

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

Advice for 2013 and 2014

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

Stock status

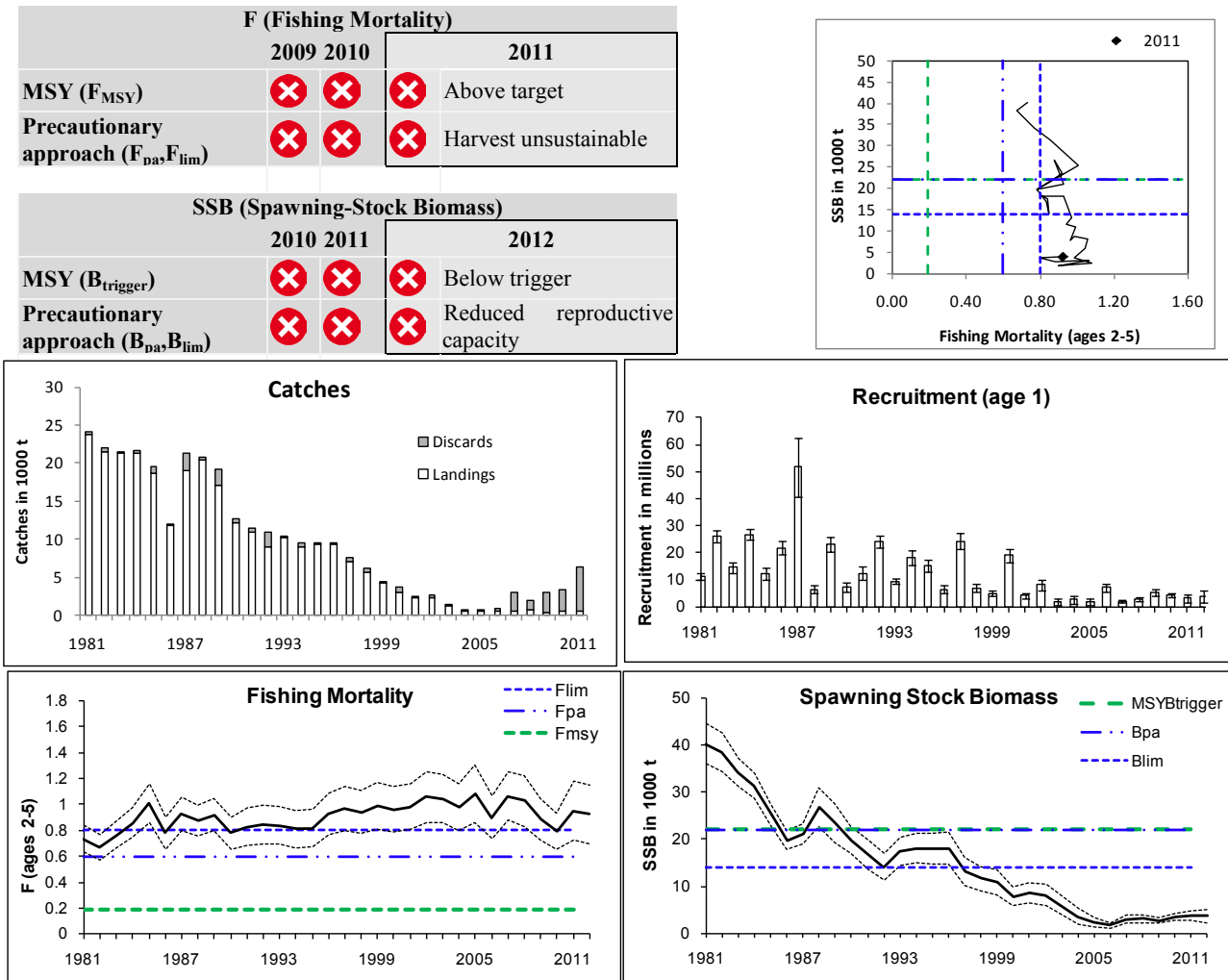


Figure 5.4.21.1 Cod in Division VIa (West of Scotland). ICES observed catches and summary of stock assessment (weights in thousand tonnes), dotted black lines are assessment estimates' standard error. Top right: SSB/F for the time-series used in the assessment.

