ECOREGION	**Faroe Plateau ecosystem**
STOCK	**Haddock in Division Vb**

Advice for 2015

ICES advises on the basis of the MSY approach that there should be no directed fishery on haddock in 2015 and bycatch should be minimized. A recovery plan should be developed and implemented as a prerequisite to reopening the directed fishery. All catches are assumed to be landed.

Stock status

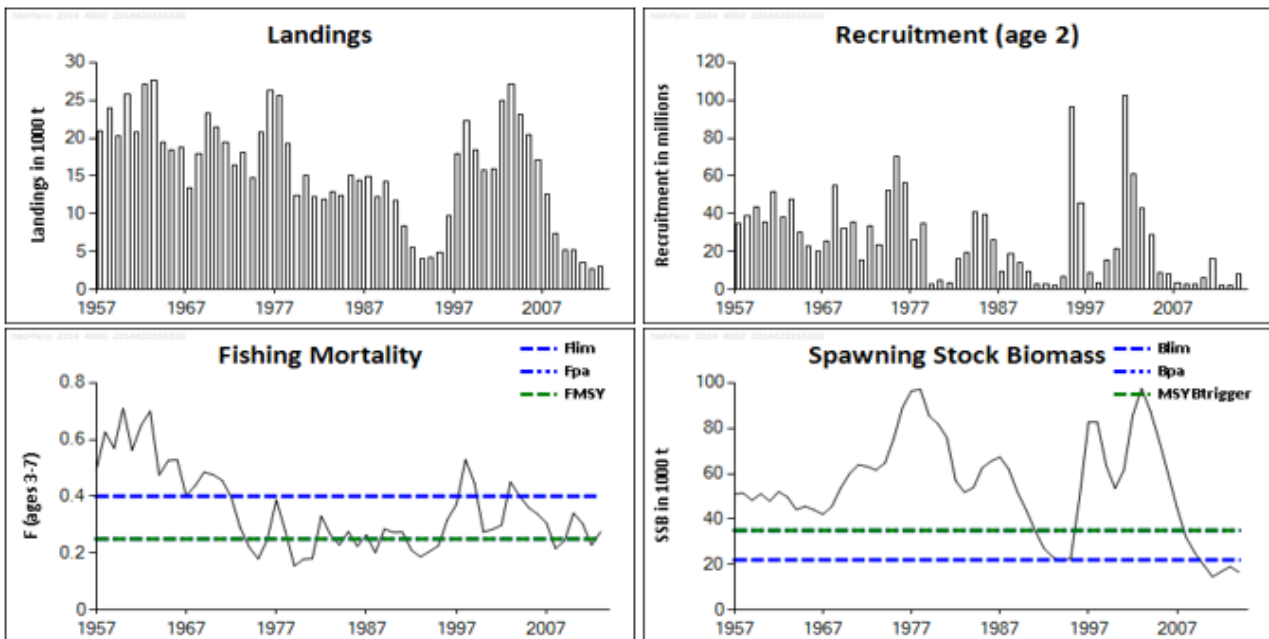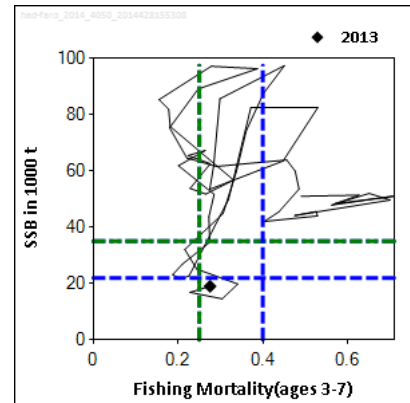| F (Fishing Mortality)			
	2011	2012	**2013**
MSY (F_{MSY})	❌	✅	✅ At target
Precautionary approach (F_{pa}, F_{lim})	🟠	✅	🟠 Increased risk
SSB (Spawning-Stock Biomass)			
	2012	2013	**2014**
MSY ($B_{trigger}$)	❌	❌	❌ Below trigger
Precautionary approach (B_{pa}, B_{lim})	❌	❌	❌ Reduced reproductive capacity

Figure 4.3.3.1   Haddock in Division Vb. Summary of stock assessment (weights in thousand tonnes). Top right: SSB/F for the time-series used in the assessment. ($F_{pa} = F_{MSY}$, and MSY $B_{trigger} = B_{pa}$).

