–2010) = 619 million.

Rationale	Landings (2013)	SSB (2013)[1]	Basis	F (2013)	SSB (2014)	SSB change[2]	TAC change[3]
Management Plan	27.480	104	20% TAC constraint	0.22	103	−1%	+20%
MSY Framework	31	102	F_{MSY}	0.25	98	−4%	+34%
Zero catch	0	120	F=0	0	142	+18%	−100%
Other options	18	110	F_{2012}*0.66	0.14	115	+5%	−20%
	23	107	F_{2012}*0.84	0.18	109	+2%	0%
	27	105	F_{2012}	0.22	103	−1%	+17%

Weights in thousand 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 2014 relative to SSB 2013.
[3)] Landings 2013 relative to TAC 2012.

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 27 480 t in 2013. This is based on a maximum TAC increase of 20%. SSB in 2013 is estimated to be above 75 000 t implying an F target of F = 0.25, constrained by a maximum 20% TAC increase.

A similar management plan was evaluated by ICES in 2005 and found to be consistent with the precautionary approach. In 2008 ICES checked that the changes in stock dynamics and the changes to the plan had not significantly increased the risks.

MSY approach

Following the ICES MSY framework implies a fishing mortality at F_{MSY} = 0.25, resulting in landings of less than 31 000 t in 2013. This is expected to lead to an SSB of 98 000 t in 2014. 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

Actions which perturb or pollute herring spawning beds or increase turbidity after spawning are likely to have a negative effect on recruitment. Such activities include aggregate extraction, dumping of dredge spoi, and the placement of certain structures on or over the seabed. The placement of structures on or over the seabed in spawning grounds should only be permitted if it can be shown that they do not disturb individual spawning beds or negatively impact spawning, larval production, or stock dynamics.

Ecosystem changes

Grey seal abundance is significant to the west of Scotland and they are known to feed on herring, among other species. Latest estimates of grey seal abundance over time show the population in the area to have remained stable since the mid-1990s (Thomas, 2011). The contribution of seal predation to total herring mortality may be significant, but data are limited. Because the consumption of herring by seals is estimated with great uncertainty, the impact on the stock cannot be estimated accurately.

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 west and north of the Hebrides and to the north of Scotland.

Uncertainties in assessment and catch options

The assessment is noisy, leading to annual revisions of SSB and F. The management plan has been designed to cope with this by applying a constraint on year-on-year change in TAC. Revisions in SSB can be upwards or downwards, so it is important to maintain the restrictions on change in TAC both when the stock is revised upwards 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 acoustic survey catches comprised a mixture of fish from Divisions VIa (North), VIa (South) and VIIb,c, and VIIa (North). The extent of stock mixing in Division VIa (North) catches is unknown. In 2008 ICES began to evaluate the management for Divisions VIa (South) and VIIb,c and Division VIIa (North). ICES is working to produce an assessment that takes mixing into account. Efforts to split the Malin Shelf acoustic survey according to stock component should continue.

Minimum sampling requirements are met in some quarters of the fishery. However, samples from all quarters where there is fishing activity would improve the allocation of sampled métiers in the stock-raising process and knowledge of the biology of the exploited stock.

Comparison with previous assessment and advice

Compared to the assessment in 2011, SSB(2010) was revised upwards by 3.5% and F(2010) downwards by 5%.

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

Sources

ICES. 2010. Report of the Herring Assessment Working Group for the Area South of 62°N (HAWG), 15–23 March 2010. ICES CM 2010/ACOM:06.

ICES. 2012. Report of the Herring Assessment Working Group for the Area South of 62°N (HAWG), 13–22 March 2012. ICES CM 2012/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.

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

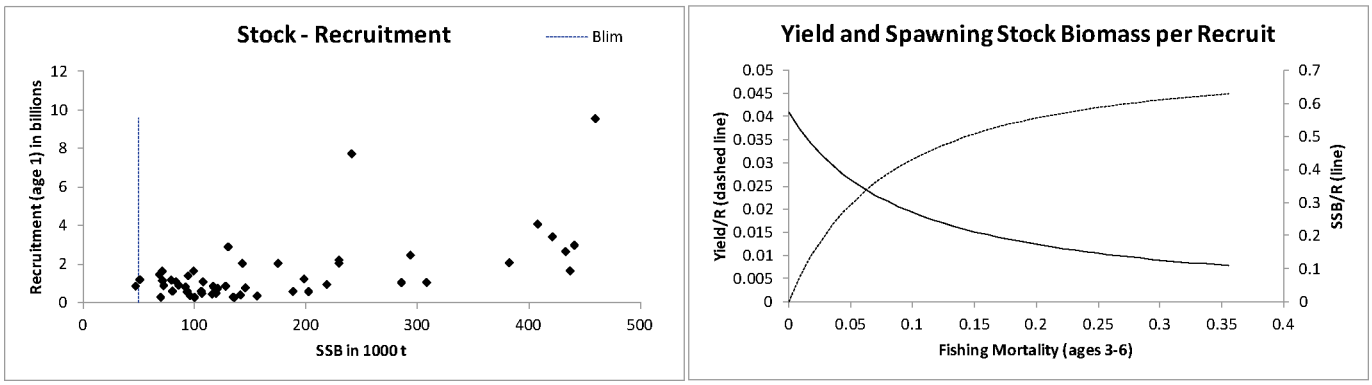


Figure 5.4.30.3 Herring in Division VIa North. Stock–recruitment relationship and yield- and SSB-per-recruit plot.

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

Weights in thousand tonnes.
[1)] Adjusted for misreporting.
[2)] Catch at *status quo* F.
[3)] Revised in 1999.
[4)] Revised in 2007.

Table 5.4.30.2 Herring in Division VIa (North). Catch in tonnes by country. These figures do not correspond in all cases to the official statistics and cannot be used for management purposes.

Country	1988	1989	1990	1991	1992	1993	1994	1995
Denmark								
Faroes			326	482			274	
France	44	1342	1287	1168	119	818	5087	3672
Germany	1860	4290	7096	6450	5640	4693	7938	3733
Ireland	6740	8000	10000	8000	7985	8236	6093	3548
Netherlands	6131	5860	7693	7979	8000	6132	8183	7808
Norway	456		1607	3318	2389	7447	30676	4840
UK	26894	29874	38253	32628	32730	32602	-4287	42661
Unallocated	5229	2123	2397	-10597	-5485	-3753	700	-4541
Discards		1550	1300	1180	200			
Total	47354	53039	69959	50608	51578	56175	54664	61271
Area-Misreported	-11763	-19013	-25266	-22079	-22593	-24397	-30234	-32146
ICES Estimate	35591	34026	44693	28529	28985	31778	24430	29575

Country	1996	1997	1998	1999	2000	2001	2002	2003
Faroes							800	400
France	2297	3093	1903	463	870	760	1340	1370
Germany	7836	8873	8253	6752	4615	3944	3810	2935
Ireland	9721	1875	11199	7915	4841	4311	4239	3581
Netherlands	9396	9873	8483	7244	4647	4534	4612	3609
Norway	6223	4962	5317	2695				
UK	46639	44273	42302	36446	22816	21862	20604	16947
Unallocated	-17753	-8015	-11748	-8155			878	-7
Discards		62	90					
Total	64359	64995	65799	61514	37789	35411	36283	28835
Area-Misreported	-38254	-29766	-32446	-23623	-19467	-11132	-8735	-3581
ICES Estimate	26105	35233	33353	29736	18322	24556	32914	28081

Country	2004	2005	2006	2007	2008	2009	2010	2011
Faroes	228	1810	570	484	927	1544	70	
France	625	613	701	703	564	1049	511	504
Germany	1046	2691	3152	1749	2526	27	3583	3518
Ireland	1894	2880	4352	5129	3103	1935	2728	3956
Netherlands	8232	5132	7008	8052	4133	5675	3600	1684
Norway								
UK	17706	17494	18284	17618	13963	11076	12018	11696
Unallocated								
Discards	123	772	163				95	
Total	29854	31392	34230	33735	25216	21306	22510	21358
Area-Misreported	-7218	-17263	-6884	-4119	-9162	-2798	-2728	-3599
ICES Estimate	25021	14129	27346	29616	16054	18508	19877	17759

Table 5.4.30.3 Herring in Division VIa (North). Summary of stock assessment.

Year	Recruitment Age 1 Thousands)	TSB Tonnes	SSB	Fbar (Ages 3-6)	Landings Tonnes
1957	1031284	386838	174428	0.2989	43438
1958	2004997	471073	187847	0.3529	59669
1959	2055467	505860	197797	0.328	65221
1960	604949	403504	229141	0.2128	63759
1961	1250113	411187	229156	0.1396	46353
1962	2234720	514027	218335	0.2217	58195
1963	2067704	545998	240549	0.1955	49030
1964	962524	498431	285226	0.1634	64234
1965	7744999	1086122	293381	0.1674	68669
1966	1058606	824984	407499	0.2025	100619
1967	2485451	810242	440554	0.1964	90400
1968	4091898	936437	420874	0.1473	84614
1969	2996425	966104	459283	0.2477	107170
1970	3438053	989940	432592	0.3647	165930
1971	9564422	1506702	307931	0.7982	207167
1972	2674750	1108405	436679	0.3688	164756
1973	1073144	798402	382106	0.6093	210270
1974	1669599	574002	201852	0.9623	178160
1975	2088191	431861	105645	0.9154	114001
1976	598870	260996	71898	1.0802	93642
1977	614804	160345	50290	1.018	41341
1978	906699	167857	46614	0.7156	22156
1979	1214143	213564	70605	0.0008	60
1980	877315	249379	120274	0.0004	306
1981	1653259	361280	129728	0.3681	51420
1982	762971	302170	107112	0.6863	92360
1983	2915338	418513	78697	0.7293	63523
1984	1110832	345697	116402	0.5326	56012
1985	1186008	340875	142548	0.329	39142
1986	876435	306587	127453	0.5501	70764
1987	2051987	368931	116953	0.3637	44360
1988	877858	323393	140785	0.2996	35591
1989	807846	305169	155721	0.2588	34026
1990	426615	258301	145218	0.367	44693
1991	376264	199412	118280	0.2756	28529
1992	789219	185164	91338	0.3014	28985
1993	575424	176359	93058	0.2596	31778
1994	843278	170392	85194	0.2356	24430
1995	603900	152177	67987	0.272	29575
1996	922140	186769	106239	0.1756	26105
1997	1477822	204985	69092	0.5277	35233
1998	497762	184848	98641	0.5173	33353
1999	305656	142607	82770	0.3183	29736
2000	1659950	202026	70735	0.2476	18322
2001	1112447	225225	115407	0.1982	24556
2002	1167155	259767	135005	0.3464	32914
2003	462012	217532	134388	0.2498	28081
2004	287165	171091	118908	0.1943	25021
2005	313993	143136	99572	0.1158	14129
2006	508373	162049	95588	0.2165	27346
2007	299363	144274	92895	0.2681	29616
2008	381607	134805	93734	0.144	16054
2009	565534	165386	79721	0.218	18508
2010	1412631	177289	63785	0.252	19877
2011*	618751	211196	82158	0.1777	17759
2012*	618751		101313		
Average	1496026				

*geometric mean 1989-2010 predicted SSB

Annex 5.4.30 Agreed management plan for Division VIa (North) herring: Council Regulation (EC) 1300/2008

1. *Each year, the Council, acting by qualified majority on the basis of a proposal from the Commission, shall fix for the following year the TAC applicable to the herring stock in the area west of Scotland, in accordance with paragraphs 2 to 6.*

2. *When STECF considers that the spawning stock biomass level will be equal or superior to 75 000 tonnes in the year for which the TAC is to be fixed, the TAC shall be set at a level which, according to the advice of STECF, will result in a fishing mortality rate of 0.25 per year. However, the annual variation in the TAC shall be limited to 20%.*

3. *When the STECF considers that the spawning stock biomass level will be less than 75 000 tonnes but equal or superior to 50 000 tonnes in the year for which the TAC is to be fixed, the TAC shall be set at a level which, according to the advice of STECF, will result in a fishing mortality rate of 0.2 per year. However, the annual variation of the TAC shall be limited to:*

   (a) 20% if the spawning stock biomass level is estimated to be equal or superior to 62 500 tonnes but less than 75 000 tonnes;

   (b) 25% if the spawning stock biomass level is estimated to be equal or superior to 50 000 tonnes but less than 62 500 tonnes.

4. *When STECF considers that the spawning stock biomass level will be less than 50 000 tonnes in the year for which the TAC is to be fixed, the TAC shall be set at 0 tonnes.*

5. *For the purposes of the calculation to be carried out in accordance with paragraphs 2 and 3, STECF shall assume that the stock will experience a fishing mortality rate of 0.25 in the year prior to the year for which the TAC is to be fixed.*

6. *By way of derogation from paragraphs 2 or 3, if STECF considers that the herring stock in the area west of Scotland is failing properly to recover, the TAC shall be set at a level lower than that provided for in those paragraphs.*

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

Advice for 2013 and 2014

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

Stock status

F (Fishing Mortality)	
	2009-2011
Qualitative evaluation	? Insufficient information

SSB (Spawning Stock Biomass)	
	2009-2011
Qualitative evaluation	? Insufficient information

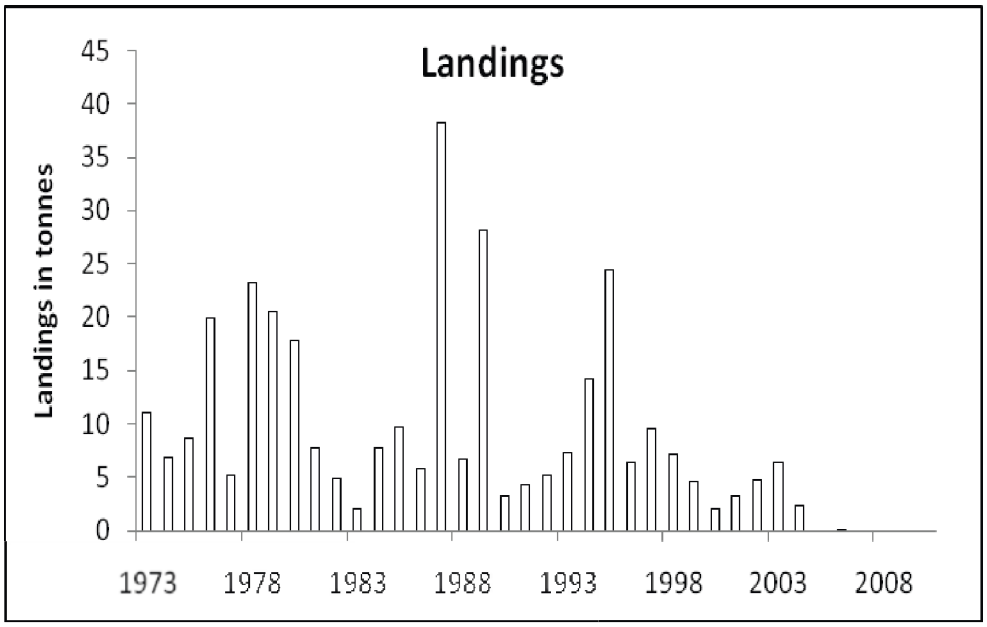


Figure 5.4.31.1 Norway pout in Division VIa. Total landings (tonnes).

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 very low and do not provide an adequate basis for scientific advice.

Fisheries

A directed industrial fishery existed in the past but this fishery has ceased to exist. If industrial fisheries resumes in this area they may take a bycatch of juvenile herring and other species.

Sources

Eurostat/ICES database on catch statistics - ICES 2012 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
2010	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0

ECOREGION Celtic Sea and West of Scotland
STOCK Sandeel in Division VIa

Advice for 2013 and 2014

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

Stock status

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	? Insufficient information

SSB (Spawning Stock Biomass)	
	2009–2011
Qualitative evaluation	? Insufficient information

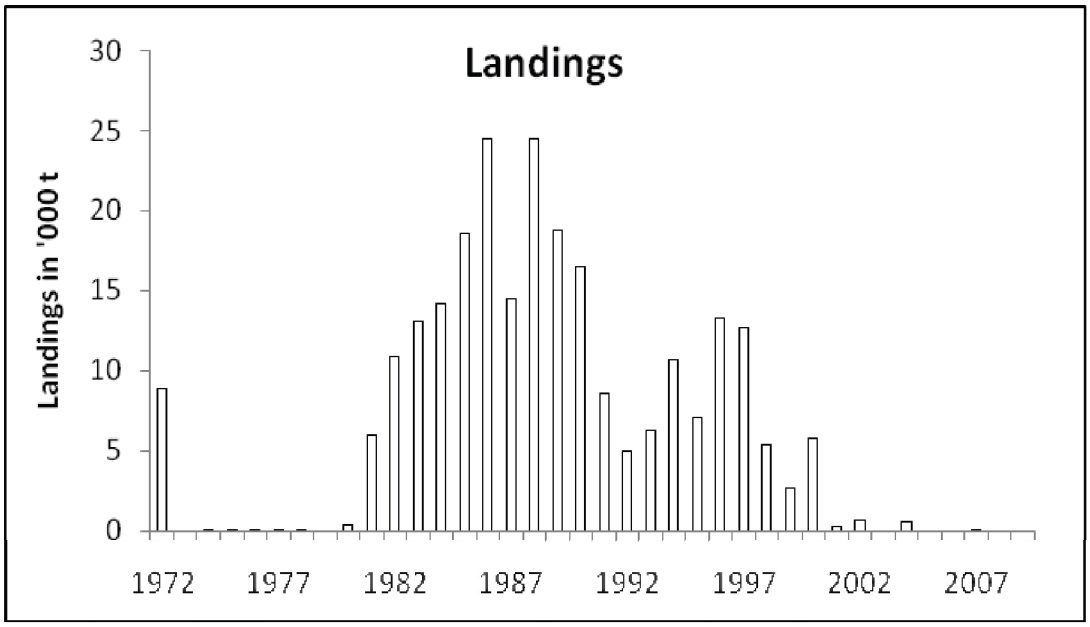


Figure 5.4.32.1 Sandeel in Division VIa. Total landings (tonnes).

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 very low and do not provide an adequate basis for scientific advice. The stock was last assessed in 1996.

Fisheries

A directed industrial fishery existed in the past but this fishery has ceased to exist. If industrial fisheries resumes in this area they may take a bycatch of juvenile herring and other species.

Sources

Eurostat/ICES database on catch statistics - ICES 2012 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
2010	.	-	.	.	.	.	0
2011	.	.	.	.	.	.	0

ECOREGION Celtic Sea
STOCK *Nephrops* in Division VIa

Introduction

Nephrops are limited to a muddy habitat. This means that the distribution of suitable sediment defines the species distribution and the stocks are therefore assessed as three separate functional units (FUs) (Figure 5.4.33.1). The advice for *Nephrops* stocks is given by functional units in Sections 5.4.33.1–3.

Section	FU no.	Name	ICES Division	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

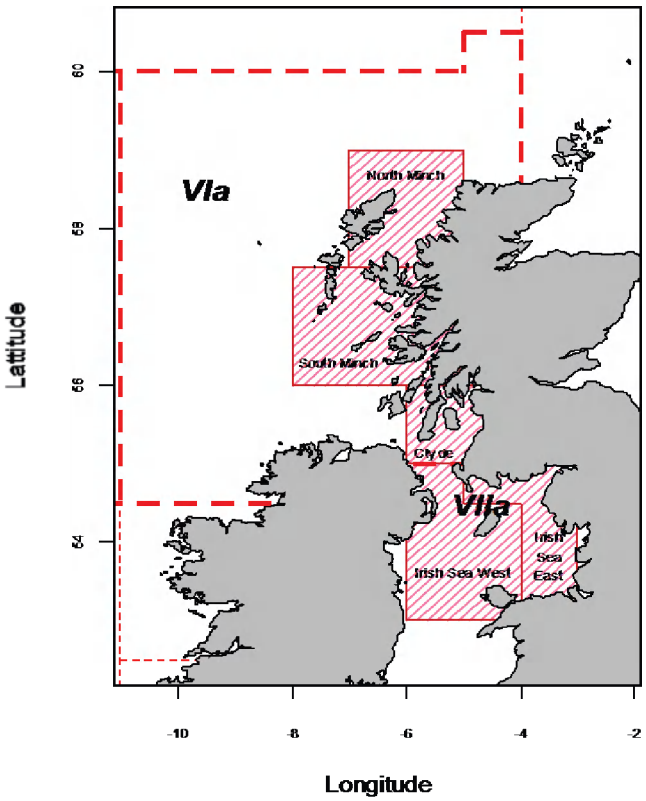


Figure 5.4.33.1 *Nephrops* functional units in Subarea IV and Division VIIa (see Section 5.4.34).

Summary of the advice for 2013

A summary of the advice per area can be found in Table 5.4.33.1.

To protect the *Nephrops* stocks in this management area, management should be implemented at the functional unit level.

There is no information available on the trends in the stock or exploitation status for the rectangles outside the FUs ('other rectangles') for which ICES provides advice. 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	12.8
2012	< 3.2	< 5.5	< 4.2	< 0.9	[4]	[3]	14.1	
2013	< 4.2	< 5.8	< 5.6	< 0.8	[4]	[3]		

Weights in thousand tonnes.
[1] Subarea VI and EC waters of Division Vb.
[2] Effort should not be increased.
[3] ICES advises that stocks should be managed by functional unit.
[4] ICES advises that the catches in the other rectangles should not increase.

Biology

Nephrops is limited to a muddy habitat and requires sediment with a silt and clay content of between 10% and 100% to excavate its burrows. This means that the distribution of suitable sediment defines the species distribution. Adult *Nephrops* only undertake very small-scale movements (a few 100 m), but larval transfer may occur between separate mud patches in some areas. Catches typically consist of a smaller proportion of females than males, due to the lower burrow emergence (resulting in lower catchability) of females during the egg bearing. It is likely that maximum stock size and fishery potential is constrained by the available space since the species competes for space and there are upper limits on density.

Environmental influence on the stock

Temperature and hydrographic factors are critical to recruitment success in *Nephrops*, particularly during the larval phase. Different environmental factors such as sediment type and hydrography result in very different population structure, productivity, and vulnerability to fishing.

Effects of the fisheries on the ecosystem

There is a bycatch of other species in the *Nephrops* fisheries in Division VIa. This bycatch reflects the species associated with muddy sediments. Estimates of discards of whiting and haddock are high in Division VIa. Bycatches of cod are low and the Scottish Conservation Credits Scheme is in place to minimize cod catches. The use of creels for *Nephrops* fishing has increased in inshore areas in the Division VIa FUs. Discards and bycatch in the creel fisheries are considered to be low. The high mud content and soft nature of *Nephrops* grounds means that trawling readily marks the seabed, with trawl marks remaining visible for some time. Burrowing fauna can be seen re-emerging from freshly trawled grounds, implying that there is some resilience to trawling.

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	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}
Fishery history	Stable spatially and temporally	$F_{35\%SPR}$	$F_{35\%SPR}$	F_{max}
	Sporadic	$F_{0.1}$	$F_{0.1}$	$F_{35\%SPR}$
	Developing	$F_{0.1}$	$F_{35\%SPR}$	$F_{35\%SPR}$

There may be great differences in the relative exploitation rates between the sexes for many stocks. To account for this, values for each of the candidates have been determined individually for males, females, and the two sexes combined. The combined sex F_{MSY} proxy should be considered appropriate, provided that the resulting percentage of virgin spawner-per-recruit for males or females does not fall below 20%. If this happens a more conservative sex-specific F_{MSY} proxy should be chosen instead of the combined proxy.

Where possible, a preliminary MSY $B_{trigger}$ was proposed based on the lowest observed underwater TV (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), with effort in the *Nephrops* fisheries remaining 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 2013 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 proxy estimates may vary in time due to changes in selection pattern.

Stock monitoring continues, and enhanced work on observer trips on-board commercial vessels should furnish additional data which will be beneficial in further developing assessment approaches. Vessel monitoring data from satellite (VMS) are being successfully used to match survey and fishery areas for vessels >15 m.

The overall area of the ground is estimated by contoured sediment data. 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 was extended in 2010 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 (2009–2011) 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 the 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. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/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	-	-	7422	-	7428
1981	5	26	-	-	9519	-	9550
1982	1	1	-	1	9000	-	9003
1983	1	1	-	11	10706	-	10719
1984	3	6	-	12	11778	-	11799
1985	1	1	28	9	12449	-	12488
1986	8	20	5	13	11283	-	11329
1987	6	128	11	15	11203	-	11363
1988	1	11	7	62	12649	-	12730
1989	-	9	2	25	10949	-	10985
1990	-	10	4	35	10042	-	10091
1991	-	1	-	37	10458	-	10496
1992	-	10	-	56	10783	-	10849
1993	-	7	-	191	11178	-	11376
1994	3	6	-	290	11047	-	11346
1995	4	9	3	346	12527	-	12889
1996	-	8	1	176	10929	-	11114
1997	-	5	15	133	11104	-	11257
1998	-	25	18	202	10949	-	11194
1999	-	136	40	256	11078	-	11510
2000	1	130	69	137	10667	-	11004
2001	9	115	30	139	10568	-	10861
2002	-	117	18	152	10225	-	10512
2003	-	145	12	81	10450	-	10688
2004	-	150	6	267	9941	-	10364
2005	-	153	17	153	7616	-	7939
2006	-	133	1	255	13419	-	13808
2007	-	155	-	2088	14120	-	16363
2008	-	56	1	419	14795	-	15271
2009	-	53	-	1226	11462	-	12741
2010	-	45	1	1962	10250	-	12258
2011*	-	31	-	-	-	12768	12799

*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	569	12258
2011*	2696	3703	6431	111	12941

* Preliminary.

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
2011*	-	-	-	-	-	-	0

* Preliminary.

ECOREGION Celtic Sea
STOCK *Nephrops* in North Minch (FU 11)

Advice for 2013

ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 4200 t.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)	2009	2010	2011	
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

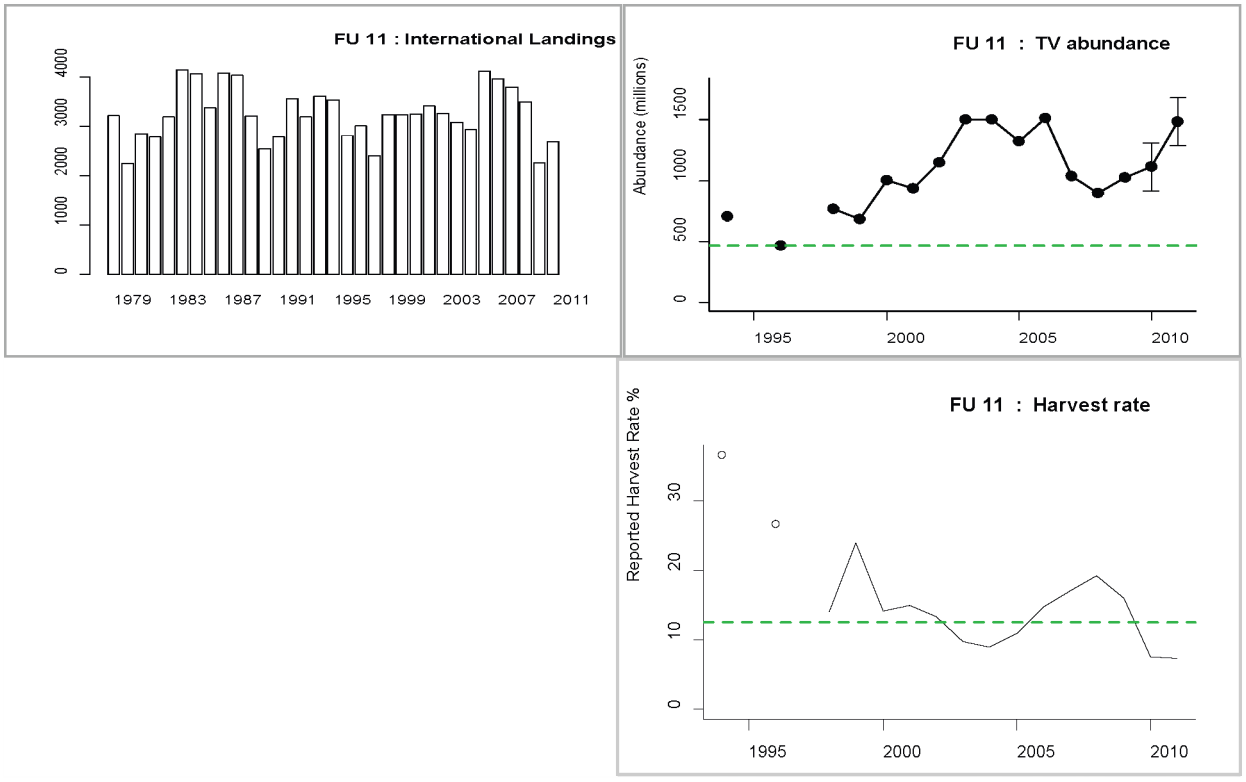


Figure 5.4.33.1.1 *Nephrops* in North Minch (FU 11). Landings (tonnes), UWTV survey abundance (millions; SSB proxy), and harvest rate (fishing mortality proxy). Harvest rates before 2006 may be unreliable due to underreporting of landings. Green dashed lines represent MSY $B_{trigger}$ and F_{MSY} harvest ratios.

The stock has been above MSY $B_{trigger}$ for more than 10 years. The harvest ratios (removals/UWTV abundance) have fluctuated around the F_{MSY} proxy.

Management plans

No specific management objectives are known to ICES.

Biology

The general biology of *Nephrops* is discussed in the overview (Section 5.4.33). The North Minch stock consistently exhibits medium densities compared to other stocks.

The fisheries

The fishery has been fairly stable over the time-series. The drop in landings observed in 2010 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 distribution	Total catch (2011) = 2850 t, where 2700 t are landings (79% trawl, 21% creel) and 150 t discards.

Effects of the fisheries on the ecosystem

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

Quality considerations

Harvest ratios since 2006 are considered reliable due to more accurate landings data reported under the new legislation. The survey area was extended in 2010 and now corresponds to the VMS distribution of fishing effort. From 1999, the incorporation of creel length compositions of catches has also improved estimates of harvest ratios. The recent increase in the mean weight in landings has a considerable impact on the catch forecast. The long-term average (rather than a three-year average) was considered to be more appropriate as input for the mean weight in landings.

Scientific basis

Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data.
Input data	One survey index (UWTV-FU11).
Discards and bycatch	Discards included in the assessment.
Indicators	Size structure of catches.
Other information	A benchmarking is planned for 2013.
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* in North Minch (FU 11)

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	465 million individuals	Bias-adjusted lowest observed UWTV survey estimate of abundance.
	F_{MSY}	12.5% harvest rate	Equivalent to $F_{35\%SpR}$ combined sex. F_{MSY} proxy based on length-based yield-per-recruit analysis.
Precautionary Approach	Not agreed.		
	Not agreed.		

(unchanged since: 2011)

Harvest ratio reference points (2011):

	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 in the UWTV survey is medium (~0.59 burrows m^{-2}). Historical harvest ratios in this FU have been above those 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 is therefore chosen as a proxy for F_{MSY}.

All F_{MSY} proxy harvest rates and MSY $B_{trigger}$ values remain preliminary and may be modified following further data exploration and analysis.

Outlook for 2013

Basis: $F_{2012} = F_{2011}$ =7.3%; Bias-corrected survey index (2011) = 1488 million; Mean weight in landings (1999–2011) = 25.47 g; Dead discard rate (by number) = 12.2%; Survey bias = 1.33.

	Harvest rate	Landings (tonnes)
F_{MSY}	12.5%	4 200
F_{2012}	7.3%	2 400
$F_{0.1}$	8.7%	2 900
F_{max}	16.6%	5 500

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 no more than 4200 t in 2013.

Additional considerations

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.

The minimum landing size for *Nephrops* in Division VIa is 20 mm carapace length. Discarding of both undersize and poor quality *Nephrops* sometimes takes place in this FU. Discard rates have been variable but generally lower than 20%. The mean sizes in the length compositions of larger individuals (>35 mm CL) are stable (Figure 5.4.33.1.2), but the mean weight in landings has increased markedly in the last three years. The time-series average (1999–2011) was used as input for the mean weight in landings for the catch forecasts.

Change in the fisheries

The *Nephrops* (TR2) fleet has been observed to have high discard rates of haddock and whiting in recent years. The selectivity for this fleet needs to be improved. In 2009, under the west coast emergency measures a square-meshed panel of 120 mm was required in the *Nephrops* trawlers and the minimum mesh size is now 80 mm. This is likely to have had little effect on *Nephrops* selection. Twin-rig vessels tend to use a 200 mm square-meshed panel (with a 100 mm codend). This means that they do not catch bulk quantities and this leads to *Nephrops* of larger average size and better quality. Reported effort by all Scottish *Nephrops* trawlers has shown a gradual decreasing trend since 2000.

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 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 since 2010. 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

Abundance bias estimates are largely based on expert opinion. The precision of these bias corrections cannot yet be quantified. The method to derive landings for the catch options is sensitive to the input of discard rate, survival of discards, and mean weight in landings. This introduces uncertainties in the catch forecasts. Precision estimates are needed for these forecast inputs.

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

As in 2011, the harvest rate is below F_{MSY} and the advice is based on the MSY framework.

Source

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

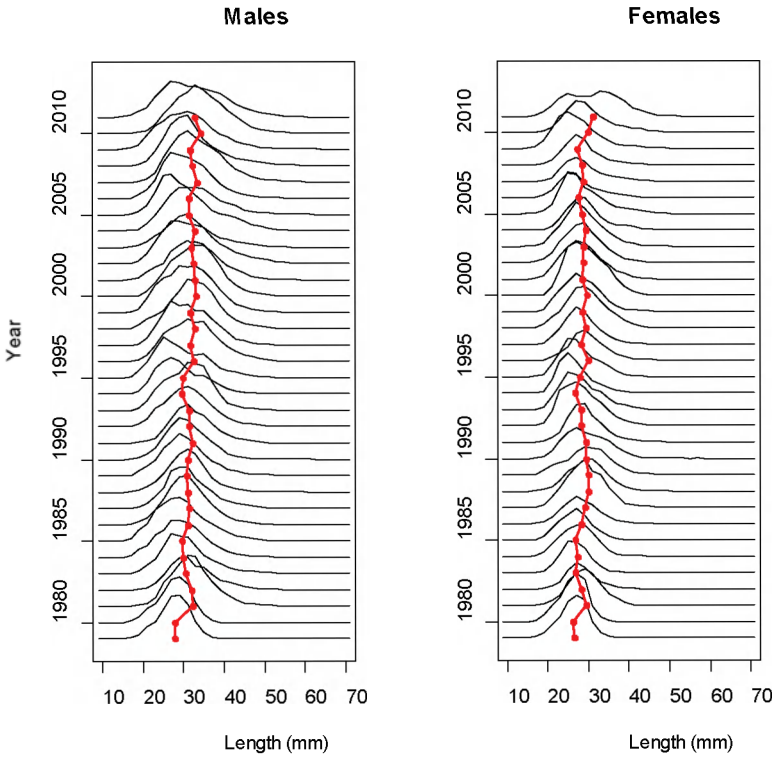


Figure 5.4.33.1.2 *Nephrops* in North Minch (FU 11). Length composition of catch of males (left) and females (right) from 1979 (bottom) to 2011 (top). Mean sizes of catch (red line) is also shown.

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	2.7
2012	MSY approach	< 3.2	
2013	MSY approach	< 4.2	

Weights in thousand tonnes.

Table 5.4.33.1.2 *Nephrops* in North Minch (FU 11). Landings (tonnes) reported to ICES (WG estimates).

Year	UK Scotland		
	Trawl landings	Creel	Total**
1981	2490	371	2861
1982	2428	371	2799
1983	2879	317	3196
1984	3610	534	4144
1985	3353	708	4061
1986	2845	537	3382
1987	3601	482	4083
1988	3598	437	4035
1989	2715	490	3205
1990	2075	469	2544
1991	2353	439	2792
1992	3128	432	3560
1993	2784	408	3192
1994	3162	454	3616
1995	3124	532	3656
1996	2502	369	2871
1997	2655	391	3046
1998	2090	351	2441
1999	2847	410	3257
2000	2723	523	3246
2001	2692	567	3259
2002	2854	586	3440
2003	2651	617	3268
2004	2425	710	3135
2005	2285	699	2984
2006	3463	697	4160
2007	3378	590	3968
2008	3242	557	3799
2009	2884	613	3497
2010	1723	540	2263
2011*	2126	570	2696

* Provisional.

** There are no landings by other countries from this FU.

Table 5.4.33.1.3 *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/m²	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
2011	41	0.79	-	-	1979	260

ECOREGION Celtic Sea
STOCK *Nephrops* in South Minch (FU 12)

Advice for 2013

ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 5800 t.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)	2009	2010	2011	
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

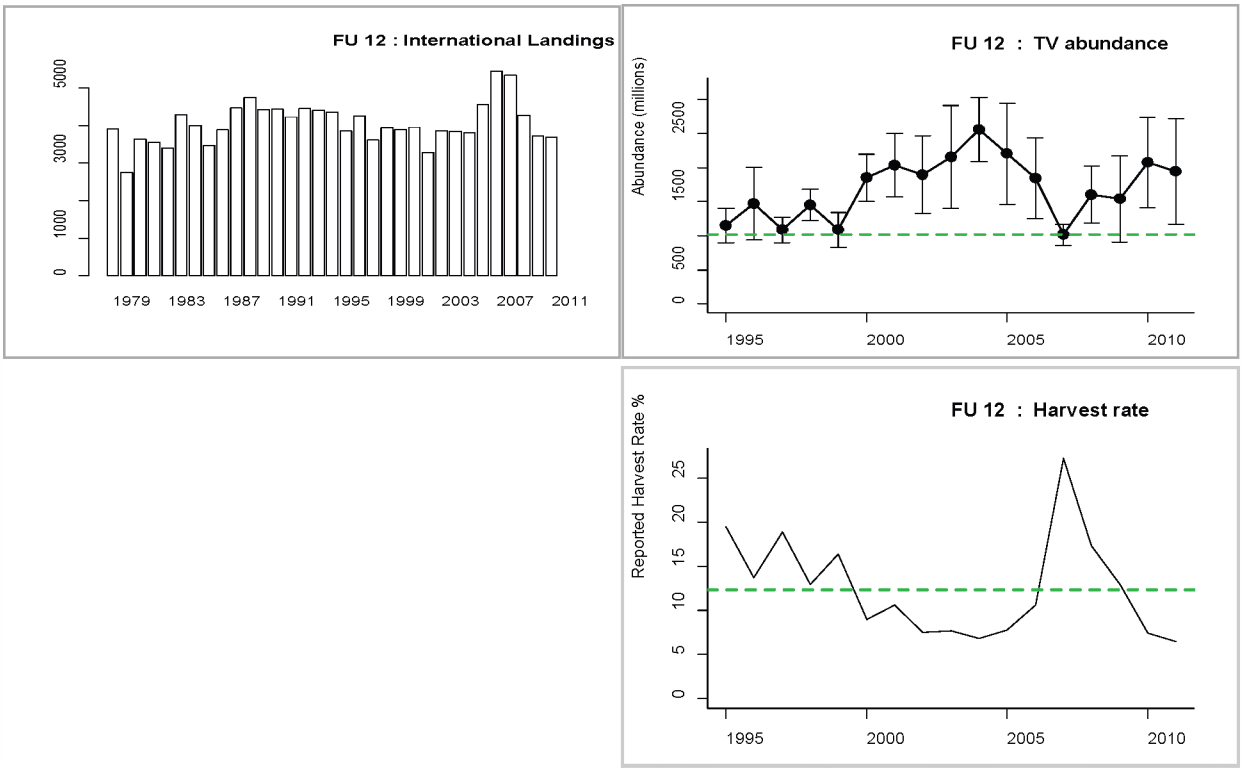


Figure 5.4.33.2.1 *Nephrops* in South Minch (FU 12). Long-term trends in landings (tonnes), UWTV survey (millions; SSB proxy; Confidence intervals 95%), and harvest rate (fishing mortality proxy). Harvest rates before 2006 may be unreliable due to underreporting of landings. Green dashed lines represent MSY $B_{trigger}$ and F_{MSY} harvest ratios.

The stock has been above MSY $B_{trigger}$ the full time-series. The harvest ratio (removals/UWTV abundance) has decreased since 2007 and is now below F_{MSY} proxy.

Management plans

No specific management objectives are known to ICES.

Biology

The general biology of *Nephrops* is discussed in the overview (Section 5.4.33). 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 distribution	Total landings (2011) = 3795 t, where 3703 t are landings (79% trawl and 21% creel) and 92 t discards from the trawl fleet. Discards from the creel fishery are considered to be very low.

Effects of the fisheries on the ecosystem

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

Quality considerations

Harvest ratios since 2006 are considered reliable due to more accurate landings data reported under the new legislation. From 1999, the incorporation of creel length compositions of catches has also improved estimates of harvest ratios. The recent increase in the mean weight in landings has a considerable impact on the catch forecast. The long-term average (rather than a three-year average) was considered to be more appropriate as input for the mean weight in landings.

Scientific basis

Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data.
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

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

(unchanged since: 2010)

Harvest ratio reference points (2011):

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

For this FU, the absolute density observed in the UWTV survey is medium (~ 0.44 burrows m^{-2}). The fishery in this area has been in existence since the 1960s. Historical harvest ratios in this FU have been variable, but generally around 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 rates and MSY $B_{trigger}$ values remain preliminary and may be modified following further data exploration and analysis.

Outlook for 2013

Basis: $F_{2012} = F_{2011}$ = 6.5%; Bias-corrected survey index (2011) = 1945 million; Mean weight in landings (1999–2011) = 26.24 g; Dead discard rate (by number) = 7.3%; Survey bias = 1.32.

	Harvest rate	Landings (tonnes)
F_{MSY}	12.3%	5 800
F_{2012}	6.5%	3 100
$F_{0.1}$	8.7%	4 100
F_{max}	16.1%	7 600

MSY approach

Following the ICES MSY approach implies the harvest ratio for the South Minch functional unit should be no more than 12.3%, resulting in landings of no more than 5800 t in 2013.

Additional considerations

Recent work comparing the area based on available VMS and sediment data showed no major differences between the two, and the original area of ground was retained. However, the survey should still be considered as a minimum estimate since areas of suitable sediment in the sea lochs are not included.

The minimum landing size for *Nephrops* in Division VIa is 20 mm carapace length. Discarding of both undersize and poor quality *Nephrops* sometimes takes place in this FU. Discard rates have been variable but generally lower than

30%. The mean weight in landings has increased markedly in the last three years. Therefore the time-series average (1999–2011) was used as input for the mean weight in landings for the catch forecasts.

Change in the fisheries

The *Nephrops* (TR2) fleet has been observed to have had high discard rates of haddock and whiting in recent years. The selectivity for this fleet needs to be improved. In 2009, under the west coast emergency measures a square-meshed panel of 120 mm was required in the *Nephrops* trawlers and the minimum mesh size is now 80 mm. This is likely to have had little effect on *Nephrops* selection. Twin-rig vessels tend to use a 200 mm square-meshed panel (with a 100 mm codend), and some of them are slightly bigger than that. This means that they do not catch bulk quantities and this leads to *Nephrops* of larger average size and better quality. Reported effort by all Scottish *Nephrops* trawlers has shown a gradual decreasing trend since 2000.

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. 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 the precision of the catch forecast has not been investigated.

Uncertainties in the assessment and forecast

Abundance bias estimates for FU 12 are largely based on expert opinion. The precision of these bias corrections cannot yet be quantified. The method to derive landings for the catch options is sensitive to the input dead discard rate and mean weight in landings, and this introduces uncertainties in the catch forecasts. Precision estimates are needed for these forecast inputs. The overall area of the ground is estimated from the available British Geological Survey contoured sediment data and at present this is considered to be a minimum estimate, although the problem is less severe than in the North Minch. 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

As in 2011, the harvest rate is below F_{MSY} and the advice is based on the MSY framework.

Source

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

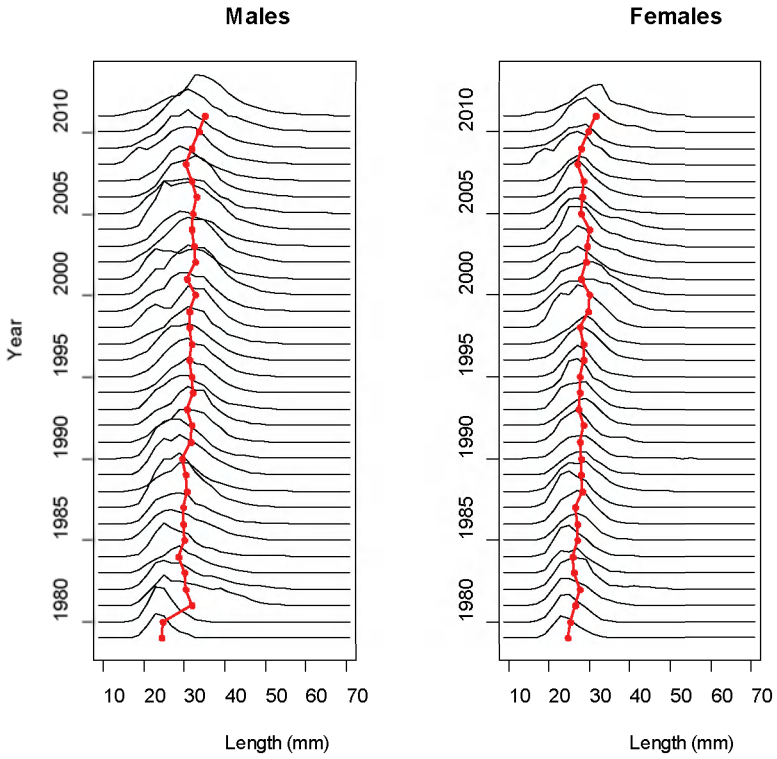


Figure 5.4.33.2.2 *Nephrops* in South Minch (FU 12). Length composition of catch of males (left) and females (right) from 1979 (bottom) to 2011 (top). Mean sizes of catch (red line) is also shown.

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	3.7
2012	MSY approach	< 5.5	
2013	MSY approach	< 5.8	

Weights in thousand tonnes.

Table 5.4.33.2.2 *Nephrops* in South Minch (FU 12). Landings (tonnes) reported to ICES (WG estimates).

Year	UK Scotland			Other UK	Ireland	Total
	Trawl landings	Creel	Sub-total**			
1981	3219	432	3651	0	0	3651
1982	3132	420	3552	0	0	3552
1983	2956	456	3412	0	0	3412
1984	3706	594	4300	0	0	4300
1985	3520	488	4008	0	0	4008
1986	2982	502	3484	0	0	3484
1987	3345	546	3891	0	0	3891
1988	3908	555	4463	10	0	4473
1989	4184	561	4745	0	0	4745
1990	3994	436	4430	0	0	4430
1991	3938	503	4441	1	0	4442
1992	3687	549	4236	1	0	4237
1993	3801	649	4450	5	0	4455
1994	4008	404	4412	3	0	4415
1995	4158	508	4666	14	0	4680
1996	3526	468	3994	1	0	3995
1997	3850	492	4342	3	1	4346
1998	3191	538	3729	0	0	3730
1999	3524	513	4037	0	14	4051
2000	3251	699	3950	0	2	3952
2001	3216	767	3983	0	9	3992
2002	2549	742	3291	0	14	3305
2003	3015	858	3873	0	6	3879
2004	2969	880	3849	0	19	3868
2005	2856	953	3809	1	31	3841
2006	3588	922	4510	9	35	4554
2007	4444	958	5402	19	30	5451
2008	4437	895	5332	2	13	5347
2009	3367	900	4267	4	11	4282
2010	2814	889	3703	16	6	3725
2011*	2883	783	3671	23	9	3703

* Provisional.