Total mortality is high, and is increasingly the result of mortality due to discarding. The spawning-stock biomass continues to increase from an all-time low in 2006, but remains at a very low level (well below B_{lim}). Recruitment has been estimated to be low over the last decade. The 2005 and 2008 year classes are estimated to be above recent average.

Management plans

Cod in Division VIa is subject to the EU cod long-term management plan ([EC 1342/2008](#)). ICES has not evaluated if the management plan is in accordance with the precautionary approach.

Biology

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

Environmental influence on the stock

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

The fisheries

The >100 mm otter trawl gear vessels targeting finfish (TR1) take roughly 80% of the cod catch and the 70–99 mm *Nephrops* fleet (TR2) takes 15–20% of the catch. Part of the landings come from vessels using TR1 gear, fishing west of the line defined in the cod long-term management plan. Discards reported to ICES (all fleets combined) are 11 times greater than landings, making catch (landings + discards) 12 times greater than landings.

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

Effects of the fisheries on the ecosystem

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

Quality considerations

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

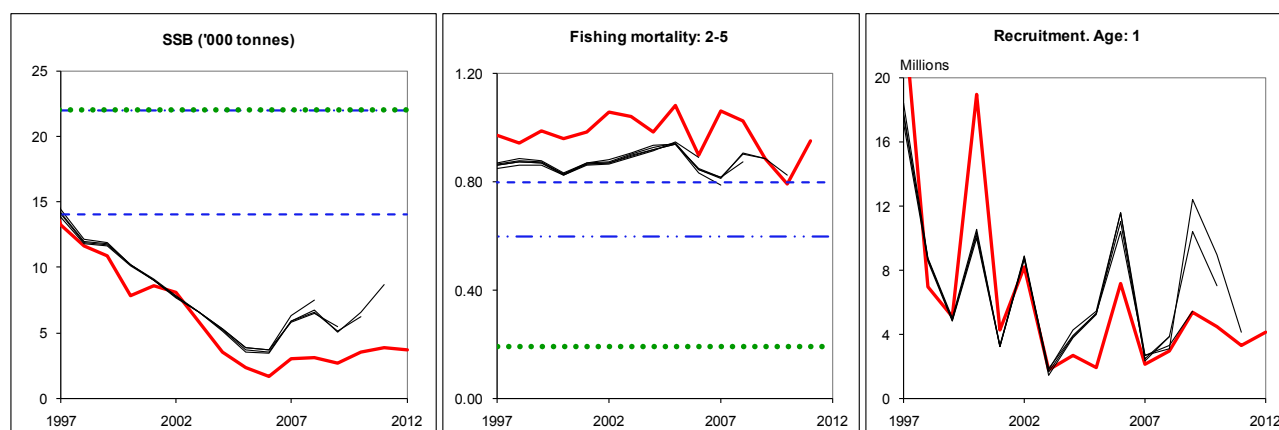


Figure 5.4.21.2 Cod in Division VIa (West of Scotland). Historical assessment results (final-year recruitment estimates included).

Scientific basis

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

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Reference points

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

(unchanged since: 2010)

Outlook for 2013 and 2014

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

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

Units: '000 tonnes.

¹⁾ SSB 2014 relative to SSB 2013.

Note: no information for % TAC change can be shown as a zero TAC was set in 2012.

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

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

Units: '000 tonnes.

¹⁾ SSB 2014 relative to SSB 2013.

Note: no information for % TAC change can be shown as a zero TAC was set in 2012.

MSY approach

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

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

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

Management plan

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

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

Precautionary considerations

Given the low SSB and low recruitments in recent years, it is not possible to identify any non-zero catch which would be compatible with the precautionary approach. No targeted fishing should take place on cod in Division VIa. Bycatches, including discards of cod in all fisheries in Division VIa, should be reduced to the lowest possible level.

