

## 5.4.2 Cod in Divisions VIIe–k (Celtic Sea Cod)

### State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to high long-term yield	Fishing mortality in relation to agreed target	Comment
Unknown	Unknown	Unknown	N/A	

The available information on landings, cpue, surveys, and stock structure are inadequate to establish reliable assessments and evaluate stock trends. Therefore the state of the stock is unknown and there is no basis for quantitative advice.

The stock is highly dependent on incoming recruitment levels. More than 50% of the stock abundance was composed of age 2 during the last four years. The total mortality estimated from the surveys does not show any trends other than a fluctuation within the span of the uncertainty. One of the noticeable points is the shrinking of the geographical area of the stock, shown by the international landings and lpue distribution maps. lpue has generally declined from 1995-2000 and remains at a low level.

Survey data indicate weak year class in 2002, 2003, and 2004 in line with the catch data. This was followed by slightly better recruitment in 2005, 2006, and 2007. These are below average compared with the time-series.

### Management objectives

There are no specific management objectives or a management plan for this stock, but a plan is under development.

### Reference points

	Type	Value	Technical basis
Precautionary approach	$B_{lim}$	6 300 t	$B_{lim} = B_{loss}$ (B76), the lowest observed spawning-stock biomass.
	$B_{pa}$	8 800 t	$B_{pa} = B_{lim} * 1.4$ . Biomass above this value affords a high probability of maintaining SSB above $B_{lim}$ , taking into account the variability in the stock dynamics and the uncertainty in assessments.
	$F_{lim}$	0.90	The fishing mortality estimated to lead to potential collapse.
	$F_{pa}$	0.68	$F_{pa} = 5^{th}$ percentile of $F_{loss}$ . This F is considered to have a high probability of avoiding $F_{lim}$ and maintaining SSB above $B_{pa}$ in the medium term (assuming normal recruitment), taking into account the uncertainty assessments.
Targets	$F_y$	Not defined.	

(unchanged since: 2004)

### Single-stock exploitation boundaries

ICES advises on the basis of precautionary considerations that fishing effort and catches should be reduced although it is not possible to determine the appropriate scale of such reduction..
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### Short-term implications

Given the lack of an analytical assessment and unknown fishing mortality, it is not possible to conduct a short-term forecast.

### Management considerations

The exclusion of the ICES Division VIIId in the TAC area since 2009 brings the management area more into line with the boundaries of the stock.

In recent years, Irish landings of cod reported from ICES rectangles immediately north of the Irish Sea–Celtic Sea boundary have been re-allocated into the Celtic Sea as they represent a combination of inaccurate area reporting and catches of cod considered to be part of the Celtic Sea stock.

Cod in Divisions VIIe–k are caught in a range of fisheries including gadoid trawlers, *Nephrops* trawlers, otter trawlers, beam trawlers, and gillnetters. Other commercial species that are caught by these fisheries include haddock, whiting, *Nephrops*, plaice, sole, anglerfish, hake, megrim, and elasmobranchs.

In the recent past there have been indications of an underreporting of cod landings in some fleets. The introduction of the buyers and sellers legislation in the UK and Ireland may have reduced this, but may also have increased discards. Measures aimed at reducing discarding and improving the fishing pattern should be encouraged. These might include spatial and temporal changes in fishing practices or technical measures. These measures would need to be evaluated in the context of other species caught in mixed fisheries.

This stock has had a truncated age structure observed in landings over many years. The historical dynamics of Celtic Sea cod have been “recruitment driven”, i.e. the stock increased in the past in response to good recruitments and decreased rapidly during times of poor recruitment. Recruitment in recent years appears to be poor. Fishing mortality should be reduced in the longer term to maximize the contributions of recruitment to future SSB and yield and will result in reduced risk to the stock.

The displacement of effort from areas with existing effort control regimes (Division VIIa, Subareas VI and IV) would have a detrimental effect on measures to reduce the mortality of cod in the Celtic Sea.