** Sub-total for Scotland includes landings from other gears.

Table 5.4.33.2.3 *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/m²	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
2011	36	0.51	2568	1028

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

Advice for 2013

ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 6400 t (5600 t for Firth of Clyde and 800 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

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✗	✗	✗	Above 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

Sound of Jura

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✓	✓	✓	Below target
Precautionary approach (F_{pa},F_{lim})	?	?	?	Not defined

SSB (Spawning-Stock Biomass)	2009	2010	2011	
MSY ($B_{trigger}$)	?	?	?	Not defined
Precautionary approach (B_{pa},B_{lim})	?	?	?	Not defined

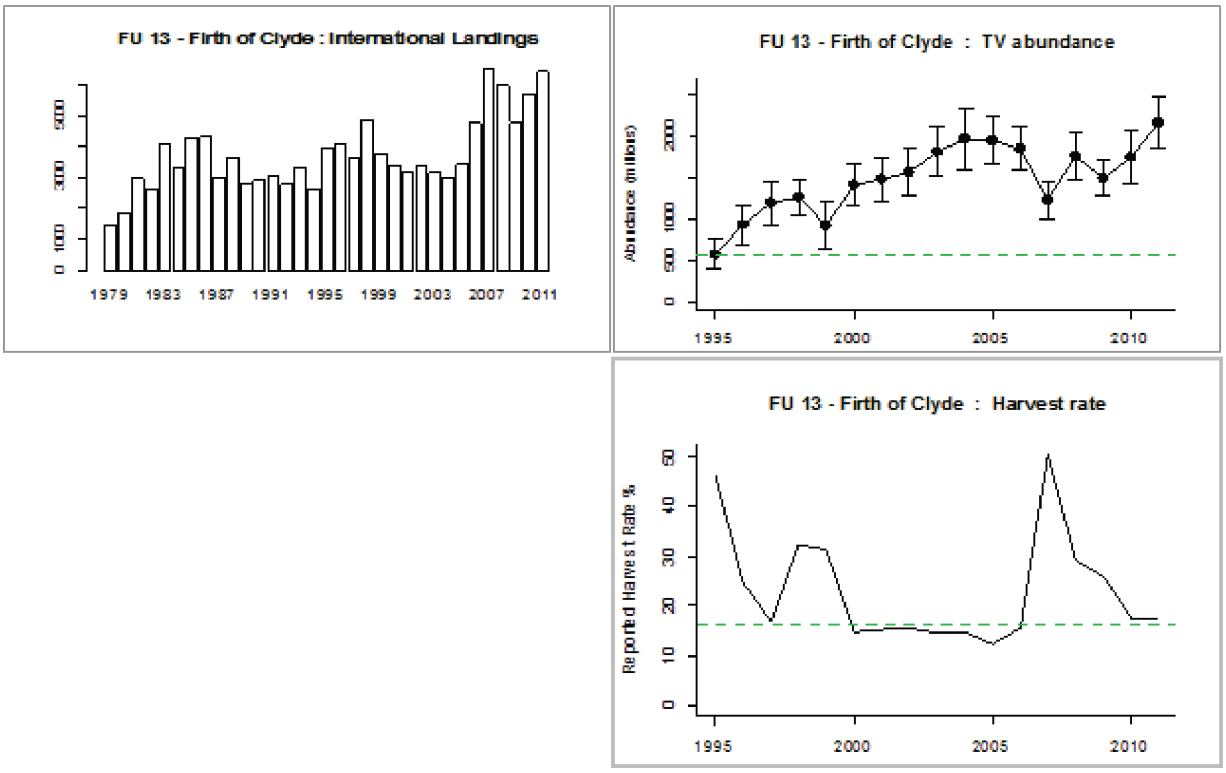


Figure 5.4.33.3.1 *Nephrops* in the **Firth of Clyde** (FU 13). Long-term trends in landings (tonnes), UWTV survey (in millions; SSB proxy), and harvest rate (fishing mortality proxy). Harvest rates before 2006 may be unreliable due to underreporting of landings. Green dashed lines represent MSY $B_{trigger}$ and F_{MSY} harvest ratios.

UWTV abundance remains well above the MSY $B_{trigger}$. Harvest rates for *Nephrops* in the Firth of Clyde have declined since 2007 but remain above the proposed F_{MSY} proxy.

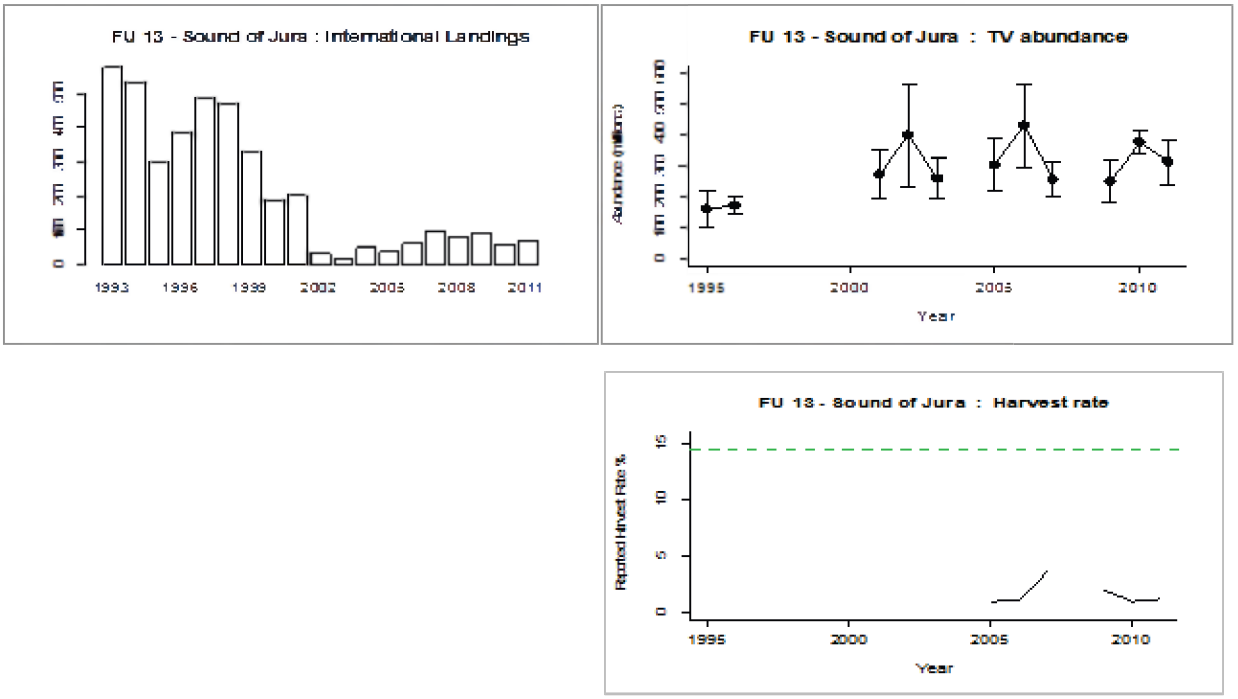


Figure 5.4.33.3.2 *Nephrops* in the **Sound of Jura** (FU 13). Long-term trends in landings (tonnes), UWTV survey (millions; SSB proxy), and harvest rate (fishing mortality proxy, no data available before 2005). Harvest rates before 2006 may be unreliable due to underreporting of landings. Green dashed 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). *Nephrops* in the Firth of Clyde occur at a very high density (average 0.8 burrows m^{-2}) and have a smaller average size and size-at-maturity than most other stocks. The high observed density implies intense competition for space and food on the seabed. This is thought to make the stock resilient to high fishing pressure. The habitat in Firth of Clyde is a relatively continuous patch of muddy sediment apart from the sea lochs, while the Sound of Jura consists of a single patch of muddy sediment.

The fisheries

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

Catch distribution	Total landings (2011) in Firth of Clyde + Sound of Jura = 6987 t, where 6431 t are landings (97% trawl and 3% creel) and 556 t discards from the trawl fleet. Discards from the creel fishery are considered to be very low.

Effects of the fisheries on the ecosystem

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

Quality considerations

Harvest ratios since 2006 are considered reliable due to more accurate landings data reported under the new legislation. In 2011 no commercial catch-at-length samples were collected from Sound of Jura and data from 2008–2010 were used to calculate the mean weight in landings.

Scientific basis

Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data.
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. F_{MSY} proxy based on length-based yield-per-recruit analysis.
Precautionary Approach	Not agreed.		
	Not agreed.		

(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 $F_{35\%SPR}$ combined sex.
Precautionary Approach	Not agreed	Not defined.	
	Not agreed	Not defined.	

(unchanged since 2010)

Harvest ratio reference points (2011):

	Male	Female	Combined
F_{max}	13.6	34.0	16.4
$F_{0.1}$	8.7	21.1	9.7
$F_{35\%}$	10.7	25.7	14.5

For the Firth of Clyde subarea of this FU, the absolute density observed in the UWTV survey is generally high (over 0.8 burrows m^{-2} for the entire series and around 1.0 burrows m^{-2} in the last 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} in 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 $F_{35\%SPR}$ 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 2013

Firth of Clyde

Basis: $F_{2012} = F_{2011} = 17.6\%$; Bias-corrected survey index (2011) = 2165 million; Mean weight in landings (2009–2011) = 19.53 g; Discard rate (by number) = 20.0%; Survey bias = 1.19.

	Harvest rate	Landings (tonnes)
F_{MSY}	16.4%	5 600
F_{2012}	17.6%	6 000
$F_{0.1}$	9.7%	3 300
$F_{35\%SPR}$	14.5%	4 900

Sound of Jura

Basis: $F_{2012} = F_{2011} = 1.2\%$; Bias-corrected survey index (2011) = 312 million; Mean weight in landings (2009–2011) = 21.44 g; Discard rate (by number) = 20.0%; Survey bias = 1.19.

	Harvest rate	Landings (tonnes)
F_{MSY}	14.5%	800
F_{2012}	1.2%	100
$F_{0.1}$	9.7%	500
F_{max}	16.4%	900

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 no more than 5600 t in 2013. As the current harvest ratio for 2011 (17.6%) is very close to the F_{MSY} proxy (16.4%), no transition stage was calculated.

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 800 t in 2013. For the Sound of Jura no transition is needed as the harvest rate is already below the F_{MSY} proxy.

Additional considerations

Landings from this FU in 2011 were 6400 tonnes compared to the advised landings for 2012 of 5100 tonnes.

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

Regulations and their effects

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

Data and methods

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

Uncertainties in assessment and forecast

The abundance 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 quantified. The method to derive landings for the catch options is sensitive to the input dead discard rate and mean weight in landings and this introduces uncertainties in the catch forecasts. Precision estimates are needed for these forecast inputs.

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

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

Comparison with previous assessment and advice

The basis for the assessment method is consistent with last year. The advice is based on the MSY approach.

Source

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

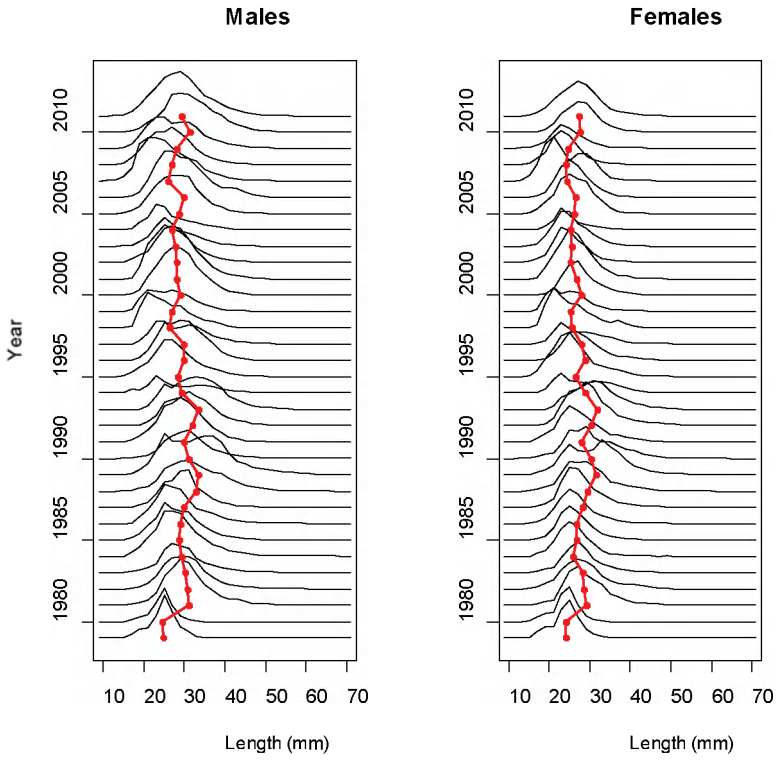


Figure 5.4.33.3.3 *Nephrops* in Clyde (FU 13). Length composition of catch of males (left) and females (right) from 1979 (bottom) to 2011 (top). Mean sizes of catch (red line) is also shown.

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	6.4
2012	MSY transition scheme in Firth of Clyde and MSY framework in Sound of Jura	< 4.2	< 0.9	
2013	MSY approach both in Firth of Clyde and Sound of Jura	< 5.6	< 0.8	

Weights in thousand tonnes.

Table 5.4.33.3.2 *Nephrops* in the Firth of Clyde + Sound of Jura (FU 13). ICES estimates of landings (tonnes).

Year	UK Scotland			Other UK & Ireland	Total
	Trawl landings	Creel	Sub-total**		
1981	2902	66	2968	0	2968
1982	2544	79	2623	0	2623
1983	4010	53	4063	14	4077
1984	3223	77	3300	10	3310
1985	4214	64	4278	7	4285
1986	4249	79	4328	13	4341
1987	2939	65	3004	3	3007
1988	3615	43	3658	7	3665
1989	2761	35	2796	16	2812
1990	2854	24	2878	34	2912
1991	2990	25	3015	23	3038
1992	2778	10	2788	17	2805
1993	3309	5	3314	28	3342
1994	2552	28	2580	49	2629
1995	3899	26	3925	64	3989
1996	3991	27	4018	42	4060
1997	3530	25	3555	63	3618
1998	4620	40	4660	183	4843
1999	3504	38	3542	210	3752
2000	3206	76	3282	137	3419
2001	2956	94	3050	132	3182
2002	3127	105	3232	151	3383
2003	2974	117	3091	80	3171
2004	2677	90	2767	258	3025
2005	3180	95	3275	148	3423
2006	4446	0	4534	244	4778
2007	6129	0	6129	366	6495
2008	5384	197	5581	416	5997
2009	4305	189	4494	283	4777
2010	5050	186	5236	465	5701
2011*	5665	219	5891	540	6431

* Provisional.
** Sub-total for Scotland includes landings from other gears.

Table 5.4.33.3.3 *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
2011	40	1.239	2576	363

Table 5.4.33.3.4 *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	0.850	324	90
2002	9	1.240	474	199
2003	12	0.810	309	81
2004	no survey			
2005	11	0.940	360	100
2006	10	1.340	512	160
2007	10	0.800	304	69
2008	no survey			
2009	12	0.780	299	81
2010	12	1.173	448	46
2011	12	0.971	371	87

ECOREGION Celtic Sea
STOCK *Nephrops* in Subarea VII

Introduction

Nephrops are limited to a muddy habitat and the distribution of suitable sediment defines the species distribution. The stocks are assessed as seven separate functional units (FUs) as shown in Figure 5.4.34.1. There are also some smaller catches from areas outside these functional units as well as all of FU 18 which are not formally assessed. The advice for *Nephrops* stocks is given by functional unit in Sections 5.4.34.1–7.

Section	FU no.	Name	ICES Divisions	Statistical rectangles
5.4.34.1	14	Irish Sea East	VIIa	35–38 E6; 38 E5
5.4.34.2	15	Irish Sea West	VIIa	36 E3; 35–37 E4–E5; 38 E4
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; 31 E1; 32 E1–E2; 33 E2–E3
5.4.34.6	20–21	Celtic Sea – Labadie	VIIg,h	28–30 E1; 28–31 E2; 30 E3
5.4.34.7	22*	Celtic Sea – the Smalls	VIIg,f	31–32 E2, 31–32 E4

* The advice for these stocks was updated in November 2012 on the basis of new survey information.

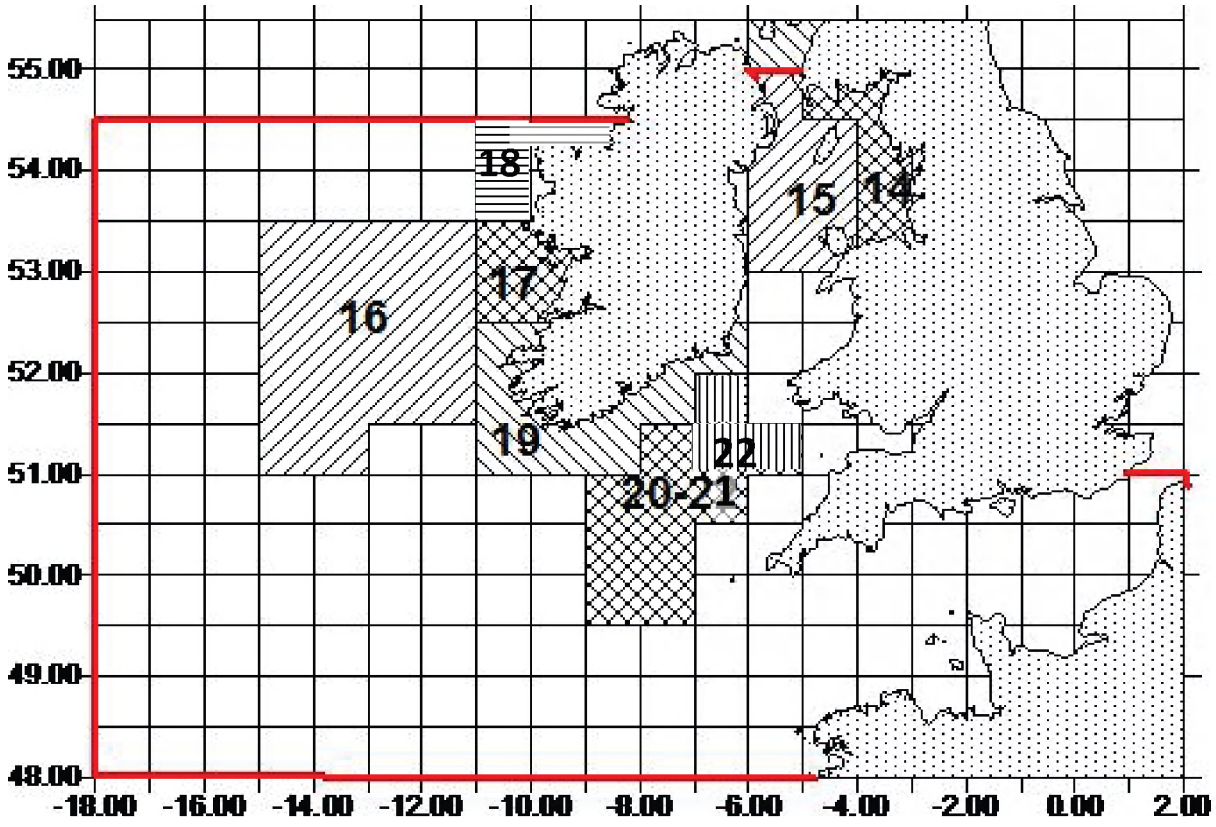


Figure 5.4.34.1 *Nephrops* functional units in Subarea VII (around Ireland). The TAC for Subarea VII applies to the area bounded by the red line. The FUs within the TAC area are shaded.

Summary of the advice for 2013

A summary of the advice for all areas can be found in Table 5.4.34.1.

There is no information available on the trends in the stock or exploitation status for FU 18 and the rectangles outside the FUs ('other rectangles') for which ICES provides advice. ICES advises that the catches in FU 18 and other rectangles should not increase from the recent average, which implies catches of no more than 200 t.

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 (FU 14)	Irish Sea West (FU 15)	Porcupine Bank (FU 16)	Aran Grounds (FU 17)	Ireland SW and SE Coast (FU 19)	Celtic Sea-Labadie (FUs 20–21)	Celtic Sea-the Smalls FU 22	Other rectangles [1]		
Division	VIIa		VIIb,c,j,k			VIIg,h	VIIg,f		VII	VII
1992	8.9		3.8			~3.8			20.0	15.8
1993	9.4		~4.0			3.8			20.0	16.6
1994	9.4		~4.0			3.8			20.0	17.2
1995	9.4		~4.0			3.8			20.0	18.5
1996	9.4		4.0			3.8			23.0	16.6
1997	9.4		4.0			3.8			23.0	18.9
1998	9.4		4.0			3.8			23.0	18.3
1999	9.4		4.0			3.8			23.0	18.6
2000	9.4		4.0			3.8			21.0	16.3
2001	9.4		4.0			3.8			18.9	16.0
2002	9.55		4.44			3.8			17.79	16.0
2003	9.55		4.44			3.8			17.79	15.7
2004	9.55		3.3			4.6			17.45	15.3
2005	9.55		3.3			4.6			19.544	16.0
2006	9.55		3.3			4.6			21.498	16.2
2007	- [2]	- [2]	- [3]	- [3]	- [3]	- [2]			25.153	19.0
2008	- [2]	- [2]	- [3]	- [3]	- [3]	< 5.3			25.153	20.5
2009	<1.0	< 8.5	< 1.0	< 0.9	< 0.8	< 5.3		< 0.2	24.650	17.7
2010	<1.0	< 5.5	0	< 0.5	< 0.8	< 5.3		< 0.2	22.432	17.2
2011	<0.68	<9.5	0	<0.9	- [4]	- [4]		< 0.2	21.759	16.1
2012	<0.96	<9.8	- [5]	<1.1	- [6]	- [6]	<2.3	[5]	21.759	
2013	<0.88	<9.3	<1.8	<0.59	<0.82	<2.5	<3.1	< 0.2		
2014						<2.5				

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

Biology

Nephrops is limited to a muddy habitat, requiring sediment with a silt and clay content of between 10 and 100% to excavate its burrows. This means that the distribution of suitable sediment defines the species distribution. Adult *Nephrops* only undertake very small scale movements (a few 100 m) but larval transfer may occur between separate mud patches in some areas. This makes some stocks, particularly those with lower average density, vulnerable to 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 the male *Nephrops* grows faster and attains a large size than the female. Density limits growth, and *Nephrops* have a smaller average size on grounds with high *Nephrops* density (>0.7 m^{-2}) than on grounds 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 the FU 15 stock, have well known and understood larval retention mechanisms (i.e. Western Irish Sea Gyre). Other stocks, such as the Porcupine Bank stock, have less well understood

larval retention mechanisms. This results in very different population structure, productivity, and vulnerability to fishing. Increasing water temperature leading to shorter larval development times is thought to improve recruitment in areas such as the Irish Sea. Increased storminess related to the NAO has also been linked to reduced recruitment and low catch rates several years later on the Porcupine Bank.

Effects of the fisheries on the ecosystem

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

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

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. The implementation of the "of which" clause on the Porcupine Bank in 2011 without other management measures has increased the risk of highgrading and area misreporting in that area in 2011.

Landings from the northwest coast of Ireland (FU 18) have previously been treated as a separate functional unit although landings have been negligible in recent years and there is no major *Nephrops* fishery in that area. There are also *Nephrops* catches in other rectangles outside functional units in Subarea VII. There is no information available on the trends in the stock or exploitation status for FU 18 and the rectangles outside the FUs ('other rectangles') for which ICES provides advice. ICES advises that the catches in the other rectangles and FU 18 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 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 differences in relative exploitation rates between the sexes for many stocks. To account for this, values for each of the candidates have been determined for males and females separately, and for the two sexes combined. The appropriate F_{MSY} candidate has been selected for each functional unit independently according to the perception of stock resilience, factors affecting recruitment, population density, knowledge of biological parameters, and the nature of the fishery (relative exploitation of the sexes and historical harvest rate 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 chosen 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}
Historical fishery	Stable spatially and temporally	$F_{35\%SpR}$	$F_{35\%SpR}$	F_{max}
	Sporadic	$F_{0.1}$	$F_{0.1}$	$F_{35\%SpR}$
	Developing	$F_{0.1}$	$F_{35\%SpR}$	$F_{35\%SpR}$

Preliminary MSY $B_{trigger}$ reference points were proposed at the lowest abundance observed in the underwater TV (UWTV) survey. However, the time-series of surveys in Subarea VII are too short for that. For FU 15, where a longer series of survey trawl cpue was available; this was used to estimate a preliminary MSY $B_{trigger}$.

Data-limited stocks

Not all functional units areas are covered by TV surveys and in some cases the biological data are also sparse, resulting in qualitative advice based on trends in catch rates and size composition. For 2012, the basis for advice has been developed from the TV survey methodology in order to provide a quantitative estimate of fishing opportunity likely to be compliant with MSY considerations. This approach has been implemented for *Nephrops* on the Labadie and other banks in the Celtic Sea (FUs 20–21).

The approach is based on habitat extent and population characteristics. The physical area of the FU has been determined either through knowledge of the sediment type, or from the fishery itself (e.g. VMS positions). Estimates of total abundance are calculated by taking the physical area and multiplying by potential values of *Nephrops* density which are drawn either from neighbouring FUs with existing TV surveys or from preliminary TV surveys of the specific FU. The numbers removed corresponding to the average (10 years) and maximum observed landings were estimated using mean weights and appropriate discard rates. Finally, the harvest rates for these removal numbers were calculated for each of the possible density values and these are laid down in a table:

Basis: Surface area FUs 20–21: 3710 km^2; mean weight: 34 g; discards: 25% in number.

		Range of potential densities (*Nephrops* m^{-2})						
Basis	**Landings**	0.2	0.25	0.3	0.35	0.4*	0.45	0.5
Minimum	1200	5.8%	4.6%	3.9%	3.3%	2.9%	2.6%	2.3%
Average (3 yr)	2100	10.3%	8.3%	6.9%	5.9%	5.2%	4.6%	4.1%
Average (10 yr)	**2500**	**12.4%**	**9.9%**	**8.3%**	**7.1%**	**6.2%**	**5.5%**	**5.0%**
Maximum	3100	15.8%	12.6%	10.5%	9.0%	7.9%	7.0%	6.3%

Shaded areas indicate harvest rates >7.5% (lowest F_{MSY} proxy of *Nephrops* across the shelf of the Celtic Seas Ecoregion, excluding the deep-water FU 16 stock).
* Most recent density estimate (preliminary TV survey results).

In order to give advice, average landings of the last ten years are considered together with the relevant densities in the area (gathered through preliminary surveys or assumed based on neighbouring FUs). The resulting harvest rate is compared to harvest rates commensurate with F_{MSY} for other *Nephrops* stocks in the shelf of the Celtic seas ecoregion, ranging from 7.5% (FU 19) to 17.1% (FU 15) and averaging 12.4%. Note that the Porcupine Bank (FU 16) stock is not taken into account here because F_{MSY} proxies for deep-water stocks (>200 m for FU 16) should not be compared to MSY proxies for shelf stocks. Based on this table and these reference points, if average landings in any FU result in a harvest rate below the minimum F_{MSY} harvest rate calculated for this ecoregion, this is considered a precautionary state and advice is given on the basis of landings at the average of the last ten years. Where the harvest rate resulting from the average landings are higher or there is particular uncertainty surrounding the appropriate density estimates, additional precautionary reductions are considered.

In lieu of sufficient data to develop a more analytic approach, advice will be given on the basis of average landings and it may not be possible to advise on increasing landings until more work is done. Methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished.

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 FUs 14 and 15 (Irish Sea), 16 (Porcupine Bank), 17 (Aran Grounds), 19 (southeast and southwest coast of Ireland), and 22 (the Smalls) are primarily based on abundance estimates from underwater TV (UWTV) surveys together with fishery landings data and estimates of quantities of discards. Additional indicators of changes in stocks are derived from trends in length compositions and sex ratio in the catches, fishery lpue, and (for FUs 15 and 16) trawl survey catch rates. The assessments and advice for FUs 20–21 (Celtic Sea) is based on a range of indicators of stock trends, including fishery lpue, trawl survey catch rates, size compositions and sex ratio, and the data-limited approach.

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

- Total population numbers are estimated from the UWTV surveys, including adjustments for a range of biases associated with the method. 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}, $F_{35\%SPR}$) for males, females, and for 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 2013 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 value for proportion retained and mean weight in the landings.

Uncertainties in assessment and forecast

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

New 2012 UWTV survey abundance estimates were available to ICES in September 2012 for FUs 17, 22, and 16. Having reviewed this new information ICES concludes that:

- For *Nephrops* in FU 17 (Aran Grounds) the abundance estimated during the summer 2012 survey was significantly lower than in 2011, which was used in the calculation of catch options by WGCSE in May (ICES, 2012). Using the 2012 survey abundance estimate and the same basis as before implies that the advice on landings decreases from 890 t to 590 t.
- For *Nephrops* in FU 22 (the Smalls) the abundance estimated during the summer 2012 survey was significantly higher than in 2011, which was used in the calculation of catch options by WGCSE in May (ICES, 2012). Using the 2012 survey abundance estimate and the same basis as before implies that the advice on landings increases from 2600 t to 3100 t.
- For *Nephrops* in FU 16 (Porcupine Bank) the results of this new survey could be used as an improved basis for management advice for 2013. A yield- and spawner-per-recruit analysis was used to estimate $F_{0.1}$ and other F reference points. A harvest rate of 5.0% corresponds to the combined sex $F_{0.1}$. This harvest rate is low compared to other FUs and can be considered very conservative. Applying this harvest rate to the bias-corrected abundance observed in the survey and using a mean weight in the landings of 45.0 g implies landings in 2013 of 1800 t.

Preliminary information for FU 15 shows no significant change in stock abundance. Survey results for FU 19, FUs 20–21, and FU 14 were not available by the time of the reopening process.

Trends in lpue data as a measure of stock abundance are subject to uncertainties due to changes in fishing practices.

Sources

ICES. 2009. Report of the Benchmark Workshop on *Nephrops* (WKNEPH), 2–6 March 2009, Aberdeen, UK. ICES CM 2009/ACOM:33.

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

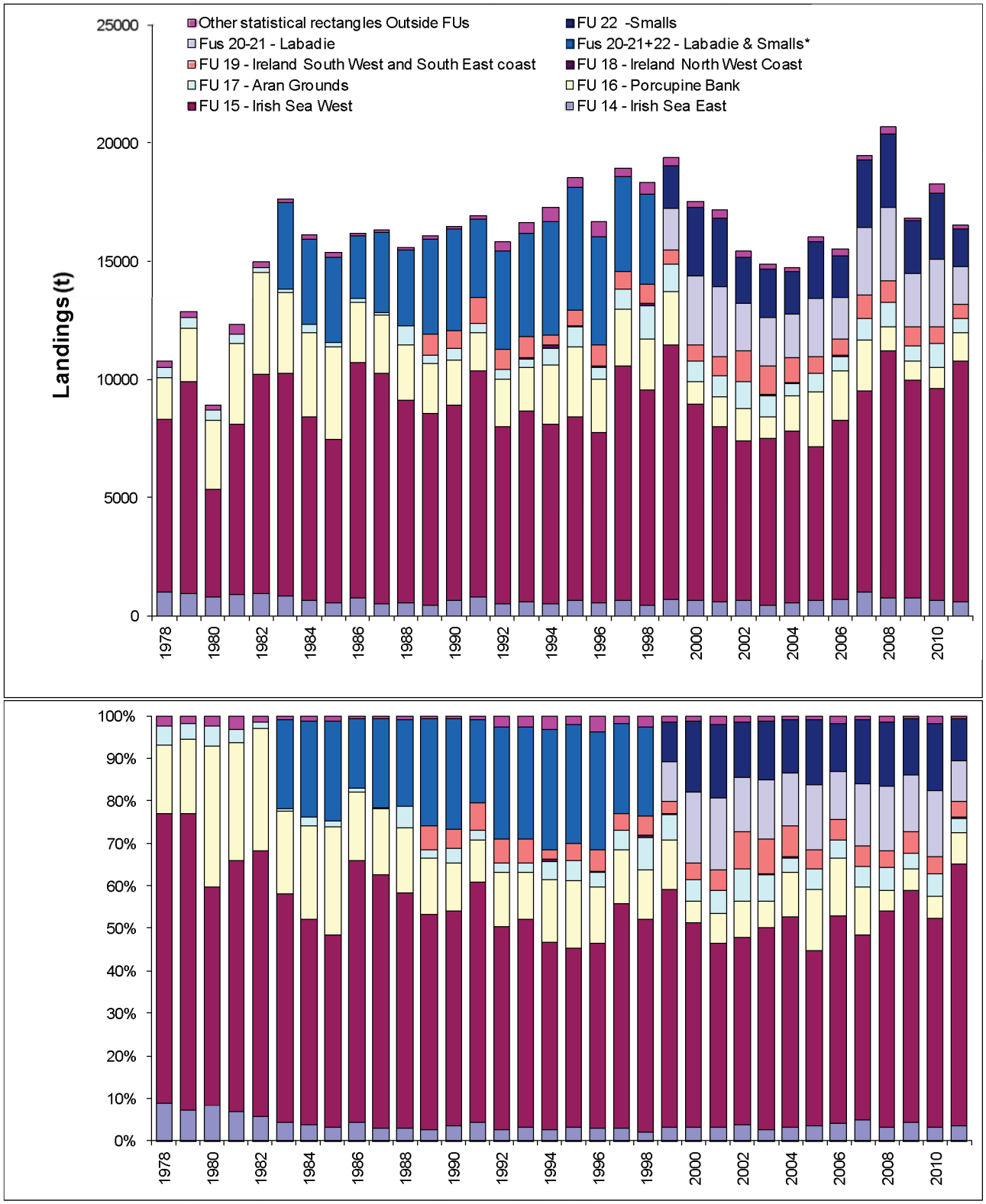


Figure 5.4.34.2 *Nephrops* in Subarea VII. Top: Total landings (in tonnes). Landings from FUs 20–21 and FU 22 are combined prior to 1999. Bottom: percentage of the total landings by functional unit (FU) and from rectangles outside the FUs.

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 – Labadie & the Smalls*	FUs 20–21 – Labadie	FU 22 –the Smalls	Other statistical rectangles outside FUs	Total landings ICES Subarea VII	TAC for Subarea VII
1978	961	7296	1744	481						249	10730	
1979	900	8948	2269	452						237	12807	
1980	730	4578	2925	442						205	8880	
1981	829	7249	3381	414						382	12255	
1982	869	9315	4289	210						234	14917	
1983	763	9448	3426	131			3667			174	17609	
1984	602	7760	3571	324			3653			187	16097	
1985	498	6901	3919	207			3599			194	15317	
1986	671	9978	2591	147			2638			113	16138	
1987	449	9753	2499	62			3409			107	16279	24700
1988	462	8586	2375	828			3165			140	15557	24700
1989	401	8128	2115	344		899	4005			134	16026	26000
1990	563	8300	1895	519		754	4290			102	16423	26000
1991	747	9554	1640	410		1077	3295			169	16892	26000
1992	427	7541	2015	372		888	4165			409	15816	20000
1993	515	8102	1857	372	10	905	4358			455	16573	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	18320	23000
1999	624	10786	2289	1140	16	579		1152	1788	322	18696	23000
2000	567	8370	911	880	9	696		1778	2907	243	16362	21000
2001	532	7441	1222	913	2	815		1833	2935	368	16062	18900
2002	577	6793	1327	1154	14	1318		2674	1990	243	16098	17790
2003	376	7065	907	933	16	1239		2953	2050	186	15726	17790
2004	472	7270	1525	525	22	1074		2443	1828	161	15320	17450
2005	570	6554	2312	778	15	711		2469	2425	180	16014	19544
2006	628	7561	2120	637	14	741		2523	1752	270	16246	21498
2007	959	8491	2186	913	3	957		2419	2880	206	19020	25153
2008	681	10508	1000	1057	1	866		2980	3114	322	20529	25153
2009	708	9198	825	625	10	833		3145	2245	107	17696	24650
2010	582	8963	917	1000	7	722		1793	2840	359	17183	22432
2011	561	10162	1187	600	13	608		1237	1617	109	16094	21759
Average	608	8304	2161	625	23	836	3919	2261	2336	265	16145	

ECOREGION Celtic Sea
STOCK *Nephrops* in Irish Sea East (FU 14)

Advice for 2013

ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 880 t.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)	2009	2010	2011
MSY (F_{MSY})	✓	✓	✓ Below target
Precautionary approach (F_{pa},F_{lim})	?	?	? Undefined

SSB (Spawning-Stock Biomass)	2009	2010	2011
MSY ($B_{trigger}$)	?	?	? Undefined
Precautionary approach (B_{pa},B_{lim})	?	?	? Undefined

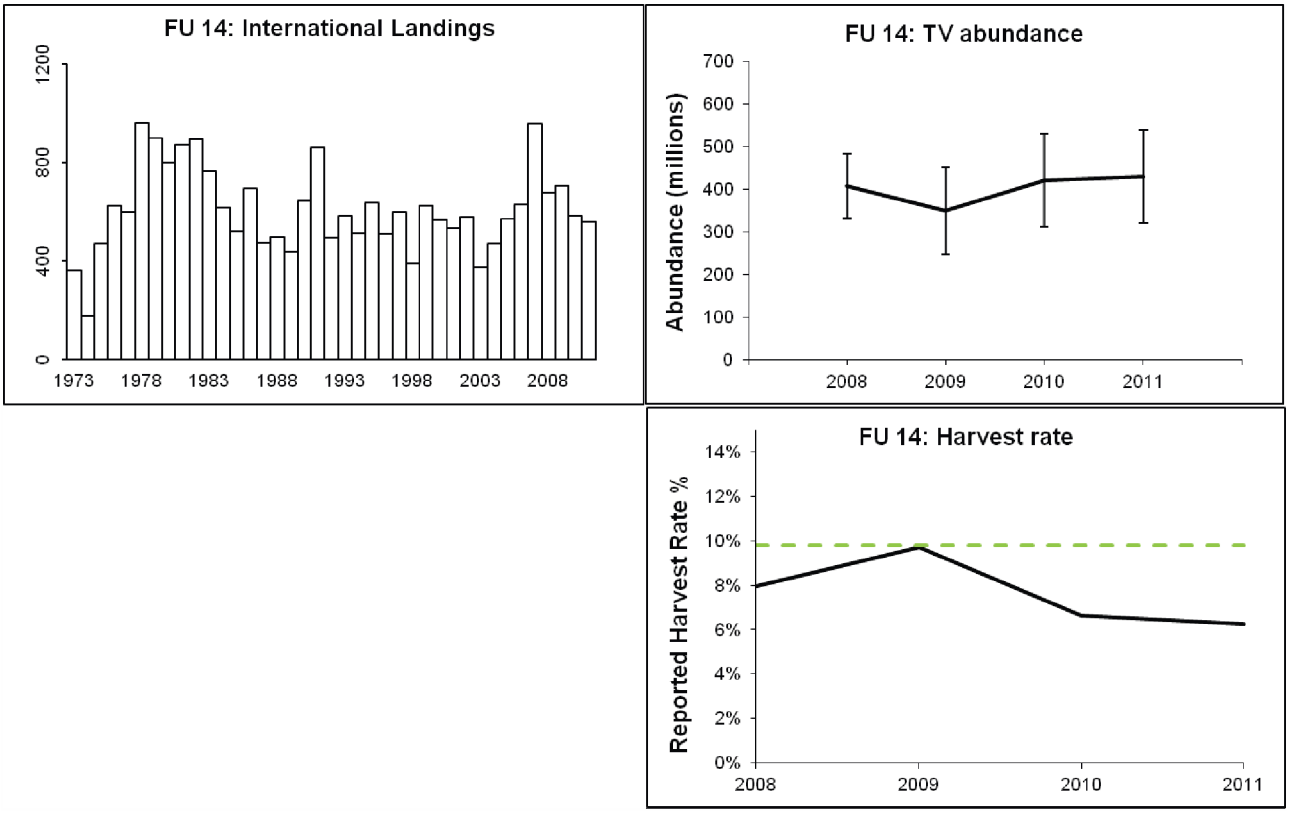


Figure 5.4.34.1.1 *Nephrops*, Irish Sea East (FU 14). Long-term trends in landings (in tonnes); UWTV survey abundance with 95% confidence limits (in millions); and harvest rate (green dashed line is F_{MSY} proxy).

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 m^{-2}) and is limited to two discrete areas of muddy sediment. The main part of the stock sits between the Isle of Man and the Cumbrian coast of England, with a smaller patch in Wigtown Bay off the southern coast of Scotland. 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 of vessels targeting *Nephrops* in 2011, with mesh sizes of 70–99 mm and where the weight of *Nephrops* landed is more than 25% of the total landing, consisted of around 25 English vessels almost entirely single-otter trawling and around 35 generally larger Northern Irish vessels, over 70% of which fish multi-rig trawls. The multi-riggers take around one third 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 distribution	Total landings (2011): 561 t (38% twin-rig otter trawls, 62% single-otter trawl). Additional discards estimated at 28% by number.

Effects of the fisheries on the ecosystem

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

Quality considerations

In 2012 ICES revised abundance estimations to correct for inappropriate bias correction factors and underwater camera parameters. No reliable length composition is available for 2010 and 2011 due to reduced discard sampling.

More sampling is required in this area and efforts have been made to reinstate the *Nephrops* catch sampling programme in the East Irish Sea.

Scientific basis

Assessment type	UWTV and trends.
Input data	One survey index (UWTV-FUs 14–15).
Discards and bycatch	Discards included in the assessment and forecast.
Indicators	Size structure of catches, sex ratio, and lpue.
Other information	This stock is scheduled for benchmarking in 2013.
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* in Irish Sea East (FU 14)

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 0.36 m^{-2}) in a highly seasonal male dominant fishery. The area covered by this fishery is relatively small and the confidence intervals for the abundance estimate are large for a geostatistical survey. The annual variability of lpue for the smaller individuals in the catch suggest that recruitment to this fishery is quite variable. However, the fishery appears to have been sustainable with harvest rates below $F_{0.1}$. 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 2013

Basis: F2012 =F2009–11 = 7.52%, bias-corrected survey index (2011) = 431 millions, mean weight in landings (2006–2008) = 28.9 g, and retention factors (72.1%) based on 2006–2008 sampling.

Basis	Harvest rate (%)	Landings 2013 (tonnes)
MSY framework	9.8	880
F_{sq}	7.52	680
$F_{35\%SpR}$	13	1200
F_{max}	16.4	1500

MSY approach

Following the ICES MSY approach implies the harvest ratio to be no more than 9.8%, resulting in landings of no more than 880 t in 2013.

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

Regulations and their effects

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

Changes in fishing technology and fishing patterns

The UK *Nephrops* directed effort in FU 14 has declined since 2007 and is estimated in 2011 to be at its lowest value since 1974.

Data and methods

In 2012 ICES revised the abundance estimations using a more precise field of view (0.75 m) and a bias of 1.2. The new estimates show a decrease around 10% in abundance compared with last year's estimations for the data series.

Uncertainties in assessment and forecast

Some general uncertainties are discussed in the introduction of Section 5.4.34.

The short time-series of reliable commercial data and UWTV surveys means that biological reference points for this stock are imprecise.

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

Comparison with previous assessment and advice

The basis for the assessment and advice is the same as last year based on the MSY approach, adopting $F_{0.1}$ as an F_{MSY} proxy.

Source

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

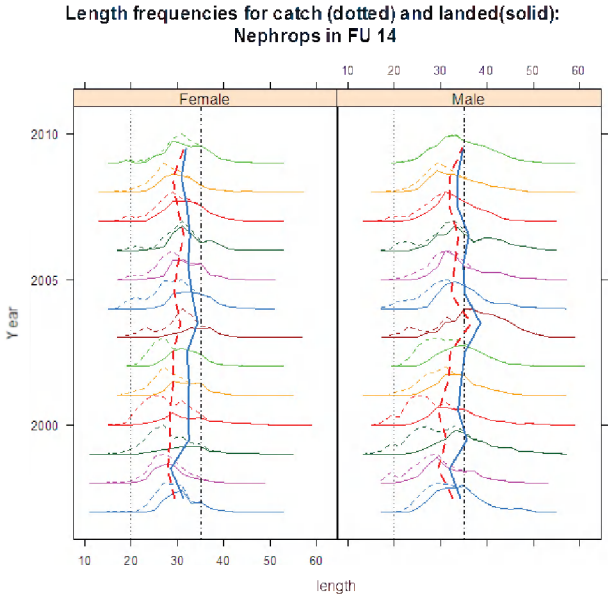


Figure 5.4.34.1.2 *Nephrops* in Irish Sea East (FU 14). Length composition of catch (dotted) and landed (solid) of males (right) and females left from 1996 (bottom) to 2009 (top). Mean sizes of catch and landings (using same line types) is shown in relation to minimum landing size (MLS). The figure shows a vertical display of MLS levels (20 mm CL and 35 mm CL). Sampling levels in 2010 and 2011 were insufficient to provide robust data; this figure was therefore not updated.

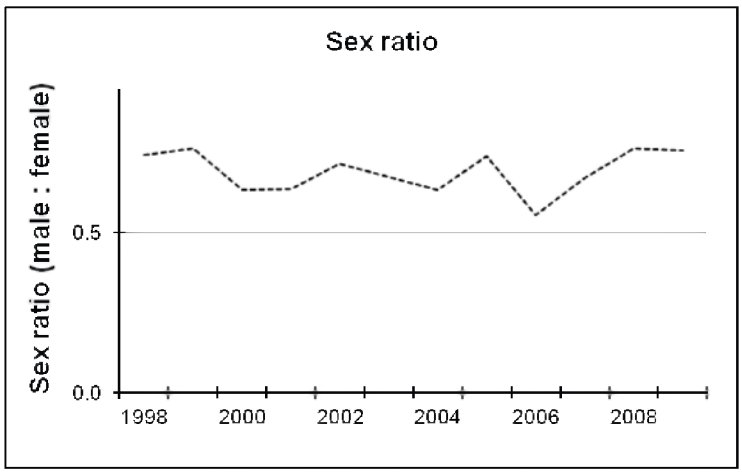


Figure 5.4.34.1.3 *Nephrops* in Irish Sea East (FU 14). Time-series of sex ratio in the landings of *Nephrops*-directed trawlers. Sampling levels in 2010 and 2011 were insufficient to provide robust data; this figure was therefore not updated.

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 (FU 14)	Recommended landings (FUs 14 + 15)	ICES landings (FU 14)
1989				0.40
1990				0.56
1991				0.75
1992			8.9	0.43
1993			9.4	0.52
1994			9.4	0.45
1995			9.4	0.58
1996			9.4	0.48
1997			9.4	0.57
1998			9.4	0.39
1999			9.4	0.62
2000			9.4	0.57
2001			9.4	0.53
2002	Set TAC in line with 1995–99 landings		9.55	0.58
2003	Set TAC in line with 1995–99 landings		9.55	0.38
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	-	0.58
2011	Transition towards the ICES MSY framework	< 0.68	*	0.56
2012	MSY approach	< 0.96	*	
2013	MSY approach	< 0.88	*	

Weights in thousand tonnes.
* 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.

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

Table 5.4.34.1.3 *Nephrops* in Irish Sea East (FU 14). Results from UWTV-FU 14 survey of *Nephrops* grounds in 2008–2011.

Year	No stations	Mean station density (no./m²)	Mean kriged density (no./m²)	Bias-corrected abundance (millions)	95% CI	Landings	Removals (millions)	Harvest rate
2007				Unreliable data				
2008	32	0.34	0.38	407.6	63.0	676	32.4	7.96%
2009	32	0.28	0.33	350.0	76.0	707	33.9	9.69%
2010	26	0.33	0.4	422.0	103.0	582	27.9	6.62%
2011	26	0.36	0.41	431.0	109.0	561	26.9	6.25%

ECOREGION Celtic Sea
STOCK *Nephrops* in Irish Sea West (FU 15)

Advice for 2013

ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 9300 t.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✗	✓	✗	Above target
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning-Stock Biomass)	2009	2010	2011	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	?	?	?	Undefined

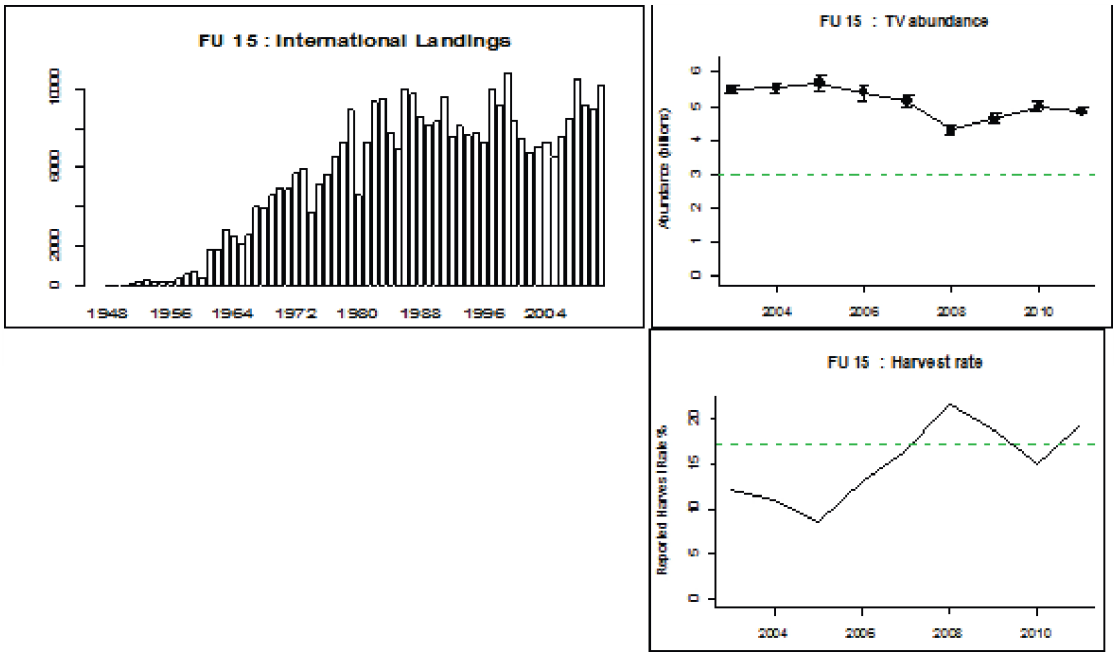


Figure 5.4.34.2.1 *Nephrops* in Irish Sea West (FU 15). Long-term trends in landings (tonnes); recent UWTV abundance (in millions; SSB proxy, and with scaled trawl survey cpue); and harvest rates (prior to 2007 the harvest rate is considered to be a minimum estimate due to possible underreporting of landings). The horizontal lines represent MSY $B_{trigger}$ (upper panel) and F_{MSY} (lower panel).

