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Report of the ICES Advisory Committee 2012

Book 2 Iceland and East Greenland

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BOOK 2

Section	Page
2 ICELAND AND EAST GREENLAND.....	1
2.1 Ecosystem Overview	1
2.2 Fishery effects on benthos and fish communities.....	1
2.3 Assessments and advice	1
2.3.1 Assessments and advice regarding protection of biota and habitats.....	1
2.3.2 Assessments and advice regarding fisheries.....	1
2.3.3 Special Requests	5
2.3.3.1 Request from Greenland on cod stocks in Greenlandic waters	5
2.4 Stock summaries	7
2.4.1.a Offshore Cod in ICES Subarea XIV (Greenland cod)	7
2.4.1.b Inshore Cod in NAFO Subarea 1 (Greenland Cod).....	14
2.4.2 Cod in Division Va (Icelandic cod).....	20
2.4.3 Haddock in Division Va (Icelandic haddock)	27
2.4.4 Saithe in Division Va (Icelandic saithe).....	33
2.4.5 Greenland halibut in Subareas V, VI, XII and XIV	41
2.4.6 Introduction to the redfish complex in Subareas V, VI, XII, XIV	53
2.4.7 Golden Redfish (<i>Sebastes marinus</i>) in Subareas V, VI, XII and XIV	65
2.4.8 Beaked Redfish (<i>Sebastes mentella</i>) in Division Va and Subarea XIV (Icelandic Slope stock)..	72
2.4.9 Beaked Redfish (<i>Sebastes mentella</i>) in Subareas V, XII, XIV and NAFO Subareas 1+2 (Shallow Pelagic stock <500 m).....	78
2.4.10 Beaked Redfish (<i>Sebastes mentella</i>) in Subareas V, XII, XIV and NAFO Subareas 1+2 (Deep Pelagic stock >500 m)	87
2.4.11 Beaked Redfish (<i>Sebastes mentella</i>) in subarea XIVb (Demersal)	94
2.4.12 Capelin in Subareas V and XIV and Division IIa west of 5°W (Iceland–East Greenland–Jan Mayen area).....	100
2.4.13 Herring in Division Va (Icelandic summer-spawning herring).....	106

2 ICELAND AND EAST GREENLAND

2.1 Ecosystem overview

This Section has not been updated in 2012. The most recent ecosystem overview is available in ICES Advisory Report 2008, Section 2.1. This overview can also be found on the ICES website: <http://www.ices.dk/advice/icesadvice.asp>.

2.2 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 2.2. This description can also be found on the ICES website: <http://www.ices.dk/advice/icesadvice.asp>.

2.3 Assessments and Advice

2.3.1 Assessment and advice regarding protection of biota and habitats

In 2011, ICES has not provided advice regarding protection of biota and habitats for this area.

2.3.2 Assessments and Advice regarding fisheries

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 2.3. This description can also be found on the ICES website: <http://www.ices.dk/advice/icesadvice.asp>.

Table 2.3.2.1 State of the stock and advice in the Iceland and East Greenland ecoregion.

Single-stock exploitation boundaries and critical stocks

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.

Stock	State of the stock				Outlook options			ICES advice for 2012 (in tonnes or effort)
	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 (within the precautionary approach)	Precautionary approach / considerations	Management plan	
Inshore cod in NAFO Subarea 1 (Greenland cod)	Unknown ?	Unknown ?	Qualitative evaluation: ↗ Increasing		-	Catches should not increase beyond 8000 t on basis of average catches over the last 10 years	-	Precautionary approach: Catches should not increase beyond 8000 t on basis of average catches over the last 10 years
Offshore cod in ICES Subarea XIV and NAFO Subarea 1 (Greenland cod)	Unknown ?	Unknown ?	Qualitative evaluation: → Local high densities		-	No offshore fishery should take place in 2013	-	Precautionary considerations: No offshore fishery should take place in 2013
Icelandic cod	Appropriate ✓	Harvested sustainably ✓	Above trigger ✓	Full capacity reproductive ✓	-	-	Landings in the fishing year 2011/2012 should be no more than 196 000 t.	Management plan: landings in the fishing year 2011/2012 should be no more than 196 000 t.
Icelandic haddock	Undefined ?	Harvested unsustainably ✗	Undefined ?	Full capacity reproductive ✓	-	Catches in 2013 should be no more than 32 000 t	-	Precautionary approach: Catches in 2013 should be no more than 32 000 t
Icelandic saithe	Appropriate ✓	Undefined ?	Above target ✓	Full capacity reproductive ✓	Catches in 2013 should be no more than 49 000 t	-	-	MSY approach: catches in 2013 should be no more than 49 000 t
Greenland halibut	Above target ✗	Undefined ?	Qualitative evaluation: ✓ Above possible reference points		-	Landings in 2013 should be no more than 20 000 t	-	MSY approach: Landings in 2013 should be no more than 20 000 t
Golden redfish <i>Sebastes marinus</i>	Unknown ?	Unknown ?	Undefined ?	Full capacity reproductive ✓	-	Catches should be no more than 40 000 t	-	Precautionary considerations: that catches should be no more than 40 000 t

Stock	State of the stock				Outlook options			ICES advice for 2012 (in tonnes or effort)
	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 (within the precautionary approach)	Precautionary approach / considerations	Management plan	
Beaked redfish <i>Sebastes mentella</i> (Icelandic slope stock)	Unknown ?	Unknown ?	Qualitative evaluation: → Without trend		-	ICES advises that catches are set no higher than 10 000 t as a starting point for the adaptive part of the management plan.	-	Precautionary approach: ICES advises that catches are set no higher than 10 000 t as a starting point for the adaptive part of the management plan.
Beaked redfish <i>Sebastes mentella</i> (Shallow pelagic stock)	Unknown ?	Unknown ?	Qualitative evaluation: ✗ Stable at very low		-	No directed fishery should be conducted and bycatch of this stock in non-directed fisheries should be kept as low as possible	-	Precautionary considerations: that no directed fishery should be conducted and bycatch of this stock in non-directed fisheries should be kept as low as possible
Beaked redfish <i>Sebastes mentella</i> (Deep pelagic stock)	Unknown ?	Unknown ?	Qualitative evaluation: → Stable		-	Catches should be reduced to less than 20 000 t and a management plan should be developed and implemented	-	Precautionary considerations: Catches should be reduced to less than 20 000 t and a management plan should be developed and implemented
Beaked Redfish (<i>Sebastes mentella</i>) in Subarea XIVb (Demersal)	Unknown ?	Unknown ?	Qualitative evaluation: ↘ Declining		-	Catches should be reduced from the current level to no more than 3500 t	-	Precautionary approach: catches should be reduced from the current level to no more than 3500 t 1000 t
Icelandic Capelin	Undefined ?	Undefined ?	Qualitative evaluation: → Stable above average		-	No fishery until new information on stock size becomes available that proves SSB to be above the escapement threshold	-	Precautionary considerations: No fishery until new information on stock size becomes available that proves SSB to be above the escapement threshold
Icelandic summer-spawning herring	Appropriate ✓	Harvested sustainably ✓	Above trigger ✓	Full reproductive capacity ✓	Catches in 2012/2013 should be no more than 67 000 t	-	-	MSY approach: Catches in 2012/2013 should be no more than 67 000 t

Table 2.3.2.2 Summary of the stock categories in the Iceland and East Greenland ecoregion (see section 1.2 for category definitions).

Total Number of stock in the ecoregion	12
Data rich stocks	5
Data-limited stocks	7

Table 2.3.2.3 Status of data rich stocks (n=5) for the Iceland and East Greenland 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 $B_{trigger} SSB_{2012} \geq MSY$	is below MSY $B_{trigger} SSB_{2012} < MSY B_{trigger}$	is not defined	
MSY Approach	Fishing Mortality...					
	is at or below MSY ($F_{2011} \leq F_{MSY}$)		60% (3)	-	-	
	is above MSY ($F_{2011} > F_{MSY}$)		20% (1)	-	-	
	is not defined		-	-	20% (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...					
	is at or below PA ($F_{2011} \leq F_{pa}$)		40% (2)	-	-	-
	is at increased risk ($F_{lim} > F > F_{pa}$)		-	-	-	-
	is above PA ($F_{2011} > F_{pa}$)		20% (1)	-	-	-
	is not defined		40% (2)	-	-	-

The advice for ling, blue ling, tusk, and argentinies appear in 2012 in Volume 9 on widely distributed and migratory stocks. This advice is issued only every second year.

ECOREGION **East and West Greenland**
SUBJECT **Request from Greenland on cod stocks in Greenlandic waters**

Advice summary

ICES recommends that separate assessments and advice for i) the offshore cod stocks in Greenland and for ii) inshore fjord stocks of cod in West Greenland be provided in the future, based on information that suggests isolated reproductive populations in the fjords and separate populations on the banks. ICES is currently not able to estimate or provide guidelines for biological reference points for the two stock complexes due to lack of information.

Request

Greenland has requested ICES to:

1. *ICES is requested to estimate or to provide guidelines for estimation of reference points for cod in ICES Subarea XIV and NAFO Subarea 1 (Greenlandic cod) including limit reference points or other estimates that are presently used to distinguish between a zero advice and an advice of reopening the fisheries.*
2. *ICES is requested to provide separate advice for the offshore stocks in ICES Subarea XIV and NAFO Subarea 1, and for the inshore fjord stocks in NAFO Subarea 1.*

Background

Ad 1. For Cod in ICES Subarea XIV and NAFO Subarea 1 (Greenlandic cod) ICES has in the past 20 years advised that no fishery or similar should take place based on the ceased fishery since the early 1990s and low stock and recruitment indices from surveys. With the implementation of the Precautionary Approach in the 1990s and recently the MSY framework in the ICES advisory system, various justifications have formed the basis for principally the same advice, namely zero catch. In the recent decade a number of strong year-classes of cod have been observed in Greenland waters, and these year-classes have to some extent resulted in an increase in adult biomass, although not in the expected increase. Despite these optimistic stock trends, ICES has kept its zero catch advice. The Greenland fishing industry and the Government of Greenland both have difficulties in interpreting the basis for the advice and also in understanding the necessary criteria that could allow for an opening of the fishery.

Ad 2. The cod stocks in the West Greenland fjords have supported an increasing fishery over the recent decades and the stock dynamics for the components seem to deviate from the offshore cod stock dynamic. Greenland authorities therefore aim at a separate management of the inshore fjord populations and therefore request separate assessment and advice commonly for the inshore cod. This request is further based on an assumption that the inshore cod constitute biological reproductive units. Similarly the offshore cod is expected to be comprised of reproductive units on the banks of West Greenland and East Greenland when the stocks have been rebuilt.

Basis of advice

Results and conclusions

Ad 1.

Calculation of reference points for these cod stocks was attempted during the workshop on reference points based on life history traits (WKLIFE) in February 2012 (ICES, 2012a). Several difficulties, including the inability to identify an appropriate period representative for the present biological regime, and also scarce survey and catch data, have prevented calculation of reference points for both the offshore bank stock and for the inshore fjord stocks. Therefore, ICES is presently not in a position to define reference points or to suggest candidates for reference points.

For the offshore stocks the management objective has been defined as the establishment of spawning populations on the banks, both in East and West Greenland, and subsequent robust recruitment to ensure the maintenance of the population. Since this is not assessed to be the case yet and is not foreseen to happen in the next few years, the requirement for biological reference points for the offshore stock is not immediate.

Ad 2.

Several studies on stock entity and dynamics of the Greenland cod stocks have been conducted in the past.

Historical and present recent tagging studies have shown that there is relative clear separation between fjord and bank cod in the spawning stage, north of 61°N on the west coast, but some mixing occurs at younger ages in the coastal area (Storr-Paulsen *et al.*, 2004; Hovgård and Christensen, 1990; Hansen, 1949; ICES, 2012c).

Preliminary genetics investigations had sufficient power to distinguish spawning populations (ICES, 2012d). It was found that cod spawning in inshore areas was more similar to other inshore locations than to offshore samples in West Greenland, which suggests the presence of distinct inshore and offshore genetic components with limited connectivity. This supports a previous genetic study which addresses the same issue (Pampoulie *et al.*, 2011).

Life history traits show a difference in maturity between inshore and offshore spawning cod where 50% maturity was found at approx. 60 cm and ages 5–6 for offshore spawning cod, whereas it was approx. 45 cm and ages 4–5 for the inshore spawning cod (ICES, 2008b). The comparisons were made between inshore spawning cod in West Greenland and offshore spawning cod in East Greenland as no significant data is available for the offshore spawning cod in West Greenland.

An analysis of the Fulton condition factor in the commercial catch information indicated substantial differences in the Fulton condition factor between various areas. The overall pattern was that offshore condition was significantly lower than inshore condition and that inshore condition increased when moving north along the coast of West Greenland (ICES, 2008b).

The fisheries are clearly separated between the fjords and the banks. In recent years, though, virtually no offshore fishery has been conducted, while the fjord fishery has increased to about 10 000 t.

Based on this information ICES considers it justified to assess the Greenlandic inshore cod stock separately from the offshore cod stock. Further work should however be done to further clarify the degree of connectivity between the stock components.

Sources

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- Hovgård, H., and Christensen, S. 1990. Population structure and migration patterns of Atlantic cod at West Greenland waters based on tagging experiments from 1946 to 1964. *NAFO Scientific Council Studies*, 14: 45–50.
- ICES. 2008a. Cod stocks in the Greenland area (NAFO Area 1 and ICES Subdivision XIVb). *In* Report of the North-Western Working Group (NWWG).
- ICES. 2008b. Greenland survey results and commercial data for Atlantic cod in Greenland inshore and offshore waters for 2006 and 2007, by H. Hovgård and A. Retzel. North-Western Working Group (NWWG) WD 19.
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- ICES. 2012c. A short review of available mark-recapture studies on Atlantic cod (*Gadus morhua*) in Greenland with the objective to separate in- and offshore components, by R. Hedeolm, A. Retzel, and J. Boje. North-Western Working Group (NWWG) WD 12.
- ICES. 2012d. Genetic differentiation in Atlantic cod (*Gadus morhua*) in Greenland – preliminary results, by R. Hedeolm, A. Retzel, and N. O. Therkildsen. North-Western Working Group (NWWG) WD 13.
- Pampoulie, C., Daniëlsdóttir, A. K., Storr-Paulsen, M., Hovgård, H., Hjörleifsson, E., and Steinarsson, B. Æ. 2011. Neutral and Nonneutral Genetic Markers Revealed the Presence of Inshore and Offshore Stock Components of Atlantic Cod in Greenland Waters. *Transactions of the American Fisheries Society*, 140(2): 307–319.
- Storr-Paulsen, M., Wieland, K., Hovgård, H., and Rätz, H-J. 2004. Stock structure of Atlantic cod (*Gadus morhua*) in West Greenland waters: implications of transport and migration. *ICES Journal of Marine Science*. 61: 972–982.

ECOREGION Iceland and East Greenland
STOCK Offshore cod in ICES Subarea XIV and NAFO Subarea 1
 (Greenland cod)

Advice for 2013

ICES advises on the basis of precautionary considerations that no offshore fishery should take place in 2013, to improve the likelihood of establishing offshore spawning stocks in West and East Greenland.

Stock status

F (Fishing Mortality)	
	2009-2011
MSY (F_{MSY})	? Unknown
Precautionary approach (F_{pa}, F_{lim})	? Unknown
SSB (Spawning-Stock Biomass)	
	2009-2011
MSY ($B_{trigger}$)	? Unknown
Precautionary approach (B_{pa}, B_{lim})	? Unknown
Qualitative evaluation	➔ Local high densities

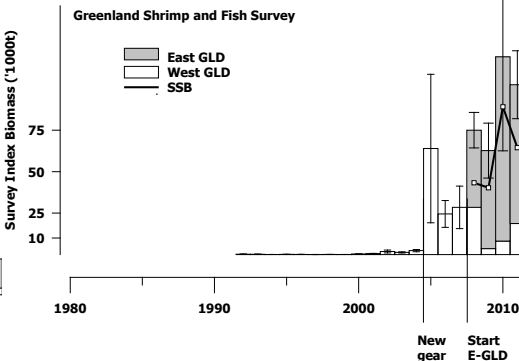
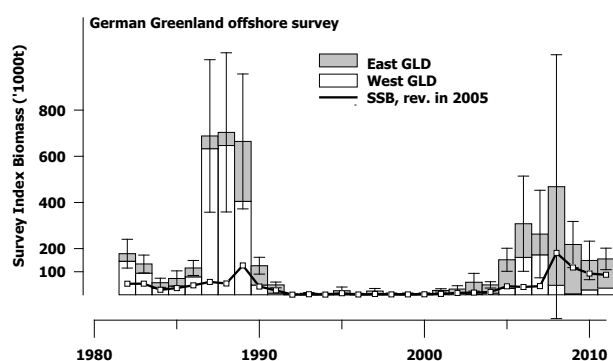
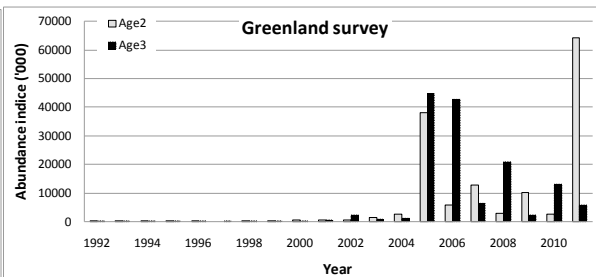
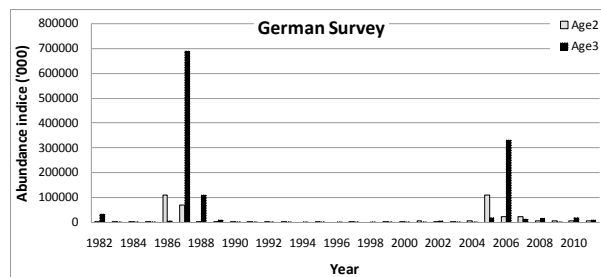
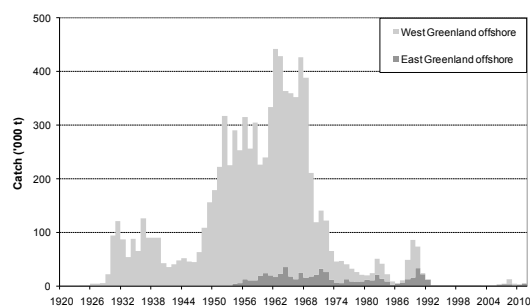


Figure 2.4.1a.1 Offshore cod in ICES Subarea XIV and NAFO Subarea 1 (Greenland cod). Upper left: landings. Middle panels: offshore recruitment indices West Greenland (ages 2 and 3, Greenland survey) and offshore recruitment indices East and West Greenland combined (ages 2 and 3, German survey). Lower panels: biomass indices from German (left) and Greenland surveys (right).

All information indicates that the offshore cod biomass is low compared to before the 1990s. The offshore component has been severely depleted since 1990, but has started to recover since 2005.

Management plans

In 2011 a management plan was agreed for the offshore cod stocks. The overall objective is to rebuild the stock and the following objectives are defined:

- Establishment of offshore spawning population in both West and East Greenland;
- Stable recruitment from this spawning population as an indicator of a stable/robust condition of the spawning population.

Overall strategy to fulfil the objective:

- ICES advice must be followed.

Initiative to fulfil these objectives:

- Yearly scientific surveys in order to monitor the spawning population and recruitment;
- Biological sampling from any experimental fishery;
- Increased logbook requirements for any experimental fishery.

The management plan has not been evaluated by ICES.

Biology

Cod in Greenland derives from three stock components, labeled by their spawning areas: I) an offshore Greenland spawning stock, II) spawning populations of inshore West Greenland fiords, and III) Icelandic spawned cod that drift to Greenland as larvae in the Irminger Current. Especially the Icelandic inputs are believed to have been responsible for the previous large year classes in Greenland (i.e. 1984 and 2003). A proportion of these cod return to Iceland when reaching maturity.

Environmental influence on the stock

Deterioration of the environmental conditions, combined with high fishing mortality, caused the offshore cod stock to be severely depleted in the 1970s. However, recent warming and documented offshore spawning, especially in East Greenland waters, indicate that environmental conditions have changed around Greenland, and continued warming can be expected. Environmental conditions may continue to lead to enhanced productivity of cod.

The fisheries

In 2011 90% of the landings were taken in East Greenland. Cod is taken in a targeted trawl fishery and to a lesser extent by longliners. Bycatches of juvenile cod occur mainly in the shrimp fishery. Before the introduction of the sorting grid in 2002, a large amount of juvenile cod may have been caught in the shrimp fishery, but the present bycatches are estimated to be insignificant.

Catch distribution	Total catch (2011) is 5129 kt, where 97% are landings (79% trawl, 21% long-line), 0% discards, 3% industrial bycatch, and 0% unaccounted removals.
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Quality considerations

Both surveys in the area are considered adequate as a biomass indicator for cod. The Greenland shrimp and fish survey time-series is, however, short as East Greenland was first covered from 2008, and the German autumn groundfish survey has in recent years had incomplete coverage. In recent years the quality and quantity of sampling from the industry has improved greatly in compliance with the license agreement.

Scientific basis

Assessment type	Qualitative stock trends.
Input data	Two survey indices: Greenland fish and shrimp survey, German groundfish survey.
Discards and bycatch	Not available, but not considered relevant.
Indicators	None.
Other information	None.
Working group report	NWVG

ECOREGION **Iceland and East Greenland**
STOCK **Offshore cod in ICES Subarea XIV and NAFO Subarea 1**
(Greenland cod)

Reference points

No reference points are defined for this stock. In 2012 Greenland requested ICES to estimate or to provide guidelines for the estimation of reference points for this stock, but ICES has not been able to provide this at present (see Section 2.3.3.1).

Outlook for 2013

No analytical assessment is available for this stock because of the lack of a time-series of landings since 1993. Therefore, fishing possibilities cannot be projected.

Precautionary considerations

ICES advises that no fishery should take place in 2013 to allow for rebuilding of the offshore spawning stocks in West and East Greenland in accordance with the management plan. Though the stock has been slightly increasing in recent years, it is still far below any possible biomass reference points.

Additional considerations

No offshore fisheries have taken place over a period of 13 years (1993–2004). An offshore cod directed fishery commenced in 2005. Offshore catches peaked in 2008 with annual catches of 13 000 t. Since 2008 offshore catches have declined due to area closure and emigration of the 2003 year class. Surveys indicate a large 2003 year class, the first significant year class since 1985. In 2011 the 2009 year class was recorded in the Greenland shrimp and fish survey in West Greenland in considerable numbers (Figure 2.4.1a.1). The German groundfish survey did not record this year class in as high numbers since it was found north of 66°N, and the German survey in West Greenland stopped at 64°N in 2011.

Management considerations

To ensure the survival of the relatively abundant 2009 year class presently observed in Greenland waters and to build the biomass and age composition, no offshore fishery should take place in 2013.

A redfish fishery in East Greenland has been developing in recent years and the fishery takes place in regions of cod spawning aggregations. Measures should be implemented to minimize the bycatch of cod.

In the last century, migration of adult cod from Greenland to Icelandic waters is indicated by results from tagging returns and catch-at-age anomalies. The high abundance of larvae in East Greenland waters in years with high recruitments in Iceland indicate that some of these year classes originate from spawning in Iceland. Based on catch-at-age data anomalies attempts have been made to estimate the extent of the migration in the historical part of the assessment. Tag returns and survey estimates in Greenlandic waters as well as anomalies in the catch-at-age matrix in Iceland, indicate that a portion of the moderate 2003 year class observed in Greenlandic waters in recent years may have migrated to Icelandic waters in 2009. No sustainable offshore cod fishery at Greenland can presently be based on the infrequent inflow of cod from Iceland waters.

Regulations and their effects

Regulations in the offshore fisheries include quota constraints, closed areas, minimum mesh size, and minimum landing size (40 cm). Greenland has set an offshore cod TAC of 5000 t in 2012 as a limited fishery in order to provide information. In East Greenland east of 44°W, fishing is only allowed from 1 July–31 December, and the “Kleine Bank” area in East Greenland is closed for all fisheries. This area is delimited by: 1) 64°40'N 37°30'W, 2) 64°40'N 36°30'W, 3) 64°15'N 36°30'W, and 4) 64°15'N 37°30'W.

Comparison with previous assessment and advice

The assessment and advice are the same as in previous years.

Sources

Horsted, S. A. 1994. A review with some proposals for amendments of the catch statistics for the cod fisheries in Greenland waters since 1911. NAFO SCR Doc., No. 38, Serial No. N2407. 33 pp. (mimeo).

Horsted, S. A. 2000. A review of the cod fisheries at Greenland, 1910–1995. *Journal of Northwest Atlantic Fishery Science*, 28: 1–112.

ICES. 2012. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.

Table 2.4.1a.1 Offshore cod in ICES Subarea XIV (Greenland cod). ICES advice, management, and catches.

Year	ICES advice for Subarea XIV ¹	Pred. catch corresp. to advice	TAC			Catch		
			East	West	Total	East	West	Total
1987	TAC	5	11.5	12.5		7	4	11
1988	No increase in F	10 ²	11.5	53		12	37	49
1989	TAC	5	15	90		15	70	85
1990	No specific recommendation	-	15	110	125	34	40	74
1991	No advice	-	25	90	115	22	2	24
1992	No advice	-	17.25	66	99.25	11	<1	11
1993	No fishing	0	17.25	66	83.25	1	0	1
1994	No fishing on offshore stock complex	0	17.25	66	83.25	< 1	0	<1
1995	No fishing on offshore stock complex	0	17.25	66	83.25	< 1	0	<1
1996	No fishing on offshore stock complex	0	17.25	66	83.25	< 1	0	<1
1997	No fishing on offshore stock complex	0	17.25	66	83.25	< 1	0	<1
1998	No fishing on offshore stock complex	0	17.25	66	83.25	< 1	0	<1
1999	No fishing on offshore stock complex	0	17.25	66	83.25	< 1	0	<1
2000	No commercial fishing	0	17.25	66	83.25	< 1	0	<1
2001	No commercial fishing	0	17.25	66	83.25 ³	< 1	0	<1
2002	No commercial fishing	0			54.25 ³	<1	0	<1
2003	No commercial fishing	0			54.25 ³	<1	<1	<1
2004	No commercial fishing	0			5	<1	<1	<1
2005	No fishing	0			5	<1	<1	1
2006	No fishing	0			5	2	<1	2
2007	No fishing	0			5	3	2	5
2008	No fishing	0			15	3	10	13
2009	No fishing	0			10	2	3	5
2010	No fishing	0			5	2	<1	2
2011	No fishing	0			5	5	<1	5
2012	No fishing	0			5			
2013	No fishing	0						

Weights in thousand tonnes.

¹Advice for NAFO Subarea 1 provided by NAFO Scientific Council.

²Preliminary catch corresponding to advice.

³Since 2001 the agreed TAC has been based on a variable system accounting for the actual stock status and more flexibility between East and West Greenland. The given TAC figures represent the maximum levels that could be taken in case of stock recovery only.

Previously assessed together with the inshore cod (Cod in ICES Subarea XIV and NAFO Subarea 1 (Greenland cod)).

Table 2.4.1a.2

German survey, catch curve analysis. Year-class mortalities at ages 4–8 estimated from German survey catch-at-age data. No values for year classes 1986–1997 due to many zeros in the catch-at-age data. Yellow highlights strong year classes.

YC	Z (4–8)	R2	Ages in analysis
1982	1.04	0.68	no 7-year-olds
1983	1.46	0.95	
1984	1.57	0.96	no 8-year-olds
1985	2.42	0.95	no 8-year-olds
1986			
1987			
1988			
1989			
1990			
1991			
1992			
1993			
1994			
1995			
1996			
1997			
1998	0.41	0.52	
1999	0.32	0.59	
2000	0.13	0.08	
2001	0.43	0.46	
2002	0.55	0.81	
2003	0.85	0.97	

Table 2.4.1a.3

Cod off Greenland (inshore and offshore components). Catches (t) as used by the Working Group, inshore total and offshore divided into East and West Greenland, and total. Data until 1995 are based on Horsted (1994, 2000). * indicates preliminary results.

Cod		Offshore			Total
Year	Total inshore	East	West	Total offshore	Greenland
1924	843		200	200	1043
1925	1024		1871	1871	2895
1926	2224		4452	4452	6676
1927	3570		4427	4427	7997
1928	4163		5871	5871	10034
1929	7080		22304	22304	29384
1930	9658		94722	94722	104380
1931	9054		120858	120858	129912
1932	9232		87273	87273	96505
1933	8238		54351	54351	62589
1934	9468		88122	88122	97590
1935	7526		65846	65846	73372
1936	7174		125972	125972	133146
1937	6961		90296	90296	97257
1938	5492		90042	90042	95534
1939	7161		89807	89807	96968
1940	8026		43122	43122	51148
1941	8622		35000	35000	43622
1942	12027		40814	40814	52841
1943	13026		47400	47400	60426
1944	13385		51627	51627	65012
1945	14289		45800	45800	60089
1946	15262		44395	44395	59657
1947	18029		63458	63458	81487
1948	18675		109058	109058	127733
1949	17050		156015	156015	173065
1950	21173		179398	179398	200571
1951	18200		222340	222340	240540
1952	16726		317545	317545	334271
1953	22651		225017	225017	247668
1954	18698	4321	286120	290441	309139
1955	19787	5135	247931	253066	272853
1956	21028	12887	302617	315504	336532
1957	24593	10453	246042	256495	281088
1958	25802	10915	294119	305034	330836
1959	27577	19178	207665	226843	254420
1960	27099	23914	215737	239651	266750
1961	33965	19690	313626	333316	367281
1962	35380	17315	425278	442593	477973
1963	23269	23057	405441	428498	451767
1964	21986	35577	327752	363329	385315
1965	24322	17497	342395	359892	384214
1966	29076	12870	339130	352000	381076
1967	27524	24732	401955	426687	454211
1968	20587	15701	373013	388714	409301
1969	21492	17771	193163	210934	232426

Table 2.4.1.3a continued Cod off Greenland (inshore and offshore components). Catches (t) as used by the Working Group, inshore total and offshore divided into East and West Greenland, and total. Data until 1995 are based on Horsted (1994, 2000). * indicates preliminary results.

Cod		Offshore			Total
Year	Total inshore	East	West	Total offshore	Greenland
1970	15613	20907	97891	118798	134411
1971	13506	32616	107674	140290	153796
1972	14645	26629	95974	122603	137248
1973	9622	11752	53320	65072	74694
1974	8638	6553	39396	45949	54587
1975	6557	5925	41352	47277	53834
1976	5174	13027	28114	41141	46315
1977	13999	8775	23997	32772	46771
1978	19679	7827	18852	26679	46358
1979	35590	8974	12315	21289	56879
1980	38571	11244	8291	19535	58106
1981	39703	10381	13753	24134	63837
1982	26664	20929	30342	51271	77935
1983	28652	13378	27825	41203	69855
1984	19958	8914	13458	22372	42330
1985	8441	2112	6437	8549	16990
1986	5302	4755	1301	6056	11358
1987	18486	6909	3937	10846	29332
1988	18791	12457	36824	49281	68072
1989	38529	15910	70295	86205	124734
1990	28799	33508	40162	73670	102469
1991	18311	21596	2024	23620	41931
1992	5723	11349	4	11353	17076
1993	1924	1135	0	1135	3059
1994	2115	437	0	437	2552
1995	1710	284	0	284	1994
1996	948	192	0	192	1140
1997	1186	370	0	370	1556
1998	323	346	0	346	669
1999	622	112	0	112	734
2000	764	100	0	100	864
2001	1680	221	0	221	1901
2002	3698*	448	0	448	4146
2003	5215*	286	7	293	5508
2004	4948*	369	27	396*	5344
2005	6043	773	75	847*	6890*
2006	7388*	1981	408	2389	9777*
2007	11693	3221	1620	4841	16533
2008	12270	2997	9651	12648	24918
2009	7672	1720	3286	5006	12678
2010	9270	2127	290	2417	11687
2011	11007	4579	550	5129	16136

ECOREGION Iceland and East Greenland
STOCK Inshore cod in NAFO Subarea 1 (Greenland cod)

Advice for 2013

ICES advises, based on the precautionary approach, that catches should not increase beyond 8000 t on basis of average catches over the last 10 years.

Stock status

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

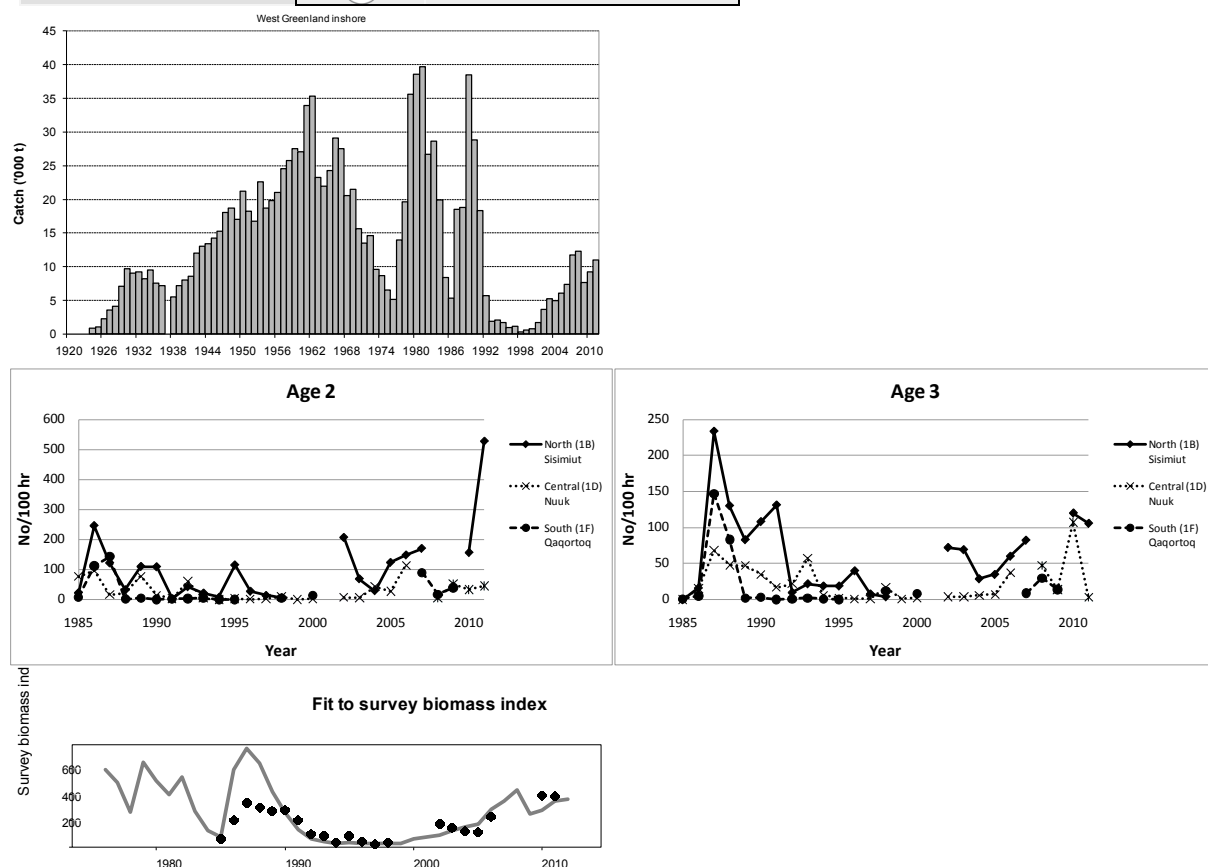


Figure 2.4.1b.1 Inshore Cod in NAFO Subarea 1 (Greenland cod). Upper left: landings; Middle: inshore recruitment index ages 2 and 3 (West Greenland gillnet survey); Lower: results from the exploratory statistical catch-at-age model, showing the model fit (black line) to the observed survey biomass index.

The recruitment and the biomass of the Greenland inshore cod have been increasing in recent years, and catches have been increasing. Several year classes are seen in the landings and the average size in landings has increased in the past six years. The stock size and exploitation rates are however unknown.

Management plans

There is no management plan for the Greenland inshore cod.

Biology

In recent years, inshore cod spawning has been documented in numerous fjords, especially on the Greenland west coast. These extend from Kap Farvel (60°N) at the southern tip of Greenland to the Uummannaq area (72°N). Spawning in the Nuuk (64°N) and Sisimiut (68°N) fjord areas is believed to be of particular importance. Recent genetic studies, knowledge on life history traits, and reviewed information on tagging all indicate separation from the offshore stock component. The Greenland Government has requested separate advice for the inshore cod component in 2011 (Section 2.3.3.1).

Environmental influence on the stock

Cod in Greenland live close to the distributional limit, which renders the population vulnerable to environmental fluctuations – especially in the northern fjords, where cod spawning is not believed to have been common prior to recent warming. To what extent these effects are direct temperature effects or indirect feeding-related effects is unknown. It is believed that the inshore Greenland cod rely on capelin, at least during the summer period.

The fisheries

No trawling is allowed in the inshore area. Inshore cod is primarily targeted by poundnets in the summer months (June–September, ~85% of catches) close to shore in shallow waters, and partly using longlines and gillnets during winter. The dominating poundnet fishery is gentle and fish under the legal size can be released. No other fisheries in the fjord catch cod as bycatch.

Catch distribution	Total catches (2011) are 11007 t, where 100% landings (80% gear-type poundnet and 20% handlines, longlines, gillnets, and other gear types). 0% discards, 0% industrial bycatch, and 0% unaccounted removals.
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Quality considerations

The recruitment gillnet survey has low coverage in some years, but is in most years considered adequate as a measure of recruitment (ages 2 and 3). Overall landings statistics are reliable but the more detailed information, such as fishing effort and precise fishing grounds, is limited (no logbook data prior to 2008) and the quality is questionable. Sampling from the fishery is considered good, covering large parts of the area and season. The quality of these inputs was considered sufficient to allow for exploratory model runs (statistical catch-at-age).