SSB has decreased since 2003 and is estimated to have been below B_{lim} since 2010. The fishing mortality has decreased from above F_{lim} in 2003 to slightly above F_{MSY} in 2013. Recruitment from 2003 onwards has been well below the long-term average.

Management plans

There is no explicit management plan for this stock. A group representing the Ministry of Fisheries, the Faroese industry, the University of the Faroe Islands, and the Faroe Marine Research Institute has, however, proposed a management plan based on general maximum sustainable yield (MSY) principles developed by ICES. The plan has not yet been approved by the authorities.

Biology

Since the mid-1970s, recruitment has fluctuated with 1–3 strong year classes followed by several weak to moderate ones. Mean weights-at-age have also fluctuated in this period.

Environmental influence on the stock

A positive relationship has been documented between primary production and the individual fish growth and recruitment 1–2 years later.

The fisheries

Haddock are mainly caught in a directed longline fishery for cod and haddock and as bycatches in trawl fisheries for saithe. Normally, longline gears account for 80–90% of the catches. In 2013 longlines accounted for 78% of the catches, trawlers took the rest.

Catch distribution	Total landings (2013) were 3 kt, with longliners accounting for 78% and trawlers for 22%. There were no discards and no unaccounted removals.

Quality considerations

The landings data are considered accurate. There are no incentives to discard fish under the effort management system. The sampling of the landings is believed to be adequate. No major problems have been observed with the tuning indices (the two surveys).
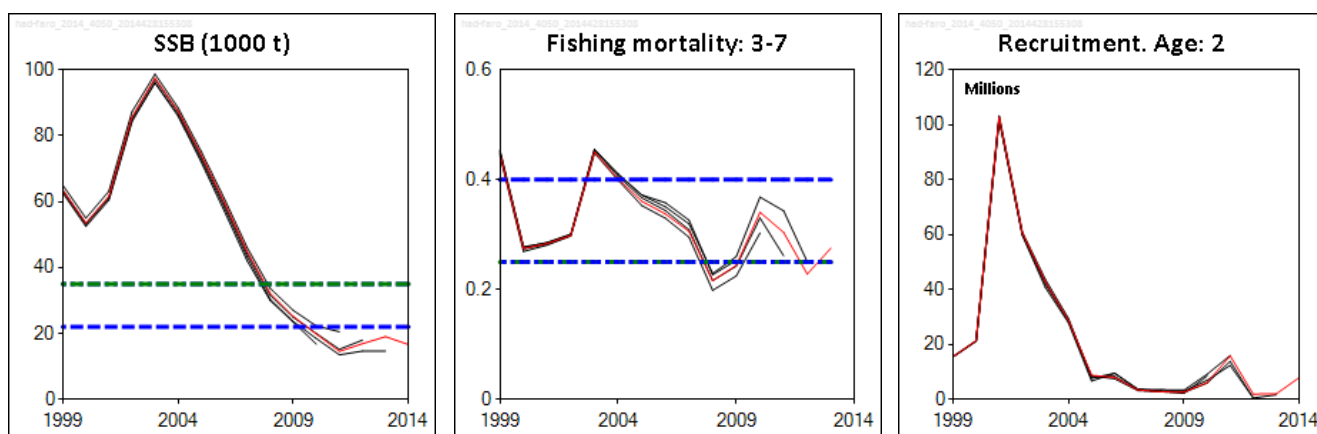

Figure 4.3.3.2   Haddock in Division Vb. Historical assessment results (final-year recruitment estimates included).