The stock abundance is stable and above MSY $B_{trigger}$. Recent harvest rates have fluctuated around F_{MSY}. This stock has sustained landings at around 9000 t for many years.

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 m^{-2}) and have a smaller average size and size-at-maturity than most other stocks. The observed high density implies intense competition for space and food on the seabed. This is thought to make the stock resilient to high fishing pressure.

Environmental influence on the stock

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

The fisheries

The gears used are a mixture of single- and twin-rig otter trawls. Around 45% of the Irish vessels use separator trawls and Swedish grids to reduce bycatch.

Catch distribution	Total catch (2011) = 12.9 kt, where 10.2 kt are landings (>99% otter trawls) and 2.7 kt discards.

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 a 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. The quality of input data and level of sampling are good for this stock.

Scientific basis

Assessment type	UWTV and trends, catch options based on UWTV and Fs from per-recruit analysis.
Input data	One survey index (UWTV (FUs 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 lpue.
Other information	The 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 on a scaled trawl survey.
Approach	F_{MSY}	HR 17.1%.	Equivalent to F_{max} for combined sexes in 2010.
Precautionary Approach	Not defined.		

(unchanged since 2010).

Harvest ratio reference points (2010):

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

Density of *Nephrops* in FU 15 is considered very high (average density 1.1 m^{-2}), Recent harvest rates have been high ($>F_{max}$) and the stock size has been stable at a high level. The stock has sustained landings of 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 2013

Basis: $F_{2012} = F_{2011}$= 19%; bias-corrected survey index (2011) = 4.9 billion; mean weights in landings (2009–2011, 15.9 g) and retention factors (70%) based on 2009–2011 sampling.

Basis	Harvest ratio	Landings 2013 (tonnes)
MSY framework	17.1%	9300
F_{2011}	19.4%	10600
$F_{0.1}$	11.0%	6000
$F_{35\%}$	13.4%	7300

MSY approach

Following the ICES MSY approach implies a harvest ratio of less than 17.1%, resulting in landings of 9300 t in 2013.

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 FU 15 *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 a gyre that retains the larvae over the mud patch, thus ensuring good recruitment. The ground can be characterized as an area of very high densities of small *Nephrops*. All available information indicates that size structure of catches appears to have changed little since the fishery first began.

Regulations and their effects

The cod long-term plan was introduced in 2009 (EC 1342/2008). Annual effort baselines in *Nephrops* trawl fisheries (Effort group TR2 OTB 70–99 mm) in Division VIIa have been reduced by 25% annually since 2009. There are provisions in the cod long-term plan to be exempt from these effort restrictions, or have it reduced, making the impact of this regulation on overall effort difficult to assess. Since 2009, four Irish vessels have been using "Swedish grids" in the fishery to reduced bycatches of cod, whiting, and haddock. The number increased to seven towards the end of 2011. A conditional national licence has been introduced by Ireland since March 2012, making the use of grids or separator panels mandatory for all TR2 boats fishing in the Irish Sea.

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

Uncertainties in assessment and forecast

Some general uncertainties are discussed in the introduction 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 2009–2011 sampling by Northern Ireland and by Ireland.

The harvest ratio prior to 2006 may be underestimated due to underreporting of landings.

The calculation of harvest ratio and reference points $F_{0.1}$ and F_{max} 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 FU 15 is in equilibrium due to variable recruitment. In addition, important assumptions are made on growth, natural mortality, and discard rates in the derivation of reference points.

Comparison with previous assessment and advice

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

Source

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

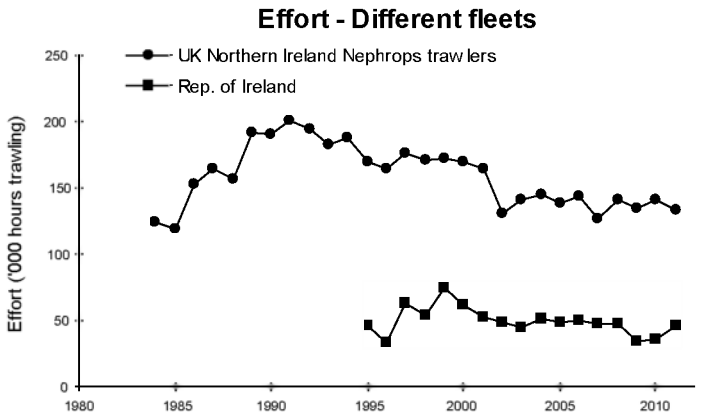


Figure 5.4.34.2.2 *Nephrops* Irish Sea West (FU 15). Effort trends of *Nephrops* fleets.

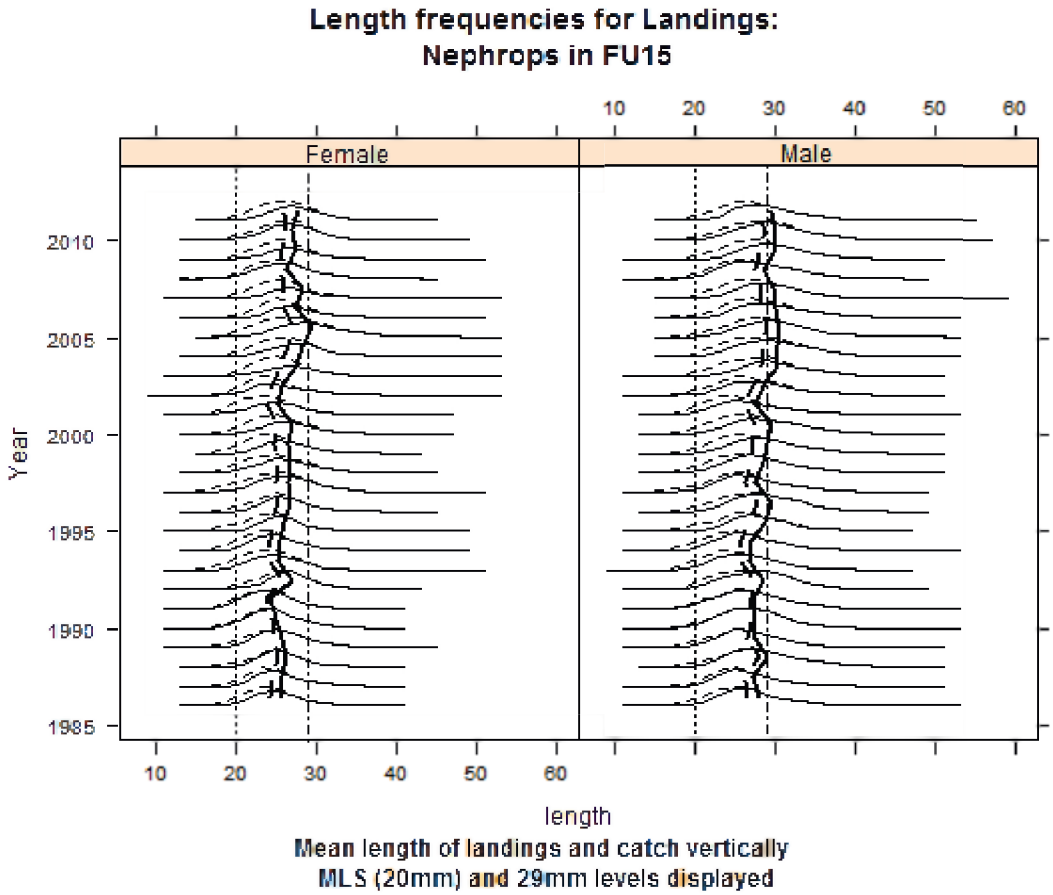


Figure 5.4.34.2.3 *Nephrops* Irish Sea West (FU 15). Length composition of catch (dotted) and landed (solid) of males (right) and females (left) from 1986 (bottom) to 2011 (top).

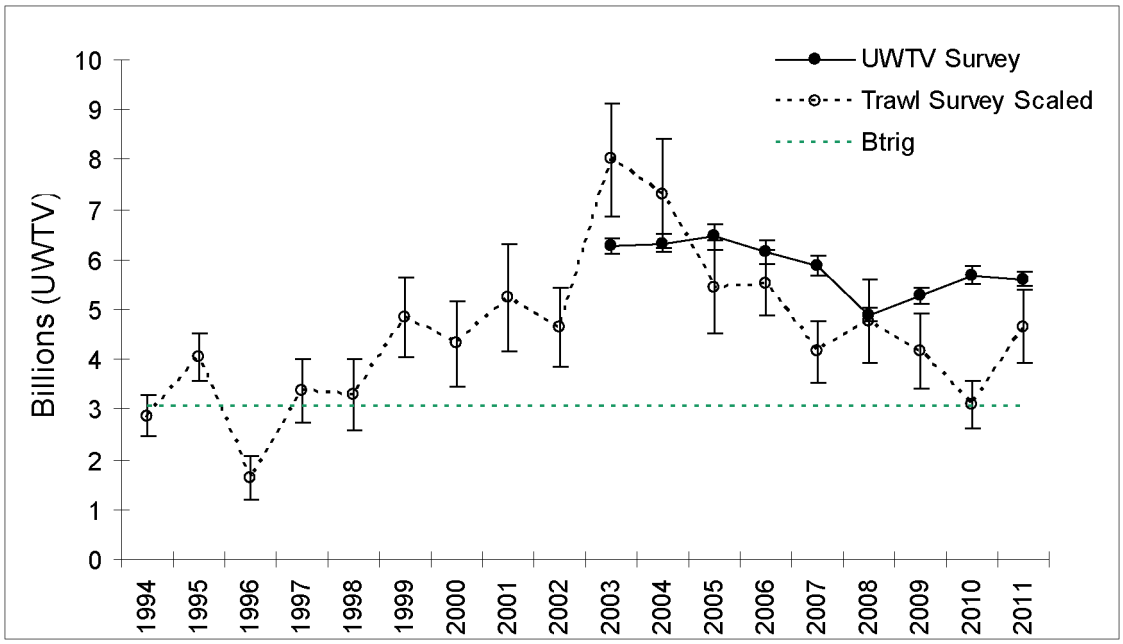


Figure 5.4.34.2.4 *Nephrops* Irish Sea West (FU 15). UWTV index (in billions) and scaled NI-NEP-Trawl-Summer survey. The green dotted line is MSY $B_{trigger}$.

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 (FUs 14 + 15)	ICES landings (FU 15)
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	-	10.2
2012	MSY approach	< 9.8		
2013	MSY approach	< 9.3		

Weights in thousand tonnes.

Table 5.4.34.2.2 *Nephrops* in Irish Sea West (FU 15). Results from the UWTV-FU 15 survey of *Nephrops* grounds in 2003–2011.

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%
	2011	149	1.00	5289	5.6	2%

Table 5.4.34.2.3 *Nephrops* in Irish Sea West (FU 15). Landings (tonnes) by country, 1965–2011.

Year	Ireland	UK	UK E&W	UK NI	UK Scotland	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	2.709	4.352				4	7.065
2004	2.786	4.470				13	7.270
2005	2.133	4.420				0	6.554
2006	2.051		56	5.429	23	1	7.561
2007	2.767		102	5.585	36	0	8.491
2008	3.132		131	7.166	26	50	10.508
2009	2.343		200	6.622	32	1	9.198
2010	2.578		100	6.251	33	0	8.963
2011*	3.575		88	6.444	52	2	10.162

* Provisional.

ECOREGION Celtic Sea
STOCK *Nephrops* on Porcupine Bank (FU 16)

This advice was updated in November 2012 to take account of the most recent UWTV survey information.

Advice for 2013

ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 1800 tonnes.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)	2011	
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa},F_{lim})	?	Undefined
Qualitative evaluation	✓	Below possible reference points

SSB (Spawning-Stock Biomass)	2011	
MSY ($B_{trigger}$)	?	Undefined
Precautionary approach (B_{pa},B_{lim})	?	Undefined
Qualitative evaluation	↗	Increasing, from low abundance

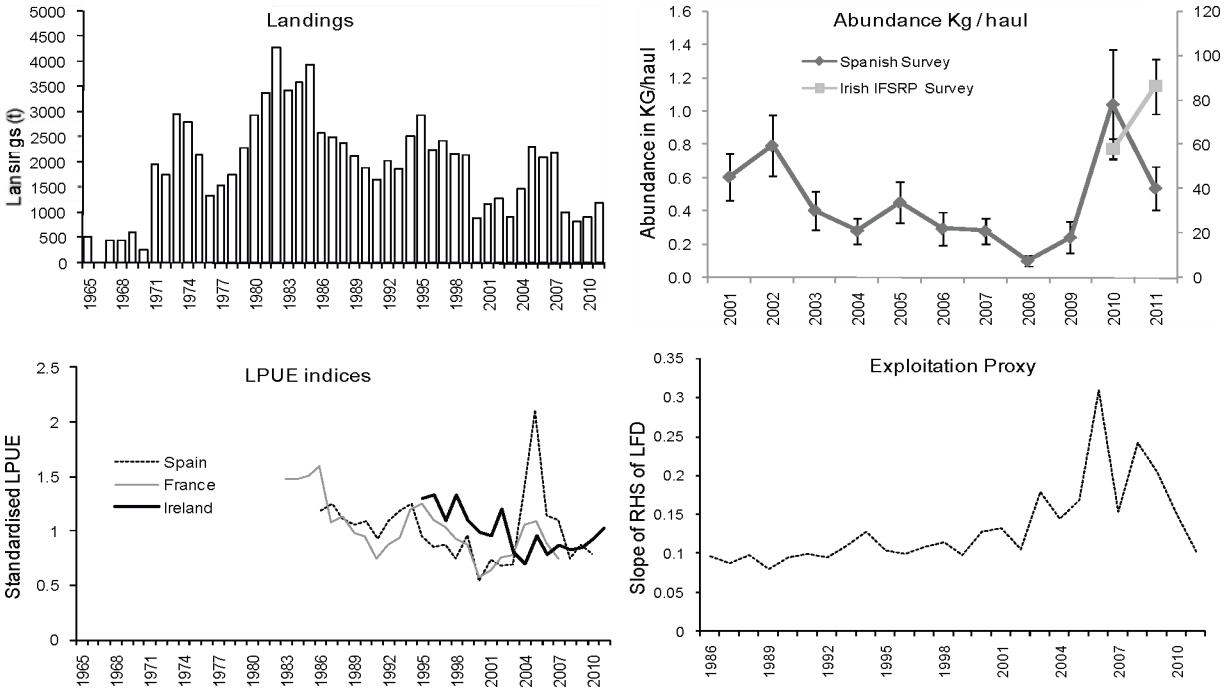


Figure 5.4.34.3.1 *Nephrops* on the Porcupine Bank (FU 16). Top left: ICES landings. Bottom left: standardized (scaled to mean by index) lpues by fleet. Top right: Abundance estimate (in kg haul^{-1}) from Sp-PGFS-WBITS-Q4 and Irish IFSRP surveys. Bottom right: Trends in an exploitation proxy (derived from the slope of the length–frequency for male *Nephrops* between carapace lengths of 41–56 mm that are considered fully selected in the fishery).

The exploitation proxy indicates that the exploitation rates increased during the 2000s but declined significantly in 2011. Survey and commercial lpue and cpue show declining trends up to the late 2000s. Survey cpue increased significantly in 2010 and this has been linked to a stronger recruitment first observed in the survey in 2009. The first UWTV survey for FU 16 was carried out in June 2012; this provides an abundance estimate for this stock for the first time.

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 overexploitation 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 normal situation where male *Nephrops* make up 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 on the Porcupine Bank several years later (González Herraiz *et al.*, 2009).

The fisheries

The fishery takes place throughout the year with a peak between April and July. A seasonal closure covering much of the stock distribution area has been in place between 1 May and 31 July each year since 2010. Most vessels are relatively large (between 20 and 35 m in total length) multi-purpose otter trawlers using single or twin rigs. Freezing of catches at sea has become increasingly prevalent since 2006.

Catch distribution	Total landings (2011) were 1186 t (100% otter). Discarding is assumed to have been minimal in the past, but the discarding rate in 2011 is unknown.

Effects of the fisheries on the ecosystem

Discarding by the *Nephrops* trawl fishery is around 50% of the total catch by weight. The main species that are discarded by weight are blue-mouth redfish, blue whiting, and argentines (Anon., 2011).

Quality considerations

Data on Spanish landings for 2011 were not available, which increases the uncertainty in the advice. The 2011 Spanish landings were estimated by ICES, based on an adjustment to past lpue and VMS effort information.

The Spanish Porcupine survey (SpPGFS-WIBTS-Q4) series is short, but it gives consistent indications of recent changes in the stock. Landings length–frequency data for all countries involved in the fishery have been sparse in recent years but this has improved in 2011. This influences the calculation of exploitation and recruitment proxies. The industry has collaborated with scientists by providing data on the grade composition of landings and carrying out a trawl survey. Discard observer coverage should be increased.

The advice is based on a new UWTV survey taking into account a number of conservative assumptions: The survey covered the majority of the fished *Nephrops* grounds and conservative assumptions were made for areas not surveyed. The reference point can also be considered conservative relative to other stocks.

Scientific basis

Assessment type	UWTV and trends of the size structure of catches.
Input data	One survey index (UWTV-FU 16), size structure of catches.
Discards and bycatch	Not included in the assessment and estimated to be minimal up to 2010.
Indicators	Two trawl surveys (SpPGFS-WIBTS-Q4, Irish IFSRP), cpue, and catch size.
Other information	Commercial lpue for Ireland, Spain, and France. Sex ratio. The June advice was updated in November to take the new 2012 UWTV survey into account.
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* on Porcupine Bank (FU 16)

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	Not defined.	
	F_{MSY}	HR 5.0%.	Equivalent to $F_{0.1}$ for combined sex in 2012.
Precautionary Approach	Not defined.		

(unchanged since 2012)

Harvest ratio reference points (2012):

	Male	Female	Combined
F_{max}	6.8%	17.8%	10.5%
$F_{0.1}$	4.2%	11.2%	5.0%
$F_{35\%SpR}$	5.2%	13.9%	7.7%

Density of *Nephrops* in FU 16 is considered very low (low density < 0.3 m^{-2}). The stock size has increased in recent years and exploitation rates have declined. For this FU, the exploitation rate on males is usually higher than on females. A harvest ratio consistent with a combined sex $F_{0.1}$ of 5.0% is suggested as a proxy for F_{MSY}.

All F_{MSY} proxy harvest rate values are considered preliminary and may be modified following further data exploration and analysis.

Outlook for 2013

Bias-corrected survey index (2012) = 787 million; Mean weights in landings (45.0 g) and retention factors (100%), based on negligible discards during observer trips.

Basis	Harvest ratio	Landings 2013 (tonnes)
MSY framework	5.0%	1800
$F_{35\%\ SpR}$	7.7%	2700
F_{max}	10.5%	3700

MSY approach

No MSY $B_{trigger}$ has been defined for this FU. The recent stock size is known to be relatively high compared to that in the late 2000s. Hence the ICES MSY approach has been applied only in relation to F_{MSY}. This implies a harvest ratio of 5.0%, resulting in landings of 1800 t in 2013.

Additional considerations

The advice has been updated in November 2012 to take into account a new UWTV survey (Lordan *et al.*, 2012). It has been possible to use the results of this survey and the assessment and catch advice framework previously developed by ICES for use with UWTV surveys for the first time in this FU. The catch advice issued in June (1100 t) was based on the ICES approach to data-limited stocks.

The introduction of the "of which limit" with the TAC regulations in 2011 and 2012 has increased the risk of highgrading and area misreporting in this fishery. It has also resulted in an increase in effort in one country as vessels try to establish track record.

A seasonal closed area (1 May–31 July) has been in place since 2010. The closure has been respected by the fleet and has therefore afforded some protection to the majority of the stock area (~75%). For this part of the stock area fishing effort and mortality has been reduced at a time of peak female emergence and typically high lpue and landings. The closure will also have inadvertently concentrated effort and fishing mortality in ~25% of the stock area not currently

covered by the closure. Survey information indicates that abundance was 2.5 times higher inside the closed area than outside.

Whereas the seasonal closure may not be necessary if the "of which limit" of the TAC regulation is fully respected, ICES recommends that discussion with stakeholders should take place before possibly considering removing it.

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 overexploitation 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 female *Nephrops* accounting for a larger proportion. Landings in 2009 ~825 t are the lowest observed since the development of the fishery.

Discarding by the *Nephrops* trawl fishery is around 50% of the total catch by weight. The main species that are discarded by weight are blue-mouth redfish, blue whiting, and argentines (Anon., 2011). Discarding of *Nephrops* in the fishery has been negligible up to 2011 (ICES, 2012).

Area-misreporting and highgrading in the fishery should be discouraged through management measures.

Changes in fishing technology and fishing patterns

In the past the *Nephrops* fishery on the Porcupine Bank has been both seasonal and opportunistic, with increased targeting during periods of high *Nephrops* emergence and good weather. Freezing of catches at sea has become increasingly prevalent since 2006 and the fishery now operates throughout the year, mainly targeting larger *Nephrops* in lower volumes. Fishing effort has fluctuated considerably in the recent past in response to availability of *Nephrops*.

Information from the fishing industry

The Irish industry has provided grade information for around 60% of the landings in 2011. These data have been used to reconstruct the size distribution of Irish landings in 2011. The industry has also been collaborating on the development of a trawl survey largely funded by the allocation of scientific quota since 2010. These are major improvements to the information base for this stock and should be maintained.

Uncertainties in assessment and forecast

Some general uncertainties are discussed in the introduction of Section 5.4.34.

There are several uncertainties in the UWTV survey, mean weight in the landings, and reference points which are not taken into account in the advice. The survey design, protocols, quality control, and analysis methodologies follow best practice but coverage was not complete and conservative assumptions were made to extrapolate abundance for the non-surveyed area. The mean weight in the landings has declined due to recruitment into the fishery. A conservative assumption of 45 g is used, which is close to that observed in 2011 and to the average mean weight in the landings before the stock declined. The Separable Cohort Analysis (SCA) and yield-per-recruit analysis was based on 2010 and 2011 sampling; the fit to the SCA model was problematic so F_{MSY} proxies are likely to be uncertain. The proposed $F_{0.1}$ harvest rate is very low compared to other FUs and can be considered very conservative and fairly robust to some model and data uncertainties.

Comparison with previous assessment and advice

The assessment is based on indicators similar to last year's, with the addition of catch advice based on a 2012 UWTV survey.

The basis for this year's advice is the ICES MSY approach. Last year it was based on precautionary considerations.

Sources

Anon. 2011. Atlas of Demersal Discarding, Scientific Observations and Potential Solutions, Marine Institute, Bord Iascaigh Mhara, September 2011. ISBN 978-1-902895-50-5. 82 pp.

González Herraiz, I,, Torres, M. A., Farina, A. C, Freire, J., and Cancelo J. R. 2009. The NAO index and the long-term variability of *Nephrops norvegicus* population and fishery off West of Ireland. Fisheries Research, 98: 1–7.

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

Lordan, C., Doyle, J., Dobby, H., Heir, I., Fee, D., Allsop, C., and O'Neil, R. 2012. Porcupine Bank *Nephrops* Grounds (FU 16) 2012 UWTV Survey Report and catch options for 2013. Marine Institute UWTV Survey report. http://hdl.handle.net/10793/832.

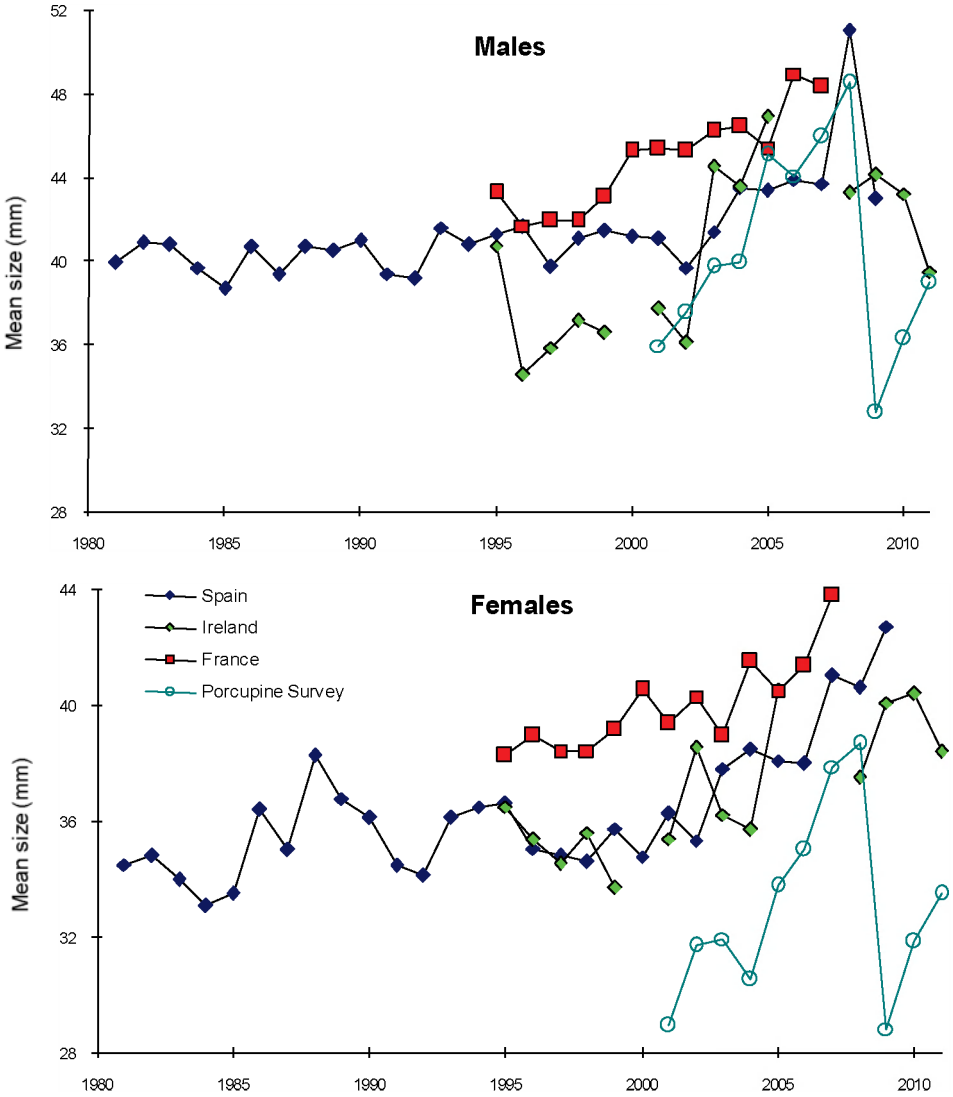


Figure 5.4.34.3.2 *Nephrops* on the Porcupine Bank (FU 16). Mean sizes of ICES landings by sex and country and in mean size in the catch for the SpPGFS-WIBTS-Q4 survey.

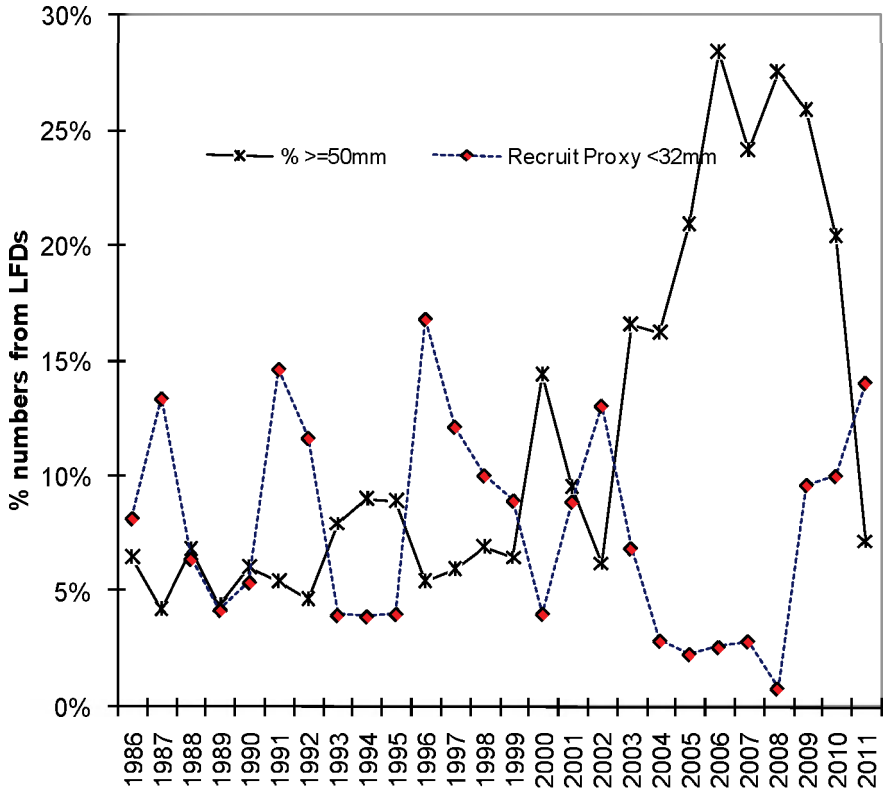


Figure 5.4.34.3.3 *Nephrops* on the Porcupine Bank (FU 16). Trends in the percentages of the sampled male *Nephrops* landings < 32 mm carapace length (a possible recruitment proxy) and >50 mm carapace length.

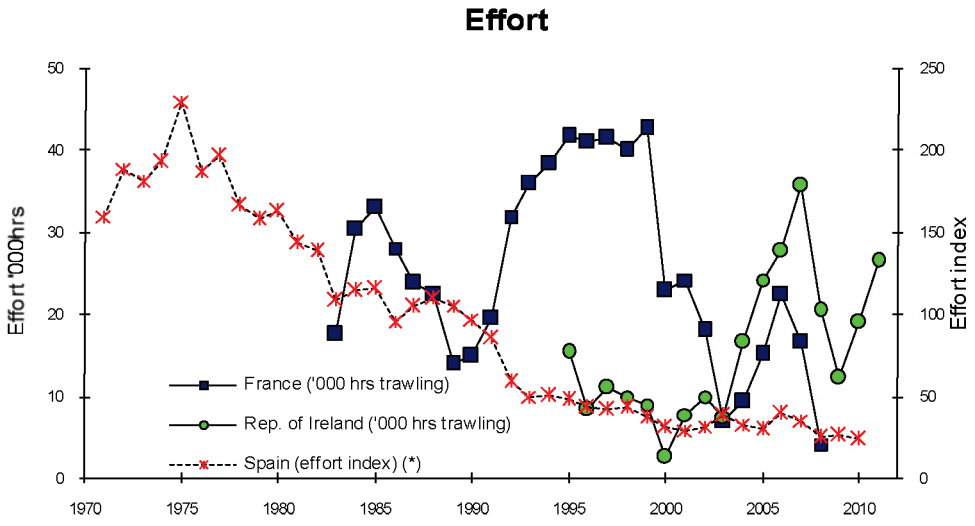


Figure 5.4.34.3.4 *Nephrops* on the Porcupine Bank (FU 16). Effort trends for fleets.

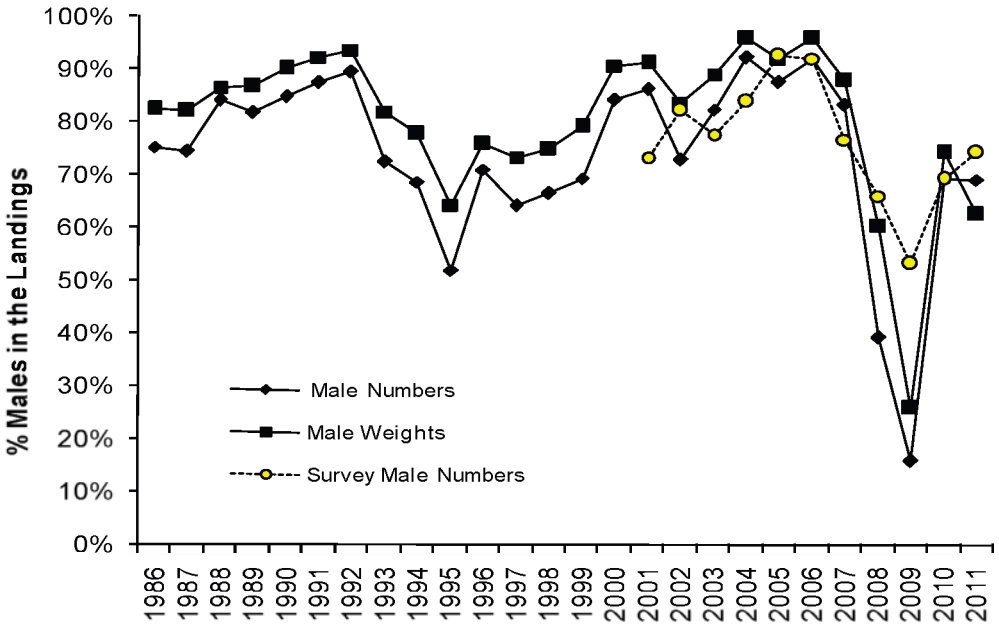


Figure 5.4.34.3.5 *Nephrops* on the Porcupine Bank (FU 16). Sex ratio of landings and survey (SpPGFS-WIBTS-Q4) catches.

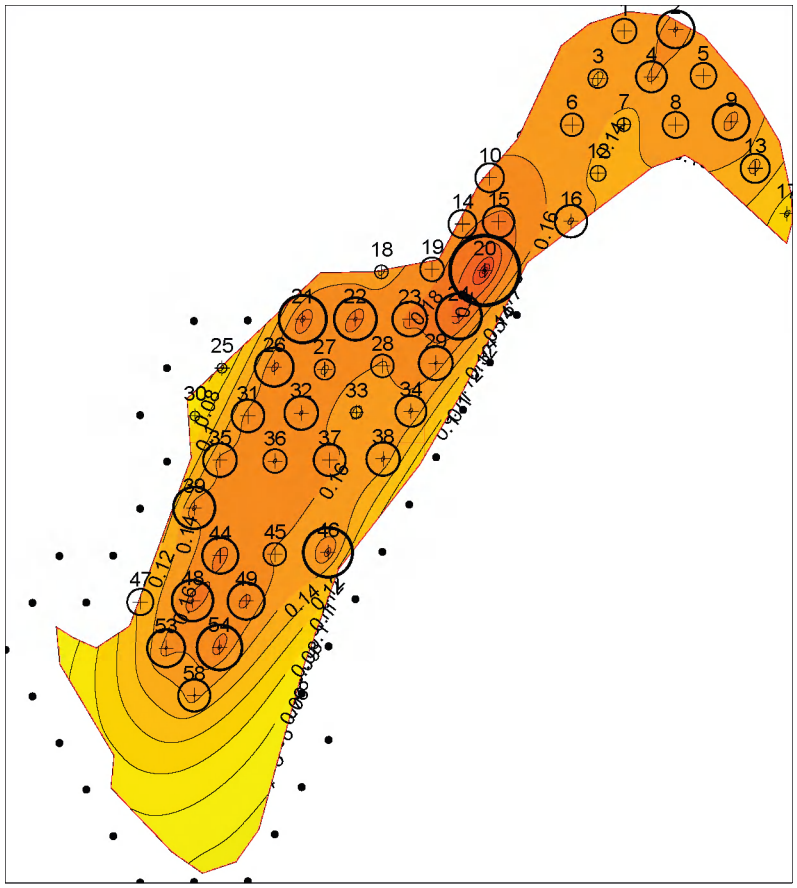


Figure 5.4.34.3.6 *Nephrops* on the Porcupine Bank (FU 16). UWTV bubble plot of the burrow density observations overlaid on a head map of the krigged burrow density surface. Observed station positions are indicated using a + and assumed zero densities beyond the boundary are shown as black filled circles.

Table 5.4.34.3.1 *Nephrops* on the Porcupine Bank (FU 16). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU 16)	Recommended landings in Divisions VIIbcjk[1]	ICES landings FU 16 [2]
1987				2.5
1988				2.4
1989				2.1
1990				1.9
1991				1.6
1992			3.8	2.0
1993			~4.0	1.9
1994			~4.0	2.5
1995			~4.0	2.9
1996			4.0	2.2
1997			4.0	2.4
1998			4.0	2.2
1999			4.0	2.3
2000			4.0	0.9
2001			4.0	1.2
2002			4.44	1.3
2003			4.44	0.9
2004	Restrict landings to 2000–2002 levels		3.3	1.5
2005	Restrict landings to 2000–2002 levels		3.3	2.3
2006	Restrict landings to 2000–2002 levels		3.3	2.1
2007	Constrain effort at recent levels		--	2.2
2008	Constrain effort at recent levels		--	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		1.2
2012	No increase in catch	-		
2013	MSY approach (Updated November 2012)	< 1.8		

Weights in thousand tonnes.
[1] Previously ICES gave combined advice for FUs 16, 17, 18, and 19, and "other rectangles" in this area.
[2] This includes inshore rectangles along the southern and southeastern coast of Ireland.

Table 5.4.34.3.2 *Nephrops* on the Porcupine Bank (FU 16). ICES landings (tonnes) by country.

Year	France	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
2011	8	643	na	23	122	1187*

*The 2011 landings estimates remain provisional and include an estimate of 391 for unallocated catches.

ECOREGION Celtic Sea
STOCK *Nephrops* on the Aran Grounds (FU 17)

This advice was updated in November 2012 to take account of the most recent UWTV survey information.

Advice for 2013

ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 590 tonnes.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✓	✓	✓	Below target
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning-Stock Biomass)	2010	2011	2012	
Qualitative evaluation	↗	↘	↘	Lowest in the time series

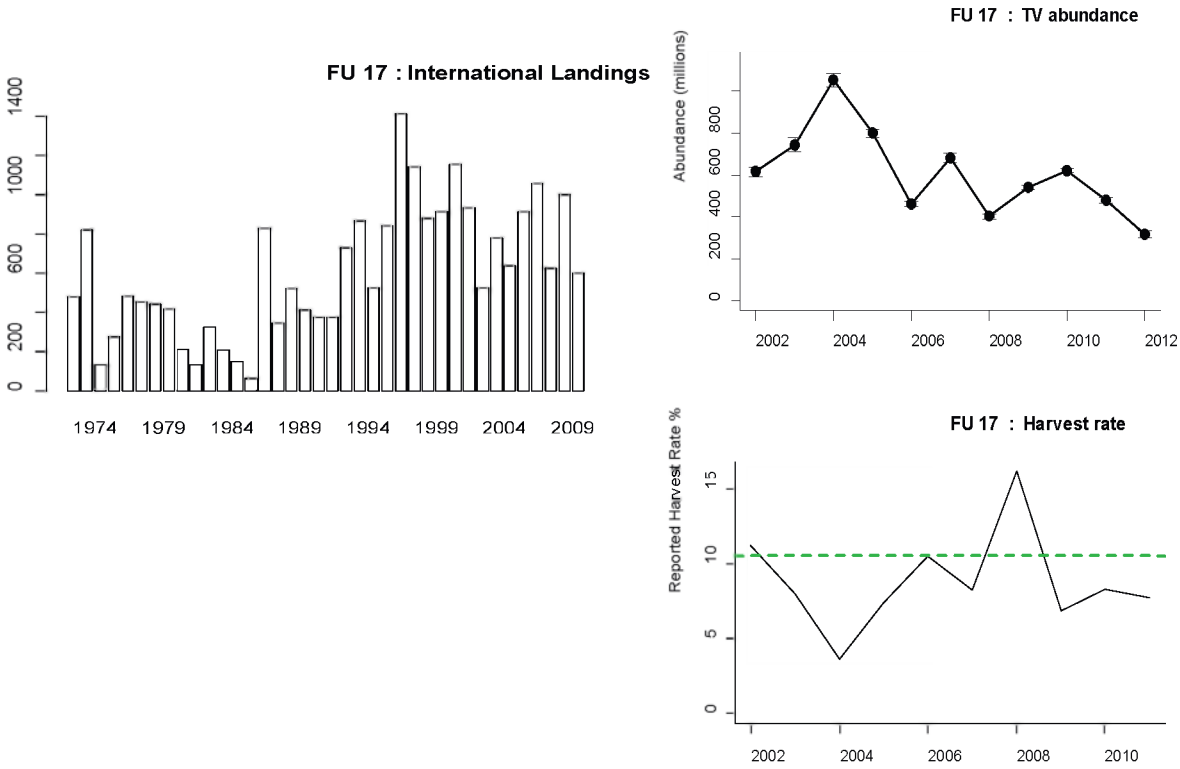


Figure 5.4.34.4.1 *Nephrops* on the Aran Grounds (FU 17). Landings (in tonnes), UWTV abundance (in millions; SSB proxy), and harvest rates (F_{MSY} proxy shown as the dashed green line).

The UWTV surveys conducted since 2002 give estimates of abundance that have fluctuated widely. The 2012 abundance estimate is the lowest in the eleven-year time-series. The generally low harvest rate 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 characterized as an area with a 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 have increased and now account for over 90% of the fishery. In the last few years the fishery has exploited more of the male component of the stock as a higher proportion of catches have been taken in the autumn.

Catch distribution	Total catch (2011) = 683 t, where 88% were landings (100% otter trawl) and 12% discards.

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.

Biological sampling in this stock is very good. There is a dedicated annual UWTV survey and the results of the 2012 survey were provided to ICES in September 2012 to update the advice.

Scientific basis

Assessment type	UWTV and trends of the size structure of catches.
Input data	One survey index (UWTV-FU 17), size structure of catches.
Discards and bycatch	Discards are included in the assessment.
Indicators	Sex ratio and lpue.
Other information	The latest benchmark was performed in 2009. The June advice was updated in November to take into account the 2012 survey information.
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* on the Aran Grounds (FU 17)

Reference points

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

(unchanged since 2010)

Harvest ratio reference points (2010):

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

The density of *Nephrops* in FU 17 is considered to be high (average density 0.9 m^{-2}). Recent harvest rates have been low and the stock size has been fluctuating. For this FU, the exploitation rate on males is usually higher than on females. A harvest ratio consistent with a combined-sex $F_{35\%SpR}$ 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 2013

Basis: F2012 = F2011 = 7.7%; Bias-corrected survey index (2012) = 325 million; Mean weights in landings (2009–2011, 23.5 g) and retention factors based (74%) on 2009–2011 sampling.

Basis	Harvest ratio	Landings 2013 (tonnes)
F_{MSY}	10.5%	590
F_{2011}	7.7%	430
$F_{0.1\ Combined}$	7.2%	410
$F_{max\ Combined}$	11.1%	630

MSY approach

No MSY $B_{trigger}$ has been identified for this FU. Hence the ICES MSY approach has been applied only in relation to F_{MSY}. This implies a harvest ratio of 10.5%, resulting in landings of 590 t in 2013.

Additional considerations

The advice has been updated in November 2012 to take into account the most recent UWTV survey results; these show a significant decline in stock abundance. The landings advice issued in June (890 t) was also based on the MSY approach, but used the results from the survey in 2011.

Discarding by the *Nephrops* trawl fleet is around 47% of the total catch by weight. The main discards are small *Nephrops*. The main fish species discarded are dogfish, haddock, whiting, and megrim (Anon., 2011).

Changes in fishing technology and fishing patterns

In recent years several newer vessels specializing in *Nephrops* fishing have participated in this fishery. These vessels target *Nephrops* on several other grounds within the TAC area and move around to optimize catch rates. 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 shows a decreasing trend since 1998.

Uncertainties in assessment

Some general uncertainties are discussed in the introduction of Section 5.4.34.

There are several uncertainties in the survey, mean weight in the landings, and discard rates that are not taken into account in the advice. The Separable Cohort Analysis (SCA) and yield-per-recruit analysis were based on 2008 and 2009 sampling; the fit to the SCA model was problematic so F_{MSY} proxies are likely to be uncertain.

The 2012 survey covered less stations than in recent years, but the resulting increased uncertainty is still well below the maximum relative standard error recommended for UWTV surveys.

Comparison with previous assessment and advice

The basis for assessment and advice is the same as last year. The advice was updated in November 2012 to take the most recent UWTV survey information into account.

Sources

Anon. 2011. Atlas of Demersal Discarding, Scientific Observations and Potential Solutions, Marine Institute, Bord Iascaigh Mhara, September 2011. ISBN 978-1-902895-50-5. 82 pp.

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

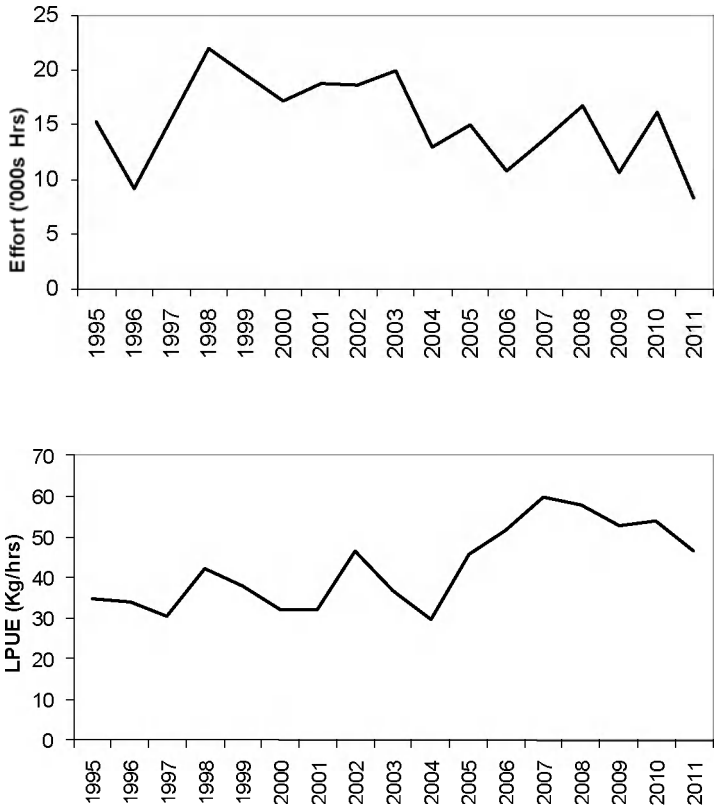


Figure 5.4.34.4.2 *Nephrops* on the Aran Grounds (FU 17). Irish effort and lpue for the *Nephrops*-directed fleet.