The present survey presently only targets juveniles.

Scientific basis

Assessment type	Qualitative.
Input data	One survey indices: West Greenland inshore gillnet survey, landings, catch-at-age.
Discards and bycatch	Not relevant (0 t).
Indicators	None.
Other information	None.
Working group report	NWWG

ECOREGION **Iceland and East Greenland**
STOCK **Inshore cod in NAFO Subarea 1 (Greenland cod)**

Reference points

No reference points are defined for this stock.

Management plan

There are no explicit management objectives for the inshore cod in Greenland.

Precautionary approach

ICES advises that catches should not exceed 8000 t, which is the average catch for the past 10 years and represents the latest period of fishery.

Additional considerations

Landings by the coastal fleet component have increased by a factor of ten over the last decade. The dynamics of recent year classes differ for inshore and offshore areas, indicating differences in environment and stock dynamics. The recruitment index of the 2009 year class is the highest recorded in the time-series in the northern part of the survey area (Figure 2.4.1b.1). A large 2005 year class is recognized, which is believed to be partly of offshore origin.

Management considerations

Presently, no management objectives have been set for this stock. It should be noted that the inshore cod tend to form dense spawning aggregations in limited areas, providing a possibility for spatial management measures such as closed areas and times, especially if the stock shows a declining trend. This is especially important in areas that are considered to have maintained the stocks in periods of overall stock decline in Greenland (i.e. the Nuuk and Sisimiut fjords).

Migration of young cod (3–6 years) in the last century, from the offshore regions to the coastal regions in West Greenland, is indicated by results from tagging returns. High abundance of young cod in offshore West Greenland waters in years where recruitments has been high in the offshore region indicate that some of these year classes in the coastal region have originated from offshore spawning. Strong year classes in the fjords, however, are believed to originate from local spawning stocks, as tagging returns indicate that only the coastal region is a zone of mixing between young inshore and offshore cod.

Quality considerations

Exploratory model runs (statistical catch-at-age) were performed using landings and the inshore gillnet survey as well as catch-at-age in both survey and landings, but further development is needed before advice can be based on these runs.

Regulations and their effects

The TAC for the coastal fleet is set at 15 000 t in 2012. The fleet is limited by gear, vessel size, and minimum landing size (40 cm), and operates in inshore and coastal waters.

Comparison with previous assessment and advice

This is the first year an assessment and advice has been drafted for this stock.

Sources

- Horsted, S. A. 1994. A review with some proposals for amendments of the catch statistics for the cod fisheries in Greenland waters since 1911. NAFO SCR Doc., No. 38, Serial No. N2407. 33 pp. (mimeo).
 Horsted, S. A. 2000. A review of the cod fisheries at Greenland, 1910–1995. Journal of Northwest Atlantic Fishery Science, 28: 1–112.
 ICES. 2012. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.

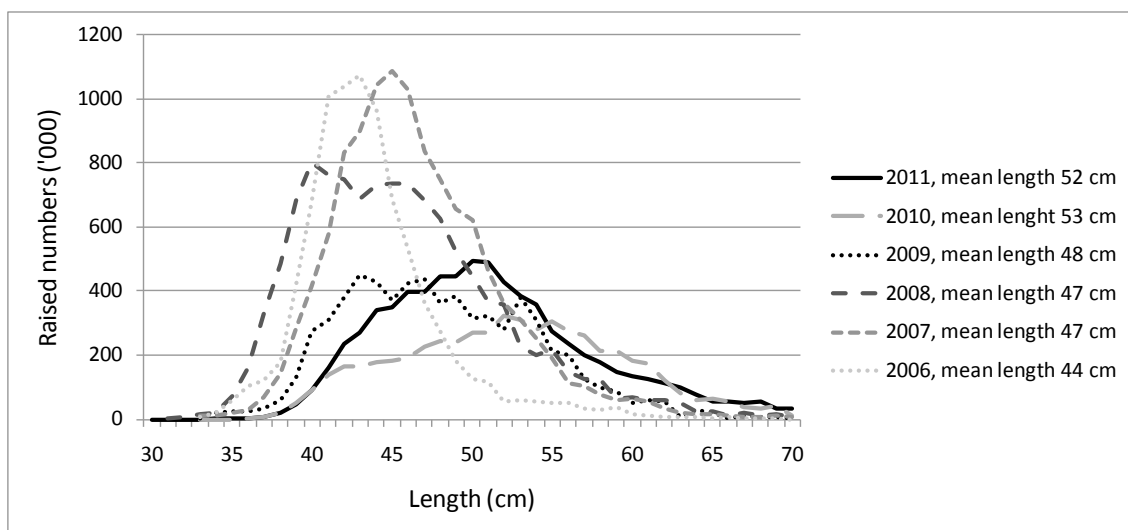


Figure 2.4.1b.2 Length distribution in the inshore fishery in the period 2006–2011.

Table 2.4.1b.1 Inshore cod in NAFO Subarea 1 (Greenland cod). ICES advice, management, and catches.

Year	ICES advice for NAFO Subarea 1	Pred. catch corresp. to advice	TAC		Catch
			Coastal	West inshore	
2013	8				

Weights in thousand tonnes.

Previously assessed together with the offshore cod (Cod in ICES Subarea XIV and NAFO Subarea 1 (Greenland cod)).

Table 2.4.1b.3

Cod off Greenland (inshore and offshore components). Catches (t) as used by the Working Group, inshore total and offshore divided into East and West Greenland and total. Data until 1995 are based on Horsted (1994, 2000). * indicates preliminary results.

Cod		Offshore			Total
Year	Total inshore	East	West	Total offshore	Greenland
1924	843		200	200	1043
1925	1024		1871	1871	2895
1926	2224		4452	4452	6676
1927	3570		4427	4427	7997
1928	4163		5871	5871	10034
1929	7080		22304	22304	29384
1930	9658		94722	94722	104380
1931	9054		120858	120858	129912
1932	9232		87273	87273	96505
1933	8238		54351	54351	62589
1934	9468		88122	88122	97590
1935	7526		65846	65846	73372
1936	7174		125972	125972	133146
1937	6961		90296	90296	97257
1938	5492		90042	90042	95534
1939	7161		89807	89807	96968
1940	8026		43122	43122	51148
1941	8622		35000	35000	43622
1942	12027		40814	40814	52841
1943	13026		47400	47400	60426
1944	13385		51627	51627	65012
1945	14289		45800	45800	60089
1946	15262		44395	44395	59657
1947	18029		63458	63458	81487
1948	18675		109058	109058	127733
1949	17050		156015	156015	173065
1950	21173		179398	179398	200571
1951	18200		222340	222340	240540
1952	16726		317545	317545	334271
1953	22651		225017	225017	247668
1954	18698	4321	286120	290441	309139
1955	19787	5135	247931	253066	272853
1956	21028	12887	302617	315504	336532
1957	24593	10453	246042	256495	281088
1958	25802	10915	294119	305034	330836
1959	27577	19178	207665	226843	254420
1960	27099	23914	215737	239651	266750
1961	33965	19690	313626	333316	367281
1962	35380	17315	425278	442593	477973
1963	23269	23057	405441	428498	451767
1964	21986	35577	327752	363329	385315
1965	24322	17497	342395	359892	384214
1966	29076	12870	339130	352000	381076
1967	27524	24732	401955	426687	454211
1968	20587	15701	373013	388714	409301
1969	21492	17771	193163	210934	232426

Table 2.4.1.3b continued Cod off Greenland (inshore and offshore components). Catches (t) as used by the Working Group, inshore total and offshore divided into East and West Greenland and total. Data until 1995 are based on Horsted (1994, 2000). * indicates preliminary results.

Cod		Offshore			Total
Year	Total inshore	East	West	Total offshore	Greenland
1970	15613	20907	97891	118798	134411
1971	13506	32616	107674	140290	153796
1972	14645	26629	95974	122603	137248
1973	9622	11752	53320	65072	74694
1974	8638	6553	39396	45949	54587
1975	6557	5925	41352	47277	53834
1976	5174	13027	28114	41141	46315
1977	13999	8775	23997	32772	46771
1978	19679	7827	18852	26679	46358
1979	35590	8974	12315	21289	56879
1980	38571	11244	8291	19535	58106
1981	39703	10381	13753	24134	63837
1982	26664	20929	30342	51271	77935
1983	28652	13378	27825	41203	69855
1984	19958	8914	13458	22372	42330
1985	8441	2112	6437	8549	16990
1986	5302	4755	1301	6056	11358
1987	18486	6909	3937	10846	29332
1988	18791	12457	36824	49281	68072
1989	38529	15910	70295	86205	124734
1990	28799	33508	40162	73670	102469
1991	18311	21596	2024	23620	41931
1992	5723	11349	4	11353	17076
1993	1924	1135	0	1135	3059
1994	2115	437	0	437	2552
1995	1710	284	0	284	1994
1996	948	192	0	192	1140
1997	1186	370	0	370	1556
1998	323	346	0	346	669
1999	622	112	0	112	734
2000	764	100	0	100	864
2001	1680	221	0	221	1901
2002	3698*	448	0	448	4146
2003	5215*	286	7	293	5508
2004	4948*	369	27	396*	5344
2005	6043	773	75	847*	6890*
2006	7388*	1981	408	2389	9777*
2007	11693	3221	1620	4841	16533
2008	12270	2997	9651	12648	24918
2009	7672	1720	3286	5006	12678
2010	9270	2127	290	2417	11687
2011	11007	4579	550	5129	16136

ECOREGION Iceland and East Greenland
STOCK Cod in Division Va (Icelandic cod)

Advice for 2012/2013

ICES advises on the basis of the Icelandic 2009 management plan that landings in the fishing year 2012/2013 should be no more than 196 000 t.

Stock status

	F (Fishing Mortality)		
	2009	2010	2011
MSY (F_{MSY})	✓	✓	✓ Below possible candidate
Precautionary approach (F_{pa}, F_{lim})	✓	✓	✓ Below possible candidate F_{pa} and F_{lim}
Management plan (HR_{MP})	✓	✓	✓ Within expected range
	SSB (Spawning-stock Biomass)		
	2010	2011	2012
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{lim})	✓	✓	✓ Full reproductive capacity
Management plan ($MP_{Btrigger}$)	✓	✓	✓ Above trigger

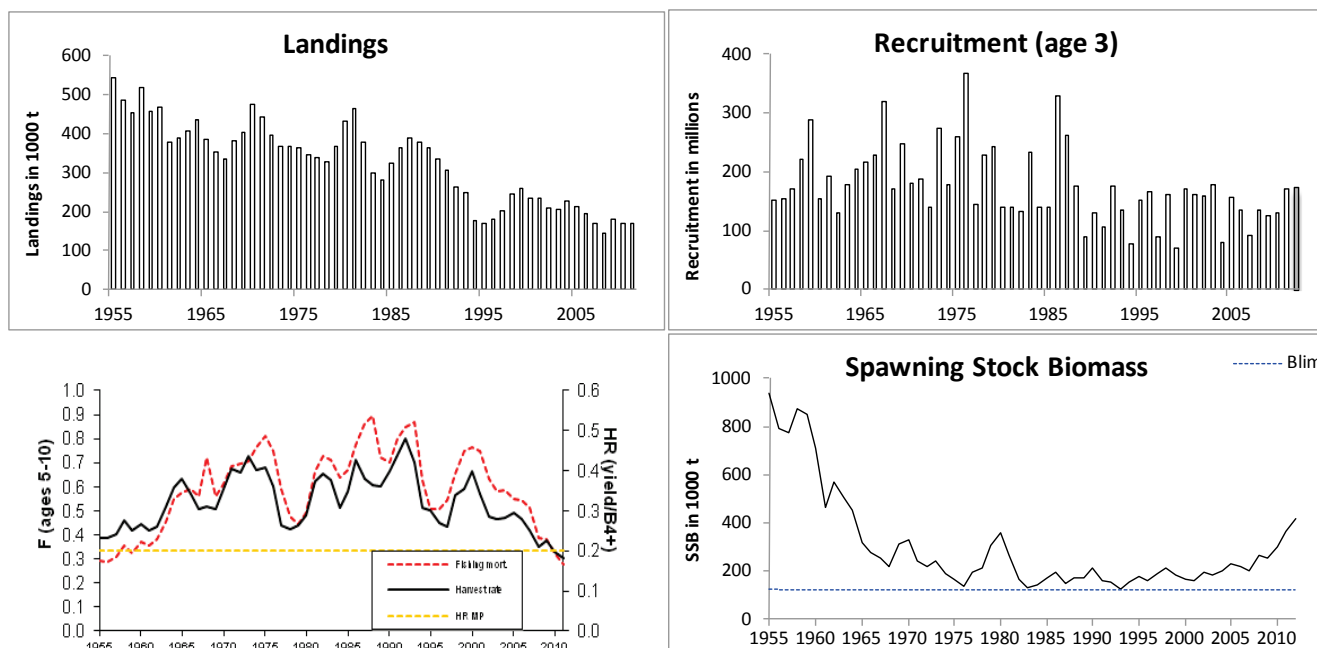
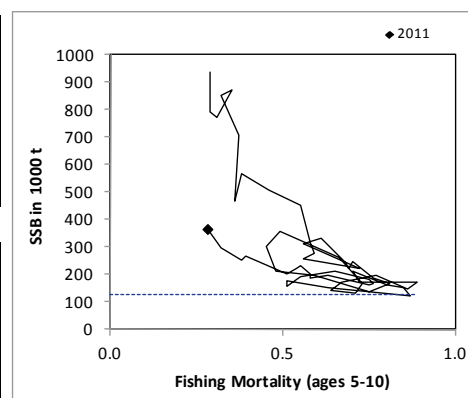


Figure 2.4.2.1 Cod in Division Va (Icelandic cod). Summary of stock assessment (weights in thousand tonnes). Top right: SSB/F for the time-series used in the assessment.

The spawning stock of Icelandic cod is increasing and is higher than has been observed over the last four decades. Fishing mortality has declined significantly in the last decade and is presently at a historical low and below likely candidates for F_{pa} and F_{lim} . Year classes since early 1990s are estimated to be stable around lower values than previously.

Management plan

In spring 2009 the Icelandic Government adopted a management plan for the Icelandic cod. ICES has evaluated the plan and concludes that it is in accordance with the precautionary approach and the ICES MSY framework.

Biology

The Icelandic cod is distributed all around Iceland. Spawning takes place in late winter mainly off the southwestern coast, but smaller and variable regional spawning components have also been observed all around Iceland. The pelagic eggs and larvae drift clockwise around the island to the main nursery ground off the north coast. A larval drift to Greenland waters has been recorded in some years and substantial immigrations of mature cod from Greenland, which are considered to be of Icelandic origin, have been observed in some years.

Environmental influence on the stock

An increased inflow of Atlantic water has been observed in Icelandic waters since 1997, resulting in higher temperature and higher salinity. A northward shift in distribution of immature capelin may be linked to these hydrographical changes, resulting in lower availability of capelin for cod. In the past low weights-at-age of cod have been related to a low biomass of capelin. In recent years the productivity of capelin has improved to some degree and may be the reason for increased weights-at-age in the cod stock.

The fisheries

Cod has traditionally been targeted in the trawl fisheries with other species being bycatch. With the recent constraints in TAC the fleet has reduced effort in areas where cod is in relatively high abundance, manifested in a higher proportion of the annual catches being taken in tows where the species composition is more mixed in nature. For vessels that can target cod the catch rates are very high.

Estimates of annual cod discards since 2001 are in the range of 1.4–4.3% of numbers landed.

Catch distribution Total landings (2011) are 173 kt (45% bottom trawl, 35% longline, 10% gillnet, 5% Danish seine, and 5% hooks). Discards are in the range of 1.4–4.3%.

Quality considerations

This assessment is considered very consistent.

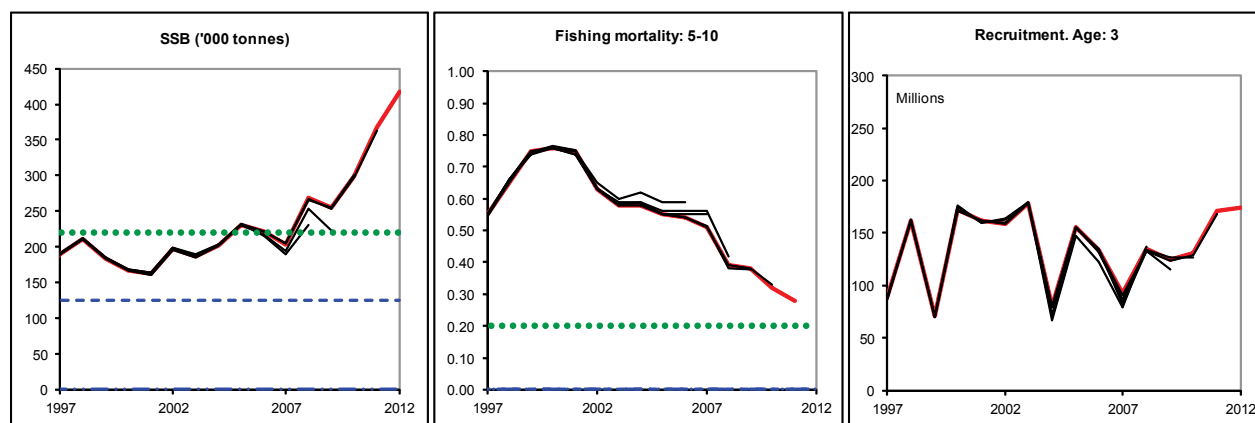


Figure 2.4.2.2 Cod in Division Va (Icelandic cod). Historical assessment results (final year recruitment estimates included).
SSB plot: green line $MSYB_{trigger}$, blue line B_{lim} . F plot: green line $Harvest Rate_{MP}$

Scientific basis

Assessment type	A forward-based statistical catch-at-age model, implemented in the AD model builder.
Input data	Landings-at-age and age-structured spring and fall survey indices.
Discards and bycatch	Not included in the assessment and considered low.
Indicators	None.
Other information	Immigration has been taken into account.
Working group report	NWWG

ECOREGION **Iceland and East Greenland**
STOCK **Cod in Division Va (Icelandic cod)**

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
Management plan	MP _{Btrigger}	220 000 t	Set by managers, consistent with ICES MSY framework.
	Harvest Rate _{MP}	0.2	Set by managers, consistent with ICES MSY framework.
MSY	MSY B _{trigger}	220 000t	Trigger point in HCR considered consistent with ICES MSY framework.
Framework	F _{MSY}	Not relevant	
Precautionary Approach	B _{lim}	125 000 t	B _{loss}
	B _{pa}	Not defined	
	F _{lim}	Not defined	
	F _{pa}	Not defined	

(unchanged since 2011)

Outlook for 2013

Basis: F(2012) = TAC constraint: F = 0.26; landings (2012) = 177; SSB(2013) = 460; B4+(2013) = 1195; R (2012) = 174 million.

Rationale	Landings (2013)	Basis	F (2013)	SSB (2014)	%SSB change ¹⁾	% TAC change ²⁾
Management plan	196	Harvest Control Rule	0.26	523	13%	11%
Zero catch	0	F=0	0	739	43%	

Weights in thousand tonnes.

¹⁾ SSB 2014 relative to SSB 2013.

²⁾ Landings 2013 relative to TAC 2012.

Management plan

The TAC value is given for the calendar year (i.e. 2013) while it is applied in the fishery for the fishing year (September 2012 to august 2013).

Following the agreed management plan (Annex 2.4.2) implies a TAC of 196 000 t in the fishing year 2012/2013. The management plan has been evaluated to be in conformity with the ICES MSY framework.

Additional considerations

Management considerations

Prior to allocating the ITQ catches to the Icelandic fishing fleet, managers should ensure that all expected catches from other sources are subtracted. The amount is not known in advance, but is likely to be of a similar magnitude as in recent years and estimated to be 6 kt in the 2012/2013 fishing year.

Stock size is at present high in spite of low productivity because of a sharply decreasing harvest rate in recent years.

The immigration of adult cod from Greenland to Icelandic waters has occurred in some years, based on results from tagging returns and catch-at-age anomalies. The high abundance of larvae in East Greenland waters in years with high recruitments in Iceland indicate that some of these year classes originate from spawning in Iceland. Based on catch-at-age data anomalies attempts have been made to estimate some of these migrations in the historical part of the assessment. Tag returns, survey estimates in Greenlandic waters, as well as anomalies in the catch-at-age matrix in Iceland indicate that a portion of the moderate 2003 year class observed in Greenlandic waters in recent years may have migrated to Icelandic waters in 2009. This has been taken into account in the assessment, resulting in an additional 5% increase (40 kt) in the estimates of the reference biomass in 2009.

Regulations and their effects

The restrictions of the catches by the TAC have resulted in 60% reduction in fishing mortality since 2000.

A real-time-closure system aimed at protecting juvenile fish has been in force since 1976. Fishing is prohibited, for at least two weeks, in areas where the proportion by number of small cod (< 55 cm) in the catches is observed by inspectors to exceed 25%. This is the measure taken rather than setting a minimum landing size and allowing discarding. A preliminary evaluation of the effectiveness of the system indicates that the relatively small areas closed for a short time most likely do not contribute significantly to the protection of juveniles. On the other hand, several consecutive quick closures often lead to closures of larger areas for a longer time and force the fleet to operate in other areas. The effect of these longer closures has not been evaluated.

Since 1995, spawning areas have been closed for 2–3 weeks during the spawning season for all fisheries. The intent of this measure was to protect spawning fish. In 2005, the maximum mesh size allowed in gillnets was decreased to 20.3 cm (8 inches) in order to protect the largest spawners. The effect of these measures has not been evaluated.

The mesh size in the codend in the trawling fishery was increased from 120 mm to 155 mm in 1977. Since 1998 the minimum codend mesh size allowed is 135 mm, provided that a so-called “Polish cover” is not used. Numerous areas are closed temporarily or permanently for all fisheries or specific gears to protect juveniles and habitat, or for socio-political reasons. The effects of these measures have not been evaluated.

Data and methods

The data used in the assessment are landings-at-age and two age-structured survey indices. The analytical assessment is based on landings and survey data using a forward-based statistical catch-at-age model, implemented in the AD model builder. Landings-at-age data as well as survey indices are considered reliable. The modelling setup is the same as last year, using both the spring and the fall survey indices in the final assessment.

Comparison with previous assessment and advice

The SSB, F, and recruitment estimates are consistent with last year’s estimates (Figure 2.4.2.2).

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

Sources

ICES. 2010. Icelandic request on evaluation of Icelandic cod management plan. Report of the ICES Advisory Committee, 2010. ICES Advice, 2010. Book 2, Section 2.3.3.1, pp. 4–8.

ICES. 2012. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.

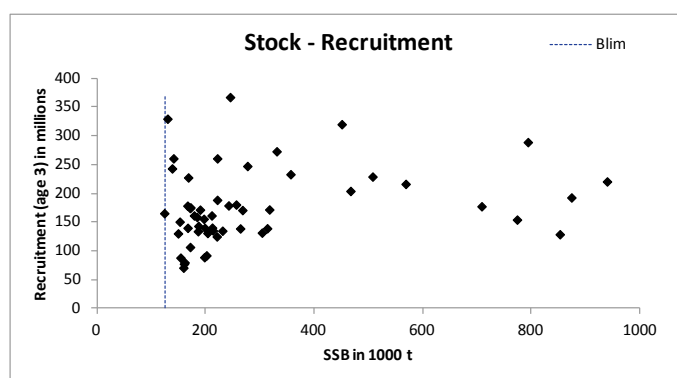


Figure 2.4.2.3 Cod in Division Va (Icelandic cod). Stock–recruitment plot.

Table 2.4.2.1 Cod in Division Va (Icelandic cod). ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ICES landings for the fishing year	ICES landings for the calendar year
1988 ¹	National advice	300	350		378
1989 ¹	National advice	300	325		356
1990 ¹	National advice	250	300		335
1991 ¹	National advice	240	245		309
1991/1992 ²	National advice	250	265	274	274
1992/1993 ²	Reduce F by 40%	154	205	241	241
1993/1994 ²	Reduce F by 40%	150	165	197	197
1994/1995 ²	Reduce F by 50%	130	155	165	169
1995/1996 ²	Apply catch rule	155	155	170	182
1996/1997 ²	Apply catch rule	186	186	202	203
1997/1998 ²	Apply catch rule	218	218	227	243
1998/1999 ²	Apply catch rule	250	250	254	260
1999/2000 ²	Apply catch rule	247	250	257	236
2000/2001 ²	Apply catch rule	203	220 ³	221	235
2001/2002 ²	Apply catch rule	164	190 ³	217	209
2002/2003 ²	Apply catch rule	183	179 ³	198	206
2003/2004 ²	Apply catch rule	210	209	225	226
2004/2005 ²	Apply catch rule	205	205	214	214
2005/2006	Apply catch rule	198	198	209	196
2006/2007	Apply catch rule	187	193 ⁴	187	170
2007/2008	Apply catch rule	152	130	140	147
2008/2009	Apply F_{\max}	< 124	160 ⁵	168	181
2009/2010	Apply F_{\max}	< 135	150 ⁶	168	169
2010/2011	Apply catch rule	160	160	165	165
2011/2012	Apply catch rule	177	177		
2012/2013	Apply catch rule	196			

Weights in thousand tonnes.

¹ Calendar year.

² National fishing year ending 31 August.

³ Amended catch rule.

⁴ Catch rule 2006.

⁵ Initial TAC set to 130 according to the catch rule, raised to 160 in January 2009.

⁶ Set according to the catch rule.

Table 2.4.2.2 Cod in Division Va (Icelandic cod). Summary of the assessment.

Year	Landings	F5-10	SSB	N3	B4+	Harvest rate
1955	545	0.29	940	152	2359	0.23
1956	487	0.29	794	153	2083	0.23
1957	455	0.31	774	171	1880	0.24
1958	517	0.35	874	221	1866	0.28
1959	459	0.32	853	289	1828	0.25
1960	470	0.37	709	154	1754	0.27
1961	377	0.36	467	193	1496	0.25
1962	389	0.38	569	129	1492	0.26
1963	409	0.46	508	178	1316	0.31
1964	437	0.55	451	204	1219	0.36
1965	387	0.58	318	216	1023	0.38
1966	353	0.59	277	229	1032	0.34
1967	336	0.56	256	320	1103	0.30
1968	382	0.72	222	172	1223	0.31
1969	403	0.56	314	248	1326	0.30
1970	475	0.61	331	181	1337	0.36
1971	444	0.68	242	189	1098	0.40
1972	395	0.69	222	139	997	0.40
1973	369	0.70	245	273	844	0.44
1974	368	0.76	187	179	918	0.40
1975	365	0.81	168	261	895	0.41
1976	346	0.75	138	367	955	0.36
1977	340	0.59	199	143	1289	0.26
1978	330	0.48	212	228	1297	0.25
1979	366	0.45	304	243	1397	0.26
1980	432	0.49	357	140	1490	0.29
1981	465	0.66	264	140	1242	0.37
1982	380	0.73	167	132	970	0.39
1983	298	0.71	130	233	791	0.38
1984	282	0.64	141	139	914	0.31
1985	323	0.67	172	140	928	0.35
1986	365	0.77	198	330	854	0.43
1987	390	0.86	150	261	1030	0.38
1988	378	0.89	172	176	1033	0.37
1989	363	0.72	171	89	1003	0.36
1990	335	0.70	214	130	841	0.40
1991	308	0.80	161	107	698	0.44
1992	265	0.85	153	175	550	0.48
1993	251	0.87	124	135	595	0.42
1994	178	0.63	154	78	576	0.31
1995	169	0.51	179	151	557	0.30
1996	181	0.51	159	165	670	0.27
1997	203	0.55	190	88	782	0.26
1998	244	0.65	211	162	720	0.34
1999	260	0.75	184	71	731	0.36
2000	235	0.76	167	172	590	0.40
2001	234	0.75	162	162	687	0.34
2002	208	0.63	197	159	728	0.29
2003	208	0.58	186	179	739	0.28
2004	227	0.58	202	80	799	0.28
2005	213	0.55	231	156	722	0.30
2006	196	0.54	221	134	700	0.28
2007	170	0.51	204	92	680	0.25
2008	146	0.39	268	135	697	0.21
2009	181	0.38	254	125	798	0.23
2010	169	0.32	299	131	849	0.20
2011	172	0.28	367	171	944	0.18
2012			419	174	1070	
2013				108		
2014				182		

Annex 2.4.2 Icelandic management plan

The Icelandic Government has adopted a management plan for the Icelandic cod stock for the next five fishing years, starting with the 2009/2010 fishing season. The main objective of the management plan is to ensure that the spawning-stock biomass (SSB) will, with high probability (>95%), be above the present size of 220 thousand tonnes by the year 2015. This will be achieved by applying the following harvest control rule (HCR) to calculate the total allowable catch (TAC):

$TAC_{y+1} = (\alpha B_{4^+,y} + TAC_y)/2$, where y refers to the assessment year, B_{4^+} to the biomass of 4-year and older cod, and α to the harvest rate. α is set to 0.2 when SSB_y is higher than 220 thousand tonnes (SSB_{MP}^*) but set to $\alpha = 0.2 SSB_y / SSB_{MP}$ when SSB_y is lower.

*ICES interprets SSB_{MP} as $B_{trigger}$.

ECOREGION Iceland and East Greenland
STOCK Haddock in Division Va (Icelandic haddock)

Advice for 2013

ICES advises on the basis of the precautionary approach that catches in 2013 should be no more than 32 000 t.

Stock status

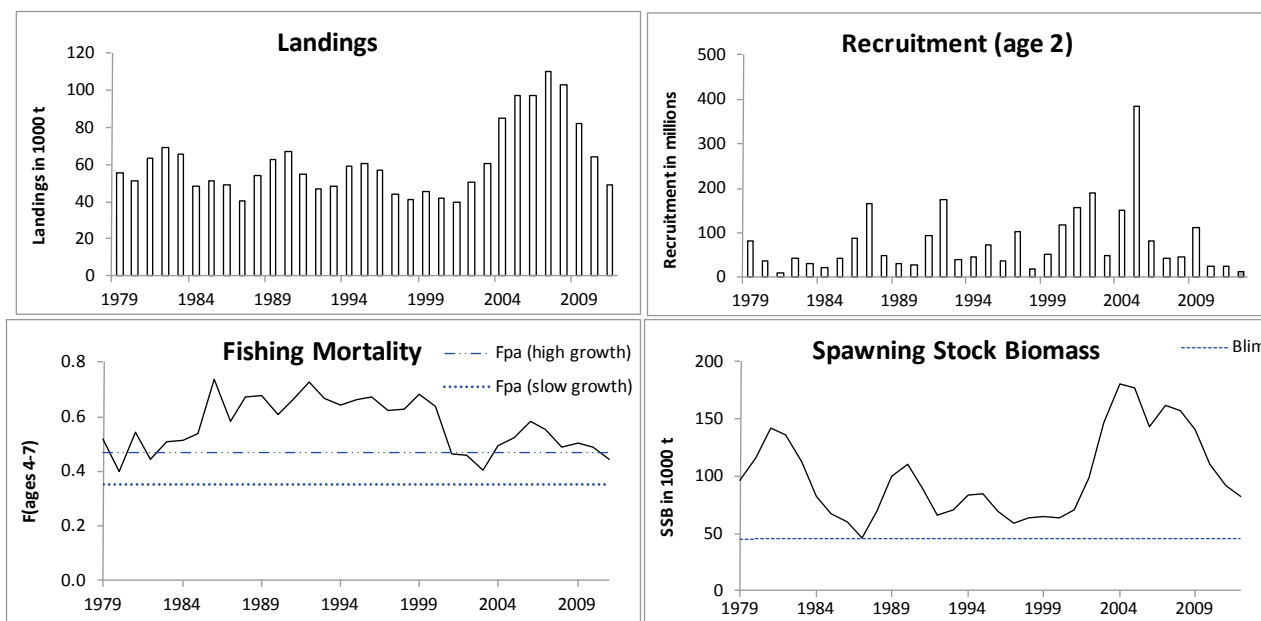
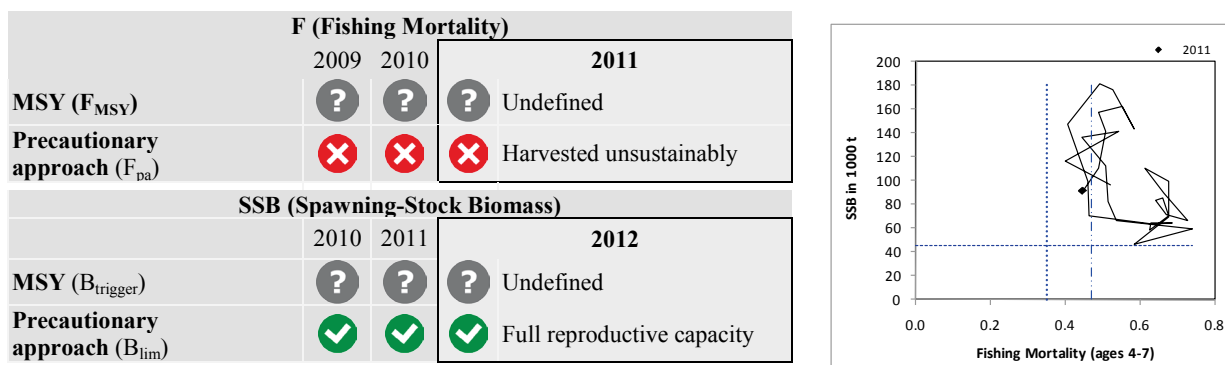


Figure 2.4.3.1 Haddock in Division Va. Summary of stock assessment (weights in thousand tonnes). Top right: SSB/ F for the time-series used in the assessment.

SSB increased from 2001 to 2005 after several strong year classes. Since then the spawning stock has decreased. Fishing mortality is currently above F_{pa} (0.35, accounting for low growth). Recruitment was high for the year classes 1998–2003, with five strong year classes of which the 2003 year class was very strong. Recruitment has been below the long-term average since the 2004 year class. The 2008–2011 year classes are estimated to be very poor.

Management plans

A management plan in accordance with the MSY approach is under development and will likely be put into force this year.

Biology of the stock

Growth of haddock is considered density dependent and the high biomass in recent years may therefore have contributed to the slower observed growth after 2003. Growth has started to improve after a number of years with poor growth, and is estimated to be above average in 2011. Mean weight-at-age remains low for most year classes contributing to the SSB.

Environmental influence on the stock

Haddock in Icelandic waters is near the northern boundary of its distribution. In cold periods the area north and east of Iceland is probably too cold for haddock, but in warmer periods the temperature in this area is suitable for haddock. The areas north and east of Iceland constitute a large part of the Icelandic continental shelf, so in warm periods much larger areas are available for haddock. Landing figures from the early 1960s support the observation that the stock can become very large in warm periods. The groundfish surveys show that the proportion of the haddock stock inhabiting the waters north of Iceland has increased from 2000 to 2006 and has remained high since then.

The fisheries

Haddock is caught in directed haddock fisheries, as well as in mixed demersal fisheries targeting cod. Recent changes in seawater temperature have had considerable effects on the spatial distribution and the distribution of the catches. In recent years an increasing proportion of haddock has been caught by longliners. The discard estimates for haddock have been ranging between 0.7% and 5% by weight since 2001 (see Section 7 of the NWWG report “Overview on ecosystem, fisheries and their management” – ICES, 2012).

Catch distribution	Total landings (2011) are 49.5 kt, with 44% taken by bottom trawl, 41% by longlines, 13% by Danish seine, and 2% by other gear. Discarding is considered minor since 2001.
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Quality considerations

The assessment is considered very consistent. Discards are not included in the assessment. Discards in 2011 were small, as they have been in most years since 2001. The main uncertainty in the assessment relates to difference between assessments based on each of the two surveys, with the final assessment fitting in between.

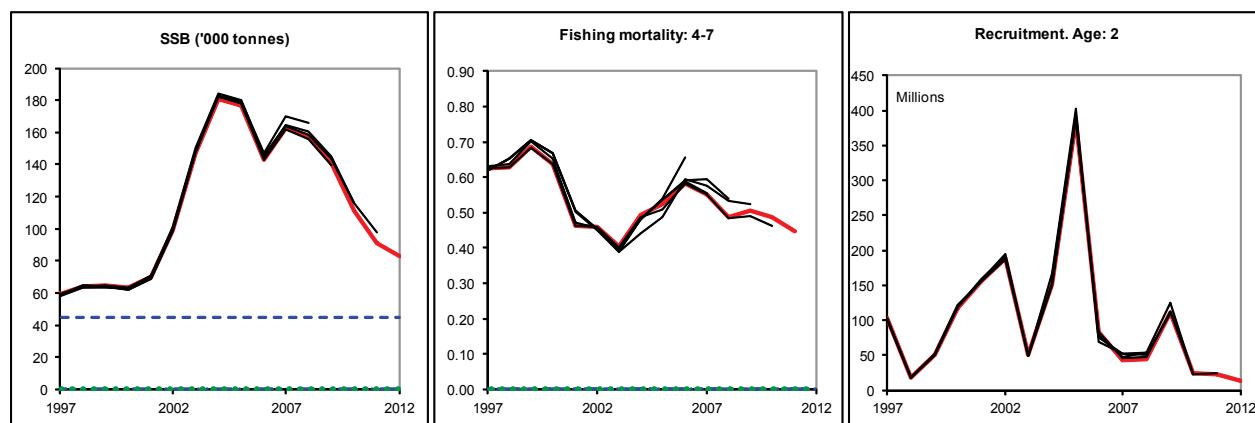


Figure 2.4.3.2 Haddock in Division Va. Historical assessment results (final-year recruitment estimates included).