Scientific basis

Stock data category	1 (ICES, 2014a).
Assessment type	XSA using landings-at-age data and age-disaggregated indices.
Input data	Commercial catches (mainly Faroese catches, ages and length frequencies from catch sampling); survey indices (FO-GFS-Q1&3); annual maturity data from FO-GFS-Q1; natural mortalities set at 0.2.
Discards and bycatch	Discards are not included and are assumed negligible.
Indicators	None.
Other information	None.
Working group report	NWWG (ICES, 2014b).

ECOREGION   Faroe Plateau ecosystem
STOCK   Haddock in Division Vb

Reference points

	Type	*Value*	*Technical basis*
MSY approach	MSY $B_{trigger}$	35 000 t.	B_{pa}
	F_{MSY}	0.25	Stochastic simulations.
Precautionary approach	B_{lim}	22 000 t.	Lowest observed SSB.
	B_{pa}	35 000 t.	$B_{lim}e^{1.645\sigma}$, with σ of 0.3.
	F_{lim}	0.40	$F_{pa}\,e^{1.645\sigma}$, with σ of 0.3.
	F_{pa}	0.25	F_{med} (1998) = 0.25.

F_{MSY} and MSY $B_{trigger}$ updated in 2012

	Fish Mort	Yield/R	SSB/R
	Ages 2		
Average last 3 years	0.27	0.59	2.33
F_{max} *	0.60	0.62	1.21
$F_{0.1}$	0.18	0.54	3.01
F_{med}	0.22	0.57	2.70

[*] F_{max} is poorly defined.

Outlook for 2015

Basis: F (2014) = average unscaled F (2011–2013) = 0.27; SSB (2015) = 17; R (2014) = age 2 from the 2014 XSA = 8 million; landings (2014) = 3; discards negligible.

Rationale	**F (2015)**	**Landings (2015)**	**Basis**	**SSB (2016)**	**%SSB change** [1]
MSY approach	0.13	2	$F_{MSY} \times B_{2014}$/MSY $B_{trigger} = F_{sq} \times 0.47$	20	20
MSY and F_{pa}	0.25	4	$F_{sq} \times 0.93$	19	12
Zero catch	0.00	0	F = 0	23	35
Status quo	0.14	2	$F_{sq} \times 0.50$	20	18
	0.27	4	F_{sq}	19	12
	0.45	6	$F_{sq} \times 1.40$	16	−6

Weights in thousand tonnes.
[1] SSB 2016 relative to SSB 2015.

 Management plan

A management system based on number of fishing days, closed areas, and other technical measures was introduced in 1996 to ensure sustainable demersal fisheries in Division Vb. This was before ICES introduced precautionary approach (PA) and MSY reference values, and at that time it was believed that the purpose was achieved if the total allowable number of fishing days was set such that on average 33% in numbers of the haddock exploitable stock would be harvested annually. This translates into an average F of 0.45, above the F_{pa} and F_{MSY} of 0.25. ICES considers this to be inconsistent with the PA and the MSY approaches. The Faroese authorities have realized this and have reduced the number of allocated days substantially. In addition, some areas close to land have recently been closed in order to protect young cod; this will also have a protection effect on haddock. At present, there is no explicit management plan for this stock. In 2013, a group representing the Ministry of Fisheries, the Faroese industry, the University of the Faroe Islands, and the Faroe Marine Research Institute proposed a management plan based on general maximum sustainable yield (MSY) principles developed by ICES. This management plan includes a stepwise reduction of the fishing mortality to F_{MSY} in 2015 and a recovery plan if the SSB declines below the MSY $B_{trigger}$. The MSY $B_{trigger}$ has been defined at 35 kt (the former B_{pa}) and F_{MSY} at 0.25. If the SSB declines below the MSY $B_{trigger}$, the fishing mortality will

be reduced by the relationship $F_{MSY} \times B_{act}/MSY\ B_{trigger}$ until the SSB has increased again above the MSY $B_{trigger}$ and is thereafter kept at F_{MSY}. The plan has not yet been approved by the authorities.

