Witch flounder in Divisions 3NO Advice June 2022 for 2023-2024

Recommendation for 2023 and 2024

In the projection period there is less than a 10% probability of being below $B_{lim,}$ however the probability of exceeding F_{lim} is estimated to be above 30% in 2024 for F greater than $2/3F_{MSY}$. Scientific Council therefore recommends that F should be no higher than $2/3\ F_{MSY}$.

Management objectives

The Commission adopted a total allowable catch (TAC) of 1 175 t for 2021 and 2022. Convention General Principles are applied (NAFO GC Doc. 07-04).

Convention General Principles	*Status*	*Comment/consideration*
Restore to or maintain at B_{MSY}	🔴	Probability of $B_{2022} < B_{MSY} = 94\%$
Eliminate overfishing	🟢	$F < F_{MSY}$
Apply Precautionary Approach	🟢	Reference points defined
Minimise harmful impacts on living marine resources and ecosystems	🟡	VME closures in effect, no specific measures.
Preserve marine biodiversity	⚪	Cannot be evaluated

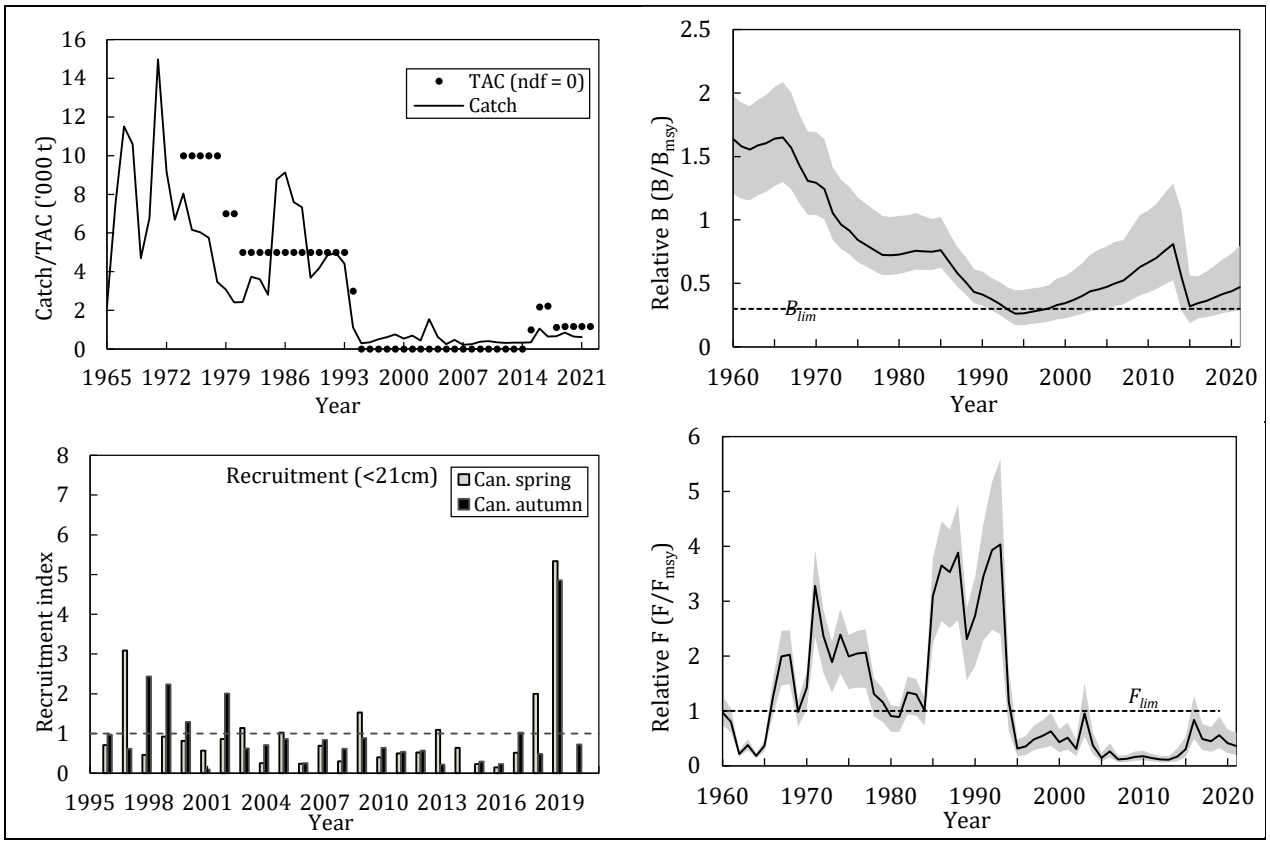
🟢 OK
🟡 Intermediate
🔴 Not accomplished
⚪ Unknown

Management unit

The management unit is NAFO Divisions 3NO. The stock mainly occurs in Div. 3O along the southwestern slopes of the Grand Bank. In most years the distribution is concentrated toward the slopes but in certain years, a higher percentage may be distributed in shallower water.

Stock status

The stock has increased slightly since 2015 and is estimated at 49% B_{MSY}. At the beginning of 2022, there is 9% risk of the stock being below B_{lim} and less than 1% risk of *F* being above F_{lim}. Recruitment is uncertain.



Reference points

Reference points are estimated from the surplus production model. Scientific Council considers that 30% B_{MSY} is a suitable biomass limit reference point (B_{lim}) and F_{MSY} a suitable fishing mortality limit reference point for stocks where a production model is used.

Projections and risk analyses.