Scientific basis

Assessment type	Adapt-type model (in ADMB).
Input data	Landings-at-age and two survey indices (Icelandic spring and fall groundfish surveys).
Discards and bycatch	Discards are not included in the assessment.
Indicators	None.
Other information	None.
Working group report	NWWG

ECOREGION **Iceland and East Greenland**
STOCK **Haddock in Division Va (Icelandic haddock)**

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B_{trigger}	Not defined	
	F_{MSY}	Not defined	
Precautionary Approach	B_{lim}	45 000 t	B_{loss} (ICES, 2011).
	B_{pa}	Not defined	
	F_{lim}	Not defined	
	F_{pa}	0.47 0.35	$F_{\text{pa}} = F_{\text{med}}$ proposed in 2000 with normal/high growth rate. Adjusted to 0.35 with low growth rate.

(unchanged since: 2011)

Outlook for 2013

Basis: $F(2012) = \text{TAC constraint} = 44$; $F=0.4$; $\text{SSB}(2013) = 85$; $R(2013) = 21.5$ million (Adapt); landings (2012) = 44.

Rationale	Landings (2013)	Basis	F (2013)	SSB (2014)	%SSB change ¹⁾	% TAC change ²⁾
Precautionary (modified to account for size)	32	$F_{\text{pa}} = 0.35$	0.35	71	-17	-28
Zero catch	0	$F = 0$	0.00	102	20	-100
Less than 5% probability of $\text{SSB}_{2015} < B_{\text{lim}}$	27	$F = 0.28$	0.28	76	-11	-37
<i>Status quo</i>	39	F_{2011}	0.44	65	-24	-12
<i>Proposed HCR</i>	31		0.33	72	-15	-30

Weights in thousand tonnes.

¹⁾ SSB 2014 relative to SSB 2013.

²⁾ Landings 2012/2013 relative to TAC 2011/2012.

Precautionary approach

The fishing mortality in 2013 should be no more than (0.35), corresponding to landings of less than 32 000 t.

Additional considerations

Management considerations

Given the low incoming recruitment, fishing at F_{pa} in 2012–2014 would result in a non-negligible probability of SSB falling below B_{lim} within 3 years. F around 0.28 will lead to the probability of $\text{SSB}_{2015} < B_{\text{lim}}$ being around 5%.

Work is in progress to evaluate candidate harvest control rules that are in conformity with the ICES MSY framework. This work is based on an approach similar to the one used for Icelandic saithe and cod. The proposed rule is based on landings as a proportion of biomass of fish above a certain size and is presented in the Working Group report (ICES, 2012).

SSB is predicted to decrease over the next years when the average year classes (2004–2007) disappear from the stock and are replaced by the poor (2008–2011) year classes. The 2008–2011 year classes are the smallest four year classes in sequence seen since 1979 or further back. With such low year classes, the maximum yield would be expected to be less than 20 000 t.

Regulations and their effects

The regulation is a TAC supplemented with technical measures like area closures for protecting juveniles, and minimum mesh size. The regulatory system includes provision for real-time closures of areas where juveniles are a high proportion of the catch. The effects of these measures have not been evaluated. Trawl grids are mandatory in certain areas.

Changes in fishing technology and fishing patterns

Discards have been low since 2001. Before that discards of undersized fish were high and variable during 1994–1997. Discarding seems related to the overlap between the spatial distribution of the fisheries and recruits and is higher when fishing mortality is high and stock size low. At low stock sizes juveniles mix more with adults.

Information from the fishing industry

Commercial cpue from the most important fleets targeting haddock are available for 20 years or more, but these data are not used in the analytical assessment. The cpue data show much more stability than the results from the assessment. The discrepancy between cpue and stock abundance is partly due to the increase in haddock biomass occurring in areas north of Iceland, where there is little fishing effort.

Data and methods

The assessment is based on age-disaggregated landings from 1979 to 2011 and on survey data from the March survey 1985–2012 and the October survey 1995–2010. The models used are an Adapt-type model, a time-series analysis, XSA, and a separable model used for evaluation of the harvest control rule for the stock. The selection pattern in the separable model is a function of mean weight-at-age, not age directly. The assessment does not include discards.

Comparison with previous assessment and advice

This year's assessment is conducted in the same way as last year. The assessment does not show any retrospective pattern.

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

Source

ICES. 2012. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.

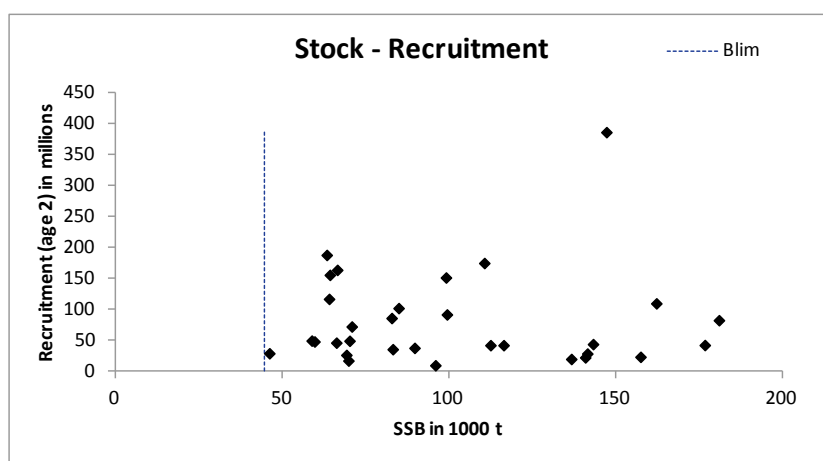


Figure 2.4.3.3 Haddock in Division Va. Stock–recruitment plot.

Table 2.4.3.1 Haddock in Division Va. ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ICES landings for the fishing year	ICES landings for the calendar year
1987	National advice	<50	60		41
1988 ¹	National advice	<60	65		54
1989 ¹	National advice	<60	65		63
1990 ¹	National advice	<60	65		67
1991 ²	National advice	<38	48		54
1991/1992 ³	National advice	<50	50	48	47
1992/1993 ³	National advice	<60	65	48	49
1993/1994 ³	National advice	<65	65	57	59
1994/1995 ³	National advice	<65	65	61	61
1995/1996 ³	National advice	<55	60	54	57
1996/1997 ³	National advice	<40	45	51	44
1997/1998 ³	National advice	<40	45	38	41
1998/1999 ³	National advice	<35	35	46	45
1999/2000 ³	F reduced below F_{med}	<35	35	42	42
2000/2001 ³	F reduced below provisional F_{pa}	<31	30	40	40
2001/2002 ³	F reduced below provisional F_{pa}	<30	41	45	50
2002/2003 ³	F reduced below provisional F_{pa}	<55	55	56	61
2003/2004 ³	F reduced below provisional F_{pa}	<75	75	79	84
2004/2005 ³	F reduced below provisional F_{pa}	<97	90	98	97
2005/2006 ³	F reduced below provisional F_{pa}	<110	105	98	98
2006/2007 ³	F reduced below provisional F_{pa}	<112	105	110	110
2007/2008 ³	F reduced below provisional F_{pa}	120	100	102	102
2008/2009	F reduced below 0.35	<83	93	82	82
2009/2010	F reduced below 0.35	<57	63	73	64
2010/2011	F reduced below 0.35	<51	50	53	
2011/2012	F reduced below 0.35	<42	45		
2012/2013	F reduced below 0.35	<32			

Weights in thousand tonnes.

¹ Calendar year.

² January/August.

³ National TAC for year ending 31 August.

Table 2.4.3.2 Icelandic haddock (Division Va). Summary of the assessment.

Year	Recruitment in thousands at age 2	Biomass 3+ tonnes	SSB tonnes	Landings tonnes	Yield/SSB	F4–7
1979	80923	162177	96072	55330	0.576	0.521
1980	37390	192244	116521	51110	0.439	0.398
1981	10426	206988	141628	63558	0.449	0.542
1982	42788	180380	136817	69428	0.507	0.444
1983	29306	148112	112589	65942	0.586	0.508
1984	20574	112797	82961	48282	0.582	0.515
1985	42788	102394	66652	51102	0.767	0.537
1986	86501	96480	59837	48859	0.817	0.739
1987	164036	105395	46298	40760	0.88	0.584
1988	48742	153708	69391	54204	0.781	0.675
1989	29778	168184	99537	62885	0.632	0.676
1990	27094	145507	110745	67198	0.607	0.611
1991	92280	122708	89825	54692	0.609	0.664
1992	175094	106310	66379	47121	0.71	0.728
1993	38437	130461	71000	48123	0.678	0.669
1994	46842	127836	83295	59502	0.714	0.641
1995	72857	124042	85054	60884	0.716	0.661
1996	36341	108036	70008	56890	0.813	0.675
1997	102509	87152	58993	43764	0.742	0.624
1998	17976	97121	64203	41192	0.642	0.627
1999	50160	91024	64439	45411	0.705	0.685
2000	117308	90674	63507	42105	0.663	0.636
2001	156016	115000	70340	39654	0.564	0.462
2002	188084	168156	99249	50498	0.509	0.461
2003	49866	219674	147350	60883	0.413	0.404
2004	151764	252575	181089	84828	0.468	0.492
2005	385847	258893	176847	97225	0.55	0.525
2006	83024	299177	143347	97614	0.681	0.582
2007	43021	295783	162319	109966	0.677	0.553
2008	44529	247415	157573	102872	0.653	0.488
2009	110125	189982	141004	82045	0.582	0.506
2010	24044	162037	110958	64168	0.578	0.487
2011	23122	138234	91371	49433	0.541	0.446
2012	13515	121144	82681			
Mean 79-2011	79685	157777	101127	61137	0.631	0.569

ECOREGION Iceland and East Greenland
STOCK Saithe in Division Va (Icelandic saithe)

Advice for 2013

ICES advises on the basis of the MSY approach (B-rule) that catches in 2013 should be no more than 49 000 t.

Stock status

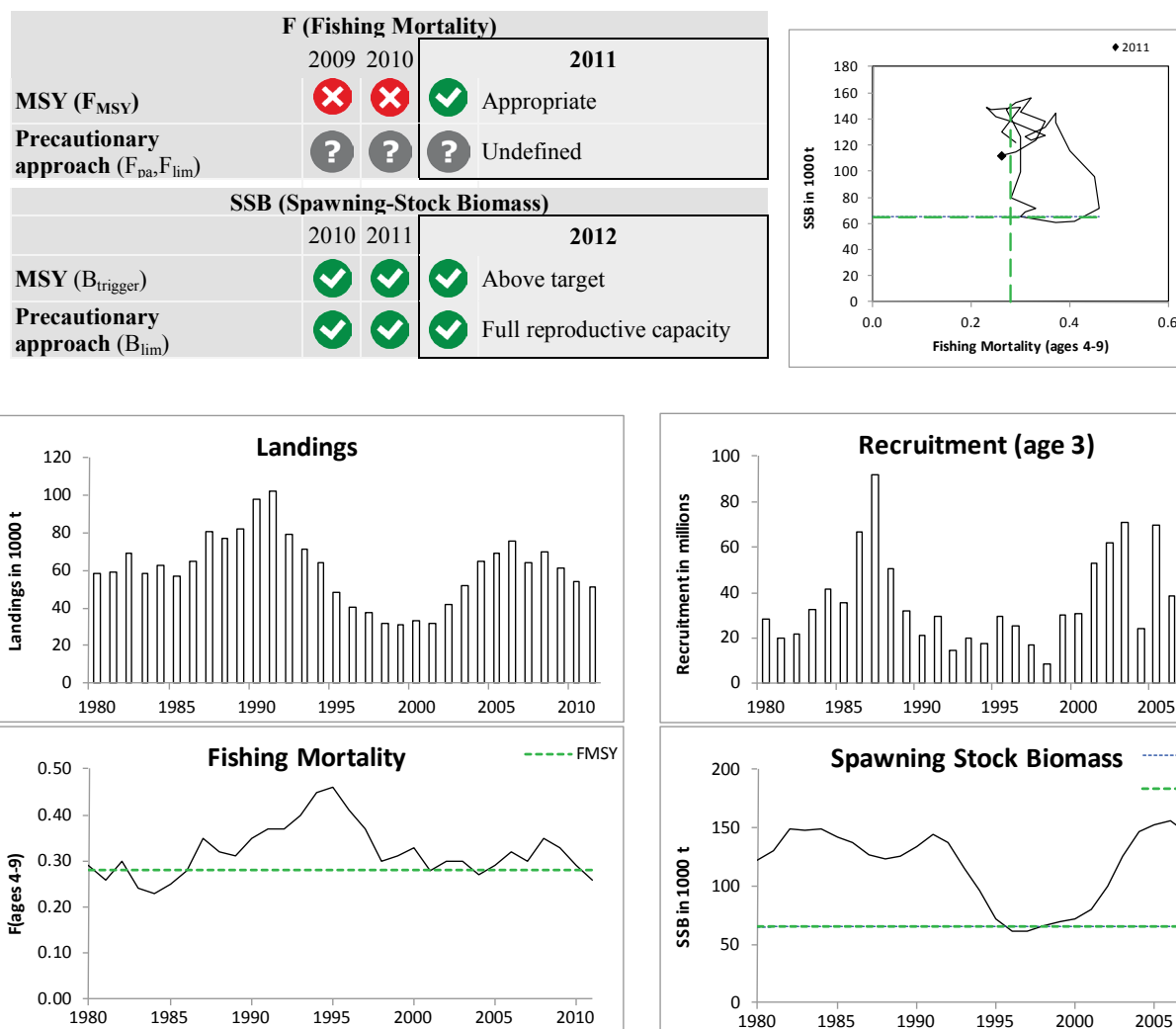


Figure 2.4.4.1 Saithe in Division Va (Icelandic saithe). Summary of stock assessment (weights in thousand tonnes). Top right: SSB/F for the time-series used in the assessment.

The fishing mortality has fluctuated around 0.3 between 1998 and 2011, decreasing from around 0.4 in the mid-1990s. SSB has been declining since 2006 and is at present close to the long-term average. Year classes 1998–2000 and 2002 were large, but recruitment since then has been around the long-term average, except for the 2008 cohort which is estimated to be large.

Management plans

A management plan in accordance with the MSY approach is under development and will likely be put into force this year.

Biology

Saithe is a migrating fish and makes both feeding and spawning migrations. The evidence from tagging experiments (ICES, 2008) shows some migrations along the Faroe–Iceland Ridge, as well as onto the East Greenland shelf.

Environmental influence on the stock

Icelandic saithe is near the northern boundary of its distribution, and a relatively small part of the stock inhabits the waters off the northern and eastern coasts of Iceland, except in warm years. The fishery and the survey show a more northerly distribution in recent years, possibly because of relative warming in the northern waters. Significant changes in the length- and weight-at-age have been observed in the Icelandic saithe. It is unknown whether these changes are fisheries or environmentally driven.

The fisheries

Saithe are caught in directed saithe fisheries, as well as in mixed demersal fisheries targeting cod. The fishery is regulated by TACs and minimum mesh size in fishing gears.

Catch distribution Total landings (2011) are 51 kt, where 80% were caught by bottom trawl and 7% by gillnet, with jiggers and Danish seine taking the majority of the rest. 1–2% discards by numbers.

Quality considerations

The assessment of Icelandic saithe is relatively uncertain due to fluctuations in the spring survey data. This produces high uncertainty in the present estimates of SSB and fishing mortality.

An issue in this year's assessment involves the 2008 cohort which is estimated to be large by the default assessment model, and this increases the biomass estimate compared to recent years. However, the size of the 2008 cohort is very uncertain, due to mixed signals about this cohort in the commercial and survey catch-at-age data.

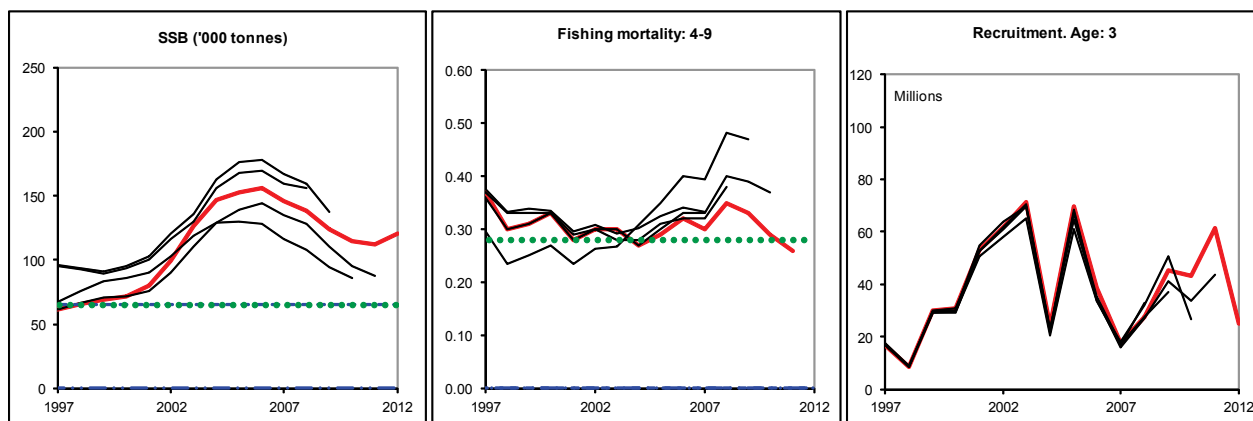


Figure 2.4.4.2 Saithe in Division Va (Icelandic saithe). Historical assessment results (final-year recruitment estimates included).

Scientific basis

Assessment type	Separable statistical catch-at-age model, with changes in selectivity for three different time periods.
Input data	Catch-at-age and spring groundfish survey.
Discards and bycatch	Not included in the assessment, estimated to be very low.
Indicators	None.
Other information	Benchmark performed in 2010.
Working group report	NWWG

ECOREGION **Iceland and East Greenland**
STOCK **Saithe in Division Va (Icelandic saithe)**

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY $B_{trigger}$	65 000 t	Stochastic projections based on hockeystick S–R function.
	F_{MSY}	0.28	Stochastic projections based on hockeystick S–R function.
Precautionary Approach	B_{lim}	65 000 t	B_{loss} estimate in 2010.
	B_{pa}	Not defined	
	F_{lim}	Not defined	
	F_{pa}	Not defined	

(MSY $B_{trigger}$ corrected in 2012, technical basis is the same as in 2010 corrected in 2012)

Outlook for 2013

Basis: $F(2011) = 0.26$; $F(2012) = 0.24$ based on landings 2012 = 52; $SSB(2013) = 130$; $B_{4+}(2013) = 259$; $N_3(2012) = 25$ from assessment model.

Rationale	Landings (2013)	Basis	F (2013)	SSB (2014)	%SSB change ¹⁾	% TAC change ²⁾
Zero catch	0	$F=0$	0.00	180	38	–100
MSY framework B-rule ³⁾	49	20% HCR	0.22	143	9	–6
Status quo	57	$F = F_{2011}$	0.26	137	5	10
MSY framework F-rule	61	$F = F_{MSY}$	0.28	134	2	17

Weights in thousand tonnes.

¹⁾ SSB 2014 relative to SSB 2013.

²⁾ Landings 2013 relative to TAC 2012.

³⁾ Average of 0.2 B_{4+} and last year's advice.

MSY approach

Given that the harvest rate of 20% of B_{4+} is more robust to changes in selectivity, ICES bases its advice on the B-rule (Figure 2.4.4.5).

Following the ICES MSY framework (B-rule) implies that the TAC is based on the average of 20% of the reference biomass in 2012 and last year's advice (2011). This implies that the TAC should be no more than 49 000 t.

Additional considerations

Management considerations

Analysis of the Icelandic saithe data (NWWG, 2012; ICES, 2010) indicates considerable changes in selectivity, and the $F_{MSY} = 0.28$ is based on the selectivity pattern estimated in 2010. The currently estimated selectivity targets younger fish, and simulation analysis with this selectivity would lead to a different F_{MSY} .

The spring survey data are relatively noisy and have therefore led to considerable fluctuations in retrospective biomass estimates.

Given the aforementioned changes in selectivity, as well as the fluctuations in the spring survey data, the B-rule with a two-year stabilizer reduces the probability of giving advice that leads to temporary overfishing or underutilization.

Information from the fishing industry

Commercial cpue from the most important fleets targeting saithe are available for 20 years or more. However, the potential for bias in commercial cpue (for example hyper-stability) is a serious concern for shoaling species such as saithe. Therefore, although these indices have been explored for inclusion in the past, they were not considered in calibrating the present assessment, as they are considered unreliable as an indicator of abundance.

Uncertainties in assessment and forecast

The Icelandic discards monitoring programme has not detected large amounts of discards in the saithe fishery. Excluding discards in the assessment is thus not considered to cause a significant bias in the assessment and the advice.

The assessment is relatively uncertain, due to high variances in survey measurements and lack of reliable recruitment estimates.

The discrepancy between the applied assessment model and a TSA model (NWWG, 2012) is greater than in recent years, estimating the total biomass (B4+) as 265 kt and 219 kt, respectively. This difference is mainly due to uncertainty about the 2008 cohort. Next year's data should decrease this uncertainty about the 2008 cohort size. If the 2008 cohort does not turn out to be large, then the current biomass estimate of 265 kt is most likely an overestimate.

Comparison with previous assessment and advice

In the current assessment, SSB in 2011 is estimated 27% higher and F in 2010 is estimated 22% lower than in last year's assessment.

This year's advice is based on the MSY framework B-rule. Last year's advice was based on the F-rule.

Sources

- ICES. 2008. Report of the North-Western Working Group (NWWG). ICES CM 2008/ACOM:03.
- ICES. 2010. Report of the Benchmark Workshop on Roundfish (WKROUND). ICES CM 2010/ACOM:36.
- ICES. 2011. Report of the North-Western Working Group, 26 April–3 May 2011. ICES CM 2011/ACOM:07.
- ICES. 2012. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.
- NWWG. 2012. Gudmundur Gudmundsson. Fish stock assessment by time-series analysis. North-Western Working Group, WD 27.

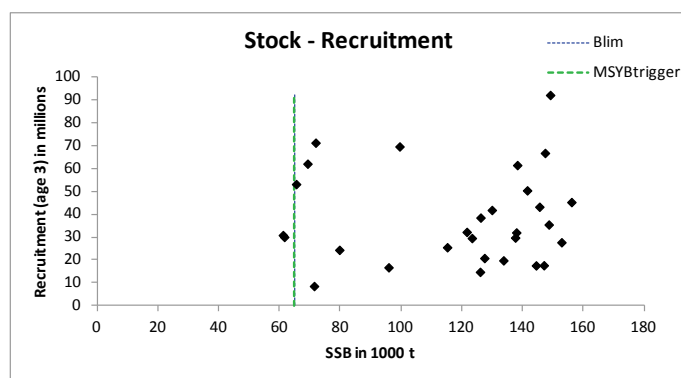


Figure 2.4.4.3 Saithe in Division Va (Icelandic saithe). Stock–recruitment plot.

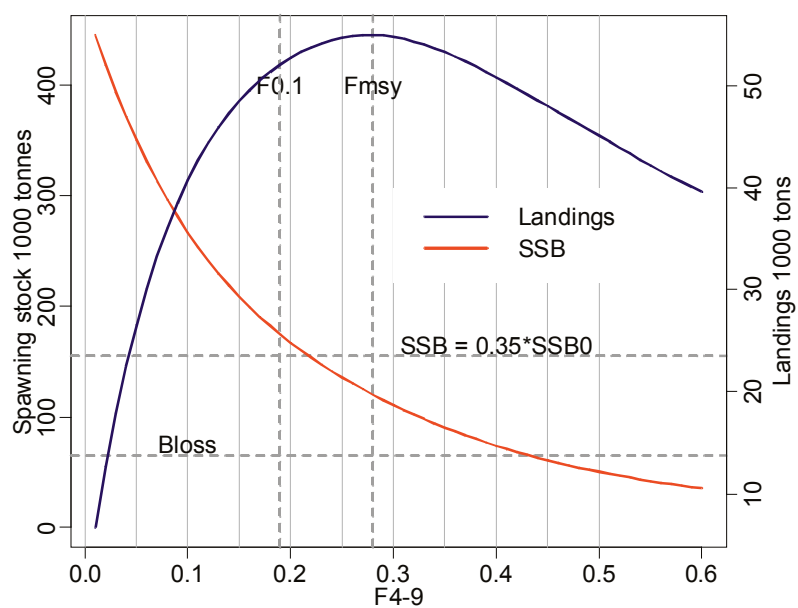


Figure 2.4.4.4 Saithe in Division Va (Icelandic saithe). Yield and SSB as a function of F_{4-9} , based on stochastic simulations from the WKROUND benchmark (ICES, 2010).

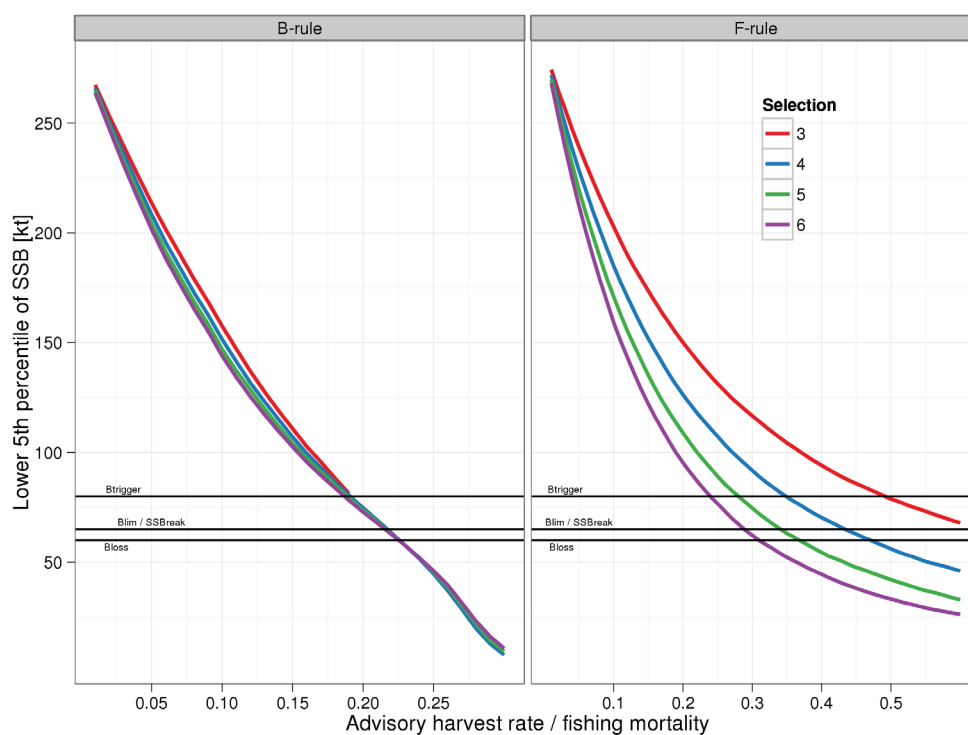


Figure 2.4.4.5 The lower 5th percentile of the spawning-stock biomass based on four arbitrary selection patterns, where higher scenario numbers reflect increasing targeting of younger fish. The left hand panel shows the outcome of the SSB when advice is based on the reference biomass (B4+). The right hand panel the shows outcome of the SSB when the advice is based on the conventional F-based rule.

Table 2.4.4.1 Saithe in Division Va (Icelandic saithe). ICES advice, management, and catches.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Landings
1987 ¹	TAC	64	70	81
1988 ¹	TAC	64	80	77
1989 ¹	TAC	80	80	82
1990 ¹	TAC	80	90	98
1991 ¹	TAC	87	65	71
1991/92 ²	TAC	70	75 ²	88
1992/93 ²	Marginal gains from increase in F	75 ¹	95 ²	78
1993/94 ²	No measurable gains from increase in F	84 ¹	85 ²	69
1994/95 ²	No measurable gains from increase in F	72 ¹	75 ²	61
1995/96 ²	No measurable gains from increase in F	65 ¹	70 ²	41
1996/97 ²	No measurable gains from increase in F	52 ¹	50 ²	38
1997/98 ²	F below $F_{med} = 0.23$	30 ³	30 ²	33
1998/99 ²	F below 60% of F(97)	28	30 ²	32
1999/00 ²	F below 60% of F(98)	24	30 ²	30
2000/01 ²	F=70% of F(99)	25	30 ²	32
2001/02 ²	No directed fishing	-	37 ²	36
2002/03 ²	2/3 F_{pa} to rebuild stock	24	45	47
2003/04 ²	No advice		50	56
2004/05 ²	F_{pa}	69	70	71
2005/06 ²	F_{pa}	78	80	78
2006/07 ²	F_{pa}	81	80	66
2007/08 ²	No advice	-	75	68
2008/09 ²	Maintain $SSB > B_{pa}$	< 22	65	62
2009/10 ²	F reduced below 0.22	< 34	50	54
2010/11 ²	F_{MSY}	< 40	50	51
2011/12	F_{MSY}	≤ 45	52	
2012/13	MSY framework [B-rule]	≤ 49		

Weights in thousand tonnes.

¹Calendar year.²National fishing year ending 31 August.

Table 2.4.4.2

Saithe in Icelandic waters (Division Va). Summary of the assessment.

	B4+	SSB	Landings	Landings/B4+	F4-9	N3	Cohort
1980	312	122	58	0.19	0.29	28	32
1981	305	130	59	0.19	0.26	20	42
1982	294	149	69	0.23	0.30	22	35
1983	270	147	58	0.22	0.24	32	67
1984	287	149	63	0.22	0.23	42	92
1985	299	142	57	0.19	0.25	35	50
1986	318	138	65	0.20	0.28	67	32
1987	335	127	81	0.24	0.35	92	21
1988	416	123	77	0.19	0.32	50	30
1989	398	126	82	0.21	0.31	32	15
1990	378	134	98	0.26	0.35	21	20
1991	336	144	102	0.30	0.37	30	18
1992	288	138	80	0.28	0.37	15	30
1993	231	115	72	0.31	0.40	20	26
1994	187	96	64	0.34	0.45	18	17
1995	153	71	49	0.32	0.46	30	9
1996	149	62	40	0.27	0.41	26	30
1997	156	61	37	0.24	0.37	17	31
1998	153	66	32	0.21	0.30	9	53
1999	131	69	31	0.24	0.31	30	62
2000	142	72	33	0.23	0.33	31	71
2001	161	80	32	0.20	0.28	53	24
2002	216	100	42	0.19	0.30	62	70
2003	274	126	52	0.19	0.30	71	38
2004	315	147	65	0.21	0.27	24	18
2005	279	153	69	0.25	0.29	70	28
2006	301	156	76	0.25	0.32	38	45
2007	267	146	64	0.24	0.30	18	43
2008	234	138	70	0.30	0.35	28	61
2009	211	124	61	0.29	0.33	45	25
2010	219	114	54	0.25	0.29	43	
2011	234	112	51	0.22	0.26	61	
2012	265	121				25	
Average	258	118	61	0.24	0.32	36	36

The table shows official landings, based on data from the Icelandic Directorate of Fisheries. The difference between the official data (51 123 t in 2011) and ICES data (51 215 t) is less than 0.2%.

ECOREGION Iceland and East Greenland
STOCK Greenland halibut in Subareas V, VI, XII, and XIV

Advice for 2013

ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 20 000 t.

Stock status

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

SSB (Spawning-Stock Biomass)			
	2010	2011	2012
MSY ($B_{trigger}$)	✓	✓	✓ At or above possible candidate MSY $B_{trigger}$
Precautionary approach (B_{pa} , B_{lim})	?	?	? Not defined

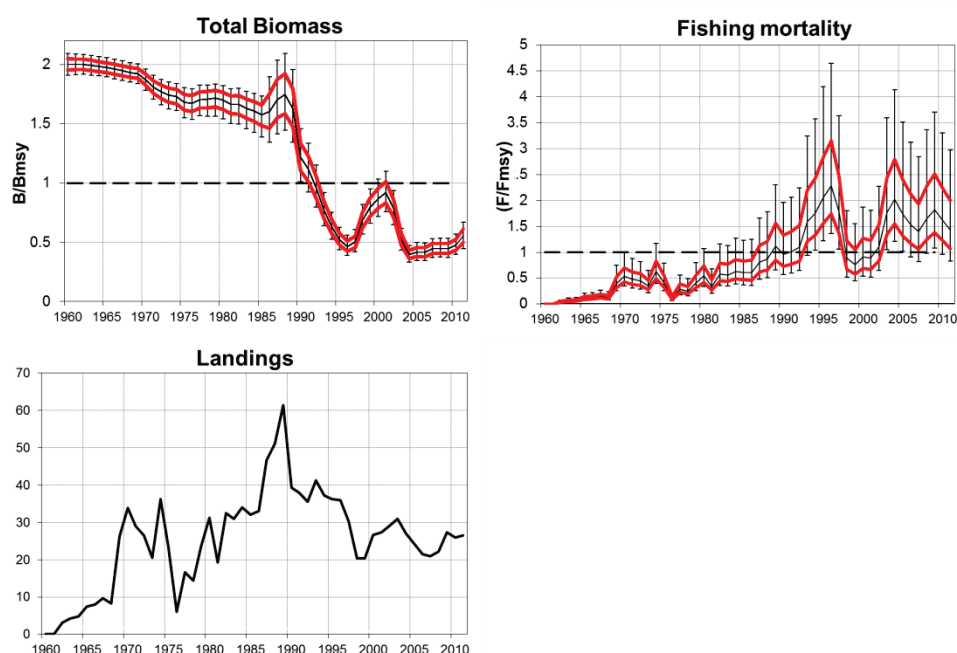
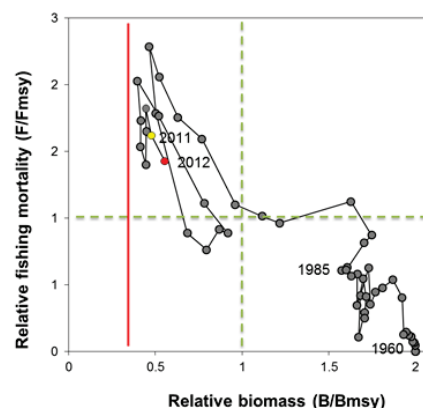


Figure 2.4.5.1 Greenland halibut in Subareas V, VI, XII, and XIV. Summary of the stock assessment (weights in '000 tonnes). Lower panels: trends of biomass and fishing mortality relative to MSY reference points (medians) with indication of 25–75 percentiles (red curves) and 95% conf. intervals (error bars). Top right: relative SSB and F over the years with indication of B_{MSY} (1.0), B_{lim} (0.3 B_{MSY}), F_{msy} (1.0), and F_{lim} (1.7 F_{MSY}). Bottom: Landings (000 tons).

The assessment is indicative of stock trends, and provides relative measures of stock status. The stock has been below B_{MSY} since the early 1990s and is presently at 55% of B_{MSY} . Since the record low biomass observed in 2004 the stock has been stable with a sign of slow increase. Landings for more than a decade has been between 20 000 and 30 000 t. Present fishing mortality is estimated to be 1.4 times the F_{msy} .

Management plans

In 2012 the coastal states have initiated work on a common management plan for Greenland halibut in V, XII and XIX. The plan is aiming on two steps, a graduals lowering of the total catches until biological reference points have been evaluated by ICES, and thereafter implementation of a harvest control rule in accordance with ICES MSY approach. The plan will include continuous monitoring of the resource and requirements on information from the fishery.

Biology

Greenland halibut is a relatively slow-growing and long-lived species. Changes in stock dynamics may take several years. Available biological data and distribution of the fisheries suggest that Greenland halibut in Subareas XIV and V belong to the same entity and do mix, although precise stock associations are not known. Tagging studies suggest that some mixing occurs also with Greenland halibut in the Norwegian Sea/Barents Sea. Nursery grounds are unknown.

The fisheries

The fishery is distributed over a vast area, mainly conducted by factory trawlers operating with demersal trawl.

Catch distribution	Total landings (2011) = 26424 t, 96% bottom trawl, 4% gillnets/longlines. Discarding is considered to be small (less than 1% by weight)
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Quality considerations

Lack of knowledge on life history and stock structure of Greenland halibut in relation to the assessment area (Subareas V, VI, XII, and XIV) impede the interpretation and weighting of the different biomass indices. Lack of information on recruitment to the stock prevents an accurate short term forecast.

Scientific basis

Assessment type	A probabilistic (Bayesian) version of a surplus-production model.
Input data	One cpue series of the Icelandic trawl fleet (since 1985) and two trawl surveys (Va: since 1996, XIV: since 1998).
Discards and bycatch	Not considered relevant for the assessment.
Indicators	None.
Other information	A benchmark is planned for 2013
Working group report	NWWG

ECOREGION **Iceland and East Greenland**
STOCK **Greenland halibut in Subareas V, VI, XII, and XIV**

Reference points

Relative reference points are defined for this stock. Fishing mortality is estimated in relation to F_{MSY} and total stock biomass is estimated in relation to B_{MSY} . A possible candidate for MSY $B_{trigger}$ will be within the range 30%-50% B_{MSY} . MSYbtrigger in this range have been adopted for a number of ICES and NAFO stocks.

Outlook for 2013

Basis: Assumed landings 2012 according to TACs = 25 000 t.

Catch option 2013 (in '000 t):	0	5	10	15	20	30
Probability of falling below 0.3 B_{MSY}	1%	2%	2%	2%	3%	10%
Probability of being below B_{MSY}	93%	94%	94%	95%	96%	97%
Probability of exceeding F_{MSY}	-	3%	13%	31%	53%	86%
Probability of exceeding 1.7 F_{MSY}	-	1%	4%	10%	20%	55%
Stock size (B/B_{MSY}), median	0.62	0.61	0.60	0.59	0.57	0.49
Fishing mortality (F/F_{MSY}),	0.00	0.24	0.49	0.75	1.04	1.83
Productivity (% of MSY)	86%	85%	84%	83%	82%	74%

Probabilities are for the catch option year

MSY approach

The stock is considered to be above any potential MSY $B_{trigger}$ (30%-50% B_{MSY}). Following the ICES MSY framework implies that the advised fishing mortality should be F_{MSY} or a transitional F_{MSY} .

