

5.4.21 Cod in Division VIa (West of Scotland)

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Reduced reproductive capacity	Unknown	Unknown	Not defined	Fishing mortality cannot be estimated but is likely to be higher than F_{pa} .

The spawning stock biomass is at an all time low, but the total mortality is uncertain and probably high. Recruitment estimates indicate a decline in recruitment in the last decade, correlated with a decline in the spawning stock to the lowest levels observed. Recruitment since the 2002 year class has been amongst the weakest in the time-series although the estimate of the recruiting 2005 year class is slightly higher.

Management objectives

The European Commission has enacted a Council Regulation ((EC) No. 423/2004) which establishes measures for the recovery of cod stocks:

For stocks above B_{lim} the harvest control rule (HCR) requires:

1. setting a TAC that achieves a 30% increase in the SSB from one year to the next,
2. limiting annual changes in TAC to $\pm 15\%$ (except in the first year of application), and,
3. a rate of fishing mortality that does not exceed F_{pa} .

For stocks below B_{lim} the Regulation specifies that:

1. conditions 1-3 will apply when they are expected to result in an increase in SSB above B_{lim} in the year of application,
2. a TAC will be set lower than that calculated under conditions 1-3 when the application of conditions 1-3 is not expected to result in an increase in SSB above B_{lim} in the year of application.

ICES has previously concluded that a precautionary recovery plan must include an adaptive element implying that fisheries for cod remain closed until an initial recovery of the cod SSB has been proven. An initial 3-year closure would be required to increase SSB above B_{lim} with high probability. Such an element of zero catch is not included in the existing plan. ICES therefore considers the recovery plan to be not consistent with the precautionary approach.

Reference points

	Type	Value	Technical basis
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	This is 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} .
Targets	F_v	Not defined.	

(unchanged since: 1998)

Single-stock exploitation boundaries

Exploitation boundaries in relation to existing management plans

The management plan is not explicit about the level of reduction in the catch when the stock is below B_{lim} . Furthermore, due to the uncertainty in the level of fishing mortality, ICES is not in a position to give quantitative forecasts. Previous simulations show that fishing should be closed for 3 years in order to bring SSB above B_{lim} .

Exploitation boundaries in relation to precautionary limits

Given the very low SSB estimates, the high total mortality and low recruitment in this stock, ICES advises zero catch of cod in 2008.

Conclusion on exploitation boundaries

As the recovery plan for this stock is considered to be consistent with the precautionary approach only when the fishery is closed for an initial period, and as this is congruent with the advice in relation to precautionary limits, ICES advises a zero catch of cod in 2008.

Short-term implications

No forecast could be presented because of the poor quality of the input data.

Management considerations

Management of cod fisheries must deal with the combined effects of assessment bias (of which unreliable catch data are a major contributing factor) and the inability of management to control catch. As long as these two interrelated conditions persist and substantial effort is permitted for fisheries catching cod, rebuilding cannot be achieved. 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 data from 1995 onwards, relying on survey data for this later period. It is, however, considered that mortality estimates arising from an assessment heavily or wholly based on survey data are poorly estimated and therefore noisy and sensitive to survey catchability. In contrast, historical trends in spawning biomass and recruitment appear to be robust measures of stock dynamics.

A study by the sea mammal research unit (SMRU) on seal predation has indicated that seal predation on cod at some or all ages is considered to have become greater than can be accommodated by the standard natural mortality figure of $M = 0.2$. It is also possibly subject to a persistent upward trend.

The recent implementation of stricter landings enforcement has potentially improved the quality of the landings data in 2006. However, the full effect of these measures cannot be fully assessed yet.

As cod is taken in mixed demersal fisheries, following the advice will likely result in having to greatly reduce harvesting of other stocks, particularly haddock, whiting, and *Nephrops*. Management needs to take this into account.

