Cod in Division 3M Advice June 2020 for 2021

Recommendation for 2021

Scientific Council notes that the strong year classes of 2009 to 2011 are dominant in the current SSB. Subsequent recruitments are much lower; therefore, substantial declines in stock size are occurring and expected to continue in the very near future under any fishing scenario.

Yield of less than or equal to 1 000 tonnes in 2021 results in a very low probability (≤10%) of SSB being below B_{lim} in 2022 and a very low probability of exceeding F_{lim}. For any catch over 1 000 tonnes, the probability of being below B_{lim} exceeds the NAFO Precautionary Approach guidelines.

Management objectives

No explicit management plan or management objectives have been defined by the Commission. Convention General Principles are applied.

Convention objectives	*Status*	*Comment/consideration*
Restore to or maintain at B_{msy}	🟡	Stock above B_{lim} in 2020. B_{msy} is unknown
Eliminate overfishing	🔴	$F>F_{lim}$ in 2019
Apply Precautionary Approach	🟢	F_{lim} and B_{lim} defined
Minimise harmful impacts on living marine resources and ecosystems	🟡	VME closures in effect, no specific measures
Preserve marine biodiversity	⚪	Cannot be evaluated

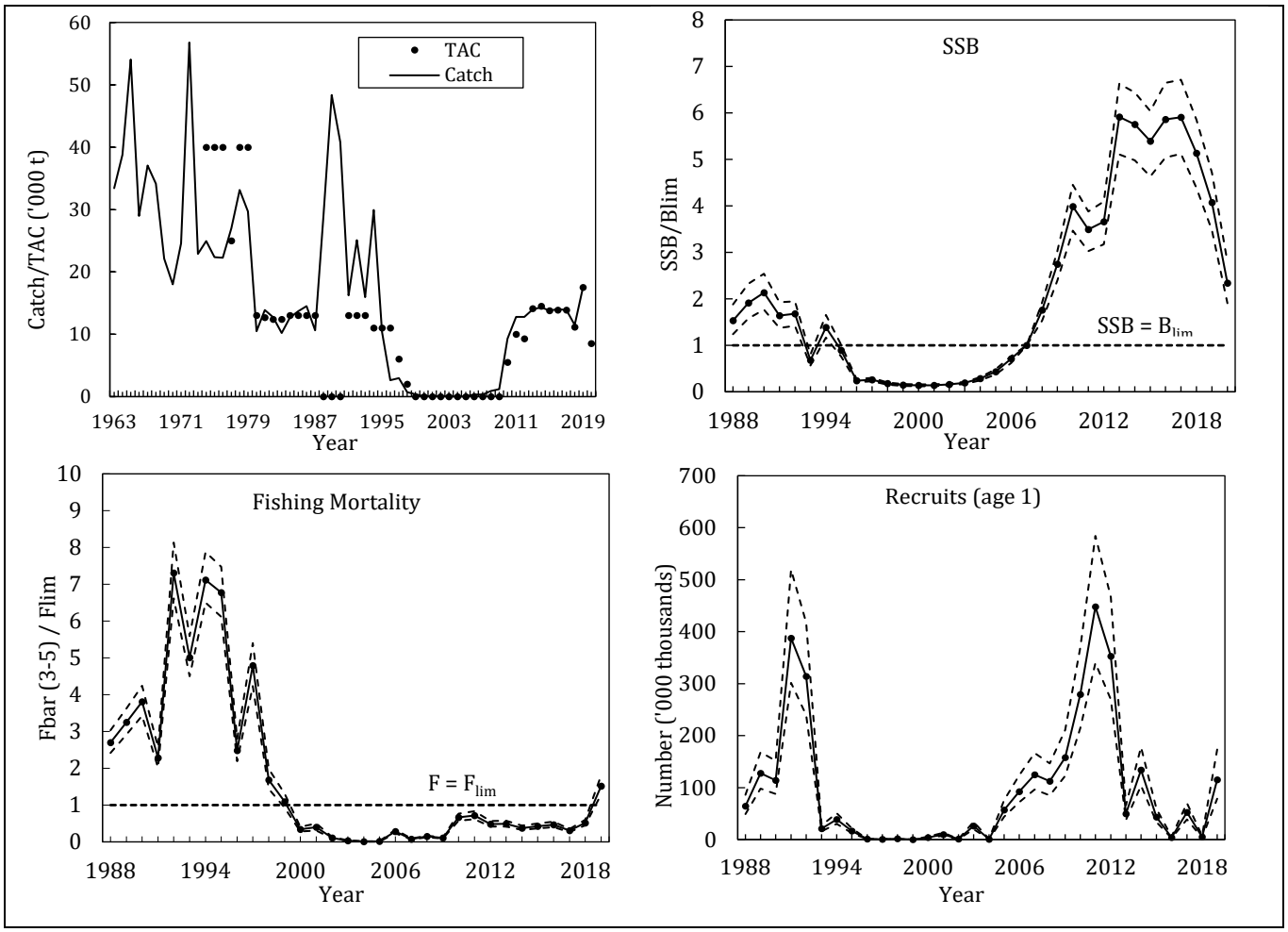
🟢 OK
🟡 Intermediate
🔴 Not accomplished
⚪ Unknown

