

iv) Full assessment of cod in Div. 3M and advice for 2015 (Item 7)

The Fisheries Commission requests the Scientific Council to conduct a full assessment of Div. 3M cod and provide advice for 2015 on a range of management options and associated risks regarding reference points, according to Annexes A or B.

Scientific Council responded:

**Cod in Division 3M**

Advice June 2014 for 2015

**Recommendation for 2015**

In the short term the stock can sustain values of  $F$  up to  $F_{max}$ , however any fishing mortality over  $F_{max}$  will result in an overall loss in yield in the long term. Scientific Council considers that yields at  $F_{statusquo}$  are not a viable option. Projections are heavily influenced by the 2010 and 2011 year classes, which is estimated to be extremely large, but with high uncertainty. Given the uncertainty in the projections, Scientific Council makes recommendations for 2015 only. The stock should be reassessed in 2015.

**Management objectives**

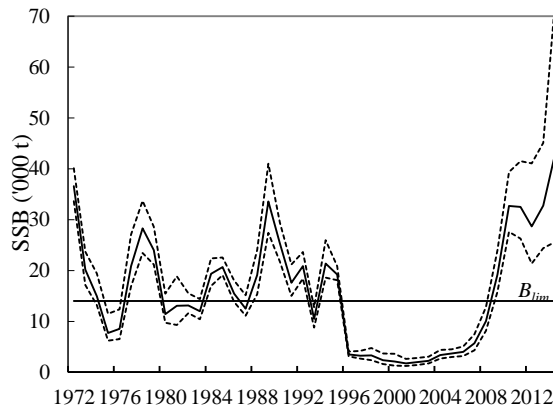
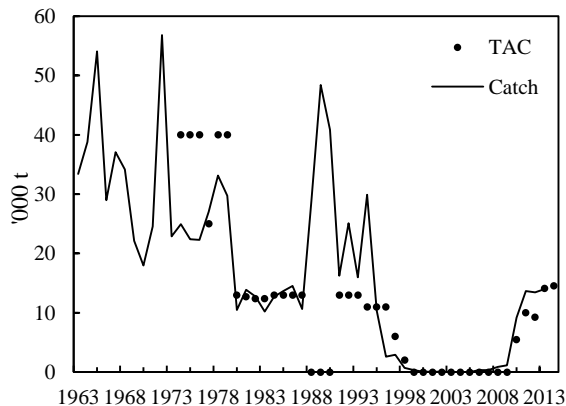
A management strategy evaluation for this stock is being developed by Fisheries Commission and Scientific Council but is not yet being implemented. At this moment general convention objectives (NAFO/GC Doc 08/3) are applied.

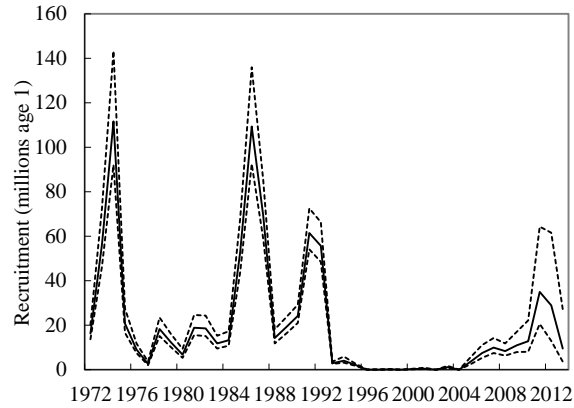
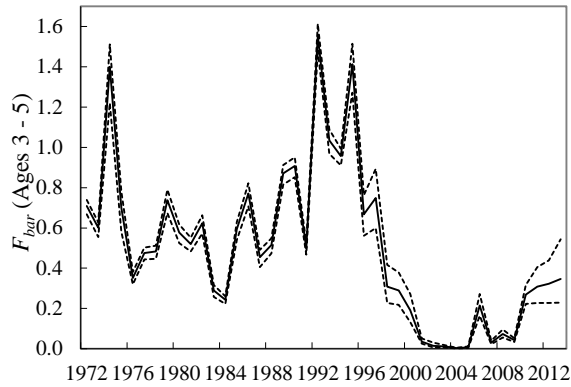
Convention objectives	Status	Comment/consideration	
Restore to or maintain at $B_{msy}$	●	Stock increasing	● OK
Eliminate overfishing	●	Current $F$ not sustainable in the long term	● Intermediate
Apply Precautionary Approach	●	$F_{lim}$ and $B_{lim}$ defined. HCR in development	● Not accomplished
Minimise harmful impacts on living marine resources and ecosystems	●	No specific measures, general VME closures in effect	○ Unknown
Preserve marine biodiversity	○	Cannot be evaluated	

**Management unit**

The cod stock in Flemish Cap (NAFO Div. 3M) is considered to be a separate population.

**Stock status**





**Stock Status (cont.)**

Current SSB is estimated to be well above  $B_{lim}$ . Recent recruitments are relatively high, but these estimates are imprecise. Fishing mortality in 2013 is high, at the level of more than twice  $F_{max}$ .