Aiming directly for a harvest at F_{MSY} because this is a vulnerable long lived species, will correspond to maximum landings in 2013 of less than 20 000 t and is expected to lead to a status quo in stock size in 2013. 20 000 t will give a 50% probability of reaching F_{msy} in 5-10 years.

Additional considerations

Management considerations

There is no regional management agreement in place, TACs are set separately for Iceland and Greenland EEZs, and the number of licences is set separately by the Faroe Islands. A common management plan by the three coastal states is presently being developed. The management plan will include monitoring of the effort and stock development as well as a framework for adapting future fishing according to the response of the stock aiming at a harvest control rule in accordance with MSY. Since Greenland halibut is a slow-growing species, it is expected that a change in stock dynamics may take several years and this will be taken into consideration in the management plan. The plan is intended to be fully implemented in 2015, however, a stepwise reduction in catches is predicted to take place already from 2013 until MSY reference points have been evaluated by ICES for this stock.

Previously, the stock have sustained catches between 20 000 t and 30 000 t in the past decades. It should be taken into account that Greenland halibut is a slow-growing and long-lived species and rebuilding the stock is therefore only likely only to be achieved within a long time frame. The medium-term forecasts suggest that stock recovery is slow under all fishing scenarios, even in the case of no fishery.

Available biological information such as tagging and genetic studies and the distribution of the fisheries suggest that Greenland halibut in Divisions XIV and V belong to the same stock entity and that a common management is therefore required.

Because the nursery grounds are not known, there is no monitoring of recruits and juveniles. Because Greenland halibut is a slow-growing species that first appears in catches at ages 4–6, recruitment failure will only be detected in the fishery some 5–10 years after it occurs. The management plan that is under development should consider these features.

Information from fishing industry

Information from the fisheries in East Greenland and the Faroe Islands, which is not contained in the assessment model, suggest stable biomasses in recent years.

Regulations and their effects

No formal agreement on the management of the Greenland halibut fishery exists presently among the three coastal states, Greenland, Iceland, and the Faroe Islands. In Greenland and Iceland, the fishery is regulated by a TAC and in the Faroe Islands by effort limitation (number of fishing licenses). This management practice has resulted in adoption of TACs by Greenland and Iceland that in total are set substantially higher than TACs advised by ICES. In addition to this a number of fishery licenses at the Faroe Islands also contributed to landings. As a result of these national TACs and effort regulations, landings have been in excess of the TACs advised by ICES since 1987. The management plan that is under development will solve this lack of coordination.

Data and methods

Two surveys (Greenland and Icelandic) and CPUE data from the Icelandic trawler fleet along with landings data back to the start of the fishery (1960) were used as input to the stock production model. Additional data was available (CPUE's from East Greenland trawlers and from Faroese trawlers) but these data had conflicting trends with the other indices and the model did not allow to include them. All available indices are considered equal relevant as biomass indicators.

Uncertainties in the assessment

Survey coverage is considered adequate to monitor the stock, but lack of sufficient knowledge on life history and stock structure of Greenland halibut in relation to the assessment area (Subareas V, VI, XII, and XIV) impede the interpretation and weighting of the different indices. Furthermore, conflicting indices cannot be accommodated by the stock production model. In the present assessment cpues from Subarea XIV have not been used for that reason. Increasing conflict between the two remaining survey indices contributes to increased uncertainty in the population estimates. Further the lack of a 2011 survey in Div. Va contributes also to the increased uncertainty.

Prior to the introduction of sorting grids in the shrimp fisheries a substantial number of juvenile Greenland halibut was expected to be discarded. However, there is no quantification of the historical as well as the present discard levels. Hence, the potential bias by not including discards in the assessment cannot be evaluated.

Comparison with previous assessment and advice

The assessment and estimates for the state of the stock are consistent with last year's results.

The basis for advice this year is the same as last year, MSY approach. A potential range for a candidate MSY Btrigger was defined and this have resulted in a substantial change in advice.

Source

ICES. 2012. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.

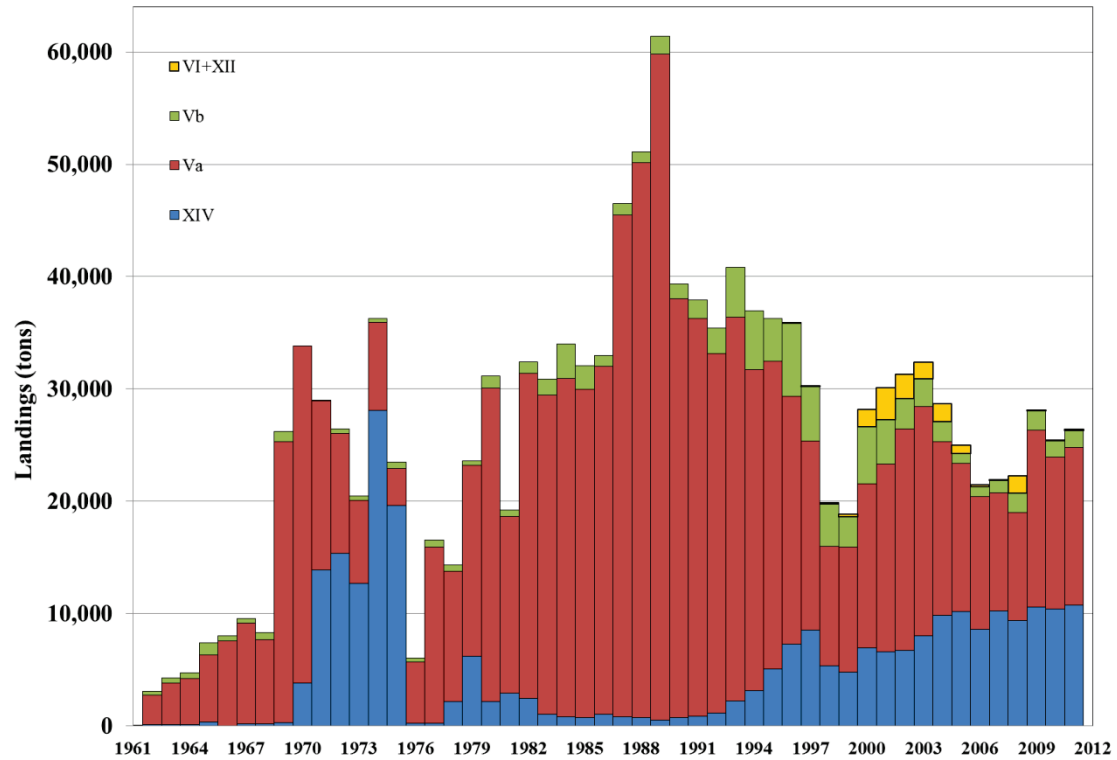


Figure 2.4.5.2 Greenland halibut in Subareas V, VI, XII, and XIV. Landings by area (tonnes).

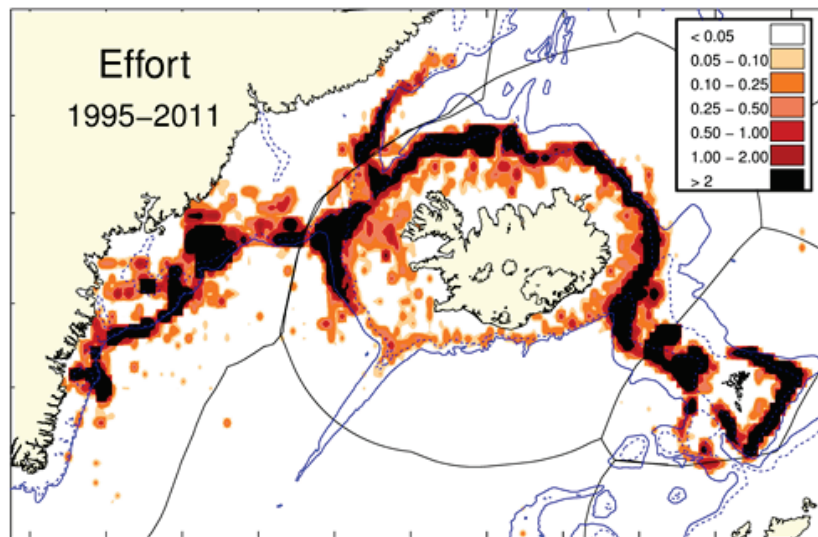


Figure 2.4.5.3 Greenland halibut in Subareas V, VI, XII, and XIV. Distribution of total effort in the fishery for the period 1991–2011. 500 m and 1000 m depth contours are shown.

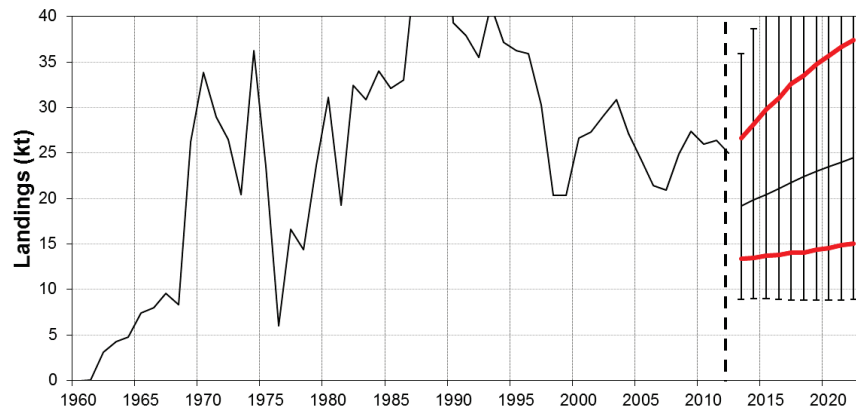


Figure 2.4.5.4 Historic landings (000' t) and projected landings 2013-2022 assuming F/F_{msy} (2013-22)=1.0. Solid line is median, red bold lines are quartiles and bars indicate 90% conf. limit.

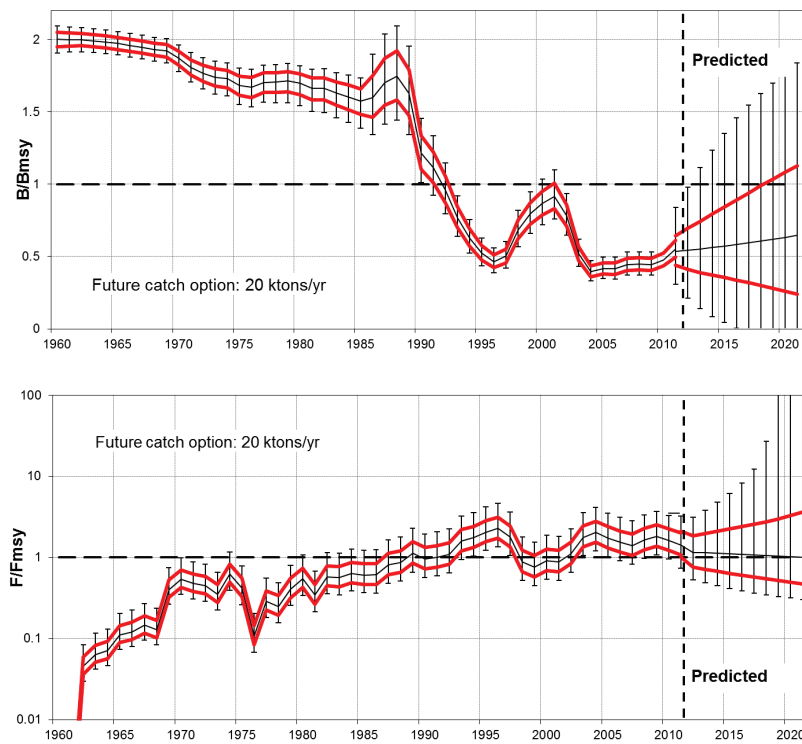


Figure 2.4.5.5 SSB (upper) and fishing mortality (lower) assuming future fixed catch option on 20 kt per year. Solid line is median, red bold lines are quartiles and bars indicate 90% conf. limit.

Table 2.4.5.1 Greenland halibut in Subareas V, VI, XII, and XIV. ICES advice, management, and landings.

Year	ICES Advice	Predicted catch Corresp. to advice	TAC for Icelandic EEZ	Greenland TAC	Landings in Va	ICES landings V, VI, XII, and XIV
1987	No increase in F	28	30		45	47
1988	No increase in F	28	30		49	51
1989	TAC	33	30		59	61
1990	No advice	-	45		37	39
1991	TAC	40	30		35	38
1992	TAC	30	25		32	35
1993	No increase in effort	28 ¹	30 ²		34	41
1994	No increase in effort	34 ¹	30 ²		29	37
1995	TAC	32	30 ²		27	36
1996	TAC	21	20 ²		22	36
1997	60% reduction in F from 1995	13	15 ²		18	30
1998	70% reduction in F from 1996	11	10 ²	8.1	11	20
1999	65% reduction in F from 1997	11	10 ²	8	11	21
2000	60% reduction in F from 1998	11	10 ²	8	15	26
2001	catch less than 98–99 catch	<20	20 ²	14.5	17	28
2002	F reduced below 0.67*F _{MSY}	<21	20 ²	14.5	20	29
2003	F reduced below 0.67*F _{MSY}	<23	23 ²	14.5	20	30
2004	F reduced below 0.67*F _{MSY}	<20	23 ²	14.1	15	28
2005	Effort reduced to 1/3 of the 2003 level	<15	15	12	13	24
2006	Effort reduced to 1/3 of the 2003 level	<15	15	10	12	21
2007	Adaptive management plan, start at 15 000 t	<15	15	11.7	10	21
2008	Adaptive management plan, start at 15 000 t	<15	15	11	12	24
2009	Adaptive management plan, reduce to 5000 t	<5	15	10	16	28
2010	Adaptive management plan, reduce to 5000 t	<5	12	12	14	26
2011	Adaptive management plan, reduce F substantially below F _{MSY}	<5	13	12	14	26
2012	No directed fishery, multi-annual management plan to be developed and implemented	-	13	13		
2013	F reduced to F _{MSY}	<20				

Weights in '000 t.

¹Catch at *status quo* F.²Year ending 31 August.

Table 2.4.5.2

Greenland halibut in Subareas V, VI, XII, and XIV. Nominal landings (tonnes) by country, as officially reported to ICES and estimated by the working group.

Country	1981	1982	1983	1985	1986	1987	1988	1989
Denmark	-	-	-	-	-	6	+	-
Faroe Islands	767	1,532	1,146	1,052	853	1,096	1,378	2,319
France	8	27	236	845	52	19	25	-
Germany	3,007	2,581	1,142	863	858	565	637	493
Greenland	+	1	5	81	177	154	37	11
Iceland	15,457	28,300	28,360	29,231	31,044	44,780	49,040	58,330
Norway	-	-	2	3	+	2	1	3
Russia	-	-	-	-	-	-	-	-
UK (Engl. and Wales)	-	-	-	-	-	-	-	-
UK (Scotland)	-	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-
Total	19,239	32,441	30,891	32,075	32,984	46,622	51,118	61,156
Working Group estimate	-	-	-	-	-	-	-	61,396

Country	1990	1991	1992	1994	1995	1996	1997	1998
Denmark	-	-	-	-	-	1	-	-
Faroe Islands	1,803	1,566	2,128	6,241	3,763	6,148	4,971	3,817
France	-	-	3	-	-	29	11	8
Germany	336	303	382	648	811	3,368	3,342	3,056
Greenland	40	66	437	867	533	1,162	1,129	747
Iceland	36,557	34,883	31,955	27,778	27,383	22,055	18,569	10,728
Norway	50	34	221	1,173 ¹	1,810	2,164	1,939	1,367
Russia	-	-	5	-	10	424	37	52
Spain	-	-	-	-	-	-	-	89
UK (Engl. and Wales)	27	38	109	513	1,436	386	218	190
UK (Scotland)	-	-	19	84	232	25	26	43
United Kingdom	-	-	-	-	-	-	-	-
Total	38,813	36,890	35,259	37,305	36,006	35,762	30,242	20,360
Working Group estimate	39,326	37,950	35,423	36,958	36,300	35,825	30,309	20,382

Country	1999	2000	2001	2003 ¹	2004 ¹	2005 ¹	2006 ¹	2007 ¹
Denmark	-	-	-	-	-	-	-	-
Estonia	-	-	-	-	-	5	3	-
Faroe Islands	3,884	-	121	458	338	1,150	855	1,141
France	-	2	32	177	157	-	62	17
Germany	3,082	3,265	2,800	2,948	5,169	5,150	4,299	4,930
Greenland	200	1,740	1,553	1,459	-	-	-	-
Iceland	11,180	14,537	16,590	20,366	15,478	13,023	11,798	-
Ireland	-	-	56	-	-	-	-	-
Lithuania	-	-	-	2	1	-	2	3
Norway	1,187	1,750	2,243	1,074	1,233	1,124	1,097	692
Poland	-	-	2	93	207	-	-	-
Portugal	-	-	6	-	-	-	1,094	-
Russia	138	183	187	-	262	-	552	501
Spain	-	779	1,698	3,075	4,721	506	33	-
UK (Engl. and Wales)	261	370	227	40	49	10	1	-
UK (Scotland)	69	121	130	367	367	391	1	-
United Kingdom	-	166	252	841	1,304	220	93	17
Total	20,001	22,913	25,897	30,900	29,286	21,579	19,890	7,301
Working Group estimate	20,371	26,644	27,291	30,891	27,102	24,978	21,466	21,873

Country	2008 ¹	2009 ¹	2010 ¹	2011 ¹
Denmark	-	-	-	-
Estonia	-	-	-	-
Faroe Islands	-	270	1,408	1,266
France	114	-	-	43
Germany	4,846	427	5,287	5,782
Greenland	-	2,819	-	3,415
Iceland	-	-	13,293	13,192
Ireland	-	-	-	-
Lithuania	566	-	-	-
Norway	639	124	233	176
Poland	1,354	988	960	-
Portugal	-	-	-	-
Russia	799	762	1,070	1,095
Spain	-	-	-	-
United Kingdom	422	581	577	648
Total	9,744	5,974	22,901	25,618
Working Group estimate	24,481	28,197	25,995	26,347

1) Provisional data

Table 2.4.5.3 Greenland Halibut in **Division Va**. Nominal landings (tonnes) by country, as officially reported to ICES and estimated by the working group.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989
Faroe Islands	325	669	33	46			15	379	719
Germany									
Greenland									
Iceland	15,455	28,300	28,359	30,078	29,195	31,027	44,644	49,000	58,330
Norway			+	+	2				
Total	15,780	28,969	28,392	30,124	29,197	31,027	44,659	49,379	59,049
Working Group estimate									59,272 ²

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998
Faroe Islands	739	273	23	166	910	13	14	26	6
Germany					1	2	4		9
Greenland					1				
Iceland	36,557	34,883	31,955	33,968	27,696	27,376	22,055	16,766	10,580
Norway									
Total	37,296	35,156	31,978	34,134	28,608	27,391	22,073	16,792	10,595
Working Group estimate	37,308 ²	35,413 ²							

Country	1999	2000	2001	2002	2003 ¹	2004 ¹	2005 ¹	2006 ¹	2,007 ¹
Faroe Islands	9		15	7	34	29	77	16	25
Germany	13	22	50	31	23	10	6	1	228
Greenland									
Iceland	11,087	14,507	2,310 ⁴	2,277 ⁴	20,360	15,478	13,023	11,798	
Norway							100		691
Russia									
UK (E/W/I)	26	73	50	21	16	8	8	1	
UK Scotland	3	5	12	16	5	2	27	1	
UK									1
Total	11,138	14,607	2,437	2,352	20,438	15,527	13,241	11,817	945
Working Group estimate		14,607	16,752	19,714	20,415	15,477	13,172	11,817	10,525

Country	2008 ¹	2009 ¹	2010 ¹	2011 ¹
Faroe Islands			37	123
Germany	4	423	797	576
Greenland				157
Iceland			13,293	13,192
Norway				
Russia	4			
Poland		270		
UK	179			
Total	187	693	14,128	14,048
Working Group estimate	11,859	15,782	14,128	14,048

1) Provisional data

2) Includes 223 t catch by Norway.

3) Includes 12 t catch by Norway.

4) fished in Icelandic EEZ, but allocated to XIVb

Table 2.4.5.4 Greenland Halibut in **Division Vb**. Nominal landings (tonnes) by country, as officially reported to ICES and estimated by the working group.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989
Denmark	-	-	-	-	-	-	6	+	-
Faroe Islands	442	863	1,112	2,456	1,052	775	907	901	1,513
France	8	27	236	489	845	52	19	25	...
Germany	114	142	86	118	227	113	109	42	73
Greenland	-	-	-	-	-	-	-	-	-
Norway	2	+	2	2	2	+	2	1	3
UK (Engl. and Wales)	-	-	-	-	-	-	-	-	-
UK (Scotland)	-	-	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-	-
Total	566	1,032	1,436	3,065	2,126	940	1,043	969	1,589
Working Group estimate	-	-	-	-	-	-	-	-	1,606 ²

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark	-	-	-	-	-	-	-	-	-
Faroe Islands	1,064	1,293	2,105	4,058	5,163	3,603	6,004	4,750	3,660
France ⁶	3 ¹	2	1	28	29	11	8 ¹
Germany	43	24	71	24	8	1	21	41	
Greenland	-	-	-	-	-	-	-	-	-
Norway	42	16	25	335	53	142	281	42 ¹	114 ¹
UK (Engl. and Wales)	-	-	1	15	-	31	122		
UK (Scotland)	-	-	1	-	-	27	12	26	43
United Kingdom	-	-	-	-	-				
Total	1,149	1,333	2,206	4,434	5,225	3,832	6,469	4,870	3,825
Working Group estimate	1,282 ²	1,662 ²	2,269 ²	-	-		-	-	-

Country	1999	2000 ¹	2001 ¹	2002 ¹	2003 ¹	2004 ¹	2005 ¹	2006 ¹	2007 ¹
Denmark									
Faroe Islands	3873		106	13	58	35	887	817	1116
France		1	32	4	8	17		40	9
Germany	22								
Iceland									
Ireland									
Norway	87	1	2	1	1		1		1
UK (Engl. and Wales)	9	35	77	50	24	41	2		
UK (Scotland)	66	116	118	141	174	87	204		
United Kingdom								19	1
Total	4057	153	335	209	265	180	1,094	876	1,127
Working Group estimate	2694 ²	5079	3,951	2,694	2,459	1,771	892	873	1060

Country	2008	2009	2010	2011
Denmark				
Faroe Islands			1,037	1,476
France	36		35	1
Germany				
Iceland				
Ireland				
Norway	1	1	5	
UK (Engl. and Wales)				
UK (Scotland)				
United Kingdom	32	117	336	11
Total	69	118	1,413	1,489
Working Group estimate	1,759	1,739	1,413	1,489

1) Provisional data

2) WG estimate includes additional catches as described in Working Group reports for each year and in the report from 2001.

Table 2.4.5.5

Greenland Halibut in **Subarea XIV**. Nominal landings (tonnes) by country, as officially reported to ICES and estimated by the working group.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989
Faroe Islands	-	-	-	-	-	78	74	98	87
Germany	2,893	2,439	1,054	818	636	745	456	595	420
Greenland	+	1	5	15	81	177	154	37	11
Iceland	-	-	1	2	36	17	136	40	+
Norway	-	-	-	+	-	-	-	-	-
Russia	-	-	-	-	-	-	-	-	+
UK (Engl. and Wales)	-	-	-	-	-	-	-	-	-
UK (Scotland)	-	-	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-	-
Total	2,893	2,440	1,060	835	753	1,017	820	770	518
Working Group estimate	-	-	-	-	-	-	-	-	-

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark	-	-	-	-	-	-	1	+	+
Faroe Islands	-	-	-	181	168	147	130	148	151
Germany	293	279	311	391	639	808	3,343	3,301	3,399
Greenland	40	66	437	288	866	533	1,162	1,129	747 ^{1,7}
Iceland	-	-	-	19	82	7	-	1,803	148
Norway	8	18	196	511	1,120	1,668	1,881 ¹	1,897 ¹	1,253 ¹
Russia	-	-	5	-	-	10	424	37	52
UK (Engl. and Wales)	27	38	108	796	513	1405	264	218	190
UK (Scotland)	-	-	18	26	84	205	13	-	-
United Kingdom	-	-	-	-	-	-	-	-	-
Total	368	401	1,075	2,212	3,472	4,783	7,218	8,533	5,940
Working Group estimate	736 ²	875 ³	1,176 ⁴	2,249 ⁵	3,125 ⁶	5,077 ⁷	7,283 ⁸	8,558 ⁹	-

Country	1999	2000	2001 ¹	2002 ¹	2003 ¹	2004 ¹	2005 ¹	2006 ¹	2007 ¹
Denmark									
Faroe Islands	2			274	366	274	186	22	
Germany	3047	3243	2,750	2,019	2,925	5,159	5,144	4,298	4,702
Greenland	200 ^{1,4}	1740	1,553	1,887	1,459				
Iceland	93	30	14,280	16,947	6				
Ireland			7						
Norway	1100	1161	1,424	1,660	846	1,114	1,023	1,094	
Poland						205			
Portugal			6	130				1,094	
Russia	138	183	186	44		261		505	500
Spain		8	10		2,131	3,406	2		
UK (Engl. and Wales)	226	262	100						
UK (Scotland)				24	188	278	160		
United Kingdom				178	799	1,294			
Total	4806	6627	20,316 ⁰	22,889 ⁷	8,720	11,991	6,515	7,013	5,202
Working Group estimate	5376 ¹¹	6958	6,588 ⁶	6,750 ⁶	8,017	9,854	10,185	8,589	10,261

Country	2008 ¹	2009 ¹	2010 ¹	2011 ¹
Denmark				
Faroe Islands		270	333	
Germany	4,842	4	4,490	5,206
Greenland		2,819		3,258
Iceland				
Ireland				
Norway	637	29	226	164
Poland	1,354	718	960	
Portugal				
Russia	763		1,070	1,095
Spain				
United Kingdom	131	452	229	309
Total	7,727	4,292	7,308	10,032
Working Group estimate	9,102	9,805	10,402	10,761

1) Provisional data

2) WG estimate includes additional catches as described in working Group reports for each year and in the report from 2001.

3) Includes 125 t by Faroe Islands and 206 t by Greenland.

4) Excluding 4732 t reported as area unknown.

5) Includes 1523 t by Norway, 102 t by Faroe Islands, 3343 t by Germany, 1910 t by Greenland, 180 t by Russia, as reported to Greenland authorities.

6) Does not include most of the Icelandic catch as those are included in WG estimate of Va.

7) Excluding 138 t reported as area unknown.

Table 2.4.5.6

Greenland Halibut in **Subarea XII**. Nominal landings (tonnes) by country, as officially reported to ICES and estimated by the working group.

Country	1996	1997	1998	1999	2000	2001	2002	2003 ¹	2004 ¹
Faroe Islands		47					40		
France					1			4	30
Ireland						49			
Lithuania								2	1
Poland						2		2	1
Spain ²	2	42	67	137	751	1338	28	730	1145
UK					7	5			
Russia									
Norway	2				553	500	316	201	119
Estonia									
Total	4	89	67	137	1,312	1,894	384	939	1,296
WGestimate									

Country	2005 ¹	2006 ¹	2007 ¹	2008 ¹	2009 ¹	2010 ¹	2011 ¹
Faroe Islands							106
France							
Ireland							
Lithuania		2	3	566			
Poland							
Spain ²	501						
UK	3						
Russia		46	1		762		
Norway					94		
Estonia		2					
Total	504	50	4	566	856	0	106
WGestimate	504	50	4	566	856	0	106

¹ Provisional data

² Based on estimates by observers onboard vessels

Table 2.4.5.7

Greenland Halibut in **Subarea VI**. Nominal landings (tonnes) by country, as officially reported to ICES and estimated by the working group.

Country	1996	1997	1998	1999	2000	2001	2002	2003 ¹	2004 ¹
Estonia							8		
Faroe Islands									
France							286	165	110
Poland							16	91	1
Spain ²			22	88	20	350	1367	214	170
UK					159	247	77	42	10
Russia						1			1
Norway					35	317	21	26	
Total	0	0	22	88	214	915	1775	538	292
WGestimate									

Country	2005 ¹	2006 ¹	2007 ¹	2008 ¹	2009 ¹	2010 ¹	2011 ¹
Estonia	5	1					
Faroe Islands						1	
France		22	8	114		38	8
Poland							
Spain ²	3	33					
UK	217	74	15	80	12	11	3
Russia		1		32			
Norway		3		1	3	2	7
Lithuania				968			
Total	225	134	23	1195	15	52	18
WGestimate	225	134	23	1195	15	52	18

¹ Provisional data

² Based on estimates by observers onboard vessels

ECOREGION **Iceland and East Greenland**
STOCK **Introduction to the redfish complex in Subareas V, VI, XII, and XIV**

Introduction

Species of the genus *Sebastes* are common and widely distributed in the North Atlantic. They are found off the coast of Great Britain, along Norway and Spitzbergen, in the Barents Sea, off the Faroe Islands, Iceland, East and West Greenland, and along the east coast of North America from Baffin Island to Cape Cod.

Three species of redfish are commercially exploited in ICES Subareas V, VI, XII, and XIV: *S. marinus*, *S. mentella*, and *S. viviparus*. The latter has minor commercial value in Icelandic waters and is exploited in two small areas south of Iceland at depths of 150–250 m (Table 2.4.6.1).

Nominal landings and splitting of the landings into species

The official statistics reported to ICES do not divide the catch by species/stocks. The splitting of the landings into species and stocks was performed with a set of criteria (Section 7.1 in ICES, 2007).

Information from various sources is used to split demersal landings into species. In Division Va, if no direct information is available on the catches for a given vessel, the landings are allocated based on logbooks and samples from the fishery. According to the proportion of biological samples from each cell (one fourth of an ICES statistical square), the unknown catches within that cell are split accordingly and raised to the landings of a given vessel. For other areas, samples from the landings are used as basis for dividing the demersal redfish catches between *S. marinus* and *S. mentella*.

A comparison of the number of vessels fishing the deep and shallow stocks and reporting to NEAFC by VMS with those visible on satellite images indicates that the unreported effort has been significant. During the observation days in June 2002 to 2006 (in the main fishing season), the effort could have been 15–33% higher than reported to NEAFC, and thus the unreported catch could be in that order of magnitude. The latest information available for 2007 indicated that unreported effort could be around 20%. No information has been available since then, but unreported effort is expected to be much less than in previous years.

Stock identity and management units of *S. mentella*

The Workshop on Redfish Stock Structure (ICES, 2009) reviewed the stock structure of *Sebastes mentella* in the Irminger Sea and adjacent waters. ICES concluded, based on the outcome of the WKREDS meeting, that there are three biological stocks of *S. mentella*:

- a ‘Deep Pelagic’ stock (NAFO Areas 1–2, ICES Subareas V, XII, and XIV >500 m) – primarily pelagic habitats, and includes demersal habitats west of the Faroe Islands;
- a ‘Shallow Pelagic’ stock (NAFO Areas 1–2, ICES Subareas V, XII, and XIV <500 m) – extends to ICES Subareas I and II, but primarily pelagic habitats, and includes demersal habitats east of the Faroe Islands;
- an ‘Icelandic slope’ stock (ICES Division Va and Subarea XIV) – primarily demersal habitats.

This conclusion is primarily based on genetic information, i.e. microsatellite information, and supported by analysis of allozymes, fatty acids, and other biological information on stock structure, such as some parasite patterns.

Adult redfish on the Greenland shelf have been attributed to several stocks and there remains a need to investigate the affinity of the adult *S. mentella* in this region. The East Greenland shelf is most likely a common nursery area for the three biological stocks.

The demersal *S. mentella* in Icelandic waters (in ICES Divisions Va and XIV, ‘Icelandic Slope stock’) is considered to be one biological stock, separated from the demersal *S. mentella* found on the continental slopes of Greenland (Division XIV) and Faroe Islands (Vb). Regarding the latter component there is insufficient information to allow an assessment for advice. The advice on the ‘Icelandic slope stock’ is found in Section 2.4.8.

ICES advice until and including 2009 for *S. mentella* fisheries was provided for two distinct management units, i.e. a demersal unit on the continental shelves and slopes and a pelagic unit in the Irminger Sea and adjacent waters. Based on this new stock identification information, ICES recommended three management units that are geographic proxies for

biological stocks that were partly defined by depth and whose boundaries are based on the spatial pattern of the fishery to minimize mixed-stock catches (Figure 2.4.6.1; ICES, 2010):

- Management unit in the northeast Irminger Sea: ICES Division Va and Subareas XII and XIV.
- Management unit in the southwest Irminger Sea: NAFO Areas 1 and 2, ICES Division Vb and Subareas XII and XIV.
- Management unit on the Icelandic slope: ICES Division Va and Subarea XIV, and to the north and east of the boundary proposed in the management unit in the northeast Irminger Sea.

The pelagic fishery in the Irminger Sea and adjacent waters shows clear distinction between two widely separated grounds fished at different seasons and depths. Spatial analysis of pelagic fishery catch and effort by depth, inside and outside the boundaries proposed for the management units in the northeast Irminger Sea, indicate that the boundaries effectively delineate the pelagic fishery in the northeast Irminger Sea from the pelagic fishery in the southwest Irminger Sea, with a small portion of mixed-stock catches. The northeastern fisheries on the pelagic *S. mentella* occur at the start of the fishing season deeper than 500 m and overlap to some extent with demersal fisheries on the continental slopes of Iceland. The boundary for the deep pelagic *Sebastes mentella* fishery is shown in Table 2.4.6.2.

A schematic illustration of the relationship between the management units and biological stocks is given in Figure 2.4.6.2. New scientific information is currently being reviewed. If additional scientific information becomes available a future review may be appropriate.

The decision to advise on two stocks of pelagic redfish instead of one stock was not unanimous among ACOM members. The Russian Federation still maintains its point of view that there is only one stock of beaked redfish in the pelagic waters of the Irminger Sea and that is why no split catches information about the fisheries is presented to the NWWG. Russia reiterates its standpoint that studies of the redfish stock structure should be continued with the aim of developing agreed recommendations using all available scientific and fisheries data as a basis.

However, ICES reiterates its previous advice that “Management action should be taken to prevent a disproportional exploitation rate of any one component.”

The individual Stock Summary Sheets provide descriptions of these stocks.

Icelandic *S. mentella* fisheries and current management practice

Detailed portrayals of the geographical, vertical, and seasonal distribution of the *S. mentella* fisheries by Icelandic vessels as well as corresponding length distributions are given in Figures 2.4.6.3–2.4.6.6. These figures show that the fisheries within the pelagic *S. mentella* management unit are separated geographically, seasonally, and by depth. These figures also show that the northeastern fisheries on the pelagic *S. mentella* that occur at the start of the fishing season at depths below 500 m overlap to some extent with the fisheries on the continental slopes of Iceland. This overlap was most pronounced in 2003 and 2007 when the Irminger Sea pelagic fishery merged with the continental slope fishery.

Abundance and distribution of 0-group and juvenile redfish

Available data on the distribution of juvenile *S. marinus* indicate that the nursery grounds are located in Icelandic and Greenlandic waters. No nursery grounds have been found in Faroese waters. The nursery areas for *S. marinus* in Icelandic waters are found all around Iceland, but are mainly located west and north of the island at depths between 50 and 350 m. The migration of juveniles is along the north coast towards the most important fishing areas off the west coast.

The only known nursery grounds of *S. mentella* are in Greenland waters mostly at depths between 100 m and 400 m. When the fish located on the nursery grounds become close to being sexually mature, they start to move out of the area. It is reported that at lengths of around 29–30 cm the fish start to emigrate from the East Greenland shelf. The emigrated young *S. mentella* can be tracked both in the Icelandic shelf fishery and in the open Irminger Sea fishery.

Abundance and biomass indices of juvenile (<17 cm) redfish (juveniles were only classified to the genus *Sebastes* spp. due to identification difficulties) from the German annual groundfish survey, conducted on the continental shelf and slope off West and East Greenland down to 400 m, show that juveniles were abundant in 1993 and 1995–1998. Figure 2.4.6.7 shows the survey abundance indices for juvenile *Sebastes* spp. ≤17 cm.

Demersal *S. mentella* in Division Vb and Subareas VI and XIV

Historically, the *S. mentella* on the East Greenland shelf (Subarea XIV) has been included in the demersal catches of Greenland, Iceland, and Faroe Islands. However, adult *S. mentella* in this area have not been attributed to any of the three biological stocks of *S. mentella*. ICES therefore decided to conduct a separate assessment of *S. mentella* in Division XIVb until further information is available to assign origin. The advice is found in Section 2.4.8.

The *S. mentella* on the Faroe Islands shelf has not been assigned to the Shallow and Deep Pelagic *S. mentella* stocks. The catches are, therefore, included here (Table 2.4.6.3). Trends in cpue and effort of the fishery are shown in Figure 2.4.6.8.

Discards and bycatch of small redfish

Information on the bycatch and length distribution of the redfish caught in the shrimp fishery indicated bycatch rates of 0.5% in 2006–2007, most of these being redfish <15 cm. Sorting grids have been mandatory in the shrimp fisheries in ICES Division XIVb since 2002 and in Division Va since 1 September 1995.