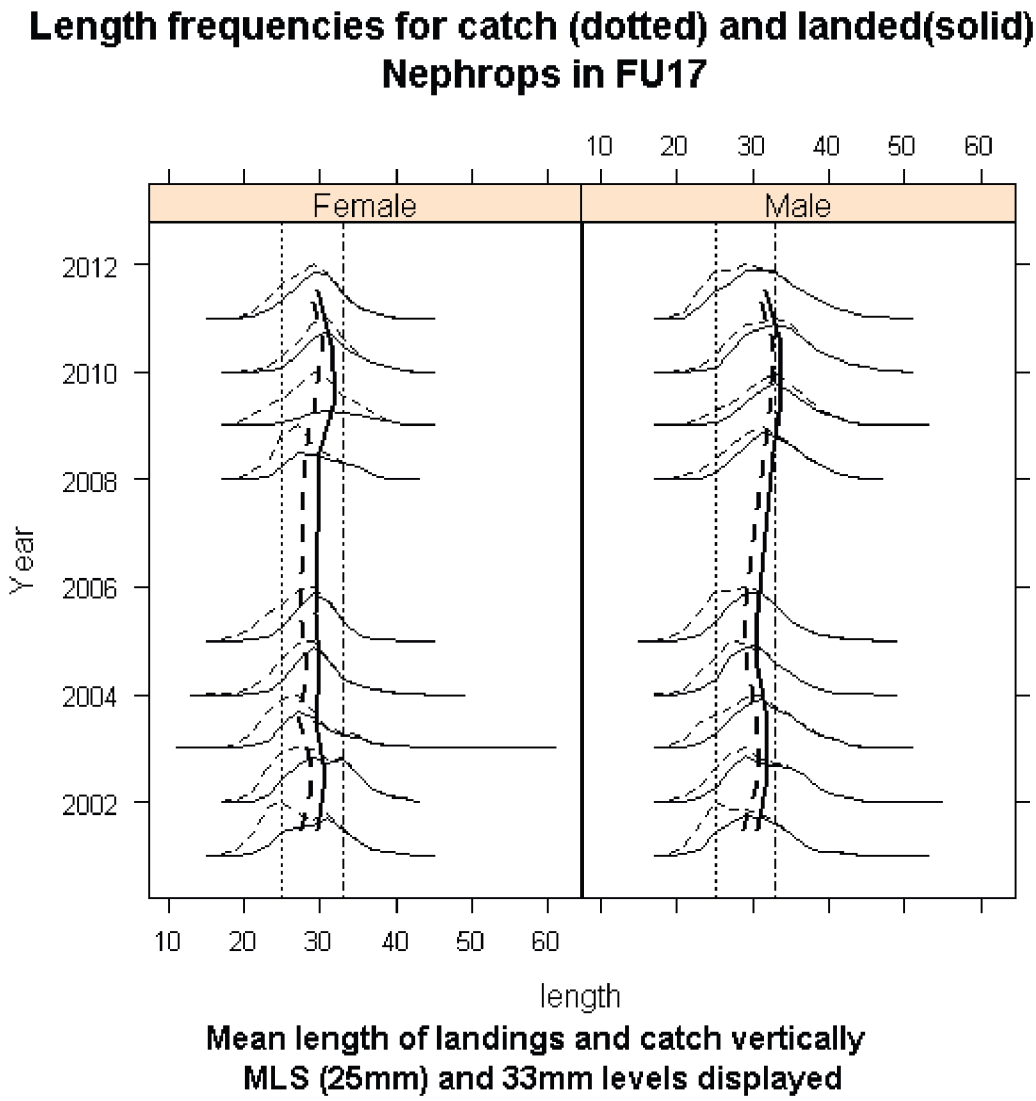


Figure 5.4.34.4.3 *Nephrops* on the Aran Grounds (FU 17) Length distributions in the catches 2001–2005 and 2008–2011.

Table 5.4.34.4.1 *Nephrops* on the Aran Grounds (FU 17). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU 17)	Recommended TAC Divisions VIIbcjk[1]	ICES landings FU 17 [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 approach	<0.95		0.6
2012	MSY approach	<1.1		
2013	MSY approach (Updated November 2012)	<0.59		

Weights in thousand tonnes.

[1] Previously ICES gave combined advice for FUs 16, 17, 18, and 19, and other rectangles in this area.

[2] This includes inshore rectangles along the southern and southeastern coast of Ireland.

Table 5.4.34.4.2 *Nephrops* on the Aran Grounds (FU 17). Landings (tonnes) by country.

	FU 17			
Year	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
2011	0	600	0	600

Table 5.4.34.4.3 *Nephrops* on the Aran Grounds (FU 17). Results from the UWTV-FU 17 survey of *Nephrops* on the Aran Grounds.

Ground	Year	Number of stations	Mean density (No. m^{-2})	Domain area (km^2)	Geostatistical abundance estimate (million burrows)	CV on abundance estimate
Aran	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%
	2011	76	0.67	909	638	3%
	2012	31	0.44	942	423	5%

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

Advice for 2013

ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 820 t.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

	F (Fishing Mortality)		
	2009	2010	**2011**
MSY (F_{MSY})	?	?	Below target
Precautionary approach (F_{pa},F_{lim})	?	?	? Undefined

	SSB (Spawning-Stock Biomass)	
	2009–2011	
Qualitative evaluation	→	Without trend

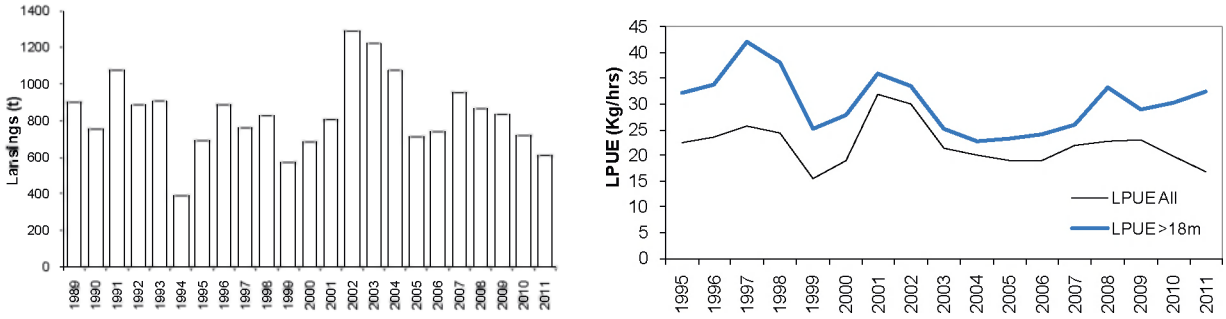


Figure 5.4.34.5.1 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19). Left: Long-term trends in landings (tonnes). Right: Landings per unit effort (lpue, kg hr^{-1}) for all vessels targeting *Nephrops* (black line) and for vessels >18 m total length (blue line).

The current harvest rates are below the MSY reference points. Biomass in relation to MSY $B_{trigger}$ cannot be evaluated. Lpue has fluctuated without trend since 1995.

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 and size in catches between mud patches, suggesting variable population densities and growth; however, the overall trend has remained stable over time. 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 a codend mesh size of 80–99 mm.

Catch distribution	Total catch (2011) = 745 t, where 82% were landings (100% otter trawl) and 18% discards.

Effects of the fisheries on the ecosystem

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

Quality considerations

A relatively extensive UWTV survey was conducted for the first time in 2011. This gave estimates of burrow densities for several of the main patches of *Nephrops* habitat in FU 19. However, one of the main patches was not surveyed. The survey abundance could be used to provide management advice for the first time.

Mean size in the landings has been quite variable over the time-series, partially reflecting the difference in mean sizes of patches with different underlying densities. Adequate catch sampling remains difficult for such a heterogeneous area.

Scientific basis

Assessment type	UWTV survey and trends in size structure of catches.
Input data	One survey index (UWTV-FU 19), size structure of catches.
Discards and bycatch	Discards are included in the assessment.
Indicators	Mean size in landings. Historical survey indicators (IRGFS-WIBTS-Q4) commenced in 2003.
Other information	This stock is scheduled to be benchmarked in 2013.
Working group report	WGCSE

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

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	Not defined.	
	F_{MSY}	HR 7.5%.	Equivalent to $F_{0.1}$ for combined sexes in 2011.
Precautionary Approach	Not defined.		

(unchanged since 2012).

Harvest ratio reference points (2012):

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

The density of *Nephrops* in FU 19 is considered moderate (average density 0.5 m^{-2}). The 2011 harvest rate is low in comparison to other FUs and the mean size and lpue indicators appear stable. For this FU, the exploitation rate on males is usually higher than on females. A harvest ratio consistent with a combined-sex $F_{0.1}$ of 7.5% 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 2013

Basis: F2012 = F2011 = 7.0%; Bias-corrected survey index (2011) = 557 million; Mean weights in landings (2009–2011, 25.4 g) and retention factors based (77%) on 2009–2011 sampling.

Basis	Harvest ratio	Landings 2013 (tonnes)
MSY framework	7.5%	820
F_{2011}	7.0%	760
$F_{35\%Combined}$	12.1%	1320
$F_{max\ Combined}$	12.7%	1390

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 a harvest ratio of 7.5%, resulting in landings of 820 t in 2013.

Additional considerations

Management considerations

The abundance estimate and the F_{MSY} harvest rate are considered conservative.

Nephrops fisheries in this area are fairly mixed, landing also megrim, anglerfish, haddock, and other demersal species. Around 44% of the total catch by weight is discarded. The main discarded fish species are haddock and boarfish (Anon., 2011).

Changes in fishing technology and fishing patterns

For all Irish vessels >18 m total length targeting *Nephrops* the fishing effort shows an overall increasing trend.

However, vessels smaller than 18 m are the main participants in the *Nephrops* fishery in FU 19 as most of the discrete grounds are mainly found inshore.

Uncertainties in the assessment and forecast

Some general uncertainties are discussed in the introduction of Section 5.4.34.

Catch options for FU 19 for 2013 at various harvest ratios were calculated using the approach agreed at the Benchmark Workshop (ICES, 2009). The area of *Nephrops* grounds used was conservative. The 2011 UWTV survey covered about 60% of this known area. Densities for the remaining 40% were assumed to be the same as those observed in the 2006 survey.

Comparison with previous assessment and advice

Last year the assessment was based on lpue trends in the commercial fishery. This year the assessment is based on an UWTV survey first carried out in 2011, and on lpue. Last year the advice was based on lpue trends. This year the advice is based on the MSY approach.

Sources

Anon. 2011. Atlas of Demersal Discarding, Scientific Observations and Potential Solutions, Marine Institute, Bord Iascaigh Mhara, September 2011. ISBN 978-1-902895-50-5. 82 pp.

ICES. 2009. Report of the Benchmark Workshop on *Nephrops* (WKNEPH), 2–6 March 2009, Aberdeen, UK. ICES CM 2009/ACOM:33.

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

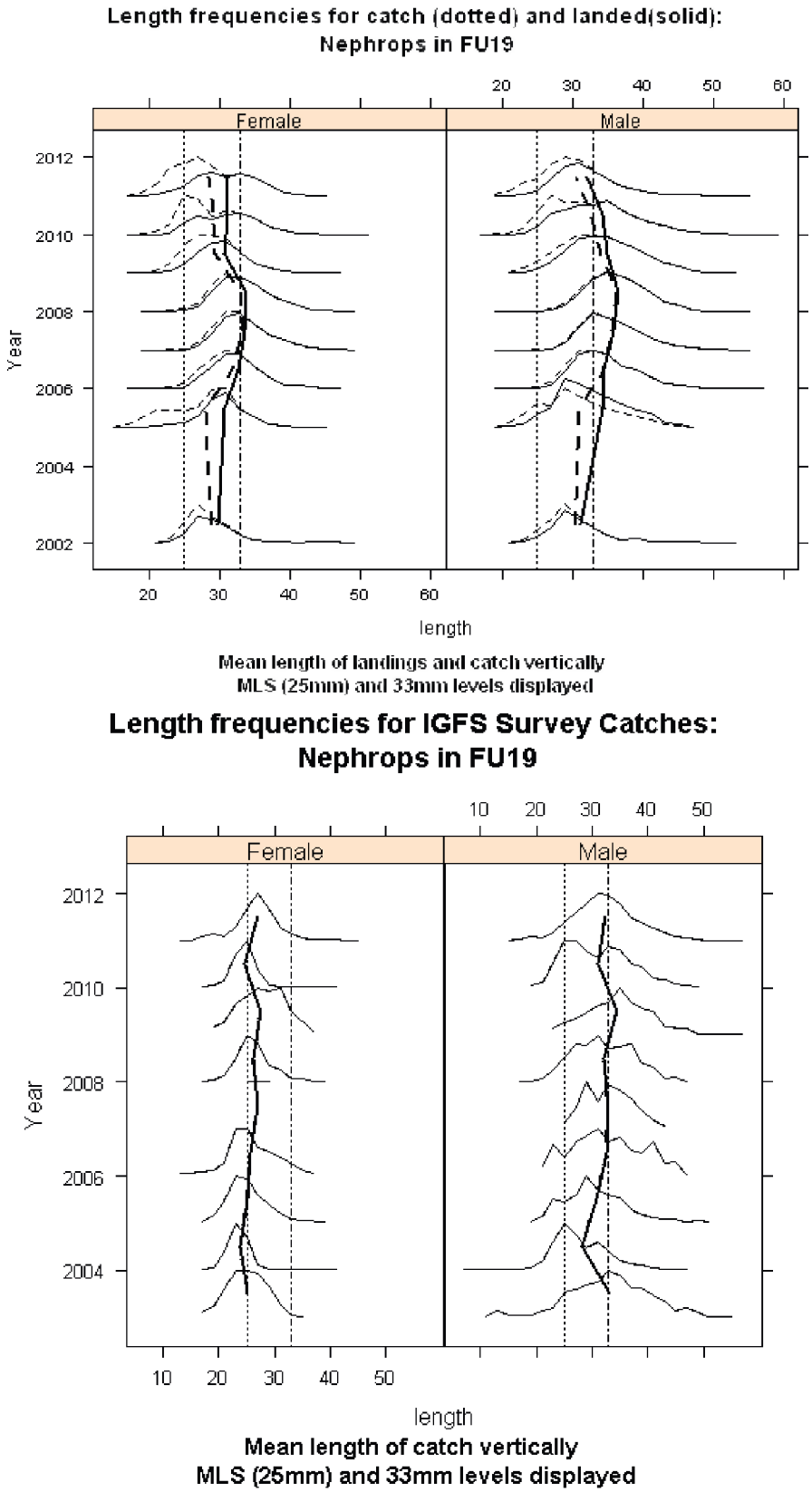


Figure 5.4.34.5.2 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19). Mean size trends for catches and whole landings by sex and in the IRGFS-WIBTS-Q4 survey catches.

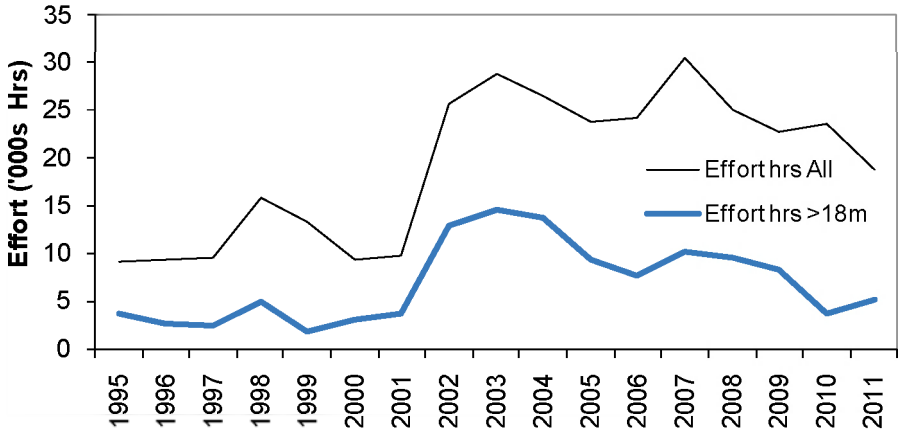


Figure 5.4.34.5.3 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19). Fishing effort by all Irish vessels targeting *Nephrops* (black line) and by vessels >18 m total length (blue line).

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 (FU 19)	Recommended landings Divisions VIIbcjk[1]	ICES landings FU 19 [2]
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	-		0.6
2012	Reduce catches	-		
2013	MSY approach	< 0.82		

Weights in thousand tonnes.
[1] Previously ICES gave combined advice for FUs 16, 17, 18, and 19, and other rectangles in this area.
[2] This includes inshore rectangles along the southern and southeastern coast of Ireland.

Table 5.4.34.5.2 *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
2011	23	585	1	608

Table 5.4.34.5.3 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19). Results from the UWTV-FU 19 survey of *Nephrops* grounds in 2006–2011.

Year	Ground	Area surveyed (m^2)	Area estimates (km^2)	Burrow count	Mean density (no. m^{-2})	95% CI	CV (relative SE)	Domain area (km^2)	Raised abundance estimate (million burrows)
2006	Bantry	-	90.91	-	-	-	-	-	
	Cork Channels	-	484.75	-	-	-	-	-	
	Galley Grounds 1	-	61.88	-	-	-	-	-	
	Galley Grounds 2	-	77.95	-	-	-	-	-	
	Galley Grounds 3	-	202.75	-	-	-	-	-	
	Galley Grounds 4	927.53	652.33	293	0.27	0.25	0.36	652.33	175.23
	Helvick 1	-	38.56	-	-	-	-	-	
	Helvick 2	-	31.47	-	-	-	-	-	
	Helvick 3	-	12.66	-	-	-	-	-	
2011	Bantry	740.51	90.91	334	0.43	0.37	0.31	90.91	38.83
	Cork Channels	1645.84	484.75	768	0.45	0.26	0.26	484.75	218.64
	Galley Grounds 1	386.74	61.88	248	0.67	1.33	0.46	61.88	41.74
	Galley Grounds 2	447.4	77.95	352	0.76	1.40	0.42	77.95	59.62
	Galley Grounds 3	615.2	202.75	472	0.75	0.46	0.19	202.75	152.63
	Galley Grounds 4		652.33					652.33	na
	Helvick 1	436.96	38.56	341	0.78	0.05	0.01	38.56	30.13
	Helvick 2	314.97	31.47	84	0.22	0.89	0.96	31.47	6.78
	Helvick 3	242.76	12.66	18	0.06	0.82	1.00	12.66	0.82
2011	FU 19	4830.46	1653.26	2616	0.51	0.14	0.13	1653.26	*850.13
2011	FU 19								**724.42

* The estimate of 850 million burrows assumes average 2011 density for the uncovered Galley ground.
** The estimate of 724 million burrows includes the 2006 estimate for the Galley grounds 4; this is used in the final catch option table.

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

Advice for 2013 and 2014

Based on ICES approach to data-limited stocks, ICES advises that landings should be no more than 2500 tonnes. This is the first year ICES is providing quantitative advice for data-limited stocks (see Quality considerations).

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	Decreasing

SSB (Spawning-Stock Biomass)	
	2009–2011
Qualitative evaluation	Unknown

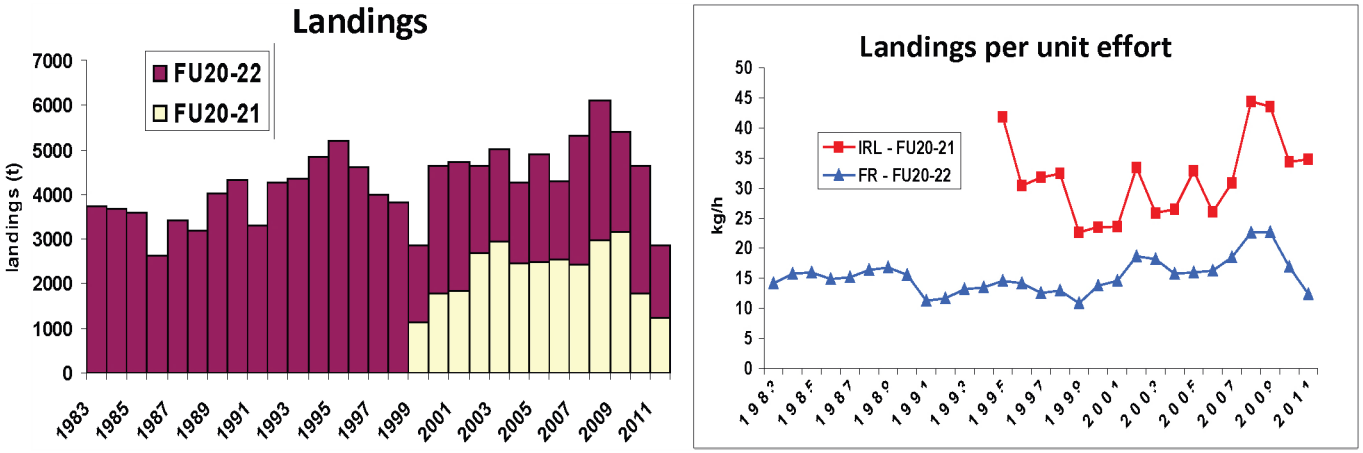


Figure 5.4.34.6.1 *Nephrops* in FU 20 (Labadie, Baltimore, and Galley) and FU 21 (Jones and Cockburn). Left: Landings (t) for the whole FUs 20–22 (years 1983–2011) and for the FUs 20–21 component (years 1999–2011). Right: Landings per unit effort (lpue) indices by country (the threshold of *Nephrops* by weight in total landings is 10% for the French and 30% for the Irish tuning fleets). French indices include FU 22. The French fleet has taken almost 90% of the landings in FUs 20–21 since 1999.

For a long period, the stock was considered to be stable, based on long-term indicators (lpue, mean size, discard rates). There have been indications of strong recruitment in recent years (e.g. 2006), resulting in an increase in commercial lpue for Irish and for French trawlers in 2008 and 2009. The lpue has decreased in the last two years, suggesting a decline in abundance since the peak in 2008–2009. Landings in 2010 and 2011 have declined substantially (potentially explained by a decreased targeting of *Nephrops* by the French fleet).

Management plans

No specific management objectives are known to ICES.

The fisheries

The fishery is prosecuted by twin- and single-trawlers. Landings are almost exclusively (98%) provided by France and the Republic of Ireland. The French landings have significantly reduced during the last decade: 90–95% of the total landings for FUs 20–21 were reported by France in the early 2000s, but the French contribution gradually decreased to 45–50%.

Catch by fleet	Total catch (2011) = 1.24 kt landings (100% trawling); discards 2011 were not specifically estimated for the FUs 20–21 component.

Effects of the fisheries on the ecosystem

Nephrops fishery in FUs 20–21 has high bycatches of cod, whiting, and to a lesser extent haddock and hake. Discards rates in this fishery are relatively high.

Quality considerations

Discards of *Nephrops* are thought to be extensive, but observations are insufficient to provide a reliable time-series. Commercial effort data have not been corrected to take into account changing fishing power and fishing practices over time.

The advice is based on a calculation of potential landing options and harvest rates given the known surface area of *Nephrops* habitat and assumed potential densities of the functional unit. The surface area is an estimate derived from the Irish directed *Nephrops* VMS data from 2006–2011 (high intensity area only). Inclusion of French VMS data and areas with less intensive VMS activity would result in a significantly larger area (and correspondingly larger abundance estimates); therefore, the harvest rates could well be lower than implied by the analysis.

The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	Data-limited method for *Nephrops*.
Input data	Habitat extent, mean size, landings and discard estimates, burrow density estimates.
Discards and bycatch	Not included in the assessment because of unavailability for the overall time-series.
Indicators	Trends based on lpue information and mean sizes in the catches (Commercial index: French trawlers – threshold 10%, Irish trawlers – threshold: 30%).
Other information	None.
Working group report	WGCSE

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

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

In the absence of a full analytical assessment, ICES bases advice for *Nephrops* on 10-year average landings, unless this is considered to be not precautionary.

The table below presents a range of harvest rates based on historical landings, the known surface area of the functional unit, and different population densities. This is not a catch options table, but rather a sensitivity analysis exploring whether average landings of the last ten years would correspond to a precautionary harvest rate under a range of potential *Nephrops* density values in the FU. The shaded cells show harvest rates above 7.5% (MSY harvest rates vary between 7.5 and 17%) that are considered less precautionary.

Basis: Surface area FUs 20–21: 3710 km^2, Mean weight: 34 g, Discards: 25% in number.

		Range of potential densities (*Nephrops* per m^2)						
Basis	**Landings**	0.2	0.25	0.3	0.35	0.4*	0.45	0.5
minimum	1200	5.8%	4.6%	3.9%	3.3%	2.9%	2.6%	2.3%
average (3 yr)	2100	10.3%	8.3%	6.9%	5.9%	5.2%	4.6%	4.1%
average (10 yr)	**2500**	**12.4%**	**9.9%**	**8.3%**	**7.1%**	**6.2%**	**5.5%**	**5.0%**
maximum	3100	15.8%	12.6%	10.5%	9.0%	7.9%	7.0%	6.3%

Shaded areas indicate harvest rates >7.5%. The range of *Nephrops* F_{MSY} proxies is 7.5–17%.
* Most recent density estimate (average TV survey density from 2006 = 0.42).

ICES approach to data-limited stocks

For this stock, the last ten years' average landings correspond to a harvest rate below the range of MSY harvest rates calculated for other *Nephrops* FUs (between 7.5 and 17%), provided that the *Nephrops* density is at least 0.35. The most recent density estimate (from 2006) is 0.4 *Nephrops* m^{-2}. Even though this density estimate is six years old, the stock development since then (as indicated by commercial effort and lpue trends) does not give reason for concern that the burrow density may have declined significantly. Therefore, ICES advises that landings should not increase in relation to the ten-year average landings, which corresponds to landings of no more than 2500 tonnes.

Additional considerations

The average landings during the 2000s have been stable with slight increases in 2002–2003 and 2008–2009, perhaps due to positive signals of recruitment (the second one verified in the UWTV Irish survey), corresponding also to periods with lower mean size in landings. Total landings from the FUs 20–21 area have declined since 2010, mainly because of the reduction of the harvested quantities by French trawlers. Information on mean sizes in landings and discard rates suggest no major change in the status of this stock.

Data and methods

The *Nephrops* data-limited method provides various harvest ratios using input parameters such as mean density, mean weight in landings, removals rate, and targeted landings level. In 2012 this approach was performed on the FUs 20–21 *Nephrops*. The current mean density is unknown, but observations in 2006 by the Irish UWTV survey allow the definition of a range of realistic values. The overall mean weight in landings and the discards rate were calculated as an average of the French and Irish estimates weighted by the relative landings of each country (for 2010). The ten-year average landings (2464 t) resulted in harvest rates in the range of 6.2–9.9% for a density range of 0.4–0.25 individuals per square meter.

The effects of regulations

The minimum EU landing size (MLS) for *Nephrops* in this area is 8.5 cm, total size (25 mm CL). For the last decades, French Producers' Organizations have implemented a higher minimum landing size of 11.5 cm, total size (35 mm CL). This has led to discarding *Nephrops* above the legal minimum landing size by the French fleet (highgrading). 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) that would have been discarded previously.

Uncertainties in assessment and forecast

Some general uncertainties are discussed in the introduction of Section 5.4.34.

Since 2009, the new registration system of official French statistics has changed the definition of fishing effort. As a consequence, no reference to the previous estimates is available for the series 1983–2008. New rough estimators tested by ICES since 2011 seem to be accurate and adequate to provide French fishing effort and lpue for 2009–2011.

Some discard data are available from France (1985, 1991, 1997, and 2010) and Ireland (since 2002). These data are insufficient to provide a full time-series of discards.

There are indications that the French fleet may be directing its effort within a trip more towards gadoids in the last two years. Since effort is estimated on a trip basis, the French lpue values for *Nephrops* in 2010 and 2011 could be underestimating *Nephrops* abundance.

The *Nephrops* data-limited new approach allows for a quantitative precautionary approach, although it is based on input mean densities of the population not updated since 2006.

Comparison with previous assessment and advice

The advice is based on the *Nephrops* data-limited method.

The basis for the assessment changed because before 2012 only trends were considered for the FUs 20–21 *Nephrops*; in 2012, however, a conservative, quantitative approach based on habitat extent and population characteristics was performed.

Source

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

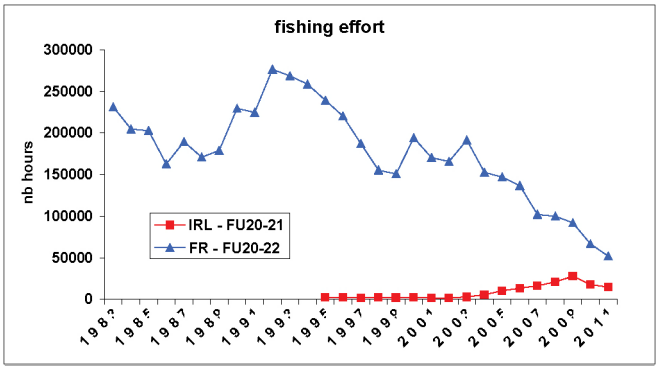


Figure 5.4.34.6.2 *Nephrops* in the Celtic Sea (FUs 20–22) and in the Labadie area (FUs 20–21). Fishing effort by country (the threshold of *Nephrops* by weight in total landings is 10% for the French and 30% for the Irish tuning fleets). French indices include FU 22. The French fleet has taken almost 90% of the landings in FUs 20–21 since 1999).

Table 5.4.34.6.1 *Nephrops* in FU 20 (Labadie, Baltimore,and Galley) and FU 21 (Jones and Cockburn). ICES advice, management, and landings.

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

Weights in thousand tonnes.
[1)] Advice prior to 2013 applies to FUs 20–**22**.
[4)]

Table 5.4.34.6.2 *Nephrops* in FU 20 (Labadie, Baltimore, and Galley) and FU 21 (Jones and Cockburn). Landings (t) by country as used by ICES. Aggregated values for the whole FUs 20–22 are given before 1999.

Year	France		Rep. of Ireland		UK		Other Countries[1,2]	Total reported[2]	Unallo-cated[2]	Total	
	FU 20–22	FU 20–21	FU 20–22	FU 20–21	FU 20–22	FU 20–21				FU 20–22	FU 20–21
1983	3667	na		na	65	na					
1984	3653	na		na	36	na					
1985	3599	na		na	3	na					
1986	2638	na		na	na	na					
1987	3080	na	329	na	na	na					
1988	2926	na	239	na	1	na					
1989	3221	na	784	na	13	na					
1990	3762	na	528	na	14	na					
1991	2651	na	644	na	13	na					
1992	3415	na	750	na	84	na					
1993	3815	na	770	na	47	na	0	4632	-274	4358	
1994	3658	na	1415	na	42	na	2	5117	-274	4843	
1995	3803	na	1575	na	100	na	2	5480	-282	5198	
1996	3363	na	1377	na	77	na	2	4819	-217	4602	
1997	2589	na	1552	na	59	na	4	4204	-213	3991	
1998	2241	na	1619	na	48	na	1	3909	-90	3819	
1999	2078	1051	824	83	38	18	0	2940	-78	2862	1152
2000	2848	1661	1793	107	45	10	1	4687	-44	4643	1778
2001	2626	1750	2123	69	19	14	1	4769	-33	4736	1833
2002	3154	2559	1496	104	15	11	8	4673	-50	4623	2674
2003	3595	2796	1389	148	19	9	na	5003	0	5003	2953
2004	2605	2140	1629	299	36	4	na	4270	0	4270	2443
2005	2502	2008	2387	455	6	6	na	4895	0	4895	2469
2006	2368	2066	1848	450	59	7	na	4275	0	4275	2523
2007	2033	1816	3214	600	52	3	6	5305	0	5305	2419
2008	2348	2036	3411	937	335	7	na	6094	0	6094	2980
2009	2165	1930	2844	1202	381	13	na	5390	0	5390	3145
2010	1112	975	3110	756	413	62	na	4635	0	4635	1793
2011	620	566	2185	637	49	34	na	2854	0	2854	1237

[1]Other countries include Belgium.
[2]Only reported for the whole area FUs 20–22.

ECOREGION Celtic Sea
STOCK *Nephrops* in the Smalls (FU 22)

This advice was updated in November 2012 to take account of the most recent UWTV survey information.

Advice for 2013

ICES advises on the basis of the MSY approach that landings from FU 22 in 2013 should be no more than 3100 tonnes.

To protect the stock in these functional units, management should be implemented at the functional unit level.

Stock status

F (Fishing Mortality)			
	2009	2010	**2011**
MSY (F_{MSY})	✓	✗	✓ Appropriate
Precautionary approach (F_{pa},F_{lim})	?	?	? Unknown

SSB (Spawning-Stock Biomass)			
	2010	2011	**2012**
Qualitative evaluation	→	→	↗ Increasing

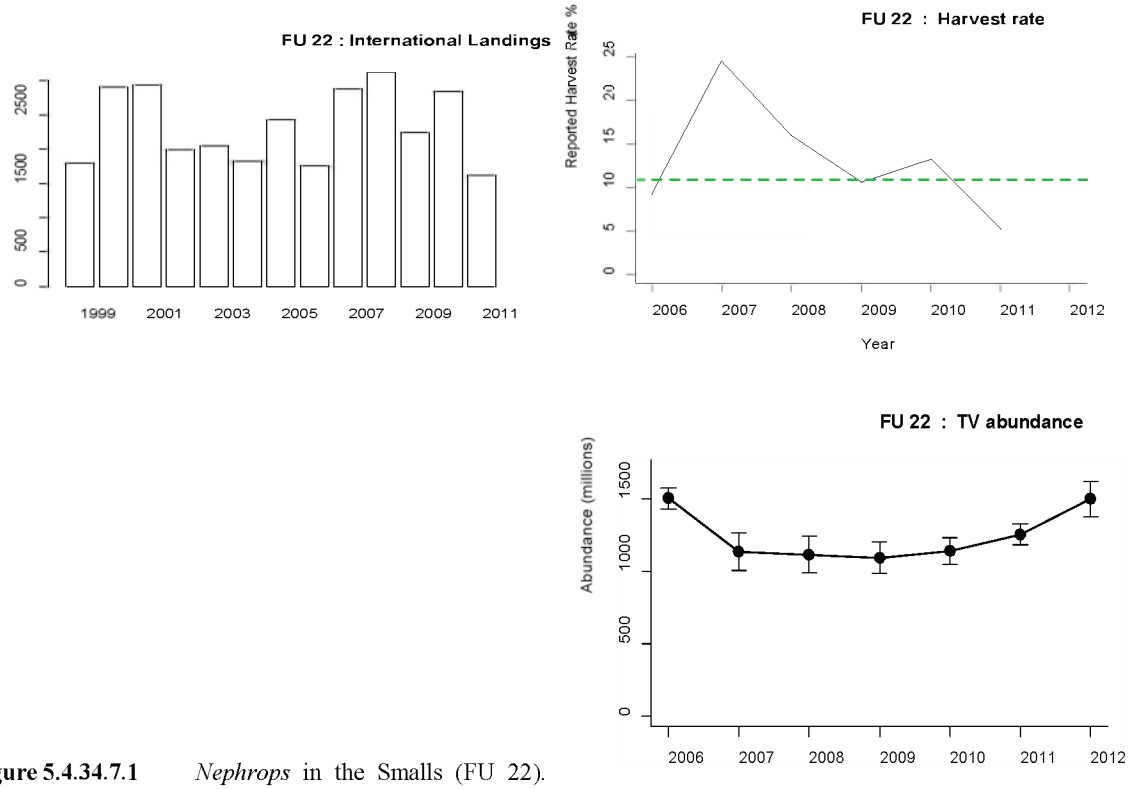


Figure 5.4.34.7.1 *Nephrops* in the Smalls (FU 22). Top left: Landings in tonnes for FU 22 (the Smalls). Top right: UWTV survey abundance for FU 22 (proxy for SSB). Bottom right: harvest rate (green dashed line represents F_{MSY} harvest ratio).

The FU 22 stock component is considered to be stable. Harvest rates have decreased since 2007 and are below F_{MSY}.

Management plans

No specific management objectives are known to ICES.

Biology

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

The fisheries

The fishery is prosecuted by twin trawlers. Landings are almost exclusively (more than 95%) provided by Republic of Ireland.

Catch distribution	Total catch (2011) = 1.7 kt, where 91% were landings (100% otter trawl) and 9% discards.

Effects of the fisheries on the ecosystem

Nephrops fishery in the Celtic Sea has bycatches of whiting and cod, and to a lesser extent of haddock and hake.

Quality considerations

The recent increase in the mean weight in landings has a considerable impact in the catch forecast. The long-term average (rather than a three-year average) was considered to be more appropriate as an input for the mean weight in landings.

The proportions retained by the fishery were averaged over the last three years to reflect current retention practices.

Sampling of this stock is good. A dedicated annual UWTV survey has taken place since 2006 and the results of the 2012 survey were provided to ICES in September 2012 to update the advice.

Scientific basis

Assessment type	UWTV and trends of the size structure of catches.
Input data	One survey index (UWTV-FU 22), size structure of catches.
Discards and bycatch	Discards are included in the assessment.
Indicators	Mean size and lpue.
Other information	The stock is scheduled to be benchmarked in 2013. The June advice was updated in November to take into account the 2012 survey information.
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* in the Smalls (FU 22)

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	Not defined.	
	F_{MSY} (FU 22) harvest rate.	10.9%	MSY under SCA model.
Precautionary Approach		Not defined.	

(unchanged since 2011)

For FU 22, the absolute density observed during the UWTV survey is medium (~ 0.5 m^{-2}), suggesting the stock has moderate productivity. The fishery in this area has been in existence since the 1960s and has been relatively stable for many years. Recent harvest ratios in this FU have been variable but generally around the $F_{35\%SpR}$. $F_{35\%SpR}$ (combined between sexes) is expected to deliver high long-term yield with a low probability of recruitment overfishing and therefore is chosen as the F_{MSY} proxy for FU 22.

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 2013

FU 22: Basis: F_{2012} = F_{2011} = 5.3%; bias-corrected survey index (2012) = 1 498 million; mean weights in landings (2003–2011, 22.2g) and retention factors based (86%) on 2009–2011 sampling.

Basis	Harvest ratio	Landings 2013 in the Smalls (FU 22) (tonnes)
MSY framework	10.9%	3 100
F_{2011}	5.3%	1 500
$F_{0.1}$	7.5%	2 100
$F_{35\%}$	10.9%	3 100
F_{max}	12.3%	3 500

MSY approach

No MSY $B_{trigger}$ has been identified for this FU. Hence the ICES MSY approach has been applied only in relation to F_{MSY}. This implies a harvest ratio for the Smalls FU 22 at less than 10.9%, resulting in landings of less than 3100 t in 2013.

Additional considerations

The advice has been updated in November 2012 to take into account the most recent UWTV survey results which show a significant increase in stock abundance. The landings advice issued in June (2600 t) was also based on the MSY approach, but used the results from the survey in 2011.

The *Nephrops* trawl fleet operating in Divisions VIIgfh discards around 38% by weight. Small *Nephrops* are the main species comprising the discards. The main fish species discarded are whiting, haddock, and dogfish (Anon., 2011).

In recent years several newer vessels specializing in *Nephrops* fishing have participated in this fishery. These vessels target *Nephrops* on several other grounds within the TAC area and move around to optimize catch rates. 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 Smalls and other *Nephrops* grounds where effort control has not been put in place.

However, information on mean sizes in landings, discard rate, and abundances provided by the UWTV survey suggest no major change in the status of this stock.

Data and methods

This year the series average (2003–2011) for mean weight of the landings and the 2009–2011 average for proportion removals retained were used as inputs to the catch option table, resulting in landings of 3100 t for 2013. Using the recent 3-year average for these inputs implies a landings forecast of 3370 t.

This year landings for FU 22 from the UK have been included in the calculations of harvest rates for 2003–2011.

Uncertainties in assessment and forecast

Some general uncertainties are discussed in the introduction of Section 5.4.34.

There are several key uncertainties and bias sources in the method based on the UWTV survey used for projections in FU 22. The survey estimates themselves are very precisely estimated (CVs 2–8%), given the homogeneous distribution of burrow density and the modelling of spatial structuring. The abundance bias estimate for FU 22 is largely based on expert opinion. The precision of these bias corrections cannot yet be quantified, but is likely to be lower than the precision of 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 FU 22 deterministic estimates of the mean weight in the landings (2003–2011) and discard rates (2009–2011) are used as 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. The method to derive landings for the catch options is sensitive to the input of discard rate, discard survival, and mean weight in landings. This introduces uncertainties in the catch forecasts. Precision estimates are needed for these forecast inputs.

The 2012 survey covered less stations than in recent years, but the resulting increased uncertainty is still well below the maximum relative standard error recommended for UWTV surveys.

Comparison with previous assessment and advice

The inclusion of UK landings has changed the harvest rates to those used in last year's assessment.

The basis for the assessment and advice is the same as last year. The advice was updated in November 2012 to take account of the most recent UWTV survey information.

Sources

Anon. 2011. Atlas of Demersal Discarding, Scientific Observations and Potential Solutions, Marine Institute, Bord Iascaigh Mhara, September 2011. ISBN 978-1-902895-50-5. 82 pp.

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

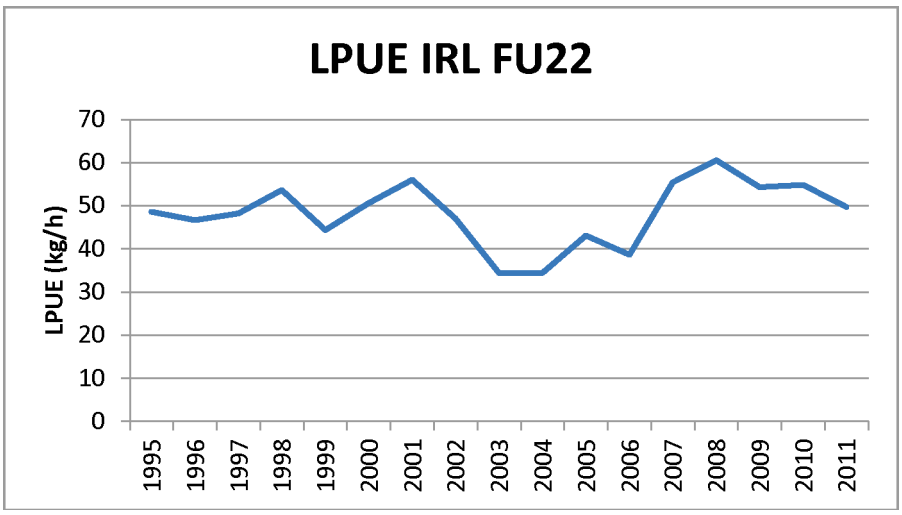


Figure 5.4.34.7.1 *Nephrops* in the Smalls (FU 22). Trends in lpue for the Irish *Nephrops*-directed fleet.

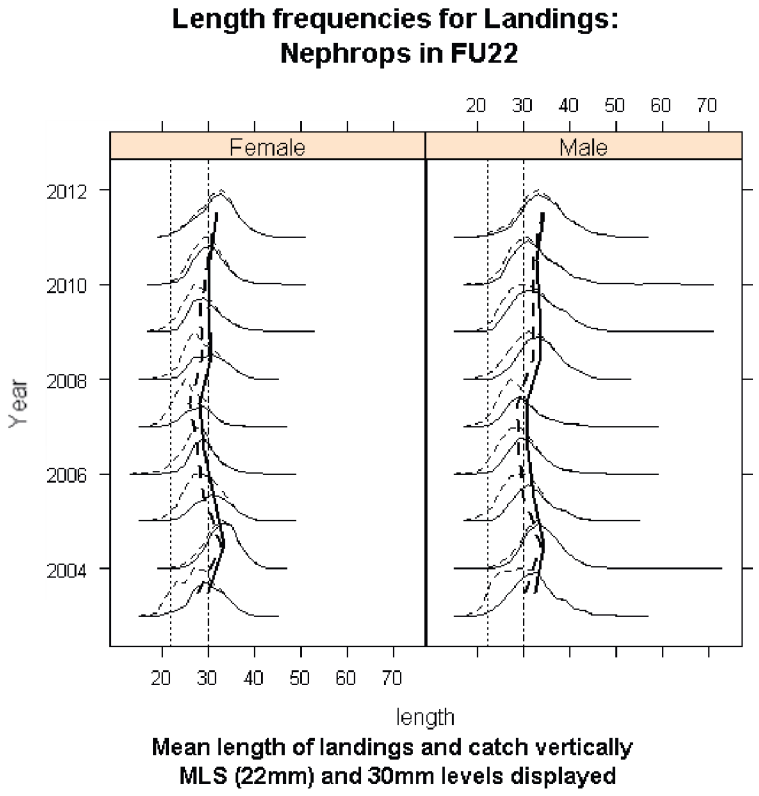


Figure 5.4.34.7.2 *Nephrops* in the Smalls (FU 22). Length distributions in the catches 2003–2011.

Table 5.4.34.7.1 *Nephrops* in the Smalls (FU 22). ICES advice, management, and landings.

Year	ICES advice[1)]	Predicted catch corresp. to advice (FU **22**)[1)]	FU **22** ICES landings	FUs **20–22** ICES landings
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			1.8	3.0
2000		3.8	2.9	4.7
2001		3.8	2.9	4.8
2002		3.8	2	4.7
2003		3.8	2.1	5.0
2004	Adjust TAC in line with landings of most recent 10 years	4.6	1.8	4.3
2005	Adjust TAC in line with landings of most recent 10 years	4.6	2.4	4.9
2006	Recent average landings 2000–2002	4.6	1.8	4.3
2007	No increase in effort	-	2.9	5.4
2008	No increase in effort	<5.3	3.1	6.4
2009	No increase in effort	<5.3	2.2	5.8
2010	No new advice, same as for 2009	<5.3	2.8	4.8
2011	See scenarios	-	1.6	2.9
2012	FUs 20–21: reduce catch FU 22: MSY approach	- 2.3[2)]		
2013	FU 22: MSY approach (Updated November 2012)	3.1[2)]		

Weights in thousand tonnes.
[1)] Advice prior to 2013 applies to FUs **20–22**
[2)] Applies to FU 22 only.

Table 5.4.34.7.2 *Nephrops* in the Smalls (FU 22). Landings (t) by country as used by ICES.

Year	France	Ireland	UK	Total
1999	1027	741	20	1788
2000	1186	1687	34	2907
2001	876	2054	5	2935
2002	595	1392	3	1990
2003	799	1241	10	2050
2004	465	1330	33	1828
2005	494	1931	0	2425
2006	302	1398	52	1752
2007	218	2614	48	2880
2008	312	2474	328	3114
2009	235	1642	368	2245
2010	136	2353	351	2840
2011	54	1548	15	1617

Table 5.4.34.7.3 *Nephrops* in the Smalls (FU 22). Results from UWTV survey of the Smalls *Nephrops* grounds.

Ground	Year	Number of stations	Mean density (No. m^{-2})	Domain area (km^2)	Geostatistical abundance estimate (millions)	CV on abundance estimate
the 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%
	2011	107	0.53	2881	1632	3%
	2012	47	0.63	2934	1947	8%

ECOREGION Celtic Sea and West of Scotland
STOCK Sole in Divisions VIIh–k

Advice for 2013 and 2014

Based on the ICES approach for data-limited stocks, ICES advises that catches should be no more than 200 t.

Management of sole should take into account the advice for reduced bycatches and discards of plaice in this management area.

This is the first year ICES is providing quantitative advice for data-limited stocks (see Quality considerations).

Stock status

F (Fishing Mortality)		
		2009–2011
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
Qualitative evaluation	?	Unknown

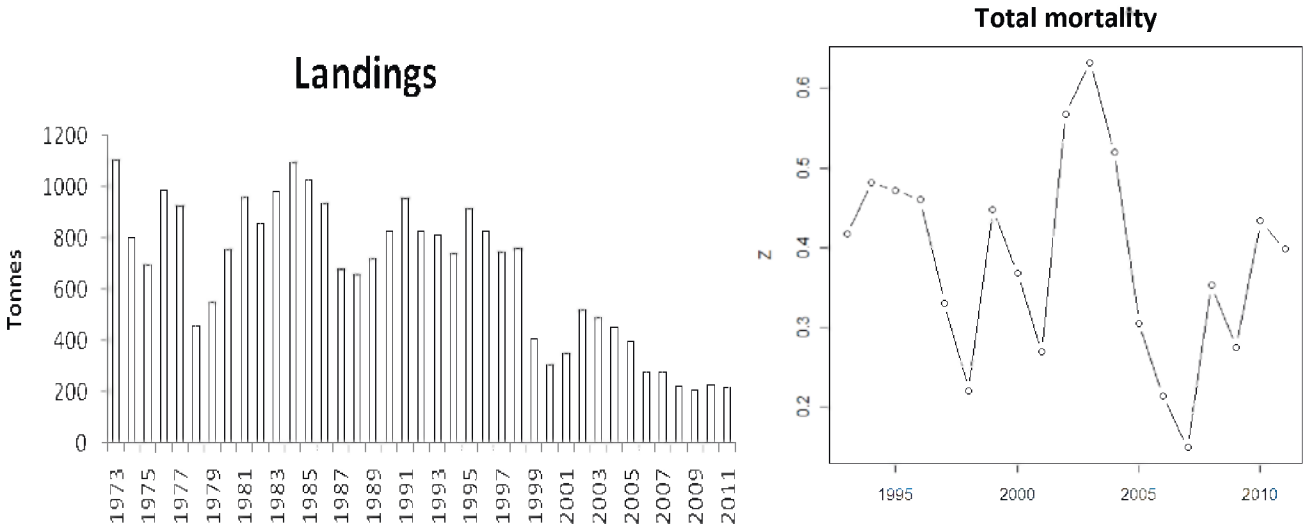


Figure 5.4.35.1 Sole in Divisions VIIh–k. Left: Official landings in tonnes. Right: total mortality Z estimated over pseudo-cohorts (ages 4–9) as the slope of the log catch numbers.