#### *Ecosystem considerations*

Cod in the Celtic Sea are at the southern limit of the range of the species in the Northeast Atlantic. It is known that at the southern limits of their range, recruitment tends to decrease in warmer waters (above 8.5°C), and that cod are not found in waters warmer than 12°C. Celtic Sea cod has higher growth rates and mature earlier than other cod stocks.

Previous tagging studies have given no evidence of cod movement out of Division VIIe and into VIIf.g, where there appears to be a simple inshore-offshore migration between deep-water wrecks and reefs in the summer and inshore spawning areas in the winter. Past tagging work in the Irish Sea suggests that only a small component of cod landings from the Celtic Sea are fish which spawn in the Irish Sea.

### **Factors affecting the fisheries and the stock**

#### *The effects of regulations*

Since 2005, ICES rectangles 30E4, 31E4, and 32E3 have been closed during the first quarter (Council Regulations 27/2005, 51/2006, and 41/2007, 40/2008, and 43/2009) with the intention of reducing the fishing mortality of cod. STECF (2007) concluded that the closure is a potentially effective measure for displacing fishing activities away from spawning aggregations off North Cornwall and hence making vessels less efficient at catching cod. The major impact of the closure appears to have been on French trawlers that historically have taken a large fraction of the VIIe-k cod landings. The effectiveness of the closed rectangle off the Irish Coast is less evident due to its lesser importance as a fishing ground for the EU whitefish fleets and the poorer knowledge of the distribution of cod spawning activity off the SE coast of Ireland. The quantitative impact of this closure was evaluated by ICES two years ago in response to a special request from the EC and it could not be quantitatively disentangled from other factors.

Technical measures applied to this stock are: a minimum mesh size for beam and otter trawlers in Subarea VII and a minimum landing size (MLS) of 35 cm. For Belgian trawlers that land in Belgium the MLS is 40 cm. Minimum landing sizes do not prevent cod from being discarded, but might prevent the targeting of juvenile cod. Recent sampling programmes in countries exploiting this stock indicate that discarding is high and variable. They may account for 40–60% by number of all fish caught. These discards were mainly under the MLS until recently when high grading became more prominent in the fishery.

The most pertinent changes to the fishing pattern for cod have been the increased high-grading and discarding in response to restrictive quotas since 2002. High-grading has occurred in French fisheries since 2003 and was also apparent in UK fisheries since 2007.

### **Scientific basis**

#### *Data and methods*

The assessment methodology for this stock has been benchmarked in 2009 (ICES, 2009b), but this process failed to develop an assessment procedure due to recent deterioration in the quality of assessment input data for this stock. The major sources of uncertainties are in the assessment of discard practices estimates (small discard and high - grading)

and landings misreporting. These problems have been exacerbated since 2003, when quotas became increasingly restrictive.

Self sampling dataset obtained in 2008 has been applied to estimate the French high grading level, assuming that the discarding practices in 2006-07 were the same as the practice observed in 2008 on the main fleet self sampled. However, applying this procedure back to 2003 was considered inappropriate.

#### *Information from the fishing industry*

The industry has cooperated in a number of scientific endeavours with regards to improving the information base for this stock. The French industry was involved in a self-sampling project since 2008 and has proved to be efficient in providing with quarterly estimates of discarding. The representatives of Fishermen Organisations at the WKROUND 2009 have indicated that the discarding level was probably not the same in earlier years than in recent years and is linked to the level of TAC. The UK Fisheries Science Partnership, conducted in cooperation between CEFAS and the UK industry, has provided information on the relative age compositions, suggesting that the main year-class signals are captured by the assessment. The Irish industry has participated in two Fisheries Science Partnership projects, tagging cod and scoping out a new survey design for this stock.