Sources

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- ICES. 2009. Report of the Workshop on Redfish Stock Structure (WKREDS). 22–23 January 2009, Copenhagen, Denmark. ICES CM 2009/ACOM:37. 71 pp.
- ICES. 2010. NEAFC Request to review the stock structure of *S. mentella* in the Irminger Sea and adjacent areas. Report of the ICES Advisory Committee, 2010. ICES Advice, 2010. Book 2 section 2.3.3.1, pp. 7–9.
- ICES. 2011. Report of the North-Western Working Group, 26 April–3 May 2011. ICES CM 2011/ACOM:07.
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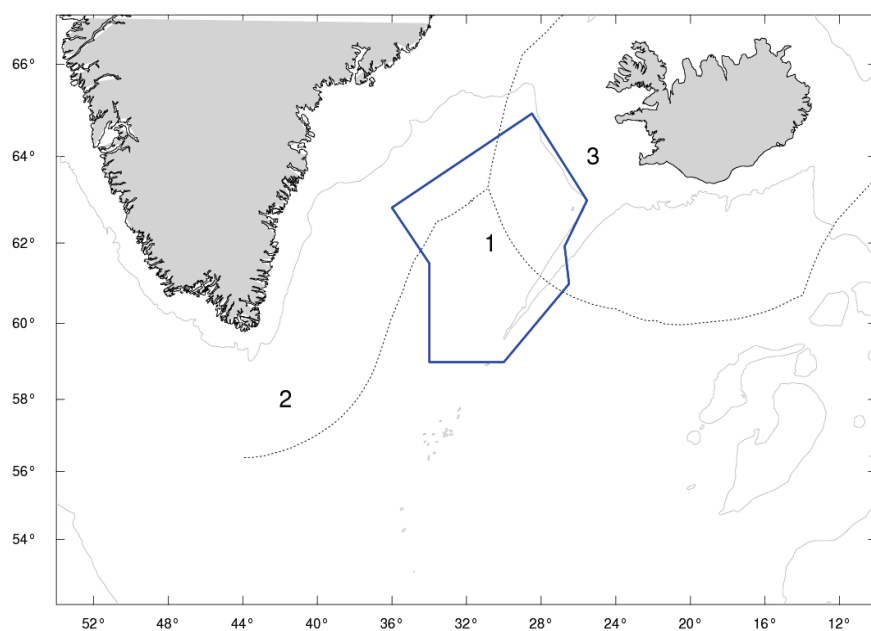


Figure 2.4.6.1

Proposed management unit boundaries for *S. mentella* in the Irminger Sea and adjacent waters. The polygon bounded by blue lines, i.e. 1, indicates the region for the ‘deep pelagic’ management unit in the northwest Irminger Sea, 2 is the “shallow pelagic” management unit in the southwest Irminger Sea, and 3 is the Icelandic slope management unit. Coordinates of the recommended boundary of the “deep pelagic” management unit (the blue box) are given in Table 2.4.6.3.

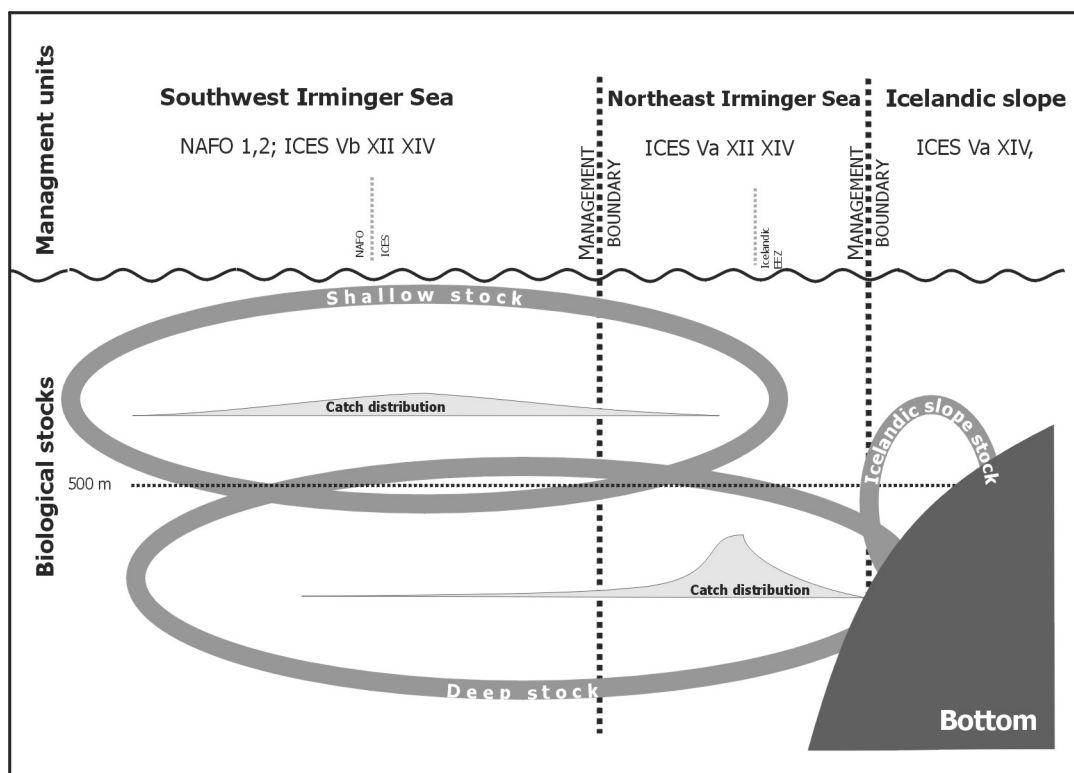


Figure 2.4.6.2

Schematic representation of biological stocks and recommended management units of *S. mentella* in the Irminger Sea and adjacent waters. The management units are shown in Figure 2.4.6.1. Included is a schematic representation of the geographical catch distribution in recent years. Note that the shallow pelagic stock includes demersal *S. mentella* east of the Faroe Islands and the deep pelagic stock includes demersal *S. mentella* west of the Faroe Islands.

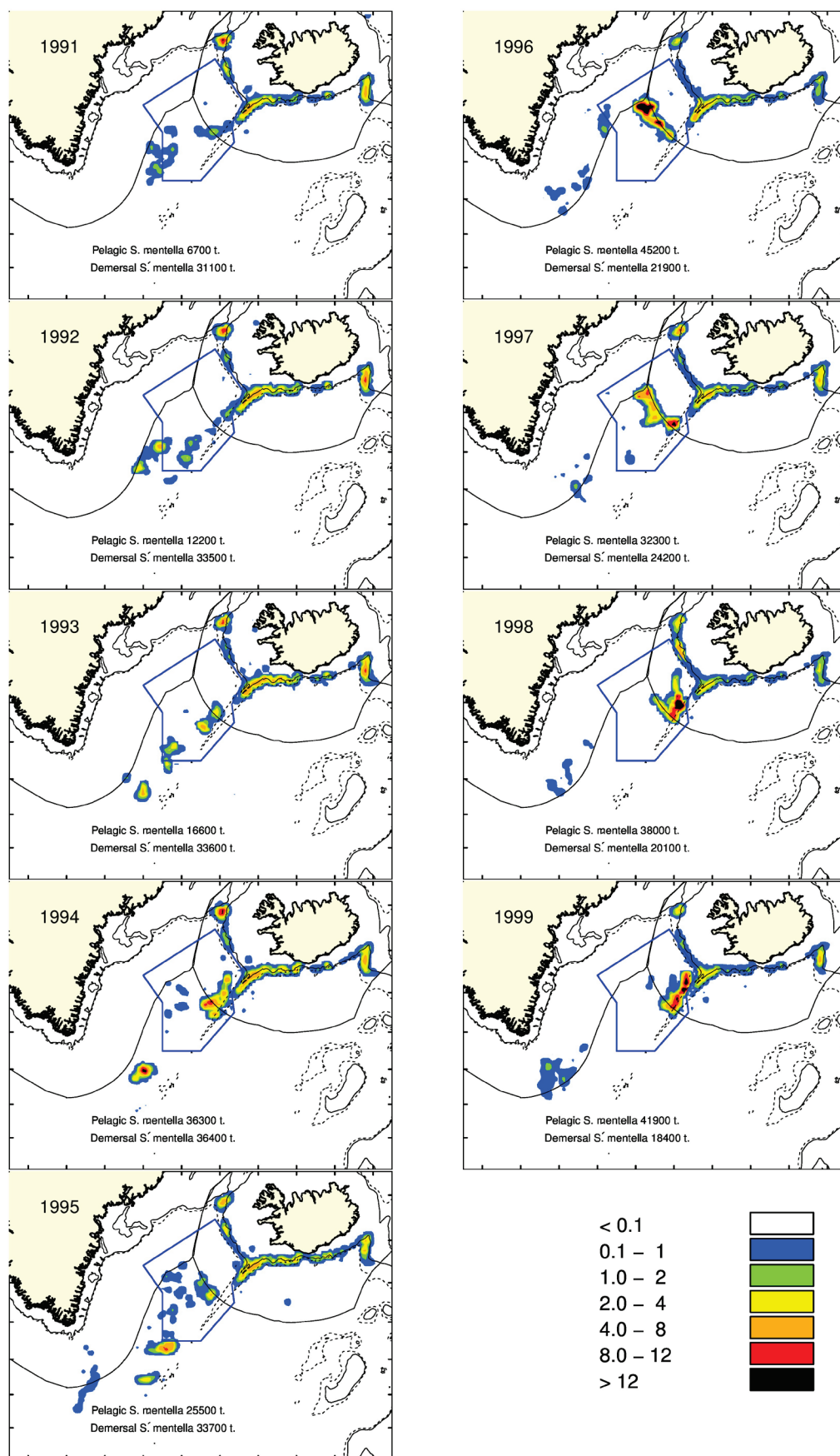


Figure 2.4.6.3 Geographical distribution of the Icelandic catches of *S. mentella* 1991–1999. The colour scale indicates catches (tonnes per NM²). The blue line marks the recommended geographical boundaries of the “deep pelagic” management unit.

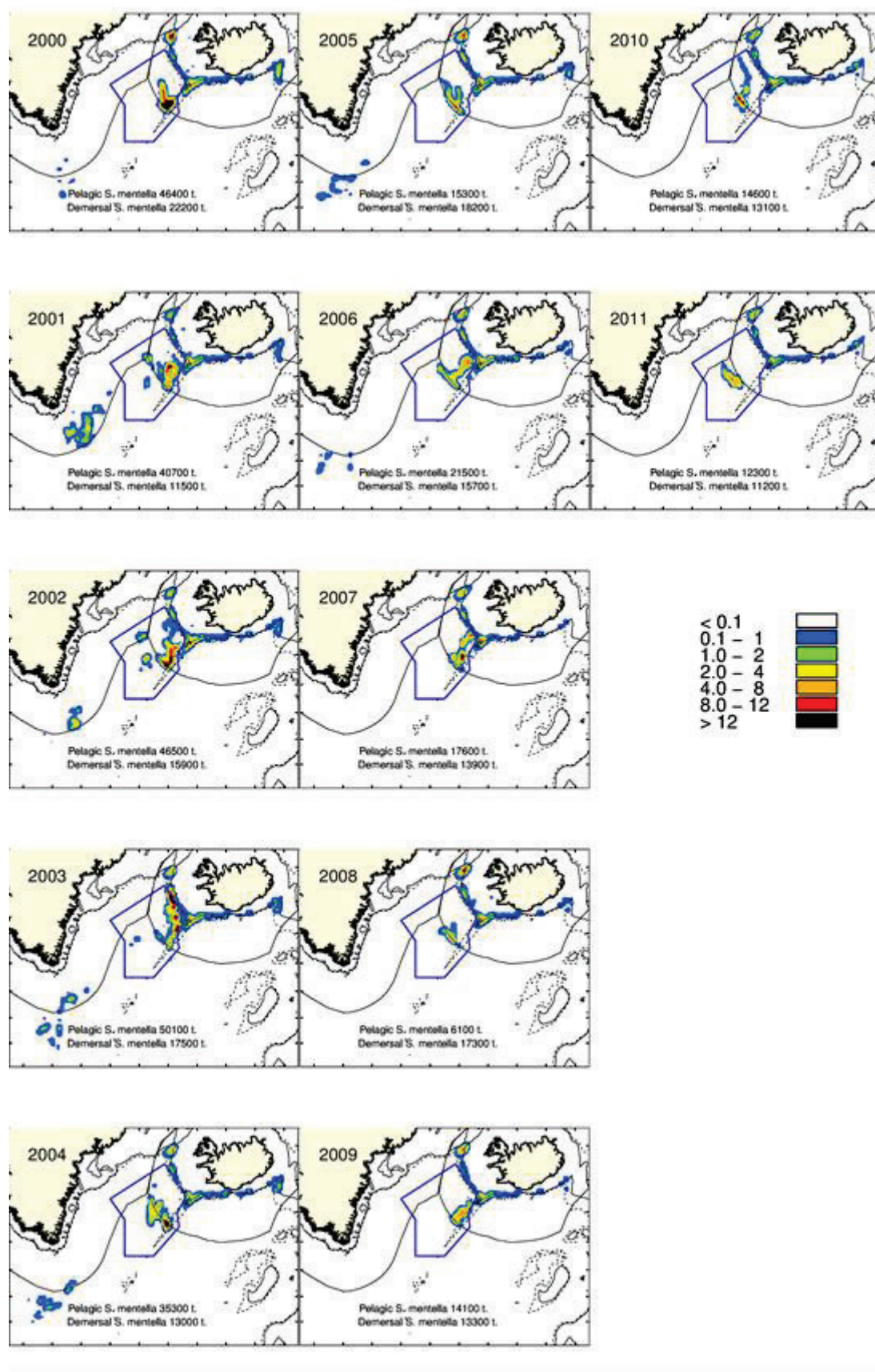


Figure 2.4.6.3 (Continued) Geographical distribution of the Icelandic catches of *S. mentella* 2000–2011. The colour scale indicates catches (tonnes per NM²). The blue line marks the recommended geographical boundaries of the “deep pelagic” management unit.

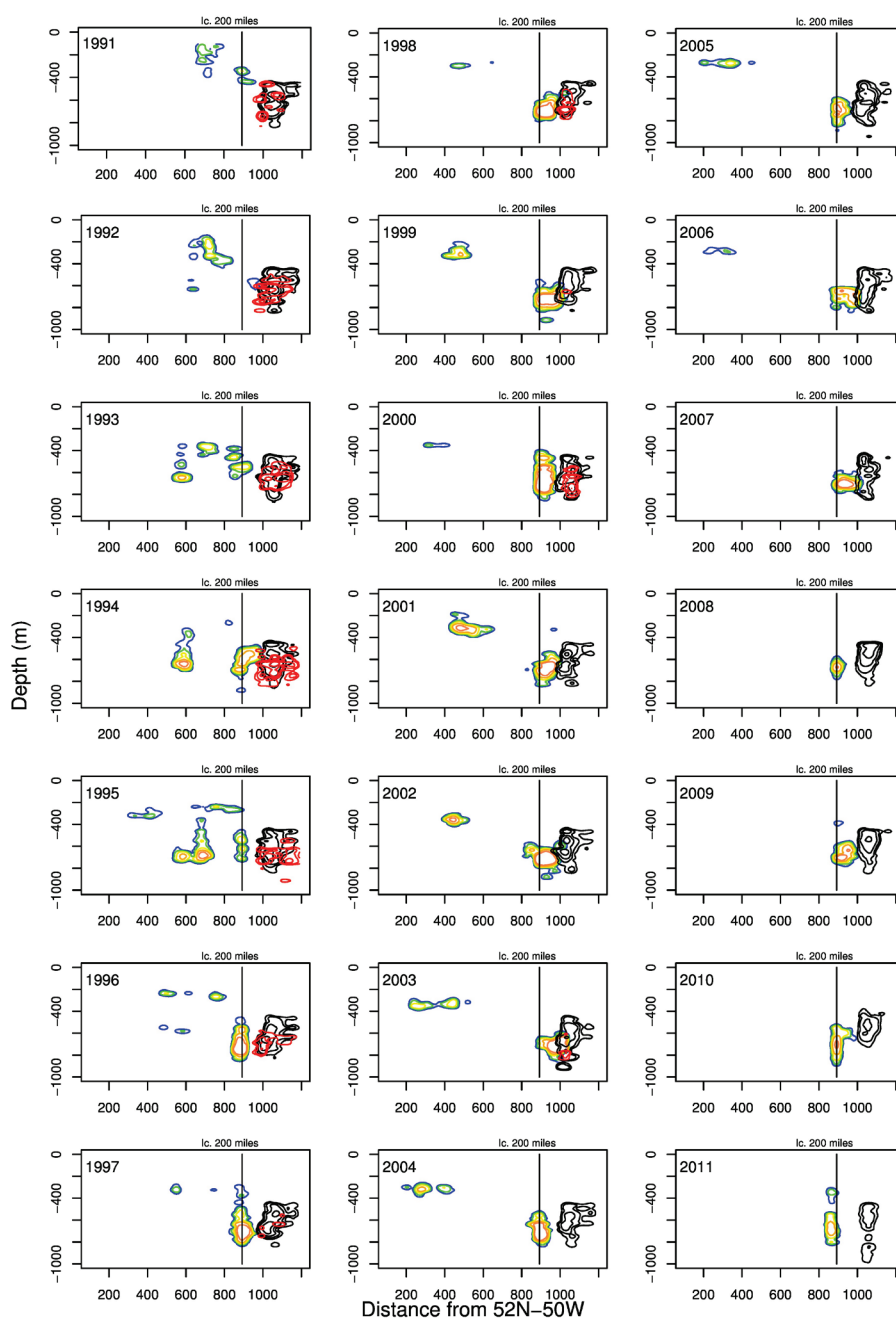


Figure 2.4.6.4

Location–depth plots for *S. mentella* catches as reported by Icelandic vessels. Location is represented by the distance (in NM in the SW–NE direction) from a fixed position (52°N 50°W). The contour lines indicate relative catches. The coloured contours represent the fishery on pelagic *S. mentella*, the black contours indicate bottom trawl catches of demersal *S. mentella*, and the red contours represent catches of demersal *S. mentella* taken with pelagic trawls. The Icelandic EEZ boundary is shown as a reference.

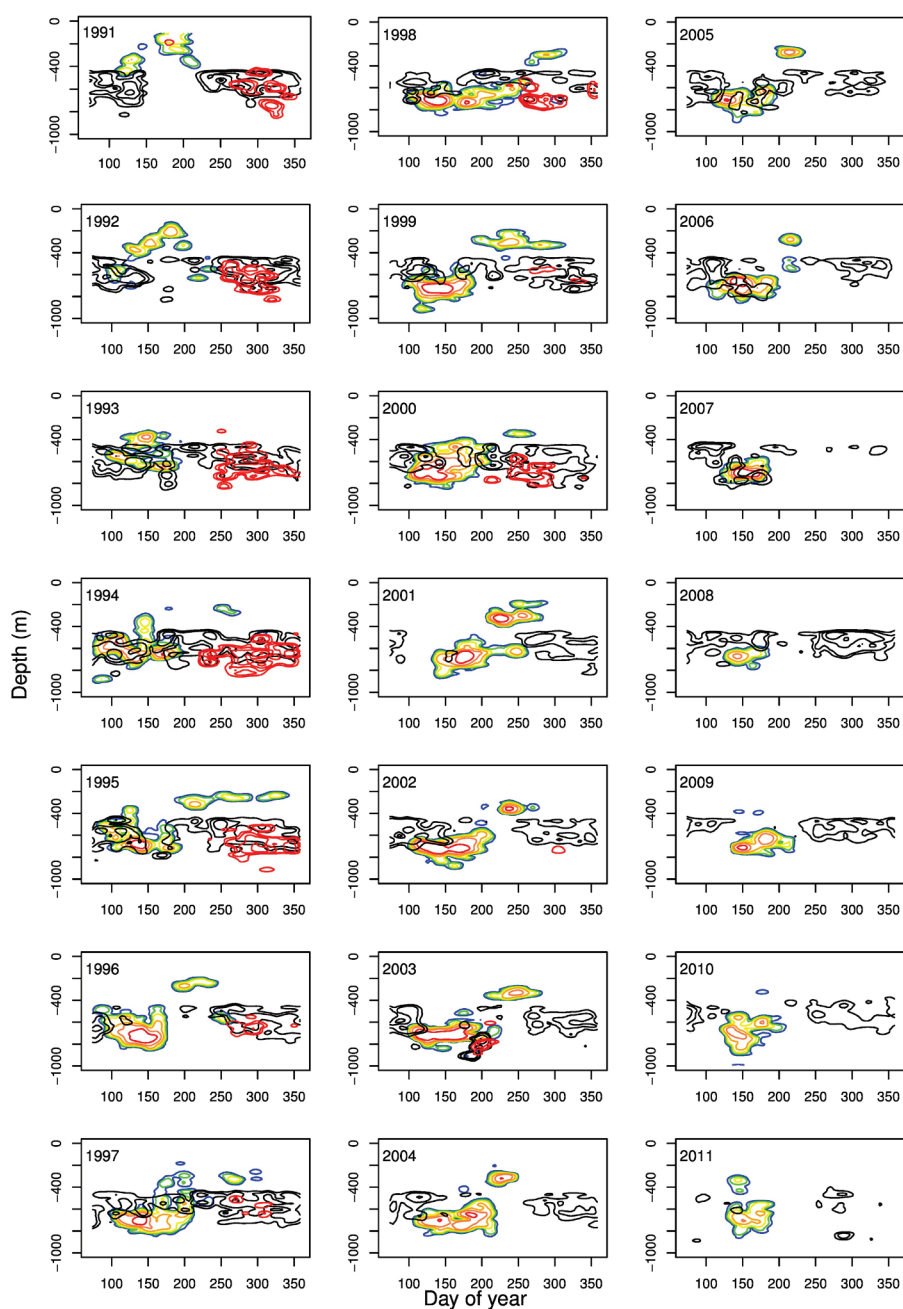


Figure 2.4.6.5

Depth–time plots for Icelandic *S. mentella* catches, where the y-axis is depth, the x-axis is day of the year, and the colour indicates the catches. The coloured contours represent the fishery on pelagic *S. mentella*, the black contours indicate bottom trawl catches of demersal *S. mentella*, and the red contours represent catches of demersal *S. mentella* taken with pelagic trawls.

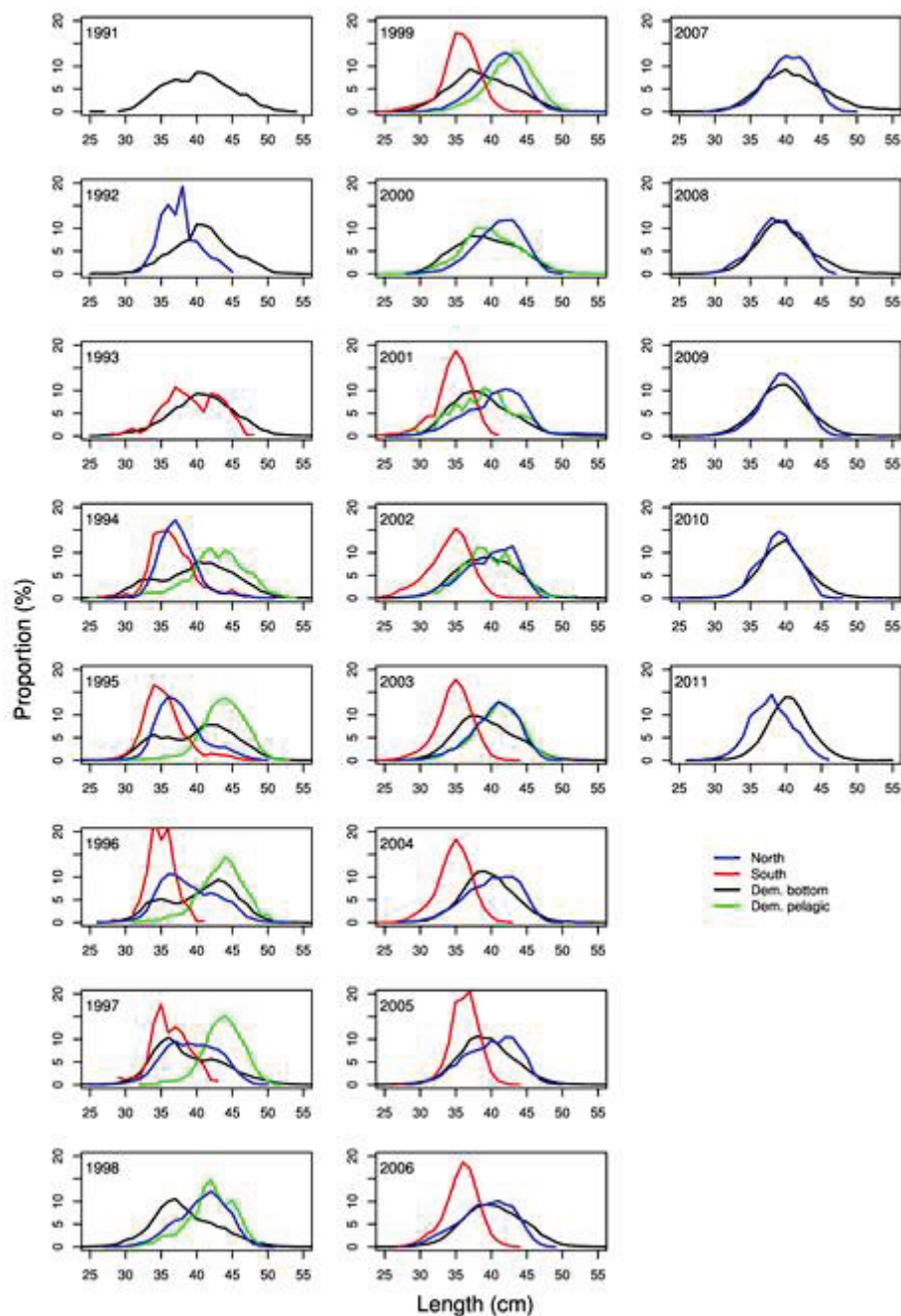


Figure 2.4.6.6 Length distributions from different Icelandic *S. mentella* fisheries. The blue lines represent the fishery on pelagic *S. mentella* in the northeastern area, the red lines the pelagic fishery in the southwestern area, the black lines indicate bottom trawl catches of demersal *S. mentella*, and the green lines represent catches of demersal *S. mentella* taken with pelagic trawls.

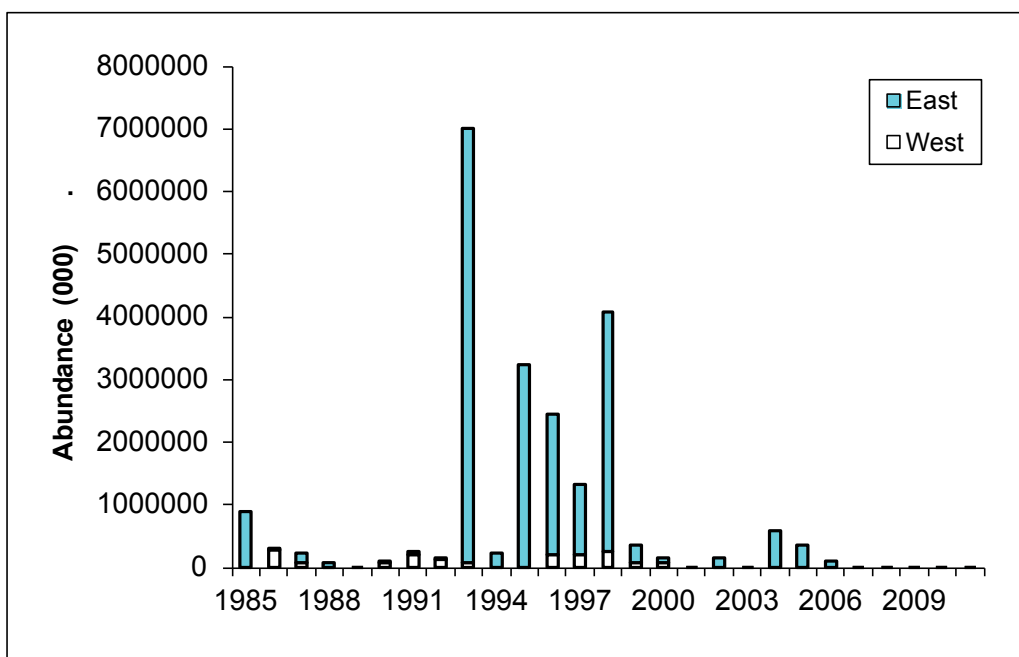


Figure 2.4.6.7 Survey abundance indices of juvenile *Sebastes* spp (≤17 cm) from the German groundfish survey conducted on the continental shelves off East and West Greenland.

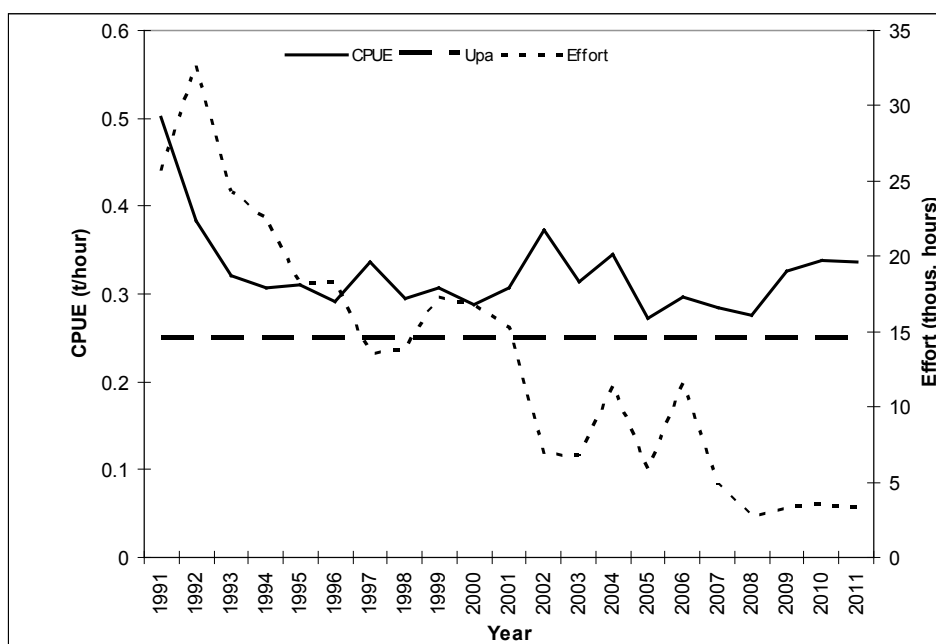


Figure 2.4.6.8 Demersal *S. mentella* on the continental shelf. Cpue (t/hour) and fishing effort (in thousands) from the Faroese Otter Board fleet where 70% of the total catch was *S. mentella*.

Table 2.4.6.1 Landings of *S. viviparus* in Division Va.

Year	Landings (t)
1996	22
1997	1159
1998	994
1999	498
2000	227
2001	21
2002	20
2003	3
2004	2
2005	4
2006	9
2007	24
2008	15
2009	37
2010	2602
2011	1427

Table 2.4.6.2 Coordinates of the recommended boundary of the “deep pelagic” management unit.

Point no.	Latitude	Longitude	Latitude	Longitude
1	64.75000	- 28.50	64° 45' N	28° 30' W
2	62.83333	- 25.75	62° 50' N	25° 45' W
3	61.91667	- 26.75	61° 55' N	26° 45' W
4	61.00000	- 26.50	61° 00' N	26° 30' W
5	59.00000	- 30.00	59° 00' N	30° 00' W
6	59.00000	- 34.00	59° 00' N	34° 00' W
7	61.50000	- 34.00	61° 30' N	34° 00' W
8	62.83333	- 36.00	62° 50' N	36° 00' W
9	64.75000	- 28.50	64° 45' N	28° 30' W

Table 2.4.6.3 Nominal landings (tonnes) of demersal *S. mentella* 1978–2011 in ICES Divisions Vb and VI.

Year	Vb	VI
1978	7 767	18
1979	7 869	819
1980	5 119	1 109
1981	4 607	1 008
1982	7 631	626
1983	5 990	396
1984	7 704	609
1985	10 560	247
1986	15 176	242
1987	11 395	478
1988	10 488	590
1989	10 928	424
1990	9 330	348
1991	12 897	273
1992	12 533	134
1993	7 801	346
1994	6 899	642
1995	5 670	536
1996	5 337	1 048
1997	4 558	419
1998	4 089	298
1999	5 294	243
2000	4 841	885
2001	4 696	36
2002	2 552	20
2003	2 114	197
2004	3 931	6
2005	1 593	111
2006	3 421	179
2007	1 376	1
2008	750	50
2009	1,077	0
2010	1202	
2011 ¹⁾	1126	

¹⁾ Provisional

ECOREGION
STOCK
Iceland and East Greenland
Golden redfish (*Sebastes marinus*) in Subareas V, VI, XII, and XIV
Advice for 2013

ICES advises on the basis of precautionary considerations that catches should be no more than 40 000 t.

Stock status

F (Fishing Mortality)		
		2009–2011
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa} , F_{lim})	?	Unknown
SSB (Spawning-Stock Biomass)		
		2010–2012
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa} , B_{lim})	✓	Full reproductive capacity
Qualitative evaluation	↗	Increasing in main area

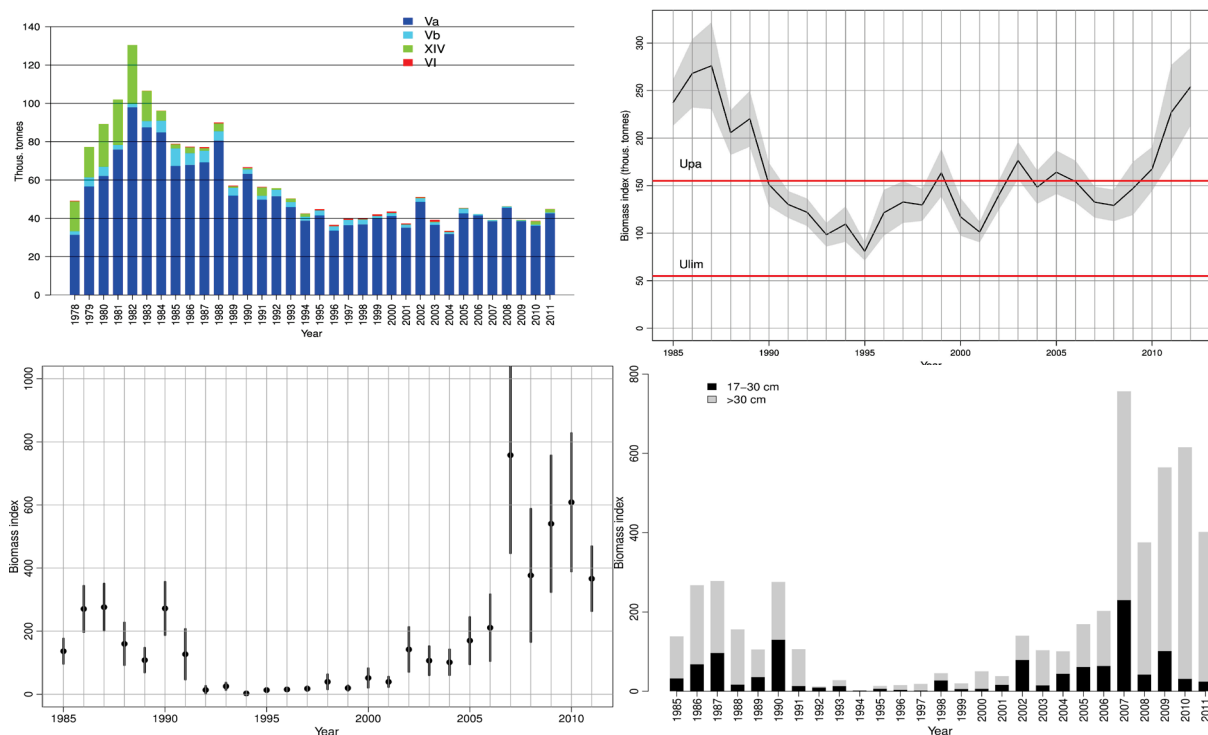


Figure 2.4.7.1

Golden redfish (*Sebastes marinus*) in Subareas V, VI, XII, and XIV. Top left: Landings by area, Top right: Survey biomass (± 1 standard error) from for Icelandic waters (spring survey). Bottom: Survey biomass and abundance indices for East and West Greenland. Left: Total biomass index, including one standard error. Right: Total biomass index split into pre-fishery recruits (17–30 cm) and fishable redfish (>30 cm).

In Division Va the survey index (U) has been increasing since 2008 and is currently far above U_{pa} . In Division XIVb (East Greenland) survey indices of both pre-fishery recruits and fishable size have increased in recent years. In Division Vb the Faroese groundfish survey indicates that the abundance has been decreasing since 2001.

Management plans

The regulation is based on TAC in Iceland and in Greenland, but through an effort system in the Faroe Islands. The separation of golden redfish and Icelandic slope *S. mentella* in the quota was implemented in the 2010/2011 fishing season. The TAC in Greenland is set for redfish, with no distinction being made between *S. marinus* and *S. mentella*.

Biology

Sebastes marinus is a species with late maturation (matures between 10 and 14 years old) and slow growth (can get older than 50 years) and is hence considered to be vulnerable to overexploitation. It can therefore only sustain low exploitation and management should be based on that consideration.

The fisheries

The majority of the golden redfish catch is taken in ICES Division Va, which has contributed 95–98% of the total landings since 1990. Between 90 and 95% of the golden redfish catch in Division Va is taken by bottom trawlers targeting redfish. The remaining catches are caught as bycatch in gillnet, longline, and *Nephrops* fishery. Average annual landings 2000–2011 have been 40 000 tonnes. *S. marinus* in Division Va is to a small extent caught in a mixed fishery with *S. mentella* (Icelandic slope).

Catch distribution	Total landings (2011) = 44.8 kt, where 94% was taken by bottom trawls and 6% by other gear-types. Discards considered very small.
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Quality considerations

Due to the aggregating behavior of the species, survey indices are often largely composed of a few large hauls. This causes high CVs in the indices and large interannual fluctuation in estimates of biomass.