The state of sole stock biomass in Divisions VIIh–k is unknown. However, exploratory estimates of mortality suggest that the current fishing mortality in Divisions VIIj,k has increased since 2007, but it remains below the 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.

Catch distribution	Total landings (2011) were 0.217 kt.

Quality considerations

There is no accepted analytical assessment for this stock.

Catch numbers-at-age are only available for Irish landings. Total mortality (Z) estimates are extremely volatile from one year to another, but always below the current MSY proxy. ICES considered that the average fishing mortality estimates over the last three years derived from catch curve analysis were reliable enough and could be used as a basis for advice.

The advice is based on a catch curve analysis used as an indicator of fishing mortality. The uncertainty associated with the estimates is not quantified.

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

Scientific basis

Assessment type	Catch curve analysis.
Input data	Official landings-at-age 1993–2011 for Divisions VIIj,k only.
Discards and bycatch	Not included in the assessment.
Indicators	None.
Other information	Yield-per-recruit analysis.
Working group report	WGCSE

ECOREGION Celtic Sea and West of Scotland
STOCK Sole in Divisions VIIh–k

Reference points

	Type	*Value*	*Technical basis*
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 2013 and 2014

No reliable assessment can be presented for this stock, mainly because catch numbers-at-age are only available for Irish landings. Therefore, fishing possibilities cannot be projected.

ICES approach to data-limited stocks

For data-limited stocks for which fishing mortality is available and estimated below F_{MSY}, ICES catch advice is based on an increase in landings proportional to the ratio of F_{MSY} to the current F.

Given that F_{MSY} (0.31) is 15% higher than the average $F_{2009-2011}$ (0.27), an increase of 15% with respect to the last 3 years average landings may be authorised, corresponding to catches of 253 t. Additionally, considering fishing mortality is progressively increasing since 2007 and that the SSB level is unknown, ICES advises that catches should decrease by 20% as a precautionary buffer. This results in catch advice of no more than 200 t.

Additional considerations

Management considerations

Sole and plaice are caught together in mixed fisheries. Management of sole should take into account the advice for reduced bycatches and discards of plaice in this management area.

The assessment area covers the Divisions VIIj,k and the management area covers Divisions VIIh–k.

For Division VIIh only landings data are available. It is likely that sole in Division VIIh are more connected with sole in Divisions VIIe,f,g than sole in Division VIIj.

Data and methods

Inputs to the yield-per-recruit analysis include selectivity parameters derived from the catch-at-age. The natural mortality is approximated from the values of sole in Divisions VIIf,g. The F_{max} derived from this method (Figure 5.4.35.2) is poorly defined and could not be used as a proxy for F_{MSY}; therefore, the F_{MSY} proxy used in 2010 and 2011 was used for this year's advice.

A proxy for total mortality (Z) was estimated from the Irish catch numbers-at-age in Divisions VIIjk (Figure 5.4.35.1). Exploratory estimates of mortality suggest that the current fishing mortality in the Divisions VIIj,k part of the stock is around or below F_{MSY} estimated from a yield-per-recruit analysis.

Comparison with previous assessment and catch options

As for last year, this assessment was based on a pseudo-cohort catch curve analysis.

The advice last year was based on precautionary considerations. The basis for this year's advice is the ICES data-limited approach.

Source

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

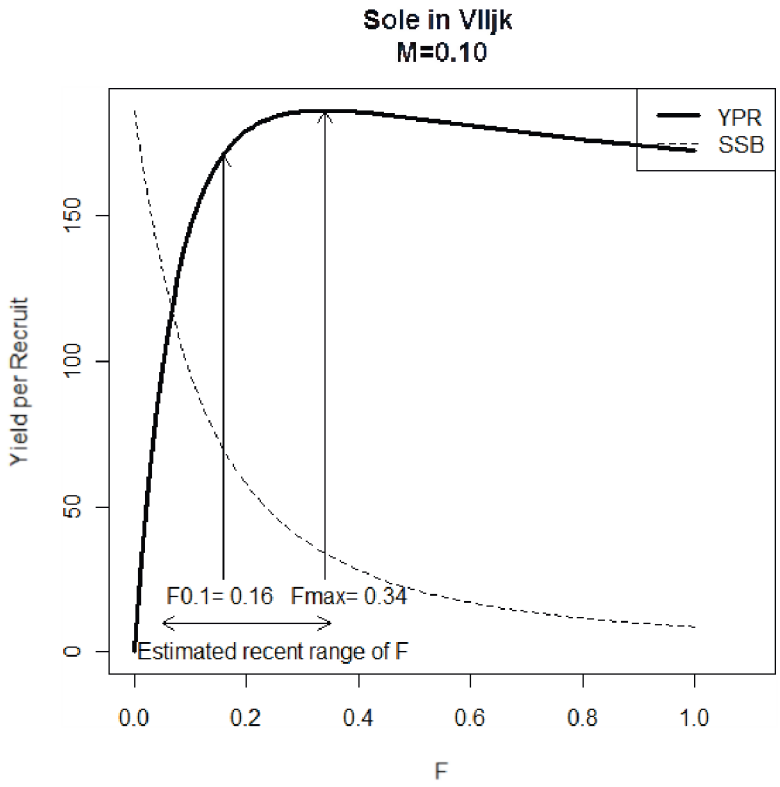


Figure 5.4.35.2 Sole in Divisions VIIh–k. Yield-per-recruit plot and the recent range of F estimates for this stock.

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	220
2012	No increase in catches	-	423	
2013	Decrease catches by 8% (15% increase, followed by 20% PA reduction	<200		
2014	Same catch advice as 2013	<200		

Weights in tonnes.

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 - Eng+Wales+N.	.	.	.	.	.	.	.	.	.	.
UK - England & Wal	6	5	24	11	12	11	18	42	83	108
UK - Scotland	-	-	-	-	-	-	-	-	-	-
Total	1104	801	692	984	926	458	548	755	961	855

Country	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Belgium	411	474	318	442	271	254	252	353	358	312
Denmark	-	-	-	-	-	-	-	-	-	-
France	176	120	25	38	44	53	84	66	55	43
Ireland	176	156	201	188	168	182	206	266	306	255
Netherlands	51	194	280	3		-	-	-	-	-
Spain	38					-	-	-	-	-
UK - Eng+Wales+N.	.	.	.	.	.	.	177	144	234	215
UK - England & Wal	129	151	200	261	193	166	.	.	.	.
UK - Scotland	-	-	-	-	-	-	-	-	-	2
Total	981	1095	1024	932	676	655	719	829	953	827

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Belgium	317	338	433	375	368	346	101	8	13	154
Denmark	-	-	-	-	-	-	-	-	-	-
France	44	42	47	50	58	74	.	79	103	108
Ireland	237	184	243	183	203	221	207	111	125	130
Netherlands	-	-	-	70	-	7	1	10	-	-
Spain	-	-	-	-	-	-	-	-	-	1
UK - Eng+Wales+N.	209	172	192	148	113	111	97	95	111	124
UK - England & Wal	.	.	.	.	.	.	.	.	.	.
UK - Scotland	5	2	-	-	-	-	-	-	-	-
Total	812	738	915	826	742	759	406	303	352	517

Country	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	170	157	90	36	31	10	11	20	10
Denmark	-	-							
France	133	103	93	92	78	57	79	87	90
Ireland	105	111	98	63	78	72	60	71	63
Netherlands	-	-		1					
Spain	-	-	2						
UK - Eng+Wales+N.	78	79	112	87	91	80	58	51	54
UK - England & Wal	.	.							
UK - Scotland	-	-							
Total	486	450	395	279	278	219	208	229	217

Table 5.4.35.3 Sole in Divisions VIIh–k. Total mortality Z estimated over pseudo-cohorts as the slope of the log catch numbers.

Year	Z
1993	0.417
1994	0.482
1995	0.472
1996	0.460
1997	0.331
1998	0.221
1999	0.447
2000	0.368
2001	0.270
2002	0.568
2003	0.633
2004	0.520
2005	0.305
2006	0.215
2007	0.150
2008	0.353
2009	0.275
2010	0.434
2011	0.398

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

Advice for 2013 and 2014

Based on the ICES approach for data-limited stocks, ICES advises that catches should be no more than 30 tonnes.

This is the first year ICES is providing quantitative advice for data-limited stocks (see Quality considerations).

Stock status

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	? Insufficient information

SSB (Spawning-Stock Biomass)	
	2009–2011
Qualitative evaluation	? Insufficient information

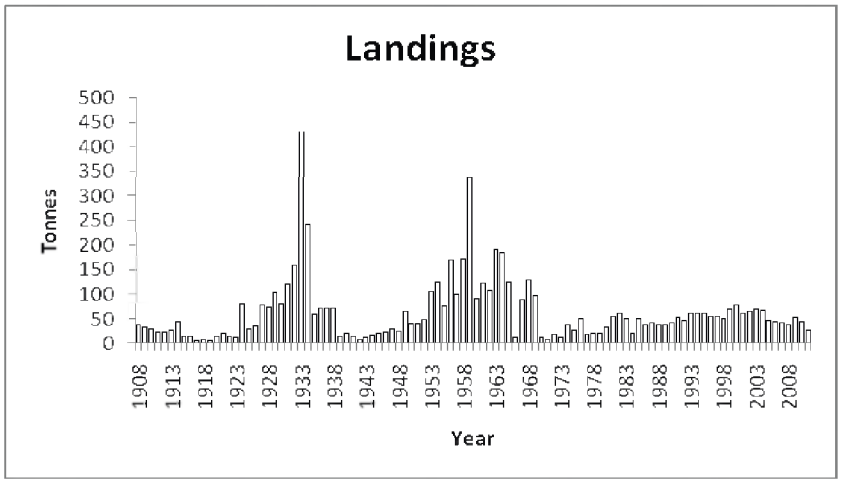


Figure 5.4.36.1 Sole in Divisions VIIb,c (West of Ireland). Official landings in tonnes.

The state of the stock is unknown, but landings have been low for several decades.

Management plans

No specific management objectives are known to ICES.

Quality considerations

The advice is based on a precautionary reduction of catches because of missing or non-representative data. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	No assessment.
Input data	Landings statistics.
Discards and bycatch	Not available.
Indicators	Lpue from Irish otter trawl fleet.
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 2013 and 2014

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

ICES approach to data-limited stocks

There is insufficient information to evaluate the status of the stock. For data-limited stocks without information on abundance or exploitation ICES considers that a precautionary reduction of catches should be implemented unless there is ancillary information clearly indicating that the current exploitation is appropriate for the stock.

For this stock, ICES advises that catches should decrease by 20% in relation to the average landings of the last three years, corresponding to catches of no more than 30 t.

Additional considerations

Sole are caught as a minor bycatch in mixed demersal trawl and *Nephrops* fisheries in Division VIIb.

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

Commercial lpue trends (see Figure 5.4.36.2) have been stable since 1995.

Comparison with previous advice

The advice last year was based on precautionary considerations. This year the advice is based on the ICES approach to data-limited stocks.

Source

ICES. 2012. Report of the Working Group on Celtic Seas Ecosystems (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

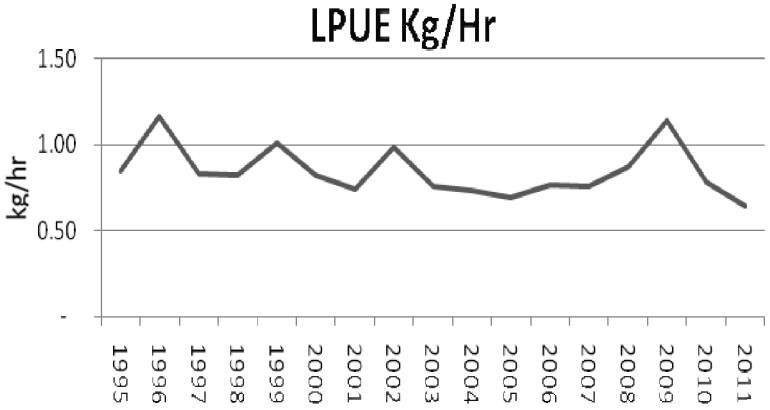


Figure 5.4.36.2 Sole in Divisions VIIb,c (West of Ireland). Lpue of Irish Otter trawl fleet (kg hr^{-1}).

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	27
2012	No increase in catch	-	44	
2013	20% reduction in catches (last 3 years' average)	<30		
2014	Same catch advice as for 2013	<30		

Weights in tonnes.

Table 5.4.36.2 Sole in Divisions VIIb,c (West of Ireland). Landings (t) as officially reported to ICES, and ICES estimates of the landings since 1993.

Year	FRA	UK	IRL	OTH	TOT
1908	0	1	37	0	38
1909	0	0	32	0	32
1910	0	0	28	0	28
1911	0	1	22	0	23
1912	0	1	22	0	23
1913	0	1	25	0	26
1914	0	1	43	0	44
1915	0	1	12	0	13
1916	0	0	14	0	14
1917	0	0	6	0	6
1918	0	0	7	0	7
1919	0	0	6	0	6
1920	0	9	5	0	14
1921	0	10	9	0	19
1922	0	4	9	0	13
1923	0	2	10	0	12
1924	0	15	64	0	79
1925	0	11	18	0	29
1926	7	10	18	0	35
1927	47	11	19	0	77
1928	49	8	16	0	73
1929	74	11	18	0	103
1930	52	5	22	0	79
1931	82	9	29	0	120
1932	122	10	27	0	159
1933	411	10	10	0	431
1934	217	10	13	0	240
1935	40	7	11	0	58
1936	43	20	9	0	72
1937	32	25	14	0	71
1938	44	21	7	0	72
1939	0	0	13	0	13
1940	0	0	19	0	19
1941	0	0	14	0	14
1942	0	0	8	0	8
1943	0	0	11	0	11
1944	0	0	16	0	16
1945	0	0	20	0	20
1946	0	12	10	0	22
1947	0	6	8	15	29
1948	0	11	14	0	25
1949	41	12	12	0	65
1950	24	9	6	0	39
1951	27	7	6	0	40
1952	40	2	6	0	48
1953	99	2	4	0	105
1954	116	1	7	0	124
1955	66	1	9	0	76
1956	161	1	6	0	168
1957	94	1	4	0	99
1958	163	2	6	0	171
1959	327	1	8	0	336
1960	80	1	9	0	90

Year	FRA	UK	IRL	OTH	TOT	Unalloc	WG est
1961	110	1	12	0	123		
1962	100	0	8	0	108		
1963	172	0	19	0	191		
1964	159	1	24	0	184		
1965	95	5	24	0	124		
1966	0	1	11	0	12		
1967	78	0	11	0	89		
1968	121	0	8	0	129		
1969	86	1	9	0	96		
1970	3	0	8	0	11		
1971	0	2	5	0	7		
1972	4	0	13	0	17		
1973	0	0	12	0	12		
1974	25	0	12	0	37		
1975	7	0	19	0	26		
1976	6	0	44	0	50		
1977	3	0	14	0	17		
1978	3	0	16	0	19		
1979	6	0	13	0	19		
1980	9	0	24	0	33		
1981	6	0	47	0	53		
1982	5	1	55	0	61		
1983	9	0	40	0	49		
1984	3	0	17	0	20		
1985	6	0	44	0	50		
1986	8	0	29	0	37		
1987	2	0	39	0	41		
1988	2	1	34	0	37		
1989	0	0	38	0	38		
1990	0	0	41	0	41		
1991	5	0	46	0	51		
1992	2	0	43	0	45		
1993	1	0	59	0	60	0	60
1994	1	0	60	0	61	9	70
1995	2	0	59	0	61	-2	59
1996	2	0	52	0	54	3	57
1997	3	1	51	0	55	0	55
1998	0	0	49	0	49	17	66
1999	0	0	68	0	68	4	72
2000	12	0	65	0	77	-9	68
2001	7	0	53	0	60	0	60
2002	14	0	50	0	64	-3	61
2003	19	0	50	0	69	-5	64
2004	18	0	49	0	67	2	69
2005	7	0	38	0	45	-1	44
2006	12	0	31	0	43	0	43
2007	7	0	34	0	41	1	42
2008	6	0	31	0	37	3	40
2009	5	0	46	0	51	0	51
2010	8	0	35	0	43	0	43
2011	5	0	22	0	27	-5	22

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

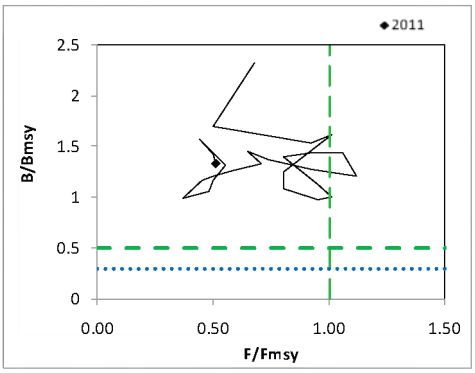
Advice for 2013 and 2014

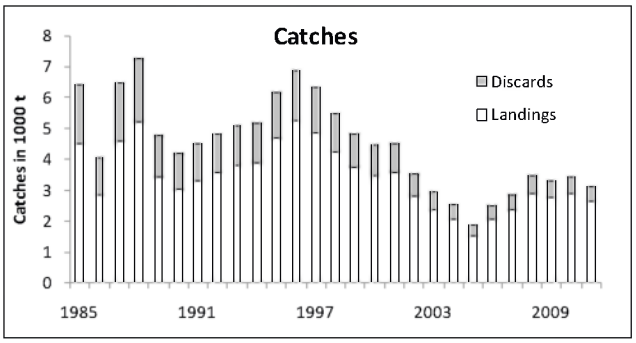
ICES advises on the basis of the MSY approach that landings in 2013 and 2014 should be no more than 4700 t.

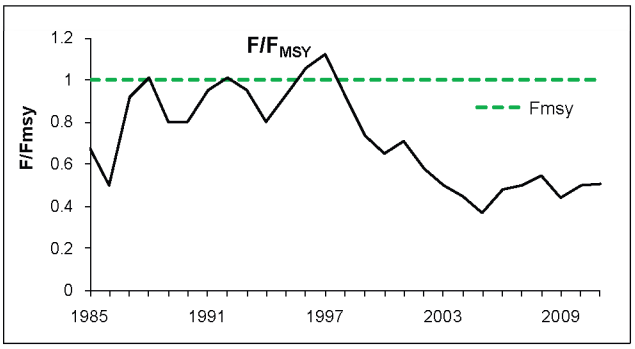
Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✓	✓	✓	Appropriate
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

Biomass	2010	2011	2012	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	✓	✓	✓	Full reproductive capacity







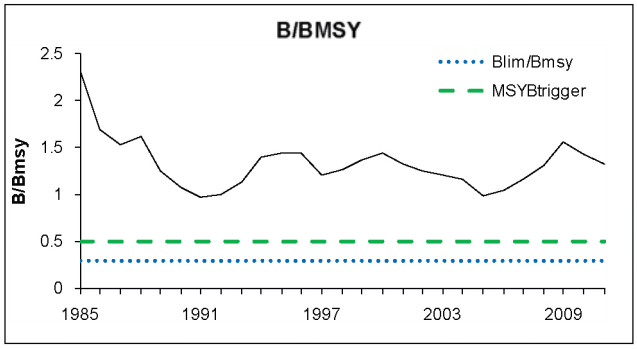


Figure 5.4.37.1 Megrim (*Lepidorhombus* spp.) in Divsions IVa and VIa. Summary of the stock assessment (weights in thousand tonnes). Top right: Biomass/F for the time-series used in the assessment.

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

Management plans

No specific management objectives are known to ICES.

Biology

There are two separate TAC areas for megrim, Subareas VI and IV, but 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 distribution	Total catch (2011) = 3100 t, where 85% were landings (97% OTB >100 mm and 3% OTB<100 m) and 15% discards.

Quality considerations

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

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

No Spanish landings data were available for 2011, which increases the uncertainty in the advice. To overcome this lack of data Spanish landings in 2011 were assumed to be the same as 2010. Historically, Spain is associated with 5–10% of the overall landings, but it is noted that this has been increasing in recent years.

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

Scientific basis

Assessment type	Bayesian state–space biomass dynamic model.
Input data	Landings and discards data, and survey cpue trends (SAMISS-Q2, IAMISS-Q2, Sco-IBTS-Q1, ScoIBTS-Q3, ScoWIBTS-Q1 until 2010, Sco-WIBTS-Q4, until 2010).
Discards and bycatch	Discards are included in the assessment.
Indicators	None.
Other information	This stock was benchmarked at WKFLAT (2011) and at IBP-MEG (2012).
Working group report	WGCSE

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

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	9 700 t	50% B_{MSY}
	F_{MSY}	0.29	Estimated directly from the model.
Precautionary Approach	B_{lim}	5 800 t	30% B_{MSY}
	B_{pa}	Not defined.	
	F_{lim}	Not defined.	
	F_{pa}	Not defined.	

(unchanged since 2012)

Outlook for 2013 and 2014

Basis: $F_{2012}/F_{MSY} = F_{2011}/F_{MSY} = 0.51$.

	Total catch option 2013 (tonnes)*			
Catch (2013)	4000	5000	5500	6000
Landings (2013)[1)]	3400	4250	4700	5100
Discards (2013)[1)]	600	750	800	900
Probability of $Biomass_{2014}$ falling below MSY $B_{trigger}$	1%	3%	4%	6%
Probability of $Biomass_{2014}$ falling below B_{lim}	0%	1%	1%	2%
Stock size (B_{2014}/B_{MSY})	1.41	1.25	1.21	1.16
Fishing mortality (F_{2013}/F_{MSY})	0.60	0.89	1.00	1.19

Weights in tonnes.
[1)] Assuming the 2011 landings:discards ratio of 0.85:0.15.
*Probabilities are based on bootstrap sampling.

MSY approach

Following the ICES MSY framework implies a fishing mortality at F_{MSY} = 0.29, resulting in landings of no more than 4700 t in 2013 and 2014. The probability of the SSB falling below MSY $B_{trigger}$ is less than 4%.

Additional considerations

Management considerations

There have been substantial reductions in effort associated with the Scottish and Irish fleets since 2002; these are considered to have contributed to the decline of landings in Subarea VI, which are well below the TAC. Official landings in Subarea IV and Division IIa in recent years are close to the TAC.

Fishing effort in Divisions VIa and IVa has declined substantially since 2000.

Area misreporting has been prevalent as megrim catches were misreported from Subarea VI into Subarea IV, due to restrictive quotas for anglerfish (i.e. vessels targeting anglerfish misreported all landings including megrim from Subarea VI into Subarea IV). However, in the most recent years there is evidence to suggest that this has reversed as the Subarea IV TAC has become more restrictive, increasing targeting of megrim in response to more restrictive fishing opportunities for other species, e.g. cod. The extent of this problem is unknown and should be quantified through integrated logbook and VMS analysis. Redistribution of landings between Divisions VIa and IVa has not be undertaken by ICES in recent years. Combining the stocks of Divisions VIa and IVa also has the advantage of eliminating the impact of area misreporting between the two areas.

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

Data and methods

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

Comparison with previous assessment and advice

Last year's assessment was based on trends of the same model used this year. This year, discards information is included in the model (ICES, 2012b) and a full analytical assessment is used as the basis for advice.

Assessment and management area

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

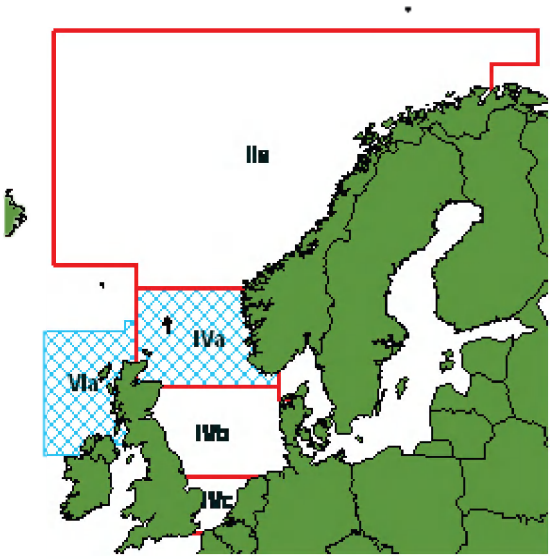


Figure 5.4.37.2 Megrim (*Lepidorhombus* spp.) in Divisions IVa and VIa. Management area (red boxes) and assessment area (blue hatched area).

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.

ICES. 2012a. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2011, Copenhagen, Denmark. ICES CM 2012/ACOM:12

ICES. 2012b. Report of the Inter Benchmark Protocol for Megrim in Subarea IV and Division IVa (IBPMeg), 2–6 April 2012. By correspondence. ICES CM 2012/ACOM:67. 23 pp.

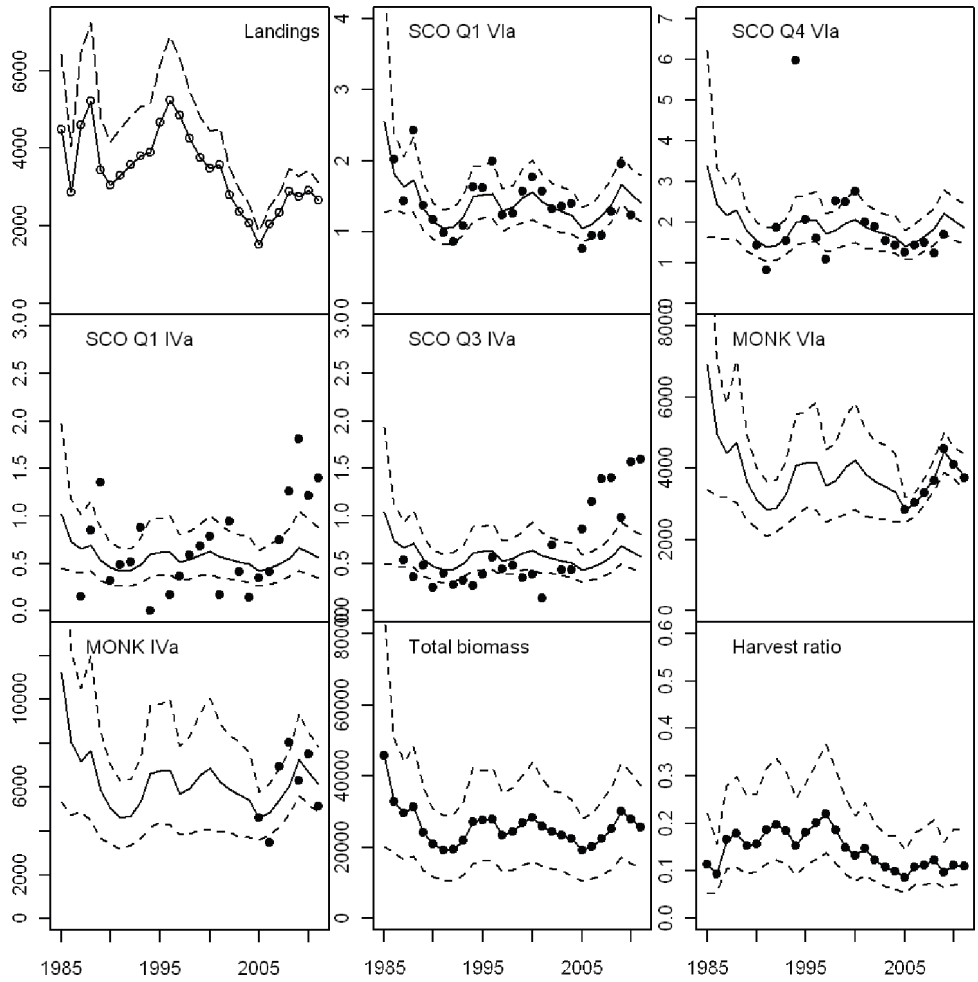


Figure 5.4.37.3 Megrim (*Lepidorhombus* spp.) in Divisions IVa and VIa. Landings in tonnes (upper left panel). Survey indices from six individual international bottom trawl (IBTS and WIBTS) and anglerfish surveys (dots) with modelled catch per unit effort estimates from surplus production assessment (black line) and 95% confidence intervals (dashed lines). SCO Q1 VIa and SCO Q4 VIa correspond to ScoWIBTS-Q1 and -Q4, respectively (units: kg/hour), SCO Q1 IVa and SCO Q3 IVa correspond to ScoIBTS-Q1 and -Q3, respectively (units: kg/hour), MONK VIa corresponds to the combined SAMISS-Q2 and IAMISS-Q2 in Division VIa (units: tonnes), and MONK IVa corresponds to SAMISS-Q2 (units: tonnes). Total biomass in tonnes.

Table 5.4.37.1 Megrim (*Lepidorhombus* spp.) in Divisions IVa and VIa. ICES advice, management, and landings.

Year	ICES Advice [1]	Predicted landings corresp. to advice	Agreed TAC 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	1.07	1.42
2012	No increase in catches	-				
2013	MSY framework	4.7				
2014	No new advice, same as last year	4.7				

Weights in thousand tonnes.

[1] Before 2011 advice was given for megrim in Divisions IVa, VIa, and VIb combined.

[2] Landings in Divisions IVa and VIa and unallocated landings from Subarea IV. Landings in Division Vb (EC) and Subareas XII and XIV are negligible.

Table 5.4.37.2 Megrim (*Lepidorhombus* spp.) Divisions IVa and VIa. Nominal catch (t) as officially reported to ICES by country, and ICES estimates of landings.

Division VIa

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France	398	455	504	517	408	618	462	192	172	0	135	252	79	92	50	48	53	104	92	134	270	139
Ireland	317	260	317	329	304	535	460	438	433	438	417	509	280	344	278	156	221	191	172	188	318	226
Netherlands	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	91	48	25	7	1	24	22	87	111	83	98	92	89	98	45	69	52	5	149	112	288	NA
UK - Eng+Wales+N.Irl.	25	167	392	298	327	322	156	123	65	42	20	7	14	13	17	10	0	8	6			
UK – Scotland	1093	1223	887	896	866	952	944	954	841	831	754	770	643	558	469	269	336	658	868	953		
UK																					822	705
Offical Total	1924	2154	2125	2047	1907	2451	2044	1795	1622	1394	1424	1630	1105	1105	859	552	662	966	1287	1387	1698	1070
Unallocated	286	278	424	674	786	1047	2010	1477	1083	1254	823	843	723	537	469	9	213	n/a	8	0	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	1387	1698	1070
Area-misreported landings	339	338	466	735	871	1126	2062	1556	1156	1066	868	829	731	544	421	n/a	212	478	250	0	0	0

Table 5.4.37.2 (cont.)

Division IVa

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	4	3	2	7	2	7	5	3	5	4	10	2	5	3	-	-	2	6	3	1.6		1.6
Denmark	2	1	4	6	1	2	7	5	18	21	29	52	8	11	7	1	6	11	31		22	25
France	-	-	36	25	27	24	14	16	14	.	7	5	6	11	9	3	4	18	21		5	6
Germany	.	6	3	4	1	2	1	2	4	1	3	1	-	2	2	4	7	16	5	4		5
Germany, Fed. Rep. of	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.				
Ireland	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	.				-
Netherlands	24	28	27	30	28	26	9	20	30	26	20	11	9	7	11	19	22	20	3	2	1	16
Norway	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	1	1	4		2	1
Spain	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.				
Sweden	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UK - Eng+Wales+N.Irl.	17	9	47	8	19	44	4	3	5	4	2	2	3	1	1	1	9	17				
UK - England & Wales	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6			1367
UK - N. Ireland	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.				
UK - Scotland	1126	1169	1372	1736	2000	2193	3221	3091	2628	2121	2044	1854	1675	1235	1130	958	1340	1436	1526			
UK																				1476	1469	
Official total	1176	1216	1491	1816	2078	2298	3261	3140	2704	2177	2115	1927	1706	1271	1160	986	1391	1525	1599	1484	1499	1421
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	1421
Area-misreported landings	339	338	466	735	871	1126	2062	1556	1156	1066	868	829	731	544	421	n/a	212	478	250	0	0	0

Table 5.4.37.3 Megrim (*Lepidorhombus* spp.) Divisions IVa and VIa. Summary of stock assessment (weights in tonnes).

Year	B/B_{MSY}	F/F_{MSY}	Biomass	Mean F	Landings	Catch	Discards
1985	2.32	0.68	45874	0.18	4499	6427	1928
1986	1.7	0.5	33916	0.13	2858	4049	1191
1987	1.53	0.92	30423	0.24	4614	6485	1871
1988	1.62	1.01	31987	0.26	5212	7266	2054
1989	1.25	0.8	24811	0.2	3451	4773	1322
1990	1.08	0.8	21298	0.2	3047	4181	1134
1991	0.98	0.95	19409	0.24	3310	4506	1196
1992	1	1.01	19848	0.26	3574	4827	1253
1993	1.13	0.95	22380	0.24	3802	5095	1293
1994	1.4	0.8	27534	0.2	3900	5187	1287
1995	1.44	0.93	28371	0.24	4670	6163	1493
1996	1.44	1.06	28452	0.27	5253	6881	1628
1997	1.21	1.12	24030	0.29	4856	6313	1457
1998	1.27	0.92	25039	0.24	4253	5488	1235
1999	1.37	0.74	27127	0.19	3759	4814	1055
2000	1.45	0.65	28578	0.17	3494	4442	948
2001	1.33	0.71	26232	0.18	3571	4507	936
2002	1.26	0.58	24815	0.15	2803	3512	709
2003	1.21	0.5	23721	0.13	2369	2947	578
2004	1.16	0.45	22715	0.11	2067	2553	486
2005	0.99	0.37	19504	0.09	1527	1873	346
2006	1.05	0.48	20633	0.12	2054	2501	447
2007	1.16	0.5	22860	0.13	2348	2839	491
2008	1.31	0.55	25721	0.14	2894	3475	581
2009	1.57	0.44	30757	0.11	2759	3291	532
2010	1.43	0.5	28208	0.13	2909	3446	537
2011	1.33	0.51	26071	0.13	2779	3269	490

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

Advice for 2013

Based on the ICES approach for data limited stocks, ICES advises that catches should be no more than 160 tonnes. This is the first year that ICES is providing quantitative advice for data limited stocks (see Quality considerations).

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

Stock status

F (Fishing Mortality)		
		2009-2011
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa},F_{lim})	?	Unknown
Qualitative evaluation	✓	Below poss. reference points

SSB (Spawning Stock Biomass)		
		2007-2011
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa},B_{lim})	?	Unknown
Qualitative evaluation	↘	Decreasing

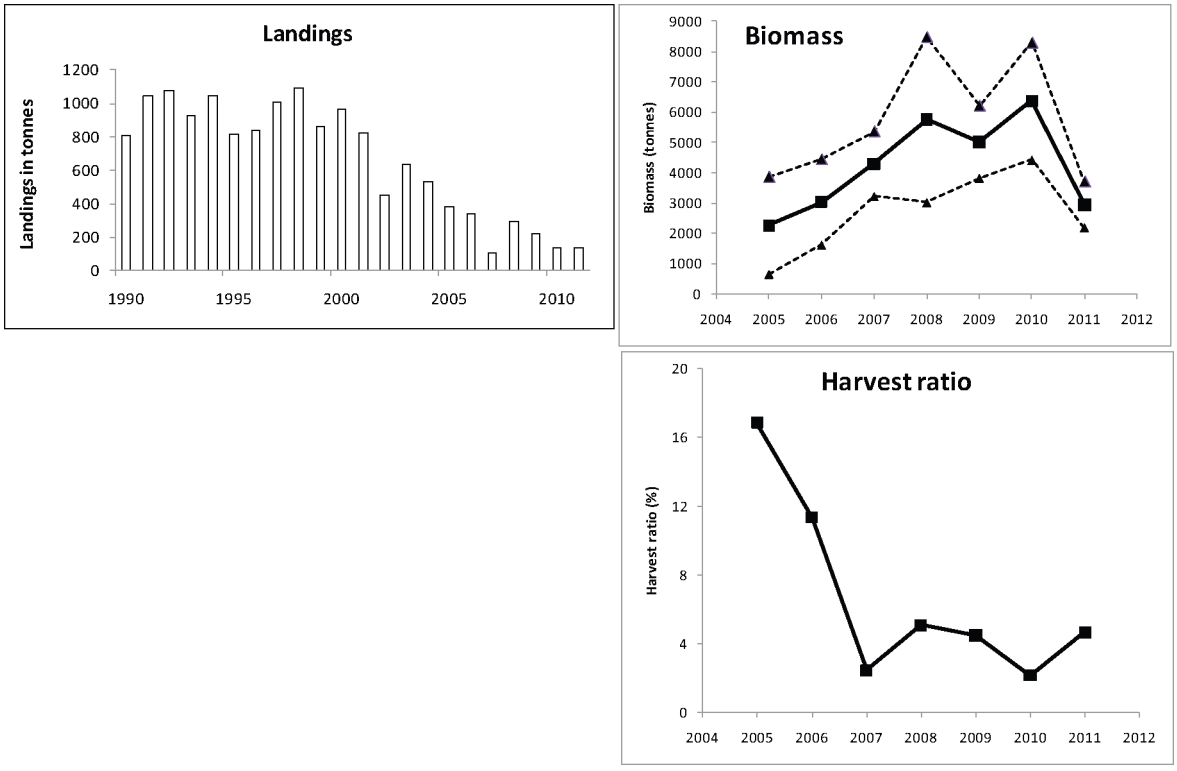


Figure 5.4.38.1 Megrim (*Lepidorhombus* spp) in Division VIb (Rockall). Landings (in tonnes) (left panel) and biomass from survey (SCO-IV-VI-AMISS-Q2) (in tonnes) (right upper panel) with 95% confidence intervals. Harvest ratio: landings/biomass (right lower panel).

There is no analytical assessment for this stock. Survey indices for Division VIb show an increase in biomass over the time series from 2005 to 2010, followed by a decline in 2011. The average of the stock size indicator, biomass from the survey, in the last two years (2010–2011) is 7% lower than the average of the three previous years (2007–2009). The harvest ratio has been on a low and stable level since 2007.

Management plans

No specific management objectives are known to ICES.

Biology

There are two separate TAC areas for megrim, VI and IV, but there is little evidence to suggest that the megrim in Subarea IV and VIa are separate stocks. ICES (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 fisheries

Megrim is predominantly caught using otter trawls.

Catch distribution	Total landings 138 t, where 100 % landings associated with OTB >100mm. Discard data not available.

Quality considerations

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

The advice is based on survey cpue (SCO-IV-VI-AMISS-Q2), used as an indicator of stock size. The decline at the end of the time series is not in agreement with the signal from the commercial lpue. Estimated landings in 2011 were only 138 t and the commercial lpue has shown an increase in recent years.

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

Scientific basis

Assessment type	Survey trends based assessment.
Input data	Landings data, survey cpue trends (SCO-IV-VI-AMISS-Q2).
Discards and bycatch	Not included in the assessment.
Indicators	Commercial lpue indicex (IRE TR1).
Other information	Benchmarked at WKFLAT (2011).
Working group report	WGCSE

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

Reference points

No reference points have been defined for this stock.

Outlook for 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.

ICES approach to data limited stocks

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

For this stock the biomass is estimated to have decreased by 7% between 2007–2009 (average of the three years) and 2010–2011 (average of the two years). This implies a decrease of catches of 7% in relation to the last three years average landings, corresponding to catches of no more than 160 tonnes. Considering that the harvest ratio is very low, no additional precautionary reduction is needed.

Additional considerations

The survey biomass indicator for Rockall megrim was computed assuming a survey catchability of 0.3. There is some uncertainty concerning this catchability value, but it is believed to be in the range 0.2-0.3. This implies a biomass of megrim in Division VIb (Rockall) in excess of 4000 tonnes. Current landings are in the order of < 200 tonnes implying a harvest ratio of < 5%.

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

Commercial lpue are shows an increase in recent years (Figure 5.4.38.3).

Management considerations

There have been substantial reductions in effort associated with the Scottish and Irish fleets since 2002 and this is considered to have contributed to the decline of landings in Subarea VI. Landings in 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 20 cm.

No information is available on changes in the French and Spanish fleets operating in this area.

Data and methods

The information for megrim is being developed, with improvements to both industry-related data and surveys.

There is currently seven years of survey data, which is now considered sufficient to provide advice on stock trends.

Comparison with previous assessment and advice

The basis for last year advice was precautionary considerations. This year the advice is based on the ICES approach to data limited 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.

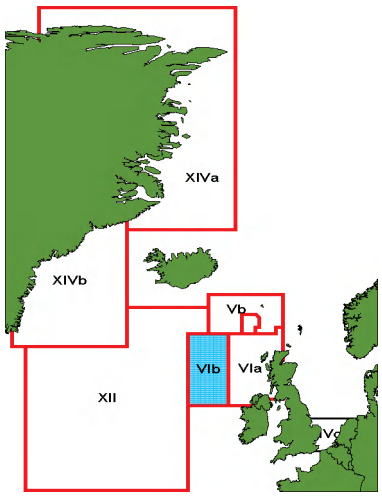


Figure 5.4.38.2 Megrim (*Lepidorhombus* spp) in DivisionVIb Megrim management area (red boxes) and assessment area (blue hatched area).

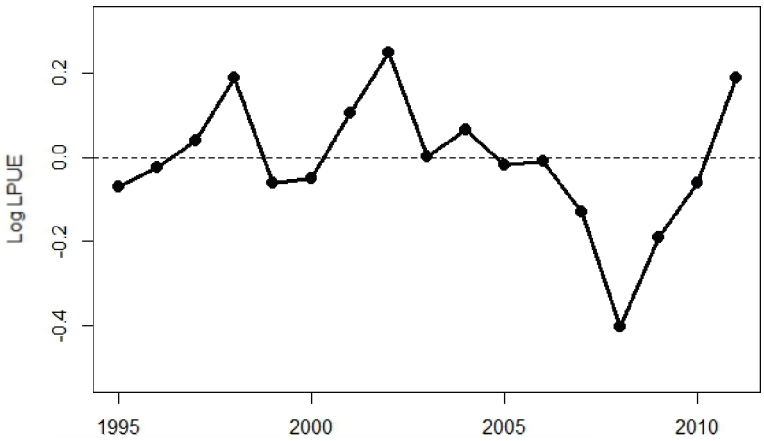


Figure 5.4.38.3 Megrim (*Lepidorhombus* spp) in DivisionVIb. Lpues for Irish otter trawl vessels (values in logarithmic scale).

Sources

ICES. 2012. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

Table 5.4.38.1 Megrim (*Lepidorhombus* spp) in Division 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	0.138
2012	No increase in catches	-	3.387	
2013	Catch decrease by 7%	<0.16		

Weights in '000 t.

[1)] Before 2011 advice was given for Megrim in Division IVa, VIa and VIb combined.

Table 5.4.38.2 Megrim (*Lepidorhombus* spp) in DivisionVIb. Nominal catch per country (in tonnes) as officially reported to ICES.

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
France	-	-	-	-	-	-	-	-	-	.	4	<0.5	<0.5	-	-	-	-	-				
Ireland	196	240	139	128	176	117	124	141	218	127	167	176	87	83	43	68	95	87	68	48	47	72
Spain	363	587	683	594	574	520	515	628	549	404	427	370	120	93	71	88	59	19	84	0	0	
UK - Eng+Wales+N.Irl.	19	14	53	56	38	27	92	76	116	57	57	42	41	74	42	19	9	.				
UK - England & Wales	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		.	.	1			
UK - Scotland	226	204	198	147	258	152	112	164	208	278	309	236	207	382	372	207	181	.	141	178		
UK																					92	66
Official Total	804	1045	1073	925	1046	816	843	1009	1091	866	964	824	455	632	528	382	344	106	294	226	139	138

Table 5.4.38.3 Megrim (*Lepidorhombus whiffiagonis*) in DivisionVIb. Biomass from the SCO-IV-VI-AMISS-Q2 survey(in tonnes).

Biomass	95% confidence intervals	
	Low	Upper
2263	657	3870
3033	1617	4447
4297	3227	5367
5760	3027	8490
5023	3830	6217
6370	4433	8310
2950	2193	3707

ECOREGION Celtic Sea and West of Scotland
STOCK Pollack in Subareas VI and VII (Celtic Sea and West of Scotland)

Advice for 2013 and 2014

Based on the ICES approach for data limited stocks, ICES advises that catches should be no more than 4200 tonnes.

This is the first year that ICES is providing quantitative advice for data limited stocks (see Quality considerations).

Stock status

F (Fishing Mortality)		
		2009–2011
Qualitative evaluation	?	Insufficient information

SSB (Spawning-Stock Biomass)		
		2009–2011
Qualitative evaluation	?	Insufficient information

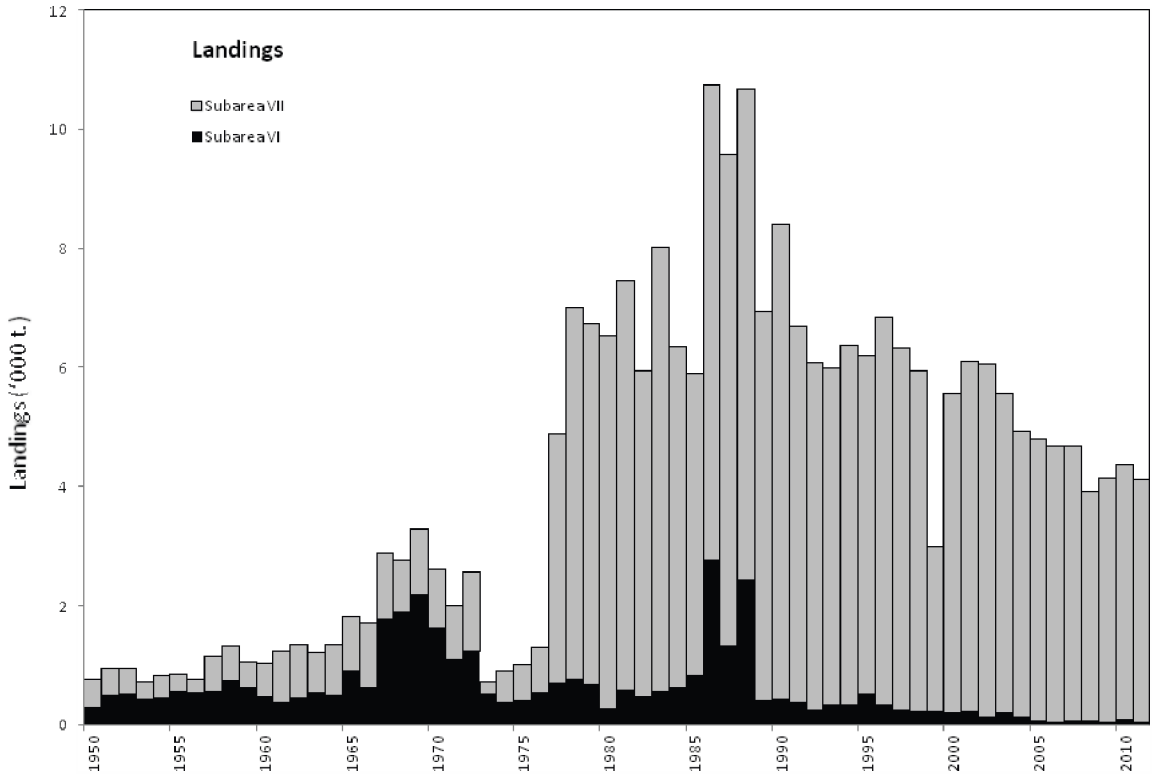


Figure 5.4.39.1 Pollack in Subareas VI and VII. Official landings (tonnes).

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 (*Pollachius pollachius*) is a benthopelagic species, 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 fairly rapid, approaching 10 cm per year. Pollack in the 0-group are found in shallow coastal waters, and move to deeper waters as they grow. Maturity occurs at approximately 3 years and spawning occurs mainly in the first half of the year, with the exact timing varying along the latitudes.