MSY approach

Based on stochastic simulations in 2012 MSY preliminary analyses suggested an $F_{MSY} = 0.25$. Work is still needed to confirm these analyses. Using this F_{MSY} value, and given that SSB in 2015 is estimated below MSY $B_{trigger}$, fishing mortality should be reduced further. F in 2015 should be no more than $F_{MSY} \times B_{2014}\ /\ MSY\ B_{trigger}$, however, because the current biomass is estimated to be below B_{lim}. ICES recommends no directed fishing on haddock in 2015 and recommends that measures are put in place that will minimize bycatches of haddock in other fisheries. A recovery plan should be developed and implemented as a prerequisite to reopening the directed fishery.

Precautionary approach

Given the recent poor recruitment and the low SSB, the forecast indicates that even a zero fishing mortality in 2015 will not result in getting the stock above B_{pa} in 2016. There should therefore be no directed fishery on haddock. Measures should be put in place to minimize bycatches of haddock in other fisheries. A recovery plan should be developed and implemented as a prerequisite to reopening the directed fishery.

Additional considerations

Management considerations

An expected benefit of the effort management system was more stability for the fishing fleet. The fleets were expected to target the most abundant fish species, thus reducing the fishing mortality on stocks that are in bad shape. This assumption is, however, not always correct; e.g. low prices for saithe and haddock and high prices for cod kept the fishing mortality higher than expected for cod. Management should include measures that avoid a disproportionate targeting of depleted stocks.

The effort management system needs to consider changes in catchability of the fishery. For baited hook gear, catchability may be related to the amount of food available in the ecosystem. Therefore, low ecosystem production may decrease haddock production and increase the catchability of longline gear.

An explicit management plan based on the MSY approach needs to be implemented, clearly stating what to do when the stock is very low.

In recent years only a fraction of the allocated number of fishing days has actually been utilized.

Impacts of the environment on the fish stocks

The productivity of the Faroe Shelf ecosystem is important to the haddock stock. The recruitment depends both on the spawning-stock biomass and on the productive state of the Faroe Shelf ecosystem. A positive relationship has been demonstrated between primary production and the cod and haddock individual fish growth and recruitment 1–2 years later. The primary production indices were above average in 2008–2010; however, this has resulted in only marginally improved recruitment of haddock, and the indices in 2011–2013 were below average.

Regulations and their effects

An effort management system was implemented 1 June 1996. Fishing days are allocated to all fleets fishing in waters < 380 m depth for the period 1 September–31 August. In addition, the majority of the waters < ca. 200 m depth are closed to trawlers and are mainly utilized by longliners.

Changes in fishing technology and fishing patterns

The effort management system can lead to improvement of fishing technology and efficiency. When such improvements have been documented, the effort needs to be adjusted to take account of the increased catchability. Presently, ICES is not able to quantify these changes.

Uncertainties in assessment and forecast

Recent years have revealed a consistent retrospective pattern of overestimating SSB and underestimating F.

Comparison of the basis of previous assessment and advice

The basis for the assessment has not changed from last year. The basis for the advice this year is the same as last year: the MSY approach.

