

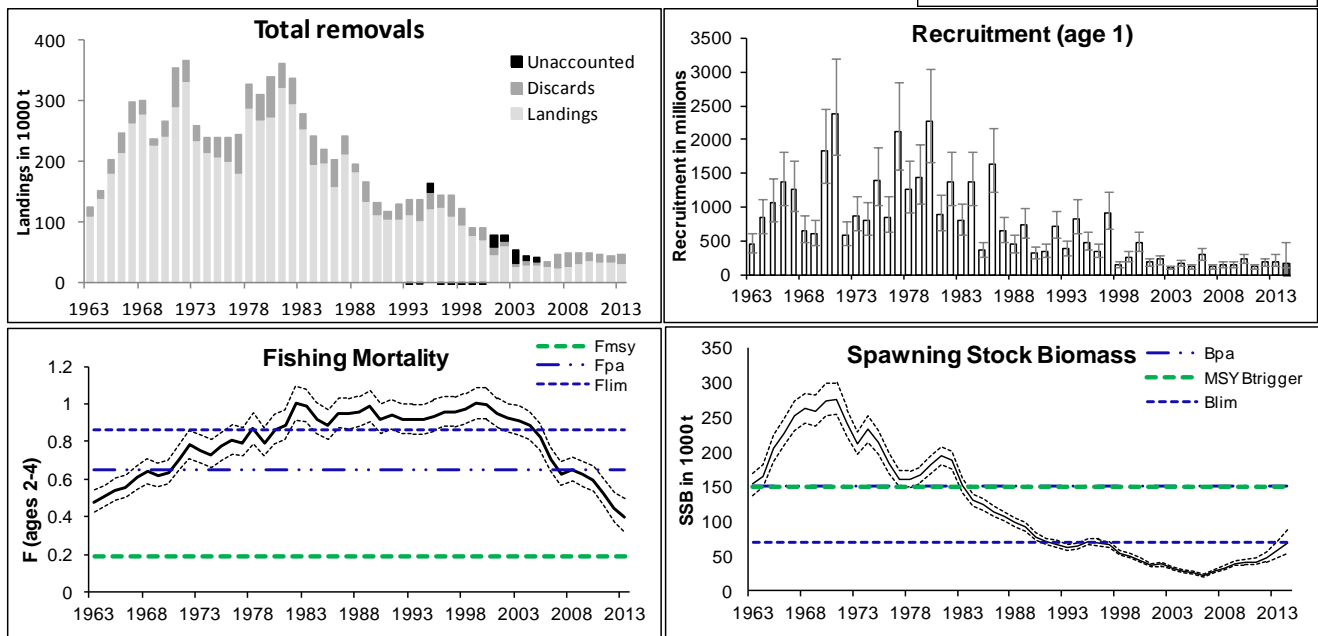
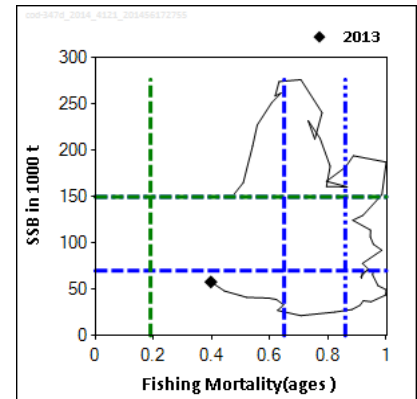
**ECOREGION** North Sea  
**STOCK** Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak)

**Advice for 2015**

ICES advises on the basis of the EU–Norway management plan that catches in 2015 should be no more than 35 486 tonnes. If discard rates do not change from those in 2013, this implies landings of no more than 26 713 tonnes.

**Stock status**

Fishing pressure				
	2011	2012	2013	
MSY ( $F_{MSY}$ )	✗	✗	✗	Above target
Precautionary approach ( $F_{pa}, F_{lim}$ )	✓	✓	✓	Harvested sustainably
Management plan ( $F_{MP}$ )	✗	✗	✗	Above target
Stock size				
	2012	2013	2014	
MSY ( $B_{trigger}$ )	✗	✗	✗	Below trigger
Precautionary approach ( $B_{pa}, B_{lim}$ )	✗	✗	✗	Reduced reproductive capacity
Management plan ( $SSB_{MP}$ )	✗	✗	✗	Below trigger



**Figure 6.3.3.1** Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak). Summary of stock assessment with point-wise 95% confidence intervals. Catch is estimated and adjusted for unaccounted removals (from 1993 to 2005). Predicted values are shaded. Top right: SSB and F over the time-series used in the assessment.

Fishing mortality declined from 2000 and is now estimated to be around 0.4, between  $F_{pa}$  and the  $F_{MSY}$  proxy. SSB has increased from the historical low in 2006, and is now in the vicinity of  $B_{lim}$ . Recruitment since 2000 has been poor.

**Management plans**

The EU–Norway agreement management plan was updated in December 2008 (Annex 6.3.3). The EU has adopted a long-term plan with the same aims (Council Regulation (EC) 1342/2008; Annex 6.3.3). ICES evaluated the plans in 2009 and concluded that they are both in accordance with the precautionary approach if implemented and enforced adequately.

## Biology

Cod is a roundfish that lives near the bottom in diverse habitats and can live up to 25–30 years. Cod is a top predator in the North Sea ecosystem; it feeds on fish, invertebrates, and can be cannibalistic (especially at high densities). Cod is widely distributed throughout the North Sea, but there are indications of subpopulations inhabiting different regions of the North Sea (e.g. from genetic studies). The inferred limited degree of mixing suggests slow recolonization in areas where subpopulations are depleted. Subpopulations also show long-term differences in productivity.

## Environmental influence on the stock

Recent recruitments have been low, possibly influenced by changes in the availability of food resources for cod larvae and increasing predation pressure. There is evidence of cannibalism and seal predation. Multispecies model runs estimate a decrease in cannibalism rates for age 1 and age 2 cod at current low stock levels, while seal predation on ages 3 to 6 has increased over the years due to an increase in seal abundance. Harbour porpoises also take a substantial amount of cod up to age 3.

## The fisheries

Cod are taken by towed gears in mixed demersal fisheries. Cod are targeted by some fleets, but are also caught as part of a mixed fisheries catching haddock, whiting, *Nephrops*, plaice, and sole. Cod discards relative to catch have declined from 49% in 2007 (the highest on record after the UK Buyers and Sellers regulation was introduced) to 21–28% in 2010–2013 (weight of cod discarded from the total estimated cod catch).

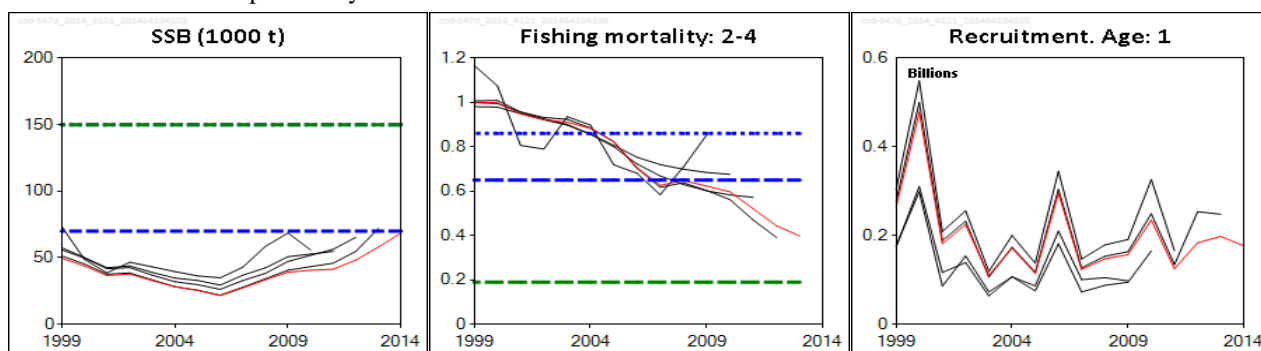
**Catch distribution** Total catch (2013): 45.5 kt, where 32.6 kt were estimated landings (65% demersal trawls and seines >100 mm, 15% gillnets, 8% *Nephrops* trawls 70–99 mm, 5% beam trawls, and 7% other gears) and 12.9 kt estimated discards.