The fisheries

French and Irish data indicate that most pollack in the Celtic Sea ecoregion is caught by trawls and gillnets. Other gears such as lines, seine nets and beam trawls contribute to a lesser extent. In 2010, 98% of the landings originated from Subarea VII, and Ireland, UK and France together comprised 99% of the official landings. There are indications of high catches by recreational fisheries on a local scale but these have not been reported.

Landings in 2011 were 4.12 kt (99% in subarea VII).

Quality considerations

ICES analyzed data for pollack in the Celtic Sea and West of Scotland for the first time in 2011. There is insufficient information to evaluate the status of pollack in this area.

Pollack has a preference for wrecks and rocky bottom habitat, making it difficult to catch with trawls and therefore poorly suited for monitoring by research surveys. Some length frequency data are available for recent years, but area specific data on life history parameters are missing and should be collected in surveys and through market sampling. Data on growth and maturity, as well as more information from the fisheries, are needed. Landings figures are incomplete and erratic and further scrutiny of this information is required.

The advice is based on estimates of the Depletion-Corrected Average Catch (DCAC) method which uses historical catch data and estimates of stock depletion over the catch time series to estimate sustainable yields. The methods applied to derive quantitative advice for data limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	DCAC (Depletion-Corrected Average Catch)
Input data	Catch statistics
Discards and bycatch	Not included in the assessment
Indicators	None
Other information	None.
Working group report	WGNEW, 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 2013 and 2014

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.

ICES approach to data limited stocks

For data limited stocks with an approximate natural mortality rate of < 0.2 and only catch or landings data available, ICES considers the Depletion-Corrected Average Catch (MacCall, 2009), an extension of the potential-yield formula, as a method for estimating sustainable yield for data-poor fisheries.

For these subareas VI and VII, historic catch statistics from 1986 to 2011 were used. The recent catch (last three year average) in VI is less than average DCAC suggested catch. For this area a step increase of 10% is applied to the recent catch. In area VII the recent catch was very similar to the average DCAC suggested catch. This corresponds to catches of no more than 4200 tonnes for subareas VI and VII, which is roughly 1% more than recent catch.

Additional considerations

Regulations and their effects

In Subarea VI, there is evidence of very low effort targeting this species due to restrictive regulations for inshore fisheries.

Stock identity

In the absence of specific information on stock structure, the ICES ecoregions are chosen as a minimum level of disaggregation for the definition of stock units. This is an interim solution until more information is available on stock units.

Uncertainty in the assessment

The ICES official landings statistics displays erratic time series per country. For example in the period 1967–1972, Sweden is declaring substantial landings; whereas it is Spain during the period 1981–1988 (see Tables 5.4.39.2–3). France, a major contributor to the landings, starts declaring in 1977 and has no declarations in 1999. From 1977 onwards, there is 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 5.4.39.1). Nevertheless, the Celtic Sea (i.e. Divisions VIIf-k) and the Western Channel (i.e. Division VIIe) compose the majority of the landings (Figure 5.4.39.2). Landings in Subarea VI have always been low and are now close to zero.

Pollack is a target for recreational fisheries, especially angling and spearfishing from shore and from boat, and recreational landings are not included in the data analysis. A survey conducted by France in 2006–2008 estimated annual recreational catches of pollack to be 3500 t +/-2500 t, the majority of which originates from the English Channel (ICES, 2010b). Catches by recreational fisheries should be monitored by all nations involved in this fishery and this historical evolution through time should also be investigated.

Management considerations

Although the overall TAC is not limiting, in some countries quotas are limiting.

Comparison with previous assessment and advice

The DCAC model, which is specifically developed to estimate a likely sustainable yield in data limited situation (MacCall, 2009), was used for this stock this year. The model was run with a range of input parameters tailored for this stock and proved to be reasonably insensitive to these (shown in Figure 5.4.39.2). The outputs were in line with what is known from the species in the area.

Data requirements

More information is needed on

- stock identity of pollack within the ICES area
- details of the fisheries (more spatial detail in landings data – especially for the earlier years in the time series, landings by gear, length compositions, discards)life history/biological parameters (surveys and commercial sampling)
- recreational fisheries (catch and effort statistics)

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.

ICES. 2010b. Report of the Planning Group on Recreational Fisheries (PGRFS), 7–11 June 2010, Bergen Norway. ICES CM 2010/ACOM:34. 168 pp.

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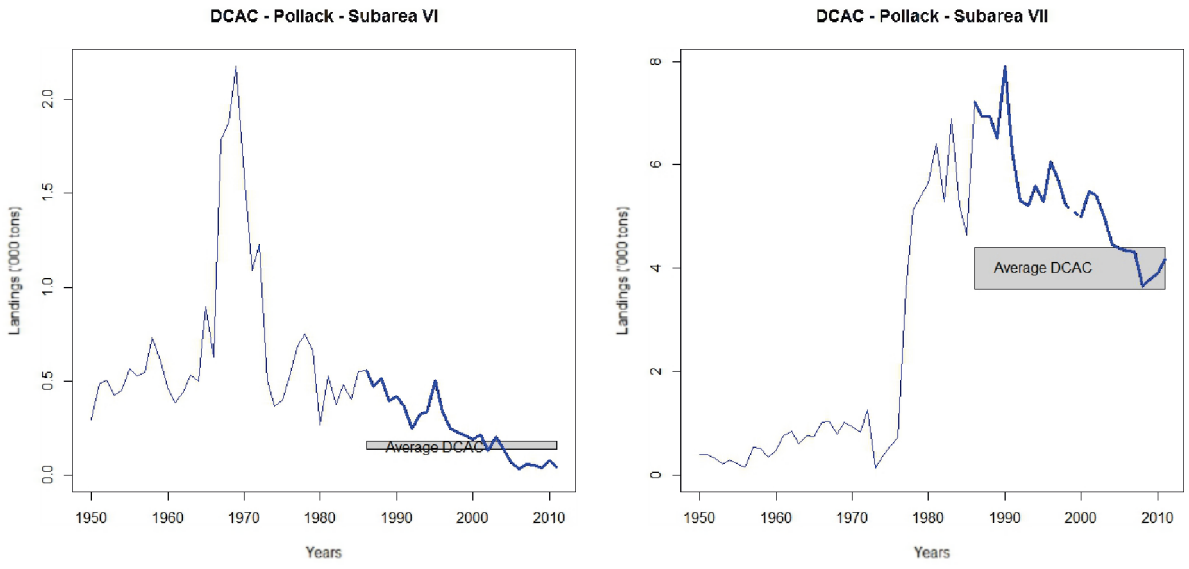

Figure 5.4.39.2 Pollack in Subareas VI and VII. Time series of landings and outputs from the DCAC analysis. The thick lines and grey box corresponds to the period used for the analysis and the sensitivity of the input parameters to the model.

Table 5.4.39.1 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	Total Official landings Subarea VII	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	45	4072	4117
2012	No increase in catch	-	397	13495			
2013	Catch should be no more than 1% more than recent catch (last 3 years)	<4200					
2014	Same as 2013 catch advice	<4200					

Weights in tonnes.
[1)] VI; EC waters of Vb; international waters of XII and XIV.

Table 5.4.39.2 Pollack in Subareas VI and VII. Official 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	-	-	-	<0.5	-	203	247
1993	-	-	39	-	12	-	-	-	-	-	273	324
1994	-	-	34	<0.5	26	-	<0.5	-	-	-	276	336
1995	-	-	64	3	83	-	-	-	-	-	354	504
1996	-	<0.5	29	<0.5	97	-	1	-	-	-	210	337
1997	-	-	14	1	69	-	2	-	-	-	162	248
1998	-	-	21	-	60	-	-	<0.5	<0.5	-	147	228
1999	-	-	-	-	73	-	3	-	<0.5	-	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	-	<0.5	-	4	-	5	37
2007	-	-	10	-	21	-	6	-	-	-	21	58
2008	-	-	8	-	21	-	1	-	-	-	23	53
2009	-	-	7	-	5	-	<0.5	-	-	-	25	37
2010	-	-	6	-	34	-	<0.5	-	-	-	38	78
2011	-	-	3	-	8	-	-	-	-	-	34	45

Table 5.4.39.3 Pollack in Subareas VI and VII. Official 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	1513	4643
2007	91	-	1970	-	782	3	-	1	1764	4611
2008	76	-	1579	-	738	1	-	14	1453	3861
2009	42	-	1670	-	828	4	-	3	1545	4092
2010	35	-	1846	-	942	2	-	3	1459	4284
2011	28	-	1415	-	912	1	-	-	1716	4072

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

Advice for 2013 and 2014

ICES advises on the ICES approach to data-limited stocks, implying that catches in 2013 should be reduced by 20% in relation to the average catch of the last three years. Because the data for catches of grey gurnard are considered highly unreliable, ICES is not in a position to quantify the result.

This is the first year ICES is providing quantitative advice for data-limited stocks (see Quality considerations).

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

Stock status

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	? Insufficient information

SSB (Spawning-Stock Biomass)	
	2009–2011
Qualitative evaluation	? Insufficient information

The available information is inadequate to evaluate overall biomass or abundance trends. Landings data are not presented for this species because gurnard catches were often reported in one generic category of "gurnards" until 2010. In addition, landings data are considered only marginally informative because catches are mainly discarded.

Management plans

No specific management objectives are known to ICES. There is no TAC for this species.

Biology

Grey gurnard, *Eutrigla gurnardus*, occurs throughout the Northeast Atlantic, with the main population residing in the North Sea. It is an abundant demersal species forming dense semi-pelagic aggregations in winter; in summer the species is more widely distributed. Spawning takes place in spring and summer. Nursery areas do not appear to be well defined. Grey gurnard has a large span of ages up to group 14 at around 40 cm, and above 19–20 cm all individuals can be considered mature.

The fisheries

Currently, grey gurnard is a bycatch species in demersal fisheries, mainly by trawlers. Catches are largely discarded.

Catch distribution	Official landings (2011) = 82 t (21% in Subarea VI and 79% in Subarea VII). Discards are unknown.

Quality considerations

Because the species is largely discarded, landings data do not reflect the actual catches. Given the high level of discarding, only the EU Data Collection Framework (DCF) programme's observations at sea can provide an accurate estimate of catches.

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

The advice is based on a precautionary reduction of catches because of missing or non-representative data. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	No assessment.
Input data	None.
Discards and bycatch	No information on discards is used.
Indicators	EVHOE-WIBTS-Q4.
Other information	The first year ICES advised on grey gurnard was 2011, and in 2012 the advice was split by ecoregion.
Working group report	WGNEW, WGCSE

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

Reference points

No reference points have been defined for this stock.

Outlook for 2013 and 2014

No reliable assessment can be presented for grey gurnard in Subarea VI and Divisions VIIa–c and e–k; therefore, no catch projections are available.

ICES approach to data-limited stocks

For data-limited stocks without information on abundance or exploitation ICES considers that a precautionary reduction of catches should be implemented, unless there is ancillary information clearly indicating that the current exploitation is appropriate for the stock.

For this stock, the ICES approach to data-limited stocks implies that catches should decrease by 20% in relation to the average catch of the last three years. Because the data for catches of grey gurnard are considered highly unreliable, ICES is not in a position to quantify the result.

Additional considerations

Management considerations

Surveys in the area collect data for gurnards, but mainly due to the minor commercial interest, data processing is concentrated on other stocks. At the moment information is available from only part of the area (Figure 5.4.40.1) and this is not considered representative for the whole area. In order to assess this species using indicators from the surveys, these will have to be developed and quality assured.

Management of all species in the demersal assemblage is best achieved in a multispecies and mixed-fisheries context. Until this is implemented, ICES will give catch advice for individual species. The ICES ecosystem advice development may influence the form of advice in future.

Stock identity

In the absence of specific information on stock structure, the ICES ecoregions are chosen as the minimum level of disaggregation for the definition of stock units. This is an interim solution until more information is available on stock units.

Data requirements

Before 2010, gurnards were often landed in one generic category of "gurnards". Catch statistics are incomplete for several years: some countries reporting no landings at all, other countries reporting exceptionally high landings. Appropriate data on catch and landings are needed, and they cannot be obtained retrospectively.

The two priority sources of information for this species are (i) the sampling information from on-board sampling programmes and (b) the demersal surveys. This is of primary priority since this species is known to be heavily discarded and captured in abundance by the surveys. Information from Russian surveys (2003, 2005, 2010) are also available and should be taken into account in further analysis.

Comparison with previous assessment and advice

In 2011, the advice for grey gurnard was based on the precautionary approach and was given for the Northeast Atlantic as a whole. This year, the advice is based on the ICES approach to data-limited stocks and this biennial advice is given for three separate ecoregions: Bay of Biscay and Atlantic Iberian waters, North Sea, and Celtic seas.

Sources

ICES. 2010. Report of the Working Group on Assessment of New MoU Species (WGNEW), 11–15 October 2010, ICES Headquarters, Denmark. ICES CM 2010/ACOM:21. 185 pp.

ICES. 2012a. Report of the Working Group on Assessment of New MoU Species (WGNEW), 5–9 March 2012, ICES Headquarters, Denmark. ICES CM 2012/ACOM:20.

ICES. 2012b. Report of the Working Group on Celtic Seas Ecosystems (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.

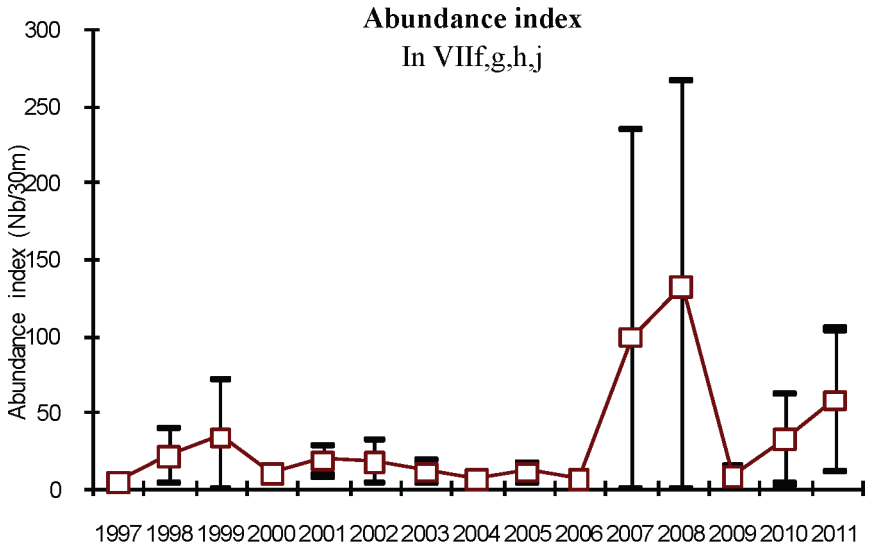

Figure 5.4.40.1 Grey gurnard in Subarea VI and Divisions VIIa–c and e–k. Abundance indicator (number per 30 minutes for all length classes combined), based on EVHOE-WIBTS-Q4 in Divisions VIIf,g,h,j.

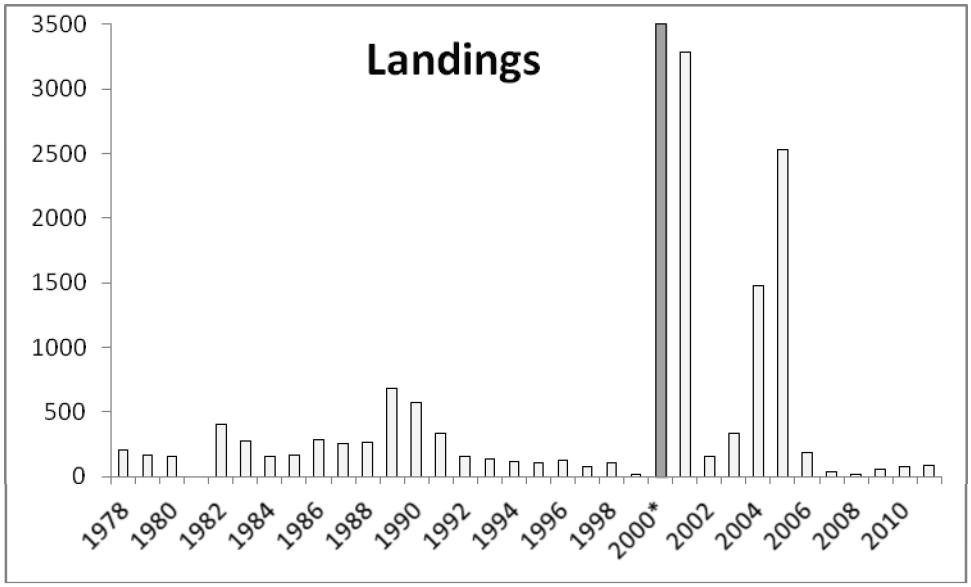

Figure 5.4.40.2 Grey gurnard in Subarea VI and Divisions VIIa–c and e–k. Total international landings (in tonnes) of gurnards from the Subarea VI and Divisions VIIa–c and e–k. Part of the landings probably consisted of grey gurnard. In the year 2000, Russia reported 26 000 t catches, which are not included in this plot.

Table 5.4.40.1 Grey gurnard in Subarea VI and Divisions VIIa–c and e–k. ICES advice and official landings.

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

Weights in thousand tonnes.
[1)] Preliminary.

Table 5.4.40.2 **Grey gurnard in** Subarea VI and Divisions VIIa–c and e–k. Official landings of grey gurnards per subarea (in tonnes). Between 1950 and 1977, no countries reported landings. These data are considered unreliable and should not be used for management purposes.

Year	Belgium	France	Ireland	Netherlands	RussianFed.	UK	Total
1978	0	206	0	0	0	0	206
1979	0	165	0	0	0	0	165
1980	0	155	0	0	0	0	155
1981	0	0	0	0	0	0	0
1982	0	407	0	0	0	0	407
1983	0	271	0	0	0	0	271
1984	0	157	0	0	0	2	159
1985	35	130	0	0	0	2	167
1986	0	280	0	0	0	0	280
1987	37	216	0	0	0	0	253
1988	30	211	0	0	0	21	262
1989	34	646	0	0	0	0	680
1990	18	538	16	0	0	0	572
1991	17	298	15	0	0	4	334
1992	13	123	17	0	0	0	153
1993	11	113	10	0	0	1	135
1994	11	107	0	0	0	2	120
1995	7	101	0	0	0	0	108
1996	6	117	0	0	0	2	125
1997	8	61	0	0	0	2	71
1998	13	59	38	0	0	0	110
1999	11	0	0	0	0	0	11
2000	13	109	0	7	26081	0	26210
2001	3	116	0	0	3155	13	3287
2002	7	81	0	0	60	11	159
2003	3	66	0	1	263	0	333
2004	5	61	0	7	1401	0	1474
2005	9	59	0	8	2456	0	2532
2006	4	28	0	10	138	6	186
2007	4	24	0	1	0	4	33
2008	7	1	0	3	0	1	12
2009	11	33	0	1	0	8	53
2010	14	45	0	5	0	12	76
2011[1)]	17	42	0	3	1	19	82

[1)] Preliminary.

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

Advice for 2013 and 2014

Based on the ICES approach to data-limited stocks, ICES advises that current catches could be increased by a maximum of 20%. Because the data for catches of lesser-spotted dogfish are not fully documented, ICES is not in a position to quantify the result.. ICES does not advise that an individual TAC be set for this stock, at present.

This is the first year ICES is providing quantitative advice for data-limited stocks (see Quality considerations).

Stock status

F (Fishing Mortality)	2009–2011	
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa},F_{lim})	?	Unknown
Qualitative evaluation	↘	Decreasing

SSB (Spawning-Stock Biomass)	2005–2011	
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa},B_{lim})	?	Unknown
Qualitative evaluation	↗	Increasing

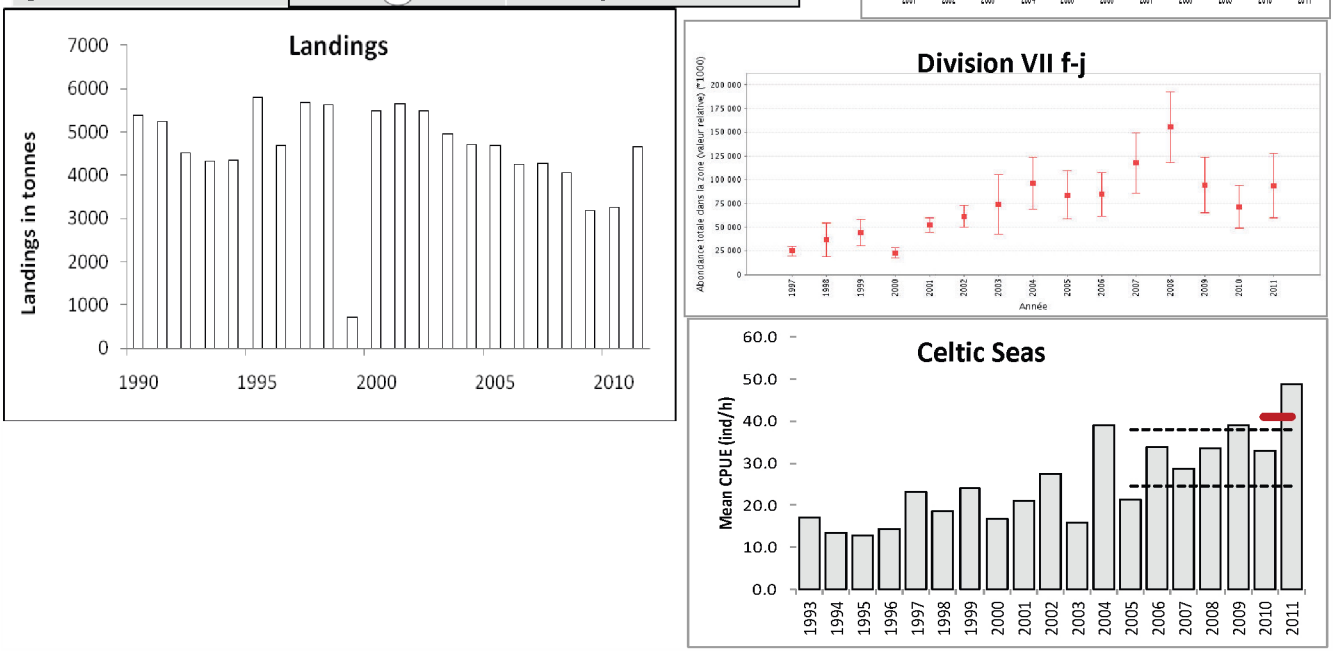

Figure 5.4.41.1 Lesser-spotted dogfish (*Scyliorhinus canicula*) in Subarea VI and Divisions VIIa–c, e–j. Left: Reported landings of lesser-spotted dogfish in Subareas VI and VII. Right: Abundance indices from surveys in: (top) SpPGFS-WIBTS-Q4 (numbers per haul; boxes mark parametric standard error of the stratified biomass index; lines mark bootstrap confidence intervals (a = 0.80, bootstrap iterations = 1000)); (middle) EVHOE-WIBTS-Q4 in Divisions VIIf–j (relative abundance in numbers); (below) UK (E&W) BTS in Divisions VIIa–f (mean catch per unit effort; dashed lines = mean annual cpue for 2005–2009, red line = mean annual cpue for 2010–2011).

Species-specific landings of lesser-spotted dogfish are stable or decreasing. The average of the UK E&W Beam trawl survey (BTS), considered a stock size indicator, in the last two years (2010-2011) is 31% higher than the average of the five previous years (2005-2009). Information from other surveys (i.e. SpPGFS-WIBTS-Q4 and EVHOE-WIBTS-Q4)

also confirms the increased trend in abundance. Given increased abundance and reduced catches, it can be inferred that exploitation rate (fishing mortality) has declined.

Management plans

There are no known management objectives for this stock.

Biology

Lesser-spotted dogfish is a small, productive, oviparous shark. It is one of the most common small sharks in this ecoregion. It has a high discard survival rate.

The fisheries

Lesser-spotted dogfish are mainly bycaught in mixed demersal fisheries. They are generally of low-commercial value and discard rates are high. Discard survivorship is not quantified. Fisheries for lesser-spotted dogfish may take place for use as bait in pot fisheries, but this is not quantified.

Effects of the fisheries on the ecosystem

Some demersal sharks, including lesser-spotted dogfish, may benefit from scavenging on trawl-damaged organisms and discards.

Quality considerations

Landings are not considered to be reliable as this species can be landed using generic categories such as "dogfish and hounds". High levels of discarding take place. As there is no TAC for lesser-spotted dogfish, there is no obligation to report these at species level.

Fishery-independent trawl surveys provide the longest time-series of species-specific information.

The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Assessment type	Survey- and landings-based trends.
Input data	Surveys: SpPGFS-WIBTS-Q4, EVHOE-WIBTS-Q4, and UK (E&W) VIIaf BTS.
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	None.
Other information	Life history.
Working group report	WGEF

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

Reference points

No reference points have been defined for this stock.

Outlook for 2013 and 2014

No reliable quantitative assessment can be presented for this stock. Therefore, no catch projections are available.

ICES approach to data-limited stocks

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

For this stock the abundance is estimated to have increased by more than 20% between 2005 and 2009 (average of the five years) and 2010–2011 (average of the two years) in the UK E&W BTS VIIaf survey. This implies that catch could increase by a maximum 20% in relation to the last three years average catch. Because the data for catches of lesser-spotted dogfish are not fully documented, ICES is not in a position to quantify the result. French and Spanish surveys show an increase, although this follows a decline after a very large abundance estimate in 2007 and 2008.

Because current exploitation levels are not thought to be detrimental to these stocks and there is a consistent increase in abundance over an extended period of time, no additional precautionary buffer is needed.

ICES does not advise that an individual TAC be set for this stock, at present.

Additional considerations

Comparison with previous assessment and advice

The advice is based on Category 3 of ICES approach to data-limited stocks. The previous advice was based on ICES precautionary considerations.

Source

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

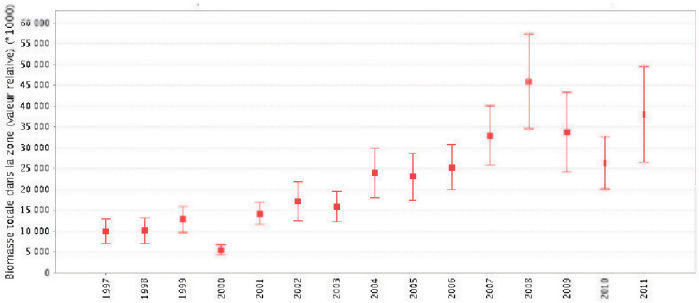

Figure 5.4.41.2 Lesser-spotted dogfish in the Celtic seas. Temporal trends in relative biomass in the French Divisions VIIf–j EVHOE-WIBTS-Q4 survey.

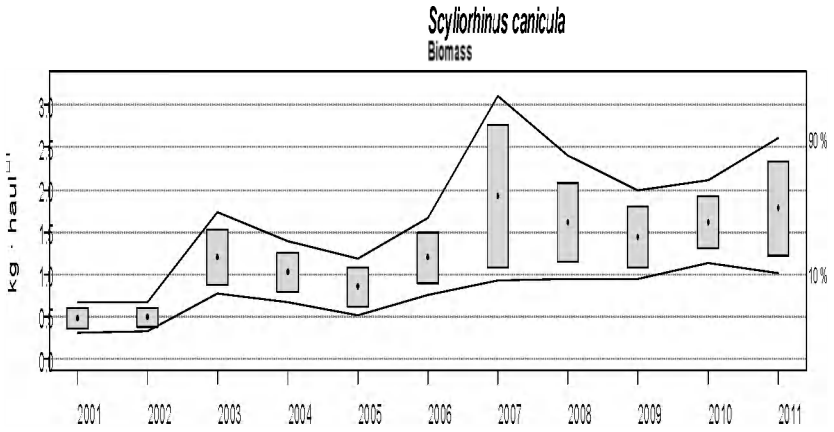

Figure 5.4.41.3 Lesser-spotted dogfish in the Celtic seas. Trends in biomass index ($kg \cdot haul^{-1}$) during the Porcupine survey time-series (2001–2011) (SpPGFS-WIBTS-Q4). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (a = 0.80, bootstrap iterations = 1000).

Table 5.4.41.1 Lesser-spotted dogfish in the Celtic seas. ICES advice, management, and landings.

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

Weights in thousand tonnes.

Table 5.4.41.2 Lesser-spotted dogfish in the Celtic seas. Official species-specific landings by country (tonnes).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Belgium								214	165	130	194
France	5395	5255	4509	4332	4353	4309	4182	4591	4568	46	4808
Ireland	.	.	.	.	.	1487	465	796	886	470	407
Netherlands											
Spain	.	.	.	.	.	.	51	73	22	67	77
UK (E&W)	.	.	.	.	.	.	.	.	.	.	11
UK (Scotland)	.	.	.	.	.	.	.	.	.	.	.
Total	5395	5255	4509	4332	4353	5796	4698	5674	5641	713	5497

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	166	202	189	226	245	220	200	164	171	166	228
France	4922	4697	4361	4314	3937	3815	3881	3360	2456	2489	3850
Ireland	518	506	285	124	85.12	40	130	257	211	321	315
Netherlands									7	1	4
Spain	46	50	20	21	41	13	17	6	1	25	4
UK (E&W)	.	.	88		325	126	11	269	329	238	259
UK (Scotland)	.	37	8	33	55	42	40	6	15	12	9
Total	5652	5492	4951	4718	4688	4256	4279	4062	3190	3252	4669

Table 5.4.41.3 Lesser-spotted dogfish in the Celtic seas. Mean annual CPUE of the UK(E&W) Beam trawl surveys (BTS).

Year	cpue in Divisions VIIa–**f**, from BTS (UK (E&W) (ind hour^{-1})
1993	16.9
1994	13.4
1995	12.8
1996	14.4
1997	23.3
1998	18.7
1999	24.1
2000	16.9
2001	21.2
2002	27.5
2003	16.0
2004	38.9
2005	21.3
2006	33.9
2007	28.6
2008	33.5
2009	38.9
2010	32.8
2011	49.0

ECOREGION Celtic Sea and west of Scotland
STOCK Rays and skates in the Celtic Seas Ecoregion

Introduction

There are about 25 species of demersal elasmobranchs in the Celtic Sea ecoregion. This advice sheet addresses the main skates and rays (Rajidae).

Section	Stock
5.4.42.1	Blonde ray (*Raja brachyura*) in Subarea VI (West of Scotland)
5.4.42.2	Blonde ray (*Raja brachyura*) in Divisions VIIa, f, g (Irish and Celtic Sea)
5.4.42.3	Blonde ray (*Raja brachyura*) in Division VIIe (Western English Channel)
5.4.42.4	Thornback ray (*Raja clavata*) in Subarea VI (West of Scotland)
5.4.42.5	Thornback ray (*Raja clavata*) in Divisions VIIa, f, g (Irish and Celtic Sea)
5.4.42.6	Thornback ray (*Raja clavata*) in Division VIIe (Western English Channel)
5.4.42.7	Small-eyed ray (*Raja microocellata*) in Divisions VIIf, g (Celtic Sea)
5.4.42.8	Small-eyed ray (*Raja microocellata*) in Division VIIe (Western English Channel)
5.4.42.9	Spotted ray (*Raja montagui*) in Subarea VI (West of Scotland)
5.4.42.10	Spotted ray (*Raja montagui*) in Divisions VIIa, f, g (Irish and Celtic Sea)
5.4.42.11	Undulate ray (*Raja undulata*) in Division VIIj (Great Sole Bank)
5.4.42.12	Sandy ray (*Leucoraja circularis*) in the Celtic Sea ecoregion
5.4.42.13	Shagreen ray (*Leucoraja fullonica*) in the Celtic Sea ecoregion
5.4.42.14	Cuckoo ray (*Leucoraja naevus*) in the Celtic Sea ecoregion
5.4.42.15	Common skate, *Dipturus batis* complex (flapper skate (*Dipturus* cf. *flossada*) and blue skate (*Dipturus* cf. *intermedia*)) in the Celtic Sea ecoregion
5.4.42.16	Other ray and skate species in the Celtic Sea ecoregion

Fisheries on skates are currently managed under a common TAC, although this complex comprises species that may have different vulnerabilities to exploitation. TAC advice is based on the status of the main commercial species, with species-specific advice for other species also provided where relevant.

Demersal elasmobranchs in this region are caught in mixed target and non-target fisheries. TACs alone may not adequately protect these species as restrictive TACs may lead to high discarding.

At present fisheries on rays and skates are managed by means of a generic, multi-species TAC, along with prohibitions for severely depleted species.

Management measures such as closed areas/seasons or effort restrictions may better protect demersal elasmobranchs. In particular, measures to protect spawning/nursery grounds would be beneficial. ICES could provide advice on such measures.

Advice for 2013 and 2014

ICES provides advice on the overall exploitation (landings and discards) of the ray and skates species assemblage, and also individual species (Table 5.4.42.1). ICES does not advise that species-specific TACs be established, at present. This is because a TAC is not considered the most effective means to regulate fishing mortality in these, mostly bycatch, species.

ICES advises that a suite of species- and fishery-specific measures be developed to manage the fisheries on the commercial species and achieve recovery of the depleted species. Such measures should be developed by management authorities involving all stakeholders; ICES could assist in this process.

Management measures should be framed in a mixed-fisheries context, considering the overall behaviour of demersal fleets, and the drivers for such behaviour. These species are mainly caught in mixed fisheries. When the TAC is exhausted, catches continue to take place, but are discarded. In order to achieve optimal harvesting of the commercial species, and to assist recovery of the depleted species, a suite of measures should be put in place.

Closure to fishing of spawning and/or nursery grounds, and measures to protect the spawning component of the population (e.g. maximum landing size) are powerful tools to protect rays and skates. In some cases, single-species TACs may be appropriate, but their effects should be carefully evaluated for each specific case before implementation.

Given that the European Community intends to introduce a ban on discards, minimum or maximum landing sizes should be carefully considered before they are introduced, because they could lead to increased discards.

ICES advises that white skate (*Rostroraja alba*) remains on the Prohibited Species List, as it appears to be depleted in the Celtic Sea ecoregion.

Stock status

Of the six main commercial skate species, two species (*Raja clavata* and *R. montagui*) show increasing trends in relative abundance. There is evidence of declining abundance of *Leucoraja naevus*, and a slight decreasing trend in recent years for *R. microocellata.* The stock status of two species (*L. fullonica* and *R. brachyura*) are unclear. There is not enough information to assess the status of any species in the Rockall area.

F_{MSY} is not currently defined for these species and may be of limited use until further information is available, including a better assessment of the species composition of the landings. Biomass reference points have not been set at the present time, but could be developed for survey indices.

Landings of skates and rays in the Celtic Sea ecoregion have generally declined (Figure 5.4.42.1, Table 5.4.42.2), and this is associated with changes in species composition and relative abundance. Species-specific landings are available from 2011.

Table 5.4.42.1 Rays and skates in the Celtic Sea. ICES advice, management and landings.

		Advised percentage change in catch (landings and discards)															
Area	VI	VIIa,f,g	VI	VIIa,f,g	VIIf,g	VI	VIIa,f,g	VIIj	VI, VII	VI, VII	VI, VII	VI, VII	VI, VII				
Stock	Blonde ray	Blonde ray	Thornback ray	Thornback ray	Small –eyed ray	Spotted ray	Spotted ray	Undeulate ray	Sandy ray	Shagreen ray	Cuckoo ray	Common skate	Other rays and skates	Total advice	General advice	Agreed TAC[1]	ICES landings
Section	1	2	4	5	7	9	10	11	12	13	14	15	16				
2009	-	-	-	-	-	-	-	D	-	-	-	D	-	<12.0	*Status quo* [3]	15.7[2]	9.0
2010	-	-	-	-	-	-	-	D	-	-	-	D	-		No new advice, same as for 2009	13.4	9.2
2011	-	-	-	-	-	-	-	D	-	-	-	D	-	<9.9	Average landings 2006–08[3]	11.4	8.6
2012	-	-	-	-	-	-	-	D	-	-	-	D	-		No new advice, same as for 2011	9.9	
2013	-20	-20	+20	+20	-36	-23	+20	D	-20	-20	-36	D	-20	-	No TAC + species –specific measures [4]		
2014	No new advice, same as for 2013														No new advice, same as for 2013		

Weights in thousand tonnes.

D – Depleted stock, no targeted fishery, minimize bycatch.

[1]EU only.

[2] Does not apply to Undulate ray (*Raja undulata*), common skate (*Dipturus batis*), Norwegian skate (*Raja (Dipturus) nidarosiensis*), and white skate (*Rostroraja alba*).

[3] Zero-catch advice for depleted species.

[4] Additional species-specific measures (see main text).

Assessment methodology

The assessment is based on ICES approach to data-limited stocks, where change in survey catch rates is the main indicator. In each case the survey index used was (average of last two years)/(average of previous five years). An average of the previous five years was chosen over the default average of the previous three years. This is to allow time for changes in abundance to become visible, as generation times in these species are longer than those of many bony fishes.

A recommended change in catch is applied according to change in survey indices, with a ±20% uncertainty cap applied in each case (Category 3). Where there is no suitable survey index available, a precautionary buffer of 20% decrease was applied to the stock (Category 5) unless ancillary information indicated that the current level of exploitation is appropriate for the stock.

Biology

Many elasmobranchs are slow growing, have a late age-at-maturity, a low reproductive capacity, have a large size, and can form large aggregations. Because of this they are considered to be highly vulnerable to over-exploitation. Skates (Rajidae) are oviparous and often produce more young than live-bearing species. Some species of demersal elasmobranchs may be locally common and found only in specific areas. Competition and species interactions between the various skate species is poorly understood. Historically, common skate was known to predate on individuals of smaller skate species, and the longer-term decline in the larger skates may have benefited populations of smaller skate species.

The fisheries

Demersal elasmobranchs are caught as a bycatch in the mixed demersal fisheries for roundfish and flatfish, mainly by beam and otter trawls. The main countries involved in these fisheries are Ireland, UK, France, and Spain, with smaller catches by Belgium and Germany. The main gears used are otter trawl, beam trawl, and bottom-set gillnets.

There are some localized, inshore fisheries targeting skates (e.g. *R. clavata*) using longline and tanglenets, and some trawl fisheries targeting various skate species in the southern Irish Sea (Division VIIa) and Bristol Channel (Division VIIf) at some times of year.

Quality considerations

Species-specific catch data for all the species covered in this advice sheet are of limited extent and there are data quality issues. Age data are not routinely collected. Data limitations and the biological characteristics of elasmobranchs restrict the use of length-based assessment methods at this point. In the absence of formal stock assessments and defined reference points for skate stocks and demersal sharks in this ecoregion, the general status of the major species is evaluated from fishery-independent trawl surveys. Such stock trends are available for many stocks, but it is not possible to identify whether overfishing takes place.

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time.

Fishery-independent trawl surveys provide the longest time-series of species-specific information, although these surveys do not sample all the size classes and habitats for the various species.

Management considerations

TACs only regulate the landings, and a low TAC on a low-value bycatch species could induce more discards. Because the elasmobranch species are usually caught as a bycatch in demersal fisheries, they would benefit from a reduction in the overall demersal fishing effort.

Additional considerations

Comparison with previous assessment and advice

The previous advice was given for 2011 and 2012. This advice was based on precautionary considerations. This year, individual advice is given for each of the main stocks, based on ICES approach to data-limited stocks. An overall TAC advice is also provided using ICES approach to data-limited stocks.

Source

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

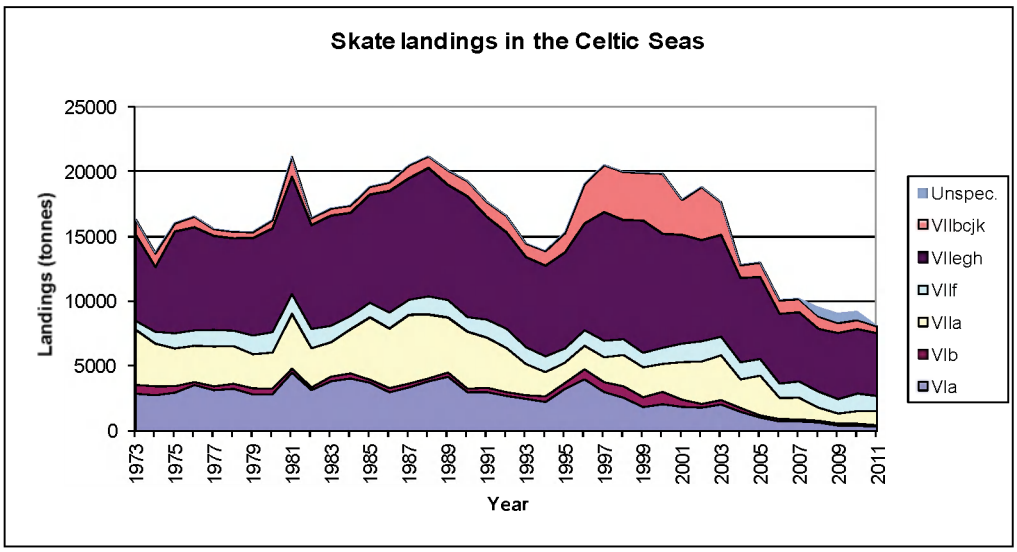

Figure 5.4.42.1 Rays and skates in the Celtic Sea ecoregion. Landings (in thousand tonnes) of skates and rays by ICES area.

Table 5.4.42.2 Total landings (tonnes) of skates (Rajidae) in the Celtic Sea ecoregion (Division VIa).

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Belgium	13	10	3	4	.	.	.	2	1	2	.	.	2	1	3	2	3	.	2
Denmark	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	.	+
Faroe Islands	107	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
France	736	907	777	918	653	839	730	583	2318	741	885	955	996	645	727	766	724	711	621
Germany	.	1	.	.	1	2	1	.	.	.	.	.	1	.	.	.	.	.	.
Ireland	281	336	458	425	342	242	268	343	474	537	806	836	574	440	367	690	630	150	200
Netherlands	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Norway	116	105	70	77	96	226	81	253	119	146	217	99	67	44	93	144	264	71	38
Poland	64	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Spain	.	.	.	.	.	.	.	.	.	19	11	8	4	12	14	8	.	.	43
UK (E. W. & N.I.)	264	266	264	334	338	292	209	89	93	99	104	141	47	47	54	87	67	57	77
UK (Scotland)	1302	1142	1393	1792	1724	1660	1540	1577	1496	1617	1818	2016	2034	1802	2111	2137	2499	2007	2026
Total	2883	2767	2965	3551	3154	3261	2829	2847	4501	3161	3841	4055	3726	2991	3370	3834	4187	2996	3007

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	.	1	2	7	1	2	2	4	2	4	2	8	9	4	4	0	.		0	0
Denmark	+	+	+	+	+	.	+	+	.	.	.	.	.	0		.	.	.	0	0
Faroe Islands	.	.	.	.	.	.	.	.	.	.	.	.	.		.	.	0	.		
France	603	606	437	553	526	384	333	NA	321	278	212	183	149	181	174	194	245	97	65	50
Germany	.	.	2	.	1	4	16	7	1	1	.	3	0	.	0					0
Ireland	350	331	265	504	681	596	488	388	274	238	311	364	363	186	176	119	109	81	111	88
Netherlands	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0				0	
Norway	82	56	9	74	29	20	50	29	49	20	25	2	2	10	4	5	11	4	11	5
Poland	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0					
Spain	.	.	.	.	47	58	69	34	2	.	9	27	14	14	0	0	4			
Spain (Basque Country)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	0	1
UK (E. W. & N.I.)	72	70	101	138	101	69	157	67	108	65	114	159	66	26	18	5	1	4	1	1
UK (Scotland)	1605	1419	1429	1980	2606	1879	1460	1324	1316	1263	1136	1307	1012	623	369	426	297	240	224	194
Total	2712	2483	2245	3256	3992	3012	2575	1853	2073	1869	1809	2053	1615	1043	744	750	667	427	412	341

Table 5.4.42.2. (continued) Total landings (tonnes) of skates (Rajidae) in the Celtic Sea ecoregion (Division VIb).

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	
Estonia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Faroe Islands	2	95	43	43	24	15	61	44	.	23	22	18	2	6	.	.	.	.	.	
France	125	423	39	44	10	20	1	0	4	8	10	6	6	4	1	2	0	3	13	
Germany	.	.	.	.	.	.	.	.	.	.	.	.	.	.		1	1	.	.	
Ireland	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Norway	.	22	123	45	60	145	217	222	117	147	332	364	164	231	200	132	279	203	248	
Portugal	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Russian Federation	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Spain	.	.	.	.	.	.	.	.	63	.	.	12	8	48	41	36	.	.	14	
UK (E, W, & N.I.)	11	.	.	39	62	36	56	.	4	.	8	4	18	15	12	7	4	4	11	
UK (Scotland)	562	166	307	77	160	189	152	181	152	44	9	15	58	38	59	72	70	76	67	
Total	700	706	512	248	316	405	487	447	340	222	381	419	256	342	313	250	354	286	353	

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Estonia	.	.	.	.	.	.	.	.	.	56	1	.	.	.	.	.	.	.		
Faroe Islands	.	.	.	.	.	.	.	.	.	.	.	.	na	na	.	.	3			
France	0	4	0	0	0	0	0	0	7	5	5	2	6	15	0	17	17	12	0	0
Germany	.	6	25	17	49	26	36	67	76	8	1	6	22	22	6	0			3	2
Ireland	.	24	23	60	68	23	15	28	20	10	1	18	7	9	24	14	15	4	3	10
Norway	234	170	272	176	95	101	98	59	120	80	44	61	46	39	82	81	66	91	120	56
Portugal	.	.	.	56	.	25	26	24	29	17	31	18	Na	0	0	.	.	.	.	.
Russian Federation	.	.	.	.	.	.	.	.	5	8	.	.	Na	na	.	.	.	.	.	.
Spain	.	.	.	.	328	410	483	322	347	158	36	46	0.5	0	0	0	0	.	.	
UK (E, W, & N.I.)	12	21	28	73	175	105	134	147	156	120	92	47	48	20	20	9	0	0	0	0
UK (Scotland)	57	70	98	97	83	91	101	123	204	97	79	146	164	59	51	30	26	35	33	34
Total	303	295	446	479	798	781	893	770	964	559	290	344	294	164	183	151	127	143	159	102

Table 5.4.42.2 (continued) Total landings (tonnes) of skates (Rajidae) in the Celtic Sea ecoregion (Division VIIa).

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Belgium	296	365	278	195	236	212	177	151	206	230	233	246	372	425	545	390	271	298	209
France	1516	426	337	491	827	967	560	593	1985	617	440	788	1194	1578	1318	1009	641	712	890
Ireland	822	916	838	936	858	796	813	725	851	803	781	1067	1946	1416	1644	1911	1808	1811	1400
Netherlands	1	1	3	1	1	.	1	+	+	+	+	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Norway	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Spain																			
UK (E, W, & N.I.)	1564	1533	1430	1163	1130	906	1045	1202	1113	1307	1133	1126	1103	976	1503	1435	1373	1378	1226
UK (Scotland)	62	69	53	39	47	52	58	132	82	89	87	192	219	224	321	210	171	227	163
Total	4265	3310	2939	2825	3099	2933	2654	2803	4237	3046	2674	3419	4834	4619	5331	4955	4264	4426	3888

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	230	107	224	218	265	298	398	542	504	724	997	830	860	860	593	680	295	250	274	471
France	642	550	330	293	282	151	285	NA	163	343	349	322	183	192	114	51	14	7	9	16
Ireland	1301	679	514	438	438	593	692	827	759	807	1032	1086	825	786	645	721	515	370	557	500
Netherlands	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	4	4	6	+	+	+	+	.	0	.	.	.	.	0
Norway	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	.	.	0
Spain	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	
UK (E, W, & N.I.)	1150	1003	748	606	789	824	1009	936	671	983	863	1184	533	1252	271	260	243	214	190	172
UK (Scotland)	107	96	86	42	55	80	52	33	86	80	68	67	38	30	65	13	1	2	9	1
Total	3430	2435	1902	1597	1829	1946	2440	2342	2189	2937	3309	3489	2439	3120	1689	1724	1071	844	1038	1161

Table 5.4.42.2 (continued) Total landings (tonnes) of skates (Rajidae) in the Celtic Sea ecoregion (Division VIIf).