Sources

ICES. 2014a. Advice basis. *In* Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 1, Section 1.2.
ICES. 2014b. Report of the North-Western Working Group (NWWG), 24 April–1 May 2014, ICES Headquarters, Copenhagen, Denmark. ICES CM 2014/ACOM:07. 902 pp.
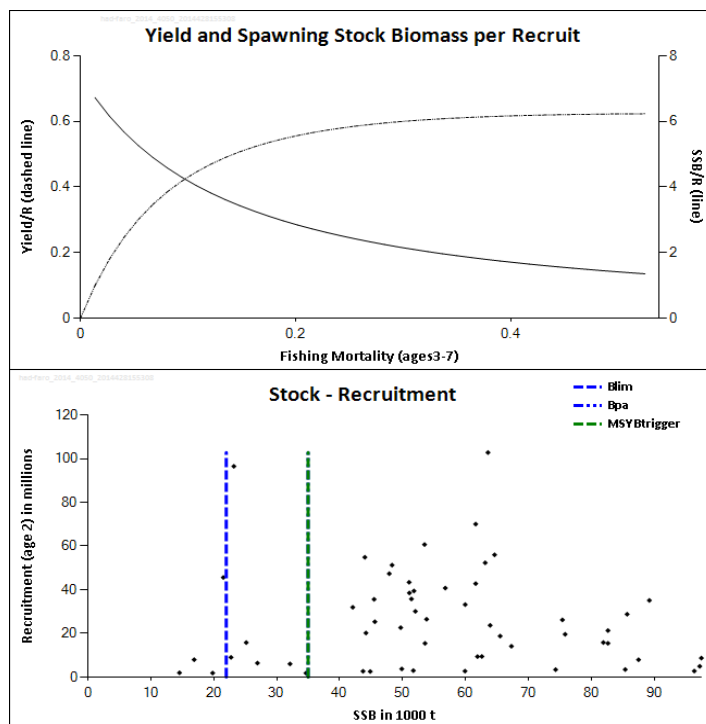

Figure 4.3.3.3   Haddock in Division Vb. Stock–recruitment and yield- and spawning-stock biomass-per-recruit plots.

Table 4.3.3.1   Haddock in Division Vb. ICES advice, management, and catches.

Fishing Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ICES catch
1987	No increase in F	17		14.9
1988	No increase in F	18		12.2
1989	No increase in F	11		14.3
1990	No increase in F	11		11.7
1991	TAC	11		8.4
1992	TAC	13–15		5.5
1993	Reduction in F	8		4.0
1994	No fishing	0	6.2	4.3
1995	No fishing	0	6.2	4.9
1996	TAC	8.3	12.6	9.6
1997	F = F(95)	9.3		17.9
1998	F = F(96)	16		22.2
1999	F< proposed F_{pa} (0.25)	9		18.5
2000	F < proposed F_{pa} (0.25)	22		15.8
2001	F< proposed F_{pa} (0.25)	20		15.9
2002	No fishing	0		24.9
2003	F< proposed F_{pa} (0.25)	12		26.9
2004	F< proposed F_{pa} (0.25)	21		23.1
2005	F< proposed F_{pa} (0.25)	19		20.3
2006	F< proposed F_{pa} (0.25)	18		17.2
2007	F< 0.20	16		12.6
2008	F_{pa}	14		7.3
2009	No fishing and recovery plan	0		5.2
2010	No fishing and recovery plan	0		5.2
2011	No direct fishing; minimize bycatch, implement recovery plan	0		3.5
2012	No direct fishing; minimize bycatch, implement recovery plan	0		2.6
2013	No direct fishing; minimize bycatch, implement recovery plan	0		3.1
2014	No direct fishing; minimize bycatch, implement recovery plan	0		
2015	No direct fishing; minimize bycatch, implement recovery plan	0		

Weights in thousand tonnes.
The fishing year runs from 1 September to 31 August the following year.

Table 4.3.3.2 Haddock in Subdivision Vb1. Nominal catches (tonnes) by country in 2000–2013 and working group estimates in Division Vb.

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013 [2]
Faroe Islands	13,620	13,457	20,776 [6]	21,615	18,995	18,172	15,600	11,689	6,728	4,895	4,932	3,350	2,490	2,846
France [1]	6	8	2	4	1	+	12 [5]	4 [5]	3 [5]	2 [5]	1	3		
Germany	1	2	6	1	6		1							
Greenland	22	0	4 [4]				1	9 [4]		6 [4]	12	+	1 [4]	
Iceland			4										2	26
Norway	355	257	227	265	229	212	57	61	26	8	5			
Russia					16				10					
Spain					49									
UK (Engl. and Wales)	19	4	11 [5]	14	8	1	1							
UK (Scotland) [5]				185	186	126	106	35	60	64				
United Kingdom											73			
Total	14,023	13,728	21,030	22,084	19,490	18,511	15,778	11,798	6,827	4,975	5,023	3,353	2,493	2,872
Used in the assessment	15,821	15,890	24,933	27,072	23,101	20,455	17,154	12,631	7,388	5,197	5,202	3,540	2,634	3,105

1) Including catches from Sub-division Vb2. Quantity unknown 1989-1991, 1993 and 1995-2001.