The fisheries' representatives from France, the UK, and Ireland, all reported that cod were abundant and widespread in the Celtic Sea in the spring of 2007 and 2008. They also further highlighted the issue of restrictive quotas resulting in high-grading. The industry questioned the accuracy of recent recruitment estimates in the 2007 WG assessment. The restrictive nature of the TAC has resulted in certain fleets avoiding areas where small cod are known to occur.

#### *Comparison with previous assessment and advice*

In 2008, advice was based on precautionary limits (50% reduction in fishing mortality, which is expected to allow rebuilding of the stock to  $B_{pa}$  in 2010). The benchmark assessment for this stock in 2009 has concluded that data and assessment quality are insufficient to produce an analytical assessment. The assessment method used previously is no longer appropriate as it treats the catch numbers as unbiased.

The advice is based on the perception of low stock size and high mortality and there is a need to reduce mortality and rebuild the stock.

#### **Source of information**

Report of the Working Group on Celtic Seas Ecoregion, 13–19 May 2009 (ICES CM 2009/ACOM:09).

ICES. 2009. Report of the Benchmark and Data Compilation Workshop for Roundfish (WKROUND), 16–23 January 2009, Copenhagen, Denmark. ICES CM 2009/ACOM:32. 259 pp.

**Table 5.4.2.1** Cod in Divisions VIIe–k (Celtic Sea Cod). Single stock exploitation boundaries (advice), management and landings.

Year	ICES Advice / Single stock exploitation boundaries	Predicted catch corresp. to advice	Agreed TAC <sup>1</sup>	ICES Landings	ICES Landings + High-grading estimates
1987	Reduce F	< 6.4 <sup>2</sup>		10.2	
1988	No increase in F; TAC	7.0 <sup>2</sup>		17.2	
1989	No increase in F; TAC	8.6 <sup>2</sup>		19.8	
1990	No increase in F; TAC	9.2 <sup>2</sup>		12.7	
1991	TAC; SSB = mean	4.5 <sup>2</sup>		9.3	
1992	Appropriate to reduce F	-		9.7	
1993	20% reduction in F	6.5 <sup>2</sup>	19.0	10.4	
1994	20% reduction in F	5.6 <sup>2</sup>	17.0	10.6	
1995	20% reduction in F	4.7 <sup>3</sup>	17.0	11.7	
1996	20% reduction in F	4.7 <sup>3</sup>	20.0	12.6	
1997	20% reduction in F	7.4 <sup>4</sup>	20.0	12.0	
1998	10% reduction in F	8.8 <sup>4</sup>	20.0	11.4	
1999	Reduce F below F <sub>pa</sub>	9.2 <sup>4</sup>	19.0	8.6	
2000	Reduce F below F <sub>pa</sub>	< 7.6 <sup>5</sup>	16.0	6.5	
2001	40% reduction in F	< 4.3 <sup>5</sup>	10.5	8.3	
2002	45% reduction in F	< 5.3 <sup>5</sup>	8.7	9.4	
2003	60% reduction in F	< 3.8 <sup>5</sup>	6.7	6.2	6.4
2004	90% reduction in F or management plan	<0.7	5.7	3.5	3.7
2005	17% reduction in F	<5.2	6.2	3.1	3.1
2006	No increase in effort [should have been reduce effort]	Cannot be estimated	5.6	3.4	3.8
2007	Zero catch	0	4.7	4.3	4.8
2008	Zero catch	0	4.3	3.6	4.0
2009	50% reduction in F	<2.6	4.0		
2010	Substantial catch reduction	-			

Weights in '000 t.