Effort data 1998–2005 from UK vessels (one of the main countries fishing in the area) suggests that overall, effort has declined in recent years in Area VIa, and that declines in particular categories have, mostly, not been compensated for by rises in other categories. Larger-meshed whitefish demersal trawls were the most important gears in Division VIa prior to 2002, but since then there has been a marked decline in KW-days by this category. This is principally explained by the recent, significant decommissioning schemes in the UK. Single-rig *Nephrops* trawls in the 70- to 99-mm mesh category are the other major gears in use and effort by these seems to have been maintained at a fairly stable level throughout the time-series. Numerous other gears generally make small contributions to the overall effort, and the pattern in most of these has been either a downward trend (e.g. seine nets and midwater trawls) or a fluctuation without trend (e.g. fixed nets).

Time and area closures for particular fisheries may be tools to reduce fishing mortality to rebuild this stock. The consequence of displacing effort, caused by the closures, needs to be considered in determining the role of such measures in the recovery plan.

Factors affecting the fisheries and the stock

The effects of regulations

The fishery is managed by a TAC that does not seem to be restricting catches.

Several regulations have been introduced for West of Scotland in recent years. These regulations and their impact on the fisheries have been discussed in detail in the overview. Emergency EU measures were established in the first half of 2001 and led to short-term area closures in the north of the Division and, on a smaller scale, in the Clyde Sea area. These closures were intended to allow as many cod as possible to spawn. The Clyde closure has continued in all subsequent years under national UK legislation. Various derogations were introduced for gears not targeting cod. A new closed area was implemented west of Scotland in 2004 (EC Reg. No. 2287/2003).

The proportion of discarded fish has been high. In 2002 and 2003 regulations were implemented to improve the exploitation pattern of cod. It is not clear whether it is possible to evaluate the potential impacts of these measures on the stock and the fishery.

Increases in cod-end mesh sizes have been introduced into the fishery to improve selectivity. The increase in minimum mesh size from 100 to 120 mm in 2001/2002 (before the introduction of effort regulation 27/2005) partly caused a shift to 80-mm mesh sizes in the mixed fishery trawls, due to the loss of valuable *Nephrops* catch. Catch composition regulations for this mesh size may have resulted in increased discarding and high grading.

The regulation is complemented by a system of fishing effort limitation. This is done by adjustment to the number of fishing days for various vessel categories deploying gears with various mesh sizes. The introduction of effort regulation has effectively further encouraged vessel operators to reduce mesh size and shift to other fisheries, particularly *Nephrops* trawling, in order to gain more days at sea. Without information on the level of adherence to catch composition regulations required when using smaller mesh sizes it is not possible to evaluate whether the mesh size changes and effort limitations may have benefited cod.

However, the continued decline in the stock indicates that these measures alone have not proven sufficient to rebuild the stock to precautionary levels. Detailed analysis of the impact of such regulations is not possible until data of sufficient quality become available.

Changes in fishing technology and fishing patterns

From mid-September 2003 to mid-July 2004 the Irish trawl fishery off Greencastle, Co. Donegal that traditionally targets juvenile cod was closed. The closure was instigated by the local fishing industry to allow an assessment of seasonal closure as a potential management measure. The fishing industry again called for and received a statutory instrument closing the fishery from November 2004 until mid-February 2005 and again November 2005 until mid-February 2006. Most of the cod catch is normally taken in the fourth quarter. During 2000–2002 50% of the Irish catch weight of cod in Division VIa (61% by number) was taken in the fourth quarter. The closure is expected to have reduced the Irish fishing mortality on cod that would otherwise have occurred in 2003, 2004, and 2005.

Scientific basis

Data and methods

A catch-at-age model using catch data up to 1994 tuned by survey data and utilizing survey information alone from 1995 onward was used to evaluate trends in spawning-stock biomass and recruitment. Trends in SSB are similar to results from a model based on survey data alone.

Uncertainties in assessment and forecast

Catch is considered to be very uncertain, due to incorrect reporting of landings (species and quantity). There are indications that misreporting has reduced from the beginning of 2006.

Some changes have been made to the survey design in the past, but surveys are considered to provide an indicator of long-term stock trends.

Comparison with previous assessment and advice

The perception of the state of the stock remains unchanged compared to 2003 and subsequent years.