2) Preliminary data

3) From 1983 to 1996 catches included in Sub-division Vb2.

4) Reported as Division Vb, to the Faroese coastal guard service.

5) Reported as Division Vb.

6) Includes Faroese landings reported to the NWWG by the Faroe Marine Research Institute

Table 4.3.3.3   Haddock in Subdivision Vb$_2$. Nominal catches (tonnes) by country in 2000–2013.

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013 [2]
Faroe Islands	1,565 [5]	1,948	3,698	4,934	3,594	2,444	1,375	810	556	192	178	194	141	45
France1						+								
Norway	48	66	28	54	17	45	1	8		3	1			
UK (Engl. and Wales)	.	.	.	.	.	1								
UK (Scotland)3	185	148	177	4	.	1			15	5	27 [4]	33		
Total	1,798	2,162	3,903	4,988	3,611	1,944	1,376	833	561	222	212	194	141	45

1) Catches included in Sub-division Vb1.

2) Provisional data

3) From 1983 to 1996 includes also catches taken in Sub-division Vb1 (see Table 2.4.1)

4) Reported as Division Vb.

5) Provided by the NWWG

Table 4.3.3.4   Haddock in Division Vb. Summary of the assessment.

Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3–7
1957	35106	51049	20995	0.49
1958	39212	51409	23871	0.627
1959	43417	48340	20239	0.57
1960	35763	51101	25727	0.71
1961	51279	47901	20831	0.562
1962	38537	52039	27151	0.651
1963	47362	49706	27571	0.7
1964	30110	44185	19490	0.475
1965	22644	45605	18479	0.526
1966	20203	44027	18766	0.529
1967	25356	42086	13381	0.403
1968	54852	45495	17852	0.438
1969	31975	53583	23272	0.485
1970	35600	59958	21361	0.476
1971	15457	63921	19393	0.456
1972	33213	63134	16485	0.396
1973	23703	61621	18035	0.29
1974	52334	64631	14773	0.221
1975	70055	75405	20715	0.18
1976	55973	89220	26211	0.248
1977	26194	96376	25555	0.387
1978	35102	97233	19200	0.278
1979	2784	85401	12424	0.155
1980	4944	81905	15016	0.178
1981	3491	75849	12233	0.181
1982	15836	56807	11937	0.331
1983	19619	51811	12894	0.265
1984	40768	53826	12378	0.228
1985	39437	62605	15143	0.276
1986	26490	65506	14477	0.224
1987	9442	67310	14882	0.264
1988	18773	61917	12178	0.201
1989	14118	51720	14325	0.285
1990	9403	43720	11726	0.273
1991	2990	34653	8429	0.275
1992	2676	26959	5476	0.21
1993	1826	23201	4026	0.187
1994	6433	21533	4252	0.206
1995	96487	22744	4948	0.226
1996	45608	49890	9642	0.319
1997	9033	82640	17924	0.372
1998	3735	82642	22210	0.53
1999	15488	63575	18482	0.448
2000	21318	53496	15821	0.275
2001	102805	61617	15890	0.284
2002	60697	85701	24933	0.299
2003	42809	97491	27072	0.451
2004	28779	87516	23101	0.401
2005	8711	74326	20455	0.361
2006	7953	59920	17154	0.338
2007	3427	44863	12631	0.306
2008	2752	32126	7388	0.216
2009	2558	25168	5197	0.244
2010	6053	19822	5202	0.341
2011	15814	14561	3540	0.304
2012	1854	16886	2634	0.228
2013	1992	19017	3105	0.275
2014	7984	16596		
Average	26351	54713	15763	0.352