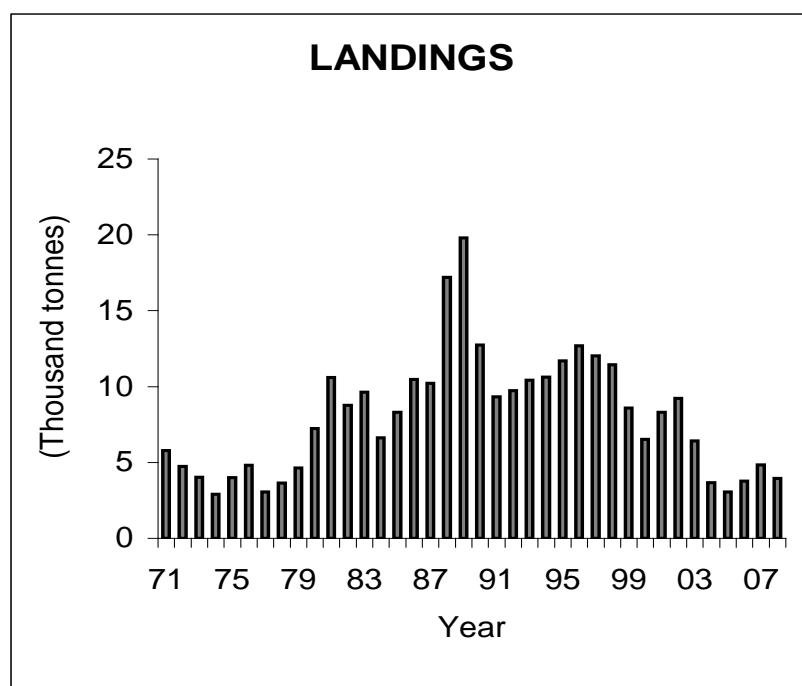
<sup>1</sup>TAC covers Subareas VII (except Division VIIa) and VIII.

<sup>2</sup>For the VIIf,g stock component.

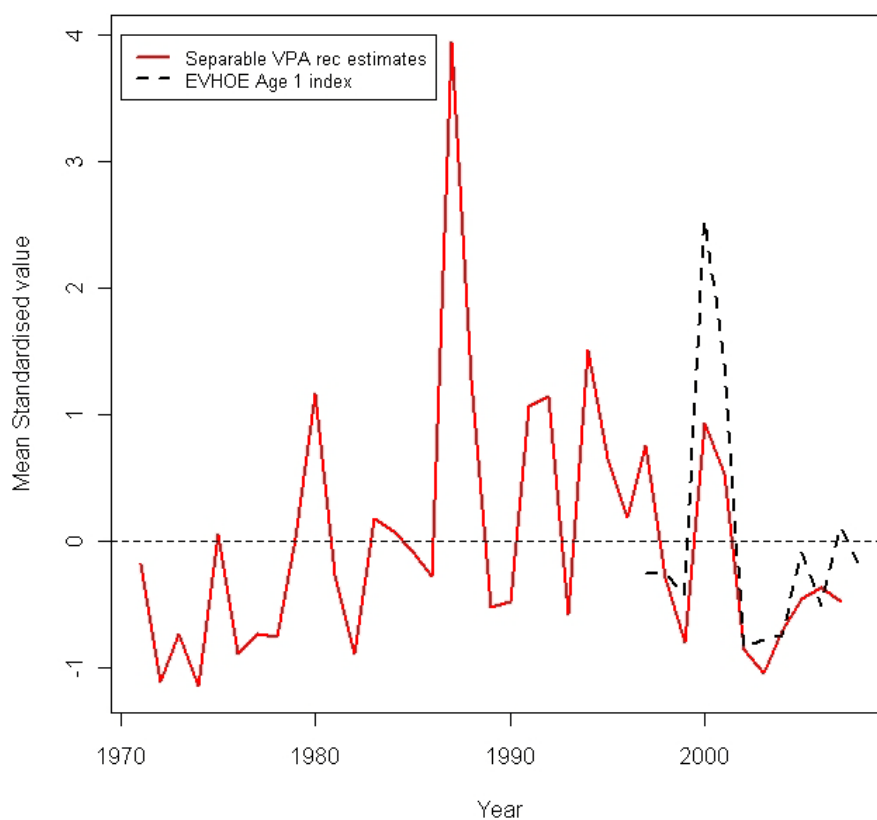
<sup>3</sup>For the VIIf–h stock component.