Additional considerations

Management considerations

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

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

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

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

Management plan evaluations

In 2009 the EU adopted a long-term plan for cod stocks and the fisheries exploiting those stocks (Council Regulation (EC) 1342/2008, see Annex 5.4.21). This regulation has the objective of ensuring the sustainable exploitation of the cod

stocks on the basis of maximum sustainable yield, while maintaining a target fishing mortality of 0.4 on specified age groups.

In 2009 ICES evaluated this revised long-term plan for cod (Council Regulation (EC) 1342/2008) in relation to the precautionary approach. This evaluation concluded that assuming TAC and effort constraints would lead to rapid declines in fishing mortality, the stock would recover by 2015. Given the recent changes in discarding in response to moderate year classes, ICES could not conclude the plan was precautionary.

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

Regulations and their effects

The fishery is managed by a combination of TAC, area closures, technical measures, and effort restrictions. TAC restrictions on landings and effort and spatial management of fisheries catching cod in Division VIa have not controlled mortality levels. Catch (landings + discards) is 12 times the reported landings.

Area closures

- Clyde Sea area closure – STECF (2007) noted that the Clyde closure includes the main spawning area of a reproductively isolated aggregation of cod and concluded that the closure is likely to have a positive effect in reducing targeting of high densities of mature cod.
- Windsock closed area – STECF (2007) concluded that the extent of the Windsock closure is unlikely to be large enough to greatly reduce fishing mortality on cod, and its boundaries should be reconsidered. However, its removal would not help improve cod recovery.
- Since 2009, the Irish authorities introduced a seasonal closure in Division VIa. The closure covers ICES statistical rectangle 39E3 and is in force from October 31 to March 31. Historically, over 40% of Irish cod landings from ICES Division VIa are from the closed area. For contrast, standardized cpue rates observed from a dedicated survey conducted inside the closed area in 2006 were on average 26.8 kg hr^{-1} while cpue rates estimated from observer trips outside the closure gathered in the same period were 0.015 kg hr^{-1} . STECF (2011) concluded that, in accordance with the provisions of article 13 (1342/2008), the partial cod mortality associated with the Irish fleet had declined considerably (>50%) since the introduction of the cod closure and other measures, although it is not possible to disentangle the effects of the Cape closure from other measures.

Mesh sizes and catch composition rules

- Catch composition rules related to days-at-sea allowances (Reg. (EC) 850/1998 Annex I and Reg. (EC) 2056/2001) – These rules legislate for landings compositions, but do not restrict discards.
- Emergency measures introduced in EC regulation 43/2009 (Annex III) (and rolled forward into 2010 and 2011) prohibited all fishing activity to the east of the West of Scotland Management (French) line in Division VIa with the exception of a number of derogated fisheries. For demersal otter trawlers targeting whitefish this required an increase in mesh size to 120 mm and the inclusion of a 120 mm square-meshed panel (SMP). Vessels targeting *Nephrops* also require the 120 mm SMP or a sorting grid. More stringent catch composition rules have also been introduced. For *Nephrops*-directed fisheries, no more than 10% of the retained catch can consist of cod, haddock, and whiting, where the limit is no more than 30% for whitefish targeted vessels. For 2012 there is a zero TAC for cod and a 1.5% bycatch by live weight limit, but the catch composition limit on haddock has been removed (Reg. (EU) 161/2012).

Effort limitations

- Between 2003 and 2010 STECF (2011) reported that the fishing effort (in kW-days) of trawlers using >100 mm mesh declined by 48%. These vessels primarily targeted roundfish, including cod. Over the same period effort for trawlers using 70–99 mm mesh declined by 35%. These vessels primarily target *Nephrops*.
- Further effort reductions have been implemented since February 2012 under Annex IIa of Reg. (EC) 43/2012. This includes a 25% reduction in effort for all trawl fleets relative to a recent average effort. ‘Buy back’ of this effort reduction is possible after adoption of cod avoidance measures or proof of operating west of the cod management line.