## Effects of the fisheries on the ecosystem

The gillnet fishery for cod takes bycatches of harbour porpoise; since 2001, effort reductions in this fishery have likely led to a decrease in bycatches. Reduced benthic biomass is found more often in areas of bottom trawl activity than in unfished areas.

## Quality considerations

The overall reporting of catch data provided to ICES has improved since 2006, with fully documented fisheries starting in 2011. Unaccounted removals are no longer estimated for 2006 onwards. The main sources of uncertainty are aspects of the input data (historical landings and discards; discrepancies between stock trends implied by the age structure of the commercial catch and surveys) and the assumption of fishing mortality and recruitment in the advice forecast. SSB has been overestimated in previous years.



**Figure 6.3.3.2** Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak). Historical assessment results (final-year recruitment estimates included).

## Scientific basis

<b>Stock data category</b>	1 ( <a href="#">ICES, 2014a</a> ).
<b>Assessment type</b>	State–space assessment model (SAM) with estimates of unaccounted removals for 1993–2005.
<b>Input data</b>	Commercial catches (international landings, ages and length frequencies from catch sampling by métier), one survey index (IBTS Q1). Maturity data from IBTS (1981–1985); maturity assumed constant over time. Annually varying natural mortalities from multispecies model.
<b>Discards and bycatch</b>	Discards included since the 2004 assessment, data series from the main fleets (in 2013 covering 95% of the landings by weight in Subarea IV, 79% in Division IIIa–Skagerrak, and 79% in Division VIIId).
<b>Indicators</b>	None.
<b>Other information</b>	Benchmarked in 2009, inter-benchmark meeting in 2011. A benchmark is planned for 2015.
<b>Working group</b>	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak ( <a href="#">WGNSSK</a> ), Working Group on Mixed Fisheries Advice ( <a href="#">WGMIXFISH-NS</a> ).

## 6.3.3

Supporting information June 2014

**ECOREGION** North Sea  
**STOCK** Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak)

## Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
Management plan	SSB <sub>MP</sub>	150 000 t.	= B <sub>pa</sub> .
	F <sub>MP</sub>	0.4	Mortality rate when SSB >SSB <sub>MP</sub> .
MSY approach	MSY B <sub>trigger</sub>	150 000 t.	The default option of B <sub>pa</sub> .
	F <sub>MSY</sub>	0.19	F <sub>max</sub> 2010, within the range of fishing mortalities consistent with F <sub>MSY</sub> (0.16–0.42).
Precautionary approach	B <sub>lim</sub>	70 000 t.	B <sub>loss</sub> (~1995).
	B <sub>pa</sub>	150 000 t.	B <sub>pa</sub> = Previous MBAL and signs of impaired recruitment below 150 000 t.
	F <sub>lim</sub>	0.86	F <sub>lim</sub> = F <sub>loss</sub> (~1995).
	F <sub>pa</sub>	0.65	F <sub>pa</sub> = approx. 5th percentile of F <sub>loss</sub> , implying an equilibrium biomass >B <sub>pa</sub> .

(Last changed in: 2011)

## Outlook for 2015

Basis:  $F(2014) = F(2013) = 0.40$ ;  $R(2014+)$  re-sampled 1998–2013 = 177 million;  $SSB(2015) = 80.569$ ;  $Catch(2014) = 53.133$ ;  $HC\ landings(2014) = 38.955$ ;  $Discards(2014) = 14.178$ .

Rationale	Catch (2015)	Landings (2015)	Discards (2015)	Basis	F <sub>total</sub> (2015)	F <sub>land</sub> (2015)	F <sub>disc</sub> (2015)	SSB (2016)	%SSB <sup>1)</sup> Change	%TAC <sup>2)</sup> Change
Management plan	35.486	26.713	8.773	Long-term phase	0.22	0.15	0.07	109.1	+35%	-20%
MSY approach	17.220	12.986	4.234	$F_{MSY} \times SSB_{2015}/B_{trigger}$	0.10	0.07	0.03	124.7	+55%	-61%
Zero catch	0	0	0	$F = 0$	0	0	0	139.7	+73%	-100%
<i>Other options</i>	30.710	23.117	7.593	$F_{MSY}$	0.19	0.13	0.06	113.1	+40%	-31%
	35.486	26.713	8.773	$TAC_{2014} - 20\%$	0.22	0.15	0.07	109.1	+35%	-20%
	44.433	33.391	11.042	Constant TAC	0.29	0.20	0.09	101.7	+26%	0%
	46.651	35.061	11.590	$TAC_{2014} + 5\%$	0.31	0.21	0.10	100.0	+24%	+5%
	48.898	36.730	12.168	$TAC_{2014} + 10\%$	0.32	0.22	0.10	98.2	+22%	+10%
	51.183	38.400	12.783	$TAC_{2014} + 15\%$	0.34	0.24	0.10	96.2	+19%	+15%
	53.444	40.069	13.375	$TAC_{2014} + 20\%$	0.36	0.25	0.11	94.3	+17%	+20%
	58.502	43.804	14.698	$F_{2014}$	0.40	0.28	0.12	90.2	+12%	+31%
<i>Mixed fisheries options – minor differences with calculation above can occur because of the different methodology used (ICES, 2014c).</i>										
<i>Maximum</i>	117.656	91.087	26.569	A	1.14	-	-	39.170	-51%	+174%
<i>Minimum</i>	27.910	22.267	5.643	B	0.18	-	-	109.603	+36%	-32%
<i>Cod MP</i>	33.528	26.713	6.815	C	0.22	-	-	104.855	+30%	-19%
<i>SQ effort</i>	57.698	45.681	12.017	D	0.41	-	-	84.826	+5%	+39%
<i>Effort_Mgt</i>	34.647	27.597	7.050	E	0.23	-	-	103.913	+29%	-16%

Weights in thousand tonnes.

<sup>1)</sup>SSB 2016 relative to SSB 2015.

<sup>2)</sup>Landings 2015 relative to TACs 2014 (North Sea 27 799 + Skagerrak 3972 + Eastern English Channel 1620 = 33 391 t).

The Outlook table assumes no change in fishing mortality in 2014 relative to 2013, based on the fact that there is no reduction in effort ceilings for 2014 compared to 2013. If discard rates in 2014 do not change from 2013, this would lead to an assumed overshoot of the TACs in 2014, higher than the additional 12% added to the North Sea TAC for fully documented fisheries (FDF) purposes.

Mixed-fisheries assumptions:

- A. Maximum scenario: Fleets stop fishing when the last quota is exhausted.
- B. Minimum scenario: Fleets stop fishing when the first quota is exhausted.
- C. Cod management plan scenario: Fleets stop fishing when the cod quota is exhausted.
- D. SQ effort scenario: Effort in 2014 and 2015 as in 2013.
- E. Effort management scenario: Effort reductions according to cod and flatfish management plans.

### ***Management plan***

The EU–Norway management plan as updated in December 2008 aims to be consistent with the precautionary approach and is intended to provide for sustainable fisheries and high yield, leading to a target fishing mortality of 0.4 (for details see Annex 6.3.3).