<sup>4</sup>For the VIIe–h stock component.

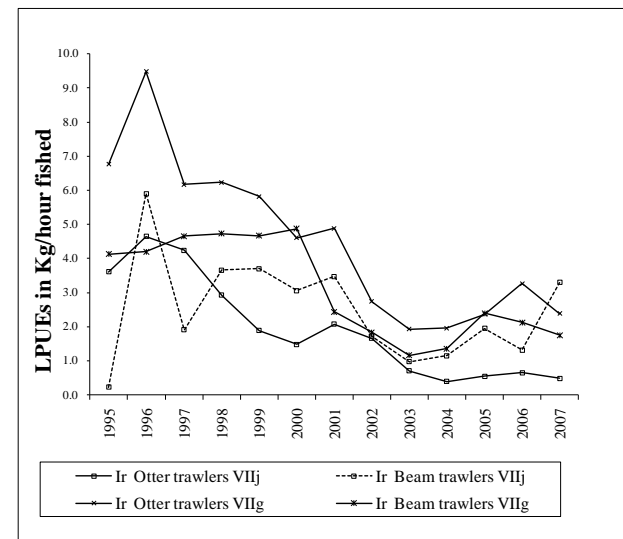
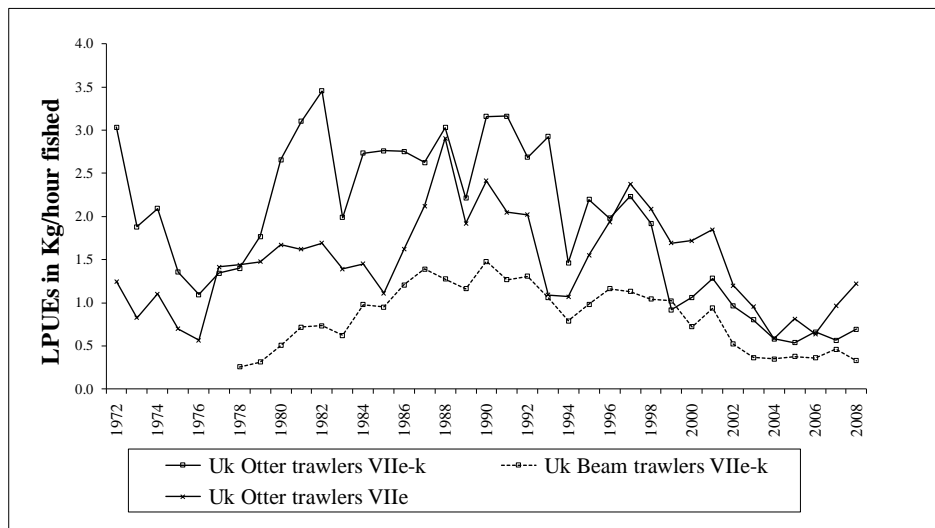
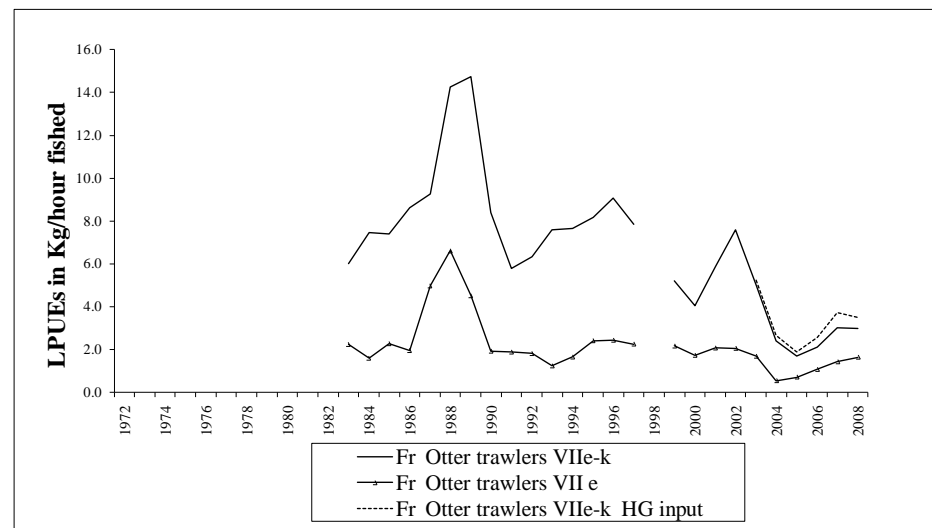
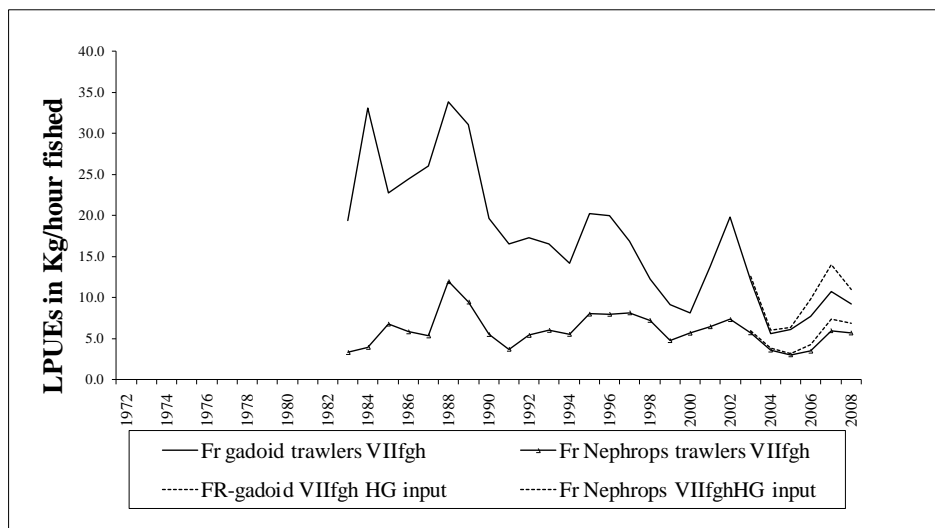
<sup>5</sup>For the VIIe–k stock component.