Scientific basis

Assessment type	Trends-based assessment.
Input data	Two survey indices (Icelandic spring survey since 1985 and autumn survey since 1996).
Discards and bycatch	Not incorporated in the assessment, but very small.
Indicators	Gadget model used as trend indicator.
Other information	Faroese groundfish surveys since 1994 and 1996, German groundfish survey on the Greenland shelf since 1985. Benchmarked in February 2012, further review of the model settings needed before 2013.
Working group report	NWWG

ECOREGION **Iceland, East Greenland, Faroe Islands**
STOCK **Golden redfish (*Sebastes marinus*) in Subareas V, VI, XII, and XIV**

Reference points

ICES suggests that the relative state of the stock be assessed through a survey biomass index series (U) in Icelandic waters.

	Type	Value	Technical basis
MSY Approach	MSY B _{trigger}	Undefined	
	F _{MSY}	Undefined	
Precautionary approach	U _{lim}	55	20% of highest observed survey index*.
	U _{pa}	155	60% of highest observed survey index*.
	F _{lim}	Undefined	
	F _{pa}	Undefined	

(unchanged since 1998)

* Technical basis for the survey index:

The basis for the calculation of the U_{pa} is the Icelandic spring groundfish survey index series starting in 1985. Since 1990 the average U has been around half of U_{max} – the highest observed index in the time-series (276 in 1987). This has not resulted in any strong year classes compared to higher U's. A precautionary U_{pa} is therefore proposed at U_{max}*0.6, corresponding to the U's associated with the most recent strong year class. U is regarded as a proxy for SSB but represents the fishable biomass.

Outlook for 2013

No analytical assessment can be presented for this stock, therefore, fishing possibilities cannot be projected.

Precautionary approach

The new data (landings and surveys) suggest the stock is increasing. The stock seems to have increased, with catches around 40 000 t since 1995. ICES advises that catches in 2013 should be no more than 40 000 t.

Additional considerations

Management considerations

Sebastes marinus is a species with late maturation and slow growth and is hence considered to be vulnerable to overexploitation. It can therefore only sustain low exploitation and management should be based on that consideration.

The strong 1990 year class has been in the Icelandic fishery for a decade and will also sustain the stock in the short term. The 1996–2001 year classes are above average and have been recruiting to the fishery since 2006.

An exploratory assessment based on the Gadget model indicates that the fishing mortality has decreased since the early 1990s and is currently close to F_{max} (Figure 2.4.7.2).

Subarea XIV is an important nursery area for *S. mentella* and *S. marinus*. The survey index of the fishable stock of *S. marinus* in Subarea XIV has increased in recent years, but with a large measurement uncertainty (Figure 2.4.7.2). Measures to protect juvenile redfish in Subarea XIV should be continued (sorting grids in the shrimp fishery).

In Subarea XIV redfish and cod are found in the same areas and depths and historically these species have been taken in the same fisheries. For 2012, ICES advises that no fishery should take place on cod in Greenland waters. Management measures should be put in place that minimize catches of cod in a directed fishery for *S. marinus*.

No formal agreement on the management of *S. marinus* exists among the three coastal states, Greenland, Iceland, and the Faroe Islands. In Greenland and Iceland, the fishery is regulated by a TAC and in the Faroe Islands by effort limitation.

On average, about 5% of the total landings have been taken in Division Vb and Subareas VI and XIV. In 2009 a fishery targeting redfish was initiated in Subarea XIV. Total catches were 1118 t in 2009, 8266 t in 2010, and 8381 t in 2011. The fishery does not distinguish between species, but based on survey information, *S. marinus* is estimated to account for 20% of catches, i.e. 224 t in 2009, 1653 t in 2010, and 1676 t in 2011.

Regulations and their effects

A quick closure system was implemented in 1977 in Iceland to protect juvenile redfish. If more than 20% of a catch observed on board is below 33 cm a small area can be closed for at least two weeks. For this reason there is no minimum landing size for golden redfish. The effect of the quick closure has not been evaluated and since 2001 there have been relatively few quick closures on small golden redfish, or on average three every year. The reason for the few quick closures on small golden redfish is because large areas southwest and west of Iceland are closed permanently or temporarily for trawling to protect juvenile golden redfish. These areas were closed partly because of frequent quick closures on redfish fisheries in 1991–1995. The effects of these closed areas have not been evaluated, but the increase in the spring survey index since 2003 is partly related to increased aggregation of golden redfish in these areas.

Since the late 1980s in Division Va and since 2002 in Subarea XIV it has been mandatory in the shrimp fishery to use sorting grids in order to reduce bycatches of juvenile redfish in the shrimp fishery.

Uncertainty in the assessment

A single abundance index that covers the whole distributional range of the stock is not available. The exploratory assessment is based on a survey index from Division Va only and landings from all three areas. This approach may create a bias in the assessment that cannot be quantified.

Comparison with previous assessment and advice

The basis and the advice has not changed compared to last year.

Sources

ICES 2012a. Report of the Benchmark Workshop on Redfish Stocks, 1–8 February 2012. ICES CM 2012/ACOM:48.
ICES. 2012b. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.

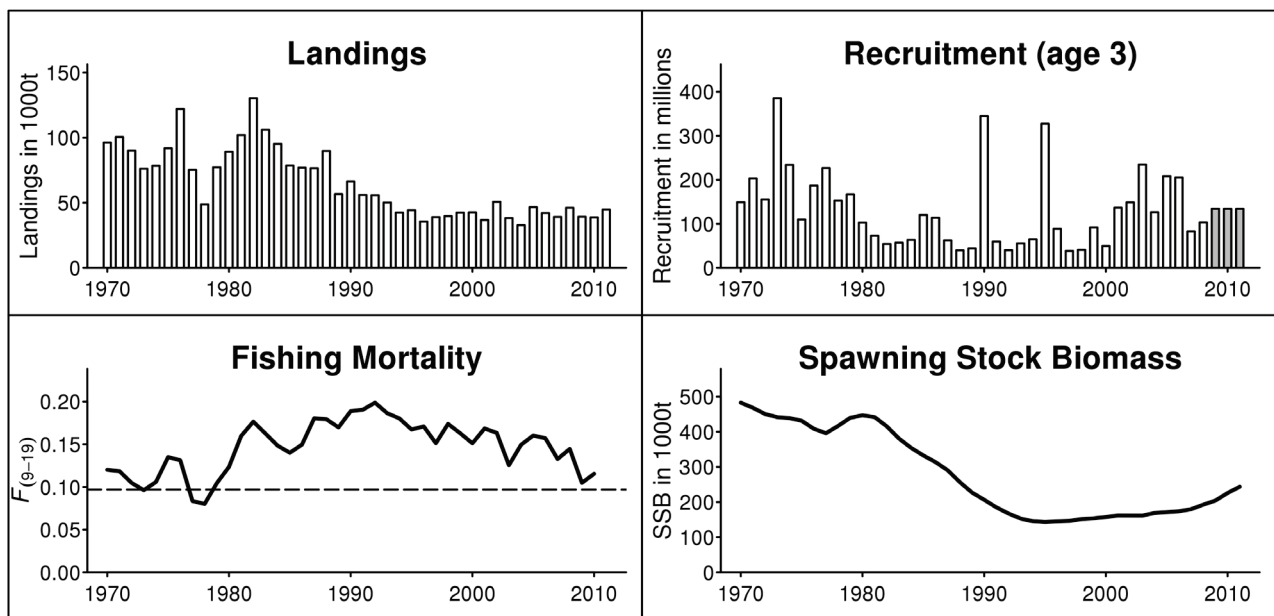


Figure 2.4.7.2 Golden redfish in Subareas V, VI, XII, and XIV. Summary of stock assessment (weights in thousand tonnes.).

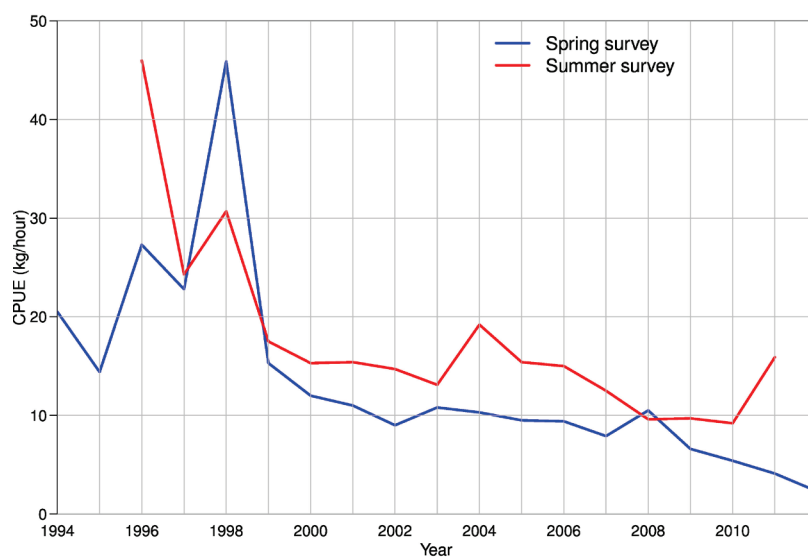


Figure 2.4.7.3 Golden redfish (*Sebastes marinus*) in Subareas V, VI, XII, and XIV. Cpue in the Faroese spring groundfish survey and the summer groundfish survey in ICES Division Vb.

Table 2.4.7.1 Golden redfish (*Sebastes marinus*) in Subareas V, VI, XII, and XIV. ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Iceland TAC ^{1,6}	Greenland TAC ⁷	<i>S. marinus</i> ICES landings
1987	No increase in F	83	95		77
1988	No increase in F	84	85		90
1989	TAC ¹	117 ¹	77		57
1990	TAC ¹	116 ¹	80		67
1991	Precautionary TAC	77 (117 ¹)	55 ⁵		56
1992	Precautionary TAC	76 (116 ¹)	90		56
1993	Precautionary TAC ¹	120 ¹	104		50
1994	Precautionary TAC, if required	100 ¹	90		43
1995	TAC	90 ¹	77		45
1996	TAC for Division Va (28); precautionary TAC for Division Vb and Subarea XIV (4)	32 ²	65		37
1997	Effort 75% of 1995 value	32 ²	65		40
1998	Effort reduced in steps of 25% from the 1995 level	37.2 ²	65		39
1999	Effort not increased compared to 1997	35 ²	65		42
2000	Catch not increased compared to 1998	35 ²	60		44
2001	Effort not increased compared to 1999	33 ^{2,3}	57		37
2002	25% reduction in effort	29 ⁴	65		51
2003	25% reduction in effort(2001)	31 ⁴	60		39
2004	25% reduction in effort(2002)	37.4 ⁴	57		33.4
2005	Maintain fishable biomass above U _{pa}	37 ⁴	57		45.4
2006	Maintain fishable biomass above U _{pa}	37 ⁴	57		42.2
2007	Maintain fishable biomass above U _{pa}	37 ⁴	57	5	39.1
2008	Maintain fishable biomass above U _{pa}	37 ⁴	57	1	46.3
2009	Maintain fishable biomass above U _{pa}	< 30	50		39.2
2010	Maintain fishable biomass above U _{pa}	< 30	50	6	38.7
2011	Same advice as last year	< 30	37.5	8	44.8
2012	Maintain catches	< 40	40	8	
2013	Maintain catches	< 40			

Weights in '000 t.

¹ Deep-sea *S. mentella* and *S. marinus* combined.

² *S. marinus* only.

³ In Division Va only.

⁴ Both Divisions Va and Vb and Subarea XIV.

⁵ Year ending 31 August.

⁶ From 1992 onwards: Quota year September–August

⁷ Demersal redfish (*Sebastes marinus* and *S. mentella*).

Table 2.4.7.2

Golden redfish (*Sebastes marinus*) in Subareas V, VI, XII, and XIV. Official landings (in tonnes) by area.

Year	Area				Total
	Va	Vb	VI	XIV	
1978	31,300	2,039	313	15,477	49,129
1979	56,616	4,805	6	15,787	77,214
1980	62,052	4,920	2	22,203	89,177
1981	75,828	2,538	3	23,608	101,977
1982	97,899	1,810	28	30,692	130,429
1983	87,412	3,394	60	15,636	106,502
1984	84,766	6,228	86	5,040	96,120
1985	67,312	9,194	245	2,117	78,868
1986	67,772	6,300	288	2,988	77,348
1987	69,212	6,143	576	1,196	77,127
1988	80,472	5,020	533	3,964	89,989
1989	51,852	4,140	373	685	57,050
1990	63,156	2,407	382	687	66,632
1991	49,677	2,140	292	4,255	56,364
1992	51,464	3,460	40	746	55,710
1993	45,890	2,621	101	1,738	50,350
1994	38,669	2,274	129	1,443	42,515
1995	41,516	2,581	606	62	44,765
1996	33,558	2,316	664	59	36,597
1997	36,342	2,839	542	37	39,761
1998	36,771	2,565	379	109	39,825
1999	39,824	1,436	773	7	42,040
2000	41,187	1,498	776	89	43,550
2001	35,067	1,631	535	93	37,326
2002	48,570	1,941	392	189	51,092
2003	36,577	1,459	968	215	39,220
2004	31,686	1,139	519	107	33,451
2005	42,593	2,484	137	115	45,329
2006	41,521	656	0	34	42,211
2007	38,364	689	0	83	39,134
2008	45,538	569	64	80	46,251
2009	38,442	462	50	224	39,177
2010	36,155	620	220	1,653	38,648
2011 ¹⁾	42,605	493	83	1,676	44,875

¹⁾ Provisional.

ECOREGION Iceland and East Greenland
STOCK Beaked redfish (*Sebastes mentella*) in Division Va and Subarea XIV (Icelandic slope stock)

Advice for 2013

The 2011 data (landings and survey) do not change the perception of the stock and give no reason to change the advice from that given last year: “ICES advises that catches should be no higher than 10 000 t. This value should be a starting point for the adaptive part of a management plan”.

Stock status

F (Fishing Mortality)		
		2009–2011
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
SSB (Spawning-Stock Biomass)		
		2010–2012
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	→	Without trend

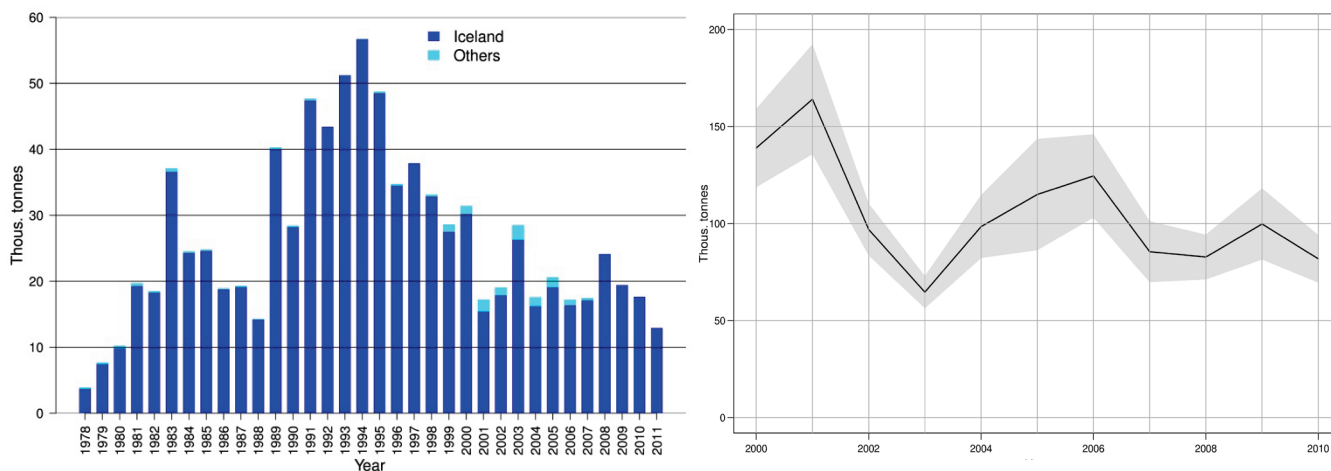


Figure 2.4.8.1 Beaked redfish (*Sebastes mentella*) in Division Va and Subarea XIV (Icelandic slope stock). Left: Landings (thousand tonnes, 1978–2010). Right: Survey biomass in Division Va (Autumn survey).

Available survey biomass estimates indicate that in Division Va the biomass shows no trend in recent years. No survey biomass estimates were available for 2011.

Management plans

There are no explicit management objectives for this stock.

Biology

Sebastes mentella is a species with late maturation (matures between 10 and 14 years old), slow growth (can get older than 50 years), and a schooling behaviour. Hence it is considered to be vulnerable to overexploitation. It can therefore only sustain low exploitation rates, and management should be based on that consideration.

Subarea XIV in Greenland waters is believed to be an important nursery area for *S. mentella* found in Icelandic waters, but data to estimate the magnitude of this contribution are not available.

The fisheries

Beaked redfish is taken by Icelandic trawlers using bottom trawl on the continental slope at depths between 450 and 700 m. Small amounts (<2%) of *S. marinus* are caught in the fishery and are possibly classified as beaked redfish in the catches.

The average annual catches in 2001–2011 have been about 20 thousand tonnes.

Catch distribution	Total landings (2011) = 13 kt, 100% bottom trawl.
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Quality considerations

There are a number of uncertainties in the assessment of *Sebastes mentella*. The lack of long time-series of abundance indices prevents the determination of stock status.

Scientific basis

Assessment type	Trend-based assessment.
Input data	Survey index (Autumn survey Division Va).
Discards and bycatch	There are no discard data, but discarding is not considered to be a major problem.
Indicators	None.
Other information	Stock benchmarked in 2012, but no assessment method agreed.
Working group report	NWWG

ECOREGION **Iceland and East Greenland**
STOCK **Beaked redfish (*Sebastes mentella*) in Division Va and Subarea XIV**
(Icelandic slope stock)

Reference points

No reference points are defined for this stock.

Outlook for 2013

The lack of long time-series indices of abundance prevents analytical assessment. Information on recruitment is not available. Therefore, fishing possibilities cannot be projected.

Precautionary approach

ICES advises that catches should be no higher than 10 000 t. This value should be a starting point for the adaptive part of a management plan.

Additional considerations

ICES has since 2009 advised that a management plan be developed and implemented for Icelandic slope beaked redfish which takes into account the uncertainties in science and the properties of the fisheries. Although there are no explicit management objectives for Icelandic slope beaked redfish, it is within the Icelandic TAC system. Until 2010/2011 Icelandic authorities set a joint quota for golden redfish and Icelandic slope beaked redfish in Icelandic waters, but now separate quotas are set for the species.

ICES also recommended that the management plan should also include:

- Objectives;
- Knowledge base (life history considerations, catch statistics, effort, surveys, etc.);
- Rules to determine removal rate (adaptive approach: start low, change according to agreed criteria);
- Implementation and enforcement.

Furthermore, the dialogue between managers, scientists, and stakeholders should go further than specifying a harvest control rule.

A catch of 10 000 t would be a significant reduction in catches compared with the recent past. This is expected to result in a lower exploitation rate, but the absolute magnitude of this reduction cannot be estimated at this time.

Measures to protect juvenile redfish in Subarea XIV should be continued (sorting grids in the shrimp fishery).

Changes in fishing technology and fishing patterns

In Icelandic waters, demersal *S. mentella* are taken mainly by Icelandic trawlers at depths greater than 500 m in a directed fishery. Prior to 2001 *S. mentella* on the continental shelf was taken in both a pelagic fishery and a demersal fishery, but since then pelagic catches have only occurred in 2003 and 2007.

A fishery for *S. mentella* on the shelf southeast of Iceland has decreased gradually since 2000 and is now insignificant.

Uncertainties in assessment and forecasts

The lack of long time-series of abundance indices prevents the determination of stock status. It is not clear to what extent observed changes in survey catch rates during 2000–2010 represent abundance rather than other factors. There was no survey in 2011.

Comparison with previous assessment and advice

The assessment and advice are the same as last year.

Sources

ICES 2012a. Report of the Benchmark Workshop on Redfish Stocks, 1–8 February 2012. ICES CM 2012/ACOM:48.
ICES. 2012b. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.

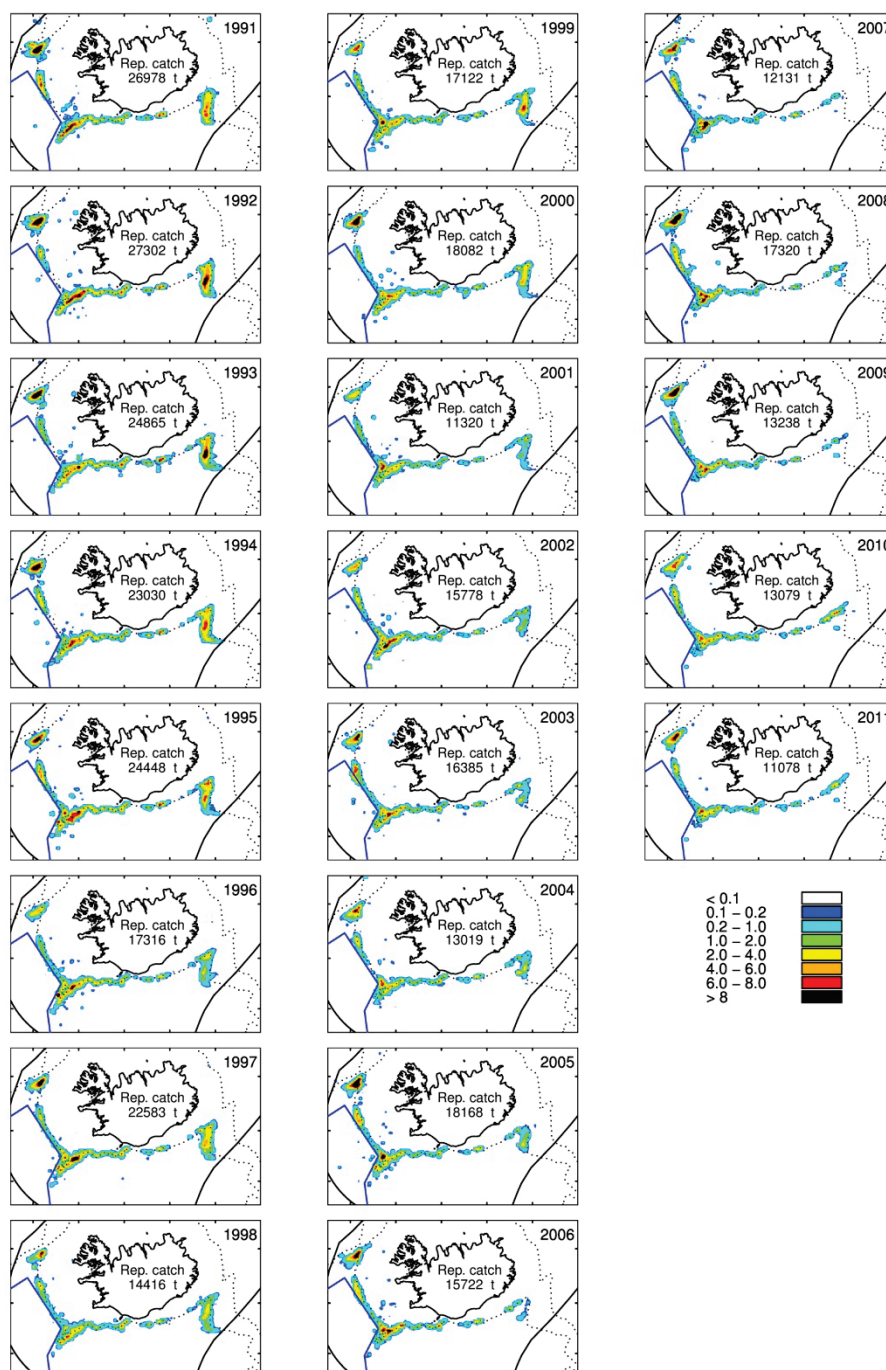


Figure 2.4.8.2 Beaked redfish (*Sebastes mentella*) in Division Va and Subarea XIV (Icelandic slope stock). Geographical location of the catch in Icelandic waters as reported in logbooks from the Icelandic bottom trawl fleet. Red line indicates the border used by Icelandic authorities to assign catches of *S. mentella* as pelagic (west of) or demersal (east of).

Table 2.4.8.1 Beaked redfish (*Sebastes mentella*) in Division Va and Subarea XIV (Icelandic slope stock). ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresponding to advice	TAC for Icelandic EEZ	Deep-sea <i>S. mentella</i> ICES landings
1987	Precautionary TAC	41–58	95 ¹	37.5
1988	Precautionary TAC	41–58	85 ¹	31.4
1989	TAC ¹	117 ¹	77 ¹	53.9
1990	TAC ¹	116 ¹	80 ¹	44.2
1991	Precautionary TAC	(40) 117 ¹	55 ^{1,5}	67.9
1992	Precautionary TAC	(40) 116 ¹	90 ^{1,6}	63.1
1993	Precautionary TAC	120 ¹	104 ^{1,6}	74.2
1994	Precautionary TAC, if required	100 ¹	90 ^{1,6}	83.6
1995	TAC	90 ¹	77 ^{1,6}	55.7
1996	Precautionary TAC (45 in Va; 23 in VI and XIV)	68 ²	65 ^{1,6}	41.9
1997	Effort 75% of 95-value	39 ²	65 ^{1,6}	43.1
1998	Fishing mortality to be further reduced towards the 86–90 levels		65 ^{1,6}	38.9
1999	Fishing mortality to be further reduced towards the 86–90 levels		65 ^{1,6}	35.0
2000	Fishing effort to be further reduced by 25%		60 ^{1,6}	38.1
2001	Fishing effort to be reduced by 25% from 1998 level	22 ³	57 ^{1,6}	23.9
2002	<i>Status quo</i> fishing effort	36 ⁴	65 ^{1,6}	23.5
2003	Not higher fishing effort than recent average	30 ⁴	60 ^{1,6}	31.1
2004	Not higher fishing effort than recent average	26.4 ⁴	57 ^{1,6}	21.9
2005	Reduce catch to 2001 level in Subarea V	22.5 ⁴	57 ^{1,6}	22.4
2006	Reduce catch to 2001 level in Subarea V	22.0 ⁴	57 ^{1,6}	21.0
2007	Same advice as last year	22.0 ⁴	57 ^{1,6}	24.1
2008	Same advice as last year	22.0 ⁴	57 ^{1,6}	
2009	Develop management plan and reduce catch	<10.0 ⁵	50 ^{1,6}	19.4
2010	Develop management plan and reduce catch	<10.0 ⁵	50 ^{1,6}	17.7
2011	Same advice as last year	<10.0 ⁵	12.5 ^{2,6}	12.9
2012	Same advice as last year	<10.0 ⁵		
2013	Same advice as last year	<10.0 ⁵		

Weights in thousand tonnes.

¹ Deep-sea *S. mentella* and *S. marinus* combined.

² Deep-sea *S. mentella* only.

³ In Division Va only.

⁴ For entire Subarea V.

⁵ Year ending 31 August.

⁶ Quota year September–August.

Table 2.4.8.2

Beaked redfish (*Sebastes mentella*) in Division Va and Subarea XIV (Icelandic slope stock).
Nominal landings (tonnes) per country.

Year	Iceland	Others	Total
1978	3 693	209	3 902
1979	7 448	246	7 694
1980	9 849	348	10 197
1981	19 242	447	19 689
1982	18 279	213	18 492
1983	36 585	530	37 115
1984	24 271	222	24 493
1985	24 580	188	24 768
1986	18 750	148	18 898
1987	19 132	161	19 293
1988	14 177	113	14 290
1989	40 013	256	40 269
1990	28 214	215	28 429
1991	47 378	273	47 651
1992	43 414	0	43 414
1993	51 221	0	51 221
1994	56 674	46	56 720
1995	48 479	229	48 708
1996	34 508	233	34 741
1997	37 876	0	37 876
1998	32 841	284	33 125
1999	27 475	1 115	28 590
2000	30 185	1 208	31 393
2001	15 415	1 815	17 230
2002	17 870	1 175	19 045
2003	26 295	2 183	28 478
2004	16 226	1 338	17 564
2005	19 109	1 454	20 563
2006	16 339	869	17 208
2007	17 091	282	17 373
2008	24 123	0	24 123
2009	19 430	0	19 430
2010	17 668	0	17 668
2011 ¹⁾	12 922	0	12 922

¹⁾ Preliminary.

ECOREGION Iceland and East Greenland
STOCK Beaked redfish (*Sebastes mentella*) in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Shallow pelagic stock < 500 m)

Advice for 2013

The advice for the fishery in 2013 is the same as the advice given in 2011 for the 2012 fishery: “ICES advises on the basis of precautionary considerations that no directed fishery should be conducted and bycatch of this stock in non-directed fisheries should be kept as low as possible.”

Stock status

F (Fishing Mortality)		
		2009–2011
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
SSB (Spawning-Stock Biomass)		
		2010–2012
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	✗	Stable at very low

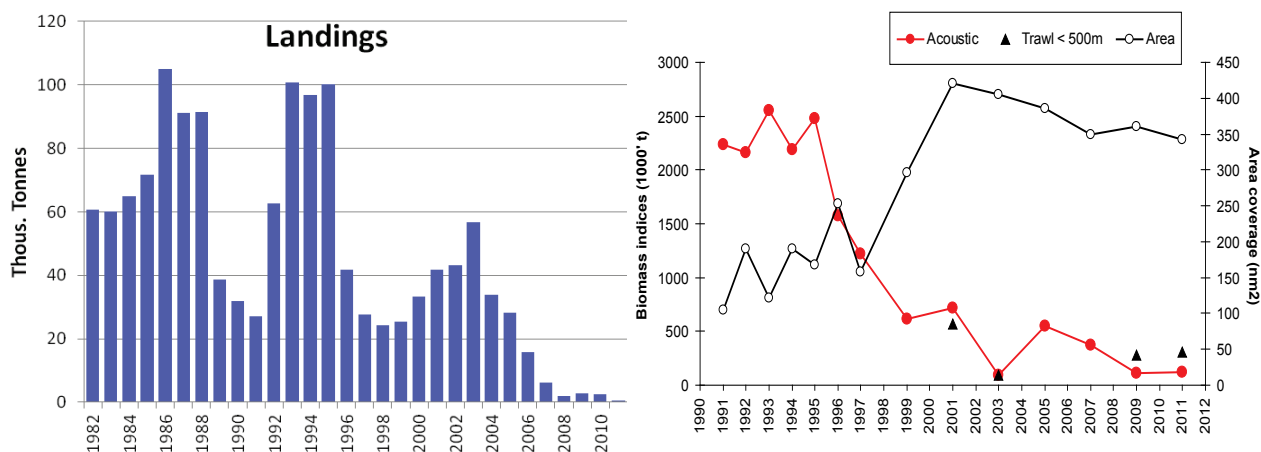


Figure 2.4.9.1 Beaked redfish (*Sebastes mentella*) in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Shallow pelagic stock < 500 m). Left: Landings (tonnes), Right: Overview of acoustic survey indices (thousand tonnes) from above the scattering layer (red filled circle), trawl estimates within the scattering layer and shallower than 500 m (black triangle), and aerial coverage (NM²) of the survey (black open circle) in the Irminger Sea and adjacent waters.

The biomass index from the acoustic survey in 2011 indicates that the stock has declined to roughly 5% of the estimates at the beginning of the survey time-series in the early 1990s. The exploitation rate for this stock is unknown.

Management plans

There are no explicit management objectives for this stock.

Biology

Sebastes mentella is a species characterized by slow growth, late maturation (matures between 10 and 14 years old), a long lifespan (> 50 years), and a schooling behaviour. Hence it is considered to be vulnerable to overexploitation. It can therefore only sustain low exploitation rates and management should be based on that consideration.

The fisheries

Nursery areas for the stock are found at the continental slope off East Greenland. Technical conservation measures such as mandatory sorting grids in the shrimp fishery that have been in place for several years should be continued in order to protect the juvenile redfish.

Catch distribution	Total catches (2011) = 568 t, where 100% are landings (100% pelagic trawl). No discards, industrial bycatch, or unaccounted removals.
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Effects of the fisheries on the ecosystem

These fisheries have no effect on the ecosystem apart from the removal of the target species. The pelagic fisheries on *S. mentella* generally have little or no bycatch.

Quality considerations

Several data improvements are needed – better catch and landings data, better survey information particularly within the deep-scattering layer, and a recruitment index. However, the acoustic index shows a sharp decline of the stock during the 1990s and the stock remains low.

ICES again had difficulties in obtaining catch estimates and landing data from some ICES member countries, and specially data disaggregated by depth. The Russian Federation has decided for the years 2011 and 2012 on an unilateral quota that considers both redfish management units as a single stock. This unilateral quota nearly equals the total quota recommended by NEAFC. The Russian Federation so far has not facilitated depth disaggregated catch data to the NWWG, and this may affect the assessment. In February 2011 ICES launched a data call requiring better data from the countries participating in the redfish fishery, but the response was very limited. There is a need for special action through NEAFC and NAFO to provide ICES with timely and complete information that might lead to more reliable catch statistics. Furthermore, ICES recommends that all nations should report depth information on a haul basis in accordance with the NEAFC logbook format.

Scientific basis

Assessment type	No analytical assessment, qualitative assessment.
Input data	Biomass and abundance survey indices obtained in biennial acoustic and trawling survey; biological data collected on this and other surveys and from commercial catches. Commercial indices (cpue, landings).
Discards and bycatch	Not included in the assessment.
Indicators	None.
Other information	Stock benchmarked in 2012.
Working group report	NWWG

ECOREGION **Iceland and East Greenland**
STOCK **Beaked redfish (*Sebastes mentella*) in Subareas V, XII, and XIV and**
NAFO Subareas 1+2 (Shallow pelagic stock < 500 m)

Reference points

No reference points have been set for this stock.

Outlook for 2013

No reliable assessment can be presented for this stock due to the insufficient commercial dataset and short time-series of suitable survey data. Therefore, fishing possibilities cannot be projected.

Precautionary approach

ICES advises on the basis of precautionary considerations that no directed fishery should be conducted and bycatch of this stock in non-directed fisheries should be kept as low as possible. A recovery plan should be developed.

The acoustic survey biomass index shows that the stock has declined to 5% of that observed in the early 1990s and the exploitation status is unknown. The stock is considered to be vulnerable to overexploitation because of its biological characteristics (slow-growing, late-maturing, and schooling behaviour).

Additional considerations

Management considerations

ICES is concerned about the lack of agreed management and TAC allocation schemes. This increases the risk of over-exploitation. The autonomous quotas that have been set are insufficient to constrain catches.

ICES has advised that an adaptive management plan be implemented and ICES provided a list of potential elements of such a management plan. The main management organization concerned with pelagic redfish in the Irminger Sea – NEAFC – has further requested ICES to specify these elements and also to estimate possible candidates for reference points. However, ICES has not yet been able to address this issue.

ICES has previously advised that most deep-water species like redfish can only sustain low rates of exploitation, since slow-growing, long-lived species that are depleted have a long recovery period. Fisheries should only be allowed to expand when indicators have been identified and a management strategy including appropriate monitoring requirements has been decided and is implemented. ICES therefore, stresses the need to develop and implement a recovery plan which takes into account the uncertainties in science and the properties of the fisheries.

The relationship of the shallow pelagic component with *S. mentella* from the Greenlandic shelf remains unclear.

Changes in fishing technology and fishing patterns

Russian trawlers started fishing on the shallow pelagic *S. mentella* stock in 1982 and covered wide areas of the Irminger Sea. Vessels from other nations soon joined this fishery. The main fishing area in the last decade has been south and southeast of Cape Farewell, Greenland, the so-called southwestern area (south of 60°N and west of about 32°W), and the area is almost entirely shallower than 500 m. Since 2000, the southwestern fishing ground extended also into the NAFO Convention Area, but in later years the fishing area has been limited to the border area between NAFO and ICES south of Greenland. Catches have declined substantially in parallel with this reduction in the fishing areas (Figure 2.4.9.1). In the period 1982–1992, the fishery was carried out mainly from April to August but since then it has been conducted from July to October. The trawlers participating in this fishery use large pelagic trawls (*Gloria*-type) with vertical openings of 80–150 m.

The shallow pelagic stock fishery in the Irminger Sea only exploits the mature part of the stock.

Data and methods

Survey indices, catches, cpue, and biological data are available for the stock, but the assessment is mainly based on surveys (Figures 2.4.9.2–2.4.9.4, Tables 2.4.9.2–2.4.9.3).

Despite the best of efforts, ICES again had difficulties in obtaining landings data from some ICES member countries. There is a need for a special action through NEAFC and NAFO to provide ICES, in a timely manner, with all information that might lead to more reliable catch statistics. Furthermore, ICES recommends that all nations should report depth information in accordance with the NEAFC logbook format.

Acoustic surveys conducted since 1991 in the Irminger Sea and adjacent waters are available for estimation of the stock biomass above the deep-scattering layer or down to ca. 350 m depth. Trawl information from within this layer and shallower than 500 m is available for 2001, 2003, 2009, and 2011.

Uncertainties in assessment and forecast

Commercial cpue series were previously used to determine stock sizes for pelagic *S. mentella*. However, the fishery targets pelagic aggregating fish and therefore stable or increasing cpues are not considered to reflect the stock status reliably, although declining cpues likely indicate a decreasing stock. Overall cpues declined between 1994 and 1999 and have since then fluctuated without a clear trend until 2010, when they increased (Figure 2.4.9.4). Table 2.4.9.1 shows the catch data. The new data available to the NWWG were insufficient to estimate the cpue for 2011.

The acoustic estimates for pelagic redfish only provide stock estimates for redfish distributed shallower than the deep-scattering layer (DSL), and the indices of stock size are approximate due to the varying coverage of the stock distribution area.

The quality of the trawl biomass estimate within the DSL and shallower than 500 m cannot be verified, as the data series is relatively short and only conducted every second year. Therefore, the abundance estimates by the trawl method must be considered as a rough attempt only to measure the abundance within the DSL and shallower than 500 m.

