Cod in Division 3M   Advice June 2015

Recommendation for 2016 and 2017

Scientific Council considers that yields at $F_{2012\text{-}14}$ are not sustainable over the longer term. In $F_{2012\text{-}14}$ projections there is a very high probability (>97%) of F exceeding F_{lim}.

Yields at F_{lim} correspond to catches of 12 425 t in 2016 and 15 436 t in 2017. In keeping with the precautionary approach, Scientific Council recommends that the TAC be less than the catch corresponding to F_{lim}

Under both F_{lim} and $F_{2012\text{-}14}$ -based scenarios there is a very low probability (<1%) of SSB being below B_{lim}.

Management objectives

A management strategy evaluation for this stock is being developed by Fisheries Commission and Scientific Council, but has not yet been finalized. 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
Eliminate overfishing	🔴	$F > F_{msy}$ - Current F not sustainable
Apply Precautionary Approach	🟡	F_{lim} and B_{lim} defined, HCR in development
Minimise harmful impacts on living marine resources and ecosystems	🟡	VME closures in effect, no specific measures.
Preserve marine biodiversity	⚪	Cannot be evaluated

🟢 OK
🟡 Intermediate
🔴 Not accomplished
⚪ Unknown

Management unit

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

Stock status

Current SSB is estimated to be well above B_{lim}. Recruitments since 2005 have been relatively high, especially in 2011 and 2012, although the 2013-2014 ones were much lower than the level observed in 2011-2012. F increased in 2010 with the opening of the fishery and it has remained stable since then at two times F_{lim}.
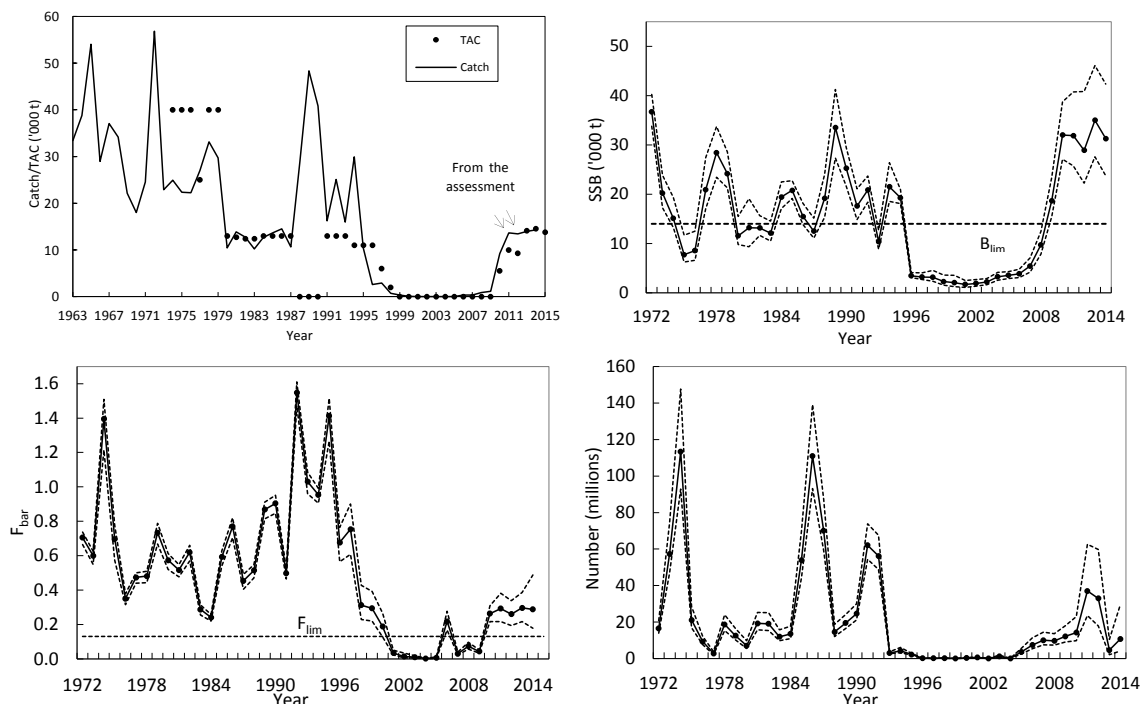
Reference points

B_{lim}: 14 000 t of spawning biomass (Scientific Council 2008)

$F_{lim} = F_{30\%SPR}$: 0.131 (Scientific Council, 2014)