Supply chain traceability

UK “Buyers and Sellers” regulation and Irish “Sales Note” regulation – Unreported landings are expected to have reduced under these regulations. Observer data, however, show an increase in discards starting in 2006. The amount of discards relative to landings has increased and the age pattern of discarding has changed. Currently discards of fish aged 3 and above are being recorded.

Cod avoidance measures

In 2008, Scotland introduced a voluntary programme known as “Conservation Credits”, which involved seasonal closures, real-time closures (RTCs), and various selective gear options. This was designed to reduce mortality and discarding of cod. The number of RTCs west of Scotland were four in 2008, twenty in 2009, nineteen in 2010, and four in 2011, representing 27%, 14%, 12%, and 2% of the total RTCs in each year. RTCs are determined by *lpue*, based on fine-scale VMS data and daily logbook records, and also by on-board inspections. The low number of RTCs west of Scotland result from few instances of high *lpue* in the area. Estimates of continuing high discard rates in Division VIa indicate the scheme has not been effective west of Scotland.

Changes in fishing technology and fishing patterns

The implementation of the cod long-term plan effort controls (Annex IIa of Reg. (EC) 43/2009) and other technical measures including gear restriction in Division VIa (Annex III of Reg. (EC) 43/2009) was expected to lead to large changes in fishing patterns starting in 2009. Analysis is not yet available to evaluate this.

Uncertainties in assessment and forecast

Survey information shows that the total removal of cod in Division VIa may have been underestimated in the past decade relative to earlier periods. In an attempt to remove bias in the assessment a catch-at-age model was used that ignored landings and discard numbers from 1995 to 2005, relying on survey data for this period. Discard information is imprecise compared to landings data because of lower sampling coverage. Catch of this stock has been dominated by discards in recent years, see Figure 5.4.21.4. Mortality estimates arising from this assessment (heavily based on survey and or discard data) are considered to be poorly estimated. In contrast, historical trends in spawning biomass and recruitment appear to be robust measures of stock dynamics, see Figure 5.4.21.1. Scottish landings and discards (from 2006) are adjusted by estimates of misreporting. The misreporting estimates will have uncertainty associated with them.

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

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

Comparison with previous assessment and advice

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

Sources

- ICES. 2012. Report of the Working Group on Celtic Seas Ecosystems (WGCSE), 9–18 May 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:12.
- STECF. 2007. Evaluation of closed area schemes (SGMOS-07-03).
- STECF. 2011. Scientific, Technical and Economic Committee for Fisheries. Evaluation of Fishing Effort Regimes Regarding Annexes IIA, IIB and IIC of TAC & Quota Regulations, Celtic Sea and Bay of Biscay (STECF-11-13).
- Thomas, L. 2011. Estimating the size of the UK grey seal population between 1984 and 2010. SCOS Briefing Paper 11/02.

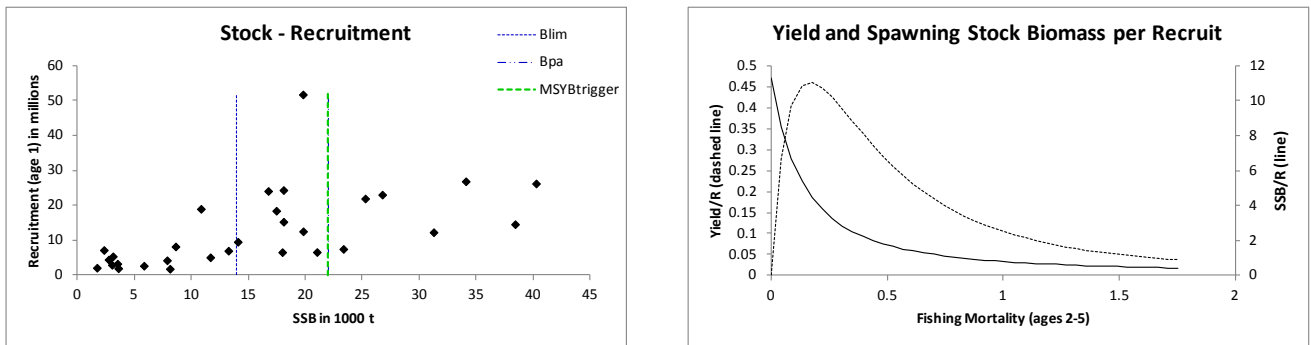


Figure 5.4.21.3 Cod in Division VIa. Stock–recruitment relationship (left panel) and yield-per-recruit analysis (right panel).