The EU has adopted a long-term plan for this stock with the same aims (Council Regulation (EC) 1342/2008; Annex 6.3.3). In addition to the EU–Norway agreement, the EU plan also includes effort restrictions that reduce the kW-days available to EU vessels in the main métiers catching cod directly proportional to reductions in fishing mortality until the long-term phase of the plan is reached, for which the target  $F$  is 0.4 if  $SSB$  is above  $B_{pa}$ . No reduction in effort ceilings was applied between 2012 and 2014.

The trigger for the long-term phase of the management plan was reached in 2013, when the TAC derived from the long-term phase exceeded the TAC derived from the recovery phase for the first time. Application of the long-term phase calculates the target  $F$  as  $0.4 - (0.2 \times (B_{pa} - SSB_{2014}) / (B_{pa} - B_{lim}))$ , leading to  $F_{2015} = 0.2$ . However, since this implies forecast landings for 2015 that are 20% smaller than the TAC in 2014, the TAC constraint of  $\pm 20\%$  is implemented, leading to  $F_{2015} = 0.22$ .

Following the management plan long-term phase, catches in 2015 should be no more than 35 486 t in total for Subarea IV and Divisions IIIa West and VIId. If discard rates do not change from those in 2013, this implies landings of no more than 26 713 t. Because of annual changes in fishing pattern the assumption on discard ratio is based on the most recent estimate.

### ***MSY approach***

Following the ICES MSY approach requires fishing mortality to be reduced to 0.10 (lower than  $F_{MSY}$  because  $SSB_{2015} < MSY B_{trigger}$ ), resulting in catches of less than 17 220 t in 2015. This is expected to lead to an  $SSB$  of 124 697 t in 2016.

### ***Precautionary approach***

Even a zero catch in 2015 is not expected to result in  $SSB$  reaching  $B_{pa}$  in 2016.

### ***Mixed fisheries***

Mixed-fisheries advice informs managers of the consequences of setting TACs for individual species exploited in a mixed fishery (ICES, 2014b). In contrast to single-species advice, mixed-fisheries advice offers no single recommendation because no management objectives have been defined for mixed fisheries. Mixed-fisheries forecasts explore a range of scenarios that provide insight into the overall balance between the various single-species TACs. Major differences between the outcomes of the various scenarios indicate a potential undershooting or overshooting of the advised landings corresponding to the single-species advice. The results provide indication of which species are globally limiting for the North Sea fisheries as a whole, but may not necessarily reflect the actual constraints on individual fishers.

Assuming fishing patterns and catchability in 2014 and 2015 are unchanged from those in 2013, cod and *Nephrops* in FU 6 are the limiting species (73% and 27%, respectively) for the fleets in the North Sea demersal fisheries in 2015.

The “Minimum”, “Cod MP”, and “Effort management” scenarios of the mixed-fisheries analyses are consistent with the single-species advice for cod. It is noted that in the “Max” scenario, the implied  $F$  would exceed  $F_{pa}$ ; this is not considered precautionary.

### **Additional considerations**

#### ***Management considerations***

The stock status is estimated to be at or below  $B_{lim}$ , recruitment remains low, and  $F$  is declining to levels at which the stock is expected to continue to rebuild.

Since the implementation of the management plan, fishing mortality rates have been reduced and the stock has increased since 2006, in spite of continued low recruitment. Furthermore, there has been an increase in the number of older fish in the population in recent years due to improved survival (Figure 6.3.3.4). Fishing mortality in 2013 is

estimated to be below  $F_{pa}$  while SSB in 2014 is estimated at around  $B_{lim}$ . The spawning stock does show a low average age; this may reduce its reproductive capacity as first-time spawners reproduce less successfully than older fish.

There has been an apparent northerly shift in the mean latitudinal distribution of the stock in the North Sea. However, this is not thought to be due to cod migrating from south to north in response to climate change. It is more likely that cod in the North Sea are composed of a complex of more or less isolated sub-stocks and there do appear to be long-term differences in recruitment trends (Rijnsdorp *et al.*, 2011). For example, over the last 10–15 years the distribution of 0-group cod (recruits) has shifted towards the eastern part of the North Sea region (i.e. the Skagerrak and Kattegat). This means that the abundance of recruits is stable and shows no trends in the eastern part, whereas in the North Sea, a pronounced decline is clearly discernible. This change in distribution of cod recruits is likely to reflect changes (erosion) of the stock structure in the North Sea, so that the only productive units left in the North Sea are those that tend to use the eastern North Sea region as a nursery area (Knutsen *et al.*, 2004; Svedäng and Svenson, 2006; Svedäng *et al.*, 2007). This picture is supported by genetic evidence of a decoupling of population dynamics between the southern and northern North Sea. Thus, signals normally interpreted as evidence for distributional shifts within the North Sea may instead reflect fluctuating densities between stock components (ICES, 2013a).

The presence of subpopulations largely inhabiting different regions of the North Sea will mean that there is a potential for regional differences in fishing mortality, because cod from the northern deep-water subpopulations would not be expected to recolonize areas depleted in the southern North Sea (ICES, 2011b). Management measures ensuring sustainable exploitation of substocks may be needed in addition to management for the stock as a whole.

The change in spatial distribution of cod in combination with the relative stability criteria used to allocate the quota has changed the access of the different fisheries to the resource. This may create problems in managing the fisheries. In some areas, where the present abundance of cod is low, a quota based on historical allocation keys cannot be fully used while in other areas where abundance is relatively high, the quota may be exhausted prematurely and increase the incentive to discarding of catches of over-quota cod. In some cases, this may be overcome by quota swaps. However, quota swaps from areas of low abundance may increase traditional levels of removals of other components of the stock.

Mixed-fisheries considerations are of primary importance for the sustainable exploitation of North Sea species, including cod. Current single-species management causes discarding in mixed fisheries, because individual management objectives are not necessarily consistent with each other. As such, the TAC of one species may be exhausted before the TAC of another, leading to catches of valuable fish that cannot be landed legally. For mixed-fishery results relevant to cod see the “Mixed fisheries” section above. The reductions in TAC that result from implementing the agreed EU–Norway management plan have not been followed in the last two years, partly because of mixed-fisheries considerations.

#### *MSY reference points*

The choice of the  $F_{max}$  as a candidate for  $F_{MSY}$  was based on the clear peak at  $F = 0.19$  in the yield-per-recruit analysis in 2010. Extensive simulations and investigations of the productivity of the stock provide a range of possible candidate values ( $F_{MSY} = 0.16$  to  $0.42$ ). The estimate of  $F_{MSY}$  is strongly dependent on the choice of stock–recruitment (S–R) model.

#### *Management plan evaluations*

ICES evaluated the EC management plan (EC 1342/2008) and the EU–Norway long-term management plan in March 2009 (Annex 6.3.3) and concluded that these management plans are in accordance with the precautionary approach only if implemented and enforced (ICES, 2011a). A joint ICES–STECF group met during 2011 to conduct a historical evaluation of the effectiveness of these plans (ICES, 2011c; Kraak *et al.*, 2013). The group concluded at the time that although there has been a gradual reduction in  $F$  and discards in recent years, the plans for North Sea cod had not controlled  $F$  as envisaged. The reductions in  $F$  observed since 2011 seem to be more pronounced than predicted in this evaluation.

#### *Regulations and their effects*

The North Sea cod benchmark workshop (ICES, 2011b) investigated the incidence of underreporting for the main fishing nations. Underreporting by the Scottish fleet fishing for cod has declined significantly since 2003, and is likely to have been low since 2006. Similarly, based on several indicators (including comparisons between the total quantity of cod registered in logbooks and those registered in sales receipts), the Danish Directorate of Fisheries estimates that the placement of illegal fish on the market does not occur on a large scale.