The advice is the same as last year.

Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 8–17 May 2007 (ICES CM 2007/ACFM:22).

Year	ICES advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC ¹	Official landings	ACFM Landings
1987	Reduce F towards F_{max}		18.0		22.0	19.2	19.0
1988	No increase in F; TAC		16.0		18.4	19.2	20.4
1989	80% of F(87); TAC		16.0		18.4	15.4	17.2
1990	80% of F(88); TAC		15.0		16.0	11.8	12.2
1991	70% of effort (89)		-		16.0	10.6	10.9 ²
1992	70% of effort (89)		-		13.5	9.0	9.7 ³
1993	70% of effort (89)		-		14.0	10.5	11.8 ³
1994	30% reduction in effort		-		13.0	9.1	10.8 ³
1995	Significant reduction in effort		-		13.0	9.7	9.6 ³
1996	Significant reduction in effort		-		13.0	9.6	9.4
1997	Significant reduction in effort		-		14.0	7.0	7.0
1998	20% reduction in F		9.5 ⁵		11.0	5.7	5.7
1999	F reduced to below F_{pa}		<9.7 ⁵		11.8	4.3	4.2
2000	Recovery plan, 60% reduction in F		<4.2		7.48	2.8 ⁴	3.0
2001	Lowest possible F, recovery plan		-		3.7	2.5	2.3
2002	Recovery plan or lowest possible F		-		4.6	2.0	2.1
2003	Closure		-		1.81	1.3	n/a
2004		Zero catch	⁶	0	0.85	0.6	n/a
2005		Zero catch	⁶		0.72	0.5	n/a
2006		Zero catch	⁶		0.613	0.5	n/a
2007		Zero catch	⁶	0	0.49		
2008		Zero catch	⁶	0			

Weights in '000 t.

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

²Not including misreporting.

³Including ACFM estimates of misreporting.

⁴Incomplete data.

⁵For VIa only.

⁶Single-stock boundaries and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