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	
Belgium	182	273	280	184	106	75	127	189	167	130	139	98	177	209	129	172	268	135	155	
Denmark	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
France	.	242	426	569	720	680	873	896	856	837	648	377	306	330	247	464	366	326	607	
Germany	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Ireland	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Netherlands	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Norway	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Spain (b)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
UK (E, W, & N.I.)	504	401	468	437	452	436	444	494	508	529	480	558	648	697	784	761	710	666	627	
UK (Scotland)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Total	686	916	1174	1190	1278	1191	1444	1579	1531	1496	1267	1033	1131	1236	1160	1397	1344	1127	1389	

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	128	96	117	108	89	116	121	103	90	91	117	134	210	208	138	206	184	193	143	175
Denmark	1	.	.	.	.	.	.	.	.	.	.	.	.	.		.	.	.	.	0
France	663	565	468	394	432	485	464	453	538	642	526	536	478	429	305	424	399	366	517	297
Germany	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0		.	.	.	0
Ireland	.	.	.	.	.	.	1	.	.	.	1	1	15	8	6	2	4	3	2	1
Netherlands	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	.	.	.	0	0
Norway	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	.	0
Spain (b)	.	.	.	.	8	10	12	1	.	3	.	.	.	.	0	0	0		.	0
UK (E, W, & N.I.)	705	638	630	589	676	664	624	560	613	691	920	766	609	631	653	620	639	546	680	
UK (Scotland)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0		0	682
Total	1497	1299	1215	1091	1205	1275	1222	1117	1241	1427	1564	1437	1312	1276	1101	1252	1226	1107	1342	1155

Table 5.4.42.2 (continued) Total landings (tonnes) of skates (Rajidae) in the Celtic Sea ecoregion (Divisions VIIe, g, h).

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	
Belgium	259	238	209	529	308	208	206	254	318	271	182	215	211	311	224	227	355	242	97	
Denmark	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	1	.	
France	5729	4095	6901	6602	6189	6095	6519	6796	7647	6765	7323	6561	6890	7771	7693	7986	7566	7734	7077	
Germany	18	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Ireland	147	158	148	241	158	143	218	399	380	291	236	303	286	251	296	315	57	100	68	
Netherlands	.	.	1	7	13	6	.	.	.	.	2	na	na	na	na	na	na	na	na	
Norway	.	.	.	.	.	.	.	.	.	.	12	.	.	25	.	.	12	5	.	
Poland	24	28	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Spain (b)	.	.	.	.	.	45	0	0	77	30	29	24	2	62	75	49	.	.	21	
UK (E, W, & N.I.)	432	466	572	556	566	615	564	528	606	637	700	832	936	939	1061	1307	865	1211	638	
UK (Scotland)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Total	6609	4985	7831	7935	7234	7112	7507	7977	9028	7994	8484	7935	8325	9359	9349	9885	8857	9293	7901	

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	183	209	172	203	177	293	260	240	223	248	347	576	407	432	582	569	636	506	479	533
Denmark	1	+	0	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
France	6477	5873	5836	6029	6425	7093	6114	6098	5710	5603	5273	5588	4261	4517	3740	3741	3302	3719	3428	3193
Germany	.	.	.	.	.	.	.	.	.	.	+	.	3	.	.	.	.	.	.	0
Ireland	.	120	106	162	349	479	446	408	203	481	729	838	844	334	315	285	214	198	174	316
Netherlands	na	na	na	na	na	na	9	na	7	7	11	.	.	.	1	.	.	1	2	1
Norway	.	.	.	.	.	.	.	.	.	11	.	.	.	.	0	0	0			0
Poland	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
Spain (b)	.	.	.	.	312	932	1178	2647	1706	1142	653	31	15	9	1	1	3	.	.	.
Spain (Basque Country)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		7	2	8
UK (E, W, & N.I.)	751	735	869	997	953	1098	1167	796	932	880	775	804	811	1024	727	730	667	650	865	771
UK (Scotland)	.	1	.	.	.	2	.	2	.	2	.	.	149	3	1	.	3	3	7	7
Total	7412	6938	6983	7391	8216	9897	9173	10191	8781	8374	7788	7837	6490	6318	5366	5326	4826	5082	4957	4830

Table 5.4.42.2 (continued) Total landings (tonnes) of skates (Rajidae) in the Celtic Sea ecoregion (Divisions VIIb, c, j, k).

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
France	907	725	292	480	239	219	188	340	1120	203	169	198	344	346	456	462	427	781	541	
Germany	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ireland	266	321	314	320	265	268	239	269	336	271	325	296	220	226	419	332	633	350	400	
Netherlands	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Norway	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	
Spain (b)	0	0	0	0	0	3	0	0	47	33	24	31	1	53	64	41	0	0	124	
UK (E, W, & N.I.)	1	+	+	0	+	0	0	+	0	+	0	4	1	3	27	28	25	5	53	
UK (Scotland)	0	0	0	0	0	1		1	0	0	0	1	+	1	+	1	13	14	15	
Total	1174	1046	606	800	504	491	427	610	1503	507	518	530	566	629	966	864	1098	1150	1133	
	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Belgium	0	0	0	0	0	0	0	24	5	0	5	1	na	0	0	0	.		0	0
France	546	298	224	297	375	599	500	NA	568	362	272	192	101	257	255	391	421	262	249	139
Germany	0	7	18	3	4	9	17	10	21	7	+	3	15	17	0					1
Ireland	619	602	625	735	757	811	741	740	653	383	354	435	511	465	473	417	384	362	285	217
Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	4	0			0
Spain (b)	0	0	0	0	1341	1676	1978	2419	2573	1205	2939	1281	7	16	19	11	1		0	0
UK (E, W, & N.I.)	71	88	201	361	469	468	376	352	597	545	373	350	364	269	176	172	83	90	94	99
UK (Scotland)	10	34	43	73	58	36	67	121	189	162	124	226	70	58	77	0	66	39	60	54
Total	1246	1029	1111	1469	3004	3599	3679	3666	4606	2664	4067	2488	1068	1081	1016	995	954	753	687	510
Celtic Sea ecoregion Unspecified	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Spain	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	643	693	605	494
Spain (Basque Country)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		0.8	0.0	8
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	643	693	605	

Table 5.4.42.2 (continued) Total landings (tonnes) of skates (Rajidae) in the Celtic Sea ecoregion (total landings).

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Belgium	750	886	770	912	650	495	510	596	692	633	554	559	762	946	901	791	897	675	463
Denmark	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	2	1	.
Estonia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Faroe Islands	109	95	43	43	24	15	61	44	.	23	22	18	3	6	.	.	.	.	.
France	9013	6818	8772	9104	8638	8820	8871	9208	13 930	9171	9475	8885	9736	10 674	10 442	10 689	9724	10 267	9749
Germany	18	1	.	.	1	2	1	.	.	.	.	.	1	.	.	1	1	0	0
Ireland	1516	1731	1758	1922	1623	1449	1538	1736	2041	1902	2148	2502	3026	2333	2726	3248	3128	2411	2068
Netherlands	1	1	4	9	14	6	1	+	+	+	2	na	na	na	na	na	na	na	na
Norway	120	127	193	122	156	371	298	475	236	293	561	463	231	300	293	276	555	279	286
Poland	88	28	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Portugal	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Russian Federation	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Spain	.	.	.	.	.	48	0	0	187	82	64	75	15	175	194	134	0	0	202
UK (E, W, & N.I.)	2776	2666	2734	2529	2548	2285	2318	2313	2324	2572	2425	2665	2753	2677	3441	3625	3044	3321	2632
UK (Scotland)	1926	1377	1753	1908	1931	1902	1750	1891	1730	1750	1914	2224	2311	2065	2491	2420	2753	2324	2271
Total	16 317	13 730	16 027	16 549	15 585	15 393	15 348	16 263	21 140	16 426	17 165	17 391	18 838	19 176	20 489	21 185	20 104	19 278	17 671

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	20111
Belgium	541	413	515	536	532	709	781	913	824	1067	1467	1549	1485	1503	1316	1455	1115	949	896	1179
Denmark	2	+	.	+	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	.
Estonia	.	.	.	.	.	.	.	.	.	56	1	.	.	.	.	.	.	.	0	0
Faroe Islands	.	.	.	.	.	.	.	.	.	.	.	.	.	na	.	.	4	.	.	.
France	8931	7896	7295	7566	8040	8712	7696	6551	7307	7233	6637	6823	5178	5591	4587	4818	4398	4463	4267	3695
Germany	0	13	45	20	54	39	69	84	98	16	2	12	40	39	7	.	.	.	4	3
Ireland	2270	1756	1533	1898	2294	2502	2382	2390	1909	1919	2428	2742	2565	1787	1640	1558	1240	1018	1132	1133
Netherlands	na	na	na	na	na	na	13	4	13	7	11	na	na	0	1	.	.	1	2	1
Norway	316	226	281	250	124	121	148	88	169	111	69	63	48	49	101	90	77	95	131	62
Poland	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Portugal	.	.	.	56	.	25	26	24	29	17	31	18	na	0	.	.	.	.	.	.
Russian Federation	.	.	.	.	.	.	.	.	5	8	.	.	na	na	.	.	.	.	.	.
Spain	0	0	0	0	2036	3086	3720	5423	4628	2508	3637	1385	37	39	20	12	655	700	607	502
UK (E, W, & N.I.)	2761	2555	2577	2764	3163	3228	3467	2858	3077	3283	3137	3310	2431	3222	1865	1796	1633	1504	1830	1725
UK (Scotland)	1779	1620	1656	2192	2802	2088	1680	1603	1795	1604	1407	1746	1433	773	562	469	393	319	332	290
Total	**16 600**	**14 479**	**13 902**	**15 282**	**19 044**	**20 510**	**19 981**	**19 938**	**19 854**	**17 830**	**18 828**	**17 648**	**13 217**	**13 004**	**10 099**	**10 198**	**9514**	**9047**	**9201**	**8590**

ECOREGION Celtic Sea and west of Scotland
STOCK Blonde ray (*Raja brachyura)* in Subarea VI

Advice for 2013 and 2014

Based on ICES approach to data-limited stocks, ICES advises that catches should be decreased by at least 20%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Stock status

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	? Unknown

SSB (Spawning-Stock Biomass)	
	2009–2011
Qualitative evaluation	? Unknown

The state of the stock is unknown and there is insufficient information to present trends in species-specific landings for this stock. Blonde ray has a patchy occurrence in Subarea VI. It is not encountered in surveys in sufficient numbers to determine trends.

Management plans

No specific management objectives are known to ICES.

Biology

Blonde ray is one of the larger-bodied skate species. It is not clear if the stock is distributed along the west of Ireland also.

The fisheries

This species are usually caught as a bycatch in demersal fisheries.

Quality considerations

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data have been reported to this level. This information covers too short a time period to influence advice at the present time, and in some instances there are data quality issues (e.g. the proportion of *R. brachyura* and *R. montagui*).

The advice is based on a precautionary reduction of catches because of missing or non-representative data. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	No assessment.
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	IGFS-WIBTS-Q4.
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Blonde ray (*Raja brachyura)* in Subarea VI

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

No reliable assessment can be presented for this stock, which has a patchy occurrence in Subarea VI. Survey trends may not be reliable due to the low numbers captured in certain areas.

ICES approach to data-limited stocks

For data-limited stocks without information on abundance or exploitation ICES considers that a precautionary reduction of catches should be implemented, unless there is ancillary information clearly indicating that the current level of exploitation is appropriate for the stock.

Following this approach, ICES advises that catches should decrease by 20% in relation to the last three years' average. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Additional considerations

Management considerations

TACs only regulate the landings, and a low TAC on a low-value bycatch species could induce more discards. Because this species is usually caught as a bycatch in demersal fisheries, it would benefit from a reduction in the overall demersal fishing effort.

Blonde ray are captured in coastal waters of this survey area, but generally in low numbers. There are known identification issues between blonde ray and spotted ray.

Comparison with previous advice

ICES has not previously provided species-specific advice for this stock. The advice is based on category 5 of ICES approach for advice provision in data-limited situations.

Sources

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

Table 5.4.42.1.1 Blonde ray in the Subarea VI. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		8
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 20%.	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Blonde ray (*Raja brachyura*) in Divisions VIIa, f, g

Advice for 2013 and 2014

Based on ICES approach to data-limited stocks, ICES advises that catches should be decreased by at least 20% compared to the last three years' average. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Stock status

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	? Unknown

SSB (Spawning-Stock Biomass)	
	2009–2011
Qualitative evaluation	? Unknown

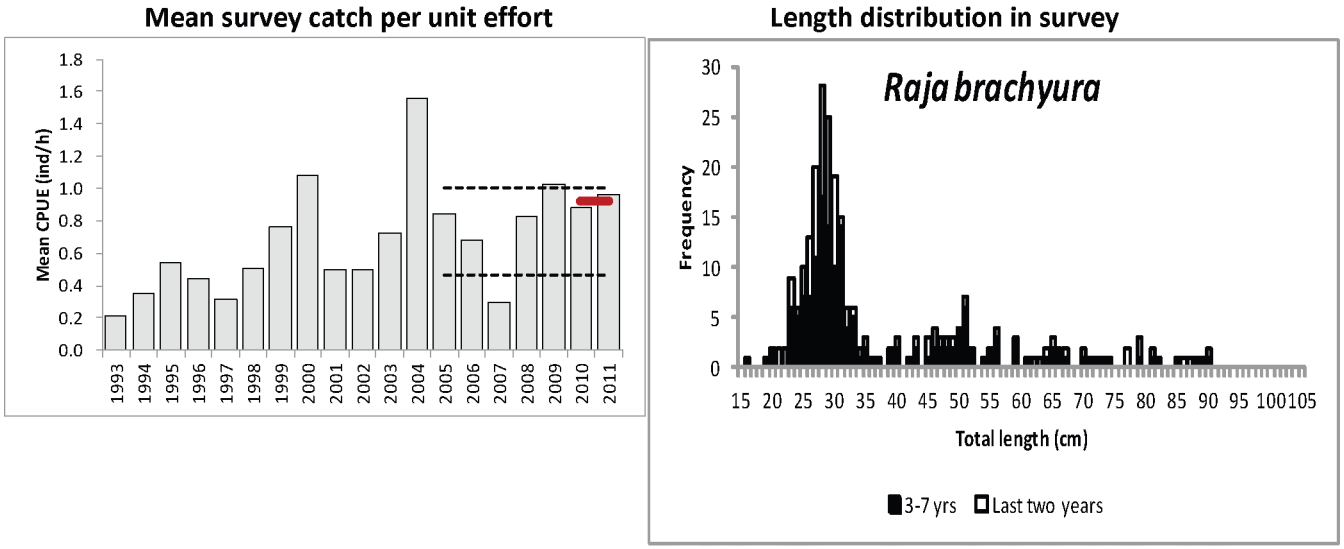

Figure 5.4.42.2.1 Blonde ray (*Raja brachyura)* in Divisions VIIa, f, g. Left: Mean catch per unit effort. Dashed lines indicate the mean annual cpue for 2005–2009, the red line shows the mean annual cpue for 2010–2011. Right: Length distribution of blonde ray in beam trawl survey for the periods 2005–2009 and 2010–2011. Source: UK (E&W) VIIaf BTS survey.

The state of the stock is unknown and there is insufficient information to present trends in species-specific landings for this stock. Survey catch rates are increasing, but larger individuals are only encountered infrequently, which may be related to a low gear selectivity for larger fish in the survey gear and that adults may occur around sandbanks. The survey should therefore not be considered as the basis for advice.

Given the large size, patchy distribution and limited biological knowledge of the species, further studies are required to determine whether current levels of exploitation are appropriate.

Management plans

No specific management objectives are known to ICES.

Biology

Blonde ray is one of the larger-bodied skate species.

The fisheries

This species is usually caught as a bycatch in demersal fisheries.

Effects of the fisheries on the ecosystem

Some demersal sharks, including lesser-spotted dogfish, may benefit from scavenging on trawl-damaged organisms and discards.

Quality considerations

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time, and in some instances there are data quality issues (e.g. the proportions of blonde ray and of spotted ray).

Fishery-independent trawl surveys provide the longest time-series of species-specific information, although these surveys do not sample all the size classes and habitats for the various species.

The advice is based on a precautionary reduction of catches because of missing or non-representative data. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	Landings-based trends.
Input data	UK (E&W) VIIaf BTS (not considered sufficiently representative of stock abundance).
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	None.
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Blonde ray (*Raja brachyura)* in Divisions VIIa, f, g

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

No reliable assessment can be presented for this stock. Blonde ray has a patchy occurrence in Divisions VIIa, f, g. In surveys, it is caught most regularly in the Bristol Channel and off the east coast of Ireland. It is known to occur around sandbanks, and such habitats are not always sampled in trawl surveys.

Survey catch rates are increasing, but larger individuals are only encountered infrequently, which may be related to a low gear selectivity for larger fish in the survey gear and that adults may occur around sandbanks.

ICES approach to data-limited stocks

For data-limited stocks without information on abundance or exploitation ICES considers that a precautionary reduction of catches should be implemented, unless there is ancillary information clearly indicating that the current level of exploitation is appropriate for the stock.

Following this approach, ICES advises that catches should decrease by 20% in relation to the last three years' average. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Additional considerations

Management considerations

TACs only regulate the landings, and a low TAC on a low-value bycatch species could induce more discards. Because this species is normally caught as a bycatch in demersal fisheries, it would benefit from a reduction in the overall demersal fishing effort.

Blonde ray has a patchy occurrence in Divisions VIIa, f, g. In surveys, it is caught most frequently in the Bristol Channel and off the east coast of Ireland. It is known to occur around sandbanks, and such habitats are not always sampled in trawl surveys.

There are known identification issues between blonde ray and spotted ray.

Comparison with previous advice

ICES has not previously provided species-specific advice for this stock. The advice is based on category 5 of the ICES approach to data-limited stocks.

Sources

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

Table 5.4.42.2.1 Blonde ray in Divisions VIIa, f, g. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		1 106
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 20%.	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Blonde ray (*Raja brachyura)* in Division VIIe

Advice for 2013 and 2014

This stock is believed to be part of the stock in the North Sea Divisions and Subarea IIIa, IV, VIId, and VIIe. Further information is available in the North Sea Advice section.

ECOREGION Celtic Sea and west of Scotland
STOCK Thornback ray (*Raja clavata*) in Subarea VI

Advice for 2013 and 2014

Based on ICES approach to data-limited stocks, ICES advises that catches could be increased by a maximum of 20%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Stock status

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	Unknown

SSB (Spawning-Stock Biomass)	
	2005–2011
Qualitative evaluation	Increasing

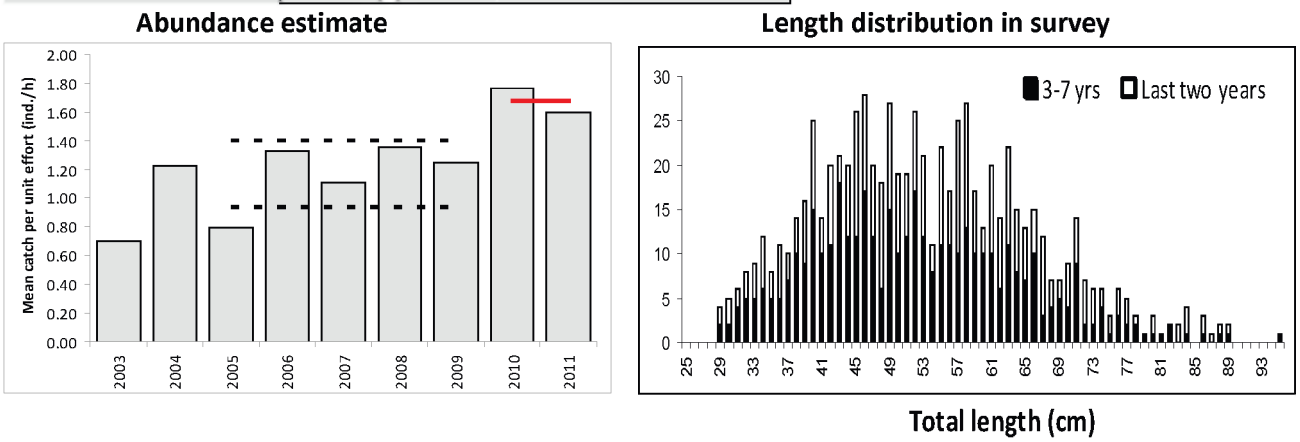

Figure 5.4.42.4.1 Thornback ray (*Raja clavata)* in Subarea VI. Left: Mean catch per unit effort (cpue). Dashed lines indicate the mean annual cpue for 2005–2009 ±1 std. dev., the red line shows the mean annual cpue for 2010–2011. Right: Length distribution of thornback ray for the periods 2005–2009 (black bars) and 2010–2011 (white bars). Source: IGFS Q4 survey.

There is insufficient information to present trends in species-specific landings for this stock. The stock has increased – the abundance estimate (survey catch rates) for the last two years is 43% above the average of the previous five years. There is no change in the length distribution over time.

Management plans

No specific management objectives are known to ICES.

Biology

Many elasmobranchs are slow growing, having a late age-at-maturity and a low reproductive capacity. Thornback rays are oviparous, often producing more young than live-bearing species. The large size and aggregating behaviour of elasmobranchs make them susceptible to over-exploitation.

Environmental influence on the stock

The degree of resource competition and species interactions between the various skate species is poorly understood. Historically, common skate were known to predate on smaller skate individuals, and the longer-term decline in the larger skates may have benefited populations of smaller skate species.

The fisheries

This is the most commercially important ray species in this ecoregion and is one of the main components of the landings. It is mainly caught close to shore**.**

Effects of the fisheries on the ecosystem

Some demersal sharks, including lesser-spotted dogfish, may benefit from scavenging on trawl-damaged organisms and discards.

Quality considerations

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time.

Fishery-independent trawl surveys provide the longest time-series of species-specific information, although these surveys do not sample all the size classes and habitats for the various species.

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

Scientific basis

Assessment type	Survey-based trends.
Input data	IGFS-WIBTS-Q4.
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	None.
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Thornback ray (*Raja clavata)* in Subarea VI

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

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

ICES approach to data-limited stocks

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

For this stock the abundance is estimated to have increased by more than 20% between 2005 and 2009 (average of the five years) and 2010–2011 (average of the two years). This implies catches could increase by 20% in relation to the last three years' average. However, as species-specific landings data are not complete, it is not possible to quantify the current catch.

A precautionary buffer has not been applied as there has been an increase in the stock over the longer term and the stock structure is constant.

ICES does not advise that an individual TAC be set for this stock, at present. Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Additional considerations

Management considerations

TACs only regulate the landings, and a low TAC on a low-value bycatch species could induce more discards. Because this species are usually caught as a bycatch in demersal fisheries, it would benefit from a reduction in the overall demersal fishing effort.

Comparison with previous advice

ICES has not previously provided species-specific advice for this stock. The advice is based on category 3 of ICES approach for advice provision in data-limited situations.

Sources

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

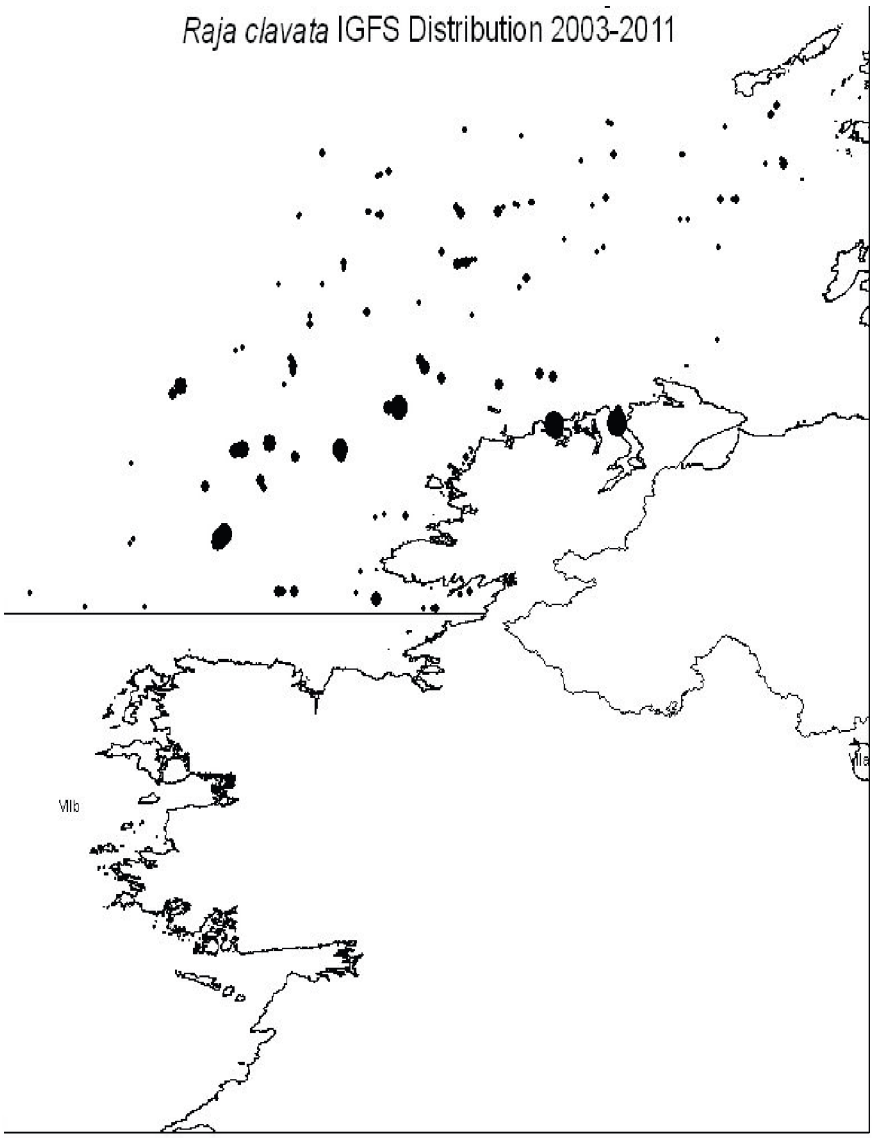

Figure 5.4.42.4.2 Thornback ray in Subdivision VI. Distribution and relative abundance of thornback ray northwest of Ireland.

Table 5.4.42.4.1 Thornback ray in Subdivision VI. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		120
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch could increase by up to 20%	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Thornback ray (*Raja clavata)* in Divisions VIIa, f, g

Advice for 2013 and 2014

Based on ICES approach to data-limited stocks, ICES advises that catches could be increased by a maximum of 20%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Stock status

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	? Unknown

SSB (Spawning-Stock Biomass)	
	2005–2011
Qualitative evaluation	Increasing

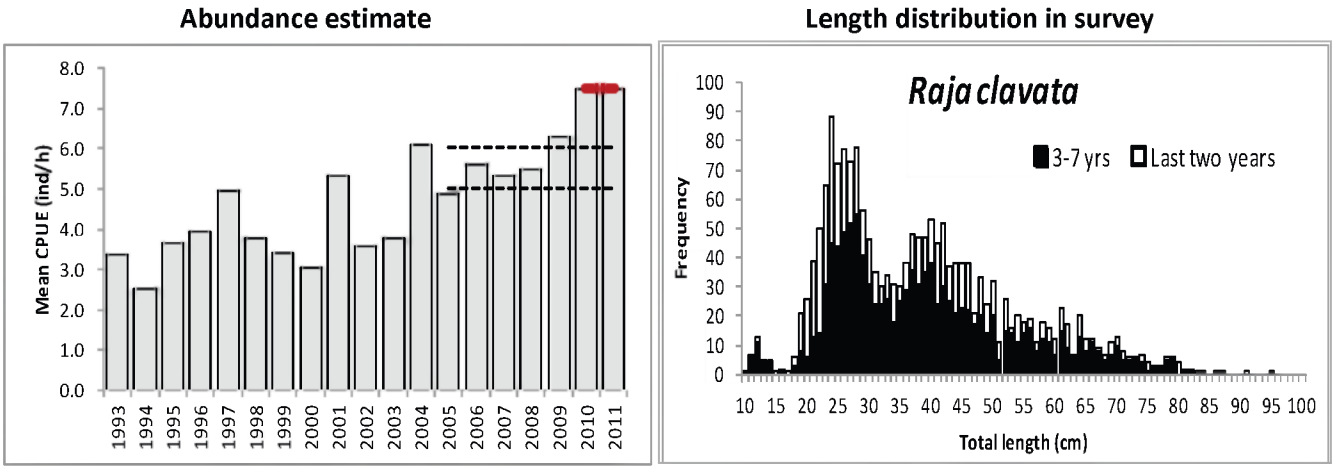

Figure 5.4.42.5.1 Thornback ray (*Raja clavata)* in Divisions VIIa, f, g. Left: Mean catch per unit effort (cpue) of Divisions VIIa, f, g thornback ray. Dashed lines indicate the mean annual cpue for 2005–2009 ±1 std. dev. The red line shows the mean annual cpue for 2010–2011. Right: Length distribution of *Raja clavata* for the periods 2005–2009 (black bars) and 2010–2011 (white bars). Source: UK (E&W) VIIAF BTS survey.

There is insufficient information to present trends in species-specific landings for this stock. The stock has increased – the abundance estimate (survey catch rates in the UK beam-trawl survey) in the last two years is 35% above the previous five year average. There is no change in the length distribution over time.

Management plans

No specific management objectives are known to ICES.

Biology

Many elasmobranchs are slow growing, having a late age-at-maturity and a low reproductive capacity. Thornback ray are oviparous, often producing more young than live-bearing species. The large size and aggregating behaviour of elasmobranchs make them susceptible to over-exploitation.

Environmental influence on the stock

The degree of resource competition and species interactions between the various skate species is only partly understood. Historically, common skate were known to predate on smaller skate individuals, and the longer-term decline in the larger skates may have benefited populations of smaller skate species.

The fisheries

Thornback ray is one of the most commercially important ray species in this ecoregion. It is mainly caught close to the eastern side of the Irish Sea by beam and otter trawlers, and in the Bristol Channel. Other landings come from inshore fisheries on the south coast of Ireland.

Effects of the fisheries on the ecosystem

Some demersal sharks, including lesser-spotted dogfish, may benefit from scavenging on trawl-damaged organisms and discards.

Quality considerations

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time.

Fishery-independent trawl surveys provide the longest time-series of species-specific information, although these surveys do not sample all the size classes and habitats for the various species. Larger individuals are only encountered infrequently in surveys, which may be related to a low gear selectivity for larger fish.

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

Scientific basis

Assessment type	Survey-based trends.
Input data	Surveys (UK (E&W) VIIaf BTS and France EVHOE IBTS).
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	None.
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Thornback ray (*Raja clavata)* in Divisions VIIa, f, g

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

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

ICES approach to data-limited stocks

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

For this stock the abundance is estimated to have increased by more than 20% between 2005 and 2009 (average of the five years) and 2010–2011 (average of the two years). This implies catches could increase by 20% in relation to the last three years' average. However, as species-specific landings data are not complete, it is not possible to quantify the current catch.

A precautionary buffer has not been applied as there has been an increase in the stock over the longer term and the stock structure is constant.

ICES does not advise that an individual TAC be set for this stock, at present. Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Additional considerations

Management considerations

TACs only regulate the landings, and a low TAC on a low-value bycatch species could induce more discards. Because this species is usually caught as a bycatch in demersal fisheries, it would benefit from a reduction in the overall demersal fishing effort.

Comparison with previous advice

ICES has not previously provided species-specific advice for this stock. The advice is based on category 3 of ICES approach to advice provision in data-limited situations.

Sources

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

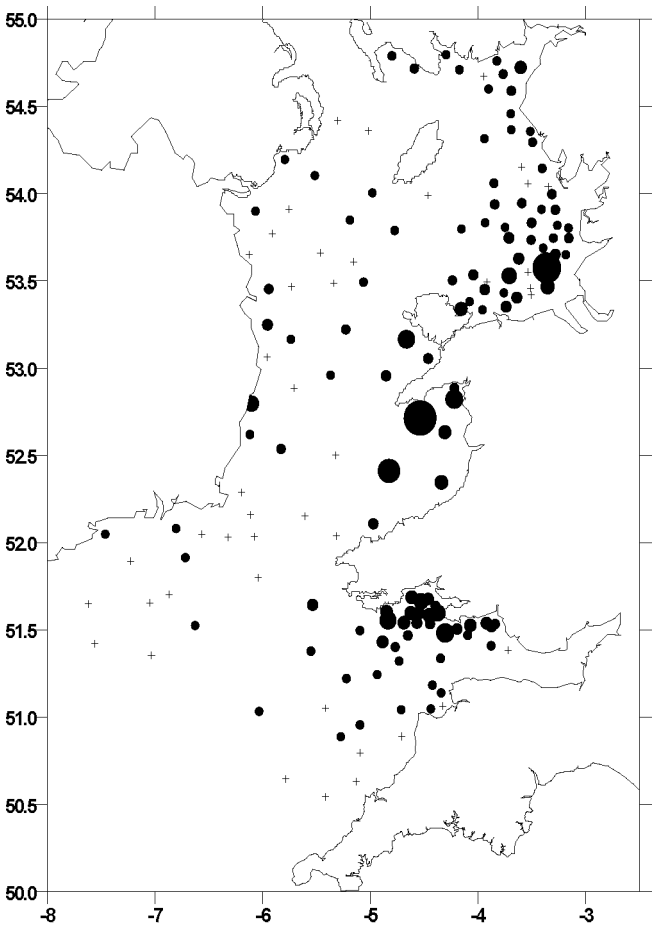

Figure 5.4.42.5.2 Thornback ray in Divisions VIIa, f, g. Distribution and relative abundance of thornback ray from the UK Q4 BTS survey.

Table 5.4.42.5.1 Thornback ray in Divisions VIIa, f, g. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		897
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch could increase by up to 20%	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Thornback ray (*Raja clavata)* in Division VIIe

Advice for 2013 and 2014

This stock is believed to be part of the stock in the North Sea Divisions and Subarea IIIa, IV, VIId, and VIIe. Further information is available in the North Sea Advice section.

ECOREGION Celtic Sea and west of Scotland
STOCK Small-eyed ray (*Raja microocellata*) in Divisions VIIf, g

Advice for 2013 and 2014

Based on ICES approach to data-limited stocks, ICES advises that catches should be decreased by at least 36%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Stock Status

F (Fishing Mortality)		
	2009–2011	
Qualitative evaluation	?	Unknown
SSB (Spawning-Stock Biomass)		
	2005–2011	
Qualitative evaluation	↘	Decreasing

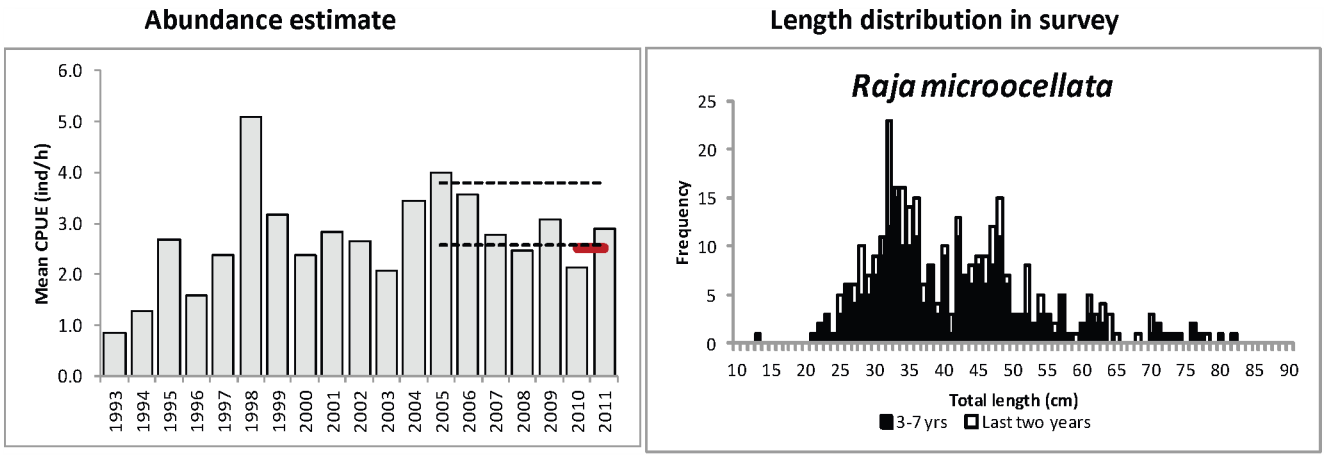

Figure 5.4.42.7.1 Small-eyed ray (*Raja microocellata)* in Divisions VIIf, g. Left: Mean cpue of Divisions VIIa, f small-eyed ray. Dashed lines indicate the mean annual cpue for 2005–2009 ±1 std. dev. The red line shows the mean annual cpue for 2010–2011. Right: Length distribution of small-eyed ray for the periods 2005–2009 (black bars) and 2010–2011 (white bars). Source: UK (E&W) VIIaf BTS survey.

There is insufficient information to present trends in species-specific landings for this stock. The stock has decreased recently – the abundance estimate (survey catch rates) in the last two years is 21% below the preceding five year average, although the longer-term trend has been increasing. There is no change in the length distribution over time.

Management plans

No specific management objectives are known to ICES.

Biology

This is a medium-bodied skate species of intermediate productivity.

The fisheries

There are no target fisheries for small-eyed ray, but they are a bycatch with other skate and ray species, particularly in the Bristol Channel.

Effects of the fisheries on the ecosystem

Some demersal sharks, including lesser-spotted dogfish, may benefit from scavenging on trawl-damaged organisms and discards.

Quality considerations

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time, and in some instances there are data quality issues.

Fishery-independent trawl surveys provide the longest time-series of species-specific information, although these surveys do not sample all the size classes and habitats for the various species.

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

Scientific basis

Assessment type	Survey-based trends.
Input data	UK (E&W) VIIaf BTS survey.
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	None.
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Small-eyed ray (*Raja microocellata)* in Divisions VIIf, g

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

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

ICES approach to data-limited stocks

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

Following this approach the abundance is estimated to have decreased by more than 20% between 2005 and 2009 (average of the five years) and 2010–2011 (average of the two years). This implies a decrease of catches of 20% in relation to the last three years' average.

Additionally, considering that exploitation is unknown, ICES advises that catches should decrease by a further 20% as a precautionary buffer. This results in a decrease of 36% in catches in relation to the last three years' average. However, as species-specific landings data are not complete, it is not possible to quantify the current catch.

ICES does not advise that an individual TAC be set for this stock, at present. Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Additional considerations

Management considerations

TACs only regulate the landings, and a low TAC on a low-value bycatch species could induce more discards. Because this species are usually caught as a bycatch in demersal fisheries, it would benefit from a reduction in the overall demersal fishing effort.

Small-eyed ray has a localised distribution in the ecoregion. The stock is concentrated in the Bristol Channel (Figure 5.4.42.7.2 below); larger individuals also occur in the Celtic Sea (Division VIIg), with occasional specimens in Division VIIa. Connectivity with Division VIIe and Subarea VIII is unknown. There is no evidence of change in distribution.

The discrete nature of this stock, in the Bristol Channel, offers a good opportunity to develop spatial and technical measures that will be capable of regulating fishing mortality.

Comparison with previous advice

ICES has not previously provided species-specific advice for this stock. The advice is based on category 3 of ICES approach to advice provision in data-limited situations.

Source

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

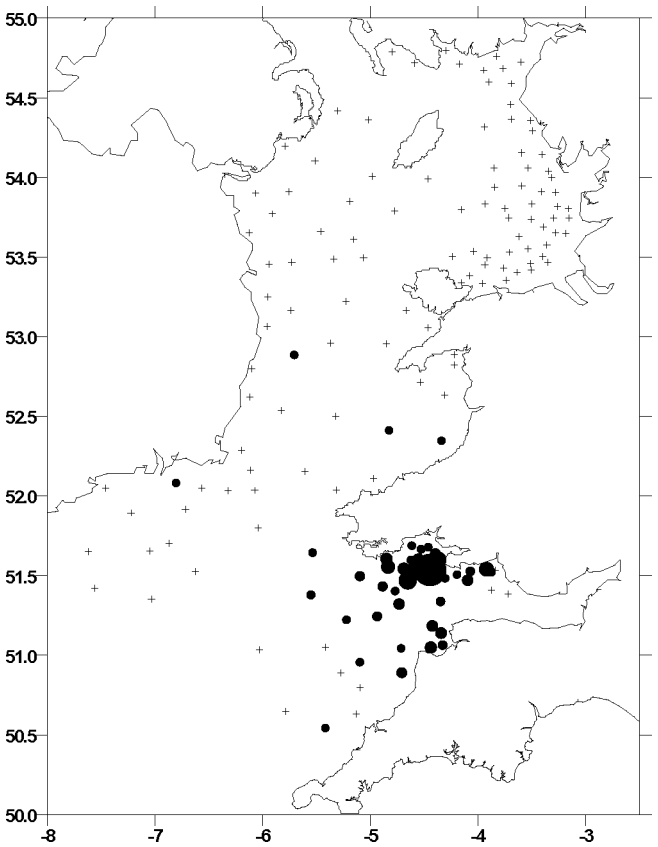

Figure 5.4.42.7.2 Small-eyed ray in Divisions VIIf, g. Distribution of small-eyed ray in the Bristol Channel (Division VIIf). Source: UK (E&W) VIIAF BTS survey.

Table 5.4.42.7.1 Small-eyed ray in Divisions VIIf, g. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		306
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 36 % (reduction of 20% followed by 20% PA buffer).	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Small-eyed ray (*Raja microcellata)* in Division VIIe

Advice for 2013 and 2014

This stock is believed to be part of the stock in the North Sea Divisions and Subarea IIIa, IV, VIId, and VIIe. Further information is available in the North Sea Advice section.

ECOREGION Celtic Sea and west of Scotland
STOCK Spotted ray (*Raja montagui)* in Subarea VI

Advice for 2013 and 2014

Based on ICES approach to data-limited stocks, ICES advises that catches should be decreased by at least 23% from current levels. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Stock status

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	? Unknown
SSB (Spawning-Stock Biomass)	
	2005–2011
Qualitative evaluation	Decreasing

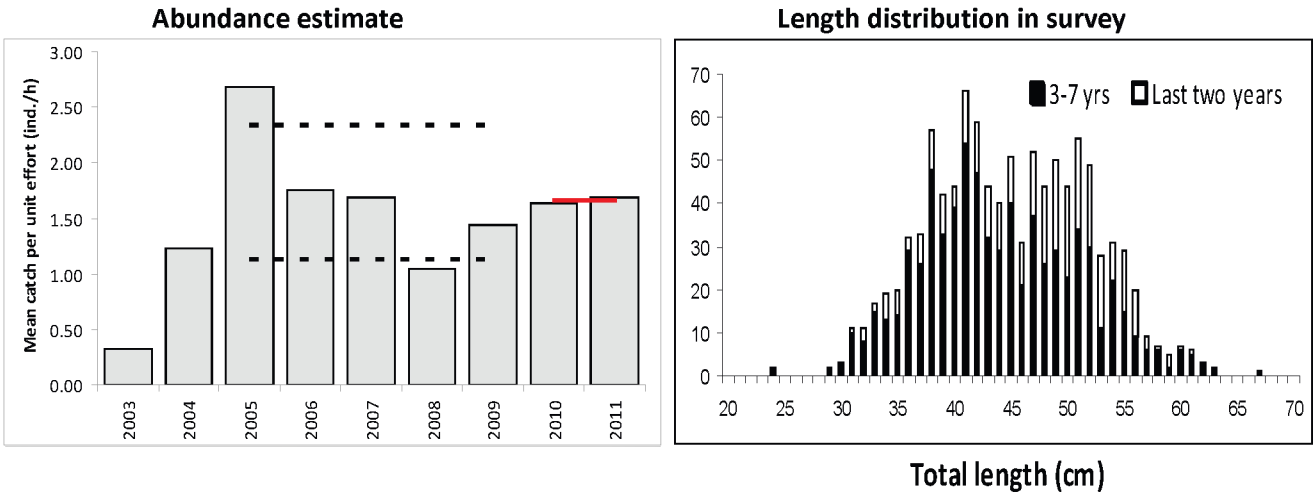

Figure 5.4.42.9.1 Spotted ray (*Raja montagui)* in Subarea VI. Left: Mean catch per unit effort (cpue) from the survey. Dashed lines indicate the mean annual cpue for 2005–2009 ±1 std. dev. The red line shows the mean annual cpue for 2010–2011. Right: Length distribution of spotted ray in survey for the periods 2005–2009 (black bars) and 2010–2011 (white). Source: IGFS Q4 survey.

There is insufficient information to present trends in species-specific landings for this stock. The stock abundance has increased since 2008, although from a previous decline. Comparing abundance estimates from the last two years average with the previous five years average shows a 4% decrease. There is no noticeable change in the size distribution of survey catches over time.

Management plans

No specific management objectives are known to ICES.

Biology

Spotted ray is a medium-bodied skate species, of high-medium productivity.

The fisheries

Spotted ray are bycaught in mixed fisheries for other demersal species.

Effects of the fisheries on the ecosystem

Some demersal sharks, including lesser-spotted dogfish, may benefit from scavenging on trawl-damaged organisms and discards.

Quality considerations

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time, and in some instances there are data quality issues (e.g. the proportion of blonde ray and spotted ray).

Fishery-independent trawl surveys provide the longest time-series of species-specific information, although these surveys do not sample all the size classes and habitats for the various species.

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

Scientific basis

Assessment type	Survey-based trends.
Input data	IGFS-WIBTS-Q4 survey.
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	None.
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Spotted ray (*Raja montagui)* in Subarea VI

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

No reliable assessment can be presented for this stock. There are identification issues with *R. montagui* and *R. brachyura* that lead to unreliable commercial landings data. Therefore, fishing possibilities cannot be projected.

ICES approach to data-limited stocks

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

For this stock the abundance is estimated to have decreased by 4% between 2005 and 2009 (average of the five years) and 2010–2011 (average of the two years). This implies a decrease of catches of 4% in relation to the last three years' average landings.

Additionally, considering that exploitation is unknown, ICES advises that catches should decrease by a further 20% as a precautionary buffer. This results in a decrease of 23% in catches in relation to the last three years' average. However, as species-specific landings data are not complete, it is not possible to quantify the current catch.

ICES does not advise that an individual TAC be set for this stock, at present. Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Additional considerations

Management considerations

TACs only regulate the landings, and a low TAC on a low-value bycatch species could induce more discards. Because this species is usually caught as a bycatch in demersal fisheries, it would benefit from a reduction in the overall demersal fishing effort.

Catches of spotted ray are widespread throughout the survey area, but there are known identification issues between this species and blonde ray.

Comparison with previous advice

ICES has not previously provided species-specific advice for this stock. The advice is based on category 3 of ICES approach to advice provision in data-limited situations.

Sources

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

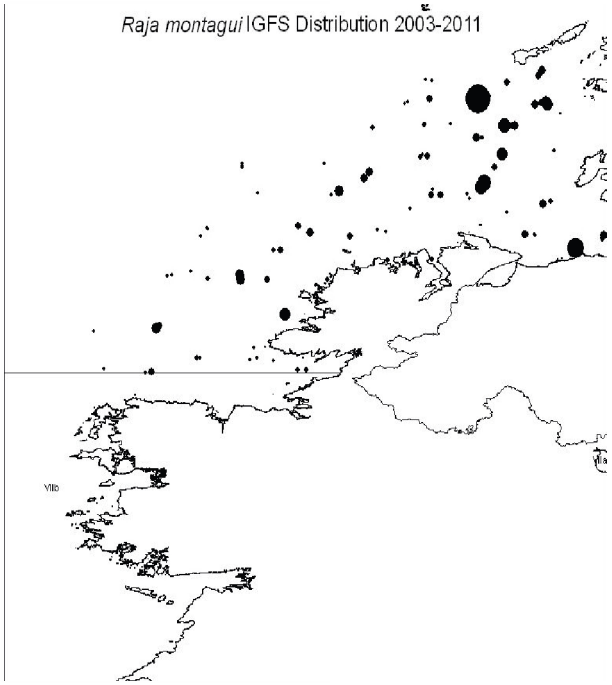

Figure 5.4.42.9.2 Spotted ray in Subarea VI. Distribution of spotted ray in the survey (IGFS, 2003–2011).