Projections

	B		SSB		Yield	
	Median (90% CI)					
	$F_{bar} = F_{lim}$ (median – 0.131)					
2015	65 670	(44 646 – 96 439)	48 340	(31 543 – 73 066)	13 795	
2016	73 884	(43 934 – 118 238)	54 691	(31 574 – 88 297)	12 425	(6250 – 23 906)
2017	91 376	(48 809 – 158 835)	57 478	(34 419 - 91 536)	15 436	(7944 – 27 988)
2018	110 214	(46 833 – 209 350)	60 049	(31 712 – 103 003)		
	$F_{bar} = ¾F_{lim}$ (median – 0.098)					
2015	65 670	(44 646 – 96 439)	48 340	(31 543 – 73 066)	13 795	
2016	73 884	(43 934 – 118 238)	54 691	(31 574 – 88 297)	9 578	(4780 – 18 656)
2017	94 576	(50 794 – 163 415)	60 421	(36 089 – 96 404)	12 468	(6336 – 23 292)
2018	115 463	(50 233 – 216 608)	64 768	(34 675 – 109 361)		
	$F_{bar} = F_{2012 – 2014}$ (median – 0.285)					
2015	65 670	(44 646 – 96 439)	48 340	(31 534 – 73 066)	13 795	
2016	73 884	(43 934 – 118 238)	54 691	(31 574 – 88 297)	23 435	(14 510 – 37 577)
2017	79 734	(39 947 – 143 720)	46 143	(26 479 – 75 954)	23 435	(13 832 – 37 384)
2018	92 346	(34 387 – 185 558)	44 176	(21 238 – 81 238)		
	$F_{bar} = ¾F_{2012 – 2014}$ (median – 0.213)					
2015	65 670	(44 646 – 96 439)	48 340	(31 543 – 73 066)	13 795	
2016	73 884	(43 934 – 118 238)	54 691	(31 574 – 88 297)	18 637	(11 489 – 29 889)
2017	85 044	(43 520 – 150 672)	51 203	(29 423 – 83 238)	20 469	(12 052 – 33 209)
2018	100 070	(39 286 – 197 776)	50 823	(25 612 – 90 466)		

	Yield			$P(B_{year} < B_{lim})$				$P(F_{year} > F_{lim})$			$P(B_{2018} > B_{2014})$
	2015	2016	2017	2015	2016	2017	2018	2015	2016	2017	
F_{lim}	13 795	12 425	15 436	<1%	<1%	<1%	<1%	50%	50%	50%	95%
$¾F_{lim}$	13 795	9 578	12 486	<1%	<1%	<1%	<1%	<1%	<1%	<1%	97%
$F_{2012-2014}$	13 795	23 435	23 435	<1%	<1%	<1%	<1%	>99%	>99%	>99%	79%
$¾ F_{2012-2014}$	13 795	18 637	20 469	<1%	<1%	<1%	<1%	97%	97%	97%	88%

Under all scenarios there is a very low probability (<1%) of SSB being below B_{lim} and for $F_{2012-2014}$ projections, a very high probability (>97%) of F exceeding F_{lim}.

Assessment

A quantitative model introduced in 2008 was used (Scientific Council 2008). Model settings were unchanged. 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 2017.

Human impact

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

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 (000 t) are as follows:

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
TAC	ndf	ndf	ndf	ndf	5.5	10.0	9.3	14.1	14.5	13.8
STATLANT 21	0.1	0.1	0.4	1.2	5.3	10.0	9.1	13.5	10.5	
STACFIS	0.3	0.3	0.9	1.2	9.2	13.6[1]	13.4[1]	14.0	14.3	

[1] Estimated via the assessment model

Effects of the fishery on the ecosystem

No specific information available. General impacts of fishing gear on the ecosystem should be considered. A large area of Div. 3M has been closed to protect sponge, seapens and coral.

Special comments

A clear trend in the biological parameters of this stock in recent years has led to revisions in estimated numbers from one year's assessment to the actual ones in the next assessment. If this pattern continues, the projection results could be biased.

Commercial catches indicate a shift in the length distribution towards the minimum landing size, which could be a concern as it would result in a larger number of individuals being taken for the same TAC, and additionally, may result in increased discarding (see also VII.1.c.iii).

Sources of information

SCR Docs. 15/17, 15/33; SCS Docs. 15/04, 15/05, 15/06, 15/07, NAFO SC Reports 2014, 2008, NAFO/GC Doc. 08/3