Sources

- ICES. 2011a. Report of the North-Western Working Group, 26 April–3 May 2011. ICES CM 2011/ACOM:07.
- ICES. 2011b. Report of the Working Group on Redfish Surveys, 2–4 August 2011. ICES CM 2011/SSGESST:21.
- ICES 2012a. Report of the Benchmark Workshop on Redfish Stocks, 1–8 February 2012. ICES CM 2012/ACOM:48.
- ICES. 2012b. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07

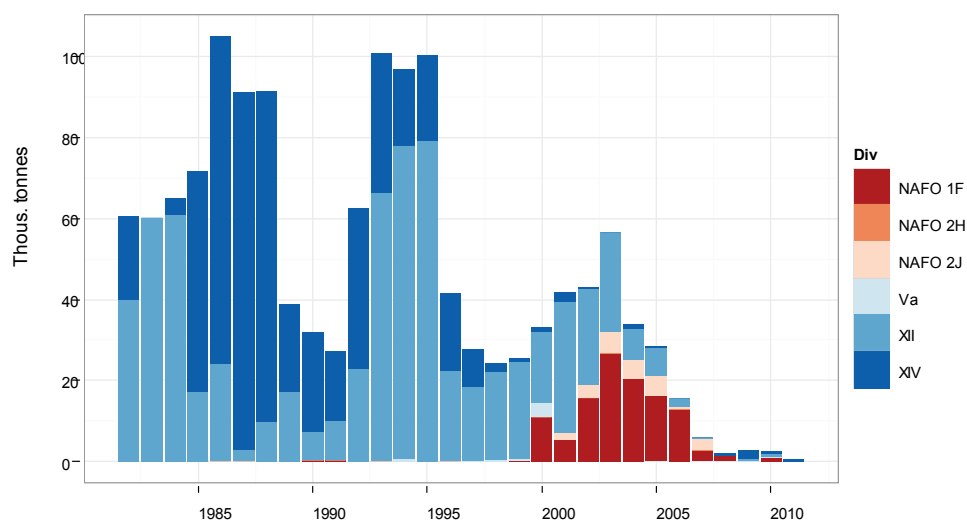


Figure 2.4.9.2 Beaked redfish (*Sebastes mentella*) in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Shallow pelagic stock < 500 m). Landings by area (weights in thousand tonnes).

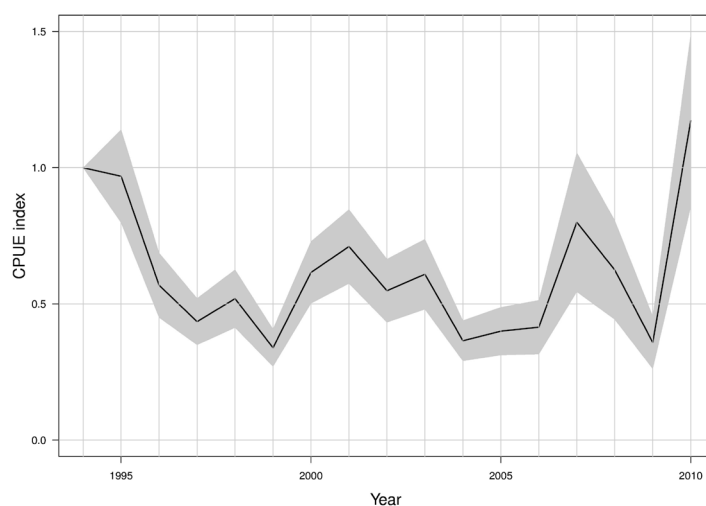


Figure 2.4.9.3 Beaked redfish (*Sebastes mentella*) in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Shallow pelagic stock < 500 m). Trends in standardized cpue, based on logbook data from several nations.

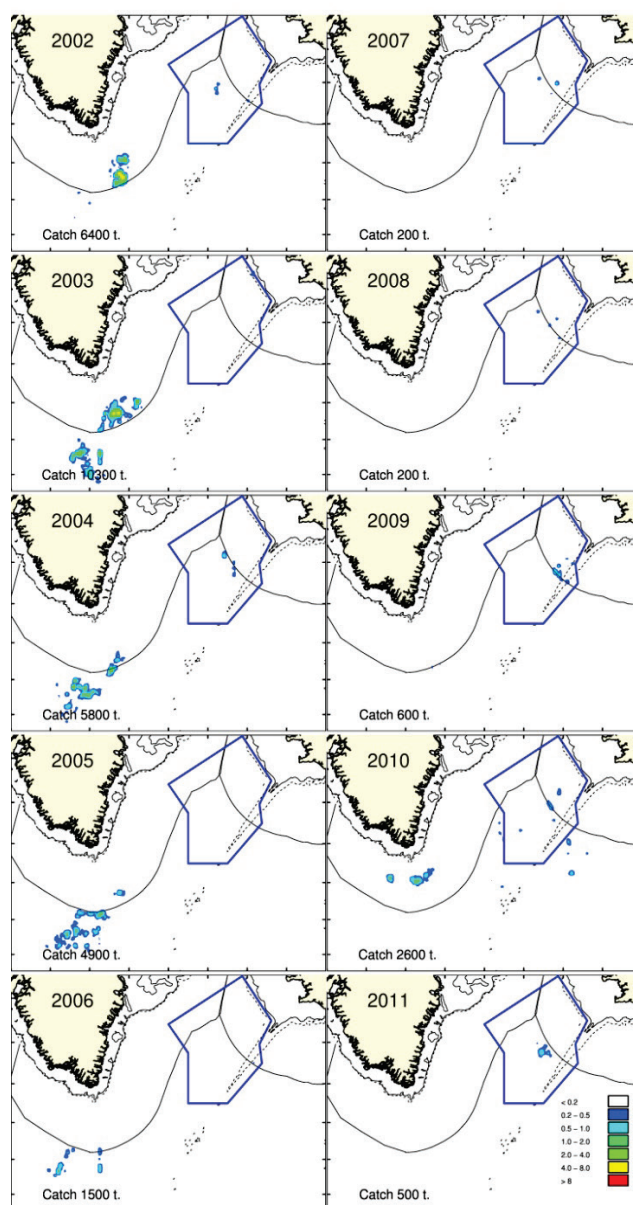


Figure 2.4.9.4 Beaked redfish (*Sebastes mentella*) in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Shallow pelagic stock < 500 m). Fishing areas and total catch of pelagic redfish (*S. mentella*) in the Irminger Sea and adjacent waters 2000–2011. This is a geographic proxy for the shallow pelagic stock. Data are from the Faroe Islands (2000–2011), Greenland (2000–2003 and 2009–2010), Iceland (2000–2011), Germany (2011), and Norway (2000–2003 and 2008–2011). The catches in the legend are given as tonnes per square nautical mile. The blue box represents the proposed management unit.

Table 2.4.9.1 Beaked redfish (*Sebastes mentella*) in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Shallow pelagic stock < 500 m). ICES advice, management, and catches.

Year	ICES Advice ¹⁾	Predicted catch corresponds to advice ¹⁾	TAC ¹⁾	ICES Catch ¹⁾ Total	ICES Catch Shallow pelagic stock
1987	No assessment	-		91	91
1988	No assessment	-		91	91
1989	TAC	90–100		39	39
1990	TAC	90–100		32	32
1991	TAC	66		28	27
1992	Preference for no major expansion of the fishery	-		66	63
1993	TAC	50		116	100
1994	TAC	100		148	97
1995	TAC	100		176	97
1996	No specific advice	-	153	180	41
1997	No specific advice	-	153–158	123	28
1998	TAC not over recent (1993–1996) levels of 150 000 t		153	117	24
1999	TAC to be reduced from recent (1993–1996) levels of 150 000 t		153	110	26
2000	TAC set lower than recent (1997–1998) catches of 120 000 t	85	120	126	33
2001	TAC less than 75% of catch 1997–1999	<85	95	129	41
2002	TAC less than 75% of catch 1997–1999 – Revised to be below current catch levels	<85	Not agreed NEAFC proposal (95)	146	43
2003	TAC not exceed current catch levels	119	Not agreed NEAFC proposal (119)	161	57
2004	TAC not exceed current catch levels	120	Not agreed NEAFC proposal (120)	126	34
2005	Limit catch to 41 kt	41	Not agreed NEAFC proposal (75) / (116 ²⁾)	74	28
2006	Catch less than 41 kt	41	Not agreed NEAFC proposal (62) / (99 ²⁾)	83	16
2007	No fishery until clear indications of recovery of the stock	0	Not agreed NEAFC proposal (46) / (73 ²⁾)	64	6
2008	Starting point for adaptive management strategy	20	Not agreed NEAFC proposal (46) / (64 ²⁾)	32	2
2009	Starting point for adaptive management strategy	20	Not agreed NEAFC proposal (0) / (72 ²⁾)	54	2.7
2010 ¹⁾	No directed fishery and bycatch as low as possible	-	Not agreed NEAFC proposal (0) / (72 ²⁾)	59	2.4
2011	Same advice as last year	-	Not agreed NEAFC proposal (0)/(60 ²⁾ / (30) ³⁾)	48	0.5
2012	Same advice as last year	-	Not agreed NEAFC proposal (0)/(56 ²⁾ / (30) ³⁾)		
2013	Same advice as last year	-			

Weights in thousand tonnes.

¹⁾ Up to 2009 advice and TAC were given for both shallow and deep stocks.

²⁾ Sum of all quotas in force for both shallow and deep pelagic.

³⁾ Unilateral Russian Federation TAC for both sShallow and deep pelagic stocks.

Table 2.4.9.2

Beaked redfish (*Sebastes mentella*) in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Shallow pelagic stock < 500 m). Catches (in tonnes) by area as used by the Working Group.

Year	Va	XII	XIV	NAFO 1F	NAFO 2J	NAFO 2H	Total
1982		39,783	20,798				60,581
1983		60,079	155				60,234
1984		60,643	4,189				64,832
1985		17,300	54,371				71,671
1986		24,131	80,976				105,107
1987		2,948	88,221				91,169
1988		9,772	81,647				91,419
1989		17,233	21,551				38,784
1990		7,039	24,477	385			31,901
1991		9,689	17,048	458			27,195
1992	106	22,976	38,709				62,564
1993	0	66,458	32,500				100,771
1994	665	77,174	18,679				96,869
1995	77	78,895	17,895				100,136
1996	16	22,474	18,566				41,770
1997	321	18,212	8,245				27,746
1998	284	21,976	1,598				24,150
1999	165	23,659	827	534			25,512
2000	3,375	17,491	687	11,052			33,216
2001	228	32,164	1,151	5,290	8	1,751	41,825
2002	10	24,004	222	15,702		3,143	43,216
2003	49	24,211	134	26,594	325	5,377	56,688
2004	10	7,669	1,051	20,336		4,778	33,951
2005	0	6,784	281	16,260	5	4,899	28,229
2006	0	2,094	94	12,692	260	593	15,734
2007	71	378	98	2,843	175	2,561	6,126
2008	32	25	422	1,580			2,059
2009	400	210	2 170				2,780
2010	160	686	498	1,074			2,419
2011		0	568				568

1982–1991 All pelagic catches assumed to be of the shallow pelagic stock.

1992–1996 Guesstimates based on different sources (see text).

1997–2010 Catches from calculations based on combined catch database and total landings.

Table 2.4.9.3 Beaked redfish (*Sebastes mentella*) in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Shallow pelagic stock < 500 m). Results for the acoustic survey indices from shallower than the scattering layer, trawl estimates within the deep-scattering layer and shallower than 500 m, and area coverage of the survey in the Irminger Sea and adjacent waters.

Year	Area covered (1000 NM ²)	Acoustic estimates 1000 t	Trawl estimates 1000 t
1991	105	2235	
1992	190	2165	
1993	121	2556	
1994	190	2190	
1995	168	2481	
1996	253	1576	
1997	158	1225	
1999	296	614	
2001	420	716	565
2003*	405	89*	92*
2005	386	550	
2007	349	372	
2009	360	108	278
2011	343	123	309

* The 2003 biomass estimate is considered inconsistent as the survey was carried out about one month earlier than usual, and a marked seasonal effect was observed.

ECOREGION Iceland and East Greenland
STOCK Beaked redfish (*Sebastes mentella*) in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Deep pelagic stock > 500 m)

Advice for 2013

The advice for the fishery in 2013 is the same as the advice given in 2011 for the 2012 fishery:

"ICES advises on the basis of the precautionary considerations that catches should be reduced to less than 20 000 t and a management plan should be developed and implemented."

Stock status

F (Fishing Mortality)		
		2009–2011
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
SSB (Spawning-Stock Biomass)		
		2010–2012
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	→	Stable

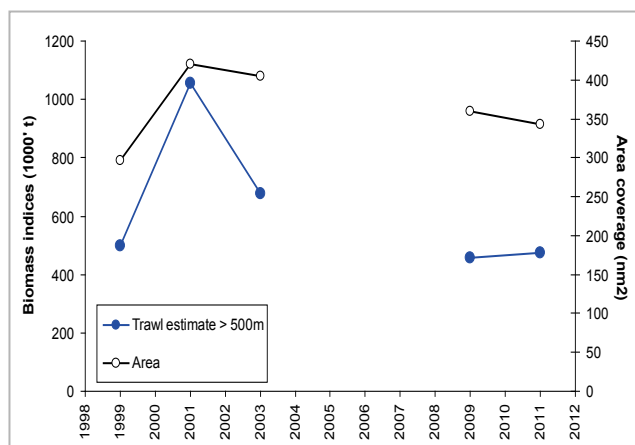
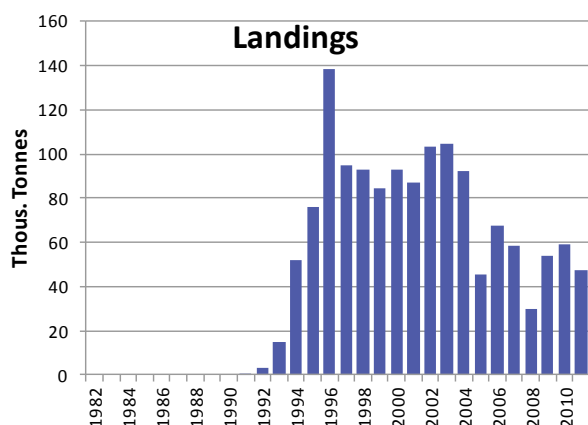


Figure 2.4.10.1 Beaked redfish in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Deep pelagic stock > 500 m). Left: Landings (thousand tonnes). Right: Overview of survey indices from trawl estimates deeper than 500 m (blue line) and aerial coverage of the survey (black open circle) in the Irminger Sea and adjacent waters.

Trawl survey estimates in 2009 and 2011 are lower than the average for 1999–2003 and near the lowest observed. These indices in combination with a marked decrease in landings since 2004 suggest that the stock has been reduced in the past decade. The exploitation rate for this stock is unknown.

Management plans

There are no explicit management objectives for this stock.

Biology

S. mentella is a species characterized by slow growth, late maturation (matures between 10 and 14 years old), a long lifespan (> 50 years), and a schooling behaviour. These characteristics make the species vulnerable to overexploitation. It can therefore only sustain low exploitation rates and management should be based on that consideration.

The fisheries

Nursery areas for the stock are found on the continental slope off East Greenland. Technical conservation measures such as mandatory sorting grids in the shrimp fishery that have been in place for several years should be continued in order to protect the juvenile redfish.

Catch distribution	Total catches (2011) are 47.5 kt, all landings (100% pelagic trawl). No discards, industrial bycatch, or unaccounted removals.
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Effects of the fisheries on the ecosystem

These fisheries are not considered to have an effect on the ecosystem apart from the removal of the target species. The pelagic fisheries on *S. mentella* generally have little or no bycatch.

Quality considerations

Several data improvements are needed – better catch and landings data, better survey information, particularly within the deep scattering layer, and a recruitment index. However, the few available indices indicate a declining stock.

ICES again had difficulties in obtaining catch estimates and landing data from some ICES member countries, and specially data disaggregated by depth. For the years 2011 and 2012 the Russian Federation has decided on an unilateral quota that considers both redfish management units as a single stock. This unilateral quota nearly equals the total quota recommended by NEAFC. The Russian Federation so far has not facilitated depth disaggregated catch data to the NWWG, and this may affect the assessment. In February 2011 ICES launched a data call requiring better data from the countries participating in the redfish fishery, but the response was very limited. In spite of the best efforts there is a need for a special action through NEAFC and NAFO to provide ICES with timely and reliable catch statistics. Furthermore, ICES recommends that all nations should report depth information in accordance with the NEAFC logbook format.

Scientific basis

Assessment type	Non-analytical.
Input data	Biomass and abundance survey indices obtained in biennial acoustic and trawling survey.
Discards and bycatch	Not included in the assessment.
Indicators	Biological data collected on this and other surveys and from commercial catches.
Other information	Stock benchmarked in 2012.
Working group report	NWWG

ECOREGION **Iceland and East Greenland**
STOCK **Beaked redfish (*Sebastes mentella*) in Subareas V, XII, and XIV and**
NAFO Subareas 1+2 (Deep pelagic stock > 500 m)

Reference points

No reference points have been set for this stock.

Outlook for 2013

No assessment can be presented for this stock due to the insufficient commercial dataset and short time-series of suitable survey data. Therefore, fishing possibilities cannot be projected.

Precautionary approach

ICES advises on the basis of the precautionary considerations that catches should be reduced to less than 20 000 t and a management plan should be developed and implemented. The stock is considered to have decreased over the last decade while the exploitation status is unknown. The stock is considered to be vulnerable to overexploitation because of its biological characteristics (slow-growing, late-maturing, and schooling behaviour).

Additional considerations

Management considerations

ICES has previously advised that most deep-water and long-living species like redfish can only sustain low rates of exploitation, since slow-growing, and long-lived species that are depleted have a long recovery period. Fisheries should only be allowed to expand when indicators have been identified and a management strategy including appropriate monitoring requirements has been decided and implemented.

ICES is concerned about the lack of agreed upon management and TAC allocation schemes. Although most nations conducting fisheries have agreed on management measures to reduce catches stepwise over the next three years, the total quotas that have been set are insufficient to constrain catches. This increases the risk of overexploitation. The autonomous quotas that have been set are insufficient to constrain catches, even though ICES acknowledges that some parties have agreed on a step-wise reduction of catches. Therefore, ICES has for the past two years advised that an adaptive management plan be implemented. ICES provided a list of potential elements that could be contained in such a management plan.

Changes in fishing technology and fishing patterns

The fishery started around 1991–1992 when the commercial fleet of the shallow pelagic redfish moved into deeper waters. Since 1997, the main fishing season occurred from late April to August in the so-called northwest fishing area near the Greenland and Icelandic EEZ and within the Icelandic EEZ, i.e. in the area east of 32°W and north of 61°N. The trawlers participating in this fishery use large pelagic trawls (*Gloria*-type) with vertical openings of 80–150 m. The vessels have operated at a depth range of 600 to 950 m in 1998–2011. Discarding is at present not considered to be significant in this fishery. The deep pelagic fishery in the Irminger Sea only exploits the mature part of the stock.

Data and methods

Survey indices, catches, cpue, and biological data are available for the stock, but the assessment is mainly based on surveys (Figures 2.4.10.1–2.4.10.4 and Table 2.4.10.1).

Data from most fishing nations have been compiled since this fishery started, although some ICES member nations do not supply the required depth information. There is a need for a special action through NEAFC and NAFO to provide ICES, in a timely manner, with all information that might lead to more reliable catch statistics. Furthermore, ICES recommends that all nations should report depth information in accordance with the NEAFC logbook format. Figure 2.4.10.4 shows detailed charts of the area distribution of the fisheries.

The quality of the trawl biomass estimate from the international trawl–acoustic surveys since 1999 cannot be verified as the data series is relatively short and the survey is only conducted every second year. Therefore, the abundance estimates by the trawl method must only be considered as a rough attempt to measure the abundance of the deep pelagic stock.

It is not known to what extent cpue reflect changes in the stock status of deep pelagic *S. mentella* stock. The fishery targets pelagic aggregating fish. Therefore, stable or increasing cpues are not considered to reflect the stock status reliably, but decreasing cpues likely indicate a decreasing stock (Figure 2.4.10.3).

Sources

ICES. 2011a. Report of the North-Western Working Group, 26 April–3 May 2011. ICES CM 2011/ACOM:07.

ICES. 2011b. Report of the Working Group on Redfish Surveys, 2–4 August 2011. ICES CM 2011/SSGESST:21.

ICES. 2012a. Report of the Benchmark Workshop on Redfish Stocks, 1–8 February 2012. ICES CM 2012/ACOM:48.

ICES. 2012b. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.

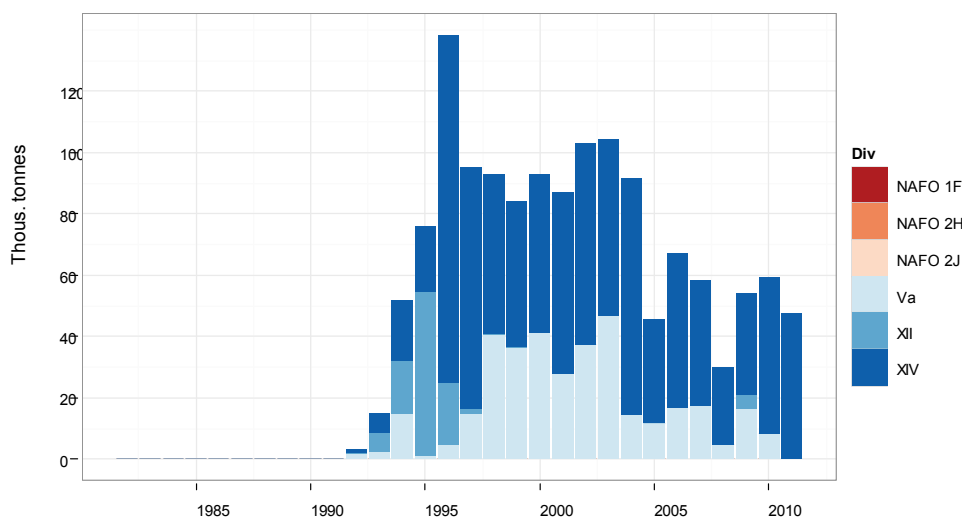


Figure 2.4.10.2 Beaked redfish in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Deep pelagic stock >500 m). Landings by area (thousand tonnes).

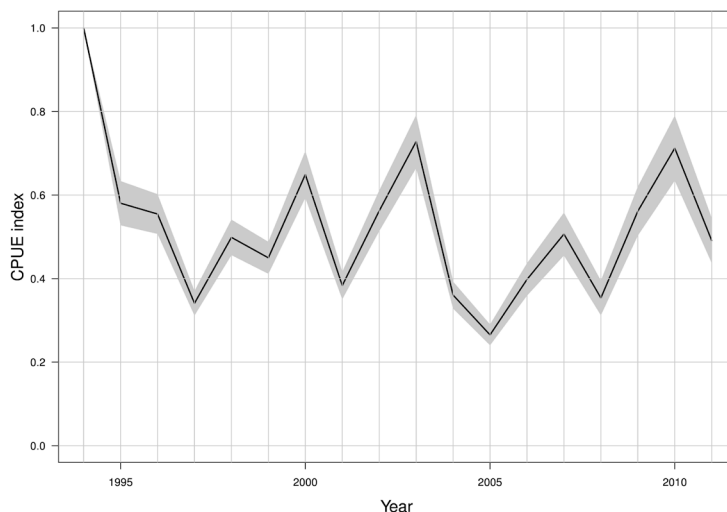


Figure 2.4.10.3 Beaked redfish in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Deep pelagic stock >500 m). Trends in standardized cpue of the deep pelagic *S. mentella* fishery in the Irminger Sea and adjacent waters, based on logbook data from several nations.

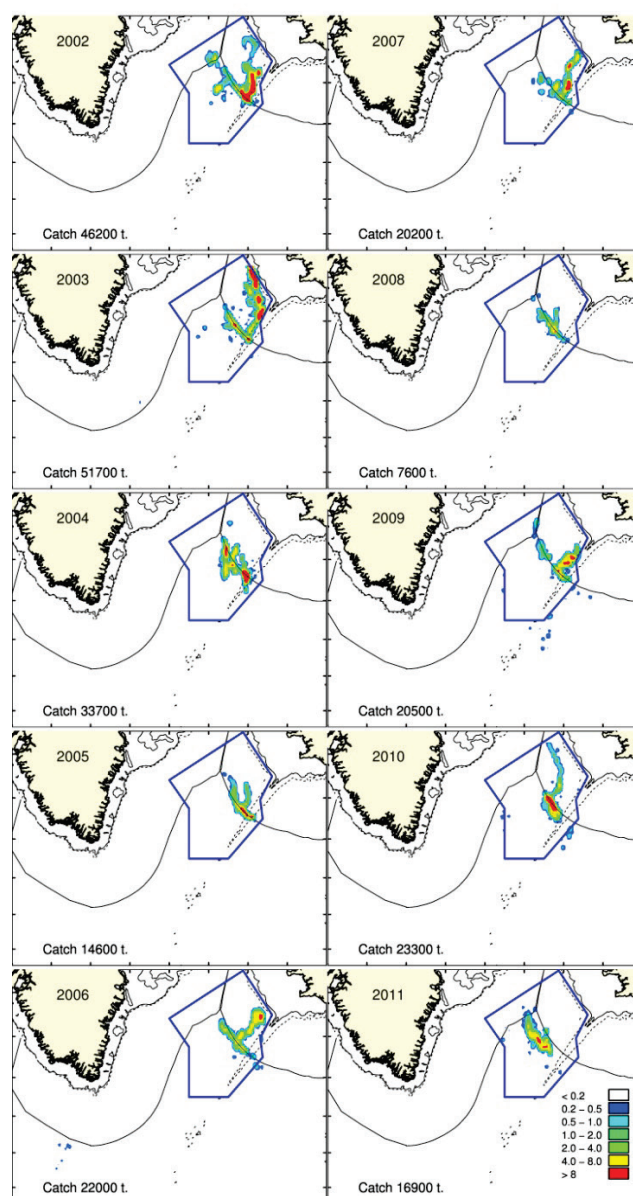


Figure 2.4.10.4 Beaked redfish in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Deep pelagic stock >500 m). Fishing areas and total catch of pelagic *S. mentella* from the recommended northeast management unit in the Irminger Sea and adjacent waters 2002–2011. This is a geographic proxy for the deep pelagic stock. Data are from the Faroe Islands (2002–2011), Germany (2002–2007 and 2011), Greenland (2002–2003 and 2009–2010), Iceland (2002–2011), and Norway (2002, 2003, and 2008–2011). The scale given is tonnes per square nautical mile.

Table 2.4.10.1 Beaked redfish (*Sebastes mentella*) in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Deep pelagic stock >500 m). ICES advice, management, and catches.

Year	ICES Advice ¹⁾	Predicted catch corresponds to advice ¹⁾	TAC ¹⁾	ICES Catch ¹⁾ Total	ICES Catch deep pelagic stock
1991	TAC	66		28	0
1992	Preference for no major expansion of the fishery	-		66	3
1993	TAC	50		116	16
1994	TAC	100		148	52
1995	TAC	100		176	78
1996	No specific advice	-	153	180	139
1997	No specific advice	-	153–158	123	95
1998	TAC not over recent (1993–1996) levels of 150 000 t		153	117	93
1999	TAC to be reduced from recent (1993–1996) levels of 150 000 t		153	110	84
2000	TAC set lower than recent (1997–1998) catches of 120 000 t	85	120	126	93
2001	TAC less than 75% of catch 1997–1999	<85	95	129	88
2002	TAC less than 75% of catch 1997–1999 – Revised to be below current catch levels	<85	No agreed NEAFC proposal (95)	146	103
2003	TAC not exceed current catch levels	119	- „ - (119)	161	104
2004	TAC not exceed current catch levels	120	- „ - (120)	126	92
2005	Limit catch to 41 kt	41	- „ - (75) / (116 ²⁾)	74	45
2006	Catch less than 41 kt	41	- „ - (62) / (99 ²⁾)	83	67
2007	No fishery until clear indications of recovery of the stock	0	- „ - (46) / (73 ²⁾)	64	59
2008	Starting point for adaptive management strategy	20	- „ - (46) / (73 ²⁾)	32	30
2009	Starting point for adaptive management strategy	20	- „ - (46) / (78 ²⁾)	54	52
2010 ¹⁾	Reducing fishing: Starting point for adaptive management strategy	20	No agreed NEAFC proposal (46) / (78 ²⁾)	59	57
2011	Reducing fishing: Starting point for adaptive management strategy	20	- „ - (38) / (60 ²⁾ / (30 ³⁾)	48	47
2012	Reducing fishing: Starting point for adaptive management strategy	20	(32) / (54 ²⁾ / (30 ³⁾)		
2013	Precautionary considerations. Management Plan to be developed and implemented	20			

Weights in thousand tonnes.

¹⁾ Up to 2009 advice and TAC was given for shallow and deep stocks combined.

²⁾ Sum of all quotas in force, for both shallow and deep pelagic.

³⁾ Unilateral Russian Federation TAC for both shallow and deep pelagic.

Table 2.4.10.2 Beaked redfish in Subareas V, XII, and XIV and NAFO Subareas 1+2 (Deep pelagic stock >500 m). Catches (in tonnes) by area as used by the Working Group.

Year	Va	XII	XIV	NAFO 1F	NAFO 2H	NAFO 2J	Total
1982		0	0				0
1983		0	0				0
1984		0	0				0
1985		0	0				0
1986		0	0				0
1987		0	0				0
1988		0	0				0
1989		0	0				0
1990		0	0	0			0
1991		7	52	0			59
1992	1 862	280	1 257				3 398
1993	2 603	6 068	6 393				15 064
1994	14 807	16 977	20 036				51 820
1995	1 466	53 141	21 100				75 707
1996	4 728	20 060	113 765				138 552
1997	14 980	1 615	78 485				95 079
1998	40 328	444	52 046				92 818
1999	36 359	373	47 421	0			84 153
2000	41 302	0	51 811	0			93 113
2001	27 920	0	59 073	0	0	0	86 993
2002	37 269	2	65 858	0		0	103 128
2003	46 627	21	57 648	0	0	0	104 296
2004	14 446	0	77 508	0		0	91 954
2005	11 726	0	33 759	0	0	0	45 485
2006	16 452	51	50 531	254	0	0	67 288
2007	17 769	0	40 748	0	0	0	58 516
2008	4 602	0	25 443	0			30 045
2009	16 428	4 658	32 920				54 006
2010	8 407	0	50 661	0			59 067
2011		7	47 490				47 497

1992–1996 Estimates based on different sources.

1997–2010 Catches from calculations based on the joint catch database and total landings.

ECOREGION Iceland and East Greenland
STOCK Beaked redfish (*Sebastes mentella*) in Division XIVb (Demersal)

Advice for 2013

Based on the precautionary approach catches should be reduced from the current level to no more than 3500 t.

The stock is not yet evaluated as being a biological entity separated from the adjacent *Sebastes mentella* stocks. Until this has been clarified, demersal *S. mentella* on the East Greenland shelf is assessed as a separate biological unit.

Stock status

F (Fishing Mortality)		
		2009–2011
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa}, F_{lim})	?	Unknown
SSB (Spawning-Stock Biomass)		
		2010–2012
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa}, B_{lim})	?	Unknown
Qualitative evaluation	↘	Declining

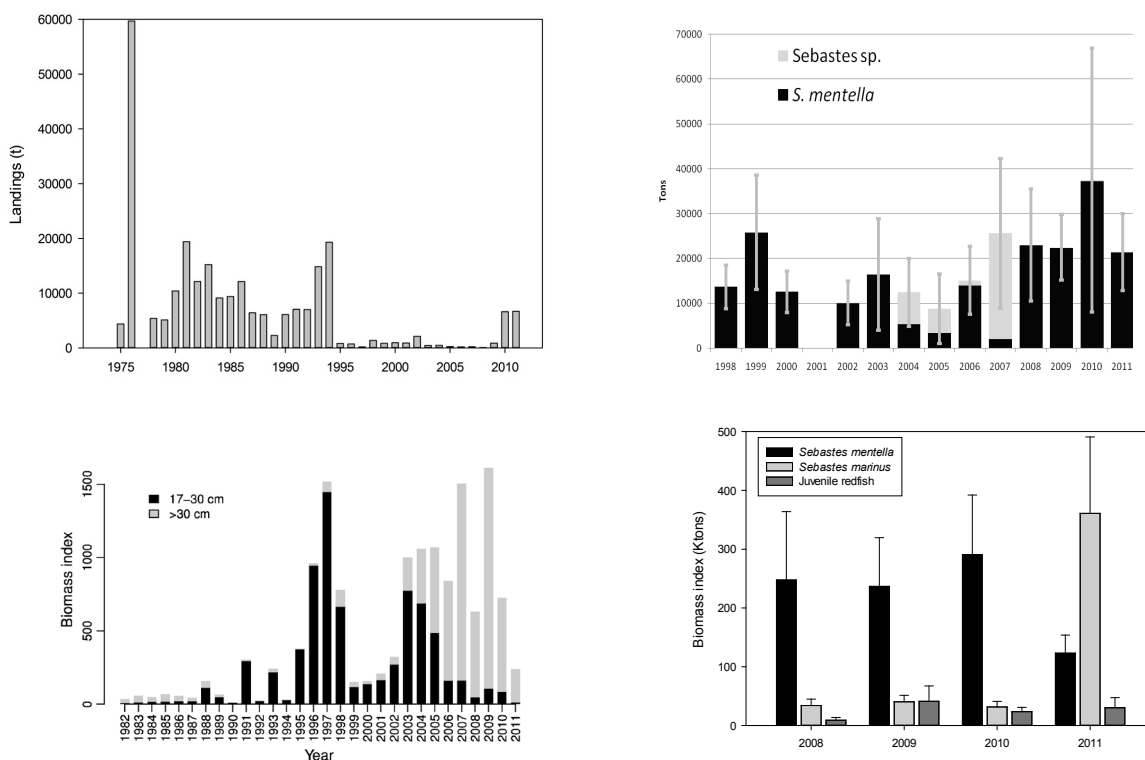


Figure 2.4.11.1

Beaked redfish (*S. mentella*) in Division XIVb (Demersal). Landings and biomass indices. Top right: Greenland deep-water survey (400–1500 m). Lines indicate 2*standard error (SE) of the estimates. Below left: German survey in Division XIVb (0–400 m). Black: fish 17–30 cm, grey: fish >30 cm. Below right: Greenland shallow water survey (0–600 m), bars represent SE.

A directed fishery started in 2009 and catches have increased from less than 100 t to nearly 7000 t in 2010–2011. Survey indices suggest that, following a stable period the biomass of the demersal *S. mentella* has been declining since 2003. The biomass found in the recent years is most likely due to one or only few year classes.

Management plans

There is presently no management plan for this fishery.

Biology

Beaked redfish is a slow-growing, late-maturing, and aggregating deep-sea species and is therefore considered to be vulnerable to overexploitation. East Greenland is considered a common nursery ground for most redfish stocks in Subareas XIV and V, thus comprising both *S. marinus* and *S. mentella* (demersal and pelagic stocks). Some migration between this stock and the other NW redfish stocks (shallow and deep pelagic and Icelandic slope) is likely to take place.

The fisheries

Historically, the fishery for *S. mentella* on the slopes in Division XIVb was an international fishery that was mainly conducted by factory trawlers operating with bottom trawl. From 2002 to 2008 *S. mentella* has mainly been caught as a valuable bycatch in the fishery for Greenland halibut. A directed fishery was initiated by Greenland in 2009, with catches increasing to approximately 7000 t in 2010 and 2011.

Catch distribution	Total catches (2011) = 6705 t, where 99.96% are landings (100% bottom trawl, 0% longlines) and 0.04% discards.
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Quality considerations

The present catch statistics prevent separation of *S. mentella* from *S. marinus*. German and Greenlandic surveys and samples from the commercial fishery are used to estimate a split of the catches, but the quality of this split is unknown. The haul-by-haul logbook information is considered good.

The German survey is designed to estimate the biomass of cod while the Greenland deep-water survey is designed for Greenland halibut. Both surveys therefore do not cover the entire depth distribution of *S. mentella*. The Greenlandic shallow water survey with better coverage regarding depth was initiated in 2008. The time-series is however short, but the survey biomass index shows a decrease in 2011, in agreement with the German survey.

Scientific basis

Assessment type	Qualitative assessment.
Input data	Three survey indices (German groundfish survey, Greenland shallow water survey, and Greenland deep-water survey).
Discards and bycatch	Not considered relevant in the assessment.
Indicators	None.
Other information	Stock benchmarked in 2012 with no assessment method agreed
Working group report	NWWG

ECOREGION **Iceland and East Greenland**
STOCK **Beaked redfish (*Sebastes mentella*) in Division XIVb (Demersal)**

Reference points

No reference points have been set for this stock.

Outlook for 2013

No reliable assessment can be presented for this stock due to the insufficient commercial dataset and the short time-series of suitable survey data. Therefore, fishing possibilities cannot be projected.

Precautionary approach

The stock size is expected to decrease due to low recruitment. ICES advises that catch should be reduced by at least 50%, corresponding to catches of less than 3500t.

Additional considerations

Indices indicate that stock sizes are declining. The large increase in the fishery in a limited area containing large aggregations of fish occurred from 2009 to 2010 and was maintained at this level in 2011. *S. mentella* is a slow-growing, late-maturing, and aggregating species, and it is considered vulnerable to overexploitation. The effects of these biological characteristics are difficult to predict, especially as little is known on migration, stock affiliation, spawning areas, etc. The stock could therefore be composed of various stock components which demands extra precaution. Given current catches (2009–2011), a fishery conducted on a local high-density aggregation, and the fact that surveys have shown declining trends, catches should be reduced from the current level to avoid local depletion.

Management considerations

The recently developed directed redfish fishery (since 2009) should be reduced from the current level until stock structure and the impact of the fishery on the biomass is better understood. The rate of reduction should be re-evaluated to allow further decrease if the stock trend continues to decline.