Table 5.4.42.9.1 Spotted ray in Subarea VI. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		34
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 23% (reduction of 4% followed by 20% PA buffer).	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Spotted ray (*Raja montagui)* in Divisions VIIa, f, g

Advice for 2013 and 2014

Based on ICES approach to data-limited stocks, ICES advises that catches could be increased by 20%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Stock status

	F (Fishing Mortality)
	2009–2011
Qualitative evaluation	? Unknown

	SSB (Spawning-Stock Biomass)
	2005–2011
Qualitative evaluation	Increasing

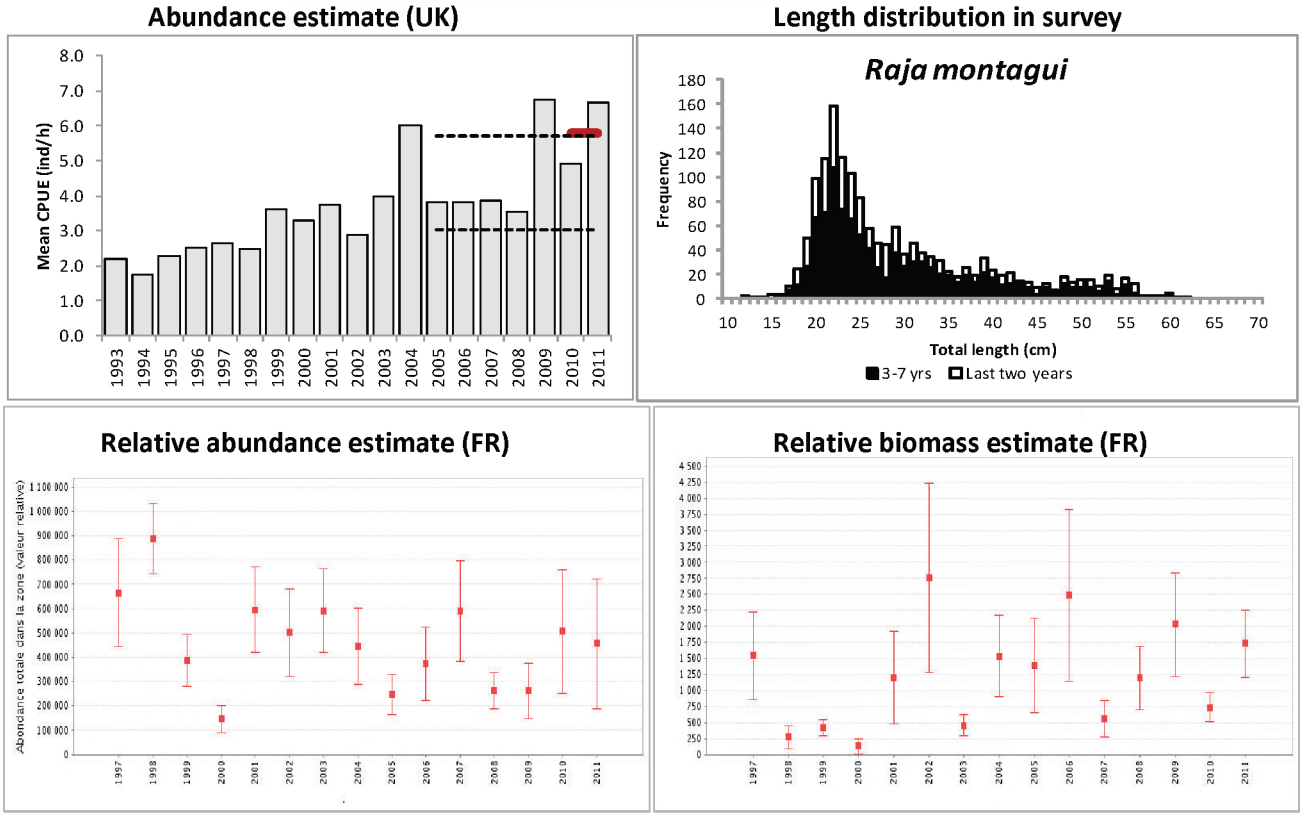

Figure 5.4.42.9.1 Spotted ray (*Raja montagui)* in Divisions VIIa, f, g. Top left: Mean catch per unit effort (cpue). Dashed lines indicate the mean annual cpue for 2005–2009 ±1std. dev. The red line shows the mean annual cpue for 2010–2011. Right: Length distribution of spotted ray in survey for the periods 2005–2009(black bars) and 2010–2011 (white). Source: UK (E&W) VIIaf BTS survey. Below: Trends in abundance (numbers) (left) and biomass (right) of spotted ray. Source: French EVHOE survey.

There is insufficient information to present trends in species-specific landings for this stock. The stock has increased both in the short and the long term, and the UK abundance estimate (survey catch rates) in the last two years is 33% higher than the preceding five year average. Relative abundance indices show a slight increasing trend following a decline. There is no noticeable change in the length distribution of survey catches.

Management plans

No specific management objectives are known to ICES.

Biology

Spotted ray is a medium-bodied skate species.

The fisheries

Spotted ray are bycaught in mixed fisheries for other demersal species. They are also caught with other skates and rays in limited target otter and beam-trawl fisheries in the Irish Sea.

Effects of the fisheries on the ecosystem

Some demersal sharks, including lesser-spotted dogfish, may benefit from scavenging on trawl-damaged organisms and discards.

Quality considerations

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time, and in some instances there are data quality issues (e.g. the proportion of *R. brachyura* and *R. montagui*).

Fishery-independent trawl surveys provide the longest time-series of species-specific information, although these surveys do not sample all the size classes and habitats for the various species.

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

Scientific basis

Assessment type	Survey-based trends.
Input data	Surveys (UK (E&W) VIIaf BTS, French EVHOE survey (VIIf-j)).
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	None.
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Spotted ray (*Raja montagui)* in Divisions VIIa, f, g

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

No reliable assessment can be presented for this stock. There are identification issues with *R. montagui* and *R. brachyura* that lead to unreliable commercial landings data. Therefore, fishing possibilities cannot be projected.

ICES approach to data-limited stocks

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

For this stock the abundance is estimated to have increased by more than 20% between 2005 and 2009 (average of the five years) and 2010–2011 (average of the two years). This implies an increase of catches of 20% in relation to the last three years' average landings. However, as species-specific landings data are not complete, it is not possible to quantify the current catch.

A precautionary buffer has not been applied as there has been an increase in the stock over the longer term and the stock structure is constant.

ICES does not advise that an individual TAC be set for this stock, at present. Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

Additional considerations

Management considerations

TACs only regulate the landings, and a low TAC on a low-value bycatch species could induce more discards. Because this species are usually caught as a bycatch in demersal fisheries, it would benefit from a reduction in the overall demersal fishing effort.

Survey catches of spotted ray are widespread throughout the survey area (Figure 5.4.42.10.2). There are known identification issues between *R. brachyura* and *R. montagui*.

Comparison with previous advice

ICES has not previously provided species-specific advice for this stock. The advice is based on category 3 of ICES approach to advice provision in data-limited situations.

Sources

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

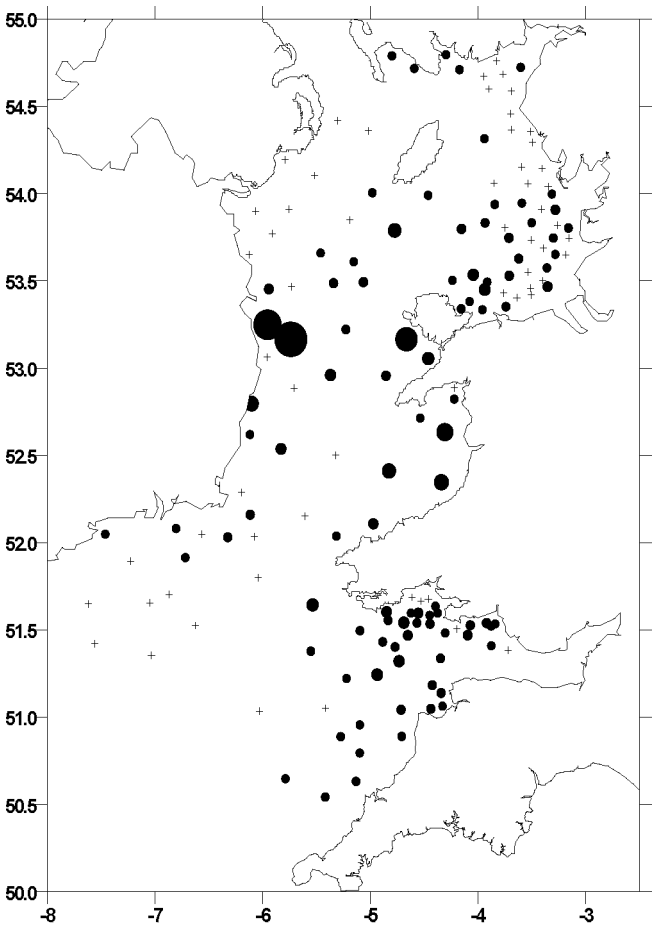

Figure 5.4.42.10.2 Distribution of spotted ray in the UK (E&W) VIIaf BTS survey.

Table 5.4.42.10.1 Spotted ray in Divisions VIIa, f, g. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		781
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch could increase by up to 20%.	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Undulate ray (*Raja undulata*) in Division VIIj

Advice for 2013 and 2014

ICES advises on the basis of the precautionary approach that there be no targeted fishery for undulate ray unless information is provided to show that these are sustainable. Measures to mitigate bycatch in coastal fisheries should be implemented.

Stock status

F (Fishing Mortality)		
	2009–2011	
Qualitative evaluation	?	Unknown
SSB (Spawning-Stock Biomass)		
	2009–2011	
Qualitative evaluation	✗	Depleted

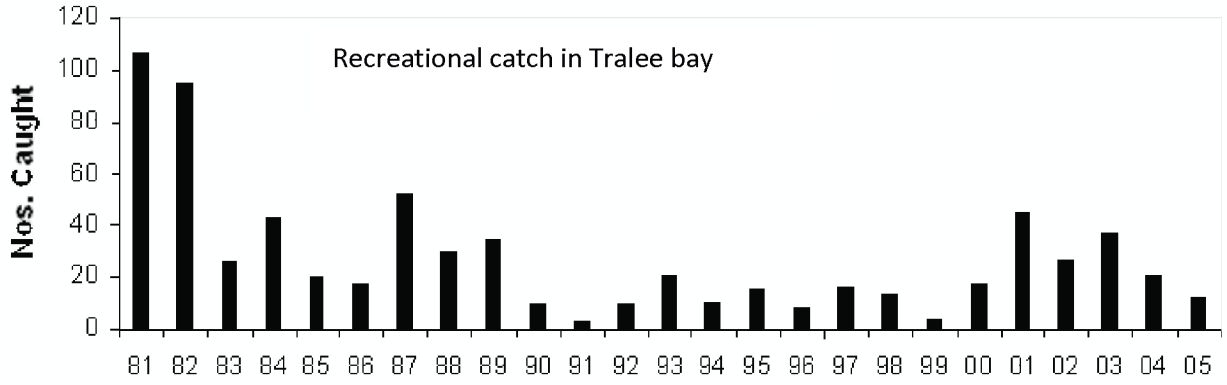

Figure 5.4.42.11.1 Undulate ray (*Raja undulata*) in Division VIIj. Recreational catch in Tralee Bay with constant effort over time of two charter boats in Tralee Bay 1981–2005. Source: Irish Central Fisheries Board, unpublished data.

There is insufficient information to present trends in species-specific landings for this stock. Catch numbers have declined in the area and there is no evidence of a recovery since the beginning of the 1980s. The stock is likely to be depleted below any candidate biomass reference point, although localised populations exist.

Management plans

Undulate ray is currently on the EU prohibited species list.

Biology

This is one of the larger-bodied rays, and is likely to have a life history that is more conservative than smaller species like spotted ray. The discrete population in southwest Ireland is particularly vulnerable. The stock is mainly distributed in Tralee and Dingle Bays, extending northwards towards County Clare.

The fisheries

There is no targeted fishery for this species, although it is bycaught, particularly in inshore, tanglenet fisheries targeting spider crab, and in near-shore mixed trawl fisheries.

Effects of the fisheries on the ecosystem

Some demersal sharks, including lesser-spotted dogfish, may benefit from scavenging on trawl-damaged organisms and discards.

Quality considerations

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time.

Undulate ray is considered to be patchily distributed within this ecoregion, mostly in inshore waters and bays.

The inshore nature of this species means that it is not adequately sampled in surveys.

Scientific basis

Assessment type	Survey-based trends.
Input data	Recreational catch numbers.
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	None.
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Undulate ray (*Raja undulata*) in Division VIIj

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

No analytic assessment can be presented for this stock. Therefore, fishing possibilities cannot be projected. There is no new information to alter the perception of the stock.

Precautionary approach

ICES advises on the basis of the precautionary approach that there should be no targeted fishery for undulate ray unless information is provided to show that these are sustainable. Measures should be taken to minimize bycatch.

Additional considerations

Tangle nets are illegal in this area, in the fishery targeting spider crab.

Due to the inshore habitat of undulate ray, survey information is very limited for this stock.

Comparison with previous advice

ICES provided information on this stock in 2008. This stock was also the basis of a special request from the EC in 2010. The basis of the advice has not changed. ICES has previously provided advice for skates and rays in this ecoregion.

Sources

Ellis, J. R., McCully, S. R., and Brown, M. J. 2012. An overview of the biology and status of undulate ray *Raja undulata*. Journal of Fish Biology, 80: 1057–1074.

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

Figure 5.4.42.11.2 Undulate ray in Division VIIj. Records of undulate ray catches off southwest Ireland. (Ellis *et al*, 2012).

Table 5.4.42.11.1 Undulate ray in Division VIIj. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2009	No target fishery	0	
2010	No new advice, same as 2009	0	
2011	No target fishery	0	NA
2012	No new advice, same as 2011	0	
2013	No target fishery	0	
2014	No new advice, same as 2013	0	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Sandy ray (*Leucoraja circularis*) in the Celtic Sea ecoregion

Advice for 2013 and 2014

Based on ICES approach to data-limited stocks, ICES advises that catches should be decreased by 20%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Stock status

F (Fishing Mortality)		
	2009–2011	
Qualitative evaluation	?	Unknown

SSB (Spawning-Stock Biomass)		
	2009–2011	
Qualitative evaluation	?	Unknown

The state of the stock is unknown and there is insufficient information to present trends in species-specific landings for this stock. Survey coverage is insufficient to describe the stock status. Sandy ray is only frequently encountered in one survey around the Porcupine bank and catch rates appear stable at low levels, but this is not considered representative of the whole stock.

Management plans

No specific management objectives are known to ICES.

Biology

Sandy ray is one of the medium-bodied skate species. They are found exclusively offshore.

The fisheries

Sandy ray are caught in low numbers in mixed fisheries on the outer continental shelf.

Quality considerations

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time.

There is only one survey that samples this species and it does not cover the entire stock range.

The advice is based on a precautionary reduction of catches because of missing or non-representative data. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	No assessment.
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	SpPGFS-WIBTS-Q4 survey (not considered sufficiently representative of stock abundance).
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Sandy ray (*Leucoraja circularis*) in the Celtic Sea ecoregion

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

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

ICES approach to data-limited stocks

For data-limited stocks without information on abundance or exploitation ICES considers that a precautionary reduction of catches should be implemented, unless there is ancillary information clearly indicating that the current level of exploitation is appropriate for the stock.

Following this approach, ICES advises that catches should be decreased by a precautionary buffer of 20%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

Additional considerations

Sandy ray is only regularly sampled in one survey. Though this survey does not cover the whole stock range of this offshore species, it is the only available index.

Comparison with previous advice

ICES has not previously provided species-specific advice for this stock. The advice is based on category 5 of ICES approach to advice provision in data-limited situations.

Sources

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

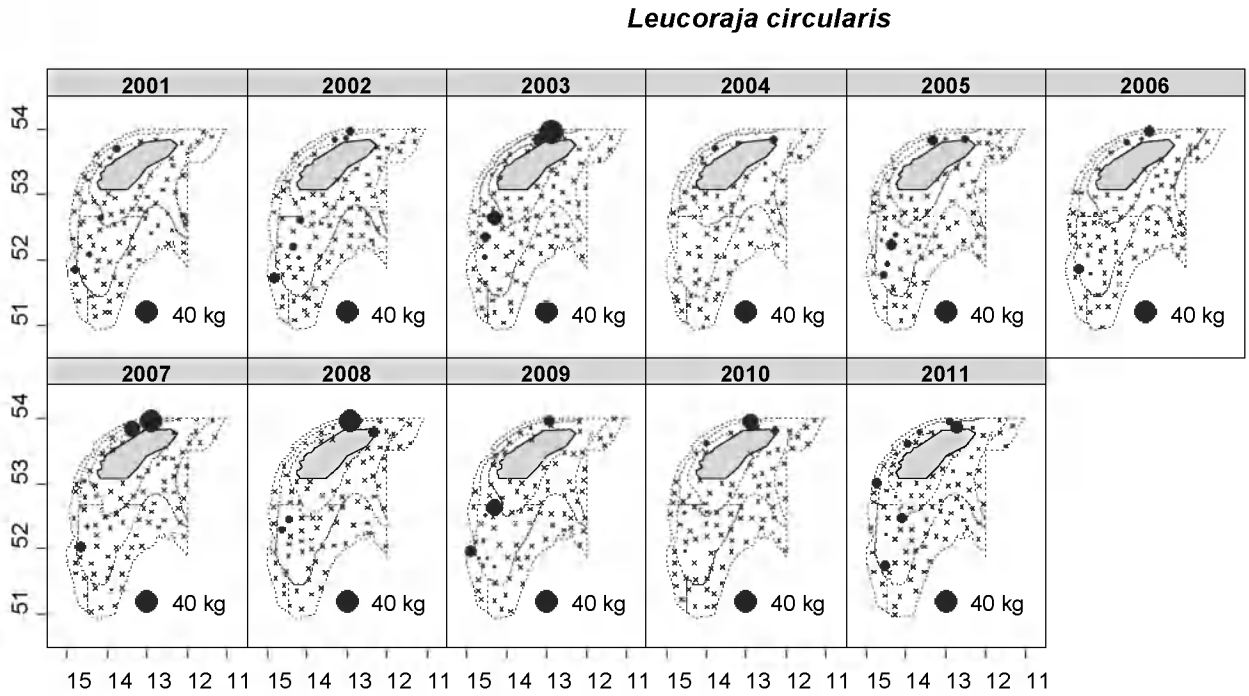

Figure5.4.42.12.1 Sandy ray (*Leucoraja circularis)* around the Porcupine bank. Geographical distribution of catches (kg·haul^{-1}) in the Porcupine survey time-series (2001–2011). Source: SpPGFS-WIBTS-Q4.

Table 5.4.42.12.1 Sandy ray in Subarea VI. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		12
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 20%.	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Shagreen ray (*Leucoraja fullonica*) in the Celtic Sea ecoregion

Advice for 2013 and 2014

Based on ICES approach to data-limited stocks, ICES advises that catches should be decreased by at least 20%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Stock status

F (Fishing Mortality)	2009–2011
Qualitative evaluation	? Unknown

SSB (Spawning-Stock Biomass)	2009–2011
Qualitative evaluation	? Unknown

The state of the stock is unknown and there is insufficient information to present trends in species-specific landings for this stock. Survey coverage is insufficient to describe the stock status. Shagreen ray is now only regularly encountered in one survey. Catch rates fluctuate, but with an overall decline. This is not considered representative of the whole stock since the survey does not cover the whole stock range.

Management plans

No specific management objectives are known to ICES.

Biology

Shagreen ray is a large-bodied skate species. It is found normally offshore, although with occasional vagrants to shallower water.

The fisheries

Shagreen ray are caught in low numbers in mixed fisheries on the continental slope. TACs only regulate the landings, and a low TAC on a low-value bycatch species could induce more discards. Because this species is usually caught as a bycatch in demersal fisheries, it would benefit from a reduction in the overall demersal fishing effort.

Quality considerations

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time.

The advice is based on a precautionary reduction of catches because of missing or non-representative data. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	No assessment.
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	EVHOE-WIBTS-Q4 survey.
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Shagreen ray (*Leucoraja fullonica*) in the Celtic Sea ecoregion

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

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

ICES approach to data-limited stocks

For data-limited stocks without information on abundance or exploitation ICES considers that a precautionary reduction of catches of 20% should be implemented, unless there is ancillary information clearly indicating that the current level of exploitation is appropriate for the stock.

Following this approach, ICES advises that catches should be decreased by a precautionary maximum of 20%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

Additional considerations

Shagreen ray is an offshore species, distributed along the outer continental shelf and upper slope. It was regularly encountered in the UK PHHT Q1 survey. However, this survey has been discontinued. Shagreen ray is now only occasionally encountered in most IBTS surveys.

Comparison with previous advice

ICES has not previously provided species-specific advice for this stock. The advice is based on category 5 of ICES approach to advice provision in data-limited situations.

Source

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

Table 5.4.42.13.1 Shagreen ray in the Celtic Sea ecoregion. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		240
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 20%.	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Cuckoo ray (*Leucoraja naevus*) in Subarea VI and Divisions VIIa–c, e–j

Advice for 2013 and 2014

Based on ICES approach to data-limited stocks, ICES advises that catches should be decreased by at least 36%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

This is the first year ICES is providing quantitative advice for data-limited stocks.

Stock status

F (Fishing Mortality)	
	2009–2011
Qualitative evaluation	? Unknown
SSB (Spawning-Stock Biomass)	
	2005–2011
Qualitative evaluation	↘ Decreasing

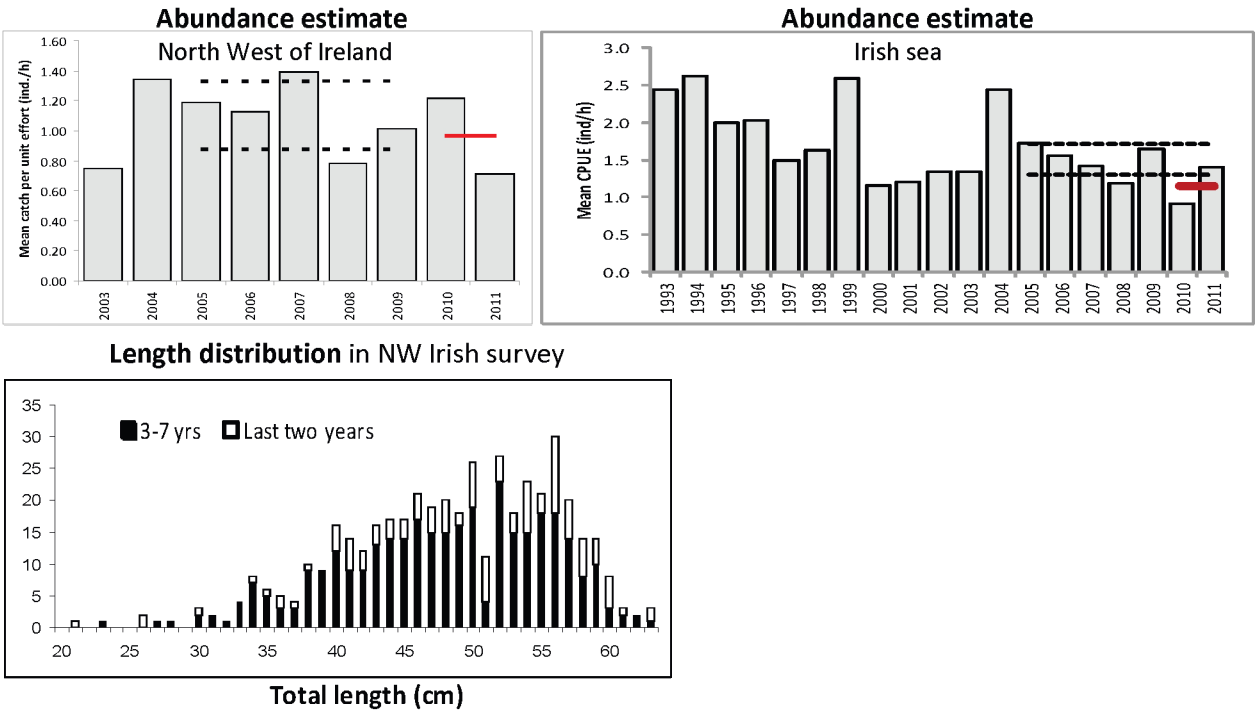

Figure 5.4.42.14.1 Cuckoo ray (*Leucoraja naevus*) in Subarea VI and Divisions VIIa–c, e–j. Top: catch per unit effort (cpue) from the survey in Divisions IVc–VIId (left) and Division VIIa (right). Sources: IGFS trawl survey Q4 and UK (E&W) VIIaf BTS. Dashed lines indicate the mean ±1standard deviation annual cpue for 2005–2009, the red line shows the mean annual cpue for 2010–2011. Below: Length distribution in the Irish Groundfish Survey for 2005–2009 (black bars) and 2010–2011 (white).

There is insufficient information to present trends in species-specific landings for this stock. For this stock the abundance trends are variable between subareas. A decrease of 23–13% is observed between the average of the last two years compared to the previous years for the Irish Sea and the northwest of Ireland, respectively, while the Porcupine bank abundance has declined to very low levels. An increase of 12% in biomass (from a low level) is found in the Celtic Sea. A decline of smaller individuals caught in the North Western Irish survey is noted. Overall, the stock appears to be in decline.

Management plans

No specific management objectives are known to ICES.

Biology

Cuckoo ray is a small-bodied ray. *Leucorajidae* are considered to be more offshore species than the *Rajidae*. The large size and aggregating behaviour of elasmobranchs make them susceptible to over-exploitation. Cuckoo ray in Subareas VI and VII may be part of a larger stock that extends from the northern North Sea to the Bay of Biscay.

The fisheries

Cuckoo ray is an important commercial species. They are a more offshore species than the *Rajidae* and so are only normally caught by trawl fleets rather than by inshore gill or tangle nets.

The main fisheries are a part of the mixed demersal fisheries. Discarding levels vary depending on market value.

Quality considerations

Better information on stock identity is required for accurate assessments of the species.

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time.

Fishery-independent trawl surveys provide the longest time-series of species-specific information, although these surveys do not sample all the size classes and habitats for the various species.

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

Assessment type	Survey-based trends.
Input data	Surveys (UK (E&W) VIIaf BTS, EVHOE-WIBTS-Q4, and SpPGFS-WIBTS-Q4).
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	None.
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Cuckoo ray (*Leucoraja naevus*) in Subarea VI and Divisions VIIa–c, e–j

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

No reliable assessment can be presented for this stock.

Based on ICES approach to data-limited stocks, ICES advises that catches should be decreased by 20%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for this stock, at present. A precautionary buffer should also be applied, unless species-specific measures are introduced to regulate exploitation, or to protect spawning/nursery areas.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

ICES approach to data-limited stocks

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

For this stock the abundance is estimated to have decreased by 23% between 2005 and 2009 (average of the five years) and 2010–2011 (average of the two years) in the UK (E&W) VIIaf BTS.

The French EVHOE Q4 (EVHOE-WIBTS-Q4) shows an approximate increase in biomass of 12% between 2005 and 2009 (average of the five years) and 2010–2011 (average of the two years).

The Spanish Porcupine survey (SpPGFS-WIBTS-Q4) shows that both abundance and biomass have declined to low levels.

Following the ICES approach to data-limited stocks, ICES therefore recommends a 20% decrease in catches in relation to the last three years' average landings.

Additionally, considering that exploitation is unknown, ICES advises that catches should decrease by a further 20% as a precautionary buffer. This results in a decrease of 36% in catches in relation to the last three years' average. However, as species-specific landings data are not complete, it is not possible to quantify the current catch.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

Additional considerations

Cuckoo ray in Subarea VII may be part of a larger stock that extends from the northern North Sea to the Bay of Biscay. Better information on stock identity is required for accurate assessments of the species.

Comparison with previous advice

ICES has not previously provided species-specific advice for this stock. The advice is based on category 3 of ICES approach to advice provision in data-limited situations.

Source

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

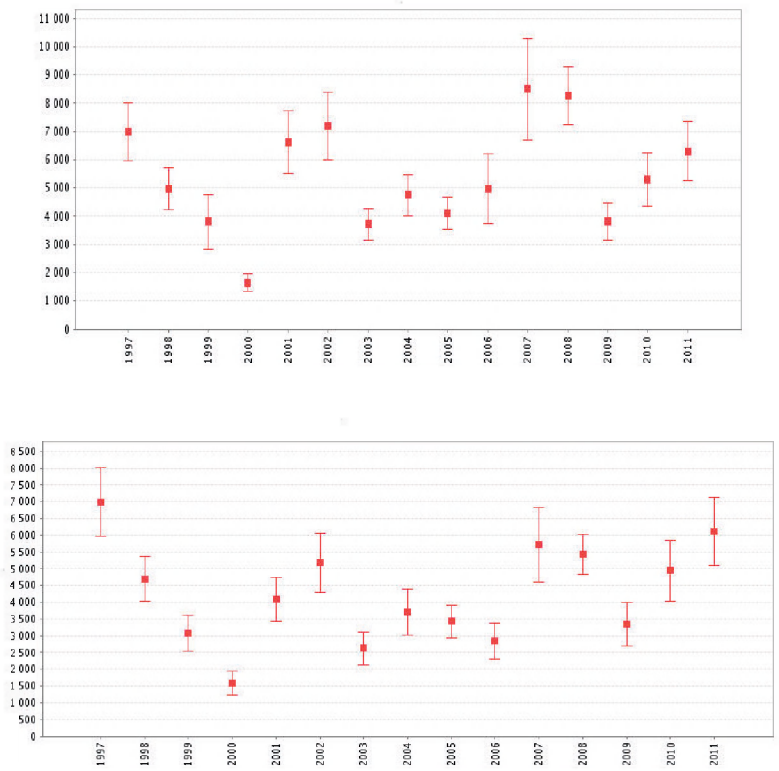

Figure 5.4.42.14.2 Temporal trends in relative abundance (numbers) (top) and biomass (bottom) of cuckoo ray, from the French EVHOE Q4 survey. Source: EVHOE-WIBTS-Q4.

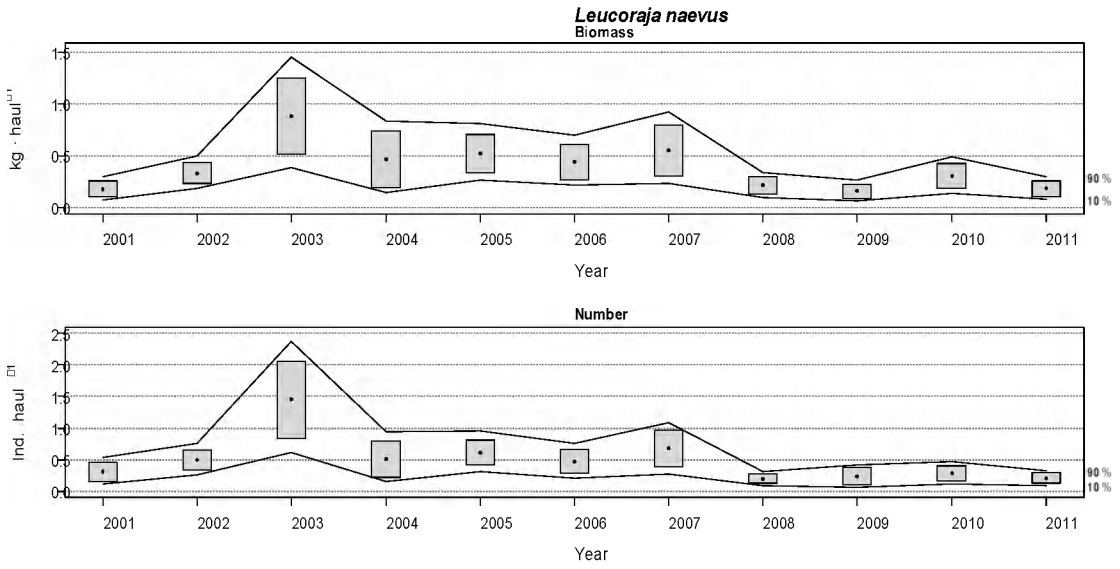

Figure 5.4.42.14.3 Temporal changes in cuckoo ray (*Leucoraja naevus*) biomass index (kg haul^{-1})(top) and numbers (numbers per haul) during the Porcupine survey timeiseries (2001–2011). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (a = 0.80, bootstrap iterations = 1000IGFS trawl survey Q4. Dashed lines indicate the mean ±1 std. dev. annual cpue for 2005–2009, the red line shows the mean annual cpue for 2010–2011. Source: SpPGFS-WIBTS-Q4 survey.

Table 5.4.42.14.1 Cuckoo ray in Subarea VI and Divisions VIIa–c, e–j. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2009	No specific advice		
2010	No specific advice		
2011	No specific advice		2606
2012	No specific advice		
2013	No TAC, species-specific measures needed, catch to decrease by at least 36% (20% reduction followed by 20% PA buffer).	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland

STOCK Common skate (*Dipturus batis*) complex (flapper skate (*Dipturus* cf. *flossada*) and blue skate (*Dipturus* cf. *intermedia*)) in Subarea VI and Divisions VIIa–c, e–j

Advice for 2013 and 2014

Based on the precautionary approach, ICES advises that there should be no targeted fishery for either *Dipturus* cf. *flossada* or *Dipturus* cf. *intermedia*, and measures should be taken to minimize bycatch.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

Stock status

F (Fishing Mortality)	2009–2011
Qualitative evaluation	? Unknown

SSB (Spawning-Stock Biomass)	2009–2011
Qualitative evaluation	✗ Depleted (Common skate)

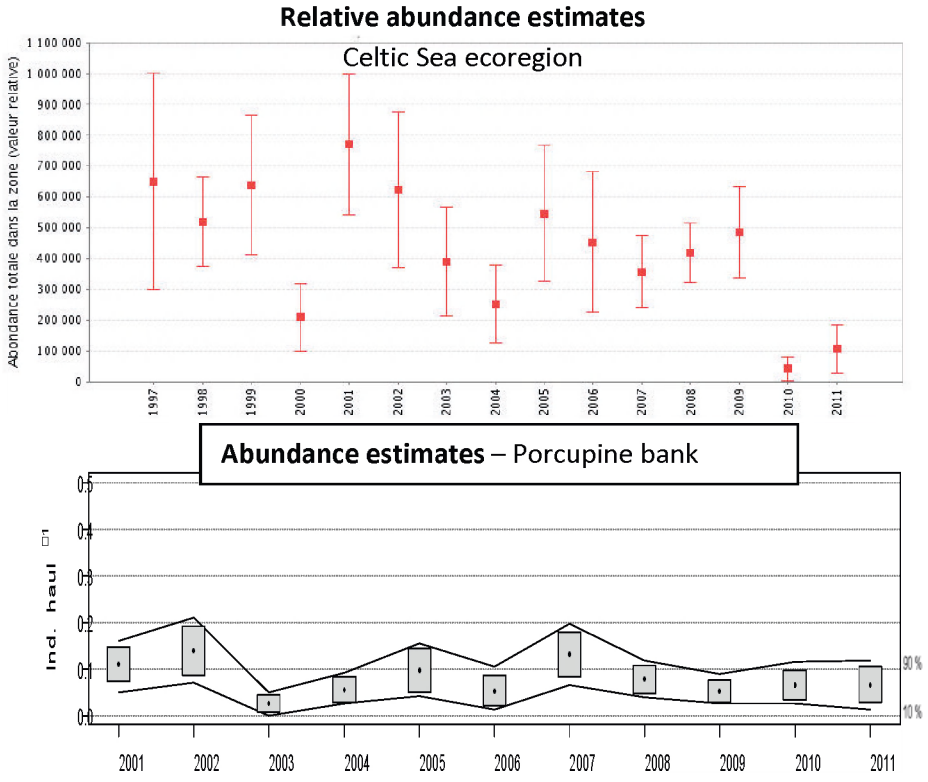

Figure 5.4.42.15.1 Common skate (*Dipturus batis*) complex in the Celtic Sea ecoregion. Trends in relative abundance in the Celtic Sea (top) and abundance (number haul^{-1}) in the Porcupine survey (below). Confidence intervals included.

There is insufficient information to present trends in species-specific landings for these species. The common skate (*Dipturus batis*) complex is considered to be depleted in the Celtic Sea ecoregion. Individuals are rarely encountered in surveys. Limited information suggests that both *D.* cf. *flossada* and *D.* cf. *intermedia* are found in the ecoregion. There is particular overlap in the Celtic Sea and at Rockall.

Management plans

The common skate (*Dipturus batis*) complex is currently on the EU prohibited species list.

Biology

This species is slow growing, having a late age-at-maturity and a low reproductive capacity. The *Dipturus* species are considered to be particularly vulnerable due to their large size.

Environmental influence on the stock

The degree of resource competition and species interactions between the various skate species is poorly understood. Historically, common skate were known to predate on smaller skate individuals, and the longer-term decline in the larger skates may have benefited populations of smaller skate species.

The fisheries

The *Dipturus* family are a very large, slow-growing species, and as such are highly vulnerable to overfishing. Commercial fisheries existed for the common skate complex in the past, but declining numbers now means that recent catches have been purely bycatch. The common skate complex has been on the EU prohibited species list since 2009.

Quality considerations

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time.

Fishery-independent trawl surveys provide the longest time-series of species-specific information, although these surveys do not sample all the size classes and habitats for these species.

Assessment type	Survey-based trends.
Input data	Surveys (IGFS-WIBTS-Q4, UK (E&W) VIIaf BTS, EVHOE-WIBTS-Q4, and SpPGFS-WIBTS-Q4).
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	None.
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Common skate (*Dipturus batis*) complex (flapper skate (*Dipturus* cf. *flossada*) and blue skate (*Dipturus* cf. *intermedia*)) in Subarea VI and Divisions VIIa–c, e–j

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

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

Precautionary considerations

ICES advises on the basis of precautionary considerations that there should be no targeted fishery for either *Dipturus* cf. *flossada* or *Dipturus* cf. *intermedia*. Measures should be taken to minimize bycatch.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

Additional considerations

Management considerations

TACs only regulate the landings, and a low TAC on a low-value bycatch species could induce more discards. Because this species is usually caught as a bycatch in demersal fisheries, it would benefit from a reduction in the overall demersal fishing effort.

If refuges and spawning grounds can be identified, and protected, it is possible to recover common skate.

Comparison with previous assessment and advice

The advice and its basis have not changed.

Sources

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

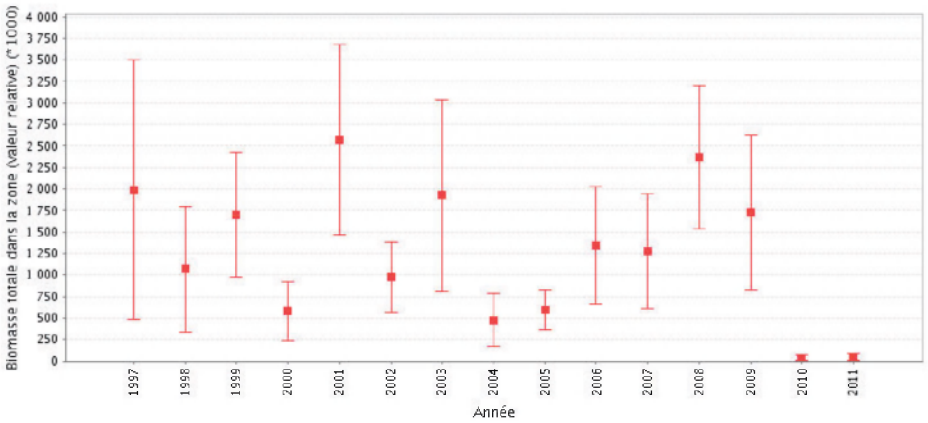

Figure 5.4.42.15.2 The common skate (*Dipturus batis*) complex in the Celtic Sea ecoregion. Trends in biomass of the common skate (*Dipturus batis*) complex in the French EVHOE survey.

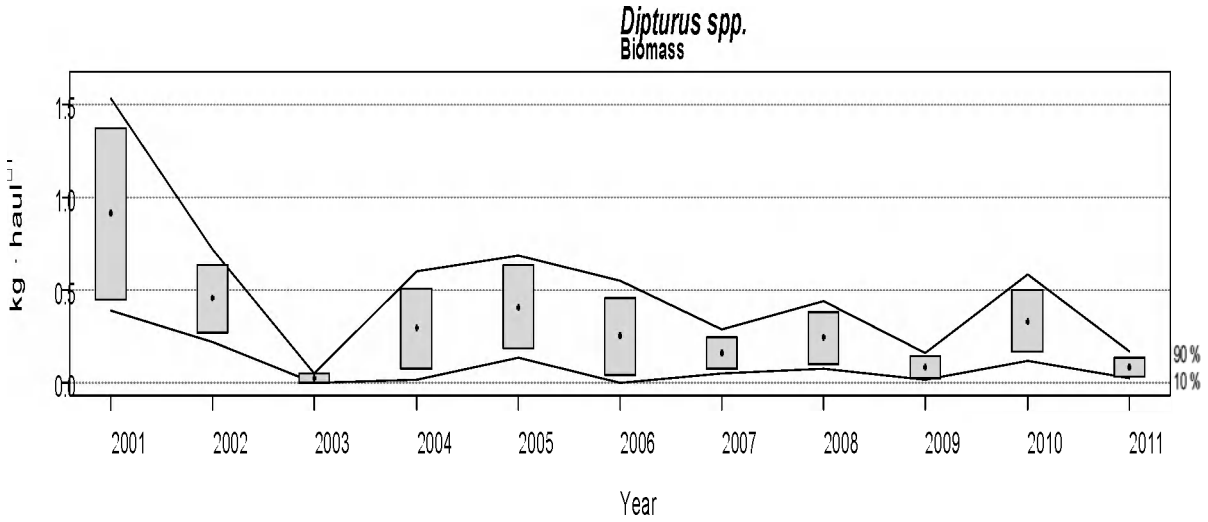

Figure 5.4.42.15.3 The common skate (*Dipturus batis*) complex in the Celtic Sea ecoregion. Temporal changes in the common skate complex biomass (kg haul^{-1}) during the Porcupine survey time-series (2001–2011). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (a = 0.80, bootstrap iterations =1000). Source: SpPGFS-WIBTS-Q4 survey.

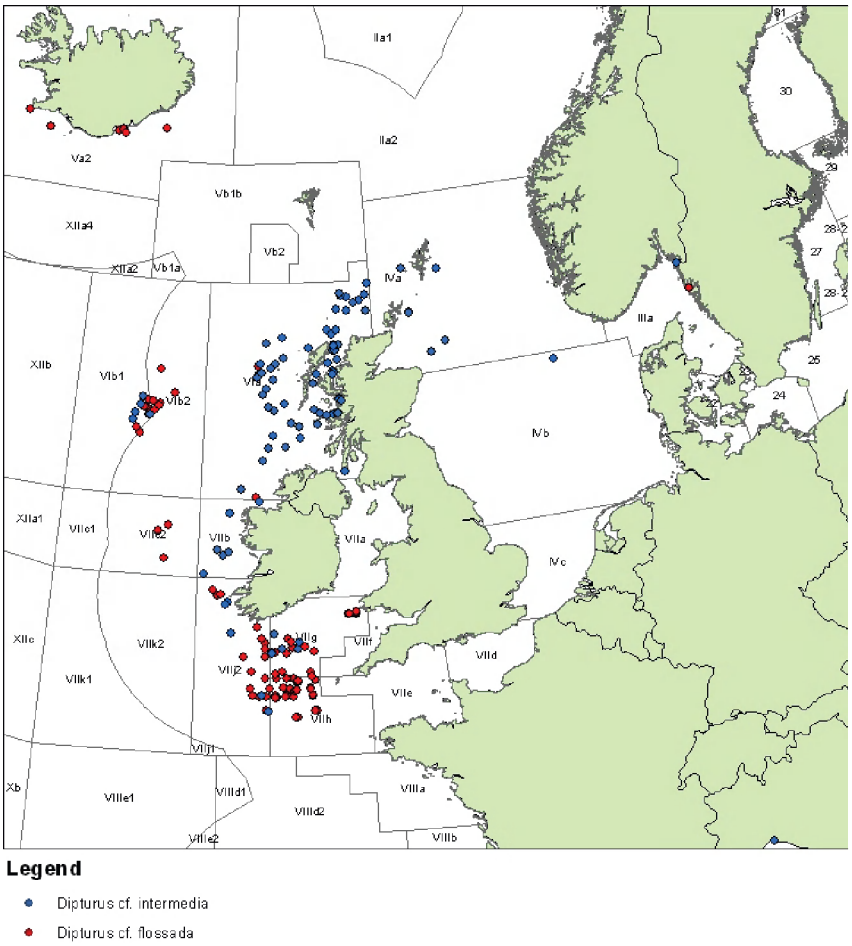

Figure 5.4.42.15.4 The common skate (*Dipturus batis*) complex in the Celtic Sea ecoregion. Distribution of *Dipturus* cf. *intermedia* and *Dipturus* cf. *flossada*. Information is sourced from IBTS surveys and other records. For further information see Special request on the *D. batis* complex, 2012.

Table 5.4.42.14.1 The common skate (*Dipturus batis*) complex in the Celtic Sea ecoregion. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2009	No targeted fishery	0	NA
2010	No new advice, same as 2009	0	NA
2011	No target fishery. Retain on Prohibited Species List	0	NA
2012	No new advice, same as 2011	0	
2013	No target fishery	0	
2014	No new advice, same as 2013	0	

Weights in tonnes.

ECOREGION Celtic Sea and west of Scotland
STOCK Other ray and skate species in Subarea VI and Divisions VIIa–c, e–j

Advice for 2013 and 2014

Other species of skates and ray are also found in this ecoregion and are occasionally declared in the landings. These include:

Amplyraja radiate, Dipturus nidarosiensis, and *Dipturus oxyrhinchus.*

Based on ICES approach to data-limited stocks, ICES advises that catches should be decreased by 20%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for these stocks, at present

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

Dipturus nidarosiensis must be released, unharmed where possible, when captured.

Stock status

F (Fishing Mortality)	2009–2011
Qualitative evaluation	? Unknown

SSB (Spawning-Stock Biomass)	2009–2011
Qualitative evaluation	? Unknown

There is insufficient survey or abundance data available to assess these species individually. There is insufficient information to present trends in species-specific landings.

Management plans

No specific management objectives are known to ICES.

Biology

Most of these species are medium- to large-bodied skates and are therefore highly vulnerable to overexploitation.

The fisheries

These species are bycaught in small quantities in demersal fisheries.

Quality considerations

Since legal obligations to declare most demersal elasmobranchs to species level were introduced, a greater proportion of data are reported to this level. This information covers too short a time period to influence advice at the present time, and in some instances there are data quality issues, e.g. identification of *Dipturus* species.

The advice is based on a precautionary reduction of catches because of missing or non-representative data. The methods applied to derive quantitative advice for data-limited stocks are expected to evolve as they are further developed and validated.

Scientific basis

Assessment type	No assessment.
Discards and bycatch	Data not examined. Improved knowledge of discard rates and discard survival is required.
Indicators	None.
Other information	Life history.
Working group report	WGEF

ECOREGION Celtic Sea and west of Scotland
STOCK Other ray and skate species in Subarea VI and Divisions VIIa–c, e–j

Reference points

No reference points are defined for this stock.

Outlook for 2013 and 2014

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

ICES approach to data-limited stocks

For data-limited stocks without information on abundance or exploitation ICES considers that a precautionary reduction of catches should be implemented, unless there is ancillary information clearly indicating that the current level of exploitation is appropriate for the stock.

Following this approach, ICES advises that catches should decrease by 20% in relation to the last three years' average. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise that an individual TAC be set for these stocks, at present.

Additional measures should be identified that can regulate exploitation of this stock. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context.

Additional considerations

Management considerations

TACs only regulate the landings, and a low TAC on a low-value bycatch species could induce more discards. Because this species is usually caught as bycatch in demersal fisheries, it would benefit from a reduction in the overall demersal fishing effort.

Fisheries information

Species composition within the landings may vary annually and include species other than those already listed. Fishery-independent trawl surveys provide the longest time-series of species-specific information, although these surveys do not sample all the size classes and habitats for the various species.

Comparison with previous advice

ICES has not previously provided species-specific advice for this stock. The advice is based on category 5 of ICES approach to advice provision in data-limited situations (Table 5.4.42.16.1).

Source

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

Table 5.4.42.16.1 Other skates and rays in Divisions VIIa–c, e–j. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	ICES Species-specific landings:– minimum estimate based on reported landings
2011	No specific advice		69
2012	No specific advice		
2013	Decrease by up to 20%	-	
2014	No new advice, same as 2013	-	

Weights in tonnes.