**Figure 5.4.2.1** Cod in Divisions VIIe-k. Landings ('000 t) as used by ICES.



**Figure 5.4.2.2** Cod in Division VIIe-k. Trends in recruitment based on comparative analysis of mean standardized values of Separable VPA recruitment estimates and FR-EVHOE survey age 1 index.



**Figure 5.4.2.3** Cod in Divisions VIIe-k. Trends in lpue per country per fleet.

**Table 5.4.2.2** Cod in Divisions VIIe–k. Nominal landings of cod in Divisions VIIe–k used by the Working Group. High grading estimated by French self sampling.

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

\* provisional

Scaled landings 1971-1987 (SSDS WG 1999)

**Table 5.4.2.3** Nominal landings (t) of cod in Division VIIb,c for 1995–2008.

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
France	91	115	71	44	... <sup>1</sup>	46	38	54	33	13
Germany	-	-	3	-	-	-	-	-		
Ireland	282	353	177	234	154	141	107	59	59	60
Netherlands	-	-	-	-	-	-	+	-	1	
Norway	3	1	6		11	+	1	5		
Spain	6	3		6	2	3	1	1		
UK(E/W/Nl)	25	35	37	25	4	4	2	1	8	
UK(Scotland)	66	12	7	9	1	-		1	1	10
UK										
Total	473	519	301	318	172	194	150	122	102	83

Country	2005	2006	2007	2008
France	13	1	18	10
Germany				
Ireland	32	16	11	17
Netherlands				
Norway		1	1	
Spain				
UK(E/W/Nl)				
UK(Scotland)				
UK		2	2	1
Total	45	20	32	28

<sup>1</sup>See VIIg-k.