This is the third year advice is given separately for *S. mentella* in East Greenland. Formerly, the advice of demersal *S. mentella* was provided for all demersal *S. mentella* in Subareas XIV and V. A TAC of 6000 t for demersal redfish in Division XIVb was set by Greenland in 2010. The TAC for 2011 and 2012 was set at 8500 t demersal redfish on the basis of a 70:30 *S. mentella*:*S. marinus* ratio obtained from one single sample from the commercial fishery, thus intending to end up with 6000 t *S. mentella* and 2500 t *S. marinus*. The TAC set for 2012 followed the same approach. The fishery is a mixed fishery for *S. mentella* and *S. marinus*. Survey catches suggest that at least 80% are *S. mentella*. The state of the *S. marinus* stock should therefore be considered in the management of this fishery.

The population structure of demersal *S. mentella* in Division XIVb is uncertain and the separate advice for *S. mentella* in East Greenland is considered a pragmatic solution to provide advice for a new fishery. The stock structure of demersal *S. mentella* is being investigated and results should be available in 2013.

Given the intense fishery in a limited, high abundance area and the declining stock trends in especially this area, this area could be protected by limiting the catch, or the area could be closed until more information is available.

Since none of the long-term surveys in the area target *S. mentella* it should be ensured that information from the fishery is available to ICES. Important information should include additional information to the official logbooks such as length samples of target species and bycatch, and samples to be used for species split between both species. This sampling was adequate in 2011. Knowledge of the species split is important particularly as there is evidence that the *S. marinus* stock has been relatively abundant off Greenland in recent years.

Regulations and their effects

S. mentella in Division XIVb is found in the same areas as other species of economical interest, e.g. *S. marinus*, cod, and Greenland halibut (Figure 2.4.11.2). If cod are present in years with fisheries directed towards *S. mentella*, some bycatch of cod must be expected. In 2011 this led to a bycatch of 510 t cod from the zone north of 62°N, an area that

has been closed to fishery directed towards cod until 1 July to ensure only little fishing on spawning aggregations of cod.

Sorting grids in the shrimp fishery devised to protect juvenile redfish have been used for a number of years, and this is considered to have reduced bycatch of juvenile redfish substantially.

Uncertainties in the assessment

The mixed nature of the fishery, e.g. the possibility of targeting other species such as cod and Greenland halibut, and the lack of catches being split by species when targeting redfish, contributes to uncertainty. Without information on the catch split by species it is not possible to use logbook information as a biomass indicator for *S. mentella*.

The two surveys that presently constitute the main basis for the qualitative assessment do not entirely cover the depth distribution of adult *S. mentella* on the East Greenland continental slope. The two surveys are designed as groundfish surveys, mainly targeting cod and Greenland halibut. The Greenland shallow water survey (0–600 m), designed to estimate the cod biomass, has a better coverage of the depths where *S. mentella* is found; however, this survey only goes back to 2008.

Comparison with previous assessment and advice

The advice basis is the same as last year, to reduce the catches.

Sources

ICES. 2012a. Report of the Benchmark Workshop on Redfish Stocks, 1–8 February 2012. ICES CM 2012/ACOM:48.
ICES. 2012b. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.

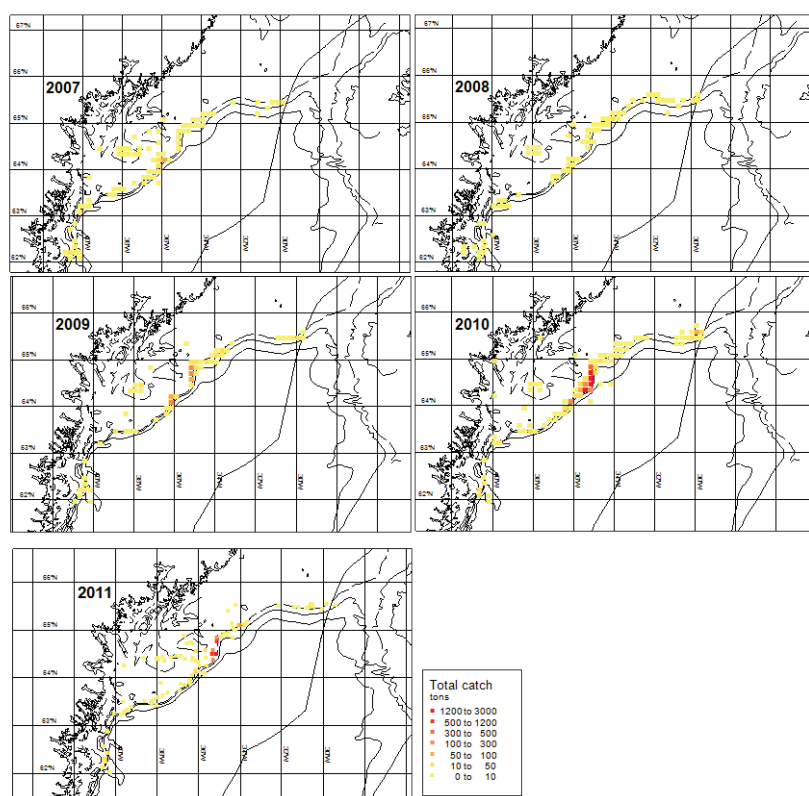


Figure 2.4.11.2 Beaked redfish (*S. mentella*) in Division XIVb (Demersal). Annual distribution of catches of demersal redfish (2007–2011).

Table 2.4.11.1 Beaked redfish (*Sebastes mentella*) in Division XIVb. ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC for demersal redfish in Greenland EEZ	Official landings
2011	No expansion of fishery	-	6	6.7
2012	No expansion of fishery	<1	6.8*	
2013	Precautionary approach	<3.5		

Weights in thousand tonnes.

Advice prior to 2011 was given for beaked redfish (*S. mentella*) in Division Va and Subarea XIV (Icelandic slope stock).

* A total TAC of 8.5 kT was set for redfish (both *S. marinus* and *S. mentella*). 6.8 is 80% of this, and the split is based on expected catch composition.

Table 2.4.11.2 Beaked redfish (*S. mentella*) in Subarea XIVb (Demersal). Nominal landings (tonnes) of beaked redfish. The 2008–2011 values are based on a percentage split of 80:20 between *S. mentella*:*S. marinus*. Splitting in earlier years is based on the same approach, but with varying ratios based on surveys.

Demersal redfish	
1974	0
1975	4 400
1976	59 700
1977	0
1978	5 403
1979	5 131
1980	10 406
1981	19 391
1982	12 140
1983	15 207
1984	9 126
1985	9 376
1986	12 138
1987	6 407
1988	6 065
1989	2 284
1990	6 097
1991	7 057
1992	7 022
1993	14 828
1994	19 305
1995	819
1996	730
1997	199
1998	1 376
1999	853
2000	982
2001	901
2002	2109
2003	446
2004	482
2005	267
2006	202
2007	226
2008	92
2009	895
2010	6 613
2011	6 705

ECOREGION Iceland and East Greenland
STOCK Capelin in Subareas V and XIV and Division IIa west of 5°W
(Iceland–East Greenland–Jan Mayen area)

Advice for 2013

ICES advises on the basis of precautionary considerations that there should be no fishery until new information on stock size becomes available that proves SSB to be above the escapement threshold.

State of the stock

F (Fishing Mortality)		
		2011
MSY (F_{MSY})	?	Undefined
Precautionary approach (F_{pa}, F_{lim})	?	Undefined
SSB (Spawning-Stock Biomass)		
		2012
MSY ($B_{trigger}$)	?	Undefined
Precautionary approach (B_{pa}, B_{lim})	?	Undefined
Qualitative evaluation	➔	Stable above average

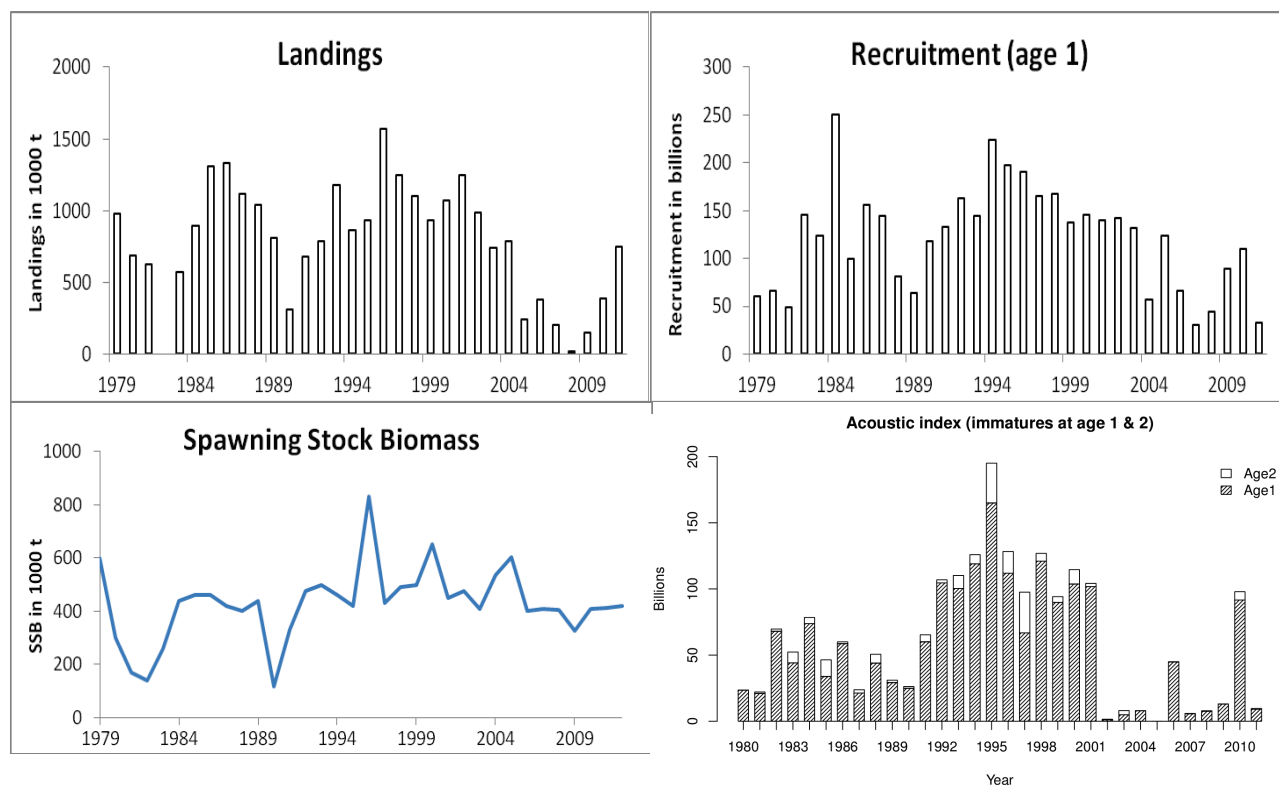


Figure 2.4.12.1 Capelin in Subareas V and XIV and Division IIa west of 5°W (Iceland–East Greenland–Jan Mayen area). Landings and assessment results (weights in thousand tonnes). Acoustic index of immature capelin at ages 1 and 2 (numbers in billions) from autumn surveys.

It is estimated that 418 000 t was left for spawning in spring 2012, which is just above the management target. In autumn 2011, the annual survey on young capelin was not conducted due to a strike. Two surveys, aimed at young capelin, conducted in November 2011 and February 2012, only covered part of the potential distribution area. The index of abundance from those surveys of young capelin was very low.

Management plans

A management plan has been agreed between Iceland, Greenland, and Norway, which aims at a spawning-stock biomass at minimum 400 000 t by the end of the fishing season.

ICES has not evaluated the management plan.

Biology

Capelin is a short-lived species that dies after spawning (aged 3–4). The SSB is comprised of only one or two age groups and is therefore highly dependent on recruitment. Before the spawning migration starts, adult capelin are mostly found in Arctic seawater where the temperature is usually lower than 3°C. Juveniles can be found on the Icelandic continental shelf.

Environmental influence on the stock

In the years 2002–2005 and 2007–2009 it is likely that the juveniles did not occupy the conventional areas on the Icelandic continental shelf. In this period, the quarterly monitoring of environmental conditions of Icelandic waters shows a rise in sea temperatures north and east of Iceland, which probably also reaches farther north and northwest. A northward shift in the distribution may have affected the productivity of the Icelandic shelf system.

The fisheries

The fishery in recent years has largely been confined to the period January–March which coincides with the last 3 months of the capelin lifespan. In 2011 a summer fishery took place, for the first time since 2004.

Catch distribution	Total landings (2011/12) = 747 kt (75% purse-seine, 25% pelagic trawl). Discards are negligible.
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Effects of the fisheries on the ecosystem

Capelin is an important forage fish and declines in stock may be expected to have implications on the productivity of their predators.

Quality considerations

Searching time in the scientific survey varies depending on initial estimates, with longer survey time when estimates are low. This may result in a biased acoustic assessment of stock size. Natural mortality used in the projection model is lower than the estimates from consumption by cod.

Scientific basis

Assessment type	Biomass estimate based on acoustic surveys. VPA regression-type forecast.
Input data	Two acoustic surveys (juvenile and adult) and catch-at-age information.
Discards and bycatch	Not included in the assessment – considered to be negligible.
Indicators	None.
Other information	The assessment was benchmarked at WKSHORT 2009 (ICES, 2009). WKSHORT was unable to approve the assessment of the Icelandic capelin stock. The workshop recommended further work, which is ongoing.
Working group report	NWWG

ECOREGION **Iceland and East Greenland**
STOCK **Capelin in Subareas V and XIV and Division IIa west of 5°W**
 (Iceland–East Greenland–Jan Mayen area)

Reference points

Reference points have not been defined for this stock. An escapement target of 400 000 t can be considered as preliminary precautionary. However, this should be evaluated.

Outlook for 2012/2013

There should be no fishery until new information on stock size becomes available, showing a predicted SSB of at least 400 000 t in March 2013 in addition to a sizeable amount for fishing.

A survey of the Denmark Strait and the Greenland plateau west of there is being planned. However, the timing of this survey depends on the ice coverage in the Strait and therefore it is impossible to say if or when it will be conducted.

Management plan

The fishery is managed according to a two-step management plan which requires a spawning-stock biomass of no less than 400 000 t by the end of the fishing season. The first step in this plan is to set a preliminary TAC, based on the results of an acoustic survey carried out to evaluate the immature 1-group and immature part of the 2-group of the capelin stock about a year before it enters the fishable stock. The initial quota is set at two thirds of the predicted TAC, calculated on the condition that 400 000 t of the SSB should be left for spawning. The second step is based on the results of another survey conducted during the fishing season for the same year classes. This result is used to revise the TAC, still based on the condition that 400 000 t of the SSB should be left for spawning.

Precautionary approach

There should be no quota until new survey estimates have proven SSB to be above the escapement threshold.

Additional considerations

Management considerations

Historically, the fishing season for capelin has started in the period from late June to July/August. At that time the availability of plankton is at its highest and the fishable stock of capelin is feeding very actively over large areas north of Iceland between Greenland and Jan Mayen, increasing rapidly in size, weight, and fatness.

Regulations and their effects

Discards are allowed when catches are beyond the carrying capacity of the vessel. Methods of transferring catches from the purse-seine of one vessel to another vessel were invented long ago, and since this is a common practice and skippers of purse-seine vessels prefer to operate in groups, discards are considered to be negligible. In the pelagic trawl fishery, such large catches of capelin rarely occur.

A regulation calling for immediate, temporary area closures when a high abundance of juveniles is measured in the catch (i.e. more than 20% of the catch is composed of fish less than 13 cm) is enforced, using on-board observers.

Information from the fishing industry

In January 2012, eleven scouting vessels mapped the distribution of capelin to aid the planning of the scientific survey.

Comparison with previous assessment and advice

The basis for the assessment and advice has not changed.

Sources

ICES. 2009. Report of the Benchmark Workshop on Short-lived Species (WKSHORT), 31 August–4 September 2009, Bergen, Norway. ICES CM 2009/ACOM:34. 166 pp.

ICES. 2012. Report of the North-Western Working Group, 26 April–03 May 2012. ICES CM 2012/ACOM:07.

Table 2.4.12.1 Capelin in Subareas V and XIV and Division IIa west of 5°W (Iceland–East Greenland–Jan Mayen area). ICES advice, management, and landings.

Year	ICES Advice	Predicted catch ¹ corresp. to advice	Agreed ² TAC	ICES landings ³
1986	TAC	1100	1290	1333
1987	TAC ¹	500	1115	1116
1988	TAC ¹	900	1065	1036
1989	TAC ¹	900	*	808
1990	TAC ¹	600	250	314
1991	No fishery pending survey results ¹	0	740	677
1992	Precautionary TAC ¹	500	900	788
1993	TAC ¹	900	1250	1179
1994	Apply the harvest control rule	950	850	864
1995	Apply the harvest control rule	800	1390	930
1996	Apply the harvest control rule	1100	1600	1571
1997	Apply the harvest control rule	850	1265	1245
1998	Apply the harvest control rule	950	1200	1100
1999	Apply the harvest control rule	866	1000	934
2000	Apply the harvest control rule	650	1090	1071
2001	Apply the harvest control rule	700	1300	1250
2002	Apply the harvest control rule	690	1000	988
2003	Apply the harvest control rule	555	900	741
2004	Apply the harvest control rule	*335	985	784
2005	Apply the harvest control rule	*No fishery	235	238
2006/07	Apply the harvest control rule	*No fishery	385	377
2007/08	Apply the harvest control rule	*207	207	202
2008/09	Apply the harvest control rule	*No fishery		15**
2009/10	Apply the harvest control rule	*No fishery	150	151
2010/11	Apply the harvest control rule	*No fishery	390	391
2011/12	Set the TAC at 50% of the initial quota in the HCR	366	765	747
2012/13	Precautionary approach	*No fishery		

Weights in thousand tonnes.

¹)TAC advised for the July–December part of the season.

²)Final TAC recommended by national scientists for the whole season.

³)July–March of following year.

*Preliminary TAC set according to the results of a preliminary assessment.

** Only scouting quota was allocated in the latter half of February 2009.

Table 2.4.12.2

Capelin in Subareas V and XIV and Division IIa west of 5°W (Iceland–East Greenland–Jan Mayen area). Summary of assessment results (a fishing season, e.g. 1978/79, starts in summer 1978 and ends in March 1979). Recruitment of 1-year-old fish (in billions at 1 August); spawning-stock biomass (thousand tonnes at spawning time in March next year, at the end of a fishing season); landings (thousand tonnes) are the sum of the total landings in the season that starts in the summer/autumn of the year indicated and ends in March of the following year.

Season (Summer/winter)	Recruitment	Landings	Spawning-stock biomass
1978/79	164	1195	600
1979/80	60	980	300
1980/81	66	684	170
1981/82	49	626	140
1982/83	146	0	260
1983/84	124	573	440
1984/85	251	897	460
1985/86	99	1312	460
1986/87	156	1333	420
1987/88	144	1116	400
1988/89	81	1037	440
1989/90	64	808	115
1990/91	118	314	330
1991/92	133	677	475
1992/93	163	788	499
1993/94	144	1179	460
1994/95	224	864	420
1995/96	197	929	830
1996/97	191	1571	430
1997/98	165	1245	492
1998/99	168	1100	500
1999/00	138	933	650
2000/01	146	1071	450
2001/02	140	1249	475
2002/03	142	988	410
2003/04	132	741	535
2004/05	57	783	602
2005/06	124	238	400
2006/07	66	377	410
2007/08	31	202	406
2008/09	44	15	328
2009/10	89	151	410
2010/11	110*	391	411
2011/12	33*	747	418

* Preliminary.

ECOREGION Iceland and East Greenland
STOCK Herring in Division Va (Icelandic summer-spawning herring)

Advice for 2012/2013

ICES advises on the basis of the MSY approach that catches in 2012/2013 should be no more than 67 000 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

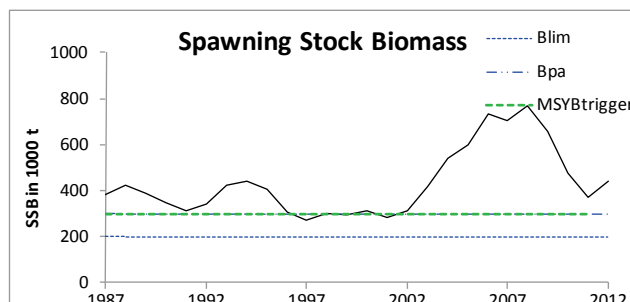
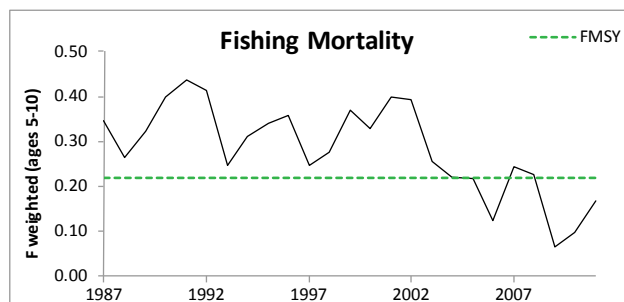
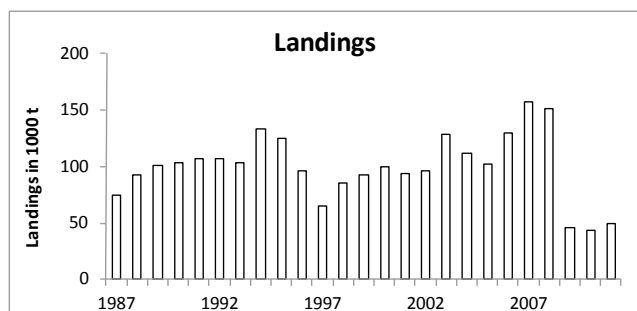
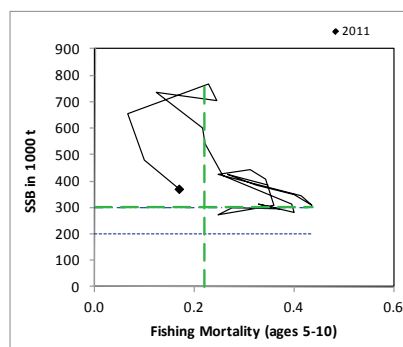


Figure 2.4.13.1 Herring in Division Va (Icelandic summer-spawning herring). Summary of stock assessment (weights in thousand tonnes). Top right: SSB/F for the time-series used in the assessment.

The SSB had been declining, likely related to the *Ichthyophonus* infection in recent years, but the decline seems to have stopped and the SSB is above reference points. Strong year classes, which show no signs of infection, are entering the fishable stock. Fishing mortality is currently below F_{MSY} .

Management plans

There is no formal management plan for this stock. For more than 20 years, the practice has been to manage fisheries at $F = F_{0.1}$ ($= 0.22$) and this target is considered to be consistent with MSY approach.

Biology

Icelandic herring is a long-lived species with age groups 4 to 6 generally most abundant in the catches, but it first appears in catches at age 3. Since 2006 the overwintering has mainly taken place in a small coastal area west of Iceland, as compared to the more easterly and/or offshore areas of the three previous decades. Younger year classes (2007 and later) and recruits to the fishable stock have only to a small degree joined the older part of the stock during its overwintering west of Iceland. Instead, they have been found off the south coast. Thus, changes in location of the overwintering of the stock can be expected to occur again in the coming years.

Environmental influence on the stock

The outbreak of *Ichthyophonus* infection in the herring stock started in 2008. Infection of the herring occurs by oral intake of the *Ichthyophonus* spores in the environment. The infection rate for age 4+ was estimated to be 32% in the SSB in the winter 2008/2009, 43% in 2009/2010, 34% in 2010/2011, and 27% in 2011/2012. The impact of the infection on the stock size is apparent, but cannot be fully quantified at present. On the basis of knowledge from other herring stocks and indications from studies conducted in the winter 2010/2011 and again in 2011/2012, the infection is likely abating and is hardly observed in herring at age 3 and younger but is still observed in older herring to a similar degree as in preceding years.

The fisheries

The Icelandic TACs for herring apply from 1 September to 1 May the following year. The catch is normally taken from September to February.

Catch distribution	Total catch (2011/2012) is 49 kt, where 88% are landings (99.5% purse seine, 0.5% gill nets) and 12% industrial bycatch (in mackerel fishery with pelagic trawls). There were no discards or unaccounted removals.
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Quality considerations

The results of the NFT-Adapt model show a retrospective pattern in SSB during the recent four years with a constant underestimation. The reason for the pattern is likely related to the *Ichthyophonus* infection and new more optimistic information from surveys regarding strength of incoming year classes to the fishable stock.

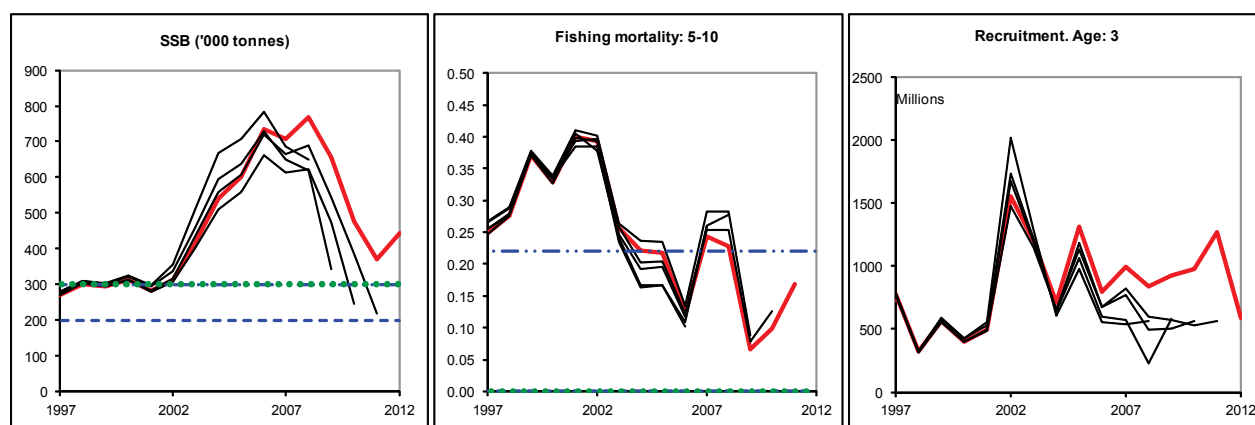


Figure 2.4.13.2 Herring in Division Va (Icelandic summer-spawning herring). Historical assessment results (final-year recruitment estimates included).

Scientific basis

Assessment type	Age-based analytical (NFT-ADAPT).
Input data	The data used in the assessment are catch-at-age and one age-structured acoustic survey index.
Discards and bycatch	Not relevant for this assessment.
Indicators	None.
Other information	Estimates of infection prevalence are used to quantify M in the most recent three years in the assessment. The stock was benchmarked in 2011.
Working group report	NWWG

ECOREGION Iceland and East Greenland
STOCK Herring in Division Va (Icelandic summer-spawning herring)

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B_{trigger}	300 000 t	B_{pa}
	F_{MSY}	0.22	HCS model for simulated harvest rules.
Precautionary Approach	B_{lim}	200 000 t	SSB with a high probability of impaired recruitment.
	B_{pa}	300 000 t	$B_{\text{pa}} = B_{\text{lim}} e^{1.645\sigma}$, where $\sigma = 0.25$.
	F_{lim}	Not defined	
	F_{pa}	0.22	$F_{\text{pa}} = F_{0.1} = 0.22$ (based on a weighted average) and used as a target.

(unchanged since: 2011)

Outlook for 2012/2013

Basis: $F(2011/2012) = 0.17$; Landings (2011/2012) = 49 kt; SSB(2012) = 377 kt; $B_{3+}(2012) = 513$ kt.

Rationale	Landings (2012/13)	Basis	F (2012/2013)	SSB (2013)	%SSB change ¹⁾	% TAC change ²⁾
MSY approach	67	F_{msy}	0.22	421	12%	36%
	40		0.13	447	19%	-19%
	50		0.19	437	16%	1%
	80		0.27	409	8%	62%

Weights in thousand tonnes.

¹⁾ SSB 2013 relative to SSB 2012.

²⁾ Landings 2012/13 relative to TAC 2011/12.

Additional considerations

Management considerations

For the fishing season 2011/2012, a regulation was enforced that prohibited fishery on the stock outside of the area of Breiðafjörður. This was because small herring were mixed with adults in the other areas and there was a lower prevalence of infection there. If similar conditions are observed in the fishing season 2012/2013 such a regulation would contribute to the protection of small fish (<27 cm). Furthermore, because of higher infection rates in the Breiðafjörður area, the fishery would target a greater proportion of fish already subjected to infection mortality.

Ecosystem considerations

Since it was first observed in the stock in the autumn 2008, *Ichthyophonus* outbreaks have had significant effects on the stock development, with a prevalence of infection and corresponding mortality ranging from 32% to 43% in the last three winters. The state of the *Ichthyophonus* infection in this stock in the winter 2011/2012 is different from previous years in two important aspects. Firstly, younger and smaller herring were almost without infection (Figure 2.4.13.4). Secondly, the development of the infection within the infected part of the stock in Breiðafjörður appeared to have slowed down. These findings might be the result of younger herring utilizing different feeding grounds with no source of *Ichthyophonus* spores and thus remaining uninfected, and/or simply that no or only little new infection occurred during 2011. The remaining infected herring are those individuals that have more resistance power against the infection, acquired or inherited, that were infected as late as in the summer 2010 and will continue to live infected for months or years. Ongoing studies are examining whether currently infected fish will die because of the infection or whether they will survive and be part of the spawning stock in the summer 2012 and the fishable stock in the fishing season 2012/2013.

Changes in fishing technology and fishing patterns

The fishing pattern in 2010/11 was similar to the pattern of the last five seasons, which differed from previous seasons because most of the catches now were taken from a small area off the west coast. Pelagic trawl fisheries were introduced in 1997/98 and have generally contributed approximately 20–60% of the catches, but since 2008 their contribution has been reduced to <5%. The relative increase in the pelagic trawl catches in 2010/2011 and 2011/2012 (10% and 12% of the total catch) is due to bycatch of the stock in the fisheries for mackerel and Norwegian spring-spawning herring in the summers of 2010 and 2011. The fishing pattern varies annually and is related to variation in distribution and catchability of the different age classes of the stock. This variation in distribution and catchability can have consequences for the catch composition, but it is still impossible to provide a forecast about this variation.

Uncertainties in assessment and forecast

The effects of *Ichthyophonus* infection on the stock, particularly the assumptions whether all infected fish die because of it within a year is not fully clear. The high estimate of the 2008 year class is still relatively uncertain, which adds uncertainty to the assessment, as well as to the forecast.

Comparison with previous assessment and advice

The assessment was conducted in the same way as last year. The overall perception of the stock size is more optimistic now. In the current assessment, SSB in 2011 is 70% higher, the abundance of the 2007 year class 84% higher, the abundance of the 2009 year class 124% higher, and F_{5-10} in 2010 is 28% lower, compared to the 2011 assessment.

No initial advice was provided last year because of the *Ichthyophonus* infection. As last year, this year's advice is based on the MSY approach (F_{MSY}).

Source

ICES. 2012. Report of the North-Western Working Group, 26 April–3 May 2012. ICES CM 2012/ACOM:07.

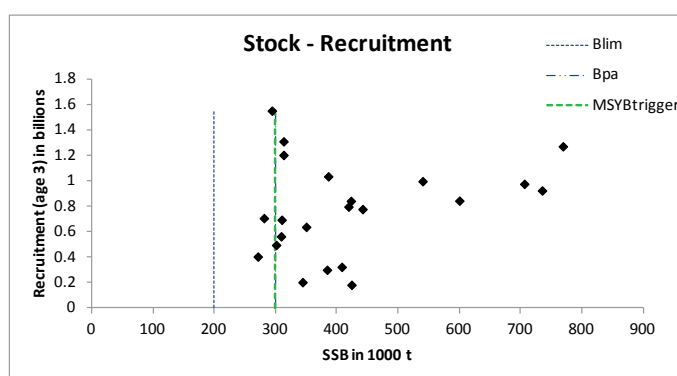


Figure 2.4.13.3 Herring in Division Va (Icelandic summer-spawning herring). Stock–recruitment relationship.

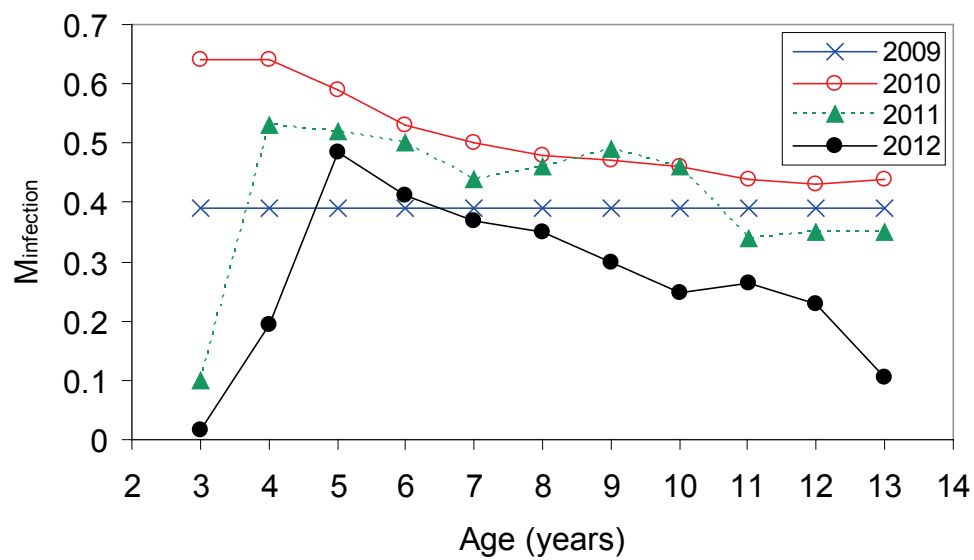


Figure 2.4.13.4 Herring in Division Va (Icelandic summer-spawning herring). Estimated natural mortality because of *Ichthyophonus* infection ($M_{\text{infection}}$) during the winters 2009–2012.

Table 2.4.13.1 Herring in Division Va (Icelandic summer-spawning herring). ICES advice, management, and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ICES landings ⁴⁾
1984		50	-	50.3
1985		50	-	49.4
1986		65	-	65.5
1987	F _{0.1}	70	72.9	75.4
1988	F _{0.1}	~100	90	92.8
1989	F _{0.1}	95	90	97.3
1990/1991 ²	<i>Status quo</i> F	90	100	101.6
1991/1992 ²	F _{0.1}	79	110	98.5
1992/1993 ²	F _{0.1}	86	110	106.7
1993/1994 ²	No gain in yield by fishing higher than F _{0.1}	110 ¹	110	101.5
1994/1995 ²	No gain in yield by fishing higher than F _{0.1}	83 ¹	130	132
1995/1996 ²	No gain in yield by fishing higher than F _{0.1}	120 ¹	110	125
1996/1997 ²	No gain in yield by fishing higher than F _{0.1}	97 ¹	110	95.9
1997/1998	No gain in yield by fishing higher than F _{0.1}	90 ¹	100	64.7
1998/1999	No gain in yield by fishing higher than F _{0.1}	90 ¹	90	87.0
1999/2000	Current F is sustainable	100 ¹	100	92.9
2000/2001	Current F is sustainable	110 ¹	110	100.3
2001/2002	Current F is sustainable	125 ¹	125	95.3
2002/2003	Current F is sustainable	113 ¹	105	97
2003/2004	Current F is sustainable	113 ¹	110	131
2004/2005	F=0.22	106	110	114.2
2005/2006	<i>Status quo</i> catch	110	110	103
2006/2007	<i>Status quo</i> catch	110	130	135
2007/2008	<i>Average of the last 3 years catch</i>	117	150	159
2008/2009	F _{pa} = 0.22	131	130	152
2009/2010	F _{pa} =0.22	75	40	46
2010/2011 ³	Domestic advice autumn 2010	40	40	44
2011/2012 ³	Domestic advice autumn 2011, no fishery until then	40	45	49
2012/2013	F _{MSY} =0.22	<67		

Weights in thousand tonnes.

¹⁾ Catch at F_{0.1}.

²⁾ Season starting in October of first year.

³⁾ In early autumn 2011 new information on *Ichthyophonus* infection and the stock size will be available from survey monitoring, and ICES cannot give advice until this information is available.

⁴⁾ Official landings and ICES landings are the same in all fishing season and are used for the assessment.

Table 2.4.13.2

Herring in Division Va (Icelandic summer-spawning herring). Summary of the assessment.

Year	Recruits _{age 3}	Biomass age		Landings		WF 5–10
	(millions)	3+ (kt)	SSB (kt)	age 3+ (kt)	Yield/SSB	
1987	530	504	384	75	0.20	0.35
1988	271	495	423	93	0.22	0.27
1989	448	459	386	101	0.26	0.32
1990	301	410	350	104	0.30	0.40
1991	842	424	310	107	0.34	0.44
1992	1035	503	344	107	0.31	0.41
1993	638	547	424	103	0.24	0.25
1994	694	555	442	134	0.30	0.31
1995	204	464	408	125	0.31	0.34
1996	183	350	309	96	0.31	0.36
1997	778	371	271	65	0.24	0.25
1998	324	370	301	86	0.29	0.28
1999	564	378	294	93	0.32	0.37
2000	405	395	313	100	0.32	0.33
2001	496	360	281	94	0.33	0.40
2002	1551	542	313	96	0.31	0.39
2003	1203	628	419	129	0.31	0.26
2004	707	680	540	112	0.21	0.22
2005	1310	829	600	102	0.17	0.22
2006	797	934	735	130	0.18	0.12
2007	997	888	706	158	0.22	0.24
2008	844	955	769	151	0.20	0.23
2009	924	1003	655	46	0.07	0.07
2010	976	838	478	43	0.09	0.10
2011	1271	692	371	49	0.13	0.17
2012*	593	596	444			

* The expected mortality because of the observed infection in 2011/12 has not been accounted for.