EU introduced effort restrictions in 2003 (annexes to the annual TAC regulations) for the protection of the North Sea cod stock. In addition, a long-term plan for the recovery of cod stocks was adopted in 2008 (EC regulation 1342/2008). In 2009, the effort management programme switched from a days-at-sea to a kW-day system (EC regulation 43/2009), in which different amounts of kW-days are allocated within each area by Member State to different groups of vessels, depending on gear and mesh size. Effort ceilings are updated annually. However, for 2013 and 2014, the European Council decided upon a roll-over of the effort level in 2012 for both the cod and the sole/plaice management plans.

Overall nominal effort (kW-days) by EU demersal trawls, seines, beam trawls, gill/trammel nets, and longlines (all mesh sizes included) in the North Sea, Skagerrak, and Eastern Channel had been substantially reduced since the implementation of the two successive effort management plans in 2003 and 2008 (−38% between 2003 and 2013, −17% between 2008 and 2013). Following the introduction of days-at-sea regulations in 2003, there was a substantial switch from the larger mesh (>100 mm, TR1) gear to the smaller mesh (70–99 mm, TR2) gear. Subsequently, effort by TR1 has been relatively stable, whereas effort in TR2 and in small-mesh beam trawl (80–120 mm, BT2) has shown a pronounced decline (0%, −52%, and −52%, respectively, between 2004 and 2013). Gill- and trammelnet fisheries have remained stable (ICES, 2014c). Effort in large-meshed beam trawl (≥120 mm, BT1) has increased significantly in 2012 and 2013 after a decade of continuous decline. Nominal effort reported by Norway has increased since 2011 due to the generalization of electronic logbooks.

In February 2008 Scotland implemented a national scheme known as the “Conservation Credits Scheme”. The principle of this two-part scheme involves additional time at sea in return for the adoption of measures which aim at reducing mortality on cod and leading to a reduction in discard numbers. One measure was real-time closures. In 2010, there were 165 closures, and from July 2010 the area of each closure increased (from 50 square nautical miles to 225 square nautical miles). During 2011 there were 185 of these larger closures, while there were 173 in 2012. ICES notes that from the initial year of operation (2008) cod discarding rates in Scotland have decreased from 62% in 2008 to 24% (by weight) in 2011 and 2012, but have increased again to 31% in 2013.

International discard rates in the period where unallocated catch is estimated (1993–2005) are considered not comparable to the later period because of the potential for fish to become undeclared landings instead of discards. There is clear indication, however, that the discard rate for age 2 fish has been increasing since the early 1980s (Figure 6.3.3.5).

#### *Information from the fishing industry*

Results of the 2013 North Sea Fishers stock survey were not available.

Both the Danish REX and the UK northeast coast cod surveys (collaborative research projects with the fishing industry) indicated that catch rates of cod were significantly greater on the hard ground than on the soft ground. The Danish REX survey also indicated much higher catch rates of cod in the first quarter compared to the third quarter for a trawler and Danish seines, but not for a gillnetter. This can possibly be explained by the high water turbidity caused by the more frequent storm events in the first quarter (the gillnetter is not affected by this to the same extent as the other two vessels). A UK whitefish survey, initiated in 2009, indicated that catches of older cod are more frequent and less noisy in this survey than in the IBTS Q3 survey. This is supported by results from the Danish REX survey, which shows good agreement with the IBTS Q3 survey for younger ages, but not for older ages. The Danish REX, UK northeast coast, and UK whitefish surveys have all been discontinued due to lack of funding. Such surveys require sustained support for at least five years in order for their outputs to be considered for inclusion in stock assessments as time-series indices.

#### *Changes in fishing technology and fishing patterns*

The introduction of closed-circuit TV (CCTV, 20% of landings in 2013) and fully documented fisheries (FDF) programmes starting in 2010 in Scotland, Denmark, Germany, the Netherlands, and England is expected to have contributed to the reduction of cod mortality. Under this scheme, UK vessels are not permitted to discard any cod, while Danish and German vessels are still permitted to discard undersized cod. For all vessels taking part, all cod caught are counted against the quota. Some of the fleets in this programme have shown a noticeable increase in smaller fish in the landings, which could imply that less highgrading occurs.

#### *Environmental influence*

The North Sea is characterized by episodic changes in the productivity of key components of the ecosystem. Phytoplankton, zooplankton, and demersal and pelagic fish have all exhibited such cycles in variability. The gadoid outburst during the 1970s and 1980s in which cod, haddock, and whiting stock abundances increased substantially was considered to result from such effects. The low recruitment abundance observed in cod in recent years is thought to be

the result of the combined effects of low spawning biomass and environmental factors (e.g., sea temperature, changes in the prey field, predation on juveniles).



### *Effects of the fisheries on the ecosystem*

Hiddink *et al.* (2006) estimates that in areas of bottom trawl activity in the North Sea, benthic biomass and production is reduced by 56% and 21%, respectively, compared with an unfished situation.

### *Uncertainty in the assessment*

The main source of uncertainty in the assessment is the discrepancy between the information coming from commercial catch and the scientific survey used to tune the assessment. The exact reason for this is unknown, but may be due to a change in the spatial distribution of the stock. The main sources of uncertainty in the advice forecast are recruitment assumptions and assumptions about fishing mortality in 2014. For the assessment in 2014, there was a downward revision in SSB and a corresponding upward revision in fishing mortality, resulting from the addition of a single year of data; although these adjustments were still within the confidence bounds of the previous assessments, they imply that the forecast provided in 2013 was overly optimistic.

Discrepancy between the information coming from commercial catch data and the scientific survey used for tuning the assessment, resulted in the estimation of unaccounted mortality and catches for the period 1993–2005. Since 2013, ICES assumes there is no unaccounted mortality from 2006 onwards, the year that catch reporting is believed to have been substantially improved compared to earlier years, partially due to the UK Buyers and Sellers' legislation coming into force in the UK (ICES, 2011b).

The IBTS Q3 survey has not been included in the assessment since 2011 because of the conflicting trends between the IBTS Q1 and Q3 indices, possibly resulting from changes in the catchability/availability of cod in Q3 related to recent changes in fish distribution (ICES, 2011b). Similar issues are becoming evident in the IBTS Q1 index.

The time-series of recruitment estimates was revised downwards in 2011 (with the change in assessment model), and upwards in 2012 (with the update of the natural mortality estimates by predation from multispecies work; ICES, 2011d). Assuming no unaccounted mortality from 2006 onwards (since the 2013 assessment) has reduced the retrospective pattern in F observed in previous assessments. This has led to a slight downward revision of recruitment and SSB. All these revisions may influence the stock–recruitment relationship and therefore require re-evaluation of reference points in a benchmark.

Despite these uncertainties the quality of the assessment is sufficient to conclude that the SSB is around Blim, recruitment remains low, and F is declining to levels at which the stock is expected to continue to rebuild.

An in-depth analyses of the issues mentioned above will be considered for the benchmark meeting in early 2015.

The overall quality of catch data provided to ICES has improved since 2012. International landings and discard rate estimates for 2013 were provided and raised according to the data collection framework (DCF) métier categories.