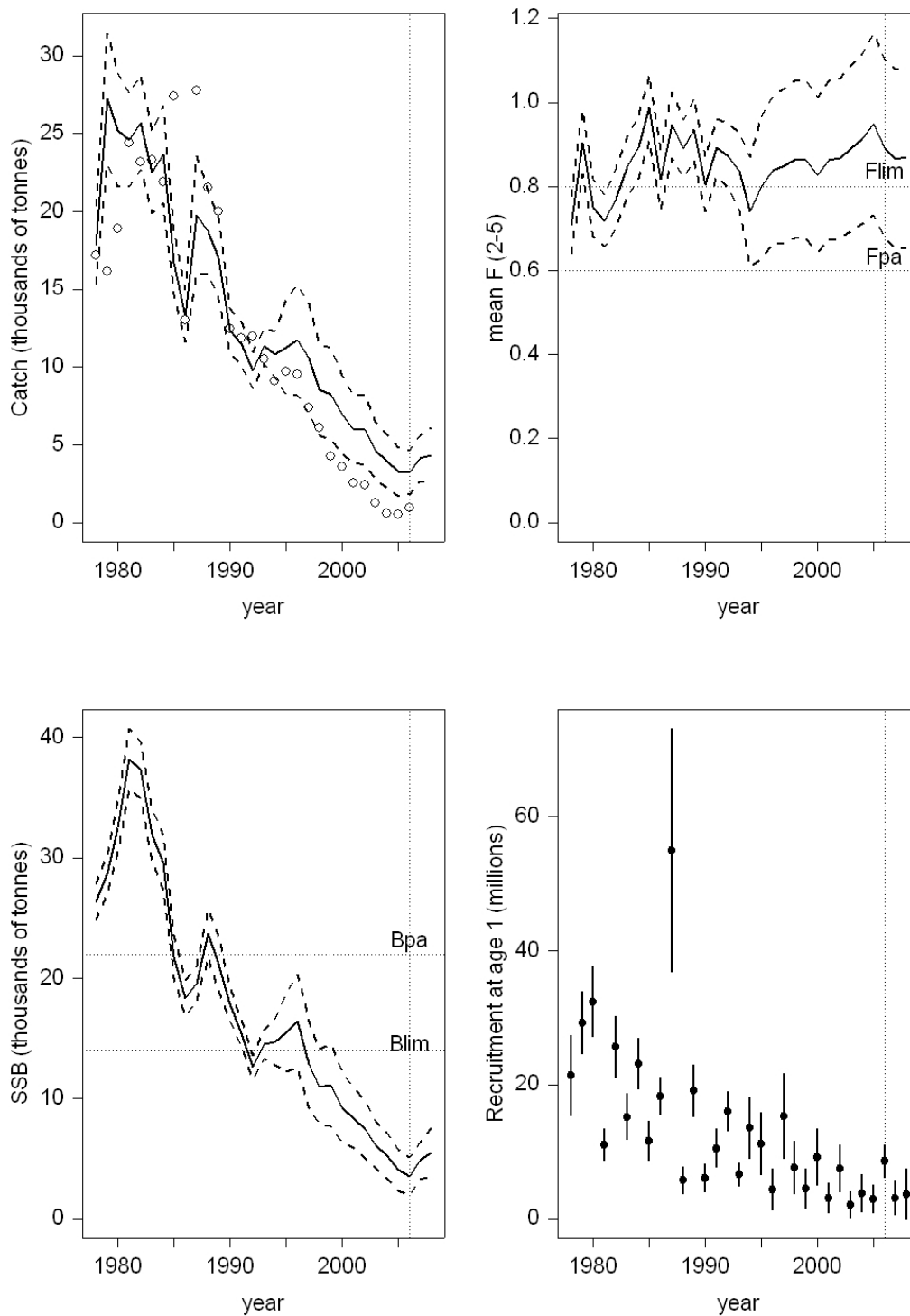


Figure 5.4.21.1 Cod in Division VIa. Summary plot of TSA final run (landings & discard data excluded from 1995 onward). In catch figure, open circles indicate observed catches, and lines indicate estimated removals.

Table 5.4.21.1 Cod in Division VIa. Official catch statistics in 1985–2006, as reported to ICES.

COUNTRY	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Belgium	48	88	33	44	28	-	6	-	22	1	2	+	11	1	+	+	2	+
Denmark	-	-	4	1	3	2	2	3	2	+	4	2	-	-	+	-	-	-
Faroe Islands	-	-	-	11	26	-	-	-	-	-	-	-	-	-	-	-	-	-
France	7,411	5,096	5,044	7,669	3,640	2,220	2,503	1,957	3,047	2,488	2,533	2,253	956	714*	842* ²	236	391	208
Germany	66	53	12	25	281	586	60	5	94	100	18	63	5	6	8	6	4	+
Ireland	2,564	1,704	2,442	2,551	1,642	1,200	761	761	645	825	1,054	1,286	708	478	223	357	319	210
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-
Norway	204	174	77	186	207	150	40	171	72	51	61	137	36	36	79	114*	40*	88
Spain	28	-	-	-	85	-	-	-	-	-	16	+	6	42	45	14	3	11
UK (E., W., N.I.)	260	160	444	230	278	230	511	577	524	419	450	457	779	474	381	280	138	195
UK (Scotland)	8,032	4,251	11,143	8,465	9,236	7,389	6,751	5,543	6,069	5,247	5,522	5,382	4,489	3,919	2,711	2,057	1,544	1,519
UK																		
Total landings	18,613	11,526	19,199	19,182	15,426	11,777	10,634	9,017	10,475	9,131	9,660	9,580	6,992	5,671	4,289	2,767	2,439	2,231

COUNTRY	2003	2004	2005	2006*
Belgium				
Denmark				
Faroe Islands		2	0	0.8
France	172	91	79	100.7
Germany	+			2
Ireland	120	34	27.9	18
Netherlands	-			
Norway	46	10		30
Spain	3			
UK (E., W., N.I.)	79	46		
UK (Scotland)	879	413		
UK			403	332.1
Total landings	1,299	596	509.9	483.6

*Preliminary.