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 above B_{lim} (median 15 271 t) although it is declining rapidly and is expected to continue its decline in the near future due to poor recruitment between 2015 and 2018. F increased in 2010 with the re-opening of the fishery although until 2018 it was below F_{lim} (median 0.191). In 2019, F increased to a level above F_{lim}.



Reference points

$B_{lim} = SSB_{2007}$:	Median = 15 271 tonnes of spawning biomass (Scientific Council, 2020).
$F_{lim} = F_{30\%SPR}$:	Median = 0.191 (Scientific Council, 2020)

Projections

	B		SSB		Yield
	Median and 80% CI				
$F_{bar}=3/4F_{lim}$ (median=0.143)					
2020	48777	(42258 - 55350)	35725	(30140 - 41365)	8531
2021	35857	(30252 - 41757)	23121	(18576 - 27867)	5595
2022	26786	(21764 - 32499)	15472	(11920 - 19144)	4622
2023	19902	(15130 - 25556)	14280	(10838 - 18316)	
$F_{bar}=0$					
2020	48777	(42258 - 55350)	35725	(30140 - 41365)	8531
2021	35857	(30252 - 41757)	23121	(18576 - 27867)	0
2022	32245	(27255 - 37930)	20159	(16445 - 23914)	0
2023	28937	(24157 - 34759)	22321	(18764 - 26370)	
Catch=1000 tons					
2020	48777	(42258 - 55350)	35725	(30140 - 41365)	8531
2021	35857	(30252 - 41757)	23121	(18576 - 27867)	1000
2022	31265	(26251 - 36956)	19317	(15655 - 23065)	1000
2023	27176	(22347 - 32982)	20743	(17192 - 24760)	
Catch=3000 tons					
2020	48777	(42258 - 55350)	35725	(30140 - 41365)	8531
2021	35857	(30252 - 41757)	23121	(18576 - 27867)	3000
2022	29305	(24278 - 35017)	17616	(13964 - 21334)	3000
2023	23596	(18837 - 29285)	17549	(14040 - 21560)	

	Yield			$P(B < B_{lim})$				$P(F > F_{lim})$			
	2020	2021	2022	2020	2021	2022	2023	2020	2021	2022	$P(B_{23} > B_{20})$
3/4Flim = 0.143	8531	5595	4622	<1%	1%	50%	62%	4%	5%	6%	<1%
F=0	8531	0	0	<1%	1%	6%	1%	4%	0%	0%	<1%
Catch=1000t	8531	1000	1000	<1%	1%	10%	4%	4%	<1%	<1%	<1%
Catch=3000t	8531	3000	3000	<1%	1%	24%	24%	4%	<1%	<1%	<1%

Although advice is given only for 2021, projection results are shown to 2023 to illustrate the medium-term implications.

The results indicate that under all scenarios, total biomass during the projected years will decrease sharply, while the SSB will increase slightly in 2023 with the *F*=0 and the Catch=1 000 tonnes scenarios. The probability of SSB being below B_{lim} in 2022 and 2023 is very high (≥24%) in the scenarios with $F_{bar}=3/4F_{lim}$ and Catch=3 000 tonnes, while being very low (≤10%) in the rest of the cases. The probability of SSB in 2023 being above that in 2020 is <1%.

Under all scenarios, the probability of F exceeding F_{lim} is less than or equal to 6% in 2021 and 2022.

Assessment

A Bayesian SCAA model was used as the basis for the assessment of this stock with data from 1988 to 2019.

The next full assessment for this stock will be in 2021.

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 directed trawl and longline fisheries and as bycatch in the directed redfish fishery by trawlers. The fishery is regulated by quota.

Recent catch estimates and TACs ('000 tonnes) are as follows:

,000 tons	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TAC	5.5	10.0	9.3	14.1	14.5	13.8	13.9	13.9	11.1	17.5	8.5
STATLANT 21	5.2	10.0	9.1	13.5	14.4	12.8	13.8	13.9	10.5	13.0	
STACFIS	9.3	12.8	12.8	13.985	14.3	13.8	14.0	13.9	11.5	17.5	

Effects of the fishery on the ecosystem

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 comment

The stock is declining very rapidly and is expected to be at very low levels during the next few years.

Sources of information

SCS Doc. 20/06, 20/07, 20/08, 20/09 and SCR Doc. 20/11, 20/31.