**Reference points**

- $B_{lim}$ : 14 000 t of spawning biomass (Scientific Council 2008).
- $F_{lim} = F_{msy} (F_{30\%})$ : 0.13 (developed in Scientific Council 2014 – not used in assessment at this time)
- $F_{max}$ : 0.145

**Projections**

	B			SSB			Yield		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
$F_{bar} = F_{0.1}$ (median = 0.090)									
2014	45089	66953	100551	29651	44869	67628		14521	
2015	51148	85726	141169	33526	58334	96126	3717	7091	13216
2016	80488	140565	242288	50201	84280	140612			
$F_{bar} = F_{max}$ (median = 0.145)									
2014	45089	66953	100551	29651	44869	67628		14521	
2015	51007	85528	141921	33538	58341	96142	5804	10838	19894
2016	75911	134970	233068	47116	79646	133162			
$F_{bar} = 2/3F_{max}$ (median = 0.097)									
2014	45089	66953	100551	29651	44869	67628		14521	
2015	51600	85659	140511	33564	58355	96133	3984	7463	13901
2016	79919	139414	241557	49720	83828	140158			
$F_{bar} = 3/4F_{max}$ (median = 0.109)									
2014	45089	66953	100551	29651	44869	67628		14521	
2015	51451	85707	141013	33554	58302	96130	4449	8327	15461
2016	79064	138195	238799	49331	82737	138519			
$F_{bar} = 0.85F_{max}$ (median = 0.123)									
2014	45089	66953	100551	29651	44869	67628		14521	
2015	50976	85605	140451	33567	58341	96114	4999	9351	17275
2016	77772	136555	239130	48233	81526	136327			
$F_{bar} = 0.75F_{2013}$ (median = 0.259)									
2014	45089	66953	100551	29651	44869	67628		14521	
2015	50963	85988	141194	33526	58346	96068	12494	17926	27715
2016	68617	125904	226920	39178	70884	121773			
$F_{bar} = F_{2013}$ (median = 0.346)									
2014	45089	66953	100551	29651	44869	67628		14521	
2015	51451	85545	141194	33526	58346	96068	12494	17926	27715
2016	64236	119001	216119	35038	65093	113266			
$F_{bar} = 1.25F_{2013}$ (median = 0.432)									
2014	45089	66953	100551	29651	44869	67628		14521	
2015	51073	85533	139749	33535	58327	96233	18611	26799	40670
2016	59161	113669	207151	31681	60010	106017			

	$p(B < B_{lim})$			$p(F > F_{0.1})$			$p(F > F_{max})$			$p(B_{2016} > B_{2013})$
	2014	2015	2016	2014	2015	2016	2014	2015	2016	
$F_{0.1}$	<5%	<5%	<5%							>95%
$F_{max}$	<5%	<5%	<5%	>95%	>95%	>95%				>95%
$2/3 F_{max}$	<5%	<5%	<5%	>95%	>95%	>95%				>95%
$3/4 F_{max}$	<5%	<5%	<5%	>95%	>95%	>95%				>95%
$0.85 F_{max}$	<5%	<5%	<5%	>95%	>95%	>95%				>95%
$0.75 F_{2013}$	<5%	<5%	<5%	>95%	>95%	>95%	>95%	>95%	>95%	>95%
$F_{2013}$	<5%	<5%	<5%	>95%	>95%	>95%	>95%	>95%	>95%	>95%
$1.25 F_{2013}$	<5%	<5%	<5%	>95%	>95%	>95%	>95%	>95%	>95%	>95%

### Assessment

A quantitative model introduced in 2008 was used (Scientific Council 2008). Model settings were unchanged. Due to problems of estimating exact catches for 2011 and 2012, catches were estimated within the model. For 2013 catches, Scientific Council agreed Daily Catch Report (DCR) data were the best available estimate. The unavailability of independently verifiable catch estimates over 2011 – 2012 introduces an additional element of uncertainty in the assessment.

The next full assessment of this stock is planned for 2015.

### Human impact

Mainly fishery related mortality. Other sources (e.g. pollution, shipping, oil-industry) are considered minor.

### Biological and environmental interactions

Redfish, shrimp and smaller cod are important prey items for cod. Recent studies indicate strong trophic interactions between these species in the Flemish Cap.

### Fishery

Cod is caught in a directed trawl fishery and as bycatch in the directed redfish fishery by trawlers. The fishery is regulated by quota. Recent catch estimates and TACs are as follows:

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
TAC	ndf	ndf	ndf	ndf	ndf	5.5	10	9.3	14.1	14.5
STATLANT 21	0.0	0.1	0.1	0.4	1.2	5.3	9.8	9.0	11.2	
STACFIS	0.0	0.3	0.3	0.9	1.2	9.2	13.6 <sup>1</sup>	13.4 <sup>1</sup>	14.0 <sup>2</sup>	

<sup>1</sup> Estimated via the assessment model

<sup>2</sup> Daily Catch Reports

### Effects of the fishery on the ecosystem

No specific information available. General impacts of fishing gear on the ecosystem should be considered.

### Special comments

In 2012 and 2013 the lack of length distributions and age-length keys from some contracting parties has further increased uncertainty in the current assessment.

Rapid changes in the biological parameters of this stock in recent years, and the sudden decrease in 2013 EU-survey indices, has led to the conclusion that last year's projections were overly optimistic. Similar revisions were noted in the 2012 assessment. If inter-annual variability continues, the accuracy of projections is reduced.

### Sources of information

SCR Doc. 14/35, 14/17; SCS Doc. 14/06, 14/10, 14/13, 14/16, NAFO/GC Doc 08/3