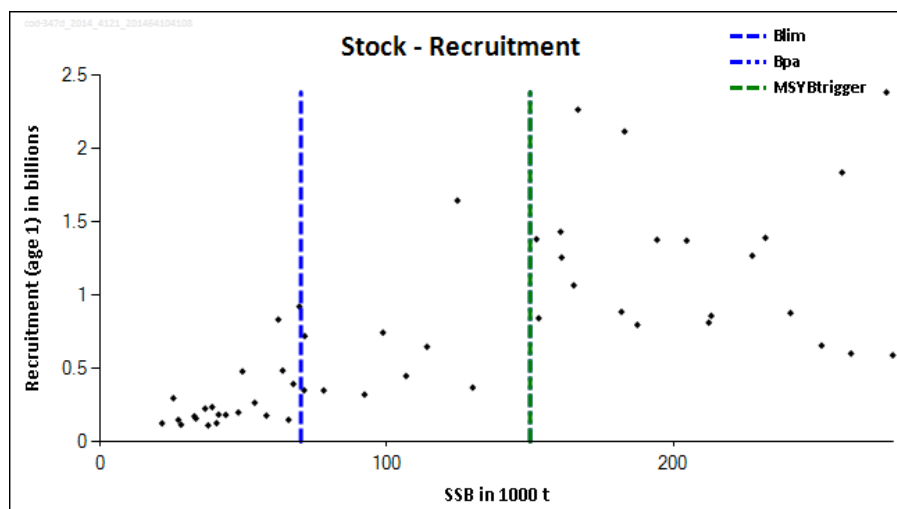
### *Comparison of the basis of previous assessment and advice*

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 EU–Norway management plan.

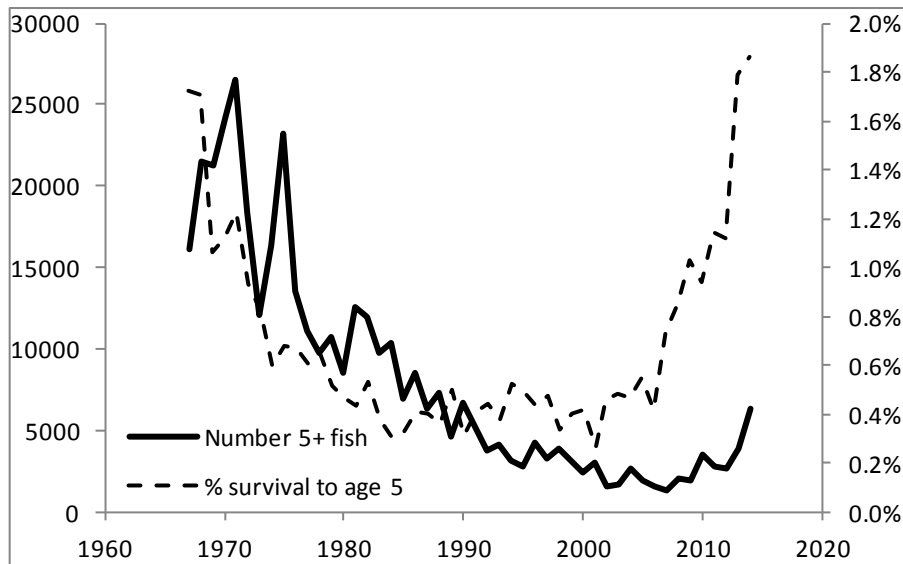
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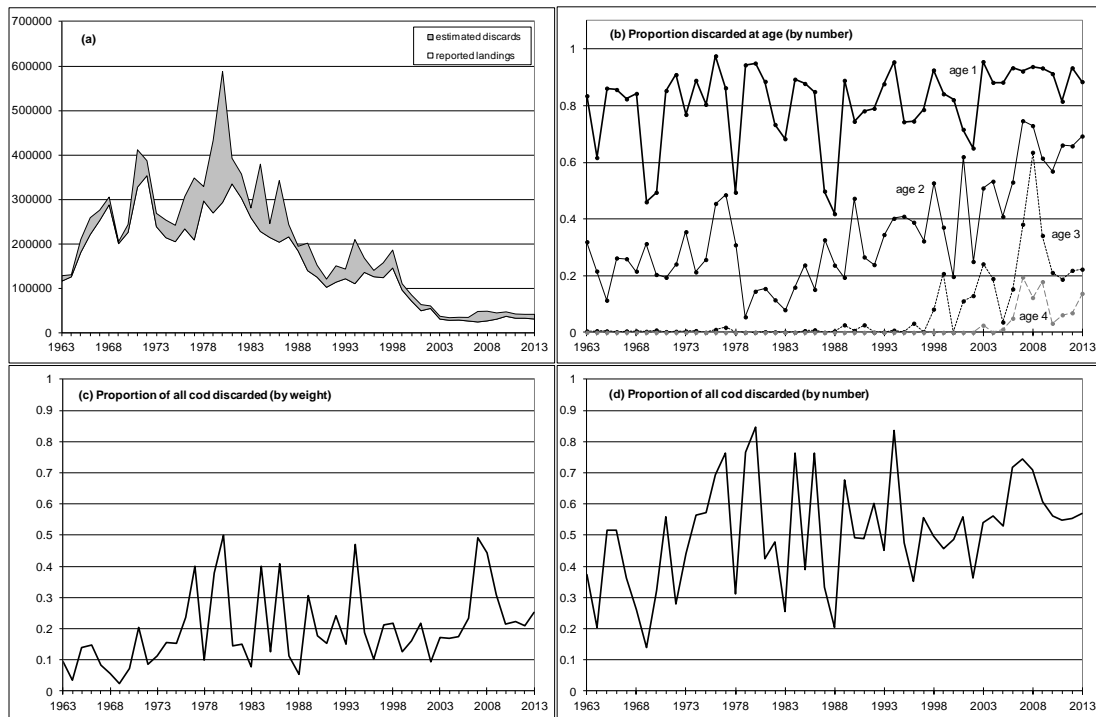
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**Figure 6.3.3.3** Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak). Stock–recruitment plot.



**Figure 6.3.3.4** Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak). Estimates of the number of 5-year-old and older cod in the population (solid line; thousands) and the percentage of 1-year-olds by number that have survived to age 5 in the given year (dashed line).



**Figure 6.3.3.5** Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak). (a) Stacked area plot of reported landings and estimated discards (in tonnes); (b) proportion of total numbers caught at age that are discarded; (c) proportion of total weight caught that is discarded; and (d) proportion of the total numbers caught that are discarded. In 2013, 96% of 1-year-old, 70% of 2-year-old, 22% of 3-year-old, and 7% of 4-year-old cod were discarded.

**Table 6.3.3.1** Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak). ICES advice, management, and catch/landings. Landings for each of the three parts of this combined-area assessment and for all areas combined are given in Table 6.3.3.2.

**North Sea (Subarea IV)**

Year	ICES Advice	Predicted landings corresponding to advice	Agreed TAC	Official landings	ICES landings
1987	SSB recovery; TAC	100–125	175	167	182
1988	70% of F(86); TAC	148	160	142	157
1989	Halt SSB decline; protect juveniles; TAC	124	124	110	116
1990	80% of F (88); TAC	113	105	99	105
1991	70% of effort (89)		100	87	89
1992	70% of effort (89)		100	98	97
1993	70% of effort (89)		101	94	105
1994	Significant effort reduction		102	87	95
1995	Significant effort reduction		120	111	120
1996	80% of F(94) = 0.7	141	130	107	107
1997	80% of F(95) = 0.65	135	115	102	102
1998	F(98) should not exceed F(96)	153	140	122	122
1999	F = 0.60 to rebuild SSB	125	132	78	78
2000	F less than 0.55	< 79	81	60.9	59
2001	lowest possible catch	0	48.6	41.7	41
2002	lowest possible catch	0	49.3	44.4	44.3
2003	Closure	0	27.3	25.9	25.9
2004	Zero catch	0	27.3	23.8	23.6
2005	Zero catch	0	27.3	22.5	23.9
2006	Zero catch	0	23.2	23.1	22.1
2007	Zero catch	0	20.0	20.8	19.7
2008	Exploitation boundaries in relation to precautionary limits. Total removals < 22 000 t	< 22	22.2	22.3	22.2
2009	Zero catch	0	28.8	27.4	25.6
2010	Management plan F (65% of F <sub>2008</sub> )	< 40.3 <sup>a</sup>	33.6	31.7	31.3
2011	See scenarios	-	26.8	27.8	27.7
2012	Management plan F (45% of F <sub>2008</sub> )	< 31.8	26.5	27.6	26.7
2013	Management plan (TAC –20%)	< 25.441	26.5	26.3	25.8
2014	Management plan long-term phase	< 28.809	27.8		
2015	Management plan long-term phase	< 26.713			

Weights in thousand tonnes.