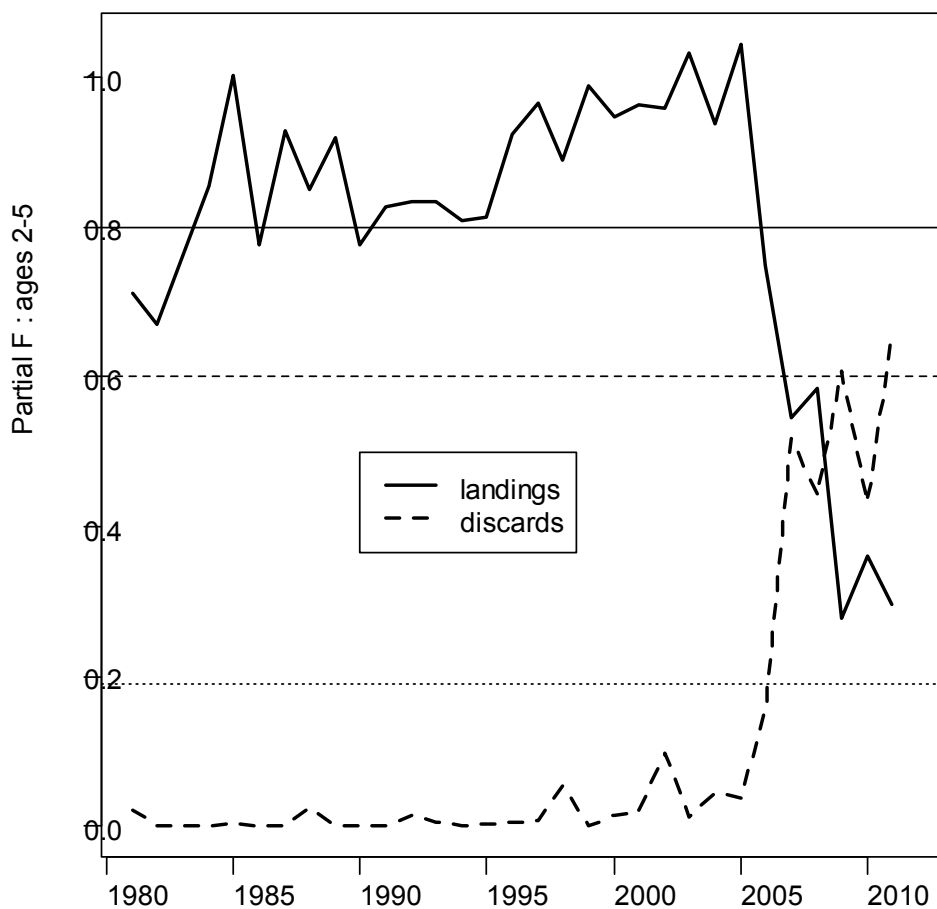


Figure 5.4.21.4 Cod in Division VIa. Partial mean F attributed to landings and discards. Horizontal lines represent F_{lim} (solid), F_{pa} (dashed), and F_{MSY} (dotted) values for the stock.

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

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

Weights in thousand tonnes.

¹ TAC is for the whole of Subdivision Vb₁ and Subareas VI, XII, and XIV.

² TAC is for Subdivision Vb₁ and Division VIa.

³ Not including misreporting.

⁴ Including ICES estimates of misreporting.

⁵ Incomplete data.

⁶ For Division VIa only.