The probability of *F* exceeding F_{lim} in 2022 is 14% at a catch of 1 175 t (TAC 2022). The probability of *F* being above F_{lim} ranged from 1% to 50% for the catch scenarios tested. The population is projected to grow under all scenarios and the probability that the biomass in 2025 is greater than the biomass in 2022 is greater than 60% in all scenarios. The population is projected to remain below B_{MSY} through to the beginning of 2025 for all levels of *F* examined with a probability of 86% or greater. The probability of projected biomass being below B_{lim} by 2025 was 5% to 9% in all catch scenarios examined and was 4% by 2025 in the *F*=0 scenario.

Projected yield (t) and the risk of F> F_{lim}, B< B_{lim} and B< B_{MSY} and probability of stock growth (B_{2025}>B_{2022}) under projected F values of F=0, F_{2021}, 2/3 F_{MSY}, 85% F_{MSY}, and F_{MSY}, and catch=TAC (1 175 t) are presented in the following tables.

Projections with catch in 2022 = TAC (1 175 t)		
Year	Yield (t) median	Projected relative Biomass(B/B_{msy}) median (80% CL)
F0		
2023	0	0.53 (0.31, 0.94)
2024	0	0.58 (0.34, 1.03)
2025		0.62 (0.37, 1.12)
F_{2021} = 0.022		
2023	699	0.53 (0.31, 0.94)
2024	744	0.56 (0.33, 1.01)
2025		0.60 (0.35, 1.09)
Catch 1 175t		
2023	1175	0.53 (0.31, 0.94)
2024	1175	0.56 (0.32, 1.00)
2025		0.58 (0.33, 1.07)
2/3 F_{msy} = 0.041		
2023	1295	0.53 (0.31, 0.94)
2024	1367	0.55 (0.32, 1.00)
2025		0.58 (0.33, 1.06)
85% F_{msy} =0.053		
2023	1651	0.53 (0.31, 0.94)
2024	1724	0.55 (0.32, 1.00)
2025		0.56 (0.32, 1.05)
F_{msy} =0.062		
2023	1943	0.53 (0.31, 0.94)
2024	2010	0.54 (0.31, 0.99)
2025		0.55 (0.31, 1.04)

Catch 2022=1 175 t	Yield (t)			P($F>F_{lim}$)			P($B<B_{lim}$)				P($B<B_{msy}$)				
	2022	2023	2024	2022	2023	2024	2022	2023	2024	2025	2022	2023	2024	2025	P(B_{2025}>B_{2022})
F0	1175	0	0	14%	12%	<1%	9%	8%	6%	4%	94%	92%	89%	86%	0.73
F_{2021} = 0.022	1175	699	744	14%	12%	1%	9%	8%	7%	5%	94%	92%	89%	87%	0.68
Catch $_{2023}$ & Catch$_{2024}$= 1 175t	1175	1175	1175	14%	12%	11%	9%	8%	7%	6%	94%	92%	90%	87%	0.65
2/3 Fmsy = 0.041	1175	1295	1367	14%	12%	19%	9%	8%	8%	7%	94%	92%	90%	88%	0.64
85% Fmsy =0.053	1175	1651	1724	14%	12%	37%	9%	8%	8%	8%	94%	92%	90%	88%	0.62
Fmsy=0.062	1175	1943	2010	14%	12%	50%	9%	8%	9%	9%	94%	92%	90%	89%	0.60

Assessment

This stock is assessed utilizing a surplus production model in a Bayesian framework. Full assessments were conducted annually from 2017-2020 and in 2022.

The input data were catch from 1960-2021, Canadian spring survey series from 1984-1990, Canadian spring survey series from 1991-2019 (no 2006, 2020 or 2021 surveys) and the Canadian autumn survey series from 1990-2020 (no 2014 or 2021 surveys).

The next assessment is planned for 2024.

Human impact

Mainly fishery related mortality. Other potential sources (e.g. pollution, shipping, and oil-industry) are undocumented. The impact of bottom fishing activities on major VMEs in the NRA was last assessed in 2021. The risk of Significant Adverse Impacts (SAIs) on sponge and large gorgonian VMEs was assessed to be low, while this risk for sea pen VMEs has been assessed as intermediate. The risks of SAIs on small gorgonian, black coral, bryozoan and sea squirt VMEs were assessed as high. This assessment of impacts of bottom fishing activities on VMEs does not include waters within coastal states jurisdictions. Within the Grand Bank (3LNO) EPU areas in Div. 3O and 3L have been closed to fishing to protect corals.

Biological and environmental interactions

Witch flounder in NAFO Divs. 3NO are distributed mainly along the tail and southwestern slopes of the Grand Bank.

The Grand Bank (3LNO) EPU continues to experience low overall productivity conditions, and total biomass remains well below pre-collapse levels. However, recent warming, earlier phytoplankton spring bloom, and an increase in the proportion of energy-rich copepod species may have positive effects on total ecosystem production in the coming years.

Fishery

The fishery was reopened to directed fishing in 2015 and is exploited by otter trawl. Prior to the reopening, witch flounder were caught primarily as bycatch in bottom otter trawl fisheries for yellowtail flounder, redfish, skate and Greenland halibut.

Recent catch estimates and TACs ('000t) are:

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
TAC	ndf	ndf	1.0	2.2	2.2	1.1	1.2	1.2	1.2	1.2
STATLANT 21	0.3	0.3	0.4	1.0	0.6	0.6	0.9	0.6	0.8	
STACFIS	0.3	0.3	0.4	1.1	0.7	0.7	0.9	0.7	0.6	

ndf = no directed fishery.

Effects of the fishery on the ecosystem

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

Special comments

It is unclear if the recruitment index (survey number of fish<21 cm) is representative. In the absence of Canadian surveys for 2021, current recruitment cannot be determined.

Sources of Information

SCR Docs. 22/005, 22/007, 22/014; SCS Docs. 22/06, 22/09, 22/10, 22/13