<sup>a</sup> From 2010 onwards, the advice is for Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak).

**Table 6.3.3.1 (cont.)** Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak). ICES advice, management, and catch/landings. Landings for each of the three parts of this combined-area assessment and for all areas combined are given in Table 6.3.3.2.

**Skagerrak (Division IIIa West)**

Year	ICES Advice	Predicted landings corresponding to advice	Agreed TAC <sup>1)</sup>	Official landings	ICES landings <sup>1)</sup>
1987	F = F <sub>max</sub>	< 21	22.5	19.9	20.9
1988	Reduce F		21.5	17.0	16.9
1989	F at F <sub>med</sub>	< 23	20.5	18.7	19.6
1990	F at F <sub>med</sub> ; TAC	21.0	21.0	17.8	18.6
1991	TAC	15.0	15.0	12.1	12.4
1992	70% of F(90)		15.0	14.0	14.8
1993	Precautionary TAC		15.0	14.7	15.3
1994	No long-term gain in increased F + precautionary TAC		15.5	15.1	13.9
1995	If required precautionary TAC; link to North Sea		20.0	19.8	12.1
1996	If required precautionary TAC; link to North Sea		23.0	17.9	16.4
1997	If required precautionary TAC; link to North Sea		16.1	15.7	14.9
1998	If required precautionary TAC; link to North Sea	21.9	20.0	15.6	15.3
1999	F = 0.60 to rebuild SSB	17.9	19.0	11.8	11.0
2000	F less than 0.55	< 11.3	11.6	9.9	9.3
2001	lowest possible catch	0	7.0	7.7	7.1
2002	lowest possible catch	0	7.1	7.1	7.5
2003	Closure	0	3.9	4.5	3.8
2004	Zero catch	0	3.9	4.5	3.8
2005	Zero catch	0	3.9	4.3	3.8
2006	Zero catch	0	3.3	3.9	3.4
2007	Zero catch	0	2.9	3.7	3.0
2008	Exploitation boundaries in relation to precautionary limits. Total removals less than 22 000 t	< 22	3.2	3.8	3.3
2009	Zero catch	0	4.1	4.0	3.9
2010	Management plan F (65% of F <sub>2008</sub> )	< 40.3*	4.8	4.2	4.1
2011	See scenarios	-	3.8	4.1	3.9
2012	Management plan F (45% of F <sub>2008</sub> )	< 31.8	3.8	4.4	4.3
2013	Management plan (TAC -20%)	< 25.441	3.8	4.2	4.4
2014	Management plan long-term phase	< 28.809	4.0		
2015	Management plan long-term phase	< 26.713			

Weights in thousand tonnes.

<sup>1)</sup> Norwegian fjords not included.

\* From 2010 onwards, the advice is for Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak).

**Table 6.3.3.1 (cont.)** Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak). ICES advice, management, and catch/landings. Landings for each of the three parts of this combined-area assessment and for all areas combined are given in Table 6.3.3.2.

**Eastern Channel (Division VIIId)**

Year	ICES Advice	Predicted landings corresponding to advice	Agreed TAC*	Official landings	ICES landings
1987	Not assessed	-	-	9.4	14.2
1988	Precautionary TAC	-	-	10.1	10.7
1989	No increase in F; TAC	10.0 <sup>a</sup>	-	n/a	5.5
1990	No increase in F; TAC	9.0 <sup>a</sup>	-	n/a	2.8
1991	Precautionary TAC	3.0 <sup>a</sup>	-	n/a	1.9
1992	If required, precautionary TAC	5.5 <sup>a</sup>	-	2.7	2.7
1993	If TAC required, consider SSB decline	-	-	2.5	2.4
1994	Reduce F + precautionary TAC	-	-	2.9	2.9
1995	Significant effort reduction; link to North Sea	-	-	4.0	4.0
1996	Reference made to North Sea advice	-	-	3.5	3.5
1997	No advice	-	-	7.2	7.0
1998	Link to North Sea	4.9	-	8.7	8.6
1999	F = 0.60 to rebuild SSB	4.0	-	n/a	6.9
2000	F less than 0.55	< 2.5	-	3.6	2.3
2001	lowest possible catch	0	-	2.0	1.6
2002	lowest possible catch	0	-	1.6	3.1
2003	Closure	0	-	1.9	1.2
2004	Zero catch	0	-	1.0	0.8
2005	Zero catch	0	-	1.2	1.0
2006	Zero catch	0	-	1.5	1.1
2007	Zero catch	0	-	2.1	1.7
2008	Exploitation boundaries in relation to precautionary limits. Total removals less than 22 000 t	< 22	-	1.7	1.4
2009	Zero catch	0	1.7	2.0	1.2
2010	Management plan F (65% of F <sub>2008</sub> )	< 40.3 <sup>b</sup>	2.0	1.8	1.8
2011	See scenarios	-	1.6	1.3	1.2
2012	Management plan F (45% of F <sub>2008</sub> )	< 31.8	1.5	1.1	1.1
2013	Management plan (TAC -20%)	< 25.441	1.5	0.9	0.9
2014	Management plan long-term phase	< 28.809	1.6		
2015	Management plan long-term phase	< 26.713			

Weights in thousand tonnes.

\* Until 2008 this area was included in the TAC for Subarea VII (except Division VIIa). From 2009 a separate TAC is set.

<sup>a</sup> Including Division VIIe.

<sup>b</sup> From 2010 onwards, the advice is for Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak).

Table 6.3.3.2

Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak). Nominal landings (in tonnes) as officially reported to ICES, and ICES estimates of catches.