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

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

⁹ Includes an adjustment for misreporting.

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

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

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

* Preliminary.

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

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

5.4.21 Annex

The European Commission has adopted a Council Regulation ((EC) No. 1342/2008) which establishes measures for the recovery and long-term management of cod stocks. The stated objective of the plan is to ensure the sustainable exploitation of the cod stocks on the basis of maximum sustainable yield while maintaining a fishing mortality of 0.4. Articles 7–9, describing aspects of the plan relevant for west of Scotland cod, are reproduced below:

Article 7

Procedure for setting TACs for cod stocks in the Kattegat the west of Scotland and the Irish Sea

1. Each year, the Council shall decide on the TAC for the following year for each of the cod stocks in the Kattegat, the west of Scotland and the Irish Sea. The TAC shall be calculated by deducting the following quantities from the total removals of cod that are forecast by STECF as corresponding to the fishing mortality rates referred to in paragraphs 2 and 3: (a) a quantity of fish equivalent to the expected discards of cod from the stock concerned; (b) as appropriate a quantity corresponding to other sources of cod mortality caused by fishing to be fixed on the basis of a proposal from the Commission.

2. The TAC shall, based on the advice of STECF, satisfy all of the following conditions: (a) if the size of the stock on 1 January of the year of application of the TAC is predicted by STECF to be below the minimum spawning biomass level established in Article 6, the fishing mortality rate shall be reduced by 25 % in the year of application of the TAC as compared with the fishing mortality rate in the previous year; (b) if the size of the stock on 1 January of the year of application of the TAC is predicted by STECF to be below the precautionary spawning biomass level set out in Article 6 and above or equal to the minimum spawning biomass level established in Article 6, the fishing mortality rate shall be reduced by 15 % in the year of application of the TAC as compared with the fishing mortality rate in the previous year; and (c) if the size of the stock on 1 January of the year of application of the TAC is predicted by STECF to be above or equal to the precautionary spawning biomass level set out in Article 6, the fishing mortality rate shall be reduced by 10 % in the year of application of the TAC as compared with the fishing mortality rate in the previous year.

If the application of paragraph 2(b) and (c) would, based on the advice of STECF, result in a fishing mortality rate lower than the fishing mortality rate specified in Article 5(2), the Council shall set the TAC at a level resulting in a fishing mortality rate as specified in that Article.

4. When giving its advice in accordance with paragraphs 2 and 3, STECF shall assume that in the year prior to the year of application of the TAC the stock is fished with an adjustment in fishing mortality equal to the reduction in maximum allowable fishing effort that applies in that year.

5. Notwithstanding paragraph 2(a), (b) and (c) and paragraph 3, the Council shall not set the TAC at a level that is more than 20 % below or above the TAC established in the previous year.

Article 9

Procedure for setting TACs in poor data conditions

Where, due to lack of sufficiently accurate and representative information, STECF is not able to give advice allowing the Council to set the TACs in accordance with Articles 7 or 8, the Council shall decide as follows: (a) where STECF advises that the catches of cod should be reduced to the lowest possible level, the TACs shall be set according to a 25 % reduction compared to the TAC in the previous year; (b) in all other cases the TACs shall be set according to a 15 % reduction compared to the TAC in the previous year, unless STECF advises that this is not appropriate.

Article 10

Adaptation of measures

1. When the target fishing mortality rate in Article 5(2) has been reached or in the event that STECF advises that this target, or the minimum and precautionary spawning biomass levels in Article 6 or the levels of fishing mortality rates given in Article 7(2) are no longer appropriate in order to maintain a low risk of stock depletion and a maximum sustainable yield, the Council shall decide on new values for these levels.

2. In the event that STECF advises that any of the cod stocks is failing to recover properly, the Council shall take a decision which: (a) sets the TAC for the relevant stock at a level lower than that provided for in Articles 7, 8 and 9; (b) sets the maximum allowable fishing effort at a level lower than that provided for in Article 12; (c) establishes associated conditions as appropriate.