Sub-area IV										
Country	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Belgium	2,648	4,827	3,458	4,642	5,799	3,882	3,304	2,470	2,616	1,482
Denmark	19,243	24,067	23,573	21,870	23,002	19,697	14,000	8,358	9,022	4,676
Faroe Islands	80	219	44	40	102	96	-	9	34	36
France	1,868	3,040	1,934	3,451	2,934	.	1,222	717	1,777	620
Germany	5,974	9,457	8,344	5,179	8,045	3,386	1,740	1,810	2,018	2,048
Greenland	.	.	.	.	.	.	.	.	.	.
Netherlands	6,512	11,199	9,271	11,807	14,676	9,068	5,995	3,574	4,707	2,305
Norway	7,707	7,111	5,869	5,814	5,823	7,432	6,410	4,369	5,217	4,417
Poland	-	-	18	31	25	19	18	18	39	35
Sweden	630	709	617	832	540	625	640	661	463	252
UK (E/W/Nl)	13,941	14,991	15,930	13,413	17,745	10,344	6,543	4,087	3,112	2,213
UK (Scotland)	28,854	35,848	35,349	32,344	35,633	23,017	21,009	15,640	15,416	7,852
Total Nominal Catch	87,457	111,468	104,407	99,423	114,324	77,566	60,881	41,713	44,421	25,936
Unallocated landings	7,066	8,555	2,161	2,746	7,779	826	-1,114	-740	-121	-89
<b>WG estimate of total landings</b>	<b>94,523</b>	<b>120,023</b>	<b>106,568</b>	<b>102,169</b>	<b>122,103</b>	<b>78,392</b>	<b>59,767</b>	<b>40,973</b>	<b>44,300</b>	<b>25,847</b>
<b>Agreed TAC</b>	<b>102,000</b>	<b>120,000</b>	<b>130,000</b>	<b>115,000</b>	<b>140,000</b>	<b>132,400</b>	<b>81,000</b>	<b>48,600</b>	<b>49,300</b>	<b>27,300</b>
Division VIIId										
Country	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Belgium	228	377	321	310	239	172	110	93	51	54
Denmark	9	-	-	-	-	-	-	-	-	-
France	2,338	3,261	2,808	6,387	7,788	.	3,084	1,677	1,361	1,730
Netherlands	-	-	-	-	19	3	4	17	6	36
UK (E/W/Nl)	312	336	414	478	618	454	385	249	145	121
UK (Scotland)	<0.5	<0.5	4	3	1	-	-	-	-	-
Total Nominal Catch	2,887	3,974	3,547	7,178	8,665	629	3,583	2,036	1,563	1,941
Unallocated landings	-37	-10	-44	-135	-85	6,229	-1,258	-463	1,534	-707
<b>WG estimate of total landings</b>	<b>2,850</b>	<b>3,964</b>	<b>3,503</b>	<b>7,043</b>	<b>8,580</b>	<b>6,858</b>	<b>2,325</b>	<b>1,573</b>	<b>3,097</b>	<b>1,234</b>
Division IIIa (Skagerrak)**										
Country	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Denmark	11,921	15,888	14,573	12,159	12,339	8,682	7,656	5,870	5,511	3,054
Germany	399	285	259	81	54	54	54	32	83	49
Norway	850	1,039	1,046	1,323	1,293	1,146	926	762	645	825
Sweden	1,834	2,483	1,986	2,173	1,900	1,909	1,293	1,035	897	510
Others	71	134	-	-	-	-	-	-	-	27
Norwegian coast *	760	846	748	911	976	788	624	846	.	.
Danish industrial by-catch *	666	749	676	205	97	62	99	687	.	.
Total Nominal Catch	15,075	19,829	17,864	15,736	15,586	11,791	9,929	7,699	7,136	4,465
Unallocated landings	-1,814	-7,720	-1,615	-790	-255	-817	-652	-613	332	-674
<b>WG estimate of total landings</b>	<b>13,261</b>	<b>12,109</b>	<b>16,249</b>	<b>14,946</b>	<b>15,331</b>	<b>10,974</b>	<b>9,277</b>	<b>7,086</b>	<b>7,468</b>	<b>3,791</b>
<b>Agreed TAC</b>	<b>15,500</b>	<b>20,000</b>	<b>23,000</b>	<b>16,100</b>	<b>20,000</b>	<b>19,000</b>	<b>11,600</b>	<b>7,000</b>	<b>7,100</b>	<b>3,900</b>
Sub-area IV, Divisions VIIId and IIIa (Skagerrak) combined										
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Nominal Catch	105,419	135,271	125,818	122,337	138,575	89,986	74,393	51,448	53,120	32,342
Unallocated landings	5,215	825	502	1,821	7,439	6,239	-3,024	-1,816	1,745	-1,470
<b>WG estimate of total landings</b>	<b>110,634</b>	<b>136,096</b>	<b>126,320</b>	<b>124,158</b>	<b>146,014</b>	<b>96,225</b>	<b>71,369</b>	<b>49,632</b>	<b>54,865</b>	<b>30,872</b>
** Skagerrak/Kattegat split derived from national statistics										
* The Danish industrial by-catch and the Norwegian coast catches are not included in the (WG estimate of) total landings of Division IIIa										
. Magnitude not available - Magnitude known to be nil <0.5 Magnitude less than half the unit used in the table n/a Not applicable										
Division IIIa (Skagerrak) landings not included in the assessment										
Country	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Norwegian coast *	760	846	748	911	976	788	624	846	.	.
Danish industrial by-catch *	666	749	676	205	97	62	99	687	.	.
<b>Total</b>	<b>1,426</b>	<b>1,595</b>	<b>1,424</b>	<b>1,116</b>	<b>1,073</b>	<b>850</b>	<b>723</b>	<b>1,533</b>	.	.

**Table 6.3.3.2 (cont.)** Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak). Nominal landings (in tonnes) as officially reported to ICES, and ICES estimates of catches.

Sub-area IV										
Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Belgium	1,627	1,722	1,309	1,009	894	946	666	653	862	1,075
Denmark	5,889	6,291	5,105	3,430	3,831	4,402	5,686	4,863	4,803	4,536
Faroe Islands	37	34	3	-	16	45	32	.	.	0
France	294	664	354	659	573	950	781	619	368	286
Germany	2,213	2,648	2,537	1,899	1,736	2,374	2,844	2,211	2,385	1,921
Greenland	.	35	23	17	17	11	.	.	.	0
Netherlands	1,726	1,660	1,585	1,523	1,896	2,649	2,657	1,928	1,955	1,344
Norway	3,223	2,900	2,749	3,057	4,128	4,234	4,496	4,898	4,614	4,060
Poland	-	-	-	1	2	3	.	2	.	0
Sweden	240	319	309	387	439	378	363	315	471	332
UK (E/W/Nl)	1,890	1,270	1,491	1,587	1,546	2,384	2,553	.	.	.
UK (Scotland)	6,650	4,936	6,857	6,511	7,185	9,052	11,568	.	.	.
UK (combined)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	12,310	12,187	12,782
Others	.	.	786	.	.	.	.	.	.	0
Norwegian indust by-catch *	.	.	48	101	22	4	201	1	.	.
Danish industrial by-catch *	.	.	34	18	46	76	11	0	0	34
Total Nominal Catch	23,789	22,479	23,108	20,080	22,263	27,428	31,646	27,799	27,645	26,336
Unallocated landings	-240	1,391	-1,012	-336	-68	-1,800	-346	-71	-987	-552
<b>WG estimate of total landings</b>	<b>23,549</b>	<b>23,870</b>	<b>22,096</b>	<b>19,744</b>	<b>22,195</b>	<b>25,628</b>	<b>31,300</b>	<b>27,728</b>	<b>26,658</b>	<b>25,784</b>
<b>Agreed TAC</b>	<b>27,300</b>	<b>27,300</b>	<b>23,205</b>	<b>19,957</b>	<b>22,152</b>	<b>28,798</b>	<b>33,552</b>	<b>26,842</b>	<b>26,475</b>	<b>26,475</b>
Division VIIId										
Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Belgium	47	51	80	84	154	73	57	56	40	52
Denmark	-	-	-	.	.	.	.	.	.	.
France	810	986	1,124	1,743	1,326	1,779	1,606	1,078	885	742
Netherlands	14	9	9	59	30	35	45	51	40	38
UK (E/W/Nl)	103	184	267	175	144	134	127	.	.	.
UK (Scotland)	-	-	1	12	7	3	1	.	.	.
UK (combined)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	126	99	100
Total Nominal Catch	974	1,230	1,481	2,073	1,661	2,024	1,836	1,311	1,064	932
Unallocated landings	-167	-197	-353	-331	-307	-777	-44	-93	0	-34
<b>WG estimate of total landings</b>	<b>807</b>	<b>1,033</b>	<b>1,128</b>	<b>1,742</b>	<b>1,354</b>	<b>1,247</b>	<b>1,792</b>	<b>1,218</b>	<b>1,064</b>	<b>898</b>
<b>Agreed TAC</b>						<b>1,678</b>	<b>1,955</b>	<b>1,564</b>	<b>1,543</b>	<b>1,543</b>
Division IIIa (Skagerrak)**										
Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Denmark	3,009	2,984	2,478	2,228	2,552	3,023	3,289	3,118	3,177	3,057
Germany	99	86	84	67	52	55	56	60	78	69
Norway	856	759	628	681	779	440	375	421	587	573
Sweden	495	488	372	370	365	459	458	518	520	501
Others	24	21	373	385	13	2	26	0	0	33
Norwegian coast *	720	759	524	494	498	342	369	342	467	378
Danish industrial by-catch *	10	18	9	.	-	1	0	0	0	26
Total Nominal Catch	4,483	4,338	3,935	3,731	3,761	3,979	4,204	4,117	4,362	4,233
Unallocated landings	-696	-533	-569	-784	-463	-101	-116	-192	-60	177
<b>WG estimate of total landings</b>	<b>3,787</b>	<b>3,805</b>	<b>3,366</b>	<b>2,947</b>	<b>3,298</b>	<b>3,878</b>	<b>4,089</b>	<b>3,925</b>	<b>4,302</b>	<b>4,410</b>
<b>Agreed TAC</b>	<b>3,900</b>	<b>3,900</b>	<b>3,315</b>	<b>2,851</b>	<b>3,165</b>	<b>4,114</b>	<b>4,793</b>	<b>3,835</b>	<b>3,783</b>	<b>3,783</b>
Sub-area IV, Divisions VIIId and IIIa (Skagerrak) combined										
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Total Nominal Catch	29,246	28,047	28,524	25,884	27,685	33,431	37,686	33,227	33,071	31,501
Unallocated landings	-1,103	661	-1,934	-1,451	-838	-2,678	-506	-356	-1,047	-409
<b>WG estimate of total landings</b>	<b>28,143</b>	<b>28,708</b>	<b>26,590</b>	<b>24,433</b>	<b>26,847</b>	<b>30,753</b>	<b>37,180</b>	<b>32,871</b>	<b>32,023</b>	<b>31,092</b>
** Skagerrak/Kattegat split derived from national statistics										
* The Danish and Norwegian industrial by-catch and the Norwegian coast catches are not included in the (WG estimate of) total landings										
. Magnitude not available - Magnitude known to be nil <0.5 Magnitude less than half the unit used in the table n/a Not applicable										
Division IV and IIIa (Skagerrak) landings not included in the assessment										
Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Norwegian coast *	720	759	524	494	498	342	369	342	467	378
Norwegian indust by-catch *	.	.	48	101	22	4	201	1	.	.
Danish industrial by-catch *	10	18	43	18	46	77	11	0	0	60
<b>Total</b>	<b>730</b>	<b>777</b>	<b>615</b>	<b>613</b>	<b>566</b>	<b>423</b>	<b>582</b>	<b>343</b>	<b>467</b>	<b>438</b>





### Annex 6.3.3 Management plans

#### EU–Norway management plan – Agreed record between EU and Norway, Clonakilty, 18 January 2013.

1. The Parties agree to restrict their fishing on the basis of TACs consistent with a fishing mortality rate that maximises long-term yield and maintains spawning stock biomass above Bpa.

#### Transitional arrangement:

2. F will be reduced as follows: 75% of F in 2008 for the TACs in 2009, 65% of F in 2008 for the TACs in 2010, and applying successive decrements of 10% for the following years.

The transitional phase ends as from the first year in which the long-term management arrangement (paragraphs 3–5) leads to a higher TAC than the transitional arrangement.

#### Long-term management

3. If the size of the stock on 1 January of the year prior to the year of application of the TACs is:
  - a. Above the precautionary spawning biomass level, the TACs shall correspond to a fishing mortality rate of 0.4 on appropriate age groups;
  - b. Between the minimum spawning biomass level and the precautionary spawning biomass level, the TACs shall not exceed a level corresponding to a fishing mortality rate on appropriate age groups equal to the following formula:  
$$0.4 - (0.2 * (\text{Precautionary spawning biomass level} - \text{spawning biomass}) / (\text{Precautionary spawning biomass level} - \text{minimum spawning biomass level}))$$
  - c. At or below the limit spawning biomass level, the TAC shall not exceed a level corresponding to a fishing mortality rate of 0.2 on appropriate age groups.
4. Notwithstanding paragraphs 2 and 3, the TAC for 2010 and subsequent years shall not be set at a level that is more than 20 % below or above the TACs established in the previous year.
5. When scientific advice indicates that the application of the rules set out in paragraphs 2 to 4 is not appropriate to meet the objectives of the plan, the Parties may, notwithstanding the above mentioned provisions, decide on an alternative TAC level.
6. Where the stock has been exploited at a fishing mortality rate close to 0.4 during three successive years, the parameters of this plan shall be reviewed on the basis of advice from ICES in order to ensure exploitation at maximum sustainable yield.
7. The TAC shall be calculated by deducting the following quantities from the total removals of cod that are advised by ICES as corresponding to the fishing mortality rates consistent with the management plan:
  - a. A quantity of fish equivalent to the expected discards of cod from the stock concerned;
  - b. A quantity corresponding to other relevant sources of cod mortality.
8. The Parties agree to adopt values for the minimum spawning biomass level (70,000 tonnes), the precautionary biomass level (150,000 tonnes) and to review these quantities as appropriate in the light of ICES advice.

#### Procedure for setting TACs in data-poor circumstances

9. If, due to a lack of sufficiently precise and representative information, it is not possible to implement the provisions in paragraphs 3 to 7, the TAC will be set according to the following procedure.
  - a. If the scientific advice recommends that the catches of cod should be reduced to the lowest possible level the TAC shall be reduced by 25% with respect to the TAC for the preceding year;
  - b. In all other cases the TAC shall be reduced by 15% with respect to the TAC for the previous year, unless the scientific advice recommends otherwise.

This plan entered into force on 1 January 2013.

## EU management plan

In December 2008 the European Council agreed on a new cod management plan implementing the new system of effort management and a target fishing mortality of 0.4 (EC 1342/2008). The HCR for setting TAC for the North Sea cod stock states:

Article 7 1.(a) and 1.(b) are required for interpretation of Article 8.

*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. [...]

*Article 8: Procedure for setting TACs for the cod stock in the North Sea*

1. Each year, the Council shall decide on the TACs for the cod stock in the North Sea. The TACs shall be calculated by applying the reduction rules set out in Article 7 paragraph 1(a) and (b).
2. The TACs shall initially be calculated in accordance with paragraphs 3 and 5. From the year where the TACs resulting from the application of paragraphs 3 and 5 would be lower than the TACs resulting from the application of paragraphs 4 and 5, the TACs shall be calculated according to the paragraphs 4 and 5.
3. Initially, the TACs shall not exceed a level corresponding to a fishing mortality which is a fraction of the estimate of fishing mortality on appropriate age groups in 2008 as follows: 75 % for the TACs in 2009, 65 % for the TACs in 2010, and applying successive decrements of 10 % for the following years.
4. Subsequently, if the size of the stock on 1 January of the year prior to the year of application of the TACs is:
  - (a) above the precautionary spawning biomass level, the TACs shall correspond to a fishing mortality rate of 0,4 on appropriate age groups;
  - (b) between the minimum spawning biomass level and the precautionary spawning biomass level, the TACs shall not exceed a level corresponding to a fishing mortality rate on appropriate age groups equal to the following formula:  $0,4 - (0,2 * (\text{Precautionary spawning biomass level} - \text{spawning biomass}) / (\text{Precautionary spawning biomass level} - \text{minimum spawning biomass level}))$
  - (c) at or below the limit spawning biomass level, the TACs shall not exceed a level corresponding to a fishing mortality rate of 0,2 on appropriate age groups.
5. Notwithstanding paragraphs 3 and 4, the Council shall not set the TACs for 2010 and subsequent years at a level that is more than 20 % below or above the TACs established in the previous year.
6. Where the cod stock referred to in paragraph 1 has been exploited at a fishing mortality rate close to 0,4 during three successive years, the Commission shall evaluate the application of this Article and, where appropriate, propose relevant measures to amend it in order to ensure exploitation at maximum sustainable yield.

*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.